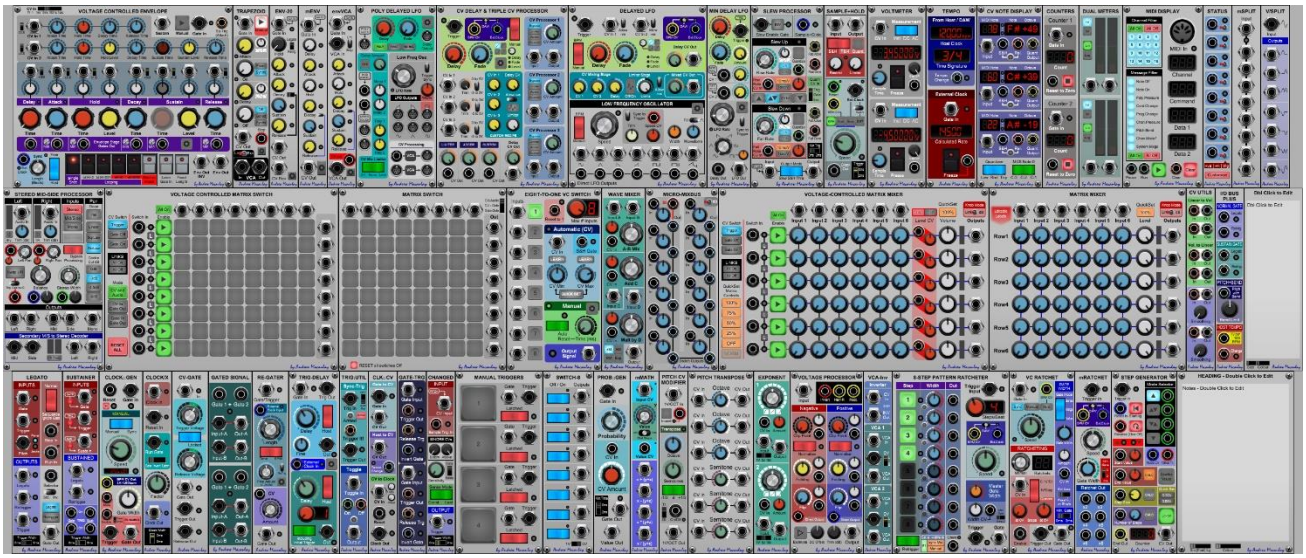
Andrew Macaulay Modules for Voltage Modular



USER GUIDE

PDF Created on 8th June 2020

Andrew Macaulay Modules Release 5.2

https://andrewmacaulaymusic.uk/modules

Table of Contents

Introduction

This document provides a PDF file which has been built from all of the individual help pages from the website https://andrewmacaulaymusic.uk/modules/help. The latest help will always be available from the website.

To simplify navigating the file, individual help pages have been kept in alphabetic order, and follow the General Help page which provides guidance on some of the standard behaviours and features that are common across many of the modules.

The final pages of the help file describe the module-wide configuration file used by Andrew Macaulay's Modules.

General Help

There are a number of standard approaches used throughout the collection of modules I have produced. As many of the modules are deliberately stripped back (to make the most effective use of space), these might not be completely obvious to start with, but once you've understood the approach in one module, it will typically be consistent across most if not all of them.

This section provides a breakdown of some of these common approaches, to help you as you start using the modules.

Clock In / Host Sync

In many of the time-based or beat-based modules, you will see reference to Host Sync and/or Clock In and a Speed/Divider knob. The approach here is simple but flexible:

- Host Sync is driven by the host or DAW speed as recognised within Voltage Modular. Effectively this bypasses the need to use the SYNC out on the main input/output panel and a Sync Divider. If nothing is connected, this currently seems to default 120 bpm.
- Clock In allows the timing to be calculated from a gate or trigger input. This takes a couple of gates/triggers to start working (for obvious reasons) and can adjust as the clock is changed – although big changes to the clock may take a few beats to settle down again.
- Time/Speed/Divider Knob allows multiplication and division of the speed or time from these inputs – from 1/16 to x16. When used on beat-based modules, the speed increases clockwise, when on time-based modules, the length of time increases clockwise.

BPM CV Inputs and Outputs

I have also used CV signals for BPM on a number of the modules, both as outputs and inputs. In all these cases, the mapping is 1 Volt = 100 bpm, with an expected range of 0V – 5V (>0bpm to 500bpm) although it does not limit it and only if over 1000bpm does it trap it. If at 0V or negative, it is ignored. This is often included as an option alongside Host and Clock In sync for beat-based modules.

A typical set of inputs for BPM-based timing is shown on the right, with a CV input (yellow), an External Clock (Blue) and a switch to select them or the internal Host DAW timings.

Speed/Divider Knob LED

On most beat-based modules, there is an LED with the Speed/Divider knob which shows the speed of the internal gate after the speed/divider factor is applied. These will typically (and in time, consistently) flash Blue for the calculated beats and will go Red if a 0bpm signal is received.

Voltage Modular Module Bypass Feature

Most of the modules (except for metering modules) now support the new Module Bypass functionality. Depending on the functionality of the module, the behaviour does differ, but the general approach is that for audio paths (or audio capable paths) the Bypass operation simply a passthrough of the audio input to the audio output.

For CV Processing modules, a similar approach is taken, with the Bypass mode simply passing through the input CV to the output where this makes sense; for Envelopes, typically the Bypass simply passes through the gate signal to the envelope out; and for Gate and Trigger manipulation, the input is passed through to the output where this makes sense.

For some modules that generate signals and do not process signals, for example the delayed LFOs and other sources like the Clock Generator, the outputs are simple nulled.

For metering modules, and in a small number of other cases (e.g. the I/O Bus Plus modules), where the Bypass functionality was so limited as to not make sense, the option is not offered.

Voltage Modular I/O Panel Inputs

Following the addition of new features in Voltage Modular 2, it has been possible to have some inputs default to the DAW/external controller inputs provided from the I/O Panel.

Typically, these inputs will be shown on the module with the input name in a rounded box and arrow to the jack which it is connected to (see example from ENV-20 above). In some cases, additional switching to disable the internal connection is provided, as illustrated above.

Customisation Options

There are a series of personalisation/customisation options available for modules across many of the modules:

1. Mid-Point for Log-Scale Time Controls

Modules which have time-based controls now have the ability to change the mid-point for the logarithmic behaviour of the knobs. This applies to e.g. Delay, Attack, Hold, Decay, Sustain and Release times on envelopes, Gate Times on the Gate Processor (Re-Gater) Module and the Delay and Fade times on the new CV Delay modules.

This setting is available through a “pop-up” configuration box and allows the mid point to be set to 500ms, 750ms, 1000ms, 1250ms, 3000ms (what is effectively a “legacy” mode) as well as to a standard linear mode. The legacy mode is automatically set (on existing modules) when loading presets from previous versions so that their behaviour is as expected.

2. Minimum Gate/Envelope Times

Minimum Attack Time, Decay/Release Time and Gate Time switches are also available on many modules such as Envelopes, Gate processing modules, Ratcheting, etc. and allows the default behaviour of allowing the times to be 0ms (a simple trigger for gates) or a minimum of 2ms, even if the control plus a CV make it less. This ensures that the gate will fully open the envelope on Cherry Audio’s standard Envelope Module which has a 2ms minimum Attack time and will remove the possible clicks from envelopes when used at 0ms.

Accessing the Settings

Where a setting is not directly available on the module, the settings will be available through a “pop-up” configuration box accessible by pressing the cogwheel (settings/config) button to open the control.

Default (system-wide across all of Andrew Macaulay’s Modules) behaviour can be set for these settings through a configuration file, details of which are provided on this page.

Help: Clock Generator

A clock generator that can create gate (and trigger) clocks from a manually controlled frequency, or as a clock multiplier/divider of the host (DAW) bpm or from a gate input. The gate input, like in most clock multipliers, does take time to react to new inputs/changes of speed, but is automatically sync'd back to the clock when it is received. There is also a separate, manual trigger, that can be used on all modes to sync the start of the timer with external devices/DAW. There are also trigger inputs to mute the clock and to re-start the clock, optionally sync'd to the reset trigger input.

The **Clock Generator module** generates a clock (gate and trigger) at a rate set by the Speed control. This can be absolute (beats per minute) when in Manual Mode or a multiplier/divider of the host or external clock when in Sync Mode.

Reset Trigger input: synchronises the clock with the reset trigger. Allows, for example, a sequencer gate to synchronise the clock. Note that the reset should be at a slower rate than the clock being generated.

Sync Mode switch: selecting Manual allows the Speed knob to control the BPM (beats per minute) directly. Set to Sync, the "input BPM" will either be the Host BPM in Voltage Modular if there is no jack connected to Gate In, or the derived BPM from the Gate In if there is a jack connected.

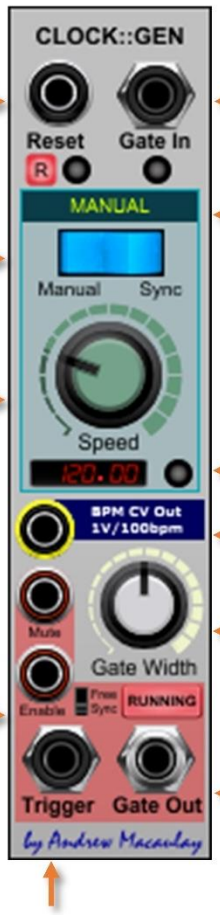
Speed knob: controls the speed of the clock being generated and works in two ways:

- In MANUAL mode the speed is directly controlled by the knob
- In SYNC mode the speed is a multiple or division of the input BPM, between 1/16th and 16x

When the mode is changed, the display of the value is changed, with sync mode showing the factor as well as the base BPM.

Editing the value directly also adjusts, allowing for input of the simple number in BPM or the factor using "x" or "" for multiples and "/" for division.*

Mute/Enable/Running: controls whether the clock generator is muted or enabled – both from a button (RUNNING/MUTED, also the status display) or from Mute and Enable trigger input jacks.
*The Free/Sync switch, **which is only visible when a Gate In connected**, allows you to select whether the Enable trigger (or button) waits for the next gate to start, allowing the clock to remain synchronised with the external Gate signal.*



Gate input: used when the mode is set to "Sync" to derive the clock rate of the gate input which is then multiplied or divided by the Speed Knob.

Sync Mode display: status display which shows the current mode of the clock generator: Manual, Host (BPM) Sync or External (BPM) Sync.

Speed indicator: showing the resulting speed of the adjusted speed that will be used.

BPM CV out: a control voltage that can be used with other Gate and Trigger utilities as well as other modules like the Formula module. This is the speed, using 1 Volt per 100 bpm as the scale.

Gate Width knob: setting the gate width for the Gate Out to between 0% and 100%.

Setting this to 0% is effectively making the Gate Out a Trigger Out. Setting to 100% means that the gate is a constant voltage.

Gate Out: outputs a gate (0-5V) signal based on the speed and gate width as set above. Can be used to control Envelope generators as well as many other modules.

Trigger Out: outputs a trigger signal based on the speed as set above. Triggers are almost zero length pulses of 0-5V. Useful to control percussion-related modules and other time-based modules.

Help: Clock Multiplier/Divider

This micro-sized Clock Divider and Multiplier module takes a clock in and multiplies or divides the clock (from divide by 32 to multiply by 32) to allow you to synchronise faster or slower sequences, etc. to the master clock for your patch. With a Reset gate input to synchronise the beat and a Run Gate which can be inverted, this can be used in many situations where you are synchronising various elements in the patch.

The **Clock Multiplier/Divider module** takes a clock in signal (gate or trigger) and multiplies or divides this by between 1 and 16. The clock can be reset (to sync with sequencers, etc.) and a "run gate" allows the clock output to be switched on and off by a gate or trigger input.

Clock In: provides the input which is used to drive the clock multiplier or divider. The LED shows when a clock trigger has been received.

Reset In: a trigger input that synchronises the clock to the reset trigger. This can be used to synchronise the clock being multiplied/divided to, for example, a sequencer gate.

Run Gate: takes a standard Gate to enable/disable the clock running. When the Invert switch is OFF, then gate off = no clock out and gate on = clock out. When the Invert switch is ON, this is reversed.

Invert/Latch Switch: three options for the CV for the Run Gate:

- **Gate** mode, taken the gate as a normal On/Off switch: gate on to run, and gate off to stop.
- **Invert** the gate input, so that gate on will stop the clock, and gate off allows it to run;
- **Latched** taking a Trigger input, with the trigger swapping the mode from On to Off and back.

Factor knob: sets the multiplier or divider of the input clock, between 1/16th and 16x.

When the mode is changed, the display of the value is changed, with sync mode showing the factor as well as the base BPM.

Clock Out: outputs a clock (0-5V) signal based on the speed calculated from the adjusted CV in value.

Trigger 0ms/2ms switch: sets the output clock to be a pure trigger (0ms) or a short gate (2ms) which can be useful when used directly with e.g. Envelope Generators which may have a min Attack of 2ms.

The default setting of this uses the setting in the global configuration file.

Help: Clock to CV to Clock

A cut down version of the Clock Generator/Multiplier/Divider focused on the output and use of a "BPM CV" where 1V is 100bpm. Outputs for a gate and the host BPM, a trigger when the host BPM changes and allows a CV input to generate a clock – all in a micro (4HP) format.

This small module can be used with Formula to do complex handling of BPM rates, as well as using LFOs, Envelopes, Sequencers, etc. to control the clock.

The **Clock to CV to Clock module** provides the ability to take a gate/clock in and generate a control voltage (1V per 100bpm) output which can be used with other Gate and Trigger utilities as well as other modules like the Formula module. It also has this capability for the internal Host Clock, and can then generate a clock signal based on the Control Voltage. The module also provide a trigger output when the host tempo (Voltage Modular Stand-Alone or DAW) changes.

Gate to CV section: takes the clock-in signal from a gate or trigger and calculates the Beats per Minute measurement, output in 1V per 100bpm.

Gate input: provides the clock in signal used to derive the clock rate in the "Gate to CV" section.

CV output: the 1V per 100bpm control voltage of the clock rate measured from the Gate input.

This can be used to drive many of the other Gate and Trigger Utilities, optionally with other modules including the Formula module to do "interesting" things with the BPM control voltage.

Host to CV section: does the same as the Gate to CV section but just for the internal Host BPM.

CV output: the 1V per 100bpm control voltage of the clock rate measured from the host BPM.

Tempo Change Output: generates a trigger when the host (Voltage Modular or DAW) tempo changes.

CV to Clock section: takes the 1V/100bpm control voltage and generates a clock at this rate.

Min control: sets the minimum BPM that will be output. Does not add anything to the value input.

Offset control: adds an amount to the BPM taken from the control voltage in.

Reset Trigger input: synchronises the clock with the reset trigger. Allows, for example, a sequencer gate to synchronise the clock. Note that the reset should be at a slower rate than the clock being generated.

Clock Out: outputs a clock (0-5V) signal based on the speed calculated from the adjusted CV in value.

Help: CV to Gate

A simple tool to generate Gate and Trigger signals from any CV, using a threshold for the start of the gate and another threshold for the end of the gate. Triggers are generated at both the start and the end, and the thresholds can be separate or synchronised. The Sync switch ties the two thresholds to make operation easier for normal uses.

The **CV-Gate module** provides the ability to take any control voltage and create a gate signal based on the voltage going above a trigger voltage and falling below the release voltage. At its simplest, this allows gate, trigger and release triggers from clock sources, but it can also be used with any source such as an LFO or random signal.

CV input: is the source for the processing, allowing any control (or audio) voltage to be used to create gates and triggers.

Trigger Voltage: setting the value above which the gate will start and the trigger generated.

Release Voltage: setting the value below which the gate will stop and the release trigger generated.

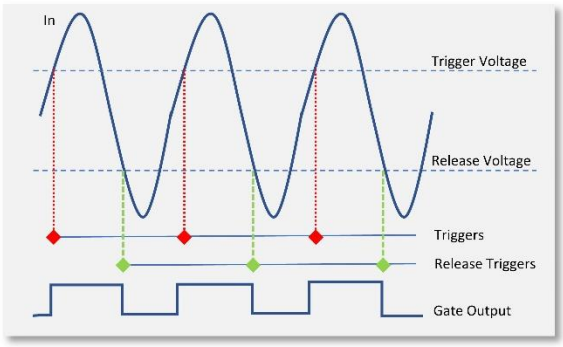
Locked switch: when enabled, makes the Trigger and Release voltages the same, so that on a sine or triangle wave, the gate would be centred on the peak value.

Gate Out: provides a +5V gate signal which goes on at the start and off at the end of the generated gate

Trigger Out: provides a +5V trigger signal from the start of the generated gate

Release Out: provides a +5V trigger signal from the end of the generated gate

Example:



Help: CV Change Gate

This CV Change to Trigger module monitors a CV and generates a trigger when the CV changes. There are controls for the sensitivity (how much it has to change) as well as ranges where the trigger is monitored; these can both be set as Voltages or as notes/semitones. When the minimum change is non-zero, you can have the trigger on changes between states, or changes since the last-changed state.

This module can be used to, for example, generate accents or additional notes on changes to a note - especially useful with sequencing which may have a note repeating with occasional change of pitch. For ease of use, the input defaults to using the Pitch panel CV Input, but can be overriden by jacks.

The **CV Change Gate module** monitors a control voltage and generates a trigger when the CV changes. There are controls for the sensitivity (how much it has to change) as well as ranges where the trigger is monitored; these can both be set as Voltages or as notes/semitones. When the minimum change is non-zero, you can have the trigger on changes between states, or changes since the last-changed state.

CV Input which defaults to the PITCH input on the Panel, from the DAW or external controller/s.

Sample Trigger Input: allows the CV to be sampled and tested only at specific trigger points. This can be used to sync the output with a clock such as a sequencer, etc.

Ignore CVs Below: any voltages below this value will be ignored for the processing in this module.

Sensitivity sets the minimum change required to generate a trigger. For example, if using notes, a 5 semitone sensitivity would mean that a move from C0 to D0 is ignored while a move from C0 to F0 would generate a trigger.

Sense Mode switch: works with the Sensitivity as follows:

- **Constant** means that each change of voltage or note is tested, so a sequence C – E – F – A# with Sensitivity 5 semitones would only generate a trigger on the first C and then the A#, i.e. the first jump between individual notes of 5 semitones;
- **Last** means that the test is against the last time a trigger was generated, so the sequence C – E – F would trigger on C and F, the first time there were more than 5 semitones from the last triggered (C)

Ignore CVs Above: any voltages above this value will be ignored for the processing in this module.

Volts/Notes Switch: to select whether the Ignore CVs and Sensitivity knobs display Volts or Notes. For the sensitivity, this will be semitones, for the Ignore range this is absolute notes (with MIDI0 set to C-2).

Output: provides the trigger output. The LED shows when a clock trigger has been generated.

Trigger 0ms/2ms switch: sets the output clock to be a pure trigger (0ms) or a short gate (2ms) which can be useful when used directly with e.g. Envelope Generators which may have a min Attack of 2ms.

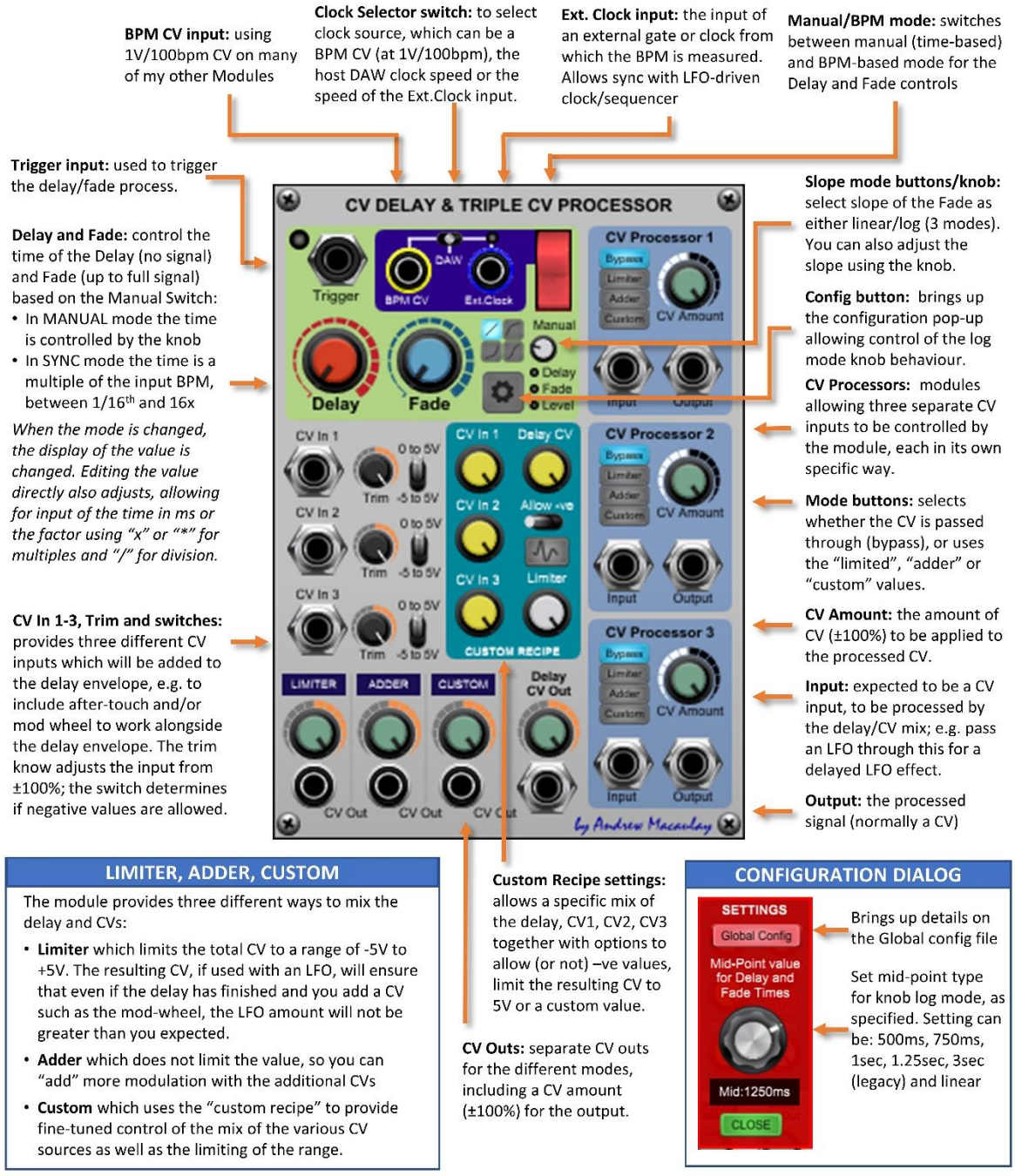
The default setting of this uses the setting in the global configuration file.

Help: CV Delay and Processor

A CV processing module that provides a Delay and Fade envelope with multiple slope types for the fade, timings for the delay and fade can be set manually or sync'd to BPM (host, external clock or CV). The delay CV can be mixed with up to three other CV inputs, allowing the mixing of e.g. keyboard after-touch, mod wheel, etc. with the delay envelope.

Options to support +ve only, or +ve and -ve voltages, +ve and -ve attenuation, limiting options (so that adding a full delay plus a full mod-wheel is the same as either at full), and three control-voltage VCAs that are driven by the delay and CV inputs allow flexible control over modulation sources. This module is ideal to provide great keyboard playability with vibrato and other modulations.

The **CV Delay and Triple CV Processor module** brings together a simple Delay/Fade envelope, as used for Delayed LFO effects, with additional CV inputs (e.g. mod wheel, aftertouch…) and flexible processing and routing to control up to three, typically CV signals, for delayed LFO and other similar effects.



***Delay and Fade knobs** control the time in milliseconds using a logarithmic or linear scale, configured through the settings configuration dialog. The options in the configuration dialog are: 500ms, 750ms, 1sec, 1.25sec, 3sec (legacy mode) and linear mode. Default setting for new instances is 1250ms unless changed in the Global Config file (see general help for more).*

Help: CV Note Display

A simple display module that shows three channels of MIDI note numbers and name/octaves for their CV input. The input voltage is quantized (which can be highest/rounding/lowest value-based) and the MIDI Note 0 can be set to octave -3/-2/-1. Each of the channels can be Held by a Sample and Hold and Release Gate and a manual button, and each channel provides a Quantized (and sample/hold) output.

The **CV Note Display module** is simple display module that shows three channels of MIDI note numbers and name/octaves for their CV input. The input voltage is quantized (which can be using low/round/top) and the MIDI Note 0 can be set to octave -3/-2/-1. Each of the channels can be Held by a Hold and Release Gate and a manual button (a track and hold behaviour), and each channel provides a Quantized (and track/hold) output..

There are three independent channels, although the Quantizer and MIDI Note 0 settings are global across all three

MIDI Note display shows the MIDI note number (0-127) as calculated from the 1V/OCT input CV (-3V = 0). If the voltage on the input is outside this range, shows ***ERR***

Input: takes the 1V/OCT input control voltage to be displayed for the channel

Under/Over LEDs shown if the input voltage is over or under the exact amount used for the quantized note

S&H Gate/Trigger Input sets the hold mode to "ON" and samples every time a trigger is received.

Hold Indicator and Button shows the status of the hold and can be used for manually setting and releasing the hold mode

Quantizer mode switch selects the quantizer mode (rounding approach) as follows:
Low *– note 1.1 is 1, 1.5 is 1 and 1.9 is 1*
Rnd *– note 1.1 is 1, 1.5 is 2 and 1.9 is 2*
Top *– note 1.1 is 2, 1.5 is 2 and 1.9 is 2*

Note/Octave display shows the note and octave for the MIDI note calculated. The scale uses G, G#, … for notes and Octaves are based on the MIDI Note 0 setting below

Quantized Output provides an output of the quantized value as currently shown, so is also subject to the HOLD button

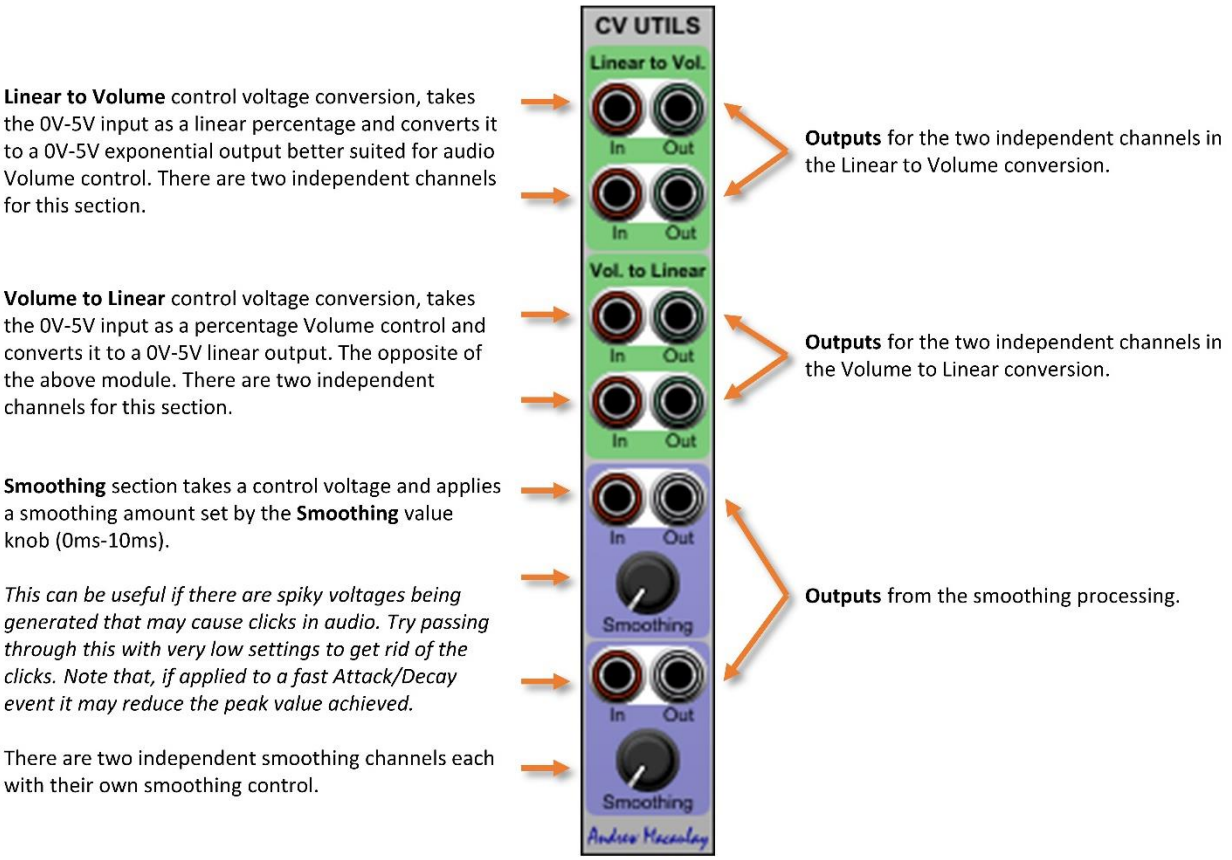
Release Gate/Trigger Input releases the hold mode to "OFF"

MIDI Note 0 selector determines whether Note 0 in MIDI is shown as C-3, C-2 or C-1. This only affects the display information.

Help: CV Utilities

A very simple, small module that provides a number of channels that take linear control voltages and convert them to exponential volumes control voltages as well as from volume to linear control voltages. In addition, there are two channels that offer simple control voltage smoothing (with smoothing factors or 0ms to 10ms).

The **CV Utilities module** is simple module that offers three utility functions for control voltages: Linear to Volume conversion, Volume to Linear conversion and CV Smoothing.



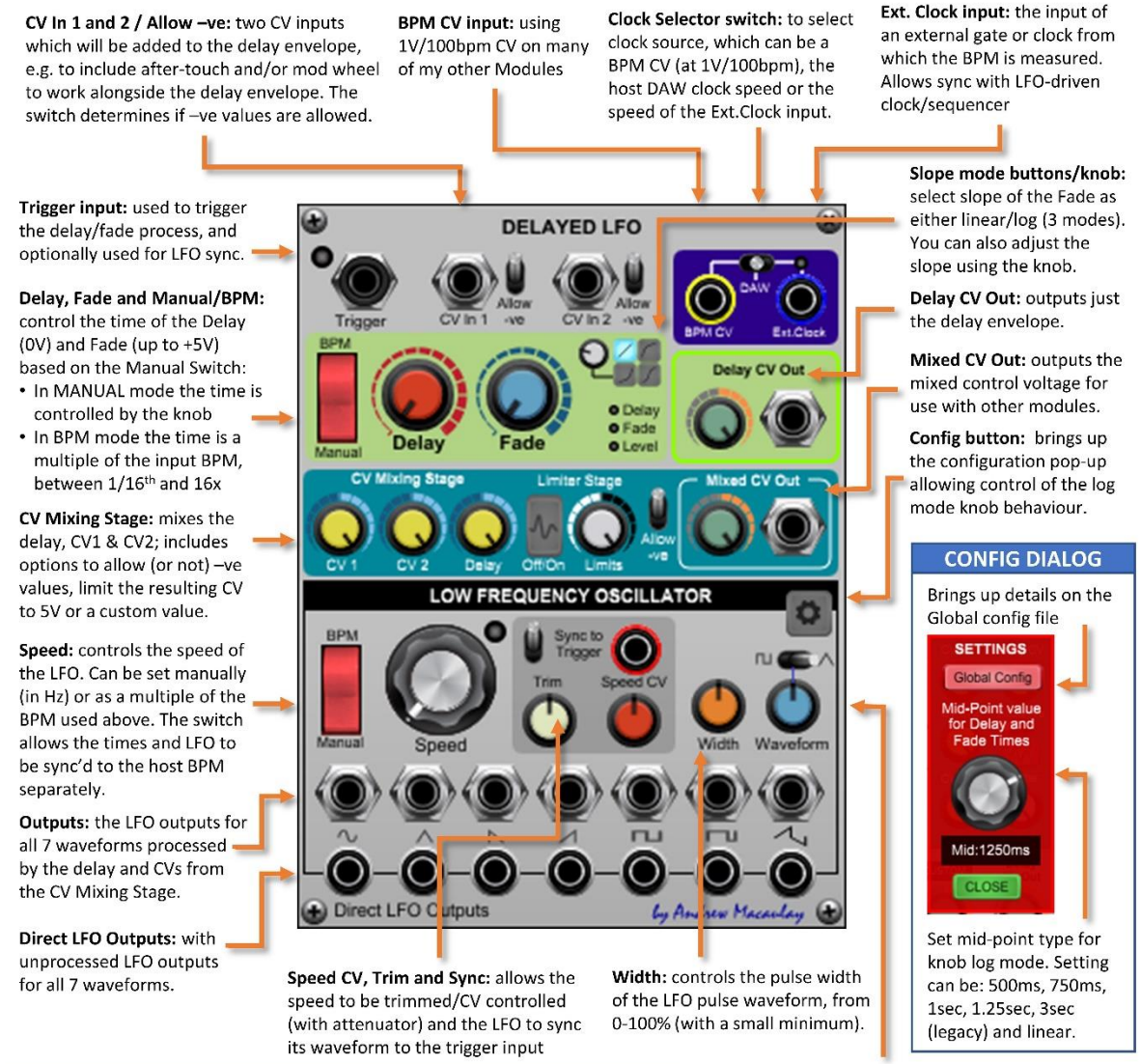
Help: Delayed LFO

A combination of the features from the Delay and CV processing module and an LFO. Provides a Delay and Fade envelope with multiple slope types for the fade, timings for the delay and fade can be set manually or sync'd to BPM (host, external clock or CV).

The delay CV can be mixed with up to two other CV inputs, allowing the mixing of e.g. keyboard after-touch, mod wheel, etc. with the delay envelope. Support for +ve and -ve control voltages and mixing, as well as limiting to a specified range allow flexible control voltages.

This is brought together with an LFO which offers manual or BPM sync'd speeds, CV speed inputs, multiple waveform outputs and both unprocessed and processed (by the delay and CV inputs) outputs providing a flexible way to provide delayed LFO for automatic vibrato, but with the ability to include e.g. the mod wheel as well.

The **Delayed LFO module** brings together the CV Delay module and an LFO, allowing the mixing of a delayed envelope (delay/fade) as used for Delayed LFO effects, with additional CV inputs available to support e.g. the mod wheel to control the built-in LFO.



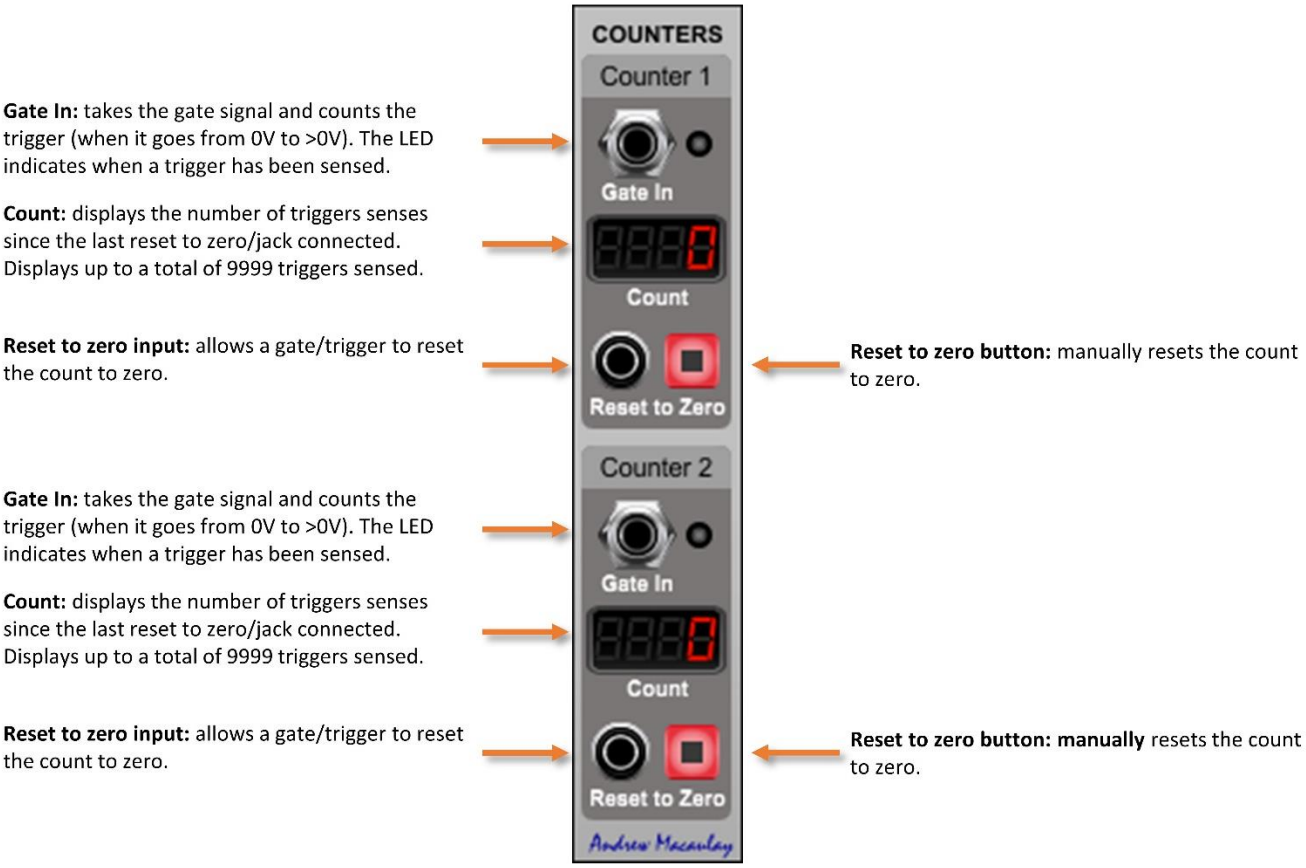
LFO Waveforms: *the LFO provides 7 waveforms: Sine, Triangle, Sawtooth, Ramp, Square, Pulse (with pulse width control) and an "Opposing Ramp" which merges square and triangle with control of the mix – which provides some interesting ways to modulate signals!*

Delay and Fade knobs *control the time in milliseconds using a logarithmic or linear scale, configured through the settings configuration dialog. The options in the configuration dialog are: 500ms, 750ms, 1sec, 1.25sec, 3sec (legacy mode) and linear mode. Default setting for new instances is 1250ms unless changed in the Global Config file (see general help for more).*

Help: Dual Counter

A very simple dual-channel module that counts gates/triggers in and allows reset by a button or a gate/trigger signal. Useful when looking at behaviour of triggers that may be set against random or other signals.

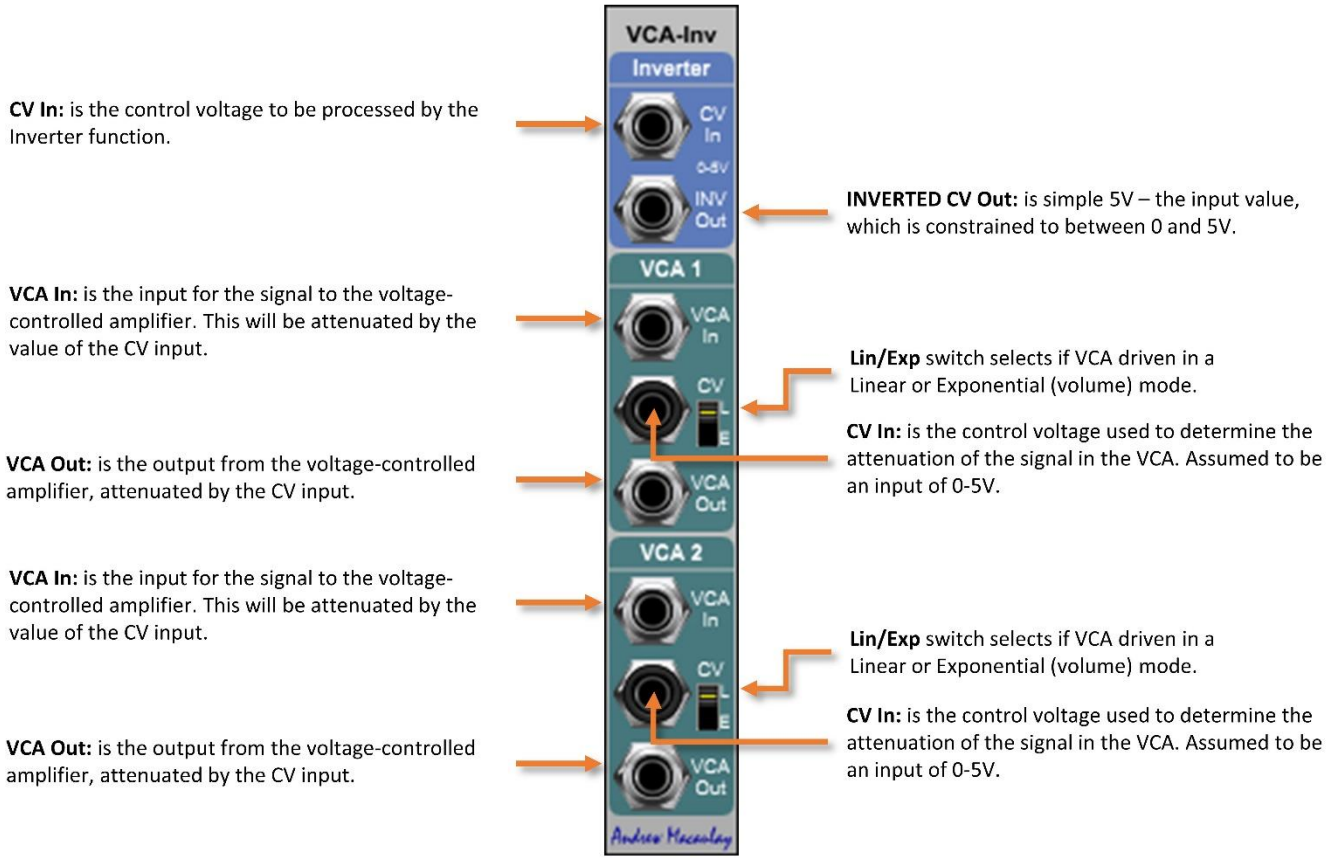
The **Dual Counter module** provides the ability to simply count gates received. This can be useful in when using modules such as the Probability Generator or other random modules to check how many gates are generated. Each of the two sections is identical.



Help: Dual VCA and Inverter

A small module that hosts two simple voltage-controlled amplifiers (for control voltages or audio signals) and a voltage inverter, that takes a control voltage between 0V and 5V and inverts this so that 0V becomes 5V and 5V becomes 0V. This is useful with envelopes to do interesting things to audio signals or other control voltages.

The **Dual VCA and CV Inverter module** provides small form-factor module that offers a Control Voltage Inverter (reversing +5V and 0V, so that 0V becomes +5V, +5V becomes 0V, 1V becomes 4V, etc.) and two simple Voltage Controlled Amplifiers.



Help: Dual Voltmeter

A dual digital voltmeter with ability to take average and instantaneous values, freeze each input measurement and have an average value calculated for a manually set refresh speed. Developed as useful when working out problems with signal flow or unexpected behaviours.

In instantaneous mode, the measurement is made every 50ms; in DC mode, the meter measures the average of the CV voltage it receives during the measurement period (set by the measurement frequency control); and in AC mode, the meter measures half the peak-to-peak value (again over the measurement period), which is half the deference between the highest voltage and the lowest voltage it receives.

The **Dual Voltmeter module** provides the ability to display the voltage of an input, both the instantaneous value or a DC or AC average value. Each of the two sections is identical in features and behaviour.

CV In: takes the CV to be measured. The display will cope with up to +/-99.99999 so easily copes with a +/-10V range.

Voltage: displays the voltage in up to 5 decimal places and from -99.99999 to +99.99999.

Freeze Button: freezes display at the current value. The button is an on/off type so pressing again "releases" the freeze.

Sample time knob and LED: when in DC or AC mode, this sets the time over which the voltage is sampled/averaged and the display refresh.

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Voltage: displays the voltage in up to 5 decimal places and from -99.99999 to +99.99999.

Freeze Button: freezes display at the current value. The button is an on/off type so pressing again "releases" the freeze.

Sample time knob and LED: when in DC or AC mode, this sets the time over which the voltage is sampled/averaged and the display refresh.

Measurement type switch: selects between the:
- Instananeous (Inst) mode where the voltage is measured on each screen refresh (every 25ms)
- DC mode, where the value is simply an average of all measurements over the sample time
- AC mode, where the average is based on half the max (+ve) to min (-ve) voltage measured in the sample time

Decimal Places: sets number of decimal places to be displayed, between 1 and 5, default 5.

Freeze Trigger Input: freezes display at current value on the input trigger. The trigger in toggles the freeze button – the first freezes the display, the next one unfreezes, etc.

Measurement type switch: selects between the:
- Instananeous (Inst) mode where the voltage is measured on each screen refresh (every 25ms)
- DC mode, where the value is simply an average of all measurements over the sample time
- AC mode, where the average is based on half the max (+ve) to min (-ve) voltage measured in the sample time

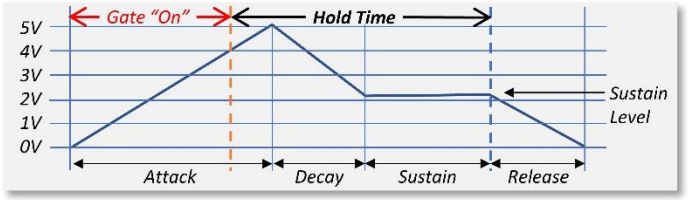
Decimal Places: sets number of decimal places to be displayed, between 1 and 5, default 5.

Freeze Trigger Input: freezes display at current value on the input trigger. The trigger in toggles the freeze button – the first freezes the display, the next one unfreezes, etc.

Help: ENV-20 EG2 Envelope

A small form-factor ADSR envelope generator inspired by the Korg MS-20 EG2 envelope generator, where the Hold time is added after the gate is released. This module supports legato and retrigger modes for the hold time and the optional linking of Decay time to Release time, and supports options for the mid-point of the time controls (from the "options" cog-wheel button).

The **ENV-20 EG2 Envelope** offers an alternate ADSR envelope inspired by the Korg MS-20 EG2 envelope with its unique Hold behaviour. The Hold time on this module only starts AFTER the gated signal has been released, extending the envelope sustain by the Hold time.



Gate input: the key input for the envelope. The gate going on triggers the envelope to start, and the gate going off releases from the sustain mode. If no jack connected, defaults to Gate In on the Input Panel.

Hold time: sets the time that the envelope will stay running AFTER the gate is released – effectively this Hold is added to the end of the gate.

Legato/Retrig mode: determines if the envelope will always complete the Hold or retrigger.

Attack time: sets the time it will take after the Delay for the envelope output to go from 0V to 5V.

Status LEDs: show the stage that the envelope is current at in its process.

Decay time: sets the time it takes for the envelope to go from the Hold Level down to the Sustain Level.

Decay Time switch, locks Decay time to Release time. When this is on, the Decay knob becomes disabled.

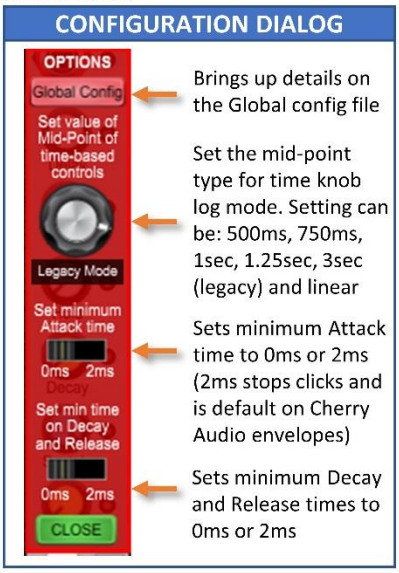
Sustain level: the level which is output during sustain phase, until the "gate" is released back to off AND after any additional Hold has completed.

Release time: sets the time it takes for the envelope to return to zero after the end of the Sustain phase.

CV Out is the output for the envelope, with values between 0V (off/delay stage) and 5V (peak).

CV Rev Out is also modelled on the Korg MS-20 EG2, with the envelope inverted BUT with 0V set to the Sustain level.

Config: opens configuration dialog, see →



Brings up details on the Global config file

Set the mid-point type for time knob log mode. Setting can be: 500ms, 750ms, 1sec, 1.25sec, 3sec (legacy) and linear

Sets minimum Attack time to 0ms or 2ms (2ms stops clicks and is default on Cherry Audio envelopes)

Sets minimum Decay and Release times to 0ms or 2ms

***All* time knobs** *control the time in milliseconds with a logarithmic or linear scale, configured through the settings configuration dialog. The options in the configuration dialog are: 500ms, 750ms, 1sec, 1.25sec, 3sec (legacy mode) and linear mode. Default setting for new instances is 750ms unless changed in the Global Config file (see general help for more). Note that the mid-point is automatically set to be 3 seconds when legacy saves/presets are loaded as the old log-mode knobs had a fixed mid-point of 3 seconds. This can be changed and the adjusted mid-point is saved if the preset is re-saved.*

Help: Exponent Shaper

A module that processes voltage signals with a variable linear to exponential control, which is also voltage-controlled. The exponential, non-linear settings are anything from very subtle to quite extreme, so this can be used for audio signals where it changes the timbre of the waveform, as well as control voltages and modulation. The module has two completely separate channels.

The **Exponent Shaper module** processes voltage signals with a variable linear to exponential control, which is also voltage-controlled. The exponential, non-linear settings are anything from very subtle to quite extreme, so this can be used for audio signals where it changes the timbre of the waveform, as well as control voltages and modulation. The module has two completely separate channels.

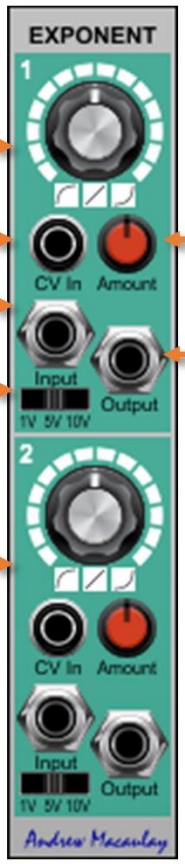
Exponent shape: controls the amount of exponential factor used for the shaping. The large the amount in either direction, the more pronounce it will become. The mid-point (0) is linear, the extreme anti-clockwise position turns a sine wave into almost a square wave.

CV Input to control the exponent shape. Allows the exponential slope to be controlled by modulation.

CV Input to control the exponent shape. Allows the exponential slope to be controlled by modulation.

CV Input Range specifies whether the input is +/-1V, +/-5V or +/-10V which is needed for the calculation to work as expected – *however, you can get some quite interesting audio effects/distortions by using an audio input of +/-5V and setting this switch to e.g. +/-1V.*

A second identical channel allowing two separate signals to be processed at the same time in this module.



CV Amount controls the amount of the CV affecting the exponential control.

Output provides the output control voltage or audio signal as processed in this channel.

Help: Gate Length Processor (Re-Gater)

A utility to change the gate length from a gate or trigger. The length can be manually set in milliseconds, controlled by CV or set as a divider or multiplier of the host (DAW) or external (gated) BPM. The module also includes setting of the mid-point of the log-scale speed dial (from the "options" cog-wheel button) and a re-trigger option.

The **Gate Time Processor (Re-Gater) module** allows you to change the gate width of a clock, trigger or gate signal. At the very least can be used to take a trigger and generate a gate, but can be used in many more scenarios.

External Clock Input: takes a gate, trigger or clock input and derives the speed (in BPM) of the clock, which can then used to control the length of the new gate output.

Length knob: controls the "length" of the output gate signal, and works in two ways:

- In TIME mode the length is directly controlled by the knob
- In HOST mode the speed is a multiple or division of the input BPM, between 1/16th and 16x, which can be from the Host/DAW or, if the External Clock Input is connected, from the external clock.

When the mode is changed, the display of the value is changed, with sync mode showing the factor as well as the base time.

Editing the value directly also adjusts, allowing for input of the simple number in BPM or the factor using "x" or "" for multiples and "/" for division.*

Time/Host switch: selects whether the Length is manually controlled or uses a multiple/division of the Host or External Clock (derived from the BPM).

Fine adjustment control: allows secondary control of the gate time, so that if you a gate to be just short of the whole time from the host-based clock, you can achieve this.

Gate input: the trigger (when voltage goes above 0V) from this gate or trigger input triggers the module.

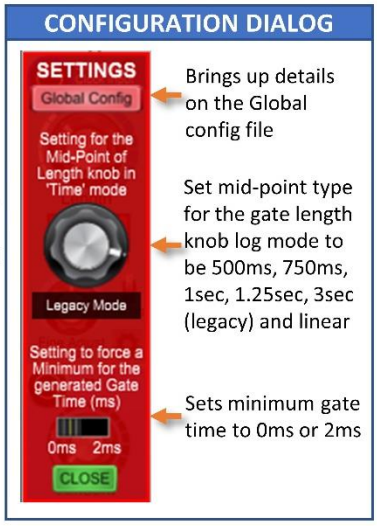
External Clock Input display: shows the triggers from the external clock input, if connected.

Re-Trig: switch allows the gate to be triggered again while still running.

Config: opens configuration dialog, see →

Gate Width CV input and control: allows a control voltage to adjust the length of the gate, with a control that takes -100% to +100% of the CV.

Gate Out: outputs the gate (0-5V) signal based on the gate/trigger in and the gate length as set above.



The length knob *controls the time in milliseconds with a logarithmic or linear scale, configured through the settings configuration dialog. The options in the configuration dialog are: 500ms, 750ms, 1sec, 1.25sec, 3sec (legacy mode) and linear mode. Default setting for new instances is 750ms unless changed in the Global Config file (see general help for more). Note that the mid-point is automatically set to be 3 seconds when legacy saves/presets are loaded as the old log-mode knobs had a fixed mid-point of 3 seconds. This can be changed and the adjusted mid-point is saved if the preset is re-saved.*

Help: Gate to Trigger

A dual gate to trigger utility that also outputs a trigger from the note-off/release part of the gate and which also outputs an inverted gate signal (gate on output as 0V and gate off output as 5V).

The **Gate to Trigger module** provides the ability to convert a Gate signal into a Trigger and a Release Trigger. The trigger is the leading edge of the gate and the release trigger is the trailing edge. The module now also provides an Inverted Gate output.

CHANNEL 1

Gate Input: takes any gate signal (0-5V) and converts this into trigger events.

CHANNEL 2

Gate Input: takes any gate signal (0-5V) and converts this into trigger events.

CHANNEL 1

Trigger Out: outputs a 5V trigger pulse at the start of the gate event.

Release Trg Out: outputs a 5V trigger pulse at the end of the gate event.

Inverted Gate Out: outputs 5V when the gate input is off (below 2.5V) and 0V when the gate input is on (2.5V and above).

CHANNEL 2

Trigger Out: outputs a 5V trigger pulse at the start of the gate event.

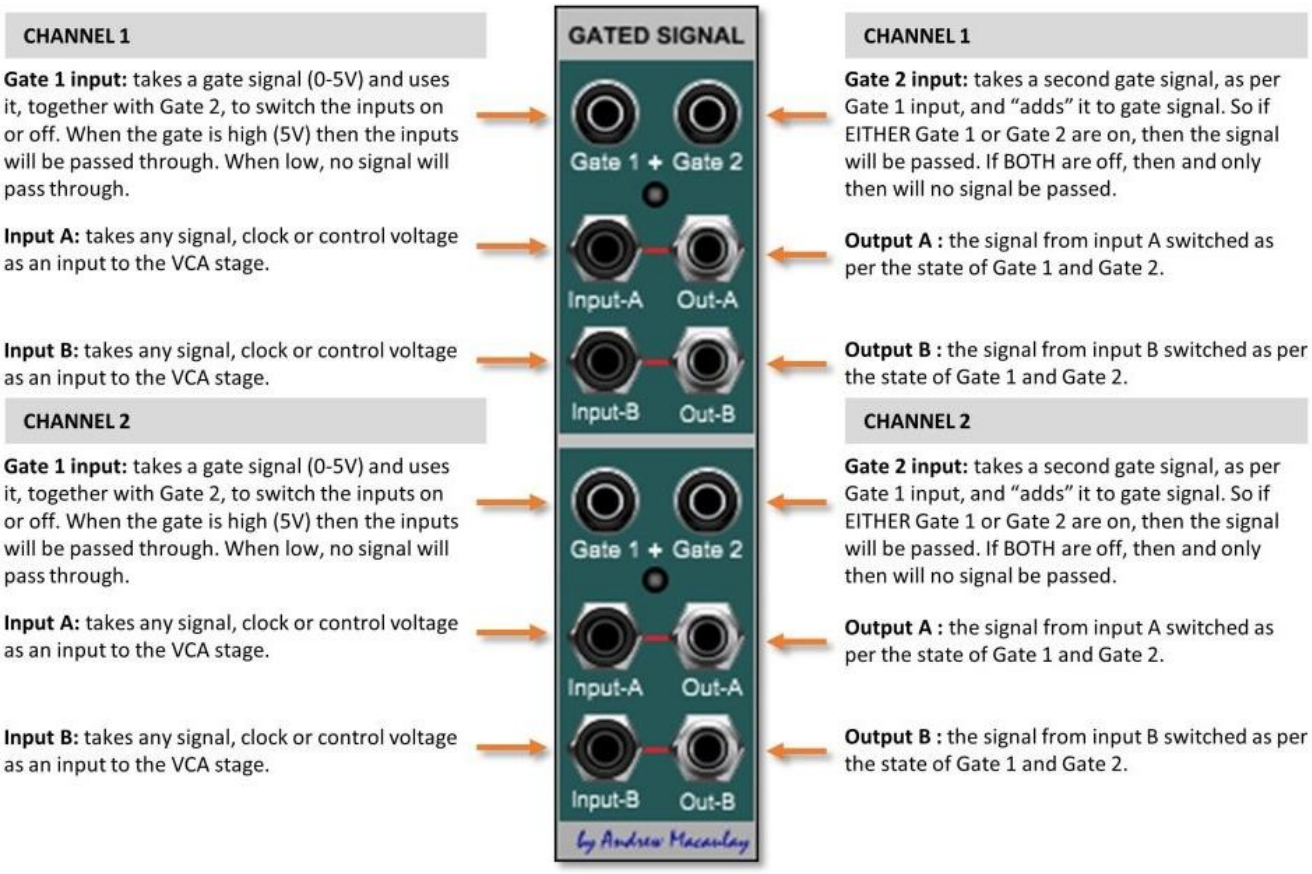
Release Trg Out: outputs a 5V trigger pulse at the end of the gate event.

Inverted Gate Out: outputs 5V when the gate input is off (below 2.5V) and 0V when the gate input is on (2.5V and above).

Help: Gated Signals

A simple dual channel utility that allows simple input gates to control up to two CVs in a simple on/off approach. Allows gating of control voltages, especially useful when driven by the sequencer or drum sequencer.

The **Gated Signal Module** provides the ability to simply use a gated input to switch on/off the signal for two channels – effectively a simple gated VCA which can be used for audio, clock and control voltage signals. There are two independent modules in this module, each with two gates (added) and two independent channels.



Help: I/O Bus Plus

This module takes the Gate, Trigger, Note and Sustain inputs from the Voltage Modular IO panel and generates Legato (Single Trigger) and Retrigger (Multi-Trigger) outputs with and without Sustain as well as providing an output for keyboard CV with Pitch Bend (and optional limiting of the bend amount).

The module also provides a trigger when the Host (stand-alone or DAW hosted) BPM changes and a 1V/100bpm CV output of the host tempo.

The **IO Bus Plus module** extends the bus outputs from Voltage Modular by adding additional Gates, Pitch outputs and Host Tempo outputs: with keyboard output gates in Legato ("single") and Retrigger ("multi") mode and with Sustained versions of the gates, making it easy to include these directly with Envelope Generators that don't offer a Sustain input; a keyboard pitch output with the pitch bend included (and control over the maximum bend); and a Host (stand-alone/DAW) tempo output CV (1V/100bpm) and tempo changed trigger output.

NORMAL GATE extends normal gates, without the Sustain feature.

Legato Output: provides a +5V gate which is only triggered when a key has been released.

Retrigger Output: provides a +5V gate which is retriggered on each key press, irrespective of whether the previous key was released.

PITCH+BEND extends the normal bus outputs by combining the PITCH output and the BEND output with control over the maximum bend amount.

Pitch With Bend Output: provides the 1V/OCT pitch output with the bend applied, subject to the limits set by the Bend Limit knob.

Bend Limit Knob limits the pitch bend amount to between ±1 semitone and ±2 octaves, with a default of ±1 octave. The 0 position passes the pitch bend wheel through giving a maximum pitch bend of 1V/OCT resulting in ±5 octaves.

SUSTAIN GATE extends the normal gates reflecting the status of the Sustain input.

Legato Output provides a sustained gate signal where the sustain overrides any retriggering of the notes.

Retrigger Output provides a sustained gate signal where any Trigger input will retrigger the notes during sustain.

HOST TEMPO section exposes additional host tempo based CVs and triggers.

1V per 100bpm Tempo Output provides a CV (1V/100bpm) output for the current host tempo.

Tempo Change trigger out sends a trigger when the host tempo (stand-alone or DAW) changes.

Help: Legato Processor

This module takes the Gate, Trigger and Note inputs and generates Legato (Single Trigger), Retrigger (Multi-Trigger) and Trigger outputs, allowing parts of a patch to respond to every note pressed whilst others only (re)trigger on the first note of a set of notes played in legato style. There is also a switched output (Legato or Retriggered) which can also be switched by a CV input, a special Sequence Mode (ignoring "gate off" signals) as well as Stop/Run inputs to allow flexible use of the module with sequencers.

The basic underlying approach of the module is that, when a note changes there is always a retrigger (and the multi-trigger can be ignored for the legato output), and when the note does not change and the gate ends, then that is the end of the legato sequence.

You can now use a pedal to select between legato and retriggered when playing a keyboard, or have the sequencer having some steps legato and others retriggering based on the step.

The **Legato Processor module** takes inputs from the keyboard, DAW or sequencer and outputs the gates from them in Legato ("single" mode), Retrigger ("multi" mode) as well as the trigger. With options that support Sequencers, and a voltage-controlled switchable Legato/Retrigger output, this can be used to generate interesting live and sequenced performances.

The inputs now default to the panel connections to simplify patching. Note that if ANY jack is connected to the inputs, then they ALL must be setup manually.

Inputs: the module needs **ALL three** of these inputs connected (from the same device) to be able to work out the gates/triggers. *See images to the left for examples of the sources.*

Gate Input: takes the Gate output from a keyboard, DAW or sequencer. If connecting to the Voltage Modular CV Outs, or a MIDI module, this can be in SINGLE or MULTI mode. Defaults to GATE if not connected.

Trigger Input: takes the Trigger output from the same source as the Gate above. Defaults to TRIG.

Pitch Input: takes the Pitch (1V/Oct) CV output from the same source as the Gate Input above. Defaults to PITCH from panel if not connected.

LEDs: shows if using the Panels input, and if the Jacks needed (Red) or Jacks connected fully (Blue). Either all from Panel or all must be manually setup.

Legato Output: provides a +5 gate which is only triggered when a key has been released.

Retrigger Output: provides a +5 gate which is retriggered on each key press, irrespective of whether the previous key was released.

Trigger Out: provides a +5V trigger signal for each retrigger point.

Trigger 0ms/2ms switch: sets the output clock to be a pure trigger (0ms) or a short gate (2ms) which can be useful when used directly with e.g. Envelope Generators which may have a min Attack of 2ms. *The default setting of this uses the setting in the global configuration file.*

Normal or Sequence Mode: when set to normal mode, the gate off is used to end a legato; when in Sequence (ignore gate) mode, the legato is not ended by the end of the gate. When used in the Sequence mode you should also connect a Stop in to end a legato session.

Stop In: allows a trigger to end the legato, forcing an Gate End signal even when in Sequence mode. Typically you will set this up to use the same trigger as used to stop the sequencer.

Run In: provides a trigger to start the running of the legato processor. Typically you will connect this to Sequencer Start trigger, along with the Stop In, to control legato when used in Sequencer Mode.

Switch In: takes a gate (0-5V) to determine the mode of the Legato/Retrigger switch. If connected, this overrides the switch. Values < 2.5V are "off" and >= 2.5V are "on".

Std/Inv mode: sets whether gate on = Retrigger (Std) or gate on = Legato (Inv).

Legato/Retrigger mode: selects whether Gate Out will be outputting the Legato or the Retrigger gate.

Gate Out: outputs the gate (0-5V) signal for either Legato or Retrigger based on the switches and CV settings – allowing swapping of legato to retrigger e.g. by sequencer or by footswitch.

Help: Manual Triggers

A simple module allowing manual triggering/gating (including latched gating) for controlling multiple sequencers, envelopes or other gated modules.

The **Manual Triggers module** provides four separate manual trigger buttons, with the ability to latch the switches (saved in presets)

Trigger Button: has two behaviours, depending on the Latched mode switch:
- in unlatched mode, pressing this button generates a gate (+5V) signal for the duration the button is pressed. Releasing it resets the output to 0V;
- in latched mode, pressing the button toggles between On and Off state.

Gate Out: outputs 5V when the gate is "on" or 0V when the gate is "off".

Trigger Out: outputs a 5V trigger pulse when the trigger button is pushed.

Latched switch: switches from normal to latched operation. The LED is on if the button is set to latched mode.

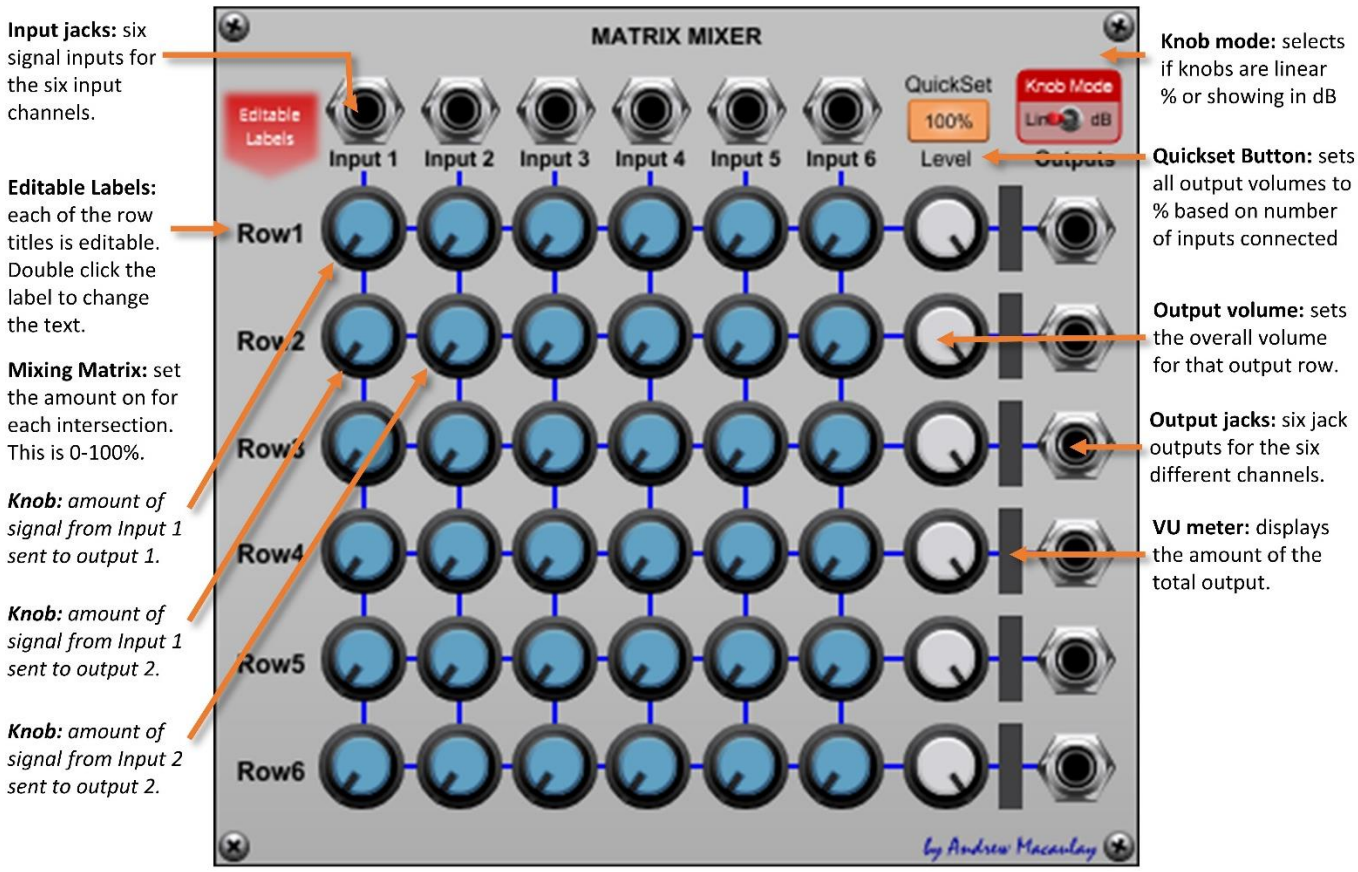
There are four identical buttons and outputs in this module.

Help: Matrix Mixer (6×6)

A matrix mixer (6×6) allowing 6 inputs to be mixed into different mixes for 6 outputs. Useful for routing and other mixing duties – for example, take the various outputs from each VCO and mix them differently into different signal chains/filters.

A QuickSet button allows you to set all the output Levels knobs based on the number of connected inputs, for example 3 jacks connected will have this set to 33% and the controls can be set to be used as linear, percentage-based controls or dB controls.

The **Matrix Mixer module** allows you to mix 6 inputs to 6 outputs in a matrix form, so you can for example send input 1 and input 3 to output 1, input 1 and input 2 and input 5 to output 2, etc. The signal can be Control Voltages or Audio Signals. Mixing uses a simple linear 0-100% mix.

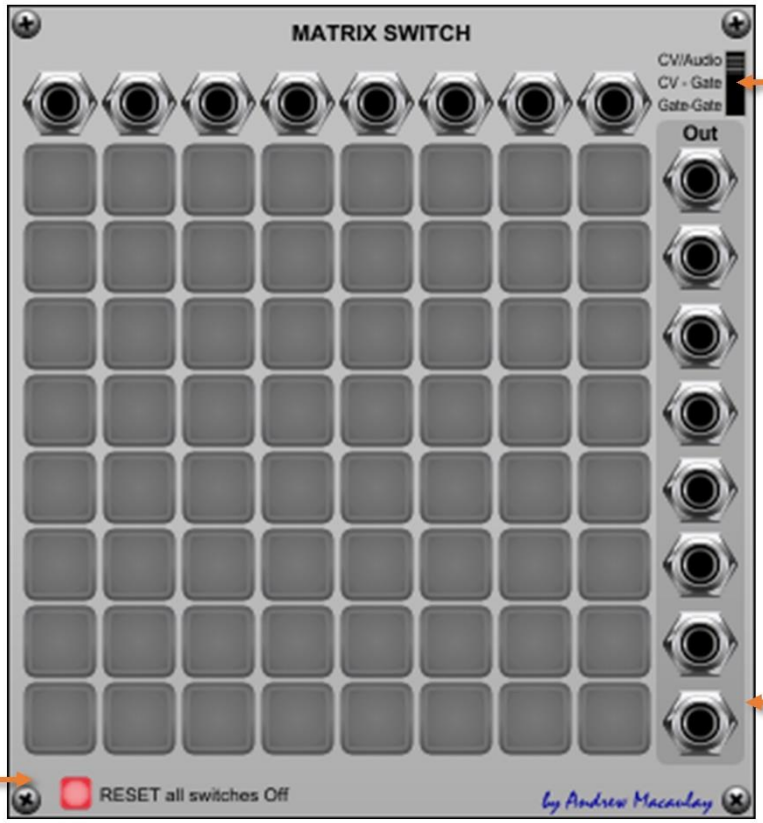


Help: Matrix Switch (8×8)

A simple 8×8 matrix module that provides switching of 8 inputs into 8 outputs.

The **Matrix Switch module** allows you to switch 8 inputs to 8 outputs in a matrix form, so you can for example send input 1 and input 3 to output 1, input 1 and input 2 and input 5 to output 2, etc. The signal can be Control Voltages, clocks or Audio Signals.

There is now the option to set the processing to specifically support Audio/CV inputs where the on/off switches are smoothed to remove 'pops' if used whilst playing audio, a CV Input to Gate Out mode which adds values together to then output a 5V/0V gate signale, and the Gate In/Gate Out mode which converts the input on all inputs to gates (<2.5V is "off", >= 2.5V is "on") before adding them together.



Input jacks: eight signal inputs for the eight input channels.

Switch matrix: each button is an on/off toggle, and sends the signal from the input in the column to the output in the row

Reset All: switches all of the Switch Matrix buttons OFF. Supports undo/redo.

Mode: select how signal is processed:

- **CV/Audio:** takes any CV or audio and simply adds them. Row on/off is smoothed to avoid pops.
- **CV – Gate:** takes CVs in, adds them and then outputs 0V or 5V gate signals.
- **Gate – Gate:** converts CV in to a gate and then adds them for gate out.

NOTE: mode setting affects ALL the rows.

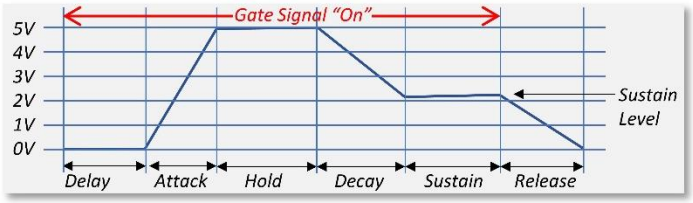
Output jacks: eight signal outputs for the eight different channels.

Help: Micro Envelope

A simple Delay, Attack, Hold, Decay, Sustain, Release envelope in a tiny module, ideal when you want to minimise the space use, for example when you want to control the Additive Oscillator with multiple envelopes.

The module includes a Decay Time "Sync" switch that locks the Decay Time to the Release Time and there is a "CV out" from the envelope and supports setting the mid-point of the log-scale time controls (from the "options" cog-wheel button).

The **Micro Envelope module** provides simple but flexible DAHDSR envelope in a very small form-factor. This was originally designed to work with the Additive Oscillator to provide individual envelopes for each of the eight partials.



Gate input: the key input for the envelope. The gate going on triggers the envelope to start, and the gate going off releases from the sustain mode. If no jack connected, uses the GATE from the Panel Inputs.

Status LEDs: show the stage that the envelope is current at in its process.

Delay time: sets a delay after the trigger/gate goes on, where the output remains at zero before the envelope starts.

Attack time: sets the time it will take after the Delay for the envelope output to go from 0V to 5V.

Hold time: sets the time the envelope stays at the full amount of 5V after the Attack phase finishes.

Decay time: sets the time it takes for the envelope to go from the Hold Level down to the Sustain Level.

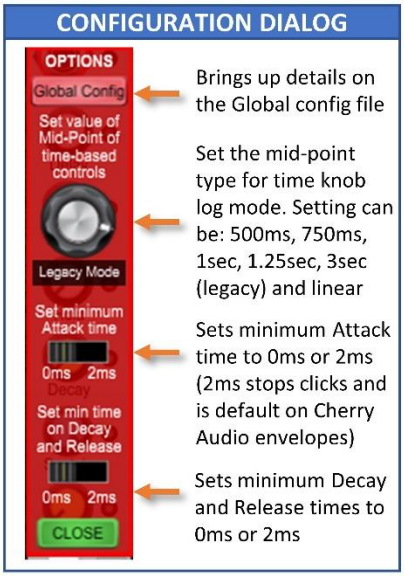
Sustain level: the level which is output during sustain phase, until the "gate" is released back to off.

Release time: sets the time it takes for the envelope to return to zero after the end of the Sustain phase.

CV Out is the output for the envelope, with values between 0V (off/delay stage) and 5V (hold stage).

Decay Time switch, locks Decay time to Release time. When this is on, the Decay knob becomes disabled.

Config: opens configuration dialog, see →



***All* time knobs** *control the time in milliseconds with a logarithmic or linear scale, configured through the settings configuration dialog. The options in the configuration dialog are: 500ms, 750ms, 1sec, 1.25sec, 3sec (legacy mode) and linear mode. Default setting for new instances is 750ms unless changed in the Global Config file (see general help for more). Note that the mid-point is automatically set to be 3 seconds when legacy saves/presets are loaded as the old log-mode knobs had a fixed mid-point of 3 seconds. This can be changed and the adjusted mid-point is saved if the preset is re-saved.*

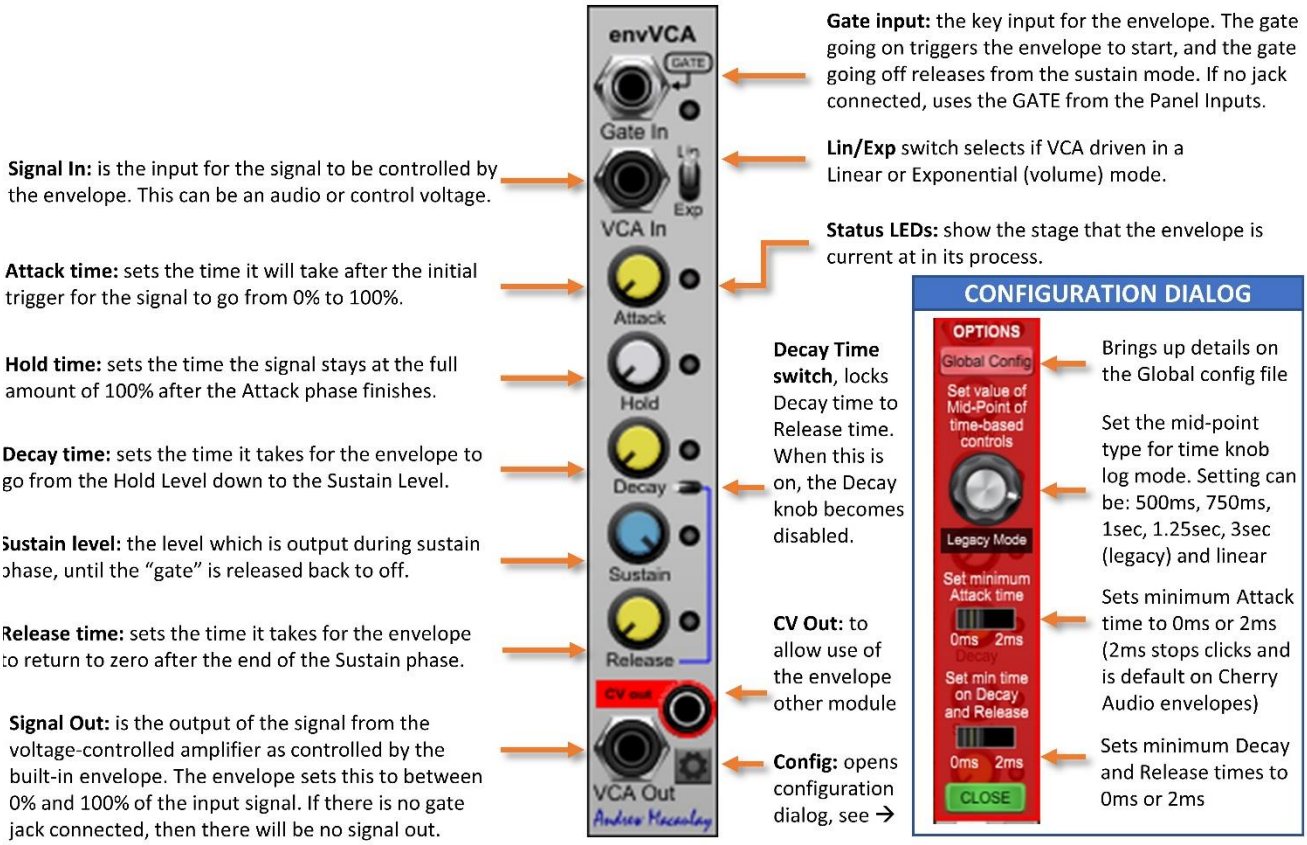
Help: Micro Envelope VCA

A simple Attack, Hold, Decay, Sustain, Release envelope driving a simple VCA in a tiny module, ideal when you want to minimise the space use, for example when you want to have multiple envelopes driving the mix of signal sources from an oscillator.

Note that this module complements the Micro Enveloper module, with the Signal In and signal Out passing through the VCA, which can be set to use a linear or exponential scale.

The module includes a Decay Time "Sync" switch that locks the Decay Time to the Release Time and there is a "CV out" from the envelope and supports setting the mid-point of the log-scale time controls (from the "options" cog-wheel button).

The **Micro Envelope VCA module** provides simple and small form-factor AHDSR envelope teamed up with a Voltage Controlled Amplifier. To keep this small, there is no Envelope CV out, just the ability to control a signal by an enveloper. An example of where this can be used is when you want to control the waveform outputs from the oscillators by individual envelopes.

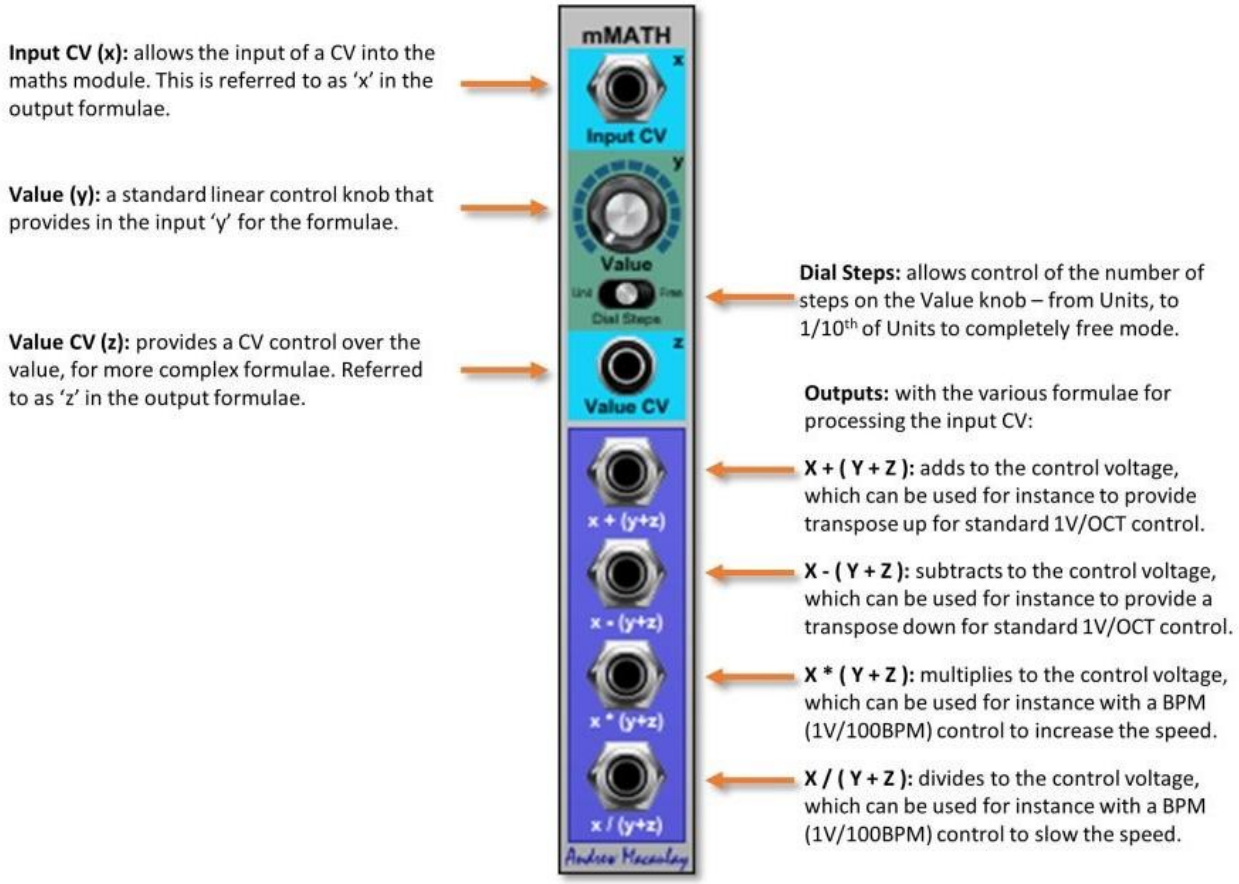


***All* time knobs** *control the time in milliseconds with a logarithmic or linear scale, configured through the settings configuration dialog. The options in the configuration dialog are: 500ms, 750ms, 1sec, 1.25sec, 3sec (legacy mode) and linear mode. Default setting for new instances is 750ms unless changed in the Global Config file (see general help for more).*

Help: Micro Maths

A very simple, small module that adds, subtracts, multiplies and divides the input CV by an amount set by the control. The control can be set with a value from 0 to 20 with a resolution of 1, 0.1 or floating point. Additional CV in that is added to the manually set CV (no attenuation) to allow for envelopes, sequencers, LFOs, etc. to be added into the maths. This can be useful for manipulating control voltages without the "complexity" (or space used) of the Formula module.

The **Micro Maths module** provides a simple control voltage processor in a small form factor, providing some of the basic functions available from the Cherry Audio Formula module but in a much easier to use and smaller module.



Input CV (x): allows the input of a CV into the maths module. This is referred to as 'x' in the output formulae.

Value (y): a standard linear control knob that provides in the input 'y' for the formulae.

Value CV (z): provides a CV control over the value, for more complex formulae. Referred to as 'z' in the output formulae.

Dial Steps: allows control of the number of steps on the Value knob – from Units, to 1/10th of Units to completely free mode.

Outputs: with the various formulae for processing the input CV:

X + (Y + Z): adds to the control voltage, which can be used for instance to provide transpose up for standard 1V/OCT control.

X - (Y + Z): subtracts to the control voltage, which can be used for instance to provide a transpose down for standard 1V/OCT control.

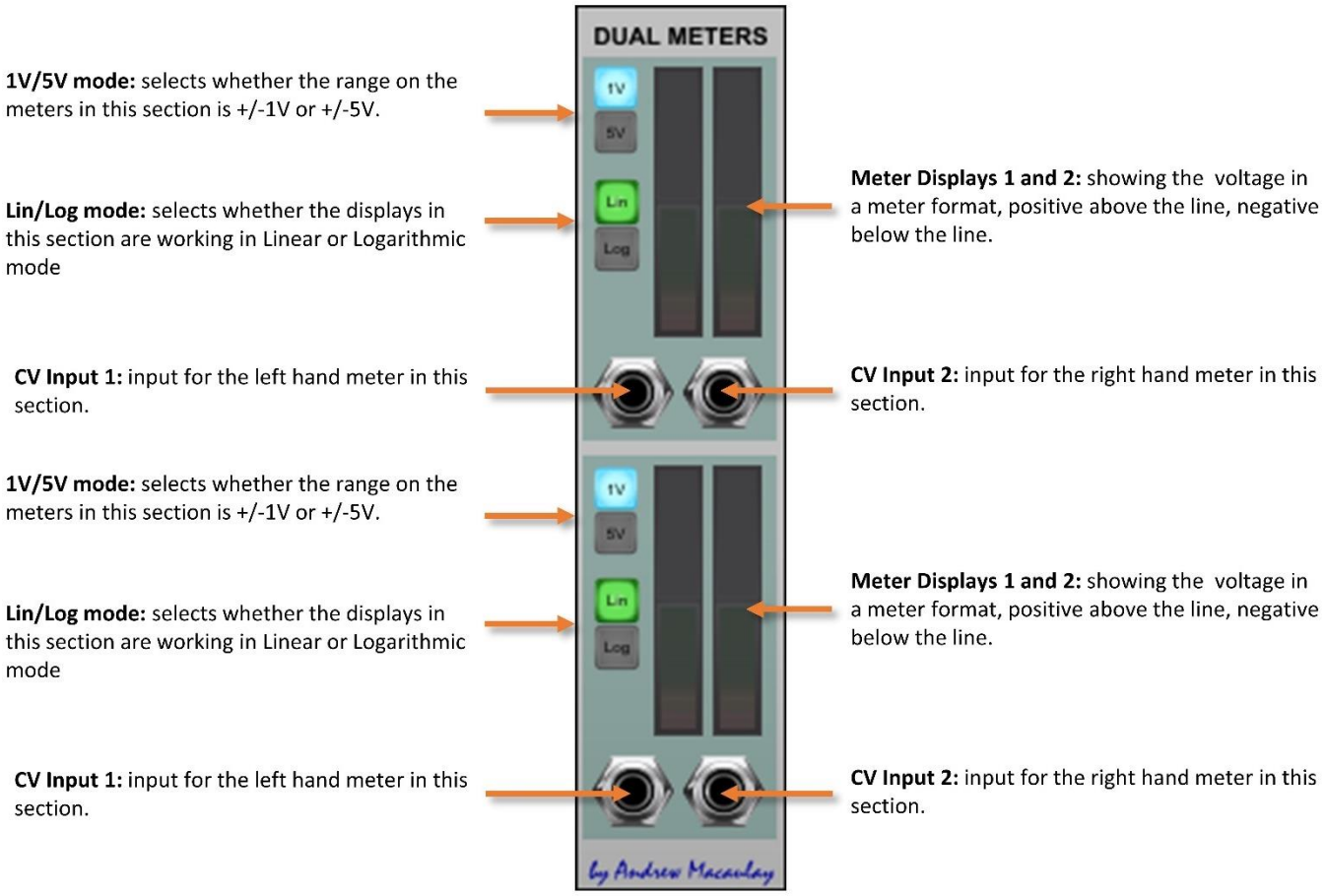
X * (Y + Z): multiplies to the control voltage, which can be used for instance with a BPM (1V/100BPM) control to increase the speed.

X / (Y + Z): divides to the control voltage, which can be used for instance with a BPM (1V/100BPM) control to slow the speed.

Help: Micro Meters

A simple module that provides two pairs of logarithmic/linear-mode meters (showing positive and negative values) in a small form factor that can support the range -1V to +1V or -5V to +5V.

The quad (dual, two-channel) **Micro Meter module** provides the ability to display the instantaneous voltage of multiple inputs in log or linear mode. Each of the two sections is identical.



Help: Micro Mixbus

As small form-factor mix bus with up to twelve inputs and twelve outputs, which can be configured in n-m mixing (similar in thinking to mix buses on, for example, the Modular Moog). The controls can be set to be linear percentage-based or dB based.

Connecting an output jack mixes the signals up to that jack (from a previous output jack). The UI clearly shows the signal routing and the attenuation is +/- 100% on each input. There is also a "Direct Injection" input at the start to allow easy chaining of these units if needed.

This can be useful for mixing the multiple audio or CV waveforms from an oscillator before the "main" mixing stage, or for controlling the amount of multiple CVs for a module.

The **Micro Mixbus module** provides mixing bus inspired to those found on the Moog Modular. Up to 12 inputs can be mixed across up to 12 outputs.

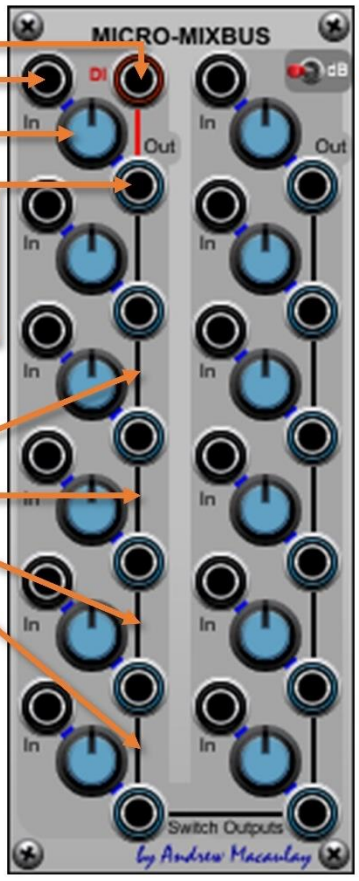
DI input: input which is always included in the first section at 100%. Useful to chain a number of these modules together.

Input: the signal input to be mixed

Mix value: the mix of this input into this part of the bus (-100% to +100%)

Output: an output of the mix from the previous inputs in the chain. The jack being connected in at any point makes that jack the "end" of the mix for inputs up to that point.

Indicator on module: lines between outputs clearly show where the mix is being taken from. Once an output jack is connected, the "following" line is hidden.



dB Switch: changes the mixers from linear % based values to logarithmic dB based values. This switch changes the behaviour of the whole module.

More detail, an example:

Connections:

- *Input signals connected to Input 1, Input 2, Input 3, Input 4, Input 5 and Input 6;*
- *Outputs are connected to Output 3 and Output 5 sockets.*

Signal paths:

- *Output from Jack 3 will be the mix of inputs 1, 2 and 3;*
- *Output from Jack 5 will be the mix of inputs 4 and 5;*
- *Input 6 is ignored.*

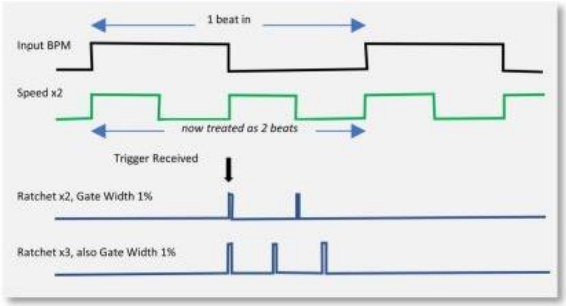
If you then connect Output 12, the output from this will be just a mix of Input 6.

Help: Micro Ratcheter

A simple, fixed ratcheting gate module with 6 outputs fixed at 2x, 3x, 4x, 5x, 6x and 8x with an overall control of the speed locked to either the Host BPM (typically from the DAW) or optionally from a gate/clock input (which is used to calculate the BPM) and the gate width for all outputs. Note the the BPM sensing process does have limitations (as with hardware) in that it takes a few beats to work out the speed of the input. The gate width has a switchable minimum 2ms setting useful for Cherry Audio (and other) Envelopes, which have a minimum Attack Time of 2ms.

A simple "baby brother" to the Pattern Ratcheter which has a lot more flexibility built in. Can be used with the 8-1 Switch or my Voltage Controlled Switch to providing complex ratcheting for sequences.

The **Micro Ratcheter module** provides a way to "ratchet" sequences, in a style like Tangerine Dream and especially Chris Franke. This means taking a step and gating/triggering it multiple times within the step so you get, for example, a triplet on a ratcheted step.
This module can be used together with a manual trigger or gated triggers from e.g. the Drum Sequencer together with voltage-controlled switches to provide complex options.



Trigger In: provides the trigger (gate on) signal for the ratchet to start on all outputs.

Clock Selector switch: to select clock source, which can be a BPM CV (at 1V/100bpm), the host DAW clock speed or the speed of the Ext.Clock input.

BPM CV input: using the 1V/100bpm CV that is on many of Andrew Macaulay's Modules.

Speed knob: provides a clock multiplier/divider for the clock speed as captured in the above section. This can be up to 16x or 1/16th of the BPM rate, and is used to determine "1 beat" for the ratcheting process – that is, a ratchet will generate 2, 3, 4, etc. triggers within this one "beat".

Gate Width knob: controls the gate width of all of the ratchets as a percentage of the total time.

Ext. Clock input: the input of an external gate or clock from which the BPM is measured. Allows sync with e.g. LFO-driven clocks, sequencer, etc.

Speed LED: provides a visual indicator of the beat to be used for the ratcheting.

Min Gate: a switch to force the gate width to have a minimum of 2ms or 0ms. Useful when driving the standard Cherry Audio envelope as this has a 2ms minimum attack time, and a shorter gate will never finish the attack phase.

Ratchet Out jacks: provide the fixed ratcheting rates of x2, x3, x4, x5, x6 and x8 for 2 triggers per beat, 3 triggers per beat…

Help: Micro Signal Splitter

The simplest of modules, providing 8-way signal splitting in a very compact form. Useful when visibility of the cabling becomes important.

The **Micro Signal Splitter module** is a really simple module that allows multiple outs from a single input. As each jack can host 6 jacks, this means 6 inputs to 48 outputs. The aim of this was to allow easier visual patching where multiple outs were needed, for example sharing a single gate signal across eight envelopers when using eight Micro-Envelopers with the Additive Oscillator.

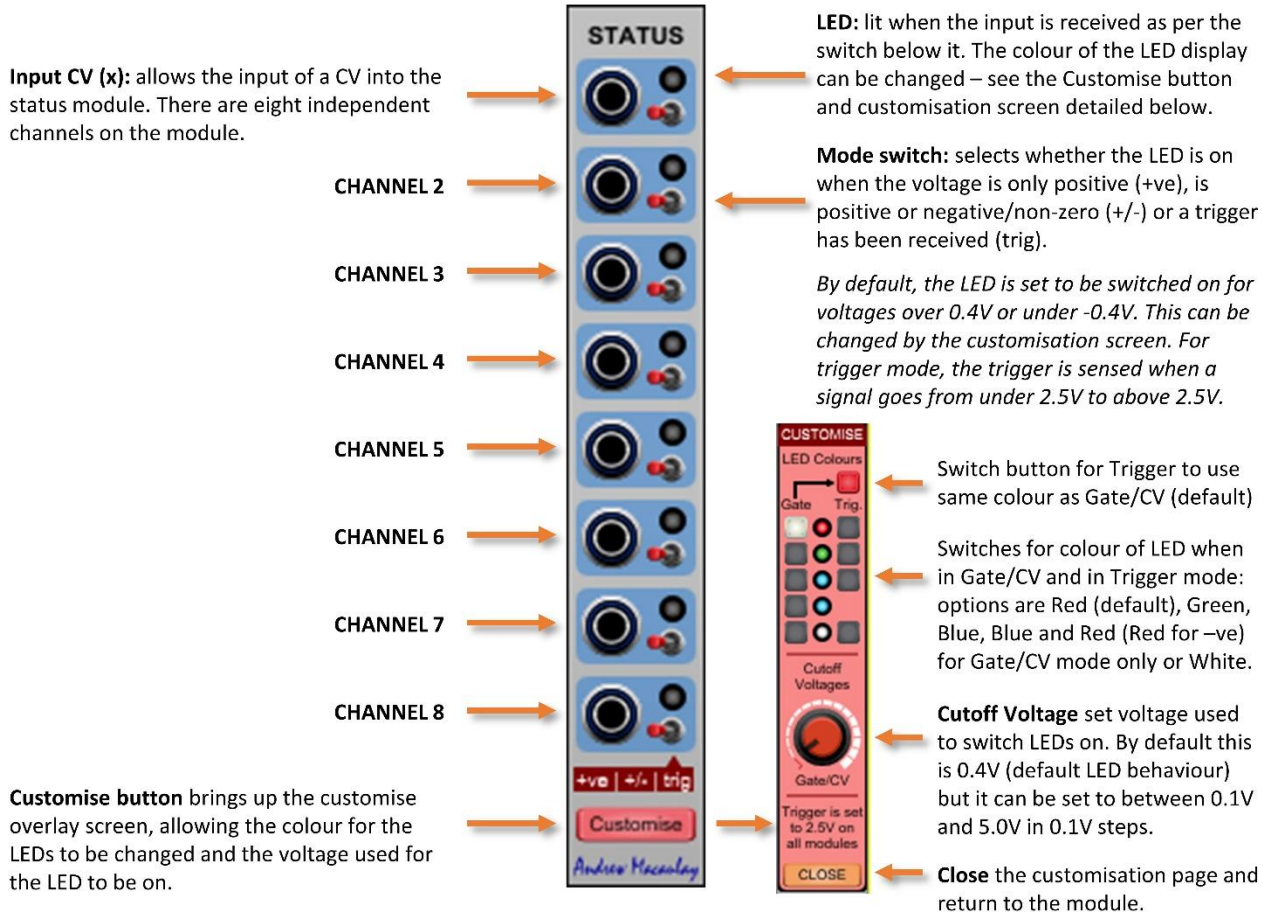
Input jack: the input to be processed by the modules. As normal in Voltage Modular, up to six inputs can be connected. This input can be an audio or control voltage.

Output jacks (8 of): simply passing the input value through. Each of these jacks can support up to six jack connections, allowing a 6 to 48 set of connections!

Help: Micro Status

A simple module that shows the status of 8 inputs through LEDs. The input signal can be measured as positive only, non-zero positive or negative, or as a trigger signal – selectable for each input.

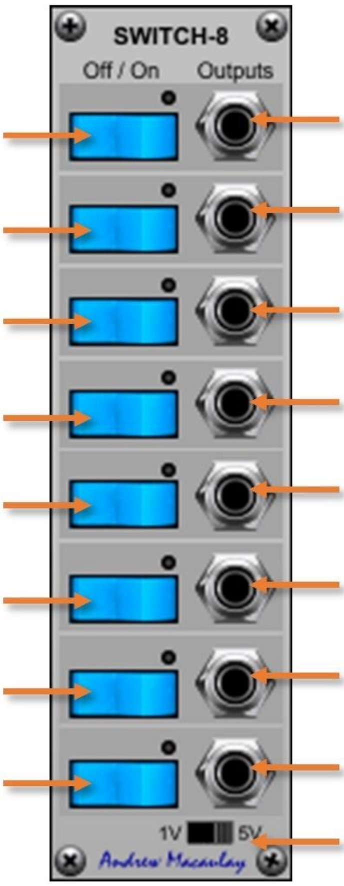
The **Micro Status module** provides a simple LED visual indication for up to eight inputs. This can be for set for each input to be for positive voltages only, positive and negative (non-zero) voltages or a trigger being received (when the LED will flash once for each trigger received).



Help: Micro Switch

A simple module that allows switching of voltage on/off for eight outputs. As state is remembered in presets, can be used to control parameters in a preset. Off is always set to 0V, and On can be set to either 5V (the default) or 1V for all switches.

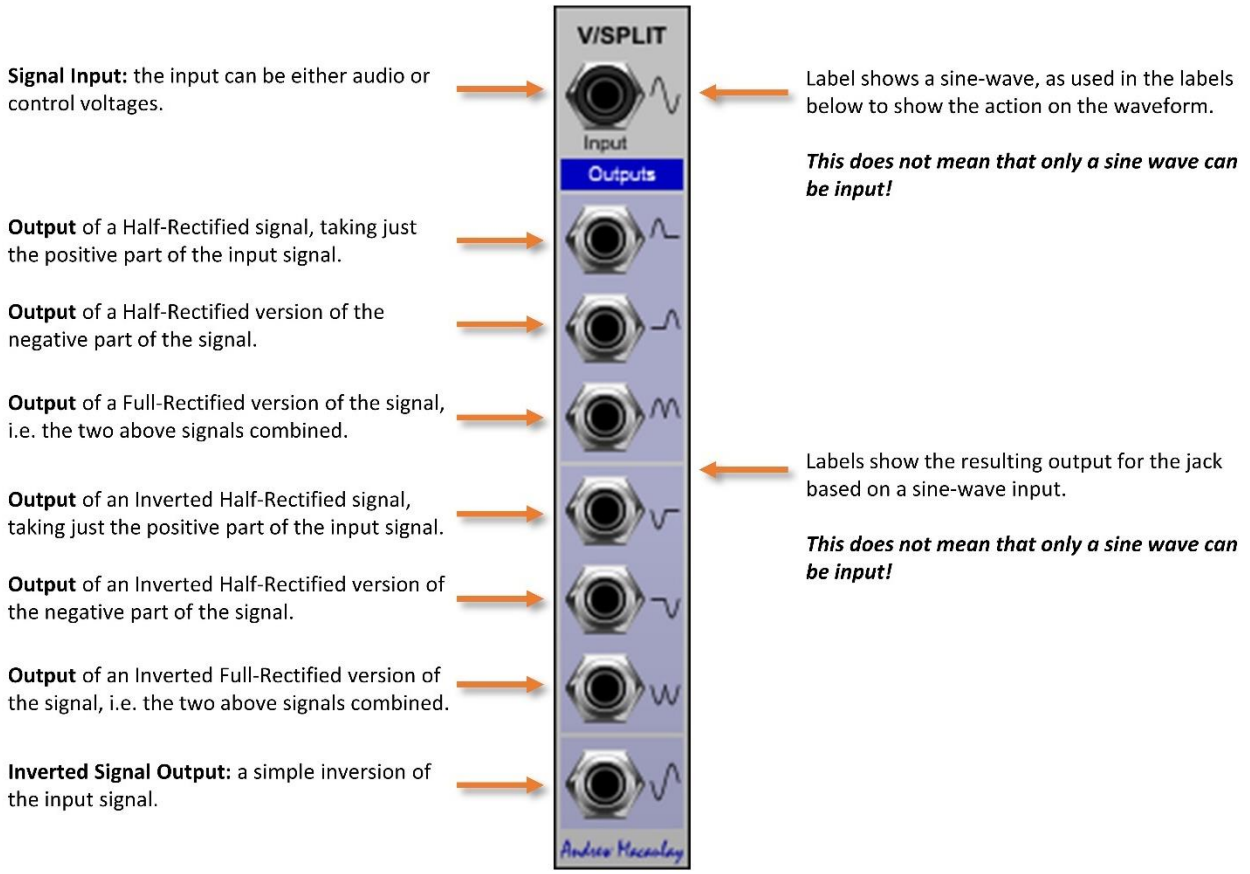
The **Micro Switch module** provides a simple on/off switch capability to output 0V (off) or 1V or 5V (selectable) for eight separate switches.



Help: Micro Voltage Splitter

A small module that separates out the positive and negative phases of an input signal (audio or control voltage) and then provides a set of seven fixed outputs that combine these for Full and Half Rectified signals, positive part only, negative part only and various inverted variants.

The **Micro Voltage Splitter** is a small module that takes an input signal, splits it into the positive and negative phases and does simple processing (on/off/inverted) on them to generate a fixed set of output transformations of the signal: inversion, rectification and simple splitting.



Help: MIDI Display

A simple display module that shows the MIDI data as it comes through the module. The data can be filtered by channel and command type, and the stream can be paused, run and cleared manually or with trigger inputs.

The **MIDI Display module** provides a display of the last MIDI message as filtered by the Channel and Message type. Using the Pause/Run/Clear inputs and filters, allows you to inspect the MIDI messages coming through the system.

Channel Filter: allows the MIDI messages to be filtered by the MIDI Channel. Each channel is controlled individually.

The "All On" button enables all channels, the "All Off " button disabled all channels and is useful if you want just 1 channel monitored.

By default all channels are enabled.

Message Filter: allows the MIDI messages to be filtered by the MIDI message type.

The types available are Note Off, Note On, Poly Pressure, Continuous Change, Programme Change, Channel Pressure, Pitch Bend, Channel Mode (special data) and System Messages.

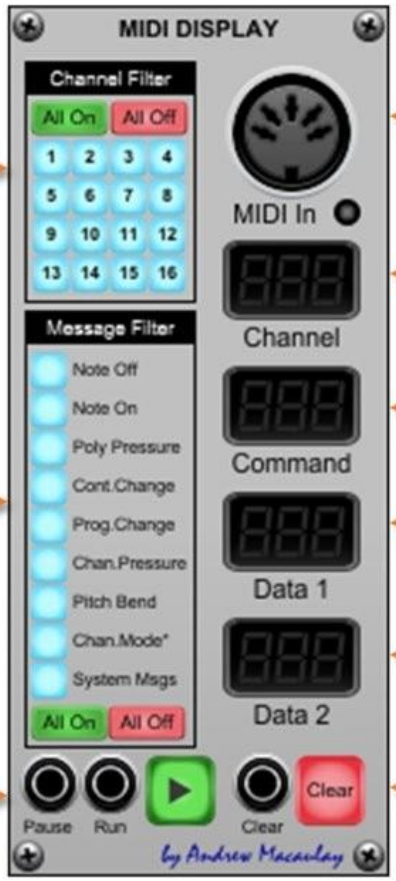
There are push buttons to switch the individual message types all on or off.

By default all message types are enabled.

Pause/Run trigger inputs: allows triggers to pause and run the display of messages.

Pause/Run mode button: allows manual control and shows the mode.

Note that PAUSE does not clear the list of messages to be displayed.



MINI Input: provides the connection for MIDI signals to this module.

MINI Input: provides the connection for MIDI signals to this module.

MINI Input: provides the connection for MIDI signals to this module.

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MINI Input: provides the connection for MIDI signals to this module.

Clear trigger input/button: clears the current queue of MIDI messages to be displayed – can be used in conjunction with Pause/Run.

Help: Mini Delayed LFO

A simplified and smaller version of the Delayed LFO module. Provides a Delay and Fade envelope (manually set times, linear slope).

The Delay CV can be mixed with up to two other CV inputs, allowing the mixing of e.g. keyboard after-touch, mod wheel, etc. with the delay envelope. The resulting control voltage is limited to 0-5V to control the LFO which offers manual speed control and selectable waveform.

The **Mini Delay LFO** module brings together the CV Delay module and an LFO in a simplified form for a narrow form factor. There is no sync to BPM options, but this still provides useful limited mixing of CV and the delay signal, for performance scenarios.

Delay Time: control the time of the Delay (at 0V) set in milliseconds, with the mid-point of the knob controlled by the config dialog.

Fade Time: controls the time of the Fade from 0V up to +5V in milliseconds, with the mid-point of the knob controlled by the config dialog. Note that the fade itself is only LINEAR in this module.

CV In 1 and 2: two CV inputs which will be added to the delay envelope, e.g. to include keyboard after-touch and/or the mod wheel to work alongside the delay envelope. If no jacks are connected to these, they will use the MOD WHEEL input (CV1) and the AFTERTOUCH input (CV2) from the I/O Panel.

LFO Rate: manually controls the speed LFO speed to values between 0.01Hz and 30Hz.

Waveform: select the output waveform from the LFO (one of 6): Sine, Triangle, Sawtooth, Ramp, Square and Pulse (with pulse width control).

Delay CV Out: outputs just the delay envelope.

Trigger input: used to trigger the delay/fade process, and optionally used for LFO sync. If no jack is connected this will take the Trigger from the main CV Inputs I/O Panel.

CV Mixing: mixes the delay, CV1 & CV2. The total is always limited to a range of 0V to +5V.

Config button: brings up the configuration pop-up allowing control of the log mode knob behaviour.

Sync to Trigger: enables the start of the LFO wave to be sync'd to the trigger input, useful for vibrato.

Pulse Width: controls the width of the LFO pulse waveform, from 5%-95% and defaulting to 50%.

LFO Out: outputs the LFO as controlled by the delay and CV inputs.

***The Delay and Fade** knobs control the time in milliseconds with a logarithmic or linear scale, configured through the settings configuration dialog. The options in the configuration dialog are: 500ms, 750ms, 1sec, 1.25sec, 3sec (legacy mode) and linear mode. Default setting for new instances of this module is 1250ms unless changed in the Global Config file (see general help for more).*

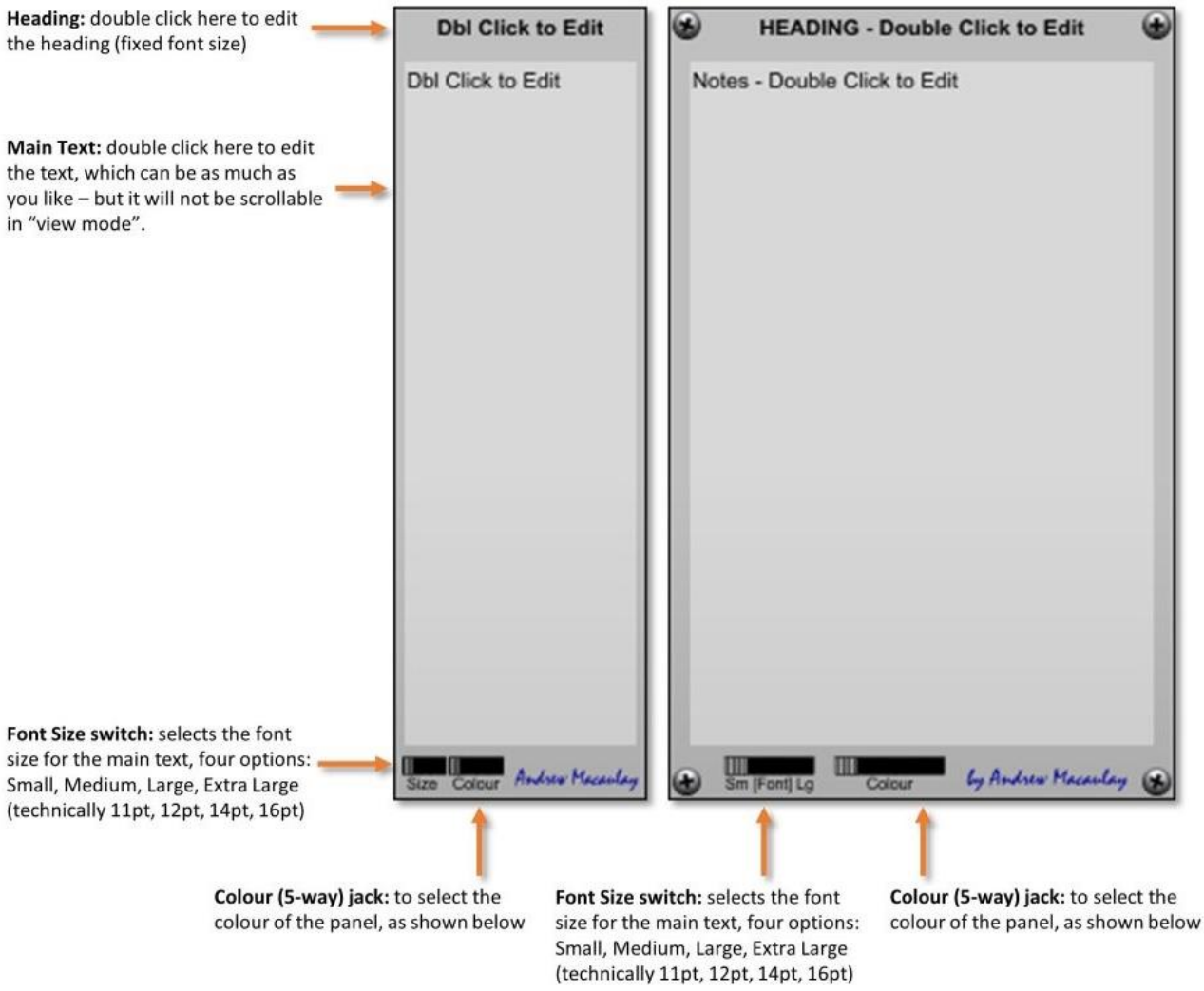
Help: Notes Panels (8HP/16HP)

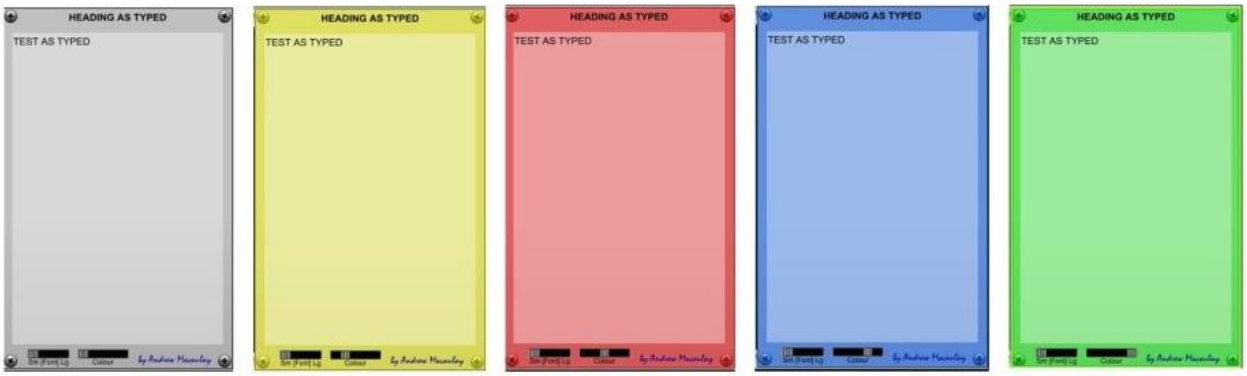
A really simple blank panel with two editable areas for a heading and notes (using doubleclick to edit) with a font size selector.

Available in a 16HP and 8HP module, aimed primarily at providing in-preset help information and tutorial information as part of the collections.

Now allows more options for text size and options for background colour ("silver", yellow, red, blue or green). Included in all Andrew Macaulay's collections and available for free as separate modules.

The **Notes Modules (8HP and 16HP)** provides modules that you can add your notes into a preset. These modules are used heavily in my Tutorial Presets.





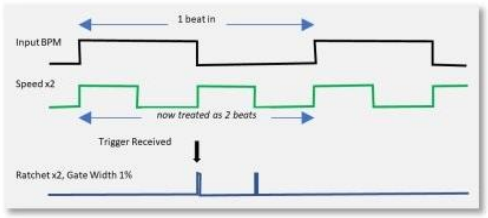
Help: Pattern Ratcheter

A timed ratcheting unit with 8 steps and customisable patterns and gate times, including CV control over the gate times. Can be used in fixed mode (runs the whole sequence, 1 to 8 steps) or re-trigger mode. Outputs the combined trigger/gate signals plus individual step gates, and a chain trigger so that multiple 8-step units can be chained.

The timing can be from the host clock or from an optional gate input – the host/DAW mode is selected when no jack plugged into the clock in socket. In both cases, the rate can be set using the Beats control, from 1/16 beat to 16 beats per BPM.

The gate width has a switchable minimum 2ms setting useful for Cherry Audio (and other) Envelopes, which have a minimum Attack Time of 2ms, and there are controls to set the individual gate widths to a single value or master value.

The **Pattern Ratcheter module** provides comprehensive "ratchet" effect that can be used for Tangerine Dream-like sequencing and many more rhythmic effects. Ratcheting means taking a "step" (beat) and gating it multiple times within the beat so you get, for example, a triplet on a ratcheted step. This module has extensive pattern-based options and step-specific gate widths, to allow to allow much more flexibility. It also provides the ability to chain Ratcheters to give you ratchets of 16 steps or even more.



Step On/Off button: select these to switch each step on or off. If the step is off, no gate/trigger is sent at the time of the step. Only steps that are available, based on the Steps/Beat knob can be changed.

Step LED: shows the step which is currently active in the ratchet, this is shown whether the step is on or off.

Step width to "Master Gate Width". When selected, the LED will light on this button and the gate width for this step will be the width as set by the "Master Gate Width" control.

Step Width control: sets the gate width for the individual step which, together with selecting steps on and off, allows for complex rhythms to be setup in the ratcheting process. This is active by default and unless the "Step width to Master Gate Width" button has been selected on the step.

Retrigger mode: allows a ratchet to be retriggered early. When off, the default mode, a Trigger In arriving during the ratchet will be ignored. When on, a Trigger In arriving during the ratchet will start a new ratchet from Step 1.

To#1 [set all widths to Step1 width]: pressing this button simply sets all the step gate width controls to be the same as the gate width set for Step 1. Note, this does NOT lock them.

sync Mast [set all to "Master Gate Width" mode]: pressing this button simply sets all the "Step width to Master Gate Width" buttons to on, and **Manual** mode to set them all to manual mode.

Chain out jack: provides the next gate after a ratchet event, so you can chain multiple 8-step ratcheters together by feeding the Chain out into the Trigger In on a second ratcheter, etc.

Trigger In: provides the signal for the pattern ratcheting to start.

Steps per beat: selects between 1 and 8 steps per beat.

Clock Selector switch: to select clock source, which can be a BPM CV (at 1V/100bpm), the host DAW clock speed or the speed of the Ext.Clock input.

Ext. Clock input: the input of an external gate or clock from which the BPM is measured. Allows sync with LFO-driven clock/sequencer

BPM CV input: using 1V/100bpm CV on many of my other Modules

Speed knob/LED: clock multiplier and divider (1/16th to 16x BPM). This determines what "1 beat" for the ratcheting process is.

Master Gate Width setting: sets the gate width to be used on any step where the "Step width to Master Gate Width" button has been selected. This is from 0-100%.

Min Gate Width: sets the gate width minimum to 0ms or 2ms (Cherry Audio envelope needs 2ms for attack to complete).

Width CV In and adjustment knob: allows a CV to control the gate width over time with a -100% to +100% control amount. Affects the gate width of the current step.

Ratchet Gate Out jack: the ratchet gates, with the gate width as set by the module for the individual step.

Ratchet Trigger jack: the ratchet trigger out (effectively 0% gate width) for use alongside the gate output.

Individual Gate out jacks: provide a gate out from each step, to allow triggering of different events/sounds on each step of a ratchet.

Help: Pitch CV Modifier

A module that allows modification of the 1V/OCT control voltage used for notes, transposing them by octaves, semitones and quartertones with optional inversion of the control signal around 0V before transposition with CV-controlled switching of the inversion and transposition. Using gates to switch these modes can generate interesting harmonic variations. Using a number of these with voltage-controlled switches or sequential switches can generate interesting harmonic movement.

The **Pitch CV Modifier module** is a CV transpose module (NOT AN AUDIO SIGNAL MODULE) which can transpose 1V/OCT inputs in octaves, semitones and quartertones. Taking inspiration from some physical Eurorack modules, this module also allows inversion of the signal and switching of the inversion and transposition on and off.

1V/OCT CV In: the input signal for the module, assumed to be a 1V/OCT note CV.

Invert button: allowing toggling between inverted and normal. Inversion of the signal is around 0V.

Invert Input: gate input to switch the Invert function on or off (Gate on = Invert on). **Only works when the Invert Button is on.**

Octave Transpose: allows transposition between -5 and +5 octaves.

Semitone Transpose: allows transposition between -12 and +12 semitones (i.e. 1 octave).

Quartertone Transpose: allows transposition of -1/2 note or +1/2 note.

Tr/Gt switch: sets whether the On/Of input jack is a Trigger (toggling the state) or a Gate (with Gate on = Transpose On).

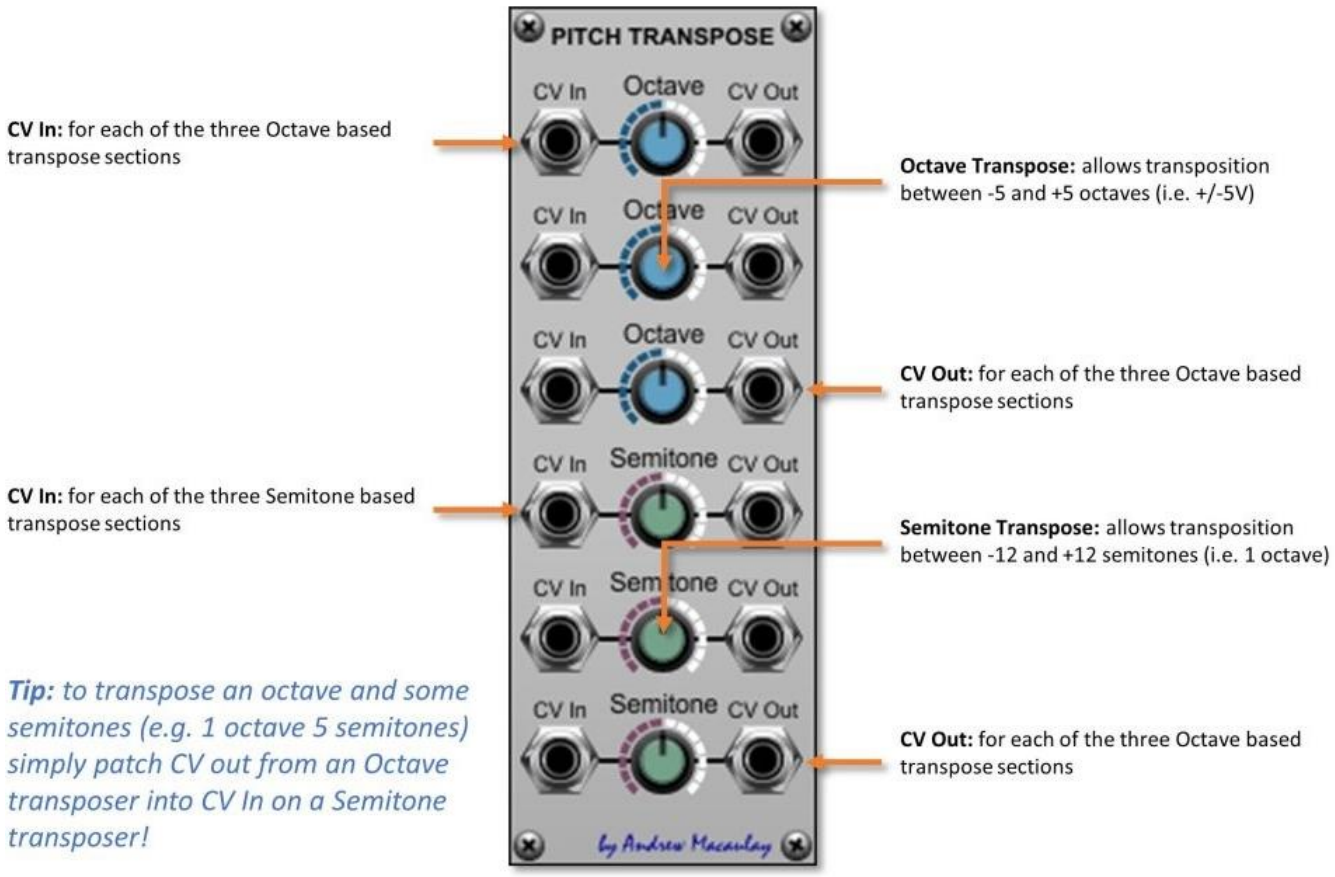
On/Off Input: switches the Transpose function on or off – either as a gate or a gated trigger.

1V/OCT CV Out: provides the transposed/inverted signal out, subject to the switches/input gates.

Help: Pitch CV Transpose

A simple control-voltage pitch transpose module (NOT AN AUDIO SIGNAL MODULE), with three octave-based transposes (-5 octave to +5 octave) and three semitone-based transposes (-12 semitones to +12 semitones).

The **Pitch Transpose module** is a simple CV transpose module (NOT AN AUDIO SIGNAL MODULE) which can transpose 1V/OCT inputs in Octaves (3 channels) and in Semitones (3 channels).



***Tip:** to transpose an octave and some semitones (e.g. 1 octave 5 semitones) simply patch CV out from an Octave transposer into CV In on a Semitone transposer!*

Help: Poly Delayed LFO

A polyphonic Delayed LFO module, with a polyphonic Delay and Fade envelope controlling the built-in monophonic LFO as well as two additional VCAs to use more powerful LFOs or other modulations with the delay module. The delay can be triggered on each separate polyphonic note, on the first note (effectively a legato mode for the LFO) or retriggered across all notes on each new note; this allows you to simulate the delayed LFO that was provided on vintage devices such as string machines.

The delay CV can be mixed with up to two mono CV inputs and two polyphonic CV inputs, allowing the mixing of e.g. keyboard after-touch, mod wheel, etc. with the delay envelope. Default routing for the POLY GATE input, as well as the MOD-WHEEL and AFTER-TOUCH inputs make this module easy to use whilst flexible. Support for +ve and -ve control voltages and mixing, as well as limiting to a specified range allow flexible control voltages.

The built in simple LFO, as controlled by the delay/modulation, is available with separate outputs for Sine, Triangle, Sawtooth, Ramp, Square and Pulse (with a variable pulse width control) and the delay module has its own polyphonic output so that you can drive other modules with this.

The **Poly Delayed LFO** module provide a polyphonic Delay and Fade envelope controlling the built-in monophonic LFO as well as two additional VCAs to use more powerful LFOs or other modulations with the delay module. The delay can be triggered on each separate polyphonic note, on the first note (effectively a legato mode for the LFO) or retriggered across all notes on each new note; this allows you to simulate the delayed LFO that was provided on vintage devices such as string machines.

The delay CV can be mixed with up to two mono CV inputs and two polyphonic CV inputs, allowing the mixing of e.g. keyboard after-touch, mod wheel, etc. with the delay envelope. Support for +ve and -ve control voltages and mixing, as well as limiting to a specified range allow flexible control voltages.

Delay and Fade: control the time of the Delay (no signal) and Fade (to full signal).

Gate input: used to trigger the delay/fade process – defaults to the POLY GATE from the I/O panel if no jack is connected.

Trigger mode: selects **Poly** mode where each note starts its own delay; **First** note mode where first note starts delay, others pick current level; and **Retrigger mode**, where each not e starts all notes' delays.

Delay CV Mix: controls the amount of Delay in the CV mix. Defaults to 100%. Off button to quickly disable the delay input.

Mono CV In 1/Mix: mono input of CV to be added into CV. Defaults to MOD WHEEL from I/O panel if no jack connected.

Mono CV In 2/Mix: mono input of CV to be added into CV. Defaults to AFTER TOUCH from I/O panel if no jack connected.

Poly CV In 1/Mix: polyphonic input of CV to be added to CV controlling LFO amount.

Poly CV In 2/Mix: polyphonic input of CV to be added to CV controlling LFO amount.

CV Mix Limiter: controls limiting of the CV mix: "Off" is no limiting; "Norm." make sure that the mix totals to ±100% and "Limit" places a hard limit of ±100% on the resulting CV.

Config button: brings up the config pop-up, allowing control of the delay and fade time knob behaviour.

Delay output: outputs the delay envelope in standard 0V-5V range.

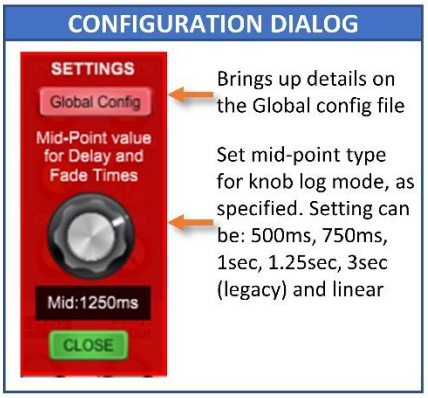
Trigger Sync: when on, forces the LFO to start its cycle – which can be on First note or Retriggered.

LFO Rate: sets the rate for the LFO. The LED shows the speed.

Pulse Width control: controls the pulse width for the Pulse output.

LFO Outputs: provide the LFO signals as controlled by the CV mixed including the delay and other CV inputs.

CV Processing takes mono or poly signal and processes using CVs used on LFO.

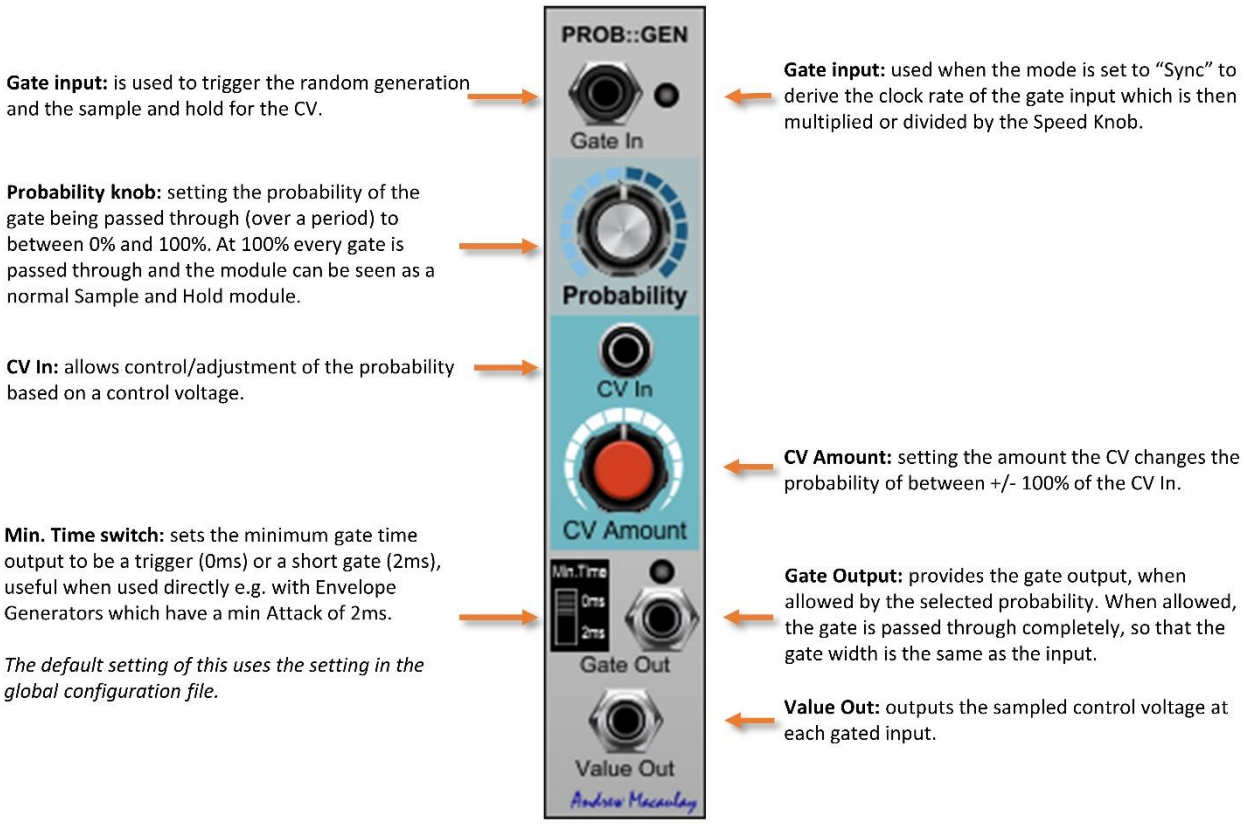


***Delay and Fade knobs** control the time in milliseconds using a logarithmic or linear scale, configured through the settings config dialog. The options in the configuration dialog are: 500ms, 750ms, 1sec, 1.25sec, 3sec (legacy mode) and linear mode. Default setting for new instances is 1250ms unless changed in the Global Config file (see general help for more).*

Help: Probability Generator

A simple voltage controlled "probability generator" that generates random voltages and gates based on a probability, set manually and also controlled by an optional CV input. Now has the switch to allow setting a minimum gate time of 2ms.

The **Probability Generator module** is designed to generate random events on a gated input. Specifically, it will take a gate input, and on each gate in (used as a trigger) will generate a random number. The random number is then used to first determine by the probability know (0-100%) whether or not the gate will be passed through and, second, determine the control voltage to be output in a Sample and Hold style of operation. This can be used to generate random "sequences" by passing the CV through the standard Quantizer.

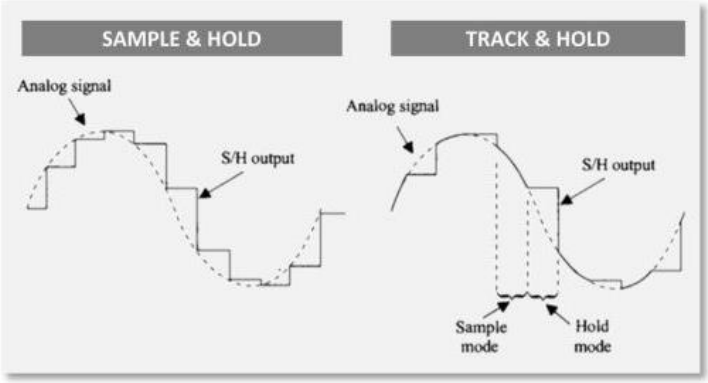


Help: Sample/Track and Hold

A Sample and Hold and Track and Hold module with some additional features. Featuring an internal clock or fully external gating for flexible use, this module supports both the

"normal" Sample and Hold approach AND the Korg MS-20 inspired Track and Hold mode where the signal is passed through while the gate is on, and is only sampled when the gate is off. In addition, the Sample and Hold mode features controls that restrict the amount of change between samples – both as a percentage of the amount of change, or a limit of a fixed voltage. It also features a switch to quantize the output.

The **Sample/Track and Hold module** provides a sample and hold module with some additional features including Sample & Hold AND Track & Hold modes. Track & Hold is inspired by the Korg MS-20 S&H module, as illustrated in the diagram to the right. The module also includes Quantizer and the Restrict and Limiter features that limit the change between samples. The module includes an internal clock, but also supports external clocking, including non-regular clocks.



Input signal for the sample and hold. This is often used for inputs such as noise, for a random effect.

Mode switch: to select between Sample and Hold or Track and Hold (inspired by the Korg MS-20) modes.

Restrict: limits the amount of change between the samples by a percentage based algorithm. Restrict and Limiter settings only apply in S&H Mode.

Reset Trigger input synchronises the internal manual or sync'd clock with, e.g. a sequencer.

BPM CV input: using 1V/100bpm CV on many of my other Modules

Speed knob: controls the delay of the trigger being generated and works in two ways: in "manual" mode the delay (in milliseconds) is directly controlled by the knob; in Host/BPM mode, the delay is a multiple or division of the input BPM, between 1/16th and 16x.

The display of the value is reflects the mode and editing directly also adjusts, allowing for input of the simple number in BPM or the factor using "x" or "" for multiples and "/" for division.*

Clock Out: outputs a clock (0-5V) signal based on the speed calculated from the adjusted CV in value.

Output of the input as processes by the Sample/Track and Hold processing.

Quantize button which, when enabled, quantize the outputs to notes.

Limiter: limits the amount of change between the samples to a specific amount (voltage). Works in conjunction with the Restrict setting.

Ext. Clock input: the input of an external gate or clock from which the BPM is measured or, when in EXT mode, the actual clock used to trigger the sample and hold.

Clock Selector buttons: to select MANUAL mode or the synchronised with the host DAW clock speed, a BPM CV (at 1V/100bpm) or the speed of the Ext.Clock input.

The **EXT** mode is a pure external clock mode where the clock is the time when a sample is triggered. This external clock can also be Inverted by the **Invert** switch.

Trigger 0ms/2ms switch: sets the output clock to be a pure trigger (0ms) or a short gate (2ms) which can be useful when used directly with Envelope Generators which may have a min Attack of 2ms. *The default setting of this uses the setting in the global configuration file.*

Help: Slew Processor

A flexible Voltage-Controlled Slew Processor that offers control over the slew up (rise) and slew down (fall) stages, rise/fall/both modes, flexible log or linear slopes, voltage control over the slew times, gated slewing (with inverted gate support, so slew can be legato only or staccato only) and output triggers from the start and end of the slews. A great way to introduce flow into sequences, etc. as well as great for live use. Can also be used with oscillators and gates to perform wave-shaping and simple envelopes.

The **Slew Processor module** provides comprehensive slew/slide processing for control voltages. With separate Slew Up and Slew Down controls, options for Up only, Up/Down and Down only modes, manually and voltage controlled set times, options to link Up/Down times, a slew enable gate, sample and glide mode and optional quantization, the module can be used in many situations for note glides and glissandos as well as to treat other control voltages (and maybe even try it with audio).

Slew Enable Gate input takes the gate and enables Slew (as per controls below) when the gate is on (or when off if **INV** switch on). *This can be used with the keyboard gate to only glide when playing legato, or only when playing staccato – or with a sequencer to only glide between specific steps.*

Slew Up panel, allows control over the slew when new voltage is more than the previous voltage (note higher than previous).

This section, like the **Slew Down** panel, will be enabled depending on the Slew Mode.

Slope control which allows the slope for the Slew to be Linear, Exponential or Logarithmic with a setting of how much the effect will be.

Rate control which sets the slew rate in milliseconds.

LINear/CONstant buttons select if the slew rate is for 5V change (linear) where smaller jumps will be faster, or for the amount of change of the current slew (constant).

CV in and controls with a CV input, selector for 10ms/V or 1sec/V and control knob which sets this to be -200% to +200%.

Sample & Glide in samples the next target value when the gate/trigger is >2.5V.

Rise Active outputs a gate (5V) when the slew up stage is active.

Rise Done trigger outputs a trigger signal when the rise stage completes.

Quant CV In selects if the Quantize CV input is trigger (flips mode), gate or inverted gate.

Slew Mode buttons select whether the Slew will be active Up only, Up/Down or Down only. The SYNC button is a variant of Up/Down where the settings of the Slew Up panel are used for up and down.

Fall Active outputs a gate (5V) when the slew down stage is active

Fall Done trigger outputs a trigger signal when the slew down stage completes.

Trigger 0ms/2ms switch: sets the triggers to be a trigger (0ms) or a short gate (2ms), useful when used directly e.g. with Envelope Generators which have a min Attack of 2ms.

The default setting of this uses the setting in the global configuration file.

Input for the control voltage (or audio) that you want the slew applied to. By default (without a jack connected) this will use the PITCH input from the Panel, providing the pitch from the DAW or external controller/s.

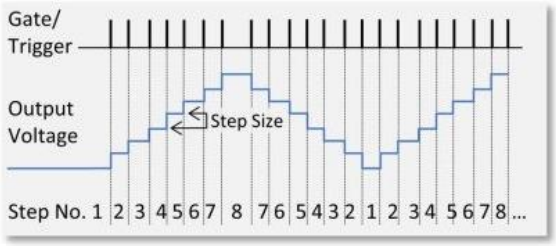
Output from the slew module.

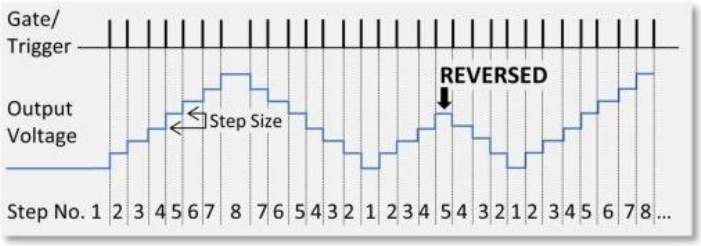
Output Mode to quickly select between the fully slewed output (Slew), the output of the Sample & Hold section (S&H) or the direct input signal (Thru).

Help: Step Generator

A flexible step generator that can be used to create stepped voltages of up to 256 steps, using start/end voltages, step sizes, and step numbers to set the sequence. The steps can be run Up / Up-Down / Down-Up / Down in either looping or single shot modes. With a reverse button/gate, a reset button/gate and using an external clock to drive the stepping, this can be used to generate simple sequences including quantized notes.

The **Step Generator module** provides a way to generate sequential Control Voltage steps from a Gate In. The steps can be a ramp Up, Up/Down, Down/Up or a ramp Down. The start, end, number and size of steps are controllable and the stepping can be reset and reversed by additional inputs. A quantization mode for the steps is available, for use as a 1V/OCT source.





Trigger In: provides the trigger/gate input that moves the step onto the next in sequence. *Ideally a pure trigger signal should be used to ensure that the Reset is sync'd to the clock.*

Reset to Starting: button/trigger input that resets step count to the start of the sequence, the Start value (Up, Up/Down) or End value (Down, Down/Up) ready for the next Trigger.

Reverse button/trigger input reverses current steps back until the start of that stage of the step sequence – see the diagrams above.

Start Value: manual control (-10V to +10V) or CV input for the value for the Start (lowest value) of the steps. *If End is set lower, this is automatically adjusted to the same as End.*

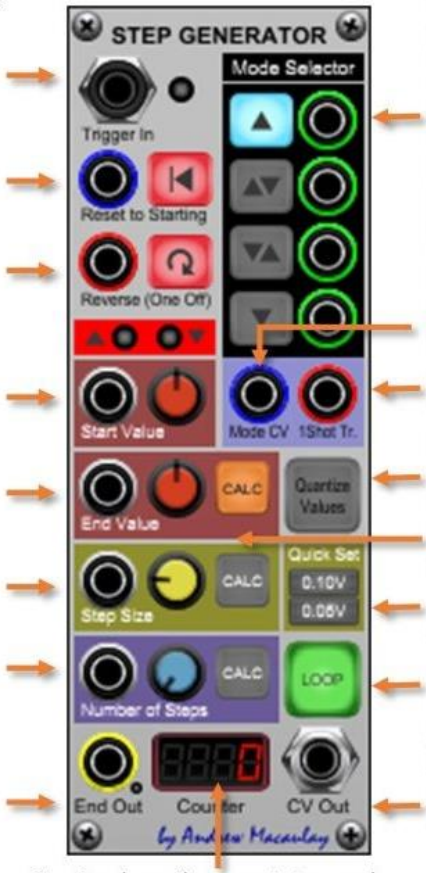
End Value: manual control (-10V to +10V) or CV input for the value for the End (highest value) of the steps. *If Start is set higher, this is automatically adjusted to the same as Start.*

Step Size: manual control (0V to +5V) or CV input for the voltage for each individual step.

Number of Steps: manual control or CV input for the number of steps, from 1 to 256.

*Note that the **CV inputs** for all of the settings above override the manual setting, and are NOT additive.*

End Out Trigger: sends a trigger at the end of the steps when in One Step mode. *This can be used to trigger another module to create end-to-end steps/sequencer, etc.*



Counter shows the current step number. Note that this starts at 1, as per diagrams.

Mode buttons and Triggers In: controls the direction of the step process, as follows:

- UP runs Start value ⇨ End value;
- UP/DOWN runs Start ⇨ End ⇨ Start value;
- DOWN/UP runs End ⇨ Start ⇨ End value;
- DOWN runs End value ⇨ Start value.

When a trigger is received/button is pressed, the steps automatically reset to the Start. In loop mode, the series repeats, but for all cases, the start/end value are triggered once each time (see the diagrams above).

Mode CV In: allows mode to be CV selected: +1V=Up,+2=Up/Down, -1=Down, -2=Down/Up.

1Shot Trigger In: alternates the Loop/One-Shot mode.

Quantize Values button: when on, all settings are quantized – and the knobs show additional info about the MIDI keys selected.

CALC buttons: selects control to be calculated from the other value (disables the control/CV).

Quickset 0.10V and 0.05V buttons to quickly set the Step Size to 0.1V or 0.5V per step.

Loop mode: the steps can be looped, or set to a One-Shot mode which then leaves the output CV as the end value for the sequence (and the End Out trigger is sent in this mode).

CV Output: The output control voltage signal of the step sequence.

Help: Stereo Mid-Side Processor

A stereo and mid-side audio processing module that takes Stereo, Mid-Side or Mono inputs (with trim and phase inversion), allows voltage controlled control over the channels (panning for Stereo/Mono, volume for Mid-Side) and overall balance and stereo width and then outputs the results in Stereo, Mid-Side and Mono. The module includes flexible "pan law" options. In addition, the modules includes a secondary Mid-Side to Stereo Decoder section so that you can use the module to take a stereo signal, do some basic processing, add some more Mid-Side processing with other modules and convert back to stereo.

The **Stereo Mid/Side Processor module** is designed to take audio inputs in Stereo, Mid/Side encoded or Mono and process them in the stereo field (with voltage controlled actions) including Balance, Stereo Width and channel flipping. The module outputs the results as Stereo, Mid/Side and Mono outputs and also includes an Secondary Mid/Side to Stereo Decoder so that the M/S Output can be processed with other modules and then recombined in Stereo without another instance of the module.

Input Channels: two audio input channels, which can be configured for Stereo (Left/Right), Mid/Side or Mono (Channel 1 and Channel 2).

Input Mode: selects whether the input is Stereo, Mid/Side or Mono. *The labels on the Input Channels change to reflect this choice.*

Audio Input: provides the audio input for the channel. Also a VU meter displays the trimmed level.

Trim (dB) allows +6bB to -6bB adjustment of the input signal.

Phase Invert button inverts the signal on this channel.

Pan (or Volume) knobs, CV inputs and CV amounts: part of the overall processing stage – for Stereo and Mono, these control the pan of the signal; for Mid/Side these affect the volume. *The labels reflect the mode.*

Swap L/R knob and gate/trigger input swaps the L/R channels. The CV input can be set to Trigger (flips mode), Gate (gate on=swapped) and an Inverted Gate (gate off=swapped).

Balance knob, CV in and CV amount controls the relative volumes of the left and right channels in the stereo image, according to the Pan Law.

Secondary M/S to Stereo Decoder provides an extra, simple Mid/Side to Stereo decoder with a Channel Swap control to reverse Left/Right (depends on the M/S algorithm).

This is especially useful if you are doing some additional Mid/Side processing using other modules.

Pan Law panel includes controls to set the Pan Law/Centre Cut for pan and balance controls:

Flat: sets the pan/balance to be linear with 0dB centre cut.

Linear/Square Law/Sin Law: sets the pan/balance to use a linear (voltage based) scale or a non-linear (power related) approach.

Centre Cut dB: adds a centre cut (logarithmic) of 0dB, -3dB, -4.5dB or -6bD to the panning process. This adjusts for centred volumes sounding louder if simply added *(plenty on the Internet about the theory and practice of Pan Law)*

Bypass switch to simply bypass the processing in this section. This does not affect the channel Trim and Phase Invert controls.

Stereo Width knob, CV and CV amount sets the stereo width to between +100% and -100% (mono) using simple M/S level adjustments.

Outputs: provides outputs for Stereo (L/R), Mid/Side and Mono signals – all at the same time.

The Mono output is level adjusted when it has been derived from Stereo or Mid/Side signals.

What is Mid/Side processing? Mid/Side processing is a special way to process stereo signals. Simply put, Mid/Side processing allows you to process (EQ, compression, etc.) the middle/centre of the stereo spectrum ("Mid") separately from processing the sides ("Side") of the stereo spectrum (stuff panned hard left and right). Mid/Side processing is often used to add space to a stereo image (as with the Stereo Width control here) but can also be used in other creative ways.

Help: Sustain Processor

This module takes the Gate and Sustain (pedal) inputs to create a sustained gate signal that can be used with the standard envelopes; with a trigger input this can include re-triggering from the keyboard. The module also outputs trigger signals for the start of Gate, end of Gate, start of Sustain and end of Sustained Gate signals for other creative uses.

The **Sustain Processor module** takes the Gate and Sustain (pedal) inputs to create a sustained gate signal that can be used with the standard envelopes; with a trigger input this can include re-triggering from the keyboard. The module also outputs trigger signals for the start of Gate, end of Gate, start of Sustain and end of Sustained Gate signals for other creative uses.

Default input (without jack connected) for **Gate Input** is from the standard gate on the Panel from a DAW or external controllers/s. The button allows this to be disabled. If either a Gate or Trigger jack are plugged in, the Gate and Trigger buttons are both switch off by default.

Default input (without jack connected) for **Trigger Input** is from the standard trigger input on the Panel from a DAW or external controllers/s. The button allows this to be disabled.

Default input (without jack connected) for **Sustain Input** is from the Sustain pedal (gate) input on the Panel from a DAW or external controllers/s. The button allows this to be disabled.

Gate Input is for the standard gate which for this module typically will be from a keyboard control. This could be from the DAW, directly or via MIDI.

Sustain Input is for the Sustain pedal (gate) input, typically from the DAW, directly or via MIDI.

Trigger Input is for the standard trigger input from the same device as the gate. This allows for the re-triggering of notes/envelopes whilst keeping the sustain pedal on.

Legato Output provides a sustained gate signal where the sustain overrides any retriggering of the notes.

Retrigger Output provides a sustained gate signal where any Trigger input will retrigger the notes during sustain. NOTE that for this to work, the Trigger input needs to be connected, otherwise this functions the same as the Legato.

Gate On Trigger Out provides a trigger out when the gate first starts.

Gate Off Trigger Out provides a trigger out when the gate is released, irrespective of the sustain.

Sust. On Trigger Out provides a trigger when the Sustain is started, i.e. when a Gate is active and the Sustain pedal is pressed.

Trigger 0ms/2ms switch: sets the output clock to be a pure trigger (0ms) or a short gate (2ms) which can be useful when used directly with e.g. Envelope Generators which may have a min Attack of 2ms. *The default setting of this uses the setting in the global configuration file.*

Sust. Off Trigger Out provides a trigger when the sustain process has finished, that is when any Gate AND any Sustain are been released.

Help: Tempo Display

A utility that shows the BPM and time signature reported from the host (DAW), provides an indicator and a Trigger Out when the host tempo changes and also measures the BPM of an incoming gate signal.

The measurement of incoming gate BPM has a very small amount of drift (due to timing constraints) and needs at least two gates/triggers to start measuring.

The **Tempo Display module** provides the ability to display the tempo and time signature of the host/DAW and the tempo from an external clock.

Host Clock: displays the host (or DAW) clock in beats per minute.

Time Signature: displays the hots (or DAW) time signature (i.e. 4/4, 3/4, 6/8…)

Tempo Change trigger out sends a trigger when the host tempo (stand-alone or DAW) changes.

Gate In: takes the gate (or trigger) to be used as the clock to be measured.

Calculated Rate: displays the tempo in beats per minute of the Gate In clock.

Freeze Button: freezes display at the current value. The button is an on/off type so pressing again "releases" the freeze.

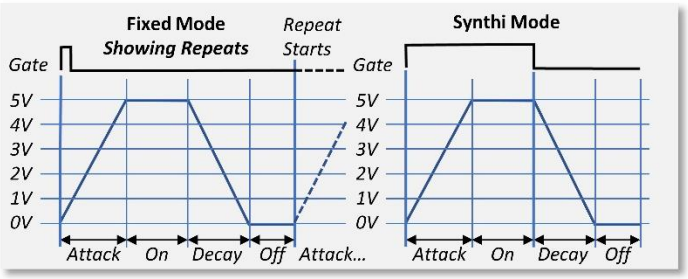
Freeze Trigger Input: freezes display at current value on the input trigger. The trigger in toggles the freeze button – the first freezes the display, the next one unfreezes, etc.

Help: Trapezoid Envelope VCA

A Trapezoid Envelope module with included VCA, taking inspiration from the EMS VCS and Synthi vintage synths, the Trapezoid generator allows simple envelopes and repeating loop.

With flexible linear and logarithmic slopes for both the attack and decay phases, plus options for gated or fixed on stage, and single-shot, repeating or gated repeat mode, the module takes the ideas from the VCS/Synthi and allows even more creativity. The module includes a simple VCA path to allow easy use of the envelope with audio or control signals.

The **Trapezoid Envelope and VCA module** provides an EMS VCS/Synthi inspired Trapezoid Envelope Generator (with some additions) and an included VCA for easy use of the envelope with audio or CV signals. Multiple modes allow use of the Trapezoid as a looping envelope and a single-shot envelope. See the diagrams to the right to see how the main modes behave.



Gate input: the main input for the envelope. The gate going "on" (or a trigger) always triggers the trapezoid to start. Gate "off" only affects the trapezoid if the On stage is in Synthi mode, where the gate determines when the On stage will end, if it is longer than On time.

Attack time: sets the time in ms it will take after the initial trigger for the signal to go from 0V to 5V (0%-100%).

On time: sets the time the signal stays at the full amount of 5V (100%) after the Attack phase finishes. This time is the minimum time it will stay on, if in Synthi mode then the gate can extend this.

Decay time: sets the time it takes for the envelope to go from 5V back to 0V.

Off time: when switch on, the time after the decay has finished and the next repeat of the trapezoid.

Status LEDs: visual display of the stage that the envelope is currently at in its process.

CV Out: provides the control voltage (0V-5V) from the Trapezoid Envelope.

Lin/Exp switch selects if VCA driven in a Linear or Exponential (volume) mode.

VCA Section: provides a simple, linear VCA for audio and control voltages, linked to the output of the trapezoid envelope generator.

VCA In: for the input signal to the VCA to be adjusted by the trapezoid envelope.

Manual Trigger: a push button that allows the manual operation of the trapezoid generator, simulating the Gate In signal.

Slope: allows a log, linear or exponential slope to be set, with the log/exponential slopes variable. This control is available on both the Attack and Decay stages.

On Gate Mode: determines the behaviour of the On stage. "Fixed" mode means that the On stage only runs for the On time. "Synthi" mode means that the On stage runs for at least the On time, or the time the Gate is on if this is longer.

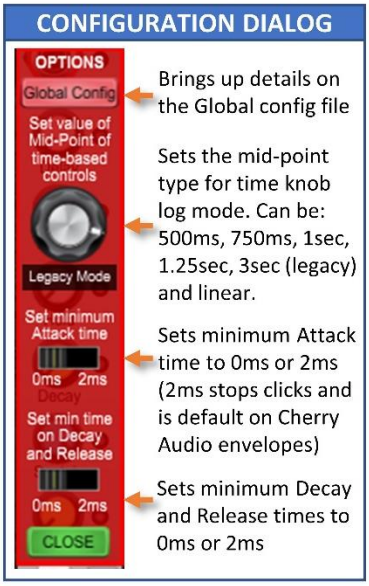
Slope: control for the Decay stage, as per the Attack slope control.

Repeat Mode: "Off" for single-shot; "Gated" for repeat while gate is on; and the "Synthi" mode which continues after trigger until a manual Stop signal is received.

Stop In: trigger to stop the repeats. *See above.*

Config: opens the time configuration dialog, see →

VCA Out: output signal from the internal VCA as adjusted by the envelope.



***All* time knobs** *control the time in milliseconds with a logarithmic or linear scale, configured through the settings configuration dialog. The options in the configuration dialog are: 500ms, 750ms, 1sec, 1.25sec, 3sec (legacy mode) and linear mode. Default setting for new instances is 750ms unless changed in the Global Config file (see general help for more).*

Help: Trigger Delay

A trigger utility that provides a delayed trigger (set in milliseconds) and a separately timed repeating trigger (again controlled in milliseconds) with a selectable number of repeats and supports the setting of the mid-point of the log-scale speed dial (from the "options" cog-wheel button). This module can be used for ratcheting and other trigger effects.

The **Trigger Delay module** allows delayed triggers and repeating triggers to be generated from gate in signals. These can be synchronised to the Host/BPM clock.

Gate In: the main input for this module, taking the gate input signal and using this signal to generate a trigger from the start of the gate.

Trig Out: simply passes on the start trigger (0% width) signal from the input gate.

Delay knob: controls the delay of the trigger being generated and works in two ways: in "manual" mode the delay (in milliseconds) is directly controlled by the knob; in Host/BPM mode, the delay is a multiple or division of the input BPM, between 1/16th and 16x.

The display of the value is reflects the mode and editing directly also adjusts, allowing for input of the simple number in BPM or the factor using "x" or "" for multiples and "/" for division.*

Fine adjustment control: allows secondary control of the delay time, useful to adjust the delay time to be slightly off pure BPM-based numbers.

BPM Gate In: allows a gate/clock signal to be used to determine the tempo (beats per minute) for use in the delays. Synchronises the module with others (sequencers, etc.). If no input connected here, the Voltage Modular Host/DAW tempo will be used.

Delay knob (Repeat Section): controls the delay of the repeating triggers being generated and works in two ways: in "manual" mode the delay (ms) is directly controlled by the knob; while in Host/BPM mode, the delay is a derived multiple or division of the input tempo (BPM) of between 1/16th and 16x.

The display of the value is reflects the mode and editing directly also adjusts, allowing for input of the simple number in BPM or the factor using "x" or "" for multiples and "/" for division.*

Host/BPM mode switch: switched off, the delay is set in milliseconds; if switched on the delay is derived as between x16 and 1/16th of a beat

Trigger Out: the output trigger from the delay stage of the module.

Config: opens configuration dialog, see →

Host/BPM mode switch: switched off, the delay is set in milliseconds; if switched on the delay is derived as between x16 and 1/16th of a beat

Repeats knob: allows selection of the number of repeats (which are <u>after</u> the initial delay) from between 1 and 16.

Initial Trigger switch: if set to OFF then the first trigger output will be after the delay as set; if set to ON, then the initial trigger will also be included.

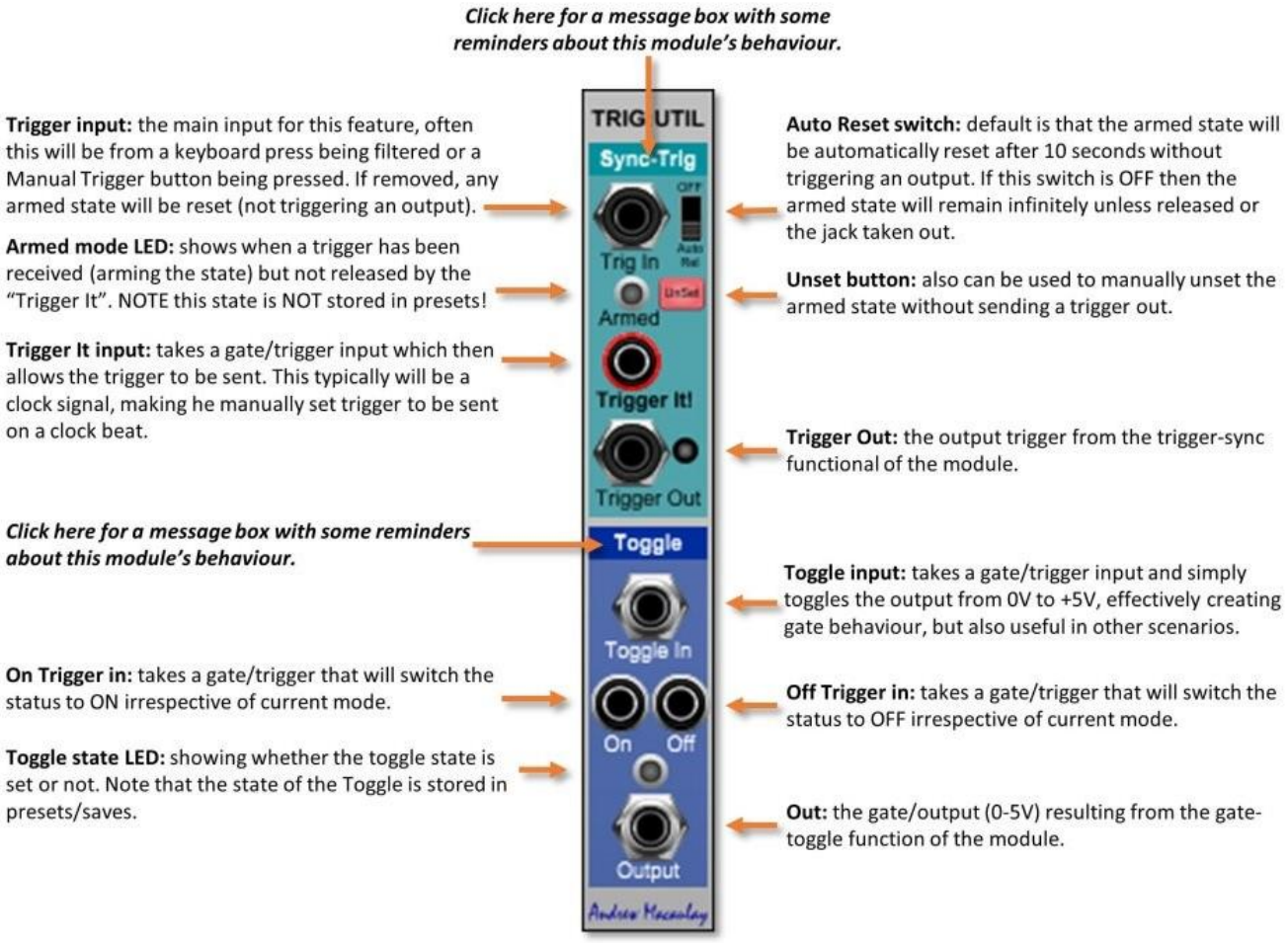
Trigger Out: the output trigger from the repeat stage of the module.

***<u>The delay</u> knobs** control the time in milliseconds with a logarithmic or linear scale, configured through the settings configuration dialog. The options in the configuration dialog are: 500ms, 750ms, 1sec, 1.25sec, 3sec (legacy mode) and linear mode. Default setting for new instances is 750ms unless changed in the Global Config file (see general help for more) and is set to 3sec when legacy saves/presets are loaded.*

Help: Trigger Sync and Gate Toggle

A small and simple trigger/gate utility module with two functions: One that allows you to sync a manual trigger (for example from the Manual Triggers utility or from a key down signal received from a keyboard) with a gate/trigger/clock timer; and the second that provides a latched signal from the Toggle, On and/or Off trigger inputs.

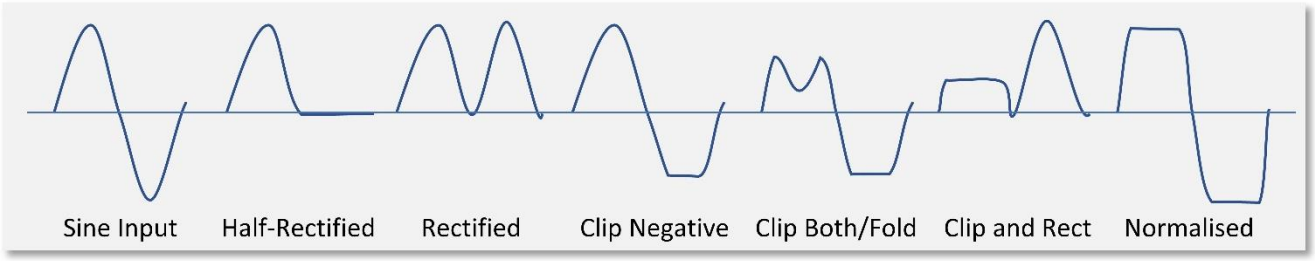
The **Trigger Sync and Gate Toggle (Trig:Util) Module** provides two utilities around triggers and gates. The first, the trigger-sync utility, allows an input trigger from, say, a key press or a Manual Trigger button, to only occur on the clock/gate to synchronise it. The second allows a gate to be simple switched on and off by triggers.



Help: Voltage Processor

A module that processes control and audio voltages by splitting the positive and negative sections of the wave/voltage separately, offering clipping and “flipping” of the signals, with voltage control of each setting to provide some interesting waveforms for modulation, and interesting timbres for audio. The module also has auto-gain features for the clipping and the ability to alter the DC offset of the resulting waveform.

The **Voltage Processor module** processes control and audio voltages by splitting the positive and negative sections (“phases”) of the voltage and then can clip, fold and "flip" of the signals (see below), with voltage control of each setting to provide some interesting waveforms for modulation, and interesting timbres for audio. The module has auto-gain features for the clipping, the ability to alter the DC offset of the resulting waveform and Direct Outputs from the Negative and Positive Phase Channels.



Input is the signal input for the module. It will take any voltage-based control (-/+5V) including modulations and audio.

Clip Point (volts) for the negative “phase” of the signal (range of -5V to 0V)

CV in and Amount for clipping the negative “phase” of the signal

Normalise switch amplifies the value of this “phase” based on the manual Clipping setting

Fold amount as percentage (-200% to 200%) of the value over the clip point: 0% = clipped, +100% = original shape, -100% = normal fold.

CV in and Amount for clipping the negative “phase” of the signal

Flip amount for the negative “phase” of the signal (range of -5V to 0V). 0% leaves voltage as is, 50% makes it 0 (Half-R) and 100% makes it positive (full Rectification).

CV in and Amount for flipping the negative “phase” of the signal

Direct Output (Negative and Positive Phase) provides separate Clipped/Flipped outputs for the Negative and Positive phases, which can be used for further voltage processing with, for example, the Exponent Shaper.

Quick Outputs provides fixed output for the basic transforms of Inversion, Half-Wave Rectification and Full-Wave Rectification *(diagram above illustrates these)*

Clip Point (volts) for the positive “phase” of the signal (range of 0V to +5V)

CV in and Amount for clipping the positive “phase” of the signal

Normalise switch amplifies the value of this “phase” based on the manual Clipping setting

LED indicators show clipping status: red for clipping “set” and blue clipping happening.

Fold amount as percentage (-200% to 200%) of the value over the clip point: 0% = clipped, +100% = original shape, -100% = normal fold.

CV in and Amount for clipping the negative “phase” of the signal

Flip amount for the positive “phase” of the signal (range of -5V to 0V). 0% leaves voltage as is, 50% makes it 0 (Half-R) and 100% makes it positive (full Rectification).

CV in and Amount for flipping the positive “phase” of the signal

Output of the modified signal, which will be between -5V and +5V.

DC Offset and Estimate button allows a DC offset to be added to adjust the waveform. The Estimate button takes current values to provide an offset based on the manual Clipping and Flip settings.

Trim (dB) knob allows adjustment of the gain on the final output, measured and shown in dB, with manual entry available as dB, 25%-400% or a simple multiplier number.

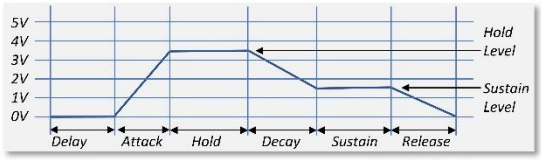
Help: Voltage-Controlled Envelope

This Voltage-Controlled envelope includes a Delay and an optional timed Sustain, as well as the AHDSR stages, the Hold Level can be set (between the Sustain Level and 100%) with all being controllable using CVs. There are two general inputs (e.g. for Keyboard Follow and Velocity) as well as individual CV inputs for each control.

Minimum times (0ms-10ms) for AHDSR can be set to fine tune voltage-control of these timings and the module supports setting the mid-point of the log-scale time controls (from the "options" cog-wheel button) and setting the minimum attack and delay/release times to either 0ms or 2ms. To provide more flexibility in timings, there are a /32 button for the master control and /16 buttons on each stage – plus the CV inputs now can be set to 1ms/V (original setting), 10ms/V, 100ms/V or 1sec/V and have a x100 option available for each CV input.

There are gate outputs from each stage of the envelope, host sync (to the DAW or a gate input bpm rate) and looping that can include the Delay stage, the Attack/Hold/Decay stages, or (with timed Sustain) the whole Delay/Attack/Hold/Decay/Sustain/Release cycle. Together with a Manual Trigger button, Sustain (pedal) in, a re-trigger (Attack) input and gate latching, this can be used for complex envelope and rhythmic purposes.

The **Voltage Controlled Envelope module** provides a flexible envelope with additional features like Delay, Hold Level, Sustain Time and extensive voltage control and looping options.



Control Voltage #1 input: to control the attack, hold, decay & release times. The knobs adjust amount of CV (between -100% to +100%) for the specific time. *Can be used to e.g. allow Keyboard Velocity to adjust the timing where the faster/harder the note has been hit, the quicker the times or the longer the release is.*

CV In: sets CV range to the original 1ms per Volt or to 10ms, 100ms or 1sec/V.

Sustain In: gate CV in that keeps Gate "On", *for use with a MIDI Sustain Pedal.*

Gate input: where "Gate On" starts an envelope; "Gate Off" starts release stage (unless in Fixed Length mode). *The Manual Trigger button provides an alternate way to generate this.*

Re-Trig In: allows a trigger to "reset" the envelope to the Attack stage. *Useful when used with sequencers or in Looping Mode.*

x100 switches: multiply the related input CV x100 for longer times./ timers.

Control Voltage #2 input: to control all aspects of the envelope. The knobs adjust the amount of the CV input (-100% to +100%) for the specific time/amount.

Individual CV in and knobs: for individual control over each stage of the envelope. The knobs adjust the input CV from -100% to +100%.

Delay time: sets the delay before envelope starts.

Attack time: sets a time it will take for the envelope output to go from 0V to 5V.

Hold time: sets the time the envelope stays at the Hold Value, which defaults to 5V.

Hold level: allows the max value of the envelope out to be controlled. This level is always the greater than or equal to the Sustain level.

Decay time: sets the time it takes for the envelope to go from the Hold Level down to the Sustain Level.

Sustain time. Only available if "Fixed Length" option is on. If Fixed Length off then sustain remains on until the note (gate) is released.

Sustain level: the level which is output during sustain phase.

Release time: time it takes envelope to return to zero after end of Sustain phase.

For all time-controls: *when in FREE mode time is set in milliseconds, in HOST mode the time is a multiple or a division of the time derived from host BPM. The extra "/16" button allows faster sync'd times on each stage.*

Free/Host switch: selecting Free allows all times to be set in milliseconds. Set to Host, the "input BPM" will either be the Host BPM in Voltage Modular or the clock derived from Ext Clock, if it is connected. *When set to Host, the Length (Beats) knob provides a multiplier/divider from the clock to beats that are used on the individual times on the envelope. The "/32" button can be used for shorter sync'd times.*

Fixed Length mode switch changes Sustain from being based on gate input to the time as set using knob/CV.

Min knobs set minimum time in ms for that stage (0-10ms)

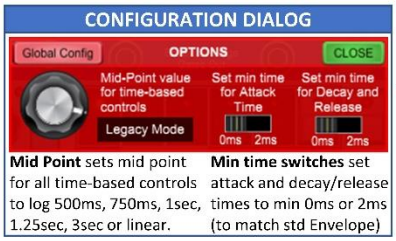
Envelope Out / Out INV provide CV out, either as 0V-5V or as an INVerted signal of 5V (off) -0V (on)

Latch Gate In: means that once a gate has been received the envelope will keep on sustain/looping.

Looping options: allow various looping modes,with the default being the normal "single shot":

- **(d)AHD:** Delay, then looping on Attack, Hold, Decay
- **(d)AHDSR:** Delay, then loops using the rest of the envelope, switches "Fixed Length" mode on
- **dAHD:** loops on Delay, Attack, Hold, Decay
- **dAHDSR:** loops whole envelope with fixed length

The "Start on Attack" option zeros the Delay. These can all generate interesting rhythmic effects.



Mid Point sets mid point for all time-based controls to log 500ms, 750ms, 1sec, 1.25sec, 3sec or linear.

Min time switches set attack and decay/release times to min 0ms or 2ms (to match std Envelope)

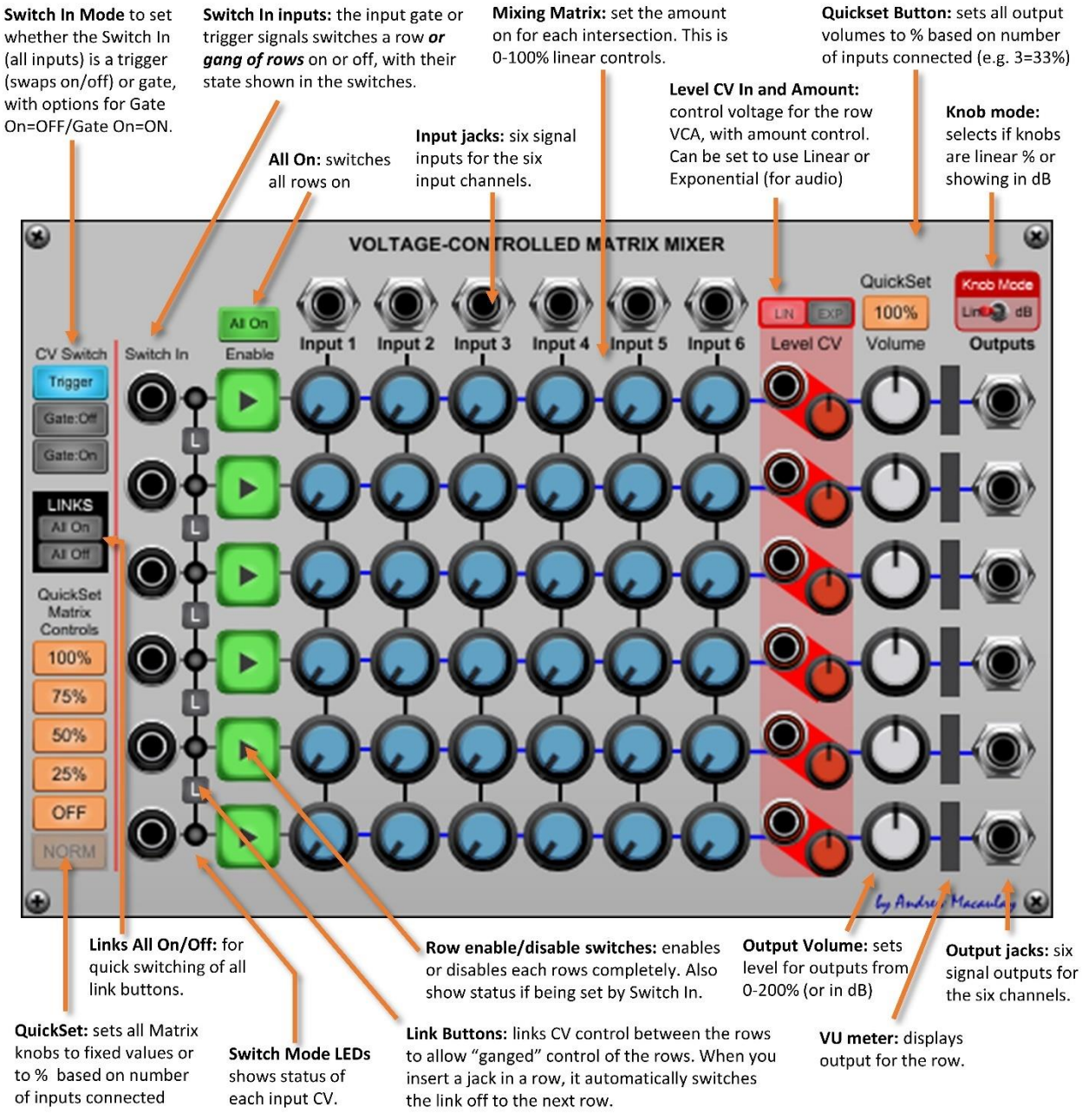
Help: Voltage-Controlled Matrix Mixer

A voltage-controlled evolution of the 6x6 Matrix Mixer, allowing 6 inputs to be mixed into different mixes for 6 outputs. Useful for routing and other mixing duties - for example, take the various outputs from each VCO and mix them differently into different signal chains/filters.

With manual switches for each row, gated/triggered switching (selectable), flexible routing of the control voltages (allowing linking into groups) and a simple VCA stage on each of the rows. The unit can be used as a 6x 6-into-1, a 6-into-6 and anything between. Patching the control points automatically sets up the most likely grouping, but full control is also available.

The **Matrix Mixer module** allows you to mix 6 inputs to 6 outputs in a matrix form, so you can for example send input 1 and input 3 to output 1, input 1 and input 2 and input 5 to output 2, etc. The signal can be Control Voltages or Audio Signals. Mixing uses a simple linear 0-100% mix.

When you connect a jack into the Switch In connections, the module will take a "best guess" at how you want the links to be set, linking earlier rows together, and splitting where there is a jack. When CV Switch is in Gate:On mode, the ganged enable buttons will be switched to Disable the row – and the "All On" button will only switch any Enable buttons on that are not under the control of the Switch In signals.



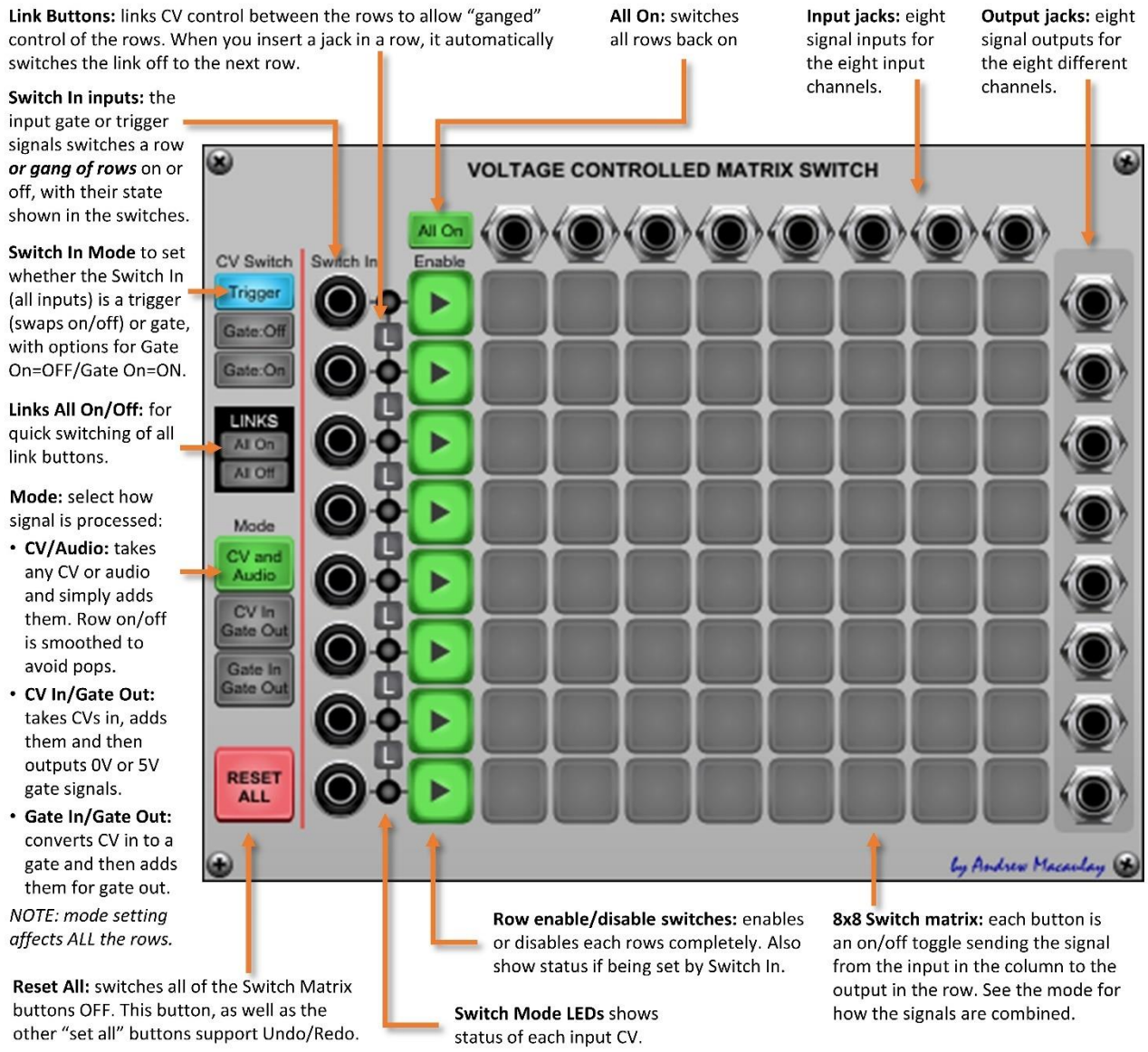
Help: Voltage-Controlled Matrix Switch

A voltage-controlled evolution of the 8x8 Matrix Switch, with manual switching of 8 inputs into 8 outputs and manual/voltage-controlled switching of the rows. With flexible routing of the control voltages and switches (allowing linking into groups), the unit can be used as a 8x 8-into-1, an 8-into-8 and anything between (i.e. a 2x 8-into-4) switch. Patching the control points automatically sets up the most likely grouping, but full control is also available.

Additional ease of use features are included such as a button to switch ALL of the matrix off. Now has smoothing of the row switching to remove "pops" when in CV/Audio mode and new Gate processing mode that converts the column inputs into gates (<2.5V is off, >= 2.5V is on) before combining these based on the matrix and limiting outputs to 0V (off) or 5V (on).

The **Voltage-Controlled Matrix Switch module** allows you to switch 8 inputs to 8 outputs in a matrix form, so you can for example send input 1 and input 3 to output 1, input 1 and input 2 and input 5 to output 2, etc. The signal can be Control Voltages, clocks or Audio Signals. The row switches, which can also be voltage controlled, can be ganged up so that one input can switch can control multiple rows.

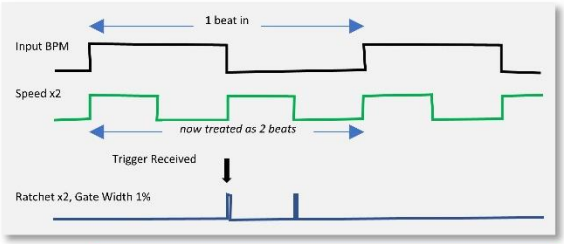
When you connect a jack into the Switch In connections, the module will take a "best guess" at how you want the links to be set, linking earlier rows together, and splitting where there is a jack. When CV Switch is in Gate:On mode, the ganged enable buttons will be switched to Disable the row – and the "All On" button will only switch any Enable buttons on that are not under the control of the Switch In signals.



Help: Voltage-Controlled Ratchet

A voltage-controlled ratcheting module that allows a simple CV in to set the number of beats that the ratchet will use for the gate in, allowing up to 16 beats in a single beat. The input CV can be set using a range of voltages, 1V/step or 0.1V/step. The module has an internal clock that can be synchronised with external clocks, with a trigger to start the ratchet. Setting the mode to Sync will use the external clock as both the trigger and the clock sync source, making its use with sequencers straight-forward.

The **Voltage Controlled Ratcheter module** provides a way to "ratchet" sequences, in a style like Tangerine Dream using a voltage control input to determine the number of steps on each gate. This means taking a step and gating/triggering it multiple times within the step so you get, for example, a triplet on a ratcheted step.



BPM CV input: uses the 1V/100bpm CV on many of Andrew Macaulay's Modules. This changes the Host option to be CV IN on the selectors.

Trigger In: provides the trigger (gate on) signal for the ratchet to start on all outputs.

Clock Selector switch: to select clock source, which can be Sync'd to the trigger input, a manual speed, the host DAW clock speed/BPM CV (at 1V/100bpm). The BPM CV is selected on the Host button when a CV input is connected.

Speed knob: a manual speed or clock multiplier/ divider for the clock speed as captured in the above section. The BPM sync's amount can be between 1/16th and 16x of the BPM rate, and is used to determine "1 beat" for the ratcheting process – that is, a ratchet will generate 2, 3, 4, etc. triggers within this one "beat".

Manual setting: if no CV is connected, this know sets the number of ratchets (1 to 16).

CV In: used to determine the number of steps in the ratchet effect. This value is sampled on each trigger, so can be changed by a sequencer or even a noise source for random effects. This can be 0 (no gate/skip a beat) through to 99.

Preset CV Ranges: selects the way the voltage in drives the number of steps. This switch has preset settings for 0.1V/Step and 1V/Step (starting at 0V) as well as the Custom mode.

Custom CV to Step settings: controls the Custom mapping of CV to steps – with controls for the number of steps at 0V and the number at 5V. You can set 5V to a lower number that 0V.

Enable Gate In: if a cable is connected to this input, then:
- a Trigger on this input will mean that the ratchet will occur on the next Trigger In.
- a Gate signal means that the ratchet will occur on each Trigger In while the gate is on.

Gate Mode: switches the way that the Gate Width is generated for the ratchet between:
- **Sense** – uses the external gate's information to identify the gate width (regular clocks only)
- **Merge** – merges the manual values and the external gate, retriggering the external gate while it is active and using the Gate Width settings when the external gate is off.
- **Value** – uses the Gate Width and CV to control the gate width.

Using the Merge mode and playing with the Gate Width of the source signal (e.g. Sequencer) and of the Ratchet will create some really interesting patterns – so have a play with this!

Gate Width: controls the width of the ratchet gate (0%-100%) for Merge/Value modes.

Amount knob to set the amount of the CV In to be used to control the Gate Width.

Ratchets: shows the number of ratchets currently selected. When using the CV input, this is selected at the start of each Trigger In.

CV In: a control voltage to alter the Gate Width when in Merge/Value modes.

Ext.Gate Passthrough on Single: switch that either forces use of the generated gate even on single-step ratchets, or passes the Gate In through, so reflecting the original gate.

Min.Gate: a switch to set the gate width to have a minimum of 2ms or 0ms. *Useful when driving the standard Cherry Audio envelope as this has a 2ms minimum attack time, and a shorter gate will never finish the attack phase.*

Trigger Out: a trigger signal for the ratchet which is also controlled by the Min.Gate switch.

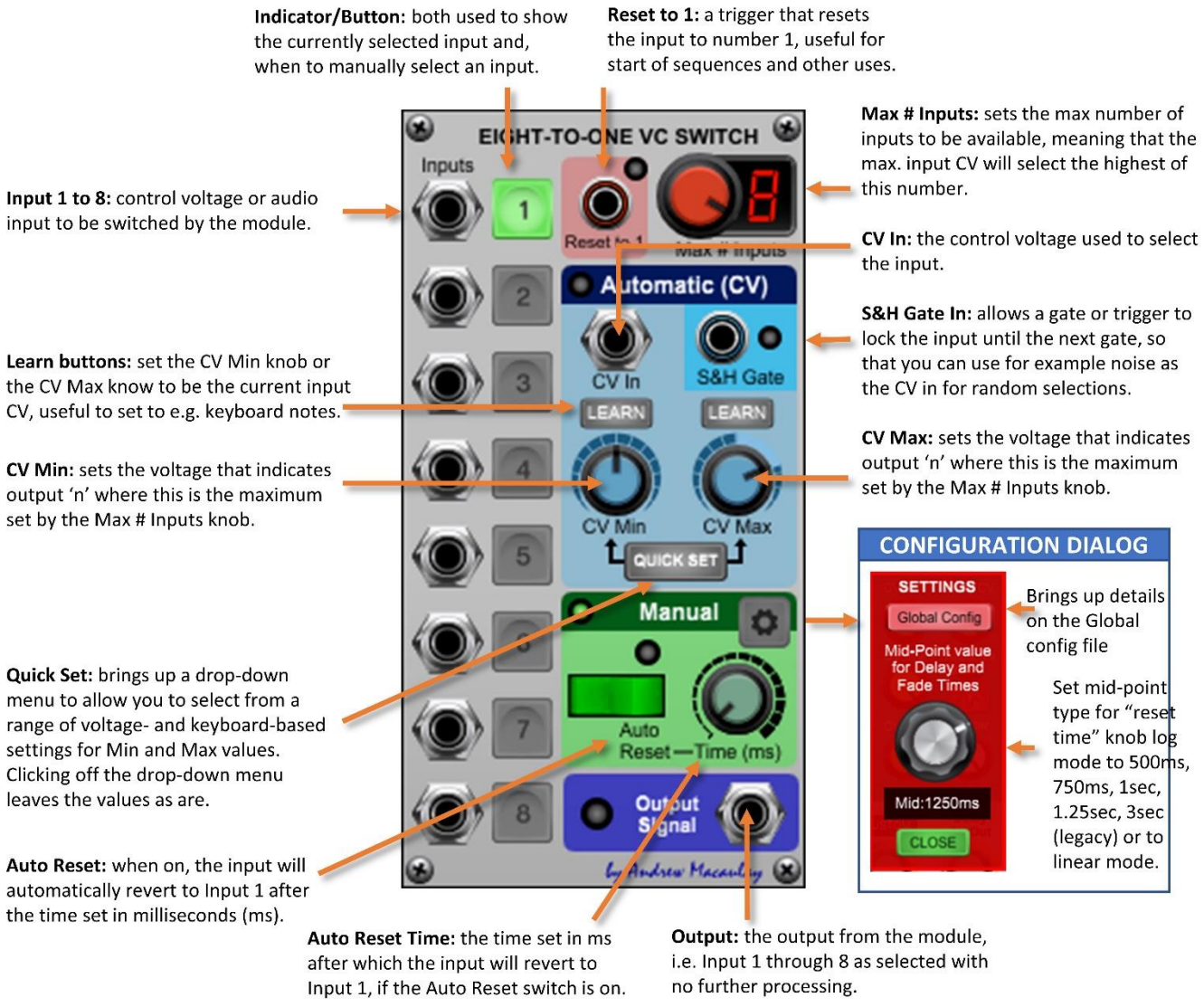
Gate Out: the Gate signal (0V/5V) for the ratchet using the gate width settings above.

Help: Voltage-Controlled Switch

A module to help with Ratcheting and other effects where you want to have one of up to 8 inputs selected at once, either manually or from a voltage-controlled source (sequencer, random or keyboard input).

The module allows manual specification of the range (supporting up to -5V to +5V) to be split across the up-to-8 input selectors and supports the setting of the mid-point of the log-scale for the Manual Time Control (from the "options" cog-wheel button).

The **Voltage Controlled Switch module** provides a flexible 8 to 1 switch module with comprehensive voltage-controlled options. The module takes up to 8 inputs (audio or control voltage) and switches the output to using one of these based on the input voltage or through manual operation.



The auto reset time knob *controls the time in milliseconds with a logarithmic or linear scale, configured through the settings configuration dialog. The options in the configuration dialog are: 500ms, 750ms, 1sec, 1.25sec, 3sec (legacy mode) and linear mode. Default setting for new instances is 750ms unless changed in the Global Config file (see general help for more) or is set to 3sec when legacy saves/presets are loaded.*

Help: Wave Mixer

A mixer with a twist! This wave mixer allows you to blend waves using normal "x-fade" mixing followed by an additive and an amplitude modulation section, all with CV control of the mix.

Allows you to do wave mixing modulation of any waveforms from any oscillator similar to the Shape, Round and Wavefold controls of the Super Oscillator.

Designed for audio and low-frequency oscillators running in sync at the same frequency or multiples, but can be used with any sources.

The **Wave Mixer module** provides a sequence of different mixing algorithms, specifically for the mixing of waveforms, both for audio and LFO use. In some ways, allows similar waveform effects as the Super Oscillator's Shape/Round/Wavefold controls, but for ANY source. Now also provides multiple algorithms for the Multiplier stage. Well worth using the Oscilloscope to see what the effect is on the waveforms.

Input A and B: first two inputs to the first stage of the processor – a simple A-B mix of the signals. If only one input is used, then the signal is always passed through at full strength.

CV Input and Amount: allows CV control over the mix. The amount attenuates the CV from -100% to 100%, and the total mix can only be between full A or full B.

CV Input and Amount: allows CV control over the mix. The amount attenuates the CV from -100% to 100%, and the total mix can only be between full A or full B.

Input C: provides signal input into the Adder stage. If no signal input here, then the mix from A/B is passed through completely.

CV Input and Amount: allows CV control over the mix. The amount attenuates the CV from -100% to 100%, and the total mix can only be between full A or full B.

Mult by D mode: switches between 4 modes for this stage: xM is the original mixed multiplier mode; AM provides a pure AM mode; RM provides a digital Ring Modulator mode and Exp add Log slopes to the input and multiplier values for a more analogue Ring Mod.

A-B Mix: controls the simple mix of signals, from 100% A to 100% B with the mid-point being 50% of each signal. This is a linear control.

Add C Amount: this adds the C signal into the mix, with a range from -500% to +500%. The result of, for example, Square + offset Triangle at 100% generates a stepped triangle wave.

Input D: provides input into the Multiplier stage. If no signal input here, then the mix from the Adder stage is passed through completely.

Mult by D Amount: controls the amount of D used to multiple the signal with (Amplitude Modulation) with a range from -100% to +100%. Fast AM with different pitches generates some interesting waves!

Output: The output signal from the complete chain, with all processing included.

CV inputs: *it is worth trying both LFO and Envelopes with the CV inputs, to see what this can do to the timbre of the sound. Similar to FM synthesis, you may find ways to generate timbres without the use of filters.*

Help: Configuration Files

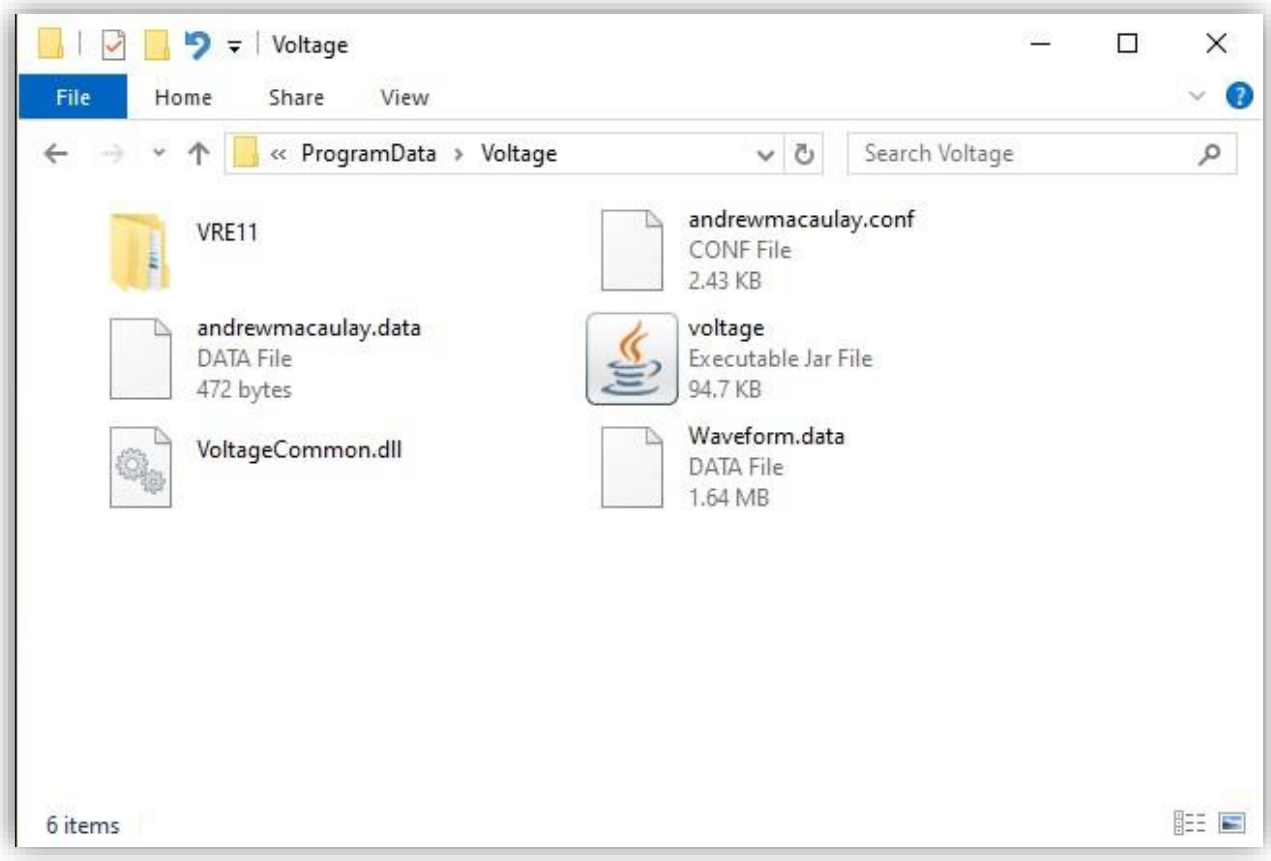
Release 3 of the modules introduced the use of two new data files for Andrew Macaulay's Modules that are stored in the Voltage Modular settings/data area:

- **`andrewmacaulay.conf`** which stores global "default" configuration settings for Andrew Macaulay's Modules. This is designed to be user editable and has comments included to describe its use. Details about this configuration file and its use are provided below.
- **`andrewmacaulay.data`** which stores module-specific data for Andrew Macaulay's Modules such as the last used version, which is used to show release notes the first time a new module is used. This is not designed to be user-editable, but can be deleted if you want to reset the state of all the Andrew Macaulay's Modules.

The location of these files depends on the operating system, with the following default locations:

Windows	`C:\ProgramData\Voltage`
Apple Mac	`/Library/Application Support/Voltage`

If you go to this folder, you should see something similar to the following list of files/folders:



Example screenshot of folder with config and data files, from Windows 10 File Explorer

Configuration File

The configuration file is a simple text file that can be edited by a text editor such as NOTEPAD.EXE in Windows or the equivalent on the Mac. The file includes detailed notes about the settings in the comments, which are lines that start with the # symbol. The following is the default config file which is created the first time one of the new modules that supports it/uses it is opened:

```
#########################################################
# GLOBAL SETTINGS FILE FOR ANDREW MACAULAY'S MODULES
#=======================================================
# the following entries can be edited, using settings
# as detailed (including any default behaviours) below
# noting all setting values expect an integer number
#-------------------------------------------------------
#########################################################
# timeMidPoint value (1-8) sets the default behaviour
# for new instances of a module of time-based knobs such
# as Attack, Decay, Gate, etc. with the following values:
#
# 1 - 250ms as seen on Sequential Circuits Prophet
# 2 - 300ms as seen on ARP Odyssey synths and others
# 3 - 500ms as seen on various Obeheim synths
# 4 - 750ms as seen on the MiniMoog Model D and others
# 5 - 1000ms as on Modular Moog, Buchla and other modulars
# 6 - 1250ms as an alternative slightly longer midpoint
# 7 - old log behaviour which is 25% of the maximum range
# 8 - LINEAR mode as seen on Korg MS-20, PS-3200, EMS, etc.
#
# Note that values of 0, invalid values or no setting in
# the file (e.g. commented out with a #) defaults to the
# module's default, which is normally '4' except for CV
# Delay modules which default to '6' (1250ms) and any
# any old presets which default to '7' when loaded.
# -------------------------------------------------------
timeMidPoint=0

#########################################################
# global-minTime values (0,1) sets the default behaviour
# for the minimum attack, decay/release or gate time for
# new instances of modules:
#
# 0 - off, minimum attack time is 0ms
# 1 - on, minimum attack time is 2ms
#
# default is '0' which retains the old module behaviour
# -------------------------------------------------------
minAttackTime=0
minDecaySustainTime=0
minGateTime=0

#########################################################
# there are some additional on/of values for controlling
# other aspects of behaviour of the system with values:
# 0 = off/disabled/false
# 1 = on/enabled/true
# -------------------------------------------------------
disableShowHelpPopups=0
disableShowReleaseNotes=0

#########################################################
# and a debugMode option which is used during development
# and which I might ask you to change if fault finding
# -------------------------------------------------------
debugMode=0
```

To make changes, simply edit the relevant settings to the values needed as specified in the notes in the configuration file.

For example, if you want to set the standard mid-point to 1000ms (1 second) for ALL modules that support this feature in Andrew Macaulay's Modules, you would simple change the line `timeMidPoint=0` to be `timeMidPoint=5`.