



# BOOTLOADER & FIRMWARE UPDATE: Version 2.0

## INTRODUCING BOOTLOADER & FIRMWARE 2.0

For this update user's need to update the Bootloader first and then update the firmware. Updating only the firmware will cause issues when running the module. This Beta is very stable however if you experience any bug please report it back to us.

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### Updating to BOOTLOADER 2.0:

1 .Using the Chrome browser go here and follow the steps on the webpage:  
<https://addacsupport.github.io/ADDAC511-bootloader/>

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### Updating to FIRMWARE 2.0:

1 .Using the Chrome browser go here and follow the steps on the webpage:  
[https://media.addacsystem.com/ADDAC511/index\\_dev.html](https://media.addacsystem.com/ADDAC511/index_dev.html)

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### Firmware revision 2.0 Release Notes:

New: External Clock Multiplier/Divider features- More options when using external clocks. (Page 24)

New: Tracker style sequencer view - A new sequencer vertical visualization allows for faster editing and overall view (Page 33)

New: Random Gate Length - A new option in the [GATE OUT] screen allows to add random length to the gate output. (Page 14)

Fixed: Several other reported bugs

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### Thanks to all users who reported bugs!

If you think you found a bug please report it to us and we'll look into it. Please always give a clear description on how to reproduce the error consistently. Videos are always appreciated.

# Welcome to:

# ADDAC511 VC STOCHASTIC VOLTAGE GENERATOR

## USER'S GUIDE

Revision.2.0 April.2026

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# Welcome to: ADDAC511 VC STOCHASTIC VOLTAGE GENERATOR USER'S GUIDE

Revision.2.0 April.2026

Tech Specs:  
20HP  
4.5cm deep  
200mA +12V  
100mA -12V

## WELCOME

At ADDAC System we love all sources of unpredictability be it by randomness or signal complexity. This module greatly expands on the principles of our ADDAC501 Complex Random from 2013. This is a fully fledged 4 channel voltage generator capable of all things random, with quantization, probability, distribution, interpolation, time control, clock, states and a 32 step sequencer.

The module operation relies on its screen for all parameter editing, each button accesses one single page where parameters can be changed allowing a fast and fluid workflow across all settings.

Long presses on all buttons have a secondary function allowing fast Channel selection plus Mute and Hold functions.

The combination of having 2 Encoders with Push buttons allow swift navigation and editing across all pages and their settings.

## FEATURES

4 independent channels with bipolar CV / Gate outputs and Clock Input that allow all things random.

Each channel can be set to generate either continuous Voltages, Envelopes or as a Quantizer.

Mutes and Holds per channel  
3 States per channel allow very fast settings changes, allowing from smooth to drastic transitions.

Controls over Voltage Range, Quantization with custom scales, Probability, Distribution curves and Smoothing, plus time and bpm ranges, time distribution curves and several clock sources.

A 32 step sequencer per channel that can work completely independent or in sync.

8 Assignable CV inputs and 4 Gate inputs can be internally mapped to any setting of any channel.

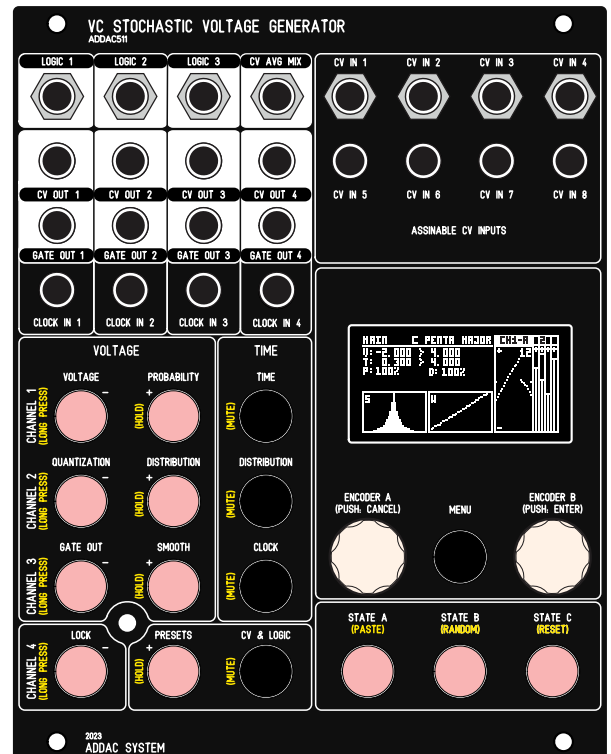
3 configurable Logic outputs allows complex logic events comparing different channel states.

Average CV output of all 4 CV outputs.

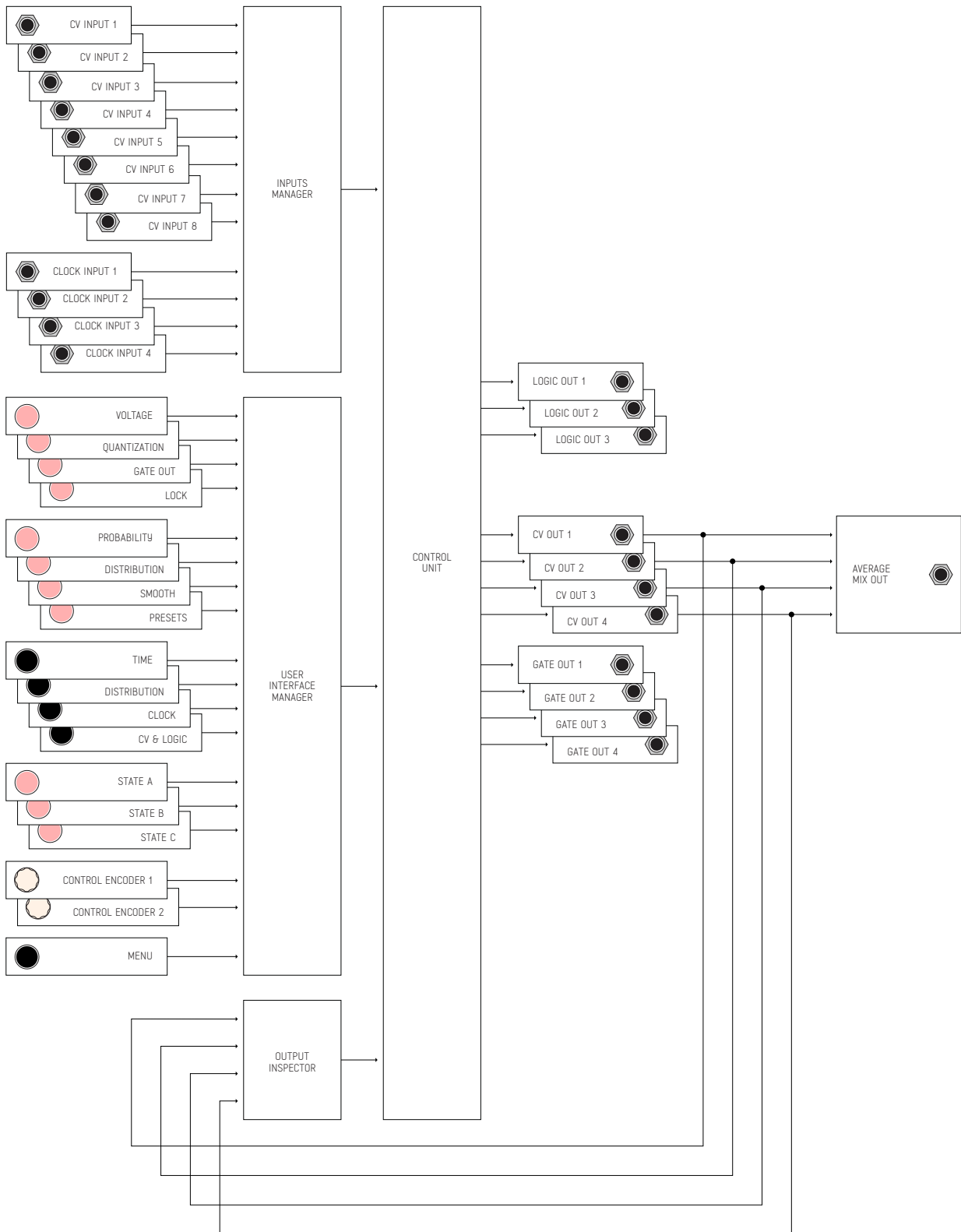
Easy VCO tuning available in the Menu.

Calibration and mapping of all 4 CV outputs is also allowed through the Menu

20HP



# SIGNAL FLOW DIAGRAM

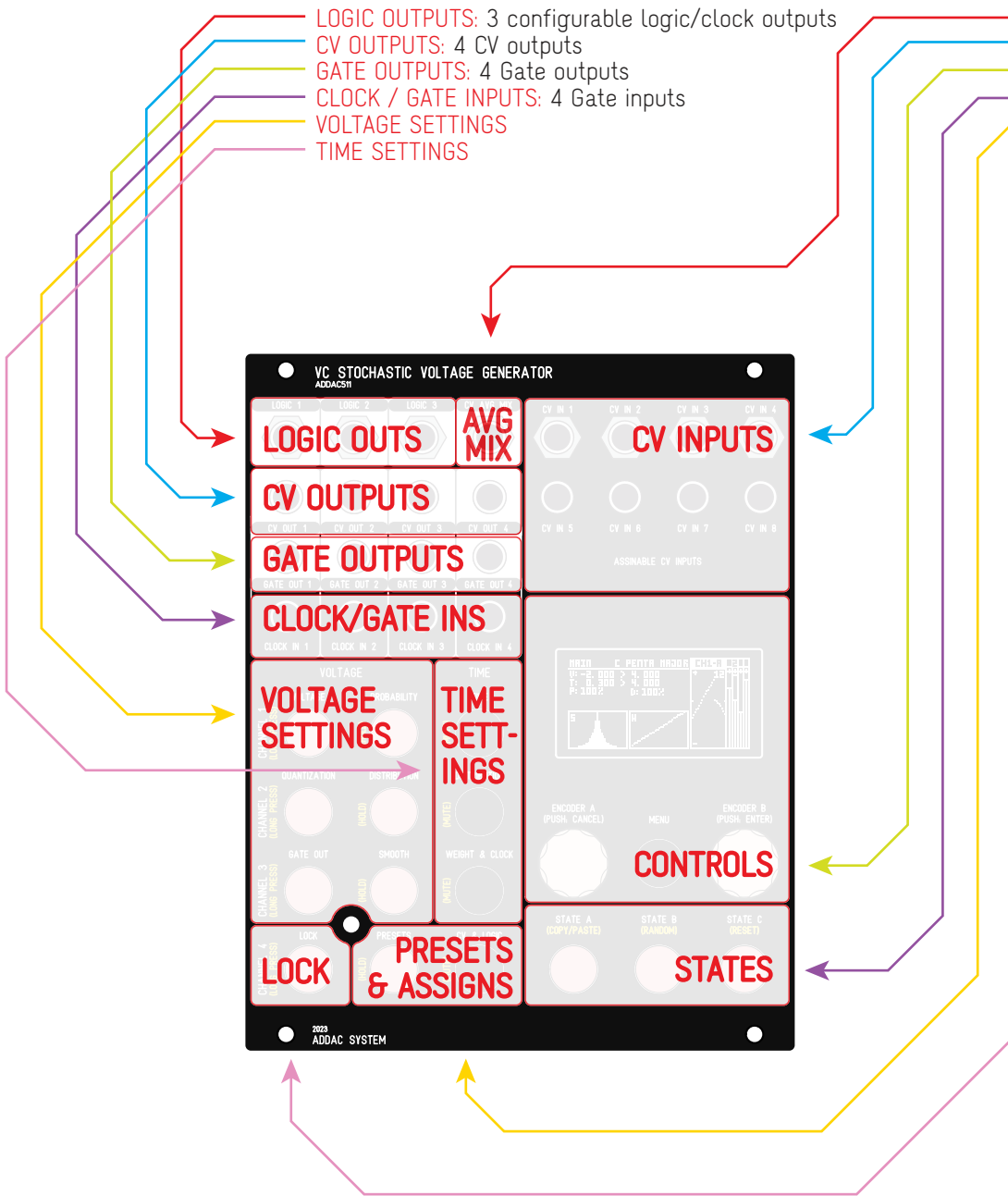


# FRONT PANEL LAYOUT

There are several distinct sections in this module:

- LOGIC OUTPUTS: 3 configurable logic/clock outputs
- CV OUTPUTS: 4 CV outputs
- GATE OUTPUTS: 4 Gate outputs
- CLOCK / GATE INPUTS: 4 Gate inputs
- VOLTAGE SETTINGS
- TIME SETTINGS

- AVERAGE MIX: CV output
- CV INPUTS: 8 CV inputs
- CONTROLS: Encoders & Menu
- STATES
- PRESETS & ASSIGNS
- LOCK / SEQUENCER



# OLED MONITOR

## MAIN SCREEN:

The Main Screen shows the most important info for overall operation.

### CHANNELS GATES & SPECIAL STATES

Four top squares shows the 4 channels Gate Output state as well as special states:  
O = Mute (0v), H = Hold

### ACTIVE CHANNEL & STATE

Shows the active channel and state

### SELECTED QUANTIZATION

Scale selected

### SCREEN TITLE

Shows the Screen name

### VOLTAGE SETTINGS

Minimum and Maximum voltage range

### TIME SETTINGS

Minimum and Maximum time range

### PROBABILITY & SMOOTH DURATION SETTINGS

Shows the Probability and

### DISTRIBUTION CURVE

Low resolution representation of the waveform

### WEIGHT CURVE

Grains envelope representation

### SELECTED CHANNEL OSCILLOSCOPE

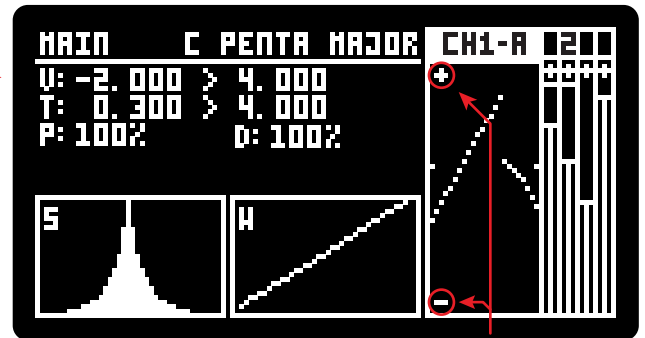
Shows the history and polarity of the selected channel.  
Rotating Encoder 2 allows zooming in and out on the display buffer.

### CHANNELS REAL TIME STATE

The current CV state of all 4 channels

### POLARITY SETTING

Shows the polarity setting: + or ±



## MAIN SCREEN ENCODER BEHAVIOUR

Rotating Encoder 1 selects shown values, Encoder 2 edits the settings.

Pressing Encoder 2 deselects any selected setting

Rotating Encoder 2 with no selected setting zooms in and out on the oscilloscope screen

# LONG PRESSES CHANNEL SELECTION, HOLDS & MUTES

Every column of the main interface features a secondary function when pressed for over 1 second.

### CHANNEL SELECTION

The first column selects the channel to be edited. The change can be seen at the top right corner as shown here

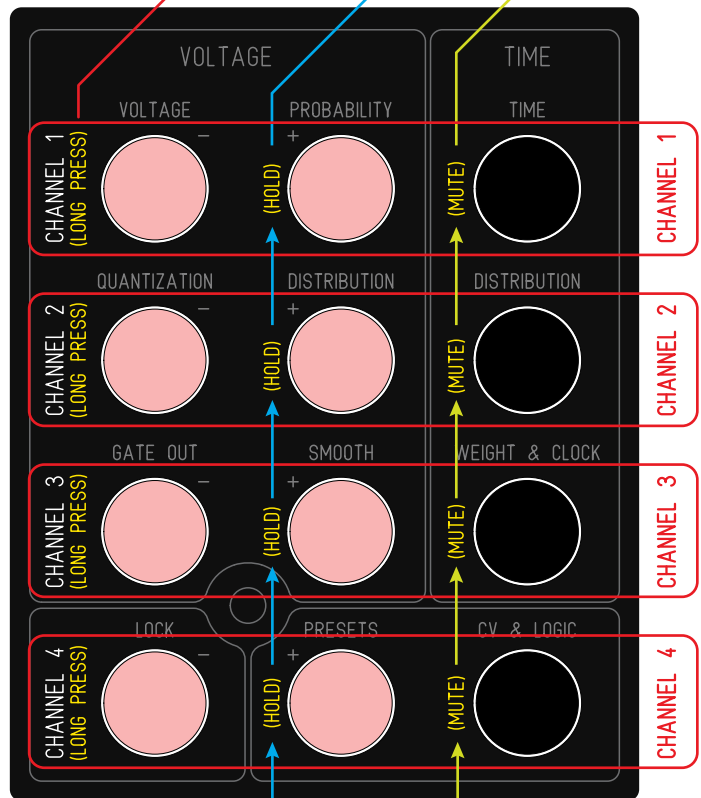
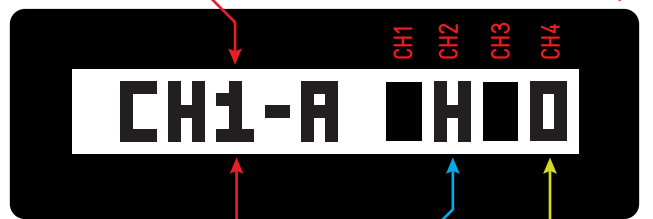
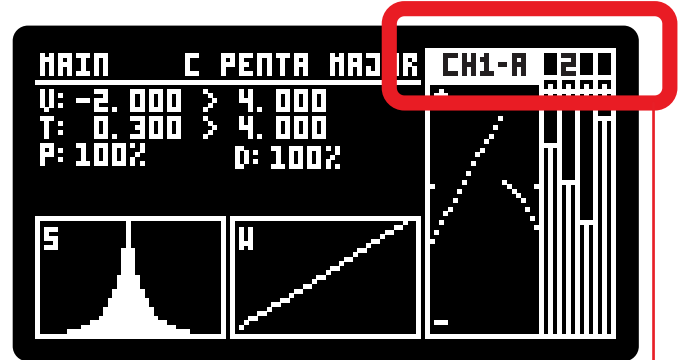
### HOLD FUNCTION

The second column activates the Hold function which holds the CV output current value until the button is pressed again. When active the respective channel will display its state on the top right corner with the letter "H"

### MUTE FUNCTION

The third column activates the Mute function which sets the CV output to 0v until the button is pressed again. When active the respective channel will display its state on the top right corner with the number "0".

Every row corresponds to a channel.

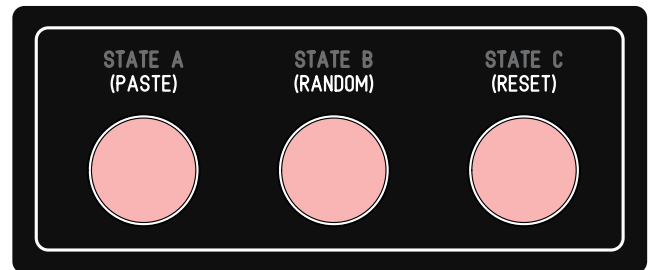


# LONG PRESSES PASTE, RANDOM & RESET

The 3 State buttons have a secondary function when pressed for longer than 1 second.

### STATE A - PASTE

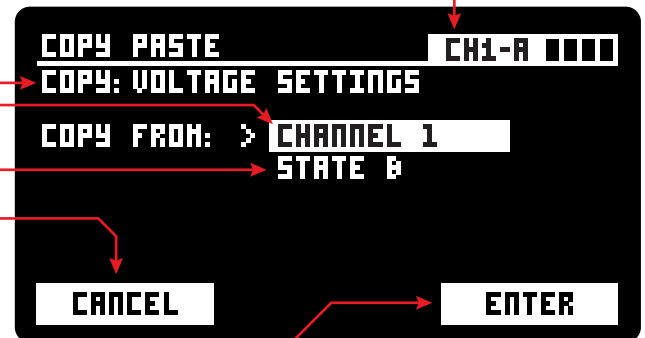
A long press on this button enters the Copy screen. The Copy function is screen dependent meaning that will copy different settings depending on the screen state. It is also Channel and State dependent meaning every State of every Channel can be accessed as a block to be copied from. If the screen is in Main then Copy will change all setting on the current Channel and State from the selection made on the Copy screen. If the screen is in any other page, the copy function will only copy the settings of that particular page.



The Copy screen shows:

- The current Channel and State
- The current Screen page
- The Channel from which to copy
- The State from which to copy related to the channel selected above.

The two Encoders buttons choose between Cancel to exit the copy screen without making changes and Enter to execute the copy process.



### STATE B - RANDOM

Randomizes the current screen settings to all new random values, only on the currently selected channel. If used in the Main Screen it will randomize only the settings available on the Main Screen.

### STATE C - RESET

Resets the current screen settings to the loaded preset settings and only on the currently selected channel. If used in the Main Screen it will reset all of the selected channel's settings.

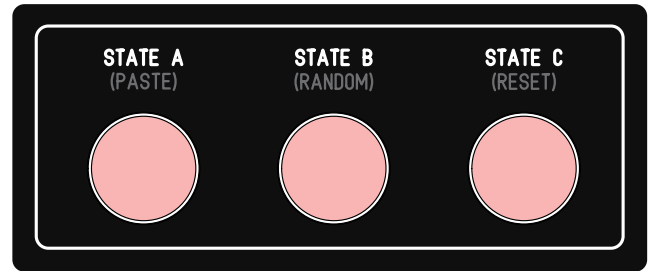
# STATES

Every channel has 3 States, every State is independent and can have completely different settings. Think of them as instantly accessible channel presets. They can be used to create drastic or slight changes to a CV output.

State changes are immediate, once engaged the new settings take control.

They can be assigned to a CV input, the incoming voltage level will trigger the corresponding state:

- STATE A < 1.6v
- STATE B > 1.6v & < 3.3v
- STATE C > 3.3v



## STATES PROBABILITY

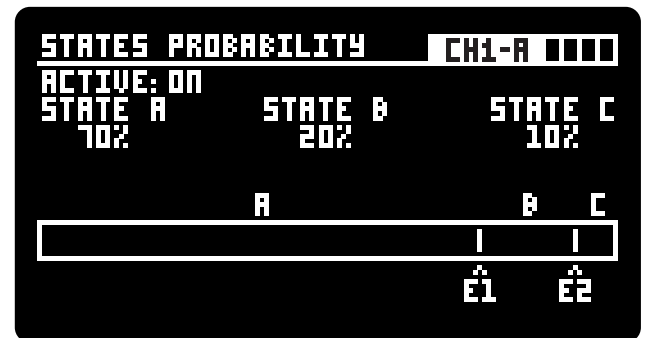
States can also be configured to automatically change, at every clock cycle, according to probability settings.

To enter this screen users can double click on any State button.

Configuring the amount of probability for each state allows to fine tune the preponderancy of each channel. Encoder 1 configures the threshold point between State A and State B while Encoder 2 configures the point between State B and State C.

Once engaged the States will be changing automatically, if the user presses a State button it will momentarily change to the selected state until the next clock cycle triggers the new state probability and eventually change the state once again.

States Probability activity is suspended everytime the user exits the main screen to enter any other screen, it's important to suspend the activity to be able to edit the parameter of the current state without jumping to another state while in the editing process.



# OPERATION MODES

There are 2 main operation modes, independently selected for each channel. Choosing the Mode can be done in the [VOLTAGE] screen.

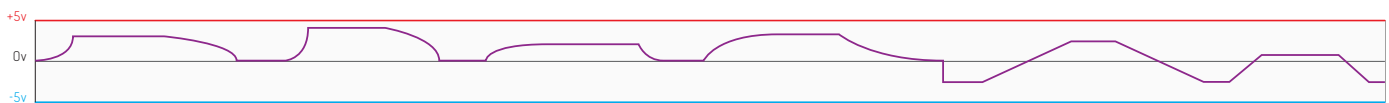
## 1. RANDOM VOLTAGE GENERATION

Fully featured random voltage generation in the time and voltage domain with fully controlled range, probability, random distribution, smooth, quantization and a 32 step sequencer.



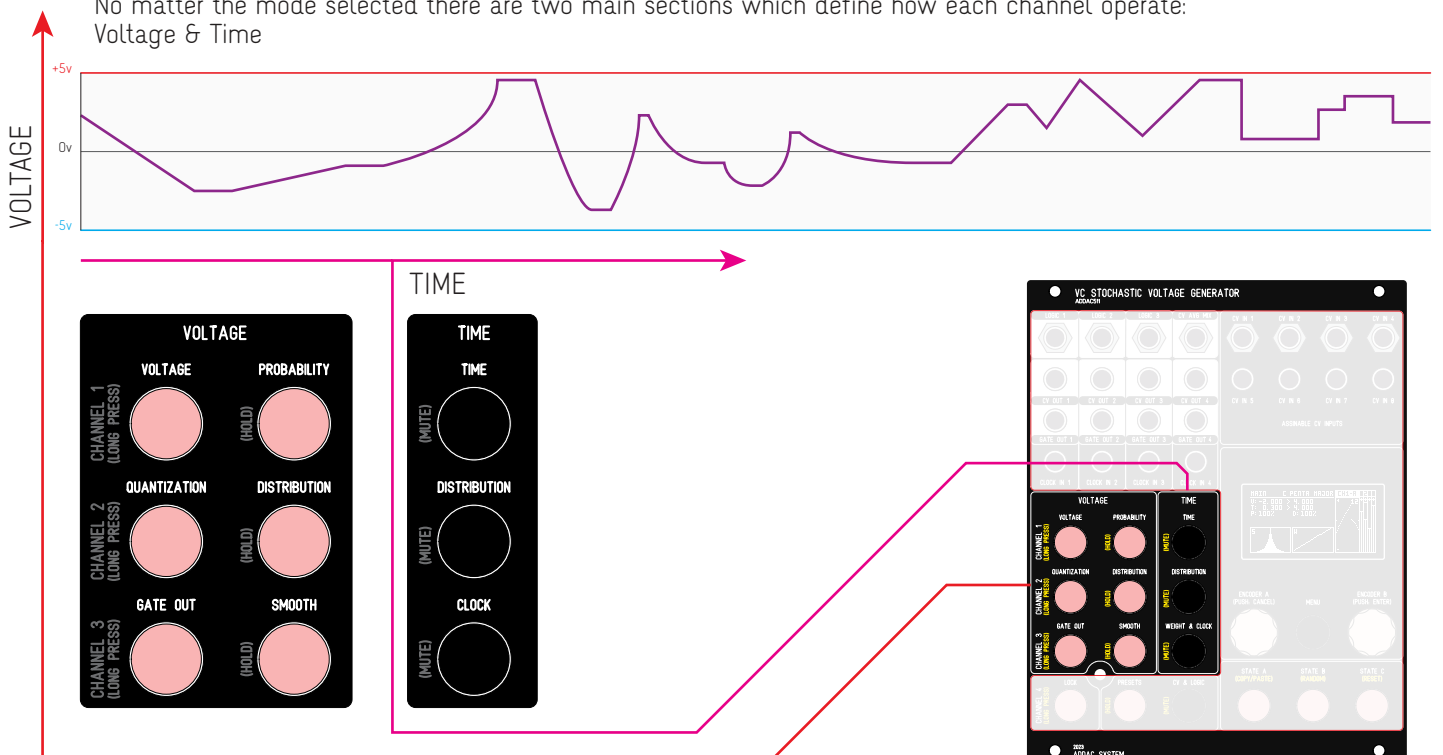
## 2. RANDOM ENVELOPE GENERATION

Fully featured random envelope generation in the time and voltage domain with fully controlled range, probability, random distribution, curve control.



# MAIN SECTIONS

No matter the mode selected there are two main sections which define how each channel operate: Voltage & Time



# 1. RANDOM VOLTAGE GENERATION

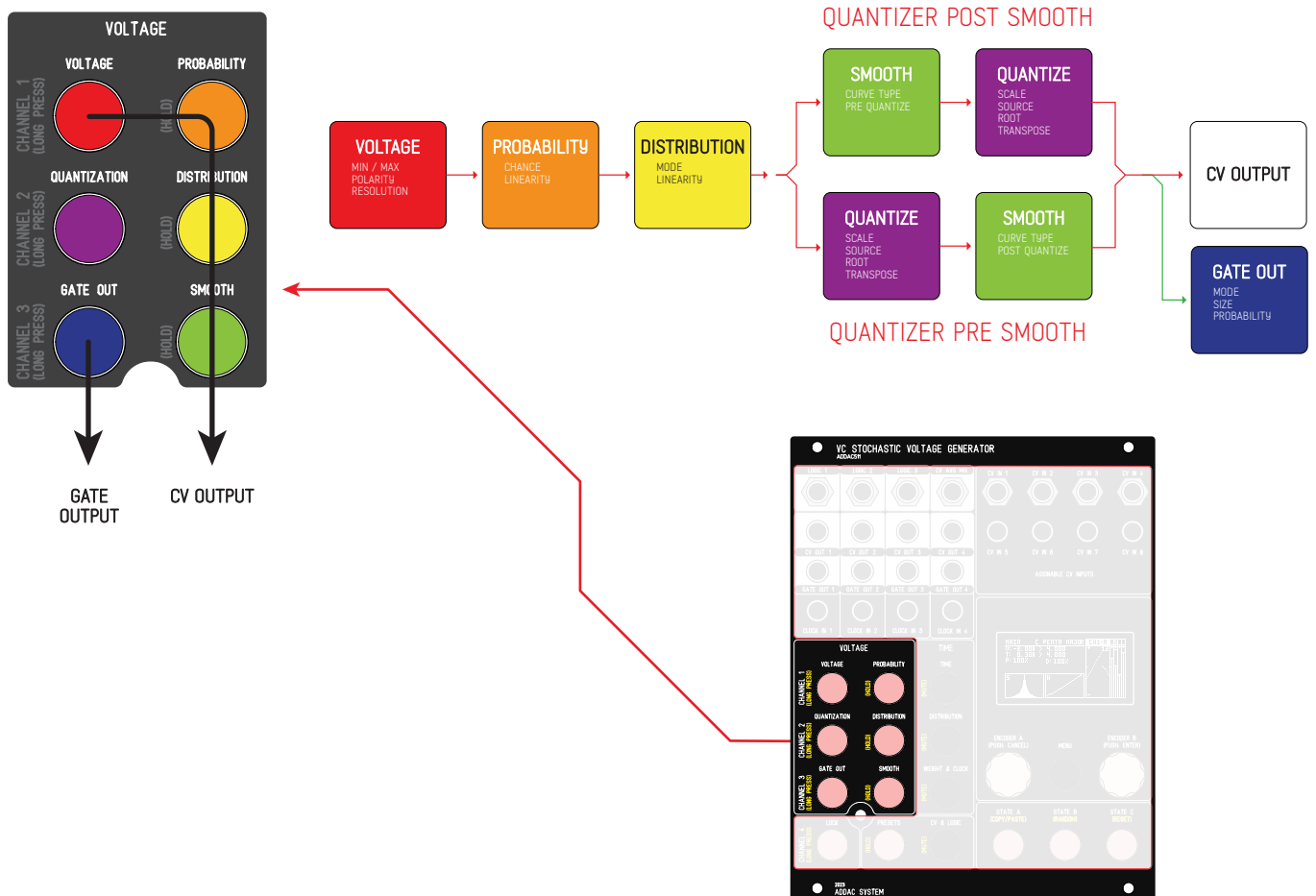
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## VOLTAGE SETTINGS : SIGNAL FLOW

### VOLTAGE GENERATION

The voltage generation process is made of a number of functions in a chain. Each function features it's own fast recall push button and configuration screen. At every clock tick a new voltage will be generated by this chain.

The [SMOOTH] and [QUANTIZE] order (A to B, B to A) can be altered in the [SMOOTH] window.

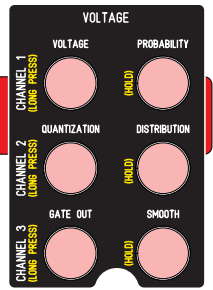


Here's an example plot of a Voltage generated output



# 1. RANDOM VOLTAGE GENERATION

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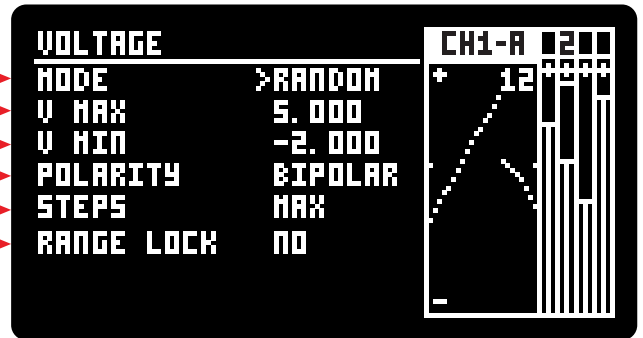


## RANDOM VOLTAGE SETTINGS

### VOLTAGE SCREEN:

Voltage range settings

- MODE** — The channels' operating Mode
- VOLTAGE MAXIMUM** — Sets the maximum voltage of the randomization range
- VOLTAGE MINIMUM** — Sets the minimum voltage of the randomization range
- CV POLARITY** — Sets a Positive (0 > +5V) or Bipolar range (-5V > +5V)
- STEPS** — Sets the number of steps to divide the MIN/MAX range defined from 2 to 320 or MAX (full 16bit resolution)
- RANGE LOCK** —

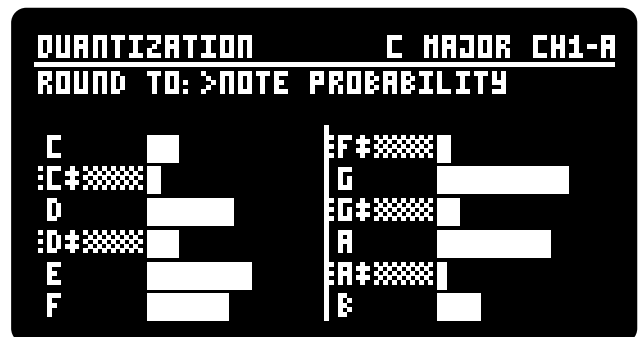
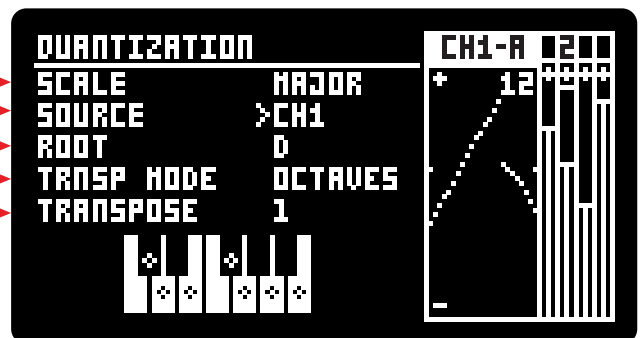


**RANGE LOCK**  
 OFF: [V. MAX] & [V. MIN] defines the range minimum and maximum boundaries independently  
 ON: Locks the current range defined, editing [V. MAX] will also change [V. MIN] and vice-versa.

### QUANTIZATION SCREENS:

There are 2 Quantization screens, pressing the [QUANTIZATION] button will change between the 2 screens.

- SCALE** — Select from a few standard scales plus a custom setting where the user can freely choose the scale notes.
- SOURCE** — The source to be quantized, by default is set to the current channel although it can be set to any of the other channels or cv inputs working as a quantizer
- ROOT NOTE** — The scale Root note
- TRANSP MODE** — SEMITONES: Transposition in semitones intervals  
 SCALE DEGREE: The scale degree transposition, transposes within the scale notes, in case of standard 7 note scales it can be used for modes:1-Ionian, 2-Dorian and so on.  
 OCTAVES: Transposition in octave intervals  
 CENTS: Transposition in cents intervals
- TRANSPOSE** — The transposition value



SCALE DEGREES TRANSPOSITION	
Ex: C Major scale - 7 notes scales behaves as standard scale modes	
1 = IONIAN	C D E F G A B
2 = DORIAN	D E F G A B C
3 = PHRYGIAN	E F G A B C D
4 = LYDIAN	F G A B C D E
...	
-1 = LOCRIAN	B C D E F G A
-2 = AEOLIAN	A B C D E F G
-3 = MIXOLYDIAN	G A B C D E F

More info regarding the quantizer operation on page 39.

# 1. RANDOM VOLTAGE GENERATION

## RANDOM VOLTAGE SETTINGS

### GATE OUT SCREEN: (same as in other modes)

Settings control the Gate Out behaviour

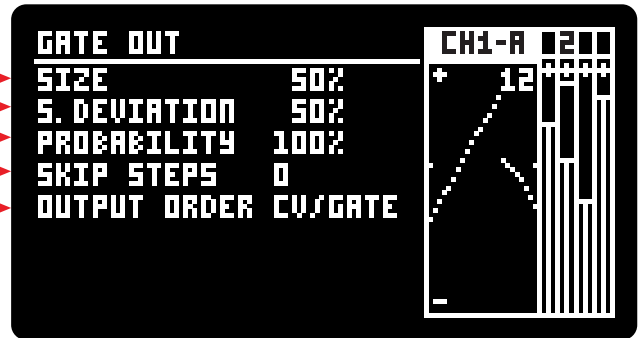
**SIZE** — Percentage of gate ON time in relation to the step size

**New SIZE DEVIATION** — A random value percentage that will offset the Size setting

**PROBABILITY** — Output probability from 0% (no output) to 100% (always outputs). Also available is 1ms and 10ms for triggers.

**New SKIP STEPS** — This feature introduces some disruption on the Gate Out behaviour, keeping its output low at every X steps. Negative values allow to only output at every X steps.

**OUTPUT ORDER** — The order at which the CV and Gate is sent to the physical outputs. Although the time difference between the two outputs will still be microseconds apart this order may be important depending on what is being patched to.  
CV/GATE: CV before the Gate Output  
GATE/CV: Gate before the CV output



### PROBABILITY SCREEN (same as in other modes)

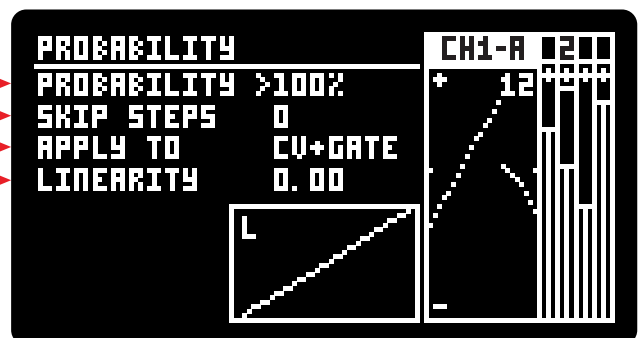
Output probability settings, determines if it will generate a new CV at the current step or skip it and hold the current value until the next step.

**PROBABILITY** — Sets the probability of new generated voltages to be interrupted and not sent to the output  
0% = All new voltages will be canceled  
100% = No new voltages will be canceled

**SKIP STEPS** — This feature introduces some disruption on the CV output behaviour, skipping the CV generation at every X steps.

**APPLY TO** — CV: only applies the probability to the CV output, Gate Out will still be generated.  
CV+GATE: applies the probability to both the CV and Gate output

**LINEARITY** — Sets the probability distribution curve



# 1. RANDOM VOLTAGE GENERATION

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## RANDOM VOLTAGE SETTINGS

### VOLTAGE DISTRIBUTION SCREEN

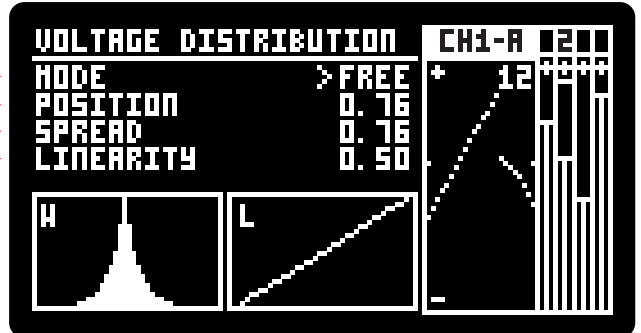
Allows for non-linear distribution of the voltage randomized as described in Page 10.

**MODE**  
OFF, FREE & WALK

**POSITION**  
Positions the distribution peak.

**SPREAD**  
Sets the Q factor for the distribution curve.

**LINEARITY**  
Sets the overall distribution curve.



### SMOOTH SCREEN

Settings control the interpolation between each two random points

**CURVE TYPE**  
The type of curve used for the interpolation  
LIN: Linear interpolation  
LOG: Logarithmic interpolation  
EXP: Exponential interpolation  
BEZIER: Bezier curve interpolation

**DURATION**  
The duration of the interpolation as a percentage of the step size

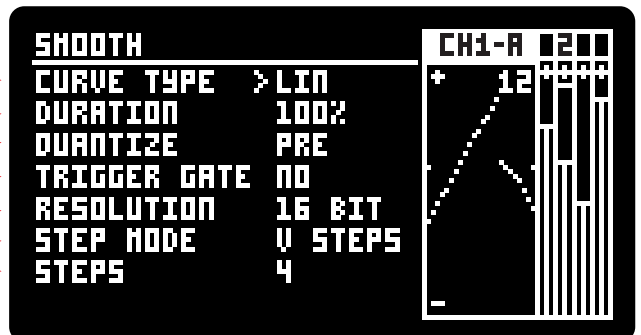
**QUANTIZE**  
Quantizer Pre/Post setting:  
Pre: Quantizer into Smooth for glissando type effect  
Post: Smooth into Quantizer for arpeggio type effect

**TRIGGER GATE**  
YES / NO: When Yes is chosen this feature triggers the Gate output at every interpolation step change

**RESOLUTION**  
A bitcrusher applied on the incoming value, limiting the DAC resolution from 16 bit to 2 bit, at 2 bit the DAC range is limited to 4 values, 8 at 3 bit, 16 at 4 bit, 32 at 5 bit and so on up to 16 bit where the resolution is 65536

**STEP MODE**  
This feature transforms the linear interpolation in user defined interval steps:  
OFF: No stepping, smooth interpolation  
VOLTAGE STEPS: interpolates at defined voltage steps  
TIME: interpolates at defined time steps

**STEPS / STEP TIME**  
STEPS: Sets the number of steps to divide the interpolation distance  
STEP TIME: Sets the time interval between interpolation changes



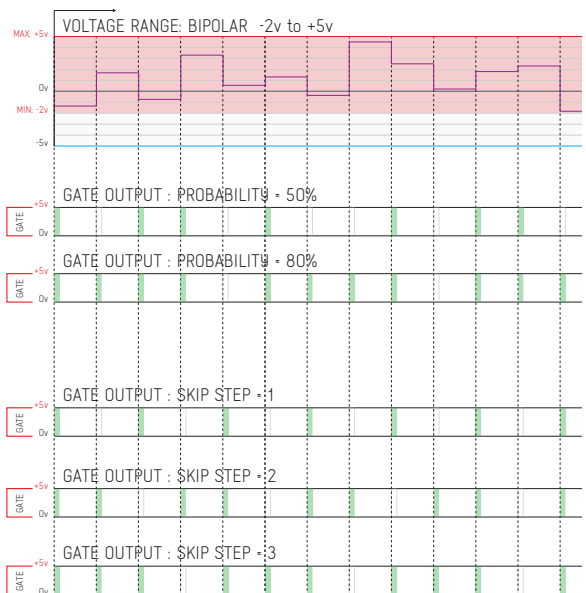
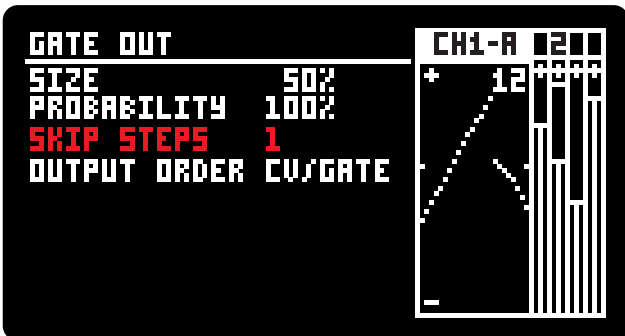
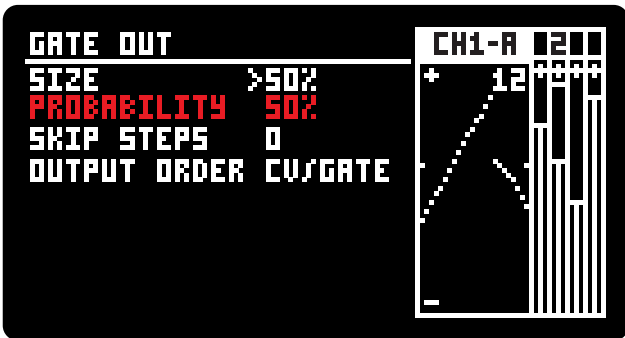
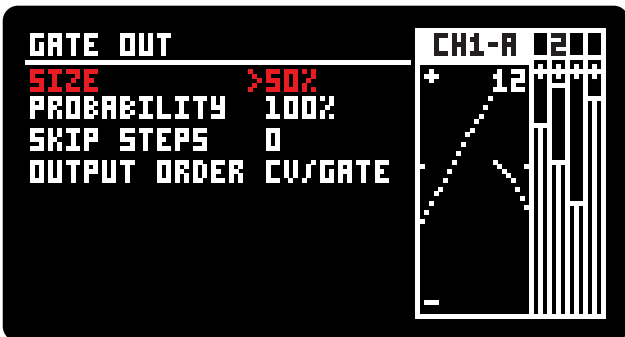
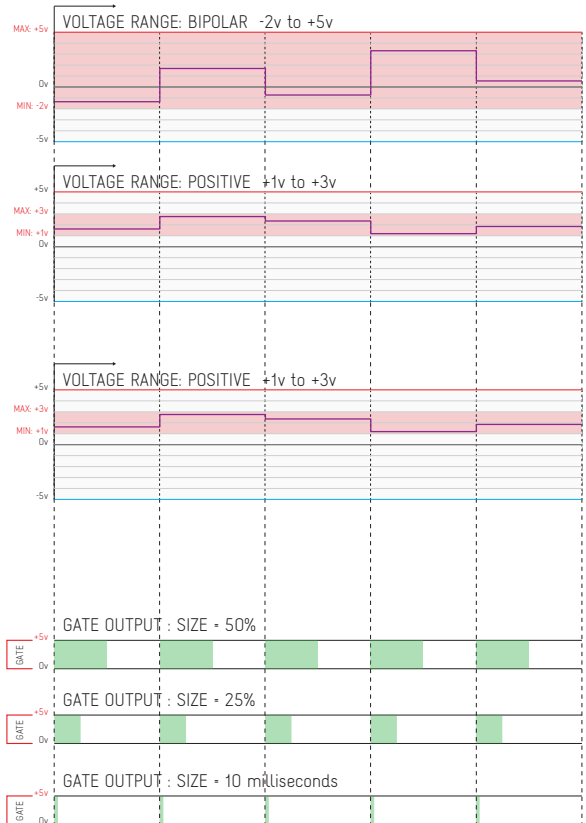
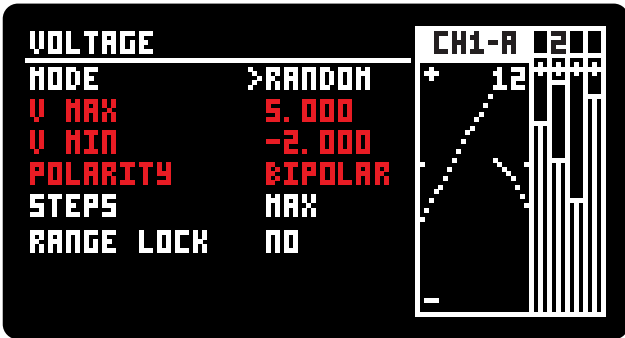
USING SMOOTH WITH CLOCK INPUTS MAY RESULT IN BAD TIMINGS AS THE MCU IS CONSIDERING THE LAST INTERVAL BETWEEN 2 GATES, IF THE EXTERNAL CLOCK ISN'T STEADY THE INTERPOLATION DURATION WILL NOT MATCH

# 1. RANDOM VOLTAGE GENERATION

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## VOLTAGE & GATE OUT EXAMPLES

Here's a few graphical examples of the Voltage and Gate Out settings.

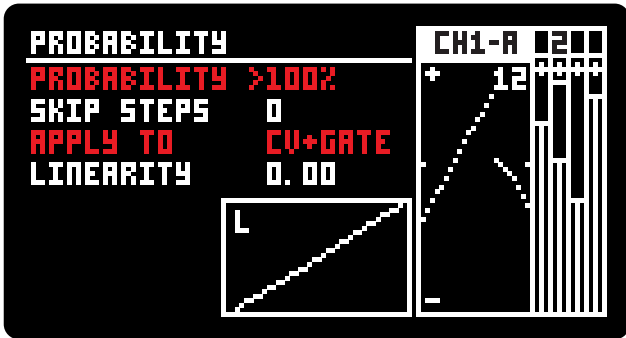


# 1. RANDOM VOLTAGE GENERATION

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## VOLTAGE PROBABILITY

Here's a few graphical examples of the Voltage and Gate Out [PROBABILITY] settings. Notice how they can be dependent or independent.

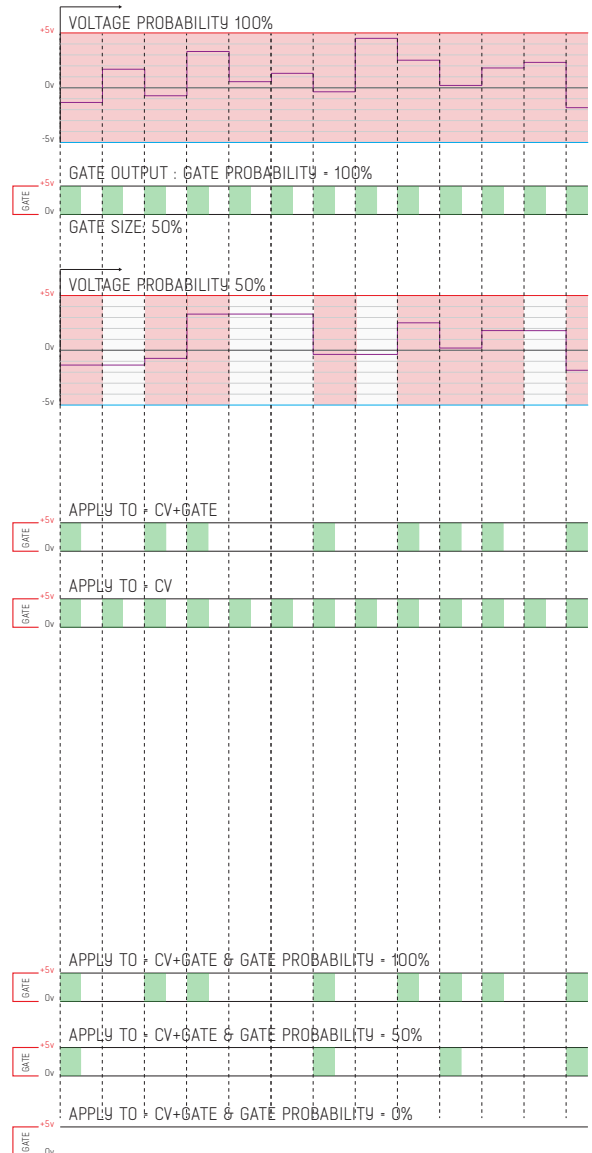
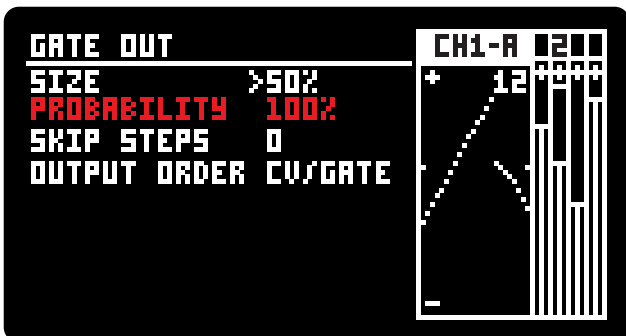


## APPLY TO

When [APPLY TO] is set to CV+GATE the Gate only outputs when the probability is true. Applying the probability only to CV leaves the Gate intact, outputting every clock tick. This makes the Voltage Probability independent from the Gate Probability.

## GATE PROBABILITY

The Probability function in the Probability Screen is the master probability. The one inside the Gate Out Screen



# 1. RANDOM VOLTAGE GENERATION

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## VOLTAGE AND TIME DISTRIBUTION

These screens set the probability distribution for each random generation made in the time and voltage domain. Every new random value by default is generated using a principle of uniform distribution (equal probability for all possibilities) however these can be weighted, meaning that they can be defined to make a certain range area more predominant, while always keeping the result within the voltage range defined in the [VOLTAGE] screen. The weighted generation may follow three types of probabilistic distributions: uniform distribution, a slightly modified normal distribution and walk/drunk distribution (walk mode).

**Uniform distribution (OFF)**, as mentioned above, has no weight, any value within the defined range has equal probability of being selected.

**Normal distribution (FREE)** is bell shaped, it can be described by its mean value and a deviation around that value defined by [POSITION]. Most random values will be around this position with more or less deviation depending on the [SPREAD] value. In our modified version of the normal distribution, if the calculated value is outside the selected voltage range, it is brought back inside the range.

**Walk (WALK)**, like uniform distribution has equal probability for all possible values but restrains its range within a proximity to the previous value, resulting in a plot similar to the stock market as an example. The probabilistic distribution is further influenced by the linearity parameter, which tilts the probability distribution either towards the lower or higher ranges.

### MODES

The CV out value will have different probability characteristics, depending on the mode setting:

#### 1. OFF

Uniform distribution (equal probability for all CV values)

#### 2. FREE

Normal distribution, folding back at the upper and lower limits, parameters:

POSITION - Central value of probability distribution (mean)

SPREAD - Allowed deviation relative to the position (deviation)

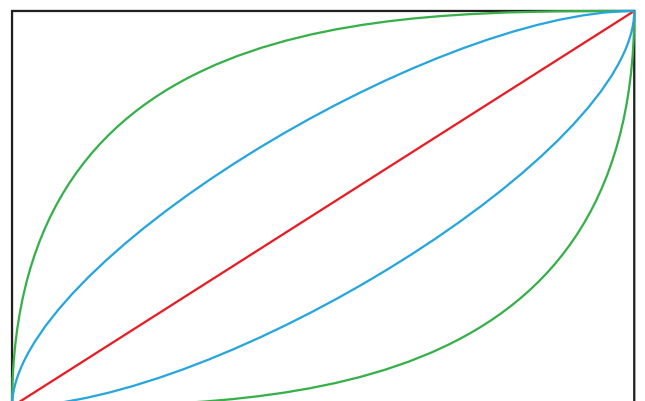
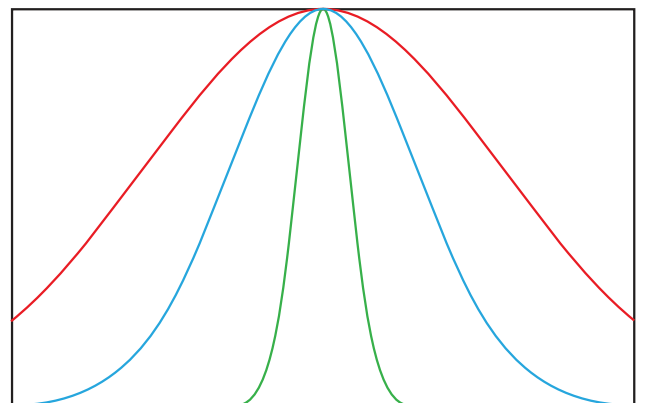
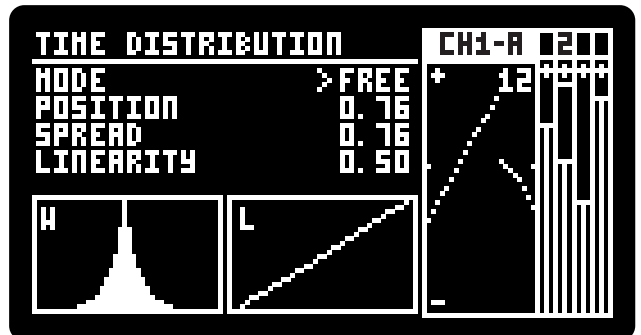
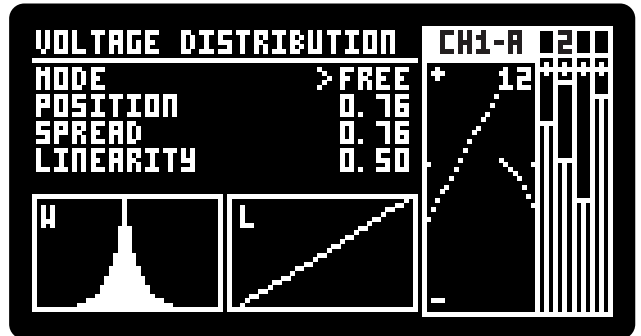
#### 3. WALK

The next value has a maximum deviation from the last value, parameters:

SPREAD - Allowed deviation relative to the last CV out value

### LINEARITY

This parameter is independent of the mode selected, it further weights the probability distribution to give preference to lower or higher values, as if tilting the distribution.

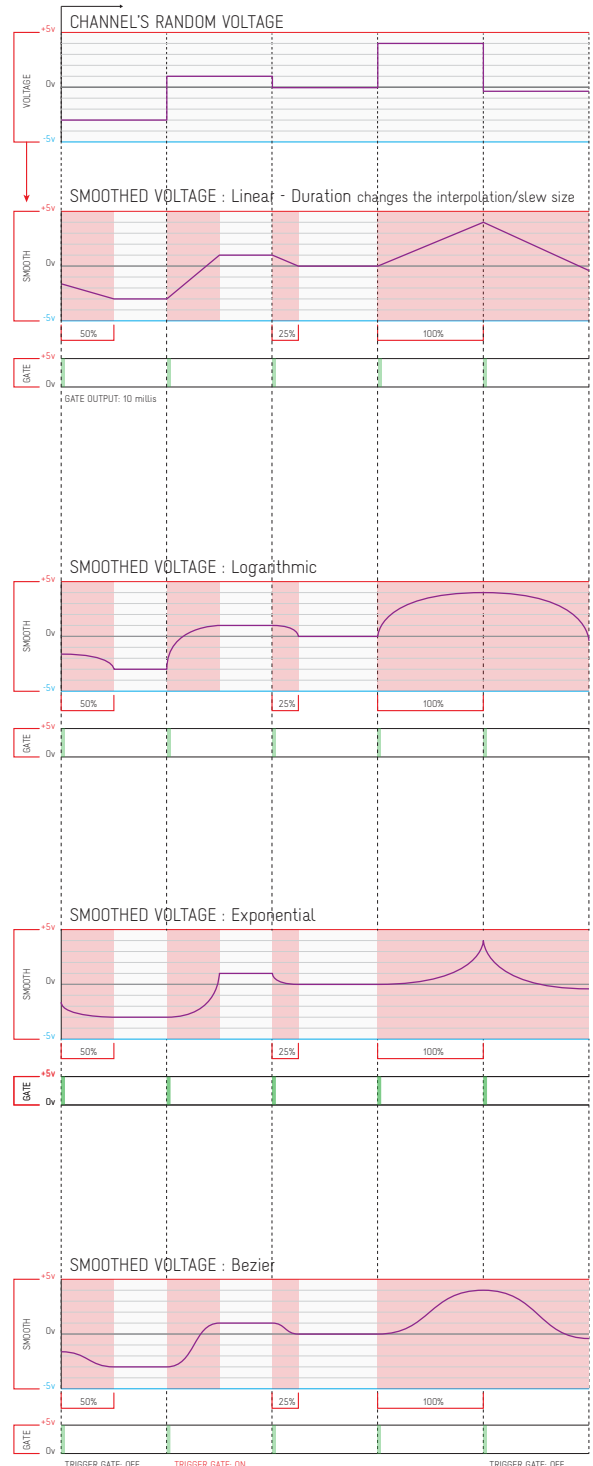
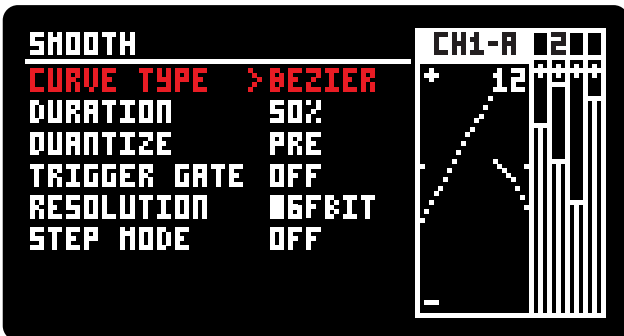
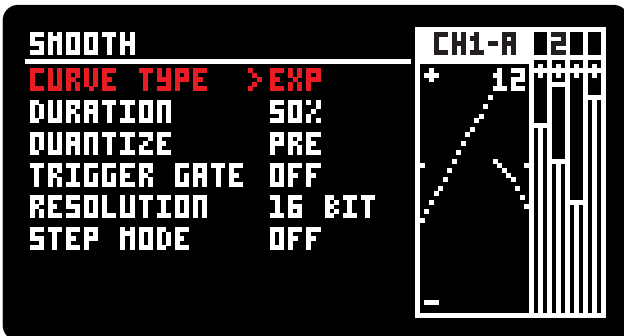
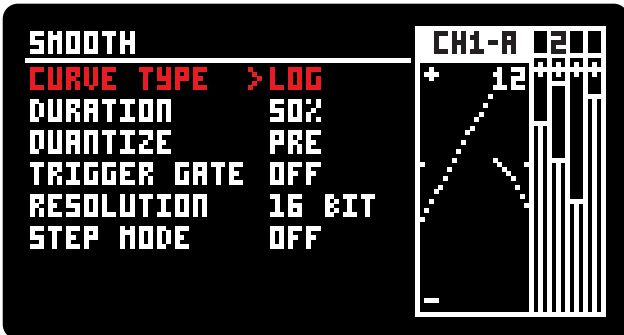
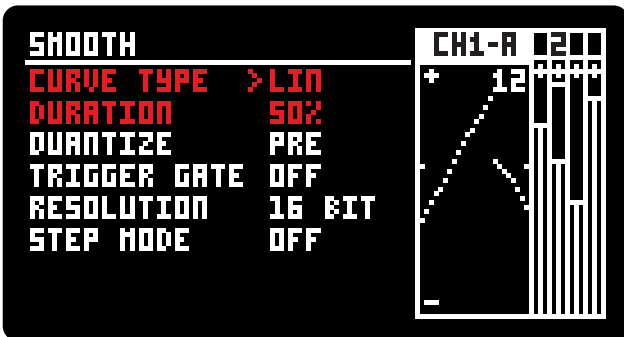


# 1. RANDOM VOLTAGE GENERATION

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## SMOOTH INTERPOLATION

Smooth allows to interpolate between the generated values at every clock tick. The user can set the duration of the interpolation between 0 and 100%, this duration is in sync with the clock keeping correct timing even with a random clock.



# 1. RANDOM VOLTAGE GENERATION

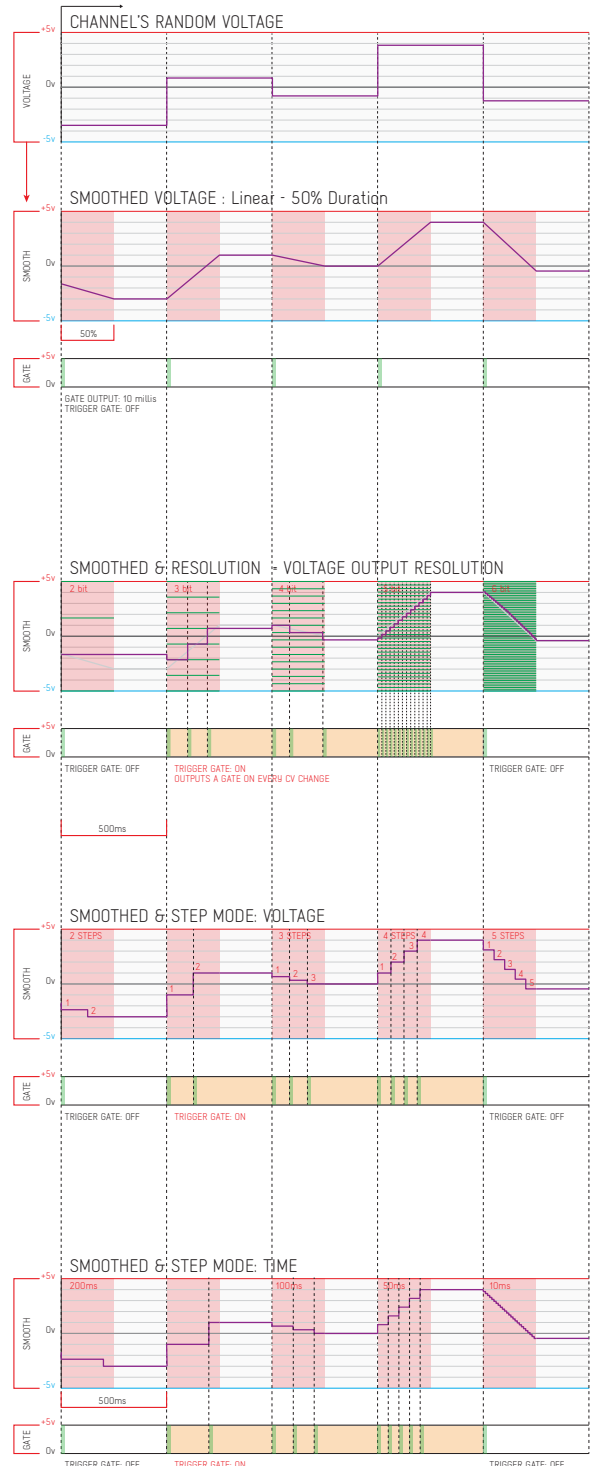
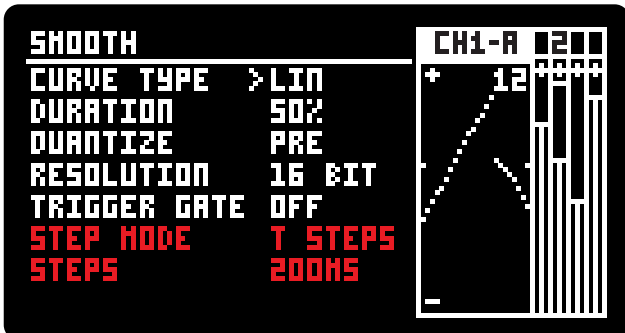
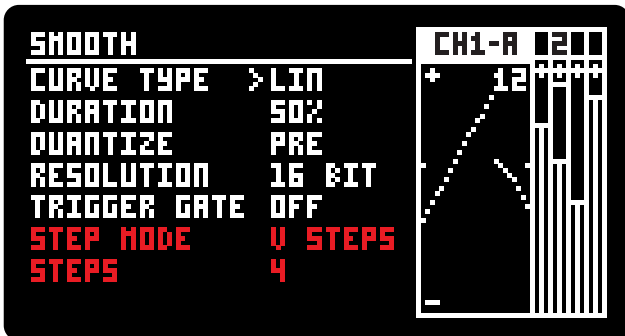
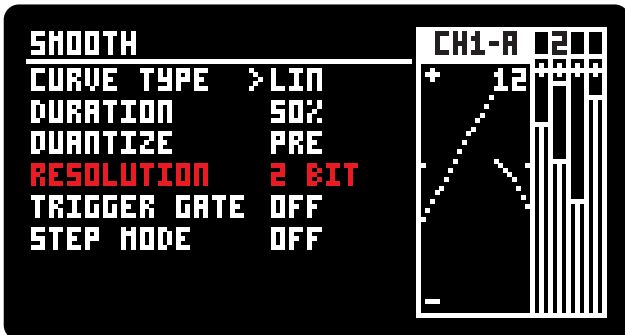
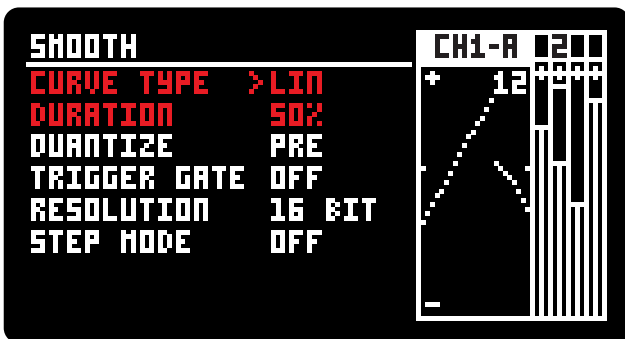
ADDAC511 User's Guide

## STEPPED INTERPOLATION

Besides smoothing in between each voltage step, smooth can be used to create stepped interpolations using [RESOLUTION] and [STEP MODE]. [TRIGGER GATE] is used to trigger at every interpolation step.

Here we're showing graphical examples of these in action.

Quantization is set to PRE if set to POST all these examples would be quantized to the scale defined in the Quantization screen.



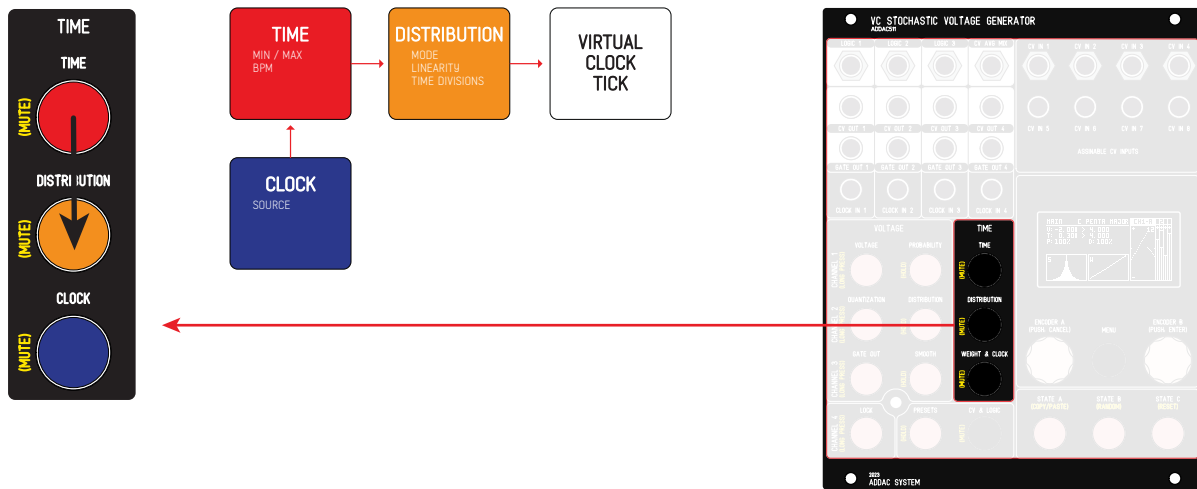
# 1. RANDOM VOLTAGE GENERATION

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## TIME SETTINGS : SIGNAL FLOW

### TIMING GENERATION

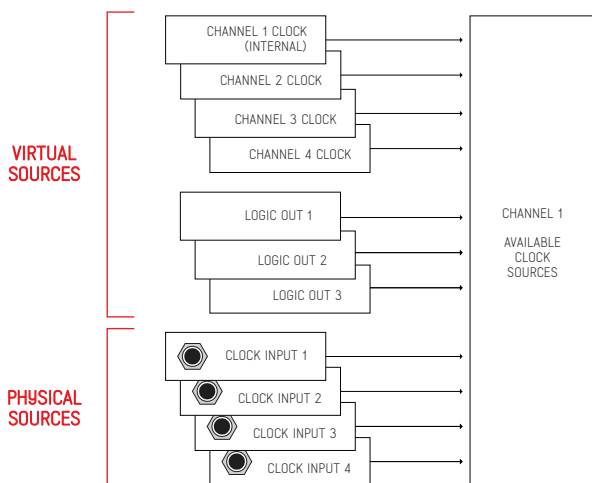
Time settings determines the rate at which the voltage and gate are generated, the interval between every generation step is defined by the setting in the [TIME] screen, That value is then "balanced" by the [DISTRIBUTION] screen settings and a virtual clock tick is generated.



### CLOCK SOURCES

There are 3 main sources to trigger each channel timing.

1. 4 virtual clocks, one per channel. Each channel can select itself (INTERNAL) or any other channel.
2. The 3 Logic Outputs, whenever the logic output goes high it triggers the channel's clock.
3. The 4 Clock inputs, any input can be routed to any channel.

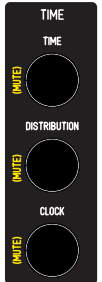


# 1. RANDOM VOLTAGE GENERATION

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## TIME SETTINGS : TIME MODE (milliseconds)

In Time Mode the clock is defined in milliseconds, the step length will be randomized from the interval defined by the Time Min & Time Max parameters. Setting the Time Minimum higher than Time Maximum will result in a steady clock at a fixed rate without any randomization.



### TIME SCREEN:

#### TIME MODE

Time mode uses seconds as a reference, at every cycle it randomizes a new value in the range defined by the Time Min / Max settings.

#### TIME MAXIMUM

Sets the maximum step time in milliseconds.

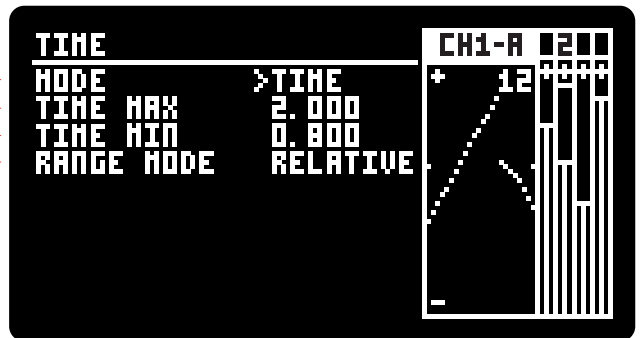
#### TIME MINIMUM

Sets the minimum step time in milliseconds.

#### RANGE MODE

Relative: Allow independent changes to Max and Min values

Absolute: Keeps the range defined, changing Max or Min will also affect the other parameter, one pushes the other to keep the same range.



### TIME DISTRIBUTION SCREEN

Allows for non-linear distribution of the time randomized

#### MODE

FREE  
WALK

#### POSITION

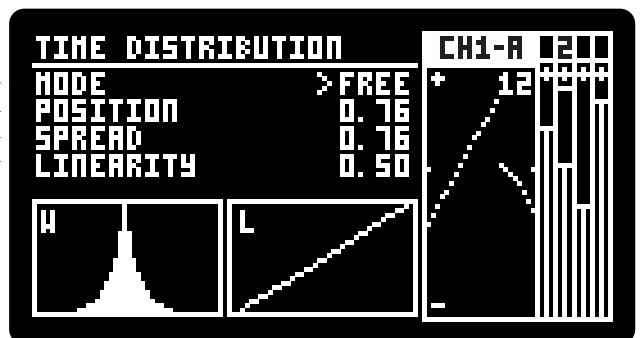
Positions the distribution peak.

#### Q FACTOR

Sets the Q factor for the distribution curve.

#### LINEARITY

Sets the overall distribution curve.



# 1. RANDOM VOLTAGE GENERATION

## TIME SETTINGS : BPM MODE

In BPM Mode the clock works as a standard BPM clock, the step length will be randomized from the intervals defined in the Distribution screen.

### TIME SCREEN:

#### BPM MODE

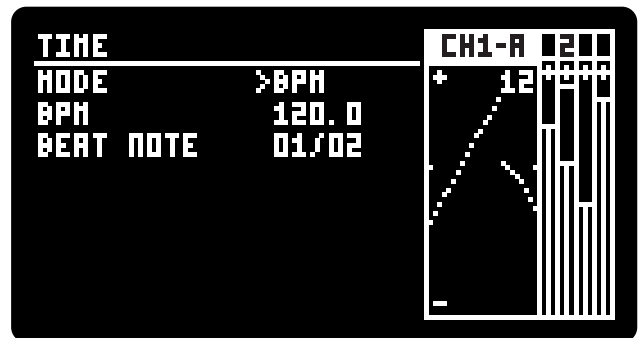
In BPM mode the clock uses a constant timing value. It can also be set to follow another channel BPM choosing BPM CH2, BPM CH3, BPM CH4. In this case the BPM field is not selectable and will show the value of the chosen follow channel.

#### BPM

Sets the clock's Beats Per Minute.

#### New BEAT NOTE

Sets the meter of the clock's BPM. Similar to changing the bottom number on a time signature. Also similar to multiplying / dividing the BPM set, allowing odd signatures.



### BPM DISTRIBUTION SCREEN

In BPM Mode the user can set up to a total of 11 divisions, any division from 32/1 to 1/32 is possible, all odd combinations included.

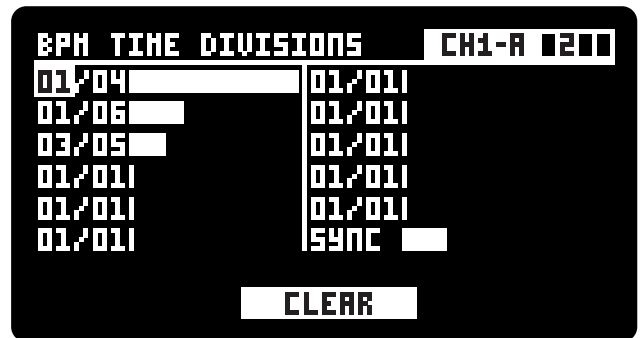
A second parameter visualised as a white bar sets the probability / predominancy of each division active.

Only ratios with probability above zero will be active.

Repeated ratios can be used.

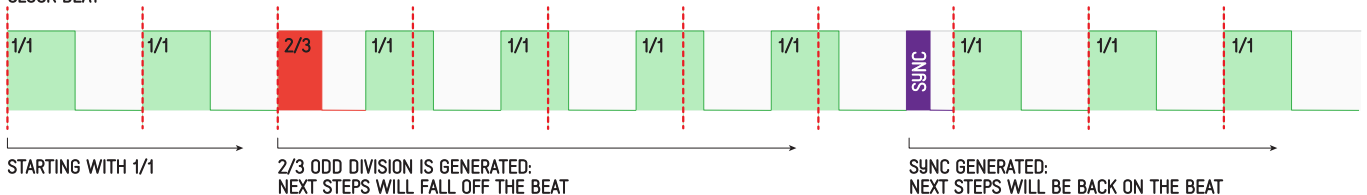
The Menu button is used for clearing the edited value to the default 1/1 with 0% probability.

Both encoders push button will exit the screen.



The SYNC slot output division is variable, it outputs the required time until the next beat. This will make sure the next step falls back on the beat. This is especially useful when using odd time divisions as it resets any offset, you can see a graphical example below.

SHOWING GATE OUT AT 50% STEP SIZE  
CLOCK BEAT



# 1. RANDOM VOLTAGE GENERATION

## CLOCK

### CLOCK SCREEN:

Configuring the selected channel's clock origin.

#### CLOCK SOURCE

Sets the origin of the Clock, options are:

**INTERNAL (default):** uses its own channel clock.

**CHANNEL X:** chooses one of the other channels clocks.

**CLOCK IN X:** chooses one of the 4 clock physical jack inputs

**LOGIC X:** chooses one of the 3 Logic outputs

#### INTERNAL

keeps the channel independent from other channels.

All other options makes the channel dependent to the source chosen. In these cases the clock parameters available will change according to the clock source selected.

#### CHANNEL 1 to 4

Syncs to any other channel: slave mode.

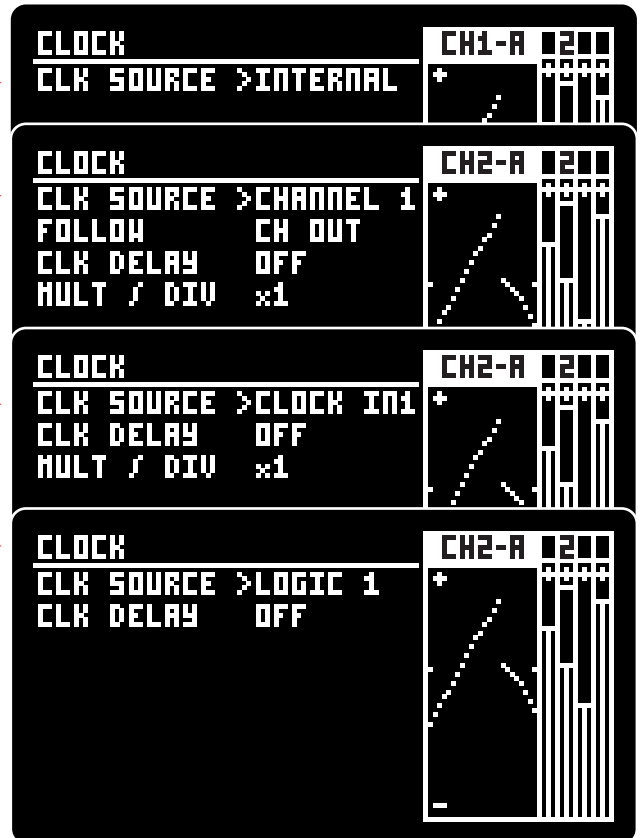
#### CLOCK IN 1 to 4

Uses the frontpanel clock inputs to sync to external sources.

#### LOGIC 1 to 3

Uses the internal logic outputs as a clock.

New ->



### CHANNEL 1 SELECTED

CLK SOURCE	CHANNEL X TIME MODE	CHANNEL 1 TIME MODE	AVAILABLE PARAMETERS	EXTRA PARAMETERS
INTERNAL				
CHANNEL X	TIME	TIME	USE TIME	
		BPM	USE TIME	
	BPM	TIME		WHEN OFF: MULT/DIV
		BPM	FOLLOW	CH BPM / CH OUT
		USE TIME	WHEN OFF: MULT/DIV	
CLOCK IN X			USE TIME	
LOGIC X			USE TIME	

The grey area shows parameters that are defined outside the clock configuration screen, these parameters are defined in the time screen.

# 1. RANDOM VOLTAGE GENERATION

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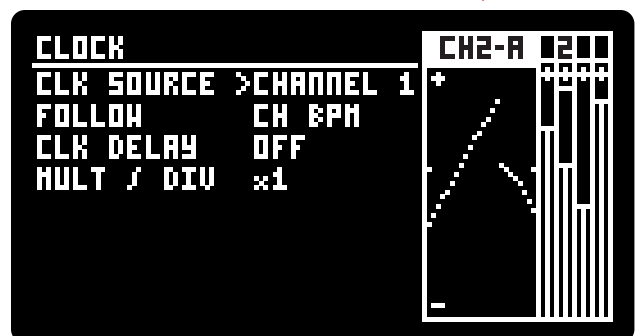
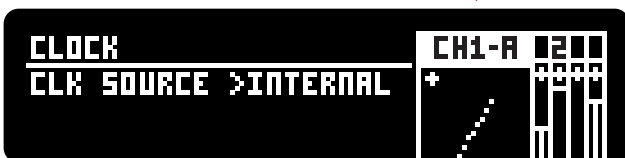
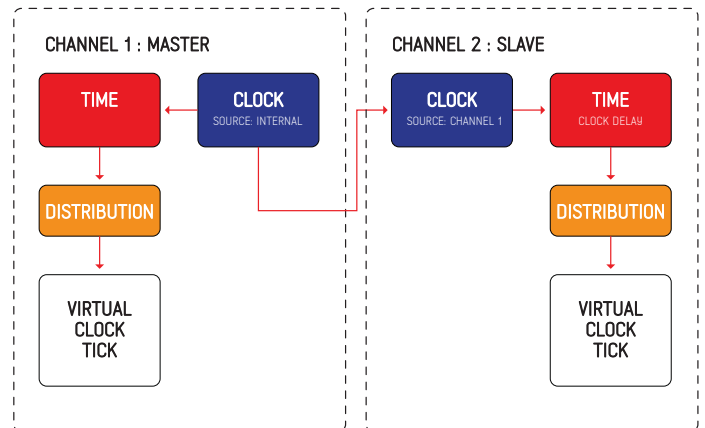
## CLOCK MASTER/SLAVE

### Sync Channels

Channels can be sync'ed to other channels using the [CLOCK SOURCE] setting in the [CLOCK] screen. By default every channel is a Master channel, independent from all others.

To change any channel to Slave the user just needs to select to any other channel in the [CLOCK SOURCE] parameter, this will make that channel follow the selected clock.

When set to Slave the [TIME] and [DISTRIBUTION] screens will then be used to set the parameters for a new function: Clock Delays. When active [CLOCK DELAY] will use the slave channel's [TIME] and [DISTRIBUTION] parameters to generate a delay value that will be added to the clock tick, effectively delaying the incoming clock. This delay can be steady or random depending on the [TIME] and [DISTRIBUTION] settings selected.



# 1. RANDOM VOLTAGE GENERATION

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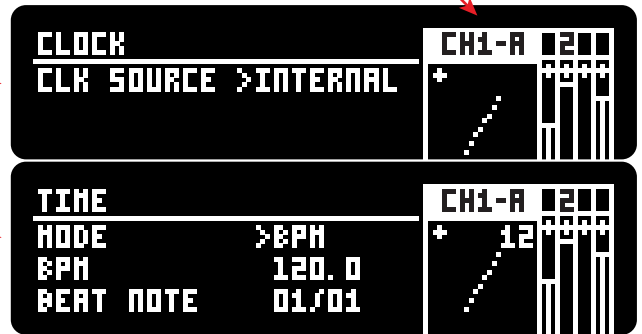
## CLOCK FOLLOW

### Sync Channels: BPM Mode

The best practice to sync channels is to choose one to be the master channel setting its [CLK SOURCE] to [INTERNAL]. The remaining channels can then refer to this master channel.

In this example Channel 1 is set as [INTERNAL]  
Channel 1 [TIME MODE] is set to BPM

The [TIME MODE] setting is very important here as it will show different options if set to [BPM] or [TIME].



Channel 2 [CLK SOURCE] is set to sync to Channel 1

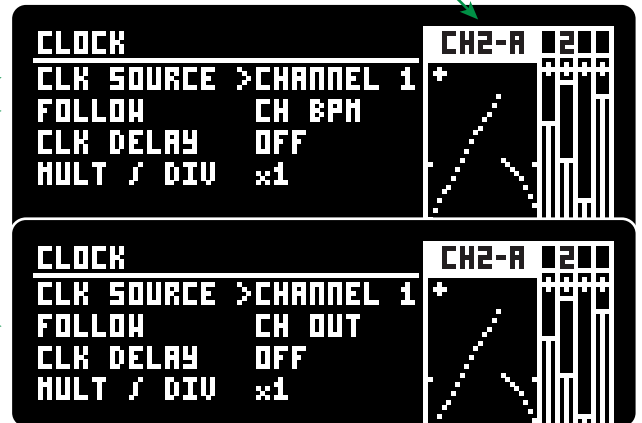
### FOLLOW

Follow will determine the sync mode.

The slave channel can sync to:

[CH BPM] the virtual grid of the master channel BPM

[CH OUT] the real-time gate output.

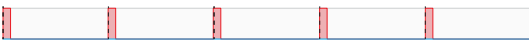


### FOLLOW EXAMPLE

Here is a side by side comparison of both [FOLLOW] options including examples for diferent [MULT/DIV] values.

#### FOLLOW CHANNEL BPM

CHANNEL 1 Virtual BPM

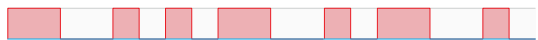


This would be the Channel 1 virtual BPM.

Virtual here means this is not the Channel 1 real output but instead the BPM grid to which channel 1 is syncing to. Channel 2 will then follow this virtual grid depending of the [USE TIME] and [MULT/DIV] settings.

#### FOLLOW CHANNEL OUTPUT

CHANNEL 1 Real-time GATE OUTPUT



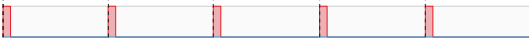
This would be the Channel 1 real-time Gate Output. This output will depend on all other parameters on Channel 1, for simplicity in the example above it's randomizing whole and half notes.

### [MULT / DIV]

When [USE TIME] is Off, the virtual BPM can be:

- . Multiplied (x1, x2, x3, x4, x5, x6, x7, x8, x16, x32)
- . Divided (/2, /3, /4, /5, /6, /7, /8, /16, /32)

CHANNEL 1 Virtual BPM



CHANNEL 2 - FOLLOW CH BPM

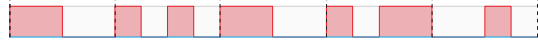


### [MULT / DIV]

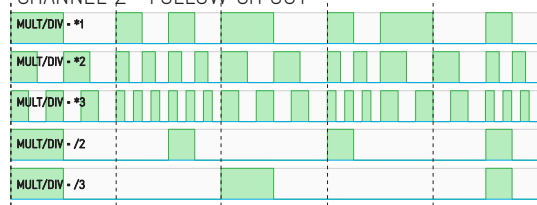
When [USE TIME] is Off, the virtual BPM can be:

- . Multiplied (x1, x2, x3, x4, x5, x6, x7, x8, x16, x32)
- . Divided (/2, /3, /4, /5, /6, /7, /8, /16, /32)

CHANNEL 1 Real-time GATE OUTPUT



CHANNEL 2 - FOLLOW CH OUT



# 1. RANDOM VOLTAGE GENERATION

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## CLOCK DELAY: BPM

### Sync Channels: Slave TIME MODE = BPM

#### [CLOCK DELAY]

The [CLOCK DELAY] parameter is used to cause deviation/delay to the incoming clock timing. In this case the Channel 2 [TIME MODE] setting is very important as it will behave differently if set to [BPM] or [TIME].

When using BPM the engine will use the time divisions set on the [TIME DISTRIBUTION] screen and generate a new interval from the divisions pool always using the Channel 1 BPM as reference ignoring the channel's own BPM setting.

#### [CLOCK DELAY] - ON & CHANNEL TIME MODE - BPM

In this example Channel 2 [TIME MODE] is set to [BPM]

#### FOLLOW

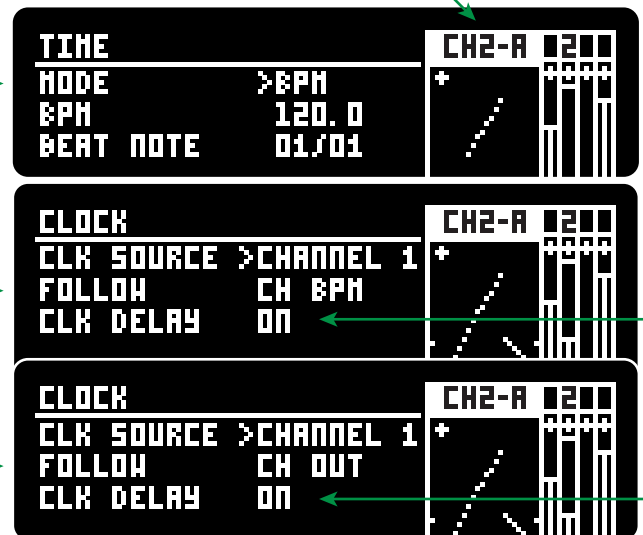
Follow will then determine the sync mode.

The slave channel can sync to:

[CH BPM] the virtual grid of the master channel BPM

[CH OUT] the real-time gate output.

When [USE TIME] is On there is no [MULT/DIV] option.

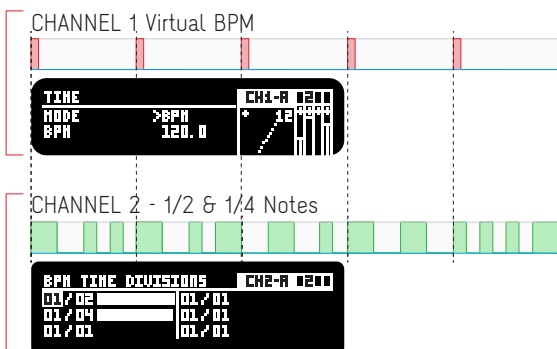


#### FOLLOW EXAMPLE

Here is a side by side comparison of both [FOLLOW] options, notice the time divisions selected

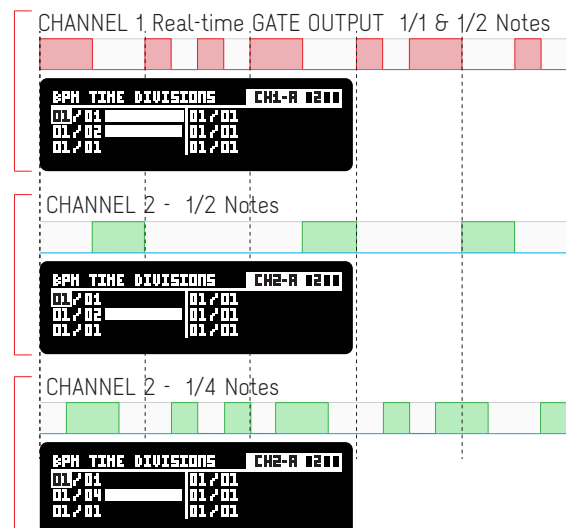
#### FOLLOW CHANNEL BPM

This will generate a consecutive stream of notes which lengths are randomized from the [TIME DIVISIONS] pool. As the current note reaches its final length a new note is immediately generated.



#### FOLLOW CHANNEL OUTPUT

This will create a delay to every incoming clock, the delay length is randomized from the [TIME DIVISIONS] pool. **Time divisions longer than the incoming clock are canceled by the next incoming clock and will not output.**



# 1. RANDOM VOLTAGE GENERATION

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## CLOCK DELAY: TIME

### Sync Channels: Slave TIME MODE = TIME

When using [TIME MODE] set to [TIME] the engine will simply add a delay to the incoming clock source. This setting is usefull used for generating time based delays, fixed or random, in this case although it is being triggered by the master channel BPM grid the delays are set in seconds and will most probably fall out of the grid creating odd delays.

The delay time is randomized from the range defined by the [TIME MIN] [TIME MAX] settings in the [TIME] screen.

Delay times longer than the incoming clock are canceled by the next incoming clock and will not output.

In this example Channel 2 [TIME MODE] is set to [TIME]  
Keep in mind that Channel 1 [TIME MODE] is still set to [BPM].

#### FOLLOW

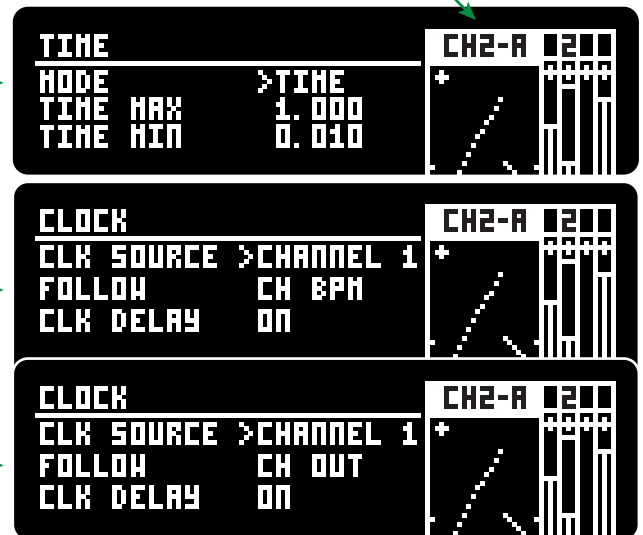
Follow will then determine the sync mode.

The slave channel can sync to:

[CH BPM] the virtual grid of the master channel BPM

[CH OUT] the real-time gate output.

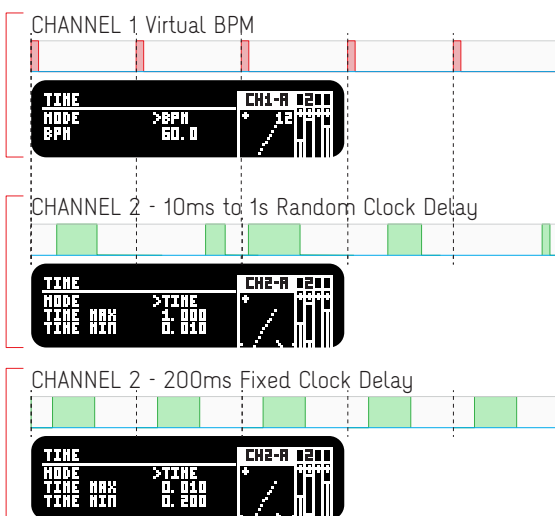
When [CLOCK DELAY] is On there is no [MULT/DIV] option.



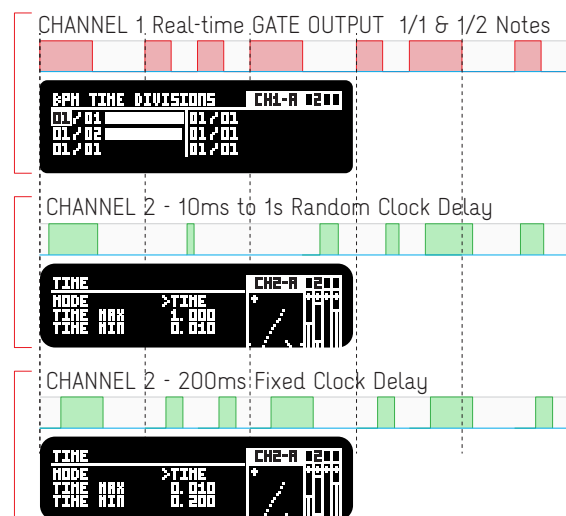
#### FOLLOW EXAMPLE

Here is a side by side comparison of both [FOLLOW] options, notice the time settings.

#### FOLLOW CHANNEL BPM



#### FOLLOW CHANNEL OUTPUT



# 1. RANDOM VOLTAGE GENERATION

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## CLOCK FOLLOW: More Examples

### Sync Channels > Follow: CH BPM vs CH OUT

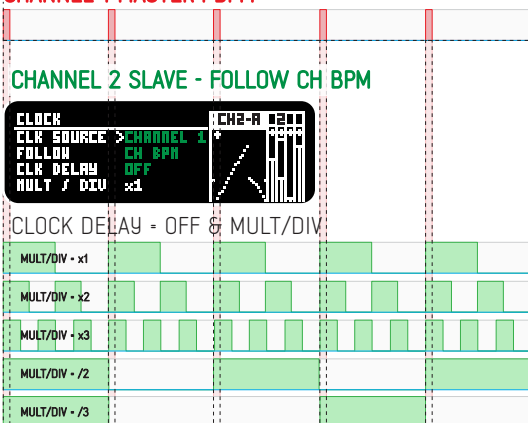
When setting an external clock the user can choose to follow the Master Channel BPM or Gate Output. Following the Master BPM will set a steady BPM for the Slave channel. Following the Gate Output of the Master channel creates complex changes on the Slave channel period. Below you can find graphical examples with all the different possible settings.

For easier visualization all gate representations show the Gate On time, Gate Length is always at 50%. **Master channel in RED** : **Slave channel in GREEN**.

#### Follow: CH BPM



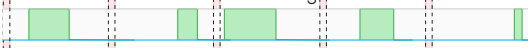
CHANNEL 1 MASTER : BPM



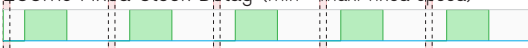
TIME MODE = BPM & CLOCK DELAY = ON  
Delay 1/2 & 1/4 Notes



TIME MODE = TIME & CLOCK DELAY = ON  
10ms to 1s Random Clock Delay



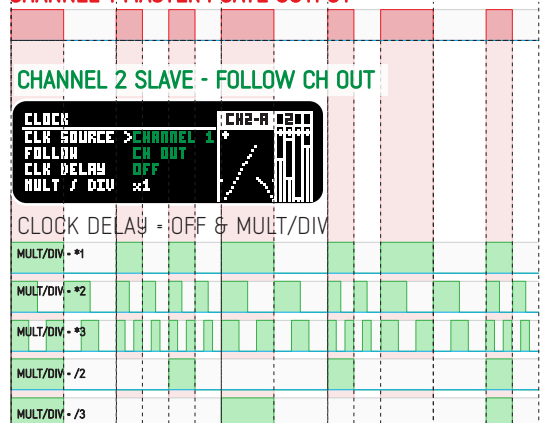
200ms Fixed Clock Delay (min > max: fixed speed)



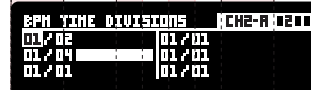
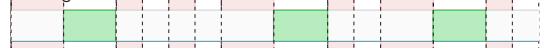
#### Follow: CH OUT



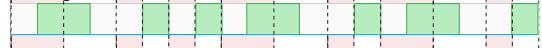
CHANNEL 1 MASTER : GATE OUTPUT



TIME MODE = BPM & CLOCK DELAY = ON  
Delay 1/2 Note



Delay 1/4 Note



TIME MODE = TIME & CLOCK DELAY = ON  
10ms to 1s Random Clock Delay



200ms Fixed Clock Delay (min > max: fixed speed)





# 1. RANDOM VOLTAGE GENERATION

## LOCK : STATE

The channel's internal generation and lock feature are not active at the same time, although the internal generation can influence and write values into the lock sequence. For this there are 3 Lock States:

### TRACK

When in Track mode the lock sequence is disabled and not editable. The internal generation is active and continuously stores its output into the lock sequence active steps in a loop.

As an example, if Steps are set to 8 then it will iterate over these 8 steps storing the new value over the oldest step.

### HOLD

In Hold mode the sequence is locked, not playing but still editable.

The channel internal generation is active

As an example, if you have a sequence you don't want to erase but want to use the internal generation for a transition the Hold mode will keep your sequence safe.

### ON

In ON mode the sequencer takes over, the internal generation is disabled unless special changes (Change Once / Change Allways) are programmed, the sequence can be played and edited in real-time.

	INTERNAL GENERATION	SEQUENCE LOCKED	SEQUENCE EDITABLE	SEQUENCE PLAYBACK
TRACK	YES	X	X	X
HOLD	YES	YES	YES	X
ON	X	YES	YES	YES

## LOCK : STEP SETTINGS

### GATE:

The Gate can be set to either On or OFF

### Step Voltage:

The step voltage can be set in Volts (ex. 2v) or Notes (ex. C2) + Cents, the Cents parameter allows for step microtuning.

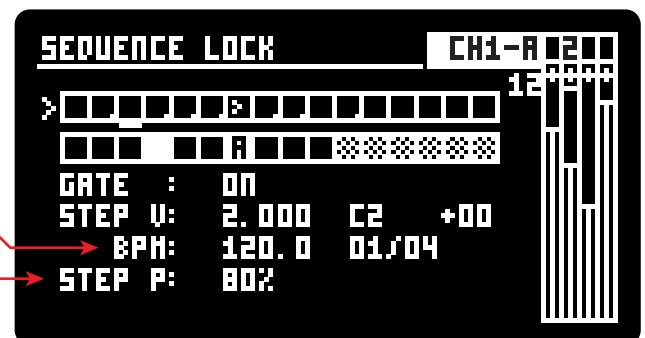
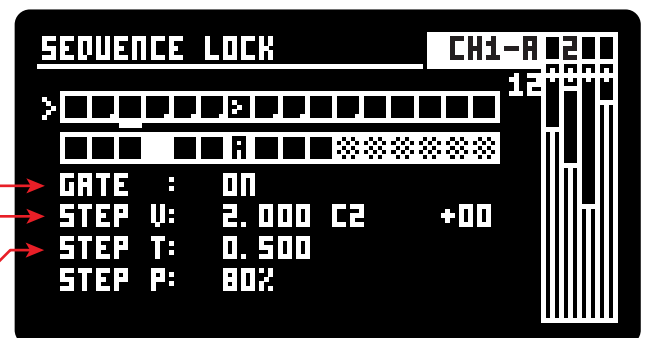
### Step Time:

Unlike a conventional sequencer each step can have different lengths, this can be set in milliseconds or as a time division depending if the [TIME] is set to time or BPM.

This allows programming complex phrases where any time division can be set, ex. 1/16, 1/9 and 15/1 and where each step can have its own BPM.

### Step Probability:

Sets the probability for the step to be outputted, if the probability is false then the sequencer will hold the last step voltage for the time defined in the current not outputted step.



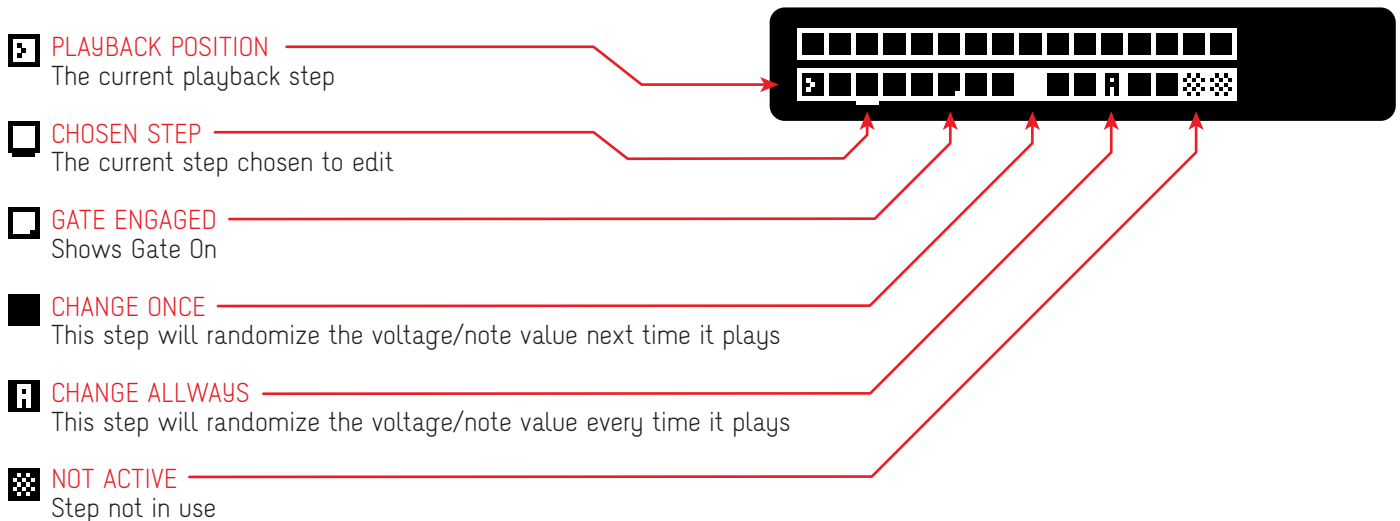
# 1. RANDOM VOLTAGE GENERATION

ADDAC511 User's Guide

## LOCK : Transport Controls

### STEPS GRAPHICS

Here's the different graphics used and their functions



### STEP SELECTION

With [ENCODER A] set the cursor on the grid then use [ENCODER B] to select the desired step.

### SPECIAL CHANGES

Pressing [ENCODER B] when the cursor is on the grid will create Special Changes on the selected step. At each press it iterates between: normal step, change once or change allways.

### EDITING STEPS

After selecting the step to edit then scroll to the parameter to edit with [ENCODER A], use [ENCODER B] to edit the GATE, STEP V, STEP T and STEP P values.

### CURSOR POSITION AND SHOWN VALUES

if the cursor is selecting the grid then the values displayed will show the settings for the current step being played.

If the cursor is on a step value ( GATE, STEP V, STEP T, STEP P) then it will show the selected step values, pressing [ENCODER B] advances to the next step.

### STEP T

Step Time is dependent on the [TIME] mode selected in the Time Screen.

If BPM mode is selected the steps' time are defined as fractions (1/1, 1/2, 1/4...).

If TIME mode is selected the steps' time are defined in milliseconds.

## LOCK : TRANSPOSITION

The user can transpose any programmed sequence simply by using the transpose features in the [QUANTIZER] screen.

# 1. RANDOM VOLTAGE GENERATION

## LOCK : Tracker Style View

For programming convenience a 3rd screen shows the steps in a tracker style view allowing faster editing and better overall visualization of the steps settings.

Encoder A scrolls through the Y rows, Encoder B scrolls through the X columns. Clicking Encoder B edits the selected value.

SEQUENCE		LOCK			CH1-A0000		
	G	V	N	C	T0	T0	P
>	1: X	1.333	E1	0	01/04	100%	
	2: X	1.500	F#1	0	01/04	100%	
	3: X	1.917	B1	0	01/04	100%	
	4: X	2.083	C#2	0	01/04	100%	
	5: X	2.167	D2	0	01/04	100%	
	6: X	2.500	F#1	0	01/04	100%	
	7: X	1.333	E1	0	01/04	100%	

### SCREEN 3

#### TRACKER EDITOR

Gate (ON / OFF)

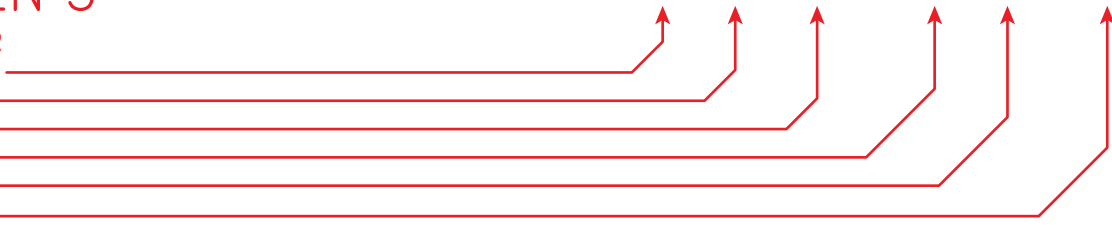
Voltage

Note

Cents Detune

Time Division

Probability



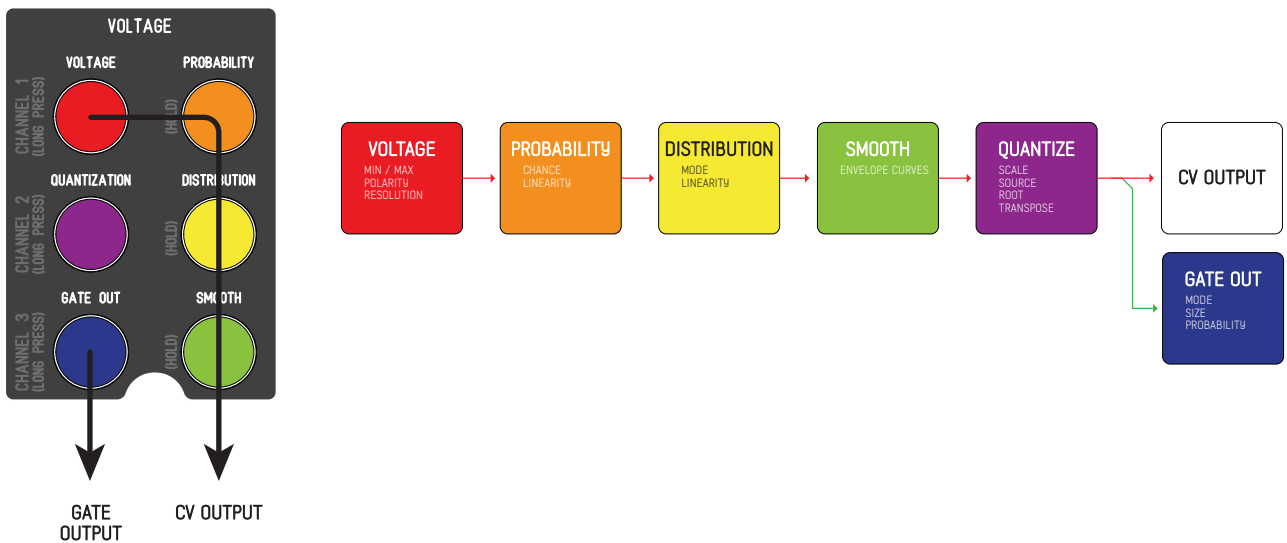
# 2. RANDOM ENVELOPE GENERATION

ADDAC511 User's Guide

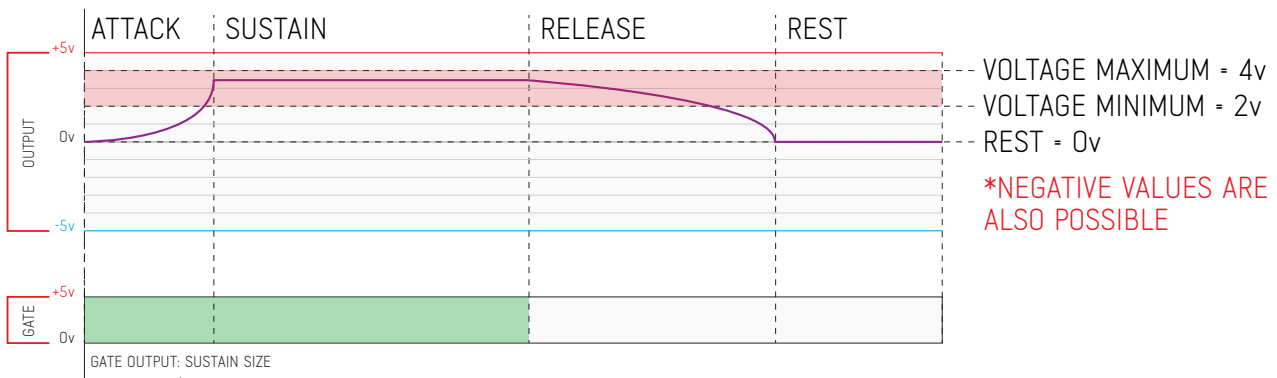
## VOLTAGE SETTINGS : SIGNAL FLOW

### ENVELOPE GENERATION

The envelope generation process is made of a number of functions in a chain. Each function features it's own fast recall push button and configuration screen. At every cycle a new Envelope will be generated by this chain.



Here's an example plot of an Envelope generated output



## 2. RANDOM ENVELOPE GENERATION

ADDAC511 User's Guide

### ENVELOPE VOLTAGE SETTINGS

#### VOLTAGE SCREEN:

Voltage range settings

##### MODE

The channels' operating Mode

##### VOLTAGE MAXIMUM

Sets the maximum voltage of the randomization range

##### VOLTAGE MINIMUM

Sets the minimum voltage of the randomization range

##### VOLTAGE REST

Sets the voltage for when the envelope is in rest state

##### CV POLARITY

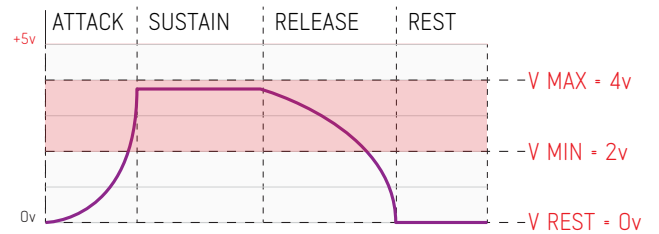
Sets a Positive (0 > +5V) or Bipolar range (-5V > +5V)

##### STEPS

Sets the number of steps to divide the MIN/MAX range defined from 2 to 320 or MAX (full 16bit resolution)

##### RANGE LOCK

OFF: [V. MAX] & [V. MIN] defines the range minimum and maximum boundaries independently  
ON: Locks the current range defined, editing [V. MAX] will also change [V. MIN] and vice-versa.



#### QUANTIZATION SCREEN (same as in voltage mode)

Voltage quantization settings same as in random mode

##### SCALE

Select from a few standard scales plus a custom setting where the user can freely choose the scale notes.

##### SOURCE

The source to be quantized, by default is set to the current channel although it can be set to any of the other channels or cv inputs working as a quantizer

##### ROOT NOTE

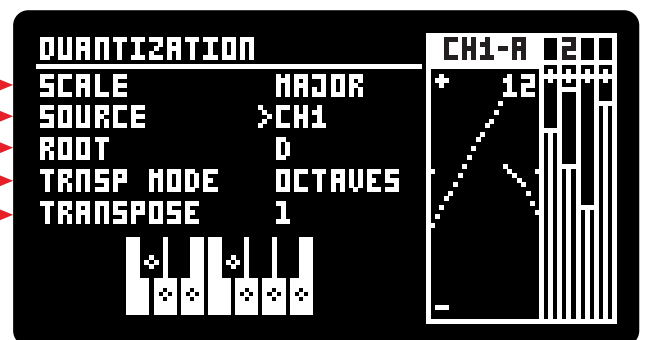
The scale Root note

##### TRANSPOSE MODE

SEMITONES: Transposition in semitones intervals  
SCALE DEGREE: The scale degree transposition, transposes within the scale notes, in case of standard 7 note scales it can be used for modes:1-Ionian, 2-Dorian and so on.  
OCTAVES: Transposition in octave intervals  
CENTS: Transposition in cents intervals

##### TRANSPOSE

The transposition value



## 2. RANDOM ENVELOPE GENERATION

ADDAC511 User's Guide

### ENVELOPE VOLTAGE SETTINGS

#### GATE OUT SCREEN

Settings control the Gate Out behaviour

##### SIZE

The Gate out length, it can be set to match the length of the envelope Attack (A), Attack and Sustain (AS) or Attack, Sustain and Release (ASR), as a 1ms or 10ms fixed output or as a percentage of the envelope overall length.

##### PROBABILITY

Output probability from 0% (no output) to 100% (always outputs). Also available is 1ms and 10ms for triggers.

##### SKIP STEPS

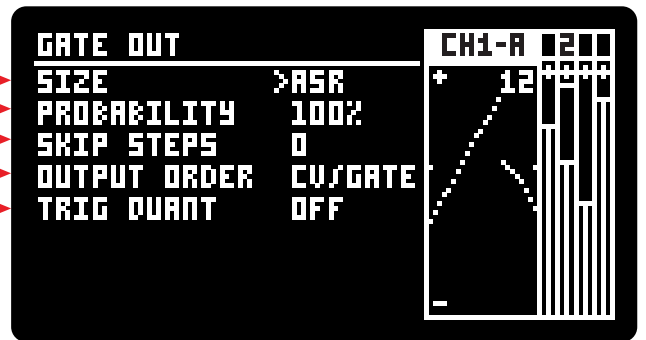
This feature introduces some disruption on the Gate Out behaviour, canceling it at every X steps.

##### OUTPUT ORDER

The order at which the CV and Gate is sent to the physical outputs. Although the time difference between the two outputs will still be microseconds apart this order may be important depending on what is being patched to.  
CV/GATE: CV before the Gate Output  
GATE/CV: Gate before the CV output

##### TRIGGER ON QUANTIZATION

When enabled it will output a 1ms Trigger at every new quantized note. It has no effect when Quantization is Off.



#### PROBABILITY SCREEN (same as in voltage mode)

Output probability settings, determines if it will generate a new CV at the current step or skip it and hold the current value until the next step.

##### PROBABILITY

Sets the probability of new generated voltages to be interrupted and not sent to the output  
0% - All new voltages will be canceled  
100% - No new voltages will be canceled

##### SKIP STEPS

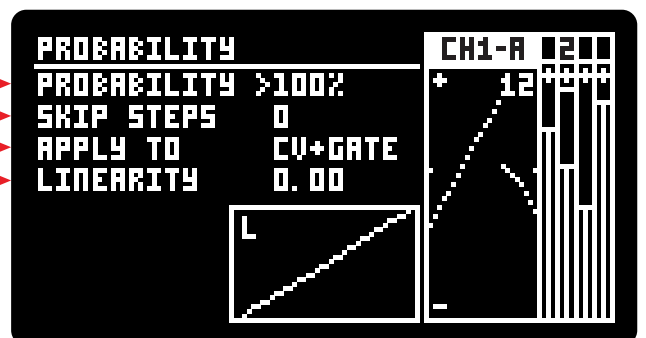
This feature introduces some disruption on the CV output behaviour, skipping the CV generation at every X steps.

##### APPLY TO

CV: only applies the probability to the CV output. Gate Out will still be generated.  
CV+GATE: applies the probability to both the CV and Gate output

##### LINEARITY

Sets the probability distribution curve



## 2. RANDOM ENVELOPE GENERATION

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### ENVELOPE VOLTAGE SETTINGS

#### VOLTAGE DISTRIBUTION SCREEN (same as in voltage mode)

Allows for non-linear distribution of the voltage randomized

##### MODE

FREE

WALK

##### POSITION

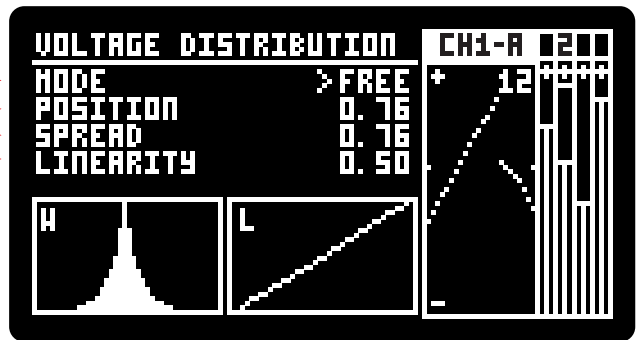
Positions the distribution peak.

##### Q FACTOR

Sets the Q factor for the distribution curve.

##### LINEARITY

Sets the overall distribution curve.



#### SMOOTH SCREEN

Settings control the Envelope shape

##### ATTACK CURVE

Sets the Attack curve from Log (1.00) to Exp (-1.00)

Linear at 0.00

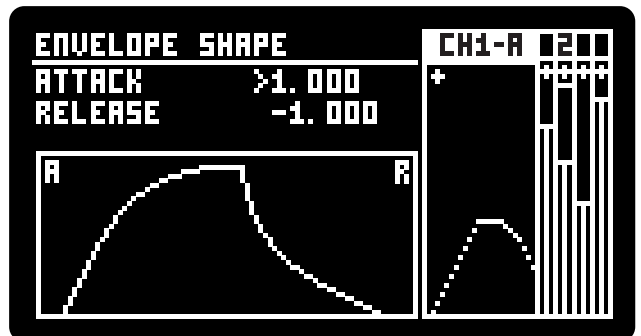
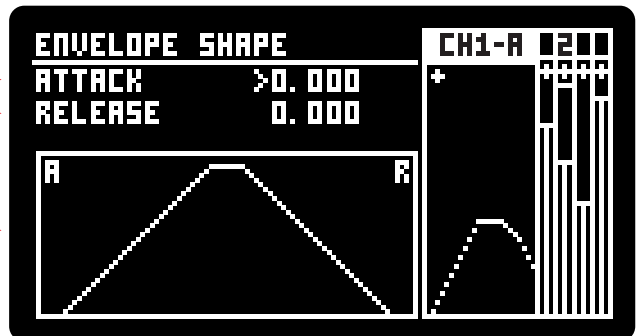
##### RELEASE CURVE

Sets the Release curve from Log (1.00) to Exp (-1.00)

Linear at 0.00

##### ENVELOPE SHAPE VISUALIZATION

Here you can see the Envelope shape



# 2. RANDOM ENVELOPE GENERATION

ADDAC511 User's Guide

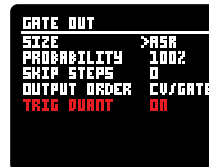
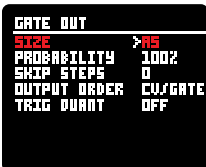
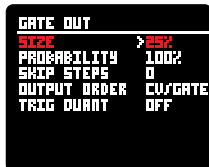
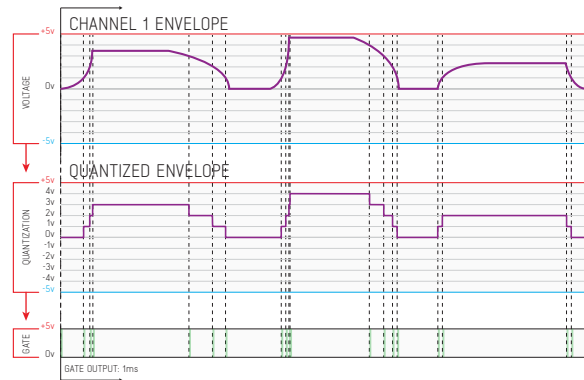
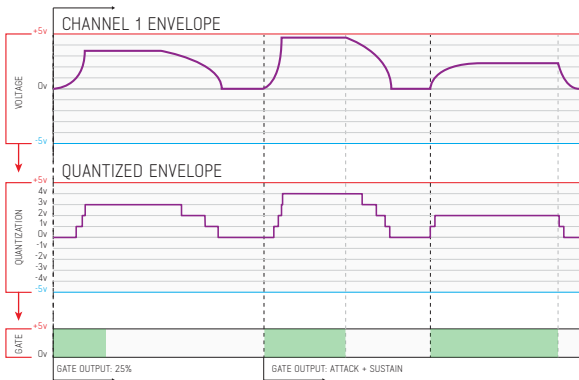
## QUANTIZING ENVELOPES

It is possible to quantize the envelope generated allowing arpeggio like effects.  
 Below you can see some graphical examples, here the quantizer is set to octaves for better readability  
 Quantized to: nearest note above.



### TRIGGER ON QUANTIZATION

Ignores the [SIZE] setting and outputs  
 1ms Triggers at every new quantized note.



### GATE SIZE

3 options:  
 Sync to Envelope: A, AS, ASR  
 Fixed size: 1ms or 10ms  
 As a percentage: 0% to 90%

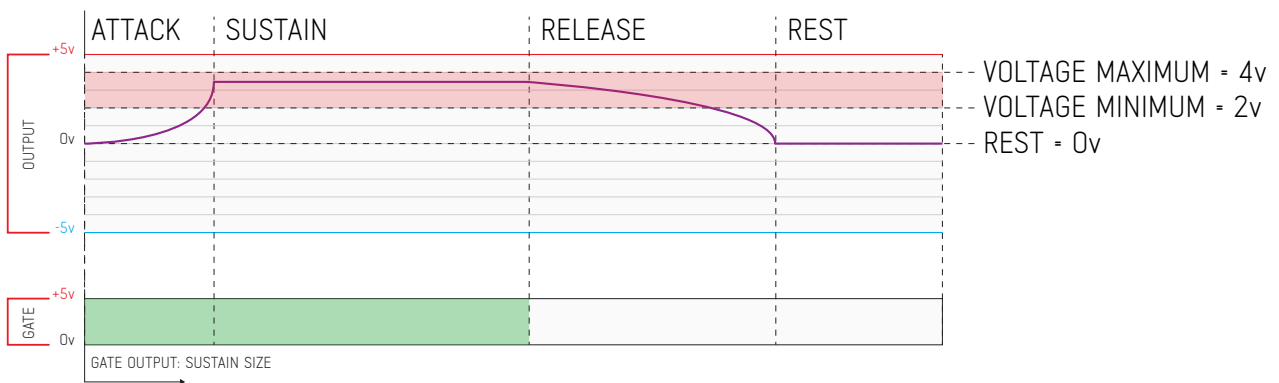
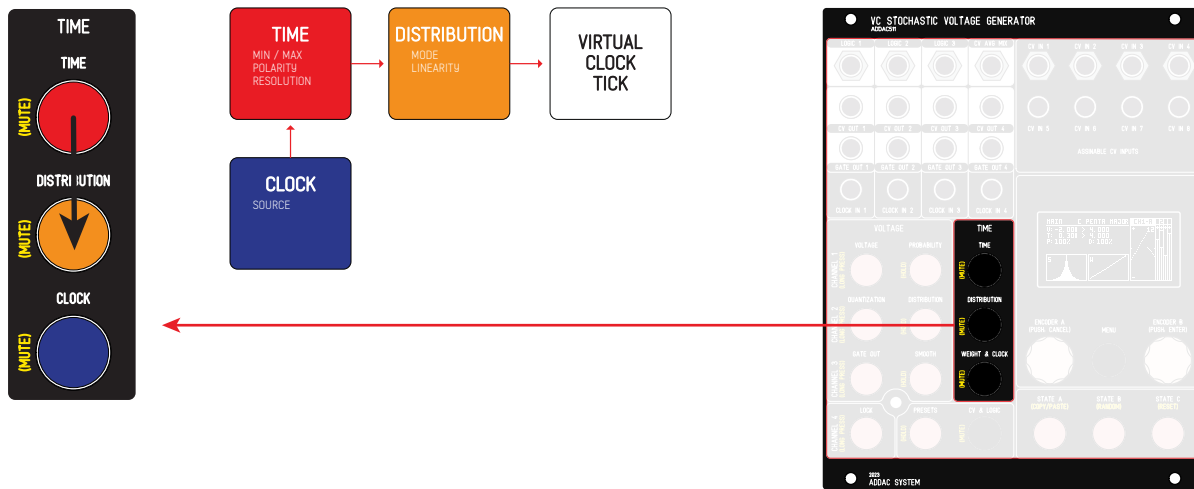
# 2. RANDOM ENVELOPE GENERATION

ADDAC511 User's Guide

## TIME SETTINGS : SIGNAL FLOW

### TIMING GENERATION

Time settings determines the rate at which the voltage and gate are generated, the interval between every generation step is defined by the setting in the [TIME] screen, That value is then "balanced" by the [DISTRIBUTION] screen settings and a virtual clock tick is generated.



## 2. RANDOM ENVELOPE GENERATION

ADDAC511 User's Guide

### TIME SETTINGS : TIME MODE (milliseconds)

In Time Mode the clock is defined in milliseconds, the step lengths will be randomized from the interval defined by the Minimum & Maximum parameters.  
Setting the Minimum value higher than Maximum will result in a fixed time without any randomization.

#### TIME SCREEN:

##### TIME MODE

Sets the Time Mode to: Time or BPM

##### ATTACK MINIMUM & MAXIMUM

Sets the Attack Min & Max time in milliseconds.

##### SUSTAIN MINIMUM & MAXIMUM

Sets the Sustain Min & Max time in milliseconds.

##### RELEASE MINIMUM & MAXIMUM

Sets the Release Min & Max time in milliseconds.

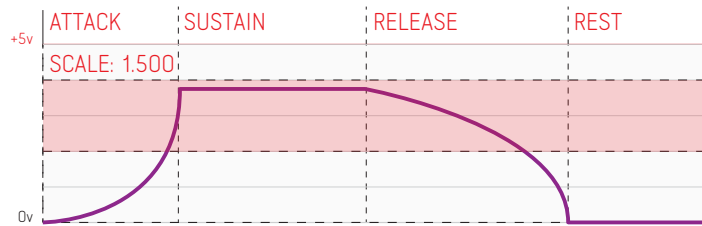
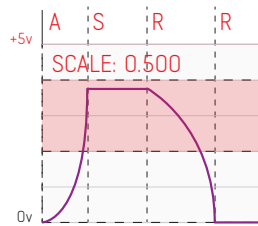
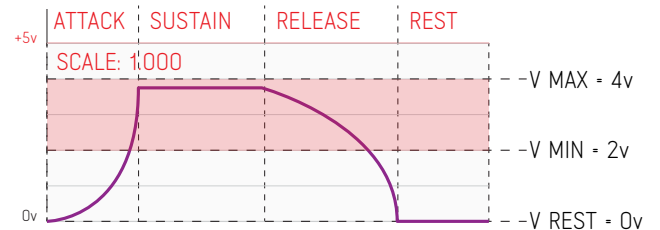
##### REST MINIMUM & MAXIMUM

Sets the Release Min & Max time in milliseconds.

##### SCALE MINIMUM & MAXIMUM

Sets the Scale Min & Max multiplication factor.  
This setting allows to stretch/compress the length of the envelope keeping the proportion of all time settings.  
Here's an example of the same envelope shape with different scale settings.

TIME		CH1-A 1200	
MODE	>TIME		
PARAM	MIN	MAX	
ATTACK	0.500	2.000	s
SUSTAIN	0.500	2.000	s
RELEASE	0.500	2.000	s
REST	0.500	2.000	s
SCALE	1.000	1.000	x



#### TIME DISTRIBUTION SCREEN

Allows for non-linear distribution of the randomized [TIME] screen settings.  
Equally affects all random generations: Attack, Sustain, Release, Rest and Scale.

##### MODE

FREE  
WALK

##### POSITION

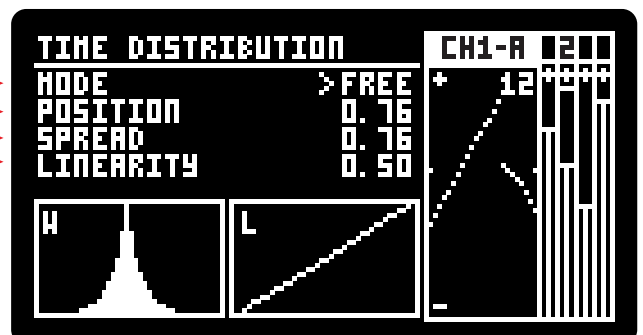
Positions the distribution peak.

##### SPREAD

Sets the Q factor for the distribution curve.

##### LINEARITY

Sets the overall distribution curve.



## 2. RANDOM ENVELOPE GENERATION

ADDAC511 User's Guide

### CLOCK

#### CLOCK SCREEN (same as in voltage mode)

Configuring the selected channel's clock origin.

##### CLOCK SOURCE

Sets the origin of the Clock, options are:

**INTERNAL (default):** uses its own channel clock.

**CHANNEL X:** chooses one of the other channels clocks.

**CLOCK IN X:** chooses one of the 4 clock physical jack inputs

**LOGIC X:** chooses one of the 3 Logic outputs

##### INTERNAL

keeps the channel independent from other channels.

All other options makes the channel dependent to the source chosen. In these cases the clock parameters available will change according to the clock source selected.

##### CHANNEL 1 to 4

Syncs to any other channel: slave mode.

##### CLOCK IN 1 to 4

Uses the frontpanel clock inputs to sync to external sources.

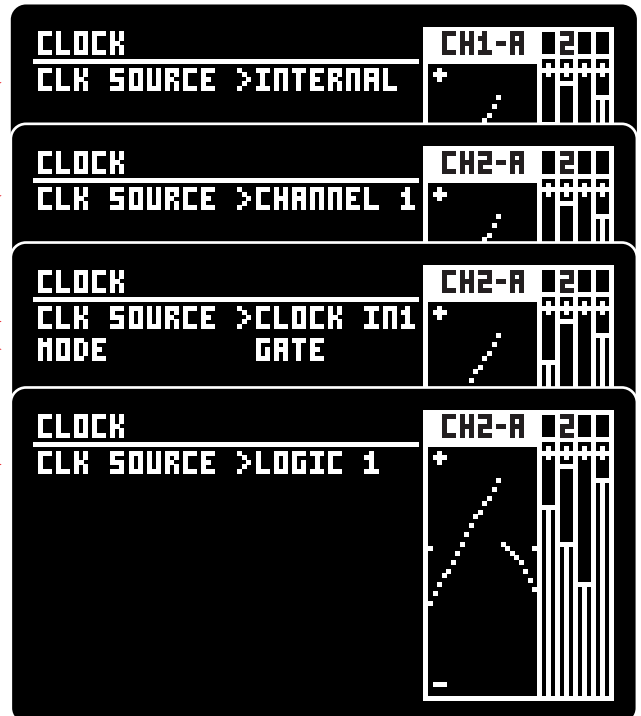
##### CLOCK IN MODES:

**GATE:** In Gate mode it will sustain the envelope until the Gate goes off.

**TRIGGER:** In Trigger mode will not consider the trigger/gate length.

##### LOGIC 1 to 3

Uses the internal logic outputs as a clock.



# QUANTIZER

ADDAC511 User's Guide

## QUANTIZER POTENTIAL

The Quantizing engine is extremely powerful and can be used in many creative ways. It features 16 bit DACs making it also very accurate.

Possibilities include linking all channels for chord generation or, using 4 CV inputs and 4 clock inputs, becomes a fully independent 4 channel quantizer, each with its own scale, outputting 4 CVs and 4 gate signals working as a fully featured 4 channel quantizer.

in the next pages we'll describe in detail all its possibilities.

### SCALES:

As default we offer a few standard scales, we also added a custom setting where the user can freely choose the scale notes.

#### SOURCE

The source to be quantized, by default is set to the current channel although it can be set to any of the other channels or cv inputs working as a quantizer.

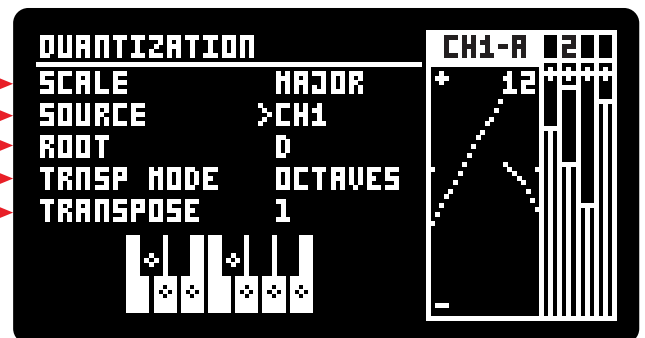
**ROOT NOTE** The scale Root note

#### TRANSPOSE MODE

SEMITONES: Transposition in semitones intervals  
SCALE DEGREE: The scale degree transposition, transposes within the scale notes, in case of standard 7 note scales it can be used for modes:1-Ionian, 2-Dorian and so on.  
OCTAVES: Transposition in octave intervals  
CENTS: Transposition in cents intervals

#### TRANSPOSE

The transposition value



## QUANTIZER ROUNDING

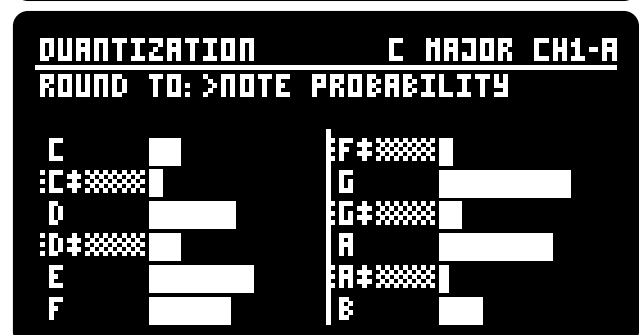
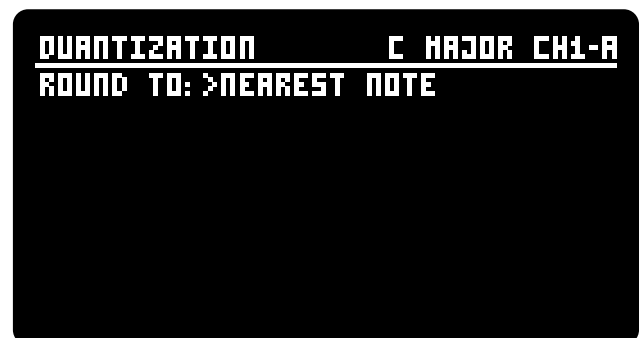
In the [MENU] the user can find a quantization rounding setting that will determine how the incoming voltage will be quantized:

**NEAREST NOTE:** Quantizes to the nearest note no matter if above or below.

**NOTE ABOVE:** Quantizes to the closest note above

**NOTE BELLOW:** Quantizes to the closest note bellow

**NOTE PROBABILITY:** Quantizes to a set of pre-defined probabilities



# QUANTIZER

ADDAC511 User's Guide

## INTERNAL vs. EXTERNAL QUANTIZATION

### QUANTIZER SOURCES:

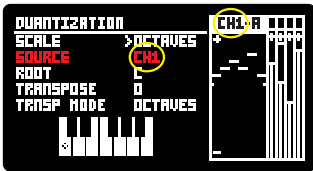
The Quantizing function is normally used following the channel's mode chain but it can be routed to accept any other channel or an external CV as its input allowing 4 quantization channels that can be linked in order to create chords or totally independent with different scales for each channels.

Changing the quantizer [SOURCE] to any other option than the channel's own input will render the channel's [VOLTAGE], [PROBABILITY] and [DISTRIBUTION] to be bypassed and will have no influence on the channel's output.

Bellow you can find examples and a diagram with both internal and external quantization.

### SELF QUANTIZATION

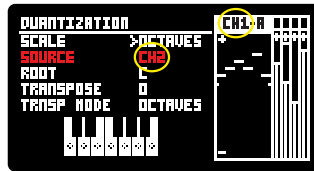
QUANTIZING CHANNEL'S VOLTAGE GENERATION



CHANNEL 1 QUANTIZING CHANNEL 1 VOLTAGE

### OTHER CHANNELS QUANT.

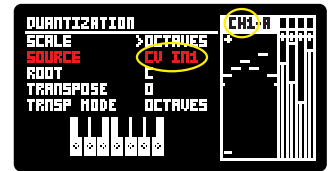
QUANTIZING OTHER CHANNEL'S VOLTAGE



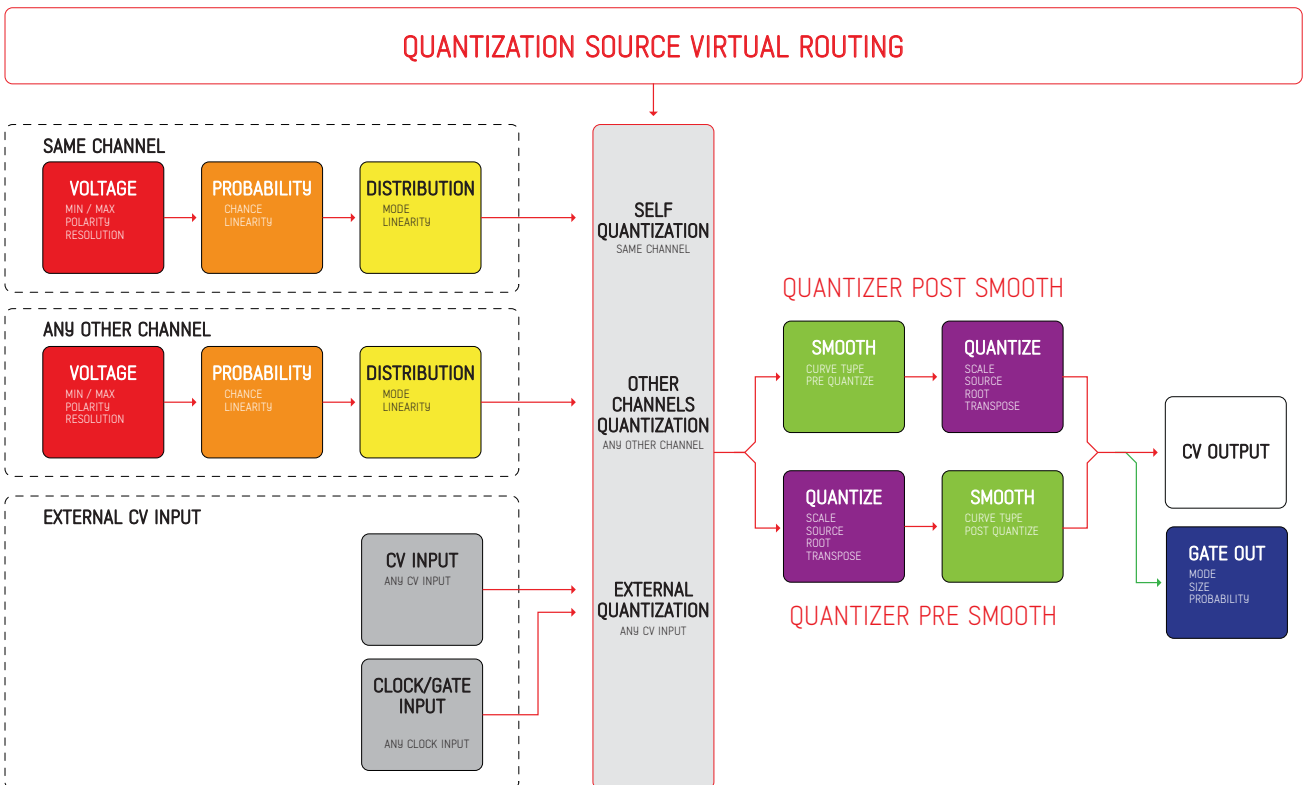
CHANNEL 1 QUANTIZING CHANNEL 2 VOLTAGE  
CHANNEL 1 VOLTAGE GENERATION IS BYPASSED

### EXTERNAL QUANTIZATION

QUANTIZING CV INPUTS



CHANNEL 1 QUANTIZING CV INPUT 1 VOLTAGE  
CHANNEL 1 VOLTAGE GENERATION IS BYPASSED



# QUANTIZER


ADDAC511 User's Guide

## QUANTIZER SOURCES GRAPHICAL EXAMPLES

Bellow you can find graphical examples with both internal and external quantization. Quantizer set to octaves for better readability. Quantized to closest note above.

```

QUANTIZATION
SCALE >OCTAVES
SOURCE CH1
ROOT C
TRANSPOSE 0
TRNSP MODE OCTAVES
    
```




### SELF QUANTIZATION

QUANTIZING CH1 VOLTAGE GENERATION

Quantizer set to octaves for better readability. Quantized to closest note above.

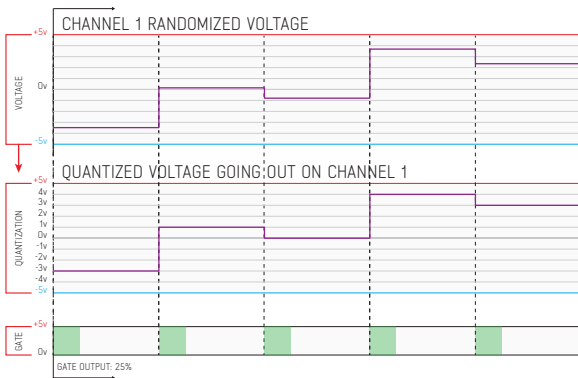
```

QUANTIZATION
SCALE >OCTAVES
SOURCE CH2
ROOT C
TRANSPOSE 0
TRNSP MODE OCTAVES
    
```



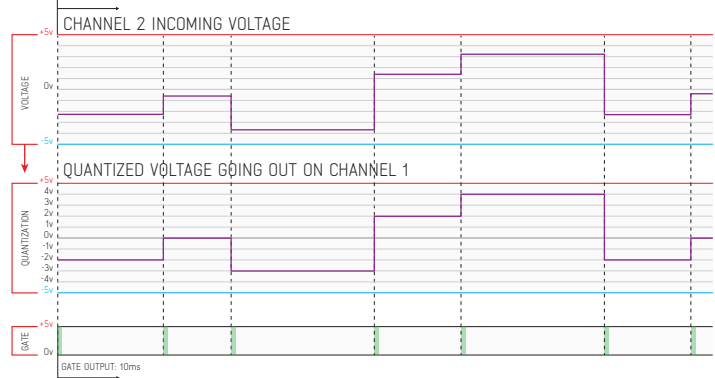
### OTHER CHANNELS QUANTIZATION

QUANTIZING OTHER CHANNELS VOLTAGE



```

GATE OUT
SIZE 25%
PROBABILITY 100%
SKIP STEPS 0
OUTPUT ORDER CV/GATE
    
```




```

GATE OUT
SIZE 10ms
PROBABILITY 100%
SKIP STEPS 0
OUTPUT ORDER CV/GATE
    
```

```

QUANTIZATION
SCALE >OCTAVES
SOURCE CV IN1
ROOT C
TRANSPOSE 0
TRNSP MODE OCTAVES
    
```

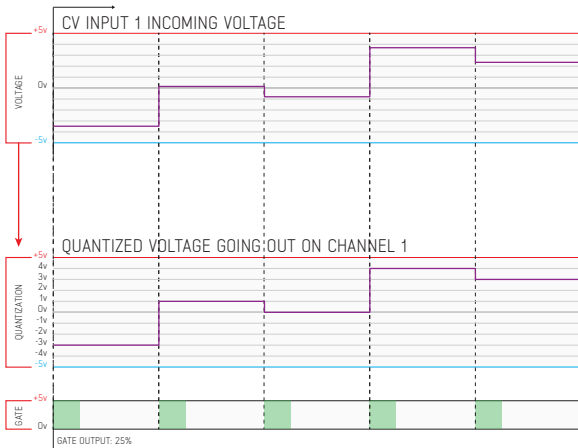


### EXTERNAL QUANTIZATION

QUANTIZING CV INPUT 1

```

CLOCK
CLR SOURCE >INTERNAL
CLK DELAY OFF
    
```



```

GATE OUT
SIZE 25%
PROBABILITY 100%
SKIP STEPS 0
OUTPUT ORDER CV/GATE
    
```

```

QUANTIZATION
SCALE >OCTAVES
SOURCE CV IN1
ROOT C
TRANSPOSE 0
TRNSP MODE OCTAVES
    
```

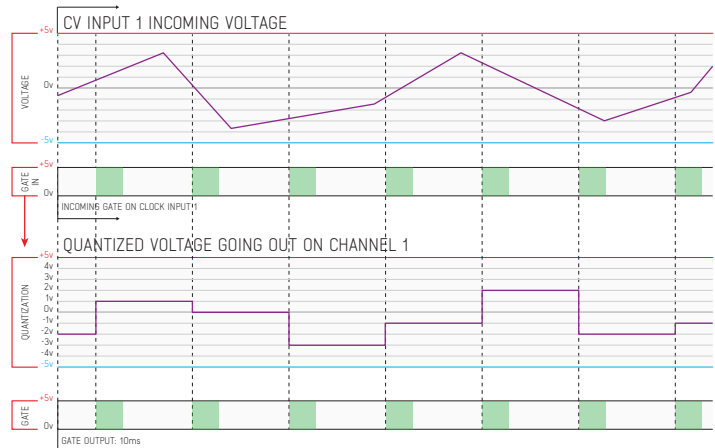


### EXTERNAL QUANTIZATION WITH GATE INPUT

QUANTIZING CV INPUT 1 USING CLOCK IN 1

```

CLOCK
CLR SOURCE >CLOCK IN1
CLK DELAY OFF
    
```



```

GATE OUT
SIZE 10ms
PROBABILITY 100%
SKIP STEPS 0
OUTPUT ORDER CV/GATE
    
```

# QUANTIZER

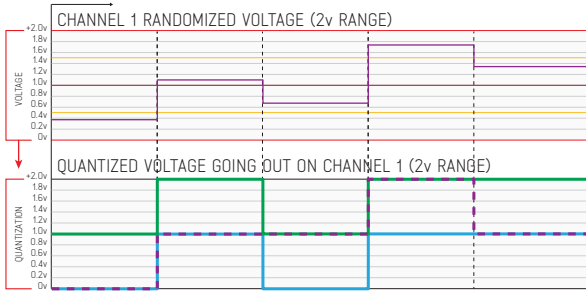
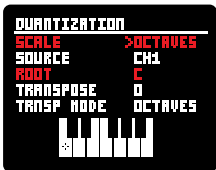
ADDAC511 User's Guide

## QUANTIZER ROUNDING & NOTE PROBABILITY

Bellow you can find graphical examples with all 3 quantizer rounding standards as well as the note probability method

### STANDARD QUANTIZER ROUNDING

Quantizer set to octaves of C and voltage range restricted to 2V



The incoming voltage in this case will be quantized to C Octaves, meaning the output will be a multiple of 1v (0v, 1v, 2v, 3v, 4v)

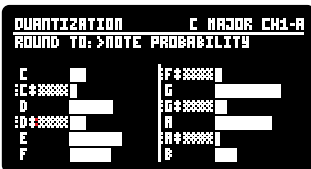
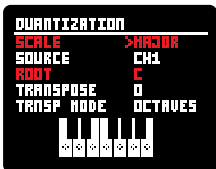
If a voltage of 1.2v is detected then:  
 Closest note above will be: 2v  
 Nearest note will be: 1v  
 Closest note below will be: 1v

If a voltage of 1.7v is detected then:  
 Closest note above will be: 2v  
 Nearest note will be: 2v  
 Closest note below will be: 1v

ABOVE ————  
 NEAREST NOTE - - - -  
 BELOW ————

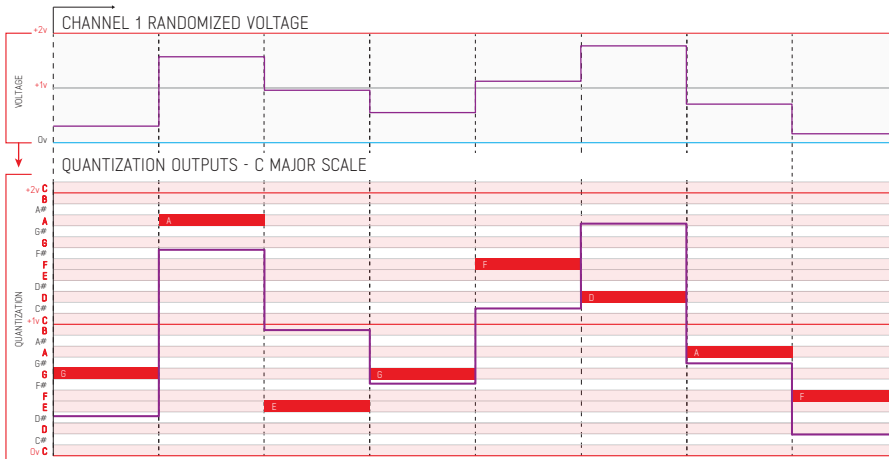
### ROUNDING TO NOTE PROBABILITY

Quantizer set to Major C and voltage range restricted to 2V



Note Probability rounding will force quantization to a set of note defined probabilities. The incoming voltage only defines the octave output, the probability outcome will set the note. The note in this case can be furthest from the incoming voltage. Notes not present in the selected scale appear checked.

If a voltage of 1.2v is detected then:  
 The output will be any note in the Major C scale in the octave between 1v and 2v.

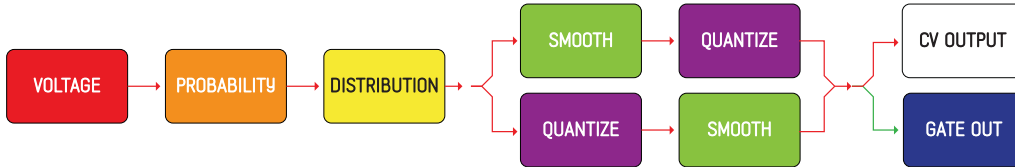


# QUANTIZER

ADDAC511 User's Guide

## QUANTIZER PRE / POST SMOOTH

The [SMOOTH] and [QUANTIZE] order (A to B, B to A) can be altered in the [SMOOTH] window.  
 QUANTIZER PRE SMOOTH will result in glide effects  
 QUANTIZER POST SMOOTH will result in arpeggio effects



Below you can see some graphical examples with both options  
 Quantizer set to octaves for better readability  
 On the bottom right you'll find an example of the [TRIGGER GATE] function.

### QUANTIZER PRE SMOOTH

```

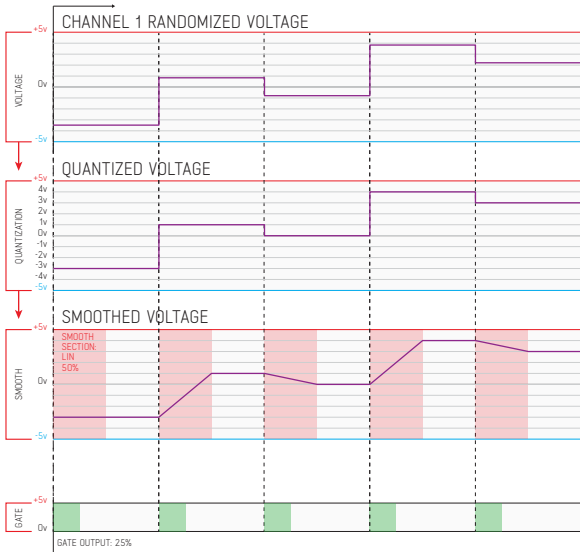
SMOOTH
CURVE TYPE >LIN
DURATION 50%
QUANTIZE PRE
RESOLUTION 16 BIT
TRIGGER GATE NO
STEP MODE OFF
    
```

Smooth duration set to 50%

```

QUANTIZATION
SCALE >OCTAVES
SOURCE CH1
ROOT C
TRANSPOSE 0
TRASP MODE OCTAVES
    
```

**QUANTIZE SOURCE**  
 Quantizer set to octaves (for better graphical readability below).  
 Quantized to: nearest note.



```

GATE OUT
SIZE 25%
PROBABILITY 100%
SKIP STEPS 0
OUTPUT ORDER CV/GATE
    
```

Gate size set to 25%

### QUANTIZER POST SMOOTH

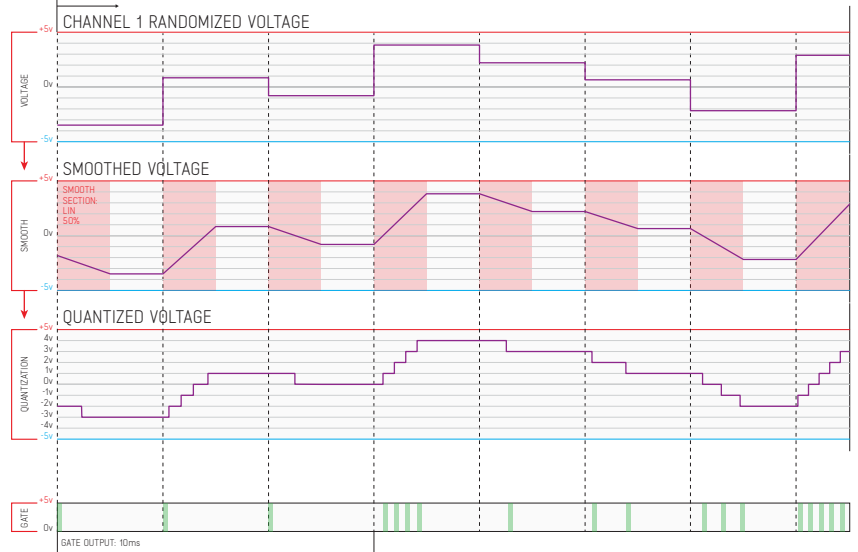
```

SMOOTH
CURVE TYPE >LIN
DURATION 50%
QUANTIZE POST
RESOLUTION 16 BIT
TRIGGER GATE NO
STEP MODE OFF
    
```

```

QUANTIZATION
SCALE >OCTAVES
SOURCE CH1
ROOT C
TRANSPOSE 0
TRASP MODE OCTAVES
    
```

**QUANTIZE SOURCE**  
 Quantizer set to Major scale.  
 Quantized to: nearest note.



```

GATE OUT
SIZE 10%
PROBABILITY 100%
SKIP STEPS 0
OUTPUT ORDER CV/GATE
    
```

```

SMOOTH
CURVE TYPE >LIN
DURATION 50%
QUANTIZE POST
RESOLUTION 16 BIT
TRIGGER GATE YES
STEP MODE OFF
    
```

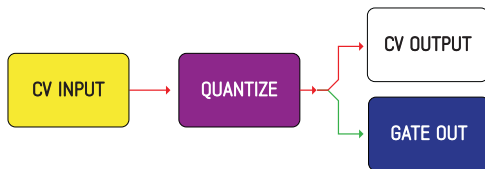
**TRIGGER GATE**  
 Gate Out triggered at every quantized CV change.

# QUANTIZER

ADDAC511 User's Guide

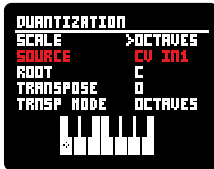
## EXTERNAL QUANTIZER

When quantizing external CV inputs the smooth effect will be bypassed.



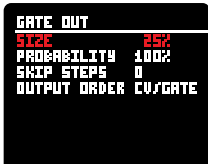
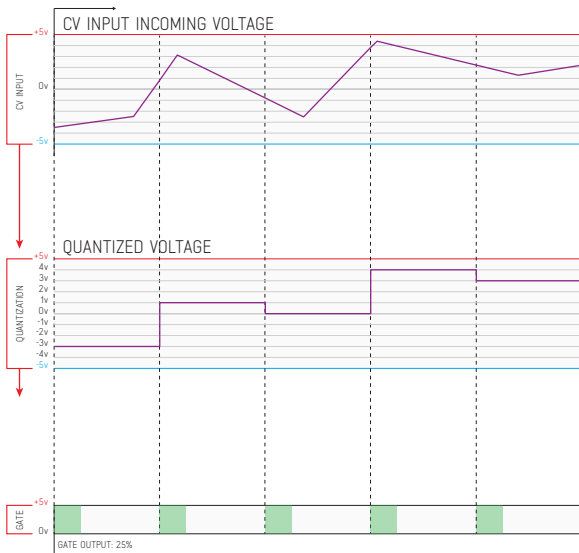
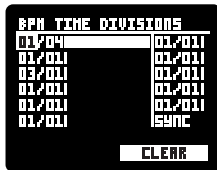
Below a graphical example

### QUANTIZING WITH INTERNAL CLOCK

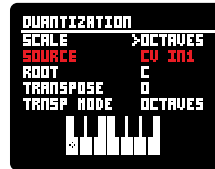


#### INT. CLOCK

Using the internal Clock to quantize the cv input at the rate defined.



### QUANTIZING WITH EXTERNAL CLOCK



#### EXT. CLOCK

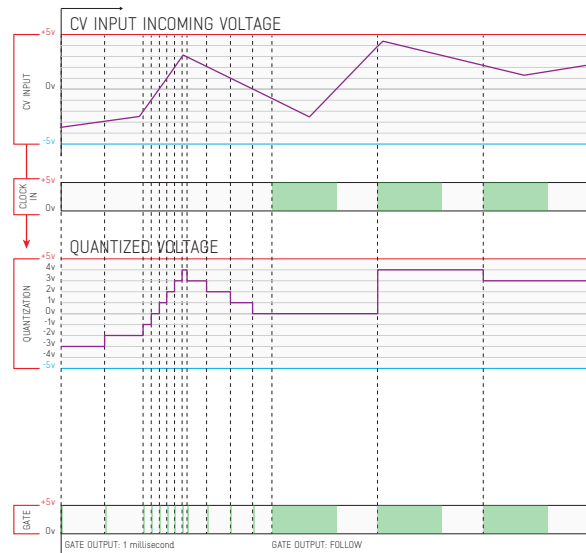
When set to Clock In there are two quantization modes: Real-time and Locked

#### REAL-TIME

Once the user chooses a clock input the quantization will start working in real-time. no clock is used, the quantization happens as a new value is detected.

#### EXTERNAL CLOCK

Once the clock input receives a Gate input the quantization will sync to and be clocked by the Gate input. To go back to real-time choose internal clock and then Clock In once again.



#### FOLLOW

When the Gate Out size is set to Follow the Gate Out will have the same size as the Clock Input.

## QUANTIZER TRANSCOPE

There are 4 Transposition modes:

### CENTS

Microtonal detune, -50 to +50 cents.  
The Cents mode is cumulative with any of the next 3 modes

### SEMITONES

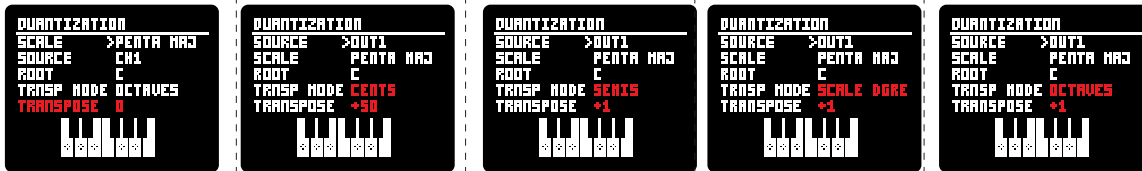
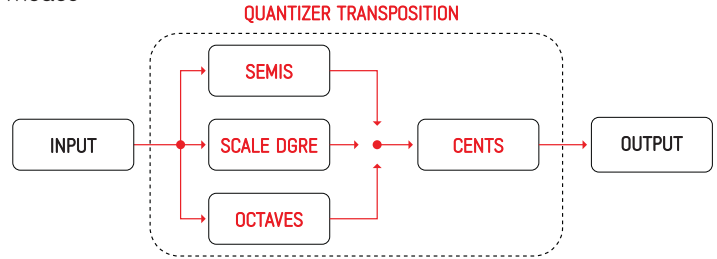
Semitone transposition

### SCALE DEGREES

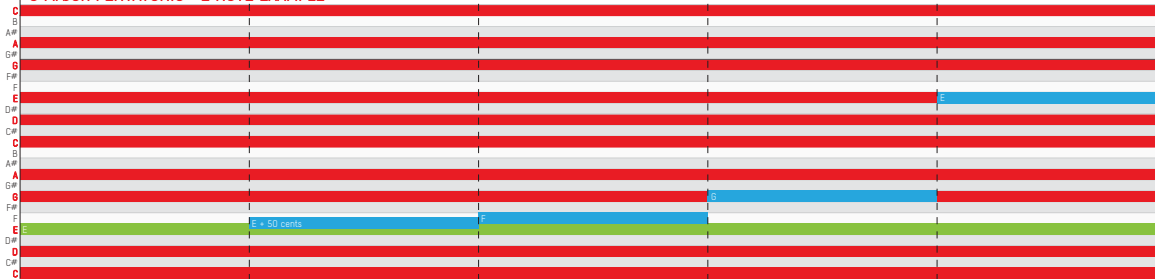
Transposition within the scale selected

### OCTAVES

Octave transposition



C MAJOR PENTATONIC - E NOTE EXAMPLE



E Note  
No Transposition

E Note  
+50 Cents

E Note  
+1 Semi

E Note - G  
2nd Degree

E Note  
+1 Octave

C MAJOR PENTATONIC - SMALL PATTERN EXAMPLE



No Transposition

+50 Cents

+1 Semi

2nd Degree

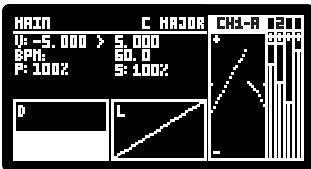
+1 Octave

## QUANTIZER : CHORD GENERATION EXAMPLE

### CHANNEL 1

GENERATING CHORD ROOT NOTE

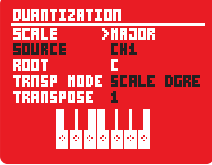
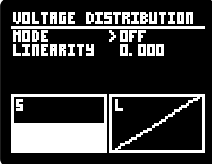
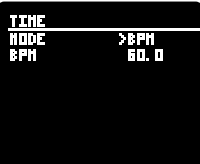
MAIN SCREEN



VOLTAGE SETTINGS



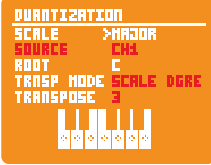
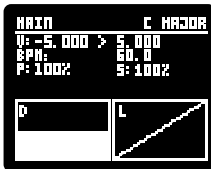
TIME SETTINGS



### CHANNEL 2

3rd SCALE DEGREE

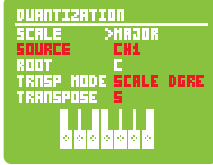
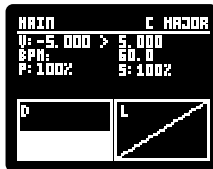
MAIN SCREEN



### CHANNEL 3

5th SCALE DEGREE

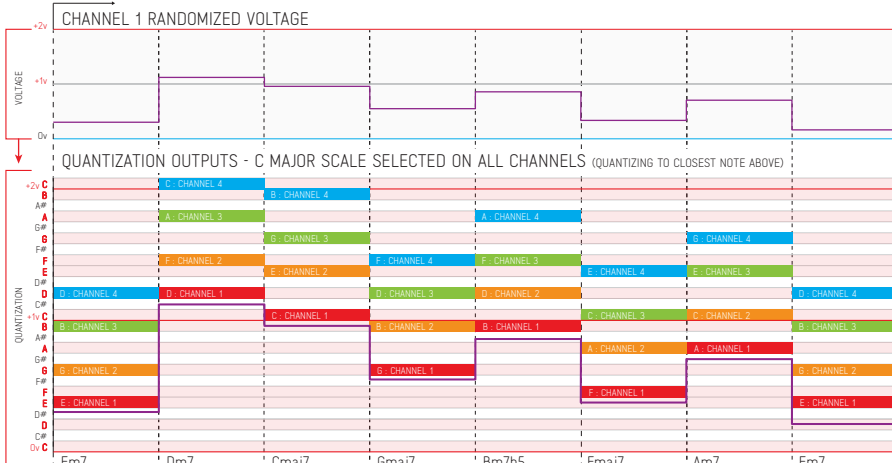
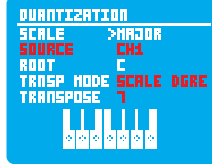
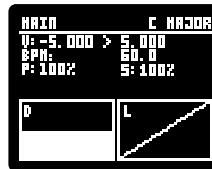
MAIN SCREEN



### CHANNEL 4

7th SCALE DEGREE

MAIN SCREEN

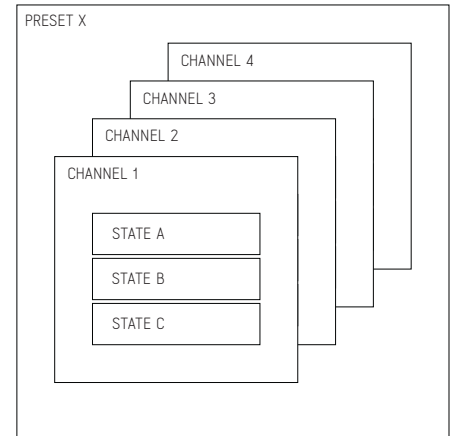


### 4 NOTE CHORDS

C Major scale is chosen for all channels. Channel 1 is used to generate the chord root note. Channels 2, 3 and 4 get their Clock and Quantization source from Channel 1. Channels 2, 3 and 4 transpose the incoming Channel 1 root note to its 3rd, 5th and 7th degree, generating chords always in the scale. The transpose values can be independently assigned to different CV inputs to be modulated.

# PRESETS

Every Preset stores all info of all channels. There are 16 slots available, these can be downloaded as a one single file Bank to a computer allowing users to manage their Banks in the computer.



The Presets screen allows to scroll through the list with any of the Encoders and Load or Save by pressing the respective Left / Right Encoder.

There are 75 available slots to save Presets.

### SAVING

When saving the user can select the preset name using the Encoders: Left Encoder selects which character to edit, Right Encoder selects the character.



## PRESETS BACKUP & RESTORE

Presets can be downloaded to a computer for backup and can be later uploaded into the module.

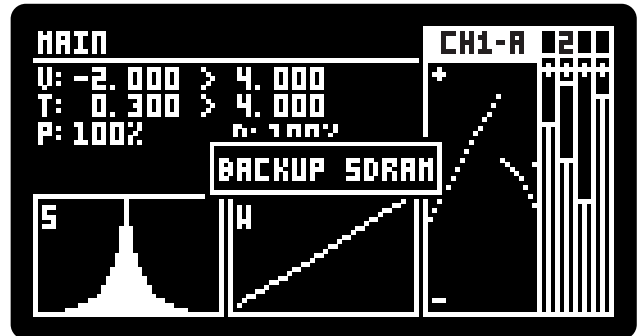
All presets are saved into one single file, you can think of each file as a Bank of Presets.

This can be done through the Module Utility Webpage using an updated Google Chrome browser, follow the instructions on the page:

<https://media.addacsystem.com/ADDAC511>

Here you can connect to the module while it's running and backup or restore presets files.

While backup is in progress the module will show a message on the screen.



# CV ASSIGNMENTS

There are 8 CV Inputs on the top right corner of the module which can be assigned to any parameter of any output channel.  
To assign them just enter the Assign Screen and press the Right Encoder to ADD a new assign.

Here's the description of all configuration settings:

- INPUT CHANNEL** — The CV Input channel to be used
- CHANNEL TO ASSIGN** — The channel to be affected by the CV input
- FUNCTION** — The function to be affected by the CV input
- INPUT GAIN** — The Gain of the CV Input, from 0 to times 10
- OFFSET** — The Offset applied to the CV Input, from -1.0 to 1.0
- PHASE INVERSION** — Invert the Phase of the incoming signal

In this screen rotating the Left encoder chooses the parameter to edit, rotating the Right Encoder edits the parameter value.

Once configured pressing the Enter button (right encoder) saves the settings, exits to the main screen and displays the assign as a new line.

The same input can be assigned to multiple functions becoming more like a macro controller.

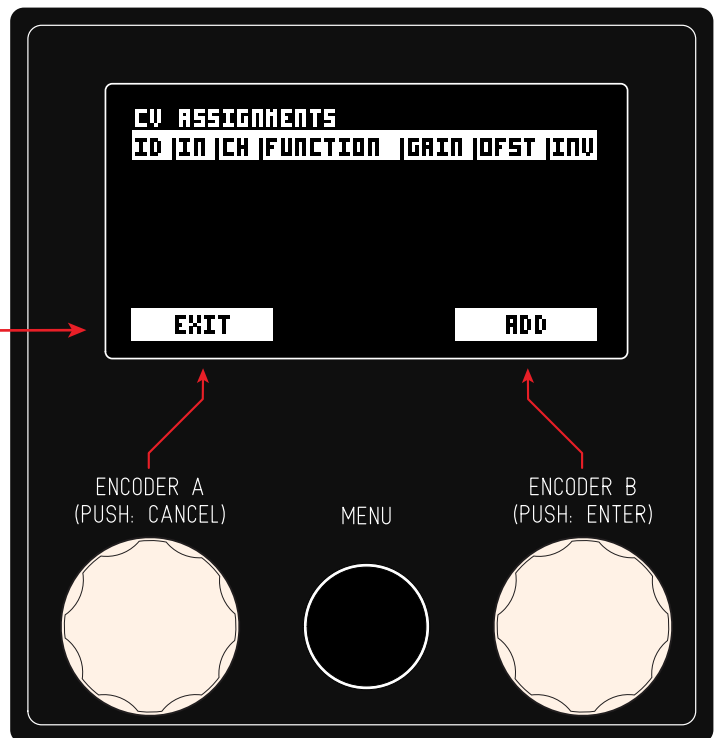
Fifty assignments can be added.



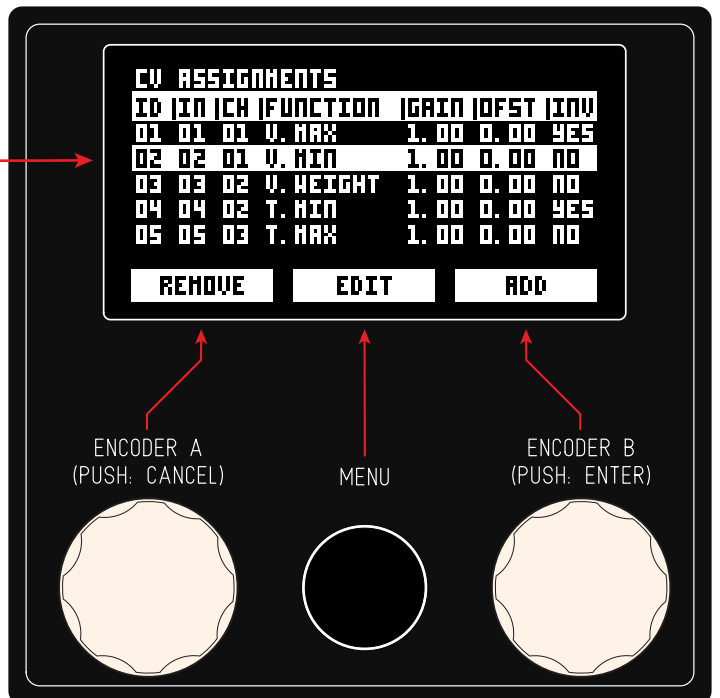
# CV ASSIGNMENTS

## ENCODERS INTERACTION

The virtual buttons on the screen show the current function for what the encoders will do when pressed.



Rotating any of the Encoders will select and scroll through already assigned lines. Selected line appears with white background



# CV ASSIGNMENTS - FUNCTIONS

CV assignments allow to access most functions on the 511, due to space available these names were shortened, here's a list of the functions and how they appear on the display:

VMIN VOLTAGE MINIMUM (NORMAL & ENVELOPE)  
 VMAX VOLTAGE MAXIMUM (NORMAL & ENVELOPE)  
 VSTEPS VOLTAGE STEPS

QSCALE QUANTIZER SCALE  
 QSRC QUANTIZER SOURCE  
 QROOT QUANTIZER ROOT NOTE  
 QMODE QUANTIZER TRANSPOSE MODE  
 QSTEPS QUANTIZER TRANSPOSE STEPS

GATE SIZE GATE LENGTH  
 GATE PROB GATE PROBABILITY  
 TRG QUANT TRIGGER OUT AT NEW QUANTIZATION

PROB PROBABILITY  
 PROBSTPS PROBABILITY SKIP STEPS  
 PROBAPP PROBABILITY APPLY TO (CV/CV+GATE)  
 PROBLIN PROBABILITY LINEARITY

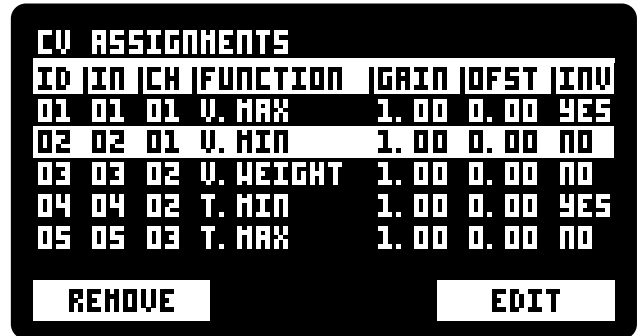
DISTMODE DISTRIBUTION MODE  
 DISTPOS DISTRIBUTION POSITION  
 DISTSPREAD DISTRIBUTION SPREAD (Q)  
 DISTLIN DISTRIBUTION LINEARITY

SMCURVE SMOOTH CURVE TYPE  
 SMDUR SMOOTH DURATION  
 SMQUAPP SMOOTH QUANTIZER ORDER PRE/POST  
 SMRES SMOOTH RESOLUTION  
 SMSTMOD SMOOTH STEP MODE  
 SMSTEPS SMOOTH SKIP STEPS

TMODE TIME MODE (TIME/BPM)  
 TMIN TIME MINIMUM  
 TMAX TIME MAXIMUM  
 TBPM TIME BPM

TDMODE TIME DISTRIBUTION MODE  
 TDPOS TIME DISTRIBUTION POSITION  
 TDSPREAD TIME DISTRIBUTION SPREAD (Q)  
 TDLIN TIME DISTRIBUTION LINEARITY

"CLKSRC" CLOCK SOURCE  
 CLKMULTDIV CLOCK MULTIPLIER/DIVIDER  
 CLKFOLL CLOCK FOLLOW CH (BPM/OUT)  
 CLKUSET CLOCK USE TIME (DELAY)  
 SYNCBPM CLOCK SYNC BPM



E REST V ENV. REST VOLTAGE  
 E AMIN ENV. TIME ATTACK MIN  
 E AMAX ENV. TIME ATTACK MAX  
 E SMIN ENV. TIME SUSTAIN MIN  
 E SMAX ENV. TIME SUSTAIN MAX  
 E RMIN ENV. TIME RELEASE MIN  
 E RMAX ENV. TIME RELEASE MAX  
 E RTMIN ENV. TIME REST MIN  
 E RTMAX ENV. TIME REST MAX  
 E SCAL MIN ENV. SCALE MIN  
 E SCAL MAX ENV. SCALE MAX  
 E ASHAPE ENV. ATTACK SHAPE  
 E RSHAPE ENV. RELEASE SHAPE  
 E SIZE ENV. SIZE

HOLD HOLD STATE  
 MUTE MUTE STATE  
 STATE STATE CV  
 STATE A STATE A  
 STATE B STATE B  
 STATE C STATE C

L PLAY LOCK: PLAY  
 L PLAYALL LOCK: PLAY ALL  
 L STOP LOCK: STOP  
 L STOPALL LOCK: STOP ALL  
 L RESET LOCK: RESET  
 L RSTALL LOCK: RESET ALL  
 STEP SELECT LOCK: SELECT STEP  
 STEP VOLT LOCK: SELECTED STEP VOLTAGE  
 STEP TIM LOCK: SELECTED STEP TIME MILLIS  
 STEP NUM LOCK: STEP TIME NUMERATOR  
 STEP DIV LOCK: STEP TIME DENOMINATOR  
 STEP NOTE LOCK: SELECTED STEP NOTE  
 STEP CENTS LOCK: SELECTED STEP CENTS

# LOGIC ASSIGNMENTS

There are 3 Logic Outputs, pressing the [CV & LOGIC] button iterates through each Logic screen, you can see the selected Logic on the top left corner of the screen.

Logic operations compare 2 variables and output a true or false statement. Think of it as a gate output where true will output +5V, false outputs 0V.

The user can configure these operations with any of the CV inputs, Clock Inputs, CV outputs or Logic outputs. So it can be used to process External sources as well as internal sources.

When CV sources are used the logic threshold is 2.5v, crossing the threshold while rising or falling triggers the logic comparison.

Besides Logic operations these outputs can also be configured as counters or clock outputs.

To assign them just enter the Logic Assignment Screen, select the channel page, press the right encoder to ADD a new assign:

**OPERATION**

The Operation to be performed: NOT, AND, NAND, OR, NOR, XOR, XNOR, COUNTER, CLOCK OUTPUT

**CHANGE**

Change defines which variable triggers the logic comparison: ON X ONLY, ON X & Y

**VARIABLE X**

The source to be used for Input X

**VARIABLE Y**

The source to be used for Input Y

In this screen rotating the Left encoder chooses the parameter to edit, rotating the Right Encoder edits the parameter value.

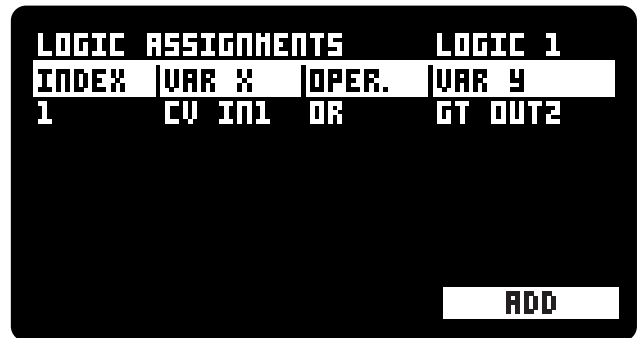
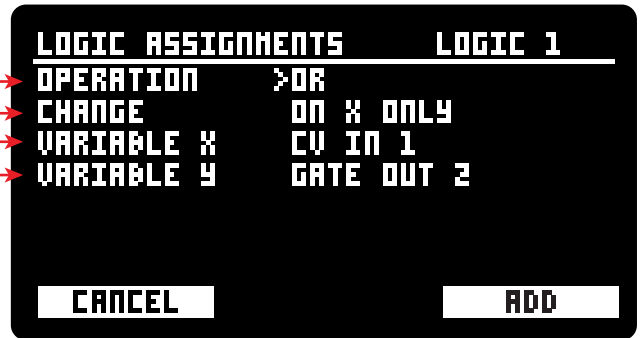
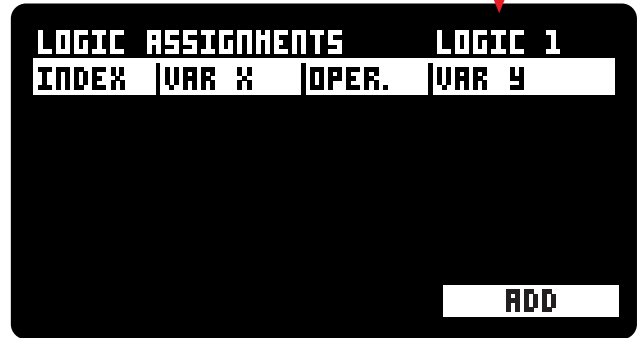
Once configured pressing the ADD button [ENCODER B] saves the settings and will display the assign as a new line in the main Logic Assignments screen

The output is the result of all lines added.

**TRUTH TABLE**

Adding more than one line allows for more complex Logic operations. When setting a second line choosing OP1 (Operation 1) uses the result from the first operation as an input for the second operation.

Logic operations on wikipedia:  
[https://en.wikipedia.org/wiki/Logic\\_gate](https://en.wikipedia.org/wiki/Logic_gate)



INPUT		OUTPUT					
X	Y	AND	NAND	OR	NOR	XOR	XNOR
0	0	0	1	0	1	0	1
0	1	0	1	1	0	1	0
1	0	0	1	1	0	1	0
1	1	1	0	1	0	0	1

# LOGIC ASSIGNMENTS

## EXAMPLES OF LOGIC OPERATIONS

Notice that NOT operations only use input variable X and simply inverts the input signal.

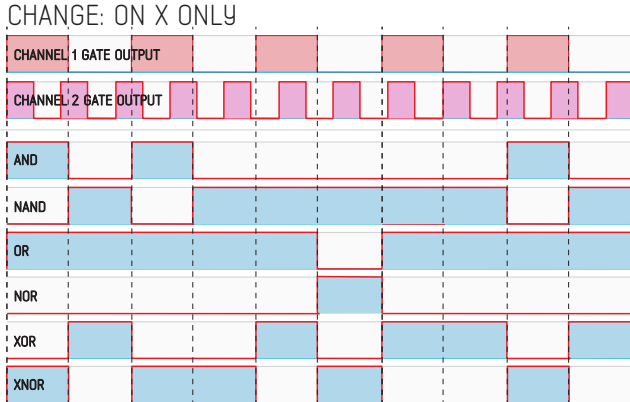


```

LOGIC ASSIGNMENTS      LOGIC 1
INDEX | VAR X | OPER. | VAR Y
-----|-----|-----|-----
1     |  GT  | OUT1  | NOT
    
```

**ADD**

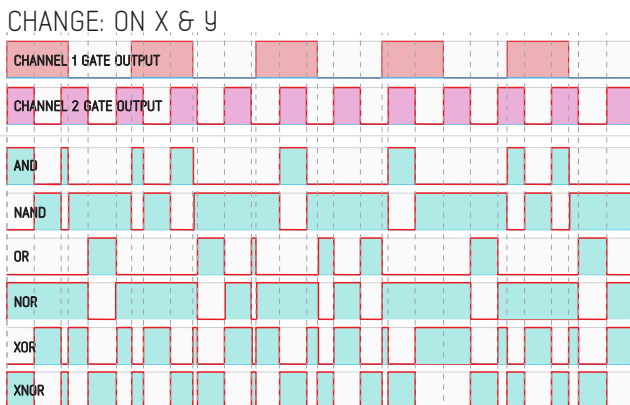
Here we configured one logic output to compare Gate output 1 and Gate output 2. Below you can find graphical examples of all possible operations.



```

LOGIC ASSIGNMENTS      LOGIC 1
INDEX | VAR X | OPER. | VAR Y
-----|-----|-----|-----
1     |  GT  | OUT1  | OR
        |      | OUT2  |
    
```

**ADD**



# LOGIC ASSIGNMENTS

## CASCADING OPERATIONS

Adding more than one line allows for more complex Logic operations. When setting a second line choosing OP1 (Operation 1) uses the result from the first operation as an input for the second operation. It is also possible to choose other Logic channels to cascade between channels.

Below a graphical example of this process with the configuration shown on the left.

LOGIC ASSIGNMENTS			LOGIC 1
INDEX	VAR X	OPER.	VAR Y
1	GT OUT1	NAND	GT OUT2
2	OP1	AND	GT OUT3
3	OP2	XOR	GT OUT4

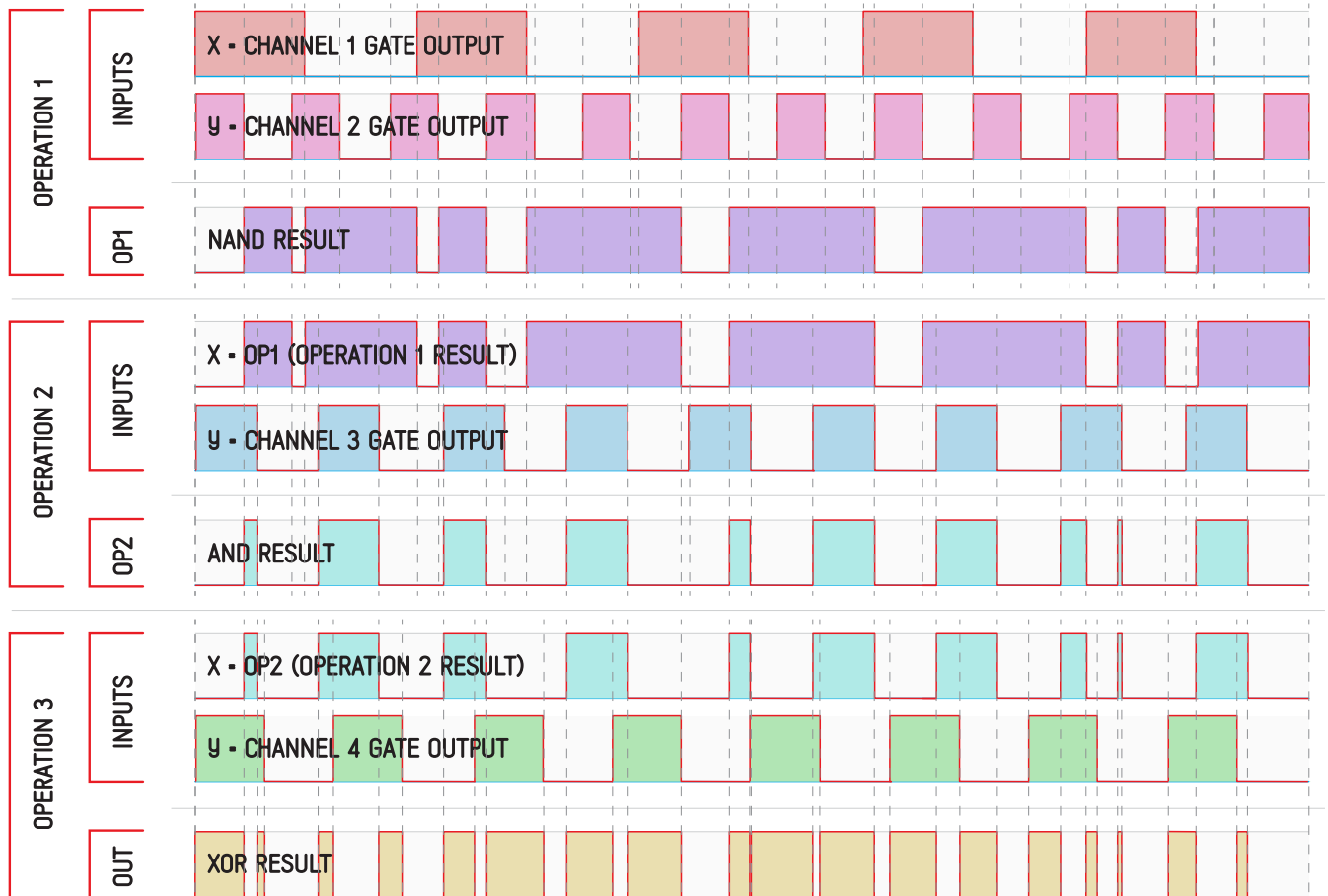
REMOVE      EDIT      ADD

## ENCODERS INTERACTION

Rotating any of the Encoders will scroll through already assigned lines. The virtual buttons on the screen show the current function for what the encoders are [MENU] button will do when pressed.

To exit this screen press any other function button.

ALL OPERATIONS SET TO CHANGE ON X & Y

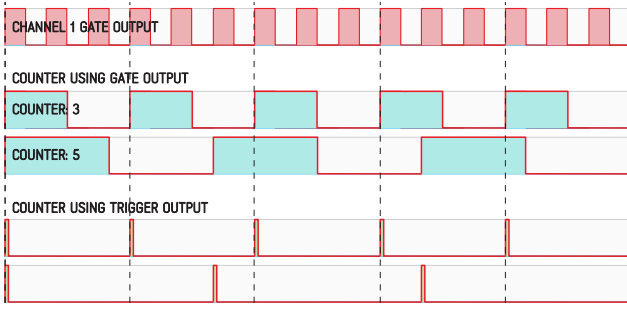


# SPECIAL NON-LOGIC ASSIGNMENTS

## COUNTER

The counter function allows to output a gate or trigger at every X pulses. Any of the CV inputs, Clock Inputs, CV outputs or Logic outputs can be used as an input.

### COUNTER OUTPUT EXAMPLE



```

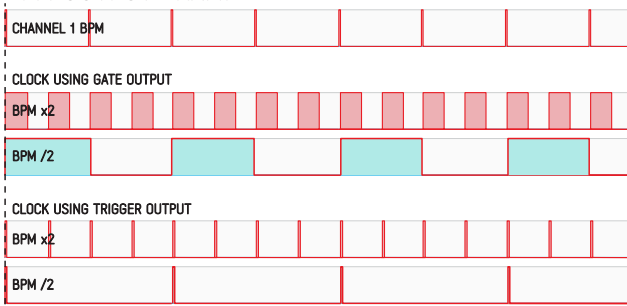
LOGIC ASSIGNMENTS          LOGIC 1
OPERATION          >COUNTER
INPUT              GATE OUT 1
COUNTER SIZE      8
OUTPUT            GATE
    
```

**CANCEL** **ADD**

## BPM - CLOCK OUTPUT

The BPM function allows to output a clock signal at a multiplication (up to x 32) or division (up to /32) of the selected channel BPM. This feature can be used to sync other modules to the ADDAC511.

### BPM OUTPUT EXAMPLE



```

LOGIC ASSIGNMENTS          LOGIC 1
OPERATION          >BPM CLK
MULT/DIV          x2
OUTPUT            GATE
    
```

**CANCEL** **ADD**

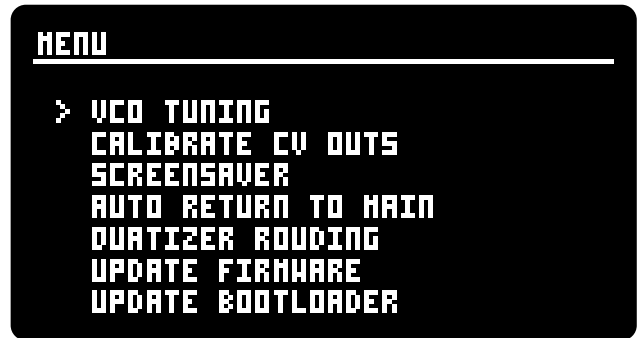
## MIDI CLOCK OUTPUT

The BPM function allows to output a standard midi clock signal when set to x24, which will output a standard 24 pulse per quarter note midi clock.

# MENU

The Menu has 4 features:

- VCO Tuning - Utility program to help calibration of VCOs
- Calibrate CV Outputs - CV Output calibration / mapping
- Screensaver - Extends screen longevity
- Auto Return to Main - Automatically exits to main screen
- Quantizer Rounding - Quantize to closest note, above or below.
- Update Firmware - Enter firmware update process
- Update Bootloader - Enter DFU mode for bootloader update



## VCO TUNING

This is a utility feature which allows to easily tune VCOs when you're using the 511 as a 1v/oct generator. It will override the main program and force all outputs to the same voltage defined as a musical note. Octave (0 to 4): raises the voltage in intervals of 1v Note (C to B): raises the voltage in semitones

A voltage output monitor and keyboard monitors the parameters selected.



## CALIBRATE CV OUTS

This screen allows to easily calibrate the 1v per octave standard. OFFSET: This value offsets the whole CV output in very fine intervals of -0,00076v GAIN: Amplify or attenuate the 1v/oct scaling

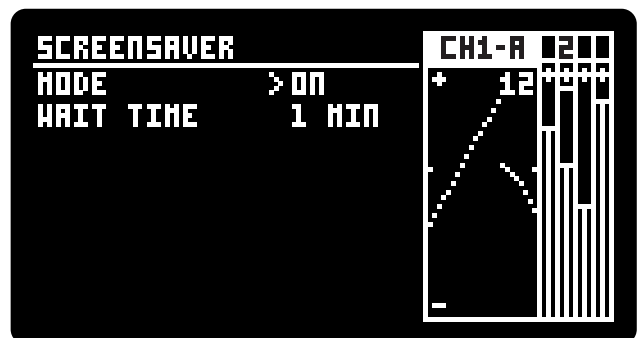
- CANCEL: Exits the screen without saving.
- RESET: resets calibration to the factory values.
- SAVE: Saves and exits the screen.



## SCREENSAVER

The screensaver is used to save the screen life over periods when the modules is not in use. When set to ON the screen will go black after the Wait Time is elapsed and no button is pressed during this time. Pressing any button will exit the screensaver mode and resume the regular screen operation.

Wait Time can be set to: 10 seconds, 1 minute, 2 minutes or 5 minutes.



# MENU

## AUTO RETURN TO MAIN

By default after 30 seconds of physical inactivity the screen will automatically return to the Main screen, this function can be turned ON/OFF.

The user can also define the auto return time: 10 seconds, 30 seconds, 1 minute.



# MENU : FIRMWARE UPDATES

## FIRMWARE UPDATE INSTRUCTIONS

1. Remove your 511 from your rack while leaving the ribbon power cable connected and the frame On.

2. Connect the module to your computer through the module's back USB connector.

3. Using an up-to-date [Google Chrome](#) browser (you will need at least version 61 or newer) go to this address: <https://media.addacsystem.com/ADDAC511>

4. Press the Connect button on the webpage, notice the list of devices, among the devices list it should show: **"ADDAC511 STOCHASTIC VOLTAGE GENERATOR"**  
Do not select the device at this moment.

5. On your module click the [MENU] button and select: [UPDATE FIRMWARE], click [ENCODER B] to enter firmware update mode, after which Press & Hold [ENCODER A]

6. On your browser notice the list will change: **"ADDAC511 STOCHASTIC VOLTAGE GENERATOR"** will disappear and a new device will appear: **"ADDAC511 - FIRMWARE UPDATE MODE"**  
Release [ENCODER A], select this new device and press connect.

The firmware update process status can be followed on the browser. Once finished the usb cable can be removed and the module can be placed back in your eurorack frame.

## AUTO RESTART

If the device "ADDAC511 - FIRMWARE UPDATE MODE - Paired" is not selected within 30 seconds the module will auto restart and disappear from the browser devices list. If this happen you can repeat step 5 and 6.

## WINDOWS TROUBLESHOOTING

If **"ADDAC511 - FIRMWARE UPDATE MODE"** device does not appear in the devices list please follow the steps below:

1. Press <win key> + R

2. Write "devmgmt.msc" in the text box and press OK

This will open the device manager. Under Universal Serial Bus devices check that **"ADDAC511 - FIRMWARE UPDATE MODE"** appears. If the device icon has an exclamation mark, that means the driver must be installed. If you haven't done it before, go to <https://zadig.akeo.ie> and follow the instructions to install it.

After this, follow these steps:

1. Select Menu > Update Firmware

2. While module reboots, keep [ENCODER A] pressed

3. Re-install the driver for the **"ADDAC511 - FIRMWARE UPDATE MODE"** device:

3a. Right-click and select update driver

3b. Select "Browse my computer for drivers"

3c. Select "Let me pick from a list of available drivers on my computer"

4. Select "Universal Serial Bus devices"

5. Select (Undefined Vendor) and WinUSB Generic Device

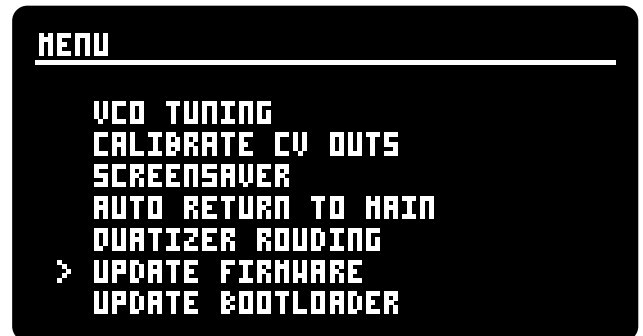
6. Select YES on the Update Driver Warning

7. Allow module to restart

8. Select Menu > Update Firmware

9. While module reboots, keep Encoder A pressed

10. On the ADDAC511 website refresh the webpage and press the Connect button, the **"ADDAC511 - FIRMWARE UPDATE MODE"** device should now be listed. You can now follow the regular update steps at the top of the page.

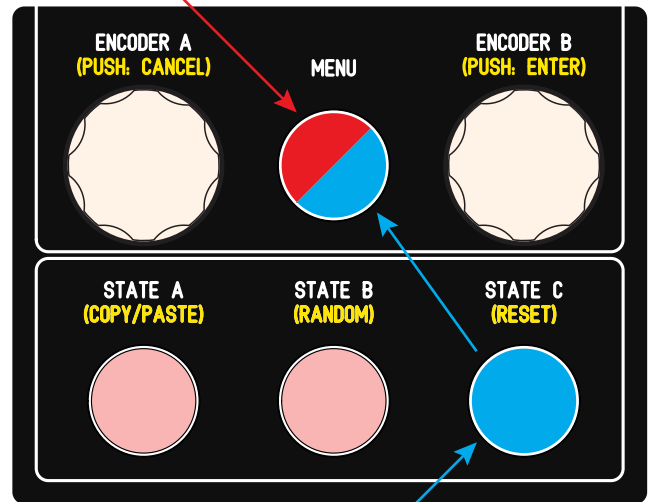


# SPECIAL STARTUPS

On power up there are 2 special startups, they can be accessed by Pressing and Holding the highlighted buttons during power up as shown here:

**MENU:** start with default preset (bypasses previously selected preset)

**MENU + STATE C:** delete all stored presets

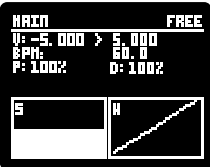


# PATCH EXAMPLES

## PATCH 1

SIMPLEST FULL RANGE RANDOM VOLTAGE AT 1/4 BEAT

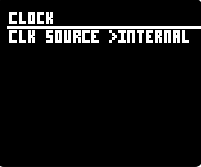
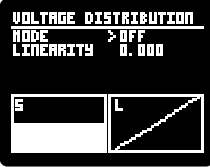
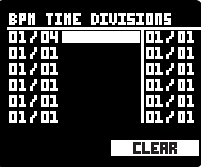
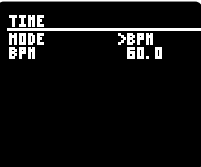
MAIN SCREEN



VOLTAGE SETTINGS



TIME SETTINGS



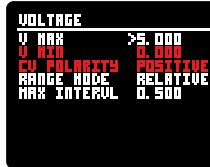
## PATCH 2

POSITIVE RANDOM VOLTAGE AT RANDOM BEAT

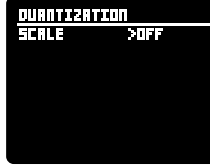
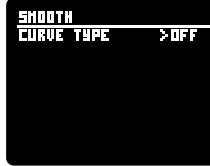
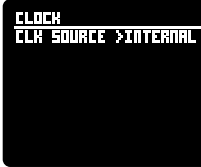
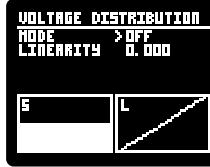
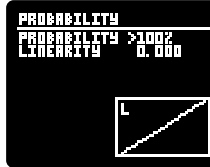
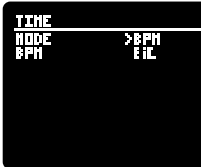
MAIN SCREEN



VOLTAGE SETTINGS



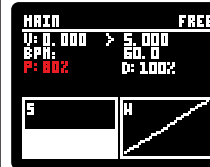
TIME SETTINGS



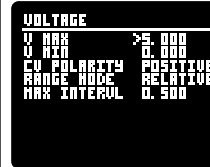
## PATCH 3

RANDOM VOLTAGE WITH PROBABILITY AT 1/16 BEAT

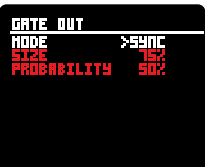
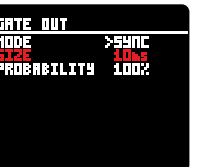
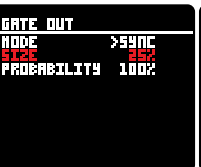
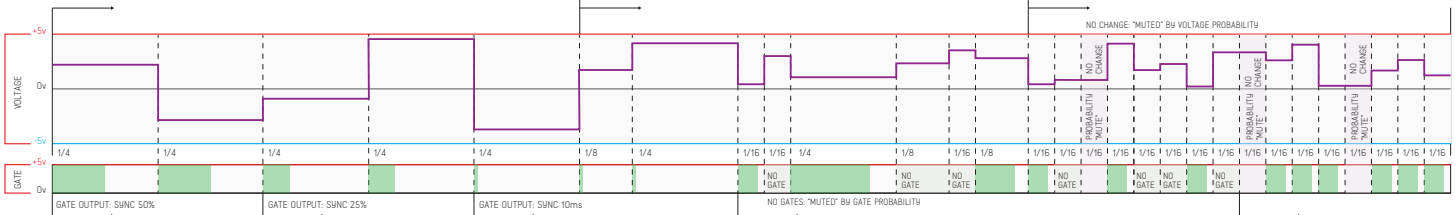
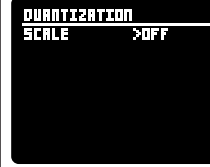
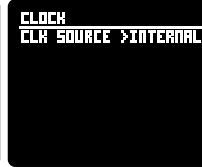
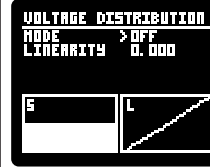
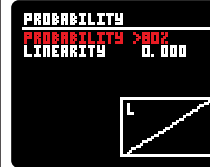
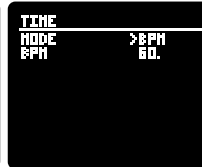
MAIN SCREEN



VOLTAGE SETTINGS



TIME SETTINGS

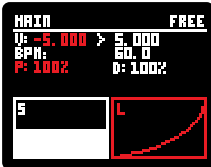


# PATCH EXAMPLES

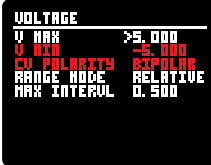
## PATCH 4

RANDOM VOLTAGE WITH EXPONENTIAL DISTRIBUTION

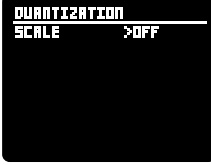
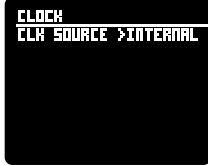
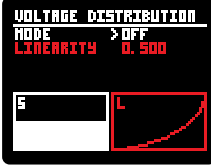
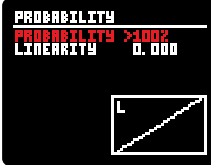
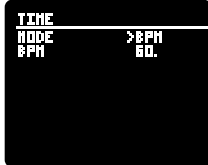
MAIN SCREEN



VOLTAGE SETTINGS



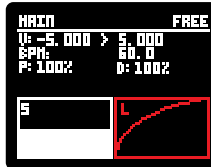
TIME SETTINGS



## PATCH 5

RANDOM VOLTAGE WITH LOGARITHMIC DISTRIBUTION

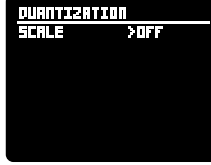
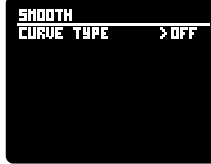
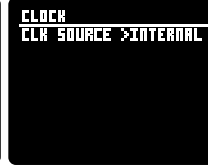
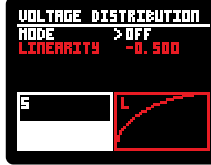
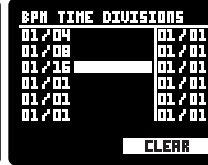
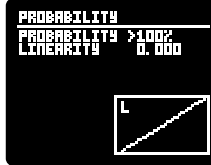
MAIN SCREEN



VOLTAGE SETTINGS



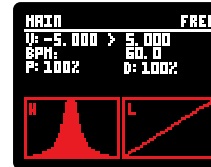
TIME SETTINGS



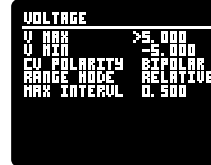
## PATCH 6

RANDOM VOLTAGE WITH WALK DISTRIBUTION

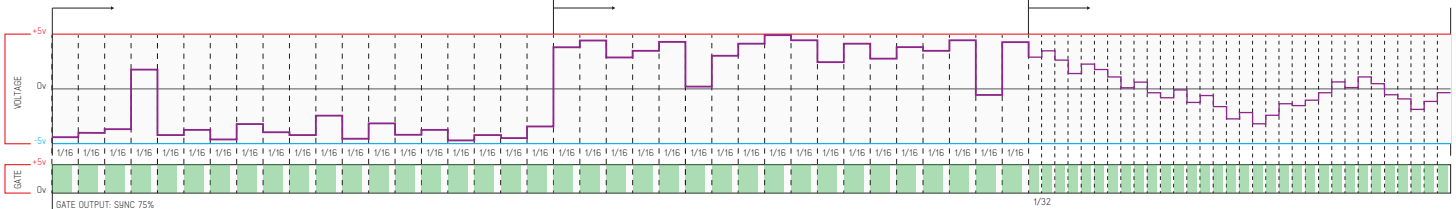
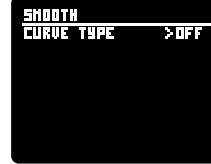
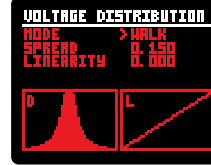
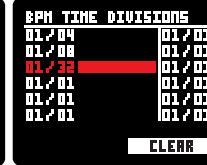
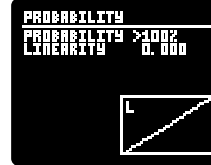
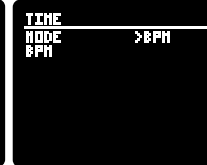
MAIN SCREEN



VOLTAGE SETTINGS



TIME SETTINGS

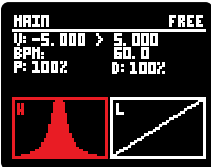


# PATCH EXAMPLES

## PATCH 7A

RANDOM VOLTAGE WITH WEIGHTED DISTRIBUTION

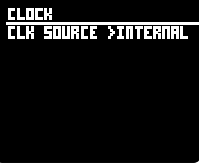
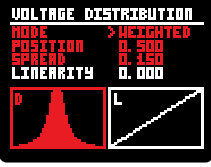
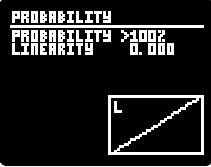
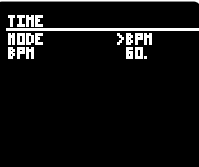
MAIN SCREEN



VOLTAGE SETTINGS



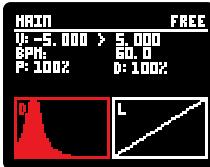
TIME SETTINGS



## PATCH 7B

RANDOM VOLTAGE WITH WEIGHTED DISTRIBUTION

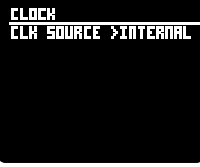
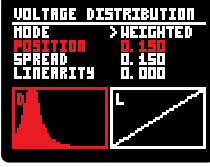
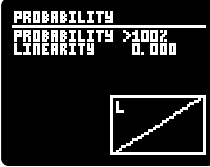
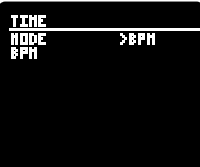
MAIN SCREEN



VOLTAGE SETTINGS



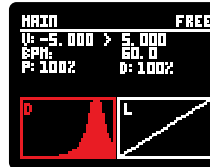
TIME SETTINGS



## PATCH 7C

RANDOM VOLTAGE WITH WEIGHTED DISTRIBUTION

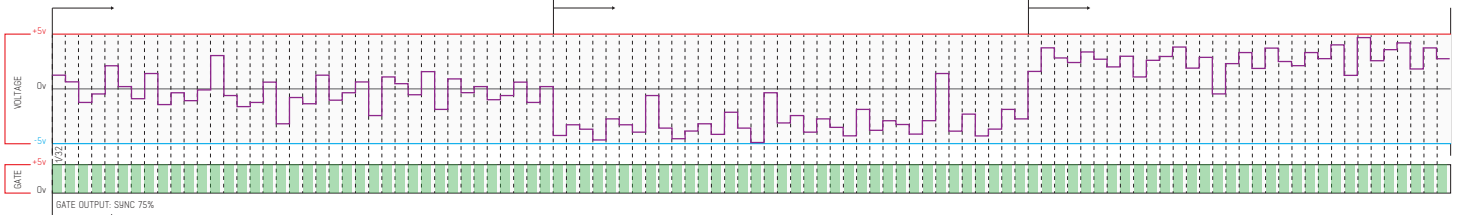
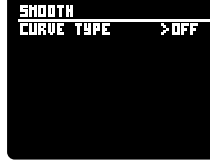
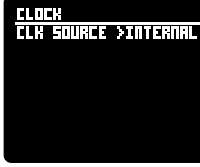
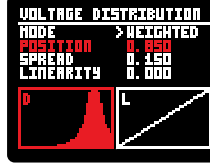
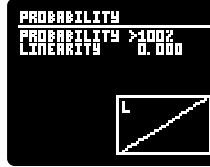
MAIN SCREEN



VOLTAGE SETTINGS



TIME SETTINGS

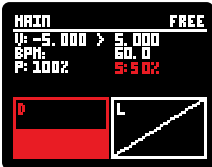


# PATCH EXAMPLES

## PATCH 8A

RANDOM VOLTAGE WITH LINEAR SMOOTH

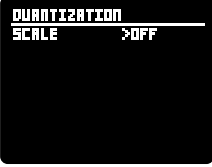
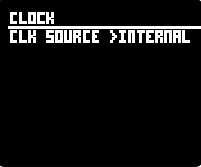
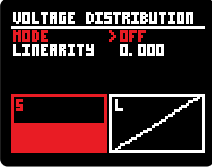
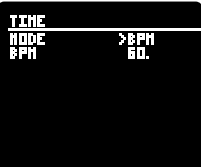
MAIN SCREEN



VOLTAGE SETTINGS



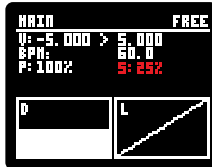
TIME SETTINGS



## PATCH 8B

RANDOM VOLTAGE WITH LINEAR SMOOTH

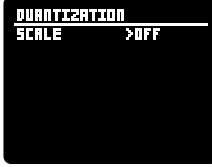
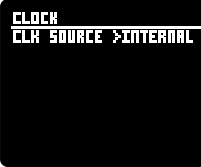
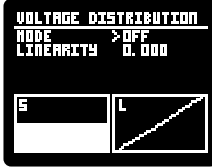
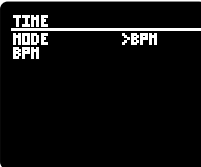
MAIN SCREEN



VOLTAGE SETTINGS



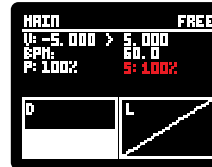
TIME SETTINGS



## PATCH 8C

RANDOM VOLTAGE WITH LINEAR SMOOTH

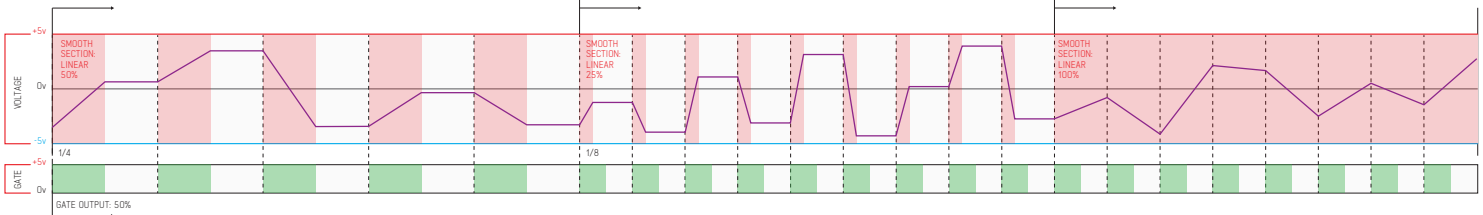
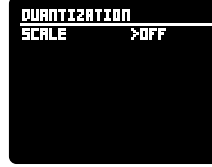
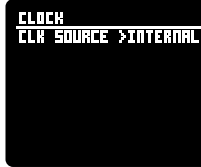
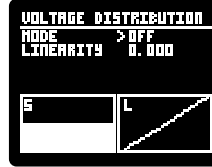
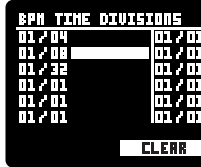
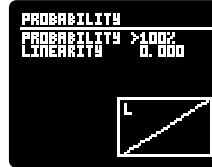
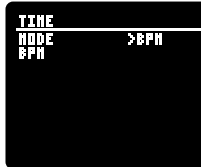
MAIN SCREEN



VOLTAGE SETTINGS



TIME SETTINGS

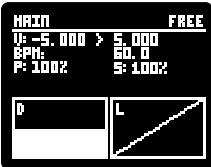


# PATCH EXAMPLES

## PATCH 9

RANDOM VOLTAGE WITH LOGARITHMIC SMOOTH

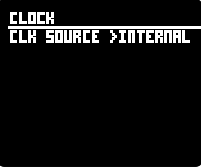
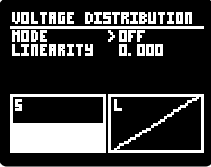
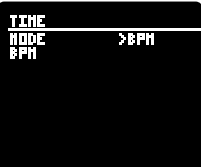
MAIN SCREEN



VOLTAGE SETTINGS



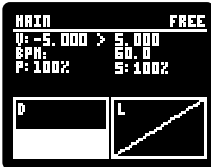
TIME SETTINGS



## PATCH 10

RANDOM VOLTAGE WITH EXPONENTIAL SMOOTH

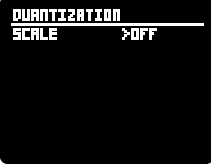
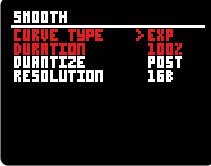
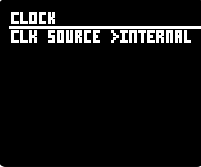
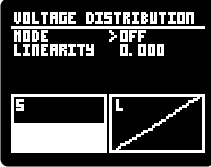
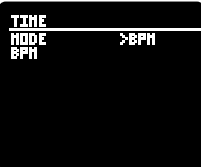
MAIN SCREEN



VOLTAGE SETTINGS



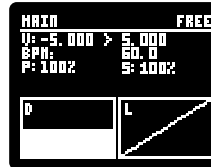
TIME SETTINGS



## PATCH 11

RANDOM VOLTAGE WITH BEZIER SMOOTH

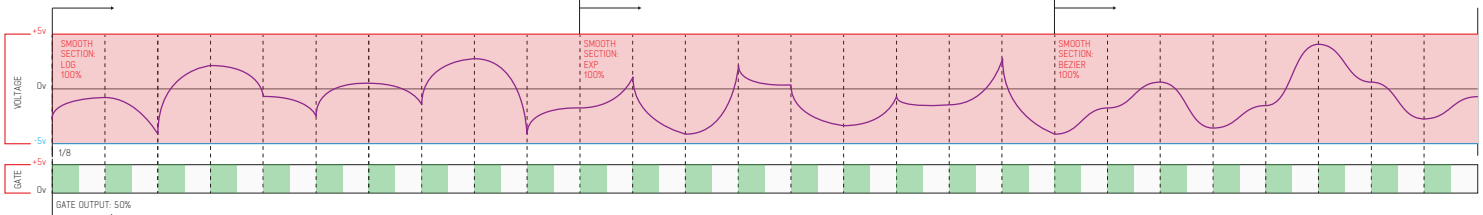
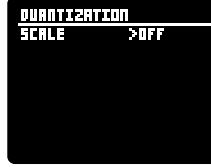
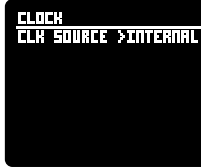
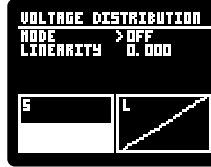
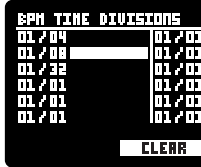
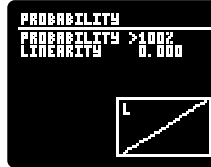
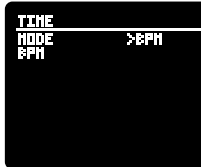
MAIN SCREEN



VOLTAGE SETTINGS



TIME SETTINGS



For feedback, comments or problems please contact us at:  
[addac@addacsystem.com](mailto:addac@addacsystem.com)