loop   cv in   chaos

prob   width

time

quant
slew

Chaos manual // v 1.17

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CLANK

1. Thanks!

Thank you for purchasing Chaos,

for us, designing this module has been a big step ahead from both a technical and intellectual point of view, but, since we've always had a clear vision of how this module should be , nothing stopped us from studying and working hard on it all the time. No matter how challenging it proved to be.

That's why we hope you'll enjoy it as much as we did when creating it!

Finally,
a special thanks goes to:

Our families, partners and friends for the support, Samuele Nigro (a.k.a. Fluize), Dan Sanfufano (whose real name is yet to be known), Luca Romanelli (a.k.a. Mastrovalvola Pedals), Alessio Bianchi (AB elettronica) Enrico Corsi and Robert Bardi.

A special mention also goes to all the beta testers who helped with their feedback on the new Firmware updates.

Ciao,

Andrea and Emanuele.

CLANK

2. The concept

What is Chaos for real?

Chaos is the hidden force that moves everything around us. It's a random stream of events, whose correlation is impossible to understand.

Even if its presence is a living paradox in our life, we are used to influence chaos in a very deterministic way by setting the limits of its dynamic behavior: in this way we can predict events and make them possible.

We can set steady points, enclose them into cycling loops and then make them work for us as laws.

That's exactly what our Chaos does.

A continuous stream of gates and voltages is produced by a sophisticated random engine controlled by a series of parameters that can be set to define its acting behavior.

Chaos is a six-channel aleatoric brain where a random generator helps you quickly finalize your idea. You can start from an extremely random and uncontrolled mood but easily shift towards a more deterministic and manageable atmosphere with just one-click.

It's like shaping a block of stone.

2.1. Main features. Chaos was conceived to be the fulcrum of your system providing:

*   An extremely wide range (10ms/10s) and stable master clock
*   6 gate outputs with independent probability, width and time control (synced or completely independent from the master clock)
*   6 voltage outputs with independent quantization, slew, random voltage window selection and ground transpose
*   For each channel there's the option of using the internal random generator or sampling an external incoming voltage
*   Individual channel looping capability
*   60 save and recall slots with no lag (also under CV control)
*   The ability to randomize all the parameters of any channel on its own or in group with the entropy control setting
*   3 External gate inputs for external clock/start and stop, looping and Chaos function,
*   1 CV input for external voltage mirroring, scale transposing, saved slots recall.

With all these functions combined together, Chaos is pretty flexible and can be easily used as a really powerful multi-channel Turing machine, drum sequencer, modulation generator, clock source, voltage recorder and can perform many other tasks.

Even if we're in a pure digital domain, the random generation feeling, and the design are pretty analog. Chaos has been designed with playability in mind: all parameters are always readable and immediately available with no menus or hidden elements to be remembered.

2.2. New Firmware additions. If you have correctly installed a new firmware, when the Chaos module is powered up, the initial LED flash should be composed by one red LED on the channel bar and a certain number of red LEDs on the value bar. Their number will indicate wich version of FW is currently installed. (i.e. FW 1.17 is 1 red LED on the *channel bar* and 7 red LEDs on the *value bar*)

FW 1.16 main additions:
*   Channel settings *Clear*
*   Channels *Copy & Paste*
*   Channels *Run/stop*
*   Time *Swing* function
*   Tap tempo
*   Time *Racheting*
*   Adjustable slew limiting
*   CV IN transpose
*   Two new sets of quantized scales
*   Root note selection
*   Loop direction
*   Loop counter reset
*   Inbeetween 1-32 loop steps selectable
*   Indipendent entropy amount for each modifier
*   Last saved slot recall at startup

FW 1.17 main additions:
*   External *Loop Reset* function
*   Sequencer mode

3. Getting Started
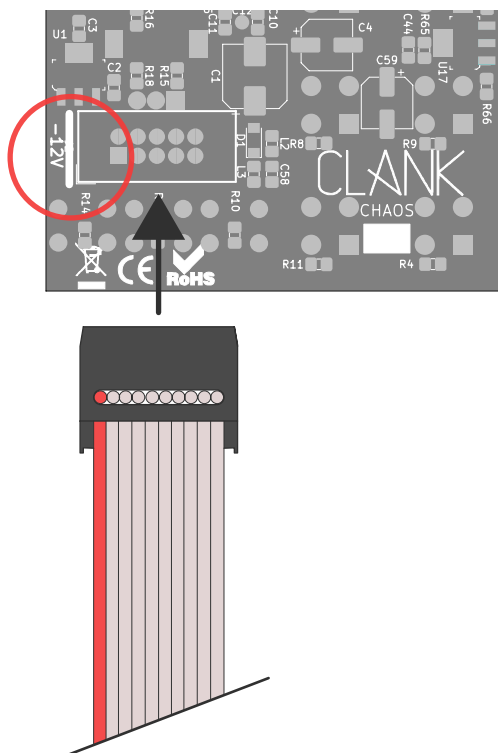
3.1 Hooking up the module. Make sure your system is turned off, then connect the module to the power bus using the ten to sixteen IDC cable provided. The red line on the cable corresponds to the -12V power rail. On the back of the module a thick white line indicates where the -12V rail is located on the IDC connector.

Before powering up make sure to have completely installed the module by using the four panel screws provided. Devices must stay firm inside their case. Make sure the back is not touching other objects inside the case. The exposed electronics may cause shortcuts when coming into contact with other electronic surfaces or objects.

3.2. Dimensions.
12Hp

3.3. Power Consumption.
+12V: 115mA
-12V: 0mA
+5V: 0mA

3.4. Safety Instructions

* Do not power up your system before the module is completely installed
* Never use or power up the module with the back panel exposed
* If you ever see sparks coming from the module or its circuit or see or smell fumes while the module is turned on, please turn off the power supply immediately. Exposure to erroneous voltages, currents, or shortcuts can damage the device in a few seconds
* Never turn the module on if there is water inside or on the case
* Never turn the module on if any external tools or objects have fallen inside the case
* Never use the module in environments with temperatures below 0°C or over 50°C degrees. In case of long exposure to unwanted temperatures let the device rest at an acceptable temperature for at least 30 minutes or until cooled down before powering up
* The front panel may warm up because of continued usage. A temperature of up to 30°C is acceptable for use and functioning.

3.5. Warranty Policy. Clank offers a two-year period of warranty on each product purchased from our site. During this period all defective or malfunctioning devices will be repaired or even substituted with a new unit. Shipping costs will be refunded by Clank. This service will be applied unless an external damage is proven to have happened. Only Clank is allowed to repair its own products. Any external attempts of repair/modding will void the warranty. In case of out of warranty damages, devices can also be sent for servicing. In this case shipping costs must be covered by the owner. Requests must be sent by email to the following address: info@clank.eu

DO NOT FORGET:
* *The purchase invoice number always has to be communicated by email when requesting servicing and must subsequently be included inside the shipped box containing the module*
* *Only units shipped with their own packaging will be serviced/repaired*
* *The packaging provided is not meant to be a shipping box itself. When shipping back, put everything inside a larger shipping enclosure*
* *Remember to fill the gaps between the module and its packaging and also between the packaging and the shipping box with some shock absorbing foam/paper*
* *We are not responsible for improper boxing and shipping damages*

4. Panel overview

First row. On Chaos' first row, from left to right, there are four inputs and one output:

- *Clock in*: gate trigger/input
- *Loop in*: gate trigger/input
- *CV in*: 0-8V CV input
- *Chaos in*: gate/trigger input
- *Clock out*: 8V gate output

Second and third row: Outputs

- In the middle row there are six gate outputs, one for each channel. The gate high state level is 8V and a dedicated LED blinks every time a gate signal is sent.
- Under those you have the six corresponding CV outputs (0v-8v) .

The LED bars. There are two LED bars on the module, one with six LEDs and the other one with ten [3].

- The first one is the channel bar; it indicates the selected channel in red and reflects its real time CV intensity by changing LED luminosity.
- The ten LED bar is the value bar, and it is mainly thought for editing purposes. Press any button to show the parameter value. By default, if nothing is pressed it will display the current channel's CV output value.

This LED system is meant to be a minimal yet effective way to control what is happening on all the CVs and gates of each channel. Everything is under your control and ready for action.

Encoder. To change the selected channel, simply rotate the encoder without pressing any other button.

When you reach the limit on the right all the LEDs will become red, meaning you have selected all the channels together. In this way you can easily loop or change a modifier or configuration at the same time for all the channels.

The Modifiers. The five black buttons on the bottom left are the *modifiers*.

Hold down a modifier to see the corresponding value, rotate the encoder to change the value and release the button when you are done .

The Loop button. The white button is used to enter the *loop mode*. (p.12) .
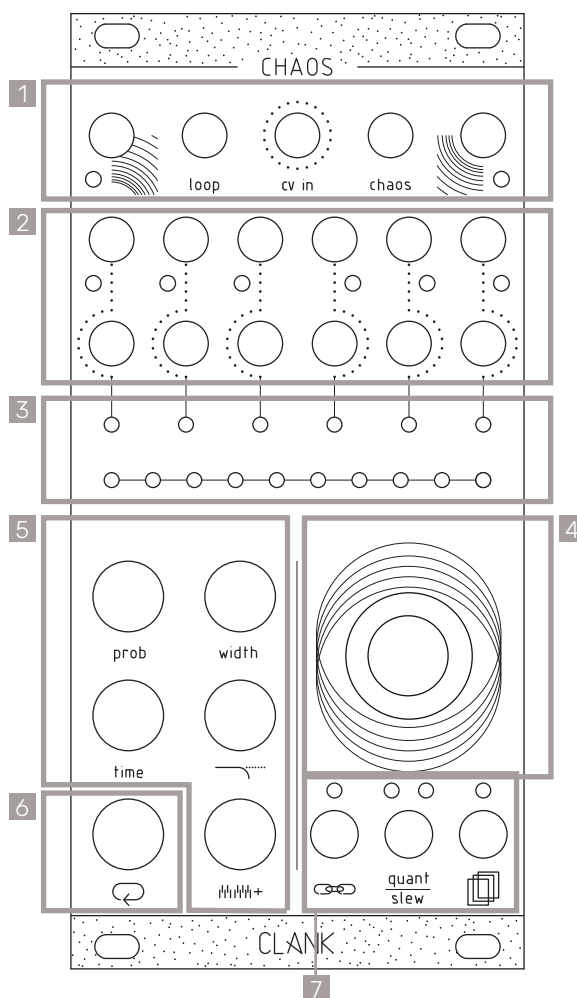
Global settings. To access to channels global settings three small buttons placed under the encoder. Their name came reflects their macro functions wich are respectively:

- *Input assign*
- *Scale quantization/slewing*
- *Memory access*

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5. Channel Setup

5.1. Inputs assign. Before starting to play with Chaos a suggested routine is to give a check to each channel settings by pressing on the *Input assign button* [1].

This button, indeed, will show if the four inputs at the top of the module are linked to their relative function or not. In this way, they can be activated or controlled, on the selected channel, thru external gates or CVs.

To change a channel's settings, hold the button [1], on the value bar, the first four LEDs on the left [2] will glow representing each one of the four inputs respectively.

Rotate the encoder CW or CCW to select an LED and press it to change its status. A white LED will indicate a non active link. Otherwise it will glow in green except for *CV in* wich has other two different status, red and orange (see pag 10-11) and *Loop In* wich now (from FW 1.17) also has a red status (see pag XX).

5.2. Channel reset. To reset a channel to it's default values, double tap on the *Memory access* button [4]. The corresponding LED will blink briefely and, all the modifiers values and channel settings will be restored.

To reset only the loop modifiers, hold the loop button while double tapping.

If all the channels are selected, then all the channels will be restored to their default values.

5.3. Copy & Paste. To copy all the channel settings, hit the *Memory access* button [4] once. The corresponding LED will light up and all the informations will be copied into the memory buffer.

Select another channel with the encoder and hit the *Save/recall/channel reset* button again. The LED will turn off and everything will be copied to the new channel.

Everytime you paste a channel settings to another the memory buffer will be erased so. To copy the same informations to more than a second channel the whole process has to be repeated each time. Otherwise, if all channels are selected when pasting, every channel will end with the same informations copied.

5.4. Channel Run/Stop. To access this function
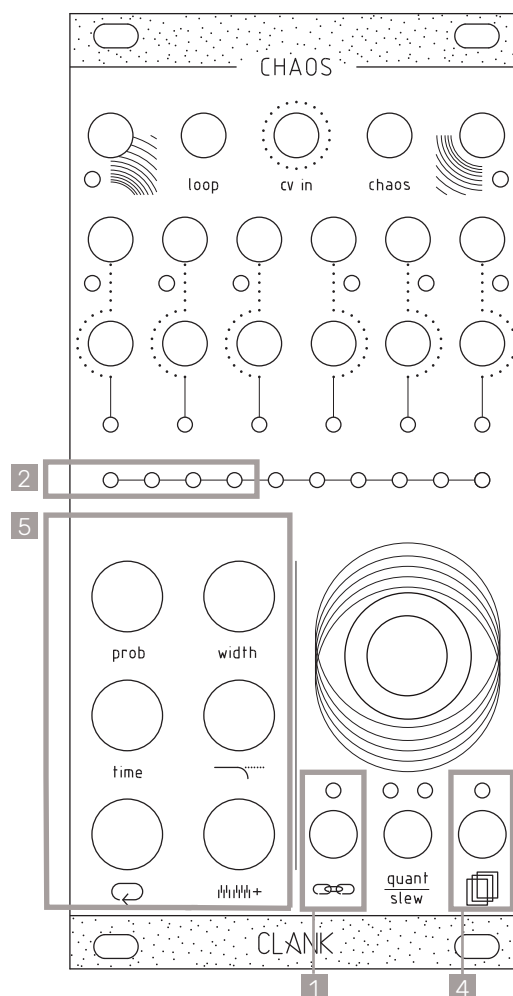
double tap on the *Input assign* button [1]. Now, each one of the *modifiers buttons* (plus *loop*) [5] corresponds, respectively, to each one of the six channels. (Ch.1 is Probability, Ch.2 is Width, Ch.3 is Time and so on..).
Press one of these to activate or mute its corresponding channel.
An orange LED on the *channel bar* will indicate wich one is active.

Press the *Channel settings button* to go back to the mainpage. If muted, a channel will now appear as pale orange on the channel bar.

If the first channel is un synced and therefore will act as master clock, when muted, all the system will stop. In this way it can double up as global Start'n'stop command.

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6. Time Control

At its core, Chaos is composed of six channels of clock generators [2] and all the channels can be individually synced to the master clock or be completely time independent.

To change this press the *Channel settings* button [6] and rotate the encoder to select *clock in* LED [1]. When green, it will be linked to the master clock, when white, it will be unsynced and time independent.

6.1. Clock sync [1]. If no signal is applied to the *Clock input* [1], Channel 1 will be the master clock.

To sync Chaos to an external clock source, send a 50% pulse width gate to *Clock input* [1]. A trigger or a LFO may be also inserted.

When synced to an external clock source the start'n'stop function is also activated . Chaos brain, indeed, always awaits a trigger to create the next step, so if you interrupt the clock signal, it will stop. Otherwise it will start again, as soon as another pulse is applied.

6.2. Probability [3]. This function is a sort of coin toss to declare if a gate of the selected channel will fire or not.

Changing the *probability* value will reduce its possibility to happen. The range of value is from 0% to 100%.

If you're using channel 1 as the master clock, changing its *probability* will affect its gate output but not the master clock data stream.

Turn it to zero will also mute a channel.

6.3. Width [5]. The length of a gate's duty cycle expressed in percentage. Range is from 1% to 100% (fully open).

6.4. Racheting [5]. This function allows to multiply the number of emitted gates for each step.

This means that inside the same time lenght more than one gate can be played and their time distance will be a fraction of the initial interval.

To access this function, tap and hold the *width button* [5] , on the *value bar* 8 white LEDs will indicate all the the possible divisions.
The orange LED will show wich ratio is selected,
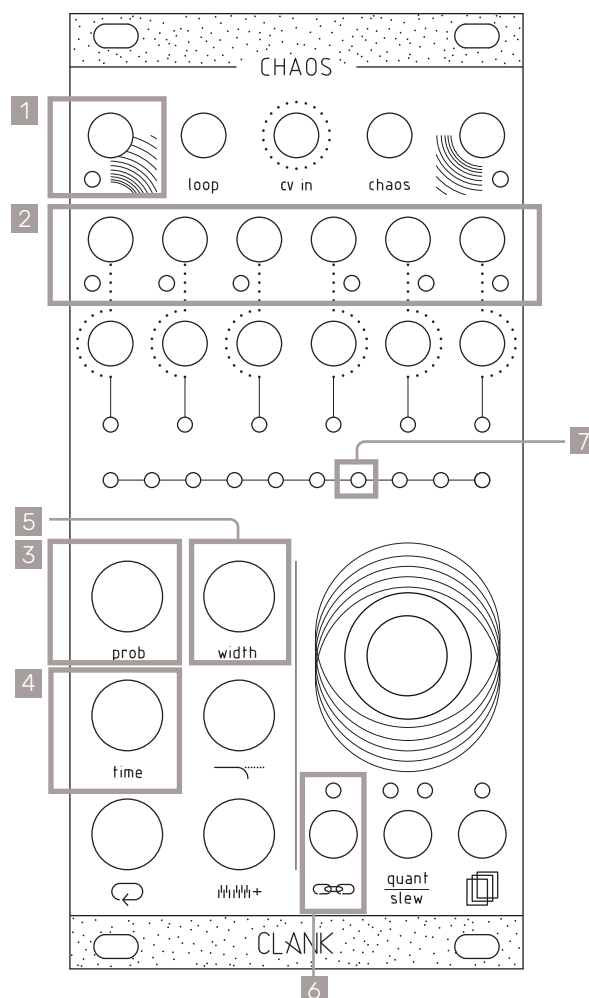
rotate the encoder to change it beetwen 1:1 and 8:1.

Gate width will be effected at the same manner, meaning that each dot on the value bar will also halve the gate lenght.

6.5. Time [4] is expressed in two different ways, depending on if a channel is synced or not:
If the selected channel is synced to the master clock the *Time button* will let you set a multiplication or division of the master itself. The pulse of the two-central LEDs on the main bar means that the channel is at the same rate of the master clock.

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Rotating the encoder CW multiplies it (LEDs in white), CCW divides it (LEDs in orange) and the available multiplications and divisions are from 1 to 8, then from 16 to 32.

If the selected channel is the master or if it's not synced to the clock, time will be expressed in milliseconds between two consecutive gates.

You can easily change it by pressing time and turning the encoder. Rotating it CCW will result in a faster clock, whereas rotating CW will make the clock slower (this is because you will be reducing or augmenting the milliseconds between two consecutive gates).

When un-synced, default value beetween each gate is 500ms (120bpm) while time range goes from 10ms to 10 seconds.

In the first window, in white, every LED corresponds to 100ms each step. By reaching the upper limit you will enter a second window in blue. Here every LED corresponds to 1 second.

Keep in mind that Chaos can emit gates from one every 5.5 minutes to audio band (approximately 100hz) so timing changes can be very drastic.

6.6. Tap Tempo. When a channel is un-synced, another cool feature is the tap tempo ability. Just tap on the Time button and the clock will automaticaly set to the tapped tempo.

6.7. Swing. To easily achieve upbeats, each Chaos channel can be shifted in time for a fraction of their clock rate. To change *swing* settings:

• Tap and hold the *Time button* [4]
• On the value bar, the four LEDs on the left are rapresenting the channel swing to its clock rate.
• Rotate the encoder to choose the delay beetween 0, 1/4, 2/4 or 3/4 and press to select the desired value. The selected one will light up in orange while, the not selected ones will be white.

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7. Voltage control

Along with its internal clock generator Chaos engine is composed of six channels of randomic voltage generators. By default every time a gate rises up a new random voltage from 0 to 8v will be available on the CV output of that channel [1].

On the value bar [6] each LED corresponds to 1 volt step. The LED intensity will also reflect the value inbeetween voltages. In this way the final output value will always be easy to understand and read.

Since a span of 8V is quite a lot (especially when controlling the pitch of a VCO) some useful controls have been created to limit the range of action.

7.1 Voltage window [2]. , This control reduces the upper limit of values that the generator can pick.

When pressed, the value bar [6] will turn to white and it will express how many volts of range to select. If the whole range is selected, the eight LED will flash in orange.

7.2. Ground transpose [3]. With this modifier you can shift the window of values that the generator can pick. It's like setting its lower limit.

Press the button and rotate the encoder, the more you turn and more your lower limit will be shifted from 0V to a higher base level. Counting how many dark LEDs from the right will indicate the new transposed ground level.

When not quantized every encoder dent will increase the ground voltage by a semitone (1V/12).

When quantized on a particular scale, instead, the ground transpose will work differently. Turning the encoder, infact, won't change the output value untill the next note of the scale is reached.

7.3. CV IN transpose. This feature permits to control the ground transpose function with an external voltage source. In this way tonal jumps can be controlled in a more deterministic way thru the CV IN input [5].

To access to this function, go to the *Input assign* menu and rotate the encoder to the right on the third LED. Then press untill it goes red. Now CV IN transpose is applied on that channel.

7.4. Slewing. For a more fluid transition beewteen
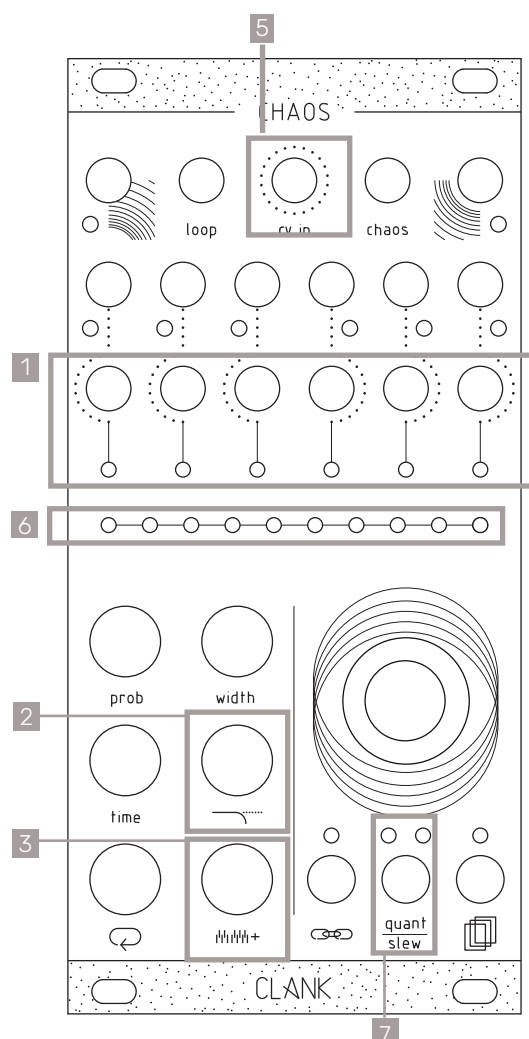
output voltages slewing can be activated.

To apply slewing to the selected channel, press the *quant/slew* button once [4].
The corresponding LED will light up in white to indicate that.

To adjust the lenght of the transition just tap and hold the *quant/slew button*.
The value bar will now express a percentage referred to the whole step duration.
This means that with 100% of slew, the CV will keep all the step lenght to reach the new value.

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7.5. Quantization. Chaos can quantize voltages to a defined scale transforming its chaotic behaviour or an external source to a more melodic one.

To choose a scale, hold the *quant/slew* button and turn the encoder to scroll between them. To select a scale simply release the button.

The left *quant/slew* LED will stay on indicating the current scale's color. While keeping *quant/slew* pressed, the current scale will be shown blinking on the value bar as well.

There are three sets of modes. Each time you reach the end of a set turning the encoder CW will make it skip to the next set and vice versa.

The first set includes 10 basic scales, the second set includes the 7 modes of the melodic major scale, and the third set includes the 7 modes of the melodic minor scale.

First set:

- Unquantized (Default)
- Chromatic
- Octave
- Major pentatonic
- Minor pentatonic
- Blues
- Arabic
- Pelog
- Hirajōshi
- Chinese

Second set:

- Ionian
- Dorian
- Phrygian
- Lydian
- Mixolydian
- Aeolian
- Locrian

Third set:

- Ascending melodic minor
- Dorian b2
- Lydian augmented
- Lydian dominant
- Mixolydian b6
- Locrian #2
- Super Locrian

7.6. Root note selection. Since every quantization option is referred to the C note, changing the root could be handy to adjust the *Chaos'* output voltages to a specific intonation.

To do this hold the *quant/slew* button and then press and hold down the encoder. On the value bar the first LED will be in white and it will represent the C note. Rotate CW while keeping it pressed and the whole output will be shifted by a semitone every dent increase. Each white LED will be one of the seven keys while red LEDs will represent sharp notes.

7.7. CV IN Sample & Hold. Thanks to its dedicated input an external voltage can be used in place of the random generators. In this way, Chaos will produce, a sample and hold of the external voltage source.

To activate this option, select the desired channel, hold the Channel settings button, rotate the encoder to select the third LED (wich, by default is in white) and then press the knob. Now the light will turn to green, meaning that the CV IN mode is active on that channel.

To go back to the internal generators, press it again twice. First press will turn it to red (CV transpose mode) and the second will go back to white (random mode).

Even when sampling an external voltage, all the voltage modifiers and quantizing modes will work the same as with random voltages. In this way precise melodic lines can be edited or created from an LFO or envelop too. Since the external CV oscillations can't be predicted, Slewing, instead, won't work in this case.

8. Looping

All six channels have an independent looping capability. At all times, Chaos is keeping the last 32 steps memorized.

To start a loop, press the white *loop button* once [1]. The value bar and the *input assign [2]* LED will turn blue. Chaos is now in a loop that reflects everything that happened in the last steps.

The loop length can be changed by holding down the *loop button* and by rotating the encoder, the number of steps will be shown as 8 yellow dots on the value bar.

Four pages of 8 steps, are then used to show the steps and the 9th and 10th LED will indicate wich page you are in.

- When Both OFF, first page (step 1-8).
- 9th LED ORANGE , second page (step 9-16),
- 10th LED ORANGE, third page (step 17-24).
- both LEDs RED, step (25-32).

Press the *loop button* again to exit from this mode.

Keep in mind that every change of parameter (except time) made before looping will be recorded and then played back. In this way even time changes can be looped!

Whether Chaos is in loop mode or not, the recorded sequence can be altered by holding the loop button together with one of the five modifier buttons.

It is important to note that channel loop modifier values are dependent from the random modifier values of the same channel:

- The loop's *probability* modifier works within the *probability* percentage of the channel's original probability value. That is to say that if the channel's original *probability* is at 70%, that will be the loop's *probability* maximum value
- The loop's *width* will increase or decrease the lenght of the original random width value. On the ten LED bar the original value is placed at the center and if rotating to to the left it will decrese its lenght. Viceceversa when going to the right it will increase untill the maximum is reached.
- The loop's *time* modifier works as a multiplier/divider of the channel's original random time value
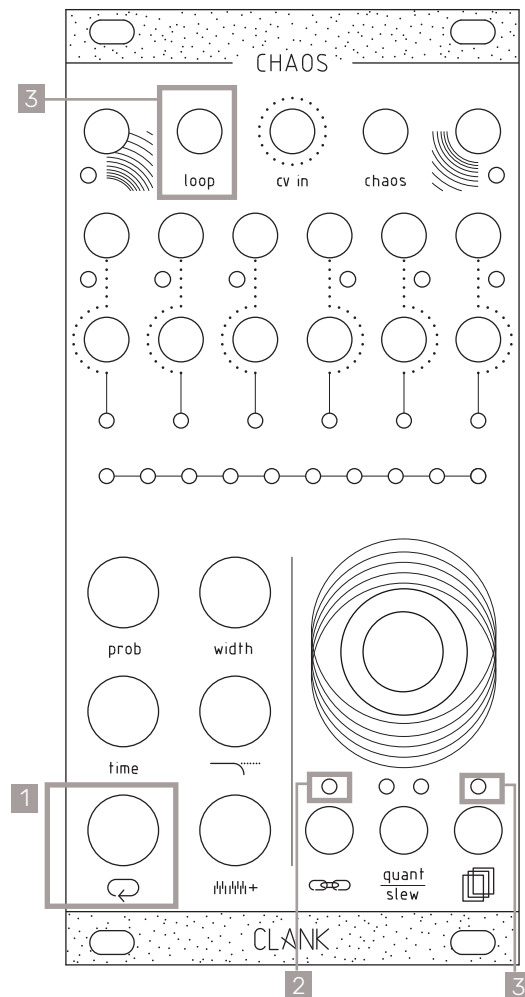
- The loop's *voltage window* modifier value works similarly to probability, and therefore can only be decreased from its original non-looped value
- The loop's *ground transpose* value works similarly to *width*, and therefore can be increased or increased from its original non-looped value keeping the two central LEDs as reference point to the original value.

To reset loop values to their original state hold the *loop button*, and then double tap on the *memory access button*. This way you can easily transpose a loop or modify its timing and return to the initial loop settings in a moment.

Please note that changing the original parameters of the channel while the channel is in loop mode will not alter the loop's starting values, as loop memorizes a state and operates on those values until it's disabled.

8.1. Loop IN. Loop mode can also be activated by sending a gate to its dedicated input [3]. In this case, the eight LED on the input assign menu has to be green.

With this workflow, looping can be even more expressive than just recording. It could be thought of as a pre-determined variance to the whole random generation!

8.2. Loop direction. When in loop mode, the direction of the recorded sequence can be inverted on the fly.

To access this function, hold the loop button: if the sequence is running forward, the LED over the Memory access button will be ON. Viceversa, if it's going backwards, the one over the Input assign button will be lit.

To change direction, simply press the corresponding button .

8.3. Loop counter reset. When in loop mode, the recorded sequence can be reverted back to its initial step to achieve cool live effects or just to understand wich one is the first note.

To do this, hold the loop button and then press the quant slew button. Each press, the looped sequence will restart from its beginning.

8.4. External loop reset. With the latest firmware revision (1.17) looped sequences can now be resetted also with an external gate.

To activate this function go to the channel input assign menu [2] , select the *loop in* LED and then press the encoder untill it turns red.

Now each time a gate is sent to the *loop in* [3] the looped sequence will restart to the first step.

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9. Sequencer

Talking about the workflow, CHAOS has already proven to be an handful device to sketch and create rhythms and sequences on the fly: sometimes you love this ability to quickly create something that has a musical sense, sometimes you prefer to have a way to edit the sequence in a more detailed and traditional way.

That's why we entroduced the new *Edit Mode*.

This new mode (avalaible from firmware revision 1.17) transforms Chaos in a very detailed and powerful sequencer where every single step can be modified with all the parameters present when on *random generation mode*.

9.1. Working principles. First of all*,* to start with this new feature, a channel has to be looped.

Once in *Loop mode*, pressing the encoder [2] will, now, activate the *Edit Mode.*

On the *value bar* [1] a red LED now indicates the step wich is actually played, while the orange one indicates the one you're editing. Rotate the encoder to select the desired step to edit.

Chaos EDIT mode has not a "following" behaviour, so the focus is on the edited step.

Blue LEDs, now, indicates the steps where a gate is generated. "Empty" LEDs inbeetween the looped sequence represent a pause on the gate line.

As in loop mode, when a sequence is longer than 8 steps, two orange LEDs on the right side of the *value bar* will indicate wich page you are in.

To exit from *Edit Mode* just press the encoder.

9.2. Adjusting the note/voltage. Since we aren't in the randomic domain anymore, to adjust the voltage output on each step, press the *Ground Voltage* button [7].

The voltage at the output is shown with yellow LEDs on the value bar [1]. Turn the encoder to lower or increase that voltage.

9.3 Setting the step lenght. When on *edit mode*, variations on each step duration can be made by
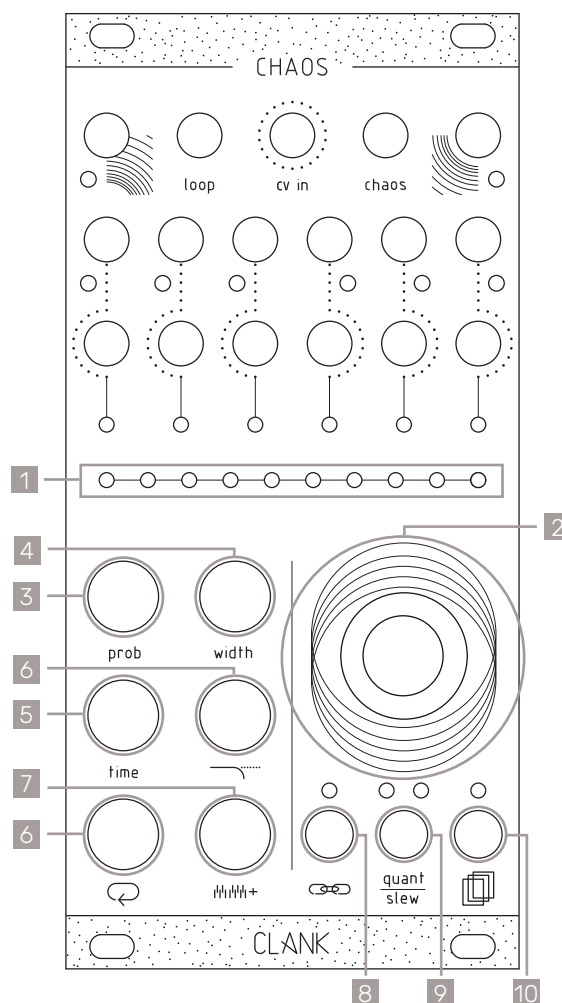
pressing *Time* button [5].

This modifier, In this mode, it's not a divider/multiplier anymore but only sets the step duration.

Step duration lenght is made by one or more *time units*.

To adjust time units lenght simply change the loop div/mult rate by pressing loop[6] + time[5] modifiers toghter.

Creating steps that are shorter than a time unit, can be done with Ratcheting but the note will remain the same inside the same step.

In this case just double tap the *Width* button [4] on

the selected step and select the desired ratchets number.

As in random mode, the voltage output will stay the same for all the ratchets that belong to the same step.

9.4 Adding a pause. Turn the *Probability* control [4] to 0% to add a pause on a certain step. Viceversa, setting it to 100% will make that step happen every time.

If a value inbeewtween 1% and 99% is choosen, a certain degree of randomicity can be added to a precise step.

This is very helpful on creating continue variations on your patterns.

9.5 Note Deviation. This new control called *deviation* has been put in place of the *Voltage window* modifier [6].

Increasing its value will add random variations on that specific voltage each time the step is played.

In this way, keeping the original value as a fulcrum, the higher the *deviation* value the more the new random voltage will be distant from the original one.

When on 0% it wil stay exactly on the choosen voltage/note.

9.6. Editable functions per step. Beside changings made on modifiers [5-6-7], all the other functionalities will work the same of random mode and can be edited individually on each step.

Here is a list of them:

• *Probability*
• *Width and ratcheting*
• *Swing*
• *Slewing and slew amount*
• *Copy and Paste*

9.7. Loop management. When on edit mode adjusting the loop step number works a bit in a different way.

In this mode, indeed, if you increase the loop length the newer steps will be clones of the last one.

Viceversa, if you decrease the steps you will erase them from memory. (i.e. if you decrease loop length to 1 and then increase it to 16 you will have all identical steps).

This is pretty useful if you want to start from zero but with all the steps adjusted to specific parameters.

All the other loop functions can be altered the same also when on *edit mode*. Just press the *Loop* button [6] and the desired modifier togheter, no need to exit from the menu!

Chages will be performed globally on the whole sequence.

10. Chaos function

Every time you press the encoder , Chaos will fire up and the *input assign* LED will blink in purple. Each time every modifier value will be randomized creating a new mood.
Since Chaos' limits are very vast, changes can be quite drastic, that's why *entropy* factor is pretty useful: it represents the percentage of how much the new value can variate from the one you have set. Create subtle differences or completely distant moods.

Entropy can be set independently on each channel or on one or more of each channel's modifiers. To change the channel's entropy, hold down and rotate the encoder [2] CCW to reduce entropy, turn it CW to increase it. The entropy percentage can be visualized on the value bar.

To change a channel modifier's entropy, hold a modifier and the encoder at the same time, then rotate the encoder CCW to reduce entropy, turn it CW to increase it. The entropy percentage can be visualized on the value bar.

When a channel modifier's entropy value is changed it overrides the channel entropy value when chaos is activated. When a channel's general entropy is changed it assigns that value to every modifier equally.

When you need help starting a new part, Chaos function can quickly suggest infinite combinations to choose from. It's like zapping between different styles or moods. Instead, if you're pretty satisfied of what you've created but you need to add some variances to it, a low entropy use of the Chaos function could be the way to go.

10.1. Chaos IN. Chaos function can also be activated sending a gate to its dedicated input [1]. In this case every channel linked to this input will be hit be *Chaos* each time a gate is sent. Individual entropy settings will be keep intact. To assign or avoid this input to a channel , go to Channel settings menu and flip the status of the second LED on the left.

Self-patching a gate out to the Chaos dedicated input [1] will bring you instantly into the magic world of self-generating music. Limiting the variance with low entropy on some channels and setting the modifiers to a preferred position will create a "pseudo-controlled" but still random environment where you set its starting point and
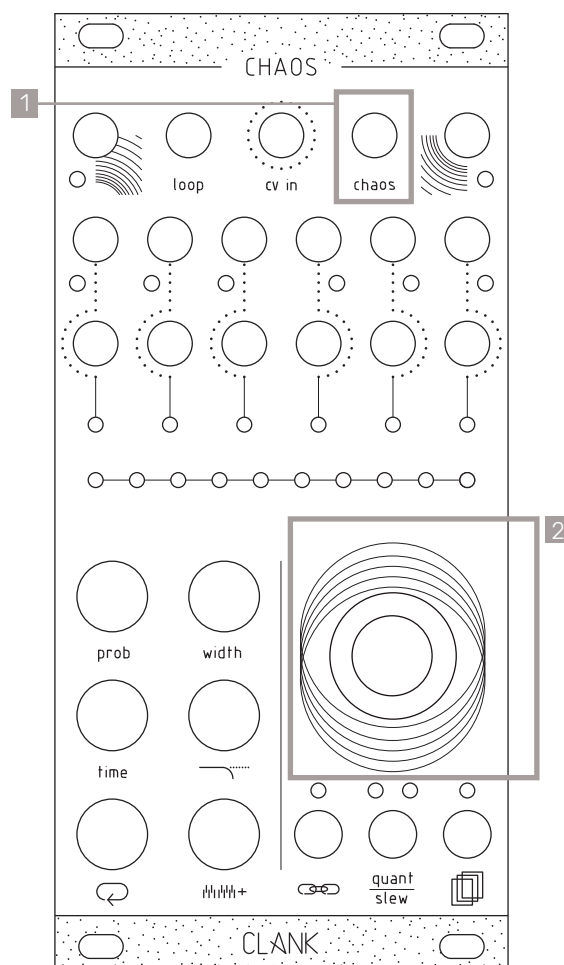
its limits, letting Chaos do the rest.

11. Save/Recall

Ten slots are available for saving.

Hold down the *save/recall button* [1] to access the save/recall menu. The value bar indicates the slots [2].

Turn the encoder to select the slot you prefer.

Press the encoder to save a slot, release the *save/recall button* to load one of the available slots. The white LEDs on the value bar will indicate the already saved slots.

Press the *probability button* [3] to clear the selected slot. Recalling an empty slot will not have any effects on your session.

When saving, an exact picture of what is happening at the moment will be taken and every channel will be saved in its current state: if a channel is looped, the sequence with all its modifiers will also be recorded. If muted, the channel will be saved as is.

Saving and recalling non-looped channels is really useful for modulation or the recreation of a mood based on recorded parameters rather than exact sequences.

11.1. CV in slot recall. This function can be used to scroll beetween the ten saved slots transforming Chaos into a complete sequencing machine.

To achieve that, go to the *Channel settings* menu by pressing the dedicate button, then, rotate the encoder to the third LED on the value bar and then press the knob for few seconds.

The LED color will turn to orange and now this function is activated. Sending a CV from 0V to 5V will move you thru the saved slots with increments of 0,5V each.

Please keep in mind that, this mode is GLOBAL, so it will override all the other channels CV IN setup.

11.2. Automatic slot recall at startup. When saved slots are present, at the startup, Chaos will automatically recall the last saved or used one. In this way it will restart exactly from where it was left the last time before turning it off.
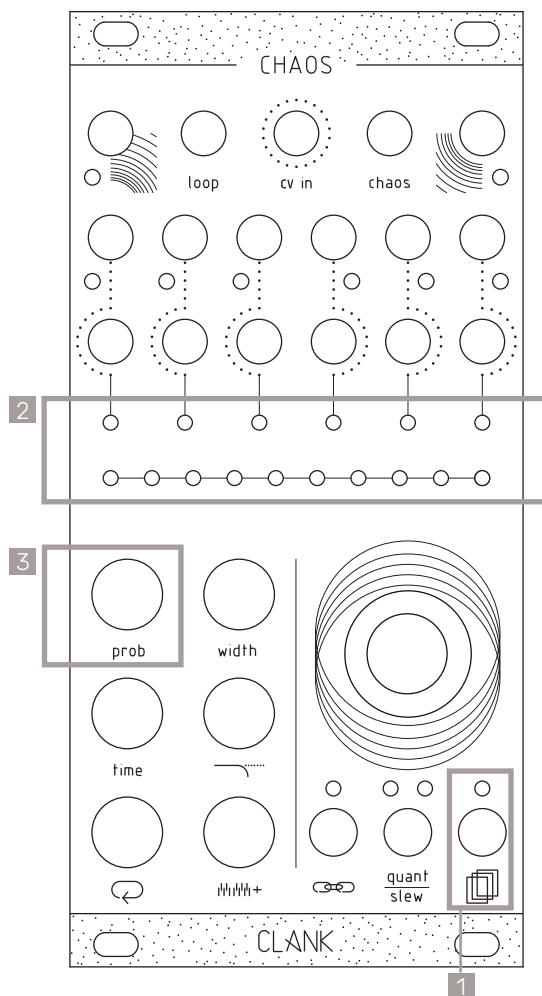
12. Manteinance

12.1 Calibration

Chaos CV outs are already calibrated by factory. If in some way the internal DACs scaling needs to be adjusted, that can be done by following this procedure:

- Hold down the encoder while powering up the module.
- After the initial LED transition they all will turn purple.
- Now you can release the encoder and the first channel LED will be selected.
- Connect the channel CV output to a multimeter.
- Turn the encoder untill you read a steady 8V voltage.
- When the first channel is calibrated, press the encoder and it will skip to the next channel. Repeat that for every channel and when the last one is set Chaos will go back to standard operation mode.

12.2 EEPROM erasing

Pressing the probability button while on the calibration process will erase Chaos EEPROM. All the savings will be then erased.

ATTENTION: When upgrading from Firmware v1.0 to v1.1, erasing the EEPROM is mandatory! Since saving slots will be allocated in another region of the memory, trying to load them will , otherwise, make the new FW crash.

12.3 Firmware Update (Windows and Mac users)

To update your Chaos just follow these easy steps:

- First, go to https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers and click on the Downloads tab. Download and install the "CP210x Driver" compatible with your device.
- Next, go to https://www.st.com/en/development-tools/stm32cubeprog.html#get-software and download and install the "STM32CubeProgrammer" file compatible with your device. [Please note that to download the software you will have to have an st.com account or leave your name and email address. There are no fees to register and download.]
- Finally, go to https://www.clank.eu/chaos and download the firmware .bin file from the link at the bottom of the page.

IMPORTANT: At this point, please make absolutely sure that your Chaos module is NOT attached to any kind of power source.

- Connect the micro-USB end of a micro-USB/USB cable to Chaos. While holding down the BOOT button [next to the micro-USB port on the backside of the module], insert the USB end of the cable into your computer. Once this is done you may release the BOOT button.
- Next, open the Cube programmer. Select UART, and the correct port. On MAC devices it should appear as "cu.SLAB_USBtoUART". On Windows it is usually the COM port with the highest number. If the port should not be listed, try refreshing the port list. If this doesn't work as well, try repeating the boot process.

For MAC users with MacOS 10.13 (High Sierra) or later, installing requires some further actions:
Even if passed by MacOS gate keeper, it won't launch. To avoid that, go to the downloaded app (show package content>contents>macos>SetupSTM32CubeProgrammer-2_8_0_macos) and launch it with Terminal. At this point, installation should run fine.

- Once you have selected the correct port, click on "Connect". Your device should be recognized immediately.
- Next click on "Open file". Find the firmware's .bin file and open it. Click on "Download" and the firmware should be installed within seconds. Click on "Disconnect" and you're all done.

12.4 Firmware Update (Linux users).

This is the guide as posted by "drfiredesign" on ModWiggler Chaos page. While we can't verify it, we would like to thank him for his big contribute, and if you find it useful, go on the discussion page and say thanks to him! (https://modwiggler.com/forum/viewtopic.php?t=241187&start=125)

• Check if your kernel was already distributed with the appropriate drivers:

CODE: SELECT ALL

$ locate cp210
/usr/lib/modules/5.11.0-7614-generic/kernel/drivers/usb/serial/cp210x.ko
/usr/lib/modules/5.11.0-7620-generic/kernel/drivers/usb/serial/cp210x.ko
/usr/lib/modules/5.11.0-7633-generic/kernel/drivers/usb/serial/cp210x.ko
/usr/lib/modules/5.13.0-7614-generic/kernel/drivers/usb/serial/cp210x.ko
/usr/lib/modules/5.13.0-7620-generic/kernel/drivers/usb/serial/cp210x.ko
/usr/lib/modules/5.15.23-76051523-generic/kernel/drivers/usb/serial/cp210x.ko
/usr/lib/modules/5.15.5-76051505-generic/kernel/drivers/usb/serial/cp210x.ko
/usr/src/linux-headers-5.11.0-7614-generic/include/config/usb/serial/cp210x.h
/usr/src/linux-headers-5.11.0-7620-generic/include/config/usb/serial/cp210x.h
/usr/src/linux-headers-5.11.0-7633-generic/include/config/usb/serial/cp210x.h

• If you have any output ending in cp210x.h or cp210x.ko you should be fine to proceed. Otherwise you will need to sign up for an account on Silicon Labs as they do not provide Linux downloads without actual account creation. There are no fees to register and download. Click in the link in the previous Mac and Windows section to get started.
• Device Programmer: Download and install the STM32CubeProgrammer version compatible with your device. Please note that to download the software you will have to have an st.com account or leave your name and email address.
• Firmware Files: Finally, go to https://www.clank.eu/firmware-download and download the firmware .bin file from the appropriate link.
• Connect your module:

IMPORTANT: At this point, please make absolutely sure that your Chaos module is NOT attached to any kind of power source.

• Connect the micro-USB end of a micro-USB/USB cable to Chaos. While holding down the BOOT button [next to the micro-USB port on the backside of the module], insert the USB end of the cable into your computer. Once this is done you may release the BOOT button.

NOTE: You need to make sure your user is part of the appropriate usergroup in order to connect to your device. Once you have connected your device, check for the owner group of the device you have connected. This is probably going to be the dialout group, but your distro may be different.

CODE: SELECT ALL

$ ls -la /dev/ttyUSB0 | cut -d' ' -f4
dialout

• If you are already part of the appropriate group it will be listed in the output of the groups command:

CODE: SELECT ALL

$ groups
username dialout sudo plugdev

•

- If you do not see the same group, you need to add yourself to that group and then restart your computer. You cannot just log out and back in. To add yourself, use the following command:

Be very careful with this command! You need to be POSITIVE to include -a or you will remove yourself from the sudo group and will not be able to install anything.

CODE: SELECT ALL

$ sudo usermod -a -G dialout username

- Make sure to replace dialout with whatever group your system reports is the owner of your ttyUSB device. Finally, if you did change your groups, you will need to restart your computer. You cannot just log out and back in.
- And seriously, if you do not include -a you are going to completely lock yourself out of your system. You can't install updates, you can't change anything not directly owned by your user, you can't add yourself back into sudo. I did this one time and I just simply had to wipe my computer do a fresh install. I do not recommend it.
- Writing the Firmware: Open the STM32CubeProgrammer application. Linux users may need to open it from the command line:

CODE: SELECT ALL

$ ~/path/to/unpacked/archive/STMicroelectronics/STM32Cube/STM32CubeProgrammer/bin/ STM32CubeProgrammer
Above the right hand panel, select UART, and the correct port. The port will be named according to your Operating

- System: on Linux devices it should be a ttyUSB port and an associated number, for example:

CODE: SELECT ALL

ttyUSB0

- If a port is not listed, try refreshing the port list. If this doesn't work, unplug the USB cable and try repeating the boot process.
- Once you have selected the correct port, click on "Connect". Your device should be recognized immediately. Next click on "Open file". Find the firmware's .bin file and open it. Click on "Download" and the firmware should be installed within seconds. Click on "Disconnect" and you're all done.

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