# Noodlebox

Noodlebox is a self-contained music sequencer which can control voltages (CV), gate pulses and MIDI data.

Noodlebox is intended for jamming and creative experimentation within a loop based approach. U

# General

Noodlebox has many functions but quite a simple control panel. We have tried to avoid excessive menu diving by making use of button combinations to access functions. Most functions are accessed using eight buttons and a single knob.

A click means to press and immediately release a single button

A key combo of keys A+B means that key A is held down and key B is pressed

# Get to Know Your Noodlebox

Power up the Noodlebox by plugging in the power supply and holding the ON button for 2-3 seconds.

Turn it off again by pushing the OFF button. This is the correct way to shut down the Noodlebox; it allows the current state of your session to be saved so that you can be back where you left off next time you power up. If you just pull the plug you will lose your session state.

TIP: If you really don’t care about restoring your session, just hold the CV button next time you power up. Holding CV when you turn the Noodlebox on means it starts with a clear session.



When you start a new session, the screen looks like this when you power up

Xx

Lets get to know this screen:

The screen has 32 columns and 16 rows. Each column represents a single step in a musical pattern which can contain up to 32 steps. Therefore you can see every step position on the display, which does not scroll horizontally.

The line along the bottom is the loop ruler. It defines the start and end points of the part of the pattern that is playing (the “loop window”). While 32 steps is the maximum length of the pattern, we can use fewer than that if we like, and when we start a new session, the loop ruler contains just the first 16 steps. Every fourth step is shown in medium brightness, which helps when visually counting steps. The active step (the one which is playing) is indicated on the loop ruler in full brightness.

To the left of the display is a vertical line 13 rows high. This is the cursor, which we use for the various editing functions. Turn the encoder knob and you’ll see the cursor move.

The top 13 rows of the display provide a scrolling window where we can see the data points (e.g. musical notes) that we have entered into the pattern. Each step of a pattern can contain just one data point. This makes Noodlebox a fundamentally monophonic sequencer (although see later..)

There are also two horizontal dotted lines that appear in these rows. These are octave markers and indicate each “C” note when in pitch editing modes. Noodlebox allows scaled editing of pitch (where each octave takes up 7 rows) and chromatic (where each octave takes 11 rows). In a new session we are editing in scaled mode (the scale being C major/ionian)

Now let’s add a note into the pattern: Use the encoder to move the cursor somewhere within the loop window and then hold down the CV button and turn the encoder. You will see a medium brightness point appear just above the loop ruler, and a horizontal line that you can move up and down by moving the encoder. Also, a note name (e.g. “C1”) is shown

The point which has appeared above the loop ruler is a “trig”. It shows that a gate pulse and/or a MIDI note will be generated at this point in the pattern. The horizontal line indicates the pitch of the note, but why is this a line rather than just a single point? the reason is that the CV output will maintain this voltage whether or not there is a trig. However if you release the CV button and move the cursor, you will see that the note we actually entered with the trig is shown brighter than the rest of the line. This brighter is a “data point” (one we actually entered) while the dimmer points that continue the line are “fill points” (showing what the CV output will be at that point). As you will see later we can work with data points, fill point and trigs independently.

Press the RUN button to start the pattern playing. You should now see the active step counting along the loop ruler and jumping back to the start. You’ll also see the current data or fill point being highlighted. If you connect up the CV socket “A” and Gate “1” to your synth you should have it playing your single note pattern. Get noodling!

If you want to use the MIDI output, click the LAYER button to show the menu. Use the encoder to scroll down to the entry MID NONE and hold the CV button while turning the encoder to select NOTE. Now change the MIDI channel if needed. Press the LAYER button to return to the main display.

# Layers

A Noodlebox session is made of four **layers**. Each layer may be used like a self-contained step sequencer, with its own pair of CV/gate outputs. All layers are clock synced to each other, but otherwise can be used quite separately.

Each layer can have up to four **pages**. A page is what you see on the Noodlebox screen and it contains up to 32 **steps**. Pages within a layer can be selected individually for editing and playback, or they can play in consecutive order (allowing you to make sequences up to 128 steps) or you can arrange them to play in a specific order.

Each step has a musical value corresponding to its vertical position. This value can be a specific note pitch or generic modulation value and can be mapped to a voltage or to MIDI data. However

A CV value is always present for every one of the 32 steps on any page. Some of these values are real data entered by the user, which we’ll refer to as **data points**. The other values are **fill points** which are added automatically to steps which contain no user-entered data. These fill points are shown in a dimmer colour than the data points.

Fill points can be generated in the following ways

* **Pad** – Each data point is padded out with fill points of the same value, until the next data point.
* **Interpolated** – Data points are joined by diagonal lines of fill points
* **Off** – All fill points have a value of 0

Each step contains both CV and gate information. The CV component always has a value between 0 and 127. How this is displayed and edited and how it is mapped to the actual output voltage depends on other parameters that are described below.

Each layer has an **edit mode** determines how steps are displayed and edited within the page

* **Pitch** – step values are presented as musical notes (e.g. C#2) based on the MIDI note equivalent of the data value. The display allows editing based on chromatic scale (all notes are visible and one octave takes 11 display lines) or to the selected musical scale (notes are force to scale points for viewing a one octave takes 7 display lines)
* **Modulation** – step values are presented numerically (e.g. 001) and the entire 0-127 range is visible on the display (so a single display line covers multiple values)
* **Offset** – step values are presented numerically from -63 to +63

Changing between editing modes will also set some default settings

When the sequencer is running, each layer outputs CV and gate information on its own CV and gate socket.

In addition, a layer can also provide CV input to the next layer (in numeric order) via the next layer’s **mix** setting. This mixing can happen in one of the following ways

* **None** – The previous layer output CV is not used
* **Add** – the CV output from the previous layer is added to this layer (prior to scale quantization)
* **Mask** – The layer outputs voltage information from the previous layer, with the exception of data points (not fill points) which are played, ‘masking’ the data at that point.
* **Both** – Rather like the Mask mode, but when a data point is present the CV output from the data point is added to the CV from the previous layer. Otherwise the previous layer CV is played unchanged

Mix mode is not available for layer 1 since there is no previous layer to provide input.

A layer can also be configured to send MIDI note or controller information

Pitch Layers send MIDI notes

# Gates

Each step has the following kinds of gate information attached to it

* **Gate** - these are points that create a positive edge on the gate output associated with the layer. If the gate is already open, it will quickly close and reopen at a trigger point (i.e. retrigger action). A per-layer setting allows gates to have a fixed duration (as a short trigger pulse or a percentage of full step time) or to be held open until the next gate.
* **Tie** – tie points can be used to hold a gate open for the full duration of a step without creating a new trigger (assuming that the gate was already open – if the gate was closed it will open).

Tie points on consecutive steps will be joined together into a single long tie.

If gate and tie are present at the same step a trigger pulse will be generated but the gate will be held open for a full step.

Tie points can also be used to selectively “glide” or slew CV between different values, based on the **slew** setting for the layer. In this case the voltage will glide between the previous step output and the new one. This glide will take place over the full step duration of the current step, with the step CV only being reached at the end of the step.

**When sending MIDI notes**, a tie without a gate results in legato play (second note on message is sent before first note off message) provided that the previous step is also tied or the gate length is 100%. If the MIDI note has not changed then the playing note is simply extended without being retriggered.

* **Retrig** – a gate or tie point can be set to retrigger multiple times during the duration of a single step. Retrig can be set from 0 for no retrigger, or to a number 1-15. This number is based on the sixteenth fraction of the full step period. The following diagram shows the number and distribution of retriggers during a single step period. After each retrigger, the gate stays open according to the duration setting



To set the retrig for a gate press GATE + LOOP. All gate points with nonzero retrig settings are shown in a bright colour. Continuing to hold these keys while turning the encoder sets the retrig for the selected gate point.

* **Random**– an element of chance can be attached to a gate point, which allows **both the gate point and the associated CV point** to be ignored (as if it they did not exist).

Probability can be set to 0 (always play) or to a number between 1-15 where 1 is least likely to play (on average 1 time out of 16) and 15 is most likely (average 15 times out of 16).

To set the probability for a gate press GATE + RAND. All gate points with nonzero probability settings are shown in a bright colour. Continuing to hold these keys while turning the encoder sets the probability for the selected gate point.

* **MIDI accent** **–** if a layer is sending out MIDI notes, it is possible to modify the MIDI velocity on a gate by gate basis. The MIDI accent can be set to - - (No accent) or LO, ME, HI (increasing levels of velocity accent). Accent is a multiplier applied to the layer velocity.

To set the probability for a gate press GATE + CV. All gate points with accent settings are shown in a bright colour. Continuing to hold these keys while turning the encoder sets the accent for the selected gate point.

Only MIDI notes are affected by accents. The setting has no affect on the gate output voltage.

# MIDI Output

MIDI notes generated by a layer are based on the CV value (0-127) generated by the layer. Since the CV might not be a whole number/exact note pitch (e.g. due to odd scalings and mix with other layer data) the MIDI note is the closest whole note to the CV value.

The layer can also generate pitch bend messages to represent the partial note component of the CV value. For this to work, the layer must be configured with the pitch bend range of the instrument being played. By default this is 0 meaning no pitch bend messages will be sent.

If pitch bend is being sent, steps that have ties but not triggers will be pitched based on pitch bend alone (from the previous note) if possible. If the new pitch point is out of range then a new MIDI note is triggered using legato play and pitch bend is reset according.

# Editing Pages

Each layer comprises of 4 pages (A, B, C, D) of 32 steps each

**Select a page:** To view a specific page, hold down the PAGE button then press one of the first four buttons (CV, GATE, CLONE, CLEAR) to select page A, B, C, D respectively. The display switches to the selected layer and also shows the layer number and page letter (e.g. 2B). You can simply press and release PAGE at any time to view the layer/page for the currently shown page.

**Create pages:** Initially a layer has just page A defined. If you select a non-existent page, the data from the last valid page will be copied to the newly selected page slot and any other slots between before the new page is viewed (so if page A is visible and you select page C, the current contents of page A are copied to pages B and C)

An alternative way to create new pages is to hold PAGE and turn the knob to the right until all the required pages are listed (e.g. A -> ABC). The data from the last valid page will be copied into any newly created page slots.

**Remove pages:** Holding PAGE and turning the encoder to the left removes pages (e.g. ABCD -> AB) when the button is released. If the currently viewed page is removed, the highest valid page becomes the current page.

Tip: You can quickly copy page A into pages B,C,D to replace the current contents of those pages with the sequence PAGE+(encoder to left), release button, PAGE+(encoder to right)

**Clear page contents:** All CV and gate points can be cleared for a page, and loop points set to their 16 step default, by holding CLEAR + PAGE and then turning the encoder to the right to accept the SURE? confirmation

**Copy page contents:** Usually the fastest way to copy pages within a layer is via the “remove and recreate” process described above. However if you want to copy pages between layers, or (for example) copy page A to page D without affecting pages B and C you hold CLONE + PAGE and turn the encoder to select the destination page (which can be in a different layer). To cancel the operation turn the encoder left until destingation ?? is shown. If a destination page is selected that does not exist, the last valid page on that layer is copied into any newly created pages on the target layer (so copying 1A to 3C would also result in page 3A being copied to 3B if layer 3 had only page A existing)

# Playing pages

Pages are typically used to set up variations of a pattern but they can also be chained together to allow creation of a pattern up to 128 steps

Normally all pages on a layer share the same loop points. If preferred, each page can have loops points defined individually (Press FN + LOOP to set LOOP:PAG)

Pages can be played back in a “Foreground” (FGD) or Background “(BCK)” mode.

In **foreground mode**, the page that is playing for a layer is always the page that is being viewed for that layer. If you switch to a new page, that new page will immediately play from the current step position (unless outside the loop points for the new page). If you switch to a new layer, playback of the previous layer continues on the selected layer.

In **background mode** it is possible to have one page playing while you view or edit a different page on the same layer. This mode also allows you to sequence the playback of layers

If you press PAGE+ (A/B/C/D) you will immediately switch to the new page for editing, however this does not cause that page to play.

Instead, playback will advance through the defined pages for the layer in sequential order (e.g. A, B, C, D)

Each time a new page starts to play in background mode, the background playback indicator will appear briefly in the lower right corner of the display. The indicator has four segments representing pages A, B, C, D as indicated below



Segments for those pages that are defined for the layer are lit up, with the page that has just started playback shown brighter. The example shows that page B has started playing in a set of A, B, C

While the layers are played back sequentially by default, it is possible to change this so that only one page plays repeatedly, or multiple pages play in an arrangement.

To cue up a page for playing, press LOOP + (A/B/C/D). The new page will play only when the currently playing page has reached its end of loop point.

To cue up multiple pages, keep LOOP held down and press the A/B/C/D buttons to specify an arrangement of up to 16 pages. This can include repetition – for example A, A, B, C. After the LOOP button is released, this sequence starts to play when the current page reaches end of loop.

The next time LOOP + (A/B/C/D) is pressed, the new page(s) will replace the current arrangement.

To clear the cued page list (so that the currently viewed page starts to play when the previous page ends) press LOOP+PAGE

To go back to sequential playback of pages press LOOP + LAYER. This will clear any selected arrangement

These LOOP combinations have no effect in foreground mode

# Editing Layers

# Layer Menu

|  |  |
| --- | --- |
| **TYP**  Layer type | **PTCH** : Pitch Layer  **MOD** : Modulation Layer  **OFFS** : Offset Layer |
| **DUR**  Gate duration | **01:** Trigger pulse  **02-15:** 1/16 fraction of step duration  **16** : Full step duration |
| **RAT**  Step rate | **1, 2D, 2, 4D,2T, 4, 8D, 4T, 8, 16D, 8T, 16, 16T, 32:** Musical step division |
|  |  |
| **MIX**  CV mix with previous layer  *Only for layers 2,3,4* | **OFF** : No mix  **ADD** : CV added at all times  **MASK** : CV replaced at data points  **BOTH** : CV added at data points |
| **VLT**  CV range | **1,2,3,4,5,6,7,8 :** Volts at full CV value (127)  **1VO** : Treat as note, scale as 1V/oct  **1.2V** : Treat as note, scale as 1.2V/oct  **HZV** : Treat as note, scale as Hz/volt |
| **QUA**  CV quantization | **OFF** : No quantization of CV  **CHRO** : Treat as note, quantize chromatically  **SCAL :** Treat as note, force to selected scale |
| **SCA**  musical scale: diatonic mode  *Global setting* | **IONI, DORI, PHRY, LYDI, MIXO, AEOL, LOCR :**  Diatonic mode, note that IONI (Ionic) is major scale, AEOL (Aeolian) is minor scale |
| **ROO**  musical scale: root note  *Global setting* | **C,C#,D,D#,E,F,F#,G,G#,A,A#,B**  The root note for the selected diatonic scale |
| **OFS**  CV offset | **-5 through +5**  Volts to add or subtract |
| **SLW**  CV slew | **OFF** – no slew applied  **ON**  - slew applied to all steps  **TIES** – slew applied to steps with tied gates |
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| **MID**  MIDI output type | **NONE** – No MIDI output from the layer  **NOTE** – CV/gate mapped to MIDI notes  **CC –** CV mapped to MIDI CC |
| **CHN**  MIDI output channel  *Only in mode MID ≠ NONE* | **1-16**  MIDI channel for output |
| **VEL**  MIDI note velocity  *Only in mode MID = NOTE* | **0-127**  MIDI note velocity |
| **BND**  MIDI pitchbend range  *Only in mode MID = NOTE* | **OFF** – Do not create MIDI pitchbend messages  **1-12** - Send MIDI pitch bend messages for fractional notes CV based on target semitone range |
| **CC**  MIDI controller number  *Only in mode MID = CC* | **000-127**  MIDI continuous controller number |
| **SMO**  MIDI controller smoothing  *Only in mode MID = CC* | **OFF** – do not interpolate CC output  **ON** – interpolate CC output |
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| **CLK**  Clock source  *Global setting* | **INT** – internal BPM clock  **MIDI** – external master clock via MIDI  **EXT** – external master pulse clock |
| **BPM**  Internal clock tempo  *Only in mode CLK=INT*  *Global setting* | **030-300**  Tempo of internal clock |
| **IN**  Pulse clock input rate  *Only in mode CLK=EXT*  *Global setting* | **32, 16, 8, 4, 24PP**  Rate of incoming master pulse clock |
| **OUT**  Pulse clock output rate  *Global setting* | **32, 16, 8, 4, 24PP**  Rate of pulse clock output |
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| FN + CV | Row spacing for editing CV values in pitch mode  **ROWS:CHR** – Each row is a chromatic scale point and there are 12 rows per octave  **ROWS:SCA** – Each row is a diatonic scale point (according to the selected scale) and there are 7 rows per octave. Use fine adjust to select CV values which are not in the selected scale |
| FN + GATE | Automatic gate points  **TRIG:MAN** – gate points must always be created manually  **TRIG:AUT** – when creating a new data point, a gate point is added automatically |
| FN + CLONE | How fill points are derived  **FILL:PAD** – fill points maintain the value of the previous data point  **FILL:INT**– fill points interpolate between data points  **FILL:0** – fill points are always value 0 |
| FN + CLEAR | Grid visibility in pitch mode  **GRID:HID** – grid is hidden  **GRID:SHO** – grid is shown |
| FN+LOOP | Whether loop points are defined per layer or per page  **LOOP:LAY** – all pages in a layer have same loop points  **LOOP:PAG** –pages in a layer have own loop points |
| FN+PAGE | Page playback mode  **PAGE:FGD** – foreground page is always playing  **PAGE:BKG** – play in background; edit and playback pages may be different |
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# Mixing Layers

A fun feature of the Noodlebox is the ability for layers to modulate each other’s outputs via the MIX feature. This enables you to do things like sequencing the transposition of a single pattern over several bars, or mixing two melody lines together. It also allows for a lot of experimentation and the creation of complex unpredictable patterns.

All type of layers (pitch, modulation, offset) can be mixed together. Layers 2,3,4 can optionally take as an input the next lower numbered layer and either

* Output the sum of the previous layer’s output and their own sequenced CV (ADD mode)
* Output either the previous layer’s output or their own sequenced CV, depending on whether the sequence CV is a user-entered data point (MASK mode)
* Output either their own sequenced CV or the sum of previous layer’s output and the sequenced CV, depending on whether the sequenced CV is at a user-entered data point (BOTH mode)

If a voltage scaling (1-8V range) is selected for a layer, it is applied to the CV value before any mixing. For these selections, the CV value (0..127) is scaled such that there are 12 points per octave. For example, a CV value of 78 is internally scaled to 12\*(78/127) = 7.37

Any selected offset is then applied. Each voltage offset point equates 12 being added or subtracted from the CV value.

If a quantization is selected, the CV value is rounded to a whole number and, if quantization to scale is selected, the CV is forced into the selected scale, and into the valid range 0..127 by adding or subtracting whole octaves.

The resulting CV is then made available to the next layer and also to the CV and MIDI outputs for the layer:

* For pitch modes (V/Oct and Hz/Volt modes) the CV value is scaled appropriately and is forced into the voltage range of the analog output (0-8.192V) by adding or subtracting octaves (12 CV points).
* For non-pitch modes (1-8V range) the output is “clamped” (clips at selected voltage value)
* CV slew (glide) is added just prior to the voltage output and does not affect the output that is passed to the next layer, or the MIDI output
* The output is passed to the next layer prior to clamping
* For MIDI notes the CV value is forced into the 0..127 range by adding or subtracting octaves. MIDI notes are only sent for a CV value when a gate is present at the same step.
* For MIDI CC the CV value is clamped into the 0..127 range.



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| CV | Click: show value  Encoder: Edit value |
| CV+GATE | Encoder: fine adjust value |
| CV+CLONE | Encoder: scroll display |
| CV+CLEAR | Encoder: horizonal shift |
| CV+RAND | Encoder: vertical shift |
| CV+LOOP |  |
| CV+PAGE | Press – auto scroll |
| CV+LAYER |  |
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| GATE | Click: Toggle gate point  Encoder: toggle tie point |
| GATE+CV | Press – show velocity adj  Encoder: Set midi velocity |
| GATE+CLONE |  |
| GATE+CLEAR |  |
| GATE+RANDOM | Press – show probability points  Encoder: Set chance of gate point |
| GATE+LOOP | Press – show retrig points  Encoder: Set retrig of gate point |
| GATE+PAGE |  |
| GATE+LAYER |  |
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| CLONE | Click: set clone source  Encoder: clone values |
| CLONE+CV | Encoder: clone cv |
| CLONE+GATE | Encoder: clone gate |
| CLONE+CLEAR |  |
| CLONE+RAND |  |
| CLONE+LOOP |  |
| CLONE+PAGE | Encoder: select destination |
| CLONE+LAYER | Encoder: select destination |
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| CLEAR | Click: clear at current location  Encoder: clear multiple locations |
| CLEAR+CV | Encoder: clear cv |
| CLEAR+GATE | Encoder: clear gate |
| CLEAR+CLONE |  |
| CLEAR+RAND |  |
| CLEAR+LOOP |  |
| CLEAR+PAGE | Encoder: confirm clear of current page |
| CLEAR+LAYER | Encoder: confirm clear of current layer |
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| RANDOM | Click: jump to a random point in the layer |
| RANDOM+CV | Click: Randomize cv settings at step  Encoder: Randomize cv settings at multiple steps |
| RANDOM+GATE | Click: Randomize gate settings at step  Encoder: Randomize gate settings at multiple steps |
| RANDOM+CLONE |  |
| RANDOM+CLEAR |  |
| RANDOM+LOOP | Encoder: Confirm Randomize loop points |
| RANDOM+PAGE | Encoder: Randomize page points incrementally |
| RANDOM+LAYER | Encoder: Confirm randomization of entire layer |
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| LOOP | Click: Set play position to current page and step  Encoder: Change loop points |
| LOOP+CV | Cue page A for playback in background mode |
| LOOP +GATE | Cue page B for playback in background mode |
| LOOP +CLONE | Cue page C for playback in background mode |
| LOOP +CLEAR | Cue page D for playback in background mode |
| LOOP+RAND |  |
| LOOP+PAGE | Clear page sequence in background mode |
| LOOP+LAYER | Sequence all pages in background mode |
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| PAGE | Click: identify  Encoder: Set page range |
| PAGE+CV | Select page A for editing |
| PAGE +GATE | Select page B for editing |
| PAGE +CLONE | Select page C for editing |
| PAGE +CLEAR | Select page D for editing |
| PAGE+RAND |  |
| PAGE+LOOP |  |
| PAGE+LAYER |  |
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| LAYER | Click: menu |
| LAYER+CV | Click: Select layer 1 for editing |
| LAYER+GATE | Click: Select layer 2 for editing |
| LAYER+CLONE | Click: Select layer 3 for editing |
| LAYER+CLEAR | Click: Select layer 4 for editing |
| LAYER+RAND |  |
| LAYER+LOOP |  |
| LAYER+PAGE | Click: Mute/Unmute later |
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| RUN | Click: Start / Stop |
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| FN |  |
| FN+CV | Encoder: Toggle pitch mode |
| FN+GATE | Encoder: Set auto gate when CV point edited |
| FN+CLONE | Encoder: Toggle data fill mode |
| FN+CLEAR | Encoder: Toggle grid |
| FN+RAND |  |
| FN+LOOP | Encoder: Toggle loop per layer |
| FN+PAGE | Encoder: Set page advance mode` |
| FN+LAYER |  |
| FN+RUN |  |
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Randomize

Holding RAND and turning the encoder clockwise progressively corrupts the existing data on a page. Turning the encoder anticlockwise undoes the same, such that it is possible to get back to the original pattern

When RAND is released, the pattern returns to its original data. However if you press PAGE, the change is made permanent

RAND+PAGE initialises a page to random data

RAND+LAYER initialises all pages on a layer to random data

RAND+LOOP randomizes the loop points (for all layers if loop points per layer is active)