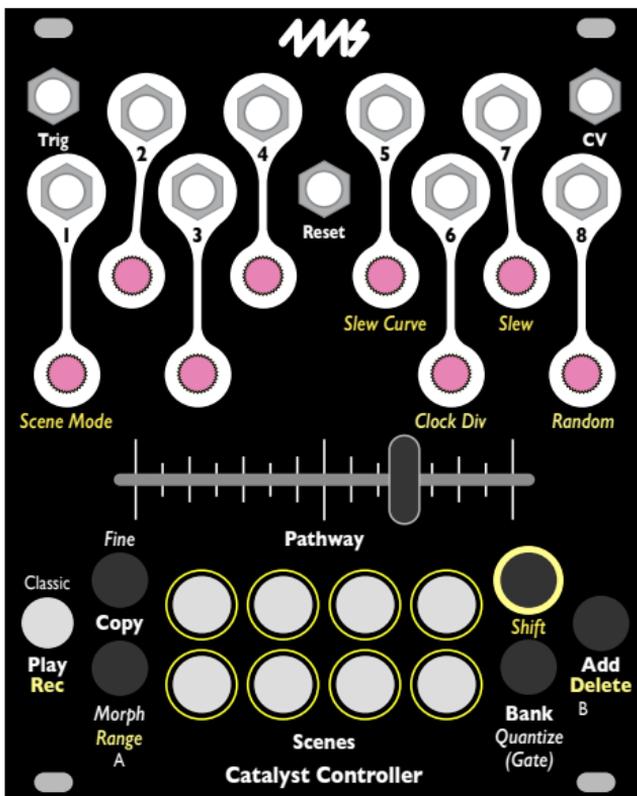


Catalyst Controller



4ms Company

User Manual 1.3 — July 1, 2024

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Overview

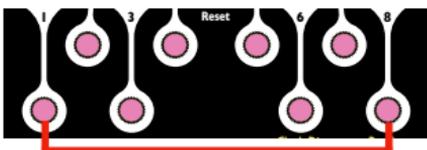
The **Catalyst Controller** is a macro controller with eight precision CV outputs and a responsive crossfader to morph between scenes.

- Eight output channels, each can be CV or Gate
- Arrange scenes into pathways of up to 64 scenes
- Smooth, responsive crossfader morphs from scene to scene along the pathway
- Set **Slew** (lag) to limit how fast scenes can change
- Adjustable **Morph** time per output
- Control crossfading with an external CV
- Record and playback up to 10 seconds of CV and crossfader motion
- CV outputs can be set to -5V to +10V maximum, or limited to +/-5V, +5V, +3V, or +1V
- CV outputs can be un-quantized (sub-1mV resolution), or quantized to common scales
- Randomization of channel values/gates
- Copy/paste scenes
- Classic Bank emulates legacy A/B crossfading
- Blind mode allows setting up a scene while another scene is active
- Based on the original Catalyst module from Emblematic Systems

Quick Explanation



Channel Outputs



Knobs

Red=neg. Off=0V Blue=pos.
Green=Gates



Crossfade Scenes



Scene Select

buttons are lit, both are active and the outputs will be a crossfade between those two scenes. Moving the crossfader or applying CV changes this crossfade. Holding down a **Scene** button makes that scene active.

Channels

There are eight output channels, each one has a CV output jack.

Knobs

The knobs control the output levels on each jack for the active scene. Hold down **Fine** while turning to change by small amounts.

Crossfader

The crossfader fades the outputs from scene to scene along a “pathway” (see [page 7](#)).

Scenes

A scene is a snapshot of all eight channels' output levels. The active scene's **Scene** button will be lit up, and its values will be present on the output jacks. If two **Scene**

Channels

Each of the eight channels has an output jack and a knob. By default, all channels will output CV (see *Channel Modes*, [page 12](#)). When outputting CV, turning the knob will adjust the jack's output level. The knob will change color and brightness to indicate the level present on the jack. Blue is positive voltages, red is negative voltages and off is zero volts. The lights get brighter the farther away from zero a voltage gets. The level that you set with the knob is stored in the active scene. If you are crossfading between two scenes, then the level on both scenes will be changed.

Each click of the knob changes the level by a semitone, or about 83mV. If you hold down **Fine** while turning a knob, the level will change by 4 cents, or about 4mV. If you hold down **Fine** and **Morph**, the level will change by octaves, or 1.00V per click.

The output level can be adjusted from -5V to +10V. You can limit this range if you want (see *Range* on page 16). Channels can output gates instead of CV, see *Channel Modes*, [page 12](#) for more information. You can also adjust the crossfade curve for each channel (see *Morph*, [page 17](#)), and choose a scale to quantize to (see *CV Quantization*), [page 12](#)).

Pathways and Scenes

Scenes

A scene is a snapshot of each channel's output level. If you connect the **Catalyst Controller** outputs to various places in your modular patch, you could think of a scene as a or “preset” or a particular sound in your patch.

Whichever **Scene** button is lit indicates which scene(s) are active. If more than one **Scene** button is lit, then the channel outputs will be a crossfade of those two scenes, with their relative presence in the mix represented by their relative brightnesses.

Normally, pressing a **Scene** button will make that channels output that scene for as long as you hold down the button. When no **Scene** button is pressed, the outputs will be whichever scene or mix of scenes is selected by the crossfader on the current pathway.

There are also two other button modes: Blind Mode and Latch Mode that let you view and edit a scene without changing the outputs, or change to a scene without having to hold the button down. See *Scene Button Modes* on [page 20](#).

Pathway

A pathway is two or more scenes that you crossfade between. When you first turn on a new **Catalyst Controller**, or after a factory reset, a pathway with scenes 1 and 8 is automatically loaded. As you move the crossfader back and forth, the button lights will fade between scenes 1 and 8. The output jacks will also fade their voltages and the knobs will fade their colors between the levels set for these two scenes.

Adding a Scene

Scenes are always spaced equally along a pathway. To add a scene, move the slider to an any position between two existing scenes, then press and hold the **Add** button. You should see two scene lights illuminated; the new scene will be added exactly halfway between these two scenes, regardless of how close the crossfader is to either existing scene. If you see only one scene light when pressing **Add**, nudge the crossfader in the direction of a neighboring scene till you see both lights turn on. For example, if you start with the default pathway (1 -> 8) and you move the crossfader to the middle of the pathway (or anywhere between scene 1 and 8), and then press **Add + Scene 2**, your new pathway will be 1->2->8.

Notice that some of the knobs turn green when you press and hold the **Add** button. The number of green knobs indicates the number of scenes currently in the pathway. If you keep adding scenes until you have more than eight, the knobs will change color. Scenes 9 – 16 are yellowish green, and subsequent groups of eight will be shown by a color that gradually fades to yellow, then to red as the total number approaches the maximum of 64.

If you want to add multiple scenes quickly, you can keep holding down the **Add** button and press the **Scene** buttons you want to add in order. For example if you had 1->2->8 and you moved the crossfader to between 2 and 8, you could hold down **Add**, tap **Scene 3** and then tap **Scene 4**. This would result in a pathway of 1->2->3->4->8.

Replacing a Scene

If you want to replace one scene with a different scene, move the crossfader to the scene's position, hold **Add** and tap the new **Scene** button. While you are holding down the **Add** button, only one **Scene** button should be on. If you see two lights, nudge the crossfader closer to one scene's position until just a single light is on. The scene which is illuminated is the one you will be replacing.

Continuing with the previous example, if you move the crossfader all the way to the right (where scene 8 is positioned), and press **Add + Scene 5**, then scene 8 will be replaced by scene 5. Now the pathway will be 1->2->3->4->5.

If you replace a scene and keep holding down the **Add** button, you can add more scenes after the one you just replaced. So, if in the previous example you kept holding down **Add** after tapping **Scene 5**, and then you tapped **Scene 1** and then **Scenes 2, 6 and 7**, the pathway would be 1->2->3->4->5->1->2->6->7.

Deleting a Scene

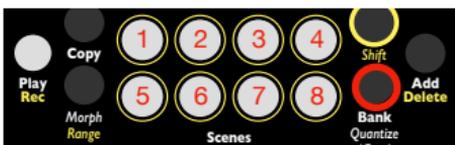
To remove a scene, move the slider to the scene's position and hold down **Shift + Add**. One or more **Scene** buttons will light up. Pressing any of the lit buttons will delete that scene from the **pathway**.

When you delete a scene, its corresponding light will turn off, and the next available scene will illuminate. You can also select which scenes are illuminated by moving the crossfader. If you want to delete multiple scenes at once, you can tap each **Scene** button as it lights up while holding down **Shift + Add**.

Latching a Scene

Normally, pressing a **Scene** button jumps to that scene only as long as you hold the button down. Starting in firmware v1.3, there is a new mode called *Latch Mode* that keeps a scene active even after you release the button. See *Scene Button Modes* on [page 20](#) for details. There is another way to latch scenes that does not involve changing modes: using the Replace Scene feature, you can make a scene stay active even after you release the scene button. As described above, Replace Scene only works when the slider is positioned exactly over a scene. An easy way to try out this method is to first move the slider fully to the right or left, and then press **Add + Scene** to latch a new scene. Note that applying CV or playing back recorded motions will override the latched scene.

Banks



Bank + Scene = Change Bank

There are eight regular banks, each with eight scenes. There's also a special ninth bank called the Classic Bank (see [page 21](#)).

You can check what bank you're in by holding down the **Bank**

button and looking at which of the white **Scene** buttons is lit. For the *Classic Bank*, the **Play** button will be lit.

Holding down **Bank** and then pressing a **Scene** button or the **Play** button will select a different bank.

Each bank has its own pathway, so changing banks will load the pathway for that bank. All the scenes in a pathway must belong to the pathway's bank. If you want to use a scene from a different bank, you can copy/paste it into the current bank (see [Copy/Paste](#), [page 23](#)).

Channel Modes: CV, Gate and Quantization

Each of the eight channels can be set to output CV or gates.

CV Mode

By default, each channel outputs CV without any quantization to a scale. The knob will be blue for positive voltage, red for negative voltage and off for zero volts. The color will get brighter as the voltage gets farther from zero. The maximum positive voltage is +10V, and the maximum negative voltage is -5V. Each click of the knob changes the output by a semitone, about 83mV or 1/12th of a volt. Holding down **Fine** while turning the knob will increment the voltage by 4 cents, or about 4mV. Holding down **Fine** and **Morph** will adjust the voltage by octaves, or 1.00V per click.

CV Quantization

Hold down **Bank/Quantize** and notice that all the knob lights change to dim grey (by default). This color indicates no quantization.

If you keep holding the **Bank/Quantize** button and turn a knob it will select a different scale for that channel. The knob will change colors as follows:

- | | |
|---|---|
|  <i>Dim grey</i> = no quantization |  <i>Salmon</i> = Lydian Dom. |
|  <i>Pink</i> = semitones |  <i>Lavender</i> = Beebop |
|  <i>Red</i> = major |  <i>Dim Red</i> = Enigmatic |
|  <i>Orange</i> = minor |  <i>Dim Yellow</i> = Vietnamese |
|  <i>Yellow</i> = harmonic minor |  <i>Dim Orange</i> = Yo scale |
|  <i>Teal</i> = major pentatonic |  <i>Dim Blue</i> = 16-TET |
|  <i>Blue</i> = minor pentatonic |  <i>Dim Teal</i> = 21-TET |
|  <i>White</i> = whole tones |  (flashing) = Custom scale slots |
| |  <i>Green</i> = Gates |

Starting in firmware v1.3, there are eight custom scale slots. Custom scale slots that are empty will not be shown as you turn the knob. You can only create a custom scale from Sequencer mode (see page 26). The **Catalyst Sequencer** manual describes the process in the *Custom Scales* section.

Gate Mode

By holding down **Bank/Quantize** and turning a knob until it's green, you can set that channel to output gates instead of CV.

Adjusting the knob for a channel in Gate mode will change the pulse width. When the knob light is off, no gate will be output for that scene. As you turn the knob up the pulse width of the gate will increase and the light will go from dim green to a bright green, and then to bright whitish-blue. The pulse width at the dimmest green is 2ms and 500ms at the brightest green. At the bright whitish-blue setting, the gate will always be high when that scene is active.

In firmware version 1.3 and later, the gate amplitude will be the maximum voltage allowed by the channel's *Range* setting, which is +10V by default (see [page 17](#)). In previous firmware versions, gates were always +5V.

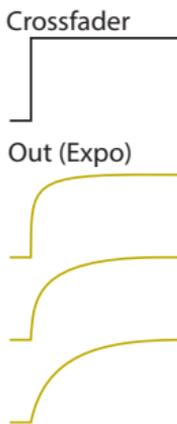
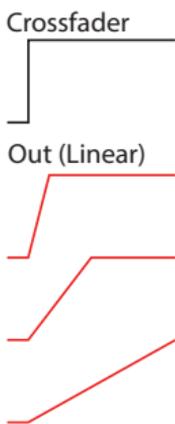
When a Channel is set to Gate mode, a gate will fire whenever a scene containing a gate is made active. No crossfading is possible in this mode. For example, if you press a **Scene** button, any Channels with gates on that scene will fire their gate. Or if you use the crossfader, CV, or recorded motions to crossfade from one scene to

another, a gate will fire whenever a crossfade begins from a scene that has gates.

Automation

CV Crossfading

Running CV into the **CV** jack has the same effect as moving the crossfader by hand. The **CV** jack accepts voltage from 0V to +5V, with 0V selecting the first scene of the pathway, 5V selecting the last scene, and everything in between crossfading along the pathway. The position of the pathway set by CV is added to the position set by the crossfader, so you can use both at once. If the final position were to be past the last scene (say, for instance if you input 4V of CV and the crossfader was 75% to the right), then the position will wrap around from the end to the beginning, as if the pathway were circular.



Slew

Slew adds “friction” or “lag” to the motions of the crossfader or CV. By default there is no **Slew**, so the position on the pathway will perfectly track the crossfader and CV. When **Slew** is added, the pathway will change slowly even if the crossfader or CV change quickly. Holding down the **Shift** button and turning the knob for Channel 7 will

adjust the **Slew**. The knobs will start to turn pink as **Slew** is turned up. With a small amount of **Slew**, the effect is barely noticeable. As you turn **Slew** up, you'll notice that moving the crossfader quickly from one side to the other will cause the pathway to slowly crossfade, as if you had moved the crossfader slowly but steadily. At the maximum setting, it will take about 4 minutes to move through a pathway if you quickly shift the crossfader from one side to the other. Holding down **Shift + Fine** while you turn the knob will adjust the **Slew** by smaller amounts.

New in firmware v1.3: Slew also affects scene changes when pressing **Scene** buttons.

As an advanced feature, the response curve of the **Slew** can be changed between linear and exponential (see diagram). Hold down **Shift** and turn the knob for Channel 5 to adjust the curve of the **Slew**: the knob will turn white for linear or yellow for exponential.

Recording Motion

You can record up to 10 seconds of crossfader and CV motion and then play it back to automate moving through the pathway.

To record a motion, first you must enable recording by holding **Shift** while tapping **Play**. Release the **Shift** button, and the **Play** light will flash to indicate that the recording is armed. To initiate the recording, either press **Play** or fire a trigger into the **Trig** jack. Move the crossfader and/or apply CV to the **CV** jack. While recording, the **Scene** buttons will flash in order from 1 to 8, indicating what

percentage of the maximum recording length you have used (each **Scene** button represents about 1.25 seconds).

When you're done, press **Play** again or fire another trigger into the **Trig** jack. The recording will immediately play back once.

To play the saved recording at any time, tap the **Play** button. The module will act as if you are moving the crossfader (or inputting CV) in the same way that you did when recording.

If you accidentally armed recording, you can un-arm it by holding **Shift** and tapping **Play** again.

Note that the raw crossfader and CV motions are recorded, regardless of the pathway, bank, or **Slew**. So you can record a motion and then play it back on any pathway or bank, or even adjust **Slew** while playing to get different effects.

Synchronizing Recording with an External Clock

Using an external trigger to record and playback a motion is an excellent way to sync your recording to a clock. You can feed a steady clock into the **Trig** jack and then use the clock divider (see [page 18](#)) to set the number of beats you want the recording to be. For example, if you want the recording to be 16 beats long, set the clock divider to 16. When you're ready to record, arm recording and it will automatically begin on the next divided clock pulse. After 16 more clocks, it will stop recording and immediately begin playing it back. The recording will be exactly 16 beats long, and every 16th clock will make it play again, so it will play back in a perfectly synchronized loop.

Parameters

Morph

Morph controls how a channel crossfades as it moves along the pathway. Maximum Morph enables smooth transitions on all channels. With minimum or no Morph, a channel will jump from one value to the next as scenes are crossfaded along the pathway.

To adjust Morph, hold down the **Morph** button and turn a channel's knob. By default, Morph is 100% and the knobs will be red. Turning the knobs down will turn the knobs white as Morph decreases



Range

Holding down **Shift** and **Morph/Range** while turning a channel's knob changes the allowed voltage range of that channel. When you first press **Shift + Morph/Range**, the knob lights will turn colors to indicate the range of each channel. By default, they will be dark blue to indicate the full range (-5V to +10V). The first click of a knob will graphically display the current range of its corresponding channel without making changes. The lights will be either bright or dim: each bright light represents 2.5V, while dim lights represent 1V or less. Red lights indicate negative voltage and will always appear left of

center. All other colors represent positive voltage and will always appear right of center. See the diagram below.

The color of the knobs when you initially press **Shift + Morph/Range** will match the color of the positive valued lights.



Clock Divider

Hold **Shift** and turn the knob for Channel 6 (**Clock Div.**) to set the clock division amount for the **Trig** jack. This works with the recording feature, see [page 15](#).

When you hold **Shift** and turn the knob, the lights will indicate the clock divider amount. The first click of the knob will display the current value without changing it.

If only **Scene 1** is lit, then the knob that's blue indicates the clock divider amount (1 – 8). If **Scene 1** and **Scene 2** are lit, then the knobs represent clock divider amounts between 9 and 16. If **Scenes 1, 2 and 3** are lit, then the knobs represent clock divider amounts

between 17 and 24. This pattern continues until all **Scene** buttons are lit and the knobs represent clock divider amounts between 57 and 64. Continuing to turn up the knob after this will repeat the whole process but the knob will be pink and the clock divider amounts will start counting up from 65 to 128. Next, the knob will be grey for 129 to 192, and finally orange for 193 to 256.

Random

Holding **Shift** and a **Scene** button while turning Channel 8's knob (**Random**) will add random values to all channels on the selected scene. Each channel's value will be shifted up or down by a random amount. Turning the knob up will increase the maximum amount a value can change. The knob will light red and increase in brightness as you approach the maximum value. Each click of the knob increases the range by one semitone.

The set of all random values can be re-seeded, that is, the random values themselves can be changed. This is done by holding down **Fine** and **Shift** while turning **Random**. This will change all random values on all scenes.

Scene Button Modes

There are three modes that handle what happens when you press a **Scene** button: Momentary Mode, Blind Mode and Latch Mode.

To change button modes, hold down the **Shift** button and turn Channel 1's knob. The color of the knob indicates the Scene Button Mode:

- **Red:** *Blind Mode*
- **Green:** *Momentary Mode* (default)
- **Blue:** *Latch Mode*

Momentary Mode

Pressing a **Scene** button will make that scene active for as long as you hold down the button. The encoder lights will display the scene's values and the output jacks will update. If Slew is enabled, the output jacks will fade from the current values to the scene's values. When you release the **Scene** button, it will jump (or fade, if Slew is enabled) back to the previous scene.

Blind Mode

If you want to set values for a scene without the outputs being affected, you can use Blind Mode. In this mode, pressing a **Scene** button will display that scene's values without sending them to the outputs. You can edit the values by turning knobs while holding down the **Scene** button. When you release the button, the knobs will return to displaying the current scene's values.

This is useful for the workflow where you set up a scene and then crossfade into it, then set up another scene and crossfade into it, etc. This workflow works well with the Classic Bank, described below.

Latch Mode (new in firmware v1.3)

In Latch Mode, pressing a **Scene** button will make that scene active, keeping it active even after you release the button. In this mode, the crossfade and CV jacks have no effect and there is no notion of a Pathway. If Slew is enabled, the outputs will fade from their current values to the selected scene (see [page 14](#)).

Classic Bank

There are eight normal banks on the **Catalyst Controller** (see [page 11](#)), plus a ninth bank with special properties known as the Classic Bank. This bank behaves more like the classic Catalyst module from Emblematic Systems in that there are always exactly two scenes on the **pathway**.

To enter the Classic Bank, hold **Bank** and press **Play**. You can check if you're in Classic Bank at any time by pressing the **Bank** button: if only the **Play** light is on and no **Scene** buttons are lit then you're in the Classic Bank. To leave the Classic Bank, just change to another bank as you normally would, by holding down **Bank** and pressing a **Scene** button.

When in the Classic Bank, the pathway is always composed of two scenes. These are referred to as Scene A (accessed when the

crossfader is to the left) and Scene B (accessed when the crossfader is to the right). To replace Scene A, hold down the **Morph** button and tap a **Scene** button. To replace Scene B, hold down the **Add** button and tap a **Scene** button.

Unlike normal banks, you cannot add, delete, or insert scenes into the pathway of the Classic Bank because it can only consist of two scenes (A and B).

The Classic Bank works well with a workflow where you want to transition from one preset “sound” in your patch to another. You would start with your first scene in Scene A, your second scene in Scene B and the crossfader all the way to the left. When you are ready to transition, crossfade to the right. Then when you want to transition to something else, you would replace Scene A with the next scene and crossfade to the left. You can continue this process, picking new scenes to crossfade to for each transition.

Blind Mode also works well with this if you want to edit scenes before transitioning into them (see the previous section).

Other Features

Copy/Paste

You can copy the data from a scene and paste it into another scene. The scene data includes the eight channel values plus its **Random** amount. Note that if the scene is using the **Random** feature, then just the pre-randomized values will be copied, as well as the **Random** range value that's set with **Shift + Scene + Random** (see [page 19](#)). When you paste, the new scene will have different random values.

Copying and pasting a scene is done by pressing the **Copy** button and a **Scene** button in a particular order. To copy a page, hold down the **Scene** button first, and then (while keeping **Scene** pressed down) tap **Copy** second. The **Scene** button will flash to confirm the copy.

To paste over another scene, hold down the **Copy** button first, and then tap the **Scene** button for the scene you want to overwrite. The **Scene** button will flash to confirm the paste. You can take as much time as you want between copying and pasting, and you can even copy/paste between banks by changing banks before pasting. *Tip:* If you want to paste a scene multiple times, you can keep **Copy** held down and tap multiple **Scene** buttons, one at a time.

Saving

To save all data (banks, scenes, modes and settings), hold down **Bank** first and then press and hold **Morph** for about one second. When the lights flash, you can release the buttons. Everything will be loaded the next time you power on.

Clearing a Scene

To clear all channel values on a scene, hold down **Shift** and **Play** for three seconds. When you see all the scene lights flash, release the buttons. Tap a **Scene** button to clear its data. This will also clear any **Random** amount you set for this scene.

Color Palettes (new in firmware v1.3)

By default, negative voltages are red and positive voltages are blue, with the brightness of either color indicating the magnitude. You can change the color palette globally by holding down **Bank/Quantize** for four seconds until the lights change. Channel 1's encoder will be flashing grey. Turning it will select one of four different palettes. The other seven encoders will display example colors of the palette.

Palette 1: default: negative = red, positive = blue

Palette 2: "rainbow": each semitone is a different color

Palette 3: "octave rainbow": each octave is a different color

Palette 4: "ice": negative = blue, positive = white

The palette selection will be saved and restored after power-on.

Changing to a Catalyst Sequencer

The **Catalyst Controller** and **Catalyst Sequencer** are the same module with different faceplates. The faceplate itself is double-sided, with the sequencer artwork on one side and the controller artwork on the other. You can change your **Catalyst Controller** into a **Catalyst Sequencer** by holding down **Play + Copy + Morph** (three buttons on the left side). The lights will flash rapidly and you'll be in controller mode.

To change back, hold down three buttons on the right side: **Shift + Add + Bank**.

If you want to have your unit always power up as a **Sequencer**, then hold down the three buttons on the left side while powering up. Similarly, you can hold down the three buttons on the right side to restore your unit to powering up as a **Controller**.

Firmware Updates

To update your firmware, power off and then back on again while holding down **Copy** and **Shift**.

Once you release these buttons, the **Play** button will be flashing. Patch an audio cable from a phone or computer to the **Trig** jack. Turn the volume up to 100%. Play the firmware file you downloaded from 4mscompany.com. You'll see the button lights flash as it plays. If the top row of lights all flash together rapidly, that indicates an error. Reset the audio file the beginning, check your cable connections and volume, and press the **Play** button to reset. Play the audio file to try again.

When it's done, there will be a chase-animation (each button light turns on, in order, one at a time). If you don't see this animation then the update failed.

Otherwise, power off and back on again to use the new firmware.

Firmware Version

On startup, the lights will display a colored pattern on the knobs while the **Page** button lights will indicate the firmware version.

Firmware version 1.0: the first **Page** button is on for a moment and then turns off in the middle of the animation.

Firmware version 1.1: the first **Page** button is on for the entire time while the knobs animate.

Firmware version 1.2: the first **Page** button is on for a moment, and then the second **Page** button turns on.

Firmware version 1.3: the first **Page** button is on for a moment, and then the third **Page** button turns on.

Technical Specifications

Outputs

- Range: $< -4.950V$ to $> +9.950V$
- Accuracy:
 - Post-calibration: $\pm 0.5mV$ over entire range
 - Uncalibrated: $\pm 12mV$ over entire range
- Precision:
 - Using knobs without Fine: $83.3mV$ per knob click
 - Using knobs and Fine button: $3.3mV$ per knob click
 - When interpolating (Morph, Glide, or Slew): $0.46mV$
- Temperature drift: $2ppm/^{\circ}C$
- Output update rate: $4kHz$

Inputs

- CV jack:
 - Range: $0V$ to $+5V$
 - Accuracy: $1.2mV$ (4096 points)
- Slider: Accuracy: 4096 points
- Reset jack: not used
- Clock In/Trig jack: threshold = $0.7V$

Power

- $+12V$: max $60mA$
- $-12V$: max $25mA$
- $+5V$ not used