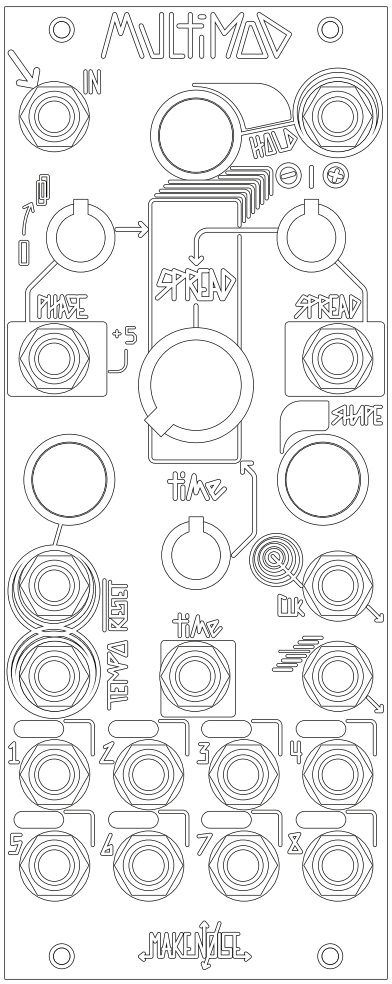
MULTIMOD



MAKENOISE

TABLE OF CONTENTS

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes / modifications not approved by the Make Noise Co. could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

makenoisemusic.com
Make Noise Co., 414 Haywood Road, Asheville, NC 28806

LIMITED WARRANTY

Make Noise warrants this product to be free of defects in materials or construction for a period of one year from the date of purchase (proof of purchase/invoice required).

Malfunction resulting from wrong power supply voltages, backwards or reversed eurorack bus board cable connection, abuse of the product, removing knobs, changing faceplates, or any other causes determined by Make Noise to be the fault of the user are not covered by this warranty, and normal service rates will apply.

During the warranty period, any defective products will be repaired or replaced, at the option of Make Noise, on a return-to-Make Noise basis with the customer paying the transit cost to Make Noise.

Make Noise implies and accepts no responsibility for harm to person or apparatus caused through operation of this product.

Please contact technical@makenoisemusic.com with any questions, Return To Manufacturer Authorization, or any needs & comments.

http://www.makenoisemusic.com

About This Manual:

Written by Tony Rolando and Walker Farrell
Illustration and layout by Lewis Dahm

INTRODUCTION

With MultiMod... from one control signal, we create many

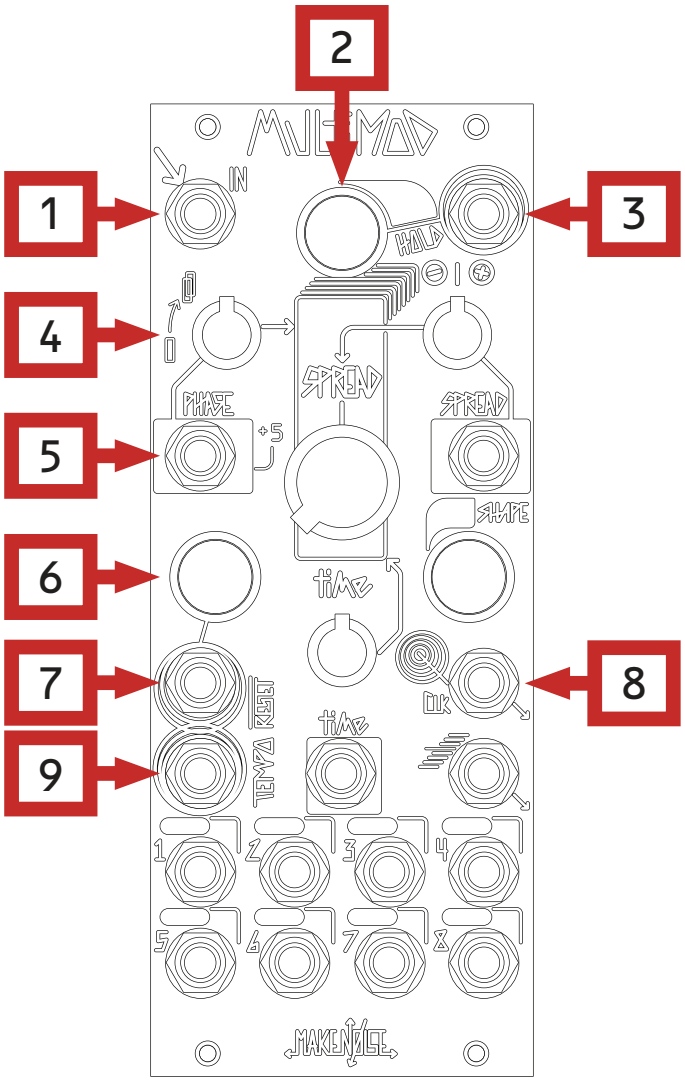
The first of the New Universal Synthesizer System modules, the MultiMod is the DSP superpowered N.U.S.S. Mult allowing us to derive many control signals from one.

MultiMod takes a single control signal and copies it 8 times, but further it modifies those copies by weighted adjustment of phase and speed so the modulation is related to the source, but not identical at each destination.

If a cluster of traditional LFOs or Random Voltages is desired, patch nothing to the Signal In and Multi-Mod will generate an LFO internally, copy it 8 times and allow for modulation of Phase, Speed and Time.

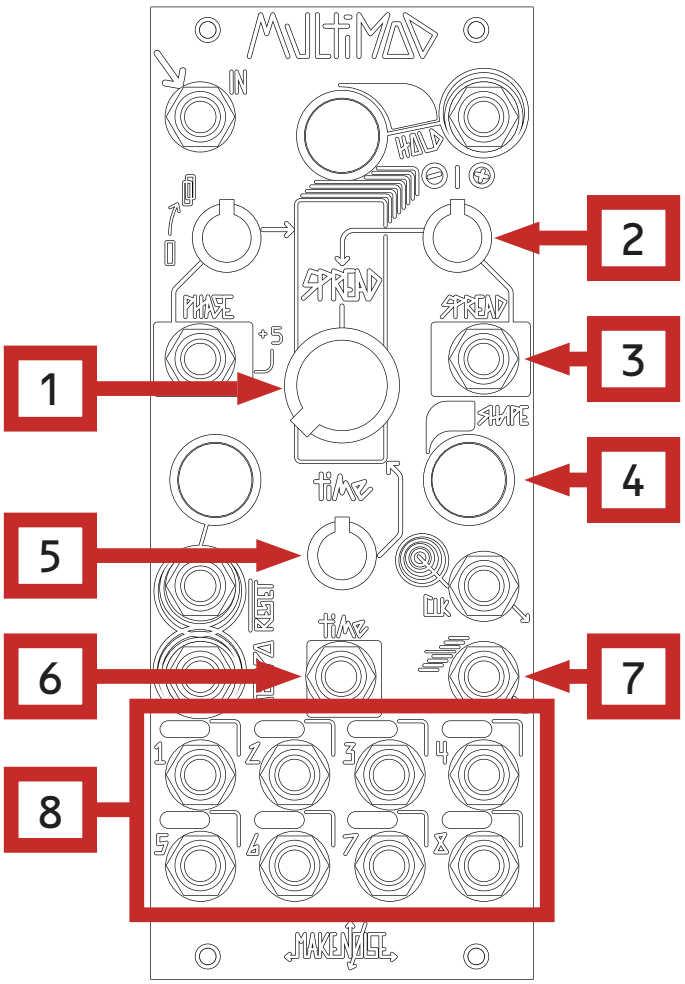
MultiMod is a small and simple looking module that produces highly complex results, especially when you start using the different Read Shapes and modulating Phase. The Spread parameter allows for dramatic change within a complex patch, from a single parameter.

PANEL CONTROLS



1. Signal IN
2. HOLD Button
3. HOLD IN
4. Phase Panel Control
5. Phase CV IN
6. Reset Button
7. Reset IN
8. CLK OUT
9. TEMPO IN

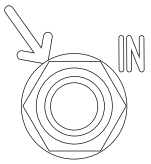
PANEL CONTROLS



1. Spread Panel Control
2. Spread CV Attenuvertor
3. Spread CV IN
4. Shape Button
5. Time Panel Control
6. Time CV IN
7. Channel Index OUT
8. Channel Outputs 1-8

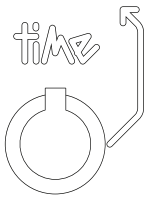
I/O EXPLAINED

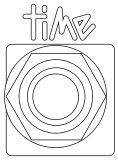
Signal IN



Patch CV signal here for modified copies at outputs 1 thru 8. With nothing patched, an internal LFO is utilized. The Shape button sets the path that the Multi-Mod will take when reading through the copies of the signal at the input, also creating analogous LFO shapes when the Signal In is not in use. The rate at which new copies are written and read is determined by the Time parameter, while copies are sped up, slowed down, or phase-spaced by the Spread and Phase parameters. **DC coupled, +/-10ppVDC range.**

Time

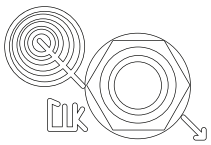




Sets the global write/read speed. CCW results in shorter Time making the multi-mod more responsive to input, whereas CW settings result in longer copies of modulation sequences and parameter changes at the source. Slower Time settings also allow for Phase and Spread to have greater modulation depth. By slowing Time this parameter also acts as an Global Event Delay, which is like a Pulse Delay but for any control signal event, so parameter changes at the source signal will take longer to reveal themselves at the 8 channel outputs. Modulating Time aggressively will result in waveform discontinuities. With nothing patched to Signal In, Time will set the global rate of the internal LFO applied to the MultiMod. With TEMPO patched, Time is quantized to subdivisions of the incoming tempo clock (from /1 at CCW to /32 at CW). When Hold is engaged to loop the copies, Time will act to stretch or compress all of the copied control signals. Time is indicated by the Clock Activity Window which flashes white to represent the clock with no tempo patched.

Unity CV Input with Panel offset control. Total Range +/-10V. Soft Guard Rails at 0VDC and +5VDC cover the range of the associated panel control (roughly 20Hz at CCW to 30 seconds at CW when unclocked). Voltage values outside 0-5VDC will push the Time parameter further, beyond the possible range of the panel control.

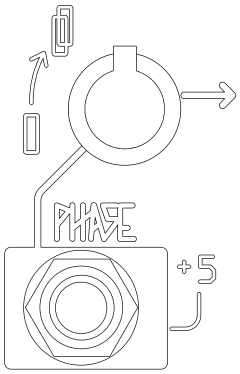
CLK Out



Outputs a clock at the Write speed set by Time (when Tempo In is not in use), or a subdivision of the external clock (also set by Time) when Tempo is in use. The associated activity window flashes white to indicate the clock activity. Additionally there is a background color which indicates the relationship to the clock when patched to Tempo In.

```
Green = Power of 2
Red = Multiples of 3
Gold = all other integers
```

Phase



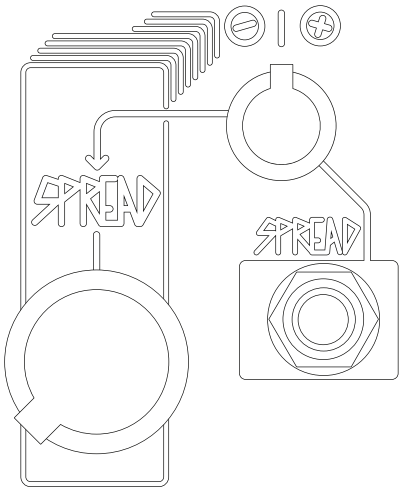
Sets the phase spacing of the Multimod signal copies, weighted by channel, each channel getting progressively more out of phase from the original Signal. With Spread at 12:00 (x1) and Phase set to minimum the copies would all be at the same speed and phase as the original signal, all channels will output the same signal, effectively making the MultiMod a 24 bit digital mult :) When Spread is set to 12:00, Phase is indicated by the color of the activity window of the associated channel becoming more Red as its Phase spacing increases. As the Phase parameter is increased in value, the copies become spaced apart from each other by weighted increments of phase delay per channel. At full CCW all channels are in phase. At Full CW all channels are evenly spread out of phase with channels 1 and 8 being fully 180° out of phase from each other.
Faster modulation of Phase can result in waveform discontinuities with channel 8 having the greatest discontinuities and channel 1 having the least.

When TEMPO is patched the phase spacings are locked to a tempo based grid.

CV Input with Combo Pot. With nothing patched to Phase CV In, associated potentiometer allows for manual adjustment of Phase Offset. With signal patched to Phase CV In, the associated potentiometer operates as an attenuator. Total range +-10VDC. Soft Guard Rails at 0VDC and +5VDCcover the associated panel control range, Voltage values above 5VDC continue to increment phase and eventually all channels meet at full phase offset at +10VDC. Below 0VDC the control affects the eight channels in reverse order (Channel 1 is affected the most and Channel 8 the least).

Note: changing Spread from and back to x1 can also result in phase shifts, to which the Phase parameter is added. Use the Reset Button or Reset Gate input to re-align phase of all channels.

Spread



Sets the divisors/multipliers of the resulting channel playback speeds, weighted by channel, each channel getting progressively slower or faster with channels at either extreme, 1 and 8, responding most quickly and deeply to speed changes. In other words Channels 4 and 5 are affected the least by the Spread control, while Channels 1 and 8 are affected the most. Imagine stretching a piece of taffy between two hands, where at either end is most of the taffy and as you approach the center there is significantly less taffy.

Spread at 12:00 is 1x, which is represented by white output activity windows for all 8 channels.

CW from 12:00 multiplies channels 1,2, 3 and 4 (increasing their speeds) while dividing channels 8, 7, 6 and 5 (decreasing their speeds) with Full CW or Full CCW being an even speed spread across all 8 channels. CCW from 12:00 does the opposite, dividing channels 1, 2, 3 and 4 and multiplying channels 8, 7, 6 and 5.

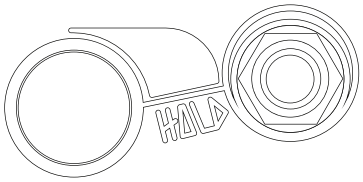
The maximum spread achieved by adjusting the Spread panel control clockwise is x8 at Channel 1, and /8 at Channel 8, with the remaining channels filling out a spread of speed values. When adjusting the Spread panel control counterclockwise, the channels are affected inversely, with x8 at Channel 8, and /8 at Channel 1. (See Appendix B for a table describing each channel's path through these values.) The change in speed per channel is indicated by the channels' respective activity windows, with increasingly green output activity windows indicating increasing speeds, and blue indicating decreasing speeds.

When TEMPO is patched, Multi-Mod locks the multipliers/ divisors to a grid. The rate of the incoming clock patched to Tempo In and the Time setting will impact the range of the Spread control.

Note: changing Spread will result in phase shifts. Use the Reset Button or Gate input to re-align phase of all channels.

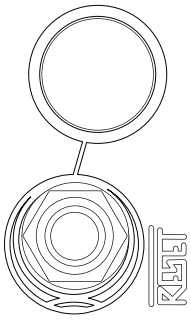
Panel offset control and CV In with attenuverter. Total range +-10VDC. Soft guard rails at -5VDC (CCW) and +5VDC (CW). Outside +/-5VDC, Spread parameter will continue advancing until each row of all channels meets at /24 (hot pink) or x24 (yellow) speed.

Hold



Stops creating new copies and begins looping current ones. “Holds” the copy contents. Also sets current position as the Reset point to be used for Reset as long as Hold is active. If nothing patched to Signal In, this input operates as a Track and Hold on the internal LFO. Button toggles Hold On/ Off. Gate In is momentary, with Hold engaged at the leading edge of signal greater than 2VDC. Hold Activity Window illuminates to indicate Hold is engaged. If patched, Tempo conforms Hold and loop times to grid.

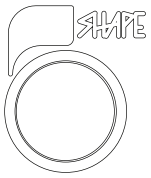
Reset



When channels are active at differing Speeds according to the Spread control, they will constantly be drifting in and out of phase with each other. Reset returns all channels to the current position according to Time and Phase. When Spread is at 12:00, channels will stay Reset and continue to conform to the current value of the Phase control. When Spread is not at 12:00, channels will immediately begin to drift in and out of phase again according to their individual speeds, until they are Reset again. (When Hold is active, channels will reset to the position that was current at the time Hold was pressed.) When nothing is patched to signal In, internal LFO returns to the beginning of its waveshape upon reset. Reset activates on button press, or the leading edge of a signal greater than 2VDC.

CLOCK activity window flashes BLUE to indicate Reset.

Shape



Button to select read shape. The signal at the Multi-Mod's input is constantly written and overwritten, with the duration of the "written" material determined by the Time control. Each channel plays back from this "written" material at its own speed and with its own Phase offset as determined by the Spread and Phase controls. Additionally, the direction of playback at any given time is determined by the selected read Shape. For example the default Ramp shape is a forward read (same shape as the material is written), while Sawtooth is a backward read, etc. (see below for details on each Shape). With no signal patched to the input, these Shapes determine the Shape of the internal LFO.

Note: because channels often play back slower or faster than the write speed set by the Time control, there may be resulting discontinuities as a channel switches from the previously written material to new material. For explanatory purposes of the read shapes, this may be referred to as the "beginning/end," but in practice, beginning and end are arbitrary or meaningless concepts.

With no signal patched, the internal LFO's length will be identical to that set by Time, and each repeat of the LFO will also be identical to the previous iteration, so the reading and writing will always happen together.

When a signal is patched to Signal In, the Shape button determines the read path of the copied signals. When nothing is patched to the Signal In, it determines the resulting LFO signal shape: Ramp, Saw, Sine, Triangle, Square, Stepped Random, Smooth Random. The Shape setting is retained across power cycles.

Associated activity window shows shape by both color and brightness:

Red = Ramp / Forward Read (default). This is the best read shape for accurately reproducing copies of a signal.

Green = Saw / Backward Read. Signal reproduction is accurate but in reverse. This read shape is good for creating variations of a signal.

Blue = Triangle / Ping Pong Read. Forward read from beginning to end followed by reverse read from end to beginning. This read shape will result in signal discontinuities where the read head changes directions.

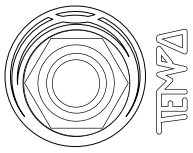
Purple = Sine / Wow and Flutter Ping-Pong Read. Similar to Blue mode, but with speed variations added (slowing down as direction change is approached). This read shape will result in fewer signal discontinuities than Blue mode, but with both speed and direction changes greatly altering the resulting signal copies.

Pink = Square / Staircase. This Shape moves through the copied signal in a staircase motion per channel. In LFO mode, a Square wave is generated instead.

Orange = Stepped Random / Random Access Read. In a physical sense, this is like having multiple tape playback heads which are picked up and moved to a different location on a tape loop. In LFO mode, a Stepped Random voltage output is generated per channel.

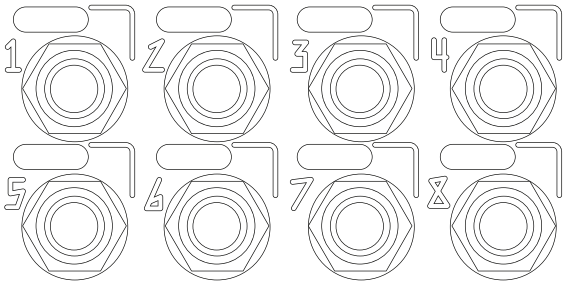
Yellow = Ramplets / Smoothed Random Access Read. Similar to stepped random, a new location is selected per channel at its own clock rate, however once the location is selected, playback will continue forward until the next clock. In LFO mode, a Smooth Random output is generated per channel.

TEMPO In



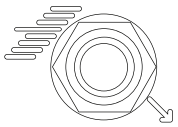
Conforms Time, Phase, Spread and Channel Index results to a grid derived from the incoming clock. This results in these parameters no longer being continuous, instead they are stepped, being quantized to integer relationships to the incoming tempo. Clock input activated by the leading edge of a signal greater than 2VDC.

Channel Outputs 1-8



Phase spread, vari-speeded copies of the input signal. +/-10Vpp

Channel Index Out



The channel with the highest amplitude at any given time is represented at this output, coded by voltage: 1 to 8 volts representing the 8 channels. When Tempo In is patched, this output will only update at the onset of each Tempo Clock.

```
1VDC = Ch. 1
2VDC = Ch. 2
3VDC = Ch. 3
4VDC = Ch. 4
5VDC = Ch. 5
6VDC = Ch. 6
7VDC = Ch. 7
8VDC = Ch. 8
```

The Channel Index will be of greater use with forthcoming New Universal Synthesizer System modules.

TIPS AND TRICKS

- After returning to a 12:00 Spread, press Reset to remove any residual differences in Phase caused by differing speeds.

- Don't forget that any modulation or alteration of your INPUT signal will make an appearance at all the OUTPUTS at different times! For example, something as simple as changing a signal's amplitude with an attenuator over a few seconds, may then cascade its way across the copies at the outputs over many seconds or even minutes!

- Time and Spread are highly inter-related parameters! Channel Speeds with Spread at 12:00 are always the same as the setting of Time, with faster and slower speeds arising at other values of Spread.

- Use the Pink (Square) read shape with nothing at the input to use Multi-Mod as a clock generator with variable divisions and multiples available at the outputs.

- Utilize various types of input with the Stepped Random (Orange) read shape to create weighted random outputs. For example: PWM square wave for random gates out with variable probability; Linear/Exponential/Log function generator for random CV outs with different weighted voltage ranges, etc.

- When patching a triggered function to the Input of Multimod, patch a copy of the gate triggering the function to the Multimod's Reset. This will result in repeatable actions at the Multimod's outputs with each gate event.

PATCH CORNER

Shift Register

Set Spread to noon and Phase fully CCW. Patch however many of the Multimod's outputs as you like to the v/oct inputs on Oscillators in your patch (tune all of the VCOs to match in frequency prior to making this connection). Patch a control voltage to the Multi-Mod's Input and increase Phase. Higher settings of Phase will result in wider distances between the Multi-Mod outputs.

For more precision with clocked control voltages (such as the output of a sequencer), patch a copy of the tempo driving the CV source to the Multi-Mod's Input and set Time fully CCW.

Snap Focus

Patch a leading tempo to the Multi-Mod's Tempo input and patch the Multi-Mod's outputs however you like within your system. Set Spread however you wish to best suit your patch. Patch a division of the leading tempo (say /8) to the Reset input. In this way, while the Multi-Mod's outputs will drift out of sync with one another, they will snap back into momentary alignment with the arrival of the Reset pulse.

Noise Spectrum

Patch a noise source to the Multi-Mod's Input and patch the Multi-Mod's outputs to a mixer. Use Time and Spread on the Multi-Mod to set the relative pitch/color of these outputs and use the mixer to set their levels. Great for gritty, lower-fi noise textures, chiptune drums, etc.

APPENDIX: LED CHEAT SHEET

SHAPE

```
Red = Ramp / Forward Read (default)
Green = Saw / Backward Read
Blue = Triangle / Ping Pong Read
Purple = Sine / Wow and Flutter Ping-Pong Read
Pink = Square / Staircase
Orange = Stepped Random / Random Access Read
Yellow = Ramplets / Smoothed Random Access Read
```

SHAPE Activity window shows shape by both color and brightness.

CLOCK

Tempo Unpatched:

```
Red = Shortest Time
Orange = Shorter Time
Yellow = Longer Time
Green = Longest Time
Purple = Shorter than Shortest Time (requires additional negative CV)
Blue = Longer than Longest Time (requires additional positive CV)
```

Clock Activity Window flashes respective color at current Time rate when Clock Output goes high.

Tempo Patched:

```
Green = Time division is /1, or a power of 2 of the clock rate (1, 2, 4, 8, 16, etc.)
Red = Time division is a multiple of 3 of the clock rate (3, 6, 9, 12, 15, etc.)
Gold = Time division is any other integer in the range (5, 7, 10, 11, 13, 14, etc.)
```

Clock Activity Window Flashes White at current Time rate when Clock Output goes high.

CHANNELS

Note: With Spread at 12:00, all channels are at original speed, and with Spread not at 12:00, channels constantly drift in and out of phase due to having different speeds. For this reason, the channel LEDs indicate Phase when Spread is at 12:00, and they indicate channel speed when Spread is not at 12:00.

Spread at 12:00:

White = No Phase adjustment added
Pink = Phase adjustment greater than 0°, less than 180°
Red = Phase adjustment 180°
Purple = Phase adjustment 360° (> 180° requires additional CV)

Spread not at 12:00:

Aqua = Near original speed
Green = Faster than original speed (up to x8 depending on channel)
Blue = Slower than original speed (up to /8 depending on channel)
Hot Pink = Faster than max speed (up to x24) (> x8 requires additional CV)
Yellow = Slower than min speed (up to /24) (> /8 requires additional CV)