Outline

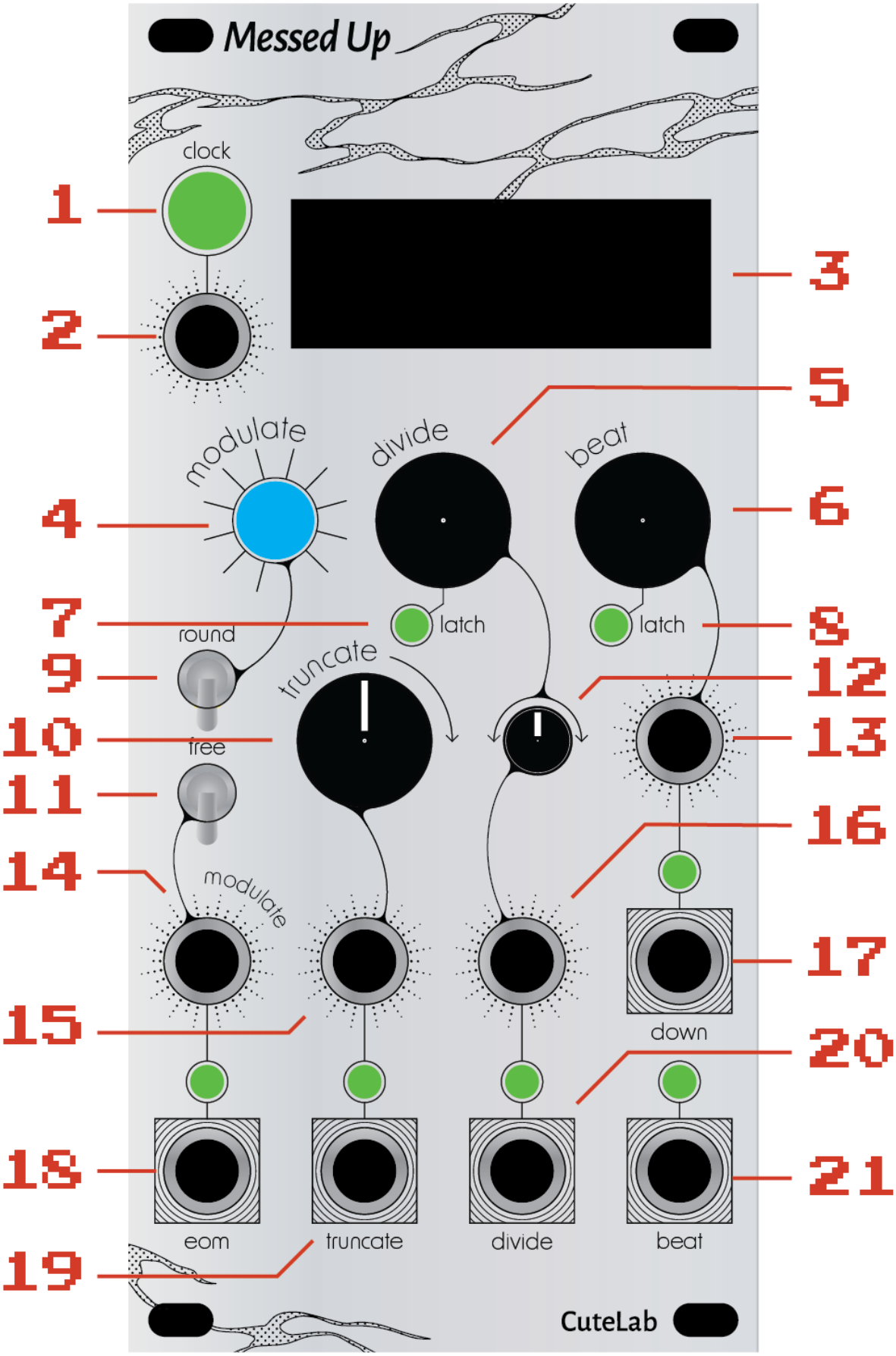
Messed Up

Messed Up is a clock source and clock stretcher, specially designed for polyrhythms and metric modulation. Given an input clock, it can stretch that clock to a precisely chosen new tempo, waiting for a downbeat in order to stay in sync with the input clock.

Technical Stuff

Messed Up is powered by the +12V rail, using a 10-pin (2x5) connector. Please follow the markings on the module to ensure that the red stripe on the cable is aligned to the -12V rail on both the module and your bus board.

Overview

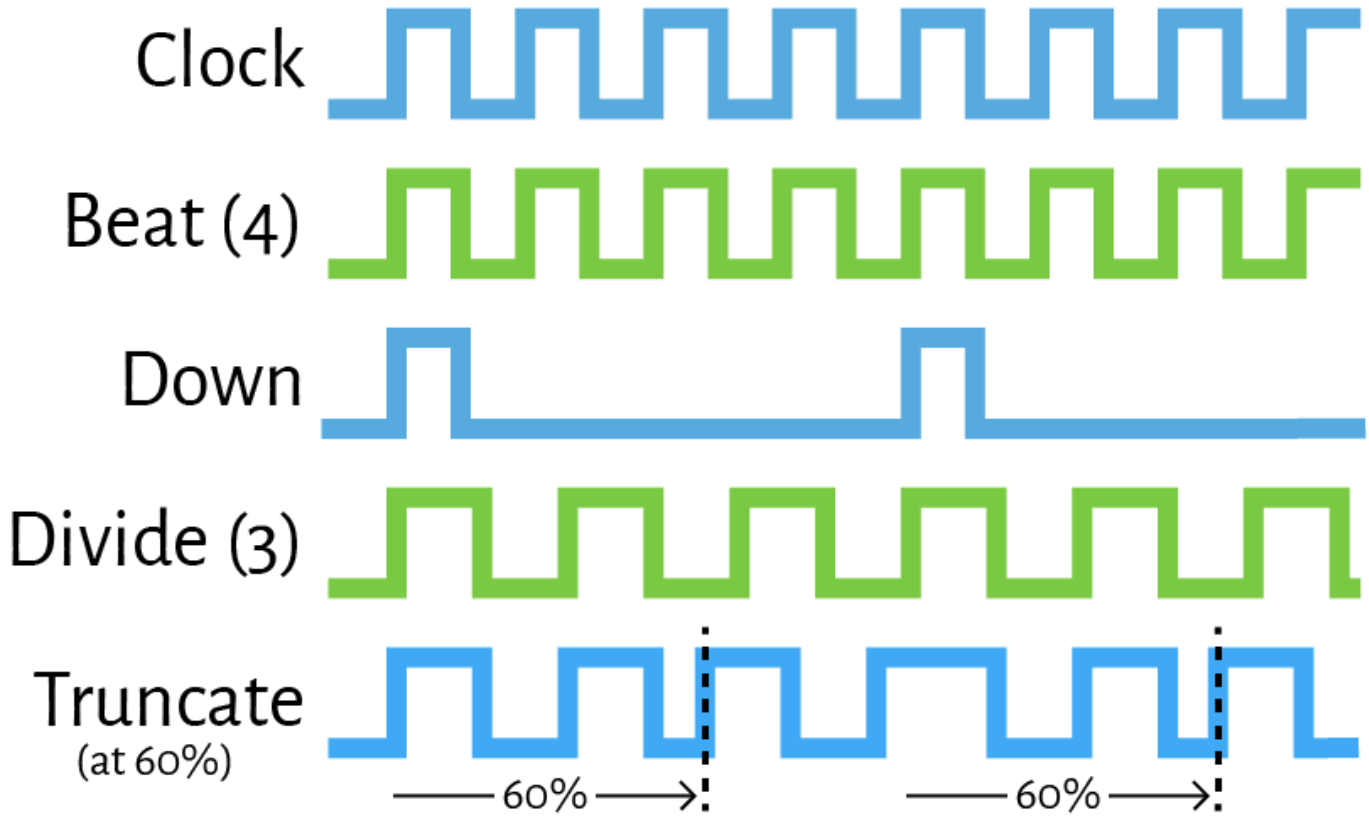

Messed Up
clock
1
2
3
5
modulate
divide
beat
4
6
7
latch
latch
8
round
9
truncate
12
10
free
13
11
16
14
modulate
17
15
down
20
18
21
eom
truncate
divide
beat
19
CuteLab

1. Tap tempo button and clock (internal/input) indicator
2. External clock input
3. Display, shows subdivisions and beats by default
4. Modulation trigger button
5. Subdivision adjust
6. Beat adjust
7. Latch subdivision changes to beats (active on)
8. Latch beat changes to beats (active on)
9. "Round Trip" modulation mode toggle
10. Truncation adjust
11. Latch modulations to downbeats mode toggle
12. Subdivision modulation attenuverter
13. Beat input CV modulation
14. Modulation trigger input
15. Truncation input CV modulation
16. Subdivision input CV modulation
17. Downbeat output (gate)
18. "End of Modulation" output (gate)
19. Truncated clock output
20. Subdivided clock output
21. Beat clock output

Basic Operation

Messed Up can act as both a clock source and clock stretcher. It will generate an internal clock unless a clock source is patched into the external clock input.

Messed Up emulates a metered grid by providing pulse outputs that represent both the downbeat and the beats of a hypothetical measure. Given an internal or external clock source, the module will generate four separate clock signals depending on the values *divide* and *beat*. With a *beat* value of four and a *divide* value of three, the *down* output will fire once for every four clock inputs, as if it were firing on a downbeat. The *beat* output will trigger on every input clock, while the *divide* output will fire three times for every four input clocks. Essentially, the *divide* output is stretched by a factor of four and multiplied by a factor of three. The *truncate* output, discussed in more detail below, is a variation of the *divide* output.



Messed Up is designed to make metric modulation easy. Pressing the *modulate* button or sending a high voltage to the *modulate* input will cause a metric modulation to occur. When a modulation does occur, Messed Up will stretch the input clock by a ratio such that the *beat* output will match the *divide* output. In this way, you can trigger a modulation to a new tempo, related in a precise way to the original. For example, with a *beat* value of four, you could introduce a "triplet" by setting the *divide* value to three, then modulate to a new tempo where the "triplet" would now feel like a quarter note. For more on metric modulation, see the appendix.

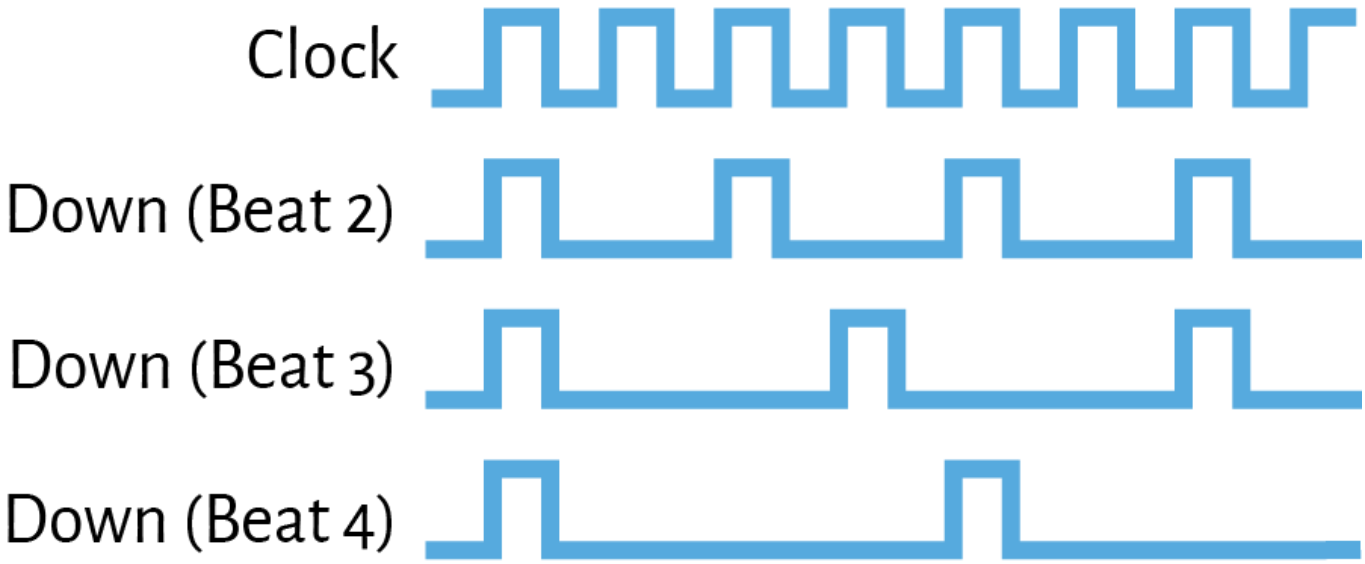
Clock and BPM

Use the tap tempo button at the top-left of the module to set the tempo of the internal clock. You have the option of tapping the button to adjust the tempo directly, or you can use the *divide* and *beat* encoders to fine tune the tempo. Hold down the tap tempo button, then use the *divide* encoder to adjust the tempo by a factor of 10, and the *beat* encoder to adjust the tempo by a factor of 0.1.

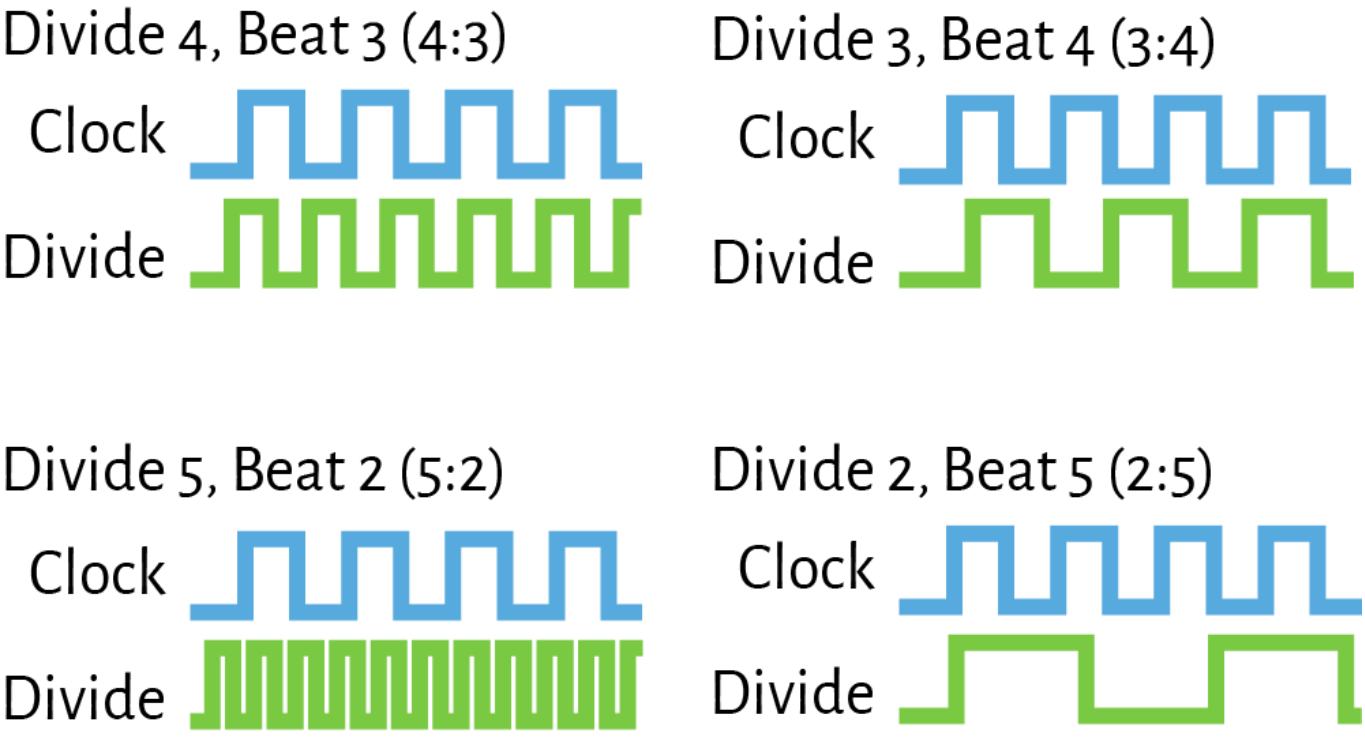
If an external clock is patched into the *clock* input below the tap tempo button, this will be used instead of the internal clock. In this configuration, you can press and hold the tap tempo button to see the tempo of the output clock.

Beats and Divisions

Messed Up uses the value of *beat* and *divide* to determine the *beat*, *divide*, *down*, and *truncate* outputs. Unless the tempo has been modulated (See Modulation), the *beat* output will be the same at the clock input. The *beat* value, which can be adjusted using both the *beat* encoder (6 in the diagram) as well as the *beat* CV input (13 in the diagram), determines how many clock inputs constitutes a single measure. If the *beat* value is 2, then the *down* output will trigger once for every two clock inputs. If the *beat* value is 3, then *down* will output once for every three clock inputs, and so on.



The *divide* value can be controlled by the *divide* encoder (5 in the diagram) and the *divide* CV input (16 in the diagram). The *divide* CV input can be scaled by the *divide attenuverter* potentiometer (12 in the diagram). The *beat* and *divide* values combine to calculate the output for *divide*. The *beat* value determines the number of clock inputs over which *divide* outputs will be spaced. So, for a *beat* value of 3 and a *divide* output of 4, there will be four *divide* outputs for every three clock inputs.

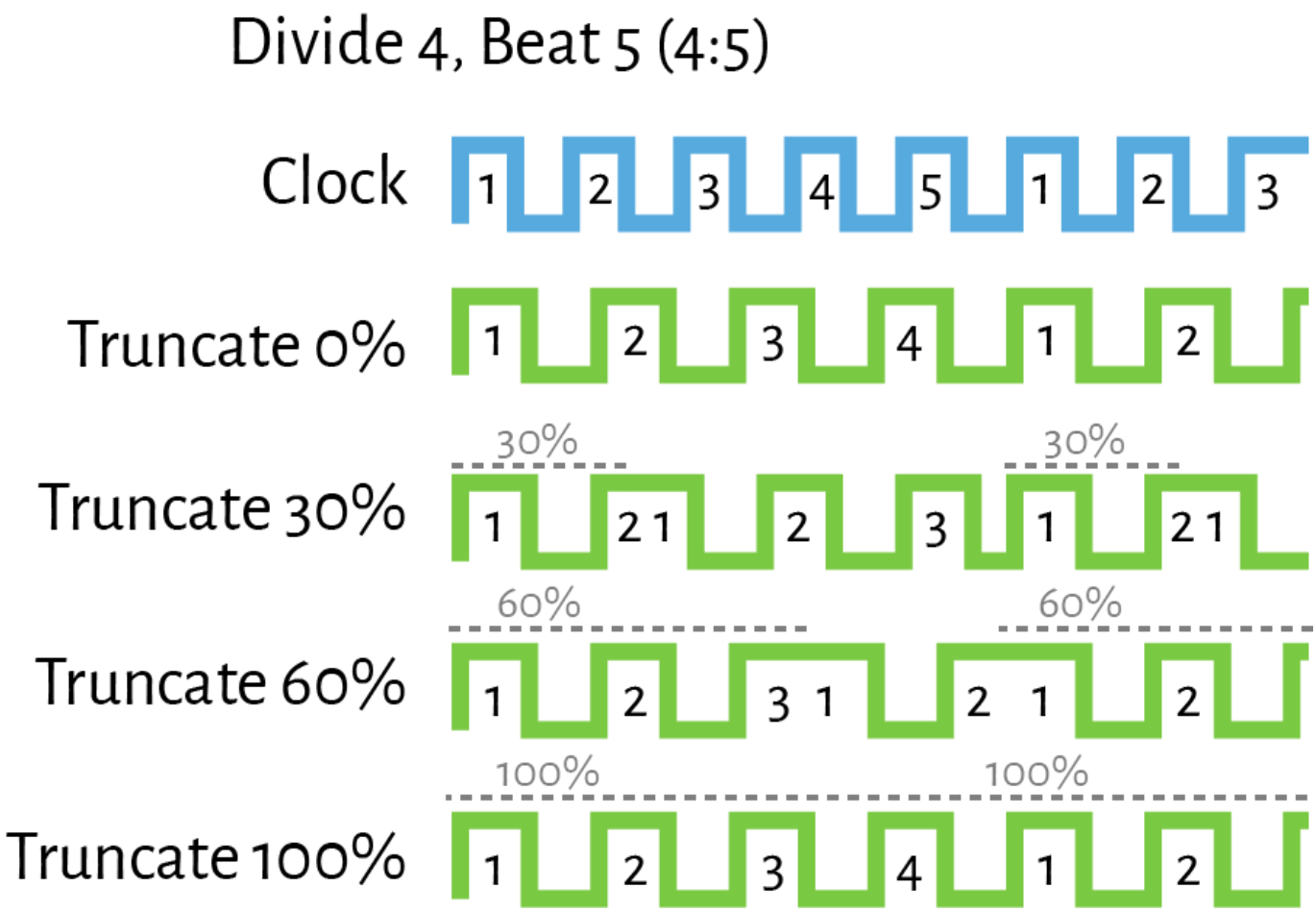


Beat and Divide Latch

Press the *beat* and *divide* encoder switches to toggle *latch* mode on and off for the *beat* and *divide* values, respectively. When *latch* is enabled, the value of *beat* or *divide* will only change on a downbeat. Adjusting the *beat* or *divide* encoder will cause the *latch* LED under that encoder to blink, indicating that a change is queued for the next downbeat. When *latch* is disabled, the *beat* and *divide* outputs will change as they are adjusted.

Truncation

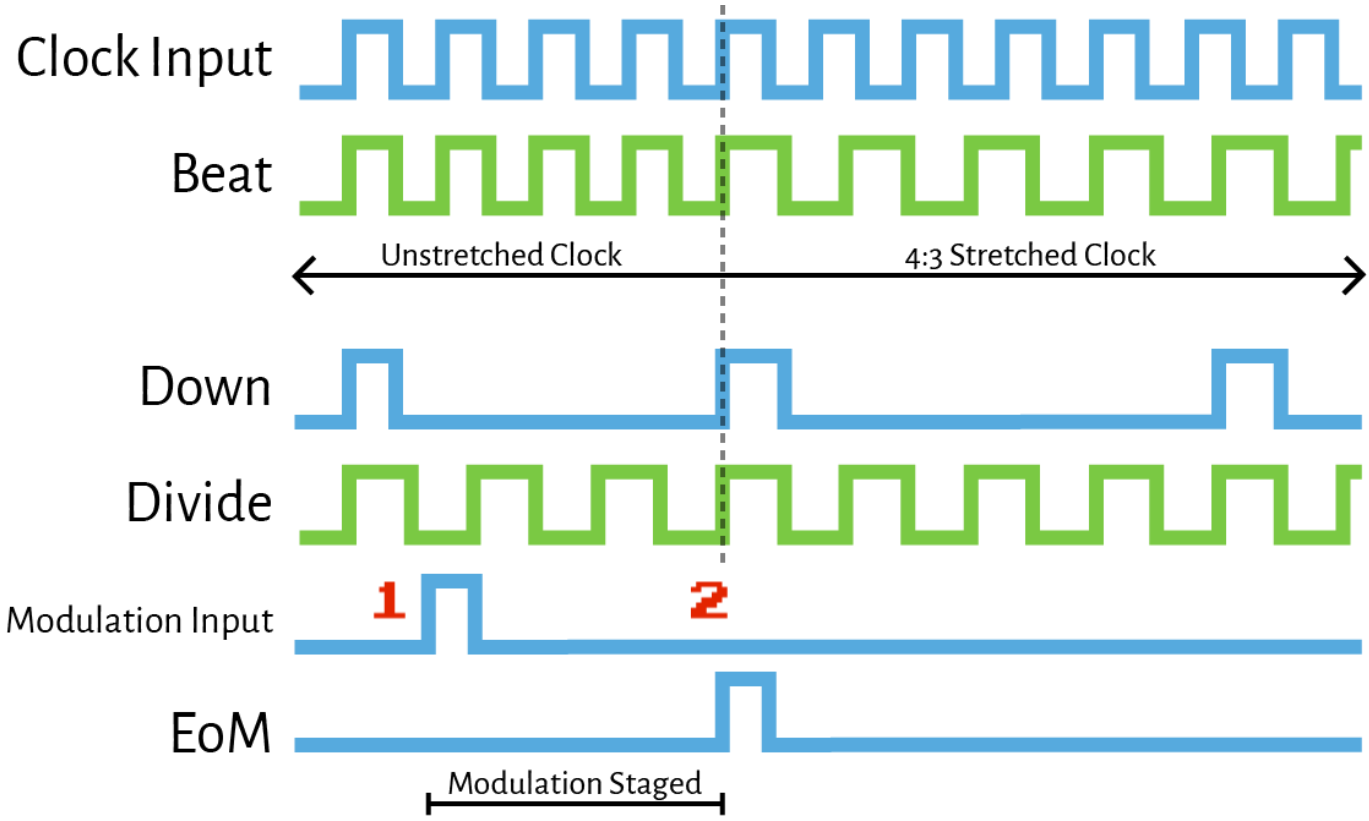
The *truncate* output is the same as the *divide* output, except the the whole pattern is truncated and reset at some point within the length of time determined by the *beat* value. That truncation point can be adjusted with the *truncate* potentiometer (10 in the diagram) or the *truncate* CV input (15 in the diagram). The *truncate* output can be a useful source of subtle variation on top of the *divide* output. In this example, the internal "beat count" has been added for clarity.



Modulation

Press the *modulate* button, or send a trigger to the *modulate* input to queue a modulation. When a modulation is queued, the *modulate* button will blink to indicate that a modulation is pending. If the *latch modulation* toggle (11, above the *modulate* input) is up, the modulation will occur on the next clock. If the *latch modulation* toggle is down, then the modulation is "latched" to the downbeat and will occur as soon as the *down* output goes high. When a modulation occurs, the *EoM* output (End of Modulation) will send a trigger.

In the following example, the module is set to four beats and three subdivisions. The *latch modulation* toggle is also low, so modulations will always occur on a downbeat. At 1, the user queues a modulation, either by pressing the *modulate* button or by sending a high signal to the *modulate* input. While the modulation is pending, the *beat* output remains unchanged. At 2, the modulation occurs, stretching the input clock to match the divide output. At the same time, a trigger goes out on the *EoM* output.



Notice that after the modulation, the *beat* output matches the *divide* output. Also, the time between two output clocks on the *down* output stretches by a factor of 4/3, reflecting the change in tempo. Finally, notice that the input clock and the *beat* output are no longer in sync, and now shift in and out of phase.

Round-Trip and One-Way Modulation

After modulating, queueing another modulation can either cause the module to stretch to another tempo, or return to its original tempo.

If the *modulation mode* toggle (9, under the *modulate* button) is up, the module is in **Round Trip** modulation mode. In this configuration, after modulating once, the *modulate* button LED will remain illuminated. Queueing a new modulation will cause the module to return to its original, unstretched tempo. If the *latch modulation* toggle is up, the return modulation will occur on the next beat. If the *latch modulation* toggle is down, and an external clock is connected, then something interesting happens. Messed Up will start a countdown, waiting until the next downbeat where the external clock and stretched clock are in phase. This means that when the queued modulation occurs, the output clock will just line up with the input clock. This only occurs if an external clock is patched in. Otherwise, Messed Up will modulate on the next downbeat.

If the *modulation mode* toggle is down, then the module is in **One Way** modulation mode. When a modulation occurs, Messed Up will modulate tempo relative to the already-modulated clock. In this way, you can continue to explore tempos further and further from the input clock.

d=b and Clock Reset

If the *beat* and *divide* values are the same, then the *beat* and *divide* outputs will be the same as well. When this is the case, modulating would stretch the clock by a ratio of 1 to 1—in other words, it would have no effect. If you try to modulate when *beat* and *divide* are the same, then the module will display **d=b**, indicating that *beat* and *divide* are identical, and that no modulation can occur. The one exception is in

Round Trip modulation mode, if a modulation has already occurred. Here, any modulation will simply return to the original tempo, so it doesn't matter if the values of *beat* and *divide* are the same.

No matter what state of modulation the module is in, flipping the *modulation mode* or the *latch modulation* toggle will cause all modulation to reset, and the *beat* output to once more track the external or internal clock.

Configuration Menu

Press and hold the *divide* encoder button to enter the configuration menu. In this menu, turn the *divide* encoder to cycle through the different configuration options. Press the *divide* encoder button to enter the configuration for the selected option, and press the *divide* encoder again to return to the menu. Press and hold the *divide* encoder button to exit the configuration menu.

CLCt - Input Clock Divider

Select **CLCt** to adjust the input clock counter/clock divider, turning the *divide* encoder to change the ratio. This lets you scale down the speed of the input clock by a fixed ratio. A value of **1:1** leaves the input clock unchanged. A value of **1:2** will count two input clocks before the module will register the input. This can be useful if you want to drive *Messed Up* with a fast clock, but you want the output to be more coarse grained. For example, a value of **1:4** would effectively treat the input clock as sixteenth notes, in a time signature that gave a quarter note one beat.

BEAt - Beat Input Reset

Select **BEAt** to change the function of the *beat* CV input. The display value **rst** indicates that *beat input reset* mode is active. Enabling this mode changes the interpretation of signals on the *beat* CV input. With *beat input reset* mode active, rather than adjusting the *beat* value, a high signal on the *beat* input will reset the internal beat counter, immediately triggering the *down* output. This can be useful for keeping *Messed Up* in "hard sync" with an external sequencer.

dUty - Duty Cycle Mode

Select **dUty** to change the duty cycle mode. In the default **1:2** mode, each *beat*, *divide*, *truncate*, and *down* output will fill 50% of the available window for any output clock pulse. The alternate **0.01** mode will send out a fixed 10 millisecond-wide pulse.

StyL - Modulation Style

Select **StyL** to change the modulation style. The default style, **SynC**, adjusts the beat count to be equal to divisions after modulating. The intent with this mode is that after modulating all of the outputs will be part of the new tempo. In the **StAy** style, neither beats nor divisions will change after modulating. Perceptually, in this modulation mode the whole module will sound faster or slower after modulating. Finally, the **FLIP** style will swap beats and divisions after modulating. This style is interesting: perceptually, it will be as if the *beat* and *divide* outputs swapped. It's hard to say which of these styles is "correct" with respect to metric modulation. You should experiment and find out which one sounds best in your setup.

Saving and Recalling Presets

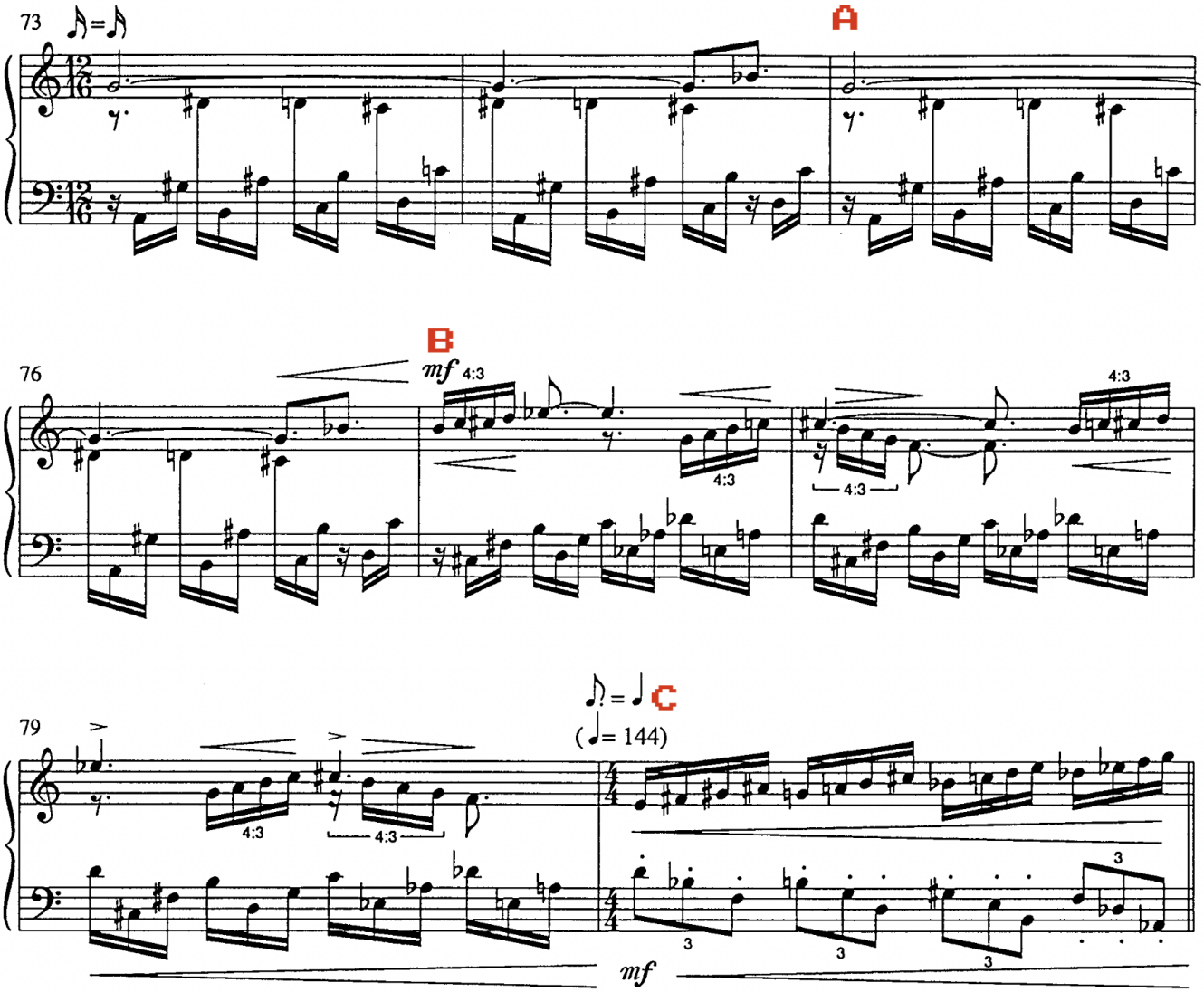
The complete state of the module (including internal tempo, *beat* and *divide* values, the *beat* and *divide* latch state, the external clock divider, the *beat input reset* mode state, the duty cycle mode, and the modulation style) can be stored to one of nine presets, and then recalled as needed. To enter *preset* mode, press and hold the *beat* encoder switch. After one second, the display should change to **p1**, indicating the first preset. Now, turning the *divide* encoder will cycle through available preset slots. Turning the *beat* encoder will switch between *save* mode, indicated with the **S** character, and *recall* mode, indicated with a lower case **r** character. With *save* mode indicated, press the *beat* encoder switch to confirm and save the current state of the module in the current preset slot. With *recall* indicated, press the encoder switch to recall the preset at that preset slot. At any time, press the *divide* encoder switch to exit preset mode.

Appendix

Metric Modulation

Metric modulation is loosely related to the more familiar notion of modulation from one tonal center to another. In both cases, the same musical element takes on a new relationship to the rest of the piece, causing the feel of the music to change. When we modulate from the key of C to G, the note G, which used to be a dominant, becomes instead the tonic. The note G can still appear in the key of C. However, after modulating, instead of feeling like it should resolve back down to C, the G note now feels like the tonal center. Metric modulation works in the same way, except with respect to note durations rather than scale degrees.

Take a look at this exerpt from Carl Vine's *Piano Sonata No. 1*.



At measure 75, marked *A*, the tempo is 108 bpm, and the key signature is 12 over 16. The sixteenth notes in the left hand establish a background pulse, rhythmically analogous to a tonal center. At measure 77, marked *B*, the composer introduces a tuplet of four notes in the space of three, which challenges the established rhythmic feel. At the measure 80, marked *C*, the composer changes both the tempo as well as the time signature. The new tempo, 144, is exactly 4/3 times faster than the original tempo of 108. The four note tuplets now establish a new rhythmic "home", similar to a key change. This is the essence of metric modulation.