OFFICIAL USER'S MANUAL FOR:

!~~~~~~~~~!

Messed Up

!~~~~~~~~~!

A Metrically
Modulating
Clock
Generator

from CuteLab

Rev: 2
Nov 2025

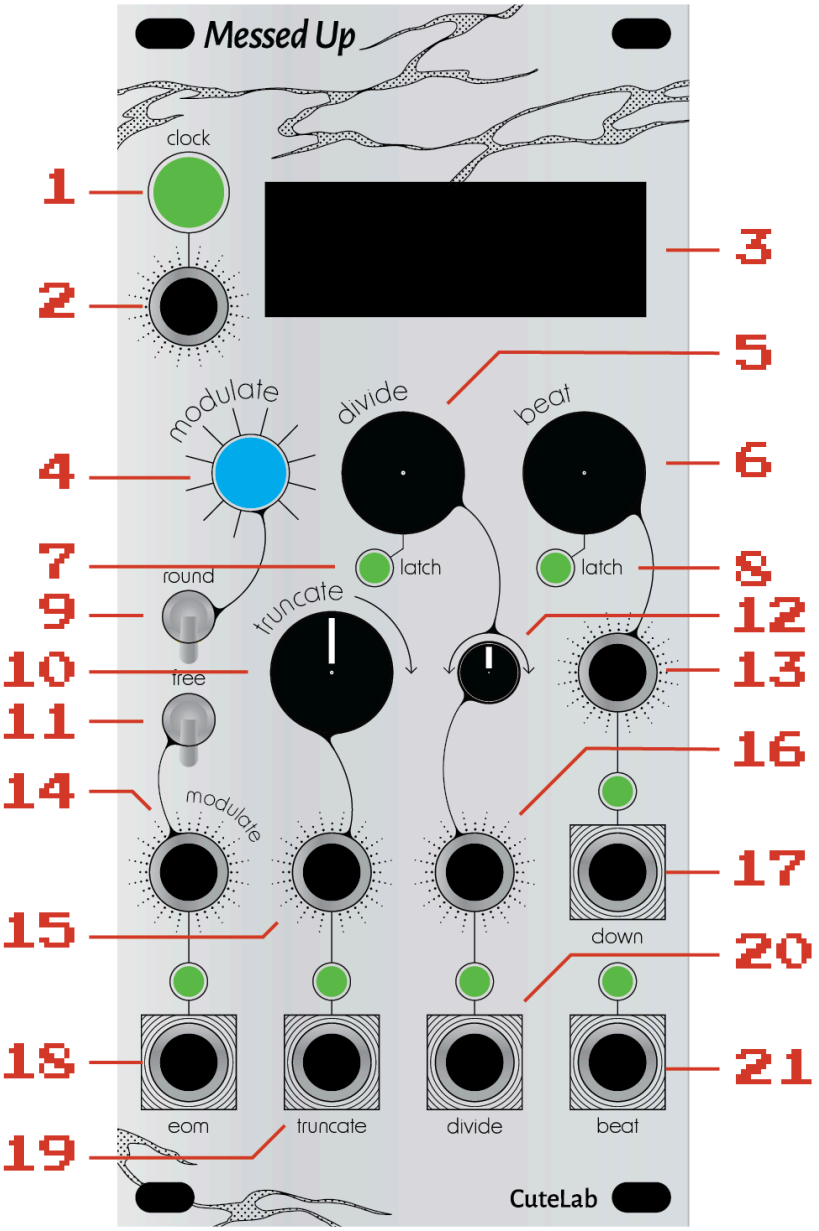
Outline

Overview

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. It can do this freely, or latched to a downbeat to stay in sync with the clock. It provides outputs not only for the clocks, but also for the downbeat and the moment of modulation, allowing other processes to be more easily synchronized with the module. There's also a unique truncate output, which modifies one clock signal with the other to create syncopated rhythms.

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. The module draws ~100mA from the positive rail and ~4mA from the negative rail.



Parameters

1. Tap tempo button and clock indicator
2. External clock input
3. 7-Segment Display
4. Modulation trigger button
5. Divide push-button encoder
6. Beat push-button encoder
7. Latch divide changes to beats indicator
8. Latch beat changes to beats indicator
9. Round Trip modulation mode toggle
10. Truncate potentiometer
11. Free modulation mode toggle
12. Divide input CV attenuverter
13. Beat input CV modulation
14. Modulation trigger input
15. Truncation CV input
16. Divide CV input
17. Downbeat gate output
18. End of Modulation (EoM) gate output
19. Truncate clock output
20. Divide clock output
21. Beat clock output

Basic Operation

Patch a clock into the clock input, and patch the beat output to the gear you'd like to clock. Your gear will be running at the same rate as your input clock. Hold down the clock button, and you'll see the bpm of your clock. Now set beat and divide to different values, turn on the free switch, and press the modulation button. You've now successfully modulated to a new but mathematically related tempo!

Messed Up can act as both a clock source and clock stretcher. By default, its processes are driven by an internal clock, but an external clock can be used as well. *Beat* and *divide* are the primary clock outputs, while the *truncate* output provides rhythmic variation by modifying one with the other. All three parameters have CV inputs to offset their current values. Additionally, *divide* has an attenuverter to modify its CV input. *Beat* and *divide* are the outputs that you'll likely use to drive external sequencers, drum machines, hihats, etc. The values of *beat* and *divide* are presented on the 7-segment display. *Downbeat* and *EoM* send out triggers, useful for triggering other events in sync with Messed Up. The encoder buttons for *divide* and *beat* let you synchronize changes of each parameter to the measure.

As you might expect, the large *modulate* button is used to trigger metric modulations. More specifically, it modulates to a new tempo that is the current tempo multiplied by the ratio of divide and beat (for example: 120bpm * ¾ = 90bpm). This is the core concept of the module. The modulate input jack offers an alternative to pressing the button: a rising edge will trigger a metric modulation. The toggles affect when and how modulation can occur. The *free* toggle synchronizes modulations to the measure. The *round* toggle allows you to modulate to and from a desired tempo.

A variety of extra settings are available using a calibration menu. Most of them allow Messed Up to interface with different kinds of external gear. It is also possible to save and recall presets.

Clock Relations

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 three separate clock signals depending on the values divide and beat.

Here's an example to illustrate: set the module with a beat value of four and a divide value of three. This will be the result: 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; 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.

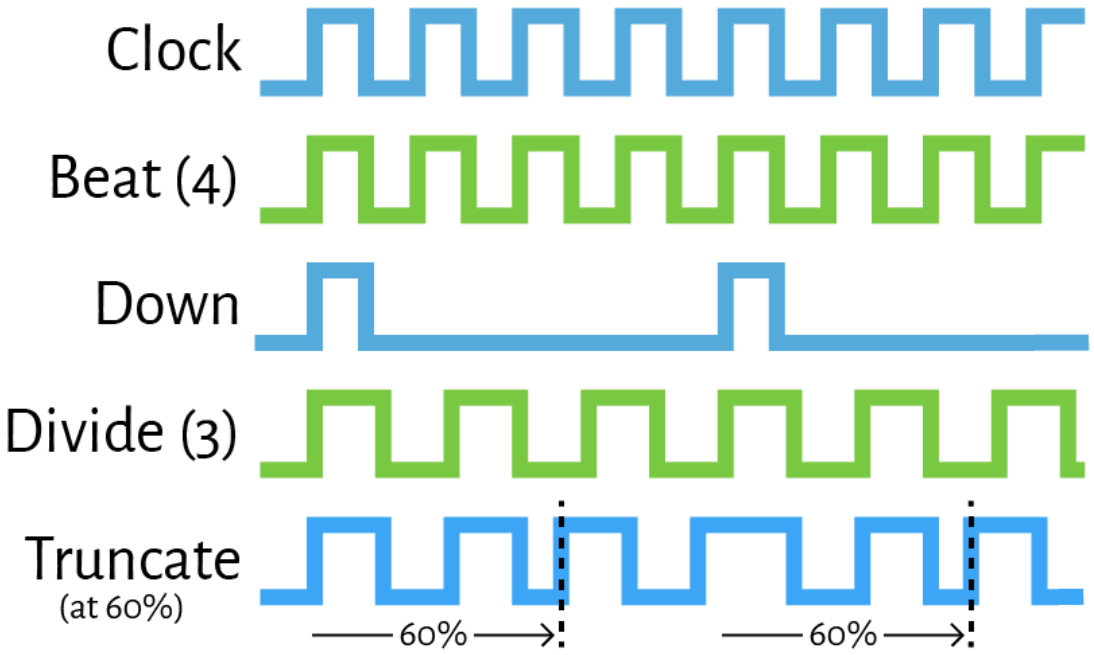


Figure 1: Output Relationships

Internal/External Clock

By default, Messed Up will operate based on an internal clock. The tempo of this clock can be set using the button at the top-left of the module (1 in the diagram). You have the option of tapping the button to set a new tempo, or you can manually set tempo. To do so manually, hold down the tap tempo button and adjust the *divide* and *beat* encoders. The *divide* encoder will adjust the tempo by a factor of 1, 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. The module can also be made to start and stop when the external clock disappears (see "Clock Stop" in the Configuration options).

Beat and Divide

Messed Up uses the values 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 as the clock input (or internal clock). 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 constitute 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. See figure 2 for more examples of how beat will affect the downbeat output.

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 and inverted 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. See figure 3 for more examples.

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.

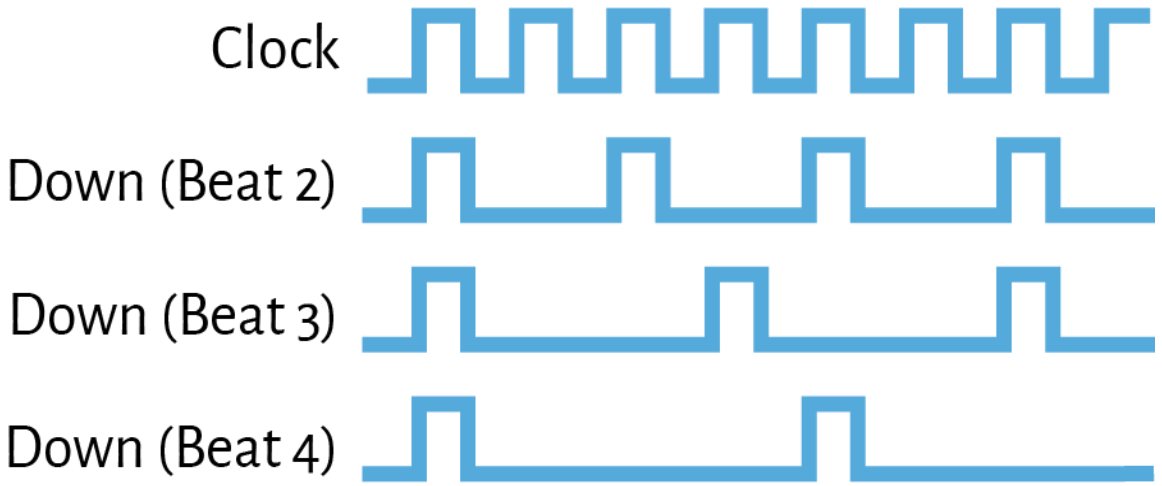


Figure 2: Beat Settings

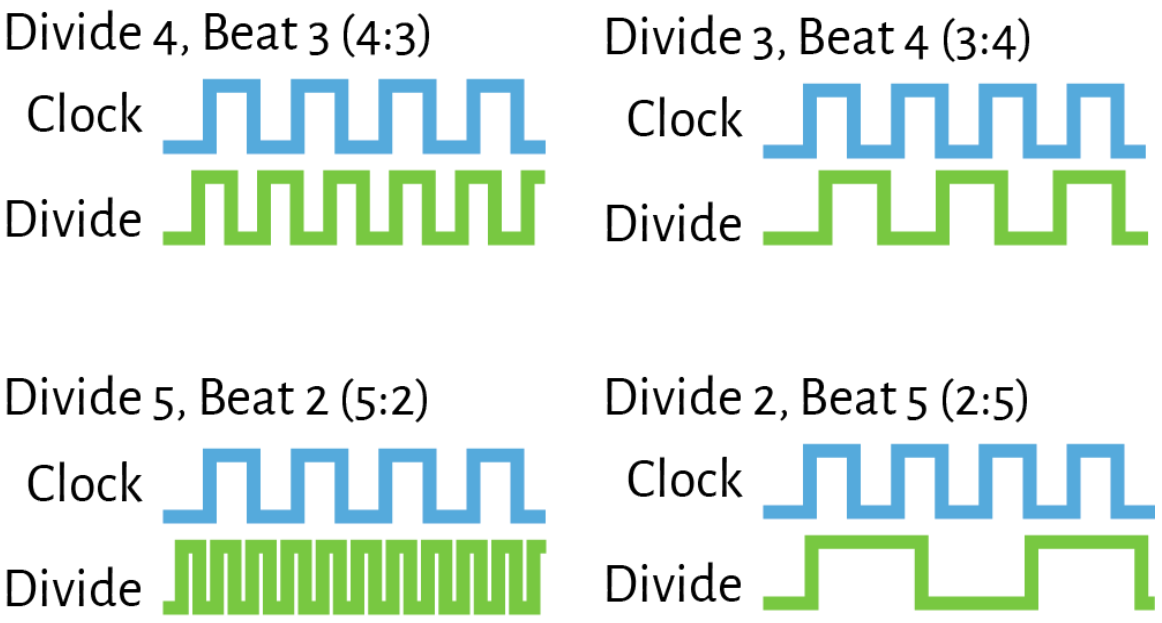


Figure 3: Beat and Divide Ratios

Truncation

The *truncate* output can be a useful source of subtle, syncopated variation on the *divide* output. The *truncate* output follows the rate of the *divide* output, but the whole pattern is truncated and reset at some point within a 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). An output identical to *divide* can be achieved by setting the truncate knob to minimum. Turning up *truncate* will cause the truncation to occur later in the measure. In the example below, the internal "beat count" has been added for clarity.

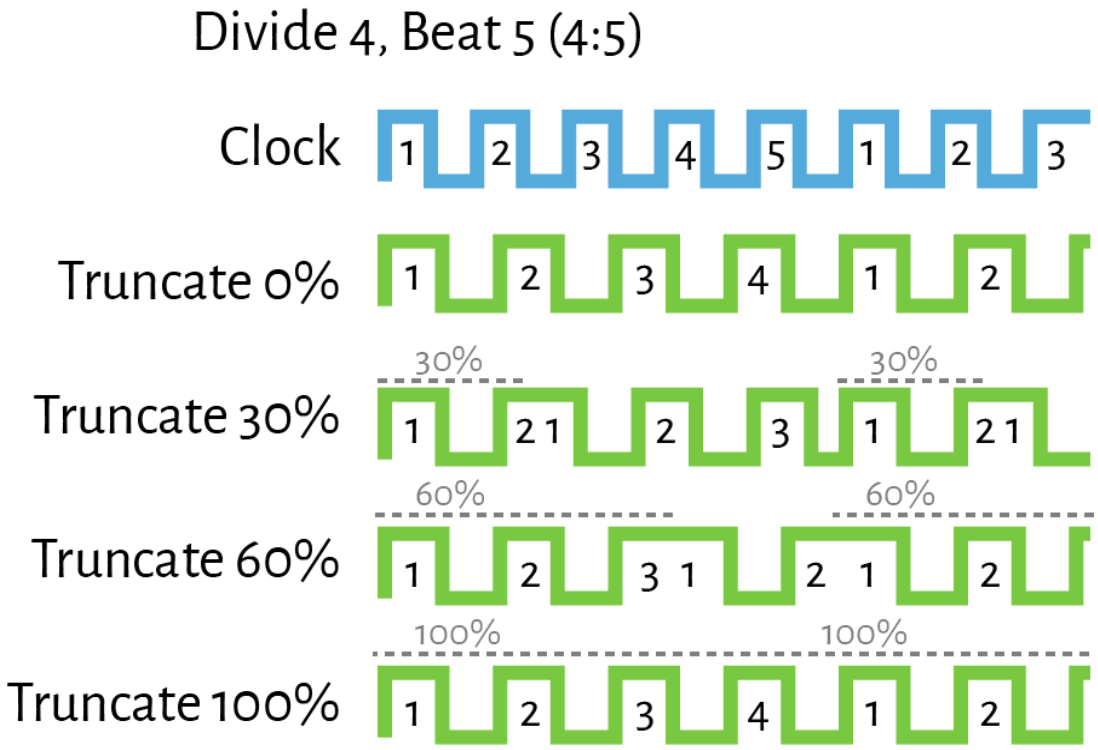


Figure 4: Truncate Settings

Modulation

Messed Up is designed to make metric modulation easy. When a modulation occurs, 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 move to a new tempo that's 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.

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.

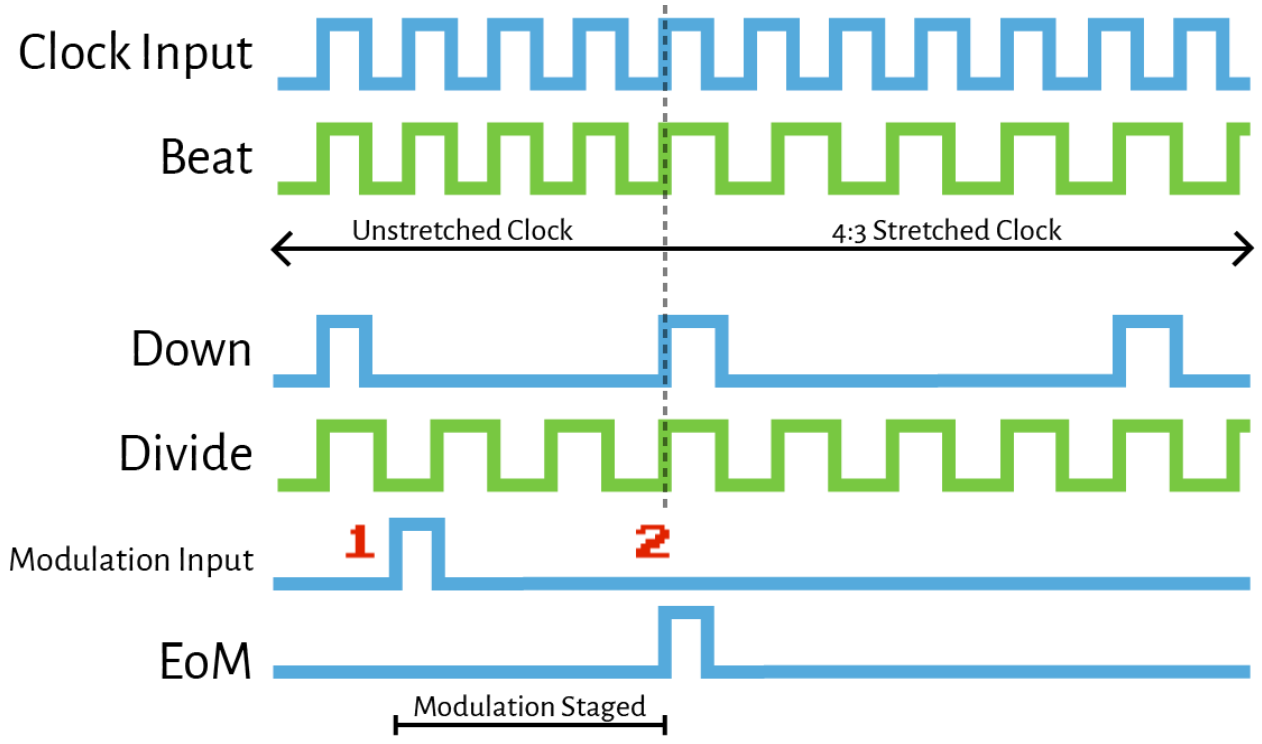


Figure 5: Modulation

Round-Trip and One-Way Modulation

After modulating, queuing 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.

No Modulation Possible: d=b

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.

Tempo Reset

No matter what state of modulation the module is in, flipping the *modulation mode (“round”)* or the *latch modulation (“free”)* toggle will cause all modulation to reset. After the reset, the *beat* output to once more track the external or internal clock. In Round Trip mode, this will have the same effect as modulating back, except it will occur instantaneously (rather than synchronizing to the next beat or downbeat).

Configuration Menu

The configuration menu allows you to select a change the behavior of the module, and even the function of one of the input jacks. The menu contains several options, each with multiple possible settings. The menu options are shown on the module's 7-segment display.

Here's a description of the configuration workflow:

- To enter the configuration menu, press and hold the *divide* encoder button.
- To cycle through the different configuration options, turn the *divide* encoder.
- To select the currently displayed option, press the *divide* encoder button.
- To cycle through possible settings of the selected option, turn the *divide* encoder. The currently viewed setting is automatically selected.
- To return to the configuration menu, press the *divide* encoder again.
- To exit the configuration menu, tap the *beat* encoder at any time. Alternatively, you can press and hold the *divide* encoder button at any time.

Configuration Options

Input Clock Divider (CLCt)

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 coarsely 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.

Possible Settings: 1:1, 1:2, 1:3, 1:4, 1:5, 1:6, 1:7, 1:8, 1:9

Clock Stop (CStP)

Select **CStP** to enable or disable Clock Stop mode. Enable this option to sync the operation of Messed Up to an external clock. While an external clock input is connected, if this option is enabled, then Messed Up will pause operation. While operation is paused, Messed Up will not output any signals, and any pending modulations will be held pending. Once the external clock resumes, or the external clock input is disconnected, or Clock Stop mode is disabled, Messed Up will unpause and resume normal operation.

Possible Settings: On, Off

Beat Count (bCnt)

Select **bCnt** to adjust how many pulses are sent per note on the *beat* output. This is useful for controlling external sequencers that expect specific input types. For example, if a drum machine expects a 4PPN clock (four pulses per note) at 120bpm, then a standard 1PPN clock would cause it to run at a slugish 30bpm. This setting can also be used simply as a way to get faster note values without affecting the general function of the module. Note that the output LED's rate will not reflect the default rate, reflecting the value of the knob.

Possible Settings: 1PPn (default), 2PPn, 4PPn, 8PPn

Div Count (dCnt)

Select **dCnt** to adjust how many pulses are sent per note on the *divide* output. This is useful for controlling external sequencers that expect specific input types. For example, if a drum machine expects a 4PPN clock (four pulses per note) at 120bpm, then a standard 1PPN clock would cause it to run at a slugish 30bpm. This setting can also be used simply as a way to get faster note values without affecting the general function of the module. Note that the output LED's rate will not reflect the default rate, reflecting the value of the knob.

Possible Settings: 1PPn (default), 2PPn, 4PPn, 8PPn

Duty Cycle Mode (dUty)

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.

Possible Settings: 1:2, 0.01

Beat Input Reset (BEAt)

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.

Possible Settings: dEF, rSt

Modulation Style (StyL)

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 have swapped. Neither of these is more correct than the other, so experiment to see which feels right to you.

Possible Settings: SYnC, StAY, FLIP

Saving and Recalling Presets

The complete state of the module can be stored to one of nine presets, and then recalled as needed. The “state” includes internal tempo, *beat* and *divide* values, the *beat* and *divide* latch states, along with the values of all of the calibration options.

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 (p1, p2, p3, etc). 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.

Updating the Firmware

It is possible to update your Mom Jeans using the USB port on the back of the module. Messed Up has a larger circuit board for controls and jacks, and a smaller circuit board for the microcontroller. The USB port is on the smaller board.

For instructions on how to update the module, and to download firmware, please visit our Github.

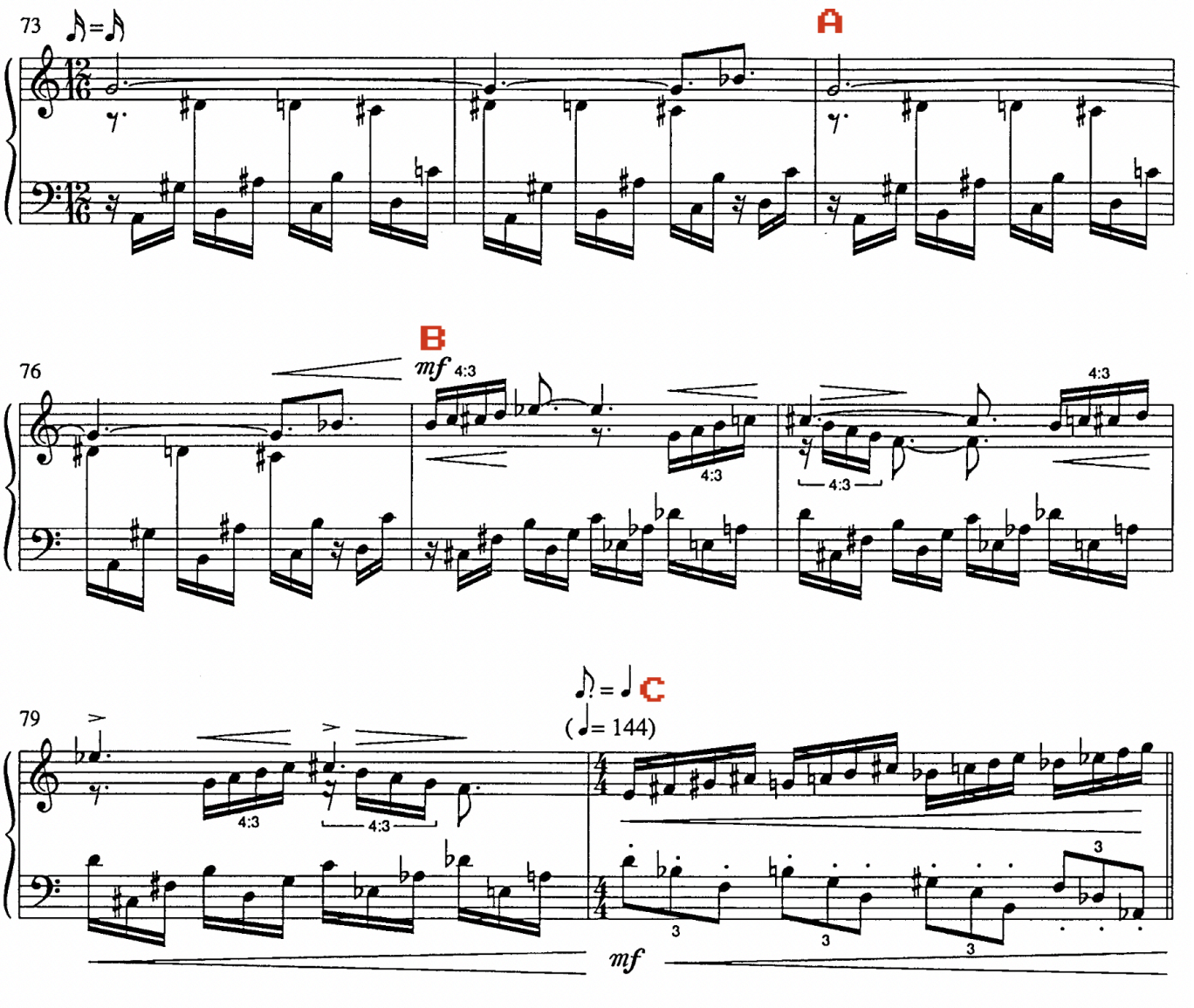
Appendix

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 the following excerpt from Carl Vine's *Piano Sonata No. 1* (see next page).

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.


73
A
B
76
mf
4:3
C
79
(♩= 144)
mf


Messed Up
Messed Up
Messed Up