

Disclaimer: This is an unofficial add-on to the M user manual, describing some of extra features added from firmware 1.05 up to firmware 1.11. This add-on also covers some complex aspects of the Multi Mode, which remains somewhat unusual.

Author: Vladi Salnikov aka VladiS.

Algorithms of FW version 1.11:

Varysaw: A VA oscillator ranging from SAW through PULSE to TRI.

Wave (red encoder): Mixes from 0 to 31 from SAW to PULSE; 32 is pure PULSE, and 33 to 63 mixes from PULSE to TRI.

Meta parameter: Pulse width for PULSE, adjustable from 5% to 95%.

CSAW: A famous Yamaha CS-80 saw oscillator with mutation towards a parabolic oscillator.

Wave : Controls the amplitude of the “step” component of the saw wave.

Meta parameter: Mixes between this saw wave and the parabolic saw wave.

Waveshpr: A SAW to TRI oscillator fed into a mild waveshaper.

Wave : 0 is pure SAW, 1-62 mixes between SAW and TRI, and 63 is pure TRI.

Meta parameter: Depth of the waveshaper.

TriplSaw: A stack of three SAW oscillators; two are detuned slightly higher and lower than the third.

Wave : Controls the amplitude of the “central” SAW oscillator relative to the two “side” SAWs.

Meta parameter: Detuning factor, from 0 to maximum detune.

S/T Fold: A SIN wave folding oscillator that folds the chosen crossmixed wave between SIN and TRI waves.

Wave : 0 is pure SIN, 1-62 mixes between SIN and TRI, and 63 is pure TRI.

Meta parameter: Folding depth.

FM 2 OP: Classic simple two-operator FM synthesis. OP1 (modulator) generates a sine wave that modulates the phase of OP2 (carrier). Both operators generate sinewaves; the algorithm's output is the carrier signal.

Wave: Maps values from 0 to 63 to harmonics ratios of 1 to 8 in stepped increments.

Meta parameter: Amount of phase modulation applied to the carrier.

FM Fback: Classic simple two-operator FM synthesis with feedback. OP1 (modulator) generates a sine wave that modulates the phase of OP2 (carrier). Both operators generate sinewaves; the algorithm's output is the carrier signal, which modulates the modulator's amount in feedback loop.

Wave : Maps values from 0 to 63 to harmonics ratios of 1 to 8 in stepped increments.

Meta parameter: Amount of phase modulation applied to the carrier.

DuoNosie: A white noise source filtered by a pair of 12dB LP/HP filters set to the same (static) cutoff frequency. The cutoff frequency differs between the first and second oscillators of M; it is 2 kHz for OSC1 and 4.4 kHz for the second oscillator. Combined with variable resonance, this allows generating different noise flavors to shape your sound.

Wave : Blends from 0-63 between low-passed (0) and high-passed filters (63).

Meta parameter: Q factor of the filter.

Multi-Mode Tips & Tricks

The M's multimode has received considerable criticism over the years. I understand this, as users often expect it to function similarly to digital-only synthesizers. However, the multimode was originally intended as a highly flexible system, allowing users to configure the four dedicated outputs for four independent instruments and process them via external effects. This led to a complicated voice management structure with reservation of hardware voices to the outputs, parts priority, and an inability to steal voices between parts.

Later additions to the synthesizer engine have further complicated matters. However, it is possible to create a working multi-arrangement by following several building rules. Here I will attempt to explain them.

Rule 1 – Parts Priority for Voice Reserve! The V.Total parameter of an arrangement sets the number of hardware voices that M will mark as reserved and locked by the DSP for each part. However, this is **not** a guaranteed reservation, as one might assume. Part priority (1 → 2 → 3 → 4) plays a crucial role here; priority always determines voice allocation. For example, if you reserve six voices for part 1, four for part 2, and two for part 3 on an 8-voice M, the actual distribution will be six voices for part 1, **but only two for part 2 and zero for part 3**. On a 16-voice M, reservations are honored as requested. Therefore, rule one is to carefully manage your voices, considering hardware limitations and part priority.

Rule 2 – Mind the PLAYMODE parameter for the part's sound. It makes no sense to set more than 1 voices for Monophonic sounds, the Voice Stealing does not matter too.

Rule 3 – Only the First Part Can Use Modern Mode! This is an important restriction related to the limited memory resources of the M's DSP. Remaining parts can be in classic or MVA modes, but only the first part can utilize extended RAM for the "modern" (i.e., Microwave 2) wavetable layout.

Rule 4 – Consequently, No Transition-Enabled Parts Can Mix with Part One in Modern Mode! Because transition replay for "classic" (i.e., PPG 2.3 / Microwave 1) mode uses the **same** extended RAM as the wavetables for "modern" mode, loading a part with transitions enabled will immediately corrupt the wavetable data for modern mode!

Rule 5 – There is Only One Arpeggiator in the M. Loading or creating an arrangement with multiple parts containing arpeggiator-enabled sounds is pointless; only one (first) part's arpeggiator will function.

Rule 6 – Cross-Parts VCF Lock. Regardless of which part is selected, if a part's LOCKVCF parameter is set to On, it will follow the VCF behavior of another part. This parameter allows all locked parts to track the controls of the currently selected locked part. For example, if you have three parts and parts 1 and 3 have LOCKVCF = On while part 2 has LOCKVCF = Off, adjusting the VCF section's controls on part 1 will cause part 3 to follow the same settings (i.e., lock to part 1), and vice versa. However, this will not affect part 2. Consequently, editing part 2's VCF section will not influence these locked parts.

Rule 7 – Be Mindful of MIDI Filters. The M has a flexible set of MIDI filters capable of blocking/passing certain messages like mod wheel, pitch bend, program/bank changes, aftertouch, channel volume, and panorama. However, there is no CC filtering! Therefore, if you have two parts in an arrangement on the same MIDI channel, both will respond to all CCs received on that channel. **And, don't forget about the global MIDI filters of the M, which applied first!**

Rule 8 – Voices Routed to Different AUX Outputs Still Appear on Main/Headphone Output. The M does not exclude voices routed to different AUX outputs from the main output. In other words, the main out is a sum of all Aux outputs (which is also true from the M's schematic perspective).

Tuning Tables Load (Since FW 1.11)

Since FW 1.11, M is capable of supporting micro-tuning, that is, any possible frequency for any MIDI note. This functionality allows loading and saving scales from simple, hand-editable .txt tuning files placed in the TTABLES folder on the SD card. The tuning table file uses a simple record convention, similar to the note name map format in Reaper. Each note's tuning is represented as a string containing its MIDI note number and frequency, separated by a single space. The frequency must include a decimal point, even if it's an integer (e.g., 440Hz must be represented as 440.0). Each note occupies a single line, and the first line of the tuning .txt file is ignored. The tuning table file can contain any number of notes, from one up to 127. Only the notes listed in the file will be applied to M's actual tuning table.

Generally, workflow for the tuning files is similar to workflow for the User wavetables and Transitions.

To load, save, and apply tuning tables, a new set of settings was introduced in FW 1.11. These settings are located on the sixth page of the settings menu:

Tune note to RAM : Specifies a single note to tune in RAM.

1/1 Herz : The integer part of the frequency for this note.

1/1000 Herz : The fractional part of the frequency for this note.

TunT file num : The number of the tuning table file, following the naming convention tuningXX.txt, where XX is a number from 00 to 15.

Load TunT on start: Loads the specified tuning table automatically when M starts up.

These settings are used within the Tuning Table Operation menu in System Operations. The following operations are available:

Load tuning table from the SD card: Reads the selected file (specified by the TunT file num setting) from the SD card into M's tuning table memory. This does not change the current tuning; it only loads the data.

Save tuning table to the SD card: Renders and saves the current tuning from M's tuning table memory to the selected file (specified by the TunT file num setting).

Set & transfer selected note: Based on the settings for Tune note to RAM, 1/1 Herz, and 1/1000 Herz, this writes the record for the selected note with the specified frequency to M's tuning table memory, enabling that tuning for a single note at the DSP level and sending an MTS realtime sysex message (Single Note Tuning).

Transfer full tuning table: Transfers the entire tuning table memory of M (128 notes/frequencies) to the DSP and enables these tunings for all notes.

Reset to standard tuning: Returns to the standard 12-equal tempered tuning, based on the Master tune setting for MIDI note 69.

Several helpful web services can simplify preparing your tuning table. I recommend using the excellent tool Scale Workshop from <https://scaleworkshop.plainsound.org>. It's possible to import scale and export it in the Reaper note name map (.txt) format, allowing you to load prepared tunings directly into M.

Over 5000 thousand of interesting modern and historical scales in .scl format can be downloaded from <https://www.huygens-fokker.org/docs/scales.zip>.

Example of the strings in file (only these MIDI notes will be loaded): One can copy and paste this directly to the file like tuning00.txt, save to SD card and test with M.

```
#Pythagorean chromatic
108 16744.036
107 14883.588
106 14127.781
```

105 13229.856
104 12558.027
103 11162.691
102 9418.520
101 8819.904
100 8372.018
99 7441.794
98 7063.890
97 6614.928
96 6279.014
95 5581.345
94 4709.260
93 4409.952
92 4186.009
91 3720.897
90 3531.945
89 3307.464
88 3139.507
87 2790.673
86 2354.630
85 2204.976
84 2093.005
83 1860.448
82 1765.973
81 1653.732
80 1569.753
79 1395.336
78 1177.315
77 1102.488
76 1046.502
75 930.224
74 882.986
73 826.866
72 784.877
71 697.668
70 588.658
69 551.244
68 523.251
67 465.112
66 441.493
65 413.433
64 392.438
63 348.834
62 294.329
61 275.622
60 261.626
59 232.556
58 220.747
57 206.716
56 196.219
55 174.417
54 147.164
53 137.811
52 130.813
51 116.278
50 110.373
49 103.358
48 98.110

47 87.209
46 73.582
45 68.905
44 65.406
43 58.139
42 55.187
41 51.679
40 49.055
39 43.604
38 36.791
37 34.453
36 32.703