



[www.muon-software.com](http://www.muon-software.com)

# CM101 User Manual

## 1. Introduction



The CM101 is a simple, fun software synthesiser which combines elements of coveted, classic analogue keyboards with the convenience of a VST Instrument Plug-in.

CM101 gets its fantastic sound from Muon Software Ltd's advanced 64-bit Analogue Modelling technology - you can read more at:

[www.muon-software.com/home/home.html](http://www.muon-software.com/home/home.html)

Also, don't forget that e-mail support for this product is available.

Send a message to **CM101@muon-software.com** if you have any problems at all with the software.

## **2. Front Panel Control Basics**

The CM101 has a wide variety of controls for creating sounds, with thousands of possible variations. The circular knob controls and sliders are used to adjust parameters that have a continuously adjustable range, whereas the buttons are used to select a choice from a limited set of options.

For example, the VCO1 waveform control may only be set to one of the available choices. Simply click on a button to change the oscillator to output the waveform indicated by the symbol. With the voices button you may left-click to increment the value and right-click to decrement. Mac users in all cases can substitute ALT-click for right click.

The knobs are not operated in the common VST plug-in "circle" mode - we have implemented the more convenient "vertical" mode that many people tell us they prefer.

In vertical mode the knob is clicked on with the mouse and the value only changes when the mouse is moved up and down. To make very fine adjustments, hold down the SHIFT key when moving the mouse.

At all times, a popup display will appear when you are adjusting a control, enabling you to see the control's exact value. Whilst you are learning your way around CM101, or if you wish to make fine adjustments, this is a very useful feature.

Sliders work either by clicking the handle and dragging it to the new position with the mouse, or by simply clicking anywhere on the slider's track to force the control to "jump" to the new value.

Finally, if you wish to set any control back to its default value quickly, then just press and hold down CTRL on your keyboard when you click.

### 3. The Oscillator Section



CM101's two Virtual Computerised Oscillators (VCO for short) produce one of four sound waveforms each, and are mixed together to make the basic sound of the synth.

The sound waveform that you select will change the entire character of the patch. The timbres (tone colors) of the waveforms, in clockwise order are as follows:

Sawtooth	-	Bright, brassy
Triangle	-	Soft, woody
Sine	-	Neutral
Square/Pulse	-	Warm, reedy

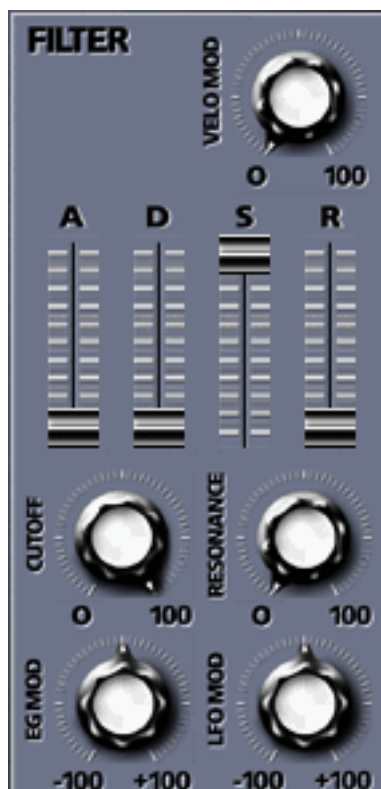
The shape of the square wave can be altered with the Pulse Width control. With the control centred at 50:50, the output is a perfect square wave. The Pulse Width control modifies how soon into each cycle the zero-crossing occurs, and is expressed as a ratio. Experimenting with this control can yield a range of timbres from just the square wave - this adds a lot of flexibility to CM101. It is also possible to automatically "sweep" the pulsewidth using the PWM Depth control, more about this in the section on the LFO (Low Frequency Oscillator).

You can adjust the individual oscillators so that the pitch they play is up to 12 semitones higher or lower (using the transpose control) than the note the synth receives over MIDI. The fine pitch (detune) can be adjusted for each oscillator also. Setting the detune on different oscillators to different amounts will produce a wide, swirling effect as the oscillators "beat" against each other - this is great for big, fat patches. You can also set the volume of each oscillator using the level control. It is also possible to "sweep" the pitch of VCO1 and VCO2 independently, more about this in the section on Modulation.



The final output volume of the synth is set using the master volume control. You can also set the range of your keyboard's pitch bend controller, and the number of voices available in the Master Section, shown above.

#### 4. The Filter Section



CM101 has a powerful VCF (Virtual Computerised Filter), capable of sculpting the sound of the oscillators beyond all recognition. This is where the majority of the work in creating a patch is done!

The filter is a Low Pass design, which means that harmonics higher than the cutoff frequency (set by the Cutoff Control) are made quieter, and frequencies below the cutoff pass through unharmed. You can use the filter to fine tune the overall tone of your patch, or in more exciting ways with resonance and modulation.

The Resonance control is used to add a boost to the frequencies immediately around the cut off point. Setting this control to 100% will cause the filter to turn into an oscillator, which can be used to great effect (though watch out for the levels - CM01 can easily distort the input of your sequencer's mixer at high resonance).

The Attack, Decay, Sustain and Release sliders are to do with the mysterious process known as “modulation”. Simply put, modulation means to vary a parameter over time.

The sliders here control what is called an Envelope Generator, which has the task of creating a varying signal that the filter cutoff control follows.

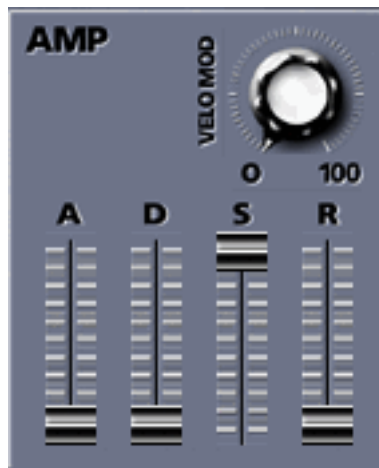
An envelope generator outputs a (non-audible) signal that rises from zero when a key is first pressed up to its peak at the speed determined by the Attack slider. Then, the output falls to a steady level (the Sustain level) at a speed determined by the Decay slider. Finally, when the key on the keyboard is released, the output of the envelope generator falls to nothing again at the speed determined by the Release slider. In synth terminology, this is an ADSR envelope generator.

The output signal of the envelope generator is used to drive (modulate) the cutoff frequency. The exact amount the cutoff changes in response to the opening and closing of the envelope is determined by the Filter Envelope Modulation control (labelled EG Mod). You should note that this control can be set to a negative amount - this will invert the effect of the envelope generator causing the cutoff to fall when the envelope signal is rising and vice-versa.

You will no doubt have heard of filter sweeps - here's how to make one. Turn the cutoff control to zero, and set the resonance to about 50%. Set the Attack slider to zero, the Decay slider to the maximum and the Sustain and Release sliders to zero. Set EG Mod to maximum, and hold down a key - you will hear the filter sweeping down the frequencies, gradually making the sound of the oscillators duller and duller until it disappears. The more resonance you add, the more defined the sweep becomes.

You can also make the Envelope Generator respond to MIDI with the Velo Mod control. If you have a velocity sensitive keyboard turn this control up, and the velocity you hit the key with will cause the envelope to open more. Harder velocities will make the envelope generator open more, and softer playing will make it open less. The Velo Mod knob sets the amount of modulation applied to the envelope generator.

## 5. The Amplifier Section



CM101's amplifier determines how much of the sound generated by the oscillators, which sound continuously, make it to the outside world. In the filter section we explained how the ADSR controls work and the basic concept of how an ADSR Envelope Generator is used to make parameters change over time.

The Amplifier ADSR Envelope Generator varies the output volume of the note over time. Just as on the Filter EG there is also a Velo Mod control for the amp EG. If you have a velocity sensitive keyboard, increase this control until you get a good range of touch between soft, quiet notes and louder ones.

The A, D, S and R controls work in the same way as the Filter EG. Note that the Release control in this case will determine just how long it takes for a note to die away after you have released the key. CM101 has dynamic voice allocation and if you then immediately hit another key before the previous one has died away the synth will need to use two voices - one for your old note and another for your new note. The exact number of voices that can be safely generated by the synth is determined by your CPU's clock frequency. A 500Mhz CPU should be capable of running all 16 voices at the same time (but your mileage may vary). To avoid CPU dropouts in your audio software watch out for patches with long releases as these will inevitably need more voices, or use the Master Section controls to limit the number of possible voices to a suitable number.

## 6. The Low Frequency Oscillator Section



The Low Frequency Oscillator or LFO for short is just like the two VCOs used to create CM101's sound, but it operates at a much lower pitch (frequency) and is inaudible. Instead of being sent to the audio output, the signal generated by the LFO is used to add rhythmic modulations to other parameters, such as VCO pitch or Filter cutoff.

The wave shape and frequency of the LFO is selected with the waveform and rate controls respectively. The LFO can be switched off (as shown in the picture, none of the lights are lit) to save CPU if it is not needed.

The LFO output signal can be used to modulate five different parameters within CM101. In each of the oscillator sections there are two controls labelled PWM Depth and Pitch Mod. When the LFO is activated, these controls can be used to “feed” an amount of the LFO signal in and use it to vary the destination parameter.

A simple illustration is vibrato. This is simply, in synth terminology, pitch modulation. To create a patch with vibrato activate the LFO by clicking on one of the waveform buttons on the left of the section. Sine or Triangle is a good choice. Turn the rate control to about 60%. Even though you can't hear it, the LFO is now happily oscillating away.

To connect the LFO signal to something, we need to locate the Depth control that relates to the parameter we want to modulate. In this case, we already know that vibrato is pitch modulation, so we should turn up VCO1 and VCO2's Pitch Mod controls to fully positive (right). The pitches of the oscillators will now start to crazily bend up and down. Turn VCO2 Pitch Mod to fully negative (left), and you will hear VCO2's pitch swinging in the opposite direction to VCO1's. This is negative modulation.

Increasing the LFO Rate control will make the pitch swings speed up and decreasing the control will cause them to slow down. If you change the wave shape to one of the other wave forms you will soon get a clear picture as to what signal the LFO is outputting and how it affects the destination parameter.

You can also route the LFO to the VCO's Pulse Width control, but this only has an effect if the oscillator waveform is set to Square. Modulating the Pulse Width with a slow triangle LFO is a great effect for pad and bass sounds, giving a rich and moving timbre.

The filter cutoff can also be modulated by the LFO, which is great fun!

## 7. MIDI Control

So far we have shown that CM101 responds to velocity and pitchbend data just like a real synth. Additionally, CM101 responds to MIDI continuous controller messages to enable you to change parameter values from a remote MIDI controller or from inside your sequencer software.

MIDI CC messages are numbered from 1-127. CM101 can only respond to CC's 75-98, and each is reserved for a particular function.

These parameters, and their value ranges, are listed below.

Please note that CM101's on-screen controls cannot SEND CC messages, they can only receive them.

Parameter		CC	Range
VCO1 Level	75	0-127	
VCO1 Pitch Mod Depth	76	0-127, 64=centre	(no modulation)
VCO1 PulseWidth	77	0-127, 64=centre	(square wave)
VCO1 PulseWidth Modulation Depth	78	0-127, 64=centre	(no modulation)
VCO2 Level	79	0-127, 64=centre	(no modulation)
VCO2 Pitch Mod Depth	80	0-127, 64=centre	(no modulation)
VCO2 PulseWidth	81	0-127, 64=centre	(square wave)
VCO2 PulseWidth Modulation Depth	82	0-127, 64=centre	(no modulation)
VCF Cutoff	83	0-127	
VCF Resonance	84	0-127	
VCF EG Cutoff Mod Depth	85	0-127, 64=centre	(no modulation)
VCF LFO Cutoff Mod Depth	86	0-127, 64=centre	(no modulation)
EG1 Attack	87	0-127	
EG1 Decay	88	0-127	
EG1 Sustain	89	0-127	
EG1 Release	90	0-127	
EG1 Velo Mod	91	0-127	
EG2 Attack	92	0-127	
EG2 Decay	93	0-127	
EG2 Sustain	94	0-127	
EG2 Release	95	0-127	
EG2 Velo Mod	96	0-127	
LFO1 Rate	97	0-127	
Master Volume	98	0-127	



## **8. Getting Help**

It's no doubt that CM01 is a powerful synthesiser, and it is designed to make creating new sounds easy and quick. For some though all that power can be daunting -just mail us at [CM101@muon-software.com](mailto:CM101@muon-software.com) and we'll do our best to answer your questions quickly and courteously.

Best of luck!!

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