



CV Thing

USER MANUAL

Firmware v1.4



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User Manual Rev 16 Feb. 2021

CHANGELOG

1.4

- Added Strum mode.

1.3.1

- Fixed Velocity bug.

1.3

- Channel Pressure message added.
- Chord mode added.
- Bug Fix: Fader attenuation is now set to multiply between 0 and 1.
- Improved compatibility with iConnectivity devices.

1.2

- New Polyphonic mode added.
- Changed save structure. Now there are four save spaces available.
- 14 bit CC implemented.
- Web configurer available [here](#).

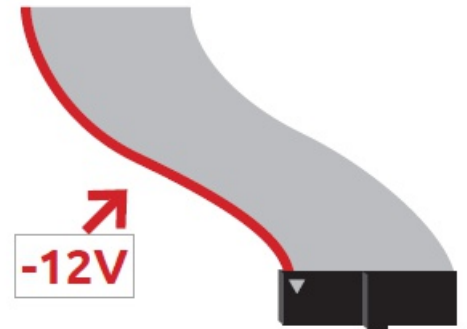
1.1

- Velocity now applies to notes sent via Gates.
- Gate functions can be mapped to CV and AUX inputs.
- Changed clock handling.
- Changed Sysex structure to improve compatibility with MACOS.
- Panic can be mapped to gates.
- Default mapping fixed to match manual and Bitwig script.
- Gates are no longer visualized in the screen as redundant.
- Some minor visual tweaks on menus.
- Improved stability on menus. Now configuring during performance is not disturbing usability.
- Calibration ranges change depending in input range.
- Calibration is not reseted when changing Input range.
- In Note mode now you can choose the time for the Note OFF.
- Fader readings are smoother now.
- NRPNs values can be set now in decimal format.
- Improved screen compatibility.

POWERING THE
MODULE

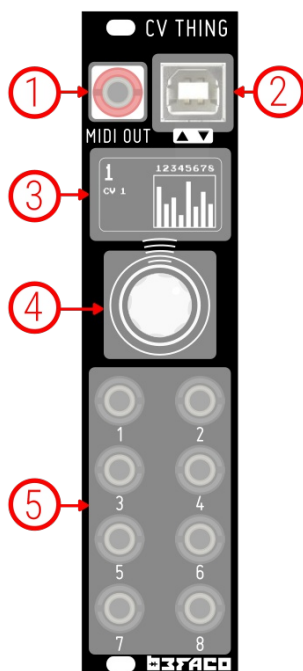
THANKS FOR PURCHASING A MODULE FROM BEFACO!
BEFORE YOU PLUG THIS MODULE IN...

1. **Disconnect your cabinet from the mains.**
2. **Triple check the power cord polarity.** The coloured line on the cable (pin number one) is the -12V rail.
3. If you plug the module backwards or in **EXP connector** you might burn it out and unfortunately this is not covered by the warranty.
4. If you have any questions about this product please send them to:
support@befaco.org



INTRODUCTION

Cv Thing is a fully mapeable CV to MIDI converter in just 6HP. Its based on our VCMC module, but aiming for small and compact performance rigs. It has eight inputs that can be mapped to any MIDI message quite easily thanks to its simple and intuitive user interface. CCs, Program change ,V/ Oct to Note or Clock are some of the messages that can be configured to easily control MIDI gear from your modular rig.

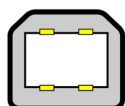
MODULE
REFERENCE | PANEL OVERVIEW

1. TRS MIDI Output
TRS MIDI Output Connector
2. USB Output
USB Type B Midi output connector.
3. OLED Screen
OLED Screen for visualization and editing all functions.
4. Encoder
Rotary encoder control.
5. CV
CV inputs.

STARTING WITH
CV THING

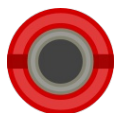
CONNECTING THE UNIT TO EXTERNAL GEAR

There are two main MIDI connections in CV Thing: USB and TRS. Both connections send every MIDI message generated by the module, choosing each one depending on the device you will be controlling. Let's take a deeper look:

**USB**

The USB port is the most convenient way to connect CV Thing to a computer. Just plug a USB Type B cable from CV Thing to a free USB port of your computer and the module should be automatically recognized as a MIDI Device. You will be able to select it on the MIDI connections of your DAW or any other software that supports MIDI.

If you have USB Host devices, you can use this port with it in the same way we did with the computer.

**TRS MIDI**

Most of the external gear out there uses DIN5 connections for MIDI control. This is why we included a TRS to DIN5 adaptor. If you want to control your external gear with CV Thing, just plug a standard MIDI DIN cable from CV Thing's TRS Out port, using the adaptor, to your device's MIDI Input.

BASIC
STRUCTURE

INPUTS & PERFORMANCE SCREEN

The Performance Screen is the main level of CV Thing menu. This screen shows quickly the status of each input via level bars.

You can browse thru the eight inputs with the encoder to see further details of each input.

Then clicking the encoder you can enter configuration menu of each input.



SETTING CV THING | CV CONFIGURATION

Each CV Thing input its own configuration menu where you can configure its behaviour. From the Performance Screen, select the input and press the encoder to enter into CV EDIT Screen.



CV Config Screen

FUNCTION

Selects the MIDI message that will be mapped to this input. By pressing on it you will have access to the MIDI Mapping screen.

1. CC

This will send CC messages. When selected you will be prompted to choose which CC number will be sent.

2. V/Oct to Note

In this mode two inputs will be linked so we can convert CV + Gate messages to MIDI notes. This mode is available at Odd inputs, then the next one will be automatically mapped as gate. (ex. If you set Port 1 in this mode, port 2 will be your gate).

When Gate goes high, a NOTE ON message will be sent with value proportional to the CV input. When Gate goes down a Note OFF message will be sent. Keep that in mind, in order to keep V/Oct range, only 120 MIDI notes will be sent for the whole range. 1 Octave=12 semitones, so 10 Octaves, 120 notes.

FOR EVERY NOTE REPRESENTATION IN CV Thing WE ARE ASSUMING THAT MIDI NOTE 0 IS C-2

When a note mode is selected new scale and chord options are available. Please refer to page 11 for further information about this mode.

3. V/Oct Poly

With this mode you can send several notes with one gate. On selection, Gate 8 will be automatically set as the gate to send a note per channel configured like this. No need to manually configure this gate. If you send several CVs as V/Oc Poly, gate 8 will send a midi note per CV configured.

When a note mode is selected new scale and chord options are available. Please refer to page 11 for further information about this mode.

4. Notes

On this mode the module will generate MIDI notes at the selected MIDI Channel following the V/Oct ratio regardless of the presence of a Gate. The Note duration is set right after selecting the mode, so you can set a few fixed durations, edit yours or select that the Note off is sent just before sending a new note:

No auto OFF, 500ms, 1000ms, 1500ms, 3000ms, Edit AutoOff

5. Velocity

CV will be mapped to velocity message representing the notes selected in the MIDI channel.

6. Pitch Bend

CV will be mapped to pitch bend message.

7. Program Change

A program change message will be sent proportional to CV value.

8. Channel Pressure

With this option CV /Fader will be converted to Channel Pressure message, also known as channel aftertouch. This message will affect to all notes that are received in that MIDI channel. Upon receiving Channel Pressure, it's up to the device how it will respond to this message (VCA, VCF cutoff or even LFO rate for vibratos)

9. Digital Functions

You can select Digital Functions, same as Gate Inputs (Check Page 6)

10. Chord Functions

In this sub-menu you will find options to control chord parameters. When you select one of the options, you will be prompted to select a bank. If you selected a Note mode in that bank, the CV will affect to any chord generated in that bank.

- * Scale Mode
- * Scale Root
- * Chord type
- * Chord Voicing
- * Chord Preset
- * Strum
- * Humanize

For further information on Chord Mode go to page 8

CC 14 Bits

With this mode CV Thing will send a 14 bit CC message. This message will be sent as two CC messages. Higher 7 bits will be sent on selected CC and lower 7 bits will be 32 values higher. Ex. If you select 14 bit CC#2, Higher bits will be sent first on CC#2 then Lower bits on CC#34.

NRPN

In this mode the CV will be converted to NRPN messages. Upon selection of this mode you will be prompted to select a NRPN number. Keep in mind there are two NRPN modes available: 7 bit and 14 bit.

MIDI CHANNEL

Selects MIDI Channel for this CV Input.

CV DELAY

Set a delay on the CV reading. Specially useful on V/Oct mode. As some sequencers have some delay between setting the gate high and sending the CV, with this feature you will avoid sending old messages.

RANGES

On this screen we will be able to set the functional ranges of the CV Input and the MIDI Output. Here you will be able to calibrate the CV Input as well. Let's take a look:

1. In Range

+10: The CV Input will expect a voltage range of 0-10V, translating each voltage in concrete MIDI value. A voltage of 10V will be translated as the maximum MIDI message value (see OUT Range below)

+5: The CV Input will expect a voltage range of 0-5V, translating each voltage in concrete MIDI value. A voltage of 5V will be translated as the maximum MIDI message value (see OUT Range below)

-5/+5: The CV Input will process negative voltages as well. In this mode a voltage of 5V will be translated as a MIDI value of 64 and -5V to -64, Negative values will be clipped to 0, so linking the fader as SUM (see CV/FDR Link) is advised for effectivity.

2. Out Range

MIDI RANGE: Select from what MIDI value to which one your CV will be scaled. This feature will select the minimum and maximum MIDI values and will scale the input to that range.

MIDI TRIM: With these you can set MIDI limits, so no messages will be sent beyond the minimum and maximum set here. This feature clips the range, do not scale.

CH:1 CV CANCEL END		
	RANGE	TRIM
MIN	000	000
MAX	127	127

Set the values of each range by turning and pressing the encoder. If you don't want to keep the changes and go back to the previous screen, press Cancel, otherwise press End.

3. Calibration

This will perform a two points calibration. You will be prompted to send 2v and 8v, stating to which MIDI Note they relate to. A voltmeter is shown to monitor incoming voltage. If you have selected 5v input range, voltages will be 1v and 4 v.

This calibration is useful when your CV source has some offset, so you can avoid note shifting on conversion. Also, if source CV does not have perfect V/Oct linearity, this will correct the scaling.

CH:1 CV CANCEL END		
POINT	MIDI	NOTE
2V	24	C0
8V	96	C6
IN: MIDI NOTE / VOLTS		

CALIBRATION PROCEDURE: Before selecting calibration, be sure you have V/Oct to Note mode selected on the CV Input you want to calibrate, otherwise you will get an error message prompting to activate it.

Once done, plug the CV signal from your sequencer or CV source, set it to send 2V (go to the manual of your CV source if you don't know the equivalent Note/Volts) and check the voltmeter at the bottom of the screen. If all is well it should show you C0/2V, then turn the encoder till you have the first line (2V 24 C0) selected and press the encoder. Repeat the process for 8V and press End to finish the calibration. If you don't want to keep the changes, press Cancel.

SETTING CV THING | DIGITAL FUNCTIONS

The CV Inputs can act also as Gate Inputs. This functions are located into the Digital Functions submenu.

1. Note Gate

A Note will be fired each time a Gate signal is received at Gate Input. Press the encoder to select the Note number and press again to confirm the operation. Note ON message will be sent when the Gate goes up and Note OFF when Gate goes down.

2. Note Latch

This mode is essentially the same as Note Gate but Note OFF message is not sent till Gate signal goes up again.

3. CC Gate

A CC message will be sent each time a Gate signal is receive at Gate Input. Press the encoder to select the CC Number, press again to select the CC value, and one last time to confirm the operation. A CC message with the selected value will be sent when a Gate goes up and a second message with a CC value of 0 when a Gate goes down.

4. CC Latch

Similar functionality as CC Gate but the CC value 0 won't be sent till a second Gate goes up.

5. Clock

Clock messages will be sent. Keep in mind it will consider a Clock IN when the level is higher than 2 Volts. By pressing the encoder you will access the Clock Set Screen. There you will be able to Divide and Multiply the incoming clock signal as well as check the BPM.

6. ST/SP

This will enter into the menu to set messages Start, Stop and Continue. A few combinations are available to match your sequencer. Options are:

- **ST/SP Gate:** START message will be sent when Gate goes up and STOP when Gate goes down.
- **ST/SP Latch:** START message will be sent when Gate goes up and STOP when Gate goes up again.
- **START:** START message will be sent when Gate goes up.
- **STOP:** STOP message will be sent when Gate goes up.
- **CONTINUE:** CONTINUE message will be sent when Gate goes up.

7. Panic

This will send an All NOTE OFF message in all channels like a regular Panic function in any MIDI device.

SETTING THE MODULE | GLOBAL SETTINGS

In Performance Screen, hold the encoder for 5 seconds to access the Global Settings. On this screen you will be able to save and load presets between other things. Let's take a look deeply.

PANIC

Sends a Note OFF message in all the channels. Press it if you experience that some messages gets stuck or held.

FACTORY RESET

Restarts the module to initial factory settings (see Out of the Box Configuration)

SAVE CONFIGURATION

Saves the current configuration of the module in one of the two banks available. At the same time the module saves the setting on its internal memory, a SYSEX message is sent via MIDI Outputs (see SYSEX paragraph below)

LOAD CONFIGURATION

You can choose either one of the settings saved in one of the settings saved in one of the two user banks or a factory preset (Go to Appendix 1 for further details)

GLOBAL CV CAL

Calibrates all CV Inputs at the same time. Quite useful when you have a multichannel CV Source (like a sequencer)

OUT OF THE BOX CONFIGURATION

By default, CV Thing comes with an initial setting that allows you to quickly test some of the features of the module. In this configuration CV Inputs are assigned to CC's **from 14 to 21**.



```
GLOBAL CFG
<- BACK
PANIC
FACTORY RST
SAVE CONF
LOAD CONF
CREDITS
```

SETTING THE
MODULE

CHORD MODE

When you select a mode that involve sending MIDI notes using a Gate, you will get new options in the first level of bank config Menu. These will allow you to send chords instead of single notes.

With this new Chord mode you can select the scale you will use, the ROOT note of this scale and the type of chord you want to send. Keep in mind that modes NOTES and Digital functions in CVs will not be affected by Chords options.

SCALE MODE

With this option you can select the scale you want your CV to be quantized to. If the CV does not match a note from selected scale it will send the previous lowest note that is present in that scale.

Available scales are:

Lydian, Major/Ionian, Mixolydian, Dorian, Minor and Phrygian.

When selecting the scale you will be automatically prompted to select the tonality of the scale. You can select Full scale, that will send all notes, meaning there is no quantization.

ROOT SCALE

Select the tonality of the scale.

CHORD TYPE

This will select the kind of chords you will be sending. Keep in mind that if you selected a scale, then the type of Chords are pre-configured as per each scale.

When a scale is selected you can choose:

- * No Chord: Send one note
- * Diatonic Triad: Three notes Chord
- * Diatonic Triad +7th: Four Notes chord with 7th

When no scale is selected (Full scale) This mode will allow you to select from a big list of chords. Feel free to explore!

CHORD VOICING

With this option you can select Inversions, open chords and Drop voicings. These will move certain notes within the chord, providing some extra flexibility.

A drop voicing is created by dropping one of the notes down an octave. If the second note from the top is dropped, the voicing is called a drop 2 voicing; if the third note from the top is dropped, the voicing is called a drop 3 voicing.

Open chords are made like drops but moving the notes up one octave instead of down.

Chord Inversions are chords that don't have their root note as the lowest note. So each inversion is made bringing the notes down one octave and keeping the root.

So you have for four notes chords, Drop3, Drop2, Inversions, Open2 and Open3. Each with the root chord and the three inversions. Having the closed chord in the center and opening the notes in both directions.

*Drop3 root
Drop3 1Inversion
Drop3 2Inversion
Drop3 3Inversion
Drop2 root
Drop2 1Inversion
Drop2 2Inversion
Drop2 3Inversion
Root
1st Inv
2nd Inv
3rd Inv
Open3 root
Open3 1Inversion
Open3 2Inversion
Open3 3Inversion
Open2 root
Open2 1Inversion
Open2 2Inversion
Open2 3Inversion*

In CV Thing you can save and load configuration presets externally via SYSEX (System Exclusive Messages). This process can be done with a lot of applications (like DAWs or specific MIDI apps) and if you have vintage digital gear for sure those terms won't be new for you. If this is not the case, don't worry, we're gonna explain a very easy and fast way using MIDI OX.

SAVING PRESETS

MIDI OX is a free program for Windows (and Linux through Wine-HQ) that is able to play *.mid/*.syx files and upload them into CV Thing. First connect your module to your PC via USB connector (Type B to Type A USB cable). Launch MIDI OX and in the top bar press "Options >> MIDI Devices..." Select CV Thing on MIDI Inputs and press OK.

Now go to "View >> SysEx..." On the new window (SysEx View & Scratchpad) press "SysEx >> Receive Manual Dump..." The program will start to wait for SysEx messages. Once done, go to the Global Settings Screen on your CV Thing (hold the encoder for 2 seconds on Performance Screen) and select Save Conf. select the bank and now check MIDI OX again. If all is fine you will have a message on MIDI OX with the size of the file received, press Done. Now go to "Display Window >> Save As..." Put a name to your file, save it in your preferred folder and that's all.

LOADING PRESETS

Launch MIDI OX and in the top bar press "Options >> MIDI Devices..." Select CV Thing on MIDI Outputs and press OK. Now go to "View >> SysEx..." On the new window (SysEx View & Scratchpad) press "File >> Send SysEx File..." Select your SysEx file and press Open. As soon as the status bar finishes, you will have a prompted screen on your module. Press Load SysEx, select the bank, press Discard and you are done.

FIRMWARE UPDATE

CV Thing code is based in our VCMC module, so code will be found at the same repository as VCMC.

1: Get latest firmware file from CV Thing folder in our github:
<https://github.com/Befaco>

2: Install Teensy uploader app found here

<https://www.pjrc.com/teensy/loader.html>

3: Connect your module to your computer using a USB cable.

4: Run Teensy uploader and load hex file. If prompted by the app, press teensy button to begin transfer...

Make sure module is plugged in.

WEB EDITOR

Check our web editor to easily configure CV Thing. The site can generate a configuration and then send it to CV Thing. It also have a live function, where you can see the changes you make in the web site at real time. This site only works on Web MIDI enabled browsers.

<https://www.befaco.org/VCMCconfig/>

- * **Size:** 6HP
- * **Depth:** 32mm
- * **+12v:** 50 mA
- * **-12v:** 8mA

This module is the result of loads of hours of work, love and care. It would have been imposible to finish without the help of beta testers, loving friends, people from Hangar's open thursdays providing very strong opinions and the whole Befaco team kicking asses BIG TIME.

Firmware coding, common sense and über-cold beers:
Sergio Retamero (sergio.retamero@gmail.com)