

# ACXSynth Polyphonic 4 voice MIDI2CV “Ultimate”

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# **USER MANUAL**

05/15/2017

The new ACXSynth MIDI2CV is a 4 voice module providing 4 CV outputs and 4 Gate/Trigger outputs. These voices are independent or can be grouped to make a polyphonic 2, 2+2, 3, or 4-voice module.

Each voice can be assigned to a different MIDI Channel or a different MIDI message. The 4 CV outputs can produce Note, Velocity, Release Velocity, After Touch Channel, Modulation or Control Change #2, #3, #4 and #5 voltages.

The Gate outputs can be used to send Gate signal, Triggers with different length, MIDI Clocks, Start/Stop or Reset signal. Some of them can also be used as input to convert analog Pulses signals into MIDI Clocks and MIDI Start/Stop messages. The module can be used to synchronize MIDI synthesizers with vintage DIN Sync devices.

The ACX MIDI2CV offers a variety of different scales (1V/Octave, Pythagor, 5, 7 and 24 TET, Harry Partch and even a V/Hz mode). Each voice can be transposed directly or with a keyboard

This module is managed by a powerful 32 bit micro controller and a quad channel 16 bit high precision DAC converter giving perfectly tuned notes even in microtonal modes.

To check or fix MIDI connections incoming MIDI Messages can be displayed.

The algorithms have been completely rewritten, which allows a much easier and more natural play, and like all new "ACXBus" modules almost all parameters are configurable and automatable by MIDI Control Change.

The module information is displayed on a two lines 8 characters LCD display. The

first line contains the parameter itself and the second the value of this parameter.

To view a setting, turn the encoder to scroll the parameters on the top line. To change a parameter, press the encoder. The cursor then blinks on the first character of the top line to indicate that the parameter is in edit mode. Select the desired value with the encoder. Press again the encoder to switch to playback mode.

Note that in the great majority of cases, there is no need to validate when you change a value. This allows a quick testing of the new values.



## SETTING MODES

**MONO mode** : In this mode the 4 voices are independent. On each one you can select:

The MIDI channel so you can use up to 4 different MIDI sources (Keyboard, Sequencers ....) at the same time.

The CV Output. You can choose between the Note, Velocity, Aftertouch Channel, Modulation, or Control Change #2 (7 or 14-bit).

The Gate Signal. You can choose the Gate, different length Trigger, MIDI clocks (with multipliers or divisors of x 12-4), Start/Stop signals, or even Reset pulses. Note that the module responds to Real Time MIDI messages and to MMC (MIDI Machine Control) commands.

**POLY mode 2** : Polyphonic mode 2 voices on the outputs 1 and 2. The two outputs share the same MIDI channel of the voice 1. The first note played is send to the Output 1 and the second one to the Output 2. Outputs 3 and 4 remain in MONO mode and are therefore independent.

**POLY Mode 2 + 2** : Polyphonic 2 voice on the outputs 1 and 2 and polyphonic 2 voice on the outputs 3 and 4. This mode is useful for example with a "split" keyboard where you can play polyphony 2-voice with the right hand on an instrument and polyphony 2-voice with the left hand on an another instrument.

**POLY Mode 3** : Polyphonic 3 voice. The three outputs 1, 2 and 3 share the MIDI channel of track 1. The forth voice stays independent.

**POLY mode 4** : Polyphonic 4 voice on the same MIDI channel.

**POLY mode 6** : Polyphonic 6 voice on the same MIDI channel (Requires a second MIDI2CV ACX).

**POLY mode 8** : Polyphonic 8 voice on the same MIDI channel (Requires a second MIDI2CV ACX).

**DRUMS Mode** : In this mode the four outputs CV behave like Triggers. 8 triggers can trig battery modules or drum pads. Their configuration is General MIDI.

Since the 1.2 version, it is possible to combine 2 MIDI2CV ACX modules to increase the number of polyphony channels to 6 or even 8 channels. The first module (which can be of an earlier version) must be set to Poly 4 and both modules must share the same MIDI channel.

## SCALES

**Tempered** : it is the temperate range used for all Western music.

**Pythagor** : scale created by Pythagoras 600 years BC and used until the beginning of the 16<sup>th</sup> century.

**5 TET** : five-tone equal temperament. The octave is divided into 5 equal parts.

**7 TET** : Octave divided into 7 equal parts. This range has been used in some Asian xylophones.

**24 TET** : Octave divided into 24 equal parts either in 24 quarter tones.

**H-Partch** : microtonal range created by the American composer Harry Partch. It contains 43 notes per octave.

**V/Hz** : Volt/Hz instead of Volt/Octave. Useful with some synthesizers (old Korg...)

With a modular is often much research sound, but unfortunately always using the same traditional temperate range. It's a shame; also why not discover all of a domain using more exotic ranges that often sound very well! MIDI2CV ACX module can play on different ranges which may interest the lovers of harmonic research.

## MIDI CHANNEL SETTINGS

**MIDICh 1** : Select the MIDI channel of voice1. (1 – 16)

**MIDICh 2** : Select the MIDI channel of voice1. (1 – 16)

**MIDICh 3** : Select the MIDI channel of voice1. (1 – 16)

**MIDICh 4** : Select the MIDI channel of voice1. (1 – 16)

## OUTPUT CV SETTINGS

**CV sel 1** : Select the MIDI message generating a voltage at output 1. Possible values are:

-**Note**: Value of the note or the lowest note if several notes are played simultaneously. The Pitch bend wheel (PitchWheel) values are added to the values of the notes.

-**Velocity**: Velocity of the note (0 – 5 Volt).

-**ReleaseV** : Release Velocity (0 – 5 Volt).

-**AfterTch**: Value of the AfterTouch Channel (0 – 5 Volt).

-**Modulat**: Value given by the modulation wheel (0 – 5 Volt).

-**Control Change #2**: Control Change value. Can be in 7 or 14-bit

-**Control Change #3**: Control Change value. Can be in 7 or 14-bit

-**Control Change #4**: Control Change value. Can be in 7 or 14-bit

-**Control Change #5**: Control Change value. Can be in 7 or 14-bit

**CV sel 2** : Select the MIDI message generating a voltage at output 2. The values are the same as for output 1.

**CV sel 3** : Select the MIDI message generating a voltage at output 3. The values are the same as for output 1.

**CV sel 4** : Select the MIDI message generating a voltage at output 4. The values are the same as for output 1.

This module is much more than a simple MIDI2CV, since it is possible to choose the type of CV for each of the 4 outputs. The note first but also the velocity which give a much more natural play, since one can modulate the intensity of the notes, the Reverse Velocity given when the key is released, Modulation or AfterTouch you can use for example to increase the level or the rate of an LFO.

There are up to 4 different Control Change which can run in 14-bit and deliver high precision DC voltage without stair step effect.

## GATE SETTINGS

**GATE 1** : Select the type of signal on the first Gate. Possible values are:

- **Gate.** The Gate is maintained high until a key is pressed.
- **TR 10ms** Trigger triggered by the note with a duration of 10 ms (10 milliseconds)
- **Tr 50 ms.** Trigger triggered by the note with a duration of 50 ms (50 milliseconds)
- **TR 100 ms.** Trigger triggered by the note of a duration of 100 ms (100 mill seconds)
- **TR 300 ms.** Trigger triggered by the note with a length of 300 ms (300 milliseconds)
- **SStp OUT.** The output goes high when the module receives a MIDI Start message and goes low when it receives a MIDI Stop signal.
- **MClk OUT.** Pulses generated by MIDI Clocks. The clock can be multiplied or divided.
- **Reset.** A short pulse is sent each time a Start signal is received. Useful for some sequencers or drum pads.

**GATE 2** : Select the type of signal on the Gate 2. Values are identical to GATE 1

**GATE 3** : Select the type of signal on the Gate3.

- **Gate.** The Gate is maintained high until a key is pressed.
- **TR 10ms** Trigger triggered by the note with a duration of 10 ms (10 milliseconds)
- **Tr 50 ms.** Trigger triggered by the note with a duration of 50 ms (50 milliseconds)
- **TR 100 ms.** Trigger triggered by the note of a duration of 100 ms (100 mill seconds)
- **TR 300 ms.** Trigger triggered by the note with a length of 300 ms (300 milliseconds)
- **SStp OUT.** The output goes high when the module receives a Start message and goes low when it receives a Stop signal.
- **MClk OUT.** Pulses generated by MIDI Clocks. The clock can be multiplied or divided.

- **Reset.** A short pulse is sent each time a Start signal is received. Useful for some sequencers or drum pads.
- **MClk IN.** The Gate 3 connector is switched as input and accepts analog pulses. Rising edges are converted into MIDI Clock messages.

**GATE 4 :** Select the type of signal on the Gate4

- **Gate.** The Gate is maintained high until a key is pressed.
- **TR 10ms.** Trigger triggered by the note with a duration of 10 ms (10 milliseconds)
- **Tr 50 ms.** Trigger triggered by the note with a duration of 50 ms (50 milliseconds)
- **TR 100 ms.** Trigger triggered by the note of a duration of 100 ms (100 mill seconds)
- **TR 300 ms.** Trigger triggered by the note with a length of 300 ms (300 milliseconds)
- **SStp OUT.** The output goes high when the module receives a Start message and goes low when it receives a Stop signal.
- **MClk OUT.** Pulses generated by MIDI Clocks. The clock can be multiplied or divided.
- **Reset.** A short pulse is sent each time a Start signal is received. Useful for some sequencers or drum pads.
- **SStp IN.** The Gate 3 connector is switched as input and accepts analog pulses. The rising edge produces a MIDI Message Start on the MIDI output and the Falling edge produces a MIDI message Stop on the MIDI output.

It is the Gate signal that is typically used in a MIDI2CV. However, Triggers can be very useful to get very percussive (short Triggers) or even if you want lasting notes perfectly equal (Triggers medium or long).

Transforming Clocks and Start/Stop MIDI Messages into analog pulses allows you to synchronize analog or DIN Sync equipment with MIDI devices which act as Master.

On the other hand, the ACX MIDI2CV can switch its outputs 3 and 4 into inputs and create Start/Stop and Clock MIDI messages from analog pulses. In this case the MIDI devices can act as Slave.

The module responds also to MMC Start and Stop messages so it can be used be used with numerous professional equipment.

## **GATE MODE SETTINGS**

*Possible values are:*

**On:** re-triggering on 4 channels.

**Off v1:** no re-triggering on voice 1

**Off v2:** no re-triggering on voice 2

**Off v3:** no re-triggering on voice 3

**Off v4:** no re-triggering on voice 4

**Off ALL:** no re-triggering on any of the 4 voice

The GATE output is normally triggered each time a key is pressed even if other keys are pressed at the same time. It is possible to modify this behavior when it is not useful (using a sequencer for example) or to reproduce the way old keyboards work. If several keys are pressed simultaneously, the priority is given to the last note played. This is the easiest and most intuitive way to play. If a key is released while other are being held then the lowest note will play.

## MIDI CLOCK SETTINGS

**MCLK 1 :** Divider/Multiplier of the MIDI clock on the Gate 1 output. The values are:

*x 12: the clock frequency is multiplied by 12*

*x 8: the clock frequency is multiplied by 8*

*x 6: the clock frequency is multiplied by 6*

*x 4: the clock frequency is multiplied by 4*

*x 3: the clock frequency is multiplied by 3*

*x 2: the clock frequency is multiplied by 2*

*x 1: the clock frequency is not multiplied*

*/ 2: the clock frequency is divided by 2*

*/ 3: the clock frequency is divided by 3*

*/ 4: the clock frequency is divided by 4*

**MCLK 2 :** Ditto for output 2

**MCLK 3 :** Ditto for output 3

**MCLK 4 :** Ditto for output 4

## TRANSPOSITIONS

*Each of the 4 voices can be transposed.*

**TRANSP 1 :** Output 1 transpose setting. Possible values: -12 to + 12 semitones

**TRANSP 2 :** Output 2 transpose setting. Possible values: -12 to + 12 semitones

**TRANSP 3** : Output 3 transpose setting. Possible values: -12 to + 12 semitones

**TRANSP 4** : Output4 transpose setting. Possible values: -12 to + 12 semitones

The transposition of the notes from the MIDI2CV is much more convenient than on the VCO. It does not require detuning the VCOs and it is always perfectly accurate.

**4-> Transp** : Values: No. Trans, 1, 1 + 2, 1 + 2 + 3.

This function allows to transpose or not, the output 1, the output 1 and 2 or even the outputs 1 and 2 and 3 with the notes of the voice 4. It is a very simple way to transpose themes from sequencers for example. Channel 4 may continue to be used normally. The transpose setting (Transp. 4) remains active on the track, but not on the transpositions that it causes on the others.

## SETTINGS OFFSETS

**OFFSET 1** : This setting adjusts the output level of channel 1 to exactly 0 millivolt when the Note , Velocity, After Touch or Modulation values are zero. This allows to connect any VCO on any output module without requiring each time to retune the VCO. To adjust the offset, turn the module on and wait for 10 minutes. Then connect a Voltmeter on the output #1. Turn the encoder until you read a value less than a millivolt. Repeat the procedure for the 4 outputs.

**OFFSET 2** : Ditto for output 2.

**OFFSET 3** : Ditto for output 3.

**OFFSET 4** : Ditto for output 4.

Amplifiers that control outputs CV are not perfect and even with 0 V input their output is never 0V. There is always a small residual voltage called offset voltage. On a 1 voice MIDI2CV it can be cancelled by slightly detuning the VCO. On a MIDI2CV 4-way it can be annoying, because this would require to retune the four VCOS each time you modify the patch. On the ACX MIDI2CV this setting is very simple. You don't have to disassemble the module and you don't need a screwdriver, just turn the encoder. The settings of the 4 outputs must be accomplished only once, since they are automatically memorized.

## TUNING

**First adjust the offset before Tuning.** Connect a voltmeter on the output #1. Turn the encoder until you read exactly 3.000 V. Repeat the procedure for the 4 outputs.

**TUNE 1** : This setting adjusts output 1 at exactly 1 Volt per Octave.

**TUNE 2** : This setting adjusts output 2at exactly 1 Volt per Octave.

**TUNE 3** : This setting adjusts output 3 at exactly 1 Volt per Octave.

**TUNE 4** : This setting adjusts output 4 at exactly 1 Volt per Octave.

As for the offset, this setting is done by the encoder and requires no disassembly of the module, nor the use of a screwdriver. The precision is very high since each step of the encoder is about 0.15 mV or less than 2 thousandths of a semitone. For a better accuracy, this adjustment is done for 3 octaves. These settings are also automatically stored in memory.

## THE MIDI CHANNEL OF THE AUTOMATION SETTINGS

**MIDI CC** : MIDI Control Change messages can be used to modify all the parameters of the module. You can select a specific MIDI channel for this. Values 1 to 16.

Having a single Encoder makes this module especially economic and also very easy to build. On the other hand, access to a parameter requires a little manipulation. This is not "one function, one button". This can be embarrassing onstage for example if you want to instantly reach adjustment. To overcome this, all of the parameters of the module can be remotely controlled by a Control Change (the list is given below). The settings can be changed in a very practical way from a surface of any control, but also automatically from a MIDI sequencer for instance. You just have to record the CC values in the sequence and the changes will appear on the module precisely and at the desired time.

## PITCHWHEEL SETTINGS

**PITCHWH** : The extent of the Pitch wheel control

- Half: +/-1 half tone.
- Tone: +/-1 tone.
- Octave: +/-1 octave.

The possibility to choose between three values (1/2 ton, 1 ton and 1 octave) greatly increases the possibilities of the PitchWheel.

## MIDI RECEPTION

**MIDI/ACX** : This setting selects how MIDI Control messages are received.

- MIDI: Setup and automation directly from the MIDI messages.
- MIDI HS: High Speed MIDI (require ACXBus Gateway module).
- ACXBus: Setup and automation directly from messages sent via the bus ACX (require ACXBus Gateway module).

## SETTINGS OF THE MIDI MACHINE CONTROL

**MMC ID** : MMC messages provide identification numbers. This setting allows you to select the Device ID of the module.

## CC COMMAND VIZUALISATION

**On** : The modified parameters are displayed when a CC message is received.

**Off** : *The modified parameters are not displayed when a CC message is received.*

Watching the effect of a CC Command message on a parameter is important.

In “On” Mode, the value of the parameter is displayed for a few second and the display returns to the former parameter. This can be a problem if you use a sequencer for instance, because it would prevent you from modifying other parameters manually.

In “Off” mode you can disable this function.

## **MIDI MESSAGES VISUALIZATION**

**SHOW RT** : *Displays Real Time MIDI Messages (0xFn messages)*

**SHOWMIDI** : *Displays MIDI Messages (Note, CC, PitchWhell ....)*

The ACXSynth MIDI2CV Module has a very interesting feature, it allows you to visualize the incoming MIDI messages. So, you can see immediately if such or such message is well received by the module, if the used MIDI channel number is good etc... It is a diagnosis and very powerful troubleshooting tool that can serve in any configurations (even those who normally do not use the MIDI2CV!) to check or fix a connection.

## **MEMORY SETTINGS**

**MEM\_CALL** : *This parameter allows to recall one of the 7 memory banks that contain all of the settings of the module.*

**MEM\_REC** : *This parameter allows to save the settings of the module in one of 7 memory banks.*

The ACXSynth MIDI2CV Module has many settings and switching from one configuration to another can take some time. The Memory banks can be used as preset for different configurations. On stage, for example, one could switch from one configuration to another instantly by pressing a button on a control surface.

These presets can also be used if you have several VCO that do not have a perfect tracking of exactly 1 V/Octave. It is possible to record different tune settings and instantly recalled the correct values on the MIDI2CV when you change the VCO.

The module has 8 Memory banks where all the parameters of the module can be saved. 7 banks are available to the user to save the presets i.e. the different configurations that he wishes to maintain. The eighth Bank cannot be accessed directly, but it saves continuously the setting of the module. Son each time you turn the module on you get exactly the same configuration it had when it was switched off.

**Important** : **the new settings are not immediately recorded. You must wait for about 30 second after a modification before turning the module off to be sure the parameters are properly recorded.**

## GENERAL SETTINGS

**Setting the MIDI Clock Values :** Set the values to 1

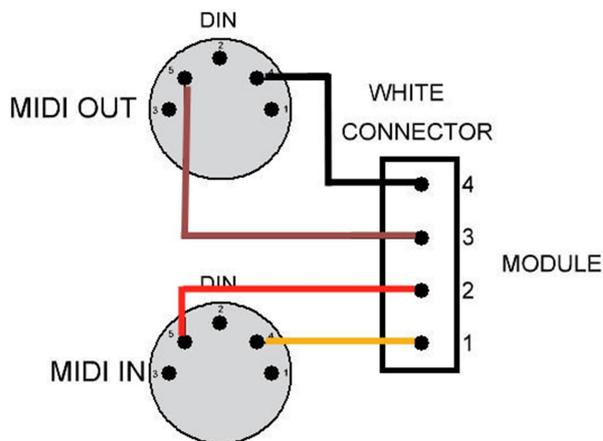
**Setting the Transposition values :** Set the 4 transposition value to 0.

**Verify that the value of the ACX / MIDI parameter is OK!**

## CONNECTING THE MODULE

For the MIDI connection a 4-pin connector (white) is provided on the back of the module on the second PCB. This configuration offers several advantages: having smaller module (10HP only), cheaper and above all it offers the ability to connect many different ACX MIDI modules (Ext MIDI, MIDI Hub, USB Wimi, Wimi Module).

If you want to make the connection yourself, here is the circuit diagram:



The simplest way is to use the ACX MIDI Ext module :



## NOTES VALUES (DRUMS MODE)

| Inst   | hex | dec | Note |
|--------|-----|-----|------|
| kick   | 24  | 36  | C    |
| snare  | 26  | 38  | D    |
| hihat  | 2A  | 42  | F#   |
| lowtom | 2B  | 43  | G    |
| midtom | 2F  | 47  | B    |
| crash  | 31  | 49  | C#   |
| hitom  | 32  | 50  | D    |
| ride   | 33  | 51  | D#   |

## MIDI MESSAGES FOR PROGRAMMING

| PARAM          | Type | Disp Type | Low Value | High Value | CC Number | CC Num HEX |
|----------------|------|-----------|-----------|------------|-----------|------------|
| MODULATION MSB | Bx   | 0 - 127   | 0         | 127        | 1         | 1          |
| CC #2 MSB      | Bx   | 0 - 127   | 0         | 127        | 2         | 2          |
| CC #3 MSB      | Bx   | 0 - 127   | 0         | 127        | 3         | 3          |
| CC #4 MSB      | Bx   | 0 - 127   | 0         | 127        | 4         | 4          |

|                  |    |         |                      |     |    |    |
|------------------|----|---------|----------------------|-----|----|----|
| CC #5 MSB        | Bx | 0 - 127 | 0                    | 127 | 5  | 5  |
| MODE             | Bx | 0 - 127 | 0                    | 5   | 6  | 6  |
| SCALE            | Bx | 0 - 127 | 0                    | 6   | 7  | 7  |
| SEL CV1          | Bx | 0 - 127 | 0                    | 8   | 8  | 8  |
| SEL CV2          | Bx | 0 - 127 | 0                    | 8   | 9  | 9  |
| SEL CV3          | Bx | 0 - 127 | 0                    | 8   | 10 | A  |
| SEL CV4          | Bx | 0 - 127 | 0                    | 8   | 11 | B  |
| TRIGGER V1       | Bx | 0 - 127 | 0                    | 7   | 12 | C  |
| TRIGGER V2       | Bx | 0 - 127 | 0                    | 7   | 13 | D  |
| TRIGGER V3       | Bx | 0 - 127 | 0                    | 8   | 14 | E  |
| TRIGGER V4       | Bx | 0 - 127 | 0                    | 8   | 15 | F  |
| TRANSPOSITION V1 | Bx | 0 - 127 | 0                    | 24  | 16 | 10 |
| TRANSPOSITION V2 | Bx | 0 - 127 | 0                    | 24  | 17 | 11 |
| TRANSPOSITION V3 | Bx | 0 - 127 | 0                    | 24  | 18 | 12 |
| TRANSPOSITION V4 | Bx | 0 - 127 | 0                    | 24  | 19 | 13 |
| MEMORY CALL      | Bx | 0 - 127 | 0                    | 6   | 20 | 14 |
| MEMORY REC       | Bx | 0 - 127 | 0                    | 6   | 21 | 15 |
| VALID REC        | Bx | 0 - 127 | 0                    | 1   | 22 | 16 |
| MODULATION LSB   | Bx | 0 - 127 | 0                    | 127 | 33 | 21 |
| CC #2 LSB        | Bx | 0 - 127 | 0                    | 127 | 34 | 22 |
| CC #3 LSB        | Bx | 0 - 127 | 0                    | 127 | 35 | 23 |
| CC #4 LSB        | Bx | 0 - 127 | 0                    | 127 | 36 | 24 |
| CC #5 LSB        | Bx | 0 - 127 | 0                    | 127 | 37 | 25 |
|                  |    |         |                      |     |    |    |
| PITCHWHEEL       | Ex |         |                      |     |    |    |
| START            | FA |         | (x = Channel Number) |     |    |    |
| STOP             | FC |         |                      |     |    |    |
| MIDI CLOCK       | F8 |         |                      |     |    |    |
| NOTE ON          | 9x |         |                      |     |    |    |
| NOTE OFF         | 8x |         |                      |     |    |    |
| AFTERTOUCH       | Dx |         |                      |     |    |    |

If possible use NRPN (14 bit messages) for Control Change Voltage Out.