

# SYNTHI VCS3 (mk1) POLY MIDI-CV INTERFACE

## Instruction Manual

VCS3(mk1)

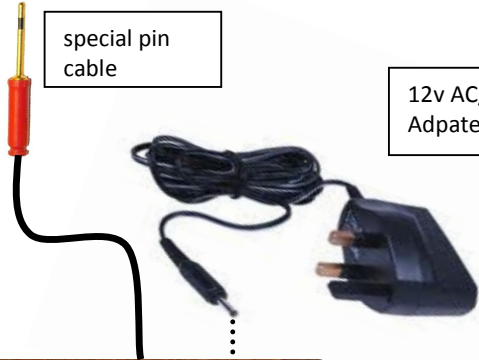


DK1/2 KEYBOARD



special pin cable

12v AC/DC Adpater



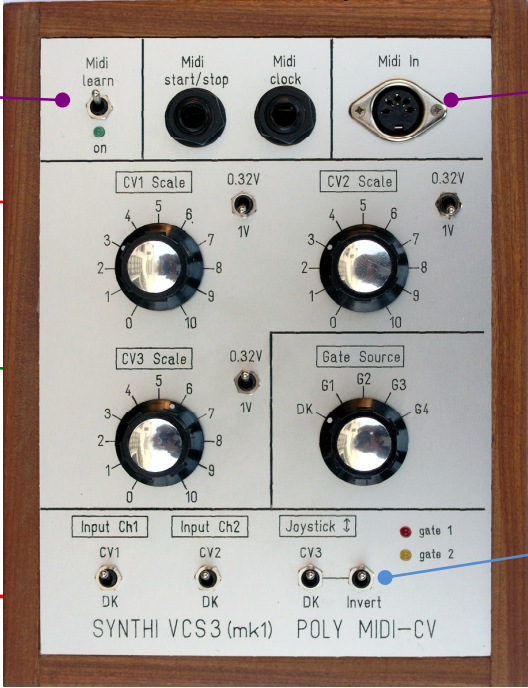
Interface Cables  
1x 8 way Jones Male  
1x8 way Jones female

Midi Learn/Midi Activity switch and LED

Toggle switches for switching between 1V/Oct or 0.32V/Oct

Gate Source switch: Switches between DK, midi gates 1-4

Switches for DK1/2 or Midi CV channel control



Midi In

Inverts CV3 voltage

Synthi VCS3(mk1) POLY MIDI CV

## Instructions on using the VCS3(mk1) aka 'Putney' Poly Midi-CV Interface

This is a **Poly Midi-CV** unit designed to be used with an EMS VCS3(mk1) aka 'The Putney', either with or without a Dk1/2 keyboard. It is based around Marc Bareille's fantastic 3-channel micro-controller based Midi-CV converter called the 'MCV876' (which Marc has kindly allowed me to incorporate in the modules)

See details of Marc's unit and all its many features at his website:-  
<http://m.bareille.free.fr/mcv876/mcv876.html>

The latest units I ship have the most recent firmware (v3.06 as of October 2010) for the Pic18F2320 microcontroller which has faster better performance than the older models (based on Pic16F876 microcontrollers).

### Before Power On

With the VCS3 powered off, plug in the two grey cables with the 8 way 'Jones' plugs at each end. The male Jones plug to the rear of the VCS3 'keyboard' socket, and the female to the DK1/2 keyboard (if you have one). The Poly Midi CV unit allows independent switching between a connected DK keyboard and midi control, through front panel toggle switches. Switch on the VCS3. Then plug in the 12v ac adapter into the rear of the Poly Midi unit. You will see the green midi activity led (top left) flash a few times to indicate all is well.

The midi cv board in the Poly Midi is powered by the external 12v ac adapter. But also some power (from the +12v and -9V power rails) is taken from the VCS3 (via the Jones plug cables) but only a few milli amps, needed for the CV3 voltage inverter and to drive the transistor buffered midi gates to trigger the VCS3 envelope shaper properly.

The reason an ac adapter is used is because the VCS3(mk1) has a weak internal psu compared to the later VCS3(mk2) and Synthi AKS. These latter units were meant to be able to power external sequencers, so the internal psu is much stronger than in the VCS3(mk1). On the Poly and Quad Midi-CV units I offer for the VCS3(mk2) and synthi AKS, all the power is derived from the synthi's and no external adapter is needed.

**N.B. The toggle switch at top left IS NOT A POWER ON/OFF SWITCH!**

It is the Midi learn switch (discussed below) and it ***should always be kept in the off (up) position in normal use.***

The Poly Midi unit has no on/off power switch. It is powered on/off when the ac adapter is plugged/unplugged and when the VCS3 is switched on/off.

### The Midi Activity Led (green)

This is a multi-purpose led! The led blinks a few times at power on. Then the led will monitor all incoming recognised MIDI status bytes. The led also blink 3 long blinks if the interface receives the "Write To Flash" sysex message. When this message is received, all MCV876 parameters are written into the flash RAM. So the MCV876 can recall a setup even after a power off. When the interface is in MIDI Learn mode, the led stays on, until a MIDI message has been received and learned by the interface. In '**mono**' play mode (see play modes description below) the mid activity led flashes when midi notes are received. In other play modes it remains off when midi notes are

sent..this is simply to speed up the mid->cv conversion in **polyphonic** and **multi** play modes where every bit of processing speed is 'squeezed' out of the microncontroller.

### The "Midi learn" switch

To place the unit in midi learn mode toggle the midi learn switch on then off (down and back up). The midi activity led stays on until a MIDI message has been received and learned by the interface. The led will blink 3 long blinks if the interface receives the "Write To Flash" sysex message and will then automatically go out of midi learn mode to midi play mode.

If you wish to come out of midi learn mode without sending any new configuration data just toggle the midi learn switch down and up once more. Then the led will switch off and the unit is in the standard play mode.

### Here is how Midi learn works:

When you toggle the Midi Learn switch down then back up the midi activity led stays on and the MCV876 is in **Learn Mode** waiting to receive a Midi message containing Midi channel information. When a message arrives ( you play a note on the master keyboard for example) , the Midi channel number is extracted, compared to the actual interface Midi channel and set to this new value if different. If the Midi channel of the message is identical to the one configured into the interface, and if the message received is a Midi note ON message, the interface extracts the Midi number of the note played and sets this value as the reference (base or lowest ) note. This allows transpose of the MCV876 to any note on the keyboard. The reference note is the Lowest note the interface can play ( digital zero).

Using the small Windows configuration programme available from Marc's website you can configure the unit to **any of the available play modes** mode as you desire.

### V3.06 Firmware and different Play Modes

The Poly Midi unit can be configured in these different playmodes using the windows configuration programme (version 3) which is available from <http://m.bareille.free.fr/mcv876/mcv876.html>

<b>Mono</b>	<ul style="list-style-type: none"> <li>• CV1-Gate1 assigned to NoteOn/Off messages</li> <li>• CV2, CV3,CV4* are assignable to controllers, velocity or PitchBend..</li> <li>• Gates 2,3,4 are assignable to controllers.</li> <li>• One channel recognition</li> </ul>
<b>Multi2</b>	<ul style="list-style-type: none"> <li>• CV1/Gate1 and CV2/Gate2 are on channel N - CV1 assignable to MIDI notes</li> <li>• CV3/Gate3 and CV/Gate4 are on channel N+1 - CV4* assignable to MIDI notes</li> </ul>
<b>Multi4</b>	<ul style="list-style-type: none"> <li>• CV1 to CV4*and Gate1 to 4 are respectively on channels N to N+4</li> <li>• CVs or gates can be assigned to MIDI notes or controllers independantly.</li> </ul>
<b>Poly2</b>	<ul style="list-style-type: none"> <li>• CV1 +Gate1 and CV2+Gate2 are assigned to NoteOn/Off messages</li> <li>• CV3 and CV4* are assignable to controllers, velocity or PitchBend..</li> </ul>
<b>Poly4</b>	<ul style="list-style-type: none"> <li>• CV1 to CV4* and Gate1 to 4 are assigned to NoteOn/Off message</li> </ul>

\*note CV4 is only available on the 4-channel Quad Midi-CV units.

## Triggering the VCS3 Envelope Shaper

The unit has Envelope Shaper (ES) trigger assignable to either keyboard (DK1 or DK2 if present) or any of the 4 gates (gate1-gate4) via a front panel rotary switch. How many of the 4 gates are available depends on the mode used (see above). Eg in **Poly2** mode, only 2 gates are available (gate1 and gate2). In **poly 4** mode (Quad Units only) or **Controller** mode all 4 gates are available to trigger the ES.

**Red** and **yellow** panel LED's light when midi Gate 1 and/or Gate2 are triggered.

Gate 5 and gate 6 outputs are via jack sockets and offer Midi start/Stop and Midi clock signals for interfacing and synchronizing with other external midi devices.

## Using the front panel CV Scaling Potentiometers

CV1-CV3 can be scaled using the 3 front panel potentiometer knobs. These allow different response to midi generated control voltages. Of particular importance is the fact that EMS Synthi oscillators use **0.32V/Octave** standard **NOT** 1V/Octave as on most other synths. For pitch CV1 it is necessary to switch the toggle switch to the 0.32V/Oct setting and scale knob set to maximum value 10. This will produce correct chromatic scales on Osc1 and Osc2. For CV2 and CV3 you can either use 0.32V or 1V/Oct setting as you wish for different responses.

The 1V/Oct option is useful if a CV channel is being used as a modulation source rather than give pitch control of a VCS3 Oscillator. Also if your VCS3 oscillators 1 and/or 2 are not exactly scaled to 0.32V/Oct.. use the 1V setting and adjust the scaling pots until you get proper chromatic pitches.

## NEW FEATURE FOR 2010: precision multi-turn trimmers for fine tuning of 0.32V/Oct scaling of CV1-CV3.

On the rear of all Midi-CV units produced from Nov 2010 onwards, you will find 3 multi-turn trimmers. These are adjusted by inserting a small flat head screwdriver. They are labelled:-



The purpose of these trimmers is that on many Synthi's, Osc1 and Osc2 scaling is not precisely 0.32V/Oct (unless its just been serviced). This results in out of tune /non-chromatic pitch scaling even if pitch cv at 0.32V/Oct is used to control Osc1/2 frequency. These trimmers allow you to get around this problem.

By default the trimmers are adjusted so that when CV1-CV3 pots are set at 10 on the front of the unit AND the 3 toggle switches are set to 0.32V/Oct, then pitch CV1-CV3 are scaled at 0.32V/Oct.

If you find that your VCS3 sounds out of tune when you patch eg CV1 to Osc1 and CV2 to Osc2 freq. control using matrix patch pins then do the following calibration. What follows assumes the play mode of the unit is **Poly2**.

### Osc1/CV1

#### Make sure the VCS3 is warmed up first (at least 15mins)

Set Input ch1 pot on the VCS3 to max 10 and Osc1 frequency to some suitable value. Set up the following patch:

	SIGNALS								CONTROLS							
	output ch 1	meter /scope	envelope	ring mod	reverb	filter	osc. freq.	decay	filter freq	reverb mix	out-put ch level					
			A	B			1	2	3		1	2				
output ch 1																1
output ch 2																2
oscillator 1	●															3
oscillator 2																4
oscillator 3																5
noise																6
input ch		1														7
filter		2														8
trapezoid																9
env. signal																10
ring mod																11
reverb																12
stick																13
																14
																15
																16

Note the above image shows the patch for mk2 matrix.

Set the CV1 scale pot to 10 on the PolyMidi-CV Unit and the toggle switch to 0.32V/Oct range.

Set the lower toggle switch to the CV1 setting and the gate setting to G1. Plug in a Midi Keyboard or software sequencer play a sequence of keys/notes at different octaves. If notes sound flat/sharp...make small adjustments to the **first** of the rear trimmers labelled CV1 with a small screwdriver. You should hear the pitches of the notes played change. Doing this you can trim the 0.32V/Oct setting of CV1 to match the scaling of VCS3 Osc1 so it tracks chromatically over several octaves.

## Osc2/CV2

Apply the same procedure as above to CV2 and Osc2. The patch will now be as above but the black pin connects Osc2 out to Output ch1 and the red precision pin connects Input Ch2 to Osc2 frequency control.

### **Make sure Input ch2 level pot is set at 10 on the VCS3.**

Set the CV2 scale pot to 10 on the Poly Midi-CV Unit and the toggle switch to 0.32V/Oct range.

Set the lower toggle switch to the CV2 setting and the gate setting to G2. Plug in a Midi Keyboard or software sequencer play a sequence of keys/notes at different octaves. This time to trigger G2 and midi note 2 pitch CV (which is CV2) you need to hit 2 keys at the same time.

In poly2 mode ..the unit is duophonic so that when 2 keys are struck at once it assigns lower note to CV1/Gate1 and upper note to CV2/Gate 2. We want to trim the CV2 0.32V/Oct so you need to hit 2 keys (eg 2 keys next to each other on the midi keyboard is easiest) to trigger gate G2 and CV2. If you hit just one key you will only trigger G1 and only Cv1 will change as you play different single notes.

Now whilst playing these two keys transpose the midi keyboard up an octave or down an octave. If the notes heard through the VCS3 sound flat/sharp...make small adjustments to the **second** of the rear trimmers with a small screwdriver. You should hear the pitches of the notes played change. Doing this you can trim the 0.32V/Oct setting of CV2 to match the scaling of VCS3 Osc2 so it tracks chromatically over several octaves.

The fine tuning of CV3 scaling is less critical unless you intend on using CV3 to act as pitch CV for controlling Osc3 in the audio range. You will need to put the unit in **Poly4** play mode if you want to use this option because In this mode CV1-CV4 (CV4 only available on Quad Midi units) correspond to pitches of Midi notes 1-4. For changing play modes on the unit see later on in this guide. Note Osc3 in the VCS3 is not (by design) tracking at 0.32V/Oct but at 0.26V/Oct (!) so you will need to adjust the **third** trimmer on the rear of the unit rather more than for CV1 and CV2 to get the scaling down to 0.26V/Oct. Other than this the procedure is as above but the patch should now take Osc3 to Output Ch1 and CV3 to Osc3 freq. control. which is achieved by inserting the special pin cable anywhere in the Osc3 freq 'column' of the matrix.

Switch the gate selection control to G3 and then hit 3 simultaneous keys on your midi keyboard. This will generate CV1-CV3 pitch CV's and trigger G1-G3 (only G1 and G2 have Led's that light ). Apply transpose to the 3 keys you are simultaneously hitting to test chromatic scaling of Osc3 and adjust the third trimmer as necessary.

Finally, You will have to have the inverter toggle switch in the on 'invert' position. Otherwise you will find Osc3 plays 'backwards' ..ie playing a higher key on the keyboard (hence a larger positive CV3 voltage) generates a lower note (and visa-versa). The reason is a bit technical but it's to do with the fact that all 3 VCS3 Oscillators actually track using a -ve CV (NOT Positive CV which is the norm for most other synths). Since Input Ch1/2 invert voltages fed into them (they are inverting amplifiers) positive midi-generated CV1 and CV2 get inverted to -ve CV by them. But row 16 (the third Input channel) does not invert..hence the reason why I designed the unit to allow inverting of CV3.

## Lower Toggle Switches

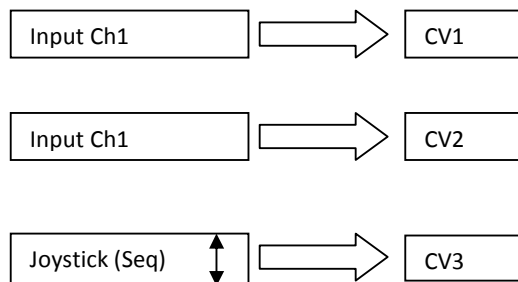
Lower toggle switches allow independent switching of DK control (if one is connected) or Midi-CV control of each of the 2 independent CV input channels into the matrix (Input Ch1, Input Ch2). The third toggle switch between 'CV3/DK' has no affect on the VCS3 Poly Midi units but is there if you happen to have an EMS TKS (touch keyboard sequencer) controlling a VCS3. This makes the latter combination equivalent to a Synthi AKS, with a third CV channel into the matrix (row 16 vertical joystick CV) as an option.

There is also the option to invert CV3 or the KS CV source into row16 of the matrix via another toggle switch..again adding to the creative possibilities.

Any pattern based or multitracking software/hardware sequencer or Midi keyboard will work with the unit. Software sequencers (eg those used in Cubase etc) allow the drawing of 'envelope shapes' for Midi continuous controller messages. These will then create dynamic envelopes (eg for velocity, pitchbend, modulation wheel etc etc) that can be used for any/all of CV1-CV3.

## Creating Patches Using the Unit

CV1 enters the AKS matrix via Input ch1 and CV2 via input ch2. It's best to have the Input Ch1 and Input Ch2 pots on the AKS set to their maximum value 10. Locate the joystick vertical control scaling Pot on the AKS lower panel and turn it to the 'seq' setting (make sure you hear the 'click' as the pot switch turns off). Then row 16 of the matrix (marked Joystick vertical control) carries CV3 instead and the joystick vertical control is disabled.



cv3 is carried by the special ems pin cable on the VCS3(mk1) Poly Midi-CV unit

Then use patch pins to simply patch CV1, CV2 or CV3 to any desired input. E.g. in **PolyMode2** for duophonic sequencer use, CV1 (which is the pitch CV1 in polymode2 ) can be patched to osc 1 and CV2 (pitch CV2 in polymode2) patched to osc 2 frequency control. So insert pins at **I8** and **J9** on the matrix. Row 16 (Joystick vertical control) can be used e.g. as modulation CV connected to filter cutoff, reverb mix, Output channel levels etc etc by inserting appropriate pins.

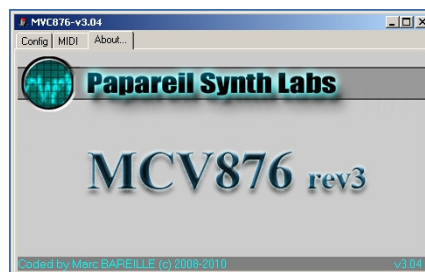
## Using the Windows Configuration Program to change Play Modes

The different play modes of the Poly and Quad Midi-CV units are accessed via sysex messages sent to the unit through a midi cable connected to eg a USB or other midi interface running on a Windows PC/laptop. The programme (and any future updates) is available from Marc Bareille's website:-

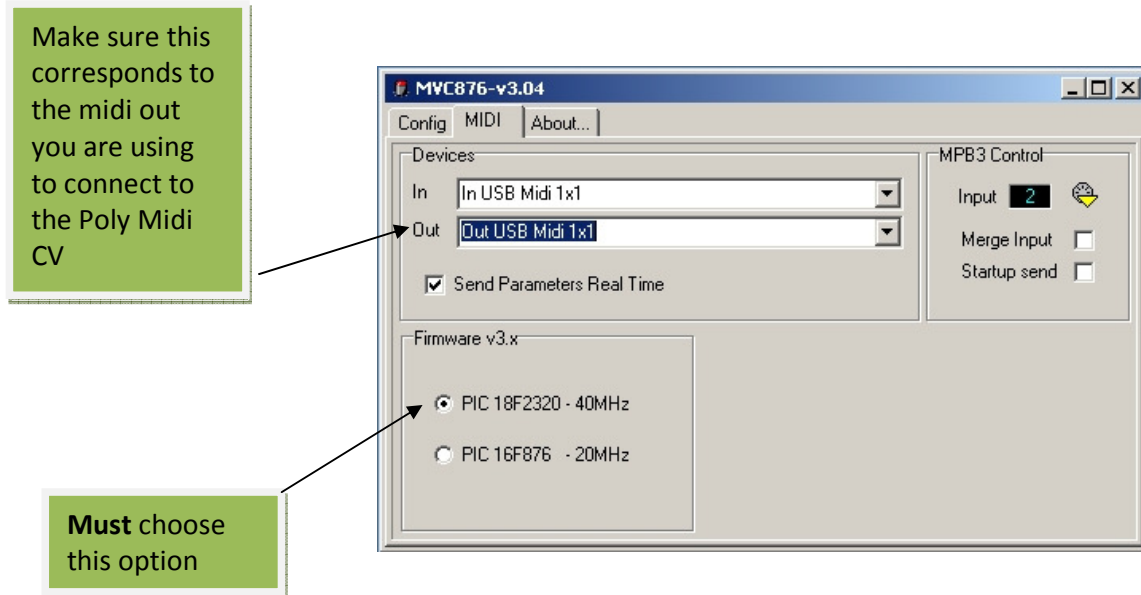
<http://m.bareille.free.fr/mcv876/mcv876.html>

**Make sure you download version 3** of the programme.

On running the programme the following screen appears:-



There are just 3 main tabs. Click on 'Midi' tab to setup the midi out port on your PC :-



In the above a 1x1 Midi Sport USB midi interface is being used.

**It is very important you tick the 'PIC 18F2320 -40MHz ' button..as all my midi cv units use this processor and firmware v 3.x**

Also click the 'send parameters in real time' button as this speeds up the process of changing play modes. There are other options to the right concerning midi inputs that you don't need worry about for basic operation.

Now click the main Config tab which is where you can choose the different play modes :-

The screenshot shows the MVC876-v3.04 software interface. The 'Master' section includes a 'Mode' dropdown set to 'Poly2', a 'Channel' set to '1', and a 'NoteRef' set to 'C-2'. The 'MIDI Clock' section has a 'Divide by' field set to '0'. The 'Triggers' section has a 'Duration' of '1' and a 'Thresh.' of '0'. The 'DAC' section has four rows: 'Bank Select', 'Modulation Wheel (coarse)', 'Modulation Wheel (coarse)', and 'Volume (coarse)'. The 'Gate' section has four rows: 'Bank Select', 'Bank Select', 'Controler n° 20', and 'Controler n° 3'. Callout boxes provide the following information:

- click to send sysex message directly to the Poly Midi-CV Unit and change the play mode (points to the sysex icon)
- 'write to Flash' button. click to save the chosen play mode into the flash memory of the Poly Midi-CV (points to the flash icon)
- 'presets' where you can save your favourite play modes settings for quick change (points to the preset buttons 1-4)
- Play mode choice (points to the Mode dropdown)
- Midi Chan. (points to the Channel field)
- Lowest midi note Poly MCV Unit responds to (points to the NoteRef field)
- 4 Digital to analogue converters (DAC's) corresponding to CV1-CV4 \* (points to the DAC section)
- 'PB'=pitch bend (points to the PB VL 5V label)
- 'VL'=Note Velocity (points to the VL label)
- limits maximum CV to +5V (points to the 5V label)

\* Note the labelling of the 4 DAC's is DAC0-DAC3 (as opposed to DAC1-DAC4 ) in the configuration program. Also **only 3 of the 4 DAC's are present on Poly Midi units so you may ignore the fourth DAC setting.**

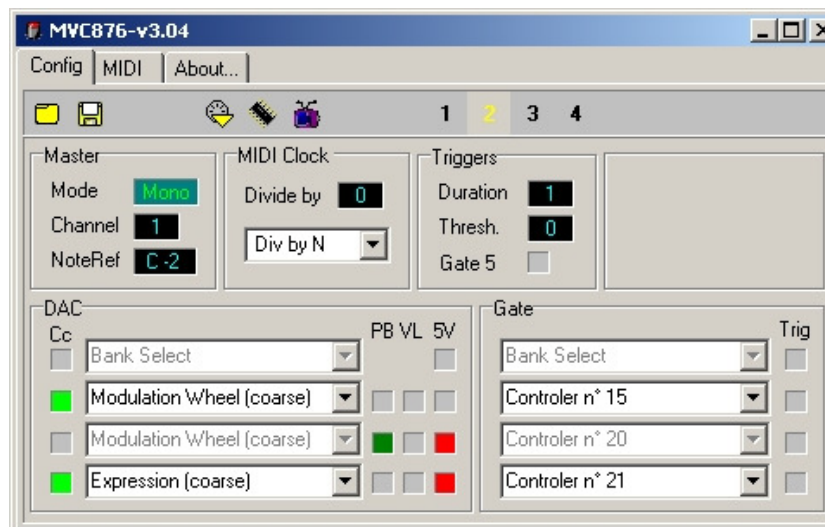
You just have to remember that DAC0-DAC2 correspond to CV1-CV3 as used in this guide. Similarly you will notice that Gate1-Gate4 are labelled as 'Gate0-Gate3' in the program.

In the above example, if the send to flash button is clicked the Poly Midi Unit would be set to **Poly2** play mode. This means CV1 corresponds to Midi note 1 and gate G1 is triggered by Midi note 1 on message; CV2 corresponds to Midi note 2 and Gate 2 is triggered when Midi note 2 on message is received. Meanwhile CV3 is set to Pitch Bend (green box). Finally for **Quad Midi-CV units only** a fourth CV channel is available, CV4, and in this example it corresponds to the Midi Volume (Coarse) CC.

In addition the '+5V' option is also checked, which means the maximum swing of CV4 = +5v. So a Midi Volume value of 0 gives 0V on CV4 whereas a Midi Volume value of 128 sets CV4 to +5V. Limiting the maximum swing to +5V can be useful and give better resolution/response depending on what control destination on the VCS3 matrix you are routing the CV.

Notice in this example all the text in the first 3 DAC boxes is greyed and CC boxes are 'unchecked'. This is because we have used up 3 DAC assignments. Two are used for Midi note 1 and Midi note 2 CV, the third on Pitch Bend CV. For Poly Midi units this exhausts all the 3 channels of CV available. On Quad Midi-CV units we still have CV4 (DAC3) which to freely assign a Midi CC. Similarly looking at the Gate CC's assigned. G1 and G2 are greyed out because they are automatically assigned to Midi note1 and note 2 'on' events. This leaves G3 and G4 assignable to a Midi CC.

Here is another example which sets the Midi-CV Unit again to **Mono** play mode.



Thus CV1 is automatically assigned to midi note1 value. This leaves CV2-CV4 (CV2-CV3 for Poly Midi units) freely assignable to PB, VL, or a CC. In the example CV2 is assigned to Modulation Wheel (Coarse) CC, CV3 to Pitch Bend and CV4 to Expression (Course) CC. In addition maximum swing of CV3 and CV4 is limited to +5v.

G1 is automatically assigned to Midi note 1 on message. But G2-G4 can be freely assigned to Midi CC's. In the example G2-G4 are assigned to controllers 15, 20 and 21.

Finally, if you click either the 'send to Midi' or 'Write to Flash' buttons you will see the Midi activity led flash briefly as the processor is updated. Writing to Flash means the unit will remember the play mode change even after power down.