1. Introduction

Module A-190-2 is an economically priced alternative to the Midi-CV/SYNC interface A-190-1. It can be used in all cases where the additional features of the A-190-1 are not required (e.g. clock output, start/stop output). A-190-2 is the modular version of the MCV4 interface.

These are the most important features of the A-190-2:

- Midi-to-CV/Gate interface
- Gate output 0/+5V
- CV1: voltage derived from incoming Midi note messages (0...+5V / 5 octaves), the glide control affects this CV output
- CV2: voltage derived from incoming Midi pitch bend messages (-2.5 ... +2.5V)
- CV3: voltage derived from the multiplication of incoming Midi volume messages and the velocity data of the note messages (0...+5V)
- CV4: voltage derived from a freely adjustable Midi control change message (0...+5V)
- Midi channel, reference note for 0V CV1 and the midi control change number for CV4 are adjusted by means of the learn button.
- Glide control: portamento/slew limiter function for CV1

By means of two jumpers CV1 and Gate can be connected to the corresponding lines of the A-100 bus.

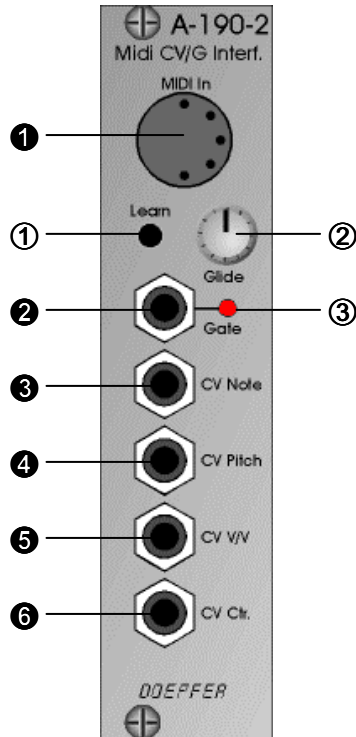Fig. 1: Schematics

2. Overview

Fig. 2: Front panel

Controls / Displays:

① Learn: Learn (momentary switch)
② Glide: Glide Control for CV output "Note"
③ Gate: Gate / Learn LED

In- / Outputs:

❶ Midi In: Midi input
❷ Gate: Gate output
❸ CV Note: CV output "Note"
❹ CV Pitch: CV output "Pitch Bend"
❺ CV V/V: CV output "Velocity/Volume"
❻ CV Ctrl.:   CV output "Controller"

Width: 6 HP

Current: 50 mA

3. In- / Outputs

❶ Midi input

The Midi input of the A-190-2 is connected to the Midi output of the Midi transmitter that is used to control the A-190-2 (e.g. Midi keyboard or sequencer).

❷ Gate output

The Gate outputs turns "high" when a valid Midi note on message is recognized by the A-190-2. It turns back to "low" when the corresponding note off message occurs. The Gate levels are +5V (high state) and 0V (low state). If desired the gate polarity can be inverted. Details in chapter 5.

Usually the gate output is connected to the gate input of an envelope generator (e.g. ADSR A-140) that is used to control the VCA and/or VCF of the patch.

The A-190-2 has available a jumper that allows to connect the Gate output of the module to the Gate line of the A-100 bus (see appendix).

Important note: The module comes with an installed Gate jumper, i.e. one has to remove the jumper if e.g. an A-190-1 or A-185-1 is connected to the gate line of the same bus board! If the A-190-2 has to be used as Gate source for the A-100 bus the Gate connection of any other Gate source (e.g. A-190-1 or A-185-1) has to be removed. Otherwise a *short circuit is made between the outputs of the Gate transmitters !*

❸ CV output "Note" (CV1)

This socket outputs a voltage that is controlled by the Midi note number of a valid note on message (i.e. on the right Midi channel and in the note range between the reference note and 5 octaves beyond). The voltage range is 0 … +5V and the scale is 1V/Octave (i.e. 5 octaves range). 0V corresponds to the reference note (see chapter 5), +5V to the note that is 5 octaves beyond the reference note.

CV1 is affected by the glide control (see chapter 4).

A trimming potentiomer can be used to re-adjust the 1V/octave scaling if necessary (see attachment for details).

Usually this CV output is connected to the 1V/Oct compatible CV input(s) of the voltage controlled oscillator(s) (VCOs) of the patch. The output is buffered, i.e. it can be used to control even 2 or more CV inputs of VCOs without the need of an additional buffer.

The A-190-2 has a jumper on board the allows to connect the CV output "Note" of the module to CV line of the A-100 bus (see appendix).

Important note: The module comes with an installed CV jumper, i.e. one has to remove the jumper if e.g. an A-190, A-185-1 or A-185-2 is already connected to the CV line of the same bus board! If the A-190-2 should be used as CV source for the A-100 bus the CV connection of any other CV source (e.g. A-190-1, A-185-1 or A-185-2) has to be removed. Otherwise a short circuit is made between the outputs of the CV transmitters !

❹ CV output "Pitch Bend" (CV2)

This socket outputs a voltage that is controlled by valid Midi pitch bend messages (i.e. on the right Midi channel). The voltage range is about -2.5V (Midi data 0) … 0V (Midi data 64) … +2.5V (Midi data 127).
Usually this output is connected to the CV input(s) of the voltage controlled oscillators (VCOs) that are equipped with attenuators. The attenuators are used to adjust the desired pitch range. If more than one VCO is used a multiple module is required to distribute the CV coming from the A-190-2. In this case the usage of the precision adder A-185-2 is a more versatile solution (see chapter 6: user examples). The CV output "Note" of the A-190-2 is patched to one of the CV inputs of the A-185-2 without attenuator. The CV output "Pitch Bend" of the A-190-2 is patched to the CV input of the A-185-2 with attenuator. That way the pitch bend range is adjusted with one common control only for all VCOs. The CV bus jumper of the A-190-2 has to be removed in this application because the A-185-2 is used as CV source for the bus.

❺ CV output " Velocity/Volume" (CV3)

This socket outputs a voltage that is controlled by valid Midi volume or velocity*volume messages. The voltage range is 0 V (velocity/volume data 0) … +5V (velocity/volume data 127). The module can be adjusted for volume control only or for both volume and velocity (velocity*volume). Details in chapter 5. The factory setting is volume only (no velocity).

Usually this output is connected to the CV input of a voltage controlled amplifier (VCA) that is used to control the overall loudness of the patch. But it can be used also to control any other function by Midi volume or velocity (e.g. filter frequency, filter resonance, LFO frequency …) .

❻ CV output "Controller" (CV4)

This socket outputs a voltage that is controlled by valid Midi control change messages (i.e. the right control change number on the right Midi channel). The voltage range is 0 V (controller data 0) … +5V (controller data 127). The control change number can be adjusted to any value. Even this output can be connected with velocity (same as CV3). Details in chapter 5. The factory setting is controller #1, i.e. modulation controller, no velocity.

The output can be used to control any parameter by the corresponding Midi control change messages (e.g. modulation depth, filter frequency, wave multiplication depth, waveform morphing, panorama …).

4. Controls

① Learn

This is a momentary switch that is used to adjust the parameters of the A-190-2 in combination with Midi note, control change or program change messages (e.g. Midi channel, reference note, control change number, gate polarity, retrigger on/off, key assign mode). Details in chapter 5.

The learn button is also used to reset the module (i.e. to call up the factory settings). For this the button has to be operated during power on of the A-100 system. Then the system has to be turned off and on again (with about 10 seconds in the "off" state"). These are the factory settings:

- Midi channel 1
- reference note 36
- trigger polarity: positive
- retrigger: off
- CV3: volume (controller #7)
- CV4: modulation (controller #1)
- CV1 characteristics: V/octave
- key assign mode: highest note

② Glide

This is the glide control for the CV output "Note" (this function is even called *Portamento* or *Slew Limiting*). In the fully CCW position no glide appears, i.e. the control voltage jumps when a new Midi note number is recognized. To obtain the glide function the control has to be turned clockwise until the desired glide time is reached.

③ Gate/Learn

The LED (light emitting diode) displays the Gate function in the normal play mode. The LED can be used to control the correct function of the module – even without having other modules connected to A-190-2.

The LED is also used as *Learn* display after the *Learn* button has been operated. Details in chapter 5.

5. Operation

To adjust the A-190-2 parameters one has to enter the *Learn mode* and send the regarding Midi messages to the module from the Midi transmitter while the A-190-2 is in learn mode. To enter the learn mode one has to press the learn button and hold it pressed down for about one second. The one-second-delay was programmed to prevent the unintentional release of the learn mode. Whenever the LED is flashing without incoming Midi messages the learn mode is active. In this mode the A-190-2 is looking forward to an incoming Midi note on, program change or control change event (see table below). If one has entered the learn mode by mistake one can leave it by pressing the learn button again. The learn mode is also be terminated if one of the Midi events in the table below is received.

While the A-190-2 is in learn mode the parameters listed in the table on the next page can be adjusted via incoming Midi messages.

Whenever the A-190-2 receives one of the Midi messages listed in the table the parameter in question is changed and the A-190-2 returnes to the normal play mode, i.e. the LED stops flashing.

Pay attention that not unintentional Midi messages appear while beeing in the learn mode (e.g. from a sequencer) as you change the settings of the A-190-2 with such messages. All parameter changes made while beeing in the learn mode are stored non volatile parameter memory. When the A-190-2 is turned on next time the parameter settings are taken from this memory.

Function	Midi message	Note	Comment
Midi channel/reference for CV1=0V	Note on	(1)	
CV3 velocity off	Program Change #1	(2)	CV3=volume
CV3 velocity on	Program Change #2	(2)	CV3=volume*velocity
CV4 velocity off	Program Change #3	(2)	CV4=Ctr.#X
CV4 velocity on	Program Change #4	(2)	CV4=Ctr.#X*velocity
Retrigger: off	Program Change #5	(3)	
Retrigger: on	Program Change #6	(3)	
Trigger polarity: normal	Program Change #7	(4)	
Trigger polarity: invertet	Program Change #8	(4)	
CV3 velocity mode 127 steps	Program Change #11	(5)	velocity resolution 0-127
CV3 velocity mode 2 steps	Program Change #12	(5)	velocity 2 steps (</>100)
CV4 velocity mode 127 steps	Program Change #13	(5)	velocity resolution 0-127
CV4 velocity mode 2 steps	Program Change #14	(5)	velocity 2 steps (</>100)
Key assign mode: highest note	Program Change #15	(6)	
Key assign mode: last note	Program Change #16	(6)	
Key assign mode: reference note	Program Change #17	(6)	
Key assign mode: stack note	Program Change #18	(6)	
Characteristics: V/Octave	*Program Change #19*	*(7)*	
Characteristics: Hz/V	*Program Change #20*	*(7)*	
Controller for CV4	any Midi-Controller (except Bank-Controller 0/32)	(8)	

Notes

(1) Midi channel/reference for CV1=0V

In case of an incoming note event in the learn mode the note number and the channel of the event are taken over as the new reference note and Midi channel. The reference note is the Midi note number that belongs to 0V CV1 output. In practice you simply enter the learn mode and press the key on your Midi keyboard that should belong to 0V CV1. Midi note events below the reference note or more than 5 octaves above the reference note are ignored (remember: the CV1 voltage range is 0...+5V). The factory default settings of reference note and Midi channel are 36 (C) and 1.

(2)...(6)

For the setting of these parameters Midi Program Change messages coming from your Midi device are used. Normally you will have to press the program change keys on your Midi keyboard or synthesizer or software while beeing in the learn mode.

Important note: Pay attention that some manufacturers count the Midi program change numbers from 1....128, others from 0...127. In this manual the counting 1…128 is used. Please look into the user's manual of your Midi device which type of counting is used. If the counting type 0…127 is used one has to subtract 1 from the program change numbers in the table above. For some devices (especially software sequencers) the type of program change numbering can be selected. In this case you should use the 1...128 range to agree with the numbers in the table above.

The program change messages must be sent on the A-190-2 Midi channel (see note 1).

(2) Velocity on/off

These program change messages are used to select whether the note on velocity affects the control voltages CV3 and CV4. If velocity is "off" only volume (CV3) or the free adjustable controller (CV4) is used to generate the control voltage. If velocity is "on" the volume or controller value is multiplied with the note on velocity, i.e. the CV value changes with every new note event as the velocity of the note event is used to calculate the control voltage together with the volume message (CV3) or the assignable controller (CV4).

(3) Retrigger on/off

With this parameter one can select whether the gate is reset for a few milliseconds when playing *legato* (i.e. playing a new note on the keyboard while the key of the former note is still pressed). The factory default setting is retrigger off. Additionally the Midi controllers LEGATO (controller #68) and SUSTAIN (controller #64) affect the gate output in the usual manner.

(4) Gate polarity

With this function the gate polarity can be changed. Within the A-100 this features is not required because all envelope generators of the A-100 use positive gate polarity only. Only if the A-190-2 is used to control other equipment or for special features this function might be useful.

(5) Velocity resolution

This parameter defines whether the velocity resolution is 127 steps (as usual) or two steps only. The two-step-mode is similiar to the *accent* used in some vintage equipment (e.g. TB303, TR808) and could make sense to simulate one of these devices.

The velocity threshold value for the two-step-mode is 100: incoming velocity values of 100 or more are converted into a fixed velocity value 127, incoming velocity values less than 100 are converted into a fixed velocity value 64.

(6) CV1 Key assign modes

These program change messages adjust the type of assign modes for CV1. If *highest note* is selected the highest key pressed on the midi keyboard is used to generate CV1 if more than one key is operated. In the *last note* mode always the last note (chronological) is taken for CV1.

The following modes are only useful if two or more A-190-2 are daisy-chained via Midi Out/In by means of the internal jumpers (see attachment).

Reference note means that only the reference note is accepted. This feature is useful if you want to trigger different devices on the same Midi channel using two or more A-190-2. In this case you have to set the reference notes for the A-190-2's to different values.

Stack note means that the A-190-2 is filtering out the note event that is used by the A-190-2 to generate Gate and CV1. The note event in question is not transmitted to the Midi output. All other note events are passed on. Stack mode is used to control more than one synthesizer voice on one Midi channel and enables polyphonic control.

(7) CV Characteristics

With programm change #19 and #20 one can select between V/Octave and Hz/V characteristics for the CV1 output. Within the A-100 this features is not required because all VCOs and VCFs use V/Oct only. Only if the A-190-2 is used to control other equipment this function might be useful. V/Octave is used by most of the synthesizer manufacturers (Moog, ARP, Oberheim, Roland, Sequential Circuits, Doepfer). Because of the non linear voltage range mode the resolution is very poor in the Hz/V mode, especially in the lower voltage range. Consequently the Hz/V mode should be treated as a free bonus and used only if there is no other solution.

(8) Control change number for CV4

If the A-190-2 receives a Midi control change message (except bank controllers 0 and 32) while being in the learn mode the control change number of this message defines the new control change number for CV4 (except bank controllers 0 and 32). I.e. the CV4 output of the A-190-2 corresponds from now on to this controller number. The control change message must be sent on the A-190-2 Midi channel (see note 1).

Temporary parameter changes

The program change messages listed in the table can be used to change the settings even temporarily without the need to select the learn mode. *Temporarily* means that the changes are not stored permanently in the non-volatile parameter memory but only as long as the module is powered. If the A-190-2 is turned off and on the previously stored parameter settings are called up again.

The temporary changes may be used to try out different settings without storing them into the memory or to change the settings temporarily from a Midi foot-switch or sequencer (e.g. retrigger on/off for, assign mode change). If the parameter changes have to be stored permanently the learn mode has to be used.

All program change messages must be sent on the A-190-2 Midi channel (see remark 1).

6. User Examples

6.1. Simple synthesizer standard patch with one envelope generator
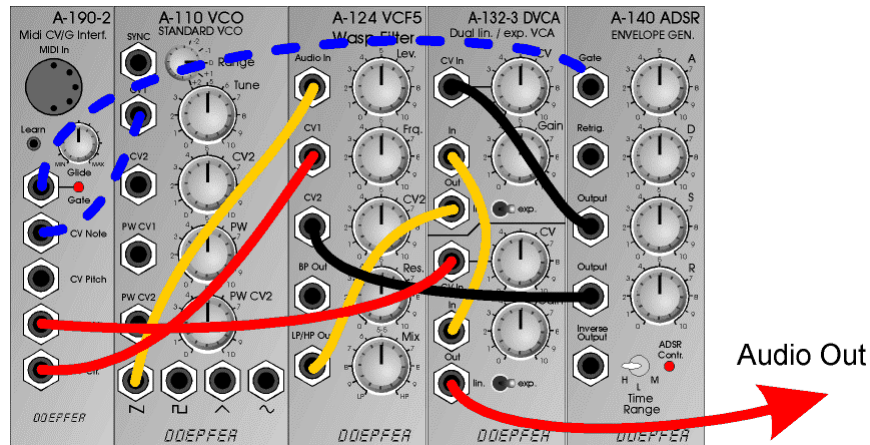
This is a simple synthesizer patch with one VCO A-110 that is processed by a VCF (A-124 Wasp filter in this example, but any other filter may be used) and two VCAs (Dual VCA A-132-3). The first VCA is controlled by the envelope of the ADSR A-140. The second VCA is controlled by the Velocity/Volume CV of the A-190-2 and used for a Midi controlled overall loudness. The VCF frequency is controlled by both the A-140 envelope (width adjustable level) and the Midi generated Controller CV (fixed level). The dashed blue connections (CV1 A-190-2 → CV1 In A-110 and Gate A-190-2 → Gate In A-140) are not required if the bus jumpers of the modules A-110, A-140 and A-190-2 are installed.

6.2. Application of A-190-2 and Precision Adder A-185-2
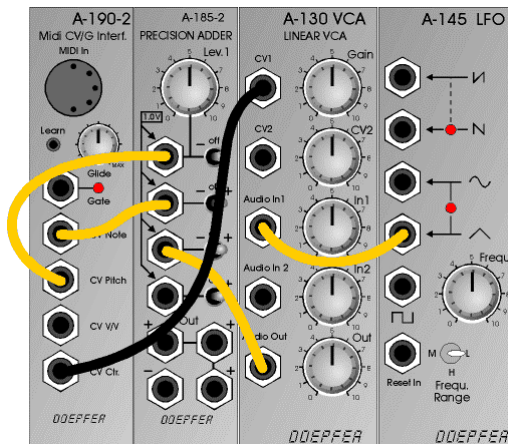
In this application the A-185-2 is used to add up several voltages that are used to control the pitch of all VCOs that are connected to the same bus board as the A-185-2:

- CV Note is connected to one of the inputs of the A-185-2 without attenuator
- CV Pitch Bend is connected to the input of the A-185-2 with attenuator to be able to adjust the pitch bend width
- CV Ctr is connected to the control input of a VCA (e.g. A-130) and controls the level of the triangle signal of the LFO A-145. The output of the VCA is connected to one of the inputs of the A-185-2 without attenuator. That way the Midi controller (e.g. modulation = control change #1) is used for the modulation depth. If the A-145 is replaced by a VCLFO A-147 the CV Volume of the A-190-2 may be used to control even the modulation frequency of the LFO.
- The CV output of a sequencer A-155 can be connected to the remaining free input of the A-185-2. Then the CV Note of the A-190-2 is used to transpose the sequence of the A-155 via Midi.

Attention: In this application the bus CV jumper of the A-190-2 has to be <u>removed</u> and the bus CV jumper of the A-185-2 has to be <u>installed</u> ! Otherwise a short circuit between both CV outputs is made !

Appendix

- Function of the jumpers/pin headers
- Position of the trimming potentiometers for CV1 scale

for daisy-chaining of several A-190-2

Midi out (to following A-190-2)

Midi in (from preceeding A-190-2)

Jumper
Gate → Bus

Jumper
CV → Bus

Trimming potentiometer
for CV scale