Poly Pressure Encoder from Dome Music Technologies

Poly
Pressure
Encoder

Pitch In

MIDI In

Pressure In

MIDI Rate

C F S

MIDI Out

Dome Music
Technologies

Introduction

The Poly Pressure Encoder module from Dome Music Technologies allows you to convert Voltage Modular polyphonic control voltages into MIDI Poly Pressure messages. The MIDI output stream can then be sent to the MIDI Out module or Plug-In Host module to drive third-party soft synth plug-ins, or external hardware synths.

The module was developed as a companion for the Poly Performance Controller module by Dome Music Technologies, so that its pseudo-poly-aftertouch operation could be extended beyond control voltages inside the Voltage Modular environment. However, it can also be used to provide multiple channels of independent, per-voice modulation for any MIDI synth which can receive and process MIDI Poly Pressure messages.

Internal Operation

The Poly Pressure Encoder module operates by combining a MIDI Input stream, polyphonic pitch voltages and polyphonic pressure voltages. By processing these three sets of input values, it generates a MIDI output stream with poly pressure values associated with the keyboard notes of the polyphonic voice channels.
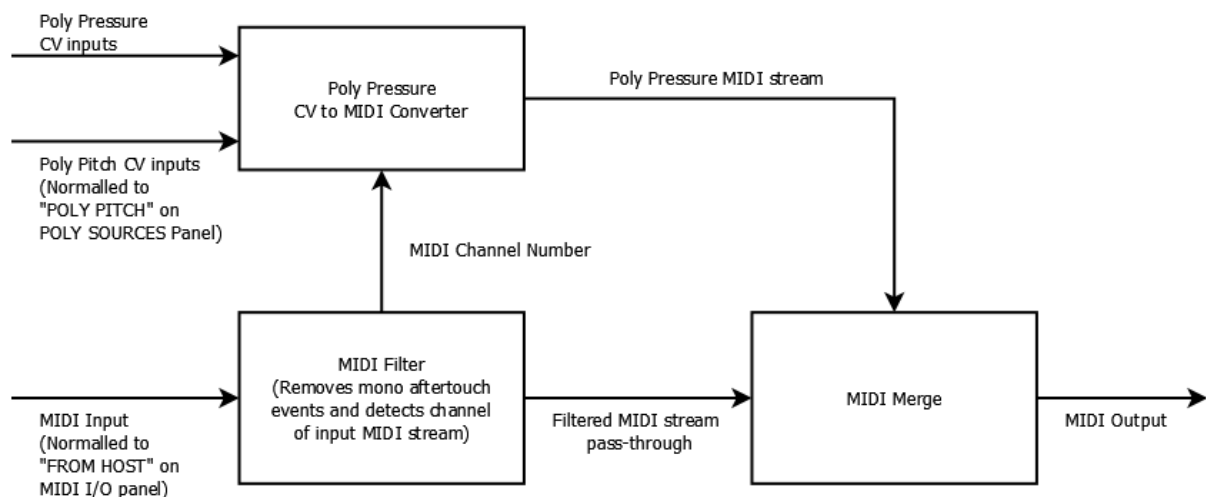

Figure 1 - Poly Pressure Encoder Schematic Diagram

The module takes advantage of the polyphonic voice-assignment algorithm within Voltage Modular. When VM receives MIDI messages from external hardware or host DAW, Note On and Note Off messages are turned into Polyphonic Gate, Pitch and Velocity values. The number of polyphonic voices to be used is set by the NUMBER OF VOICES indicator in the POLY SOURCES panel.

IMPORTANT: Always set the NUMBER OF VOICES to match the polyphony count of the current patch in the target synth.

The Poly Pressure Encoder module uses these polyphonic control voltage (CV) values to determine which key has triggered a certain voice. This is particularly important when converting CVs to MIDI events, as the target synth has its own internal voice-allocation algorithm. The only way for the target synth to determine how much pressure to assign to a particular voice is based on which key that voice was assigned to at Note On time.

Poly Pitch In and MIDI In Sockets

These sockets allow the Poly Pressure Encoder to construct MIDI Poly Pressure messages to send onwards to the target synth. MIDI Poly Pressure messages have two parameters associated with them:

Note Number (0 to 127), where 0 = C-1 and 127 = G9
Pressure Value (0 to 127), where 0 = no pressure / key released, and 127 = fully depressed.

These sockets should be connected to the same source of MIDI and Poly Pitches. If they are not connected to any other modules, they are 'normalled' internally to the "FROM HOST" and "POLY PITCH" sockets on the I/O Panel at the top of the Voltage Modular rack.

Poly Pressure In

This socket allows you to input a separate pressure control voltage for each voice. A CV of 0V or less relates to a MIDI pressure value of 0 (key released). A CV of 5V or more relates to a MIDI pressure value of 127 (fully depressed).

MIDI Data Rate Switch

This switch determines the maximum rate at which the module sends Poly Pressure messages to the target synth. Note that this setting does not affect the MIDI 'pass-through' messages such as Note On, Note Off, Pitch Bend, Mod Wheel, etc. These will all be transferred directly to the MIDI Out socket as soon as they are received at MIDI In.

There are three settings:

C – Continuous. Messages are sent out at a *maximum rate* of 48,000 times per second.

F – Fast. Messages are sent out at a *maximum rate* of 1,000 times per second.

S – Slow. Messages are sent out at a *maximum rate* of 100 times per second.

New messages will only be sent out if the pressure value or key number has changed for a voice channel within the last monitoring period.

The default setting is F – Fast. This is a typical setting for most situations, particularly if you are driving a soft-synth via the Cherry Audio Plug-In Host module. It allows for smooth pressure following whilst also throttling the data rate going through the MIDI buffer of the plug-in.

The C – Continuous setting is only appropriate for transmitting (up to) audio-rate pressure values. Use this setting at your own risk, as it could potentially swamp the MIDI channel or cause CPU spikes in your computer. However, it *might* work for you, so the option is there if you're feeling brave.

The S – Slow setting is provided to cater for physical MIDI interfaces and cables. Poly Pressure messages will be sent out to the target synth at a maximum rate of 100 per second (multiplied by the number of active voices). A *physical MIDI (DIN) cable* can transfer an **absolute maximum** of 3125 bytes per second. Given that a Poly Pressure message takes three bytes, this means we have a maximum of 1041 Poly Pressure messages per second, or 10 per 10ms period. If we are using 10 voice polyphony, and every voice channel's CV value changes every 10ms, then there will be 3000 bytes transmitted every second. This leaves only 125 bytes (or 41 messages) for other events such as Note On/Off, pitch bend, mod wheel, etc. When using physical MIDI hardware, remember the wise words of Lt Commander Montgomery Scott; "I cannnae change the laws of physics, Cap'n".

MIDI Out Socket

The MIDI Out socket should be connected to the MIDI In of the module you wish to drive. For the majority of applications, this will be one of:

Cherry Audio MIDI Output for driving a hardware interface or a MIDI loopback device:
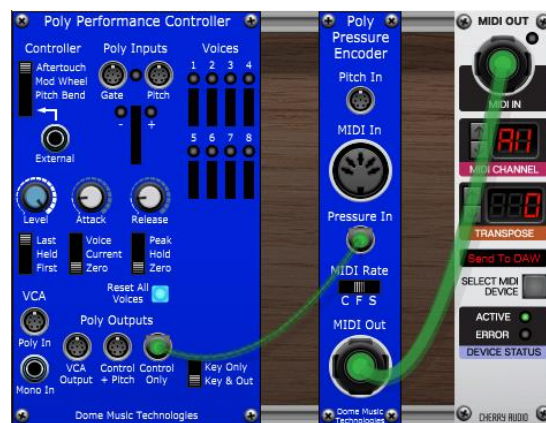
Cherry Audio Plug-In Host or Cherry Audio Mini Plug-In Host for driving a soft-synth plug-in:

Using "Pressure In" CV Socket as a Per-Voice Modulation Source

There is no reason why you have to restrict the "Pressure In" poly CV sources to pressure values. In fact, it can be used to send independent modulation values to each voice channel of the target synth.

In the patch shown below, the pitch of each voice on the Chroma is being modulated by a separate phase of two Quad Sine LFO modules, leading to a rich chorus sound. Note that polyphony has been set to six on both Voltage Modular and the target synth (in this case, Cherry Chroma):

Poly Pressure Compatible Soft-Synths (that I have used during testing)

This is a short list of soft-synths that I have tested the Poly Pressure Encoder against, together with an indication of how successful it was.

Manufacturer	Model	Results / Notes
Arturia	CS80-V3	The CS80-V responds in a similar way to the physical synth. One noticeable effect is that when it receives a Note Off MIDI message, it will not process any further Poly Pressure commands. This means that even if pressure values from the Poly Performance Controller are decaying gracefully, the pressure value 'seen' by the CS80-V voice channel immediately drops to zero, with a corresponding glitch in the audio. This *does* make sense when you consider the hardware synth – you can't continue to apply pressure when you've taken your finger off the key! 😊
Arturia	2600-V3	This works really well when running 2600-V as a polyphonic instrument. It gives you an extra source of per-voice voltage control which you can patch into pretty much any available input jack. Instead of dropping to zero when you release a key, 2600-V will hold the last received value. This mitigates the glitch that occurs in the CS80-V, but is still not ideal.
Arturia	Jup 8-V3	If you go into the Advanced Menu, then click on the Keyboard section, you can assign Poly Aftertouch to three independent destinations. Very smooth and responsive.
Cherry Audio	Chroma	It's very easy to set up Poly Aftertouch control of VCO pitch, filter cutoff etc, directly from the front panel. I have to admit that Cherry Audio **already** did a fantastic job of implementing pseudo-poly aftertouch with their "Last Note Only" setting. It *almost* removes the need for using the Poly Performance Controller and Poly Pressure Encoder at all. 😊
Arturia	SQ80-V	A synth that continues to respond to Poly Pressure messages even after Note Off has been received. It's particularly satisfying when you compare the fluidity of the Poly Performance Controller to the rather brutal native mono aftertouch response. Be sure to set voice allocation algorithm on the synth to "REASSIGN" for the best results.