Polyg User Manual 1.0

Synthmar

Contents

1 What the hell is it?

Polyg is an 8-voice two operator FM/PM synthesizer for Eurorack that is powered by a Teensy 3.2 microcontroller. It has four selectable basic waveforms and it also has a 'bonus' mode where you can have an 8-voice Karplus strong synthesizer! Or in layman's terms, an 8 voice plucky strings synth! The design utilizes a 16bit/44.1kHz DAC called CD4334.

It is controllable only by MIDI, this might anger some modular purists and I completely get that. But the design philosophy for this particular synth is to bring an open source compact polyphonic synth to the Eurorack world, there exist some but the ones that give control over every single voice eat up alot of HP. And there is nothing wrong with that, I just needed a smaller one for my humble 7U case. And for me to add V/Oct and gate for every voice would require 16 jacks and alooooot of HP.

Couple of design flaws I also want to mention.

- The Karplus Strong synthesizer is not able to play below the MIDI note E2, this is a limitation within the Audio library for the Teensy board.
- The square and the sawtooth wave have major aliasing on the very upper registers of the keyboard. As of now I haven't found a solution. But hopefully it will be a simple job to do. This hasn't bothered me at all though and it probably won't bother you as well.

2 The Controls

2.1 FM Knob

This controls the amount of FM modulation that the Modulator will apply to the Carrier.

2.2 FM Decay Knob

This controls the Decay/Release of the envelope for the FM modulation. Maximum decay is 3 seconds.

2.3 Ratio Knob

This controls the Ratio between the modulator and the carrier.

2.4 Decay Knob

This controls the Decay/Release of the Carrier and Karplus Strong envelope. Maximum decay is 3 seconds.

2.5 Waveform button

This selects the four selectable waveforms.

2.6 Mode button

This switches between the FM synth mode or the Karplus Strong Synth mode.

2.7 'Panic' and MIDI channel button

This is the well 'hidden' black button below the Mode button. If you short press this button then all notes will be turned off, really useful if you get some stuck MIDI notes. If you hold this button for longer than 5 seconds then it will enter 'Midi Learn' mode, this is used to set the MIDI channel that the module will respond to. Simply hold the button for 5 seconds and then send a MIDI note/message on the channel you want the synth to be set to.

For some visual detail on all of this see the block diagram as depicted in figure ??.

3 The Inputs and Outputs

3.1 Gate Out

This will give a Gate whenever you push a note on your MIDI keyboard/whatever, but it will only give out a gate to the first note pushed. So if you push for example C1 and then A1 then the Gate will light up when you pushed C1 and when you release C1 the gate will turn off. It's really usefull for pinging an ADSR/AD to control a VCF or something, especially for Dub-techno style stuff.

3.2 Audio Out

This is, well, the audio out. The amplitude of it will depend on how many notes are playing, this MIGHT be improved in future updates but I will see if I really want to implement some sort of a normalizer for the output. There is a trimmer at the back which controls the amplitude of the Audio out, best way to calibrate it is to play 8 notes at the same time and trimm it until you cannot hear any distortion(Sine waveform is the best for this).

3.3 MIDI In and Out

It's simple! Its the MIDI In and MIDI out/thru jacks. They are wired to the B MIDI mini-jack standard, or the Arturia standard. Here's a simple wiring diagram if you want to make your own jack. The MIDI out/thru simply mirrors all the MIDI information coming into the MIDI IN jack. To see how you set the MIDI channel for the synth itself see **??**.

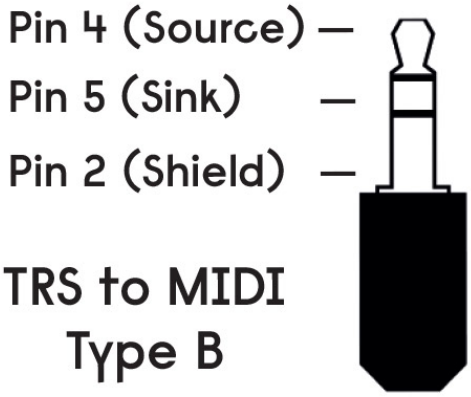

Figure 1: Wiring for B MIDI jack

3.4 FM

This is the CV input for the FM knob, it is added to the value of the knob. The CV range is from 0 to 7V.

3.5 Ratio

This is the CV input for the Ratio knob, it is added to the value of the knob. The CV range is from 0 to 7V.

3.6 Wave Trig

This receives a trigger which will change the Carriers waveshape. It's simply OR'd with the Waveform Button. It needs atleast 3.3V to interpret it as a trigger.

3.7 Gate

This will output a 3.3V Gate voltage for the first note that is played. It is on as long as that specific note is held. When this note is released the gate will go off and then it will go on again when you push another note. So if you play a chord then this gate will go high at the first note that goes on.

4 Block Diagram

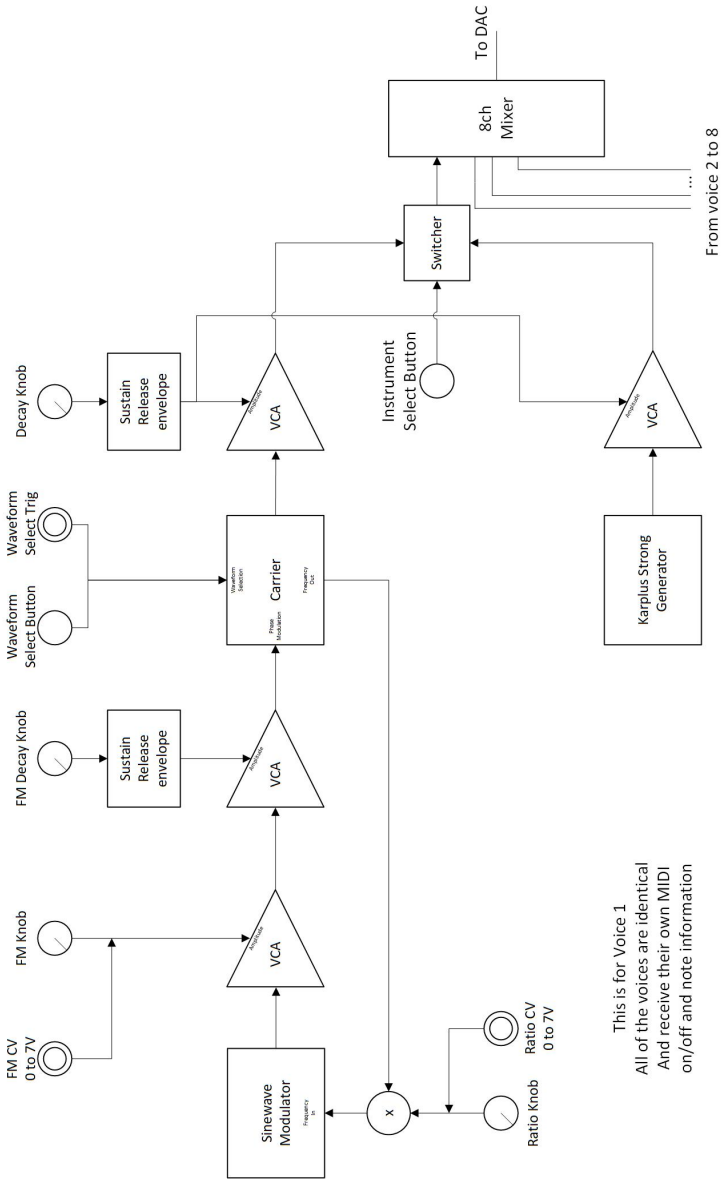

Figure 2: Block diagram of the Synthesizer architecture