Custom synth for KORG logue SDK 2.0 synthesizers

Operations Manual

v.2.0-2b

Contents

Introduction

FM64 is a custom synth for KORG drumlogue synthesizer that reproduces Yamaha DX / TX series 6-operator FM synthesis with several additional features from Yamaha SY77 series and KORG opsix. The synth is polyphonic and multitimbral.

For this custom synth module to work with, in addition to the synth file itself, the specially prepared user sample with Yamaha voices of your choice should be uploaded to KORG drumlogue synthesizer. Otherwise only the Init Voice will be available. You can create your own voice bank at the FM64 synth web page. For information on how to upload user synths and user samples to the synthesizer please refer to the KORG drumlogue Owner's Manual.

Yamaha voice banks, or ROMs, are widely available on the Internet. Any VMEM packed voice bank for Yamaha DX1, DX5, DX7, DX7II, DX7s, TX7, TX802, TX816 both in SysEx (4104 bytes) or RAW (4096 bytes) will fit. Any other format, including voice banks for 4-operator Yamaha DX9, DX11, DX21, DX21, DX27s, DX100, TX81Z, will not work.

If you find a bug or wish to propose a new feature or improvement, don't hesitate to create a new issue at GitHub or just send me an email to dukesrg@gmail.com.

This custom oscillator is open source and free. However you can support the development via PayPal me or Revolut me.

Parameters

Parameter	Range	Description
NOTE	0…127	Note for internal sequencer gate.
VOICE	0…32767	Voice select, refer to Voices section for details.
MODE	0…423	Voice mode: Poly, Duo, Unison, Chord (22), Pitch class (399)
DETUNE	-100C…+100C	Detune in cents for Poly mode or voice spread for Duo and Unison modes
ALG.	0…85	Algorithm select, refer to Algorithms section for details.
C.WAVE	0…32767	Waveform select for carriers, refer to Waveforms section for details.
M.WAVE	0…32767	Waveform select for modulators, refer to Waveforms section for details.
FB1 OFFS	-7.0…8.0	Feedback 1 offset, refer to Feedback section for details.
FB1 PATH	0…36	Feedback 1 path, refer to Feedback section for details.
FB2 OFFS	-7.0…8.0	Feedback 2 offset, refer to Feedback section for details.
FB2 PATH	0…36	Feedback 2 path, refer to Feedback section for details.
C.LEVEL.	-99.0…99.0	Level offset for carriers
M.LEVEL	-99.0…99.0	Level offset for modulators
C.RATE	-99.0…99.0	EG rate offset for carriers
M.RATE	-99.0…99.0	EG rate offset for modulators
C.KLS	-99.0…99.0	Keyboard level scaling offset for carriers
M.KLS	-99.0…99.0	Keyboard level scaling offset for modulators
C.KRS	-7.0…7.0	Keyboard EG rate scaling offset for carriers
M.KRS	-7.0…7.0	Keyboard EG rate scaling offset for modulators
C.KVS	-7.0…7.0	Key velocity sensitivity offset for carriers
M.KVS	-7.0…7.0	Key velocity sensitivity offset for modulators
C.DET.	-100C…+100C	Detune offset in cents for carriers
M.DET.	-100C…+100C	Detune offset in cents for modulators

Voices

To provide voice data to the synth, at least one single-channel user sample with the name started with **FM64Bank** prefix must be uploaded to any sample bank of the synthesizer. The sample data must contain any number of packed VMEM raw Yamaha DX voices of 128 bytes each. Voices from all suitable user samples are enumerated in a plain list. For all voices within the list, the voice name will be displayed as a voice select parameter value, otherwise the raw voice number will be displayed and Init Voice will be enforced.

Voice modes, detune and polyphony

This synth is capable of 4-voice polyphony with the last voice priority. Voices are individually allocated regardless of the voice mode selected. Switching voice mode does not affect the currently audible voices.

In Poly mode a single voice is allocated per each Note On event. Detune will directly affect all audible voices in real time.

In Duo mode two voices are allocated per each Note On, thus halving the effective note polyphony level. Detune will affect only the second voice in the pair.

In Unison mode all voices are allocated for the Note On event. Each voice in the set, starting from the second, will be detuned by the Detune value from the previous one. In this mode synth obviously becomes monophonic.

In Chord and Pitch class modes voices are allocated according to the pitch class. Detune will affect all voices in the chord. Pitch class notation provides more flexibility with drumlogue sequencer.

Algorithms

The synth supports 85 algorithms total: 32 algorithms from Yamaha DX series, 8 additional KORG opsix algorithms and also 45 Yamaha SY77 / TG77 / SY99 algorithms with feedback count limitation. The algorithm select parameter value displays the **DX7**, **opsix** or **SY77** prefix respectively. Some algorithms from different synthesizer lines might be similar and kept just for convenience. The default value for the algorithm select parameter is **Retain**, in that case the original algorithm from the voice will be used.

Waveforms

The synth contains a single Sine waveform of 256 samples long. You can add custom waveforms and select one custom waveform for carrier (output) operators and/or one another for modulator operators with the respective waveform select parameter. The default value for the waveform select parameters is **Retain**, in that case the original waveform from the voice will be used. To add custom waveforms you need to upload the single-channel user sample started with **FM64Wave** to any sample bank of the synthesizer. Waveforms from all suitable user samples are enumerated in a plain list. For all waveforms within the list, waveform select parameter value will display up to 5 characters from sample name after **FM64Wave** prefix or the sample bank first character and sample number if there is no such part of the sample name. The sample is treated as a wavetable with the waveforms of 256 samples long by default. The waveform length can be specified explicitly by the number, which must be a power of two, at the end of the sample name. Both waveform name and waveform length parts of the sample name are optional. Uploading your own waveforms will supersede the built-in Sine waveform. Several sample wavetable files with waveforms similar to those used in Yamaha DX and SY series and some others are available to download at the FM64 synth web page.

Feedback

You can alter feedback of the selected voice in several ways. The feedback offset parameters allow adjusting the existing feedback value from the voice in Yamaha DX series feedback units with more granular 1/16 unit steps. The adjusted value is capped with the range from 0.0 to 8.0 units thus allowing one additional feedback stop over the original synthesizer feature. The feedback path parameter allows to re-route the feedback signal. The **Retain** value indicates that the default feedback path is used, all other values explicitly show the source and destination operators for the feedback.

The feedback 2, or the second feedback, has the same parameters set. The only difference is that since Yamaha DX series voices do not have neither path nor value defined for the second feedback, with the zero or negative offset value or **Retain** route value the feedback 2 will not have any effect on the voice.

Known issues and limitations

- Native Yamaha DX / TX series LFO, Amp and pitch modulations are not implemented.
- All ascending EG stages (e.x. typical Attack) are exponential. Implementing the reference semi-linear behavior will introduce computational complexity that is not currently affordable.
- Yamaha SY77 / TG77 / SY99 algorithm 43 has a single feedback from Op5 to Op6. The original algorithm has in addition both Op5 and Op6 with self feedback.