RECKLESS
EXPERIMENTATION
AUDIO LLC

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This module is based on the YM3812 FM synthesizer chip, and its companion the YM3014 digital to analog converter. This module is optimized for use with standard eurorack CV and Gate controls. Six voices plus 5 percussion sounds are available for simultaneous audio generation. The YM3812 voices each have 2 operators per voice that can be configured for either an FM or AM modulation.

CV control is optional for all voices, tone can be manually set allowing for gate only control. CV inputs for voices 4,5, and 6 can be remapped to control the tone of the bass drum, snare drum, and tom drum respectively. Voices can be manually triggered using Sound Test without a gate input. Works with both CV and manually set tone.

Configuration is saved to non volatile memory. Along with the last saved or loaded instrument settings for each voice. Saved settings are loaded on power-up. Manually set tone data is saved per each voice in is unaffected by loading other sittings.

All sound generating parameters in the YM3812 are editable. 22 instruments setting can be saved into non-volatile memory, and loaded into one or more of the six voices. Settings for the percussion sounds are saved as a single block for all five sounds, there are 6 non-volatile memory slots available for these settings. Several fully editable instruments come per programed. Such as “Synth”, “Piano”, “Galaxy”, ”Flute”, “Strings”, “8Bit” and “Drums”.. The parameters of “AM Depth” and Vibrato Depth” effect all the voices and are saved separately form the instruments.

Each voice is controlled by a 0-5V CV signal and a 5V gate input. The CV is continuously sampled for each voice allowing for pitch changes during the gated part of a note and during the release. CV can be disabled for any voice, allows for a manually set tone to be produced.

Audio out is provided though a 1/8” Mono jack. Output impedance less than 1000 ohms.
CV inputs are zener diode protected to the zero to five volt range.

Power consumption: 40mA @ 12V 10mA @ -12V. Polarity protected.
Compatible with +-15V systems.

Buttons:
Up Button: increases value of parameter
Down Button: decreases value of parameter
Left & Right Buttons: change parameter
Select Button: used to select voice to edit, and in Load and Save mode to select a choice. Pressing while editing a voice will return the the edit select menu.

Main menu options:

Edit: selects voice to edit, press select again to return.

AM Depth: Controls depth of amplitude modulation. Zero: 1 dB. One: 4.8 dB. All voices affected

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Vibe Depth :Controls depth of Vibrato. Zero: 14 cent, one 7 cent. All voices affected.

Percussion CV mode: Allocate CV controls to the percussion sounds. CV 4 can be assigned to the Bass Drum. CV 5 can be assigned to the Snare Drum, and CV 6 Can be assigned to the Tom Drum, Cymbal and Hight Hat. The Cymbal and High Hat have a complex interaction with more than one CV setting.

Load: Up and Down buttons change the program number, select button loads a stored instrument form memory. This will overwrite any unsaved settings.

Save: Up and Down buttons change the program number, select button pressed once allows them name of the program to be changed. Up and down buttons change the character, the left and right buttons change the position of the cursor. The select button a second time aves the program. If you decide you don't want to save, pressing the left button until the word 'cancel' appears on the screen, then pressing the select button will cancel the save.

CV disable: Allows for disabling of the CV input of a voice and the tone produced to be manually set.

Sound test: By pressing up, the sound of a voice can be produced without the need for gate input

Voice Tone: The tone the voice will produce in CV disable mode. Represented by a 10 bit number in hexadecimal. Digits are edited one at a time.

Octave: Sets the tone range used, there is overlap between octaves over the CV rage. 0-7 zero is the lowest 7 is the highest

Modulator Attack: increase of decreases the speed which of modulator part of the sound starts. 0-15, zero is the slowest 15 in the fastest.

Modulator Decay: increase of decreases the speed which of modulator part of the sound decays after reaching maximum level 0-15, zero is the slowest 15 in the fastest

Modulator Sustain: increase of decreases the level which of modulator part of the sound remains at until the note is released. 0-15, zero is the highest, 15 is the lowest.

Modulator Release: increase of decreases the speed which of modulator part of the sound ends 0-15, zero is the slowest 15 in the fastest

Carrier Attack: increase of decreases the speed which of carrier part of the sound starts. 0-15, zero is the slowest 15 in the fastest

Carrier Decay: increase of decreases the speed which of carrier part of the sound decays after reaching maximum level 0-15, zero is the slowest 15 in the fastest

Carrier Sustain: increase of decreases the level which of carrier part of the sound remains at until the

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note is released. 0-15, zero is the highest, 15 is the lowest.

Carrier Release: increase of decreases the speed which of carrier part of the sound ends 0-15, zero is the slowest 15 in the fastest

Modulator/Carrier Wave Type wave shape used to make sound 0-3. Zero: sine wave. One: half sine wave. Two: rectified sine wave. Three: half rectified sine wave.

Modulator/Carrier Amp Mod: Amplitude Modulation, applies amplitude modulation the the sound, depth of modulation is configured later.

Modulator/Carrier Vibrato: Uses a low frequency oscillator to vary the pitch of the sound. Depth of modulation is configured later.

Modulator/Carrier Maintain: determines is notes sustain until the note is released or decays immediately.

Modulator/Carrier Scale Rate: Mates the notes shorter at high pitch.

Modulator/Carrier Freq Multi: Frequency Multiplier, 0-15. zero is ½ normal pitch for a given note. One is the note's normal pitch. Two through fifteen are said multiples of the normal pitch of a given note.

Modulator/Carrier Scaling: causes level of sound to decrease with frequency 0-3. zero: no change. One: 1 ½ dB per octave. Two: 3 dB per octave. Three: 6 dB per octave.

Modulator/Carrier Level: Changes the output level of the sound, 0-63. zero the loudest, 63 is the quietest.
Feedback: How much of the output is looped back into the sound 0-7. zero: no feedback. Seven: lots.

Algorithm: AM modulation mode, or FM modulation mode.

Setting up the percussion instruments works a little differently. The above settings control the Bass Drum, this is the only percussion instrument that uses two operators. The other 4 instruments in this mode are single operator with the Cymbal and High Hat having some tonal interaction with the other percussion sounds that is not well explained.

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	Instrument						
	Synth	Galaxy	Piano	Flute	Strings	8Bit	!
Mod Attack	5	6	5	0	7	15	7
Mod Decay	11	15	11	0	0	0	0
Mod Sustain	1	1	1	0	4	0	4
Mod Release	3	2	4	7	7	11	7
Carrier Attack	5	6	5	7	7	13	7
Carrier Decay	8	8	8	4	4	1	4
Carrier Sustain	7	5	7	1	4	0	4
Carrier Release	8	8	8	10	10	15	10
Mod Wave Type	1	3	1	0	0	3	0
Carr Wave Type	3	0	1	0	0	3	0
Mod Amp Mod	1	0	0	1	1	0	0
Carrier Amp Mod	0	0	1	1	1	0	0
Mod Vibrato	1	0	0	1	1	0	0
Carrier Vibrato	1	0	0	1	1	0	1
Mod Maintain	1	0	0	1	1	1	0
Carrier Maintain	1	1	1	1	1	1	0
Mod Scale Rate	1	0	0	0	0	0	0
Carr Scale Rate	0	1	1	0	0	0	0
Mod Freq Multi	2	5	2	8	8	1	0
Carr Freq Multi	2	0	1	2	2	1	0
Mod Scaling	3	3	3	3	3	0	0
Carrier Scaling	1	1	1	0	0	0	0
Mod Level	0	0	0	31	13	13	0
Carrier Level	0	0	0	0	0	0	0
Feedback	1	7	1	1	6	0	0
Algorithm	1	1	1	0	1	1	0

Percussion Voices

	Bass Drum	Other 4 percussion sounds			
Mod Attack	10	Snare Attack	9	Cymbal Attack	10
Mod Decay	9	Snare Decay	8	Cymbal Decay	8
Mod Sustain	6	Snare Sustain	3	Cymbal Sustain	11
Mod Release	6	Snare Release	6	Cymbal Release	6
Carrier Attack	10	Snare Wave Type	0	Cymbal Wave Type	0
Carrier Decay	4	Snare Amp Mod	0	Cymbal Amp Mod	0
Carrier Sustain	3	Snare Vibrato	0	Cymbal Vibrato	0
Carrier Release	5	Mod Maintain	0	Cymbal Maintain	0
Mod Wave Type	0	Snare Scale Rate	0	Cymbal Scale Rate	1
Carr Wave Type	0	Snare Freq Multi	0	Cymbal Freq Multi	3
Mod Amp Mod	1	Snare Scaling	0	Cymbal Scaling	1
Carrier Amp Mod	1	Snare Level	11	Cymbal Level	13
Mod Vibrato	0				
Carrier Vibrato	0	Tom Attack	10	High Hat Attack	15
Mod Maintain	0	Tom Decay	6	High Hat Decay	7
Carrier Maintain	0	Tom Sustain	6	High Hat Sustain	4
Mod Scale Rate	0	Tom Release	7	High Hat Release	6
Carr Scale Rate	0	Tom Wave Type	2	Hat Wave Type	0
Mod Freq Multi	1	Tom Amp Mod	0	Hat Amp Mod	0
Carr Freq Multi	3	Tom Vibrato	1	High Hat Vibrato	1
Mod Scaling	0	Tom Maintain	0	High Hat Maintain	0
Carrier Scaling	1	Tom Scale Rate	0	Hat Scale Rate	0
Mod Level	8	Tom Freq Multi	2	Hat Freq Multi	1
Carrier Level	1	Tom Scaling	0	Hat Scaling	0
Feedback	5	Tom Level	0	High Hat Level	5
Algorithm	1				