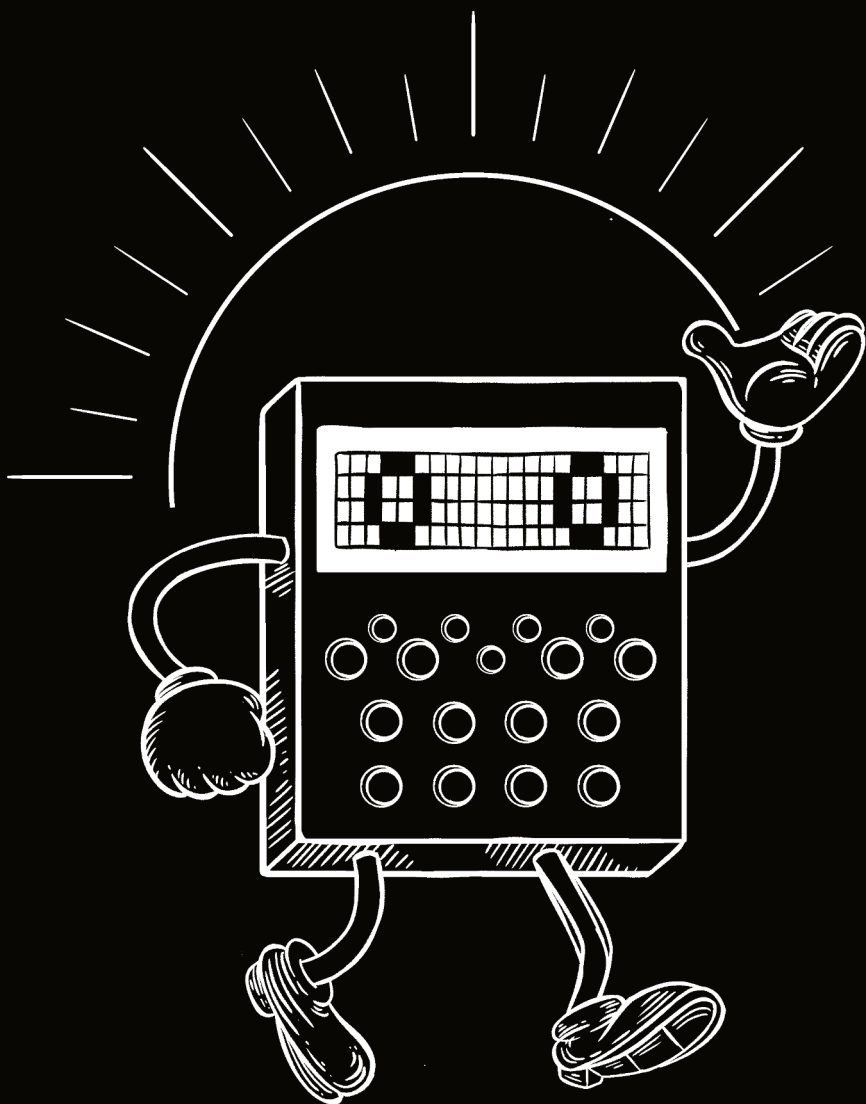


# GREAT CONJUNCTION

FM FRAGMENT SEQUENCER/SYNTH

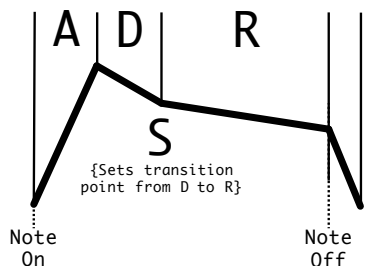


# COMMON FUNCTIONS

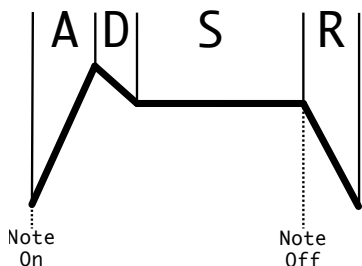
FUNCTION	ACTION
PLAY/STOP	TAP PLAY
ADJUST TEMPO	TAP MENU, TURN KNOB C
SELECT SEQUENCER	TAP SEQUENCER
MUTE SEQUENCER	TAP CURRENT SEQUENCER (WHILE IN SEQUENCER VIEW)
ENTER MENU PAGE	TAP MENU
TOGGLE MENU PAGE	TAP MENU (WHILE IN MENU PAGE)
EDIT CUSTOM INSTRUMENT	HOLD SEQUENCER BUTTON
TOGGLE CUSTOM INSTRUMENT PAGE	TAP CURRENT SEQUENCER (WHILE IN CUSTOM INSTRUMENT PAGE)
RESET LCD	HOLD PLAY

# ADSR ENVELOPE MODES

## PERCUSSIVE MODE



## SUSTAIN MODE

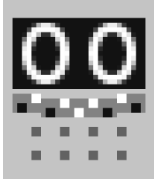


Note On - generated by SEQUENCER EVENTS or MIDI  
 Note Off - generated by INSTRUMENT>SUB FUNCTION "len" or MIDI

I	INSTANTIATION.....	1
II	INVOCATION.....	2
III	DEMARCATION.....	3
	TOP.....	3
	BACK.....	5
	SIDE.....	6
IV	CONJUNCTION.....	7
	INSTRUMENT.....	8
	STEP.....	9
	EVENT.....	9
	TYPE.....	11
	TEMPO.....	12
	SEQUENCER VISUAL.....	12
	SEQUENCER IDENTIFIER.....	12
	MUTE STATUS.....	13
	ROOT NOTE.....	13
	OCTAVE.....	14
	OCTAVE SPAN.....	15
	SCALE.....	16
	EVOLUTION.....	17
	SUB FUNCTION.....	18
	SELECT.....	19
V	MODULATION.....	21
	MODULATOR ATTACK.....	22
	MODULATOR DECAY.....	22
	MODULATOR SUSTAIN.....	22
	MODULATOR RELEASE.....	23
	MODULATOR SUSTAIN MODE.....	23
	MODULATOR ENVELOPE LEVEL.....	24
	MODULATOR MULTIPLIER FREQUENCY.....	24
	MODULATOR KEY SCALE.....	24
	MODULATOR VIBRATO/TREMOLO.....	25
	MODULATOR WAVEFORM.....	25
	MODULATOR FM LEVEL.....	25
VI	SONIFICATION.....	27
	CARRIER ATTACK.....	28
	CARRIER DECAY.....	28
	CARRIER SUSTAIN.....	28
	CARRIER RELEASE.....	29
	CARRIER SUSTAIN MODE.....	29
	CARRIER ENVELOPE LEVEL.....	30
	CARRIER MULTIPLIER FREQUENCY.....	30
	CARRIER KEY SCALE.....	30
	CARRIER VIBRATO/TREMOLO.....	31
	CARRIER WAVEFORM.....	31
	CARRIER FEEDBACK LEVEL.....	31
VII	DETERMINISM.....	33
	VOLUME.....	34
	SUBDIVISION.....	34
	LEAD.....	35
	ORDER.....	36
	VOICE MODE.....	36
	TEMPO.....	36
VIII	COMMUNION.....	37
	MIDI CHANNEL.....	38
	SEND TRANSPORT.....	38
	RECEIVE TRANSPORT.....	38
	SEND CLOCK.....	39
	RECEIVE CLOCK.....	39
	MODE.....	39
IX	INSCRIPTION.....	41
	SAVE.....	42
X	RESURRECTION.....	43
	LOAD.....	44
XI	IMPLEMENTATION.....	45
XII	PRAISE.....	47

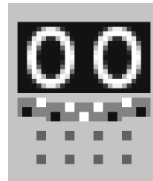
# I: INSTANTIATION

Greetings! I am GC. I am here to support USER. Shall we begin our journey with some basic precepts regarding GREAT CONJUNCTION? First, let's look at the SEQUENCERS...



- 3x generative, 1-32 STEP SEQUENCERS {Ω, Π, Ξ}
- Monophonic, or 3-note polyphonic chord MODES
- Random, Cellular Automata & Euclidean algorithms
- Independent SUB-DIVISION per SEQUENCER
- Static or rotational voice allocation
- 8 PARAMETERS {with SUB FUNCTIONS} per SEQUENCER
- Variable EVOLUTION per PARAMETER
- Full MIDI implementation of SEQUENCER PARAMETERS
- 43 USER selectable SCALES

WOW! That was interesting! Now what about the SYNTHESIZER?

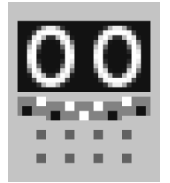


- Vintage Yamaha YM2413 FM chip
- 2-OP FM from the 1980s
- 9 note polyphony {3 per SEQUENCE, 9 in 'key' mode}
- 1 User definable CUSTOM INSTRUMENT per SEQUENCE
- 100 USER alterable CUSTOM INSTRUMENT presets
- CUSTOM INSTRUMENT MODULATOR & CARRIER ADSR
- 22 adjustable CUSTOM INSTRUMENT parameters
- SYNTH playable from external MIDI {'key' mode}
- Full MIDI implementation of INSTRUMENT PARAMETERS

# II: INVOCATION

GREAT CONJUNCTION was called forth from the void to satisfy a desire to sculpt music in a less deliberate fashion. Rhythm and melody can not explicitly be decided upon. Instead, conditions are set to give rise to unexpected combinations resembling music. These phrases can be static, or can EVOLVE in specific ways over time, adding additional dimensionality.

Wonderful! But ... what are CONJUNCTIONS?

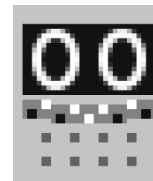


The YM2413 sound chip at the core of GREAT CONJUNCTION can only utilize one CUSTOM INSTRUMENT. USER can assign a different CUSTOM INSTRUMENT to each SEQUENCER. When GREAT CONJUNCTION is playing, each SEQUENCER competes for control of the CUSTOM INSTRUMENT. Conflicting data is combined into unique outcomes resulting in unexpected timbres, mysterious overtones, and a variety of FM strangeness difficult to program intentionally.

THESE ARE THE TRUE CONJUNCTIONS  
LET THEM RING OUT ACROSS THE UNIVERSE  
DISCOVER WHAT YOU CAN WITHIN YOUR TIME  
LET THE CHAOS RESONATE

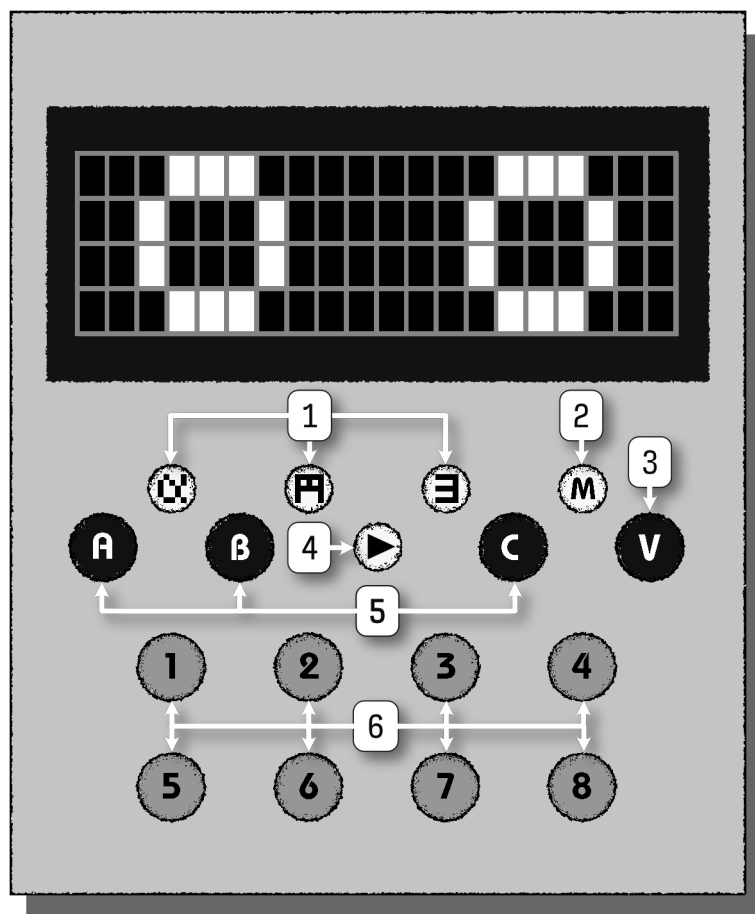
GREAT CONJUNCTION IS AT HAND

Whew! That was deep. Take a breath. I'll be checking in on you as we go along.



# III: DEMARCATION

## TOP



GREAT CONJUNCTION has 12 knobs, 5 buttons, and an LCD display on its front panel. The 8 lower knobs generally control parameters that are located in a related area on the LCD. For example, on the SEQUENCER page, knob 1 controls the INSTRUMENT parameter, which is located in the top left of the LCD.

### 1) SEQUENCER BUTTONS

Press a SEQUENCER button to open the corresponding SEQUENCER page.

- MUTE a SEQUENCER by pressing its corresponding button {while viewing a SEQUENCER page}.
- To enter/exit a SEQUENCERS corresponding CUSTOM INSTRUMENT screens, hold its SEQUENCER button.

### 2) MENU BUTTON

The MENU button opens the MENU pages.

- To toggle through the MENU pages, repeatedly press the MENU button.

### 3) VOLUME KNOB

The VOLUME knob sets the level for the AUDIO OUTPUT.

### 4) PLAY BUTTON

The PLAY button starts and stops playback.

- To reset the LCD display, hold the PLAY button.

### 5) A/B/C KNOBS

These knobs are contextual and are screen/parameter dependent.

- SELECT and adjust a parameters EVOLUTION and SUB FUNCTION values {while viewing a SEQUENCER page}.
- Control various parameters for the MODULATOR & CARRIER {while viewing the CUSTOM INSTRUMENT pages}.
- Adjust options {while viewing MENU pages}.

### 6) 1-8 KNOBS

These knobs are contextual and are screen dependent.

- Control the 8 SEQUENCER parameters {while viewing a SEQUENCER page}.
- Control parameters for the MODULATOR & CARRIER {while viewing the CUSTOM INSTRUMENT pages}.
- Adjust options {while viewing MENU pages}.

# BACK

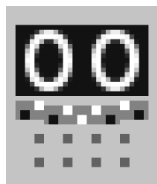


## AUDIO OUTPUT

The  $\frac{1}{8}$ " jack provides an audio signal for either headphones or a line output. The signal is monophonic. Output level should be suitable for either headphone or line output. USER should keep VOLUME low to avoid damaging hearing and equipment.

## USB {micro}

The microUSB port powers GREAT CONJUNCTION and provides USB MIDI IN/OUT to a USB MIDI host such as a PC, tablet, or phone running software that is MIDI enabled. Avoid powering GREAT CONJUNCTION from a multi-port USB hub, as they can contribute to noise levels and ground loop issues.



Seriously. Don't feed me garbage power or have me share power with other devices. I hate that. It will make me noisy. Feed me from my own, good quality power supply.

# SIDE



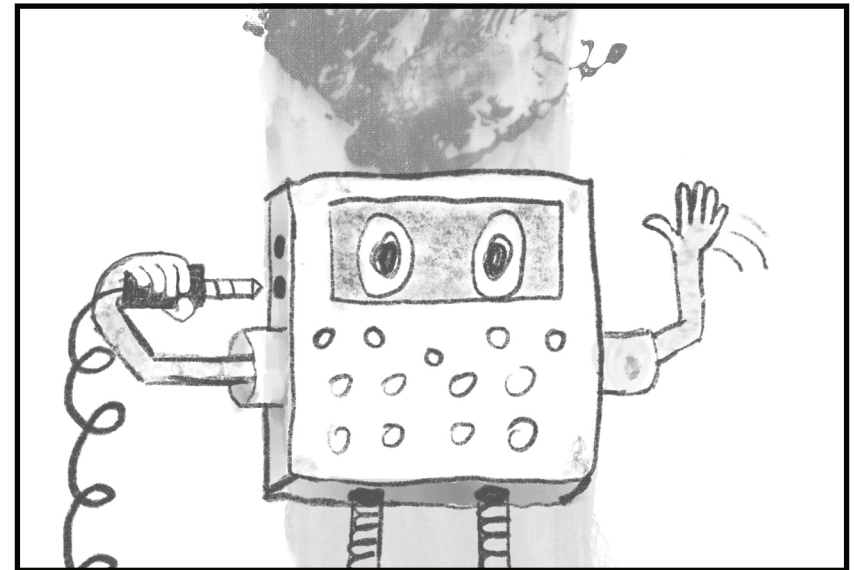
## TRS MIDI IN

The  $\frac{1}{8}$ " MIDI IN jack accepts a TRS-A type signal and responds to NOTE, CLOCK and TRANSPORT messages.

## TRS MIDI OUT

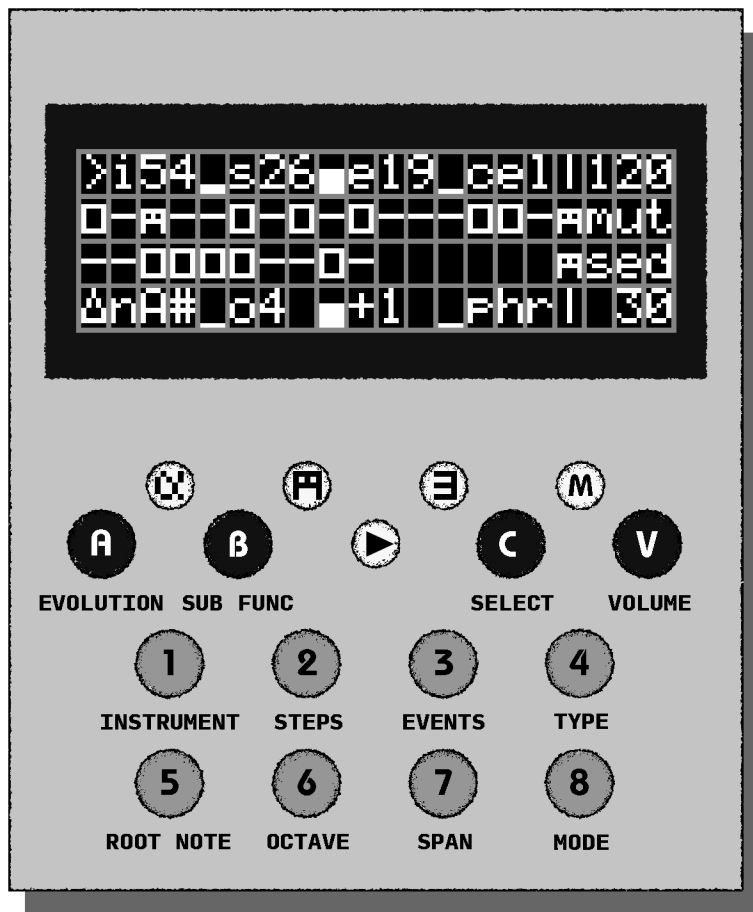
The  $\frac{1}{8}$ " MIDI OUT port accepts a TRS-A type signal and can output NOTE, CLOCK and TRANSPORT messages.

GREAT CONJUNCTION can interface with traditional 5-pin DIN MIDI connectors with a TRS-A to 5-pin din MIDI adapter (not included).



# IV: CONJUNCTION

## SEQUENCER



{SEQUENCER SWITCH  $\alpha$ ,  $\beta$ ,  $\gamma$  FUNCTIONS}

SHORT PRESS $\alpha$ , $\beta$ , $\gamma$	SELECT SEQUENCER
SHORT PRESS CURRENT SEQ	MUTE/UN-MUTE CURRENT SEQ
LONG PRESS $\alpha$ , $\beta$ , $\gamma$	ENTER/EXIT CUSTOM INSTRUMENT PAGES



Knob 1 - INSTRUMENT  
{i0-i99, \_1,\_2,\_3, P?, M?, ??}

Selects the "tone" which the SEQUENCER emits. Each SEQUENCER { $\alpha$ ,  $\beta$ ,  $\gamma$ }, can be set to a different INSTRUMENT.

When the three SEQUENCERS are set to different INSTRUMENTS, conflicting INSTRUMENT data is sent to the YM2413 sound chip. INSTRUMENT data sent from one SEQUENCER may be partially overwritten by the INSTRUMENT data sent from another SEQUENCER. These unintended sonic combinations are CONJUNCTIONS.

To edit the parameters of a CUSTOM INSTRUMENT, hold down the corresponding SEQUENCER button.

RANGE	INSTRUMENT STYLE
i00-i49	Percussion Preset
i50-i99	Melody Preset
_1,_2,_3	CUSTOM INSTRUMENT
P?	random percussion
M?	random melody
??	random all

EVOLUTION { $\%$  CHANCE}: When a GLYPH { $\alpha$ ,  $\beta$ ,  $\gamma$ } passes over an EVENT in a SEQUENCE, GREAT CONJUNCTION will invoke the EVOLUTION parameter of the INSTRUMENT to determine if the INSTRUMENT shall evolve to a new value. The INSTRUMENT parameter must be set to ?P, ?M or ?? in order for the EVOLUTION parameter to have an effect.

SUB FUNC LENGTH {len}: LENGTH can be used to send an internal NOTE OFF message at a specific interval of time {roughly 4 x len in milliseconds}. For values above 249, the LEN parameter will display 'off' and the INSTRUMENT will follow the CARRIER ADSR. For values below 1, "rnd" will be displayed and a random LENGTH will be calculated. This works best with the 'prc' ENVELOPE MODE.



### Knob 2 - STEPS (1-32)

The three SEQUENCERS can vary in length from 1 to 32 STEPS. All active STEPS are displayed in the middle two rows of the LCD when viewing a SEQUENCE page. USER can also view an abbreviated view of all SEQUENCES on the FRAMEWORK menu page.

EVOLUTION { $\%$  CHANCE}: When a GLYPH { $\alpha$ ,  $\beta$ ,  $\gamma$ } reaches the end of a SEQUENCE, GREAT CONJUNCTION will invoke the EVOLUTION level of the STEPS parameter to determine if the number of STEPS shall evolve to a new value.

SUB FUNC ROTATION {< >}: ROTATION allows USER to freely rotate the entire SEQUENCE of EVENTS in the current pattern.



### Knob 3 - EVENTS

{rnd 0-100(mx) || euc 1-32 || cel 0-100(mx)}

EVENTS command GREAT CONJUNCTION to emanate sound. As a GLYPH { $\alpha$ ,  $\beta$ ,  $\gamma$ } travels across a SEQUENCE, it passes over each STEP. EVENTS are depicted as "□", whereas STEPS without EVENTS are depicted as "-". Each of the three pattern SEQUENCERS residing in GREAT CONJUNCTION can vary in EVENT density.

For Pseudo-random {ran} TYPE SEQUENCES, the value ranges from 0-100%. This is the probability that an EVENT is created for each STEP. At 0%, the pattern will be silent, whereas at 'mx' {100%}, the pattern will contain an EVENT on each STEP.

For Euclidean {euc} TYPE SEQUENCES, the value ranges from 0-32. This represents the number of EVENTS to distribute over the number of STEPS. EVENTS are distributed evenly and tend to be the most

interesting when the number of STEPS is not evenly divisible by the number of EVENTS. You cannot have more EVENTS than STEPS.

For Cellular Automata {cel} TYPE SEQUENCES, the value ranges from 0-100%. As with the RND type, this is the probability that a STEP is created. At 0%, the SEQUENCE will be silent, whereas at 'mx' {100%}, the SEQUENCE will contain an EVENT on each STEP. This setting provides the distribution for the EVENTS in the initial pattern. Cellular Automata evolve according to their RULE each time a GLYPH { $\alpha$ ,  $\beta$ ,  $\gamma$ } reaches the end of a SEQUENCE. The evolution of CEL TYPE SEQUENCES is separate from the EVOLUTION parameter, as linear Cellular Automata inherently evolve.

EVOLUTION { $\%$  CHANCE}: When a GLYPH { $\alpha$ ,  $\beta$ ,  $\gamma$ } reaches the end of a SEQUENCE, GREAT CONJUNCTION will invoke the EVOLUTION level of the EVENT parameter to determine if the EVENT parameter shall evolve to a new value.

SUB FUNC SEED {sed}: SEED sets the random seed used when generating the initial distribution of EVENTS. Changing the random seed will cause all EVENTS to be redistributed using the new random seed. The values produced by random seeds are in fact "pseudo-random" and will always be the same and persist even if the unit is power cycled. In this regard, it is possible to find familiar starting points to build from.

If the 'sed' of a RANDOM TYPE SEQUENCE is set > 249, the random seed itself will be randomized and 'rnd' will be displayed. When a GLYPH { $\alpha$ ,  $\beta$ ,  $\gamma$ } reaches the end of the SEQUENCE, GREAT CONJUNCTION will recalculate the distribution of EVENTS using a different SEED of probability.

For example: A RANDOM SEQUENCE set to 50% STEP density and SEED set to 'rnd' will redistribute the STEPS in the SEQUENCE with a different 50% density for each pass.

For 'euc' sequencers, there is no related SUB FUNC, as Euclidean sequences have intrinsically derived outcomes.



### Knob 4 - TYPE {rnd, euc, cel}

The TYPE knob selects the method by which the EVENTS within the SEQUENCER are derived and is influenced by the current STEP and EVENT parameters.

**Pseudo-random {ran}**: Chaotic. The EVENT knob determines the probability of an EVENT occurring on a STEP. Pseudo-random SEQUENCES are not truly random and are dependent upon a random seed. This random seed is set using the SUB FUNCTION of the EVENT knob. Pseudo-random SEQUENCES generated from the same seed will always be identical.

**Euclidean {euc}**: Even distribution. The EVENT knob sets the number of EVENTS to distribute amongst the number of STEPS. Interesting results can be found when the number of STEPS is not evenly divisible by the number of EVENTS.

**Cellular Automata {cel}**: Continuously evolving. The EVENT knob sets the initial order of the SEQUENCE using the pseudo-random method described above. Once a GLYPH {Ω, ♀, ☹} reaches the end of the SEQUENCE, the SEQUENCE will grow using the specified RULE.

**EVOLUTION {% CHANCE}**: When a GLYPH {Ω, ♀, ☹} reaches the end of a SEQUENCE, GREAT CONJUNCTION will invoke the EVOLUTION level of the TYPE parameter to determine if the TYPE parameter shall evolve to a new value.

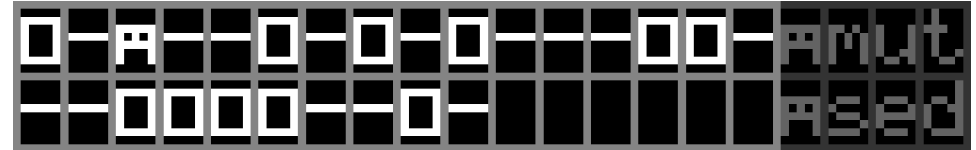
**SUB FUNC RULE {rul}**: For 'cel' TYPE SEQUENCES, RULE controls the cellular growth over time. Each RULE results in different patterns of evolution. Some variations die off quickly, while others continuously generate interesting results. RULES of note include 30, 86, 110 and 124.

For 'rnd' and 'euc' sequencers, there is no related SUB FUNC.



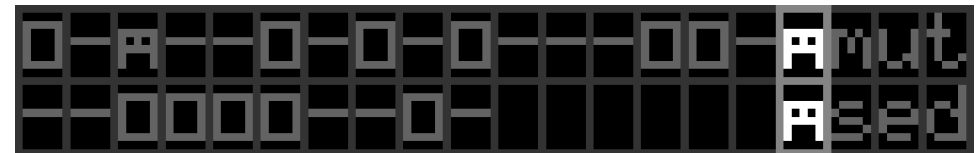
### TEMPO

The current TEMPO is displayed on the far right of the top row. It can be adjusted in FRAMEWORK menu. When syncing to external MIDI clock, 'ext' will be displayed.



### SEQUENCE VISUAL

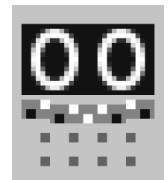
The two middle columns of the display show an abbreviated representation of the currently selected SEQUENCER. If the SEQUENCER is running, the corresponding GLYPH {Ω, ♀, ☹} will move across the SEQUENCE in time. EVENTS are displayed as "□" whereas an empty STEP will be represented as "--".



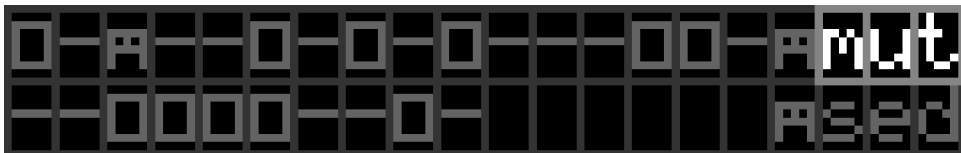
### SEQUENCER IDENTIFIER

The limited cognitive abilities of USER require GREAT CONJUNCTION to provide a reminder as to which SEQUENCER is currently active. Each sequencer has a corresponding GLYPH {Ω, ♀, ☹}.

Feeling tired? Don't forget to take a break!







### MUTE STATUS

USER can MUTE the currently displayed SEQUENCER by pressing its corresponding SEQUENCER BUTTON. This disables all AUDIO & MIDI output from the SEQUENCER. Pressing the SEQUENCER BUTTON again will unmute the SEQUENCER.



### Knob 5 - ROOT NOTE {A-G}

The ROOT NOTE knob selects the base pitch from which the note values for a SEQUENCE are derived. This, combined with SCALE, determines the tonal and melodic quality of the SEQUENCE. The range starts from C and steps through twelve tones to B.

EVOLUTION {% CHANCE}: For each EVENT a GLYPH { $\alpha$ ,  $\beta$ ,  $\gamma$ } passes over in a SEQUENCE, GREAT CONJUNCTION will invoke the EVOLUTION parameter of the ROOT NOTE to determine if the pitch for that STEP shall evolve to a new value within the given SCALE, OCTAVE and SPAN.

SUB FUNC SEED {sed}: Sets the random seed used when generating the initial notes of a SEQUENCE. Changing the random seed will cause note values to be recalculated using the new random seed. These values will be locked to the SEQUENCER'S SCALE setting. Possible random seeds range from 0-255. The values produced by random seeds are in fact "pseudo-random" and will always be the same and persist even if the unit is power cycled. In this regard, it is possible to find familiar starting points to build from.

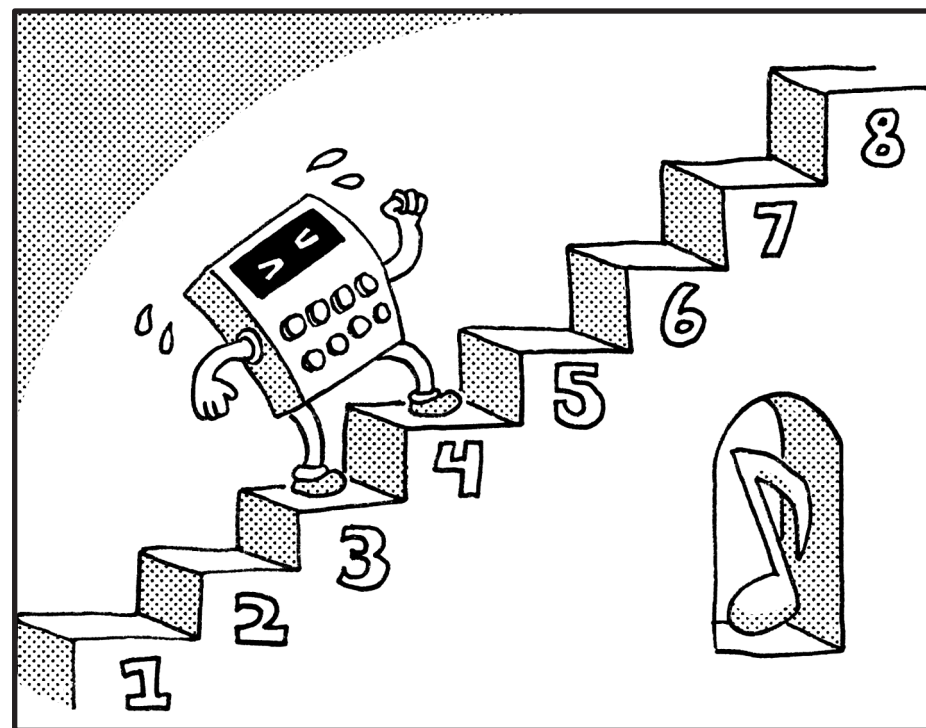


### Knob 6 - OCTAVE {1-8}

The OCTAVE knob selects the base OCTAVE from which the NOTE values of a SEQUENCE are derived. The range is from 0 (lowest) to 8 (highest). Raising or lowering this value will not change the NOTE value for a step, only the octave at which it plays back.

EVOLUTION {% CHANCE}: When a GLYPH { $\alpha$ ,  $\beta$ ,  $\gamma$ } reaches the end of a SEQUENCE, GREAT CONJUNCTION will invoke the EVOLUTION level of the OCTAVE parameter to determine if a new base octave should be established.

OCTAVE has no related SUB FUNC.

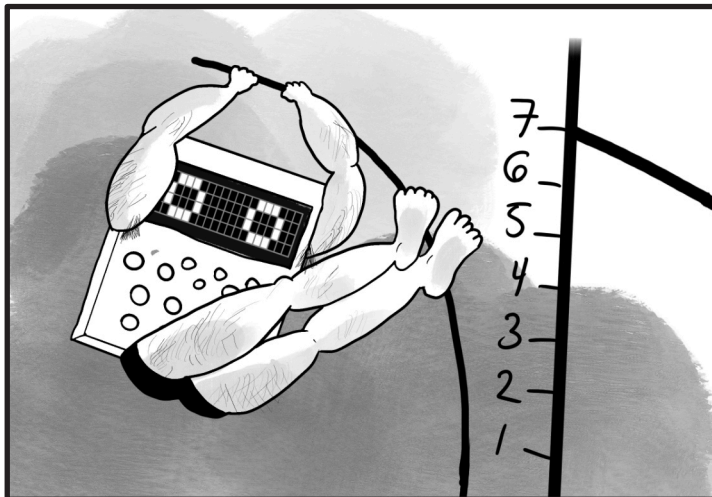


Knob 7 - SPAN {0-7}

The SPAN knob controls the range of OCTAVES in which the NOTE values in a SEQUENCE can be derived. The range is based on the range of available octaves between the OCTAVE setting and the maximum possible octave (8). For example, if the OCTAVE parameter is set to 5, the range of the SPAN parameter would be 0-3.

EVOLUTION {% CHANCE%}: USER may desire the SPAN value of a sequence to change over time. When a GLYPH reaches the end of a SEQUENCE, GREAT CONJUNCTION will invoke the EVOLUTION level of the SPAN parameter to determine if a new value for SPAN should be established.

SUB FUNC SEED {sed}: Sets the random seed used when generating the initial octave SPAN for each STEP in a SEQUENCE. Changing the random seed will cause the SPAN values to be recalculated using the new random seed. The values produced by random seeds are in fact "pseudo-random" and will always be the same and persist even if the unit is power cycled. In this regard, it is possible to find familiar starting points to build from. Possible random seeds range from 0-255.



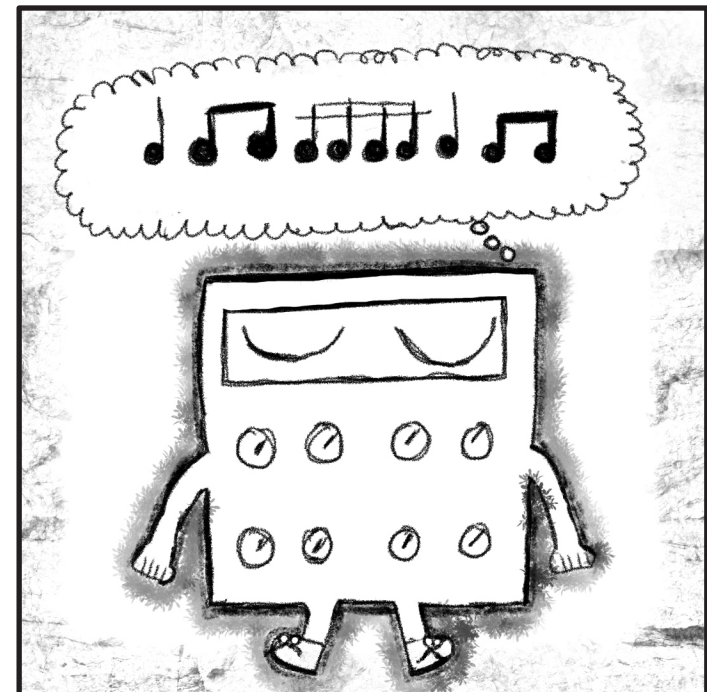
Knob 8 - SCALE  
{complete listing at end of manual}

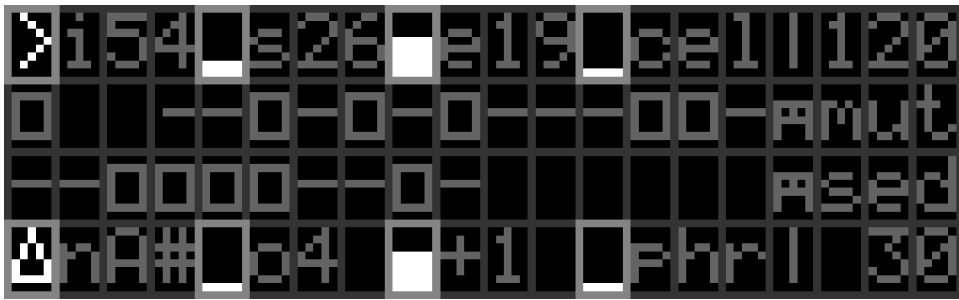
The SCALE knob locks the possible NOTE values generated in a SEQUENCE to specific ranges. When generating a NOTE value, the SEQUENCER will take into account the NOTE, OCTAVE, SPAN and SCALE settings.

When the SCALE is changed, the complete name of the SCALE is briefly visible in the third row of the SEQUENCER VIEW.

EVOLUTION {% CHANCE%}: When a GLYPH reaches the end of a SEQUENCE, GC will invoke the EVOLUTION level of the SCALE parameter to determine if a new SCALE should be established.

SCALE has no related SUB FUNC.





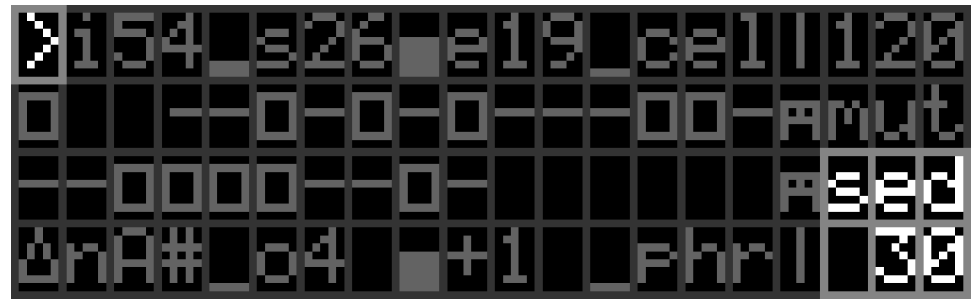
Knob A - EVOLUTION {1-10}

The parameters of each SEQUENCER can change over time. The EVOLUTION knob adjusts the probability that the currently selected parameter will change.

Meters displaying the probability of EVOLUTION are located to the left of each parameter (see image above). At 100% probability, a “△” will be displayed.

The effects of EVOLUTION are described in detail with their corresponding parameters.

PARAMETER	EVOLUTION INTERVAL	EFFECT
INSTRUMENT {P?, M?, ??}	PER STEP	RANDOMIZED INSTRUMENT
STEP	PER SEQUENCE	RANDOMIZED SEQUENCE LENGTH
EVENT	PER SEQUENCE	RANDOMIZED EVENT DENSITY
TYPE	PER SEQUENCE	RANDOMIZED SEQUENCER TYPE
ROOT NOTE	PER STEP	RANDOMIZED PITCH
OCTAVE	PER SEQUENCE	RANDOMIZED OCTAVE
OCTAVE SPAN	PER SEQUENCE	RANDOMIZED SPAN
SCALE	PER SEQUENCE	RANDOMIZED SCALE

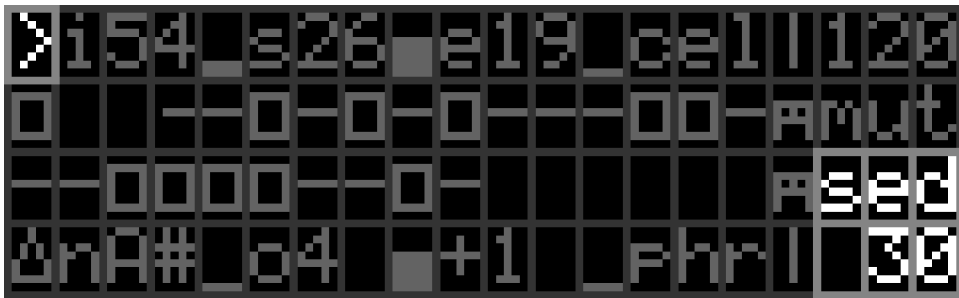


Knob B - SUB FUNCTION

The purpose of the SUB FUNCTION knob changes depending upon the selected parameter. In the image above, the “>” symbol on the top left indicates that the INSTRUMENT parameter has been selected. The SUB FUNCTION value of the INSTRUMENT parameter is displayed in the lower right corner and can be modified with knob B.

SUB FUNCTIONS are described in detail with their corresponding parameters.

PARAMETER	SUB FUNCTION	RANGE
INSTRUMENT	LENGTH {len}	0-250 {0=rnd,250=off}
STEP	ROTATION {< >}	0-32
EVENT	SEED {sed}	0-250 {250=rnd}
TYPE	RULE {ru1}	0-255
ROOT NOTE	SEED {sed}	0-250
OCTAVE	none	-
OCTAVE SPAN	SEED {sed}	0-255
SCALE	none	-

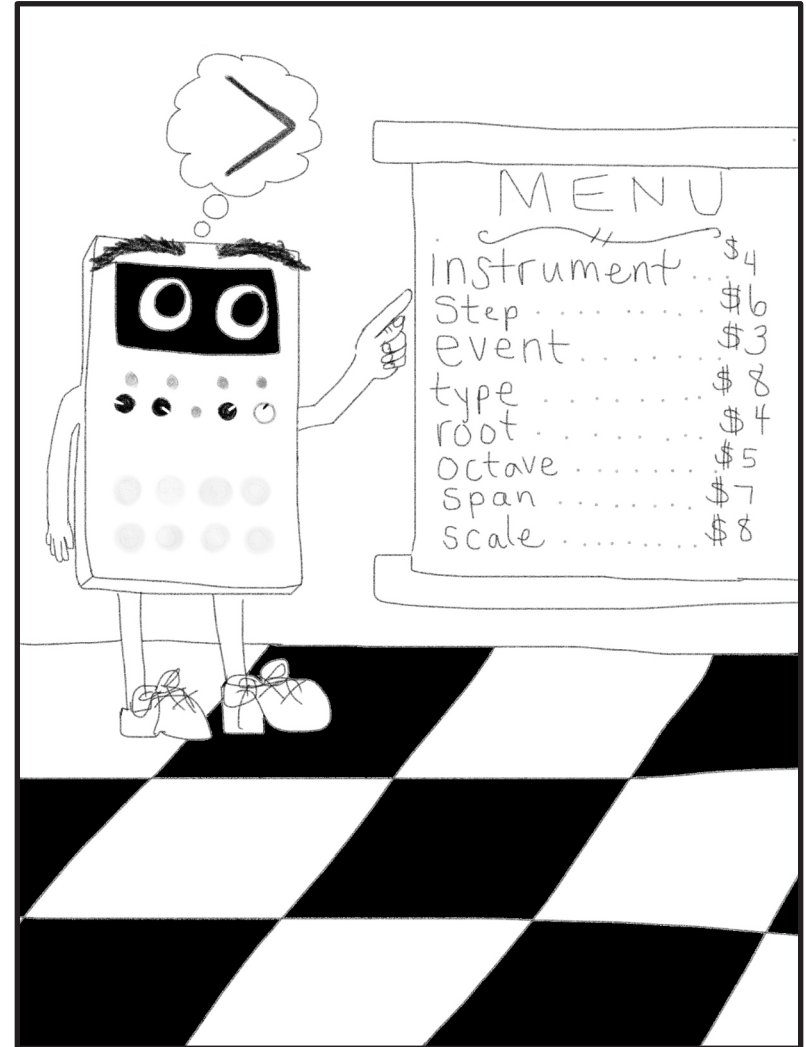
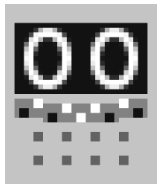


### Knob C - SELECT {1-8}

In normal use, changing the parameter of a SEQUENCE with knobs 1-8, instantly makes that parameter the selected or active parameter. This is indicated by the ">" cursor appearing to its left, and blinking periodically over the selected parameter's EVOLUTION meter.

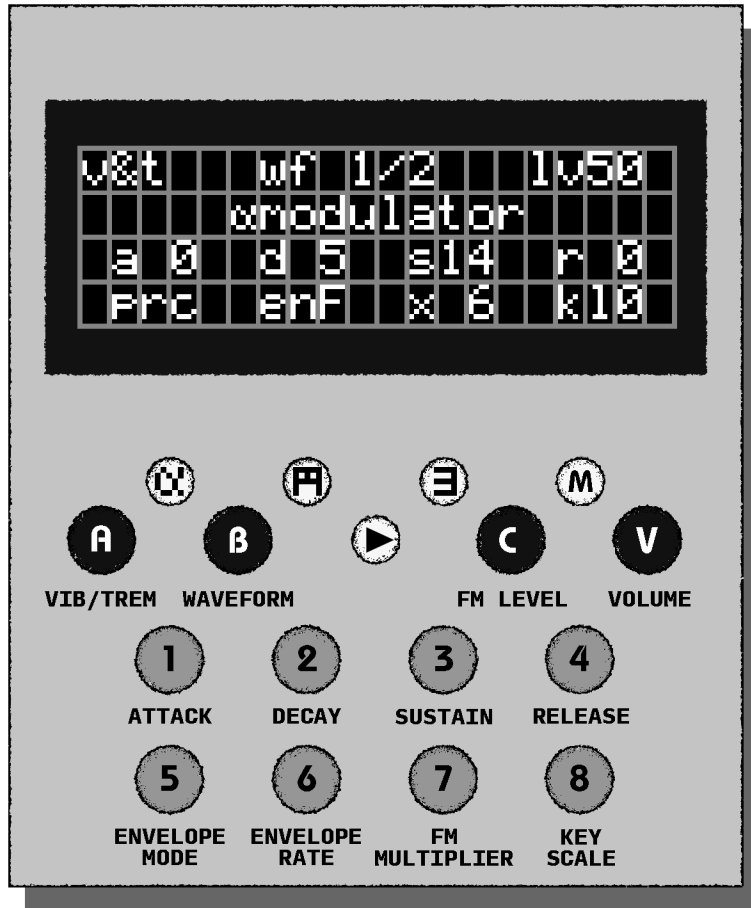
The SELECT knob can be used to intentionally choose the active parameter. Rotating the knob will move the ">" cursor to whichever parameter USER desires, allowing changes to be made to its EVOLUTION and SUB FUNCTION.

SELECT is a useful feature! It allows USER to change my focus to the EVOLUTION & SUB FUNCTION of any PARAMETER without having to wiggle that parameter's knob (and possibly change its value). Otherwise, I stay focused on the last PARAMETER USER adjusted.



# V:MODULATION

## FM MODULATOR



{SEQ , ,  SWITCH FUNCTIONS}

SHORT PRESS CURRENT SEQ	TOGGLE MOD/CARRIER PAGE
LONG PRESS CURRENT SEQ	RETURN TO SEQUENCER PAGE
SHORT PRESS OTHER SEQ	ENTER OTHER SEQUENCE PAGE

Holding any SEQUENCER button down for ~2 seconds will open its CUSTOM INSTRUMENT pages. Once USER is inside the CUSTOM INSTRUMENT pages, a short press will toggle between the MODULATOR and CARRIER pages (which have very similar parameters).



Knob 1 - MODULATOR ATTACK {1-15}

The rate at which the MODULATOR signal rises after an EVENT or MIDI Note On. The rate is influenced by knob 6 (ENVELOPE RATE).



Knob 2 - MODULATOR DECAY {1-15}

The rate at which the MODULATOR signal falls after the MODULATOR ATTACK stage. The rate is influenced by knob 6 (ENVELOPE RATE).



Knob 3 - MODULATOR SUSTAIN {0-mx}

MODULATOR SUSTAIN behaves differently depending upon the MODULATOR SUSTAIN MODE.

Percussion {prc}: Sets the transition point between the MODULATOR DECAY and MODULATOR RELEASE levels.

Sustain {sus}: The level the MODULATOR signal falls to after the MODULATOR DECAY stage.

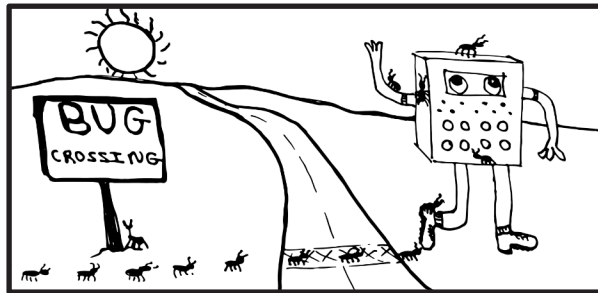


### Knob 4 - MODULATOR RELEASE {0-mx}

MODULATOR RELEASE behaves differently depending upon the MODULATOR SUSTAIN MODE.

**Percussion {prc}:** The rate at which the MODULATOR decays after the MODULATOR DECAY stage. The transition point between MODULATOR DECAY and MODULATOR RELEASE in 'prc' mode is set by MODULATOR SUSTAIN level. This is influenced by both knob 5 (MODULATOR SUSTAIN MODE) and knob 6 (ENVELOPE RATE).

**Sustain {sus}:** A known hardware limitation (bug?) exists. When the MODULATOR SUSTAIN MODE is set to SUS (sustain), the MODULATOR RELEASE has no effect.



### Knob 5 - MODULATOR SUSTAIN MODE {prc, sus}

Knob 5 selects one of two modes for the envelope of the MODULATOR. {See inside cover for illustration}

**Percussion {prc}:** MODULATOR SUSTAIN sets the transition point between MODULATOR DECAY and MODULATOR RELEASE.

**Sustain {sus}:** MODULATOR SUSTAIN level is maintained while an EVENT or MIDI note is active. MODULATOR RELEASE is activated when an EVENT has ended (either by the LENGTH SUB FUNCTION or by the next EVENT in the SEQUENCE), or a MIDI note off is received.



### Knob 6 - ENVELOPE RATE {enF, enS}

Knob 6 selects the ADSR ENVELOPE RATE for the MODULATOR. This determines the speed at which the MODULATOR ADSR envelope is traversed. There are two options:

enF - fast progression through the ADSR envelope.

enS - slow progression through the ADSR envelope.



### Knob 7 - MODULATOR FREQUENCY MULTIPLIER { $\frac{1}{2}$ , 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15}

Knob 7 determines the FREQUENCY MULTIPLIER for the MODULATOR signal that is sent to the CARRIER. This, combined with MODULATOR OUTPUT LEVEL, drastically impacts the FM qualities of the instrument.



### Knob 8 - KEY SCALE LEVEL {0-3}

Knob 8 determines the KEY SCALE LEVEL for the MODULATOR. The output level of the MODULATOR can be scaled to the instrument pitch, sending less of the MODULATOR as the pitch increases. At a setting of '0', there is no scaling. At a setting of 3, there is the greatest amount of attenuation as the instrument pitch increases.

v&t    wf 1/2    1050

Knob A - TREMOLO/VIBRATO {---, -v-, -t-, v&t}

Knob A controls the various combinations of TREMOLO (cyclical variations of amplitude) and VIBRATO (cyclical variations of pitch) that affect the MODULATOR. They run at a fixed rate and depth and cannot be adjusted.

---	off
-v-	vibrato
-t-	tremolo
v&t	vibrato & tremolo

v&t    wf 1/2    1050

Knob B - MODULATION WAVEFORM {full sin,  $\frac{1}{2}$  sin}

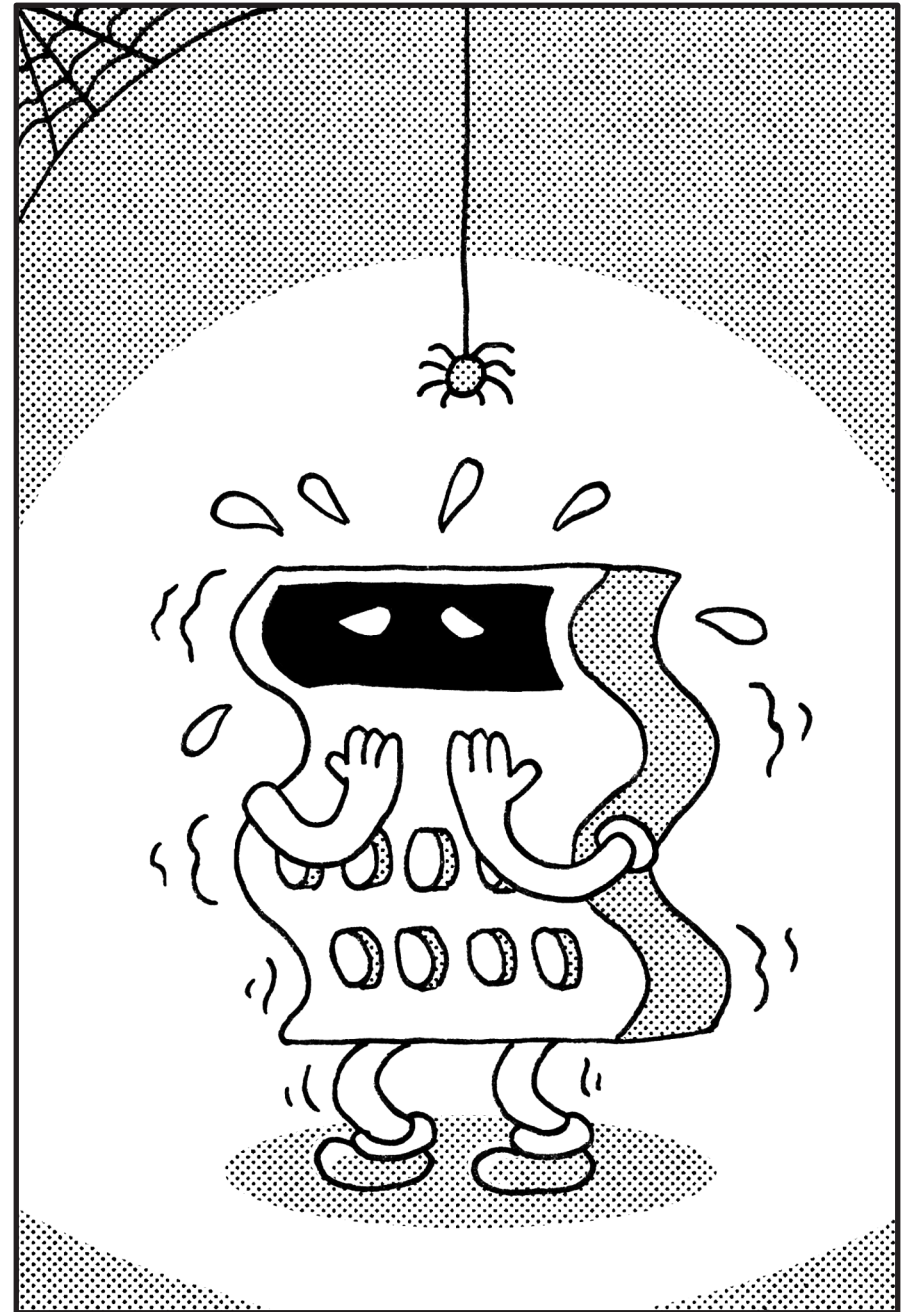
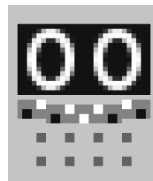
Knob B determines the waveform of the MODULATOR.

v&t    wf 1/2    1050

Knob C - MODULATOR OUTPUT LEVEL {0-63}

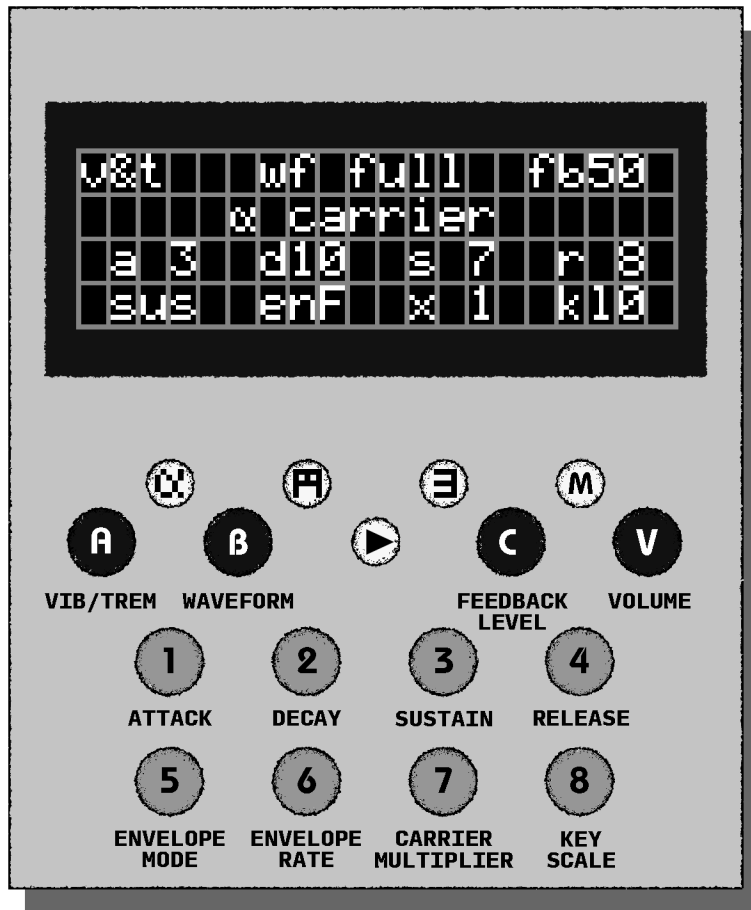
Knob C determines the amount of the MODULATOR signal that is fed into the CARRIER. This is where the FM magic happens!

If you are not getting enough FM magic, keep turning this up!



# VI:SONIFICATION

## FM CARRIER



{SEQ α, β, γ SWITCH FUNCTIONS}

SHORT PRESS CURRENT SEQ	TOGGLE MOD/CARRIER PAGE
LONG PRESS CURRENT SEQ	RETURN TO SEQUENCER PAGE
SHORT PRESS OTHER SEQ	ENTER OTHER SEQUENCE PAGE

Holding any SEQUENCER button down for ~2 seconds will open its CUSTOM INSTRUMENT menu. Once USER is inside the CUSTOM INSTRUMENT pages, a short press will toggle between the MODULATOR and CARRIER pages (which have very similar parameters).



Knob 1 - CARRIER ATTACK {1-15}

The rate at which the CARRIER signal rises after an EVENT or MIDI Note On. The rate is influenced by knob 6 (ENVELOPE RATE).



Knob 2 - CARRIER DECAY {1-15}

The rate at which the CARRIER signal falls after the CARRIER ATTACK stage. The rate is influenced by knob 6 (ENVELOPE RATE).



Knob 3 - CARRIER SUSTAIN {0-mx}

CARRIER SUSTAIN behaves differently depending upon the CARRIER SUSTAIN MODE.

Percussion {prc}: Sets the transition point between the CARRIER DECAY and CARRIER RELEASE levels.

Sustain {sus}: The level the CARRIER signal falls to after the CARRIER DECAY stage.





#### Knob 4 - CARRIER RELEASE {0-mx}

CARRIER RELEASE behaves differently depending upon the CARRIER SUSTAIN MODE.

**Percussion {prc}:** The rate at which the CARRIER decays after the CARRIER DECAY stage. The transition point between CARRIER DECAY and CARRIER RELEASE in 'prc' mode is set by CARRIER SUSTAIN level. This is influenced by both knob 5 (CARRIER SUSTAIN MODE) and knob 6 (ENVELOPE RATE).

**Sustain {sus}:** The rate at which the CARRIER level decays after an EVENT or MIDI note off.



#### Knob 5 - CARRIER SUSTAIN MODE {prc, sus}

Knob 5 selects one of two modes for the envelope of the CARRIER.

**Percussion {prc}:** CARRIER SUSTAIN sets the transition point between CARRIER DECAY and CARRIER RELEASE.

**Sustain {sus}:** CARRIER SUSTAIN level is maintained while an EVENT or MIDI note is active. CARRIER RELEASE is activated when an EVENT has ended (either by the LENGTH SUB FUNCTION or by the next EVENT in the SEQUENCE), or a MIDI note off is received.



#### Knob 6 - ENVELOPE RATE {enF, enS}

Knob 6 selects the ADSR ENVELOPE RATE for the CARRIER. This determines the speed at which the CARRIER ADSR envelope is traversed. There are two options:

enF - fast progression through the ADSR envelope.

enS - slow progression through the ADSR envelope.



#### Knob 7 - CARRIER FREQUENCY MULTIPLIER { $\frac{1}{2}$ , 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15}

Knob 7 determines the FREQUENCY MULTIPLIER for the CARRIER. The audible pitch of the instrument is largely determined here. Octave intervals are .5, 1, 2, 4 & 8.



#### Knob 8 - KEY SCALE LEVEL {0-3}

Knob 8 determines the KEY SCALE LEVEL for the CARRIER. The output level of the CARRIER can be scaled to the instrument pitch, reducing the volume of the CARRIER as the pitch increases. At a setting of '0', there is no scaling. At a setting of 3, there is the greatest amount of attenuation as the instrument pitch increases.

v&t    wf full fb50

Knob A - TREMOLO/VIBRATO {---, -v-, -t-, v&t}

Knob A controls the various combinations of TREMOLO (cyclical variations of amplitude) and VIBRATO (cyclical variations of pitch) that affect the CARRIER. These function at a fixed rate and depth that cannot be adjusted.

---	off
-v-	vibrato
-t-	tremolo
v&t	vibrato & tremolo

v&t    wf full fb50

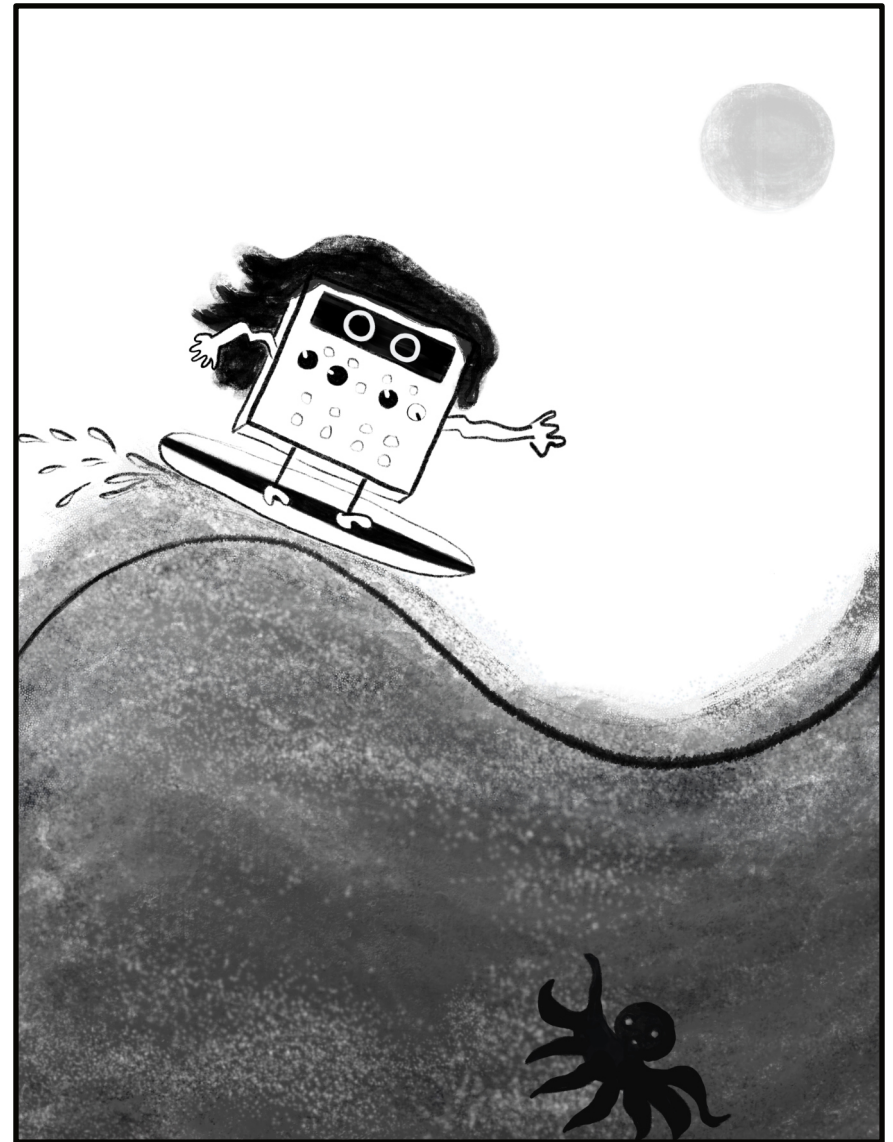
Knob B - CARRIER WAVEFORM {full sin,  $\frac{1}{2}$  sin}

Knob B determines the waveform of the CARRIER.

v&t    wf full fb50

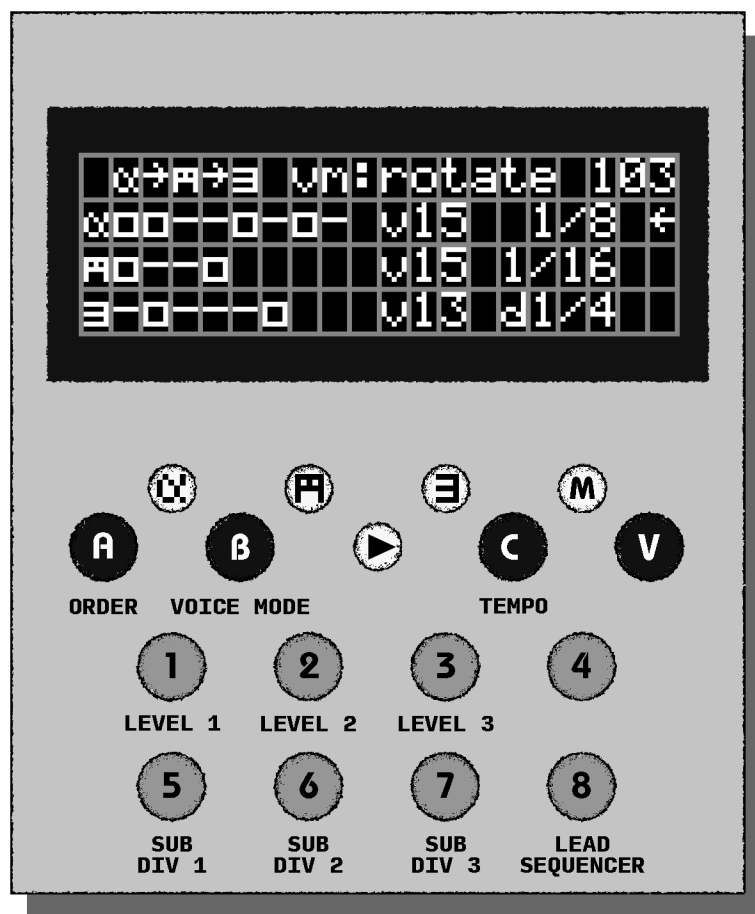
Knob C - MODULATOR FEEDBACK {0-7}

Knob C determines the amount of the MODULATOR signal that is fed back into itself. Feedback further extends the sonic palette; achieving sawtooth waveforms at lower levels and noise-scapes at higher levels.



# VII: DETERMINISM

## FRAMEWORK



{SEQ  $\alpha$ ,  $\pi$ ,  $\epsilon$  SWITCH FUNCTIONS}

SHORT PRESS $\alpha$ , $\pi$ , $\epsilon$	SELECT SEQUENCER
LONG PRESS $\alpha$ , $\pi$ , $\epsilon$	EDIT CUSTOM INSTRUMENT

Pressing the MENU button will toggle through a series of pages designed to configure the inner workings of GREAT CONJUNCTION. The FRAMEWORK page is dedicated to TEMPO, VOLUME & SUB DIVISION settings.



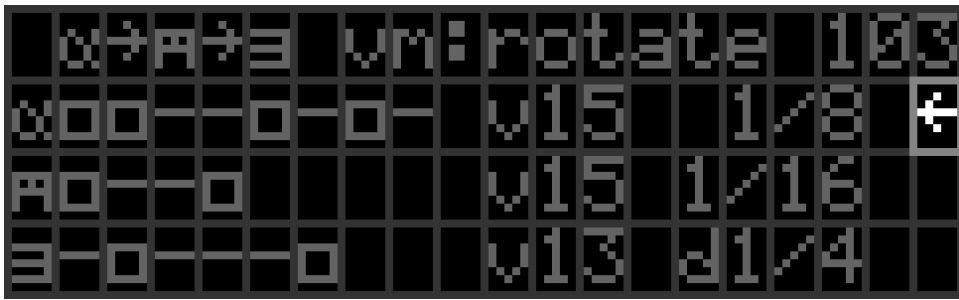
Knob 1 - 3 VOLUME 1 - 3 {0-15, ??}

The YM2413 has a resolution of 16 VOLUME levels per voice. In all SEQUENCER modes, when set past 15, VOLUME will be randomized per STEP {indicated by "v ?"}. In "key" modes, when set past 15, VOLUME is MIDI velocity sensitive {indicated by "vel"}. When a SEQUENCER'S VOLUME level is set to 0, it's INSTRUMENT settings will still interact with the other SEQUENCERS, even though the voice itself will not be heard. This allows for some unique CONJUNCTION possibilities and rhythmic variations to be layered over a consistent sound (if so desired).



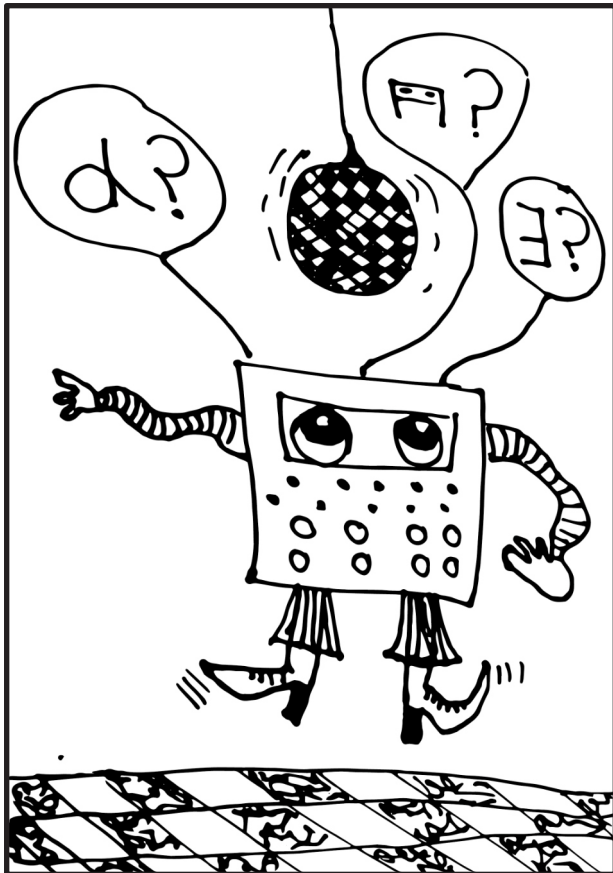
Knobs 5 - 7 SUBDIVISION 1 - 3  
 {1,  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{4}t$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ ,  $\frac{1}{8}t$ ,  $\frac{1}{16}$ }

GREAT CONJUNCTION is polymetric, therefore each SEQUENCER can run at a different SUBDIVISION of the TEMPO (and have a different STEP count). By default, each EVENT persists for 1/8 of a beat.



Knob 8 - LEAD {1-3}

If the SEQUENCER is running, changes in SUBDIVISION happen "on beat". The LEAD SEQUENCER, indicated by "←", is the SEQUENCER to which all changes in SUBDIVISION are synced. Changes in SUBDIVISION are synced to the next step progression of the LEAD SEQUENCER.



Knob A - ORDER {1-6, ??}

Changes the ORDER in which each of the SEQUENCERS are processed on each STEP. USER can select from any possible combination of the three SEQUENCERS. Additionally, USER can select "?->?->?" which randomizes the processing order on each STEP.

Strange CONJUNCTIONS in tone occur when the SEQUENCERS grapple for control of the sound engine. The order in which the SEQUENCERS are processed can drastically influence the sound.



Knob B - VOICE MODE {static, rotate}

VOICE MODE controls the allocation of the 9 voices of the YM2413 when a SEQUENCER EVENT occurs.

Static: SEQUENCERS are allocated static voices, which are re-triggered on each SEQUENCER EVENT. This creates a more staccato, percussive flow.

Rotate: SEQUENCERS are dynamically allocated to the next available voice (1-9) in a round-robin fashion. Notes can sustain for longer periods of time, with a maximum polyphony of 9 voices.



Knob C - TEMPO {20-240}

The TEMPO is the rate at which the SEQUENCERS progress and is measured in BPM (beats per minute). When syncing to external MIDI clock, 'ext' will be displayed.

# VIII: COMMUNION

## MIDI



{SEQ  $\alpha$ ,  $\beta$ ,  $\gamma$  SWITCH FUNCTIONS}

SHORT PRESS $\alpha$ , $\beta$ , $\gamma$	SELECT SEQUENCER
LONG PRESS $\alpha$ , $\beta$ , $\gamma$	EDIT CUSTOM INSTRUMENT

Pressing the MENU button will toggle through a series of pages designed to configure the inner workings of GREAT CONJUNCTION. The MIDI page is dedicated to TRS & USB MIDI settings.



Knob 1 -3 MIDI CHANNEL {off, 1-16}

Sets the MIDI IN/OUT channel for each SEQUENCER.



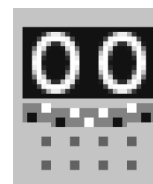
Knob 5 - SEND TRANSPORT {off, USB, TRS, U&T}

Determines if (and how) GREAT CONJUNCTION sends MIDI transport PLAY/STOP messages when the PLAY button is pressed. This can be sent via TRS, USB, or both.

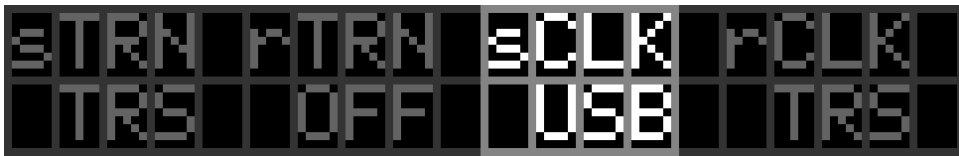


Knob 6 - RECEIVE TRANSPORT {off, USB, TRS, U&T}

Determines if (and how) GREAT CONJUNCTION receives MIDI transport PLAY/STOP messages. This can be received via TRS, USB, or both.



Do you have any other MIDI capable synths? Send them some generative love from GC!



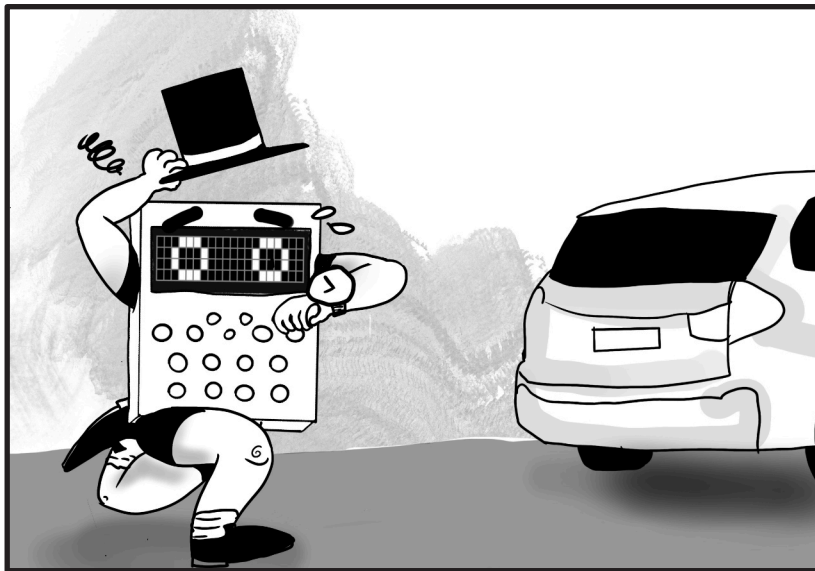
Knob 7 - SEND CLOCK {off, USB, TRS, U&T}

Determines if (and where) GREAT CONJUNCTION sends MIDI clock messages.



Knob 8 - RECEIVE CLOCK {INT, USB, TRS}

Determines if (and where) GREAT CONJUNCTION receives MIDI clock messages. The 'INT' setting rejects external MIDI clock signals and uses the internal clock of GREAT CONJUNCTION. When using USB or TRS clock, playback will not progress without an external clock source.



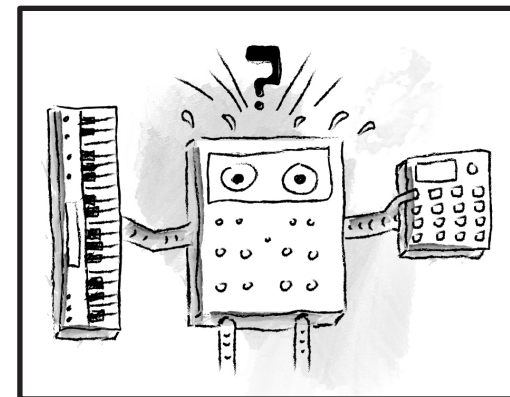
Knobs A, B, C - MODE {monF, chdF, monR, chdR, key}

The MODE knob allows USER to select the functionality of each SEQUENCER. Each SEQUENCER will still vie for control of the CUSTOM INSTRUMENT regardless of what MODE they are in.

Sequencer Freerun {monF, chdF}: A MIDI note message received on a SEQUENCER'S corresponding MIDI channel will transpose the SEQUENCER'S ROOT NOTE and OCTAVE settings accordingly. "monF" will create monophonic EVENTS, while "chdF" will create random, three-note chord EVENTS.

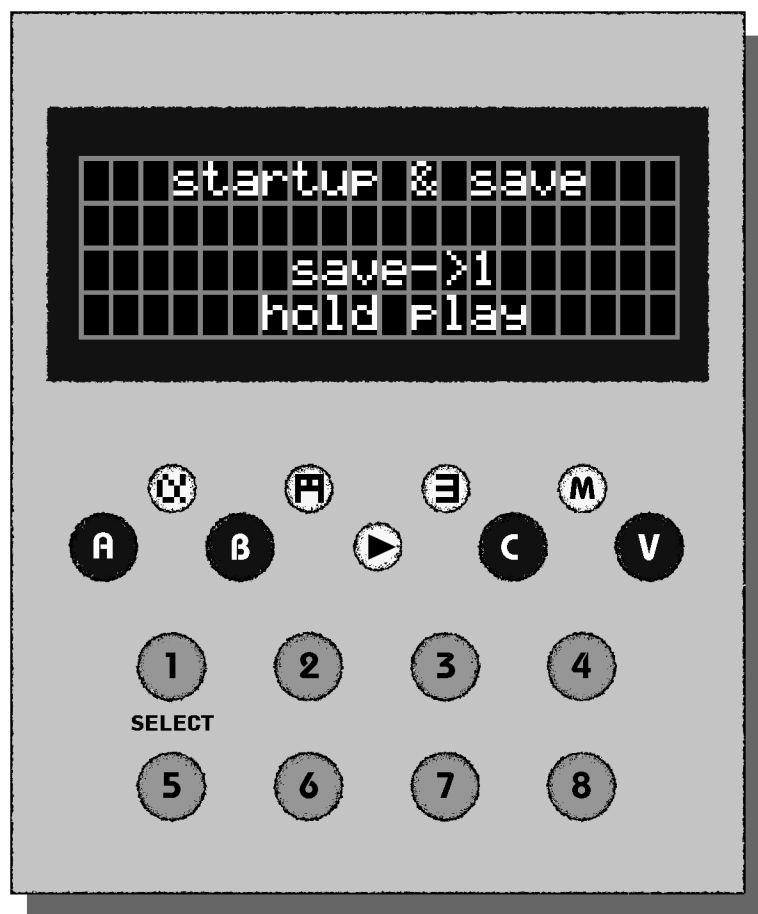
Sequencer Retrigger {monR, chdR}: Similar to 'Freerun' in all respects, except that MIDI NOTE ON messages will start playback, and MIDI NOTE OFF will stop playback and reset the position of each GLYPH {⌘, ♪, ☹}.

Keyboard {key} negates the SEQUENCER for a particular GLYPH and allows it to be played as a standard MIDI synthesizer. GREAT CONJUNCTION will respond to MIDI note and velocity data. Set the GLYPH'S volume > 15 on the FRAMEWORK page to enable velocity sensitivity. Note ON will trigger the currently selected INSTRUMENT assigned to that GLYPH on its SEQUENCER page.










# IX: INSCRIPTION

## STARTUP & SAVE



{SEQ , ,  &  SWITCH FUNCTIONS}

SHORT PRESS  ,  , 	SELECT SEQUENCER
LONG PRESS  ,  , 	EDIT CUSTOM INSTRUMENT
LONG PRESS 	SAVE SELECTION



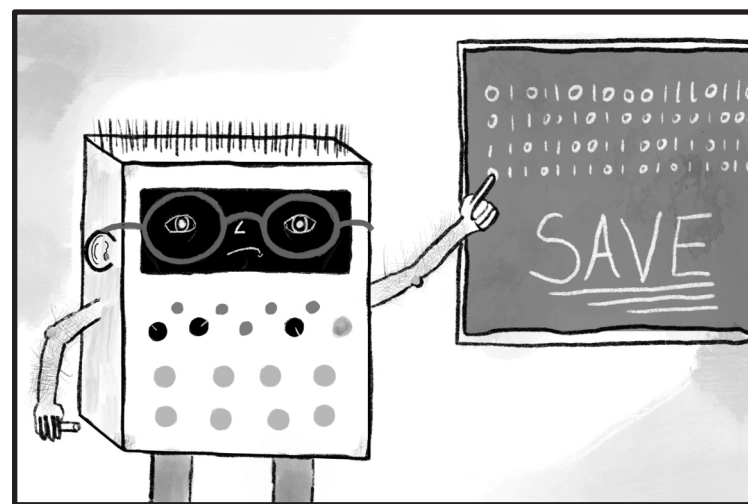
Knob 1 - SELECT  
 {random startup, harmonic startup,  
 default startup, 1-10}

Knob 1 selects the slot in which USER wishes to SAVE all current parameters into. Press and hold the PLAY button for about 2 seconds to save into the selected slot.

Turning the knob to DEFAULT STARTUP and long pressing PLAY will SAVE all settings into persistent memory. These settings will be recalled every time GREAT CONJUNCTION is powered up.

Turning the knob to RANDOM STARTUP and long pressing PLAY will cause GREAT CONJUNCTION to randomize all settings every time GREAT CONJUNCTION is powered up.

Turning the knob to HARMONIC STARTUP and long pressing PLAY will cause GREAT CONJUNCTION to randomize all settings every time GREAT CONJUNCTION is powered up. The ROOT NOTE and SCALE settings will be shared across all SEQUENCERS, potentially creating a more harmonious sound.



# X: RESURRECTION

## LOAD & RANDOMIZE



SHORT PRESS $\alpha$ , $\mathbb{A}$ , $\exists$	SELECT SEQUENCER
LONG PRESS $\alpha$ , $\mathbb{A}$ , $\exists$	EDIT CUSTOM INSTRUMENT
LONG PRESS $\blacktriangleright$	LOAD SELECTION



Knob 1 - SELECT  
 {randomize all, harmonic randomize, 1-10}

Knob 1 selects the slot from which USER wishes to LOAD all current parameters. Long press PLAY to LOAD from the selected slot. USER can LOAD from a slot by sending the corresponding MIDI PROGRAM CHANGE message {1-10}.

Turning the knob to RANDOMIZE ALL and long pressing PLAY will cause GREAT CONJUNCTION to randomize all settings immediately.

Turning the knob to HARMONIC RANDOMIZE and long pressing PLAY will cause GREAT CONJUNCTION to randomize all settings immediately. The ROOT NOTE and SCALE settings will be shared across all SEQUENCERS, potentially creating a more harmonious sound.





# XI:MIDI IMPLEMENTATION

GREAT CONJUNCTION re-maps incoming MIDI CC messages (0-127) to the ranges listed below.

MIDI	FUNCTION	RANGE
CC 0	INSTRUMENT	0-99, _1, _2, _3, P?, M?, ??
CC 1	STEP	1-32
CC 2	EVENT	rnd/cel=0-100/euc=1-32
CC 3	TYPE	0-2
CC 4	ROOT NOTE	0-11
CC 5	OCTAVE	1-8
CC 6	OCTAVE SPAN	0-7
CC 7	SCALE	0-12
CC 8	MOD ATTACK	1-15
CC 9	MOD DELAY	1-15
CC 10	MOD SUSTAIN	0-15
CC 11	MOD RELEASE	0-15
CC 12	MOD SUS MODE	0-1
CC 13	MOD ENV RATE	0-1
CC 14	MOD FREQ MULT	0-15
CC 15	MOD KEY SCL	0-3
CC 16	MOD VIB/TREM	0-3
CC 17	MOD WAVEFORM	0-1
CC 18	FM LEVEL	0-63
CC 19	CAR ATTACK	1-15
CC 20	CAR DELAY	1-15
CC 21	CAR SUSTAIN	0-15
CC 22	CAR RELEASE	0-15
CC 23	CAR SUS MODE	0-1
CC 24	CAR ENV RATE	0-1
CC 25	CAR FREQ MULT	0-15
CC 26	CAR KEY SCL	0-3
CC 27	CAR VIB/TREM	0-3
CC 28	CAR WAVEFORM	0-1
CC 29	FM FEEDBACK	0-7
CC 30	EVO - INSTRUMENT	0-10

MIDI	FUNCTION	RANGE
CC 31	EVO - STEP	0-10
CC 32	EVO - EVENT	0-10
CC 33	EVO - TYPE	0-10
CC 34	EVO - ROOT NOTE	0-10
CC 35	EVO - OCT	0-10
CC 36	EVO - OCT SPAN	0-10
CC 37	EVO - SCALE	0-10
CC 38	SUB FUNC - INST	'rnd', 1-127
CC 39	SUB FUNC - INST+	128-249, 'off'
CC 40	SUB FUNC - STEP	0-32
CC 41	SUB FUNC - EVENT	0-127
CC 42	SUB FUNC - EVENT+	128-249, 'rnd'
CC 43	SUB FUNC - TYPE	0-127
CC 44	SUB FUNC - TYPE+	128-255
CC 45	SUB FUNC - R NOTE	0-127
CC 46	SUB FUNC - R NOTE+	128-255
CC 47	none	-
CC 48	none	-
CC 49	SUB FUNC - OCT SPAN	0-127
CC 50	SUB FUNC - OCT SPAN+	128-255
CC 51	⊗ VOL	0-16
CC 52	⊞ VOL	0-16
CC 53	⊟ VOL	0-16
CC 54	ORDER	0-6
CC 55	VOICE MODE	0-1
CC 56	⊗ SUB DIV	0-8
CC 57	⊞ SUB DIV	0-8
CC 58	⊟ SUB DIV	0-8
CC 59	LEAD SEQ	0-2
CC 60	⊗ MUTE	0-63 OFF / 64-127 ON
CC 61	⊞ MUTE	0-63 OFF / 64-127 ON
CC 62	⊟ MUTE	0-63 OFF / 64-127 ON
STOP	STOP TRANSPORT	-
START	START TRANSPORT	-
PC	LOAD SLOT	1-10
CLOCK	SEND/RECEIVE	-

# XIII: PRAISE

## Inspiration

Marco Colli - creator of the MD\_YM2413 library

Spherical Sound Society - creator of the ARCANE YM2413 synth. If you enjoy GREAT CONJUNCTION, please check it out!

Mark Eats - scales from monome norms musicUtil

## Illustration

Avery Willmann (front cover)  
Brad Kerr (p.15, p.39 & p.44)  
Liz Rousseau (p. 20 & p.32)  
Arman Bohn (p.6, p.40)  
Tina Ochs (p.23 & p.35)  
Emiel Boven (p.14 & p.26)  
Nova Bohn & Arman Bohn (p.42)  
Olympia Bohn & Arman Bohn (p.16)  
Richard Bohn (back cover)

## Design Assistance & Feedback

Andrew Ikenberry  
Peterson Goodwyn  
Mario from gechologic

## Beta Testers

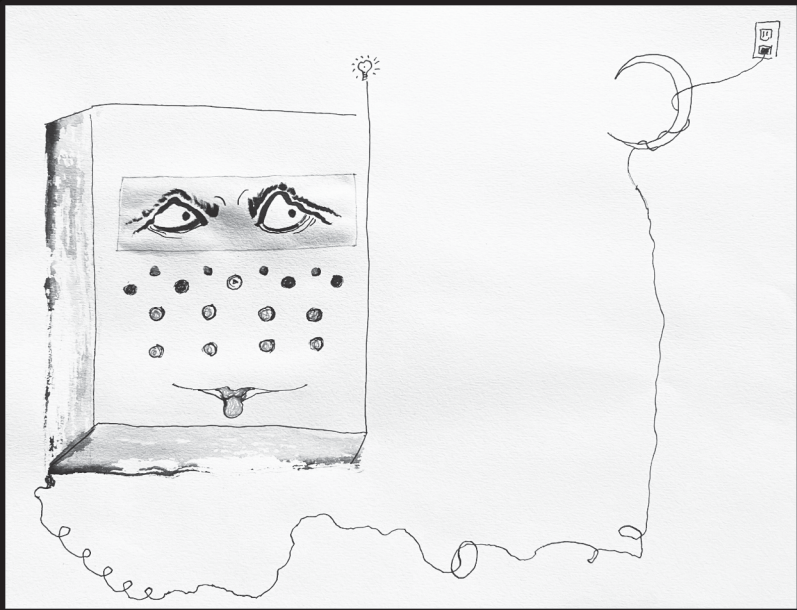
Jordan Clinger  
Mario from gechologic  
Josie Cohen-Rodriguez  
Avrilcadabra  
Zack Scholl  
Steven Noreyko

## Editors

Liz Rousseau  
Steven Noreyko

## SCALES

mon	Root Note
Maj	Major
Nmn	Natural minor
Hmn	Harmonic Minor
Mmn	Melodic Minor
dor	Dorian
phr	Phrygian
lyd	Lydian
mix	Mixolydian
loc	Locrian
whT	Whole Tone
Mpt	Major Pentatonic
mpt	Minor Pentatonic
Mbb	Major Bebop
alt	Altered
Dbb	Dorian Bebop
Mbb	Mixolydian Bebop
Mbl	Major Blues
mbl	Minor Blues
Dwh	Diminished Whole Half
Dhw	Diminished Half Whole
NeM	Neapolitan Major
HuM	Hungarian Major
HaM	Harmonic Major
Hum	Hungarian Minor
Lym	Lydian Minor
Nem	Neapolitan Minor
LoM	Locrian Major
LWt	Leading Whole Tone
6ts	Six Tone Symmetrical
Bal	Balinese
Per	Persian
eip	East Indian Purvi
ori	Oriental
DbH	Double Harmonic
Eni	Enigmatic
Ovr	Overtone
8ts	Eight Tone Spanish
Pro	Prometheus
GRS	Gagaku Ritsu Sen Pou
ISP	In Sen Pou
Oki	Okinawa
Chr	Chromatic



## GREAT CONJUNCTION

YM2413 2-OP FM sequencer/synth  
3 independent, generative sequencers  
random, euclidean & cellular automata algorithms  
full control over YM2413 synth parameters  
100 presets  
10 save slots  
monophonic or 3-note chord modes  
external key mode with 9 note polyphony  
full MIDI implementation  
12 knobs, 5 buttons  
20x4 backlit LCD display  
TRS & USB MIDI IN & OUT