

Braids v1.8 Illustrated

09-21-15



Braids is a digital Module with very high quality sound. It does a very good job of emulating analog signals and contains the latest in digital technology.

I'm not associated with Mutable Instruments, this module is special because it contains a museum of synthesis techniques. I decided to make this Encyclopedia to spotlight the modes inside and to reflect on synthesizers from the past that influenced them as well as a few from the future.

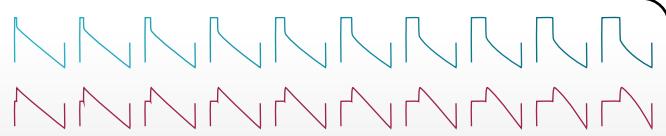
This manual of sorts is an open-source project and I new your help if you find any glaring mistakes (some of these modes I admit I'm not sure what's going on) please let me know.

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The image consists of three vertically stacked panels, each showing a different type of waveform morphing:

- Top Panel:** Labeled "ANALOG". It shows a digital display with "SAW" and controls for "Notch Width" and "Depth/Polarity".
- Middle Panel:** Labeled "ANALOG". It shows a digital display with "Variable Kobol Waveform" and "Waveforms Slew Limiting & Distortion".
- Bottom Panel:** Labeled "ANALOG". It shows a digital display with "Sawtooth Square Morph" and "Saw & PWM Morph".

Each panel includes a "TIMBRE" knob, a "COLOR" knob, and buttons for "SYNC" and "TRIG". To the right of the panels are images of a Yamaha CS-80 keyboard and a Roland Juno-106 keyboard.



The CS-80 sawtooth has a flaw at the start of the waveform that made it sound unique, the tiny notch can be increased in depth and polarity.

SYNC
TRIG



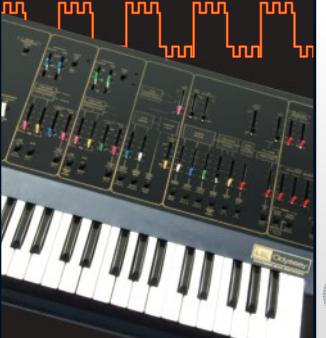
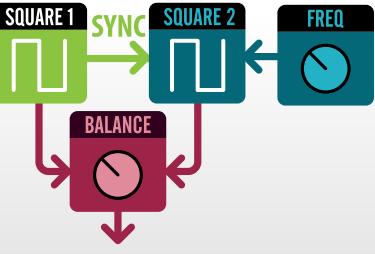
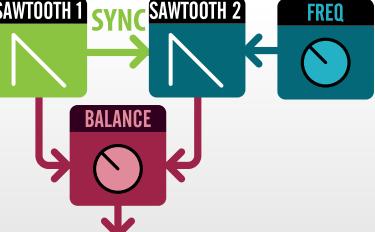
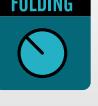
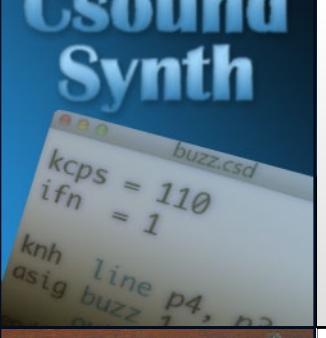
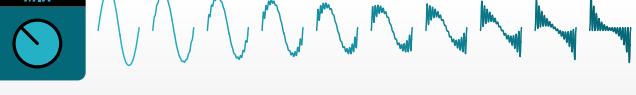
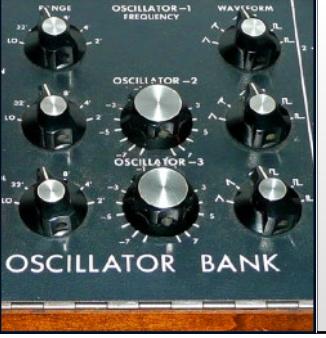
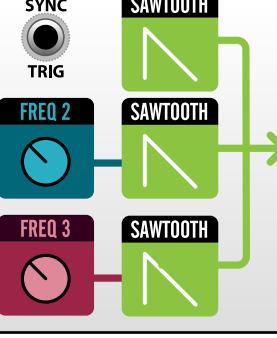
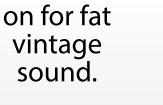
A morphing oscillator that can be tweaked into any classic waveform and anything in between. It first appeared in the RSF Kobol, MicroMoog and MultiMoog, today it's in the Voyager, Sub Phatty and Sub 37.

SYNC
TRIG

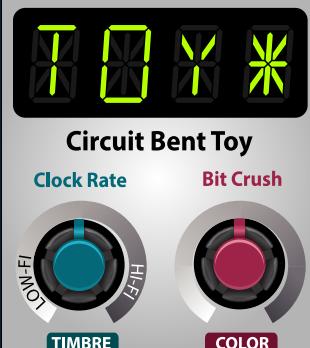
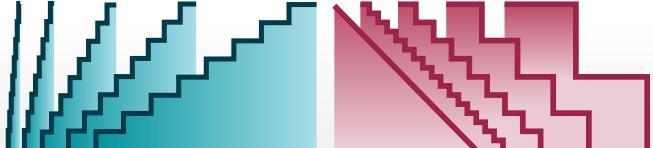


Pulse width modulation can be found in many analog synthesizers, modulating the Sawtooth waveform is rare and can be found in the Roland Juno series.

SYNC
TRIG

<p>ANALOG</p>  <p>Dual Square Hard Sync</p> <p>Sync Frequency Balance</p> <p>TIMBRE COLOR</p>		 <p>2 square waves in sync with balance control, on the left is square and to the right is sync.</p>
<p>ANALOG</p>  <p>Dual Sawtooth Hard Sync</p> <p>Sync Frequency Balance</p> <p>TIMBRE COLOR</p>		 <p>2 saw waves in sync with balance control, on the left is saw and to the right is sync.</p>
<p>ANALOG</p>  <p>Tri/Sine Folder & Morph</p> <p>Folding Strength Sine/Tri Morph</p> <p>TIMBRE COLOR</p>		 <p>As more amplification is applied, instead of clipping, the waveform folds back onto itself.</p> <p>FOLDING  WAVEFORM </p>
<p>DIGITAL</p>  <p>Band-Limited 2 Pulse Train</p> <p>Sine/Comb Mix Detune Amount</p> <p>SINE DIRAC COMB</p> <p>TIMBRE COLOR</p>		 <p>Starting with the 1st sine turning this up will mix in each sine, until all the sines are mixed together.</p> <p>MIX </p>
<p>ANALOG</p>  <p>Sawtooth times 3</p> <p>Osc 2 Frequency Osc 3 Frequency</p> <p>-12 +12 -12 +12 +24 -24 +24</p> <p>TIMBRE COLOR</p>		 <p>Turn these on for fat vintage sound.</p> <p>FLAT  DRFT </p>

<p>ANALOG</p>
<p>ANALOG</p>
<p>ANALOG</p>
<p>ANALOG</p>
<p>DIGITAL</p>

<p>DIGITAL</p>  	 <p>The Comb Delay can be used for simple body resonance, flange or to get unusual waveshapes. The MicroQ was the first to have a comb filter.</p>
<p>DIGITAL</p>  	 <p>For more mayhem try setting these utility menus to extreme settings, lower the bit value & rate. Glitchyness with the signature setting is unique to each braids module.</p>
<p>DIGITAL</p>  	 <p>Casio CZ and Roland D50 style phase distortion simulating a lowpass filter.</p>
<p>DIGITAL</p>  	 <p>Casio CZ and Roland D50 style phase distortion simulating a Peak filter.</p>
<p>DIGITAL</p>  	 <p>Casio CZ and Roland D50 style phase distortion simulating a Bandpass filter.</p>

<h3>DIGITAL</h3> <p>Casio CZ Wave D-50 HPF Highpass Filter Frequency Wave Morph</p> <p>TIMBRE COLOR</p>	<p>MORPH → WAVEFORMS → HIGHPASS FREQUENCY</p> <p>SYNC TRIG</p>	<p>Casio CZ and Roland D50 style phase distortion simulating a highpass filter.</p>
<h3>VOCAL</h3> <p>Voice Simulator Ring Sync Partial 2 Frequency Partial 3 Frequency</p> <p>TIMBRE COLOR</p>	<p>Freq 2 Delay 2 Freq 3 Delay 3</p> <p>PARTIAL 2 PARTIAL 3</p>	<p>Partial delays and frequency morphing waveform using sync and FM techniques.</p>
<h3>VOCAL</h3> <p>80's Speech Synthesizer Vowels Age/Gender</p> <p>E I O A U TIMBRE COLOR</p>	<p>A E I O U</p> <p>STUTTER TRIG</p>	<p>A special form of granular synthesis, it aids transformation between vocal imitation and granular textures.</p>
<h3>VOCAL</h3> <p>Simple Vowel FOF Speech Vowels Age/Gender</p> <p>E I O A U TIMBRE COLOR</p>		<p>VOCAL OSC. → SOFT PALATE FILTER → NASAL CAVITY FILTER ↓ GLOTTIS FILTER → TONGUE FILTER → LIPS & TEETH FILTER</p> <p>Vocal Oscillator is routed through a variable filter matrix, simulating structures of the human vocal tract.</p>
<h3>ADITIVE</h3> <p>Additive Harmonics Harmonic Frequency Harmonic Bandwidth</p> <p>HARMONIC FUNDAMENTAL + HARMONIC TIMBRE COLOR</p>	<p>1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12</p> <p>Fundamental A 440 Hz $440 \times 6 = 2640$ Hz $440 \times 12 = 5280$ Hz</p> <p>6th HARMONIC SELECTED HARMONIC SYNC TRIG</p>	<p>BANDWIDTH</p> <p>Fourier Synthesis (Harmonic Series) control a bank of 12 sine's frequency & Bandwidth.</p>

FM	<p>FM Phase Modulation</p> <p>Modulation Amount: 0.5</p> <p>Harmonic Ratio: 1</p> <p>TIMBRE: 0 LOW COLOR: 8</p>		<pre> graph LR TRIG((TUNE RATIO)) --> MODULATOR[MODULATOR] MODULATOR --> AMOUNT[AMOUNT] AMOUNT --> CARRIER[CARRIER] CARRIER --> OUTPUT[OUTPUT] CARRIER -- PHASE --> AMOUNT </pre> <p>John Chowning, a composer and researcher at Stanford University, developed some important new techniques in DX7 synths using Phase Mod.</p>
FM	<p>FM with Harsh Feedback</p> <p>Modulation Amount: 0.5</p> <p>Harmonic Ratio: 1</p> <p>TIMBRE: 0 LOW COLOR: 8</p>		<pre> graph LR TRIG((TUNE RATIO)) --> MODULATOR[MODULATOR] MODULATOR --> AMOUNT[AMOUNT] AMOUNT --> CARRIER[CARRIER] CARRIER --> OUTPUT[OUTPUT] CARRIER -- PHASE --> AMOUNT CARRIER -- FEEDBACK --> MODULATOR </pre> <p>By feedbacking the result back into itself, new timbres can be created.</p>
FM	<p>FM with Chaotic Feedback</p> <p>Modulation Amount: 0.5</p> <p>Harmonic Ratio: 1</p> <p>TIMBRE: 0 LOW COLOR: 8</p>		<pre> graph LR TRIG((TUNE RATIO)) --> MODULATOR[MODULATOR] MODULATOR --> AMOUNT[AMOUNT] AMOUNT --> CARRIER[CARRIER] CARRIER --> OUTPUT[OUTPUT] CARRIER -- PHASE --> AMOUNT CARRIER -- WT FEEDBACK --> MODULATOR </pre> <p>A harsher more unstable form of feedback, Modulator and Carrier are modulating each other.</p> <p>Mode Exclusive to Braids</p>
ADDITIVE	<p>Bell Additive Synthesis</p> <p>Damping: 0</p> <p>Inharmonicity of the sound: 8</p> <p>TIMBRE: 0 TRIG: 0 COLOR: 8</p>		<pre> graph LR TRIG((DAMP RATE)) --> SINE[SINE 1] SINE --> AMP1[AMP ENV] AMP1 --> HARMONICS[HARMONICS] SINE --> SINE[SINE 2] SINE --> SINE[SINE 3] SINE --> SINE[SINE 4] SINE --> SINE[SINE 5] SINE --> SINE[SINE 6] SINE --> SINE[SINE 7] SINE --> SINE[SINE 8] SINE --> SINE[SINE 9] SINE --> SINE[SINE 10] SINE --> SINE[SINE 11] </pre> <p>Fourier Synthesis, a bank of 11 sine generators with control of harmonic tuning and volume envelopes.</p>
ADDITIVE	<p>Metal Drum Additive Synth</p> <p>Damping: 0</p> <p>Brightness: 8</p> <p>TIMBRE: 0 TRIG: 0 COLOR: 8</p>		<pre> graph LR TRIG((DAMP RATE)) --> SINE[SINE 1] SINE --> AMP1[AMP ENV] SINE --> SINE[SINE 2] SINE --> SINE[SINE 3] SINE --> SINE[SINE 4] SINE --> SINE[SINE 5] SINE --> SINE[SINE 6] SINE --> NOISE[NOISE] NOISE --> RINGMOD[RING MOD] RINGMOD -- A+B --> AMP2[AMP ENV] RINGMOD -- A-B --> AMP3[AMP ENV] AMP2 --> LOWPASS[LOWPASS] AMP3 --> LOWPASS </pre> <p>Fourier Synthesis, a bank of 6 sine generators with control of harmonic tuning and volume envelopes with narrow bands of spectrum noise.</p>

PERCUSSIVE		808 Analog Bass Drum
		<p>808 Analog Bass Drum</p> <pre> graph LR P1[PULSE] --> F1[1 POLE LOW] P2[PULSE] --> F2[1 POLE SHELV] F1 --> R[RES DECAY] F2 --> R R --> H[RECTIFIED HALF WAVE FM] H --> LP[LOWPASS] </pre>
PERCUSSIVE		808 Analog Cymbal
		<p>808 Analog Cymbal</p> <pre> graph LR S1[SQUARE 1] --- S2[SQUARE 2] S1 --- S3[SQUARE 3] S2 --- S4[SQUARE 4] S2 --- S5[SQUARE 5] S3 --- S6[SQUARE 6] S4 --- S5 S5 --- S6 S6 --- BP[BANDPASS] BP --> B[BALANCE] BP --- HP[HIGHPASS] </pre>
PERCUSSIVE		808 Analog Snare Drum
		<p>808 Analog Snare Drum</p> <pre> graph LR BIP[BI-PULSE] --> TR1[T RESONATOR 2 POLE LOW] UP[UNI-PULSE] --> TR2[T RESONATOR 2 POLE LOW] TR1 --> B[BALANCE] TR2 --> B AMP[AMP ENV] --> NOISE[NOISE] NOISE --> BP[BANDPASS] BP --> MIX[MIX] DECAY[DECAY Past 12:00] --> MIX </pre>
PHYSICAL MODEL		String Physical Modeling
		<p>Noise Burst going through a lowpass filter into a delay that is tuned to semitones. Invented by Karplus and Strong it produces random waveforms.</p>
PHYSICAL MODEL		String Physical Modeling
		<p>Sustained friction noise going through a lowpass filter into a delay that is tuned to semitones. Add a resonant filter bank to sound more natural.</p>

PHYSICAL MODEL

Blow
Pipe Physical Modeling
Air Pressure Instrument Geometry
TIMBRE TRIG COLOR

```

graph LR
    AP((AIR PRESSURE)) --> NOISE[NOISE]
    NOISE --> LPD[LOWPASS DAMPING]
    LPD --> STD[SEMI-TONE DELAY]
    GEOM((GEOMETRY)) --> STD
    FEEDBACK((FEEDBACK)) --> NOISE
    
```

AIR PRESSURE → NOISE → LOWPASS DAMPING → SEMI-TONE DELAY
TRIGGER → NOISE
NON-LINEAR ELEMENT → FEEDBACK → NOISE
GEOMETRY → SEMI-TONE DELAY

Sustained friction noise going through a lowpass filter into a delay that is tuned to semitones.

PHYSICAL MODEL

Flut
Pipe Physical Modeling
Air Pressure Flute Geometry
TIMBRE TRIG COLOR

```

graph LR
    AP((AIR PRESSURE)) --> NOISE[NOISE]
    NOISE --> LPD[LOWPASS DAMPING]
    LPD --> STD[SEMI-TONE DELAY]
    GEOM((GEOMETRY)) --> STD
    FEEDBACK((FEEDBACK)) --> NOISE
    
```

AIR PRESSURE → NOISE → LOWPASS DAMPING → SEMI-TONE DELAY
TRIGGER → NOISE
NON-LINEAR ELEMENT → FEEDBACK → NOISE
GEOMETRY → SEMI-TONE DELAY

Sustained friction noise going through a lowpass filter into a delay that is tuned to semitones.

WAVETABLE

WAV
20 Different Wavetables
Wavetable Sweep Select 1 of 20 wavetables
TIMBRE COLOR

MORPH SWEEP

Sweep from up to 16 waves for each Transwave.
SYNC → TRANSWAVE → TRIG

01	Male PPG	000-015	11	Slap SQ-80 (8)	146-153
02	Female	016-031	12	Piano (3)	154-156
03	Choir	032-047	13	Organ!	157-171
04	Space Voice	048-063	14	Waves!	172-187
05	Tampura	064-076	15	Digital PPG	188-202
06	Shamus	077-092	16	Drone 1 (12)	203-212
07	Swept String	093-108	17	Drone 2 (8)	213-219
08	Bowed	109-124	18	Metallic D-50	220-235
09	Cello (8)	125-132	19	Fantasy	236-251
10	Vibes (12)	133-145	20	Bell (4)	252-255

WAVETABLE

WAV
16x16 Smooth Table Grid
X Scanning Y Scanning
TIMBRE COLOR

X SWEEP ← → **Y SWEEP**
SYNC → TRIG

16x16 Smooth Table Grid

Morph through all 256 wavetables, X scans in horizontal direction and Y scans vertically.

WAVETABLE

WAV
64 Waveform Linear Scan
Wavetable Scanner Interpolation CROSSFADE SAMPLES
ROUGH SMOOTH MORPH 12BIT COLOR
TIMBRE

64 WT SWEEP SYNC
A ROUGH SAMPLE NO CROSSFADE B SMOOTH SAMPLE NO CROSSFADE C SMOOTH SAMPLE MORPH CROSSFADE D BIT REDUCE SAMPLE MORPH CROSSFADE
INTERPOLATION C B A D

Morph Order: Waves! -Piano -Vibes -Female -Male -Tampura -Shamus -Female -Waves! -Tampura -Cello -Digital! -Male -Digital -Bowed -Fantasy -Choir -Tampira -Metallic -Female -Vibes -Drone1 -Choir -Waves! -Slap -Bowed -Vibes -Choir -Cello -Digital -Female -Digital -Female -Waves!

WAVETABLE	<p>4 Wavetable Oscillators</p> <p>Wavetable Morph Detune/Chords</p> <p>TIMBRE COLOR</p> <p>DETUNE</p> <p>CHORDS</p>	<p>Minor7 Major7 Power OctaveX4 OctaveX2 PowerX2</p> <p>Detune</p> <p>CHORDS</p> <p>Minor Sus2 Sus4 Minor9 Major9 Major7 Minor11 Major11</p>	<p>PowerX2 Doubled OctaveX2 Doubled OctaveX4 Minor OctaveX4 Sus2 OctaveX4 Sus4 Power Minor9 Major Major9 Major7 Minor11 Minor7 Major11</p> <p>SYNC TRIG</p>
NOISE	<p>Noise w/Oberheim Filter</p> <p>Filter Resonance NOTCH</p> <p>TIMBRE COLOR</p>	<p>ENVELOPE EXPANDER MODULE</p> <p>FREQUENCY VCF RESONANCE</p> <p>MODULATION NOTCH</p> <p>ENV 1 ENV 2 SUSTAIN</p> <p>LFO VCO1 VCO2</p>	<p>NOISE → RESONANCE → HIGHPASS / LOWPASS → CROSSFADE</p>
NOISE	<p>Twin Peaks Noise</p> <p>Filter Resonance Peak Distance from each other</p> <p>TIMBRE COLOR</p>		<p>NOISE → PEAK FILTER 1 / PEAK FILTER 2 → RESONANCE → DISTANCE</p>
NOISE	<p>Clocked Digital Noise</p> <p>Cycle Length Bit Quantize</p> <p>LONG SHORT 2 32</p> <p>TIMBRE COLOR</p>		<p>LENGTH OF LOOPING</p> <p>CRUSHING BIT DEPTH</p>
GRANULAR	<p>Granular Cloud Generator</p> <p>Grain Density and Overlap Grain Randomization</p> <p>0 10 0 10</p> <p>TIMBRE COLOR</p>		<p>GRAIN DENSITY AND OVERLAP</p> <p>GRAIN RANDOMIZATION</p>

GRANULAR

PARTICLE

Particle System Simulator

Particle Density and Overlap

Particle Randomization

TIMBRE

COLOR

DATA

QPSK

Telecommunication Data

Baud Rate

QPSK Data Modulation

TIMBRE

COLOR

This mode can be found in earlier versions of the Braids firmware

Differential phase shift keying is the method Modems and FAX machines use to send data over telephone lines. Sine waves are phase shifted to denote different on and off states of binary data.

Global Options for all Modes

- BITS** Braids Bit-Depth, Vertical resolution (up to 16 bits) at low depths extreme distortion and grit occurs.
- RATE** Braids Sample-Rate , Horizontal resolution (up to 348kHz) some modes use lower rates.
- META** When on the FM CV input will change Braids modes instead of modulating the pitch.
- TRIG** Trig input Off: Osc Sync (not Modeling modes) On: Timbre Env. Amp: Amp Env. (6 preset shapes)
- TSRC** Choice between external trigger input or trigger on large Pitch changes. (auto-mode)



TIME Delay time of trigger for timing.(None, 125u, 250u, 500u, 1mS, 2mS, 4mS)

ATT Envelope Attack (0-15) The higher the number the longer it takes the envelope to rise.

DEC Envelope Decay (0-15) The higher the number the longer it takes the envelope to fall.

FEM Frequency Modulation Envelope Amount (0-15)

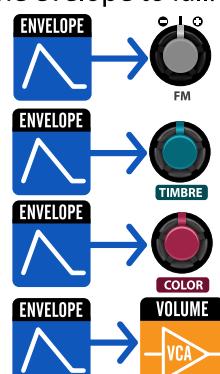
TTM Timbre Envelope Amount (0-15)

COE Color Envelope Amount (0-15)

VCA VCA Envelope Amount (0-15)

RANG Set the range of COARSE knob.

OCTV Transposition of Octaves switch.

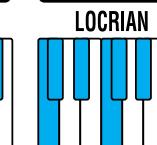
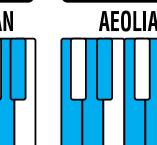
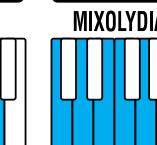
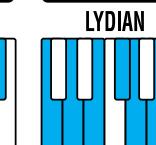
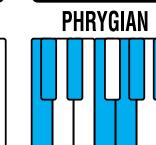
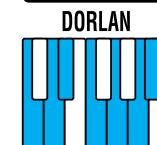
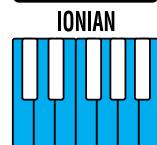
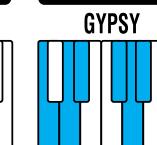
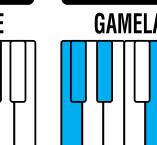
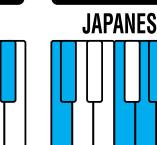
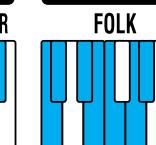
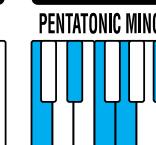
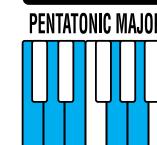
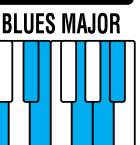
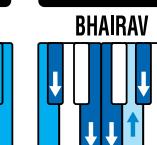
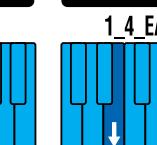
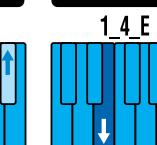
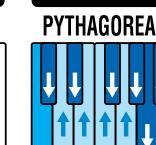
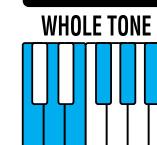
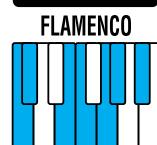
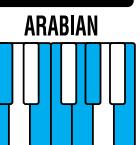
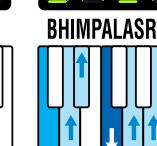
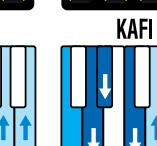
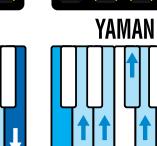
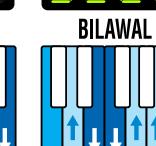
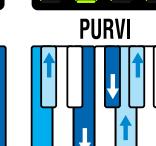
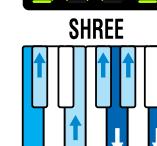
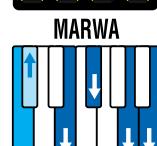
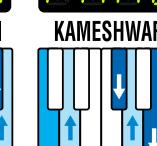
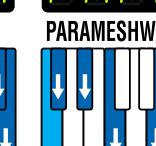
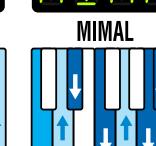
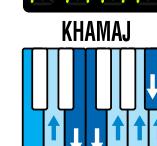
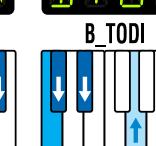
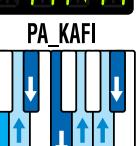


ROOT

Root note for quantizer (C is the root note for the quantizer chart below)

QNTZ

Quantizes CV input to semitones or 47 other scales, Pitch modulation to FM CV input is not quantized.

SEMI**TONI****DORI****PHRY****LYDI****MIXO****AEOL****LOCR****BLUT****BLUE****PENT****PEN****FOLK****JAPA****GAME****GYPS****ARRAB****FLAM****WHOL****PYTH****E_B74****E74****EAX4****BHAIR****GUNA****MARW****SHRI****PURV****BILA****YAMA****KAFI****BHIM****DARB****RAGE****KHAM****MIMA****PARA****RANG****GANG****KAME****PAKA****NATB****KAUN****BAIR****BTOD****CHAN****KTOO****JOGE**

↑ = Actual pitch is higher than note indicated.

↓ = Actual pitch is lower than note indicated.

PLAT

Stretch tuning with detune beating consistent with every octave.

DRFT

Vintage type analog pitch drift and instabilities, makes the pitch more animated and alive.

SIGN

Applies glitches unique to each module giving your Braids its own signature sound.

Informational Links

	Yamaha CS-80 Sawtooth	https://en.wikipedia.org/wiki/Yamaha_CS-80
	Variable Kobol Waveform	http://www.vintagesynth.com/misc/rsf_kobol.php http://www.polynomial.com/site/studio/gear/synth/Rsf-Kobol/Rsf-Kobol.html
	Sawtooth Square Morph	http://en.wikipedia.org/wiki/Roland_Alpha_Juno
	Dual Square Hard Sync	http://en.wikipedia.org/wiki/ARP_Odyssey
	Dual Sawtooth Hard Sync	https://en.wikipedia.org/wiki/Moog_Source https://en.wikipedia.org/wiki/Moog_Multimoog
	Tri/Sine Folder & Morph	http://www.serge-fans.com http://www.serge.synth.net http://www.modulargrid.net/e/modules/browser?SearchName=Fold
	Band-Limited 2 Pulse Train	http://www.csounds.com/manual/html/buzz.html http://www.csounds.com
	Sawtooth times 3	http://en.wikipedia.org/wiki/Minimoog http://en.wikipedia.org/wiki/List_of_Korg_products
	Square times 3	http://en.wikipedia.org/wiki/Electronic_Music_Laboratories http://en.wikipedia.org/wiki/MOS_Technology_SID
	Triangle times 3	http://en.wikipedia.org/wiki/Waldorf_Music
	Sine times 3	http://en.wikipedia.org/wiki/Electronic_Music_Studios http://www.modcan.com/emodules/triplevco.html
	3 Sines Ring Modulated	http://en.wikipedia.org/wiki/Ring_modulation http://www.modulargrid.net/e/modules/browser?SearchName=Ring
	7 Super Saws Detuned	http://en.wikipedia.org/wiki/Roland_Alpha_Juno http://www.modulargrid.net/e/modules/browser?SearchName=Animat
	Saw & Tuned Comb Delay	http://en.wikipedia.org/wiki/Comb_filter
	Circuit Bent Toy	http://en.wikipedia.org/wiki/Circuit_bending
	Casio CZ Wave D-50 LPF	http://en.wikipedia.org/wiki/Casio_CZ_synthesizers http://www.makenoisemusic.com/mysteron.html
	Casio CZ Wave D-50 PKF	http://en.wikipedia.org/wiki/Roland_D-50
	Casio CZ Wave D-50 BPF	
	Casio CZ Wave D-50 HPF	

	Voice Simulator Ring Sync	http://en.wikipedia.org/wiki/Speech_synthesis#Formant_synthesis
	80's Speech Synthesizer	http://www.modulargrid.net/e/flame-talking-synth
	Simple Vowel FOF Speech	https://en.wikipedia.org/wiki/Kurzweil_Music_Systems#K150_synthesizer
	Harmonic Synthesis	http://www.makenoisemusic.com/mysteron.html https://en.wikipedia.org/wiki/Fairlight_CMI
	FM Phase Modulation	http://en.wikipedia.org/wiki/Kawai_Musical_Instruments https://en.wikipedia.org/wiki/Synclavier
	FM with Harsh Feedback	http://en.wikipedia.org/wiki/Frequency_modulation_synthesis http://www.modcan.com/emodules/fmvdo.html
	FM with Chaotic Feedback	
	Bell Additive Synthesis	http://en.wikipedia.org/wiki/Fourier_analysis http://en.wikipedia.org/wiki/Kawai_Musical_Instruments
	Metal Drum Additive Synth	http://en.wikipedia.org/wiki/Digital_waveguide_synthesis http://en.wikipedia.org/wiki/Karplus–Strong_string_synthesis
	String Physical Modeling	http://mutable-instruments.net/modules/elements http://en.wikipedia.org/wiki/Waveguide#Sound_synthesis
	String Physical Modeling	
	Pipe Physical Modeling	
	Pipe Physical Modeling	
	20 Different Wavetables	http://en.wikipedia.org/wiki/Wavetable_synthesis http://www.modulargrid.net/e/modules/browser?SearchName=wavetable
	16x16 Smooth Table Grid	http://www.modulargrid.net/e/synthesis-technology-e350-morphing-terrarium http://en.wikipedia.org/wiki/Ensoniq
	64 Waveform Linear Scan	http://en.wikipedia.org/wiki/Waldorf_Music
	4 Wavetable Oscillators	http://www.modulargrid.net/e/synthesis-technology-e370
	Noise w/Oberheim Filter	http://en.wikipedia.org/wiki/Oberheim_Electronics
	Twin Peaks Noise	http://en.wikipedia.org/wiki/Filter_design

 C	Clocked Digital Noise	http://www.modulargrid.net/e/modules/browser?SearchName=Digital+Noise
 G	Granular Cloud Generator	http://en.wikipedia.org/wiki/Granular_synthetis http://www.modulargrid.net/e/synthesis-technology-e340-cloud-generator
 P	Particle System Simulator	http://mutable-instruments.net/modules/clouds/
 T	Telecommunication Data	
 K	808 Kick Drum	http://en.wikipedia.org/wiki/Roland_TR-808 http://www.modulargrid.net/e/modules/browser?SearchName=808
 C	808 Cymbal	
 S	808 Snare	

SEMITONE	GUNAKRI
https://en.wikipedia.org/wiki/Semitone	?
IONIAN	MARWA
https://en.wikipedia.org/wiki/Ionian_mode	https://en.wikipedia.org/wiki/Marva_(raga)
DORIAN	SHREE
https://en.wikipedia.org/wiki/Dorian_mode	https://en.wikipedia.org/wiki/Shree_(raga)
PHRYGIAN	PURVI
https://en.wikipedia.org/wiki/Phrygian_mode	https://en.wikipedia.org/wiki/Purvi
LYDIAN	BILAWAL
https://en.wikipedia.org/wiki/Lydian_mode	https://en.wikipedia.org/wiki/Semitone
MIXOLYDIAN	YAMAN
https://en.wikipedia.org/wiki/Mixolydian_mode	https://en.wikipedia.org/wiki/Yaman_(raga)
AEOLIAN	KAFI
https://en.wikipedia.org/wiki/Aeolian_mode	https://en.wikipedia.org/wiki/Kafi_(raga)
LOCRIAN	BHIMPALASREE
https://en.wikipedia.org/wiki/Locrian_mode	http://chandrakantha.com/raga_raag/bhimpalasi/bhimpilasi.html
BLUES MAJOR	DARBARI
https://en.wikipedia.org/wiki/Jazz_scale	https://en.wikipedia.org/wiki/Darbari_Kanada
BLUES MINOR	RAGESHREE
http://www.pianoscales.org/blues.html	?
PENTATONIC MAJOR	KHAMAJ
https://en.wikipedia.org/wiki/Pentatonic_scale	http://chandrakantha.com/raga_raag/khammaj/khammaaj.html
PENTATONIC MINOR	MIMAL
http://musictheorysite.com/pentatonic-scales	?
FOLK	PARAMESHWARI
https://en.wikipedia.org/wiki/Folk_music	?
JAPANESE	RANGESHWARI
https://en.wikipedia.org/wiki/Japanese_mode	?
GAMELAN	GANGESHWARI
https://en.wikipedia.org/wiki/Gamelan	?
GYPSY	KAMESHWARI
https://en.wikipedia.org/wiki/Gypsy_scale	?
ARABIAN	PA_KAFI
https://en.wikipedia.org/wiki/Arabic_scale	?
FLAMENCO	NATBHAIK
https://en.wikipedia.org/wiki/Flamenco_mode	http://www.parrikar.org/hindustani/bhairav/
WHOLE	M_KAUNS
https://en.wikipedia.org/wiki/Whole_tone_scale	http://chandrakantha.com/raga_raag/malkauns/malkosh.html
PYTHAGOREAN	BAIRAGI
https://en.wikipedia.org/wiki/Pythagorean_tuning	https://en.wikipedia.org/wiki/Bairagi
E_B_X4	B_TODI
?	https://en.wikipedia.org/wiki/Todi_(raga)
E_X4	CHANDRADEEP
?	?
E_A_X4	KAUSHIK_TODI
?	?
BHAIK	JOGESHWARI
https://en.wikipedia.org/wiki/Bhairav_(raga)	?

