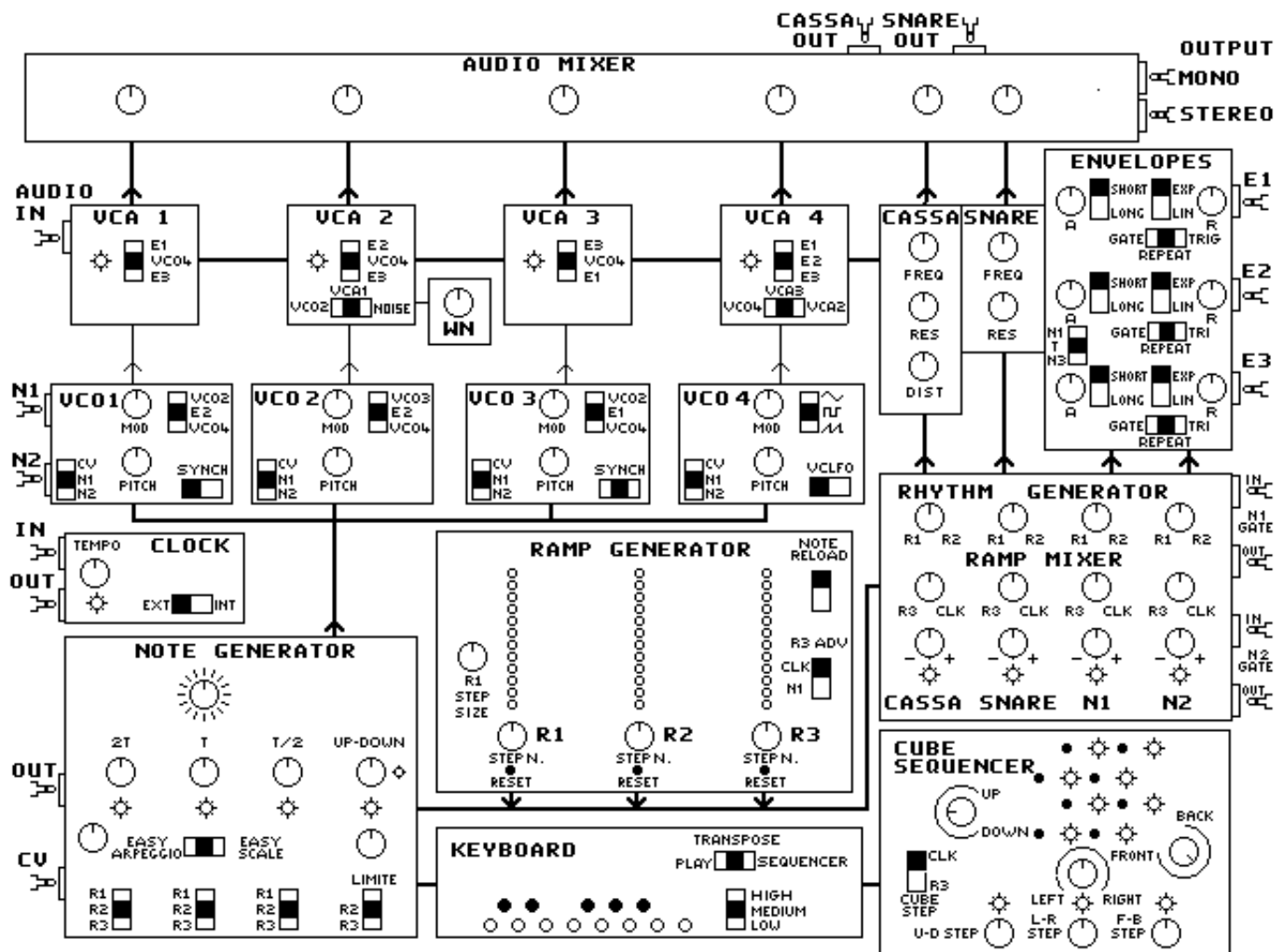


# The ArpoLoop

Arpoloop is a full analog synthesizer with a built-in full analog rhythm and melody composer. Since there is no microprocessor nor digital memory it can not be programmed in the usual way instead it can be set and guided to play a line whose parameters are user definable with virtually infinite combinations.

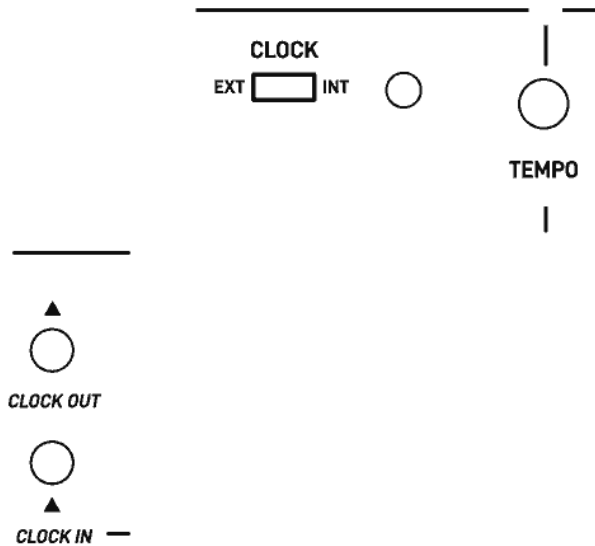


- Four voltage controlled oscillators (VCO1-4).  
VCO1 sine wave with sync and FM capabilities.  
VCO2 sine wave with FM.  
VCO3 sine wave with sync and FM.  
VCO4 sine, square, sawtooth with LFO option.
- Four cascadable voltage controlled amplifiers (VCA) controlled by envelope or ring modulated by a VCO.
- Bass drum (CASSA) with pitch, resonance and distortion.
- Snare drum with tom pitch and decay controls.
- Three Attack-Release envelope generators (E1,E2,E3) with three modes of operation: GATE, REPEAT, TRIG.
- Six channel Audio Mixer with volume and four mini jack audio out.  
MONO out  
STEREO out(VCA1-2 left,VCA3-4 right,CASSA-SNARE both cannels)  
CASSA only  
SNARE only

control board (the lower section)

- Clock generator
- Three Ramp generators for general timing
- Four Rhythm generator to control notes and drums
- Note generator with two sample and hold CV outputs(N1,N2)
- Eight step capacitor sequencer(cube sequencer)
- One octave musical keyboard

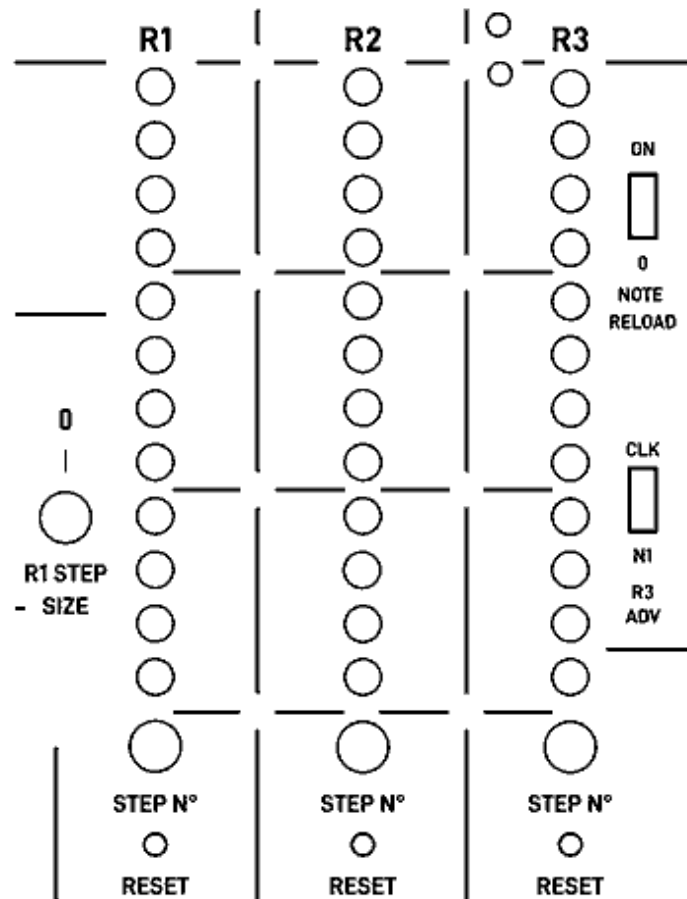
----- CLOCK GENERATOR



CLOCK pulses are generated internally at the rate set by the TEMPO control. With external clock the TEMPO control becomes a clock divider, ranging from 1 to 6. It is possible to synchronize a Clock24 signal or even a MIDI clock as long as the clock is the only signal appearing on the MIDI line.

- EXT INT                      in INT mode clock pulses are generated internally, TEMPO pot. controls the speed.  
In EXT mode the external clock (CLOCK IN) must be provided. TEMPO now acts a clock divider ranging from 1 (right) to 6 (left)  
Divide x1 synch with 2ppqn, divide x6 synch with MIDI or Clock24
- TEMPO                         Set the global speed of internal clock  
or the division rate of an external clock (division rate 1 to 6)  
Each flash of the green led indicates a clock pulse, this will be the fastest note on your execution all other notes derive from a ramp generator that divides the clock pulses and thus are slower.
- CLOCK OUT                    It outputs a clock pulse same as the green LED.  
With external clock it gives the output of the clock divider NOT the CLOCK IN input.

## RAMP GENERATOR



RAMP generators (R1,R2,R3) are driven by the clock pulses and generate a stepped voltage that is displayed by the three led strips the number of steps is controlled by the STEP N. knobs.

At the last step the upper led will indicate that the ramp will reset at next pulse.

Single ramps or a combination of different ramps are used to generate rhythms and melodies.

-R1 has a further control: STEP SIZE it can reduce or enlarge the step and so increase or decrease the number of steps and hence the length of the ramp. in central position steps are the same as in other ramps.

-R3 can be driven also by the N1 pulses making some looping melodies easier.

STEP N.

Set the number of step for a ramp generator i.e. the number of clock pulses to complete a ramp for example a step number set to 4 will give a sequence of 1,2,3,4 led , a 4/4 pattern.

At the last step the upper led will indicate that ramp will reset at next step.

Two or more ramps can be combined in the ramp mixer to generate more complex patterns.

R1 STEP SIZE

Central position = normal ramp (1 led step)

when in left side the steps are smaller (more clock x led)

and the opposite for the right side, useful to make long patterns

R3 ADV

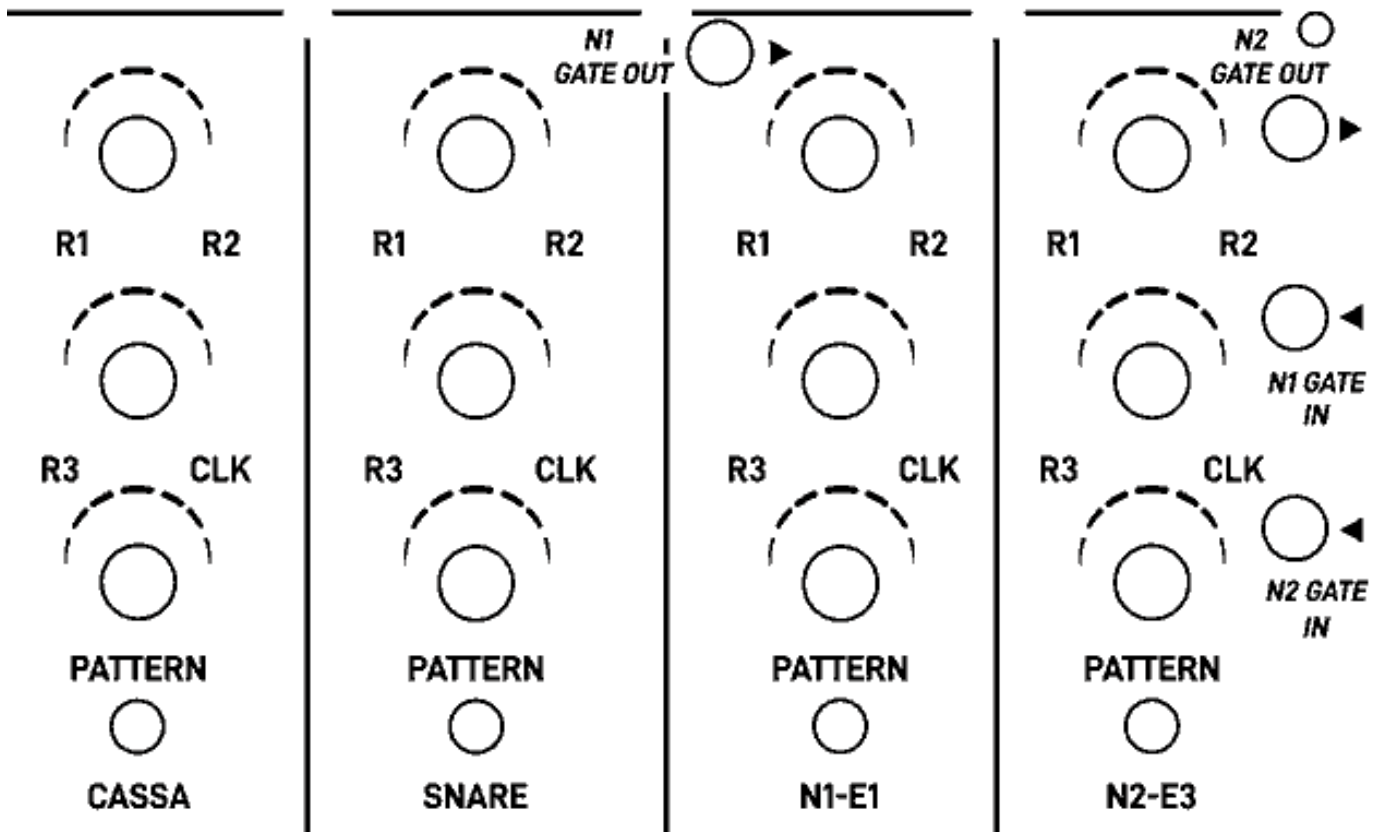
Ramp R3 can advance either on CLK pulses (as other ramps) or on N1 pulses generated by the rhythm generator (white led).

WARNING if N1 LED is always OFF the ramp R3 will never advance.

RESET button

Restarts each single ramp to 0 .

----- RHYTHM GENERATORS



The three ramps along with the clock itself are mixed together to generate a more complex signal that is sent to a comparator to extract the rhythmic pattern

There are 4 identical channels:

CASSA	green led	Bass drum
SNARE	orange led	Snare drum
N1-E1	white led	Note generator + Envelope E1 & E2 + advance R3
N2-E3	purple led	Second note + Envelope E2 & E3

Each channel has:

-RAMP MIX R1←----→R2

Cross mixer for R1 and R2: the highest ramp has more influence on output.

Example: if R1 = 4 steps and R2 = 3 steps

-all way left : output will be a 4 beat pattern.

-all way right: 3 beat pattern.

-somewhere in the middle: 4 beat pattern repeating 3 times with different variations, in total 12 beats.

-RAMP MIX R3←----→CLK

Cross mixer for R3 and CLK : This is added to RAMP 1←----→2 to generate even more complex patterns.

## -PATTERN

Select all possible pattern from the ramp combinations  
-at minimum value (full left) the output led is always off.  
-at maximum value (full right) the output led is always on.  
-around middle position the output blinks according to a pattern.  
small variations around this point brings to different patterns.

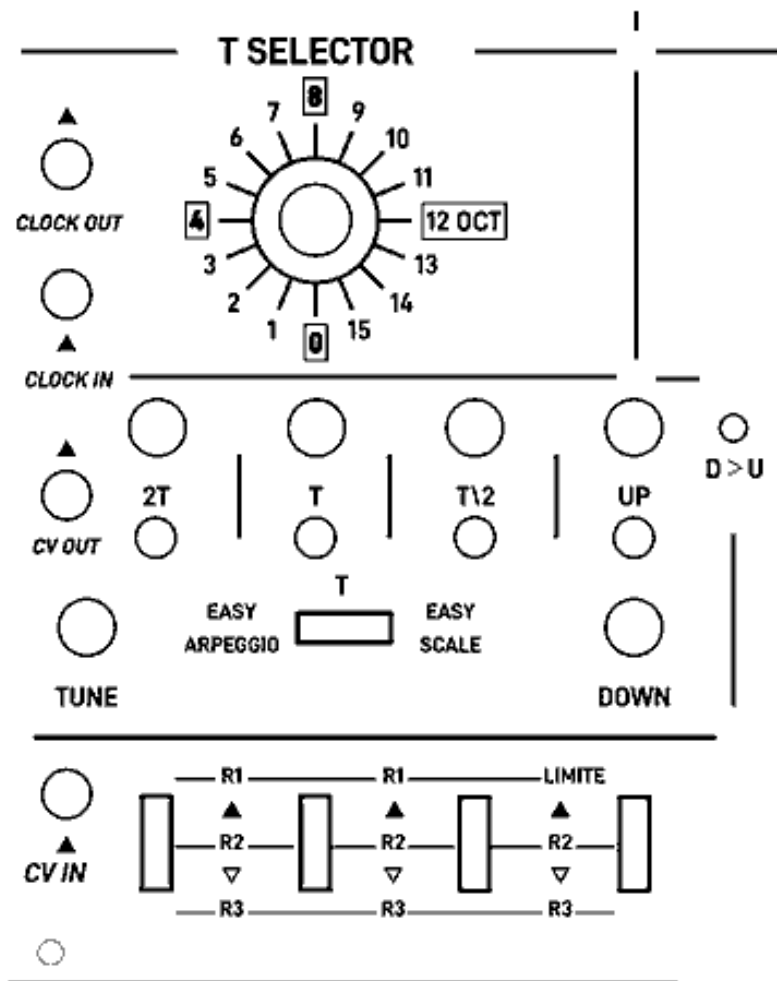
CASSA, SNARE and ENV in TRIG mode are percussive sounds, they will play only on the OFF→ON transition of the output.

Instead ENVELOPES when set in GATE or REPEAT mode will play whenever the output is ON allowing longer notes to be produced.

External gate inputs N1 GATE IN and N2 GATE IN are provided to drive N1 and N2 by other machines,  
N2 is also controlled by keyboard.

GATE INs are subjected to PATTERN control. It has to be set until the instrument responds to the input.

----- NOTE GENERATOR



The most remarkable (and difficult to understand) feature of the Arpoloop is the note (or melody) generator.

It uses some analog computer elements to store one CV note and changing it.

Each N1 pulse will change the note by a musical interval depending on the four white Led.

The four white LEDs are associated with a threshold control potentiometer with its comparator and a ramp selector switches.

-Ramp selector

Select the ramp at the comparator input

-R1,R2,R3 can be selected one at a time (not mixed)

- the U/D comparator has a LIMIT option instead of R1

in LIMIT mode the notes bounce between upper and lower limits this is useful when NOTE RELOAD =0 to prevent the note generator to saturate.

-2T,T,T/2,UP Thresholds

Work exactly as rhythm PATTERN

at left : always off, at right always on , in the middle: all possible patterns extracted from the selected ramp (no ramp mix in this case) output of the comparators (white led)

- U/D ON = note goes up OFF = note goes down

- T/2 semitone

- T selectable interval via T SELECTOR (0-15 semitones)

- 2T two tones (a major 3rd)

Combining all these comparators the interval can range from 0 (same note as before) to 20 semitones both up and down when all led are ON

-EASY ARPEGGIO/SCALE

In T position the T led works as always, controlled by its threshold.

In EASY SCALE the T led is always the opposite of the T/2 led, this makes easy to alternate the tone-semitone sequence to make scales.

In EASY ARPEGGIO the T led is always the inverse of the 2T led, this makes easy to alternate the minor-major third sequence for arpeggios.

When in scale or arpeggio the comparator T is not used, however it can be always routed to drive E2 envelope (see envelopes)

-NOTE RELOAD

When ON the note generator is loaded every time R3 resets, the CV loaded depends on the KYB MODE switch.

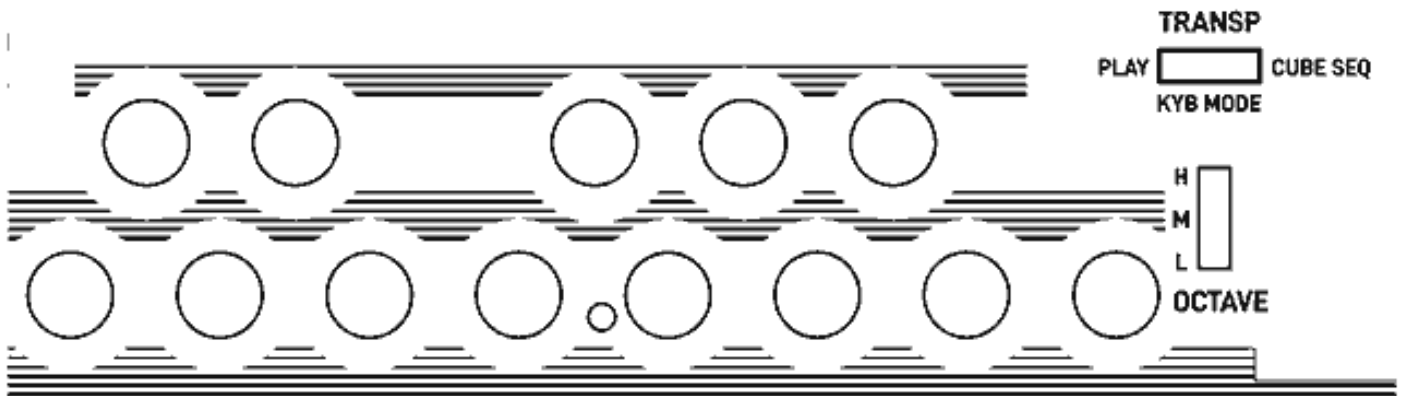
When OFF(0) it is never loaded: this option is combined with the LIMITE option on the U/D ramp otherwise the note generator could overflow and hang on the ultra high or ultra low ranges.

-TUNE

The note loaded coming from keyboard or cube sequencer can be tuned with this control.

DON'T SET TO 0 OR TOO LOW! or this could stop all VCO's

## ----- KEYBOARD



The Keyboard cv can play directly or can be used to program notes into the cube sequencer or note generator.

Notes cv are always played thru N2 output of the note generator.

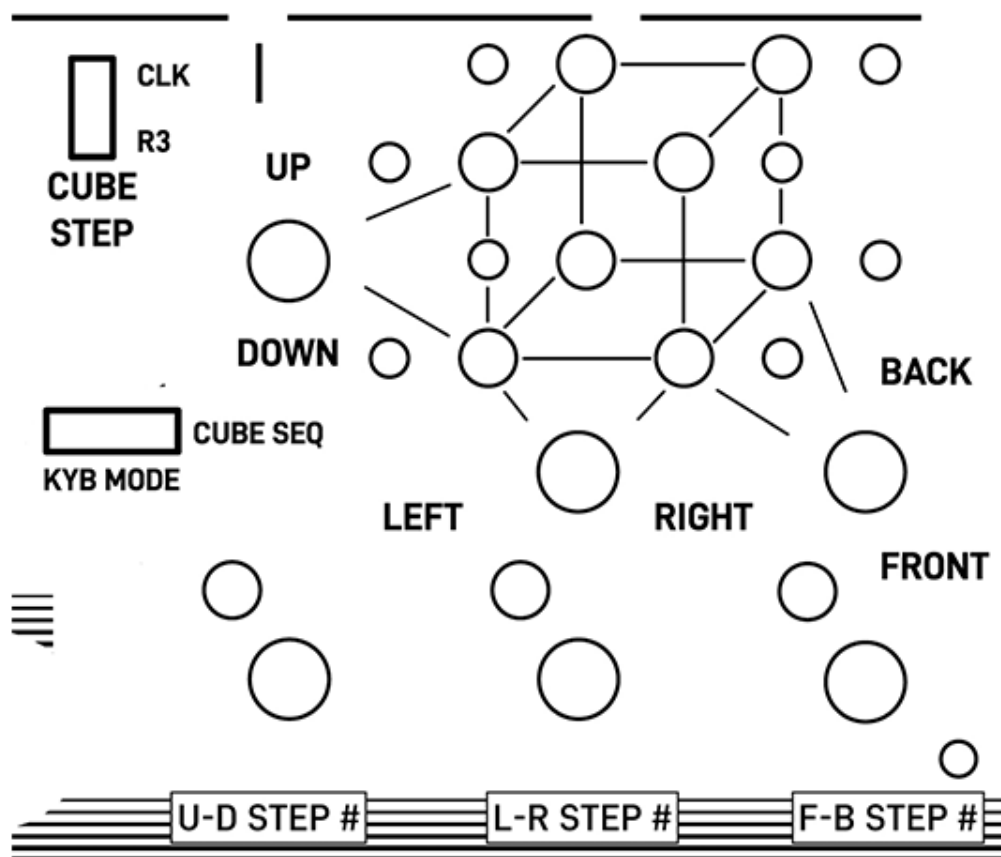
Be sure that PATTERN control N2 be set to 0 to not interfere with keyboard gate.

The different function are set by the KYB MODE switch

- KYB MODE Defines the behavior of CV and N2 gate, there are three modes:
- PLAY Keyboard Gate controls N2-E3 purple LED so Envelopes 3 or 2 can be used.  
CV set to maximum.
- TRANSP No gate is sent to N2-E3,  
CV is connected to keyboard so the note loaded by NOTE RELO AD can be changed pressing a key.  
It is also possible to play two keys simultaneously using CV and N2 as VCO's inputs creating a two part harmony.
- CUBE SEQ Gate is sent to N2, CV is connected to the CUBE SE QUENCER (see)
- OCTAVE Allows to extend the range to three octaves (Low-Medium-High)



## CUBE SEQUENCER



The capacitor sequencer, consist of a eight note memory arranged as a cube whose vertex are the notes.

You can select any sequence of notes using three ramp generator (different from the main ones) and three tresholds.

U-D STEP N.  
L-R STEP N.  
F-B STEP N.

These are the number of steps for a simplified versions of the ramp generator. The green LED blinks every N step  
Each generator is associated with a comparator that drives the cube

UP-DOWN

Threshold of the comparators that select a couples of faces of the cube.

LEFT-RIGHT  
FRONT-BACK

All vertex are at a combination of the three comparator.  
At one end of the cursor the first face is selected, at the other the second face, at mid position both faces alternate at the speed of their ramp.

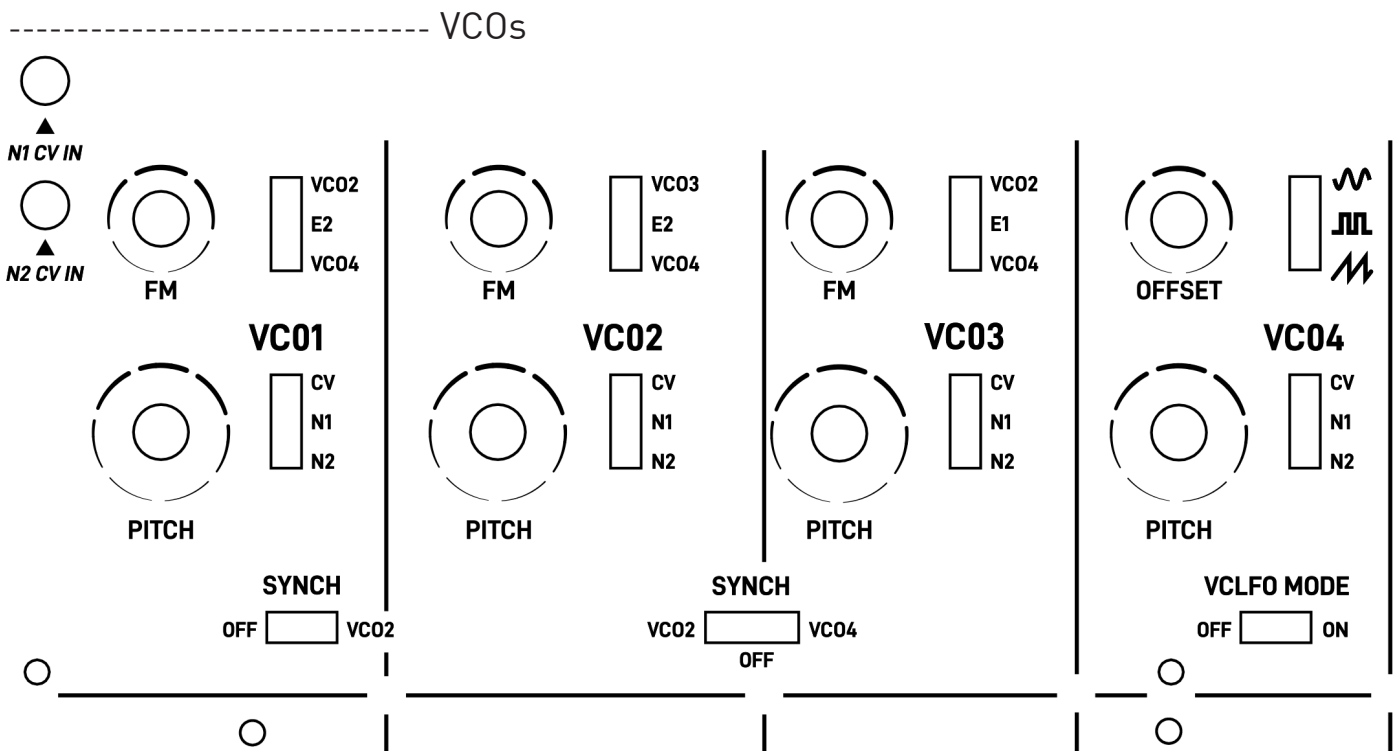
Depending of how many couples are moving we can have 2,4 or 8 different notes alternating at different rates.

CUBE BUTTONS

The eight button near each LED of the cube write a note into one of the eight capacitors at the vertex of the cube sequencer  
You can do it anytime you want: while keeping a note on the keyboard press briefly a cube button ,the note will be written on that vertex, dont press the button without a keyboard note or the note will be corrupted.

CUBE STEP switch

Select CLOCK or R3 reset (the top led of the yellow ramp) as step for the cube sequencer.



Three VCO are sine wave, the fourth is wave selectable (sine, square, saw)  
 VC01 and VC03 are hard syncable via the SYNC switch.

VC02 will do the pitch and VC01 the harmonic contents, more or less like a resonant filter (VC01 pitch = cutoff).

The same is possible with VC03 (cutoff) and VC04 (pitch) featuring a full two voices synth.

A two formant voicing is possible by syncing both VC01 and VC03 with the same VC02 making possible, among others, human voice imitation.

The MOD control can produce FM synthesis as well as vibrato or envelope modulation.

**-PITCH** Sets the height of the sound produced by the oscillator the ratio between the notes is always the same,so you can transpose a melody.  
 Two or more oscillator can be set at a fixed interval to produce chords if the oscillator is Synced with another it becomes so mething like a filter the pitch acts as a CUTOFF

**-PITCH SELECTOR** Select the control voltage for each VCO  
 CV = keyboard or cube sequencer (see KYB MODE) you can set the global pitch with TUNE control N1,N2 a note generated by the NOTE GENERATOR

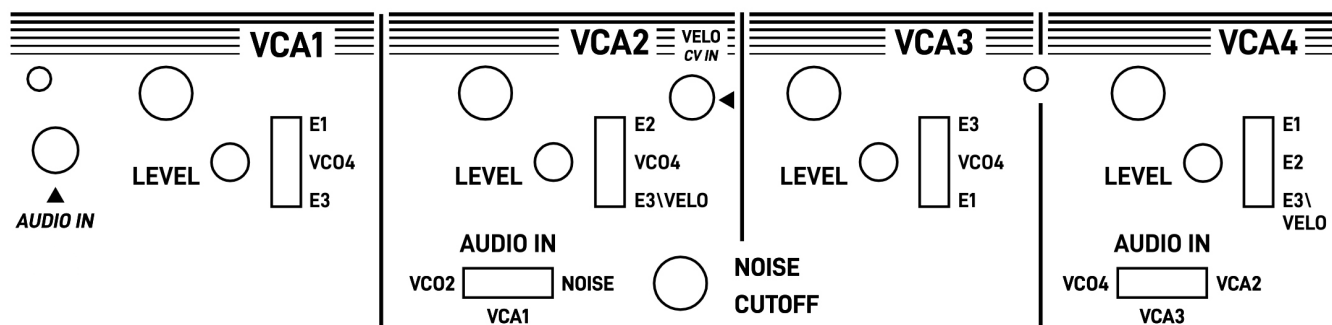
**-MOD** Frequency modulation amount: 0 = clean sound

**-MOD SELECTOR** Select the source for FM  
 VC02,VC03,VC04: one VCO is FM modulated by the next,useful for FM synthesis  
 E1,E2 envelope modulation useful for filter cutoff (sync mode) or for vintage space sounds

**-SYNC** VC01 can be synchronized to VC02  
 VC03 can be sychronized to VC02 or VC04  
 Synced oscillators will follow the pitch of their master oscillator (VC02 or VC04) but produces harmonics

- WAVE Select waveform for VCO4 (sine,square,sawtooth)
- LFO VCO4 can be lowered in frequency and become an LFO still CV controllable
- OFFSET Adds a positive offset to output of VCO4 when controlling VCA
- N1\N2 cv in You can control the vco with an external cv, N1 and N2 cv in are selectable by the vco cv in switch selector.  
Arpoloop accept linear Hz\Volt cv control.

## ----- VCAs



Each VCA is connected to its own VCO and can be controlled by an envelope or by VCO4 becoming a ring modulator.

In alternative VCA2 and VCA4 can be routed to another VCA output obtaining a velocity control or a double modulation, up to three VCA's can be chained this way.

A white noise can be used for VCA2 input, this can give a further "piattino" sound and is particularly convenient when using VCO1 in sync with VCO2, this way the unused VCA2 can be rerouted to noise.

The pink LED near CV SELECTOR shows the amplitude of sound produced by VCA.

If an envelope is selected it lights the same way as the selected envelope.

If led is OFF no sound will exit from this channel.

### -CV SELECTOR

Select VCA control voltages

E1,E2,E3 envelope generators

VCO4 the output of OSC4 plus a fixed amount (VCO4 OFFSET)

if OSC4 is in LFO mode they give a tremolo effect

if OSC4 is in VCO mode it acts as a ring modulator

### -VCA2IN

Selects audio input for VCA2

-VCO2 = oscillator2

-VCA1 = VCA1 output redirected to VCA2 (two cascaded VCAs)

-NOISE = white noise (filtered by NOISE CUTOFF)

### -VCA4IN

Selects audio input for VCA4

-VCO4 = oscillator 4

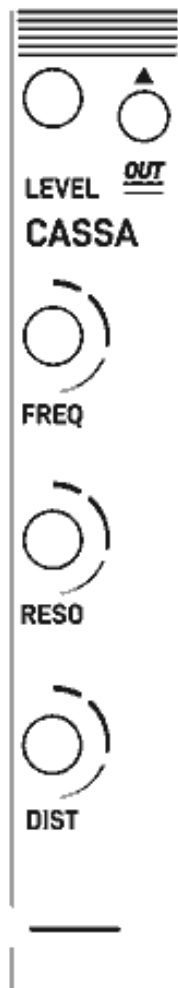
-VCA3 = VCA3 out routed to VCA4 (two other cascaded VCAs)

-VCA2 = VCA2 routed to VCA4

it is possible to route three cascaded VCAs (VCA1,VCA2,VCA4)



----- CASSA (Bass Drum)



Directly connected to its own rhythm generator it has three controls

- |       |   |
|-------|---|
| -FREQ | The pitch control   |
| -RESO | Resonance, ranging for very dry to a fat bubbling sound, and finally self oscillating |
| -DIST | Adds harmonics to the percussive sound  |

----- SNARE (Rullante)



It has a percussive tom section and a white noise combined to give its characteristic sound

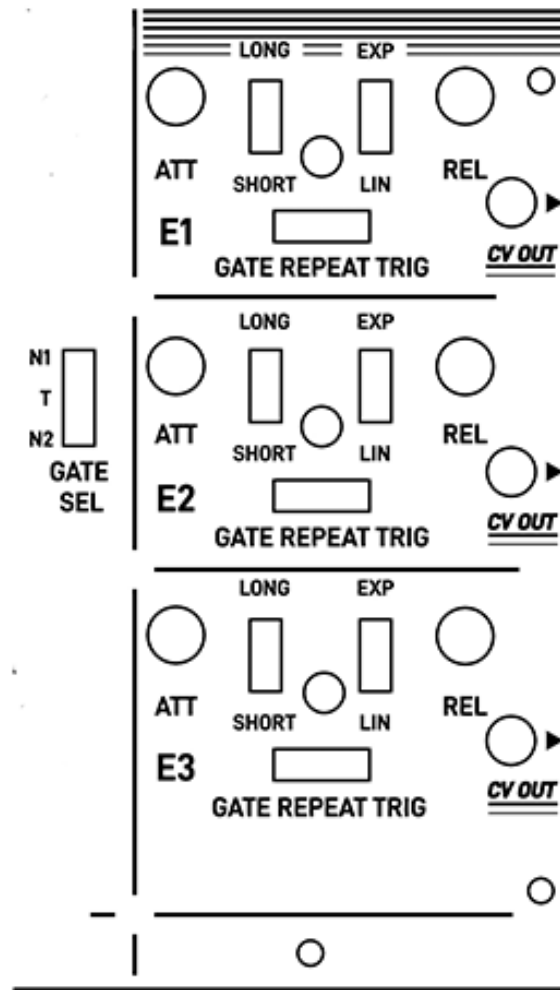
-FREQ

The pitch control for the tom

-DECAY

Set duration of the noise section

## ----- ENVELOPES



There are three identical linear-exponential envelope generators with Attack and Release time controls

ENV1 is driven by N1-E1 (white led)

ENV2 is driven according to GATE SEL selector

ENV3 is driven by N2-E3 (purple led)

### MODE SWITCH

Selects the operation mode:

-GATE aka sustain mode the outputs goes up and stay up as long its gate input is high (led N1 or N2 on) then goes down, it adds expression to the performance but may not work when A or R time is set too high and gate time is short (would never raise up)

-REPEAT aka LFO mode if the gate is high the output oscillate continuously at the rate set by ATTACK and RELEASE

-TRIG aka LELOOP mode the output pulses one time when the gate goes on during the cycle further gate pulses are ignored, good for percussive sound

### LONG-SHORT

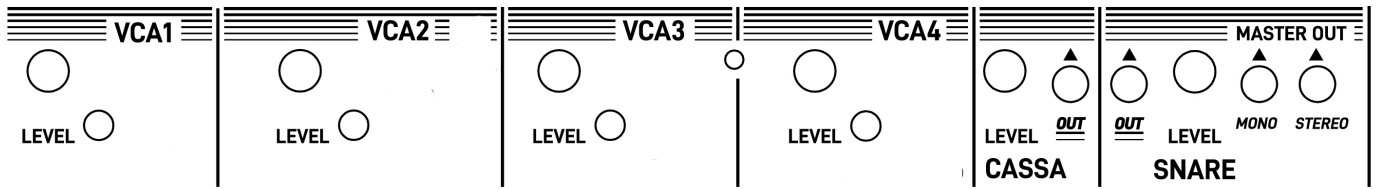
Select a faster or slower range for ATTACK and RELEASE allowing snappy to long drones sounds



EXP-LIN	Select the curve of the envelope EXP=natural LIN=brutal
ATT	Set the rise time of the envelope: in GATE mode when gate time is shorter than ATTACK time the output may never reach its final level.
REL	Set the fall time of the envelope.
E2 GATE SEL	Select the source for ENV2 -N1 ENV2 is gated along with ENV1 -T the T comparator from the note generator -N2 ENV2 is gated along with ENV3

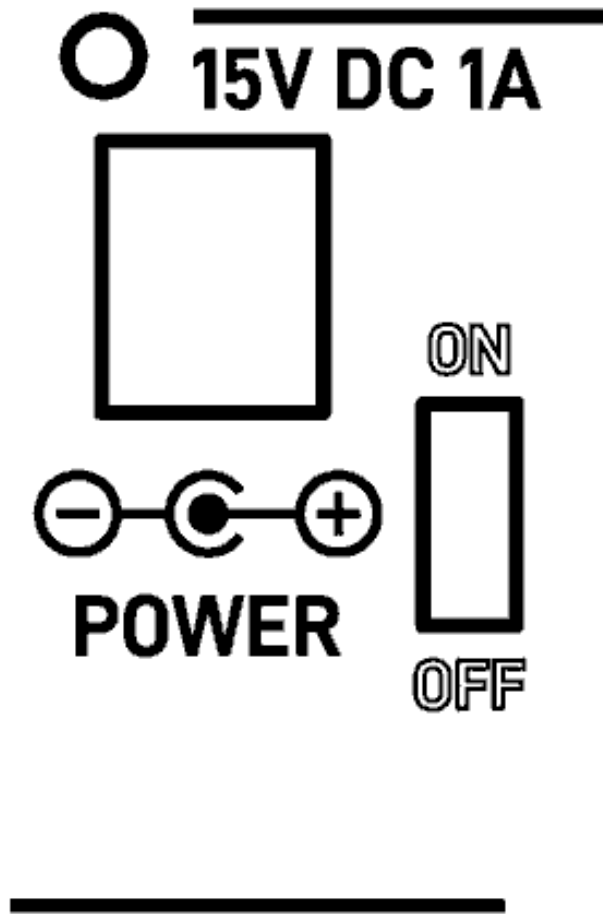
Beware that when easy scale or arpeggios are selected the T white led doesn't reflect anymore the status of its comparator, however you can rely on the ENV2 red led for monitoring the comparator.

----- AUDIO MIXER

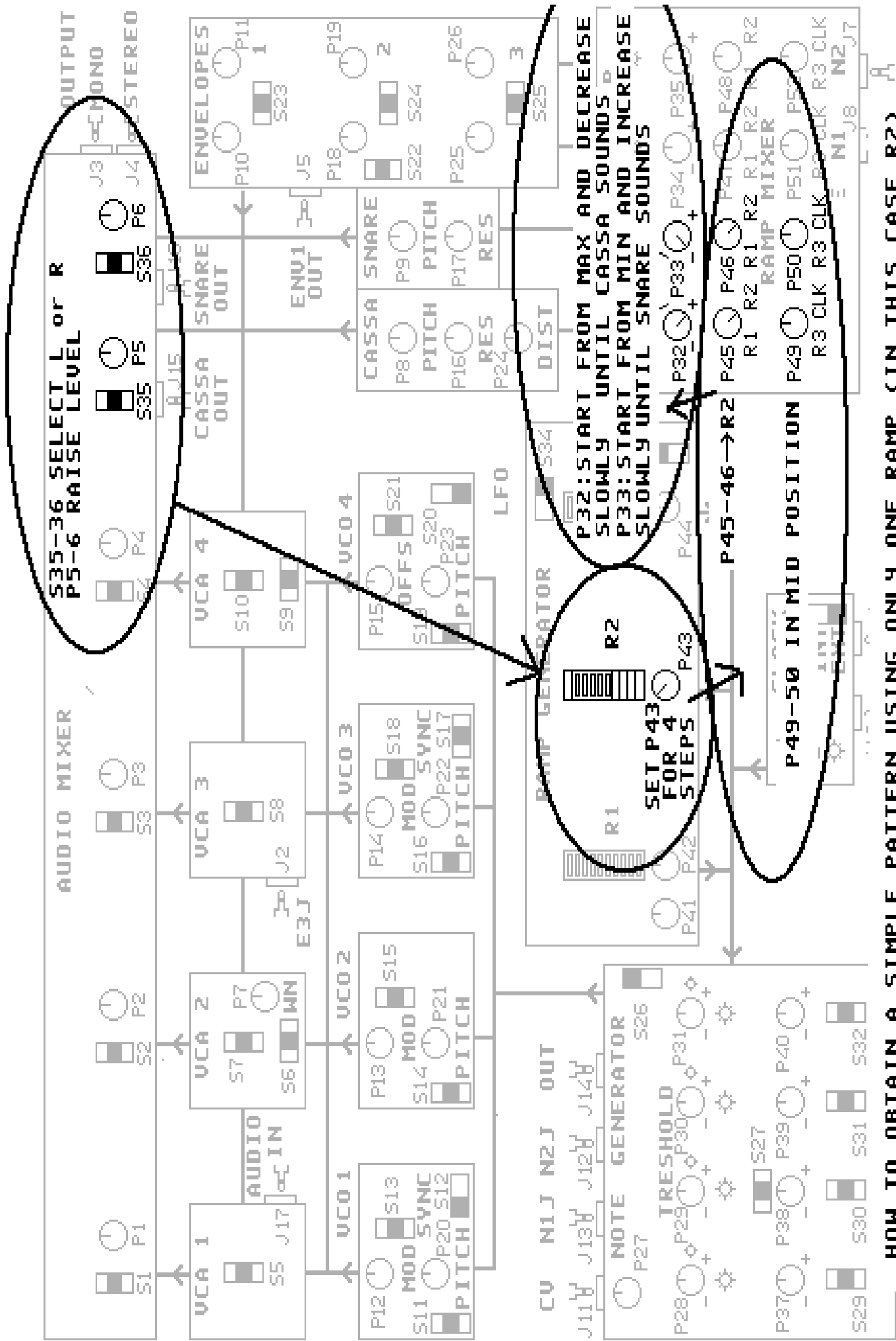


- LEVEL Adjust the level of the six audio channels VCA1,VCA2, VCA3,VCA4,CASSA,SNARE
- STEREO OUT Left channel VCA 1-2, right channel VCA 3-4, CASSA and SNARE center.
- MONO OUT All mixed on a mono mini jack.
- CASSA OUT CASSA individual out
- SNARE OUT SNARE individual out

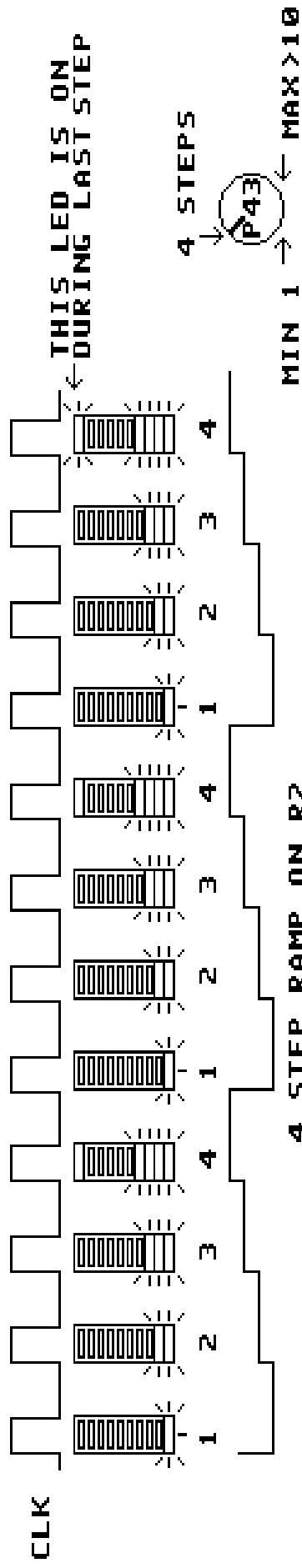
----- POWER



ARPOLOOP works with 15 Volt 1A power supply, center positive, there is a reverse polarity protection and a fuse to secure operation.



HOW TO OBTAIN A SIMPLE PATTERN USING ONLY ONE RAMP ( IN THIS CASE R2 ) GATE



P45 R2

P46 R1

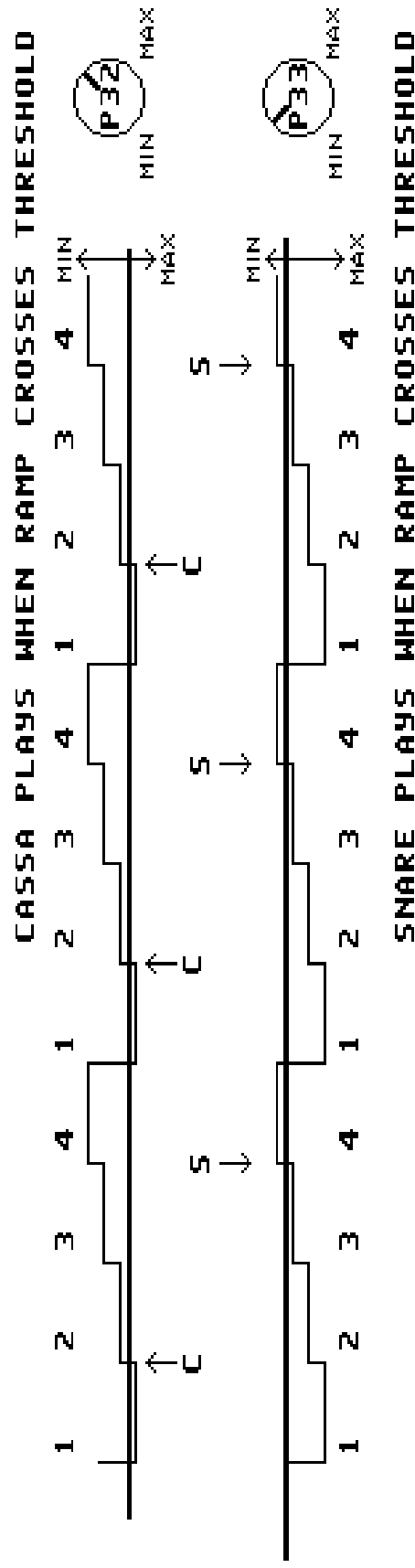
THESE ARE SET TO R2 (FULL RIGHT)

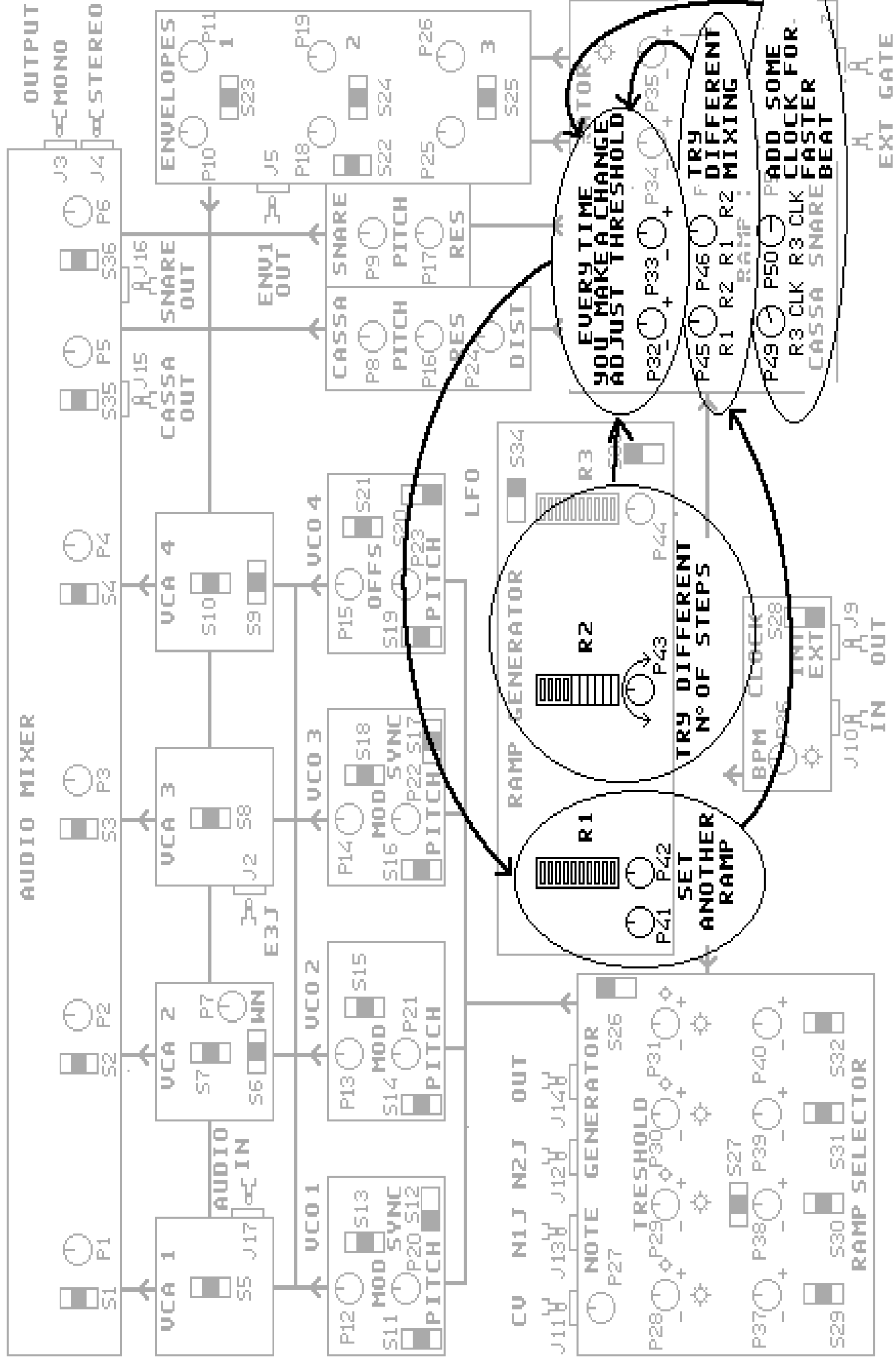
P49 CLK

P50 R3

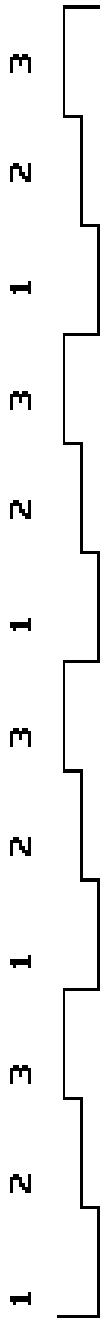
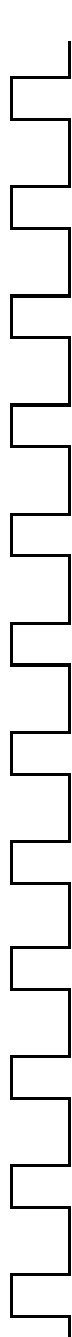
CLK

THESE ARE CENTERED TO MINIMIZE AMOUNT OF BOTH R3 AND CLK

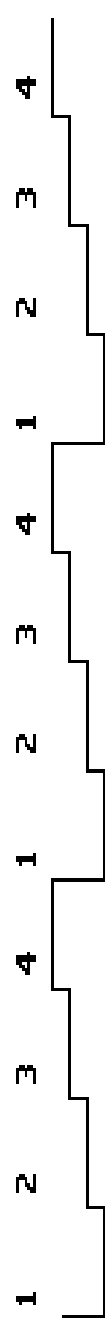




CLOCK

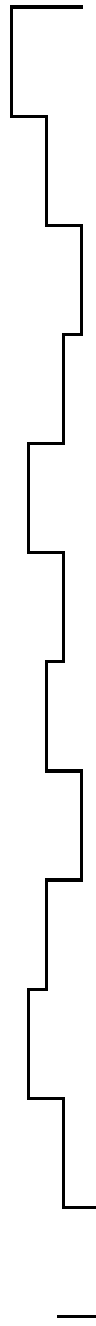


3 STEP RAMP ON R2

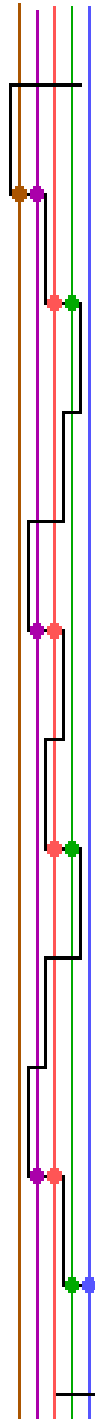


4 STEP RAMP ON R1

R1 MIXED WITH R2



R1



R3

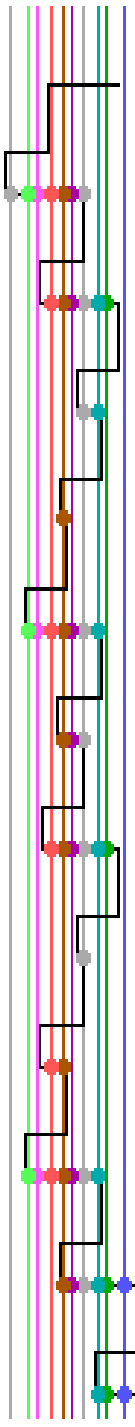
THE COLORED DOTS ARE THE PATTERN SELECTED BY CHANGING THE THRESHOLD

NOTE THAT THE CENTRAL PATTERN (RED) IS MORE DENSE

NOW ADD SOME CLOCK



R3 CLK



THERE ARE MANY MORE PATTERN TO CHOOSE BY FINE TUNING THRESHOLD

