Serge Modular Manual: SFU Music Area

[???, 2022]

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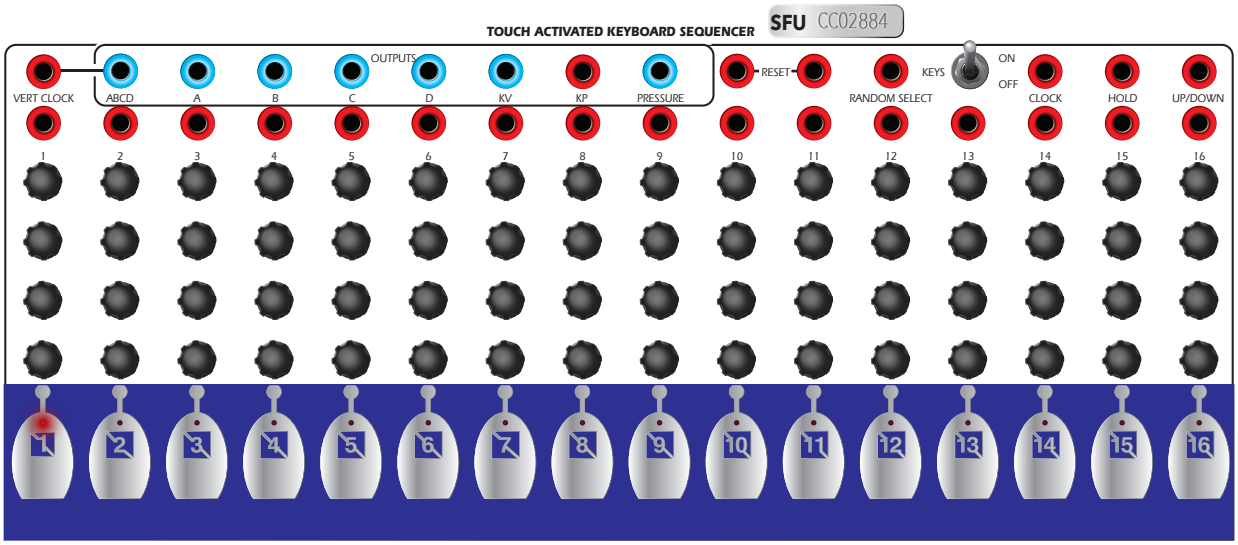
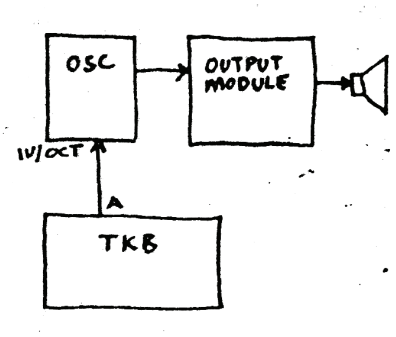


The Touch Activated Keyboard Sequencer Module, or TKB is a single large module designed specifcally to produce control voltiges. As discussed earlier, there is no physical or electrical difference between audio and control voltages other than that MOST audio voltages are between -2.5 volts and +2.5 volts, and all audio voltages are between 20 and 20,000 Hertz; while control voltages are between -12 and 0 volts, or 0 and +12, with frequencies anywhere between 0 and 500 Hertz. The actual difference between the two voltages are the uses to which they are put. The same voltage can be used in different ways. In one case it could be an audio voltage, in the other it could be a control voltage. However, some voltages are simply more useful in one situation than the other. The voltages produced by the TKB are designed to be used as control voltages.



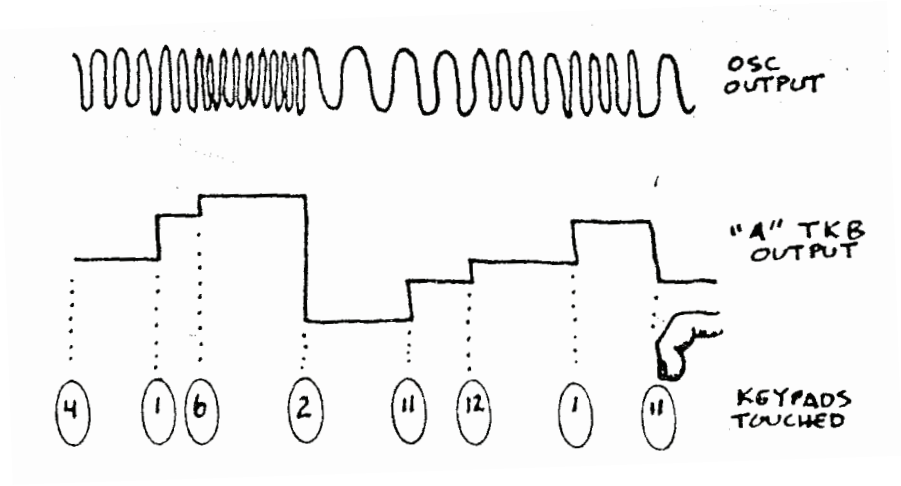
The TKB has four rows of pots across, labelled A,B,C, and D, and one row of keypads. There are 16 columns each with four pots (ofe from each row) and one keypad. At any given instant ONE and ONLY ONE column is activated and this is indicated by an LED (Light Emitting Diode) on the keypad of the respective column. These columns will be referred to from now on as STAGES.

5.1 The main outputs of the TKB are located at the top left-hand section on the module, enclosed in a border. There are five gain voltages outputs (blue jacks) labelled A,B,C,D and ABCD. Patch the A output of the TKB to the 1V/OCT input of the OSC as shown in the above diagram. The OSC should be set to an audio frequency and its output sent to the output modules. Turn KEYS switch on and make sure that no other cords are patched to the TKB.

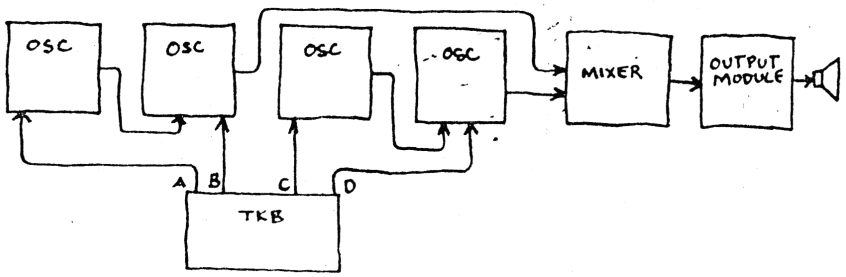
5.2 Touching keypad #1 activates stage #1 which is indicated by the LED that lights on keypad #1. Turn the pot in stage #1 and in row A (the top pot in stage #1) right and left. The OSC's frequency should shift up and down correspondingly. This pot is now remote-controlling the frequency of the OSC using a voltage that is appearing at output A.

5.4 Touch keypad #2 and set its A pot to a different setting then the A pot of stage #1. By alternately tapping keypads #1 and #2 you can get the OSC to produce two different "notes" or pitches without sliding from one to the other. This same procedure can be used to tune all 16 pots in row A. This is the tuneable keyboard.

The output of the TKB is NOT an audio voltage but rather a series of steady, or DC (direct current) voltages which are CONTROLLING the setting of the OSC (or whatever module or parameter the output is patched to). The OSC is designed to respond to these control voltages exactly like it responds to the turning of its pots. Just as the notes on a singer's score do not oscillate, so the voltages from the TKB do not oscillate but merely specify the OSC frequency. Below is a diagram of the voltage outputs of the TKB, and the OSC.

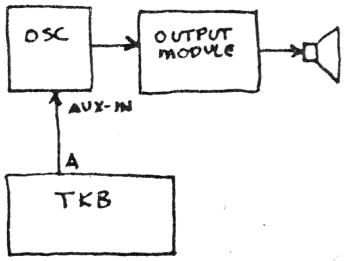


Patched in this fashion, none of the pots in Rows B, C, or D have any effect. However, if it is re-patched so that the output of the TKB is taken from the B output instead of the A output then only the pots in Row B will Be active. The same is true for Rows C and D. It is possible to use all four of these outputs (or as many as needed) SIMULTANEOUSLY as in the Patch below.

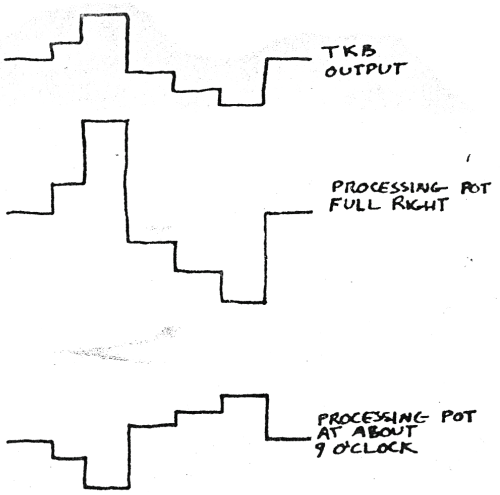


Now at each stage the pot in Row A controls the frequency of the Modulating OSC while the pot in Row B controls The base frequency of the modulated OSC. Row A and B could be replaced by any two rows. By touching the Sixteen different keypads and setting the appropriate pots, sixteen different sounds can be set up and recalled In any order at the touch of a finger.

5.5



In the above patch the processing pot associated with the AUX-IN processes the incoming voltage from the TKB. Below are some typical processed TKB voltages:



5.6 It is convenient to think of the TKB in this manner: All the pots in each row are tied to a common output (output A for the pots in row A for instance) but only one pot is activated and that is determined by which keypad was last touched. Since there are four rows, four parameters or modules can be controlled in 16 pre-set ways and these pre-sets, or stages, can be accessed directly by the touch pads.

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TOUCH ACTIVATED KEYBOARD SEQUENCER: (TKB). It is useful to think of the TKB as composed of two seperate parts: The Sequencer and the Touch Pad Controller.

16-STAGE Sequecer. Only one stage can be on at any given instant. Each stage controls a specific column of pots, so that if stage #7 of the Sequencer is on, it activates all four pots in stage #7.

In its normal mode the Sequencer will advance one stage every time is receives a CLOCK pulse. That is, if the Sequencer was on stage #5 and it receives a CLOCK pulse it will advance to stage #6. If it is on stage #16 and receives a CLOCK pulse, it wraps around and activates stage #1. This function was described in an earlier section. There are, however, a number of other ways of controlling the Sequencer to produce elaborate musical patterns.

UP/DOWN. If a HI voltage is applied to the UP/DOWN input, the Sequencer wil step DOWNWARDS instead of upward when it receives a CLOCK pulse. If it is on stage #1, it will wrap-up to stage #16.

[intentionally left blank]

HOLD. If at any time (either in its up or down mode) the Sequencer receives a HI voltage at its HOLD input, the Sequencer will stop until the HOLD input again drops LO. This is useful for producing elaborate rhythms.

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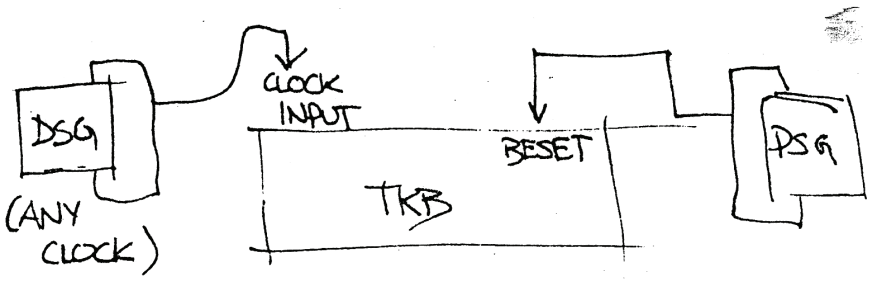
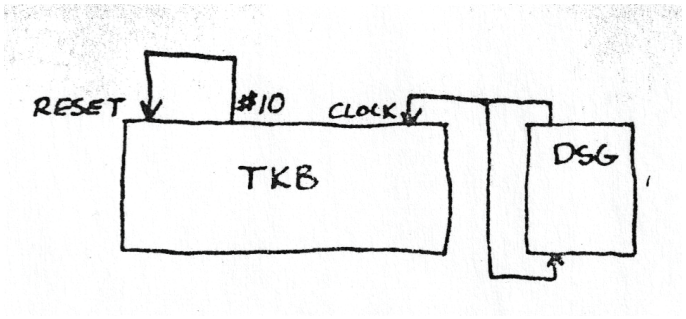
VARIABLE LENGTH SEQUENCES. It is often desirable to have sequences shorter than sixteen stages, or to have variable length sequences. For these purposes two RESET inputs are available at the top of the TKB. The RESET is triggered by a pulse from other pulse outputs on the TKB or by pulses from other modules.



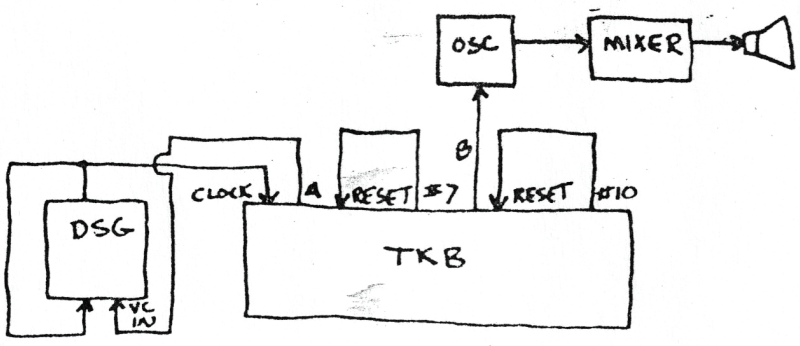
In the above patch, to get the TKB to RESET to Stage # you must first touch Keypad #1. The number of stages clocked advaced before resetting is determined by the Transient generator which is Triggering the RESET. Set this Transient generator so that about four stages are clocked through before RESETting occurs. If you touch a different keypad, say #7, you will find that the sequence resets to that stage. Each RESET input resets to the Keypad last touched. Using the above patch, and by touching different keypads, it is possible to produce an interesting interactive sequencer.

Above each stage of the Sequencer is a Pulse output that goes high when that stage is ON. One of their uses is to Trigger the RESETs providing a second way of producing sequences shorter than 16 stages. If the pulse out of stage #10 is patched to the RESET, the sequencer will step through to Stage #9 and then RESET instead of activating Stage #10. Note that the sequencer will sequence only to the stage just preceding the stage that is patched to the RESET and will not include that stage.

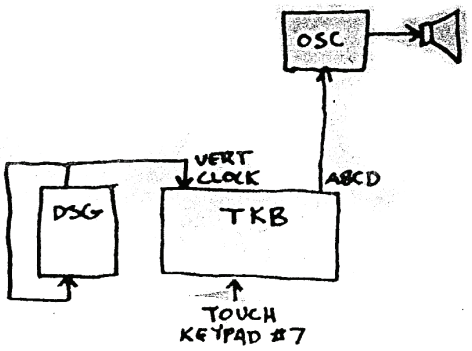


In this patch, just like in the previous one, the sequence will return to stage #1 only if that was the last keypad touched, otherwise, it will reset to whatever pad was last touched. In the above patch you can get the sequence to activate stages 5,6,7,8,9 and then reset to 5 by tapping stage 5's keypad. By tapping different keypads different length sequences can be "plated", each ending at stage 9.

The two RESET inputs on the TKB are independent of each other though identical in function. By using them both, two different sequences can be set up and chosen by a tap of the finger. In the patch below the Pulse out of stage 7 is sent to one RESET input and the pulse from stage 15 is sent to the other. By touching keypads 1-6, sequences are activated that start with the touched key and terminate with stage $6. By touching keys 8-14 similiar sequences, but ones that terminate with stage #14 are set up. With a touch of a finger they can be selected. That touch also chooses the beginning stage of the sequence.

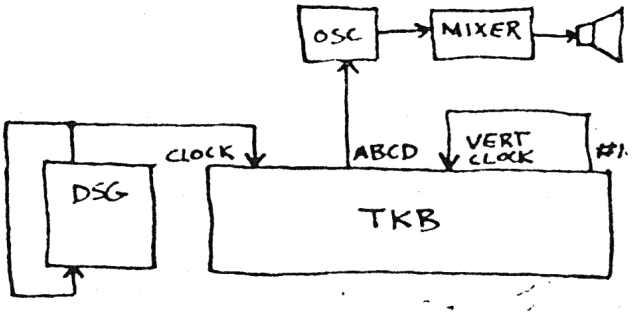


VERTICAL SEQUENCER. The TKB contains a second sequencer, this one in 4 stages, which is clocked independently of the main 16 stage sequencer. The clock input for this sequencer is labelled VERT CLOCK. The VERT Sequencer's output is labelled ABCD. Every time a Trigger is received by the Vertical Sequencer it steps DOWN one ROW. That is, if it was on Row B, it will progress to Row C. After Row D it wraps around to Row A. The output of ABCD is determined by the pot that is in the activated Stage of the Ptrogrammer (as determined by the main Sequencer and the Keypads) AND in the rown specified by the Vertical Sequencer. If the activated stage of the Programmer is not changed, then the Vertical Sequencer will have a four stage sequence set by the four pots in the activated stage.



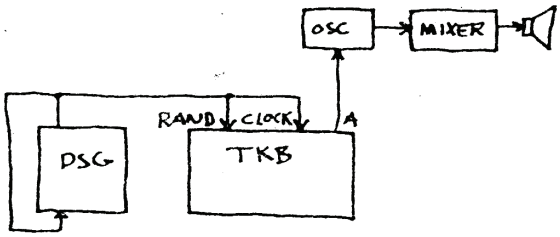
If in the aboe patch, stage #7 is now activated by touching its associated keypad, the four pots in stage #7 will determine ABCD's output.

A particularly useful function of this Vertical clock is that it allows the user to produce sequences of up to 64 stages. This is done by having the main sequencer clocked by an external clock and having the Vertical Sequencer clocked by the Trigger out of stage #1. The 64 stage output is found at the ABCD output.

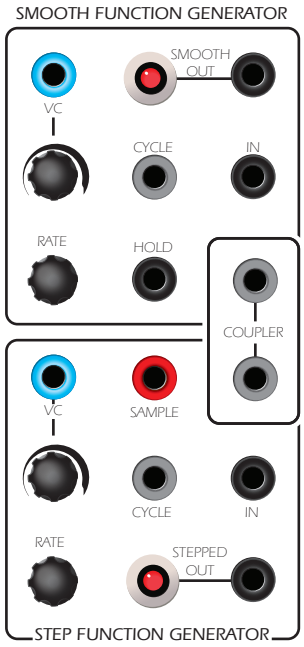


Consider what happens when the vertical sequence starts on Row A. Since the main sequencer clocks through all sixteen stages, all of Row A appears at output ABCD. When the main Sequencer gets to Stage #1, its pulse out, steps the Vertical Sequencer down one row, to Row B. The Main (horizontal) Sequencer now wraps around and clocks all the way across with the pot settings in Row B appearing at the ABCD output. This will continue, stepping to row C then to Row D until the 64 stages have been sent to the ABCD Output. The sequence will then repeat itself.

RANDOM SELECT. If the Random Select is pulsed at the same time as the RESET, the sequencer will reset to a random stage.



TOUCH PADS. The 16 Touch Pads can be used to interact with the 16-stage Sequencer, or can be used independently. Some of its interactive functions have been discussed already. It is important to note that the KB, KP, and PRESSURE outputs are always selected by the touch pads and not the Sequencer except when the Sequencer is in the Random mode. when the KEYS switch is ON, the Touch Pads will also turn the associated Sequencer stage on. If the KEYS switch is OFF, then the Sequencer and Touch Pads will be totally independent unless the RESET inputs are used. Both the KB and PRESSURE outputs produce the full range of control voltages, from - to +5 volts. The KV output is equal-voltage steps, so with the proper processing, a 12-note equal-tempered scale can be set on the oscillators and filters. Of course, other equal-tempered scales can also be set.

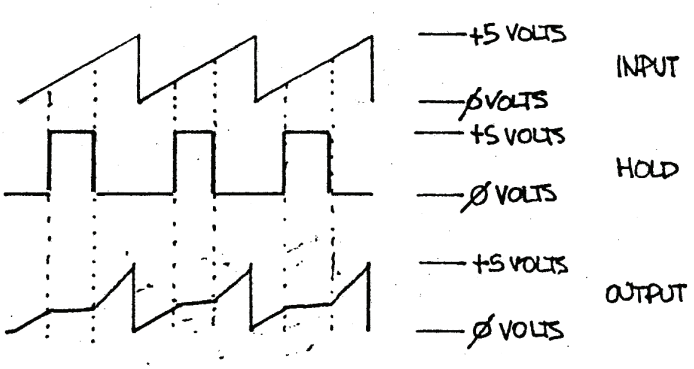


SMOOTH FUNCTION GENERATOR

FUNCTIONS:

1. SLEW LIMITER: SLOPE DETERMINED BY [RATE] POT. AND/OR ASSOCIATED ATTENUATION POT. SIGNAL IN AT [IN] CONTROL VOLTAGE APPEARS AT [SMOOTH OUT]

2. TRACK & HOLD: WHEN [HOLD] RECEIVES A HIGH VOLTAGE IT HOLDS THE LEVEL OF VOLTAGE SEENS AT INPUT UNTIL GOLD VOLTAGE GOES LOW. [RATE] SETS CORRELATION IE. TRACKING SPEED. FOR EXAMPLE:



3. LOW FREQUENCY OSCILLATOR: [CYCLE] ---> [IN] APPEARING AT SMOOTH OUT IS A TRIANGLE WAVE WHOSE FREQUENCY IS CONTROLLED BY THE [RATE] OR VC INPUT. IN THIS INSTANCE [CYCLE] IS A PULSE TRAIN (WAVE) OF THE SAME FREQUENCY AS THE TRIANGLE WAVE. [HOLD] STILL FUNCTIONS AS WELL.

COUPLER

A HARDWIRED COMPARATOR. IT COMPARES LEVELS AT SMOOTH & STEPPED OUTPUTS: WHEN STEP IS HIGHER OUTPUT OF [COUPLER] IS +5 VOLTS.; OTHERWISE IT IS 0 VOLTS. THE TWO OUTPUTS ARE PARALLEL

STEPPED FUNCTION GENERATOR (SAMPLE & HOLD DEVICE)

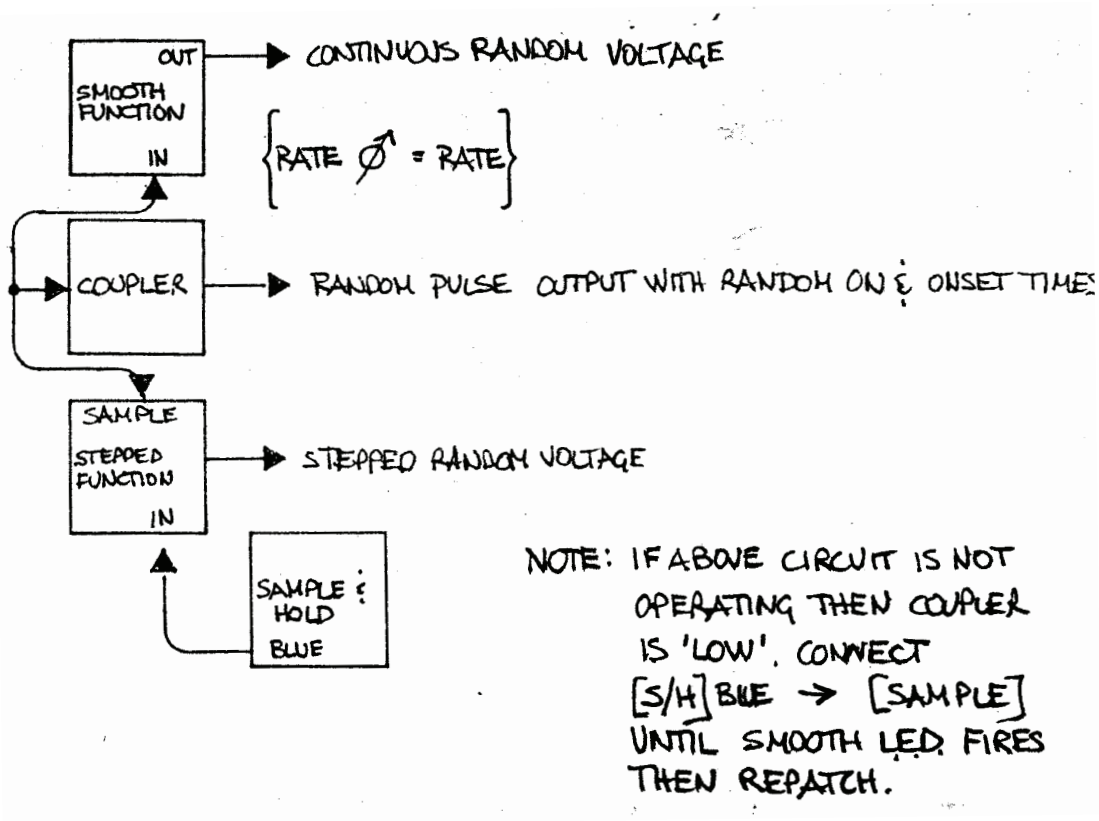
FUNCTIONS: SAMPLE & HOLD

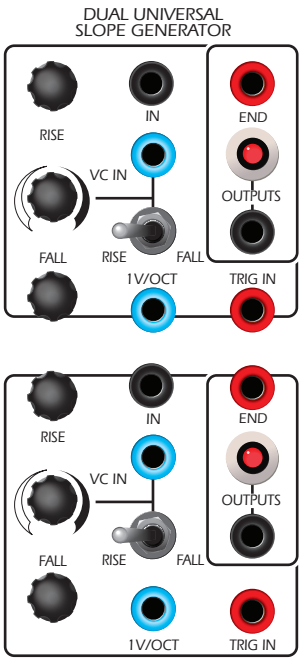
WHEN A PULSE IS RECEIVED AT [SAMPLE] THE VOLTAGE APPEARING AT [IN] IS OUTPUT AT [STEPPED OUT] AND IS HED CONSTANT AT THAT LEVEL UNTIL ANOTHER PULSE APPEARS AT [SAMPLE]. RATE POT & ITS ASSOCIATED V.C. INPUT CONTROL THE CORRELATION OF ONE VOLTAGE LEVEL TO THE PREVIOUS VOLTAGE OUTPUT LEVEL: IE. AS CORRELATION INCREASES THE 'STEPS' GET CLOSER TOGETHER THERBY CREATING A STAIRCASE EFFECT. IF THE RATE POT. IS AT 12:00 AND THE INPUT IS A RANDOMLY GENERATED VOLTAGE THE [STEPPED OUT] VOLTAGE APPROCIMATES A 1/F FUNCTION.

STAIRCASE GENERATOR

[IN] <--> [CYCLE] PULSE TRAIN OR (WAVE) TO [SAMPLE] [STEPPED OUT] OUTPUTS A 'STAIRCASE' VOLTAGE SERIES WHOSE FREQUENCY & STEPS ARE DETERMINED BY THE PULSE WAVE FREQUENCY, THE [RATE] SETTING, ETC.

RANDOM VOLTAGE GENERATOR:

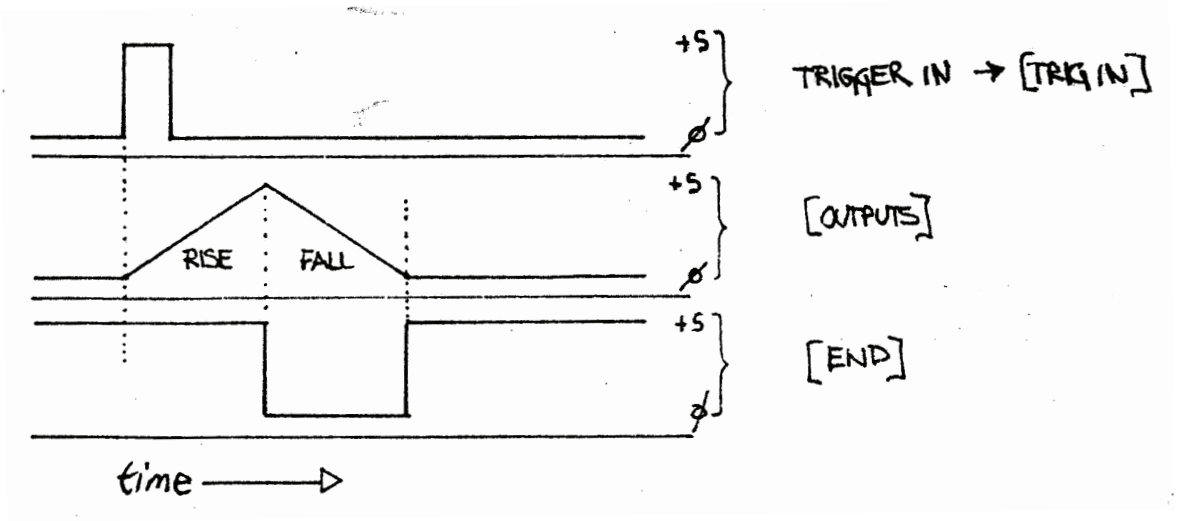




DUAL UNIVERSAL SLOPE GENERATOR

FUNCTIONS:
(ENVELOPE GENERATOR)
A TIGGER VOLTAGE INITIATES A RISE CYCLE WHOSE SLOPE IS DETERMINED BY A POT. OR A CONTROL VOLTAGE IF THE TOGGLE SWITCH IS IN THE RISE POSITION (NOTE THE PROCESSOR POT. FOR THIS C.V. BELOW THE RATE POT). THE FALL CYCLE WILL NOT BEGIN UNTIL THE TRIGGER LEVEL GOES LOW. THE DSG WILL NOT RESPOND TO A NEW TRIGGER UNTIL THE RISE/FALL CYCLE IS COMPLETE. ENVELOPE APPERS AT [OUTPUTS] TIME RANGE: 001 SEC --> 5 SEC APPROX.

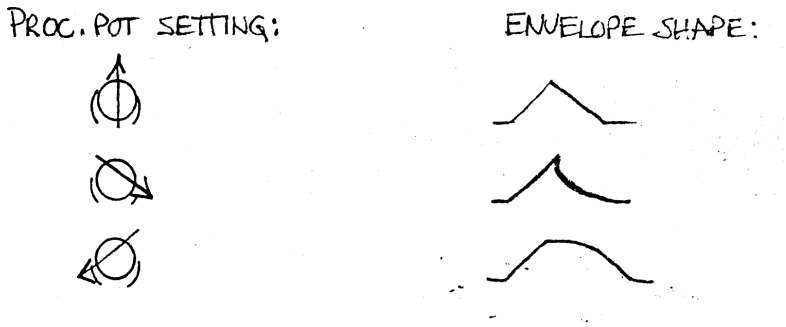
[END]: TRIGGER OUT
[VC IN] AS DESCRIBED ABOVE: C.V. INPUT FOR RISE TIME / RISE & FALL TIME / FALL TIME.
[IN] OUTPUT VOLTAGE AT [OUTPUTS] WILL RISE OR FALL TO VOLTAGE LEVEL AT [IN] AT RATE SET BY [RISE]/[FALL]. THIS WILL FUNCTION AS AN ENVELOPE SUSTAIN. [IN] OVERRIDES [TRIG IN]



LOW FREQ. OSCILLATOR / CLOCK:

[TRIG IN] <--> [END] [OUTPUT] IS TRIANGLE WAVE WITH WAVE SHAPE AND FREQ. A FUNCTION OF [RISE] [FALL] LEVELS OR A V.C. SIGNAL AT [VCIN] OR [1V/OCT] (SEE FIG.1). [END] OR [TRIG IN] PROVIFE A CLOCK OUTPUT (PULSE) OR LEADING EDGE SUITABLE FOR TRIGGERING TKB ETC.

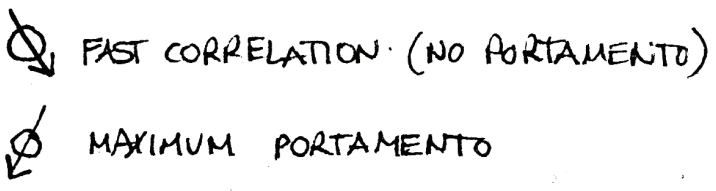
TO CREATE A NON LINEAR SLOPE:
[TRIG IN] <--> [END]   [VC IN] <--> [OUTPUT]



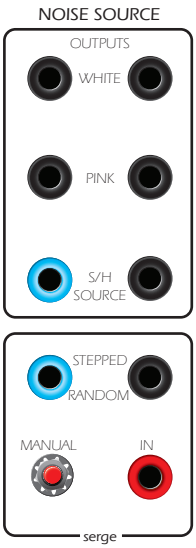
LOW PASS FILTER (VOLTAGE CONTROLLABLE):

SIGNAL --> [IN]   [OUTPUT] --> FILTERED DUE TO SLEWING EFFECT:
[RISE][FALL] SET CLOCKWISE VERY FAST CORRELATION / SLEW
THEREFORE LITTLE FILTERING; A [RISE][FALL] SLOWED SLEWING
REMOVES HIGH FREQ:

WITH A CONTROL VOLTAGE IT ACTS AS A V.C. SLEW OR
PORTAMENTO DEVICE BOTH POSITIVE AND NEGATIVE:

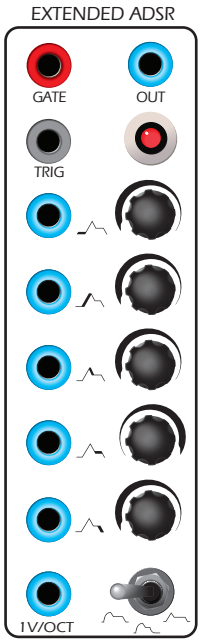


TRIGGER DELAY: TRIG --> [IN(1)] [END(1)] --> [TRIG IN(2)][END(2)] --> DELAYED TRIG



NOISE SOURCE

[WHITE] & [PINK]	NOISE OUTPUTS
[S/H SOURCE]	RANDOMLY MODULATED SAWTOOTH WAVE OF 400 HZ. OUTPUTS RANDOM VOLTAGES FROM 0 --> +5V. BLUE JACK IS A POSIBITE GOING WAVEFORM. BLACK JACK IS BOTH POSITIVE AND NEGATIVE GOING (BIPOLAR).
[STEPPED RANDOM]	PRODUCES A NEW RANDOM VOLTAGE EACH TIME THE BUTTON IS PRESSED OR EACH TIME A TRIGGER APPEAR AT [IN]



EXTENDED ADSR

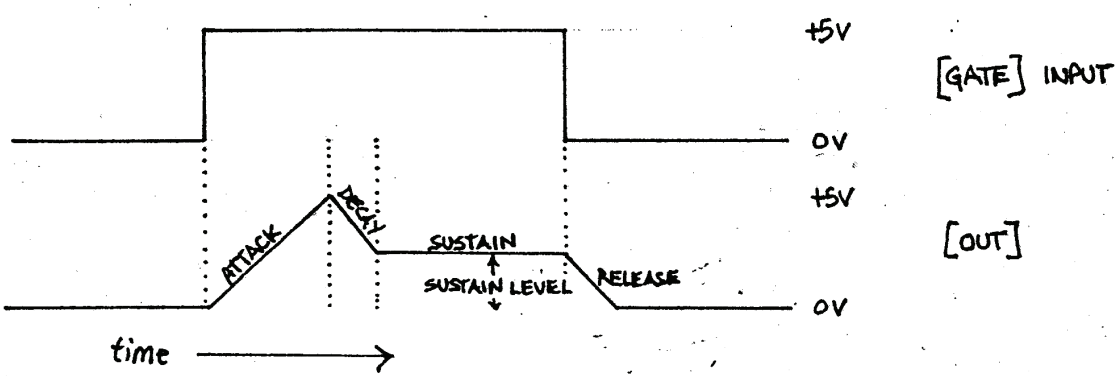
1. LENGTH OF DELAY BEWTEEN RECEIPT OF TRIGGER PULSE & ONSET OF ENV.

2. ATTACK SLOPE

3. DECAY SLOPWE: FALLS TO LEVEL SET BY 4.

4. SUSTAIN LEVEL: DURATION DETERMINED BY HOW LONG GATE REMAINS AT +5V

5. RELEASE SLOPE: WILL BEGIN ONLY AFTER GATE INPUT GOES TO 0



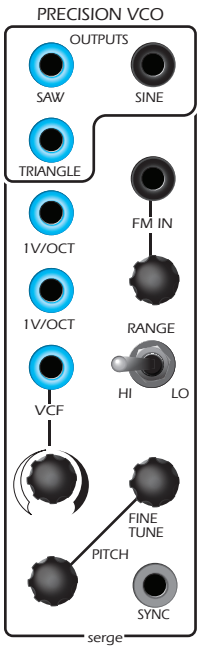
[GATE] : NORMAL TRIGGER INPUT. NOTE: MUST RAEMAIN AT +5 V UNTIL END OF INITIAL DECAY

[OUT] : WITH NO INPUT AT [GATE] [OUT] OUTPUTS A VOLTAGE WHOSE LEVEL IS SET BY THE SUSTAIN LEVEL POT

[TRIG] : WITH A TRIGGER AT [TRIG] VOLTAGE AT [OUT] DROPS TO - AT A RATE SET BY THE RELEASE SLOPE POT. VOLTAGE THEN RISES TO PEAK VOLTAGE AT RATE SET BY ATTACK SLOPE POT THEN DROPS TO LEVEL SET BY SUSTAIN LEVEL POT AT RATE SET BY THE DECAY SLOPE PO

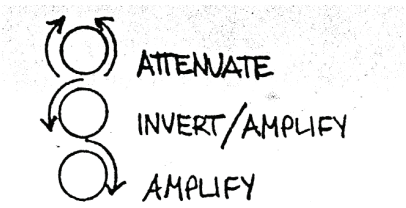
NOTE : DURING SUSTAIN MODE WITH A TRIGGER AT [GATE] ANOTHER TRIGGER AT [TRIG] WILL CAUSE A NEW ATTACK TO BEGIN.

[1V/OCT]: AN INCREASING VOLTAGE APPLIED HERE WILL DECREASE ALL TIME SETTINGS.



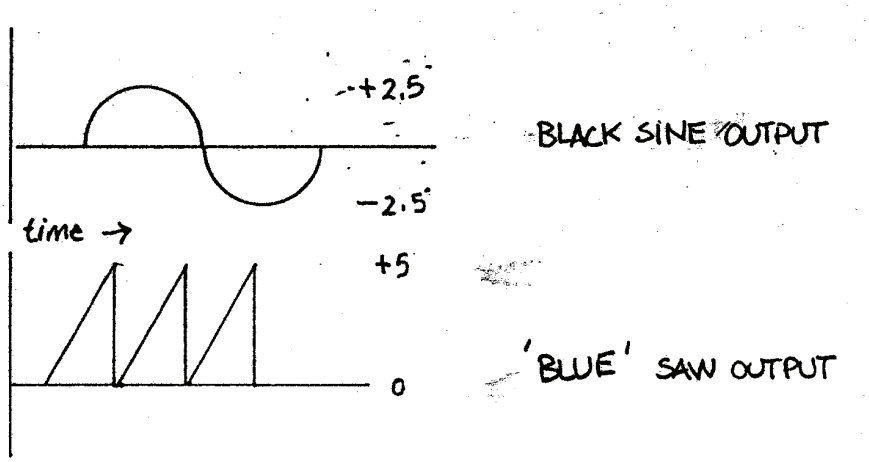
PRECISION VCO

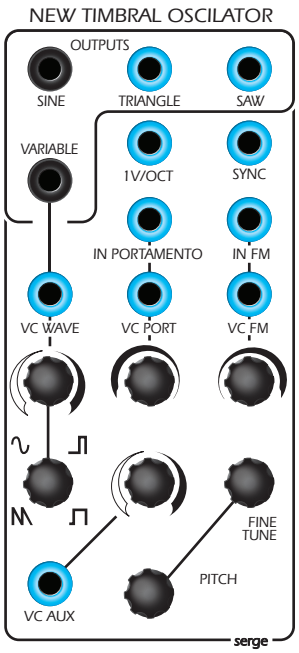
[VCF] POT PROCESSED INPUT FOR VOLTAGE CONTROL



[1V/OCT] EVERY INCREASE AT THIS INPUT OF 1 VOLT WILL CAUSE FREQUENCY TO DOUBLE (PITCH CHANGE OF 1 OCT.)

[SYNC] FROM SAWTOOTH OUTPUT OF ANOTHER OSCILLATOR LOCKS TWO OSCILLATORS TOGETHER: NOTE THEY WILL LOCK ONLY TO THE FUNDAMENTAL OR STRONG HARMONIC.





NEW TIMBRAL OSCILATOR

[IN PORTAMENTO] : INPUT IS A VOLTAGE CONTROL SLEWING PROCESSOR: IT 'GLISSES' OR SLEWS BETWEEN STEPPED VOLTAGES. THE RESULTING SMOOTH FUNCTION IS SUMMED WITH THE OTHER VOLTAGE CONTROLS OF THE NTO. RATE (IE. SLOPE) IS DETERMINED BY THE POT AND OR VOLTAGE CONTROL INPUT.

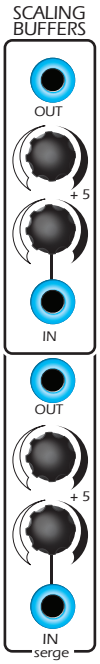
[VC AUX] : VOLTAGE CONTROL INPUT WITH ASSOCIATED INVERT/ AMPLIFY/ATTENUATE POT : LOGARITHMIC.

[IN FM] : FREQUENCY MODULATION MODULATOR INPUT : LINEAR

[VC FM] : VOLTAGE CONTROL INPUT FOR ADJUSTING DEPTH OF FM & ASSOCIATED MANUAL POT ADJUST. IN EXTREME CLOCKWISE POSITION RESULT IS NOT LINEAR.

[VC WAVE] : V.C. INPUT WITH ASSOCIATED INVERT/AMPLIFY/ATTEN. POT SUBSTITUTES FOR MANUAL POT WHICH SELECTS WAVEFORMS. LOW VOLTAGES = ⩘⩘⩘ , HIGH VOLTAGES ⎍

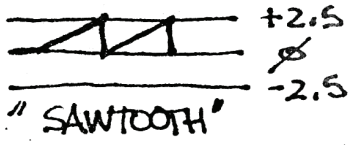
[VARIABLE] : VARIABLE WAVEFORM OUTPUT



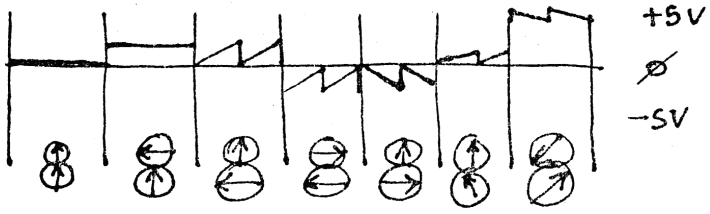
SCALING BUFFERS

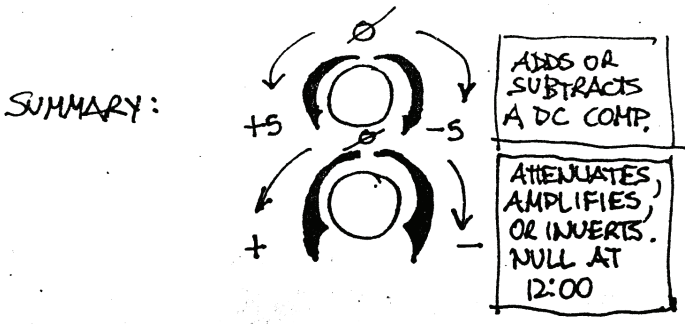
TWO IDENTICAL VOLTAGE PROCESSORS FOR CONTROL VOLTAGES. INCOMING VOLTAGES CAN BE AMPLIFIED, ATTENUATED OR INVERTED & A D.C. COMPONENT (+ OR -) OR AN OFFSET MAY BE ADDED. WITHOUT AN INPUT, MODUL WILL OUTPUT A D.C. VOLTAGE FROM +5 TO -5V.

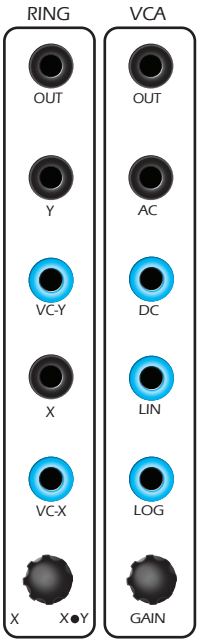
TO ILLUSTRATE:
WITH A GIVEN
CONTROL VOLTAGE INPUT



MODULE OUTPUTS:
(POT SETTINGS ON BOTTOM)



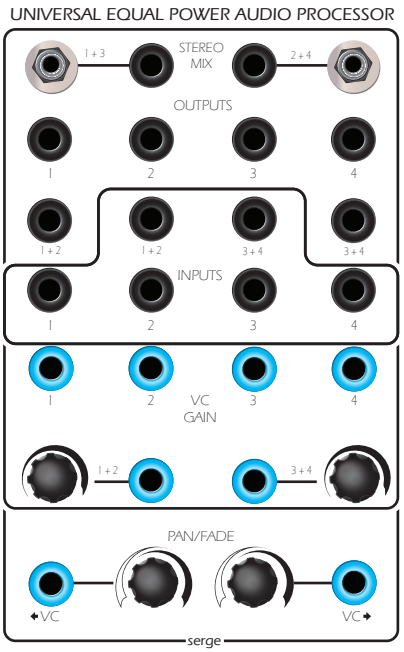


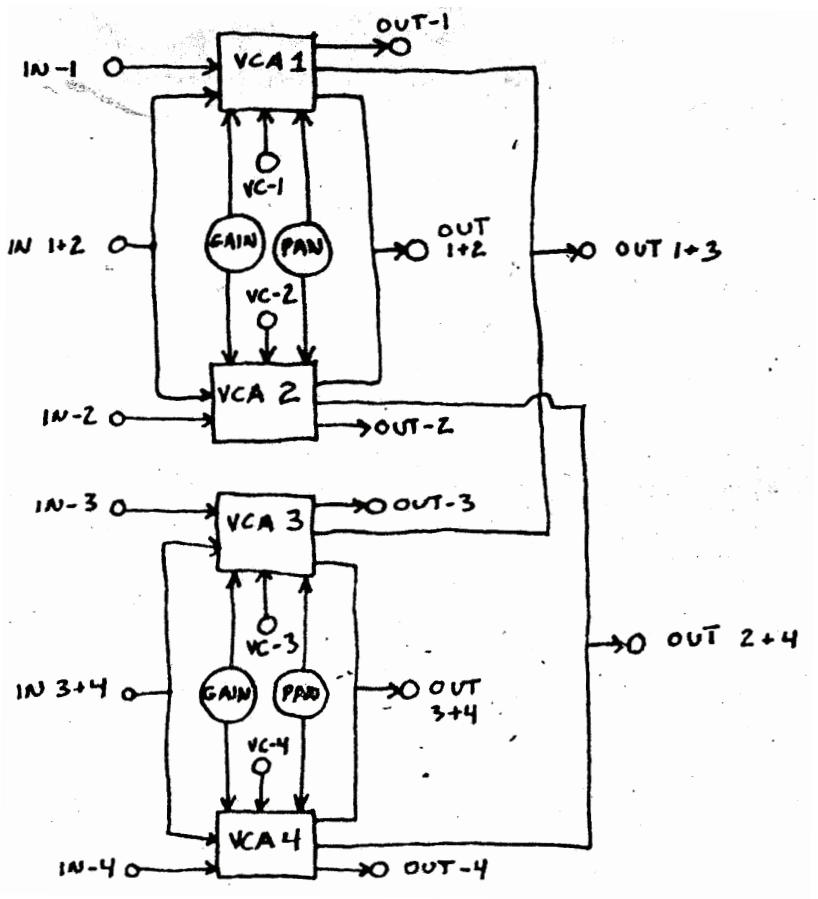


RING MOD & VCA

RING	:	INPUTS 2 SIGNALS, OUTPUTS SUM & DIFFERENCE OF THE FREQUENCIES INVOLVED BUT NOT THE FREQUENCY OF THE 2 INPUT SIGNALS
[VC-Y][VC-X]	:	VOLTAGE CONTROL AMPLIFIERS WHICH MIX IN THE ORIGINAL INPUT SIGNALS WITH THE OUTPUT RESPOND TO C.V. AT THESE INPUTS.
[X] [X·Y]	:	POT IN FULL COUNTER CLOCK WISE POSITION CHANGES MODULES FUNCTION FROM RING MODULATOR TO V.C.A. IN CLOCK WISE POSITION MODULE FUNCTIONS AS A RING MODULATOR.
VCA	:	AUDIO SIGNAL INPUT [AC] CONTROL VOLTAGE (IE. DC TYPE OR WITH DC OFFSET] INTO [DC]
[LIN]	:	CONTROL VOLTAGE INPUT : LINEAR
[LOG]	:	CONTROL VOLTAGE INPUT : LOGARITHMIC
[GAIN]	:	THRESHOLD ADJUSTMENT

UNIVERSAL EQUAL POWER AUDIO PROCESSOR (UPAP). At the heart of the UPAP are four VCAs which, though they can be used seperately, can also be used as dual VCA units, providing various panning, crossfading and mixing functions. Because of the range of uses it is the most space-effective module for a small Serge System. Below is a block diagram of the module.





Each VCA can be used seperately with signal input at 1,2,3 and 4 respectively. A signal to input 1 + 2 will be sent to VCAs 1 AND 2 for panning and an input to 3 + 4 will be sent to VCAs 3 AND 4. These "dual" inputs can be mixed with the individual inputs to the VCAs.

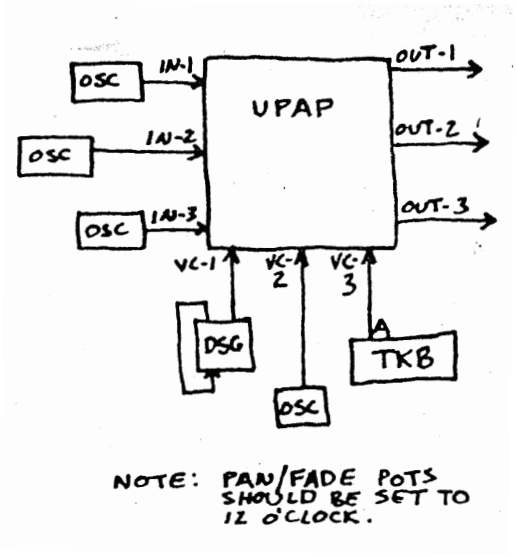
The output of each VCA appears individually at outputs 1,2,3, and 4 respectively. There are four mixed outputs: 1 + 2, 3 + 4, and 2 + 4. Outputs 1 + 3 and 2 + 4 have, in addition to their bannana jacks, mini-phone jacks to be used to send the output to external equipment. These are the usual left and right stereo outputs.

Each individual VCA has its own VC input located directly beneath its signal input. The overall gain of VCA 1 & 2 can be controlled by a single pot labelled 1 + 2 and its associated VC input. There is an identitcal configuration for VCA 3 & 4.

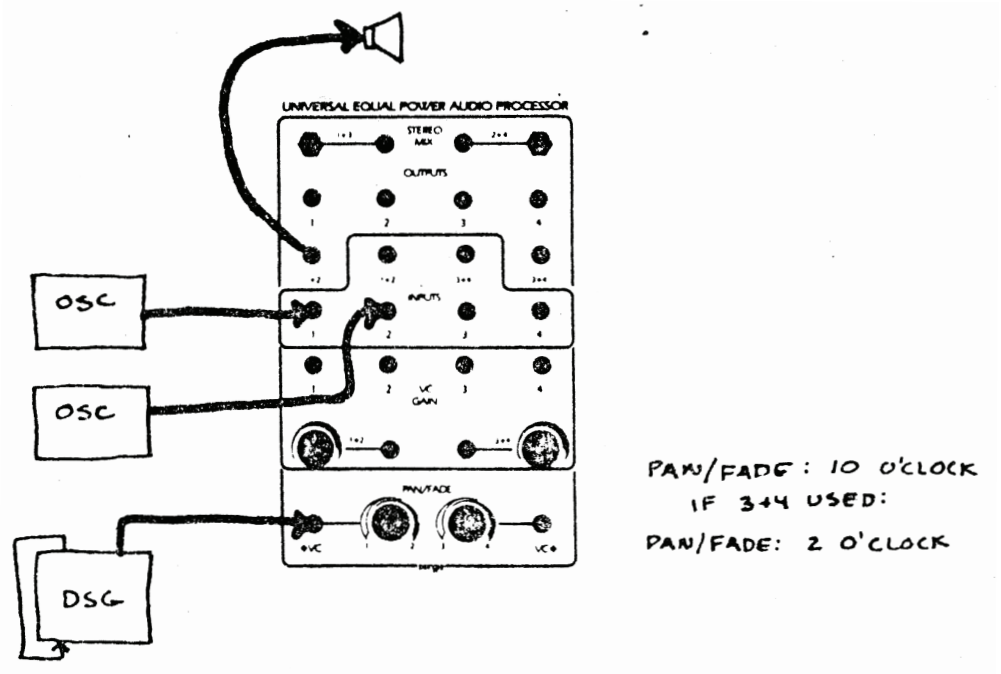
Lastly, the gain of the two pairs of VCAs (1 & 2 and 3 & 4) can be controlled by the Pan/Fade pots and their associated VC inputs such that, if set properly, the combined gain of the two remains the same during a cross-fade between them.

PATCHES:

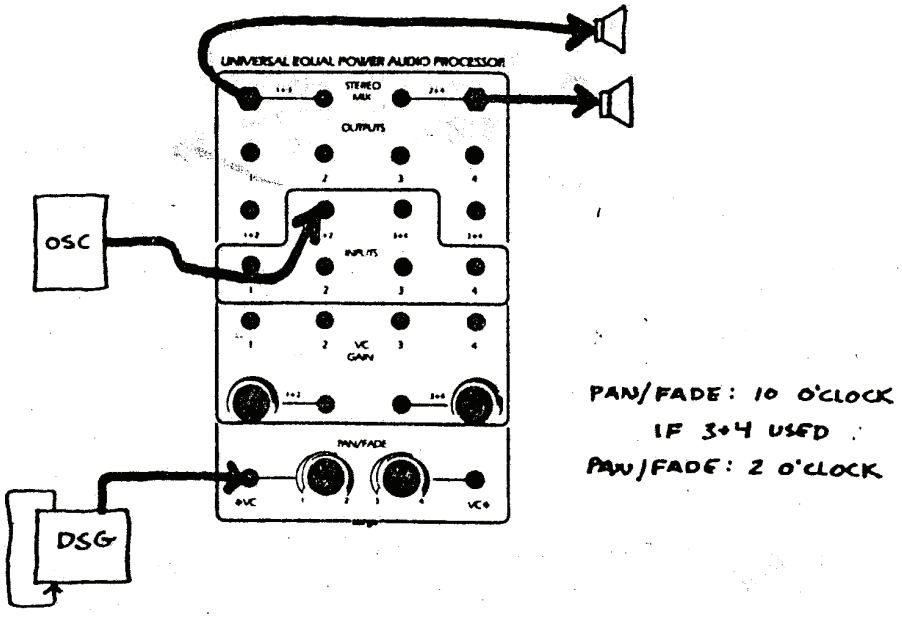
1. Four VCAs:



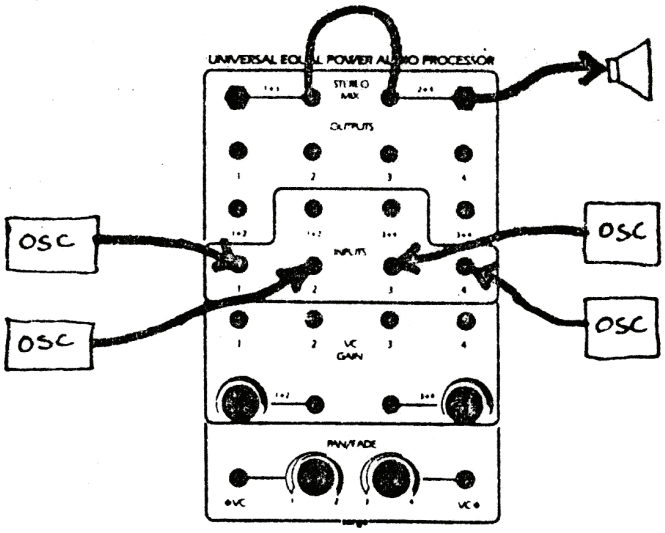
2. Two Crossfaders:

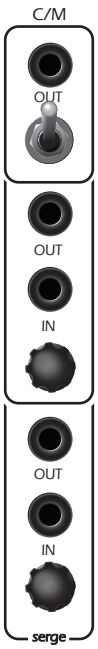


3. Two Stereo Panners:



4. Four out mixer:

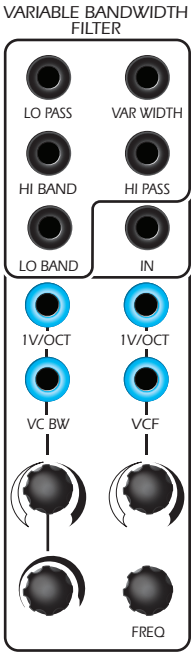




C/M: CONTROL MODULE

REDJACK : TRIGGER OUTPUT ACTIVATED BY SWITCH
LOWER POSITION IS MOMENTARY ON; UPPER
POSITION REMAINS ON.

LOWER TWO MODULES RE SIMPLE ATTENUATORS



VARIABLE BANDWIDTH FILTER

[FREQ] : POT DETERMINES CENTRE FREQUENCY OR LOPASS
HI PASS CUTOFFS (SEE DIAGRAM)

| : POT DETERMINES BANDWIDTH

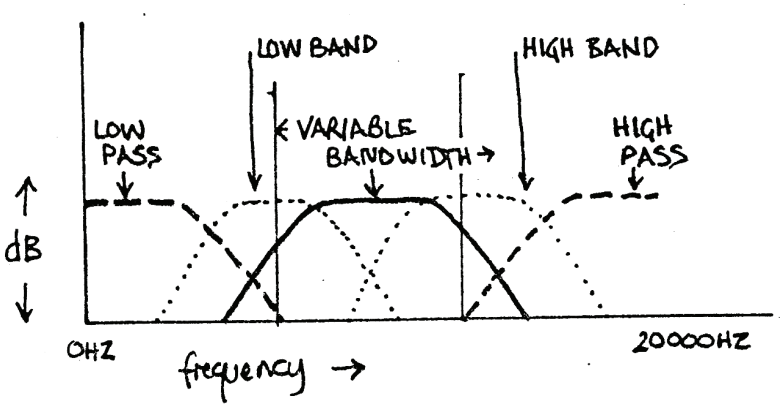
[1V/OCT] : PRECISION CALIBRATED VOLTAGE CONTROL INPUT TO
FACILITATE TRACKING WITH OSCILATORS

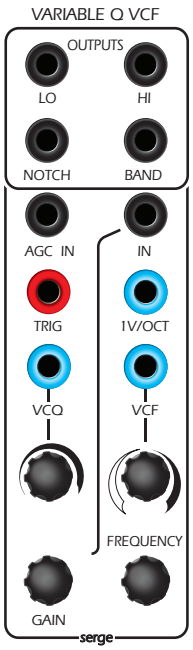
[VCF] : VOLTAGE CONTROL INPUT FOR FILTER FREQUENCY
WITH ASSOCIATED AMPLIFY / ATTENUATE / INVERT POT

[VC BW] : AS ABOVE FOR BANDWIDTH

[HI PASS] : GIXED WIDTH BANDPASS FILTER WHOSE LOW CUTOFF
FREQUENCY IS THE LOW EDGE OF THE VARIABLE BANDWIDTH

[HI BAND] : FIXED WIDTH B.P. FILTER WHOSE HIGH CUTOFF FREQ.
IS THE HIGH EDGE OF THE VAR. B.W.





VARIABLE Q VCF

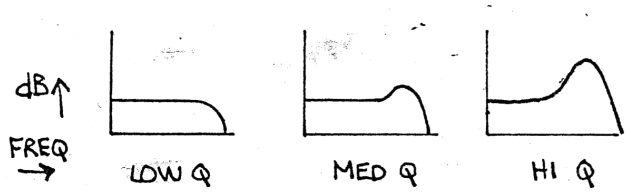
[IN] SIGNAL IN WITH ASSOCIATED [GAIN] CONTROL POT

[AGC IN] AUTOMATIC GAIN CONTROLLED SIGNAL INPUT

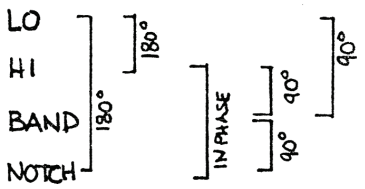
[FREQUENCY] WITH ASSOCIATED V.C. INPUT AND AN ATTENUATE/ AMPLIFY / INVERT POT AND PRECISION CALIBRATED [1V/OCT] INPUT FOR PRECISE TRACKING WITH OSCILLATORS.

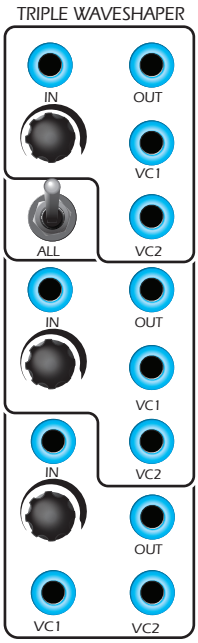
[TRIG] TRIGGER SENT HERE WILL RING THE FILTER: FREQUENCY & Q ADJUSTMENTS WILL CHANGE SOUND FROM A CLICK TO A BELL-LIKE TONE. OUTPUT IS A DAMPED SINE WAVE.

[VCQ] INPUT FOR CONTROL VOLTAGES TO ADJUST Q OR FILTER RESONANCE. NOTE: MANAUAL POT.



PHASE RELATIONSHIPS OF OUTPUTS WITH A SINE INPUT:





TRIPLE WAVESHAPER

[ALL] DAISYCHAINS UNITS WHEN IN UP POSITION (IE, NOT POINTED TO ALL)

INPUT TO [IN] BOTTOM FLOWS TO [OUT] TOP THROUGH MIDDLE UNIT. OUTPUTS AVAILABLE AT EACH STAGE.

[IN] SAW INPUT WITH V.C. PROCESS KNOB

(A) OUTPUT
(B) OUTPUT
(C) OUTPUT

[VC1] ACCORDING TO SERGE, A FULLSCALE 0 TO +5 VOLT CHANGE WILL MODIFY A TRAINGLE WAVE TO A SAWTOOTH TYPE; EXPERIENCE HERE IS A MORE COMPLEX TYPE OF RECTIFIED WAVE ETC.

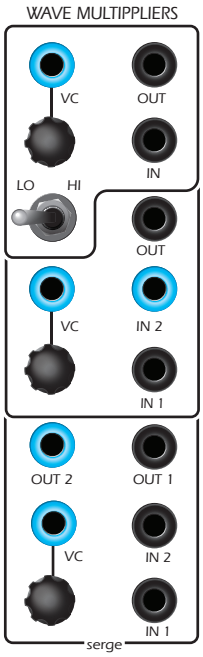
[VC2] INTO

OUTPUT -->

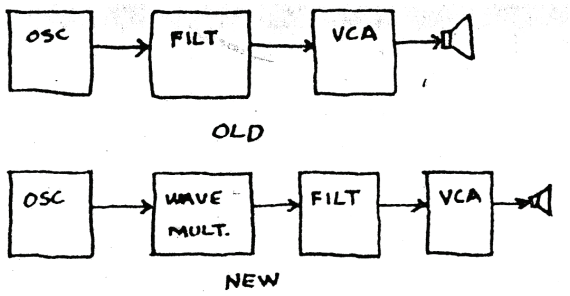
TO

ETC.

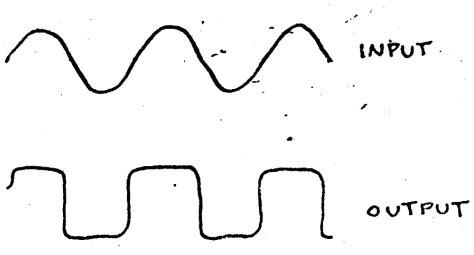
NOTE: OUTPUTS MAY “BLANK OUT” IN SPOTS SO BE CAREFUL WITH KNOB ADJUSTMENTS. WITH AUDIO SPEED OR CHANGING V.C. INPUTS EFFECTS ARE SIMILAR TO PHASING OR PULSE-WIDTH MODIFICATION/MODULATION ETC



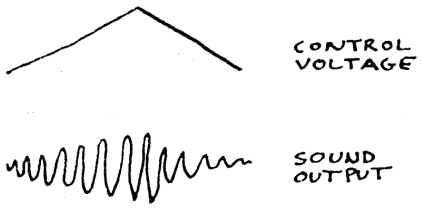
WAVE MULTIPLIERS (VCM). The Wave Multiplier Module is a triple module that, unlike most other multi-modules on the Serge, contains three DIFFERENT modules. Each of the three modules operates on its input in a unique fashion, transforming simple sounds into musically complex and interesting ones. They should not be confused with such devices as Ring modulators which multiply their input signals in a linear fashion – the Wave Multipliers are highly non-linear in their action. In many ways these modules represent a new need in the typical synthesis patch.



UPPER WAVE MULTIPLIER: The Upper module of the trio is a the simplest of the three. It has a switch for two different settings characteristics. In the HI setting it acts to moderately "square up" or soft clip the signal. The soft clipping is amplitude dependant, producing changes in timbre as the loudness increases.

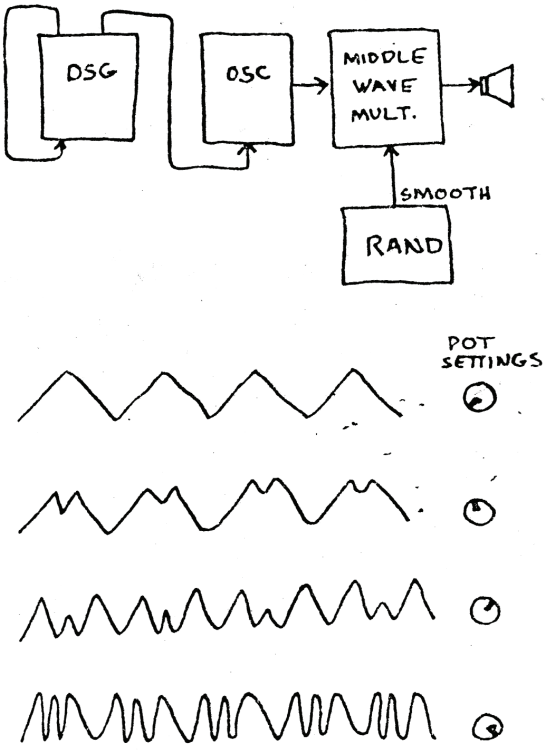


In the LO setting it acts like a linear VCA, a device useful for producing different types of AM sounds.

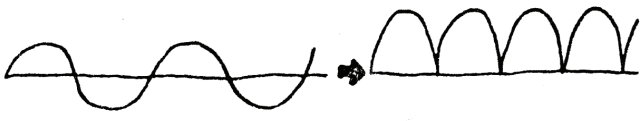


In both settings the module can be controlled either manually or with a VC (control voltage.)

MIDDLE WAVE MULTIPLIER: The middle Wave Multiplier has two inputs, each producing a slightly different result at the output. One input is DC coupled and has a blue jack. The other input is AC coupled and has a black jack. A sine wave will sound the same when connected to either input, but a triangle wave will produce different effects. These inputs can be used together to provide unusual effects. The general effect of the module is to produce new odd overtones from a sine wave input when the manual pot is turned or when a voltage is applied to the VC input. However, control voltages of complicated natures or inputs more complex than sine or triangle waves can create shimmering bodies of sound somewhat reminiscent of over-blown wind instruments. The VC input can accept AC signals, allowing for complex modulation.



BOTTOM WAVE MULTIPLIER: Like the Middle Multiplier, the Bottom one also has two independent (but identical) inputs. Both inputs are AC coupled. The general effect of the module is that of a full-wave rectifier for audio signals, which means that negative voltages are “flipped” up into the positive.

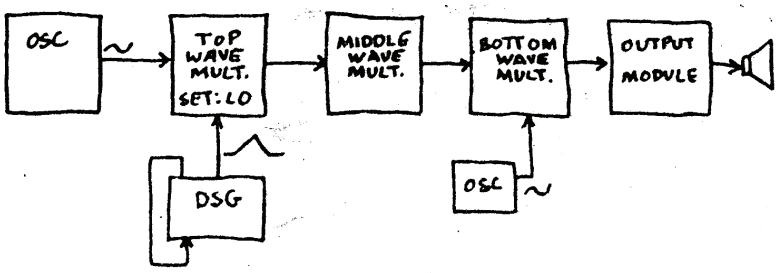


Such a rectified sine wave contains only even harmonics and is one of the few waveforms to contain only these harmonics. The Bottom Wave Multiplier, in actuality, contains three waveform-transforming circuits in a carefully controlled series.

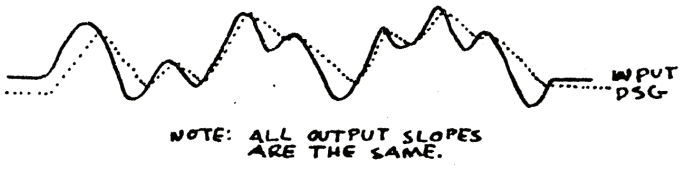
Like the upper two wave multipliers, the module provides both manual and voltage control over the output. Unlike its companion modules, however, there are two distinct outputs, OUT 1 and OUT 2. OUT 2 provides a "squared up" version of OUT 1.

One important feature of this lower module is that, unlike simple rectifiers, the amplitude of the output does not decrease through successive rectifications.

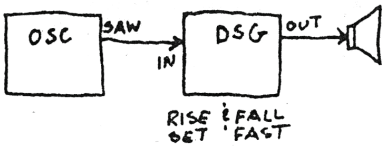
Overall, these three Wave Multipliers provide a method of producing timbres as rich and as varied as acoustic sounds and yet having the precision and repeatability of analog synthesis.



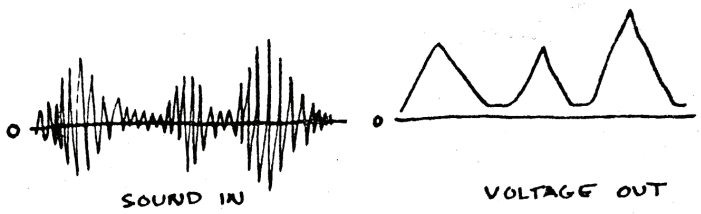
DUAL UNIVERSAL SLOPE GENERATOR (DSG). The DSG can function as a non-linear lo-pass filter essentially by softening the slopes of the IN signal. Generally speaking, the less steppingstones the slope of a waveform the fewer high frequencies it contains. To accomplish this the RISE and FALL times must be set quite fast. Increasing either the Rise or Fall time will increase the filtering action.



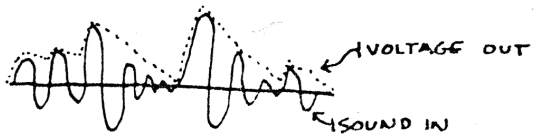
Because the RISE andFALL time on the DSG is voltage controllable, when used in this fashion, the module becomes a voltage controlled filter.



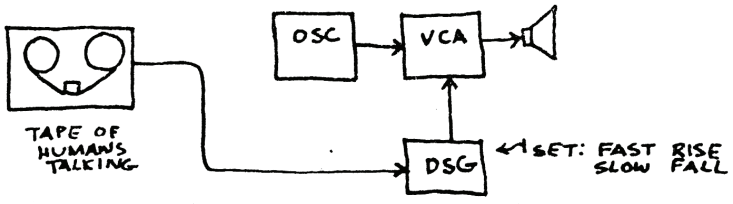
Closely related to this patch is the use of the DSG as an ENVELOPE FOLLOWER. An envelope follower is a device or module that inputs a complex sound and outputs a control voltage proportional to the envelope of the input.

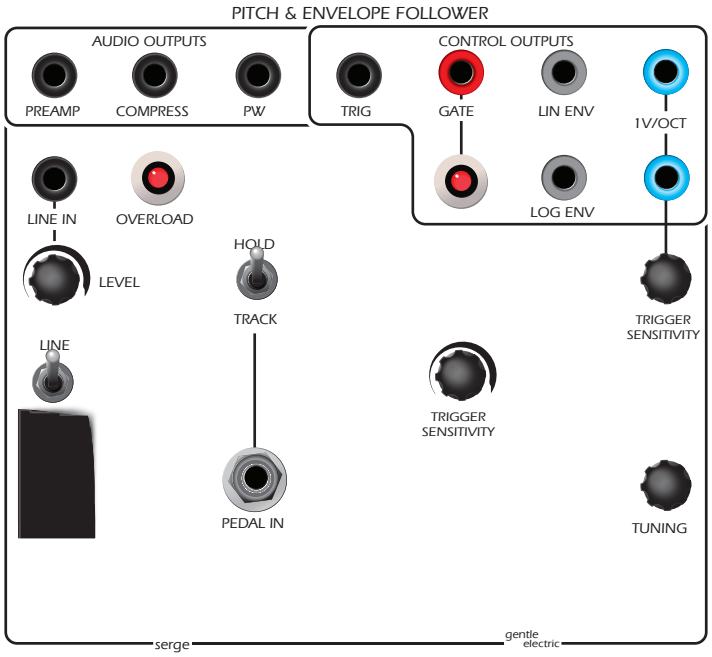


To create an ENVELOPE FOLLOWER it is not desirable to exactly follow the voltage, for that will simply reproduce the wave itself, perhaps with a slight delay or softening of the slopes. Rather, an envelope follower should follow the rising voltages as closely as possible, but have a very slow FALL time. When this is done, the upper edge of the waveform alone is traced, this being the envelope.



On the DSG this is easily accomplished by using a very fast RISE time and slow FALL time.





PITCH & ENVELOPE FOLLOWER (PEF)
FUNCTIONS:

[1V/OCT]: 1 VOLT/OCTAVE DC CONTROL VOLTAGE

[1V/OCT ADJUST]: ADJUSTMENT FOR ACCURATE TRACKING

[TUNING]: CHANGES [1V/OCT] OUTPUT BY 2.5 OCTAVES. HAS NO AFFECT ON PULSE WAVE OUTPUT

[PW]: PULSE WAVE OUTPUT AT THE FUNDAMENTAL FREQ. OF THE INPUT SIGNAL. PULSE WIDTH IS DETERMINED BY INPUT WAVE SHAPE.

[LIN ENV]: LINEAR ENVELOPE: A DC VOLTAGE PROPORTIONAL TO THE AMPLITUDE OF THE INPUT SIGNAL.

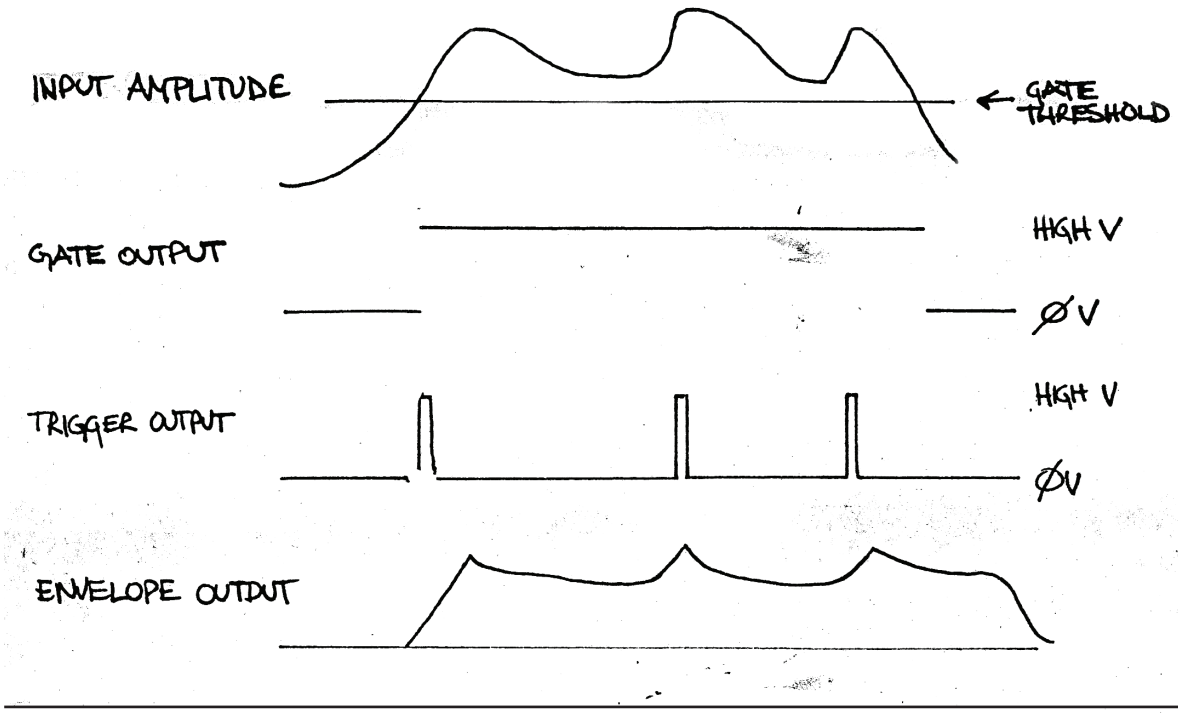
[LOG ENV]: LOGARITHMIC ENVELOPE: AS ABOVE BUT IN AN EXPONENTIAL PROPORTION

[GATE]: HIGH (+5) GEN ON AND (ZERO) VOLTS WHEN OFF. THIS FUNCTION IS SET TO GO ON BY MEDIUM TO LOUD SIGNALS AND OFF BY SOFT SIGNALS OR NO SIGNAL. L.E.D. FIRES WHEN GATE IS ON.

[HOLD/TRACK]: WHEN IN HOLD POSITION, UNIT HOLDS LAST PITCH AND GATE STAYS “ON”. [PEDAL IN] IS FOR AN EXTERNAL SWITCH SUCH AS A PEDAL.

[TRIG]: NORMALLY ZERO VOLTS: PRODUCES A HIGH VOLTAGE / 3 MSEC. PULSE TWO CONDITIONS ARE RESPONSIBLE FOR THIS: (1) WHENENVER THE GATE COMES ON. (2) WHENEVER THERE IS A SUBSEQUENT SHARP CHANGE IN VOLTAGE (AMPLITUDE) OF INPUT SIGNAL. THIS LATTER RETRIGGER FUNCTION CAN HAVE ITS SENSITIVY ADJUSTED BY THE [TRIGGER SENSITIVITY] POT.

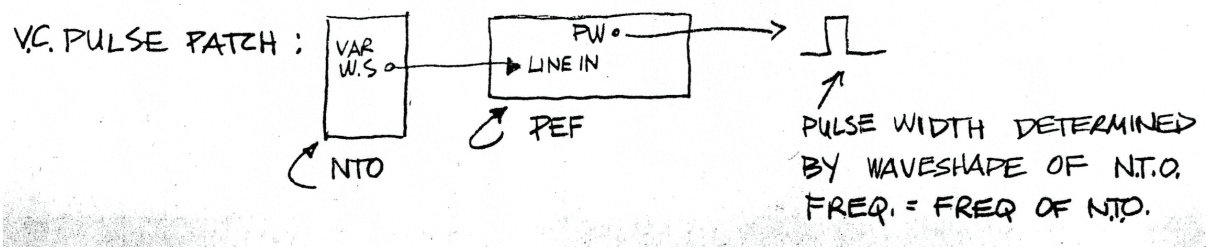
TRIGGER DIAGRAM (PEF)

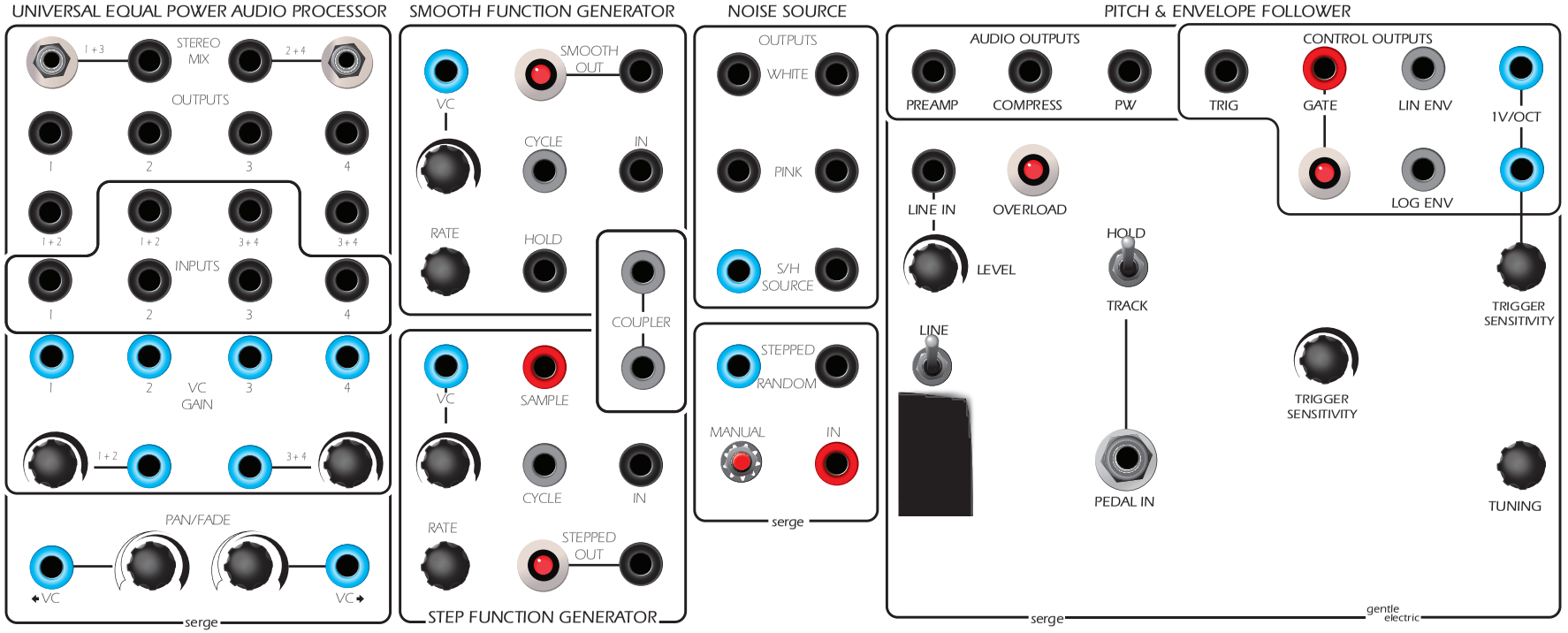


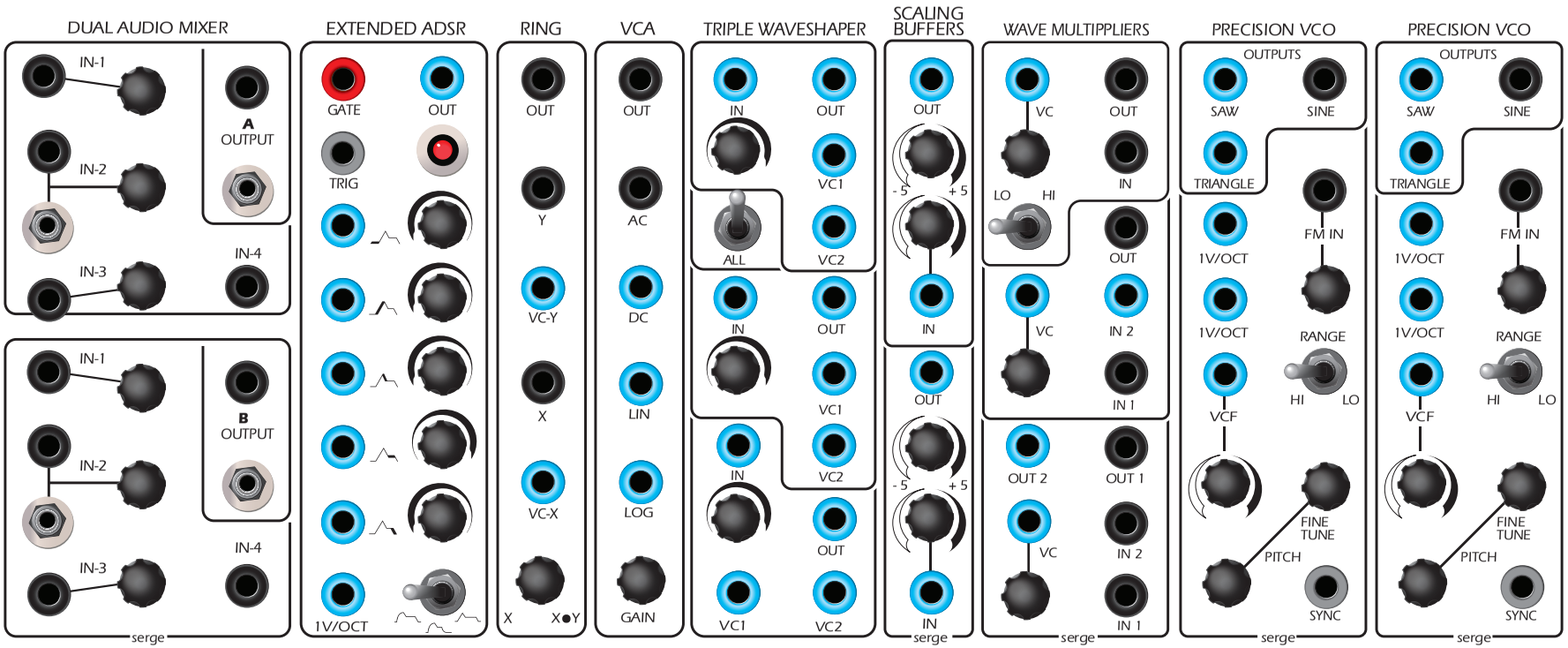
[MIC IN] ACCEPTS SIGNALS FROM MICROPHONES ETC. HIGH IMPEDANCE UNBALANCED. NOTE: INPIUT IS VERY SESITIVE. OVERLOAD MAY OCCUR EVEN IF OVERLOAD LED IS NOT ON BEST RESULTS MAY BE OBTAINED WITH AN EXTERNAL PREAMP AND USE OF THE LINE INPUT. ELECRIC GUITARS SHOULD BE PLUGGED INTO [LINE].

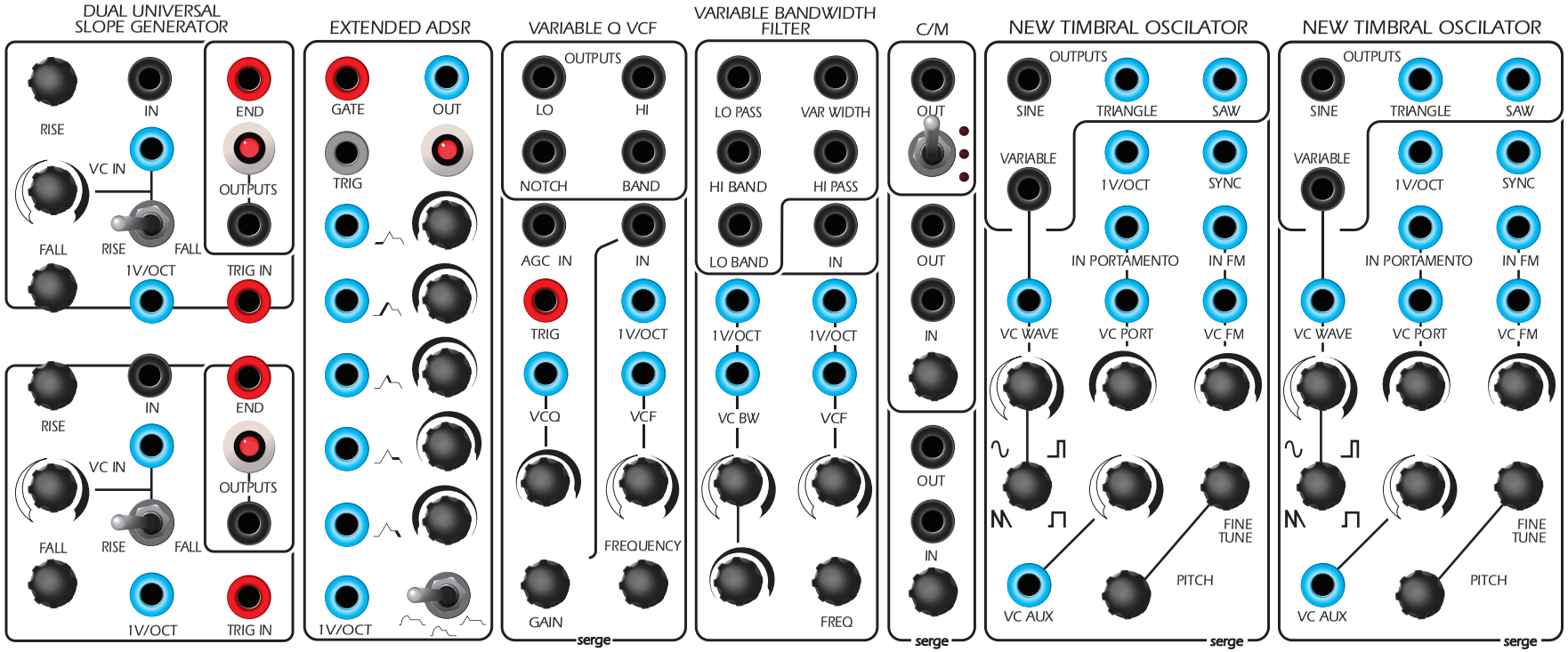
[PREAMP] OUTPUT OF AUDIO PREAMP FOR MIC OR LINE IS NORMALLED TO LINE INPUT ON PEF

[COMPRESS] COMPRESSED OUTPUT OF MIC PREAMP




UNIVERSAL EQUAL POWER AUDIO PROCESSOR
STEREO MIX
1 + 3
2 + 4
OUTPUTS
1
2
3
4
1 + 2
3 + 4
INPUTS
VC GAIN
PAN/FADE
VC
serge
SMOOTH FUNCTION GENERATOR
SMOOTH OUT
CYCLE
IN
RATE
HOLD
COUPLER
SAMPLE
STEP FUNCTION GENERATOR
STEPPED OUT
NOISE SOURCE
OUTPUTS
WHITE
PINK
S/H SOURCE
STEPPED RANDOM
MANUAL
PITCH & ENVELOPE FOLLOWER
AUDIO OUTPUTS
PREAMP
COMPRESS
PW
CONTROL OUTPUTS
TRIG
GATE
LIN ENV
LOG ENV
1V/OCT
LINE IN
OVERLOAD
LEVEL
HOLD
TRACK
TRIGGER SENSITIVITY
LINE
PEDAL IN
TUNING
gentle electric


DUAL AUDIO MIXER
IN-1
IN-2
IN-3
IN-4
A OUTPUT
B OUTPUT
serge
EXTENDED ADSR
GATE
OUT
TRIG
1V/OCT
RING
Y
VC-Y
X
VC-X
X●Y
VCA
AC
DC
LIN
LOG
GAIN
TRIPLE WAVESHAPER
ALL
VC1
VC2
SCALING BUFFERS
- 5
+ 5
WAVE MULTIPPLIERS
LO
HI
OUT 2
OUT 1
PRECISION VCO
OUTPUTS
SAW
SINE
TRIANGLE
1V/OCT
FM IN
RANGE
VCF
FINE TUNE
PITCH
SYNC


DUAL UNIVERSAL SLOPE GENERATOR
RISE
IN
END
VC IN
OUTPUTS
FALL
RISE
FALL
1V/OCT
TRIG IN
EXTENDED ADSR
GATE
OUT
TRIG
1V/OCT
VARIABLE Q VCF
OUTPUTS
LO
HI
NOTCH
BAND
AGC IN
IN
TRIG
1V/OCT
VCQ
VCF
FREQUENCY
GAIN
VARIABLE BANDWIDTH FILTER
LO PASS
VAR WIDTH
HI BAND
HI PASS
LO BAND
IN
1V/OCT
1V/OCT
VC BW
VCF
FREQ
C/M
OUT
OUT
IN
OUT
IN
NEW TIMBRAL OSCILATOR
OUTPUTS
SINE
TRIANGLE
SAW
VARIABLE
1V/OCT
SYNC
IN PORTAMENTO
IN FM
VC WAVE
VC PORT
VC FM
FINE TUNE
PITCH
VC AUX
NEW TIMBRAL OSCILATOR
OUTPUTS
SINE
TRIANGLE
SAW
VARIABLE
1V/OCT
SYNC
IN PORTAMENTO
IN FM
VC WAVE
VC PORT
VC FM
FINE TUNE
PITCH
VC AUX
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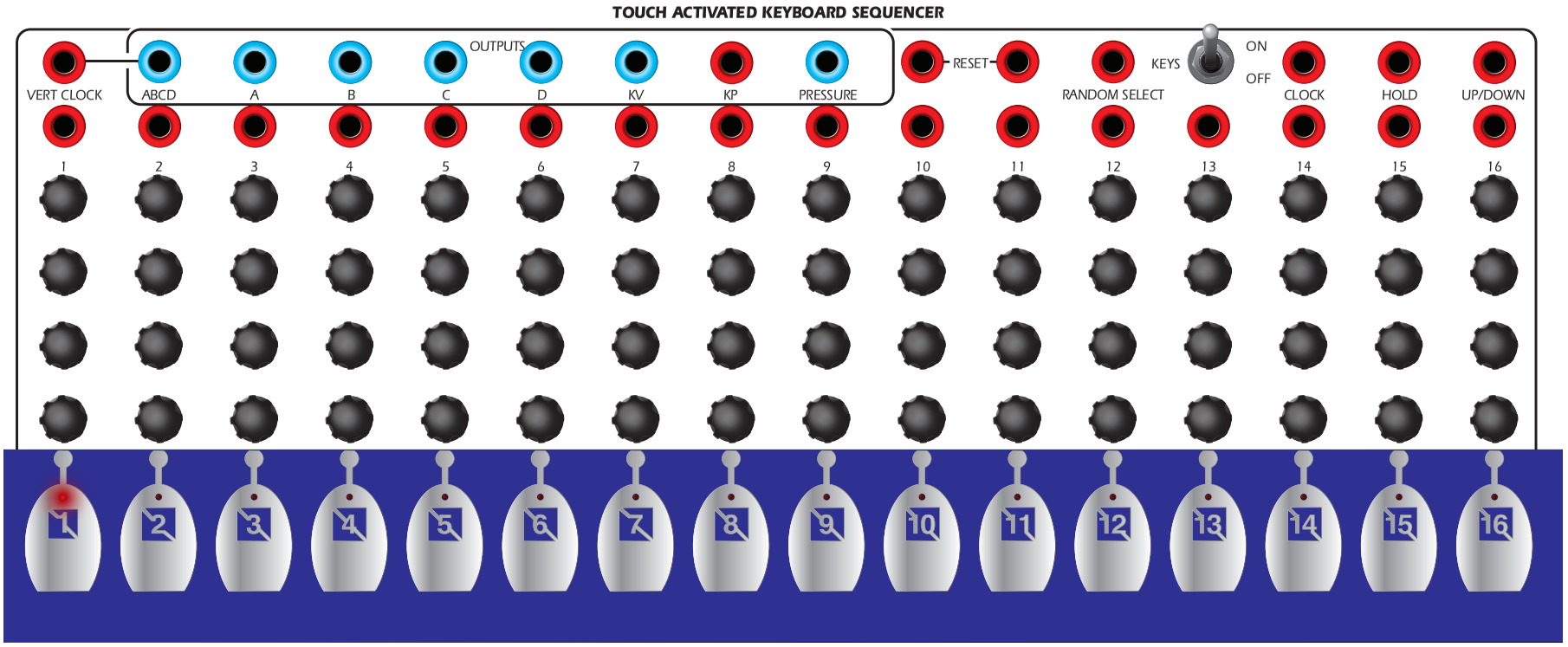
serge


TOUCH ACTIVATED KEYBOARD SEQUENCER
VERT CLOCK
OUTPUTS
ABCD
A
B
C
D
KV
KP
PRESSURE
RESET
RANDOM SELECT
KEYS
ON
OFF
CLOCK
HOLD
UP/DOWN
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16