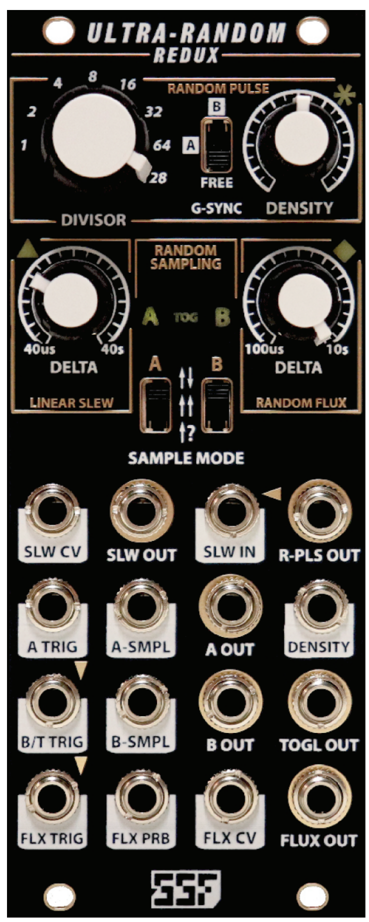
ULTRA-RANDOM REDUX

QUICK START

The Ultra-Random Redux is a new and revised version of the original Ultra-Random Analog. Additional features and improvements have been applied to the major functions; including more accurate sampling of external signals and greatly enhanced sample holding time. Three different output modes are now available in the sample and hold section as well, providing the traditional bipolar output as well as full and have wave rectified outputs. Rectification may also be applied to external sampled signals. The Random Pulse section now features a rotary switch to select pulse division and a newly added G-SYNC (gated sync) function for randomized pulse bursts that will be synced to the A or B trigger input signals. The Integrator has been replaced with a wide range linear slew for processing external and internal signals. The Random Pulse output is normalized to the Linear Slew input jack as in the original URA. Finally, the Random Flux section has been updated with a dedicated Flux Trigger input and manual time constant control in addition to CV modulation inputs. Flux out can also now function as a fourth stepped random voltage output.

Please take to time to read through the quick-start guide. I have kept it short and to the point in order for you to get patching quickly. The different sections of the URR can be used independently or inter-patched for separate and correlated random voltage patching. The design offers use as a multi-noise source and voltage processor for non-random applications in addition to being a workhorse for providing up to 6 random voltages in a compact 10hp.

Attached the power cable to the header by aligning the RED STRIPE with the BLACK LINE and -12V text on the PCB. This header is also reverse power protected and no damage will occur if power is improperly connected.



RANDOM PULSE

The RANDOM PULSE section provides a randomized gate signal for triggering external modules as well as random and pseudo random digitized noise. The frequency of the output is controlled via the DENSITY potentiometer and CV modulation input. The DIVISOR rotary switch selects the divided state of the output frequency. The output becomes less random as you increase the divisor. For the most random output, you can select '1' as the divisor. The output probability of this state varies from almost never occurring to a fully dense state well into the upper audio range. The R-PULSE output may also be used as a clock source for the A & B sample and holds, or FLUX. The '128' divisor state is great for providing a *semi-stable* clock source that varies from a very low frequency to about 70Hz via the DENSITY control.

As mentioned, R-PULSE can also be used as a noise source with varying degrees of randomness. The output signal becomes more pseudo-random as increased divisions are selected. The audible result is a sound that is less noisy and more tonal as you divide further down.

The G-SYNC (gated sync) switch is used to select FREE cycling operation, or can be slaved to the external clock/trigger signals that you apply to the A or B trigger inputs of the Random Sampling section. When synced to A or B, the R-PULSE output will only fire when synced to one of these triggers. Since R-PULSE will vary in both an on/off state, and duration of that state - the synced signal will result in random-gated pulse trains of the applied triggers. Changing the DENSITY control value will alter whether these synced pulse trains will occur, and how long they will occur for, including the off state. The spread of the DENSITY control is by in large dependent on the frequency of the applied trigger signal - and so, you may want to experiment with different divisor settings and well and using the DENSITY control. You can grasp the effect by experimenting with an audio rate signal and listening to the output while synced. This also makes for an interesting morse-code type of sound effect.

Please note that while the output generally follows the duration of the synced trigger - the output can also result in a very fast trigger that will not always be shown by the LED indicator, but will still register as a trigger when controlling other modules and the URR itself.

LINEAR SLEW

The LINEAR SLEW section provides an independent voltage controlled linear slew generator for manipulating external signals as well as self-patching from the other outputs of the URR. For instance, you might patch one of the sample and hold outputs into SLW IN for voltage controlled glide of the sampled output. By default, the R-PULSE output is normalized into the LINEAR SLEW's input. Patching in an external source breaks this normalization. With the normalized R-PULSE as the input signal, the SLEW output offers a triangular/trapezoidal envelope for smoothly modulating external modules - or can be self patched into one of the URR's CV or S&H inputs.

Slew time range is from about 40us to 40s and is controlled via the associated LINEAR SLEW DELTA control as well as via the SLW CV input.

RANDOM SAMPLING

The RANDOM SAMPLING section controls three S&H outputs; A, B, and TOGGLE. S&H A and B are independent sample and holds that feature thier own analog noise sample sources. These noise sources are normalzed to the respective A/B-SMPL inputs and can of course be interrupted by an external signal that you want to sample, by patching into these inputs.

An external source (clock/trigger/gate/LFO) must be applied to one of the respective TRIG inputs to trigger a sample. A cascaded normalization scheme is utilized, whereas a trigger applied to A-TRIG is normalized down to the B-TRIG input, which is then normalized to the FLX-TRIG input. This allows all to be controlled together, independently, or in groups.

TOGGLE follows the triggering of the B-TRIG input signal. TOGL OUT switches between the A and B S&H outputs every time a new trigger is applied. The B output is selected via TOGGLE when the input trigger is high - this will also illuminate the TOG LED indicator in the RANDOM SAMPLING section of the URR. The effect of toggle is to essentially splice the A/B S&H outputs together, producing an interrelated S&H output based on the two. This can make for creating more complex signals when sampling external VCO waveforms in discrete-time sample rate reduction patches, where you can splice two wave shapes together.

The A/B S&H can both function in three modes via the switches in the RANDOM SAMPLING section of the URR panel. BIPOLAR outputs a positive and negative random stepped voltage and will follow bipolar waveforms when patched into the SMPL inputs. This mode is indicated by the UP/DOWN arrows. FULL WAVE RECTIFICATION will flip all negative signals into the positive region and only output positive voltage signals. Externally sampled signals will also be rectified in this mode. You may use this feature as a general full-wave rectifier as long as the trigger frequency is sufficiency high enough to perform this function. This mode is indicated by the UP/UP arrows. HALF WAVE RECTIFICATION will only pass positive signals; cutting off the negative half. When sampling the internal noise, this has the effect of producing a baseline output of 0V and a probabilistic behavior of the output producing a random voltage that is not 0V. Externally sampled signals will also be half-wave rectified. This mode is indicated by the UP/? arrow.

RANDOM SAMPLING (continued)

The Sample and Hold performance is significantly improved over the original URA in both sampling accuracy and droop rate. The sampling window is optimized for discrete-time sample rate reduction applications with the ability to sample at a rate above 170kHz. The sample window is also sufficient for other sampling applications such as V/OCT sampling. However, trigger timing and inconsistencies during sample acquisition can always affect the accuracy of precise samples and therefore will not always be perfect. Some improvement can be attained by adjusting the sample window. The sample window may be increased by applying a slight slew to the clock/trigger. This can be through an external module or via the LINEAR SLEW circuitry on the URR. You may also try an external fast envelope. The max slew limit that will register on the URR trigger inputs is about 15ms of linear rise time. This may be increased when using an exponential rising signal. This technique may also improve situations where some sequencers or other modules have timing delays in their trigger/gate outputs. Please realize that while this technique can be very helpful in some situations, *it will not always cure all issues due to the inherent possibility of sampling errors found in analog sample and holds.*

The Sample and Hold outputs make for excellent noise sources as well. Triggering at high frequencies will allow the normalized noise sources to pass on to the output. Performing sample rate reduction (reducing the trigger frequency) serves to digitize the noise into discrete steps. At audio rates, this sound is a very familiar 8-bit style noise reminiscent of 80's computer games. Changing the SAMPLE MODE will also affect the tonality of this technique. You may also try patching the noise into the LINEAR SLEW for Low-Pass Filtering the noise.

RANDOM FLUX

Owners of the URA will be familiar with the RANDOM FLUX section of the URR. This feature has been improved with the addition of a dedicated FLX TRIG input and dedicated manual FLUX DELTA control for changing the slew-rate. The DELTA control now allows for scaling the smoothness of the fluctuating voltages manually as well as via the FLX CV input. The minimum DELTA will allow for FLUX out to operate as a fourth S&H output with slew. Some slewing of about a few milliseconds will still be applied to the output when DELTA is fully CCW. As DELTA is increased CW, the output is smoothed into a fluctuating DC voltage. Trigger timing determines when a new FLUX sample is taken and should be considered when adjusting the DELTA to achieve the desired behavior. Generally, you will want the timing of each sample to allow for a full swing (+/-5V) of the output but this is not always necessary. If the DELTA is much longer than the trigger frequency, this will attenuate the output similar to a low-pass filter.

FLX PRB (Flux Probability) is used to push the FLUX output into the region of the applied voltage. This has the effect of increasing the probability that the FLUX output will be in that voltage region. One simple way to alter this probability density would be to patch a DC voltage into FLX PRB. This can be useful if you want to focus on small variations of a modulate-able parameter. You can apply heavy DELTA smoothing to attenuate the span of the FLUX and then a DC signal into FLX PRB to focus onto the region of voltages you would like to modulate with.

You can also use other signals from LFOs and Envelopes into FLX PRB in order to push the output signal around, or apply some randomness to those signals. The FLUX DELTA will also affect the slew time of the signals patched into FLX PRB and this should be taken into account when using this input to randomize external signals. Trigger timing also plays an import role when randomizing. For instance, say you would like to add some random fluctuations to an LFO. Patch the LFO into FLX PRB and patch a somewhat similarly timed trigger into FLX-TRIG. With DELTA set at minimum, you should notice some heavy stepping in the output waveform. You should increase DELTA until you achieve a smoother result. Experiment with different trigger timings and adjust parameters to taste.

OUTPUT LEVELS:
RANDOM PULSE: 0-10V (FREE MODE), follows trigger level in G-SYNC
LINEAR SLEW: Follows input signal level
RANDOM SAMPLING: 14Vpp maximum, follows external sample input level
TOGGLE: Follows S&H A and B
RANDOM FLUX: 11Vpp maximum.

TECHNICAL:
10hp width, 23mm depth

+100mA, -57mA maximum power consumption

Reverse power protected

CV INPUT RANGE:
RANDOM PULSE DENSITY: 0-10V, control behaves as positive offset for Bipolar CV signals
LINEAR SLEW DELTA: 0-10V, control behaves as positive offset for Bipolar CV signals
ALL TRIGGER INPUTS: Minimum of 2V amplitude trigger.
TOGGLE TRIGGER Follows S&H B
RANDOM FLUX DELTA: 0-10V, control behaves as positive offset for Bipolar CV signals
FLX PRB: +/-5V maximum input range.