ULTRA-RANDOM ANALOG

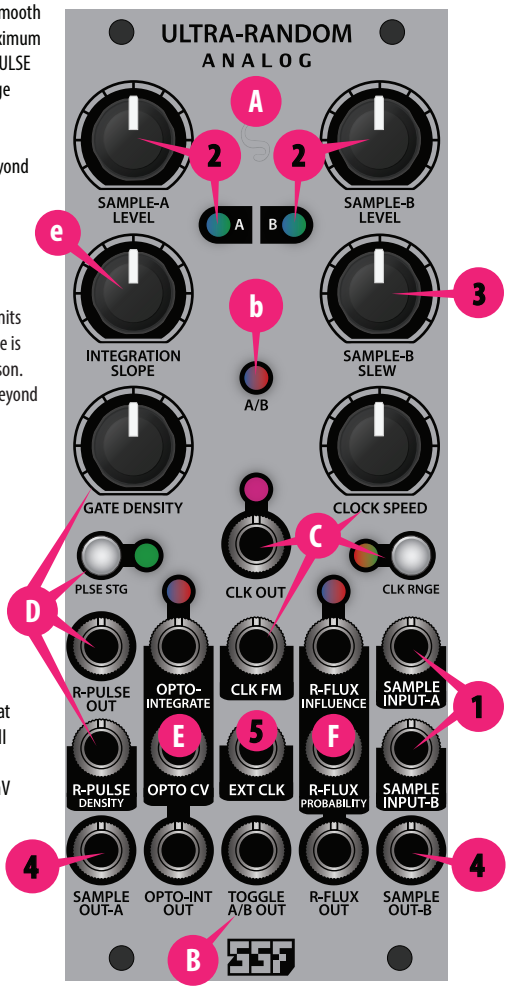
Control and function reference guide

Thank you for purchasing the Steady State Fate Ultra-Random Analog

The URA is a comprehensive random voltage source comprised of 6 major functions: (A) Dual Sample and Hold units. (B) Toggling A/B Sample and Hold. (C) Temperature Compensated VCO/Clock. (D) 7 Stage VC Random Pulse/Clock and Digital Noise Generator. (E) Voltage Controlled Vactrol Integrator. (F) a VC Smooth Fluctuating Random Voltage Generator (R-FLUX). Many routing and clock configurations are available via jack normalization and jumper selection for maximum flexibility. This Analog version utilizes two independent transistor noise generators for sourcing the three stepped random outputs (A, B, A/B) and the R-PULSE generator. The two noise generator outputs are accessible via the sample and hold outputs, providing additional functionality as noise sources with voltage controlled sample rate. R-FLUX is sourced via a composite random oscillator.

We hope you find the URA to be one of the best and full featured random sources available.

Please read this manual and use it as a reference to get the most out of your URA. The Ultra-Random is designed to offer maximum flexibility and uses beyond the random functionality. Please use our contact form at www.steadystatefate.com for questions and feedback. Enjoy!



A SAMPLE AND HOLD

Two Sample and Hold circuits are accessible via the front panel. They are labeled **A** and **B** to denote the panel controls and jacks for each unit.

Both Sample and Hold units feature a sample attenuator, bi-color polarity/emphasis LED and an input and output jack. S&H **B** features a dedicated sample slew control. Each unit's input is normalized to a respective analog white noise generator. A positive clock pulse is required to advance both S&H units to begin a new sampling period. The units hold and output the amplitude level of the sample source at the time of the rising edge pulse - until a new pulse is received. Although the droop rate for analog S&Hs is considered poor, most will find the URA's hold droop performance to be quite satisfactory in comparison. While most stepped random generators fail to provide access to their sample and hold inputs, the URA is designed with sample and hold inputs for uses beyond the default random functions.

1 SAMPLE INPUTS

Any type of signal can be applied here. As mentioned above, two white noise sources are normalized to these input jacks in order to provide the nominal stepped random outputs. Applying a signal to either input breaks the connection to the respective white noise source and begins to sample whatever signal is applied. Please note that the output will only be as random as your new applied source. The units will then be functioning as classic sample and holds and are useful for creating stepped voltages from smooth voltages. Using a high speed clock will pass the input signal at a ~23kHz sample rate (extremely low artifact) to the outputs. Modulating the clock speed by hand or CV will therefore vary the sample rate and produce a bit crush or sample reduction type effect. Using a high clock rate without an external signal patched into the inputs will pass the white noise to the outputs. Varying the clock speed will vary the texture of the noise to sound like those old-school video games from the 80's. Asteroids, anyone?

2 SAMPLE LEVEL ATTENUATORS AND LEDS

Both S&H units feature attenuators for adjusting the sample input level. Attenuating the sample source limits the positive and negative amplitude range at the hold outputs. The range of output voltages trend symmetrically toward 0V as the attenuator travels counter clockwise. Leave these controls at their full clockwise position to utilize the full range of the sample input.

The respective bi-color LEDs indicate the amplitude and polarity of the current sample level. Please note that voltage levels less than approximately 600mV will not light the LEDs brightly or at all. Also note that if the clock speed is fast enough and the slew control is engaged, the **B** LED may not light to full brightness and stay dim. This is normal behavior.

3 SAMPLE-B SLEW

Use this control to slew/smooth the transition between samples. This control is a passive low-pass filter and functions exactly like a classic logarithmic portamento control. It can even be used as a simple audio low pass filter when using S&H **B** with high sampling (clock) speeds.

4 SAMPLE OUTPUTS

The outputs for S&H units **A** and **B** are labeled respectively. For instance; **SAMPLE OUT-A** goes with **SAMPLE INPUT-A** and **SAMPLE-A LEVEL** control. No tricky stuff here - it is just that simple! Please make note that while the **B** jacks are located in close proximity, the A input and output are spaced apart. If you missed it, the white noise for each S&H can be accessed via the outputs. Just turn the clock rate up to maximum speed in high range mode and adjust to vary the sample rate and texture of the noise.

B TOGGLE A/B SAMPLE AND HOLD OUTPUT

In addition to the two main S&H outputs, a third output labeled **TOGGLE A/B OUT** is available. The toggle circuitry alternates the sample source between noise generator **A** and **B** with every clock pulse. To make it interesting, a slight clock propagation delay is built into the design so that a unique sample is taken from the noise generators. For instance, the main S&H **A** will take a sample from noise generator **A** and the Toggle S&H will take a sample from noise generator **A** a fraction of a second later. The same goes for source **B**. This unique behavior creates a third unique random stepped voltage that is indeed derived from two independent analog noise generators.

When an external signal is applied to either or both **A/B SAMPLE** inputs, the **TOGGLE** unit will alternate sampling between those signals. When processing audio rate signals in this fashion, many interesting tones can be achieved as the unit effectively behaves as a switch - interlacing the audio with the noise sources or other audio signals. High clock speeds equate to higher resolution audio at the **TOGGLE** output and very interesting FM effects can be achieved by modulating the frequency of the audio source(s) and adjusting the clock rate. Please note that because of the toggle-on-alternating clock pulse action, the effective max sampling resolution will be less than what can be achieved using the main sample and hold units when the internal clock is used. Using a higher speed clock from the WMD Synchrodyne or SSF/WMD Spectrum can increase the **TOGGLE** resolution when used in this manner. The sample clock source can either be hardwired to the main clock or **EXT CLK** input via jumper selection. Please read the **MAIN CLOCK** and **EXT CLOCK** sections for more info.

b TOGGLE A/B LED

This LED indicates the polarity and amplitude of the sample level present at the **TOGGLE A/B** output. Please note that output levels less than approximately 600mV will not light up the LED brightly. This is completely normal.

C MAIN CLOCK OUT - SPEED CONTROL - RANGE SWITCH - CLK FM

The Ultra-Random's internal clock is a temperature compensated, 1V/OCT tracking VCO. The output is a positive only 50% duty cycle square wave - also known as a pulse wave. The pulse is traditionally used as a clock or gate but can also be used as an audio source. The main clock is permanently hardwired to S&H **A** and normalized to the **EXT CLK** input jack. Via jack normalization, the main clock controls the timing of S&H B, TOGGLE A/B and FLUX when nothing is patched into the **EXT CLK** input. See the **EXT CLK** section for more info on connections to this input.

The CLOCK SPEED control varies the clock frequency and the Range switch (**CLK RNGE**) toggles between the full frequency spectrum (sub audio to ~23kHz) and a limited spectrum (sub audio to ~1.5kHz) for finer control of lower clock rates. The low range (Red LED indication) makes it easier to manage beat related clock speeds and the high range (Green LED indication) is better for using the clock as an audio VCO, for sample/bit crushing and general use.

The **CLK FM** input controls the clock frequency via external control voltages. This is an exponential (1V/OCT calibrated) CV input. It is therefore recommended to use an attenuator before this input for greater control. A buffered attenuator via SSF MIXMODE works perfectly for driving the URA and multiple VCOs simultaneously.

TECH SPECS

Width.....10hp
Depth, Max.....33mm
Current Draw
Quiescent.....+65mA, -37mA
Peak.....+76mA,-47mA

SIGNAL LEVELS
Inputs accept +/-10V (20Vpp)
Output Range is +/-10V (20Vpp)
Adjustable via:
Noise adjustable to +/-10V (PCB TRIM)
Flux adjustable to +/-10V (PCB TRIM)

R-PULSE range adjustable (PCB TRIM)
R-PULSE CV Exp, Bipolar

MAIN CLOCK FM - 1V/OCT, Bipolar

FLUX INFLUENCE CV - Unipolar
FLUX PROBABILITY CV - Bipolar

OPTO CV - Unipolar

Rev Polarity Protected
RoHS & CE compliant

5 EXTERNAL CLOCK INPUT

The **EXT CLK** input controls the sampling rate of S&H **B** and **FLUX**. This input also controls the sampling rate of the **TOGGLE A/B** output when the PCB jumper on the back of the module is set to the respective position. The PCB jumper allows the user to choose whether the main clock always controls **TOGGLE A/B** or only through the **EXT CLK** jack normalization. Both positions are useful depending on your needs and desired functionality. As stated previously, the main clock is normalized to the **EXT CLK** input and therefore will control the timing of all the clock dependent functions. Patching an external clock source into this jack will break the normal and allow you to control S&H **B**, **FLUX** and **TOGGLE A/B** (if jumper selected) with other timing sources. For instance, you could use the Random Pulse output; **R-PULSE** as a clock source. This will provide an additional random element as the clock pulses will be random as well as the sample source. You can also randomize the main clock's speed using S&H **B** output into the **CLK FM** input when an external clock source is used to time **B**. To sum it up, using external sources opens up deeper modulation and routing possibilities and allows you to sync to your other modules in a patch. Don't forget that you can sync your other modules to the URA by using the main clock output as well. Be sure to reference to the Patch Guide available at www.steadystatefate.com to fully grasp the self and external patching possibilities of the URA.

D RANDOM PULSE - GATE/PULSE DENSITY - PULSE DIVISION SWITCH

The **R-PULSE** output is a very powerful feature of the URA. This output functions independently from any clock source and sample input. This output can be used as a gate for triggering envelopes and other transients, as a clock source for the URA and other modules and as a voltage controlled digital noise source. The pulses are additionally normalized to the **OPTO-INTEGRATOR** input. The **GATE** DENSITY control varies the frequency and length of the pulses and the **R-PULSE DENSITY** input is used to vary these parameters using control voltages from other modules and the URA's other outputs. You can think of the **GATE** DENSITY and **R-PULSE DENSITY** controls as accomplishing the same effect via different means. The **R-PULSE DENSITY** input accepts nominal +/-5V control voltages and will work together with the **GATE DENSITY** control as an index for the incoming CV. The density or frequency of pulses spans into the sub audio range and well into the audio range. This output can therefore be quite effectively utilized as a pitched digital noise -which is fantastic for percussion and mixing with other noise sources and audio. The **PULSE STAGE DIVIDER** tactile switch cycles through 7 consecutive divisions by 2 of the main frequency. The first (main) division is the fastest and most random - and sounds the most like white noise in the audible range. With every subsequent division, the noise begins to exhibit an intelligible tone - which also divides down one octave from the last division. The output patterns become less and less random with every division. This is very useful for dialing in the amount of randomness desired when using **R-PULSE** as a clock/beat source and the level of tonality desired when used as an audio source. The maximum frequency is reduced with every division but still remains capable of driving into the audio spectrum. The division steps divide down with every button push and multiply up as the button is held down. Hold the button down for at least one second to start cycling upwards. The division mode is saved in eprom every minute so that your settings can be saved between power cycles. The turquoise LED indicates the frequency and length of the pulses present at the output.

E VOLTAGE CONTROLLED OPTO-INTEGRATOR

An Integrator is traditionally used, but not limited to smooth out pulsed waveforms into linear trapezoidal and triangle shaped voltages. The **OPTO-INTEGRATOR** is a vactrol based version of the classic circuit. The effect is generally the same with the vactrol based integrator with the exception that the transitions are no longer linear but resemble loose s-curves along the integral path. The Integrator can accept both unipolar and bipolar signals of any voltage level but works most effectively on the positive transition of a signal. Therefore, envelopes and LFOs work as good alternative inputs to pulsed waves. As mentioned previously, the **R-PULSE** output is normalized to the integrator's input (**OPTO-INTEGRATE**) so that an additional smooth random voltage is available at **OPTO-INT OUT**, by default. The blue/red LED above the input is symbolic of the amplitude and voltage present at the **OPTO-INT OUT** jack. A positive polarity is signified by red and negative, by blue. The output polarity swings naturally and is dependent on the input and integration slope level control, as well as any signal present at the **OPTO CV** input. The **OPTO CV** input responds to positive voltages only - up to 10V. The CV response works in tandem with the **INTEGRATION SLOPE** control - described below.

e INTEGRATION SLOPE CONTROL

This control varies the slope or gradient of integration. Full clockwise rotation equates to the fastest transition. Full counter clockwise rotation equates to the slowest transition. This knob setting will also vary the effect of CV when using the OPTO CV input to vary the slope speed by working in tandem as a positive index. For instance, turning the INTEGRATION SLOPE all the way up will result in no effect via external CV and turning it all the way down will allow for the full range of incoming CV. Use the entire knob range to dial that in.

F RANDOM FLUX VOLTAGE GENERATOR

The Random FLUX generator is one of the most versatile sections of the URA. This unit was designed to mimic smooth random control variations. This is a very powerful feature that can breath new life into a stale patch and add natural ebb and flow to keep things interesting. The R-FLUX output is affected by the timing pulse present at the **EXT CLK** input (Which is the main clock if nothing is patched in the **EXT CLK** input). The **R-FLUX** output starts drifting to a new voltage state with every clock pulse. The slew time is set to be very slow by default and can be increased in speed by patching a positive control voltage (0 -10V) into the **R-FLUX INFLUENCE** input. Like the Integrator, the Influence is also controlled via a vactrol.

Use the **R-FLUX PROBABILITY** input to increase or decrease the probability that the output will be in the positive or negative polarity region. For instance, applying a variable DC voltage into this input (-10V to +10V) will shift the R-FLUX output voltage to be mostly positive, negative or in between. In this fashion, R-FLUX can be a random LFO, envelope etc. **R-FLUX** PROBABILITY is not restricted to DC voltages, however. Patching your LFOs, Envelopes and other transients into this input will imbue them with random fluctuations. Using all available CV options can result in very dramatic random effects. The blue/red LED above the Influence jack is symbolic of the amplitude and voltage present at the **R-FLUX** output. A positive polarity is signified by red and negative, by blue.

GENERAL PATCHING TIPS

Attenuators such as the SSF MIXMODE or GND CTRL are highly recommended for processing control voltages and signals going into the URA's CV inputs. If you are familiar with modular synthesis, then you know that attenuators are essential to the art. If you are unfamiliar, using an attenuator on a signal is identical lowering the volume or reducing the depth of a modulation. If you find that a particular signal has too dramatic of an affect on a CV input, patch it through an attenuator first and dial it in.

If a signal exhibits too little an effect, it could be too low in amplitude or perhaps the wrong polarity for that input. All of the URA CV inputs are unipolar or bipolar. Use the SSF GND CTRL to easily scale and shift CV into the accepted input region for the best use of your mod sources.

SELF-PATCHING TIPS

The URA can be self-patched for more randomness and interesting effects in general. Some patch examples are listed below:

1. Use **R-PULSE** as a clock source patched into **EXT CLK**. This gives you a highly adjustable clock source coupled with sampling a random source (or the source of your choosing) via S&H B. Use a stackable or mult when patching into **R-PULSE** so that you can tap off the clock to use it as a simultaneous random gate/trigger.

2. You can self patch the **R-FLUX** back into it's own clock source **FM** (internal or external). The slewing effect of **R-FLUX** makes for an organic modulation feedback bus - that randomly shifts the clock speed. Start out with the main clock at about 12:00 in high range mode. Use a stackable cable or mult to free the FLUX output for other simultaneous uses.

3. When using an external clock, you can use the S&H **B** to modulate the main clock for a stepped clock speed modulation effect.

4. In general, you can use any S&H output and the **R-FLUX** output to modulate the **R-PULSE DENSITY.**

5. The default **OPTO-INTEGRATOR** output can be patched into the **R-PULSE DENSITY** input in order to modulate the pulse density with its own integrated output. This works as long as the **INTEGRATION SLOPE** is set somewhere below fully CW rotation. Adjust the **GATE DENSITY** and use mults as desired. Also try modulating the main **CLK FM**, **R-FLUX PROBABILITY** and **INFLUENCE** with the **INTEGRATOR**'s output to add even more randomness.

6. Use S&H **A**, **B**, **TOGGLE A/B** and **R-FLUX** to modulate **OPTO CV**. Remember however that this is a unipolar input so shifting these outputs into the positive region and scaling appropriately will exhibit the best results.

INSTALLATION AND WARM-UP

Now that you read all that important info it's time to install your URA into your modular system. Start by connecting the small end of the power cable by aligning the RED STRIPE on the cable to face down on the module. There is a marking on the PCB -12V/RED, in which the red stripe should be closest to if it is installed correctly. Now install the cable in the proper orientation with the red stripe aligning with negative 12V on your bus board. When you power the URA please allow for a roughly 8 second warm up period before all features are fully operational.