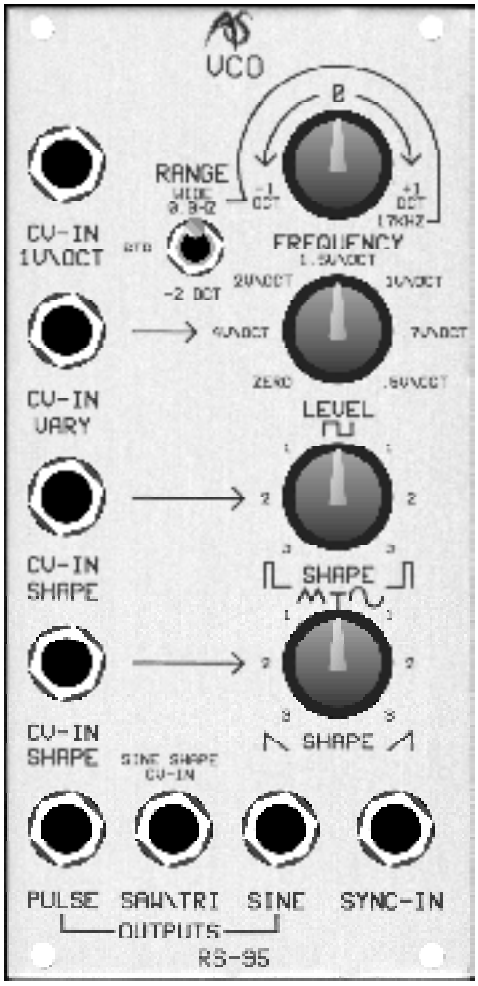
RS95

ADVANCED VOLTAGE CONTROLLED OSCILLATOR WITH WAVE SHAPING



INTRODUCTION

The RS95 is a further development of the RS90 Voltage Controlled Oscillator, with extra waveforms, additional waveshaping, and an third audio output. Consequently, many of the details in this section are identical to those relating to the RS90. Nevertheless, we have repeated each explanation in full so that you can gain a complete picture of the RS95 without flicking between pages.

(For background information regarding VCOs in general, please refer to the Introduction in the previous section, and to the Appendices.)

IN USE

The operation of any oscillator can be subdivided into three major categories: its pitch (or 'frequency') its tone (as defined by its waveform), and its volume (or 'level').

FREQUENCY

- CV-IN 1V/OCT

The RS95 generates a particularly wide range of frequencies. The minimum - approximately 0.3Hz - is well into the subsonic range, so the RS95 will double as an LFO when required. This architecture emulates that of the Minimoog and larger Moog synthesisers such as the IIIC and System 55. At the upper end of the scale, the RS95 will reach frequencies of approximately 17kHz, which is at the top end of hi-fi reproduction, and beyond many peoples' upper limit of hearing.

The primary method of controlling the pitch is by applying a suitable CV to the CV IN socket. This respond correctly to the 1V/Oct standard adopted by Moog, ARP, Roland and Sequential Circuits (among others). It will not allow you to play conventional melodies if you apply a CV conforming to the Hz/Volt standard used by Yamaha and most Korg monosynths.

Before leaving the factory, every RS95 is calibrated to respond linearly to input control voltages ranging from -10V to +10V. This gives the RS95 a theoretical audio range of 20 octaves. In practice, the range is closer to a "mere" 16 octaves - still far exceeding the capabilities of most other manufacturers' devices.

FREQUENCY

The frequency knob has three ranges:

- WIDE
  Turning the FREQUENCY control from its minimum to its maximum will cause the RS95 to produce its full range of frequencies from 0.3Hz to 17kHz.

- "-2 OCT"
  This reduces the pitch of the RS95 two octaves with respect to "STD" (see below), but in all other respects the oscillator's operation is identical to the "STD" mode.

- "STD"

  Note: On the RS90 this is called the "0" mode

  Unlike the "0" setting on the RS90, the STD mode allows the FREQUENCY control to tune the RS95 by somewhat more than one octave on either side of the nominal pitch. This allows you to tune the oscillator across a full two octaves (with additional detune if desired), making it possible to generate any given pitch between the -2 OCT and STD settings without applying a pitch CV.

  Slight detuning of one of a pair of RS95s produces a much thicker sound than would be obtained if both oscillators were in tune with each other. More radical tunings - such as fundamental with added third and fifth - offer a range of conventional 'synth' sounds.

- CV-IN VARY

  The CV-IN VARY socket and its associated LEVEL control allow you to specify the oscillator's sensitivity to pitch CV within the range ∞V/oct (marked "ZERO") to approximately 0.5V/Oct. The former of these makes the oscillator invariant to incoming CVs, while the latter makes it oversensitive compared to CV-IN 1V/OCT. This is particularly useful when using an RS95 as a 'sync' oscillator because it then becomes harmonically unrelated to the audio oscillator, thus generating a different timbre on each note that you play.

Waveforms

Unlike the RS90 (which generates two families of waveforms), the RS95 generates three such families. The first of these is the rectangular family, whose waves are generally known as pulse waves or square waves. The second is the sawtooth family which includes falling saws, triangle waves, and rising saws (also known as 'ramp' waves). The third is the sine wave and an associated family of skewed waves with unusual harmonic structures..

You can set the exact nature of the waveforms manually or, unlike the majority of other manufacturers' oscillators, control them dynamically using the CV-IN inputs provided for each family.

- PULSE WAVE

  You can adjust the pulse wave output from 0% (leading pulse) through square wave to 0% (trailing pulse) as you turn the PULSE SHAPE control from its fully anticlockwise position through to its most clockwise position. As factory calibrated, the square wave shape will be obtained when the knob is at "12 o'clock". You can also influence the pulse wave shape by applying a CV to the CV-IN SHAPE socket next to the PULSE SHAPE control, as follows:

  - A CV of +2.5V will generate a 0% leading pulse wave;
  - A CV of 0V will generate a square wave;
  - A CV of -2.5V will generate a 0% trailing pulse wave.

  The output from the SQR OUTPUT socket is approximately ±5V.

- SAWTOOTH / TRIANGLE WAVES

You can adjust the sawtooth wave output from a falling sawtooth through a triangle wave to a rising sawtooth (ramp) waveform as you turn the SAWTOOTH SHAPE control from its fully anticlockwise position through to its most clockwise position. As factory calibrated, the triangle shape will be obtained when the knob is at "12 o'clock". You can also influence the sawtooth wave shape by applying a CV to the CV-IN SHAPE socket next to the SAWTOOTH SHAPE control, as follows:

- A CV of +2.0V will generate a falling sawtooth wave;
- A CV of 0V will generate a triangle wave;
- A CV of -2.0V will generate a rising sawtooth (ramp) wave.

The output from the SAW / TRI OUTPUT socket is -2V to +8V when a true sawtooth wave is produced, and ±2.5V when a triangle wave is produced.

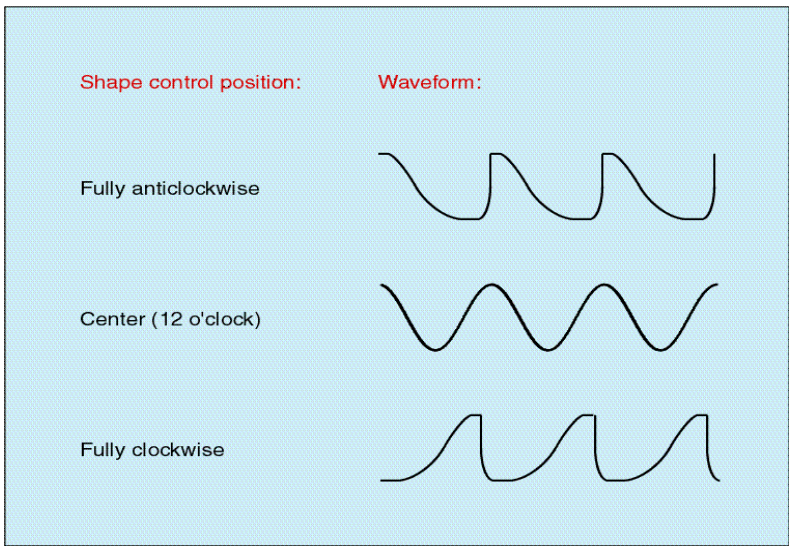
- SINE AND SKEWED SINE WAVES

The sinewave is a sadly underused waveform found on few analogue synthesisers. There is a good reason for this: it is not simple to generate a pure sinewave. Most oscillators with sinewave ouputs generate the waveform by re-shaping another wave... usually the triangle or, if this unavailable, the sawtooth. Analogue Systems has taken this idea a step further to built a uniquely ***shapeable*** sinewave output.

There are two ways to shape the sinewave

- Using the Shape control

  You can use the shared SAW / TRI / SINE SHAPE knob to generate any of the waveforms shown below, or to select a waveform that lies anywhere between these extremes. These are unusual waveforms with uncommon harmonic structures, and you can use them to create timbres that you will not be able to obtain from conventional synthesisers.

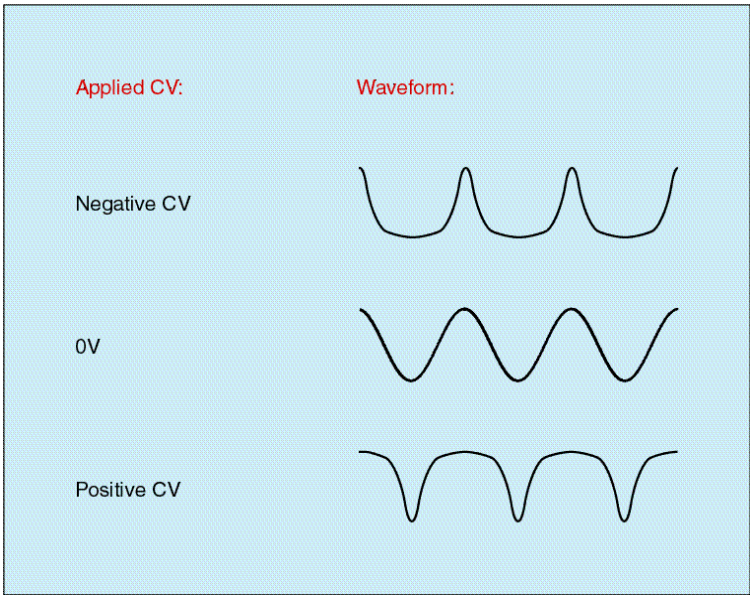


- Using the SINE-SHAPE CV IN

  You can use SAW / TRI OUTPUT* as a SINE SHAPE CV IN. This facility is unique to the RS95, and provides another family of waveforms, as shown in the diagram below.

  The greater the applied CV (either positive or negative) the greater the amount of waveshaping there will be. Again, these are unusual waveforms with uncommon harmonic structures and, as with the SHAPE control, you can use them to create timbres that you will not be able to obtain from conventional synthesisers.

  * ***This is not a typographical error. You use this OUTPUT as a CV INPUT.***



More on sinewave shaping:

There is nothing stopping you from using both the SINE SHAPE CV IN and the SHAPE control to create new waveforms not shown in these diagrams. Furthermore, a varying CV presented to the CV INPUT will produce interesting "chorused" sounds similar to, but more subtle than conventional Pulse WIdth Modulation.

The output from the SINE OUTPUT socket varies from approximately ±1.5V to ±2.5V, depending upon the waveform produced.

Outputs

The RS95 has an additional output compared with the RS90. This allows you to obtain the sine family waveforms simultaneoulsy with the pulse and saw / triangle waveforms.

Sync

Like the RS90, the RS95 offers oscillator 'sync' which allows you to re-initialise the waveform by applying a second waveform at the SYNC IN input. The RS95 is re-initialised every time the voltage of the synchronising oscillator passes 0V in a positive-going direction, increasing the harmonic complexity of the waveform, and thus the range of tones that you can obtain. The most popular use for sync is to generate "tearing" or "rasping" lead-synth or bass-synth sounds. However, the sync on the RS95 is 'softer' than that of the RS90, and this makes it possible to generate a wider range of effects than before.

The SYNC IN socket will accept voltages in the range ±10V, but the sound produced by syncing the RS95 to an external source depends upon a wide range of factors. These include the level of the sync source, its frequency, its waveform, and its polarity.

For a 'hard' sync sound (as produced, for example, by the Moog Prodigy and Moog Source) you should apply a square- or pulse- wave that crosses 0V. For best results the sync source should be at a lower frequency than the RS95 it is modulating.

Note: Using the RS95 as a simple tone generator

If no CVs are applied to any of the inputs you can use the RS95 as a simple tone generator with fixed pitch and fixed waveform.

With the RANGE switch set to "0" and the FREQUENCY control at its minimum, the frequency generated is 64Hz. With the RANGE set to "-2 OCT" and the FREQUENCY control at its minimum, the frequency generated is 16Hz.