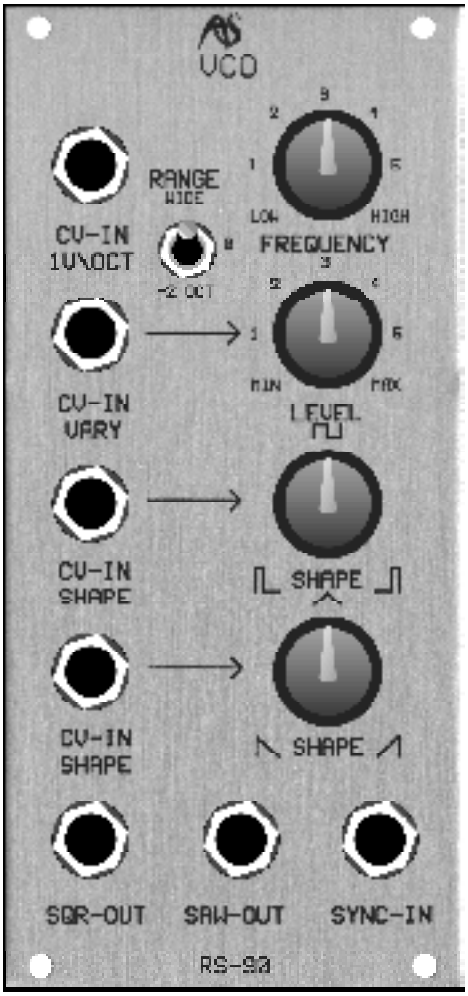
RS90

VOLTAGE CONTROLLED OSCILLATOR WITH WAVE SHAPING



INTRODUCTION

Most audio frequency oscillators generate a range of periodic waveforms. In general, these waveforms contain a large number of harmonics and are suitable for use as the basis of subtractive synthesis, wherein harmonics are removed or emphasised to create new sounds. (Some oscillators also produce aperiodic waveforms which are perceived as noise, but the RS Integrator has a dedicated module for this.)

These oscillators are the prime sound sources within a synthesiser. There are other sources - such as self-oscillating filters - but for the majority of applications the initial sound will be generated by one or more conventional oscillators. It is therefore vital that these offer accurate waveforms, are stable with respect to pitch, and that they suffer from a minimum of unwanted noise and/or distortion. They should also be very flexible, which means that they must be capable of producing a wide range of timbres. Finally, they must exhibit one further, but unquantifiable quality: they must sound good.

You may think that it would be straightforward to satisfy these criteria. Unfortunately, it isn't, and many synthesisers suffer from a "weak" or "characterless" sound. And, since analogue synthesis is subtractive you can't put back what wasn't there in the first place. The oscillator itself must be of the highest possible quality. Which leads us to the RS90...

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

  The RS90 generates a particularly wide range of frequencies. The minimum - approximately 0.3Hz - is well into the subsonic range, so the RS90 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 RS90 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 RS90 is calibrated to respond linearly to input control voltages ranging from -10V to +10V. This gives the RS90 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 RS90 to produce its full range of frequencies from 0.3Hz to 17kHz.

- "0"
  The FREQUENCY control allows you to tune the RS90 by approximately an octave. Slight detuning of one of a pair of RS90s 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.

- "-2 OCT"
  This reduces the pitch of the RS90 two octaves with respect to "0", but in all other respects the oscillator's operation is identical to the "0" mode.

- 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 to approximately 0.4V/Oct. The former of these makes the oscillator invariant to incoming CVs, while the latter makes it oversensitive compared to CV-IN. This is particularly useful when using an RS90 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

The RS90 simultaneously generates two families of waveforms. 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. The exact nature of the waveforms can be set manually or, unlike the majority of other manufacturers' oscillators, can be dynamically controlled using independent CV-INs for each family.

- PULSE WAVE

  The pulse wave output can be adjusted 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-OUT socket is approximately ±5V.

- SAWTOOTH / TRIANGLE

  The sawtooth wave output can be adjusted from a falling sawtooth through a triangle wave to a rising sawtooth 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 wave.

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

Sync

The RS90 offers oscillator 'sync' which allows you to re-initialise the waveform by applying a second waveform at the sync input. The RS90 is re-initialised every time the voltage of the synchronising oscillator passes 0V in a positive-going direction. This facility increases the harmonic complexity of the waveform, and vastly increases 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.

The SYNC IN socket will accept voltages in the range ±10V, but the sound produced by syncing the RS90 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 RS90 it is modulating.

Note: Using the RS90 as a simple tone generator

If no CVs are applied to any of the inputs you can use the RS90 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.