

RS500E

EMS SYNTHI FILTER

INTRODUCTION

The various models of EMS VCS3 and Synthi rank among the most desirable of all vintage synthesisers. Designed in England between the late 1960s and mid 1980s, these eschewed common designs and control mechanisms, and performed very differently from synthesisers manufactured in America and Japan.

The earliest commercial Synthi (although not called by that name) and by far the most famous, was the VCS3. This was later joined by the Synthi A, Synthi AKS, the monstrous Synthi 100, and the Synthi E. (For further information about these, please refer to the chapter entitled "The EMS Story" found before the appendices in this manual.) The RS500E low-pass filter for the RS Integrator was recreated by former EMS engineer Steve Gay and is, as far as possible, an exact reproduction of the filter within these synthesisers.

Although there are minor differences between the circuitry in the RS500E and the originals, most have been made specifically so that the EMS circuit will fit the RS Integrator format. Other modifications allow it to handle modern signal levels and control voltages.

In addition, the RS500E offers three facilities not found on unmodified EMS synthesisers. These allow you to use the filter in ways not possible on an original Synthi. The additional facilities are:

Voltage Control of Response

"Response" was the EMS term for filter resonance. EMS synthesisers allowed you to alter this using a knob, but they did not provide for voltage control. Fortunately, it has been simple to add a CV input to control the Response. This has not altered the filter's sound.

Rapid Cut-Off Frequency response to incoming CVs

Due to a capacitor that slewed incoming control voltages, the cut-off frequencies of early EMS filters responded slowly to changes in incoming CVs. The consequence of this was obvious when you tried to create snappy, percussive sounds on a Synthi... you couldn't. The RS500E allows you to switch this capacitor out of the circuit, allowing you to program significantly different types of sound.

18dB/octave and 24dB/octave filter slopes

Until early 1974, all VCS3s and Synthi were fitted with filters that rolled-off at 18dB/octave. But in response to market forces, later models offered the more common slope of 24dB/octave. Although this was in some respects an improvement, it came at a price... the sound of the filter changed, and many players stated a preference for the earlier design.



Happily, you don't have to choose between one or the other when configuring your RS Integrator. The RS500E offers both filter characteristics, selectable using a simple front-panel switch.

Note: The CV slew switch and the 18dB/24dB filter options were - and remain - standard modifications for vintage EMS instruments.

IN USE

The RS500E is a low-pass filter with variable resonance. It is modelled on the filters produced for EMS synthesisers, and shares their principle sonic characteristics.

Cutoff Frequency

You control the filter cut-off frequency (F_c) using the FREQUENCY control. In its fully anticlockwise position, F_c is approximately 20Hz. As you rotate the knob clockwise F_c will increase until, in its fully clockwise position, it reaches approximately 20kHz. These extreme positions are called 'Low' and 'High' respectively. You may also control F_c using one or both of the CV inputs:

- CV-IN FIXED

Unlike other RS Integrator filters (which will track an incoming 1V/oct CV accurately over a wide range of frequencies) the fixed input on the RS500E is not strictly a 1V/oct CV input. It is calibrated to respond to 1V/oct as well as possible, but it is one of the quirks of the original EMS design that it is not linear enough to track over a range greater than about two octaves.

- CV-IN VARY

You may wish F_c to track incoming CVs at >100% or <100% relative to 1V/oct, so a CV-IN VARY input is provided. This socket and its associated LEVEL control allow you to specify the filter's sensitivity to CVs within the range ∞ V/oct to approximately 0.2V/oct. The former of these makes the filter invariant to incoming CVs, while the latter makes it over-sensitive compared to the FIXED input.

Cutoff Frequency Slew

The RS500E offers two CV response modes: CV SLEW FAST and CV SLEW SLOW (STD). You should select the correct mode for the type of sound required.

- CV SLEW SLOW (Standard)

When high frequency CVs are applied to the unmodified Synthi filter they are low-pass filtered by a slewing capacitor. This means that the filter will not respond to high frequency CVs, and will respond slowly to rapid changes in incoming CVs. You can use this mode to recreate the bubbling and warbling effects for which early VCS3s and Synthi are famous.

- CV SLEW FAST

With the switch in this position, the slewing capacitor is removed from the CV input circuitry, so the filter will respond to high frequency CVs. Use this mode for sounds such as percussion and effects that require a rapidly varying filter cut-off frequency.

Filter Slope

Changing the filter slope alters the way in which upper frequencies are removed from an audio signal passing through the device. This change can be subtle or obvious, and can be the single most defining characteristic of an analogue synthesiser.

- PRE 1974
The filter attenuates frequencies above F_c at a rate of 18dB/oct. This recreates sounds of EMS synthesisers built before 1974.
- POST 1974
The filter attenuates frequencies above F_c at a rate of 24dB/oct. This recreates sounds of EMS synthesisers built from 1974 onwards.

Response

The RS500E has variable resonance, which on early EMS synthesisers was called "Response".

As this is increased from its minimum, the filter will accentuate F_c , and will attenuate frequencies below F_c as well as those above it. As the resonance is increased further, the RS500E will exhibit 'ringing', and will strongly colour any signal passing through it. At high resonance, the filter will begin to oscillate, and it will then act as an audio signal generator, the frequency of which is F_c itself.

You can control the resonance using the RESPONSE control. In its fully anticlockwise position, the resonance is approximately zero, and there is no emphasis of the signal at F_c . As you rotate the knob clockwise, the resonance will increase until, in its fully clockwise position, the filter oscillates. You may also control the filter resonance using the RESPONSE CV-IN, which accepts and responds to all standard RS Integrator control voltages.

Audio Input and Output

The RS500E has a single audio input: SIG IN, with an associated LEVEL control. This input accepts signals in the range $\pm 10v$.

The LEVEL control offers unity gain in approximately the 2 o'clock position, marked '4' on the panel. At its fully anticlockwise position it attenuates the signal fully (MIN = $-\infty$ dB gain) while at its fully clockwise position it offers a small gain.

There is a single output with an associated LEVEL control. This carries a signal in the range $\pm 10v$.

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