

# digitally-controlled phaser

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Phasing is a well-known musical effect which is obtained by varying the phase relationship of a signal with respect to an original version of the same signal, whilst ensuring that its amplitude remains constant; the phase-shifted and original signals are then summed in proportions which are determined by the intensity of phasing required.

In the circuit shown here, the phase shift is provided by op-amps A2...A7. The constant changes in phase are obtained by arranging for the resistance between the '+' inputs of the op-amps and earth to be varied

with the aid of a low frequency modulation signal. Normally FETs are used as voltage-controlled attenuators, however they have the drawback of introducing a noise component and are not perfectly linear. The approach adopted here, although more complex, is superior. Eight resistors are switched in and out of circuit via multiplexers IC3...IC8 (which thus function as single-pole, 8-way electronic switches). The multiplexers are controlled by the information present on address lines A, B and C. Thanks to the configuration of gates, N1...N14, the address

data continuously cycles from 000 to 111 and back down to 000 again. The clock pulses are provided by the 555 timer, IC9. The clock frequency, and hence the speed of the phasing, can be varied by means of P3, whilst P1 allows the depth of phasing to be adjusted. The overall gain of the circuit is controlled by P2.

A symmetrical supply voltage (max.  $\pm 7.5$  V) is used. In the prototype version the author used 2 x 4 1.5 V batteries to make up the 6 V supply lines shown in the diagram.

G. Duffau

(France)

