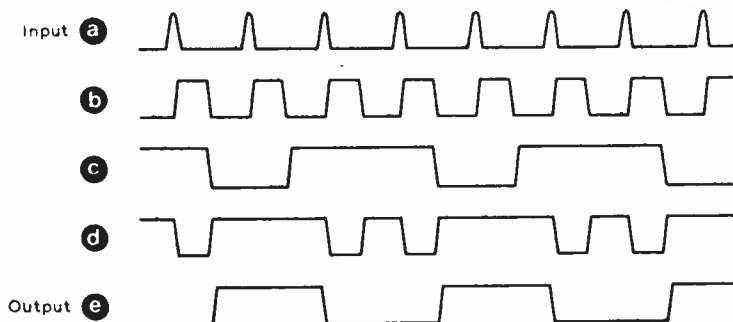
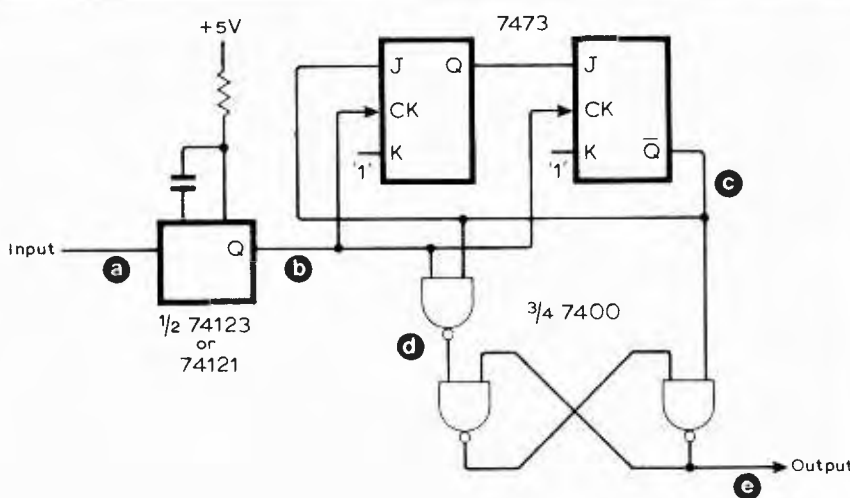
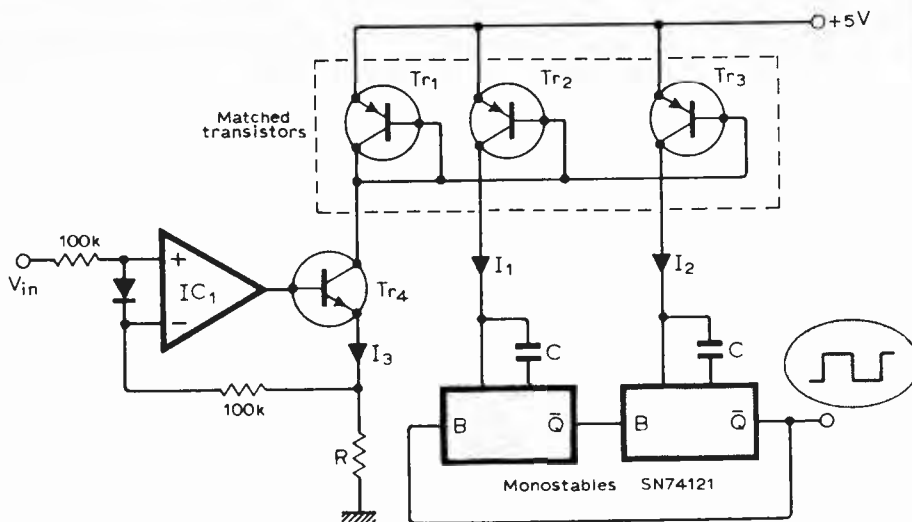


### High a.c. loads

A shortage of high-current loads presented a problem when it was necessary to soak-test two identical mains transformers. The test conditions were satisfied by using a reflected load technique with the two transformers back-to-back as shown. Readily available 240V domestic lamps provided highly suitable loads. With a little care and adaptation this principle can be applied to dissimilar transformers. Also, suitable resistors can be used in conjunction with the lamps for fine load trimming.  
Geoffrey T. Edwards,  
Woodley,  
Reading.

### Linear v.c.o. operates from 5V

When designing hybrid analogue/digital systems, it is often necessary to use a voltage controlled oscillator operating from a 5V supply rail. This circuit uses a standard current differencing amplifier IC<sub>1</sub> together with t.t.l. monostables to achieve this. The amplifier is biased as a voltage follower so that a current  $V_{in}/R$  flows through Tr<sub>1</sub>. Because Tr<sub>2</sub>, Tr<sub>3</sub> and Tr<sub>4</sub> are connected in a current mirror configuration, equal currents I<sub>1</sub> and I<sub>2</sub> are injected into the monostables. The monostables, which are connected back to back, oscillate at a frequency defined by the current in Tr<sub>1</sub>. Care should be taken in choosing the current defining resistor R because thermal considerations limit the current to 2.5mA. The centre frequency may be chosen by  $f_c = 1/(4CR)$  for  $V_{in} = 2.5V$ . Nonlinearities in the emitter base junction of Tr<sub>1</sub> are removed by feedback. In practice the main deviations in V-to-F occur because of a mismatch between the current mirror transistors. This mismatch is most significant at currents above 1mA.  
Kirit Patel,  
London Business School.



### Divide by three

This circuit uses only three t.t.l. i.cs to divide an input signal by three and provide an equal mark-to-space ratio output. The monostable is adjusted to produce an equal mark-to-space ratio from any input signal.  
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St. Leonards on Sea,  
E. Sussex.