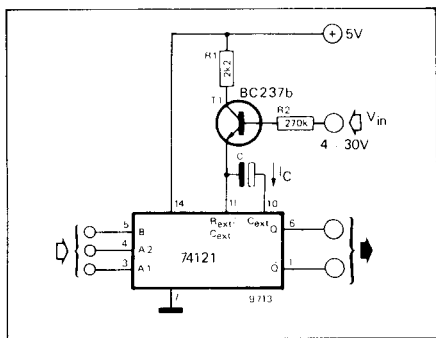


voltage-to-time converter

The well-known TTL IC type 74121 is a monostable multivibrator that can be set to give an output pulse with a duration of anything between 40 ns and 40 s. This pulse duration is determined by a single external RC combination. If the fixed resistor in the basic circuit is replaced by a variable resistor (i.e. a potentiometer), the length of the output pulse can be varied over a wide range.

In the circuit shown here, this principle is used to obtain a monostable multivibrator with a pulse duration that is determined by an external (DC) voltage. The original fixed resistor, which would have been connected between pin 11 and the positive supply, has been replaced by transistor T1. Resistor R1 is



included to protect the IC from inadvertent overdrive.

The transistor works as a sort of variable resistor (with a 'resistance' that depends on the DC voltage applied to its base) and it determines the charging current flowing into the external capacitor C. The duration of the output pulse (t) is now set by the input voltage V_{in} , approximately as follows:

$$t \approx 0.7C \times (5 - V_{tr}) \times \frac{R_2}{\alpha' \cdot (V_{in} - V_{tr} - 0.7)}$$

where

t = duration of the output pulse (seconds)

C = value of capacitor C (Farads)

R_2 = value of resistor R_2 (Ohms)

V_{tr} = trigger voltage (typ. 3 V)

V_{in} = input voltage (volts)

α' = DC current gain of the transistor.

The monostable is triggered in the normal way, via the A1, A2 and/or B inputs.