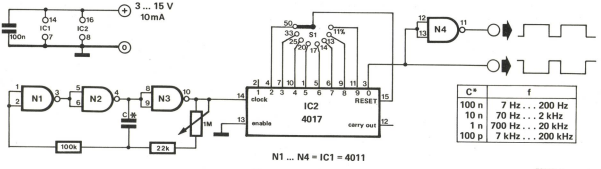
15 duty-cycles at the turn of a switch

1



C*	f
100 n	7 Hz . . . 200 Hz
10 n	70 Hz . . . 2 kHz
1 n	700 Hz . . . 20 kHz
100 p	7 kHz . . . 200 kHz

Only two CMOS-ICs are used in the generator described here, but in spite of its simplicity it offers a selection of 15 precisely determined duty-cycles without any need for calibration. It is a useful item of test gear, especially for calibrating other instruments that are designed to measure duty-cycles in one form or another – dwell meters, for instance.

The outputs of a divide-by-ten counter, the CD4017, are connected to an 8-position switch. One of the outputs is selected and fed back to the reset input of the IC. The result is a divider stage that can be set at any division ratio between 2 and 9. If the output is taken from the '0' output of the divider, both the frequency and the duty-cycle of the input frequency will be 'divided' by the preset ratio. Furthermore, the duty-cycle of the output signal will be independent of the input frequency: it is determined only by the setting of the selector switch.

To complete the unit, a clock generator is included (N1 . . . N3). The 'clock' frequency is determined by the value of the capacitor, C, and by the setting of the 1 M potentiometer. The Table lists frequency ranges for a few capacitor values.

The duty-cycle at the output (pin 3 of IC2) is equal to the division ratio times 100%. For instance, if output '5' (pin 1) of IC2 is selected, the division ratio is 1:5 and the duty-cycle is

$$\frac{100}{5} = 20\%.$$

No calibration required! As can be derived from figure 2, eight duty-cycles between 50% and 11.1% can be selected. N4 inverts the output signal, providing eight duty-cycles varying from 50% up to 88.9%. Since 50% is 50% no matter which way you look at it, the total number of duty-cycles available is fifteen.

The amplitude of the output signal is equal to the supply voltage, i.e. anywhere between 3 and 15 volts.

2

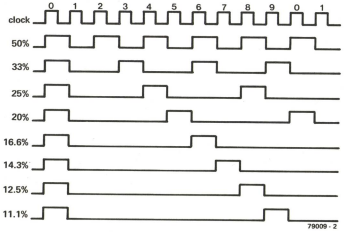


Figure 1. Only two IC's are required for this little generator. The Table lists frequency ranges for a few capacitor values.

Figure 2. The duty-cycle at the output is determined by the division ratio.