PROGRAMMABLE TIMER

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This portable device can accurately time any period from 15 minutes to 3 hours, 45 minutes in 15-minute steps. The circuit can be divided into four discrete parts, as shown in Fig. 1. The pulse generator causes the circuit to increment once for every pulse received, and these form the basis of a timer.

The programmable logic looks for this number and when it appears, activates the oscillator which sounds the piezoelectric transducer. The alarm will sound until silenced.

The pulse generator is formed from a 4541 CMOS IC. Following the oscillator is an on-chip progammble divider which divides the oscillator frequency by either 256, 1024, 8192 or 65536 depending on the binary code at pins 12 and 13; with both at logic 1, the 65536 division is selected and the output is available at pin 8. Pin 6, when taken high, resets the output from pin 8 to zero.

The Counter

Referring to Fig. 2, resistors R1 and R2 and capacitor C1 determine the time constant for IC1's oscillator. Trim pot VR1 is a 22-turn cermet type used to fine-tune the frequency to 1165Hz. Following division by 65536, the output at pin 8 completes one cycle (low to high and back again) in 56.25 seconds.

Every time pin 9 of IC2 goes high, capacitor C3 and resistor R4 generate a pulse to beep the sounder every two minutes to indicate that the timer is working. Constructors who do not want this feature can omit C3, R4 and D2.

Capacitor C2 and R3 produce a pulse at pin 11 of IC2 which ensures that the counter is reset when power is applied. This pulse is also sent to the output via D3 to produce a power-up beep.

The output at pin 3 of IC2 first goes high on the 16th pulse from IC1, or 15 minutes after power-up. Similarly, pin 2 goes high after twice this period (30 min.), pin 4 after one hour and pin 13 after two hours.

PARTS LIST

R1: 33k metal film, 1%, R2: 82k, R3-9: 100k, R10: 39k (all resistors 5%, .25W unless noted). VR1: 10k 22-turn cermet trim, VR2: 100k carbon trim, C1: 10n polyester, C2-3: 1u 35V tantalum, C4: 10u 16V tantalum, C5,6: 10n ceramic, D1-3: 1N4148, IC1: 4541 CMOS oscillator, IC2: 4040 CMOS 12-stage counter, IC3: 4012 CMOS NAND, IC4: 4093 NAND Schmitt trigger.

S1-4: miniature single-po;le DIP switches (4-way), S5: latching pushbutton, B1: PX28 6V silver-oxide camera battery, WD1: piezoelectric sounder.
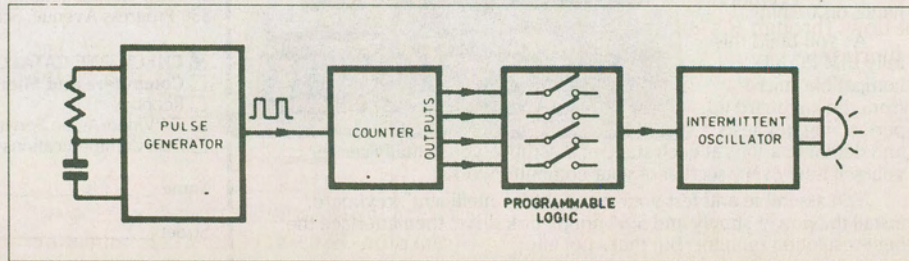

Fig. 1. The system block diagram for the Programmable Timer.
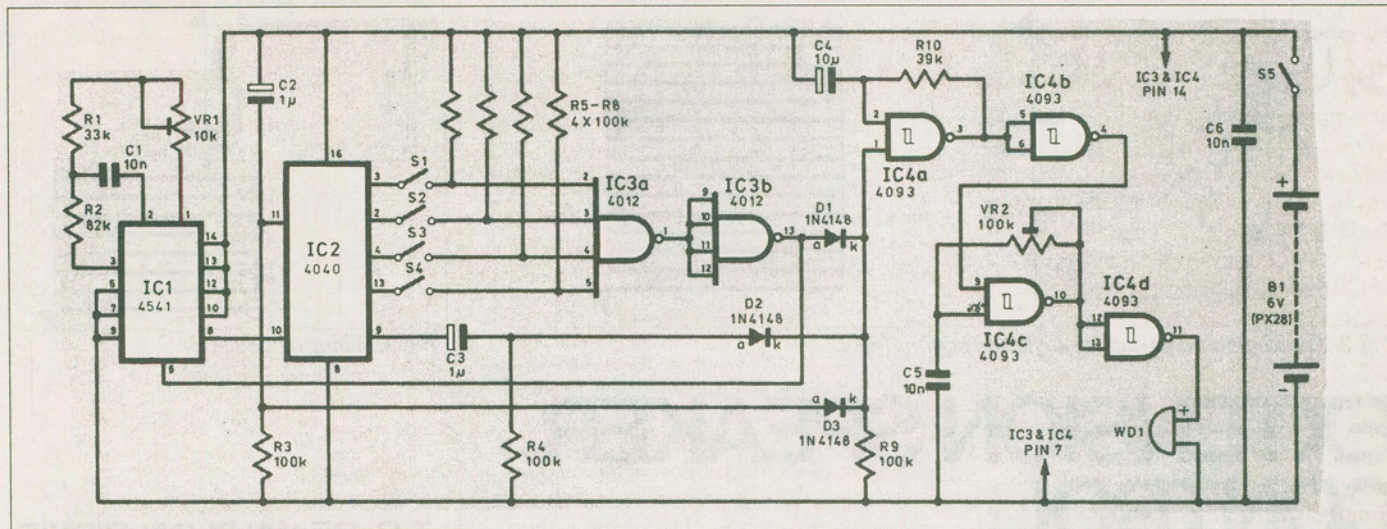
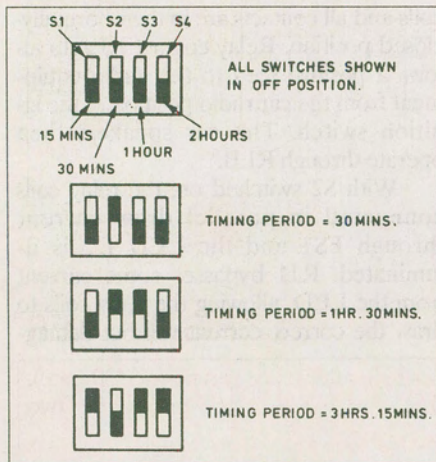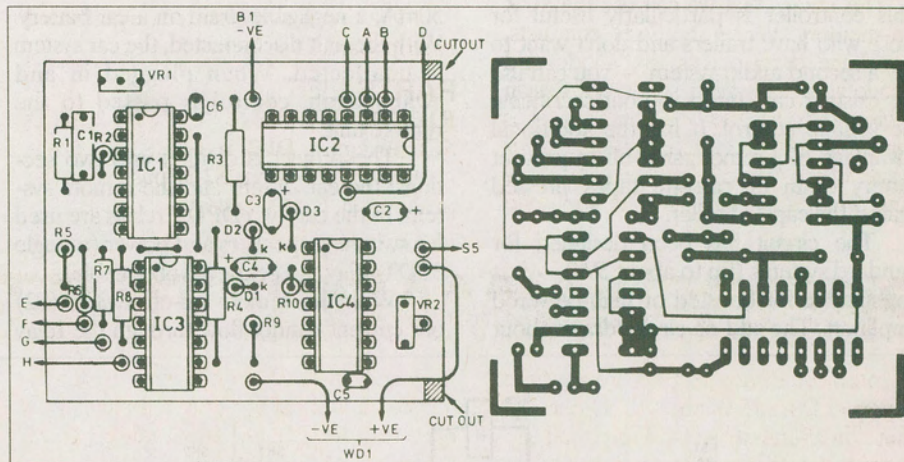Fig. 2. Complete circuit diagram for the Programmable Timer.

Fig. 3. Various timing combinations.

Fig. 4. The component layout. and Fig. 5. The circuit board.