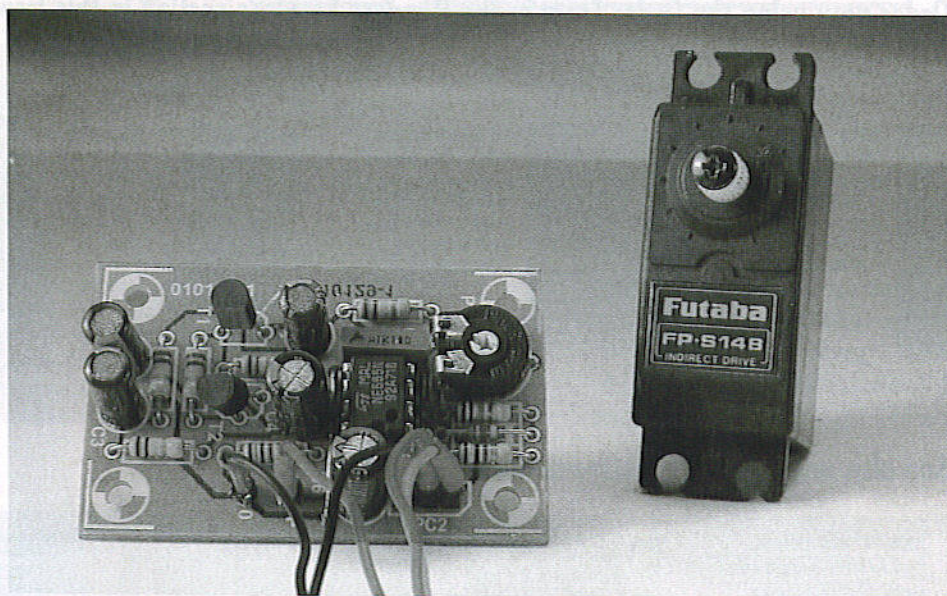


# Relaxation Machine

A servo-powered pendulum

Design by B. Kainka

It is a generally known and accepted fact that servos used in radio-controlled models see very little or no use outside the model flying, racing or boating season. A pity, considering these devices can be used for many useful tasks...



For example, a servo that's not used anyway could be attached to a large pendulum of which the smooth and steady motion may help people relax and even fall asleep. For this (psychological) effect to be achieved the movement has to be sine-shaped like that of a real and very long pendulum.

The small circuit of the Relaxation Machine you find in **Figure 1** consists of two parts. A pulse generator based on a 555 supplies positive pulses with a length between 1 and 2 ms ('mark') and a pause of 20 ms ('space'), representing a typical servo control signal. In addition there's a sinewave generator designed to supply a very low frequency

of about 0.25 Hz which corresponds to one full period in four seconds. The sinewave generator employs a phase shifting network and supplies a sinewave with very low distortion. If you want to lengthen the period, simply increase the value of C1, C2 and C3 a little.

The generator drives the control input of timer component IC1 via an electrolytic capacitor. IC1, by the way, should be a 7555, 555C or another CMOS version of the 555. The generator drive scheme ensures that the timer 'mark' duration is con-

trolled, while the 'space' length is not affected.

A PCB was designed for the Relaxation machine (see **Figure 2**). Like all PCB designs that appear in this magazine the artwork files to enable you to make your own board may be found among this month's Free Downloads on the Publisher's website at [www.elektor-electronics.co.uk](http://www.elektor-electronics.co.uk).

With the board available, the circuit should be easy to build up. All you need to do is follow the parts list and the components mounting plan. There is one wire link on the board



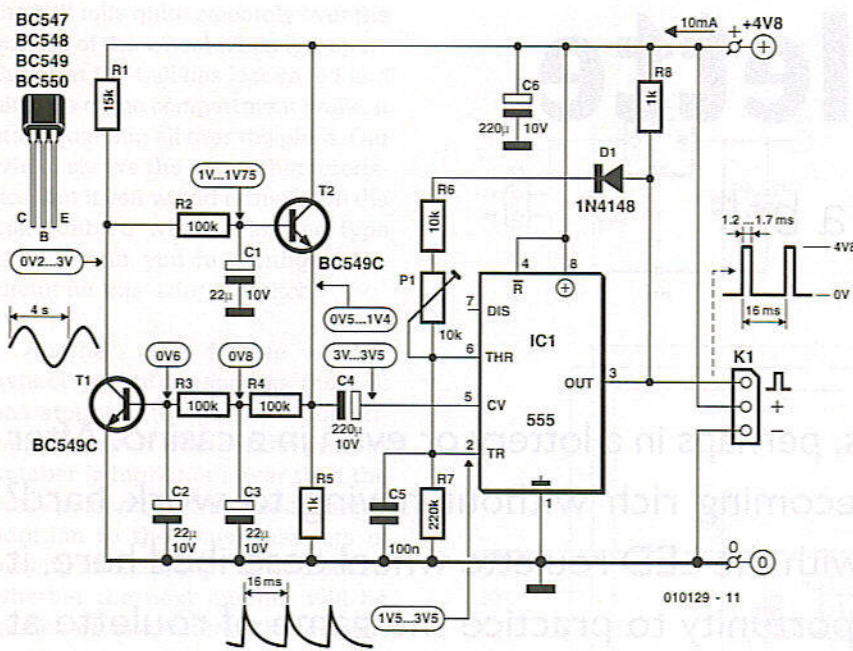


Figure 1. Circuit diagram of the Relaxation Machine.

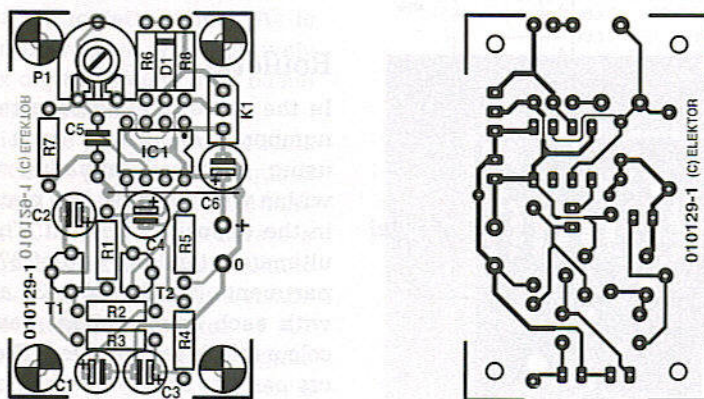


Figure 2. PCB design.

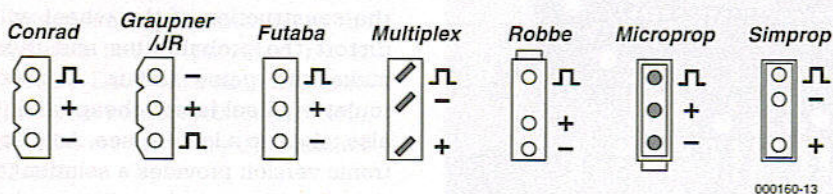


Figure 3. Servo pinouts.

which should not be forgotten. The link is best made using thin isolated wire because it runs dangerously close to the pins of IC1.

Positions T1 and T2 can take almost any NPN transistors with a sufficiently high gain. In most cases,

this means that C suffix devices will work best, i.e., the  $h_{fe}$  should exceed about 300. Suggested types include the BC547C, BC548C, BC549C and BC550C.

Preset P1 is adjusted until the servo covers the full motion in both

directions without hitting any of the stops. If the elongation (the distance between a moving body and the point of origin) is too small or too large, you may need to experiment a little with the value of R1. If you make the resistors too small ( $<10\text{ k}\Omega$ ) then the oscillator will no longer oscillate. Capacitor C4, too, has an effect on the amplitude.

The current consumption of the circuit is of the order of 10 mA excluding the servo.

The 3-way pinheader in position K1 will allow most servos to be connected up easily. If you are using a 'less than standard' servo, then a small adapter may be required. The connections of a couple of well-known servos are shown in Figure 3.

Using our circuit, a correctly connected servo will turn slowly, describing a pure sinewave, its period being about equal to that of a pendulum with a length of four metres (!). Of course, you may also attach a smaller pendulum, a painted carton board or another ingenious creation to the servo spindle, provided is not too large or heavy (because of the mechanical load on the servo).

The swinging pendulum has a relaxing effect, while the sound of the servo motor at such a low speed is not unlike snoring.

### Warning

This circuit should not be used on (or by) persons with an epileptic or narcoleptic condition or subject to easy hypnosis.

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## COMPONENTS LIST

### Resistors:

- R1 = 15k $\Omega$
- R2, R3, R4 = 100k $\Omega$
- R5, R8 = 1k $\Omega$
- R6 = 10k $\Omega$
- R7 = 220 k $\Omega$
- P1 = 10k $\Omega$  preset

### Capacitors:

- C1, C2, C3 = 22 $\mu$ F 10V
- C4, C6 = 220 $\mu$ F 10V
- C5 = 100nF

### Semiconductors:

- D1 = 1N4148
- T1, T2 = BC 549C
- IC1 = 555C or 7555 (CMOS)

### Miscellaneous:

- K1 = 3-way pinheader
- 2 solder pins
- PCB, available from **The PCBShop**