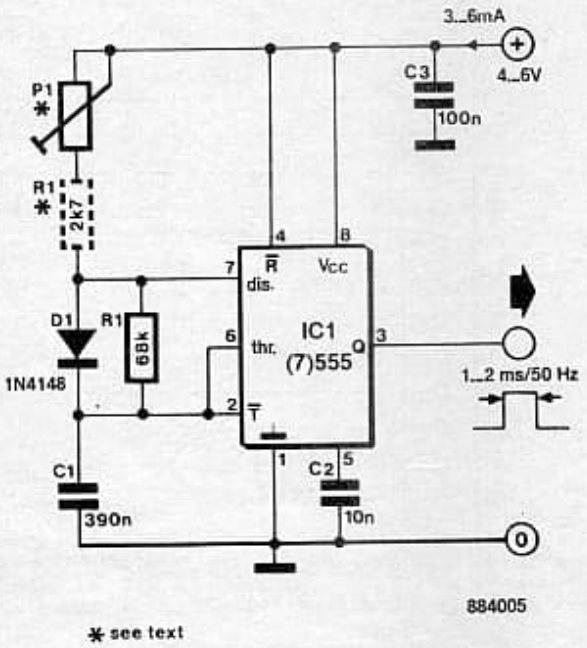
011 SERVO-PULSE GENERATOR

Circuits for the generation of control pulses for servo apparatus remain popular, which seems a good enough reason to present another one.
The popularity of servo control is enhanced by the low price of servo motors, and the fact that they can be used for a variety of applications. The present design is geared to stand-alone use of the servo.
Simplicity of the circuit was the first design consideration, and it seemed reasonable, therefore, to base it on the well-known 555 IC. Unfortunately, this chip has the property, in its standard configuration, of producting pulse trains with a duty factor* of 50% or greater. This is so, because the charging time constant is always greater than the discharge one, since during charging the discharge resistance is in series with the charge resistance.
Servos, on the other hand, require pulse trains with duty factors well below 50%. Ideally, the pulses should have a width of 1–2 ms, and the pulse repetition frequency – prf – should be about 50 Hz. This gives a duty factor of 5–10%.



This problem may be resolved by inverting the output signal of the 555 with the aid of a transistor and two resistors, but this was considered extravagant. All it needs is an extra diode and relocating the discharge resistance. The charging time, and therefore the length of time that the output is logic high, is now determined by P_1, R_1, and the discharge time through R_2.
The component values in the circuit have been chosen in a manner that causes the pulse width to change from 1 ms to 2 ms when the resistance between the positive line and the anode of D_1 is increased from 2k7 to 5k4. This reduction in resistance is brought about by a 75° shift of P_1 (normal joystick travel), if this potentiometer has a value of 10k. This potentiometer must be set to a position where its resistance is 4k1 when the joystick is at centre position. Resistor R_1 should then be replaced by a wire link.
It is possible to use the normal 270° travel of the potentiometer, which should then have a value of 2k7. Resistor R_1 must then be used as shown.

*The duty factor of a pulse train is the ratio of the average pulse width to the average pulse spacing of pulses in the train.