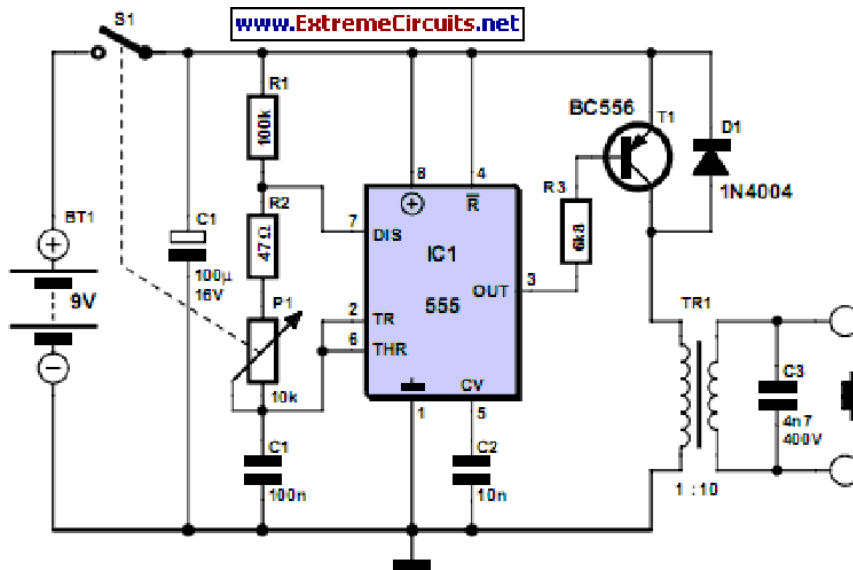


Transcutaneous Electrical Nerve Stimulator (TENS)

A Transcutaneous Electrical Nerve Stimulation (TENS) device is, put bluntly, a machine for giving electric shocks. The author was prescribed such a device on loan by his orthopaedic specialist. The unit has a large number of programmes, of which he used only one. Measuring the signals at the output of the device in this mode revealed damped oscillations at a frequency of approximately 2.5 kHz, with a repetition rate of approximately 100 Hz.



Transcutaneous Electrical Nerve Stimulator Circuit Diagram

How hard can it be to make such a device ourselves? The simple circuit uses a CMOS 555 timer to produce a brief pulse which feeds a 1:10 miniature transformer. Together with a 4.7 nF capacitor the transformer makes a parallel resonant circuit: the resonance leads to a considerable increase in the output voltage. The pulse width can be adjusted using a potentiometer, here shown combined with the on-off switch. Wider pulses produce higher output voltages. Since a peak voltage of up to 200 V can be produced, the transformer must have adequate insulation: Conrad Electronics type 516260-62 is suitable. A low-cost phono socket at the output gives reliable connection to the electrode cable.

The adhesive electrodes shown in the photograph (disposable and permanent types are available) can be obtained from pharmacies and medical suppliers. They generally have connectors compatible with 2 mm banana plugs, and so it is possible to make up the necessary cable yourself. To treat responsive parts of the body, such as the arm, the potentiometer need not be turned up far to obtain the necessary sensation. Less sensitive parts, such as the knee or foot, need a rather higher voltage and hence a correspondingly higher potentiometer setting.

Author: Klaus Rohwer - Copyright: Elektor Electronics Magazine