Basic Metronome.

Specification

Operates from a 6 - 12V supply. Adjustable from ~30 - 250 beats per minute (bpm). Beats indicated by 2.3kHz sounder.

Circuit Diagram



How it works

This circuit works in the same way as the LED Flasher circuit, but instead of the flash rate being fixed it can now be changed by adjusting the variable resistor VR1. C1 has been made smaller to provide the full range of beats per minute. R2 and C2 have also been changed to make the buzzer only sound for a very small time.

Traditionally, a metronome produces clicks. This can be achieved by replacing the buzzer with a loudspeaker, but the clicks produced are very quiet. The buzzer was used - the 'beeps' are quite audible when playing a musical instrument and are of a pitch that it does not interfer with the music being played. The buzzer used was 35-0053 from rapid Electronics.

The variable resistor, VR1, is a logarithmic potentiometer and is wired so that the high beats per minute are at the anticlockwise end of the range, so spreading out this part of the scale.



Terminal Strip Layout



Step by step construction.

1). Cut two pieces of insulated wire approximately 5cm long and strip both ends. Bend the ends of the wires so that it will fit where the blue wires are in the diagram below. Cut a piece of insulated wire approximately 10cm long and strip both ends. Bend the ends of the wire so that it will fit where the red wire is in the diagram below.



2). Take the 470Ω resistor (yellow, violet, brown and gold) and the $10k\Omega$ resistor (brown, black, orange and gold) and the $100k\Omega$ resistor (brown, black, yellow and gold). Carefully bend the leads so that they will fit as in the diagram below. Trim the leads if necessary. It does not matter which way round they are connected.



3). Take the two 2N3904 transistors - carefully spread out the leads so that it will fit as in the diagram below. Trim the leads if necessary. Ensure that the transistors are connected the correct way round.

Take the LED - carefully spread out the leads so that it will fit as in the diagram below. Trim the leads if necessary. Ensure that the LED is connected the correct way round - the flat on the side of the LED body is the negative side.



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4). Take the 47μ F and the 1μ F capacitors and the buzzer. Carefully bend the leads so that they will fit as in the diagram below. Trim the leads if necessary. Ensure that they are connected the correct way round.

Take the variable resistor and carefully bend the leads so that they will fit as in the diagram below. Trim the leads if necessary.



- 5). Finally connect the battery connector ensure that the red and black wires are connected to the correct terminals. Connect the battery. If all is well, the LED will light up and the buzzer will beep. Adjusting the variable resistor will alter how often the buzzer beeps. If your circuit does not work, carefully check that there are no wiring errors and that all of the wires are secure in the terminal strip.
- 6). Secure your circuit the variable resistor and battery to the cardboard base with Sticky Tac.
 Cut a 6cm diameter piece of card to form the scale of the metronome.
 Cut a 1 cm diameter hole on the centre of the card or

Cut a 1cm diameter hole on the centre of the card and fix under the nut and washer of the variable resistor. Attach the control knob to the variable resistor.

Calibration

To put a scale onto the cardboard disk, set the control knob to the slowest speed and count how many beeps there are in a minute. Put a mark on the cardboard disk and record the number of beeps. Twist the knob a little way and repeat.

As the number of beeps per minute increases, it will be sufficient to just count how many there are in 30 seconds and then double the number to give beeps per minute.

At the fastest speeds, counting for just 10 seconds may be sufficient and then multiplying by 6 to give beeps per minute.

For the fastest speeds, a more accurate method would be to record the beeps on a computer using Audacity and then on playback you will be able to count the number of beats in a minute accurately.



