# METRONOME

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The musicians need a 'beat' or tempo adjustable at a given rate for practising music.

The present circuit is based on a Unijunction Transistor. Use of a UJT makes the circuit simple.

***THE CIRCUIT***

The complete circuit of the metronome is shown in Fig. 1. For detailed working and construction of a UJT you can refer to the January 2004 issue of EM.

As the supply is switched on, there is internal resistance between the bases b2 and b1 of the UJT Q1 and only a very small current of the order of 1mA flows through it. At the same time the capacitor C1 starts to charge-up through the combination of R1+VR1. As the voltage at the emitter terminal reaches a threshold level usually about 5 to 7 volts, the emitter suddenly conducts and capacitor C1 quickly discharges via the resistor R3. This lowers the internal resistance of the device and greater current flows through the UJT discharged, the device goes back to its intitial state, and the above cycle repeats.

If we observe the output at the base b1, this is in the form of short positive-going pulses.

The wave form at the emitter will be a sawtooth wave.

The frequency of the pulses at b1 depends upon the total resistance of R1+VR1 and the value of the capacitor C1.

The output is coupled to the low impedance speaker of 8 to 25 Ohm via transistor Q2. This transistor is switched on only when a positive pulse appears at its base. The potentiometer VR2 acts as a volume control. The circuit can be operated from a small PP3, 9V battery Capacitor C2 acts as a supply decoupling capacitor.

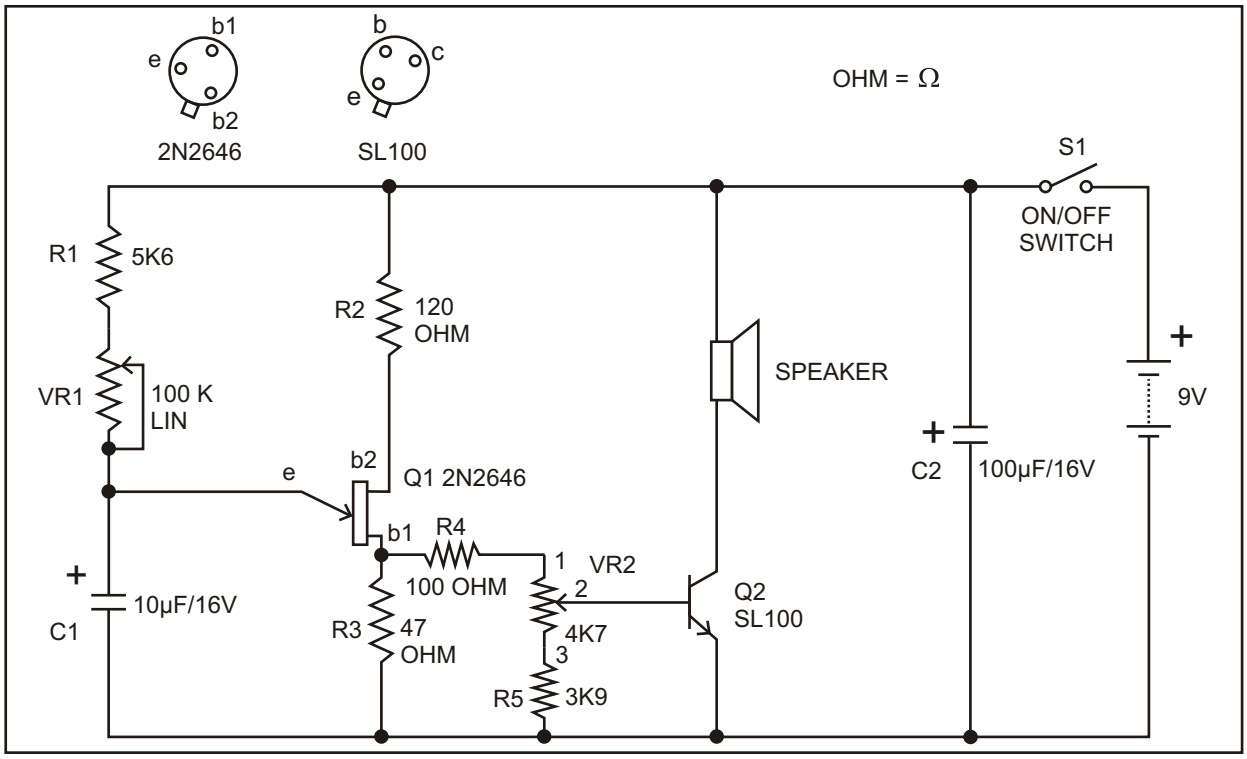


*Fig. 1: Circuit diagram of the Metronome.*

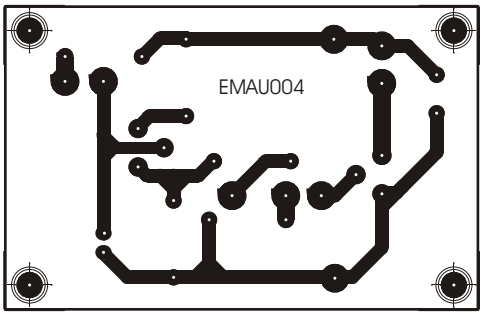


*Fig. 2: Actual - size, solder-side PCB layout for the Metronome*

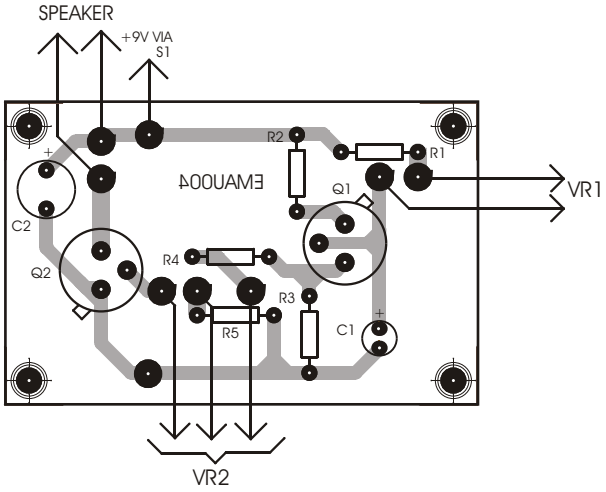


*Fig. 3: Component layout for the PCB.*

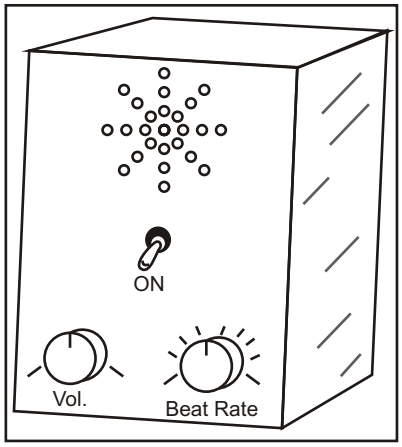


*Fig. 4 : Completed Metronome*

The pulse rate can be varied with VR1 over the range of approximately 40 beats to over 300 beats per minute.

***CONSTRUCTION***

The layout is not critical and the circuit can be wired on a piece of vero board, a general purpose PCB. However a PCB design is given in Fig. 2 alongwith its component layout in Fig.3.

The complete wiring can be done as per Fig. 4.

Fig. 5 shows how the finished Metronome may look like.

**COMPONENT LIST**

| PART | TOTAL Qty. | DESCRIPTION |
|---|---|---|
| R1, | 1 | 5K6 ¼w ± 5% Resistor |
| R2, | 1 | 120 Ohm, ¼w ± 5% Resistor |
| R3, | 1 | 47 Ohm, ¼w ± 5% Resistor |
| R4, | 1 | 100 Ohm, ¼w ± 5% Resistor |
| R5, | 1 | 3K9, ¼w ± 5% Resistor |
| C1 | 1 | 10µF/16V Electrolytic capacitor |
| C2, | 1 | 100µF/16V Electrolytic capacitor |
| VR1 | 1 | 100K Liner Potentiometer |
| VR2 | 1 | 4K7 LOG. Potentiometer |
| Q1, | 1 | UJT 2N2646 |
| Q2, | 1 | SL 100 Transistor |
| Speaker | 1 | 8 OHM to 25 OHM, 2½" dia speaker |
| S1 | 1 | SPST Toggle switch miniature type |
| Batt. | 1 | PP3, 9V Dry Battery. |
| MISC | - | Knobs x2 for potentiometers, flex wires suitable plastic enclosure etc. |