

Transistor Flip-Flop

In this circuit a red and green LED is switched on and off alternatively by making use of the principle of a transistor flip-flop.

Tools Required

- 1) Small side cutter
- 2) Small flat screwdriver
- 3) Small sharp nose pliers

Components Required

| | |
|---|-----------|
| Electronic Workstation | JH656 X 1 |
| 15cm Red connecting wire | X 1 |
| 15cm Black connecting wire | X 1 |
| 3cm Yellow connecting wire | X 2 |
| 5cm Orange connecting wire | X 2 |
| 1kΩ Resistor 1/4 Watt 5% (brown, black, red, gold) | DB056 X 2 |
| 22kΩ Resistor 1/4 Watt 5% (red, red, orange, gold) | DB072 X 2 |
| 47uF 16V Electrolytic Capacitor | HB185 X 2 |
| BC337 Transistor | FB167 X 2 |
| 5mm Red LED | HB077 X 1 |
| 5mm Green LED | HB078 X 1 |

Before you start (General Information)

Remove the paper strip of the resistors and diodes by cutting it away. If you just pull it of some of the glue will remain this will prevent it from making electric contact.

You will need to identify each component by observing the following characteristics.

Resistors



Do not have any polarity you can insert any terminal in to any

respective hole.

LED (Light Emitting Diode)

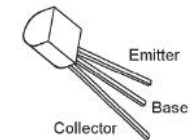


LED's do have polarity and must be placed the correct way round into the circuit its polarity is indicated by a long and short terminal. The short terminal is the cathode (-) and the long terminal is the anode (+). If the legs are cut use the flat side as a indication of the cathode.

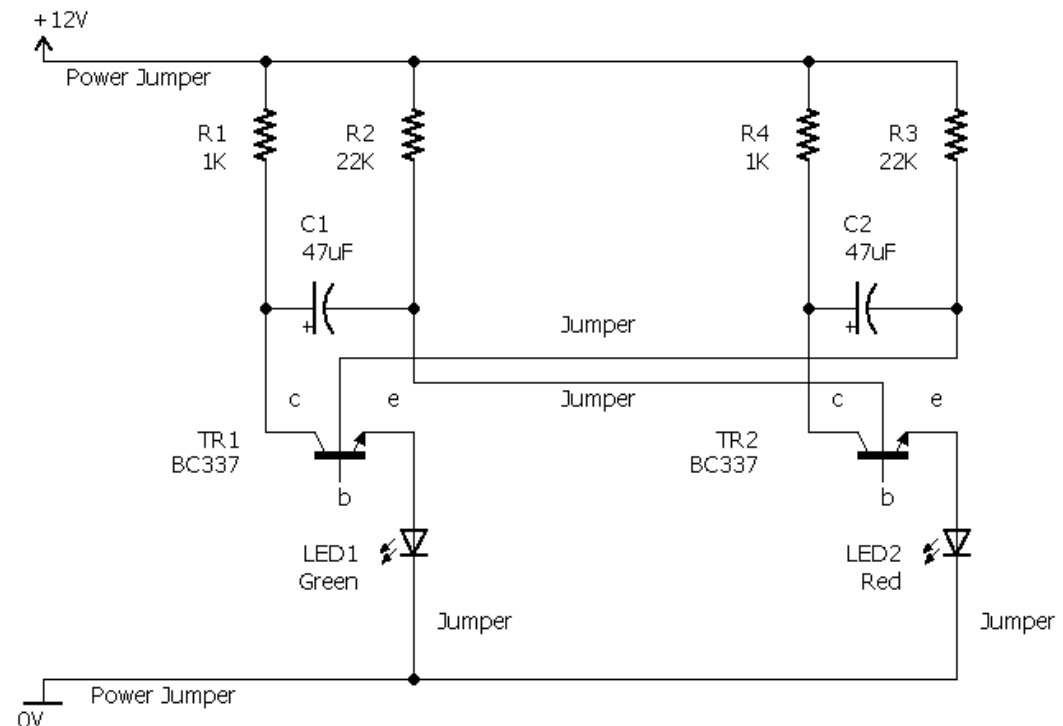
Electrolytic Capacitor

Identify the Electrolytic Capacitor by reading its value of 46uF 16V on it and also observe the negative terminal indicated by a white strip.

BC337 Transistor



The transistor is a three terminal component, Emitter (e), Base (b), Collector (c).



Transistor Flip-Flop Configuration

| | |
|---|------------|
| 15cm Red connecting wire | (+6V) - B1 |
| 15cm Black connecting wire | (-6V) - M1 |
| 1k Ω Resistor 1/4 Watt 5% (brown, black, red, gold) | B17 - C17 |
| 22k Ω Resistor 1/4 Watt 5% (red, red, orange, gold) | B20 - C20 |
| 1k Ω Resistor 1/4 Watt 5% (brown, black, red, gold) | B23 - C23 |
| 22k Ω Resistor 1/4 Watt 5% (red, red, orange, gold) | B26 - C26 |
| 47 μ F 16V Electrolytic Capacitor positive (+) | D17 |
| negative (-) | D20 |
| 47 μ F 16V Electrolytic Capacitor positive (+) | D23 |
| negative (-) | D25 |
| BC337 Transistor | |
| Collector | E17 |
| Base | E18 |
| Emitter | E19 |
| Important! The flat side of the transistors must face toward you. | |
| BC337 Transistor | |
| Collector | E23 |
| Base | E24 |
| Emitter | E25 |
| Important! The flat side of the transistors must face toward you. | |
| 5mm Green LED | |
| Anode (+) | G19 |
| Cathode (-) flat side | H19 |
| 5mm Red LED | |
| Anode (+) | G25 |
| Cathode (-) flat side | H25 |
| 3cm Yellow connecting wire | L19 - M19 |
| 3cm Yellow connecting wire | L25 - M25 |

| | |
|----------------------------|-----------|
| 5cm Orange connecting wire | F18 - F26 |
| 5cm Orange connecting wire | F20 - F24 |

Transistor Flip-Flop Explained

When the 12Volt power supply is connected to the circuit one of the transistors will switch on, for example, TR1. This will cause LED1 to glow. While TR1 is switched on, TR2 and LED2 will be switched off. Capacitor C1 will start discharging through resistor R2 and capacitor C2 will start charging through resistor R4. When capacitor C1 is discharged then transistor TR2 will switch on (through resistor R2) and LED2 will glow. This will cause transistor TR1 to switch off and LED1 will also go off. Capacitor C2 will now discharge through resistor R3 while capacitor C1 starts charging through resistor R1. The charge and discharge process of C1 and C2 will now repeat in cycle.

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