MX-905 75 in 1

PROJECTS

I. BASIC SEMICONDUCTOR AND COMPONENT CIRCUITS

III. ENTERTAINMENT CIRCUITS

II. THE WORLD DIGITAL CIRCUITS

IV. ELECTRONIC APPLICATION CIRCUITS

5. Winking LEDs

The circuit that you build in this project is called an oscillator. An oscillator is a circuit that turns itself on and off (or goes from high to low output). There are several types of oscillators; slow oscillators are often used to control blinking lights (like the turn signal in a car or truck), and faster oscillators are used to produce sound. Super-fast oscillators produce radio frequency signals called RF signals.

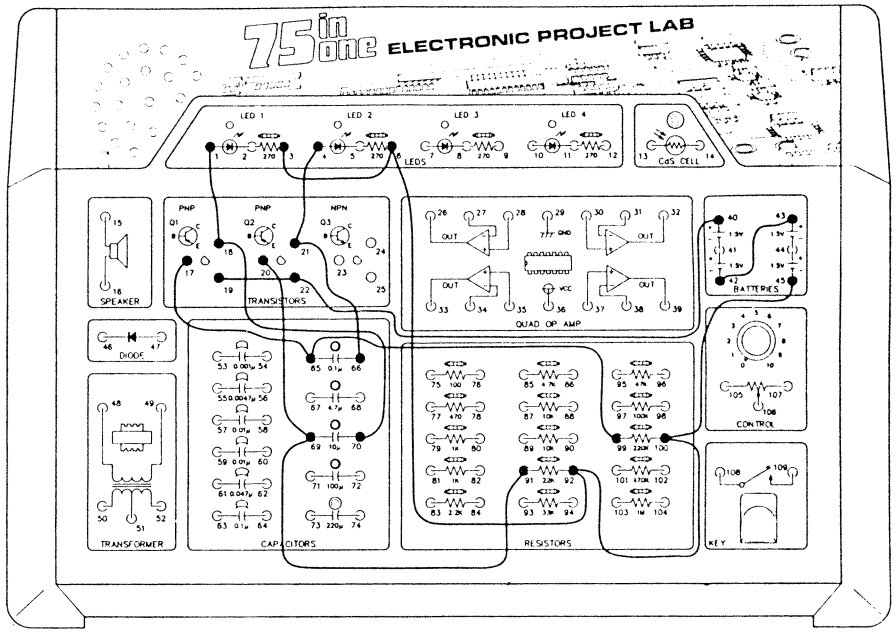
The oscillator that you build in this project is called a multivibrator. A multivibrator uses components that direct current back to each other. This multivibrator circuit controls oscillations to make the LEDs flash at certain intervals.

Connect the wires according to the wiring sequence. Note what happens when you make the last connection; LED1 and LED2 flash alternately.

You'll notice that the LEDs flash at the same speed. The rate that they flash is controlled by two time-constant circuits. Each time-constant circuit is controlled by a resistor, a capacitor, and a transistor. The capacitor charges and discharges through its resistor – the voltage across the capacitor controls its transistor. Then, the transistor acts like an electronic switch, turning the LED on and off.

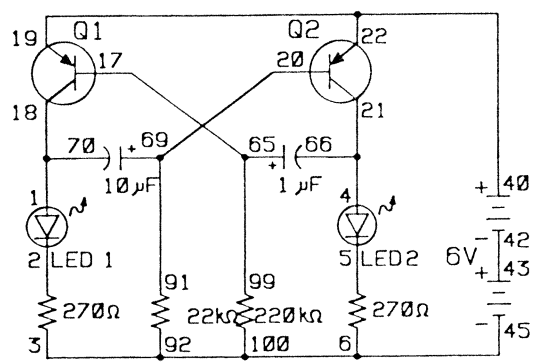
The flashing speed depends on the product value of the capacitor and resistor in the time constant circuit. In this project, the products of the two circuits are the same (22 k ohm × 10 µF = 220 k ohm × 1 µF), so the LEDs flash on and off at about the same speed. You can change the flashing speed by changing the values of the capacitor and/or resistor in the time constant circuit.

NOTES



Wiring Sequence:

1-18-70, 3-6-92-100-45, 4-21-66, 17-65-99, 19-22-40, 20-69-91, 42-43



11. RC Oscillator

The circuit is an oscillator that uses the OP AMP. One capacitor and several resistors are connected around the OP AMP: the oscillating frequency is determined by the values of the capacitors and resistors. That is where the name, RC oscillating circuit, comes from. The RC stands for resistors and capacitors.

Connect the wires according to the wiring sequence. When you're finished, notice that LED1 flashes periodically. Turn the control to change LED1's flashing cycle.

LED1 illustrates the oscillator's oscillating status. The oscillator generates a signal that changes from negative to positive to negative... When the signal is positive, LED1 lights. When the signal is negative, LED1 goes out.

The number of times the positive/negative change occurs in a second is called the frequency. You can adjust the frequency by turning the control.

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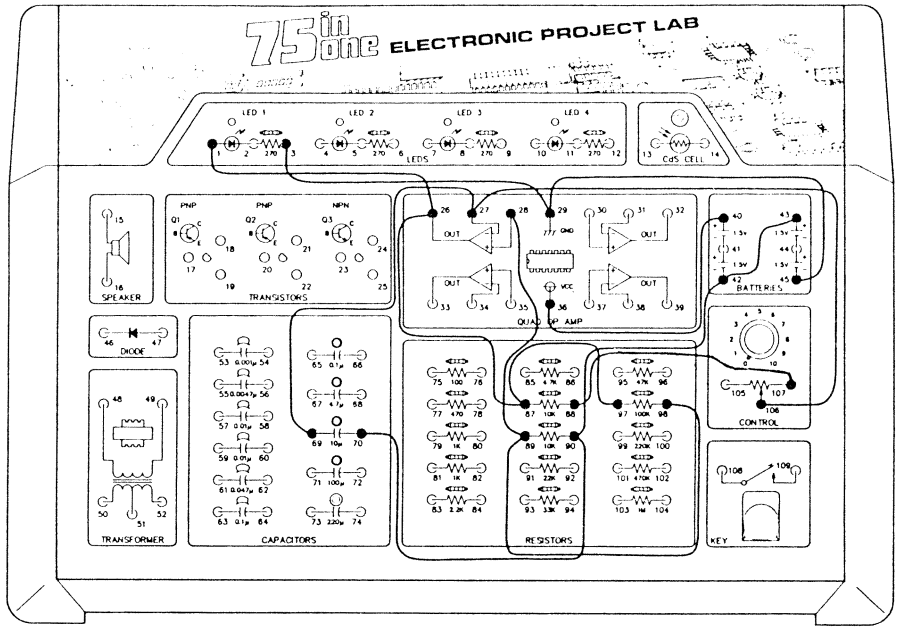
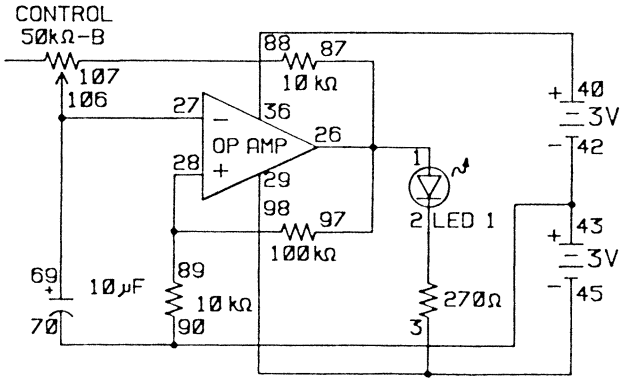


Wiring Sequence:

1-26-87-97, 3-29-45, 28-89-98, 36-40, 69-27-106, 88-107, 70-90-42-43

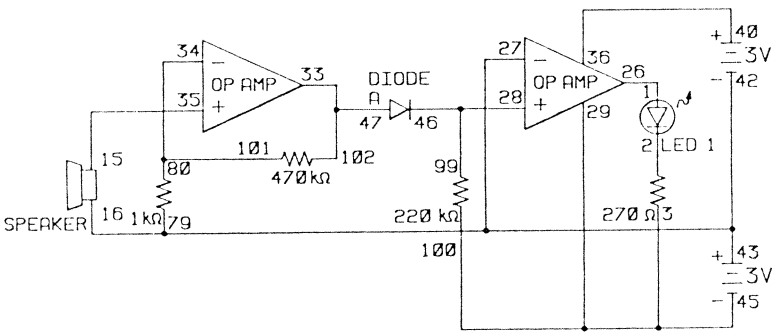


23. Sound Light

This project senses your voice, converts the sound to an electric signal, and lights LED1. For this circuit, the speaker behaves like a microphone.

Connect the wires as shown in the wiring sequence. When you're finished, speak into the speaker. When you speak, your voice signal converts into an electric signal. The signal is very weak, so the left OP AMP amplifies it almost five hundred times.

The signal is a AC signal and not suitable to light the LED. The diode rectifies (converts) the signal into a DC signal. The right OP AMP is the comparator. When the diode outputs the DC signal, LED1 lights.



Wiring Sequence:

1-26, 3-29-100-45, 15-35, 34-80-101, 36-40, 46-28-99, 47-33-102, 16-79-27-42-43

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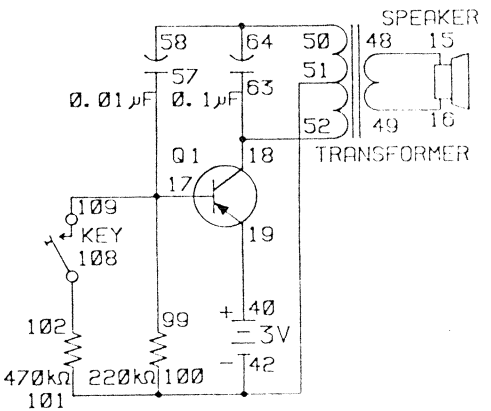
24. Two-Tone Patrol Car Siren

In this project, you build a two-tone patrol car siren using a low-frequency oscillator that consists of Q1, the transformer, and the 0.01 µF and 0.1 µF capacitors.

Connect the wires according to the wiring sequence. When you connect the last wires, you hear a beep from the speaker.

Press the key. The pitch becomes higher. Can you guess why? Pressing the key connects the 470k ohm resistor with the 220k ohm resistor in parallel, so the resistance value is reduced. As a result, the pitch increases.



Wiring Sequence:

15-48, 16-49, 17-57-99-109, 18-63-52, 50-64-58, 51-101-100-42, 10
19-40

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