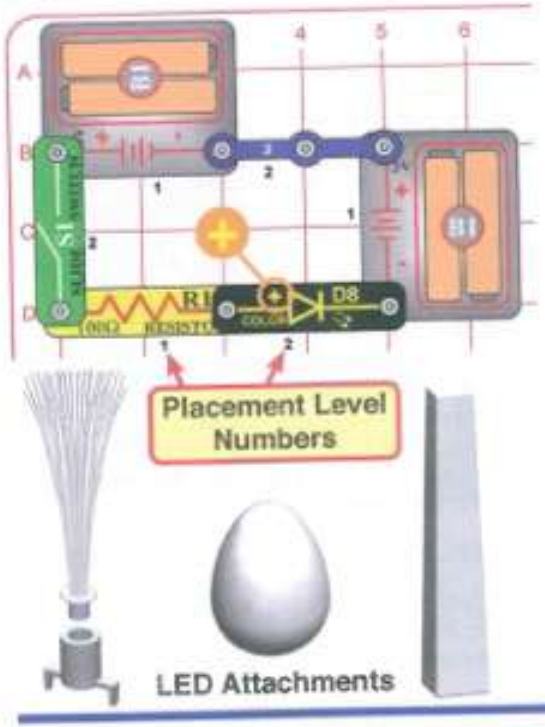
Project 1 Color Light



Snap Circuits® uses electronic blocks that snap onto a clear plastic grid to build different circuits. These blocks have different colors and numbers on them so that you can easily identify them.

Build the circuit shown on the left by placing all the parts with a black 1 next to them on the board first. Then, assemble parts marked with a 2. Install two (2) "AA" batteries (not included) into each of the battery holders (B1) if you have not done so already.

Turn on the slide switch (S1), and enjoy the light show from the color LED (D8). For best effects, place one of the LED attachments (tower, egg, or fiber optic tree) on the color LED, and dim the room lights. The fiber optic tree must be used with its mounting base.

Snappy says the color LED actually contains separate red, green, and blue lights, with a micro-circuit controlling them.

Project 2 White Light

The white LED produces very bright light. LEDs are this one are increasingly being used for home lighting and flashlights. They are more efficient than normal light bulbs.

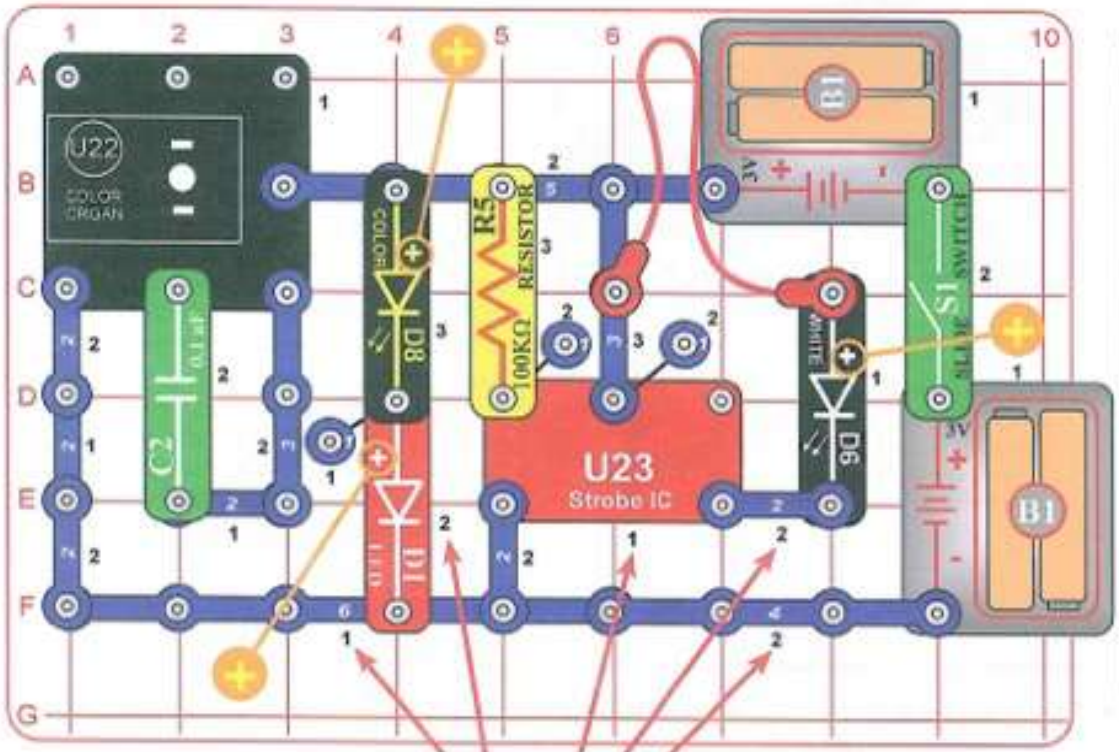
Use the circuit built in project 1, but replace the color LED (D8) with the white LED (D6). Try it with one of the LED attachments, and in a dark room.

Project 3 Red Light

The red LED is not nearly as bright as the other LEDs. LEDs like this one are used as indicators in many products in your home. They are inexpensive, but don't produce much light.

Use the circuit built in project 2, but replace the white LED (D6) with the red LED (D1). Try it with one of the LED attachments, and in a dark room.

Project 4 Light Show



Placement Level Numbers

Snap Circuits® uses electronic blocks that snap onto a clear plastic grid to build different circuits. These blocks have different colors and numbers on them so that you can easily identify them.

Build the circuit shown above by placing all the parts with a black **1** next to them on the board first. Then, assemble parts marked with a **2**. Then, assemble parts marked with a **3**. Then, assemble parts marked with a **4** (just one end of the red jumper wire, in this circuit). Install two (2) "AA" batteries (not included) into each of the battery holders (B1) if you have not done so already.

If desired, place any of the LED attachments (tower, egg, or fiber optic tree) on any of the LEDs (red (D1), color (D8), white (D6), or the LED on the color organ IC (U22). Note that the fiber optic tree requires its mounting base.

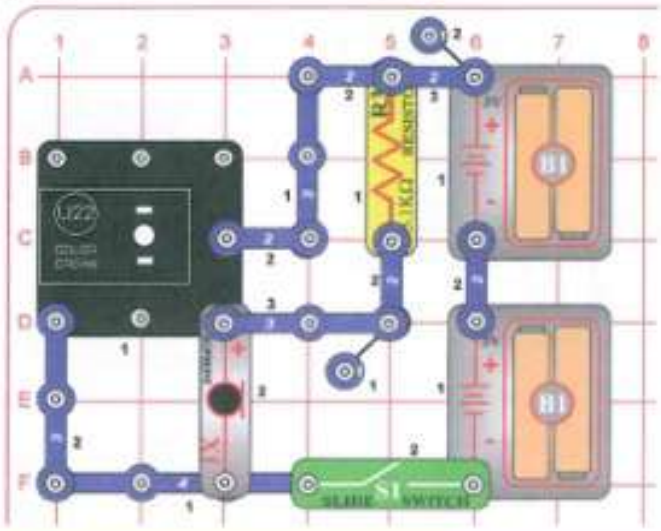
Turn on slide switch (S1) and enjoy the show!

LED Attachments

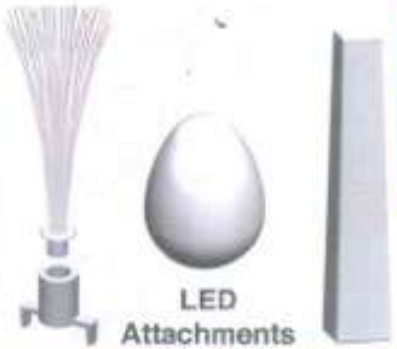
All the lights in this set are LEDs - Light Emitting Diodes. LEDs convert electrical energy into light; the color of the light emitted depends on the characteristics of the material used in them.

Project 5

Voice Light Show



Build the circuit as shown, and place one of the LED attachments (tower, egg, or fiber optic tree) over the LED on the color organ (U22). Turn on the switch (S1) and talk. The color organ light will follow your voice, in tone and loudness.

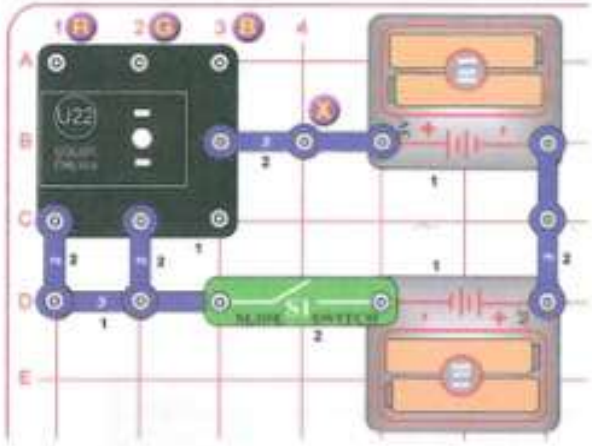


LED Attachments

How does it work? The microphone converts your voice to an electrical signal, which controls an electronic counter in the color organ. The counter controls a red-green-blue LED.

Project 6

Play the Color Organ

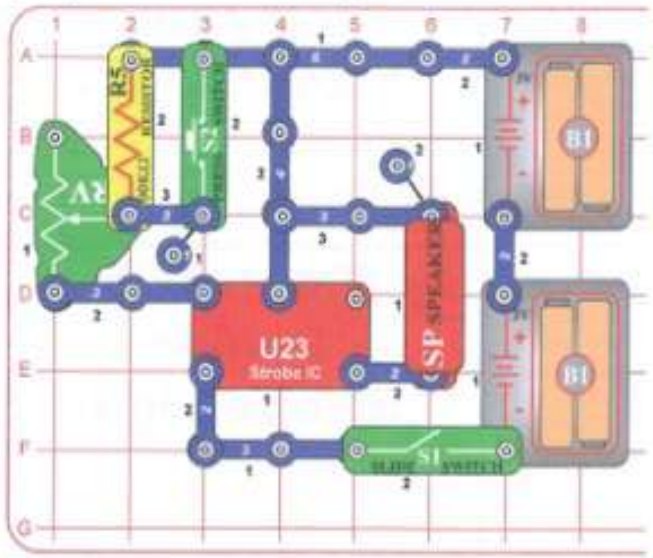


LED Attachments

Build the circuit as shown, and turn on the switch (S1). Place one of the LED attachments on the color organ (U22). Wet your fingers, and touch them between the point marked "X", and points marked "R", "G", or "B" in the drawing. Try X with every combination of R, G, and B, including touching them all at the same time.

The light in the color organ module is actually red, green, and blue LEDs together. The points marked R, G, and B control the light for those colors. Combining red and green makes yellow, green and blue makes cyan, red and blue makes purple, and combining all three colors makes white.

☐ Project 19 Sound Maker



The strobe IC (U23) produces an electrical "tone". The pitch of the "tone" is adjusted by changing how much electricity flows into its upper-left snap, using a resistor. The electrical tone it produces can be used to make sound using a speaker, or to control the flash rate of an LED see project 20, the Strobe Light).

Build the circuit and turn on the switch (S1). You hear sound from the speaker. Adjust the sound using the lever on the adjustable resistor (RV), and by pushing the press switch (S2).

Note: In rare cases the circuit may not work at all settings on RV. If this happens, move the RV lever to the side near the strobe IC, turn the slide switch off and on to reset the circuit, and only move the RV lever over a small range.

☐ Project 20 Strobe Light

Use the preceding circuit, but replace the speaker with the white LED (D6). Now you have a strobe light!

When S2 is pressed, the light may be blinking so fast that it appears to be on continuously.

☐ Project 21 Color Strobe Light

Use the preceding circuit, but replace the white LED with the color LED (D8).

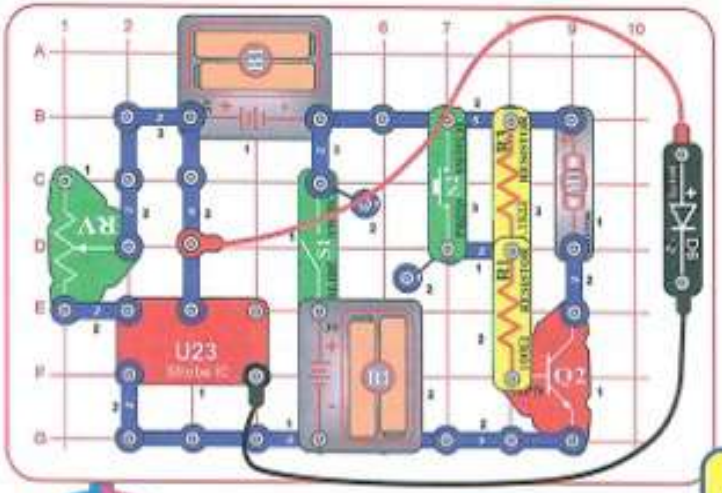
The color LED will not be changing colors like it does in other circuits. When the strobe IC (U23) turns the color LED on and off, it resets the color-control microcircuit in the color LED. Even your slowest strobe speed is too fast for the color LED.

☐ Project 22 Red Strobe Light

Use the preceding circuit but replace the color LED (D8) with the red LED (D1).

Project 46

Strobe Effects



Build the circuit as shown. Take the colored disc shown and install it into the disc holder, then place the disc holder on the motor (M1). Connect the white LED (D6) to the red & black jumper wires.

For best effects, do this in a dimly lit room. Turn on the slide switch (S1). Push the press switch (S2) until the motor spins continuously (if it stops after you release the press switch, replace your batteries). Hold the white LED upside down over the disc holder so it shines on the spinning disc, and move the lever on the adjustable resistor (RV) slowly while watching the pattern on the spinning disc.

The motor spins the disc so fast that it looks like a blur. However, as you slowly adjust RV the pattern on the disc appears to slow down, stop, and reverse direction. Patterns close to the disc center may be moving at different speeds, or in different directions, from patterns farther from the center! Some patterns may become clear while others are still blurred.

If the motor does not continue spinning after you release S2, then replace your batteries. If it still won't keep spinning then replace the 5.1kΩ resistor (R3) with a 3-snap wire.

Slide tabs into slots.


Place disc holder onto the motor as shown.


Hold white LED (D6) over disc as shown.

How does this work? The strobe IC is making the white LED flash so fast that your eyes think it is on continuously. RV sets the flash rate, and at some settings the LED flashes are synchronized with speed of the patterns spinning on the disc, making them appear visible instead of blurred.

When the disc pattern is totally blurred, it will appear as purple, orange, and light green. Combining equal amounts of red & blue makes purple, red & yellow makes orange, and yellow & blue makes green.

OPTIONAL
(Adult supervision required)

The disc holder rests on the motor top loosely and vibrates, making the disc pattern blurry even when the RV setting makes the pattern "stop". The disc patterns will appear clearer if you permanently mount the disc holder to the motor top. This set contains a spare motor top, which can be used for this. This requires removing the motor top from the motor whenever you want to switch from using the disc holder to using the glow fan, so is optional, and requires adult supervision.

If you want to do this, pry the motor top off the motor shaft using a screwdriver.

Lay the spare motor top in the disc holder upside down, and bond together with glue (glue not included).

After the glue dries, push the modified disc holder on the motor shaft and install a disc cutout. When you want to return to using the glow fan, replace the motor top disc holder with the normal motor top.

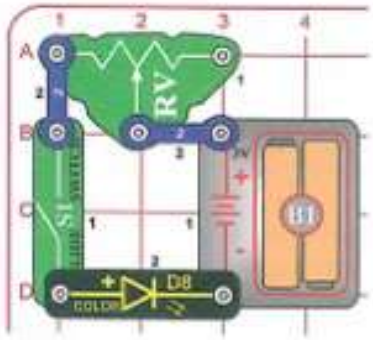
Project 47
Slow Strobe Effects

Use the preceding circuit, but replace the 3-snap on the adjustable resistor (RV) with the 100kΩ resistor (R5). The circuit works the same, but the strobe rate is much slower (now you can see the LED flashing), so the strobe effects are different. Slowly adjust the setting on RV as before, and watch the patterns on the spinning disc.

Note: In rare cases the LED may not flash at all settings on RV. If this happens, move the RV lever to the side near the strobe IC, turn the slide switch off and on to reset the circuit, and only move the RV lever over a small range.

Bonus for owners of other Snap Circuits® sets: If you have a second 100kΩ resistor (from model SC-100 / 300 / 500 / 750 or other sets), place it directly over the R5 that replaced the 3-snap in the above circuit (and place a 1-snap under one side of the additional R5). Stacking the two 100kΩ resistors together creates a "medium" range of strobe speeds, in between the speeds created with the 3-snap and single 100kΩ. Adjust the RV setting and watch the strobe effects as before.

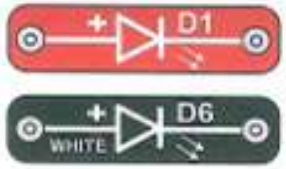
Project 64
Low Power Brightness Control



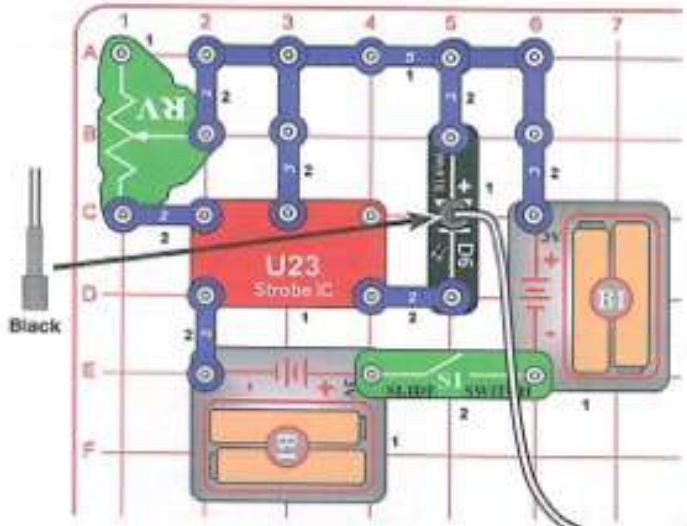
Build the circuit and turn on the slide switch (S1). Move the lever on the adjustable resistor (RV) to vary the brightness of the light from the color LED (D8). For best effects, do this in a dimly lit room. At some RV settings the LED will be very dim, and some of its colors may be totally off.

Project 65
Low Power Resistors & LEDs

Use the circuit from project 64, but replace the color LED (D8) with the red LED (D1) or white LED (D6). Vary the adjustable resistor lever to see how the light varies with each LED. The white LED may not be on at all.



Project 66
Persistence of Vision

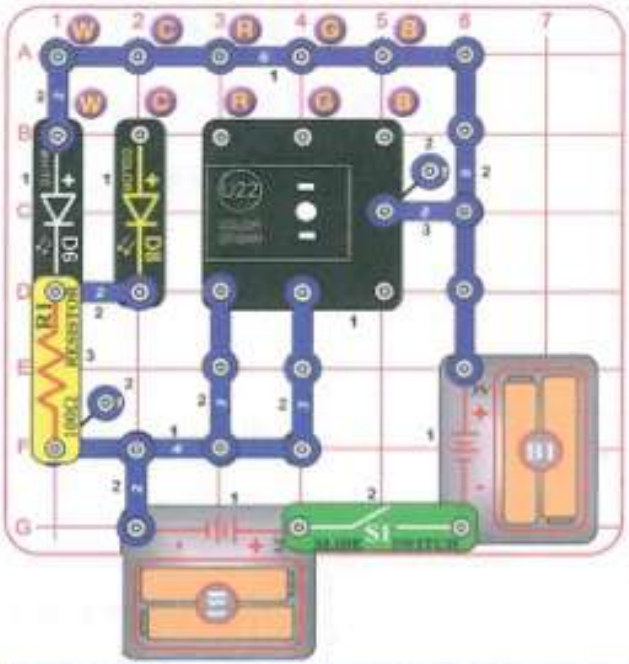


Build the circuit as shown. Place the black fiber optic cable holder on the white LED (D6) and insert the fiber cable into the black holder as far as it will go. Turn on the slide switch (S1). Take the circuit into a dark room and wave the cable around while watching the loose end. Try it with the lever on the adjustable resistor (RV) at different settings. The light coming out the loose end of the fiber optic cable will separate into short segments or dashes of light.

"Persistence of Vision" works because the light is changing faster than your eyes can adjust. Your eyes continue seeing what they have just seen.

In a movie theater, film frames are flashed on the screen at a fast rate (usually 24 per second). A timing mechanism makes a light bulb flash just as the center of the frame is passing in front of it. Your eyes see this fast series of flashes as a continuous movie.

Project 82 LED Color Spectrum



Build the circuit as shown, and turn on the switch (S1). The white LED (D6) will be on. Look at the white LED through the prismatic film to see the color spectrum of white light, which is all the colors of a rainbow. For best effects, do this in a dimly lit room.

Now remove the 2-snap across points W-W, and place it across points C-C (the color LED), then points R-R, G-G, and B-B (for the color organ). Using the prismatic film, look at the color spectrum produced by the color LED, and the different colors from the color organ. Compare them to the white LED spectrum.

Project 83 LED Color Spectrum (II)

Use the preceding circuit, but remove the 2-snap across points W-W and place 2-snaps across R-R and G-G. Use the prismatic film to look at the color spectrum. View from different directions and different angles.

Next, move the 2-snaps to R-R and B-B, and look at the spectrum. Then move the 2-snaps to G-G and B-B and look at the spectrum. View from different directions and different angles.

For each combination, the color spectrum should be mostly light of the 2 individual colors you are combining.

Project 84 LED Color Spectrum (III)

Use the preceding circuit, but place 2-snaps across points R-R, G-G, and B-B. Use the prismatic film to look at the color spectrum. View from different directions and different angles.

With the above connections, the color organ (U22) produces white light. The actual color spectrum you see will vary with your viewing angle, because the light is produced using separate red, green, and blue LEDs next to each other.

Now remove the 2-snaps from R-R, G-G, and B-B, and place one across W-W, so the circuit is like the project 82 drawing. Use the prismatic film to view the color spectrum from the white LED (D6) again, and compare it to the white light spectrum from U22. The D6 spectrum does not vary as much with the viewing angle because the light is produced by a single LED, and it is brighter.

Project 85 LED Color Spectrum (IV)

Use the circuit combinations from projects 82-84, but look at the different lights through the red, green, or blue filters instead of the prismatic film. Each filter only allows you to see light of that color, and blocks the other colors. If you put all three filters together then all light is blocked.

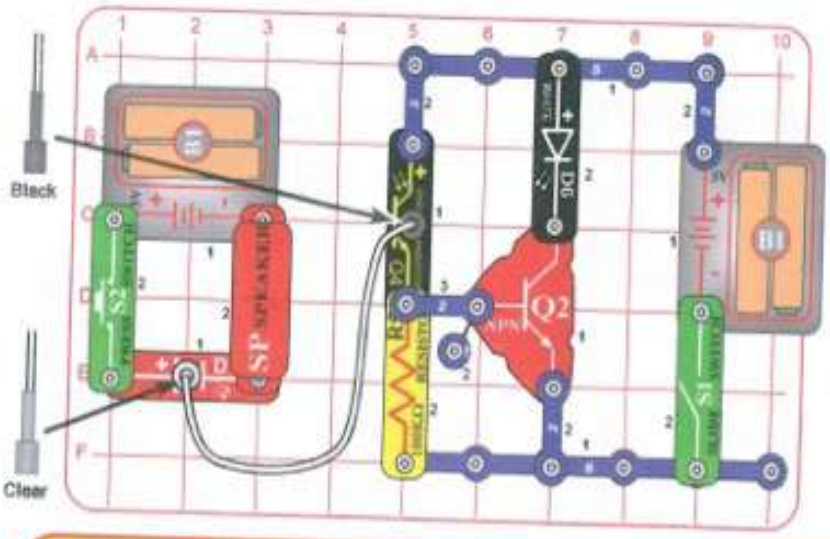
Actually, the red filter will pass a little of the green light, the blue filter will pass a little of the green light, and the green filter will pass a little of the green and blue light. This is because green light is between red and blue light in the color spectrum, and the filters are not perfect. See page 13 for more information about the color spectrum.

Project 86 LED Color Spectrum (V)

Repeat project 82, but place the black fiber optic cable holder with the fiber optic cable on the LED you want to view. Look at the light coming out the other end of the cable using the prismatic film, and view in a dimly lit room. The light is not as bright but the beam is narrower, so the color spectrum may be clearer.

Project 130

Morse Code



Build the circuit as shown. Place the clear cable holder on the red LED (D1) and the black cable holder on the phototransistor (Q4), then place the fiber optic cable into the holders as far as it will go. For best performance the fiber optic cable should stand straight up in the holders, without bending them. Turn on the slide switch (S1), then push the press switch (S2) several times to send secret messages between the circuits using Morse Code. If your fiber optic cable was a lot longer, you could use this circuit to send messages to your friends in different cities. The speaker is used to help limit the current through the red LED, and will not make noise.

If desired, you can swap the locations of the red and white LEDs (D1 & D6).

Note: If the white LED (D6) does not light or is dim, replace it with the color LED (D8). The white LED can be brighter and won't change colors, but requires higher voltage to activate.

Morse Code: The forerunner of today's telephone system was the telegraph, which was widely used in the latter half of the 19th century. It only had two states - on or off (that is, transmitting or not transmitting), and could not send the range of frequencies contained in human voices or music. A code was developed to send information over long distances using this system and a sequence of dots and dashes (short or long transmit bursts). It was named Morse Code after its inventor. It was also used extensively in the early days of radio communications, though it isn't in wide use today. It is sometimes referred to in Hollywood movies, especially Westerns. Modern fiber optics communications systems send data across the country using similar coding systems, but at much higher speeds.

MORSE CODE

A	·–	N	–·	Period	·–·–·–
B	–···	O	–––	Comma	––··––
C	–·–·	P	·––·	Question	··––··
D	–··	Q	––·–	1	·––––
E	·	R	·–·	2	··–––
F	··–·	S	···	3	···––
G	––·	T	–	4	····–
H	····	U	··–	5	·····
I	··	V	···–	6	–····
J	·–––	W	·––	7	––···
K	–·–	X	–··–	8	–––··
L	·–··	Y	–·––	9	––––·
M	––	Z	––··	0	–––––

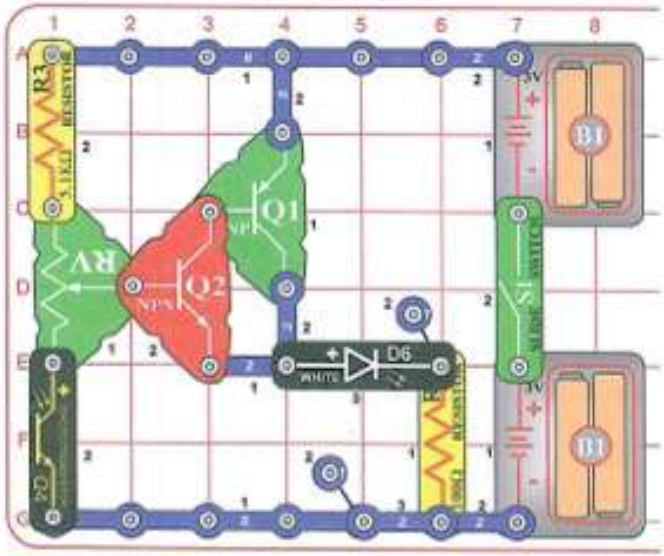
Project 131

Fiber Shut-Off

Use the preceding circuit but swap the locations of the phototransistor (Q4) and the 100kΩ resistor (R5), keep the "+" side of Q4 in the same direction. Now pushing the press switch will turn off the LED in the right half of the circuit.

Project 32

Automatic Light



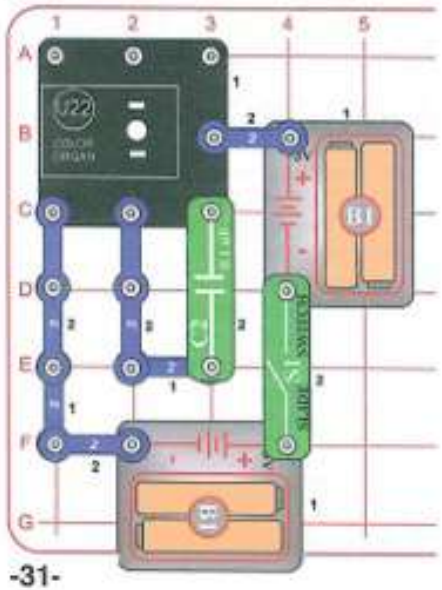
Build the circuit and turn on the slide switch (S1). Set the lever on the adjustable resistor (RV) so the white LED (D6) just turns off. Slowly cover the phototransistor (Q4) and the white LED brightens. Adjust the light to the phototransistor to turn the white LED on or off.

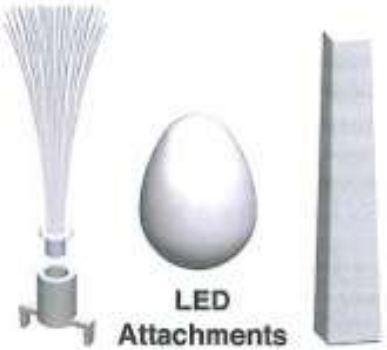
This is an automatic street lamp that you can turn on at a certain darkness and turn off by a certain brightness. This type of circuit is installed on many outside lights and forces them to turn off and save electricity. They also come on when needed for safety.

You can replace the white LED with the color LED (D8) or the red LED (D1), but you may need to readjust the sensitivity using the lever on RV.

Project 33

Color Oscillator

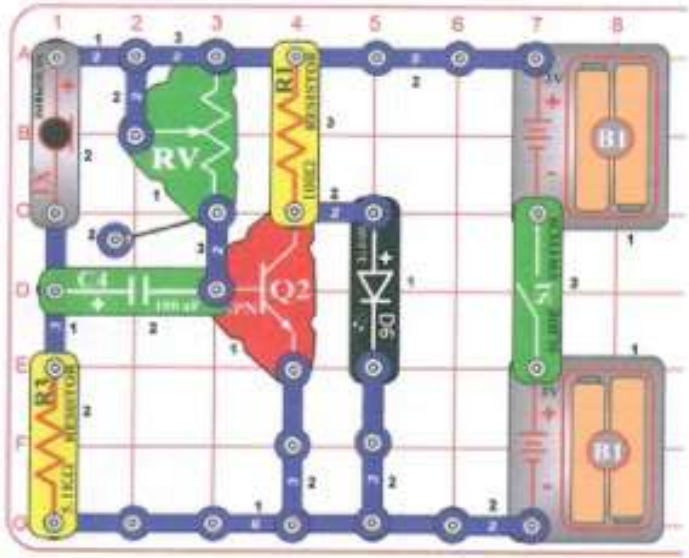




LED Attachments

Build the circuit as shown, and place one of the LED attachments (tower, egg, or fiber optic tree) over the LED on the Color Organ (U22). Turn on the switch (S1) and watch. The color organ light will change colors on its own.

Project 148

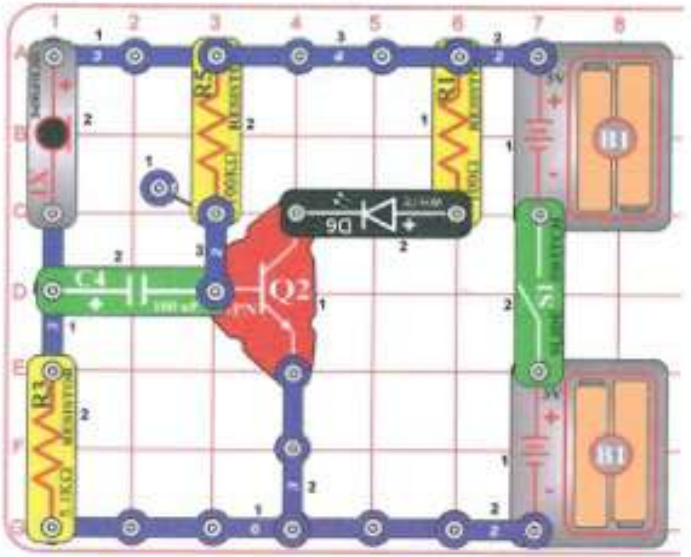


Blow On the Light

The microphone is a resistor that changes in value due to changes in air pressure on its surface.

Build the circuit and turn on the slide switch (S1). Set the lever on the adjustable resistor (RV) to the top. If the white LED (D6) is on, move the lever on RV until the LED just shuts off. Now blow on the microphone (X1) to turn the white LED on.

Project 149



Blow Off the Light

Build the circuit and turn on the slide switch (S1). Wait for the white LED (D6) to come on. Blow into the microphone (X1) to make the white LED flicker. If you blow hard enough, the LED will turn off for a moment.