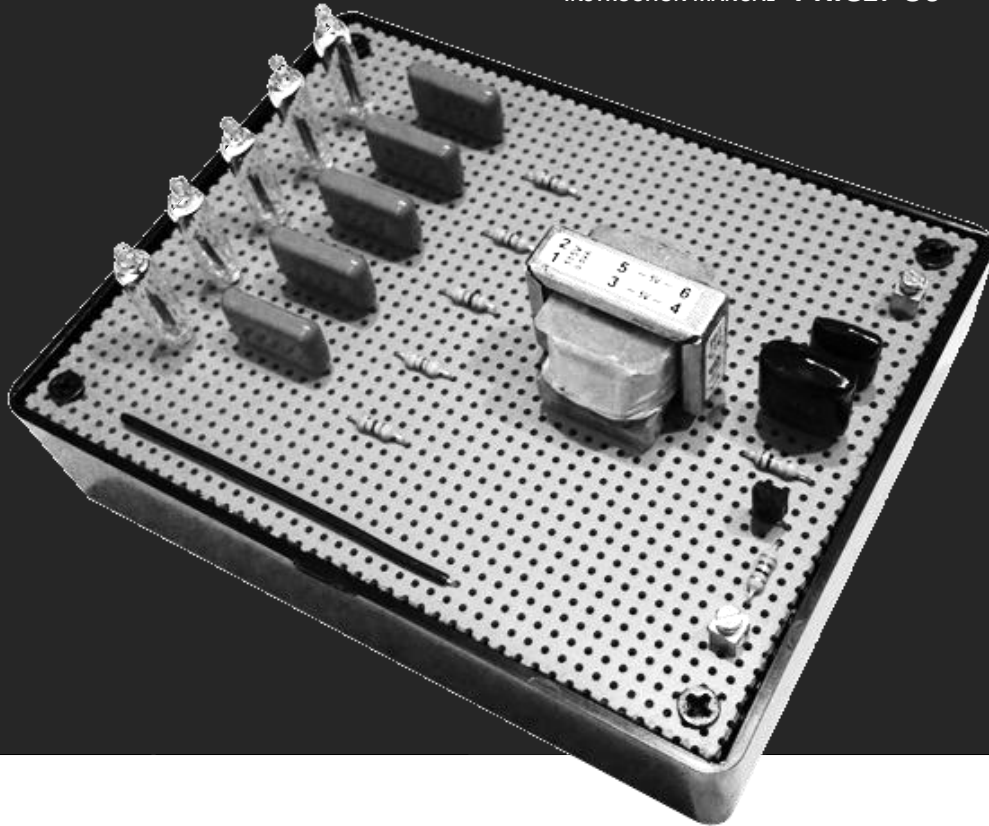


Science FairTM

INSTRUCTION MANUAL PRICE: 50¢



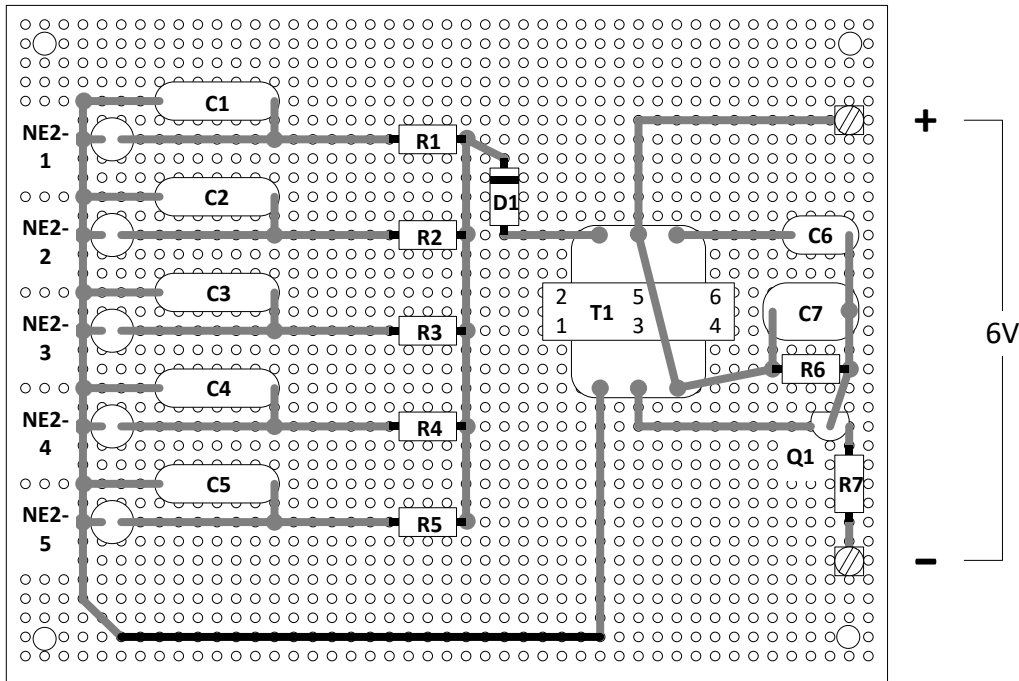
ELECTRONIC PROJECT #28-130 GOOFY-LITE

Science Fair Goofylite is an amazing device which seems to blink forever on one set of batteries. It will, in fact, go several weeks without changing batteries, especially when Radio Shack Alkaline Enercells are used. The neon lamps ordinarily fire at a voltage of 60 volts or more. Since it requires a high voltage to fire them, and since they discharge rapidly after firing, they can be used to control blinking or oscillating circuits. Oscillation is the principal use in this particular unit.

Since the battery voltage is only 6 volts, it is first necessary to build up to the sixty volts required to fire the lamp. The transistor, Q1, the capacitor C6 and C7, and the transformer T1, comprise the oscillation circuit. This oscillator circuit converts the direct current coming from the battery to an alternating current. The transformer then steps up the alternating 6 volt current to almost 200 volts at the transformer's secondary stage. This voltage is high, however the current very low and is not dangerous in any way. The voltage then passes through the resistors R1-R5 and is stored in the capacitors C1-C5 until sufficient voltage fires a particular neon bulb. The speed at which the bulb fires is determined by the particular characteristic of the bulb. If all the bulbs are connected alike then the bulbs will fire at random. If a special sequence of capacitor connection is made, however, the bulbs will fire in sequence. You have the option of wiring this kit so that it will blink either randomly or in sequence.

PICTORIAL DIAGRAM RANDOM

TOP VIEW



PARTS LIST

Quantity	Description	Identification	Part No.	Price
1	Diode	D1	625-RGP10GE-E3	\$0.50
1	Transistor (2N2222)	Q1	512-PN2222ATF	\$0.20
1	Transformer	T1	546-161C10	\$6.93
5	.22 MFD 400V Poly Film Capacitor	C1-C5	667-ECQ-E4224JF	\$0.77 ea
1	.22 MFD 250V Poly Film Capacitor	C6	667-ECQ-E2224KF	\$0.44
1	.47 MFD 250V Poly Film Capacitor	C7	667-ECQ-E2474KB	\$0.55
5	4.7 Meg Resistor	R1-R5	660-CFS1/4CT52R475J	\$0.15 ea
1	10K Resistor	R6	660-CFS1/4CT52R103J	\$0.15
1	15 Ohm Resistor	R7	660-CFS1/4CT52R150J	\$0.17
5	NE2 Neon Lamp		606-A1A	\$0.28 ea
1	Battery Holder		12BH348-GR	\$1.28
2	Battery terminal block		534-8730	\$0.31 ea
1	Project case		546-1591GS-BK	\$5.13
1	Perf Board		589-7100-45	\$4.99
1	22 Ga Solid Hookup Wire, Black			

All part numbers and prices listed above are from Mouser as of March, 2016.

RECOMMENDED PARTS SUPPLIER LIST

Joe Knows Electronics, www.joeknowselectronics.com

Mouser, www.mouser.com

Digikey, www.digikey.com

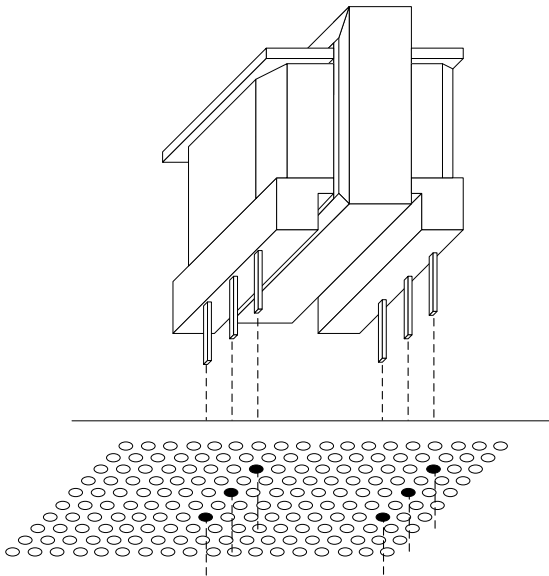
STEP-BY-STEP WIRING AND ASSEMBLY DIRECTIONS

Be sure to carefully follow all the directions. Do one step at a time and then check off the step in the box provided. Before beginning, read over the enclosed page labeled "Construction Hints".

The step by step instructions indicate a soldering requirement; however, these connections can be made by firmly twisting joining wires together. If the connection is secure the circuit will work for temporary or testing purposes. If you wish a more permanent circuit, it is always best to secure these connections by soldering. Before soldering, read the instructions in "Construction Hints".

1. () Check the parts list to see that everything listed is included. Check each step as you progress (✓).

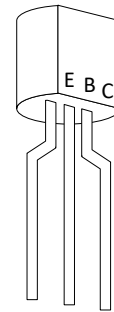
2. () Place the pictorial diagram near the perfboard chassis so that the pictorial can be used as a guide for exact placement of parts. The gray lines in the pictorial diagram indicate components and wires which are mounted under the circuit board. The solid lines indicate components and wires mounted on top of the circuit board.



3. () Mount the transformer T1, as shown in the drawing above. Install the transformer in the location indicated in pictorial diagram.

4. () Remove all of the insulation from a 1-1/4" piece of wire. Solder one end to transformer T1 Pin 4 and then solder the other end to transformer T1 Pin 5.

5. () Insert the negative (-) and positive (+) battery terminals into the perfboard positions indicated in the pictorial diagram. If the battery terminals are loose in the perfboard, apply a small blob of solder to keep them from falling out.



6. () Mount transistor Q1 as shown in the pictorial diagram and compare with the diagram above. Note that the pictorial is a top view and that a reversal of leads takes place when you turn the transistor over to solder leads to other components on the board.

7. () Strip all insulation from a 1-1/2" piece of wire. Connect one end to the Collector (C) lead of transistor Q1 and solder. Connect the other end to transformer T1 Pin 3 and solder.

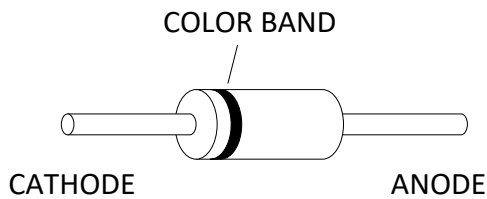
8. () Insert the 15 Ohm resistor R7 into the perfboard position indicated in the pictorial diagram. Connect one lead to the negative (-) battery terminal and solder. Connect the other end to the Emitter (E) lead of transistor Q1 and solder.

9. () Insert the 10K resistor R6 as shown in the pictorial diagram. Connect one lead to transformer T1 Pin 4 and solder. Connect the other end to the Base (B) lead of transistor Q1 and solder.

10. () Insert the .47 MFD capacitor C7 as shown in the pictorial diagram. Connect each lead to 10K resistor R6 as shown and solder.

11. () Insert the .22 MFD capacitor C6 as shown in the pictorial diagram. Connect one lead to transformer T1 Pin 6 and solder. Connect the other lead to .47 MFD capacitor C7 as shown and solder.

12. () Strip all insulation from a 2" piece of wire. Connect one end to transformer T1 Pin 5 and solder. Connect the other end to the positive (+) battery terminal and solder.



13. () Insert rectifier D1 as shown in the pictorial diagram. Note the color band on the rectifier which indicates the direction in which that the rectifier should be installed. Attach the Anode of rectifier D1 to transformer T1 Pin 2 and solder.

14. () Insert 4.7 Meg resistor R1 as shown in the pictorial diagram. Connect one lead to the Cathode lead of rectifier D1 and solder.

15. () Insert 4.7 Meg resistors R2 through R5 as shown in the pictorial diagram.

16. () Remove all insulation from a 3" piece of wire. Connect to 4.7 Meg resistors R1 through R5 as shown and solder each resistor lead to the wire.

All construction up to this point is identical for operation either as a sequential blinker or a random blinker. If you wish to have your unit operate as a random blinker, follow the steps below. If you wish to have your unit operate as a sequential blinker, follow the steps and the diagram on page 5.

17a. () Insert an NE2-1 neon lamps as shown in the pictorial diagram. Connect one lead to 2.7 Meg resistor R1.

18a. () Insert an NE2-2 neon lamps as shown in the pictorial diagram. Connect one lead to 2.7 Meg resistor R2.

19a. () Insert an NE2-3 neon lamps as shown in the pictorial diagram. Connect one lead to 2.7 Meg resistor R3.

20a. () Insert an NE2-4 neon lamps as shown in the pictorial diagram. Connect one lead to 2.7 Meg resistor R4.

21a. () Insert an NE2-5 neon lamps as shown in the pictorial diagram. Connect one lead to 2.7 Meg resistor R5.

22a. () Insert .22 MFD capacitor C1 as shown in the pictorial diagram. Connect one lead to the junction of NE2-1 and R1 and solder.

23a. () Insert .22 MFD capacitor C2 as shown in the pictorial diagram. Connect one lead to the junction of NE2-2 and R2 and solder.

24a. () Insert .22 MFD capacitor C3 as shown in the pictorial diagram. Connect one lead to the junction of NE2-3 and R3 and solder.

25a. () Insert .22 MFD capacitor C4 as shown in the pictorial diagram. Connect one lead to the junction of NE2-4 and R4 and solder.

26a. () Insert .22 MFD capacitor C5 as shown in the pictorial diagram. Connect one lead to the junction of NE2-5 and R5 and solder.

27a. () Remove 2-1/2" insulation from one end of a 7-1/4" piece of wire. Remove 2-1/2" insulation from the other end of the wire.

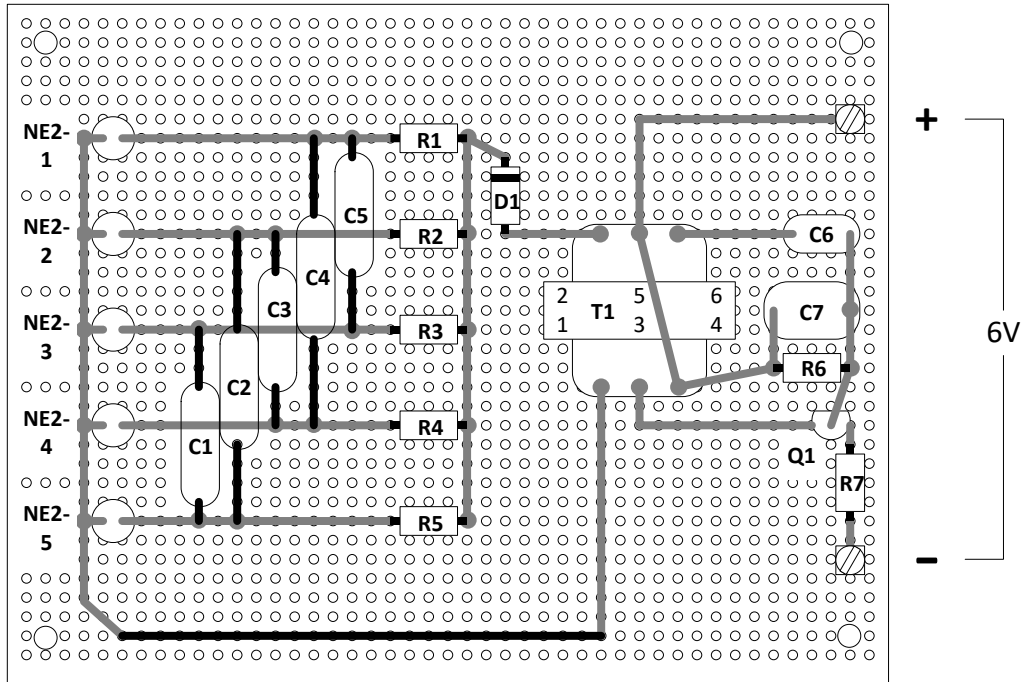
28a. () Insert the wire into the perfboard as shown in the pictorial diagram. Connect one end to transformer T1 Pin 1 and solder. Connect the other end to NE2-1 through NE2-5, and C1 through C5, and solder all leads.

Note: Clip all extra wires at the soldered points.

You have completed all connections, both wiring and soldering. Carefully double check the work against the pictorial diagram.

PICTORIAL DIAGRAM SEQUENTIAL

TOP VIEW



For sequential blinking follow steps 17b through 28b below.

17b. () Insert an NE2-1 neon lamps as shown in the pictorial diagram. Connect one lead to 2.7 Meg resistor R1 and solder.

18b. () Insert an NE2-2 neon lamps as shown in the pictorial diagram. Connect one lead to 2.7 Meg resistor R2 and solder.

19b. () Insert an NE2-3 neon lamps as shown in the pictorial diagram. Connect one lead to 2.7 Meg resistor R3 and solder.

20b. () Insert an NE2-4 neon lamps as shown in the pictorial diagram. Connect one lead to 2.7 Meg resistor R4 and solder.

21b. () Insert an NE2-5 neon lamps as shown in the pictorial diagram. Connect one lead to 2.7 Meg resistor R5 and solder.

22b. () Insert .22 MFD capacitor C1 as shown in the pictorial diagram. Connect one end to NE2-3 and the other end to NE2-5. Solder each connection.

23b. () Insert .22 MFD capacitor C2 as shown in the pictorial diagram. Connect one end to NE2-2 and the other end to NE2-5. Solder each connection.

24b. () Insert .22 MFD capacitor C3 as shown in the pictorial diagram. Connect one end to NE2-2 and the other end to NE2-4. Solder each connection.

25b. () Insert .22 MFD capacitor C4 as shown in the pictorial diagram. Connect one end to NE2-1 and the other end to NE2-4. Solder each connection.

26b. () Insert .22 MFD capacitor C5 as shown in the pictorial diagram. Connect one end to NE2-1 and the other end to NE2-3. Solder each connection.

27b. () Remove 2-1/2" insulation from one end of a 7-1/4" piece of wire. Remove 2-1/2" insulation from the other end of the wire.

28b. () Insert the wire into the perfboard as shown in the pictorial diagram. Connect one end to transformer T1 Pin 1 and solder. Connect the other end to NE2-1 through NE2-5, and C1 through C5, and solder all leads.

Note: Clip all extra wires at the soldered points.

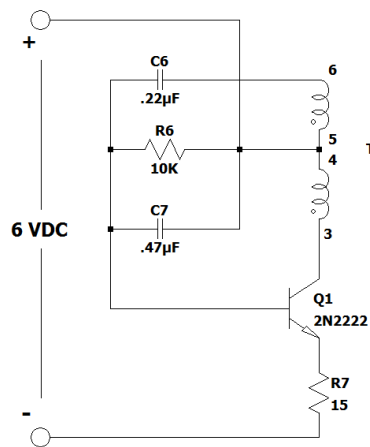
You have completed all connections, both wiring and soldering. Carefully double check the work against the pictorial diagram.

OPERATION

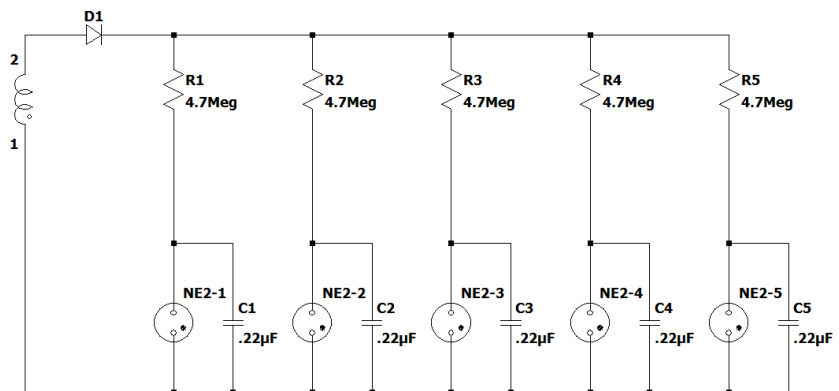
Insert four "AA" batteries (Radio Shack No. 23-468 or equivalent) into the battery holder, observing plus (+) and minus (-). Connect the red lead of the battery holder to the plus (+) terminal, and the black lead of the battery holder to the minus (-) terminal. The lights will begin to blink. The sequential lights will change

direction if you disconnect and connect the battery. The lights have other interesting effects. They seem to blink faster in the absence of light. They seem to blink faster if they are touched on the side with your finger. It is possible to extend the leads of the neon lamps so that they can be mounted through any type of cover you might wish to construct. This unit will give you many hours of entertainment and fun showing it to your friends and family or just simply watching its random blinking as people enjoy watching the random flickering of a fire.

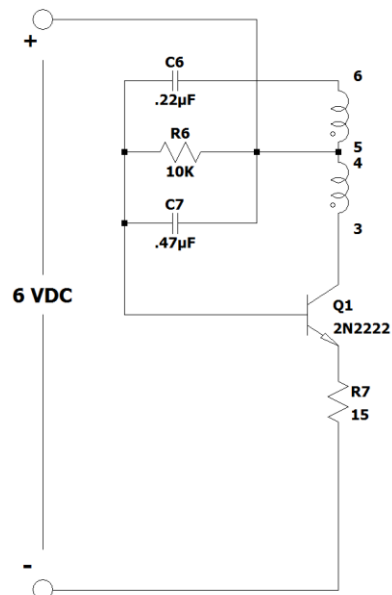
SCHEMATIC DIAGRAM



RANDOM



SCHEMATIC DIAGRAM



SEQUENTIAL

