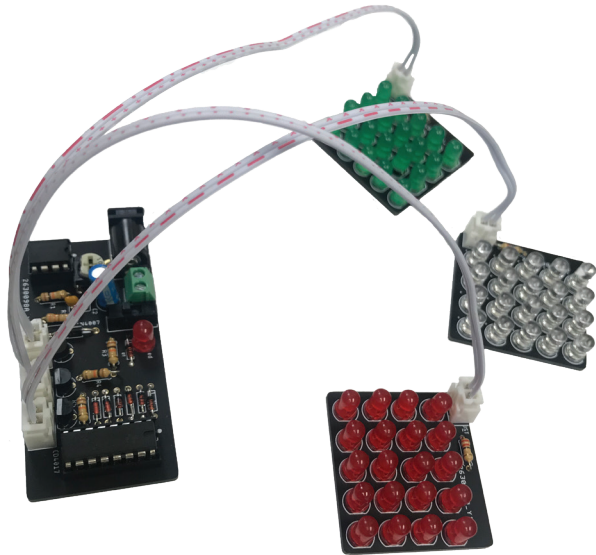# ABRA
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# DIY LED Strobe Light Learning Kit

AK-185

Component List:

- 1x   Main PCB
- 3x   LED PCB
- 60x LED 5mm: Red, Green, Water Clear Blue
- 1x   LED 3mm Red
- 1x   Potentiometer Trimmer PCB ¼W 50K Horizontal
- 1x   Capacitor Polarized (Electrolytic) 10uF 50V: C1
- 1x   Capacitor Ceramic 100nF (104)
- 3x   Transistor NPN (S8050) (Q1, Q2, Q3)
- 7x   Diode, Single Fast Switching 0.3A 100V 1N4148
- 1x   Diode, Protection 1A 1KV 1N4007
- 1x   IC, Decade Counter CD4017BE
- 1x   IC, Precision Timer NE555P
- 1x   Slide Switch Latching On/Off
- 1x   DC Jack 2.1mm 2A PCB
- 1x   Terminal Block 2 Positions Pitch 3.5mm Side Entry Ports
- 1x   Socket IC DIP 16 Positions
- 1x   Socket IC DIP 8 Positions
- 6x   Connectors JST 2 Positions Male PCB XH 2.54mm
- 3x   Wire Assemblies 2 Conductors with 2 Connectors Female JST

Component Polarity:

When dealing with polarized components, it is important to be able to identify which pins represent the anode (positive) and Cathode (negative).

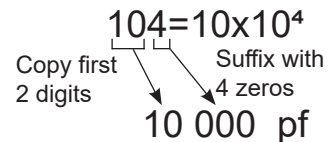Here are a few ways of doing so for LEDs and polarized capacitors:

- The shorter pin usually is the cathode (negative).
- However, for LEDs if the leads are cut you can assume the cathode lead is on the side of the LED that has a flat cut. For capacitors, there usually is a polarity marking on the component itself indicating which lead is cathode (-).

+ ANODE   − CATHODE
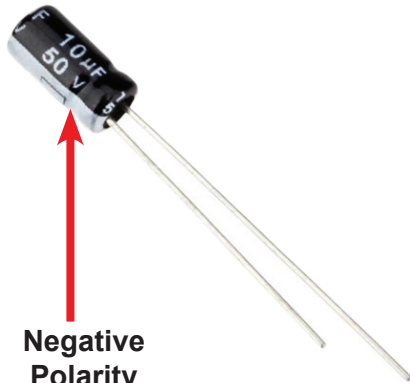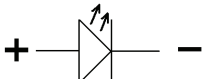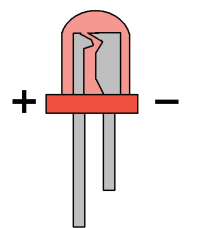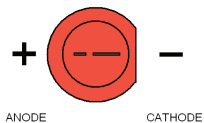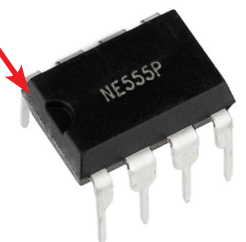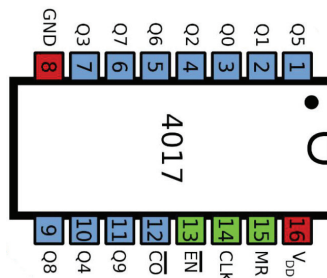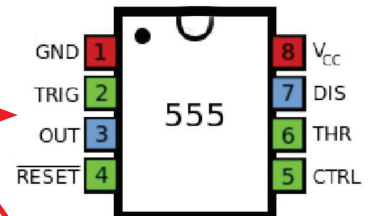
Negative Polarity Marking

Ceramic Capacitors:

Cermanic capacitors are usually of orange color. Below is a simple and easy way of calculating their values using only the number written on them as reference.

$$104 = 10 \times 10^4$$

Copy first 2 digits   Suffix with 4 zeros

10 000 pf

IC Pinout:

Use **NOTCH** and dot as reference

GND	1		8	V_{CC}
TRIG	2	555	7	DIS
OUT	3		6	THR
RESET	4		5	CTRL

4017

GND 8, Q3 7, Q7 6, Q6 5, Q2 4, Q0 3, Q1 2, Q5 1

Q8 9, Q4 10, Q9 11, CO 12, EN 13, CLK 14, MR 15, V_{DD} 16

NE555P

Assembly:

Turn on iron to 285°C (545°F) temperature (solder used for this kit 60 tin/40 lead).

Place in components and solder for the Main PCB (make sure the side of the board with the silkscreen is facing up when inserting components):

1. First, take the master board, 65 x 34mm (One with IC silkscreen).

2. Start placing the resistors and make sure their values match, refer to component list, resistor color code chart and silkscreen. Use Multimeter if needed. !iQ: Bend the leads of the resistor outwards on the back of the board to provide minimal mechanical grip but ensure that the angle formed by the bend is not smaller than 45 degrees.

3. Solder the leads of the placed resistors to the pads and cut them off once done soldering. (using a flush cutter)

Main PCB
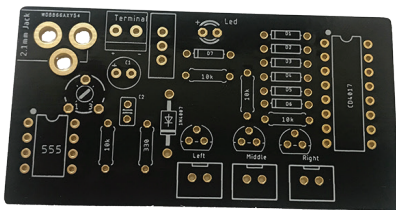
LED PCB

4. Next, begin placing the capacitors. When placing the polarized capacitor, refer to previous notes about identifying component polarity. You must make sure the negative lead of the capacitor is placed in the stripped area of the capacitor silkscreen on the board. Do not forget to verify if your values match, refer to component list. Since the ceramic capacitor (104) has no innate polarity, you may place the leads whichever way you want in the holes indicated by the silkscreen.

5. Solder the capacitor leads and cut when done.

6. Now you must prepare the transistors for mounting. You need to bend the middle pin lead of each transistors delicately (backwards) so that the leads correspond to the silkscreen outline on the PCB. Transistors should sit ¼" off the surface of the PCB.

Transistor curved side faces inward on PCB
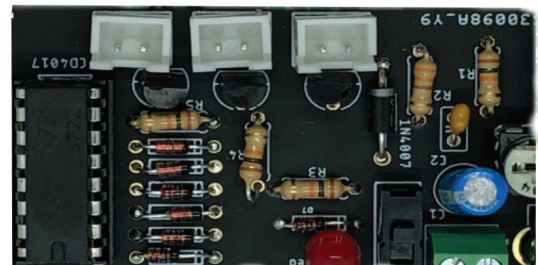
7. Solder transistor and cut if needed.

8. Now, place the diodes, 1N4148 (D<l-7>). IMPORTANT: You must make sure to place the diodes in the right direction. There is a black bar drawn around the component. This bar is representative of the cathode lead of the diode. Use this along with the silkscreen to help you place the diode.

9. Solder leads and cut.

Cathode (-)
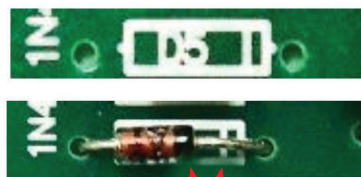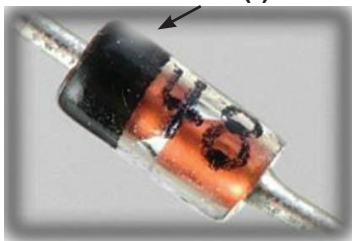
Black Bar aligns with silkscreen bar

10. Now, place the sockets you will have to insert the IC in. Start with the 16-PIN socket which belongs to the CD4017. IMPORTANT: Make sure that the notch on the socket aligns with the notch on the silkscreen layout for this IC, refer to previous notes if you miss. This will make it easier for you to place the IC afterwards.

11. Solder the leads.

12. Place the 8-pin socket for the other chip, NE555. Keep in mind the direction of the chip, once again refer to the notch.

13. Solder the leads. Do not Cut the Leads.

14. Place ICs in their respective sockets. Make sure the notch of the IC aligns with the notch of the socket and that of the silkscreen.
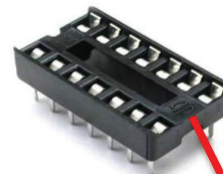

Socket must be aligned in order for the IC to be aligned (refer to notch)
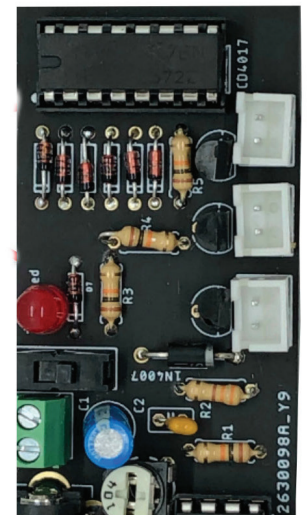
TIP: The reason you solder sockets instead of just soldering the IC right on is to have the ability to switch out burnt or broken chips for new ones. DO NOT CUT LEADS.

15. Next, place the trim pot. Think of the three leads as the three corners of an isosceles triangle. The lead that goes in the pad inside the silkscreen area of R4 is the one representing the tip of that triangle.

16. Solder the Leads, <u>Do not cut</u>.

17. Solder on-off switch, 2.1mm DC Jack and 3.5mm terminal block in their respective designations. Refer silkscreen on the board. Make sure the terminal side entry ports are facing outwards from the board. <u>Do Not Cut Leads</u>.

18. Now, place the straight JST connectors (J<l...3>), use silkscreen as reference. Just make sure the open slot side on the connector is facing inside the board.
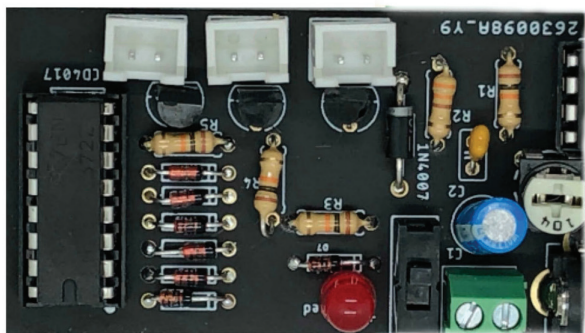
If you do not do this your power cables reference will be inversed. To make sure this does not happen, follow the convention (red-Source(+), Black-GND(-)).

Now you may move onto assembling the LED PCBs.
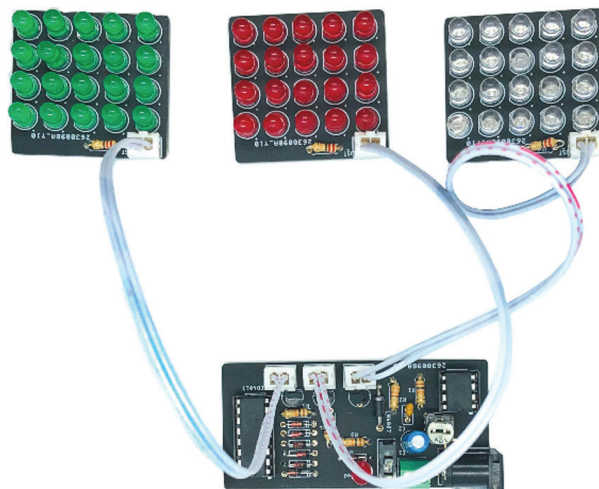
Place in components and solder for the LED PCBs (make sure the side of the board with the silkscreen is facing up when inserting components).

1. First take one of the PCBs. Start placing the LEDs. Always be aware of the polarity of these components, refer to previous notes concerning this and to the silkscreen on the top of the board. The bar on the silkscreen represents where the cathode lead of the LED should be placed. (It is recommended that you gradually place and solder the LEDs on the board to avoid overcrowding the back which can cause annoyance when soldering).

2. Now place the only resistor on the board (22 Ohm) and make sure the value matches, refer to component list, silkscreen and color code.

3. Solder and cut leads.

4. Next, place one JST connector, refer to silkscreen. (open slot should be towards the inside the board). <u>Do Not Cute Leads</u>.

5. Do the same for the two other PCBs.

6. After the assembly of all four boards is done, connect each of the PCBs to a the Main PCB you completed using female - female JST cable. Note: Be careful of the orientation of the wires (red-Source(+), Black-GND(-).

7. Finally, connect the Main PCB to a 12V power source either using 2.1mm DC Jack or 2-pin Terminal block.

Watch as each of the LED PCBs light up. You can change the frequency at which the boards are blinking by changing your potentiometers resistance value. (use a slot screwdriver if you are having trouble turning the trim pot)
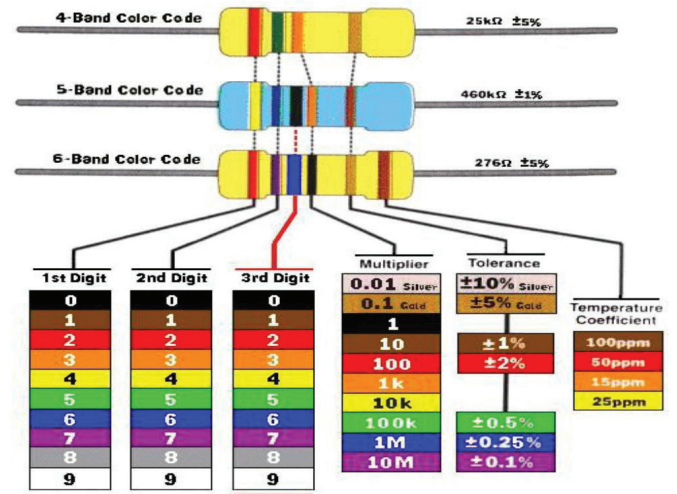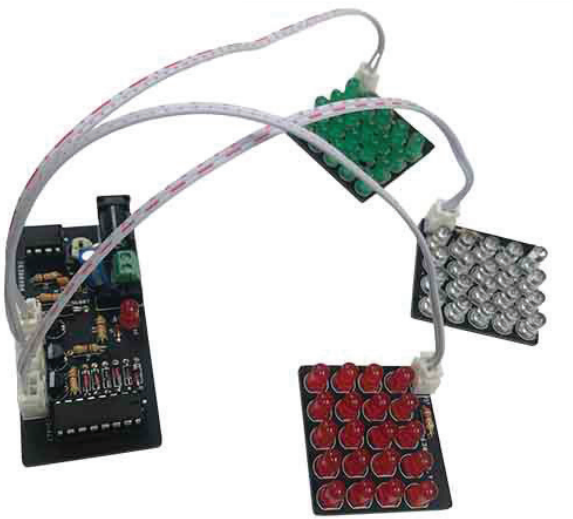
Make use of this chart to identify resistor values. Note that number of bands drawn on the resistor dictate how to calculate your values.