ONE BUTTON BANDIT KIT

MODEL K-34

Assembly and Instruction Manual

Elenco™ Electronics, Inc.

Revised 2002 REV-D 753234

PARTS LIST

If you are a student, and any parts are missing or damaged, please see instructor or bookstore.
If you purchased this One Button Bandit kit from a distributor, catalog, etc., please contact Elenco™ Electronics (address/phone/e-mail is at the back of this manual) for additional assistance, if needed.

RESISTORS

Qty.	Symbol	Value	Color Code	Part #
☐ 3	R1, R3, R5	220Ω 5% 1/4W	red-red-brown-gold	132200
☐ 1	R10	1kΩ 5% 1/4W	brown-black-red-gold	141000
☐ 1	R8	18kΩ 5% 1/4W	brown-gray-orange-gold	151800
☐ 4	R2, R4, R6, R7	100kΩ 5% 1/4W	brown-black-yellow-gold	161000
☐ 2	R9, R13	1MΩ 5% 1/4W	brown-black-green-gold	171000
☐ 1	R12	2.2MΩ 5% 1/4W	red-red-green-gold	172200
☐ 1	R11	4.7MΩ 5% 1/4W	yellow-violet-green-gold	174700

CAPACITORS

Qty.	Symbol	Value	Description	Part #
☐ 1	C2	.1μF (104)	Discap	251010
☐ 4	C1, C4, C5, C6	1μF	Electrolytic	261047
☐ 1	C3	4.7μF	Electrolytic	264747

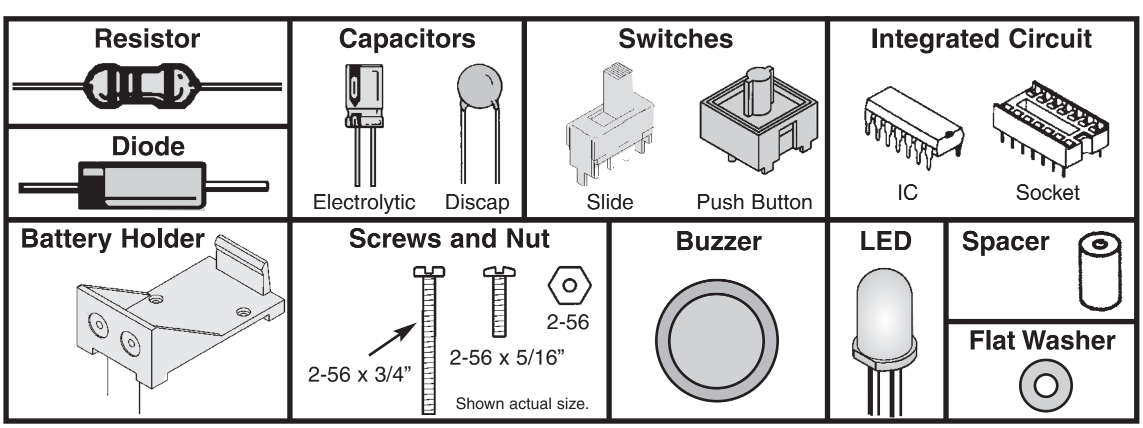
SEMICONDUCTORS

Qty.	Symbol	Value	Description	Part #
☐ 9	D16 - D24	1N4148	Diode	314148
☐ 3	U1, U2, U3	4017	Integrated Circuit	334017
☐ 1	U4	MC14584 or CD40106	Integrated Circuit	334584
☐ 12	D2-5, D7-10, D12-15		LED Red	350002
☐ 3	D1, D6, D11		LED Green	350010

MISCELLANEOUS

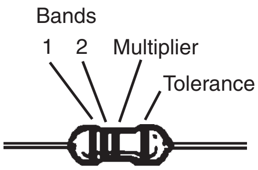
Qty.	Description	Part #	Qty.	Description	Part #
☐ 1	PC Board	518034	☐ 7	Nut 2-56 Hex	644201
☐ 1	Push Button Switch (S2)	540101	☐ 7	Flat Washer	645600
☐ 1	Slide Switch (S1)	541022	☐ 1	14-pin Socket (U4)	664014
☐ 1	Battery Holder	590096	☐ 3	16-pin Socket (U1, U2, U3)	664016
☐ 1	Buzzer Piezoelectric (BZ)	595201	☐ 1	Cover Sheet	750915B
☐ 4	Plastic Spacer	624112	☐ 1	Wire 22 Black Solid 8"	814120
☐ 3	Screw 2-56 x 5/16"	641231	☐ 1	Solder Tube	9ST4
☐ 4	Screw 2-56 x 3/4"	641233			

PARTS IDENTIFICATION



IDENTIFYING RESISTOR VALUES

Use the following information as a guide in properly identifying the value of resistors.



BAND 1 1st Digit	
Color	Digit
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Gray	8
White	9

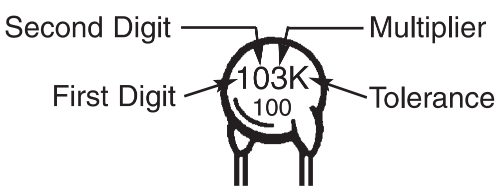
BAND 2 2nd Digit	
Color	Digit
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Gray	8
White	9

Multiplier	
Color	Multiplier
Black	1
Brown	10
Red	100
Orange	1,000
Yellow	10,000
Green	100,000
Blue	1,000,000
Silver	0.01
Gold	0.1

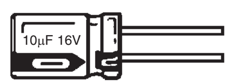
Resistance Tolerance	
Color	Tolerance
Silver	±10%
Gold	±5%
Brown	±1%
Red	±2%
Orange	±3%
Green	±.5%
Blue	±.25%
Violet	±.1%

IDENTIFYING CAPACITOR VALUES

Capacitors will be identified by their capacitance value in pF (picofarads), nF (nanofarads), or μF (microfarads). Most capacitors will have their actual value printed on them. Some capacitors may have their value printed in the following manner.



Multiplier	For the No.	0	1	2	3	4	5	8	9
	Multiply By	1	10	100	1k	10k	100k	.01	0.1



Note: The letter "R" may be used at times to signify a decimal point; as in 3R3 = 3.3

The above value is 10 x 1,000 = 10,000pF or .01μF The letter K indicates a tolerance of ±10% The letter J indicates a tolerance of ±5%

INTRODUCTION

The One Button Bandit is better known in Las Vegas as the One Arm Bandit. Our device has no arms, but instead a button. Therefore, we call it the One Button Bandit.

The One Button Bandit is a simplified version of an electronic slot machine. It contains three columns of five light emitting diodes (LED). When the switch S2 is pressed, the LEDs will flash on and off accompanied by sound. When the bandit stops, only one LED in each column will remain lit. If three green LEDs light up, you win the jackpot accompanied by sound.

THEORY OF OPERATION

Figure 1 shows the block diagram of the One Button Bandit. This block diagram consists of three identical circuits: (the basic has a timer, a decade counter, and five LEDs), the Clock Oscillator, the Sound Circuit and the Key of Ring.

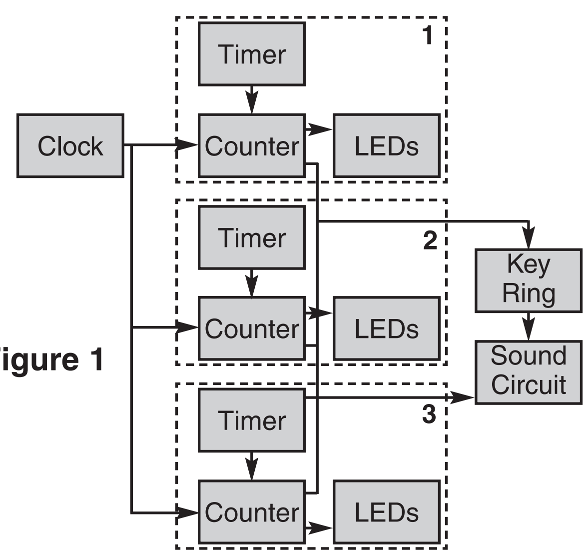


Figure 1

THE CLOCK OSCILLATOR

The clock oscillator is an electronic circuit that puts out a series of high and low voltages. It is a square wave oscillator whose frequency is controlled by the value of resistor and capacitor (see Figure 2a). The clock oscillator consists of Part A of the MC14584 integrated circuit. Figure 2b shows a diagram of the MC14584.

The MC14584 is a hex schmit trigger. The values of R7 and C1 chosen give a frequency of about 30 cycles per second. When the switch S1 is turned ON, the clock circuit oscillates pulses. The pulses will be before switch S1 is in the “ON” position. They go to the clock input of decade counters U1, U2 and U3 pin 14.

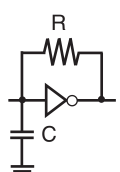


Figure 2a

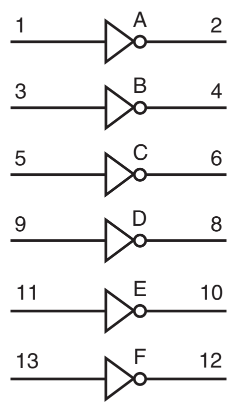


Figure 2b

THE DECADE COUNTER

The 4017 IC is a 5 stage divide by 10 counter. Figure 3 shows a diagram of this IC.

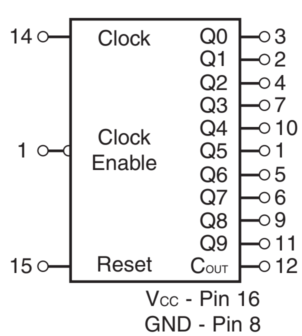


Figure 3

This IC has 10 outputs and a clear input. Only one of the 10 outputs will be high at any given time. The other 9 will be low. Let’s assume that output 1 is high. If a pulse is fed into the clock input, output 1 will go low and output 2 will go high. Each clock pulse will move the output one position. Connect an LED to the output, it will light only when the output goes high. It is obvious that when the clock is running, the LEDs will flash on and off with the speed of the clock. When the clock stops, only one LED will be lit.

In this design, 5 LEDs are used per IC, but the counter has 10 outputs. If the clock stops at an output without an LED, nothing will light. To prevent this, the 4017 IC is reset after hitting the 5th output. This is simply done by tying the 6th output to the clear pin (pin 1 and pin 15 shorted together). When the clock triggers output 5 on, the next pulse goes back to output 1.

THE TIMER

The One Button Bandit has three timers. The timers start when you turn ON the push button switch. The timers consist of Part D of the MC14584, R13 and C6; Part E and R12, C5; Part F and R11, C4. The values of the resistors and capacitors give the times of work for each decade counter.

THE LIGHT EMITTING DIODES (LED)

The operation of the LED is very simple. When current flows through the LED, it will emit light. Note that the LED is connected between an IC output and ground through a resistor. When the IC output goes high, the LED will light. The resistor limits the current so that the LED will not be damaged.

THE SOUND CIRCUIT

This circuit consists of the buzzer’s oscillator and the piezoelectric buzzer. The oscillator consists of Part B of the MC14584 integrated circuit. The value of resistor R8 and capacitor C2 chosen given a frequency of about 3000 cycles per second. This oscillator oscillates pulses only when the decade counters work. The pulses from this oscillator go to the buzzer. It is accompanied by sound when the bandit works.

THE KEY OF RING

When the One Button Bandit stops and the three green LEDs light, you will get the ring signal. This sound signal will be before you push the switch S2 again. The Key of Ring is an oscillator and consists of Part C of the MC14584. The values of resistor R9 and capacitor C3 give the frequency of ring sound.

CONSTRUCTION

Introduction

The most important factor in assembling your K-34 One Arm Bandit Kit is good soldering techniques. Using the proper soldering iron is of prime importance. A small pencil type soldering iron of 25 - 40 watts is recommended. **The tip of the iron must be kept clean at all times and well tinned.**

Safety Procedures

- Wear eye protection when soldering.
- Locate soldering iron in an area where you do not have to go around it or reach over it.
- **Do not hold solder in your mouth.** Solder contains lead and is a toxic substance. Wash your hands thoroughly after handling solder.
- Be sure that there is adequate ventilation present.

Assemble Components

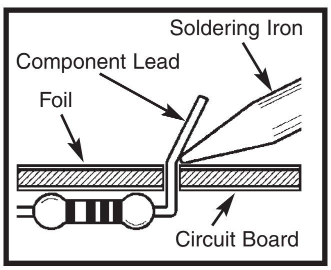
In all of the following assembly steps, the components must be installed on the top side of the PC board unless otherwise indicated. The top legend shows where each component goes. The leads pass through the corresponding holes in the board and are soldered on the foil side.
Use only rosin core solder of 63/37 alloy.

DO NOT USE ACID CORE SOLDER!

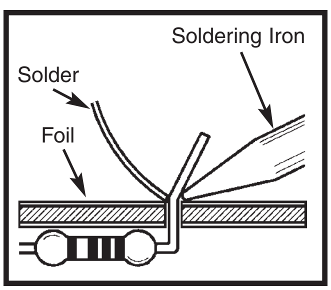
What Good Soldering Looks Like

A good solder connection should be bright, shiny, smooth, and uniformly flowed over all surfaces.

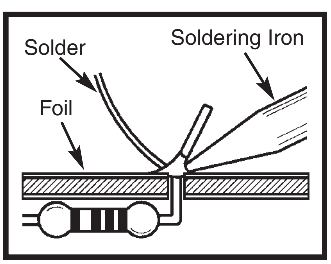
1. Solder all components from the copper foil side only. Push the soldering iron tip against both the lead and the circuit board foil.



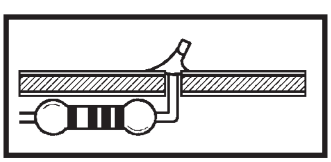
2. Apply a small amount of solder to the iron tip. This allows the heat to leave the iron and onto the foil. Immediately apply solder to the opposite side of the connection, away from the iron. Allow the heated component and the circuit foil to melt the solder.



3. Allow the solder to flow around the connection. Then, remove the solder and the iron and let the connection cool. The solder should have flowed smoothly and not lump around the wire lead.

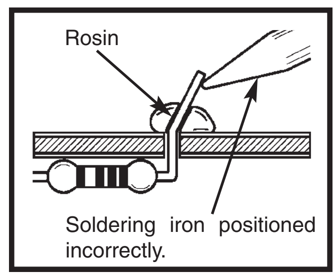


4. Here is what a good solder connection looks like.

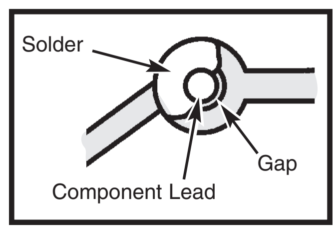


Types of Poor Soldering Connections

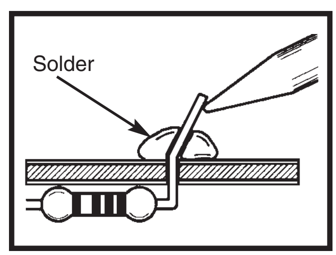
1. **Insufficient heat** - the solder will not flow onto the lead as shown.



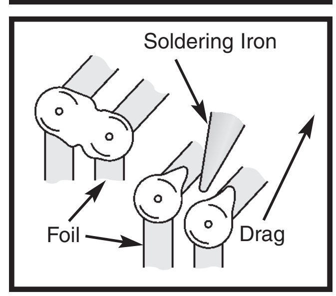
2. **Insufficient solder** - let the solder flow over the connection until it is covered. Use just enough solder to cover the connection.



3. **Excessive solder** - could make connections that you did not intend to between adjacent foil areas or terminals.



4. **Solder bridges** - occur when solder runs between circuit paths and creates a short circuit. This is usually caused by using too much solder. To correct this, simply drag your soldering iron across the solder bridge as shown.



ASSEMBLE COMPONENTS TO THE PC BOARD

☐ C5 - 1µF Electrolytic Cap.
(see Figure A)

☐ U3 - 16-pin IC Socket
☐ U3 - 4017 Integrated Circuit
(see Figure B)

☐ J4 - Jumper Wire
(see Figure C)

☐ R11 - 4.7MΩ 5% 1/4W Resistor
(yellow-violet-green-gold)

☐ C4 - 1µF Electrolytic Cap.
(see Figure A)

☐ R5 - 220Ω 5% 1/4W Resistor
(red-red-brown-gold)

☐ J3 - Jumper Wire
(see Figure C)

☐ J2 - Jumper Wire
(see Figure C)

☐ R6 - 100kΩ 5% 1/4W Resistor
(brown-black-yellow-gold)

☐ C1 - 1µF Electrolytic Cap.
(see Figure A)

☐ U2 - 16-pin IC Socket
☐ U2 - 4017 Integrated Circuit
(see Figure B)

☐ R3 - 220Ω 5% 1/4W Resistor
(red-red-brown-gold)

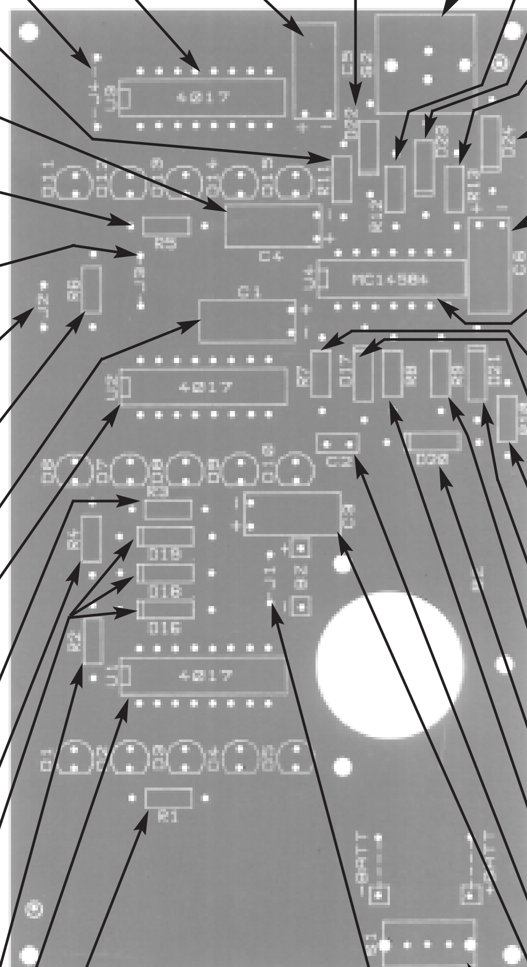
☐ R4 - 100kΩ 5% 1/4W Resistor
(brown-black-yellow-gold)

☐ D19 - 1N4148 Diode
☐ D18 - 1N4148 Diode
☐ D16 - 1N4148 Diode
(see Figure D)

☐ R2 - 100kΩ 5% 1/4W Resistor
(brown-black-yellow-gold)

☐ U1 - 16-pin IC Socket
☐ U1 - 4017 Integrated Circuit
(see Figure B)

☐ R1 - 220Ω 5% 1/4W Resistor
(red-red-brown-gold)



☐ D22 - 1N4148 Diode
(see Figure D)

☐ S2 - Push Button Switch

☐ R12 - 2.2MΩ 5% 1/4W Resistor
(red-red-green-gold)

☐ D23 - 1N4148 Diode
(see Figure D)

☐ R13 - 1MΩ 5% 1/4W Resistor
(brown-black-green-gold)

☐ D24 - 1N4148 Diode
(see Figure D)

☐ C6 - 1µF Electrolytic Cap.
(see Figure A)

☐ U4 - 14-pin IC Socket
☐ U4 - MC14584 or CD40106 IC
(see Figure B)

☐ R7 - 100kΩ 5% 1/4W Resistor
(brown-black-yellow-gold)

☐ D17 - 1N4148 Diode
(see Figure D)

☐ R10 - 1kΩ 5% 1/4W Resistor
(brown-black-red-gold)

☐ D21 - 1N4148 Diode
(see Figure D)

☐ R9 - 1MΩ 5% 1/4W Resistor
(brown-black-green-gold)

☐ D20 - 1N4148 Diode
(see Figure D)

☐ R8 - 18kΩ 5% 1/4W Resistor
(brown-gray-orange-gold)

☐ C2 - .1µF Discap (104)

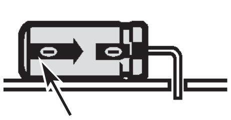
☐ C3 - 4.7µF Electrolytic Cap.
(see Figure A)

☐ S1 - Slide Switch

☐ J1 - Jumper Wire
(see Figure C)

Figure A

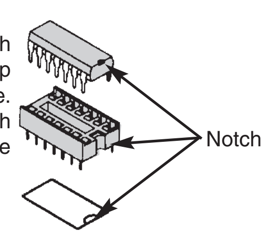
Electrolytic capacitors have polarity. Be sure to mount them with the negative (–) lead (marked on side) in the correct hole. Mount the electrolytics horizontal to the PC board. Bend the leads at right angles and then insert the leads into the PC board.



Polarity Marking

Figure B

Insert the IC socket into the PC board with the notch in the direction shown on the top legend. Solder the IC socket into place. Insert the IC into the socket with the notch in the same direction as the notch on the socket.



ASSEMBLE COMPONENTS TO THE PC BOARD

Figure C

Form a discarded piece of an electrolytic lead into a jumper wire by bending the wire to the correct length and mount it to the PC board.

Figure D

Diodes have polarity. Mount them with the band in the correct direction, as shown on the PC board.

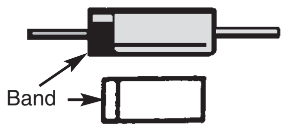
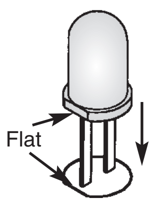
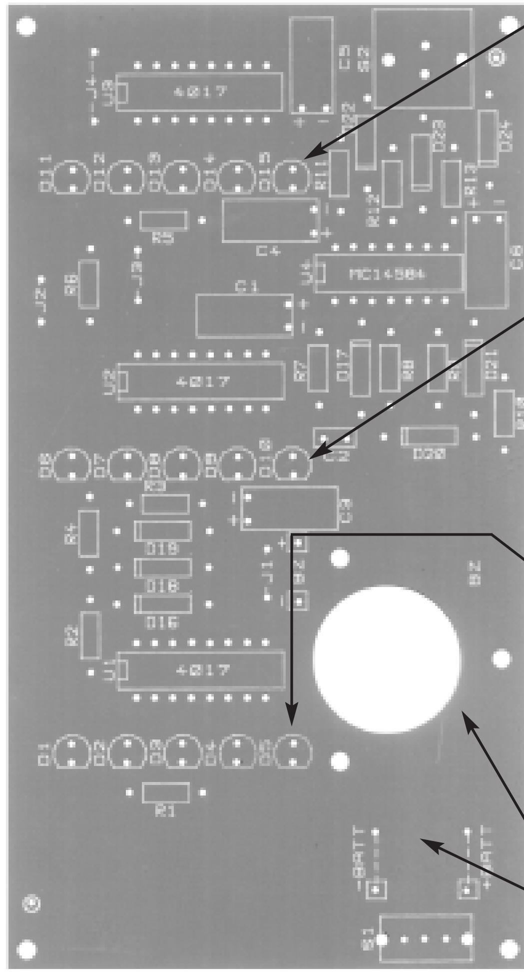


Figure E

Mount the LED flush onto the PC board with the flat side of the LED in the same direction as marked on the PC board.





- ☐ D15 - Red LED
- ☐ D14 - Red LED
- ☐ D13 - Red LED
- ☐ D12 - Red LED
- ☐ D11 - Green LED (see Figure E)

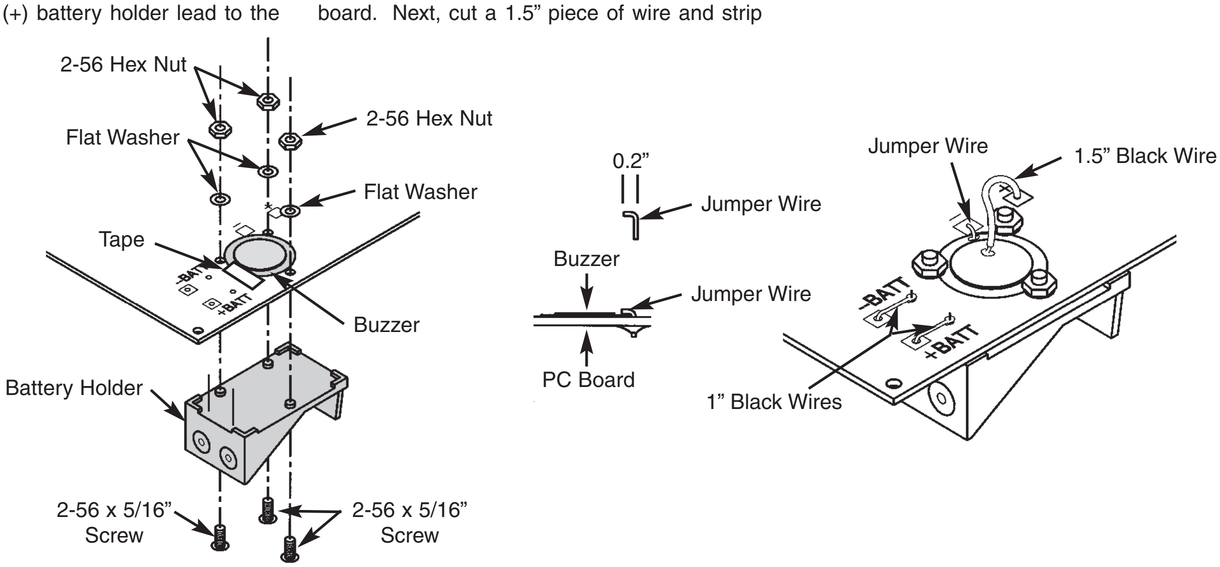
- ☐ D10 - Red LED
- ☐ D9 - Red LED
- ☐ D8 - Red LED
- ☐ D7 - Red LED
- ☐ D6 - Green LED (see Figure E)

- ☐ D5 - Red LED
- ☐ D4 - Red LED
- ☐ D3 - Red LED
- ☐ D2 - Red LED
- ☐ D1 - Green LED (see Figure E)

- ☐ BZ - Buzzer
- ☐ Battery Holder (see Figure F)

Figure F

Mount the battery holder and the buzzer to the PC board using three 2-56 x 5/16" screws, three 2-56 nuts, and three flat washers (as shown below). **Note:** Use a piece of Scotch Tape on the brass part of the buzzer only to hold it in place. Cut two 1" pieces of wire and strip 1/4" of insulation off of both ends. Solder the first wire from the positive (+) battery holder lead to the +BATT point on the PC board. Solder the second wire from the negative (–) battery holder lead to the –BATT point on the PC board. Cut off the excess leads. Use an excess lead to form a jumper wire. Bend the wire as shown below and solder this jumper from the outer edge of the buzzer to the –BZ point on the PC board. Next, cut a 1.5" piece of wire and strip 1/4" of insulation off of both ends.. Solder this wire from the +BZ point on the PC board to the middle of the buzzer. **Note:** Do not let the flat washers touch the silver part of the buzzer or let the solder from the wire from the outer edge touch the silver part.



☐ Put the 9V alkaline battery into the battery holder. Slide the switch to the ON (top) position and push on the button switch. The LEDs will flash ON and OFF accompanied by sound. If it is OK, go to the Final Assembly.

TROUBLESHOOTING

Contact Elenco™ Electronics if you have any problems. **DO NOT** contact your place of purchase as they will not be able to help you.

1. One of the most frequently occurring problems is poor solder connections.
    a) Tug slightly on all parts to make sure that they are indeed soldered.
    b) All solder connections should be shiny. Resolder any that are not.
    c) Solder should flow into a smooth puddle rather than a round ball. Resolder any connection that has formed into a ball.
    d) Have any solder bridges formed? A solder bridge may occur if you accidentally touch an adjacent foil by using too much solder or by dragging the soldering iron across adjacent foils. Break the bridge with your soldering iron.
2. Be sure that all components have been mounted in their correct places.
    a) Be sure that diodes D16 - D24 have not been installed backwards. The band on the diodes should be in the same direction as marked on the PC board.
    b) Are electrolytics C1, C3 - C6 installed correctly? These capacitors have polarity. Be sure that the negative lead is in the correct pad.
    c) Be sure that the ICs are installed correctly. The notch should be in the same direction as shown on the top legend of the PC board.
    d) Be sure that the LED has been installed correctly. The flat side of the LED should be in the same direction as marked on the top legend of the PC board.

FINAL ASSEMBLY

1. Using a small knife or scissors, very carefully cut out the holes on the cover sheet as shown in Figure G.

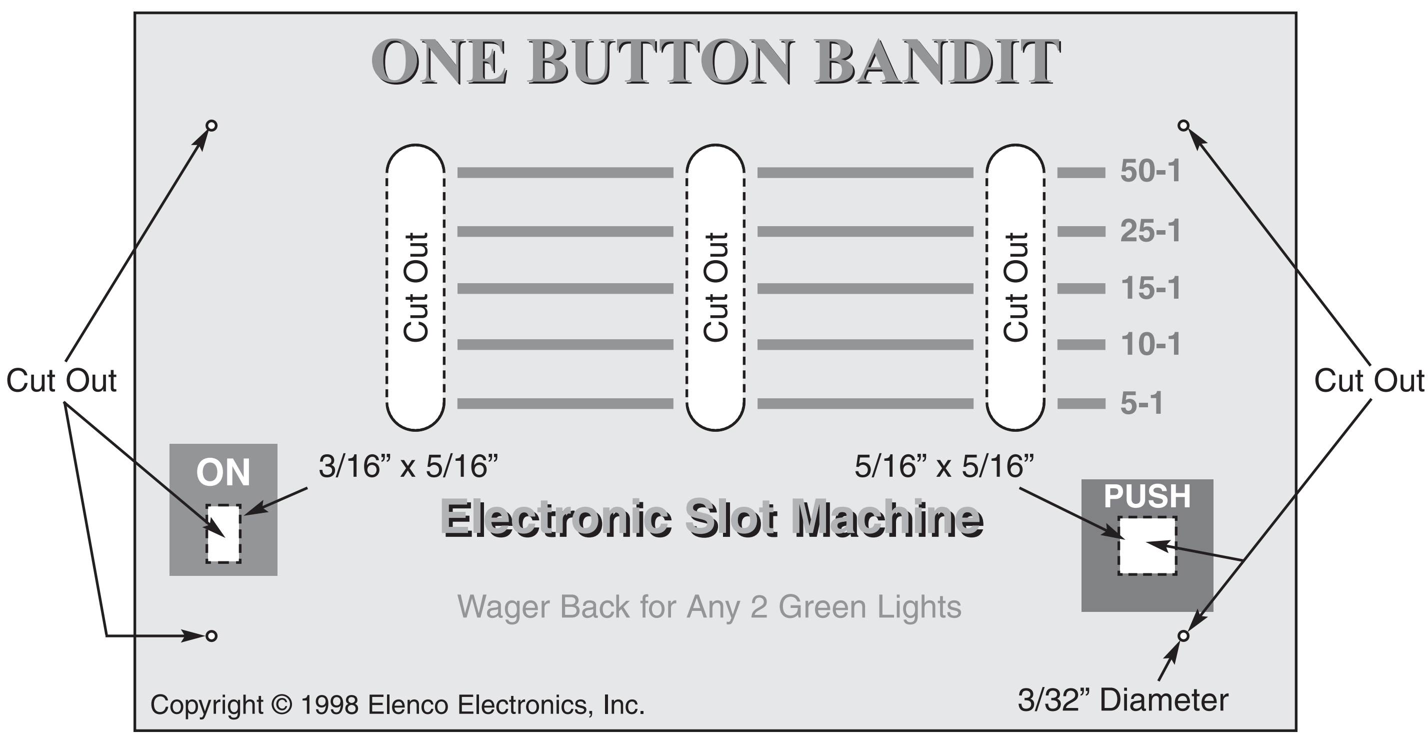


Figure G

2. Next, cut out the holes on the clam shell as shown in Figure H. To do this, you're going to have to position the cover sheet inside the clamshell to where you want it mounted. Tape the sheet to the clam shell as shown. Now cut out the four corner holes, the ON/OFF Switch hole, and the Push Button Switch hole. Remove the tape.

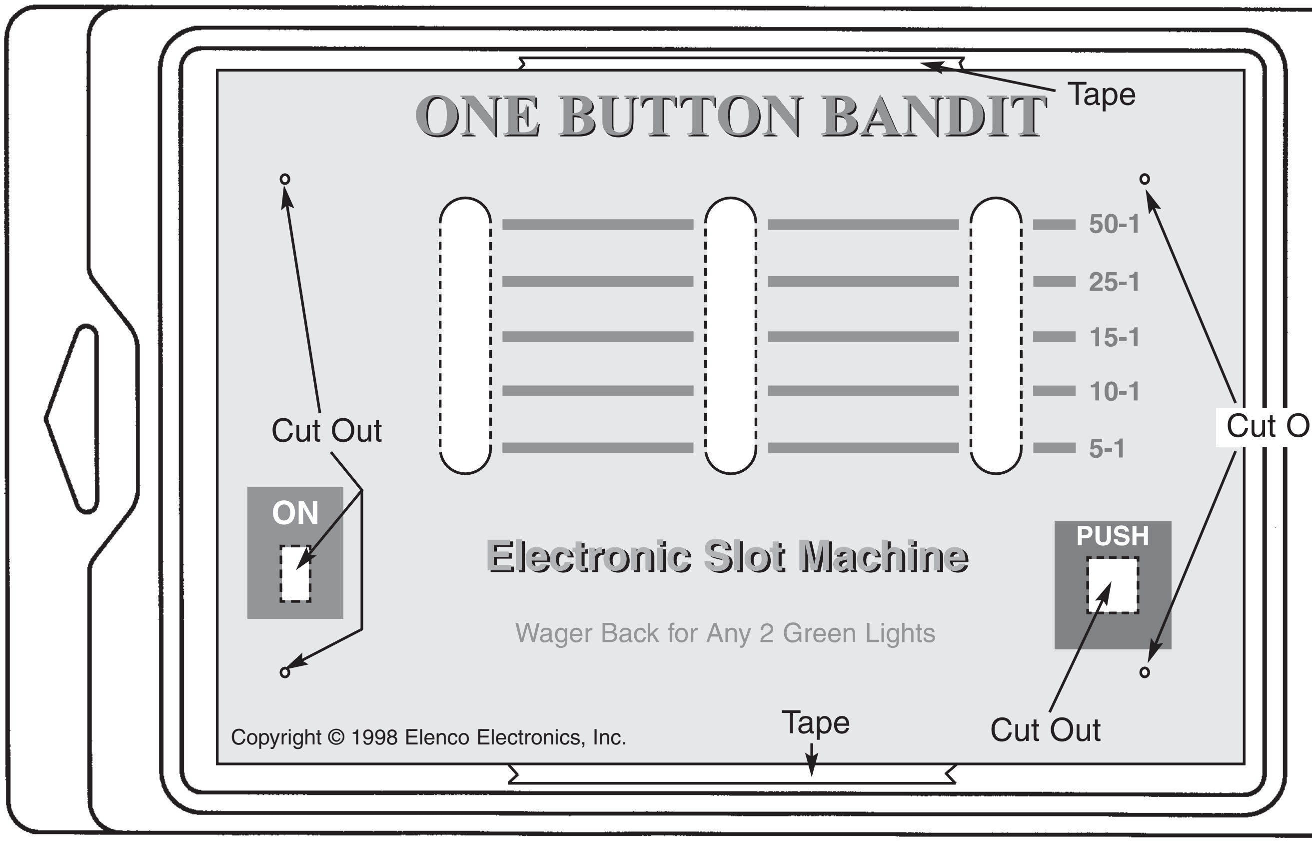
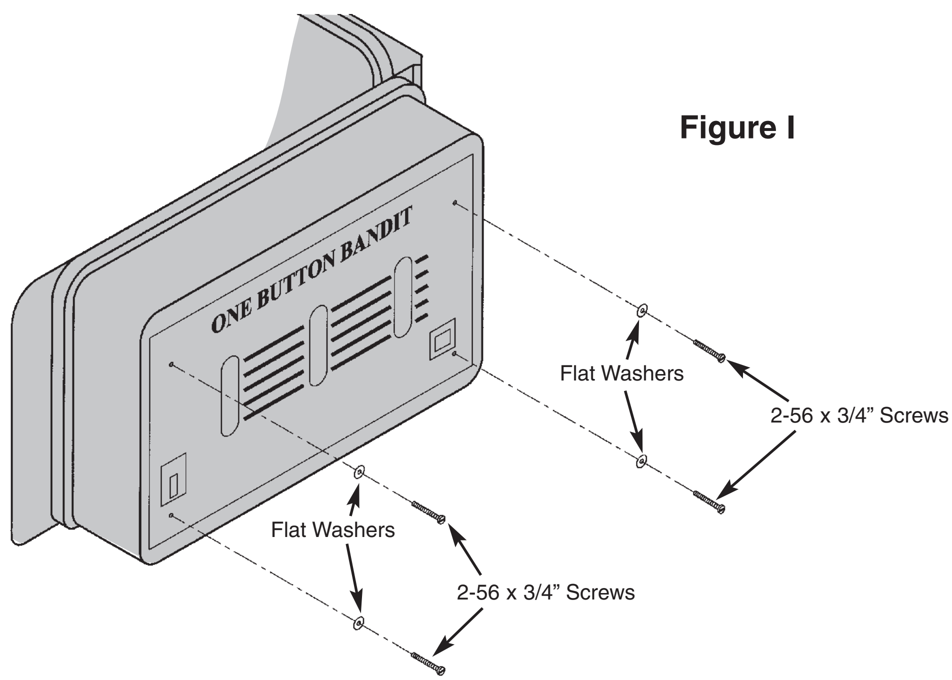


Figure H

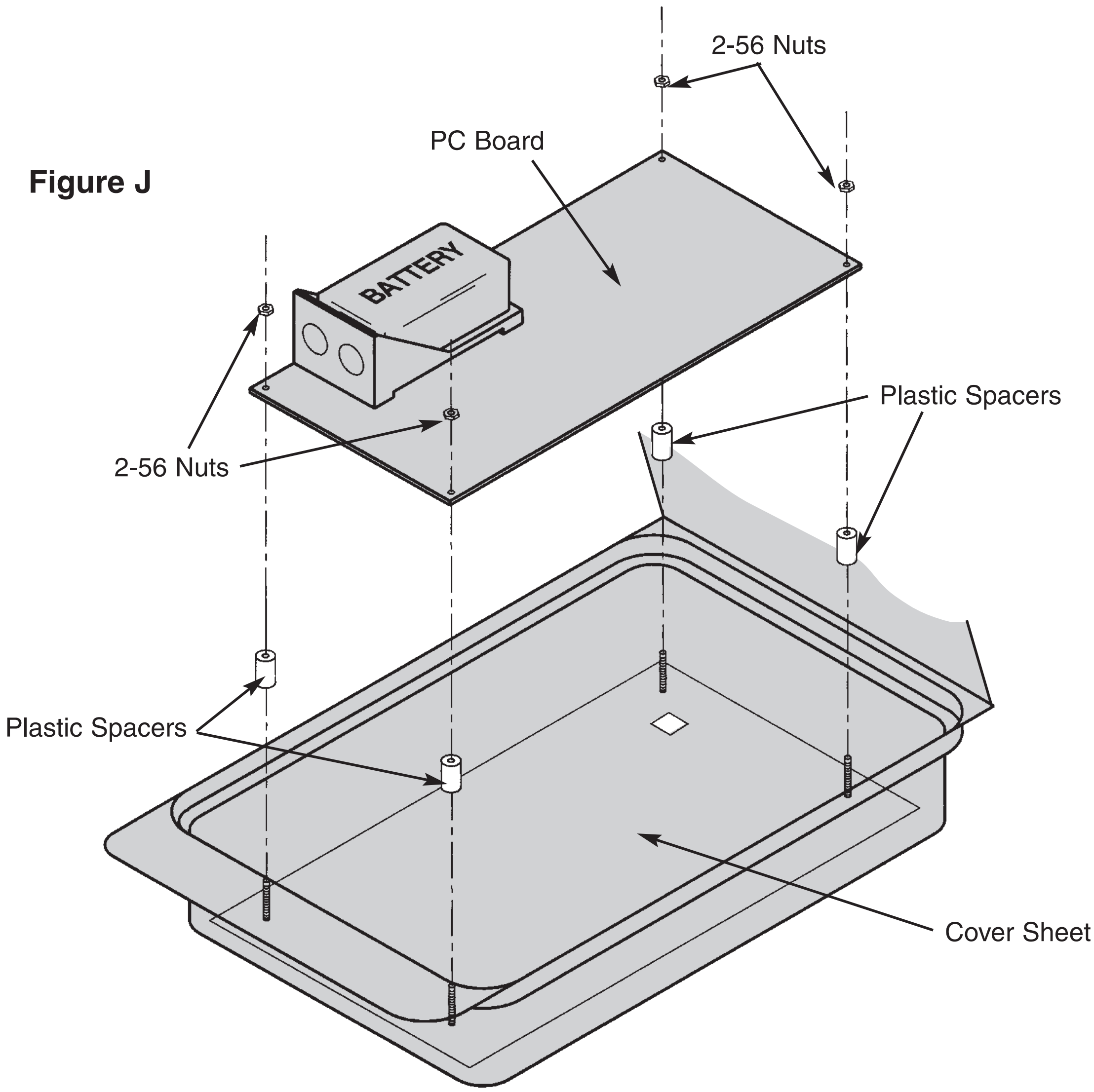
3. Insert the four 2-56 x 3/4" screws and four washers into the holes of the clamshell and cover sheet as shown in Figure I. Next, slide on the four plastic spacers onto the 2-56 x 3/4" screws as shown in Figure J. Now slide the PC board onto the screws as shown. Finally, lock everything into place by threading on the four 2-56 hex nuts onto the screws as shown in Figure J.

Figure I



FINAL ASSEMBLY (CONTINUED)

Figure J



QUIZ

1. In electronics, a capacitor is a . . .
   a) counter. c) light emitting diode.
   b) generator. d) storage device.

2. LED means . . .
   a) light emitting device. c) long electronic delay.
   b) light emitting diode. d) light electric diode.

3. The clock oscillator generates a . . .
   a) sound pulses. c) periodic waveform.
   b) DC voltage. d) light pulses.

4. The decade counter is triggered by . . .
   a) the timer. c) LEDs.
   b) the sound circuit. d) the clock oscillator.

5. The key of ring gives the sound ring signal when . . .
   a) the three green LEDs light.
   b) any three LEDs light.
   c) three LEDs light up in a row.

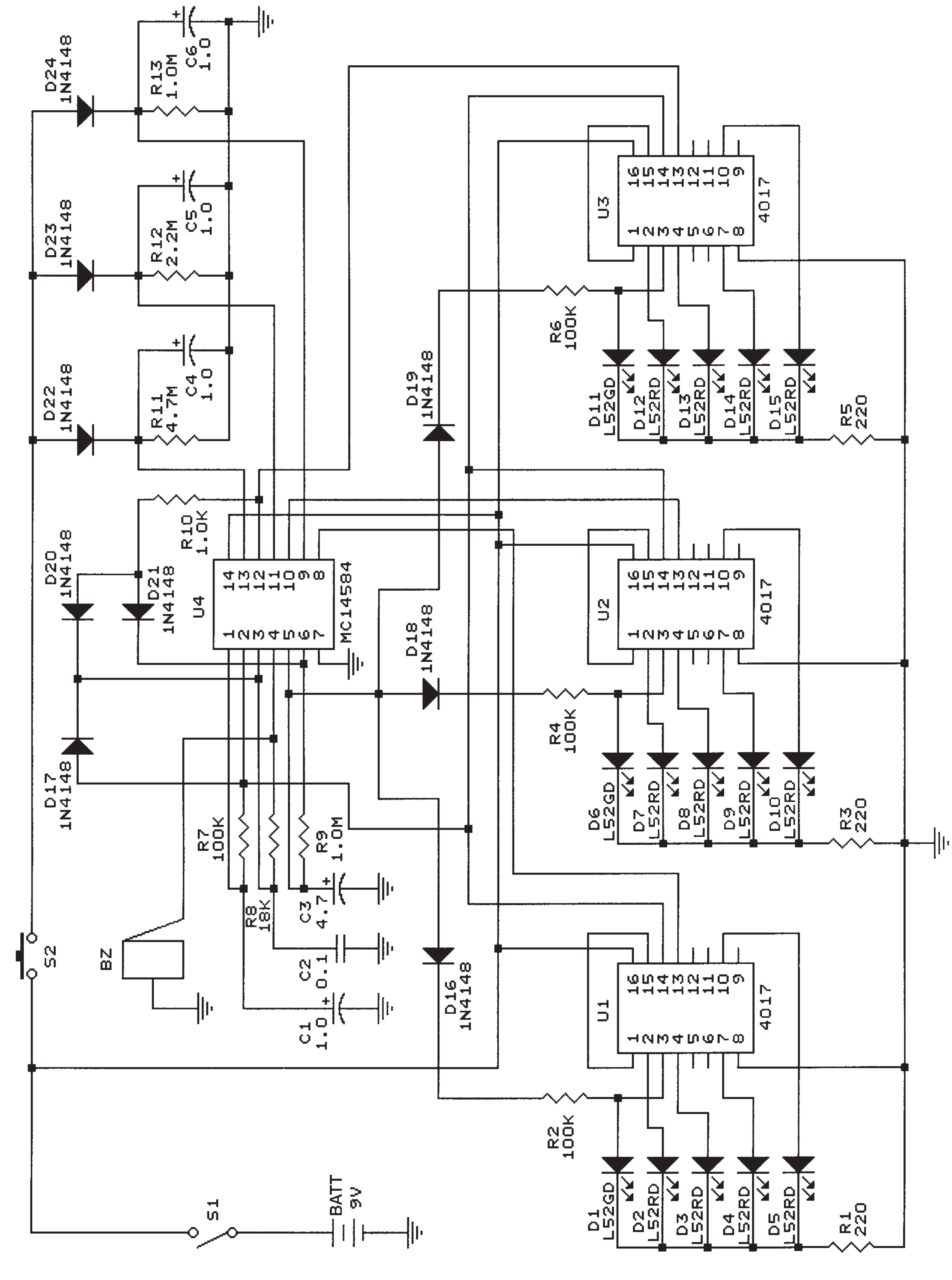
6. The buzzer transforms . . .
   a) electrical signals to light.
   b) electrical signals to sound.
   c) light to electrical signals.

7. The probability of winning any green LED is . . .
   a) 4% c) 60%
   b) 25% d) 0.8%

8. The probability of winning three green LEDs is . . .
   a) 4% c) 20%
   b) 25% d) 0.8%

Answers: 1. D; 2. B; 3. C; 4. D; 5. A; 6. B; 7. C; 8. D

SCHEMATIC DIAGRAM



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