

ELECTRONIC ROULETTE KIT

MODEL AK-300



Instruction & Assembly Manual

Elenco® Electronics, Inc.

PARTS LIST

If you are a student, and any parts are missing or damaged, please see instructor or bookstore.

If you purchased this roulette 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. **DO NOT** contact your place of purchase as they will not be able to help you.

RESISTORS

Qty.	Symbol	Value	Color Code	Part #
<input type="checkbox"/> 1	R22	1k Ω 5% 1/4W	brown-black-red-gold	141000
<input type="checkbox"/> 4	R1 - R4	1.2k Ω 5% 1/4W	brown-red-red-gold	141200
<input type="checkbox"/> 1	R19	1.5k Ω 5% 1/4W	brown-green-red-gold	141500
<input type="checkbox"/> 5	R5 - R9	10k Ω 5% 1/4W	brown-black-orange-gold	151000
<input type="checkbox"/> 2	R15, R16	20k Ω 5% 1/4W	red-black-orange-gold	152000
<input type="checkbox"/> 1	R13	47k Ω 5% 1/4W	yellow-violet-orange-gold	154700
<input type="checkbox"/> 1	R17	56k Ω 5% 1/4W	green-blue-orange-gold	155600
<input type="checkbox"/> 2	R11, R20	100k Ω 5% 1/4W	brown-black-yellow-gold	161000
<input type="checkbox"/> 1	R24	270k Ω 5% 1/4W	red-violet-yellow-gold	162700
<input type="checkbox"/> 1	R14	330k Ω 5% 1/4W	orange-orange-yellow-gold	163300
<input type="checkbox"/> 1	R10	820k Ω 5% 1/4W	gray-red-yellow-gold	168200
<input type="checkbox"/> 1	R23	1.8M Ω 5% 1/4W	brown-gray-green-gold	171800
<input type="checkbox"/> 1	R12	2.2M Ω 5% 1/4W	red-red-green-gold	172200
<input type="checkbox"/> 1	R18	3.3M Ω 5% 1/4W	orange-orange-green-gold	173300
<input type="checkbox"/> 1	R21	4.7M Ω 5% 1/4W	yellow-violet-green-gold	174700

CAPACITORS

Qty.	Symbol	Value	Description	Part #
<input type="checkbox"/> 1	C4	.001 μ F	Discap (102)	231036
<input type="checkbox"/> 1	C2	.0033 μ F	Mylar (332)	233317
<input type="checkbox"/> 1	C1	.02 μ F or .022 μ F	Discap (203 or 223)	242010
<input type="checkbox"/> 1	C5	.47 μ F	Electrolytic (Lytic)	254747
<input type="checkbox"/> 2	C3, C6	1 μ F	Electrolytic (Lytic)	261047
<input type="checkbox"/> 2	C7, C8	100 μ F	Electrolytic (Lytic)	281044

SEMICONDUCTORS

Qty.	Symbol	Value	Description	Part #
<input type="checkbox"/> 2	D41, D43	1N4001	Diode	314001
<input type="checkbox"/> 3	D39, D40, D42	1N4148	Diode	314148
<input type="checkbox"/> 7	Q1 - Q4, Q7 - Q9	2N3904	Transistor	323904
<input type="checkbox"/> 2	Q5, Q6	2N3906	Transistor	323906
<input type="checkbox"/> 2	U1, U3	4017	Integrated Circuit	334017
<input type="checkbox"/> 1	U2	4069	Integrated Circuit	334069
<input type="checkbox"/> 36	D1 - D36		LED Red	350002
<input type="checkbox"/> 2	D37, D38		LED Green	350010

MISCELLANEOUS

Qty.	Symbol	Description	Part #	Qty.	Symbol	Description	Part #
<input type="checkbox"/> 1		PC Board	517100	<input type="checkbox"/> 4		Flat Washer Black	645404
<input type="checkbox"/> 1	S1	Push Button Switch	540101	<input type="checkbox"/> 3		Flat Washer White	645600
<input type="checkbox"/> 1	BT	Battery Holder 9V	590096	<input type="checkbox"/> 1	U2	14-pin Socket	664014
<input type="checkbox"/> 1	BZ1	Buzzer Piezoelectric	595201	<input type="checkbox"/> 2	U1, U3	16-pin Socket	664016
<input type="checkbox"/> 4		Plastic Spacer	624010	<input type="checkbox"/> 1		Paper Clip	680018
<input type="checkbox"/> 3		Screw 2-56 x 5/16"	641231	<input type="checkbox"/> 1		4" Wire 22ga. Black Solid	814120
<input type="checkbox"/> 8		Screw 4-40 x 1/4" Black	641433	<input type="checkbox"/> 1		40" Wire 22ga. Bare	845000
<input type="checkbox"/> 3		Nut 2-56 Hex	644201	<input type="checkbox"/> 1		Solder Tube	9ST4A

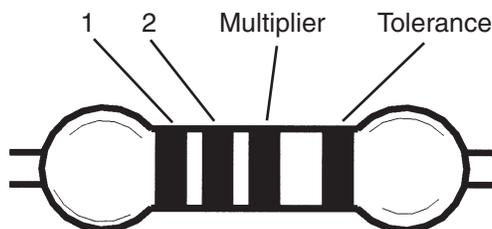
**** SAVE THE BOX THAT THIS KIT CAME IN. IT WILL BE USED ON PAGE 10. ****

IDENTIFYING RESISTOR VALUES

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

BAND 1 1st Digit		BAND 2 2nd Digit		Multiplier		Resistance Tolerance	
Color	Digit	Color	Digit	Color	Multiplier	Color	Tolerance
Black	0	Black	0	Black	1	Silver	±10%
Brown	1	Brown	1	Brown	10	Gold	±5%
Red	2	Red	2	Red	100	Brown	±1%
Orange	3	Orange	3	Orange	1,000	Red	±2%
Yellow	4	Yellow	4	Yellow	10,000	Orange	±3%
Green	5	Green	5	Green	100,000	Green	±.5%
Blue	6	Blue	6	Blue	1,000,000	Blue	±.25%
Violet	7	Violet	7	Silver	0.01	Violet	±.1%
Gray	8	Gray	8	Gold	0.1		
White	9	White	9				

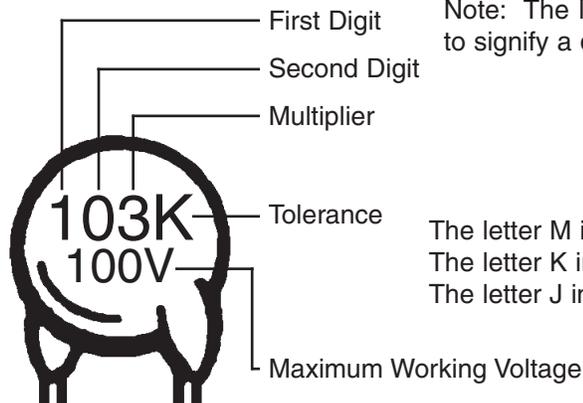
BANDS



IDENTIFYING CAPACITOR VALUES

Capacitors will be identified by their capacitance value in pF (picofarads), nF (nanofarads), or μ F (microfarads). Most capacitors will have their actual value printed on them. Some capacitors may have their value printed in the following manner. The maximum operating voltage may also be printed on the capacitor.

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



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

The letter M indicates a tolerance of ±20%
The letter K indicates a tolerance of ±10%
The letter J indicates a tolerance of ±5%

The value is $10 \times 1,000 = 10,000\text{pF}$ or $.01\mu\text{F}$ 100V

METRIC UNITS AND CONVERSIONS

Abbreviation	Means	Multiply Unit By	Or
p	Pico	.000000000001	10^{-12}
n	nano	.000000001	10^{-9}
μ	micro	.000001	10^{-6}
m	milli	.001	10^{-3}
-	unit	1	10^0
k	kilo	1,000	10^3
M	mega	1,000,000	10^6

- 1,000 pico units = 1 nano unit
- 1,000 nano units = 1 micro unit
- 1,000 micro units = 1 milli unit
- 1,000 milli units = 1 unit
- 1,000 units = 1 kilo unit
- 1,000 kilo units = 1 mega unit

INTRODUCTION

Electronic Roulette (roo-let) replaces the ivory ball with a circuit of flashing light emitting diodes (LED's). Red LED's are arranged in a circle next to a black or red number and two green LED's are positioned next to "0" and "00". When the switch is pushed, the LED's light one after another, in a sequence that represents the movement of the ivory ball. The number next to

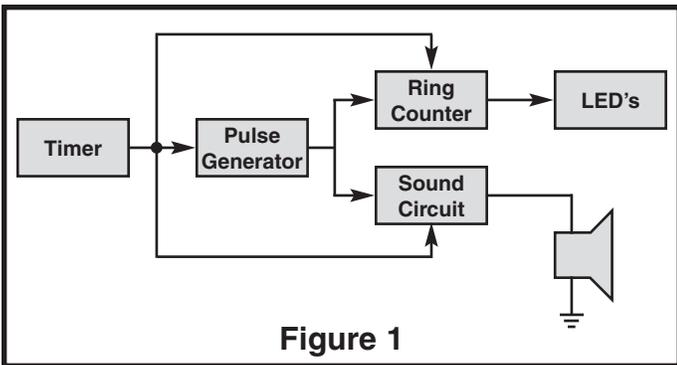
the lit LED when movement stops is the winning number. During movement, the sound of a bouncing ball is generated. If the switch is not pressed again, the circuits will automatically turn off, to conserve the battery power. A constant tone will alert you to check your number before automatic shut down.

THEORY OF OPERATION

THE BLOCK DIAGRAM

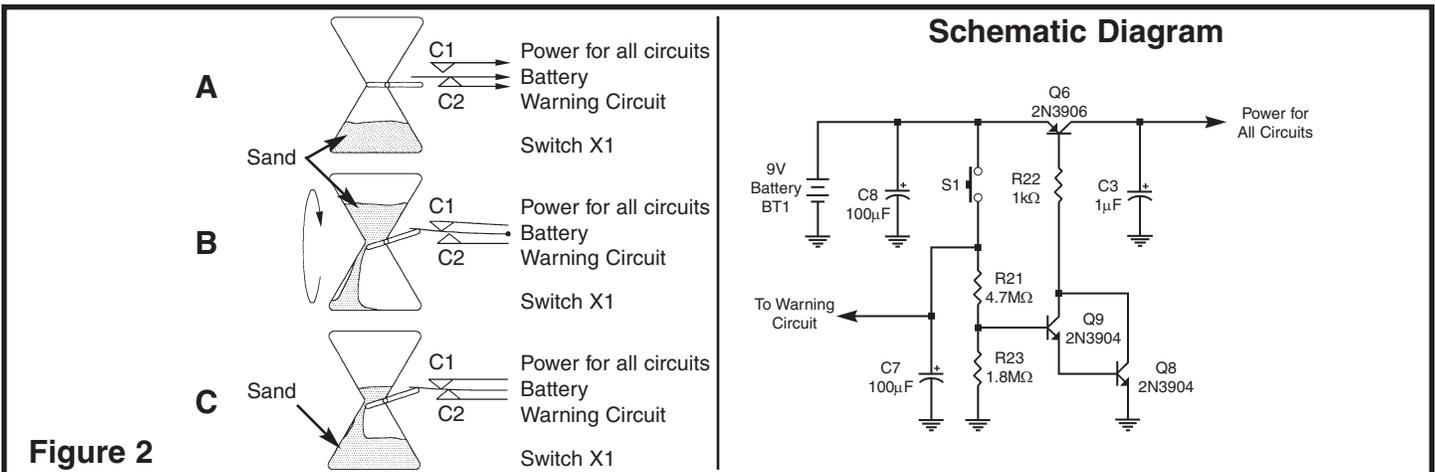
The function of many of the circuits will be presented in the form of an analogy (similar operation, but easier-to-understand system). In this manner, the operation of a circuit can be explained without the use of mathematics and equations.

Figure 1 shows a Block Diagram of the Electronic Roulette circuits. The Timer circuit is used to turn all the other circuits on and off. The Pulse Generator makes pulses that create the sound and force the ring counter to move the position of the lit LED. The Sound Circuit generates the sound of a bouncing ivory ball, and a warning tone a few seconds before power down. The Ring Counter lights each LED in a circular sequence. The LED's represent the position of the ivory ball.



THE TIMER

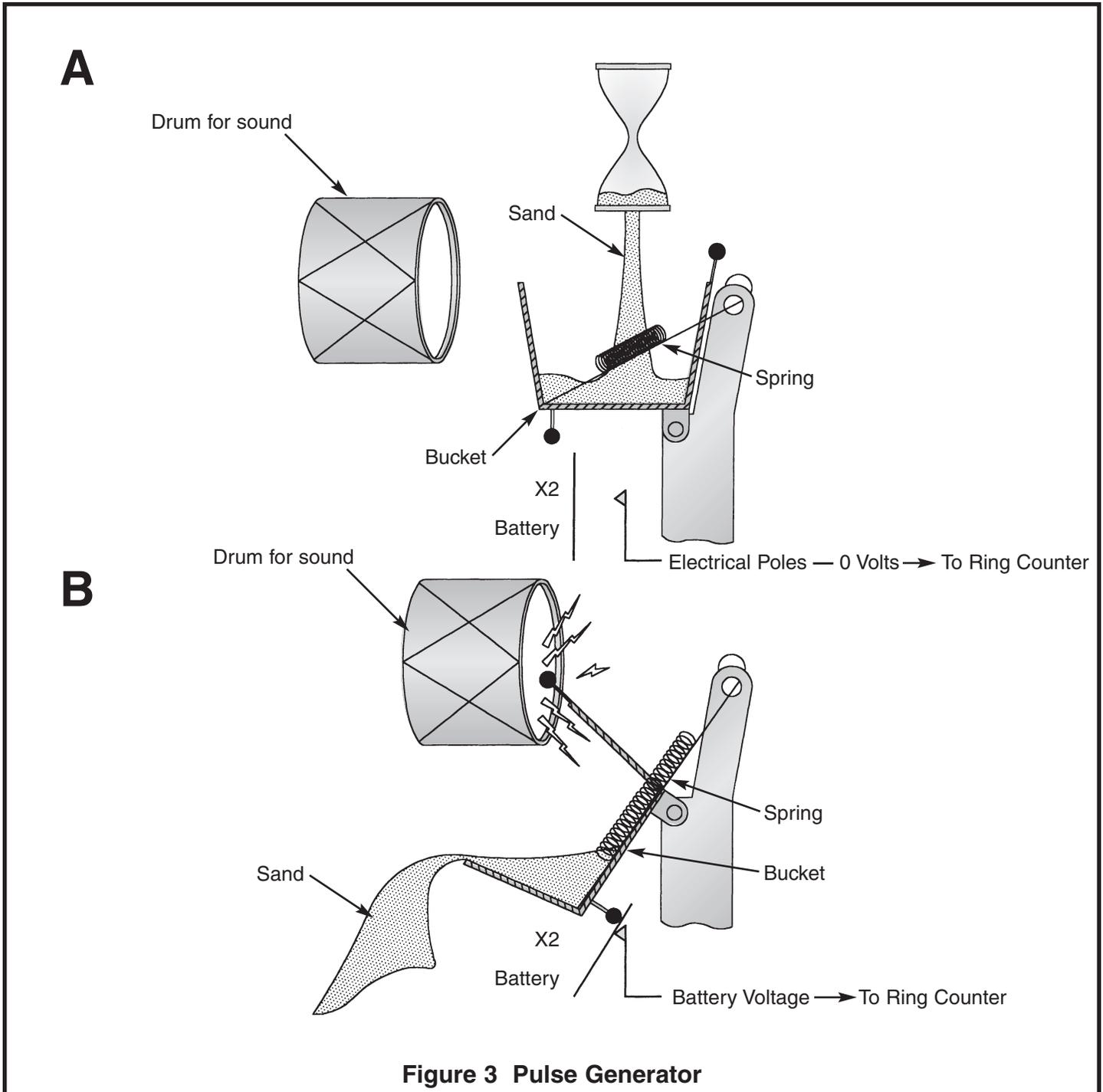
When S1, the start button, is pushed, capacitor C7 (Figure 2, Schematic Diagram) is charged to the battery voltage. This is similar to flipping the "Timer Glass" shown in Figure 2a to produce the condition shown in Figure 2b. Just as the sand runs down holding the lever arm up (Figure 2b), the charges in th capacitor C7 forces transistors Q6, Q8, and Q9 on. As long as the lever arm is up in Figure 2b, the other circuits are powered through the contact C1 on switch X1. At first, due to the weight of the sand (similar to capacitor C7 being fully charged), the contact C2 will open and remain open. Right before the sand totally runs out (capacitor C7 has lost most of its charge), the contact C2 will close, as shown in Figure 2c, and sound an alarm to warn you that the contact C1 is about to open and turn all the power off, including the power to the warning circuit. Eventually all the sand runs out of the "Timer Glass" (capacitor C7 has discharged) and the power is turned off (Figure 2a). To make the timer stay on longer, you could get a bigger "Timer Glass" (larger capacitor for C7) that holds more sand and replace the smaller one.



THE PULSE GENERATOR

Assume that part of the sand from the "Timer Glass" in Figure 2 is poured into a bucket as shown in Figure 3a. When the bucket has enough sand, it will flip and dump as shown in Figure 3b. Each time it flips, it closes switch X2, sending the battery voltage to the Ring Counter and it strikes the "Drum" producing a sound. The bucket in Figures 3a & 3b represents capacitor C6 in the schematic diagram on page 12. Capacitor C6 charges (charging = filling the bucket with sand) through resistor R20 and discharges (dumping the sand) through resistor R19 and diode

D41. Each time the sand changes buckets, a pulse is sent to the Ring Counter and to the Sound Circuit. When the bucket is empty, the spring returns it to the filling position shown in Figure 3a. The sand going into the bucket will flow slower as the "Timer Glass" in Figure 2 runs out of sand. It will take longer and longer to fill the bucket as the sand runs out. This produces more space between the pulses sent to the ring counter and has the effect of slowing down the rotation of the lights, similar to the ivory ball slowing down on a roulette wheel.

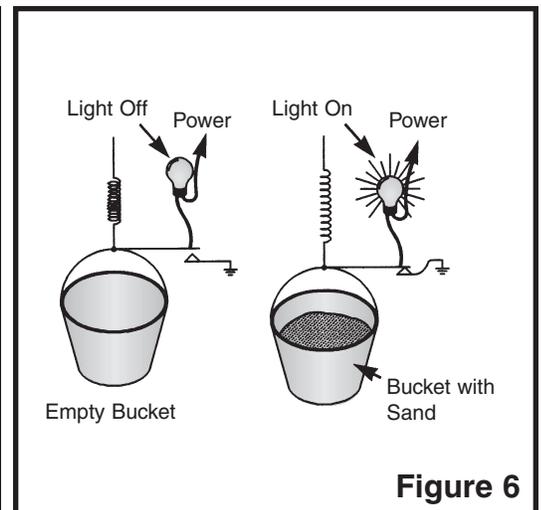
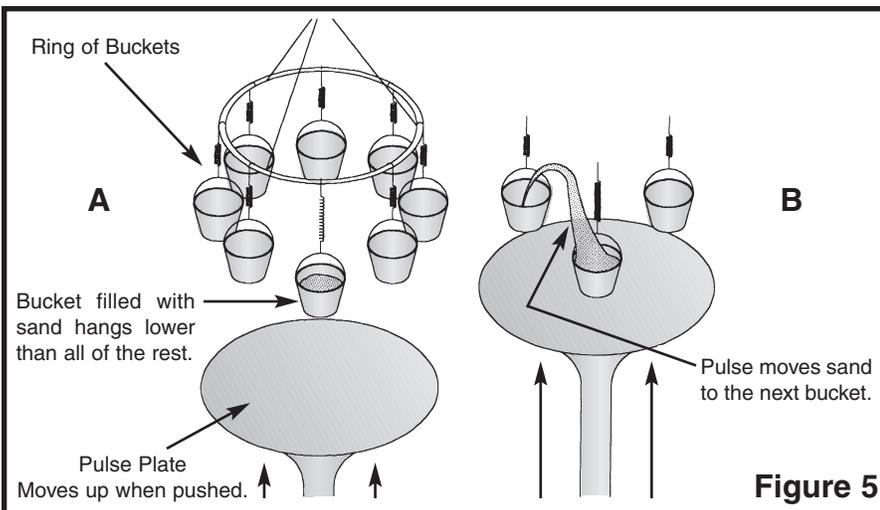
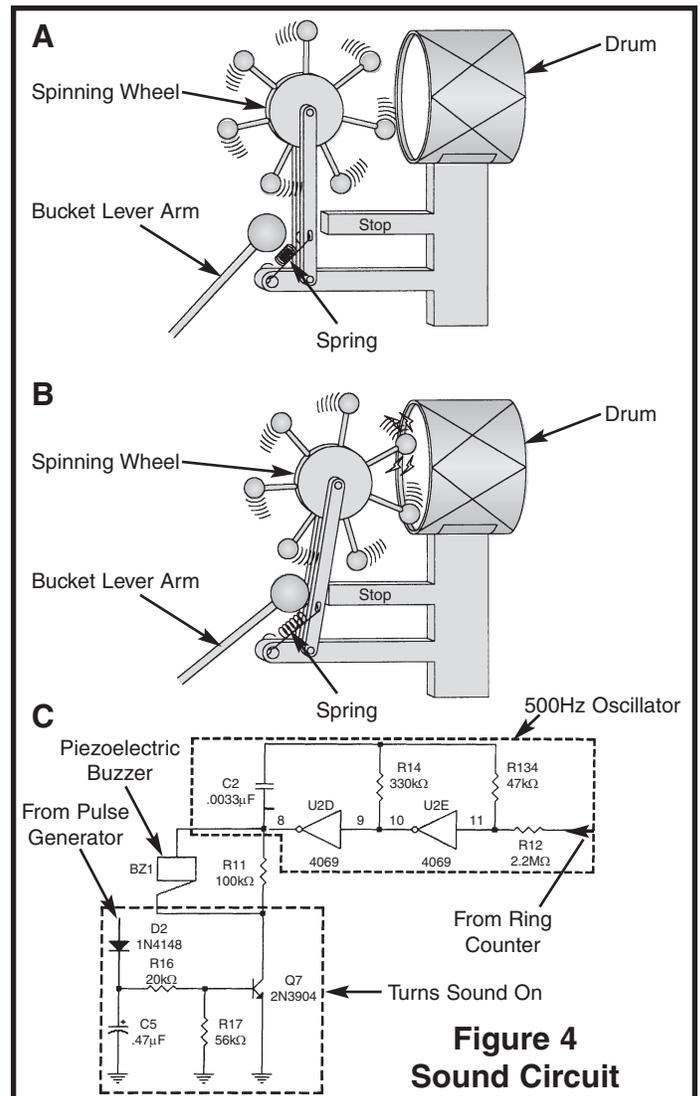


THE SOUND CIRCUIT

In the sound generator circuit, a 500Hz oscillator is always running. This oscillator is represented by the spinning wheel in Figure 4a. No sound is heard because the spinning wheel is not hitting the drum. When the bucket in Figure 3 dumps sand, the lever arm pushes the spinning wheel against the stop and the small balls on the spinning wheel hit the drum, producing a high frequency sound (Figure 4b). The lever arm turns the sound on and represents transistor Q7 in Figure 4c. When the lever arm is removed, the spring pulls the spinning wheel away from the drum and the sound stops. In much the same way, transistor Q7 turns off shortly after a pulse is received. This action stops electrical current from flowing through the piezoelectric buzzer (drum), eliminating the sound. Just before power down, transistor Q7 is turned on and kept on to produce the warning sound.

THE RING COUNTER

In it's simplest form, the ring counter can be compared to a circle of buckets with only one bucket filled with sand as shown in Figure 5a. Because of the weight of the sand, the filled bucket hangs lower than all of the rest. When a pulse is received from the pulse generator circuit, it pushes the sand to the next bucket as shown in Figure 5b. This process continues passing the sand from bucket to bucket in a circle, until no more pulses are received from the pulse generator.



THE LED's

The Light Emitting Diodes (LED's) are no more than small electronic lights. If they are arranged in a circle and connected to a ring counter, they can be used to represent the ivory ball position on the roulette wheel. When the buckets filled with sand stretch out the springs in Figure 5, they could also close a switch

as shown in Figure 6. This would light the next light in the circle and produce the effect of a ball spinning around the roulette wheel. As the pulses get further and further apart, the electronic ball will appear to slow down and eventually stop.

CONSTRUCTION

Introduction

The most important factor in assembling your AK-300 Electronic Roulette 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.

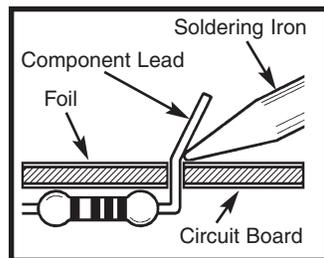
Use only rosin core solder of 63/37 alloy.

DO NOT USE ACID CORE SOLDER!

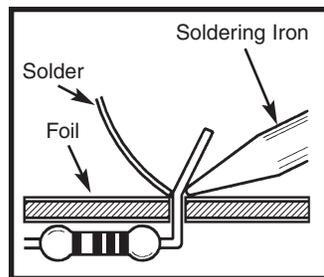
What Good Soldering Looks Like

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

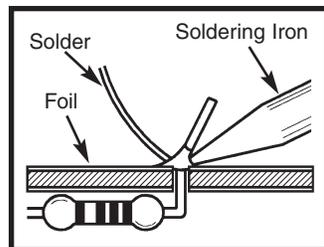
1. Solder all components from the copper foil side only. Push the soldering iron tip against both the lead and the circuit board foil.



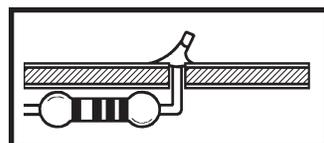
2. Apply a small amount of solder to the iron tip. This allows the heat to leave the iron and onto the foil. Immediately apply solder to the opposite side of the connection, away from the iron. Allow the heated component and the circuit foil to melt the solder.



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.

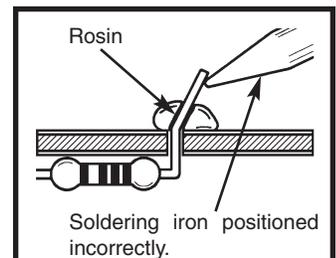


4. Here is what a good solder connection looks like.

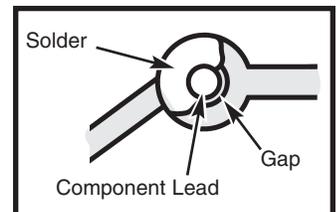


Types of Poor Soldering Connections

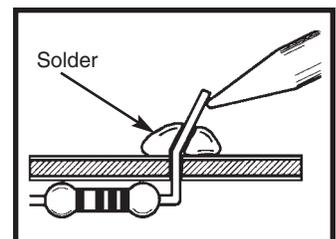
1. **Insufficient heat** - the solder will not flow onto the lead as shown.



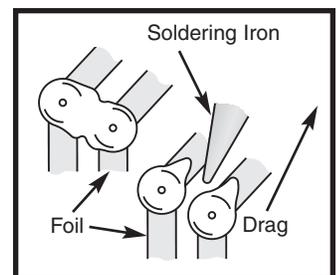
2. **Insufficient solder** - let the solder flow over the connection until it is covered. Use just enough solder to cover the connection.



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.

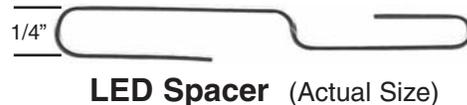


ASSEMBLE COMPONENTS TO THE PC BOARD

Identify and install the following parts as shown. After soldering each part, place a check in the box provided. Space the LED's with a paper clip (use size shown below) so that they are 1/4" off of the PC board.

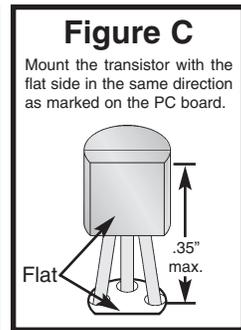
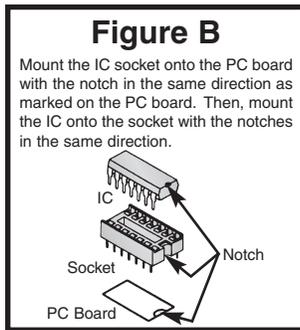
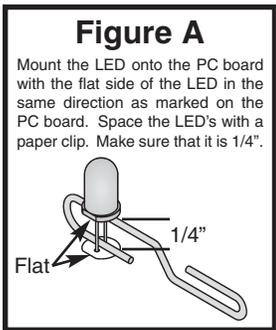
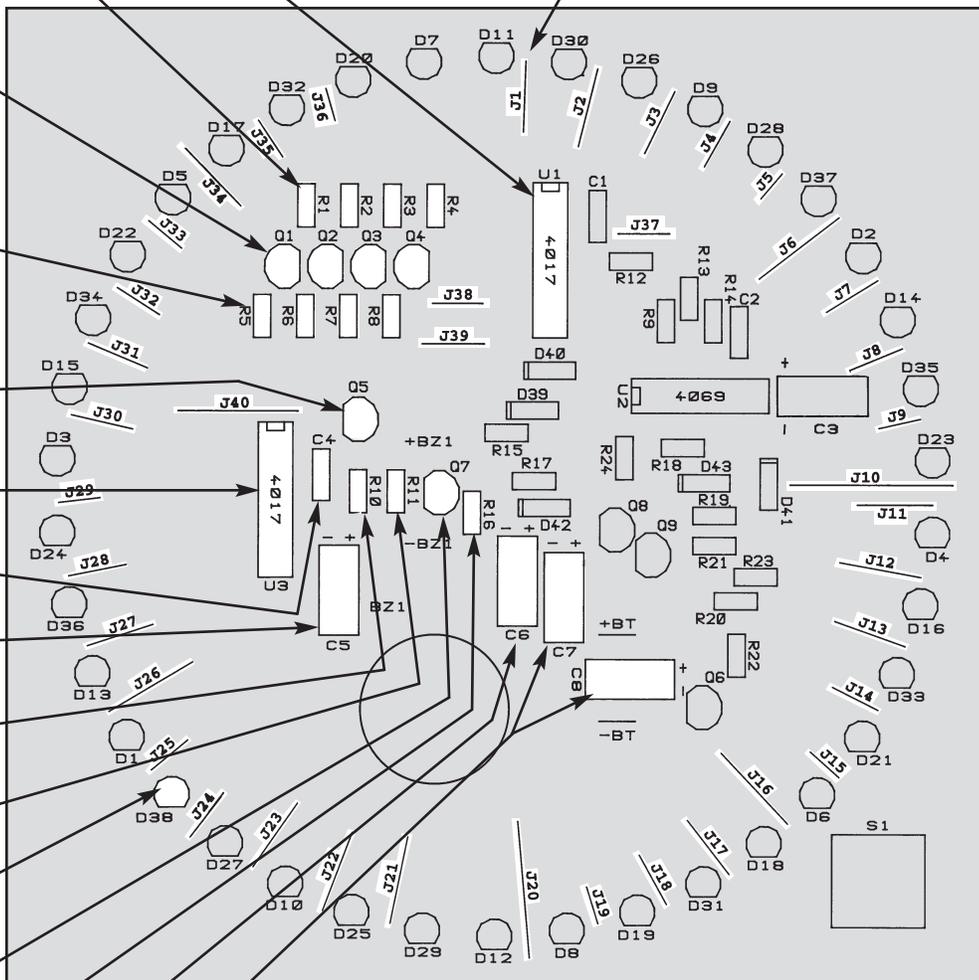
- U1 - 16-pin Socket
- U1 - 4017 Integrated Circuit (see Figure B)
- R1 - 1.2kΩ 5% 1/4W Resistor
- R2 - 1.2kΩ 5% 1/4W Resistor
- R3 - 1.2kΩ 5% 1/4W Resistor
- R4 - 1.2kΩ 5% 1/4W Resistor (brown-red-red-gold)
- Q1 - 2N3904 Transistor
- Q2 - 2N3904 Transistor
- Q3 - 2N3904 Transistor
- Q4 - 2N3904 Transistor (see Figure C)
- R5 - 10kΩ 5% 1/4W Resistor
- R6 - 10kΩ 5% 1/4W Resistor
- R7 - 10kΩ 5% 1/4W Resistor
- R8 - 10kΩ 5% 1/4W Resistor (brown-black-orange-gold)
- Q5 - 2N3906 Transistor (see Figure C)
- U3 - 16-pin Socket
- U3 - 4017 Integrated Circuit (see Figure B)
- C4 - .001μF (102) Capacitor
- C5 - .47μF Electrolytic (see Figure D)
- R10 - 820kΩ 5% 1/4W Resistor (gray-red-yellow-gold)
- R11 - 100kΩ 5% 1/4W Resistor (brown-black-yellow-gold)
- D38 - LED Green (see Figure A)
- Q7 - 2N3904 Transistor (see Figure C)
- R16 - 20kΩ 5% 1/4W Resistor (red-black-orange-gold)
- C6 - 1μF Electrolytic (see Figure D)
- C7 - 100μF Electrolytic
- C8 - 100μF Electrolytic (see Figure D)

Note: Install the jumper wires first.



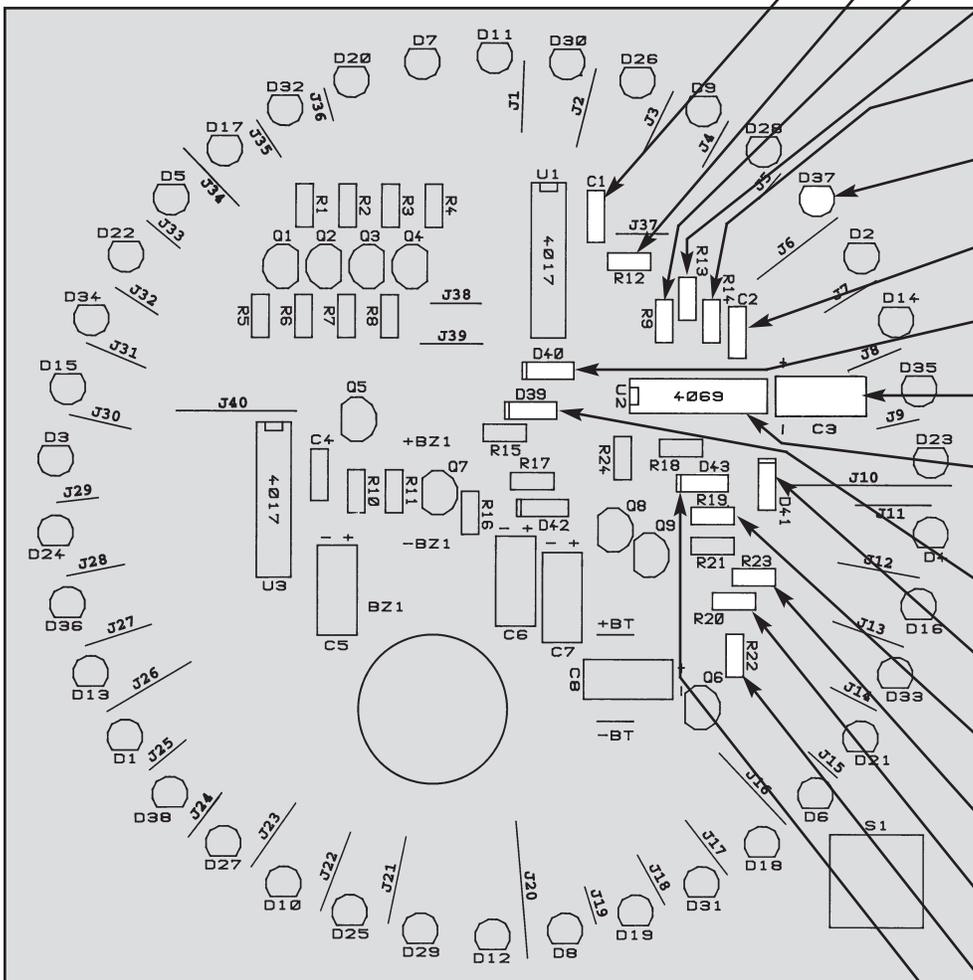
Install jumper wires J1 - J40 using bare wire.

- J1 - J40 - Jumper Wires (see Figure G)

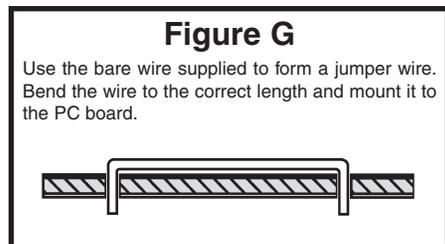
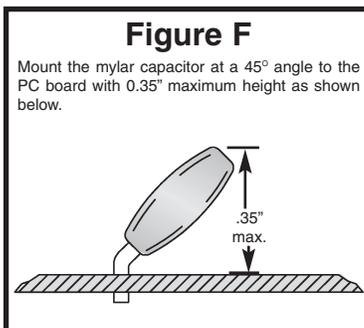
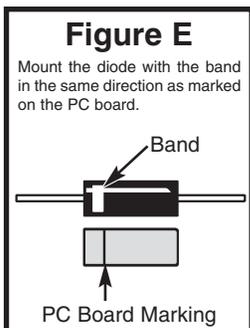
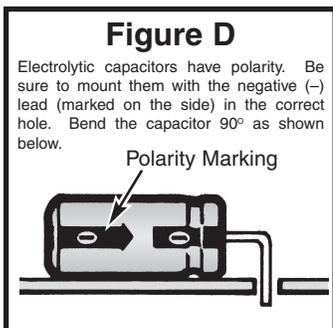


ASSEMBLE COMPONENTS TO THE PC BOARD

Identify and install the following parts as shown. After soldering each part, place a check in the box provided. Space the LED's with a paper clip (use size shown below) so that they are 1/4" off of the PC board.



- C1 - .02 μ F or .022 μ F (203 or 223) Discap
- R12 - 2.2M Ω 5% 1/4W Resistor (red-red-green-gold)
- R9 - 10k Ω 5% 1/4W Resistor (brown-black-orange-gold)
- R13 - 47k Ω 5% 1/4W Resistor (yellow-violet-orange-gold)
- R14 - 330k Ω 5% 1/4W Resistor (orange-orange-yellow-gold)
- D37 - LED Green (see Figure A)
- C2 - .0033 μ F (332) Mylar Cap. (see Figure F)
- D40 - 1N4148 Diode (see Figure E)
- C3 - 1 μ F Electrolytic (see Figure D)
- U2 - 14-pin Socket
- U2 - 4069 Integrated Circuit (see Figure B)
- D39 - 1N4148 Diode (see Figure E)
- D41 - 1N4001 Diode (see Figure E)
- R19 - 1.5k Ω 5% 1/4W Resistor (brown-green-red-gold)
- R23 - 1.8M Ω 5% 1/4W Resistor (brown-gray-green-gold)
- R20 - 100k Ω 5% 1/4W Resistor (brown-black-yellow-gold)
- R22 - 1k Ω 5% 1/4W Resistor (brown-black-red-gold)
- D43 - 1N4001 Diode (see Figure E)

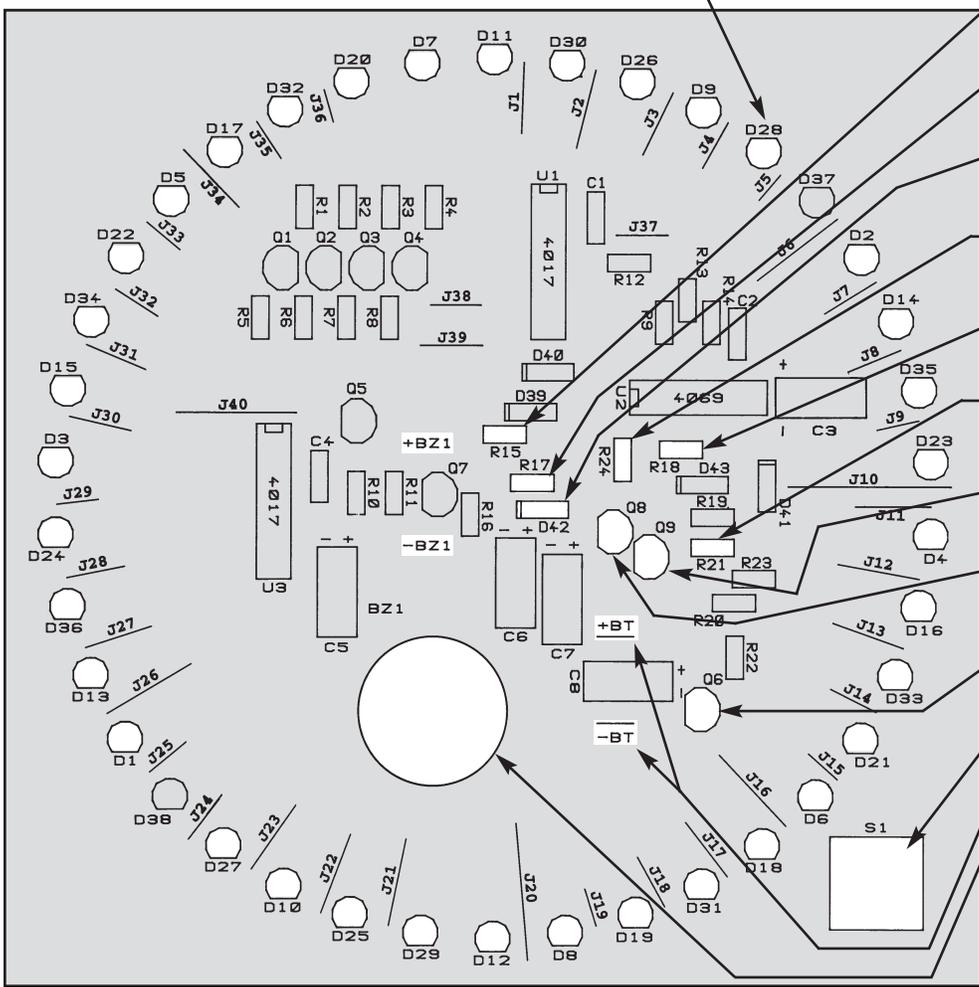


ASSEMBLE COMPONENTS TO THE PC BOARD

Identify and install the following parts as shown. After soldering each part, place a check in the box provided.



D1 – D36 - LED Red (be sure to note the flat side when installing). (see Figure A)



- R15 - 20kΩ 5% 1/4W Resistor (red-black-orange-gold)
- R17 - 56kΩ 5% 1/4W Resistor (green-blue-orange-gold)
- D42 - 1N4148 Diode (see Figure E)
- R24 - 270kΩ 5% 1/4W Resistor (red-violet-yellow-gold)
- R18 - 3.3MΩ 5% 1/4W Resistor (orange-orange-green-gold)
- R21 - 4.7MΩ 5% 1/4W Resistor (yellow-violet-green-gold)
- Q9 - 2N3904 Transistor (see Figure C)
- Q8 - 2N3904 Transistor (see Figure C)
- Q6 - 2N3906 Transistor (see Figure C)
- S1 - Switch
- BT - Battery Holder
- BZ1 - Buzzer
- 3 Screw 2-56 x 5/16"
- 3 Nut 2-56 Hex
- 3 Flat Washer White
- 4" Wire 22 ga. (see Figure H)

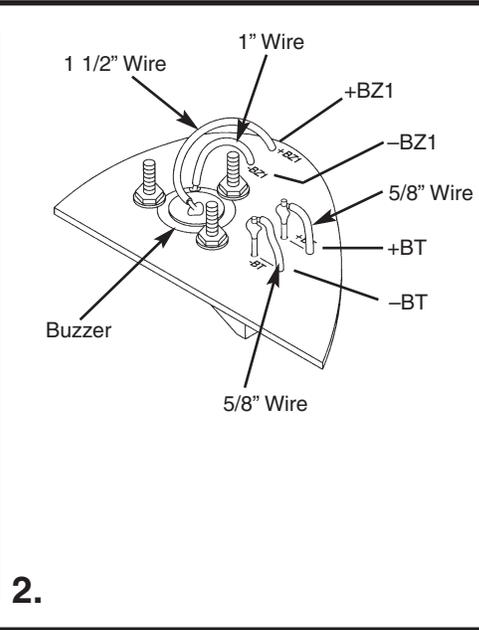
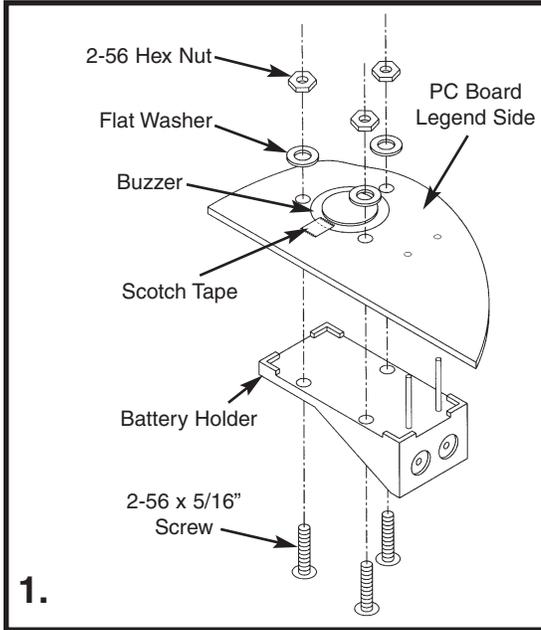


Figure H

Mount the battery holder and buzzer to the PC board as shown (1). **Note:** Use a piece of Scotch Tape on the brass part only to hold the buzzer in place. Solder a 5/8" wire from the positive (+) battery holder lead to the +BT point on the PC board (2). Solder a 5/8" wire from the negative (-) battery holder lead to the -BT point on the PC board. Solder a 1" wire from the outer edge of the buzzer to -BZ1. Solder a 1 1/2" wire from the inner circle of the buzzer to +BZ1. **Note:** Do not let the flat washers touch the solder from the wire from the outer edge touch the silver part.

COMPONENT CHECK

- Make sure that all components have been mounted in their correct places.
- Make sure that the LED's have been installed correctly. The flat side of the LED's should be in the same direction as shown on the top legend.
- Make sure that diodes D39 - D43 have not been installed backwards. The band on the diodes should be in the same direction as shown on the PC board.
- Make sure that transistors Q1 - Q9 are installed with their flat sides in the same direction as marked on the PC board.
- Are capacitors C5 - C8 installed correctly? These capacitors have polarity. Be sure that the negative lead is in the correct hole.
- Make 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.
- Put a 9V alkaline battery into the battery holder and push the switch.

TROUBLESHOOTING

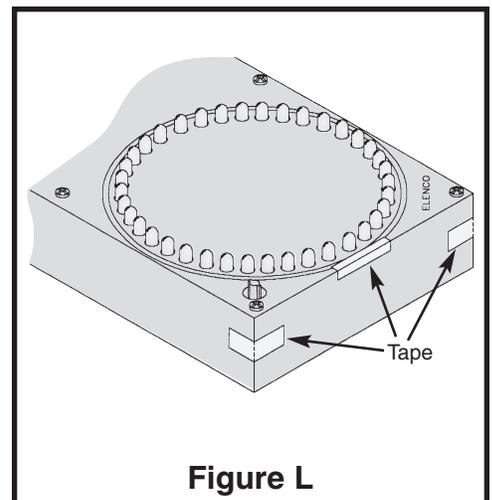
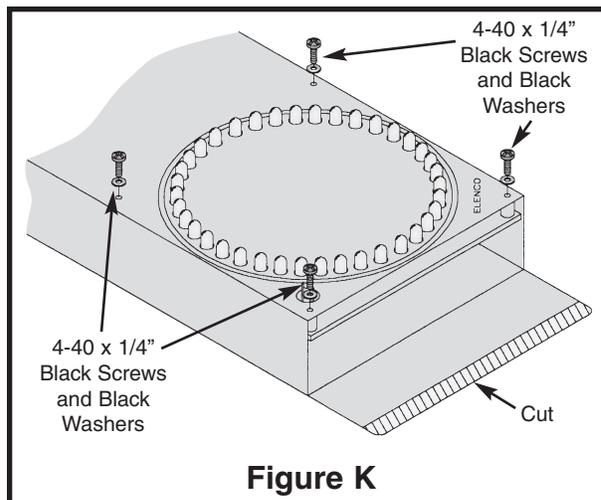
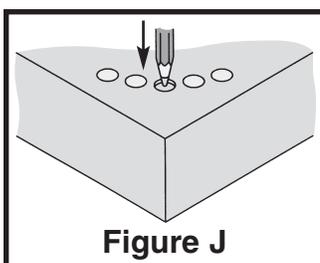
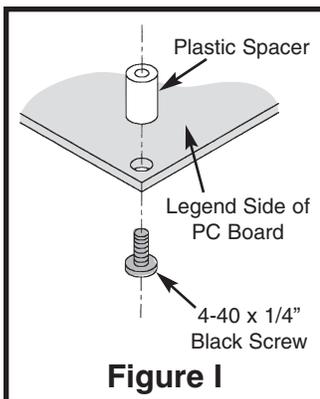
One of the most frequently occurring problems is poor solder connections.

1. Tug slightly on all parts to make sure that they are indeed soldered.
2. All solder connections should be shiny. Resolder any that are not.

3. Solder should flow into a smooth puddle rather than a round ball. Resolder any connection that has formed into a ball.
4. 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.

FINAL ASSEMBLY

- Mount the four plastic spacers onto the four corners of the PC board from the foil side with four 4-40 x 1/4" black screws (see Figure I).
- Punch out and save the chips from the box as shown in Figure J. Slide the PC board into the box
- and mount the PC board with four 4-40 x 1/4" screws and four black washers (see Figure K). Cut the strip off of the box as shown.
- Tape the box lid shut (see Figure L) and you're ready to go!



RULES FOR PLAYING ROULETTE

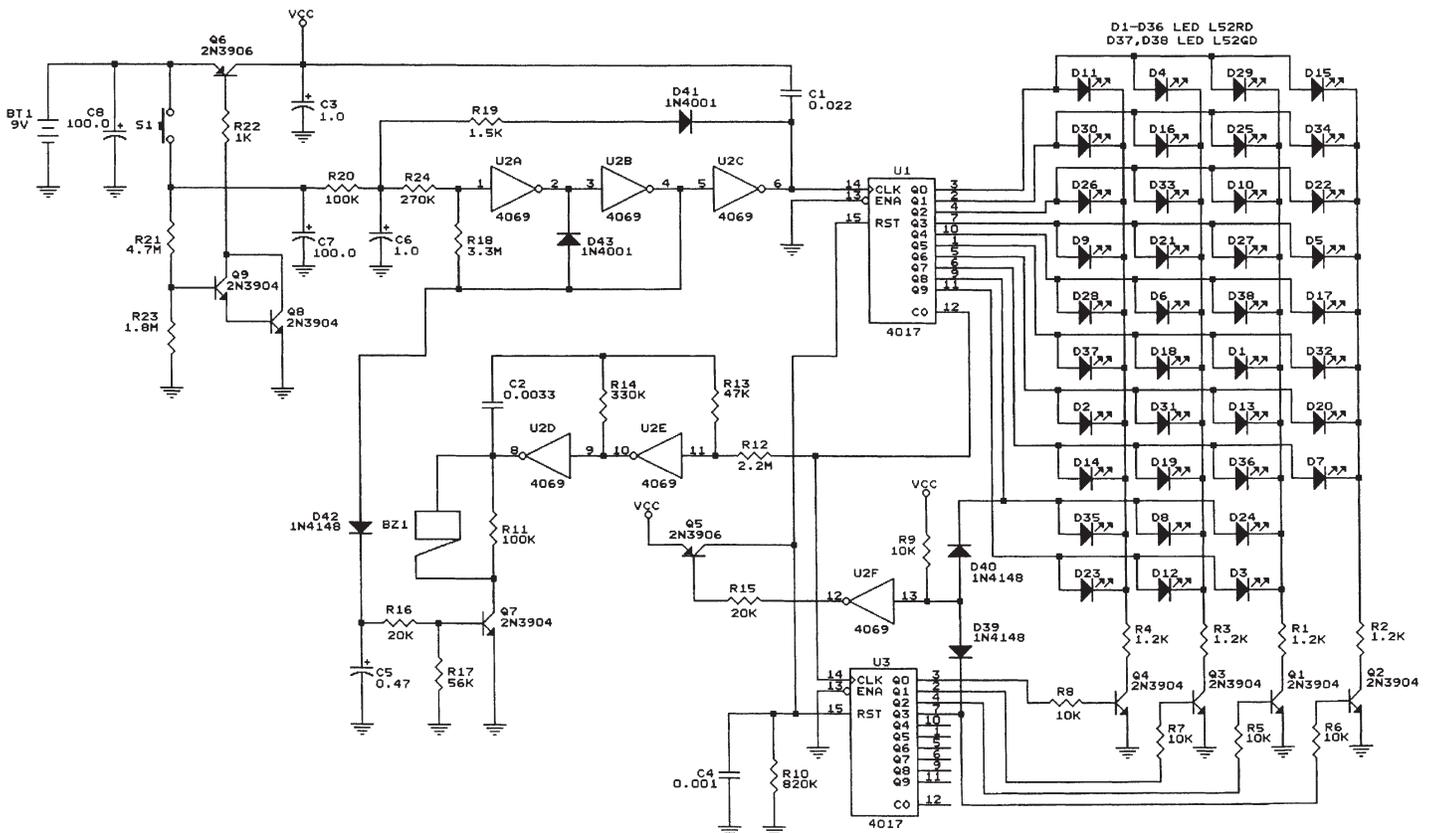
The object of the game is to increase the value of your chips more than any other player. Chips with gold centers are worth \$100.00, green centers = \$25.00, red centers = \$5.00, and white centers are worth \$1.00. Each player starts with 1 green, 2 red, and 5 white chips (\$40.00). All the rest of the unused chips belong to the house. Determine how long the roulette table will be open, one hour for example. One person must act as the Croupier (kroo-pya). The Croupier is the attendant who collects and pays the stakes using the houses money. Since there is no way to predict the outcome of each spin, the Croupier may also be a player. It is possible for a person to play roulette alone and try to beat the house by increasing his total chip value.

The very first action in roulette is to place your wager on the gaming table. The types of bets and their rates of return are listed in Chart A. The method for placing a wager is shown in Chart B. Placing wagers starts when the Croupier announces "Place your Wagers!". All wagers must be in place when the Croupier announces "No more wagers!".

After all wagers have been placed, the start button is pressed by the Croupier and the lit LED that represents the ivory ball races around the circle adding excitement and anticipation to the game. The number next to the lit LED, when the motion stops, is the winning number. All wagers are paid by the Croupier according to the rates of return listed in Chart A.

The game ends when the house runs out of chips or the predetermined time period expires. To prevent a person from doubling his wager until he wins, a maximum limit of \$100 should be placed on each wager. When a player loses all of their chips, they may borrow from other players at whatever interest rate that player demands. At no time may a player borrow more than \$40.00. Once a player owes \$40.00 and has lost all of their chips, they are bankrupt and can no longer place wagers. A bankrupt player may assume the position of Croupier and earn \$1.00 from the house for every 10 spins to remain in the game. A Croupier who is not bankrupt is paid no salary by the house.

SCHEMATIC DIAGRAM

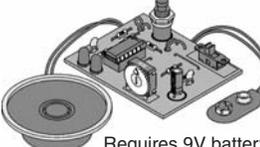
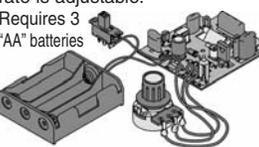
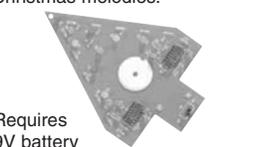
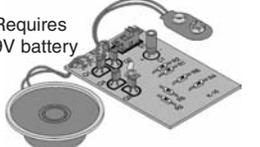
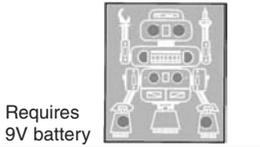
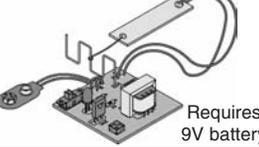
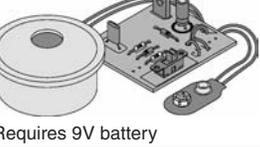
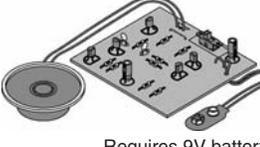
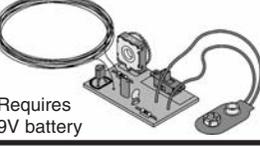
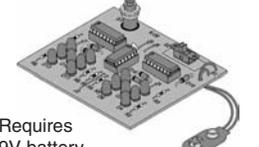
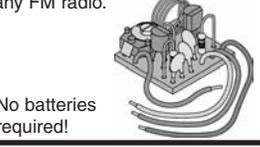
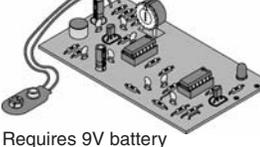
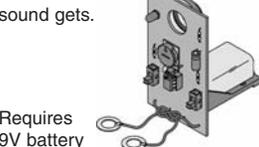
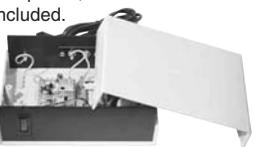
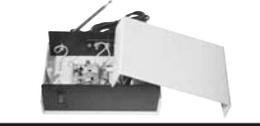
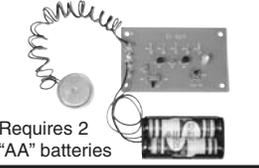


WORD GLOSSARY

Capacitor	An electrical component that can store electrical pressure (voltage) for periods of time.	Resistor	Component used to control the flow of electricity in a circuit. It is made of carbon.
Cold Solder Joint	Occurs because insufficient heat was applied or the connection was moved before the solder had set. Connection looks crystalline, crumbly, or dull.	Rosin Core Solder	The most common type of solder used in electronics generally referred to as 63/37 rosin core solder.
Flux	A substance that is used to cleanse the surface of oxide before it is soldered. Always used in electronics work. Most of the solder used in electronics has flux built right into it.	Solder	A tin/lead alloy that melts at a very low temperature, used to join other metals together. It produces excellent electrical connections.
Heat Sinking	A process of keeping the component from becoming overheated during soldering. Any metal object that can be clamped to the component lead will work as an effective heat sink. An alligator clip or pliers work well.	Solder Bridge	An unwanted solder connection between two points that are close together.
Integrated Circuit (IC)	A type of circuit in which transistors, diodes, resistors, and capacitors are all constructed on a semiconductor base.	Solder Melting Point	The temperature at which a tin/lead alloy (solder) melts. The common solder used in electronics (63% tin / 37% lead) has a melting point of 370°F.
Jumper Wire	A wire that is connected from one place to another on a PC board, thereby making a connection between two pads.	Solder Wick	Braided wire coated with flux to effectively remove solder from a connection.
LED	Common abbreviation for light emitting diode.	Soldering	The process of joining two or more metals by applying solder to them.
Light Emitting Diode	A diode made from gallium arsenide that has a turn-on energy so high that light is generated when current flows through it.	Tack Soldering	A connection where the lead or wire does not have any mechanical support.
Oxidation	Most metals, when exposed to air, form an oxide on their surface which prevents solder from adhering to the metal.	Tinning the Tip	A process of coating the soldering iron tip with solder to minimize the formation of oxide on the tip, which would reduce the amount of heat transfer.
Polarity	The division of two opposing forces or properties.	Transistor	An electronic device that uses a small amount of current to control a large amount of current.
Printed Circuit Board	A board used for mounting electrical components. Components are connected using metal traces "printed" on the board instead of wires.	Wire Gauge	Refers to the size of the wire. The bigger the number, the smaller the diameter of the wire. 18 gauge to 24 gauge is generally used for hook-up in electronics.

EDUCATION KITS

Complete with PC Board and Instruction Book

<p>Space War Gun K-10 Rapid fire or single shot with 2 flashing LED's.</p>  <p>Requires 9V battery</p>	<p>0-15V Power Supply K-11 A low-cost way to supply voltage to electronic games, etc. 0-15VDC @ 300mA.</p> 	<p>Strobe Light K-12A Produces a bright flash via xenon flash tube. The flashing rate is adjustable. Requires 3 "AA" batteries</p> 	<p>Christmas Tree K-14 Produces flashing colored LED's and three popular Christmas melodies.</p>  <p>Requires 9V battery</p>	<p>Electronic Cricket K-16 Your friends will go crazy trying to find it.</p>  <p>Requires 9V battery</p>
<p>LED Robot Blinker K-17 You'll have fun displaying the PC board robot. Learn about free-running oscillators.</p>  <p>Requires 9V battery</p>	<p>Digital Bird K-19 You probably have never heard a bird sing this way before.</p>  <p>Requires 9V battery</p>	<p>Nerve Tester K-20 Test your ability to remain calm. Indicates failure by a lit LED or mild shock.</p>  <p>Requires 9V battery</p>	<p>Yap Box K-22A This kit is a hit at parties. Makes 6 exciting sounds.</p>  <p>Requires 9V battery</p>	<p>Burglar Alarm K-23 Alarm for your car, house, room, or closet.</p>  <p>Requires 9V battery</p>
<p>Whooper Alarm K-24 Can be used as a sander or siren.</p>  <p>Requires 9V battery</p>	<p>Metal Detector K-26 Find new money and old treasure. Get started in this fascinating hobby.</p>  <p>Requires 9V battery</p>	<p>Pocket Dice K-28 To be used with any game of chance.</p>  <p>Requires 9V battery</p>	<p>FM Microphone AK-710/K-30 Learn about microphones, audio amplifiers, and RF oscillators. Range up to 100 feet. Requires 2 "AA" batteries</p>  <p>Training course incl.</p>	<p>Telephone Bug K-35 Our bug is only the size of a quarter, yet transmits both sides of a telephone conversation to any FM radio. No batteries required!</p> 
<p>Sound Activated Switch K-36 Clap and the light comes on . . . clap again and it goes off.</p>  <p>Requires 9V battery</p>	<p>Decision Maker K-43 Need help in making up your mind? The Decision Maker will do it for you.</p>  <p>Requires 9V battery</p>	<p>Lie Detector K-44 The sound will tell if you are lying. The more you lie, the louder the sound gets.</p>  <p>Requires 9V battery</p>	<p>Stereo Amplifier K-45 Boost your sound by 12 watts. Use on CD players, tuners, computers, etc. Attractive case included.</p> 	<p>Stereo Pre-amplifier K-46 Boost your speaker sound with this stereo pre-amp kit. Case included.</p> 
<p>Wireless A/V Sender K-47 Transmit audio/video signals over the air to a receiving TV. It's like having your own mini broadcasting station.</p> 	<p>Photo Sensor K-48 This photo sensor kit uses light to control the relay "on" or "off". Use on appliances up to 300 watts.</p>  <p>Requires 9V battery</p>	<p>Mosquito Repellent K-49 Keep those hungry little female mosquitoes away with this kit.</p>  <p>Requires 2 "AA" batteries</p>	<p>Touch Sensor K-50 Touch the sensor to control the relay "on" or "off". Use on appliances up to 300 watts.</p>  <p>Requires 9V battery</p>	<p>Motion Detector AK-510 Use as a sentry, message minder, burglar alarm, or a room detector.</p>  <p>Requires 9V battery</p>
<p>Strobe Light AK-520 Produces a bright flash via xenon flash tube. The flashing rate is adjustable. Case included.</p>  <p>Requires 4 "C" batteries</p>	<p>Two IC AM Radio AM-780K New design - easy-to-build, complete radio on a single PC board. Requires 9V battery.</p> 	<p>Transistor Tester DT-100K Test in-circuit transistors and diodes.</p>  <p>Requires 9V battery</p>	<p>Telephone Line Analyzer TWT-1K A telephone line analyzer kit that tests active phone lines with RJ-11 or RJ-45 modular jacks.</p> 	<p>Variable Power Supply XP-720K Three fully regulated supplies: 1.5-15V @ 1A, -1.5 to -15V @ 1A or (3-30V @ 1A) and 5V @ 3A.</p> 

QUIZ

1. In electronics, a capacitor is a . . .
 - A. - counter.
 - B. - generator.
 - C. - light emitting device.
 - D. - storage device.
2. The Timer Circuit is used to . . .
 - A. - turn power on.
 - B. - keep track of time.
 - C. - turn power off.
 - D. - make pulses.
3. The Ring Counter is triggered by . . .
 - A. - the pulse generator.
 - B. - the timer.
 - C. - LED's.
 - D. - the sound circuit.
4. LED means . . .
 - A. - light emitting device.
 - B. - light emitting diode.
 - C. - long electronic delay.
 - D. - light electric diode.
5. The probability of winning a wager placed on four numbers in electronic roulette is . . .
 - A. - 21%.
 - B. - 89%.
 - C. - 11.111111%.
 - D. - 10.5263%.
6. The house advantage for a four number wager in electronic roulette is . . .
 - A. - 5.26%.
 - B. - 11%.
 - C. - 89.5%.
 - D. - 21%.
7. In the sound circuit, the 500 hertz oscillator is . . .
 - A. - a warning.
 - B. - turned on by pulses.
 - C. - turned on by counter.
 - D. - always running.
8. The slowing down motion is due to . . .
 - A. - the ring counter.
 - B. - the timer.
 - C. - pulses being further apart.
 - D. - the probability changing.
9. The sound is turned on by . . .
 - A. - LED's.
 - B. - the pulse generator.
 - C. - the timer.
 - D. - the 500 hertz oscillator.
10. An analogy is . . .
 - A. - an electronic device.
 - B. - a similar system.
 - C. - a diagram.
 - D. - a drawing.

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Answers: 1. D; 2. C; 3. A; 4. B; 5. D; 6. A; 7. D; 8. C; 9. B; 10. B