

CENTURY'S STARBATTLE

OWNERS MANUAL

CENTURY CONSOLIDATED INDUSTRIES

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STARBATTLE ELECTRONIC PINBALL GAME

ELECTRONICS SAFETY PRECAUTIONS

There are many advantages to low voltage pinball, including substantially reduced maintenance, low power consumption, and added operator safety. However, due to the semiconductor circuits used in this design the following precautions should be observed:

1. A C line cord (3 prong) must be in a grounded outlet anytime the game is to be worked on. "Do Not" use cheater plug or static discharge damage may result to electronics.
2. Do not work on carpeting because of high static discharge possibility. If you must work on carpeting, be sure to ground yourself out before working on game (touch the front door to discharge any body static). Be sure plug is in 3 prong grounded outlet.
3. Keep all pens, pencils, and any metal related objects away from circuit board. If these warnings are not heeded, damage may occur to circuitry and thus void any further warranty.

ELECTRONIC CIRCUITS AND ADJUSTMENTS

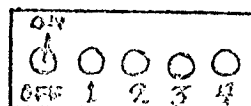
The following is an explanation of the electronic controls which run the game. They will be broken down into the following assemblies:

Logic P C Board
Sound Generation P C Board
Playfield Wiring
Power Supply

POWER SUPPLY

The Starbattle power supply delivers three voltages to the game logic +5V-DC, 10V-AC, and 28V-DC solenoid power. The supply also delivers 6.30 AC to all lamps not driven by the logic circuits. Four circuit breakers are provided to protect against over load conditions. See Figure #1

FIG 1



Breaker #1 is used for 10V-AC Winding
Breaker #2 is used for 6.3V to Playfield Lights.
Breaker #3 is used for 6.3V to Logic Board Power Supply
Breaker #4 is used for 28V Solenoid Power

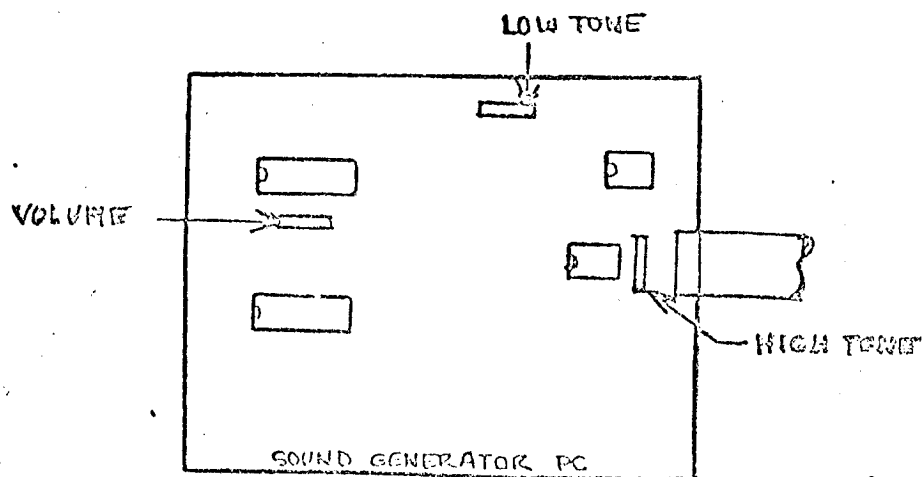
A "GE" MOV device is used across the AC line to prevent line spikes and static discharge from entering the power supply.

Two bridge rectifiers are used to convert 6.3V-AC and 28V-AC into DC voltages for use by the logic circuits. The bridge for the 10V-AC winding is located on the logic P C Board. A complete schematic of the Power Supply is included in this book. See drawing #15-0670.

SOUND GENERATION P C BOARD

A complete schematic #15-0657 is included in the back of the book. The sound generation board produces 6 sounds. Two of these sounds, the scoring chimes, may need adjusting from time to time for best tone quality. Two pots are located on the P C Board for this purpose. See figure #2. These two pots should be adjusted for the best tone quality. The third pot is the volume control which should be adjusted to fit the size of the room in which the games is located.

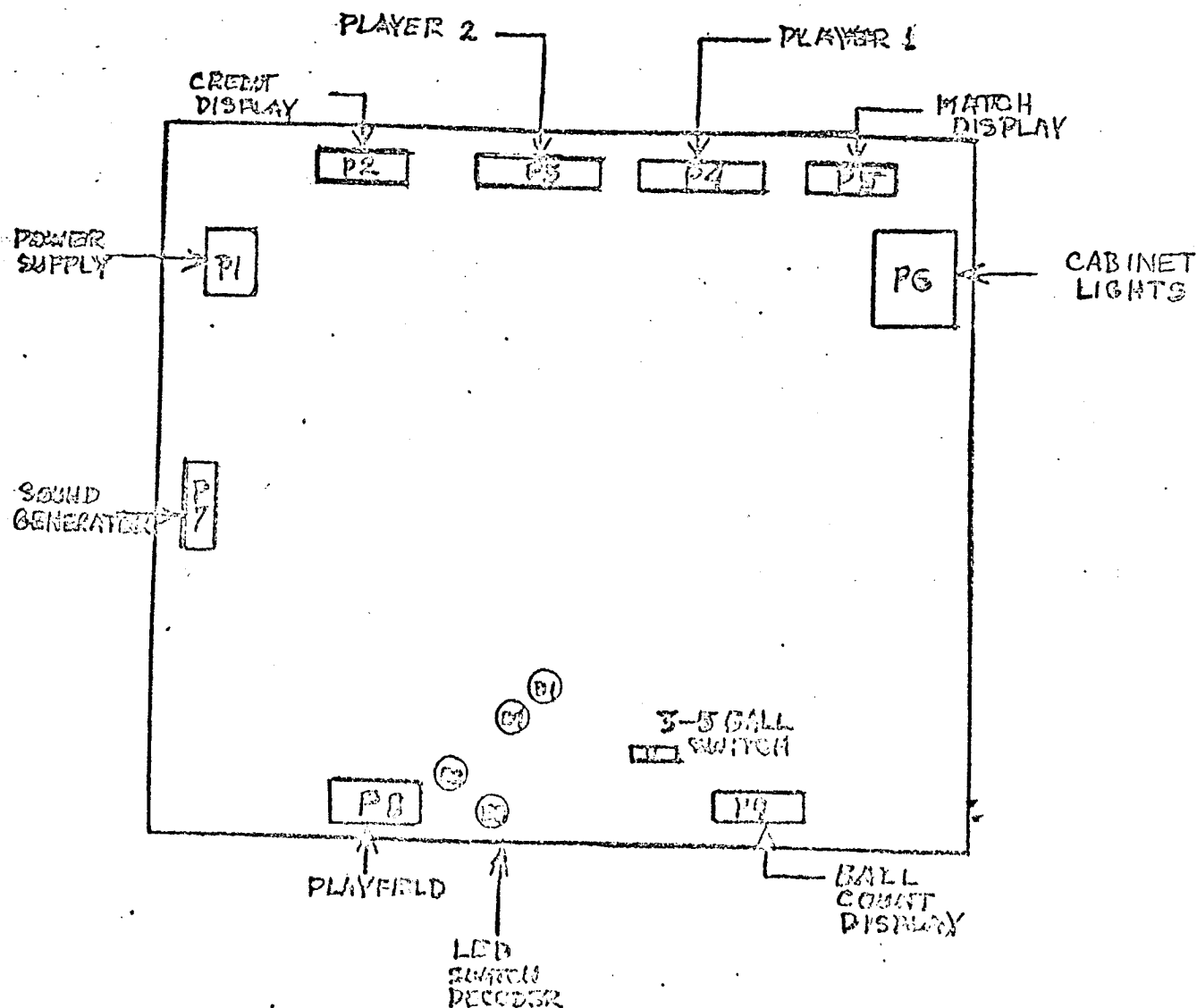
FIG 2



LOGIC PC BOARD

The logic board contains all the control circuits for the game. The TMS 1100 Microcomputer is the main logic element of the system. One switch is provided to change from 3 ball to 5 ball operation. To change ball count first turn power "off", change switch to new position, and turn power back "on". Four LED's are located on the bottom of the circuit board. All switches on the playfield except "Ball Return" and "Out Hole" are matrixed into a 4 Bit Binary code by the playfield decoder board. These four LED's represent the four input lines. When any contact is closed the proper code should appear on the LED's. If an LED remains on a contact list is provided which will show which contact is stuck closed. See figure # 3

FIG 3



CONTACT LIST

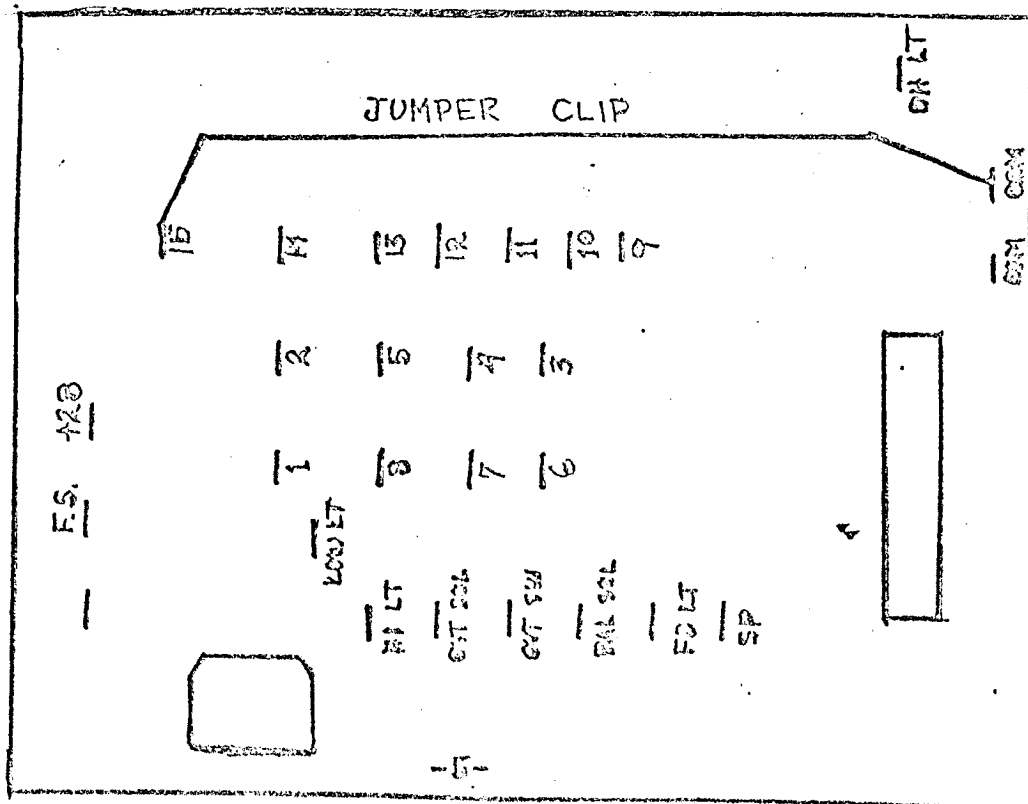
CONTACT	B1	B2	B4	B8
100	L	X	X	X
500	X	L	X	X
1000 Extra Ball	L	L	X	X
Outhole Switch				
500 + change (Target)	L	X	L	X
100 + change	X	L	L	X
LOW 1000 + Extra Ball				
Enable when lit	L	L	L	X
Score 100-1000 when lit				
Right	X	X	X	L
Score 100-1000 when lit				
Left	L	X	X	L
HIGH Score 1000 + cuthole				
Enable when lit	X	L	X	L
Tilt	L	L	X	L
Ball Ret.				
Start	L	X	L	L
Credit	X	L	L	L
Self test	L	L	L	L

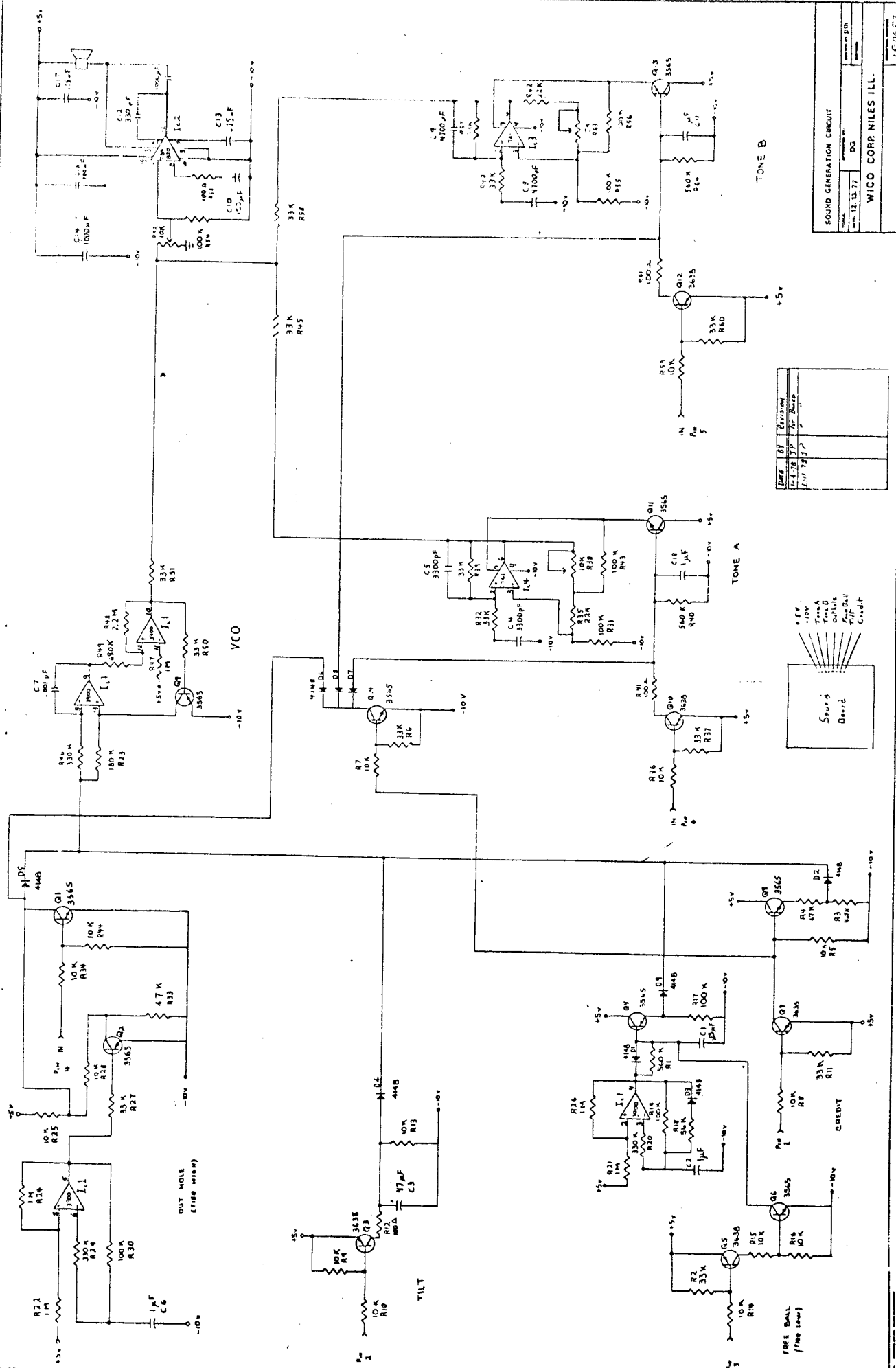
L - Lighted
X - Not Lighted

PLAYFIELD WIRING

All playfield score contacts have a common +5V-DC line. The slingshot kickers, Thumper Bumper, and flipper contact have a + 28V common line. Great care must be taken when adjusting contacts, so that the adjusting tool does not short between contacts of 5V and 28V. Damage to the logic will result. When adjusting 28V contacts or when working close to them the power should be turned "off". "Do Not" remove 3 prong plug from outlet as this will remove static protection. Always ground yourself to front door before working on playfield. All playfield switches are normally open except Out Hole, and Ball Return. These two switches must be closed and open only when ball is present. These two switches run back to the logic board on separate lines and will not show on LED's. If unit lights but will not see credit on start switch even though proper LED's are lighted check these two switches for good contact. To test playfield and score lights this unit is provided with a self test function. To enter self test turn game "On" hold both credit switch and start button in at the same time. Unit will flash all lamps except (Game Over), all displays will increment slowly so each digit can be checked (except credit display) which can be tested with credit switch. Sound generation will also test amp and speakers. To stop self test release buttons. If self test is desired for a long period of time a clip lead can be connected between the common pin and B 15 lug on playfield decoder board. See figure # 4. Turn unit on after clip is in place.

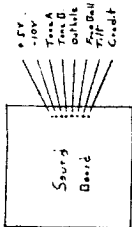
FIG
4.



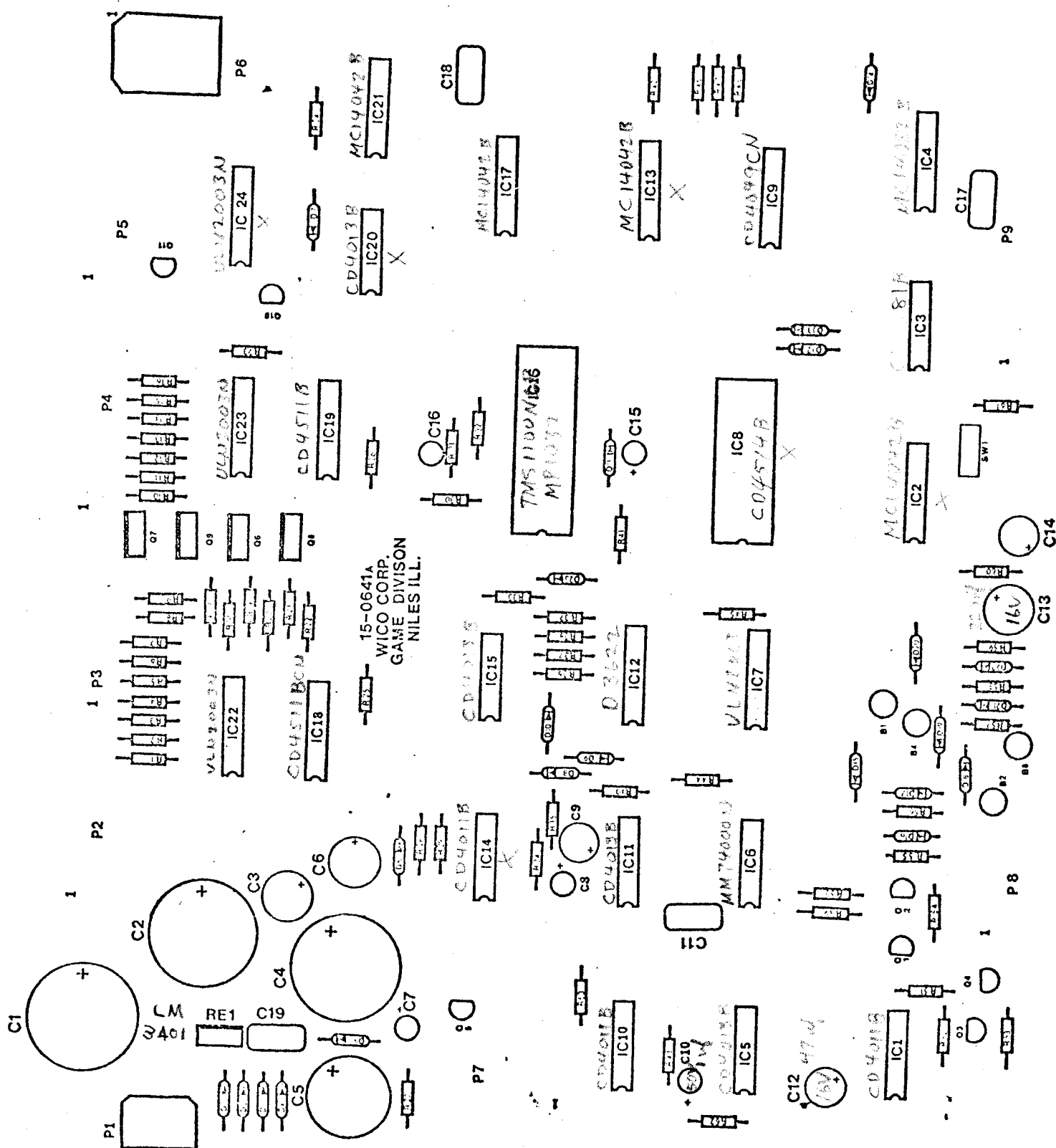


SOUND GENERATION CIRCUIT
 WICO CORP NILES ILL.
 1/7-6657

DATE	BY	REVISION
1-1-66	J.P.	1st
1-1-66	J.P.	2nd
1-1-66	J.P.	3rd



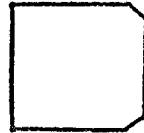
FREE BALL
 (1000 LOW)



LF RF +28

WICO CORP
PLAYFIELD DECODE
#15-0642A

P1



LOW LT LTRT INSD OUT
B1 B2 LN
ROBIE SW SLNG SHOT

HI LT RT INLANE TARGET
B8 B5
SW

OUT SOL

B7 BL LN TAG
B4

OUT SW

CH SW RD LN TAG
B6 B3

BAL SOL

FB LT

SP

B15

B14

B13

B12

B11

OUTSD
B10
OUTLN

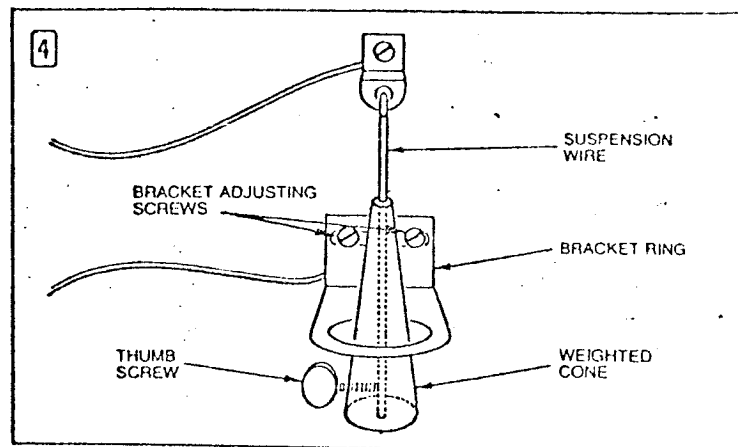
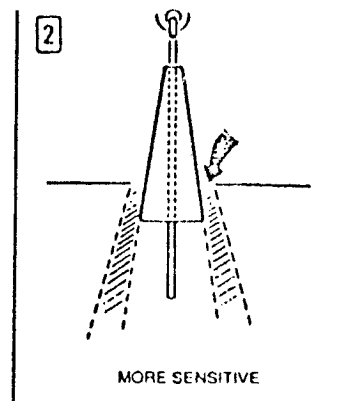
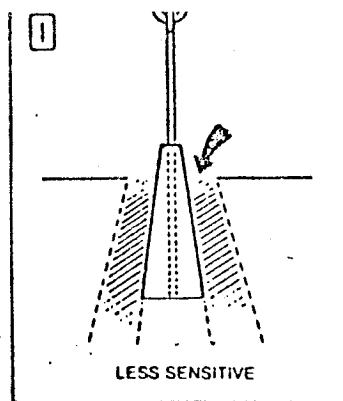
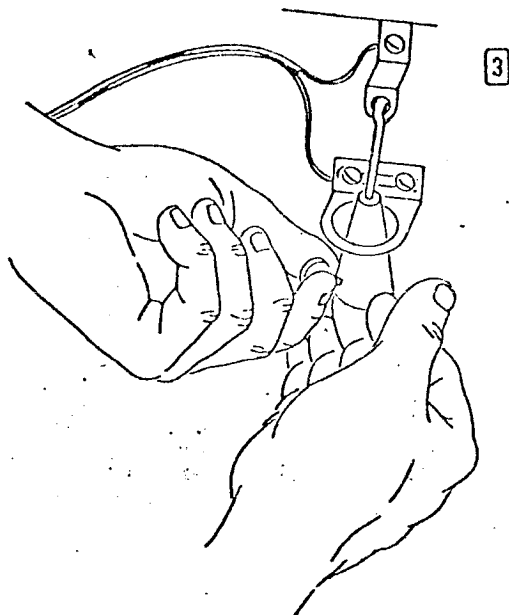
LT IN
B9
SW

OH LT

COM COM

The Tilt mechanism is located inside the playfield cabinet. The weighted cone can be moved up and down on the suspension wire. The higher the cone, the more sensitive the tilt. The lower the cone, the less sensitive the tilt. See illustrations 1 and 2 at right.

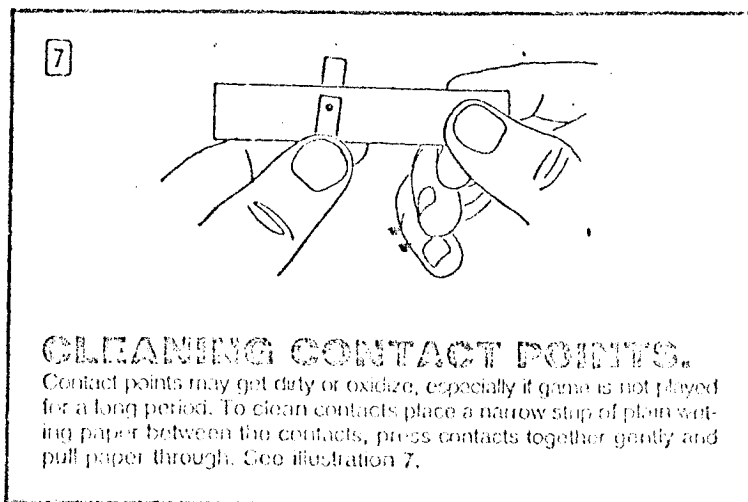
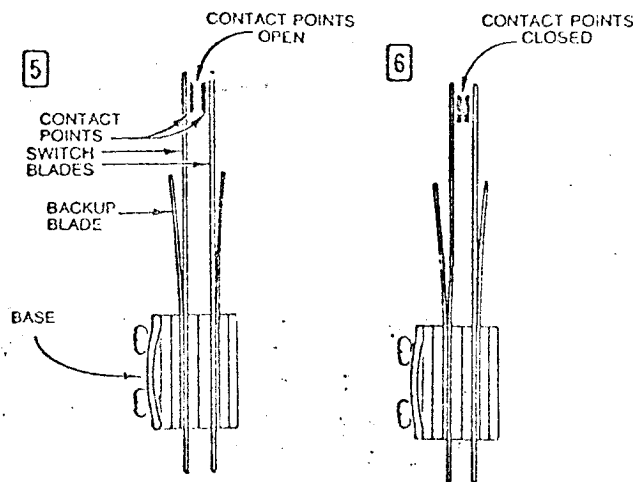
To adjust tilt, loosen thumb screw on cone. Slide cone up or down on suspension wire to desired level. Tighten thumb screw. If cone is not hanging in center of bracket ring, loosen 2 bracket screws and slide bracket side to side until cone is centered. Tighten bracket screws. See illustrations 3 and 4 below.



SWITCH ADJUSTMENTS

The scoring and action of this game is controlled by switches which open and close as the ball hits and rolls over various points on the playfield. These switches will need minor adjustments from time to time. Switch adjustment is not complicated when you understand their operation and read the instructions in this manual carefully.

A switch is simply two contact points on blades of spring steel. When the contact points touch electricity passes thru activating the sounds and scoring. When there is a space between the contacts, no electricity passes. See illustrations 5 and 6 at right.



CLEANING CONTACT POINTS.

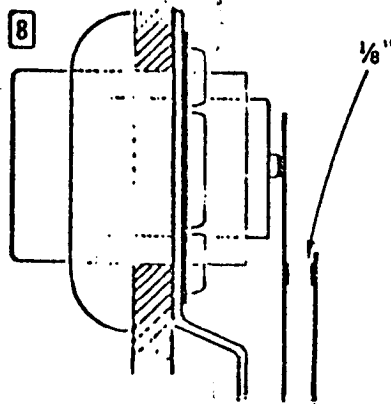
Contact points may get dirty or oxidize, especially if game is not played for a long period. To clean contacts place a narrow strip of plain wetting paper between the contacts, press contacts together gently and pull paper through. See illustration 7.

ADJUSTMENT

Three Button Switches are located in the playfield cabinet. Buttons on the cabinet sides control the flippers. Button on the front panel controls the Game Start.

All 3 Button Switches are adjusted in the same way:

- Inside blade should rest against the plastic button.
- There should be a gap of about $\frac{1}{8}$ -inch (thickness of two nickels) between the two contact points.
- After making necessary adjustments, check by depressing button—contact points should touch. Release button—contact points should be separated.
- See illustration 8.

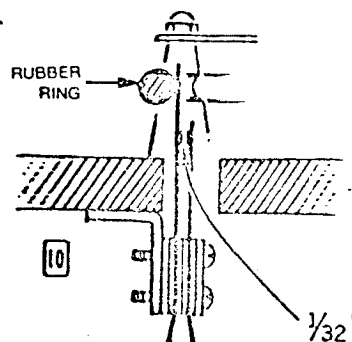
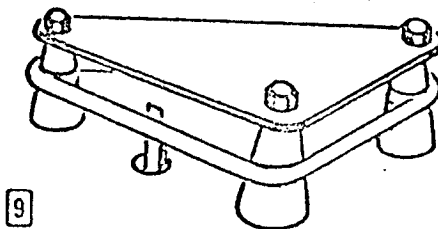


STAND-UP SWITCH ADJUSTMENT.

These switches can be seen from the top side of the playfield, behind rubber rings. Switches beside slingshot kicker activate slingshots. Other switches advance score.

Stand-up switches are adjusted on the underside of the playfield as follows:

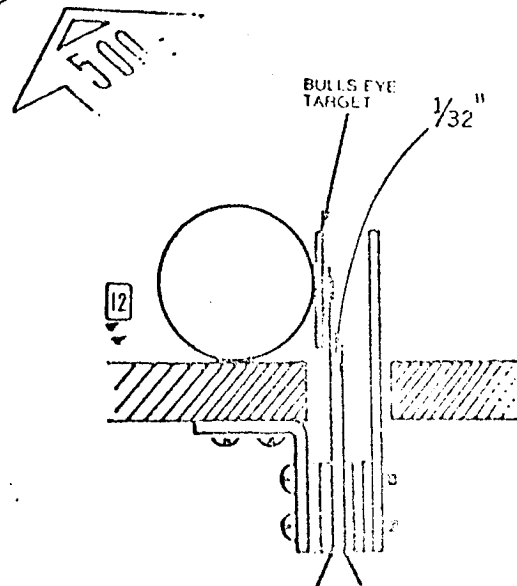
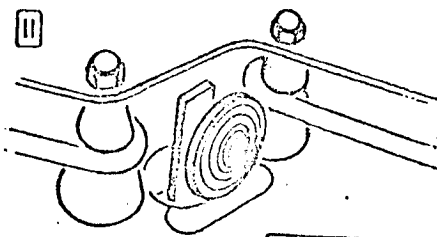
- Outside blade should be just touching the rubber ring.
- There should be a gap of about $\frac{1}{32}$ -inch (thickness of a dime) between the two contact points.
- If contact points cannot be seen clearly, remove the plastic cover by unscrewing the cap nuts.
- See illustrations 9 and 10.



BULLS EYE TARGET SWITCH ADJUSTMENT.

Bulls Eye Target switches are adjusted on the underside of the playfield as follows:

- Blade on which the Bulls Eye is attached needs no adjustment.
- There should be a gap of about $\frac{1}{32}$ -inch (thickness of a dime) between the two contact points.
- See illustrations 11 and 12.

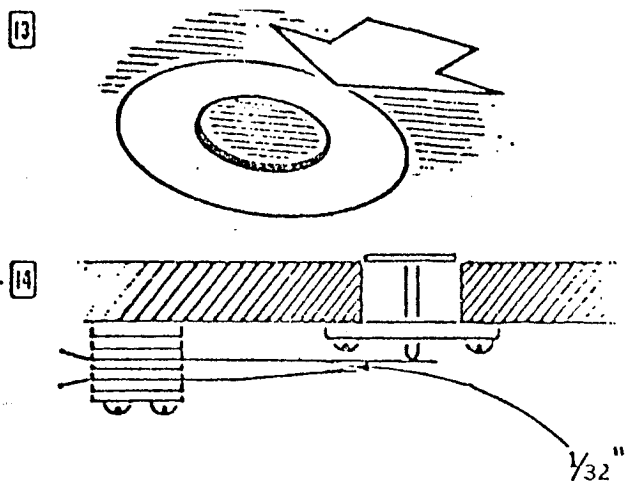


BUTTON ROLL-OVER SWITCH ADJUSTMENT

Two Button Roll-over Switches are located in the center of the playfield near the top and at mid-field.

Button Roll-over Switches are adjusted on the underside of the playfield as follows:

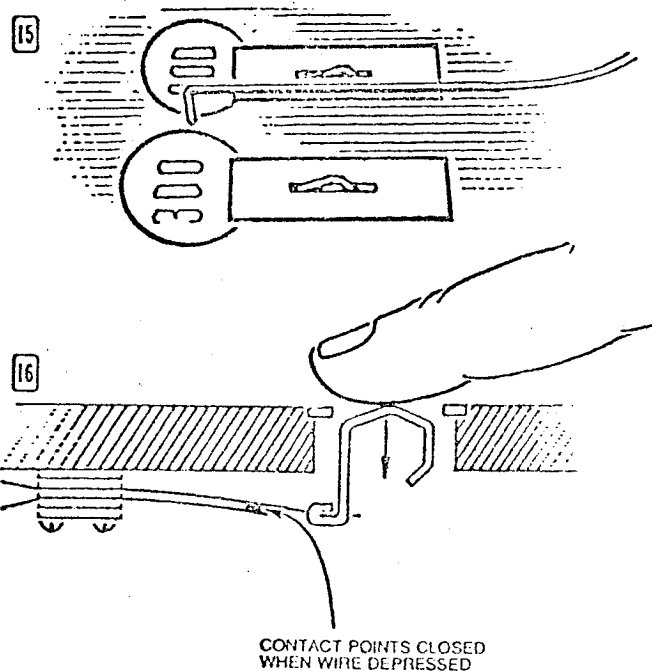
- Long blade should be just touching the plastic tip.
- Gap between contact points should be about $\frac{1}{32}$ -inch (thickness of a dime).
- After making necessary adjustments, check by lightly pressing the plastic button from the top side of the playfield. When depressed, contact points should touch. When released, contact points should be separated.
- See illustrations 13 and 14.



LANE ROLL-OVER SWITCH ADJUSTMENT

Lane Roll-over Switches are adjusted on the underside of the playfield as follows:

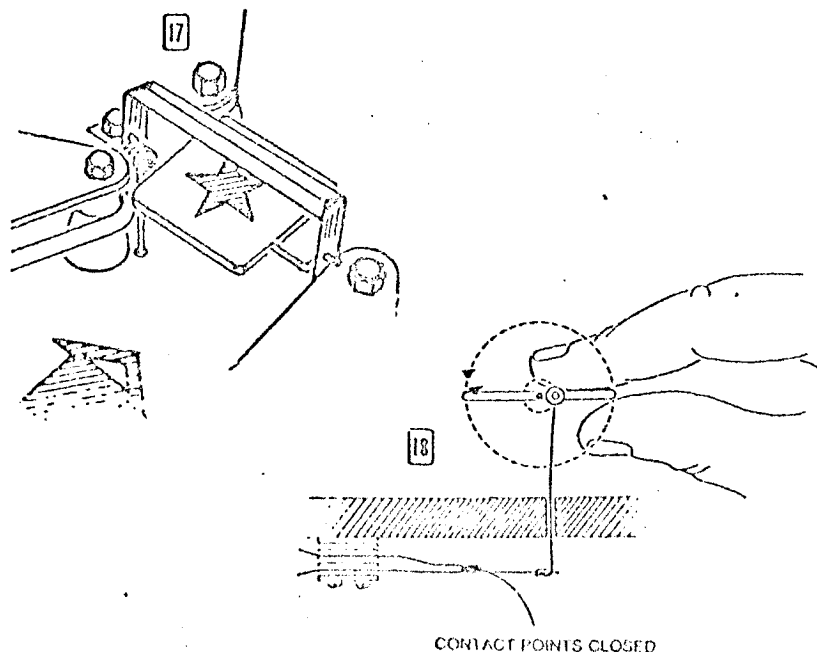
- Depress wire from top side of playfield so top of wire arch is flush with playfield surface. Contact points should be touching. If they do not touch, adjust short switch blade.
- Release wire. There should be a gap between the contact points. The amount of space between the contact points is not important.
- Do not adjust the long switch blade.
- See illustrations 15 and 16.



SPINNER TARGET SWITCH ADJUSTMENT.

Spinner Target Switch is adjusted on the underside of the playfield as follows:

- Turn Spinner Target from top side of playfield so face of target is horizontal to playfield surface. In this position the contact points should be touching. If they do not touch, adjust short switch blade.
- Release Spinner Target. There should now be a gap between the contact points.
- Do not adjust the long switch blade.
- See illustrations 17 and 18.

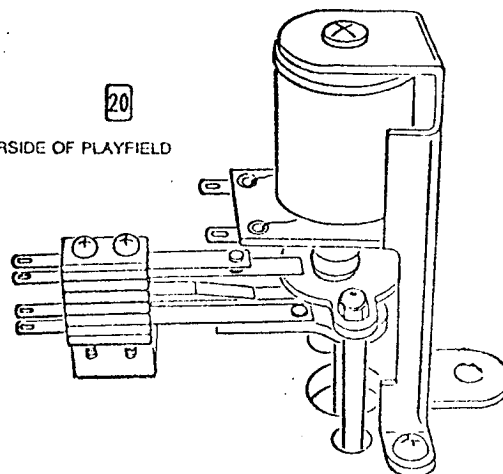
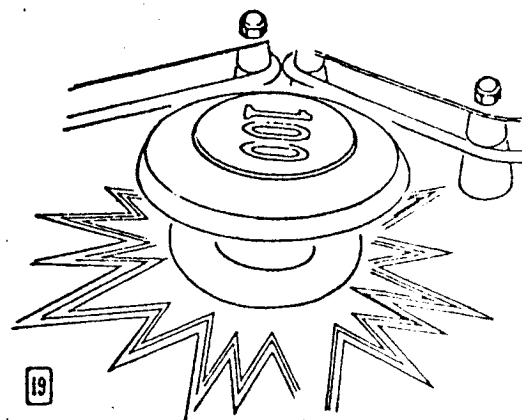


THUMPER-BUMPER SWITCH ADJUSTMENT.

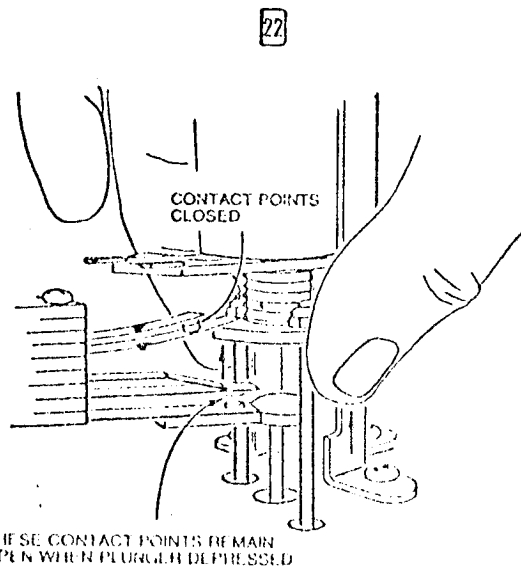
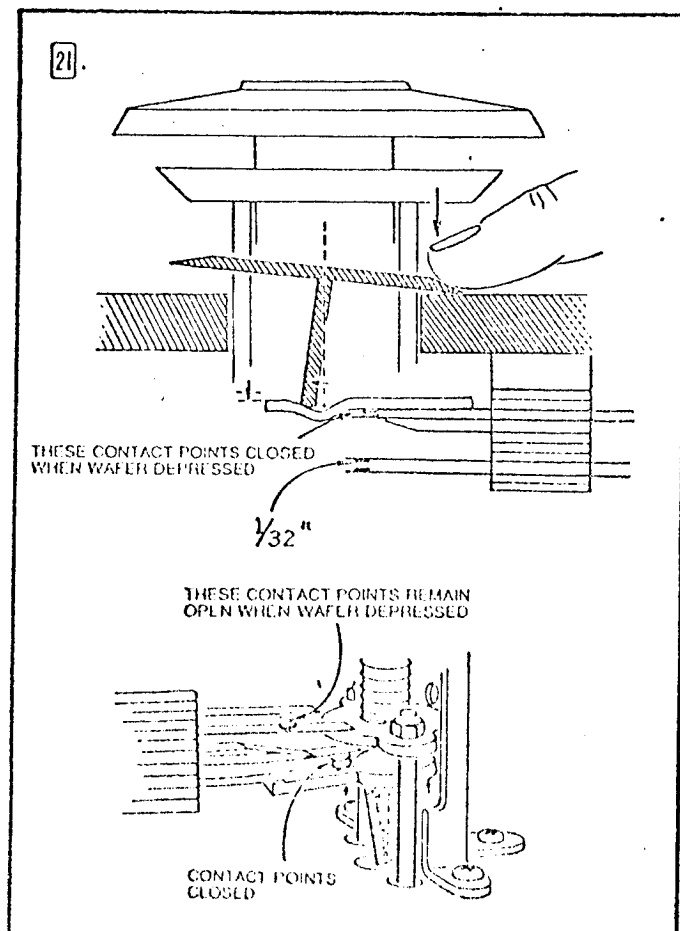
Thumper Bumper switches are adjusted on the underside of the playfield. There are two switches, one mounted on top of the other. They are adjusted as follows:

- (a) First look at the switch closest to the underside of the playfield surface. There should be a gap between the contact points of about 1/32-inch (thickness of a dime).
- (b) Adjust only the short blade. Do not adjust the long blade.
- (c) After making necessary adjustment, check by depressing the red plastic wafer from the top side of the playfield. Hold with one finger so that the edge of the wafer touches the playfield surface at one point. The entire wafer should not be depressed. In this position the contact points should be touching. Release wafer—contact points should now be separated.
- (d) Now look at the switch furthest away from the playfield surface. There should be a gap between the contact points of about 1/32-inch (thickness of a dime).
- (e) Adjust only the short blade. Do not adjust the long blade.
- (f) After making necessary adjustment, check by pulling the two steel rods toward the coil. Contact points should be touching. Release rods—contact points should now be separated.
- (g) See illustrations 19 thru 22.

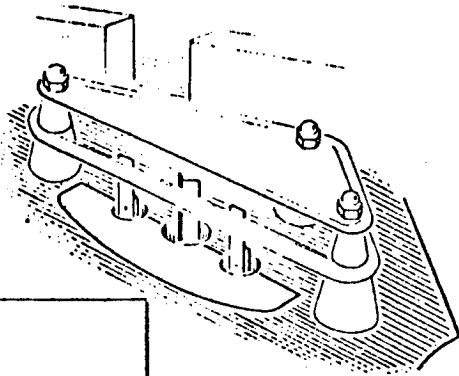
**NOTE: ONLY ADJUST THESE
CONTACTS WITH POWER OFF**



UNDERSIDE OF PLAYFIELD



23

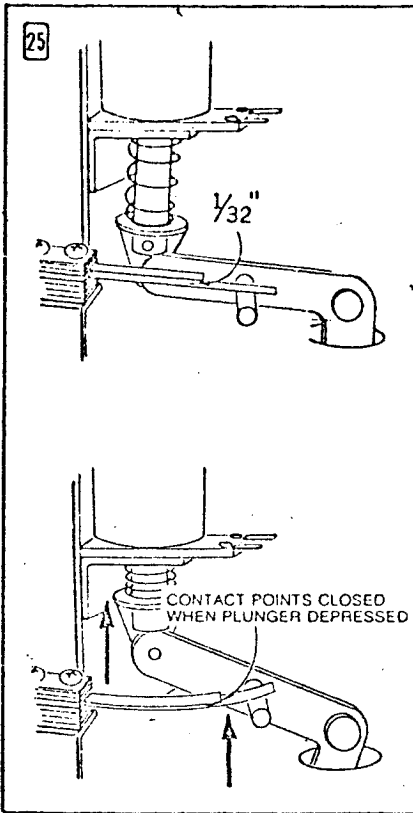


SLINGSHOT KICKER SCORE SWITCH ADJUSTMENT.

Slingshot Kicker score switches are adjusted on the underside of the playfield as follows:

- Turn power off.
- There should be a gap of about $\frac{1}{32}$ -inch (thickness of a dime) between the contact points.
- Adjust short blade only. Do not adjust long blade.
- After making necessary adjustment, check by pulling back on vertical steel shaft. Contact points should be touching. Release—contact points should now be separated.
- See illustrations 23 thru 25.

25



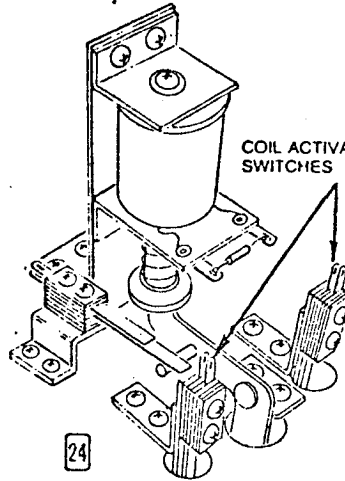
COIL ACTIVATING SWITCHES

FLIPPER COIL SWITCH ADJUSTMENT.

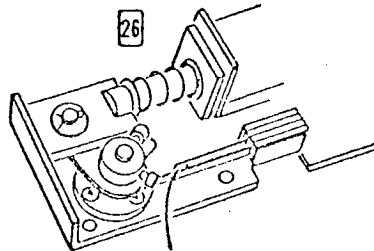
Flipper Coil switches are adjusted on the underside of playfield as follows:

- Turn power off.
- In rest position contact points should be touching.
- Depress steel plunger rod into coil. Contact points should separate near end of stroke.
- Adjust long blade.
- See illustrations 26 and 27.

24



26



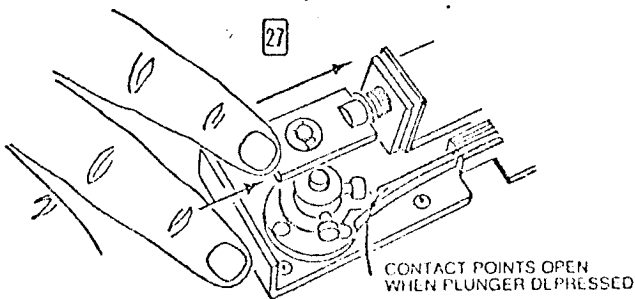
CONTACT POINTS CLOSED IN REST POSITION

BALL RETURN AND OUTHOLE SWITCH ADJUSTMENT.

The Ball Return switch is located at the bottom of the playfield. The Outhole Switch is located at mid-field. Both switches are adjusted on the underside of the playfield as follows:

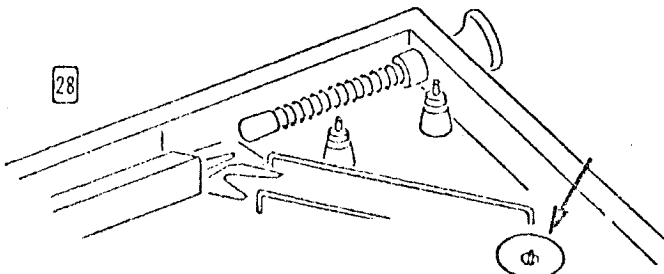
- Short blade should touch the under surface of playfield.
- There should be a gap of about $\frac{1}{32}$ -inch (thickness of a dime) between the contact points when ball is on switch.
- After making necessary adjustment, check by holding steel ball in the ball return depression on the top side of the playfield. Contact points should open. Remove ball—contact points should now be connected.
- See illustrations 28 and 29.

27

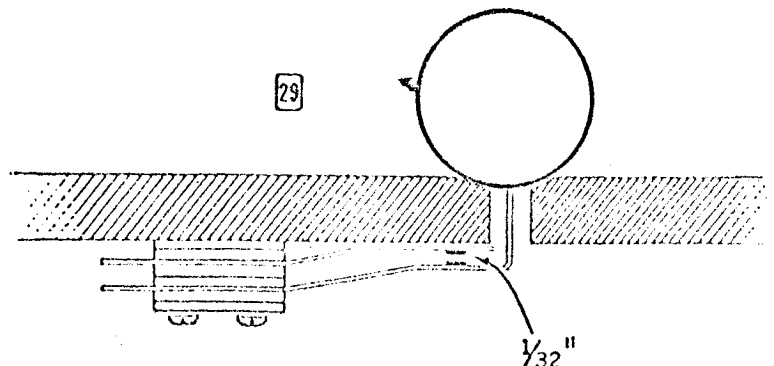


CONTACT POINTS OPEN WHEN PLUNGER DEPRESSED

28



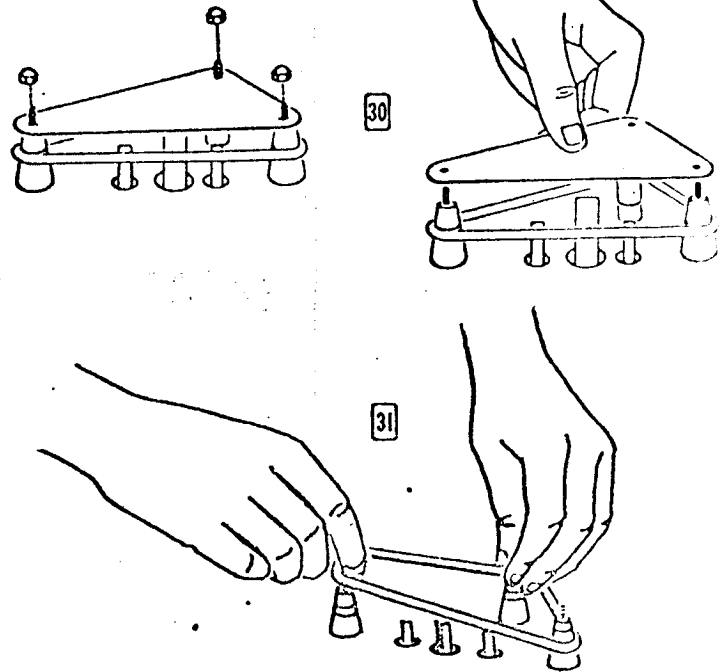
29



RUBBER RING REPLACEMENT

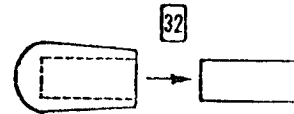
Rubber Rings do not need to be replaced often. Even with heavy play you will probably not have to replace rings more than once a year. Dirty rubber rings can be wiped clean with a soft, lint-free cloth dampened slightly with any mild, non-abrasive detergent.

To replace rubber rings unscrew the cap nuts that hold plastic covers in place. Lift off plastic cover. Slip rubber ring off support posts. See illustrations 30 thru 31. Place new rubber ring on support posts, making sure ring is seated in the holding grooves on each post. Replace plastic cover. Fasten with cap nuts.



RUBBER TIP REPLACEMENT

This tip will require replacement more frequently than the rubber rings. See illustration 32.



FLIPPER RUBBER REPLACEMENT

Large Rubber Rings encircle each flipper located near the bottom of the playfield. See illustration 33.

Flipper Rubber need not be replaced often. The ball hits only one side of the flipper bar. When rubber shows wear, we recommend rotating the rubber ring so that unused back side faces front. When full ring needs replacement, simply pull rubber ring upward from flipper bar. New rubber ring is then placed on bar from the top. See illustrations 33 and 34.

