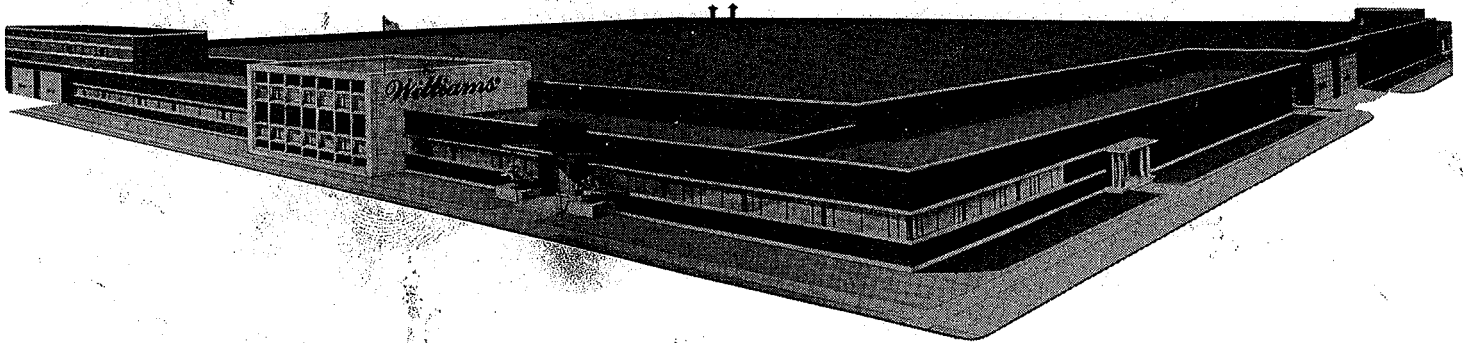


# Instruction Manual

*for*

# EPSILON



**Williams<sup>®</sup> ELECTRONICS, INC.**  
SUBSIDIARY OF THE SEEBURG CORPORATION

3401 N. California Ave.  
Phone 267-2240

Chicago, Ill. 60618, U.S.A.  
Cable Address: Wilcoin

**NOTES**

# GENERAL INSTRUCTIONS FOR SHUFFLE ALLEY

1. **INSTALLATION:** See Installation Instructions. After game is assembled, plug in connection jacks tightly. Plug line cord into A.C. ONLY, 60 cycles, 115 volts. The power to this game is controlled by a toggle switch which is located under the front part of the cabinet.
2. In low voltage areas (105 Volts or less) an additional boost in the output voltage of the transformer can be obtained by switching Rotary Adjustment Jack to "LOW".
3. To prevent abuse and cheating of this game, a vibration switch is installed on the back-door. Instructions for sensitivity are located adjacent to the switch.
4. To make the playfield rollover switches accessible for servicing, remove two screws from the access panel located directly below the switches and pull panel forward.
5. To make the retractable pins accessible for servicing, remove (2) wood screws from the top of the hood panel and lift panel.
6. To remove pin panel completely, remove (2) shipping screws from bottom front of pin panel, plus (2) screws from bottom member of hood frame, drop hood glass, disconnect jacks, then slide pin panel forward.
7. To change lite bulbs in hood insert, remove (2) screws from bottom member of hood frame and drop hood glass.
8. To remove back glass, pull back on lock brackets at inside top of back box. From front of game, lift glass up and out.
9. The equipment panel (insert) is hinged for better servicing.
10. This game has multiple methods of play. Press the button on the front of the cabinet, at the start of the game, to select the type of scoring desired.

A. **REGULATION:** Scoring is identical to official bowling.

~~B. STRIKES 90: This game scores 90 for a strike, 60 for a spare. Player continues to shoot as long as he makes a strike. A spare, or blow, will advance to next players turn, or to next frame.~~

*B, XXX 100: Same as Regulation except 100 points Awarded Per Strike after 3 strikes are Made*

C. **BONUS SCORING:** The bonus game scores as indicated on the backglass. Frames 1 thru 7 score 300 for a strike and 200 for a spare. Frames 8 thru 10 score 600 for a strike and 400 for a spare. In addition, frames 1 thru 10 advance the BONUS SCORE, 400 for a strike and 200 for a spare. The BONUS SCORE on the backglass shows only the accumulated bonus of the player who is up. After the 10th frame each player shoots one additional frame to collect the accumulated bonus score. The full bonus is transferred to the players score for a strike. One half of the bonus is transferred to the players score for a spare. A blow loses the bonus score.

D. **DUAL FLASH:** Strike and spare scores are indicated by flashing lites. Lites stop on first shot if a strike is made. If a strike is not made, lites flash for spare score.

E. **FLASH SCORING:** Strike and spare scores are indicated by flashing lites. Lites stop flashing when the pins are hit on first shot.

11. For a faster playing game, the spare shot can be thrown immediately after the first shot. NO waiting for the score.

# WARRANTY

THE MOTORS IN ALL NEW WILLIAMS PRODUCTS ARE UN-CONDITIONALLY GUARANTEED FOR 6 MONTHS FROM DATE OF PURCHASE.

ANY DEFECTIVE MOTORS RETURNED DURING THE WARRANTY PERIOD WILL BE REPLACED FREE OF CHARGE BY YOUR WILLIAMS DISTRIBUTOR.

## IMPORTANT NOTICE

WHEN ORDERING PARTS ALWAYS SPECIFY NAME OF UNIT, GAME AND SERIAL NUMBER, IN ADDITION TO A CLEAR DESCRIPTION OF THE PART AND PART NUMBER IF POSSIBLE.

### UNIT PARTS LIST

UNIT NAME	CONTACT DISC	WIPER ASSEMBLY	RATCHET GEAR ASSEMBLY	MOTORS
STRIKE SPARE	C-6981	A-6443-6	A-6402-24	
FRAME CONTROL	C-6417	C-6520	A-6402A-11	SCORE (60C)
PLAYER UP	C-6417	C-6521	A-6405-5	14A-7765
GAME SELECTION	C-6417	C-6521	A-6403	SCORE (50C)
EXTRA SHOTS	C-6414	A-6443-4	A-6402A-5	14A-7776
COIN	C-6896	C-6443-5	A-6402A-5	PIN RESET (60C)
1 - 9	---	---	3C-7272	14A-7820
TENS	---	---	3C-7272	PIN RESET (50C)
HUNDREDS	---	---	3C-7272	14A-7777
THOUSANDS	---	---	3C-7272	FLASH(60C)14A-7766
SCORE MOTOR	C-6418-9	C-6519-7	---	FLASH(50C)14A-7775
FLASH MOTOR	C-6413-9	C-6520-8	B-6833	

COIL LIST FOR "EPSILON" SHUFFLE ALLEY

COIL NUMBER	DESCRIPTION	LOCATION
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SOLENOID COILS

A 24-975	Player Up Unit Step Up Frame Control Unit Step Up	Insert Back Door
A 25-1000	Extra Shots Unit Step Up Coin Unit Step Up Strike Spare Unit Step Up .. (6 req'd.)	Insert Insert Back Door
B 27-1100	Frame Control Reset Strike Spare Unit Reset .. (6 req'd.) Extra Shots Unit Reset Player Up Unit Reset Coin Unit Reset Pin Release Coil .. (10 req'd.)	Back Door Back Door Insert Insert Insert Pin Panel
B 28-1450	Frame Drum Unit Score Drum Unit .. (24 req'd.)	Insert Insert
C 27-1300	Bell Coil	Back Door
D 22-1150	Relay Bank Reset Coil	Back Door
FL 26P-950/250	Game Selection Unit Step Up	Back Door

RELAY COILS

M 31P-1500	1-9 Score Relay 10-90 Score Relay 100's Score Relay Strike Spare Advance Relay Strike Spare Reset Relay	Back Door Back Door Back Door Back Door Back Door
M1-32-2400	Coin Lockout Coil	Front Door
S 27-750	Relay Bank Coil (#1 Relay)	Relay Bank
S 29-950	Relay Bank Coils .. (16 req'd.)	Relay Bank
XM 29-1100	Coin Meter	Cabinet
Z 29P-1400	Coin Relay Score Reset Relay .. (3 req'd.) Bonus Reset Relay	Back Door Insert Insert
Z 30P-1800	Roll Over Motor Relay Player Reset Relay Extra Shots Relay Score Control Relay Score Motor Relay Bonus Relay	Back Door Back Door Back Door Back Door Back Door Back Door
Z 30P-1600	Flash Motor Release Coil	Back Door
Z 31P-2000	Rear Roll Over Relay Pin Reset Relay Bonus Lite Relay Flash Relay	Back Door Pin Panel Back Door Back Door
Z 32P-2700	Lock Relay	Back Door

MOTORS & TRANSFORMERS, ETC.

14 A 7765	Score Motor	Back Door
14 A 7766	Flash Motor	Back Door
14 A 7820	Pin Reset Motor .. (2 req'd.)	Pin Panel
15 A 6775	Transformer	Back Door
24 A 6597-7	Fluorescent Lamp	Insert
24 A 6597-11	Fluorescent Lamp	Pin Panel
1 B 4276	Cash Box Cover	Coin Box
E 6872 SA	Coin Box with door only	Center Front
C 6876	Cash Box	Coin Box

# INSTRUCTIONS FOR ALTERING COIN CHUTES EQUIPPED WITH A FLIP-OVER DEVICE.

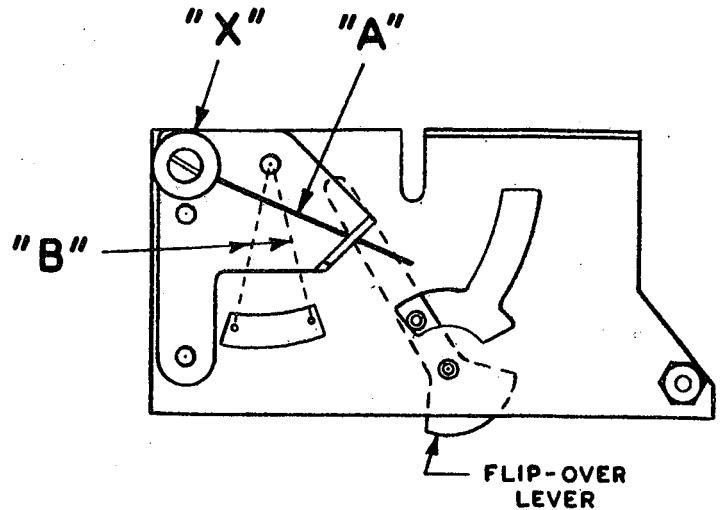
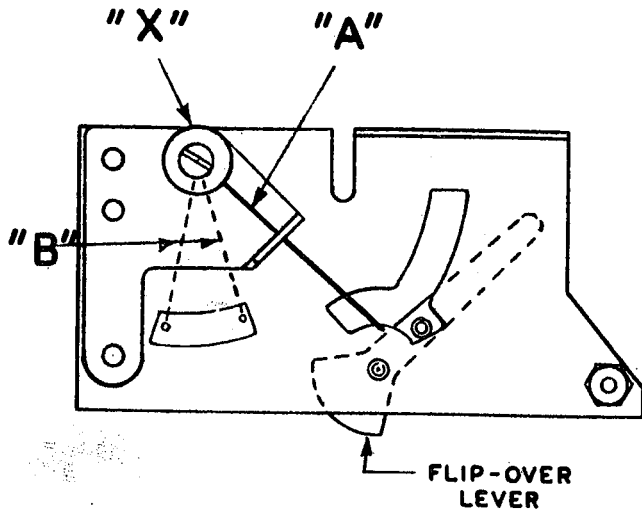
FOR 1 COIN - FOR 1 PLAY

OR

2 COINS - FOR 1 PLAY

**FIGURE 1**

**FIGURE 2**



## **1 COIN - FOR 1 PLAY (FIGURE 1):**

Wire form "A" should be in position as shown in Figure 1. Flip-over lever should rebound from wire form "A" and return to position shown in Figure 1 everytime a coin is inserted. All coins pass over the coin trip switch wire "B".

## **2 COINS - FOR 1 PLAY (FIGURE 2):**

Wire form "A" should be in position as shown in Figure 2 (see note). Flip-over lever should alternate from side to side. 1st coin should go to cash box without actuating coin trip switch wire "B", 2nd coin should pass the coin trip switch wire "B" and returns flip-over to position as shown in Figure 2.

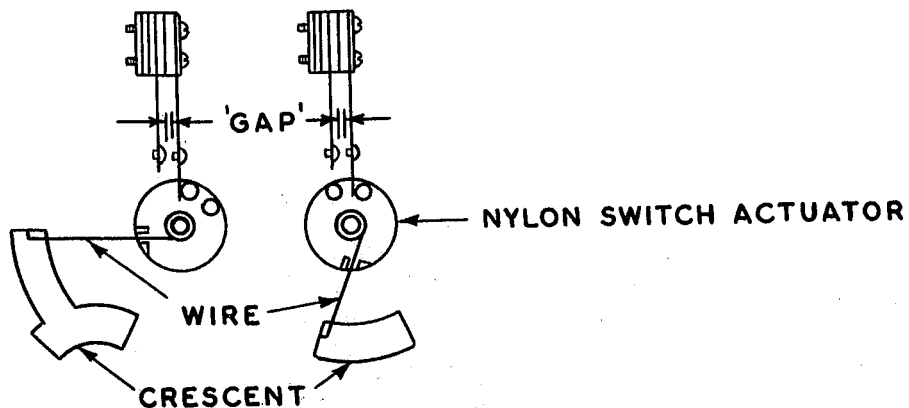
## **NOTE:**

To change from 1 coin play to 2 coin play or vice versa - loosen screw "X" and move screw, bushing & wire form "A" to position as required - shown in Figure 1 position as required - shown in Figure 1 or Figure 2.

When using 1 coin for 1 play, wire form "A" should not under any circumstances be allowed to enter the "Banana" slot and cause binding of flip-over lever.

## INSTRUCTIONS FOR COIN TRIP SWITCH ADJUSTMENT

WIRE SHOULD BE IN CONTACT WITH END OF CRESCENT OPENING WHEN BLADE ADJUSTMENT IS MADE.



Long blade should be in contact with nylon switch actuator and have a maximum overtravel of  $1/32$ .

or

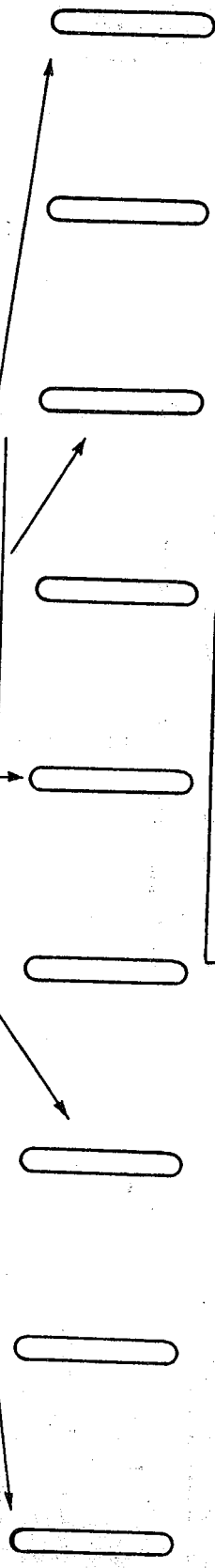
Using a gram gauge, tension of long blade should not exceed 10 grams.

### SWITCH ADJUSTMENT

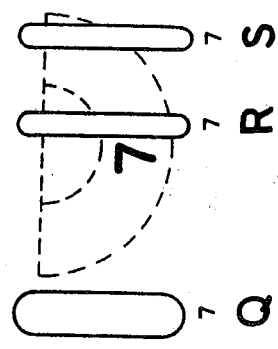
1. For small coins, such as dimes, adjust short blade so that the 'gap' between the silver contacts is .045 to .055.
2. For larger & heavier coins the 'gap' should be .045 to .060.
3. Do not adjust 'gap' closer than .040.

# PLAYFIELD SWITCHES DIAGRAM

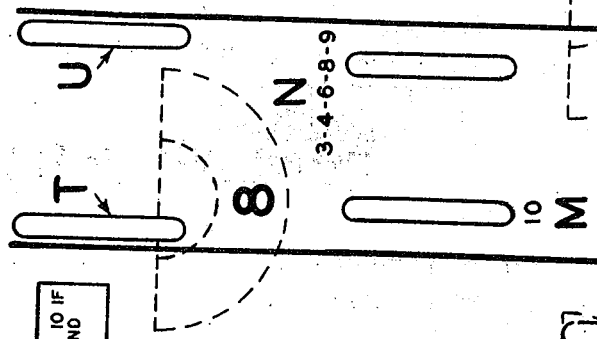
TOP 9 SWITCHES OPERATE 1ST & 2ND BALL RELAYS



ON THE SPARE SHOT  
SWITCHES Q & R TRIP  
THE 10 IF HIT  
SIMULTANEOUSLY WHEN  
THE 1 IS DOWN

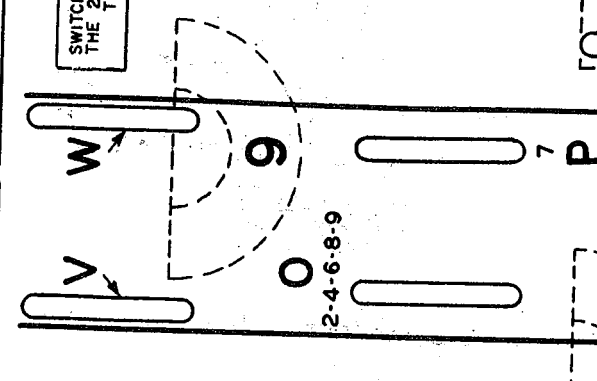


SWITCHES T & U TRIP 10  
IF HIT SIMULTANEOUSLY



SWITCH T TRIPS THE 10 IF  
THE 3 & 9 ARE UP AND  
THE 1 IS DOWN

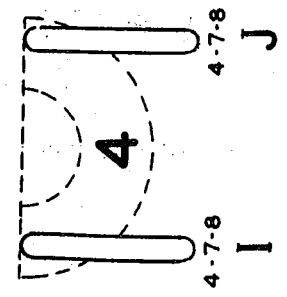
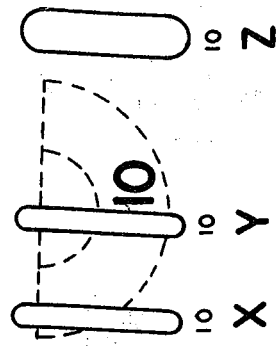
STRIKE ZONES SWITCHES G, H, M, N, O,  
P, T, U, V & W OPERATE ONLY WHEN 1  
IS DOWN, HOWEVER IF 1 IS DOWN ON  
THE 1ST SHOT, THEY ARE INOPERATIVE  
ON THE SPARE SHOT.



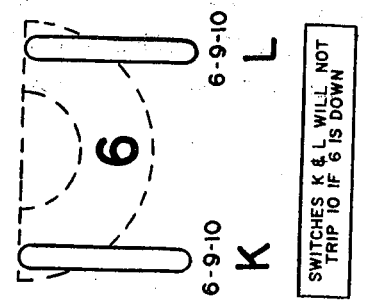
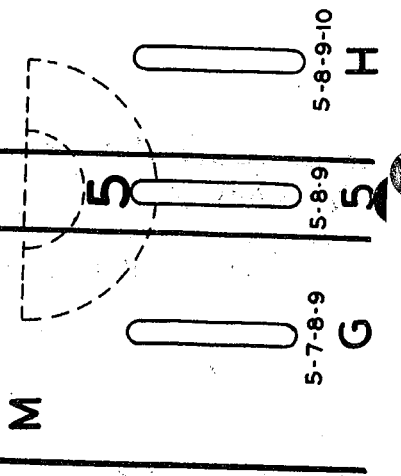
SWITCHES V & W TRIP 7  
IF HIT SIMULTANEOUSLY

SWITCH W TRIPS THE 7 IF  
THE 2 & 8 ARE UP AND  
THE 1 IS DOWN

ON THE SPARE SHOT  
SWITCHES Y & Z TRIP  
THE 7 IF HIT  
SIMULTANEOUSLY WHEN  
THE 1 IS DOWN



SWITCHES I & J WILL NOT  
TRIP 7 IF 4 IS DOWN



SWITCHES K & L WILL NOT  
TRIP 10 IF 6 IS DOWN

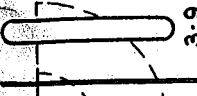
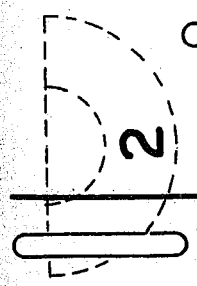


SWITCH C OPERATES ONLY WHEN HIT SIMULTANEOUSLY WITH SWITCH D  
SWITCH C ALSO TRIPS 6 WHEN 2 IS UP AND 1 IS DOWN

5-8-9 C

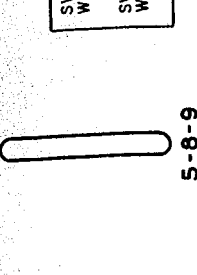
2-8 D

SWITCH D ALSO TRIPS THE 7 WHEN IT HAS BEEN HIT SIMULTANEOUSLY WITH SWITCH C, WHEN 2 IS UP 4 IS DOWN.



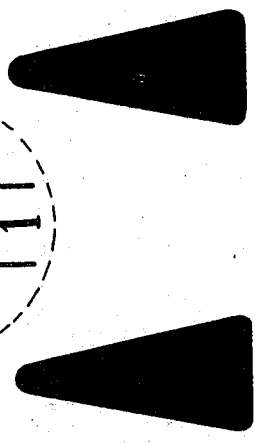
5-8-9 F

SWITCH E ALSO TRIPS THE 10 WHEN IT HAS BEEN HIT SIMULTANEOUSLY WITH SWITCH F, WHEN 3 IS UP 6 IS DOWN.



SWITCH F OPERATES ONLY WHEN HIT SIMULTANEOUSLY WITH SWITCH E  
SWITCH F ALSO TRIPS 4 WHEN 3 IS UP AND 1 IS DOWN

3-9 E



# STRIKE ZONES

## EXPLANATION

N → PLAYFIELD SWITCH LETTER  
3-4-6-8-9 ↙ REFERS TO RELAYS TRIPPED  
DOWN MEANS BOWLING PIN IS TRIPPED  
UP MEANS BOWLING PIN IS LATCHED & IN AN EXTENDED POSITION

## NOTES

THE 7-10 RAILROAD CAN BE PICKED-UP EASIER BY MOVING THE Z SWITCH TO THE LEFT AND THE Q SWITCH TO THE RIGHT. THESE TWO SWITCHES ARE LOCATED IN WIDE SLOTS WHICH HAVE EXTRA DRILLED HOLES FOR THE NEW Q & Z SWITCHES LOCATIONS

SWITCHES M & P OPERATE IN ACCORDANCE WITH THE STRIKE ZONES CONTROL JACK

## 1. GENERAL

NEVER EXPERIMENT with any of the mechanism. Locate any trouble with the aid of Wiring Diagrams or Operating & Servicing Information supplied with the machine, then check for proper adjustment of the units involved before making any changes. Improper adjustment or make-shift repair will only cause serious damage to other parts of the machine or repeated failure of the part.

NOTE: Always look for a possible loose wire, bad connection at a plug and socket, broken or unhooked springs on step-up units, relays, etc., before adjustments are made or wires reconnected.

## 2. FUSES

IMPORTANT: Never replace fuses with any rating other than specified on the fuse block; this block is located adjacent to the transformer.

## 3. LUBRICATION

Over-lubrication causes far more trouble in coin operated equipment than under-lubrication. Practically all cases of poor contact on switches and wiper discs are due to oil or grease, or oil vapor, which forms a film or residue on the contacts and will not allow current to pass through. Excess lubricant may also seep into clutches causing them to slip.

IMPORTANT: NEVER USE VASELINE FOR LUBRICATION OF ANY PART OF THE MACHINE. Vaseline is not a true lubricant. It leaves a dirty and gummy residue and it becomes very thick when cold. A special Coin Machine Lubricant is supplied with each machine.

STEP-UP Levers, Ratchets, Cams, Shafts and other sliding or oscillating parts should be very lightly greased with special Coin Machine Lubricant (supplied with machine) not oftener than every six months. The bakelite discs (biscuits) on the Motor Units and Step-up Units will require lubrication with the special Coin Machine Lubricant only after the grease is completely evaporated (3 to 12 months, depending on climate) or when the film of grease becomes dirty. In either event, clean the parts thoroughly with a solvent, then apply an extremely thin coat of the special grease.

Solenoid Plungers should not have a lubricant of any kind. Should there be a sluggish tendency or if plungers are sticking, the parts should be cleaned with a solvent and flaked graphite applied on reassembly.

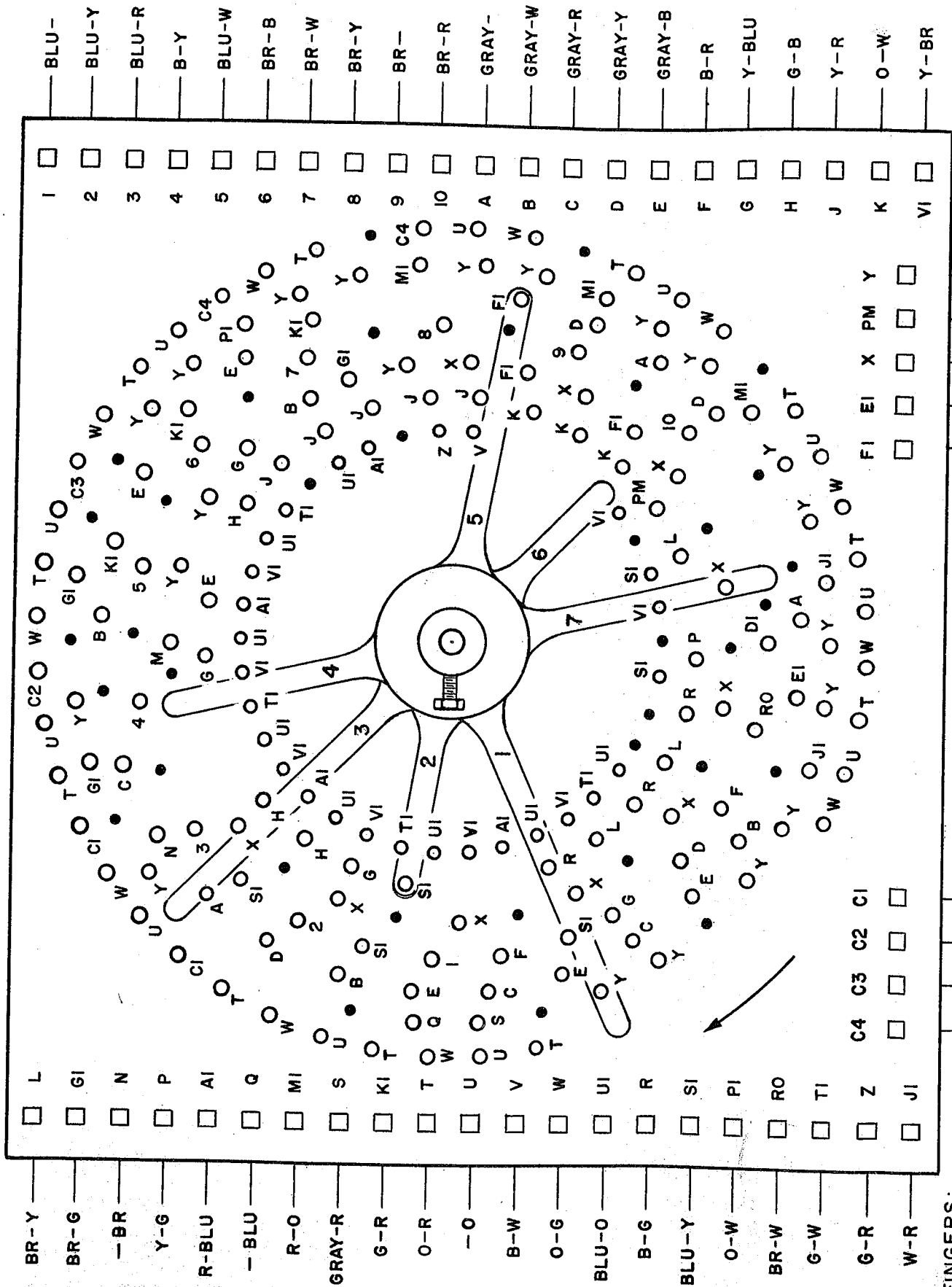
## 4. RELAY and SWITCH ADJUSTMENT

Where relay adjustments are called for, before bending blades, in all cases, on any machine, make certain that the screws holding the switch stacks are down very tightly. This is suggested because the plastic spacers in the switch stacks have occasionally shrunk by drying out, causing a poor adjustment.

WHAT TO DO IF:

1. Lights are out, game is inoperative:
  - a. Check A.C. cord and plug for breaks, cuts or other damage.
  - b. Check fuses, located on back door.
  - c. Check master switch, located under the front end of the cabinet.
  - d. Check plugs and jacks for proper installation.
2. Lights are on, game is inoperative:
  - a. Check the 15 Amp fuse, heavy Black wire.
  - b. Check plugs and jacks.
3. Lights are out, game operates:
  - a. Check the 15 Amp fuses, heavy White wire and heavy Orange wire.
  - b. Check plugs and jacks.
  - c. Check lite bulbs.
4. Coin is accepted, game is inoperative:
  - a. Check Drop Chute Switch.
  - b. Check Coin Relay Coil and Switches.
  - c. Check Start Relay Switch, Black-white to Green-Yellow-White.
  - d. Check switch on Score Motor Relay, Red-White and Green-Yellow-White.
  - e. Check Front Door Slam Switch.
  - f. Check Coin Chute adjustment jack.
5. Drum Units fail to reset at start of game:
  - a. Check switches on the 'A', 'B', & 'C' Reset Relays.
  - b. Check Zero Position Switches on the Drum Units.
6. Drum Units fail to score properly:
  - a. Check 1-9, 10-90 or 100's Score Relay Switches.
  - b. Check Wiper Fingers on Score Motor Disc.
  - c. Check 9th Position Switch on Drums.
7. Game Selection S.U. does not advance to 'Regulation' in reset cycle:
  - a. Check Game Selection S.U. Coil, Gray-Red and Black.
  - b. Check switch on 'B' Reset Relay, Gray-Red and Red-Black.
  - c. Check Game Selection disc., Red-Black. Also, sno-shoe wipers on that unit.
8. Player gets only one shot per frame:
  - a. Check 1st & 2nd Ball Relays for proper reset.
  - b. Check Score Motor for over-riding.
9. Bowling Pins do not reset:
  - a. Check switch on Pin Reset Relay, Yellow and Gray-Black.
  - b. Check Zero Position Switch on Pin Reset Motor.
10. Game shows "Game Over" in 1st Frame:
  - a. Check Lock Relay.
  - b. Check switches on the Lock Relay.
  - c. Check Tilt Switch for proper adjustment.
  - d. Check Frame Control S.U. Unit for proper resetting.

# SCORE MOTOR DISC



**VIEW LOOKING AT  
WIPER FINGERS**

WIPER FINGERS:  
1 - GRO  
2 - 3 & 6 INSULATED  
3 - 4 & 5 INSULATED  
4 - 6 & 7 INSULATED

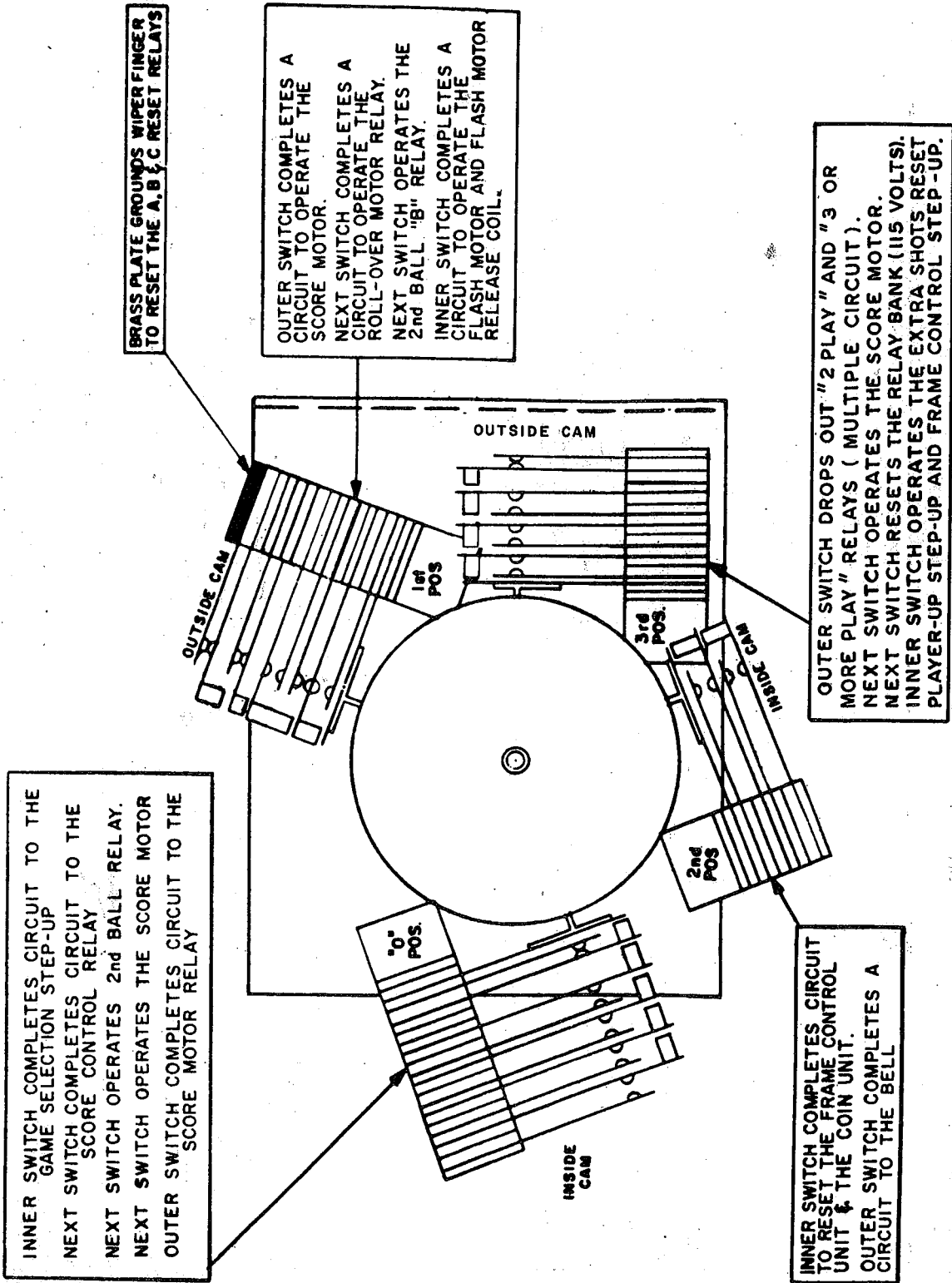
# SCORE MOTOR DISC

Diagram Location	Diagram Location	Diagram Location
L A-8	PULSES STRIKES-SPARE RESET RELAY THRU 'C' OR 'E' POSITIONS ON STRIKE-SPARE UNIT DISCS.	1 A-9 FROM SWITCH ON R.O. SW. CONTROL RE.
GL A-6	3 RIVETS TO PULSE THE 100'S SCORE RE., IN FRAMES 1 THRU 10 OF A "BONUS" GAME.	2 A-9 FROM SW. ON 2 RELAY.
N C-11	TO PLAYER RESET RELAY FROM 'PM' RIVET.	3 A-9 FROM SW. ON 3 RELAY.
P A-8	PULSES STRIKE-SPARE RESET RELAY WHEN SPARE FOLLOWS A STRIKE.	4 A-10 FROM SW. ON 4 RELAY.
AL A-8	IN CIRCUIT TO STRIKE-SPARE RESET RELAY AT START OF GAME, & 11TH FRAME OF "BONUS".	5 A-10 FROM SW. ON 5 RELAY.
Q C-11	OPERATES EXTRASHOTS RESET RELAY FROM 'V' RIVET.	6 A-10 FROM SW. ON 6 RELAY.
ML A-7	IN CIRCUIT TO 100'S SCORE RELAY THRU FLASH MOTOR DISC.	7 A-10 FROM SW. ON 7 RELAY.
S A-8	TO PIN RESET RELAY FROM 'Z' RIVET.	8 A-10 FROM SW. ON 8 RELAY.
KL A-8	IN CIRCUIT TO STRIKE-SPARE RESET RELAY IN "DUAL" & "FLASH" GAMES.	9 A-10 FROM SW. ON 9 RELAY.
T A-3	11 RIVETS TO PULSE "C" RESET RELAY AT START OF GAME.	10 A-10 FROM SW. ON 10 RELAY.
U A-3	11 RIVETS TO PULSE 'B' RESET RELAY AT START OF GAME.	A A-7 3 RIVETS-IN CIRCUITS TO 10-90 SCORE RE., STRIKE-SPARE RESET RE., & SCORE CONTROL RE.
V C-11	FEEDS 'Q' RIVET FROM CIRCUITS WHICH ORIGINATE IN THE EXTRA SHOTS UNIT DISC.	B A-8 4 RIVETS-SAME AS 'A' (ABOVE).
W A-3	11 RIVETS TO PULSE 'A' RESET RELAY AT START OF GAME.	C A-7 3 RIVETS-IN CIRCUITS TO 10-90 SCORE RE. & STRIKE-SPARE RESET RELAY.
UI A-6	8 RIVETS TO PULSE 100'S SCORE RE. WHEN COLLECTING BONUS.	D A-7 4 RIVETS-SAME AS 'A' (ABOVE).
R A-8	SAME AS KI RIVETS.	E A-8 4 RIVETS-SAME AS 'C' (ABOVE).
SL A-6	GETS FEED FROM F1 & G1 RIVETS.	F A-9 2 RIVETS PULSE THE STRIKE-SPARE ADVANCE RELAY ON A STRIKE. (1 RIVET ON A SPARE.)
PL A-7	CIRCUIT TO 100'S SCORE RELAY THRU FLASH MOTOR DISC.	G A-7 PULSES 10-90 SCORE RELAY, ON 1ST SHOT, WHEN PLAYER IS HOLDING A SPARE OF TWO STRIKES. ALSO, WHEN A BLOW FOLLOWS A STRIKE.
RO C-8	TRIPS ROLLOVER SWITCHES CONTROL RELAY, THRU SWITCH ON #1 RELAY.	H A-7 ENERGIZES SCORE CONTROL RELAY, ON 1ST SHOT, WHEN PLAYER IS HOLDING A SPARE OR TWO STRIKES. ALSO, WHEN A BLOW FOLLOWS A STRIKE.
TL A-8	IN CIRCUIT TO STRIKE-SPARE RESET RELAY AT START OF GAME, & 11TH FRAME OF "BONUS".	J A-7 5 RIVETS TO PULSE 10-90 SCORE RELAY. 2 OF THESE RIVETS ON A STRIKE-SPARE OR SPARE -STRIKE COMBINATION. 3 RIVETS ON 3 STRIKES.
Z A-8	FEEDS RIVET 'S' FROM SWITCH ON SCORE CONTROL RELAY.	K A-8 TO PULSE STRIKE-SPARE RESET RELAY, ON 1ST SHOT, WHEN PLAYER IS HOLDING A SPARE OR TWO STRIKES. ALSO, WHEN A BLOW FOLLOWS A STRIKE.
JL A-7	IN CIRCUIT TO 100'S SCORE RELAY, THRU FLASH MOTOR DISC.	VL A-7 8 RIVETS TO PULSE 100'S SCORE RELAY IN "DUAL" OR "FLASH" GAMES.
CL4	USED IN MULTIPLE COIN CIRCUIT ONLY.	Y 50 VOLT COMMON.
C3		PM FEEDS 'N' RIVET FROM COIN S.U. DISC. & PLAYER S.U. DISC.
C2		
CL1		
X A-9	10 RIVETS TO PULSE THE 1-9 SCORE RELAY.	
A-10		
EL A-7	1 RIVET TO PULSE THE 100'S SCORE RE., IN "3X" GAME.	
FL A-5	3 RIVETS TO PULSE THE 100'S SCORE RE., IN THE 8-9 OR 10TH FRAMES OF A "BONUS" GAME.	

PULSES 1-9 SCORE RELAY THRU X RIVETS.

THESE WIRES CONNECT TO THE A-B-C-D-E LUGS ON ALL 6 STRIKE-SPARE UNIT DISC.

# SCORE MOTOR SWITCHES



INNER SWITCH COMPLETES CIRCUIT TO THE GAME SELECTION STEP-UP  
 NEXT SWITCH COMPLETES CIRCUIT TO THE SCORE CONTROL RELAY  
 NEXT SWITCH OPERATES 2nd BALL RELAY.  
 NEXT SWITCH OPERATES THE SCORE MOTOR  
 OUTER SWITCH COMPLETES CIRCUIT TO THE SCORE MOTOR RELAY

BRASS PLATE GROUNDS WIPER FINGER TO RESET THE A, B & C RESET RELAYS

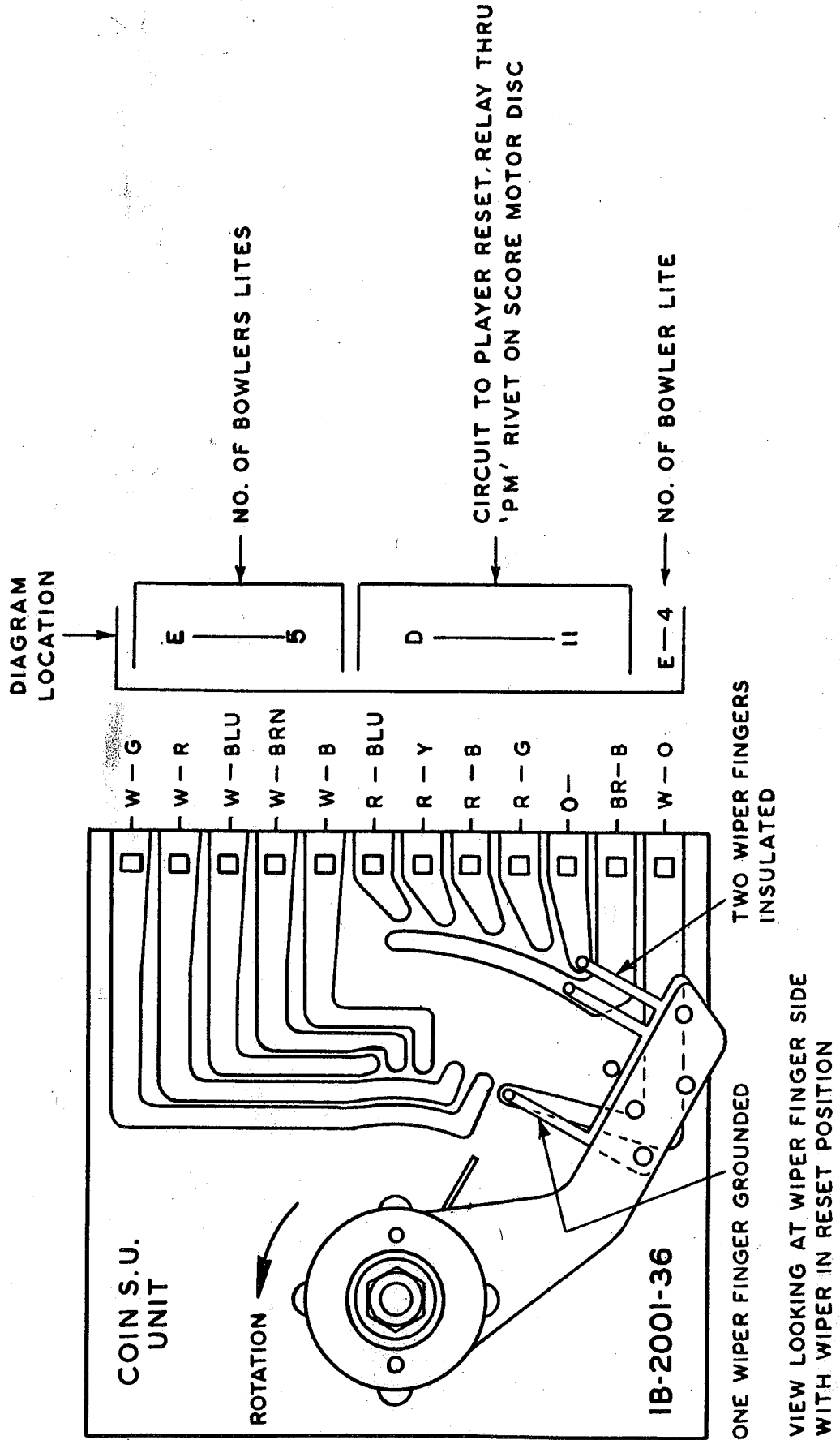
OUTER SWITCH COMPLETES A CIRCUIT TO OPERATE THE SCORE MOTOR.  
 NEXT SWITCH COMPLETES A CIRCUIT TO OPERATE THE ROLL-OVER MOTOR RELAY.  
 NEXT SWITCH OPERATES THE 2nd BALL "B" RELAY.  
 INNER SWITCH COMPLETES A CIRCUIT TO OPERATE THE FLASH MOTOR AND FLASH MOTOR RELEASE COIL.

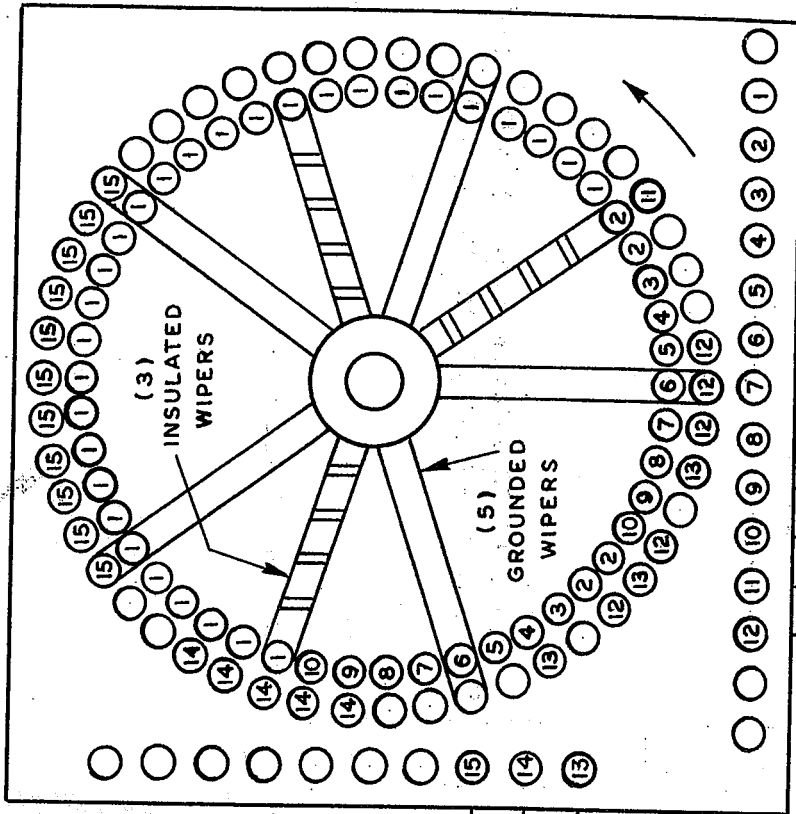
OUTER SWITCH DROPS OUT "2 PLAY" AND "3 OR MORE PLAY" RELAYS ( MULTIPLE CIRCUIT ).  
 NEXT SWITCH OPERATES THE SCORE MOTOR.  
 NEXT SWITCH RESETS THE RELAY BANK (115 VOLTS).  
 INNER SWITCH OPERATES THE EXTRA SHOTS RESET PLAYER-UP STEP-UP AND FRAME CONTROL STEP -UP.

INNER SWITCH COMPLETES CIRCUIT TO RESET THE FRAME CONTROL UNIT & THE COIN UNIT.  
 OUTER SWITCH COMPLETES A CIRCUIT TO THE BELL

# COIN S.U. UNIT DISC

THIS UNIT RESETS AT THE START OF A NEW GAME, AND ADVANCES EVERY TIME THE COIN RELAY IS PULSED





WIRE CONNECTS TO	IN CIRCUIT TO	DIAG. LOC.
SWITCH ON FLASH RELAY	100'S SCORE RE.	A-6
M-1 RIVETS ON SCORE MOTOR DISC	100'S SCORE RE.	A-7
J1 RIVETS ON SCORE MOTOR DISC	100'S SCORE RE.	A-7

O-BLU  
R-O  
W-R

VIEW LOOKING AT WIPER FINGER SIDE

DIAG. LOC.	IN CIRCUIT TO	WIRE CONNECTS TO
	6 VOLTS TO LITES	
Y-		
BR-	E-8	300-100
BR-R	E-8	400-200
BR-Y	E-8	500-300
BR-W	E-8	600-400
BR-B	E-8	800-500
Y-BR	E-8	600-400
Y-R	E-9	500-300
Y-G	E-9	400-200
Y-B	E-9	300-100
R-BR	A-7	SW. ON 2ND BALL "A" RELAY
O-W	A-6	P1 RIVET ON SCORE MOTOR DISC

# FLASH MOTOR DISC

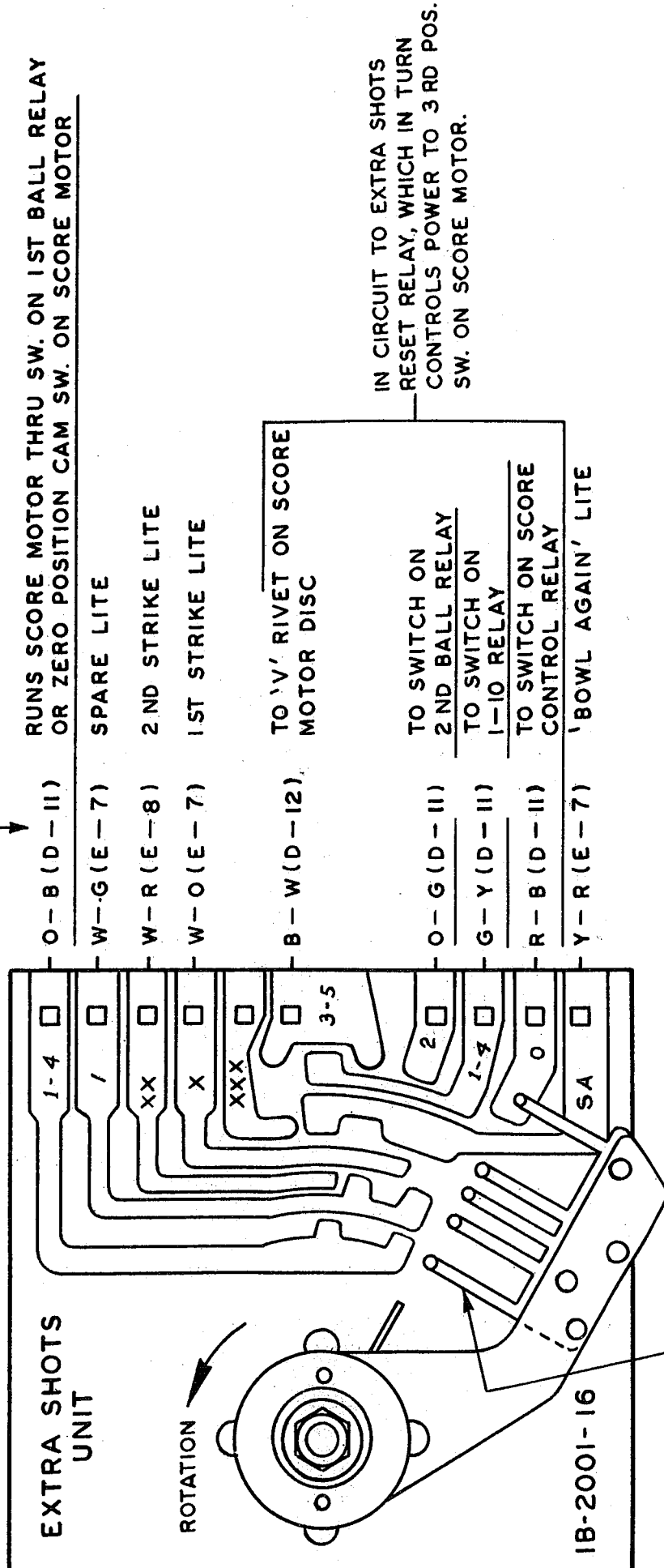
THE MAIN FUNCTION OF THE FLASH MOTOR IS TO COMPLETE THE PROPER CIRCUITS TO ENERGIZE THE 100'S SCORE RELAY WHEN A STRIKE OR SPARE IS MADE. THIS MOTOR OPERATES ONLY IN A "FLASH" OR "DUAL FLASH" GAME.



# EXTRA SHOTS UNIT DISC

THIS UNIT OPERATES IN THE 10th FRAME. IT DOES NOT OPERATE IN "STRIKES 90" GAME. IT ADVANCES TWO TIMES PER STRIKE AND ONCE ON A SPARE. THE FUNCTION OF THIS UNIT IS TO GIVE EXTRA SHOTS TO THE PLAYER.

DIAGRAM LOCATION

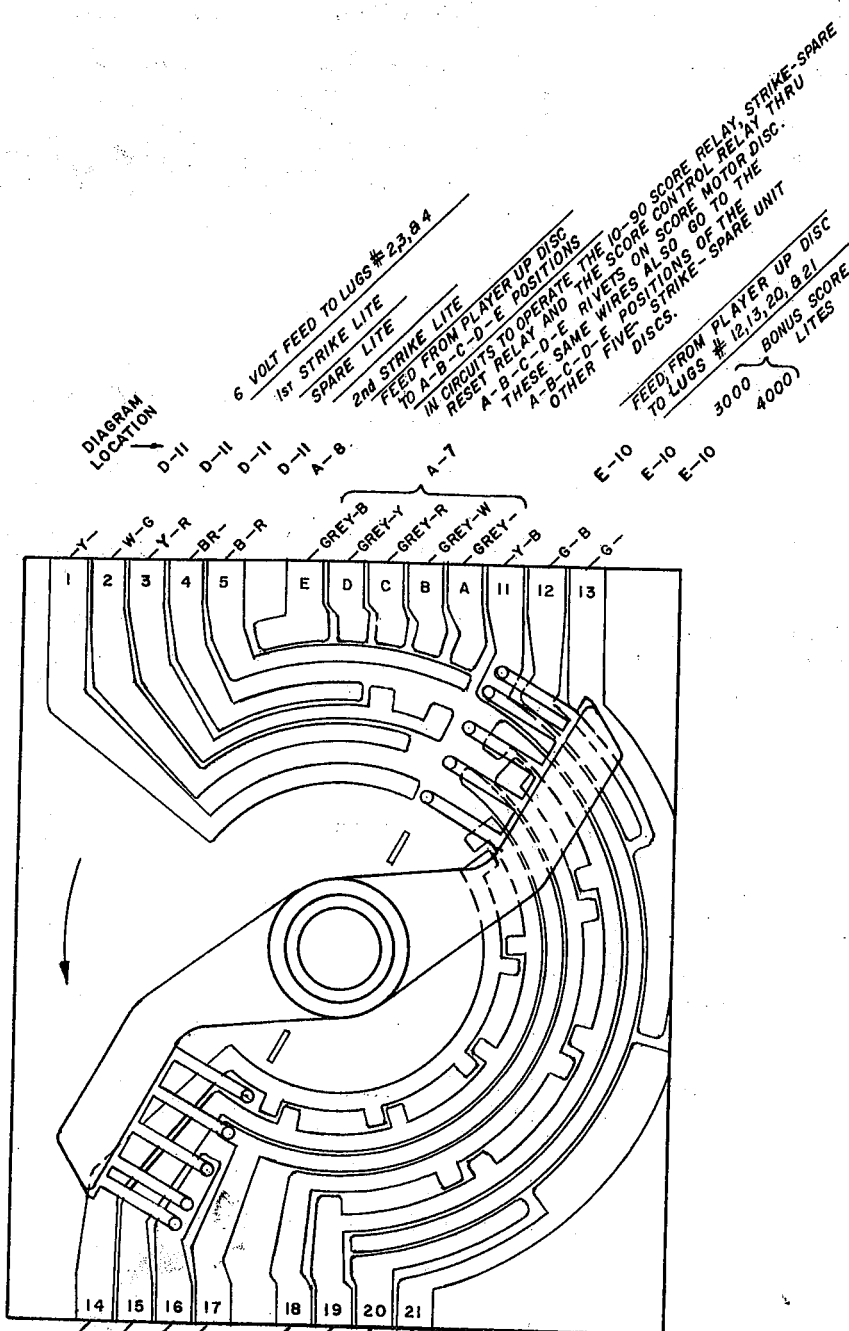


FIVE WIPER FINGERS GROUNDED TO YELLOW VIEW LOOKING AT WIPER FINGER SIDE AND WITH WIPER IN RESET, OR ZERO POSITION



# PLAYER UP UNIT DISC

LUG		LUG		
1	<i>TO PLAYER UP LITES</i>	43	<i>TO 1000 DRUM S.U. COILS, THRU 9th POSITION SWITCHES ON 100's DRUM UNITS.</i>	
2		44		
3		45		
4		46		
5		47		
6		48		
7	<i>THESE WIRES CONNECT TO THE (6) STRIKE - SPARE UNIT DISCS, TO LITE THE 0, 200, 400, 600, AND 800 BONUS SCORE LITES.</i>	49	<i>THESE WIRES CONNECT TO 1-9 DRUM S. U. COILS.</i>	
8		50		
9		51		
10		52		
11		53		
12		54		
13	<i>IN CIRCUIT TO 100's SCORE RELAY THRU 9th POSITION SWITCHES ON 10-90 DRUM UNITS.</i>	55	<i>FEEDS 49 to 54 FROM SW. ON 1-9 SCORE RE.</i>	
14		56	<i>THESE WIRES CONNECT TO 10-90 DRUM S. U. COILS.</i>	
15		57		
16		58		
17		59		
18		60		
19	<i>IN CIRCUIT TO 10-90 SCORE RELAY THRU 9th POSITION SWITCHES ON 1-9 DRUM UNITS.</i>	61		<i>FEEDS 56 to 61 FROM SW. ON 10-90 SCORE RE.</i>
20		62	<i>IN CIRCUIT TO BONUS RELAY IN 11th FRAME, AND DURING RESET CYCLE.</i>	
21		63		
22		64		
23		65		
24		66		
25	<i>TO STRIKE-SPARE UNIT RESET COILS THRU ZERO POSITION SWITCHES ON THOSE UNITS.</i>	67		<i>FEEDS RIVETS 63 to 68</i>
26		68		
27		69		
28		70	<i>IN CIRCUITS TO SCORE CONTROL RELAY, STRIKE-SPARE RESET RELAY, &amp; 10-90 SCORE RELAY IN "REGULATION" GAME. THESE WIRES CONNECT TO THEIR RESPECTIVE STRIKE-SPARE UNIT DISCS.</i>	
29		71		
30		72		
31	73			
32	<i>IN CIRCUIT TO STRIKE-SPARE S.U. COILS.</i>	74	<i>THESE WIRES CONNECT TO THE 100's DRUM UNIT COILS.</i>	
33		75		
34		76		
35		77		
36		78		
37		79		
38	<i>IN CIRCUIT TO ENERGIZE PLAYER RESET RELAY.</i>	80	<i>FEEDS 43 to 48, And 76 to 81 Thru SW. on 100's Re.</i>	
39		81		
40		82		
41		83		
42	<i>IN CIRCUIT TO ENERGIZE GAME SELECTION S.U. COIL.</i>	84	<i>THESE WIRES CONNECT TO THE (6) STRIKE-SPARE UNIT DISCS, TO LITE THE 1000, 2000, 3000, AND 4000 BONUS SCORE LITES.</i>	
		85		
		86		
		87		
		88		



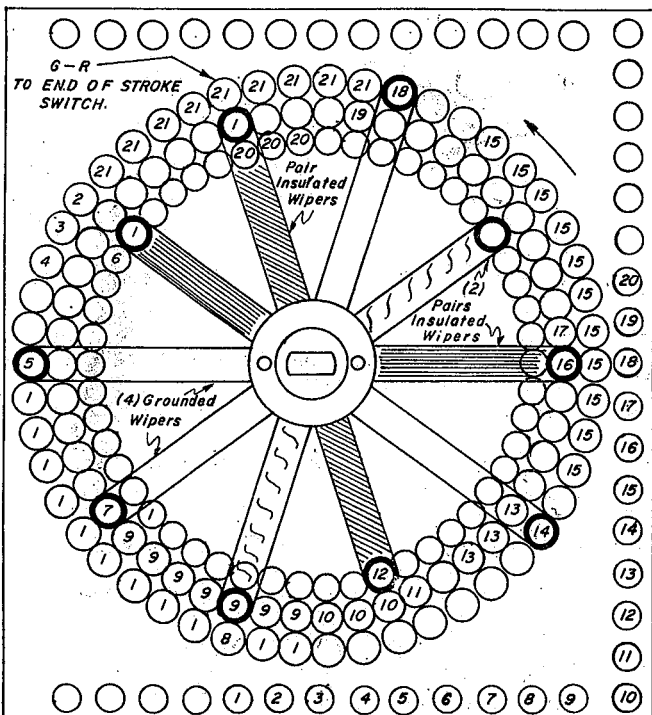
## STRIKE-SPARE UNIT DISC (1st Player)

THERE ARE (6) SIX STRIKE-SPARE UNIT DISCS, ONE FOR EACH PLAYER. THE DISCS ARE IDENTICAL. THE WIRE COLORS FOR THE STRIKE AND SPARE LITES, TO THE OTHER FIVE STRIKE-SPARE DISCS, ARE SHOWN BETWEEN E-II AND E-14. WIRES THAT FEED THE BONUS LITES, LUGS #11 AND #17, ARE SHOWN AT E-10. WIRE COLORS TO LUG #5, WHICH FEED THE A-B-C-D-E POSITIONS ARE SHOWN AT A-8

# FRAME CONTROL S.U. UNIT

THIS UNIT ADVANCES ONE STEP EACH TIME THE LAST PLAYER COMPLETES HIS TURN. IT RESETS TO ZERO POSITION AND ADVANCES ONE STEP DURING RESET CYCLE.

*View looking at WIPER FINGER side  
with wiper in ZERO position*

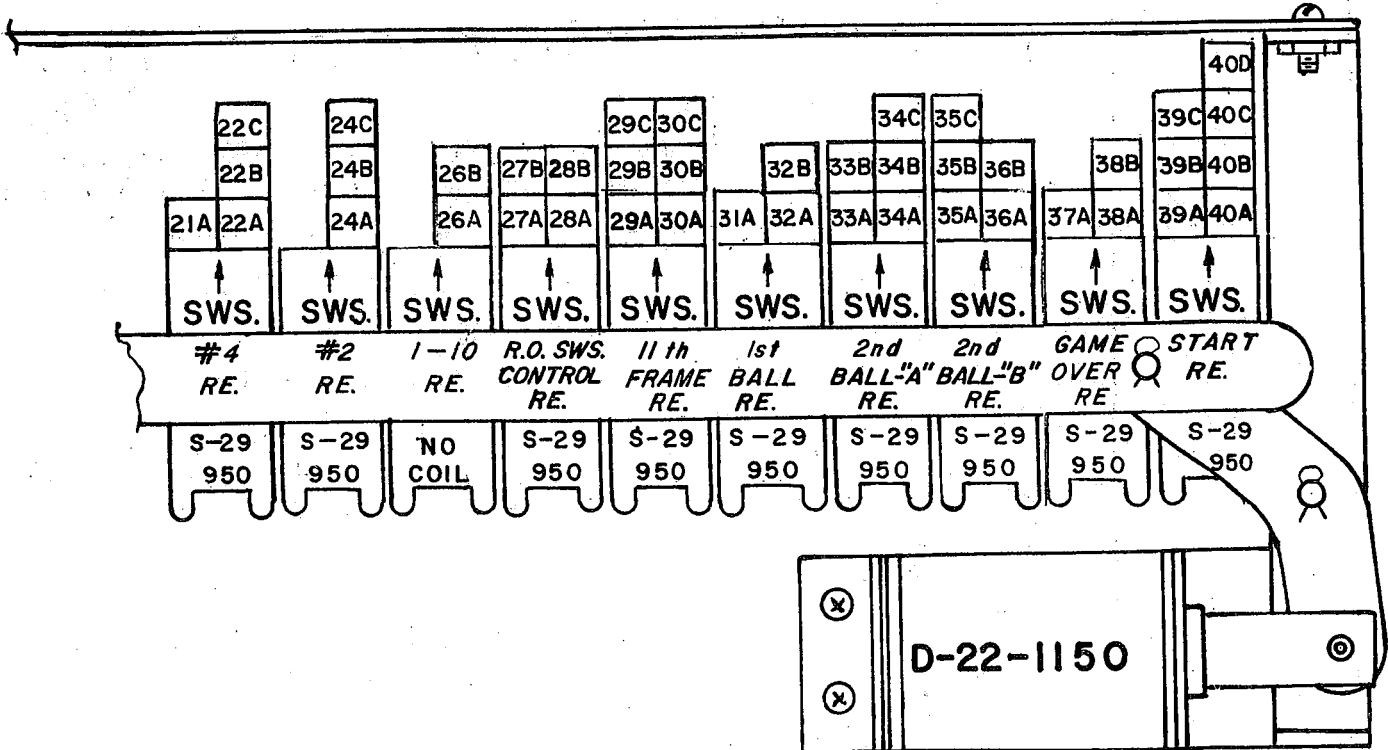
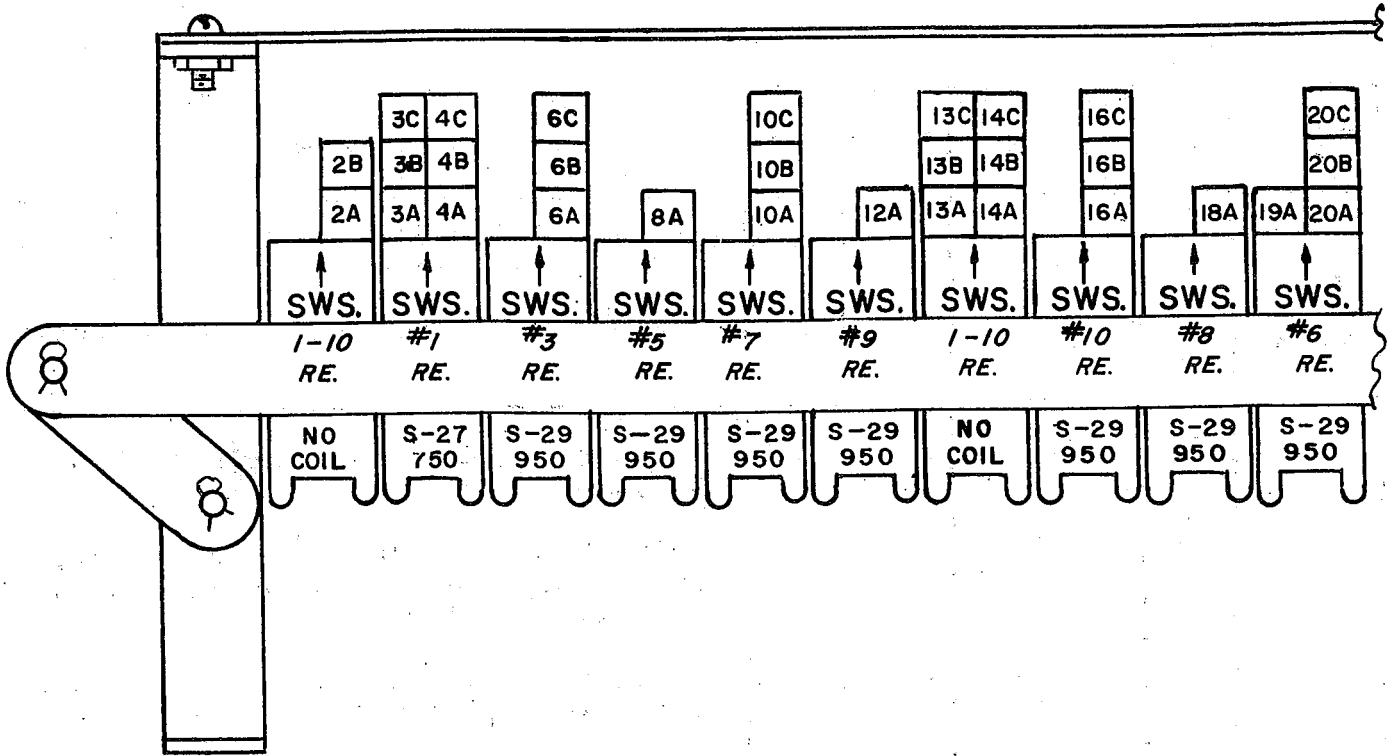


- |        |      |   |
|--------|------|---|
| BR-G   | A-6  | IN CIRCUIT TO 100'S SCORE RELAY IN "BONUS" GAME.                              |
| GREY-G | B-4  | TRIPS GAME OVER RELAY IN ALL GAMES EXCEPT "BONUS"                             |
| R-W    | C-7  | IN CIRCUIT TO 5 TH PLAYER STRIKE-SPARE RESET COIL.                            |
| BR-O   | D-10 | IN CIRCUIT TO GAME SELECTION S.U. COIL.                                       |
| R-BLU  | C-7  | IN CIRCUIT TO 6 TH PLAYER STRIKE-SPARE RESET COIL.                            |
| G-W    | D-8  | TO-START RELAY COIL.  |
| R-G    | C-7  | IN CIRCUIT TO 4 TH PLAYER STRIKE-SPARE RESET COIL.                            |
| BLU-B  | A-6  | IN CIRCUIT TO 100'S SCORE RELAY IN 8-9-10 FRAMES OF "BONUS" GAME.             |
| B-W    | D-12 | ENERGIZES EXTRA SHOTS RESET RELAY, THRU "V" & "Q" RIVETS ON SCORE MOTOR DISC. |
| Y-R    | E-10 | TO "BONUS FRAME COLLECTS" LITES.  |
| W-R    | E-9  | TO "8 THRU 10 SCORES $\frac{600}{400}$ " LITES.                               |

DIAGRAM LOCATION

TO "1 THRU 7 SCORES 300/200" LITES.  
 ENERGIZES EXTRA SHOTS UNIT S.U. COIL, THRU SWITCH ON STRIKE-SPARE ADVANCE RELAY.  
 IN CIRCUIT TO 3 RD PLAYER STRIKE-SPARE RESET COIL.  
 FEEDS BR-O (LUG # 17) FROM PLAYER STRIKE-SPARE RESET COIL.  
 IN CIRCUIT TO 2 ND PLAYER STRIKE-SPARE RESET COIL.  
 TRIPS GAME-OVER RELAY.  
 IN CIRCUIT TO 11 TH FRAME "LITE".  
 TRIPS 11 TH FRAME "LITE".  
 TO "10 TH FRAME" LITE.  
 6 VOLT AND 50 VOLT COMMON.





**RELAY BANK SWS.**

RELAY	SW.	WIRE COLORS	DIAG. LOC.	TYPE	SWITCH OPERATION
1-10 RELAY (No Coil)	2B	O-W BR-Y	B-8	N.C.	In circuit to Strike-Spare Reset Relay thru (3) K rivets on Score Motor Disc.
	2A	-B- B-0	B-8	N.C.	Opens circuit to Score Control Relay.
# 1 RELAY	3C	BR-0 GRAY-G	D-9	N.C.	Opens circuit to Game Selection S.U. Coil.
	3B	Y-0 BR-W	C-8	N.O.	Trips R.O. Switches Control Relay, thru Score Motor Disc or Switch on 2nd Ball "B" Relay.
	3A	-J- B-0	A-12	N.O.	In circuit to 6 Pin Coil, on second shot, when player has a 2-4-6 leave.
	4C	R-0 Y-BR	A-4	N.C.	Opens circuit to Flash Motor and Release Coil in "Flash" game.
	4B	-J- -G- G-Y-W	B-11	M&B	Energizes 1 Pin Coil. Also in circuit to Strike Zone Rollover switches.
4A	-J- -J-	A-12	N.O.	In circuit to 4 Pin Coil, on second shot, when player has a 3-4-6 leave.	
# 3 RELAY	6C	R-B BLU-Y	B-13	N.C.	In circuit to 10 Pin Coil thru "T" rollover switch.
	6B	GRAY-W -J-	B-12	N.C.	In series with switch 19A on #6 Relay.
	6A	-J- O-G BLU-R	A-9	M&B	In circuit to trip #3 Relay---also to pulse 1-9 Score Relay.
# 5 RELAY	8A	-J- R-Y BLU-W	A-10	M&B	In circuit to trip #5 Relay---also to pulse 1-9 Score Relay.
# 7 RELAY	10C	Y-R -J-	B-13	N.C.	In circuit to 10 Pin Coil, on second shot, when player has a 7-10 leave.
	10B	-J- R-G	A-12	N.C.	In circuit to 7 Pin Coil, on second shot, when player has a 2-7 leave.
	10A	-J- B-G BR-W	A-10	M&B	In circuit to trip #7 Relay---also to pulse 1-9 Score Relay.



RELAY	SW.	WIRE COLORS	DIAG. LOC.	TYPE	SWITCH OPERATION
<b>#9</b> RELAY	12A	-J- BLU-B -BR-	A-10	M&B	In circuit to trip #9 Relay---also to pulse 1-9 Score Relay.
<b>1-10</b> RELAY	13C	B-BLU Y-BR	B-4	N.C.	Opens circuit to Flash Motor and Release Coil.
	13B	-Y- GRAY-BR	D-10	N.O.	Runs Score Motor, thru Switch on Score Motor Relay.
	13A	W-G BR-B	C-10	N.O.	To Bell Coil.
	14C	G-Y B-W	D-11	N.C.	In circuit to Extra Shots Reset Relay during 10th Frame.
	14B	-J- BLU-Y	B-6	N.O.	In circuit to 100's Score Relay.
	14A	Y-BLU R-G Y-R	B-7	M&B	In circuit to 10-90 Score Relay, thru (3) "G" or (5) "J" rivets on Score Motor Disc.
<b>#10</b> RELAY	16C	BLU-Y -J-	A-12	N.C.	In circuit to 10 Pin Coil, on second shot, when player has a 3-10 leave.
	16B	-J- Y-B	B-13	N.C.	In circuit to 7 Pin Coil, on second shot, when player has a 7-10 leave.
	16A	-J- O-G BR-R	A-10	M&B	In circuit to trip #10 Relay---also to pulse 1-9 Score Relay.
<b>#8</b> RELAY	18A	-J- B-Y BR-Y	A-10	M&B	In circuit to trip #8 Relay---also to pulse 1-9 Score Relay.
<b>#6</b> RELAY	19A	-J- -J- -J-	A-12	M&B	In series with switch 4A on #1 Relay, or with switch 16C on #10 Relay.
	20C	O-R BLU-Y	B-13	N.C.	To 10 Pin Coil from "K" or "L" Rollover switch.
	20B	BLU-R -J-	A-12	N.C.	In series with switch 3A on #1 Relay.
	20A	-J- R-BLU BR-B	A-10	M&B	In circuit to trip #6 Relay---also to pulse 1-9 Score Relay.

RELAY	SW.	WIRE COLORS	DIAG. LOC.	TYPE	SWITCH OPERATION
<b>#4 RELAY</b>	21A	B-O -J- -J-	A-12	M&B	In series with switch 3A on #1 Relay, or with switch 10B on #7 Relay.
	22C	G-W R-G	B-12	N.C.	Energizes 7 Pin Coil thru 'I' or 'J' rollover switch.
	22B	-J- Y-G	A-12	N.C.	In series with switch 4A on #1 Relay.
	22A	-J- O-W B-Y	A-10	M&B	In circuit to trip #4 Relay,---also to pulse 1-9 Score Relay.
<b>#2 RELAY</b>	24C	R-W R-G	A-12	N.C.	Energizes 7 Pin Coil, thru "W" Roll-over Switch.
	24B	B-R -J-	B-12	N.C.	In series with Switch 21A on #4 Relay.
	24A	-J- O-R BLU-Y	A-9	M&B	In circuit to trip #2 Relay---also to pulse 1-9 Score Relay.
<b>1-10 RELAY</b>	26B	GRAY-R -J-	B-5	N.O.	To Bonus Relay in 11th Frame.
	26A	G-Y -J- G-O	B-9	M&B	Breaks circuit to 1-9 Score Relay and makes in circuit to Strike-Spare Advance Relay.
<b>R.O. SWS. CONTROL RELAY</b>	27B	-G- -BR-	B-11	N.C.	Opens circuits to Rollover Switches in Strike Zones.
	27A	-Y- -BLU-	A-9	N.O.	Pulses 1-9 Score Relay, thru "1" and "X" rivets on Score Motor Disc.
	28B	Y-O -J-	C-8	N.C.	In circuit to this relay coil.
	28A	R-G -J-	B-13	N.O.	In series with switch 10C on #7 Relay or with switch 16B on #10 Relay.
<b>11th FRAME RELAY</b>	29C	Y-B -Y-	E-9	N.C.	To "Bonus Frames Score" lites.
	29B	-J- W-R	B-6	N.C.	In series with Switch 14B on 1-10 Relay.

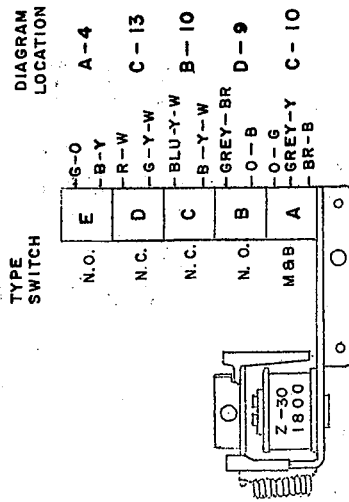
RELAY	SW.	WIRE COLORS	DIAG. LOC.	TYPE	SWITCH OPERATION
<i>11th</i> <b>FRAME RELAY</b>	29A	-Y- O-R	E-9	N.C.	To "Bonus Score Advances 400/200" lites.
	30C	W-G -Y-	E-6	N.C.	To Frame Drum lite.
	30B	BR-B -J-	B-4	N.C.	To 11th Frame Relay Coil, from Frame Control Unit Disc.
	30A	-J- -GRAY- -J-	B-5 & B-9	M&B	Opens in circuit to 1-9 Score Relay and closes in circuit to Bonus Relay.
<i>1st</i> <b>BALL RELAY</b>	31A	GRAY-Y O-B	C-10	N.O.	Runs Score Motor to 1st Position.
	32B	R-O -J-	A-4	N.C.	In series with Switch 4C on #1 Relay.
	32A	G-O -J-	A-3	N.C.	Opens circuit to this relay coil.
<i>2nd</i> <b>BALL-"A" RELAY</b>	33B	BLU-W Y-BR	A-4	N.C.	Opens circuit to Flash Motor and Release Coil in "Dual Flash" game.
	33A	G-W R-BLU	B-8	N.O.	In circuit to Strike-Spare Reset Relay thru (4) T1 rivets on Score Motor Disc.
	34C	-BR- G-Y-W	B-11	N.C.	Opens circuit to all Rollover Switches.
	34B	R-BR O-W	A-7	N.C.	In circuit to 100's Score Relay, thru "P1" rivets on Score Motor Disc.
	34A	-J- -Y- Y-R	A-3 & D-12	M&B	Completes circuit to 2nd Ball "B" Relay, thru 1st Position Cam Switch on Score Motor.
<i>2nd</i> <b>BALL-"B" RELAY</b>	35C	BR-Y Y-G	B-8	N.O.	In circuit to Strike-Spare Reset Relay from "P" rivet on Score Motor Disc.
	35B	O-G G-Y	D-11	N.O.	In series with Switch 14C on 1-10 Relay.
	35A	-Y- BR-W	D-8	N.O.	Trips Rollover Switches Control Relay, thru switch on #1 Relay.
	36B	W-BR -J-	C-12	N.C.	To 2nd Ball "B" Relay Coil.

RELAY	SW.	WIRE COLORS	DIAG. LOC.	TYPE	SWITCH OPERATION
	36A	-Y- O-B	D-10	N.O.	Runs Score Motor, thru switch 31A on 1st Ball Relay.
<b>GAME OVER RELAY</b>	37A	-J- -GRAY-	B-3	N.C.	Breaks power line (BLACK) to all scoring relays and rollover switches.
	38B	-Y- G-W	D-8	N.O.	Trips Start Relay when Coin Relay is energized.
	38A	R-Y-W -W- Y-BLU	E-5	M&B	Makes to Game-Over lite, and breaks circuit from 6 VOLT (WHITE) line.
<b>START RELAY</b>	39C	G-Y-W B-W	C-12	N.C.	Opens Circuit To Coin Relay, Coin Lockout Coil and 2nd Ball "B" Relay.
	39B	G-O -Y-	D-9	N.O.	Energizes Reset Coils on Frame Control and Coin Units.
	39A	-J- B-W BR-W	B-3	M&B	Closes to "A", "B", and "C" Reset Relays.
	40D	BR-R BLU-W	D-5	N.C.	Prevents Feedback to 1st Player 1000 Drum S.U. during Reset Cycle.
	40C	R-BLU G-W	B-8	N.O.	Pulses Strike-Spare Reset Relay, thru (4) T1 rivets on Score Motor.
	40B	GRAY-B -Y-	D-10	N.O.	Runs Score Motor.
	40A	G-R -O- -J-	C-12	M&B	To Player-Up Unit Reset Coil.

# A. C. RELAYS & SWITCHES

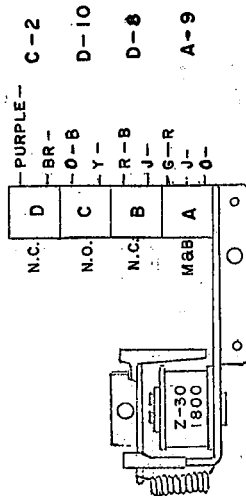
## SCORE MOTOR RELAY

IS ENERGIZED WHENEVER THE SCORE MOTOR IS RUNNING.



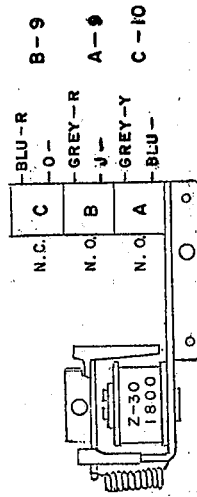
## SCORE CONTROL RELAY

IS ENERGIZED THRU THE "H" RIVETS ON SCORE MOTOR DISC., WHEN A PLAYER IS HOLDING A SPARE OR TWO STRIKES AND GETS LESS THAN 10 PINS ON HIS 1st SHOT. ALSO WHEN A STRIKE IS FOLLOWED BY A BLOW.



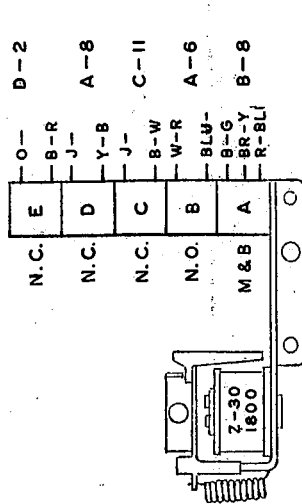
## EXTRA SHOTS RESET RELAY

IS ENERGIZED BY THE "Q" AND "V" RIVETS ON SCORE MOTOR DISC., THRU CIRCUITS ORIGINATING IN THE EXTRA SHOTS UNIT DISC.



## BONUS RELAY

IS ENERGIZED, DURING RESET CYCLE, BY SWITCHES ON "BONUS RESET RELAY", THRU ZERO BREAK SWITCHES ON (6) STRIKE-SPARE UNITS. IN 11th FRAME, DURING A "BONUS" GAME, IT IS ENERGIZED WHEN A STRIKE OR SPARE IS MADE.



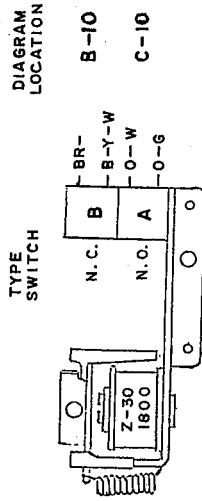
## OPERATION

- TRIPS 2nd BALL 'A' RELAY, THRU SWITCH ON REAR ROLLOVER RELAY.
- BREAKS CIRCUIT TO COIN RELAY, COIN LOCKOUT COIL AND 2nd BALL 'B' RELAY.
- PREVENTS #2 TO #10 RELAYS FROM TRIPPING WHILE SCORE MOTOR CYCLES.
- RUNS SCORE MOTOR THRU SWITCH ON 1-10 RELAY.
- IN CIRCUIT TO ROLLOVER MOTOR RELAY---ALSO IN HOLD CIRCUIT TO SCORE MOTOR RELAY.
- BREAKS CIRCUIT TO RELAY BANK RESET COIL.
- RUNS SCORE MOTOR THRU SWITCH ON 1st BALL RELAY.
- IN SERIES WITH SWITCH C ON BONUS RELAY.
- IN CIRCUIT TO PIN RESET RELAY---ALSO IN HOLD CIRCUIT TO SCORE CONTROL RELAY.
- BREAKS CIRCUIT TO SCORE CONTROL RELAY.
- ENERGIZES PIN RESET RELAY, THRU ZERO POSITION CAM SWITCH ON SCORE MOTOR.
- IN HOLD CIRCUIT TO THIS RELAY---ALSO CONTROLS POWER TO 3rd POSITION CAM SWITCH, B-R AND BLU.
- IN SERIES WITH SWITCH D ON SCORE CONTROL RELAY.
- IN HOLD CIRCUIT TO SCORE CONTROL RELAY.
- OPENS CIRCUIT TO EXTRA SHOTS RESET RELAY.
- IN CIRCUIT TO 100'S SCORE RELAY, THRU UI RIVETS ON SCORE MOTOR DISC.
- IN CIRCUIT TO STRIKE-SPARE RESET RELAY.

# A.C. RELAYS & SWITCHES

## ROLL-OVER MOTOR RELAY

IS ENERGIZED, ON THE FIRST SHOT, BY THE SAME CIRCUIT THAT RUNS THE SCORE MOTOR. IT IS THEN HELD IN UNTIL A CAM SWITCH ON 1ST POSITION OF SCORE MOTOR OPENS.

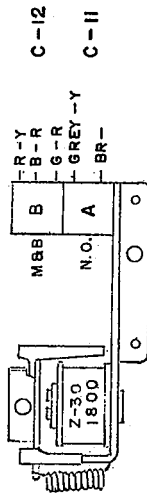


**OPERATION**  
BREAKS CIRCUIT TO ROLLOVER SWITCHES AS PUCK RETURNS TO PLAYER. (ON 1st SHOT).

HOLD CIRCUIT TO THIS RELAY, THRU 1st POSITION CAM SWITCH ON SCORE MOTOR.

## PLAYER RESET RELAY

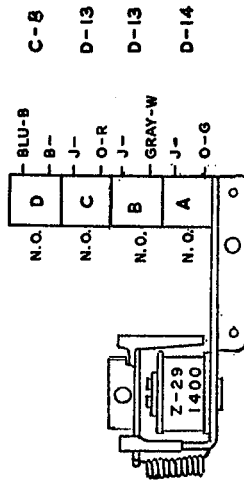
IS ENERGIZED BY THE "N" & "PM" RIVETS OF SCORE MOTOR, THRU THE COIN DISC & PLAYER UP DISC.



IN CIRCUIT TO PLAYER UP S.U. AND RESET COILS. ALSO TO FRAME CONTROL S.U. COIL. (THRU SW. A ON EXTRA SHOTS RESET RELAY).  
IN HOLD CIRCUIT TO THIS RELAY.

## COIN RELAY

IS PULSED BY DROP CHUTE SWITCH. THE FRONT DOOR SLAM SWITCH IS ALSO IN THIS CIRCUIT.

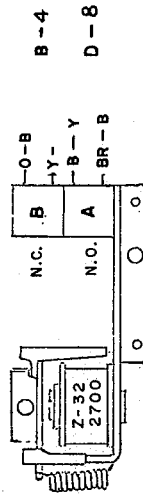


TRIPS START RELAY AND PULSES COIN METER.  
IN HOLD CIRCUIT TO THIS RELAY, THRU COIN UNIT E.O.S. SWITCH.

PULSES CREDIT BUTTON RELAY (IN MULTIPLE PLAY CIRCUIT).  
ENERGIZES COIN UNIT S.U. COIL. ALSO ENERGIZES CREDIT UNIT RESET COIL IN MULTIPLE PLAY CIRCUIT.

## LOCK RELAY

IS ENERGIZED BY A SWITCH ON THE "A" RESET RELAY.

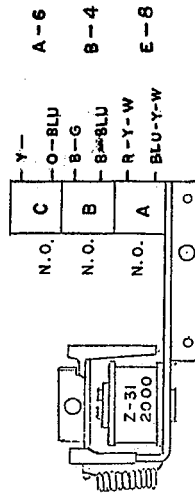


TRIPS CAME-OVER RELAY.

HOLD CIRCUIT TO THIS RELAY, THRU BACK-BOX TILT SWITCH.

## FLASH RELAY

IS ENERGIZED THRU THE GAME SELECTION DISC. IN "DUAL" OR "FLASH" GAMES.



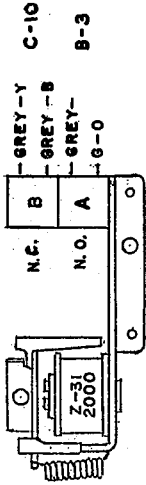
IN CIRCUIT TO 100's SCORE RELAY, THRU FLASH MOTOR DISC.

TO FLASH MOTOR AND FLASH MOTOR RELEASE COIL.

TO HOOD AND PLAYFIELD FLASHING LITES.

### REAR ROLL OVER RELAY

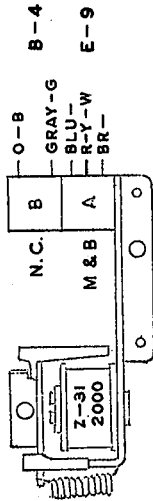
IS ENERGIZED BY ANY OF THE NINE (9) REAR ROLLOVER SWITCHES.



OPENS CIRCUIT TO SCORE MOTOR.  
TRIPS 1ST BALL RELAY AND 2ND BALL "A" RELAY.

### BONUS LITE RELAY

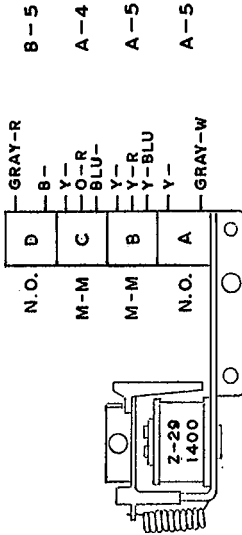
IS ENERGIZED BY GAME SELECTION DISC.



TRIPS GAME OVER RELAY IN 11th FRAME.  
OPENS CIRCUIT TO ALL 6 PLAYERS STRIKE AND SPARE LITES, AND MAKES TO ALL LITES USED ON BONUS GAME.

### BONUS RESET RELAY

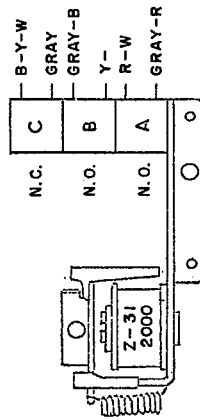
IS ENERGIZED BY A SWITCH ON START RELAY.



IN SERIES WITH SWITCHES BELOW.  
ENERGIZE BONUS RELAY, THRU ZERO SWITCHES ON 2ND, 3RD, 4TH, 5TH, OR 6TH PLAYER "STRIKE-SPARE" UNITS.

### PIN RESET RELAY

IS ENERGIZED BY SWITCH B ON EXTRA SHOTS RESET RELAY. IT IS ALSO PULSED BY RIVETS "S" & "Z" OF SCORE MOTOR DISC, THRU SWITCH A ON SCORE CONTROL RELAY.

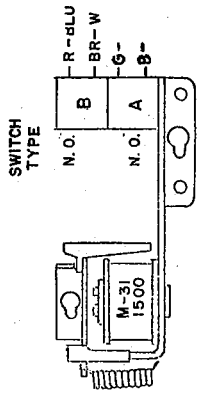


B-9 OPENS CIRCUIT TO ROLLOVER SWITCHES.  
D-9 RUNS PIN RESET MOTORS.  
A-9 IN HOLD CIRCUIT TO THIS RELAY.

# A. C. RELAYS & SWITCHES

## STRIKE-SPARE ADVANCE RELAY

IS PULSED ONCE FOR A SPARE AND TWICE FOR A STRIKE BY THE "F" RIVETS ON SCORE MOTOR DISC.



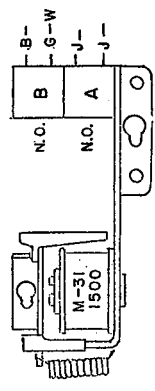
## OPERATION

ENERGIZES EXTRA SHOTS S.U. COIL IN 10TH FRAME.  
ENERGIZES (6) STRIKE-SPARE S.U. COILS THRU PLAYER UP DISC.

DIAGRAM LOCATION  
C-9  
C-7

## STRIKE-SPARE RESET RELAY

IS PULSED, DURING RESET CYCLE AND 11TH FRAME OF "BONUS" GAME, BY (L) T1 AND (L) AL RIVETS ON SCORE MOTOR. IN "REGULATION", IT IS CONTROLLED BY THE POSITION OF THE PLAYERS STRIKE-SPARE UNITS, THRU THE "K", "I" AND "P" RIVETS ON SCORE MOTOR.



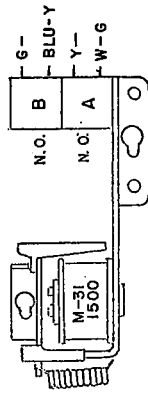
C-7

THESE SWITCHES ARE IN PARALLEL. THEY ENERGIZE THE STRIKE-SPARE UNIT RESET COILS THRU THE CORRESPONDING STRIKE-SPARE S.U. ZERO POSITION SWITCHES.

C-6

## 1-9 SCORE RELAY

OPERATES WHEN LESS THAN 10 PINS ARE MADE ON TWO SHOTS. IT ALSO OPERATES IN "REGULATION", AFTER THE FIRST SHOT, WHEN PLAYER IS HOLDING A SPARE OR TWO STRIKES AND GETS LESS THAN 10 PINS.



B-6

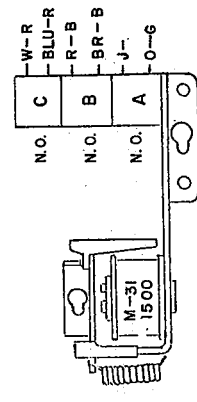
PULSES 10-90 SCORE RE. THRU 9TH POSITION SW. ON 1-9 DRUM UNITS.

D-3

PULSES 1-9 DRUM S.U. COILS THRU THE PLAYER UP DISC.

## 10-90 SCORE RELAY

OPERATES, IN "REGULATION" THRU THE "G" OR "J" RIVETS ON SCORE MOTOR.



A-6

PULSES 100'S SCORE RE. THRU 9TH POSITION SW. ON 10-90 DRUM UNITS.

C-10

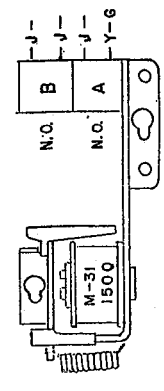
ENERGIZES BELL COIL.

D-4

PULSES 10-90 DRUM S.U. COILS THRU THE PLAYER UP DISC.

## 100'S SCORE RELAY

OPERATES, IN "DUAL" AND "FLASH", THRU RIVETS ON SCORE MOTOR AND FLASH MOTOR DISCS. IT ALSO OPERATES IN "BONUS" GAME THRU RIVETS ON SCORE MOTOR & FRAME CONTROL DISCS.



C-10

ENERGIZES BELL COIL.

D-5

PULSES 100'S DRUM S.U. COILS-ALSO 1000 DRUM S.U. COILS THRU 9TH POSITION SWITCHES ON 100'S DRUM UNITS.

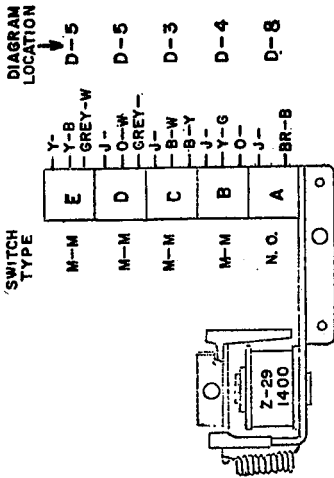


# A. C. RELAYS & SWITCHES

## "A"-RESET RELAY

THIS RELAY IS PULSED BY (11) "W" RIVETS ON SCORE MOTOR DISC. WHEN SWITCH ON START RELAY IS CLOSED.

(DURING RESET CYCLE)



## OPERATION

PULSES 1ST & 2ND PLAYER 100-900 DRUM.

PULSES 1ST & 2ND PLAYER 1,000 DRUM UNITS.

PULSES 1ST & 2ND PLAYER 1-9 DRUM UNITS.

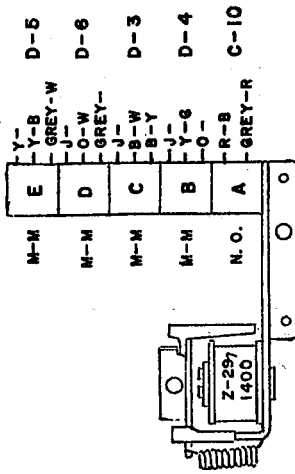
PULSES 1ST & 2ND PLAYER 10-90 DRUM UNITS.

ENERGIZES LOCK RELAY.

## "B"-RESET RELAY

THIS RELAY IS PULSED BY (11) "W" RIVETS ON SCORE MOTOR DISC. THRU SW. ON START RELAY.

(DURING RESET CYCLE)



PULSES 3RD & 5TH PLAYER 100-900 DRUM UNITS.

PULSES 3RD & 5TH PLAYER 1,000 DRUM UNITS.

PULSES 3RD & 5TH PLAYER 1-9 DRUM UNITS.

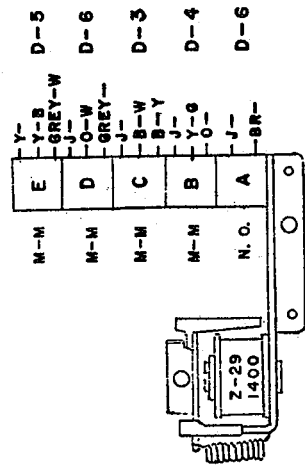
PULSES 3RD & 5TH PLAYER 10-90 DRUM UNITS.

ENERGIZES GAME SELECTION S.U. COIL THRU GAME SELECTION DISC.

## "C"-RESET RELAY

THIS RELAY IS PULSED BY (11) "W" RIVETS ON SCORE MOTOR DISC., THRU SW. ON START RELAY.

(DURING RESET CYCLE)



PULSES 4TH & 6TH PLAYER 100-900 DRUM UNITS.

PULSES 4TH & 6TH PLAYER 1,000 DRUM UNITS.

PULSES 4TH & 6TH PLAYER 1-9 DRUM UNITS.

PULSES 4TH & 6TH PLAYER 10-90 DRUM UNITS.

PULSES FRAME DRUM S.U.

(SHUFFLE ALLEY)

# 25 DRUM TYPE UNITS

(BACK VIEW)

5 TH PLAYER

0-9  
UNIT

10-90  
UNIT

100'S  
UNIT

1000'S  
UNIT

3 RD PLAYER

0-9  
UNIT

10-90  
UNIT

100'S  
UNIT

1000'S  
UNIT

1 ST PLAYER

0-9  
UNIT

10-90  
UNIT

100'S  
UNIT

1000'S  
UNIT

6 TH PLAYER

0-9  
UNIT

10-90  
UNIT

100'S  
UNIT

1000'S  
UNIT

4 TH PLAYER

0-9  
UNIT

10-90  
UNIT

100'S  
UNIT

1000'S  
UNIT

2 ND PLAYER

0-9  
UNIT

10-90  
UNIT

100'S  
UNIT

1000'S  
UNIT

FRAME  
UNIT

**NOTES**