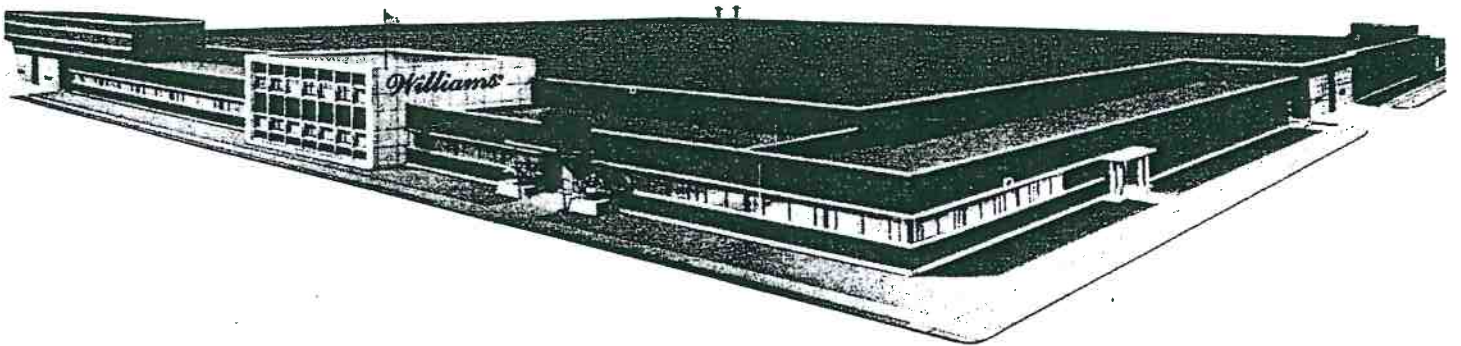


# Instruction Manual

*for*

# JOLLY ROGER



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

3401 N. California Ave.  
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Chicago, Ill. 60618, U.S.A.  
Cable Address: Wilcoin

# **IMPORTANT NOTICE**

**KINDLY INFORM LOCATIONS THAT THEY CAN TURN DISPLAY LIGHTS ON BY PRESSING LEFT FLIPPER BUTTON. MACHINE CAN STILL BE SHUT OFF BY TAPPING BOTTOM OF CABINET.**

**MASTER SWITCH (ON-OFF) IS LOCATED UNDERNEATH FRONT PART OF CABINET.**

## **CAUTION!**

The playboard on this machine has an improved finish with excellent wearing properties. Do not under any circumstances clean the board with water, water soap solutions or harsh abrasives. Avoid such things as steel wool, kitchen cleansers or abrasive hand soap. Water will weaken the adhering of the paint to the board and abrasives shorten the board life by many thousand plays. A wax base cleaner with negligible abrasive qualities used lightly, but frequently, will extend the board life to its full capabilities.

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## **SERVICEMAN TO REMOVE BACKGLASS:**

- WITH BACK DOOR REMOVED, PULL BACK ON BRACKETS AT INSIDE TOP OF LITE BOX.**
- FROM THE FRONT OF GAME, LIFT GLASS UP AND OUT.**

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

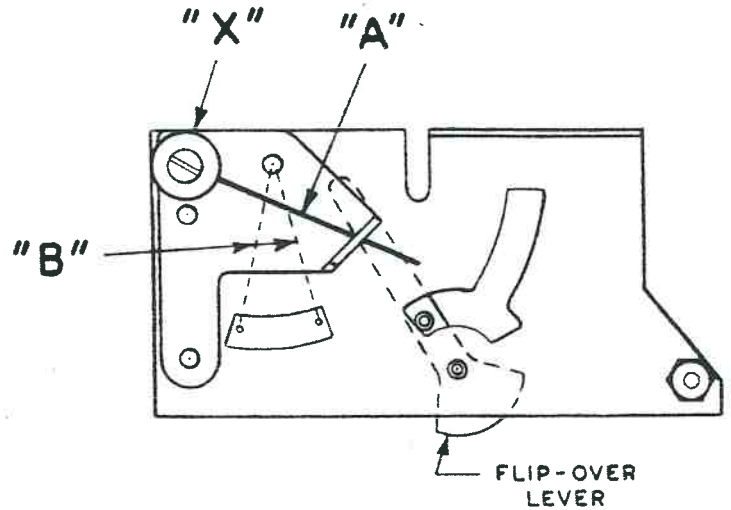
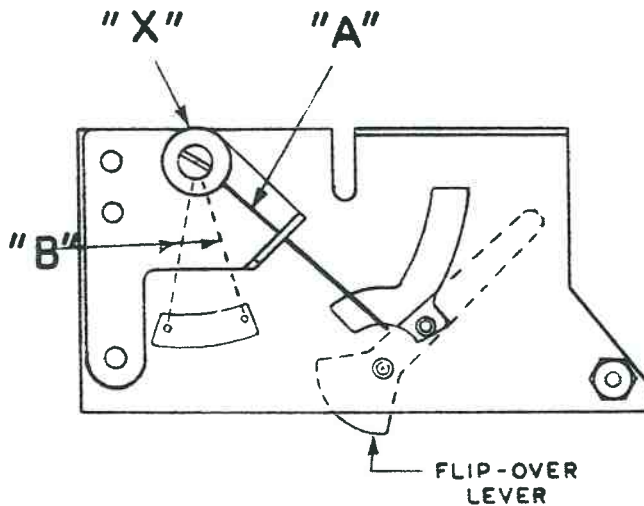
FOR 1 COIN - FOR 1 PLAY

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.

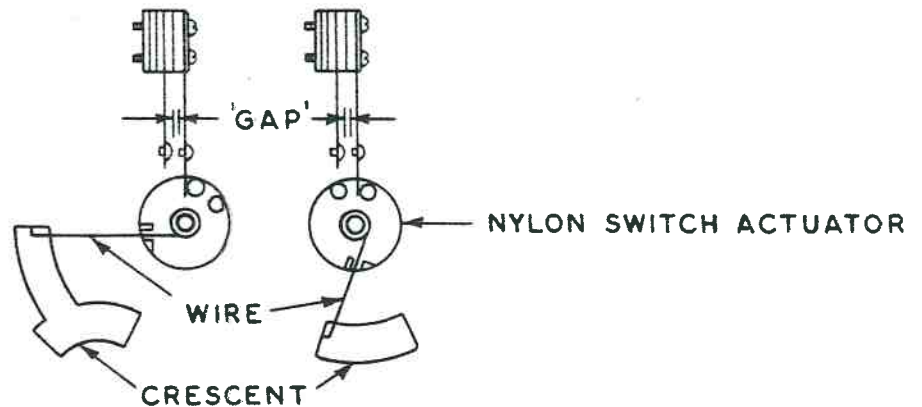
## **NOTE:**

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.

# 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 FOR "JOLLY ROGER"

UNIT NAME	CONTACT DISC	WIPER ASS'Y.	RATCHET GEAR ASSEMBLY	MOTORS
REPLAY	—	—	A-6400	
BALL COUNT	C-6932	C-6520	A-6402-5	
MATCH	C-6879	C-6520	A-6401	
ADVANCE	C-6417	C-6521	A-6403	14A-7805 (60 CYCLE)
PLAYER	C-6417	C-6521	A-6405-3	
COIN	C-6896	C-6520	A-6402-3	
O-9	B-6297	A-6294	3C-7128	
TENS	—	—	3C-7128	14A-7806 (50 CYCLE)
HUNDREDS	B-6297	A-6294	3C-7128	
THOUSANDS	B-6297	A-6294	3C-7128	
TARGET	B-6297	A-6294	3C-7128	

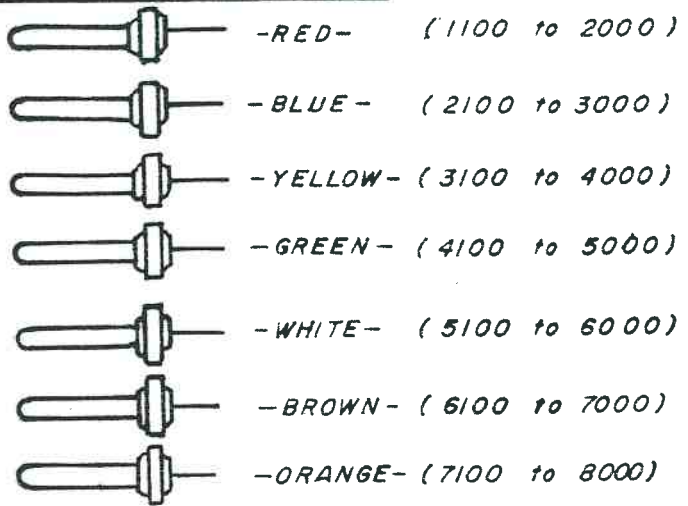
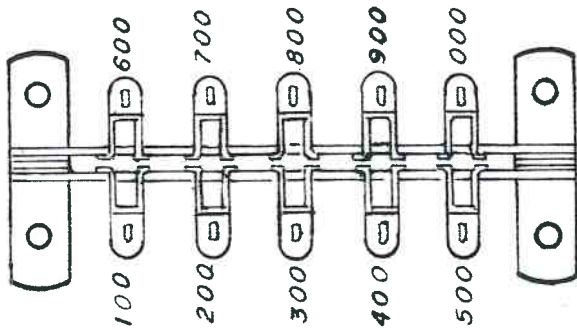
"JOLLY ROGER" COIL CHART

NOTICE:

THIS GAME OPERATES ON 24 VOLTS. WHEN ORDERING REPLACEMENT TRANSFORMERS, MOTORS, COILS OR METERS . . . . MAKE SURE TO SPECIFY CORRECT PART NUMBERS.

NUMBER	DESCRIPTION	LOCATION
14 A 7805	SCORE MOTOR - 60 CYCLE	MECH. PANEL
14 A 7806	SCORE MOTOR - 50 CYCLE	MECH. PANEL
15 A 6771	TRANSFORMER - 60 CYCLE	MECH. PANEL
15 A 6773	TRANSFORMER - 50 CYCLE	MECH. PANEL
B 6396	24 VOLT METER (Coil #XM 27-675)	MECH. PANEL
	<u>SOLENOID COILS</u>	
A 22-550	BALL RELEASE COIL PLAYER UNIT STEP UP MATCH UNIT STEP UP COIN UNIT STEP UP ADVANCE STEP UP	PLAYFIELD INSERT INSERT MECH. PANEL PLAYFIELD
A 23-600	BALL COUNT UNIT STEP UP REPLAY UNIT STEP UP	MECH. PANEL INSERT
A2-23-750	LARGE BELL KNOCKER	CABINET CABINET
B 26-800	COIN UNIT RESET REPLAY UNIT RESET PLAYER UNIT RESET BALL COUNT UNIT RESET SCORE DRUM UNIT ... (16 req'd.) TARGET DRUM UNIT	MECH. PANEL INSERT INSERT MECH. PANEL INSERT PLAYFIELD
FL 21-375/ 28-400	FLIPPER COILS ... (2 req'd.)	PLAYFIELD
G 22-550	JET BUMPER COILS ... ( 4 req'd.)	PLAYFIELD
G 23-750	KICKER COILS ... (2 req'd.)	PLAYFIELD
	<u>RELAY COILS</u>	
M 29-1000	1st & 2nd RESET RELAY 3rd & 4th RESET RELAY GAME OVER (TRIP)	INSERT INSERT MECH. PANEL
M 29-1100	1 PT. RELAY 10 PT. RELAY 100 PT. RELAY DRUM ADVANCE RELAY NO. 1 BUMPER RELAY NO. 2 BUMPER RELAY ADVANCE RELAY HOLD RELAY TARGET RELAY 300 RELAY 10¢ RELAY 25¢ RELAY	INSERT INSERT INSERT PLAYFIELD PLAYFIELD PLAYFIELD PLAYFIELD PLAYFIELD PLAYFIELD MECH. PANEL MECH. PANEL
M 30-1400	SETUP	PLAYFIELD
Z 27-1000	REPLAY RELAY COIN RELAY RESET RELAY OUTHOLE RELAY PLAYER RESET RELAY GAME OVER (LATCH)	MECH. PANEL MECH. PANEL MECH. PANEL MECH. PANEL MECH. PANEL MECH. PANEL
Z 28-1150	LOCK RELAY TILT RELAY EXTRA BALL	MECH. PANEL MECH. PANEL MECH. PANEL
Z 28-1200	BALL INDEX RELAY	MECH. PANEL
M1-31P-1500	COIN LOCKOUT	DOOR

## ADJUSTMENTS IN BACKBOX



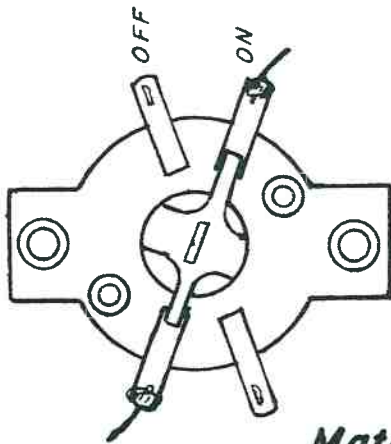
### Hi-Score Adjustment

Insert plugs into 10 Point Female at desired positions.

Examples:

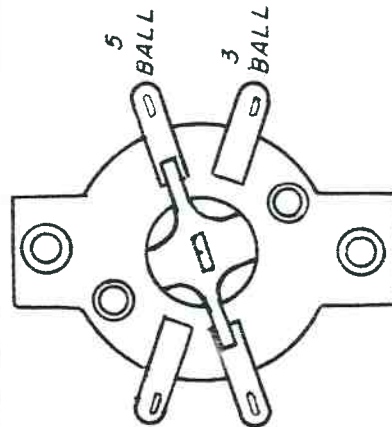
Yellow wire into 300 position scores at 3300.

Yellow wire into 000 position scores at 4000.



### Number Match Adjustment

In 'ON' position, a number match lite will appear when game is over. To award replays, when number is matched, Extra Ball Adjustment Jack must be in 'Replay' position. In 'Off' position, Number Match is inoperative.

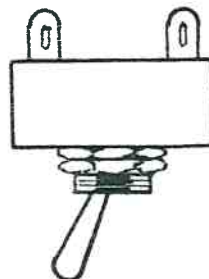


### No. of Balls Adjustment

This switch changes 3 Ball to 5 Ball play, or vice versa.

**(Located under front of Cabinet)**

### Master On-Off Switch

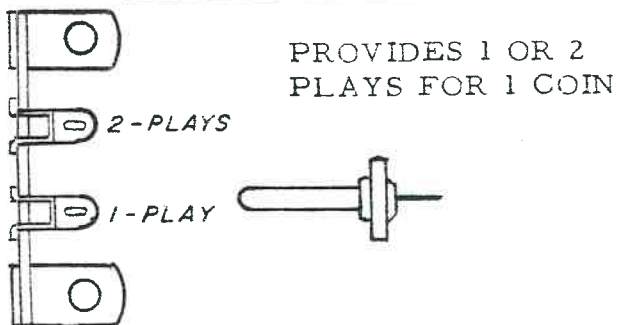


CONTROLS POWER TO TRANSFORMER

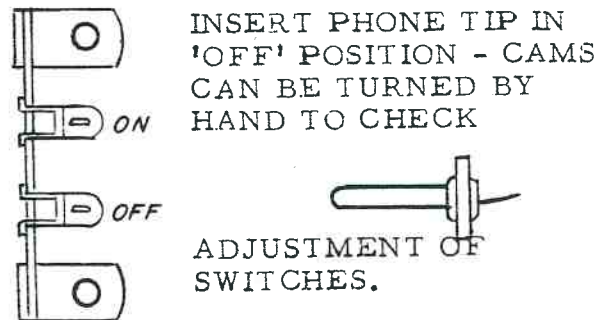


# ADJUSTMENTS ON MECHANISM PANEL

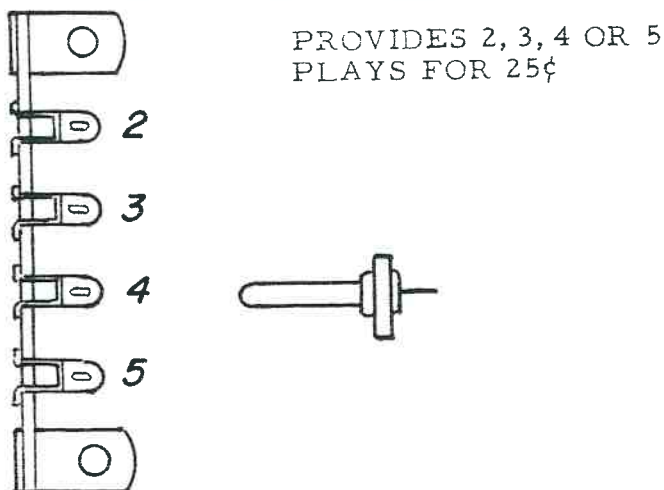
## 10¢ Adjustment



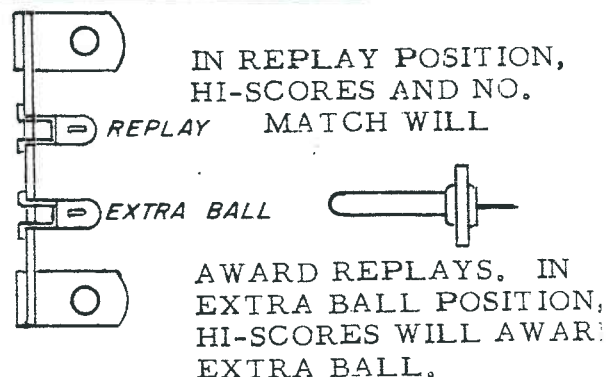
## Motor Service Jack



## 25¢ Adjustment



## Extra Ball Jack Adj.



## THE POWER TRANSFORMER,

LOCATED ON PANEL. IS EQUIPPED WITH A SECONDARY TAP. IF YOUR GAME IS ON LOCATION WITH EXTREMELY LOW LINE VOLTAGE, REMOVE LEAD FROM LUG MARKED 24 VOLT AND SOLDER TO ALTERNATE LUG MARKED "HIGH". THIS WILL BOOST SECONDARY VOLTAGE BY APPROXIMATELY 4 VOLTS.

## LEG LEVELERS,

ARE PROVIDED FOR TWO PURPOSES - 1st TO LEVEL GAME ON LOCATION, 2nd TO INCREASE PITCH FOR GAME PERCENTAGING. IF IT IS DESIRED TO SPEED UP PLAY OR DECREASE SCORES, RAISE REAR LEG LEVELERS TO INCREASE PITCH.

## SUGGESTED SCORE CARDS:

### FOR REGULAR PLAY:

5 BALL PLAY - 343-11

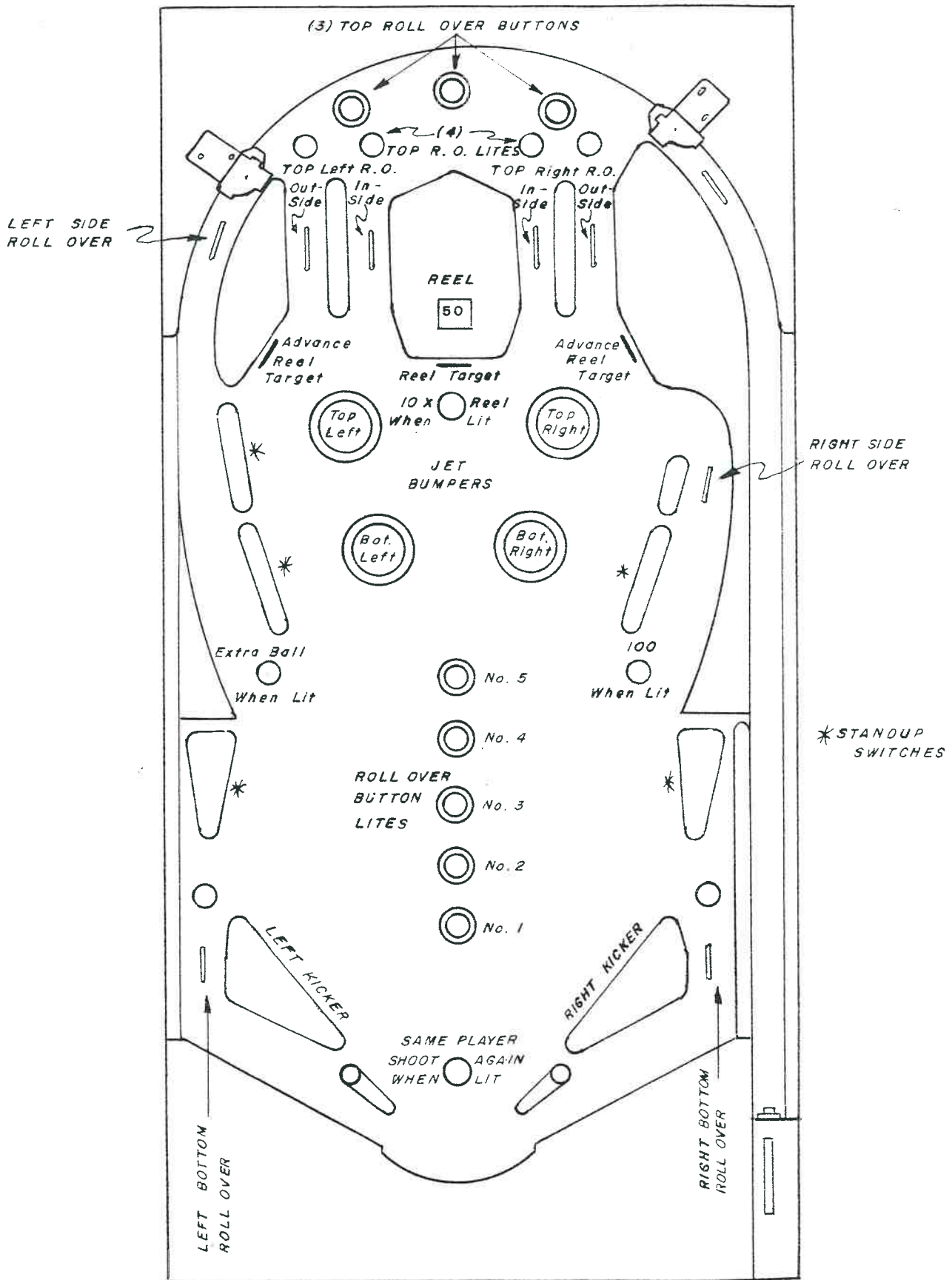
3 BALL PLAY - 343-20

### FOR EXTRA BALL ONLY (NO REPLAYS)

5 BALL PLAY - 343 EB-1

3 BALL PLAY - 343 EB-2

# PLAYFIELD LAYOUT SHOWING LOCATION OF TARGETS, ROLL OVERS, AND JET BUMPERS



## "JOLLY ROGER"

### "JOLLY ROGER" OPERATES AS FOLLOWS

AS THE CANNON BALL ADVANCES FROM THE BOTTOM POSITION, THE TOP ROLLOVER LANES LITE TO INCREASE SCORING VALUES FROM 10 TO 100 POINTS. WHEN CANNON BALL REACHES TOP (EVERY 5TH POSITION ON ADVANCE UNIT) ALL ROLLOVER LANES LITE TO INCREASE SCORING VALUE, AS INDICATED. THE CENTER TARGET LITES TO SCORE 10 TIMES REEL VALUE. ALSO, THE LEFT SIDE ROLLOVER LANE LITES TO SCORE EXTRA BALL.

THE JET BUMPER LITES ARE CONTROLLED BY THE ADVANCE UNIT, WITH ALL 4 OF THEM LITING TOGETHER WHEN CANNON BALL REACHES THE TOP.

WHEN ADVANCE UNIT STEPS TO NEXT POSITION, CANNON BALL WILL START AGAIN AT BOTTOM. ONLY THE RIGHT SIDE ROLLOVER LANE AND THE CENTER TARGET WILL REMAIN LIT UNTIL CENTER TARGET IS HIT OR BALL LEAVES PLAYFIELD.

EXTRA BALLS CAN ALSO BE AWARDED BY HI-SCORES, AS INDICATED ON SCORE CARD, IF EXTRA BALL ADJUSTMENT JACK IS IN "EXTRA BALL" POSITION.

FOR INFORMATION ON ADJUSTMENT JACKS, REFER TO PAGES 6 AND 7.

PLAYFIELD POST ADJUSTMENTS, TO MAKE GAME "CONSERVATIVE" OR "LIBERAL", WILL BE FOUND ON PAGE 13.

## **I 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.

## **II FUSES**

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

## **III 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 Benzol, Naptha, White Gasoline, or Carbon Tetrachloride, 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.

## **IV RELAY AND SWITCH ADJUSTMENT**

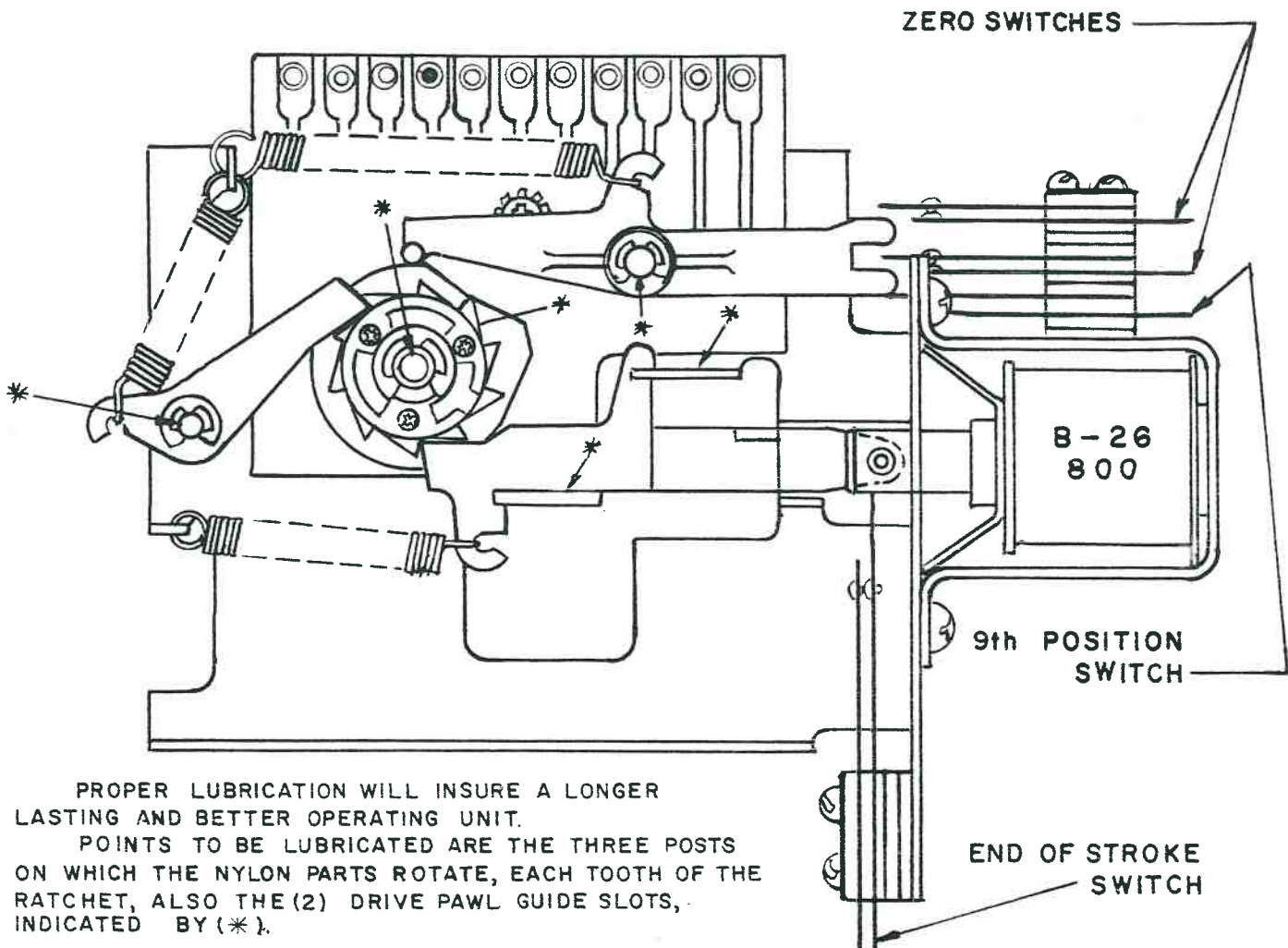
Where relay adjustments are called for, before bending blades, in all cases, on any machine, make certain that the screws holding the switch stacks are down very tightly. This is suggested because the plastic spacers in the switch stacks have occasionally shrunk by drying out, causing a poor adjustment.

## WHAT TO DO IF:

1. Lights are out, game is inoperative:
  - a. Check A.C. cord and plugs for breaks, cuts or other damage.
  - b. Check fuses, located behind cash box.
  - c. Check master switch, located under front of cabinet.
  - d. Check plugs and jacks for proper installation.
2. Lights are out, game operates:
  - a. Check two switches on Lock Relay: Blue-Yellow-White to Green-Yellow-White, and Brown-Yellow-White to Green-Yellow-White.
  - b. Check 10 AMP fuse - Blue wire, and 15 AMP fuse - Brown wire.
3. Lights are on, but all coins are rejected:
  - a. If Coin Lockout Coil (located on front door) is not energized, check the Last Position Break Switch on Replay Unit: Black and Black-Red. Check switch on Index Cam; Black-Orange and Yellow. Check switch on Reset Relay; Green-Red and White-Gray.
  - b. If Coin Lockout Coil is energized, check the wire forms actuated by the armature on this coil. Then check the slug rejector.
4. Game resets but Game Over Relay trips immediately:
  - a. Check switch on Lock Relay Blue-Red and Yellow.
  - b. Check Ball Count Unit Reset Coil.
  - c. Check Ball Count Unit wiper fingers for proper resetting.
5. Game is over, replays are indicated, but the Replay Button fails to start a new game:
  - a. Check Make and Break Switch on Index Cam (Green-Red and Yellow).
  - b. Check switch on Reset Relay (Green-Red and White-Gray).
  - c. Check Reply Button Switch.
  - d. Check Replay Unit Zero Switch.
  - e. Check switch on Game Over Relay (White-Brown and White-Blue).
  - f. Check Replay Relay Coil.
6. Jet Bumper, when hit, remains energized:
  - a. Left top or right bottom Jet Bumper Switch should energize the No. 1 Bumper Relay. Switches 1C and 1D of No. 1 Bumper Relay should then energize the left top and right bottom Jet Bumper Coils. The No. 1 Bumper Relay will hold in until the End-Of-Stroke Switch on left top Jet Bumper is opened. Check the coils and switches referred to above.
  - b. The right top and left bottom Jet Bumper Coils are energized by switches on the No. 2 Bumper Relay, which holds in until right top Jet Bumper End-Of-Stroke Switch is opened.
7. Extra Ball Relay does not energize as ball makes Left Side Rollover Switch, when
  - a. Check Advance Unit Disc; feed from grounded wiper to White-Brown.
  - b. Check Left Side Rollover Switch; Red-Black and White-Brown.
  - c. Check Extra Ball Relay Coil.

# SCORE DRUM UNIT

WITH PRINTED CIRCUIT AND CONTACT RING



PROPER LUBRICATION WILL INSURE A LONGER LASTING AND BETTER OPERATING UNIT.

POINTS TO BE LUBRICATED ARE THE THREE POSTS ON WHICH THE NYLON PARTS ROTATE, EACH TOOTH OF THE RATCHET, ALSO THE (2) DRIVE PAWL GUIDE SLOTS, INDICATED BY (\*).

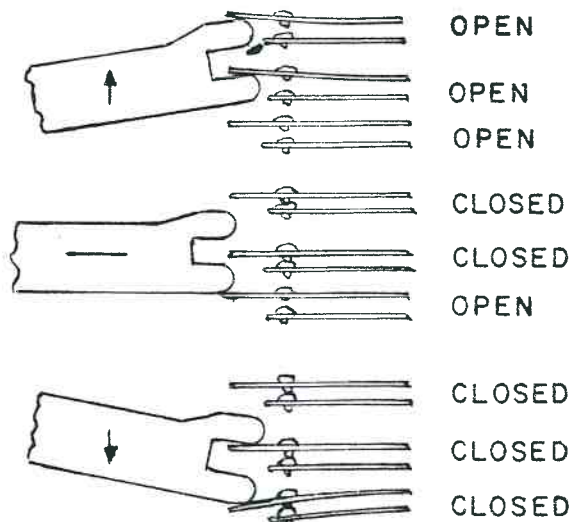
**LUBRICATION: DO NOT PUT LUBRICANT ON DRIVE ARMATURE**

## SWITCH ADJUSTMENT

AT "0" OR INDEX POSITION ALL SWITCHES ARE OPEN AS SHOWN.

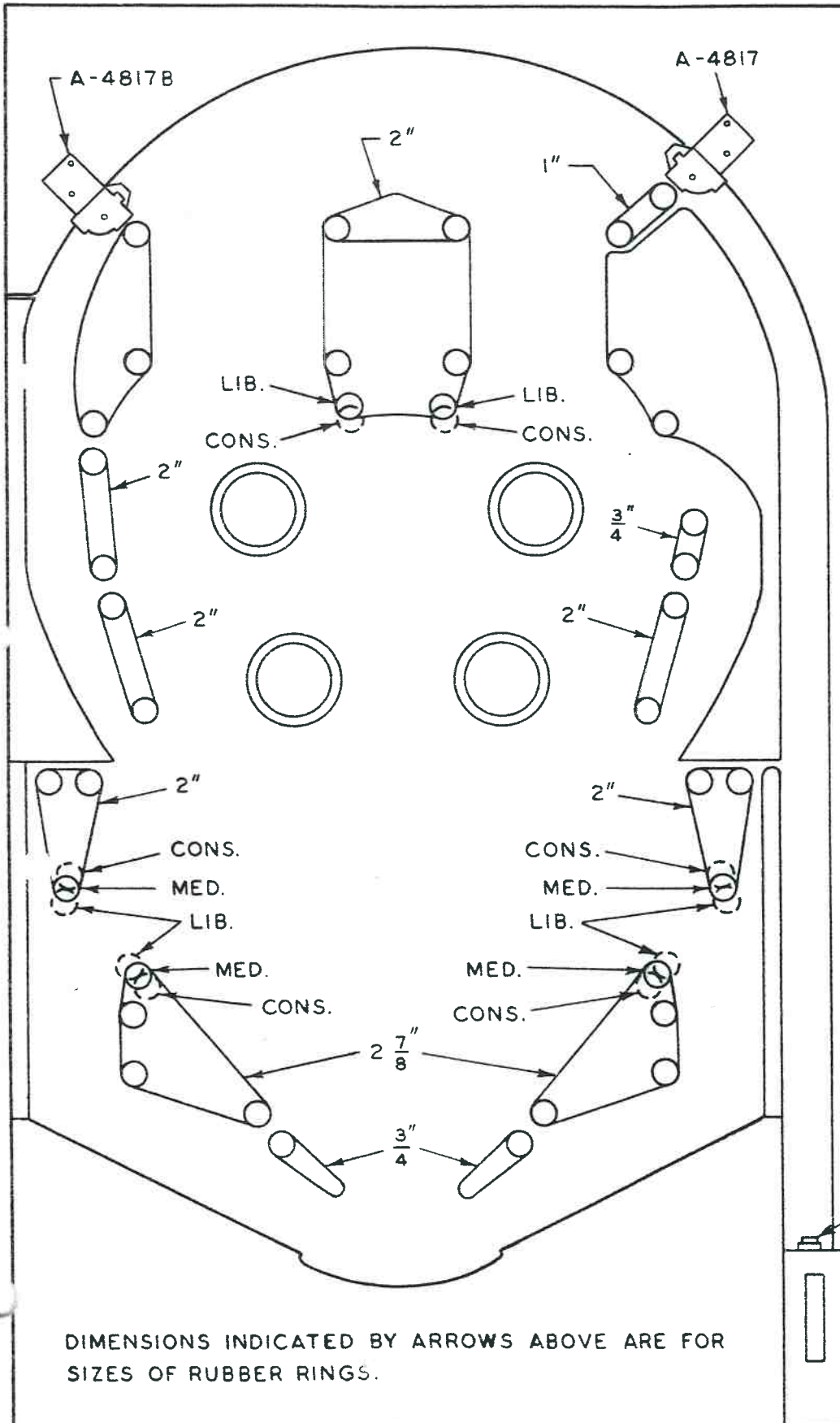
AT 1st. TO 8th. POSITION TOP SWITCHES ARE CLOSED—BOTTOM SWITCH REMAINS OPEN.

AT 9th POSITION ALL SWITCHES ARE CLOSED AS SHOWN.



# "JOLLY ROGER" - POST ADJUSTMENT SHEET

TO MAKE GAME MORE "CONSERVATIVE" OR "LIBERAL" - MOVE POSTS 3/16" AS SHOWN IN SKETCH BELOW. SPOTTING HOLES ARE PROVIDED AND CAN BE SEEN ON REMOVAL OF POSTS.



ABBREVIATIONS:  
 CONS. - CONSERVATIVE  
 LIB. - LIBERAL  
 MED. - MEDIUM

RUBBER RING NUMBERS

23A-6300	5/16" I.D.
23A-6301	3/4" I.D.
23A-6302	1" I.D.
23A-6305	2" I.D.
23A-6307	2 7/8" I.D.

A-4817 - BALL GATE ASS'Y (R)  
 A-4817B - BALL GATE ASS'Y (L)

23A-6327 - BALL SHOOTER RUBBER TIP

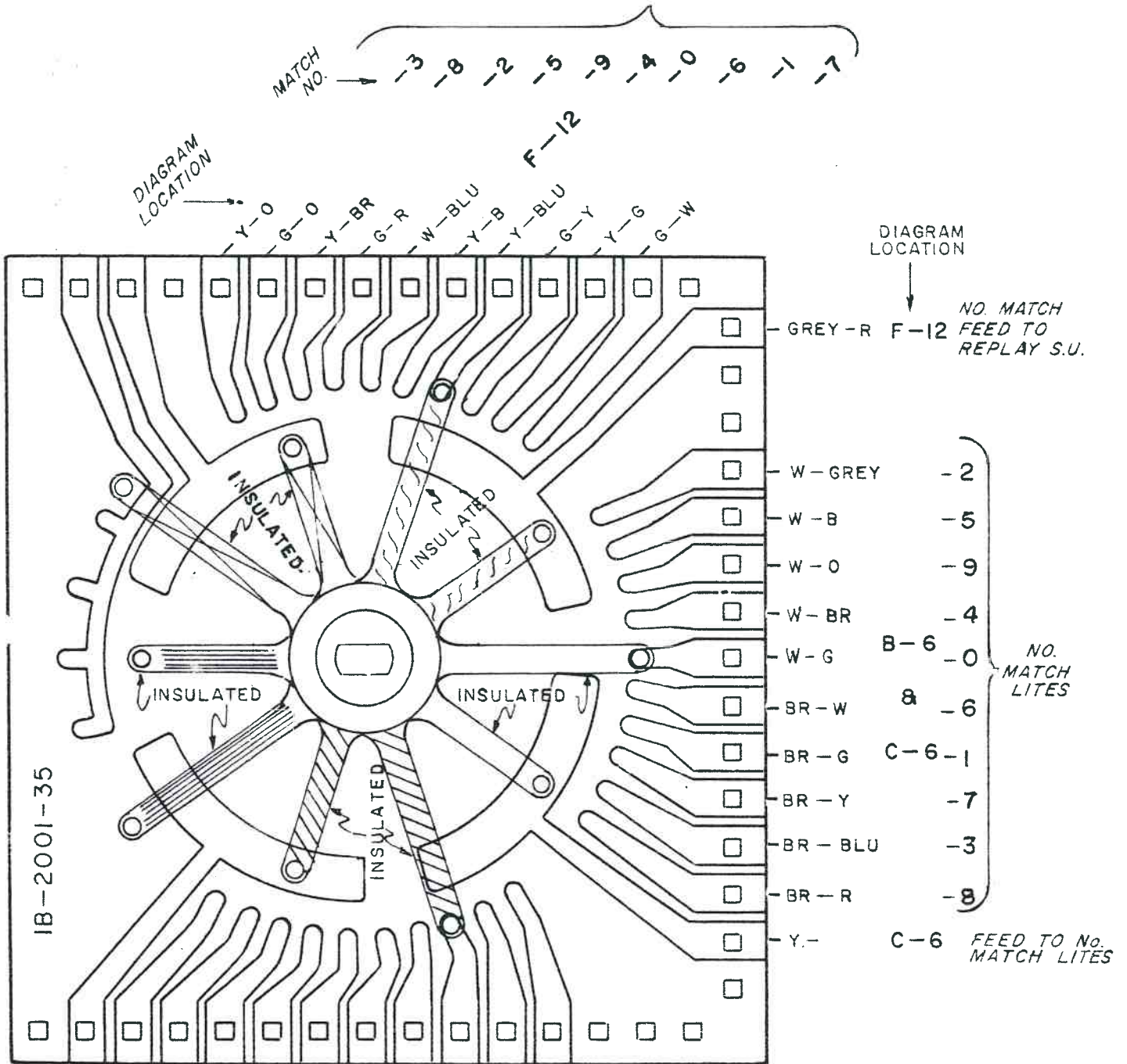
DIMENSIONS INDICATED BY ARROWS ABOVE ARE FOR SIZES OF RUBBER RINGS.

# No. MATCH UNIT

THIS UNIT ADVANCES ONE STEP EACH TIME THE ONE POINT RELAY IS PULSED.

View looking at  
WIPER FINGER side

IN No. MATCH CIRCUIT  
THESE WIRES COME FROM  
THE 1-PT. D.U. DISC OF  
ALL FOUR PLAYERS.

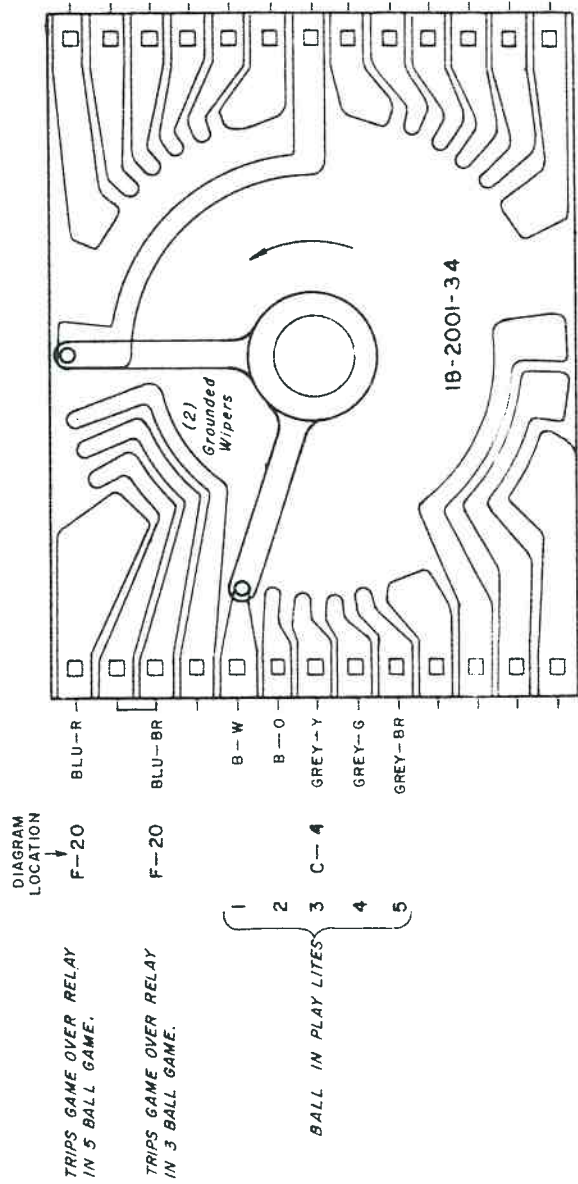




# BALL COUNT UNIT DISC

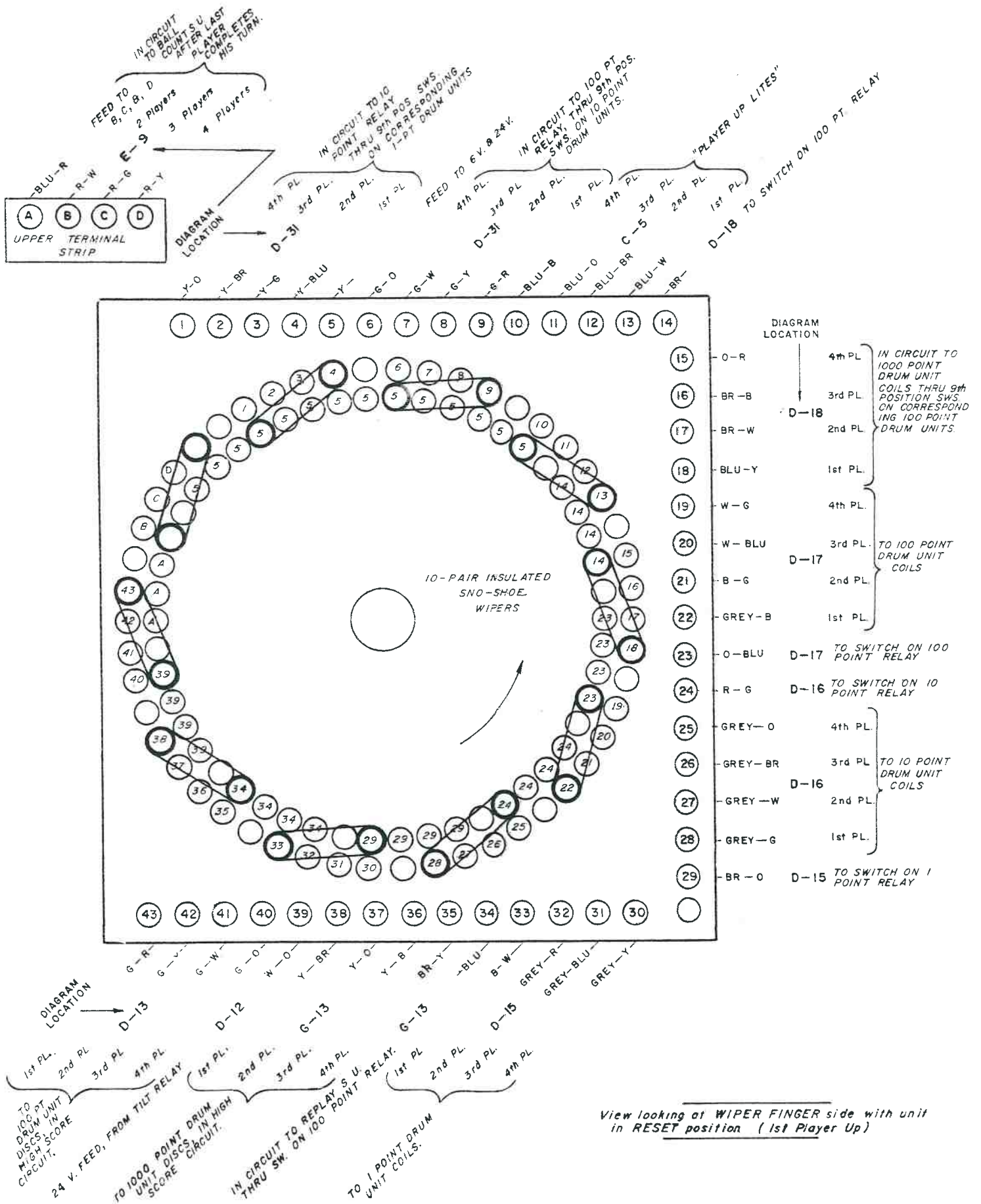
THIS UNIT RESET AT THE START OF A NEW GAME, (DURING RESET CYCLE). IT ADVANCES ONE STEP EACH TIME THE LAST PLAYER COMPLETES HIS TURN.

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





# PLAYER UNIT DISC



View looking at WIPER FINGER side with unit in RESET position (1st Player Up)



# A. C. RELAYS & SWITCHES

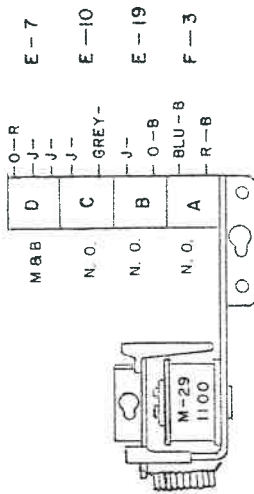
(On Mechanism Panel)

## OPERATION

### 10¢ RELAY

IS ENERGIZED BY 10¢ COIN SWITCH, IF 10¢ ADJUSTMENT JACK IS INSERTED INTO " 2 PLAYS " POSITION.

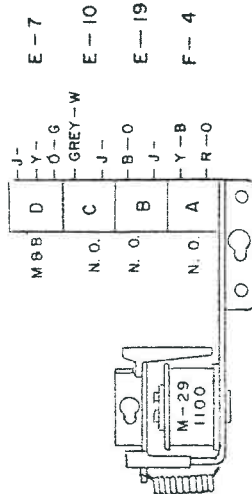
DIAGRAM LOCATION



IN CIRCUIT TO KNOCKER COIL - ALSO RUNS SCORE MOTOR  
 PULSES REPLAY S.U. FROM IMPULSE CAM SW. B  
 ENERGIZES LOCK RELAY  
 IN HOLD CIRCUIT TO THIS RELAY

### 25¢ RELAY

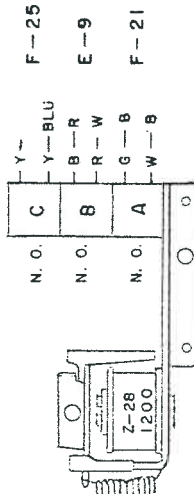
IS ENERGIZED BY THE 25¢ COIN SWITCH.



IN CIRCUIT TO KNOCKER COIL - ALSO RUNS SCORE MOTOR  
 PULSES REPLAY S.U. FROM IMPULSE CAM SW. B.  
 ENERGIZES LOCK RELAY  
 IN HOLD CIRCUIT TO THIS RELAY

### BALL INDEX RELAY

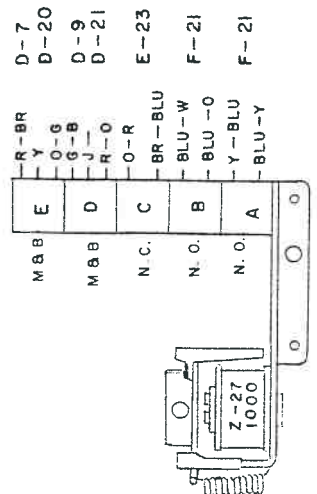
IS ENERGIZED WHEN GAME IS TILTED, OR AS SOON AS A SCORE IS MADE AFTER EACH BALL IS SHOT.



PROVIDES A HOLD CIRCUIT FOR EXTRA BALL RELAY WHILE BALL IS ON THE PLAYFIELD  
 IN CIRCUIT TO PLAYER UP UNIT STEP UP AND RESET COILS  
 IN HOLD CIRCUIT TO THIS RELAY

### OUTHOLE RELAY

IS ENERGIZED, DURING PLAY, BY THE OUTHOLE SWITCH WHEN SCORE MOTOR IS AT INDEX POSITION.



IN CIRCUIT TO TILT RELAY - ALSO RUNS SCORE MOTOR  
 IN SERIES WITH SWITCH A ON BALL INDEX RELAY OR IN SERIES WITH SWITCH B ON BALL INDEX RELAY  
 IN HOLD CIRCUIT TO SET-UP RELAY  
 ENERGIZES BALL RELEASE COIL FROM CAM SWITCH 3B  
 HOLD CIRCUIT TO THIS RELAY FROM CAM SWITCH 5B

# A. C. RELAYS & SWITCHES

(On Mechanism Panel)

## TILT RELAY

IS ENERGIZED BY THE TILT SWITCHES, AND HELD IN UNTIL THE OUTHOLE RELAY PULLS IN

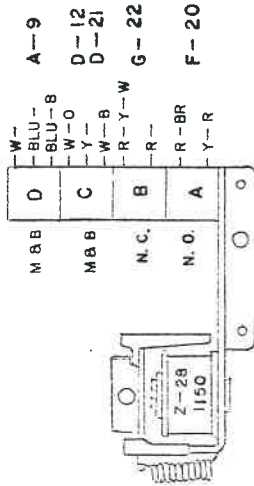
DIAGRAM LOCATION

## OPERATION

BREAKS CIRCUIT TO PLAYFIELD LITES AND MAKES TO TILT LITE  
BREAKS HIGH SCORE CIRCUIT TO REPLAY S.U. OR EXTRA BALL RELAY, AND ENERGIZES BALL INDEX RELAY

BREAKS CIRCUIT TO PLAYFIELD SWITCHES

HOLD CIRCUIT TO THIS RELAY FROM SWITCH ON OUTHOLE RELAY



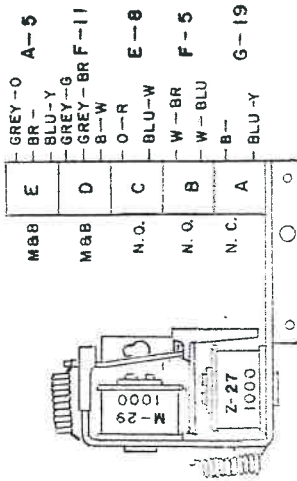
## GAME OVER RELAY (Interlock)

LATCH COIL IS ENERGIZED DURING RESET CYCLE, BY THE COIN RELAY AND RESET RELAY THRU CAM SWITCH 1B.

TRIP COIL IS ENERGIZED DURING RESET CYCLE, BY THE COIN RELAY THRU ZERO BREAK SWITCH ON BALL COUNT OR PLAYER UNIT. DURING PLAY, TRIP COIL IS ENERGIZED BY THE BALL COUNT UNIT DISC (AFTER LAST BALL HAS BEEN PLAYED), OR WHEN THE LOCK RELAY DROPS OUT.

## EXTRA BALL RELAY

IS ENERGIZED BY THE LEFT SIDE ROLLER SWITCH, THRU THE ADVANCE UNIT DISC; OR BY THE HIGH SCORE CIRCUIT



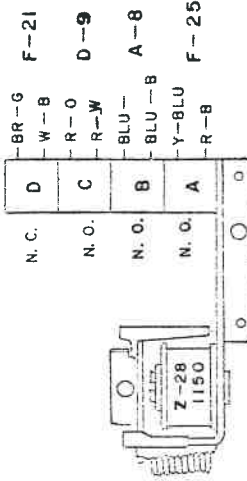
BREAKS CIRCUIT TO "PLAYER UP" LITES AND MAKES TO "GAME OVER" LITE

BREAKS HIGH SCORE CIRCUIT, AND MAKES IN NUMBER MATCH CIRCUIT, TO REPLAY S.U. OR EXTRA BALL RELAY

ENERGIZES RESET RELAY, FROM SWITCH ON COIN RELAY

ENERGIZES REPLAY RELAY, FROM REPLAY BUTTON SWITCH

BREAKS POWER TO COILS OPERATED BY SWITCHES ON PLAYFIELD



INSURES EXTRA BALL RELAY DROPS OUT BEFORE BALL INDEX RELAY PULLS IN

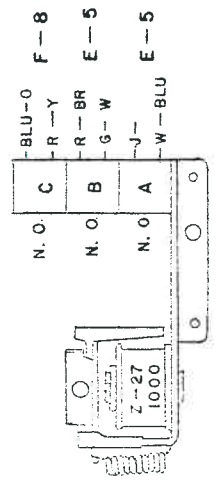
IN SERIES WITH SWITCH B ON BALL INDEX RELAY

TO "SHOOT AGAIN" LITES ON PLAYFIELD AND IN BACK BOX

IN HOLD CIRCUIT TO THIS RELAY

## REPLAY RELAY

IS ENERGIZED BY THE REPLAY BUTTON, WHEN ONE OR MORE CREDITS ARE ACCUMULATED, UNTIL 4 PLAYERS ARE SET UP



PULSES REPLAY UNIT RESET COIL, FROM CAM SWITCH 1B

ENERGIZES COIN RELAY

HOLD CIRCUIT TO THIS RELAY

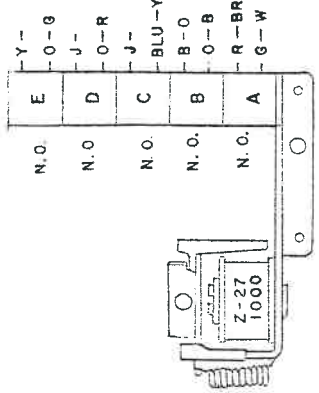
# A.C. RELAYS & SWITCHES

(On Mechanism Panel)

## OPERATION

DIAGRAM LOCATION

D-7 RUNS SCORE MOTOR  
 D-8 ENERGIZES RESET RELAY THRU SWITCH ON GAME OVER RELAY  
 D-20 TRIPS GAME OVER RELAY (ON RESET) THRU PLAYER UNIT OR BALL COUNT UNIT ZERO BREAK SWITCHES  
 E-19 ENERGIZES LOCK RELAY  
 E-4 IN HOLD CIRCUIT TO THIS RELAY

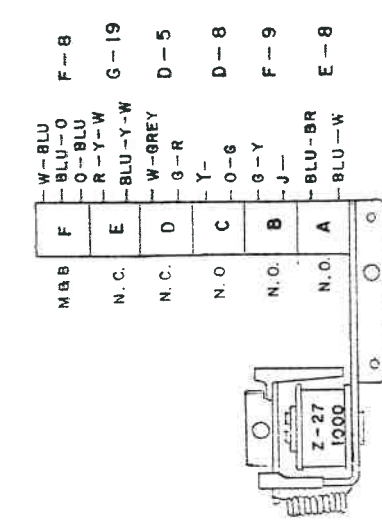


## COIN RELAY

IS ENERGIZED BY A COIN SWITCH OR BY THE REPLAY RELAY

## RESET RELAY

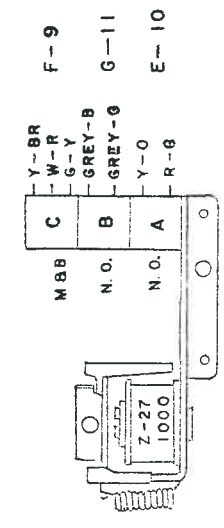
IS ENERGIZED BY THE COIN RELAY WHEN THE GAME OVER RELAY IS TRIPPED



IN CIRCUIT TO COIN, BALL COUNT AND PLAYER UNIT RESET COILS (DURING RESET CYCLE). AFTER RESET CYCLE, THIS SWITCH IN CIRCUIT TO COIN UNIT STEP-UP COIL  
 IN SERIES WITH SWITCH A ON GAME OVER RELAY  
 DOES NOT ALLOW REPLAY RELAY TO ENERGIZE, AFTER IT HAS DROPPED OUT (DURING RESET CYCLE)  
 RUNS SCORE MOTOR  
 IN CIRCUIT TO PLAYER UNIT RESET COIL (DURING RESET CYCLE)  
 HOLD CIRCUIT TO THIS RELAY, THRU DRUM UNITS (16) ZERO POSITION BREAK SWITCHES

## PLAYER RESET RELAY

IS ENERGIZED BY THE BALL COUNT UNIT END-OF-STROKE SWITCH



IN SERIES WITH SWITCH B ON BALL INDEX RELAY  
 TO REPLAY S.U. COIL, IN NO. MATCH CIRCUIT, AFTER GAME IS OVER  
 IN HOLD CIRCUIT TO THIS RELAY

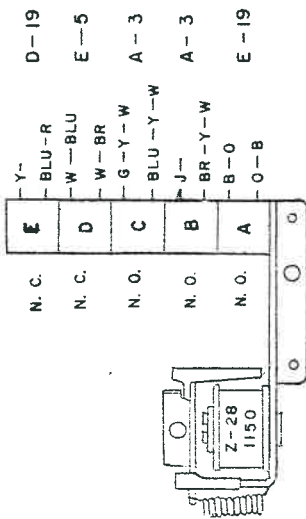
# A.C. RELAYS & SWITCHES

( On Mechanism Panel )

## LOCK RELAY

IS ENERGIZED BY THE 10¢, 25¢, OR COIN RELAYS. ALSO BY THE LEFT FLIPPER SWITCH

DIAGRAM LOCATION



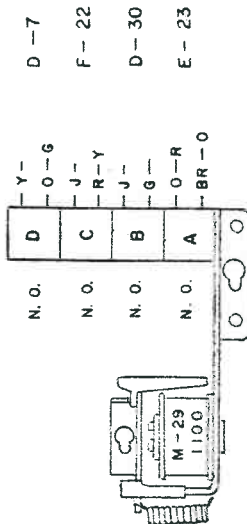
## OPERATION

TRIPS GAME OVER RELAY  
 IN CIRCUIT TO REPLAY RELAY, FROM REPLAY BUTTON  
 6 VOLT POWER TO PLAYFIELD LITES  
 6 VOLT POWER TO BACK-BOX LITES  
 IN HOLD CIRCUIT TO THIS RELAY, THRU KICK-OFF SWITCH

## TARGET RELAY

IS ENERGIZED BY THE CENTER TARGET SWITCH

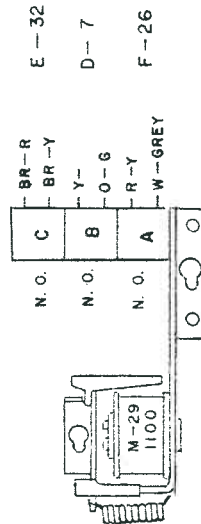
( On Playfield )



RUNS SCORE MOTOR  
 ENERGIZES HOLD RELAY  
 PULSES 10 FT. OR 100 FT. RELAY, THRU IMPULSE CAM SWITCH D  
 IN HOLD CIRCUIT TO THIS RELAY

## 300 RELAY

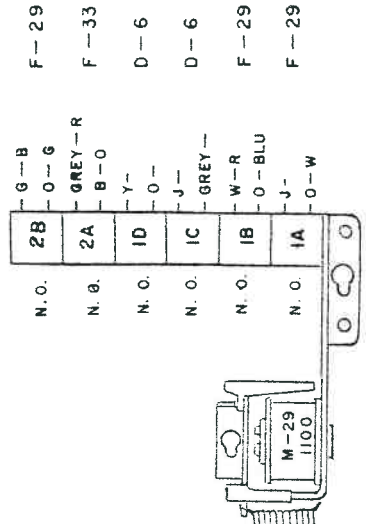
IS ENERGIZED BY THE LEFT BOTTOM OR RIGHT BOTTOM ROLLOVER SWITCH, THRU THE ADVANCE UNIT DISC. ALSO BY THE LEFT SIDE ROLLOVER SWITCH



PULSES 100 FT. RELAY, THRU IMPULSE CAM SWITCH C  
 RUNS SCORE MOTOR  
 HOLD CIRCUIT TO THIS RELAY, THRU CAM SWITCH 3C

## 1 BUMPER RELAY

IS PULSED BY THE LEFT TOP OR RIGHT BOTTOM JET BUMPER SWITCH



PULSES 1 FT. RELAY, THRU ADVANCE UNIT DISC  
 IN HOLD CIRCUIT TO THIS RELAY  
 PULSE RIGHT BOTTOM JET BUMPER  
 PULSES LEFT TOP JET BUMPER  
 PULSES 10 FT. RELAY, THRU ADVANCE UNIT DISC  
 PULSES 10 FT. RELAY, THRU ADVANCE UNIT DISC



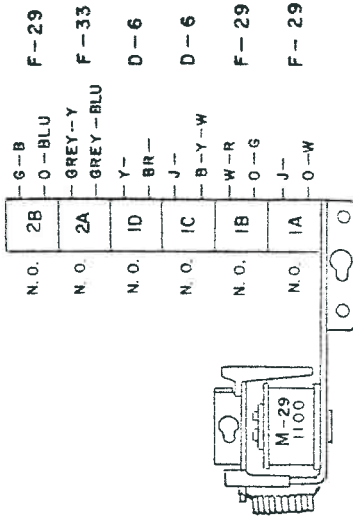
# A. C. RELAYS & SWITCHES

(On Playfield)

## 2 BUMPER RELAY

IS PULSED BY THE RIGHT TOP OR LEFT BOTTOM JET BUMPER SWITCH

DIAGRAM LOCATION



## OPERATION

PULSES 1 PT. RELAY, THRU ADVANCE UNIT DISC IN HOLD CIRCUIT TO THIS RELAY

PULSES RIGHT TOP JET BUMPER

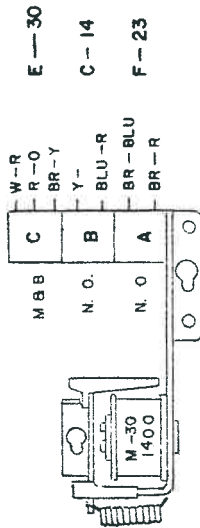
PULSES LEFT BOTTOM JET BUMPER

PULSES 10 PT. RELAY, THRU ADVANCE UNIT DISC

PULSES 10 PT. RELAY, THRU ADVANCE UNIT DISC

## SET UP RELAY

IS ENERGIZED BY THE ADVANCE UNIT DISC (EVERY FIFTH STEP)



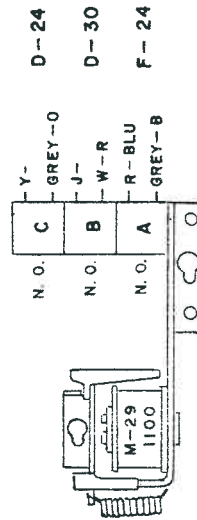
IN CIRCUIT TO 10 PT. OR 100 PT. RELAY, THRU SWITCH ON TARGET RELAY OR RIGHT SIDE ROLLOVER SWITCH

TO CENTER TARGET AND RIGHT SIDE ROLLOVER LITES

IN HOLD CIRCUIT TO THIS RELAY

## ADVANCE RELAY

IS ENERGIZED BY ANY OF THE 3 TOP ROLLOVER BUTTONS. ALSO BY NO. 1 TO NO. 5 ROLLOVER BUTTON SWITCHES, WHEN LIT



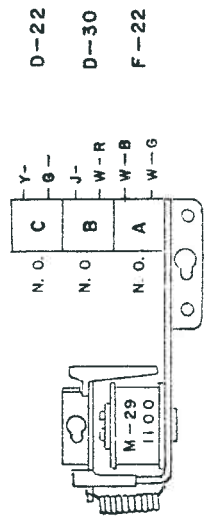
ENERGIZES ADVANCE UNIT COIL

PULSES 10 PT. RELAY

HOLD CIRCUIT TO THIS RELAY, THRU ADVANCE UNIT END-OF-STROKE SWITCH

## DRUM ADVANCE RELAY

IS ENERGIZED BY (2) STANDUP SWITCHES AND LEFT OR RIGHT TARGET SWITCHES



ENERGIZES TARGET DRUM UNIT COIL

PULSES 10 PT. RELAY

HOLD CIRCUIT TO THIS RELAY, THRU TARGET DRUM UNIT END-OF-STROKE SWITCH

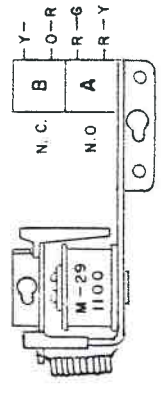
# A. C. R LAYS & SWITCHES

(On Playfield)

## OPERATION

### HOLD RELAY

IS ENERGIZED BY THE TARGET RELAY

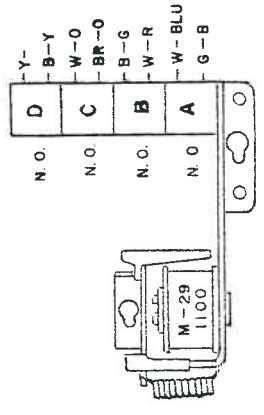


IN SERIES WITH SWITCH C ON OUTHOLE RELAY  
HOLD CIRCUIT TO THIS RELAY, THRU INDEX CAM SWITCH D

### 1 POINT RELAY

IS PULSED BY TEF #1 AND #2 BUMPER RELAYS, THRU CERTAIN POSITIONS ON THE ADVANCE UNIT DISC

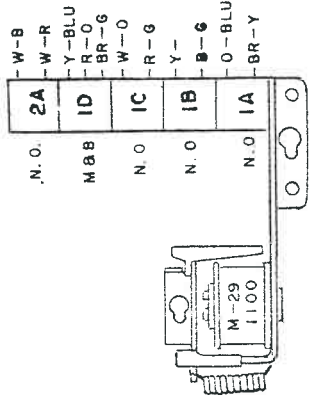
(In Back Box)



ENERGIZES NO. MATCH UNIT STEP-UP COIL  
PULSES 1 PT. DRUM UNITS, THRU PLAYER UNIT DISC  
PULSES 10 PT. RELAY, THRU 9th POSITION SWITCHES ON 1 PT. DRUM UNITS  
HOLD CIRCUIT TO THIS RELAY, THRU E.O.S. SWITCHES ON 1 PT. DRUM UNITS

### 10 POINT RELAY

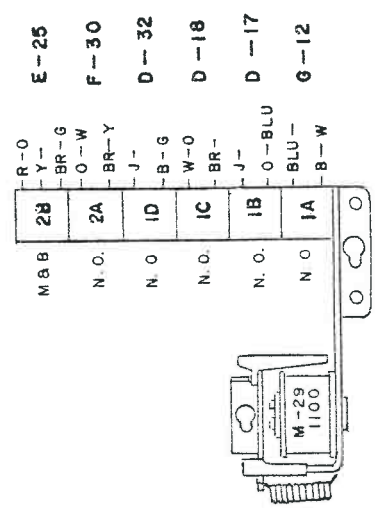
IS PULSED BY BUMPER RELAYS AND ROLLOVER SWITCHES, THRU CERTAIN POSITIONS ON THE ADVANCE UNIT DISC. ALSO WHEN HITTING CENTER TARGET, AS INDICATED ON PLAYFIELD



HOLD CIRCUIT TO THIS RELAY, THRU E.O.S. SWITCHES ON 10 PT. DRUM UNITS  
IN HOLD CIRCUIT TO EXTRA BALL RELAY. ALSO ENERGIZES BALL INDEX RELAY.  
PULSES 10 PT. DRUM UNITS, THRU PLAYER UNIT DISC  
PULSES LARGE BELL COIL  
PULSES 100 PT. RELAY, THRU 9th POSITION SWITCHES ON 10 PT. DRUM UNITS

### 100 POINT RELAY

IS PULSED BY ROLLOVER SWITCHES, AS INDICATED ON PLAYFIELD. ALSO BY THE 300 RELAY, THRU IMPULSE CAM SWITCH C



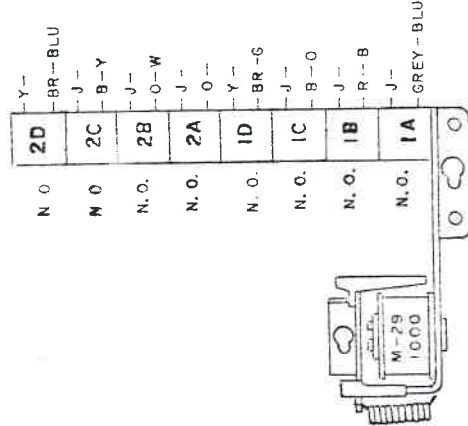
IN HOLD CIRCUIT TO EXTRA BALL RELAY. ALSO ENERGIZES BALL INDEX RELAY  
HOLD CIRCUIT TO THIS RELAY, THRU E.O.S. SWITCHES ON 100 PT. DRUM UNITS  
PULSES LARGE BELL COIL  
PULSES 1000 PT. DRUM UNITS, THRU 9th POSITION SWITCHES ON 100 PT. DRUM UNITS  
PULSES 100 PT. DRUM UNITS, THRU PLAYER UNIT DISC  
ENERGIZES REPLAY S.U. OR EXTRA BALL RELAY: (IN HIGH SCORE CIRCUIT)

# A. C. RELAYS & SWITCHES

(In Back Box)

## 1 & 2 RESET RELAY

IS PULSED BY IMPULSE CAM SWITCH E, DURING RESET CYCLE



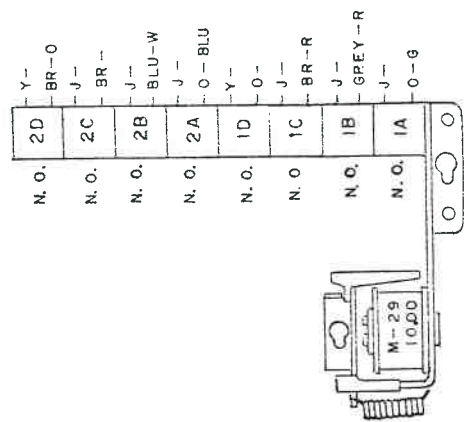
## OPERATION

- 1ST PLAYER 1000 Pt. DRUM UNIT
- 1ST PLAYER 100 Pt. DRUM UNIT
- 1ST PLAYER 10 Pt. DRUM UNIT
- 1ST PLAYER 1 Pt. DRUM UNIT
- 2ND PLAYER 1000 Pt. DRUM UNIT
- 2ND PLAYER 100 Pt. DRUM UNIT
- 2ND PLAYER 10 Pt. DRUM UNIT
- 2ND PLAYER 1 Pt. DRUM UNIT

THESE DRUM UNITS ARE PULSED, IN THE RESET CYCLE, THRU ZERO SWITCHES ON THE CORRESPONDING DRUM UNITS

## 3 & 4 RESET RELAY

IS PULSED BY IMPULSE CAM SWITCH A, DURING RESET CYCLE



- 3RD PLAYER 1000 Pt. DRUM UNIT
- 3RD PLAYER 100 Pt. DRUM UNIT
- 3RD PLAYER 10 Pt. DRUM UNIT
- 3RD PLAYER 1 Pt. DRUM UNIT
- 4TH PLAYER 1000 Pt. DRUM UNIT
- 4TH PLAYER 100 Pt. DRUM UNIT
- 4TH PLAYER 10 Pt. DRUM UNIT
- 4TH PLAYER 1 Pt. DRUM UNIT

THESE DRUM UNITS ARE PULSED, IN THE RESET CYCLE, THRU ZERO SWITCHES ON THE CORRESPONDING DRUM UNITS

