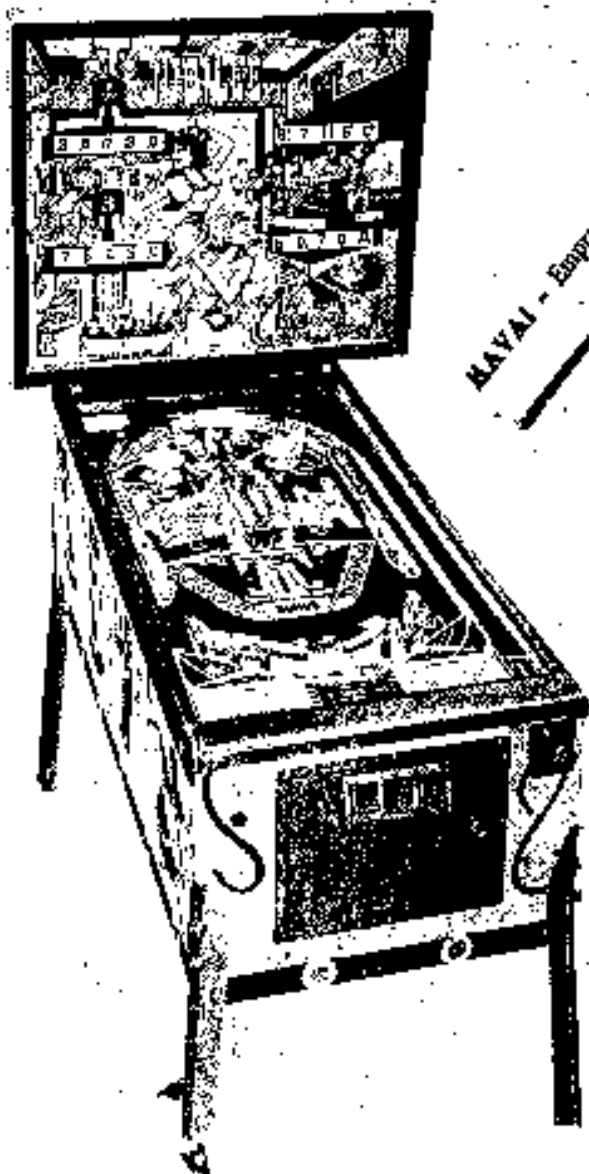


# Instruction Manual for

# JUBILEE



RAYAL - Empresa de Diversiones Publicas Ltda.



**Williams** ELECTRONICS, INC.  
SUBSIDIARY OF THE SEEBURG CORPORATION

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

# "JUBILEE"

## 4 PLAYER

GAME OPERATES AS FOLLOWS:

BONUS CAN BE ADVANCED FROM 1,000 TO 20,000.

WHENEVER BALL LEAVES PLAYFIELD THE BONUS IS ADDED TO SCORE.  
DOUBLE BONUS IS SCORED ON LAST BALL.

ADVANCE BONUS BY THE FOLLOWING METHODS:

1. LOOPING BALL IN ENCLOSED CENTER OF PLAYFIELD
2. ROLLOVER BUTTONS (TWO)
3. BOTTOM OUT LANES (TWO)
4. TOP ROLLOVER LANE
5. TOP ROLLOVER LANE, WHEN LIT, ADVANCES 2, 3 OR 4 TIMES. "3" ADJUSTMENT RECOMMENDED FOR 5 BALL PLAY. "4" ADJUSTMENT RECOMMENDED FOR 3 BALL PLAY. ADJUSTMENT JACK IS LOCATED UNDER PLAYFIELD AT FRONT OF GAME.

IF ALL FIVE ENCLOSED BALLS ARE LOOPED TO LIT SIDE, THEN SAME PLAYER SHOOTS AGAIN.

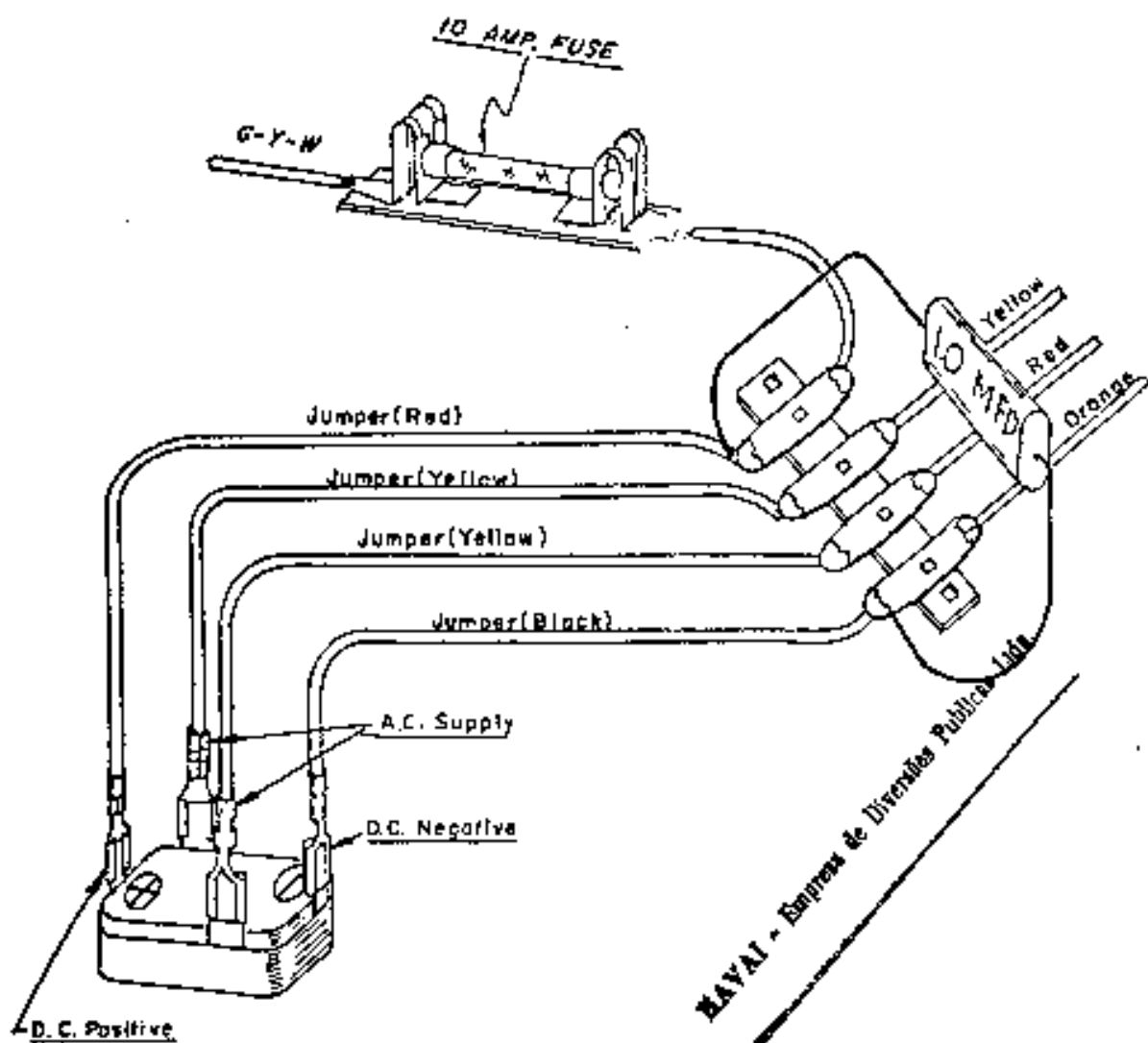
TWO BOTTOM SHOOTERS PROPUL PLAYFIELD BALL TOWARDS ENCLOSED BALLS AND HELP IN SETTING FIVE BALLS TO LIT SIDE.

ONE OF THE BOTTOM SHOOTERS, WHEN LIT, SCORES 300 POINTS.

FIVE ENCLOSED BALLS CAN BE LOOPED TOWARDS LIT SIDE BY PLAYING PLAYFIELD BALL INTO LIT SHOOTER, OR BY SKILLFULLY PLAYING BALL OFF THE FLIPPERS TOWARDS DESIRED SIDE.

FOUR SIDE REBOUNDS SCORE 50 POINTS.

## SILICON BRIDGE RECTIFIER



THE FUNCTION OF THE RECTIFIER AND CAPACITOR IS TO CONVERT THE ALTERNATING CURRENT (A.C.) TO DIRECT CURRENT (D.C.), SUPPLYING D.C. TO THE BUMPERS, KICKERS ETC.

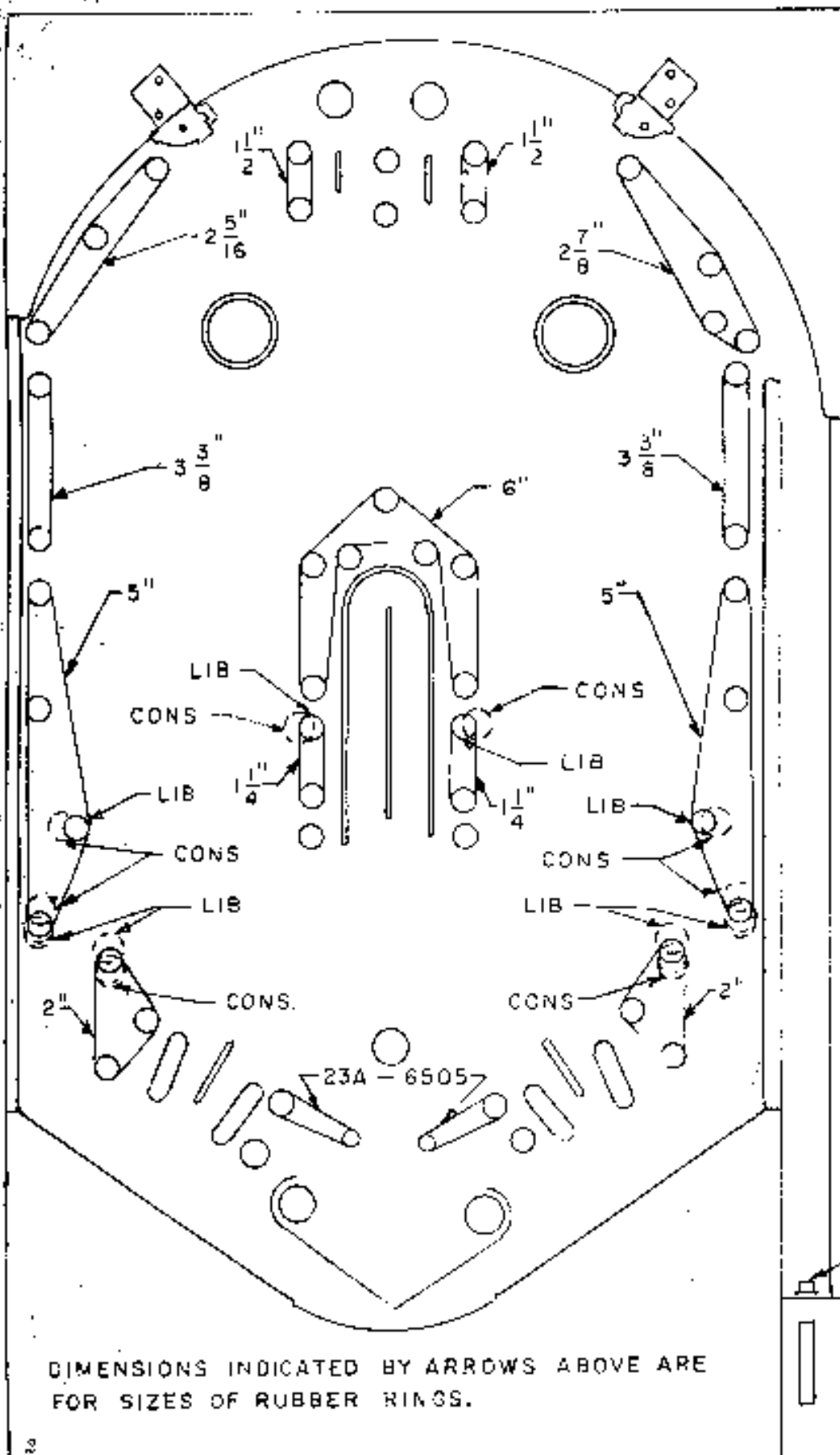
THE BRIDGE RECTIFIER SHOULD PRACTICALLY NEVER NEED REPLACING, AS IT IS RATED WELL OVER THE VOLTAGE AND CURRENT REQUIREMENTS OF THE COMPONENTS IT SUPPLIES.

IF, HOWEVER, THE 15 AMP 24 VOLT FUSE ON THE MECHANISM PANEL OPENS, IT COULD BE DUE TO A FAULTY RECTIFIER. DISCONNECT THE A.C. INPUT TO RECTIFIER, REPLACE FUSE, AND RECHECK.

IF THE 10 AMP FUSE LOCATED NEXT TO THE RECTIFIER OPENS, CHECK ALL D.C. COMPONENTS I.E. BUMPERS, KICKERS ETC. FOR SHORTS.

# JUBILEE - 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-6303	1-1/4"	I. D.
23A-6304	1-1/2"	I. D.
23A-6305	2"	I. D.
23A-6307	2-7/8"	I. D.
23A-6308	3-3/8"	I. D.
23A-6505	1-1/2"	I. D.
23A-6429	6"	I. D.
23A-6306	2-5/16"	I. D.
23A-6310	5"	I. D.

A-4817-R } BALL GATE  
A-4817-L } ASSEMBLIES

23A-6327 BALL  
SHOOTER  
RUBBER TIP

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

## 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.

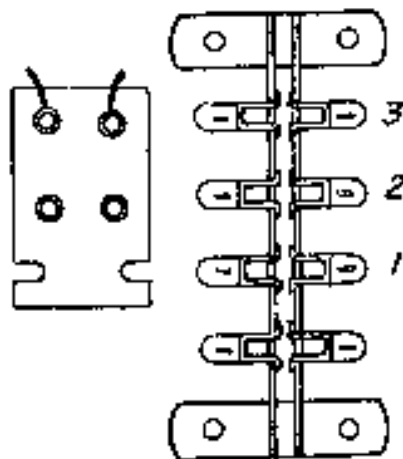
Solenoid Plungers should not have a lubricant of any kind. Should there be a sluggish tendency or if plungers are sticking, the parts should be cleaned with a solvent and flaked graphite applied on reassembly.

## SWITCH ADJUSTMENT

BEFORE ADJUSTING SWITCHES, MAKE CERTAIN THE SCREWS HOLDING THE SWITCH STACKS ARE DOWN TIGHTLY. BAKELITE SPACERS IN THE SWITCH STACKS, DUE TO EXCESSIVE MOISTURE, HAVE OCCASIONALLY SHRUNK BY DRYING OUT, CAUSING POOR ADJUSTMENT.

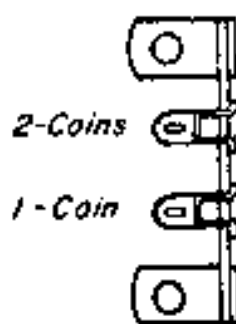
# ADJUSTMENTS ON MECHANISM PANEL

## 10¢ Adjustment



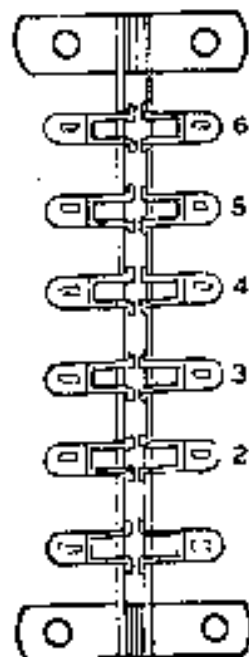
PROVIDES  
1, 2 OR  
3 PLAYS  
FOR ONE  
COIN.

## 5¢ Adjustment



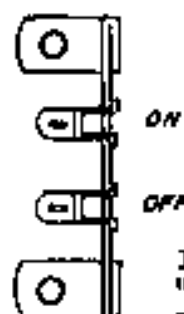
IN "2 COINS FOR  
1 PLAY", CIRCUIT  
TO COIN RELAY  
PASSES THRU SW.  
ON ALTERNATOR  
UNIT.

## 25¢ Adjustment



PROVIDES 2, 3, 4, 5  
OR 6 PLAYS FOR 25¢.

## Motor Service Jack



INSERT PHONE TIP IN  
"OFF" POSITION - CAMS  
CAN BE TURNED BY HAND  
TO CHECK ADJUSTMENT OF  
SWITCHES.

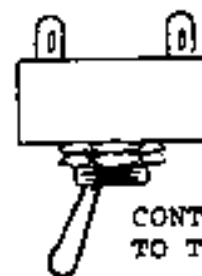
### SUGGESTED SCORE CARDS

5 BALL---416-19 REPLAY 3BALL--416-9

5 BALL---416-35 NOVELTY 3 BALL--416-31

## MASTER ON-OFF SW.

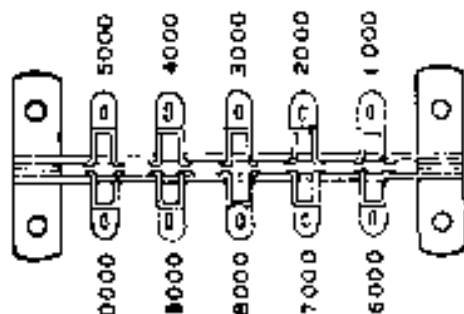
(Located under front of  
Cabinet)



CONTROLS POWER  
TO TRANSFORMER

## ADJUSTMENTS IN BACKBOX

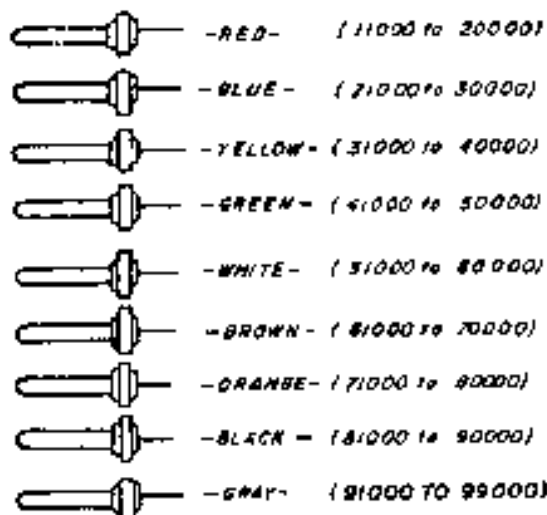
### Hi-Score Adjustment



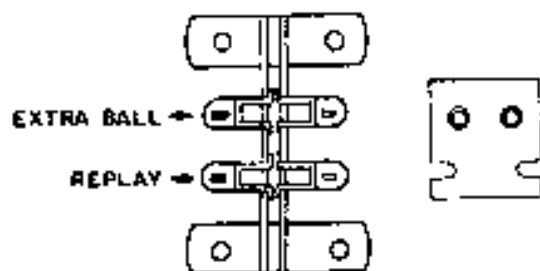
Insert plugs into 16 Point Female at desired positions.

Examples:

Yellow wire into 3000 position scores at 33000.  
Yellow wire into 0000 position scores at 40000.

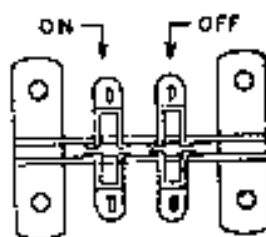


### REPLAY-EXTRA BALL ADJ.



IN "REPLAY" POSITION, HI-SCORES AND NUMBER MATCH WILL AWARD REPLAYS.  
IN "EXTRA BALL" POSITION, HI-SCORE AWARD AN EXTRA BALL.

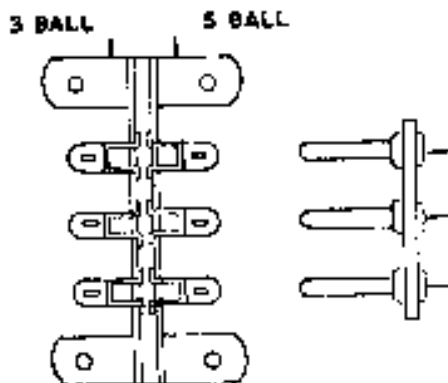
### NUMBER MATCH ADJUSTMENT



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.

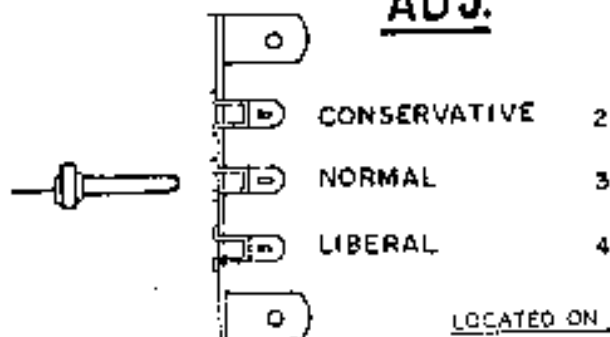
~~NAVAL - NUMBER & DIVISION PULLERS LITE.~~

### No. of Balls Adjustment



THIS JACK CHANGES 3 BALL TO 5 BALL PLAY OR VICE VERSA.

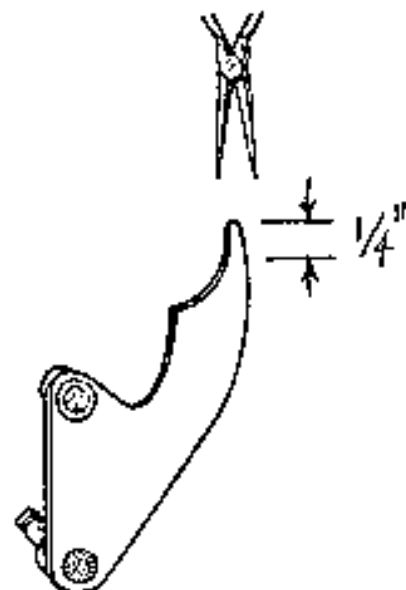
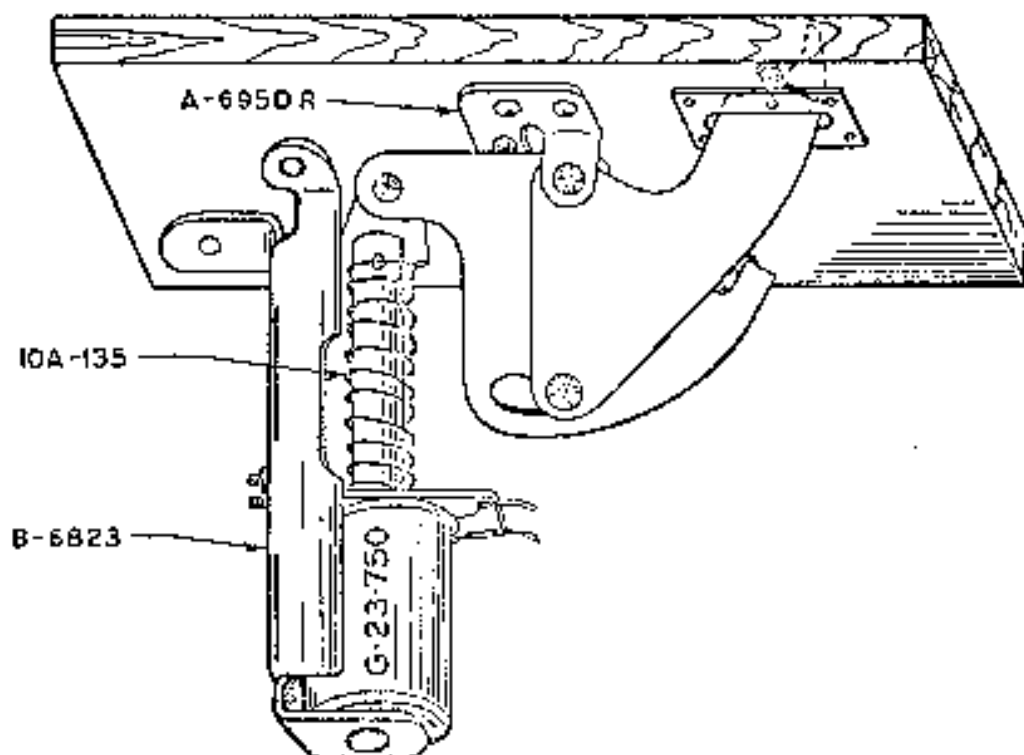
### EXTRA ADVANCE ADJ.



LOCATED ON PLAYFIELD

THIS ADJUSTMENT IS IN HOLD CIRCUIT TO "3 ADVANCE RE.", AND DETERMINES HOW MANY PULSES THE 100 POINT RELAY AND ADVANCE UNIT S.U. COIL WILL RECEIVE (2, 3 OR 4).

# BALL EJECT CAM UNIT



TO CHANGE DIRECTION OF BALL,  
WHEN EJECTED, GRASP "BALL EJECT CAM"  
WITH LONG-NOSED PLIERS (APPROXIMATELY  
1/4") AND BEND SLIGHTLY.

BENDING TO THE LEFT WILL CHANGE  
DIRECTION OF EJECTED BALL SLIGHTLY  
TO THE RIGHT, AND VICE-VERSA.

**CAUTION**  
IF BEND IS TOO GREAT, IT MAY  
CAUSE A BIND WHEN "BALL EJECT CAM"  
IS RESTING IN PART #3A-6015G-6.



3A-6015G-6



# **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.**

*BY AI - Kopyra & Diversa Publicos Ltd*

## **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**

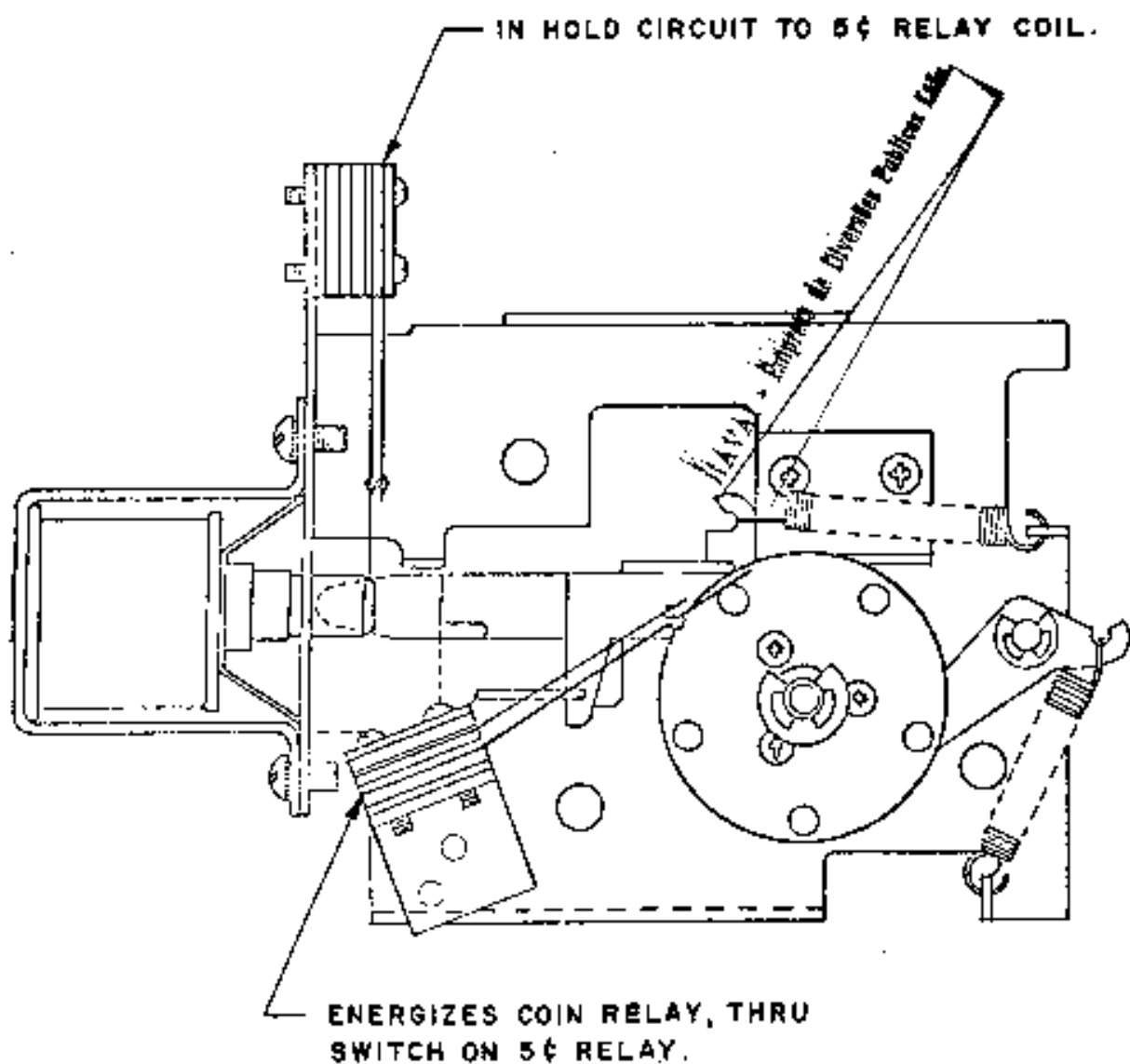
### **TO REMOVE BACKGLASS:**

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

# ALTERNATOR UNIT

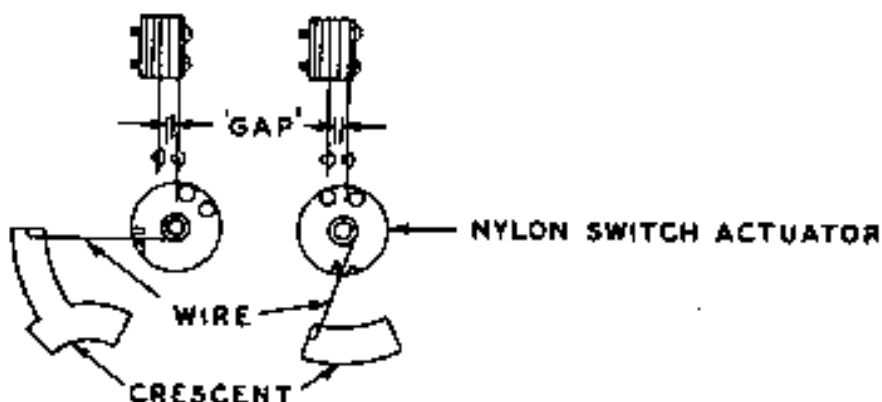
LOCATED ON MECHANISM PANEL.

USED IN CONJUNCTION WITH 5¢ RELAY FOR "2 COINS-1 PLAY" FEATURE.



## 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.

### POWER TRANSFORMER:

LOCATED ON MECHANISM PANEL, IT IS EQUIPPED WITH A SECONDARY TAP. IF YOUR GAME IS ON LOCATION WITH EXTREMELY LOW LINE VOLTAGE, REMOVE LEAD FROM LUG MARKED 24 VOLTS AND SOLDER TO ALTERNATE LUG MARKED "HIGH". THIS WILL BOOST SECONDARY VOLTAGE APPROXIMATELY 2-3 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 AND DECREASE SCORES, RAISE REAR LEG LEVELERS TO INCREASE PITCH.

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

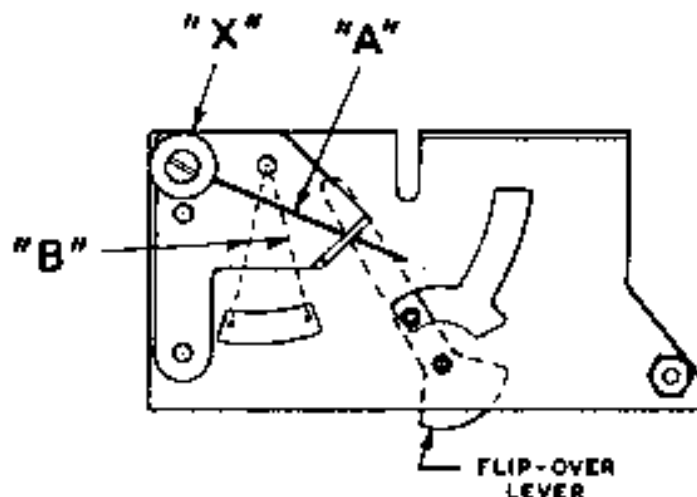
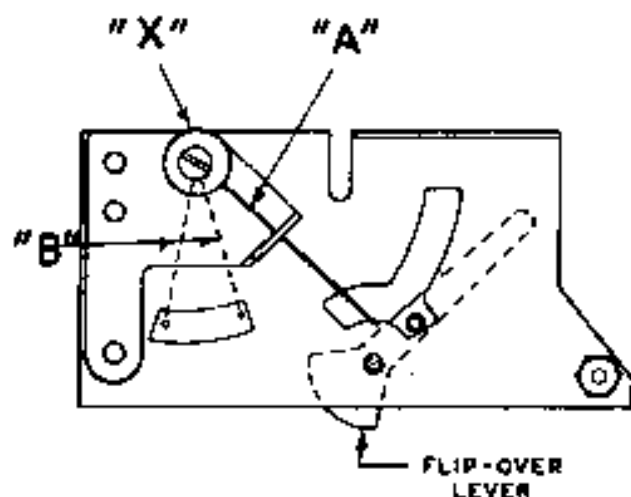
FOR 1 COIN-FOR 1 PLAY

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.

## 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
REPLAY	-----	-----	A-6400	SCORE MOTOR 14A 7883 (60 CYCLE) 14A 7884 (50 CYCLE)
BALL COUNT	C-6414	B-7456-6	A-6402-5	
NO. MATCH	C-6414	B-7456-2	A-6401	
PLAYER	C-6417	C-6521	A-6404-3	
COIN	C-6414	B-7456-9	A-6402-3	
ADVANCE	C-6417	B-7456-17	A-6402-20	
10 POINT	B-7253	A-6294	30-7272	
100 POINT	-----	-----	30-7272	
1000 POINT	B-7253	A-6294	30-7272	
10000 POINT	B-7253	A-6294	30-7272	
ALTERNATOR	-----	-----	30-7272	

"JUBILEE" COIL CHART

NOTICE:

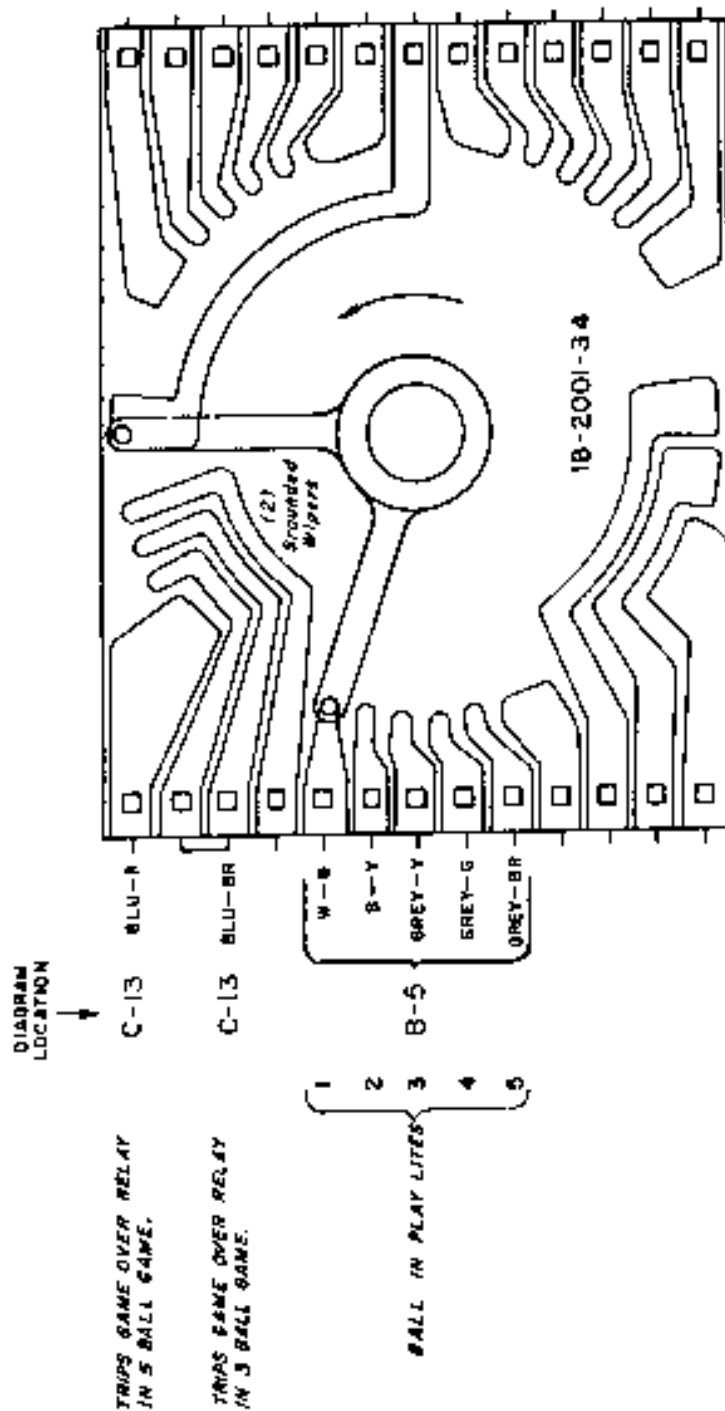
THIS GAME OPERATES ON 24 VOLTS. WHEN ORDERING REPLACEMENT TRANSFORMERS, MOTORS, COILS OR METERS ... MAKE SURE TO SPECIFY CORRECT PART NUMBER.

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>LOCATION</u>
<u>MOTORS &amp; TRANSFORMERS</u>		
14 A-7883	CONTROL MOTOR - 60 CYCLE	MECH. PANEL
14 A-7884	CONTROL MOTOR - 50 CYCLE	MECH. PANEL
15 A-8771	TRANSFORMER - 60 CYCLE	MECH. PANEL
15 A-6782 -1	TRANSFORMER - 50 CYCLE	MECH. PANEL
B 6396	24 VOLT METER	MECH. PANEL
<u>SOLENOID COILS</u>		
A 21-850	COIN UNIT STEP UP ADVANCE UNIT STEP UP BALL RELEASE COIL PLAYER UP UNIT STEP UP	MECH. PANEL PLAYFIELD PLAYFIELD INSERT
A 21-800	BALL COUNT UNIT STEP UP REPLAY UNIT STEP UP NUMBER MATCH STEP UP	MECH. PANEL INSERT INSERT
A2-23-750	KNOCKER	CABINET
A2-26-1923	TRIPLE CHIME COILS ... (3 req'd.)	CABINET
B 26-800	BALL COUNT UNIT RESET COIN UNIT RESET ALTERNATOR UNIT STEP UP REPLAY UNIT RESET PLAYER UP UNIT RESET ADVANCE UNIT RESET	MECH. PANEL MECH. PANEL MECH. PANEL INSERT INSERT PLAYFIELD
B1-26-800	SCORE DRUM UNITS ... (16 req'd.)	INSERT
FL 20-300/28-400	FLIPPERS ... (2 req'd.)	PLAYFIELD
G 22-500	SHOOTER COILS ... (2 req'd.)	PLAYFIELD
G 23-750 - DC	D.C. TET BUMPER COILS ... (2 req'd.)	PLAYFIELD
M 24-350	DOUBLE BONUS RELAY	PLAYFIELD
M 28-900	1 - 2 RESET RELAY 3 - 4 RESET RELAY	INSERT INSERT
M 29-1000	GAME OVER RELAY TRIP CAPTIVE BALL RELAY TRIP	MECH. PANEL PLAYFIELD
M 29-1100	50 RELAY 100 RELAY 250 RELAY 3 ADVANCE RELAY ADVANCE RELAY 50 POINT RELAY BONUS RELAY 10 POINT RELAY 100 POINT RELAY 1,000 POINT RELAY	MECH. PANEL MECH. PANEL MECH. PANEL PLAYFIELD PLAYFIELD PLAYFIELD PLAYFIELD INSERT INSERT INSERT INSERT
M1-31-1500	COIN LOCKOUT COIL	FRONT DOOR
XM 27-675	TOTAL PLAY METER COIL	MECH. PANEL
Z 27-1000	SHOOTER RELAY COIN RELAY GAME OVER RELAY LATCH OUTSOLE RELAY PLAYER RESET RELAY REPLAY RELAY RESET RELAY CAPTIVE BALL RELAY LATCH	MECH. PANEL MECH. PANEL MECH. PANEL MECH. PANEL MECH. PANEL MECH. PANEL MECH. PANEL MECH. PANEL PLAYFIELD
Z 29-1150	EXTRA BALL RELAY TILT RELAY BALL INDEX RELAY	MECH. PANEL MECH. PANEL PLAYFIELD
Z 28-1200	CHANGE RELAY	PLAYFIELD
Z 29-1250	LOCK RELAY	MECH. PANEL

## BALL COUNT UNIT DISC

THIS UNIT RESETS 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.

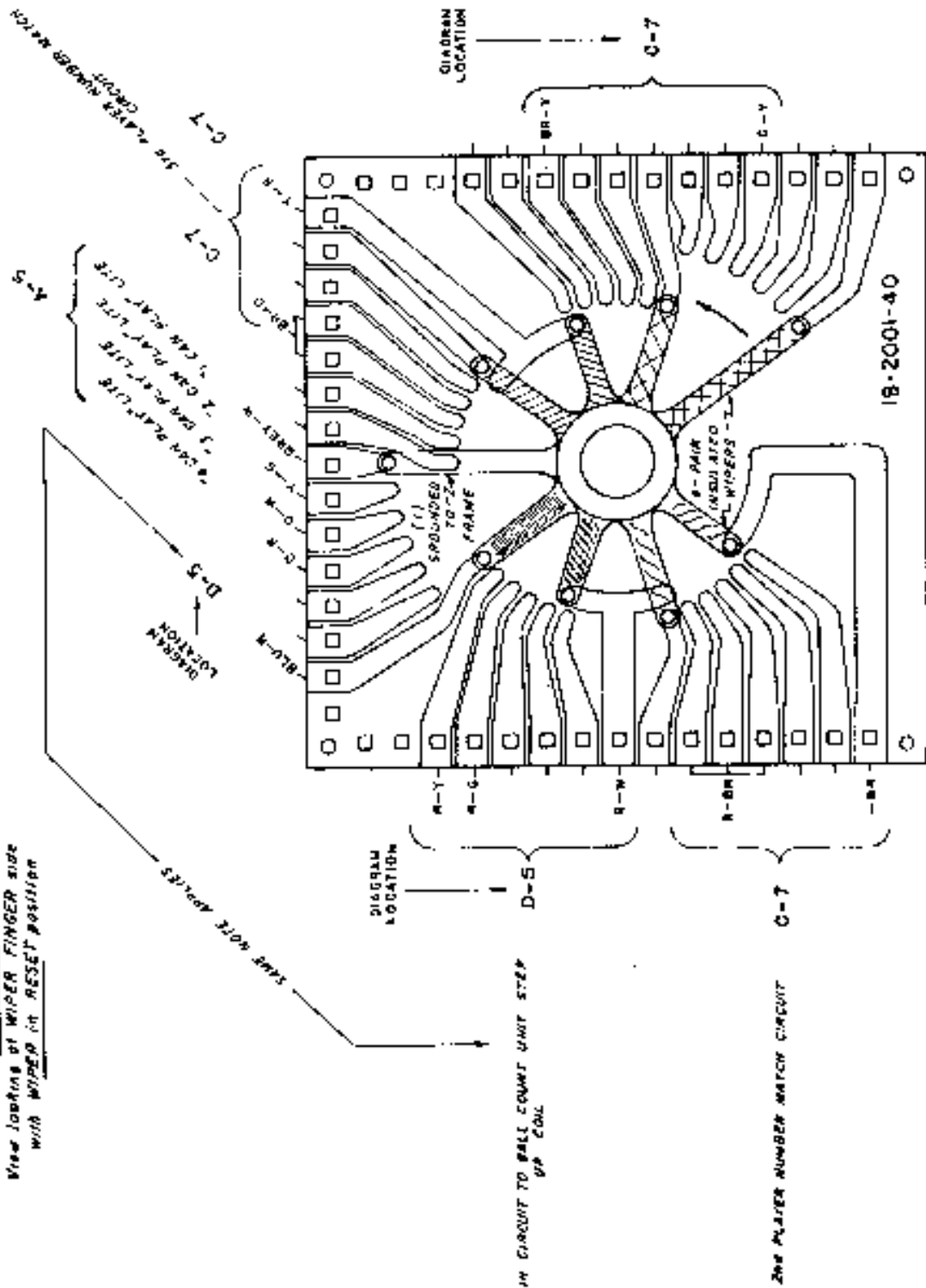




# COIN S. U. DISC

THIS UNIT RESETS AT START OF A GAME (DURING RESET CYCLE). IT THEN ADVANCES ONE STEP EACH TIME THE COIN RELAY IS PULSED.

View looking at WIPER FINGER side with WIPER in RESET position



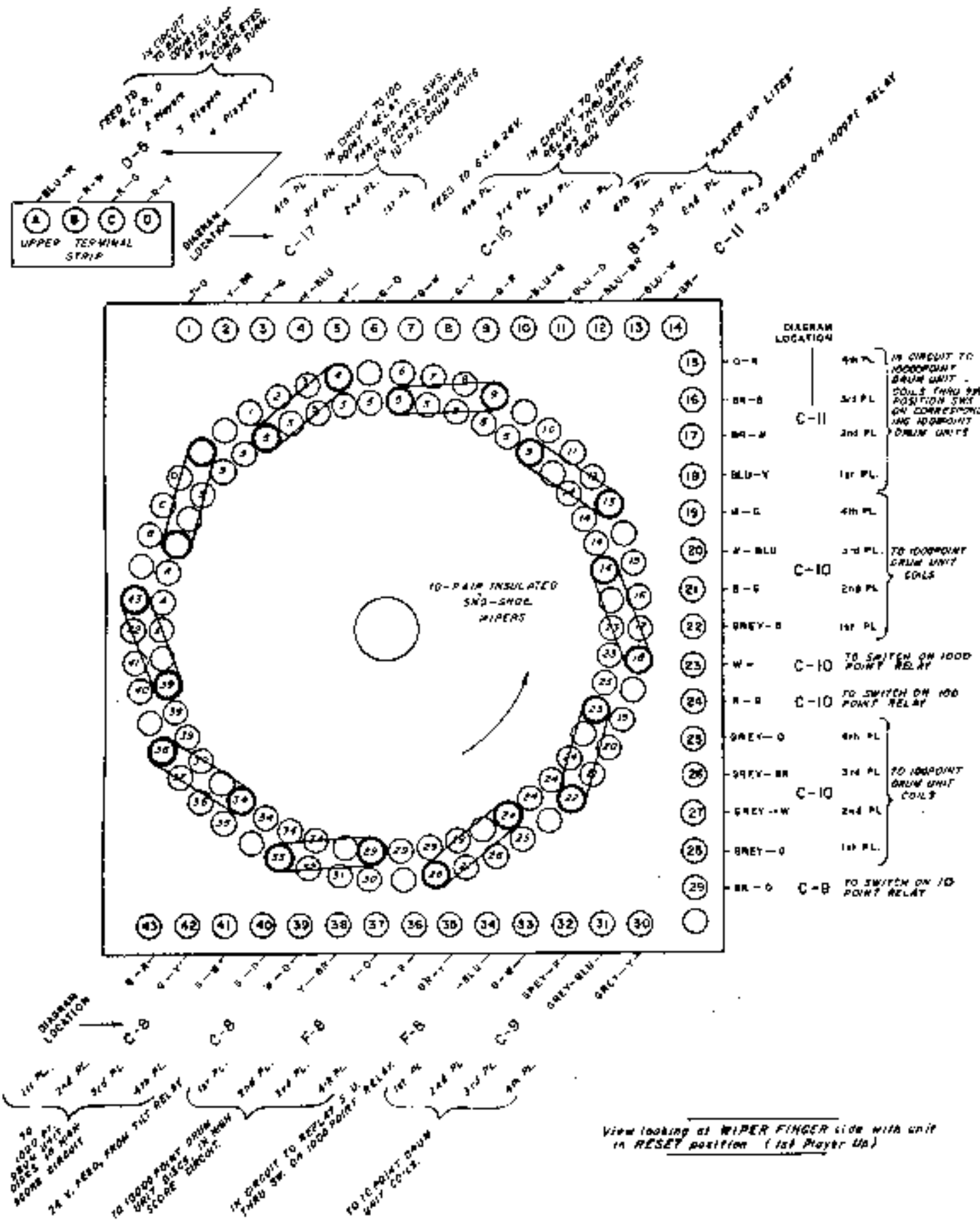
IN CIRCUIT TO BALL COUNT UNIT STEP UP COIL

2ND PLAYER NUMBER MATCH CIRCUIT

4TH PLAYER NUMBER MATCH CIRCUIT

18-2001-40

# PLAYER UNIT DISC



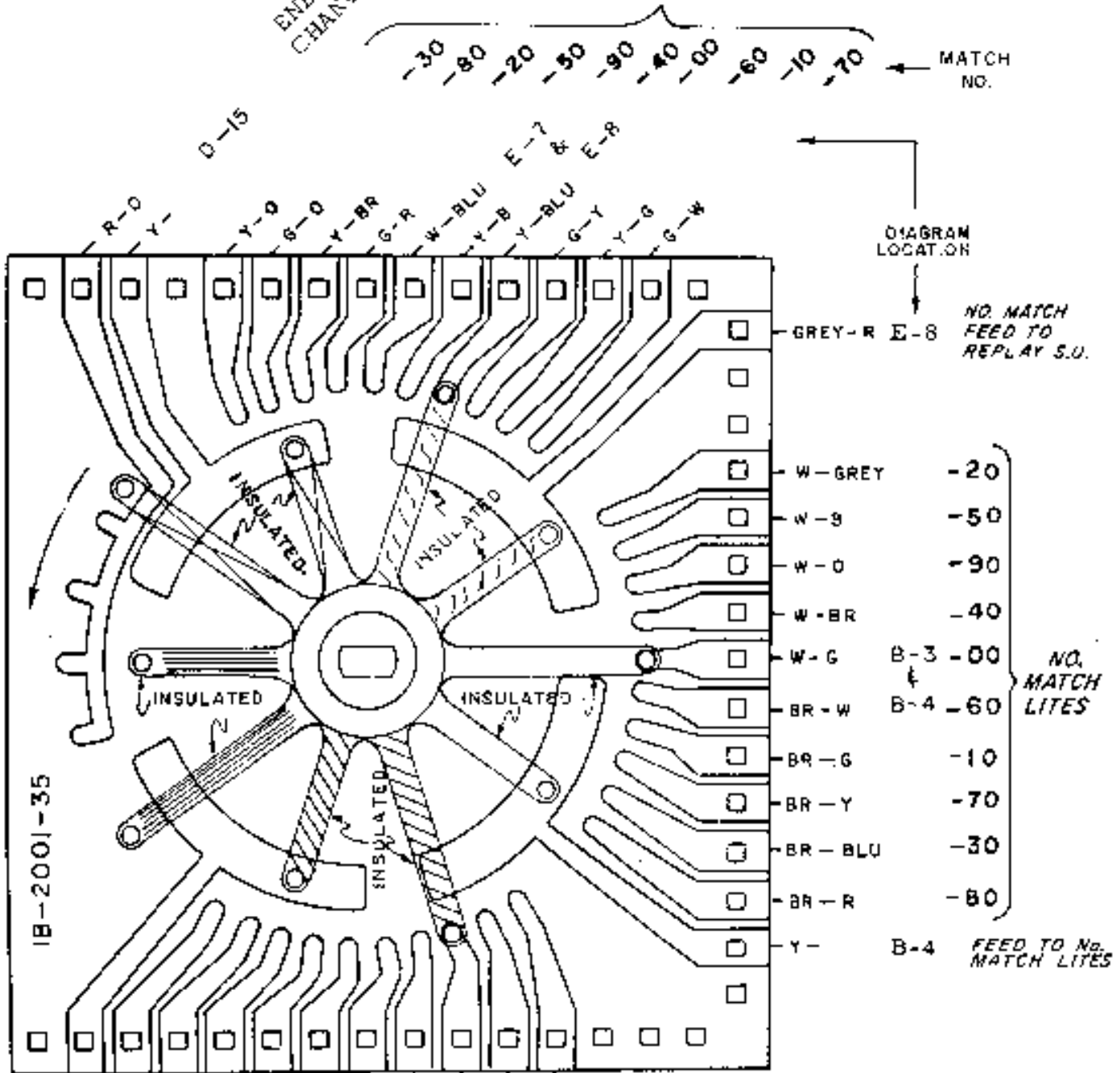
# No. MATCH UNIT

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

VIEW LOOKING AT WIPER FINGER SIDE

ENERGIZES CHANGE RF.

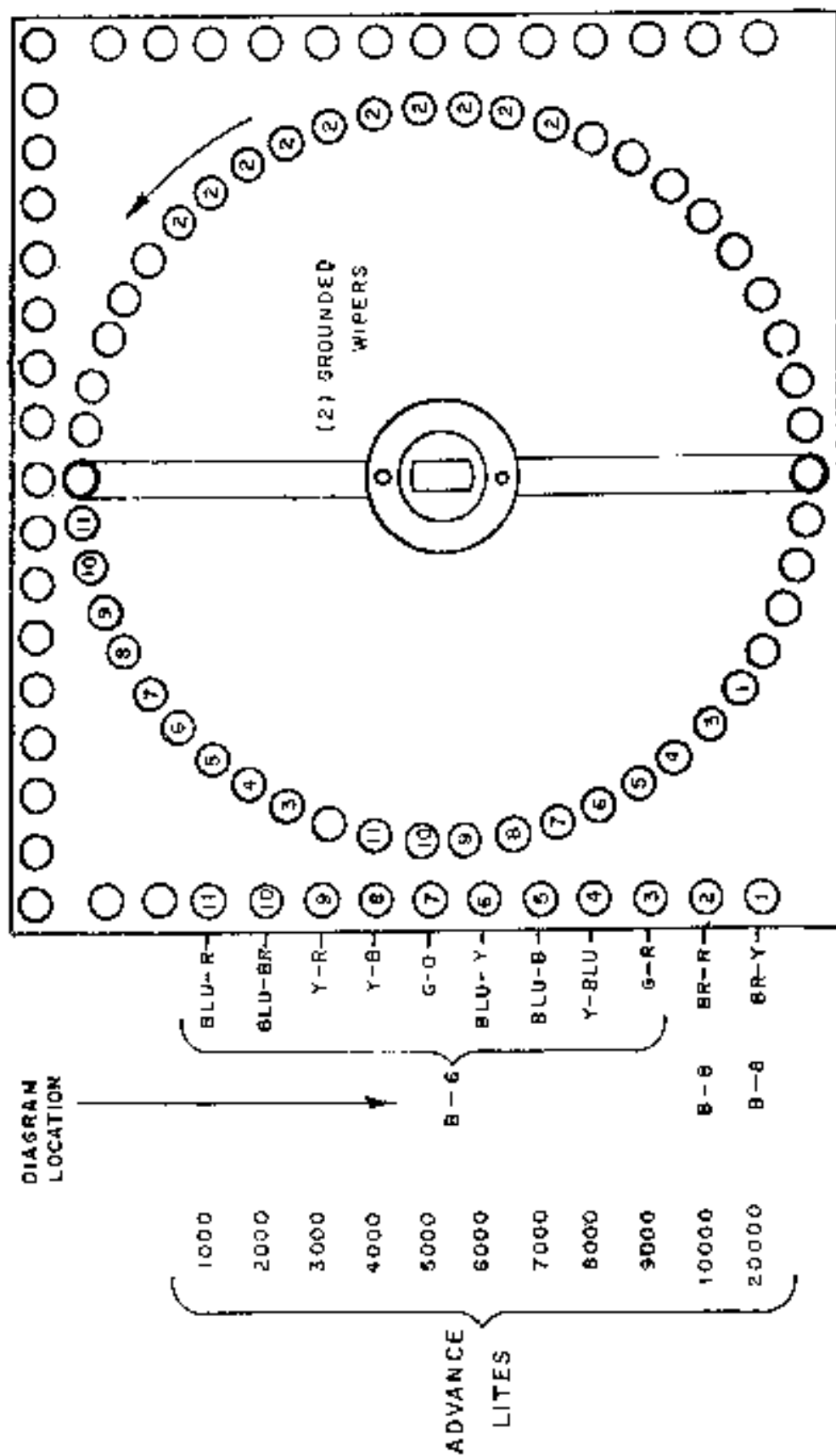
IN NO. MATCH CIRCUIT, THESE WIRES COME FROM THE 10 PT. D.U. DISC OF ALL 4 PLAYERS.



# ADVANCE UNIT

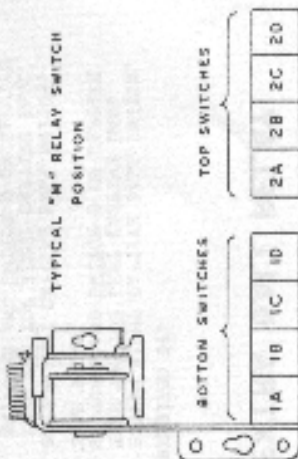
VIEW LOOKING AT WIPER  
FINGER SIDE, WITH  
WIPER IN ZERO POSITION.

THIS UNIT ADVANCES ONE STEP WHEN  
"ADVANCE RELAY" IS PULSED, AND 3 STEPS  
WHEN "3 ADVANCE RELAY" IS ENERGIZED.  
IT RESETS, ONE STEP AT A TIME,  
WHEN "SONUS RELAY" IS ENERGIZED.



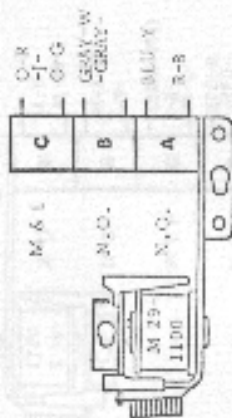
# A.C. RELAYS & SWITCHES

Located on Mechanism Panel



## 10¢ RELAY

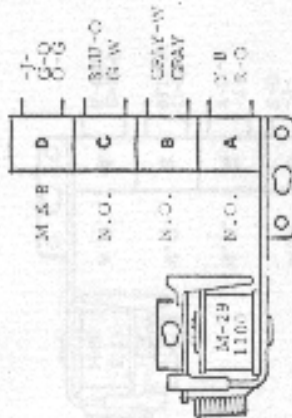
IS ENERGIZED BY 10¢ COIN SWITCH, IF 10¢ ADJUSTMENT JACK IS IN "2 OR "3" POSITION FOR 1 COIN POSITION.



C-4 OPENS IN CIRCUIT TO KNOCKER COIL & D CLOSURES TO RUN SCORE MOTOR.  
 D-7 PULSES REPLAY UNIT S.U. COIL, THRU IMPULSE CAM SWITCH B.  
 E-2 IN HOLD CIRCUIT TO THIS RELAY.

## 25¢ RELAY

IS ENERGIZED BY 25¢ COIN SWITCH, THRU FRONT DOOR SLAM SWITCH.

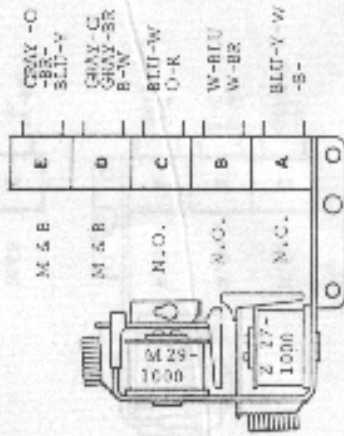


C-4 OPENS IN CIRCUIT TO KNOCKER COIL AND CLOSURES TO RUN SCORE MOTOR.  
 D-3 ENERGIZES COIN RELAY WHEN GAME IS ADJUSTED TO "6 PLAYS FOR 25¢.  
 D-7 PULSES REPLAY UNIT S.U. COIL, THRU IMPULSE CAM SWITCH B.  
 E-2 IN HOLD CIRCUIT TO THIS RELAY.

## GAME-OVER RELAY (INTERLOCK)

LATCH COIL IS ENERGIZED BY SCORE MOTOR CAM SWITCH 19, THRU SWITCH ON COIN RELAY AND RESET RELAY.

TRIP COIL IS ENERGIZED BY COIN RELAY, LOCK RELAY OR WIPER ON BALL COUNT UNIT.

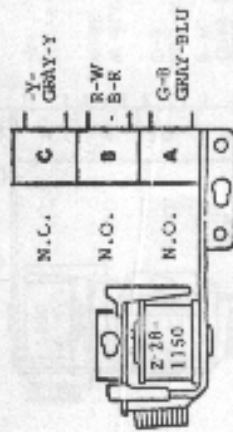


A-3 OPENS TO PLAYER UP LITES AND CLOSURES TO NUMBER MATCH & GAME-OVER LITES.  
 E-7 OPENS HI-SCORE CIRCUIT AND CLOSURES IN NUMBER MATCH UNIT.  
 F-5 IN CIRCUIT TO RESET RELAY, THRU SWITCH ON COIN RELAY.  
 E-3 IN CIRCUIT TO REPLAY RELAY.  
 F-12 OPENS CIRCUITS TO PLAYFIELD SWITCHES.

## BALL INDEX RELAY

IS ENERGIZED BY 10 POINTS, 100 POINT OR 1,000 POINT RELAY, THRU SWITCH ON EXTRA BALL RELAY.

ALSO BY TILT RELAY.

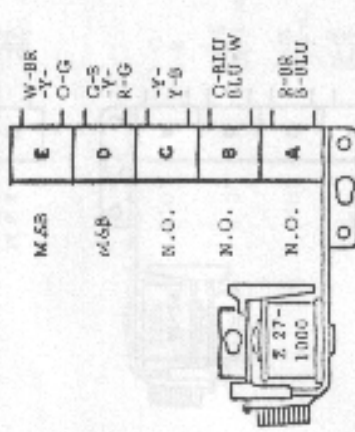


C-19  
C-6  
D-14

IN SERIES WITH SWITCH A ON EXTRA BALL RELAY.  
IN CIRCUIT TO BALL COUNT UNIT S.U.---ALSO IN SERIES WITH SWITCH C ON PLAYER RESET RELAY.  
IN HOLD CIRCUIT TO THIS RELAY.

## OUTHOLE RELAY

IS ENERGIZED BY OUTHOLE SWITCH, THRU ZERO POSITION SWITCH ON ADVANCE UNIT.

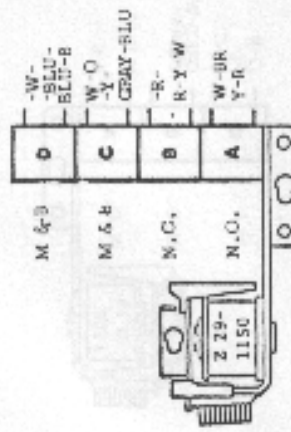


C-14  
C-4  
C-14  
C-6  
C-19  
D-13  
E-13

OPENS IN HOLD CIRCUIT TO TILT RELAY AND CLOSSES TO RUN SCORE MOTOR.  
OPENS IN HOLD CIRCUIT TO BALL INDEX RELAY AND CLOSSES IN SERIES WITH SWITCH C ON EXTRA BALL RELAY.  
IN CIRCUIT TO CAPTIVE BALL RELAY (TRIP AND LATCH COILS).  
PULSES BALL RELEASE COIL AT SCORE MOTOR CAM SWITCH 4R.  
IN HOLD CIRCUIT TO THIS RELAY.

## TILT RELAY

IS ENERGIZED BY FLOWS BOLT TILT, BALL ROLLOVER TILT OR PLAYFIELD VIBRATION TILT SWITCH.



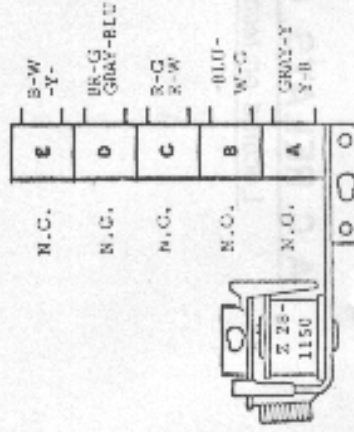
A-5  
C-8  
D-14  
F-14  
D-14

OPENS IN CIRCUIT TO PLAYFIELD LITES AND CLOSSES TO TILT LITE.  
OPENS IN HI-SCORE CIRCUIT TO REPLAY S.U. AND CLOSSES TO ENERGIZE BALL INDEX RELAY.  
OPENS ALL SCORING CIRCUITS.  
IN HOLD CIRCUIT TO THIS RELAY.

## EXTRA BALL RELAY

IS ENERGIZED BY:

1. BOTTOM RIGHT CAPTIVE BALL SWITCH, THRU TWO TOP LEFT CAPTIVE BALL SWITCHES AND SWITCH B ON CAPTIVE BALL RELAY.
2. BOTTOM LEFT CAPTIVE BALL SWITCH, THRU TWO TOP RIGHT CAPTIVE BALL SWITCHES AND SWITCH B ON CAPTIVE BALL RELAY.
3. HI - SCORE CIRCUIT, THRU "REPLAY - EXTRA BALL" ADJUSTMENT.



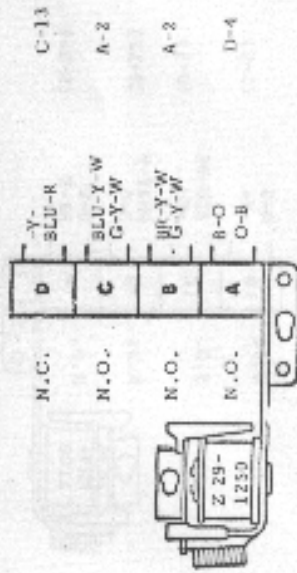
B-8  
D-14  
C-5  
A-5  
E-19

IN SERIES WITH SWITCH A ON CAPTIVE BALL RELAY.  
IN CIRCUIT TO BALL INDEX RELAY.  
IN SERIES WITH SWITCH B ON BALL INDEX RELAY.  
TO "SHOOT AGAIN" LITES.  
IN HOLD CIRCUIT TO THIS RELAY.



## LOCK RELAY

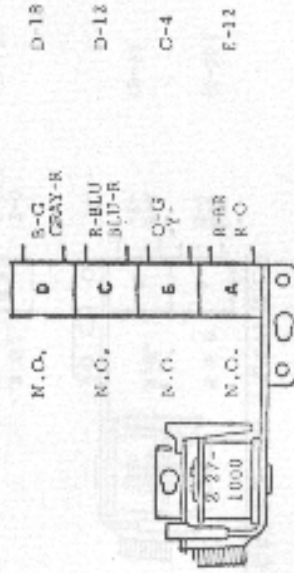
IS ENERGIZED BY 5 $\frac{1}{2}$  RELAY, LEFT FLIPPER SWITCH OR SCORE MOTOR CAM SWITCH 5 A.



C-13  
ENERGIZES GAME OVER RELAY (TRIP COIL).  
A-2  
6 VOLTS FROM TRANSFORMER TO LITES.  
A-2  
6 VOLTS FROM TRANSFORMER TO LITES.  
D-4  
IN HOLD CIRCUIT TO THIS RELAY.

## SHOOTER RELAY

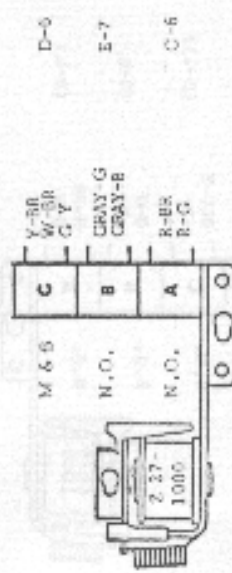
IS ENERGIZED BY LEFT OR RIGHT SHOOTER SWITCH, THRU SCORE MOTOR INDEX CAM SWITCH 3.



D-18  
IN SERIES WITH SWITCH D OR SWITCH E ON CAPTIVE BALL RELAY. (THRU LEFT OR RIGHT SHOOTER SWITCH).  
D-12  
PULSES LEFT AND RIGHT SHOOTER COILS, THRU SCORE MOTOR CAM SWITCH 4A.  
C-4  
RUNS SCORE MOTOR.  
E-12  
HOLD CIRCUIT TO THIS RELAY, THRU SCORE MOTOR CAM SWITCH 5C.

## PLAYER RESET RELAY

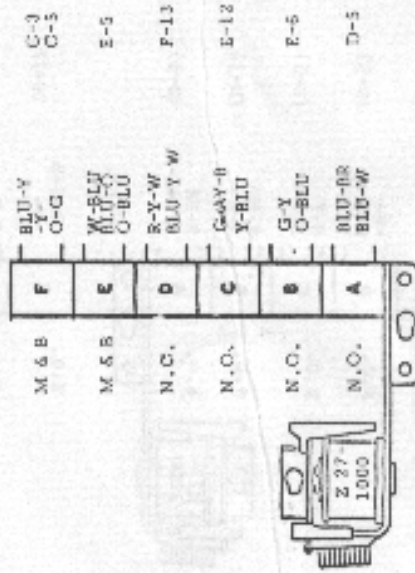
IS ENERGIZED BY BALL COUNT UNIT END-OF-STROKE SWITCH.



D-6  
OPENS IN CIRCUIT TO PLAYER UNIT S.U. COIL AND CLOSSES TO PLAYER UNIT RESET COIL.  
E-7  
IN NUMBER MATCH CIRCUIT TO REPLAY UNIT S.U. COIL.  
C-6  
HOLD CIRCUIT TO THIS RELAY, THRU SCORE MOTOR INDEX CAM SWITCH C.

## RESET RELAY

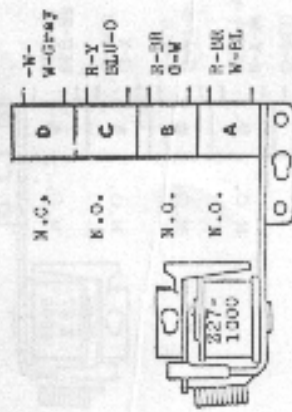
IS ENERGIZED BY COIN RELAY, THRU SWITCH ON GAME-OVER RELAY.



C-9  
OPENS IN CIRCUIT TO REPLAY RELAY AND CLOSSES TO RUN SCORE MOTOR.  
C-3  
OPENS IN CIRCUIT TO COIN UNIT S.U. AND CLOSSES TO RESET COILS ON COIN UNIT, BALL COUNT UNIT AND GAME-OVER RELAY.  
E-5  
IN SERIES WITH SWITCH A ON GAME-OVER RELAY.  
F-13  
IN CIRCUIT TO BONUS RELAY, THRU SWITCH ON COIN RELAY.  
E-12  
IN CIRCUIT TO PLAYER UNIT RESET COIL.  
E-5  
IN CIRCUIT TO PLAYER UNIT RESET COIL.  
D-5  
IN HOLD CIRCUIT TO THIS RELAY.

### REPLAY RELAY

IS ENERGIZED BY RELAY BOTTOM, THRU ZERO SWITCH ON REPLAY UNIT.

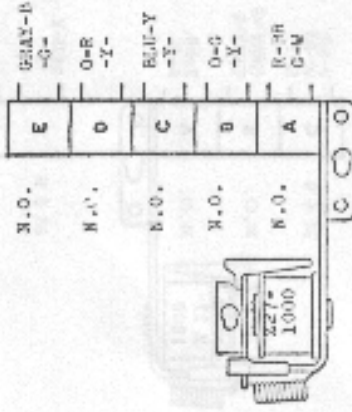


OPENS CIRCUIT TO COIN LOCKOUT COIL.  
TO REPLAY UNIT RESET COIL.  
ENERGIZES COIN RELAY.  
IN HOLD CIRCUIT TO THIS RELAY

(D-3)  
(E-5)  
(D-3)  
(D-3)

### COIN RELAY

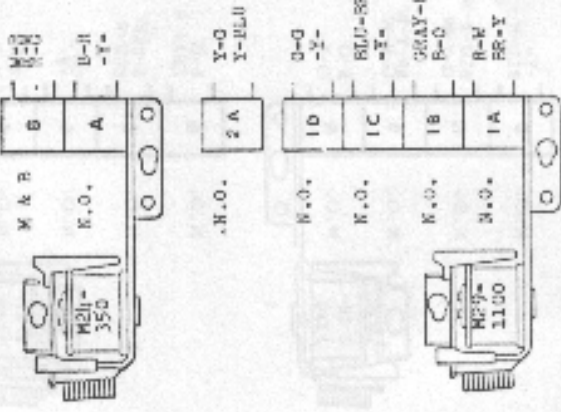
IS ENERGIZED BY COIN SWITCH OR REPLAY RELAY.



IN SERIES WITH SWITCH C ON RESET RELAY.  
ENERGIZES RESET RELAY, THRU SWITCH ON GAME-OVER RELAY.  
IN CIRCUIT TO GAME-OVER RELAY (TRIP COIL).  
RUNS SCORE MOTOR.  
IN HOLD CIRCUIT TO THIS RELAY.

(D-12)  
(O-5)  
(O-13)  
(O-4)  
(D-4)

### LOCATED ON PLAYFIELD



### DOUBLE BONUS RELAY

THIS 6 VOLT COIL IS ENERGIZED BY WIPER ON BALL COUNT UNIT, THRU 3-5 BALL ADJUSTMENT JACK.

IN CIRCUIT TO PULSER 1,000 POINT RELAY, THRU SWITCH A ON BONUS RELAY.  
TO "DOUBLE BONUS" LITE.

(D-16)  
(B-9)

### BONUS RELAY

IS ENERGIZED, DURING THE RESET CYCLE, BY SWITCHES ON COIN RELAY AND RESET RELAY.  
DURING PLAY, IT IS ENERGIZED BY OUTSIDE SWITCH, THRU ADVANCE UNIT ZERO POSITION SWITCH.

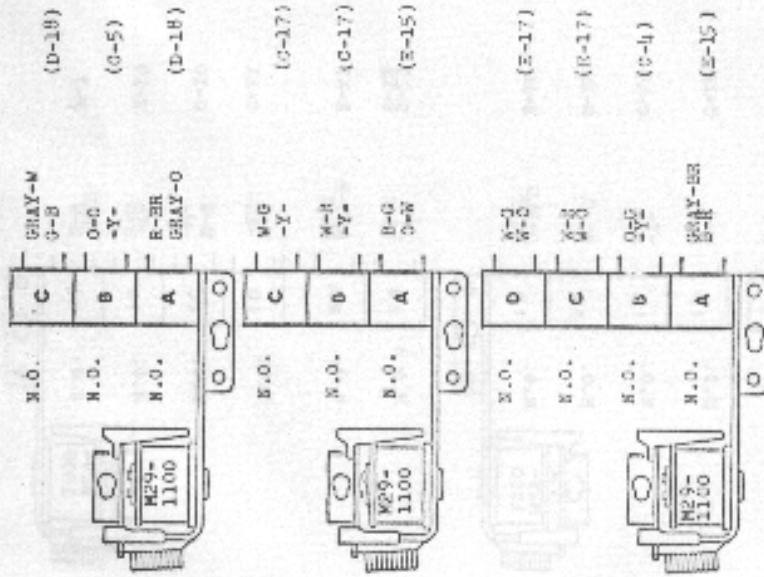
HOLD CIRCUIT TO THIS RELAY, THRU ZERO POSITION SWITCH ON ADVANCE UNIT.  
RUNS SCORE MOTOR.  
IN HOLD CIRCUIT TO RESET RELAY.  
PULSES ADVANCE UNIT RESET COIL, THRU SCORE MOTOR CAN SWITCHES 2C AND 5B.  
IN CIRCUIT TO 1,000 POINT RELAY.

(E-12)  
(O-5)  
(O-5)  
(E-12)  
(E-16)



## 50 POINT RELAY

IS ENERGIZED BY (U) STAND-UP SWITCHES.



## ADVANCE RELAY

IS ENERGIZED BY:

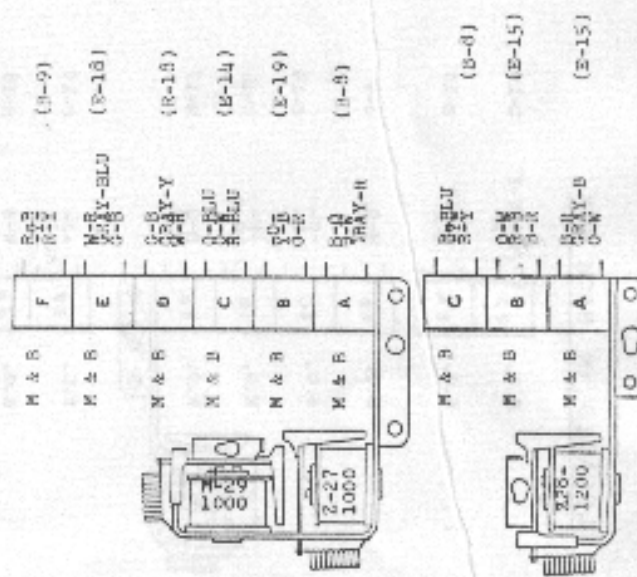
1. LEFT AND RIGHT TOP ROLLERS,
2. WIND UP LITE,
3. LEFT AND RIGHT BOTTOM ROLLERS,
4. LEFT AND RIGHT ROLLER BUTTON SWITCHES
5. "3 ADVANCE" RELAY.

## 3-ADVANCE RELAY

IS ENERGIZED BY LEFT AND RIGHT TOP ROLLERS, WIND LIT.

## CAPTIVE BALL RELAY (INTERLOCK)

IS ENERGIZED BY WIPER ON NUMBER MATCH UNIT DISC. (EVERY OTHER STEP).



## CHANGE RELAY

LATCH COIL IS ENERGIZED BY SWITCH C ON OUTSIDE RELAY, THRU LEFT SIDE CAPTIVE BALL SWITCH (MADE BY 3-3 BALL IN LANE).

TRIP COIL IS ENERGIZED BY SWITCH C ON OUTSIDE RELAY, THRU RIGHT SIDE CAPTIVE BALL SWITCH (MADE BY 3RD BALL IN THAT LANE).

PULSES 10 POINT RELAY, THRU IMPULSE CAM SWITCH B.

RUNS SCORE MOTOR.

IS HOLD CIRCUIT TO THIS RELAY.

ENERGIZES ADVANCE UNIT S.U. COIL.

PULSES 100 POINT RELAY.

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

PULSES ADVANCE UNIT S.U. COIL, THRU IMPULSE CAM SWITCH C.

PULSES 100 POINT RELAY, THRU IMPULSE CAM SWITCH C.

RUNS SCORE MOTOR.

IS HOLD CIRCUIT TO THIS RELAY.

OPENS TO RIGHT BOTTOM SCORER LITE AND CLOSSES TO LEFT BOTTOM SCORER LITE.

OPENS IN CIRCUIT TO 10 POINT RELAY AND CLOSSES TO 100 POINT RELAY.

OPENS IN CIRCUIT TO 100 POINT RELAY AND CLOSSES TO 10 POINT RELAY.

IS CIRCUIT TO ADVANCE RELAY, THRU LEFT OR RIGHT CAPTIVE BALL SWITCH.

IS CIRCUIT TO EXTRA BALL RELAY, THRU LEFT AND RIGHT CAPTIVE BALL SWITCHES.

OPENS TO RIGHT CAPTIVE BALL LANE LITE AND CLOSSES TO LEFT CAPTIVE BALL LANE LITE.

OPENS TO LEFT TOP ROLLER LITE AND CLOSSES TO RIGHT TOP ROLLER LITE.

OPENS IN CIRCUIT TO ADVANCE RELAY AND CLOSSES TO 3 ADVANCE RELAY (THRU RIGHT TOP ROLLER SW.)

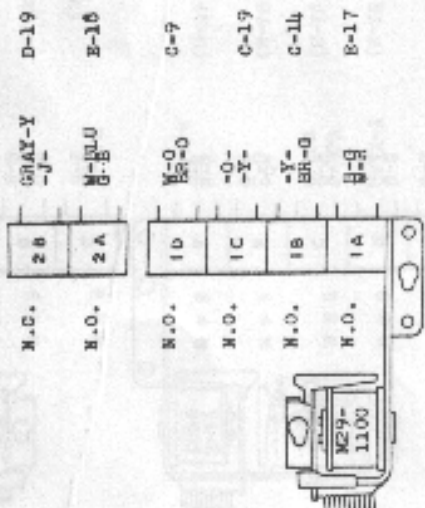
OPENS IN CIRCUIT TO 3 ADVANCE RELAY AND CLOSSES TO ADVANCE RELAY (THRU LEFT TOP ROLLER SW.).

LOCATED IN BACK BOX

### 10 POINT RELAY

IS PULSED BY:

1. "50 POINT RELAY".
2. STAND-UP SWITCHES.
3. LEFT OR RIGHT SHOOTER SWITCH, WHEN NOT LIT.



IN SERIES WITH SWITCH A ON EXTRA BALL RELAY.

IN HOLD CIRCUIT TO THIS RELAY.

PULSES 10 POINT DRUM UNITS, THRU PLAYER UNIT DISC.

ENERGIZES MEDIUM CHIME COIL AND NUMBER MATCH UNIT S.U. COIL.

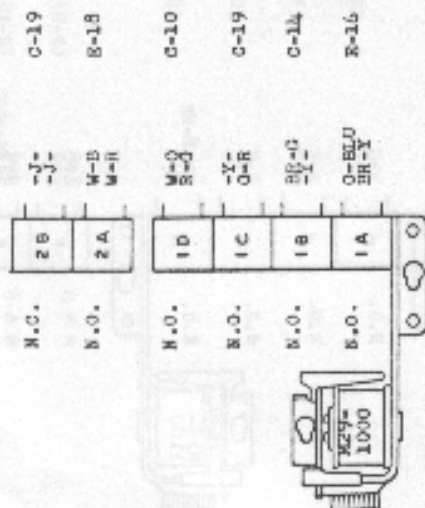
IN SERIES WITH SWITCH D ON EXTRA BALL RELAY.

PULSES 100 POINT RELAY, THRU 9TH POSITION SWITCHES ON 10 POINT DRUM UNITS.

### 100 POINT RELAY

IS PULSED BY:

1. LEFT AND RIGHT TOP JET BUMPER SW.
2. "3 ADVANCE RELAY".
3. ADVANCE RELAY.
4. LEFT OR RIGHT SHOOTER SWITCH, WHEN LIT.



IN SERIES WITH SWITCH 2B ON 10 POINT RELAY.

IN HOLD CIRCUIT TO THIS RELAY.

PULSES 100 POINT DRUM UNITS, THRU PLAYER UNIT DISC.

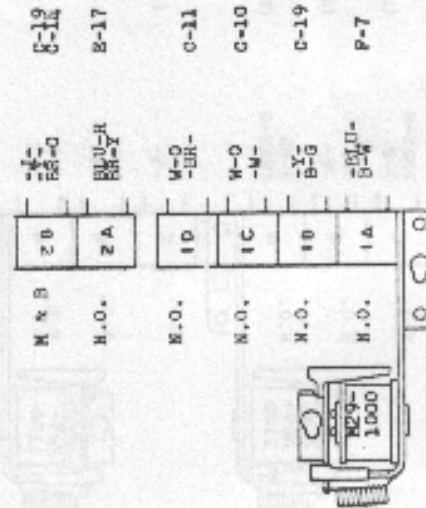
PULSES SMALL CHIME COIL.

IN SERIES WITH SWITCH D ON EXTRA BALL RELAY.

PULSES 1,000 POINT RELAY, THRU 9TH POSITION SWITCHES ON 100 POINT DRUM UNITS.

### 1000 POINT RELAY

IS PULSED BY SCORE MOTOR CAM SWITCHES, THRU SWITCH B ON DOUBLE BONUS RELAY AND SWITCH A ON BONUS RELAY.



OPENS IN HOLD CIRCUIT TO EXTRA BALL RELAY AND CLOSSES TO ENERGIZES BALL INDEX RELAY.

IN HOLD CIRCUIT TO THIS RELAY.

PULSES 10,000 POINT DRUM UNITS, THRU 9TH POSITION ON 1,000 POINT DRUM UNITS.

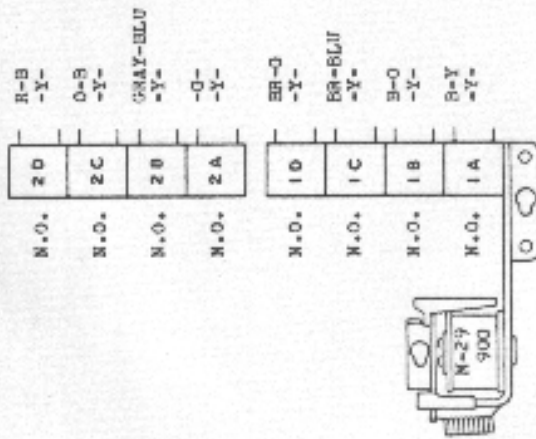
PULSES 1,000 POINT DRUM UNITS, THRU PLAYER UNIT DISC.

PULSES LARGE CHIME COIL.

IN HI-SCORE CIRCUIT TO REPLAY S.U. COIL OR EXTRA BALL RELAY.

### 1-2 RESET RELAY

IS PULSED BY IMPULSE CAM SWITCH D,  
THRU SWITCH A ON RESET RELAY.



### 3-4 RESET RELAY

IS PULSED BY IMPULSE CAM SWITCH A,  
THRU SWITCH A ON RESET RELAY.

