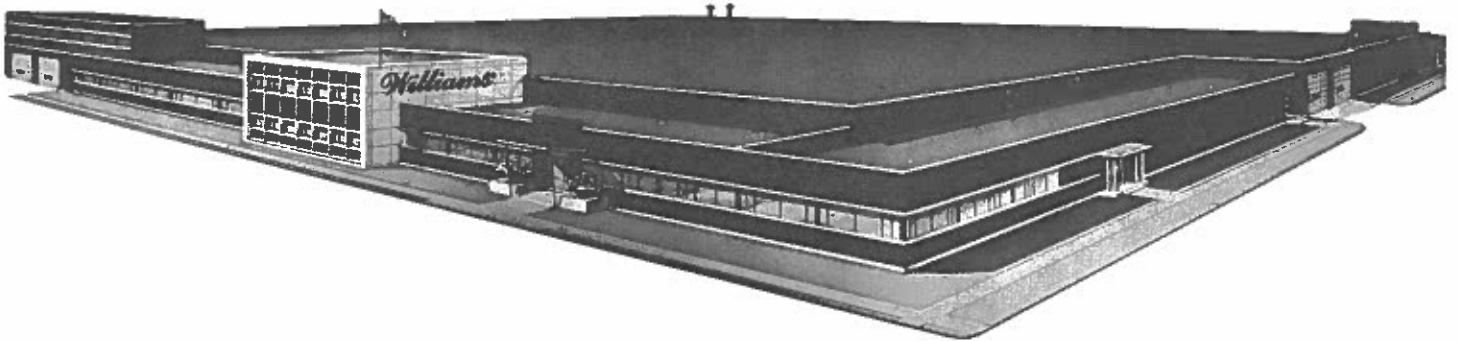


Instruction Manual

for

DOODLE BUG and LOVE BUG



Williams[®] ELECTRONICS, INC.
SUBSIDIARY OF THE SEEBURG CORPORATION

3401 N. California Ave.
Phone 267-2240

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.

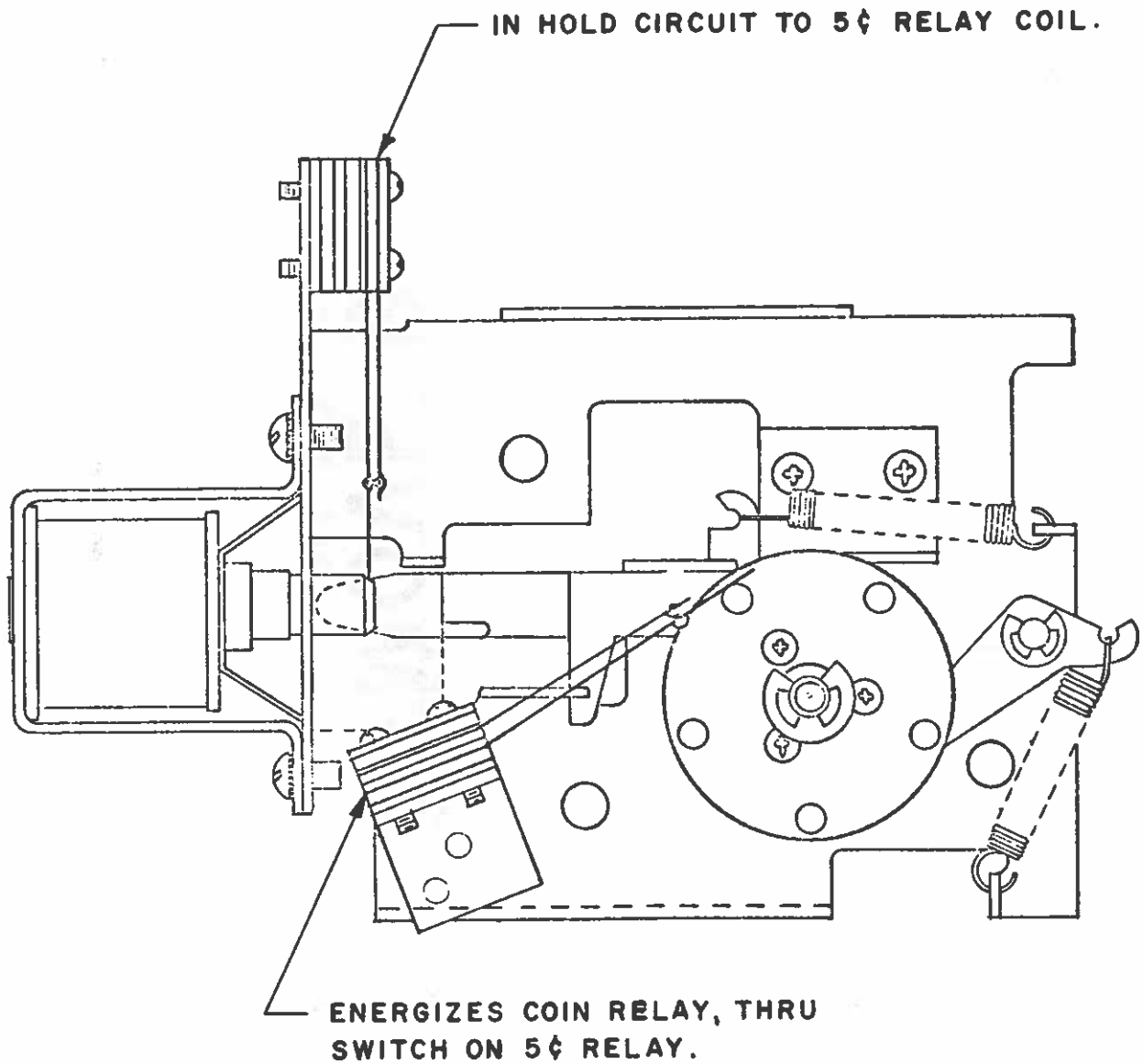
SERVICEMAN TO REMOVE BACKGLASS:

- **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

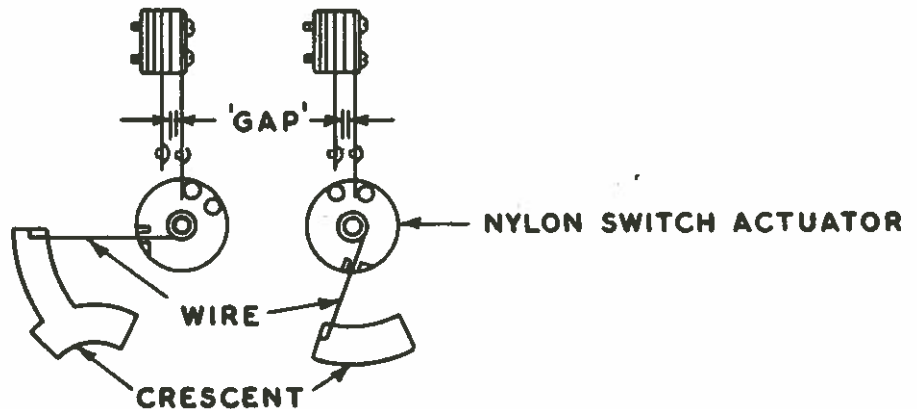
LOCATED ON MECHANISM PANEL.

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

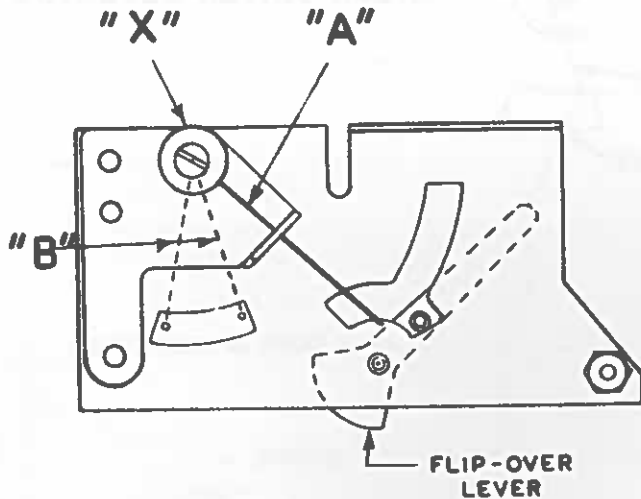
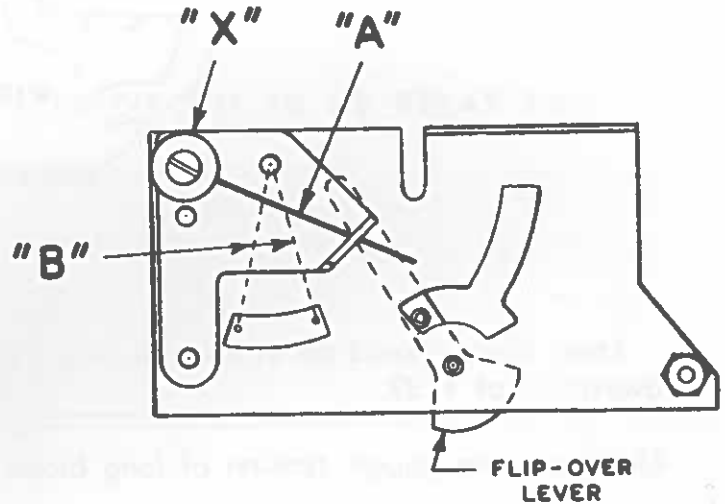


FIGURE 2



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

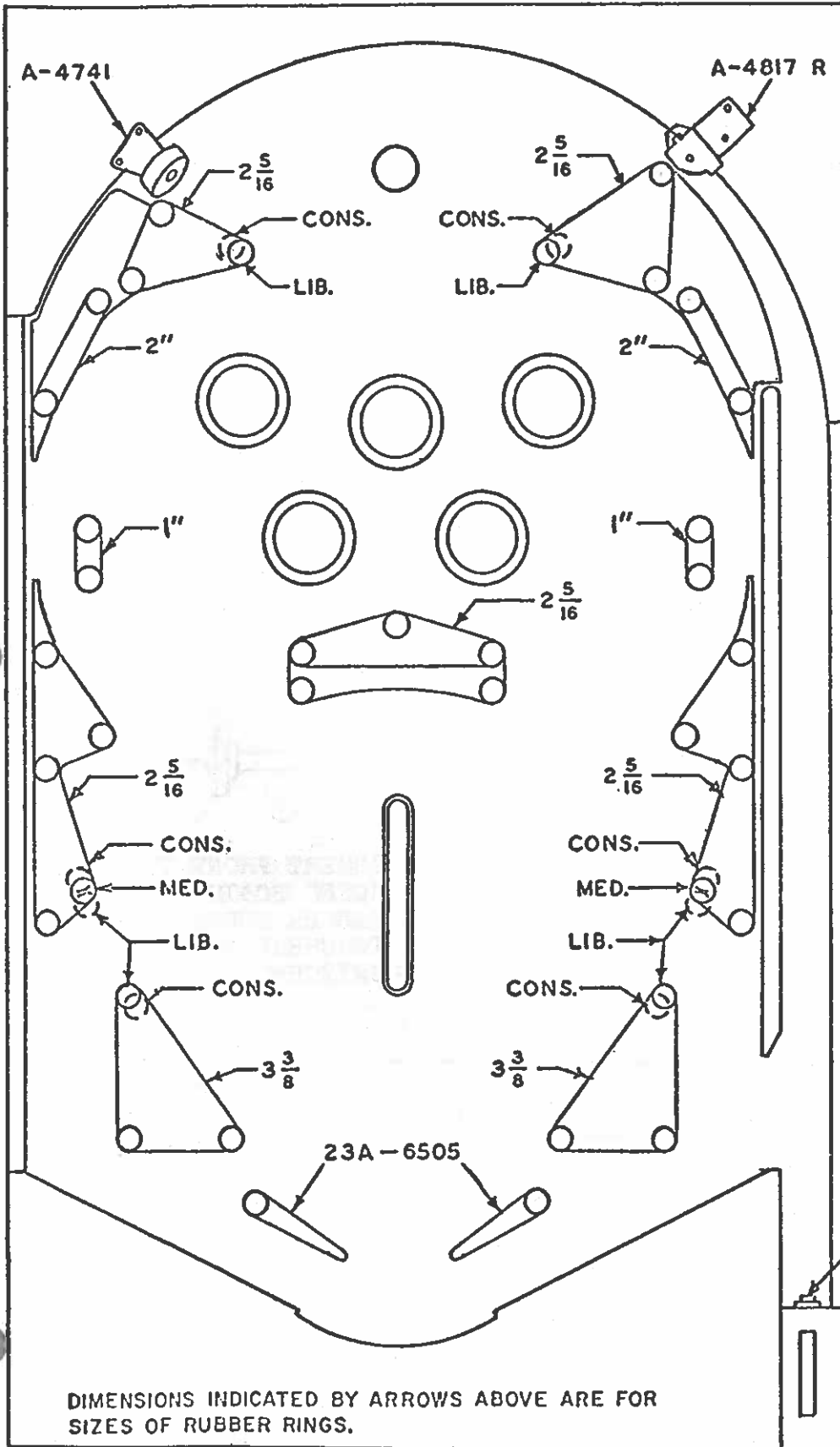
UNIT NAME	CONTACT DISC	WIPER ASSEMBLY	RATCHET GEAR ASSEMBLY	MOTORS
REPLAY	-----	-----	A-6400	
BALL COUNT	A-7398	C-6520	A-6402-9	SCORE MOTOR
NO. MATCH	C-6417	C-6520	A-6401	
ADVANCE	C-6417	C-6521	A-6404-17	14A-7805 (60 CYCLE)
TENS	A-7195	A-6294	3C-7272	14A-7806 (50 CYCLE)
HUNDREDS	-----	-----	3C-7272	
THOUSANDS	-----	-----	3C-7272	
10 THOUSANDS	A-7195	A-6294	3C-7272	

"DOODLE BUG" COIL CHART

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

NUMBER	DESCRIPTION	LOCATION
14 A 7871	SCORE MOTOR - 50 & 60 CYCLE	MECH. PANEL
15 A 6771	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 22-550	ADVANCE STEP MATCH UNIT STEP UP BALL COUNT UNIT STEP UP BALL RELEASE	PLAYFIELD INSERT INSERT PLAYFIELD
A 23-600	REPLAY UNIT STEP UP	INSERT
A2-23-750	KNOCKER	CABINET
B 26-800	ALTERNATOR UNIT BALL COUNT UNIT RESET SCORE DRUM UNITS ... (4 req'd.) ADVANCE UNIT RESET REPLAY UNIT RESET	MECH. PANEL INSERT INSERT PLAYFIELD INSERT
C 2-26-800	CHIME	CABINET
G 22-550	JET BUMPERS ... (5 req'd.)	PLAYFIELD
G 23-750	AUTO KICKERS ... (2 req'd.) EJECT COIL DOWN POST	PLAYFIELD PLAYFIELD PLAYFIELD
FL 21-375/ 28-400	FLIPPERS ... (2 req'd.)	PLAYFIELD
<u>RELAY COILS</u>		
M1-31-1500	COIN LOCKOUT	DOOR
M 29-1000	GAME TRIP GAME OVER TRIP UP POST	MECH. PANEL MECH. PANEL PLAYFIELD
M 29-1100	5¢ RELAY 10¢ RELAY 25¢ RELAY 10 POINT RELAY 100 POINT RELAY 1,000 POINT RELAY 10,000 POINT RELAY NO. 1 BUMPER RELAY NO. 2 BUMPER RELAY NO. 3 BUMPER RELAY POST RELAY ADVANCE RELAY CENTER TARGET RELAY STOP RELAY PULSE RELAY ROLLOVER RELAY SCORE RESET RELAY TRANSFER RELAY	MECH. PANEL MECH. PANEL MECH. PANEL INSERT INSERT INSERT INSERT PLAYFIELD PLAYFIELD PLAYFIELD PLAYFIELD PLAYFIELD PLAYFIELD PLAYFIELD PLAYFIELD PLAYFIELD INSERT INSERT
M 30-1300	DOODLE BUG RELAY 100,000 POINT RELAY	PLAYFIELD INSERT
M 30-1400	TROUGH RELAY OVER THE TOP RELAY	PLAYFIELD INSERT
Z 27-1000	GAME LATCH GAME OVER LATCH EJECT RELAY COIN RELAY OUTHOLE RELAY RESET RELAY	MECH. PANEL MECH. PANEL MECH. PANEL MECH. PANEL MECH. PANEL MECH. PANEL
Z 28-1150	LOCK RELAY BALL INDEX RELAY GATE RELAY ON YELLOW RELAY ON GREEN RELAY	MECH. PANEL MECH. PANEL PLAYFIELD PLAYFIELD PLAYFIELD
Z 28-1200	SET UP RELAY	PLAYFIELD
XM 27-675	METER COIL	B 6396

"DOODLE BUG" — 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

- 23A-6300 $5/16$ " I.D.
- 23A-6302 1" I.D.
- 23A-6305 2" I.D.
- 23A-6306 $2 \ 5/16$ " I.D.
- 23A-6308 $3 \ 3/8$ " I.D.

A-4741 REBOUND ASS'Y
 A-4817 R BALL GATE ASS'Y

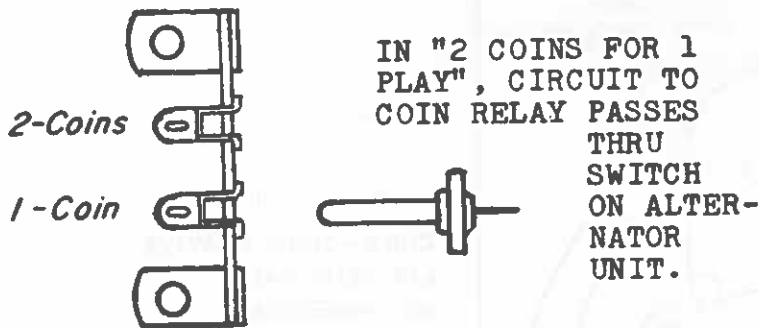
23A-6327 BALL SHOOTER
 RUBBER TIP

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

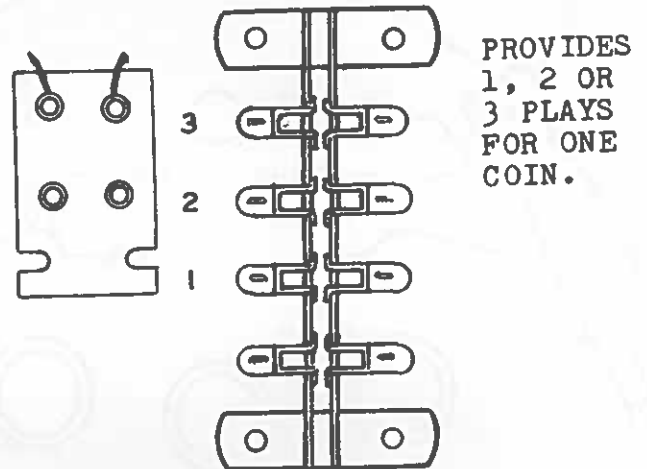
16A-386 PA

ADJUSTMENTS ON MECHANISM PANEL

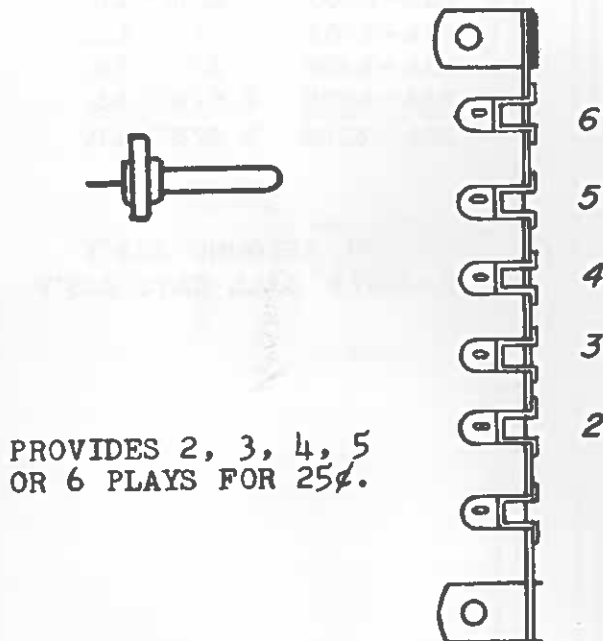
5¢ Adjustment



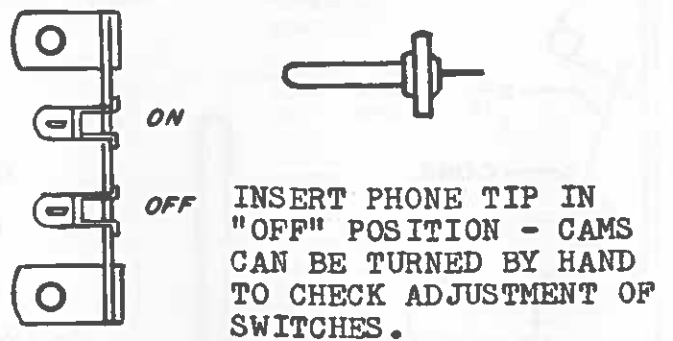
10¢ Adjustment



25¢ Adjustment



Motor Service Jack



SUGGESTED SCORE CARDS:

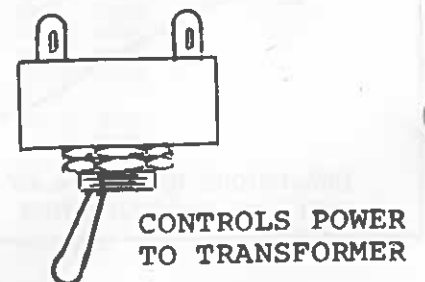
5 BALL PLAY-----390-1

3 BALL PLAY-----390-2

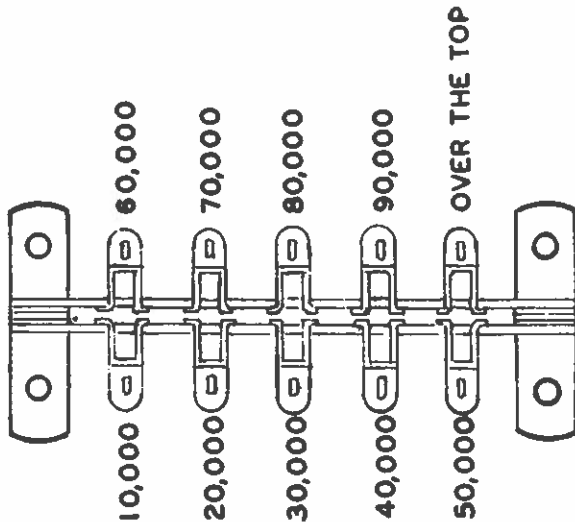
5 BALL ADD-A-BALL 390-6 and
3 BALL ADD-A-BALL 390-7

MASTER ON-OFF SW.

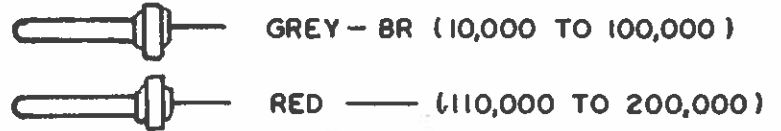
(Located under front of Cabinet)



ADJUSTMENTS IN BACKBOX



Hi-Score Adjustment

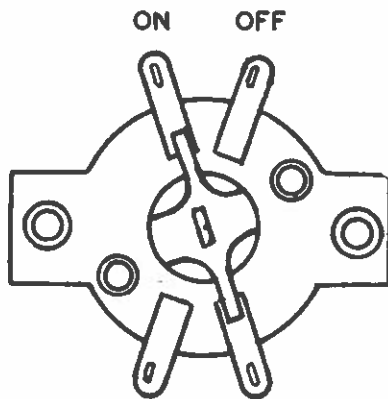


INSERT PLUGS INTO 10 POINT FEMALE AT DESIRED POSITIONS.

EXAMPLES:

- GREY - BR INTO 30,000 SCORES AT 30,000.
- GREY - BR INTO "OVER THE TOP" SCORES AT 100,000.
- RED - INTO 30,000 SCORES AT 130,000.
- RED - INTO "OVER THE TOP" SCORES AT 200,000.

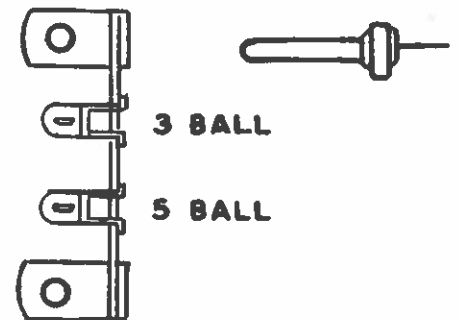
NO. MATCH ADJ.



IN "ON" POSITION, A NUMBER MATCH LITE WILL APPEAR WHEN GAME IS OVER. TO AWARD REPLAYS, WHEN NUMBER IS MATCHED, "REPLAY-ADD A BALL-NOVELTY" ADJUSTMENT MUST BE IN REPLAY POSITION.

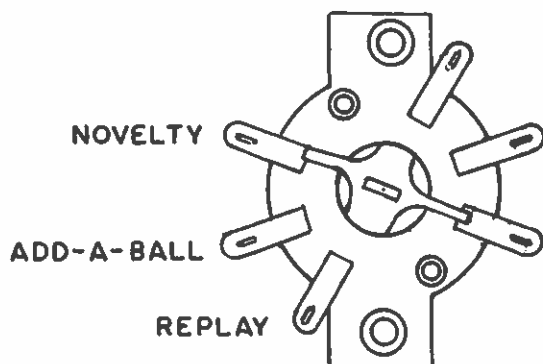
IF IT IS IN "ADD A BALL" POSITION, NUMBER MATCH ADJUSTMENT MUST BE TURNED TO "OFF".

No. of Balls Adjustment



Plug changes 3 to 5 ball play, or vice versa.

GAME ADJUSTMENT

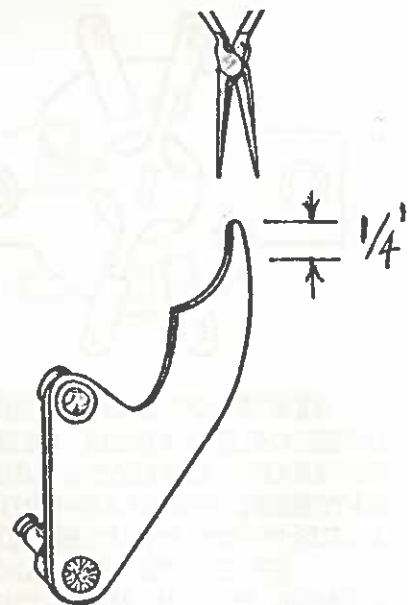
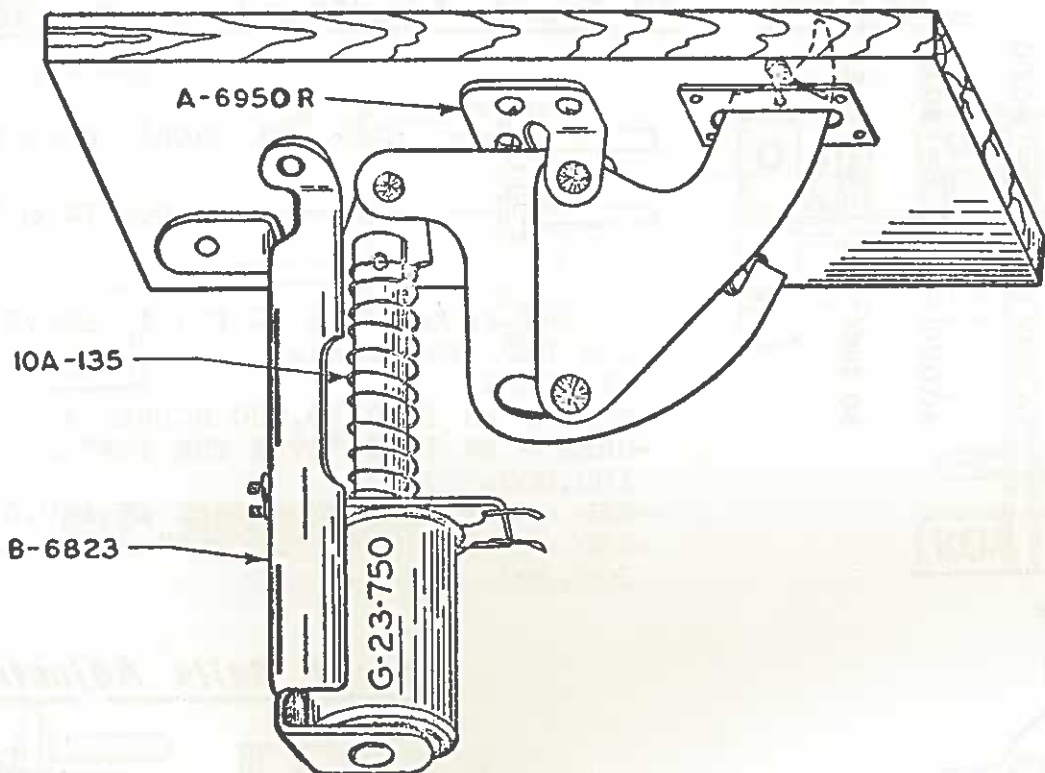


IN "REPLAY" POSITION, HI-SCORES AND NUMBER MATCH CIRCUITS WILL ADVANCE REPLAY UNIT. HITTING CENTER TARGET, WHEN LIT, WILL ADVANCE BALL COUNT UNIT.

IN "ADD A BALL" POSITION, HI-SCORES AND CENTER TARGET (WHEN LIT) WILL ADVANCE BALL COUNT UNIT. NUMBER MATCH ADJUSTMENT MUST BE IN "OFF" POSITION.

IN "NOVELTY" POSITION, CENTER TARGET (WHEN LIT) SCORES 10,000 POINTS.

BALL EJECT CAM UNIT

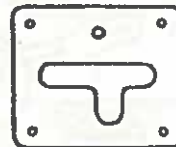


TO CHANGE DIRECTION OF BALL,
WHEN EJECTED, GRASP "BALL EJECT CAM"
WITH LONG-NOSED PLIERS (APPROXIMATELY
1/4") AND BEND SLIGHTLY.

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

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.

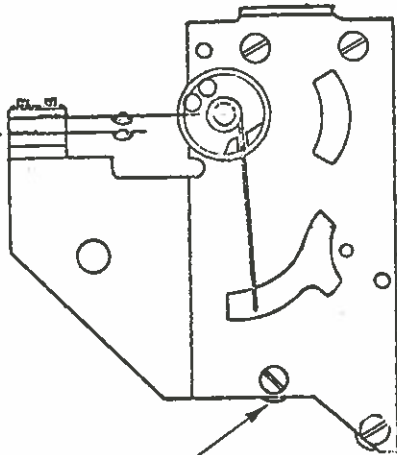
Solenoid Plungers should not have a lubricant of any kind. Should there be a sluggish tendency or if plungers are sticking, the parts should be cleaned with a solvent and flaked graphite applied on reassembly.

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.

- CONVERTING FROM (10¢-25¢) PLAY TO (2/25¢ - 2/25¢) PLAY
- REPLACE 10¢ COIN CHUTE WITH 25¢ COIN CHUTE.
- REPLACE 10¢ COIN INSERT PLATE WITH (1A-4215) 25¢ COIN INSERT PLATE.
- REPLACE 10¢ IDENTIFICATION PLATE WITH (16C-8640-100) 2 PLAYS-QUARTER.
- REPLACE 10¢ COIN SWITCH WITH 25¢ COIN SWITCH (3M-3)

REMOVE MACHINE SCREW AND SPACER IN "COIN TRIP AND SWITCH ASSEMBLY" B-6853, TO ALLOW QUARTER TO PASS THRU.



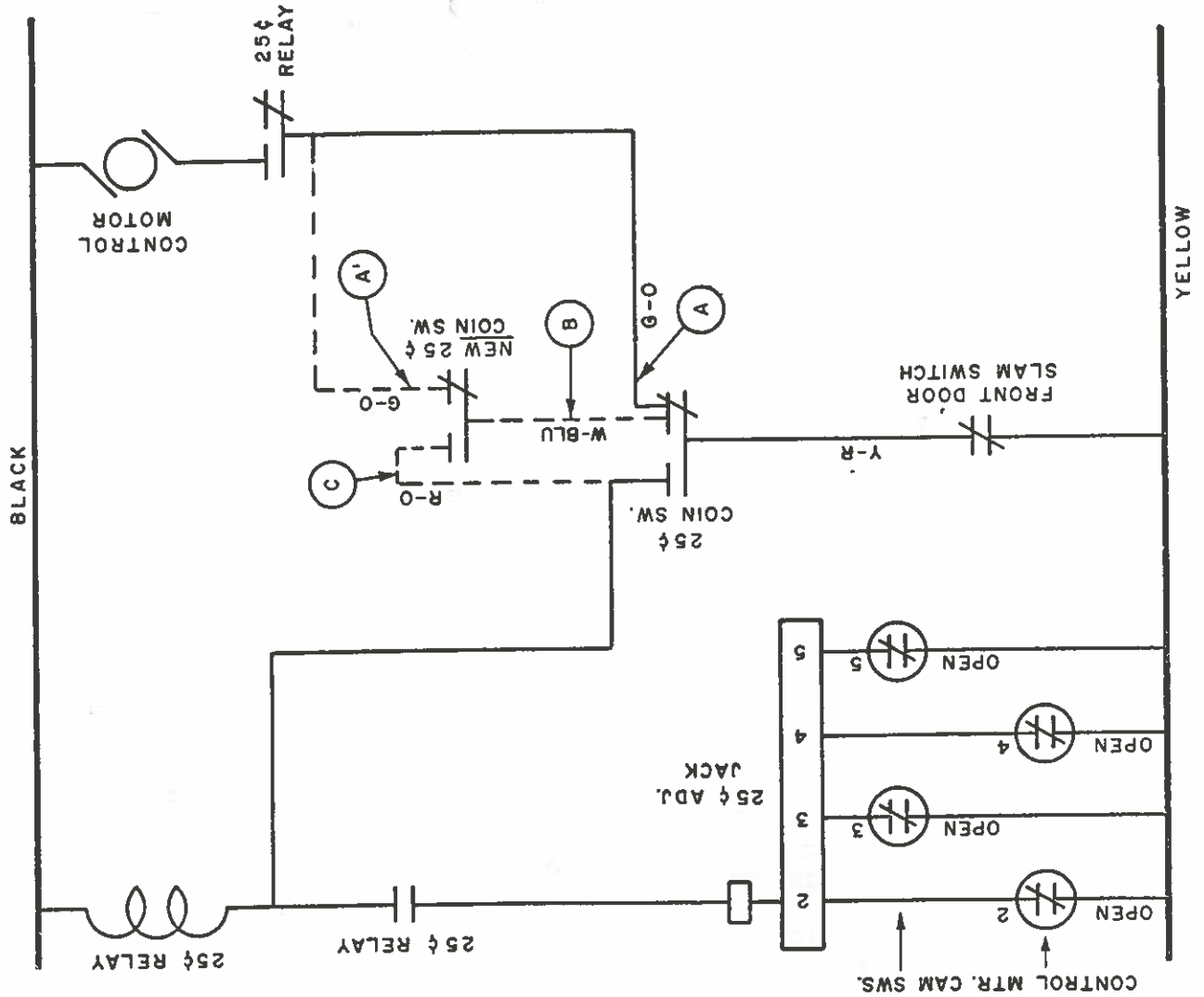
B-6853 COIN TRIP & SWITCH ASS'Y

TO CONVERT FROM (5¢ 5¢ - 10¢ - 25¢) TO (2/25¢ - 2/25¢)

- REPLACE (5¢ 5¢) COIN TRIP AND SWITCH ASSEMBLY WITH B-6853 (10¢) COIN TRIP AND SWITCH ASSEMBLY.
- REPLACE 5¢ COIN CHUTE WITH 25¢ COIN CHUTE.
- REPLACE 5¢ COIN INSERT PLATE WITH (1A-4215) 25¢ COIN INSERT PLATE.
- REPLACE 5¢ IDENTIFICATION PLATE WITH (16C-8640-100) 2 PLAYS - QUARTER.
- MAKE CHANGES ON B-6853 "COIN TRIP AND SWITCH ASSEMBLY" AS SHOWN ABOVE.
- USE PART NO. 16A-8636 (DUMMY COIN ENTRY COVER) ON CENTER CHUTE.

WIRING INSTRUCTIONS

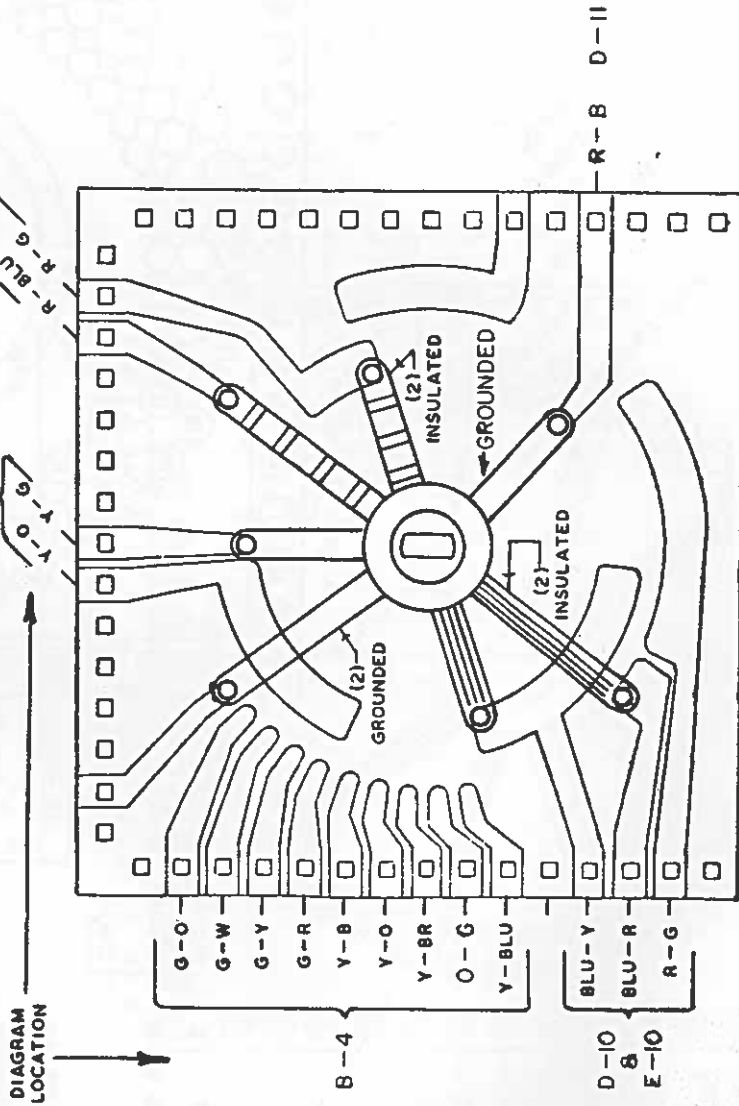
- AT ORIGINAL 25¢ COIN SWITCH, UNSOLDER GREEN-ORANGE WIRE (A) AND TAPE IT. REMOVE TAPE FROM WHITE-BLUE WIRE AND SOLDER IN ITS PLACE.
- AT NEW 25¢ COIN SWITCH, REMOVE TAPE FROM GREEN-ORANGE, WHITE-BLUE AND RED-ORANGE WIRES AND SOLDER AS SHOWN BY DOTTED LINES (A), (B) AND (C).
- INSERT 25¢ ADJUSTMENT JACK INTO "2 PLAYS FOR QUARTER" POSITION.



BALL COUNT UNIT DISC

DURING RESET CYCLE, THIS UNIT RESETS TO ZERO AND THEN ADVANCES 5 STEPS. DURING PLAY, IT ADVANCES ONE STEP IF BALL FALLS INTO EJECT POCKET BEFORE "BALL INDEX RELAY" IS ENERGIZED. IT ALSO ADVANCES ONE STEP WHEN BALL MAKES LEFT SIDE ROLLOVER WHILE WEST GATE IS OPEN.

VIEW LOOKING AT WIPER FINGERS SIDE WITH WIPERS IN ZERO POSITION.



- NO.1
- NO.2
- NO.3
- NO.4
- NO.5
- NO.6
- NO.7
- NO.8
- NO.9

BALLS TO PLAY LITES

FEEDS BLU-R AND R-G (BELOW) FROM SWS. ON BALL INDEX AND OUTHOLE RELAY.

TO GAME OVER RELAY. (TRIP COIL)
TO GAME OVER RELAY. (LATCH COIL)

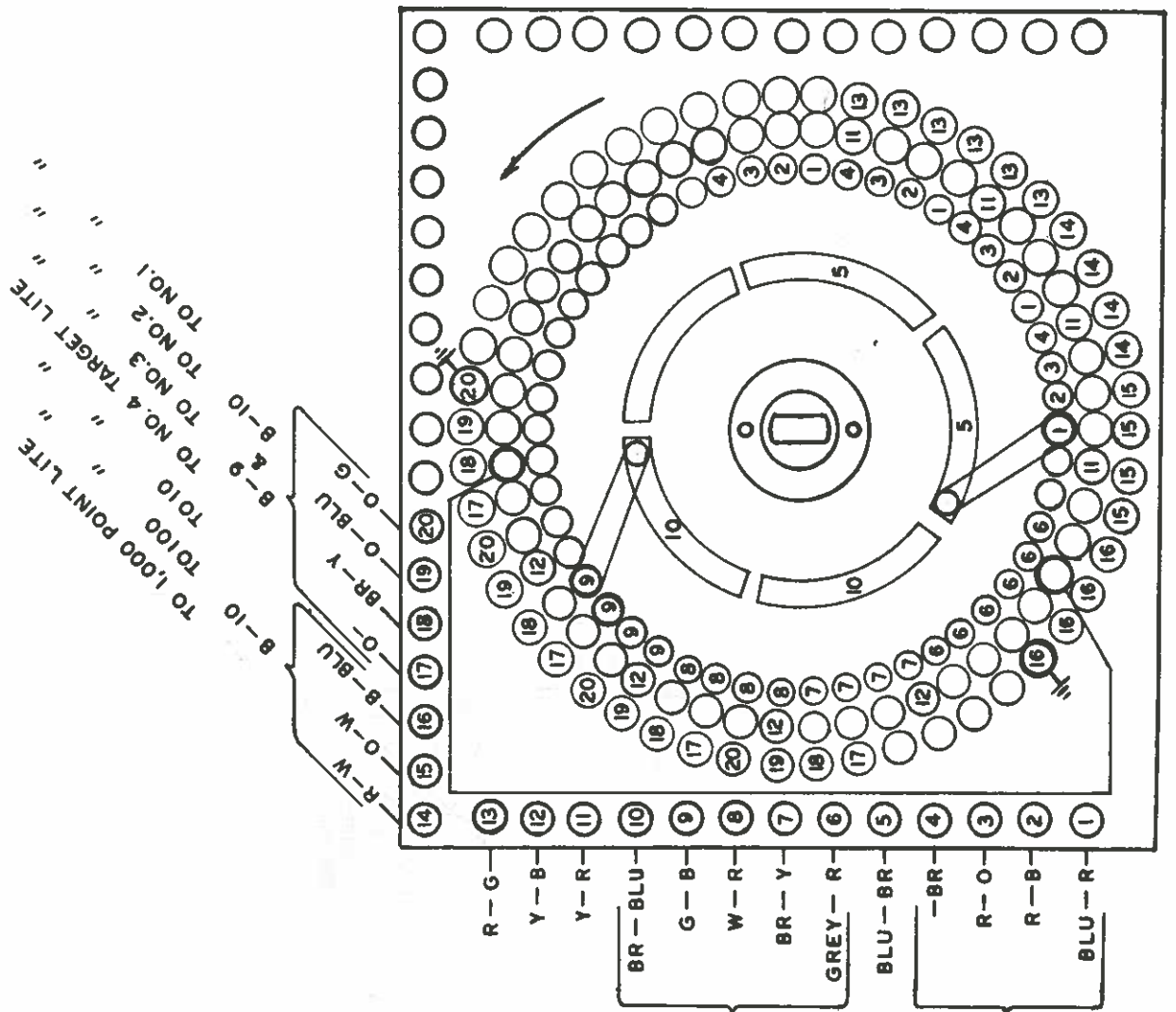
FEEDS BLU-R AND R-G (BELOW) FROM SWS. ON BALL INDEX AND OUTHOLE RELAY.
TO GAME OVER RELAY. (TRIP COIL)
TO GAME OVER RELAY. (LATCH COIL)

VIEW LOOKING AT SNO-SHOE WIPER SIDE

3 PAIRS OF INSULATED WIPERS
2 GROUNDED WIPERS

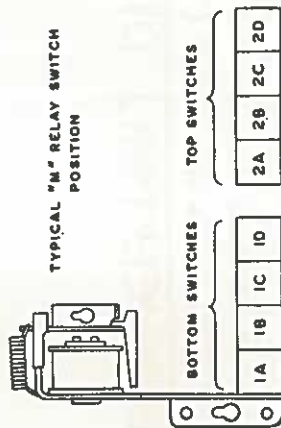
ADVANCE UNIT DISC

THIS UNIT TAKES ONE STEP EACH TIME THE ADVANCE RELAY IS PULSED, AND ONE STEP AT SCORE MOTOR CAM SWITCH 1B WHEN EJECT RELAY IS IN ENERGIZED POSITION. IT RESETS TO ZERO AT CAM SWITCH 2B WHEN OUTHOLE RELAY OR COIN RELAY IS ENERGIZED.



- B-11 TO 10,000 POINT LITE
- E-14 CIRCUIT TO SET UP RELAY, THRU E.O.S.
- D-14 SWITCH ON ADVANCE UNIT.
- D-17 FEEDS LUGS 6, 7, 8, & 9, THRU SWITCH ON PULSE RELAY
- E-17 TO 10 POINT RELAY
- D-15 TO 100 " "
- D-15 TO 1,000 " "
- D-15 TO 10,000 " "
- D-15 TO ADVANCE RELAY
- D-15 FEED TO NO.5, BLU-BR, THRU NO.4 TARGET SWITCH
- E-15 " " " NO.3 " "
- E-15 " " " NO.2 " "
- E-15 " " " NO.1 " "

A.C. RELAYS & SWITCHES LOCATED ON MECHANISM PANEL



OUTHOLE RELAY

IS ENERGIZED BY OUTHOLE SWITCH, THRU BALL COUNT UNIT ZERO SWITCH.

SWITCH TYPE	DIAGRAM LOCATION
M&B	C-8 & C-14
M&B	C-6 & C-13
N.O.	C-10
N.O.	D-11
N.O.	F-13
N.O.	F-13

OPENS IN HOLD CIRCUIT TO DOODLE BUG ANS SET UP RELAYS, AND CLOSES TO RESET THE ADVANCE UNIT.

OPENS TO HOLD CIRCUIT TO "ON GREEN" AND "ON YELLOW" RELAYS, AND CLOSES TO RUN SCORE MOTOR.

IN CIRCUIT TO BALL COUNT RESET COIL, GAME-OVER RELAY (TRIP COIL), AND BALL RELEASE COIL.

IN NUMBER MATCH CIRCUIT, THRU BALL COUNT UNIT DISC.

ENERGIZES BALL INDEX RELAY, THRU SWITCH ON GAME-OVER RELAY.

IN HOLD CIRCUIT TO THIS RELAY.

LOCK RELAY

IS ENERGIZED BY 5¢, 10¢, 25¢, OR COIN RELAYS----ALSO BY LEFT FLIPPER SWITCH.

SWITCH TYPE	DIAGRAM LOCATION
N.O.	D-9
N.O.	D-5
N.O.	A-2
N.O.	A-2
N.O.	F-5

ENERGIZES GAME-OVER RELAY (TRIP COIL).

IN CIRCUIT TO RESET RELAY.

6 VOLTS FROM TRANSFORMER TO LITES.

6 VOLTS FROM TRANSFORMER TO LITES.

IN HOLD CIRCUIT TO THIS RELAY.

BALL INDEX RELAY

IS ENERGIZED BY 10 POINT, 100 POINT OR 1000 POINT RELAY.

SWITCH TYPE	DIAGRAM LOCATION
N.O.	D-11
N.O.	C-10
N.O.	E-12
N.O.	D-13

IN SERIES WITH SWITCH C ON OUTHOLE RELAY.

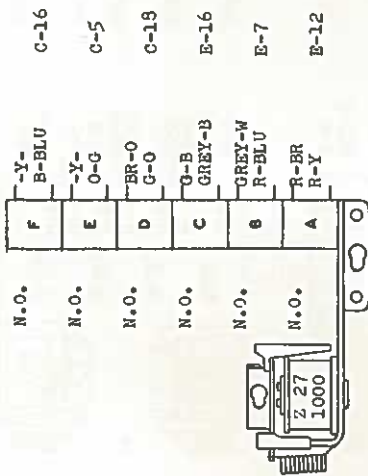
IN CIRCUIT TO BALL COUNT RESET COIL AND GAME-OVER RELAY (TRIP COIL).

ENERGIZES GAME RELAY (TRIP COIL).

IN HOLD CIRCUIT TO THIS RELAY.

EJECT RELAY

IS ENERGIZED BY EJECT POCKET SWITCH.



ENERGIZES "ON YELLOW" OR "ON GREEN" RELAY, THRU NO. MATCH UNIT DISC.

RUNS SCORE MOTOR

IN CIRCUIT TO 100 POINT RELAY OR 1000 POINT RELAY, THRU NO. MATCH UNIT DISC.

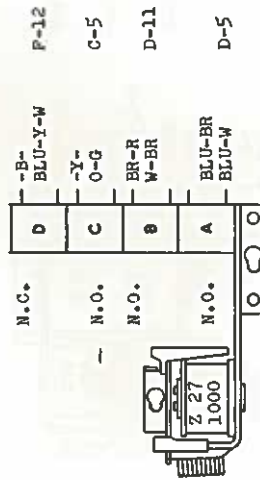
ENERGIZES ADVANCE S.U. COIL AT SCORE MOTOR CAM SWITCH 1B.

PULSES EJECT COIL AT SCORE MOTOR CAM SWITCH 4B.

IN HOLD CIRCUIT TO THIS RELAY.

RESET RELAY

IS ENERGIZED BY SWITCH C ON COIN RELAY.



OPENS CIRCUITS TO PLAYFIELD SWITCHES.

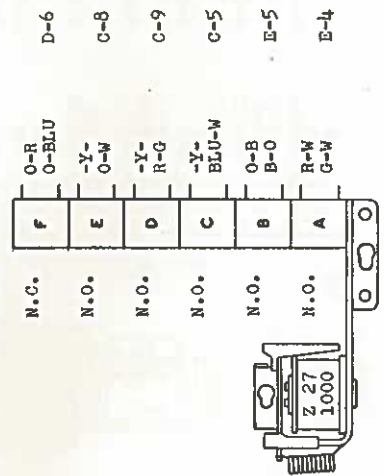
RUNS SCORE MOTOR.

PULSES SCORE RESET RELAY, THRU IMPULSE CAM SWITCH B.

IN HOLD CIRCUIT TO THIS RELAY.

COIN RELAY

IS ENERGIZED BY COIN SWITCH----ALSO BY REPLAY BUTTON WHEN CREDIT IS AVAILABLE.



OPENS CIRCUIT TO KNOCKER COIL.

IN CIRCUIT TO "DOWN POST" COIL AND ADVANCE UNIT RESET COIL.

IN CIRCUIT TO GAME RELAY AND GAME-OVER RELAY (LATCH COILS); ALSO TO BALL COUNT UNIT S.U. AND RESET COILS.

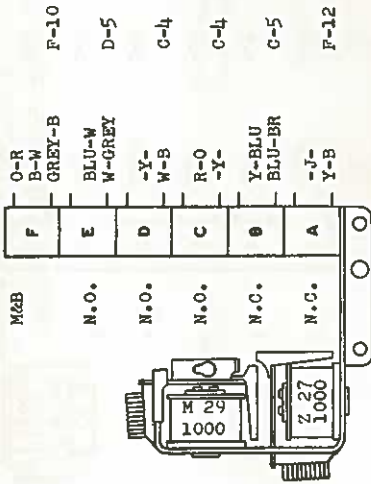
ENERGIZES RESET RELAY.

ENERGIZES LOCK RELAY.

IN HOLD CIRCUIT TO THIS RELAY.

GAME RELAY INTERLOCK

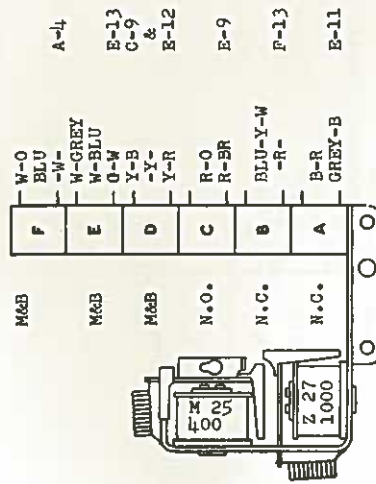
LATCH COIL IS ENERGIZED BY COIN RELAY, WHEN BALL COUNT UNIT IS IN RESET POSITION.
TRIP COIL IS ENERGIZED BY BALL INDEX RELAY OR GAME-OVER RELAY.



OPENS IN CIRCUIT TO BALL COUNT S.U. COIL AND CLOSSES TO BALL COUNT RESET COIL.
IN CIRCUIT TO COIN RELAY AND COIN LOCKOUT COIL.
IN HOLD CIRCUIT TO COIN RELAY, THRU 3-5 BALL ADJUSTMENT JACK.
IN HOLD CIRCUIT TO COIN RELAY, THRU 3-5 BALL ADJUSTMENT JACK.
IN SERIES WITH SWITCH D ON LOCK RELAY.
TO GAME RELAY (TRIP COIL).

GAME OVER RELAY INTERLOCK

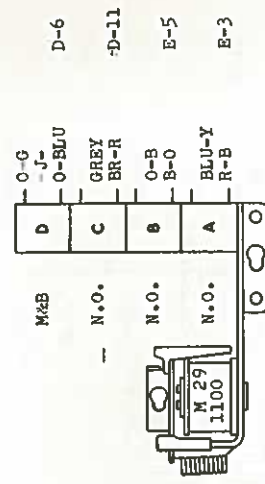
LATCH COIL IS ENERGIZED BY COIN RELAY.
TRIP COIL IS ENERGIZED BY OUTHOLE RELAY AND BALL INDEX RELAY, THRU BALL COUNT UNIT DISC.
TRIP COIL IS ALSO ENERGIZED BY LOCK RELAY AND TILT SWITCHES.



OPENS IN CIRCUIT TO PLAYFIELD LITES AND CLOSSES TO TILT, GAME-OVER & NO. MATCH LITES.
OPENS IN CIRCUIT TO OUTHOLE RELAY AND CLOSSES TO BALL INDEX RELAY.
OPENS IN CIRCUIT TO TRIP COIL ON THIS RELAY, AND CLOSSES TO TRIP COIL ON GAME RELAY.
ENERGIZES POST RELAY.
IN SERIES WITH SWITCH D ON RESET RELAY.

10¢ RELAY

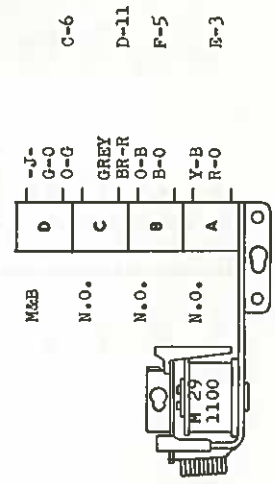
IS ENERGIZED BY COIN SWITCH, IP 10¢ ADJUSTMENT JACK IS IN "2 PLAYS" OR "3 PLAYS" POSITION.



OPENS IN CIRCUIT TO KNOCKER COIL AND CLOSSES TO RUN SCORE MOTOR.
PULSES REPLAY S.U. COIL, THRU IMPULSE CAM SWITCH B.
ENERGIZES LOCK RELAY.
IN HOLD CIRCUIT TO THIS RELAY.

25¢ RELAY

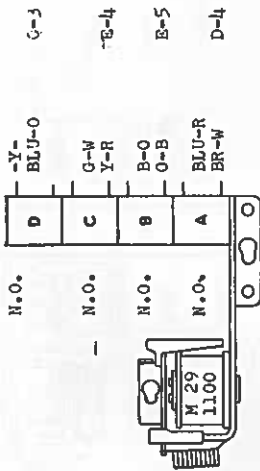
IS ENERGIZED BY 25¢ COIN SWITCH.



OPENS IN CIRCUIT TO KNOCKER COIL AND CLOSSES TO RUN SCORE MOTOR.
PULSES REPLAY S.U. COIL, THRU IMPULSE CAM SWITCH B.
ENERGIZES LOCK RELAY.
IN HOLD CIRCUIT TO THIS RELAY.

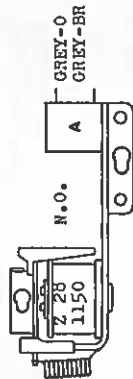
5¢ RELAY

THIS RELAY IS USED IN CONJUNCTION WITH ALTERNATOR UNIT. IT IS ENERGIZED BY 5¢ COIN SWITCH.



ENERGIZES ALTERNATOR UNIT COIL.
 ENERGIZES COIN RELAY, THRU SWITCH ON ALTERNATOR UNIT.
 ENERGIZES LOCK RELAY.
 IN HOLD CIRCUIT TO THIS RELAY.

LOCATED ON PLAYFIELD



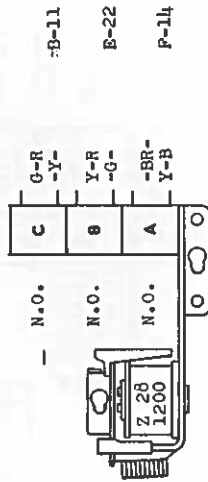
GATE RELAY

IS ENERGIZED BY RIGHT SIDE ROLLOVER, THRU "ON GREEN" RELAY, OR BY LEFT SIDE ROLLOVER, THRU "ON YELLOW" RELAY.

HOLD CIRCUIT TO THIS RELAY, THRU SWITCH ON TROUGH RELAY.

SET UP RELAY

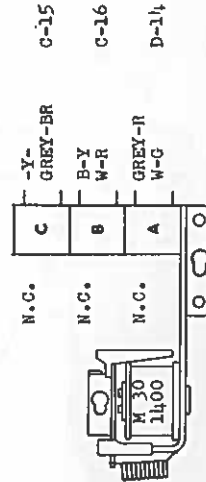
IS ENERGIZED BY ADVANCE UNIT END-OF-STROKE SWITCH, THRU ADVANCE UNIT DISC.



TO CENTER TARGET LITE.
 TO CENTER TARGET RELAY, FROM CENTER TARGET SWITCH.
 IN HOLD CIRCUIT TO THIS RELAY.

TROUGH RELAY

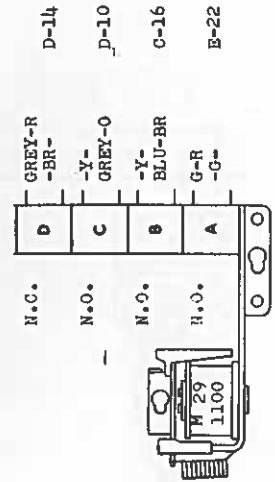
IS ENERGIZED BY TROUGH SWITCH, LOCATED JUST IN FRONT OF PLUNGER.



IN SERIES WITH SWITCH A ON GATE RELAY.
 IN HOLD CIRCUIT TO "ON GREEN" AND "ON YELLOW" RELAYS.
 IN HOLD CIRCUIT TO DOODLE BUG RELAY.

CENTER TARGET RELAY

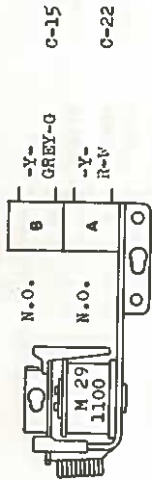
IS ENERGIZED BY CENTER TARGET SWITCH, THRU SET-UP RELAY.



IN SERIES WITH SWITCH A ON SET-UP RELAY.
 SCORES A "SPECIAL", THRU "REPLAY-ADD-A-BALL-NOVELTY" ADJUSTMENT JACK.
 PULSES ADVANCE RELAY.
 IN HOLD CIRCUIT TO THIS RELAY.

ROLLOVER RELAY

IS ENERGIZED BY EITHER OF 2 SIDE ROLL-OVER SWITCHES.

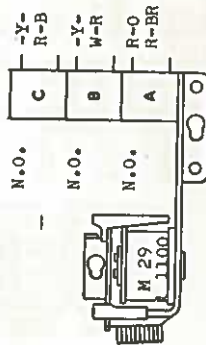


ENERGIZES STOP RELAY.
ENERGIZES "UP POST" COIL.

C-15
C-22

POST RELAY

IS ENERGIZED BY DOODLE BUG RELAY, GAME-OVER RELAY OR (2) STAND UP SWITCHES.

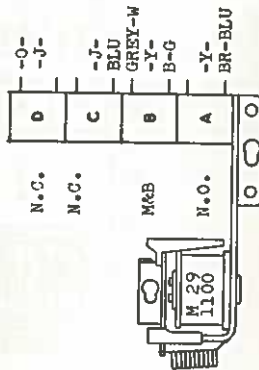


ENERGIZES "DOWN POST" COIL.
PULSES 100 POINT RELAY.
IN HOLD CIRCUIT TO THIS RELAY.

C-8
C-19
E-8

PULSE RELAY

IS ENERGIZED BY DOODLE BUG ROLLOVER SWITCH, THRU DOODLE BUG RELAY.

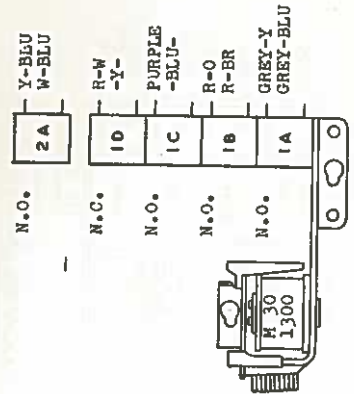


TO 110 VOLT "DOODLE BUG" COIL, THRU 1 AMP SLO-BLO FUSE.
IN SERIES WITH SWITCH D ON THIS RELAY.
FLASHES DOODLE BUG LITES.

C-2
C-2
B-3
C-17

DOODLE BUG RELAY

IS ENERGIZED BY CENTER TARGET SWITCH.

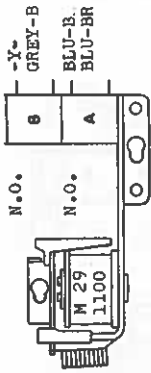


IN HOLD CIRCUIT TO THIS RELAY.
IN CIRCUIT TO NO. MATCH UNIT S.U. COIL.
IN SERIES WITH SWITCH C ON PULSE RELAY.
ENERGIZES POST RELAY
ENERGIZES "PULSE" RELAY, WHEN CAPTIVE BALL MAKES DOODLE BUG ROLLOVER SWITCH.

F-14
C-20
B-2
B-8
E-14

ADVANCE RELAY

IS ENERGIZED BY CENTER TARGET RELAY, OR BY NO. 1, 2, 3 OR 4 TARGET SWITCHES WHEN LIT.



C-16

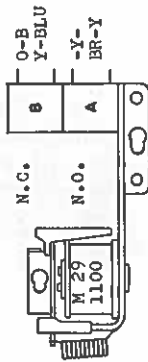
ENERGIZES ADVANCE UNIT S.U. COIL.

E-16

IN HOLD CIRCUIT TO THIS RELAY.

STOP RELAY

IS ENERGIZED BY ROLLOVER RELAY, (2) ROLL-OVER BUTTON SWITCHES, AND (2) TOP STAND UP SWITCHES.



E-14

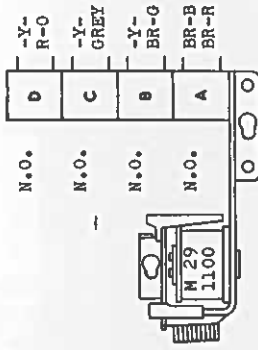
IN SERIES WITH SWITCH 2A ON DOODLE BUG RELAY.

C-17

PULSES 1000 POINT RELAY.

NO. 3 BUMPER RELAY

IS ENERGIZED BY LEFT BOTTOM AND RIGHT TOP JET BUMPER SWITCHES.



C-6

ENERGIZES LEFT BOTTOM JET BUMPER COIL.

C-7

ENERGIZES RIGHT TOP JET BUMPER COIL.

C-18

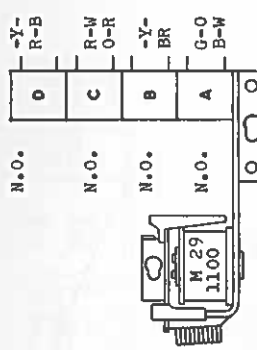
IN SERIES WITH SWITCH E ON "ON GREEN RELAY".

E-21

IN HOLD CIRCUIT TO THIS RELAY.

NO. 2 BUMPER RELAY

IS ENERGIZED BY CENTER JET BUMPER SWITCH.



C-6

ENERGIZES CENTER JET BUMPER COIL.

E-20

TO NO. MATCH UNIT S.U. COIL.

C-19

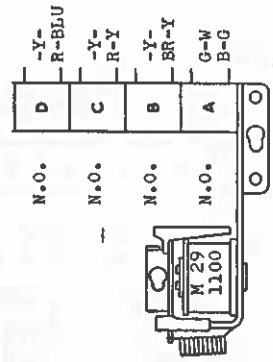
IN SERIES WITH SWITCH E ON "ON YELLOW" RELAY.

E-21

IN HOLD CIRCUIT TO THIS RELAY.

NO. 1 BUMPER RELAY

IS ENERGIZED BY LEFT TOP AND RIGHT BOTTOM JET BUMPER SWITCHES.



C-6

ENERGIZES LEFT TOP JET BUMPER COIL.

C-7

ENERGIZES RIGHT BOTTOM JET BUMPER COIL.

C-18

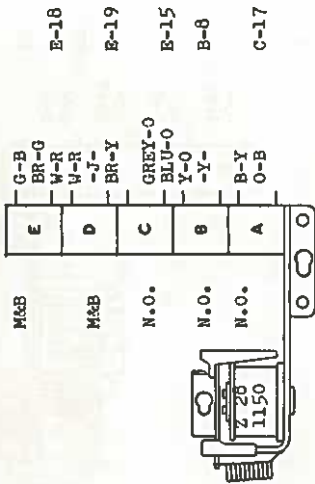
IN SERIES WITH SWITCH F ON "ON YELLOW" RELAY.

E-21

IN HOLD CIRCUIT TO THIS RELAY.

ON GREEN RELAY

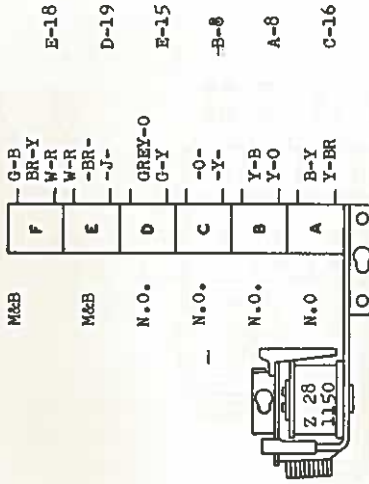
IS ENERGIZED BY EJECT RELAY, THRU NO. MATCH UNIT DISC.



OPENS IN CIRCUIT TO 10 POINT RELAY AND CLOSES TO 100 POINT RELAY.
 OPENS IN CIRCUIT TO 100 POINT RELAY AND CLOSES TO 1000 POINT RELAY.
 TO GATE RELAY, FROM RIGHT SIDE ROLLOVER SWITCH.
 TO LEFT BOTTOM AND RIGHT TOP JET BUMPER LITES-----ALSO RIGHT SIDE ROLLOVER LITE.
 IN HOLD CIRCUIT TO THIS RELAY.

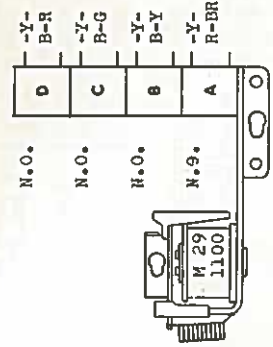
ON YELLOW RELAY

IS ENERGIZED BY EJECT RELAY, THRU NO. MATCH UNIT DISC.



OPENS IN CIRCUIT TO 10 POINT RELAY AND CLOSES TO 100 POINT RELAY.
 OPENS IN CIRCUIT TO 100 POINT RELAY AND CLOSES TO 1000 POINT RELAY.
 TO GATE RELAY, FROM LEFT SIDE ROLLOVER SWITCH
 TO LEFT TOP AND RIGHT BOTTOM JET BUMPER LITES-----ALSO LEFT SIDE ROLLOVER LITE.
 TO CENTER JET BUMPER LITE.
 IN HOLD CIRCUIT TO THIS RELAY.

LOCATED IN BACKBOX



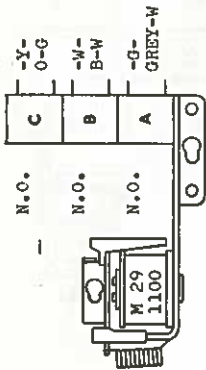
SCORE RESET RELAY

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

PULSES 10 POINT DRUM UNIT, THRU ZERO SWITCH ON THAT UNIT.
 PULSES 10,000 POINT RELAY, THRU ZERO SWITCH ON THAT RELAY.
 PULSES 1000 POINT DRUM UNIT, THRU ZERO SWITCH ON THAT UNIT.
 PULSES 100 POINT DRUM UNIT, THRU ZERO SWITCH ON THAT UNIT.

TRANSFER RELAY

IS ENERGIZED BY 10,000 POINT RELAY, THRU 9TH POSITION SWITCH ON 10,000 POINT DRUM UNIT.



C-5
F-13
E-14

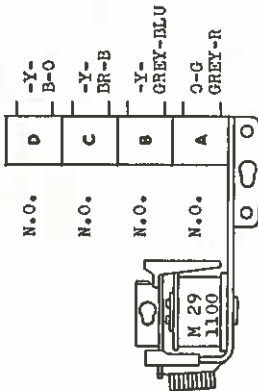
RUNS SCORE MOTOR.

ENERGIZES 100,000 RELAY AT SCORE MOTOR CAM SWITCH 4C.

IN HOLD CIRCUIT TO THIS RELAY.

10,000 POINT RELAY

IS ENERGIZED BY PULSE RELAY, THRU ADVANCE UNIT DISC.



C-8

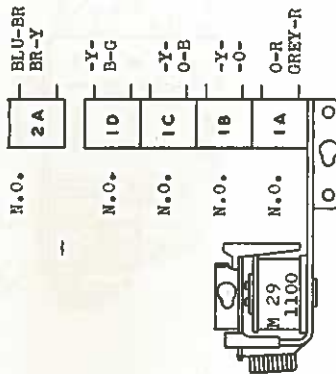
IN HI-SCORE CIRCUIT TO SCORE A "SPECIAL".

IN SERIES WITH SWITCH 2B ON 100,000 RELAY.

IN HOLD CIRCUIT TO THIS RELAY.

1000 POINT RELAY

IS PULSED BY:
EJECT RELAY, THRU NO. MATCH UNIT DISC.
PULSE RELAY, THRU ADVANCE UNIT DISC.
CENTER JET BUMPER, WHEN LIT.
NO. 1, 2, 3 AND 4 TARGET SWITCHES.
LEFT AND RIGHT BOTTOM ROLLERS.



E-20

IN HOLD CIRCUIT TO THIS RELAY.

ENERGIZES CHIME COIL.

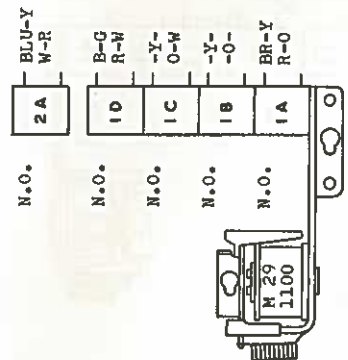
PULSES 1000 POINT DRUM UNIT.

ENERGIZES BALL INDEX RELAY.

ENERGIZES 10,000 POINT RELAY, THRU 9TH POSITION SW. ON 1000 POINT DRUM UNIT.

100 POINT RELAY

IS PULSED BY:
EJECT RELAY, THRU NO. MATCH UNIT DISC.
PULSE RELAY, THRU ADVANCE UNIT DISC.
JET BUMPER & ROLLERS AS INDICATED ON PLAYFIELD.



E-19

IN HOLD CIRCUIT TO THIS RELAY.

IN CIRCUIT TO CHIME COIL.

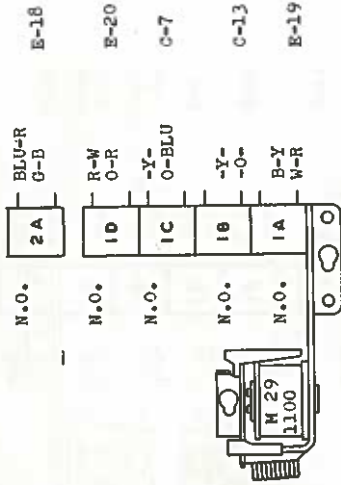
PULSES 100 POINT DRUM UNIT.

ENERGIZES BALL INDEX RELAY.

PULSES 1000 POINT RELAY, THRU 9TH POSITION SWITCH ON 100 POINT DRUM UNIT.

10 POINT RELAY

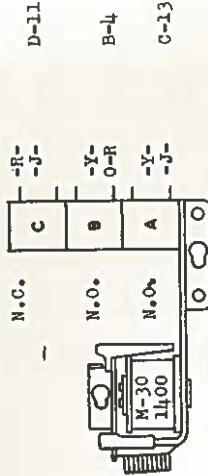
IS PULSED BY:
PULSE RELAY, THRU ADVANCE UNIT DISC.
STANDUP AND KICKER SWITCHES.
JET BUMPERS, AS INDICATED ON PLAY-
FIELD.



IN HOLD CIRCUIT TO THIS RELAY.
IN CIRCUIT TO NO. MATCH UNIT S.U. COIL.
PULSES 10 POINT DRUM UNIT.
ENERGIZES BALL INDEX RELAY.
PULSES 100 POINT RELAY, THRU 9TH POSITION SWITCH ON
10 POINT DRUM UNIT.

OVER THE TOP RELAY

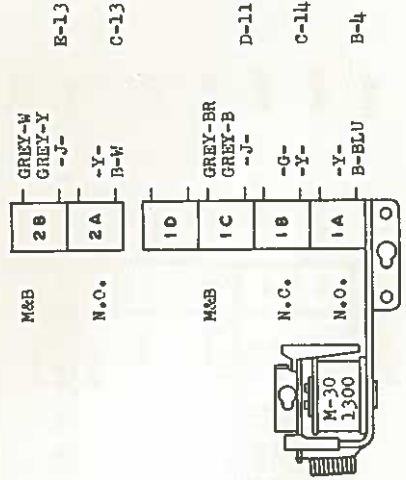
IS ENERGIZED BY 10,000 POINT RELAY, THRU
9TH POSITION SWITCH ON 10,000 POINT DRUM
UNIT.
A SWITCH ON 100,000 RELAY IS ALSO IN THE
CIRCUIT.



IN HI-SCORE CIRCUITS TO SCORE "SPECIAL" ON SCORES OF
100,000 TO 200,000.
TO "OVER THE TOP" LITE.
IN HOLD CIRCUIT TO THIS RELAY.

100,000 RELAY

IS ENERGIZED BY TRANSFER RELAY AT SCORE
MOTOR CAM SWITCH 4C.



OPENS IN CIRCUIT TO TRANSFER RELAY AND CLOSSES TO "OVER
THE TOP" RELAY.
IN HOLD CIRCUIT TO THIS RELAY.
IN HI-SCORE CIRCUITS TO SCORE "SPECIALS".
IN SERIES WITH SWITCH A ON TRANSFER RELAY.
TO "100,000" LITE.