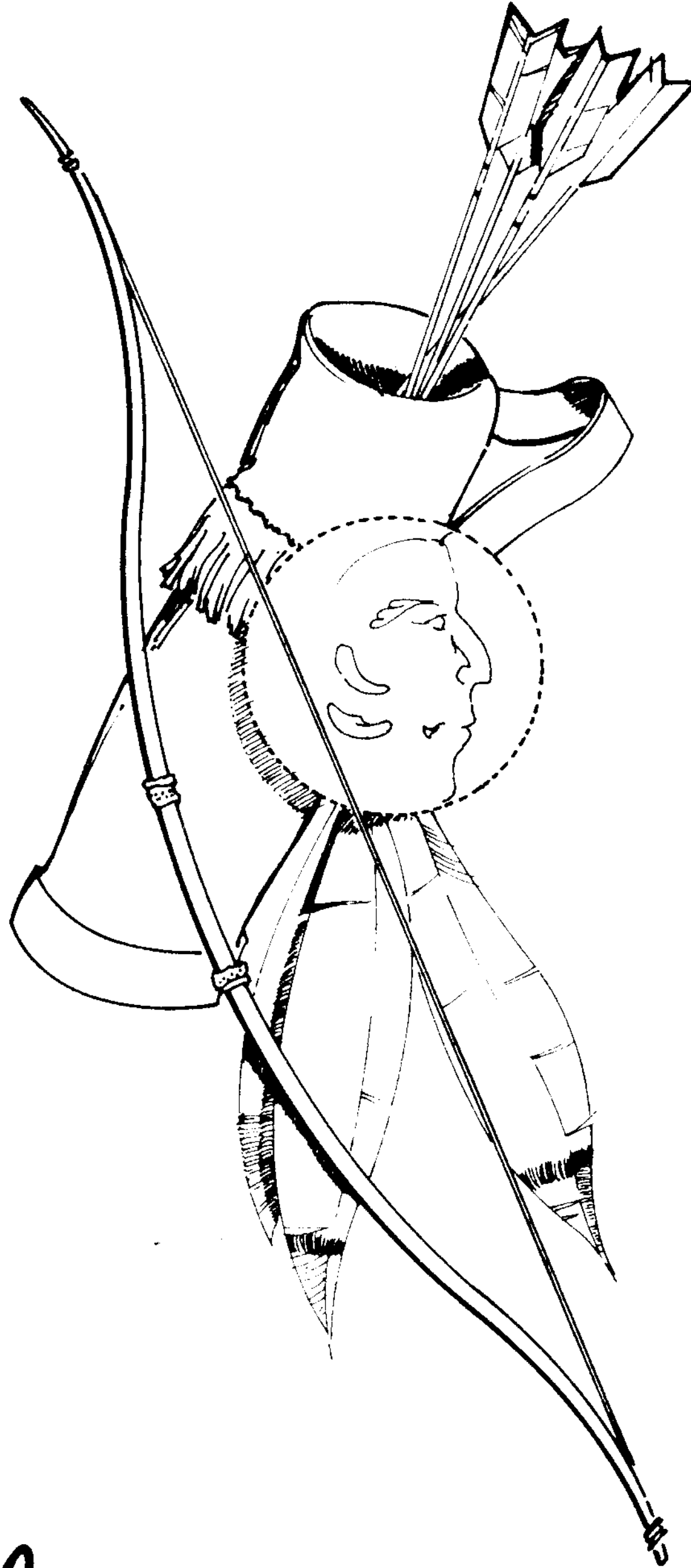


*Bally*

SERVICE MANUAL 3700  
GAME 1033

# BOW & ARROW



*Bally*

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## #1033 BOW & ARROW

### INSTALLATION AND GENERAL GAME OPERATION INSTRUCTIONS

#### INSTALLATION

On all games there are certain items that should be checked after shipment. These are visual inspections which may avoid time consuming service work later. Minor troubles caused by abusive handling in shipment are unavoidable. Cable plugs and sockets may be loosened, switches (especially tilt switches) may go out of adjustment. Plumb bob tilt switch should always be adjusted after game is set on location and leg levelers are adjusted.

Visual inspections before plugging in line cord:

1. Check that all cable plugs are firmly seated in proper sockets.
2. Check that cables are clear of all moving parts and relays.
3. Check for any wires that may have become disconnected.
4. Check switches for loose solder or other foreign material that may have come loose in shipment and could cause shorting of contacts.
5. Check wires on relay coils for proper soldering especially the bare (common) wire connecting a row of relay coils. Cold solder connections may not show up in factory inspection, but vibration in shipment may break contact.
6. Check that fuses are firmly seated and making good contact.
7. Check (manually) the stepping and resetting of all step-up units. The wiper action should not be sluggish.
8. Check the transformer for any foreign material shorting across wiring lugs.
9. Check wiring of transformer to correspond to location voltage. (Transformer wiring card in front cabinet).

Before line cord is plugged in:

Check all plugs and sockets and dress cables:

- (A) Plugs in correct sockets.

- (B) Plugs securely seated in sockets.
- (C) Dress cables away from relays.

Check adjustment of the three (normally open) tilt switches:

- (A) Panel tilt on bottom of playfield panel.
- (B) Plumb bob tilt on left side of cabinet near front door.
- (C) Ball tilt above plumb bob tilt.  
Insert the smaller ball (15/16" dia.) into the ball tilt assembly, and adjust the bracket so the ball will roll free to contact the switch blade, if front of cabinet is raised.

Plug in line cord:

Check adjustment of the (normally open) kick off switch at rear of cabinet mounting board near cable plugs. Check adjustment of the (normally open) anti slam switch, on front door. If either of those switches is closed, the delay relay is energized momentarily.

General Game Operation:

Place ball into playfield by outhole.

Coin Game:

If coin should be rejected move on-off master switch at bottom right front corner of cabinet to "on" position, then coin game. Coin lock out device rejects all coins when power (master switch) is off. Also check the delay relay. If this relay is energized, the game will not accept coins.

- 1A. If coin is inserted in 1st (nickel) coin chute and game is conditioned for 1 play - 5¢, it will energize the coin relay. If game is conditioned for 1 play - 10¢, the first coin inserted will advance the 2 coin unit, then second coin inserted will energize the coin relay thru the 2 coin unit switch. (See 1st coin chute adjustment plug positions on game adjustments sheet).
- 1B. If coin is inserted in 2nd (dime) coin chute and game is conditioned for 1 play - 10¢, it will energize the coin relay. If game is conditioned for 2 play - 10¢, it will energize the 2nd coin chute relay and 2nd coin chute relay will advance the credit unit (2 steps) thru the credit circuit. (See 2nd coin chute adjustment plug positions on game adjustments sheet).
- 1C. If coin is inserted in 3rd (quarter) coin chute and game is conditioned for 2-3-4-5 or 6 plays - 25¢, it will energize the 3rd coin chute relay and the 3rd coin chute relay will advance the credit unit (2-3-4-5-6 steps) thru the credit circuit. (See 3rd coin chute adjustment plug positions on game adjustment sheet).

- 1D. When the credit unit has been advanced from 2nd or 3rd coin chute, (as described in section 1B and 1C) the front door credit button switch, (when actuated) will energize the credit relay and then the credit relay will energize coin relay.
- 2A. The coin relay, when energized by any of the ways described (in sections 1A thru 1D) will stay energized thru its own hold-in switch and (normally closed) #8 score motor switch.
- 2B. The coin relay will energize the reset relay thru a game over relay switch, operate the score motor and then thru normally open #2 and #11 score motor switches, energize the #1 and #2 score reset relays, The reset relay will operate the score motor. Both the reset and the score reset relays will be energized thru a normally closed #8 score motor switch, or until all score counter units are reset to zero position.
- 2C. The coin relay, thru a normally open #3 score motor switch will advance the total play meter, and thru the reset relay will reset the coin unit, ball count unit and the player up unit. The coin relay will also reset the credit unit, (1 step) when energized by the credit button. Thru a normally open #4 score motor switch, it will energize the game over relay latch coil, and thru a normally open #7 score motor switch, it will energize the four 100,000 relay latch coils.
- 3A. A ball on the outhole switch, at the start of game will energize the (outhole relay) thru a normally (closed #1 score motor switch, and it will stay energized thru its own hold-in and a normally closed #10 score motor switch. For Operations after the first ball, see under heading "Sequence of Operation".
- 3B. When the outhole relay is energized, it will operate the score motor and then energize the outhole kicker solenoid (thru a normally open #7 score motor switch). The ball will be kicked thru the ball trough to the shooter alley. The game is ready for the first player to play.
- 3C. To condition the game for 2nd player, inserting coin (s) or use the credit button before the 1st ball is played, it will energize the coin relay again. This time, the coin relay will not energize the reset relay. It will operate the score motor, advance the total play meter, subtract a credit from credit unit, (if credit button was used) and advance the coin unit thru a normally open #3 score motor switch. The game is now set for 2 players; repeating this sequence will set game for 3rd player and 4th player.

SEQUENCE OF OPERATION:

1A. When a ball is played, the ball index relay will be energized thru the 10 point, 100 point or 1,000 point score relay and it will stay energized thru its own hold in switch and normally closed #6 score motor switch and a normally closed outhole relay switch.

1B. When the ball goes into the outhole:

A. The bonus score relay is energized and operates the score motor to add the bonus score to the total score of the player. When the scoring is completed, this bonus score relay is de-energized and the outhole relay is energized. The outhole relay will remain energized thru its own lock in switch until the normally closed #8 score motor cam switch opens.

B. The outhole relay will advance the player up unit thru #4 score motor cam switch, (if more than one player is playing and no extra ball has been scored)

C. The outhole relay will advance the ball count unit thru #3 score motor cam switch after the last eligible player has played if no extra ball was earned, the extra ball must be played off before the ball count unit will advance. When the ball count unit has advanced, the player up unit will reset thru #4 score motor cam switch.

D. The outhole relay when energized will operate the score motor and thru #7 score motor cam switch it will energize the outhole kicker solenoid which will eject the ball from the outhole to the shooter alley. The outhole relay thru another #6 score motor cam switch will advance the bonus unit from zero to 1,000 position. The outhole relay when energized will de-energize the ball index relay, the extra ball relay and the tilt relay.

## FEATURE OPERATION AND SCORING

### Bonus score features:

A bonus score of 1,000 to 10,000 may be scored. The game starts with a bonus score of 1,000. The bonus score advances one step at a time each time the upper right target is hit. It also advances each time the spinner lites complete one sequence; each sequence is completed by lighting the top (10th) spinner lite. When the ball goes into the playfield collect bonus hole, the bonus score lit is added to the player's score. When the ball goes into the outhole, the bonus score lit is added to the player's total score; if the double bonus lite is lit, twice the bonus score lit is added to the player's total score. (Note: Double Bonus is awarded in outhole only.) Ball in bonus hole adds score but does not step down; bonus steps down in outhole only. A tilt nullifies the bonus score.

### Double Bonus feature:

When "A", "B", "C", "D" Thumper bumpers are lit, the Double Bonus lite lites.

    Hitting "A" target lites "A" thumper bumper.

    Hitting "B" target lites "B" thumper bumper.

    Hitting "C" target lites "C" thumper bumper.

    Hitting "D" target lites "D" thumper bumper.

Thumper bumpers score 100 when lit and 10 all other times; targets score 3,000 when lit and 500 all other times. The double bonus lite goes out at the end of a game, when the ball goes into the outhole after the bonus score is collected or when the game is tilted.

### Flash-Motor Lites:

When the ball goes into the top center saucer or strikes the lower center target the indicated Flash-Motor score is added to the player's total score. The Flash-Motor score is controlled by the Flash-Motor unit. The Flash-Motor stops when a ball goes into the top center saucer or strikes the lower center target; it also stops when the game is tilted or completed.

### Skill Shot:

To register a high score when the ball is in the shooter alley the ball shooter should be released so the ball will enter the top center saucer when the "5000" score lite is lit.

### Free Ball Gate Feature:

The free ball gate is opened when the Flash-Motor unit score of "3000 and Opens Gate" is collected. (To open the Free-Ball gate, the playfield ball must go into the top center saucer or hit the lower center target when the Flash-Motor unit score indicates "3000 and Opens Gate"). A ball through this gate when open

scores 3000 points and is returned to the ball shooter. The gate remains open until a ball goes through and is returned to the ball shooter, a ball goes into the outhole, or the game is tilted.

#### Extra Ball Feature:

The game will award an extra ball when the lower center target is hit when the extra ball lite is lit. The extra ball lite lites with an ON/OFF made once a bonus score of 10,000 is registered; the ON/OFF sequence is controlled by an alternating cam on the score motor. Only one extra ball is awarded at any one time; the extra ball earned must be played off before another extra ball can be scored. The game is adjustable to award an extra ball when a pre-adjusted hi-score is registered or through the special feature (see below).

#### Special Feature:

The "Special" award is scored when the ball enters either out lane when the special lite is lit. The "Special" lites lite with an alternating mode once a bonus score of 10,000 is registered; the alternating sequence is controlled by an alternating cam on the score motor. The special award is adjustable to score a credit or an extra ball.

Score cards to be used on Bow & Arrow  
are as follows:

3 Ball Scores	71,000 114,000 147,000	Card Number M-1508-45-E (payout set on replay)
5 Ball Scores	97,000 148,000 181,000	Card Number M-1508-45-D (payout set on replay)
3 Ball Scores	73,000 120,000	Card Number M-1508-45-FF (payout set on extra ball)
5 Ball Scores	91,000 142,000	Card Number M-1508-45-HH (payout set on extra ball)

NOTE: All playfield posts to be set in medium position.



## GAME ADJUSTMENTS

### PLAYFIELD PANEL POST ADJUSTMENTS:

Posts that control left and right outlane opening on panel (see panel sketch) can be moved to make access to outlanes easier or harder for ball to enter.

Easier entry will decrease playing time and scoring.  
Harder entry will increase playing time and scoring.

### HI-SCORE ADJUSTMENT PLUG:

Located on back box lite insert. This plug provides a wide range of coverage at which hi-score credits can be scored. (See the score adjustment card in back box for plug positions).

### MATCH FEATURE ADJUSTMENT PLUG:

Located on front cabinet mounting board. This plug provides positions to operate match feature on or off.

### HI-SCORE FEATURE ADJUSTMENT PLUG:

Located on front cabinet mounting board. This plug provides positions to award Hi-Score credit or extra ball.

### BALLS PER GAME ADJUSTMENT PLUG:

Located on front cabinet mounting board. This plug provides positions to operate game on 5 ball or 3 ball play.

### 1ST COIN CHUTE ADJUSTMENT PLUG:

Located on the 2 coin unit, on front cabinet mounting board. This plug provides positions to give 1 play for 1 coin or 1 play for 2 coins thru the 1st (nickel) coin chute.

### 2ND COIN CHUTE ADJUSTMENT PLUG:

Located on front cabinet mounting board. This plug provides positions to give 1 play for 1 coin or 2 plays for 1 coin thru the 2nd (dime) coin chute. NOTE: When this plug is set for 2 plays - 1 coin, brown-white (male plug) wire on 3rd coin chute adjustment must be in position 2.

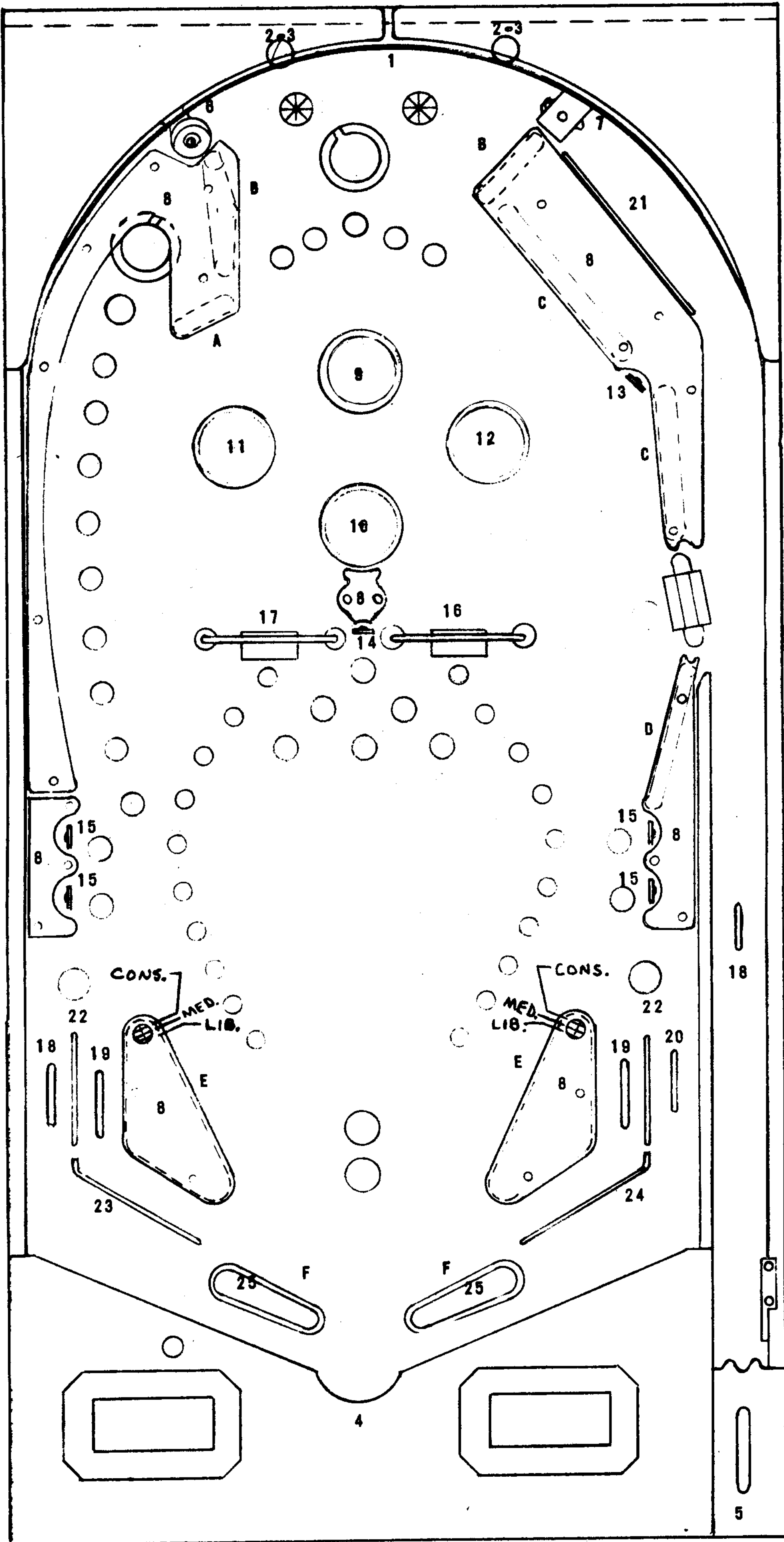
### 3RD COIN CHUTE ADJUSTMENT PLUG:

Located on front cabinet mounting board, this plug provides positions to give 2 to 6 plays for 1 coin thru the 3rd (quarter) coin chute. Use orange-white (male plug) wire to set number of credits.

#1033 BOW & ARROW

PARTS LIST

MISCELLANEOUS	PART NO.	ASSEMBLY COILS	PART NO.
Transformer	E-122-95	Coin Lockout	FC-33-2600
Score Motor (Domestic)	E-119-354	Chime 10, 100 & 1000 Pts. (3)	CC-31-2000
Score Motor (Export)	E-119-411	Knocker	C-27-1000
Total Play Meter	E-32-1700	Slingshot Left & Right -2	AP-27-1300
Flash Motor	E-119-410	Flipper Left & Right - 2	AF-25-500/ 28-1000
RELAY COILS		Thumper Bumper	AP-27-1300
Delay	G-30-1500	Bonus Hole Eject	A-27-1300
Coin	G-31-2000	Top Hole Eject	A-27-1300
2nd Coin Chute	G-31-2000	Outhole Kicker	A-25-850
3rd Coin Chute	G-31-2000	UNIT COILS	
Credit	G-31-2000	2 Coin (Step Up)	CD-29-1600
Lock	G-33-2800	Credit (Step Up)	B-26-1100
Reset	G-31-2000	Coin (Step Up)	B-26-1100
#1 Score Reset	G-30-1500	Credit (Reset)	C-28-1100
#2 Score Reset	G-30-1500	Ball Count (Step Up)	B-26-1100
Game Over (Trip)	G-31-2000	Ball Count (Reset)	C-28-1100
Game Over (Latch)	G-31-2000	Player Up (Step Up)	B-26-1100
100,000 (4) (Trip)	G-31-2000	Player Up (Reset)	C-28-1100
100,000 (4) (Latch)	G-31-2000	00-90 (Step Up)	CD-29-1600
Player Reset	G-31-2000	Score Drums (Step Up) (16)	CD-29-1600
Out Bonus Score	G-31-2000	Bonus Unit (Step Up)	B-26-1100
Outhole	G-31-2000	Bonus Unit (Reset)	C-28-1100
Ball Index	G-32-2500	Spinner (Step Up)	CD-29-1600
Tilt	G-32-2500	Flash Release	FC-32-2100
Extra Ball	G-31-2500	UNIT DISCS	
10, 100 & 1000 Point (3)	G-31-2000	Coin	W-923-260
Bonus Hole Score	G-31-2000	Ball Count	W-1043-17
Top Hole & Center Targ.	G-31-2000	Player Up	W-923-207
Spin	G-31-2000	00-90	W-999-28
Double Bonus	G-32-2500	Bonus	W-999-29
5000 BOnus Hole	G-31-2000	Flash Motor	W-1072-47
500	G-31-2000	UNIT WIPERS	
3000	G-31-2000	Coin	AS-827-460
"A", "B", "C", "D" (4)	G-32-2500	Ball Count	AS-1046-648
Gate	G-32-2500	Player Up	AS-1046-620A
		00-90	A1618-3A
		Bonus	AS-1046-794
		Bonus Unit	A-1402-351
		Flash Motor	A-1402-353



**RUBBER PARTS**

- |    |         |                    |
|----|---------|--------------------|
| A. | R-521-1 | 1" RUBBER RING     |
| B. | R-521-2 | 1-1/2" RUBBER RING |
| C. | R-521-3 | 2" RUBBER RING     |
| D. | R-521-4 | 2-1/2" RUBBER RING |
| E. | R-521-5 | 3" RUBBER RING     |
| F. | R-406-3 | FLIPPER RUBBER     |

**PANEL TOP PARTS**

- |     |            |                   |
|-----|------------|-------------------|
| 1.  | M-1774     | ARCH RAIL         |
| 2.  | C-907      | RAIL POST         |
| 3.  | C-908      | RAIL POST CAP     |
| 4.  | P-5871-48  | BOTTOM ARCH       |
| 5.  | P-6359-14  | SHOOTER GAUGE     |
| 6.  | AS-493-8   | REBOUND ASSEM.    |
| 7.  | A-1475-9   | BALL GATE         |
| 8.  | A-2890-110 | SCREENED PLASTICS |
| 9.  | A-3713-1   | BUMPER CAP        |
| 10. | A-3713-2   | BUMPER CAP        |
| 11. | A-3713-3   | BUMPER CAP        |
| 12. | A-3713-4   | BUMPER CAP        |
| 13. | AS-982-752 | TARGET ASSEM.     |
| 14. | AS-982-807 | TARGET ASSEM.     |
| 15. | AS-982-813 | TARGET ASSEM.     |
| 16. | AS-2250-34 | SPINNER GATE      |
| 17. | AS-2250-35 | SPINNER GATE      |
| 18. | AS-2806-2  | R.O. WIRE ASSEM.  |
| 19. | AS-2806    | R.O. WIRE ASSEM.  |
| 20. | AS-2806-1  | R.O. WIRE ASSEM.  |
| 21. | M-121-34   | GUIDE WIRE        |
| 22. | M-121-18   | GUIDE WIRE        |
| 23. | M-121-43   | GUIDE WIRE        |
| 24. | M-121-44   | GUIDE WIRE        |
| 25. | AS-2214-24 | FLIPPER & SHAFT   |

⊖ INDICATES MOVABLE POSTS FOR ADJUSTMENT;  
 CONS. — ⊕  
 MED. — ⊕  
 LIB. — ⊕

## A) Schematics

The schematic as drawn shows the power-on and game illumination only condition. The lock relay is de-energized. (See Figure II-1). Figure III-1 shows the location of specific game functions on the schematic. This figure can be used to localize the area of interest on the schematic for a given type of game fault. For example, if the game were coined and the credit button pressed, Figure II-3 shows that the lock relay should be energized. The schematic shows it should be self-holding in the energized position. If 'game over' is lit on the insert, the fault must either be in the lock relay self-holding or in the coin relay contact. Visual inspection will usually reveal the source of the trouble. A volt-ohmmeter will always locate the trouble.

The schematic, therefore, allows us to trace each circuit through the game to the power source (the transformer secondary). A color code is given for each lead to facilitate this tracing in the game.

The numbers on the bottom of the schematic and the letters on the left hand margin of the schematic can be used with the coil location chart at the right hand side to locate relays and solenoids. If the coil number is not recognizable in the game, the schematic will give the number for re-ordering (for example, reset relay G-31-2000). The nominal resistance of each coil is also given.

Score motor operation is detailed on the schematic. See A-29 on the schematic. The score motor is used in the coining, reset and scoring operations. The sequence of operation table indicates that the score motor, when energized, will actuate contacts associated with cams one through twelve in the positions indicated. Cam #1 is physically closest to the motor. Cam switches are lettered alphabetically starting with "A" for the bottom of a switch stack. For example, the switch 2C, SCM, on the schematic is driven by the cam in the second position from the motor and is physically the third switch assembly above the cam in the switch stack. It is actuated by the score motor driven second cam in positions 1, 2, 3, 4 and 5.

The motor receives a starting pulse from various sources. It will index itself one-half revolution ( $180^{\circ}$ ) by means of a self-holding switch associated with Cam #1.

Relays shown on the schematic are shown de-energized. (See A-25). A relay consists of a coil of wire (electromagnet, when energized) armature or heel plate, plastic switch actuator, switch assemblies and frame. When the coil is energized, the armature is pulled to the coil by the electromagnetic force created by the current flowing through the turns of the coil. The plastic switch actuator is connected to the armature. The moving armature pulls the actuator and the long switch blades to the energized position. Contacts that were closed in the

de-energized are opened in the energized position and vice-versa. In general, Bally relays are designed to self-hold or remain energized through a contact in the stack after the source of initial energization is removed. (See lock relay, E-10).

## B. ASSEMBLY ADJUSTMENTS

### 1. General

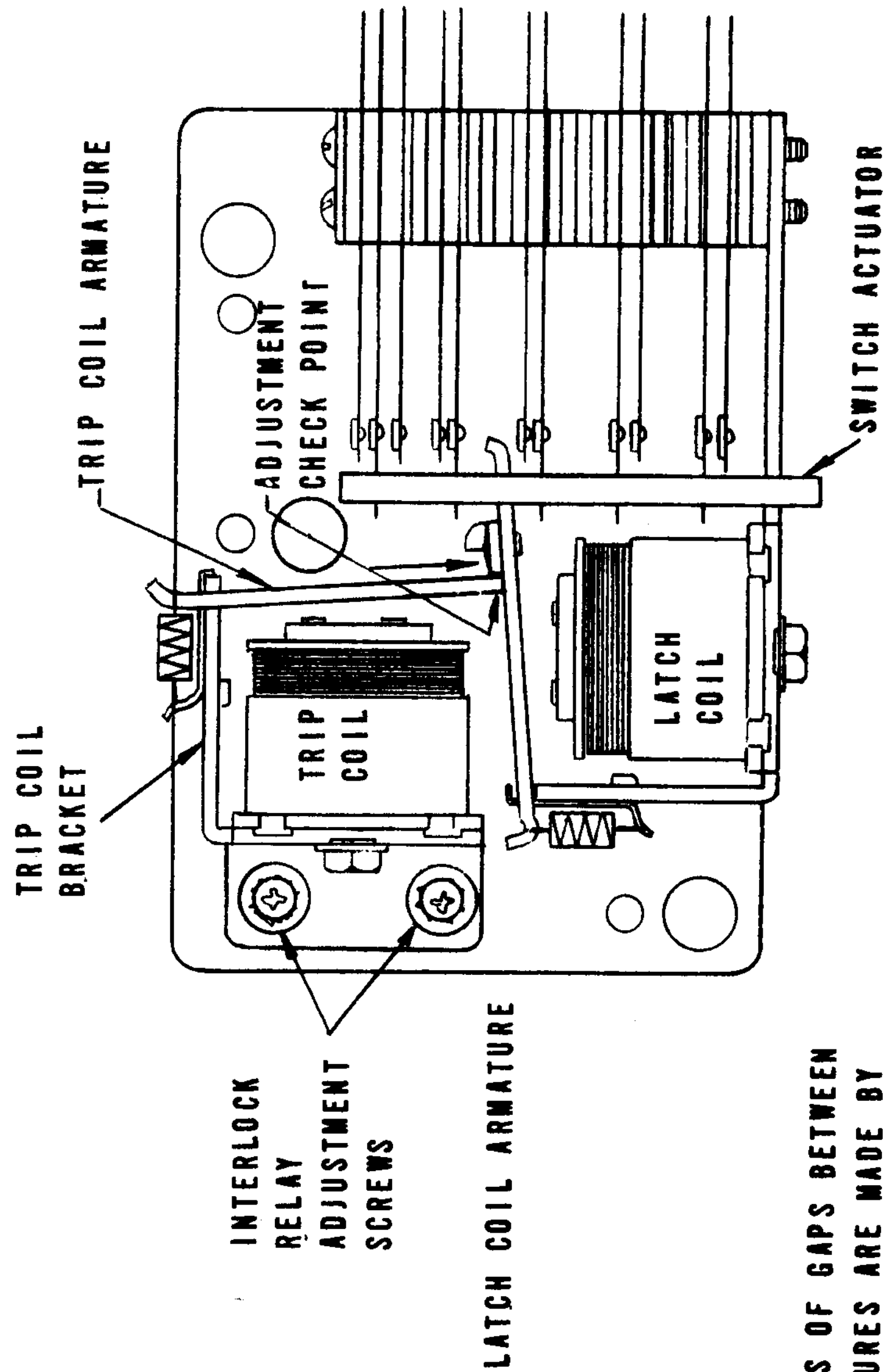
All switch assemblies consist of leaf springs, contacts, separators, plastic tubing and screws to hold them to the mounting surface on the relay frame. Before attempting to adjust a switch assembly, make sure that these screws are tight. If not, tighten screw closest to the contact end of the leaf spring first. This will prevent the assembly from being secured in such a manner that the leaf springs tend to fan out. In general, all leaf springs are adjusted for a 1/32" gap in the open position and .010" overtravel or wipe in the closed position. All contacts should be in good condition. Unless otherwise instructed they should be dry or non-lubricated. All contacts should be free of dust and dirt. Tarnish can be removed with a contact file followed by a burnishing tool. Severely pitted contacts must be replaced as an assembly. In general, contacts need be cleaned or replaced and adjusted when they are found to be a source of game malfunction.

### 2. Relays

All of the above applies. Relay contacts are operated dry. Beyond the normal 1/32" gap adjustment, relays with a self-holding circuit must be adjusted such that the self-holding contacts make just before the other contacts (adjust to .025" gap). Care in making this adjustment prevents false crediting and false scoring during the game.

The game-over relay and the 100,000 relay are examples of an interlock relay. Interlock relays are adjusted for a .010" gap between the trip and latch coil armatures in the trip position and a .010" gap between the nylon on the latch coil armature and the trip coil armature in the latch position. If an adjustment is necessary, the interlock relay adjustment screws should be loosened and the trip coil repositioned until the trip and latch armature gaps are proper. The screws are then secured. Always check the switch adjustments after a gap adjustment is made. Open contacts should have a 1/32" gap. Closed must show .010" overtravel.

BALLY INTERLOCK RELAY



WHEN THE LATCH ARMATURE IS HELD DOWN DIRECTLY OVER THE CENTER OF THE LATCH COIL, THERE SHOULD BE A .010 GAP BETWEEN THE TRIP COIL ARMATURE AND THE NYLON PIECE OF THE LATCH COIL ARMATURE AT THE ADJUSTMENT POINT.

WHEN THE TRIP COIL ARMATURE IS HELD DOWN AND THE LATCH ARMATURE IS RELEASED, THERE SHOULD BE A GAP OF ABOUT .010 BETWEEN THE TWO ARMATURES.

ADJUSTMENTS OF GAPS BETWEEN THE TWO ARMATURES ARE MADE BY LOOSENING THE INTERLOCK RELAY ADJUSTMENT SCREWS. BE SURE TO TIGHTEN DOWN THE SCREWS AFTER ADJUSTMENT IS MADE.

ALWAYS CHECK SWITCH ADJUSTMENTS WHENEVER A GAP ADJUSTMENT IS MADE.

FIGURE III - 2 INTERLOCK RELAY ADJUSTMENTS

### 3. Printed Circuit and Riveted Disc Units

Examples of these are the bonus, the player up, the ball count, the coin and the 00-90 units. The force exerted on the disc contacts by the rotor requires lubrication of the disc contacts. Periodic maintenance must include an inspection for the presence of lubrication and for contact condition. Touching the contacts with the fingers should result in a shiny trace on the finger. This, and absence of contact pitting and dirt indicate a satisfactory operating condition. Contact pitting can be corrected with a contact file and burnishing tool. Dirt should be removed with a clean, lint free cloth. If contact cleaning fluids are used to remove greasy dirt, a cloth must be used to remove any chemical residue. Finally, apply Bally coin machine lubricant to a clean cloth. Apply a thin film to the contact surfaces.

If, in trouble shooting, a rotor blade is suspected as the source of the problem, it can be checked for proper adjustment. A blade exerting too little pressure can be intermittent. A blade exerting too much pressure may slow or stop the rotor. A check for the force exerted by the rotors can be made as follows: gently warp the disc or printed circuit board away from the rotor. The rotor blade should follow the disc or board for 1/32" before contact is broken. If it follows further, contact force is too great. If it breaks contact too soon, contact force is not great enough. Use a contact adjusting tool to adjust the rotor blade pressure.

### 4. Credit Unit

The credit unit is used to store in memory the number of credits or games due a player. Credits are payed for or won for high score, match feature or as a special game feature. Improper adjustment of the credit unit can result in too many or too few credits issued to the player. To check for proper adjustment of the credit unit: (See Figure III-3)

- a) Slowly hand actuate the step-up plunger. The step-up arm must not engage the next tooth on the ratchet (occasional engagement is acceptable). If the step-up arm does, gently bend the base plate tab down (away from the step-up solenoid) until hand actuation does not cause consistent engagement of the next tooth on the ratchet. This adjustment, properly made, prevents multiple crediting when only one credit is due the player.

# CREDIT (REPLAY) UNIT

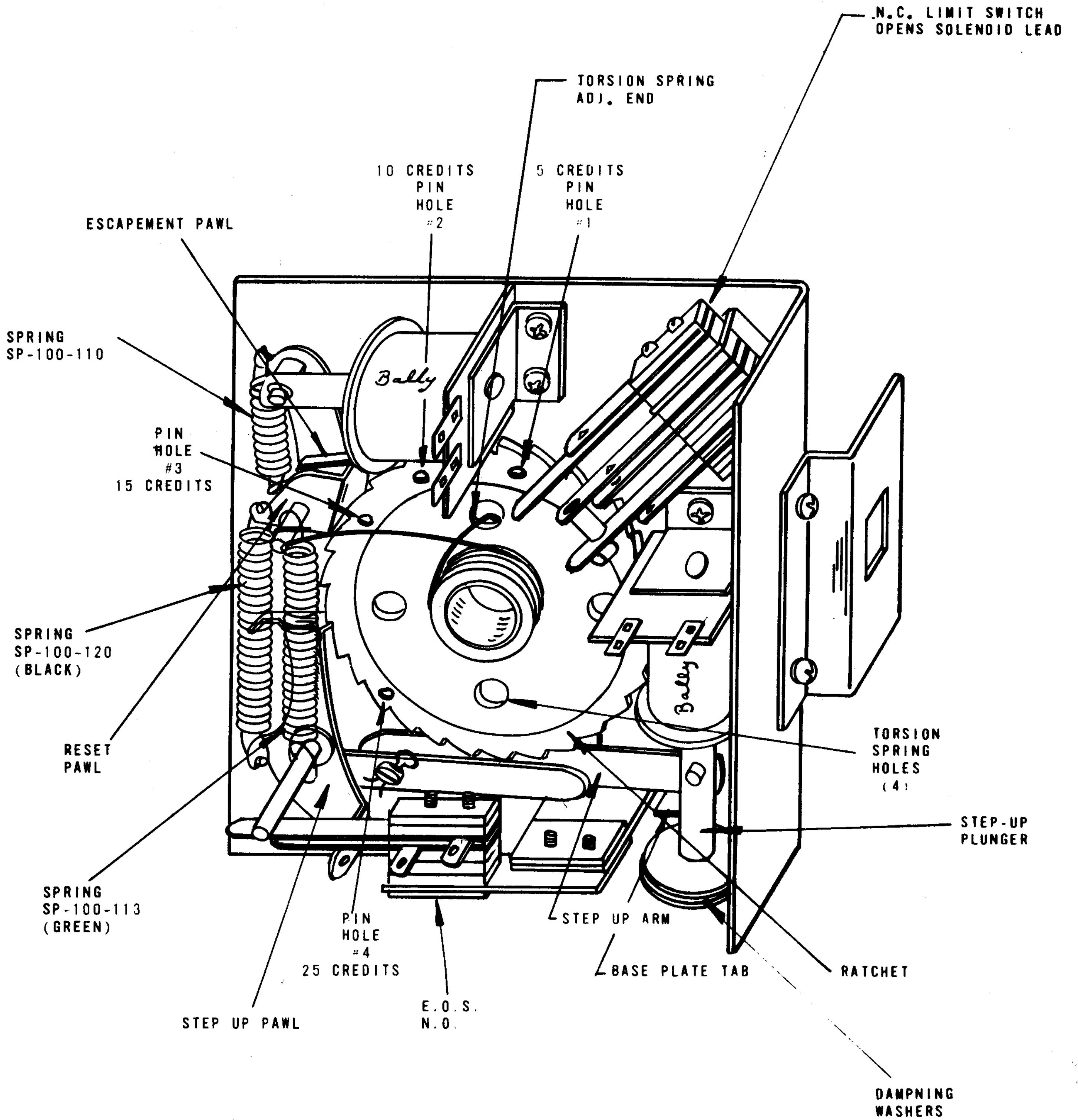


FIGURE III - 3 CREDIT UNIT ADJUSTMENTS



- b) If multiple crediting persists, increase spring tension by moving the ratchet torsion spring (short end) one hole or 1/4 turn clockwise to the next hole. This will slow the ratchet wheel and decrease the probability of multiple crediting. Finally, check springs SP-100-120 (black) and SP-100-113 (green) to make sure that they are not interchanged.
- c) If the credit unit does not return to zero, check the adjustment of the switch stack just above the step-up solenoid. If the force exerted by the blades in this stack is excessive, the credit unit will not return to zero. Adjust the stack for a 1/32" gap when the credit wheel is not on zero, and a .010" overtravel at zero. Now spin the credit wheel by hand for the maximum allowable number of credit. The normally closed switch in the stack must now be opened by the pin in the ratchet wheel. This switch is the limit switch and opens the lead to the step up solenoid.
- d) If two or more credits are subtracted each time the credit button is actuated, the spring (SP-100-110) that positions the escapement pawl is too strong. Gently spread the turns on the spring until the proper action is obtained.

It is to be noted that selection of the #1, 2, 3, or 4 pin hole will limit the maximum number of credits possible to 5, 10, 15 or 25, as desired. This pin actuates the limit switch on the switch stack.

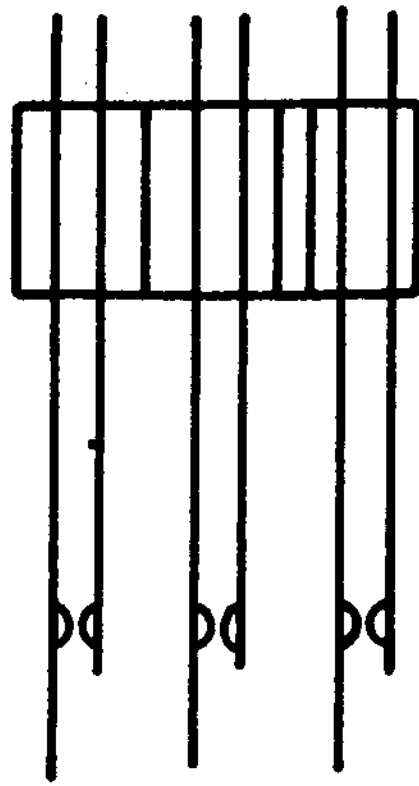
#### 5. Score Drum Unit Adjustment (See Figure III-4)

All sixteen score drum unit assemblies are essentially the same. End of stroke switches are adjusted for a 1/32" gap and .010" overtravel (wipe) at the end of the solenoid stroke. The switches in the stack are adjusted likewise. Note that if the solenoid plunger is actuated by hand, all switches are open in the zero position, i.e. the numeral '0' in the viewing window on the insert. Malfunctions can be corrected by proper adjustment. Typical malfunctions are:

- a) Score drum continues to step through zero during the reset cycle (top switch in switch assembly always closed).
- b) Score drum does not score (second switch in switch assembly always open).
- c) Score drum and next higher drum advance simultaneously on a continuous or intermittent basis. This is proper when advancing from the 9th position to zero. For all other numerical positions it indicates that the last switch (closest to the metal frame) is always or intermittently closed.

SCORE DRUM UNITS SWITCHES

10-80, 100-900 & 1,000-9,000 UNITS (ALSO 10,000-90,000 UNIT WHEN 100,000 RELAY IS INVOLVED)



LOCK-IN FOR RESET RELAY

ZERO SWITCHES

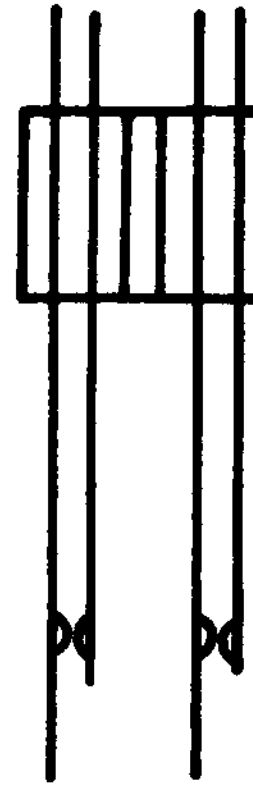
CIRCUIT TO STEP-UP COIL DURING RESET CYCLE

COMPLETES CIRCUIT TO ADVANCE NEXT HIGHER DRUM UNIT WHEN A SCORE OF '9' IS SHOWING, AND THE SCORE RELAY IS ENERGIZED TO ADVANCE THIS UNIT.

OPEN WHEN ZERO IS SHOWING

CLOSED WHEN 9 IS SHOWING

10,000-90,000 UNIT (EXCEPT IN GAME HAVING 100,000 RELAYS - SEE ABOVE)



LOCK-IN FOR RESET RELAY

ZERO SWITCHES

CIRCUIT TO STEP-UP COIL DURING RESET CYCLE

OPEN WHEN ZERO IS SHOWING

FIGURE III-4 SCORE DRUM UNIT SWITCH ASSEMBLY

Score drums are easy to trouble shoot. A faulty unit can be found visually. Visual inspection and adjustment is adequate to correct the problem. Do not overlook cable dress as a source of the problem. Dress bare leads away from adjacent connections.

#### SECTION IV SERVICE PARTS

A parts catalogue is available upon request. The catalogue is illustrated and lists all replacement parts for each game manufactured by Bally. Requests should be addressed to :

BALLY MANUFACTURING CORPORATION  
2640 WEST BELMONT AVENUE  
CHICAGO, ILLINOIS 60618  
ATTENTION: PARTS DEPARTMENT

Enclose \$1.00 for postage and handling.

#### SERVICE HINTS

To maintain trouble free operation, all stepping unit contact plates, rivet and printed circuit type should be cleaned and lubricated sparingly every 30 days using Bally coin machine lubricant.

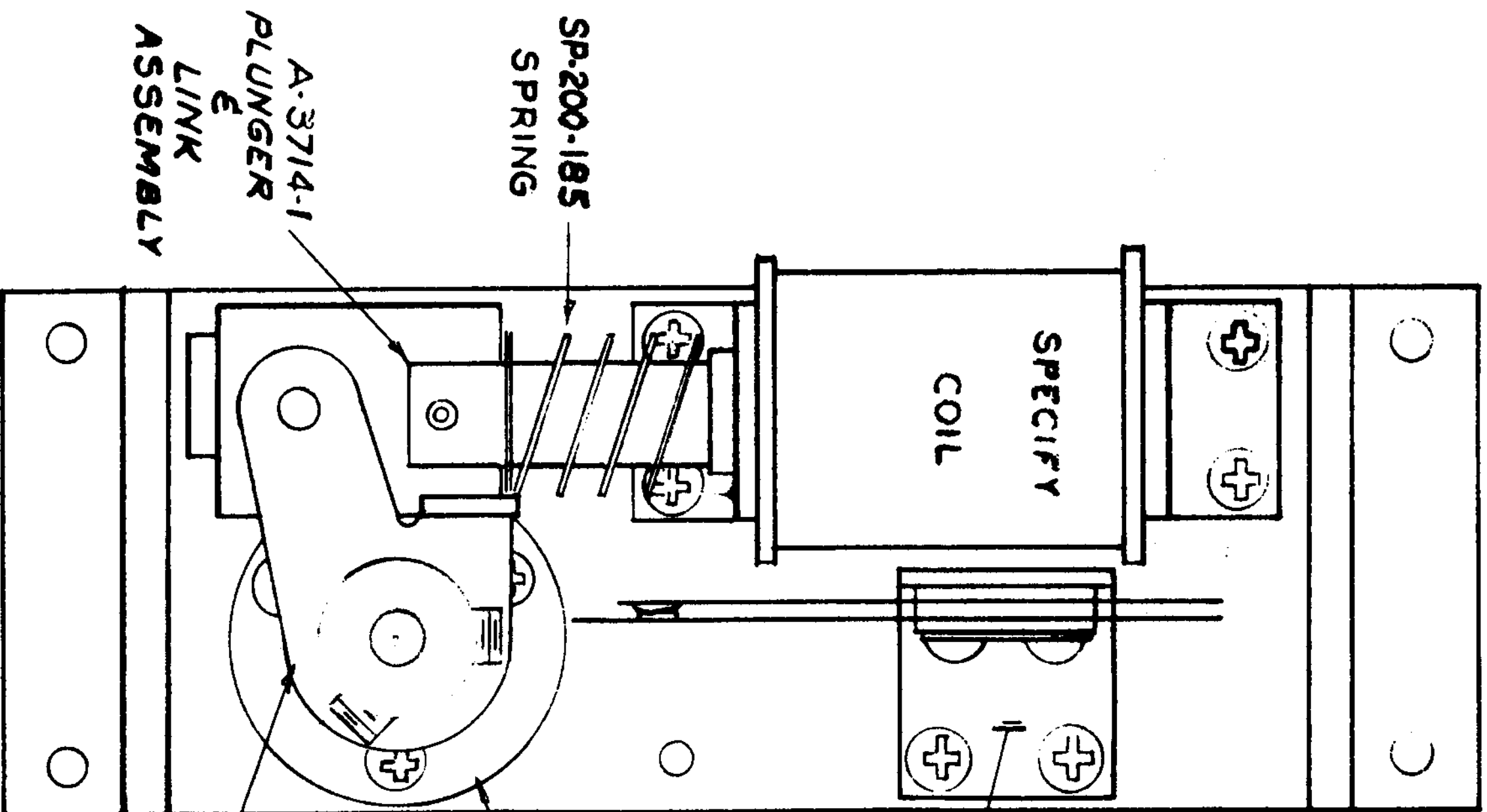
The Bally playfield has an improved tuff-coat finish with excellent wearing properties. It's life expectancy, as well as play appeal, can be extended by periodic cleaning of the playfield.

DO: Consult your local distributor for his product recommendations on this subject. Chances are, he has direct experience based on usage. If not, clean with a mild face type soap and a clean cloth dampened with water or clean with a product manufactured specifically for this purpose. Petroleum disillate based cleaners do not harm the playfield finish. Polish, if desired. A combination cleaner and polish such as Wildcat #125\* (Wildcat Chemical Co., 1333 W. Siminary Dr., Ft. Worth, Texas 76115) or simply a cleaner such as Waterless Lemonite Cleaner\* (Graco Sales Co., Rebel Labs, 8152 Highway 70, Arlington, Tenn. 38002) cleans even the dirtiest of playfields with ease. Use all cleaning agents sparingly. An accumulation of residue can jam roll-over buttons. Inspect and hand polish the ball in a clean cloth. A chipped ball must be replaced. It can ruin the finish on the playfield in a short period of time.

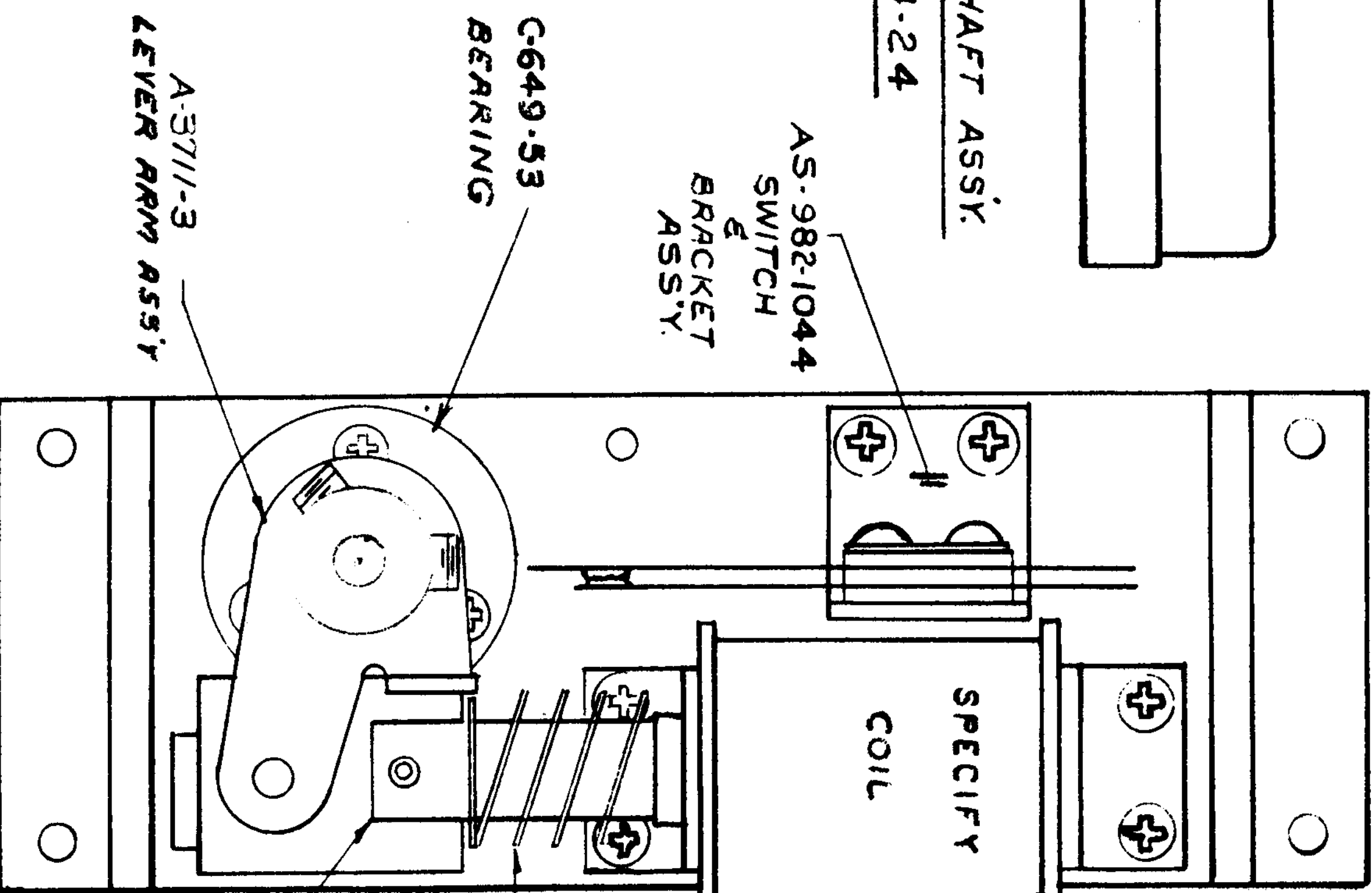
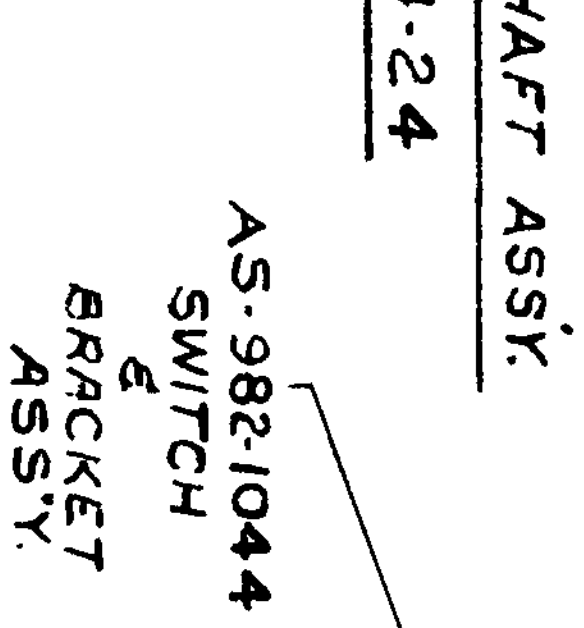
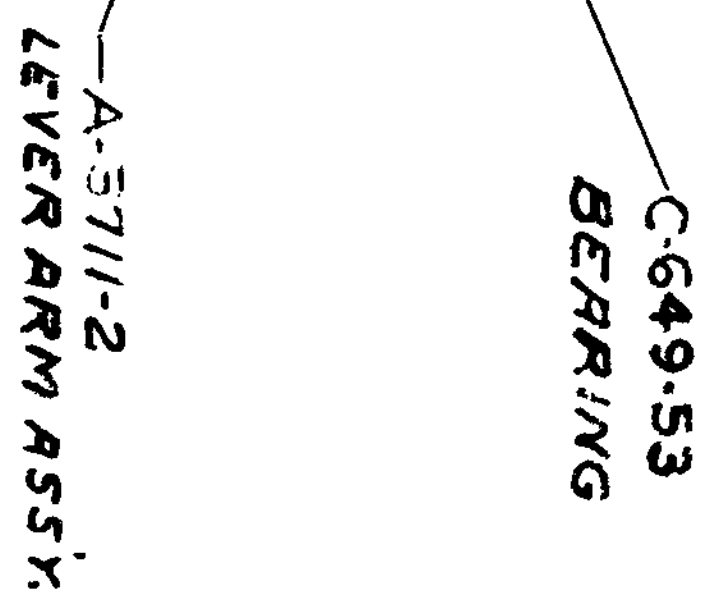
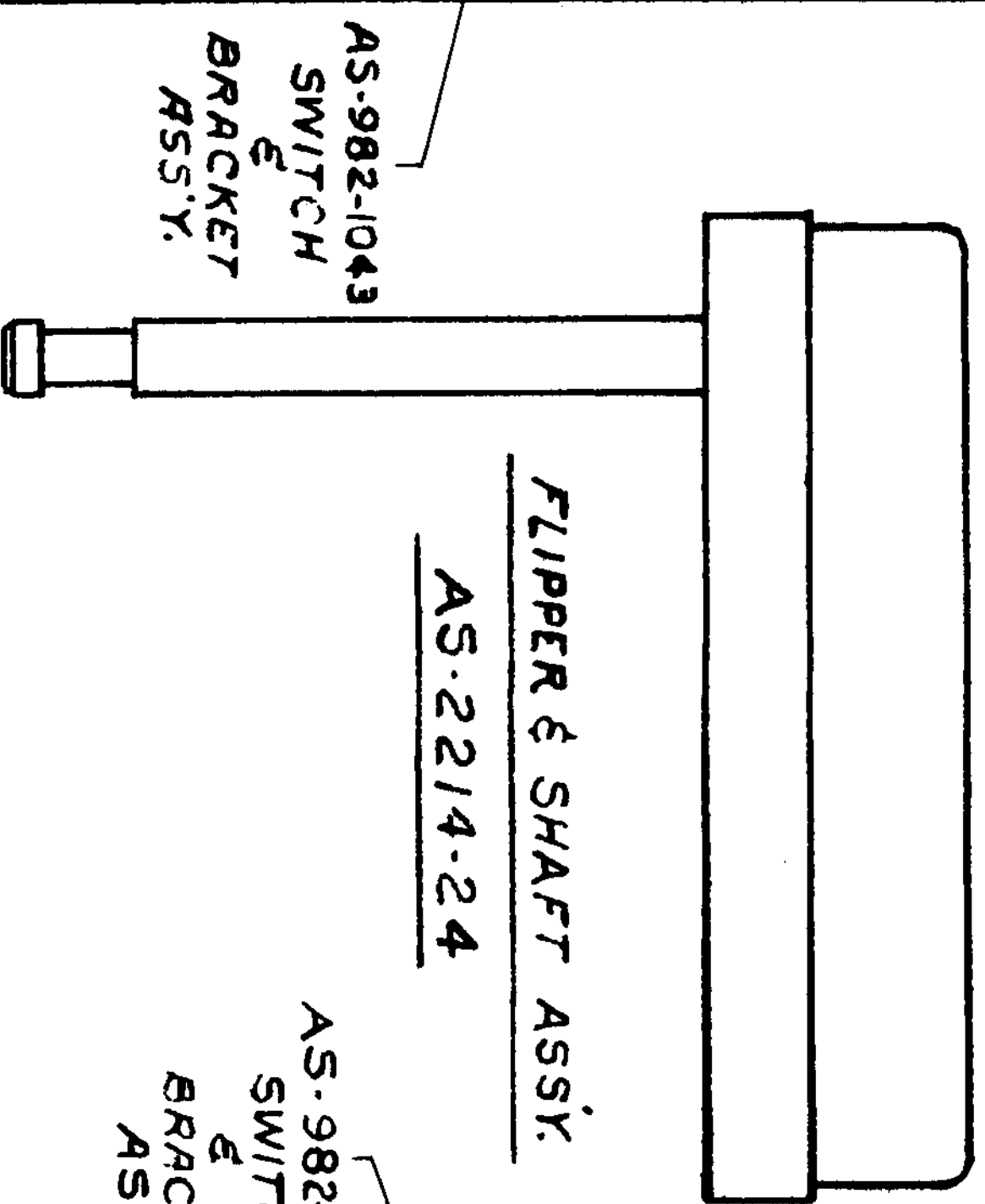
DON'T: Use water in large quantities, highly caustic cleaners, abrasive cleaners or cleaning pads on the playfield. Do not allow a wax or polish build up. Waxes yellow with age and spoil play appeal.

Bally has tried these products and found them effective. Bally assumes no responsibility for their use, however, as Bally has no control over the manufacturers and any product changes they may make.

# NEW BALLY FLIPPER UNITS



FLIPPER UNIT  
LEFT SIDE

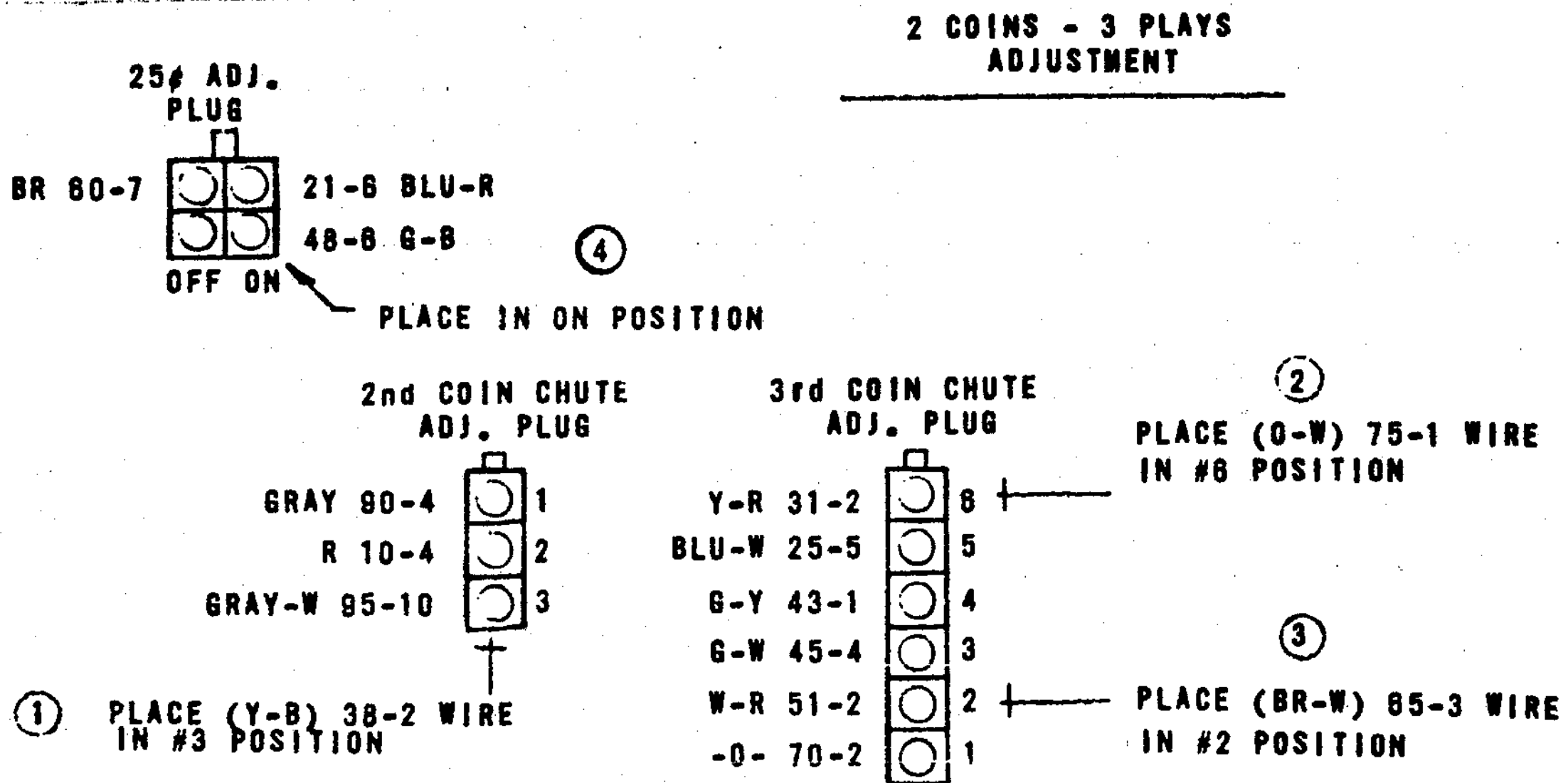


FLIPPER UNIT  
RIGHT SIDE

## KIT #458 INSTRUCTIONS

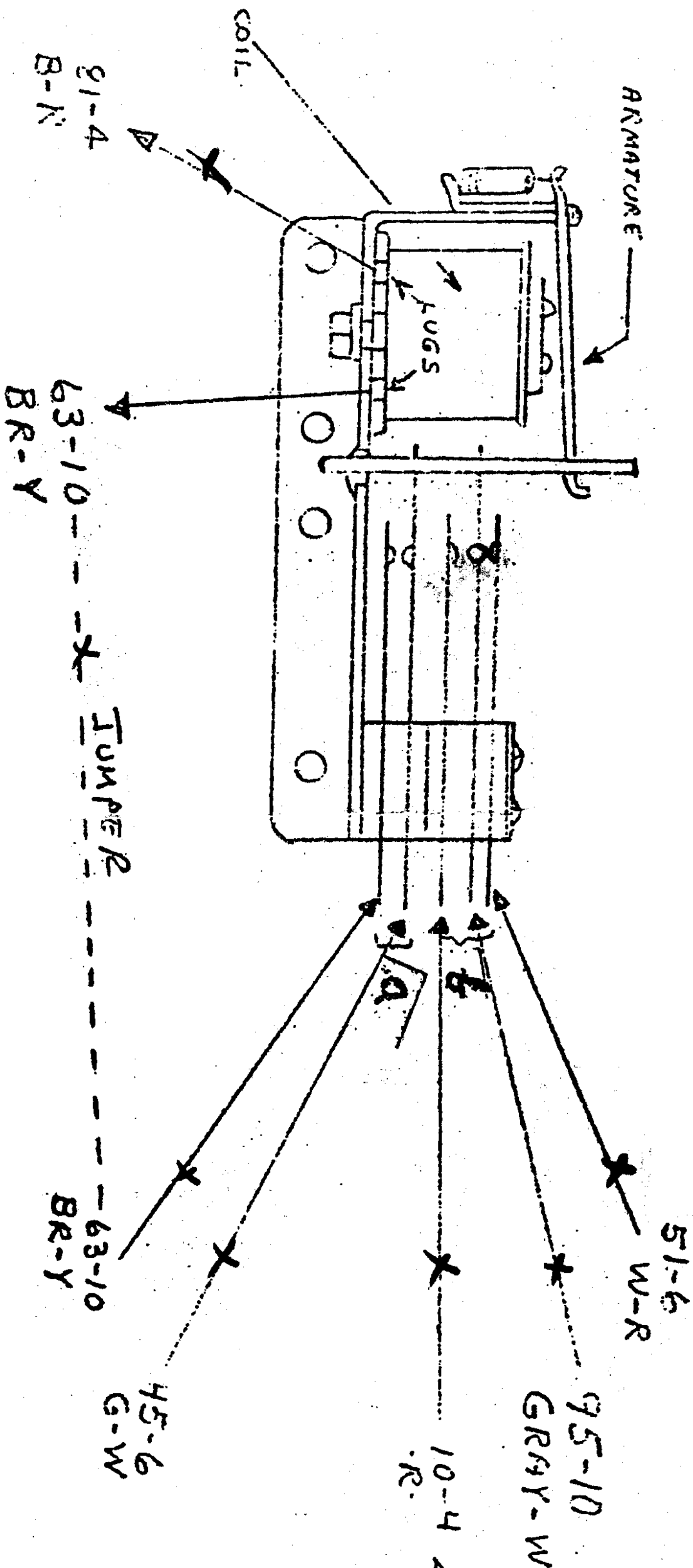
1. SCREW DOWN 2ND COIN SET UP AND 3RD COIN CHUTE RELAYS AT LABELED POSITIONS.
2. WIRES TO BE SOLDERED, AS PER RELAY AND SCHEMATIC DRAWINGS ARE TAPED OR TUCKED IN UNDER THE MAIN CABLE.
3. CONNECT WIRES TO 2ND COIN SET UP RELAY AS PER RELAY DRAWING MARKED A + B ON SCHEMATIC.
4. CONNECT WIRES TO 3RD COIN CHUTE RELAY AS PER RELAY DRAWING MARKED A, B, C, D ON SCHEMATIC DRAWING. NOTE! (WIRES MARKED WITH Ⓞ ARE TO BE JUMPED FROM 2ND COIN CHUTE RELAY.)
5. CONNECT W-O AND YELLOW WIRES TO UNUSED SW ON 2ND COIN CHUTE RELAY. (N.C. SW.) MARKED X ON SCHEMATIC.
6. CONNECT G-W AND W-O TO UNUSED SW. ON BALL INDEX RELAY. (N.C. SW.) MARKED X ON SCHEMATIC. NOW THERE ARE 2 SWS. ON THE SCORE MTR. SW. BANK TO BE CONNECTED. YOU MAY NEED TO LENGTHEN WIRES IF THEY ARE TOO SHORT.
7. ON THE 3RD CAM SW. STACK OF SCORE MTR. TOP SW. CONNECT W-Y (N.O.) W-O (N.C.) YELLOW (COM.) MARKED XX ON SCHEMATIC.
8. CONNECT BLU-R AND YELLOW TO THE SIXTH CAM SW. STACK 2ND SW. FROM BOTTOM OF SCR. MTR. MARKED XXX ON SCHEMATIC.
9. CHECK SCHEMATIC TO BE SURE YOU HAVE MADE ALL CONNECTIONS AS SHOWN BY X, XX, XXX.

10. 25¢ ADJ. PLUG SHOULD BE PUT TO ON POSITION.
11. 2ND COIN CHUTE ADJ. PLUG Y-B WIRE PUT INTO #3 POSITION.
12. 3RD COIN CHUTE ADJ. PLUG O-W PUT IN #6 POSITION. B-W PUT IN #2 POSITION.
13. FOR THE METER TO COUNT TOTAL COINS DISCONNECT W-BR WIRE ON METER. CONNECT JUMPER WIRE FROM METER AND CONNECT TO GRAY-W WIRE OF 2ND COIN CHUTE ADJ. PLUG. (#3 POS.)



# END COIN SET UP RELAY

AS-2650-25/a

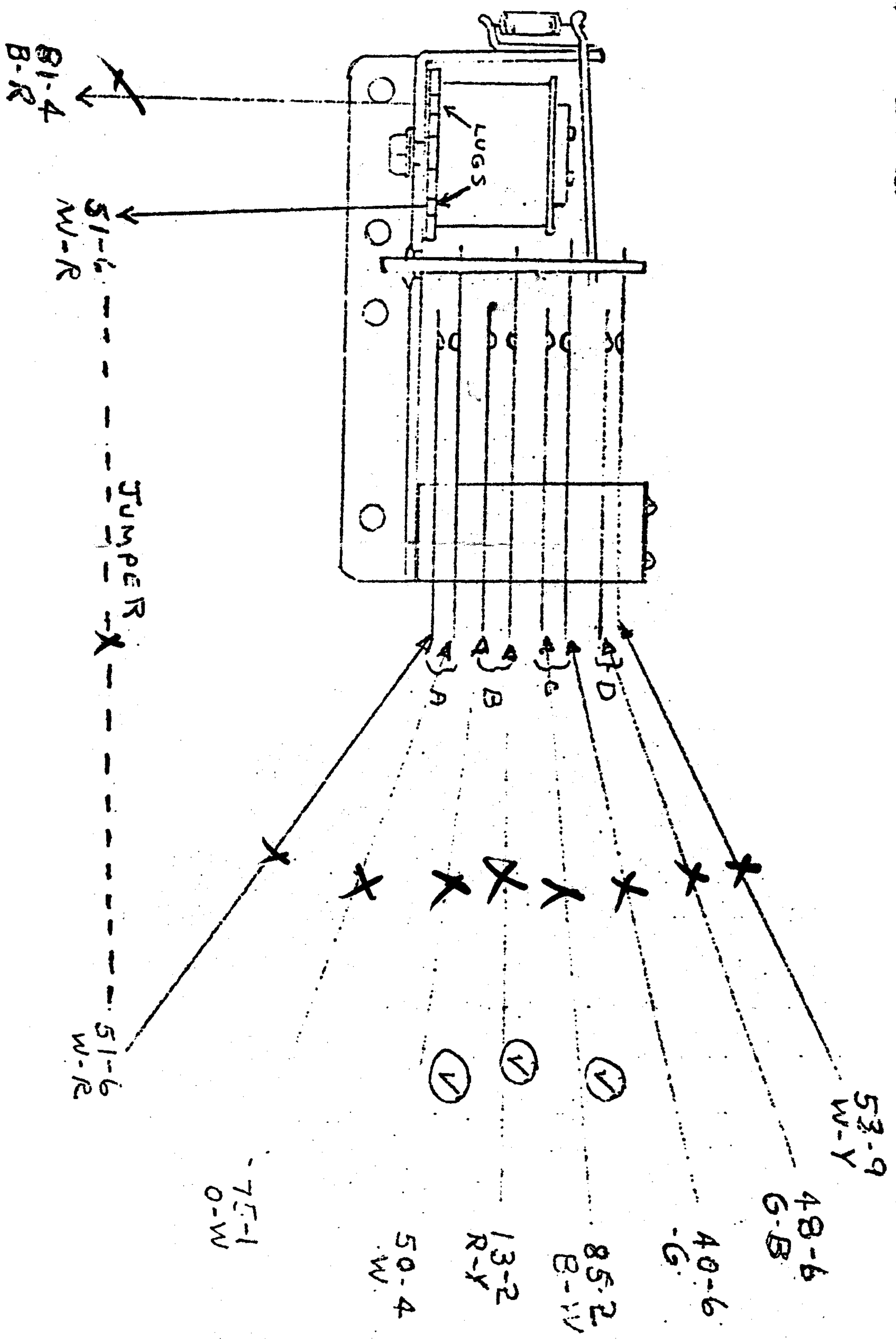


CONNECT  
JUMPER  
WIRE FROM  
END COIN  
CHUTE RELAY  
COIL TO THIS  
PRINT

# 3RD COIN CHUTE RELAY

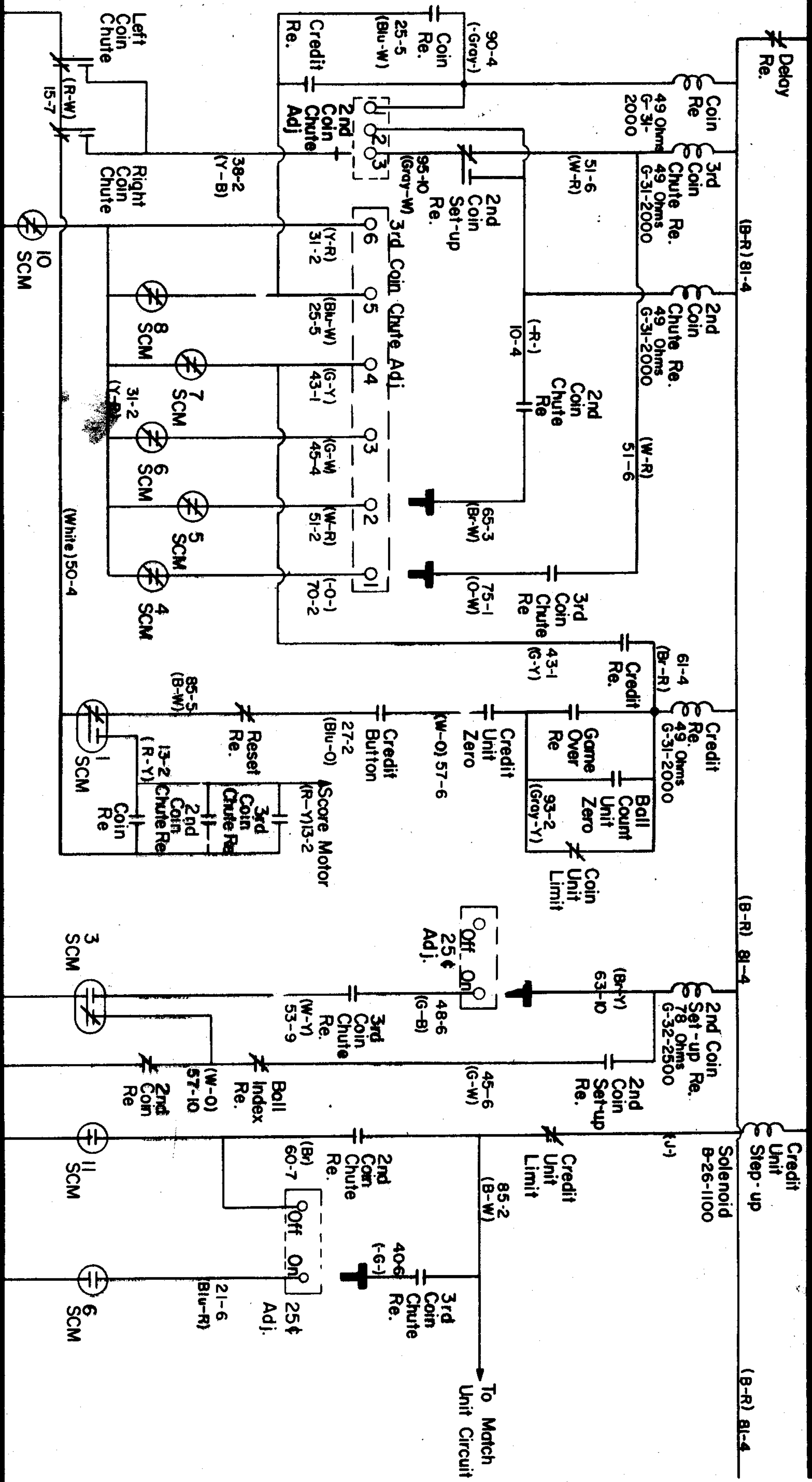
AS-2659-261a

31128 1976



(V) JUMPERS FROM 2ND COIN  
CHUTE RELAY.





**TYPE #10 DOOR WITH 2 CHUTES**

- 1) Left or Right Chute \_\_\_\_\_ Takes 1 Coin \_\_\_\_\_ For 1 to 6 Credits (Off Position)
- \* 2) Left or Right Chute \_\_\_\_\_ Takes 1 Coin \_\_\_\_\_ For 1 Credit, 2 Coins - 3 Credits (On Position)
- \* NOTE: For (2), O-W Lead Plug Must Be In Position 6; Coin Chute Adj. Circuit Shown is Connected For Condition 2
- \* NOTE: For (2), Y-B (38-2) Lead Plug Must Be In Position 3

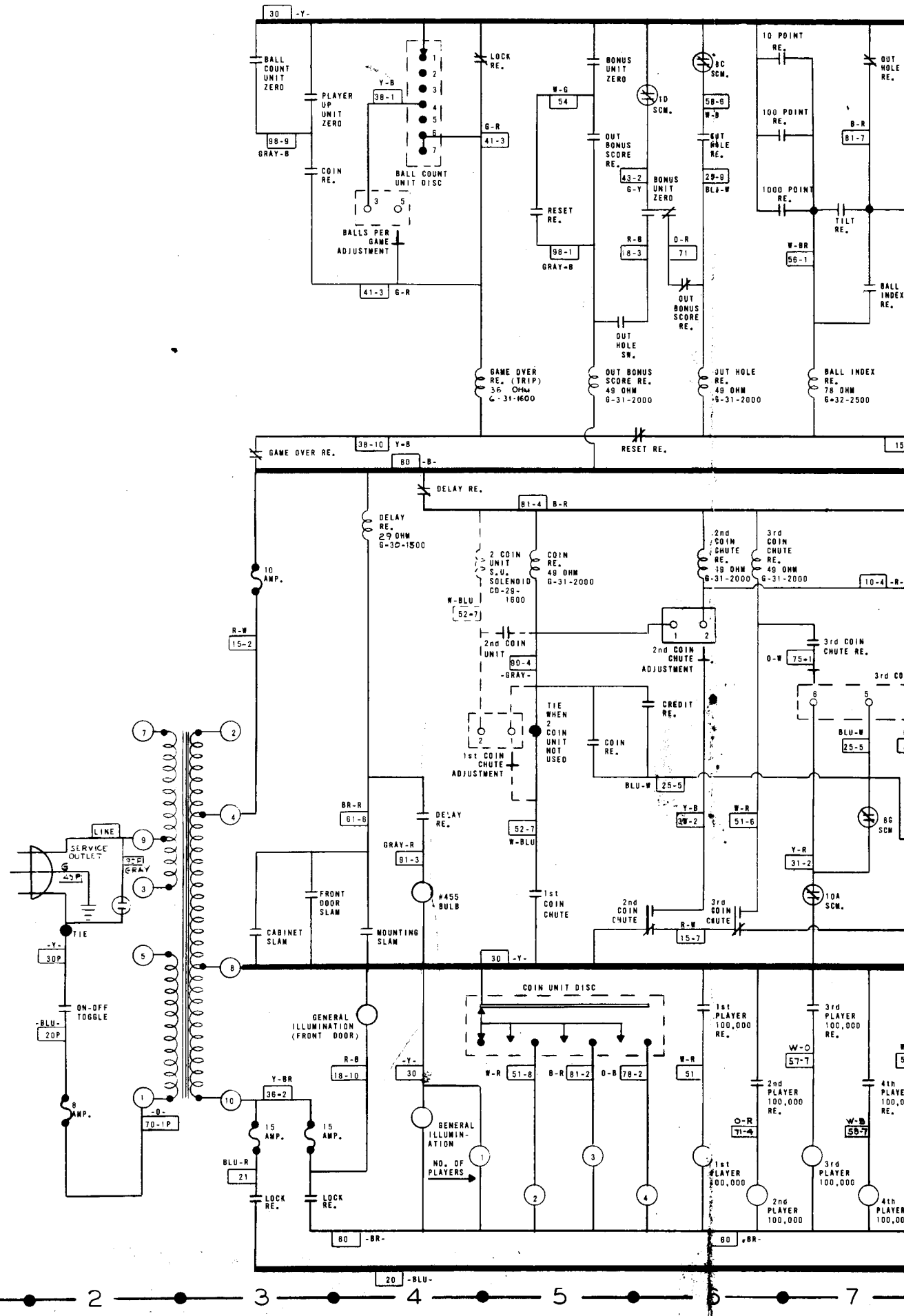
4/23/75

## TIME DELAY CIRCUIT

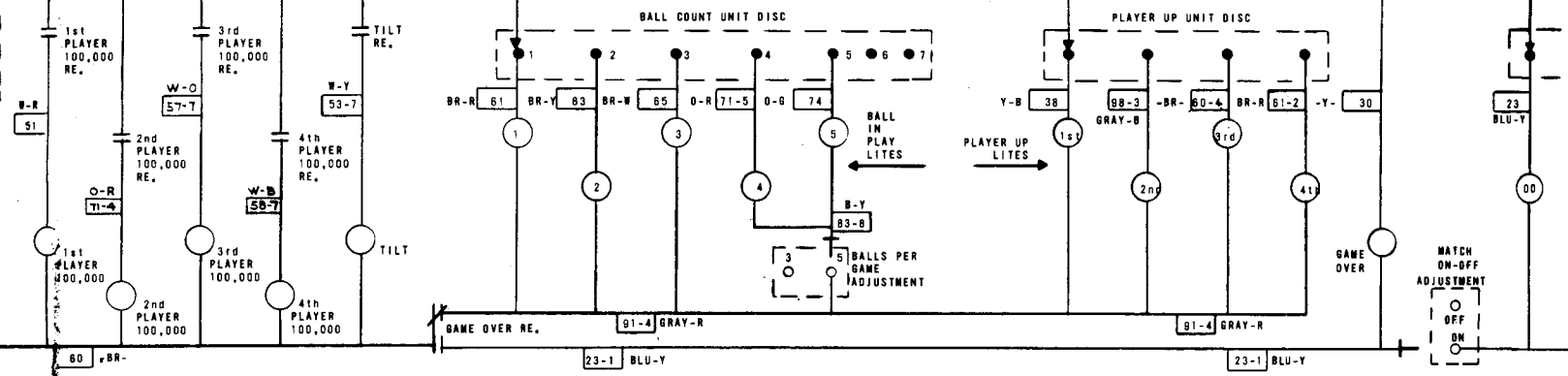
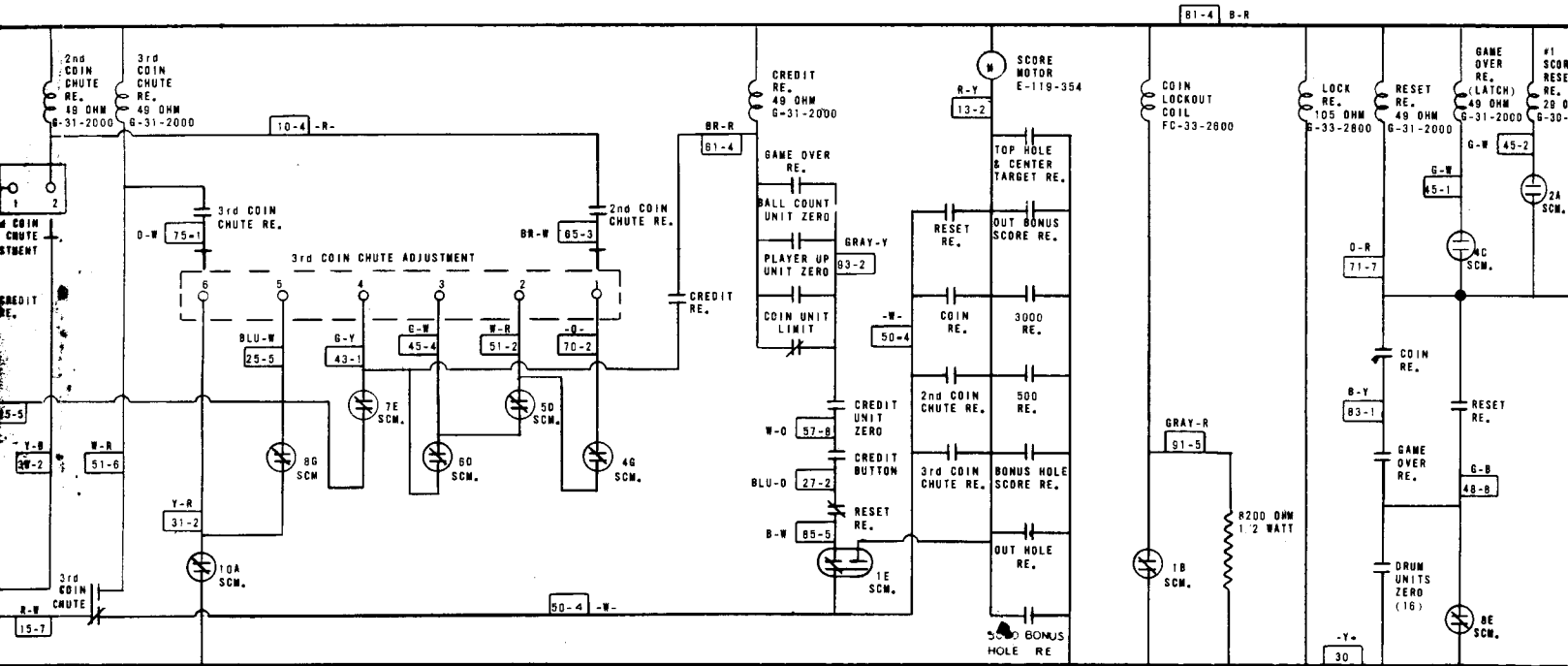
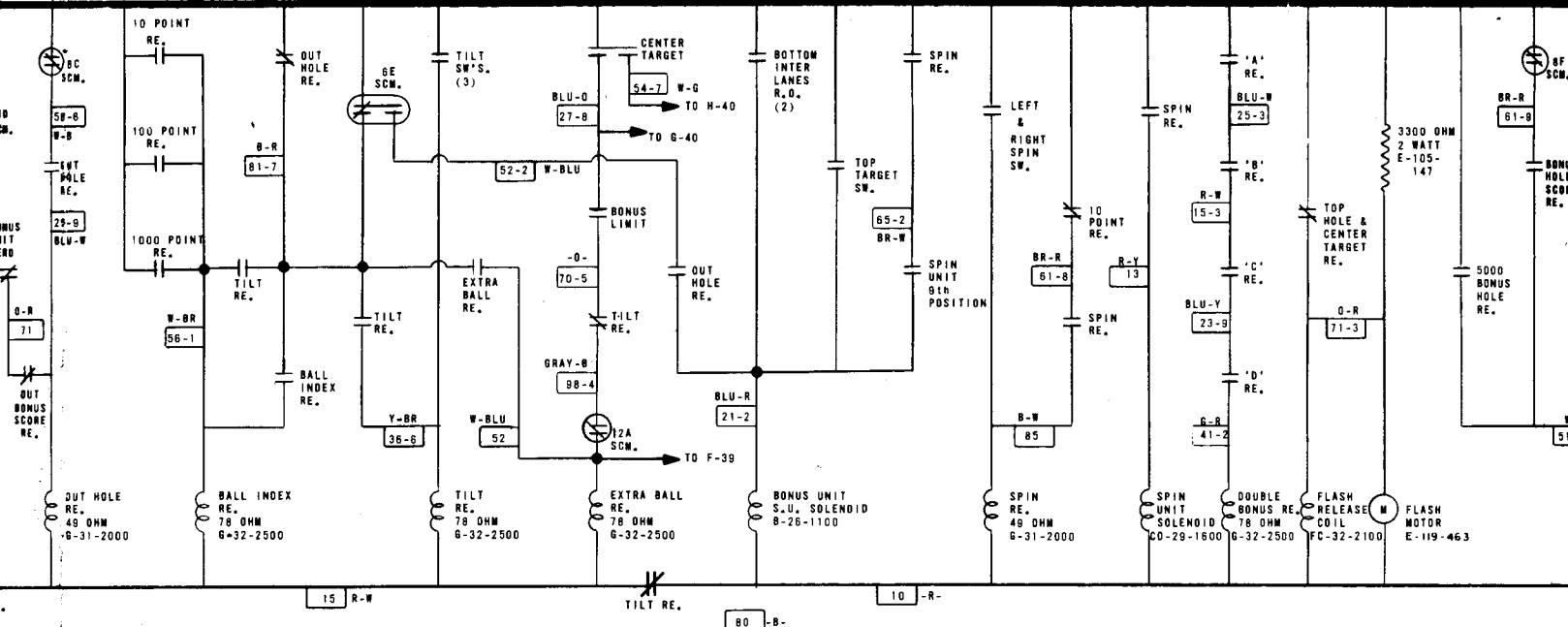
Purpose of the time delay circuit is to prevent unnecessary abuse of the machine it is installed in.

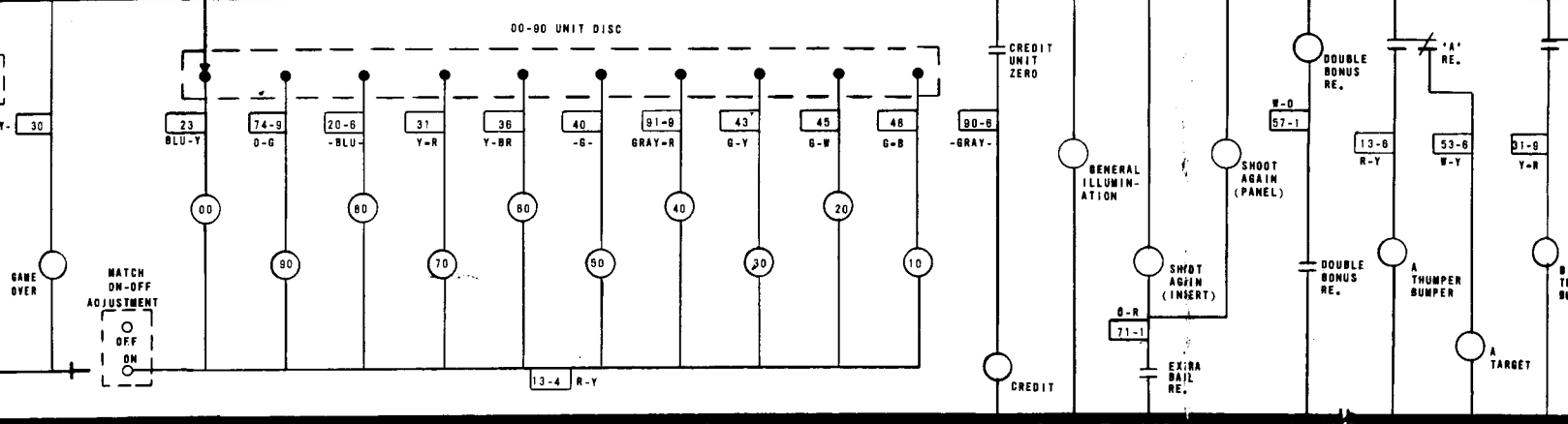
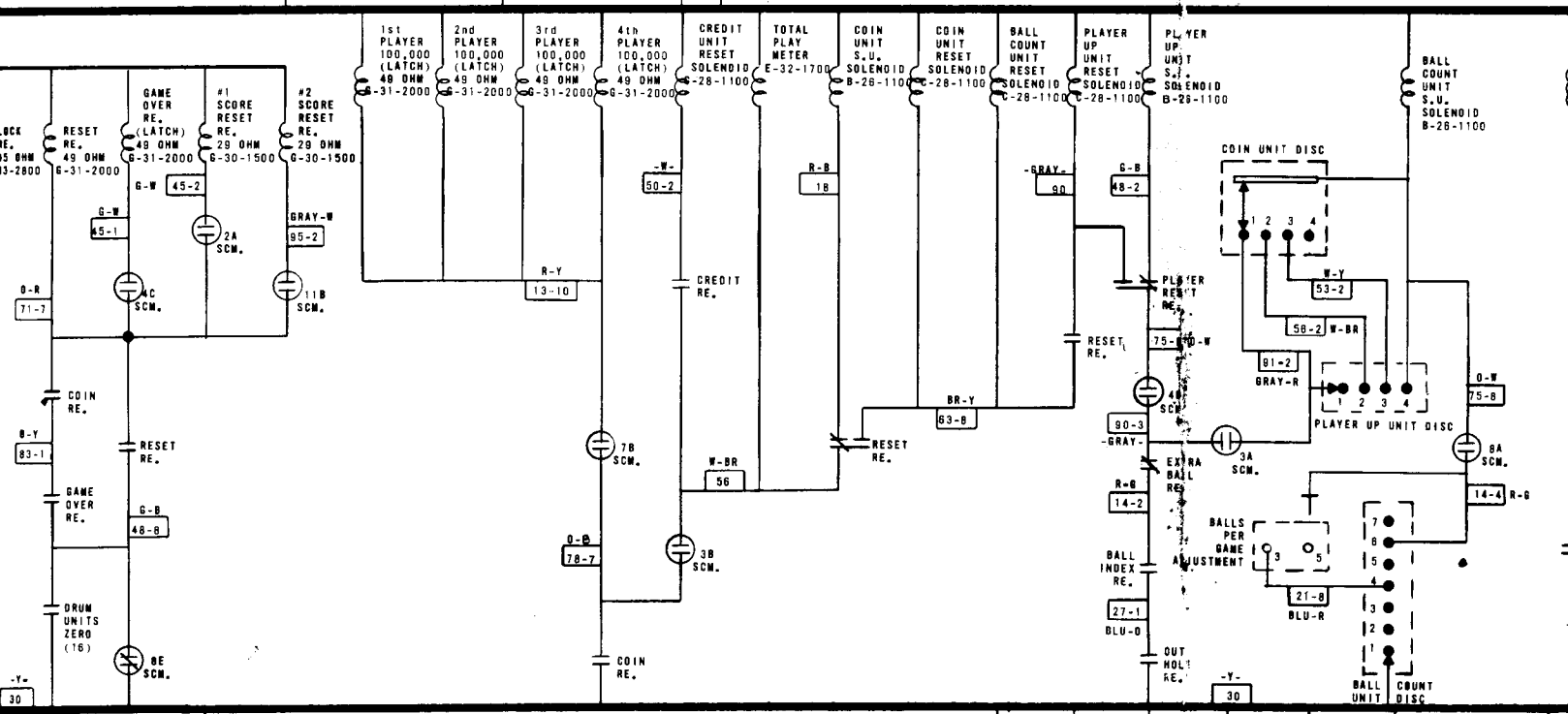
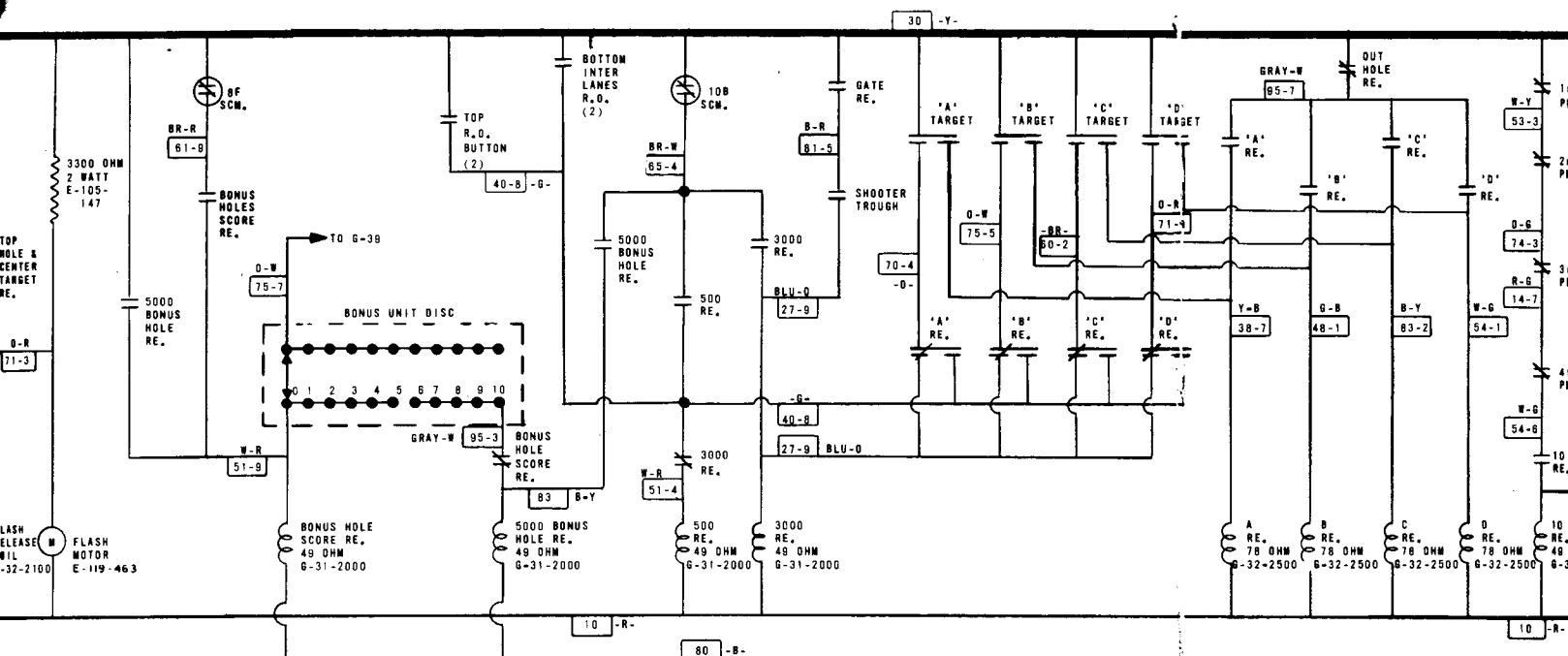
The time delay relay is energized anytime one of the slam switches are made to contact. There are two factory installed slam switches, one on the front door and one on the mechanism mounting board. (Any number of slam switches could be installed by the operator, to meet his individual requirement). The switches should be adjusted to have approximately 1/16" gap between the contacts. The weighted blade should be adjusted to attain the desired sensitivity. Decreasing the gap between contacts will make switch more sensitive. Opening the gap will reduce sensitivity. The total time the delay relay is energized can be varied by changing the #455 lite bulb mounted on the delay relay frame. If unable to get a short enough time of delay, get a Westinghouse #455 bulb; these units are considerable faster. If still unable to bring the time down, check the location voltage. It should not be under 49.5 V.A.C. on the transformer secondary.

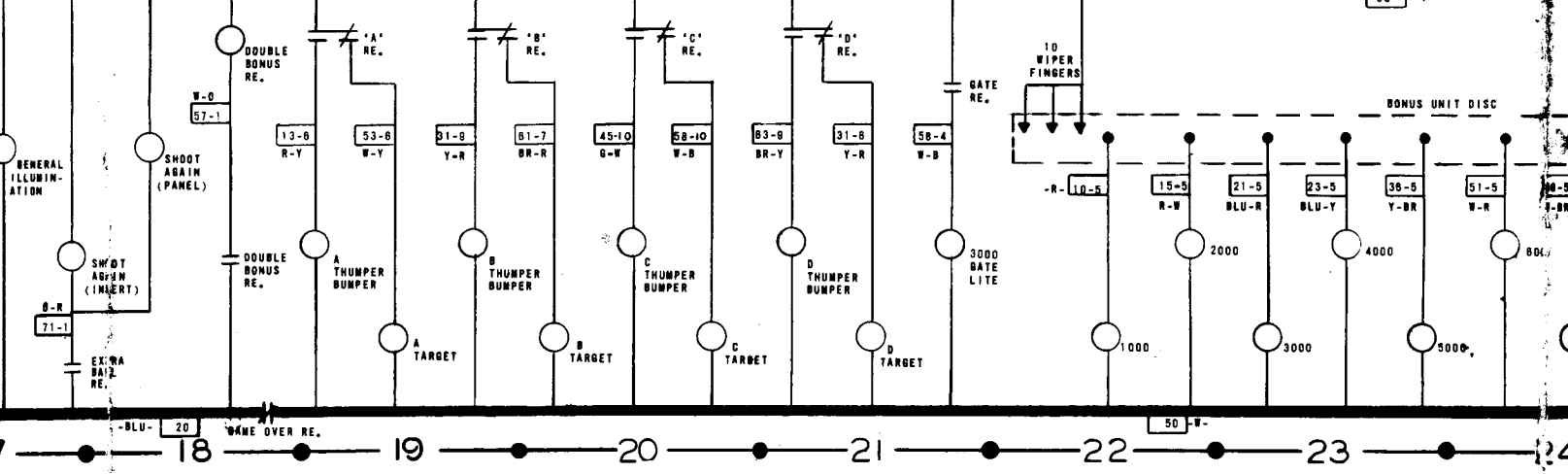
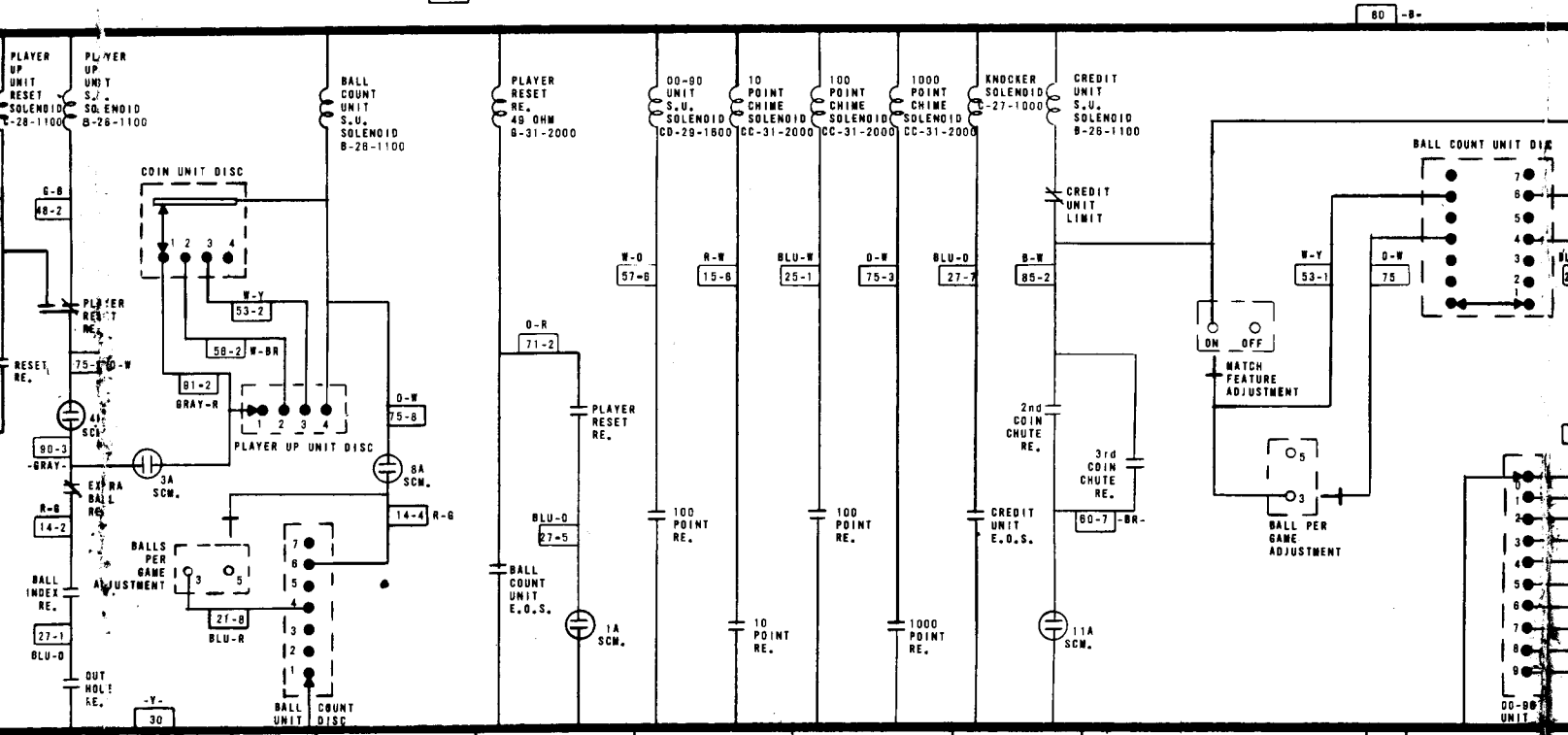
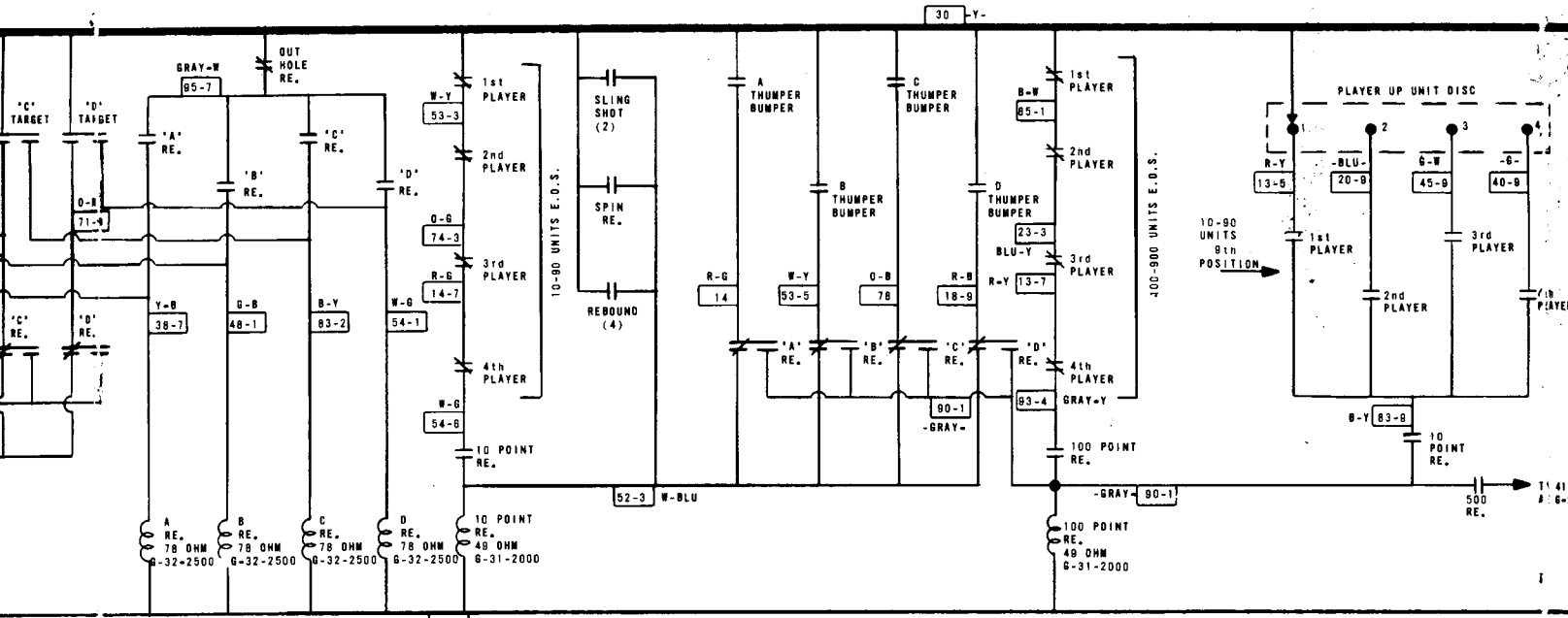
H  
G  
F  
E  
D  
C  
B  
A

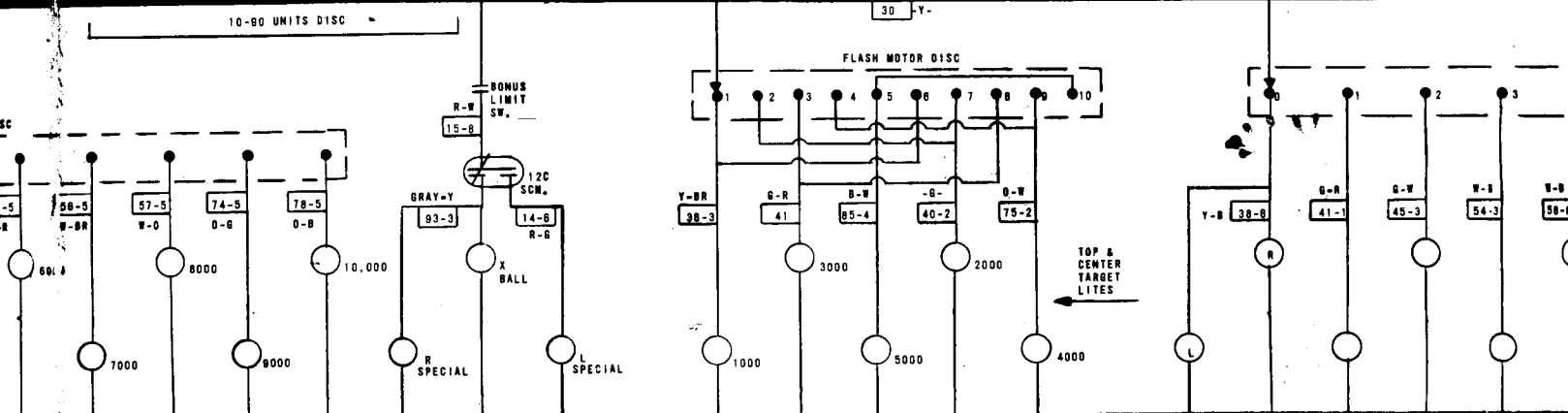
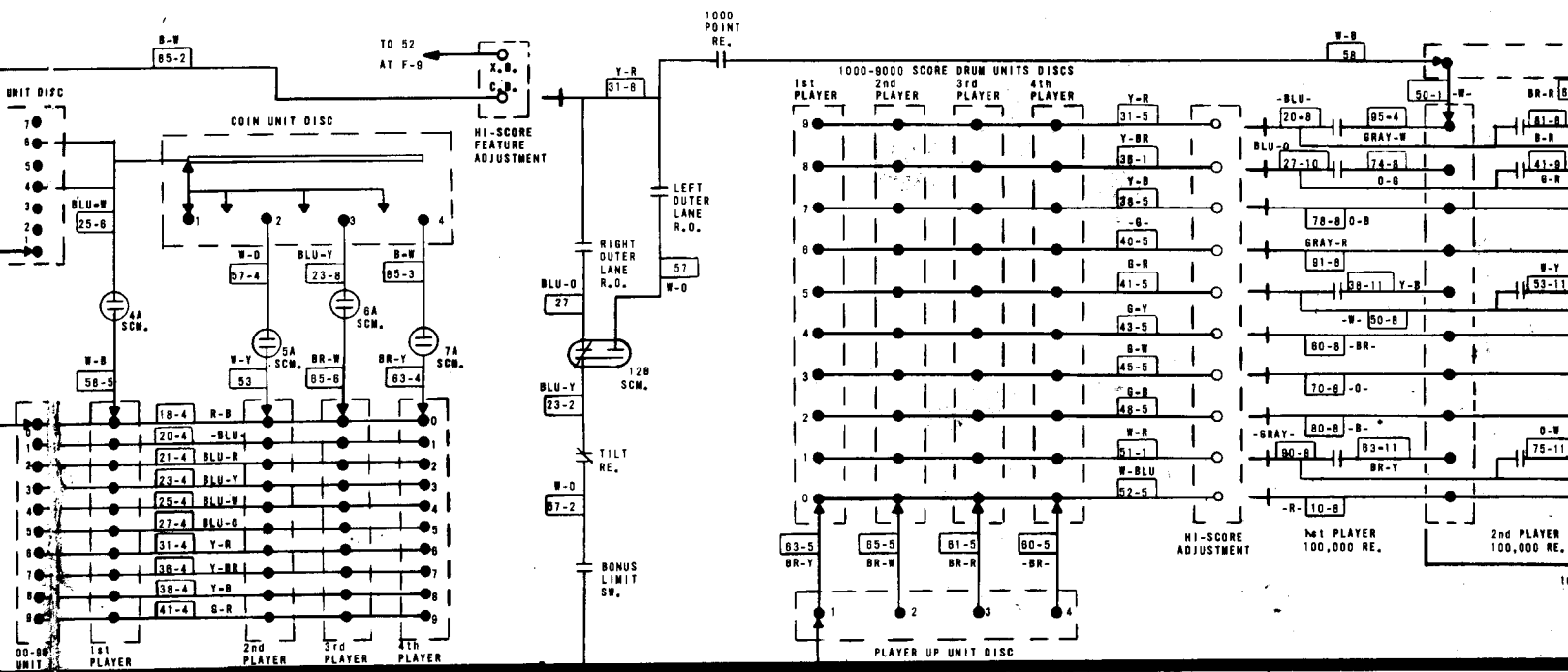
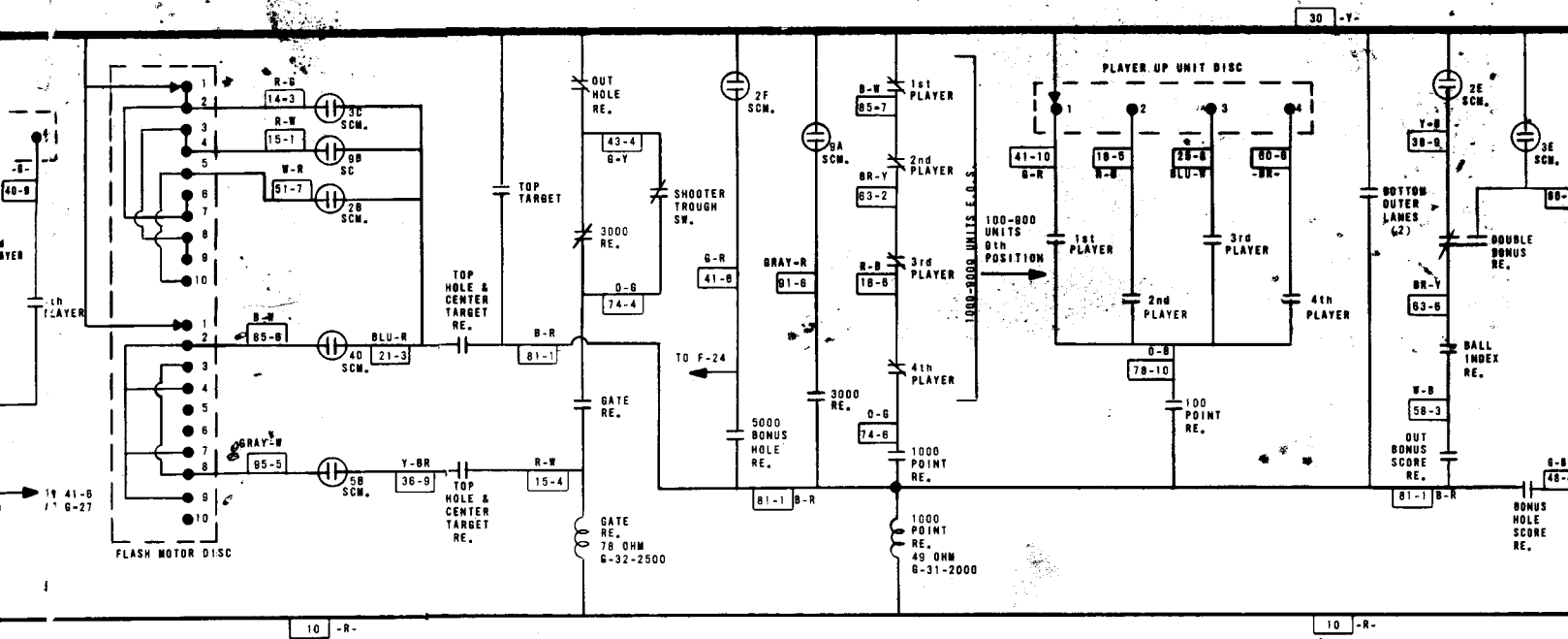


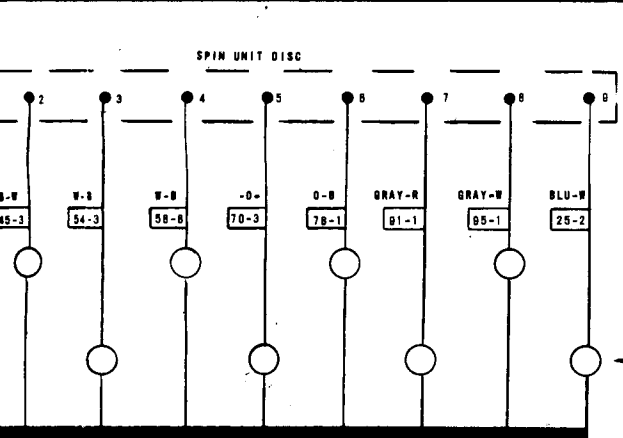
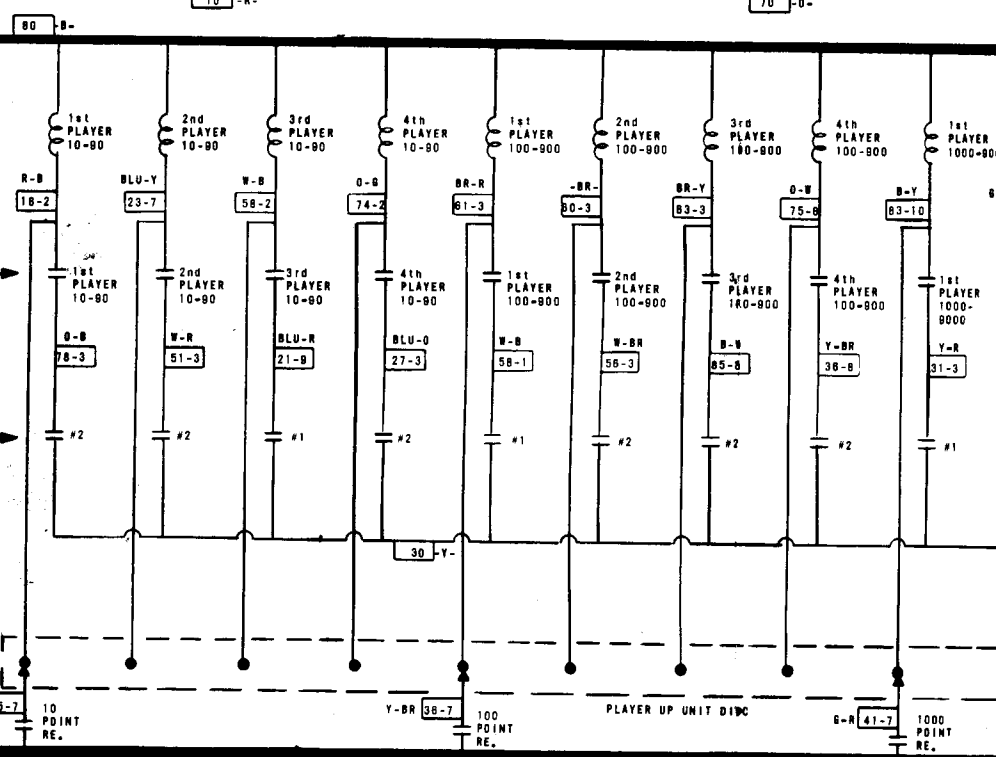
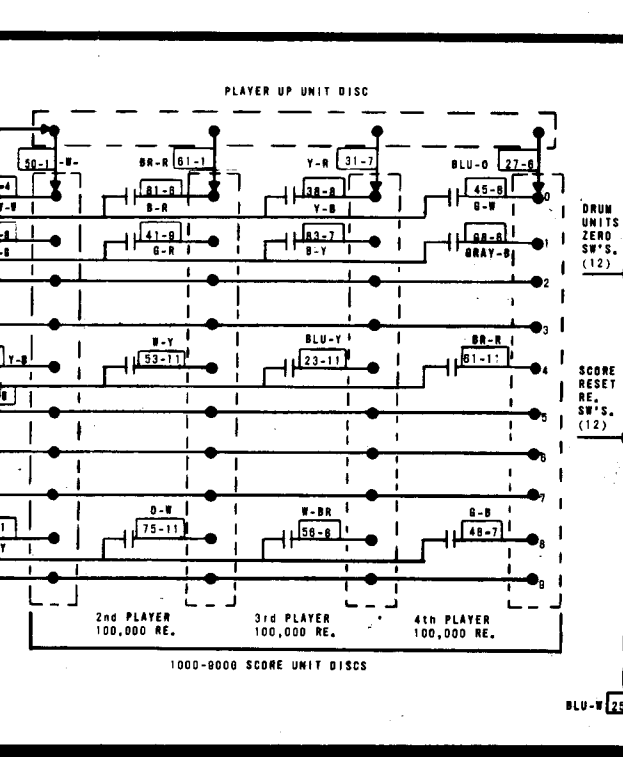
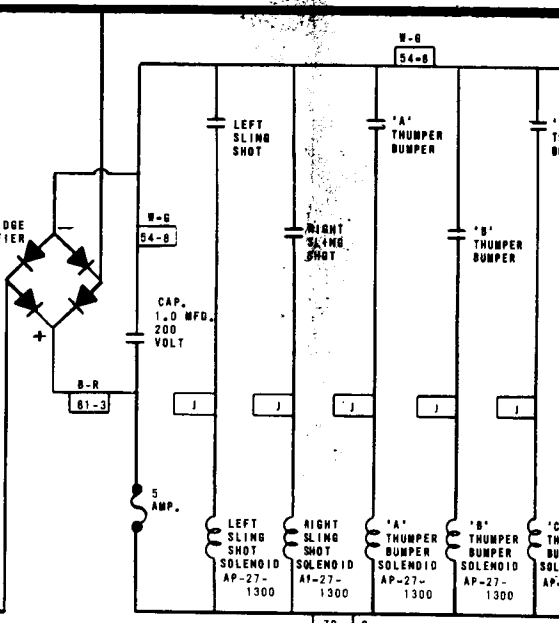
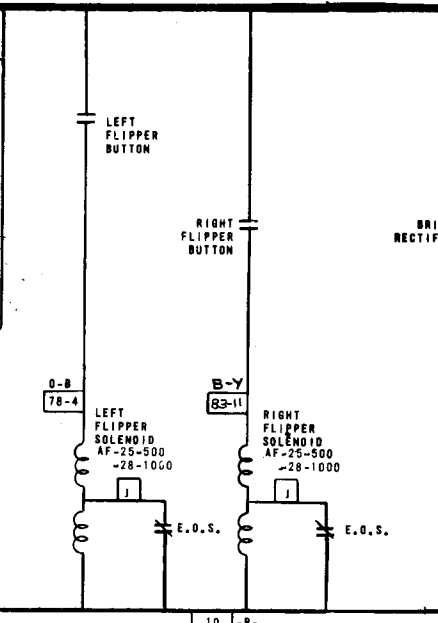
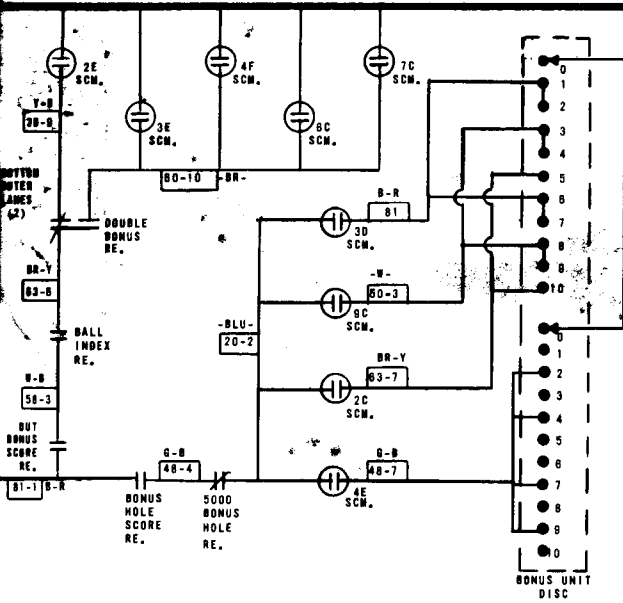
1 2 3 4 5 6 7











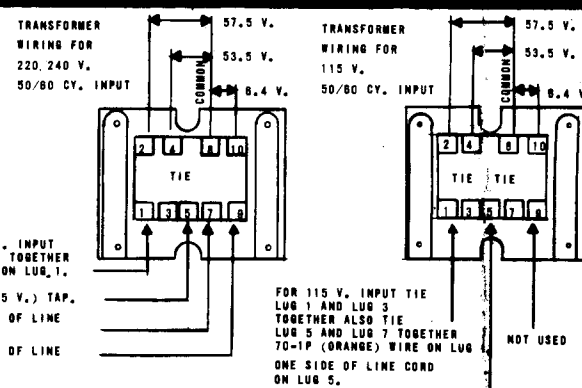
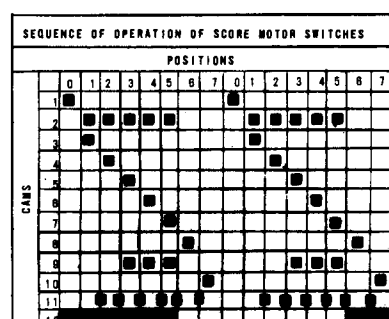
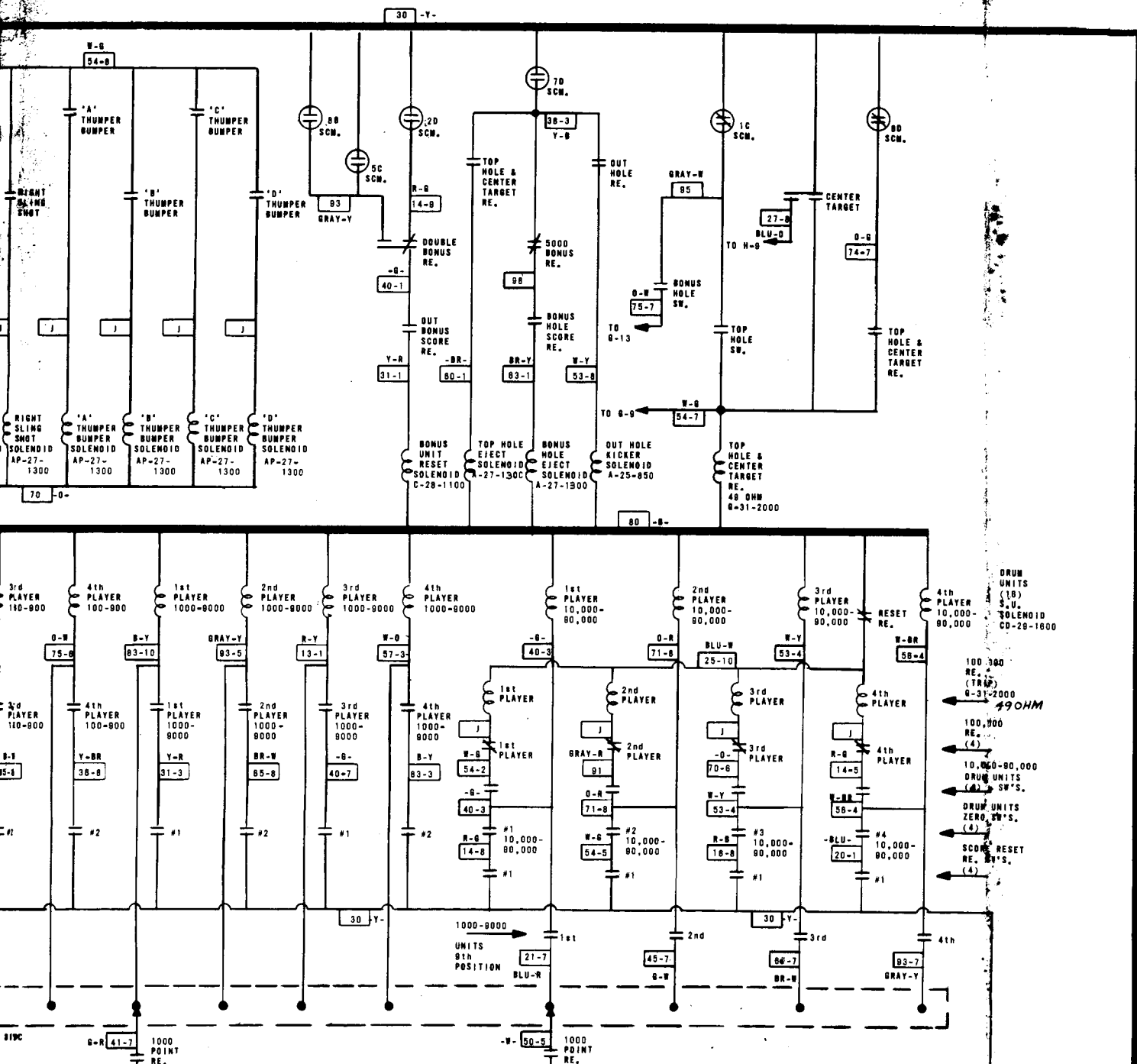
SWITCH SYMBOLS	
	NORMALLY OPEN SWITCH (CLOSED WHEN ENERGIZED)
	NORMALLY CLOSED SWITCH (OPEN WHEN ENERGIZED)
	MAKE & BREAK SWITCH
	SCORE MOTOR OPERATED SWITCH

WIRE COLOR CODE	
1-RED -R-	6-BROWN -BR-
2-BLUE -BLU-	7-ORANGE -O-
3-YELLOW -Y-	8-BLACK -B-
4-GREEN -G-	9-GRAY
5-WHITE -W-	0-NO TRACER
J-JUMPER	

EX. 50 -WHITE  
S1 -WHITE-RED  
S1-1-WHITE-RED (USED AGAIN)

SEQUENCE OF OPERATION OF	
POSITION	
CANS	POSITION
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	





NAME

BALL

BALL

BONUS

BONUS

BONUS

BONUS

COIN

COIN

COIN

COIN

COIN

CRED

CRED

CRED

DELA

DOUB

EXTR

FLASH

GAME

GATE

KNOG

LEFT

LEFT

LOCK

OUT

OUTH

PLAY

PLAY

PLAY

RISE

RISE

RIGH

SPIN

SPIN

TILT

TOP

TOP

TOTA

TOTA

00-8

#1 S

#2 S

2 CD

2nd

3rd

(18)

1st

2nd

3rd

4th

10 P

100

100

100

1000

500

3000

5000

'A'

'B'

'C'

'D'

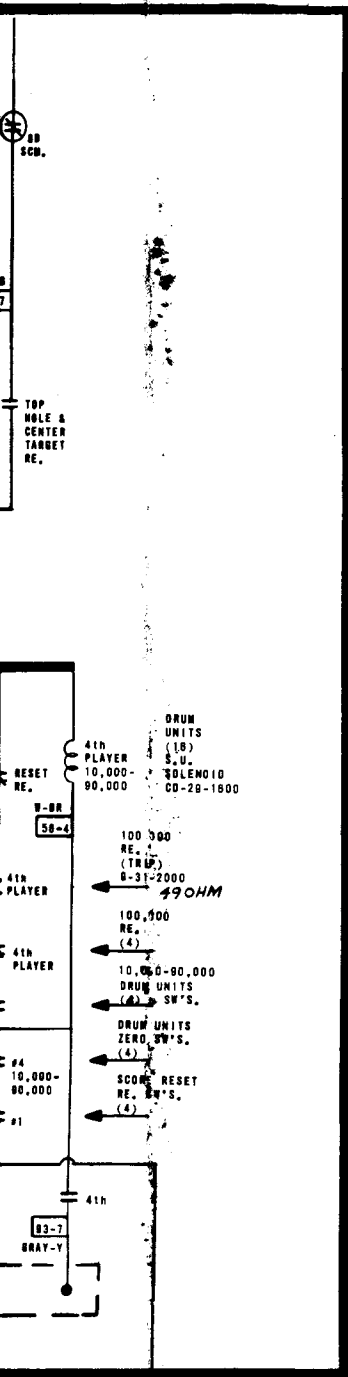
'A'

'B'

'C'

'D'

MAN  
264  
CHIC



**COIL LOCATIONS CHART**

NAME OF COIL	LOCATION
BALL COUNT UNIT RESET SOLENOID	E-17
BALL COUNT UNIT STEP UP SOLENOID	E-19
BALL INDEX RE.	F-8
BONUS HOLE EJECT SOLENOID	F-39
BONUS HOLE SCORE RE.	F-14
BONUS UNIT RESET SOLENOID	F-38
BONUS UNIT STEP UP SOLENOID	F-9
COIN LOCKOUT COIL	E-11
COIN RE.	E-5
COIN UNIT RESET SOLENOID	E-17
COIN UNIT STEP UP SOLENOID	E-19
CREDIT RE.	E-9
CREDIT UNIT RESET SOLENOID	E-16
CREDIT UNIT STEP UP SOLENOID	F-22
DELAY RE.	E-4
DOUBLE BONUS RE.	F-12
EXTRA BALL RE.	F-9
FLASH RELEASE COIL	F-12
GAME OVER RE. (LATCH)	E-13
GAME OVER RE. (TRIP)	F-4
GATE RE.	F-28
KNOCKER SOLENOID	F-22
LEFT FLIPPER SOLENOID	F-33
LEFT SLING SHOT SOLENOID	F-35
LOCK RE.	E-12
OUT BONUS SCORE RE.	F-5
OUTHOLE KICKER SOLENOID	F-39
OUTHOLE RE.	F-5
PLAYER RESET RE.	E-20
PLAYER UP UNIT RESET RE.	E-17
PLAYER UP UNIT STEP UP SOLENOID	E-18
RESET RE.	E-12
RIGHT FLIPPER SOLENOID	F-34
RIGHT SLING SHOT SOLENOID	F-36
SPIN RE.	F-10
SPIN UNIT SOLENOID	F-11
TILT RE.	F-8
TOP HOLE EJECT SOLENOID	F-38
TOP HOLE & CENTER TARGET RE.	F-40
TOTAL PLAY METER	E-18
00-90 UNIT STEP UP SOLENOID	F-20
#1 SCORE RESET RE.	E-13
#2 SCORE RESET RE.	E-13
2 COIN UNIT STEP UP SOLENOID	E-5
2nd COIN CHUTE RE.	E-6
3rd COIN CHUTE RE.	E-6
(18) UNITS STEP UP SOLENOID	
1st PLAYER 10-90	E-33
2nd PLAYER 10-90	E-33
3rd PLAYER 10-90	E-34
4th PLAYER 10-90	E-34
1st PLAYER 100-900	E-34
2nd PLAYER 100-900	E-35
3rd PLAYER 100-900	E-35
4th PLAYER 100-900	E-38
1st PLAYER 1000-9000	E-38
2nd PLAYER 1000-9000	E-37
3rd PLAYER 1000-9000	E-37
4th PLAYER 1000-9000	E-38
1st PLAYER 10,000-90,000	E-39
2nd PLAYER 10,000-90,000	E-39
3rd PLAYER 10,000-90,000	E-40
4th PLAYER 10,000-90,000	E-41
1st PLAYER 100,000 RE. (LATCH)	E-14
2nd PLAYER 100,000 RE. (LATCH)	E-14
3rd PLAYER 100,000 RE. (LATCH)	E-15
4th PLAYER 100,000 RE. (LATCH)	E-15
1st PLAYER 100,000 RE. (TRIP)	D-38
2nd PLAYER 100,000 RE. (TRIP)	D-39
3rd PLAYER 100,000 RE. (TRIP)	D-40
4th PLAYER 100,000 RE. (TRIP)	D-40
10 POINT CHIME SOLENOID	F-21
100 POINT CHIME SOLENOID	F-21
1000 POINT CHIME SOLENOID	F-21
10 POINT RE.	F-19
100 POINT RE.	F-22
1000 POINT RE.	F-28
500 RE.	F-15
3000 RE.	F-18
5000 BONUS HOLE RE.	F-15
'A' RE.	F-18
'B' RE.	F-18
'C' RE.	F-19
'D' RE.	F-19
'A' THUMPER BUMPER SOLENOID	F-38
'B' THUMPER BUMPER SOLENOID	F-38
'C' THUMPER BUMPER SOLENOID	F-37
'D' THUMPER BUMPER SOLENOID	F-37

**CABINET TO INSERT PLUGS**

20	10	81-8	13-4	81	13-10	90
	15-8	83-4	25-1	83	25-10	91-2
	23-1	85-8	30	71-5	53	83-2
	45-2	71-1	31-8	74	58-1	85-2
	48-2	75-8	48-8	80	61-4	88-9
	50-2	78-2	53-7	81-1	65	
	51-8	81-4	58-2	85-2	76-3	
	52-3	83-8	57-8	88-4	81-2	
	53-2	90-1	60	83-4		
	58-5					

**PANEL TO CABINET PLUGS**

22	14-8	53-8	14-8	54-7	10	80
	20	54	15-8	57-2	15-4	81
	21-2	57	27-9	83-1	31-8	83-11
	27	60-1	38-3	70-5	40-1	85-4
	38	83-8	40-8	71-1	48-7	90-1
	31-1	71	41	75-2	80-10	93
	38-8	80-8	43-4	78-4	81-8	95
	38-9	85-3	50-3	81-1	83-7	
	40-2	88-1	51-8	93-3	74-4	
	43-2		52-3	95-7		
	50					

**DOOR PLUG**

12	18-10	32-7
	27-2	57-8
	30	61-8
	38-2	81-4
	50-4	91-5
	51-8	

8200 OHM  
1/2 WATT

**FLIPPER PLUG**

8	30	78-4
	38-8	83-11
	61-8	

**CHIME PLUG**

4	15-8	75-3
	25-1	80

WIRES ENCLOSED IN    INDICATES #18 GAUGE WIRE USED AT POSITION ON PLUGS.

NOTE: ALL INTERLOCK RELAYS ARE IN LATCHED POSITION.



MANUFACTURING CORP.  
2640 W. BELMONT AVE  
CHICAGO, ILL. 60618

1033  
BOW & ARROW  
4 - PLAYER  
5-27-75  
W-1042-138