

SERVICE MANUAL

FOR

**"TEAM"
SHUFFLE ALLEY**



UNITED MANUFACTURING COMPANY

3401 NORTH CALIFORNIA AVENUE

CHICAGO 18, ILLINOIS

MAINTENANCE AND ADJUSTMENT

I GENERAL

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

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

II FUSES

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

III LUBRICATION

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

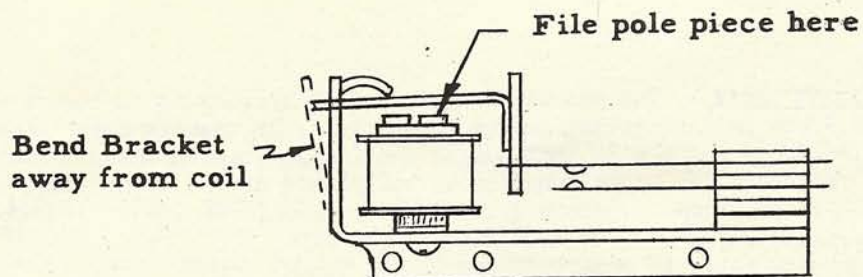
IMPORTANT: NEVER USE VASELINE FOR LUBRICATION OF ANY PART OF THE MACHINE. Vaseline is not a true lubricant. It leaves a dirty and gummy residue and it becomes very thick when cold. A special Coin Machine Lubricant is supplied with each machine.

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

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

IV RELAY AND SWITCH ADJUSTMENTS

- A. 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.
- B. With the exception of a few instances, such as on drum unit impulse relays, all blade-type switches should have at least 1/32 inch between the contact points and should follow through for at least 1/32 inch beyond the point at which the contacts close. This follow-through action provides a wiping motion between the contacts, keeping them clean and insuring good contact between the points.
- C. On the 10-90 unit relay located under the playfield and the Reset relays located in the back box, the switches should be adjusted with the follow-through reduced to approximately 1/64 inch. This is to insure better operation of the drum units.
- D. HUMMING RELAY may be silenced by filing the face of the coil pole piece with a point file. If the trouble still persists, relieving some of the switch tension will tend to reduce the hum. As a last resort, bending the bracket, as noted in Sketch #1, is suggested.



V OPERATION OF A. C. RELAYS

See the Relay Charts at the end of the manual for detailed information on the switches' function.

- A. **LOCK RELAY** - Is energized when a game is started and continues to stay energized until the 115 volt power is removed from the game. Its sole function is to prevent cheating of the game by causing the "Game-over" relay to trip through the orange-black wire.
1. If the lock relays fail to energize at the start of a game,
 - a. Check the adjustment of the make and break switch on the lock relay to make before it breaks.
 - b. Check the switch on the Start relay with the orange-red wire.
- B. **COIN RELAY** - is operated directly by the Drop-chute coin switch; the Coin relay in turn operates the Start relay with the first coin, and advances the Coin unit with the next coins.
- C. **PLAYER RESET RELAY** - The function of this relay is to either advance or reset the player unit; in addition, it permits the Frame unit to advance to the next frame when the last player in each frame has completed his shot.
1. If this relay fails to energize when the last player in the frame has completed his shots,
 - a. Check the inside make and break switch on the Player Reset relay to be adjusted to "make" before it "breaks".
 - b. Check the wiper fingers on the Coin unit for proper alignment and adequate contact pressure.
 - c. Check the wiper fingers on the Player unit.
 - d. Check the Brown wire circuit on the Score motor disc; also check the wiper fingers for proper alignment & pressure.
- D. **10-90 UNIT RELAY** - operates three times when a strike is made and operates two times when a spare is made. In a Double Score frame, the relay operates six times on a strike and four times on a spare. In a Triple Score frame, the relay operates nine times for a strike and six times for a spare. In a Super Score frame the relay operate twelve times for a strike and eight times on a spare. It always operates once on a blow.
1. If this relay fails to operate properly,
 - a. Check the make and break switch on the 1-10 relay with the Black-yellow wire.
 - b. Check the wiper fingers on the Score Motor disc for adequate pressure and alignment.
 - c. Check the Q,T,D,QS and S rivets on the Score Motor disc controlled by the Green, Black-green, Green-white, Yellow, Red-Blue and Blue-white wires.
 - d. Check the wiper fingers on the Frame Unit operating the Green, Black-green, Green-white and Red-green wires.
 - e. Check the 10th Frame Control jack for proper positioning.
- E. **PUCK RELAY** - operates only when the puck becomes lodged on one of the rear ten puck switches. This relay, when energized, keeps the Score motor from operating continuously. In normal play, the Puck relay never operates.

V (continued)

F. 10TH FRAME RESET RELAY - The primary function of this relay is to insure proper operation of the 10th Frame unit resetting in the tenth frame; it assures that the 4th position switch on the Score motor will continue to receive power even when the 10th Frame unit is resetting. Although its prime function is to operate in the 10th frame, the relay functions in all other frames.

1. If this relay fails to operate properly,
 - a. Check the inside make and break switch on the 10th Frame relay to be adjusted to "make" before it "breaks".
 - b. Check for proper operation of the 10th Frame unit in paragraph VII - A.

G. 00-90 MATCH RELAY - operates whenever the Number is matched with the last two digits of the player's score. The relay in turn operates the bell, the Number Matched Meter, the Star and Clover relays, and the Frame Unit. Whenever the Frame Unit receives an impulse from this relay, it advances to the 13th position to operate "Number Matched" light.

1. If this relay fails to operate,
 - a. Check and make and break switch on the Start relay with the Red-black wire.
 - b. Check the Mystery-Skill jack in the back box for establishing a circuit from the Red-black wire to the Green-yellow wire.
 - c. Check the insulated wiper fingers on the Frame unit operating the Red-yellow and Black-white wire circuits in the 11th, 12th, and 13th positions.
 - d. Check the special 6 finger wiper on the Coin Unit operating the Black-white, Black-green, Black-yellow, Black-red, Green-white, and Green-red wire circuits. These six wires come from the Score Motor disc.
 - e. Check the insulated wiper fingers on the Score Motor disc operating the six wires in (d) above.
 - f. Check the wiper fingers on the 00-90 Score drum units.
 - g. Check the wiper fingers on the 00-90 Match unit operating the ten wires soldered to the terminals on top of the 00-90 Match unit disc. These ten wires go to all six players 00-90 Score drum units.

H. SPOT CLOVER RELAY. The function of this relay is to operate the CLOVER light; it operates on an average of every 10th, 17th or 25th game, depending upon the position of the adjustment jack. While this relay operates in the 6th frame, the lite does not come "on" until the game is over.

1. If this relay fails to operate properly,
 - a. Check the insulated wipers on the Frame Unit operating the Green-yellow wire in the 6th frame position.
 - b. Check the end of stroke switch on the Frame unit with Black-red wire; this switch should "make" at the end of stroke with a maximum of 1/16 rub.
 - c. Check the wiper fingers on the Star Match Unit operating the Black-white, Black green and Black-red wire circuits.
 - d. Check the Star Unit Control Jack which controls the Clover lite for proper positioning.

I. CLOVER MATCH RELAY. The main function of this relay is to operate the "Clover Matched" light at the end of the game. The relay should be tripped whenever the Star and Number are matched with the last two digits of the player's score at the same time the clover is lit.

1. If this relay fails to operate,
 - a. Check the switch on the Spot Clover Relay with the Brown-red wire.
 - b. Check for proper operation of the Star Match Relay in Paragraph V-J.

J. STAR MATCH RELAY. The main function of this relay is to operate the "Star-Matched" light at the end of the game. The relay should be tripped whenever the Star and Number are matched with the last two digits of the player's score.

1. If this relay fails to operate,
 - a. Check for proper operation of the 00-90 Match relay in Paragraph V-G.
 - b. Check the switch on the 00-90 Match Relay with the Blue-Red wire.
 - c. Check the wiper fingers on the 00-90 Match Unit operating the Blue-red wire circuit and the ten wires which lead from the brass rivets on the 00-90 Match unit disc to the solder terminals on top of the Star Match unit disc.

V J. (Continued)

- d. Check the wiper fingers on the Star Match unit disc operating the ten wires which are soldered to the terminals on top of the Star Match unit disc.
- K. 1ST, 2ND & 3RD PLAYERS RESET RELAY. This relay operates only at the start of the game to reset the 1st, 2nd & 3rd players' Scores to zero. This relay receives eleven impulses from the Score motor and, in turn, operates each coil on the drum units, advancing these units to the zero position, through the zero switch on each unit.
 1. If this relay fails to operate properly,
 - a. Check the make and break switch on the Start relay with the Brown-white wire.
 - b. Check the outer row wiper finger on the Score motor disc.
- L. 4TH, 5TH & 6TH PLAYERS RESET RELAY AND TEAM SCORE RESET RELAY - operate identically to the 1ST, 2ND & 3RD Players reset relay.
- M. TEAM SELECTION RELAY. This relay controls the scoring of the Left Team and Right Team drum units. It is energized by the Player Up Unit for the 2ND, 4TH & 6TH Players.

VI LATCH BANK RELAYS

See the Trip Relay Charts at the end of the manual for detailed information of the switches' function.

- A. START RELAY - operates only at the start of the game, with the first coin only. Its function is to reset all the units to a zero position.
 1. If this relay fails to operate with a deposit of the first coin,
 - a. Check the drop chute switch.
 - b. Check the zero make and break switch on the Frame unit with Green-white wire.
 - c. Check paragraph V - B for proper operation of the Coin relay.
- B. The #1, #2-8, #3-9, #4, #4-7-8, #5, #5-8-9, #6, #6-9-10, #7 and #10 relays are all operated by the bowling pin roll-over switches which are actuated by the puck. Refer to the switch diagram located in the cabinet for a detailed explanation of these puck switches.
 1. If any of these relays fail to operate properly, check the normally closed switches on the respective relays that have a jumper going to the trip coil. Also check the normally closed switch on the Game-over relay, which has the Red wire.
- C. #5 PIN SWITCH RELAY operates on the first shot, providing the #1 relay is tripped. This relay in turn controls the operation of the six puck switches between #8 and #9 bowling pins.
 1. If this relay fails to operate,
 - a. Check the normally open switch on the #1 relay with Red-white wire.
 - b. Check the normally closed switch on the #5 Pin Switch relay.
- D. 1-10 RELAY - operates whenever all ten pins are tripped, and the Score motor starts to operate.
 1. If this relay fails to operate,
 - a. Check the normally closed switch on the 1-10 relay with the Green-yellow wire.
 - b. Check the continuity of the circuit starting with the normally open switch on the #1 relay with the Red-white wire and continuing to the normally open switches on those relays noted in Paragraph VI - B.
- E. 1ST SHOT RELAY always operates on the first shot.
 1. If this relay fails to operate,
 - a. Check the inside normally closed switch on the Game-over relay.
 - b. Check the ten rear puck switches for proper adjustment.
 - c. Check the normally closed switch on the 1st Shot relay with the Gray-red wire.
- F. 2ND SHOT RELAY always operates on the second shot. If this relay fails to operate properly, check Paragraph VI - E. In addition, check the 1st position switch on the Score Motor with the Gray-red wire.

VII (continued)

- G. **GAME OVER RELAY** - operates when the last player in the 10th frame completes his shots; it also operates when the game is pounded or dropped.
1. If this relay fails to operate,
 - a. Check the wiper fingers on the Frame unit in the 11th frame position operating the Orange-black wire.
 - b. Check the normally closed switch on the Game-over relay, which has a jumper wire going to the Game-over coil.
 2. If the Game-over relay operates in the 10th frame instead of the 11th frame, check the wiper fingers on the Frame unit for over-riding momentarily and hitting the 11th frame button. To fix this, rotate the bakelite disc (biscuit) slightly in a counter-clockwise direction, when looking in at the wiper fingers.
 3. If the Game-over relay operates too soon, check the vibration switches (tilt). One switch is located under the playfield, adjacent to the #1 pin switches; another switch is located on the side of the back-box.

VII STEP-UP UNITS

- A. **10TH FRAME UNIT**: The function of this unit is to give extra shots to the player in the 10th frame, and to indicate with lights on the back glass what was made in the 10th frame, such as two strikes, etc. This unit advances three times when a strike is made and advances two times when a spare is made, only in the tenth frame. If three strikes are made, the unit advances nine times; when a strike and spare are made, the unit advances five times.
1. If this unit fails to advance properly,
 - a. Check the wiper fingers on the Frame unit in the 10th frame position, which completes a circuit to the Brown-red wire and the Blue-red wire.
 - b. Check the insulated wiper on the Score motor operating the Blue wire and the Blue-red wire circuits.
 - c. Check the switch on the 10-90 unit relay with the Blue wire.
 2. If the unit fails to reset properly,
 - a. Check Paragraph VII-B for proper operation of the Frame unit.
 - b. Check the normally open switch on the 10th Frame Reset relay with the Black-white wire.
 - c. Check the normally open switch on the 1st Shot relay with the Black-white wire.
 - d. Check the Make & Break switch on the 1-10 relay, with a jumper going to the 1st Shot relay.
 - e. Check for proper operation of the 10th Frame Reset relay in paragraph V-F.
- B. **FRAME UNIT** advances when the last player in each frame has completed his shot; for example, in a six player game, the unit will not operate until the sixth player has completed his shot. The main function of this unit is to denote the frame position by light indication. In addition, it controls the operation of the 10th Frame unit and the scoring of the strikes and spares.
1. If this Frame unit fails to operate properly,
 - a. Check the Make & Break switch on the Player Reset relay with the Green-red wire.
 - b. Check the 4th Position switch on the Score motor with the Black-red wire.
 - c. Check the wiper finger on the 10th Frame unit disc, which operates the Black-white circuit.
 - d. Check proper operation of the Player Reset relay as noted in Paragraph V - C.
- C. **COIN UNIT**: The purpose of this unit is to permit operation of the game from one to six players; it is operated by the Coin relay which in turn is operated by the drop chute switch. The first coin resets the unit to zero, where it would remain for a One Player game; if extra coins are deposited, the Coin unit would advance one step for each coin. This unit also shows the "NUMBER OF PLAYER" lites on the back-glass through the wiper finger on the disc.
1. If this unit fails to advance properly,
 - a. Check the switch on the Coin relay.
 - b. Check the Make & Break Zero switch on the Frame unit; this switch should be adjusted to "make" the Black-white wire circuit at the zero and 1st positions, and then transfer the circuit to the Green-white wire at the 2nd position.

VII (continued)

D. **PLAYER-UP UNIT:** The purpose of this unit is to show what player is "up" and to give the score to the proper player. It should advance after each player has completed his shots. As a 1 player game, this unit should never advance. If the game is operated as a 4 player game, the unit should advance until the 4th player has completed his shots, after which the unit should reset.

1. If this unit fails to operate properly,
 - a. Check for proper operation of the Player Reset relay in Paragraph V - C.
 - b. Check for proper operation of the 10th Frame Reset relay in Paragraph V - F.
 - c. Check for proper operation of the 10th Frame unit in Paragraph VIII - A.

E. **00-90 MATCH UNIT.** The purpose of this unit is to show a NUMBER to be matched at the end of the game if operated in the MYSTERY jack position. If the game is operated in the SKILL jack position, the NUMBER will show at the start of the game.

1. If this unit fails to advance properly,
 - a. Check the end of stroke switch on the Star Match unit; this switch should always operate the 00-90 Match unit.
 - b. Check the switch on the 10-90 relay with the Green-black wire; this switch should always operate the 00-90 Match Unit in the 0, 1st, and 8th frames. Four positions in ten on the Star Match unit disc make the switch on the 10-90 relay also operate the 00-90 Match unit in the 3rd, 7th, and 9th frames.

F. **STAR MATCH UNIT.** The purpose of this unit is to show a STAR to be matched at the end of the game.

1. If this unit fails to operate properly,
 - a. Check and make and break switch on the Start relay with the Red-black wire.
 - b. Check the Myster-Skill jack for establishing a circuit from the Red-black wire to the Green-yellow wire.
 - c. Check the switch on the 10-90 relay with the Red-black wire; this switch should operate the Star Match unit in the 2nd, 4th, 6th, and 8th frames.
 - d. Check the end of stroke switch on the Frame unit with the Red-white wire. This switch should operate the Star Match Unit in the 0, 1st, and 8th frames. Four positions in ten on the Star Match unit disc make the switch also operate in the 3rd, 7th, and 9th frames.

G. SCORE UNIT (DRUM TYPE)

1. 10-90 DRUM UNIT is operated by the 10-90 unit relay on strikes spares, and blows through the Player unit disc. (Black-green wire). If the 10-90 Drum unit fails to operate properly,
 - a. Check the adjustment of the inside switch (Black-green wire) on the 10-90 unit relay in accordance with Paragraph IV - C.
 - b. Check for proper operation of the 10-90 relay in paragraph V-- D.
 - c. Check the wiper fingers on the Player Unit for adequate pressure.
2. 100-300 DRUM UNIT - is operated by the same switch on the 10-90 unit relay that operates the 10-90 Drum unit (Black-green wire). If this unit fails to operate properly,
 - a. Check the 9th position switch on the 10-90 Drum unit for adequate contact pressure.
 - b. Check Paragraph VII - G1 for proper operation of the 10-90 unit.

VIII MOTORS

Whenever a motor is found that is noisy or too slow, it should be lubricated with a few drops of fine oil applied to the rotor shaft bearings and the bearings on the larger shaft to which are attached the wiper fingers. It is not necessary to lubricate the gears inside the motor housing.

VIII (continued)

A. **SCORE MOTOR** - operates whenever a puck hits one of the rear ten puck switches; its main function is to impulse the 1-9 and 10-90 unit relays.

1. The Score motor should rotate only a 1/4 revolution to the 1st Position Switch when less than 10 pins are made. If it fails to operate properly,
 - a. Check Paragraph VI - E for proper operation of the 1st Shot relay. Also check the normally open switch on the 1st Shot relay with the Green-red wire. If the 1st Shot relay operates properly, check the switch on the Puck relay and Paragraph V - E for proper operation of the Puck relay.
 - b. If the Score motor rotates a full revolution on the 1st shot, when less than 10 pins are made, instead of rotating only a 1/4 revolution, check Paragraphs VI - E and VI - F for proper operation of the 1st Shot and 2nd Shot relays. If the trouble still persists, check the Score motor for a sticky rotor, causing the motor to override; if lubricating the rotor shaft with fine oil does not correct the condition, the motor should be replaced.
 - c. If the Score motor fails to operate for a full revolution on a strike, check Paragraph VI - D for proper operation of the 1-10 relay. Also check the right make and break switch on the 1-10 relay; the "make" portion of this switch operates the Score motor.
 - d. The Score motor should operate an extra full revolution when the game is over to scan for matching Numbers and Stars. This circuit is established from the 11th position of the Frame Unit disc via the Gray-black wire.

B. PIN RESET MOTOR

This motor should operate after any strike or 2nd Shot. If it fails to operate,

1. Check the 3rd Position switch on the Score motor with the Gray-white wire.

IX TRANSFORMER

The primary function of the transformer is to reduce the line voltage of 115 volts to 30 volts for all the coils and to 6 volts for all miniature bulbs. The exception to this is the long latch bank reset coil and the drum unit display lites which are operated by 115 volts.

In low voltage areas, (105 volts or less), a boost in the output voltages can be obtained by inserting the Transformer Control plug into the "LOW" line. This plug is located adjacent to the transformer.

X GENERAL SERVICE INSTRUCTIONS

A. IF DRUM UNITS FAIL TO RESET TO ZERO AT START OF GAME.

1. Check Paragraphs IV - A and IV - C for proper relay adjustments.
2. Adjust the zero position cam switch on a failing drum unit to operate with more contact pressure or follow-through; this is done by adjusting the upper stationary blade closer to the cam follower blade.

B. IF DRUM UNITS FAIL TO SCORE PROPERLY.

1. Check Paragraph VII - G.
2. Check to see that the wires leading to the coil and switches on the drum units do not hit the cardboard drum.
3. If the drum units still fail to score properly, loosen the two mounting screws, enabling the units to be slightly free. On later model games all the drum units were shock-mounted to achieve better operation.

C. IF SPARE DOES NOT REGISTER, AND GAME SCORES 10 POINTS.

1. Check Paragraph VI - D for proper operation of the 1-10 relay.
2. Check the 1-10 Latch relay for tripping properly; this is generally caused by too much tension on the top switches.
3. There may be too much armature gap on the 1-10 latch relay which may be reduced by forming the tip of the armature up very slightly. In addition, apply our Coin Machine Lubricant to the latching point of the relay.

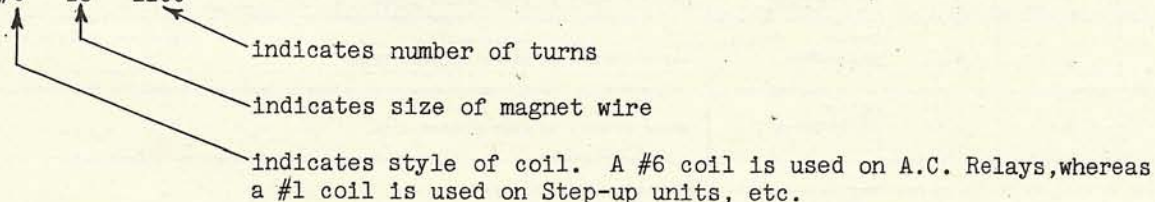
X GENERAL SERVICE INSTRUCTIONS (continued)

- D. IF GAME SCORES AFTER 1ST SHOT ON LESS THAN 10 PINS.
1. Check paragraph VIII - A for proper operation of the Score motor.
 2. Check to see if the 2nd Shot relay is resetting properly. See Paragraph X- H.
- E. IF THE BOWLING PINS FAIL TO RESET,
1. Check Paragraph VIII - B for proper operation of the Pin Reset motor.
- F. IF A RELAY "HUMS"
1. Check Paragraph IV - D.
- G. IF THE LONG LATCH BANK FAILS TO RESET COMPLETELY,
1. Check the 4th Position switch on the Score motor (Red-wire).
 2. Check the top switches on the latch bank for excessive tension; this can be corrected by relieving some of the tension.
- I. IF THE PLAYER-UP UNIT FAILS TO RESET AND STAYS IN THE 6TH PLAYER POSITION,
1. Check Paragraph V - C for proper operation of the Player Reset relay, particularly the adjustment of the switch.
 2. Check VII - D for proper operation of the Player-up unit.
 3. Check for excessive wiper finger tension on the Player-up unit.
- J. IF THE GAME IS COMPLETELY INOPERATIVE, INDICATING POWER FAILURE,
1. Check the lead-in cord to the wall outlet, particularly at the plug for a poor connection; wiggling the plug may disclose a poor solder connection in the plug or a poor outlet connection.
 2. Check the jack plugs in the back box and cabinet for proper matching and fitting tightly.
 3. Check the cabinet "OFF" switch located in the cash box area.
 4. Check the Transformer Control plug being inserted properly into the "NORMAL" line part of the jack; this control plug is located adjacent to the Transformer. See Paragraph IX.
 5. Check the fuses for burn-outs. See Paragraph II.
- K. IF THE 115 VOLT BACK BOX LIGHTS BURNS OUT,
1. Replace them with Sylvania, 7-1/2 watt bulbs; these bulbs have been found to be superior to those of the other manufactures. On later games, all the drum units were shock-mounted, which results in longer bulb life.
- L. IF BRASS TUBING WEARS OUT ON RELAY BANK RESET COIL,
1. Replace the coil with a type using Aluminum tubing which has proven to be much superior to the brass tubing. All games are now being shipped with coils using the aluminum tubing.
- M. IF STEP-UP UNITS WORK SLUGGISHLY,
1. Clean the units in accordance with paragraph III and use the new type Coin Machine Lubricant which is a special instrument grease. This new instrument grease is identified by its yellow color.

XI MISCELLANEOUS

A. Coil Designations

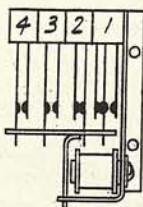
#6 - 28 - 1200

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- ↑ indicates number of turns
- ↑ indicates size of magnet wire
- ↑ indicates style of coil. A #6 coil is used on A.C. Relays, whereas a #1 coil is used on Step-up units, etc.

- B. COIN METER: If a coin meter is desired, connect one wire to the Blue-black wire on the Coin relay switch and connect the other meter coil wire to the Black wire power circuit at the fuse.

A.C. RELAYS

TEAM SHUFFLE ALLEY



SWITCH NUMBER INDICATES PHYSICAL POSITION OF SWITCH ON RELAY.

SWITCH CLOSEST TO MOUNTING FRAME IS SWITCH ONE.

SWITCH CODE

N.O. - NORMALLY OPEN (MAKE)
 N.C. - NORMALLY CLOSED (BREAK)
 M&B - MAKE & BREAK

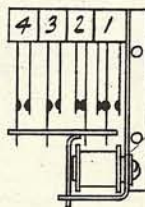
NAME OF RELAY	SWITCH POSITION	TYPE OF SWITCH	*WIRE COLORS	FUNCTION OF SWITCH
LOCK RELAY	1	M&B	Orange-Red (2) Jumpers	Energizes Lock Relay and opens circuit from Start Relay.
	2	N.C.	Orange-Black Yellow	Operates Game-over relay.
COIN RELAY	1	N.O.	Blue-Black Yellow	Operates Start relay and Coin unit.
PLAYER RESET RELAY	1	M&B	Brown (2) Jumpers	Energizes Player Reset Relay and opens circuit from Start Relay.
	2	M&B	Red-Yellow Black-Red Green-Red	Either advances or resets Player-up unit.
10-90 RELAY	1	N.O.	Black-Green Jumper	Operates 10-90 and 100-900 Step-up units through Player-Step-up unit disc.
	2	N.O.	Blue Brown-Black	Operates Bell and advances 10th Frame unit in Last Frame.
	3	N.O.	Red-Black Red-White	Operates Star Match Step-up unit in 2nd, 4th, 6th and 8th frames.
	4	N.O.	Green-Black Red-Green	Operates 00-90 Match Step-up unit in different frame positions.
	5	N.O.	Black-White Green-Yellow	Operates Left and Right Team Score units.
PUCK RELAY	1	N.C.	Gray-Yellow Gray-Black	Opens circuit to Score Motor.
10TH FRAME RESET RELAY	1	M&B	(3) Jumpers	Transfers 10th Frame relay coil holding circuit from 4th Position switch on Score motor to Zero Position switch on the Score motor.
	2	N.O.	Black-White Yellow	Keeps 4th Position switch on Score Motor hot when 10th Frame unit is being reset.
	3	N.O.	Yellow Gray-White	Operates Pin Reset Motor.
	4	N.C.	Black-Green Red-White	Opens circuit to Coin Lock-out coil and to Puck switches.
00-90 MATCH RELAY	1	N.O.	Brown Jumper	Operates Number Matched Meter.
	2	N.O.	Jumper Green-Red	Operates Frame Step-up unit.
	3	N.O.	(2) Jumpers	Operates Bell.
	4	N.O.	Brown-White Blue-Red	Operates Star Match Trip Relay and Star Matched Meter if Number and Star are matched.
SPOT CLOVER RELAY	1	N.O.	Brown-Red Brown-White	Operates Clover Match relay and Clover Matched Meter if Star and Number are matched.
	2	N.O.	Jumper White-Orange	Makes circuit to Spot Clover lite.
CLOVER MATCH RELAY	1	N.O.	Jumper White-Blue	Makes circuit to Clover Matched lite.
STAR MATCH RELAY	1	N.O.	Yellow White-Brown	Makes circuit to Star Matched lite.

*NOTE: Due to wire shortages it has been necessary to substitute colors in many instances.

A C RELAYS

TEAM OR LEAGUE SHUFFLE ALLEY

SWITCH CODE	
N.O.	- NORMALLY OPEN (MAKE)
N.C.	- NORMALLY CLOSED (BREAK)
M&B	- MAKE & BREAK



SWITCH NUMBER INDICATES PHYSICAL POSITION OF SWITCH ON RELAY.

SWITCH CLOSEST TO MOUNTING FRAME IS SWITCH ONE.

NAME OF RELAY	SWITCH POSITION	TYPE OF SWITCH	*WIRE COLORS	FUNCTION OF SWITCH
TEAM SELECTION RELAY	1	M&B	Red-Yellow Black-White Red-Black	Opens Score circuit to Left Team units and makes Score circuit to Right Team units.
	2	N.O.	Green-Yellow Jumper	Makes Score circuit to Right Team 100-900 unit.
	3	N.O.	Red-White Green-Red	Makes Score circuit to Right Team 1000 unit.
TEAM RESET RELAY	1	N.O.	Gray-Black Yellow	Operates Right Team 10-90 drum unit.
	2	N.O.	Orange Jumper	Operates Right Team 100-900 drum unit.
	3	N.O.	Gray-White Jumper	Operates Right Team 1000 drum unit.
	4	N.O.	Gray Jumper	Operates Left Team 10-90 drum unit.
	5	N.O.	Yellow-Red Jumper	Operates Left Team 100-900 drum unit.
	6	N.O.	Orange-White Jumper	Operates Left Team 1000 drum unit.
1ST, 2ND, & 3RD PLAYERS RESET RELAY	1	N.O.	Gray-Black Yellow	Operates 2nd Player 10-90 drum unit.
	2	N.O.	Orange Jumper	Operates 2nd Player 100-900 drum unit.
	3	N.O.	Gray-White Jumper	Operates 1st Player 10-90 drum unit.
	4	N.O.	Gray Jumper	Operates 1st Player 100-900 drum unit.
	5	N.O.	Yellow-Red Jumper	Operates 3rd Player 10-90 drum unit.
	6	N.O.	Orange-White Jumper	Operates 3rd Player 100-900 drum unit.
4TH, 5TH & 6TH PLAYERS RESET RELAY	1	N.O.	Gray-Black Yellow	Operates 4th Player 10-90 drum unit.
	2	N.O.	Orange Jumper	Operates 4th Player 100-900 drum unit.
	3	N.O.	Yellow-Red Jumper	Operates 5th Player 10-90 drum unit.
	4	N.O.	Orange-White Jumper	Operates 5th Player 100-900 drum unit.
	5	N.O.	Gray-White Jumper	Operates 6th Player 10-90 drum unit.
	6	N.O.	Gray Jumper	Operates 6th Player 100-900 drum unit.

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TRIP RELAYS

TEAM OR LEAGUE SHUFFLE ALLEYS

4-L	4-R
3-L	3-R
2-L	2-R
1-L	1-R

THESE SWITCHES IDENTIFY THE SWITCH POSITION ON TRIP RELAY LOOKING AT SOLDERING LUGS

SWITCH CODE

N.O. - NORMALLY OPEN (MAKE)
 N.C. - NORMALLY CLOSED (BREAK)
 M&B - MAKE & BREAK

NAME OF RELAY	SWITCH POSITION	TYPE OF SWITCH	*WIRE COLORS	FUNCTION OF SWITCH
START RELAY	1-L	M&B	Brown-White Jumper Red-Black	Transfers circuit from 10-90 relay to player unit and team unit reset relays.
	2-L	N.O.	Jumper Orange-Red	Energizes lock relay & player reset relay.
	3-L	M&B	Orange-Green Orange Green-Red	Transfers player unit reset circuit from 4th position switch to 2nd position switch on Score motor.
	1-R	N.C.	Blue-White Brown-Red	Opens circuit to 100-900 unit, 1st player to prevent feed-back.
	2-R	N.O.	Yellow Gray-Black	Operates Score Motor.
	3-R	Double Break	Blue-Red Black-Red Black-Green	Opens Scoring circuit to Left Team 100-900 and 1000 drum units at start of game.
#1 RELAY	1-L	N.O.	Jumper Red-White	Part of 1-10 Trip relay continuity circuit.
	2-L	M&B	Blue (2) Jumpers	Opens circuit to #1 relay and trips #1 pin.
	1-R	N.O.	Red Green-Black	Makes the six puck switches between the #8 and #9 pins hot.
	2-R	N.O.	Blue-Black Jumper	Permits #4 and #6 relays to be tripped on splits through the 5-8-9 switches.
	3-R	N.O.	(2) Jumpers	Operates #5 relay.
#2 - 8 RELAY	1-L	N.O.	(2) Jumpers	Part of 1-10 Trip relay continuity circuit.
	2-L	M&B	Blue-Yellow (2) Jumpers	Opens circuit to #2-8 relay and trips #2 pin.
	1-R	N.O.	Jumper Brown-Yellow	Trips #8 pin
	2-R	M&B	(3) Jumpers	Permits #4 and #6 relays to be tripped on splits through the 5-8-9 puck switches.
#3 - 9 RELAY	1-L	N.O.	(2) Jumpers	Part of 1-10 Trip relay continuity circuit.
	2-L	M&B	Blue-Red (2) Jumpers	Opens circuit to #3-9 relay and trips #3 pin.
	1-R	N.O.	Jumper Brown	Trips #9 pin
	2-R	N.C.	(2) Jumpers	Opens circuit to #4 relay from the 5-8-9 puck switches.
#4 RELAY	1-L	N.O.	(2) Jumpers	Part of 1-10 Trip relay continuity circuit.
	2-L	M&B	(3) Jumpers	Opens circuit to #4 relay and trips #4 pin.
	1-R	N.C.	Blue-White Jumper	Opens circuit to #4-7-8 relay.
#4-7-8 RELAY	1-L	N.O.	(2) Jumpers	Part of 1-10 Trip relay continuity circuit.
	2-L	M&B	Black-Yellow (2) Jumpers	Opens circuit to #4-7-8 relay and trips #4 pin.
	1-R	N.O.	(2) Jumpers	Trips #8 pin.
	2-R	N.O.	(2) Jumpers	Trips #7 pin.
#5 RELAY	1-L	N.O.	(2) Jumpers	Part of 1-10 Trip relay continuity circuit.
	2-L	M&B	Blue-Black (2) Jumpers	Opens circuit to #5 relay and trips #5 pin.
#5-8-9 RELAY	1-L	N.O.	(2) Jumpers	Part of 1-10 Trip relay continuity circuit.
	2-L	M&B	(3) Jumpers	Opens circuit to #5-8-9 relay and trips #9 pin.
	1-R	N.O.	(2) Jumpers	Trips #8 pin.
	2-R	N.O.	(2) Jumpers	Trips #5 pin.

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TRIP RELAYS

TEAM OR LEAGUE SHUFFLE ALLEYS

SWITCH CODE	
N.O.	- NORMALLY OPEN (MAKE)
N.C.	- NORMALLY CLOSED (BREAK)
M&B	- MAKE & BREAK

4-L	4-R
3-L	3-R
2-L	2-R
1-L	1-R

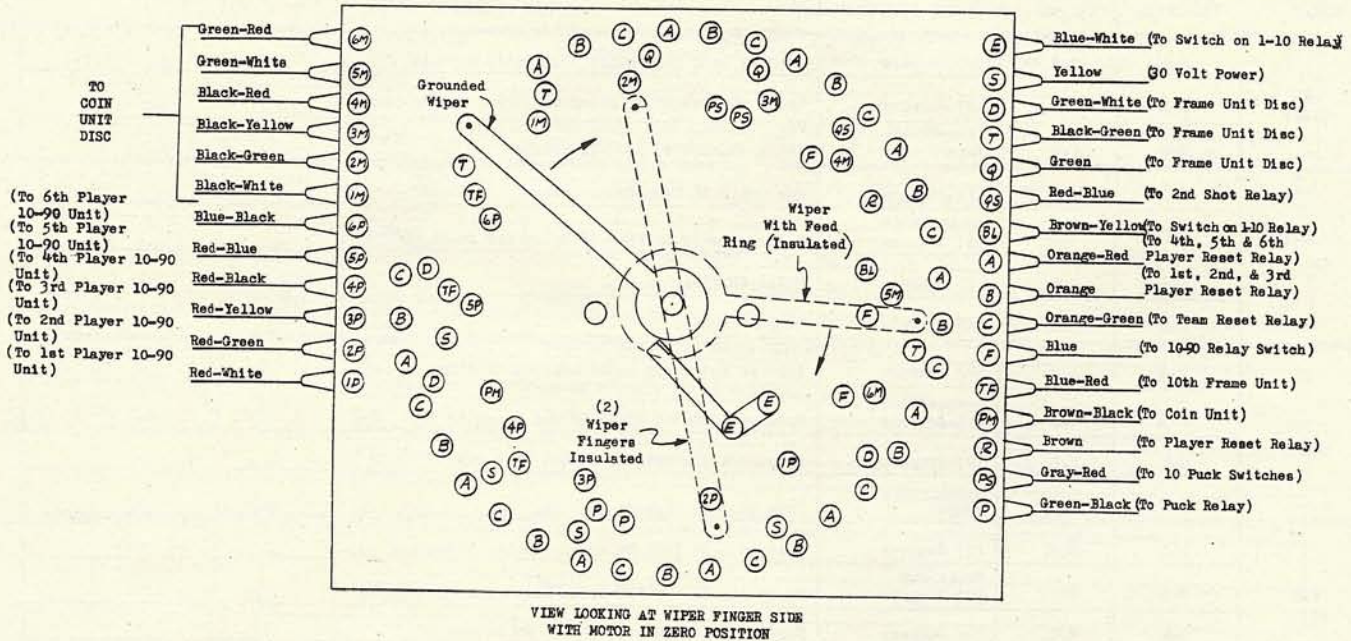
THESE SWITCHES IDENTIFY THE SWITCH POSITION ON TRIP RELAY LOOKING AT SOLDERING JUGS

NAME OF RELAY	SWITCH POSITIONS	TYPE OF SWITCH	*WIRE COLORS	FUNCTION OF SWITCH
#6 RELAY	1-L	N.O.	(2) Jumpers	Part of 1-10 Trip Relay continuity circuit.
	2-L	M&B	(3) Jumpers	Opens circuit to #6 Relay and trips #6 Pin.
	1-R	N.C.	Blue-Red Jumper	Opens circuit to #6-9-10 Relay.
#6-9-10 RELAY	1-L	N.O.	(2) Jumpers	Part of 1-10 Trip Relay continuity circuit.
	2-L	M&B	Brown-Black (2) Jumpers	Opens circuit to #6-9-10 Relay and trips #6 Pin.
	1-R	N.O.	(2) Jumpers	Trips #9 Pin.
	2-R	N.O.	(2) Jumpers	Trips #10 Pin.
#7 RELAY	1-L	N.O.	(2) Jumpers	Part of 1-10 Trip Relay continuity circuit.
	2-L	M&B	Brown-White (2) Jumpers	Opens circuit to #7 Relay and trips #7 Pin.
	1-R	N.O.	(2) Jumpers	Forms circuit between #4 and #6 Relay.
	2-R	N.C.	Black-Green Jumper	Part of 7-10 Pick-up circuit.
#10 RELAY	1-L	N.O.	(2) Jumpers	Part of 1-10 Trip Relay continuity circuit.
	2-L	M&B	Brown-Red (2) Jumpers	Opens circuit to #10 Relay and trips #10 Pin.
	1-R	N.O.	(2) Jumpers	Forms circuit between #4 and #6 Relays.
	2-R	N.C.	Jumper Black-White	Part of 7-10 Pick-up circuit.
#5 PIN SWITCHES RELAY	1-L	N.C.	Green-Black Red-Black	Opens circuit to six puck switches between #8 and #9 Pins.
	2-L	N.C.	Jumper Red-White	Opens circuit to #5 Pin Switches Relay.
#1-10 RELAY	1-L	N.C.	Red-Black Green-Yellow	Opens circuit to #1-10 Relay.
	2-L	M&B	Brown-Yellow Black-Yellow Blue-White	Makes Feed Ring on Score Motor disc hot to operate 10-90 Relay on Strike or Spare and opens circuit to operate 10-90 Relay on Blow.
	1-R	N.O.	(2) Jumpers	Makes circuit to Strike or Spare lites.
	2-R	M&B	(3) Jumpers	Opens circuit to 4th position switch on Score Motor and makes circuit to Score Motor coil.
1ST SHOT RELAY	1-L	N.O.	Gray-Yellow Green-Red	Part of Scoring Motor circuit.
	2-L	N.C.	(2) Jumpers	Opens circuit to Puck Switches.
	1-R	N.O.	Jumper Black-White	Makes circuit to 4th position switch on Score Motor in 10th Frame.
	2-R	N.C.	Jumper Gray-Red	Opens circuit to 1st Shot Relay.
2ND SHOT RELAY	1-L	N.O.	(2) Jumpers	Part of Scoring Motor circuit.
	2-L	M&B	White-Green Jumper Yellow-Black	Transfers circuit from Strike lite to Spare lite.
	1-R	N.C.	Green Red-Blue	Opens circuit to one Super Score Button on Score Motor disc.
	2-R	N.C.	Black-Green Black-Yellow	Opens circuit to Puck Switches.
GAME OVER RELAY	1-L	N.C.	Brown-White Jumper White-Red	Opens circuit to 1st and 2nd Shot Relays, Game Over Relay and 10-90 Relay.
	2-L	M&B	White Orange-White	Opens circuit to Player-up, Coin and Score Lites and makes circuit to Game Over Lite.
	1-R	N.O.	Blue-Black Green-White	Completes circuit to Start Relay.
	2-R	N.C.	Red-White Red	Opens circuit to Puck Switches.

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SCORE MOTOR DISC

TEAM SHUFFLE ALLEY

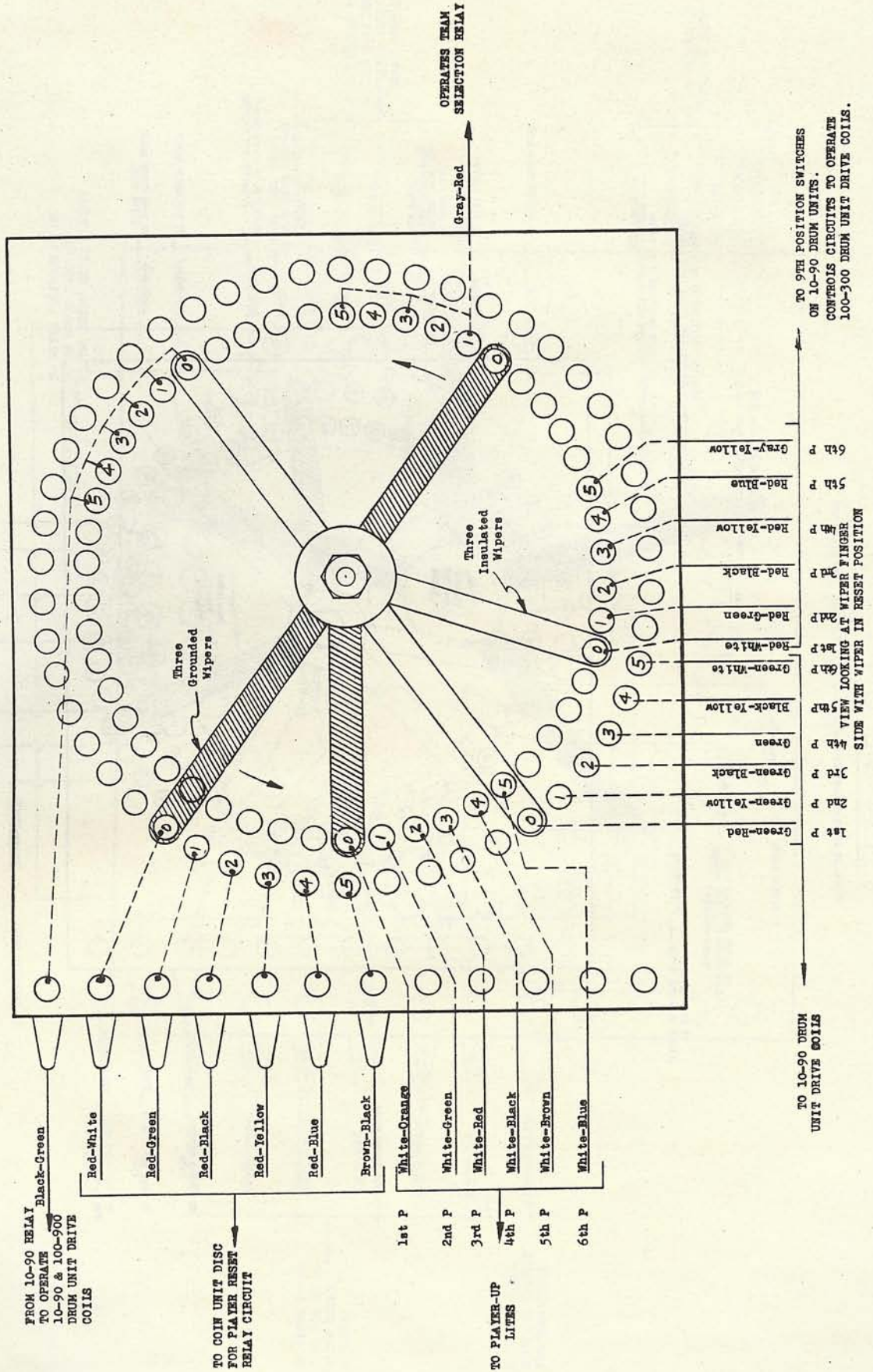


RIVET POSITIONS	FUNCTION OF RIVETS	RIVET POSITIONS	FUNCTION OF RIVETS
6M	Operates 00-90 Match Relay through Rivet Position 6P if Number is matched on 6TH Player 10-90 Drum Unit.	E	Operates 10-90 Relay on Strike or Spare.
5M	Operates 00-90 Match Relay through Rivet Position 5P if Number is matched on 5TH Player 10-90 Drum Unit.	S	Three Rivets operate 10-90 Relay on Strikes and Spares in Single, Double, Triple and Super Score Frames.
4M	Operates 00-90 Match Relay through Rivet Position 4P if Number is matched on 4TH Player 10-90 Drum Unit.	D	Three Rivets operate 10-90 Relay on Strikes and Spares in Double, Triple and Super Score Frames.
3M	Operates 00-90 Match Relay through Rivet Position 3P if Number is matched on 3RD Player 10-90 Drum Unit.	T	Three Rivets operate 10-90 Relay on Strikes and Spares in Triple and Super Score Frames.
2M	Operates 00-90 Match Relay through Rivet Position 2P if Number is matched on 2ND Player 10-90 Drum Unit.	Q	Two Rivets operate 10-90 Relay on Strikes and Spares in Super Score Frames.
1M	Operates 00-90 Match Relay through Rivet Position 1P if Number is matched on 1ST Player 10-90 Drum Unit.	QS	One Rivet operates 10-90 Relay on Strikes in Super Score Frames.
6P	Completes circuit to Rivet Position 6M through insulated wiper if Number is matched on 6TH Player 10-90 Drum Unit.	BL	One Rivet operates 10-90 Relay on Elow.
5P	Completes circuit to Rivet Position 5M through insulated wiper if Number is matched on 5TH Player 10-90 Drum Unit.	A	Eleven Rivets operate 4th, 5th & 6th Players Reset Relay only at start of game.
4P	Completes circuit to Rivet Position 4M through insulated wiper if Number is matched on 4TH Player 10-90 Drum Unit.	B	Eleven Rivets operate 1st, 2nd, & 3rd Players Reset Relay only at start of game.
3P	Completes circuit to Rivet Position 3M through insulated wiper if Number is matched on 3RD Player 10-90 Drum Unit.	C	Eleven Rivets operate Team Reset Relay only at start of game.
2P	Completes circuit to Rivet Position 2M through insulated wiper if Number is matched on 2ND Player 10-90 Drum Unit.	F	3 Buttons complete circuit to Rivet Position TF through insulated wiper.
1P	Completes circuit to Rivet Position 1M through insulated wiper if Number is matched on 1ST Player 10-90 Drum Unit.	TF	3 Buttons operate 10TH Frame Unit on Strikes or Spares in 10TH Frame.
		PM	Completes circuit from Coin Unit Disc to Rivet Position R through insulated wiper.
		R	Operates Player Reset Relay from Rivet Position PM.
		PS	Completes circuit from 10 Puck Switches to Rivet Position P through insulated wiper.
		P	Operates Puck Relay.

PLAYER UP UNIT DISC

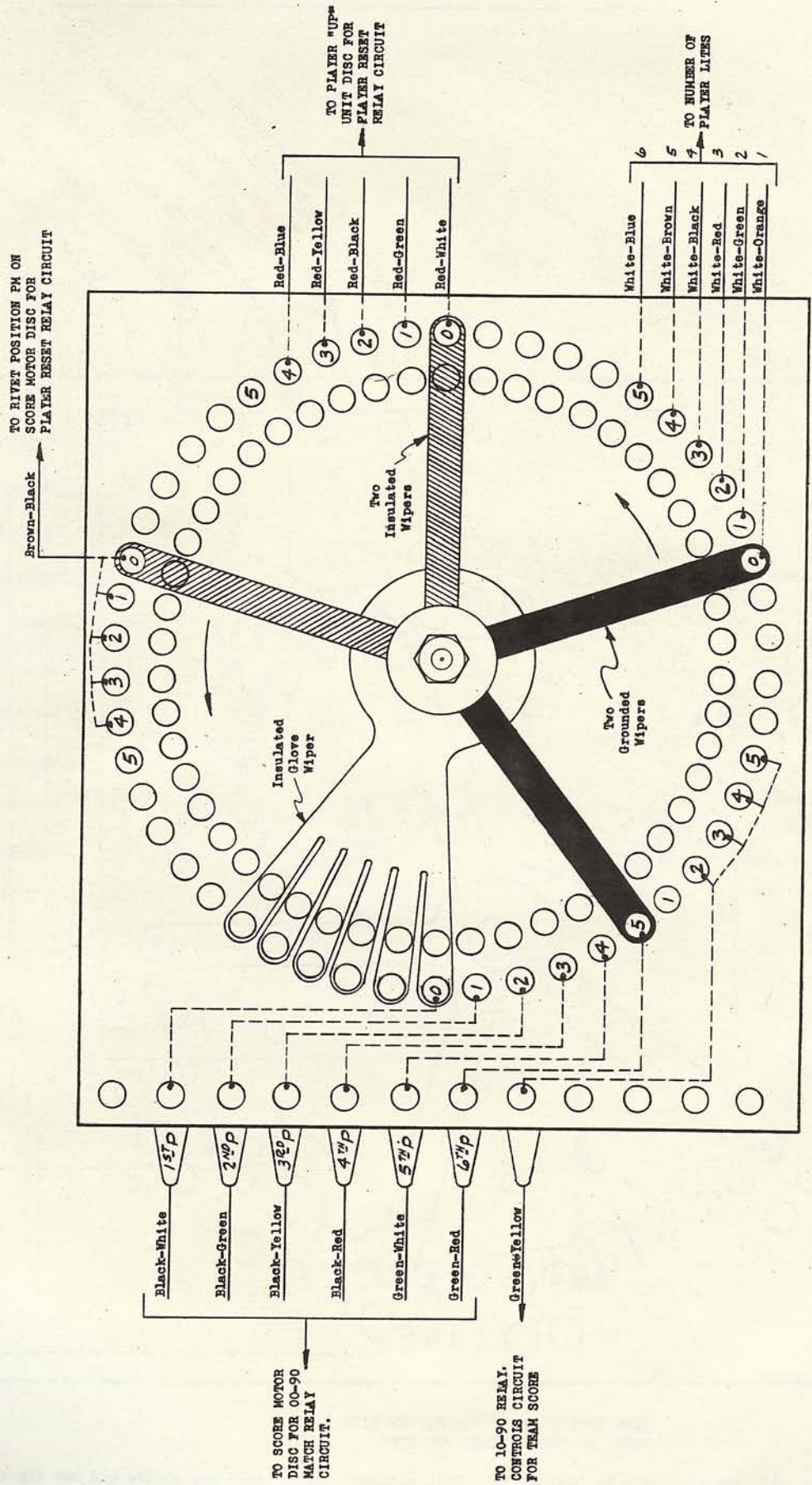
7.5.A.
4.5.A.

OPERATES AFTER EACH PLAYER COMPLETES HIS PORTION OF FRAME



COIN UNIT DISC

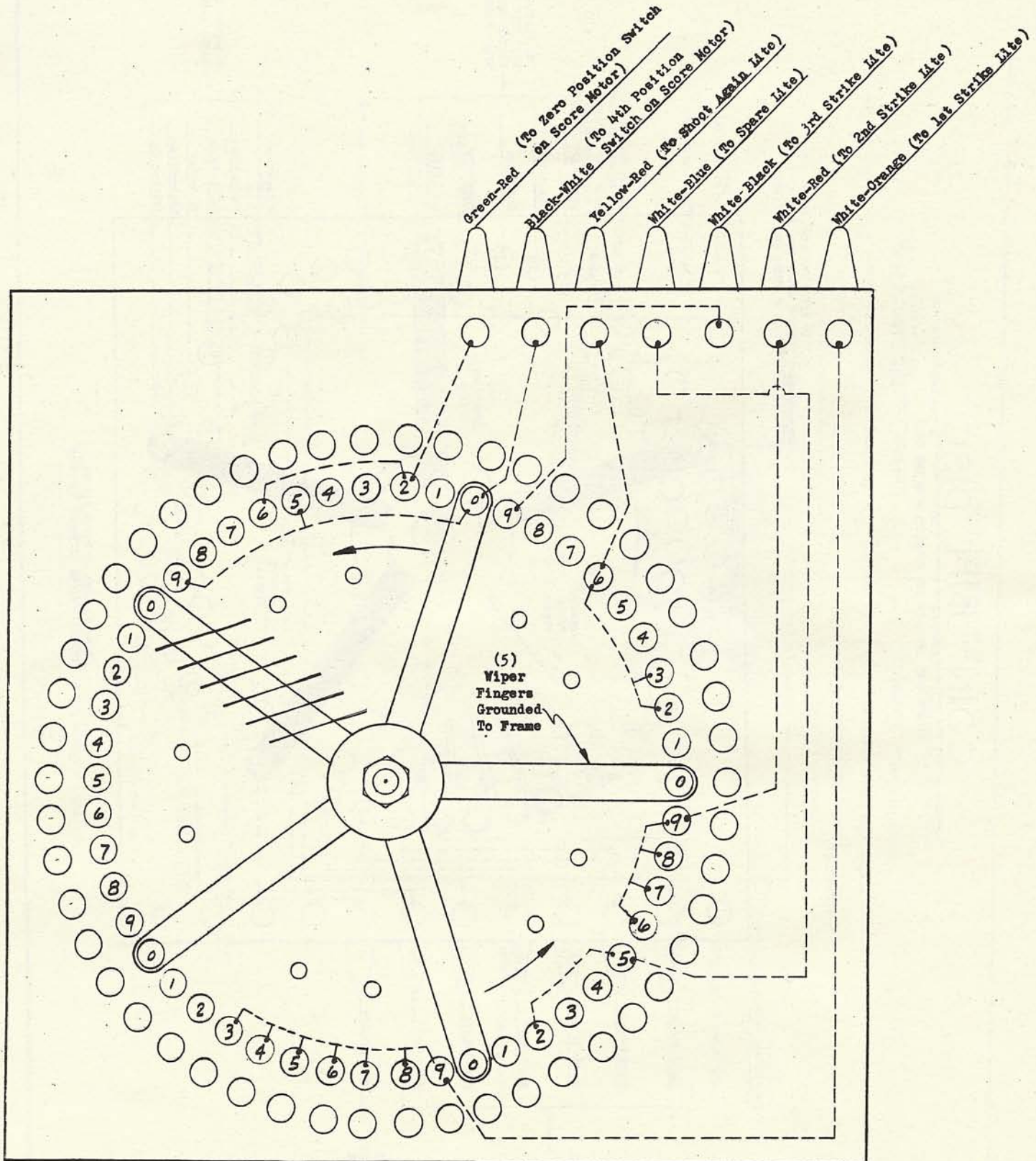
T.S.A.
 RESETS WITH 1ST COIN AND ADVANCES WITH 2ND COIN



VIEW LOOKING AT WIPER FINGER
 SIDE WITH WIPER IN RESET POSITION

10TH FRAME UNIT DISC

T.S.A.
L.S.A.



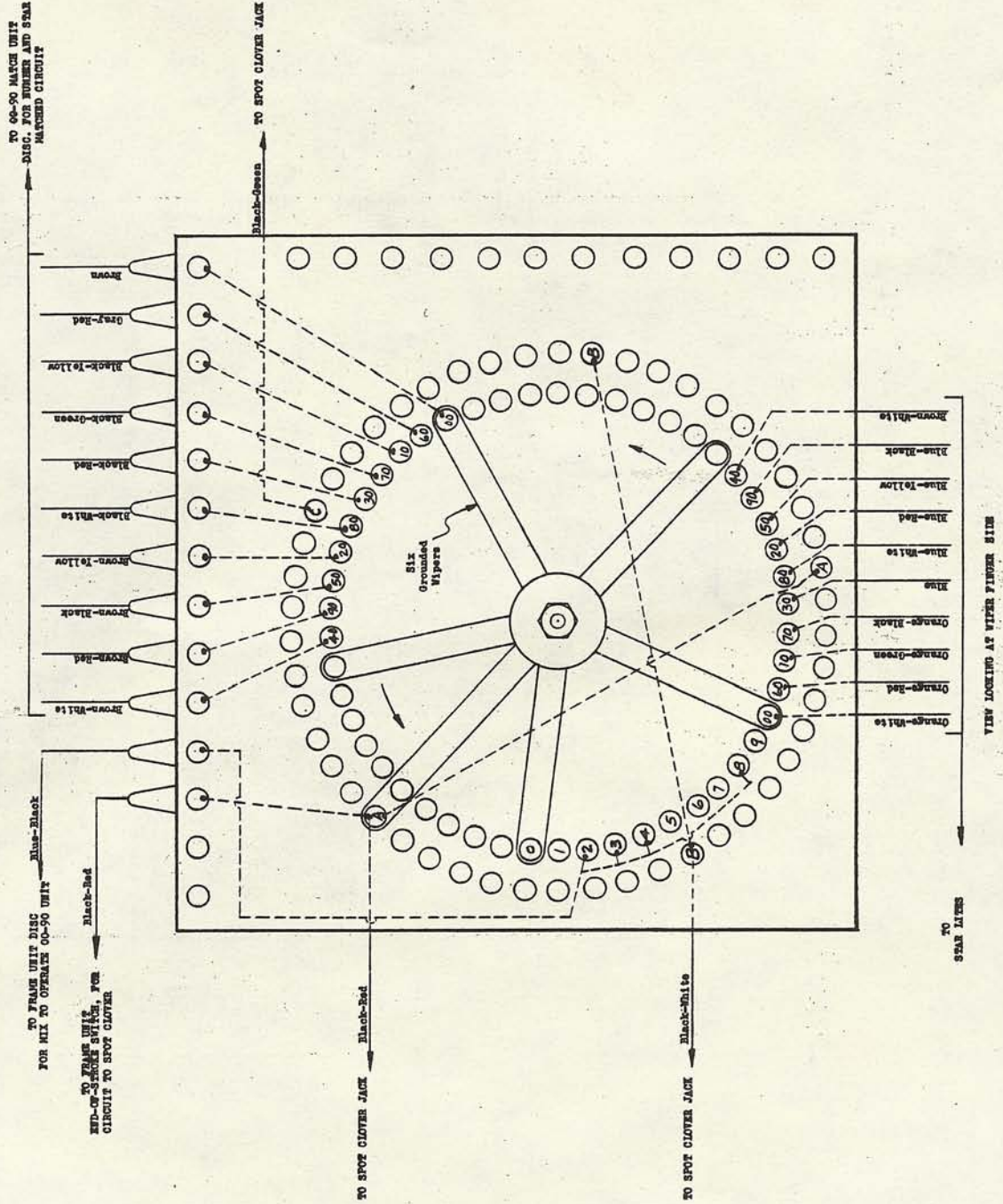
VIEW LOOKING AT WIPER FINGER SIDE WITH
WIPER IN TOTAL RESET POSITION

NOTE: This unit operates only in last frame. Unit advances three times per strike and two times on a spare.

STAR MATCH UNIT DISC

T.S.A.

UNIT ADVANCES IN 2ND, 4TH, 6TH & 8TH FRAMES THROUGH 10-90 RELAY. IT ALSO IS ADVANCED BY THE FRAME UNIT END-OF-STRUCK SWICH.



00-90 MATCH UNIT DISC

UNIT ADVANCES IN ZERO, 1ST & 5TH FRAMES THROUGH 10-90 RELAY.
IT ALSO ADVANCES BY TEN STAR UNIT END-OF-SENSE SWITCH.

