

Bally[®]

ROLLER DERBY

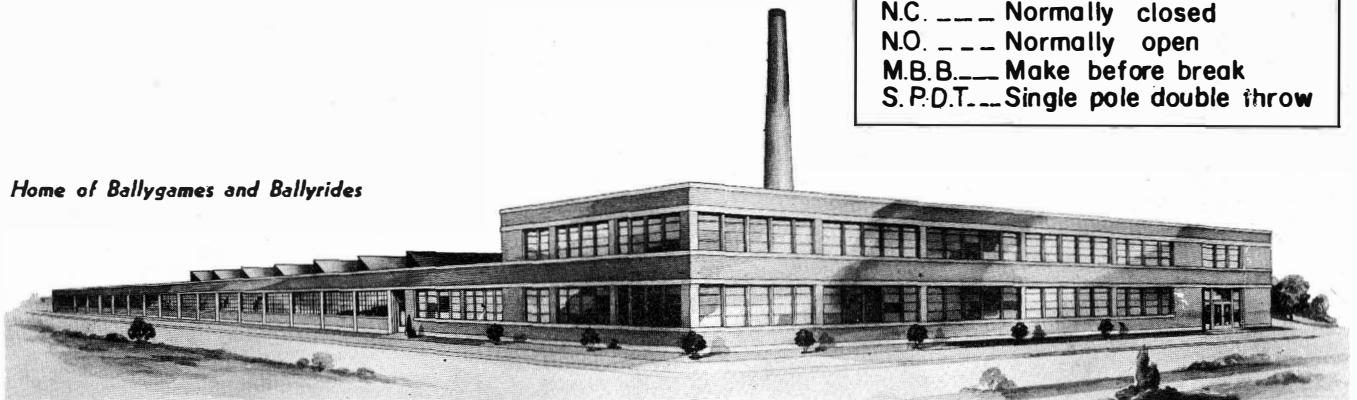
OPERATING INSTRUCTIONS AND PARTS CATALOG

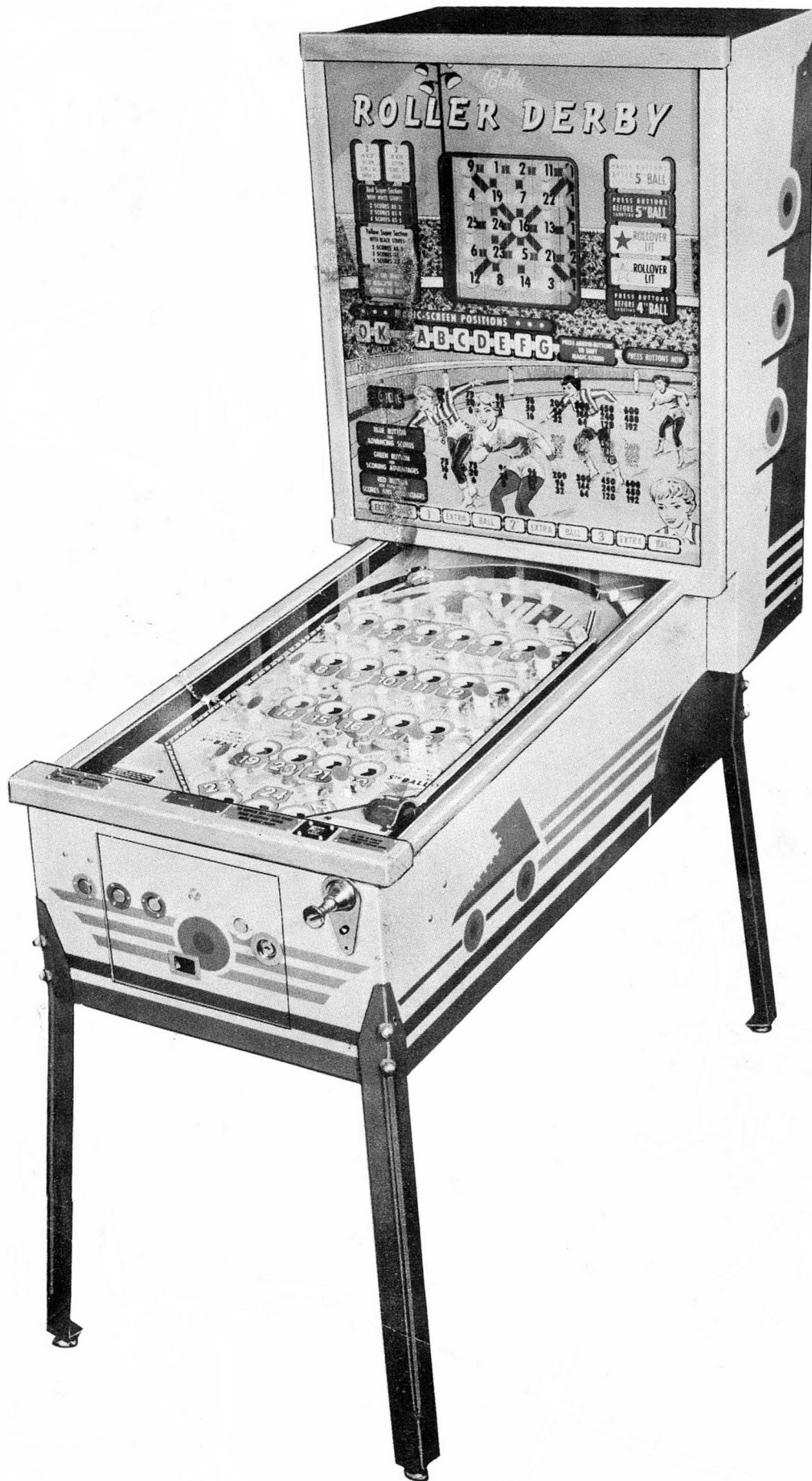
Part Numbers are marked on illustrations
and a list of miscellaneous parts appears
on back cover.

**FOR QUICKEST SERVICE
STATE CORRECT PART NUMBER
WHEN ORDERING PARTS**

Code	
N.C. ---	Normally closed
N.O. ---	Normally open
M.B.B.---	Make before break
S.P.D.T.---	Single pole double throw

Home of Ballygames and Ballyrides

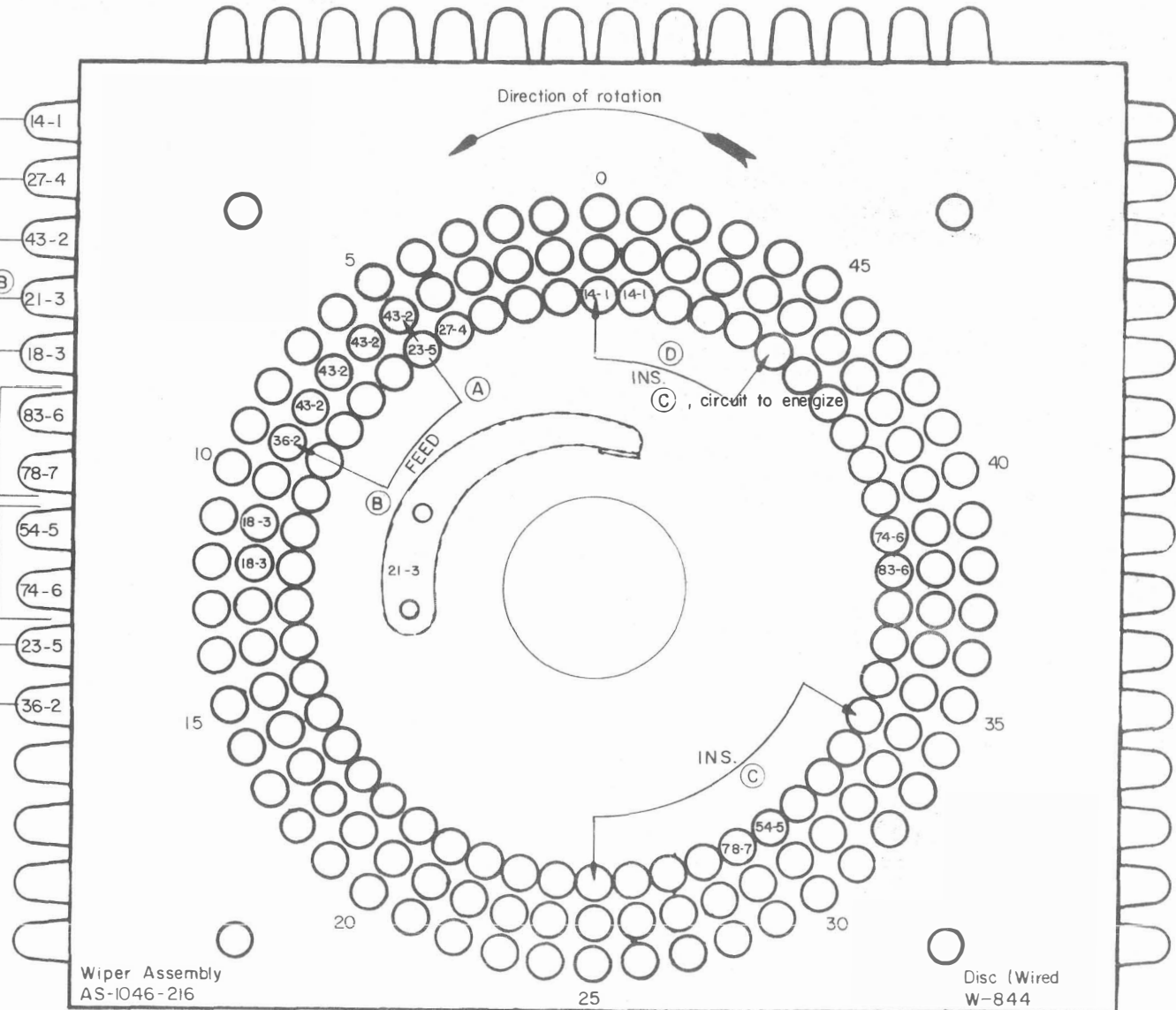




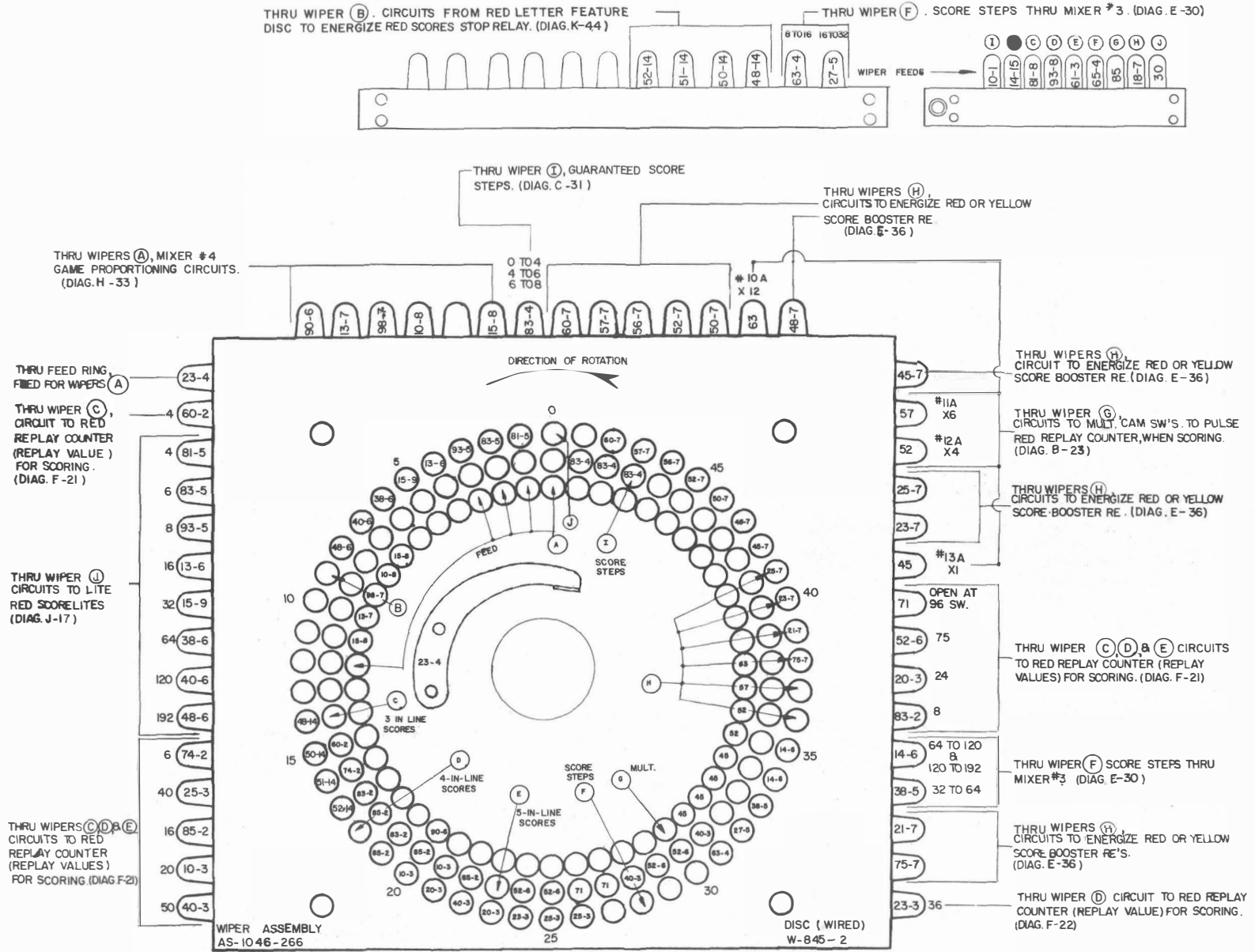
TIMER UNIT viewed from BUTTON or WIPER side

8 step unit. Wipers shown in zero or reset position

- Feed for wipers (D) ————— (14-1)
- Thru wipers (D), circuit to flash
"select-now" lite at 4th step. (Diag. K-1) — (27-4)
- Thru wiper (A), circuit to step this
unit 1st 4 steps. (Diag. H-8) ————— (43-2)
- Thru feed ring, feed for wipers (A) & (B) — (21-3)
- Thru wiper (B), circuit to close shutter
at 2nd step of unit. (Diag. H-8) — (18-3)
- Thru wipers
before 4th selector lock trip relay,
when 4th ball is shot. (Diag. C-11) — (83-6)
— (78-7)
- Thru wipers (C), circuit to energize
before 5th selector lock trip relay,
when 5th ball is shot. (Diag. C-11) — (54-5)
— (74-6)
- Thru wipers (D), circuit to flash
"select-now" lite at 5th step. (Diag. K-1) — (23-5)
- Thru wiper (A), circuit to step unit
from 4th to 5th step. (Diag. H-8) — (36-2)

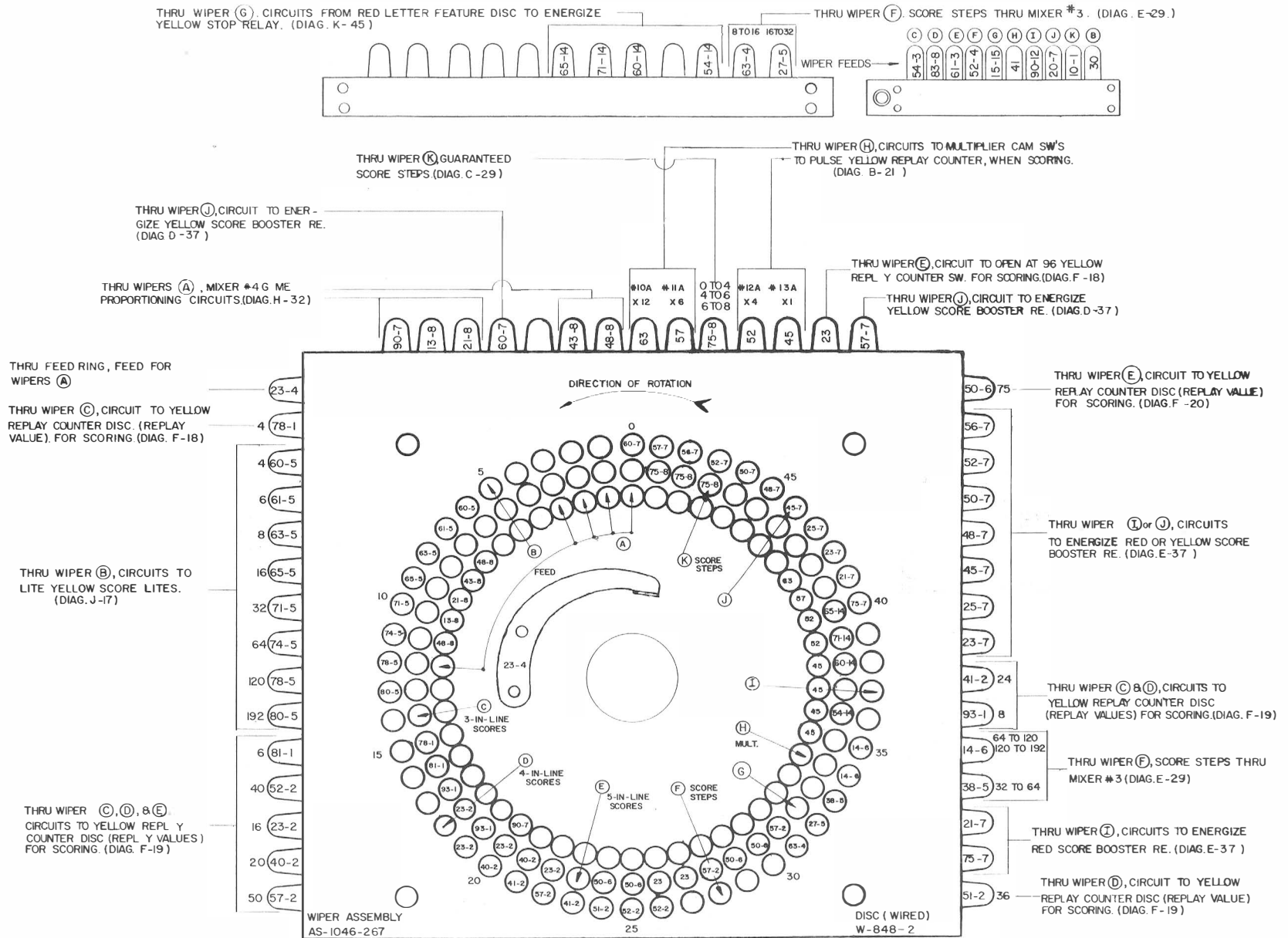


- Complete unit... AS-110-29
- Reset coil... 28-R-15
- Step-up coil... 25-GG-7
- Step-up plunger... S-496-100
- Step-up arm... A-1765-4
- Ratchet & shaft... C-1050-8-43

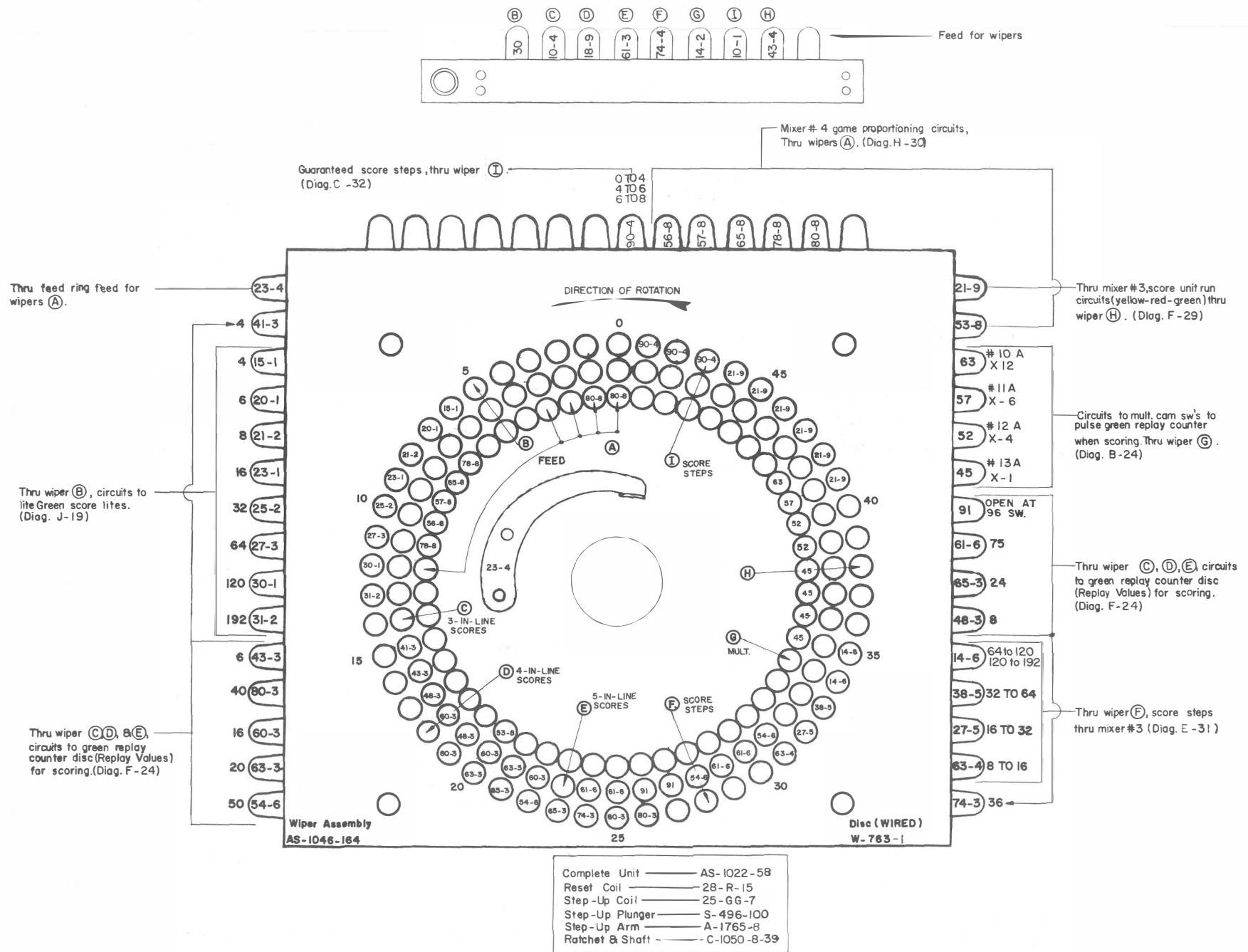


YELLOW SCORE UNIT viewed from BUTTON or WIPER side

8 step unit. Wipers shown in zero or reset position

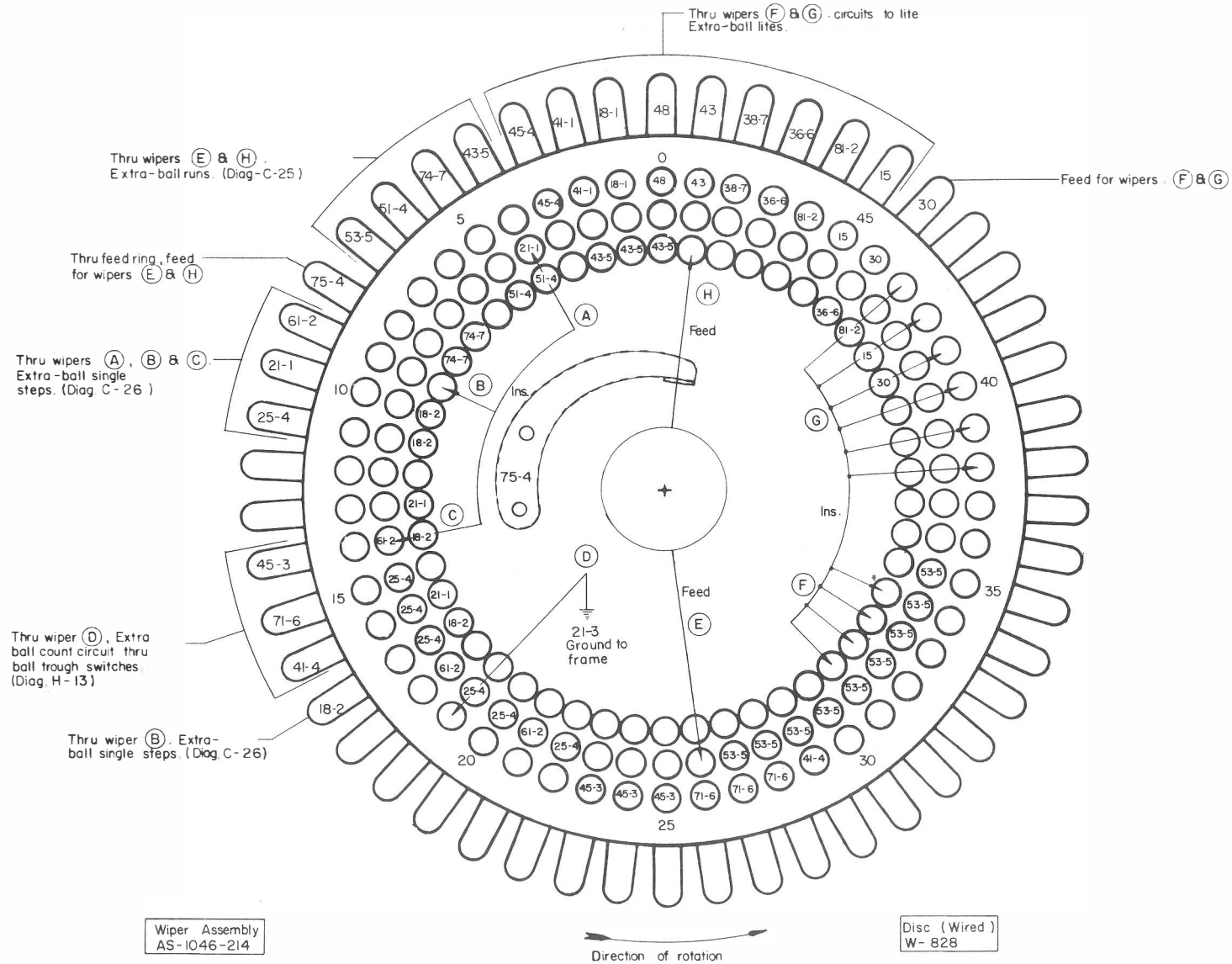


- COMPLETE UNIT — AS-1022-56
- RESET COIL — 28-R-15
- STEP-UP COIL — 25-GG-7
- STEP-UP PLUNGER — S-496-100
- STEP-UP ARM — A-1765-8
- RATCHET & SHAFT — C-1050-8-39



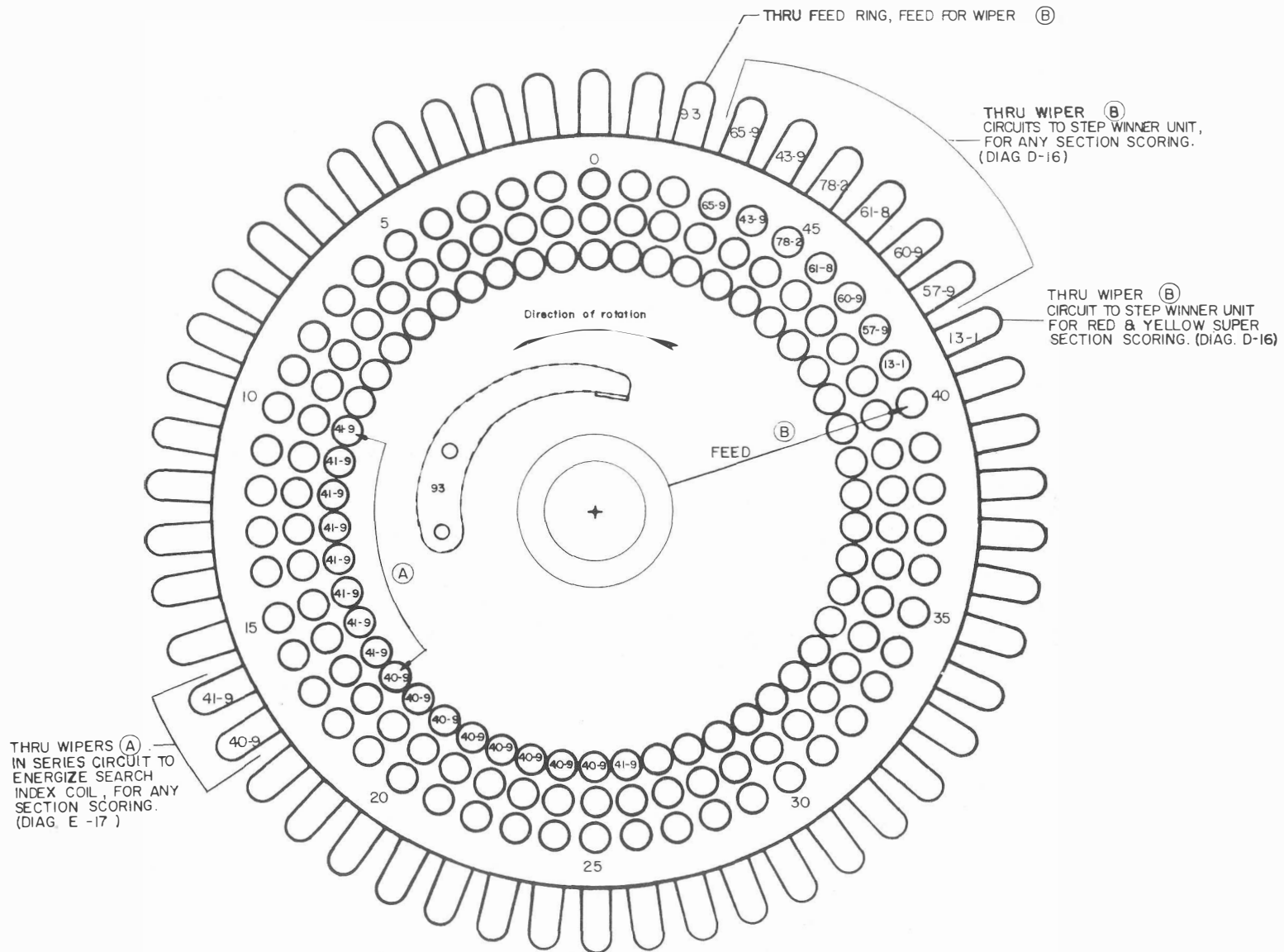
EXTRA BALL UNIT viewed from BUTTON or WIPER side

10 step unit. Wipers shown in zero or reset position



Complete unit
 Reset coil _ _ _ 28-R-15
 Step-up coil _ _ _ 25-GG-7
 Step-up plunger _ _ _ S-496-100
 Step-up arm _ _ _ A-1765-4
 Ratchet & shaft _ _ _ C-1050-10

--- AS-1148-16



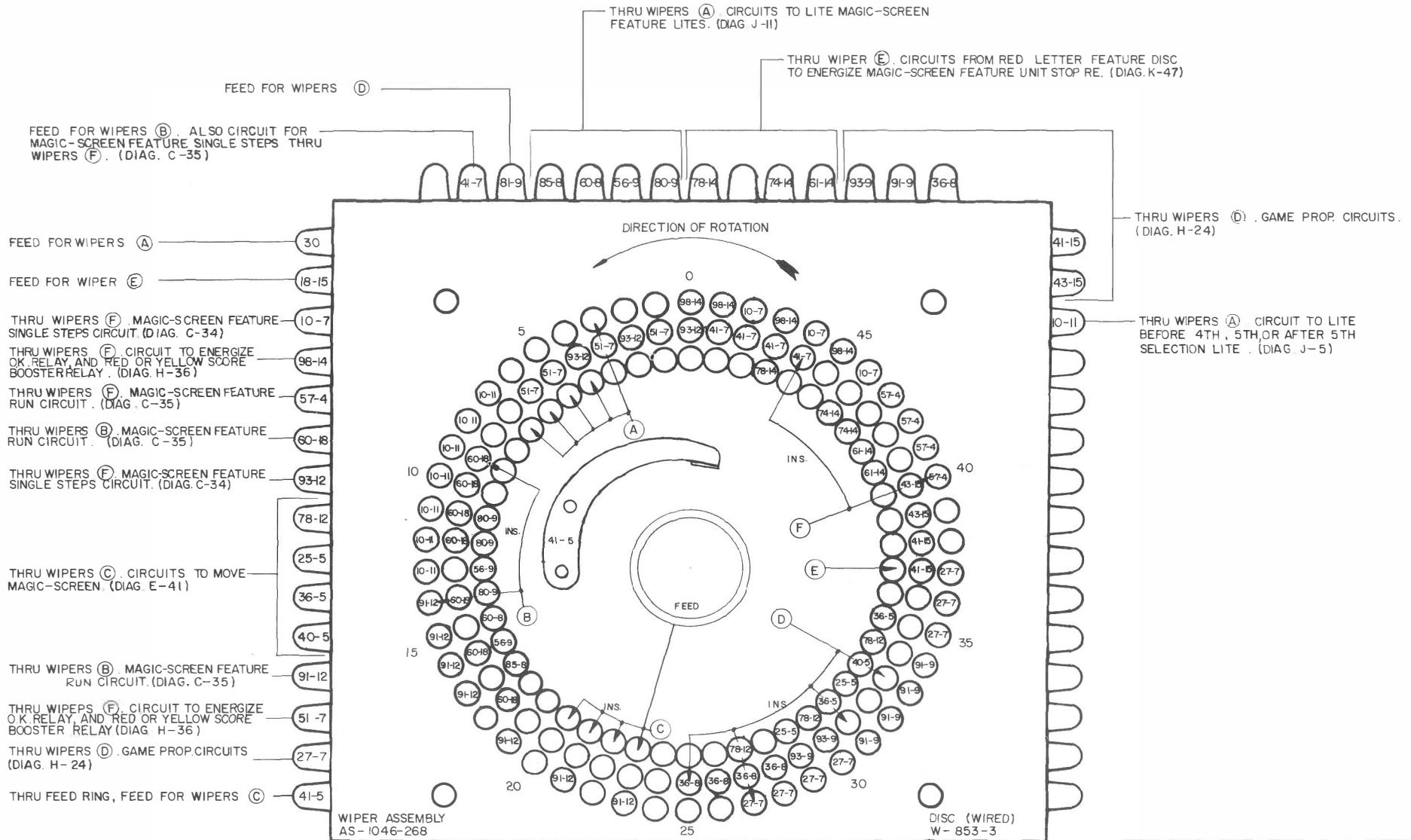
Complete unit... AS-827-71
 Reset coil... 28-R-15
 Step-up coil... E-184-160
 Step-up arm... A-1765-4
 Step-up plunger... S-4
 Ratchet & shaft... C-1050-9-43

Wiper Assembly
 AS-1046-224

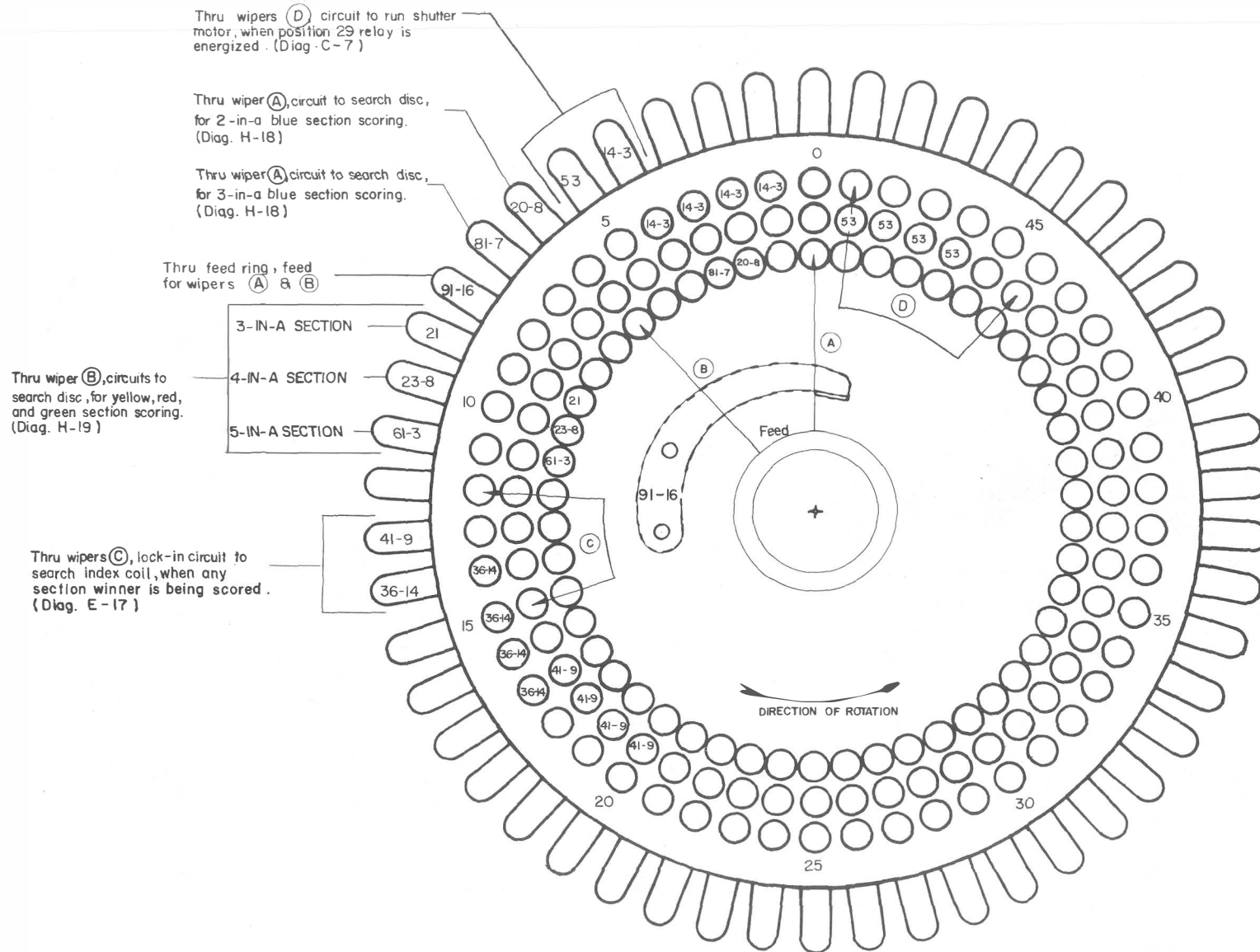
Disc (Wired)
 W-847

MAGIC SCREEN FEATURE UNIT viewed from BUTTON or WIPER side

12 step unit. Wipers shown in zero or reset position



COMPLETE UNIT	AS-827-95
RESET COIL	28-R-15
STEP-UP COIL	25-GG-7
STEP-UP PLUNGER	S-496-100
STEP-UP ARM	A-1765-4
RATCHET & SHAFT	C-1050-10-43



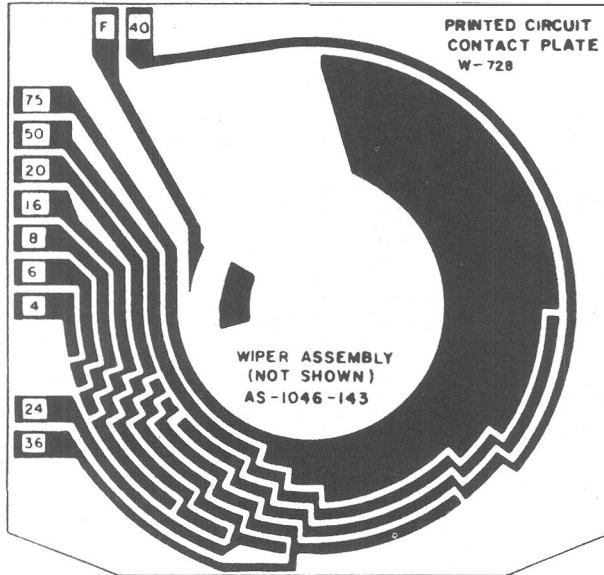
Complete unit... AS-827-94
 Reset coil 28-R-15
 Step-up coil... 25-GG-7
 Step-up arm... A-1765-4
 Step-up plunger... S-496-100
 Ratchet & shaft... C-1050-5

Wiper Assembly
 AS-1046-265

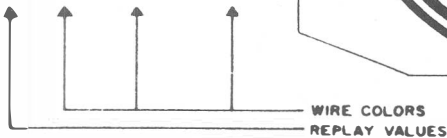
Disc (Wired)
 W-846-1

REPLAY COUNTER viewed from WIPER side 3 used (see code box at left)

LUG	YELLOW REPLAY COUNTER	RED REPLAY COUNTER	GREEN REPLAY COUNTER
50	57-2	40-3	54-6
75	50-6	52-6	61-6
F	23	71	91
36	51-2	23-3	74-3
24	41-2	20-3	65-3
20	40-2	10-3	63-3
16	23-2	85-2	60-3
8	93-1	83-2	48-3
6	81-1	74-2	43-3
4	78-1	60-2	41-3
40	52-2	25-3	80-3

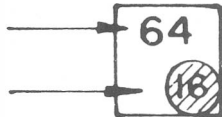



- Complete Unit - AS-797-36
- Reset Coil - 28-R-15
- Step-up Coil - 25-GG-7
- Step-up Plunger - S-496-116
- Step-up Arm - A-1765-4
- Ratchet & Shaft - C-100

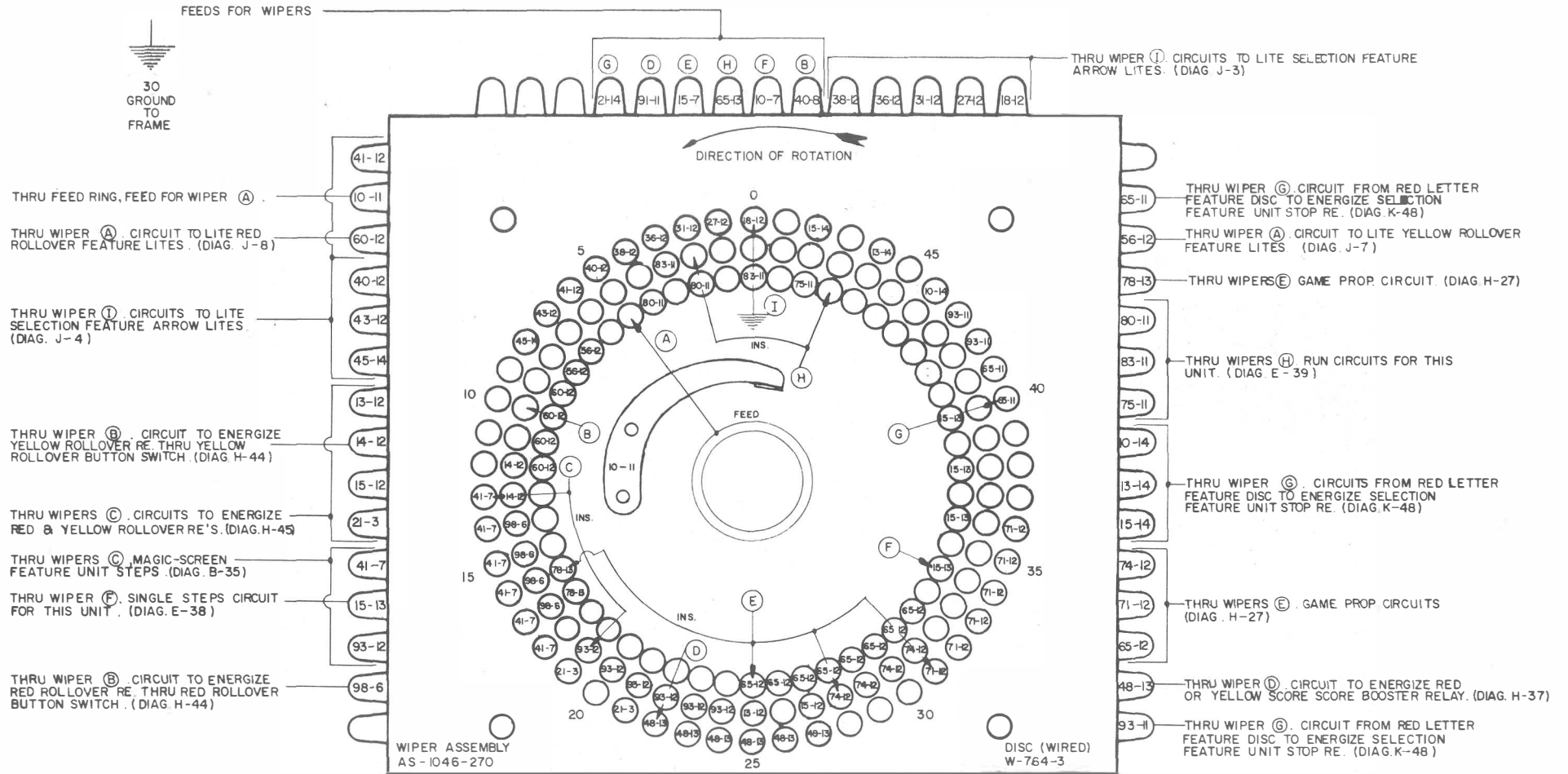


CAM SWITCHES THAT PULSE YELLOW, GREEN & RED REPLAY COUNTER STEP-UP COILS								
	sw.13A	sw.13A	sw.13A	sw.13A	sw.12A	sw.12A	sw.11A	sw.10A
5 IN LINE	75	75	96	96	200	300	450	600
4 IN LINE	16	20	24	50	96	144	240	480
3 IN LINE	4	6	8	16	32	64	120	192

LARGE NUMBERS ARE REPLAY SCORES SHOWN ON BACK GLASS.
 NUMBERS IN SHADED CIRCLES INDICATE WHICH PORTION OF REPLAY CIRCUIT STRIP IS EFFECTIVE FOR A PARTICULAR REPLAY SCORE.

EXAMPLE: ON A 3-IN-LINE SCORE OF  REPLAYS THE CIRCUIT IS EFFECTIVE THRU THE  REPLAY CIRCUIT STRIP

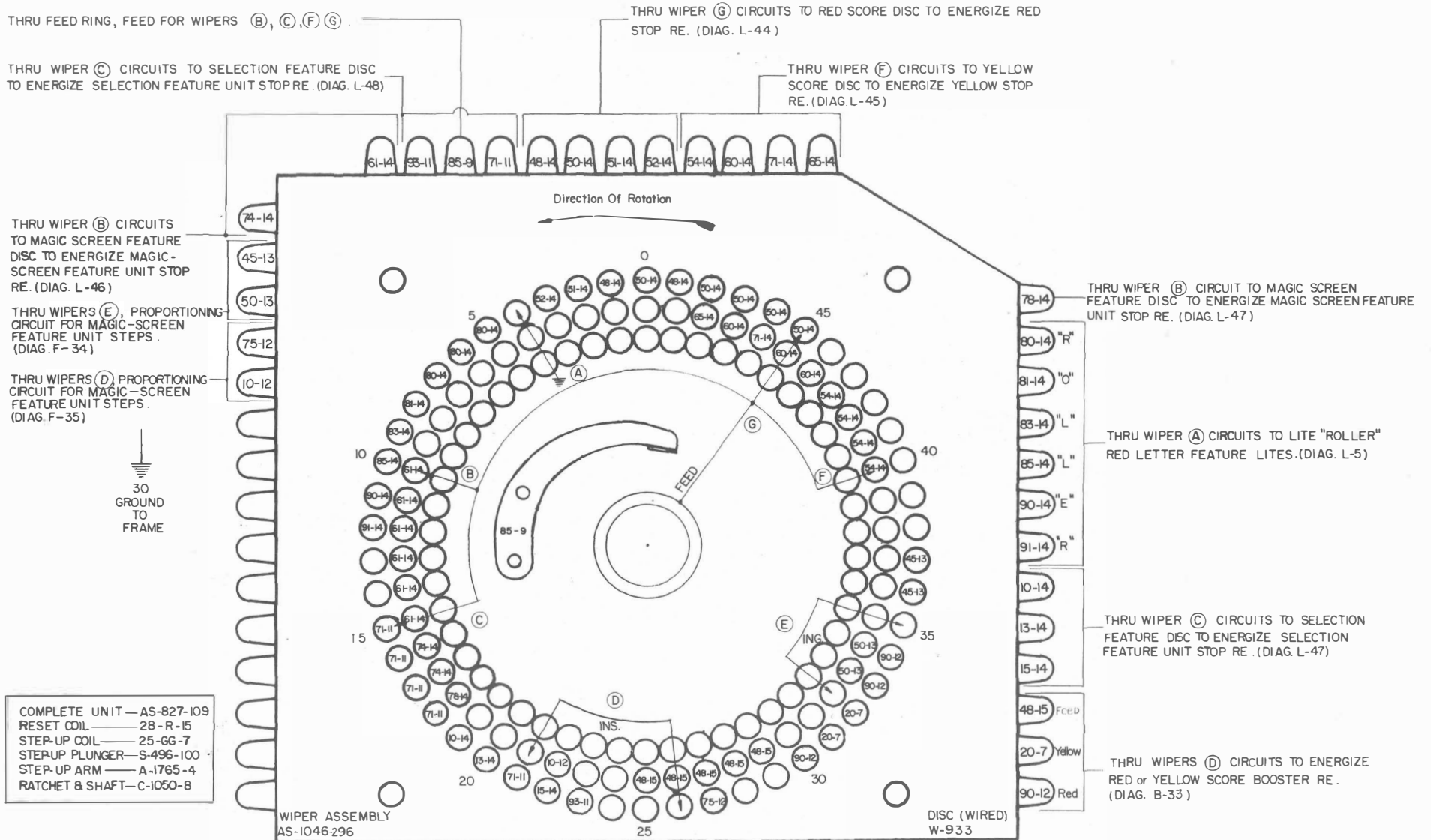
NOTE: 96 VALUE REPLAY SCORES ARE EFFECTIVE THRU THE OPEN AT 96 SWITCH.



- | | |
|-----------------|-------------|
| COMPLETE UNIT | AS-827-93 |
| RESET COIL | 28-R-15 |
| STEP-UP COIL | 25-GG-7 |
| STEP-UP PLUNGER | S-496-100 |
| STEP-UP ARM | A-1765-4 |
| RATCHET & SHAFT | C-1050-8-41 |

RED LETTER FEATURE UNIT viewed from BUTTON or WIPER side

8 step unit. Wipers shown in zero or reset position

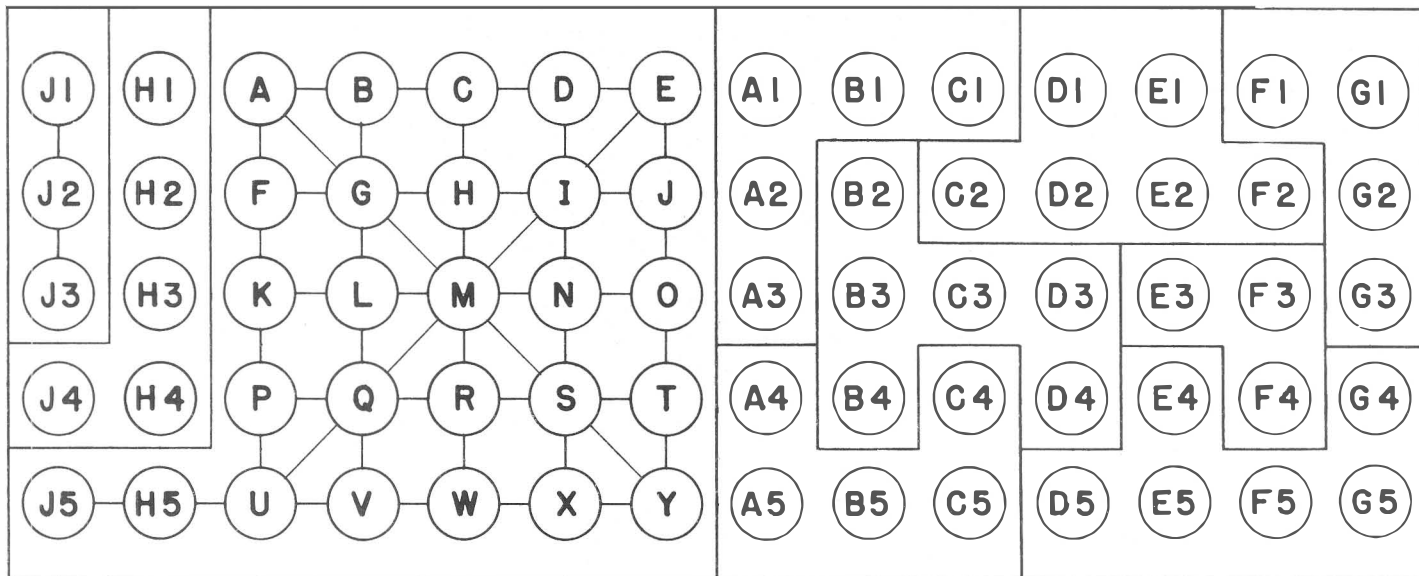


SEARCH POSITIONS CHART

	RED WIPER AT POSITION	WIPER D ROW 4 SEARCH RE. # 1	WIPER F ROW 6 SEARCH RE. # 2	WIPER G ROW 8 SEARCH RE. # 3	WIPER E ROW 5 SEARCH RE. # 4	WIPER C ROW 2 SEARCH RE. # 5	WIPER H ROW 7 SEARCH RE. # 6
6 NO. GREEN SECTION	1	B2	B3	B4	C3	D3	D4
	2						
	3						
	4						
RED SUPER SECTION	5	A4	A5	B5	C4	C5	
	6						
	7						
	8						
YELLOW SECTION	9	D5	E4	E5	F5	G4	G5
	10						
	11						
	12						
YELLOW SUPER SECTION	13	A1	B1	C1	A2	A3	
	14						
	15						
RED SECTION	16						
	17	D1	E1	C2	D2	E2	F2
	18						
	19						
	20						
4 NO. GREEN SECTION	21	F1	G1	G2	G3		
	22						
	23						
	24						
BLUE SECTION	25	E3	F3	F4			
	26						
	27						
	28						
ORANGE SECTION	29	H1	H2	H3	H4	J4	
	30						
	31						
	32						
	33						
YELLOW	VERTICAL LINE	34	J1	J2	J3		
	HORIZONTAL LINE	35	J5	H5	U	V	W
	HORIZONTAL LINE	36	H5	U	V	W	X
	VERTICAL LINE	37	D	I	N	S	X
RED	VERTICAL LINE	38	A	F	K	P	U
	HORIZONTAL LINE	39	U	V	W	X	Y
	HORIZONTAL LINE	40	F	G	H	I	J
	VERTICAL LINE	41	E	J	O	T	Y
GREEN	VERTICAL LINE	42	B	G	L	Q	V
	HORIZONTAL LINE	43	P	Q	R	S	T
	HORIZONTAL LINE	44	A	B	C	D	E
	DIAGONAL LINE	45	E	I	M	Q	U
DIAGONAL LINE	46	A	G	M	S	Y	
HORIZONTAL LINE	47	K	L	M	N	O	
VERTICAL LINE	48	C	H	M	R	W	
	49						
	50						

ROTATION OF SEARCH DISC WIPERS FROM 50 TO 1

MAGIC-SCREEN LAYOUT

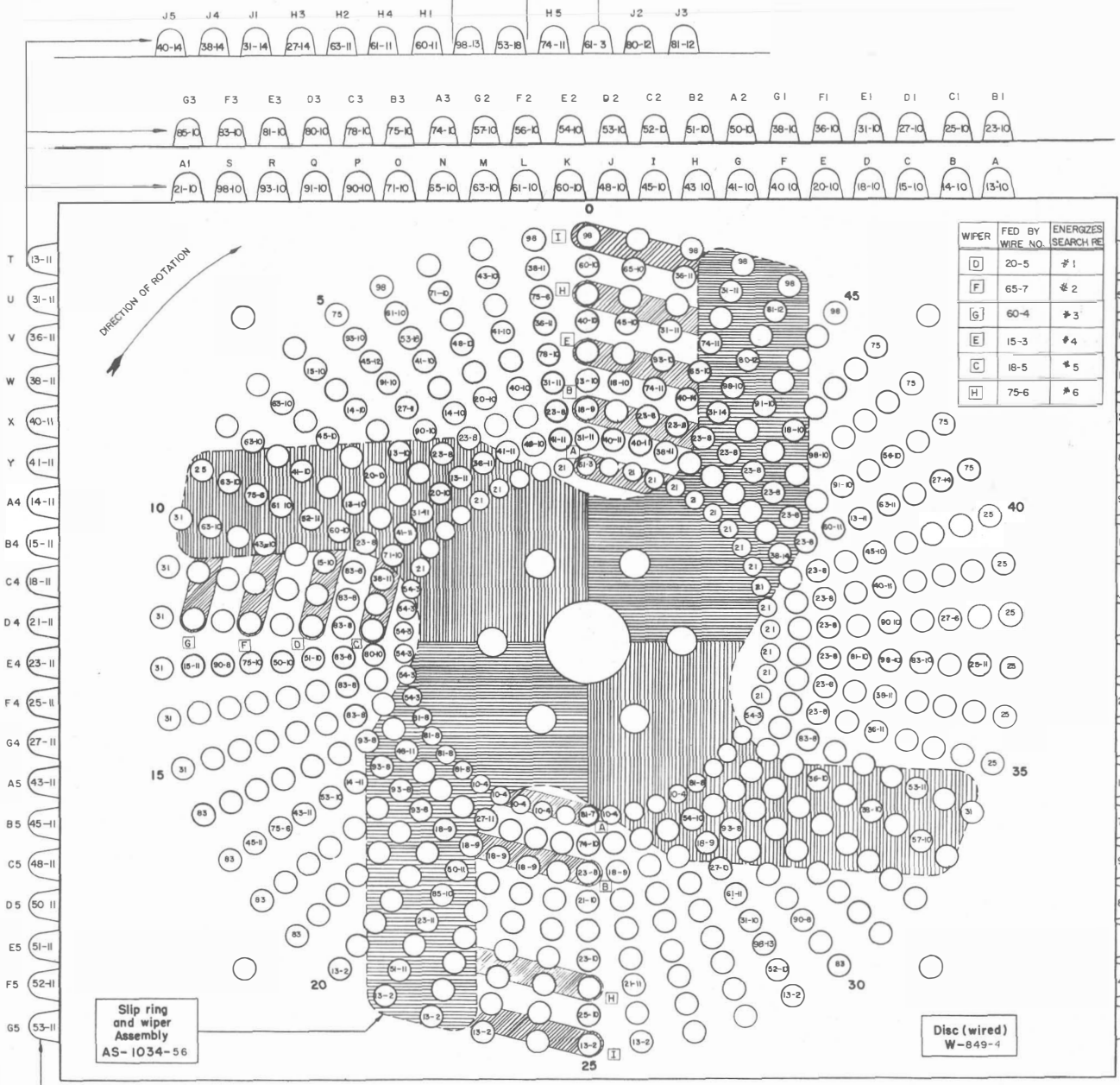


WHEN CHECKING OUT ANY "IN-LINE" OR "SECTION" REPLAY SCORING CIRCUIT, REFER TO SEARCH POSITIONS CHART FOR THE POSITION ON "SEARCH DISC" WHERE THAT "IN-LINE" OR "SECTION" REPLAY SCORING CIRCUIT IS SEARCHED.

EXAMPLE :

WITH BALLS IN PROPER HOLES ON PLAYFIELD CORRESPONDING TO $\textcircled{J1} - \textcircled{J2} - \textcircled{J3}$ (SEE MAGIC-SCREEN LAYOUT ABOVE), REFER TO SEARCH POSITIONS CHART. THE CHART WILL SHOW THAT THIS YELLOW VERTICAL "3-IN-LINE" COMBINATION IS SEARCHED AT POSITION 34 ON THE "SEARCH DISC", THRU SEARCH DISC WIPERS \boxed{D} \boxed{F} & \boxed{G} , AND SEARCH RELAYS #1 #2 #3 SHOULD BE ENERGIZED TO SCORE REPLAYS .

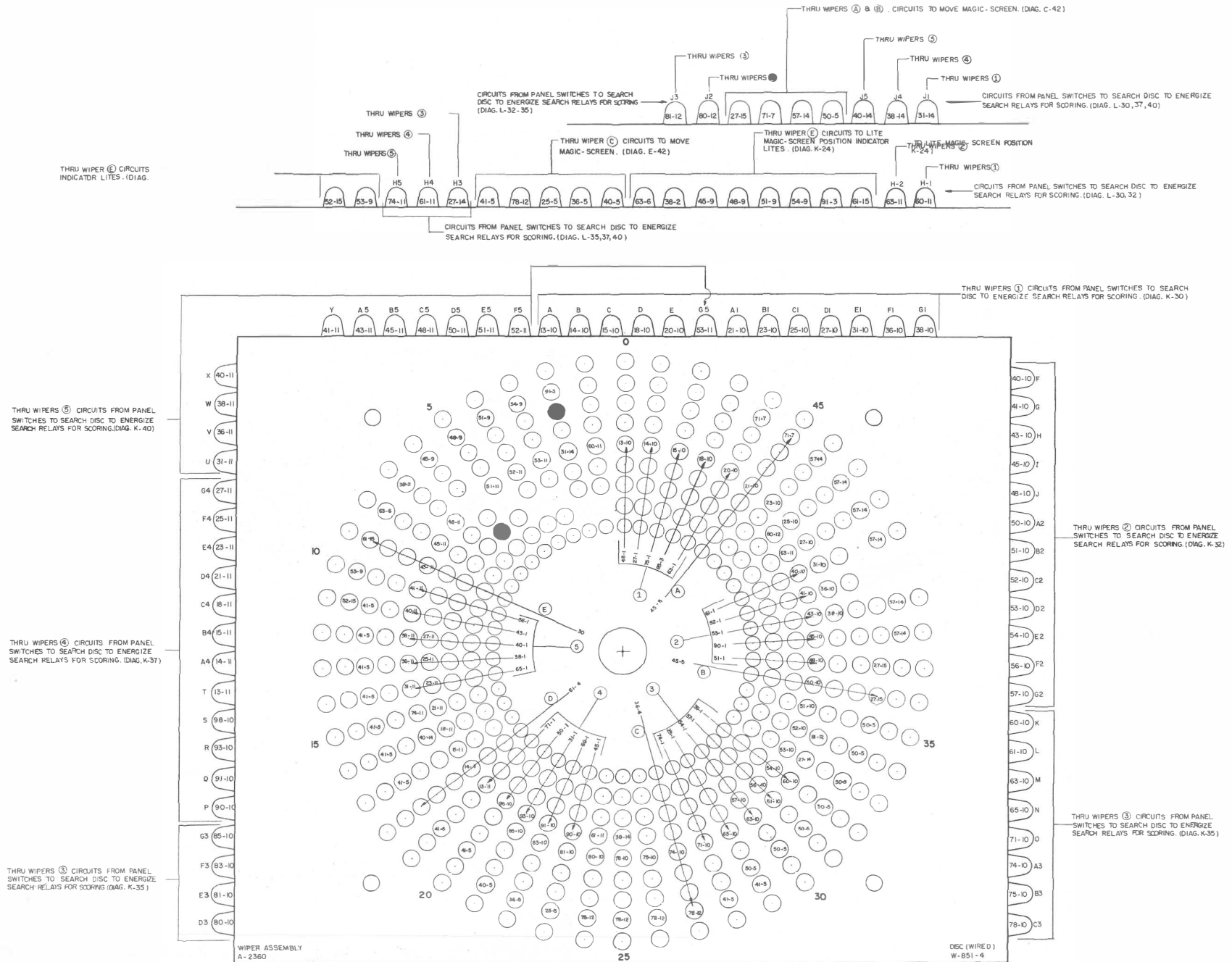
THRU WIPERS [H] CIRCUIT TO ENERGIZE POSITION 29 RE. (DIAG. G-44) THRU WIPERS [A] CIRCUIT FOR BLUE SECTION SCORING. (DIAG. G-18)



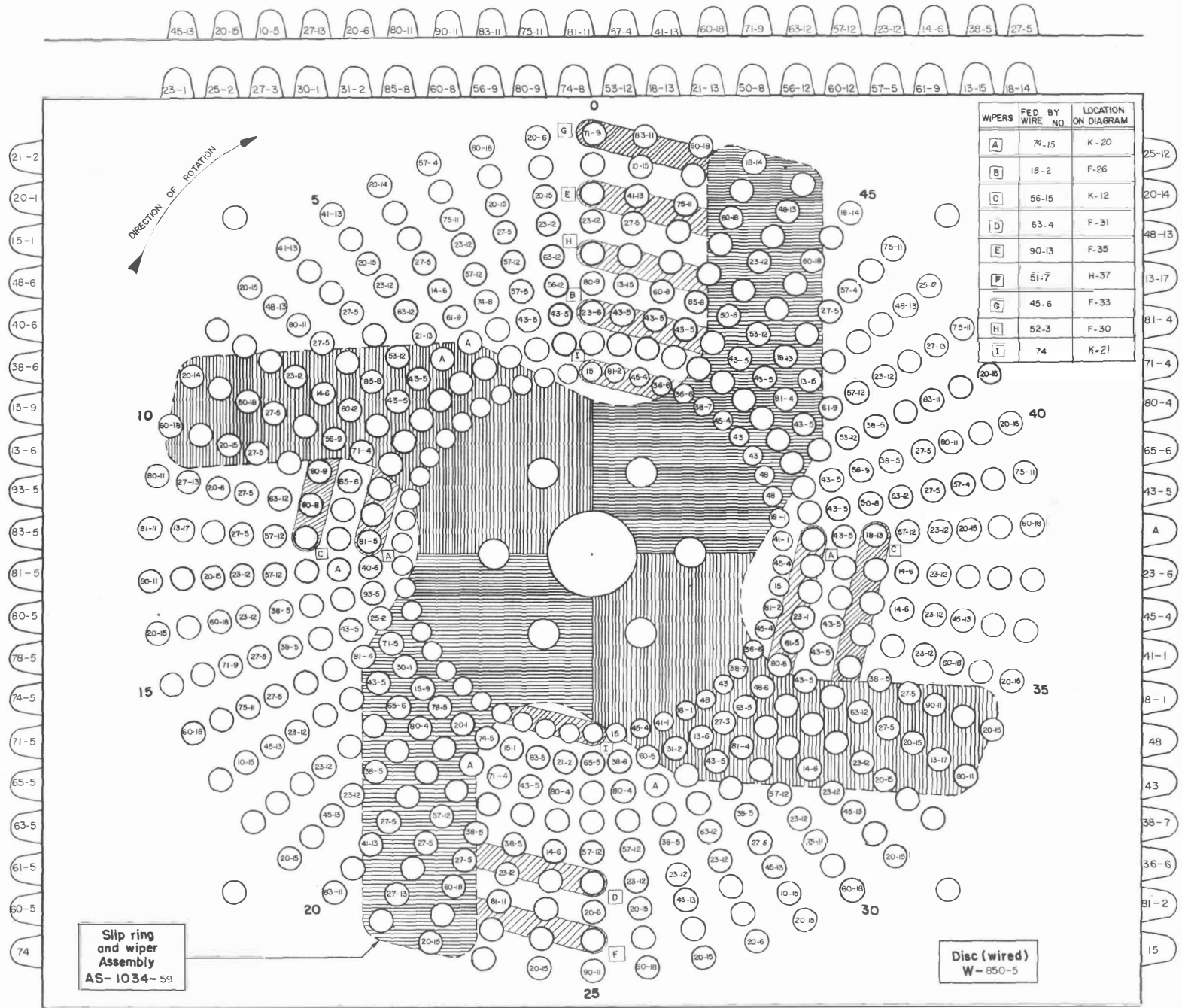
- 75 — THRU WIPERS [I] PART OF RED REPLAY COUNTER STEP-UP CIRCUIT WHEN SCORING (DIAG. D-22)
- 54-3 — THRU WIPERS [A] YELLOW, RED, GREEN 3-IN-LINE, AND 3-IN-SECTION SCORING CIRCUITS (DIAG. G-9)
- 81-B — THRU WIPERS [A] YELLOW, RED, GREEN 3-IN-LINE, AND 3-IN-SECTION SCORING CIRCUITS (DIAG. G-9)
- 10-4 — THRU WIPERS [A] YELLOW, RED, GREEN 3-IN-LINE, AND 3-IN-SECTION SCORING CIRCUITS (DIAG. G-9)
- 23-B — FEEDS WIPERS [B] FOR YELLOW, RED, GREEN 4-IN-LINE, AND 4-IN-SECTION SCORING.
- 83-B — THRU WIPERS [B] YELLOW, RED, GREEN 4-IN-LINE, AND 4-IN-SECTION SCORING CIRCUITS (DIAG. H-20)
- 93-B — THRU WIPERS [B] YELLOW, RED, GREEN 4-IN-LINE, AND 4-IN-SECTION SCORING CIRCUITS (DIAG. H-20)
- 18-9 — THRU WIPERS [B] YELLOW, RED, GREEN 4-IN-LINE, AND 4-IN-SECTION SCORING CIRCUITS (DIAG. H-20)
- 25 — THRU WIPERS [F] YELLOW REPLAY COUNTER STEP-UP CIRCUIT WHEN SCORING (DIAG. D-20)
- 31 — FEED WIPERS [A] FOR YELLOW, RED OR GREEN 3-IN-LINE, AND 3-IN-SECTION SCORING CIRCUITS (DIAG. G-9)
- 27-6 — THRU WIPERS [H] CIRCUIT TO STEP WINNER UNIT WHEN YELLOW SCORE BOOSTER RE. IS ENERGIZED (DIAG. B-14)
- 98 — THRU WIPERS [I] GREEN REPLAY COUNTER STEP-UP CIRCUIT WHEN SCORING (DIAG. D-24)
- 13-2 — FEEDS WIPERS [H] FOR CIRCUITS TO ENERGIZE SEARCH-RELAY #6. (DIAG. K-43)
- 75-6 — FEEDS WIPERS [H] FOR CIRCUITS TO STEP WINNER UNIT. (DIAG. B-14)
- 90-8 — FEEDS WIPERS [A] FOR BLUE SECTION SCORING (DIAG. G-18)
- 81-7 — THRU WIPERS [I] PART OF RED REPLAY COUNTER STEP-UP CIRCUIT WHEN SCORING (DIAG. D-22)
- 83 — THRU WIPERS [H] CIRCUIT TO STEP WINNER UNIT WHEN RED SCORE BOOSTER RE. IS ENERGIZED. (DIAG. B-14)
- 45-12 — THRU WIPERS [H] CIRCUIT TO STEP WINNER UNIT WHEN RED SCORE BOOSTER RE. IS ENERGIZED. (DIAG. B-14)
- 80 — THRU FEED RING, FEED FOR WIPERS [I]

THRU WIPERS [D], [F], [G], [E], [C], [H] CIRCUITS FROM MAGIC-SCREEN DISC TO ENERGIZE SEARCH RELAYS FOR SCORING. (DIAG. K-42)

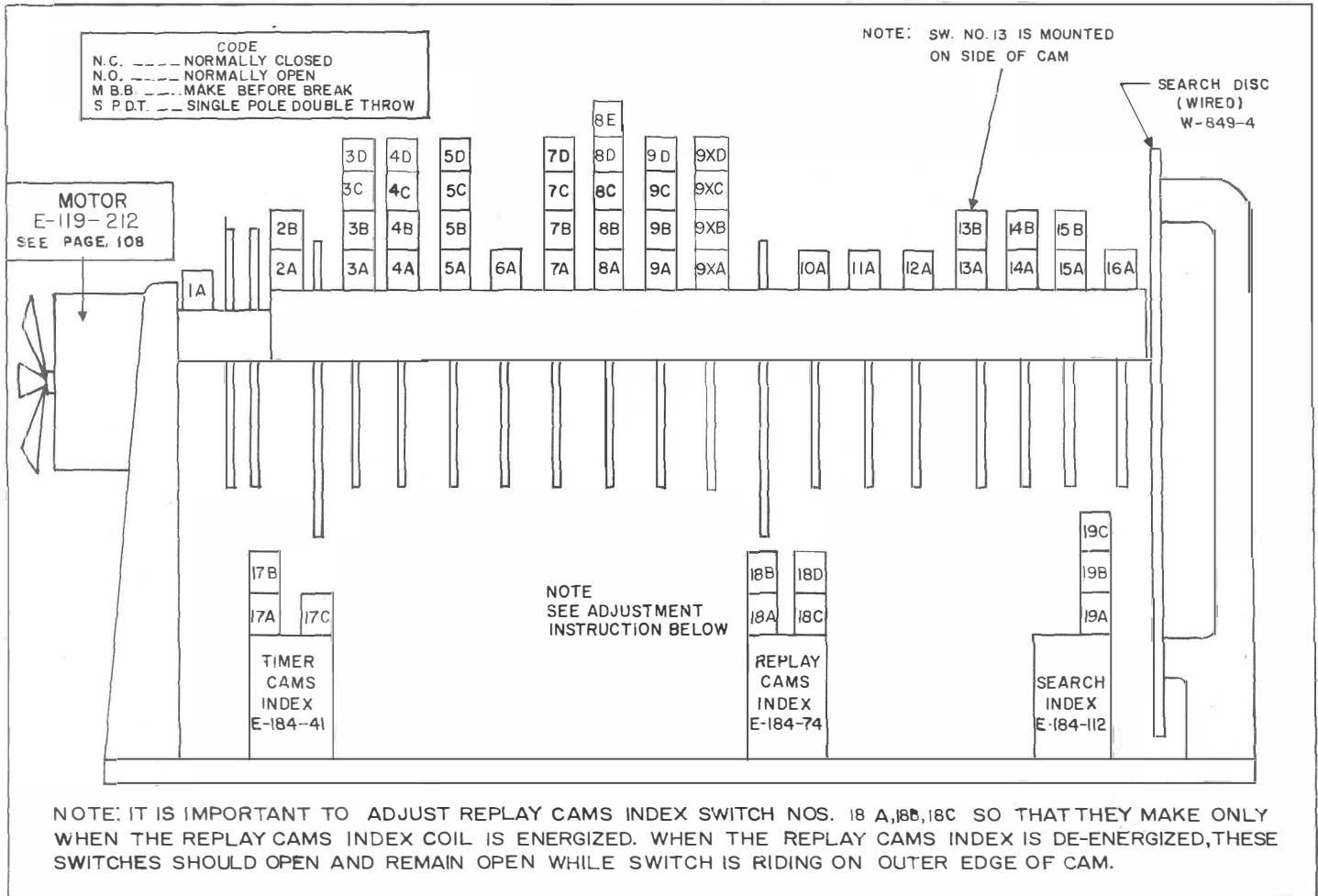
MAGIC SCREEN UNIT viewed from BUTTON or WIPER side



SPOTTING DISC viewed from **BUTTON** or **WIPER** side

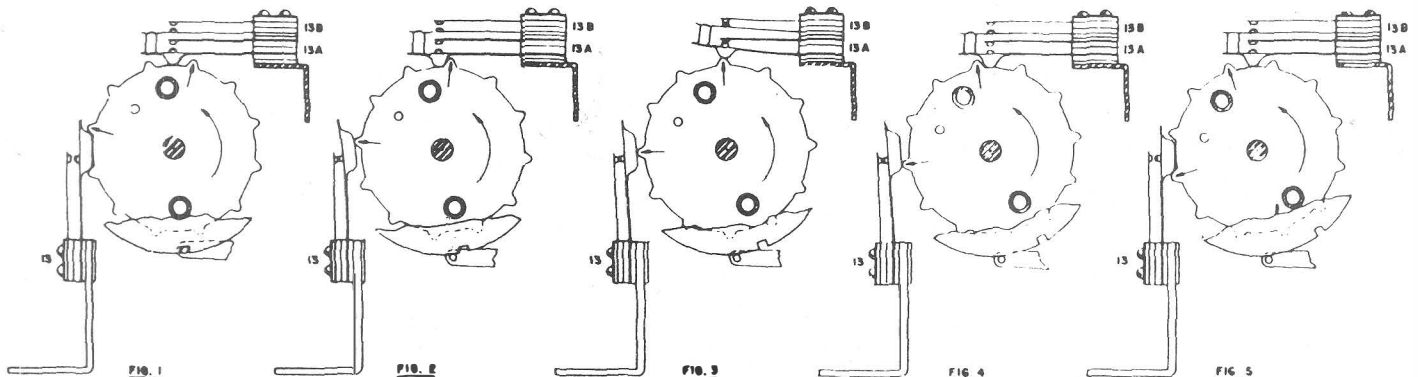


CONTROL UNIT PICTORIAL VIEW NUMBERS CORRESPOND TO SWITCH CHART ON PAGE 96



CORRECT ADJUSTMENT: CONTROL UNIT CAM SWITCHES 13, 13A & 13B

NOTICE: IMPORTANT PART OF ILLUSTRATION IS TO SHOW THAT SWITCH 13 CLOSSES FIRST AND OPENS LAST. IF AN ADJUSTMENT IS NECESSARY, SWITCH 13 CAN BE MOVED UP OR DOWN. LOOSEN SCREWS THAT HOLD SWITCH, THEN MOVE UP OR DOWN.



REPLAY CAMS SHOWN IN THEIR NORMAL INDEXED POSITION. SWITCHES 13A, 13B & 13 ARE OPEN AT THIS TIME
NOTE:
 ARROWS POINT TO LOBES THAT WILL ACTUATE SWITCHES.

REPLAY CAMS SHOWN STARTING TO ROTATE. THEY ARE NOW OUT OF THEIR INDEX POSITION. SWITCHES 13A, & 13B ARE STILL OPEN. SWITCH 13 IS NOW CLOSED.

SWITCHES 13A, & 13B ARE NOW CLOSED. SWITCH 13 IS STILL CLOSED.

SWITCHES 13A, & 13B ARE NOW OPEN AGAIN. SWITCH 13 IS STILL CLOSED

ALL SWITCHES ARE NOW OPEN AGAIN, SAME AS IN FIG. 1. THIS SEQUENCE IS REPEATED THRUOUT REPLAY SCORING CYCLE.

CONTROL UNIT CAM SWITCH CHART FOR POSITION OF SWITCHES REFER TO PICTORIAL VIEW ON PAGE 95

CAM SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
1A	N.O.	G-8 36-9 65-2	Yellow-Brown Brown-White	Completes circuit to step timer unit after 5th ball is shot.
2A	N.O.	H-3 90-5 30	Gray Yellow	Completes a circuit to energize reflex play magnet coil, replay register unit reset coil and total plays meter.
2B	N.O.	F-38 10-2 61-7	Red Brown-Red	Completes a circuit to energize red or yellow score booster relay.
3A	N.C.	I-4 30 48-2	Yellow Green-Black	Opens start circuit.
3B	S.P.D.T.	B-19 93-7 98-4 91-7	Gray-Yellow Gray-Black Gray-Red	Directs circuit from replay meter, to total plays meter.
3C	S.P.D.T.	C-48 60-13 57-13 21-3	Brown White-Orange Blue-Red	Opens circuit for energizing play scores relay, and completes lock-in circuit for relay when energized.
3D	S.P.D.T.	C-47 74-16 81-13 21-5	Orange-Green Black-Red Blue-Red	Opens circuit for energizing play features relay, and completes lock-in circuit for relay when energized.
4A	N.O.	I-47 98-1 30	Gray-Black Yellow	Completes circuit to energize spotting cams index coil.
4B	N.O.	E-46 56-5 30	White-Brown Yellow	Completes circuit to energize score extra step index coil.
4C	N.O.	D-5 27-9 80-2	Blue-Orange Black	Completes circuit to pulse coin meter. (When a coin meter is used)
4D	S.P.D.T.	G-5 13-9 90-9 14-5	Red-Yellow Gray Red-Green	(Safety circuit) opens start circuit, and completes a circuit to energize tilt relay, if coin switch is closed too long.
5A	N.O.	G-9 65-2 83-1	Brown-White Black-Yellow	Completes a circuit to reset timer unit, when playing for extra-balls.
5B	N.O.	B-26 21-1 38-4	Blue-Red Yellow-Black	Completes circuit to step extra-ball unit. (Single steps)
5C	N.O.	D-27 78-4 91-6	Orange-Black Gray-Red	Completes circuit to energize anti-cheat relay.
5D	N.O.	F-32 10-7 85-4	Red Black-White	Completes circuit to step magic-screen feature unit, and selection feature unit. (Single steps)
5E	N.C.	D-47 21-3 40-15	Blue-Red Green	Opens lock-in circuit for features lock relay, and scores lock relay.
6A	N.C.	I-29 51-5 75-5	White-Red Orange-White	(Proportioning circuit) opens game advantage circuits.
7A	N.O.	D-28 10-1 54-12	Red White-Green	Completes circuit for yellow, red, and green score unit guaranteed single steps (0-4, 4-6, 6-8).
7B	N.O.	D-47 21-3 43-14	Blue-Red Green-Yellow	Completes circuit to energize features lock relay, and scores lock relay.
7C	N.O.	G-28 60-6 63-4	Brown Brown-Yellow	Completes circuit for yellow, red, and green score unit single steps, after guaranteed steps.
7D	N.O.	G-29 52-3 60-6	White-Blue Brown	Same function as above.

CAM SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
8A	N.O.	B-27 25-4 38-4	Blue-White Yellow-Black	Completes circuit for extra-ball unit single steps.
8B	N.O.	F-36 18-7 61-7	Red-Black Brown-Red	Completes a circuit to energize red or yellow score booster relay.
8C	N.O.	G-36 20-6 27-13	Blue Blue-Orange	Completes a circuit to energize OK feature relay.
8D	N.O.	G-30 56-11 63-4	White-Brown Brown-Yellow	Completes circuit for yellow, red, and green score unit single steps, after guaranteed steps, when playing for scores.
8E	N.O.	D-28 54-12 91-5	White-Green Gray-Red	Completes circuit for yellow, red, and green score unit guaranteed single steps, when playing for scores.
9A	Alt.	D-26 43-5 74-7	Green-Yellow Orange-Green	Proportioning circuit for extra-ball unit steps.
9B	Alt.	C-37 90-12 10-2 20-7	Gray Red Blue	Proportioning circuit for red or yellow score booster feature relay.
9C	Alt.	I-28 15-7 54-8	Red-White White-Green	Proportioning circuit for score steps, or extra-ball steps, when playing extra-balls.
9D	Alt.	C-34 41-7 93-12	Green-Red Gray-Yellow	Proportioning circuit for magic-screen feature unit steps.
9XA	Alt.	D-38 14-13 25-12	Red-Green Blue-White	Proportioning circuit for blue score booster feature relay.
9XB	Alt.	C-39 15-13 65-13	Red-White Brown-White	Proportioning circuit for selection feature unit steps.
9XC	Alt.	H-38 48-13 91-11	Green-Black Gray-Red	Proportioning circuit for red or yellow score booster feature relay.
9XD	Alt.	C-36 20-6 52-16	Blue White-Blue	Proportioning circuit for OK feature relay.
MULT. X12 10A	N.O.	A-22 63 70	Brown-Yellow Orange	Steps replay counter units while scoring, when score units are at 8th step.
MULT. X6 11A	N.O.	A-22 57 70	White-Orange Orange	Steps replay counter units while scoring, when score units are at 7th step.
MULT. X4 12A	N.O.	A-21 52 70	White-Blue Orange	Steps replay counter units while scoring, when score units are at 5th or 6th step.
MULT. X1 13A	N.O.	A-21 45 70	Green-White Orange	Steps replay counter units while scoring, when score units are at 1st, 2nd, 3rd, or 4th step.
13B	N.O.	D-18 48-4 80	Green-Black Black	Steps replay register unit, and pulses reflex replay magnet, and replay meter while scoring.
BACKSIDE 13	N.O.	H-18 21-3 27	Blue-Red Blue-Orange	Completes replay scoring lock-in circuit. (See control unit pictorial view)
14A	N.C.	H-15 14 18	Red-Green Red-Black	In series with in-line or section replay scoring circuit.
14B	N.C.	C-8 27-2 90-2	Blue-Orange Gray	Opens timer unit step-up circuit during replay scoring.

CONCLUDED ON NEXT PAGE

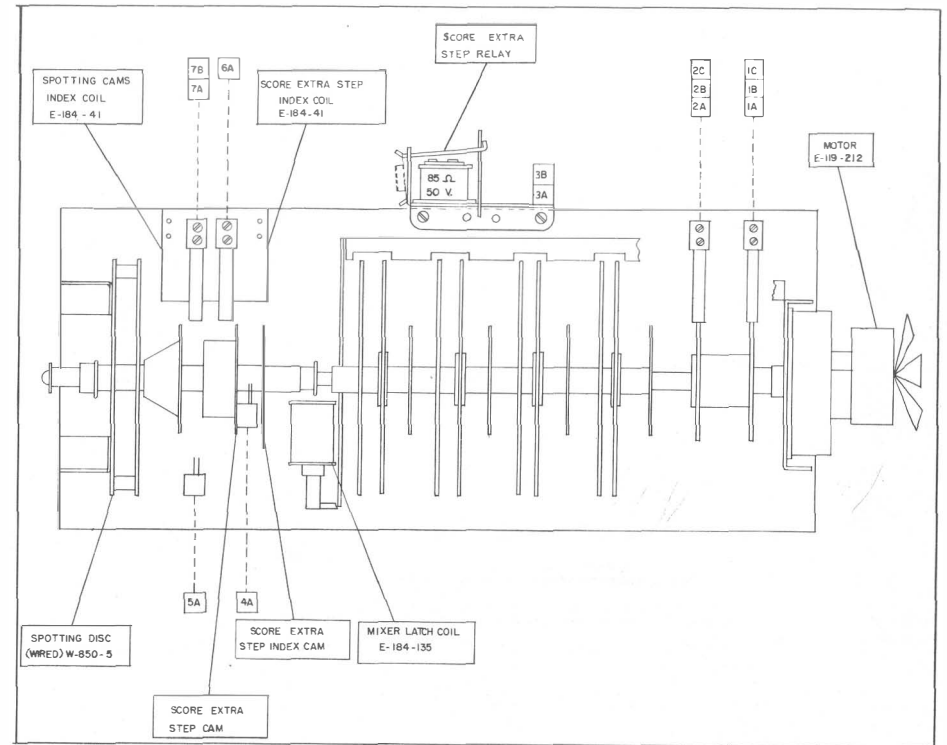
CONTROL UNIT CAM SWITCH CHART

FOR POSITION OF SWITCHES REFER TO PICTORIAL VIEW ON PAGE 95

CAM SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
CHANGE-OVER 15A S.P.D.T.	H-17	56 18 54	White-Brown Red-Black White-Green	Directs circuit for in-line or section replay scoring.
CHANGE-OVER 15B S.P.D.T.	D-17	80 51-8 41-9	Black White-Red Green-Red	Directs circuit to energize search index coil for in-line or section replay scoring.
16A N.O.	I-48	21-3 31-6	Blue-Red Yellow-Red	Resets sequence unit, and winner unit.
TIMER CAMS INDEX COIL	A-6	93-2 70	Gray-Yellow Orange	Energized when playing coins or replays (each time start relay is energized).
17A N.O.	G-1	40P 60P	Green (Plastic) Brown(Plastic)	Completes a circuit to run control unit, and mixer-spotting unit motors.
17B N.C.	G-6	27-9 71-2	Blue-Orange Orange-Red	Opens circuit to coin lock-out magnet.
17C N.C.	F-12	13 30	Red-Yellow Yellow	Opens circuit to red button relay, and extra-ball relays.
REPLAY CAMS INDEX COIL	A-18	40-4 70	Green Orange	Energized by search index switch #19C when a score is made, and releases replay cams for scoring.
18A N.O.	G-18	27 80	Blue-Orange Black	In series with in-line or section replay scoring lock-in circuit. (See control unit pictorial view for correct adj.)
18B N.O.	H-15	14 18	Red-Green Red-Black	In series with in-line or section replay scoring circuit. (See control unit pictorial view for correct adj.)
18C N.O.	F-18	36-14 80	Yellow-Brown Black	In series with section replay scoring lock-in circuit. (See control unit pictorial view for correct adj.)
18D N.C.	B-17	15-2 91-8	Red-White Gray-Red	Opens direct 50 volt circuit to search index coil, coil then held in thru resistor.
SEARCH INDEX COIL	A-17	15-2 70	Red-White Orange	Energized thru control unit change-over cam switch #15B, when an in-line or section winner is scored.
19A N.O.	E-43	10-9 98-13	Red Gray-Black	Completes circuit from search disc to energize position 29 relay for red letter game scoring. (orange section)
19B N.O.	H-18	54 91-16	White-Green Gray-Red	In series with section replay scoring circuit.
19C N.O.	C-18	40-4 60	Green Brown	Completes circuit to energize replay cams index coil.
SEARCH INDEX LOCK MAGNET COIL	A-40	23-16 70	Blue-Yellow Orange	(Not shown on pictorial view) energized by front rail (R) collect scores button switch to release search disc wipers to search for scores.
SEARCH WIPER CAM 20A N.C.	H-42	14-4 20-2	Red-Green Blue	(Not shown on pictorial view) opens circuit for moving magic-screen during search for scores.
SEARCH WIPER CAM 20B N.C.	C-5	13-16 83-3	Red-Yellow Black-Yellow	Opens start relay circuit during search for scores.
SEARCH WIPER CAM 20C N.C.	D-40	23-16 52-9	Blue-Yellow White-Blue	Opens circuit to search index lock magnet.

MIXER AND SPOTTING UNIT ASSEMBLY

NUMBERS CORRESPOND TO SWITCH CHART BELOW



MIXER AND SPOTTING UNIT CAM SWITCH CHART

FOR POSITION OF SWITCHES REFER TO PICTORIAL VIEW ABOVE

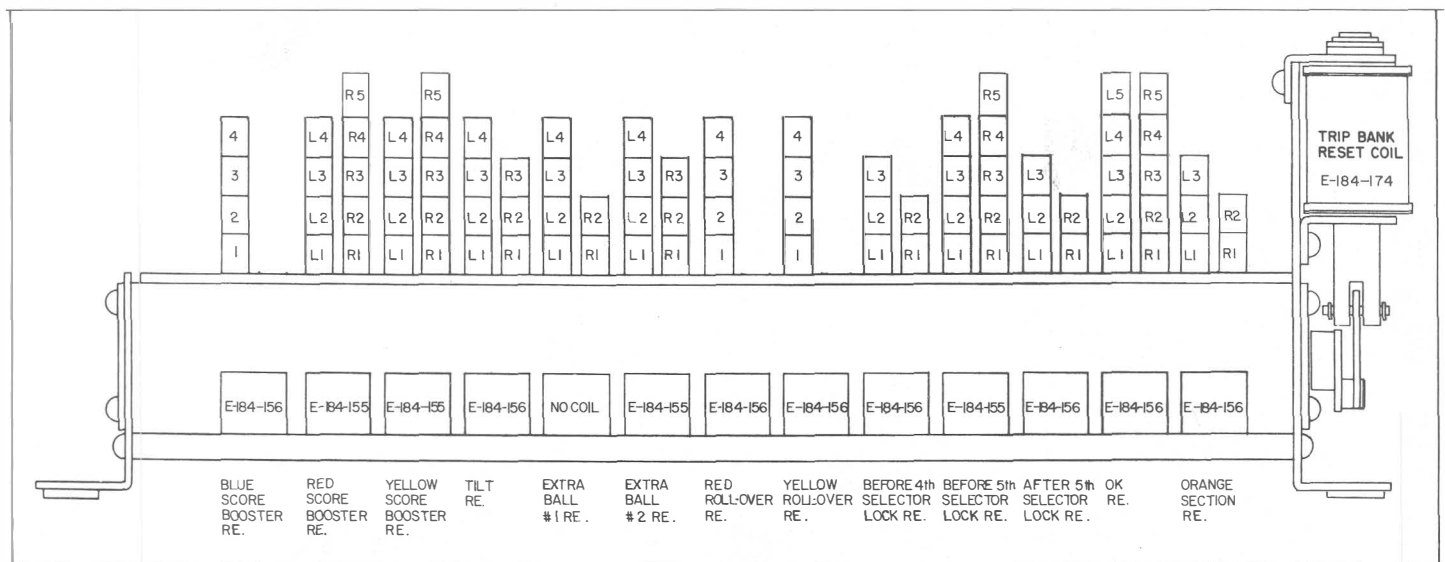
CAM SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
16 PULSE 1A N.O.	F-33	45-6 98-14	Green-White Gray-Black	Thru spotting disc, completes circuit for orange section feature, magic screen feature steps, OK feature, blue score booster feature, and selection feature steps.
16 PULSE 1B N.O.	D-4	53-7 75-2	White-Yellow Orange-White	Steps replay register unit, when replay reset relay is energized.
16 PULSE 1C N.O.	J-2	10-11 90	Red Gray	Thru timer unit disc, flashes select-now lite.
16 PULSE 2A N.O.	F-15	52-8 93	White-Blue Gray-Yellow	Steps sequence unit, and winner unit, when searching for section scores.
16 PULSE 2B N.O.	B-26	38-4 78	Yellow-Black Orange-Black	Steps extra-ball unit for multiple steps.
16 PULSE 2C N.O.	E-33	36-7 61-2	Yellow-Brown Brown-Red	Steps red, and yellow score units, magic screen, and selection feature units, and energizes red or yellow score booster relay, when scoring red letter games.

MIXER AND SPOTTING UNIT CAM SWITCH CHART

FOR POSITION OF SWITCHES REFER TO PICTORIAL VIEW ON PAGE 97

CAM SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
SCORE EXTRA STEP RELAY COIL	A-9	43-6 70	Green-Yellow Orange	Energized by score unit step-up arm switches. (On yellow, red and green score units)
3A N.O.	C-10	43-6 81-3	Green-Yellow Black-Red	Lock-in circuit for this relay.
3B N.O.	D-29	50-4 51-6	White White-Red	In series with circuit thru mixer #3 for yellow, red and green score unit multiple steps.
EXTRA STEP PULSE SWITCH 4A N.O.	E-29	43-4 50-4	Green-Yellow White	Pulses yellow, red, and green score units for multiple steps.
SQUARE PIN SWITCH 5A N.C.	D-10	13-5 21-3	Red-Yellow Blue-Red	Opens lock-in circuit to score extra step relay.
SCORE EXTRA STEP INDEX COIL	A-46	56-5 70	White-Brown Orange	Energized by control unit cam switch #4B on each spin of game.
6A N.O.	C-10	13-5 81-3	Red-Yellow Black-Red	In series with lock-in circuit to score extra step relay.
SPOTTING CAMS INDEX COIL	I-50	98-1 70	Gray-Black Orange	Energized by control unit cam switch #4A on each spin of game.
7A N.O.	J-21	13-4 30	Red-Yellow Yellow	Flashes score lites or extra-ball lites.
7B N.O.	J-12	81-6 30	Black-Red Yellow	Flashes feature lites.

TRIP RELAY BANK PICTORIAL VIEW NUMBERS CORRESPOND TO SWITCH CHART ON PAGE 99



TRIP RELAY BANK CHART FOR POSITION OF SWITCHES REFER TO PICTORIAL VIEW ON PAGE 98

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
BLUE SCORE BOOSTER RELAY COIL	A-38	J 70	Jumper Orange	Energized thru spotting disc when circuit complete thru other factors.
1 N.C.	A-38	14-13 J	Red-Green Jumper	Opens circuit to coil.
2 N.O.	H-18	20-8 81-7	Blue Black-Red	In series with replay scoring circuit for 2 in blue section scores green 3-in-line.
3 N.O.	J-12	85-1 30	Black-White Yellow	Completes circuit to blue 2 scores green 5 indicator lite.
4 S.P.D.T.	L-12	18-4 60-8 61-9	Red-Black Brown Brown-Red	Opens circuit to blue 3 scores green 5 feature lite, and completes circuit to blue 2 scores green 5 feature lite.
RED SCORE BOOSTER RELAY COIL	C-38	10-5 90-12	Red Gray	Energized thru spotting disc, when circuit complete thru other factors. Also energized thru red letter feature disc as part of red letter game scoring.
L1 N.C.	E-35	41-13 93-13	Green-Red Gray-Yellow	Proportioning circuit for magic screen feature unit steps.
L2 N.O.	J-8	54-7 80-9	White-Green Black	Completes circuit to red score booster feature lite.
L3 S.P.D.T.	D-30	65-4 63-7 52-4	Brown-White Brown-Yellow White-Blue	Proportioning circuit for red or yellow score unit steps.
L4 S.P.D.T.	C-30	83-4 25-14 75-8	Black-Yellow Blue-White Orange-White	Same function as switch L3 above.
R1 N.C.	H-24	27-7 78-11	Blue-Orange Orange-Black	Proportioning circuit. (Score steps)
R2 N.O.	B-14	13-1 45-12	Red-Yellow Green-White	Thru search disc, completes a circuit to step winner unit, when searching for section scoring.
R3 N.C.	B-37	10-5 53-6	Red White-Yellow	Opens circuit to this coil. Also opens circuit to yellow score booster relay coil.
R4 N.C.	D-39	15-13 36-13	Red-White Yellow-Brown	Proportioning circuit for selection feature unit steps.
R5 N.C.	L-9	21-13 43-7	Blue-Red Green-Yellow	Opens circuit for flashing yellow score booster feature lite.

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
YELLOW SCORE BOOSTER RELAY COIL	C-36	10-5 20-7	Red Blue	Energized thru spotting disc, when circuit complete thru other factors. Also energized thru red letter feature disc, as part of red letter game scoring.
L1 N.C.	D-35	91-12 93-13	Gray-Red Gray-Yellow	Proportioning circuit for magic screen feature unit steps.
L2 N.O.	K-9	43-7 80-9	Green-Yellow Black	Completes circuit to yellow score booster feature lite.
L3 S.P.D.T.	D-30	52-4 31-9 65-4	White-Blue Yellow-Red Brown-White	Proportioning circuit for red or yellow score unit steps.
L4 S.P.D.T.	C-30	75-8 38-9 83-4	Orange-White Yellow-Black Black-Yellow	Same function as switch L3 above.
R1 N.C.	A-37	53-6 70	White-Yellow Orange	Opens circuit to this coil. Also opens circuit to red score booster relay coil.
R2 N.O.	B-15	13-1 27-6	Red-Yellow Blue-Orange	Thru search disc completes a circuit to step winner unit, when searching for section scoring.
R3 N.C.	D-39	36-13 65-13	Yellow-Brown Brown-White	Proportioning circuit for selection feature unit steps.
R4 N.C.	I-24	78-11 81-9	Orange-Black Black-Red	Proportioning circuit. (Score steps)
R5 N.C.	L-9	18-13 54-7	Red-Black White-Green	Opens circuit for flashing red score booster feature lite.
TILT RELAY COIL	A-12	14-5 70	Red-Green Orange	Energized by any tilt switch. Also thru control unit cam switch #4D, if coin switch is closed too long.
L1 N.C.	H-38	40-8 93-3	Green Gray-Yellow	Opens circuits for moving magic-screen, and energizing search index lock magnet.
L2 N.C.	M-27	10 20-4	Red Blue	Opens 17 volt circuits.
L3 S.P.D.T.	I-7	21-3 30 45-8	Blue-Red Yellow Green-White	Opens circuit to this coil. Also opens all game feature, scoring, and ball counting circuits, and completes a circuit to close shutter if game is tilted when shutter is open.
L4 S.P.D.T.	L-25	38 54-2 91-2	Yellow-Black White-Green Gray-Red	Opens 6 volt lite circuits, and completes circuit to tilt lite.
R1 N.C.	G-2	30P 60P	Yellow (Plastic) Brown (Plastic)	Opens circuit to control unit, and mixer-spotting unit motors.
R2 N.O.	F-13	57-6 85-7	White-Orange Black-White	Completes a circuit to energize red button relay. (Safety circuit)
R3 N.O.	B-4	13-6 83-3	Red-Yellow Black-Yellow	In series with a circuit to energize start relay. (Safety circuit)

CONTINUED ON NEXT PAGE

TRIP RELAY BANK CHART FOR POSITION OF SWITCHES REFER TO PICTORIAL VIEW ON PAGE 98

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
EXTRA-BALL #1 RELAY				Trips with extra-ball #2 relay.
L1 N.C.	E-27	85-4 91-6	Black-White Gray-Red	In series with circuit to energize anti-cheat relay.
L2 N.O.	G-9	71-8 83-1	Orange-Red Black-Yellow	In series with circuit to reset timer unit while playing extra-balls.
L3 S.P.D.T.	E-26	85-4 30 61-2	Black-White Yellow Brown-Red	In series with circuits to energize anti-cheat relay, and score units guaranteed steps when relay is latched. In series with extra ball step-up circuit when relay is tripped.
L4 S.P.D.T.	H-28	60-6 56-6 18-2	Brown White-Brown Red-Black	Opens circuit for score steps, and completes circuit for extra-ball steps.
R1 N.C.	J-12	27-16 81-6	Blue-Orange Black-Red	Opens circuit for flashing other game feature lites.
R2 S.P.D.T.	I-28	75-5 15-7 45-2	Orange-White Red-White Green-White	In series with function of switch L4 above.
EXTRA-BALL #2 RELAY COIL	A-13	J 70	Jumper Orange	Energized by yellow button switch when playing for extra-balls. (After 5 balls are shot)
L1 N.C.	A-13	10-6 J	Red Jumper	Opens circuit to coil.
L2 N.O.	D-14	38-3 91-1	Yellow-Black Gray-Red	In series with circuit to run ball lifter motor to raise extra-balls.
L3 S.P.D.T.	D-6	14-3 61 98-2	Red-Green Brown-Red Gray-Black	Opens circuit to run shutter motor when starting new game, and completes a circuit to energize mixer latch, and timer cams index coils.
L4 S.P.D.T.	J-21	31-5 13-4 74	Yellow-Red Red-Yellow Orange-Green	Opens circuit to flash score lites, and completes circuit to flash extra-ball lites.
R1 N.C.	I-28	45-2 83-9	Green-White Black-Yellow	Opens other game feature circuits.
R2 N.O.	K-25	21-4 50-9	Blue-Red White	Completes circuit to lite extra balls feature lite.
R3 N.O.	H-28	56-6 54-8	White-Brown White-Green	In series with circuit for extra ball steps.
RED ROLLOVER RELAY COIL	A-45	J 70	Jumper Orange	Energized directly thru selection feature disc, also by red rollover button switch, thru selection feature disc.
1 N.C.	B-45	25-13 J	Blue-White Jumper	Opens circuit to coil.
2 N.O.	H-40	21-12 93-3	Blue-Red Gray-Yellow	Completes a circuit to keep magic screen buttons (left & right) alive until 6th ball (1st extra ball) is shot.
3 S.P.D.T.	J-1	51-12 90 52-13	White-Red Gray White-Blue	Opens circuit to flash select-now lite before 4th, and before 5th ball, and completes circuit to flash select-now lite after 5th ball.
4 S.P.D.T.	J-6	31-8 10-11 53-12	Yellow-Red Red White-Yellow	Opens circuit to select before 4th, and select before 5th ball feature lites, and completes circuit to lite select after 5th ball feature lite.

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
YELLOW ROLLOVER RELAY COIL	A-44	J 70	Jumper Orange	Energized directly thru selection feature disc. Also by yellow rollover button switch, thru selection feature disc.
1 N.C.	B-44	38-13 J	Yellow-Black Jumper	Opens circuit to coil.
2 N.O.	G-40	93-3 98-3	Gray-Yellow Gray-Black	Completes circuit to keep magic screen buttons (left & right) alive until 5th ball is shot.
3 S.P.D.T.	J-1	50-12 51-12 23-5	White White-Red Blue-Yellow	Opens circuit to flash select-now lite before 4th ball, and completes circuit to flash select-now before 5th ball.
4 S.P.D.T.	K-6	57-5 31-8 74-8	White-Orange Yellow-Red Orange-Green	Opens circuit to select before 4th ball feature lite, and completes circuit to select before 5th ball feature lite.
BEFORE 4th SELECTOR LOCK RELAY COIL	A-11	J 70	Jumper Orange	Energized thru timer unit disc, when 4th ball is shot.
L1 N.C.	B-11	83-6 J	Black-Yellow Jumper	Opens circuit to coil.
L2 S.P.D.T.	G-40	98-3 93-3 53-18	Gray-Black Gray-Yellow White-Yellow	Opens circuit to magic screen buttons (left & right) and, completes circuit to collect scores (R) button.
L3 N.O.	H-8	36-2 43-2	Yellow-Brown Green-Yellow	Thru timer unit disc, completes a circuit to step timer unit from 4th to 5th step.
R1 N.C.	K-1	27-4 50-12	Blue-Orange White	Opens circuit to flash select-now lite at 4th step of timer unit.
R2 N.O.	C-17	23-13 51-8	Blue-Yellow White-Red	In series with circuit to energize search index coil for scoring.
BEFORE 5th SELECTOR LOCK RELAY COIL	A-11	J 70	Jumper Orange	Energized thru timer unit disc, when 5th ball is shot.
L1 N.C.	B-11	74-6 J	Orange-Green Jumper	Opens circuit to coil.
L2 N.O.	C-13	10-6 25-8	Red Blue-White	Completes circuit to energize extra-ball relays, during extra-ball play.
L3 N.O.	E-4	18-6 50-2	Red-Black White	Completes circuit to energize start relay, during extra-ball play.
L4 S.P.D.T.	L-1	14-1 48-12 53-2	Red-Green Green-Black White-Yellow	Opens circuit to flash select-now lite before 5th ball, and completes circuit to flash it after 5th ball.
R1 N.C.	L-7	52-12 56-12	White-Blue White-Brown	Opens circuit to yellow rollover lite (on panel)
R2 N.C.	C-44	13-12 38-13	Red-Yellow Yellow-Black	Opens circuit to yellow rollover relay.
R3 N.C.	G-10	54-11 71-8	White-Green Orange-Red	Completes circuit to reset timer unit thru collect scores (R) button switch.
R4 N.O.	F-9	27-2 78-6	Blue-Orange Orange-Black	In series with circuit to step timer unit after 5th ball is shot.
R5 N.C.	G-41	21-12 98-3	Blue-Red Gray-Black	Opens circuit to magic-screen buttons (left and right).

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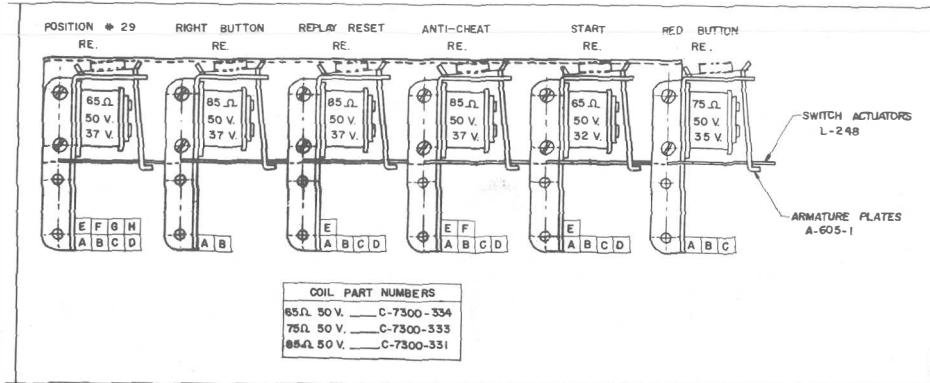
TRIP RELAY BANK CHART FOR POSITION OF SWITCHES REFER TO PICTORIAL VIEW ON PAGE 98

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
AFTER 5th SELECTOR RELAY COIL	A-11	J 70	Jumper Orange	Energized when 6th ball (1st extra-ball) is shot.
L1	N.C.	G-41	14-4 21-12 Red-Green Blue-Red	Opens circuit to magic screen buttons (left and right).
L2	N.C.	C-45	15-12 25-13 Red-White Blue-White	Opens circuit to red rollover relay.
L3	N.C.	B-45	98-11 J Gray-Black Jumper	Opens circuit to coil.
R1	N.C.	K-2	52-13 53-2 White-Blue White-Yellow	Opens circuit to flash select-now lite.
R2	N.C.	L-8	41-8 60-12 Green-Red Brown	Opens circuit to red rollover lite (on panel).

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
OK RELAY COIL	A-36	J 70	Jumper Orange	Energized thru spotting disc, when circuit complete thru other factors.
L1	N.C.	B-36	52-16 J White-Blue Jumper	Opens circuit to coil.
L2	N.O.	L-10	50-8 30 White Yellow	Completes circuit to OK feature lite.
L3	N.O.	B-42	57-14 71-7 White-Orange Orange-Red	Thru magic screen unit disc, completes a circuit to magic screen unit index coil.
L4	N.O.	C-43	27-15 98-12 Blue-Orange Gray-Black	Thru magic screen unit disc, completes a circuit to move right winding of magic screen motor, and circuit to energize move right button relay.
L5	N.O.	E-34	20-15 21-16 Blue Blue-Red	In series with circuit to energize orange section feature relay.
R1	N.C.	H-26	53-13 74-12 White-Yellow Orange-Green	Proportioning circuit for scores, and extra-ball steps.
R2	N.O.	J-6	10-11 30 Red Yellow	In series with a circuit to flash select-now lite, and thru selection feature disc lite red or yellow rollover lite.
R3	N.C.	H-26	54-13 65-12 White-Green Brown-White	Proportioning circuit for scores, and extra ball steps.
R4	N.C.	I-25	21-3 56-13 Blue-Red White-Brown	Proportioning circuit for scores and extra ball steps.
R5	N.C.	F-39	83-11 90-11 Black-Yellow Gray	Proportioning circuit for selection feature unit steps.
ORANGE SECTION RELAY COIL	A-34	J 70	Jumper Orange	Energized thru spotting disc, when circuit complete thru other factors.
L1	N.C.	B-34	21-16 J Blue-Red Jumper	Opens circuit to coil.
L2	N.O.	J-9	13-15 30 Red-Yellow Yellow	Completes circuit to orange section feature lite.
L3	N.O.	C-18	60 80 Brown Black	Completes a circuit to energize replay cams index coil for orange section replay scoring.
R1	N.C.	H-26	43-13 65-12 Green-Yellow Brown-White	Proportioning circuit for scores, and extra-ball steps.
R2	N.C.	H-25	45-13 72-12 Green-White Orange-Red	Proportioning circuit for scores, and extra-ball steps.

6 RELAY BANK PICTORIAL VIEW

LETTERS CORRESPOND TO SWITCH CHART BELOW



6 RELAY BANK SWITCH CHART

FOR POSITION OF SWITCHES REFER TO PICTORIAL VIEW ABOVE

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES	
POSITION 29 RELAY COIL	A-44	38-15 70	Yellow-Black Orange	Energized thru search disc when circuit is complete thru all other factors. This relay is energized when scoring in orange section (red letter game).	
A	N.C.	B-32	15-4 74-13	Red-White Orange-Green	Opens green score unit step-up circuit.
B	N.C.	C-18	60 80	Brown Black	Opens circuit to replay cams index coil.
C	N.O.	F-33	25-18 61-12	Blue-White Brown-Red	Completes circuit for stepping red, and yellow score units, magic screen feature unit, and selection feature unit. Also to energize red or yellow score booster relay.
D	N.O.	D-44	10-9 63-8	Red Brown-Yellow	Lock-in circuit for this relay.
E	N.C.	H-48	14-9 78-3	Red-Green Orange-Black	Opens green score unit, and red letter feature unit reset circuit.
F	N.C.	H-29	18-16 83-9	Red-Black Black-Yellow	Opens regular features step-up circuit.
G	N.O.	M-44	85-9 30	Black-White Yellow	Completes circuits to energize red scores stop relay, yellow scores stop relay, magic screen feature unit stop relay, and selection feature unit stop relay.
H	N.O.	D-7	50-16 53	White White-Yellow	Completes a circuit to run shutter motor. (Opens shutter to dump balls)
RIGHT BUTTON RELAY COIL	A-43	45-5 70	Green-White Orange	Energized by (right) button switch on front rail for moving magic screen right.	
A	S.P.D.T.	B-43	25-6 48-5 45-5	Blue-White Green-Black Green-White	Opens circuit to move left winding of magic screen motor, and completes lock-in circuit for this relay.
B	N.C.	G-42	31-16 36-4	Yellow-Red Yellow-Brown	Opens circuit to (left) button switch on front rail.

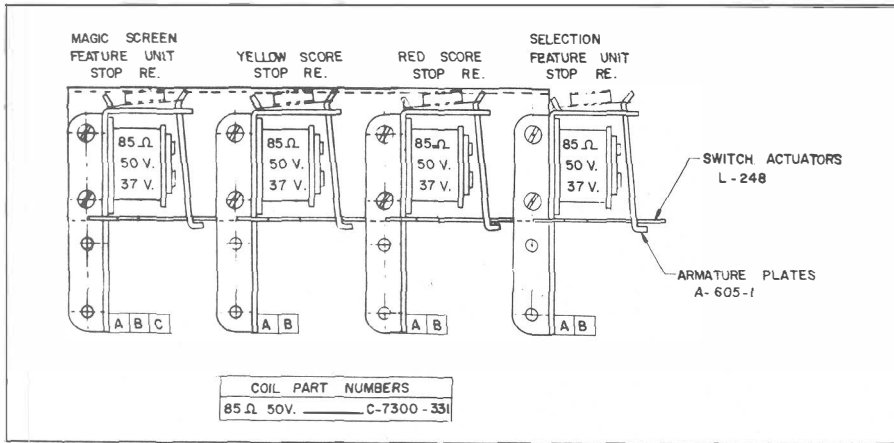
6 RELAY BANK SWITCH CHART

FOR POSITION OF SWITCHES REFER TO PICTORIAL VIEW AT LEFT

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES	
REPLAY RESET RELAY COIL	A-4	75-2 70	Orange-White Orange	Energized when anti-cheat relay drops out.	
A	S.P.D.T.	C-4	90-5 41-6 53-7	Gray Green-Red White-Yellow	Opens circuit to pulse replay register unit reset coil thru control unit cam switch #2A, and completes circuit to pulse coil thru mixer-spotting 16 pulse cam switch #1B.
B	N.O.	G-1	20P 60P	Blue (Plastic) Brown (Plastic)	Completes a circuit to run control unit, and mixer-spotting unit motors.
C	N.O.	G-4	56-2 75-2	White-Brown Orange-White	Lock-in circuit for this relay.
D	N.C.	C-5	13-9 83-3	Red-Yellow Black-Yellow	Opens circuit to start relay.
E	N.O.			This switch is used when replay meter is changed.	
ANTI-CHEAT RELAY COIL	A-27	78-4 70	Orange-Black Orange	Energized by control unit cam switch #5C, when circuit complete thru other factors. Switches on this relay protect replay scoring, feature and lite circuits.	
A	S.P.D.T.	G-4	75-2 56-2 50-2	Orange-White White-Brown White	Opens circuit to start relay, and completes circuit to energize replay reset relay, when this relay drops out.
B	N.O.	M-26	20-4 80-1	Blue Black	Opens 17 volt circuit, when this relay drops out.
C	N.O.	E-27	78-4 30	Orange-Black Yellow	Lock-in circuit for this relay, when energized.
D	N.C.	I-7	14-14 30	Red-Green Yellow	(Safety circuit) in series with circuit to close shutter when this relay drops out, and shutter is open.
E	S.P.D.T.	L-24	91-2 38 40	Gray-Red Yellow-Black Green	Opens 6 volt circuit to score lites, and completes circuit to tilt lite, when this relay drops out.
F	N.C.	F-13	57-6 85-7	White-Orange Black-White	(Safety circuit) completes a circuit to energize red button relay, when this relay drops out.
START RELAY COIL	A-5	13-16 70	Red-Yellow Orange	Energized each spin of game, playing coins or replays.	
A	N.C.	C-26	75-4 78	Orange-White Orange-Black	Opens extra-ball unit step-up circuit during spin.
B	N.C.	H-29	18-16 85-12	Red-Black Black-White	Opens circuit for features advantages during spin.
C	N.O.	F-4	13-16 48-2	Red-Yellow Green-Black	Lock-in circuit for this relay.
D	N.O.	F-6	10-10 48-2	Red Green-Black	Completes circuits to energize timer cams, and mixer latch coils, also in series with a circuit to run shutter motor. (Open shutter)
E	N.C.	B-43	10-9 38-9	Red Yellow-Black	Opens circuit to position 29 relay.
RED BUTTON RELAY COIL	B-12	85-7 91-15	Black-White Gray-Red	Energized by red button switch. Also when tilt relay is energized, or anti-cheat relay drops out.	
A	S.P.D.T.	C-6	93-2 98-2 14-3	Gray-Yellow Gray-Black Red-Green	Opens circuit to energize mixer latch, and timer cams index coils during extra-ball play, and completes a circuit to run shutter motor (open shutter) when starting new game after extra ball play.
B	S.P.D.T.	L-13	21-4 51-15 25-15	Blue-Red White-Red Blue-White	Opens circuit to extra-balls lite, and completes circuit to all features lite.
C	N.O.	D-12	27-8 57-6	Blue-Orange White-Orange	Lock-in circuit for this relay.

(VERTICAL) 4 RELAY BANK PICTORIAL VIEW

LETTERS CORRESPOND TO SWITCH CHART BELOW



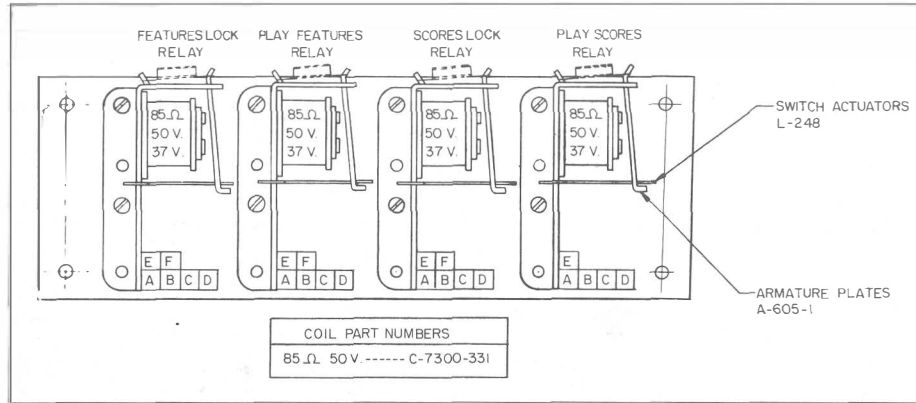
(VERTICAL) 4 RELAY BANK SWITCH CHART

FOR POSITION OF SWITCHES REFER TO PICTORIAL VIEW ABOVE

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
MAGIC SCREEN FEATURE UNIT STOP RELAY COIL	J-46	18-15 70	Red-Black Orange	Energized thru red letter feature disc, and magic-screen feature disc, when position #29 relay is energized. (For red letter games scoring).
A S.P.D.T	D-33	52-5 41-14 45-15	White-Blue Green-Red Green-White	Opens circuit for stepping magic-screen feature unit, and completes circuit for other guaranteed features of a red letter game.
B N.C.	B-39	15-13 78-15	Red-White Orange-Black	Opens regular selection feature unit step-up circuit.
C N.O.	K-49	65-11 71-11	Brown-White Orange-Red	Thru selection feature, and red letter feature discs, completes a circuit to energize selection feature unit stop relay.
YELLOW SCORE STOP RELAY COIL	J-45	15-15 70	Red-White Orange	Energized thru red letter feature disc, and yellow score disc when position #29 relay is energized. (For red letter games scoring.)
A S.P.D.T.	E-33	56-3 40-13 41-14	White-Brown Green Green-Red	Opens circuit for stepping yellow score unit, and completes circuit for other guaranteed features of a red letter game.
B N.C.	B-34	52-5 93-12	White-Blue Gray-Yellow	Opens regular magic-screen feature unit step-up circuit.
RED SCORE STOP RELAY COIL	J-44	14-15 70	Red-Green Orange	Energized thru red letter feature disc, and red score disc when position #29 relay is energized. (For red letter game scoring.)
A S.P.D.T.	E-33	85-15 36-7 40-13	Black-White Yellow-Brown Green	Opens circuit for stepping red score unit, and completes circuit for other guaranteed features of a red letter game.
B N.C.	B-30	13-3 85-15	Red-Yellow Black-White	Opens regular red score unit step-up circuit.
SELECTION FEATURE UNIT STOP RELAY COIL	J-47	21-14 70	Blue-Red Orange	Energized thru red letter feature disc, and selection feature disc when position #29 relay is energized. (For red letter game scoring.)
A S.P.D.T.	C-33	78-15 45-15 48-15	Orange-Black Green-White Green-Black	Opens circuit for stepping selection feature unit, and completes circuit for other guaranteed features of a red letter game.
B N.C.	G-37	61-7 91-11	Brown-Red Gray-Red	(Safety circuit) opens regular circuit for energizing red or yellow score booster relay.

(HORIZONTAL) 4 RELAY BANK PICTORIAL VIEW

LETTERS CORRESPOND TO SWITCH CHART BELOW



(HORIZONTAL) 4 RELAY BANK SWITCH CHART

FOR POSITION OF SWITCHES REFER TO PICTORIAL VIEW ABOVE

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
FEATURES LOCK RELAY COIL	A-46	53-14 70	White-Yellow Orange	Energized by control unit cam switch #7B, when play feature relay is energized.
A N.O.	B-46	40-15 53-14	Green White-Yellow	Lock-in circuit for this relay.
B N.O.	F-35	45-6 75-12	Green-White Orange-White	Completes a possible magic-screen feature unit run circuit.
C N.O.	E-34	50-13 71-9	White Orange-Red	Same function as switch B above.
D N.O.	G-35	45-6 90-13	Green-White Gray	Completes a possible circuit for all game features.
E N.C.	I-29	21-3 80-8	Blue-Red Black	Game proportioning circuit.
F N.O.	H-37	13-17 48-13	Red-Yellow Green-Black	Completes a possible circuit for red or yellow score booster feature relay.

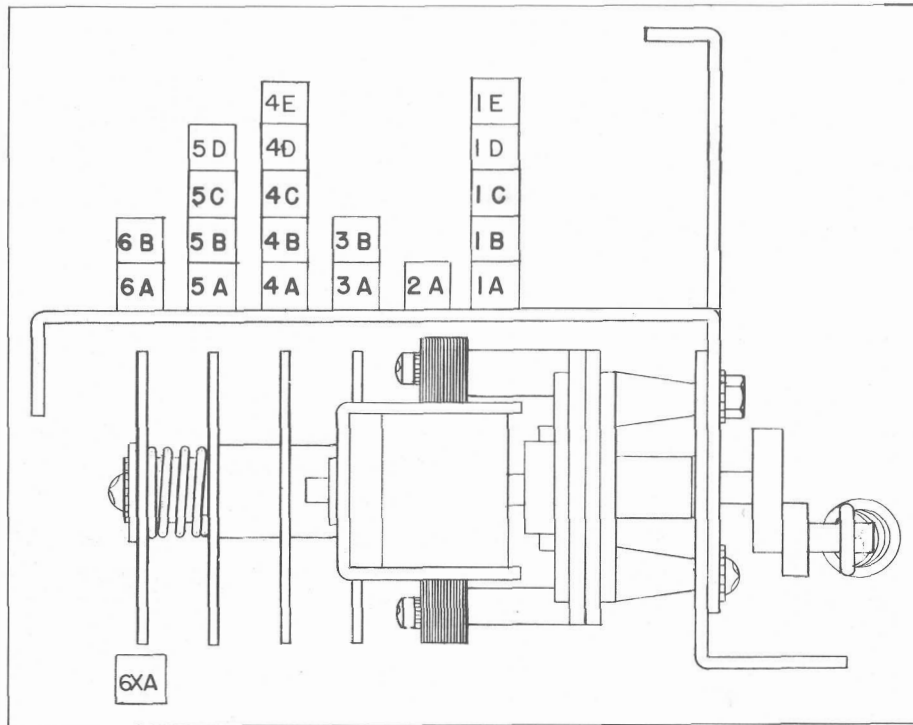
(HORIZONTAL) 4 RELAY BANK SWITCH CHART

FOR POSITION OF SWITCHES REFER TO PICTORIAL VIEW AT LEFT

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
PLAY FEATURES RELAY COIL	A-47	61-13 70	Brown-Red Orange	Energized by (green) play features button switch, when playing to advance features only.
A S.P.D.T.	J-13	36-15 30 23-15	Yellow-Brown Yellow Blue-Yellow	Opens circuit to "all features lite," and "play scores feature lite," and completes circuit to "play features lite."
B N.O.	C-46	43-14 53-14	Green-Yellow White-Yellow	Completes circuit to energize features lock relay.
C N.O.	G-36	10-15 27-13	Red Blue-Orange	Completes a possible circuit for OK feature.
D N.O.	B-48	61-13 81-13	Brown-Red Black-Red	Lock-in circuit for this relay.
E N.C.	A-31	71-13 70	Orange-Red Orange	Opens yellow, red, and green score unit step-up circuit.
F N.C.	K-20	31-5 74-15	Yellow-Red Orange-Green	Opens circuit for flashing score lites.
SCORES LOCK RELAY COIL	A-47	93-14 70	Gray-Yellow Orange	Energized by control unit cam switch #7B, when play scores relay is energized.
A N.O.	F-30	23-12 27-5	Blue-Yellow Blue-Orange	Completes a possible circuit for yellow, red and green score unit steps.
B N.O.	F-30	38-5 57-12	Yellow-Black White-Orange	Same function as switch A above.
C N.O.	F-30	14-6 63-12	Red-Green Brown-Yellow	Same function as switch A & B above.
D N.O.	G-29	56-11 60-6	White-Brown Brown	Same function as switch A, B, C above.
E N.C.	G-33	91-13 98-14	Gray-Red Gray-Black	Opens circuit to all game features.
F N.O.	B-47	40-15 93-14	Green Gray-Yellow	Lock-in circuit for this relay.
PLAY SCORES RELAY COIL	A-49	65-15 70	Brown-White Orange	Energized by (blue) play scores button switch, when playing to advance scores only.
A S.P.D.T.	K-13	15-15 36-15 21-15	White-Red Yellow-Brown Blue-Red	Opens circuit to "all features lite" and completes circuit to "play scores feature lite."
B N.O.	D-28	10-1 91-5	Red Gray-Red	Completes circuit for score steps.
C N.O.	C-47	43-14 93-14	Green-Yellow Gray-Yellow	Completes circuit to energize scores lock relay.
D N.O.	B-49	57-13 65-15	White-Orange Brown-White	Lock-in circuit for this relay.
E N.C.	K-12	27-16 56-15	Blue-Orange White-Brown	Opens circuit for flashing feature lites.

SHUTTER MOTOR PICTORIAL VIEW

LETTERS CORRESPOND TO SWITCH CHART BELOW



SHUTTER MOTOR CAM SWITCH CHART

FOR POSITION OF SWITCHES SEE PICTORIAL VIEW AT LEFT

CAM SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES	
2A	N.C.	F-14	31-3 36-3	Yellow-Red Yellow-Brown	(Closed when shutter is closed) in series with circuit to run ball lifter motor.
3A	N.O.	G-46	85-5 30	Black-White Yellow	Resets extra-ball unit, yellow, red, green replay counter units, and selection feature unit, when starting new game.
3B	N.O.	H-2	20P 70P	Blue(Plastic) Orange (Plastic)	Resets trip relay bank, when starting new game.
4A	N.O.	F-7	14-3 18-3	Red-Green Red-Black	(Closed when shutter is open) in series with circuit to close shutter if game is tilted, when shutter is open.
4B	N.C.	I-38	21-3 40-8	Blue-Red Green	(Closed when shutter is closed) in series with circuit to make magic screen buttons (L-R), and collect scores button (R) alive. Also in series with circuit to energize selector lock relays.
4C	N.O.	H-7	18-3 45-8	Red-Black Green-White	(Closed when shutter is open) Same function as switch 4A above.
4D	N.C.	I-11	10-13 40-8	Red Green	(Closed when shutter is closed) in series with circuit to energize before 5th, and after 5th selector lock relays.
4E	N.O.	F-44	63-8 30	Brown-Yellow Yellow	Completes lock-in circuit for position 29 relay.
5A	N.C.	H-9	65-2 98-8	Brown-White Gray-Black	(Closed when shutter is closed) Same function as switch 1C.
5B	N.O.	G-45	31-4 91-4	Yellow-Red Gray-Red	(Closed when shutter is open) In series with lock-in circuit for lifter start relay.
5C	N.O.	G-32	85-2 91-13	Black-White Gray-Red	(Closed when shutter is open) In series with circuit for game advantages.
5D	S.P.D.T.	E-6	61 10-10 93-2	Brown-Red Red Gray-Yellow	Directs circuits to open shutter, and energize timer cams, and mixer latch coils, when start relay is energized.
6XA	N.C.	B-12	91-15 70	Gray-Red Orange	Note: This switch is mounted on bracket under cam 6. (Open only during shutter cycle) In series with circuit to energize red button relay.
6A	N.O.	H-9	71-8 30	Orange-Red Yellow	Resets timer unit, when starting new game.
6B	N.O.	H-46	78-3 30	Orange-Black Yellow	Resets magic screen feature unit, yellow, red, and green score units and red letter feature unit, when starting new game.

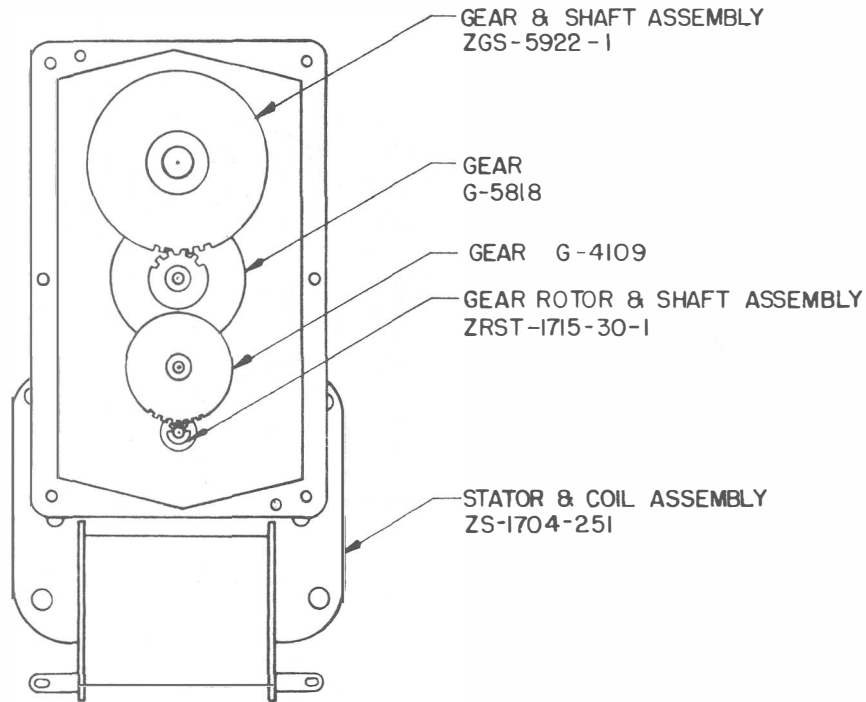
SHUTTER MOTOR CAM SWITCH CHART

FOR POSITION OF SWITCHES SEE PICTORIAL VIEW ABOVE

CAM SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES	
1A	N.C.	I-15	14 21-3	Red-Green Blue-Red	(Closed when shutter is closed) completes circuit for section or in-line replay scoring thru control unit change-over cam switch #15A.
1B	N.O.	G-6	14-3 30	Red-Green Yellow	Completes carry-over circuit to shutter motor.
1C	N.C.	I-9	21-3 98-8	Blue-Red Gray-Black	(Closed when shutter is closed) in series with circuit to step timer unit, after 5th ball is shot.
1D	N.O.	F-44	63-8 30	Brown-Yellow Yellow	Starts lock-in circuit for position 29 relay.
1E	N.C.	I-35	21-3 90-3	Blue-Red Gray	(Closed when shutter is closed) in series with circuit to advance features, and scores for red letter game scoring.

SHUTTER MOTOR

(MOTOR PART NO. E-119-99)



NOTE:

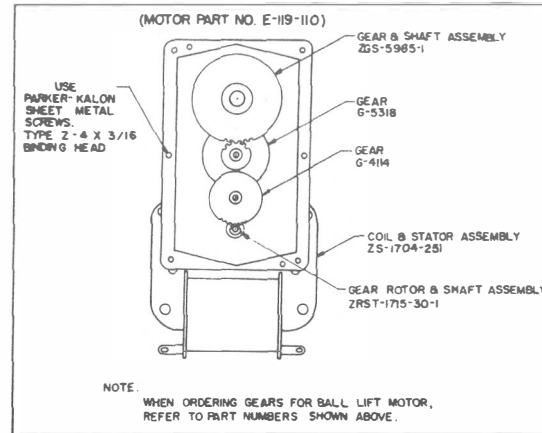
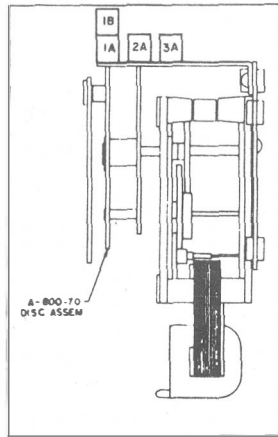
WHEN ORDERING GEARS FOR SHUTTER MOTOR,
REFER TO PART NUMBERS SHOWN ABOVE.

NEW ANTI-CHEAT COIN SWITCH CIRCUIT

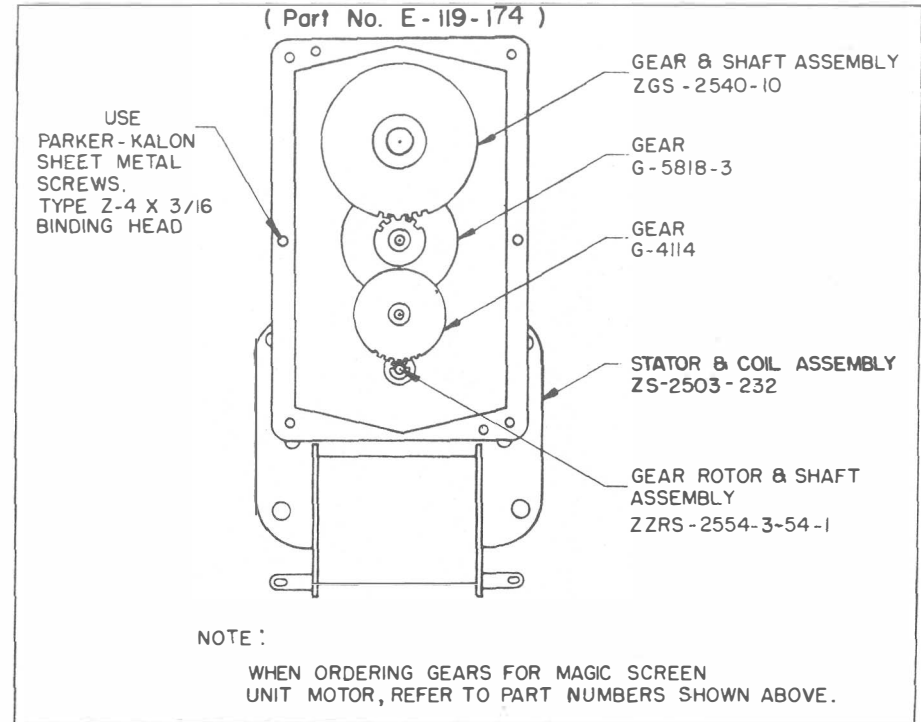
The coin switch gives a very short pulse, when operated by a coin. With this new circuit, the game will tilt if the pulse is not as short as from a coin, so that operating the coin switch with wire, strings, etc., usually results in a tilt.

The circuit is completed thru control unit cam switch #4D (on wiring diagram at G-5).

BALL LIFT MOTOR PICTORIAL VIEW



MAGIC SCREEN UNIT MOTOR



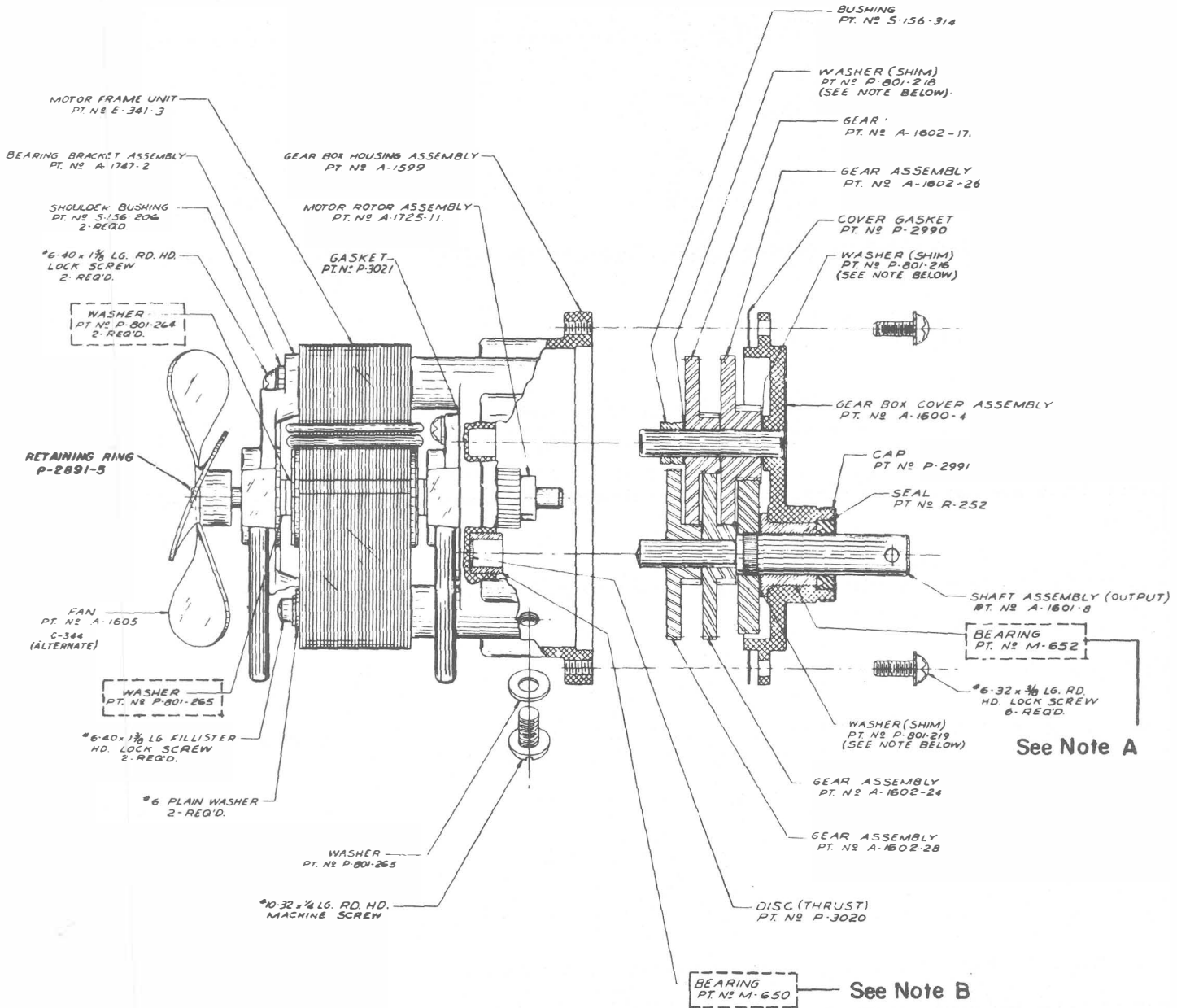
BALL LIFT MOTOR CAM SWITCH CHART FOR POSITION OF SWITCHES SEE PICTORIAL VIEW

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
1A	N.C.	G-11 15-6 85-6	Red-White Black-White	(Safety circuit) for before 5th selector lock trip relay.
1B	N.O.	G-14 91-1 30	Gray-Red Yellow	Completes carry-over circuit to ball lift motor.
2A	N.O.	F-8 27-2 43-2	Blue-Orange Green-Yellow	Completes circuit to energize timer unit step-up coil.
3A	N.O.	H-11 21-3 83-7	Blue-Red Black-Yellow	Completes circuit to energize before 4th selector lock relay, thru timer unit disc.

MAGIC SCREEN UNIT PARTS

PART No.	NAME
AS-1809-2	Complete Magic Screen Unit assembly
W-851-4	Contact plate
26-GG-10	Coil
A-613-55	Core plug
AS-1846-1	Index Arm and plunger assembly
P-163-32	Key Washer
M-943	Ladder Chain
P-801-310	Leather Washer
E-119-174	Motor
S-496-152	Plunger only for AS-1846-1

MOTOR ASSEMBLY (Part No. E-119-212)



NOTE

IN ORDER TO MAINTAIN PROPER CLEARANCES BETWEEN GEARS IT IS MOST IMPORTANT THAT WHEN REASSEMBLING GEAR TRAIN:

1. SHIMS BE REPLACED IN THEIR RESPECTIVE LOCATIONS.
2. SAME NUMBER OF SHIMS BE REPLACED IN EACH RESPECTIVE LOCATION.

NOTE A: Bearing M-652 is part of Gear Box Cover Assembly A-1600-4 and cannot be ordered separately.

NOTE B: Bearing M-650 is part of Gear Box Housing Assembly A-1599 and cannot be ordered separately.

CABINET				PANEL					
24		22		8		24		24	
20-2	57-14	13	45-3	57-13	74-16	14-3	61	10-10	52-12
25-8	71-2	14-5	48-2	60-13	75-13	25-1	71-1	14	57-1
27-8	78-7	15-6	50-2	61-13	81-13	31-1	74-1	15-6	61-4
30	80-2	18-6	54-5	65-15		36-3	75-13	18-3	63-1
31-16	81	21-3	63-2			40-8	78-3	21-3	65-1
40-7	85-13	27-2	70			41-5	81	25-18	70
45-16	90-5	31-4	71-6			43-1	85-3	30	71-8
48-4	91-7	36-3	80-6			45-8	90-1	36-1	75-1
50-16	93-7	38-3	85-7			51-1	91-15	40-1	80-6
52-9	98-11	41-4	90-9			53-1	93-2	41-4	85-5
53-18	40 P	43-2	91-1			54-1	98-12	45-1	91-13
54-11	90 P					60-1		50-1	98-6

PANEL

20	
13-12	50-5
14-12	52-1
15-12	56-1
20	61-1
27-1	63-8
31-4	65-2
38-1	85-12
41-8	91-4
45-16	20 P
48-1	70 P

TRANSFORMER

10	
20	81
30	20 P
54-2	40 P
70	50 P
80-1	90 P

FRONT DOOR

20	
13	61-13
14-5	63-2
18-6	70
21-3	71-2
25-8	74-16
27-8	75-13
40-7	80-13
48-2	85-7
50-2	90-9
57-13	

PLUG SHEET FOR ROLLER DERBY

NOTES

NOTES

MISCELLANEOUS PARTS

Back Cabinet Assembly:

Part No.	Name of Part
G-292-9	Back glass
M-281-14	Lock and keys (2) keyed alike
E-122-19	Transformer

Back Door Assembly:

M-281-24	Lock and Keys (2) keyed alike
SW-100-106	Lock switch
E-300-115	Search relay bank assembly

Front Cabinet Assembly:

M-168-15	Ball
AS-187-17	Ball shooter assembly
AS-1835	Ball shooter housing
A-100-7	Ball shooter rod
SP-200-24	Ball shooter spring (long)
SP-243	Ball shooter spring (short)
R-108-3	Ball shooter tip
P-711-1	Cigarette holder
P-1900-47	Coin box
A-2304-2	Coin box cover
E-130-10	Counter—48 volt
P-4052	Legs
M-106-1	Leg bolt
M-163-4	Leg adjuster
P-2768-15	Ring—blue
E-108-57	Toggle switch

Front Door Assembly:

Part No.	Name of Part
A-1538-3	Armature plate (AS-277-50)
A-1729-6	Button—metal
E-101-45	Coil for coin lock out
AS-277-50	Coin switch assembly 5¢ or 10¢
CA-567-106	Front door only
AS-2041	Front door assembly 5¢
AS-2041-1	Front door assembly 10¢
A-254-33	Hinge and bracket
M-281-6	Lock and keys
E-108-14	Micro switch for coin switch assembly 5¢ or 10¢
P-2768-5	Ring—red
P-2768-6	Ring—yellow
P-2768-7	Ring for M-281-6 lock
P-2768-16	Ring—green
M-280-15	Slug rejector 5¢
M-280-16	Slug rejector 10¢

Front Moulding Assembly:

A-2359	Coin slide 5¢ or 10¢
AS-1305-16	Front moulding assembly complete
A-1272-29	"R" Button
A-1272-30	Right Button
A-1272-31	Left Button
P-2210-81	5¢ Plate
P-2210-80	10¢ Plate
P-2210-84	Plate—Red letter game
P-2210-85	Plate—Register all replays
P-2210-63	Plate for Left & Right button
P-2210-38	Plate for "R" Button
CA-1053-2	Front moulding only

Panel Assembly:

AS-1315	Ball gate and switch assembly
C-326-9	Light Shield post
R-115-4	Rebound rubber
M-170	Rebound spring-Double post
C-387-1	Roll over button—red
C-387-2	Roll over button—yellow
R-243	Rubber ring for Yellow post
R-243-2	Rubber ring for Red post

Bally pin game lubricant now available in one half-pint
(8 Oz.) containers with plastic spout and screw cap.