Bally® MIAMI BEACH

OPERATING INSTRUCTIONS AND PARTS CATALOG

Part Numbers are marked on illustrations

FOR QUICKEST SERVICE STATE CORRECT PART NUMBER WHEN ORDERING PARTS

MISCELLANEOUS PARTS

Back Cabinet Assembly:

Part No.	
G-248	Back glass
M-281-14	Lock and keys (2) keyed alike
E-122-19	Transformer

Back Cabinet Insert Assembly:

AS-1489	Curtain assembly
A-1787	Drive wheel assembly—Top
A-1795	Motor and Rail Assembly
E-119-102	Motor only
G-249	Numbered glass
A-1788-1	Rail assembly—Bottom
A-1788	Rail assembly—Top

Back Door Assembly:

M-281-12	Lock and Keys (2) keyed alike
E-300-66	Search relay bank complete

Front Cabinet Assembly:

M-168-15	Ball
AS-187-12	Ball shooter assembly
A-1540	Ball shooter housing
A-100-7	Ball shooter rod
SP-200-24	Ball shooter spring (long)
SP-237	Ball shooter spring (short)
R-108-3	Ball shooter tip
A-429-14	Ball trough only
P-1900-18	Cash box
E-130-10	Counter—48 volt
CA-753-2	Front moulding only
CA-350-1	Leg
M-163-4	Leg Adjuster
M-106	Leg Bolt
M-310-2	Leg—Anti-Split Bolt
P-2210-8	Plate—Coin entry—5¢
P-2210-9	Plate—Coin entry—10¢
M-497	Wire (long) for A-429-14 ball trough
M-497-1	Wire (short) for A-429-14 ball trough

Front Door Assembly:

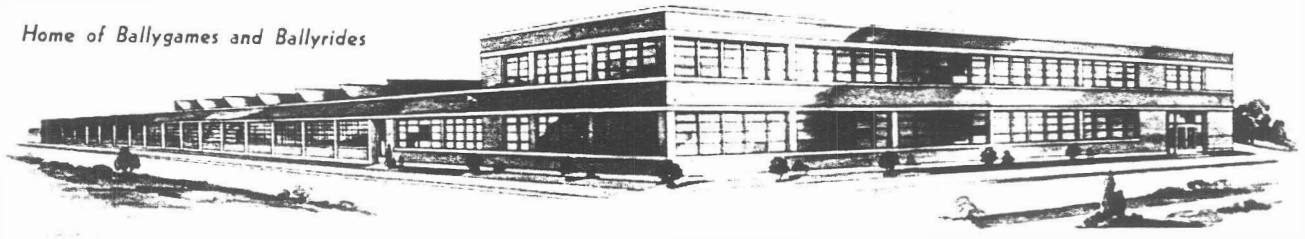
Part No.	
A-1729-4	Button—Metal
C-2342-102	Coil for coin kicker assembly
E-101-45	Coil for coin lock out
AS-1316	Coin kicker assembly
AS-277-26	Coin switch assembly complete 5¢
AS-277-27	Coin switch assembly complete 10¢
CA-567-22	Front door only
AS-1491	Front door complete 5¢
AS-1491-1	Front door complete 10¢
A-254-36	Hinge and bracket
M-281-6	Lock and keys
E-108-32	Micro switch—Coin switch assembly 5¢ or 10¢ play.
P-2768-5	Ring—Red—for A-1729-4 button
P-2768-6	Ring—Yellow—for A-1729-4 button
M-280-15	Slug rejector 5¢
M-280-16	Slug rejector 10¢

Rotary Switch Assembly—Front Door:

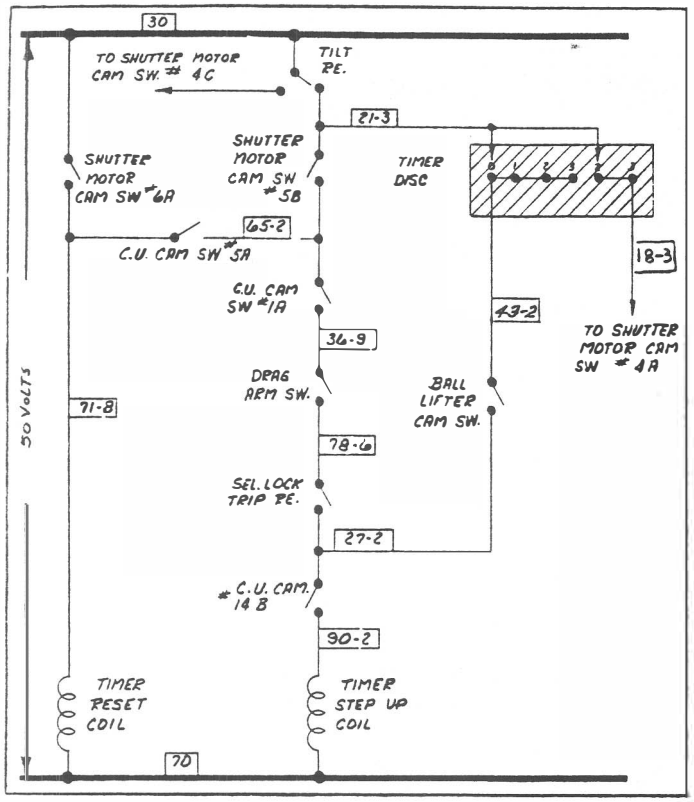
A-1123-1	Arm and roller
W-629	Contact plate
A-105-5	Gear
A-776-1	Knob and shaft
AS-901-6	Magnet and bracket assembly
E-101-53	Magnet only
AS-832-9	Rotary switch assembly complete
A-480-9	Wiper assembly

Panel Assembly—Top:

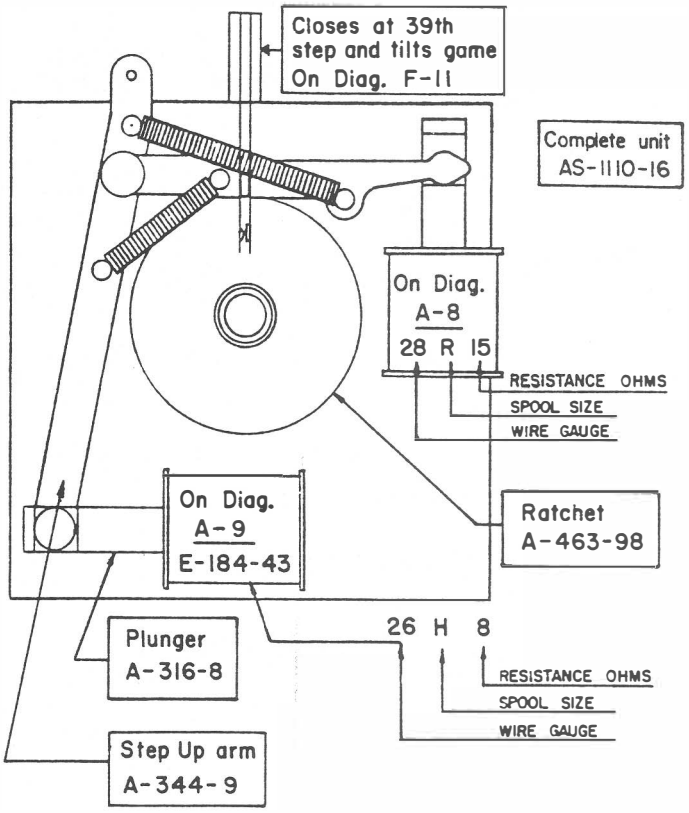
AS-1315	Ball gate and switch assembly
C-326-9	Light shield post
R-115-4	Rebound rubber
M-170	Rebound Spring—Double post
R-243	Rubber ring for Yellow post
R-243-2	Rubber ring for Red post



TIMER UNIT STEP-UP AND RESET CIRCUIT



TIMER UNIT viewed from COIL side



FUNCTION OF TIMER UNIT

The Timer Unit resets to zero position at the start of a new game by shutter motor cam switch No. 6A. (Diagram H-8).

Control Unit cam switch No. 5A resets this unit every time a play occurs on extra balls. (Diagram G-8).

This unit steps up one position when the 1st ball comes up thru a circuit on wiper (A) and the ball lifter cam switch. (Diagram E- 7).

When the 1st ball is shot the 2nd ball is raised and the timer unit is stepped to its 2nd position; at this position wiper (B) completes circuit to the shutter motor which will close the shutter board. (Diagram H- 7).

At the 2nd position wiper (E) diagram E-11 keeps the circuit to the ball lifter motor alive even though the 8th ball trough switch is now open. This circuit remains closed for 38 steps.

Wiper (A) diagram H- 7 keeps the timer step-up coil circuit alive for 4 steps or until the 4th ball is raised.

The three other circuits which are made at the 4th step of the unit are as follows:

Wipers (D) and (E) makes magic pocket button alive.

Wipers (F) and (G) completes circuit to selector lock trip.

Wipers (H) and (I) completes circuit to "Turn Knobs Now" and "Press Buttons Now" lites.

TIMER UNIT viewed from BUTTON or WIPER side

39 step unit. Wipers shown in zero or reset position

Completes circuit to ball lift motor at 1st step of unit to 39th step when 8th ball trough switch opens Diag.- E-1 — 38-3

Completes circuit to "Select Now Lite" at 4th step of this unit. Diag.-J-3 — 61-6

Completes circuit for 4 steps to this unit for ball count. Diag.-H-7 — 30

Completes circuit to shutter motor cam switch #4 B and then to shutter motor. Shutter will close at 2nd step of this unit. Diag.-H-7 — 43-2

Feeds the above two circuits Diag.-H-7 — 18-3

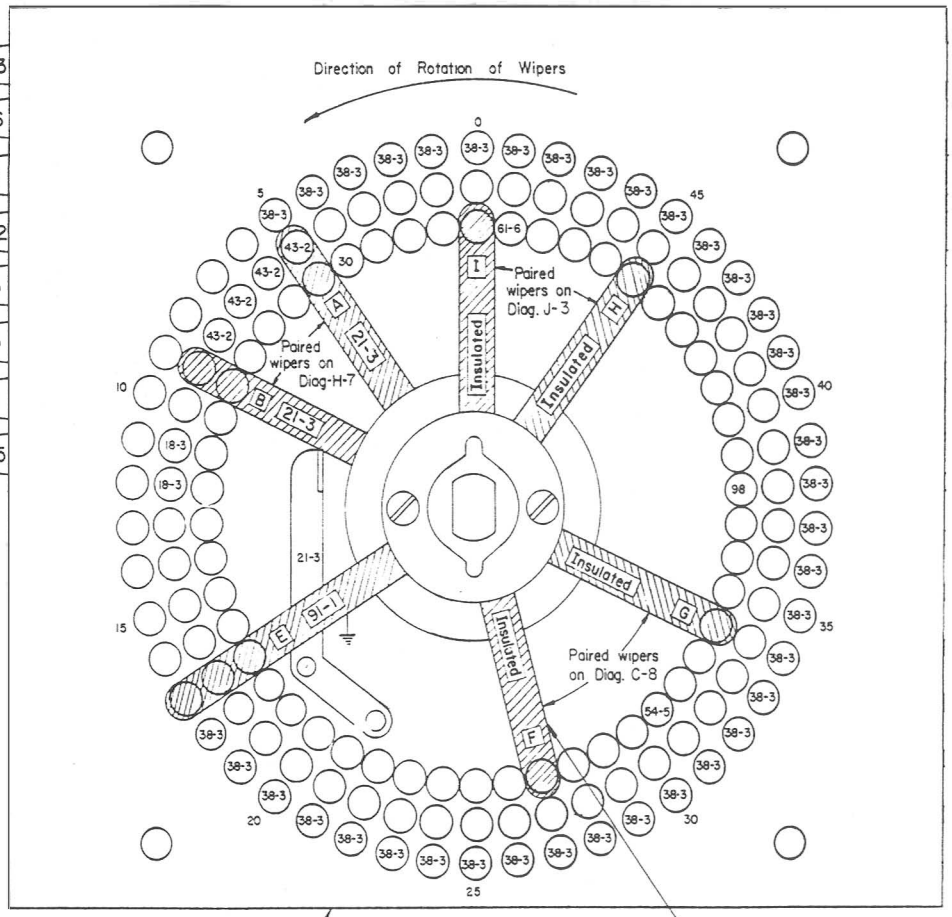
21-3

98

To normally closed switch on Selector Lock trip coil. These two wires are shorted by wipers F & G at 4th step of this unit. Diag.-B-9 — 54-5

91-1 — Ground to frame of unit

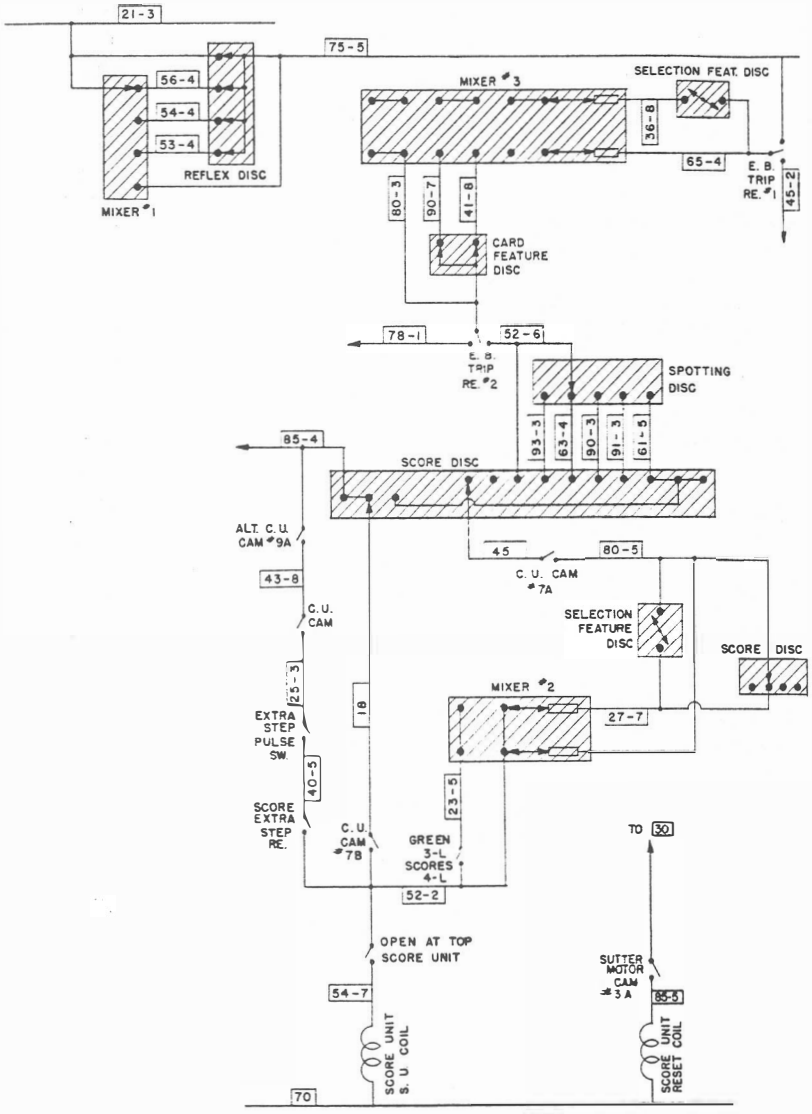
Note:- Diag.-E-11 etc. refers to location on schematic diagram



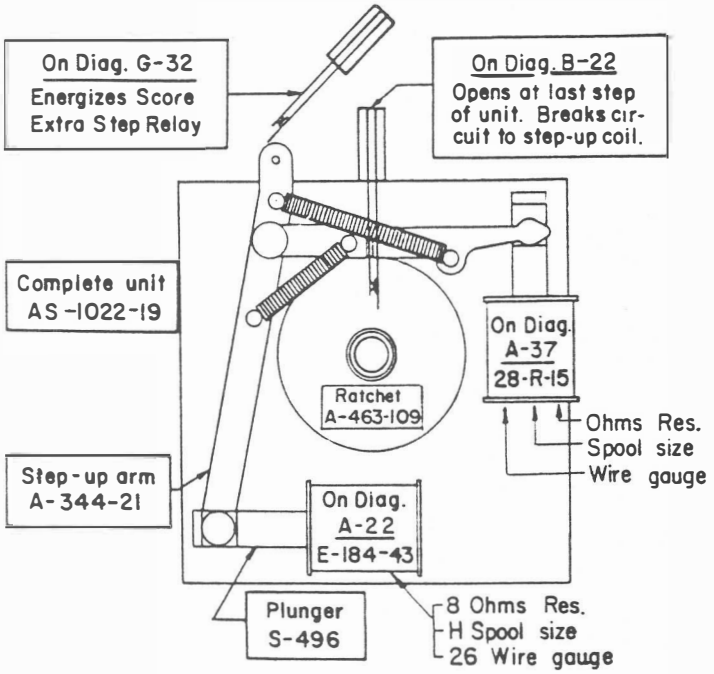
Disc (wired) W-643

Wiper Assembly AS-1046-116 a

SCORE UNIT STEP-UP AND RESET AND RED AND YELLOW 3-IN-LINE SCORES 4-IN-LINE CIRCUIT



SCORE UNIT viewed from COIL side



FUNCTION OF SCORE UNIT

The score unit resets to zero position at the start of a new game when shutter motor cam switch #3A operates (diagram C-38). Near the end of the spin of the control unit, cam switch #7B closes and steps unit to 1st position (diagram B-22). When another play is made the unit will step again to its 2nd position. In other words the first two steps are guaranteed, and operate on successive spins of the control unit.

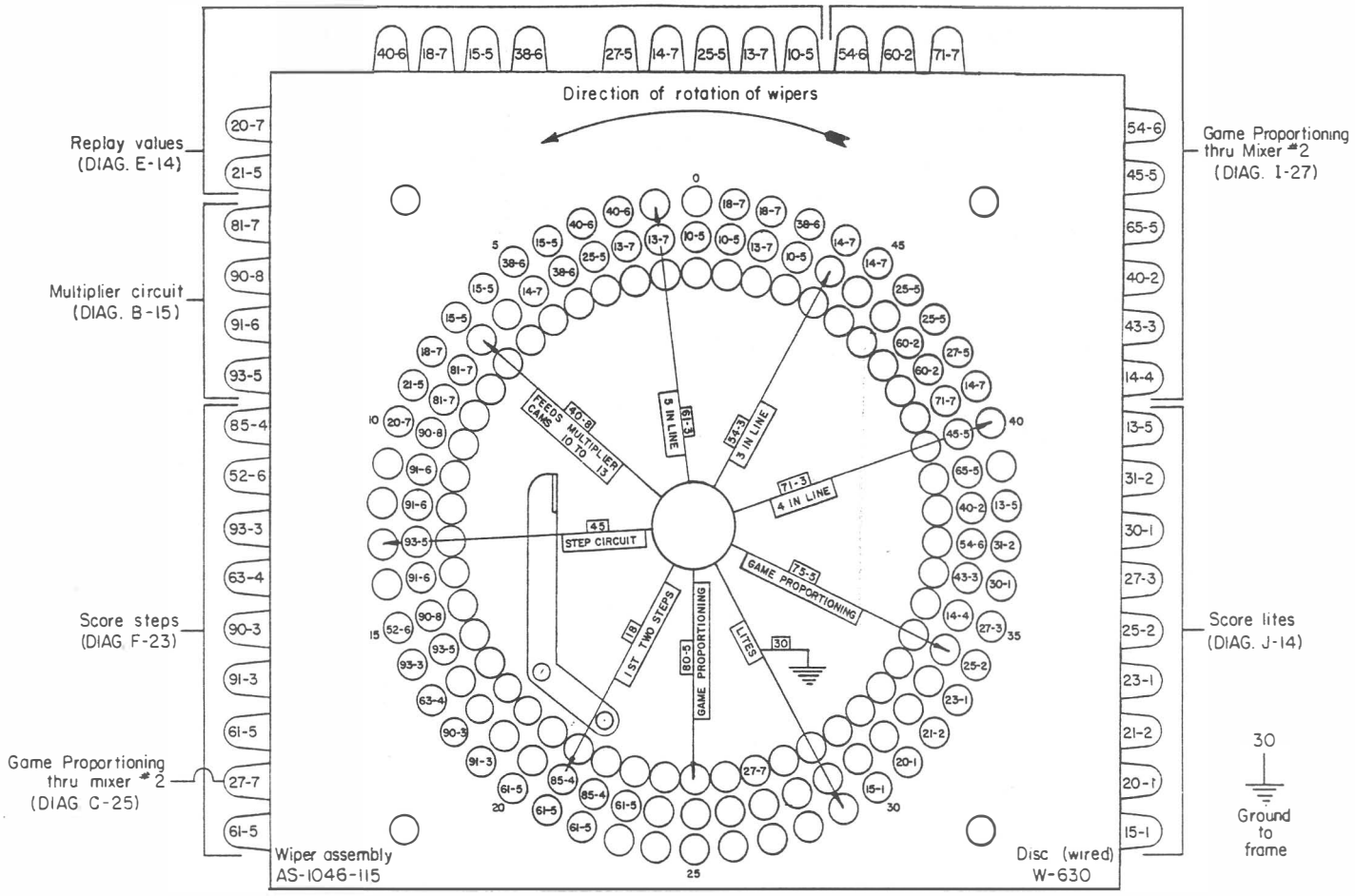
Additional single steps occur thru wires 52-6; 93-3; 63-4; 90-3; 91-3; 61-5.

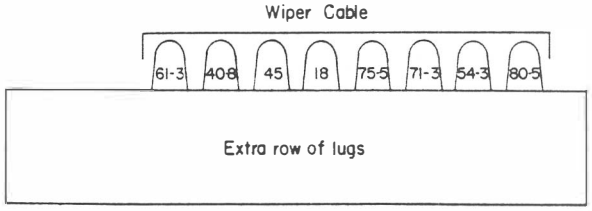
Multiple steps occur on this unit when the score extra step assembly stops on one of its irregular shaped ledges at the same time that a single step occurs. (See mixer spotting unit).

The score unit at the time it makes a single step energizes the score extra step relay and a switch on it completes the circuit for multiple steps.

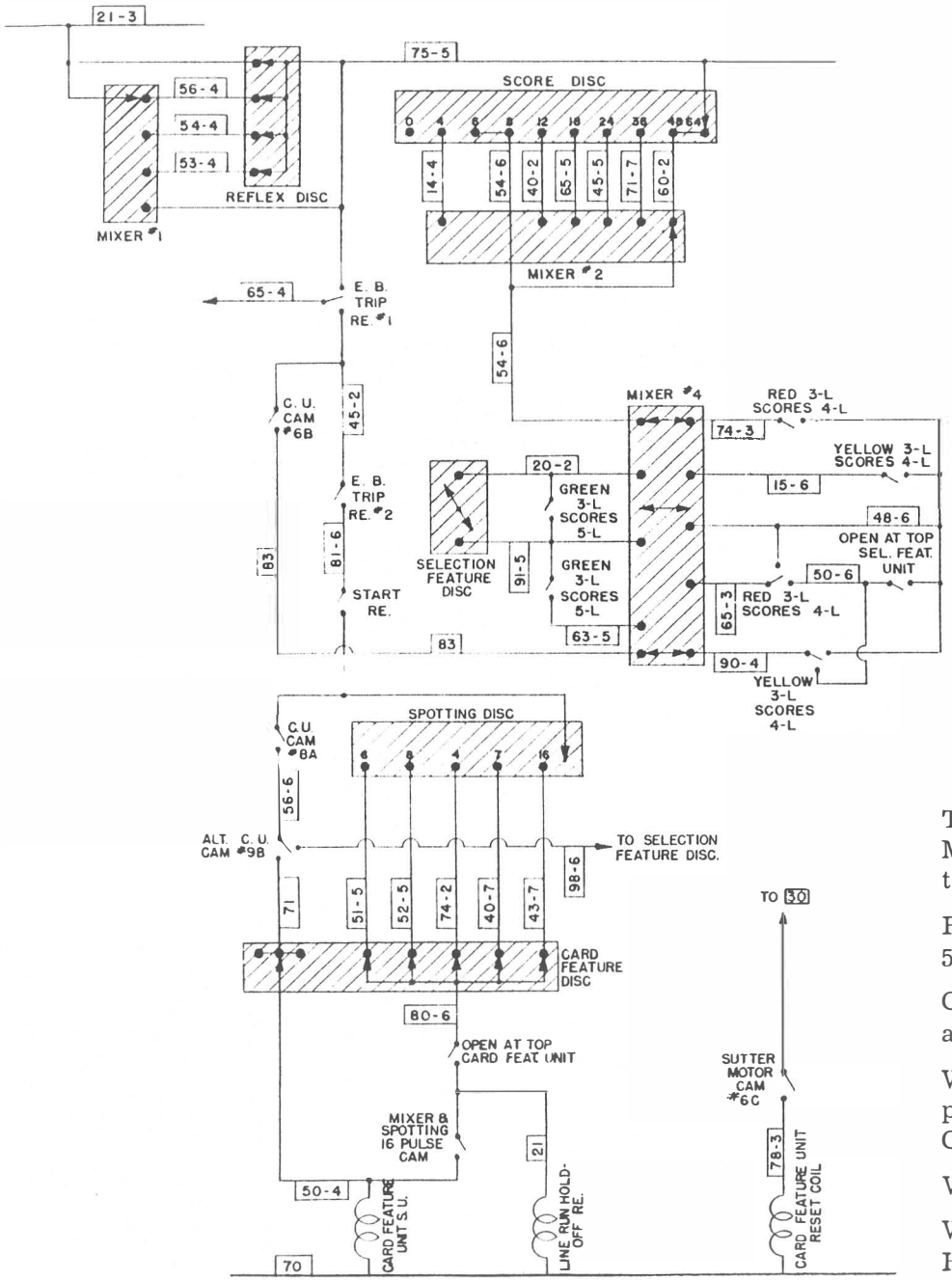
SCORE UNIT viewed from BUTTON or WIPER side

9 step unit. Wipers shown in zero or reset position

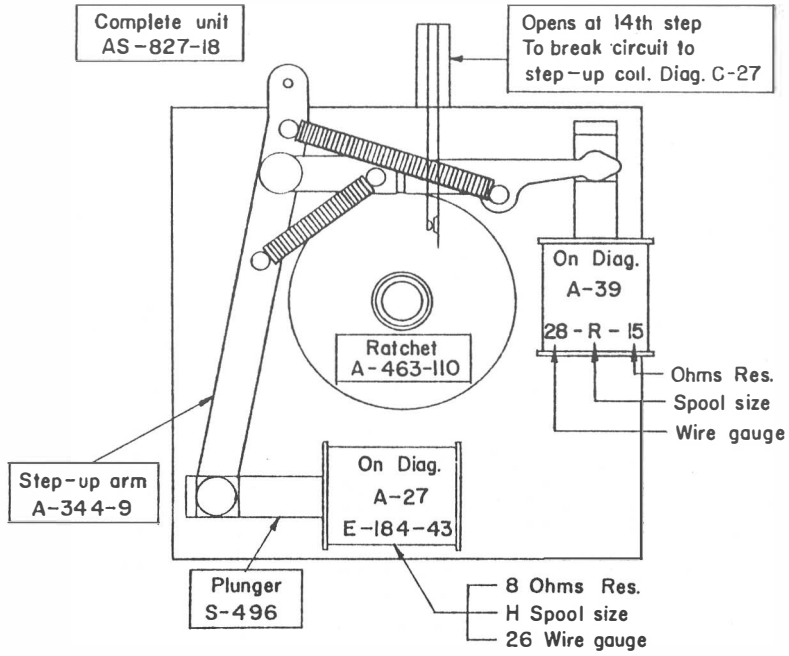




CARD FEATURE STEP-UP AND RESET CIRCUIT



CARD FEATURE UNIT viewed from COIL side



FUNCTION OF CARD FEATURE UNIT

The Card Feature Unit resets at the start of a new game when Shutter Motor Cam No. 6C closes. (Diagram C-39) Single step circuits are made thru wiper **E** and wire No. 71. (See next page)

Run circuits are made thru wiper **F** and wire numbers 74-2; 40-7; 43-7; 51-5; 52-5. (See next page)

Circuits to run curtain motor for opening cycle are made thru wiper **C** and wire numbers 75; 10-2; 57-2. (See next page)

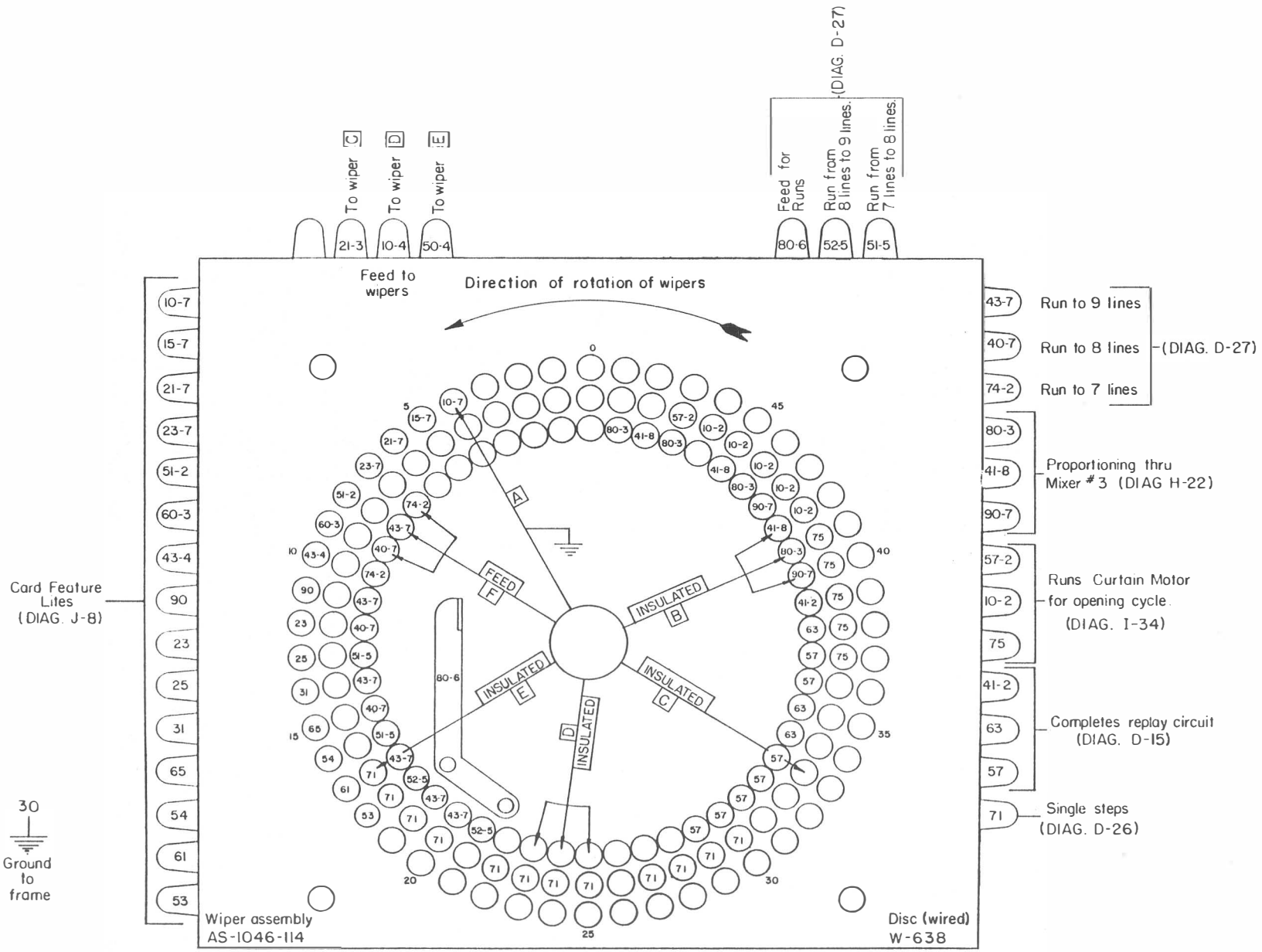
Wiper **D** completes circuit thru wire numbers 57; 63; 41-2; (See next page) to Search Index Coil (diagram A-12) and Replay Counter Step-up Coil (diagram A-15) for replay scoring when winner is made.

Wiper **A** completes circuit to "Card Feature" lites. (Diagram J-8)

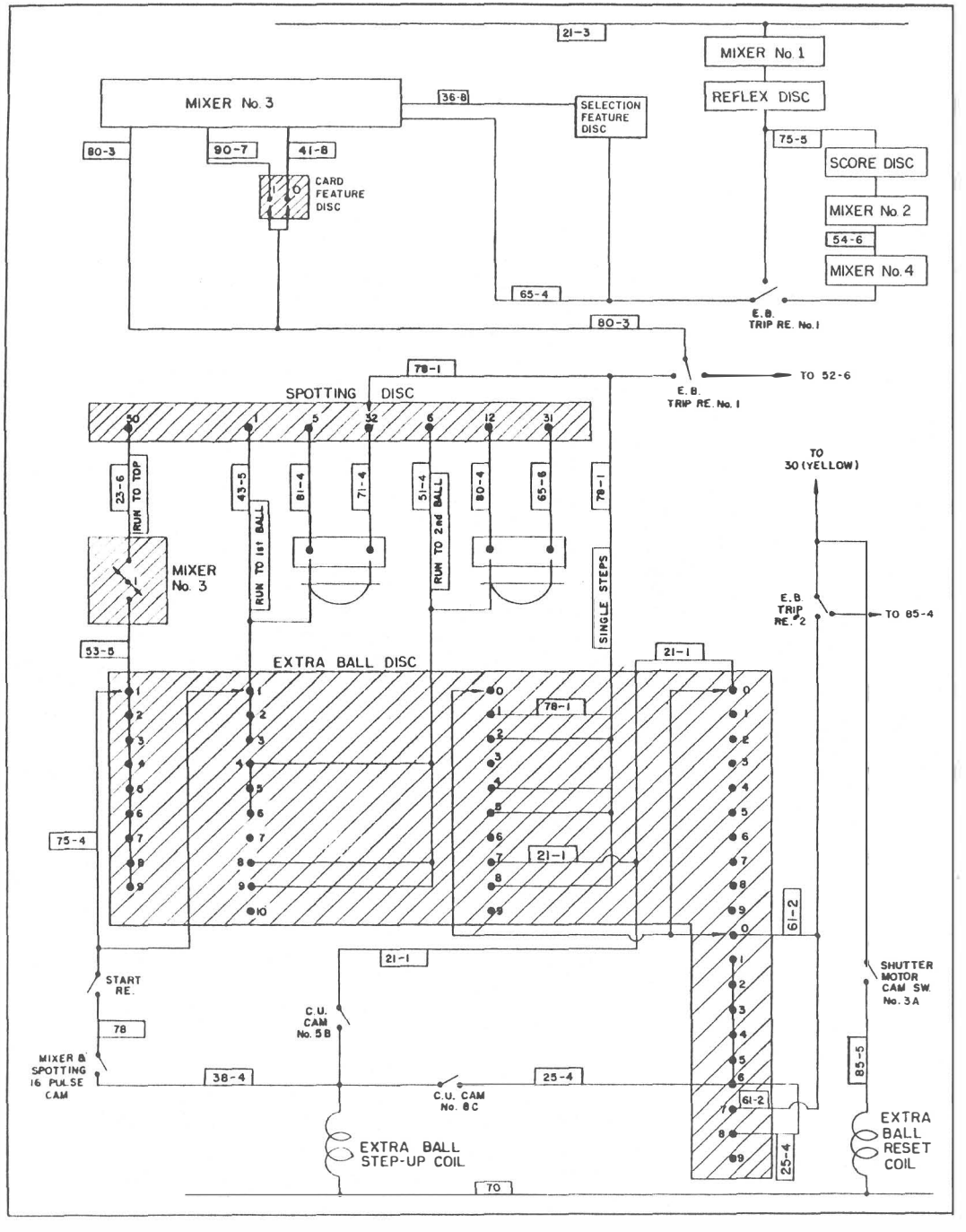
Wiper **B** completes proportioning circuits thru mixer No. 3. (Diagram H-22)

CARD FEATURE UNIT viewed from BUTTON or WIPER side

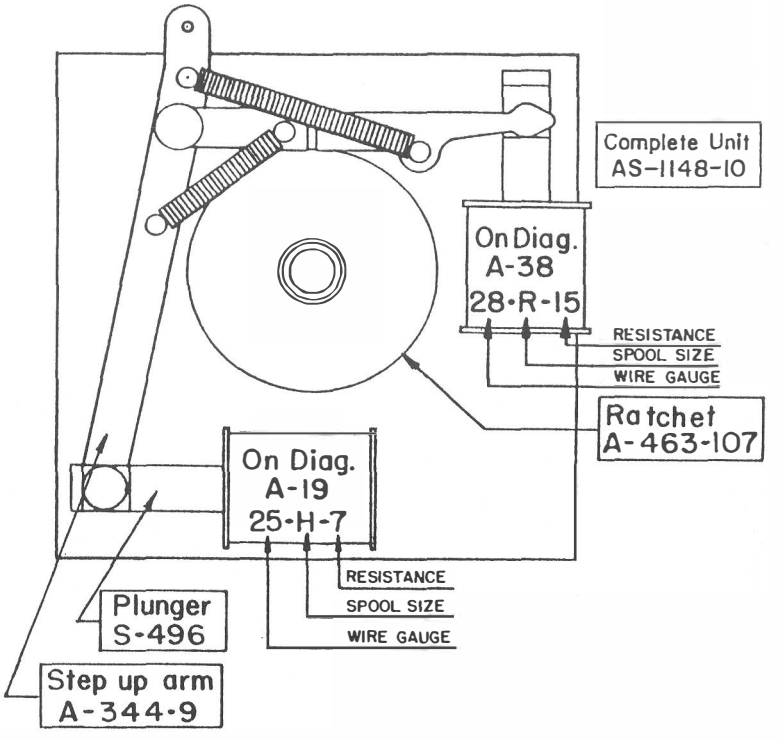
14 step unit. Wipers shown in zero or reset position



EXTRA BALL STEP-UP AND RESET CIRCUIT



EXTRA BALL UNIT viewed from COIL side



FUNCTION OF EXTRA BALL UNIT

The Extra Ball Unit resets to zero position at the start of a new game when Shutter Motor Cam Switch No. 6A operates.

The first spin that occurs on Extra Ball play will allow cam No. 5B to step the unit to its first position. (Wipers F and E).

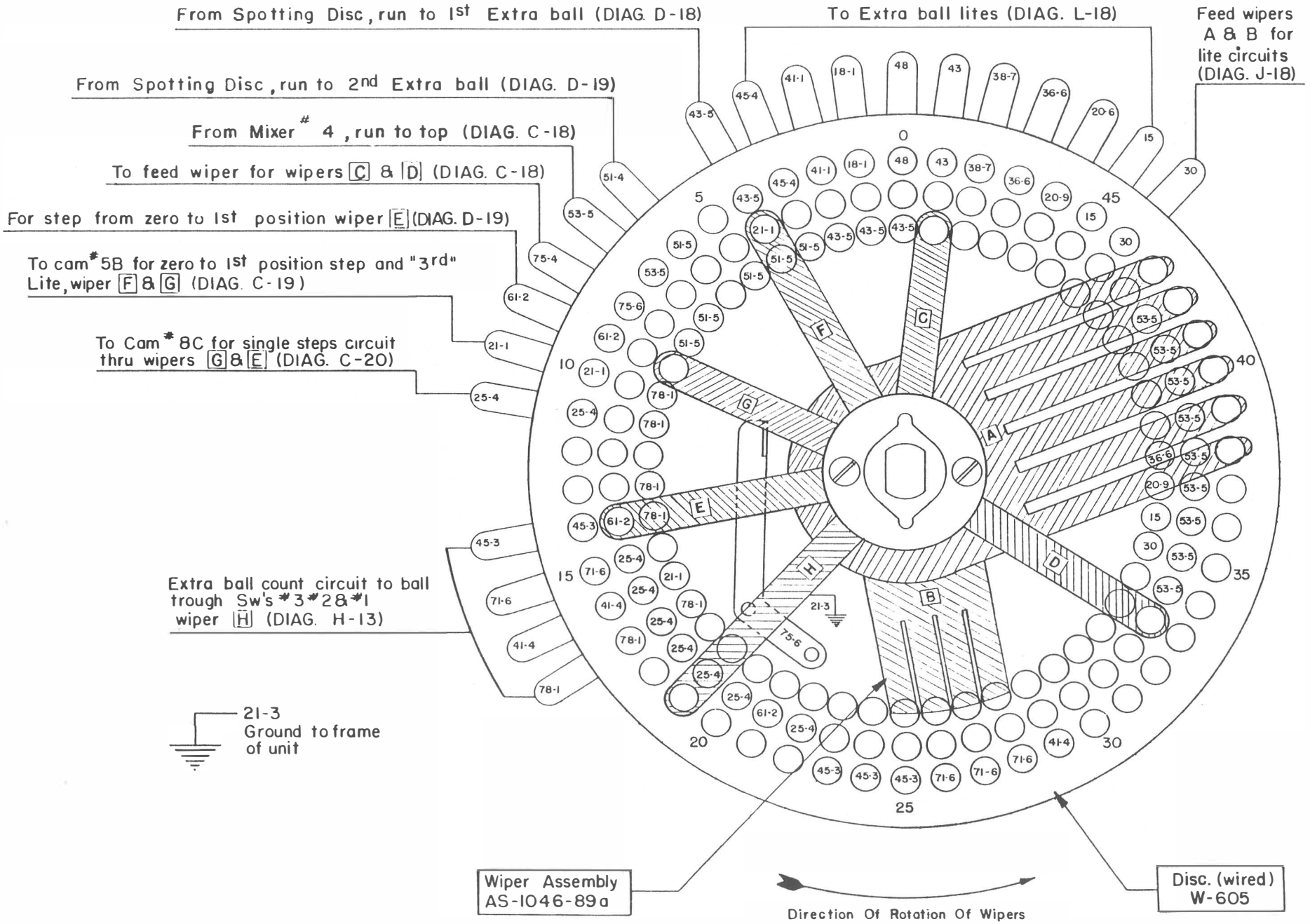
Single step circuits are made thru G and wire No. 78-1 (see next page).

The circuit to the 1st Extra Ball is made thru wiper C and wire No. 43-5 (see next page). The same wiper carries the circuit for stepping to the 2nd extra ball, and 3rd extra ball.

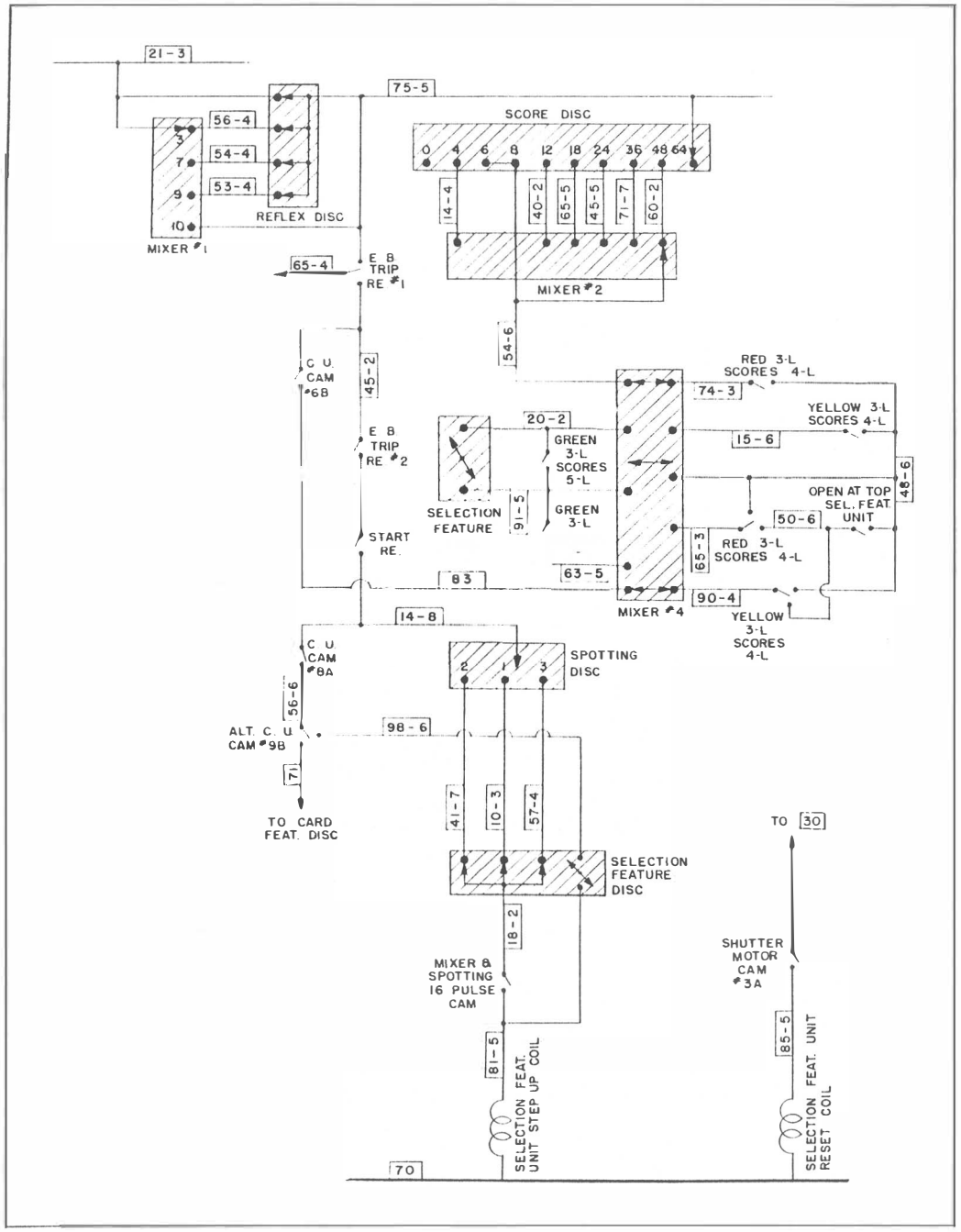
For a complete circuit to the top of the unit, wiper D completes a circuit thru wire No. 53-5.

EXTRA BALL UNIT viewed from BUTTON or WIPER side

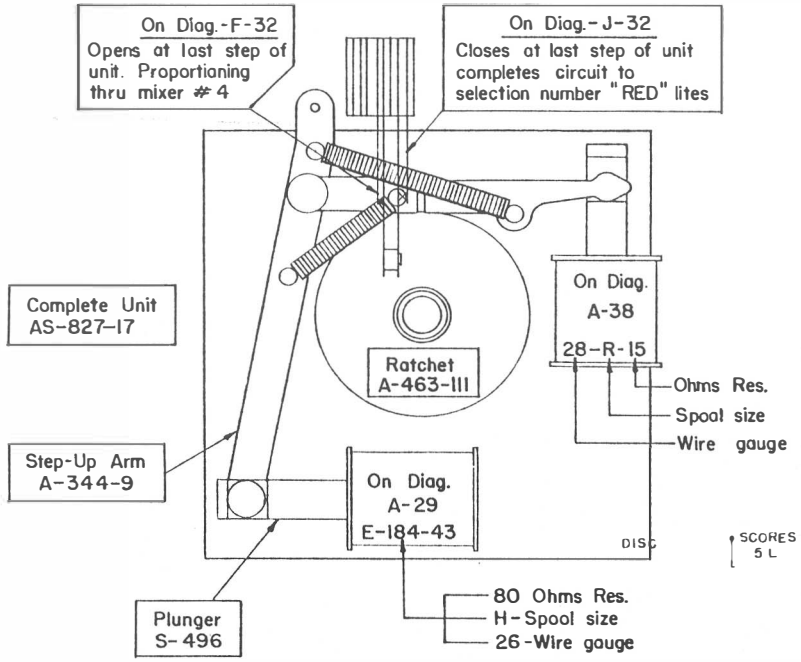
10 step unit. Wipers shown in zero or reset position



SELECTION FEATURE UNIT STEP-UP AND RESET CIRCUIT



SELECTION FEATURE UNIT viewed from COIL side



FUNCTION OF SELECTION FEATURE UNIT

The Selection Feature Unit resets at the start of a new game when Shutter Motor Cam No. 3A closes. (Diagram C-38)

Single step circuits are made thru wipers **C** & **E** fed by wires No. 98-6 and 81-5. (See next page)

Run circuits are made thru wiper **F** and wire numbers 57-4; 41-7; 18-2; 10-3. (See next page)

Wiper **D** completes proportioning circuits thru mixer No. 2. (Diagram C-26)

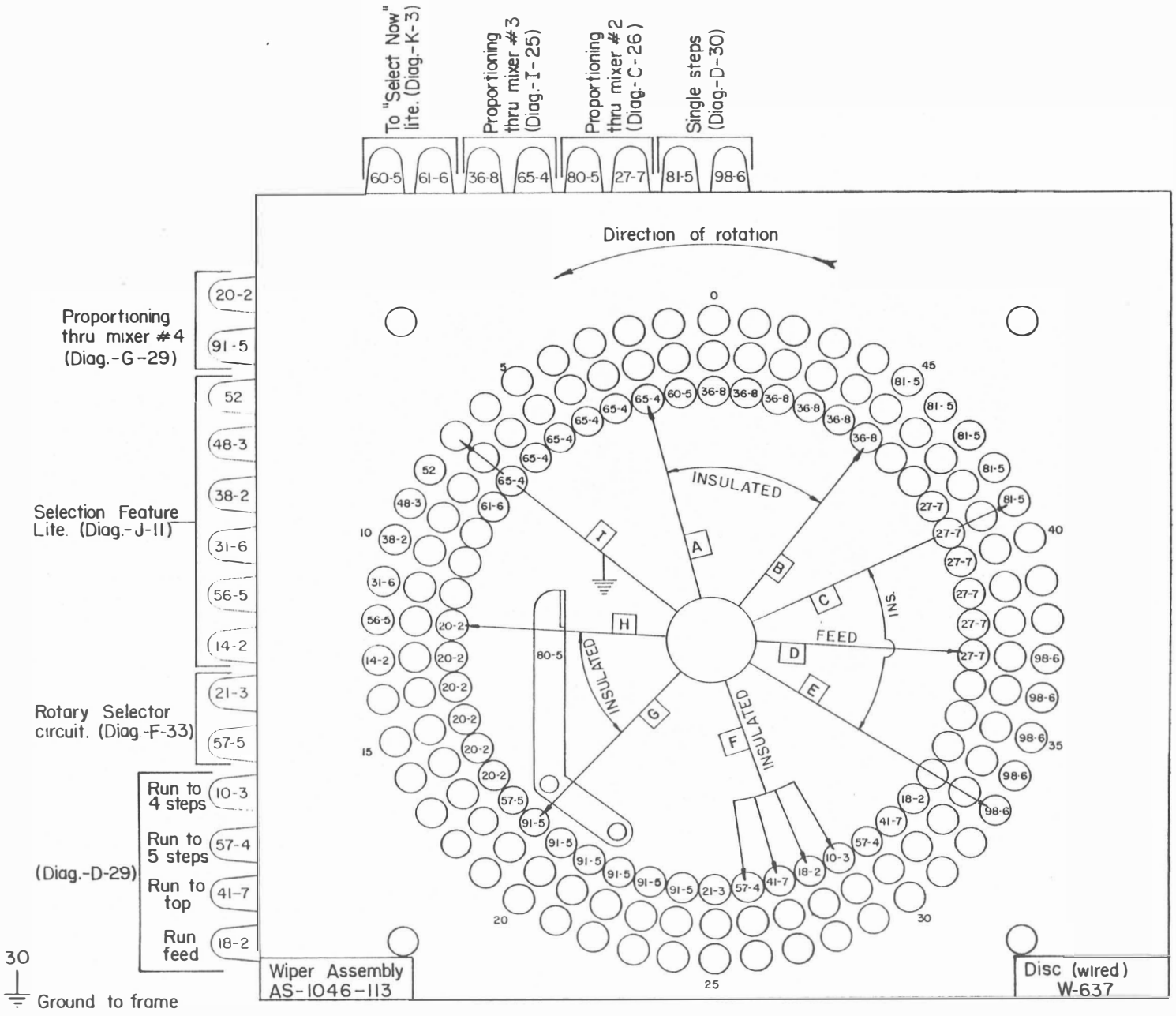
Wipers **A** & **B** complete proportioning circuits thru mixer No. 3. (Diagram I-25). They also complete circuit to flash "Select Now" lite when this unit is at its 6th step. (Diagram K-3)

Wipers **H** & **G** complete proportioning circuits thru mixer No. 4. (Diagram G-29). They also complete circuit to rotary selector coil when this unit is at its 6th step. (Diagram F-33).

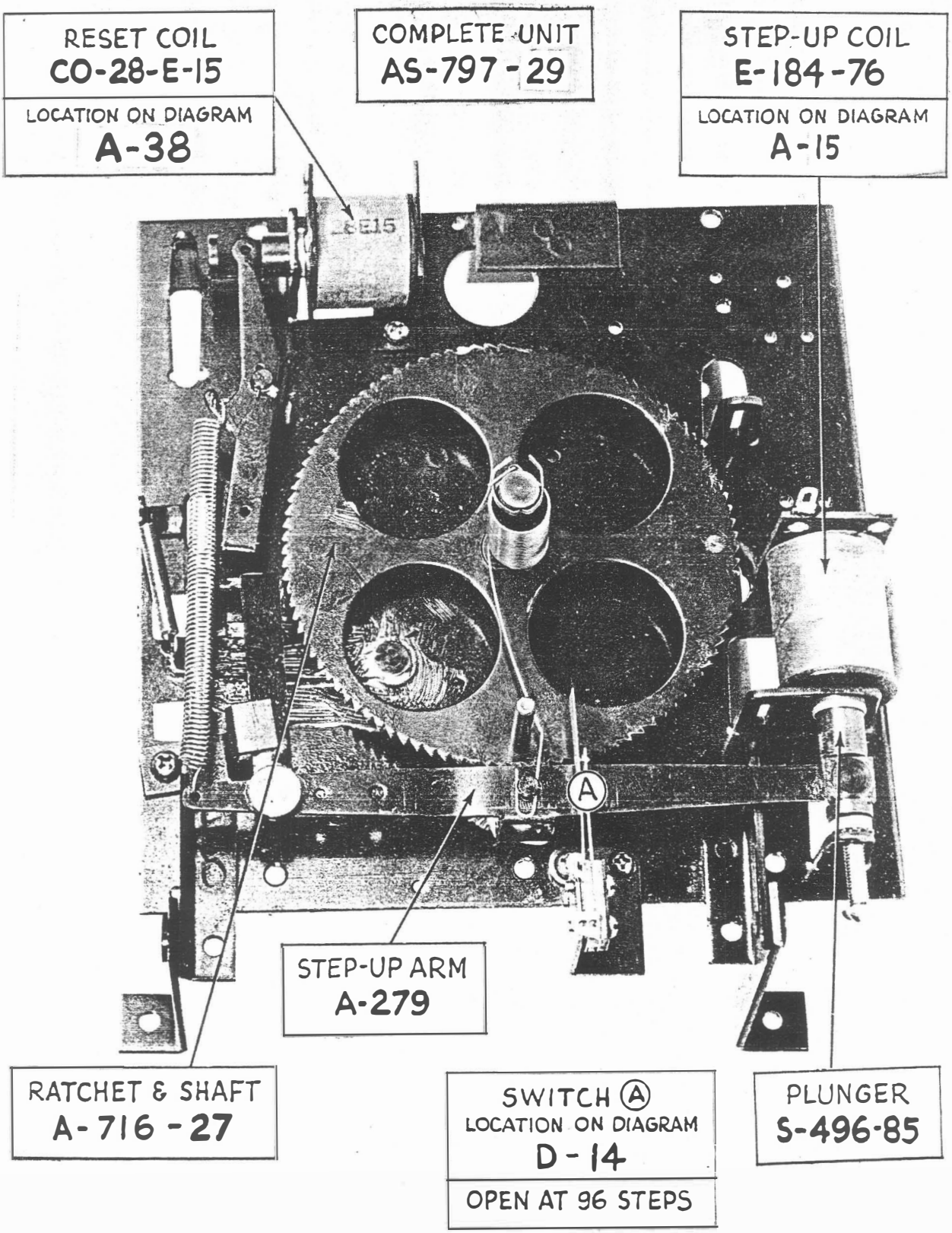
Wiper **I** completes circuit to "Selection Feature" lites. (Diagram J-11)

SELECTION FEATURE UNIT viewed from BUTTON or WIPER side

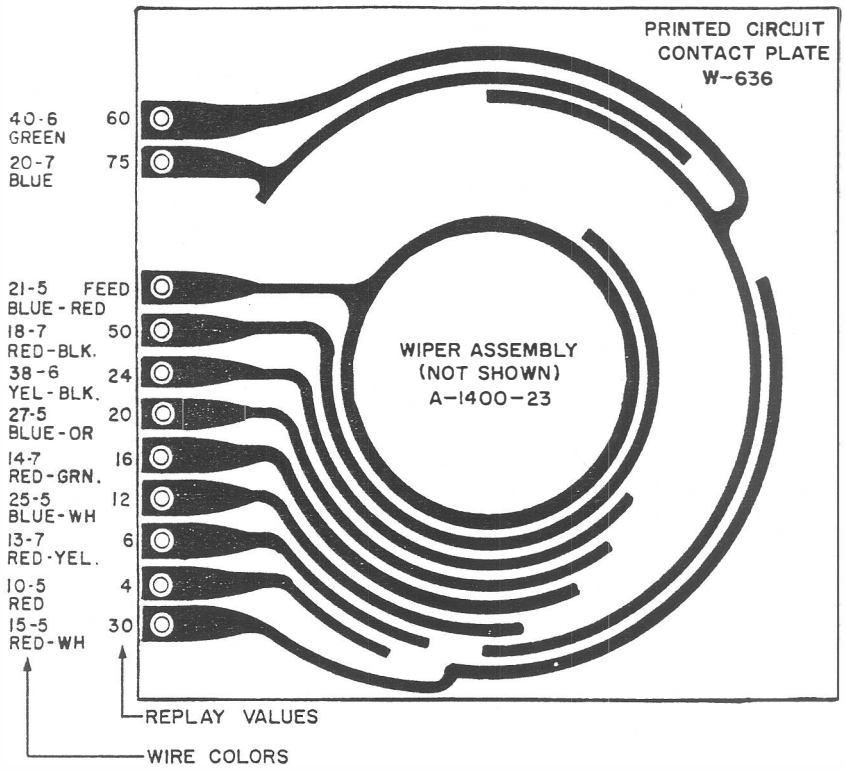
6 step unit. Wipers shown in zero or reset position



REPLAY COUNTER viewed from COIL side



REPLAY COUNTER viewed from WIPER side



	CAM SWITCHES THAT PULSE REPLAY COUNTER STEP-UP COIL								
	SW. 13A	SW. 13A	SW. 12A	SW. 11A	SW. 11A	SW. 10A	SW. 11A	SW. 12A	SW. 10A
5 IN LINE	60 (60)	60 (60)	60 (30)	72 (24)	90 (30)	120 (30)	150 (50)	192 (NOTE)	300 (75)
4 IN LINE	16 (16)	20 (20)	24 (12)	36 (12)	48 (16)	64 (16)	72 (24)	100 (50)	200 (50)
3 IN LINE	4 (4)	6 (6)	8 (4)	12 (4)	18 (6)	24 (6)	36 (12)	48 (24)	64 (16)

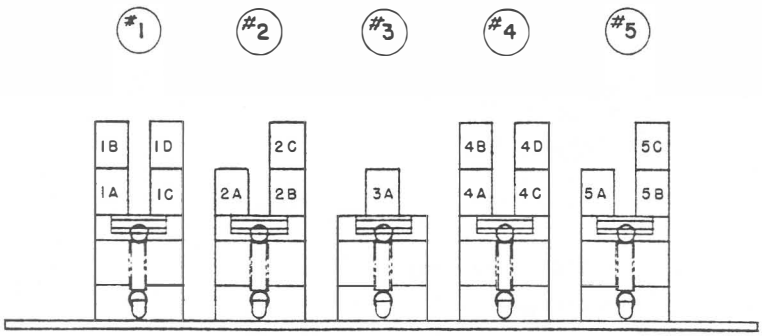
LARGE NUMBERS ARE REPLAY SCORES SHOWN ON BACK GLASS.
NUMBERS IN SHADED CIRCLES INDICATE WHICH PORTION OF REPLAY CIRCUIT STRIP
IS EFFECTIVE FOR A PARTICULAR REPLAY SCORE.

EXAMPLE: ON A 3-IN-LINE SCORE OF → 36 REPLAYS

THE CIRCUIT IS EFFECTIVE THRU THE → (12) REPLAY CIRCUIT STRIP

NOTE: 192 VALUE REPLAY SCORES ARE EFFECTIVE THRU THE OPEN AT 96 SWITCH.

SEARCH RELAYS



Relay	Coil	Armature
#1	C-2342-88	Z-44-29
#2	C-2342-59	Z-44-29
#3	C-2342-59	Z-44-12
#4	C-2342-88	Z-44-29
#5	C-2342-59	Z-44-29

Corners Scores

Thru → Switch no's	Wire no's & colors
3A	21-8 blue-red
	51-3 white-red
2A	51-3 white-red
	74-4 orange-green
4D	74-4 orange-green
	75-3 orange-white
1C	75-3 orange-white
	23-4 blue-yellow

3 in line scores

Thru → Switch no's	Wire no's & colors
3A	21-8 blue-red
	51-3 white-red
2C	51-3 white-red
	52-3 white-blue
1A	52-3 white-blue
	54-3 white-green
3A	21-8 blue-red
	51-3 white-red
2C	51-3 white-red
	52-3 white-blue
4C	52-3 white-blue
	54-3 white-green
3A	21-8 blue-red
	51-3 white-red
4B	51-3 white-red
	56-3 white-brown
5A	56-3 white-brown
	54-3 white-green

4 in line scores

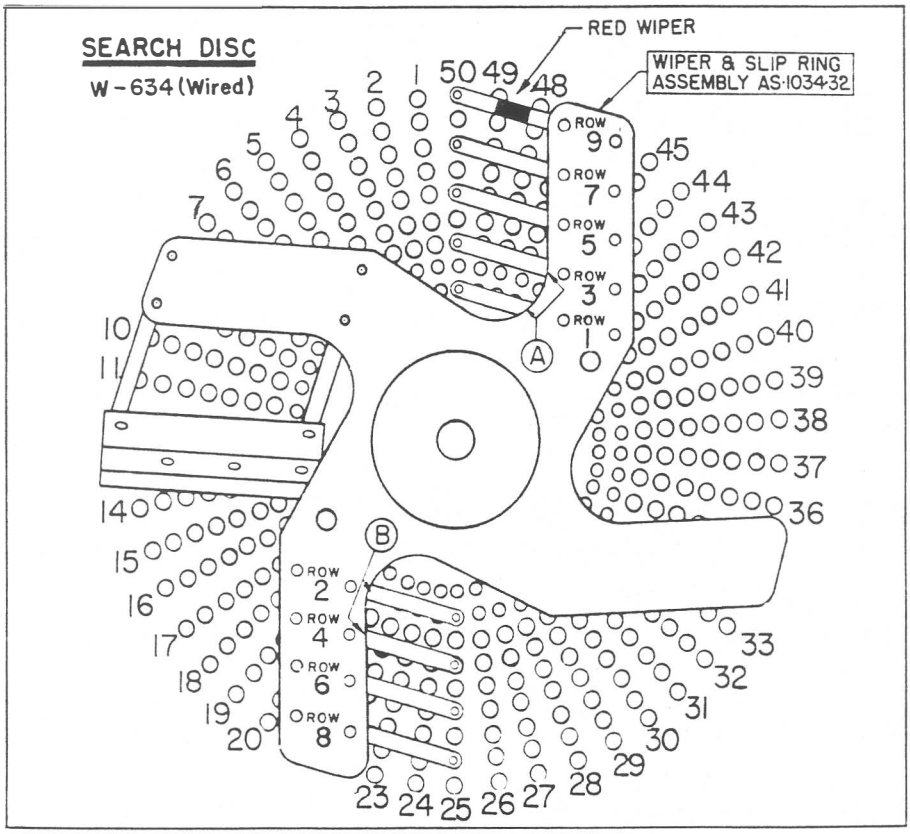
Thru → Switch no's	Wire no's & colors
3A	21-8 blue-red
	51-3 white-red
2B	51-3 white-red
	50-3 white
4A	50-3 white
	53-3 white-yellow
1B	53-3 white-yellow
	71-3 orange-red
3A	21-8 blue-red
	51-3 white-red
2B	51-3 white-red
	50-3 white
4A	50-3 white
	53-3 white-yellow
5B	53-3 white-yellow
	71-3 orange-red

5 in line scores

Thru → Switch no's	Wire no's & colors
3A	21-8 blue-red
	51-3 white-red
2A	51-3 white-red
	74-4 orange-green
4D	74-4 orange-green
	75-3 orange-white
5C	75-3 orange-white
	57-3 white-orange
1D	57-3 white-orange
	61-3 brown-red

SEARCH DISC

W-634 (Wired)



WIPERS (A) FED BY WIRE 80 (ON DIAG. C-15) THRU FEED WIPER. COMPLETES CIRCUIT TO SEARCH INDEX COIL AND REPLAY COUNTER STEP-UP COIL, WHEN SCORING REPLAYS.

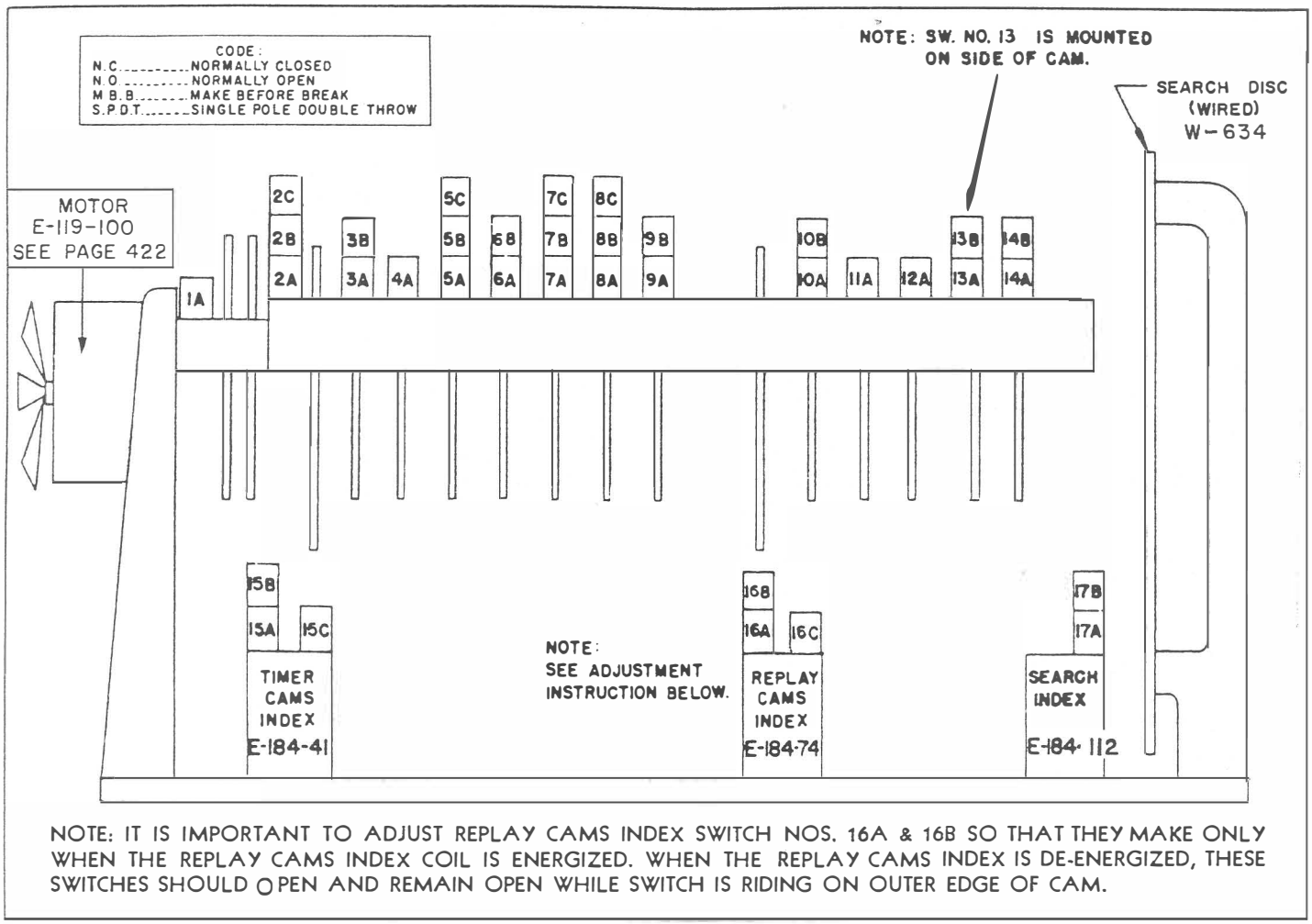
WIPERS (B) (ON DIAG. F-14) COMPLETES CIRCUIT TO SCORE 4 IN LINE SCORES — FOR 3 IN LINE, WHEN "RED" OR "YELLOW" RELAYS ARE TRIPPED. ALSO TO SCORE 5 IN LINE SCORES FOR 3 IN LINE, WHEN "GREEN" RELAY IS TRIPPED.

SEARCH POSITIONS

	RED WIPER POSITION	ROW 7 SEARCH RELAY #1	ROW 8 SEARCH RELAY #2	ROW 9 SEARCH RELAY #3	ROW 6 SEARCH RELAY #4	ROW 5 SEARCH RELAY #5
5 LINE CARD HORIZONTAL	1	9	4	24	15	6
	2	10	19	14	20	8
	3	2	18	16	12	1
	4	13	22	25	21	17
	5	11	7	5	23	3
5 LINE CARD VERTICAL	6	9	10	2	13	11
	7	4	19	18	22	7
	8	24	14	16	25	5
	9	15	20	12	21	23
	10	6	8	1	17	3
5 LINE CARD DIAGONAL	11	24	20	1		
	12	5	21	1		
	13					
6 LINE CARD HORIZONTAL	14	4	24	15	6	5
	15	19	14	20	8	19
	16	18	16	12	1	23
	17	22	25	21	17	22
	18	7	5	23	3	2
6th VERTICAL LINE	19	5	19	23	22	2
	20					
	21					
	22					
7 LINE CARD HORIZONTAL	23	24	15	6	5	13
	24	14	20	8	19	9
	25	16	12	1	23	10
	26	25	21	17	22	14
	27	5	23	3	2	12
7th VERTICAL LINE	28	13	9	10	14	12
7 LINE CARD DIAGNAL	29	24	20	1	22	12
	30	5	21	1	19	13
	31					
CORNERS	32	5	12	13	24	
	33					
8 LINE CARD HORIZONTAL	34	15	6	5	13	4
	35	20	8	19	9	20
	36	12	1	23	10	15
	37	21	17	22	14	21
	38	23	3	2	12	6
8th VERTICAL LINE	39	4	20	15	21	6
	40					
9 LINE CARD HORIZONTAL	41	6	5	13	4	1
	42	8	19	9	20	3
	43	1	23	10	15	8
	44	17	22	14	21	11
	45	3	2	12	6	7
9th VERTICAL LINE	46	1	3	8	11	7
	47					
	48					
	49					
	50					

CONTROL UNIT PICTORIAL VIEW

NUMBERS CORRESPOND TO SWITCH CHART



NOTE: IT IS IMPORTANT TO ADJUST REPLAY CAMS INDEX SWITCH NOS. 16A & 16B SO THAT THEY MAKE ONLY WHEN THE REPLAY CAMS INDEX COIL IS ENERGIZED. WHEN THE REPLAY CAMS INDEX IS DE-ENERGIZED, THESE SWITCHES SHOULD OPEN AND REMAIN OPEN WHILE SWITCH IS RIDING ON OUTER EDGE OF CAM.

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

NOTICE: IMPORTANT PART OF ILLUSTRATION IS TO SHOW THAT SWITCH 13 CLOSES 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.

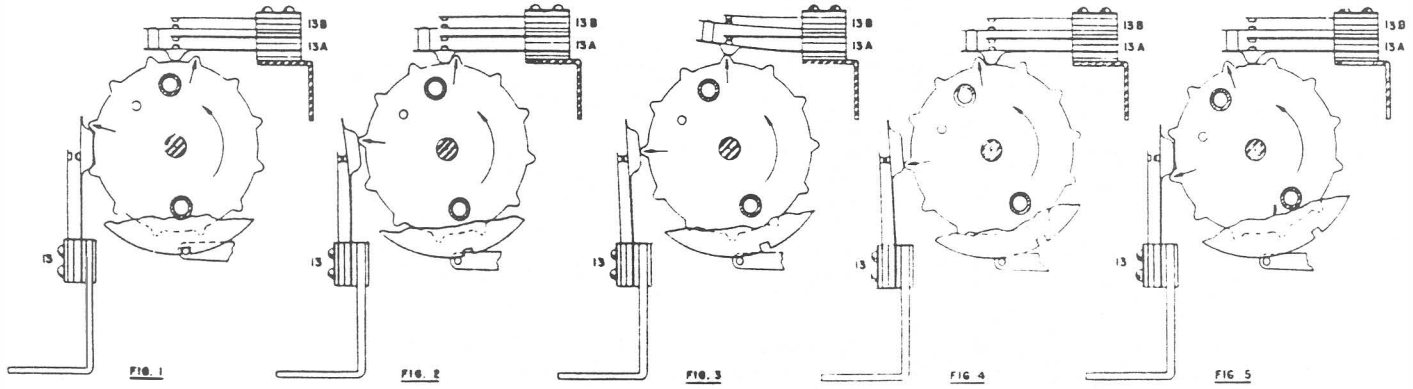


FIG. 1

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.

FIG. 2

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.

FIG. 3

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

FIG. 4

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

FIG. 5

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

CONTROL UNIT SWITCH CHART FOR POSITION OF SWITCHES SEE PICTORIAL VIEW

CAM SWITCH		LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
1A	N.O.	F-9	65-2 36-9	Brown-White Yellow-Brown	Energizes timer step-up coil, when drag arm switch, selector lock relay switch and cam switch #14B are closed.
2A	N.O.	I-3	90-5 30	Gray Yellow	Energizes reflex play magnet, and replay register reset.
2B	N.O.	C-37	93-4 30	Gray-Yellow Yellow	Energizes coin kicker magnet.
2C	N.C.	E-9	31-7 57-6	Yellow-Red White-Orange	Drops out red button relay.
3A	N.C.	I-4	83-3 48-2	Black-Yellow Green-Black	Drops out start relay and acts as safety switch during spin.
3B	S.P.D.T.	B-14	93-7 98-4 91-7	Gray-Yellow Gray-Black Gray-Red	Directs circuit to replay meter or total plays meter.
4A	N.O.	C-39	98-1 30	Gray-Black Yellow	Energizes score extra step index and control unit spotting index coils.
5A	N.O.	G-8	65-2 71-8	Brown-White Orange-Red	Energizes timer reset coil.
5B	N.O.	B-19	38-4 21-4	Yellow-Black Blue-Red	Energizes extra ball unit step-up coil. Steps unit from minus one position to zero position.
5C	N.O.	B-21	78-4 85-4	Orange-Black Black-White	Energizes anti-cheat relay.
6A	N.C.	D-21	43-8 25-3	Green-Yellow Blue-White	Score extra step safety switch.
6B	N.C.	G-25	83 45-2	Black-Yellow Green-White	Opens game advantage circuits during timing cycle.
7A	N.O.	D-24	45 80-4	Green-White Black	Energizes 3-in-line red, 3-in-line yellow scores 4-in-line relays, and 3-in-line green scores 5-in-line relay, when circuit is complete thru all other factors.
7B	N.O.	B-22	18 52-2	Red-Black White-Blue	Score unit steps.
7C	N.O.	D-37	93-4 30	Gray-Yellow Yellow	(Safety switch) energizes coin kicker magnet.
8A	N.O.	E-27	14-8 56-6	Red-Green White-Brown	Completes circuit to "card feature", or "selection feature" step-up coils. (For single steps.)
8B	N.O.	C-31	61-4 63-3	Brown-Red Brown-Yellow	Energizes "300 corners" relay, when circuit is complete thru all other factors.
8C	N.O.	B-19	25-4 38-4	Blue-White Yellow-Black	Extra ball unit steps.
9A	Alt.	E-21	85-4 43-8	Black-White Green-Yellow	Opens score extra step circuit every other time.
9B	Alt.	D-27	98-6 56-6 71	Gray-Black White-Brown Orange-Red	Single step circuit, for "card feature", or selection feature unit.

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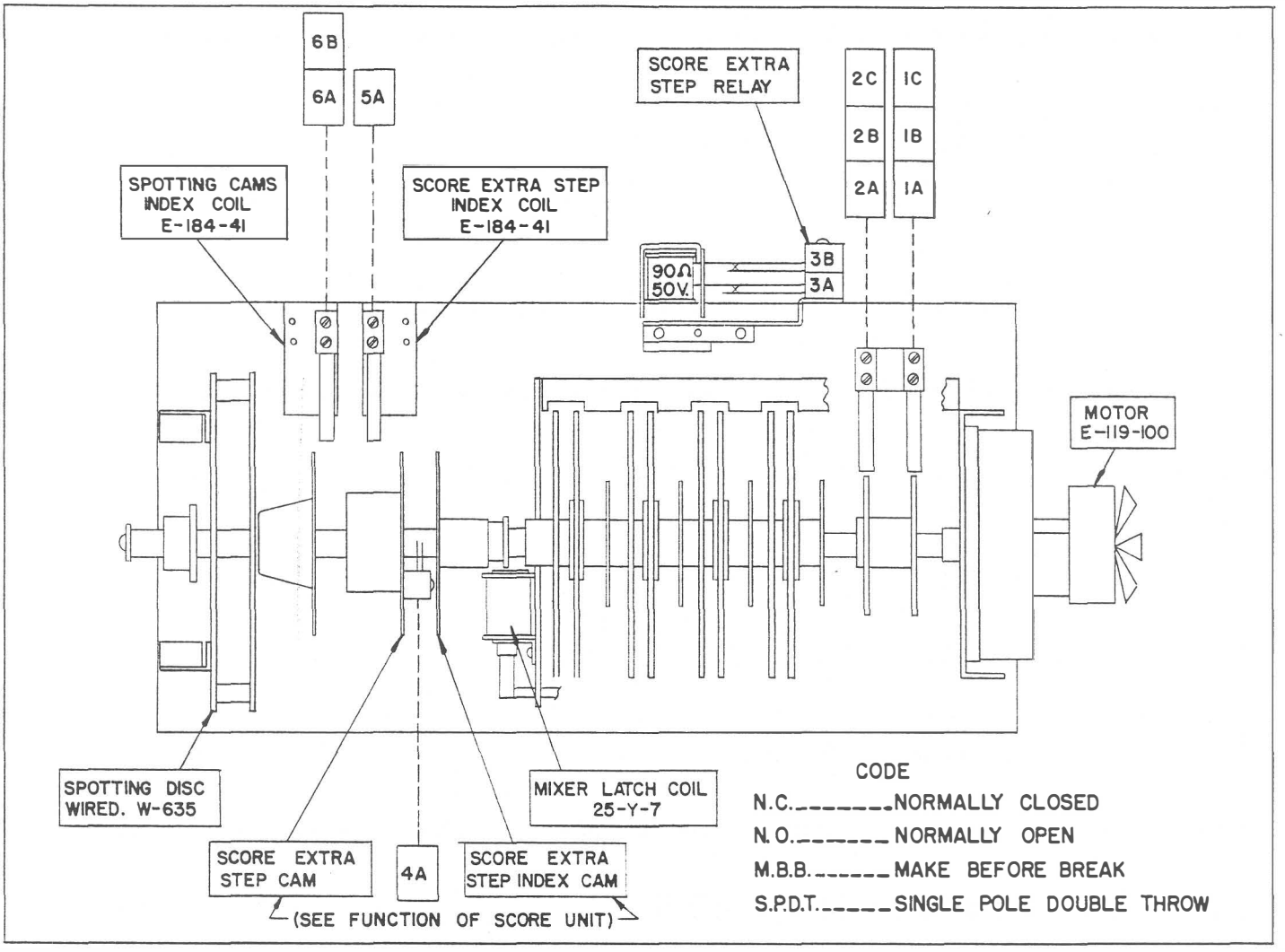
CONTROL UNIT CAM SWITCH CHART — CONCLUDED

CAM SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
10A N.O.	B-15	54-5 93-8	White-Green Gray-Yellow	Pulses replay counter, when score unit is at 6th and 9th steps.
10B N.O.	B-16	38-8 53-6	Yellow-Black White-Yellow	Pulses "corners" replay counter.
11A N.O.	B-15	54-8 91-6	White-Green Gray-Red	Pulses replay counter, when score unit is at 4th, 5th and 7th steps.
12A N.O.	B-15	54-8 90-8	White-Green Gray	Pulses replay counter, when score unit is at 3rd and 8th steps.
13A N.O.	B-14	54-8 81-7	White-Green Black-Red	Pulses replay counter, when score unit is at 1st and 2nd steps.
13B N.O.	C-13	48-4 80	Green-Black Black	Pulses replay register step-up coil, and reflex replay magnet.
13 N.O. (Backside)	H-13	21-3 27	Blue-Red Blue-Orange	Replay lock-in switch. NOTE: See control unit pictorial view.
14A N.C.	I-14	56-7 93	White-Brown Gray-Yellow	Prevent the start of another replay scoring until cams are indexed.
14B N.C.	C-8	27-2 90-2	Blue-Orange Gray	Opens circuit to timer step-up coil, during replay winner.
TIMER CAMS INDEX COIL	A-6	83-6 70	Black-Yellow Orange	Energized by switch on start relay. Also thru shutter motor cam switch #5C.
15A N.O.	G-1	20-P 60-P	Blue (Plastic) Brown(Plastic)	Operates control unit and mixer and spotting motors.
15B N.C.	G-5	14-9 71-2	Red-Green Orange-Red	Opens circuit to coin lockout magnet during spin.
15C N.C.	D-9	13 30	Red-Yellow Yellow	Lock in safety switch for red button relay.
REPLAY CAMS INDEX COIL	A-12	40-4 70	Green Orange	Energizes when winning score is made and releases replay cams.
16A N.O.	E-13	27 80	Blue-Orange Black	In series with replay lock in circuit. NOTE: See control unit pictorial view for correct adj.
16B N.O.	H-14	56-7 93	White-Brown Gray-Yellow	In series with replay winner circuit. NOTE: See control unit pictorial view for correct adj.
16C N.C.	C-11	15-2 80	Red-White Black	Opens direct 50 volt circuit to search index coil, coil then held in thru resistor.
SEARCH INDEX COIL	A-12	15-2 70	Red-White Orange	Energizes when 3-in-line or more is scored.
17A N.O.	B-12	40-4 80	Green Black	Energizes replay cams index if a score is made.
17B N.C.	I-4	83-3 30	Black-Yellow Yellow	Opens start circuit and also acts as safety switch.

MIXER AND SPOTTING UNIT ASSEMBLY PICTORIAL VIEW

Numbers correspond to switch chart



MIXER AND SPOTTING UNIT SWITCH CHART

FOR POSITION OF SWITCHES REFER TO PICTORIAL VIEW ABOVE

CAM SWITCH		LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
1A	N.O.	D-3	53-7 75-2	White-Yellow Orange-White	Pulse switch for operating replay register reset, and when replay relay is energized.
1B	N.O.	B-27	50-4 21	White Blue-Red	Pulse switch for multiple steps of "card feature" unit.
1C	N.O.	C-29	18-2 81-5	Red-Black Black-Red	Steps "selection feature" unit for multiple steps.
2A	N.O.	L-3	71-5 41-5	Orange-Red Green-Red	Flashes "select now" lite.
2B	N.O.	B-18	78 38-4	Orange-Black Yellow-Black	Steps extra ball unit for multiple steps.
2C	N.O.	G-17	40-9 85-2	Yellow-Red Black-White	Steps corners replay counter to its zero position. (In series with corners unit homing switch.)

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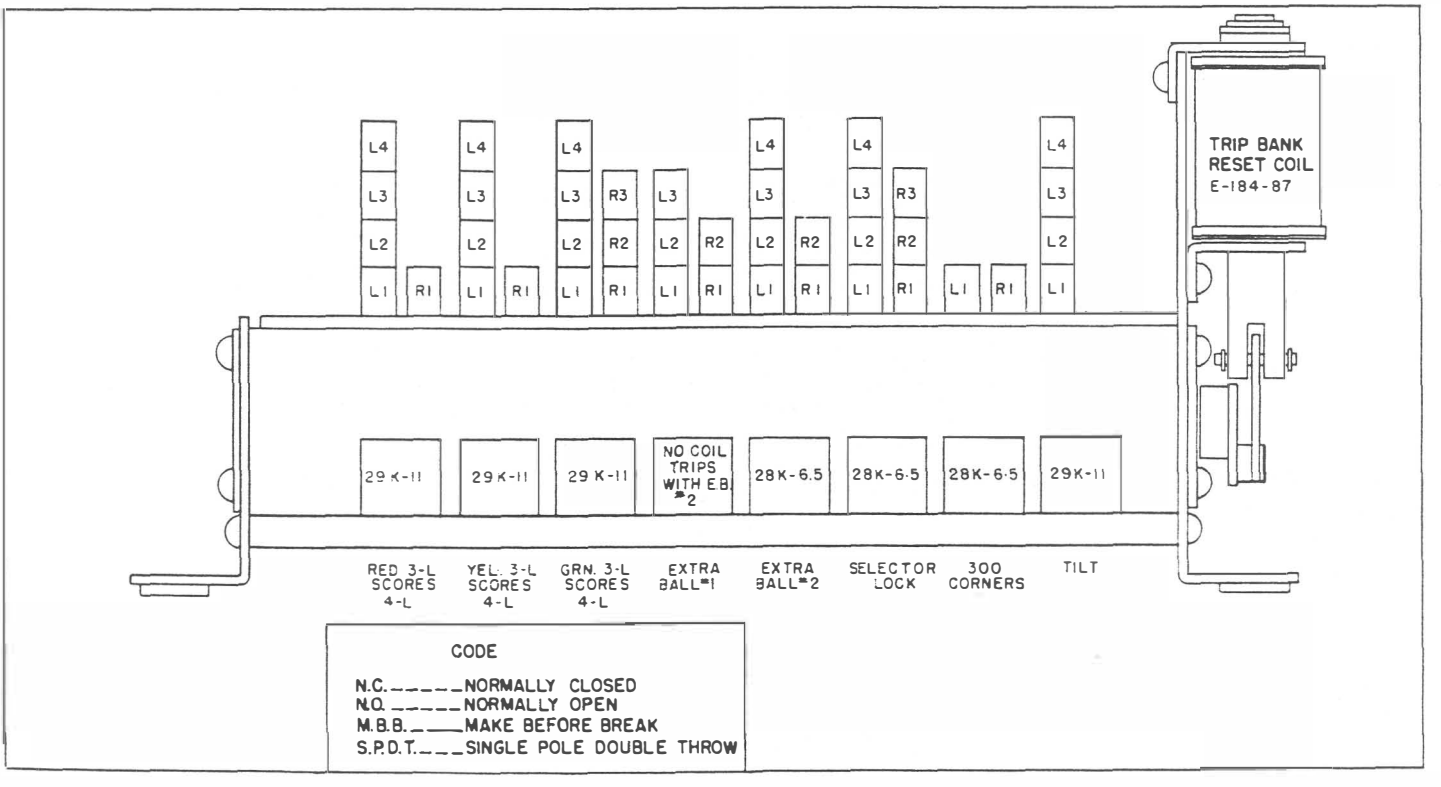
MIXER AND SPOTTING UNIT SWITCH CHART — CONCLUDED

CAM SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
SCORE EXTRA STEP RELAY COIL	A-32	43-6 70	Green-Yellow Orange	Energized by score unit step-up arm switch.
3A N.O.	H-32	43-6 81-1	Green-Yellow Black-Red	Completes lock-in circuit to score extra step relay.
3B N.O.	B-21	52-2 40-5	White-Blue Green	Completes circuit to score unit for mulitple steps.
4A N.O.	C-21	40-5 25-3	Green Blue-White	Pulse switch for multiple steps of score unit.
SCORE EXTRA STEP INDEX COIL	A-39	98-1 70	Gray-Black Orange	Energized during timing cam cycle by control unit cam switch #4A.
5A N.O.	H-32	75-5 81-1	Orange-White Black-Red	Completes lock-in circuit to score extra step relay.
SPOTTING CAM INDEX COIL	A-39	98-1 70	Gray-Black Orange	Energized during timing cam cycle by control unit cam switch #4A.
6A N.O.	J-3	30 83-1	Yellow Black-Yellow	Completes flash circuit for red & yellow 3-L scores 4-L. Green 3-L scores 5-L, 2 extra lines, 3 extra lines, 4 extra lines, selection feature, and 100-300 corner lites.
6B N.O.	J-16	30 13-4	Yellow Red-Yellow	Completes flash circuit for score lites, or extra ball lites.

TRIP RELAY BANK PICTORIAL VIEW

NUMBERS CORRESPOND TO SWITCH-CHART



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

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
RED 3-L SCORES 4-L TRIP COIL	A-24	13-1 70	Red-Yellow Orange	Energized by control unit cam switch #7A, when circuit is complete thru all other factors.
L1 N.O.	K-3	85-1 30	Black-White Yellow	Lites "Red 3-in-line scores 4-in-line" feature lite.
L2 N.C.	C-24	13-1 13-1	Red-Yellow Red-Yellow	Breaks circuit to this coil.
L3 N.O.	G-15	36-4 71-3	Yellow-Brown Orange-Red	Completes circuit to replay counter, for "red 3-in-line scores 4-in-line" scoring.
L4 N.C.	G-31	48-6 74-3	Green-Black Orange-Green	Game Proportioning switch.
R1 S.P.D.T.	F-31	48-6 65-3 50-6	Green-Black Brown-White White	Game proportioning switch.
YELLOW 3-L SCORES 4-L TRIP COIL	A-24	98-5 70	Gray-Black Orange	Energized by control unit cam switch #7A, when circuit is complete thru all other factors.
L1 N.O.	J-4	40-3 30	Green Yellow	Lites "yellow 3-in-line scores 4-in-line" feature lite.
L2 N.C.	C-24	98-5 98-5	Gray-Black Gray-Black	Breaks circuit to this coil.
L3 N.O.	F-15	71-3 41-3	Orange-Red Green-Red	Completes circuit to replay counter, for "yellow 3-in-line scores 4-in-line" scoring.
L4 N.C.	G-31	48-6 15-6	Green-Black Red-White	Game proportioning switch.
GREEN 3-L SCORES 5-L TRIP COIL	A-25	36-2 70	Yellow-Brown Orange	Energized by control unit cam switch #7A, when circuit is complete thru all other factors.
L1 N.O.	J-5	81-3 30	Black-Red Yellow	Lites "green 3-in-line scores 5-in-line" feature lite.
L2 N.O.	F-14	18-8 61-3	Red-Black Brown-Red	Part of circuit to replay counter, for "green 3-in-line scores 5-in-line" scoring.
L3 N.C.	C-23	23-5 52-2	Blue-Yellow White-Blue	Proportioning switch for scores, and extra ball steps.
L4 N.O.	F-14	15-8 71-3	Red-White Orange-Red	Part of "green" 3-in-line scores 5-in-line replay scoring circuit.
R1 N.C.	C-24	36-2 36-2	Yellow-Brown Yellow-Brown	Breaks circuit to this coil.
R2 N.C.	G-29	91-5 20-2	Gray-Red Blue	Game proportioning switch.
R3 N.C.	F-29	63-5 91-5	Brown-Yellow Gray-Red	Game proportioning switch.

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TRIP RELAY BANK CHART — CONTINUED

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
EXTRA BALL #1 TRIP COIL				
L1 N.O.	D-11	38-3 91-1	Yellow-Black Gray-Red	Completes circuit to ball lifter motor, when playing for extra balls.
L2 S.P.D.T.	H-26	75-5 65-4 45-2	Orange-White Brown-White Green-White	Extra ball proportioning switch.
L3 S.P.D.T.	H-27	54-6 43-3 14-4	White-Green Green-Yellow Red-Green	Game proportioning switch.
R1 N.O.	J-21	21-4 30	Blue-Red Yellow	Lites extra ball lite on back glass.
R2 S.P.D.T.	F-22	52-6 80-3 78-1	White-Blue Black Orange-Black	Shuts off score advantages and completes circuit to extra ball steps during extra ball play.
EXTRA BALL #2 TRIP COIL	A-10	25-7 70	Blue-White Orange	Energized by switch on extra ball play button (yellow).
L1 S.P.D.T.	E-20	85-4 30 61-2	Black-White Yellow Brown-Red	Shuts off score multiple step circuit, and completes circuit to step extra ball unit from minus one to zero position.
L2 N.C.	B-10	25-7 52-4	Blue-White White-Blue	Breaks circuit to this coil.
L3 S.P.D.T.	D-6	14-3 43-9 98-2	Red-Green Green-Yellow Gray-Black	Breaks circuit to shutter motor and completes circuit to mixer latch, and timer cams index coils during extra ball play.
L4 S.P.D.T.	J-16	31-5 13-4 74	Yellow-Red Red-Yellow Orange-Green	Breaks circuit for flashing score lites and completes circuit to flash extra ball lites during extra ball play.
R1 N.C.	F-26	45-2 81-6	Green-White Black-Red	Breaks circuit to other game advantages when playing for extra balls.
R2 N.C.	J-3	36-5 83-1	Yellow-Brown Black-Yellow	Breaks flash circuit to all game advantage feature lites, when playing for extra balls.
SELECTOR LOCK TRIP COIL	A-8	98 70	Gray-Black Orange	Energized at 4th step of timer unit.
L1 N.O.	C-10	25-8 52-4	Blue-White White-Blue	Completes circuit to energize extra ball trip relays, when playing for extra balls.
L2 N.C.	K-3	60-5 71-5	Brown Orange-Red	Breaks circuit to "select now" lite.
L3 N.O.	I-15	21-8 56-7	Blue-Red White-Brown	Completes replay scoring circuit, when this relay trips.
L4 N.O.	D-8	27-2 78-6	Blue-Orange Orange-Black	Completes circuit to timer step-up coil thru control unit cam switch #1A.
R1 N.O.	J-32	14-6 20-3	Red-Green Blue	Completes circuit to "selected" number lite.
R2 N.O.	E-4	18-6 50-2	Red-Black White	Completes circuit to start relay, when playing for extra balls.
R3 N.C.	D-33	13-2 57-5	Red-Yellow White-Orange	Breaks circuit to rotary selector coil.

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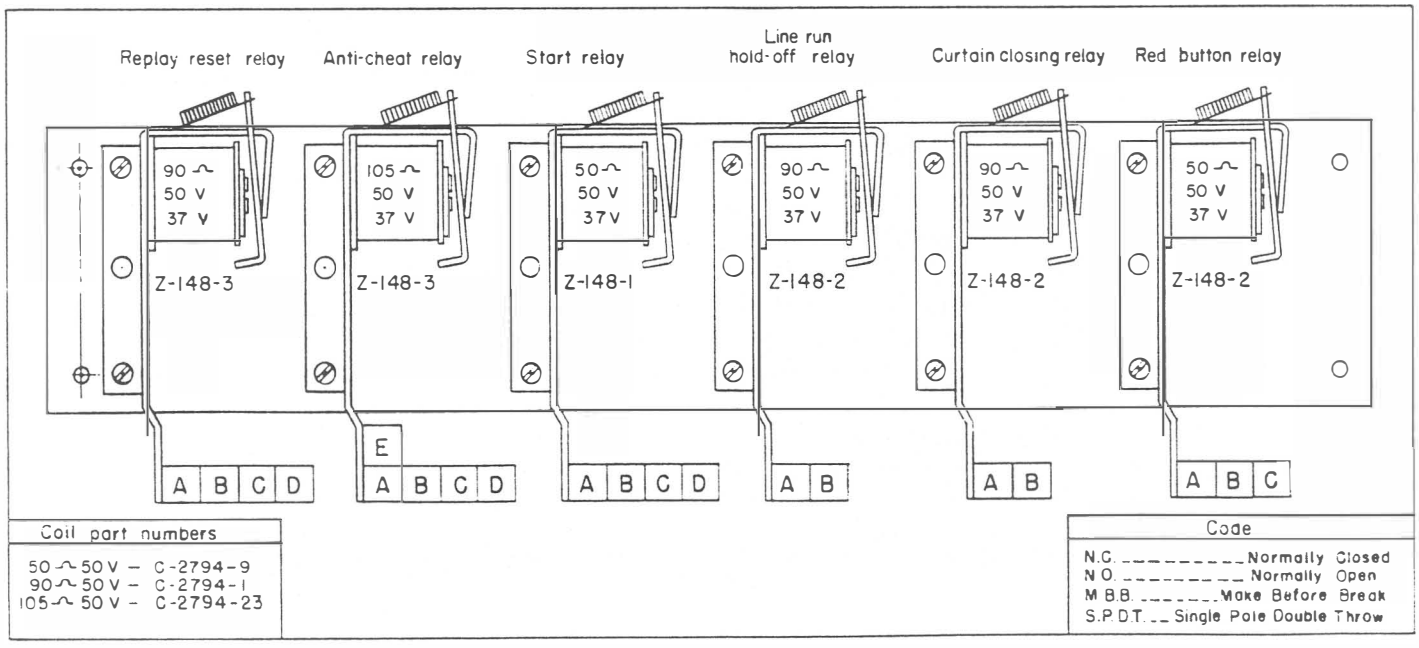
TRIP RELAY BANK CHART — CONCLUDED

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
300 CORNERS TRIP COIL	A-31	63-3 70	Brown-Yellow Orange	Energized by control unit cam switch #8B, when circuit is complete thru all other factors.
L1 S.P.D.T.	J-16	53-2 83-4 90-6	White-Yellow Black-Yellow Gray	Breaks circuit to 100 corners lite, and completes circuit to lite "300" corners lite.
R1 S.P.D.T.	F-17	25-6 23-4 14	Blue-White Blue-Yellow Red-Green	Breaks 100 corners replay scoring circuit, and completes "300" corners replay scoring circuit.
TILT TRIP COIL	A-11	14-5 70	Red-Green Orange	Energized by any tilt switch, or plumb bob. Also at 39th step of timer unit.
L1 S.P.D.T.	I-7	21-3 30 45-8	Blue-Red Yellow Green-White	Break circuit to ball counting, extra ball, replay scoring, button circuits, and completes circuit to shutter motor when game is tilted.
L2 N.C.	F-2	20-P 60-P	Blue (Plastic) Brown(Plastic)	Breaks circuit to control unit and mixer unit motor.
L3 N.C.	M-23	10 20-4	Red Blue	Breaks 17 volt circuit.
L4 S.P.D.T.	M-22	38 81 91-2	Yellow-Black Black-Red Gray-Red	Breaks 6 volt circuit and lites "tilt" lite.
R1 N.O.	E-10	57-6 85-7	White-Orange Black-White	Safety circuit for red button relay.

6 RELAY BANK PICTORIAL VIEW

NUMBERS CORRESPOND TO SWITCH CHART



6 RELAY BANK SWITCH CHART FOR POSITION OF SWITCHES REFER TO PICTORIAL VIEW

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
REPLAY RESET RELAY COIL	A-4	75-2 70	Orange-White Orange	Energizes when replays are cancelled by push button, or if anti-cheat relay drops out.
A S.P.D.T.	C-3	90-5 13-9 53-7	Gray Red-Yellow White-Yellow	Directs replay register reset circuit thru control unit cam switch #2A, when replays are being played, or thru 16 pulse cam when replays are being cancelled.
B N.O.	F-1	20-P 60-P	Blue (Plastic) Brown (Plastic)	Completes circuit to control unit motor.
C N.O.	G-3	56-2 75-2	White-Brown Orange-White	Lock-in switch for this relay.
D N.C.	C-4	21-6 63-2	Blue-Red Brown-Yellow	Opens start circuit during replay cancel.
ANTI-CHEAT RELAY COIL	A-21	78-4 70	Orange-Black Orange	Energized thru control unit cam switch #5C, its switches protect replay, and lite circuits.
A S.P.D.T.	M-21	91-2 38 54-2	Gray-Red Yellow-Black White-Green	Opens 6 volt circuit, and lites tilt lite, when this relay drops out.
B N.O.	L-23	20-4 80-1	Blue Black	Opens 17 volt circuit when this relay drops out.
C N.O.	D-21	78-4 30	Orange-Black Yellow	Lock-in switch for this relay.
D N.C.	D-9	57-6 85-7	White-Orange Black-White	Safety switch.
E S.P.D.T.	G-4	75-2 56-2 50-2	Orange-White White-Brown White	Breaks start relay circuit, and completes circuit to replay reset relay when this relay drops out.
START RELAY COIL	A-4	21-6 70	Blue-Red Orange	Energized every time a coin is played, or when a red or yellow button is pressed.
A N.C.	F-26	14-8 81-6	Red-Green Black-Red	Opens game advantage circuits during spin of control unit.
B N.C.	C-18	75-4 78	Orange-White Orange-Black	Opens extra ball step-up circuit during spin of control unit.
C N.O.	F-5	13-3 85	Red-Yellow Black-White	Completes circuit to timer cams index, and mixer latch coils.
D N.O.	F-4	48-2 63-2	Green-Black Brown-Yellow	Lock-in switch for this relay.

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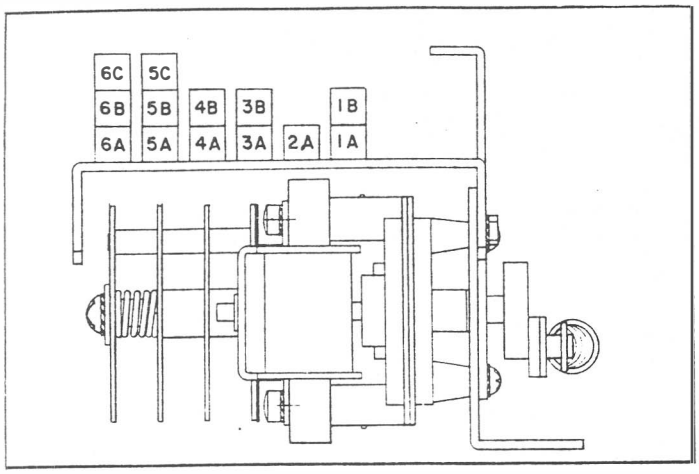
6 RELAY BANK SWITCH CHART — CONCLUDED

RELAY SWITCH	LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
LINE RUN HOLD-OFF RELAY COIL	A-28	21 70	Blue-Red Orange	Energized thru run circuit of "card feature" unit disc.
A N.C.	B-5	83-6 93-2	Black-Yellow Gray-Yellow	Breaks circuit to timer cams index, and mixer latch coils.
B N.C.	C-34	45-6 91-4	Green-White Gray-Red	Breaks "curtain" motor (opening) circuit during spin of control unit.
CURTAIN CLOS-ING RELAY COIL	A-35	10-1 70	Red Orange	Energized by shutter motor cam switch #6C.
A N.C.	D-34	45-6 93-1	Green-White Gray-Yellow	Breaks "curtain" motor (opening) circuit.
B N.O.	B-34	10-1 41	Red Green-Red	Lock-in switch for this relay.
RED BUTTON RELAY COIL	A-9	85-7 70	Black-White Orange	Energizes when red button is pressed.
A S.P.D.T.	C-6	93-2 98-2 14-3	Gray-Yellow Gray-Black Red-Green	Directs circuit from mixer latch, and timer cams index coils during extra ball play, to shutter motor when starting new game after extra ball play.
B N.O.	C-9	31-7 85-7	Yellow-Red Black-White	Lock-in switch for this relay.
C N.C.	K-22	50-5 21-4	White Blue-Red	Opens extra ball lite circuit.

SHUTTER MOTOR PICTORIAL VIEW

NUMBERS CORRESPOND TO SWITCH CHART



SEE LABEL ON MOTOR FOR MOTOR PART NO.

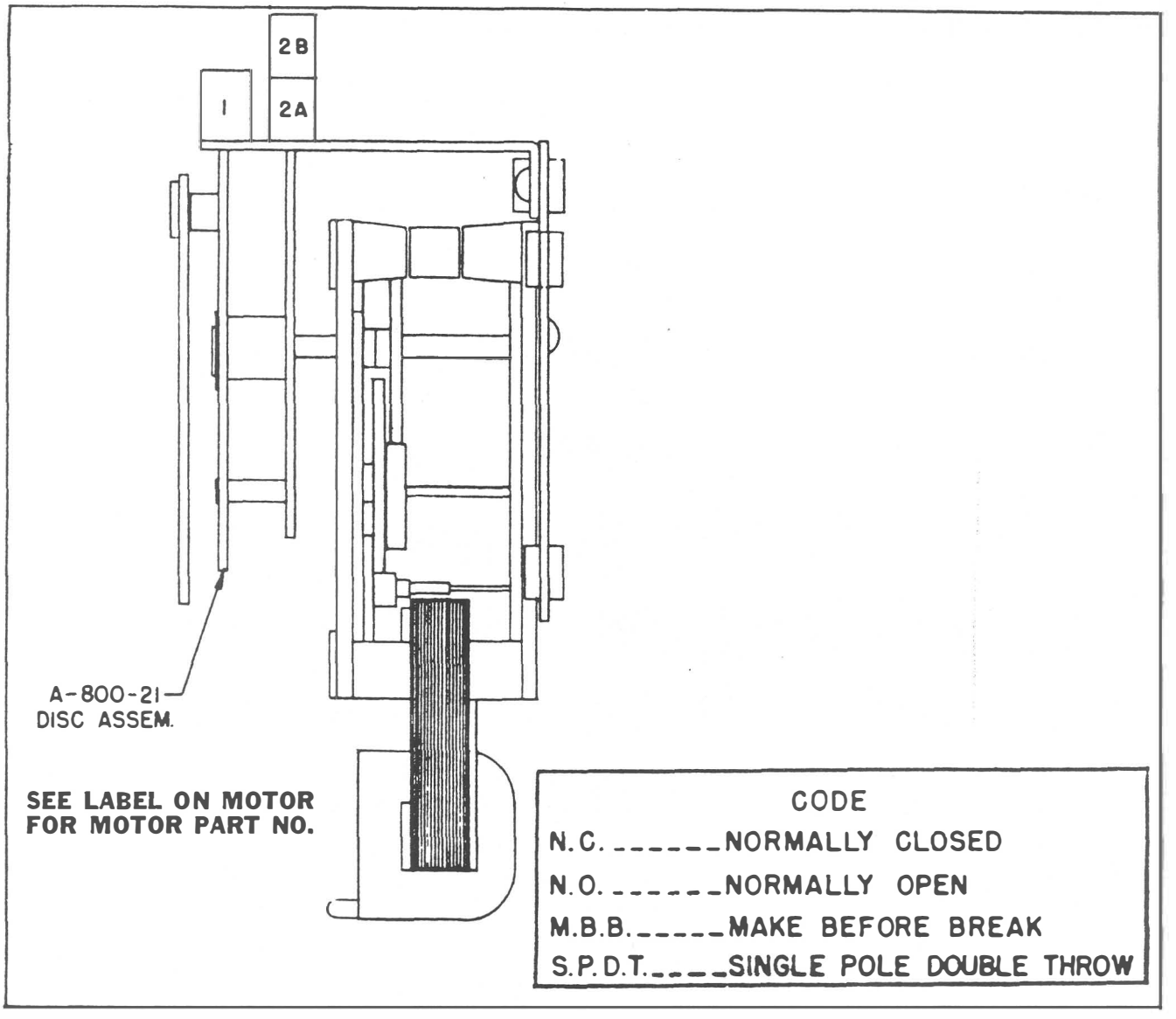
CODE

N.C. _____ NORMALLY CLOSED
N.O. _____ NORMALLY OPEN
M.B.B. ____ MAKE BEFORE BREAK
S.P.D.T. ___ SINGLE POLE DOUBLE THROW

SHUTTER MOTOR CAM SWITCH CHART

FOR POSITION OF SWITCHES SEE PICTORIAL VIEW

CAM SWITCH		LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCHES
1A	N.C.	I-13	93 21-3	Gray-Yellow Blue-Red	Completes circuit to replay scoring circuit.
1B	N.O.	G-6	30 14-3	Yellow Red-Green	Carry thru for shutter motor.
2A	N.C.	F-11	31-3 36-3	Yellow-Red Yellow-Brown	Completes circuit to ball lifter motor (closed normally) open during shutter cycle.
3A	N.O.	C-38	30 85-5	Yellow Black-White	Resets score, extra ball, and selection feature units.
3B	N.O.	H-2	20-P 70-P	Blue (Plastic) Brown(Plastic)	Resets trip relay bank.
4A	N.O.	F-6	18-3 14-3	Red-Black Red-Green	(Closed when shutter is open). Completes circuit to shutter motor.
4B	N.O.	H-6	45-8 18-3	Green-White Red-Black	Starts shutter motor if game is titled when shutter is open.
5A	N.O.	I-17	30 40-9	Yellow Green	Completes circuit to step corners replay counter to reset position.
5B	N.C.	H-8	21-3 65-2	Blue-Red Brown-White	Safety switch for timer reset.
5C	S.P.D.T.	E-5	43-9 13-3 93-2	Green-Yellow Red-Yellow Gray-Yellow	Breaks circuit to shutter motor and makes circuit to timer index coil.
6A	N.O.	H-8	30 71-8	Yellow Orange-Red	Completes circuit to timer reset coil.
6B	N.O.	C-35	41 10-1	Green-Red Red	Completes circuit to curtain closing relay, and motor (curtain closing).
6C	N.O.	C-39	30 78-3	Yellow Orange-Black	Resets replay counter, and card feature units.

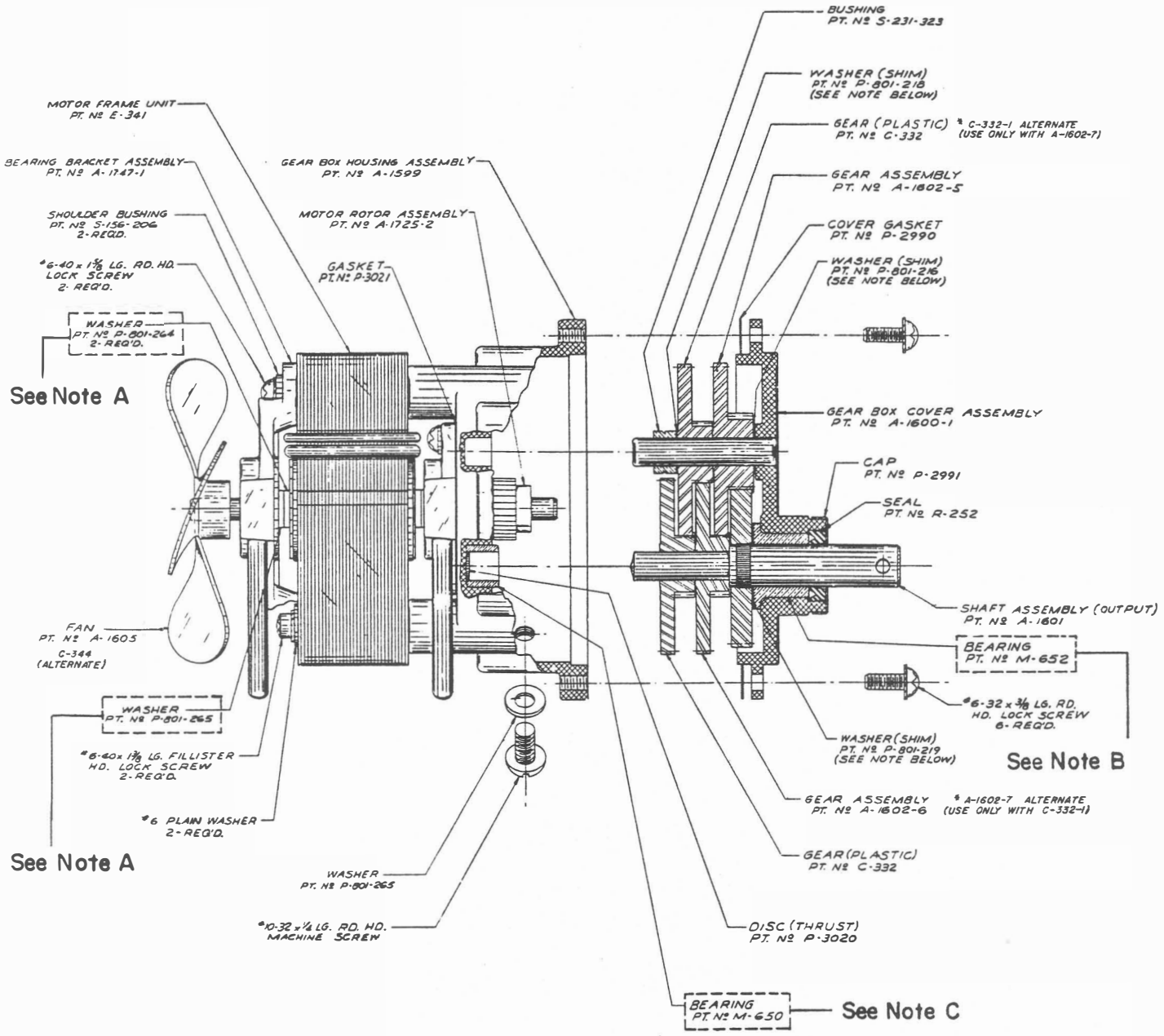


BALL LIFT MOTOR PICTORIAL VIEW

NUMBERS CORRESPOND TO SWITCH CHART BELOW

CAM SWITCH		LOCATION ON DIAGRAM	WIRE No.	WIRE COLORS	FUNCTION OF SWITCH
1	N.O.	H-12	30 91-1	Yellow Grey-Red	Carry-over switch for ball lifter motor.
2A	N.O.	E-7	43-2 27-2	Green-Yellow Blue-Orange	Energizes timer unit step-up coil.
2B	N.O.	F-8	30 98-3	Yellow Gray-Black	Completes circuit to selector lock trip relay.

MOTOR ASSEMBLY (Part No. E-119-100)



NOTE

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

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

CHECK PART NUMBER ON GEAR BEFORE ORDERING GEAR

NOTE A: Washers P-801-264 and P-801-265 are parts of Motor Rotor Assembly A-1725-2 and cannot be ordered separately.

NOTE B: Bearing M-652 is part of Gear Box Cover Assembly A-1600-1 and cannot be ordered separately.

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