

# *Electro-Dart*

MODEL 1045

ELECTRONIC SENSING PRODUCTS, INC.  
445 Jacksonville Road  
Hatboro, Pa. 19040

# ELECTRO-DART

## MANUAL

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## ELECTRO-DART DESCRIPTION

The ELECTRO-DART game Model 1045 consists of four units, a Main Panel (Target Panel), a Secondary Panel (Player Panel), a Coin Box, and a Controller.

The Main Panel contains a power supply, digital logic circuits to sequence the game, a radio receiver to accept signals from the controller, connections to supply signals to the secondary panel and receive signals from the coin box, and finally the major portion of the visual display.

The Secondary Panel contains the remaining visual display.

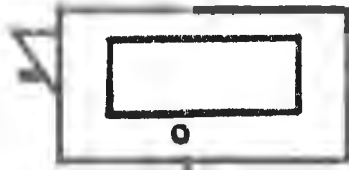
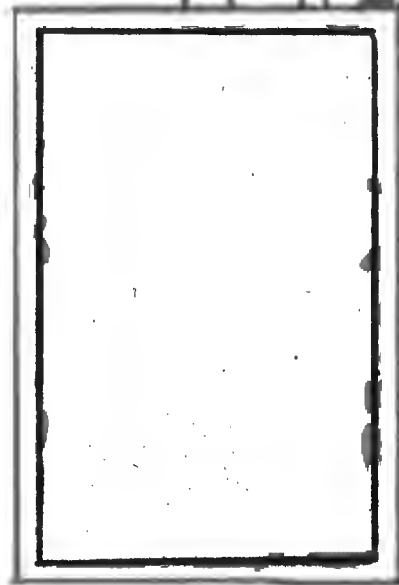
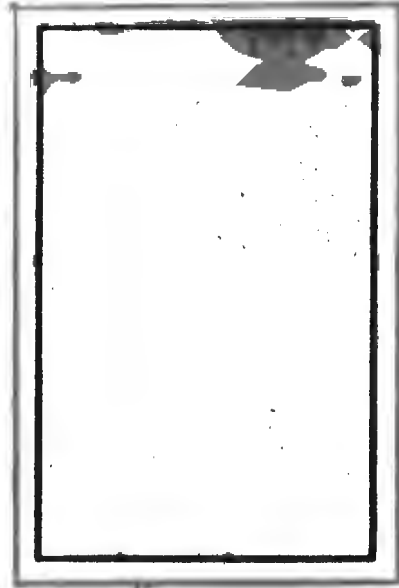
The Coin Box accepts coins and signals the game to accumulate credits.

The Controller signals the Main Panel via a radio link to start the dart throw and stop the scoring logic from the operation of the pushbutton.

# ELECTRO-DART

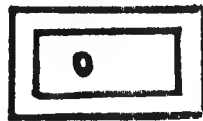
SECONDARY PANEL  
(PLAYER PANEL)

MAIN PANEL  
(TARGET PANEL)



COIN BOX

115/230 V  
50/60 Hz  
60 WATTS



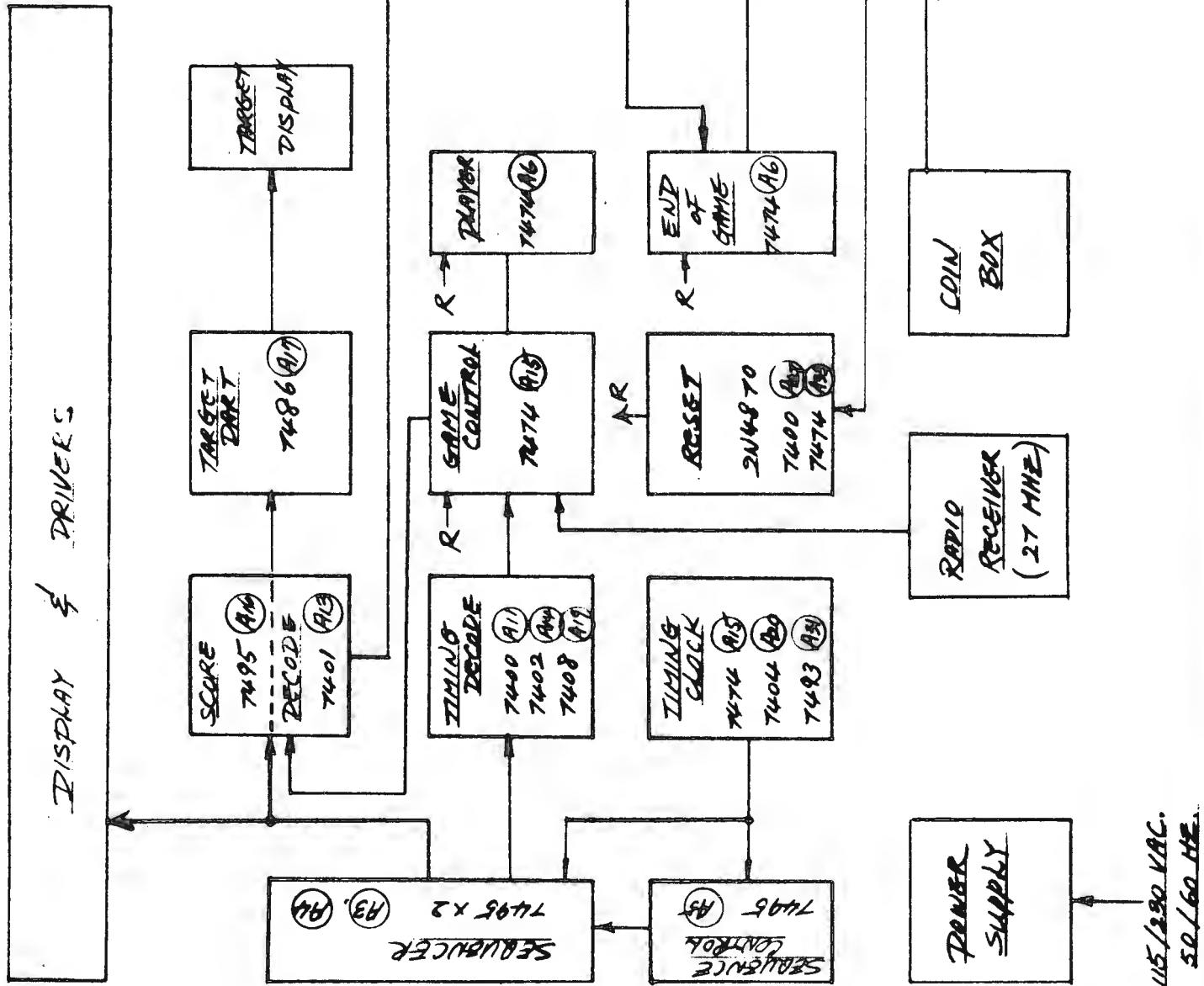
CONTROLLER  
(TRANSMITTER)  
(REMOTE)

## ELECTRO-DART

### SET-UP & OPERATING INSTRUCTIONS

1. Hang two displays using picture hanging technique.
2. Plug large connector from "Player" display into "Target" display.
3. Plug coin box connector into "Target" display.
4. Plug game into wall socket.
5. Turn switch on.
6. Insert 25¢. When game clears and only Tom is lit up, game is ready to play.
7. To play, press button to start action. Hold button down until dart is released from "player's" hand. If button is released precisely as dart starts from hand, a "Bulls-Eye" and 10 score will result. Early or late release will result in lower score.

ENCLOSED NUMBERS INDICATE  
 DEVICE AS REFERENCED ON  
 LOGIC DIAGRAM ED-1015.



BLOCK DIAGRAM OF  
 ELECTRO PART.  
 ED - 1027 MODEL - 1045  
 B. W. KIM 7/24/72

ELECTRO-DART  
MAINTENANCE PROCEDURES

The following maintenance procedures are provided for the guidance of service personnel. It includes a selected list of performance problems and, in simple terms, the procedure to be followed in restoring the ELECTRO-DART to specified performance.

ELECTRO-DART  
MODEL 1045  
MAINTENANCE PROCEDURES

1. AT POWER TURN-ON

A. NO RESPONSE.

CHECK - POWER OUTLET

- FUSE

- POWER TRANSFORMER

B. LAMPS ARE DIM AND GAME DOES NOT OPERATE PROPERLY.

CHECK - BRIDGE RECTIFIER CR-41 OUTPUT FOR 8-9 VOLTS.

- BRIDGE RECTIFIER CR-40 OUTPUT FOR 6-8 VOLTS.

C. BEFORE ANY CREDIT IS APPLIED GAMES COUNTER DOES NOT INDICATE "0".

REPLACE - IC A29 74192 A-481010

- IC A34 7474 A-481006

D. GAME IS READY TO PLAY WITHOUT REQUIRING CREDIT.

REPLACE - IC A6 7474 A-481006

2. APPLY CREDIT (PUT QUARTER IN COIN BOX)

A. CREDIT DOES NOT APPEAR.

CHECK - COIN BOX PLUGGED IN

- COIN BOX WIRING

- COIN BOX SWITCH FOR FREEDOM OF OPERATION



CHECK - PIN #3, A33 FOR 30Hz CLOCK. IF THERE IS NO 30Hz CLOCK PULSE, REPLACE IC A31 7493 A-481008

- PIN #5, A29 WHILE SWITCHING THE COIN BOX SWITCH. IF THERE IS NO SWITCHING LEVEL, REPLACE IC A33 7474 A-481006

- IC A29 74192. IF PIN #14 LOW THEN REPLACE IC A29 74192. IF PIN HIGH, THEN REPLACE IC A34 7474 A-481006

B. GAMES DO NOT REGISTER CORRECT COUNT.

REMOVE - C-8

C. COUNTS UP BUT NOT DOWN. GAME DOES NOT PREPARE TO PLAY.

REPLACE - IC A32 7404 P-591091

IC A33 7474 A-481006

D. COUNTS UP BUT NOT DOWN. GAME RESETS AND IS PREPARED TO PLAY.

REPLACE - IC A29 74192 A-481010

E. COUNTS UP BUT COUNTS DOWN INCORRECTLY.

REMOVE - C-15

3. GAME ACCEPTS CREDIT AND PREPARES TO PLAY

A. TOM READY BUT WILL NOT THROW DART.

CHECK - RECEIVER OUTPUT FOR +5V WITHOUT TRANSMIT AND 0V WITH TRANSMIT ON.

- IF NOT, RETUNE RECEIVER.

B. A DART IN TRAJECTORY OR A HAND IS LIT AND GAME WILL NOT PLAY.

REPLACE - IC A31 7493 A-481008

IC A15 7474 A-481006

4. GAME PLAYS

A. DART SEQUENCE NOT CORRECT

CHECK - FOR SHORT CIRCUIT OR OPEN CIRCUIT IN  
PLAYER FRAME.

B. A DART IN TRAJECTORY FLICKERS OR DOES NOT LIGHT AT  
ALL AS THE GAME SEQUENCES ANOTHER DART.

REPLACE - DIODE FOUND ON PC BOARD ASSOCIATED WITH  
SOCKET.

C. A DART IN EACH TRAJECTORY (OPPOSITE EACH OTHER)  
DOES NOT LIGHT AT ALL.

REPLACE - TRANSISTOR DRIVER FOR LAMP PAIR B-481014

D. AN ENTIRE TRAJECTORY FAILS TO LIGHT OR IS ENERGIZED  
FOR THE OPPOSITE FIGURE.

REPLACE - TRAJECTORY DRIVER TRANSISTOR Q43, Q41,  
Q44, Q42 B-481014

5. TARGET & SCORING

A. MORE THAN ONE DART HITS TARGET.

REPLACE - IC A17 7486 A-481005

B. SCORE INCREMENTS WRONG COUNT.

REPLACE - IC A13 7403 P-591089

C. MAXIMUM POSSIBLE DART AND SCORE IS LESS THAN 10.

REPLACE - IC A16 7495 A-481009

D. GAME SHOOTS ONLY TWO'S

CHECK - AS IN 3A, RECIEVER OUTPUT TO REMAIN  
(WITHOUT BREAKS) AT 0 VOLTS WHILE THE  
TRANSMIT BUTTON IS PRESSED. REALIGN  
RECEIVER AND IF REQUIRED, TRANSMITTER.

E. SCORE RUNS WILD WHEN DART HITS TARGET.

REPLACE - IC A13 7403 P-591089

- IC A7 7402 A-481003

- IC A32 7404 P-591091

F. SCORE DOES NOT INCREMENT.

REPLACE - IC A21 7490 A-481007 FOR TOM

- IC A9 7490 A-481007 FOR DICK

6. END OF GAME

A. PLAY DOES NOT TRANSFER TO DICK OR IT DOES TRANSFER  
BUT IMMEDIATELY RETURNS TO TOM.

REPLACE - IC A6 7474 A-481006

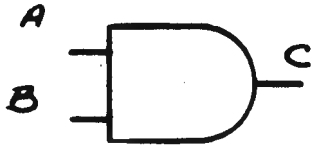
B. END OF GAME OCCURS AT A LOWER SCORE THAN 90.

REPLACE - IC A7 7402 A-481003

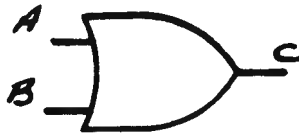
C. END OF GAME DOES NOT OCCUR.

REPLACE - IC A6 7474 A-481006

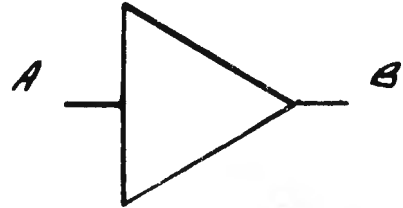
IC A24 7400 A-481001



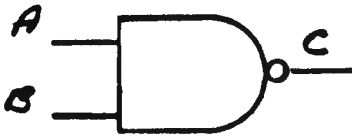
"AND"  
 $C = AB$



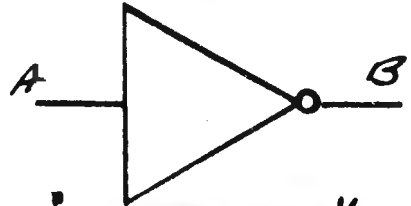
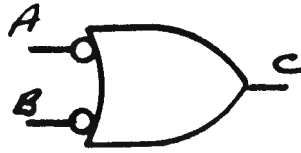
"OR"  
 $C = A + B$



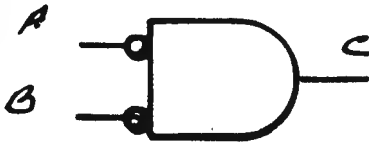
AMPLIFIER  
 (OR DRIVER)  
 $B = A$



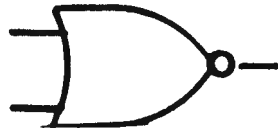
"NAND"  
 $C = \overline{AB} = \overline{A} + \overline{B}$



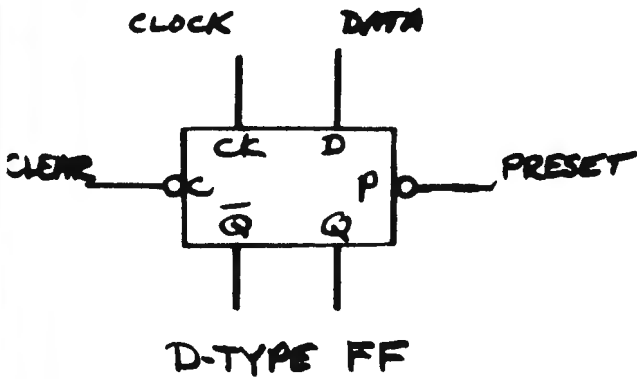
"INVERTER"  
 $B = \overline{A}$



"NOR"  
 $C = \overline{A+B} = \overline{A} \cdot \overline{B}$



"EXCLUSIVE OR"  
 $C = A\overline{B} + \overline{A}B$



OTHER LOGIC FUNCTIONS  
 WILL BE ENCLOSED WITHIN  
 RECTANGLES. POWER, VCC AND GND,  
 WILL NOT NORMALLY BE SHOWN  
 HOWEVER GROUNDED INPUTS AND TIED  
 HIGH INPUTS WILL BE SHOWN.

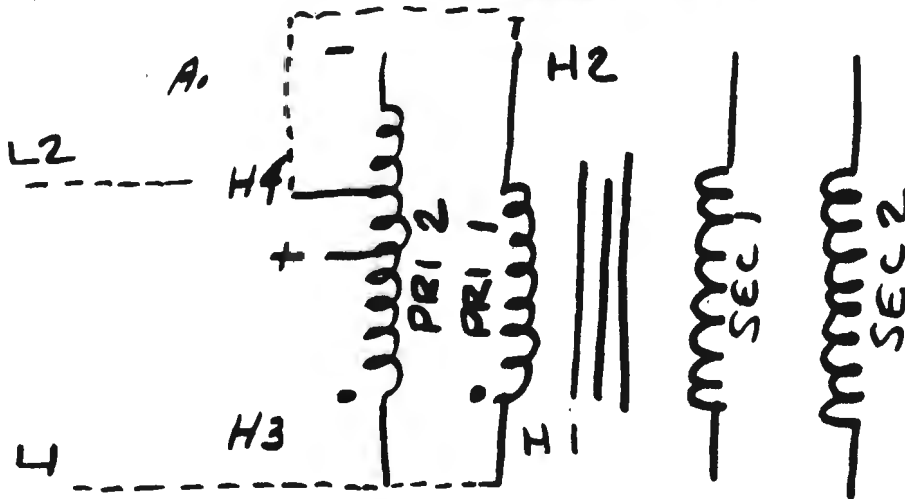
ELECTRO-DART  
 LOGIC CONVENTION

LOGIC SUPPLY -  $V_{CC} = 5.00 \pm_{-0.25}^{+0.25}$  VOLTS DC  
 LM 309 K REGULATOR INPUT = 8-9.5 V DC  
 LAMP SUPPLY  $V_L = 6-8$  V DC (UNFILTERED)

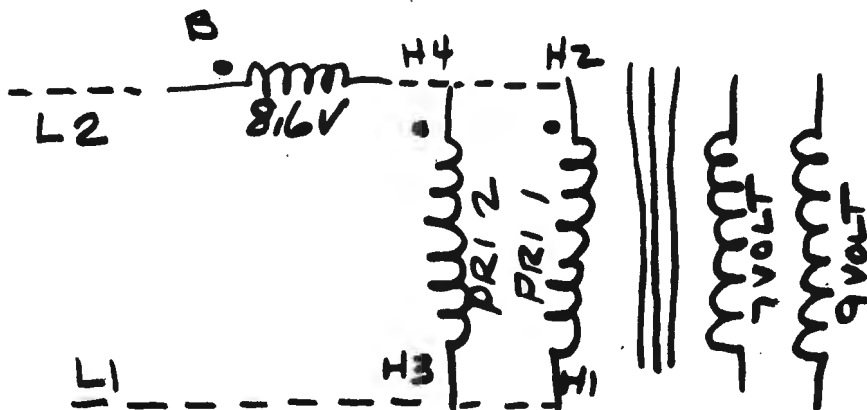
LOGIC HIGH LEVEL = 2.50 TO 5.25 V DC  
 LOGIC LOW LEVEL = 0.00 TO 0.40 V DC

A.C. INPUT @ 60 Hz = 105 TO 125 V AC

TWO TRANSFORMERS MAY BE ADJUSTED.



CONNECT  
 H1 TO H3  
 H2 TO H4  
 L1 TO H1  
 L2 TO -



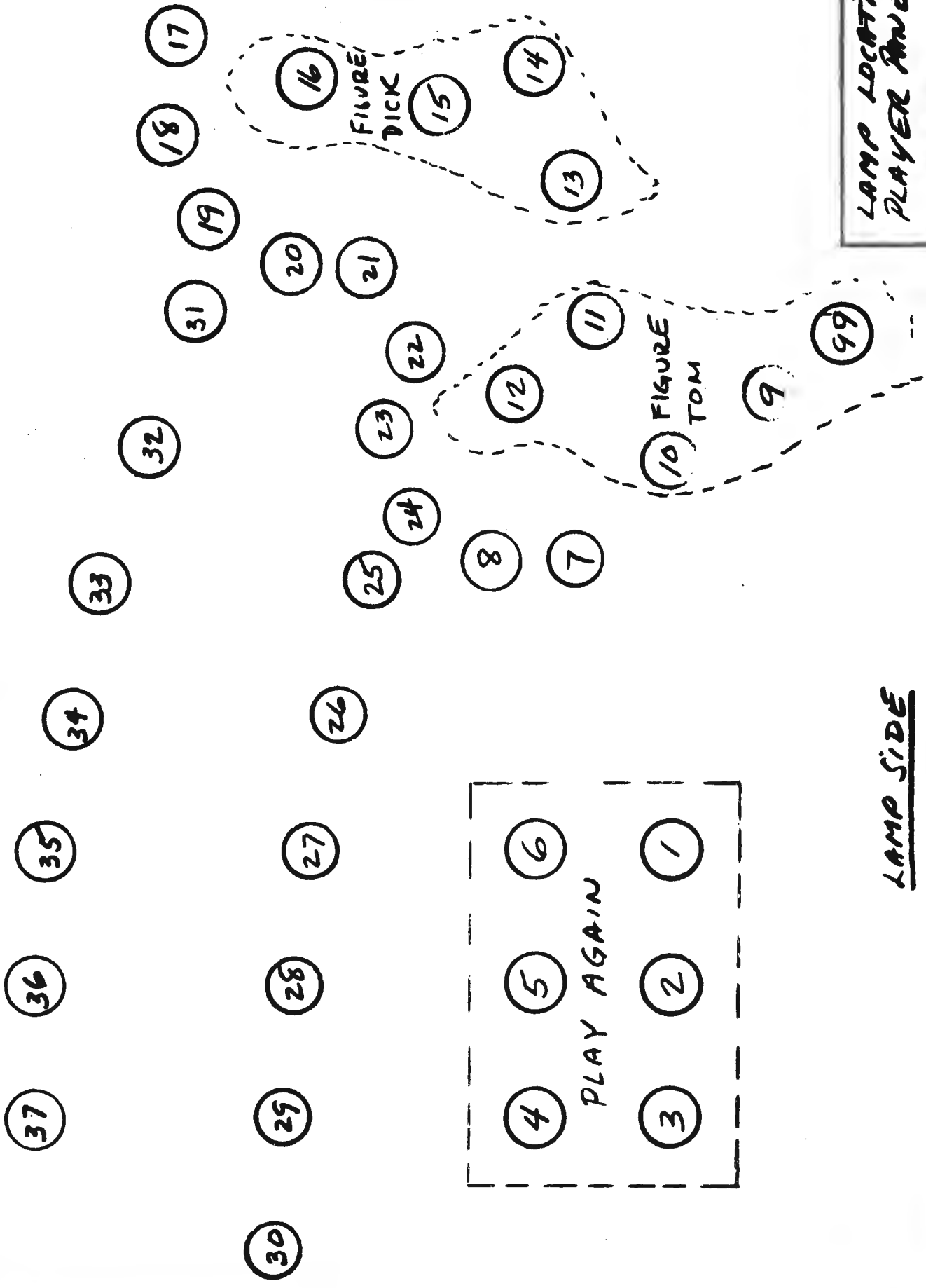
CONNECT  
 H1 TO H3  
 H2 TO H4  
 8.6V LAMP TO H4  
 L1 TO H1  
 L2 TO 8.6V LAMP

Lamp Numbers

<u>Sequence</u>	<u>Tom</u>	<u>Dick</u>	<u>Sequence</u>	<u>Tom</u>	<u>Dick</u>
1	7	21	23	49	42
2	8	20	24	50	43
3	24	19			
4	23	18			
5	24	19			
6	23	18			
7	22	17			
8	23	18			
9	24	19			
10	25	31			
11	26	32			
12	27	33			
13	28	34			
14	29	35			
15	30	36			
16		37			
17					
18	44				
19	45	38			
20	46	39			
21	47	40			
22	48	41			

Refer to Fig's 1 & 2  
For Location of Lamps

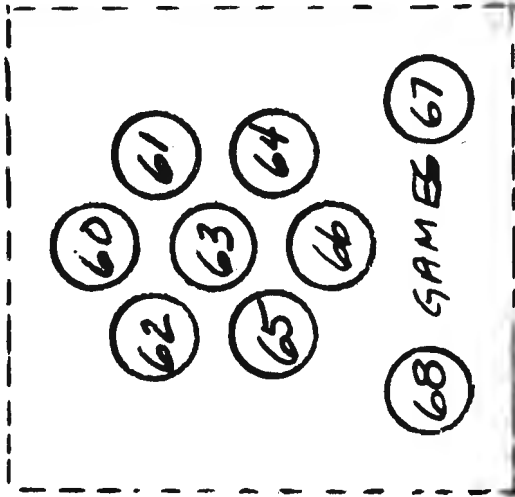
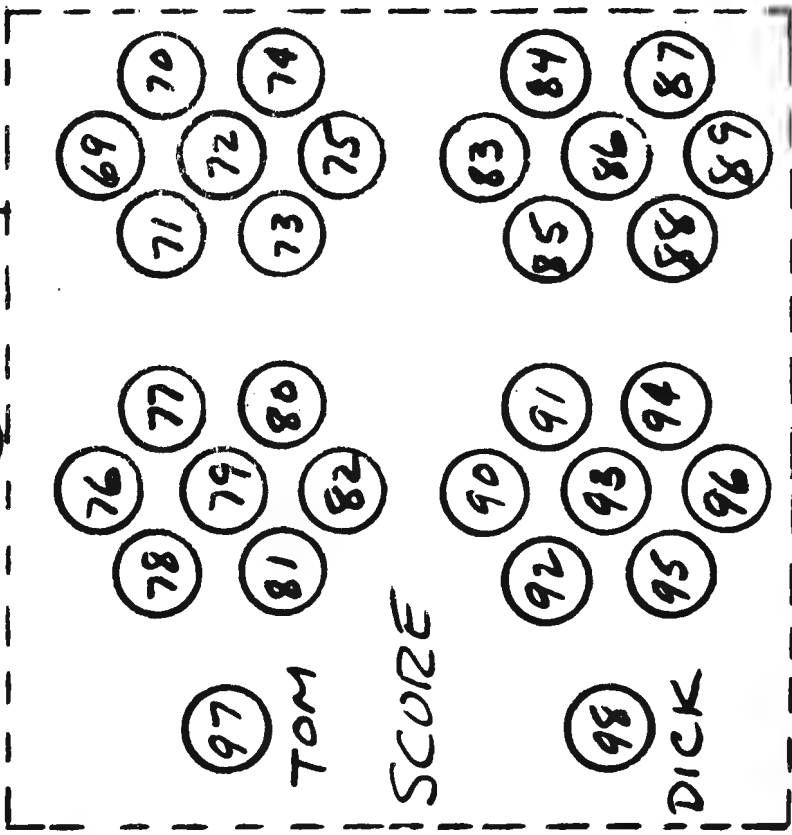
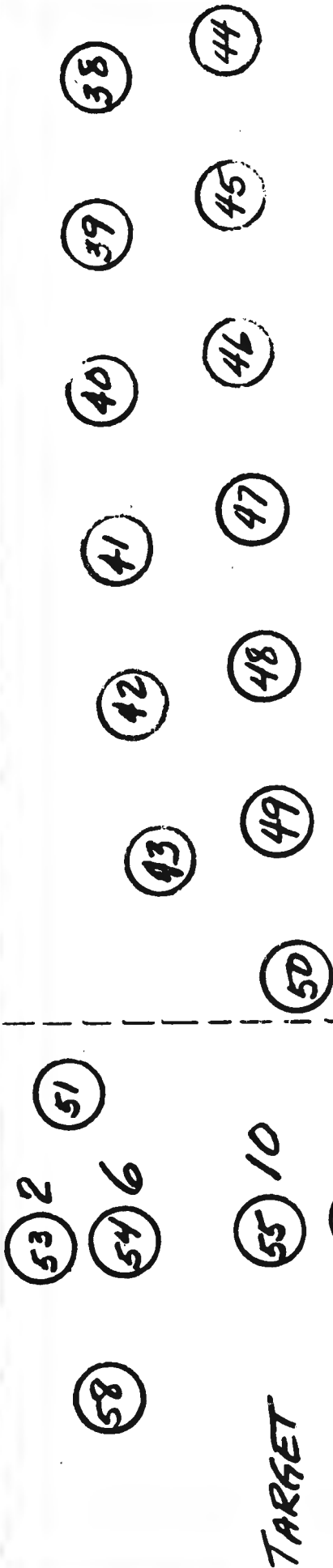
LAMP SEQUENCING  
TABLE #1



LAMP LOCATION  
 PLAYER ANGLE  
 FIGURE #1

LAMP SIDE

PLAY AGAIN



LAMP LOCATION  
TARGET PANEL  
FIGURE 2



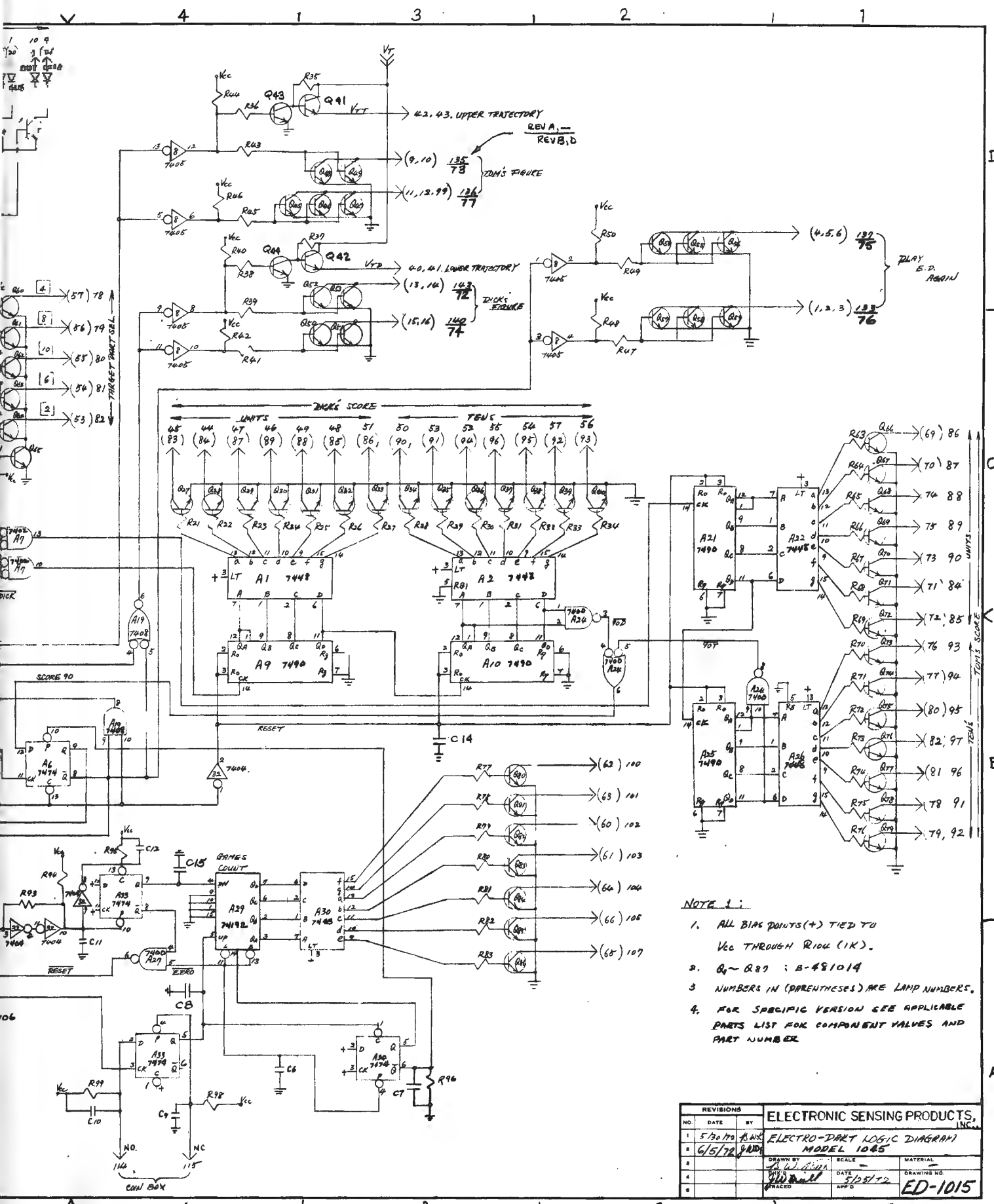
ELECTRO-DART  
 Model 1045  
 Recommended Spare Parts List  
 Quantity Recommended to Support  
 100 Operating Electro-Dart Games

<u>Part No.</u>		<u>Description</u>	
A-481001	#7400	Quad 2 Input Nand Gates. . . . .	10
A-481003	#7402	Quad 2 Input Nor Gates . . . . .	10
A-481004	#7448	BCD-to 7 Segment Decoder/Drivers . . . . .	6
A-481005	#7486	Quad 2 Input Exclusive or Gates. . . . .	5
A-481006	#7474	Dual D-Type Flip-Flop. . . . .	10
A-481007	#7490	Decade Counter . . . . .	10
A-481008	#7493	4 Bit Binary Counter . . . . .	5
A-481009	#7495	4 Bit Shift Register . . . . .	10
A-481010	#74192	4 Bit Up/down Counter. . . . .	5
B-481012		#47 Lamp . . . . .	50
B-481014		Lamp Driver Transistor . . . . .	10
B-481016		8000 MFD Capacitor . . . . .	1
B-481018		1N914 Diode. . . . .	4
B-481019		220 1/4 w Resistor. . . . .	10
B-481020		100 1/4 w Resistor. . . . .	10
B-481022		.01 MFD Capacitor. . . . .	5
B-481023		.1 MFD Capacitor . . . . .	5
C-481025		Fuse Holder Assembly . . . . .	2
C-481026		1A Fuse. . . . .	20
C-481028		12' AC Line Cord . . . . .	
C-481029		15' 3 Conductor Cable. . . . .	1
C-481033		Toggle Switch. . . . .	2
D-481034		1N5171 Diode . . . . .	2
D-481035		Coin Box Assembly. . . . .	2
R-592001		Cash Box Drawer. . . . .	2
D-481036		Target Display Assembly. . . . .	
D-481037		Player Display Assembly. . . . .	
E-481040		4.7K 1/4w Resistor. . . . .	10
E-481041		220K 1/4w Resistor. . . . .	10
E-481042		1K 1/4w Resistor . . . . .	10
E-481043		20 MFD Electrolytic Capacitor. . . . .	2
E-481044		2N4870 Transistor, Unijunction . . . . .	2
F-481049		Panel Bulb Socket Assembly . . . . .	10
G-481051		Bright Al. Frame Assembly. . . . .	
J-481061		4 Pin Male Connector . . . . .	3
J-481062		4 Pin Female Connector . . . . .	3

Recommended  
Spares List

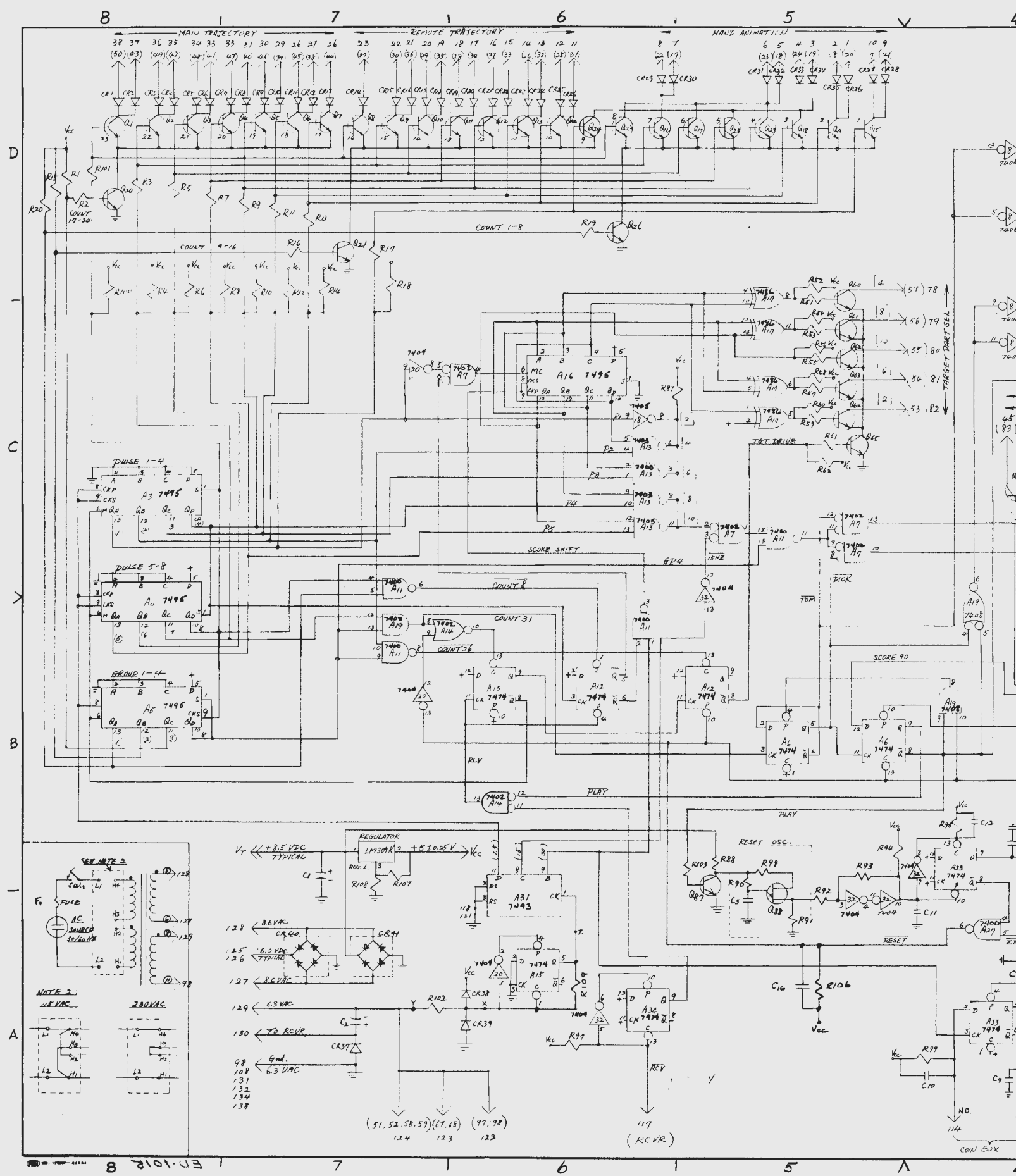
ELECTRO-DART

<u>Part No.</u>	<u>Description</u>	
L-481067	RF Transmitter (specify frequency).	10
L-481068	RF Receiver Assembly (specify frequency).	2
M-481078	LM 309K Regulator Assembly.	1
M-481079	MDA-970-1 Rectifier Assembly.	2
M-481080	150 MFD Electrotyic Capacitor	2
M-481081	1N4001 Diode.	2
M-481082	Power Transformer	2
M-481083	2700 pf Capacitor	2
M-481084	MDA-970-1 Rectifier Assembly.	6
M-481085	Heat Sink	*
M-481087	"A" Freq. Transmitter Crystal	*
M-481088	"A" Freq. Receiver Crystal.	*
M-481089	"G" Freq. Transmitter Crystal	*
M-481090	"G" Freq. Receiver Crystal.	*
M-481091	"F" Freq. Transmitter Crystal	*
M-481092	"F" Freq. Receiver Crystal.	*
M-481093	Transmitter Case (Box & Lid).	10
M-481094	Transmitter Case (Lid only)	10
M-481095	Transmitter Pushbutton Switch	5
M-481096	Rubber Feet (transmitter) Set of 4.	2 sets
M-481097	Transistor (Green Dot) (Tx/Rx) 2329	
M-481098	Transistor (Yellow Dot) (Tx/Rx) 2328.	
M-481099	Transistor 2N5356 (Tx/Rx) 3045.	
M-481100	Coil, Audio, Transmitter.	
M-481101	Coil, Audio, Receiver	
P-591087	40 Conductor Cable (5.5 ft.).	
P-591088	#7405 Hex Inverters (OCO)	5
P-591089	#7403 Quad 2 Input Positive Nand Gates (OCO).	5
P-591090	#7408 Quad 2 Input Positive and Gates	5
P-591091	#7404 Hex Inverters	5
P-591092	470 1/4 W Resistor	10
P-591094	330 1/4 W Resistor	10
P-591096	1.5 1/4 W Resistor	10
P-591099	33 Pin Male Connector	1
P-591100	33 Pin Female Connector	1
P-591101	Target Web.	
P-591102	Player Web.	
P-591103	Target Case	
P-591104	Player Case	



- NOTE 1:**
1. ALL BIAS POINTS (+) TIED TO Vcc THROUGH R104 (1K).
  2. Q<sub>1</sub> ~ Q<sub>87</sub> : A-481014
  3. NUMBERS IN (PARENTHESES) ARE LAMP NUMBERS.
  4. FOR SPECIFIC VERSION SEE APPLICABLE PARTS LIST FOR COMPONENT VALUES AND PART NUMBER

REVISIONS			ELECTRONIC SENSING PRODUCTS, INC.		
NO.	DATE	BY			
1	5/30/72	AWK	ELECTRO-DART LOGIC DIAGRAM		
2	6/5/72	JND	MODEL 1085		
3			DRAWN BY	SCALE	MATERIAL
4			DATE		DRAWING NO.
5			APPRO	5/25/72	ED-1015



8

7

6

5

4

MAIN TRAJECTORY  
 38 37 36 35 34 33 32 31 30 29 28 27 26 23 22 21 20 19 18 17 16 15 14 13 12 11  
 (50) (43) (44) (42) (41) (40) (39) (38) (37) (36) (35) (34) (33) (32) (31) (30) (29) (28) (27) (26) (25) (24) (23) (22) (21) (20)

REMOTE TRAJECTORY  
 8 7 (22) (17) 6 5 4 3 2 1 10 9  
 CR29 CR30 CR31 CR32 CR33 CR34 CR35 CR36 CR37 CR38

HAND ANIMATION  
 COUNT 1-8  
 COUNT 9-16  
 COUNT 17-24

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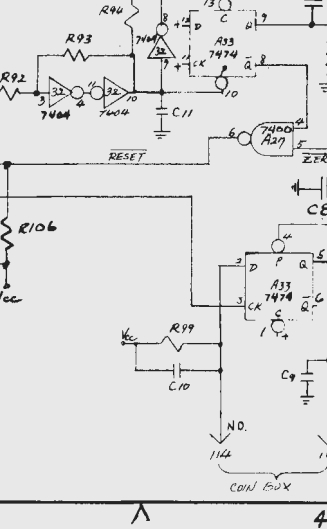
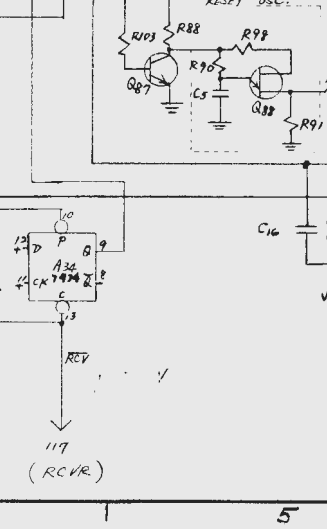
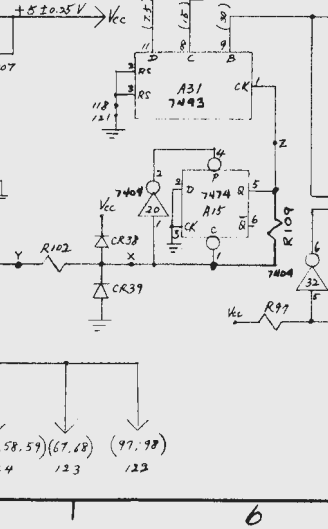
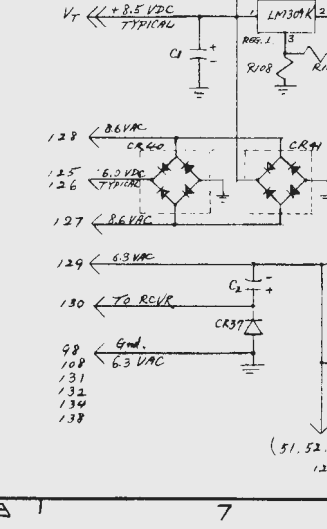
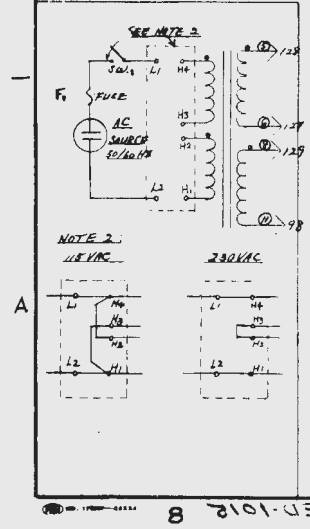
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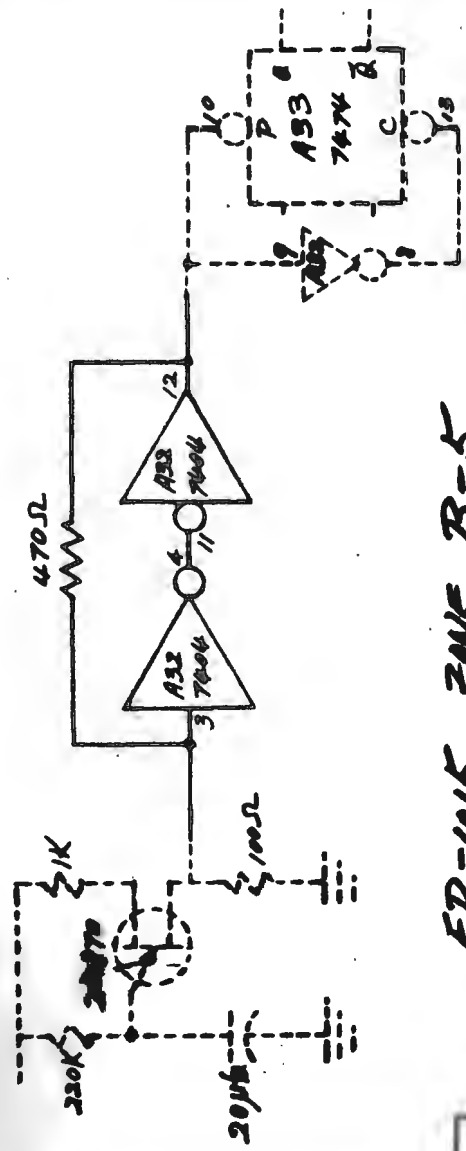
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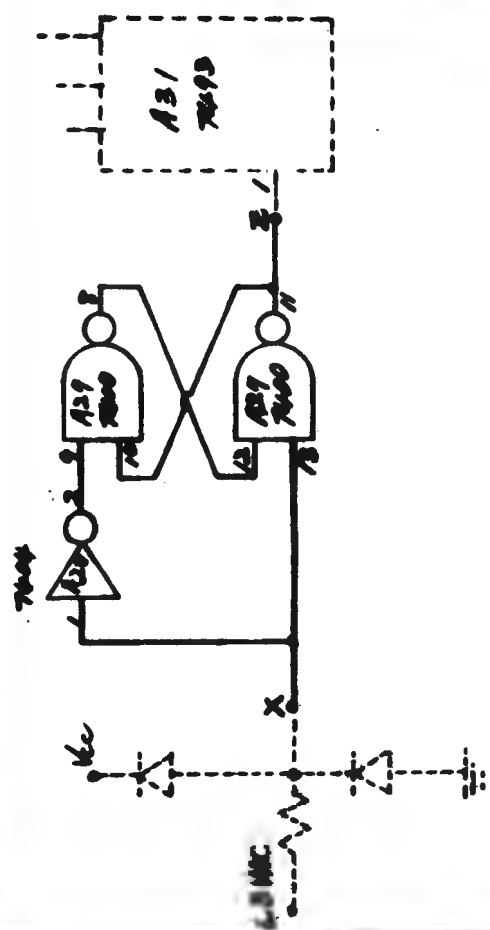


EN-1012 8 7 6 5 4

MODIFICATION TO ED-1015  
 EAR WIRE-IN BOARD  
 PRIOR TO REVISION "A"



ED-1015 ZONE B-5



ED-1015 ZONE A-6

E.S.P.

SCALE: APPROVED BY: jpm 7/2/72

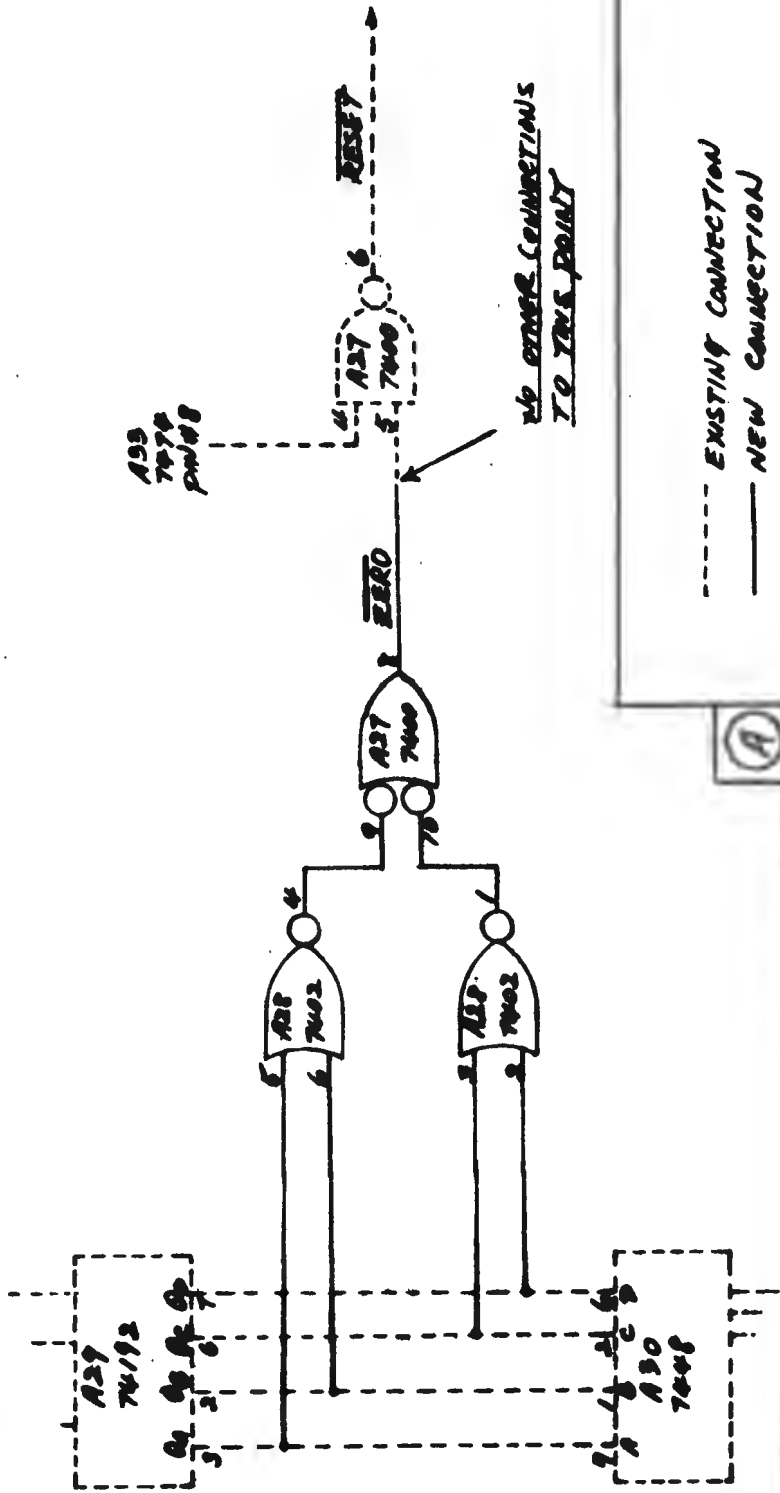
DATE: 7/2/72

OSCILLATOR SCHMITT TRIGGER

Clock Sampling Circuit

DRAWING NUMBER

ED-1015

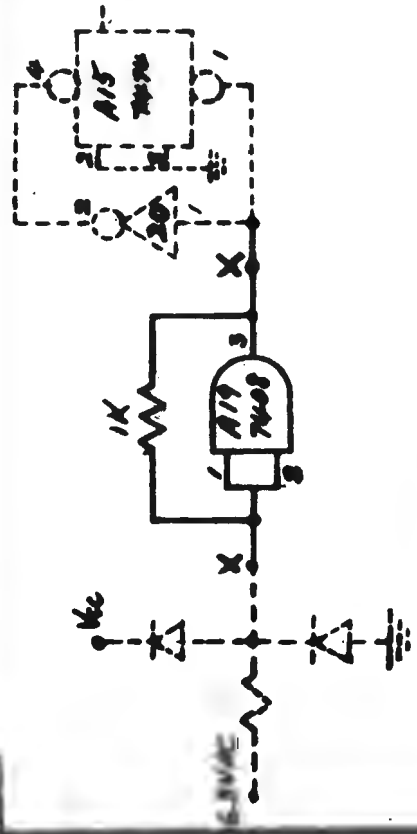


ED 1015 ZONE A-6

--- EXISTING CONNECTION  
 ——— NEW CONNECTION

LOGIC MODIFICATION TO ED-1015 FOR REV. C & E  
 PLUG IN BOARD GAME

(A)



ED 1015 ZONE A-6

SCALE:

DATE:

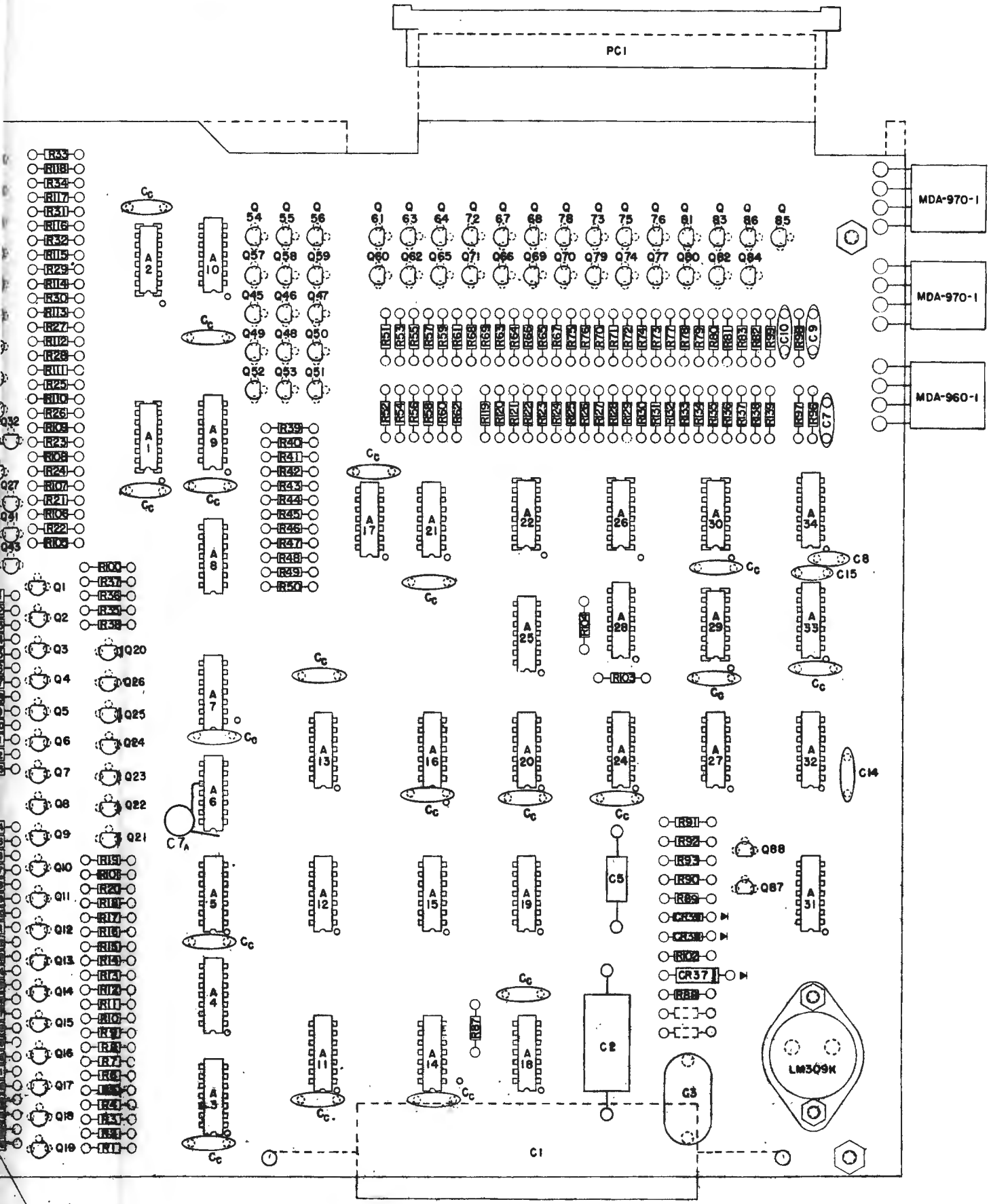
DRAWN BY:

REVISED

*E.S.P.*  
*John White*

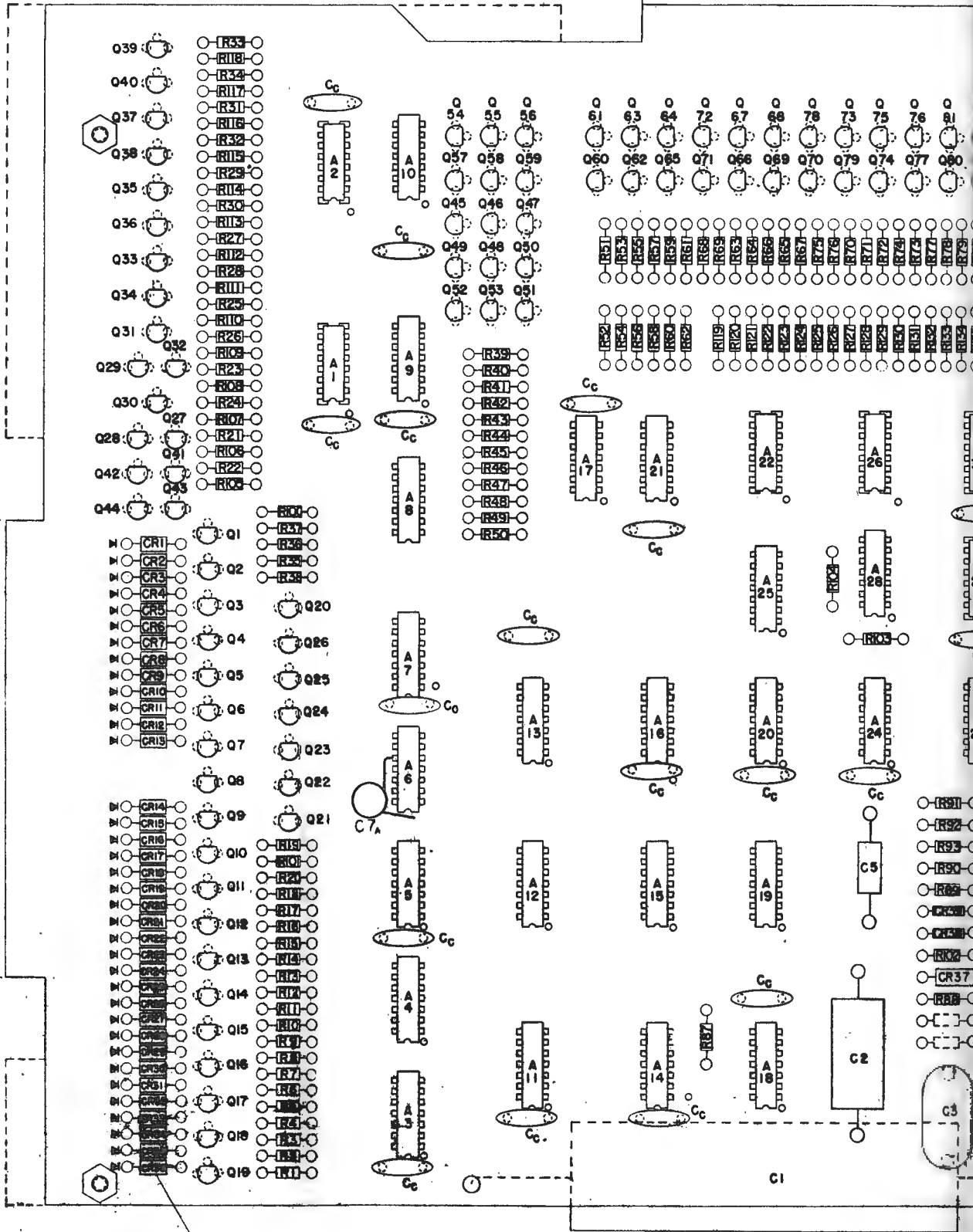
A ZERO-GAMES RECOGNITION LOGIC

REVISION NUMBER  
 ED 1034




BATHOSRE ORIENTATION  
 DE PLACES (YTR)  
 GP1-CR2P

PCI

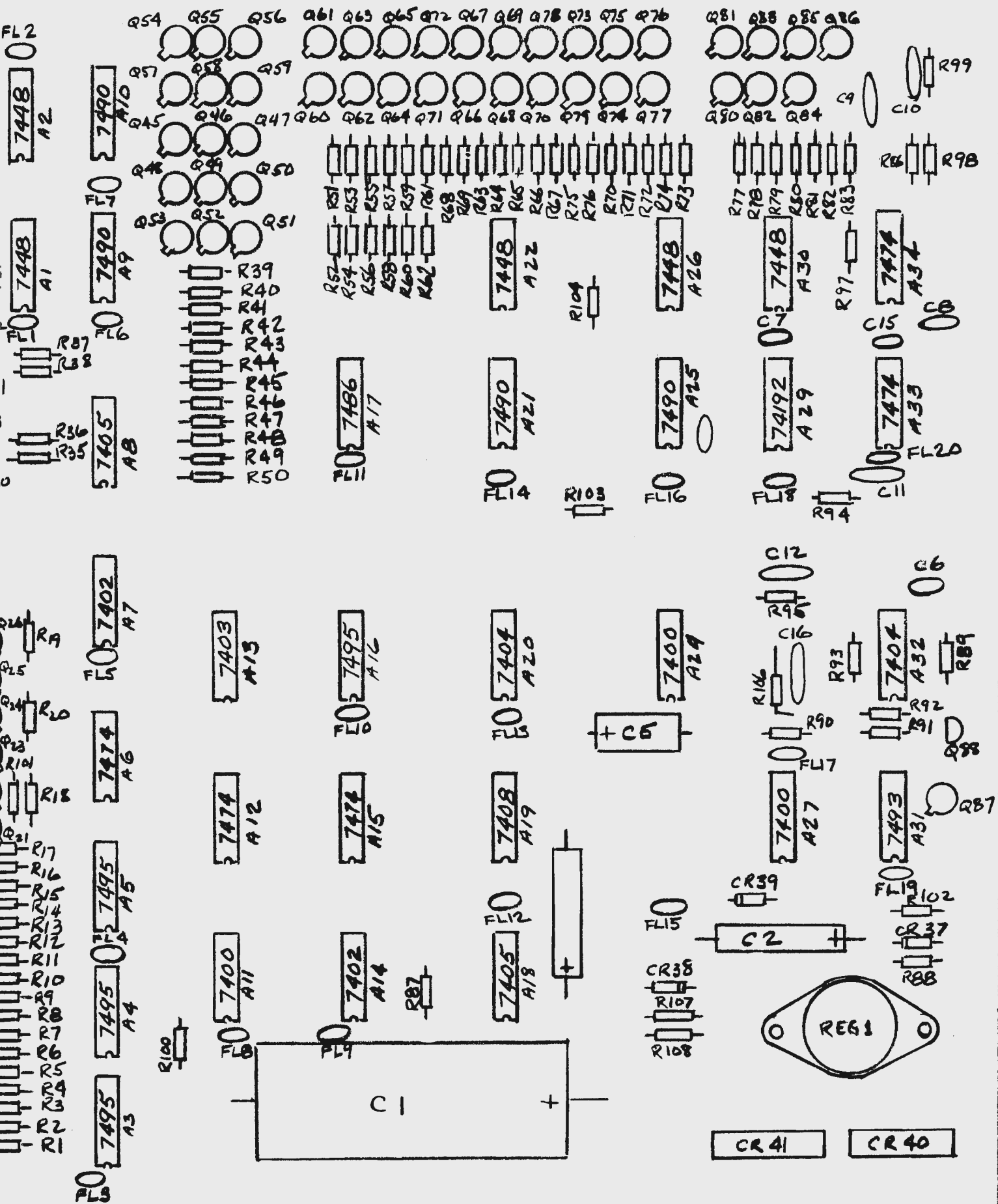


PC2

C1


  
 CATHODE ORIENTATION
   
 IN PLACES (TR)
   
 CR1-CR20





FL2  
7448  
A2

7448  
A1

7405  
A8

7402  
A7

7474  
A6

7495  
A5

7495  
A4

7495  
A3

FL3

7490  
A10

7490  
A9

7405  
A8

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7495  
A5

7495  
A4

7495  
A3

Q54 Q55 Q56 Q61 Q63 Q65 Q72 Q67 Q69 Q78 Q73 Q75 Q76

Q57 Q58 Q59 Q45 Q46 Q47 Q60 Q62 Q64 Q71 Q66 Q68 Q70 Q79 Q74 Q77

R52 R54 R55 R56 R58 R60 R62 R68 R69 R73 R74 R75 R76 R70 R72 R74 R73

R39 R40 R41 R42 R43 R44 R45 R46 R47 R48 R49 R50

R37 R38 R35 R36

7486  
A17

7490  
A21

7403  
A13

7495  
A16

7474  
A12

7474  
A15

7402  
A14

7408  
A19

7405  
A18

Q81 Q83 Q85 Q86

Q80 Q82 Q84

R77 R78 R79 R80 R81 R82 R83

7448  
A30

7492  
A29

7492  
A29

7400  
A27

7400  
A29

7400  
A27

7493  
A31

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A31

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A31

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A31

7493  
A31

R99  
C10

R98

7474  
A34

7474  
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7404  
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7493  
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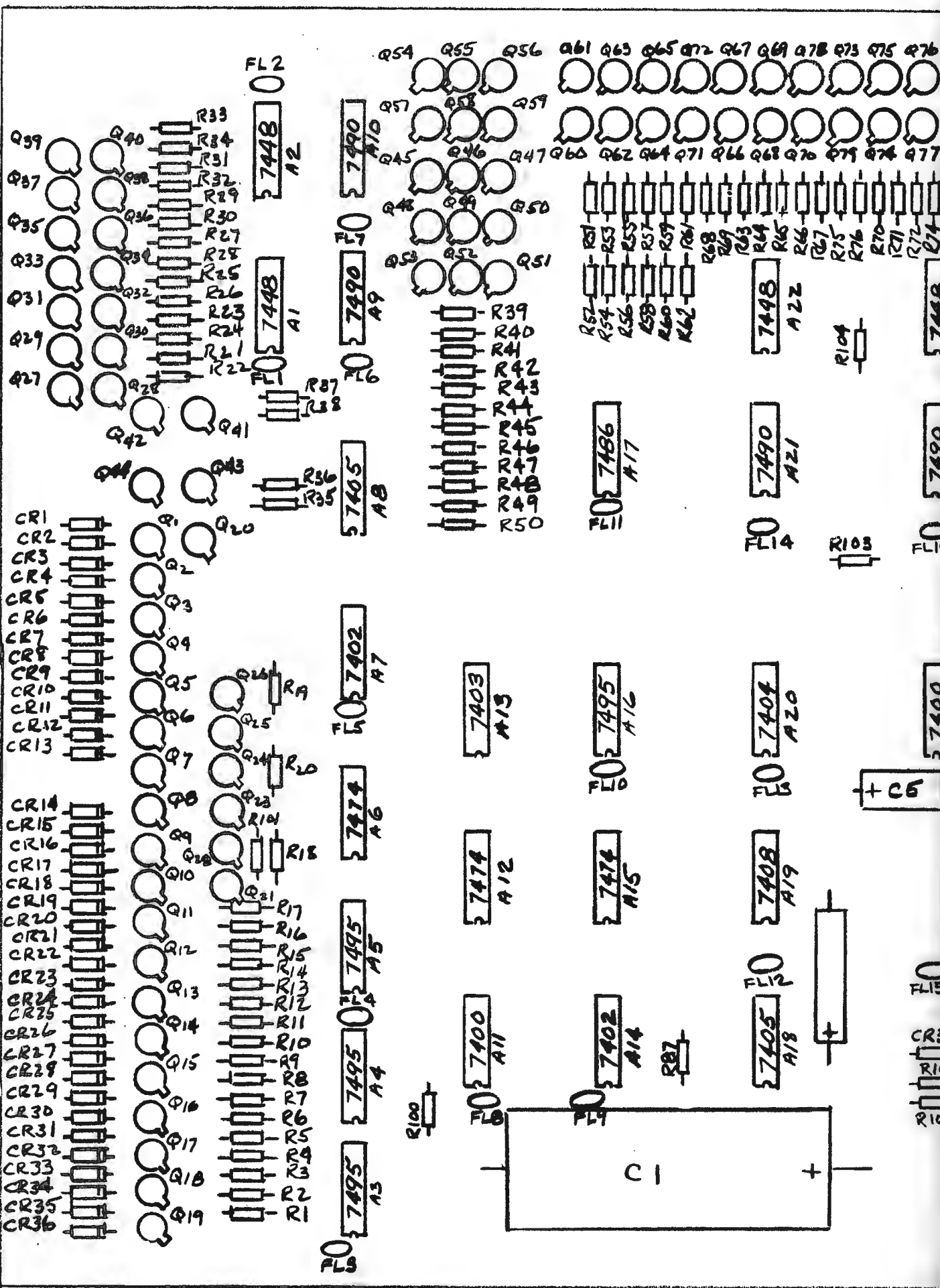
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A31

7493  
A31



CR41

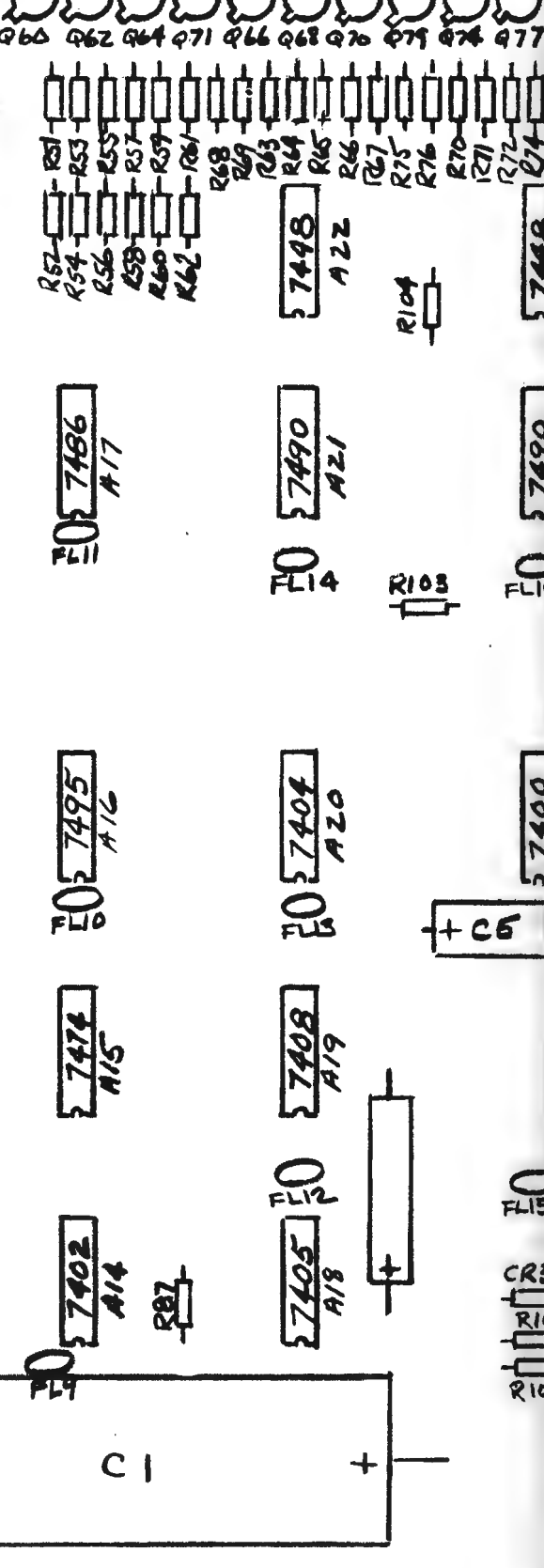
CR40

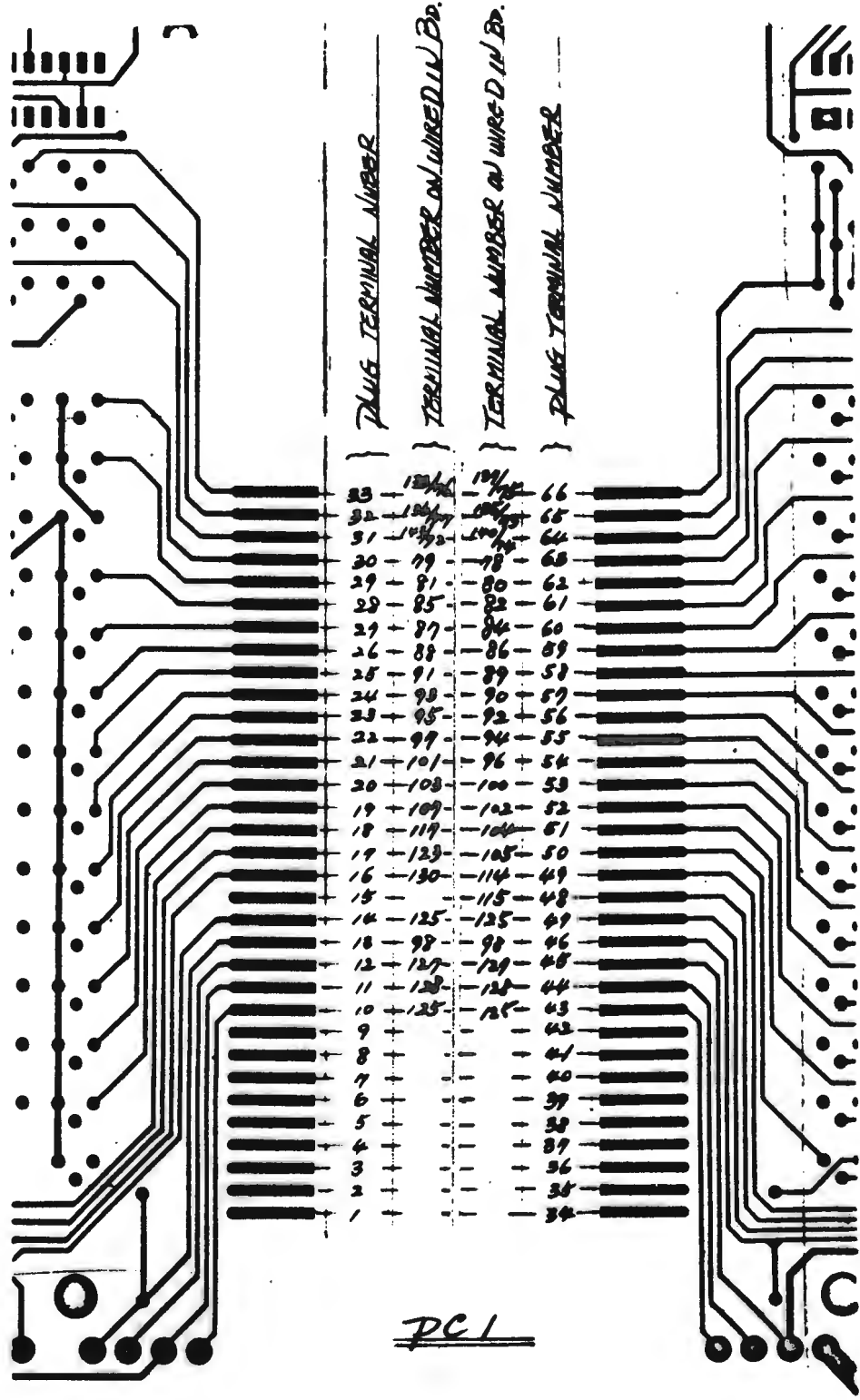


- CR1
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- CR14
- CR15
- CR16
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- CR33
- CR34
- CR35
- CR36

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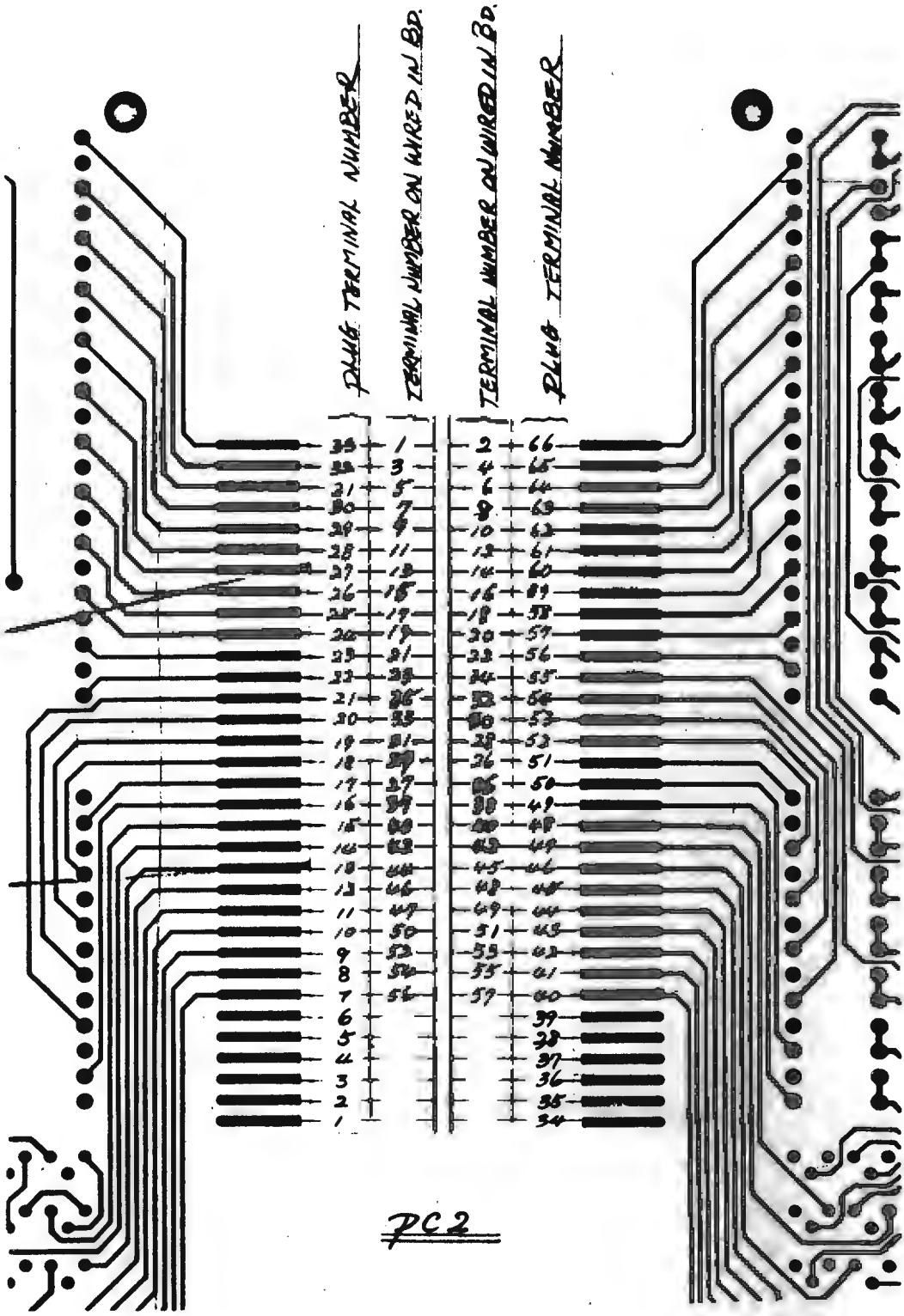




PLUG TERMINAL NUMBER  
TERMINAL NUMBER ON WIRED IN BO.  
TERMINAL NUMBER ON WIRED IN BO.  
PLUG TERMINAL NUMBER

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31	103	107	64
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29	81	80	62
28	85	82	61
27	87	84	60
26	88	86	59
25	91	89	58
24	98	90	57
23	95	92	56
22	99	94	55
21	101	96	54
20	103	100	53
19	109	102	52
18	119	104	51
17	123	105	50
16	130	114	49
15		115	48
14	125	125	47
13	98	98	46
12	127	129	45
11	128	128	44
10	125	125	43
9			42
8			41
7			40
6			39
5			38
4			37
3			36
2			35
1			34

PC1



PLUG TERMINAL NUMBER

TERMINAL NUMBER ON WIRED IN BOARD

TERMINAL NUMBER ON WIRED IN BOARD

PLUG TERMINAL NUMBER

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34	3	4	65
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