

## **CHAPTER 4 Drawings**

Backbox Wiring Diagram

CPU Board Assembly Drawing

CPU Board Logic

Driver Board Assembly Drawing

Driver Board Logic Diagram (Sheet 1 of 2)

Driver Board Logic Diagram (Sheet 2 of 2)

Power Supply Assembly and

Schematic Diagrams

Power Wiring Diagram

Sound Board Assembly Drawing

Sound Board Logic Diagram

Insert Board Wiring Diagram

C-8363 Master Display Board Assembly Drawing

C-8363 Master Display Board Logic Diagram

C-8364 and C-8365 Slave Display Board

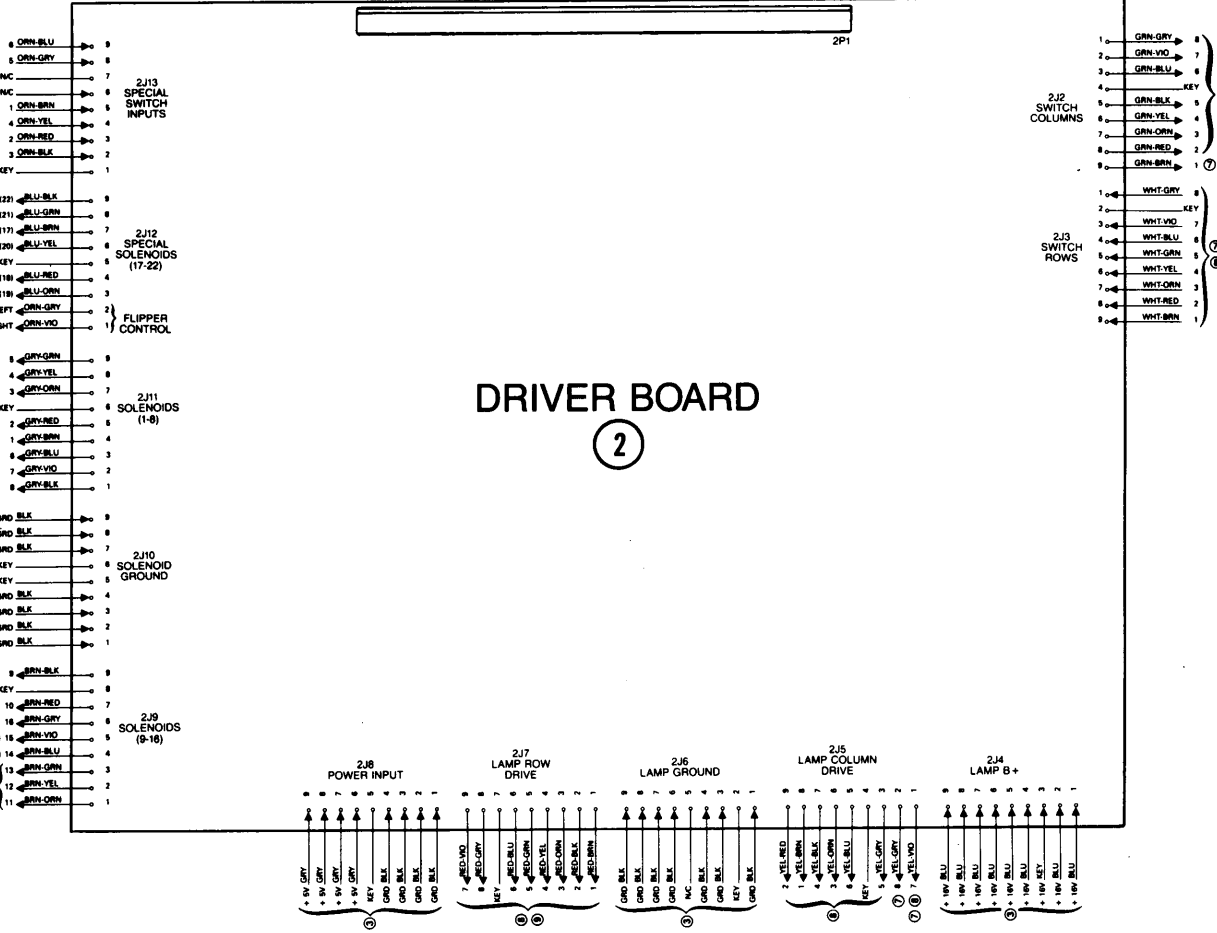
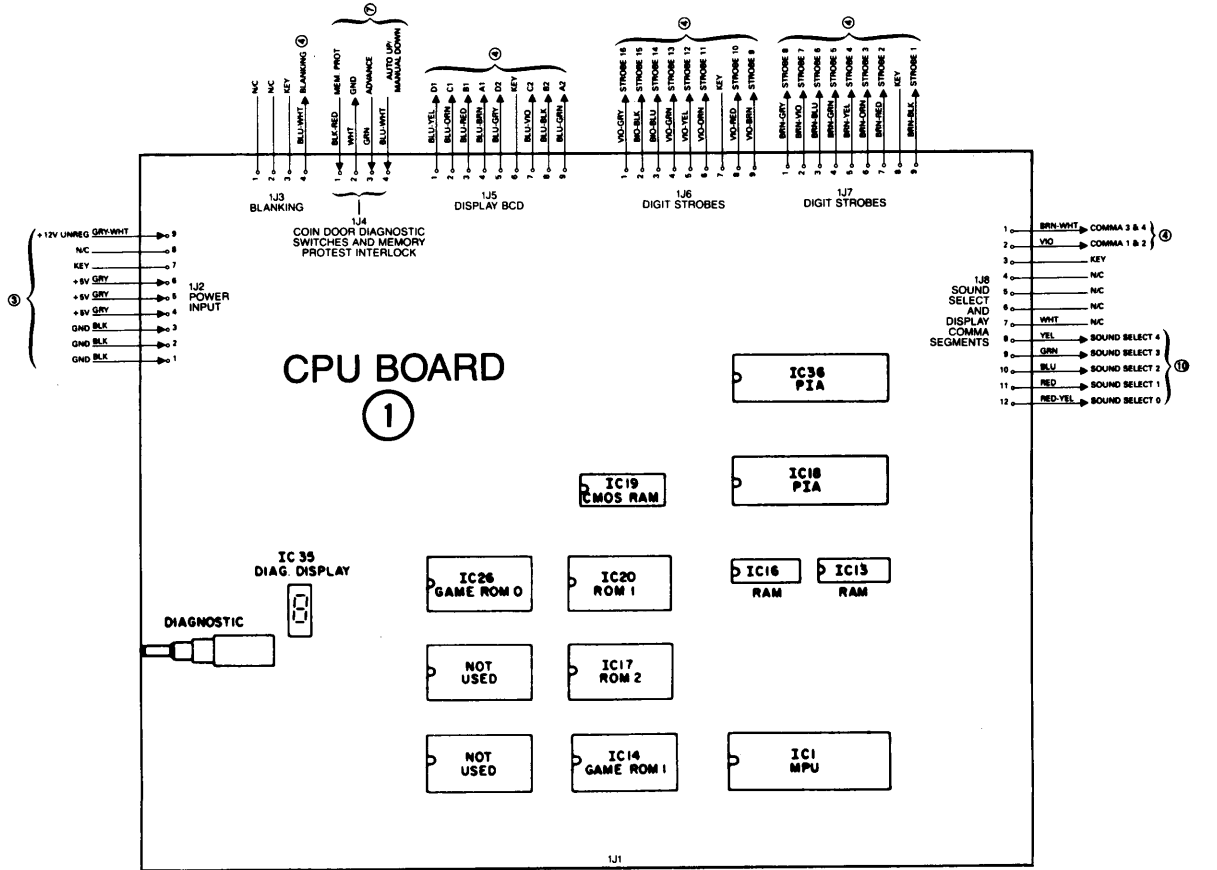
Assembly and Schematic Diagrams

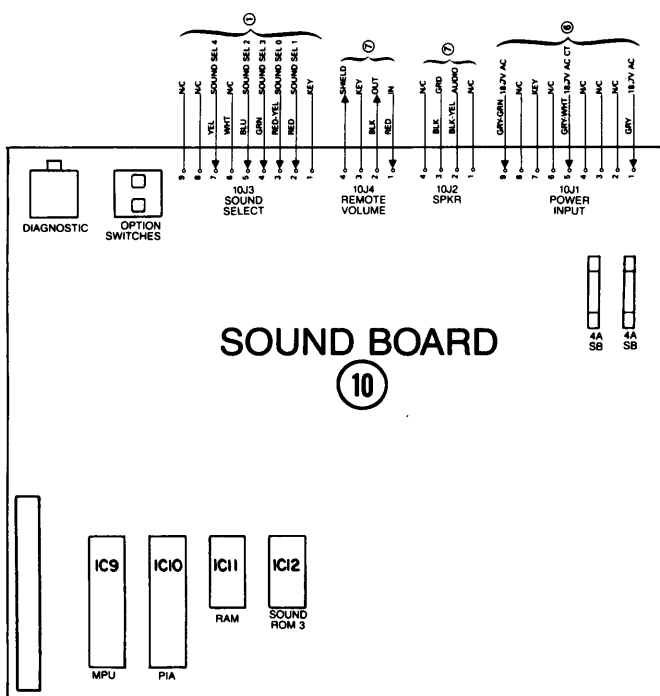
Cabinet Wiring Diagram

Playfield Lamp Wiring Diagram

Solenoid Wiring Diagram

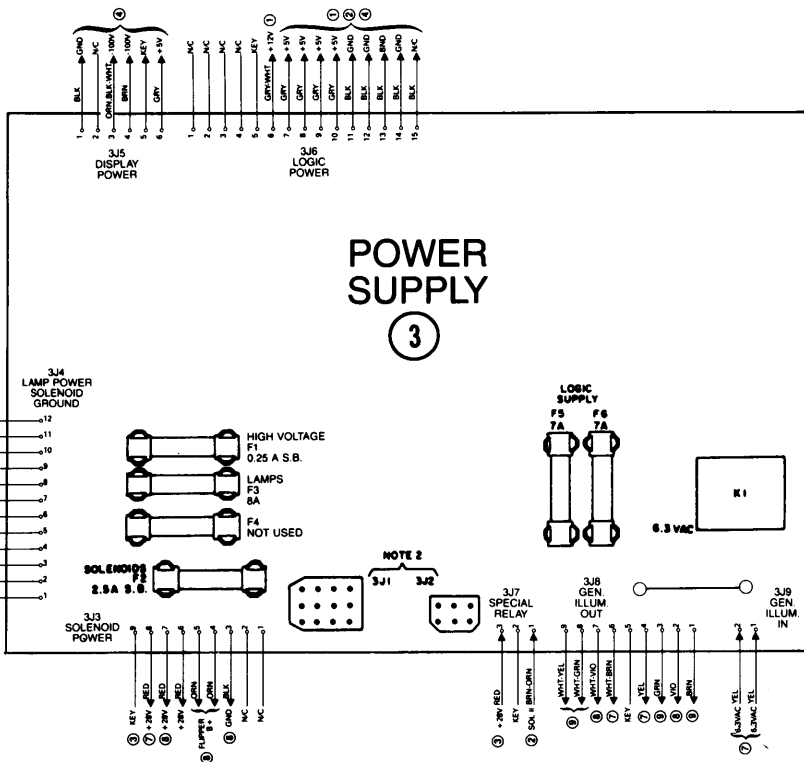
Playfield Switch Wiring Diagram





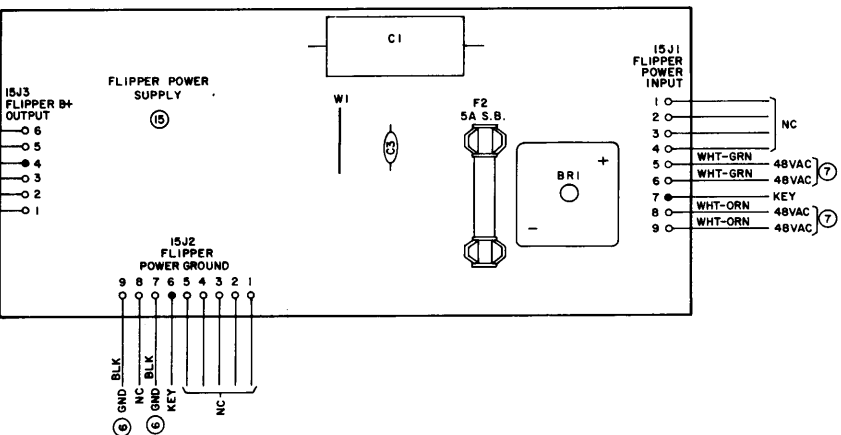
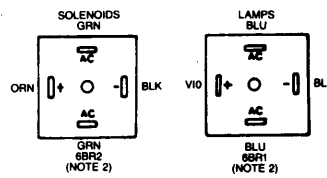
**NOTES:**

- CONNECTIONS ARE INDICATED BY CIRCLED NUMBERS AS FOLLOWS:
  - ① CPU BOARD
  - ② DRIVER BOARD
  - ③ POWER SUPPLY BOARD
  - ④ MASTER DISPLAY BOARD
  - ⑤ SLAVE DISPLAY BOARD
  - ⑥ BACKBOX
  - ⑦ CABINET
  - ⑧ PLAYFIELD
  - ⑨ INSERT BOARD
  - ⑩ SOUND BOARD
  - ⑪ NOT ASSIGNED
  - ⑫ NOT ASSIGNED
  - ⑬ NOT ASSIGNED
  - ⑭ NOT ASSIGNED
  - ⑮ FLIPPER POWER SUPPLY
- REFER TO POWER WIRING DIAGRAM FOR CONNECTIONS TO 3PI.

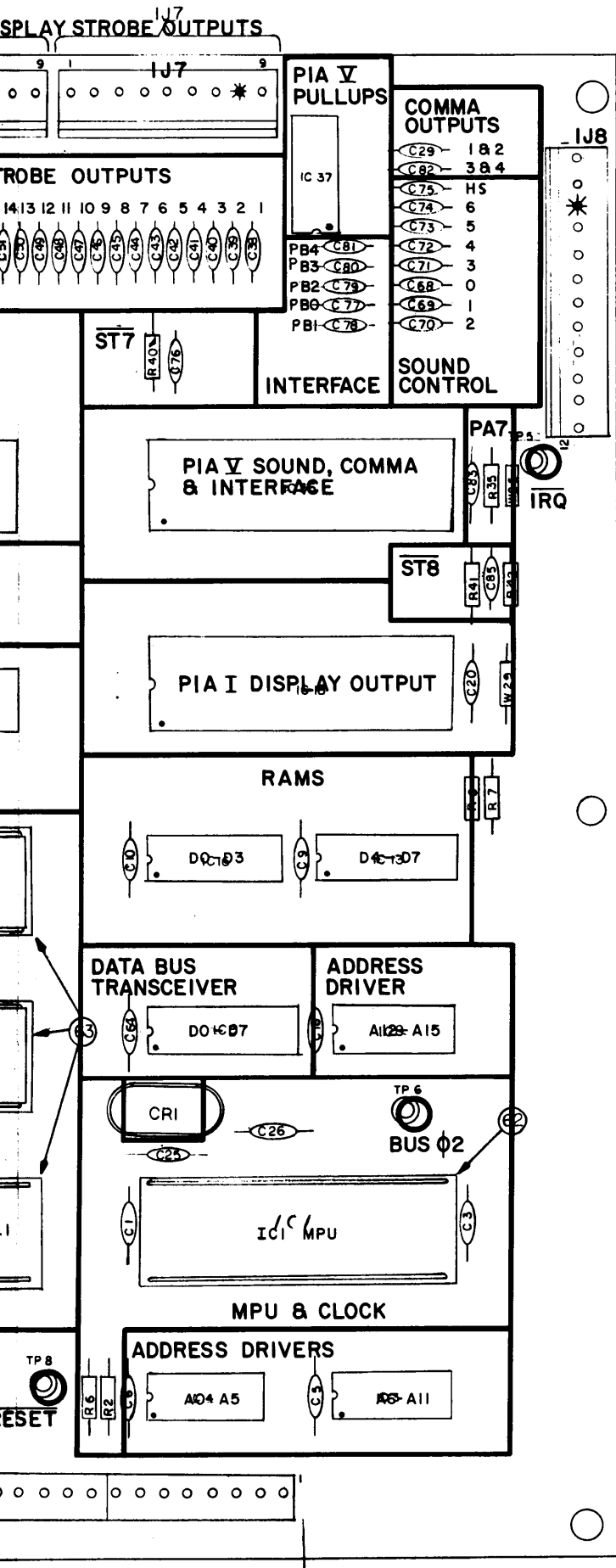


**BILL OF MATERIAL  
FLIPPER POWER SUPPLY**

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION
1	5768-09725-00		BARE P.C. BOARD
2	5100-09690-00	BR1	BRDG. REC. 35A 200V
3	5040-09794-00	C1	CAP. ELECTROLYTIC 100 uf 250V AXIAL
4	5043-09072-00	C3	CAP. CERAMIC 0.1 uf 500V
5	5731-09651-00	F2	FUSE 5A S.B. 250V
6	5732-09178-00		FUSE HOLDER
7	5791-09453-00	15J1 & 15J2	9 PIN HEADER
8	5791-09038-00	15J3	6 PIN HEADER







SOUND CONTROL & COMMAS

BILL OF MATERIAL

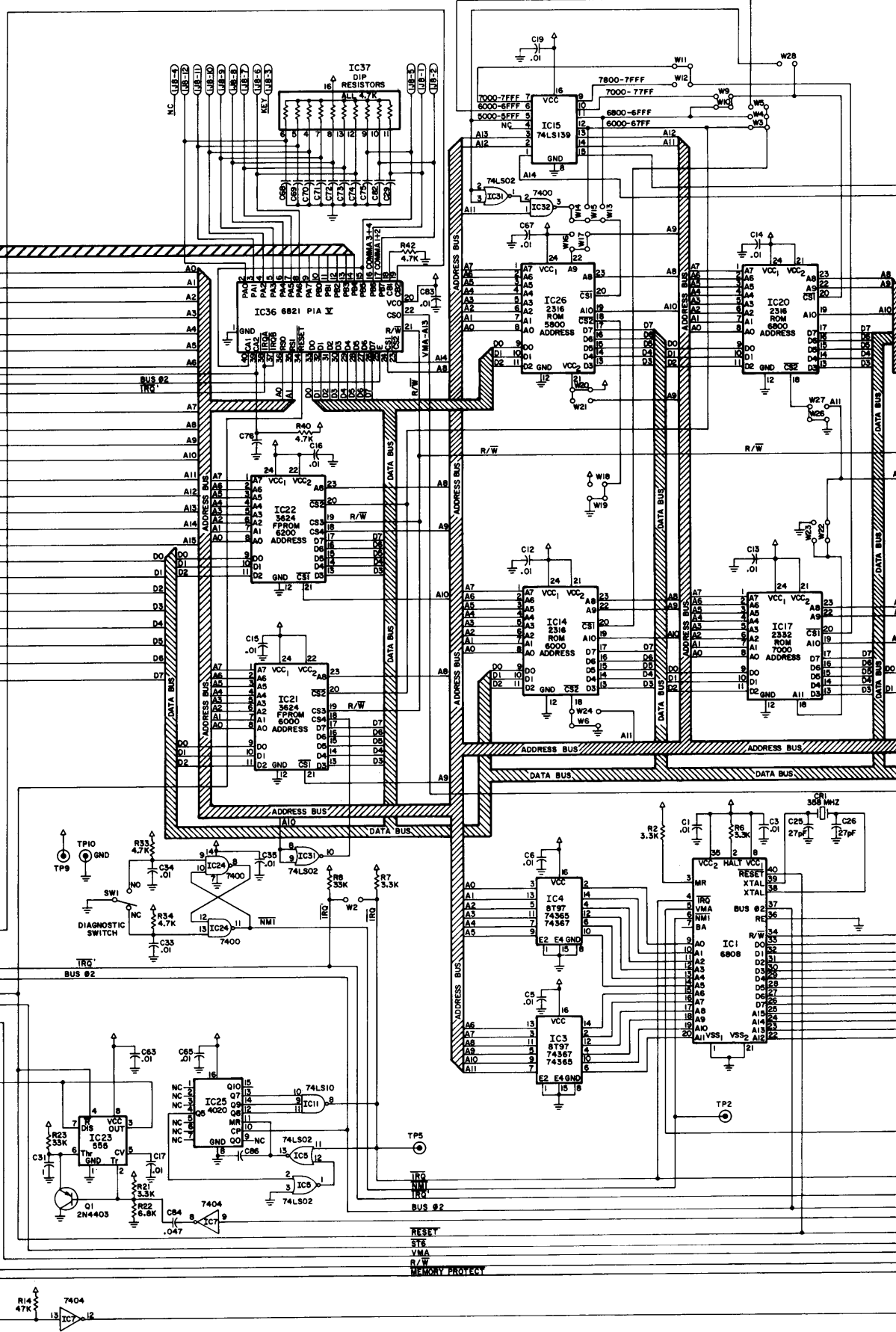
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQD NO.
1	5764-09465-X0		BARE PC. BOARD CPU	1
2				
3	5370-08989-00	IC3,IC4,IC8	8T97 HEX TRISTATE BUFFER	3
4	5281-09308-X0	IC9	74LS245 OCTAL BUFFER	1
5	5280-09010-00	IC6	74154 4 TO 16 DECODER	1
6	5280-09013-00	IC7	7404 HEX INVERTER	1
7	5281-09235-00	IC11	74LS10 TRIPPLE 3 INVERTER	1
8	5280-08973-00	IC12	7408 QUAD AND	1
9	5340-09409-X0	IC13,IC16	2114-45 1K X4 STATIC RAM	2
10	5281-09246-00	IC15	74LS139 DUAL 2 TO 4 LINE DECODER	1
11	5341-09553-00	IC20	ROM 2K X8 LOWER	1
12	5341-09554-00	IC17	ROM 4K X8 UPPER	1
13	5430-09372-00	IC18,IC36	MC6821 PIA	2
14	5340-09017-00	IC19	MC 5101 CMOS RAM	1
15	5431-09449-00	IC25	MC 1455 PI TIMER	1
16	5280-09073-00	IC24,IC32,IC33	7400 QUAD 2 INPUT NAND	3
17	5310-09236-00	IC25	4020 CMOS 14 BIT COUNTER	1
18	5310-09237-00	IC10	4071 CMOS QUAD 2 INPUT NOR	1
19	5281-09247-00	IC5,IC31	741302 QUAD 2 INPUT NOR	2
20	5280-09407-X0	IC34	7447 BCD TO 7 SEG LED DISP	1
21	5671-09411-00	IC35	MAN 72A 7 SEG LED DISP	1
22	5019-09238-00	IC28,IC29	13 DIP RES./PACK 47K OHM	2
23	5019-09223-00	IC37	15 DIP RES./PACK 10K OHM	1
24	5645-09025-00	DS1,DS2	8 STD DIP SWITCHES	2
25	5075-09018-00	ZR1	1N5996 ZENER DIODE 6.8V	1
26	5075-09059-00	ZR2	1N5990 ZENER DIODE 3.9V	1
27	5070-08919-00	D17,D19	1N4148 DIODE	18
28	5160-08938-00	Q3-Q9	2N4401 NPN TRANSISTOR	7
29	5190-09016-00	Q1,Q2	2N4403 PNP TRANSISTOR	2
30	5070-09266-00	D18	1N5817 DIODE	1
31	5520-09020-00	CR1	CRYSTAL 3.58 MHZ	1
32	5010-09358-00	R5,R9,R20	RESISTOR FC 1K OHM 5% 1/4W	3
33	5010-08983-00	R2,R6-R8,R21,R28	RESISTOR FC 3.3K OHM 5% 1/4W	6
34	5010-08991-00	R13-R18,R29,R33-R35,R40,R42	RESISTOR FC 4.7K OHM 5% 1/4W	13
35	5010-09086-00	R22	RESISTOR FC 6.8K OHM 5% 1/4W	1
36	5010-09036-00	R19,R30	RESISTOR FC 100 OHM 5% 1/4W	2
37	5010-09187-00	R36-R39,R46-R50	RESISTOR FC 150 OHM 5% 1/4W	5
38	5010-09113-00	R23,R26	RESISTOR FC 33K OHM 5% 1/4W	2
39	5010-09024-00	R1,R3	RESISTOR FC 10K OHM 5% 1/4W	2
40	5010-09241-00	R25,R32,R10,R11	RESISTOR FC 22K OHM 5% 1/4W	4
41	5010-08998-00	R27	RESISTOR FC 2.2K OHM 5% 1/4W	1
42	5010-09039-00	R12	RESISTOR FC 10 OHM 5% 1/4W	1
43	5010-09442-00	R43	RESISTOR FC 330K OHM 5% 1/4W	1
44	5010-08997-00	R24,R31	RESISTOR FC 27K OHM 5% 1/4W	2
45	5010-09083-00	R44,R45	RESISTOR FC 470 OHM 5% 1/4W	2
46	5043-08980-00	C1-C22,C28,C30,C32-C37,C63-C67,C83	CAPACITOR CERAMIC 0.01MED 50V	36
47	5040-08986-00	C23	CAPACITOR ELECT 100MFD 10V	1
48	5043-08996-00	C24	CAPACITOR CERAMIC 1MFD 50V	1
49	5043-09169-00	C25,C26	CAPACITOR CERAMIC 27PFD 1KV	2
50	5041-09243-00	C27	CAPACITOR TANT. 10 MFD 10V	1
51	5041-09031-00	C31	CAPACITOR TANT. 1MFD 25V	1
52	5043-09030-00	C84	CAPACITOR CERAMIC 0.47MFD 50V	1
53	5043-09065-00	C29,C38,C62,C68-C82,C85,C86	CAPACITOR CERAMIC 470PFD 50V	43
54				
55	SEE NOTE		SWITCH MOMENTARY	2
56	5881-09021-00		BATTERY HOLDER #171	1
57	5791-09026-00	IJ1	HEADER 09-64-1083 8 PIN	5
58	5791-09028-00	IJ3,IJ4	HEADER 09-65-1041 4 PIN	2
59				
60	5791-09027-00	IJ2,IJ5-IJ7	HEADER 09-65-1091 9 PIN	4
61	5791-09043-00	IJ8	HEADER 09-65-1121 12 PIN	1
62	5700-08985-00		40 PIN IC SOCKET	1
63	5700-09004-00		24 PIN IC SOCKET	6
64	5010-09534-00	W3,W6,W8,W10,W11,W14,W17,W20,W25,W26,W29,W22	RESISTOR FC 0 OHM 1/4W	13
65	5824-09248-00	TPI-TPIO	TEST TERMINALS #1502-1	10

NOTE: USE EITHER 5641-09312-00, 5641-09024-00 OR 5641-09371-00

TOLERANCES UNLESS OTHERWISE SPECIFIED		QTY.	ASSEMBLY ON
FRACTIONAL	±1/64"		
DECIMAL	±.005"		
HOLE DIA.	+0.000 -0.005"		
ANGULAR	±1/32"		
CONCENTRICITY	T.I.R. .005"		
SCREW THREADS	CLASS 2		
WILLIAMS ELECTRONICS, INC. 2801 N. CALIFORNIA CHICAGO, ILL. 60618 287-2840			
NAME PIN BALL CPU SUB-ASSEMBLY			
MATERIAL	HEAT TREATMENT		FINISH
DRW. 6/NOBBS	DATE 9-20-80	APP'D.	SCALE D-8342

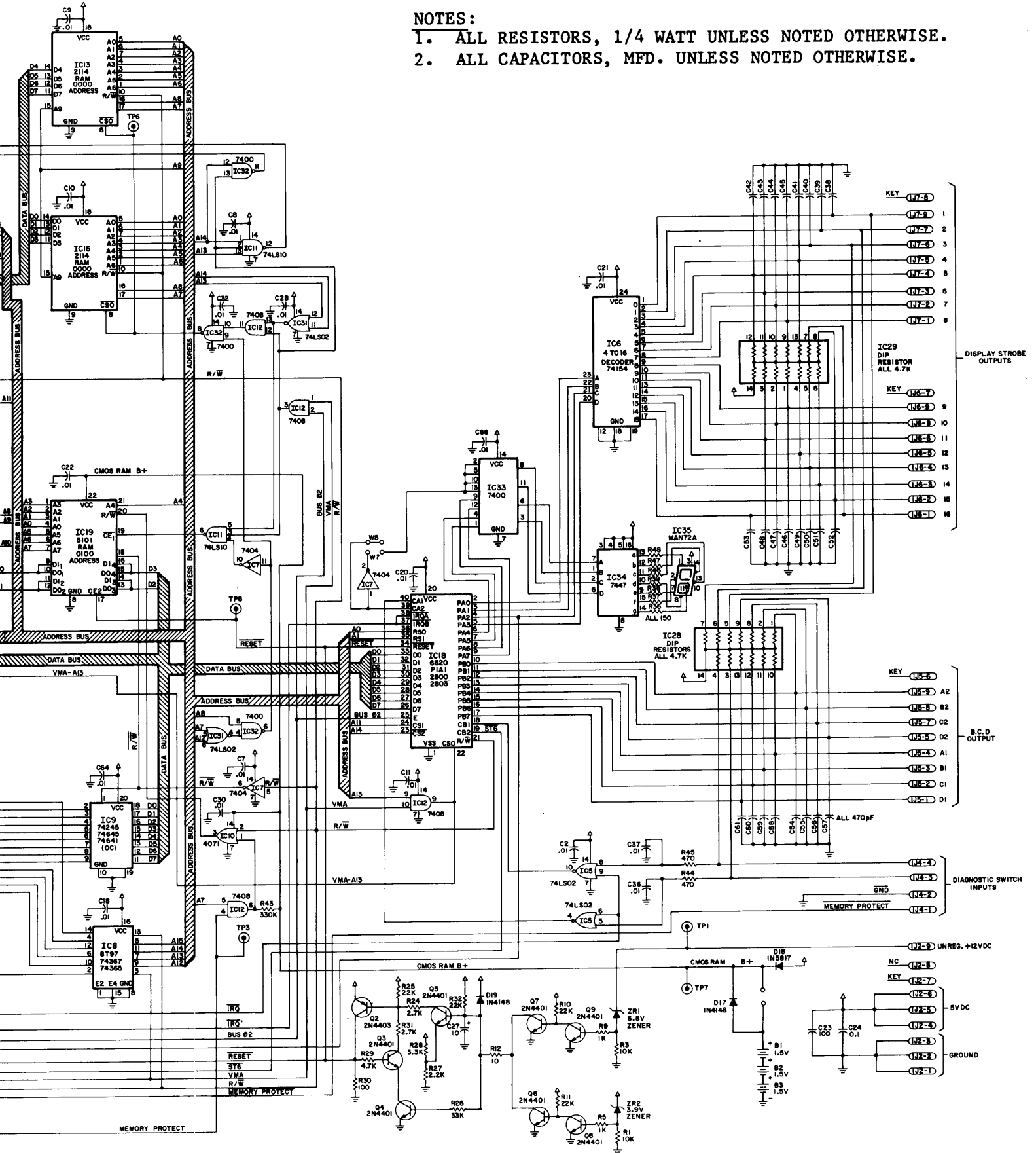
- (N1-1) +5V
- (N1-2) +5V
- (N1-3) NC
- (N1-4) NC
- (N1-5) NC

- (N9-4) (N1-21) A0
- (N9-5) (N1-20) A1
- (N9-6) (N1-19) A2
- (N9-7) (N1-18) A3
- (N9-8) (N1-17) A4
- (N9-9) (N1-16) A5
- (N9-10) (N1-15) A6
- (N9-11) 3T7
- (N9-12) (N1-14) A7
- (N9-13) (N1-13) A8
- (N9-14) (N1-12) A9
- (N9-15) (N1-11) A10
- (N9-16) (N1-10) A11
- (N9-17) (N1-9) A12
- (N9-18) (N1-8) A13
- (N9-19) (N1-7) A14
- (N9-20) (N1-6) A15
- (N9-21) (N1-5) D0
- (N9-22) (N1-4) D1
- (N9-23) (N1-3) D2
- (N9-24) (N1-2) D3
- (N9-25) (N1-1) D4
- (N9-26) (N1-0) D5
- (N9-27) (N1-24) D6
- (N9-28) (N1-23) D7
- (N9-29) +5V
- (N9-30) +5V
- (N9-31) TP9
- (N9-32) GND
- (N9-33) TP9
- (N9-34) GND
- (N9-35) SW1
- (N9-36) NC
- (N9-37) R33 4.7K
- (N9-38) R34 4.7K
- (N9-39) C34 .01
- (N9-40) C35 .01
- (N9-41) TRG
- (N9-42) W25
- (N9-43) C77 470pF
- (N9-44) PBI
- (N9-45) C78 470pF
- (N9-46) C79 470pF
- (N9-47) C80 470pF
- (N9-48) PBA
- (N9-49) C81 470pF
- (N9-50) W30
- (N9-51) TRG
- (N9-52) C85
- (N9-53) R44 4.7K
- (N9-54) TP4
- (N9-55) RESET
- (N9-56) ST6
- (N9-57) VMA
- (N9-58) R/W
- (N9-59) BLANKING
- (N9-60) NC
- (N9-61) NC
- (N9-62) GND
- (N9-63) NC
- (N9-64) GND
- (N9-65) NC
- (N9-66) GND
- (N9-67) R13 4.7K
- (N9-68) C62 470pF
- (N9-69) KEY
- (N9-70) NC
- (N9-71) MEMORY PROTECT



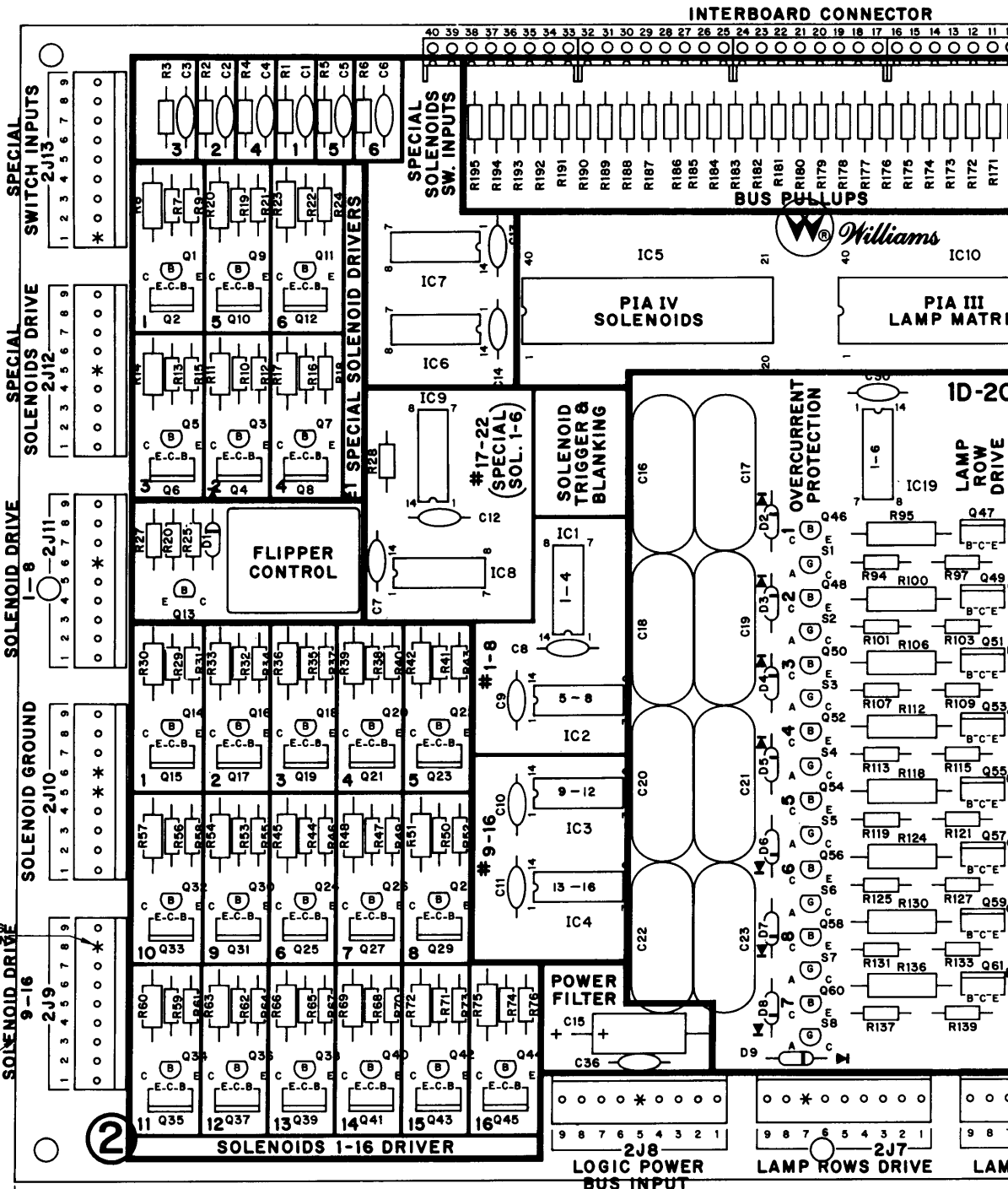
NOTES:

- 1. ALL RESISTORS, 1/4 WATT UNLESS NOTED OTHERWISE.
- 2. ALL CAPACITORS, MFD. UNLESS NOTED OTHERWISE.



CPU Board Logic Diagram

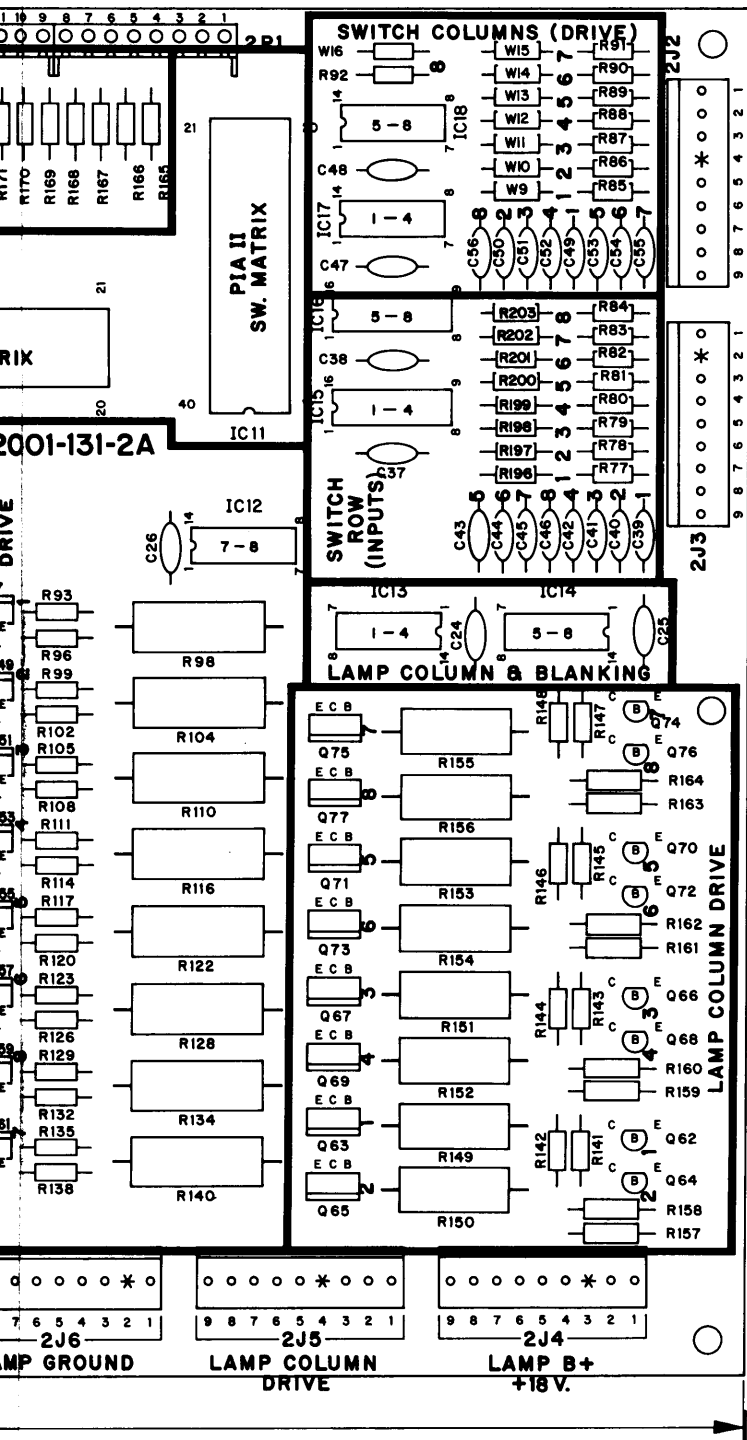
REVISION LETTER	REVISION
C	REVISED AND REDRAWN R. GAY 11-28-77
D	ITEM NO. 28, PT. NO. WAS SA-8999 & ADDED MOUNTING NOTE FOR R149 THRU R156. R. GAY 4-11-78
E	DELETED ITEM NO. 36, PT. NO. SA-8985, E.C.O. R. GAY 9-12-78
F	ADDED ITEM NO. 36 B ITEM NO. 22, DELETED (B) RESISTORS & QTY. WAS 32 E.C.O. 4624 R. GAY 10-4-78



\* - INDICATES KEYING POINT

REDUCE TO EXACTLY 13.000"





BILL OF MATERIAL				
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	1B-2001-131		BARE P.C. BOARD	1
2	5A-8948	IC8, IC9	N7402 QUADRUPLE 2 INPUT POSITIVE NDR GATE	2
3	5A-8974	IC12, IC17, IC18, IC19	N7406 HEX. INVERTER BUFFER DRIVERS W/ OPEN COLLECTOR HIGH VOLTAGE OUTPUTS	4
4	5A-8973	IC1 THRU IC4, IC6, IC7, IC13, IC14	N7408 QUADRUPLE 2 INPUT POSITIVE AND GATE	8
5	5A-8975	IC15, IC16	MC1049 INVERTING HEX. BUFFER	2
6	5A-8972	IC5, IC10, IC11	MC8820 PERIPHERAL INTERFACE ADAPTER	3
7	5A-8938	Q1, Q3, Q5, Q7, Q9, Q11, Q13, Q14, Q16, Q18, Q20, Q22, Q24, Q26, Q28, Q30, Q32, Q34, Q36, Q38, Q40, Q42, Q44	2N4401 NPN TRANSISTOR	23
8	5A-8976	Q46, Q48, Q50, Q52, Q54, Q56, Q58, Q60, Q62, Q64, Q66, Q68, Q70, Q72, Q74, Q76	2N6427 DARLINGTON NPN TRANSISTOR	16
9	5A-8977	Q2, Q4, Q6, Q8, Q10, Q12, Q15, Q17, Q19, Q21, Q25, Q27, Q29, Q31, Q33, Q35, Q37, Q39, Q41, Q43, Q45	TIP122 DARLINGTON NPN POWER TRANSISTOR	22
10	5A-8978	Q83, Q85, Q87, Q89, Q71, Q73, Q75, Q77	TIP42 PNP POWER TRANSISTOR	8
11	5A-8979	Q47, Q49, Q51, Q53, Q55, Q57, Q59, Q61	2N6122 NPN POWER TRANSISTOR	8
12	5A-6258	D1	1N4001 DIODE	1
13	5A-8919	D2 THRU D9	1N4148 DIODE	8
14	5A-9014	S1 THRU S8	2N5060 SCR	8
15	5A-8980	C1 THRU C4, C24, THRU C26, C30, C37, C38, C47, C48	CAPACITOR, CERAMIC, .01 MFD. +80 -20% 50 V.	22
16	5A-8995	C16 THRU C23	CAPACITOR, POLYESTER FILM, 1 MFD. 10%	7
17	5A-9065	C37 THRU C46, C49 THRU C58	CAPACITOR, CERAMIC, 470 PFD. 20% 50 V.	16
18	5A-8986	C15	CAPACITOR, ELECT., 100 MFD. 10 V.	1
19	5A-8996	C36	CAPACITOR, CERAMIC, 1 MFD. +80 -20% 50 V.	1
20	5A-8991	R1 THRU R6, R27, R77 THRU R92, R157 THRU R195	RESISTOR, FC, 4.7 K OHM 10% 1/4 W	62
21	5A-8983	R27	RESISTOR, FC, 3.3 K OHM 10% 1/4 W	1
22	5A-8984	R86, R97, R102, R103, R108, R109, R114, R115, R121, R122, R126, R127, R132, R133, R158, R159, R196 THRU R203	RESISTOR, FC, 1 K OHM 10% 1/4 W	24
23	5A-8992	R7, R10, R13, R16, R19, R22, R29, R32, R35, R38, R41, R44, R47, R50, R55, R56, R59, R62, R65, R68, R71, R74	RESISTOR, FC, 560 OHM 10% 1/4 W	22
24	5A-8993	R8, R11, R14, R17, R20, R23, R30, R33, R36, R39, R42, R45, R48, R51, R54, R57, R60, R63, R66, R69, R72, R75	RESISTOR, FC, 68 OHM 10% 1/2 W	22
25	5A-8997	R9, R12, R15, R18, R21, R24, R25, R31, R34, R37, R40, R43, R46, R49, R52, R55, R58, R61, R64, R67, R70, R73, R76	RESISTOR, FC, 2.7 K OHM 10% 1/4 W	23
26	5A-8817	R26	RESISTOR, FC, 10 K OHM 10% 1/4 W	1
27	5A-8998	R141 THRU R148	RESISTOR, FC, 2.2 K OHM 10% 1/4 W	8
28	5A-8999-1	R149 THRU R156	RESISTOR, FC, 27 OHM 10% 2 W	8
29	5A-9084	R95, R100, R106, R112, R118, R124, R130, R136	RESISTOR, FC, 100 OHM 10% 3 W	8
30	5A-9085	R93, R99, R105, R111, R117, R123, R129, R135	RESISTOR, FC, 1.8 K OHM 10% 1/4 W	8
31	5A-9086	R94, R101, R107, R113, R119, R125, R131, R137	RESISTOR, FC, 6.8 K OHM 10% 1/4 W	8
32	5A-9037	R98, R104, R110, R116, R122, R128, R154, R140	RESISTOR, WIREWOUND, .4 OHM 10% 3 WATT	8
33	5A-8994	Z1	RELAY - 4 POLE - 5 AMP. CONTACTS 40 OHM COIL 6 V.D.C.	1
34	5A-9066	2P1	8 PIN RECEPTACLE	5
35	5A-9027	2J2 THRU 2J3	9 PIN HEADER	12
36	5A-0534	W9 THRU W16	RESISTOR, FC, 0 OHM, 1/4 W	8

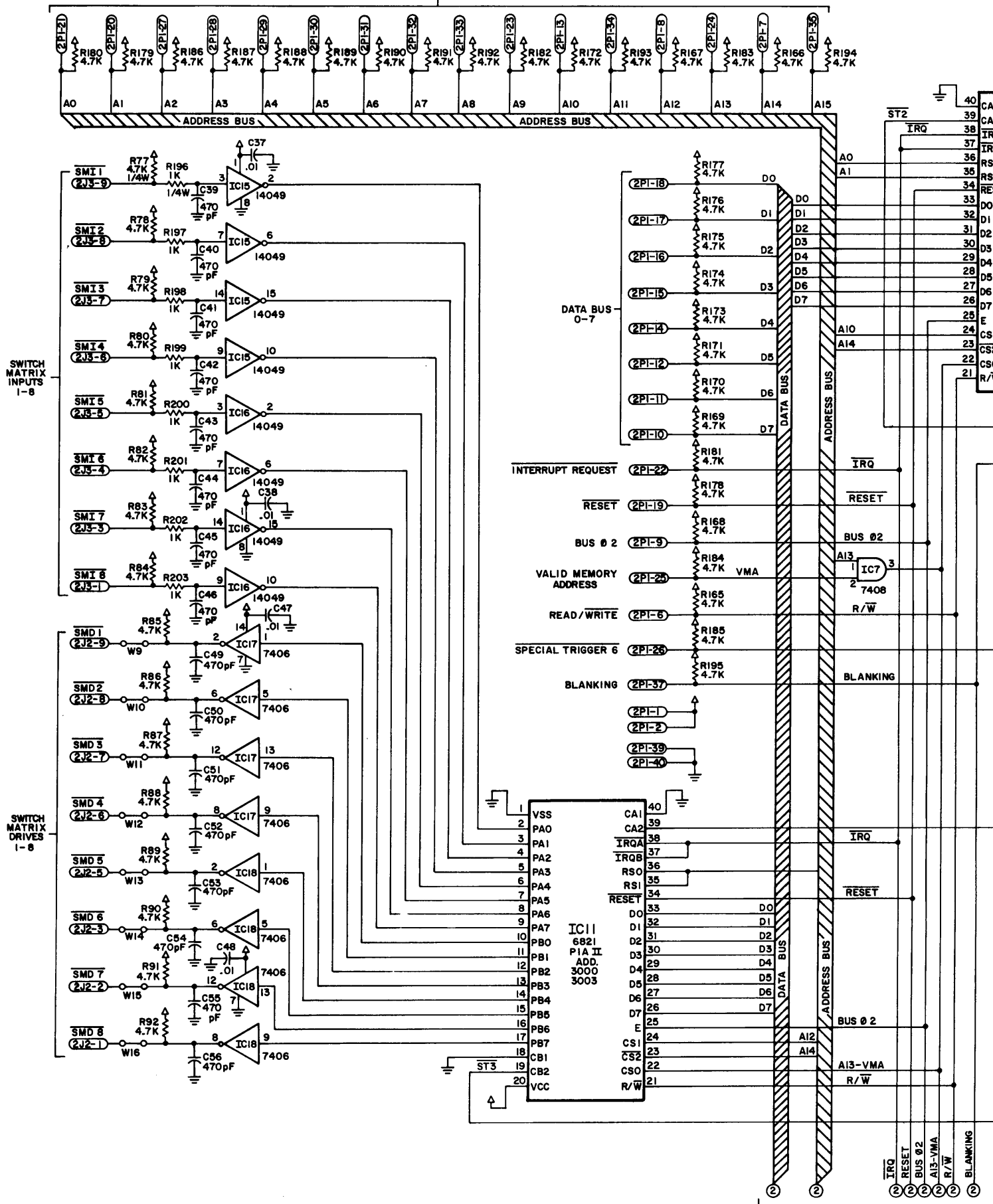
★ R149 THRU R156 MUST BE MOUNTED 1/8" ABOVE SURFACE OF BOARD.

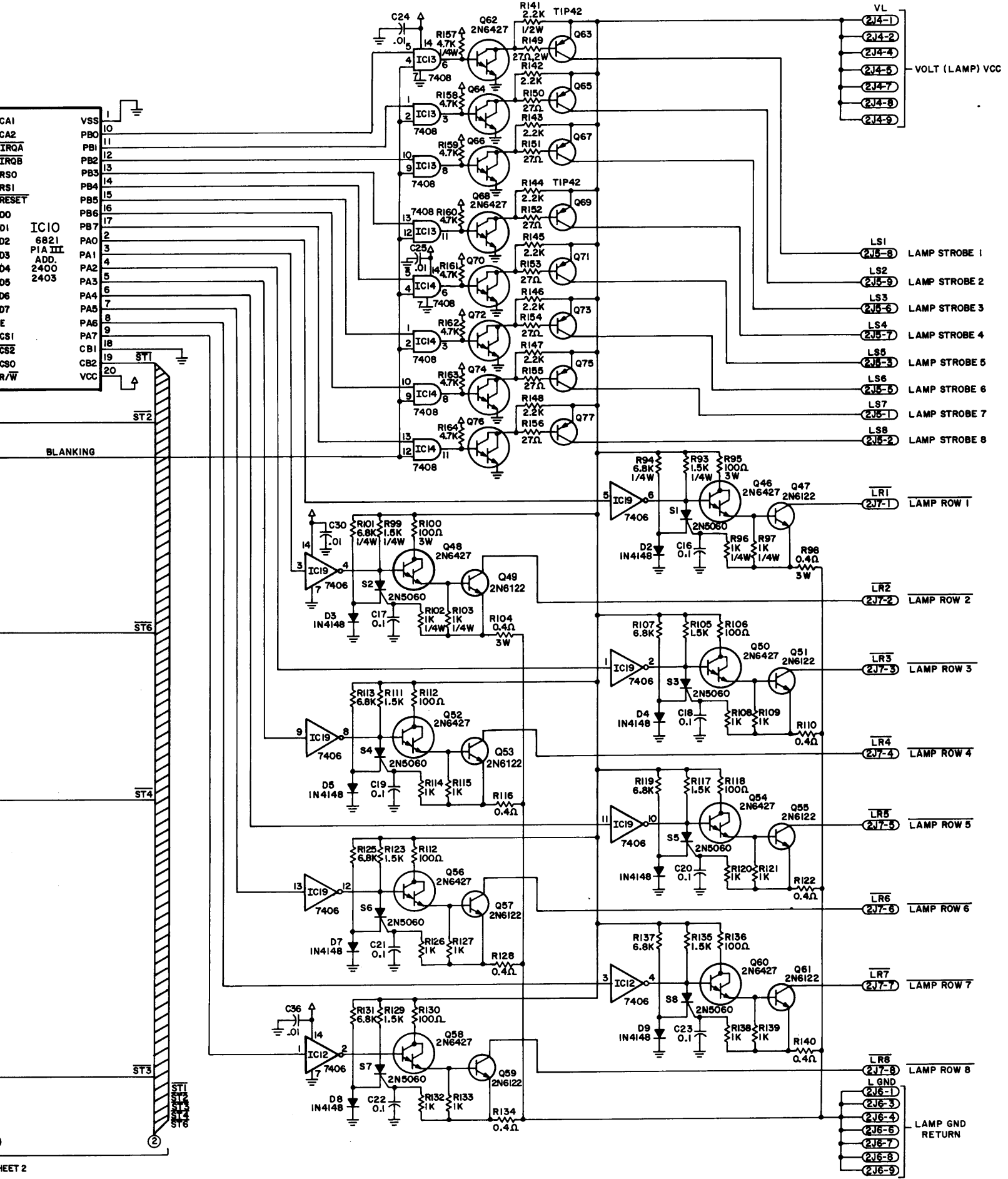


WILLIAMS ELECTRONICS, INC.  
 SUBSIDIARY OF XCOR CORPORATION  
 3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240

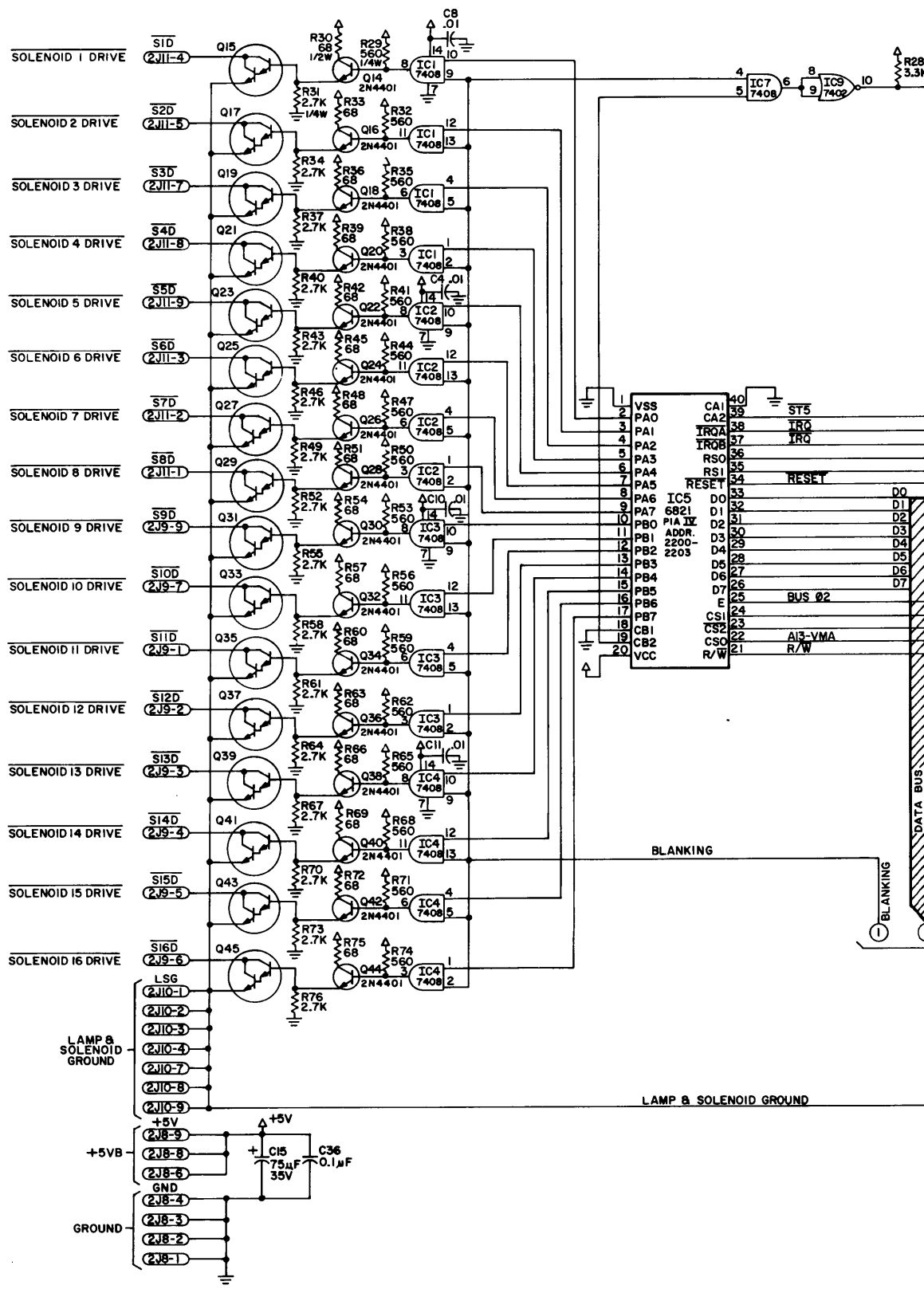
PART NAME: DRIVER BOARD ASSEMBLY

DWN. DATE: R. Gay 8-16-77 APPD. SCALE: 2=1 PART NO. D-7997

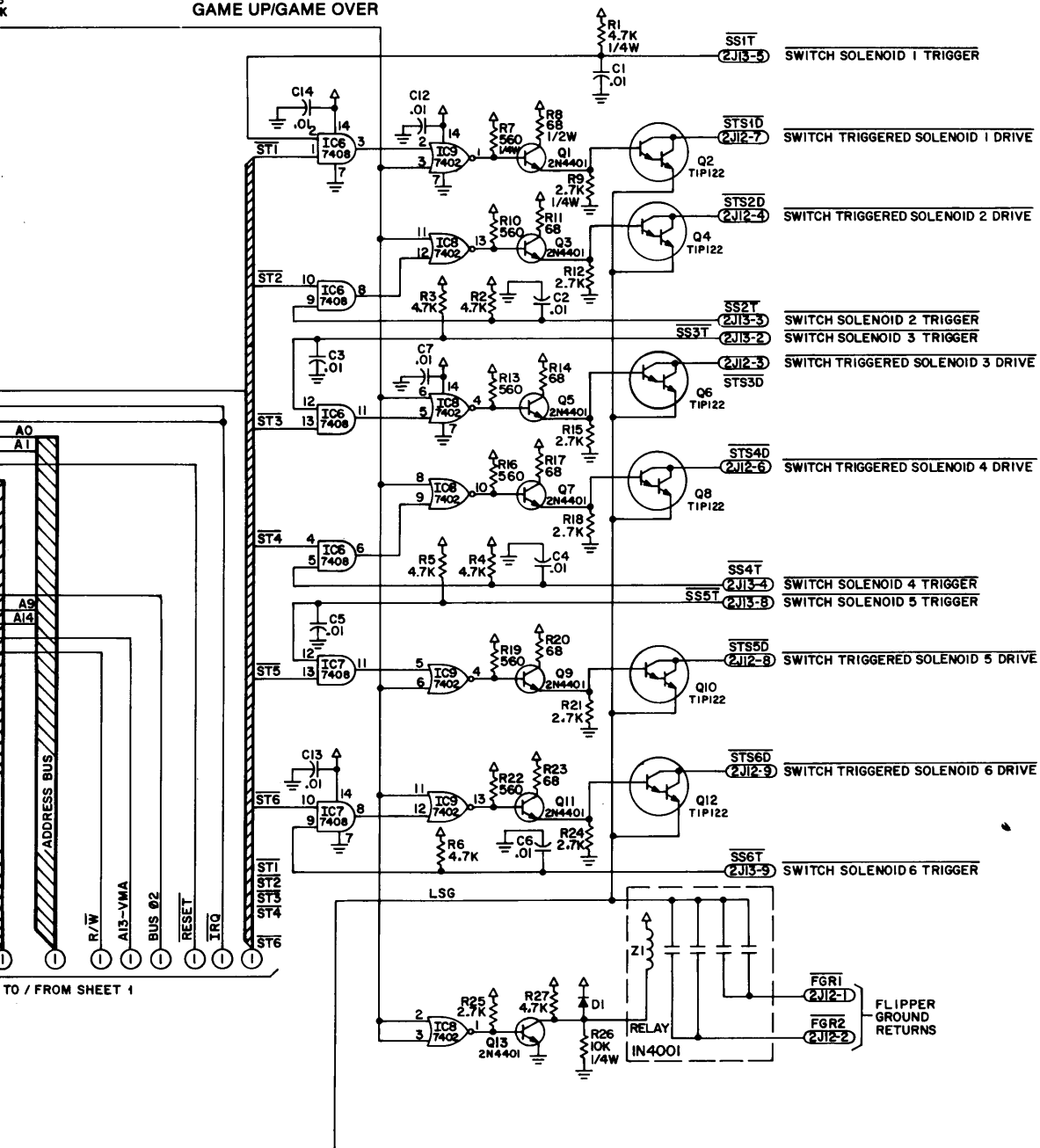




Driver Board Logic Diagram (Sheet 1 of 2) 29



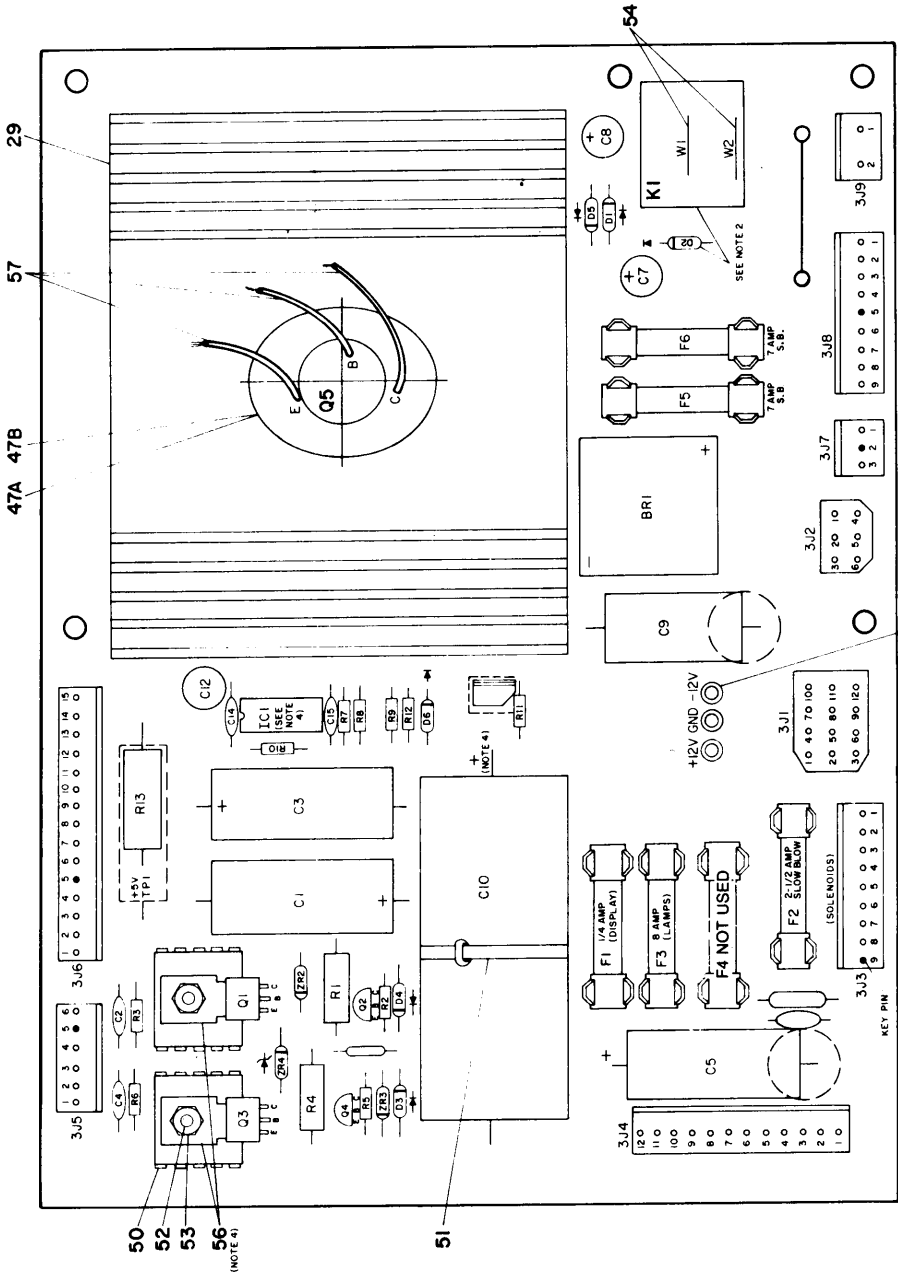
GAME UP/GAME OVER



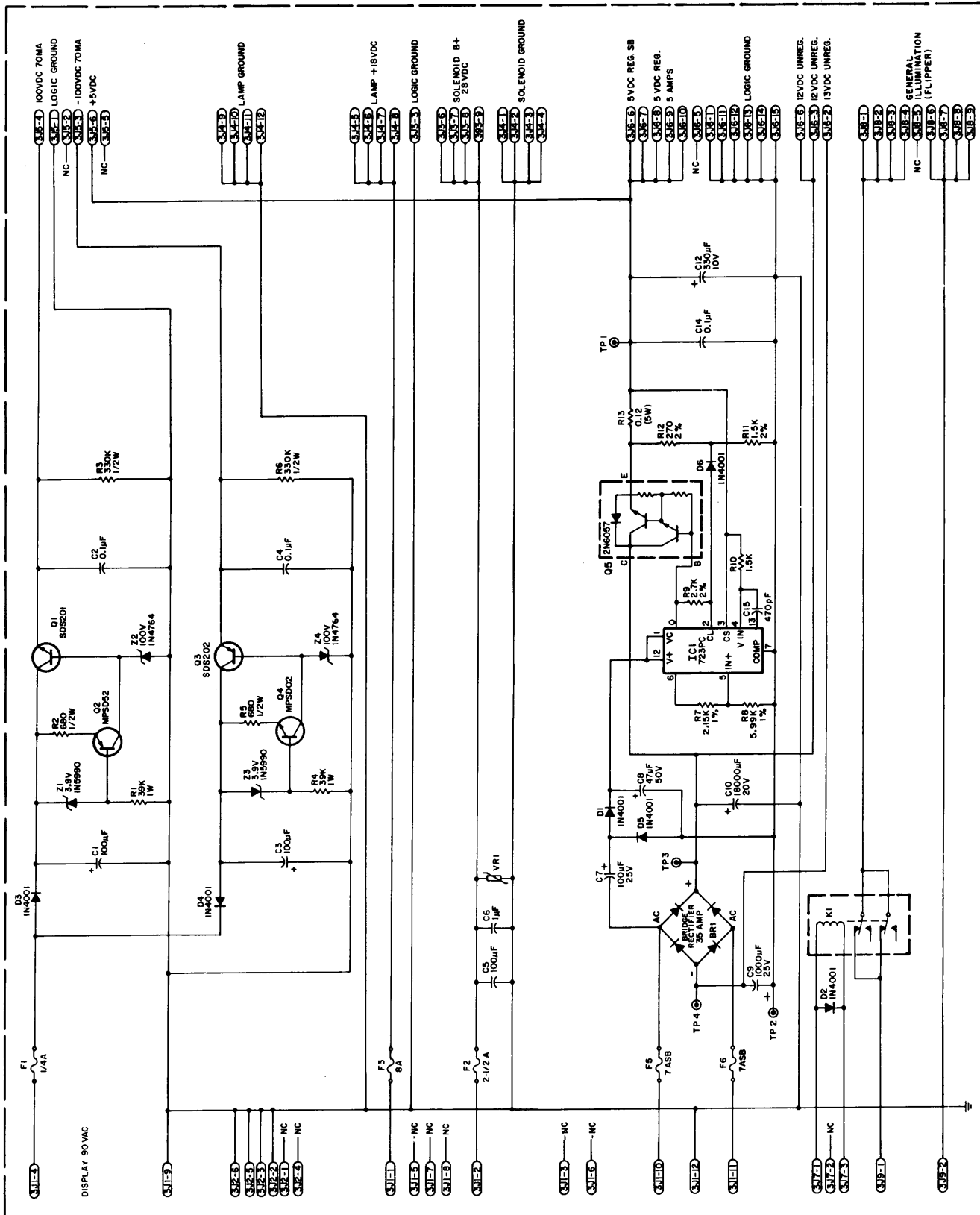
Driver Board Logic Diagram (Sheet 2 of 2)

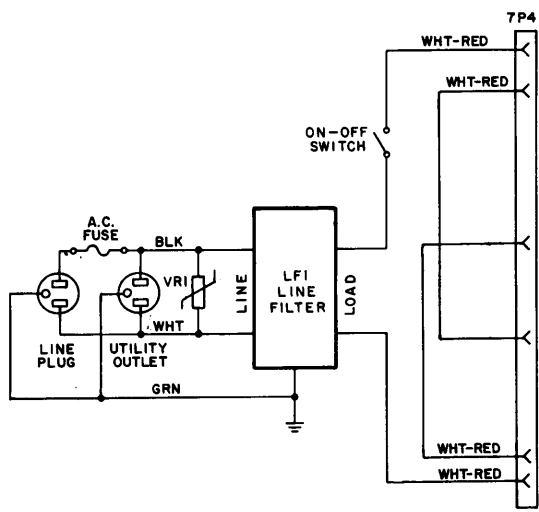
**BILL OF MATERIAL**

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D NO.
1	5765-09466	R7	BARE P.C. BOARD	1
2	5013-09426	R8	RESISTOR, 2.15K, 1Z, 1/4 W, METAL FILM	1
3	5013-09427	R11	RESISTOR, 4.99K, 1Z, 1/4 W, METAL FILM	1
4	5010-09428	R10	RESISTOR, 1.5K, 2Z, 1/4 W, CARBON FILM	1
5	5010-09085	R9	RESISTOR, 2.7K, 2Z, 1/4 W, CARBON FILM	1
6	5010-09541	R12	RESISTOR, 270 OHM, 2Z, 1/4 W, CARBON FILM	1
7	5010-09508	R13	POWER RESISTOR, 0.12 OHM, 5Z, 5W	1
8	5012-09429	R1, R4	RESISTOR, 39K, 5Z, 1 W	2
9	5010-09536	R2, R5	RESISTOR, 680 OHM, 2 W	2
10	5010-09061	R3, R6	RESISTOR, 330K, 5Z, 1/2 W	2
11	5010-09069	C10	CAP. ELECTROLYTIC, 18,000 MFD, 20V, AXIAL	1
12	5040-09419	C9	CAP. ELECTROLYTIC 1,000 MFD 25V, RADIAL OR AXIAL	1
13	5040-09420	C12	CAP. ELECTROLYTIC 330 MFD, 10V, RADIAL	1
14	5040-09423	C15	CAPACITOR, 470 PFD	1
15	5043-09065	C1, C3	CAPACITOR, 100 MFD, ELECT., 150V	2
16	5040-09053	C5	CAPACITOR, 100 MFD, ELECT., 100V, AXIAL OR RADIAL	1
17	5040-09070	C14	CAPACITOR, 0.1 MFD, 50V, DISC.	1
18	5070-09466	D1, D2, D3, D4, D5, D6	DIODE, 1N4001	6
19	5070-04358	ZR1, ZR3	ZENER, 1N990, 3.9V, 5W	2
20	5075-09059	ZR2, ZR4	ZENER, 1N4754, 100V, 5W	2
21	5075-09060	Q1	VOLTAGE REGULATOR, MC1723 PC	1
22	5069-09424	C7, C2, C4, C6	CAPACITOR, 0.1 MFD, 200V, DISC	4
23	5043-09413	Q1	CAPACITOR, 100 MFD, 25V, RADIAL	1
24	5040-09051	Q1	TRANSISTOR, SDS 201 NPN	1
25	5164-09037	Q1	TRANSISTOR, MFS 201 NPN	1
26	5194-09058	Q3	TRANSISTOR, SDS 202 PNP	1
27	5194-09059	Q2	TRANSISTOR, MFS D52 PNP	1
28	5194-09055	Q2	TRANSISTOR, MFS D52 PNP	1
29	5705-04431	Q2	HEAT SINK	1
30	5791-09067	3J5	CONNECTOR, 6 PIN (H)	1
31	5791-09074	3J6	CONNECTOR, 15 PIN (H)	1
32	5791-09027	3J8, 3J3	CONNECTOR, 9 PIN (H)	2
33	5791-09038	3J2	CONNECTOR, 6 PIN (H)	1
34	5163-09425	Q5	TRANSISTOR, POWER, 2N6087 NPN	1
35	5791-09063	3J4	CONNECTOR, 12 PIN (H)	1
36	5791-09423	3J7	CONNECTOR, 3 PIN (H)	1
37	5791-09426	3J9	CONNECTOR, 2 PIN (H)	1
38	5791-09428	3J1	CONNECTOR, 12 PIN	1
39	5731-09178	F2	FUSE, 2-1/2 AMP, S.B.	1
40	5731-09128	F4	FUSE, 2-1/2 AMP, S.B.	1
41	5730-09071	F4	FUSE, 2-1/2 AMP, S.B.	1
42		F4	NOT USED	1
43		F4	NOT USED	1
44	5731-08761	F1	FUSE, 20 AMP	1
45	5017-09061	VR1	VARIABLE RESISTOR	1
46	5700-09415	K1	SOCKET	1
47A	5701-09338	K1	ALCA INSULATOR	1
47	5800-09335	K1	RELAY, 24 VDC, 10 AMP, DPDT	1
48	5824-09246	BR-1	TERMINAL, #1502-1 (TEST POST)	3
49	5100-09416	BR-1	BRIDGE RECTIFIER, 35 AMP, 100V	1
50	5703-09042	BR-1	HEAT SINK	2
51	3A-7520-1	W1, W2	TIE WRAP	1
52	4003-01016-07	W1, W2	5-40 X 7/16 R.H. MECH. SCREW	2
53	4405-01117	C8	5-40 HEX NUT	2
54	5040-09422	C8	JUMPER, #18 AWG	2
55	20-9229	C8	CAPACITOR, 47 MFD, 50V, RADIAL	1
56		C8	THERMAL COMPOUND	1
57		F6, F5	LEAD WIRE, #18 AWG (3")	3
58	5731-09432	F6, F5	FUSE, 7A, 5-B., 250V	2

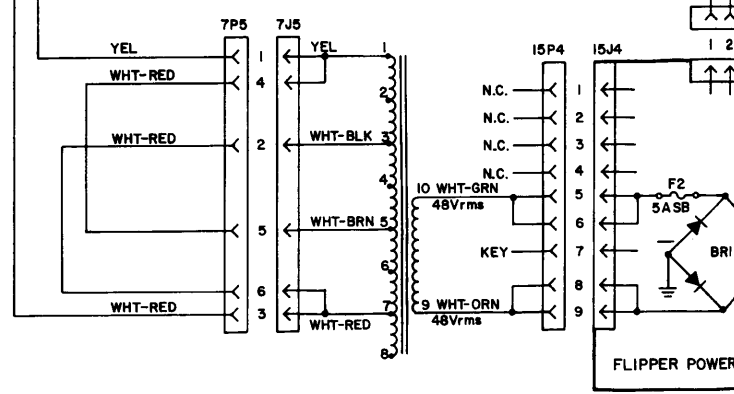
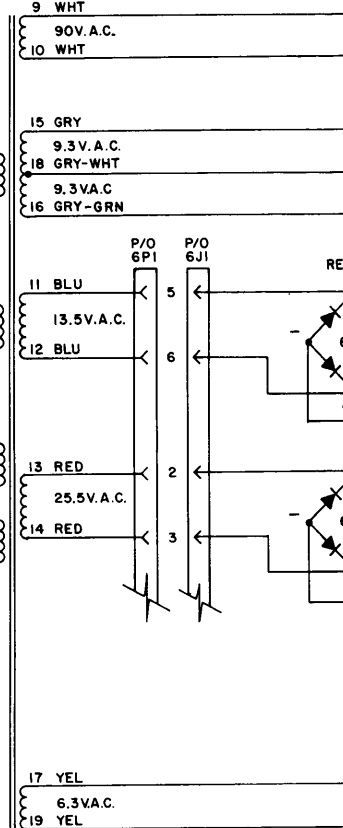


- NOTES:**
- HEAT SINK COMPOUND MUST BE APPLIED BETWEEN TRANSISTOR AND HEAT SINK.
  - FOR BLACKOUT AND FUTURE GAME WITH SAME FEATURE REMOVE JUMPERS (W1 & W2)
  - OBSERVE INDEX MARK OF INTEGRATED CIRCUIT, POLARITY OF CAPACITORS, DIODE AND INSERT RELAY K1, DIODE, D2 AND 3J7.
  - REFERENCE DWG'S: SCHEMATIC 16-8786.



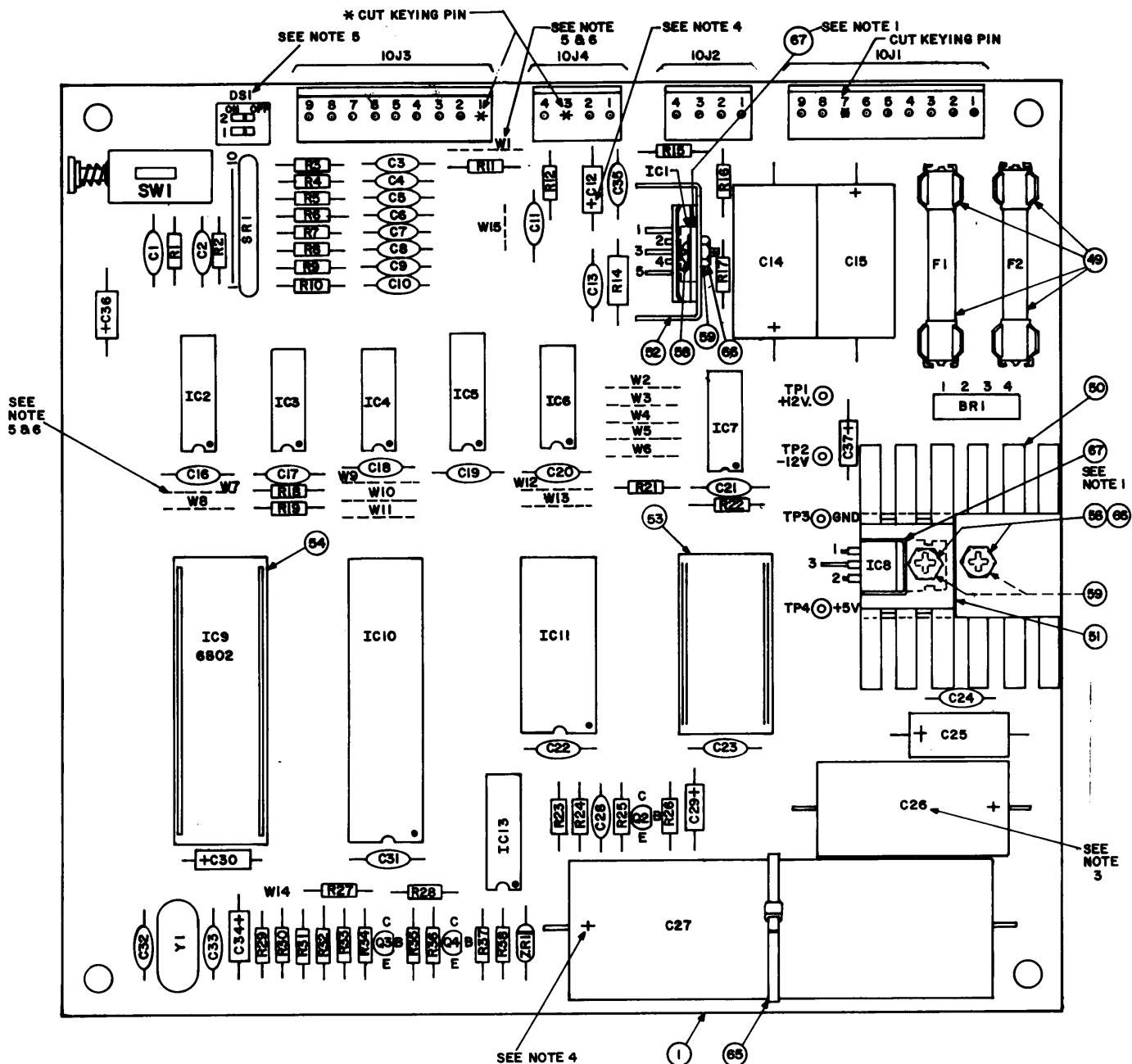


**POWER WIRING**









### SOUND BOARD JUMPERS

JUMPERS USED	TOM TYPE	FORMAT	GAMES USED IN
W2, W5, W7, W9, W10, W15	2K x 8 2516, 2716	Sound & Speech	Gorgar, Blackout, Firepower, Black Knight, Jungle Lord, Pharaoh.
W1, W2, W5, W7, W9, W10, W15	2K x 8 2516, 2716	Sound Only	Defender Video & Pin, Solar Fire, Barracora, Hyperball, Stargate, Cosmic Gunfight, Varkon, Time Fantasy.
W3, W4, W5, W7, W10, W15	4K x 8 2532	Sound & Speech	Sinistar (Upright & Cockpit Front)
W1, W3, W4, W5, W7, W10, W15	4K x 8 2532	Sound Only	Robotron, Joust Video & Pin, Bubbles, Sinistar (Cockpit Rear)
W1, W2, W4, W5, W7, W10, W15	2K x 8 2516, 2716	Sound Only	Warlock
W1, W3, W6, W7, W9, W11, W12, W15	512 x 8 7641	Sound Only	Big Strike

BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	01-2 01-146-6		BARE P.C. BOARD REV F	1
2	5370-09156-00	IC1	TDA 2002 V AUDIO AMPLIFIER	1
3	5280-09012-00	IC2	7442 BCD-DEC DECODER	1
4	5280-09073-00	IC3	7400 QUAD 2 INPUT NAND	1
5	5280-08973	IC4	7408 QUAD 2 INP. AND GATE	1
6	5310-09153-00	IC5	4050 BUFFER	1
7	5310-09154-00	IC6	4068 8 INPUT NAND GATE	1
8	5310-08971-00	IC7	4069 HEX INVERTER	1
9	5250-09157-00	IC8	7805 5 VOLT REG. W/TO 220 CASE	1
10	5430-08972-00	IC10	6821 P.I.A.	1
11	5340-09003-00	IC11	6810 RAM	1
12	5371-09152-00	IC13	1408 D/A CONVERTER	1
13	5160-08938-00	Q2, Q3, Q4	2N4401 NPN TRANSISTOR	3
14				
15	5075-09018-00	ZR1	1N5996A 6.8V ZENER DIODE	1
16				
17	5100-09357-00)	BR1	MDA 200/3N253	1
	5100-09158-00)		BRIDGE RECTIFIER	0
18	5520-09020-00	Y1	3.58 MHZ CRYSTAL	1
19	5010-08991-00	R1,R18,R19,R21,R22, R27,R30,R31, R32	RESISTOR, FC, 4.7K OHM, 5% 1/4 WATT	9
20	5010-09036-00	R2 thru R10	RESISTOR, FC, 100 OHM, 5% 1/4W	9
21	5010-09358-00	R12,R15,R28,R36,R38	RESISTOR, FC, 1K OHM, 5% 1/4W	5
22	5010-09181-00	R14	RESISTOR, FC, 1 OHM, 10% 1/2 WATT	1
23	5010-09161-00	R16	RESISTOR, FC, 2.2 OHM, 5% 1/4 WATT	1
24	5010-09361-00	R17	RESISTOR, FC, 220 OHM, 5% 1/2 WATT	1
25				
26	5010-08983-00	R23, R24, R26	RESISTOR, FC, 3.3K OHM, 5% 1/4 WATT	3
27	5010-09179-00	R25	RESISTOR, FC, 3.3M OHM, 5% 1/4 WATT	1
28	5010-09035-00	R29	RESISTOR, FC, 47K OHM, 5% 1/4 WATT	1
29	5010-09034-00	R33, R35, R37	RESISTOR, FC, 10K OHM, 5% 1/4 WATT	3
30	5010-09039-00	R34	RESISTOR, FC, 10 OHM, 5% 1/4 WATT	1
31	5043-08980-00	C1, C16 thru C23, C31	CAPACITOR, CER. .01 MFD. 50V. +80%, -20%	10
32	5043-09065-00	C2 thru C10	CAPACITOR, CER. 470 PFD. 50V. +-20%	9
33	5043-09345-00	C11	CAPACITOR, CER. .001 MFD. +-20% 100V.	1
34	5040-09365-00	C12, C30, C36	CAPACITOR, ELECT. 1 MFD. 63V. -10 +50%	3
35	5043-08996-00	C13, C24, C35	CAPACITOR, CER. .1 MFD. 50V. +-20%	3
36	5040-09165-00	C14	CAPACITOR, ELECT. 1,000 MFD. 16V. +-20%	1
37	5040-09164-00	C15	CAPACITOR, ELECT. 470 MFD. 10V. +-20%	1
38	5040-08986-00	C25	CAPACITOR, ELECT. 100 MFD. 10V. +-20%	1
39	5040-08893-00	C26	CAPACITOR, ELECT. 1,000 MFD. 25V. +-20%	1
40	5040-09376-00	C27	CAPACITOR, ELECT. 4700 MFD. 16V. +-20%	1
41	5043-09180-00	C28	CAPACITOR, CER. 47 PFD. 1K V. +-20%	1
42	5040-09343-00)	C29	CAPACITOR, ELECT. 10 MFD. 20V	1
43	5043-09169-00	C32, C33	CAPACITOR, CER. DISC, 27 PFD. 1KV. +-10%	2
44	5041-09163-00	C34	CAPACITOR, TANTALUM 2.2 MFD. 15V. +-20%	1
45	5041-09031-00	C37	CAPACITOR, TANTALUM 1 MFD. 25V. +-20%	1
46	5641-09658-00)	SW1	MOMENTARY SWITCH SPDT	1
47	5645-09330-00	DS1	2 STD, DIP SWITCH	1
48	5731-06314-00	F1, F2	4 AMP SLOW BLOW FUSE	2
49	5732-09178-00		FUSEHOLDER	4
50	5705-09172-00		HEAT SINK THERMALLOY #6072B	1
51	5705-09173-00		HEAT SINK THERMALLOY #6071B	1
52	5705-09199-00		HEAT SINK THERMALLOY #6030	1
53	5700-09004-00		24 PIN SOCKET	1
54	5700-08985-00		40 PIN SOCKET	1
55	5791-09027-00	10J1, 10J3	9 PIN MALE CONNECTOR 09-65-1091	2
56	5791-09028-00	10J2, 10J4	4 PIN MALE CONNECTOR 09-65-1041	2
57				
58	4006-01003-06		6-32x3/8" P-PH-S	3
59	4406-01117-00		6-32 HEX NUT	3
60	5010-09534-00		0 OHM RESISTOR	A/R
61	5824-09248-00	TP1 THR TP4	TERMINAL #1502-1	4
62	5010-09363-00	R11	RESISTOR, FC, 5.6K OHM 5% 1/4 WATT	1
63				
64	5019-09362-00	SR1	RESISTOR, 4.7K OHM 10 PIN SIP	1
65	03-7520-1		TIE WRAP	1
66	4703-00007-00		#6 EXT. LOCKWASHER	3
67	20-9229		THERMAL COMPOUND	.01

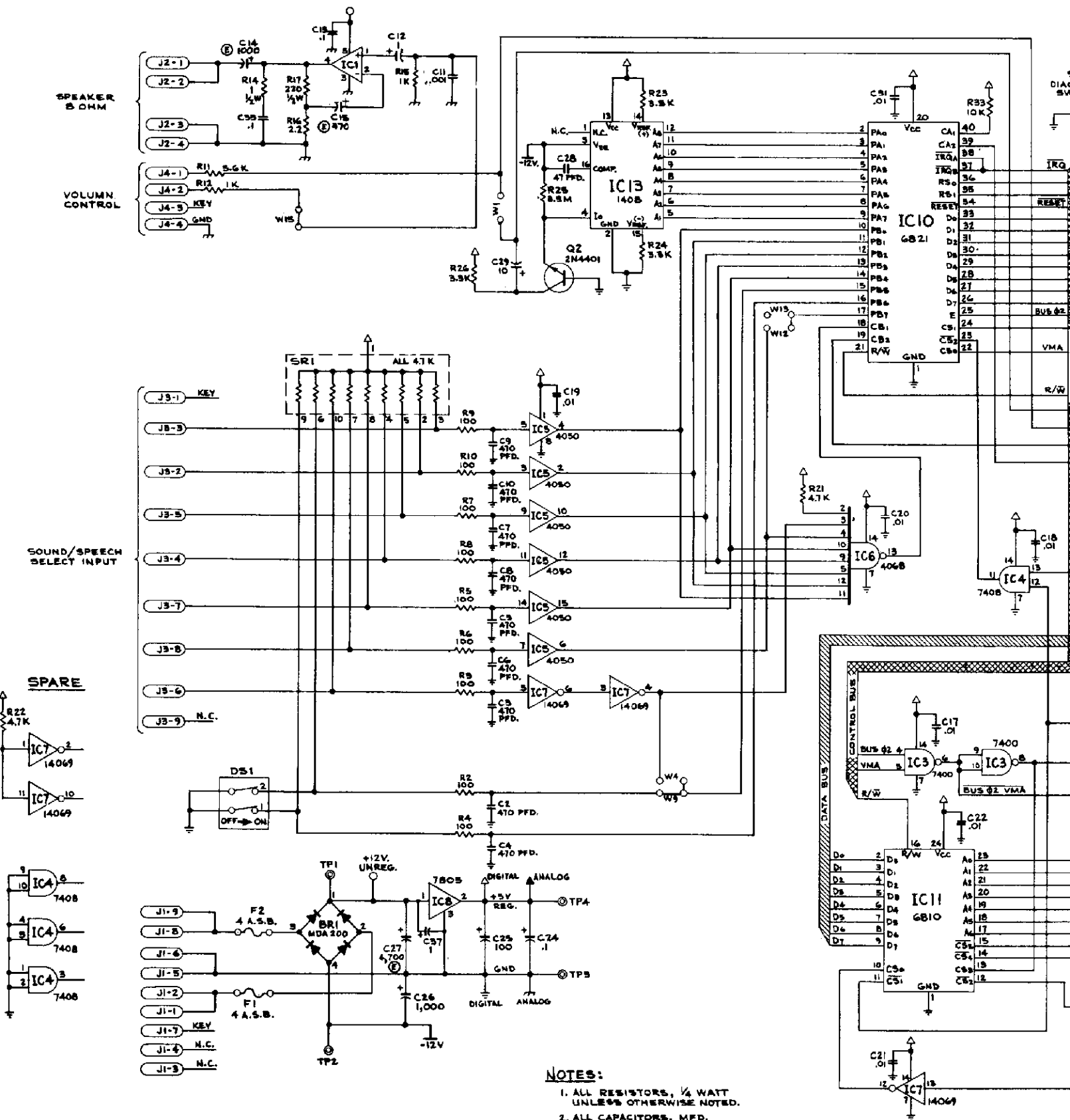
NOTES:

1. USE THERMAL COMPOUND BETWEEN IC1 AND IC8, AND HEAT SINKS.
2. CAUTION: AVOID STATIC DISCHARGE DAMAGE TO MOS LOGIC.
3. SYMBOLS SHOWN ON COMPONENTS ARE FOR REFERENCE ONLY. DO NOT SCREEN OR STAMP.
4. OBSERVE INDEX MARK OF ALL INTEGRATED CIRCUITS;

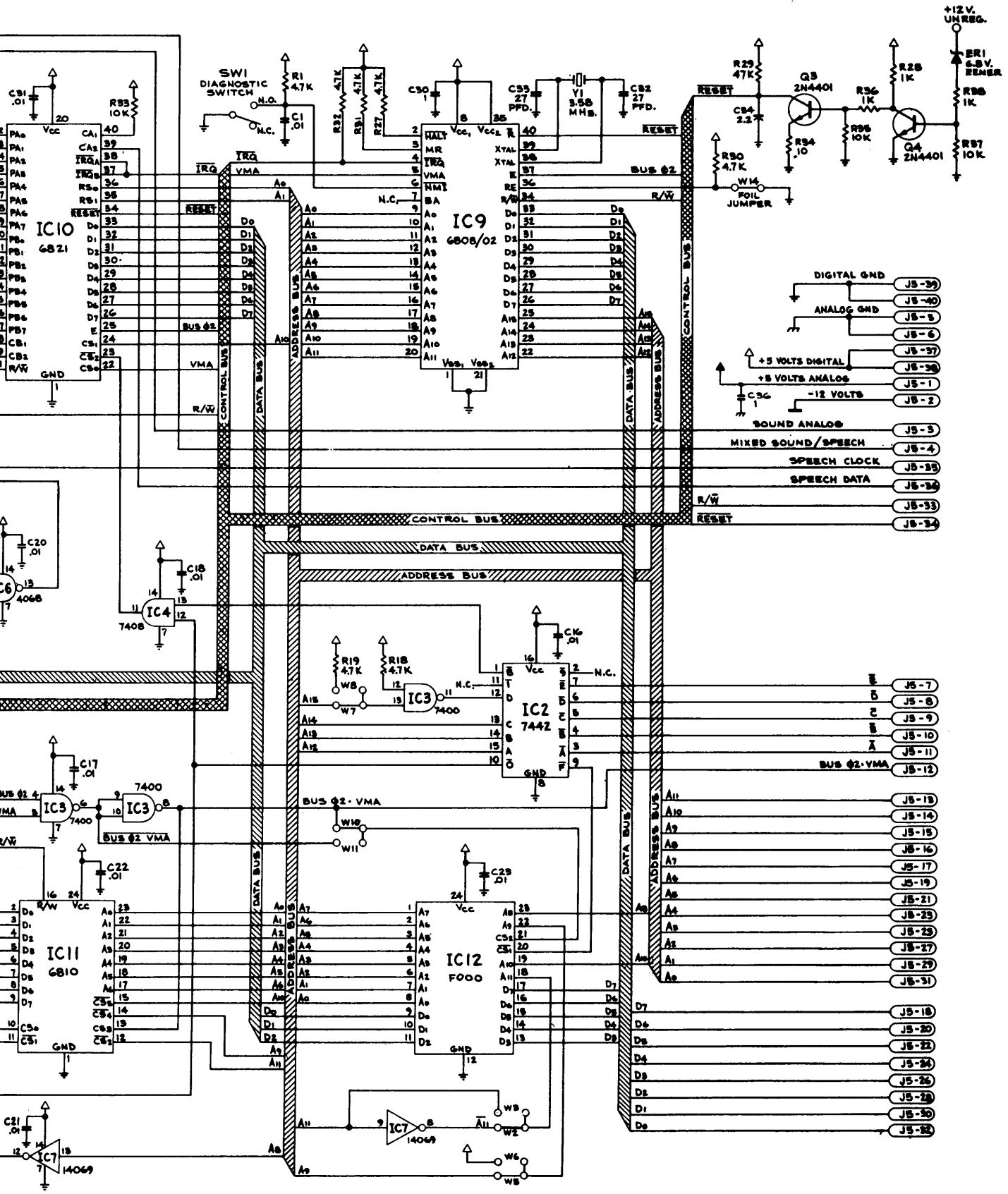
DIODES D1, D2, AND ZR1;

CAPACITORS C12, C14, C15, C25, C26, C27;

CONNECTORS, 10J1, 10J2, 10J4, 10J3, 10J5.

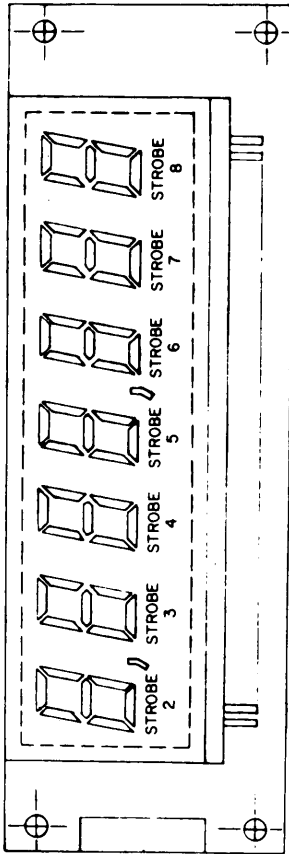


**NOTES:**  
 1. ALL RESISTORS, 1/4 WATT UNLESS OTHERWISE NOTED.  
 2. ALL CAPACITORS, MFD. UNLESS OTHERWISE NOTED.



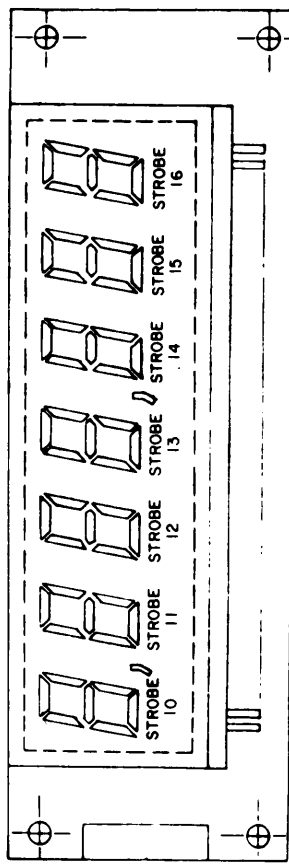
Sound Board Logic Diagram

PLAYERS #1 AND 3



5J1  
5J3

PLAYERS #2 AND 4



5J2  
5J4

4J1/5J1 (PLAYER 1)

- 1 100,000's
- 2 -100V KEEP ALIVE
- 3 1,000,000's
- 4 f SEGMENT
- 5 N/C
- 6 g SEGMENT
- 7 +100V (N/C)
- 8 e SEGMENT
- 9 10,000's
- 10 d SEGMENT
- 11 1,000's
- 12 +100V KEEP ALIVE
- 13 100's
- 14 COMMA
- 15 10's
- 16 c SEGMENT
- 17 N/C
- 18 b SEGMENT
- 19 UNITS
- 20 a SEGMENT

4J2/5J2 (PLAYER 2)

- 1 100,000's
- 2 -100V KEEP ALIVE
- 3 1,000,000's
- 4 f SEGMENT
- 5 N/C
- 6 g SEGMENT
- 7 +100V (N/C)
- 8 e SEGMENT
- 9 10,000's
- 10 d SEGMENT
- 11 1,000's
- 12 +100V KEEP ALIVE
- 13 100's
- 14 COMMA
- 15 10's
- 16 c SEGMENT
- 17 N/C
- 18 b SEGMENT
- 19 UNITS
- 20 a SEGMENT

4J8/5J5 (CREDIT/MATCH)

- 1 f' Segment (Credit)
- 2 -100V Keep Alive
- 3 e' Segment
- 4 g' Segment
- 5 c' Segment
- 6 d' Segment
- 7 b' Segment
- 8 10's
- 9 Units
- 10 a' Segment
- 11 e Segment
- 12 f Segment
- 13 10's
- 14 d Segment
- 15 +100V Keep Alive
- 16 c Segment
- 17 g Segment
- 18 b Segment
- 19 Units
- 20 a Segment

Credit

Match

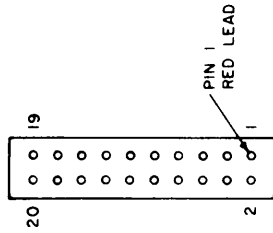
Match

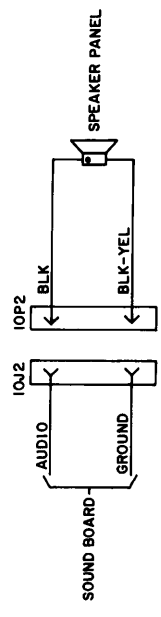
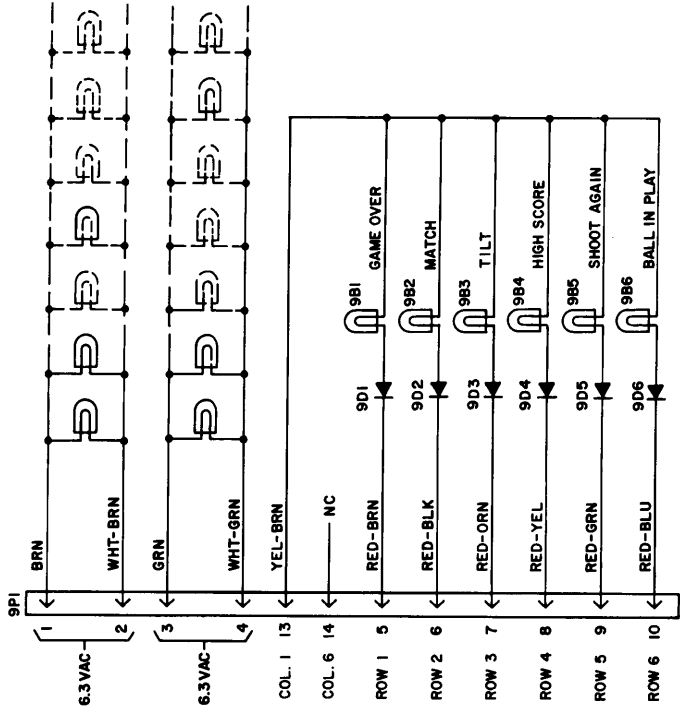
DETAIL A

4J1 - 4J4, 4J8

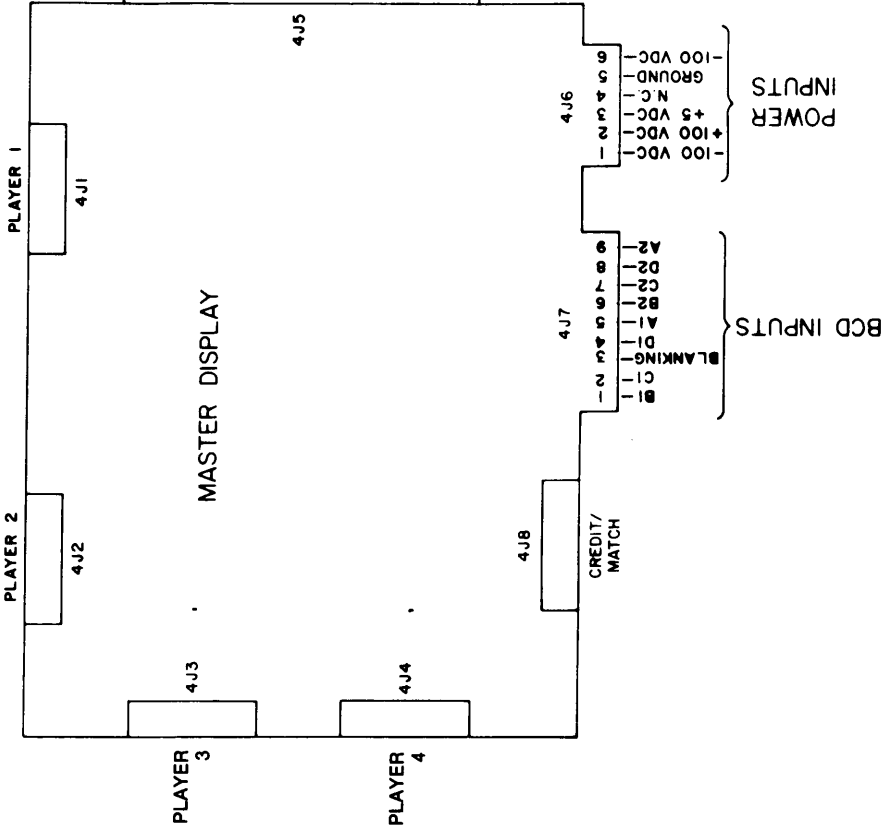
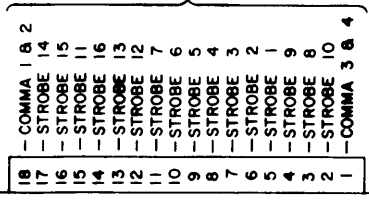
5J1 - 5J5

CONNECTORS

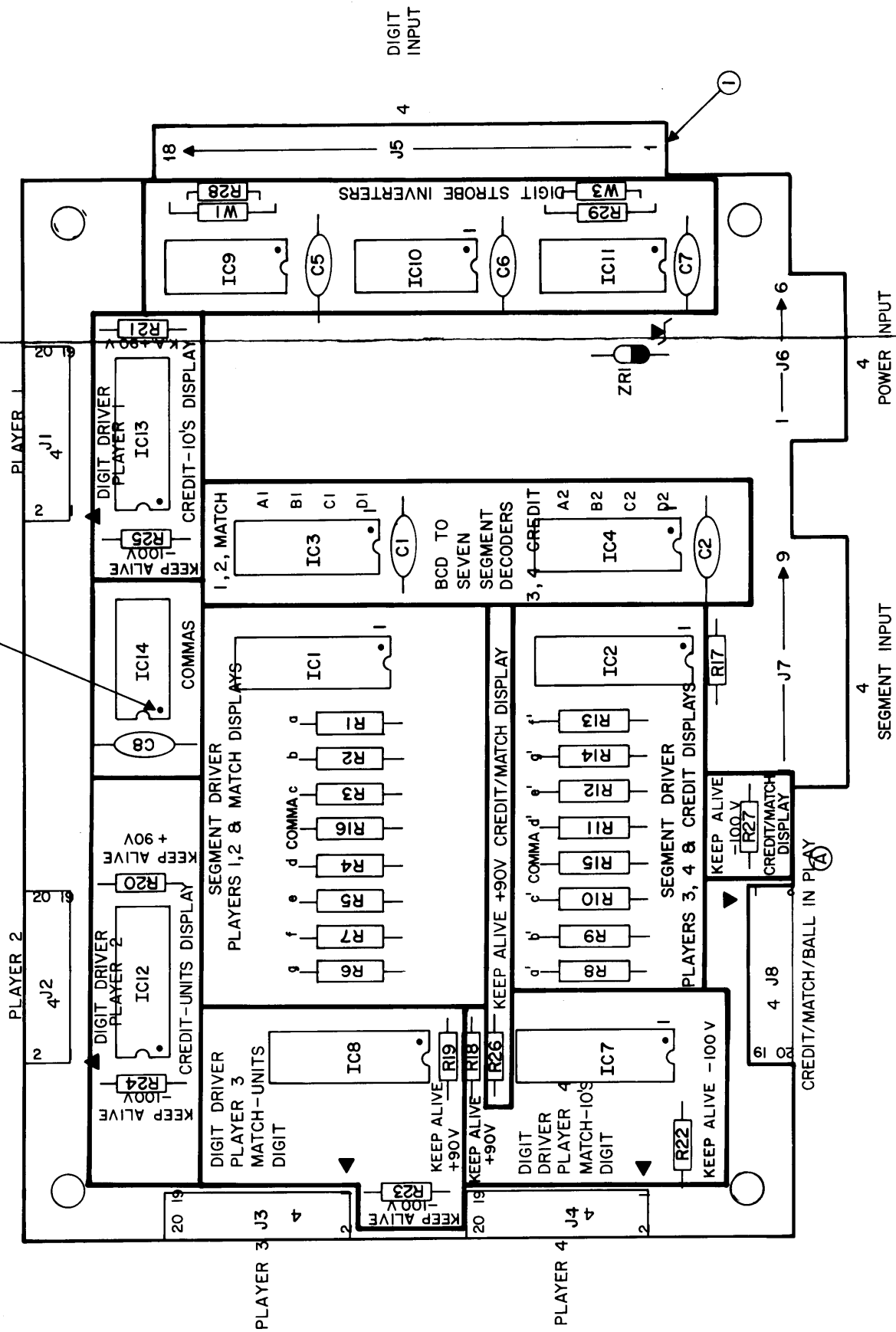




STROBE  
INPUTS



ALL IC'S WITH  
DOT INDICATES  
PIN NO. 1



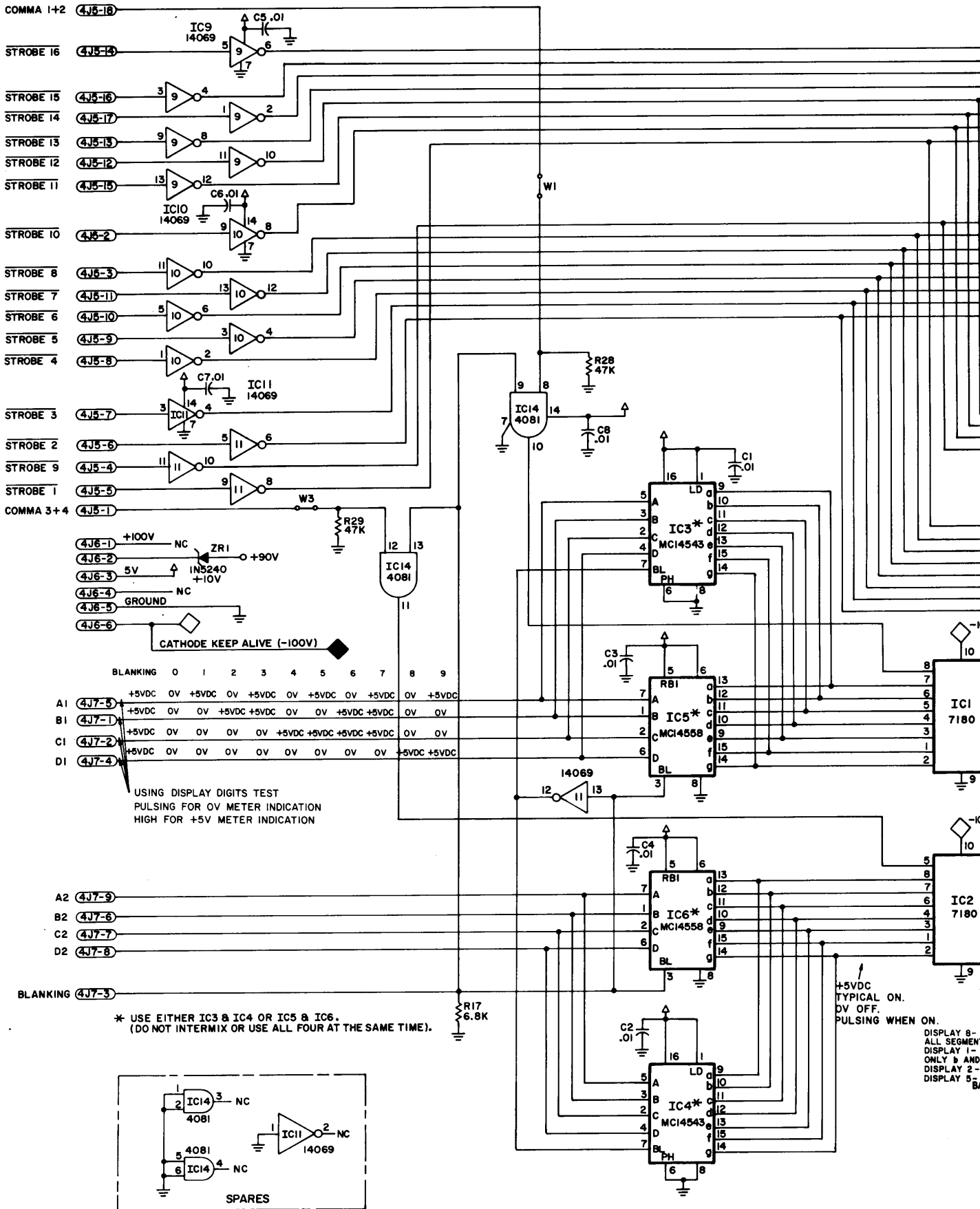


BILL OF MATERIAL

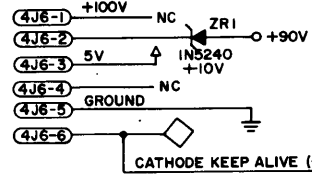
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D NO.
1	5760-09461		BARE P.C. BOARD	1
2	5310-08971	IC9,IC10,IC11	MC14069 HEX INVERTER	3
3	5310-08970	IC3, IC4	MC14543 BCD TO SEVEN SEGMENT LATCH/DECODER/DRIVER	2
4	5680-08969	IC1, IC2	UDN-7180 GAS DISCHARGE DISPLAY SEGMENT DRIVER	2
5	5680-08968	IC7,IC8,IC12,IC13	UDN-6184A OR UDN-6118A GAS DISCHARGE DISPLAY SEGMENT DR.	4
6	5310-09450	IC14	MC14081 QUAD 2-INPUT AND GATE	1
7	5010-08981	R1-R14	RESISTOR, FC, 10K OHM, 5%, 1/2 WATT	14
8	5075-09135	ØR1	IN4740A ZENER DIODE 10V, 5%, 1 WATT	1
9	5043-08980	C1,C2 C5 THRU C8	CAPACITOR, CERAMIC, 0.01 MFD., 50V, +80 -20%	6
10	5010-09035	R28, R29	RESISTOR, FC, 47K OHM, 5%, 1/4 WATT	2
11	5010-09086	R17	RESISTOR, FC, 6.8K OHM, 5%, 1/4 WATT	1
12	5010-08982	R18 THRU R27	RESISTOR, FC, 3 MEG. OHM, 5%, 1/4 WATT	10
13	5791-09437	J1 THRU J4, J8	20 PIN RIBBON HEADER	5
14	5010-09149	R15, R16	RESISTOR, FC, 15K OHM, 5%, 1/2 WATT	2
15	5010-09534	W1, W3	RESISTOR, 0 OHM	2

DIGIT CROSS REFERENCE

DIGIT	7-SEGMENT DECODER/DRIVER	STROBE (DRIVER)
Credit 10's	IC4/IC2	1 (IC13)
Credit Units	IC4/IC2	9 (IC12)
Match 10's	IC3/IC1	1 (IC7)
Match Units	IC3/IC1	9 (IC8)
#1 1,000,000	IC3/IC1	2 (IC13)
#1 100,000's	IC3/IC1	3 (IC13)
#1 10,000's	IC3/IC1	4 (IC13)
#1 1,000's	IC3/IC1	5 (IC13)
#1 100's	IC3/IC1	6 (IC13)
#1 10's	IC3/IC1	7 (IC13)
#1 Units	IC3/IC1	8 (IC13)
#2 1,000,000's	IC3/IC1	10 (IC12)
#2 100,000's	IC3/IC1	11 (IC12)
#2 10,000's	IC3/IC1	12 (IC12)
#2 1,000's	IC3/IC1	13 (IC12)
#2 100's	IC3/IC1	14 (IC12)
#2 10's	IC3/IC1	15 (IC12)
#2 Units	IC3/IC1	16 (IC12)
#3 1,000,000's	IC4/IC2	2 (IC8)
#3 100,000's	IC4/IC2	3 (IC8)
#3 10,000's	IC4/IC2	4 (IC8)
#3 1,000's	IC4/IC2	5 (IC8)
#3 100's	IC4/IC2	6 (IC8)
#3 10's	IC4/IC2	7 (IC8)
#3 Units	IC4/IC2	8 (IC8)
#4 1,000,000's	IC4/IC2	10 (IC7)
#4 100,000's	IC4/IC2	11 (IC7)
#4 10,000's	IC4/IC2	12 (IC7)
#4 1,000's	IC4/IC2	13 (IC7)
#4 100's	IC4/IC2	14 (IC7)
#4 10's	IC4/IC2	15 (IC7)
#4 Units	IC4/IC2	16 (IC7)
#1 Comma	-/IC1	2,5 (IC13)
#2 Comma	-/IC2	10,13 (IC12)
#3 Comma	-/IC1	2,5 (IC8)
#4 Comma	-/IC2	10,13 (IC7)



- COMMA 1+2 (4J5-18)
- STROBE 16 (4J5-14)
- STROBE 15 (4J5-16)
- STROBE 14 (4J5-17)
- STROBE 13 (4J5-13)
- STROBE 12 (4J5-12)
- STROBE 11 (4J5-15)
- STROBE 10 (4J5-2)
- STROBE 8 (4J5-3)
- STROBE 7 (4J5-11)
- STROBE 6 (4J5-10)
- STROBE 5 (4J5-9)
- STROBE 4 (4J5-8)
- STROBE 3 (4J5-7)
- STROBE 2 (4J5-6)
- STROBE 9 (4J5-4)
- STROBE 1 (4J5-5)
- COMMA 3+4 (4J5-1)



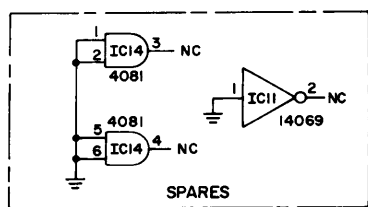
	0	1	2	3	4	5	6	7	8	9
A1 (4J7-5)	+5VDC	0V	+5VDC	0V	+5VDC	0V	+5VDC	0V	+5VDC	0V
B1 (4J7-1)	+5VDC	0V	0V	+5VDC	+5VDC	0V	0V	+5VDC	+5VDC	0V
C1 (4J7-2)	+5VDC	0V	0V	0V	0V	+5VDC	+5VDC	+5VDC	+5VDC	0V
D1 (4J7-4)	+5VDC	0V	0V	0V	0V	0V	0V	0V	0V	+5VDC

USING DISPLAY DIGITS TEST  
PULSING FOR 0V METER INDICATION  
HIGH FOR +5V METER INDICATION

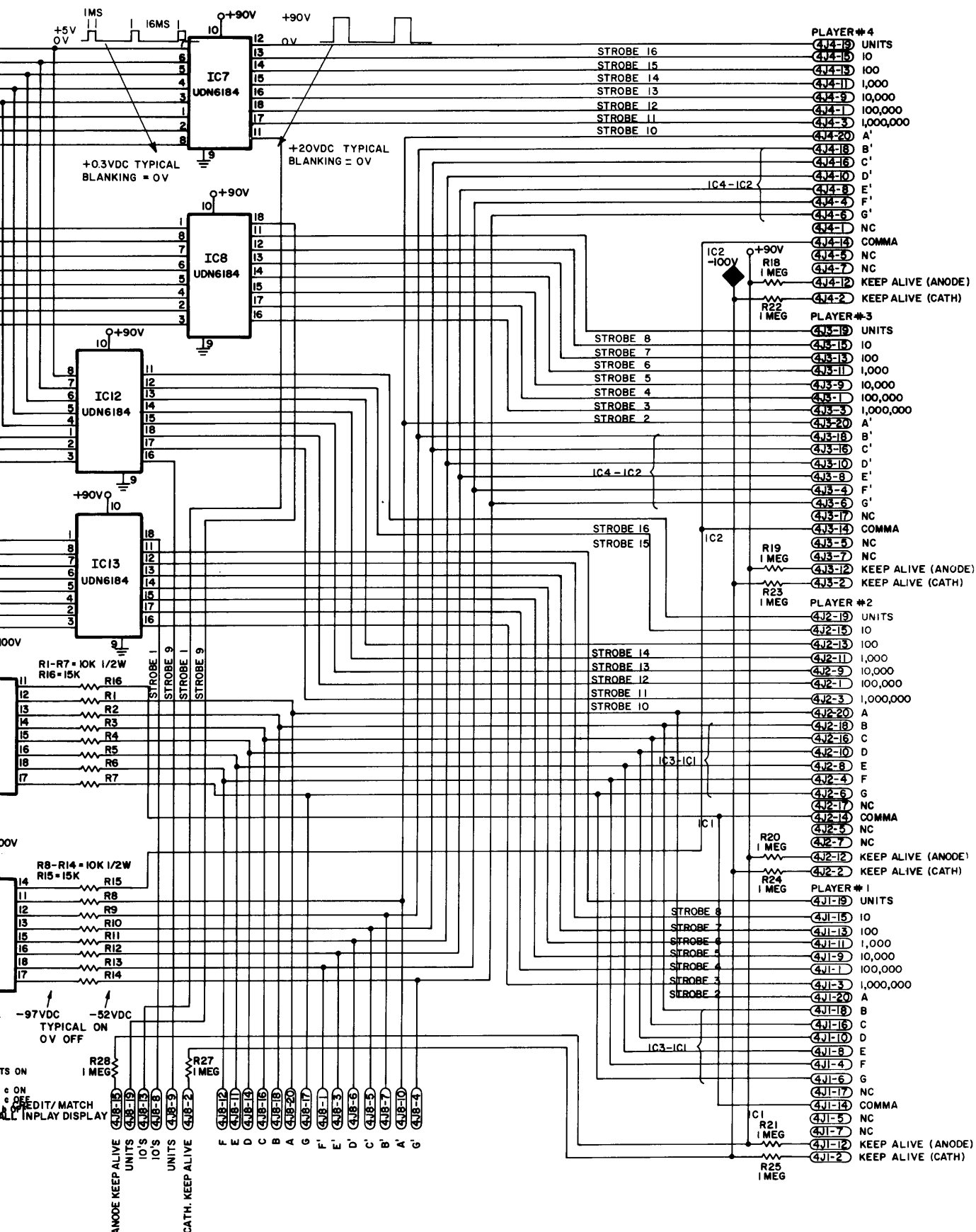
- A2 (4J7-9)
- B2 (4J7-6)
- C2 (4J7-7)
- D2 (4J7-8)

BLANKING (4J7-3)

\* USE EITHER IC3 & IC4 OR IC5 & IC6.  
(DO NOT INTERMIX OR USE ALL FOUR AT THE SAME TIME).

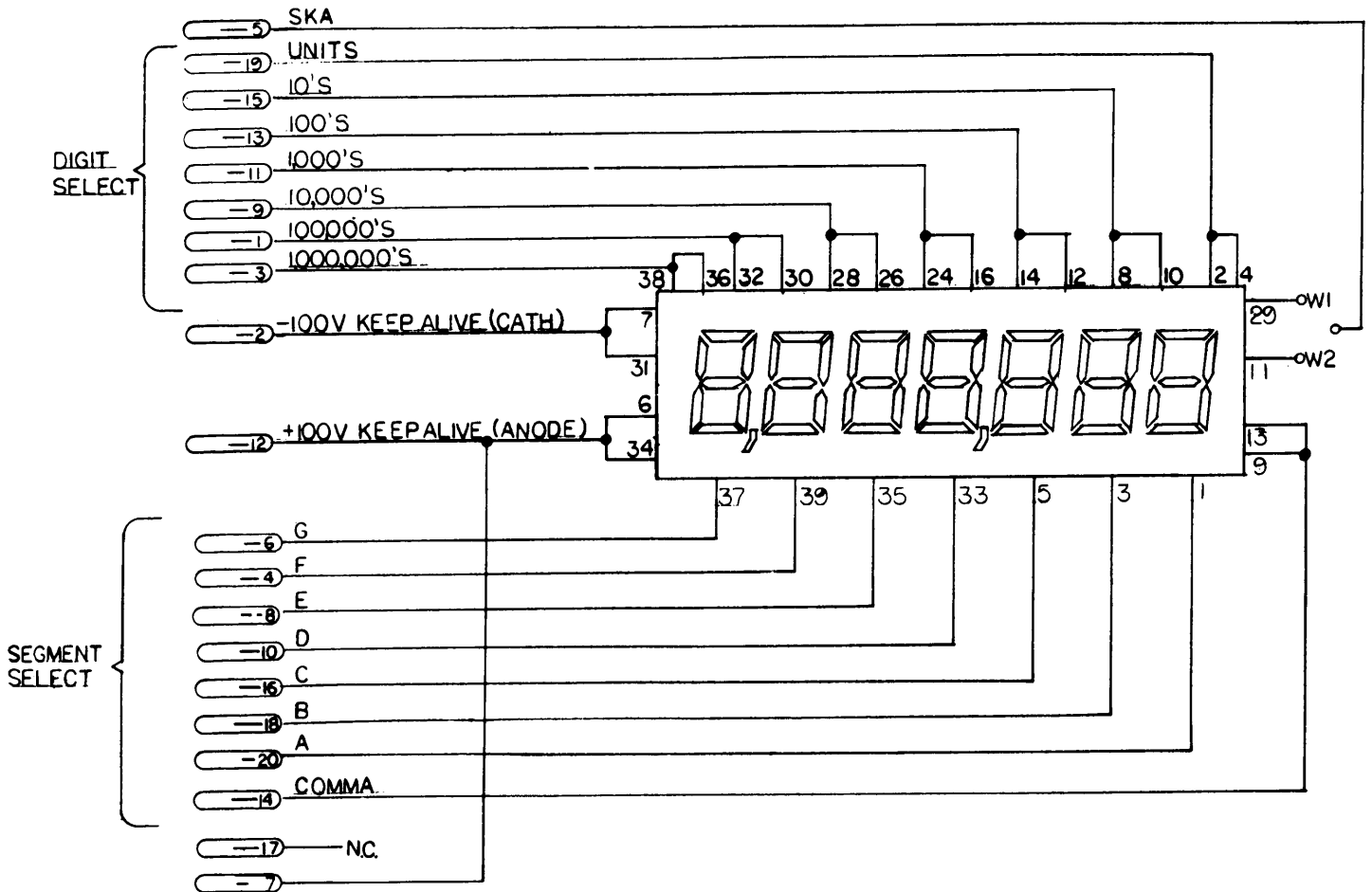
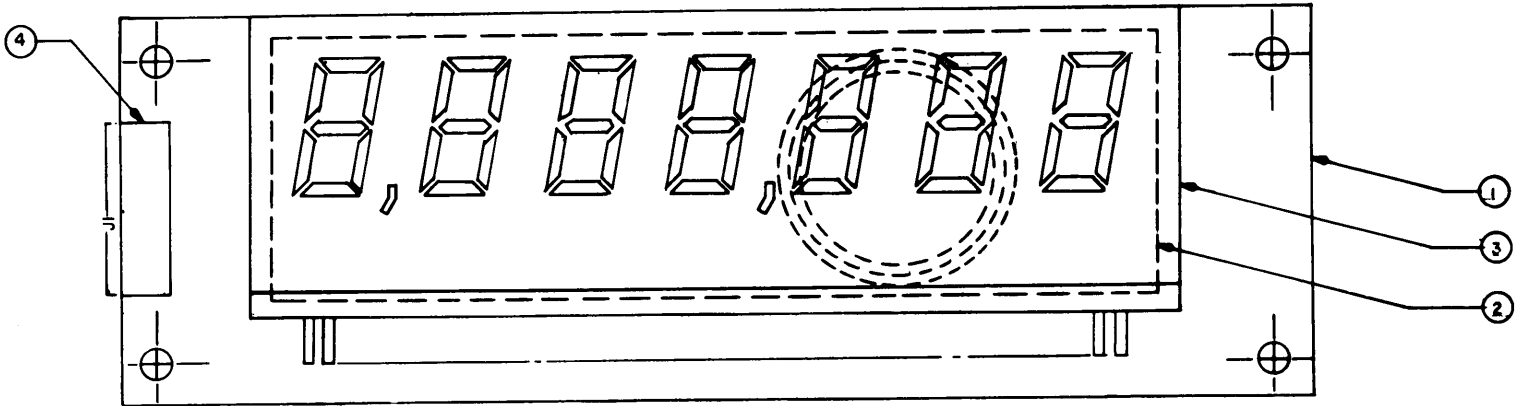


+5VDC TYPICAL ON.  
0V OFF.  
PULSING WHEN ON.  
DISPLAY 8 - ALL SEGMENTS  
DISPLAY 1 - ONLY 9 AND  
DISPLAY 2 -  
DISPLAY 5 - BA



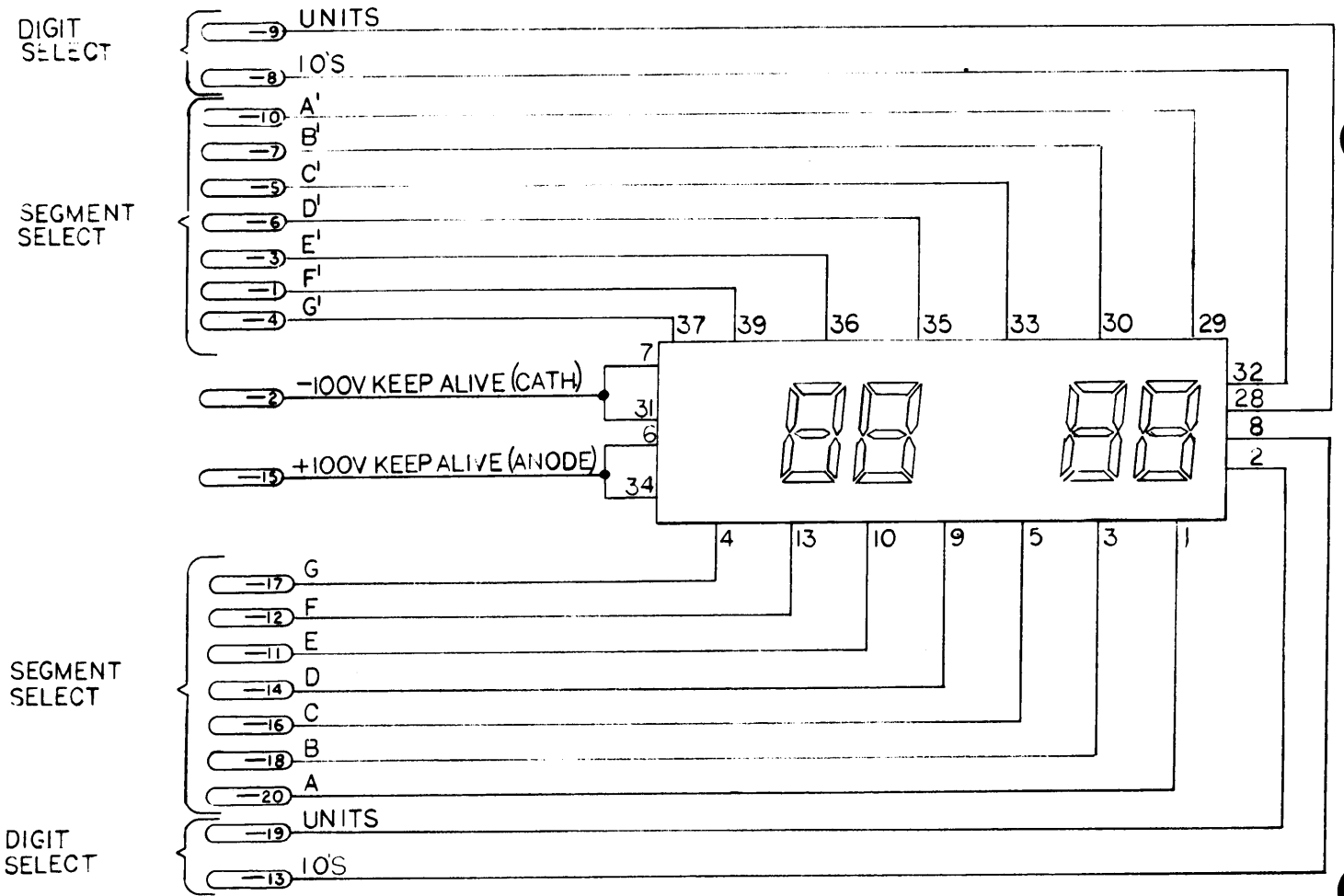
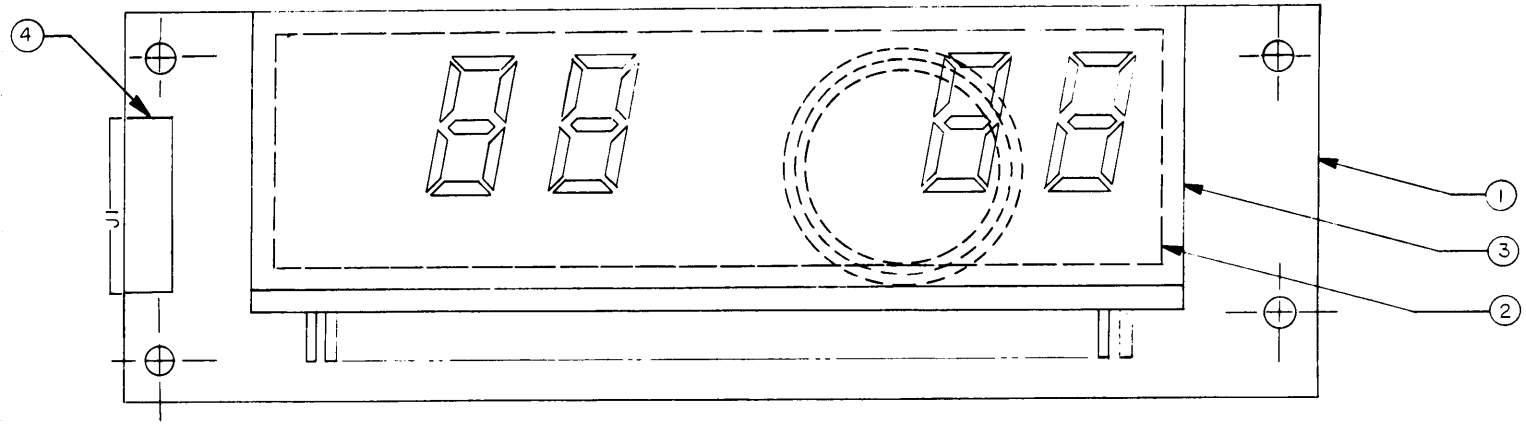
C 8363 Master Display Board Logic Diagram

BILL OF MATERIAL				
ITEM	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D.
1	5762-0848-XP		SLAVE DISPLAY P.C. BOARD	1
2	33-0648		DISPLAY MTG ADHESIVE FOAM	1
3	8670-0848-XP		7 DIGIT DISPLAY	1
4	5761-0848-XP	J1	20 PIN RIBBON HEADER	1
5	05-7673-2		CAPLUG	1



C 8364 PLAYER SLAVE DISPLAY

BILL OF MATERIAL				
ITEM	PART NO.	PART DESIGNATION	DESCRIPTION	REQ' D
1	5167-0946B-00		CREDIT/MATCH SLAVE PC BOARD	1
2	23-6546		FOAM DISPLAY - BACK	1
3	5670-0944B-00		4 DIGIT DISPLAY	1
4	5791-0942B-00	J1	20 PIN RIBBON HEADER	1
5	23-6546		FOAM DISPLAY - FRONT	1
6	03-1573-2		CAPLUG	1



C 8365 CREDIT/MATCH SLAVE DISPLAY