

Williams[®]

16P-504-101
Game No. 504
June, 1981

PHARAOH



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800-621-4765
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Williams[®] 
ELECTRONICS, INC.

3401 N. California Ave., Chicago, IL 60618
Cable Address: WILCOIN CHICAGO
(312) 267-2240

FOREWORD

This instruction and drawing set provides essential installation information unique to PHARAOH. For game operation, bookkeeping, game adjustment, diagnostic and self-test and basic troubleshooting procedures, refer to the instruction booklet located in the envelope inside the coin door. For detailed troubleshooting and interconnection information, refer to Williams Solid State Flipper Maintenance Manual and Supplements.

SPECIAL CONSIDERATIONS WHEN REPLACING CIRCUIT BOARDS

CPU Board

1. Revision level 7 CPU Boards (batteries located on lower left corner at board) of later boards must be used.
2. Must be equipped with blue-labeled Flipper ROMs and blue-labeled Game ROMs.
3. Jumpers W3, W10, W11, W14, W17, W19, W20, and W22 must be connected. Jumpers W4, W9, W12, W15, W16, W18, W21, and W23 must be removed. With the exception of W25; (Factory Setting Jumper) all other jumpers are not changed.

Driver Board

Must be equipped with zero-ohm resistors or wire jumpers (W9-W16) in place of switch matrix drive series resistors R204-R211.

Sound Board

1. Model D 8224 required for speech.
2. Must be jumpered for ROM operation and be equipped with Sound ROM 6. (Jumpers W3, W5, W7, W9, W10, W12, and W15 connected; W2, W4, W6, W8, W11, and W13 removed).

Power Supply Board

1. Model D 8345 board required (equipped with relay).
2. Fuse F4 (20A SB) for flipper solenoids and magnets must be installed.

Display Boards

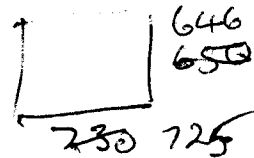
Model C 8363 Master Display and 7-digit Slave Displays required.

Optional Speech Module

Requires 5T5041 (IC7), 5T5042 (IC5), 5T5043 (IC6), and 5T5044 (IC4) Speech ROMs.

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Assembly and Interconnection

With legs attached to cabinet and backbox positioned face-down on top of cabinet with the opening facing the rear of the cabinet proceed as follows:

- A. Pull five cables from backbox.
- B. Reach into right side of pedestal hole, pull up ground strap, and push it into backbox.
- C. Remove ties securing cabinet and playfield cables to cabinet and pull up these cables.
- D. Interconnect five cables. They are size and color coded.
- E. Insert line cord into notch in cabinet. DO NOT PLUG IN AT THIS TIME.
- F. Push remote volume control cable, White-Red solenoid ground cable, and transformer cable (terminated with four plugs) into backbox.
- G. Lift up backbox and position on cabinet pedestal, engaging brackets for support.
- H. Remove shipping blocks from insert door.
- I. Secure backbox to cabinet using two bolts and washers.
- J. Connect ground braid and White-Red wires under wing nut and washer at bottom of backbox.
- K. Loosely position remote volume cable and Sound Board power cable in harness and plug connector into 10J4 and 10J1, respectively.
- L. Connect bridge rectifier connector 6P1/6J1, and plug remaining two transformer connections into 3J1 and 3J9 on the Power Supply Board.

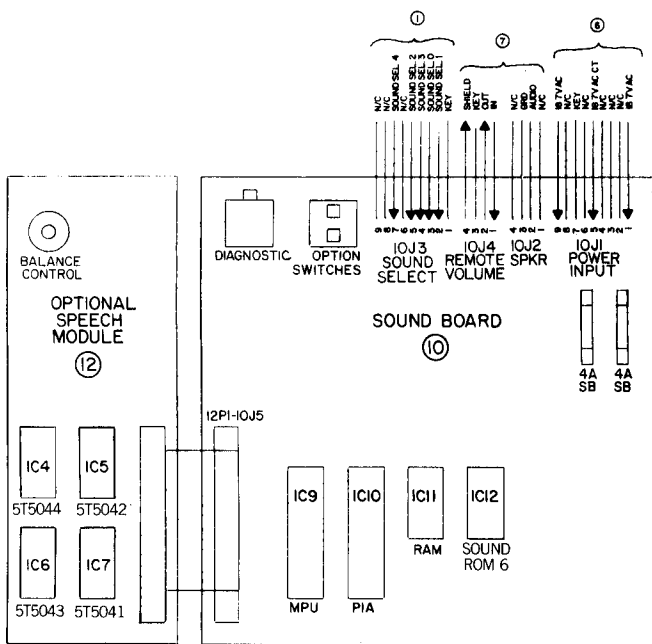
Inspection

- A. Check all connectors in backbox for loose wire termination. Reseat any loose wires by pushing in on the terminal.
- B. Push on all connectors attached to Master Display, CPU, Driver, and Sound Boards, and check terminations on capacitor and bridge rectifier at the lower right of the backbox.
- C. Gently press on all the socketed IC packages on the CPU and Sound Boards.
- D. Check that two fuses on the Sound Board, seven fuses on Power Supply Board, and two fuses on Insert Board are secure.
- E. Push on the connector attached to Slave Display Boards.
- F. Check that the line fuse in the bottom of the cabinet is secure.
- G. Check the transformer input connector in bottom of cabinet for loose wire termination. Reseat any loose wires by pushing in on the termination.
- H. Check the cabinet to coin door connector for loose wire termination. Reseat any loose wires by pushing in on the termination.

Power Turn-On and Game Setup

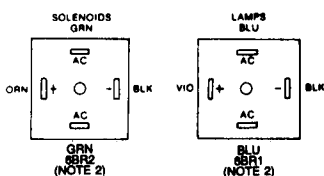
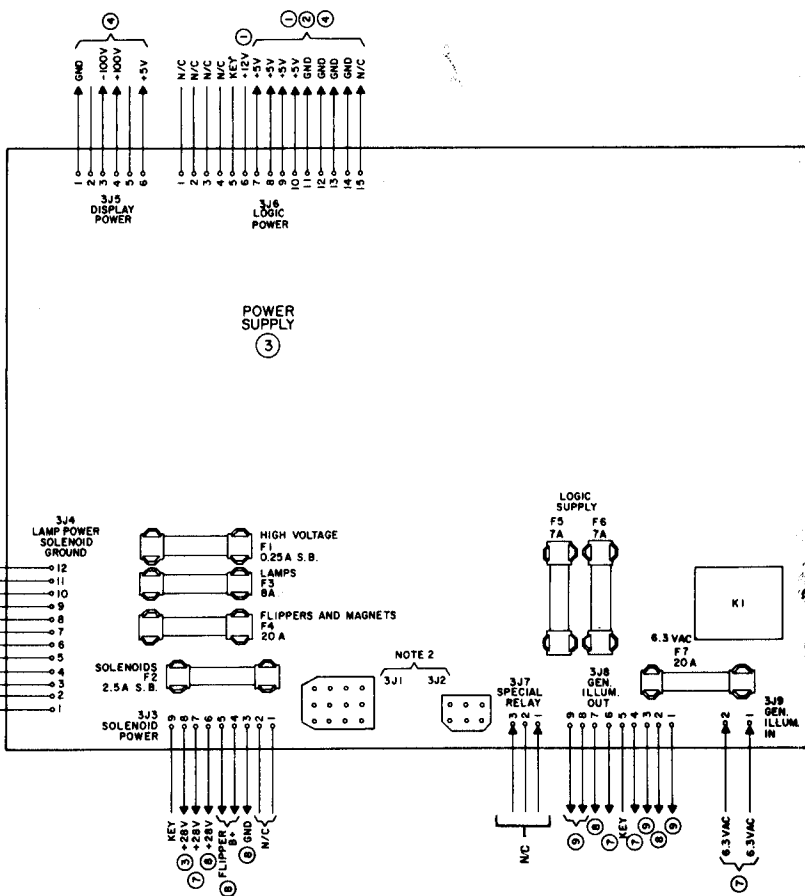
This machine MUST BE PLUGGED INTO A PROPERLY GROUNDED OUTLET to PREVENT SHOCK HAZARD to ensure PROPER GAME OPERATION. DO NOT use a "cheater" plug to defeat the ground pin on the line cord, DO NOT cut off the ground pin. The line voltage MUST agree with that specified on the back of the cabinet or serious damage to the machine could occur. For low-line applications (105 or 210V ac), refer to the power wiring diagram.

1. With the coin door closed, plug the game in and turn it ON. The game should come on in the game over mode as indicated by the player 1 score reading zero, game over lights lit, and the high score to date alternating with the player scores.
2. If the game comes on in the diagnostic mode (number of credits display showing 04, ball in play display showing 00, and player 1 display showing game identification) turn the game OFF and ON again.
 - a. If the game now comes on in the game over mode the bookkeeping and game evaluation totals have been reset to zero.
 - b. If the game still comes on in the diagnostic mode, open the coin door and turn the game OFF, and ON twice. This is an indication of the batteries being removed with the power OFF or coming loose during shipment. This has also resulted in features reverting to factory settings. Any changes from factory settings must be reentered using procedures provided in the instruction booklet.
3. If the game still comes on in the diagnostic mode, refer to troubleshooting procedures in the maintenance manual.
4. Lift plastic at upper right of playfield to insert captive ball, and place two balls on playfield next to outhole.
5. Perform diagnostic tests and make any desired changes to features as described in the instruction booklet.



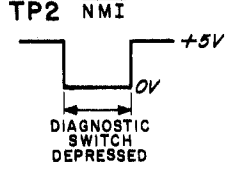
NOTES:

1. 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 SPEECH MODULE
2. REFER TO POWER WIRING DIAGRAM FOR CONNECTIONS TO 3PI.

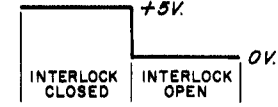


DISPLAY BLANKING MEM. PROTECT & DIAGNOSTIC SW. MASTER DISPLAY BCD OUTPUTS MASTER DIS

TP1 +12V. UNREG.



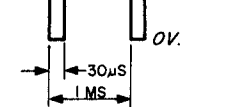
TP3 MEMORY PROTECT



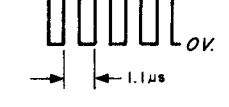
TP4 BLANKING



TP5 IRQ



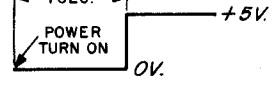
TP6 BUS φ2



TP7 CMOS RAM B+

POWER ON 4.3K
POWER OFF 3.9K

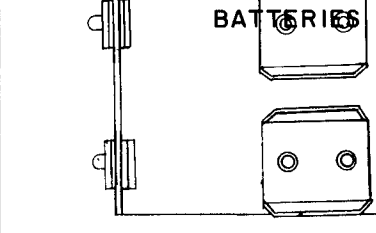
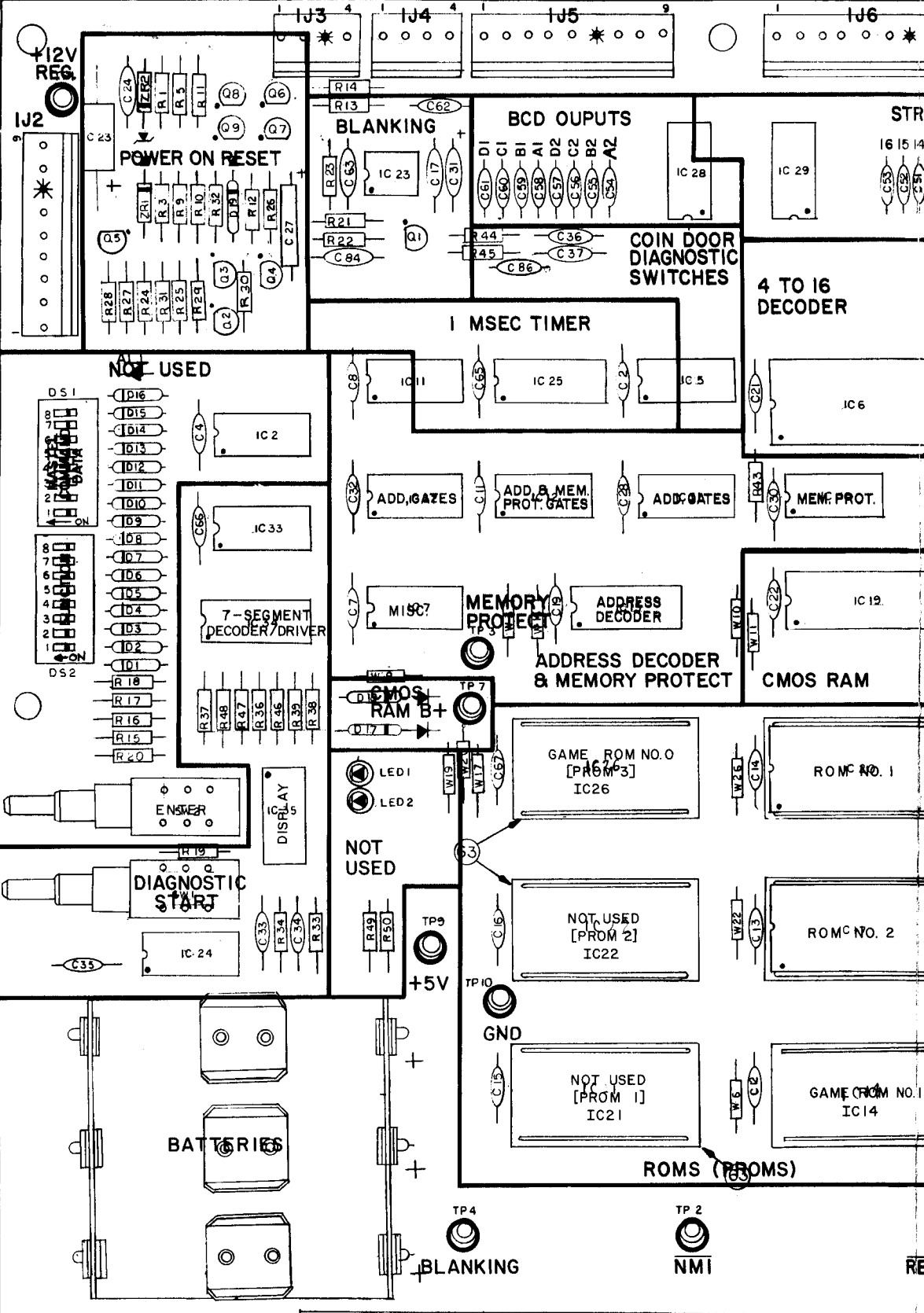
TP8 RESET



TP9 +5V.

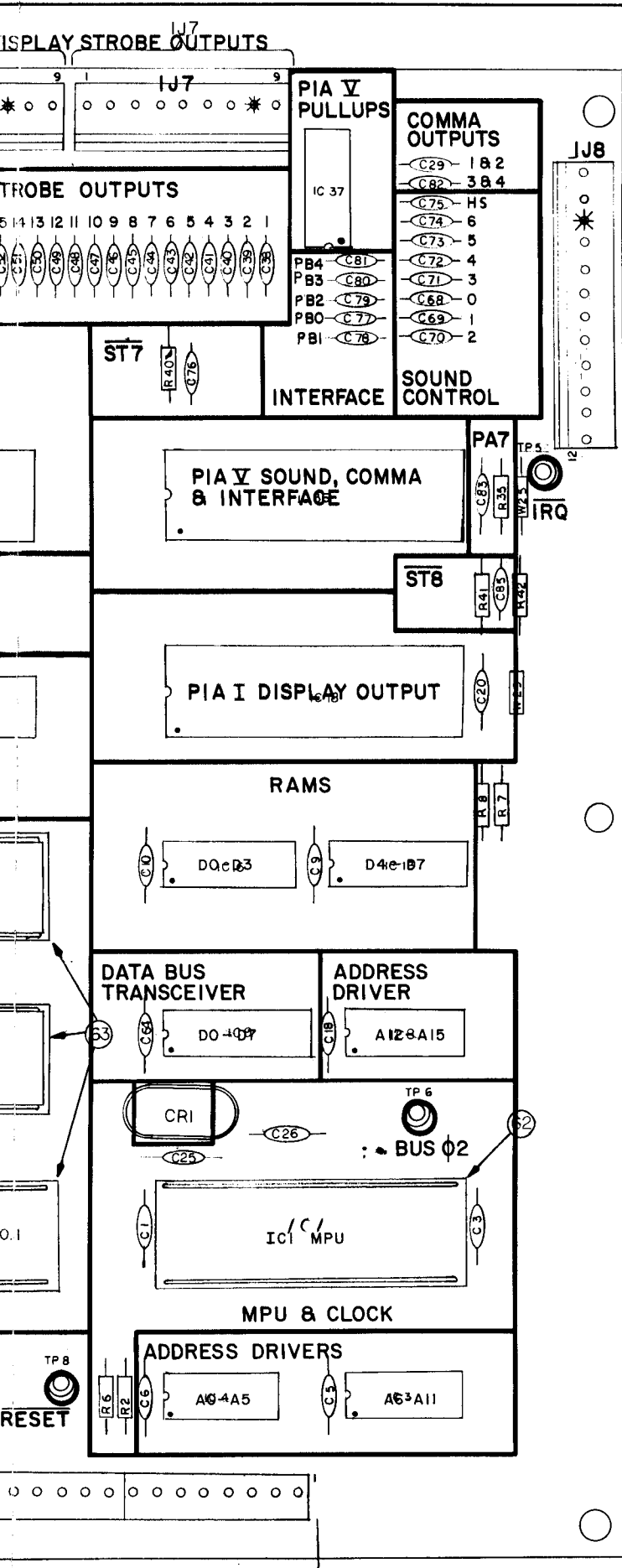
TP10 GND

LOGIC POWER BUS INPUT



A	ITEM No. 11 was	10/10/80
	5341-09233-00	G.H
A	ITEM No. 12 was	
	5341-09234-00	
REVISION LETTER	REVISION	BY

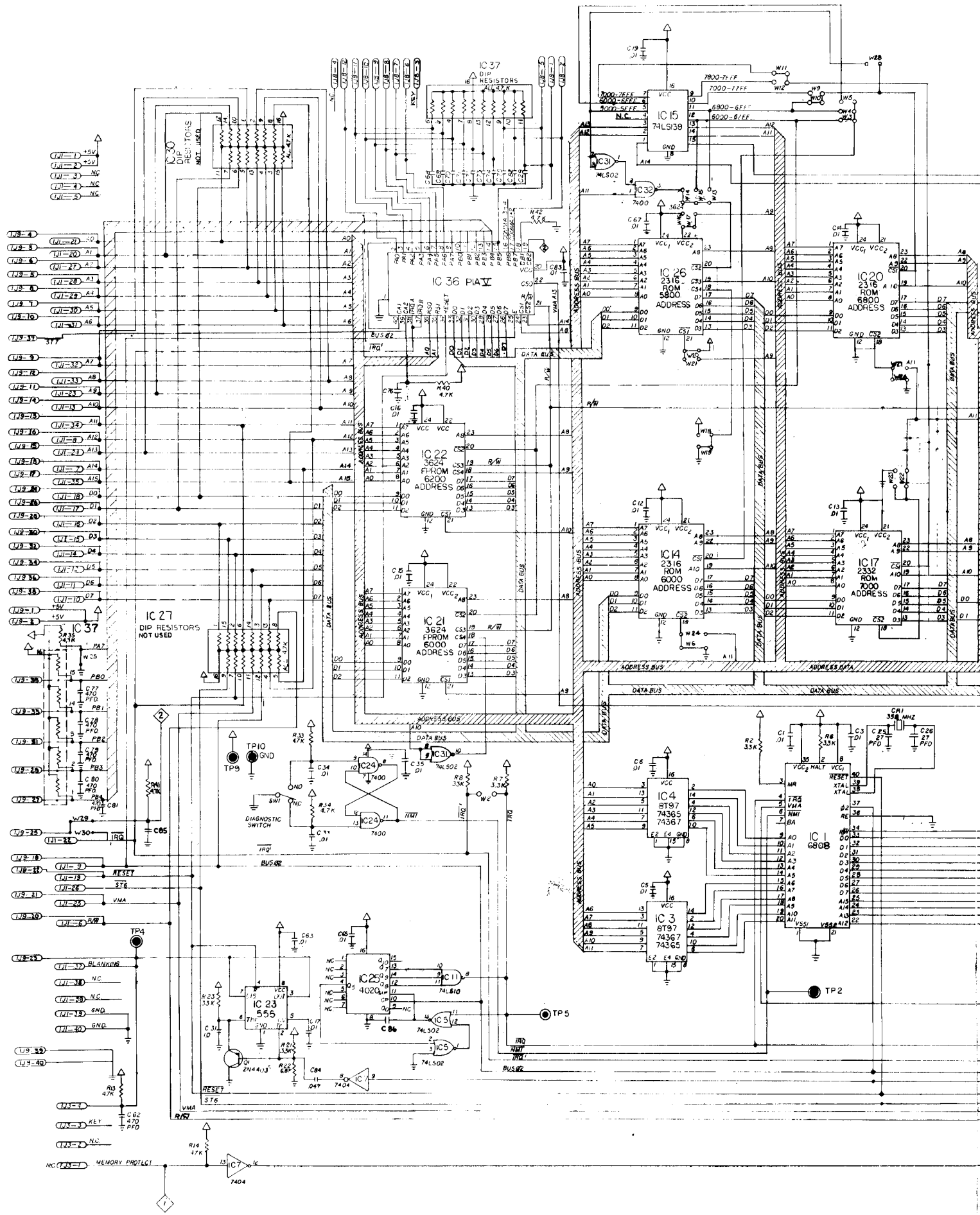
INTERBOARD CONNECTOR



BILL OF MATERIAL				
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQD NO.
1	5764-09465-X0	IC2	BARE PC. BOARD CPU	1
2	5280-09408-X0	IC2	74125 HEX TRISTATE BUFFER	1
3	5370-08989-00	IC3,IC4,IC8	8197 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	5430-08972-00	IC18,IC36	MC6821 PIA	2
14	5340-09017-00	IC19	MC 5101 CMOS RAM	1
15	5431-09449-00	IC23	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	74LS02 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 4.7K 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	IN5996 ZENER DIODE 6.8V	1
26	5075-09039-00	ZR2	IN5990 ZENER DIODE 3.9V	1
27	5070-08919-00	D1-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	9
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 10MED 50V	36
47	5040-08986-00	C23	CAPACITOR ELECT 100MFD 10V	1
48	5043-08996-00	C24	CAPACITOR CERAMIC 1MED 50V	1
49	5043-09169-00	C25,C26	CAPACITOR CERAMIC 27PF 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 .047MFD 50V	1
53	5043-09065-00	C29,C38-C62,C64-C82,C85,C86	CAPACITOR CERAMIC 470PF 50V	43
54	5671-09019-00	LED1,LED2	LED RED	2
55	SEE NOTE	SW1,SW2	SWITCH MOMENTARY	2
56	5881-09021-00		BATTERY HOLDER #171	1
57	5791-09026-00	H1	HEADER 09-64-1083 8 PIN	5
58	5791-09028-00	H3,H4	HEADER 09-65-1041 4 PIN	2
59				
60	5791-09027-00	H2,H5-H7	HEADER 09-65-1091 9 PIN	4
61	5791-09043-00	H8	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,W19,W20,W25,W26,W29,W22	RESISTOR FC 0 OHM 1/4W	13
65	5824-09248-00	TP1-TP10	TEST TERMINALS #1502-1	10

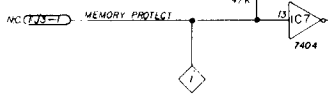
NOTE: USE EITHER 5641-09312-00, 5641-09024-00 OR 5641-09371-00

TOLERANCES		QTY.	ASSEMBLE ON
UNLESS OTHERWISE SPECIFIED		WILLIAMS ELECTRONICS, INC.	
FRACTIONAL	21/64"	3401 N. CALIFORNIA CHICAGO, ILL. 60618 267-2840	
DECIMAL	±.008"	MATERIAL	
HOLE DIA.	±.008 - .000"	HEAT TREATMENT	
ANGULAR	±1/2°	FINISH	
CONCENTRICITY	±1/8, .005"		
SCREW THREADS	CLASS 2		
DWN. CHOBBS	DATE 9-20-83	APP'D.	SCALE
			D-8342



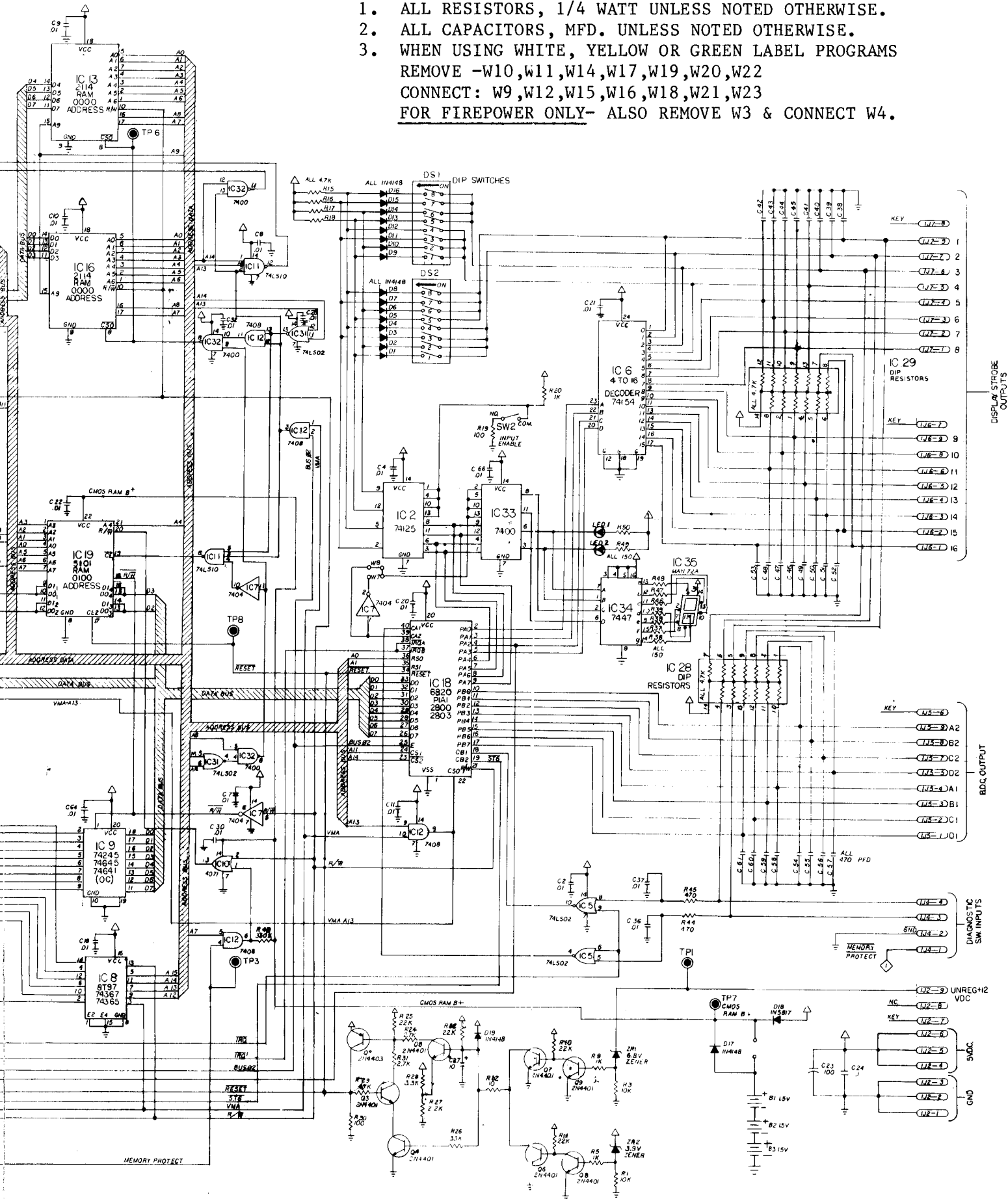
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- (U1-2) +5V
- (U1-3) NC
- (U1-4) NC
- (U1-5) NC

- (U2-4) (U1-21) S0
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- (U2-6) (U1-27) A2
- (U2-7) (U1-28) A3
- (U2-8) (U1-29) A4
- (U2-9) (U1-30) A5
- (U2-10) (U1-31) A6
- (U2-11) 3TT
- (U2-12) (U1-32) A7
- (U2-13) (U1-33) A8
- (U2-14) (U1-24) A9
- (U2-15) (U1-23) A10
- (U2-16) (U1-22) A11
- (U2-17) (U1-7) A12
- (U2-18) (U1-35) A13
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- (U2-23) (U1-14) A18
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- (U2-65) (U1-7) A60
- (U2-66) (U1-6) A61
- (U2-67) (U1-5) A62
- (U2-68) (U1-4) A63
- (U2-69) (U1-3) A64
- (U2-70) (U1-2) A65
- (U2-71) (U1-1) A66
- (U2-72) (U1-37) BLANKING
- (U2-73) NC
- (U2-74) NC
- (U2-75) GND
- (U2-76) GND
- (U2-77) GND
- (U2-78) GND
- (U2-79) +5V
- (U2-80) RESET
- (U2-81) STB
- (U2-82) VMA
- (U2-83) RW
- (U2-84) RW
- (U2-85) RW
- (U2-86) RW
- (U2-87) RW
- (U2-88) RW
- (U2-89) RW
- (U2-90) RW
- (U2-91) RW
- (U2-92) RW
- (U2-93) RW
- (U2-94) RW
- (U2-95) RW
- (U2-96) RW
- (U2-97) RW
- (U2-98) RW
- (U2-99) RW
- (U2-100) RW



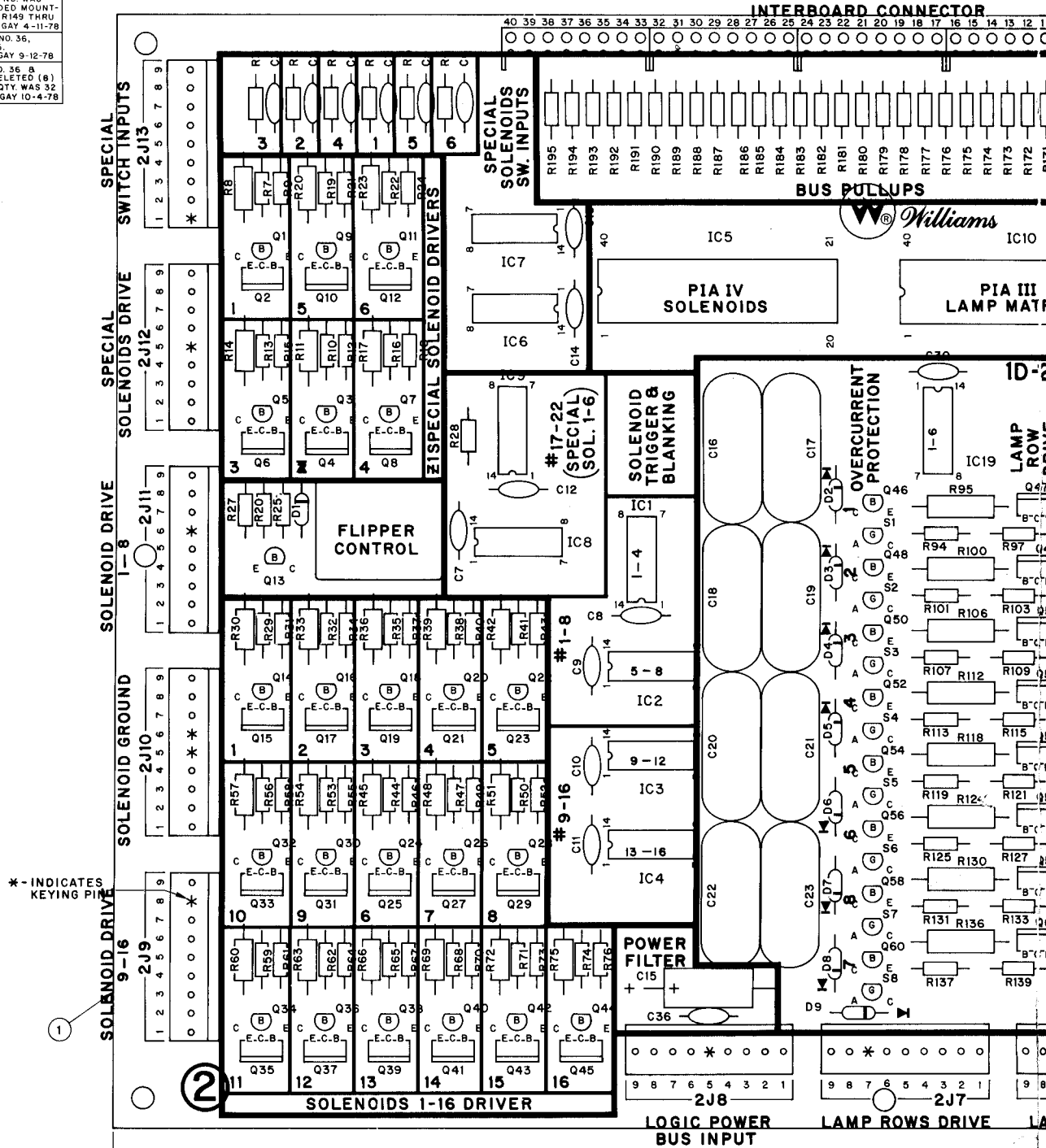
NOTES:

1. ALL RESISTORS, 1/4 WATT UNLESS NOTED OTHERWISE.
2. ALL CAPACITORS, MFD. UNLESS NOTED OTHERWISE.
3. WHEN USING WHITE, YELLOW OR GREEN LABEL PROGRAMS REMOVE -W10,W11,W14,W17,W19,W20,W22 CONNECT: W9,W12,W15,W16,W18,W21,W23 FOR FIREPOWER ONLY- ALSO REMOVE W3 & CONNECT W4.



CPU Board Logic Diagram

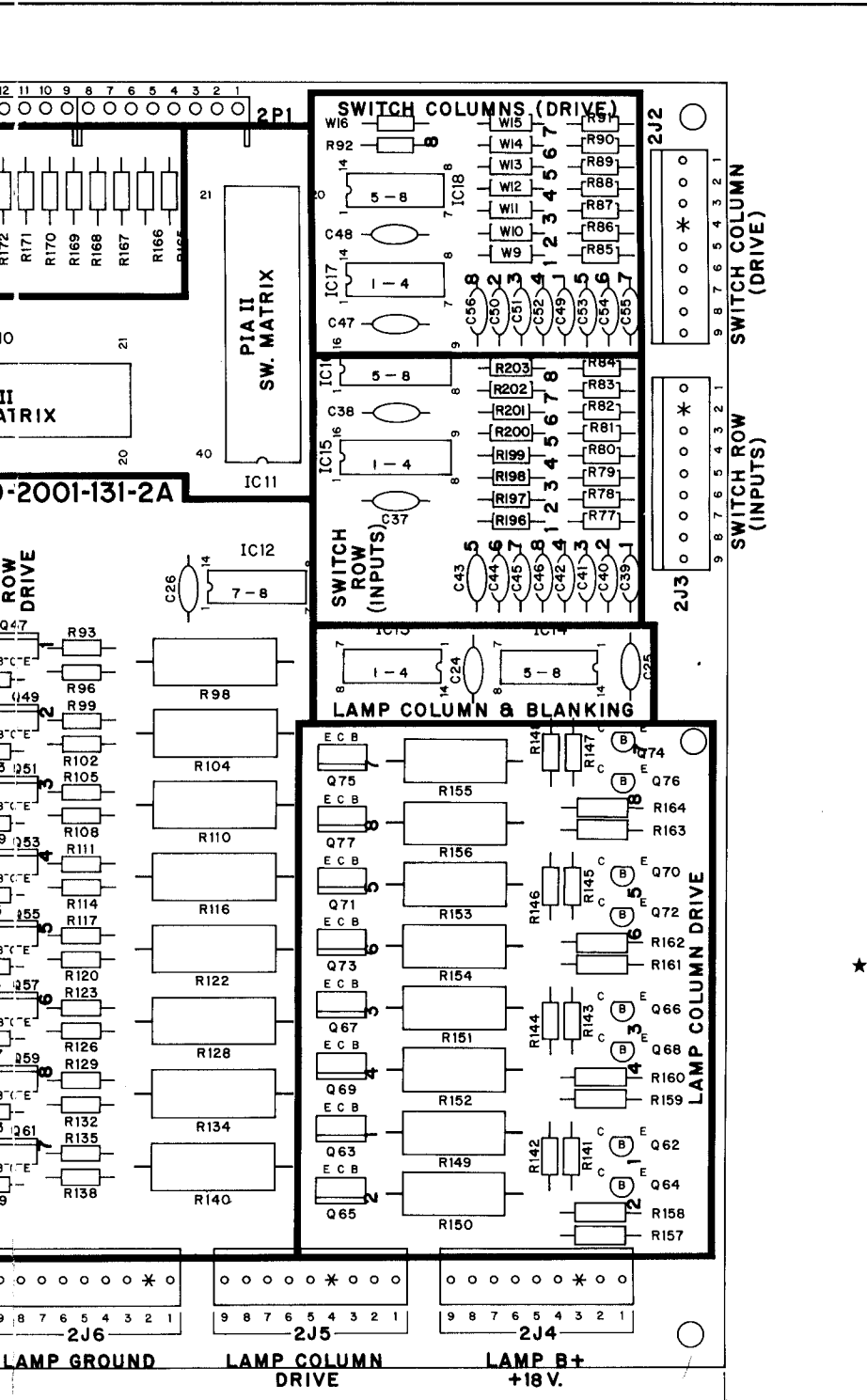
REVISION LETTER	REVISION
C	REVISED AND REDRAWN R. GAY 11-28-77
D	ITEM NO. 28, PT. NO. WAS 5A-8999 B ADDED MOUNTING NOTE FOR R149 THRU R156. R. GAY 4-11-78
E	DELETED ITEM NO. 36, PT. NO. 5A-8985. E.C.O. R. GAY 9-12-78
F	ADDED ITEM NO. 36 B ITEM NO. 22, DELETED (B) RESISTORS B QTY. WAS 32 E.C.O. 4624 R. GAY 10-4-78



* - INDICATES KEYING POINT

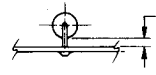
LOGIC POWER BUS INPUT LAMP ROWS DRIVE

REDUCE TO EXACTLY 13.000"



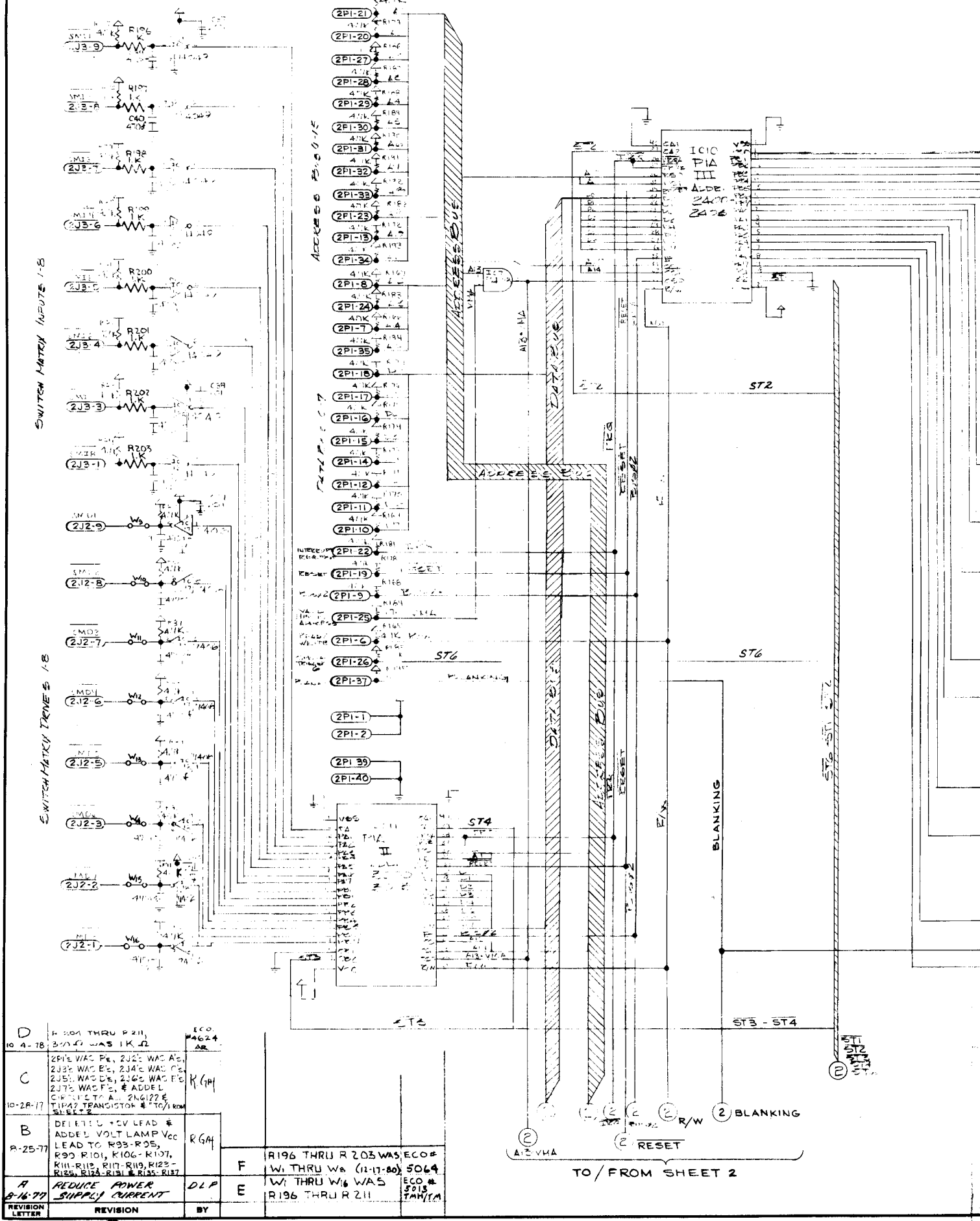
BILL OF MATERIAL				
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	1B-2001-131		BARE P.C. BOARD	1
2	5A-8948	IC8, IC9	N7402 QUADRUPLE 2 INPUT POSITIVE NOR GATE	2
3	5A-8974	IC12, IC17, IC18, IC19	N7406 HEX. INVERTER BUFFER DRIVERS W/ OPEN COLLECTOR HIGH VOLTAGE OUTPUTS	4
4	5A-8973	IC1 THRU IC4, IC6, IC7, IC13, IC14	N7408 QUADRUPLE 2 INPUT POSITIVE AND GATE	8
5	5A-8975	IC5, IC16	MC14049 INVERTING HEX. BUFFER	2
6	5A-8972	IC5, IC10, IC11	MC6820 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	TIPI22 DARLINGTON NPN POWER TRANSISTOR	22
10	5A-8978	Q63, Q65, Q67, Q69, Q71, Q73, Q75, Q77	TI142 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, C25, 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 C56	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	R96, R97, R102, R103, R108, R109, R114, R115, R121, R122, R126, R127, R132, R133, R138, R139, R196 THRU R203	RESISTOR, FC, 1K OHM 10% 1/4 W	24
23	5A-8992	R7, R10, R13, R16, R19, R22, R29, R32, R35, R39, R41, R44, R47, R50, R53, 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, R116, R124, R130, R136	RESISTOR, FC, 100 OHM 10% 3 W	8
30	5A-9085	R93, R99, R105, R111, R117, R123, R129, R135	RESISTOR, FC, 1.5 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, R134, 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	6
35	5A-9027	2J2 THRU 2J3	9 PIN HEADER	12
36	5A-8534	W9 THRU W16	RESISTOR, FC, 0 OHM, 1/4 W	8

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



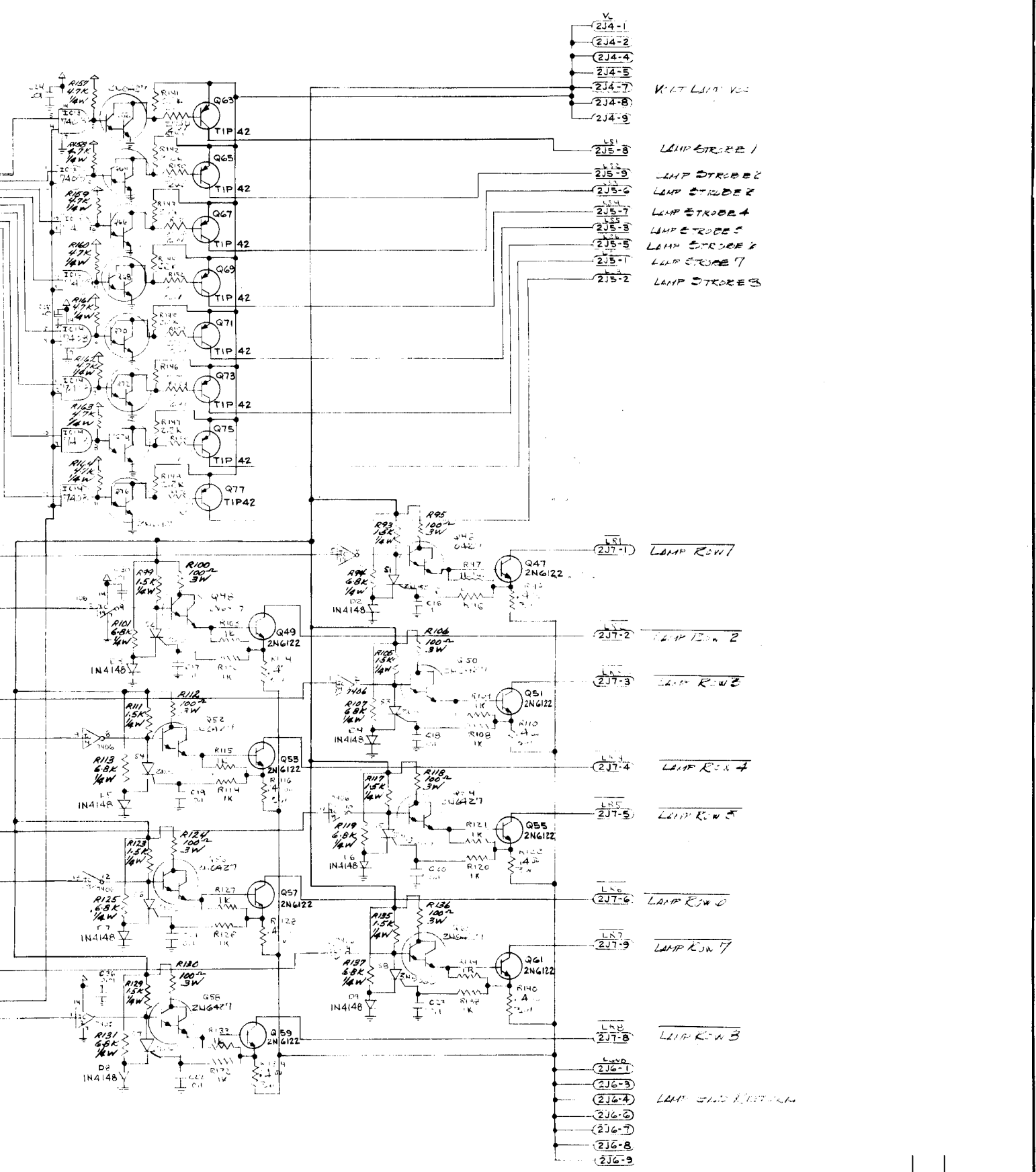
WILLIAMS ELECTRONICS, INC.
 SUBSIDIARY OF XCOR CORPORATION
 3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA, 7-2240

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



D	4-30-78	R 201 THRU R 211, 3-20-78 WAS 1K Ω	ECO #4624 AR
C	10-28-77	2PI'S WAG Pcs, 2J2'S WAG As, 2J3'S WAG Bs, 2J4'S WAG Cs, 2J5'S WAG Ds, 2J6'S WAG Es, 2J7'S WAG Fs, & ADDED C/P L'S TO ALL 2N6122 & 2N1613 TRANSISTORS * TO 1/2 WATT	RGM
B	8-25-77	DEFERED +CV LEAD & ADDED VOLT LAMP Vcc LEAD TO R98-R95, R99 R101, R106-R107, R118-R119, R121-R122, R135-R136-R137 & R135-R137	RGM
A	8-16-77	REDUCE POWER SUPPLY CURRENT	DLP

F	R196 THRU R 203 WAS ECO # W1 THRU W6 (11-17-80) 5064
E	R196 THRU R 211 WAS ECO # R196 THRU R 211 5015 1AH/TA



VOLT LAMP VOLT

2J4-1
2J4-2
2J4-4
2J4-5
2J4-7
2J4-8
2J4-9

LS1
2J5-8 LAMP STROBE 1
2J5-9 LAMP STROBE 2
2J5-6 LAMP STROBE 3
2J5-7 LAMP STROBE 4
2J5-3 LAMP STROBE 5
2J5-5 LAMP STROBE 6
2J5-1 LAMP STROBE 7
2J5-2 LAMP STROBE 8

LS1
2J7-1 LAMP ROW 1

2J7-2 LAMP ROW 2

LS2
2J7-3 LAMP ROW 3

LS3
2J7-4 LAMP ROW 4

LS5
2J7-5 LAMP ROW 5

LS6
2J7-6 LAMP ROW 6

LS7
2J7-7 LAMP ROW 7

LS8
2J7-8 LAMP ROW 8

LS9
2J6-1
2J6-3
2J6-4 LAMP STROBE 9
2J6-6
2J6-7
2J6-8
2J6-9

TOLERANCES		WILLIAMS ELECTRONIC MFG. CORP.	
UNLESS OTHERWISE SPECIFIED		SUBSIDIARY OF THE HUBBARD CORP.	
FRACTIONS	± 1/64	3401 N. CALIFORNIA	CHICAGO 18, ILL.
DECIMALS	± .005	CORNELIA 7-2240	
HOLES	+ .002	NAME SCHEMATIC, DRIVER BOARD	
HOLES	- .000	MATERIAL	
ANGULAR	± 1/2°	HEAT TREATMENT	
FINISH		FINISH	
APP'D	W.E.	PAT	7777
APP'D		SCALE	
		16-7997	

Driver Board Logic Diagram
(Sheet 1 of 2) 11/12

SOLENOID 1 DRIVE

SOLENOID 2 DRIVE

SOLENOID 3 DRIVE

SOLENOID 4 DRIVE

SOLENOID 5 DRIVE

SOLENOID 6 DRIVE

SOLENOID 7 DRIVE

SOLENOID 8 DRIVE

SOLENOID 9 DRIVE

SOLENOID 10 DRIVE

SOLENOID 11 DRIVE

SOLENOID 12 DRIVE

SOLENOID 13 DRIVE

SOLENOID 14 DRIVE

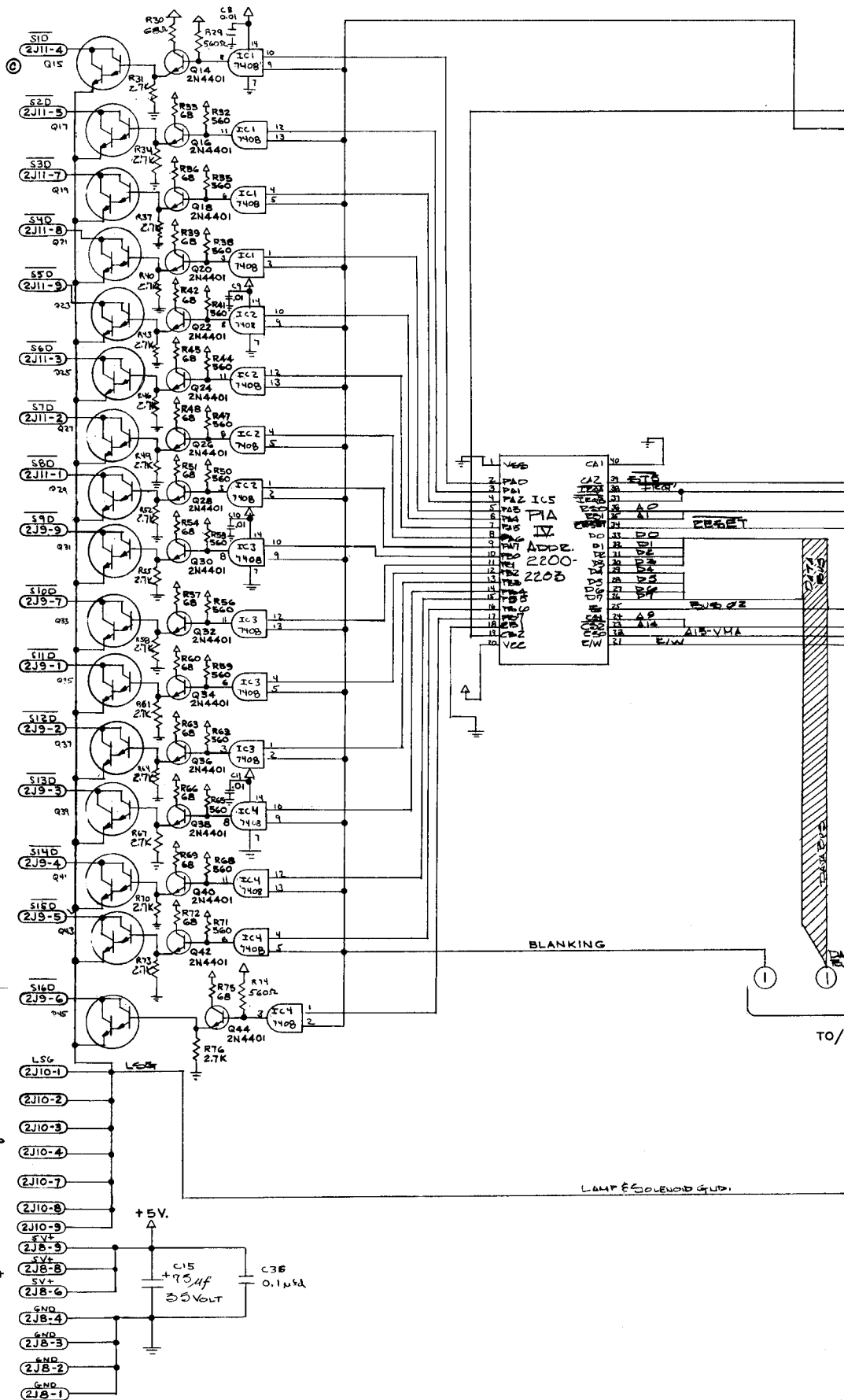
SOLENOID 15 DRIVE

SOLENOID 16 DRIVE

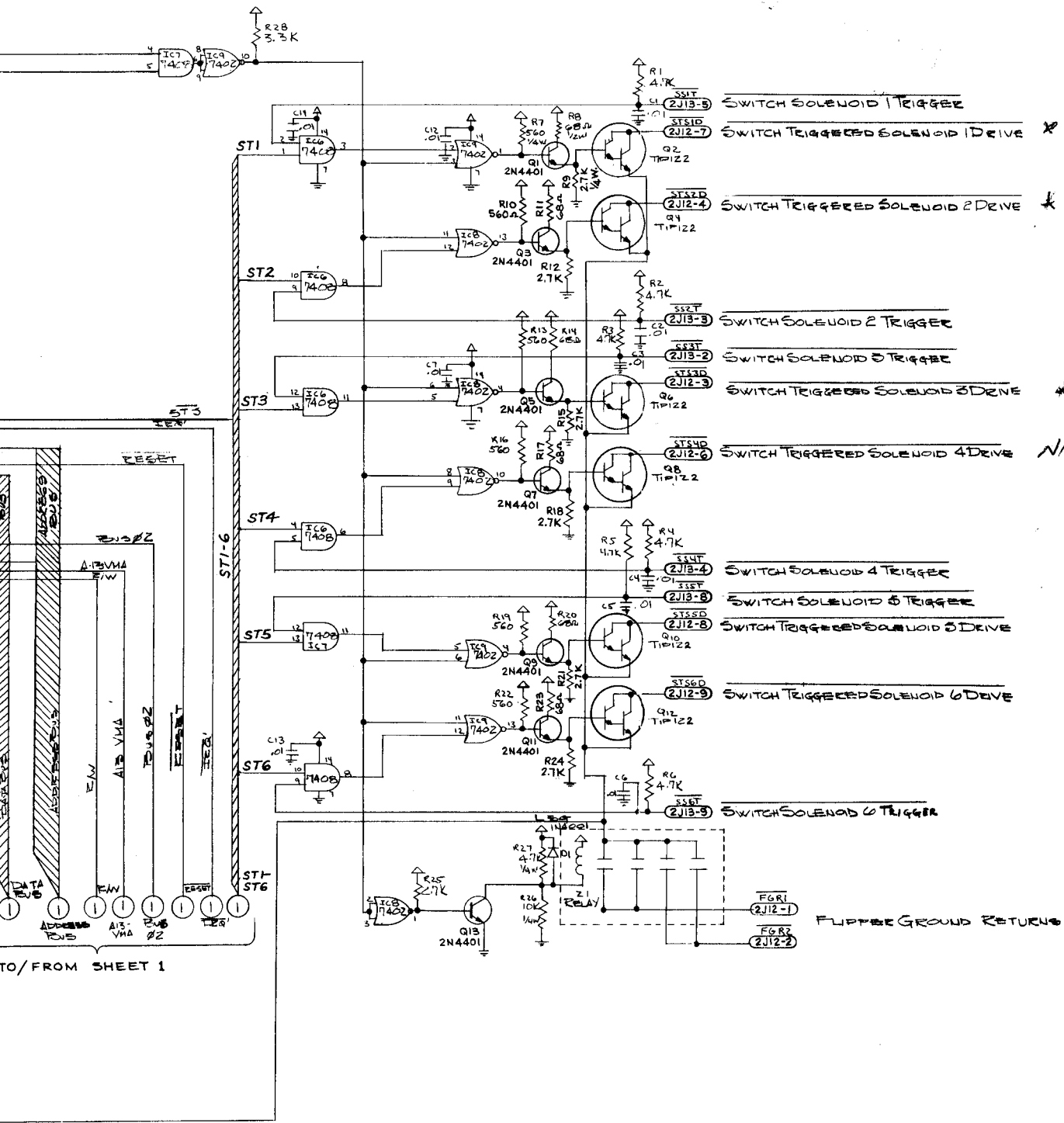
LAMP & SOLENOID GROUND

BLANKING

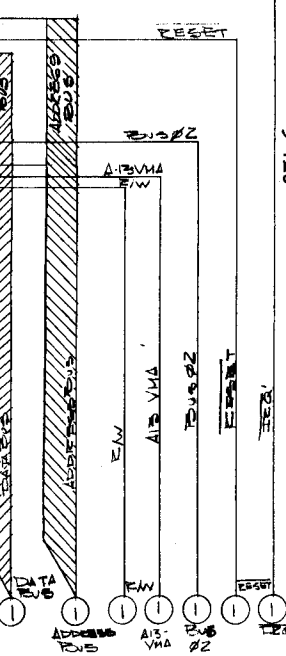
LAMP & SOLENOID GND.



C	CHANGE TIP J20 TO VENDOR SELECTED DARLINGTON	E.C.O. 4889
B	2J8'S WAS G'S, 2J9'S WAS H'S, 2J10'S WAS J'S, 2J11 WAS K'S, 2J12 WAS L'S, 2J13'S WAS M'S & ADDED 170/FROM SHEET 1 & CIRCLES TO ALL 2N4401 TRANSISTORS	P. Gaff 10-28-77
A	REVISION "A"	
REVISION LETTER	REVISION	BY



TO/FROM SHEET 1

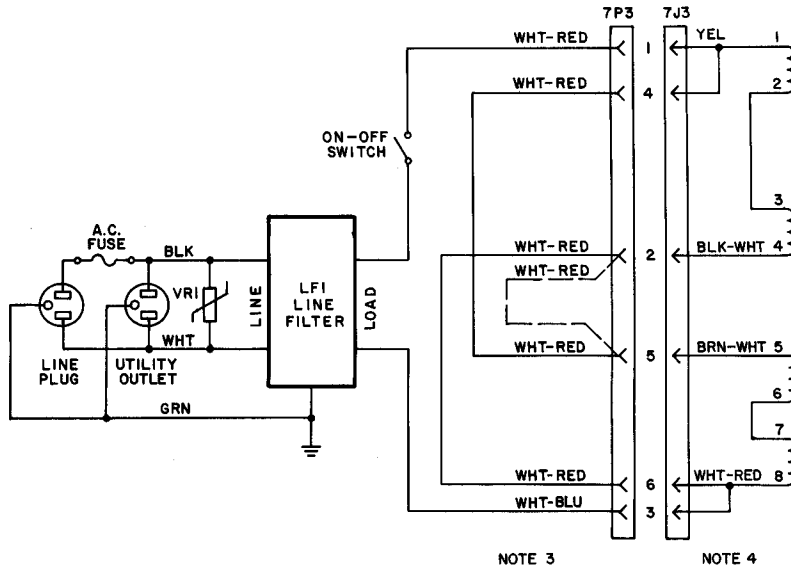


- SWITCH SOLENOID 1 TRIGGER
- SWITCH TRIGGERED SOLENOID 1 DRIVE *
- SWITCH TRIGGERED SOLENOID 2 DRIVE *
- SWITCH SOLENOID 2 TRIGGER
- SWITCH SOLENOID 3 TRIGGER
- SWITCH TRIGGERED SOLENOID 3 DRIVE *
- SWITCH TRIGGERED SOLENOID 4 DRIVE N/A.
- SWITCH SOLENOID 4 TRIGGER
- SWITCH SOLENOID 5 TRIGGER
- SWITCH TRIGGERED SOLENOID 5 DRIVE
- SWITCH TRIGGERED SOLENOID 6 DRIVE
- SWITCH SOLENOID 6 TRIGGER

FLIP-FLOP GROUND RETURNS

TOLERANCES UNLESS OTHERWISE SPECIFIED		WILLIAMS ELECTRONIC MFG. CORP. SUBSIDIARY OF THE REGINA CORP.		
FRACTIONS	± 1/64	3401 N. CALIFORNIA	CHICAGO 18, ILL.	CORNELIA 7-2840
DECIMALS	± .008	NAME SCHEMATIC, DRIVER BOARD		
HOLER	- .008	MATERIAL		
ANGULAR	± 1/8°	HEAT TREATMENT		
		FINISH		
DATE	1-3-77	APP'D.	SCALE	16D-7997

SHEET 2 OF 2



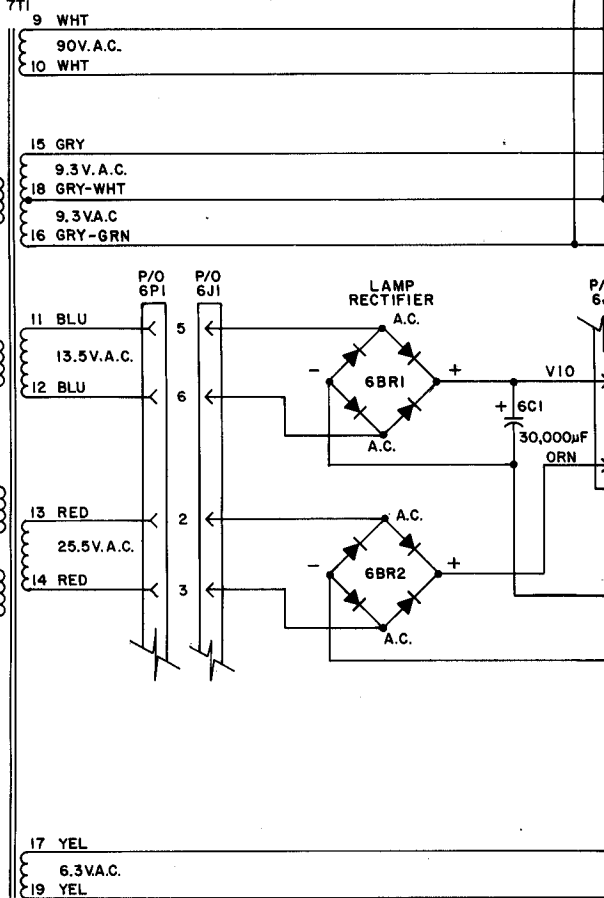
NOTE 3

NOTE 4

NOTES:

1. FOR 105 OR 117V.A.C., 7.5A FUSE & 130V. VARISTOR #5A-9044 ARE USED.
2. FOR 210 OR 235V.A.C., 4A FUSE & 275V. VARISTOR #5A-9063 ARE USED.
3. JUMPER WIRES ON 6P1 SHOWN WITH SOLID LINES ARE CONNECTED FOR 117V.A.C. OPERATION. ONLY THE ONE SHOWN WITH A DASHED LINE IS CONNECTED FOR 220 V.A.C. OPERATION.
4. FOR LOW-LINE CONDITIONS (105 OR 210V.A.C.) MOVE BLK-WHT WIRE FROM 6T1-4 TO 6T1-3 & MOVE 2 WHT-RED WIRES FROM 6T1-8 TO 6T1-7.

POWER WIRING

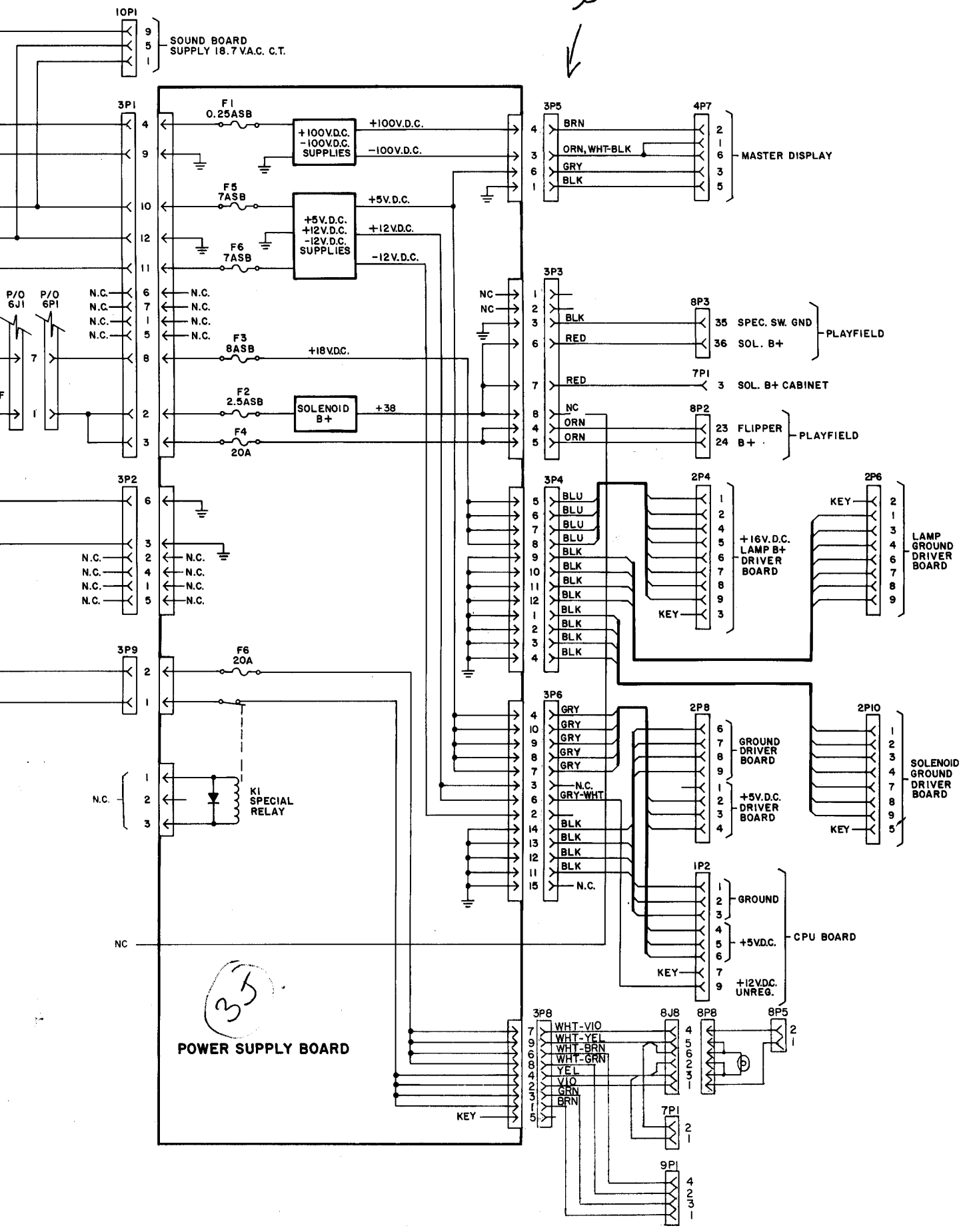


17 YEL

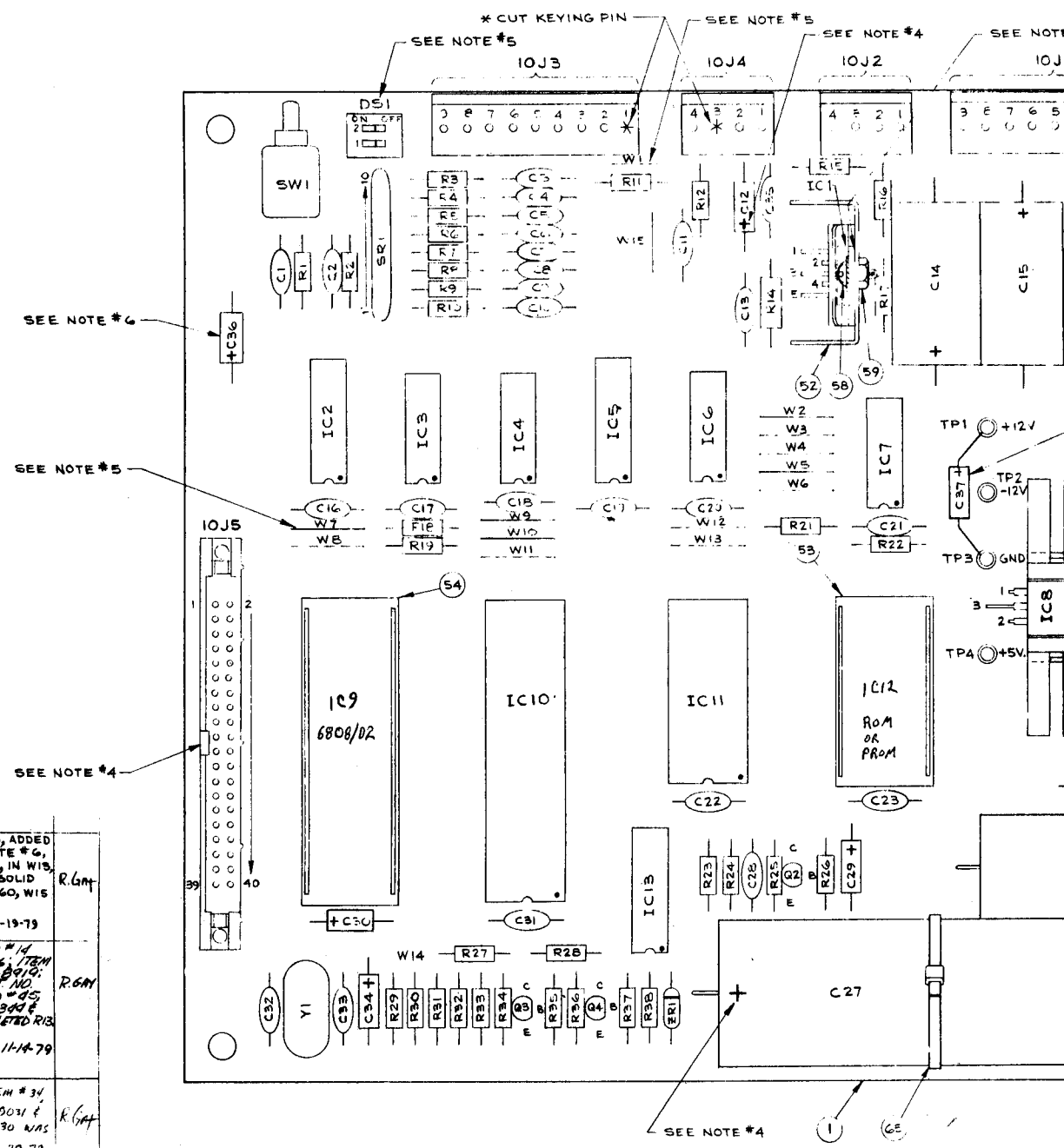
6.3V.A.C.

19 YEL

35
↓



ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION
58			6-32 x 3/8" BINDER
59			6-32 HEX NUT
60		W1, W2, W5, W7, W9, W10, W15	WIRE JUMPER 21
61	5A-9248	TP1 THRU TPA	TERMINAL # 15
62	5A-9363	R11	RESISTOR, FC, 5 1/2 1/4 WATT
64	5A-9562	SRI	RESISTOR, 4.7 10 PIN SIP
65	3A-7520-1		TIE WRAP

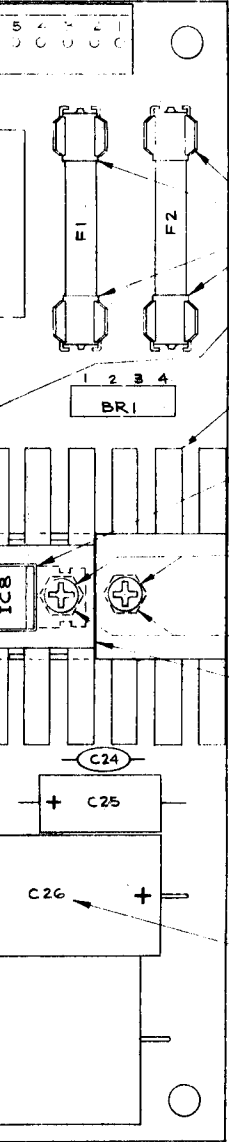


E	REVISED NOTES, ADDED ITEM #45 & NOTE #6, RELOCATED W15, IN W15, DASH LINE WAS SOLID LINE & ITEM #60, W15 WAS W1B E.C.O.	11-19-79	R.G.M.
D	DELETED ITEM #14, PT. NO. 26-906, ITEM #16, PT. NO. 53-8910, ITEM #25, PT. NO. 5A-934, ITEM #45, PT. NO. 5A-9340 & IN ITEM #21, DELETED R13, PTY. WAS B E.C.O. 4764	11-14-79	R.G.M.
C	ADDED C36, ITEM #34, PT. NO. WAS 5A-5031 & R17 WAS 1, & C30 WAS OF MFD. E.C.O. 4760	10-29-79	R.G.M.
B	REMOVED ITEM #62, ADDED W1 & R12, ITEM #14, PT. NO. WAS 5A-934, ITEM #62, ADDED W1, ITEM #62, ADDED W1, ITEM #62, ADDED W1, ITEM #62, ADDED W1	10-2-79	R.G.M.
A			R.G.M.

REVISION LETTERS REVISION BY
 SHEET NO. 1268 A8E8PROOF

DESCRIPTION	REQ'D. NO.	ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
SCREW HEAD SCREW	3	48	5A-6314	F1, F2	4 AMP SLOW BLOW FUSE	2
...	3	49	5A-9178		FUSEHOLDER	4
...	7	50	5A-9172		HEAT SINK THERMALLOY #6072B	1
...	1	51	5A-9173		HEAT SINK THERMALLOY #6071B	1
...	1	52	5A-9199		HEAT SINK THERMALLOY #6030	1
...	1	53	5A-9004		24 PIN SOCKET	1
...	1	54	5A-8985		40 PIN SOCKET	1
...	1	55	5A-9027	10J1, 10J3	9 PIN MALE CONNECTOR	2
...	1	56	5A-9028	10J2, 10J4	4 PIN MALE CONNECTOR	2
...	1	57	5A-9349	10J5	40 PIN RIBBON HEADER	1

BILL OF MATERIAL				
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	1C-2001-146-3		BARE P.C. BOARD	1
2	5A-9156	IC1	TDA2002 V AUDIO AMPLIFIER	1
3	5A-9012	IC2	7442 BCD-DEC DECODER	1
4	5A-9073	IC3	7400 QUAD 2 INPUT NAND	1
5	5A-8973	IC4	7408 QUAD 2 INP. AND GATE	1
6	5A-9153	IC5	4050 BUFFER	1
7	5A-9154	IC6	4068 8 INPUT NAND GATE	1
8	5A-8971	IC7	14069 HEX INVERTER	1
9	5A-9157	IC8	7805 5 VOLT REG. W/T0220 CASE	1
10	5A-8972	IC10	6821 P.I.A.	1
11	5A-9003	IC11	6810 RAM	1
12	5A-9152	IC13	1408 D/A CONVERTER	1
13	5C-8938	Q2, Q3, Q4	2N4401 NPN TRANSISTOR	3
14				
15	5A-9018	ZR1	1N5996 6.8V. ZENER DIODE	1
16				
17	5A-9158 OR 5A-9357	BR1	MDA 200/3N253 BRIDGE RECTIFIER	1
18	5A-9020	Y1	3.58 MHZ CRYSTAL	1
19	5B-8991	R1, R18, R19, R21, P22, R27, R31, R31, R32	RESISTOR, FC, 4.7K OHM 5% 1/4 WATT	9
20	5B-9036	R2 THRU R10	RESISTOR, FC, 100 OHM 10% 1/4 WATT	9
21	5A-8984	R12, R15, R28, R36, R38	RESISTOR, FC, 1K OHM 10% 1/4 WATT	5
22	5A-9181	R14	RESISTOR, FC, 1 OHM 10% 1/2 WATT	1
23	5A-9161	R16	RESISTOR, FC, 2.2 OHM 10% 1/4 WATT	1
24	5A-9361	R17	RESISTOR, FC, 220 OHM 10% 1/2 WATT	1
25				
26	5B-8985	R23, R24, R26	RESISTOR, FC, 3.3K OHM 10% 1/4 WATT	3
27	5A-9179	R25	RESISTOR, FC, 3.3M OHM 10% 1/4 WATT	1
28	5A-9359	R29	RESISTOR, FC, 47K OHM 5% 1/4 WATT	1
29	5B-8817	R33, R35, R37	RESISTOR, FC, 10K OHM 10% 1/4 WATT	3
30	5B-9039	R34	RESISTOR, FC, 10 OHM 10% 1/4 WATT	1
31	5A-8980	C1, C16 THRU C25, C31	CAPACITOR, CERAMIC, .01 MFD. 50 V. ±20%	11
32	5A-9065	C2 THRU C10	CAPACITOR, CERAMIC, 470 PFD. 50 V. ±20%	9
33	5A-9345	C11	CAPACITOR, CERAMIC, .001 MFD. 20% 100 V.	1
34	5A-9345	C12, C30, C36	CAPACITOR, ELECTROLYTIC 1 MFD. 6.3 V. -10/+50%	3
35	5A-8996	C13, C24, C35	CAPACITOR, CERAMIC, .1 MFD. 50 V. ±20%	3
36	5A-9165 OR 5A-9165-1	C14	CAPACITOR, ELECTROLYTIC, 800 MFD. 16 V. OR 1,000 MFD. 15 V. ±20%	1
37	5A-9164 OR 5A-9164-1	C15	CAPACITOR, ELECTROLYTIC, 500 MFD. 15 V. OR 470 MFD. 25 V. ±20%	1
38	5A-8986	C25	CAPACITOR, ELECTROLYTIC, 100 MFD. 10 V. ±20%	1
39	5A-8893	C26	CAPACITOR, ELECTROLYTIC, 1,000 MFD. 25 V. ±20%	1
40	5A-9046	C27	CAPACITOR, ELECTROLYTIC, 12,000 MFD. 16 V. ±20%	1
41	5A-9180	C28	CAPACITOR, CERAMIC, 47 PFD. 1K V. ±20%	1
42	5A-9343	C29	CAPACITOR, ELECTROLYTIC, 10 MFD. 25 V. LOW LEAK	1
43	5A-9169	C32, C33	CAPACITOR, CERAMIC DISC, 27 PFD. 1K V. ±10%	2
44	5A-9163	C34	CAPACITOR, TANTALUM, 2.2 MFD. 15 V. ±20%	1
45	5A-9031	C37	CAPACITOR, TANTALUM, 1 MFD. 25 V. ±20%	1
46	5A-9024	SW1	MOMENTARY SWITCH SPDT	1
47	5A-9330	DS1	2 STD. DIP SWITCH	1



NOTES:

- USE THERMAL COMPOUND BETWEEN ICs AND HEAT SINK.
- CAUTION: AVOID STATIC DISCHARGE DAMAGE TO MOS LOGIC.
- SYMBOLS SHOWN ON COMPONENTS ARE FOR REFERENCE ONLY. DO NOT SCREEN OR STAMP.
- OBSERVE INDEX MARK OF ALL INTEGRATED CIRCUITS, DIODES, DI, D2, AND ZR1.
- CAPACITORS C12, C14, C15, C25, C27, C29, C27.
- CONNECTORS 10J1, 10J2, 10J3, 10J4, 10J5.
- POSITION OF TRANSISTORS Q1, Q2, Q3, Q4.
- DS1 - 1 SELECTS SOUNDS/NOTES
2 SELECTS SPEECH/NO SPEECH (W9/W1)
W1 - SPEECH MODULE STATUS
IN - SPEECH MODULE NOT ATTACHED
OUT - SPEECH MODULE ATTACHED
W14 - MPU INTERNAL RAM ENABLE
W7 & W8 - MEMORY MAP CONTROL
W12 & W13 - PB7 STATUS CONTROL (W13 NEVER USED)
W4 & W9 - PB5 STATUS CONTROL
- SOLDERED ON TOP OF BOARD
INSTALL THESE JUMPERS FOR FOLLOWING GAMES:
W15, W8, W12, W4, W1, W3, W6, W11 FOR:
WORLD CUP
DISCO FEVER
CONTACT
POKEMO
PHOENIX
ARISTOCRAT SHUFFLE
POMPHLI SHUFFLE
KING TUT SHUFFLE
TAURUS SHUFFLE
W15, W8, W12, W4, W1, W2, W5, W10, FOR:
FLASH
STELLAR WARS
TRI ZONE
TIME WARP
W7, W15, W9, W1, (SEE NOTE #5) W2, W5, W10 FOR:
GORGAR
SOUND ROM 2 - JT-4960
- IC12 SELECTION STRAPPING:

(2K x 8)	(1K x 4)	(512 x 8)
W2	W3	W3
W1 IN	W2 IN	W6 IN
W1	W2	W11

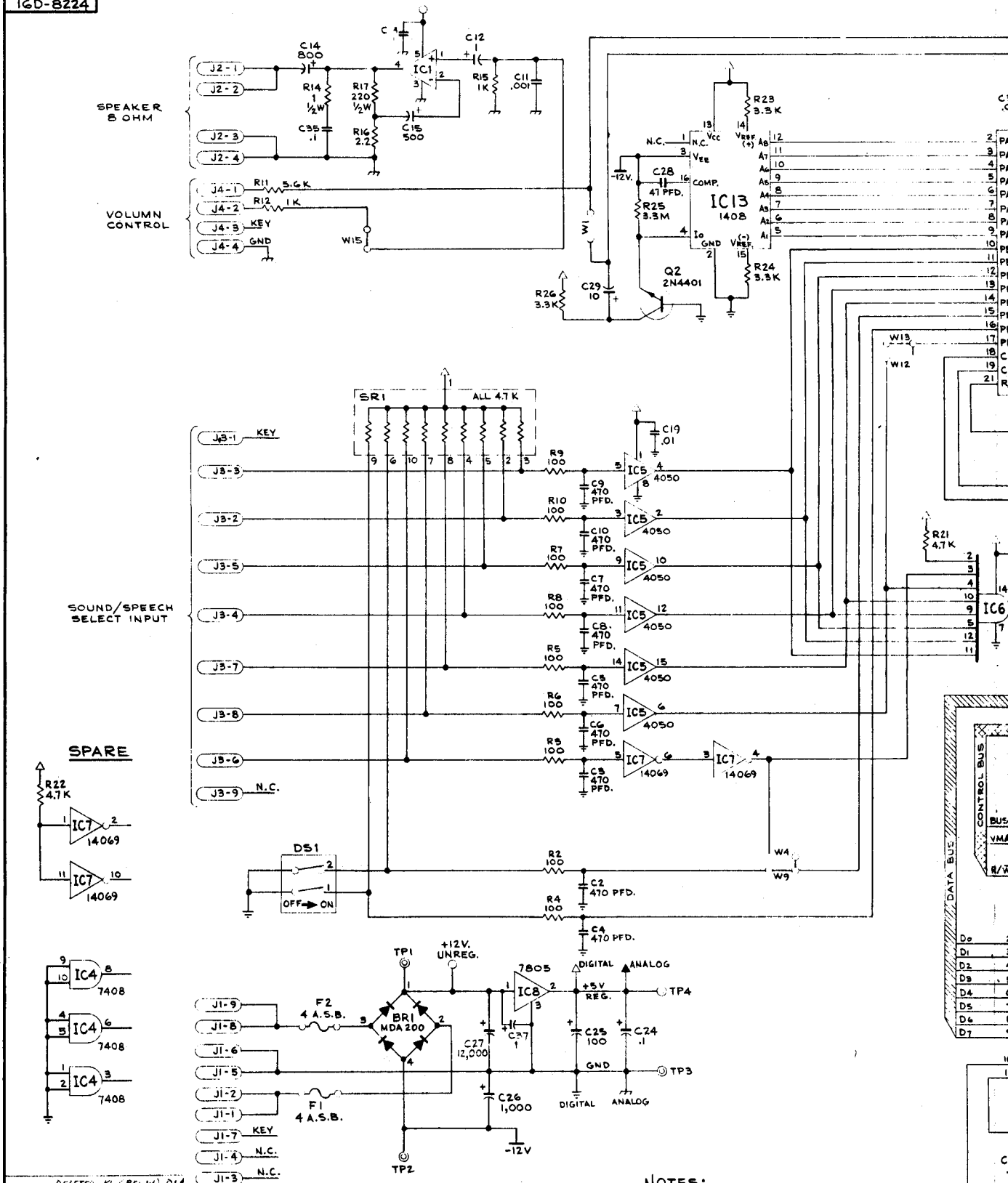
SEE NOTE #3

SEE NOTE #1

SEE NOTE #6

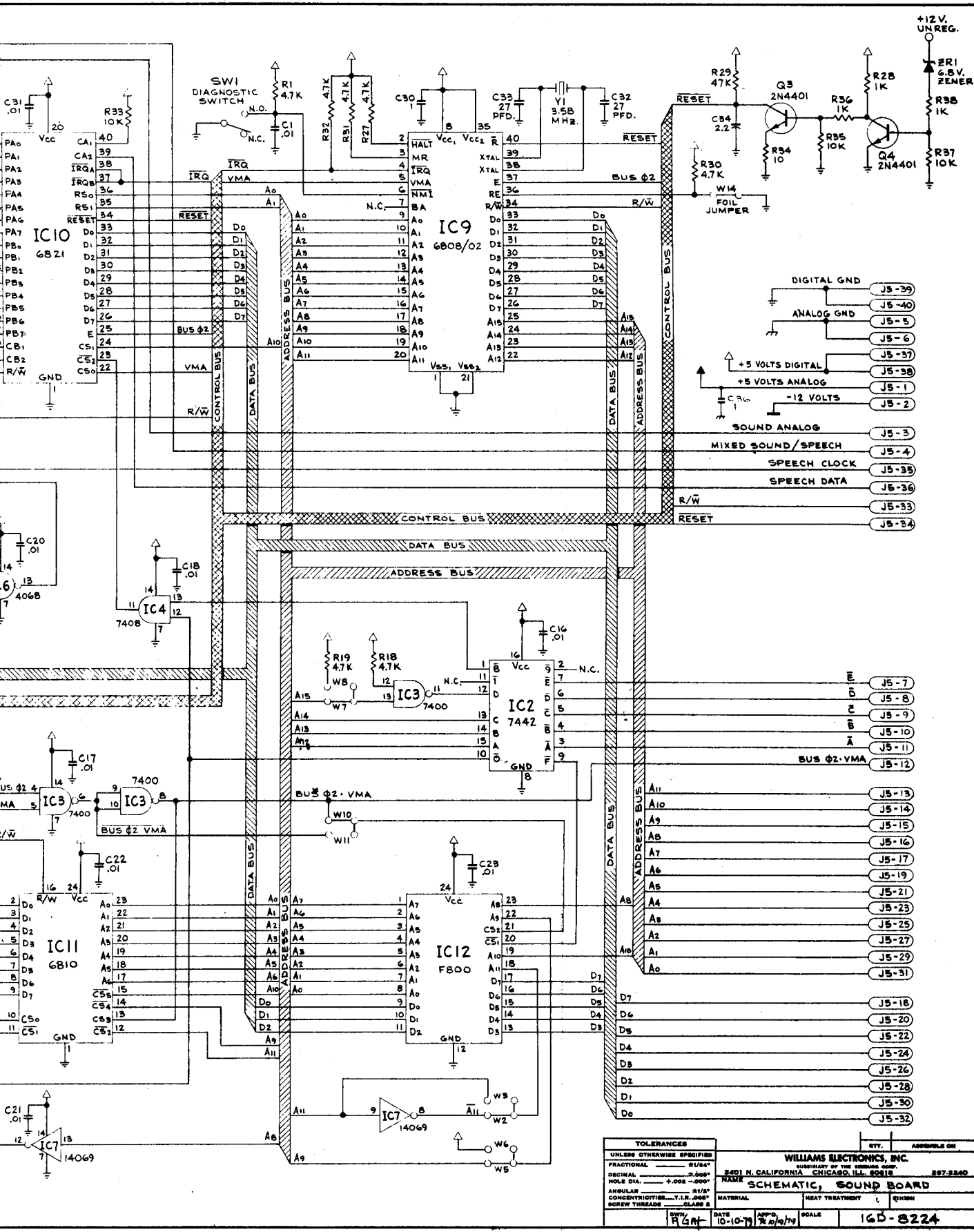
TOLERANCES UNLESS OTHERWISE SPECIFIED		QTY.	ASSEMBLE ON
FRACTIONAL	21/64"		
DECIMAL	±.005"		
HOLE DIA.	±.008 - .001"		
ANGULAR	±1/4°		
CONCENTRICITY	±.008"		
SCREW THREADS	CLASS 2		
WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF THE REGGENT GROUP 3801 N. CALIFORNIA CHICAGO, ILL. 60618 367-2240		NAME	
MATERIAL		HEAT TREATMENT	
FINISH		FINISH	
DATE	APP'D.	SCALE	DRAWING NO.
9/23/79	[Signature]	2:1	D-822B

IGD-8224



C	DELETED R1 (RES.), D18, D2 (IN 1148), 51 (COMM), R19 (100 & R20 (12K), 10000, W15, R.G. 11-17-79			
E	ADDED R26, C27 WAS 51 MFD. 11-23-79			
A	10/23/79 C12, C14, C15, POLARITY REVERSE			
REVISION LETTERS	REVISION	BY	REVISION LETTERS	REVISION
			D	ADDED C37 & IN W15, DASH LINE WAS SOLID LINE 11-17-79 R.G.M

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

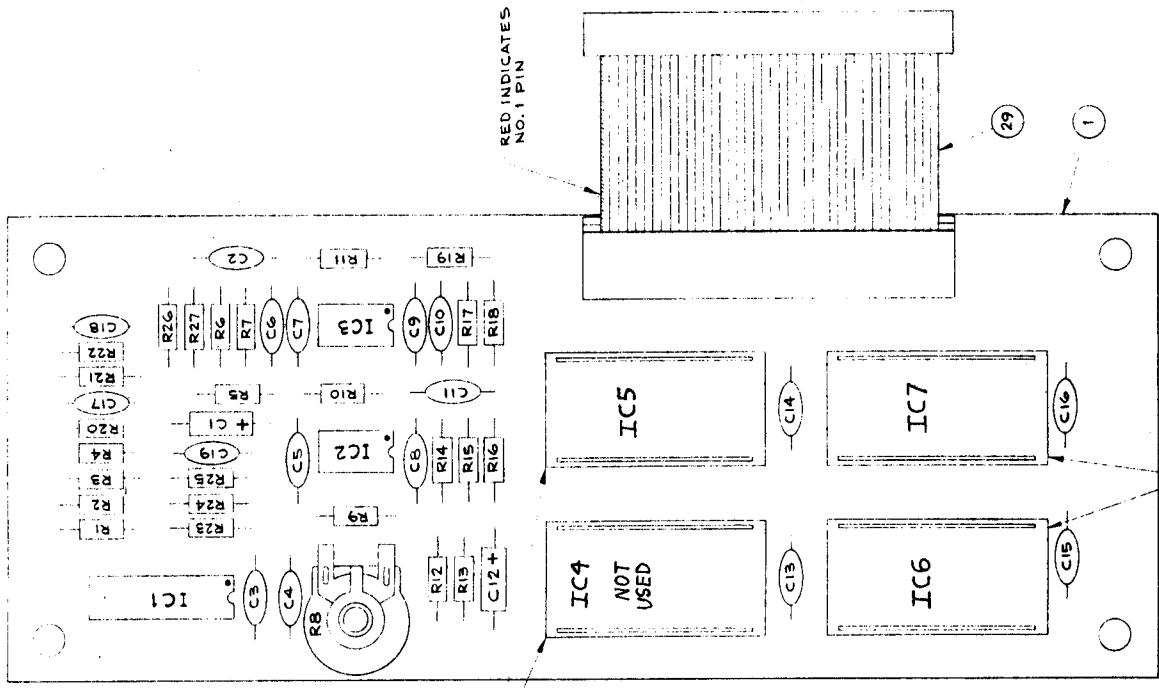


TOLERANCES		QTY.	APPROX. CH.
UNLESS OTHERWISE SPECIFIED			
FRACTIONAL	±0.004"		
DECIMAL	±0.008"		
HOLE DIA.	+0.008 -0.000"		
ANGULAR	±0.1°		
CONCENTRICITY	±0.004"		
SCREW THREADS	CLASS 2		
WILLIAMS ELECTRONICS, INC. DIVISION OF THE BIRDSONG GROUP 8401 N. CALIFORNIA CHICAGO, ILL. 60618 807-2840		NAME SCHEMATIC, SOUND BOARD	
MATERIAL	HEAT TREATMENT	Q/MSM	
DATE	SCALE	165-8224	

Sound Board Logic Diagram 17

BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQD. NO.
1	IC-2001-148-2		BARE P.C. BOARD	1
2	5A-9334	IC1	3417 CONTINUOUSLY VARIABLE SLOPE DELTA MODULATOR	1
3	5A-9321	IC2, IC3	1458 DUAL OP-AMP	2
4	5A-8992	R1, R4, R22, R23	RESISTOR, FC, 560 OHM 10% 1/4 WATT	4
5	5A-8776	R2	RESISTOR, FC, 1/4 WATT 68K OHM 5%	1
6	5A-8983	R3	RESISTOR, FC, 3.3K OHM 10% 1/4 WATT	1
7	5B-8817	R5, R16	RESISTOR, FC, 10K OHM 10% 1/4 WATT	2
8	5A-8773	R6	RESISTOR, FC, 1/4 WATT 18K OHM 5%	1
9	5A-9353	R7	RESISTOR, FC, 1/4 WATT 4.2K OHM 5%	1
10	5A-9324	R9, R10, R11, R15, R18, R19	RESISTOR, FC, 27K OHM 10% 1/4 WATT	6
11	5B-8997	R12, R13	RESISTOR, FC, 1/4 WATT 2.7K OHM 10%	2
12	5A-8772	R14, R17	RESISTOR, FC, 1/4 WATT 15K OHM 5%	2
13	5A-9314	R20	RESISTOR, FC, 1.2K OHM 10% 1/4 WATT	1
14	5A-9331	R21	RESISTOR, FC, 1/4 WATT 19K OHM 10%	1
15	5A-9185	R8	POTENTIOMETER, 5K OHM	1
16	5A-9218	R24	RESISTOR, FC, 2.2M OHM 10% 1/4 WATT	1
17	5A-8984	R25, R27	RESISTOR, FC, 1K OHM 10% 1/4 WATT	1
18	5A-9356	R26	RESISTOR, FC, 820 OHM 5% 1/4 WATT	1
19	5A-9031	C1	CAPACITOR, TANTALUM, 1 MFD-20% 25 VOLT	1
20	5A-8980	C2, C3, C5, C7, C8, C9, C13 THRU C16	CAPACITOR, CERAMIC, .01 MFD. +80% -20% 50 VOLT	10
21	5A-9030	C4	CAPACITOR, CERAMIC, .047 MFD. 20% 50 VOLT	1
22	5A-9347	C6	CAPACITOR, CERAMIC, 1800 PFD. 5% 50 VOLT	1
23	5A-9346	C10	CAPACITOR, CERAMIC, 1200 PFD. 5% 50 VOLT	1
24	5A-9348	C11	CAPACITOR, CERAMIC, 4700 PFD. 5% 50 VOLT	1
25	5A-9343	C12	CAPACITOR, ELECTROLYTIC, 10 MFD. 20% 25 VOLT LOW LEAK	1
26	5A-9263	C17	CAPACITOR, .33 MFD. 20% 200 VOLT	1
27	5A-8996	C18, C19	CAPACITOR, CERAMIC, .1 MFD. 20% 25 VOLT	2
28	5A-9004	J1	24 PIN SOCKET	4
29	5A-9354	J1	RIBBON CABLE ASSEM	1



TOLERANCES

UNLESS OTHERWISE SPECIFIED

RESISTORS: ±1% (A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, T, U, V, W, X, Y, Z)

CAPACITORS: ±5% (A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, T, U, V, W, X, Y, Z)

SCREW THREADS: CLASS 2

FINISH

DATE: 9-28-74

REV: 21

ASSEMBLY ON

WILLIAMS ELECTRONICS, INC.

SUBSIDIARY OF THE REMBAK COMPANY OF DELAWARE

8811 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELLIA 7-3289

NAME: SPEECH MODULE ASSEMBLY

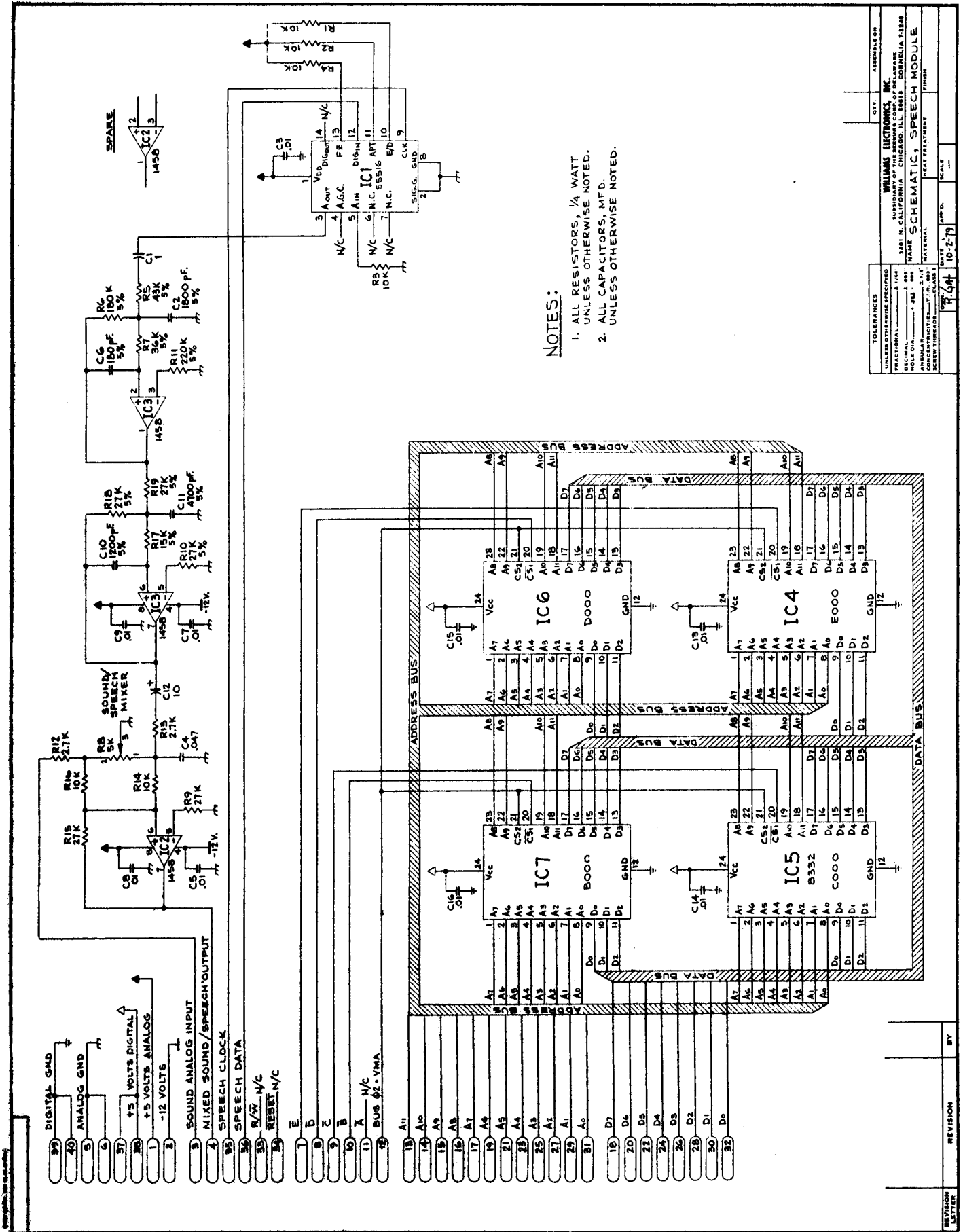
MATERIAL

REVISION LETTER

REVISION

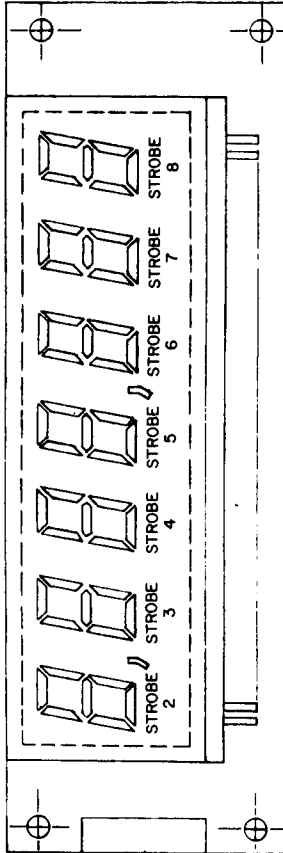
BY

C-8225



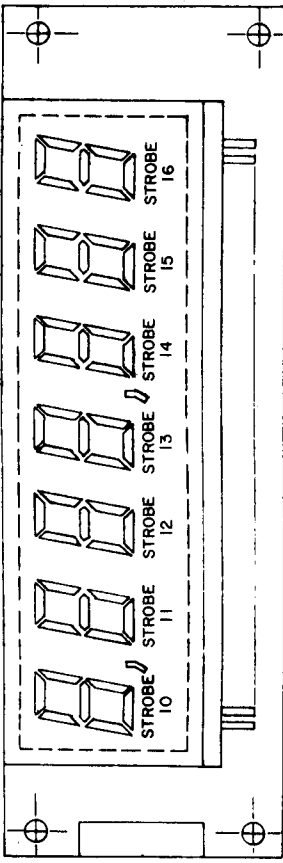
TOLERANCES UNLESS OTHERWISE SPECIFIED	
FRACTIONAL	± 1%
DECIMAL	± 0.005
HOLE DIA.	± 0.001
CONCENTRICITY	± 0.001
SCREW TIGHTENING CLASS	10-2-19
APPROX.	SCALE
CITY	ASSEMBLED ON
WILLIAMS ELECTRONICS, INC.	
SUBSIDIARY OF THE BURNING COMPANY OF DELAWARE	
300 N. CALIFORNIA CHICAGO, ILL. 60610 CORNELIA 7-2368	
NAME SCHEMATIC, SPEECH MODULE	
MATERIAL HEAT TREATMENT FINISH	

PLAYERS #1 & #3



SJ1
SJ3

PLAYERS #2 & #4



SJ2
SJ4

**4J1/5J1 (PLAYER 1)
4J3/5J3 (PLAYER 3)**

- 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)
4J4/5J4 (PLAYER 4)**

- 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)

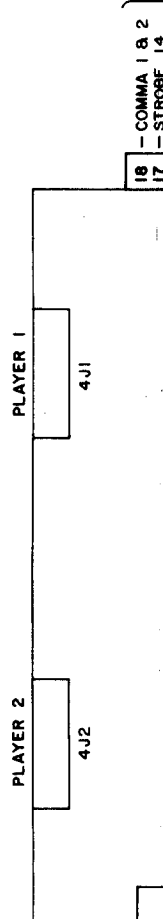
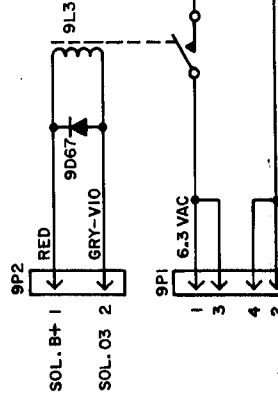
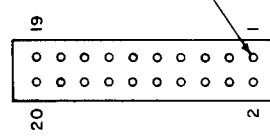
- 1 f' Segment (Credit)
- 2 -100V Keep Alive
- 3 e' Segment
- 4 g' Segment
- 5 c' Segment
- 6 d' Segment
- 7 b' Segment
- 8 10's
- 9 Units
- 10 a' Segment
- 11 e Segment
- 12 f Segment
- 13 10's
- 14 d Segment
- 15 +100V Keep Alive
- 16 c Segment
- 17 g Segment
- 18 b Segment
- 19 Units
- 20 a Segment

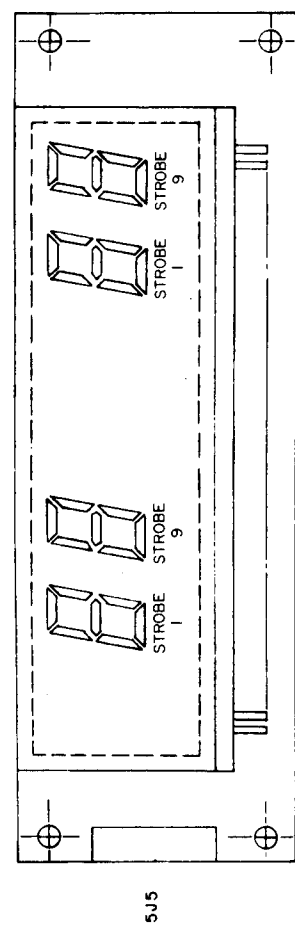
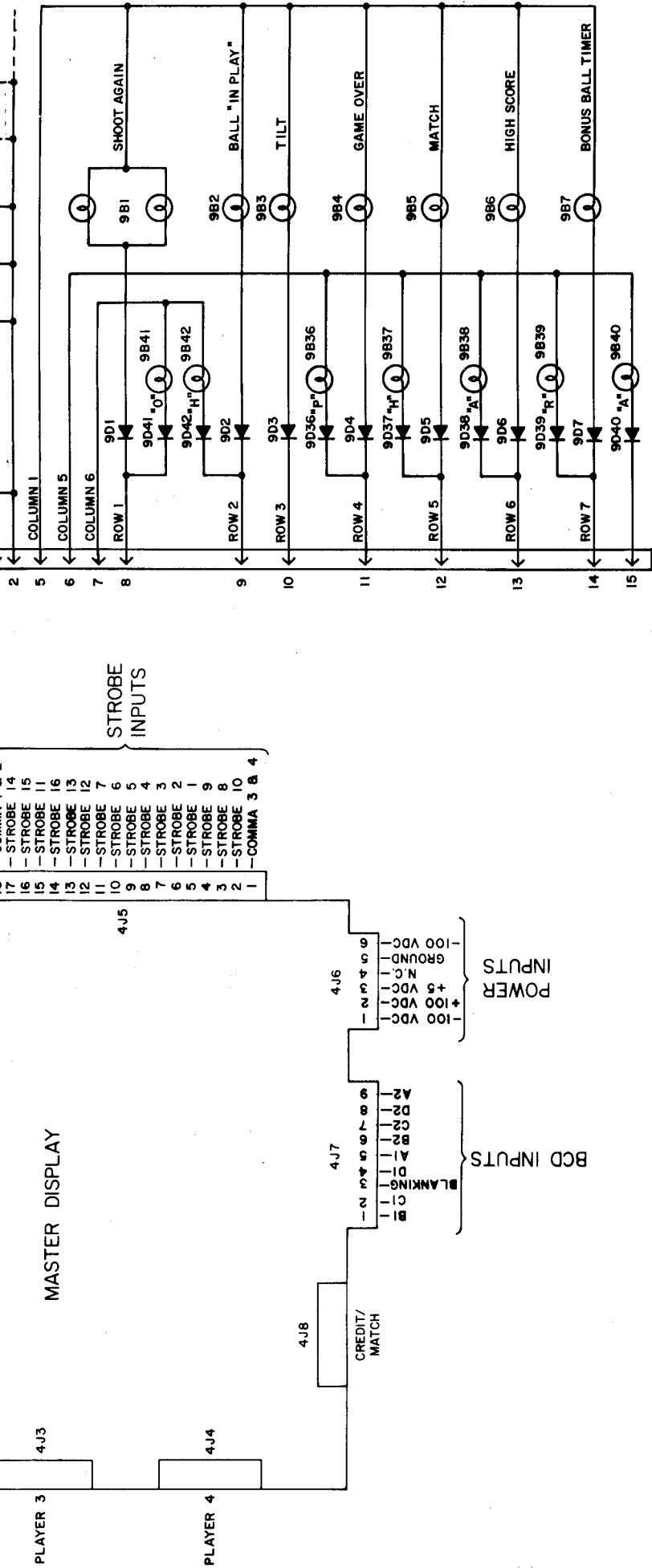
DETAIL A

4J1 - 4J4, 4J8

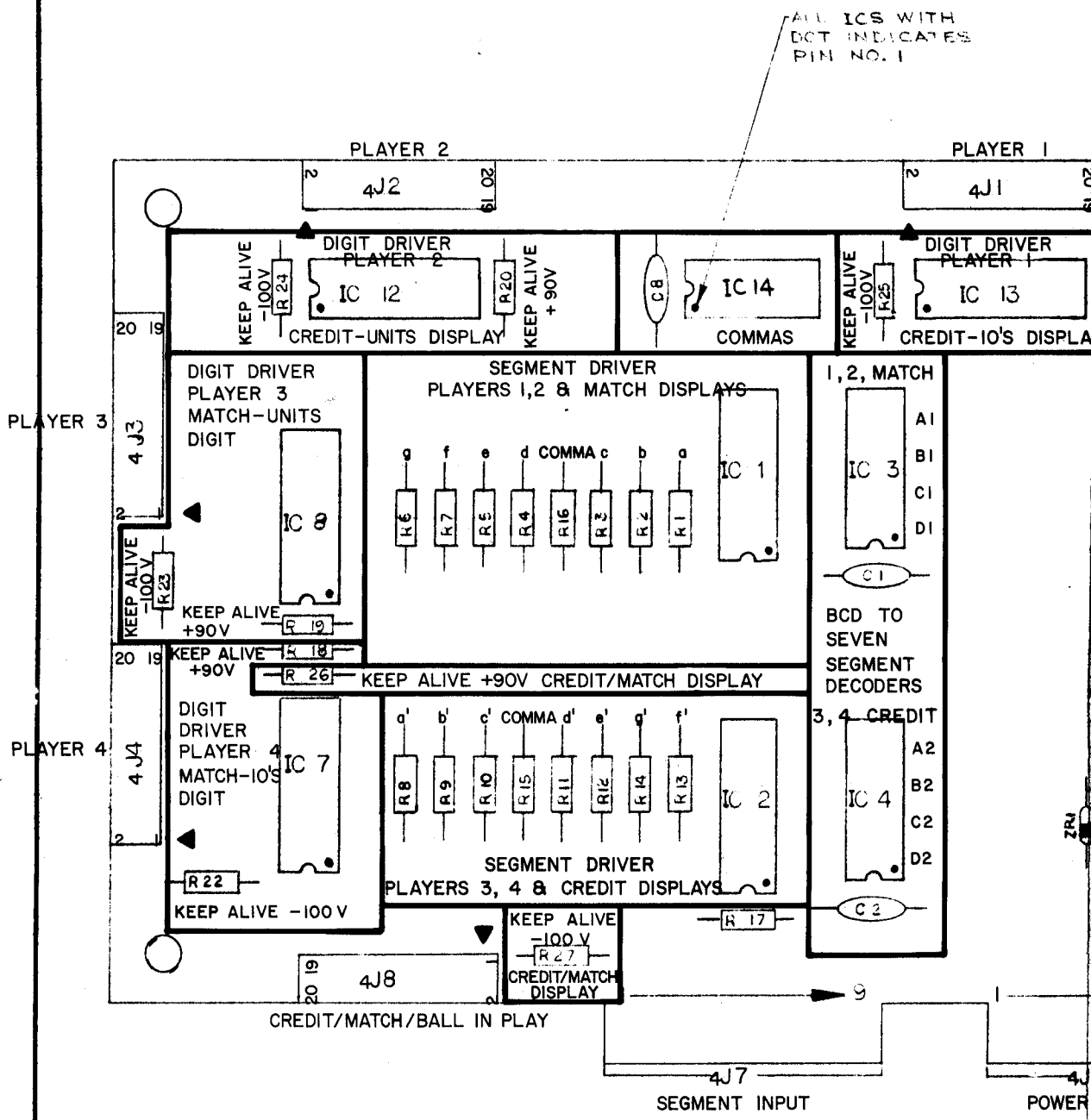
5J1 - 5J5

CONNECTORS





Insert Board Wiring Diagram 19

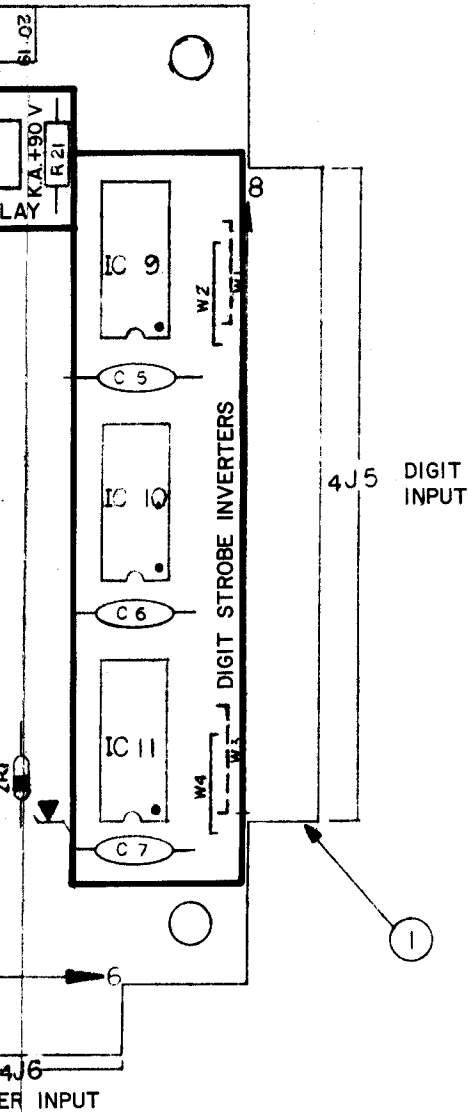


REVISION LETTER	REVISION	BY

BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D U.O.
1	IC-200-152-B		BARE P.C. BOARD	1
2	5A-8971	IC 9, IC10, IC11	MC14069 HEX. INVERTER	3
3	5A-8970	IC3, IC4	MC14543 BCD TO SEVEN SEGMENT LATCH/DECODER/DRIVER	2
4	5A-8969	IC1, IC2	UDN-7180 GAS DISCHARGE DISPLAY SEGMENT DRIVER	2
5	5A-8968	IC7 IC8 IC12 IC13	UDN-6184A OR UDN-6185A GAS DISCHARGE DISPLAY SEGMENT DR.	4
6		IC14	MC14081 QUAD 2-INPUT AND GATE	1
7	5B-8981	R1-R14	RESISTOR, FC, 10K OHM 10% 1/2 WATT	14
8	5A-9135	ZR1	IN4740A ZENER DIODE 10V, 5% 1W	1
9	5A-8980	C1, C2 C5 THRU C8	CAPACITOR CERAMIC, 01 MFD, 50V	6
10		W2, W4	JUMPER *22 GA SOLID WIRE	2
11	5A-9086	R17	RESISTOR, FC, 6.8K OHM 10% 1/4 WATT	1
12	5B-8982	R18 THUR R27	RESISTOR, FC, 3 MEG. OHM 10% 1/4 WATT	10
13		J8, J1 THUR J4	20 PIN RIBBON HEADER	5
14		R15, R16	RESISTOR, 15K OHM, 10% 1/2 WATT	2

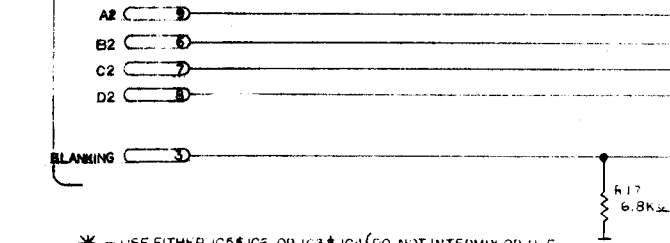
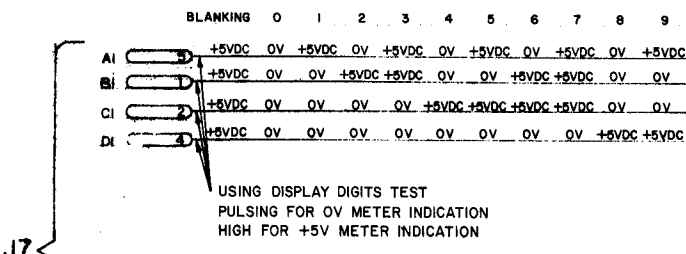
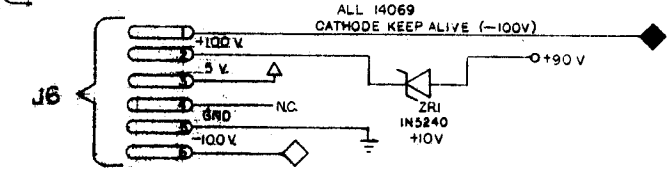
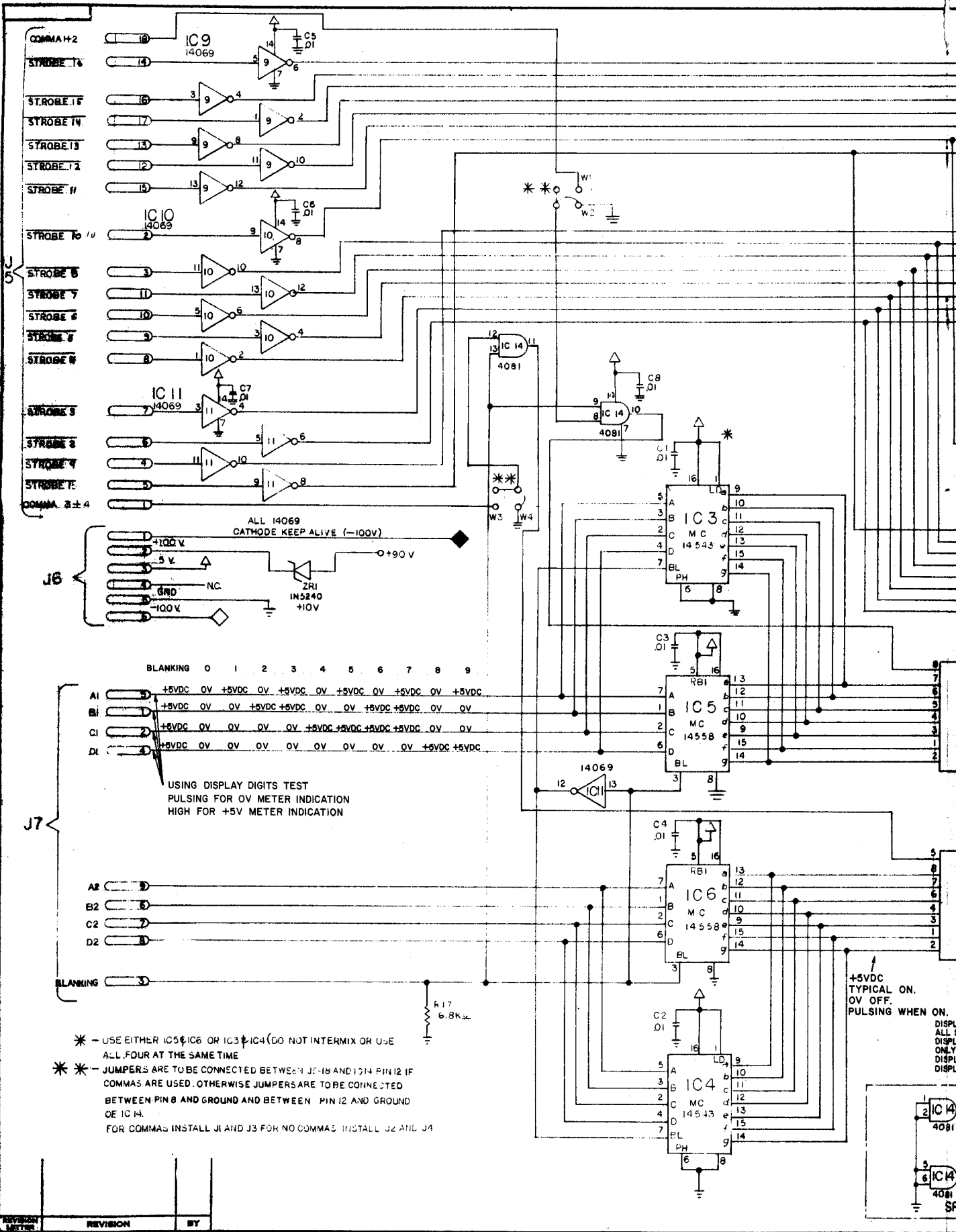
6115 126



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)

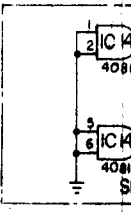
TOLERANCES		QTY.		ASSEMBLE ON	
UNLESS OTHERWISE SPECIFIED					
FRACTIONAL	2 1/64"				
DECIMAL	2 .005"				
HOLE DIA.	+.002 - .000"				
ANGULAR	± 1/2°				
CONCENTRICITIES	T.I.R. .003"				
SCREW THREADS	CLASS 2				
WILLIAMS ELECTRONICS, INC.					
SUBSIDIARY OF THE SEEBURG CORP. OF DELAWARE					
3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240					
NAME MASTER DISPLAY BOARD ASSEMBLY					
MATERIAL		HEAT TREATMENT		FINISH	
OWN.	DATE	APP'D.	SCALE		
G.H.	3-23-80		2:1 5470		



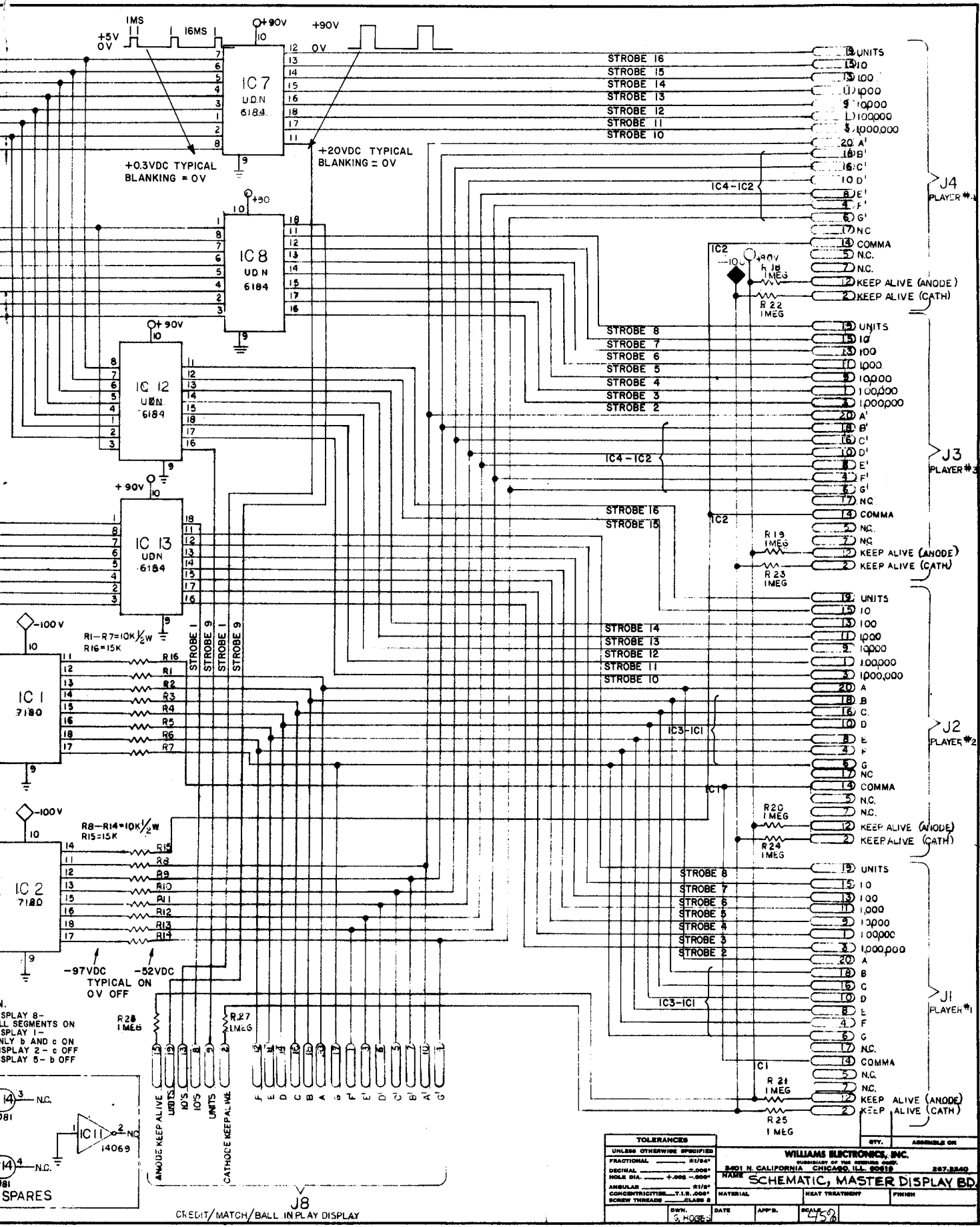
- * - USE EITHER IC5 & IC6 OR IC3 & IC4 (DO NOT INTERMIX OR USE ALL FOUR AT THE SAME TIME)
- * * - JUMPERS ARE TO BE CONNECTED BETWEEN J1-18 AND J14 PIN 12 IF COMMAS ARE USED. OTHERWISE JUMPERS ARE TO BE CONNECTED BETWEEN PIN 8 AND GROUND AND BETWEEN PIN 12 AND GROUND OF IC 14.
- FOR COMMAS INSTALL J1 AND J3 FOR NO COMMAS INSTALL J2 AND J4

+5VDC TYPICAL ON.
0V OFF.
PULSING WHEN ON.

DISPL
ALL 5
DISPL
ONLY
DISPL
DISPL



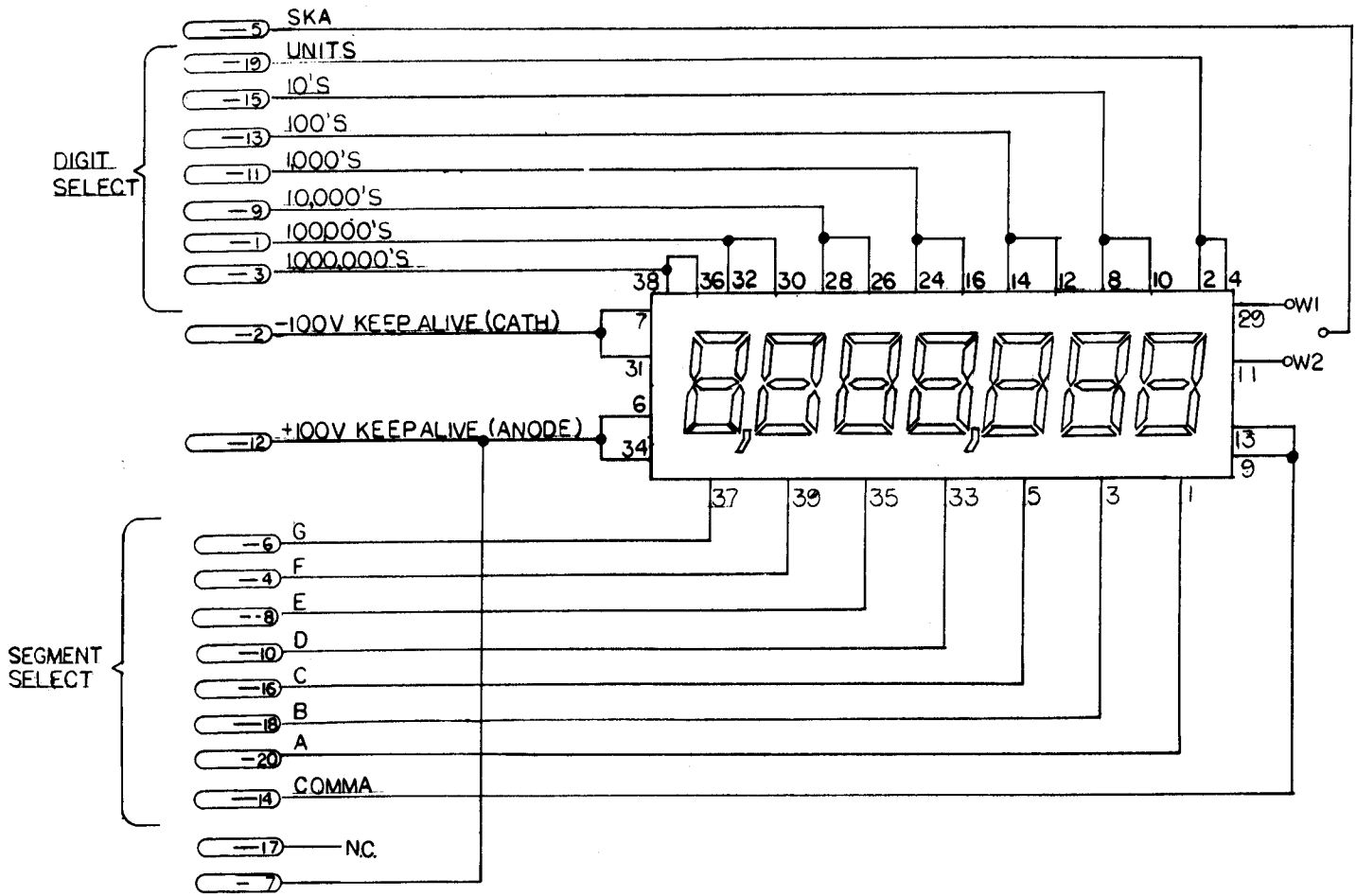
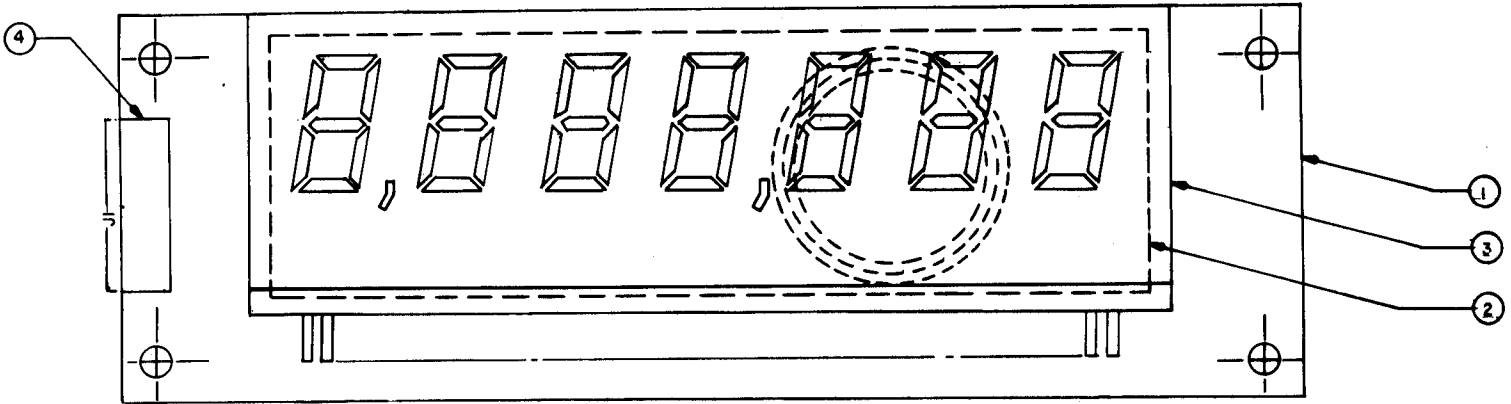
REVISION	REVISION	BY



TOLERANCES		WILLIAMS ELECTRONICS, INC.	
UNLESS OTHERWISE SPECIFIED	FRACTIONAL	21/64"	267-8840
DECIMAL	±.0005 - .0008"	8401 N. CALIFORNIA	CHICAGO, ILL. 60618
HOLE DIA.	±.0008 - .0010"	NAME SCHEMATIC, MASTER DISPLAY BD.	
ANGULAR	R1/8"	MATERIAL	HEAT TREATMENT?
CONCENTRICITY	±.0005"	FINISH	
SCREW THREADS	CLASS 8	QTY.	ASSEMBLED ON
DRW.	DATE	APP.	SCALE
S. HOBBS			45%

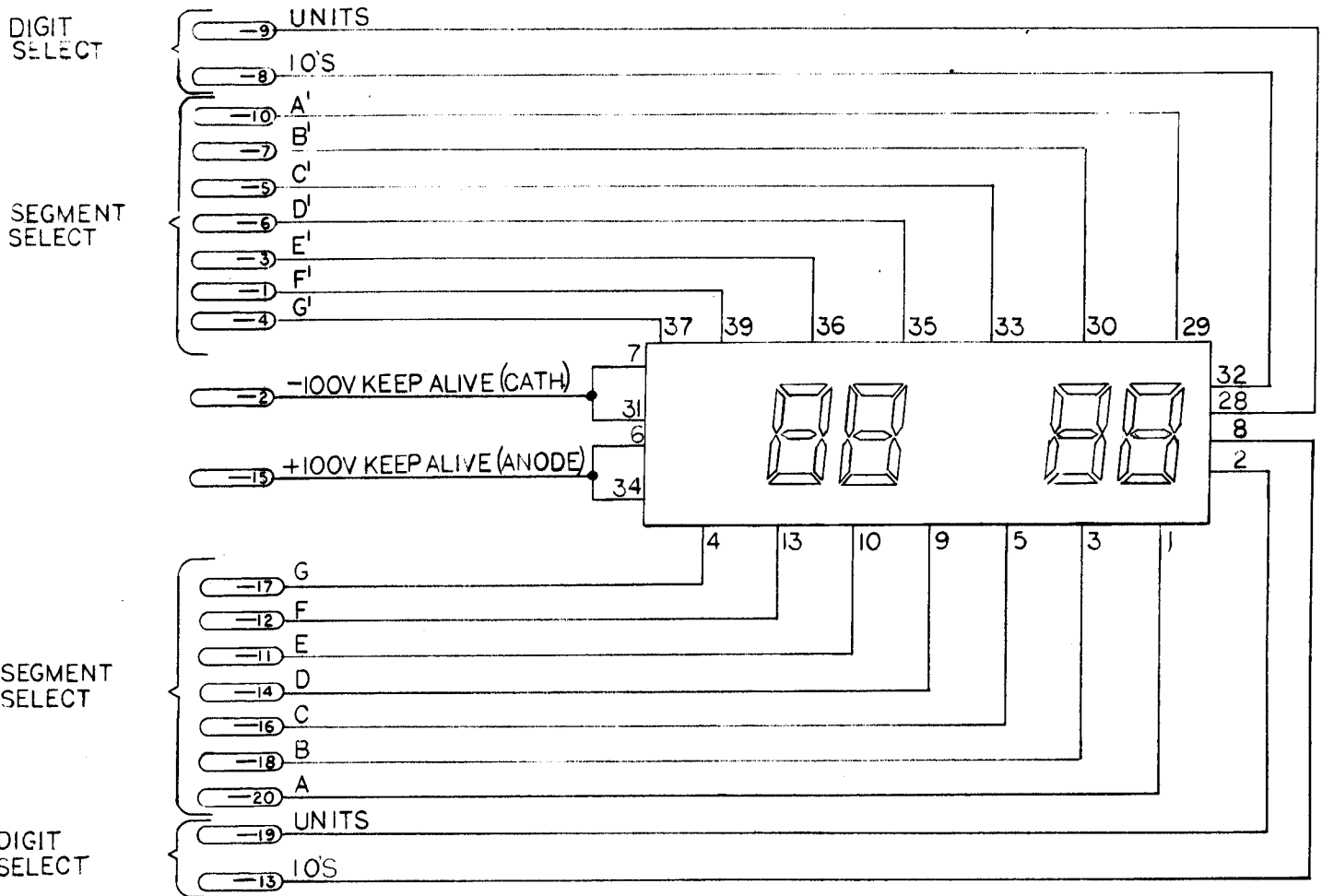
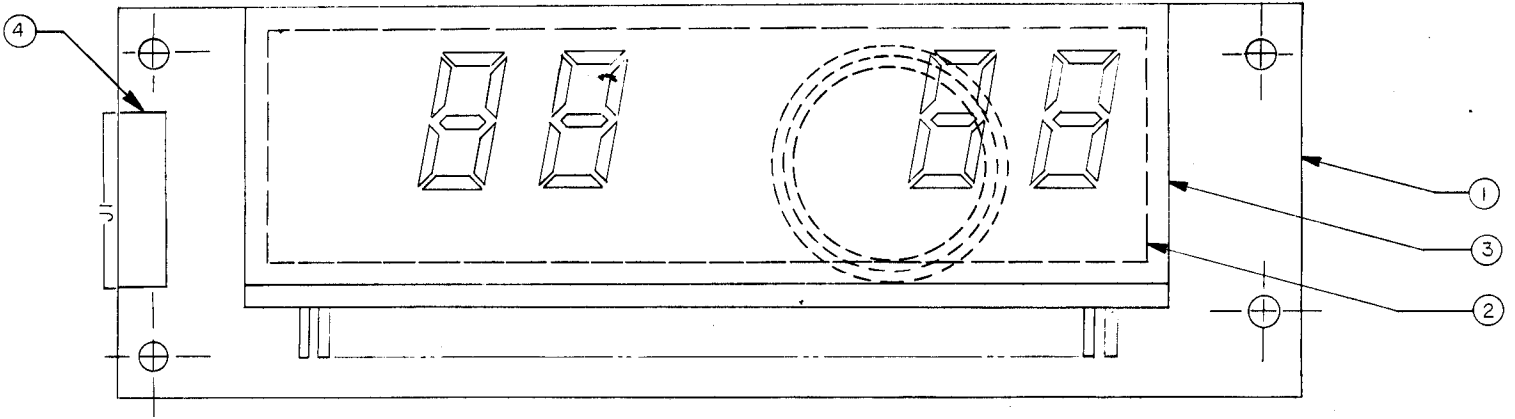
C 8363 Master Display Board Logic Diagram 21

BILL OF MATERIAL				
ITEM	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D.
1	5162-08448-XP		SLAVE DISPLAY P.C. BOARD	1
2	33-4648		DISPLAY MTG ADHESIVE FOAM	1
3	8670-08418-XP		7 DIGIT DISPLAY	1
4	5781-08418-XP	J1	20 PIN RIBBON HEADER	1
5	03-7673-2		CAPLUG	1

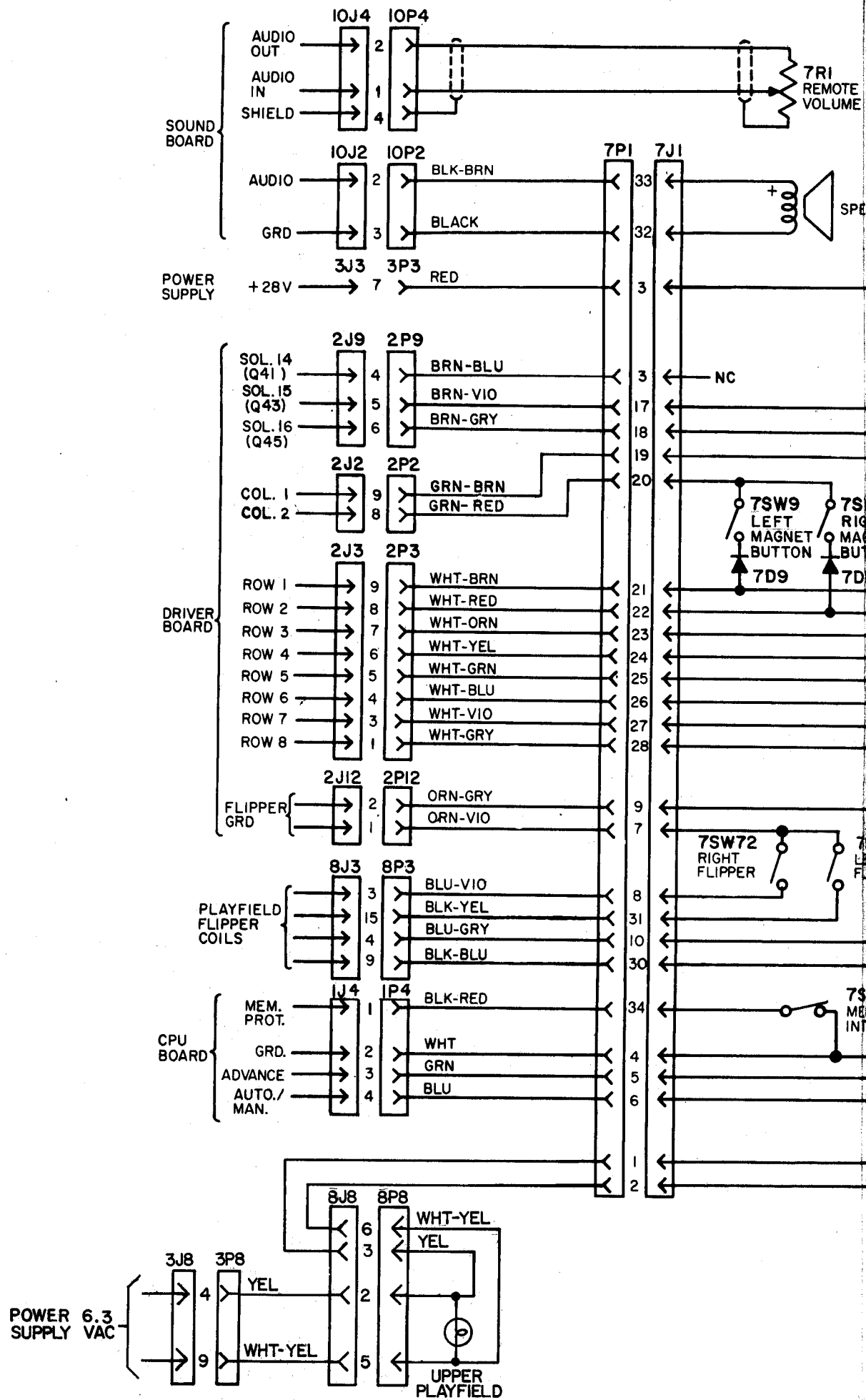


C 8364 PLAYER SLAVE DISPLAY

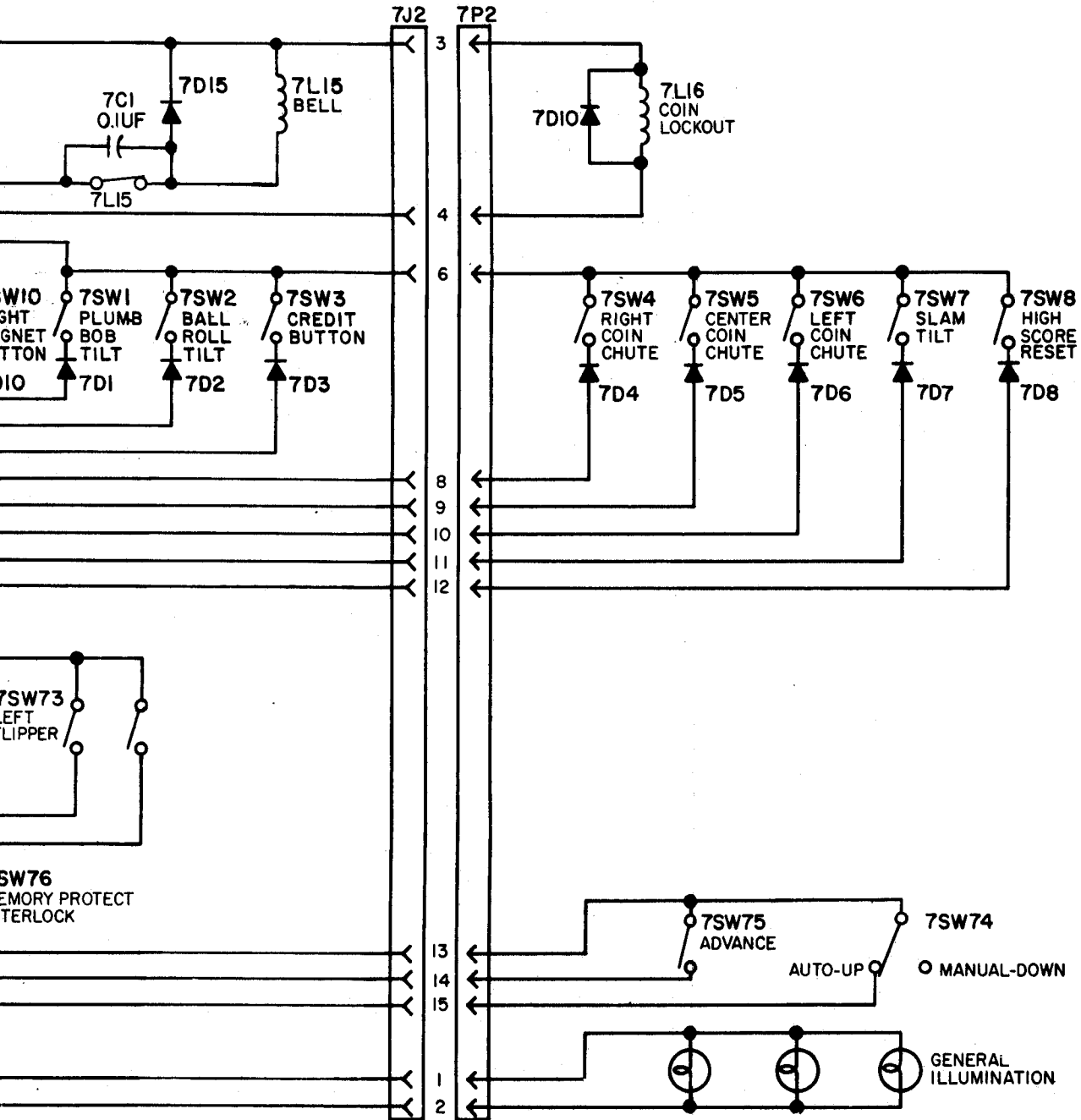
BILL OF MATERIAL				
ITEM	PART NO.	PART DESIGNATION	DESCRIPTION	REQ' D
1	576709468-00		CREDIT/MATCH SLAVE PC. BOARD	1
2	23-6545		FOAM DISPLAY - BACK	1
3	5670-0844B-00		4 DIGIT DISPLAY	1
4	5791-0843B-00	J1	20 PIN RIBBON HEADER	1
5	23-6546		FOAM DISPLAY - FRONT	1
6	03-1513-2		CAPLUG	1

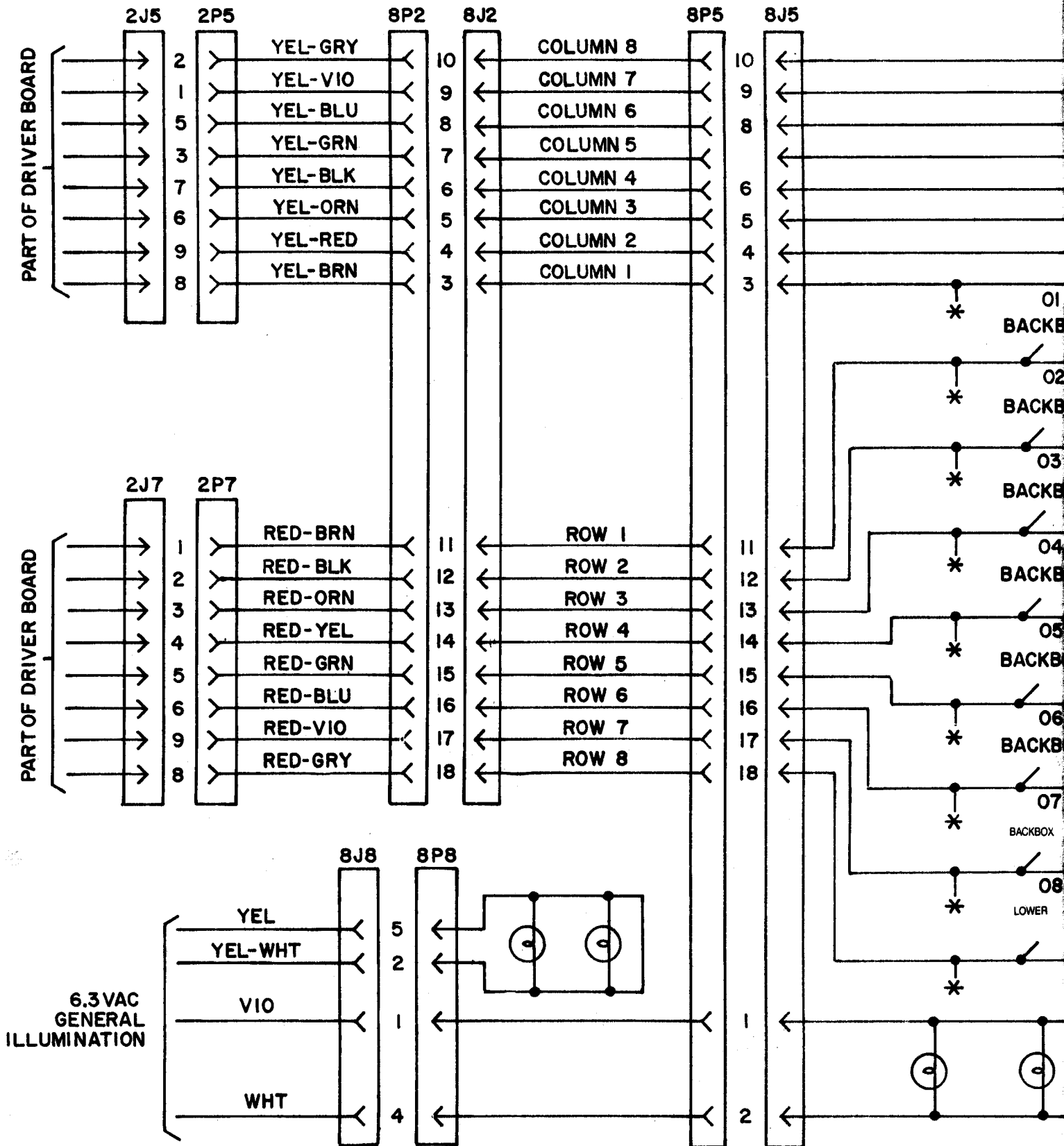


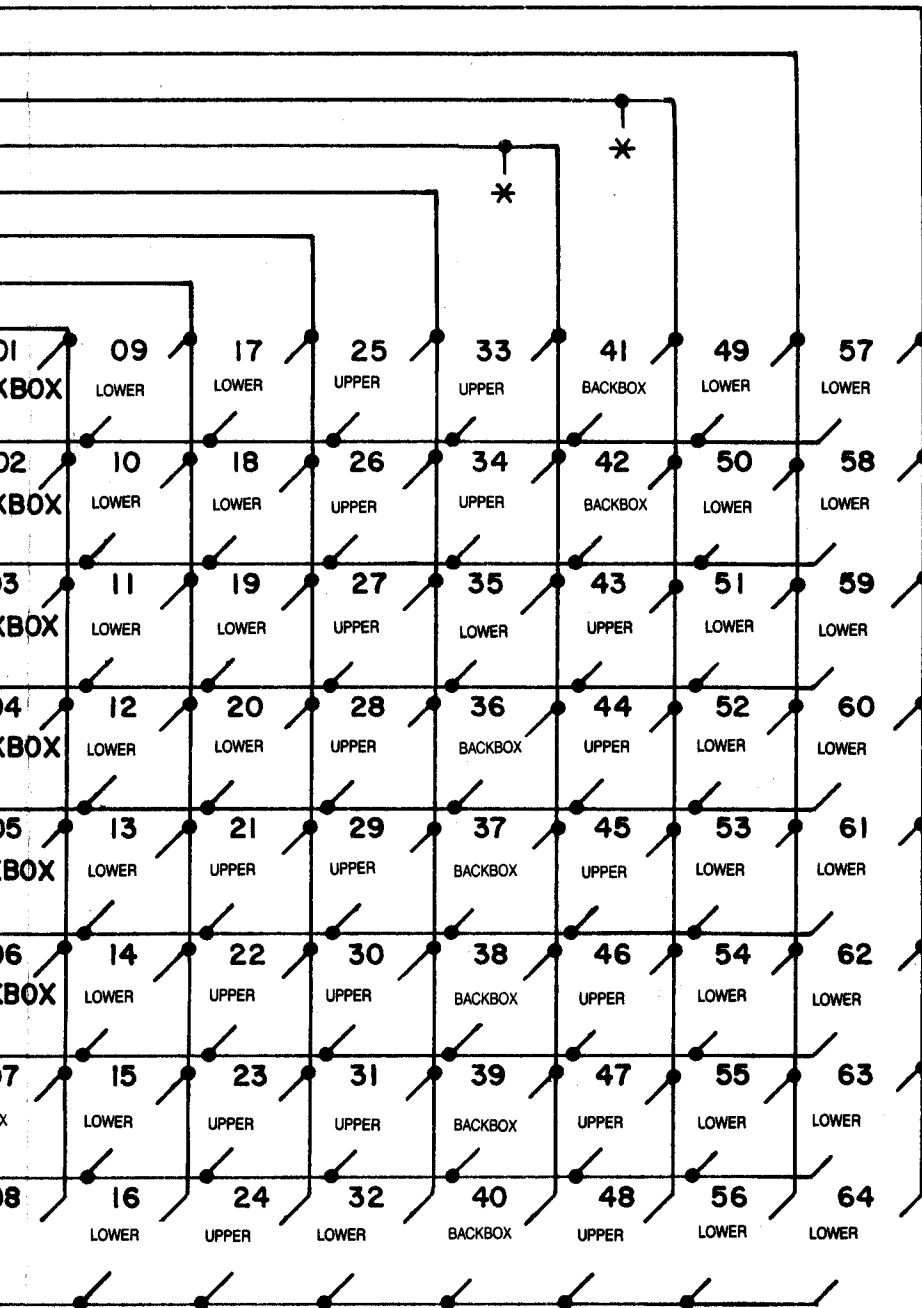
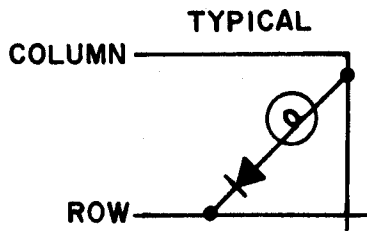
C 8365 CREDIT/MATCH SLAVE DISPLAY



FEAKER





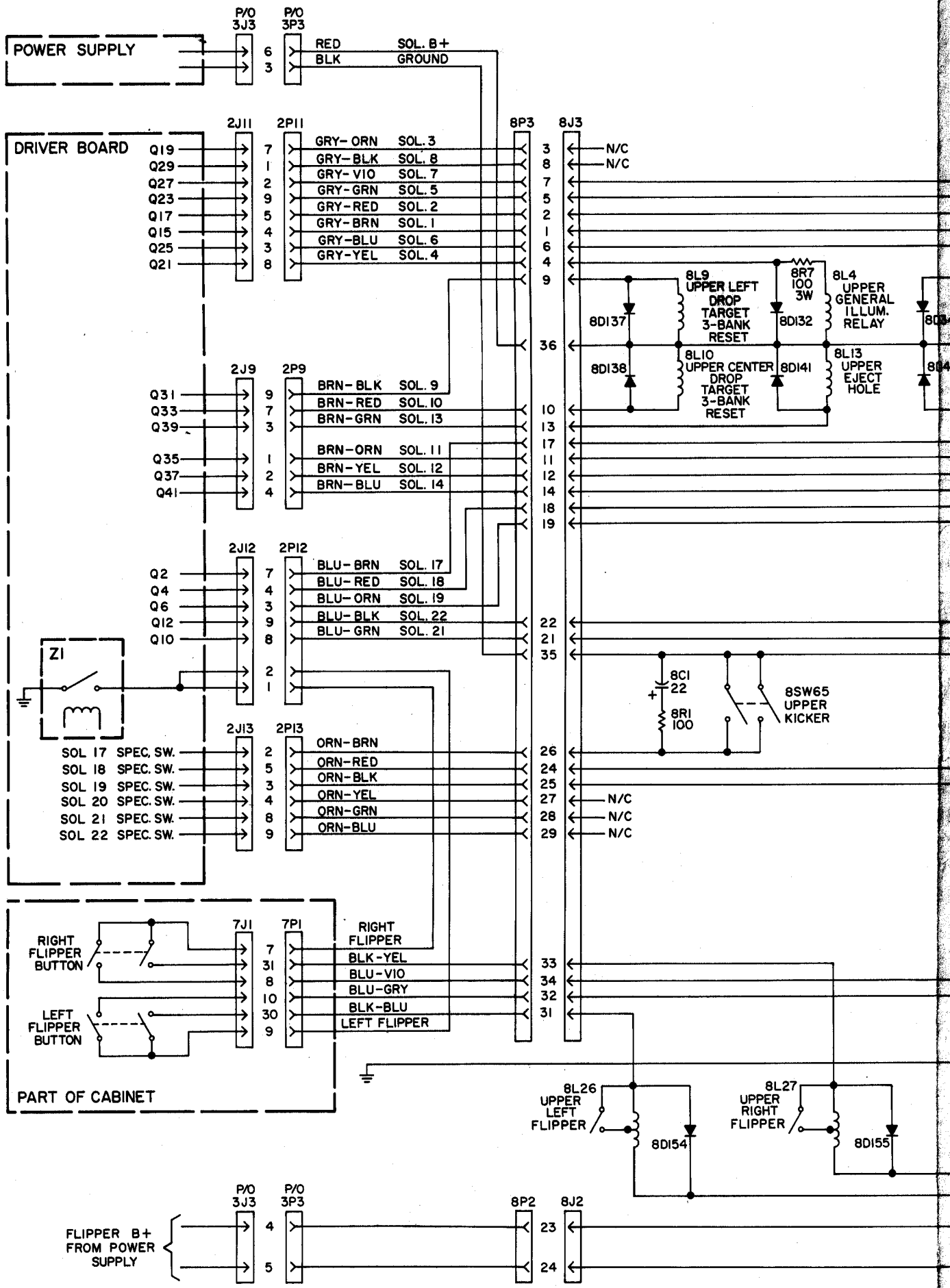


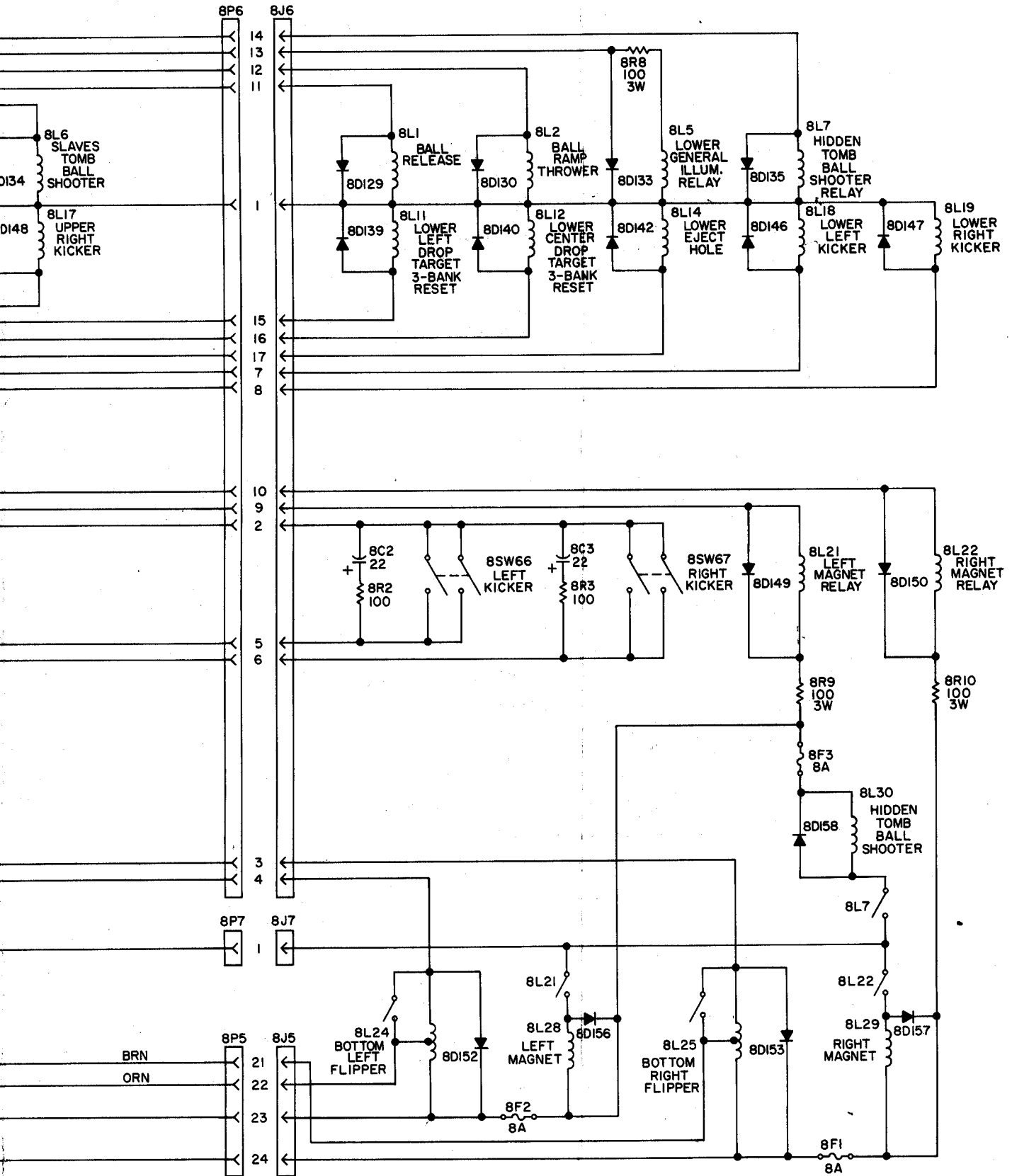
Bulb No.	Function
01	Same Player Shoots Again (Backbox)
02	Left Magnet, Bottom Arrow
03	2X Scoring
04	"A"
05	Slaves Tomb Extra Ball When Lit
06	"O"
07	"I" Bonus
08	"9" Bonus
09	Ball in Play
10	Left Magnet, 2+ Arrow
11	Hidden Tomb Collect Bonus
12	"O"
13	Upper Eject Hole Arrow
14	"H"
15	"2" Bonus
16	"10" Bonus
17	Tilt
18	Left Magnet 4+ Arrow
19	Lower Center 3-Bank
20	"H"
21	Lower Eject Hole Arrow
22	Extra Ball When Lit Hidden Tomb
23	"3" Bonus
24	"20" Bonus
25	Game Over
26	Right Magnet Bottom Arrow
27	Lower Right 3-Bank
28	Upper Bull's-Eye Target
29	"P" (Backbox)
30	Slaves Tomb General Illumination
31	"4" Bonus
32	"30" Bonus
33	Match
34	Right Magnet 2+ Arrow
35	"P" (Playfield)
36	Upper Left 3-Bank Bottom Arrow
37	"H"
38	Captive Ball General Illumination
39	"5" Bonus
40	"40" Bonus
41	High Score to Date
42	Right Magnet 4+ Arrow
43	"H"
44	Upper Left 3-Bank Center Arrow
45	"A"
46	Upper Center 3-Bank Left Arrow
47	"6" Bonus
48	2X
49	Bonus Ball Timer
50	Left ? Lane
51	"A"
52	Upper Left 3-Bank Top Arrow
53	"R"
54	Upper Center 3-Bank Center Arrow
55	"7" Bonus
56	3X
57	Same Player Shoots Again (Playfield)
58	Right ? Lane
59	"R"
60	Lower Bull's-Eye Target
61	"A"
62	Upper Center 3-Bank Right Arrow
63	"8" Bonus
64	5X

* SEE INSERT BOARD WIRING DIAGRAM FOR CONNECTIONS FOR BACKBOX LAMPS.

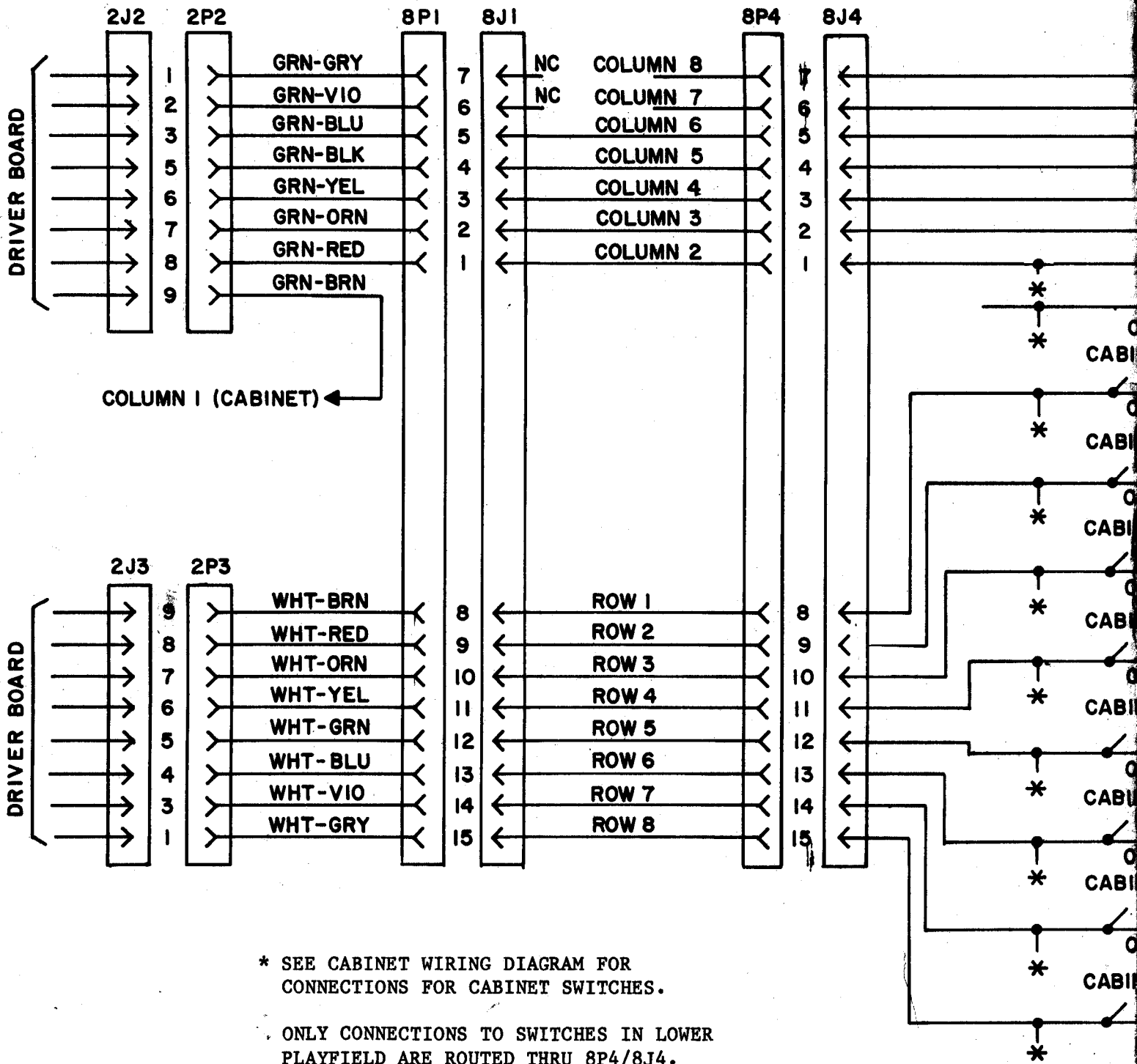
ONLY CONNECTIONS TO LAMPS IN LOWER PLAYFIELD ARE ROUTED THRU 8P5/8J5.

GENERAL ILLUMINATION



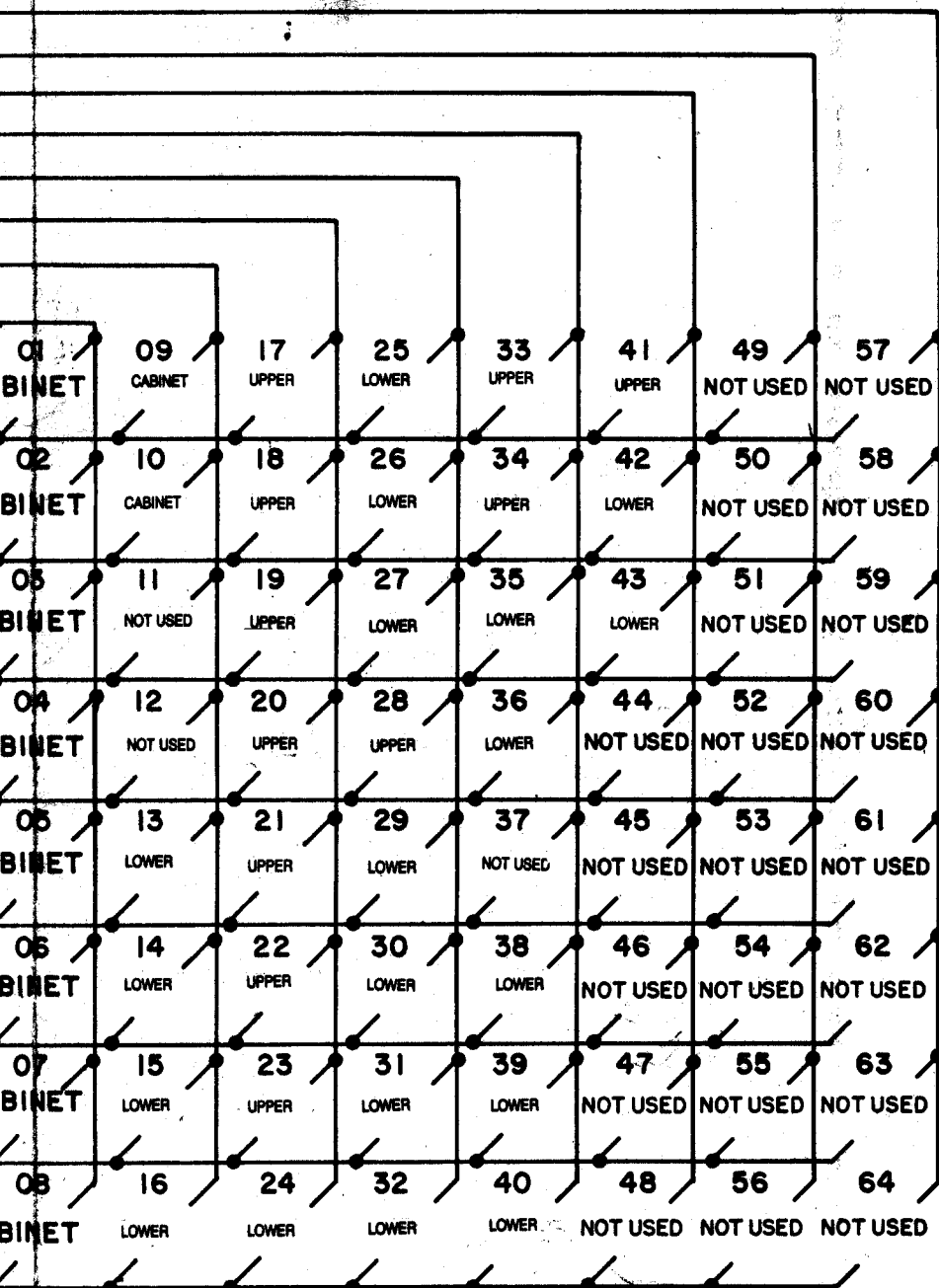
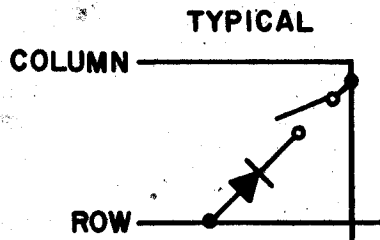


Playfield Solenoid Wiring Diagram



* SEE CABINET WIRING DIAGRAM FOR CONNECTIONS FOR CABINET SWITCHES.

ONLY CONNECTIONS TO SWITCHES IN LOWER PLAYFIELD ARE ROUTED THRU 8P4/8J4.



Switch

No. Function (Score*)

- 09 Left Magnet Button
- 10 Right Magnet Button
- 11 Not Used
- 12 Not Used
- 13 Left Inside Rollover (10,000)
- 14 Right Inside Rollover (10,000)
- 15 Left ? Lane Rollover (5,000/Mystery)
- 16 Right ? Lane Rollover (5,000/Mystery)
- 17 Upper Left 3-Bank Bottom Target (3,000)
- 18 Upper Left 3-Bank Center Target (3,000)
- 19 Upper Left 3-Bank Top Target (3,000)
- 20 Upper Kicker (10/110)
- 21 Upper Center 3-Bank Left Target (3,000)
- 22 Upper Center 3-Bank Center Target (3,000)
- 23 Upper Center 3-Bank Right Target (3,000)
- 24 Left Kicker (10)
- 25 Lower Center 3-Bank Bottom Target (3,000)
- 26 Lower Center 3-Bank, Center (3,000)
- 27 Lower Center 3-Bank, Top (3,000)
- 28 Upper Bull's-Eye Target (5,000/15,000)
- 29 Lower Right 3-Bank, Top Target (3,000)
- 30 Lower Right 3-Bank, Center Target (3,000)
- 31 Lower Right 3-Bank, Bottom Target (3,000)
- 32 Lower Bull's-Eye Target (5,000/15,000)
- 33 Slaves Tomb Shooter (20,000)
- 34 Upper Eject Hole (7,000)
- 35 Lower Eject Hole (7,000)
- 36 Outhole
- 37 Not Used
- 38 Ball Ramp Left Switch
- 39 Ball Ramp Right Switch
- 40 Ballshooter Trough
- 41 Captive Ball (5,000/5,000 per lit letter)
- 42 Playfield Tilt
- 43 Hidden Tomb Shooter (20,000)
- 44 Right Kicker (10)

*All scores are doubled for 2X Scoring.

Mystery for switches 15 and 16 (awarded when lit) is random bonus advances, bonus multiplier, random points, or special.

Second value for switch 20 is randomly scored.

Second value for switches 28 and 32 is scored when lit with 5X bonus multiplier.

With full bonus, 10,000 is awarded instead of each bonus advance.