Fire Power

Schematics

Assembly and Interconnection
With legs attached to cabinet, position backbox as shown and proceed as follows:

A Pull six cables from backbox.

B Reach into right side of pedestal hole, pull up ground strap, and push it into backbox.

C Remove the tie securing cabinet and playfield cables to cabinet and pull up these cables.

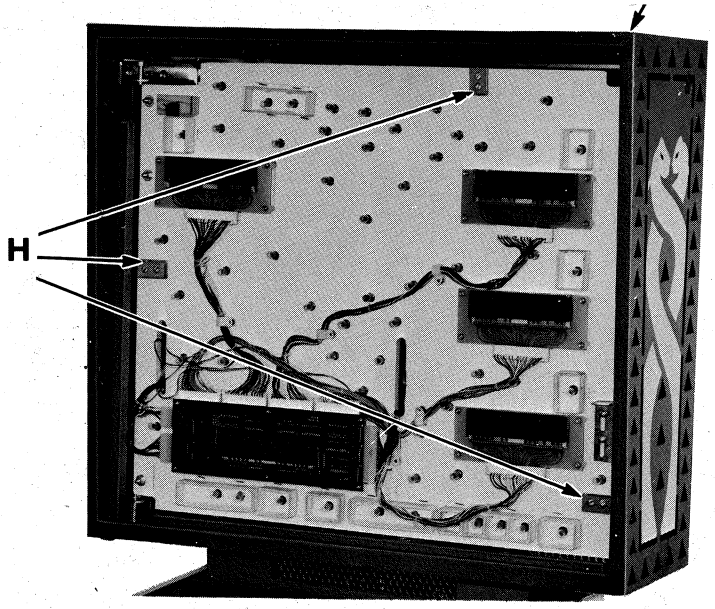
D Interconnect six cables. They are size and color coded except for power connector where wire colors do not match.

E Insert line cord into notch in cabinet. DO NOT PLUG IN AT THIS TIME.

F Push remote volume control cable into backbox.

G Lift up backbox and position on cabinet pedestal, engaging brackets for support.

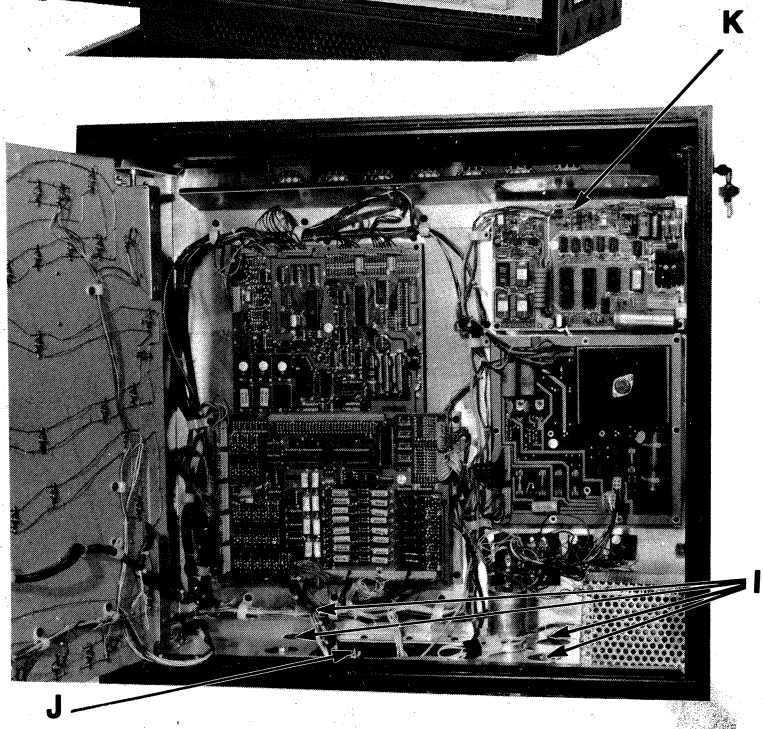
H Remove shipping blocks.



I Secure backbox to cabinet using four bolts and washers.

J Connect ground braid under wing nut and washer.

K Loosely position remote volume control cable in harness and plug connector into 10J4 on Sound Board.



Inspection

A Check all connectors in backbox for loose wire terminations. Reseat any loose wires by pushing in on the termination.

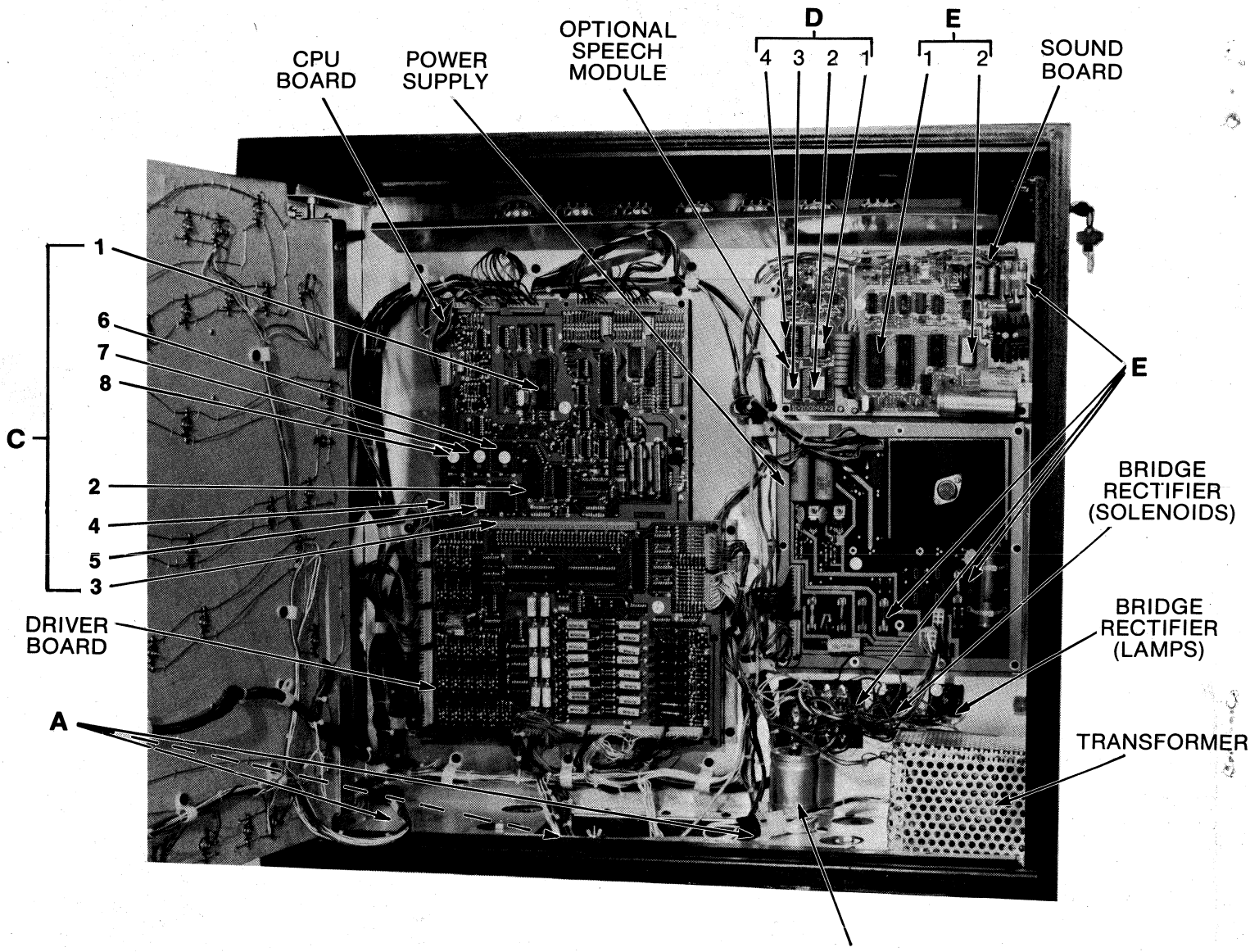
B (Not called out) Push on all connectors attached to the CPU, Driver, Sound, and Power Supply Boards and check terminations on capacitor and bridge rectifiers.

C Gently press on the socketed IC packages on CPU Board: 1 MPU, 2 RAM, 4 and 5 ROMs, 6, 7, and 8, PROMs, and 3, Game ROM.

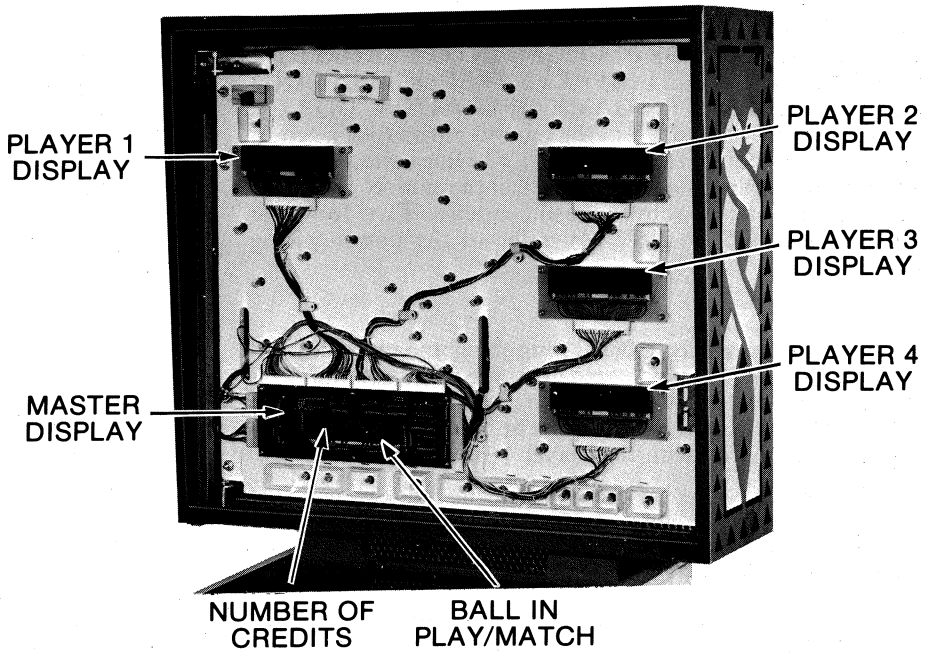
D Gently press on the socketed IC packages on the Speech Module (if provided): 1, 2, and 3 ROMs.

E Gently press on the socketed IC packages on Sound Board: 1 MPU, 2 Sound ROM.

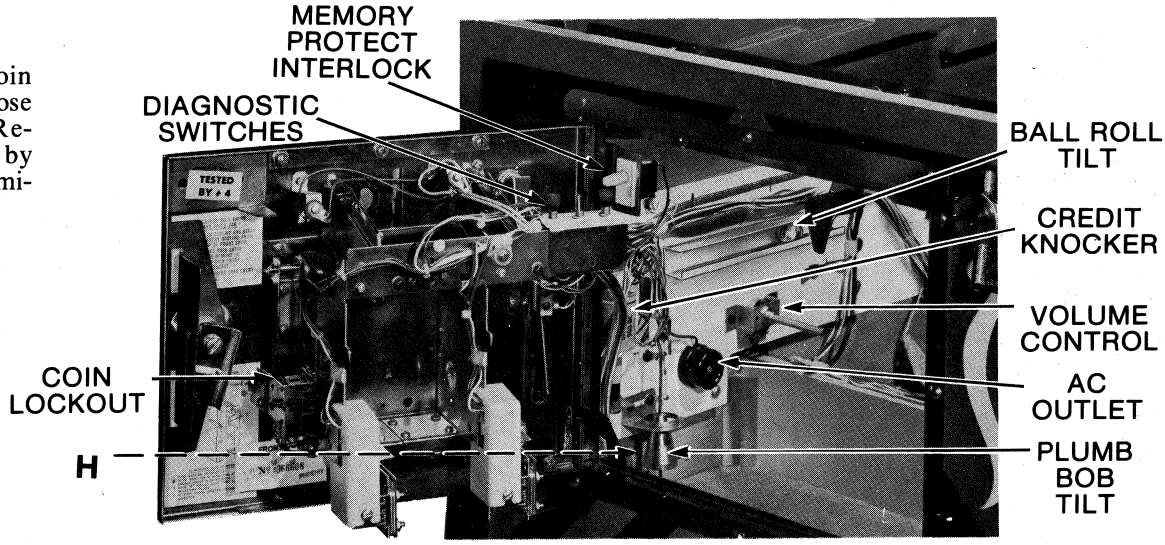
F Check that two fuses on Sound Board, five fuses on Power Supply, and three fuses on fuse card are secure.



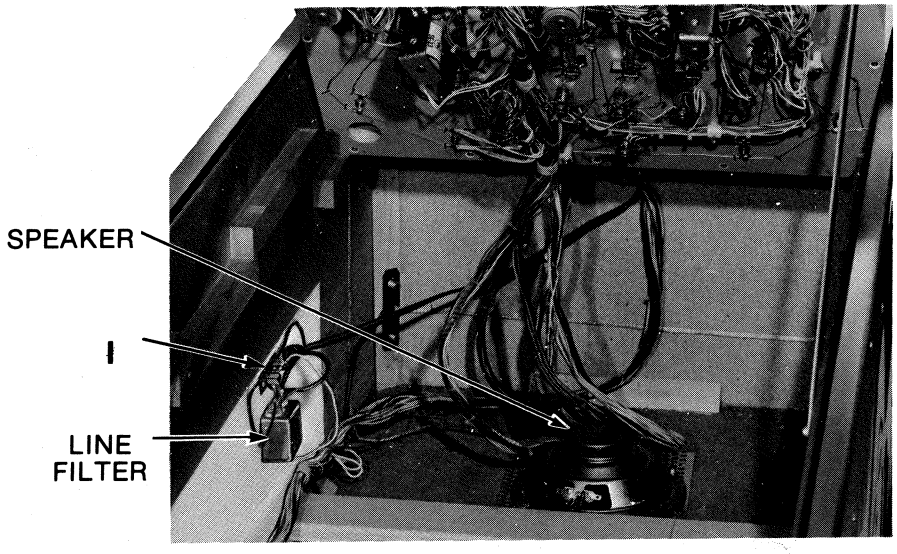
G (Not called out) Push on all connectors attached to Master and Player Display Boards.



H Check the cabinet to coin door connectors for loose wire terminations. Reseat any loose wires by pushing in on the termination.



I Check that the line fuse is secure.



Power Turn-On

This machine MUST BE PLUGGED INTO A PROPERLY GROUNDED OUTLET to PREVENT SHOCK HAZARD and to ensure PROPER GAME OPERATION. DO NOT use a "cheater" plug to defeat the ground pin on the line cord, and 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 (page 23).

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 scores reading zero, player 1 up light flashing, game over lights lit, and the high score to date alternating with the player 1 score.
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. Perform diagnostic tests and make any desired changes to features as described in the instruction booklet.

Electrical Adjustments

Games with Speech Module

1. Set miniature switch 2 to ON to enable speech; set it t OFF to inhibit speech.
2. Set switch 1 to OFF to select synthesized sounds, set it to ON to select musical notes.
3. Adjust balance control on Speech Module for relative volume of speech and sounds.
4. Adjust volume control in cabinet for desired volume.

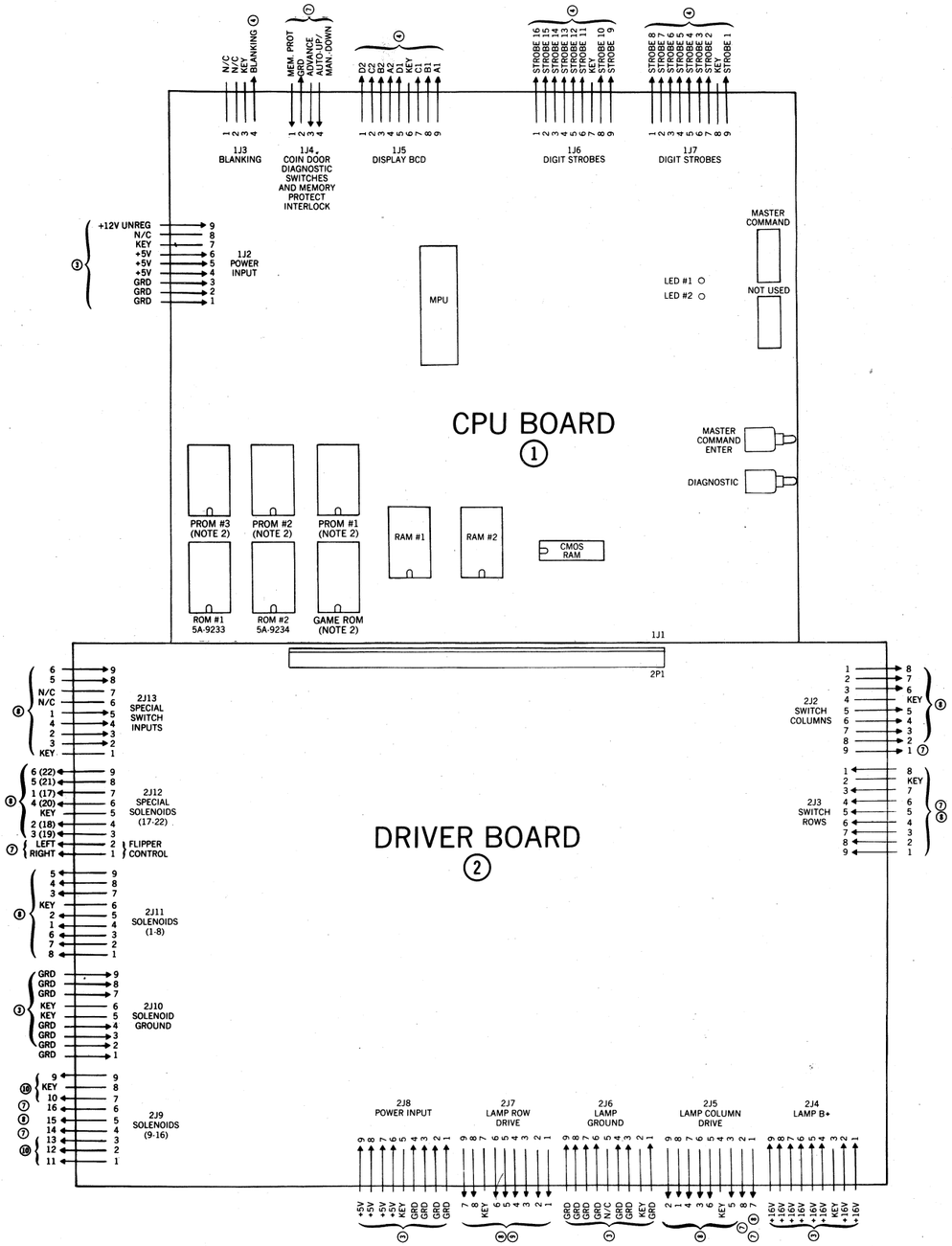
Games without Speech Module

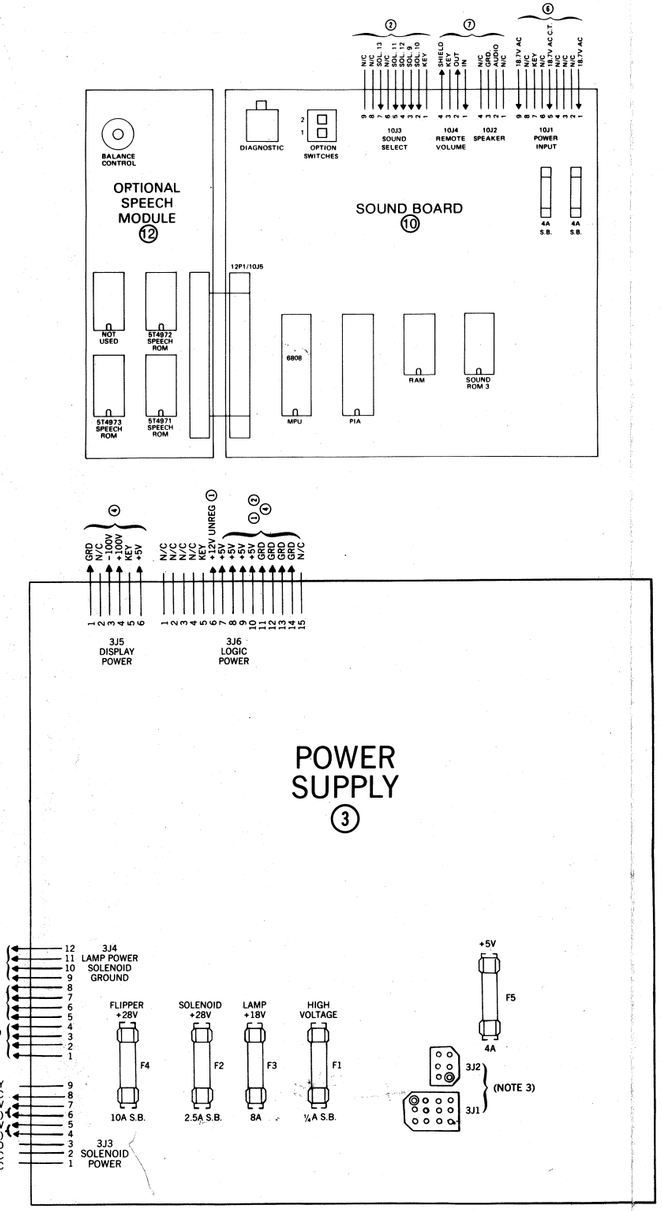
1. Setting of miniature switch 2 does not matter.
2. Set switch 1 to OFF to select synthesized sounds; set it to ON to select musical notes.
3. Adjust volume control in cabinet for desired volume.

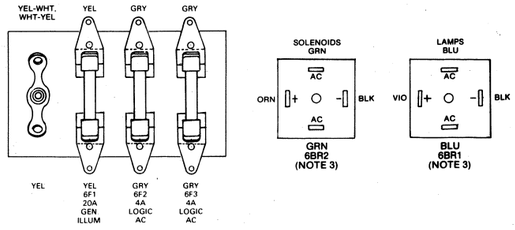
Special Maintenance Information

When the diagnostic pushbutton is depressed, five electronic sounds are produced. Next, if the optional Speech Module is provided, the FIREPOWER vocabulary is produced. This sequence is continuously repeated until the game is turned OFF and back ON.

VOCABULARY	LOCATED IN ROM
FIRE	5T 4971
POWER	5T 4971
ONE (Won)	5T 4971
TWO	5T 4971
THREE	5T 4972
ENEMY	5T 4972
DESTROYED	5T 4972
MISSION	5T 4972 and 5T 4973
ACCOMPLISHED	5T 4973
YOU	5T 4973
ARE	5T 4973







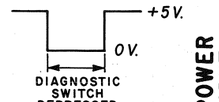
NOTES:

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. GAME ROM, PROM #1, PROM #2, AND PROM #3 ARE USED.
3. REFER TO POWER WIRING DIAGRAM (PAGE 23) FOR CONNECTIONS TO 3P1, 3P2, 6BR1, 6BR2, 6F1, 6F2, AND 6F3.

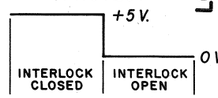
REVISION LETTER	REVISION
D	REVISED AND REDRAWN REVISED DWG. TO CONFORM TO ARTWORK NO. 1B-2001-133 LATEST ISSUE NO. 6. R. GAY, 1-8-79
E	ITEM NO. 3, MFG'S PT. NO. WAS 1N5991. E.C.O. 4670 R. GAY, 1-31-79

TP1 +12 V. UNREG

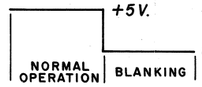
TP2 $\overline{\text{NMI}}$



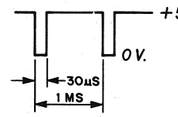
TP3 MEMORY PROTECT



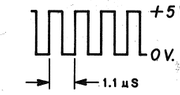
TP4 BLANKING



TP5 $\overline{\text{IRQ}}$



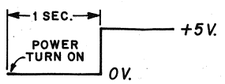
TP6 BUS ϕ2



TP7 CMOS RAM B+

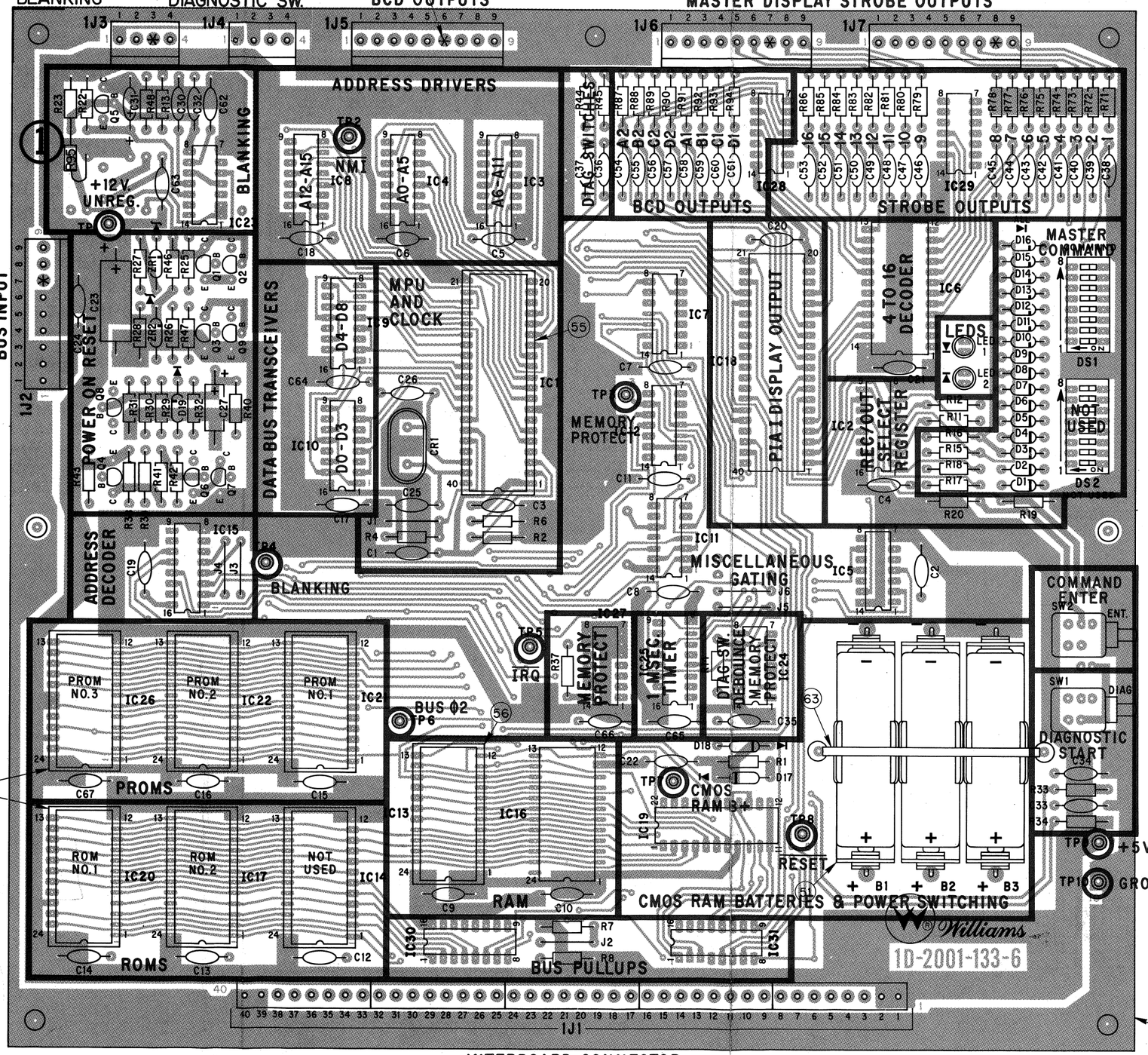
POWER ON 4.3V.
POWER OFF 3.9V.

TP8 $\overline{\text{RESET}}$



TP9 +5 V.

TP10 GND



BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	1B-2001-133-6		BARE P.C. BOARD	1
2	5A-8990	IC2, IC9, IC10	8T28 QUAD BUFFER/RECEIVER	3
3	5A-8989	IC3, IC4, IC8	8T97 HEX. TS BUFFER	3
4	5A-9010	IC6	74154 4 TO 16 DECODER	1
5	5A-9013	IC7	7404 HEX. INVERTER	1
6	5A-9235	IC11	74LS10 TRIPLE 3 INPUT NAND	1
7	5A-8973	IC12	7408 QUAD AND	1
8	5A-9063	IC13, IC16	MC6810 RAM	2
9	5A-9246	IC15	74LS139 DUAL 2 TO 4 LINE DECODER	1
10	5A-_____	IC17	ROM 2K X 8 LOWER	1
11	5A-8972	IC18	MC6820 PIA	1
12	5A-9017	IC19	CMOS RAM 5101	1
13	5A-_____	IC20	ROM 2K X 8 UPPER	1
14	5C-9002	IC23	MC3456/556 DUAL TIMER	1
15	5A-9073	IC24	7400 QUAD 2 INPUT NAND	1
16	5A-9236	IC25	4020 CMOS 14 BIT COUNTER	1
17	5A-9237	IC27	4071 CMOS QUAD 2 INPUT NOR	1
18	5A-9247	IC5	74LS02 QUAD 2 INPUT NOR GATE	1
19	5A-9238	IC28, IC29	13 DIP RESISTOR/PACK, 4.7 K OHM	2
20	5A-9239	IC30, IC31	15 DIP RESISTOR/PACK, 4.7 K OHM	2
21	5B-9025	DS1, DS2	8 STN. DIP SWITCH	2
22	5A-9018	ZR1	1N5996 ZENER DIODE	1
23	5A-9240	ZR2	1N5990 ZENER DIODE	1
24	5A-8919	D1 THRU D17, D19	1N4148 DIODE, SILICON	19
25	5C-8938	Q1, Q2, Q3, Q6 THRU Q9	2N4401 TRANSISTOR	9
26	5C-9016	Q4, Q5	2N4403 TRANSISTOR	2
27	5A-9020	CR1	CRYSTAL, 3.58 MHZ	1
28	5B-8984	R20, R25, R26, R48, R71 THRU R94	RESISTOR, FC, 1 K OHM 10% 1/4 W.	28
29	5B-8983	R2, R6, R7, R8, R23, R30	RESISTOR, FC, 3.3 K OHM 10% 1/4 W.	6
30	5B-8991	R4, R13 THRU R19, R33, R34, R41	RESISTOR, FC, 4.7 K OHM 10% 1/4 W.	11
31	5A-9033	R1	RESISTOR, FC, 680 OHM 5% 1/4 W.	1
32	5B-9036	R11, R12, R42	RESISTOR, FC, 100 OHM 10% 1/4 W.	3
33	5B-9113	R22, R40	RESISTOR, FC, 33 K OHM 5% 1/4 W.	2
34	5B-9034	R27, R28,	RESISTOR, FC, 10 K OHM 10% 1/4 W.	2
35	5A-9241	R29, R38, R46, R47	RESISTOR, FC, 22 K OHM 10% 1/4 W.	4
36	5A-8998	R31	RESISTOR, FC, 2.2 K OHM 10% 1/4 W.	1
37	5A-9039	R32	RESISTOR, FC, 10 OHM 10% 1/4 W.	1
38	5A-9242	R37	RESISTOR, FC, 300K OHM 10% 1/4 W.	1
39	5A-8997	R39, R43	RESISTOR, FC, 2.7 K OHM 10% 1/4 W.	2
40	5B-9083	R44, R45	RESISTOR, FC, 470 OHM 10% 1/4 W.	2
41	5A-8980	C1 THRU C21, C30, C33 THRU C37, C63 THRU C67	CAPACITOR, CERAMIC, .01 MFD. 50 V.	30
42	5A-8986	C23	CAPACITOR, ELECT., 100 MFD. 10 V.	1
43	5A-8996	C22, C24	CAPACITOR, CERAMIC, .1 MFD. 50 V.	2
44	5A-9169	C25, C26	CAPACITOR, CERAMIC, 27 PFD. 1K V.	2
45	5A-9243	C27	CAPACITOR, TANT., 10 MFD. 10 V.	1
46	5A-9031	C31	CAPACITOR, TANT., 1 MFD. 25 V.	1
47	5A-9030	C32	CAPACITOR, CERAMIC, .047 MFD. 50 V.	1
48	5A-9065	C38 THRU C62	CAPACITOR, CERAMIC, 470 PFD. 50 V.	25
49	5A-9019	LED1, LED 2	LED, RED	2
50	5A-9024	SW1, SW 2	SWITCH, SPDT MOMENTARY	2
51	5A-9021		BATTERY HOLDER # 171	1
52	5A-9026	1J1	HEADER 09-64-1083	5
53	5A-9028	1J3, 1J4	HEADER 09-65-1041	2
54	5A-9027	1J2, 1J5, 1J6, 1J7	HEADER 09-65-1091	4
55	5A-8985		40 PIN IC SOCKET	1
56	5A-9004		24 PIN IC SOCKET	7
57		J1 THRU J6	WIRE JUMPER 22 GUADE WIRE WITH INSULATION	6
58		-TP1 THRU TP10	TERMINAL # 1502-1	10
59	5A-9250	IC1	MC6808 MICROPROCESSOR	1
60	5A-9366	IC14	FIREPOWER GAME ROM	1
61	5A-9015	IC21, IC22	PROM 512 X 8 7641/6341	2/3
62	5A-9022	B1, B2, B3	BATTERY, ALKALINE, 1.5 V.	3
63	3A-7520-1		TIE WRAP	1
64	5A-9266	D18	IN5817 DIODE	1
65	5A-9086	R95	RESISTOR, 6.8K OHM 10% 1/4 W	1

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

PART NAME				
CPU BOARD ASSEMBLY				
DWN. R. Gay	DATE 1-11-79	APP'D.	SCALE 2=1	PART NO. D-8161

CPU Board Assembly Drawing

REVISION LETTER	REVISION

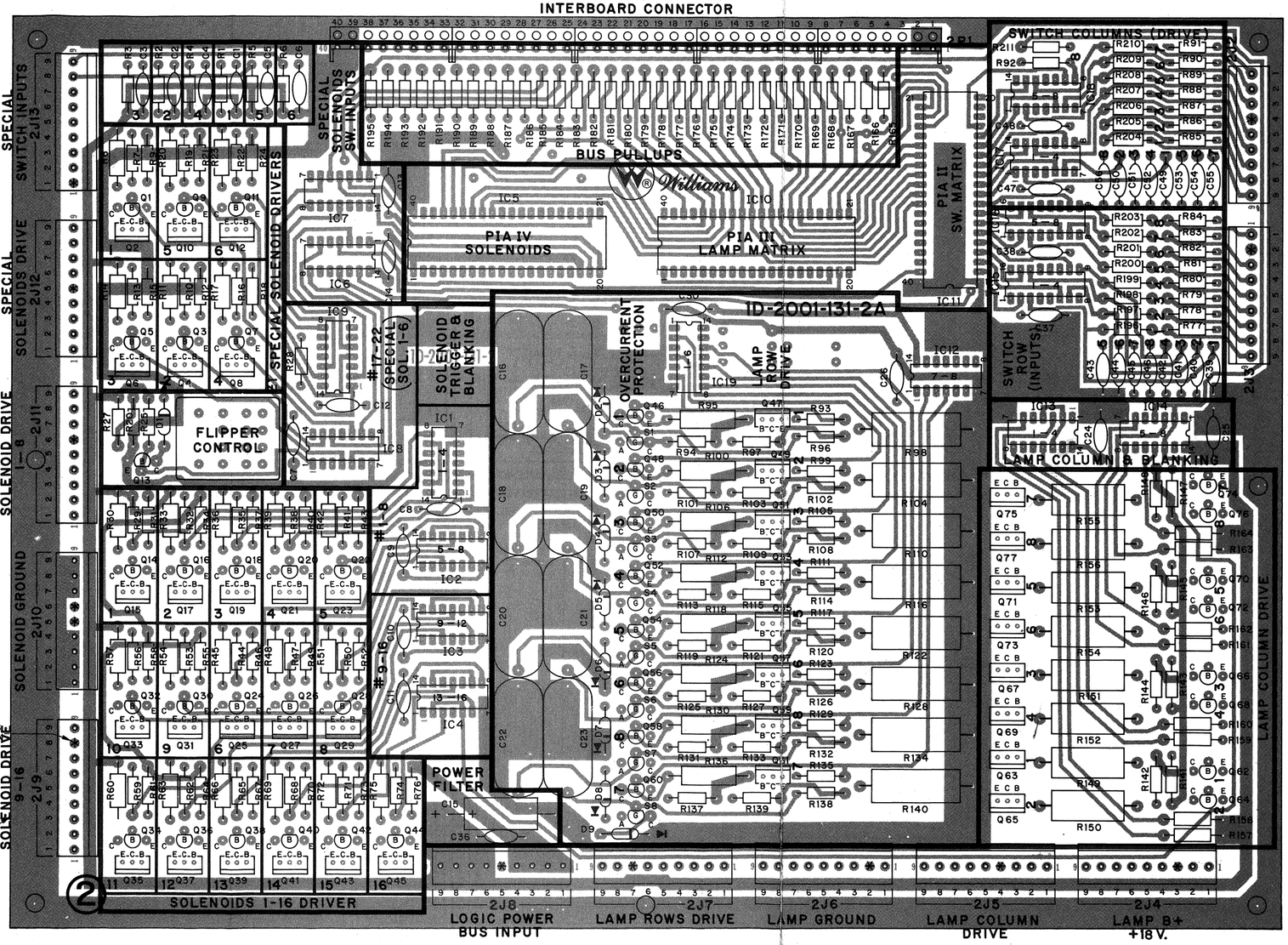
NOTES:

1. ALL RESISTORS 1/4W UNLESS OTHERWISE INDICATED.
2. ALL CAPACITORS ARE MFD UNLESS OTHERWISE INDICATED.
3. *WITH 6802 FOR IC1, IC13 MAY BE REMOVED AND MPU INTERNAL RAM ENABLED BY ADDING R4 AND REMOVING JUMPER J1.
   **WITH 6808 FOR IC1, IC13 MUST BE USED, R4 NOT USED, AND JUMPER J1 MUST BE CONNECTED.
4. WHEN IC14 GAME ROM IS USED IN PLACE OF PROMs JUMPER J3 MUST BE CONNECTED AND J4 REMOVED (IC14 ADDRESS 6000_{16}). WHEN IC14 GAME ROM **AND** PROMs ARE USED JUMPER J4 MUST BE CONNECTED AND J3 REMOVED (IC14 ADDRESS 6800_{16}).

WILLIAMS ELECTRONICS, INC.	
SUBSIDIARY OF XCOR CORPORATION	
3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240	
PART NAME	SCHEMATIC, CPU BOARD
DWN. R. Gay	DATE 2-13-79
APP'D.	SCALE 2=1
PART NO.	16D-8163

CPU Board Logic Diagram
9

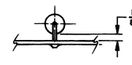
REVISION LETTER	REVISION
C	REVISED AND REDRAWN R. GAY 11-28-77
D	ITEM NO. 26, PT. NO. WAS 5A-8999 & ADDED MOUNTING NOTE FOR R149 THRU R156. R. GAY 4-11-78
E	DELETED ITEM NO. 36, PT. NO. 5A-8985, E.C.O. R. GAY 9-12-78
F	ADDED ITEM NO. 36 & ITEM NO. 22, DELETED (8) RESISTORS & QTY. WAS 32 E.C.O. 4624 R. GAY 10-4-78



BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	18-2001-131		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. INVENTER 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	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	TIP120 DARLINGTON NPN POWER TRANSISTOR	22
10	5A-8978	Q63, Q65, Q67, Q69, 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 C14, 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 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% ¼ W	62
21	5A-8983	R27	RESISTOR, FC, 3.3 K OHM 10% ¼ 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% ¼ W	24
23	5A-8992	R7, R10, R13, R16, R19, R22, R29, R32, R35, R38, R41, R44, R47, R50, R53, R56, R59, R62, R65, R68, R71, R74	RESISTOR, FC, 560 OHM 10% ¼ 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% ½ 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% ¼ W	23
26	5A-8817	R26	RESISTOR, FC, 10 K OHM 10% ¼ W	1
27	5A-8998	R141 THRU R148	RESISTOR, FC, 2.2 K OHM 10% ¼ 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, 1.5 K OHM 10% ¼ W	8
31	5A-9086	R94, R101, R107, R113, R119, R125, R131, R137	RESISTOR, FC, 6.8 K OHM 10% ¼ 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	5
35	5A-9027	2J2 THRU 2J13	9 PIN HEADER	12
36	5A-9001	R204 THRU R211	RESISTOR, FC, 330 OHM 10% ¼ W	8

★ R149 THRU R156 MUST BE MOUNTED $\frac{1}{8}$" ABOVE SURFACE OF BOARD.



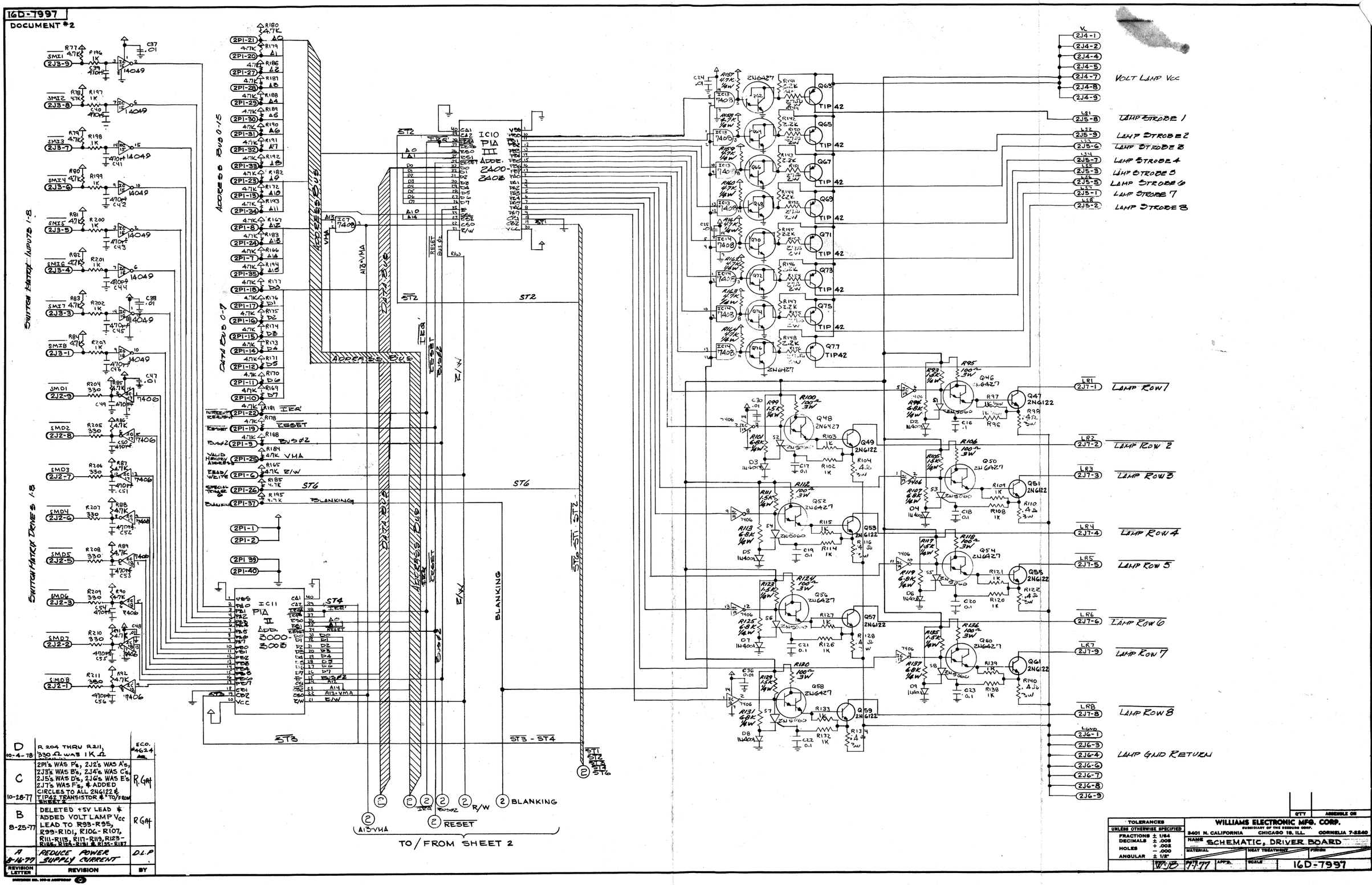
WILLIAMS ELECTRONICS, INC.
SUBSIDIARY OF XCOR CORPORATION
3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240

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

DOCUMENT #1

16D-7997

DOCUMENT #2



REVISION LETTER	REVISION	BY	ECO.
D 10-4-78	R 204 THRU R211, 330 Ω WAS 1K Ω		#4624
C 10-28-77	2P1's WAS P's, 2J2's WAS A's, 2J3's WAS B's, 2J4's WAS C's, 2J5's WAS D's, 2J6's WAS E's 2J7's WAS F's, & ADDED CIRCLES TO ALL 2N6122 & TIP42 TRANSISTOR & "TO/FROM SHEET 2"	R.GAT	
B 8-25-77	DELETED +5V LEAD & ADDED VOLT LAMP Vcc LEAD TO R95-R95, R99-R101, R106-R107, R111-R113, R117-R119, R123-R125, R129-R131 & R135-R137	R.GAT	
A 8-16-77	REDUCE POWER SUPPLY CURRENT	D.L.P.	

DISTRIBUTION NO. 100-10 ASSIGNMENT 0

TOLERANCES UNLESS OTHERWISE SPECIFIED	WILLIAMS ELECTRONIC MFG. CORP. SUBSIDIARY OF THE BEARING CORP. 3401 N. CALIFORNIA CHICAGO 18, ILL. CORNELIA 7-2240		
FRACTIONS ± 1/64	NAME SCHEMATIC, DRIVER BOARD		
DECIMALS ± .005			
HOLES + .002 − .000	MATERIAL	HEAT TREAT SPEC	FINISH
ANGULAR ± 1/8°	DRWN. W.B. 7-7-77	APPD.	SCALE

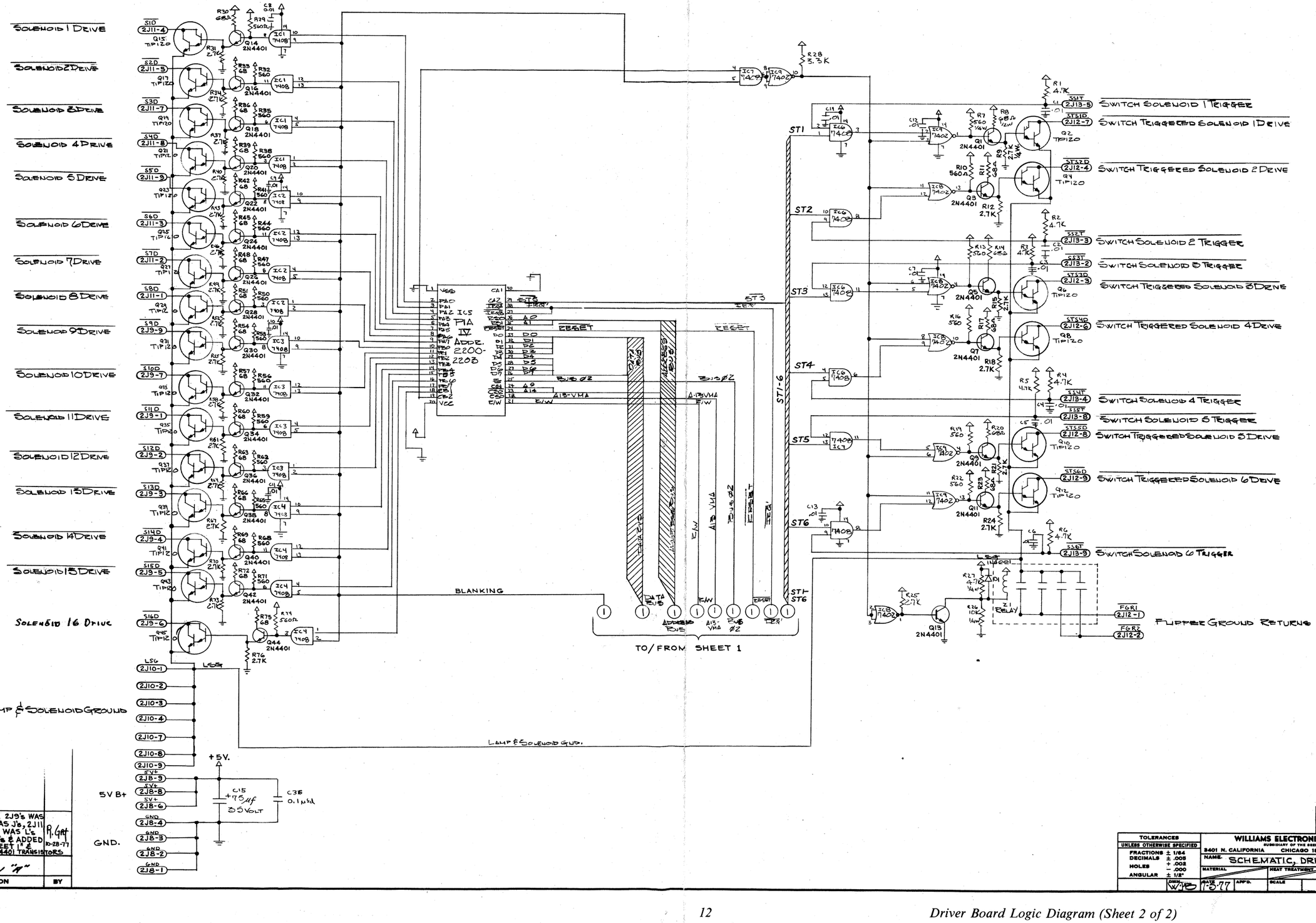
QTY ASSEMBLE ON

16D-7997

Driver Board Logic Diagram (Sheet 1 of 2) 11

DARLA

16D-7997
DOCUMENT #2



REVISION LETTER	REVISION	BY
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 R TO/FROM SHEET 1 & CIRCLES TO ALL 2N4401 TRANSISTORS	R. Gatt 10-28-77
A	REVISION "A"	

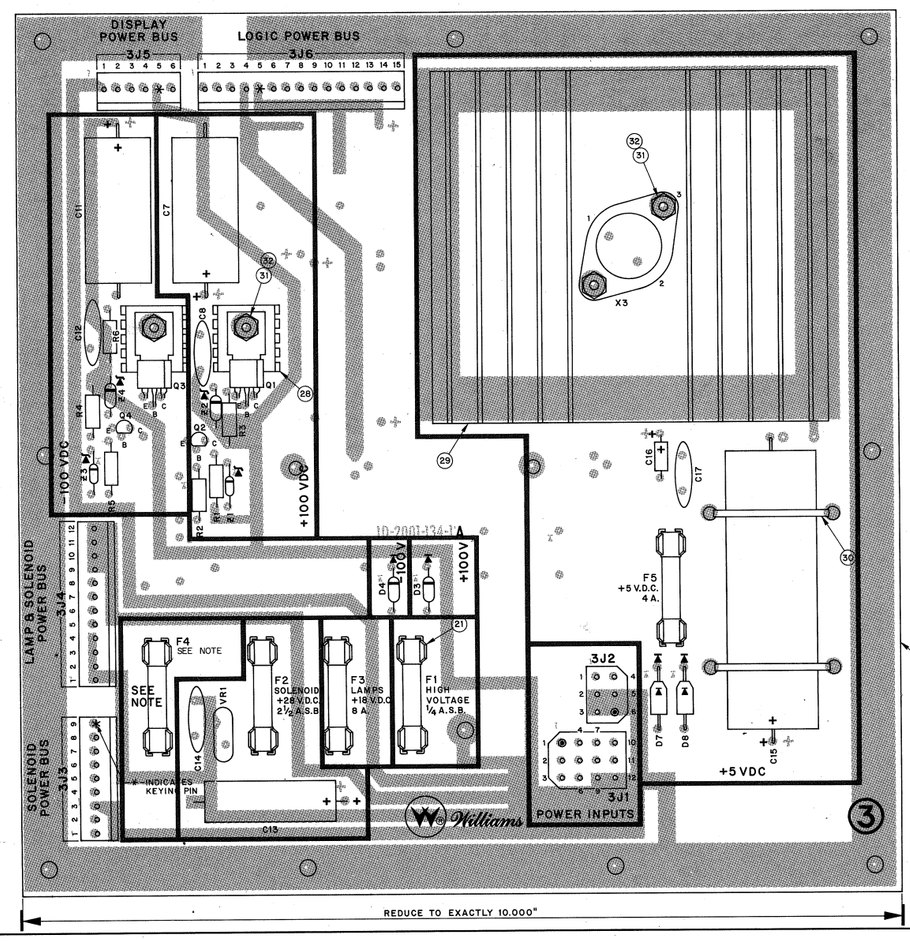
TOLERANCES UNLESS OTHERWISE SPECIFIED	WILLIAMS ELECTRONIC MFG. CORP. SUBSIDIARY OF THE BEBURNE CORP.
FRACTIONS ± 1/64	3401 N. CALIFORNIA CHICAGO 18, ILL. CORNELIA 7-2240
DECIMALS ± .005	NAME SCHEMATIC, DRIVER BOARD
HOLES + .002 − .000	MATERIAL / HEAT TREATMENT / FINISH
ANGULAR ± 1/2°	DRWN. WJB DATE 7-5-77 APPD. SCALE
	16D-7997

QTY ASSEMBLE ON

SHEET 2 OF 2

12 *Driver Board Logic Diagram (Sheet 2 of 2)*

REVISION LETTER	REVISION
	REVISED AND REDRAWN R.GAY 7-14-78



BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	10-2001-134		BARE P.C. BOARD	1
2	5A-9049	X3	3 AMP. 5 VOLT POSITIVE VOLTAGE REGULATOR	1
3	5A-9057	Q1	SDS-201 NPN TRANSISTOR	1
4	5C-9055	Q2	MPSD52 PNP TRANSISTOR	1
5	5A-9058	Q3	SDS-202 PNP TRANSISTOR	1
6	5C-9056	Q4	MPSD02 NPN TRANSISTOR	1
7	5B-9054	D3, D4	IN4001 DIODE	2
8	5B-9045	D7, D8	MR500 DIODE	2
9	5A-9059	Z1, Z3	IN5990 ZENER DIODE	2
10	5B-9060	Z2, Z4	IN4764 ZENER DIODE	2
11	5B-9064	VR1	VARISTOR	1
12	5B-9062	R1, R4	RESISTOR, FC, 39K OHM 10% ½ W	2
13	5B-9061	R2, R5	RESISTOR, FC, 680 OHM 10% ½ W	2
14	5B-9069	R3, R6	RESISTOR, FC, 330 K OHM 10% ½ W	2
15	5A-9053	C7, C11	CAPACITOR, ELECT., 100 MFD. 150 V.	2
16	5A-9070	C13	CAPACITOR, ELECT., 100 MFD. 100 V.	1
17	5A-9046	C15	CAPACITOR, ELECT., 12,000 MFD. 16 V.	1
18	5A-9072	C8, C12, C14, C17	CAPACITOR, CERAMIC, .1 MFD. 500 V.	4
19			-	
20	5A-9031	C16	CAPACITOR, ELECT., 1 MFD. 25V.	1
21	5A-9052		FUSEHOLDER	10
22	5A-9068	J1	12 PIN CONNECTOR	1
23	5A-9067	J2	6 PIN HEADER CONNECTOR	1
24	5A-9027	J3	9 PIN HEADER CONNECTOR	1
25	5A-9043	J4	12 PIN HEADER CONNECTOR	1
26	5A-9038	J5	15 PIN HEADER CONNECTOR	1
27	5A-9074	J6	6 PIN CIRCUIT CONNECTOR	1
28	5A-9042		HEAT SINK	2
29	5B-9041		4" X 4½" HEAT SINK	1
30	5A-7520-1		TIE WRAP	2
31			5-40 X 7/16 R.H. MECH. SCREW	4
32			5-40 HEX. NUT	4
33	5A-8761	F1	S.B. FUSE ¼ AMP.	1
34	5A-9128	F2	S.B. FUSE 2.5 AMP.	1
35	5A-9071	F3	FUSE 8 AMP.	1
* 36	5A-6508 OR 5A-6567 OR 5A-9127	F4	FUSE 10 AMP. (FLIPPER) FUSE 15 AMP. (DUAL ACTION FLIPPER) FUSE 20 AMP. (SHUFFLE ALLEYS)	1
37	5A-6314	F5	S.B. FUSE 4 AMP.	1

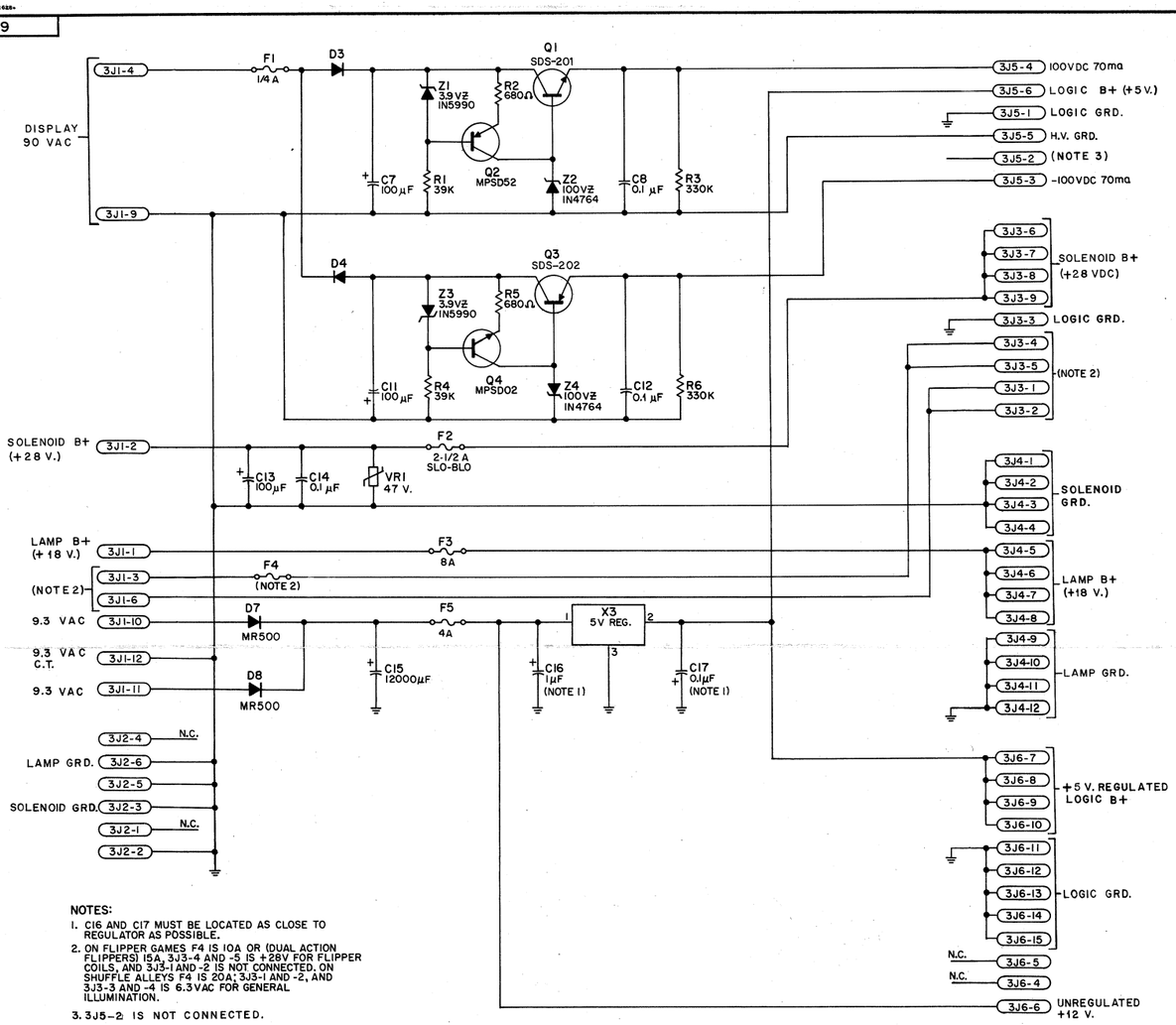
NOTE:
F4 IS FLIPPER FUSE ON FLIPPER GAMES AND GENERAL ILLUMINATION ON SHUFFLE ALLEYS.

WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF SCM CORPORATION			
3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240			
PART NAME POWER SUPPLY BOARD ASSEMBLY			
DWN. D.D.G.	DATE 8-15-77	APP'D.	SCALE 2=1
PART NO. D-7999			

DOCUMENT #1

FDC CORP. 800 12-75 61688-

16C-7999



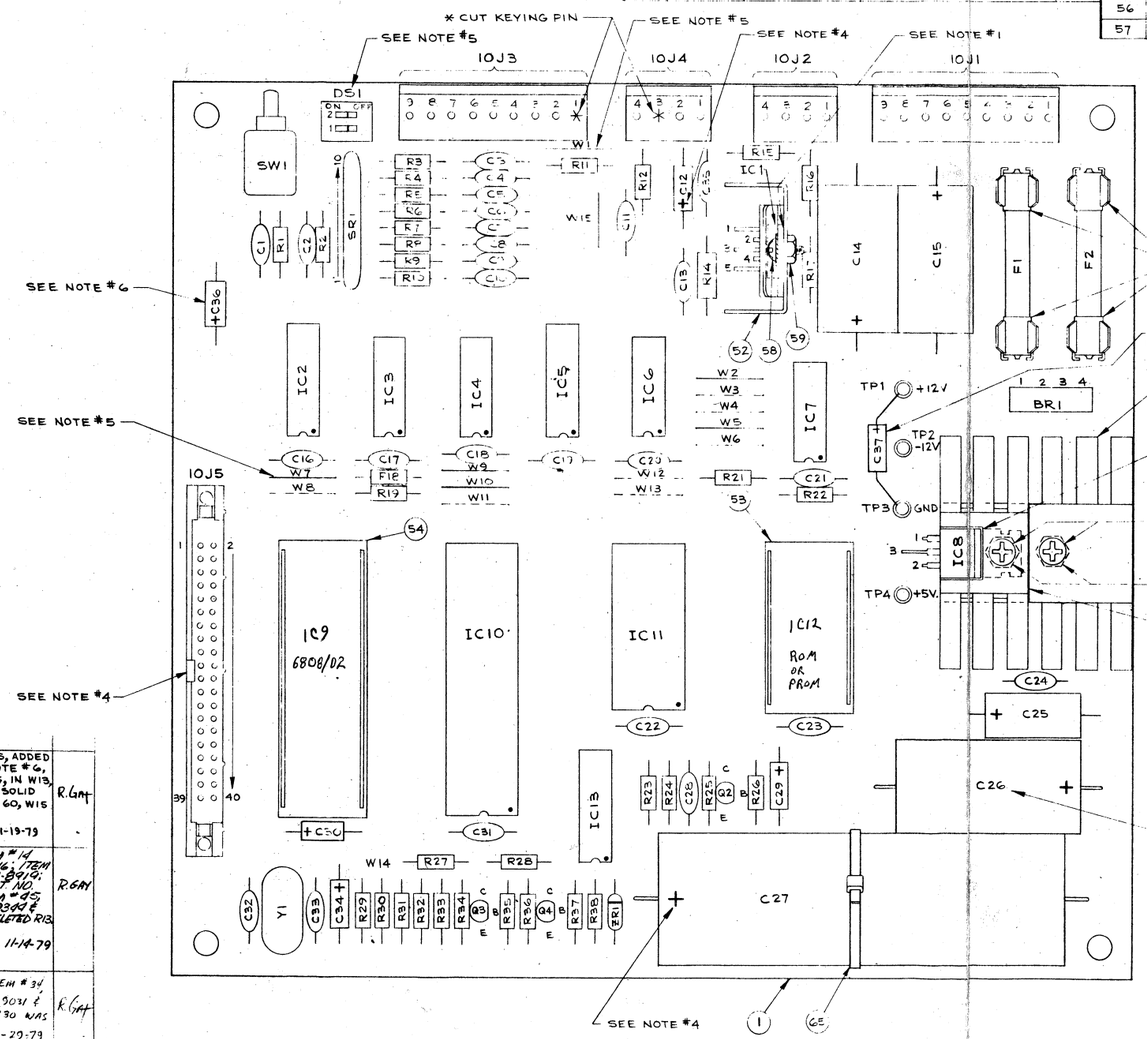
NOTES:
1. C16 AND C17 MUST BE LOCATED AS CLOSE TO REGULATOR AS POSSIBLE.
2. ON FLIPPER GAMES F4 IS 10A OR (DUAL ACTION FLIPPERS) 15A, 3J3-4 AND -5 IS +28V. FOR FLIPPER COILS, AND 3J3-1 AND -2 IS NOT CONNECTED. ON SHUFFLE ALLEYS F4 IS 20A, 3J3-1 AND -2, AND 3J3-3 AND -4 IS 6.3VAC FOR GENERAL ILLUMINATION.
3. 3J5-2 IS NOT CONNECTED.
4. UNLESS OTHERWISE INDICATED ALL RESISTORS ARE ½ W. AND ALL DIODES ARE TYPE 1N4004.

REVISION LETTER	REVISION	BY
A	REDRAWN, WAS D SIZE, F4 AND NOTES 2,3,4 ADDED	5-9-79

TOLERANCES		QTY.	ASSEMBLE ON
UNLESS OTHERWISE SPECIFIED	WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF THE SEEBURG CORP. OF DELAWARE		
FRACTIONAL ± 1/64	3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240		
DECIMAL ± .005	NAME SCHEMATIC, POWER SUPPLY BOARD		
HOLE DIA. +.002 -.000			
ANGULAR ± 1°	MATERIAL —	HEAT TREATMENT —	FINISH —
CONCENTRICITIES T.I.R. .003			
SCREW THREADS CLASS 2	DWN. A.V.	DATE 5-10-79	APP'D.
	SCALE —	16C-7999	

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
58			6-32 x 3/8" BINDER HEAD SCREW	3
59			6-32 HEX NUT	3
60		W1, W2, W5, W7, W9, W10, W15	WIRE JUMPER 22 GAUGE WIRE WITH INSULATION	7
61	5A-9248	TP1 THR TP4	TERMINAL # 1502-1	4
62	5A-9363	R11	RESISTOR, FC, 5.6 K OHM 5% 1/4 WATT	1
64	5A-9362	SR1	RESISTOR, 4.7 K OHM 10 PIN SIP	1
65	3A-7520-1		TIE WRAP	1

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



NOTES:

1. USE THERMAL COMPOUND BETWEEN IC8 AND HEAT SINK.
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, C13, C15, C25, C26, C27.
   CONNECTORS 10J1, 10J2, 10J4, 10J3, 10J5.
   POSITION OF TRANSISTORS Q1, Q2, Q3, Q4.
5. DS1 - 1 SELECTS SOUNDS/NOTES
   2 SELECTS SPEECH/NO SPEECH (W9/W4)
   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
6. SOLDERED ON TOP OF BOARD
7. INSTALL THESE JUMPERS FOR FOLLOWING GAMES:

W15, W8, W12, W4, W1, W3, W6, W11 FOR:

WORLD CUP DISCO FEVER CONTACT POKERINO PHOENIX ARISTOCRAT SHUFFLE POMPELLI SHUFFLE KING TUT SHUFFLE TAURUS SHUFFLE	SOUND ROM 1

W15, W8, W12, W4, W1, W2, W5, W10, FOR:

FLASH STELLAR WARS TRI ZONE TIME WARP	SOUND ROM 1 5A-9198

W7, W15, W9, W1, (SEE NOTE #5) W2, W5, W10 FOR:

GORGAR; SOUND ROM 2 - 5T-4960

IC 12 SELECTION STRAPPING:

(2K x 8)	(1K x 8)	(512 x 8)
W2	W3	W3
W5 IN	W5 IN	W6 IN
W10	W6	W11

BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	IC-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/TO220 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	IN5996 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, R22, R27, R30, 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-8983	R23, R24, R26	RESISTOR, FC, 3.3K OHM 10% 1/4 WATT	3
27	5A-9179	R25	RESISTOR, FC, 3.3 M OHM 10% 1/4 WATT	1
28	5A-9359	R29	RESISTOR, FC, 47 K OHM 5% 1/4 WATT	1
29	5B-8817	R33, R35, R37	RESISTOR, FC, 10 K 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 C28 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-9305	C12, C30, C36	CAPACITOR, ELECTROLYTIC 1 MFD. 63 V. -10/+ 50%	3
35	5A-8996	C13, C24, C35	CAPACITOR, CERAMIC, .1 MFD. 50 V. ±20%	3
36	5A-9165 5A-9165-1	C14	CAPACITOR, ELECTROLYTIC, 800 MFD. 16 V. OR 1,000 MFD. 15 V. ±20%	1
37	5A-9164 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 ±20%	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

REVISION LETTER	REVISION	BY
E	REVISED NOTES, ADDED ITEM #45 & NOTE #6, RELOCATED W15, IN W13, DASH LINE WAS SOLID LINE & ITEM #60, W15 WAS W13 E.C.O. 11-19-79	R.GAY
D	DELETED ITEM #14 PT. NO. 5C-9016 ITEM #16 PT. NO. 5A-9010, ITEM #25 PT. NO. 5A-9314 ITEM #35 PT. NO. 5A-9390 & IN ITEM #21, DELETED R13 QTY. WAS 6 E.C.O. 9764 11-14-79	R.GAY
C	ADDED C36, ITEM #34 PT NO WAS 5A-9031 & QTY WAS 1, & C30 WAS .01 MFD. E.C.O. 9760 10-29-79	R.GAY
B	DELETED ITEM #62 ADDED R1 & R12 TO ITEM #14 QTY WAS 7 10-5-79	R.G.
A	ITEM #13, ADDED 5A-9357 ITEM #52, ADDED PT NO ITEM #62 ADDED PT NO. 10-4-79	R.G.

DIETZGEN NO. 186H AGEPROOF

TOLERANCES	QTY.	ASSEMBLE ON
UNLESS OTHERWISE SPECIFIED FRACTIONAL ±1/64" DECIMAL .XX ±.005" HOLE DIA. +.003 -.000" ANGULAR ±1/2° CONCENTRICITIES .T.I.R. .005" SCREW THREADS CLASS 2		

WILLIAMS ELECTRONICS, INC.
SUBSIDIARY OF THE BEBURG CORP.
3401 N. CALIFORNIA CHICAGO, ILL. 60618 267-2240

NAME SOUND BOARD SUB-ASSEM

MATERIAL	HEAT TREATMENT	FINISH

DWN.	DATE	APP'D.	SCALE	
R.G.A.Y.	9-23-79		2:1	D-8228

IGD-8224

SPEAKER 8 OHM

VOLUMN CONTROL

SOUND/SPEECH SELECT INPUT

SPARE

IC1 IC2 7442 IC3 7400 IC4 7408 IC5 4050 IC6 4068 IC7 14069 IC8 7805 IC9 6808/02 IC10 6821 IC11 6810 IC12 F800 IC13 1408

Q2 2N4401 Q3 2N4401 Q4 2N4401

SW1 DIAGNOSTIC SWITCH

DS1 OFF→ON

BRI MDA 200

F1 4 A.S.B. F2 4 A.S.B.

Y1 3.58 MHz.

ZR1 6.8V. ZENER

+12V. UNREG.

DIGITAL GND
ANALOG GND
+5 VOLTS DIGITAL
+5 VOLTS ANALOG
-12 VOLTS
SOUND ANALOG
MIXED SOUND/SPEECH
SPEECH CLOCK
SPEECH DATA
R/W
RESET

CONTROL BUS
DATA BUS
ADDRESS BUS

BUS φ2
BUS φ2 · VMA
VMA
IRQ
R/W
RESET

W1 W2 W3 W4 W5 W6 W7 W8 W9 W10 W11 W12 W13 W14 W15 W16 W17

FOIL JUMPER

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

REVISION LETTER	REVISION	BY
C	DELETED: K1 (RELAY), D1 & D2 (1N4148) & S1 (2N4403), R23,R10 & R28 (FLEX) BOARD W15 E.C.O 4764 11-14-79	R.G.
B	ADDED C32 & C33 W16 & W17 .01 MFD 10-23-79	R.G.
A	10/23/79 C12,C14,C15, Polarity Reversed	R
D	ADDED C37 & IN W13, DASH LINE WAS SOLID LINE E.C.O 11-19-79	R.G.

DIETZGEN NO. 198H AGEPROOF

TOLERANCES UNLESS OTHERWISE SPECIFIED		QTY.	ASSEMBLE ON
FRACTIONAL ±1/64"	WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF THE BEBBING CORP.		
DECIMAL .X ±.005"	3401 N. CALIFORNIA CHICAGO, ILL. 60618 267-2240		
HOLE DIA. .XXX +.003 -.000"	NAME SCHEMATIC, SOUND BOARD		
ANGULAR ±1/2°			
CONCENTRICITIES .Y.I.R. .003"	MATERIAL	HEAT TREATMENT	FINISH
SCREW THREADS CLASS 2			
DWN. R.G.	DATE 10-10-79	APP'D.	SCALE
			16D-8224

13.5
12.5
4.9

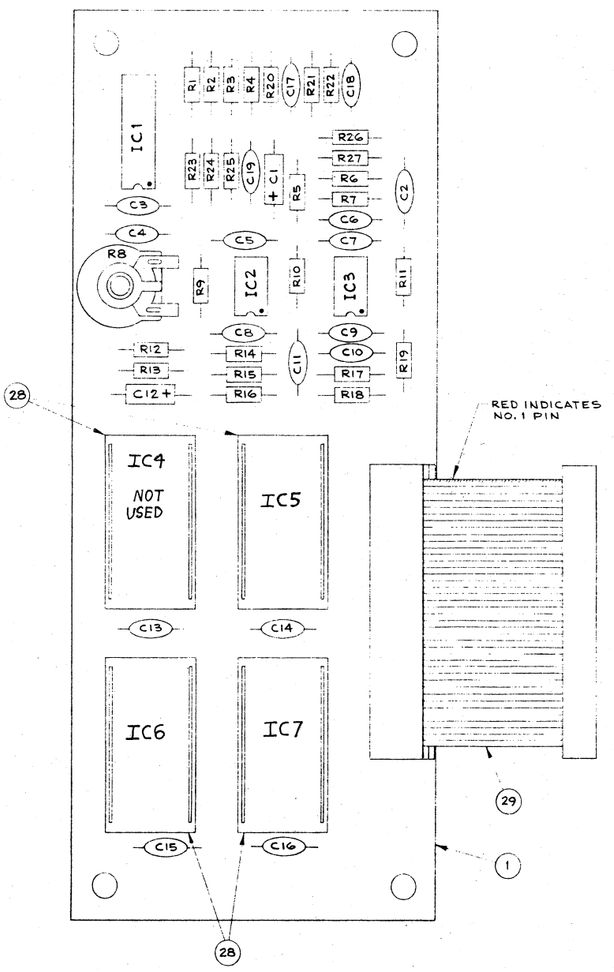
C.37 C.26 C.27

Sound Board Logic Diagram
15

FDC CORP. 800 5-79 67182+

C-8225

IC 1
SSS16



BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. 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% ¼ WATT	4
5	5A 8776	R2	RESISTOR, FC, 68K OHM 5% ¼ WATT	1
6	5A-8983	R3	RESISTOR, FC, 3.3 K OHM 10% ¼ WATT	1
7	5B-8817	R5, R16	RESISTOR, FC, 10 K OHM 10% ¼ WATT	2
8	5A-8773	R6	RESISTOR, FC, 18 K OHM 5% ¼ WATT	1
9	5A-9353	R7	RESISTOR, FC, 6.2 K OHM 5% ¼ WATT	1
10	5A-9324	R9, R10, R11, R15, R18, R19	RESISTOR, FC, 27 K OHM 10% ¼ WATT	6
11	5B-8997	R12, R13	RESISTOR, FC, 2.7 K OHM 10% ¼ WATT	2
12	5A-8772	R14, R17	RESISTOR, FC, 15K OHM 5% ¼ WATT	2
13	5A-9314	R20	RESISTOR, FC, 1.2 K OHM 10% ¼ WATT	1
14	5A-9331	R21	RESISTOR, FC, 13K OHM 10% ¼ WATT	1
15	5A-9185	R8	POTENTIOMETER, 5K OHM	1
16	5A-9218	R24	RESISTOR, FC, 2.2 M. OHM 10% ¼ WATT	1
17	5A-8984	R25, R27	RESISTOR, FC, 1 K OHM 10% ¼ WATT	1
18	5A-9356	R26	RESISTOR, FC, 820 OHM 5% ¼ 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		24 PIN SOCKET	4
29	5A 9354	J1	RIBBON CABLE ASSEM	1

REVISION LETTER	REVISION	BY

TOLERANCES
UNLESS OTHERWISE SPECIFIED
FRACTIONAL ± 1/64"
DECIMAL .X ± .005"
HOLE DIA .XXX ± .002" .XXXX ± .001"
ANGULAR ± 1/2°
CONCENTRICITIES .T.I.R. .003"
SCREW THREADS CLASS 2

QTY. | ASSEMBLE ON

WILLIAMS ELECTRONICS, INC.
SUBSIDIARY OF THE SEEBURG CORP. OF DELAWARE
3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240

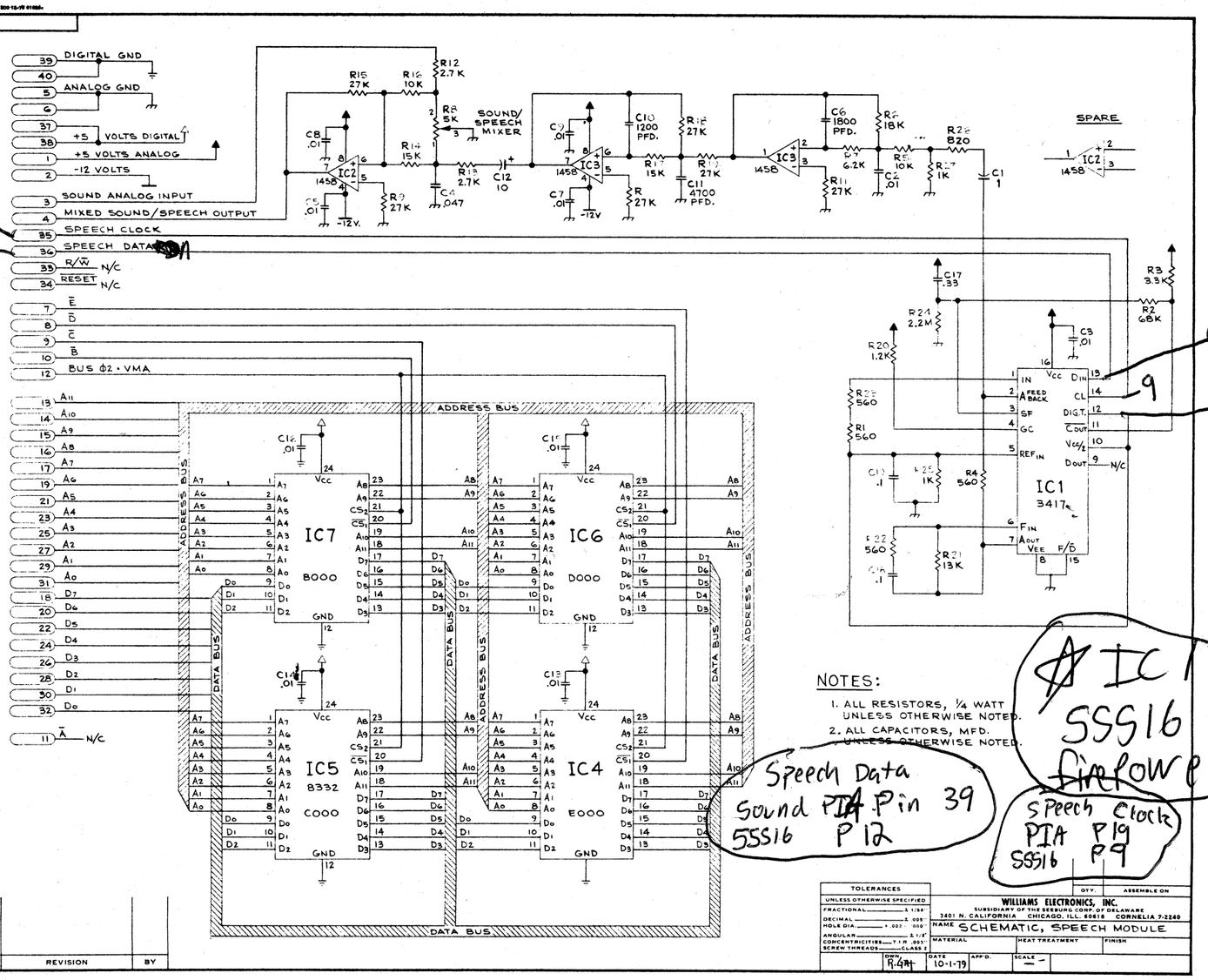
NAME SPEECH MODULE ASSEMBLY

MATERIAL | HEAT TREATMENT | FINISH

DWN. R.G.H. | DATE 9-28-79 | APP'D. | SCALE 2:1 | C-8226

FDC CORP. 800 10-78 61488+

PIA 19
PIA 39



REVISION LETTER	REVISION	BY

TOLERANCES
UNLESS OTHERWISE SPECIFIED
FRACTIONAL ± 1/64"
DECIMAL .X ± .005"
HOLE DIA .XXX ± .002" .XXXX ± .001"
ANGULAR ± 1/2°
CONCENTRICITIES .T.I.R. .003"
SCREW THREADS CLASS 2

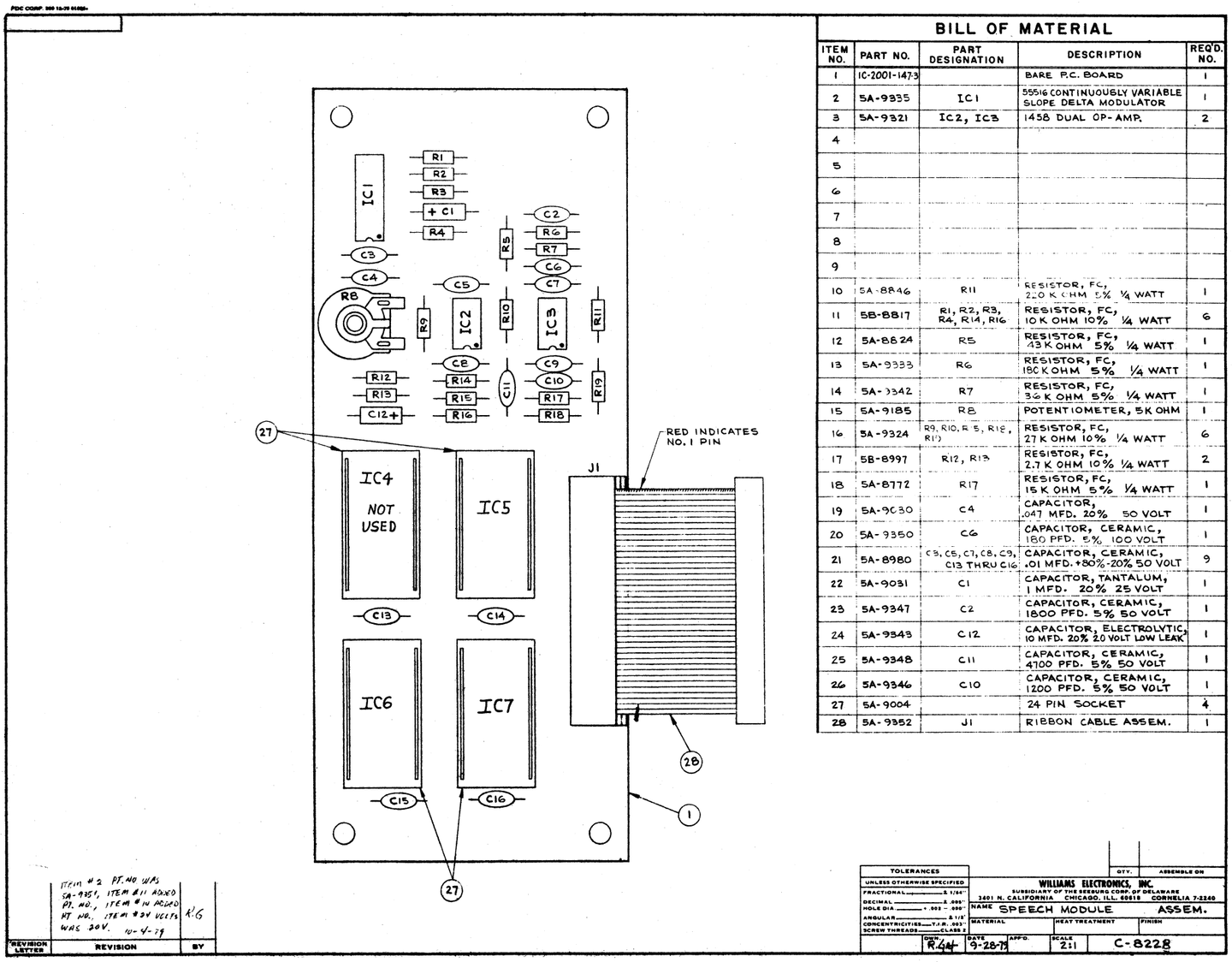
QTY. | ASSEMBLE ON

WILLIAMS ELECTRONICS, INC.
SUBSIDIARY OF THE SEEBURG CORP. OF DELAWARE
3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240

NAME SCHEMATIC, SPEECH MODULE

MATERIAL | HEAT TREATMENT | FINISH

DWN. R.G.H. | DATE 10-1-79 | APP'D. | SCALE —

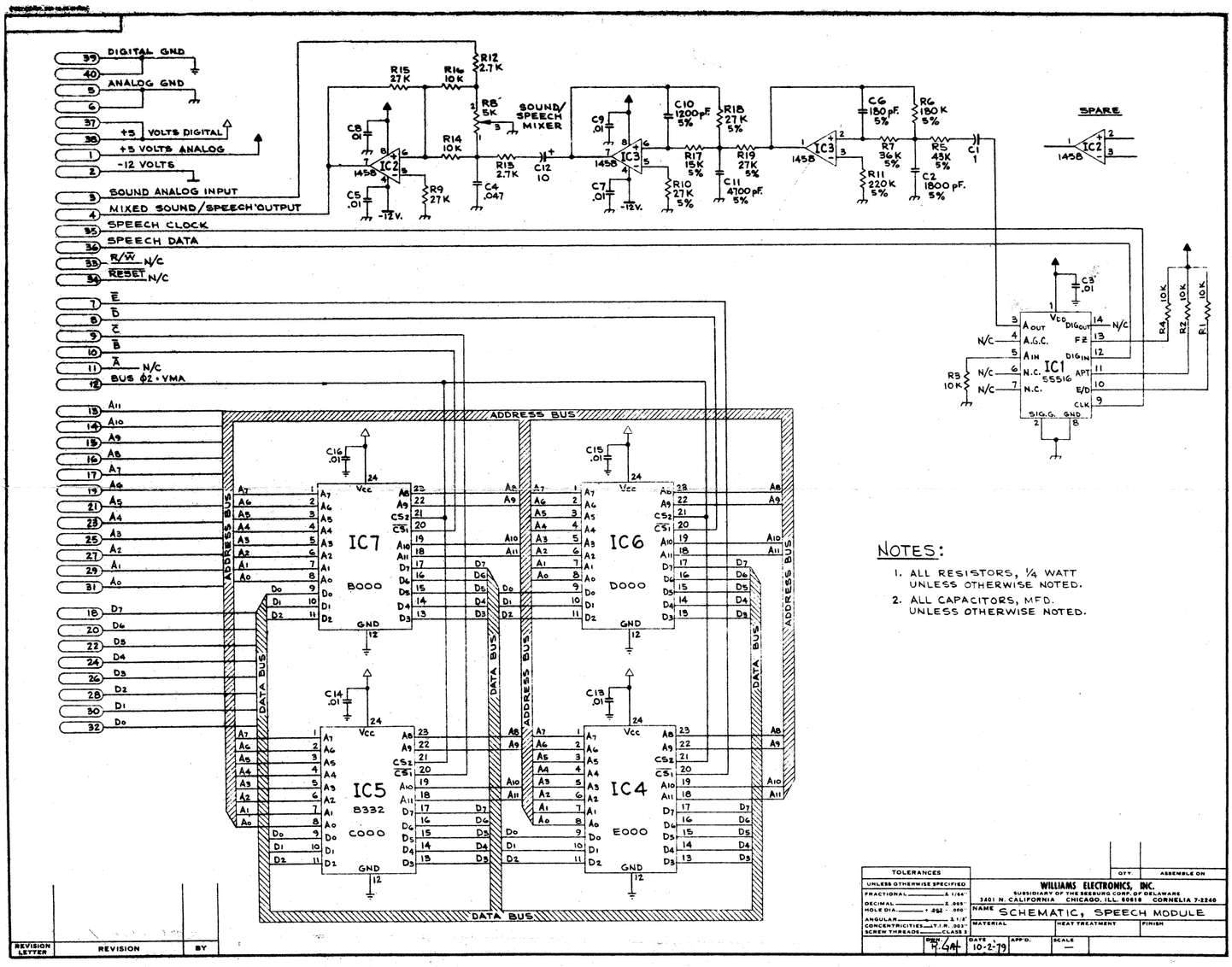


BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D NO.
1	IC-2001-1473		BARE P.C. BOARD	1
2	5A-9335	IC1	55516 CONTINUOUSLY VARIABLE SLOPE DELTA MODULATOR	1
3	5A-9321	IC2, IC3	1458 DUAL OP-AMP.	2
4				
5				
6				
7				
8				
9				
10	5A-8846	R11	RESISTOR, FC, 2.20 K OHM 5% ¼ WATT	1
11	5B-8817	R1, R2, R3, R4, R14, R16	RESISTOR, FC, 10 K OHM 10% ¼ WATT	6
12	5A-8824	R5	RESISTOR, FC, 43 K OHM 5% ¼ WATT	1
13	5A-9333	R6	RESISTOR, FC, 180 K OHM 5% ¼ WATT	1
14	5A-9342	R7	RESISTOR, FC, 36 K OHM 5% ¼ WATT	1
15	5A-9185	R8	POTENTIOMETER, 5K OHM	1
16	5A-9324	R9, R10, R 5, R12, R13	RESISTOR, FC, 27 K OHM 10% ¼ WATT	6
17	5B-8997	R12, R13	RESISTOR, FC, 2.7 K OHM 10% ¼ WATT	2
18	5A-8772	R17	RESISTOR, FC, 15 K OHM 5% ¼ WATT	1
19	5A-9030	C4	CAPACITOR, .047 MFD. 20% 50 VOLT	1
20	5A-9350	C6	CAPACITOR, CERAMIC, 180 PFD. 5% 100 VOLT	1
21	5A-8980	C8, C5, C7, C8, C9, C13 THRU C16	CAPACITOR, CERAMIC, .01 MFD. +80%-20% 50 VOLT	9
22	5A-9031	C1	CAPACITOR, TANTALUM, 1 MFD. 20% 25 VOLT	1
23	5A-9347	C2	CAPACITOR, CERAMIC, 1800 PFD. 5% 50 VOLT	1
24	5A-9343	C12	CAPACITOR, ELECTROLYTIC, 10 MFD. 20% 2.0 VOLT LOW LEAK	1
25	5A-9348	C11	CAPACITOR, CERAMIC, 4700 PFD. 5% 50 VOLT	1
26	5A-9346	C10	CAPACITOR, CERAMIC, 1200 PFD. 5% 50 VOLT	1
27	5A-9004		24 PIN SOCKET	4
28	5A-9352	J1	RIBBON CABLE ASSEM.	1

REVISION LETTER	REVISION	BY
	ITEM # 2 PT. NO WAS 5A-9351, ITEM #11 ADDED PT. NO., ITEM # IN ADDED PT. NO., ITEM #24 VOLTS WAS 30V. 10-4-79	R.G

TOLERANCES		QTY.	ASSEMBLE ON
UNLESS OTHERWISE SPECIFIED	WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF THE SEEBURG CORP. OF DELAWARE 3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240		
FRACTIONAL ± 1/64"	NAME SPEECH MODULE ASSEM.		
DECIMAL ± .005			
HOLE DIA + .005 - .000			
ANGULAR ± 1/2°	MATERIAL	HEAT TREATMENT	FINISH
CONCENTRICITIES T.I.R. .003"			
SCREW THREADS CLASS 2	DWN. R.G.H. DATE 9-28-79 APP'D.	SCALE 2:1	C-8228



NOTES:

1. ALL RESISTORS, ¼ WATT UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS, MFD. UNLESS OTHERWISE NOTED.

REVISION LETTER	REVISION	BY

TOLERANCES		QTY.	ASSEMBLE ON
UNLESS OTHERWISE SPECIFIED	WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF THE SEEBURG CORP. OF DELAWARE 3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240		
FRACTIONAL ± 1/64"	NAME SCHEMATIC, SPEECH MODULE		
DECIMAL ± .005			
HOLE DIA + .002 - .000			
ANGULAR ± 1/2°	MATERIAL	HEAT TREATMENT	FINISH
CONCENTRICITIES T.I.R. .003"			
SCREW THREADS CLASS 2	DWN. R.G.H. DATE 10-2-79 APP'D.	SCALE —	

DIGIT CROSS-REFERENCE

DIGIT	7-SEGMENT DECODER	STROBE
Master 1 (Left)	IC5	15
Master 2	IC5	16
Master 3	IC5	7
Master 4 (Right)	IC5	8
#1 100,000	IC5	1
#1 10,000	IC5	2
#1 1,000	IC5	3
#1 100	IC5	4
#1 10	IC5	5
#1 Units	IC5	6
#2 100,000	IC5	9
#2 10,000	IC5	10
#2 1,000	IC5	11
#2 100	IC5	12
#2 10	IC5	13
#2 Units	IC5	14
#3 100,000	IC7	1
#3 10,000	IC7	2
#3 1,000	IC7	3
#3 100	IC7	4
#3 10	IC7	5
#3 Units	IC7	6
#4 100,000	IC7	9
#4 10,000	IC7	10
#4 1,000	IC7	11
#4 100	IC7	12
#4 10	IC7	13
#4 Units	IC7	14

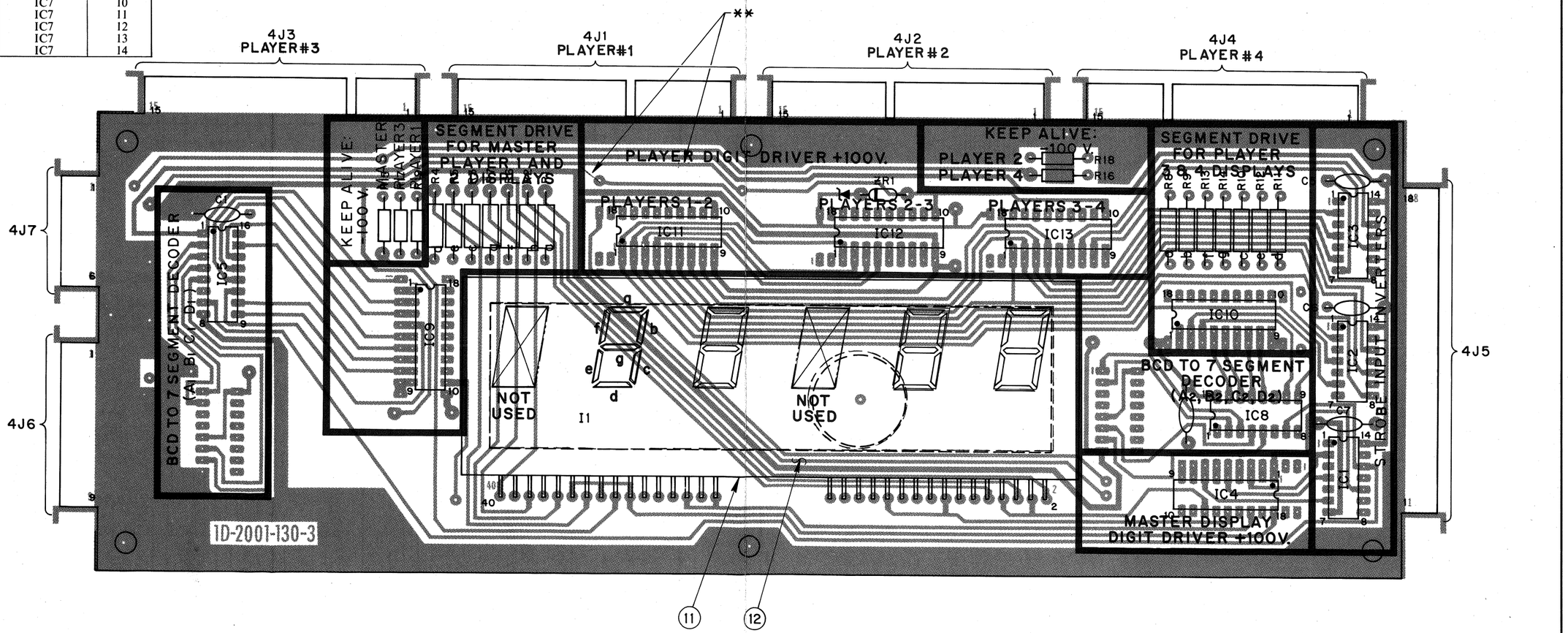
NOTES:

* - IF IC11, IC12, IC13 & IC14 ARE DIONICS-512 DRIVERS THEN R1 - R14 ARE 5A-9149 RES., F.C., 15K OHM ±10% ½ W. ZR1 NOT USED.

** - CUT & JUMP ON +100V. NOT IMPLEMENTED.

BILL OF MATERIAL

	ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
	1	ID-2001-130-3		BARE P.C. BOARD	1
	2	5A-8971	IC1, IC2, IC3	MC14069 HEX. INVERTER	3
	3	5A-8970	IC5, IC8	MC14543 BCD TO SEVEN SEGMENT LATCH/DECODER/DRIVER	2
	4	5A-8969	IC9, IC10	UDN-7180 GAS DISGHARGE DISPLAY SEGMENT DRIVER	2
*	5	5A-8968	IC4, IC11, IC12, IC13	UDN-6184 GAS DISCHARGE DISPLAY SEGMENT DRIVER	2
*	6	5B-8981	R1 THRU R14	RESISTOR, FC, 10K OHM 10% ½W	14
	7	5B-8982	R15 THRU R19	RESISTOR, FC, 3 MEG OHM 10% ¼W	5
	8	5A-9135	ZR1	1N4740A ZENER DIODE, 10V. 5% 1W	1
	9	5A-8980	C1, C4 THRU C7	CAPACITOR, CERAMIC, .01 MFD. 50V.	5
**	10			JUMPER, #22 GA. SOLID WIRE	1
	11	5B-8966	I1	6 DIGIT DISPLAY	1
	12	23A 6542		DISPLAY MTG. ADHESIVE FORM	1



WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF XCOR CORPORATION 3401 N. CALIFORNIA CHICAGO, ILL 60618 CORNELIA 7-2240				
PART NAME MASTER DISPLAY ASSEMBLY				
DWN. R. Gay	DATE 1-30-79	APP'D.	SCALE 2=1	PART NO. D-8000

D8000 Master Display Board Assembly Drawing (IC Drivers)

16D-8000
DOCUMENT #2

STROBE 8 — 4J5-1 N.C. — 4J5-2
STROBE 7 — 4J5-3
STROBE 14 — 4J5-14
STROBE 13 — 4J5-16
STROBE 12 — 4J5-17
STROBE 11 — 4J5-13
STROBE 10 — 4J5-12
STROBE 9 — 4J5-15
STROBE 16 — 4J5-4
STROBE 15 — 4J5-5
STROBE 6 — 4J5-11
STROBE 5 — 4J5-10
STROBE 4 — 4J5-9
STROBE 3 — 4J5-8
STROBE 2 — 4J5-7
STROBE 1 — 4J5-6
4J5-18 N.C.

C7 .01, C5 .01, C6 .01 — IC1, IC3, IC2 — 14069

* USE EITHER IC6 & IC7 OR IC5 & IC8 (DO NOT INTERMIX OR USE ALL FOUR AT THE SAME TIME).

C1 .01 — IC5 MC14543 (LD, Ph)
C2 .01 — IC6 MC14558
C3 .01 — IC7 MC14558
C4 .01 — IC8 MC14543 (LD, Ph)

BCD SEG. DATA
A1 4J6-5
B1 4J6-1
C1 4J6-2
D1 4J6-4
A2 4J6-9
B2 4J6-6
C2 4J6-7
D2 4J6-8
BLANKING 4J6-3

4J7-1 CATHODE KEEP ALIVE (-100 V.D.C.)
4J7-2 +100 V.
4J7-3 +5 V.D.C.
4J7-4 N.C.
4J7-5 GND
4J7-6 -100 V.
ZR1 ***

IC4 UDN-6184 OR DI-0512 — +100 V.
GD1 — NOT USED, 31/33, 25/27, NOT USED, 9/13, 3/5
35 38 40 36 34 6 4 2 32
R15 3 MEG.

IC9 7180 — -100 V.
R1 R2 R3 R4 R5 R6 R7 — ALL 10K **
IC10 7180 — -100 V.
R8 R9 R10 R11 R12 R13 R14 — ALL 10K **

NOTES:
** IF IC4, IC11, IC12, IC13 ARE DI-0512, R1-R14 ALL 15K.
*** IF IC4, IC11, IC12, IC13 ARE UDN-6184, +100V. TRACE 15 CUT AND ZR1 ADDED.

IC13 UDN-6184 OR DI-0512 — +100 V.
4J4-8 UNITS
4J4-9 10's
4J4-10 100's
4J4-12 1,000's
4J4-13 10,000's
4J4-14 100,000's
} PLAYER #4
4J4-7 a
4J4-6 b
4J4-3 c
4J4-1 d
4J4-2 e
4J4-5 f
4J4-4 g
} SEGMENTS
4J4-15 CATHODE KEEP ALIVE
4J4-11 KEY
R16 3 MEG.

IC12 UDN-6184 OR DI-0512 — +100 V.
4J3-8 UNITS
4J3-7 10's
4J3-2 100's
4J3-3 1,000's
4J3-5 10,000's
4J3-6 100,000's
} PLAYER #3
4J3-9 a
4J3-10 b
4J3-13 c
4J3-15 d
4J3-14 e
4J3-11 f
4J3-12 g
} SEGMENTS
4J3-1 CATHODE KEEP ALIVE
4J3-4 KEY
R17 3 MEG.

IC11 UDN-6184 OR DI-0512 — +100 V.
4J2-2 UNITS
4J2-3 10's
4J2-4 100's
4J2-5 1,000's
4J2-14 10,000's
4J2-15 100,000's
} PLAYER #2
4J2-13 a
4J2-12 b
4J2-8 c
4J2-6 d
4J2-7 e
4J2-11 f
4J2-10 g
} SEGMENTS
4J2-1 CATHODE KEEP ALIVE
4J2-9 KEY
R18 3 MEG.

4J1-1 UNITS
4J1-2 10's
4J1-3 100's
4J1-4 1,000's
4J1-5 10,000's
4J1-7 100,000's
} PLAYER #1
4J1-8 a
4J1-9 b
4J1-12 c
4J1-14 d
4J1-13 e
4J1-10 f
4J1-11 g
} SEGMENTS
4J1-15 CATHODE KEEP ALIVE
4J1-6 KEY
R19 3 MEG.

REVISION LETTER	REVISION	BY
G	(2)-NE584, (4)-NE585 & R20, R21, R22 REMOVED. ** AND *** NOTES ADDED.	A.V. 1/28/77
F	4J1-15, 4J2-1, 4J3-1 4J4-15 & 4J7-1 WAS "KEEP ALIVE (-100 V.D.C.)"	R.GAY
E	REVISED STROBE CONNECTOR	R.G.
D	CHANGE CONNECTOR DESIGNATIONS	DDG
C	4J1's WAS A's, 4J2's WAS B's 4J3's WAS C's, 4J4's WAS D's 4J5's WAS E's, 4J6's WAS F's 4J7's WAS G's, IN PLAYERS #1 THRU #4, UNITS WAS 100,000's 10's WAS 10,000's, 100's WAS 1,000's 1,000's WAS 100's, 10,000's WAS 10's & 100,000's WAS UNITS, ADDED "S" EACH DIGIT & "NOT USED" & DELETED "BLANK" 9-28-77	R.GAY
B	REDRAWN & REVISED 8-26-77	R.GAY

TOLERANCES UNLESS OTHERWISE SPECIFIED	WILLIAMS ELECTRONIC MFG. CORP. A SUBSIDIARY OF THE SEEBURG CORP.
FRACTIONS ± 1/64	3401 N. CALIFORNIA CHICAGO 18, ILL. CORNELIA 7-2240
DECIMALS ± .005	NAME SCHEMATIC, MASTER DISPLAY BD.
HOLES + .002 − .000	MATERIAL — HEAT TREATMENT — FINISH —
ANGULAR ± 1/2°	DWN. R.GAY DATE 9-26-77 APP'D. — SCALE — 16D-8000

QTY ASSEMBLE ON

DOCUMENT #2

D8000 Master Display Board Logic Diagram (IC Drivers) 19

D-8168

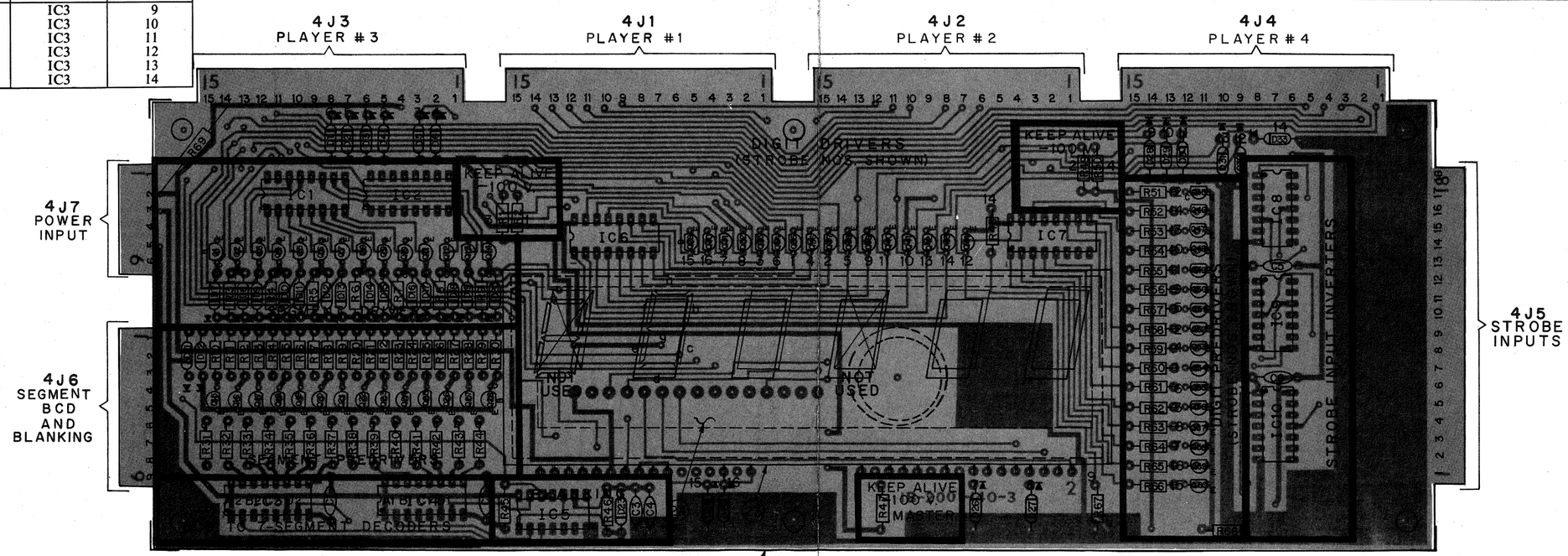
DIGIT CROSS-REFERENCE

DIGIT	7-SEGMENT DECODER	STROBE
Master 1 (Left)	IC4	15
Master 2	IC4	16
Master 3	IC4	7
Master 4 (Right)	IC4	8
#1 100,000	IC4	1
#1 10,000	IC4	2
#1 1,000	IC4	3
#1 100	IC4	4
#1 10	IC4	5
#1 Units	IC4	6
#2 100,000	IC4	9
#2 10,000	IC4	10
#2 1,000	IC4	11
#2 100	IC4	12
#2 10	IC4	13
#2 Units	IC4	14
#3 100,000	IC3	1
#3 10,000	IC3	2
#3 1,000	IC3	3
#3 100	IC3	4
#3 10	IC3	5
#3 Units	IC3	6
#4 100,000	IC3	9
#4 10,000	IC3	10
#4 1,000	IC3	11
#4 100	IC3	12
#4 10	IC3	13
#4 Units	IC3	14

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
17	5A-8774	R45, R67	RESISTOR, FC, 22 K OHM 10% 1/4 W	2
18	5A-9035	R10, R12, R13, R15, R16, R18, R19, R21, R22, R24, R25, R27, R26, R30	RESISTOR, FC, 47K OHM 10% 1/4 W	14
19	5A-9162	R3 THRU R9, R11, R14, R17, R20, R23, R26, R29, R46	RESISTOR, FC, 100K OHM 10% 1/4 W	15
20	5A-9218	R1, R2, R47, R49, R50	RESISTOR, FC, 2.2 M.OHM 10% 1/4 W	5
21	5A-8980	C1, C2, C5, C6	CAPACITOR, CERAMIC, .01 MFD. 50 V.	4
22	5A-9065	C3, C4	CAPACITOR, CERAMIC, 470 PFD. 50 V.	2
23	5B-8966	I1	6-DIGIT DISPLAY	1
24	23A-6542	F1	DISPLAY MOUNTING ADHESIVE FOAM	1
25	5A-9285	R69	RESISTOR, FC, 180 OHM 5% 1/2 W	1

BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	18-2000-140-3		BARE P.C. BOARD	1
2	5A-9221	IC1	15 DIP RESISTOR/PACK 2.2 K OHM	1
3	5A-9222	IC2	15 DIP RESISTOR/PACK 1 K OHM	1
4	5A-8970	IC3, IC4	MC14543 7 SEGMENT DRIVER	2
5	5A-9213	IC5	4012 CMOS DUAL 4 INPUT NAND GATE	1
6	5A-9220	IC6	15 DIP RESISTOR/PACK 2.2 K OHM	1
7	5A-9223	IC7	15 DIP RESISTOR/PACK 10 K OHM	1
8	5A-9267	IC8, IC9, IC10	4069 LOW PWR. HEX. INVERTER	3
9	5A-9216	Q1 THRU Q14 Q45 THRU Q60	HIGH VOLTAGE NPN TRANSISTOR MPS-A42	30
10	5A-9217	Q15 THRU Q44	HIGH VOLTAGE PNP TRANSISTOR MPS-A92	30
11	5A-8785	D1 THRU D20 D24 THRU D33	IN4003 DIODE, SILICON	30
12	5A-8919	D21, D22, D23	IN4148 DIODE, SILICON	3
13	5A-9224	R68	RESISTOR, FC, 270 OHM 10% 1/4 W	1
14	5A-9219	R51 THRU R66	RESISTOR, FC, 8.2 K OHM 10% 1/4 W	16
15	5A-8817	R48	RESISTOR, FC, 10 K OHM 10% 1/4 W	1
16	5A-9032	R31 THRU R44	RESISTOR, FC, 12 K OHM 10% 1/4 W	14



WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF XCOR CORPORATION 3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240				
PART NAME: DISCRETE MASTER DISPLAY BD. ASSEM.				
DWN. A.V.	DATE 5-8-79	APP'D.	SCALE 2=1	PART NO. D-8168

D8169 Master Display Board Assembly Drawing (Discrete Drivers)

16D-8169

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

PLAYER #1 / PLAYER #2 / PLAYER #3 / PLAYER #4

IC1 DIP RESISTORS (2.2K) · IC2 DIP RESISTORS (1K) · IC3 MC 14543 · IC4 MC 14543 · IC5 4012 · IC6 DIP RESISTORS (22K) · IC7 DIP RESISTORS (10K)

GD1

REVISION LETTER	REVISION	BY
A	AT 4J7-2 CONNECTION R69 ADDED E.C.O. 478	6-23-79 A.V.

DIETZGEN NO. 198H AGEPROOF

TOLERANCES			
UNLESS OTHERWISE SPECIFIED	WILLIAMS ELECTRONICS, INC.		
FRACTIONAL ±1/64"	SUBSIDIARY OF THE RESORTS CORP.		267-2240
DECIMAL ±.005"	3401 N. CALIFORNIA CHICAGO, ILL. 60618		
HOLE DIA. +.003 -.000"	NAME SCHEMATIC, DISCRETE MASTER DISPLAY BOARD		
ANGULAR ±1/2°	MATERIAL	HEAT TREATMENT	FINISH
CONCENTRICITIES T.I.R. .005"			
SCREW THREADS CLASS 2	DRWN. R.G.H. DATE 5-21-79	APP'D.	SCALE 16D-8169

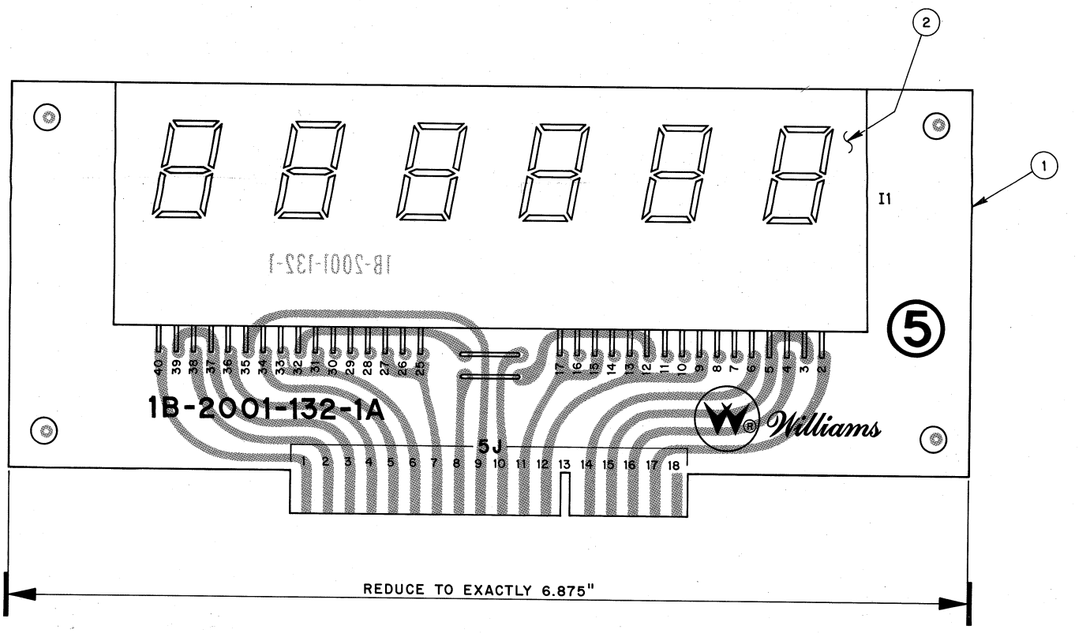
QTY. | ASSEMBLE ON

D8169 Master Display Board Logic Diagram (Discrete Drivers) 21

REVISION LETTER	REVISION
	REVISED AND REDRAWN R.GAY 7-19-78

BILL OF MATERIAL

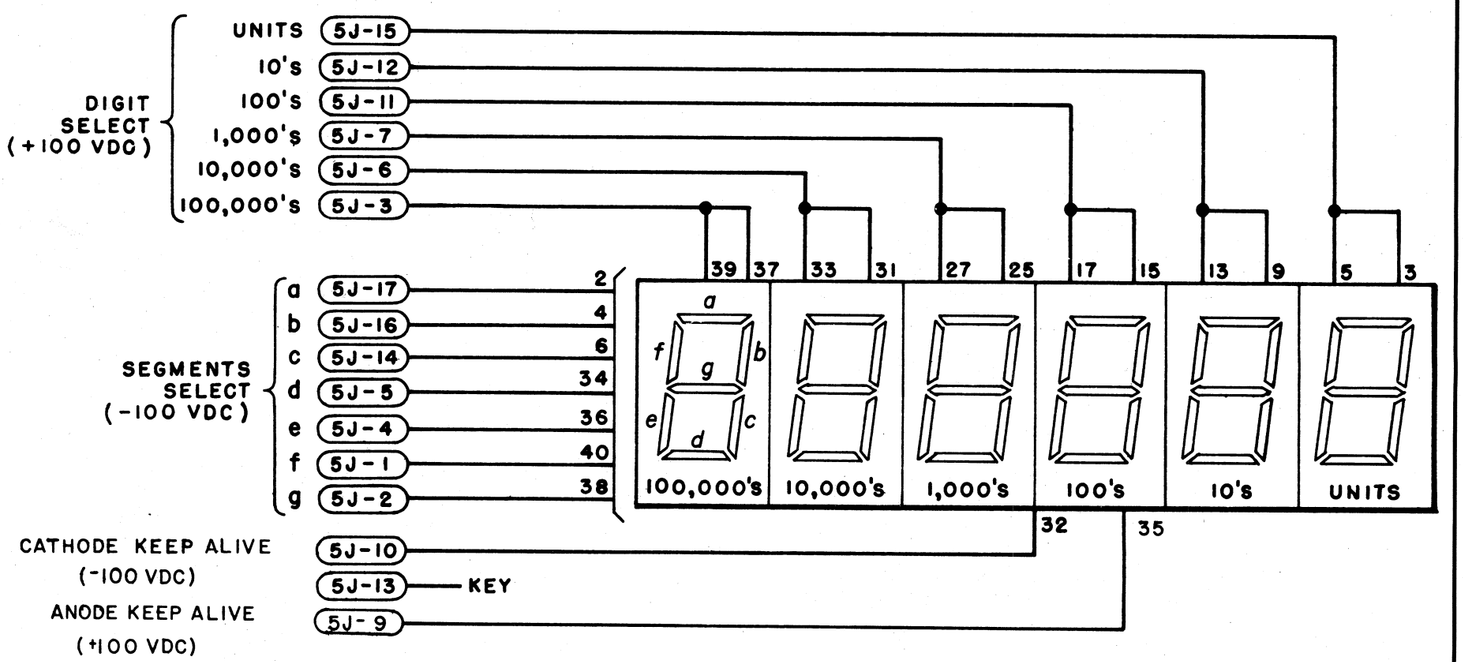
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	1B-2001-132		BARE P.C. BOARD	1
2	5A-8966	I1	6 DIGIT DISPLAY	1
3	23A-6534		DISPLAY MTG. ADHESIVE FOAM	1

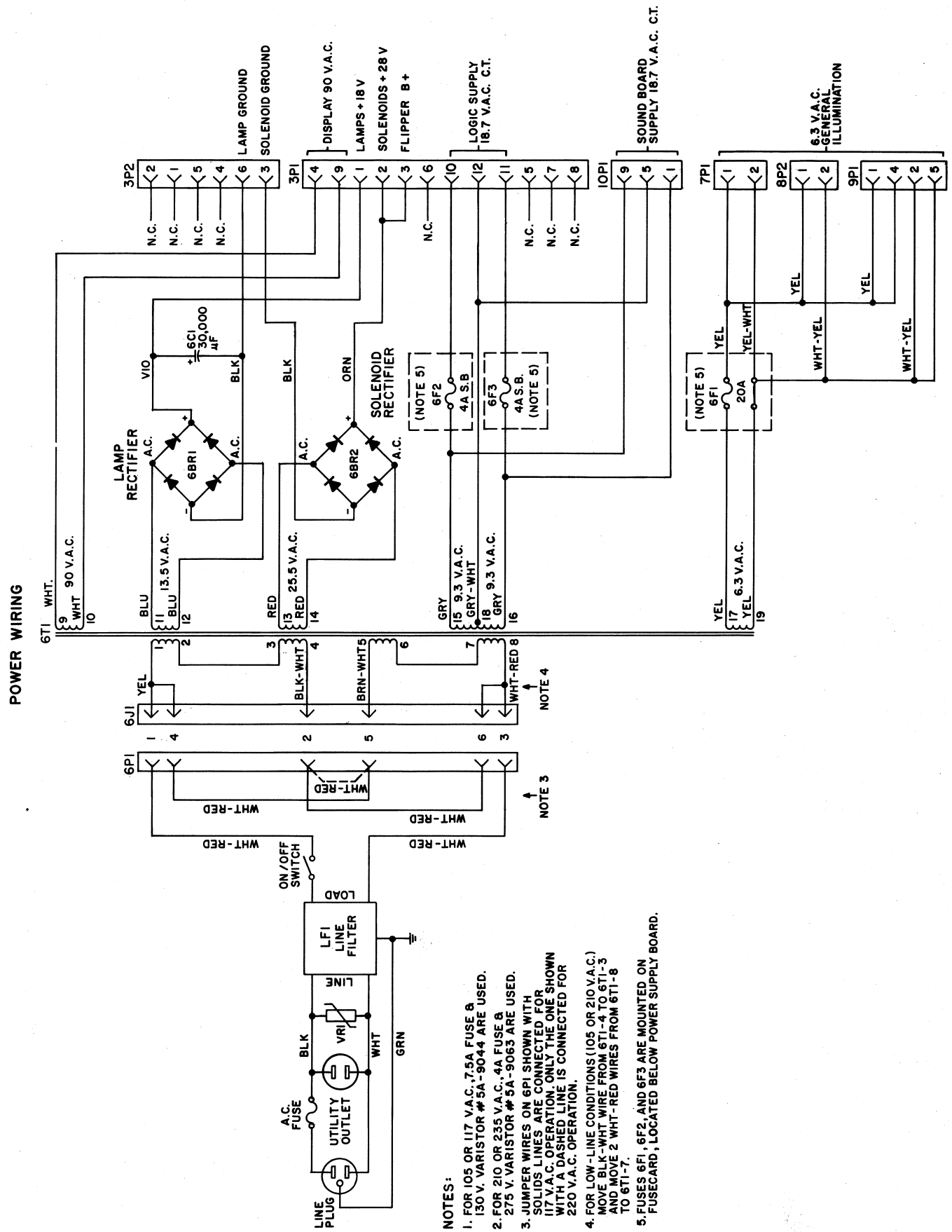


WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF XCOR CORPORATION 3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240				
PART NAME SLAVE DISPLAY BOARD ASSEMBLY				
DWN. R.Gay	DATE	APP'D.	SCALE 2=1	PART NO. C-8019

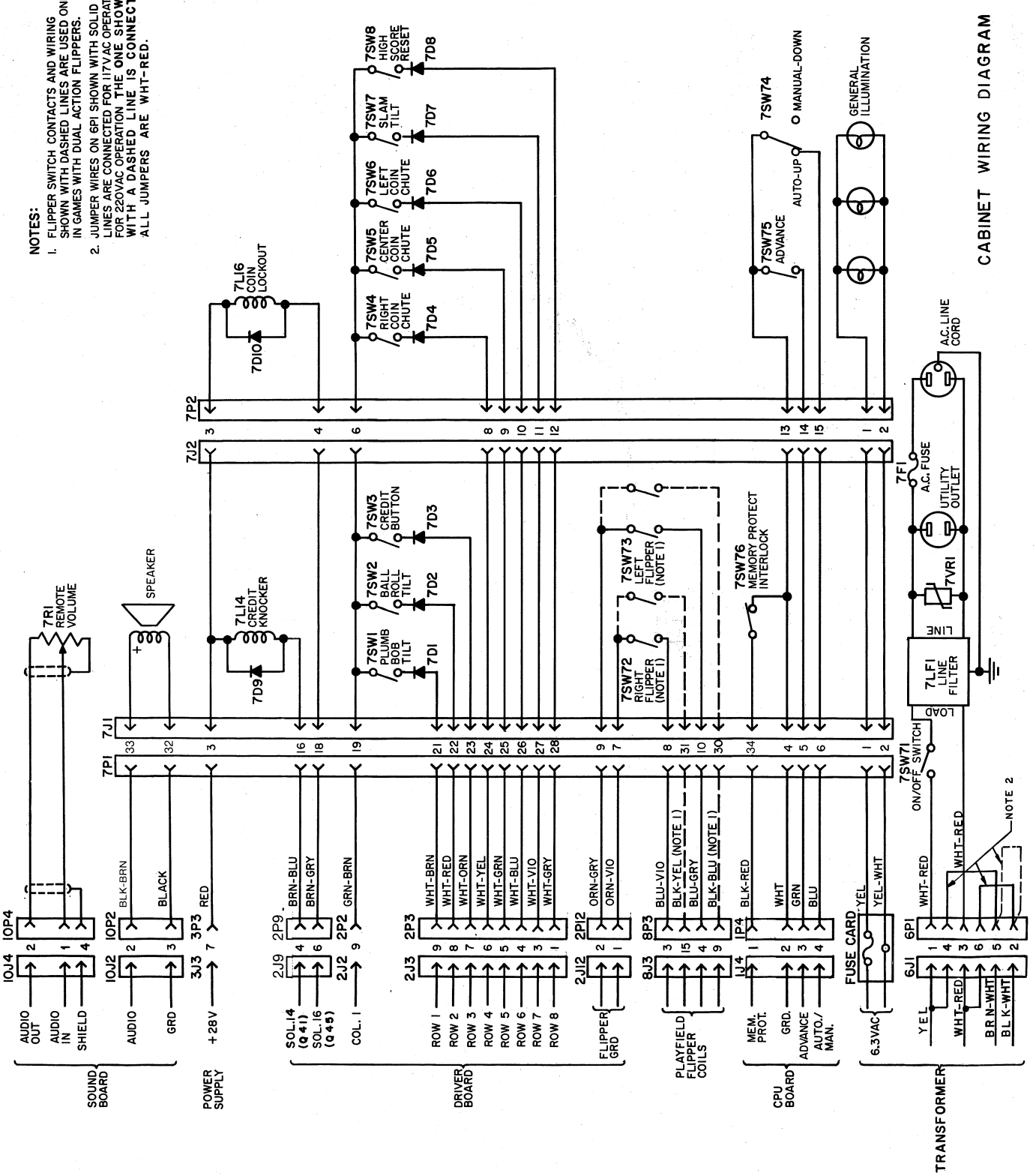
DOCUMENT #1

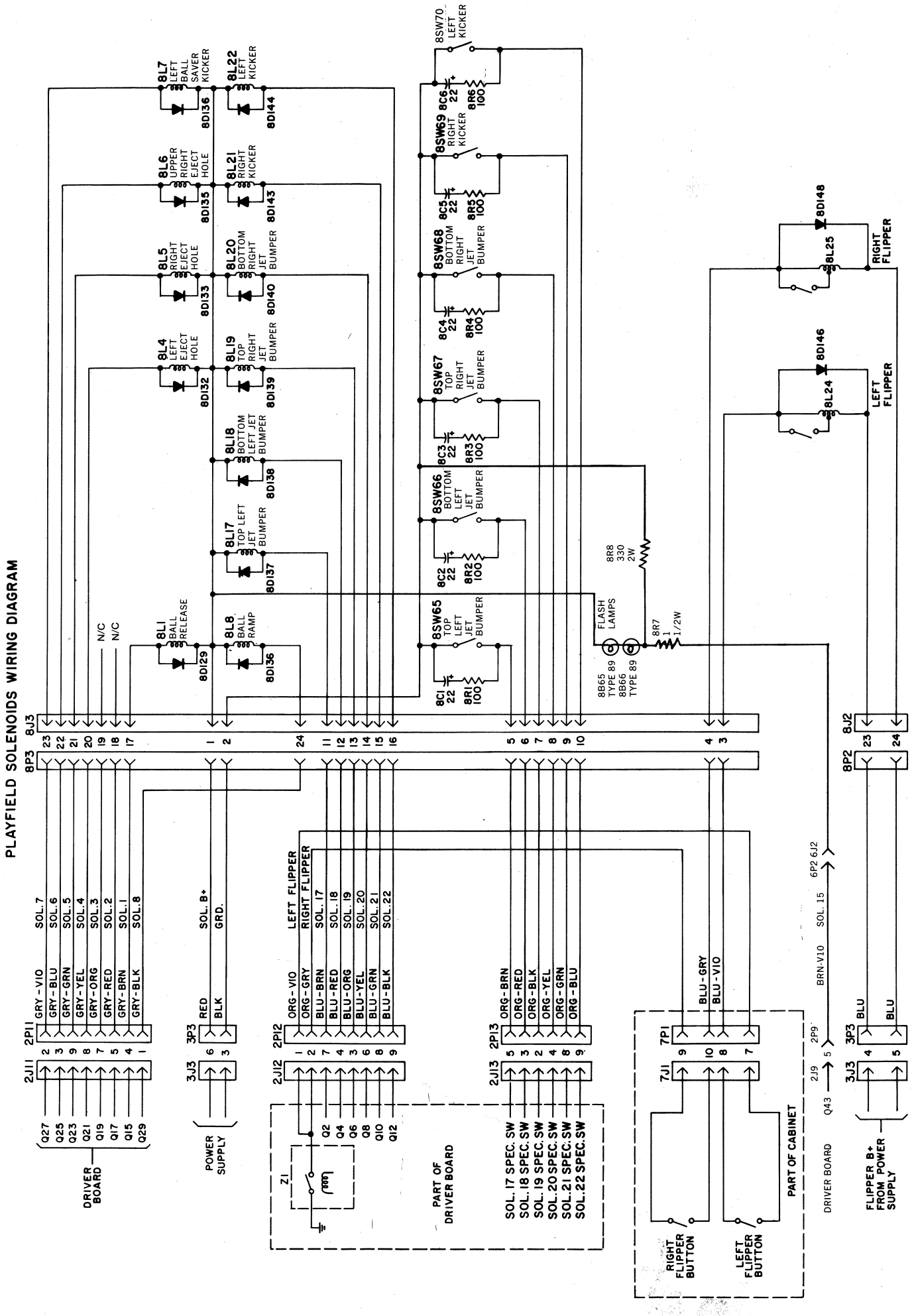
SLAVE DISPLAY BOARD



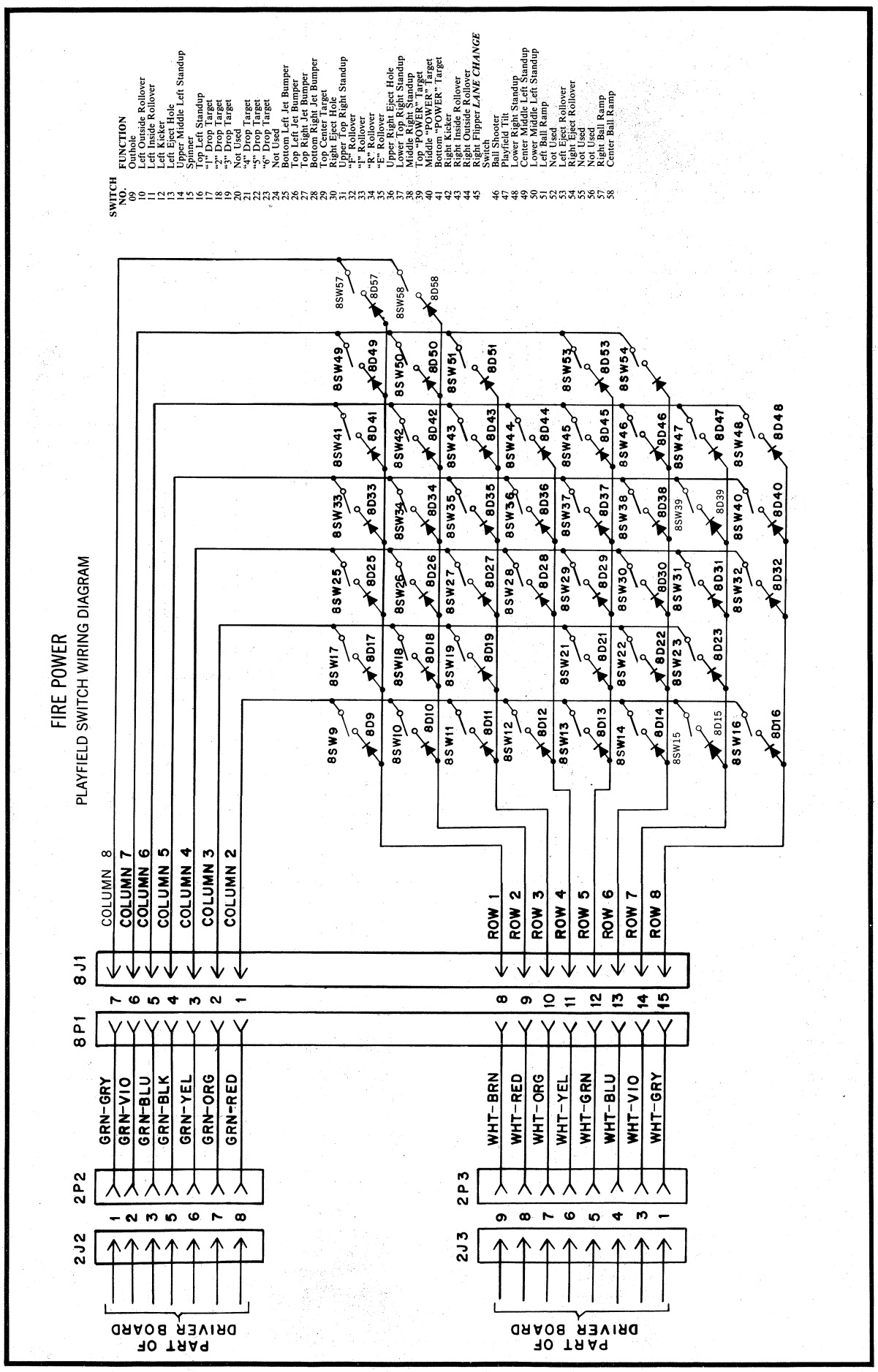


Power Wiring Diagram

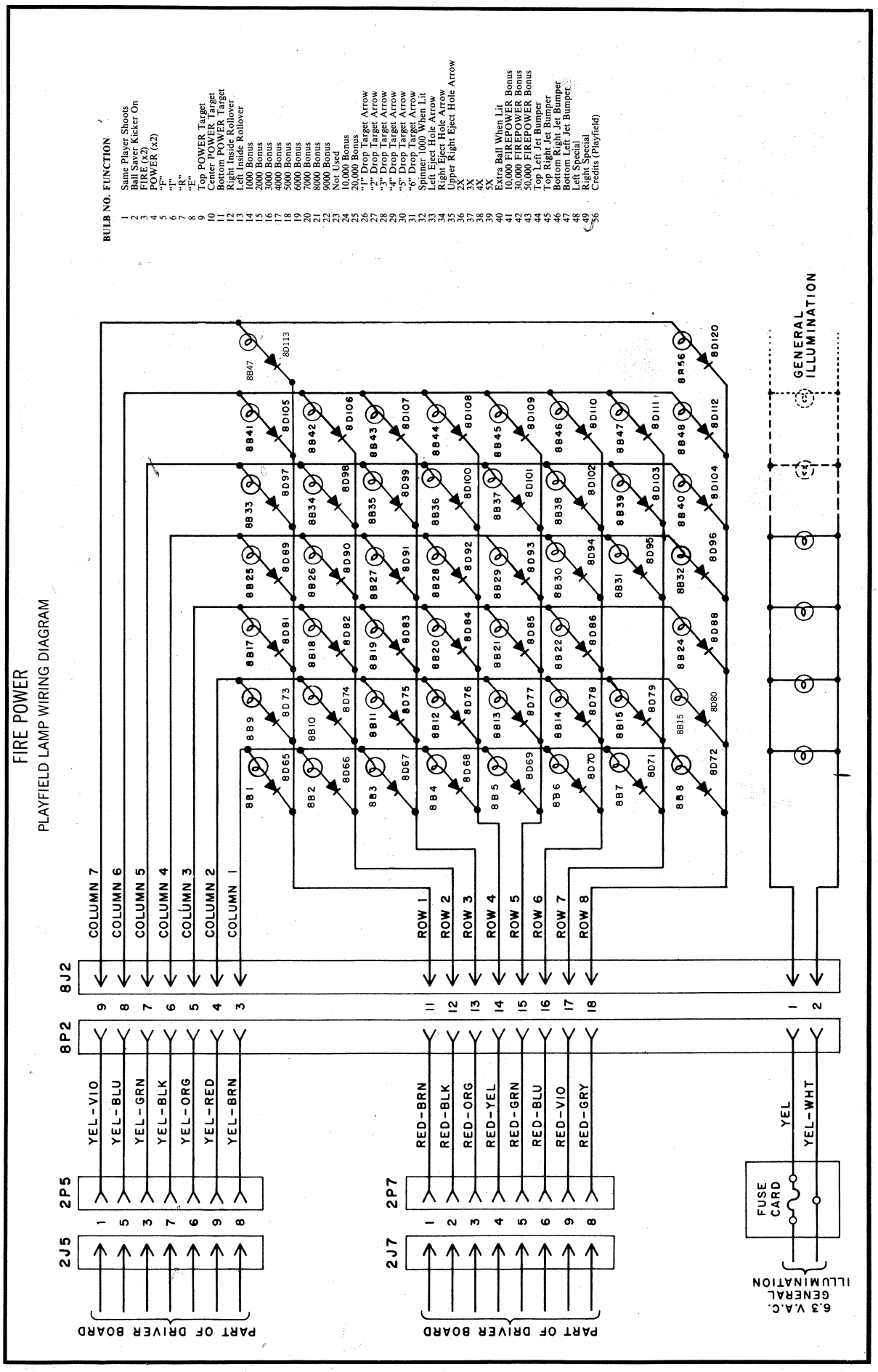

NOTES:
1. FLIPPER SWITCH CONTACTS AND WIRING SHOWN WITH DASHED LINES ARE USED ONLY IN GAMES WITH DUAL ACTION FLIPPERS.
2. JUMPER WIRES ON 6PI SHOWN WITH SOLID LINES ARE CONNECTED FOR 117V AC OPERATION, FOR 220VAC OPERATION THE ONE SHOWN WITH A DASHED LINE IS CONNECTED. ALL JUMPERS ARE WHT-RED.
CABINET WIRING DIAGRAM
7R1 REMOTE VOLUME
SPEAKER
7LI4 CREDIT KNOCKER
7LI6 COIN LOCKOUT
7D10
7SW1 PLUMB BOB TILT
7D1
7SW2 BALL ROLL TILT
7D2
7SW3 CREDIT BUTTON
7D3
7SW4 RIGHT COIN CHUTE
7D4
7SW5 CENTER COIN CHUTE
7D5
7SW6 LEFT COIN CHUTE
7D6
7SW7 SLAM TILT
7D7
7SW8 HIGH SCORE RESET
7D8
7D9
7SW72 RIGHT FLIPPER (NOTE 1)
7SW73 LEFT FLIPPER (NOTE 1)
7SW76 MEMORY PROTECT INTERLOCK
7SW74 MANUAL-DOWN AUTO-UP
7SW75 ADVANCE
GENERAL ILLUMINATION
A.C. LINE CORD
7F1 A.C. FUSE
UTILITY OUTLET
7VR1
7LF1 LINE FILTER
7SW71 ON/OFF SWITCH
NOTE 2
7P1
7P2
7J1
7J2
10P4
10J4
10P2
10J2
3P3
3J3
2P9
2J9
2J2
2P3
2J3
2PI2
2JI2
8P3
8J3
IP4
IJ4
FUSE CARD
6PI
6JI
AUDIO OUT
AUDIO IN
SHIELD
AUDIO
GRD
+28V
SOL.14 (Q41)
SOL.16 (Q45)
COL. 1
ROW 1
ROW 2
ROW 3
ROW 4
ROW 5
ROW 6
ROW 7
ROW 8
FLIPPER GRD
PLAYFIELD FLIPPER COILS
MEM. PROT.
GRD.
ADVANCE
AUTO./ MAN.
6.3VAC
YEL
WHT-RED
BRN-WHT
BLK-WHT
SOUND BOARD
POWER SUPPLY
DRIVER BOARD
CPU BOARD
TRANSFORMER



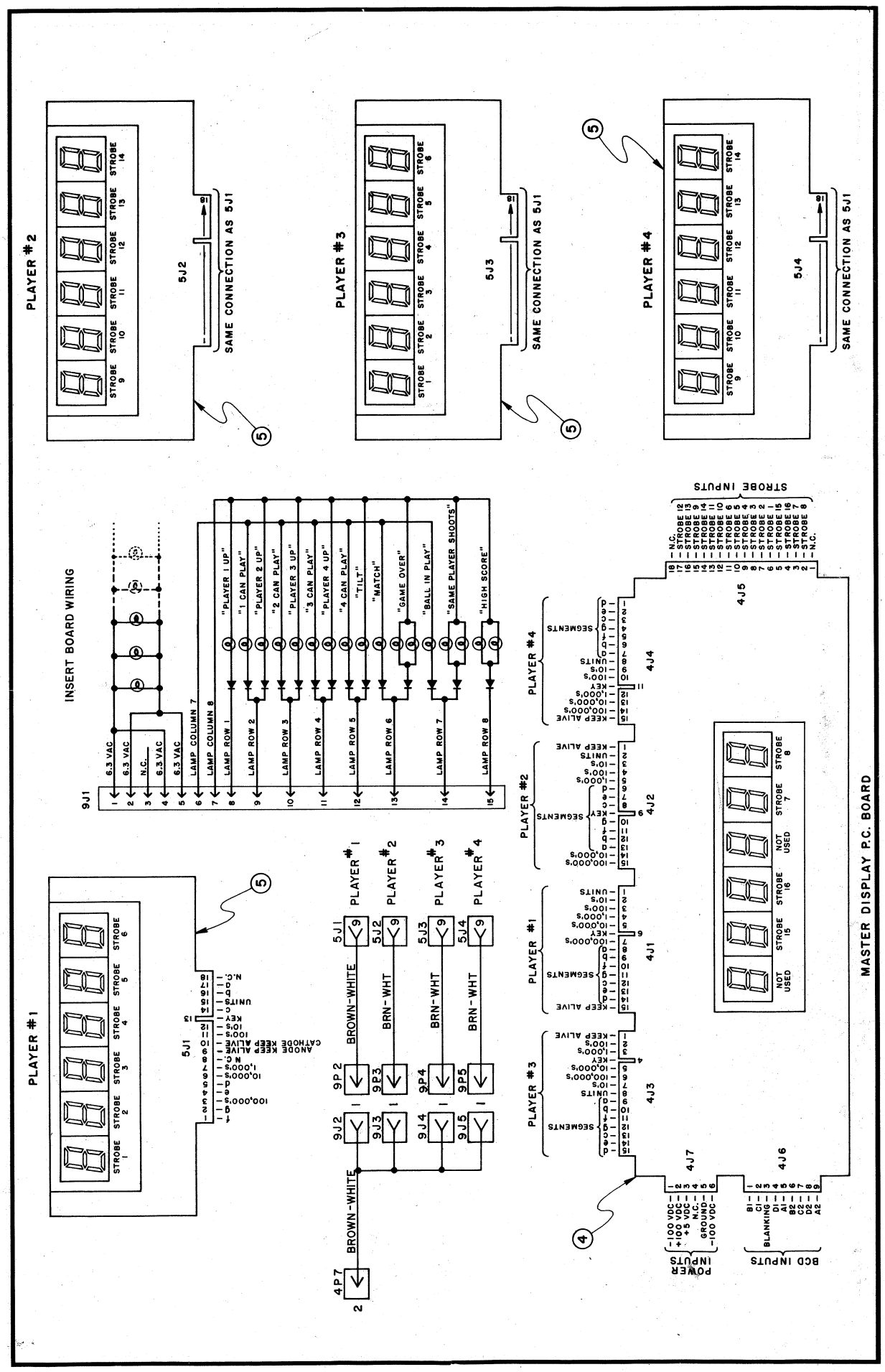
Playfield Solenoid Wiring Diagram



Playfield Switch Wiring Diagram



Playfield Lamp Wiring Diagram



Insert Board Wiring Diagram