Williams®



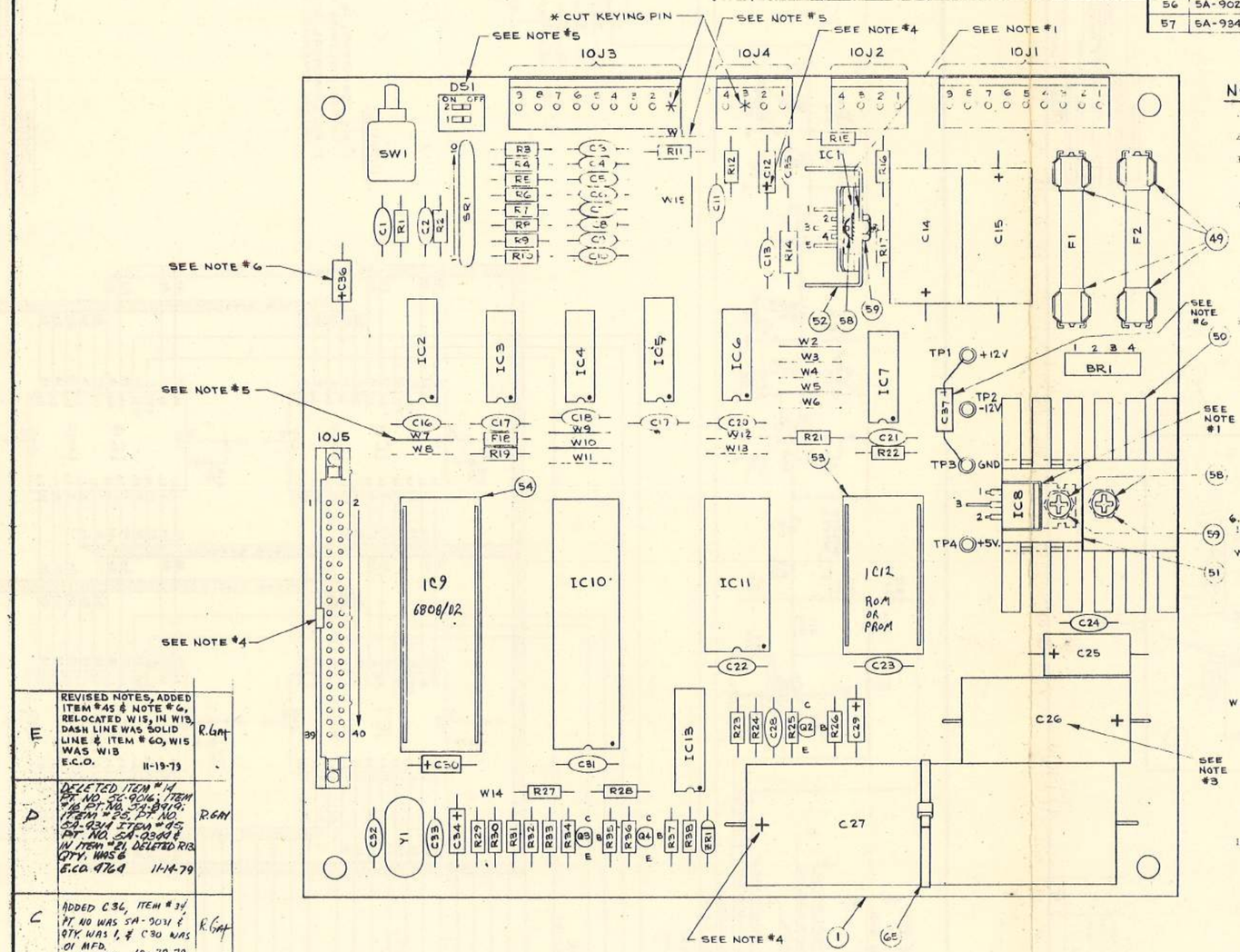
SCHEMES



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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 6814	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, C14, 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)
   W4 - 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 POMPELI 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 SA-9198

   W7, W15, W9, W1, (SEE NOTE #5) W2, W5, W10 FOR:
   GORGAR; SOUND ROM 2 - SA-9960
   IC 12 SELECTION STRAPPING:

(2K x 8)	(4K x 8)	(512 x 8)
W2	W3	W3
W5 IN	W5 IN	W6 IN
W10	W10	W11

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.Gat
D	DELETED ITEM #4 PT. NO. SC-9016; ITEM #48 PT. NO. SA-9349; ITEM #25, PT. NO. SA-9314 ITEM #65, PT. NO. SA-9340 & IN ITEM #21, DELETED R18 QTY. WAS 8 E.C.O. 9764 11-14-79	R.Gat
C	ADDED C36, ITEM #34, PT. NO WAS SA-9031 & QTY. WAS 1, & C30 WAS .01 MFD. E.C.O. 9760 10-29-79	R.Gat
B	DELETED ITEM #62 ADDED R11 x R12 TO ITEM # IN QTY. WAS 9 10-4-79	K.L.
A	ITEM #11, A-16- SA-93- ITEM #62, ADDE- SC-90 ITEM #64 HOLDE- H. 10-4-79	K.L.

DIETZGEN NO. 188H ASEPROOF

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-8988	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-9345	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-9168	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-9380	DS1	2 STD. DIP SWITCH	1

TOLERANCES	QTY.	ASSEMBLE ON
UNLESS OTHERWISE SPECIFIED FRACTIONAL ± 1/64" DECIMAL ± .005" HOLE DIA. +.002 -.000" ANGULAR 21'/2" CONCENTRICITIES T.I.R. .005" SCREW THREADS CLASS 2		

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

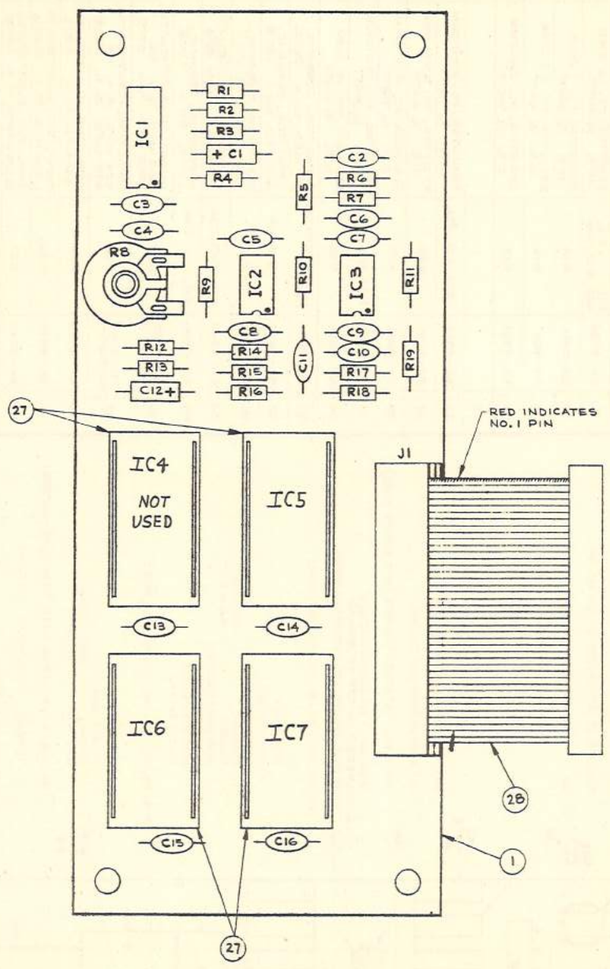
NAME SOUND BOARD SUB-ASSEM

MATERIAL | HEAT TREATMENT | FINISH

DRN. RGM | DATE 9-28-79 | APP'D. 10/4/79 | SCALE 2:1 | D-8225

BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	10-2001-1473		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, 2.0 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	C3, 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-9349	C12	CAPACITOR, ELECTROLYTIC, 10 MFD. 20% 20 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



ITEM # 2 PT. NO WAS 5A-9351, ITEM # 11 ADDED PT. NO., ITEM # 14 ADDED PT. NO., ITEM # 24 VOLTS WAS 20V. 10-4-79 R.G

REVISION LETTER	REVISION	BY

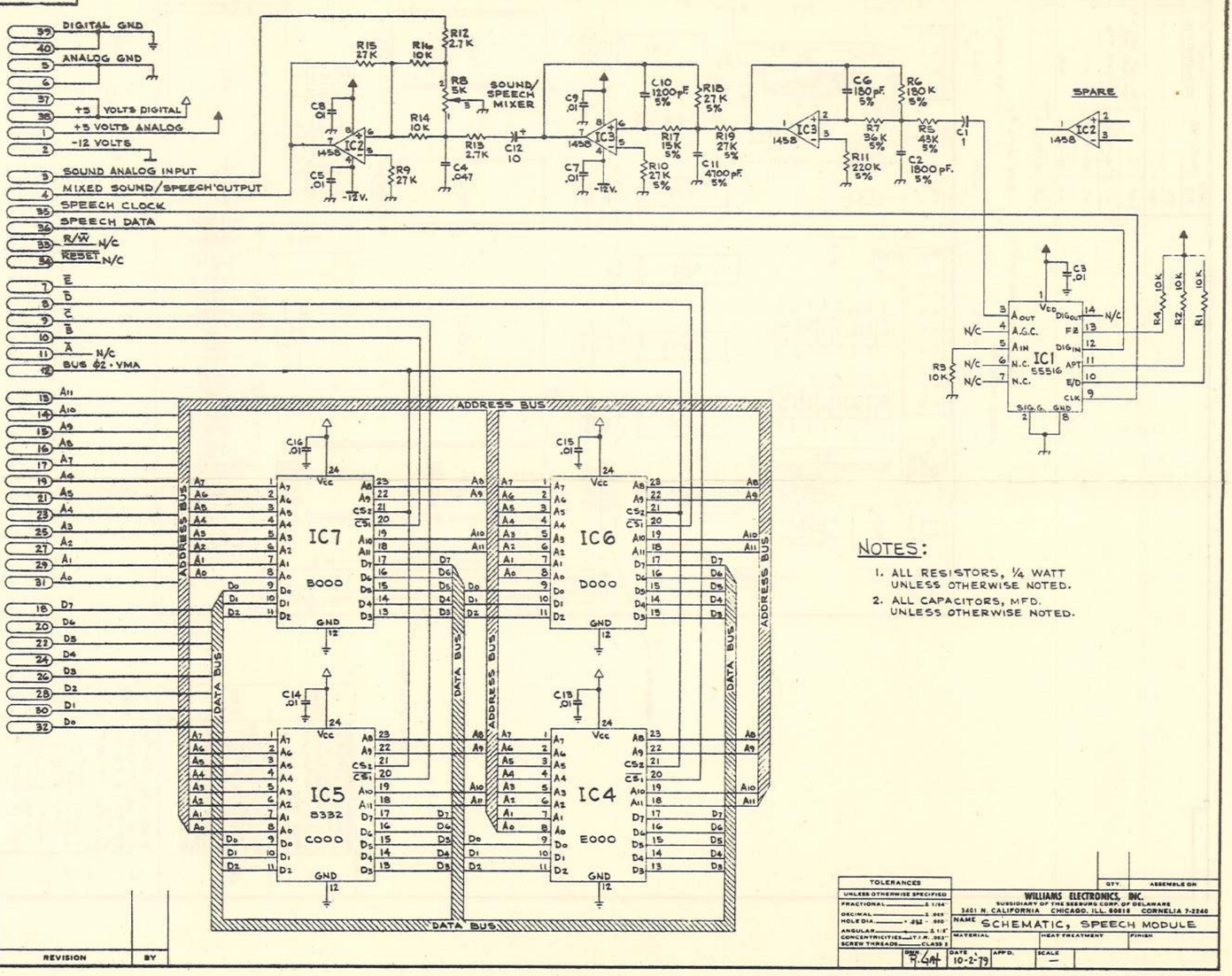
TOLERANCES	QTY.	ASSEMBLE ON
UNLESS OTHERWISE SPECIFIED: FRACTIONAL ± 1/64, DECIMAL ± .005, HOLE DIA + .002 - .000, ANGULAR ± 1/2°, CONCENTRICITIES T.I.R. .002, SCREW THREADS CLASS 2		

WILLIAMS ELECTRONICS, INC.
SUBSIDIARY OF THE SEEBURG CORP. OF DELAWARE
3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-3240

NAME SPEECH MODULE ASSEM.

MATERIAL | HEAT TREATMENT | FINISH

DRW. R.G. | 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

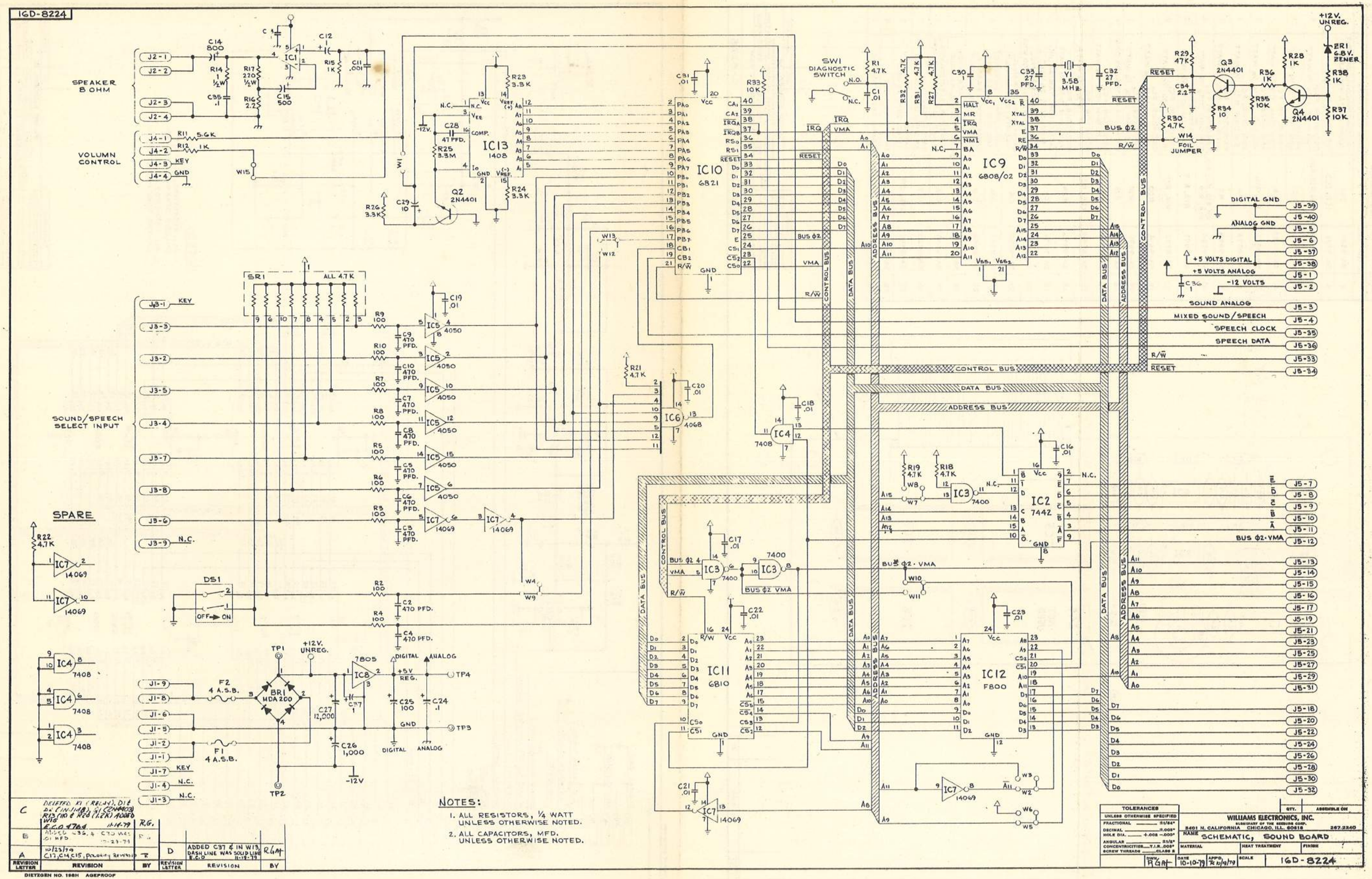
TOLERANCES	QTY.	ASSEMBLE ON
UNLESS OTHERWISE SPECIFIED: FRACTIONAL ± 1/64, DECIMAL ± .005, HOLE DIA + .002 - .000, ANGULAR ± 1/2°, CONCENTRICITIES T.I.R. .002, SCREW THREADS CLASS 2		

WILLIAMS ELECTRONICS, INC.
SUBSIDIARY OF THE SEEBURG CORP. OF DELAWARE
3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-3240

NAME SCHEMATIC, SPEECH MODULE

MATERIAL | HEAT TREATMENT | FINISH

DRW. R.G. | DATE 10-2-79 | APP'D. | SCALE —


16D-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
BR1 MDA 200
+12V. UNREG.
ZR1 6.8V. ZENER
CONTROL BUS
DATA BUS
ADDRESS BUS
DIGITAL GND
ANALOG GND
+5 VOLTS DIGITAL
+5 VOLTS ANALOG
-12 VOLTS
SOUND ANALOG
MIXED SOUND/SPEECH
SPEECH CLOCK
SPEECH DATA
NOTES:
1. ALL RESISTORS, 1/4 WATT UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS, MFD. UNLESS OTHERWISE NOTED.
WILLIAMS ELECTRONICS, INC.
3401 N. CALIFORNIA CHICAGO, ILL. 60618
NAME SCHEMATIC, SOUND BOARD
SCALE 16D-8224

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% 1/4 WATT	4
5	5A 8776	R2	RESISTOR, FC, 68K OHM 5% 1/4 WATT	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, 18K OHM 5% 1/4 WATT	1
9	5A-9353	R7	RESISTOR, FC, 6.2 K OHM 5% 1/4 WATT	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, 2.7K OHM 10% 1/4 WATT	2
12	5A-8772	R14, R17	RESISTOR, FC, 15K OHM 5% 1/4 WATT	2
13	5A-9314	R20	RESISTOR, FC, 1.2 K OHM 10% 1/4 WATT	1
14	5A-9331	R21	RESISTOR, FC, 13K OHM 10% 1/4 WATT	1
15	5A-9185	R8	POTENTIOMETER, 5K OHM	1
16	5A-9218	R24	RESISTOR, FC, 2.2 M. 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		24 PIN SOCKET	4
29	5A 9354	J1	RIBBON CABLE ASSEM	1

TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL ± 1/64; DECIMAL .X ± .100, .XX ± .020, .XXX ± .005; ANGULAR ± 1°; CONCENTRICITIES .XXX .005; SCREW THREADS CLASS 2A/2B

WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF THE ARSENAL CORP. OF CHICAGO 3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2288

NAME SPEECH MODULE ASSEMBLY

MATERIAL — HEAT TREATMENT — FINISH

DATE 9-28-79 APP'D. — SCALE 2:1 — C-8225

ASSEMBLE ON — QTY.

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

TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONAL ± 1/64; DECIMAL .X ± .100, .XX ± .020, .XXX ± .005; HOLE DIA ± .003; ANGULAR ± 1°; CONCENTRICITIES .XXX .005; SCREW THREADS CLASS 2A/2B

WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF THE ARSENAL CORP. OF CHICAGO 3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2288

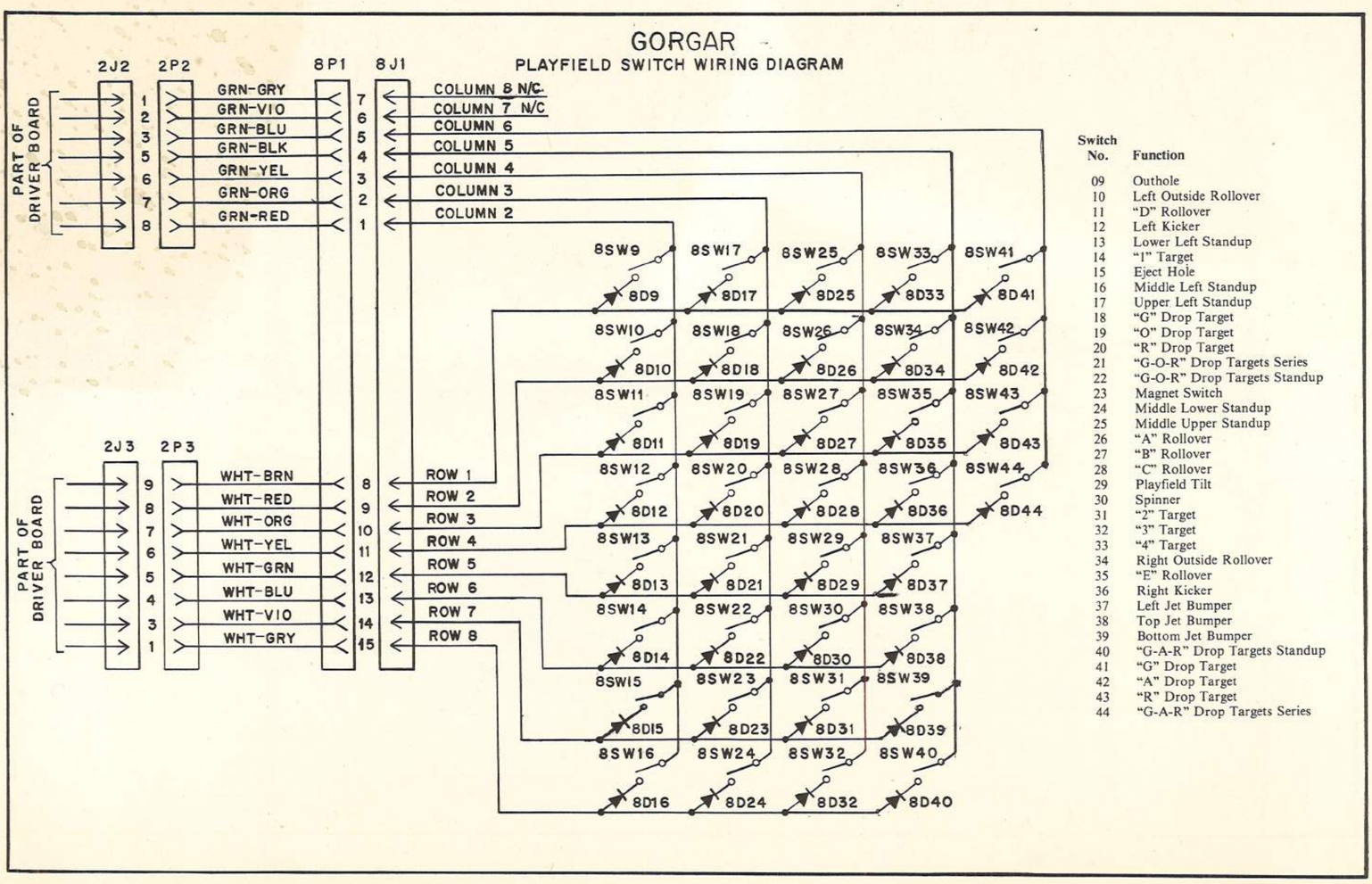
NAME SCHEMATIC, SPEECH MODULE

MATERIAL — HEAT TREATMENT — FINISH

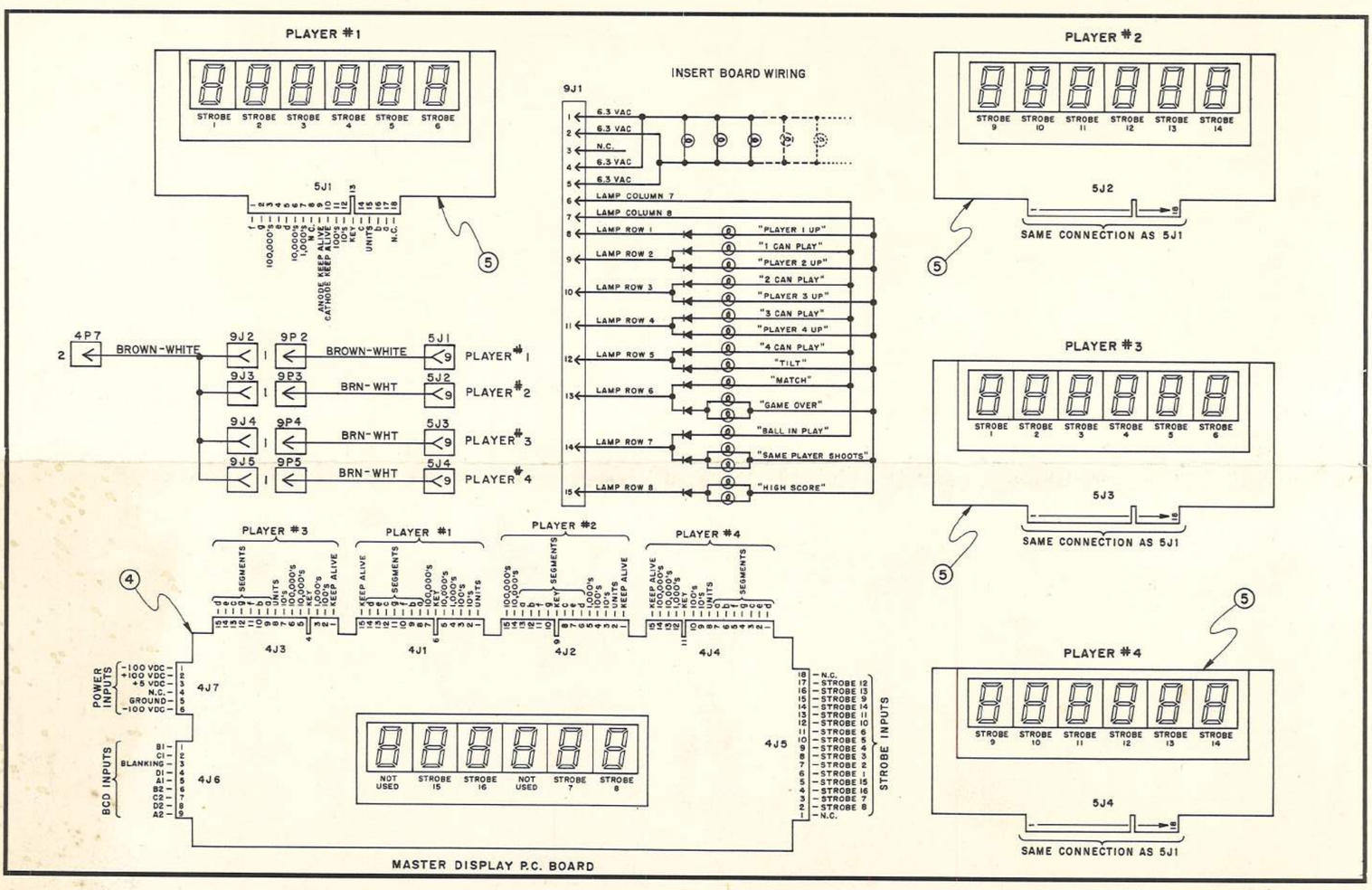
DATE 10-1-79 APP'D. — SCALE —

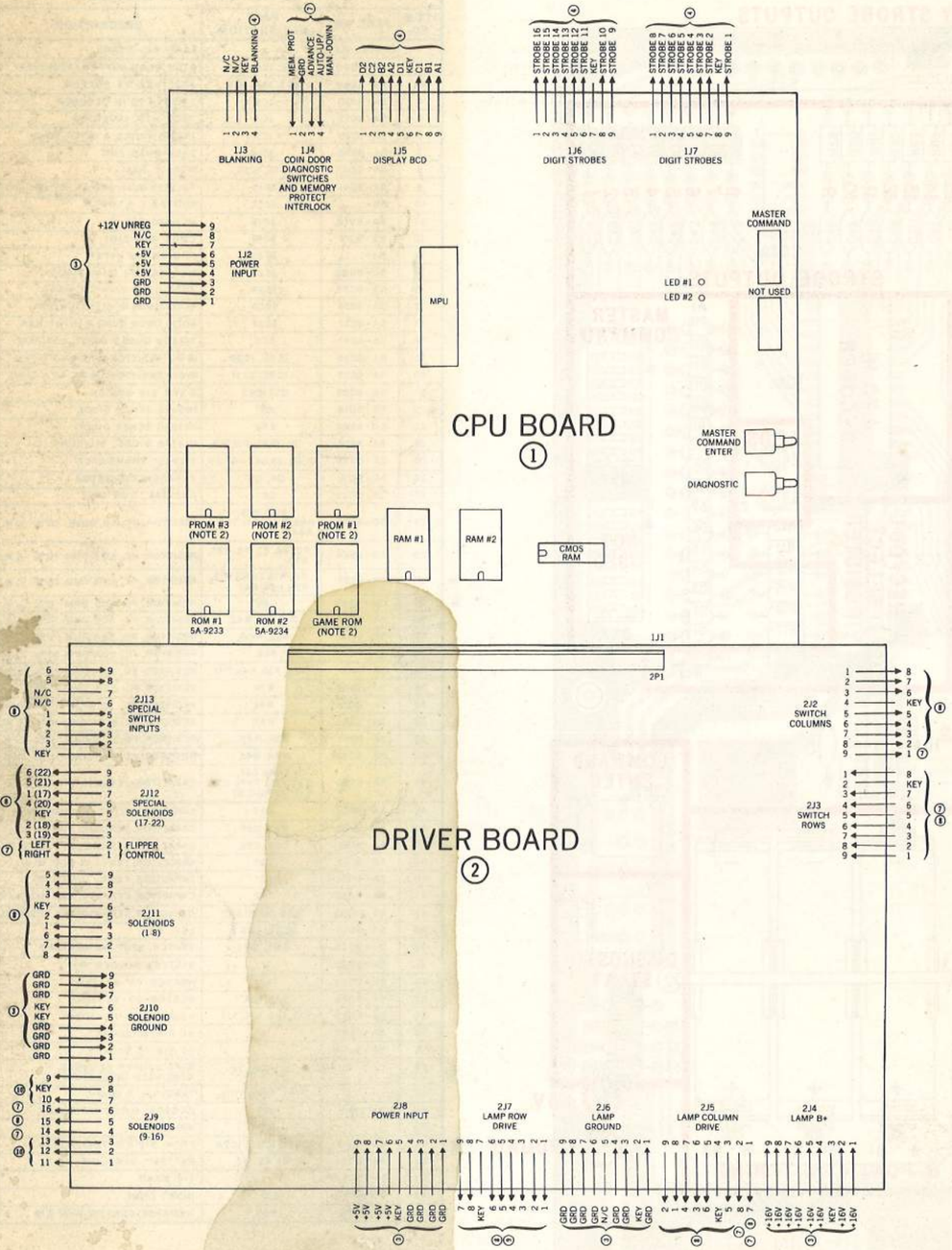
ASSEMBLE ON — QTY.

REVISION LETTER — REVISION — BY



Switch No.	Function
09	Outhole
10	Left Outside Rollover
11	"D" Rollover
12	Left Kicker
13	Lower Left Standup
14	"1" Target
15	Eject Hole
16	Middle Left Standup
17	Upper Left Standup
18	"G" Drop Target
19	"O" Drop Target
20	"R" Drop Target
21	"G-O-R" Drop Targets Series
22	"G-O-R" Drop Targets Standup
23	Magnet Switch
24	Middle Lower Standup
25	Middle Upper Standup
26	"A" Rollover
27	"B" Rollover
28	"C" Rollover
29	Playfield Tilt
30	Spinner
31	"2" Target
32	"3" Target
33	"4" Target
34	Right Outside Rollover
35	"E" Rollover
36	Right Kicker
37	Left Jet Bumper
38	Top Jet Bumper
39	Bottom Jet Bumper
40	"G-A-R" Drop Targets Standup
41	"G" Drop Target
42	"A" Drop Target
43	"R" Drop Target
44	"G-A-R" Drop Targets Series





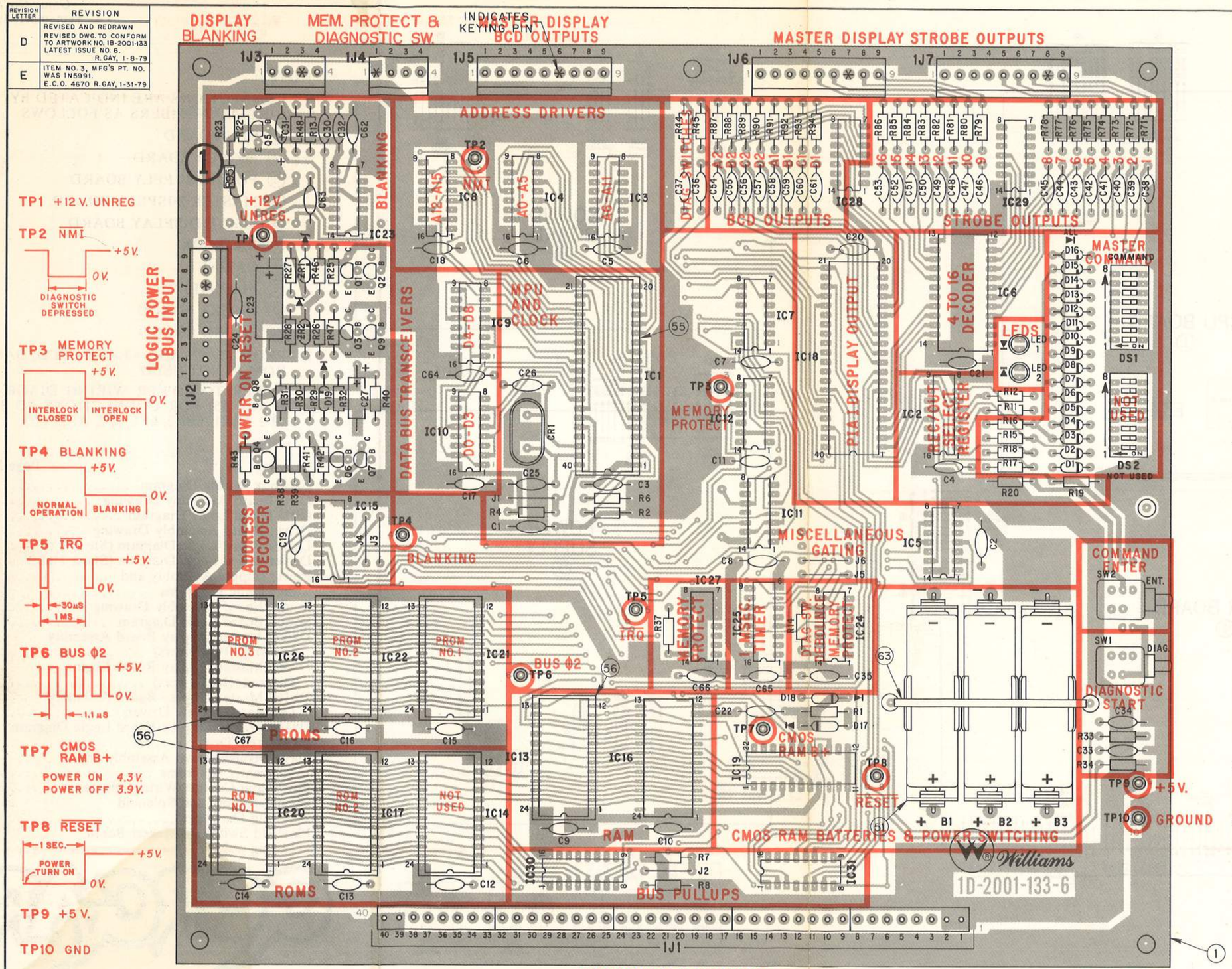
NOTES:

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
2. PROM #1, #2, AND #3 ARE USED; GAME ROM IS NOT USED.
3. REFER TO POWER WIRING DIAGRAM (PAGE 15) FOR CONNECTIONS TO 3P1, 3P2, 6BR1, 6BR2, 6F1, 6F2, AND 6F3.

Drawing	Page No.
Backbox Wiring Diagram	1
CPU Board Assembly Drawing	2
CPU Board Logic Diagram	3
Driver Board Assembly Drawing	4
Driver Board Logic Diagram (Sheet 1 of 2)	5
Driver Board Logic Diagram (Sheet 2 of 2)	6
Power Supply Assembly and Schematic Diagrams	7
Sound Board Assembly Drawing	8
Sound Board Logic Diagram	9
D8000 Master Display Board Assembly Drawing (IC Drivers)	10
D8000 Master Display Board Logic Diagram (IC Drivers)	11
D8169 Master Display Board Assembly Drawing (Discrete Drivers)	12
D8169 Master Display Board Logic Diagram (Discrete Drivers)	13
Slave Display Board Assembly and Schematic Diagrams	14
Power and Cabinet Wiring Diagrams	15
Playfield Lamp and Solenoid Wiring Diagrams	16
Playfield Switch and Insert Board Wiring	17

GORGAR

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 $\overline{NMI}$

TP3 MEMORY PROTECT

TP4 BLANKING

TP5 $\overline{IRQ}$

TP6 BUS Ø2

TP7 CMOS RAM B+

POWER ON 4.3V.
POWER OFF 3.9V.

TP8 $\overline{RESET}$

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-9093	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, 1K OHM 10% 1/4W.	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, 300 K 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, SW2	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 09-65-1094	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	MC6806 MICROPROCESSOR	1
60		IC14	NOT USED	0
★ 61	5A-9015	IC21, IC22, IC26	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

★ – WHEN USED, IC14 REPLACES IC21, IC22, AND IC26.
* – J2 THRU J4, R1 & R4 NOT USED.

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

REVISION LETTER	REVISION

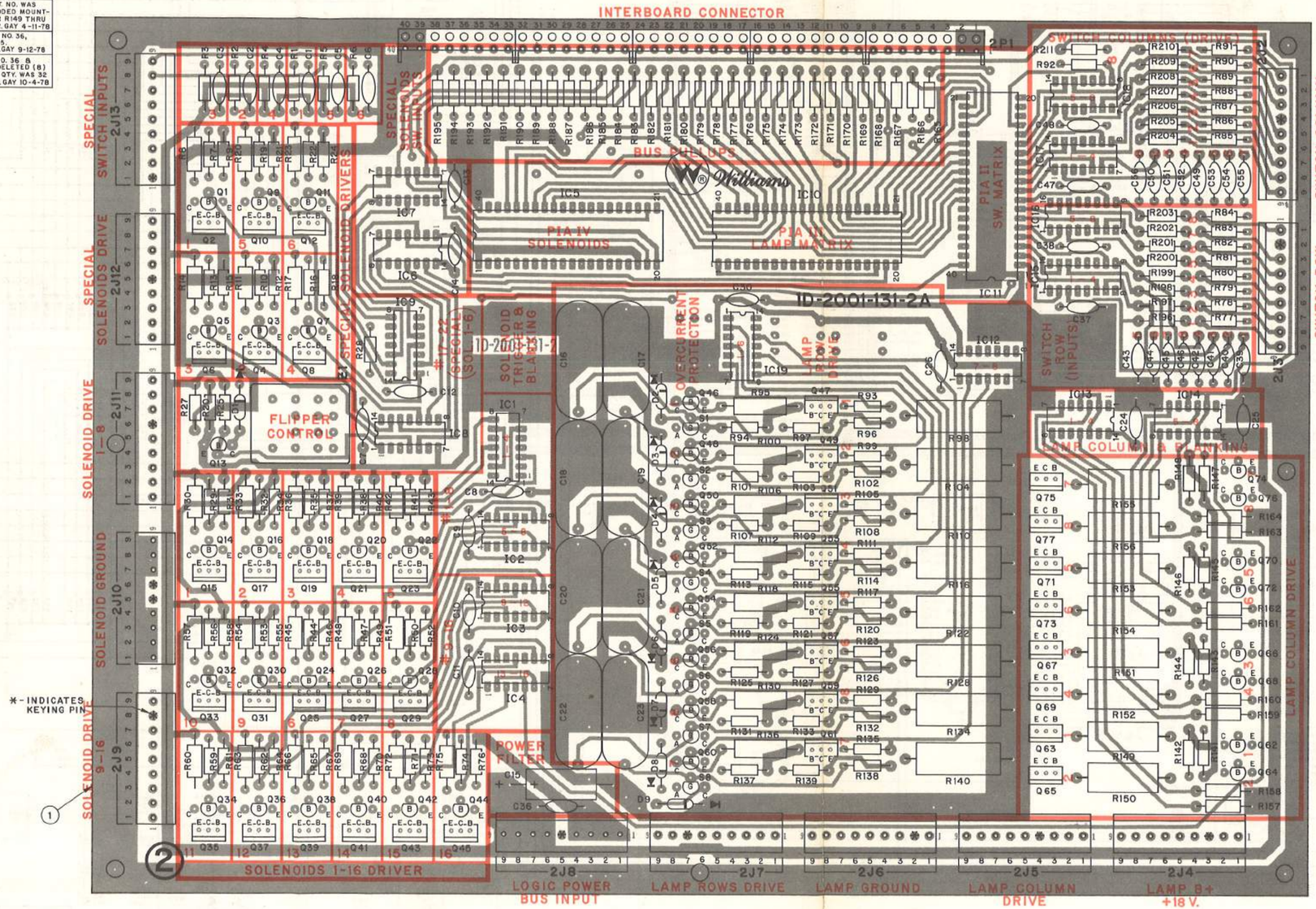
NOTES:
1. ALL RESISTORS, 1/4 WATT UNLESS NOTED OTHERWISE.
2. ALL CAPACITORS, MFD. UNLESS NOTED OTHERWISE.
3. #-IC1A (6802) USED WITH R4. ##-IC1B (6808) USED WITH J1.
4. WHEN IC 14 GAME ROM IS USED J3 MUST BE CONNECTED AND J4 MUST BE REMOVED.

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

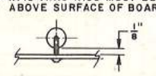
REVISION LETTER	REVISION
C	REVISED AND REDRAWN R.GAY 11-28-77
D	ITEM NO. 28, PT. NO. WAS 5A-8999 & ADDED MOUNTING NOTE FOR R149 THRU R156. R.GAY 4-11-78
E	DELETED ITEM NO. 36, PT. NO. 5A-8985. E.C.O. R.GAY 9-12-78
F	ADDED ITEM NO. 36 & ITEM NO. 22, DELETED (8) RESISTORS & QTY. WAS 32 E.C.O. 4624 R.GAY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



BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	1B-2001-131		BARE P.C. BOARD	1
2	5A-8948	IC6, 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 NOR GATE	6
5	5A-8975	IC15, IC16	MC14049 INVERTING HEX. BUFFER	2
6	5A-8972	IC5, IC10, IC11	MC6820 PERIPHERAL INTERFACE ADAPTER	3
7	5A-8939	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	2N5122 NPN POWER TRANSISTOR	8
12	5A-6258	D1	IN4001 DIODE	1
13	5A-8919	D2 THRU D9	IN4148 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	C27 THRU C46, C49 THRU C56	CAPACITOR, CERAMIC, 470 PFD. 20% 50 V.	16
18	5A-8966	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, 1 K 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.



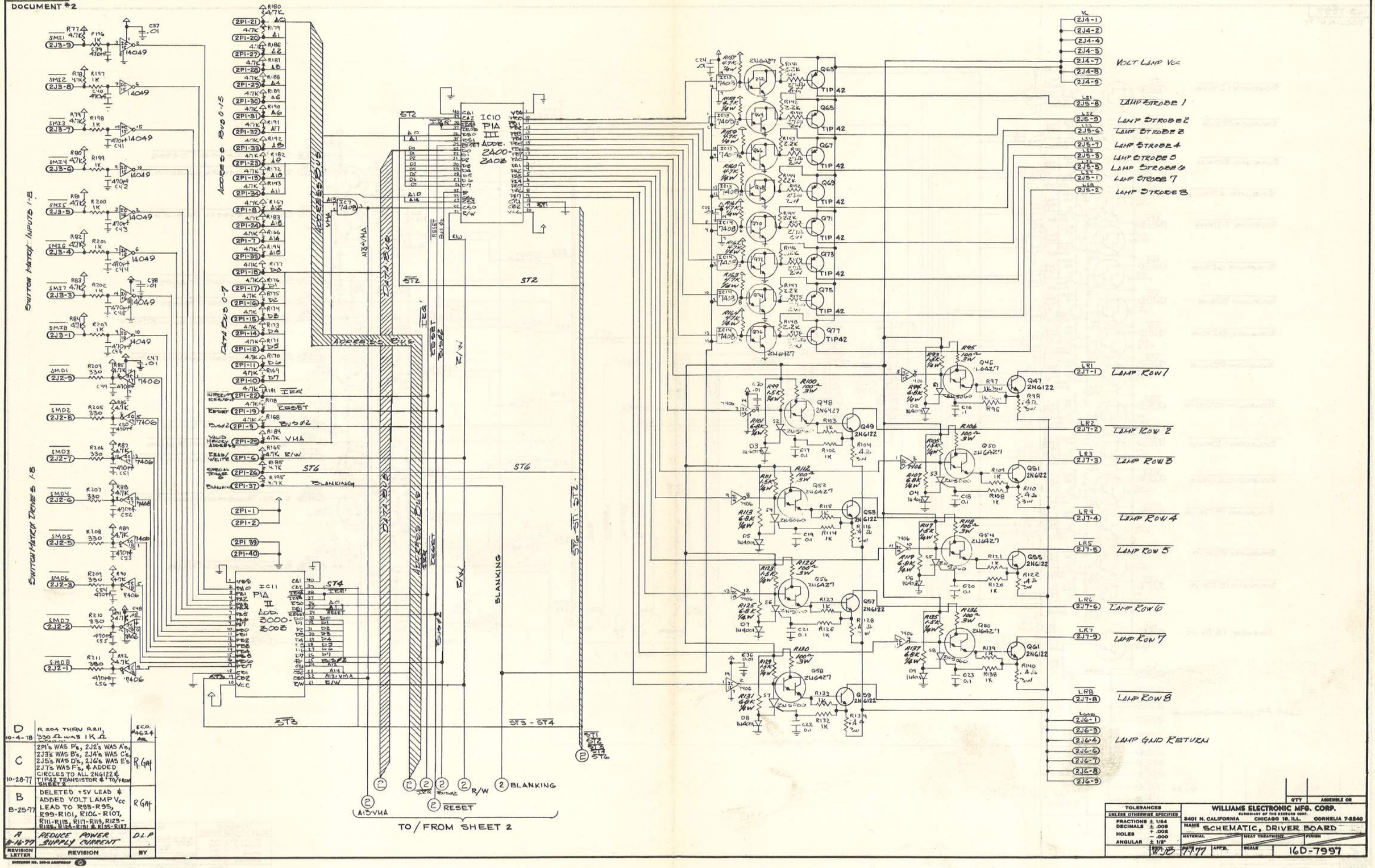
WILLIAMS ELECTRONICS, INC.
SUBSIDIARY OF XCOR CORPORATION
3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240

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
D 10-4-78	R 204 THRU R211, 330 Ω WAS 1K Ω	ECO #4624 AR
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 R93-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

TOLERANCES UNLESS OTHERWISE SPECIFIED	WILLIAMS ELECTRONIC MFG. CORP. SUBSIDIARY OF THE RESEARCH CORP.
FRACTIONS ± 1/64	3401 N. CALIFORNIA CHICAGO 18, ILL. CORNELIA 7-2340
DECIMALS ± .008	NAME SCHEMATIC, DRIVER BOARD
HOLES + .008 - .000	MATERIAL / HEAT TREATMENT / FINISH
ANGULAR ± 1/2°	DWN. BY 7-7-77 APP'D. SCALE 16D-7997

QTY ASSEMBLE ON

Driver Board Logic Diagram (Sheet 1 of 2) 5

16D-7997
DOCUMENT #2

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

5V B+

GND.

+5V.

C15 +18μf 25 VOLT

C36 0.1 MFD

PIA IC5 ADDR. 2200-2208

RESET

ADDRESS BUS

DATA BUS

A15-VMA

E/W

BLANKING

LAMP & SOLENOID GND.

TO/FROM SHEET 1

ST1
ST2
ST3
ST4
ST5
ST6
ST1-6

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
SWITCH SOLENOID 4 TRIGGER
SWITCH SOLENOID 5 TRIGGER
SWITCH TRIGGERED SOLENOID 5 DRIVE
SWITCH TRIGGERED SOLENOID 6 DRIVE
SWITCH SOLENOID 6 TRIGGER

FLIPPER GROUND RETURN

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 # TO/FROM SHEET 1's & CIRCLES TO ALL 2N4401 TRANSISTORS	R. GAF 10-28-77
A 8-2877	REVISION "A"	

TOLERANCES UNLESS OTHERWISE SPECIFIED	
FRACTIONS	± 1/64
DECIMALS	± .005
	+ .002
HOLES	- .000
ANGULAR	± 1/2°

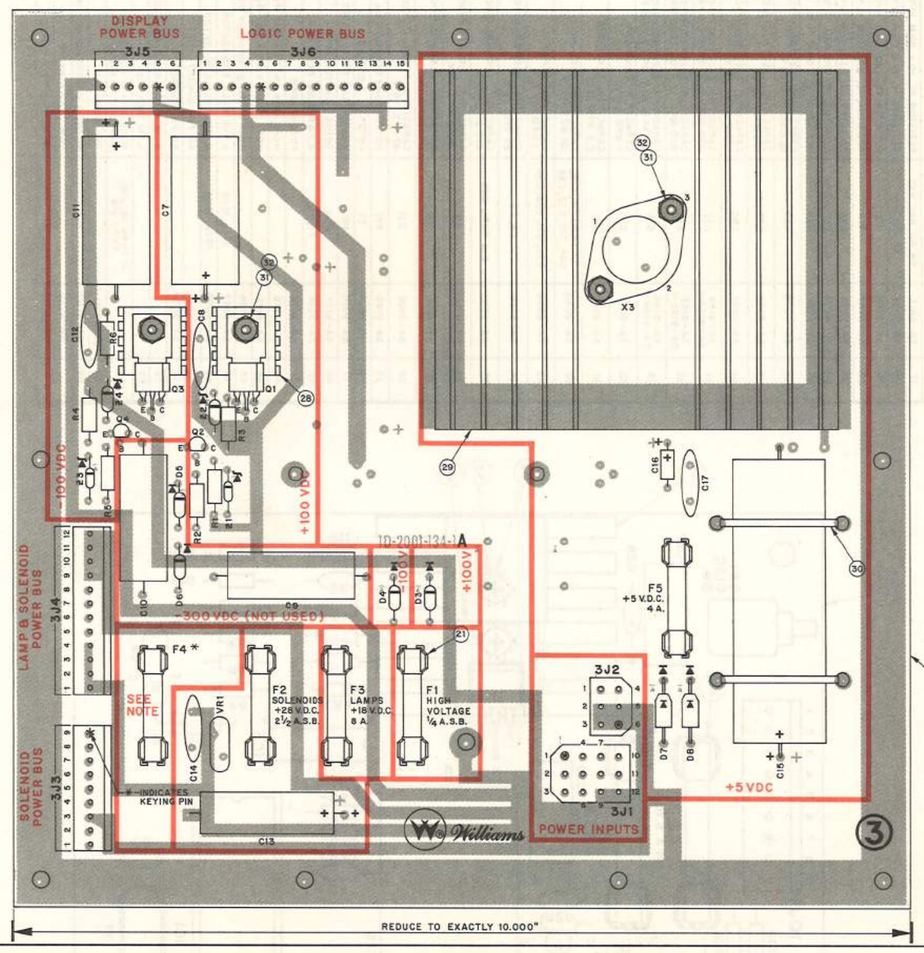
WILLIAMS ELECTRONIC MFG. CORP.
SUBSIDIARY OF THE BEEBURG CORP.
3401 N. CALIFORNIA CHICAGO 18, ILL. CORNELIA 7-2240

NAME: SCHEMATIC, DRIVER BOARD
MATERIAL | HEAT TREATMENT | FINISH
DRWN. W.R.D. DATE 7-5-77 APP'D.
SCALE
16D-7997
SHEET 2 OF 2

Q'TY | ASSEMBLE ON

6 *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	5 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 THRU D6	IN4001 DIODE	4
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	5A-9047	C9, C10	CAPACITOR, POLYESTER FILM .22 MFD. 400 V.	2
20	5A-9031	C16	CAPACITOR, ELECT., 1 MFD. 25 V.	1
21	5A-9052		FUSEHOLDER	10
22	5A-9066	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	3A-7520-1		TIE WRAP	2
31			5-40 X ⅜ 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

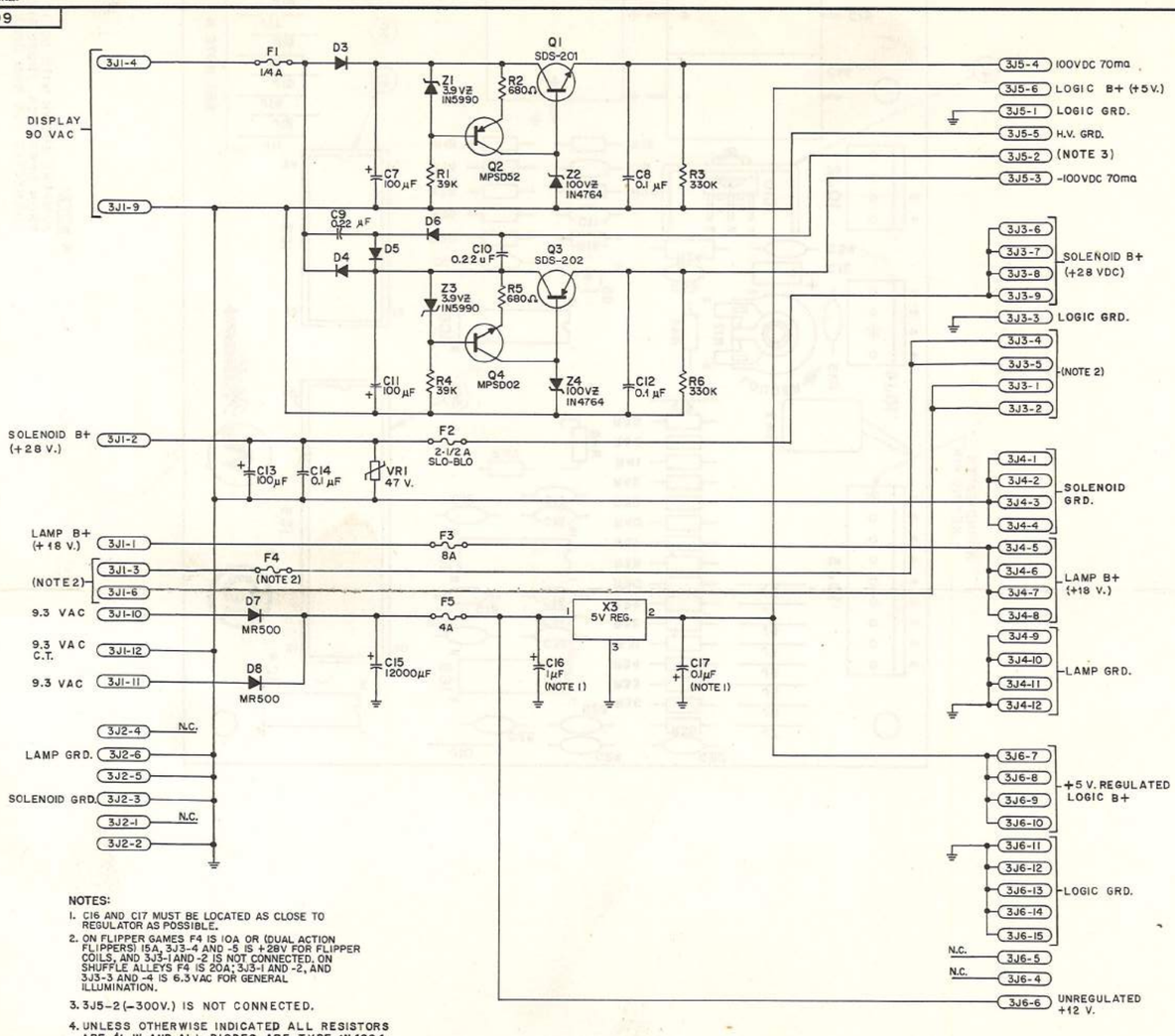
NOTE:
F4 IS FLIPPER FUSE ON FLIPPER GAMES AND GENERAL ILLUMINATION ON SHUFFLE ALLEYS.

WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF TOUR CORPORATION 3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240				
PART NAME: POWER SUPPLY BOARD ASSEMBLY				
DWN. D.D.G.	DATE 6-15-77	APP'D.	SCALE 2=1	PART NO. D-7999

DOCUMENT #1

FDC CORP. 300 12-75 61628+

16C-7999

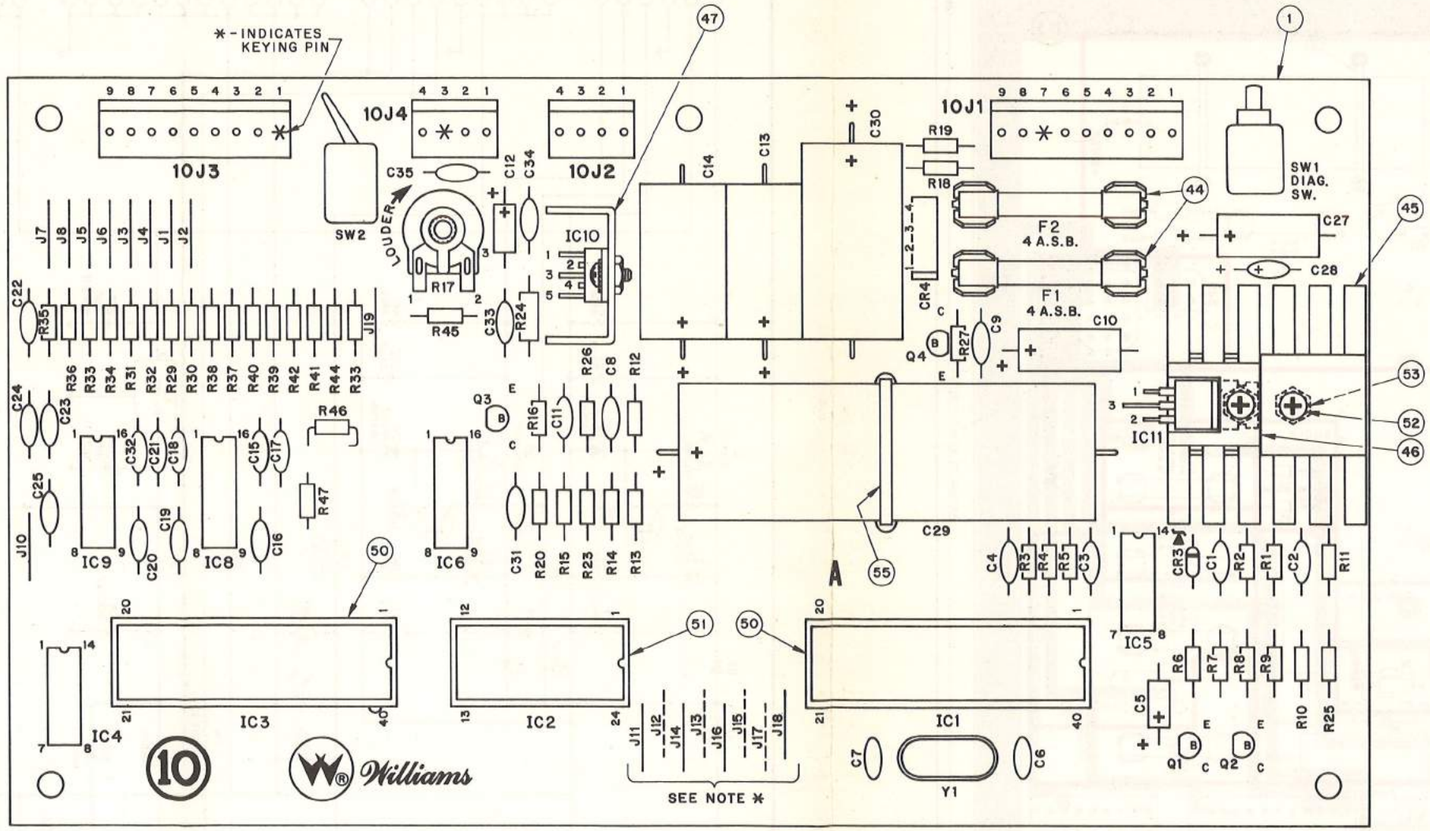


NOTES:
1. C16 AND C17 MUST BE LOCATED AS CLOSE TO REGULATOR AS POSSIBLE.
2. ON FLIPPER GAMES F4 IS 10A OR (DUAL ACTION FLIPPERS) 15A, 3J3-4 AND -5 IS +28V FOR FLIPPER COILS, AND 3J3-1 AND -2 IS NOT CONNECTED. ON SHUFFLE ALLEYS F4 IS 20A; 3J3-1 AND -2, AND 3J3-3 AND -4 IS 6.3 VAC FOR GENERAL ILLUMINATION.
3. 3J5-2 (-300V.) 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			
FRACTIONAL ± 1/64	WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF THE SEEBURG CORP. OF DELAWARE 3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240		
DECIMAL .X ± .005 .XX ± .010	NAME SCHEMATIC, POWER SUPPLY BOARD		
HOLE DIA. .XXX ± .002 .XXXX ± .000			
ANGULAR ± 1/2°	MATERIAL	HEAT TREATMENT	FINISH
CONCENTRICITIES T.I.R. .XXX			
SCREW THREADS CLASS 2	DWN. A.V.	DATE 5-10-79	APP'D.
	SCALE	16C-7999	

DOCUMENT # 2



BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	1B-2001-137		BARE P.C. BOARD	1
2	5A-8972	IC3	MC6820 PIA	1
3	5A-9154	IC4	4068 8 INPUT NAND GATE	1
4	5A-9155	IC5	4011 QUAD 2 INPUT NAND GATE	1
5	5A-9152	IC6	MC1408 D/A CONVERTER	1
6	5A-9153	IC8, IC9	4050 BUFFER	2
7	5A-9156	IC10	TDA2002V AUDIO AMPLIFIER	1
8	5A-9157	IC11	7805 5 VOLT REG. W/TO220 CASE	1
9	5C-8938	Q1, Q2, Q3	2N4401 NPN TRANSISTOR	3
10	5A-8976	Q4	2N6427 NPN TRANSISTOR	1
11	5A-9018	CR3	1N5996 6.8 V ZENER DIODE	1
12	5A-9158	CR4	MDA200/3N253 BRIDGE RECTIFIER	1
13	5B-8991	R1, R2, R14, R23, R37 THRU R45	RESISTOR, FC, 4.7 K OHM 10% 1/4 W	13
14	5B-8983	R3, R4, R5, R15, R16, R20	RESISTOR, FC, 3.3 K OHM 10% 1/4 W	6
15	5A-8984	R9, R10, R25, R27	RESISTOR, FC, 1K OHM 10% 1/4 W	5
16	5B-9039	R7	RESISTOR, FC, 10 OHM 10% 1/4 W	1
17	5B-8817	R8, R11, R46, R47	RESISTOR, FC, 10 K OHM 10% 1/4 W	4
18	5B-9035	R6, R12, R13	RESISTOR, FC, 47 K OHM 10% 1/4 W	3
19	5A-9160	R18	RESISTOR, FC, 220 OHM 10% 1/4 W	1
20	5A-9161	R19	RESISTOR, FC, 2.2 OHM 10% 1/4 W	1
21	5A-9179	R26	RESISTOR, FC, 3.3 M OHM 10% 1/4 W	1
22	5B-9036	R29 THRU R36	RESISTOR, FC, 100 OHM 10% 1/4 W	8
23	5A-9181	R24	RESISTOR, FC, 1 OHM 10% 1/2 W	1
24	5A-9046	C29	CAPACITOR, ELECTROLYTIC, 12,000 MFD. 16 V.	1
25	5A-8986	C27	CAPACITOR, ELECTROLYTIC, 100 MFD. 10 V.	1
26	5A-8893	C30	CAPACITOR, ELECTROLYTIC, 1,000 MFD. 25 V.	1
27	5A-9164 5A-9164-1	C13	CAPACITOR, ELECTROLYTIC, 500 MFD. 15 V. OR 470 MFD. 25 V.	1
28	5A-9165 5A-9165-1	C14	CAPACITOR, ELECTROLYTIC, 800 MFD. 16 V. OR 1,000 MFD. 15 V.	1
29	5A-9168 5A-9168-1	C10	CAPACITOR, ELECTROLYTIC, 25 MFD. 20 V. OR 33 MFD. 16 V.	1
30	5A-9031	C12	CAPACITOR, TANTALUM, 1 MFD. 25 V.	1
31	5A-9163	C5	CAPACITOR, TANTALUM, 2.2 MFD. 15 V.	1
32	5A-8980	C1 THRU C4, C15, C24, C25, C32, C35	CAPACITOR, CERAMIC, .01 MFD. 50 V.	9
33	5A-8996	C28, C31, C33, C34	CAPACITOR, CERAMIC, .1 MFD. 50 V.	4
34	5A-9169	C6, C7	CAPACITOR, CERAMIC DISC, 27 PFD. 1K V.	2
35	5A-9065	C16 THRU C23	CAPACITOR, CERAMIC DISC, 470 PFD. 50 V.	8
36	5A-9166	C9	CAPACITOR, CERAMIC DISC, .0015 MFD. 1K V.	1
37	5A-9167	C8	CAPACITOR, CERAMIC DISC, .003 MFD. 1K V.	1
38	5A-9180	C11	CAPACITOR, CERAMIC DISC, 47 PFD. 1K V.	1
39	5A-9185	R17	POTENTIOMETER, 5K OHM	1
40	5A-9020	Y1	CRYSTAL, 3.58 MHZ.	1
41	5A-9024	SW1	MOMENTARY SWITCH SPDT	1
42	5A-9171	SW2	TOGGLE SWITCH SPDT	1
43	5A-6314	F1, F2	4 AMP. SLOW BLOW FUSE	2
44	5A-9178		FUSEHOLDER	4
45	5A-9172		HEAT SINK THERMALLOY #6072 B	1
46	5A-9173		HEAT SINK THERMALLOY #6071B	1
47	5A-9199		HEAT SINK THERMALLOY #6030	1
48	5A-9027	10J1, 10J3	9 PIN MALE CONNECTOR	2
49	5A-9028	10J2, 10J4	4 PIN MALE CONNECTOR	2
50	5A-8985		40 PIN SOCKET	2
51	5A-9004		24 PIN SOCKET	1
52			6-32 X 3/8 BINDER HEAD SCREW	2
53			6-32 HEX. NUT	2
54		J1 THRU J8, J10, THRU J19	WIRE JUMPER 22 GAUGE WIRE WITH INSULATION	18
55	3A-7520-1		TIE WRAP	1
56	5A-9150	IC1	MC6802 MICROPROCESSOR	1
57	5A-9015 5A-9198	IC2	7641 512 X 8 PROM MCM68312 2 K X 8 ROM	1

* NOTE:
JUMPERS SHOWN WITH SOLID LINES CONNECTED FOR PROM OPERATION. THOSE SHOWN WITH DASHED LINES CONNECTED FOR ROM OPERATION.

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

PART NAME				
SOUND BOARD ASSEMBLY				
DWN. R. Gay	DATE 12-20-78	APP'D.	SCALE 2=1	PART NO. D-8121/25

Sound Board Assembly Drawing

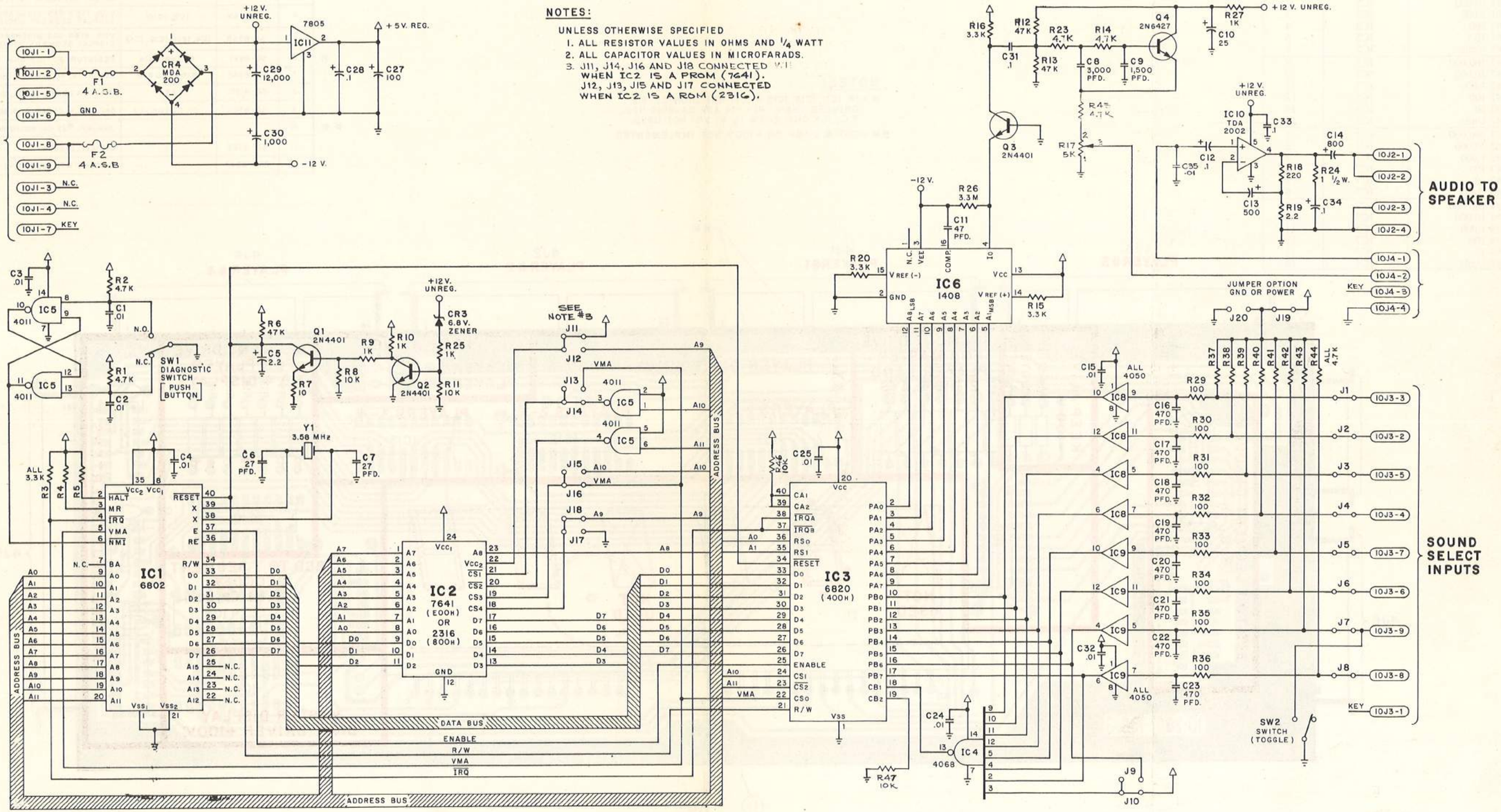
NOTES:

UNLESS OTHERWISE SPECIFIED
1. ALL RESISTOR VALUES IN OHMS AND 1/4 WATT
2. ALL CAPACITOR VALUES IN MICROFARADS.
3. J11, J14, J16 AND J18 CONNECTED WHEN IC2 IS A PROM (7641). J12, J13, J15 AND J17 CONNECTED WHEN IC2 IS A ROM (2316).

POWER SUPPLY

AUDIO TO SPEAKER

SOUND SELECT INPUTS



Sound Board Logic Diagram

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

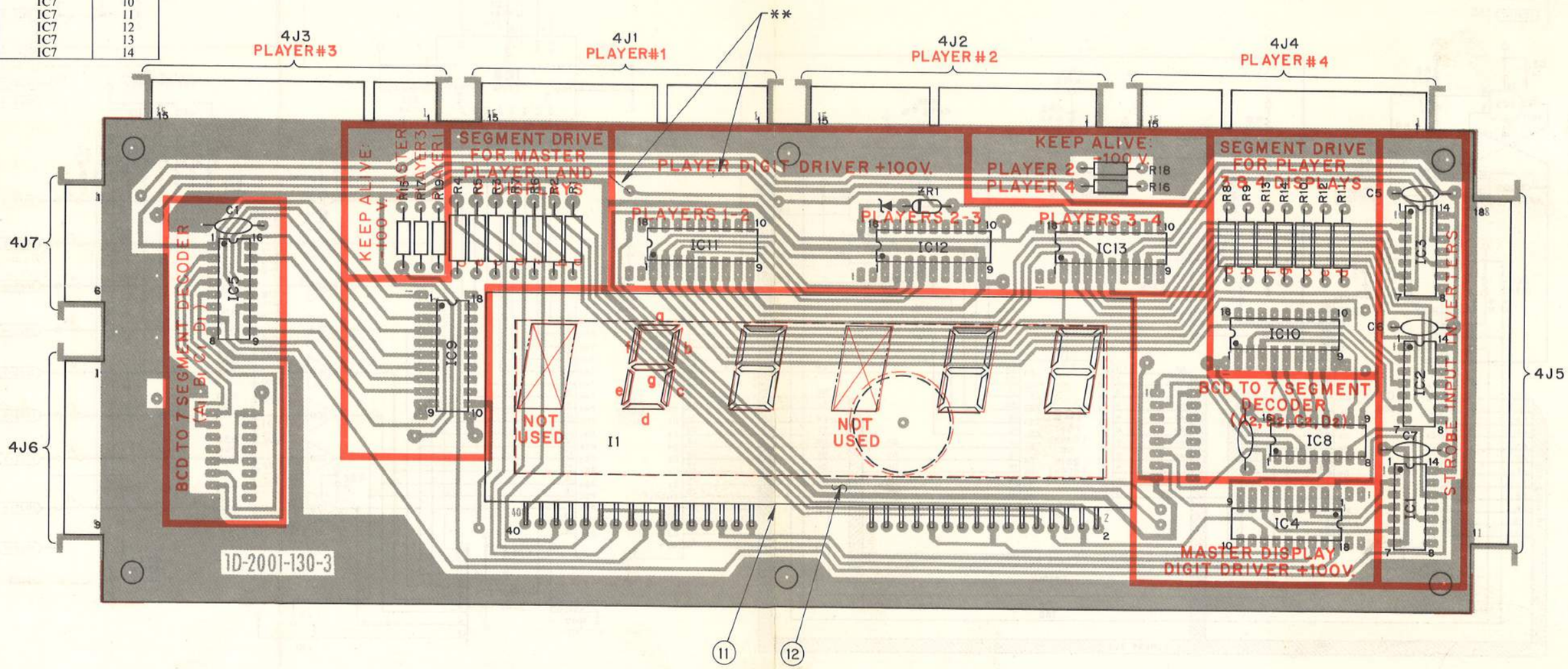
NOTES:

* - IF IC11, IC12, IC13 & IC14 ARE DIONICS-512 DRIVERS THEN R1-R14 ARE 5A-9149 RES., F.C., 15K OHM ±10% 1/2 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 DISCHARGE 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% 1/2 W	14
	7	5B-8982	R15 THRU R19	RESISTOR, FC, 3 MEG OHM 10% 1/4 W	5
	8	5A-9135	ZR1	1N4740A ZENER DIODE, 10V. 5% 1W	1
	9	5A-8980	C1, C4 THRU C7	CAPACITOR, CERAMIC, .01 MFD. 50 V.	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 (4J5-2)
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)
4J5-1 N.C.
4J5-18 N.C.

C7 .01, C5 .01, C6 .01, C1 .01, C2 .01, C3 .01, C4 .01
IC1, IC3, IC2 — 14069
IC5 MC14543 *
IC6 MC14558
IC7 MC14558
IC8 MC14543 *
IC9 7180
IC10 7180

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

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 ***

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)

IC4 UDN-6184 OR DI-0512
GD1 — NOT USED, 31/33, 25/27, NOT USED, 9/13, 3/5
R15 3 MEG.
R1 R2 R3 R4 R5 R6 R7 ALL 10K **
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, +100 V. TRACE IS CUT AND ZR1 ADDED.

+100 V.
IC13 UDN-6184 OR DI-0512
IC12 UDN-6184 OR DI-0512
IC11 UDN-6184 OR DI-0512

PLAYER #4: 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
SEGMENTS: 4J4-7 a, 4J4-6 b, 4J4-3 c, 4J4-1 d, 4J4-2 e, 4J4-5 f, 4J4-4 g
4J4-15 CATHODE KEEP ALIVE
4J4-11 KEY
R16 3 MEG.

PLAYER #3: 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
SEGMENTS: 4J3-9 a, 4J3-10 b, 4J3-13 c, 4J3-15 d, 4J3-14 e, 4J3-11 f, 4J3-12 g
4J3-1 CATHODE KEEP ALIVE
4J3-4 KEY
R17 3 MEG.

PLAYER #2: 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
SEGMENTS: 4J2-13 a, 4J2-12 b, 4J2-8 c, 4J2-6 d, 4J2-7 e, 4J2-11 f, 4J2-10 g
4J2-1 CATHODE KEEP ALIVE
4J2-9 KEY
R18 3 MEG.

PLAYER #1: 4J1-1 UNITS, 4J1-2 10's, 4J1-5 100's, 4J1-4 1,000's, 4J1-5 10,000's, 4J1-7 100,000's
SEGMENTS: 4J1-8 a, 4J1-9 b, 4J1-12 c, 4J1-14 d, 4J1-13 e, 4J1-10 f, 4J1-11 g
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. 1/22/77
F	4J1-15, 4J2-1, 4J3-1 4J4-15 & 4J7-1 WAS "KEEP ALIVE (-100 V.D.C.)"	R.Gat
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 #4 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 "5" EACH DIGIT & "NOT USED" & DELETED "BLANK" 10-28-77 REDRAWN & REVISED 8-26-77	R.GAY
B		R.GAY

TOLERANCES UNLESS OTHERWISE SPECIFIED: FRACTIONS ± 1/64, DECIMALS ± .005, HOLES + .003 − .000, ANGULAR ± 1/2°

WILLIAMS ELECTRONIC MFG. CORP.
SUBSIDIARY OF THE RESORTS CORP.
3401 N. CALIFORNIA CHICAGO 18, ILL. CORNELIA 7-2240

NAME SCHEMATIC, MASTER DISPLAY BD.
MATERIAL — HEAT TREATMENT — FINISH —
DWN. R.Gat DATE 9-26-77 APP'D. — SCALE — 16D-8000
QTY — ASSEMBLE ON
DOCUMENT #2

D-8168

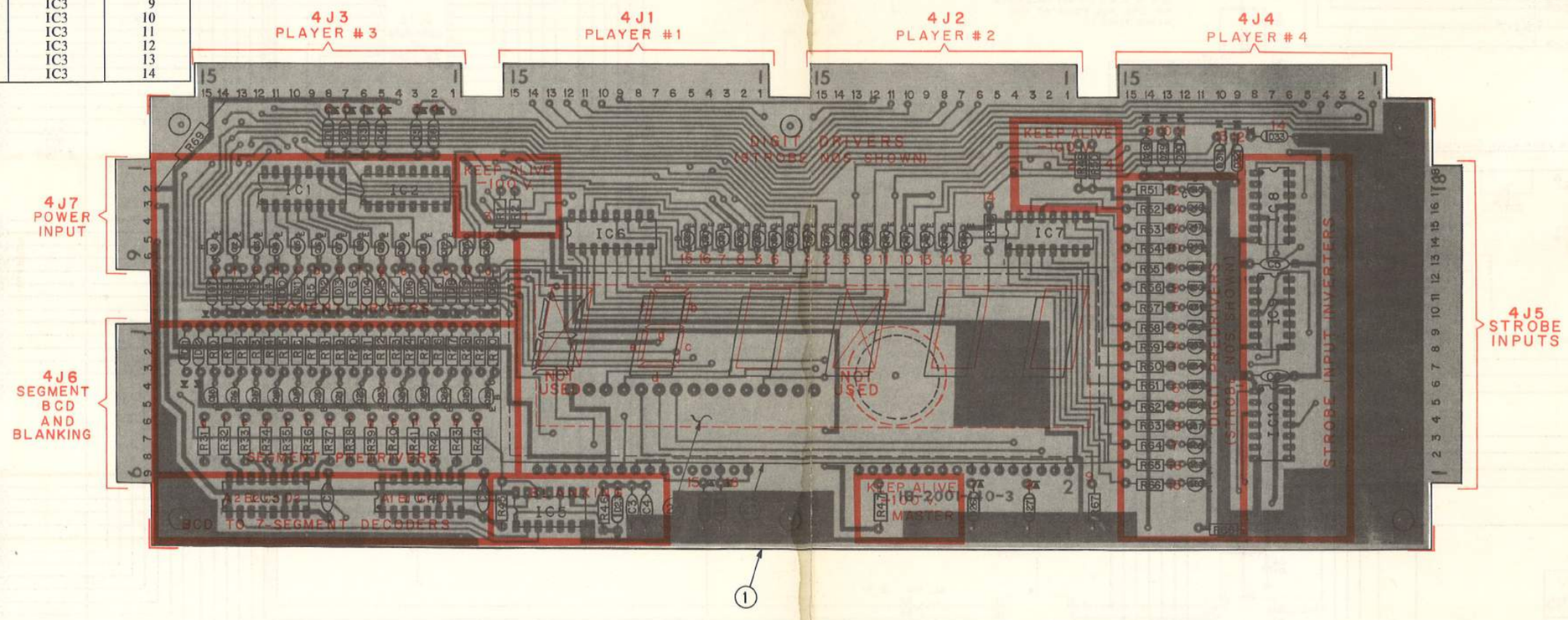
DIGIT CROSS-REFERENCE

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, 2.2M 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	1B-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 (Discrete Drivers)

16D-8169

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

PLAYER #1 — PLAYER #2 — PLAYER #3 — PLAYER #4

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

DIETZGEN NO. 198H AGEPROOF

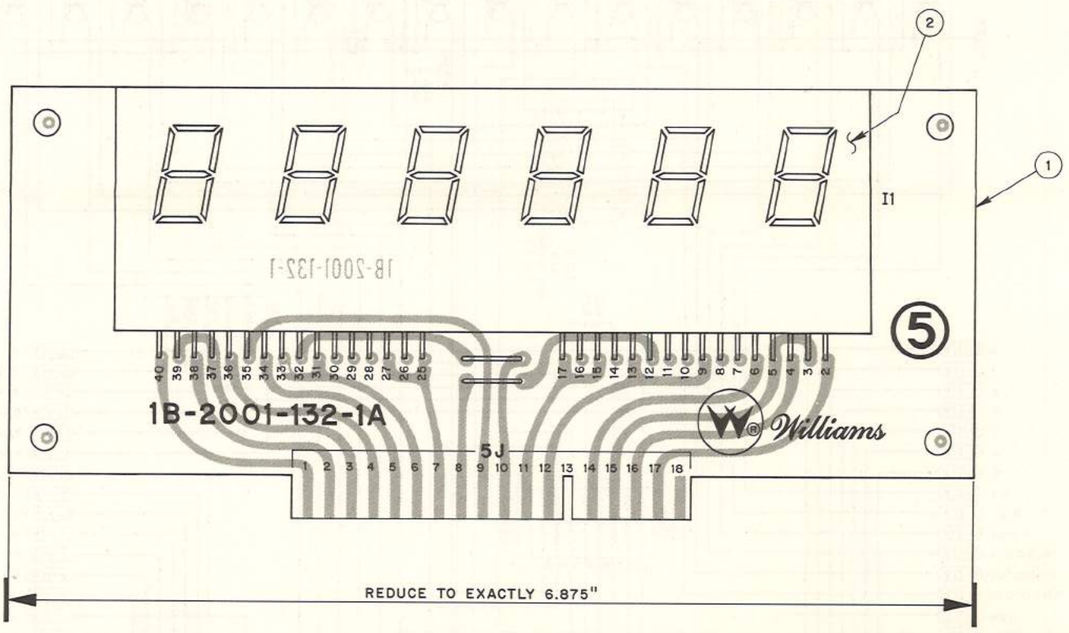
WILLIAMS ELECTRONICS, INC.
3401 N. CALIFORNIA CHICAGO, ILL. 60618 267-2240
NAME SCHEMATIC, DISCRETE MASTER DISPLAY BOARD
DWN. R. GAY | DATE 3-21-79 | SCALE | 16D-8169

D8169 Master Display Board Logic Diagram (Discrete Drivers) 13

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

BILL OF MATERIAL

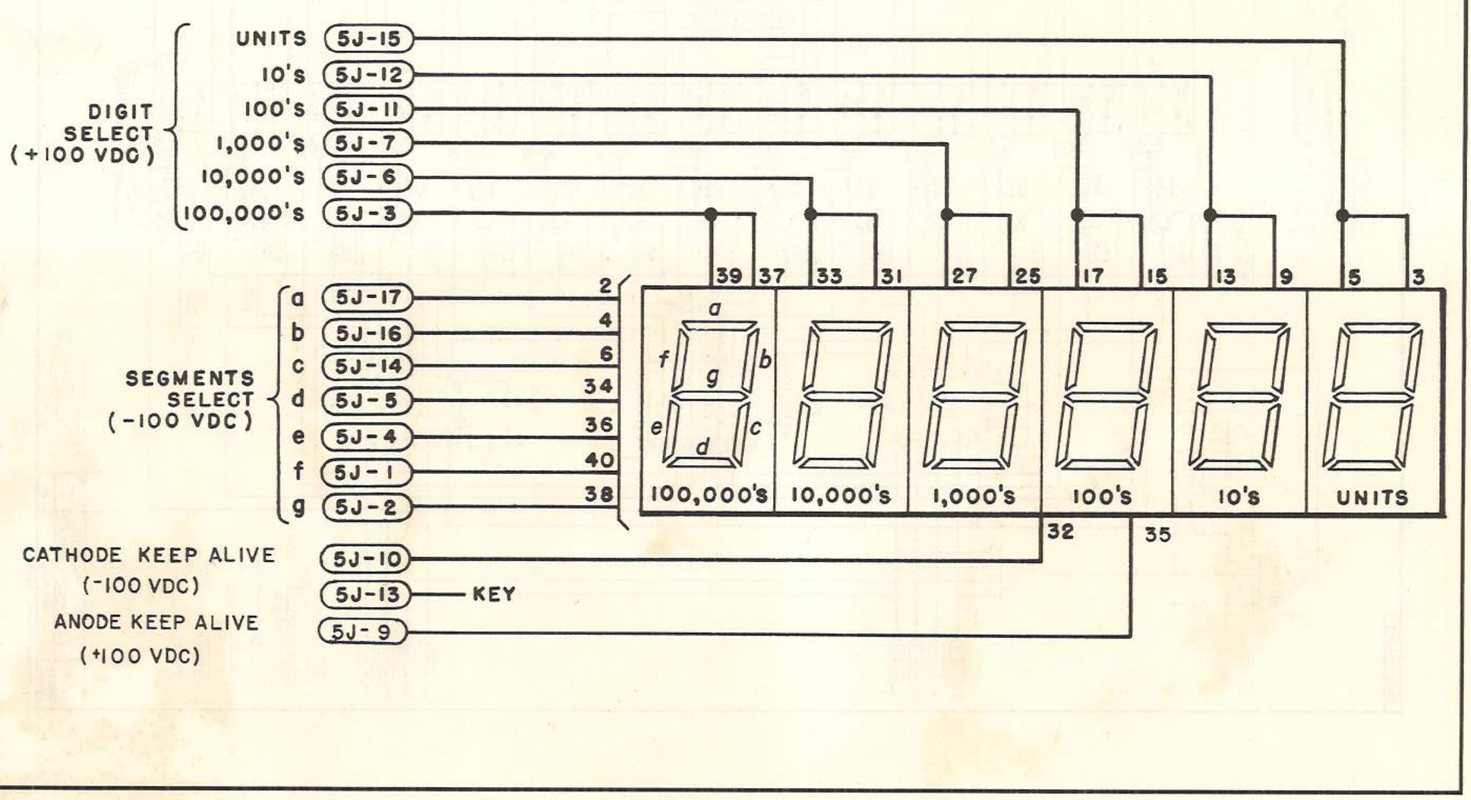
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	1B-2001-132		BARE P.C. BOARD	1
2	5A-8966	I1	6 DIGIT DISPLAY	1
3	23A-6534		DISPLAY MTG. ADHESIVE FOAM	1



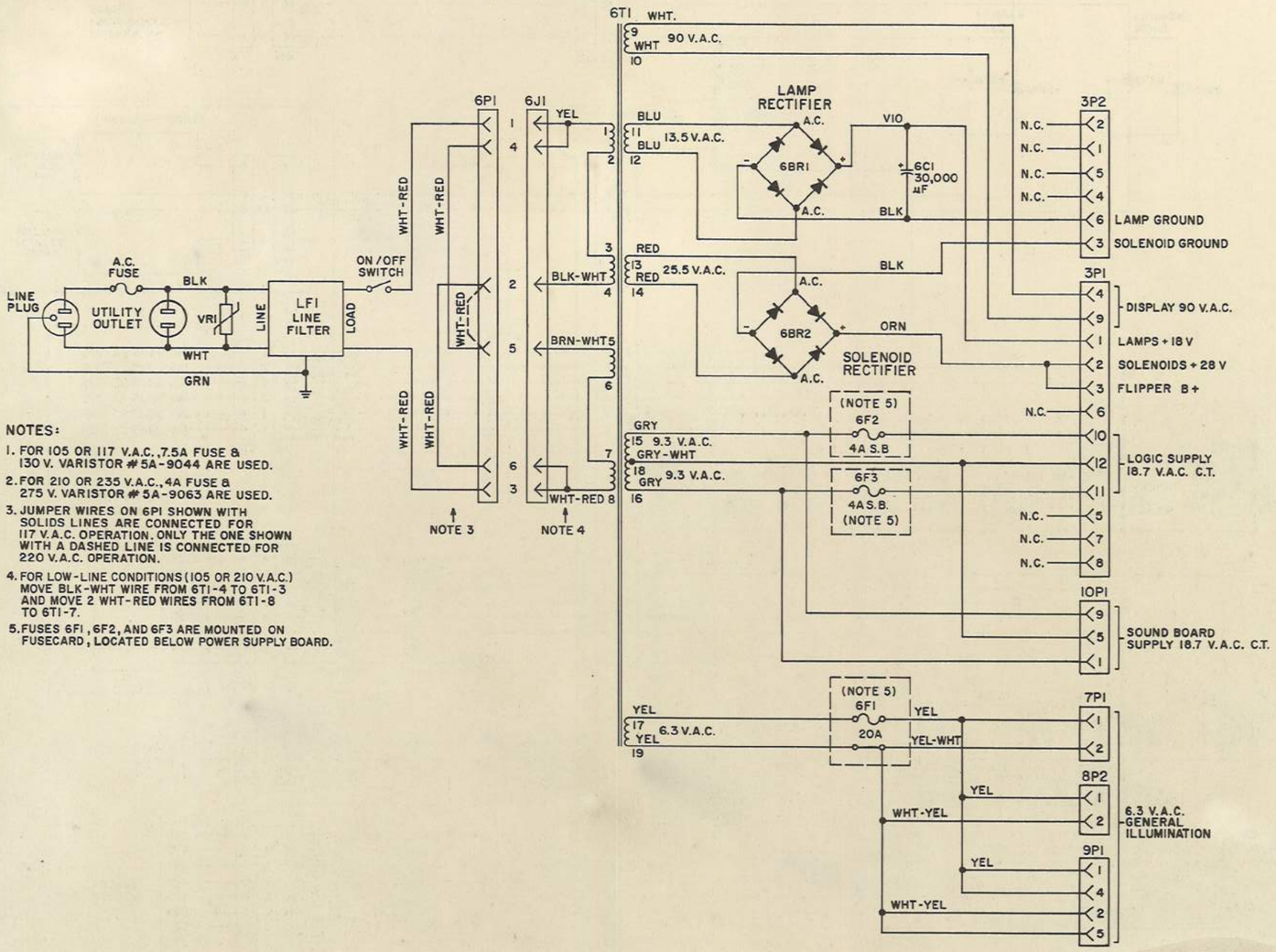
WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF XCOR CORPORATION 3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240				
PART NAME SLAVE DISPLAY BOARD ASSEMBLY				
DWN. R. Gay	DATE	APP'D.	SCALE 2=1	PART NO. C-8019

DOCUMENT #1

SLAVE DISPLAY BOARD

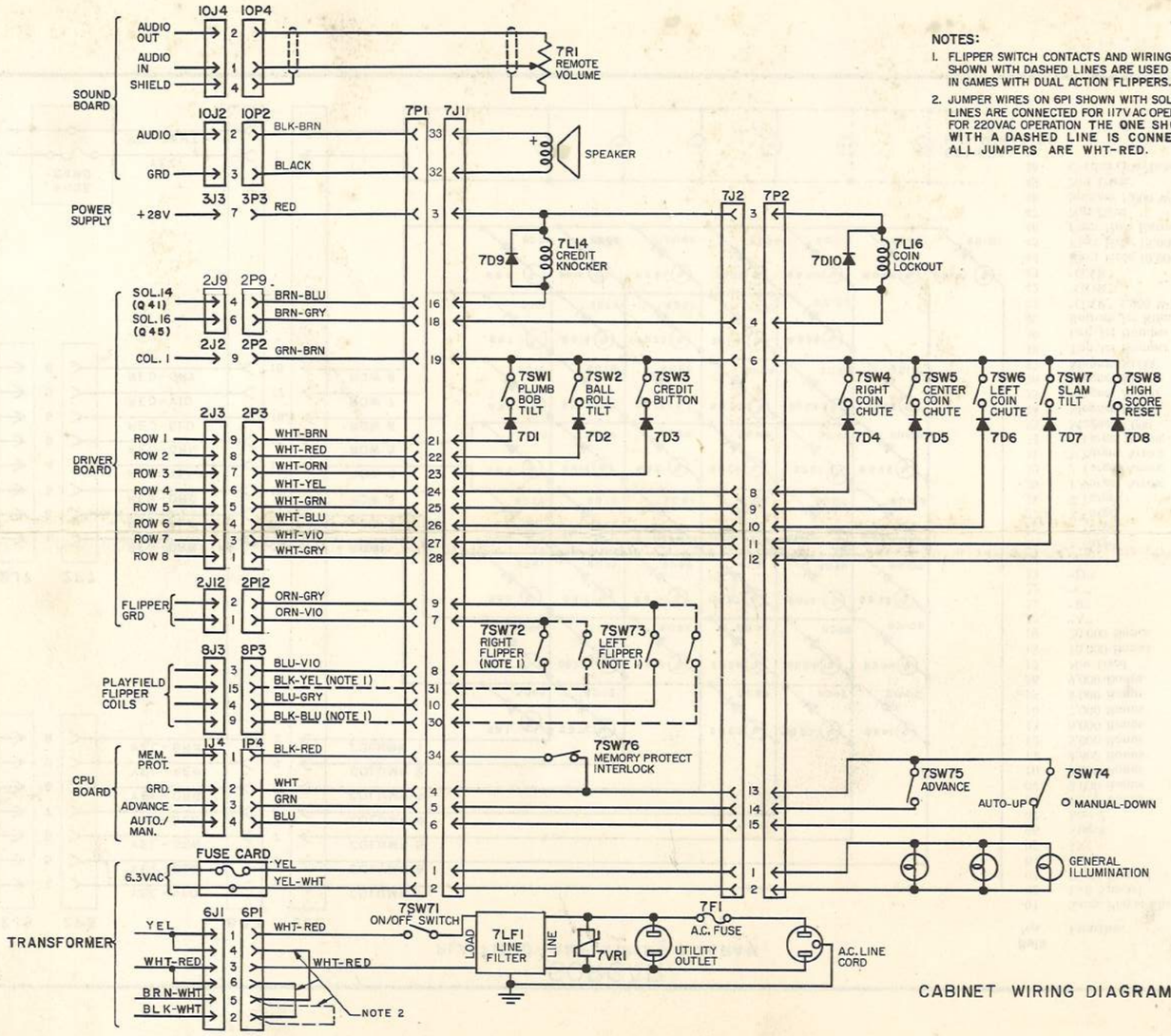


POWER WIRING



NOTES:

1. FOR 105 OR 117 V.A.C., 7.5A FUSE & 130 V. VARISTOR # 5A-9044 ARE USED.
2. FOR 210 OR 235 V.A.C., 4A FUSE & 275 V. VARISTOR # 5A-9063 ARE USED.
3. JUMPER WIRES ON 6PI SHOWN WITH SOLIDS LINES ARE CONNECTED FOR 117 V.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 210 V.A.C.) MOVE BLK-WHT WIRE FROM 6TI-4 TO 6TI-3 AND MOVE 2 WHT-RED WIRES FROM 6TI-8 TO 6TI-7.
5. FUSES 6FI, 6F2, AND 6F3 ARE MOUNTED ON FUSECARD, LOCATED BELOW POWER SUPPLY BOARD.



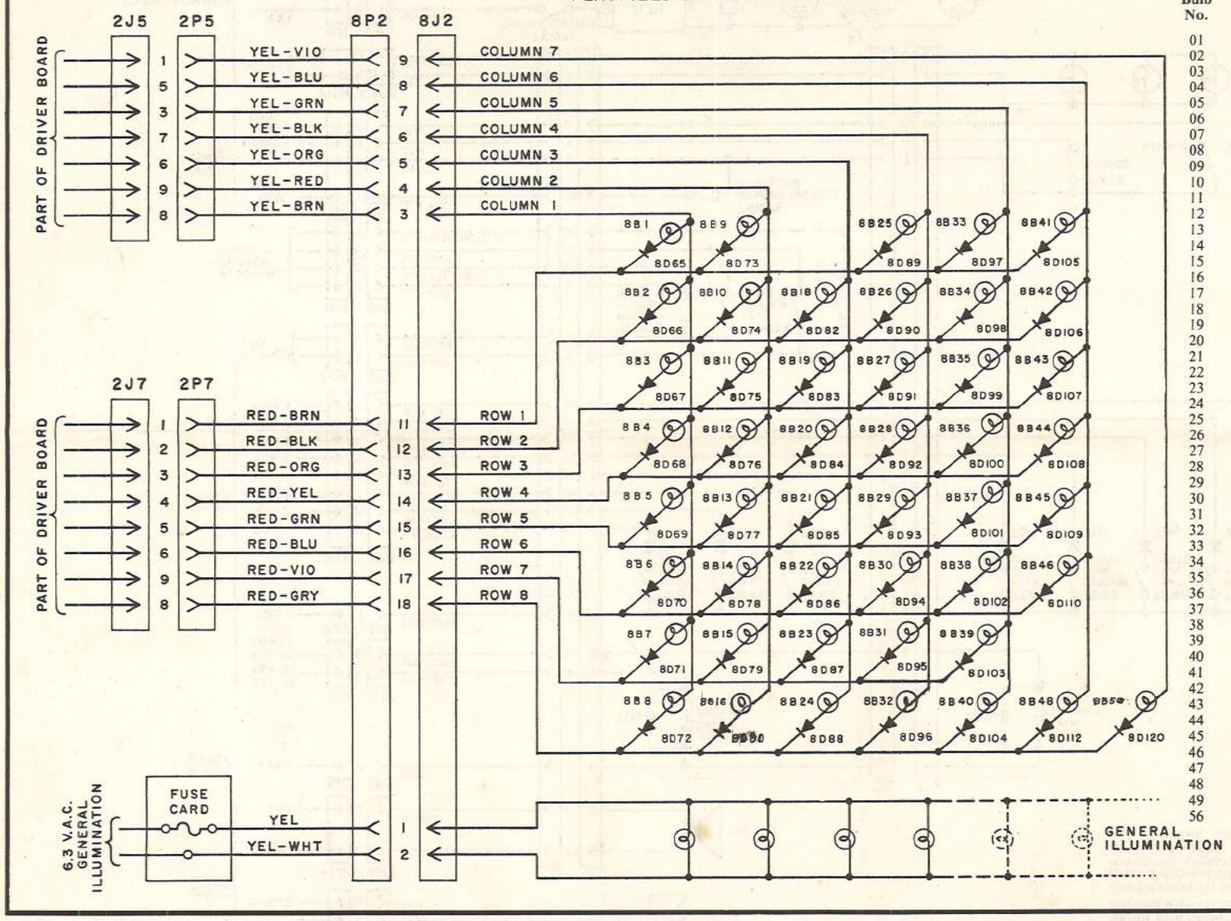
NOTES:

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 117 VAC OPERATION, FOR 220VAC OPERATION THE ONE SHOWN WITH A DASHED LINE IS CONNECTED. ALL JUMPERS ARE WHT-RED.

CABINET WIRING DIAGRAM

GORGAR

PLAYFIELD LAMP WIRING DIAGRAM



Bulb No.	Function
01	Same Player Shoots Again (Playfield)
02	Left Special
03	Right Special
04	2X
05	3X
06	Star 1
07	Star 2
08	1,000 Bonus
09	2,000 Bonus
10	3,000 Bonus
11	4,000 Bonus
12	5,000 Bonus
13	6,000 Bonus
14	7,000 Bonus
15	8,000 Bonus
16	9,000 Bonus
17	Not Used
18	10,000 Bonus
19	20,000 Bonus
20	"A"
21	"B"
22	"C"
23	"D"
24	"E"
25	1 Target
26	2 Target
27	3 Target
28	4 Target
29	1 Target Arrow
30	2 Target Arrow
31	3 Target Arrow
32	4 Target Arrow
33	Magnet 5,000
34	Magnet 10,000
35	Magnet 20,000
36	Magnet 30,000
37	Magnet 50,000
38	Top Jet Bumper
39	Left Jet Bumper
40	Bottom Jet Bumper
41	"GAR" 5,000 When Lit
42	"GOR"
43	"GAR"
44	Eject Hole 10,000
45	Eject Hole 15,000
46	Eject Hole Extra Ball
47	Not Used
48	Spinner 1,000 When Lit
49	Not Used
56	Credits (Playfield)

GORGAR

PLAYFIELD SOLENOIDS WIRING DIAGRAM

