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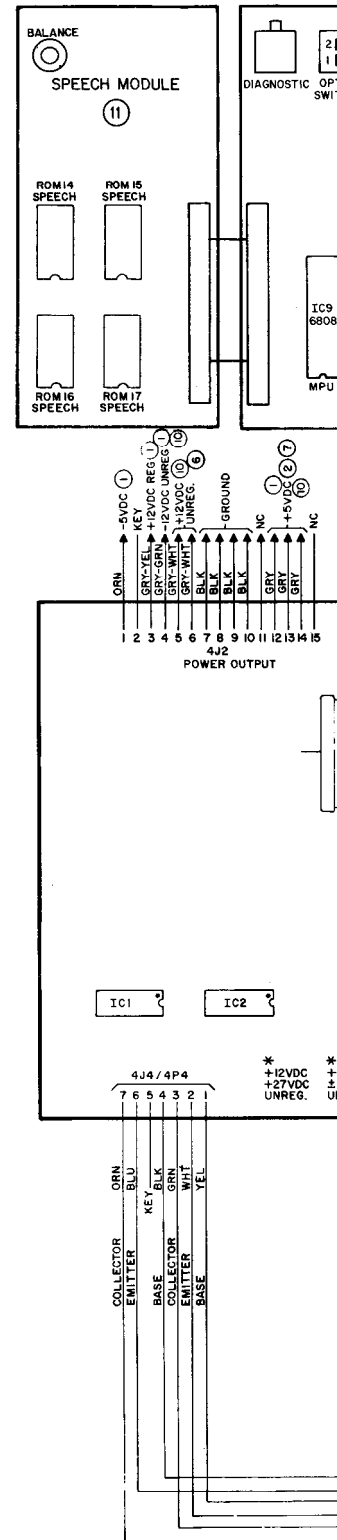
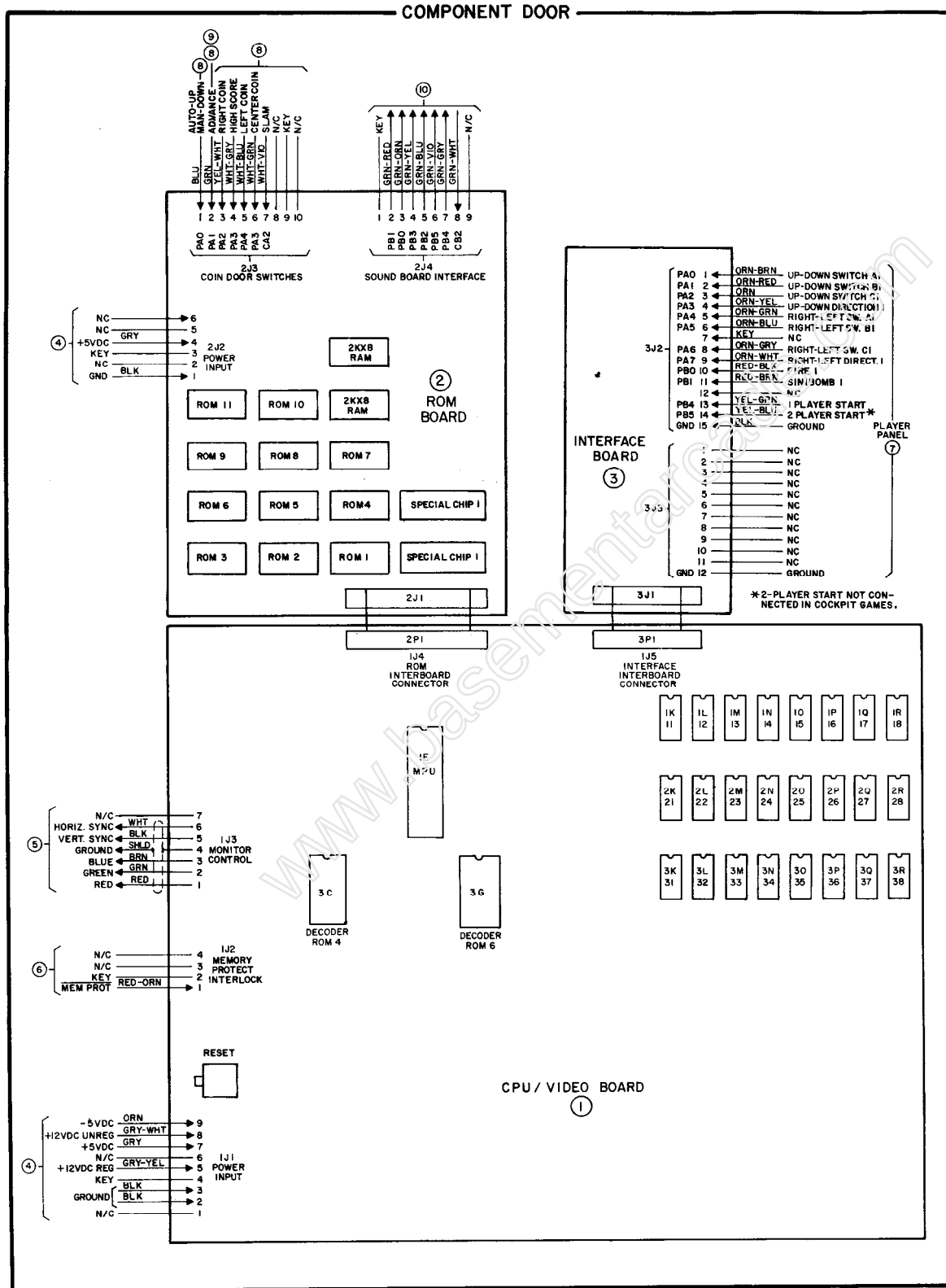
Drawing Set



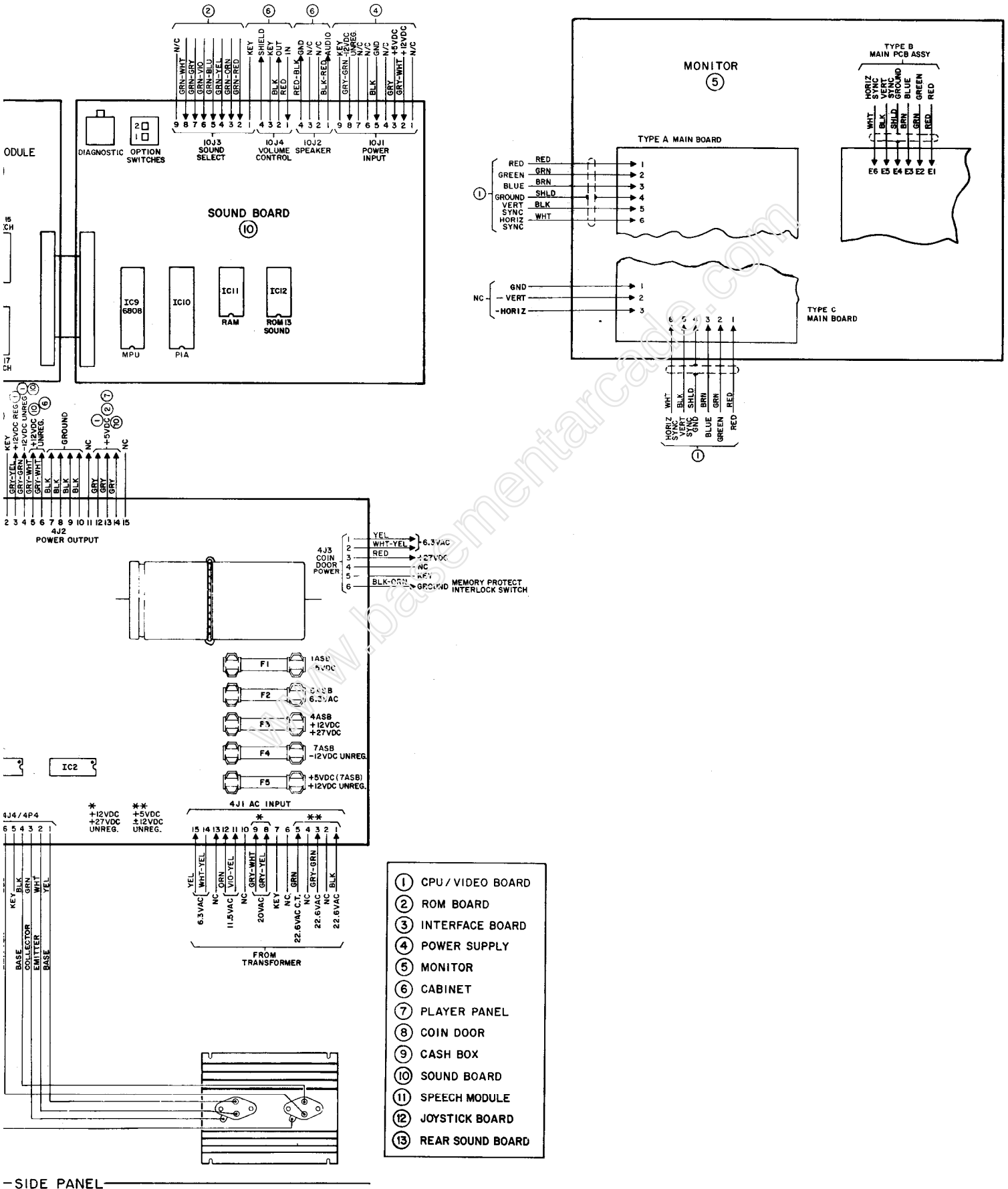
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INTERBOARD WIRING

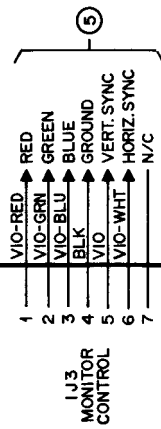
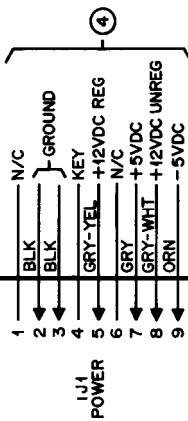


—SIDE PANEL—

Interboard Wiring Diagram
(upright)

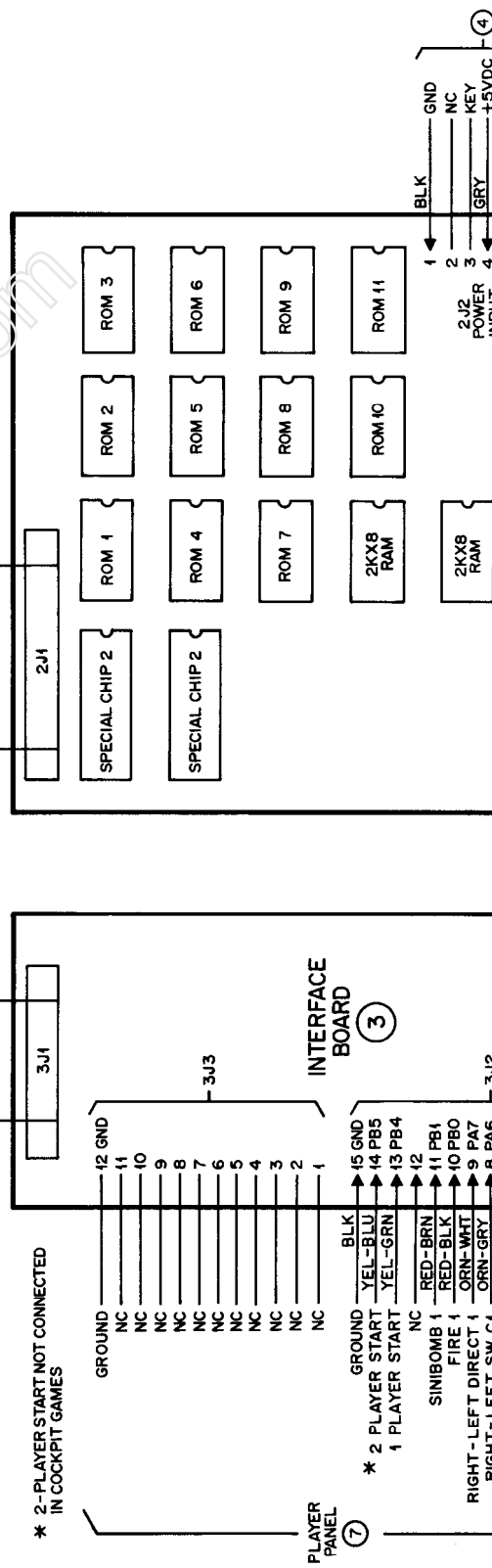
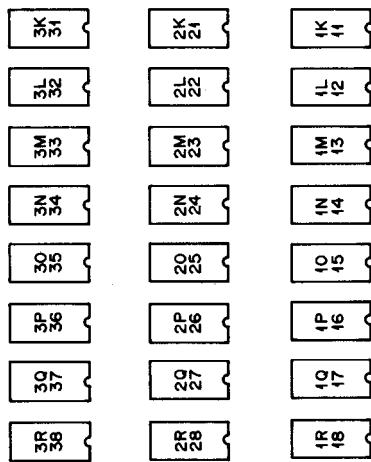
CPU / VIDEO BOARD

1

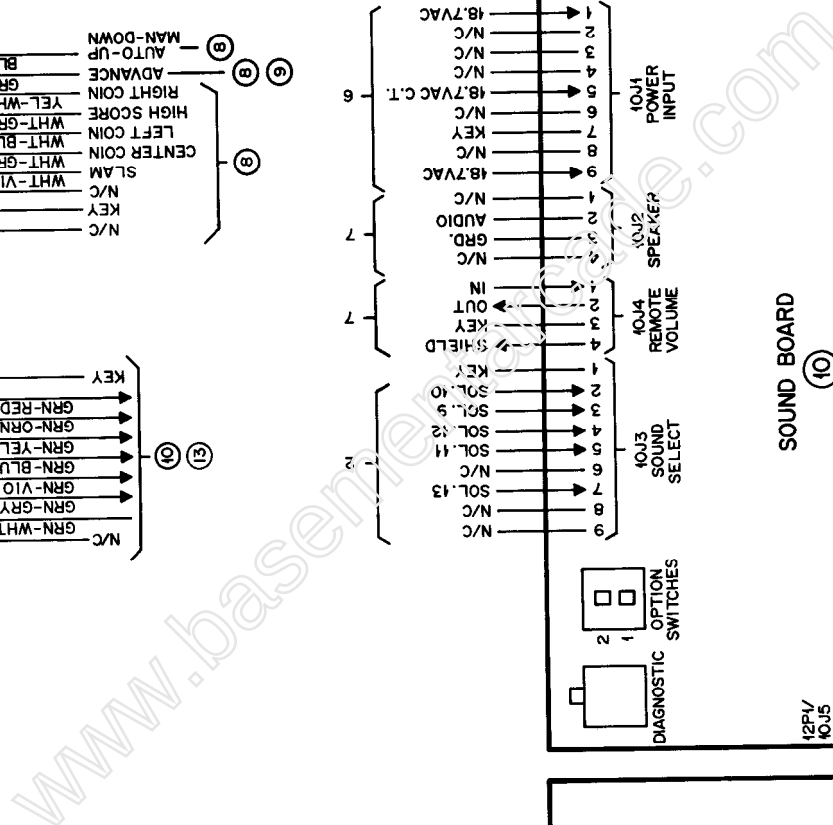
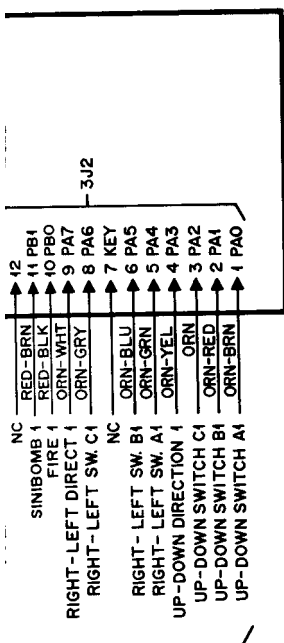


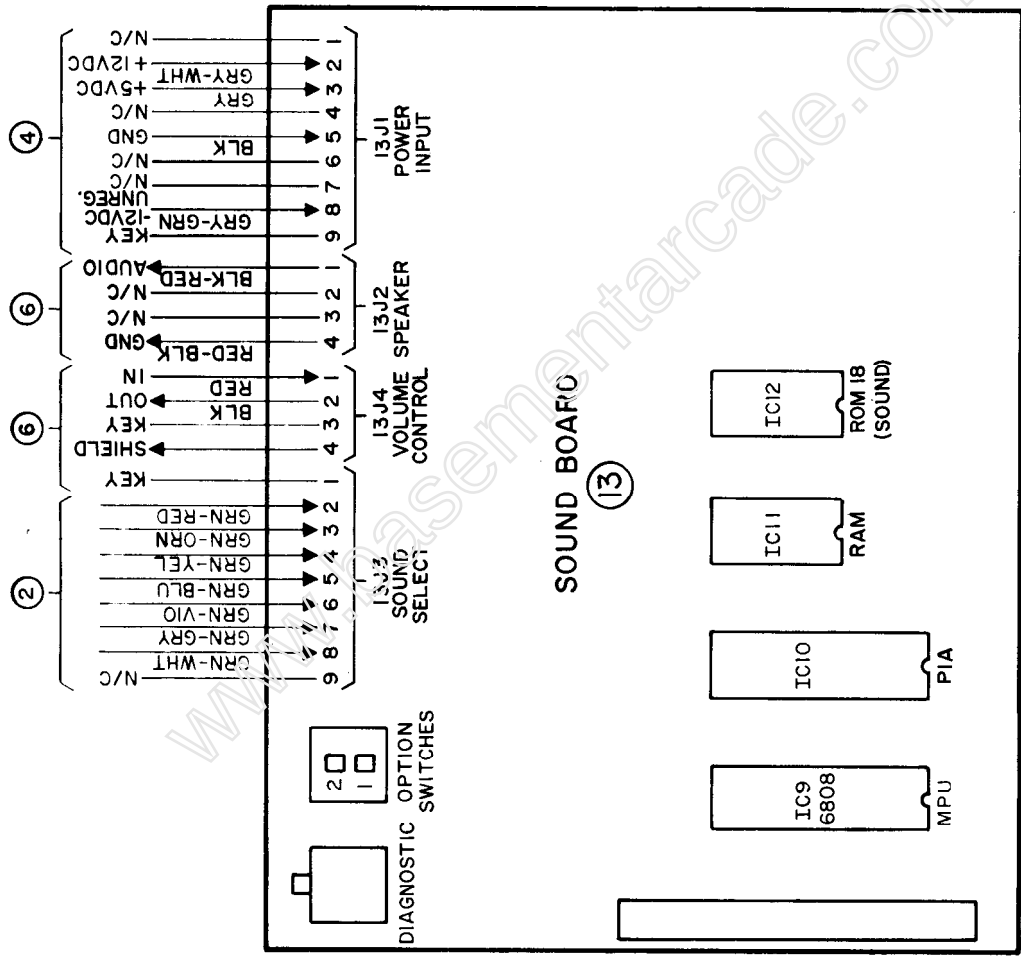
1J4 ROM INTERBOARD CONNECTOR 2P1

1J5 INTERFACE INTERBOARD CONNECTOR 3P1



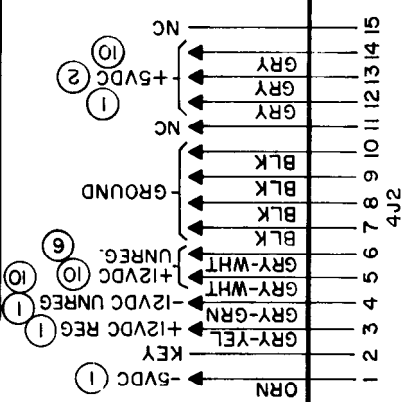
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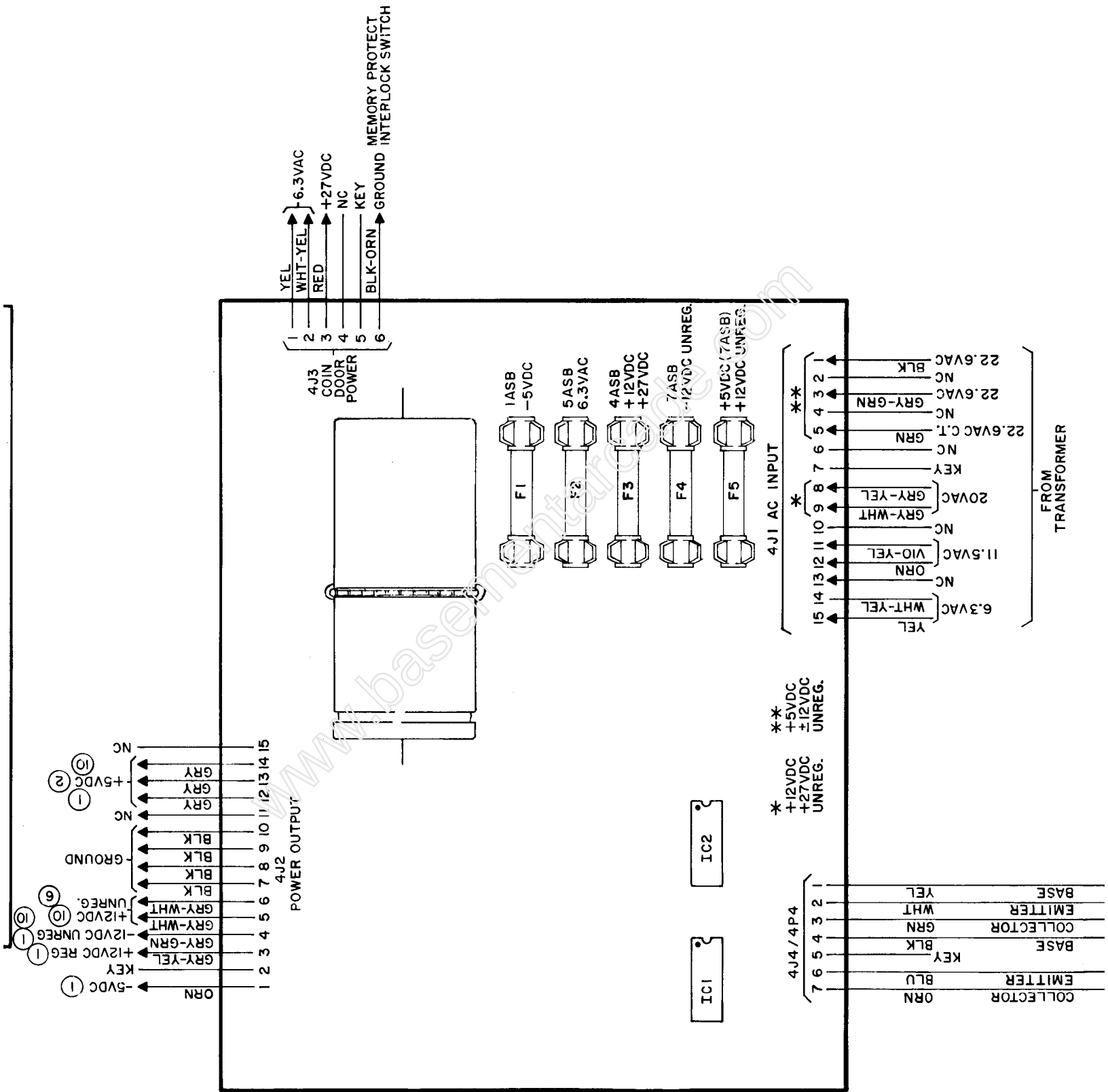


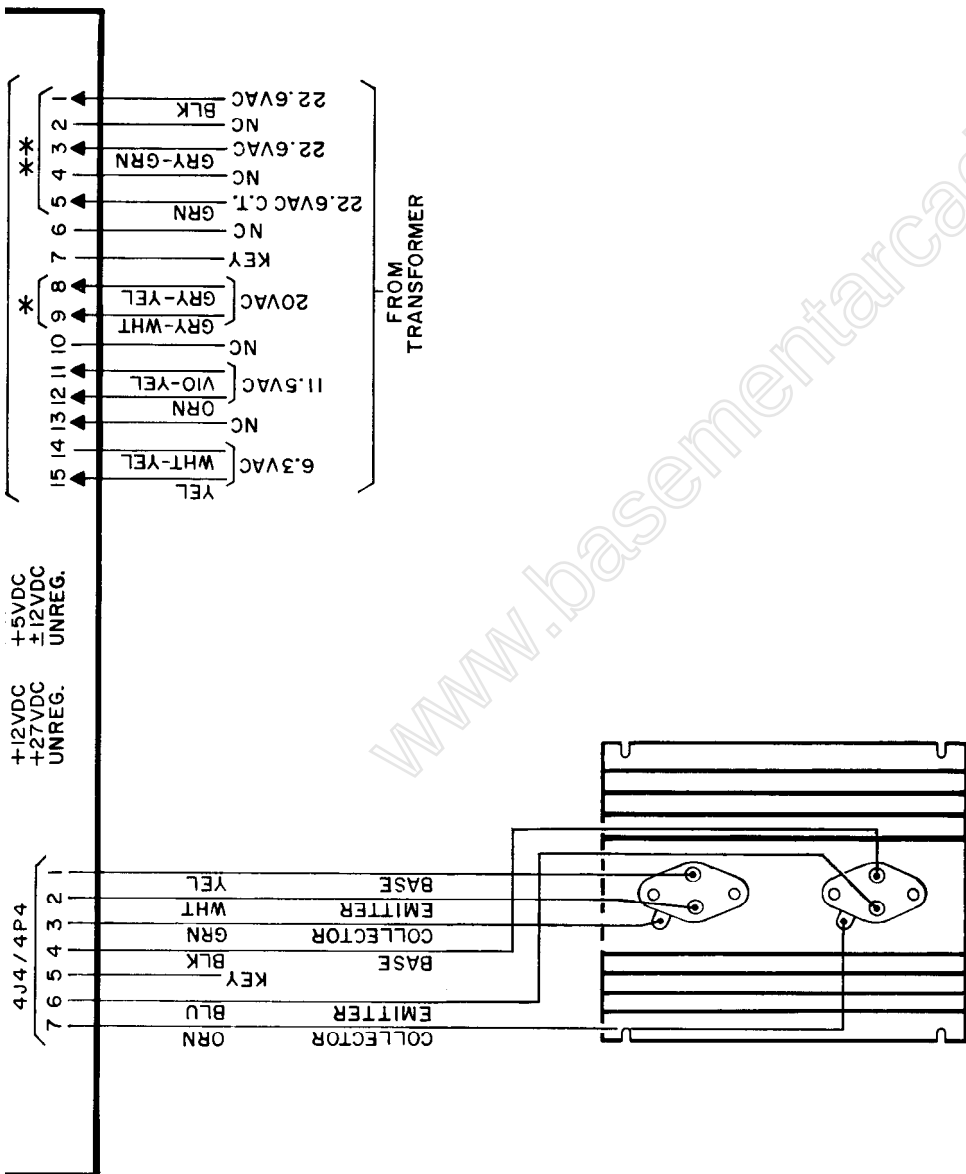
REAR VOL. CONT.

FRONT VOL. CONT.



FRONT
VOL. CONT





ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
74	5791-09497-00	IJ3	7 PIN HEADER 09-65-1071	1
75	5791-09021-00	IJ1	9 PIN HEADER 09-65-1091	1
76	5019-09669-00	SR1	RESISTOR, 1K OHM 10 PIN SIP	1
77	5010-09534-00	W1, W2, W3	RESISTOR, C.F. 0 OHM 1/4 WATT	3
78	5340-09489-00	IC	5114 1K X 4 CMOS STATIC RAM	1
	5340-09667-00		6514 1K X 4 CMOS STATIC RAM	0
79	5281-09483-00	1B, 2B	74LS189 16 X 4 RAM	0
	5280-09625-00		7489 16 X 4 RAM	0
	5282-09716-00		74LS189 16 X 4 RAM	0
	5281-09715-00		74LS289 16 X 4 RAM	2
	5282-09717-00		74LS289 16 X 4 RAM	0
80	5641-09371-00	SW1	PUSH BUTTON SW. SPST	0
	5641-09312-00		PUSH BUTTON SW. DPDT MOM.	1
81	16-8850-26	—	LABEL PCB ASSY I.D.	1
82				
83	5019-09786-00	SR2	SIP 4.7KΩ 5R 6 PIN 5% 125 W/R@70°C	1
84	5281-09856-00	1H, 3H, 4H	OCTAL LATCH 74LS373	3
85				
47	5010-09035-00	R64	RESISTOR, C.F. 47K OHM 5% 1/4 W.	1
48	5551-09822-00	L3	COIL, 9.74H, 3A	1
49	5010-09001-00	R2, R21, R24	RESISTOR, C.F. 330 OHM 5% 1/4 W.	3
50	5010-09039-00	R56	RESISTOR, C.F. 10 OHM 5% 1/4 W.	1
51	5043-09491-00	C89, C93	CAPACITOR, AXIAL 22 PFD. 1K V. ±10%	2
52	5043-09492-00	C88	CAPACITOR, AXIAL 100 PFD. 50 V. ±10%	1
53	5040-09545-00	C84	CAPACITOR, AXIAL 22 MFD. 10 V. ±20%	1
54	5043-09065-00	C94 THRU C97	CAPACITOR, AXIAL 470 PFD. 50 V. XTR ±20%	4
55	5043-08996-00	SEE NOTE #3	CAPACITOR, AXIAL .1 MFD. 50 V. ±20%	85
56	5040-09421-00	C81, C82, C83	CAPACITOR, RADIAL 100 MFD. 25 V. +50 -10%	3
57	5075-09059-00	ZR2	1N5990A 3.9 V. ZENER DIODE	1
58	5075-09018-00	ZR1	1N5996A 6.8 V. ZENER DIODE	1
59	5070-08919-00	D1, D2, D3, D4, D5, D6, D7, D8	1N4148 DIODE, SILICON	8
60	5070-09266-00	D9	1N5817 DIODE, SILICON	1
61	5160-08938-00	Q5, Q6, Q7, Q8, Q9, Q10, Q11, Q13	2N4401, TO-92 TRANSISTOR, NPN	8
62	5190-09016-00	Q1, Q2, Q3, Q4, Q12	2N4403, TO-92 TRANSISTOR, PNP	5
63	5520-09495-00	CR1	12 MHZ CRYSTAL	1
64	5043-09845-00	C98-C105	CAPACITOR, AXIAL 100 PFD. 50V ±20%	8
65	5880-09022-00	B1, B2, B3	BATTERY ALKALINE 1.5 V. (AA)	3
66	5881-09021-00	—	BATTERY HOLDER #171	1
67	5100-09628-00	—	14-PIN IC SOCKET	0
68	5100-09006-00	—	16-PIN IC SOCKET	24
69	5100-09004-00	—	24-PIN IC SOCKET	2
70	5100-08986-00	—	40-PIN IC SOCKET	1
71	5791-09437-00	IJ5	20 PIN RIBBON CABLE HEADER	1
72	5791-09349-00	IJ4	40 PIN RIBBON CABLE HEADER	1
73	5791-09028-00	IJ2	4 PIN HEADER 09-65-1041	1

NOTES:

1. 4116: 1K, 1L, 1M, 1N, 1O, 1P, 1Q, 1R, 2K, 2L, 2M, 2N, 2O, 2P, 2Q, 2R, 3K, 3L, 3M, 3N, 3O, 3P, 3Q, 3R

2. 4.7K 4 RESISTOR:

R26, R27, R28, R29, R32, R33, R35, R36, R37, R38, R39, R41, R43, R45, R50, R51, R52, R66, R67, R68, R69, R70, R71, R75, R84, R76, R77, R78

3. .1 MFD. CAPACITORS:

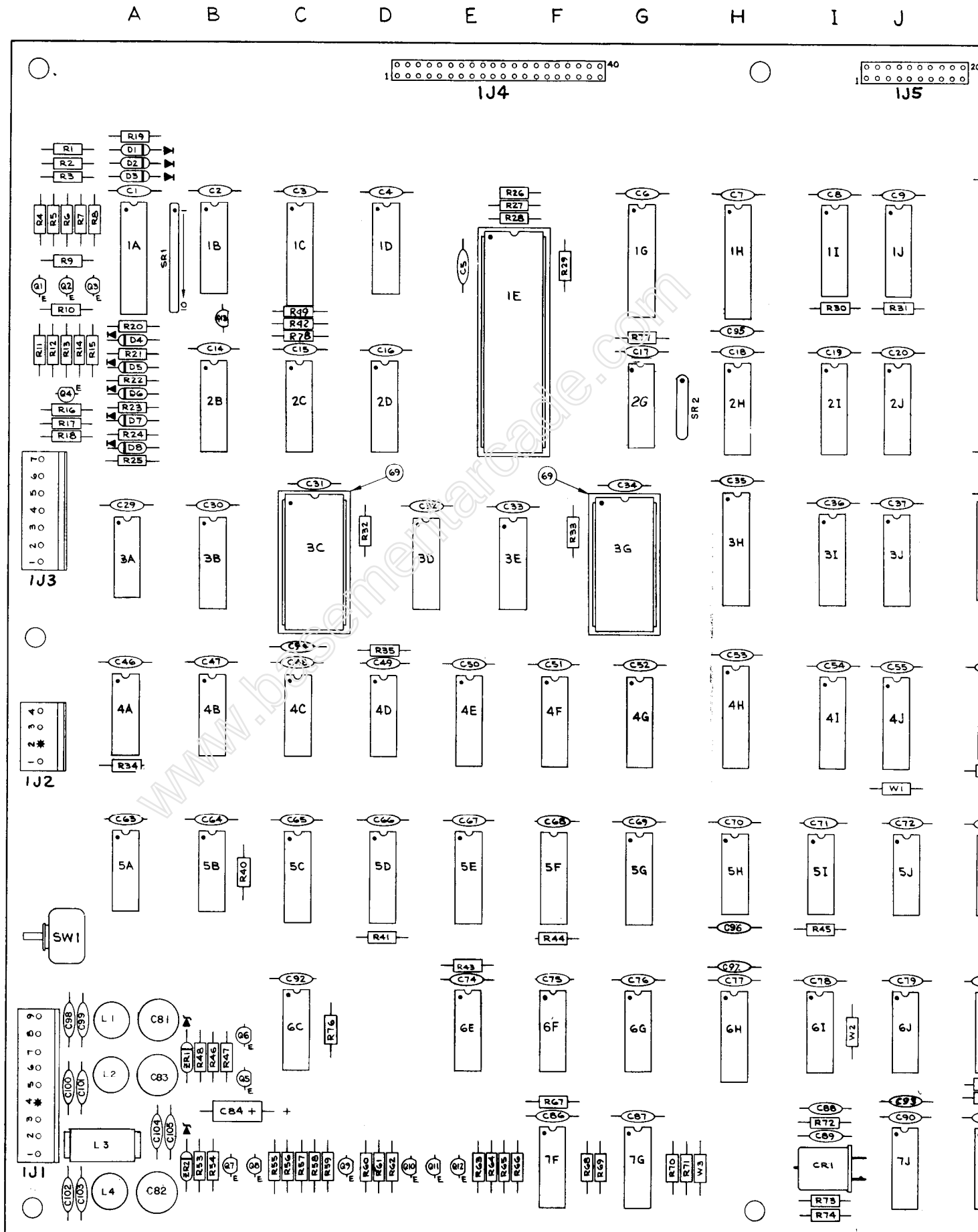
C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61, C62, C63, C64, C65, C66, C67, C68, C69, C70, C71, C72, C73, C74, C75, C76, C77, C78, C79, C80, C86, C87, C90, C91, C92

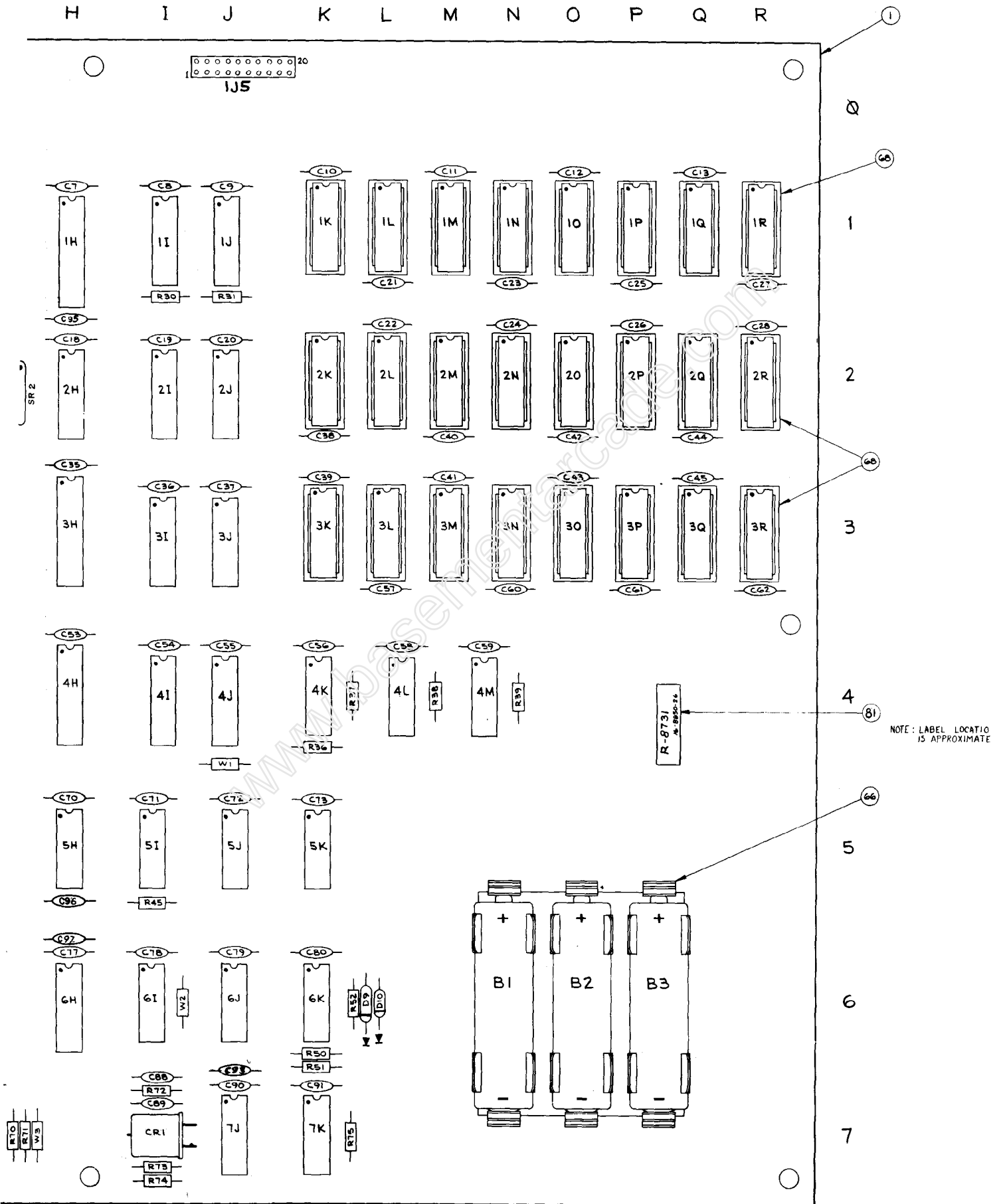
4. FOR SCHEMATIC REFER TO 16-8809

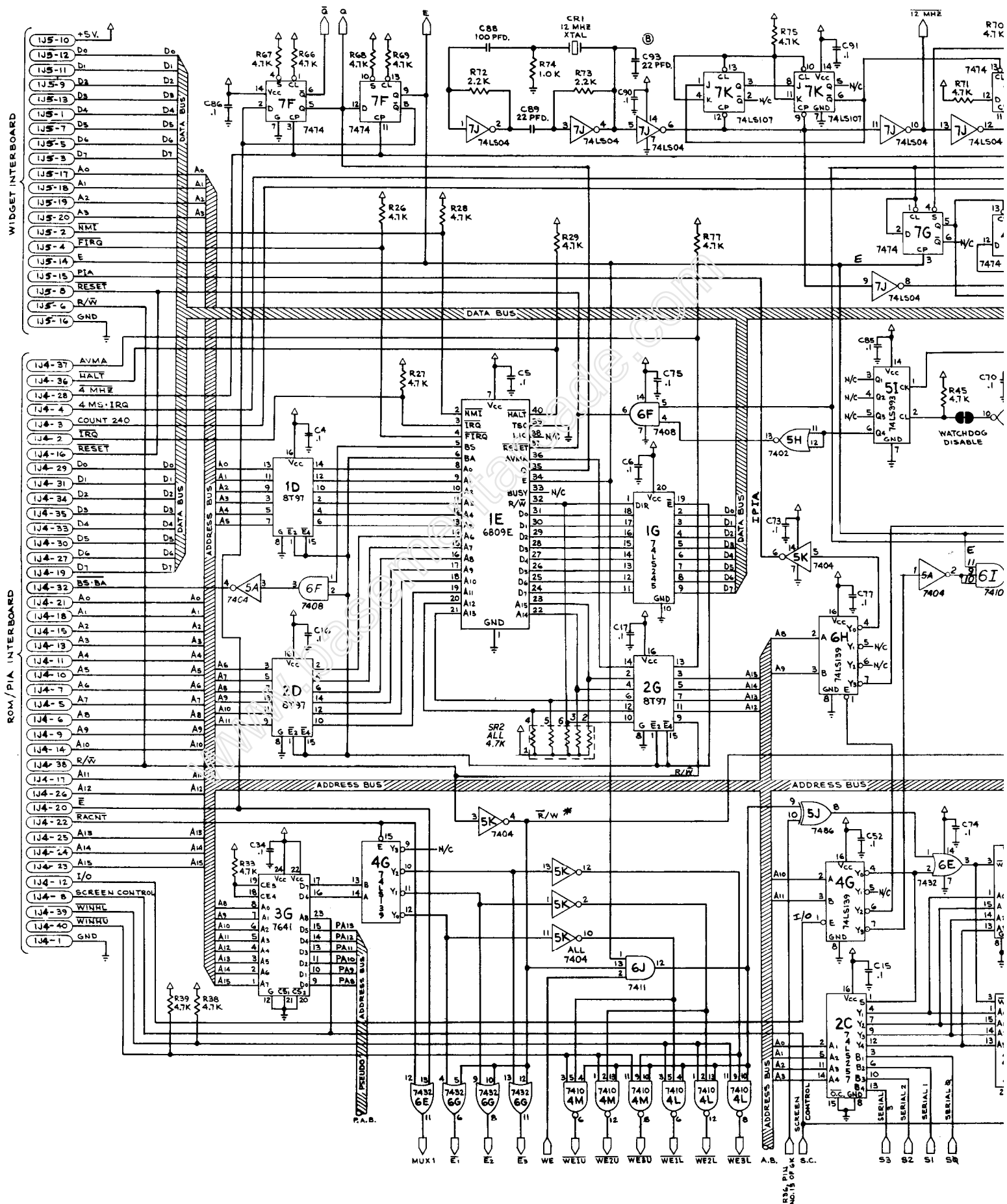
BILL OF MATERIAL				
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	5770-09656-00		BASE P.C. BOARD REV. D	1
2	5280-09073-00	4B	7400 QUAD 2-INPUT NAND	1
3	5280-08948-00	5H	7402 QUAD 2-INPUT NOR	1
4	5281-09215-00	7J	74LS04 HEX. INVERTER	1
5	5280-09013-00	5A, 5K	7404 HEX. INVERTER	2
6	5280-08973-00	6F	7408 QUAD AND	1
7	5280-09011-00	4L, 4M, 6I	7410 TRIPLE 3-INPUT NAND	3
8	5280-09475-00	3A, 6J	7411 TRIPLE 3-INPUT AND	2
9	5280-09530-00	5B	7420 DUAL 4-INPUT NAND	1
10	5280-09476-00	4C	7421 DUAL 4-INPUT AND	1
11	5280-09477-00	6E, 6G	7432 QUAD 2-INPUT OR	2
12	5280-09478-00	4D, 4K, 6K, 6C, 7F, 7G	7474 DUAL D-TYPE FLIP-FLOP	6
13	5280-09479-00	4A, 5J	7486 QUAD 2-INPUT EX-OR	2
14	5281-09480-00	7K	74LS107 DUAL J-K FLIP-FLOP	1
15	5281-09532-00	5G	74LS183 13-INPUT NAND	1
16	5281-09246-00	4G, 6H	74LS139 DUAL 2 to 4 LINE DECODER	2
17	5280-09481-00	3D, 3E, 4E, 4F	74153 DUAL 4 to 1 DATA INVERT	4
18	5280-09668-00	1I, 1J, 2I, 2J, 3I, 3J, 4I, 4J	74166 8-BIT SHIFT REGISTER	8
19				
20	5281-09308-00	1G	74LS245 OCTAL BUS TRANSCEIVER	1
21	5281-09485-00	2C, 2H	74LS257 QUAD DATA MUX.	2
22	5370-08989-00	1D, 2D, 2G, 3B	8T97 HEX. TS BUFFER	0
	5281-09385-00		74LS367 HEX BUS DRIVER	4
23	5281-09486-00	1A,	74LS374 OCTAL D-TYPE FLIP-FLOP	1
24	A-5342-09821	3C	UNIVERSAL VERT. DECODER ROM 6	1
25	A-5342-09694	3G	UNIVERSAL HORIZ. DECODER ROM 4	1
26	5551-09848-00	L1, L2, L4	COIL, 2.04H, .5A	3
27	5281-09533-00	5I	74LS393 DUAL 4-BIT BIN. COUNTER	1
28	5340-09488-00	SEE NOTE #1	4116 (450 ns ACCESS) 16 K X 1 DYNAMIC RAM	24
29	5070-06258-00	D10	1N4001 DIODE	1
30	5280-09489-00	5C, 5D, 5E, 5F	9316 4-BIT BIN. COUNTER	4
31	5400-09490-00	1E	6809E MICROPROCESSOR	1
32	5010-09548-00	R10, R12, R14	RESISTOR, C.F. 68 OHM 2% 1/4 W.	3
33	5010-09036-00	R65	RESISTOR, C.F. 100 OHM 5% 1/4 W.	1
34	5010-09187-00	R4, R6, R7, R16, R19, R25	RESISTOR, C.F. 150 OHM 5% 1/4 W.	6
35	5010-09508-00	R11, R13, R15	RESISTOR, C.F. 270 OHM 2% 1/4 W.	3
36	5010-09416-00	R18	RESISTOR, C.F. 470 OHM 5% 1/4 W.	1
37	5010-08992-00	R1, R20, R23	RESISTOR, C.F. 560 OHM 5% 1/4 W.	3
38	5010-09358-00	R42, R50, R77, R48, R54, R74	RESISTOR, C.F. 1K OHM 5% 1/4 W.	8
39	5010-09314-00	R3, R22	RESISTOR, C.F. 1.2 K OHM 5% 1/4 W.	2
40	5010-08998-00	R59, R72, R73	RESISTOR, C.F. 2.2 K OHM 5% 1/4 W.	3
41	5010-08997-00	R60, R63	RESISTOR, C.F. 2.7 K OHM 5% 1/4 W.	2
42	5010-08983-00	R30, R31, R40, R44, R58	RESISTOR, C.F. 3.3 K OHM 5% 1/4 W.	5
43	5010-08991-00	SEE NOTE #2	RESISTOR, C.F. 4.7 K OHM 5% 1/4 W.	
44	5010-09034-00	R49, R46, R53	RESISTOR, C.F. 10 K OHM 5% 1/4 W.	3
45	5010-08774-00	R47, R55, R57, R62	RESISTOR, C.F. 22K OHM 5% 1/4 W.	4
46	5010-09113-00	R61	RESISTOR, C.F. 33K OHM 5% 1/4 W.	1

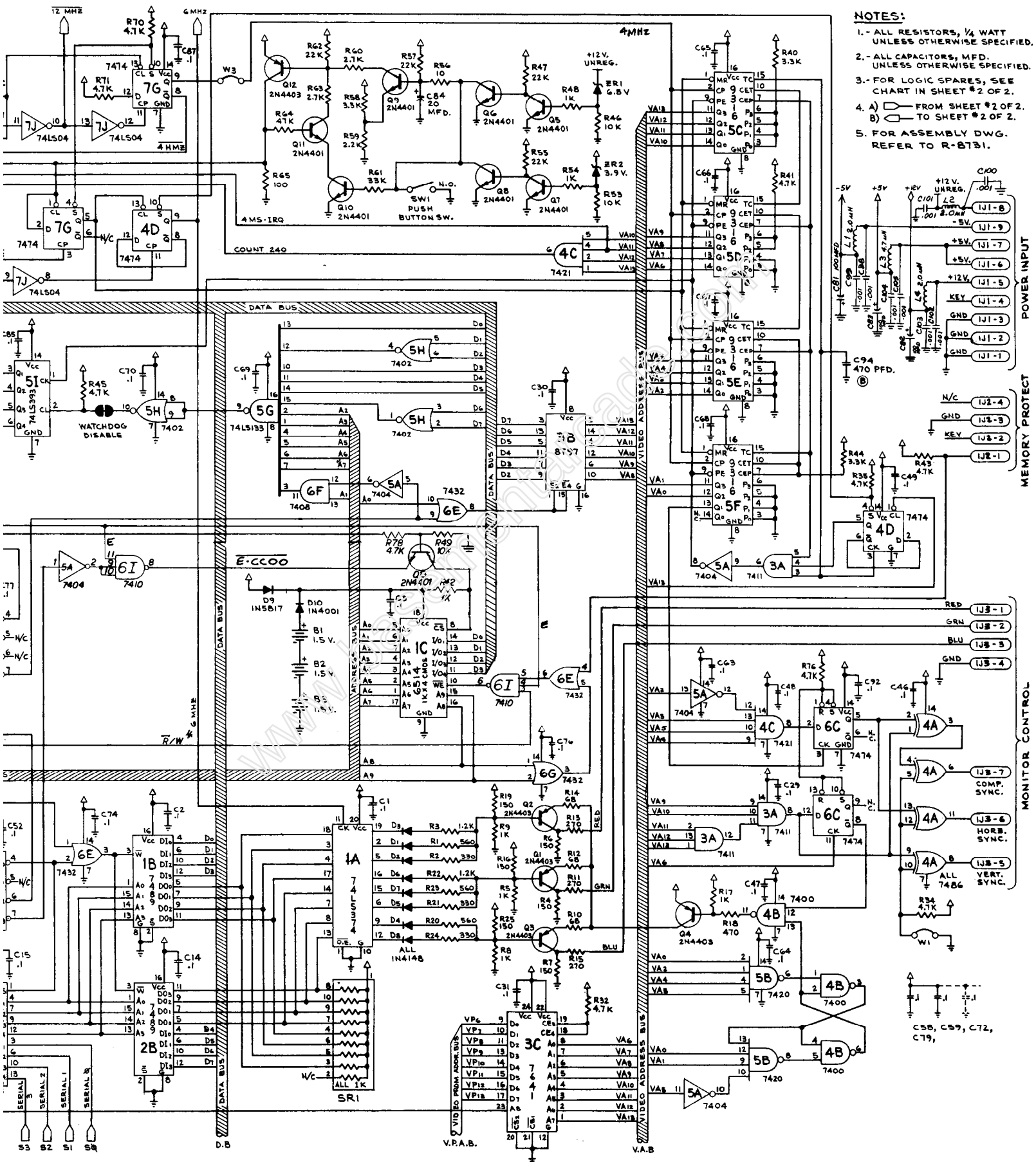


REQD. NO.	
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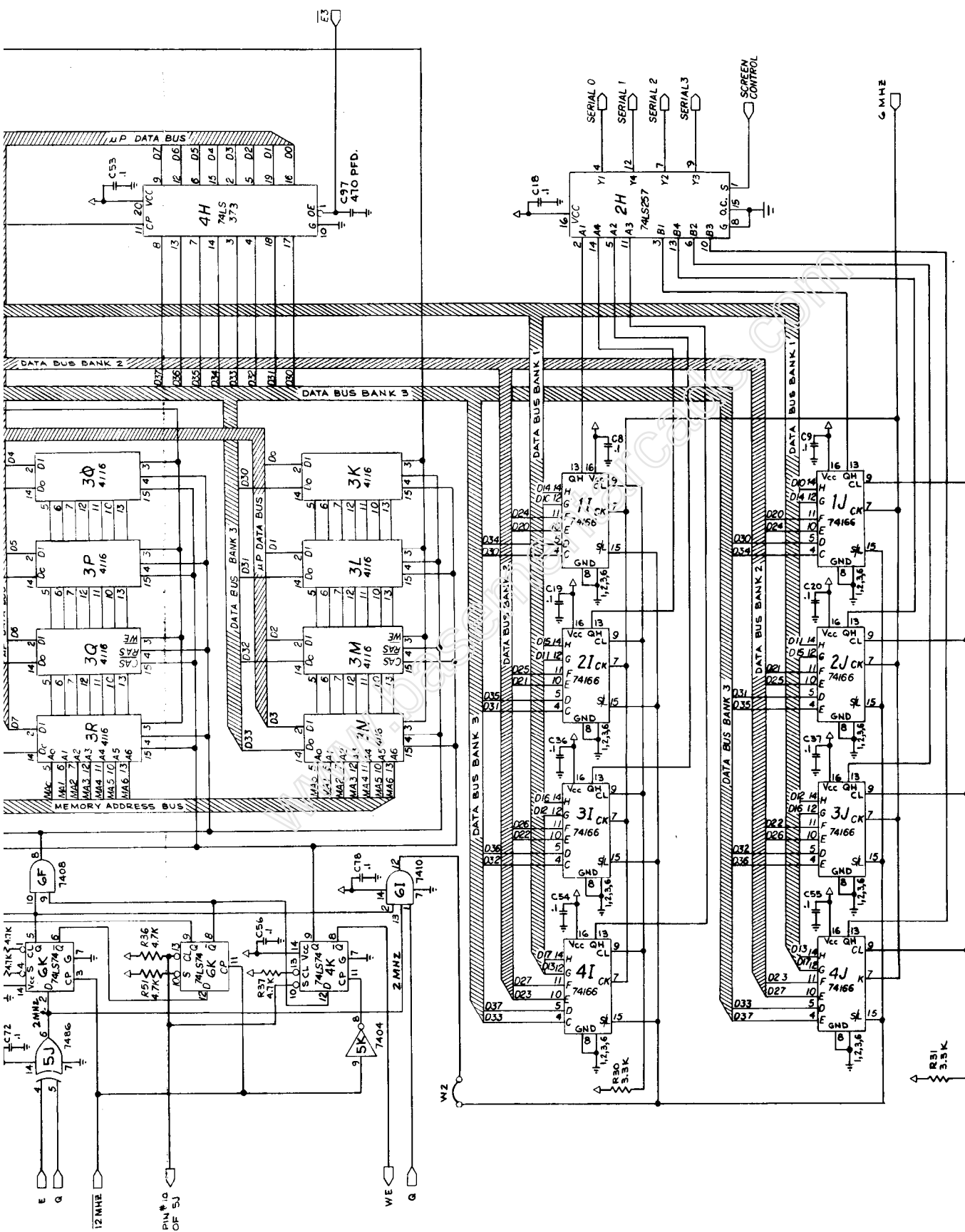




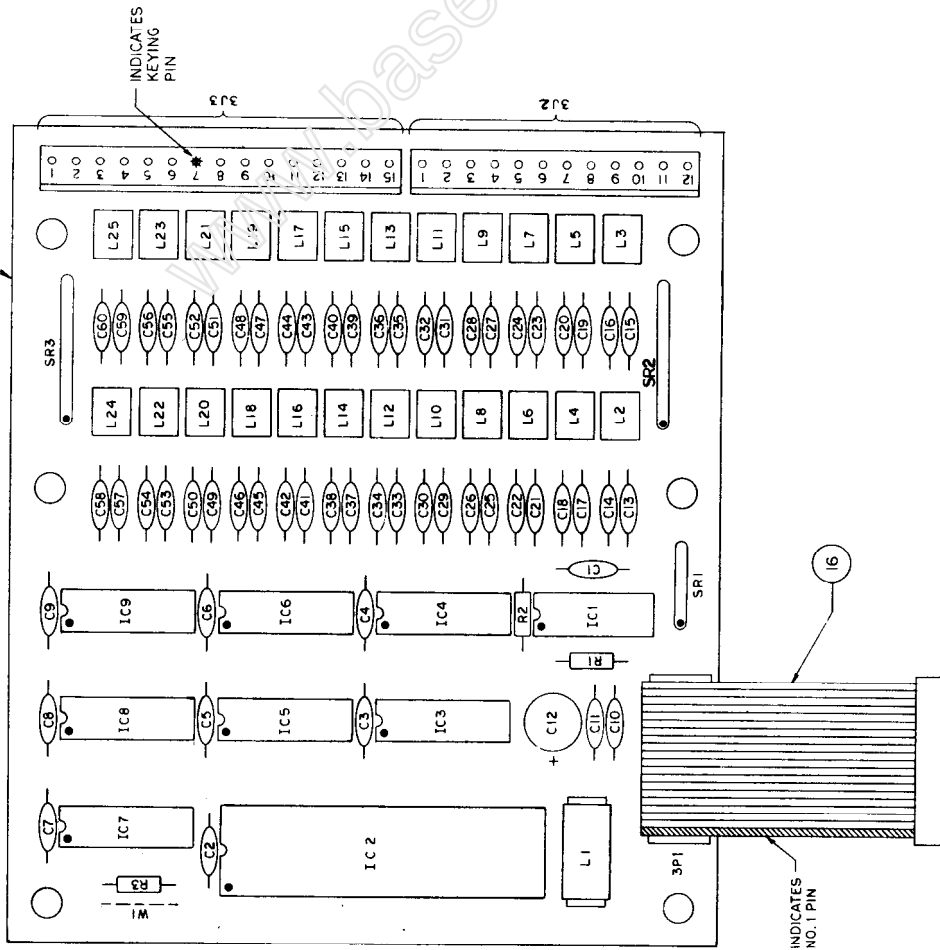


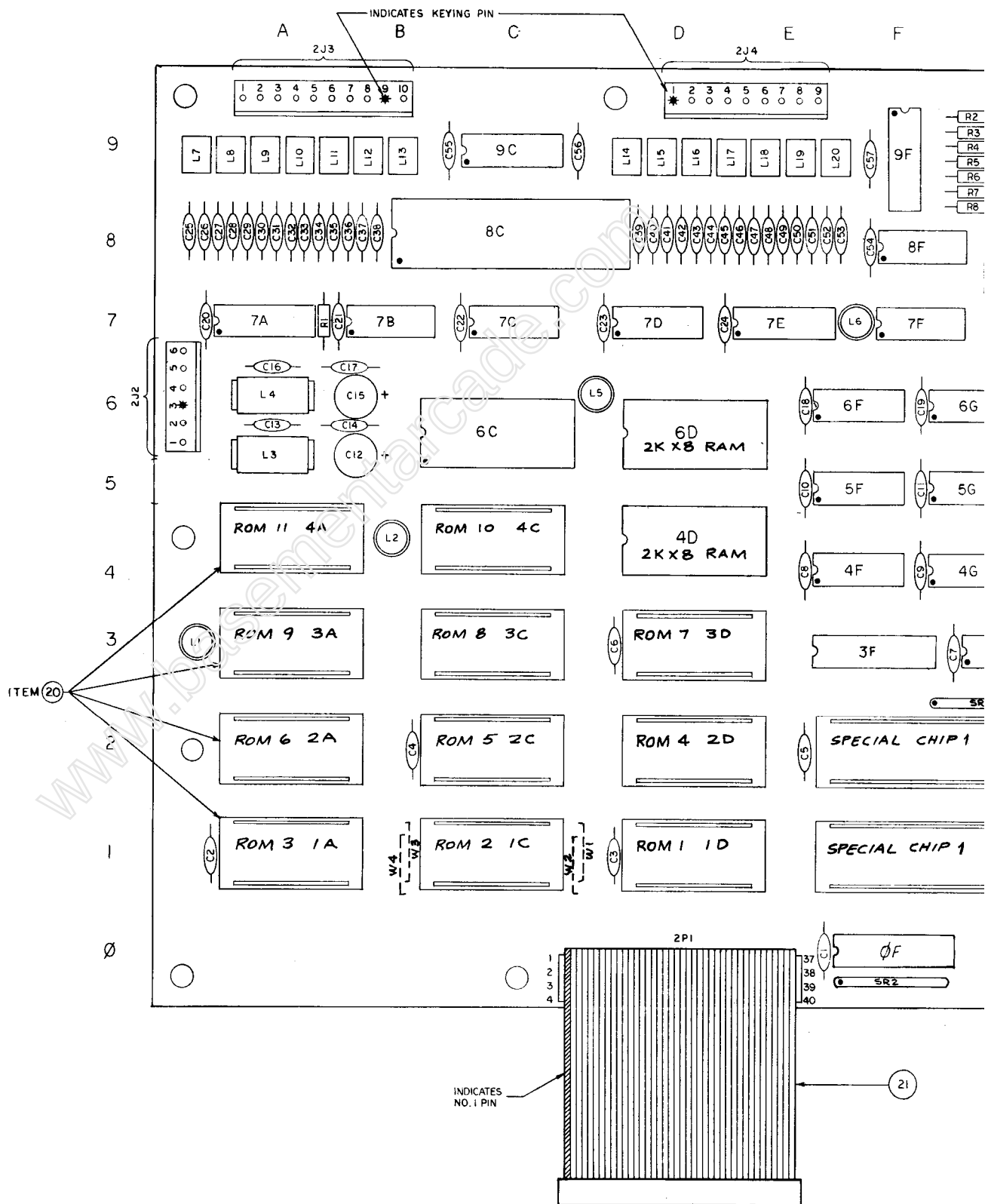


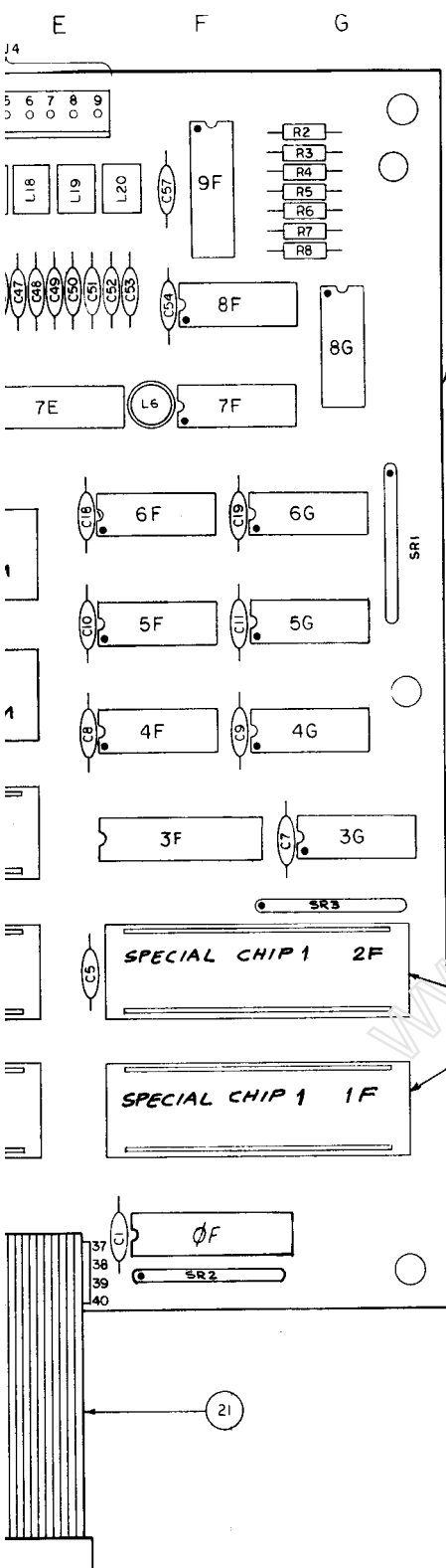
R-8731 CPU Board Logic Diagram
(Sheet 1 of 2)



BILL OF MATERIAL				
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	NO. REQ'D
1	5712-09869-00		BARE P.C. BOARD	1
2	5280-09013-00	IC1	I.C. 7404 HEX INVERTER	1
3	5430-08972-00	IC2	I.C. MC6821 PIA	1
4	5281-09485-00	IC3, IC5, IC7	I.C. 74LS257	3
5	5310-08975-00	IC4, IC6, IC8, IC9	I.C. 4049 INV. HEX BUFFER	4
6	5010-08991-00	R1, R2, R3	RESISTOR, 4.7K Ω 1/4W 5%	3
7	5019-09786-00	SRI	SIP 4.7K Ω 5R 6-PIN 5% .125 W/R @ 70°C	1
8	5019-09362-00	SR2, SR3	SIP 4.7K Ω 9R 10-PIN 5% .125 W/R @ 70°C	2
9	5043-09845-00	C10, C13 THRU C60	CAP. AXIAL, 1000 pF, 50V 50V $\pm$ 20%	49
10	5043-08996-00	C11	CAPACITOR, AXIAL .1 μ F, 50V $\pm$ 20%	1
11	5040-09421-00	C12	CAPACITOR, RADIAL 100 pF 25V + 50-10%	1
12	5551-09822-00	L1	COIL, 4.7 μ H 3A	1
13	5551-09825-00	L2 THRU L25	COIL, 4.7 μ H 30mA	24
14	5791-09043-00	3J2	HEADER 12-PIN, .09-.65-.1121	1
15	5791-09074-00	3J3	HEADER 15-PIN, .09-.65-.1151	1
16	5795-09540-00	3P1	20 PIN RIBBON CABLE ASSY.	1
17	5043-08980-00	C1 THRU C9	CAP. AXIAL, CERAMIC, .01 MFD. 50V + 80-20%	9
18	5010-09534-00	W1	RESISTOR, C.F. 0 Ω	0

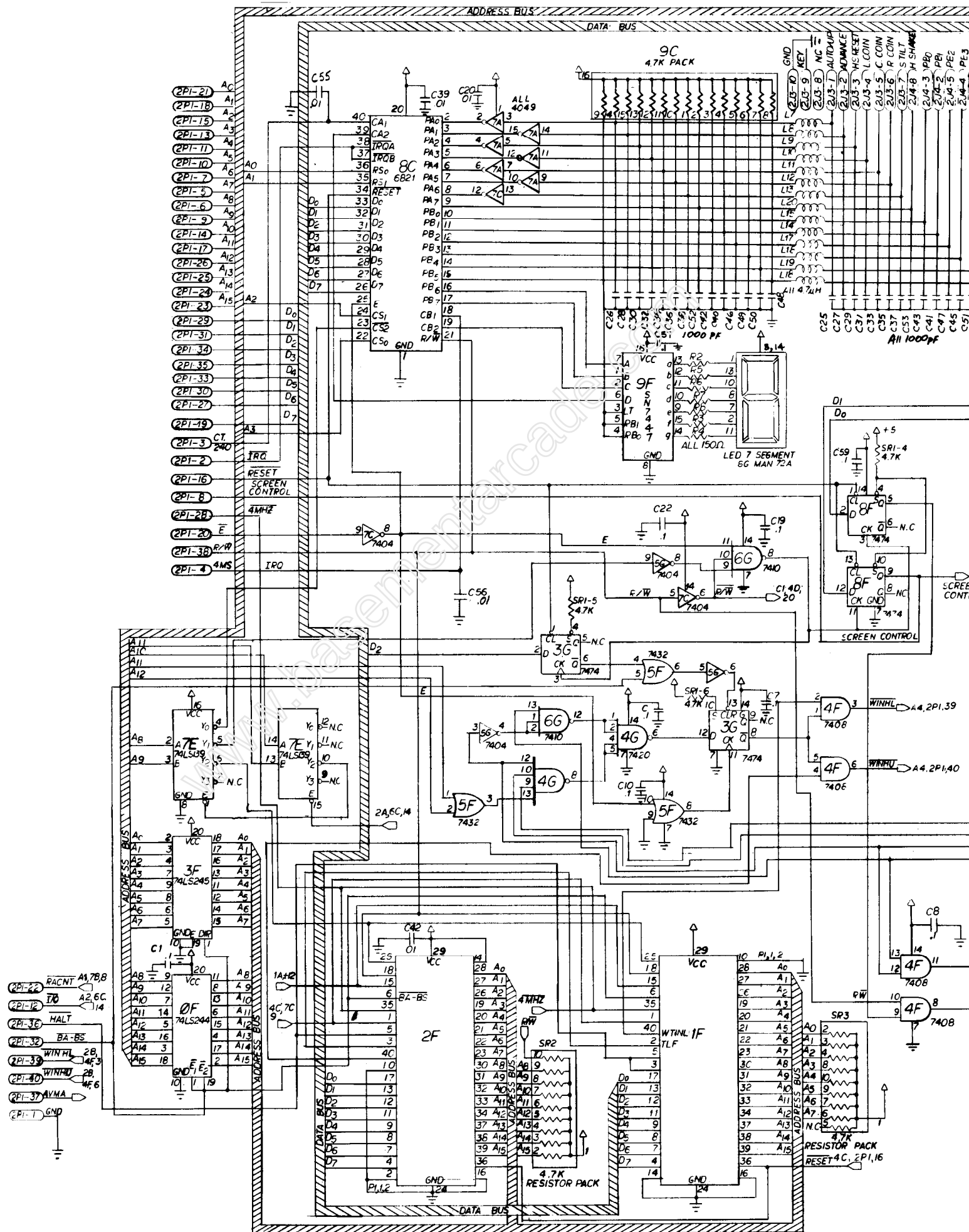


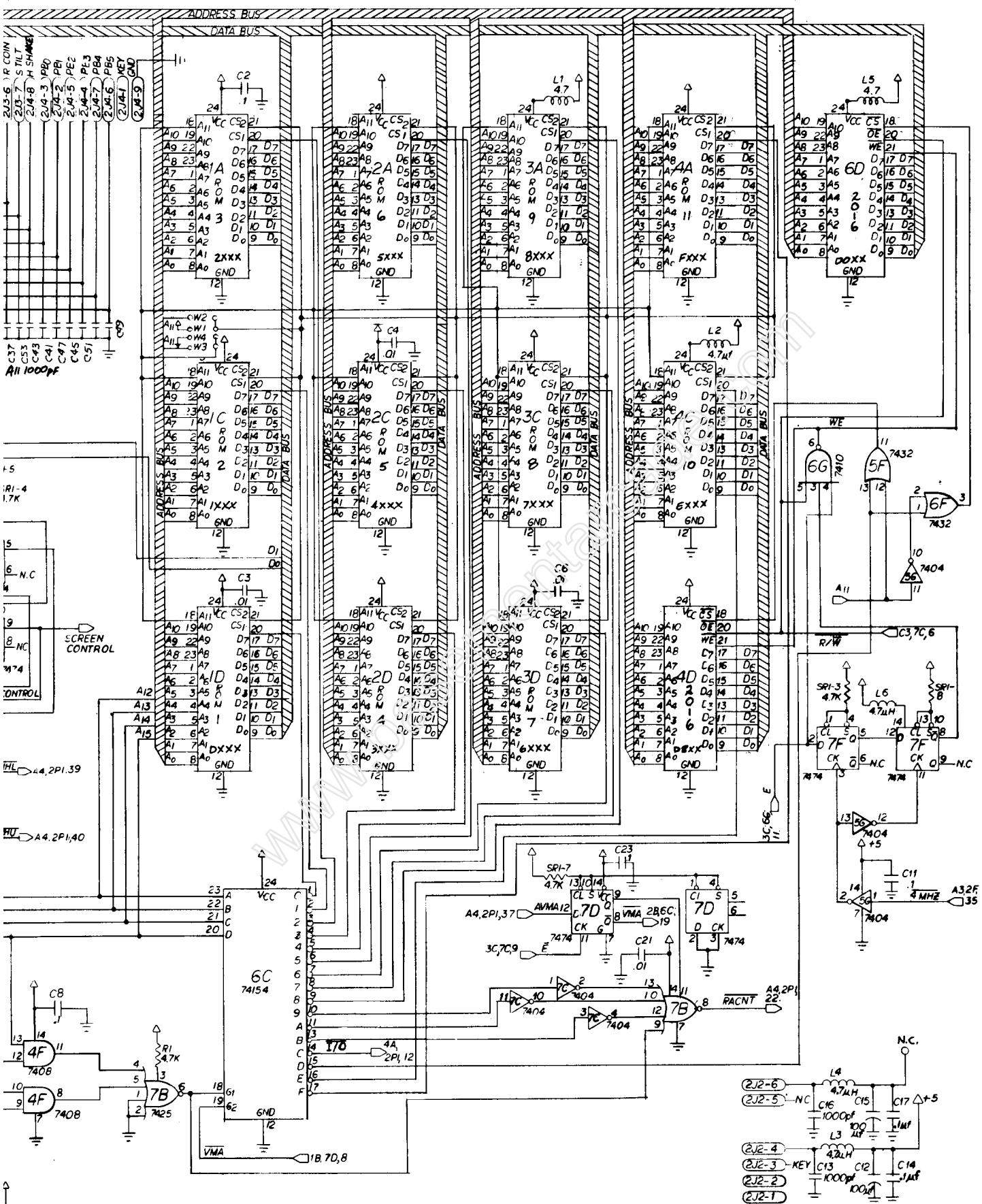




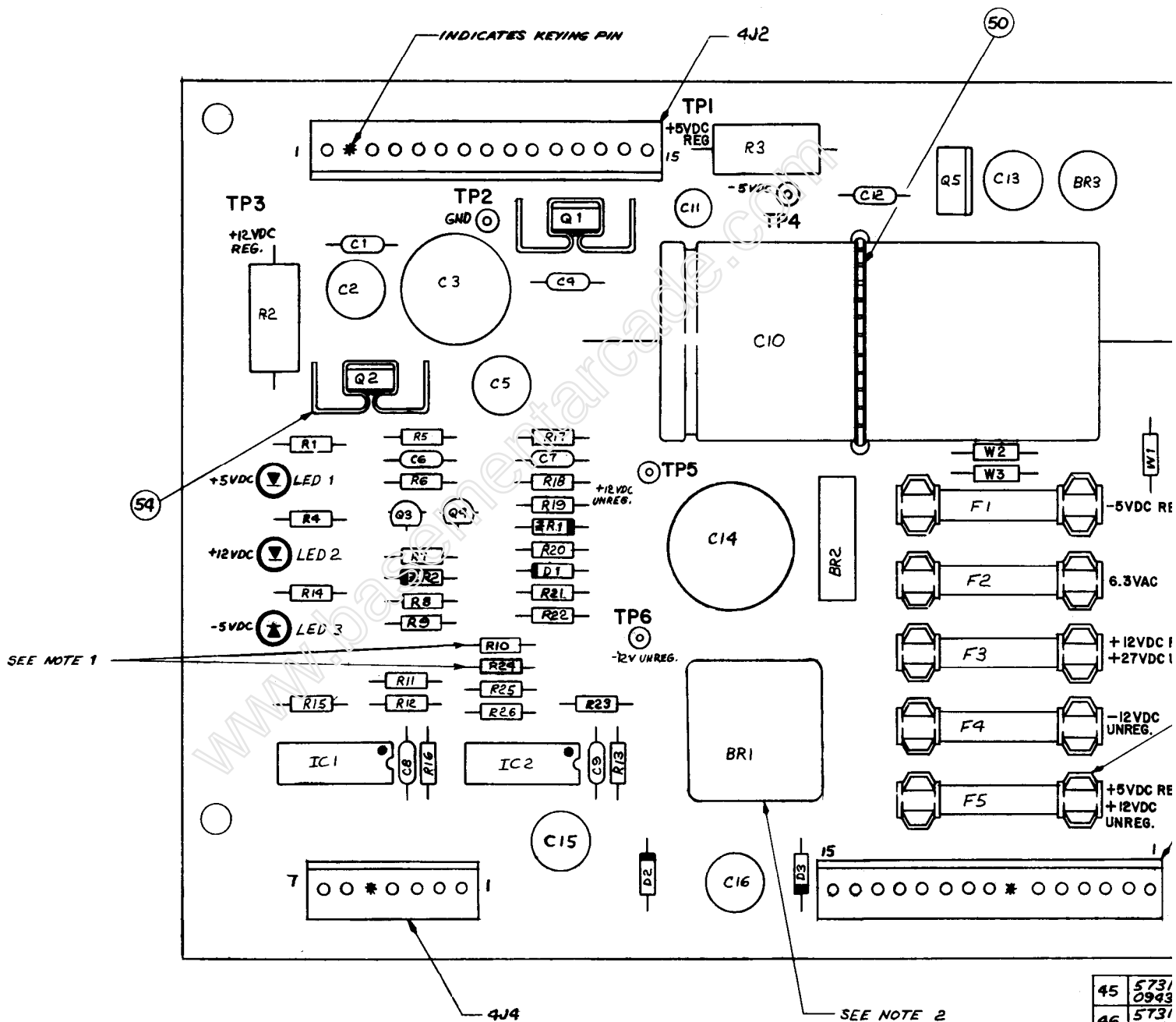
NOTE:
FOR TYPE "A" ROMS (2532) USE W-1,
W-4, FOR TYPE "B" ROMS (2732) USE
W-1, W-3.

D-9176 BILL OF MATERIALS				
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	NO. REQ'D
1	5771-09859-00		BARE P.C. BOARD	1
2	5280-09407-00	9F	7447BCD TO 7 SEG LED DISPLAY	1
3	5280-09478-00	3G,7D,7F,8F	7474 DUAL D TYPE FLIP-FLOP	4
4	5281-09246-00	7E	74LS139 DUAL 2 TO 4 LINE DECODER	1
5	5280-09530-00	4G	7420 DUAL 4-INPUT NAND	1
6	5280-09011-00	6G	7410 TRIPLE 3 INPUT NAND	1
7	5280-09013-00	5G,7C	7404 HEX INVERTERS	1
8	5280-09551-00	7B	DUAL 4 INPUT 7425 NOR GATE WITH	1
9	5280-09010-00	6C	74154 4 TO 16 LINE DEC./DEMULT	1
10	5430-08972-00	8C	MC 6821 PIA	1
11	5019-09239-00	9C	4.7K 15 RES 16 PIN DIP PACK	1
12	5010-02187-00	R2 THRU R8	RESISTOR CF 150 OHM 5% 1/4W	7
13	5280-09477-00	5F,6F	7432, QUAD 2 INPUT OR	2
14	5010-08991-00	R1	RESISTOR CF 4.7K OHM 5% 1/4W	1
15	5671-09411-00	8G	MAN 72A 7SEG LED DISPLAY	1
16	5043-08980-00	C1-C11,C13-C16, C20-C24,C54-58	CAP CERAMIC .01 MFD. 50V + 80 -20%	23
17	5040-09421-00	C12,C15	CAP ELEC 100 MFD. 25V RAD + 50% -10%	1
18	5043-08996-00	C14,C17	CAP. CERAMIC, .1 MFD. 50V ± 20%	2
19	5043-09845-00	C25 - C53	CAP CERAMIC 1000 PFD. 50V AXIAL +/-20%	29
20	5700-09004-00		24 PIN SOCKET	11
21	5795-09611-00	2P1	40 PIN RIBBON CABLE ASSY 5'	1
22	5791-09038-00	2J2	6 PIN MALE CONN 09-65-1061	1
23	5791-09444-00	2J3	10 PIN MALE CONN 09-65-1101	1
24	5791-09027-00	2J4	9 PIN MALE CONN 09-65-1091	1
25	5310-08975-00	7A	4049 INVERTING HEX BUF	1
26	5551-09825-00	L7 THRU L20	COIL, 4.7μH 30MA	14
27				
28	5551-09822-00	L3,L4	COIL, 4.7μH 3AMP	2
29	5551-09848-00	L1,L2,L5,L6	COIL, 2.0μH (RADIAL) 5A	4
30	5280-08973-00	4F	7408 QUAD 2 INPUT AND	1
31	5700-08985-00		40 PIN IC SOCKET	2
32	5281-09867-00	0F	IC 74LS244 OCTAL BUS TRANSCEIVER	1
33	5019-09362-00	SR1, SR2, SR3	SIP 4.7K Ω 9 RES 10-PIN	3
34	5281-09308-00	3F	IC 74LS245 OCTAL BUS/LINE DR/LINE RCVR	1
35	5340-09878-00	6D,4D	RAM 2016 2K X 8	2
D-9179 BILL OF MATERIALS				
1	D-9176		ROM/PIA BD SUB-ASSEMBLY	1
2	SEE CHART	1A THRU 4C SEE CHART	GAME ROM	11
3	5010-09534-00	W1 THRU W4 SEE CHART	RESISTOR C.F. 0 OHM 1/4 WATT	SEE NOTE
4	A-5410-09911	1F, 2F	SPECIAL CHIP 2	2





ROM Board Logic Diagram

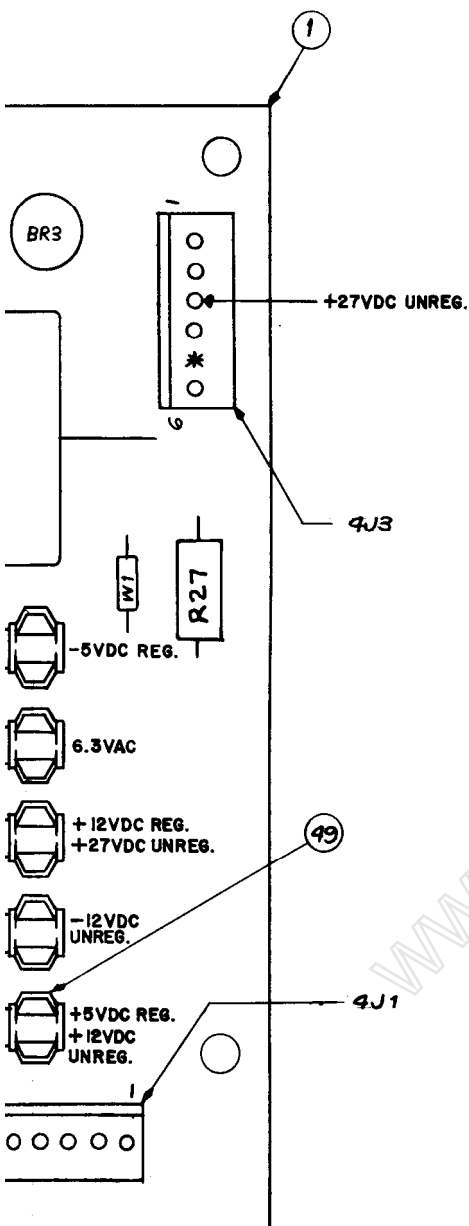


NOTES:

1. REMOVE R24 IF +5VDC IS GREATER THEN 5.25 VDC,
REMOVE R10 IF +5VDC IS LESS THAN 4.75 VDC.
2. BR1 MUST BE MOUNTED 1/8" ABOVE SURFACE OF
BOARD.
3. FOR SCHEMATIC REFER TO 16-8811.

55	5010-09682-00	R10	RESISTOR C.F. 51K ± 5% 1/4W	1	53	5791-09491
56	5010-09324-00	R24	RESISTOR C.F. 27K ± 5% 1/4W	1	54	5705-09661
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D NO.		

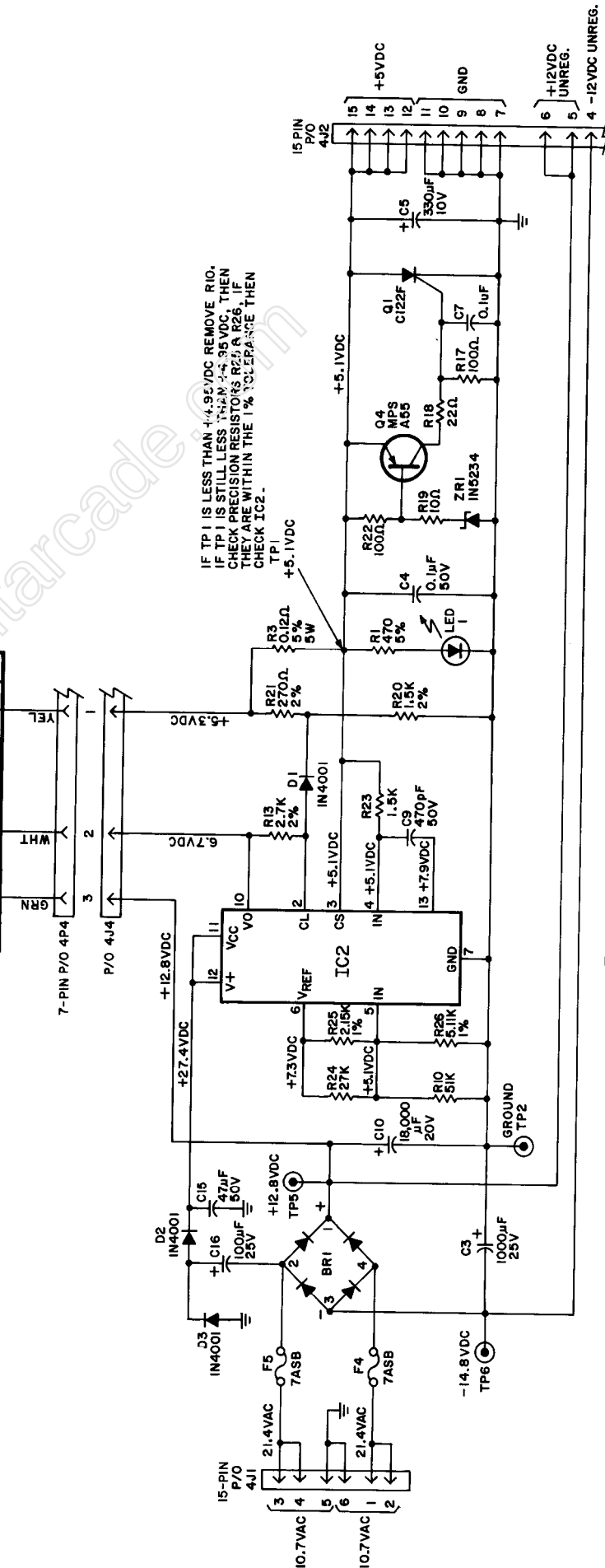
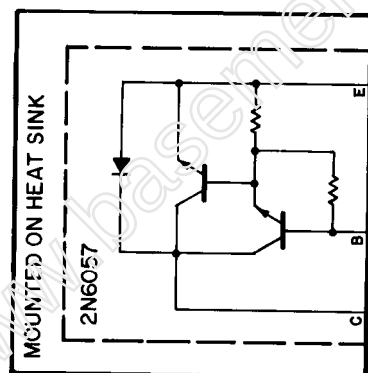
45	5731-09431
46	5731-06341
47	5731-06541
48	5731-09661
49	5732-09171
50	03-71
51	5791-09011
52	5791-09031

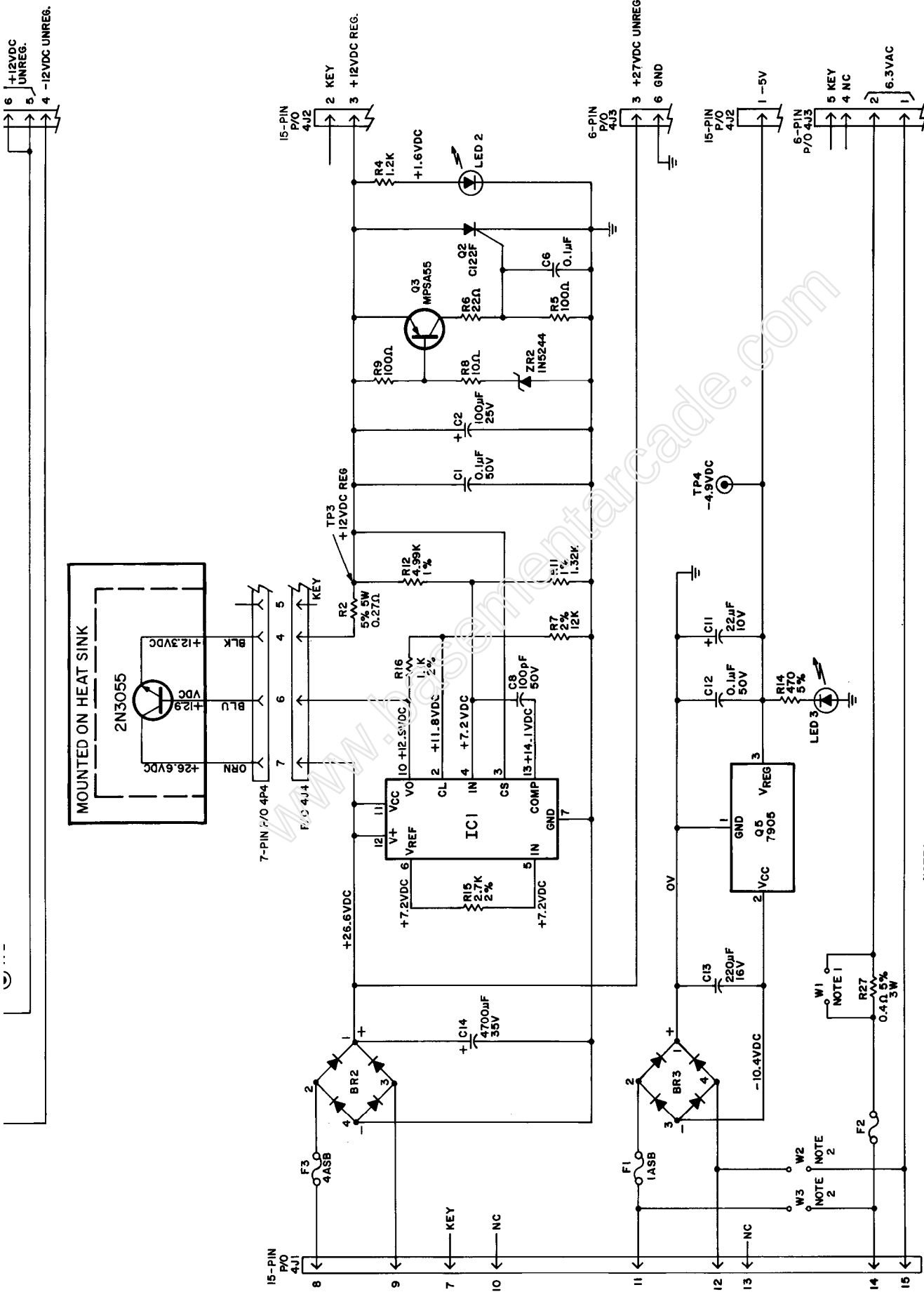


BILL OF MATERIAL				
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D NO.
1	5773-09679-00		BARE P.C. BOARD	1
2	5010-09085-00	R23	RESISTOR, 1.5K 5%, 1/4W	1
3	5010-09541-00	R13, R15	RESISTOR, 2.7K 2%, 1/4W	2
4	5010-09508-00	R21	RESISTOR, 870Ω 2%, 1/4W	1
5	5010-09428-00	R20	RESISTOR, 1.5K 2%, 1/4W	1
6	5010-09509-00	R16	RESISTOR, 1.1K 2%, 1/4W	1
7	5010-09510-00	R7	RESISTOR, 12K 2%, 1/4W	1
8	5010-09314-00	R4	RESISTOR, 1.2K 5%, 1/4W	1
9	5010-09416-00	R1, R14	RESISTOR, 470Ω 5%, 1/4W	2
10	5013-09542-00	R11	RESISTOR, 7.32K 1%, 1/4W	1
11	5013-09427-00	R12	RESISTOR, 9.99K 1%, 1/4W	1
12	5013-09426-00	R25	RESISTOR, 2.15K 1%, 1/4W	1
13	5012-09429-00	R3	RESISTOR, 12Ω 5%, 5W	1
14	5012-09512-00	R2	RESISTOR, 27Ω 5%, 5W	1
15	5012-09037-00	R27	RESISTOR, 6.4Ω 5%, 3W	1
16	5013-09665-00	R26	RESISTOR, 5.11K 1%, 1/4W	1
17	5010-09434-00	R6, R18	RESISTOR, C.F. 22Ω ±5%, 1/4W	2
18	5010-09036-00	R5, R9, R17, R22	RESISTOR, C.F. 100Ω ±5%, 1/4W	4
19	5010-09039-00	R8, R19	RESISTOR, C.F. 10Ω ±5%, 1/4W	2
20	5010-09034-00	W1	RESISTOR, 0Ω	1
21	5043-09396-00	C6, C7	CAPACITOR, 0.1μF CERAMIC +80%-20% 50V	2
22	5040-09421-00	C2, C16	CAPACITOR, 100MFD, 25V RADIAL +50%-10%	2
23	5040-09422-00	C15	CAPACITOR, 47MFD, 50V RADIAL +50%-10%	1
24	5040-09420-00	C3	CAPACITOR, 1000MFD, 25V RADIAL +75%-10%	1
25	5040-09419-00	C10	CAPACITOR, 18,000MFD 20V AXIAL +75%-10%	1
26	5040-09423-00	C5	CAPACITOR, 330MFD 10V RADIAL +50%-10%	1
27	5040-09504-00	C14	CAPACITOR, 4700MFD 35V RADIAL +50%-10%	1
28	5043-09446-00	C1, C4 & C12	CAPACITOR, 1MFD, 50V AXIAL 25V-20+80%	3
29	5043-09065-00	C9	CAPACITOR, 470PFD 50V AXIAL XTR ±10%	1
30	5043-09492-00	C8	CAPACITOR, 100PFD 50V AXIAL S2L ±5%	1
31	5040-09506-00	C13	CAPACITOR, 220MFD 16V RADIAL +50%-10%	1
32	5040-09493-00	C11	CAPACITOR, 22MFD 10V RADIAL +50%-10%	1
33	5070-06258-00	D1, D2 & D3	DIODE, 1N4001	3
34	5075-09406-00	ZR1	ZENER, 1N5234 ±5% (6.2V)	1
35	5075-09662-00	ZR2	ZENER, 1N5244 ±5% (14V)	1
36	5190-09430-00	Q3, Q4	TRANSISTOR, MPS A55	2
37	5130-09661-00	Q1, Q2	SCR, 8 AMP, 100V	2
38	5250-09515-00	Q5	VOLTAGE REGULATOR, T905	1
39	5460-09424-00	IC1, IC2	VOLTAGE REGULATOR, 723	2
40	5700-09898-00	BR1	BRIDGE RECTIFIER, 35 AMP, 200V	1
41	5100-09513-00	BR2	BRIDGE RECTIFIER, 4.0A, 50V	1
42	5100-09544-00	BR3	BRIDGE RECTIFIER, 1.0A, 50V	1
43	5671-09018-00	LED1, LED2, LED3	LED, RED	3
44	5824-09248-00	TP1-TP6	TERMINAL #1502-1 (TEST POINT)	4

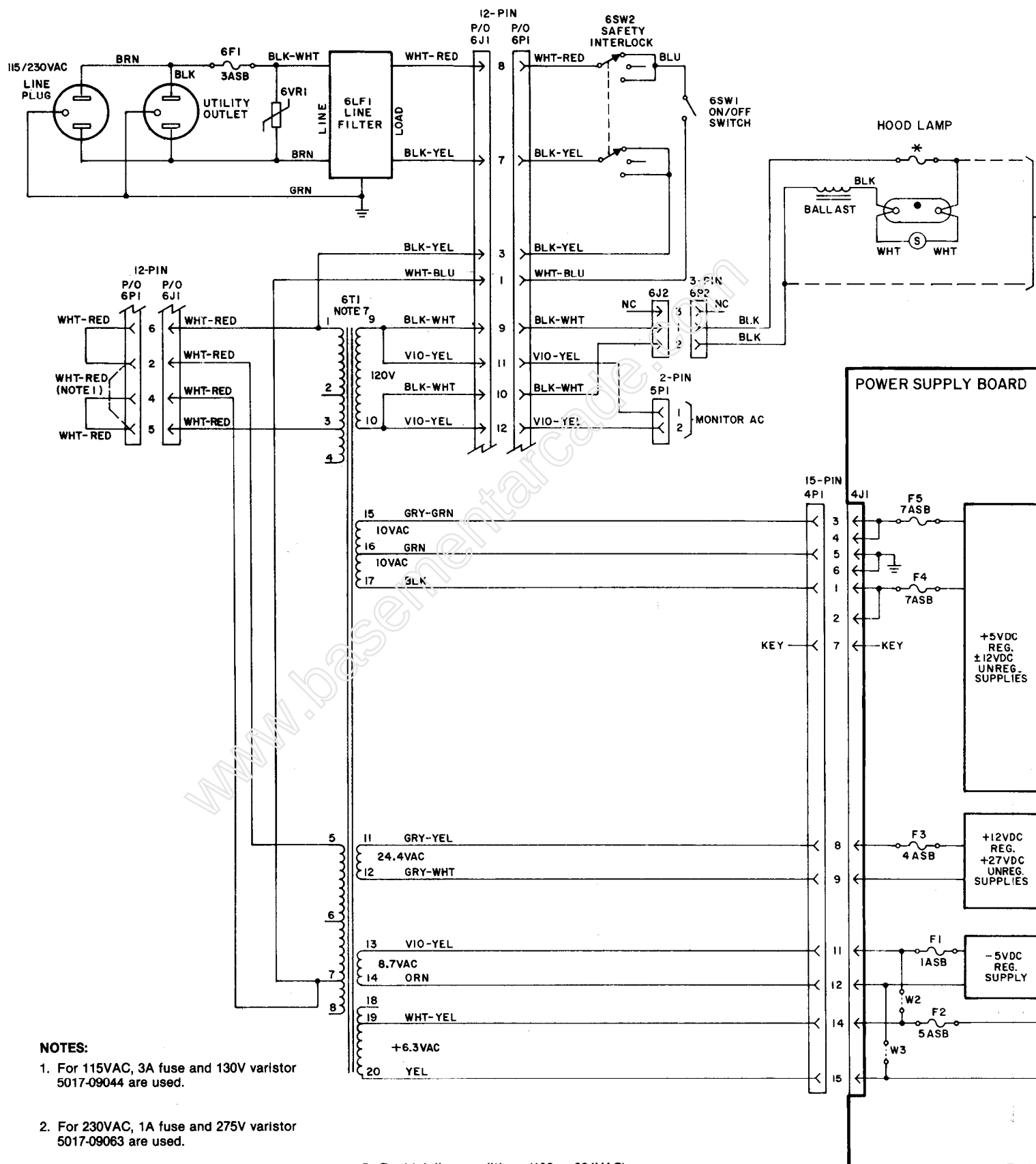
(A)

45	5731-09432-00	F4 & F5	FUSE, TA, S.B.	2
46	5731-09614-00	F3	FUSE, 4A, S.B., 250V	1
47	5731-09569-00	F1	FUSE, 1A, S.B., 250V	1
48	5731-09651-00	F2	FUSE, 5A, S.B., 250V	1
49	5732-09178-00		FUSEHOLDER,	10
50	03-7520		TIE WRAP	1
51	5791-09074-00	4J1 & 4J2	HEADER, 15 PIN 09-65-1051	2
52	5791-09038-00	4J3	HEADER, 6 PIN 09-65-1061	1
53	5791-09497-00	4J4	HEADER, 1 PIN 09-65-1071	1
54	5705-09663-00		HEAT SINK	2
55	5705-09688-00		HEAT SINK	0



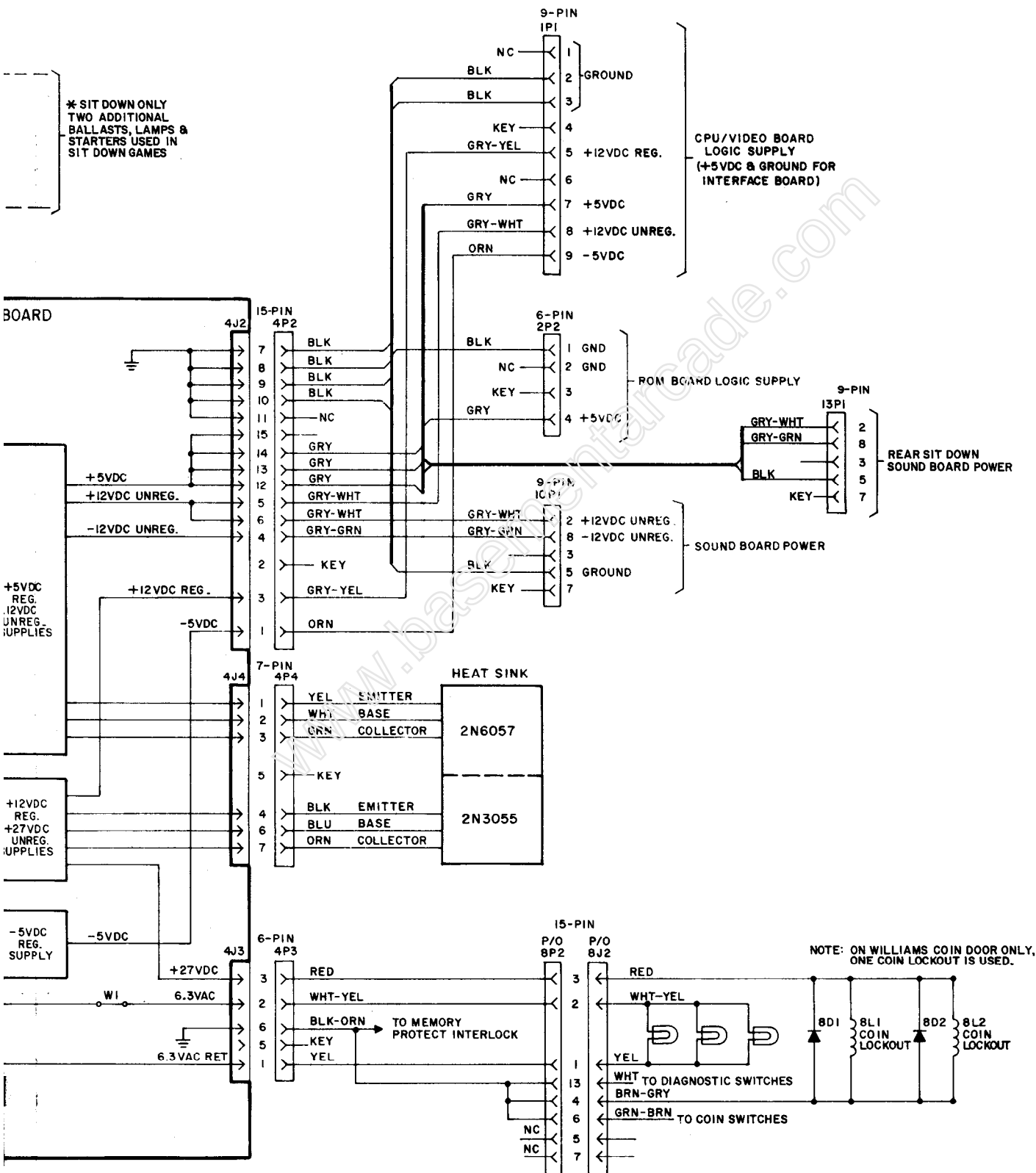


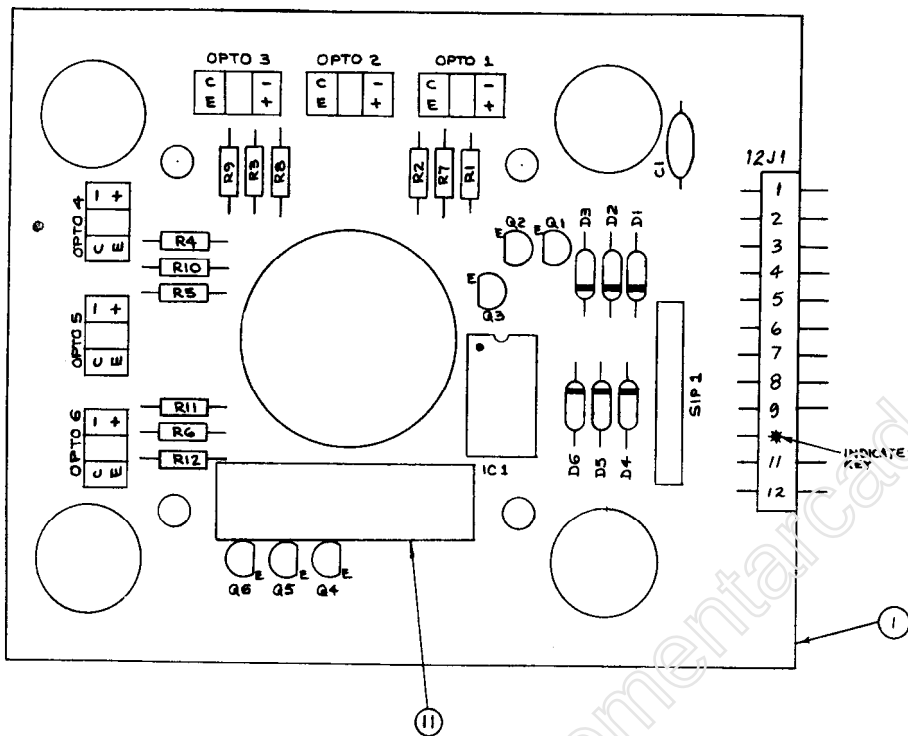
- NOTES:
1. W1 IS NOT USED ON UPRIGHT GAMES.
 2. W2 & W3 ARE NOT USED.
 3. 1ASB 250V.



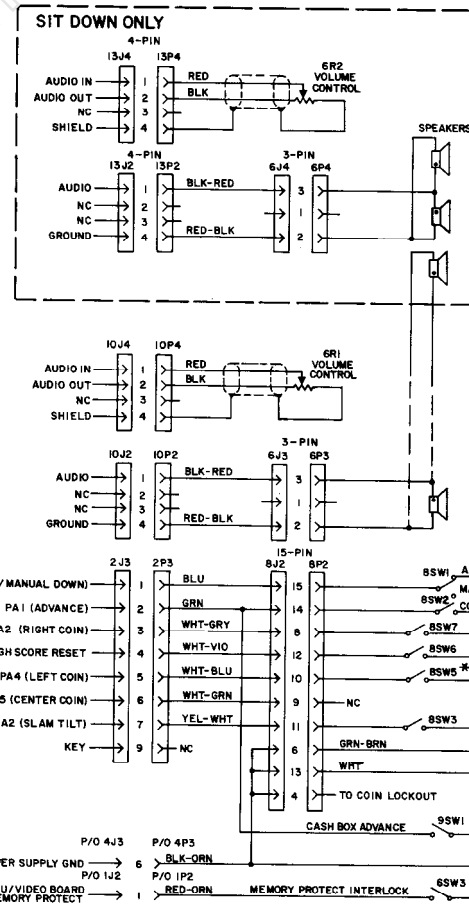
NOTES:

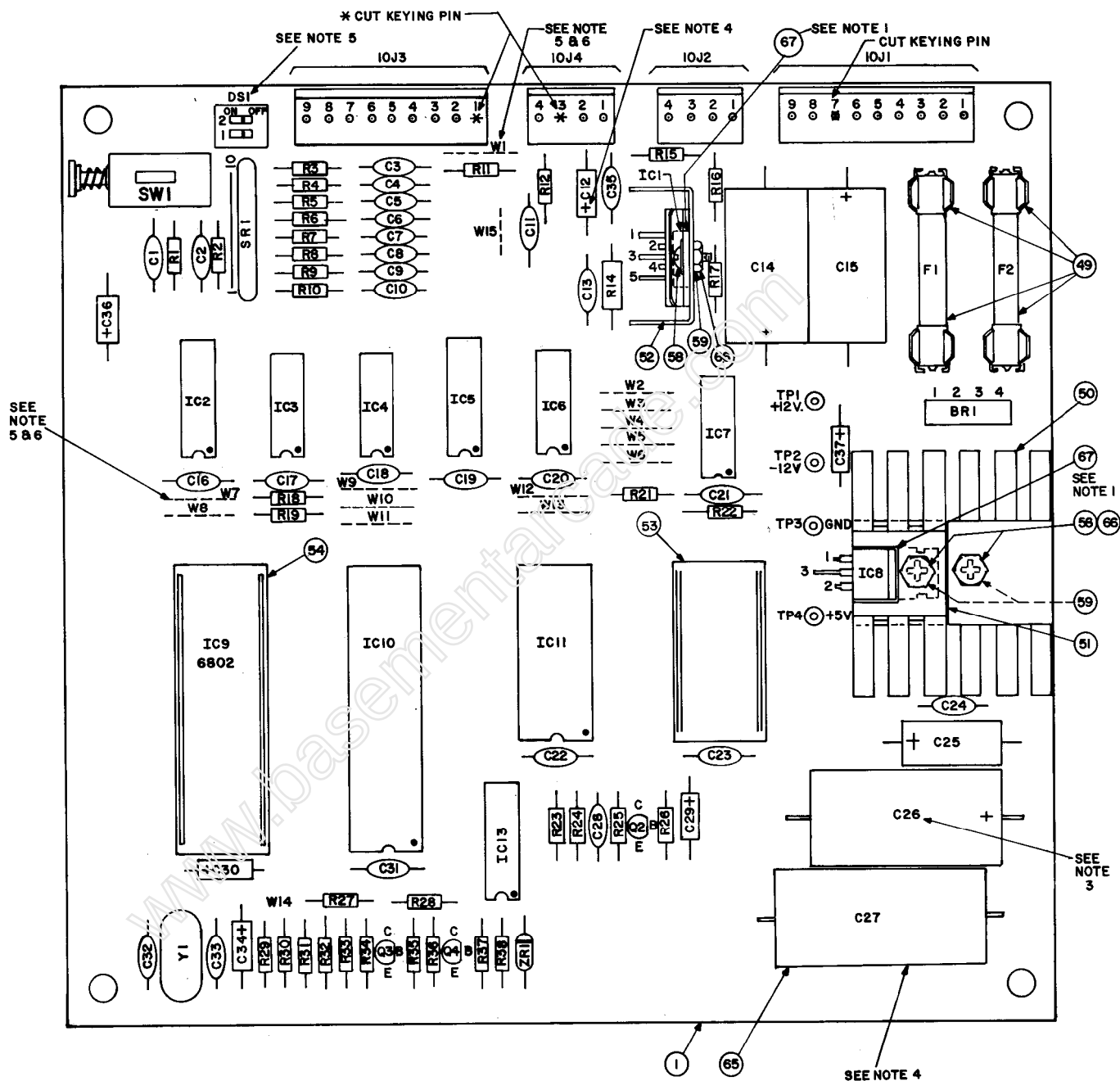
- For 115VAC, 3A fuse and 130V varistor 5017-09044 are used.
- For 230VAC, 1A fuse and 275V varistor 5017-09063 are used.
- Jumper wires on 6P1 shown with solid lines are connected for 115VAC operation. Only the one shown with a dashed line is connected for 230VAC operation.
- For low-line conditions (103.5 or 207VAC) move WHT-RED wire from 6T1-3 to 6T1-2 and move WHT-RED and WHT-BLU wires from 6T1-7 to 6T1-6.
- For high-line conditions (132 or 264VAC) move WHT-RED wire from 6T1-3 to 6T1-4 and move WHT-RED and WHT-BLU wires from 6T1-7 to 6T1-8.
- Secondary voltages shown (%3%) are with 115/230VAC input.
- Transformer Part No. 55610-09658-00.





BILL OF MATERIAL				
ITEM NO.	PART NUMBER	PART DESIGNATION	DESCRIPTION	QTY. REQD
1	5772-10068-00		BARE P.C. BOARD	1
2	5490-09827-00	OPTO 1 THRU OPTO 6	OPTO INTER MODULE SWITCH	6
3	5310-09155-00	IC 1	I.C., 4011B CMOS QUAD 2-INPUT NAND GATE	1
4	5019-09362-00	SIP 1	10 PIN, 4.7K, SIP	1
5	5010-09768-00	R1 THRU R6	RESISTOR, 180Ω, 1/4W	6
6	5160-08938-00	Q1 THRU Q6	TRANSISTOR, 2N4401 NPN	6
7	5070-08919-00	D1 THRU D6	DIODE, 1N4148	6
8	5791-10142-00	12J1	12 PIN 2420 09-75-1121	1
9	5010-09034-00	R7 THRU R12	RESISTOR, 10KΩ, 1/4W.	6
10	5043-08980-00	C1	CAP, AXIAL CERAMIC, 0.1MFD, 50V ± 20%	1
11	16-8850-59		LABEL - PCB ASSY ID	1





SOUND BOARD JUMPERS

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

BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	01-2 01-146-6		BARE P.C. BOARD REV F	1
2	5370-09156-00	IC1	TD A 2002 V AUDIO AMPLIFIER	1
3	5280-09012-00	IC2	7442 BCD-DEC DECODER	1
4	5280-09073-00	IC3	7400 QUAD 2 INPUT NAND	1
5	5280-08973	IC4	7408 QUAD 2 INP. AND GATE	1
6	5310-09153-00	IC5	4050 BUFFER	1
7	5310-09154-00	IC6	4068 8 INPUT NAND GATE	1
8	5310-08971-00	IC7	4069 HEX INVERTER	1
9	5250-09157-00	IC8	7805 5 VOLT REG. W/TO 220 CASE	1
10	5430-08972-00	IC10	6821 P.I.A.	1
11	5340-09003-00	IC11	6810 RAM	1
12	5371-09152-00	IC13	1408 D/A CONVERTER	1
13	5160-08938-00	Q2, Q3, Q4	2N4401 NPN TRANSISTOR	3
14				
15	5075-09018-00	ZR1	1N5996A 6.8V ZENER DIODE	1
16				
17	5100-09357-00)	BR1	MDA 200/3N253	1
	5100-09158-00)		BRIDGE RECTIFIER	0
18	5520-09020-00	Y1	3.58 MHz CRYSTAL	1
19	5010-08991-00	R1,R18,R19,R21,R22, R27,R30,R31, R32	RESISTOR, FC, 4.7K OHM, 5% 1/4 WATT	9
20	5010-09036-00	R2 thru R10	RESISTOR, FC, 100 OHM, 5% 1/4W	9
21	5010-09358-00	R12,R15,R28,R36,R38	RESISTOR, FC, 1K OHM, 5% 1/4W	5
22	5010-09181-00	R14	RESISTOR, FC, 1 OHM, 10% 1/2 WATT	1
23	5010-09161-00	R16	RESISTOR, FC, 2.2 OHM, 5% 1/4 WATT	1
24	5010-09361-00	R17	RESISTOR, FC, 220 OHM, 5% 1/2 WATT	1
25				
26	5010-08983-00	R23, R24, R26	RESISTOR, FC, 5.7K OHM, 5% 1/4 WATT	3
27	5010-09179-00	R25	RESISTOR, FC, 5.5M OHM, 5% 1/4 WATT	1
28	5010-09035-00	R29	RESISTOR, FC, 47K OHM, 5% 1/4 WATT	1
29	5010-09034-00	R33, R35, R37	RESISTOR, FC, 10K OHM, 5% 1/4 WATT	3
30	5010-09039-00	R34	RESISTOR, FC, 10 OHM, 5% 1/4 WATT	1
31	5043-08980-00	C1, C16 thru C23, C31	CAPACITOR, CER. .01 MFD. 50V. +80%, -20%	10
32	5043-09065-00	C2 thru C10	CAPACITOR, CER. .470 PFD. 50V. +-20%	9
33	5043-09345-00	C11	CAPACITOR, CER. .001 MFD. +-20% 100V.	1
34	5040-09365-00	C12, C30, C36	CAPACITOR, ELECT. 1 MFD. 63V. -10 +50%	3
35	5043-08996-00	C13, C24, C35	CAPACITOR, CER. .1 MFD. 50V. +-20%	3
36	5040-09165-00	C14	CAPACITOR, ELECT. 1,000 MFD. 16V. +-20%	1
37	5040-09164-00	C15	CAPACITOR, ELECT. .470 MFD. 10V. +-20%	1
38	5040-08986-00	C25	CAPACITOR, ELECT. 100 MFD. 10V. +-20%	1
39	5040-08893-00	C26	CAPACITOR, ELECT. 1,000 MFD. 25V. +-20%	1
40	5040-09376-00	C27	CAPACITOR, ELECT. 4700 MFD. 16V. +-20%	1
41	5043-09180-00	C28	CAPACITOR, CER. .47 PFD. 1K V. +-20%	1
42	5040-09343-00)	C29	CAPACITOR, ELECT. 10 MFD. 20V	1
43	5043-09169-00	C32, C33	CAPACITOR, CER. DISC, 27 PFD. 1KV. +-10%	2
44	5041-09163-00	C34	CAPACITOR, TANTALUM 2.2 MFD. 15V. +-20%	1
45	5041-09031-00	C37	CAPACITOR, TANTALUM 1 MFD. 25V. +-20%	1
46	5641-09658-00)	SW1	MOMENTARY SWITCH SPDT	1
47	5645-09330-00	DS1	2 STD, DIP SWITCH	1
48	5731-06314-00	F1, F2	4 AMP SLOW BLOW FUSE	2
49	5732-09176-00		FUSEHOLDER	4
50	5705-09172-00		HEAT SINK THERMALLOY #6072B	1
51	5705-09173-00		HEAT SINK THERMALLOY #6071B	1
52	5705-09199-00		HEAT SINK THERMALLOY #6030	1
53	5700-09004-00		24 PIN SOCKET	1
54	5700-08985-00		40 PIN SOCKET	1
55	5791-09027-00	10J1, 10J3	9 PIN MALE CONNECTOR 09-65-1091	2
56	5791-09028-00	10J2, 10J4	4 PIN MALE CONNECTOR 09-65-1041	2
57				
58	4006-01003-06		6-32x3/8" P-PH-S	3
59	4406-01117-00		6-32 HEX NUT	3
60	5010-09534-00		0 OHM RESISTOR	A/R
61	5824-09248-00	TP1 THR TP4	TERMINAL #1502-1	4
62	5010-09363-00	R11	RESISTOR, FC, 5.6K OHM 5% 1/4 WATT	1
63				
64	5019-09362-00	SR1	RESISTOR, 4.7K OHM 10 PIN SIP	1
65	03-7520-1		TIE WRAP	1
66	4703-00007-00		#6 EXT. LOCKWASHER	3
67	20-9229		THERMAL COMPOUND	.01

NOTES:

1. USE THERMAL COMPOUND BETWEEN IC1 AND IC8, AND HEAT SINKS.

2. CAUTION: AVOID STATIC DISCHARGE DAMAGE TO MOS LOGIC.

3. SYMBOLS SHOWN ON COMPONENTS ARE FOR REFERENCE ONLY.

DO NOT SCREEN OR STAMP.

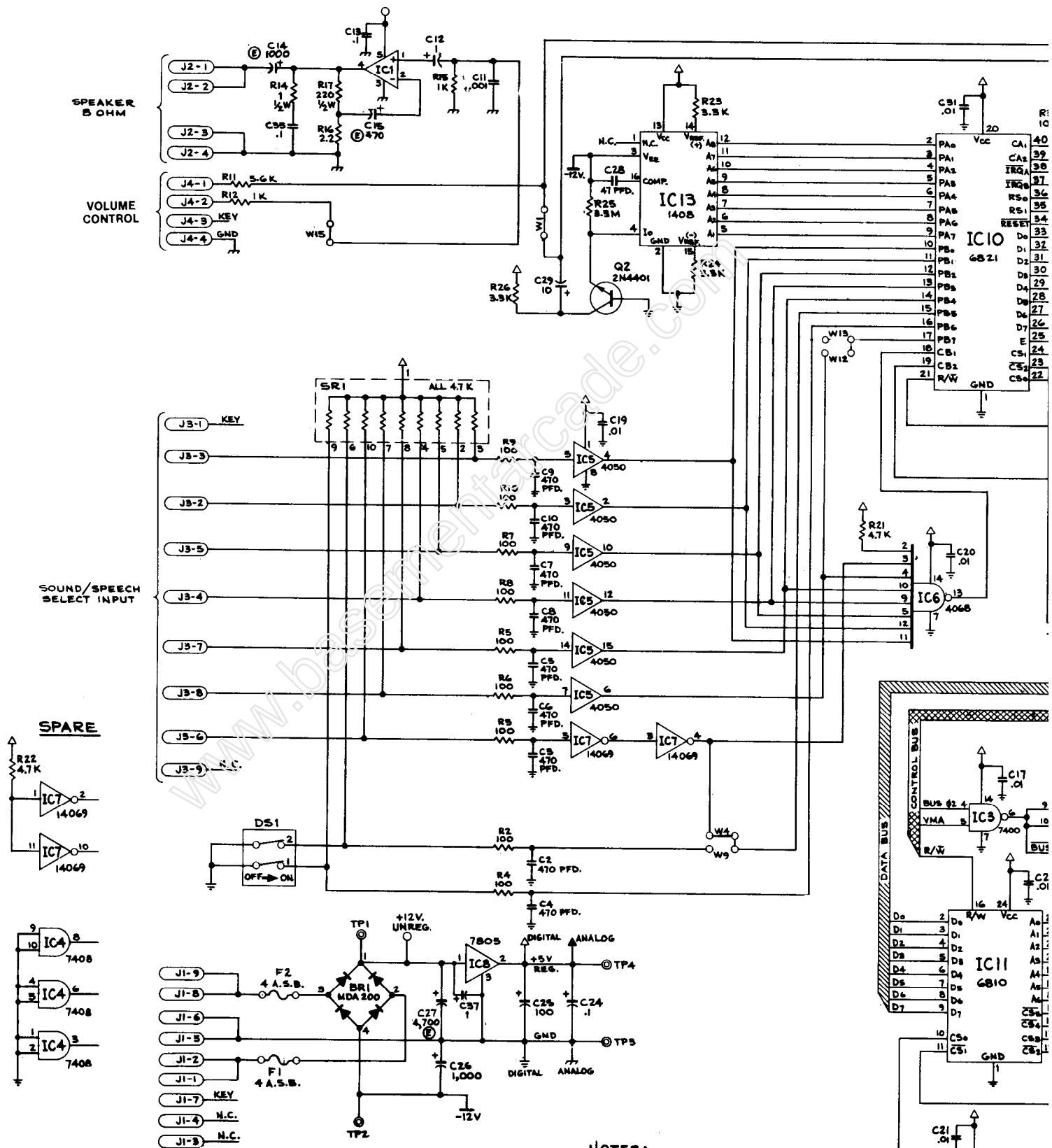
4. OBSERVE INDEX MARK OF ALL INTEGRATED CIRCUITS;

DIODES D1, D2, AND ZR1;

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

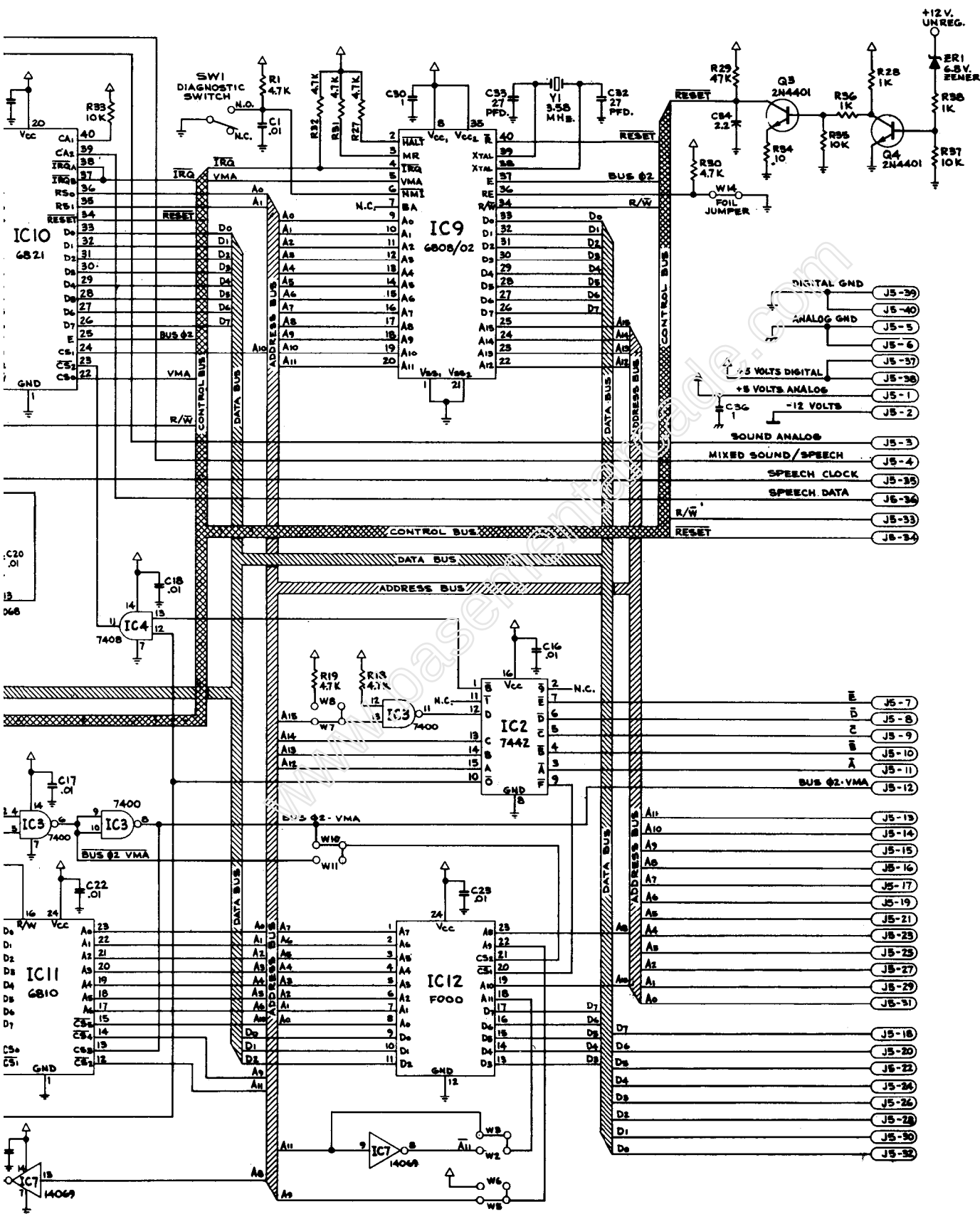
CONNECTORS 10J1, 10J2, 10J4, 10J3, 10J5;

POSITION OF TRANSISTORS Q1, Q2, Q3, Q4.



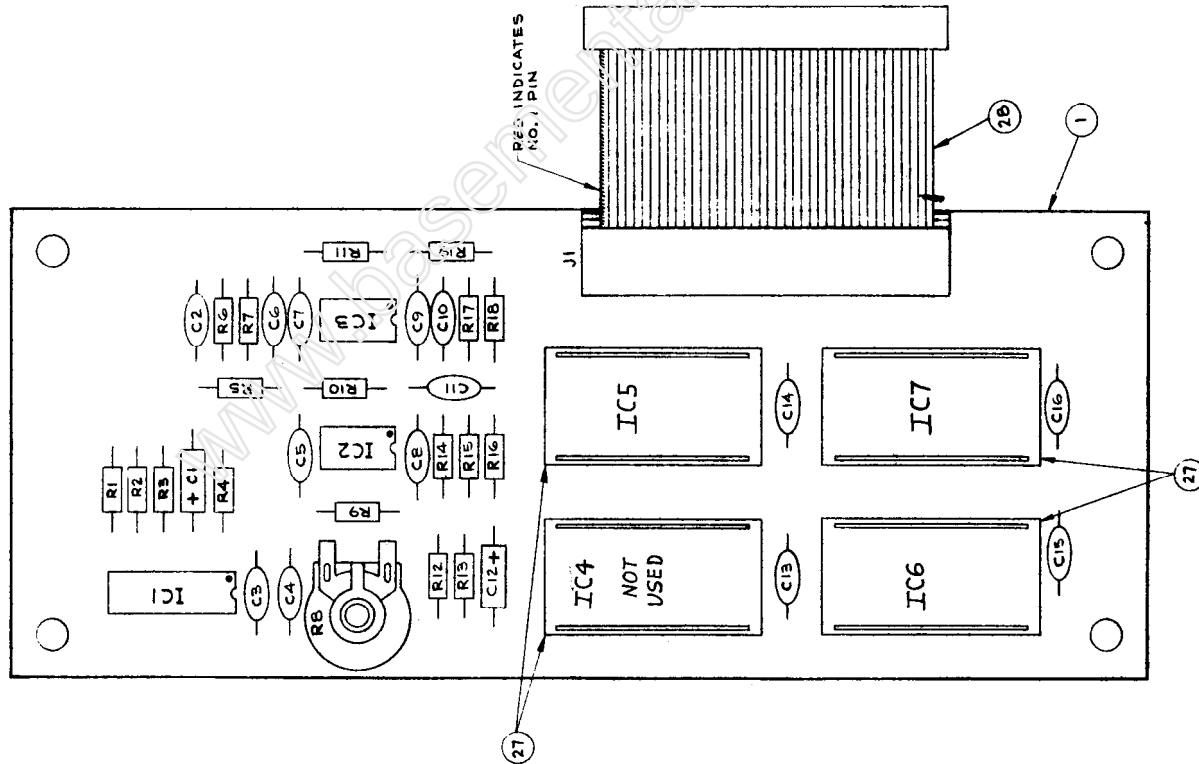
NOTES:

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



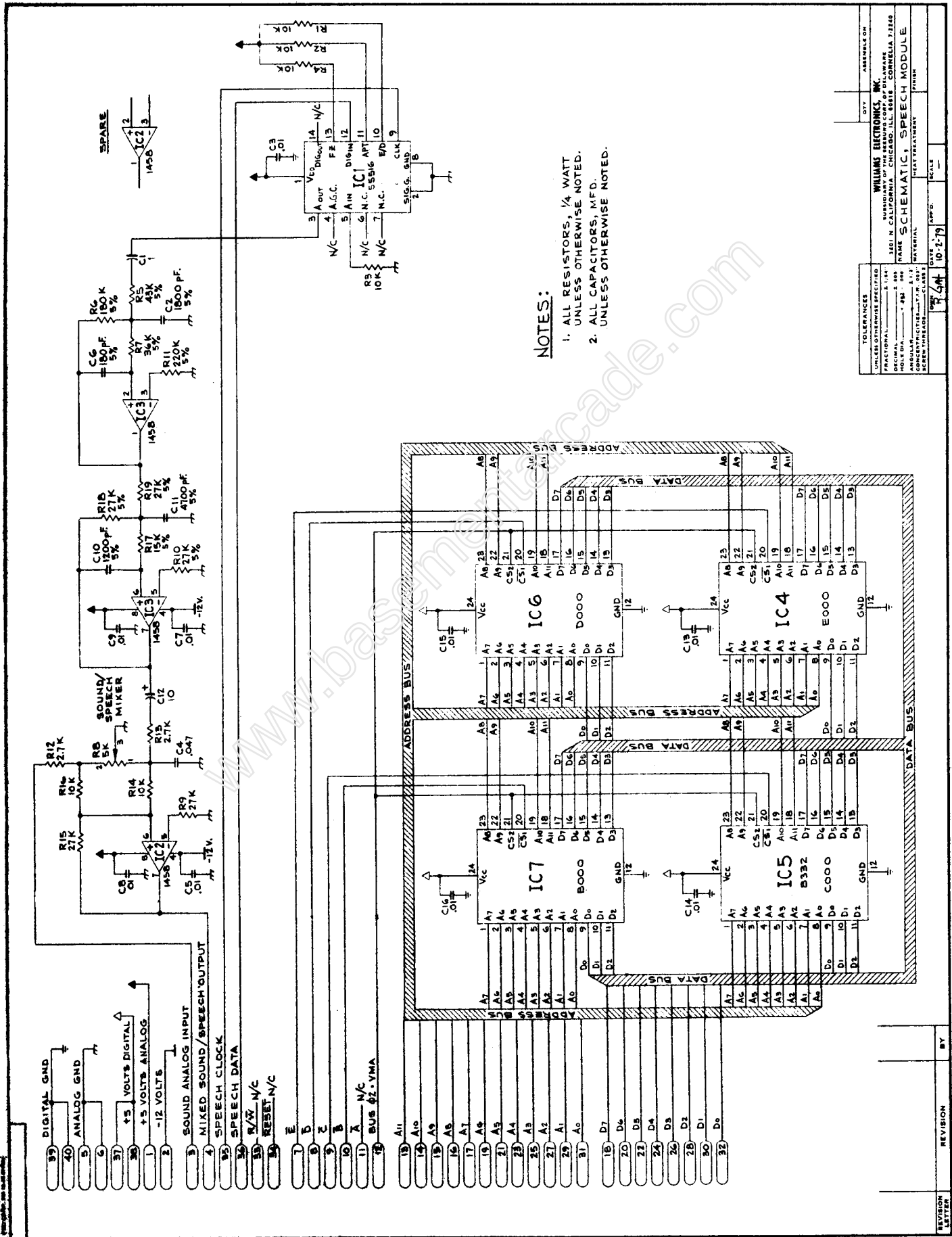
BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQD. NO.
1	IC-2001-1473		BARE P.C. BOARD	1
2	SA-9335	IC1	5556 CONTINUOUSLY VARIABLE SLOPE DELTA MODULATOR	1
3	SA-9321	IC2, IC3	1458 DUAL OP-AMP.	2
4				
5				
6				
7				
8				
9				
10	SA-8846	R11	RESISTOR, FC, 20 K OHM 5% 1/4 WATT	1
11	SB-8817	R1, R2, R3, R4, R14, R16	RESISTOR, FC, 10 K OHM 10% 1/4 WATT	6
12	SA-8824	R5	RESISTOR, FC, 43 K OHM 5% 1/4 WATT	1
13	SA-9333	R6	RESISTOR, FC, 18 K OHM 5% 1/4 WATT	1
14	SA-9342	R7	RESISTOR, FC, 5 K OHM 5% 1/4 WATT	1
15	SA-9185	R8	POTENTIOMETER, 5K OHM	1
16	SA-9324	R9, R10, R5, R15, R17	RESISTOR, FC, 27 K OHM 10% 1/4 WATT	6
17	SB-8997	R12, R13	RESISTOR, FC, 2.7 K OHM 10% 1/4 WATT	2
18	SA-8772	R17	RESISTOR, FC, 15 K OHM 5% 1/4 WATT	1
19	SA-9C30	C4	CAPACITOR, 0.47 MFD. 20% 50 VOLT	1
20	SA-9350	C6	CAPACITOR, CERAMIC, 150 PFD. 5% 100 VOLT	1
21	SA-8980	C3, C5, C1, C8, C9, C13 THRU C16	CAPACITOR, CERAMIC, .01 MFD. +80% -20% 50 VOLT	9
22	SA-9031	C1	CAPACITOR, TANTALUM, 1 MFD. 20% 25 VOLT	1
23	SA-9347	C2	CAPACITOR, CERAMIC, 1500 PFD. 5% 50 VOLT	1
24	SA-9343	C12	CAPACITOR, ELECTROLYTIC, 10 MFD. 20% 20 VOLT LOW LEAK	1
25	SA-9348	C11	CAPACITOR, CERAMIC, 4700 PFD. 5% 50 VOLT	1
26	SA-9346	C10	CAPACITOR, CERAMIC, 1200 PFD. 5% 50 VOLT	1
27	SA-9004		24 PIN SOCKET	4
28	SA-9352	J1	RIBBON CABLE ASSEM.	1

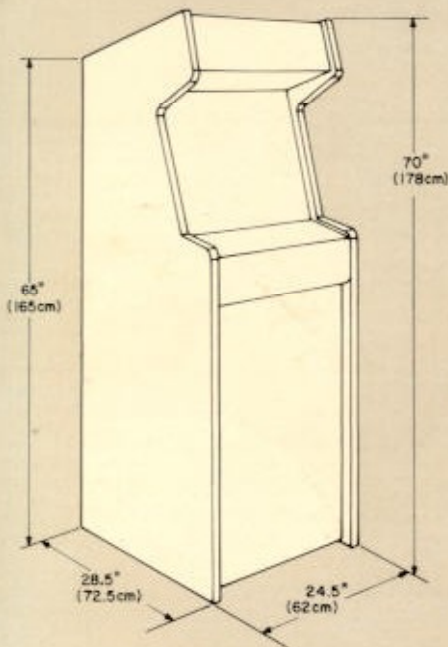


REVISION	DATE	BY
1	10-4-79	WAS
2	10-4-79	WAS
3	10-4-79	WAS
4	10-4-79	WAS
5	10-4-79	WAS
6	10-4-79	WAS
7	10-4-79	WAS
8	10-4-79	WAS
9	10-4-79	WAS
10	10-4-79	WAS
11	10-4-79	WAS
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20	10-4-79	WAS
21	10-4-79	WAS
22	10-4-79	WAS
23	10-4-79	WAS
24	10-4-79	WAS
25	10-4-79	WAS
26	10-4-79	WAS
27	10-4-79	WAS
28	10-4-79	WAS

TOLERANCES	UNLESS OTHERWISE SPECIFIED
FRACTIONAL	1/16" MIN.
DECIMAL	0.005" MIN.
HOLE DIA.	0.005" MIN.
ANGLE	45° MIN.
CONCENTRICITY	0.005" MIN.
SCREW THREADS	1.3" CLASS 1
FINISH	24
DATE	9-28-79
REV.	21
QTY.	1
ASSEMBLY ON	WILLIAM ELECTRONIC, INC.
SUBORDINATE	3501 N. CALIFORNIA, CHICAGO, ILL. 60618
NAME	SPEECH MODULE
ASSEM.	ASSEM.
C-8228	

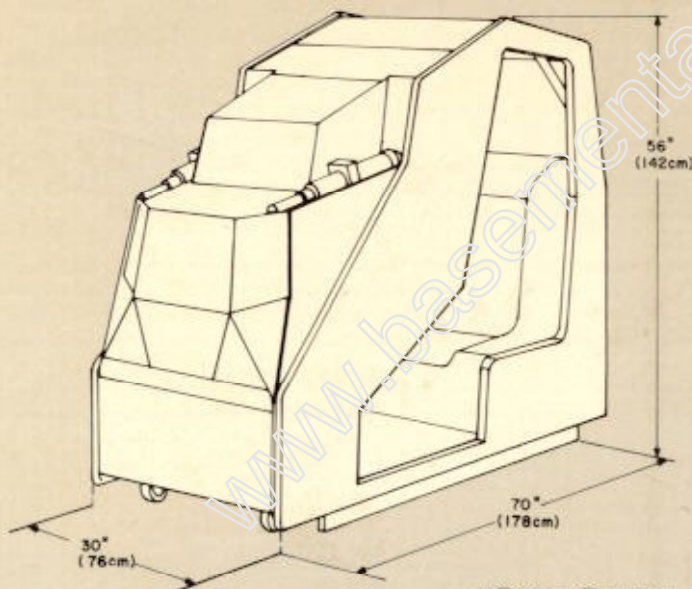


C 8228 Speech Module Assembly and Logic Diagrams



UPRIGHT:
Weight
270 lbs. (122.5 kg.) uncrated
290 lbs. (131.5 kg.) crated

COCKPIT:
Weight
342 lbs. (155 kg.) uncrated
402 lbs. (182.5 kg.) crated



****Patent Pending**
Specifications subject to change without notice.

POWER REQUIREMENTS

115/230VAC Nominal, 50/60Hz
@1.7/0.85A 192W
(20A surge for one cycle at power turn on)

Normal Line = 98-126VAC
196-252VAC

High Line* = 113-145VAC
226-290VAC

Low Line* = 88-113VAC
176-226VAC

*Transformer jumpers required.
See service manual.

ENVIRONMENT

Operating Temperature
0° to +45°C ambient
(+32° to +113°F)

Storage Temperature
-40° to +35° C ambient
(-40° to +149°F)

90% RH at 40°C (104°F), non-condensing

MONITOR

19" Color Raster
non-interlaced
UL, CSA & DHHS Approved

VIDEO SYSTEM**

256 Colors, 340 x 240 PIXEL Resolution
6809E Microprocessor
ROM: 44K BYTES
Video and Scratch RAM: 50K BYTES
CMOS RAM: 1Kx4
Special RAM: 2K BYTES

SOUND SYSTEM

6808 Microprocessor
ROM: 24K BYTES (cockpit)
U.S. Patent No. 4272649

SPEECH SYSTEM**

Digital to Analog
CVSD System

JOYSTICK**

Optical Sensing
49 discrete directions and degrees of movement
(6 separate speeds in 8 directions plus center off position)

Warning—This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been certified to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to correct the interference.

SERVICE

For the back-up that keeps you out-front,
call Williams toll-free at 800/621-1253.
In Illinois, call toll-free at 800/572-1324.

Williams®
ELECTRONICS, INC.

3401 N. California Ave., Chicago, IL 60618
(312) 267-2240, Telex 253095

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