

COMMODORE AMIGA A500 TECHNICAL SERVICE DATA



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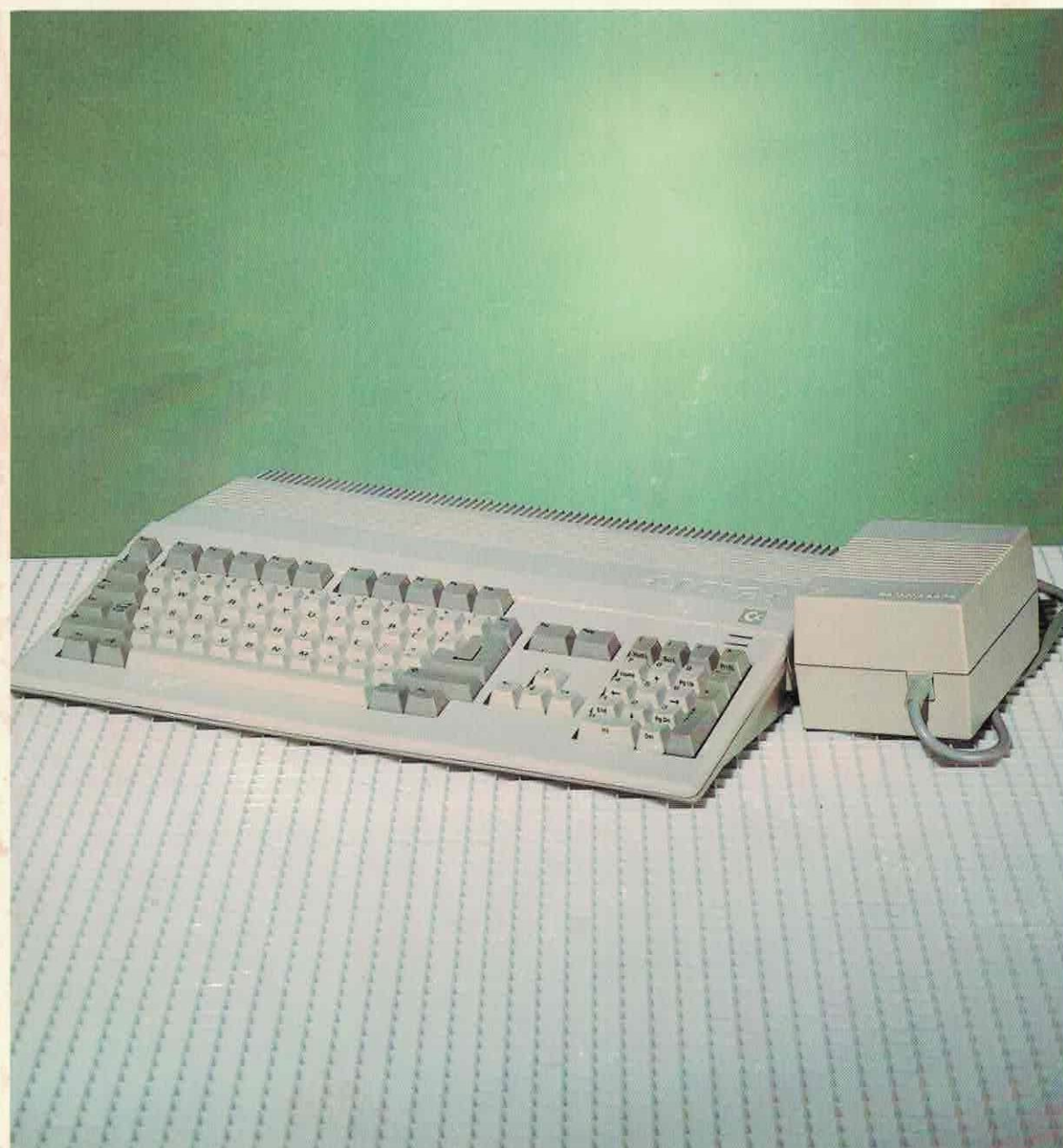
HOWARD W. SAMS & COMPANY

CSCS26 09040

COMPUTERFACTS™

Technical Service Data

COMMODORE® MODEL AMIGA A500 COMPUTER

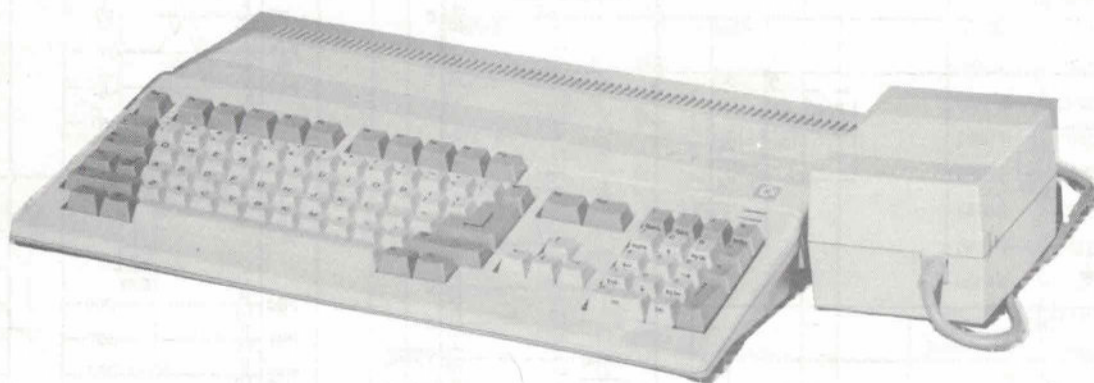


FEATURES COMPLETE SCHEMATICS • PRELIMINARY SERVICE CHECKS • TROUBLESHOOTING TIPS •
EASY-READ WAVEFORMS • REPLACEMENT PARTS LISTS • SEMICONDUCTOR CROSS-REFERENCE

IF THE POWER SUPPLY $< 5VDC$ OUT
THEN THE SECOND DRIVE WON'T WORK
CORRECTLY & POSSIBLY THE SCREEN
WILL FLICKER.

COMMODORE
AMIGA A500

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SAFETY PRECAUTIONS

See page 11.

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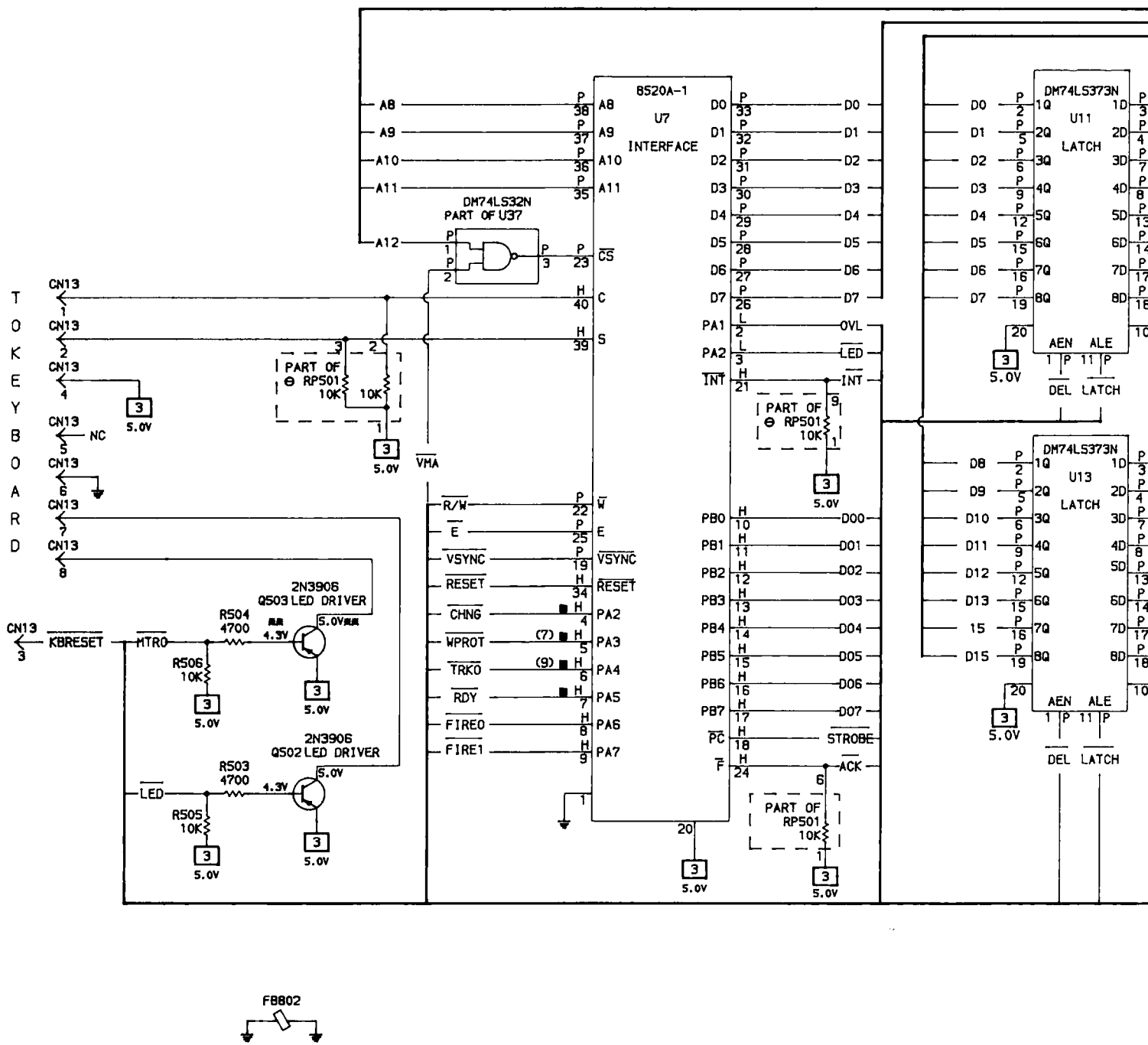
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The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co. as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co. by the manufacturers of the particular type of replacement part listed. 88CS 19055 DATE 12-88

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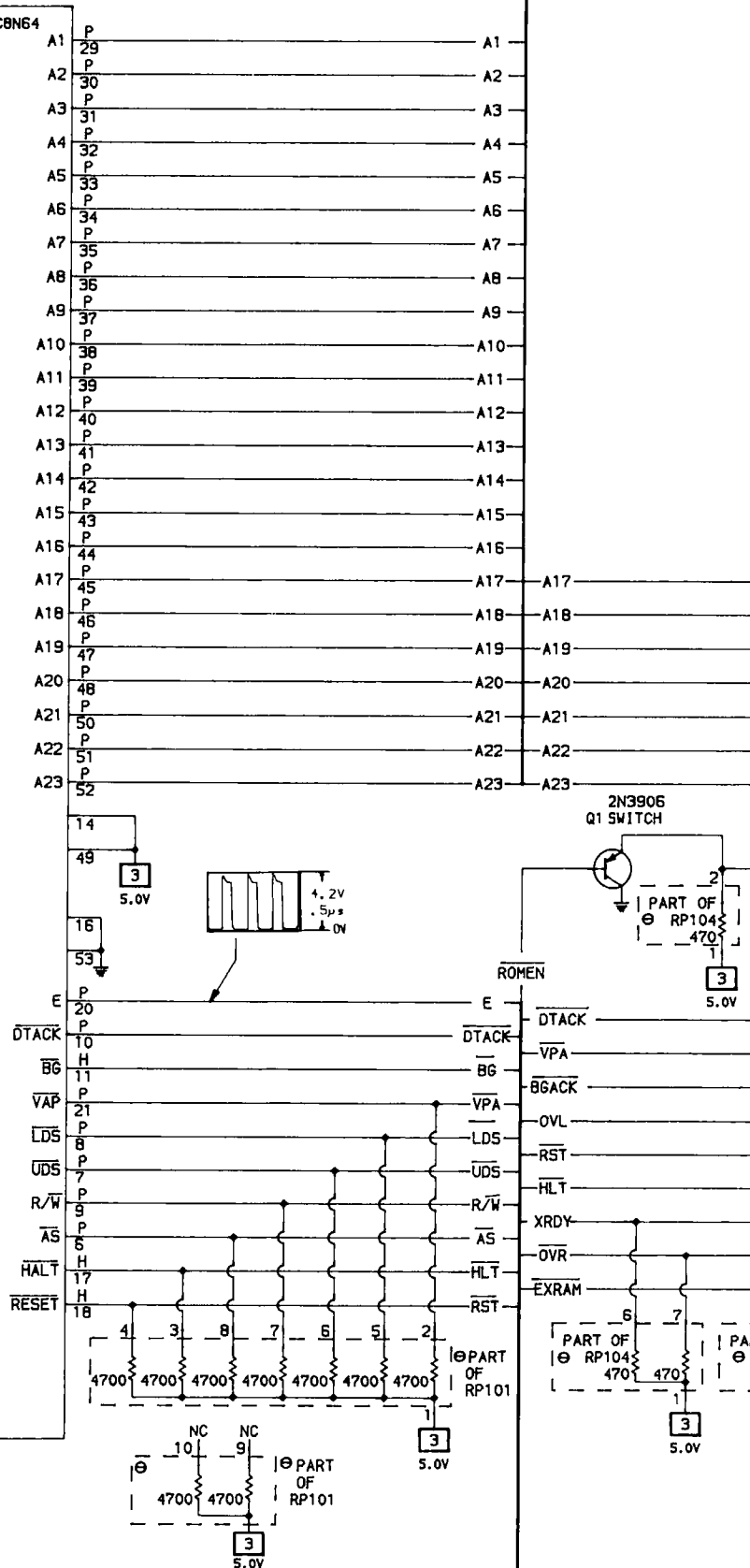
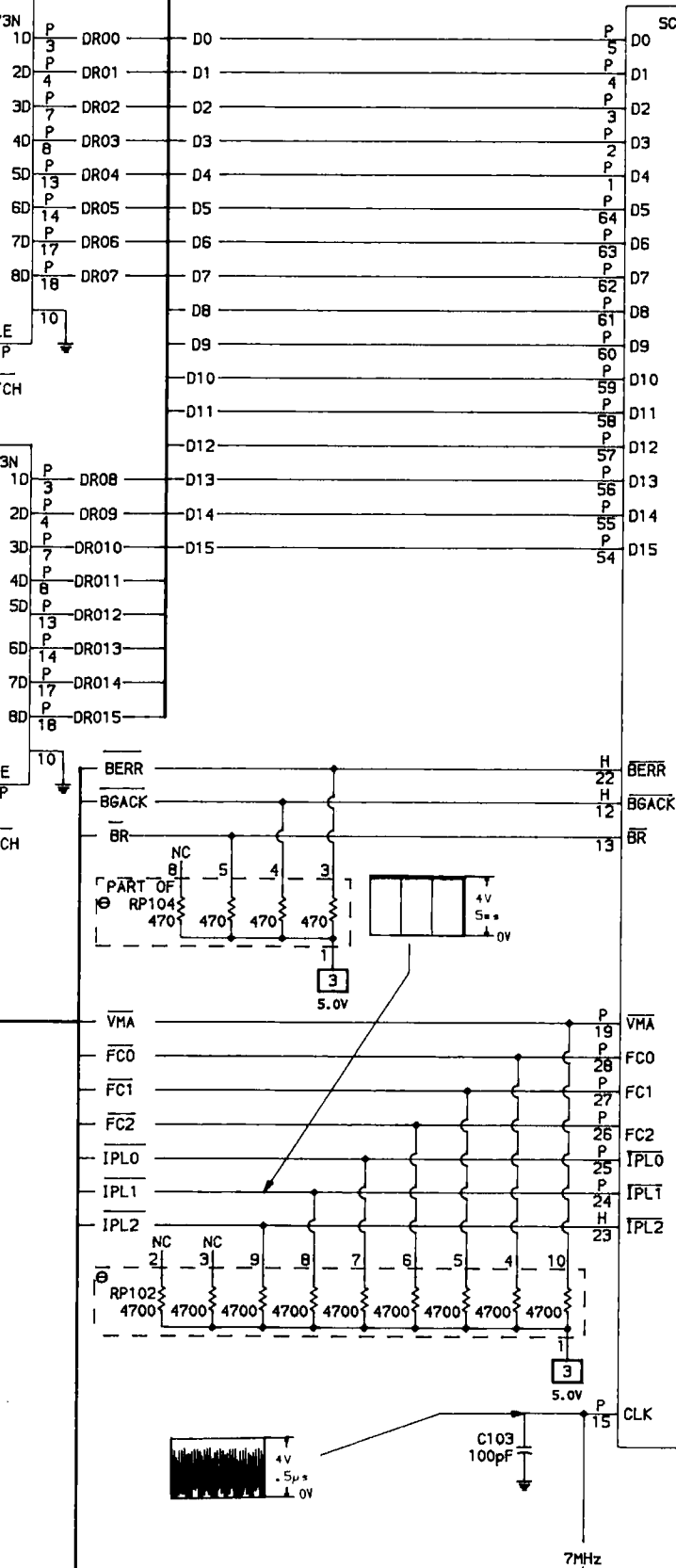
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A PHOTOFAC STANDARD NOTATION SCHEMATIC
WITH **CIRCUITRACE**

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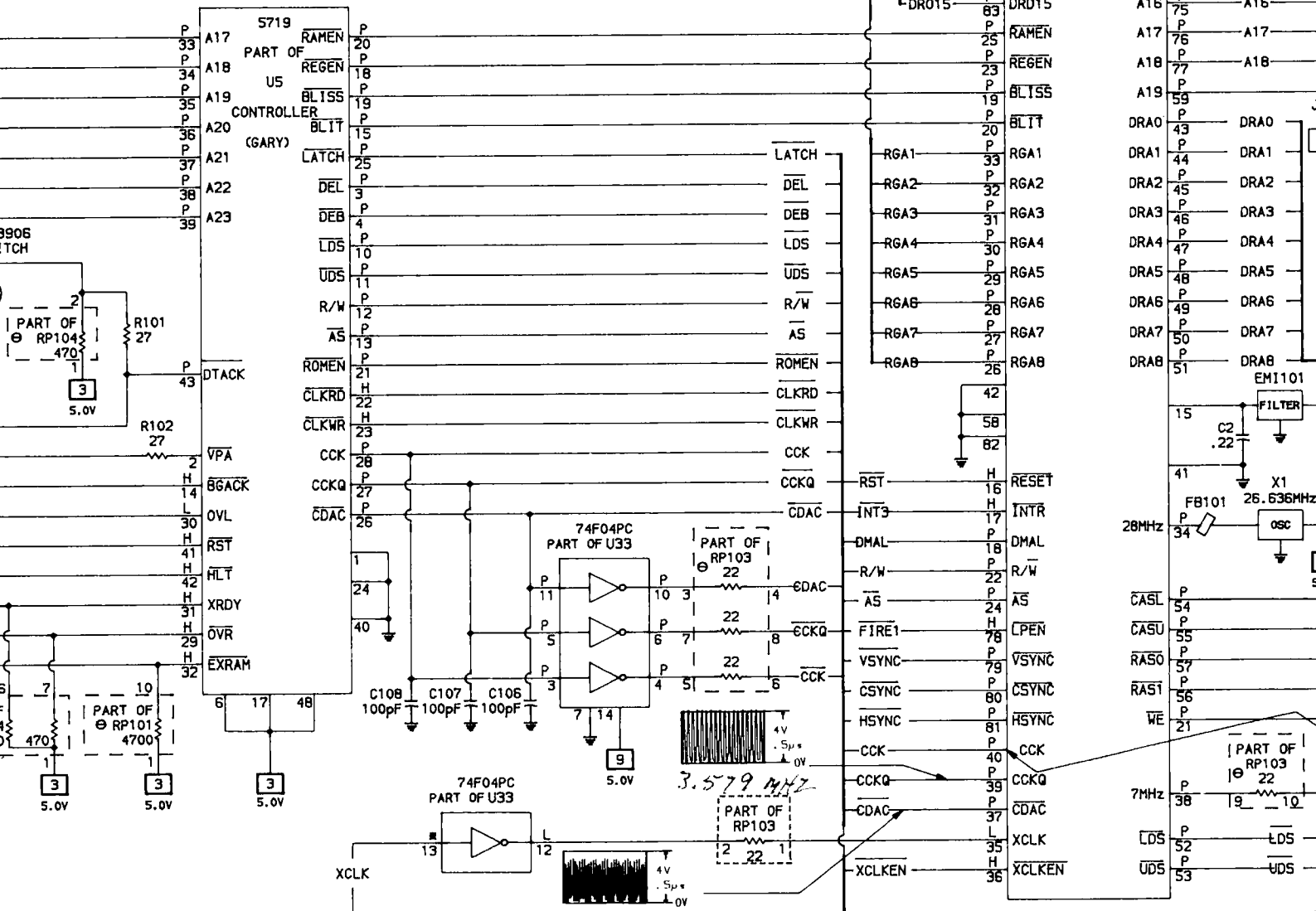
CABLING,
HEAVY LINES REDUCE
USE OF MULTIPLE LINES

PHOTO CIRCUITRACE = 11

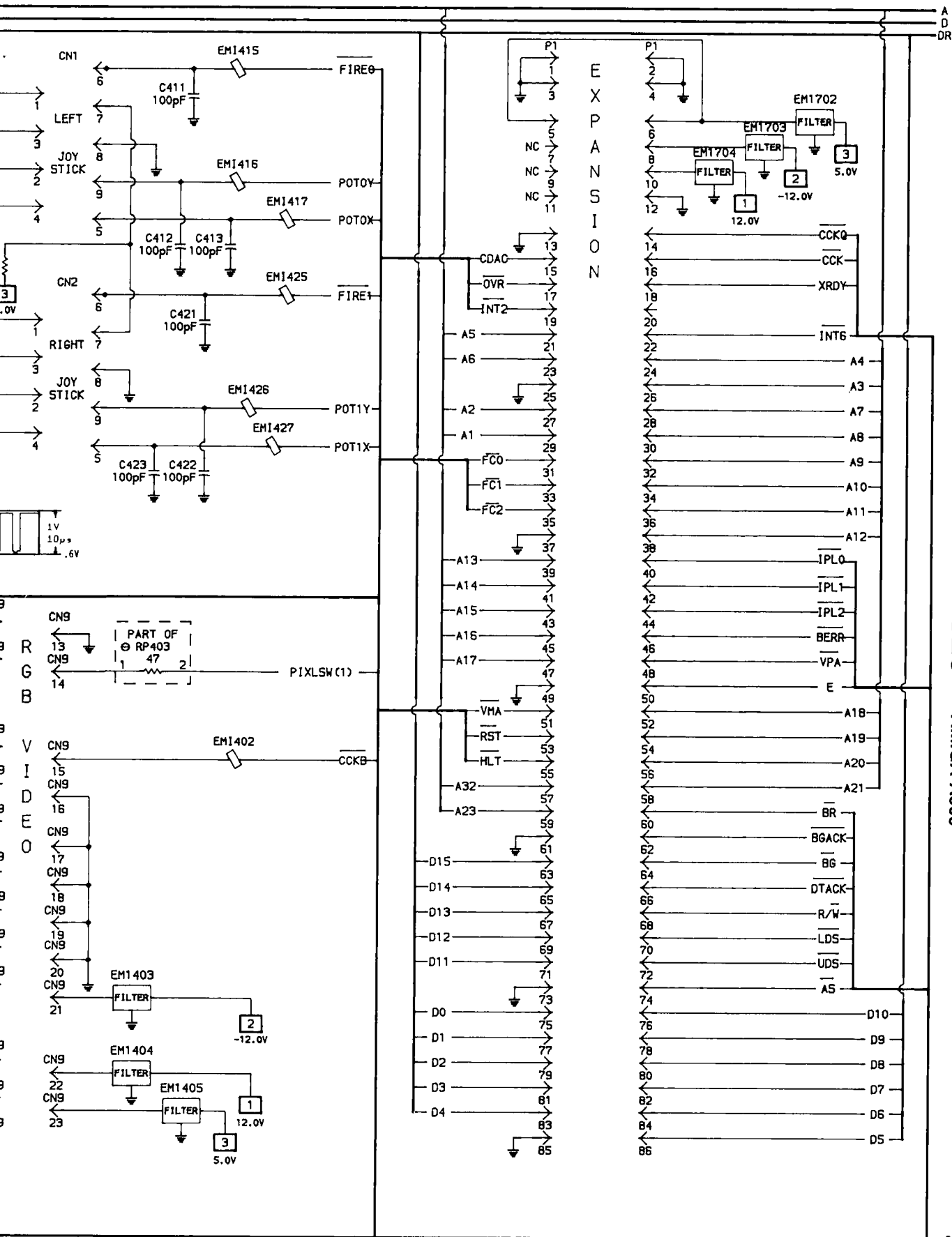
SCHEMATIC CIRCUITRACE = 11

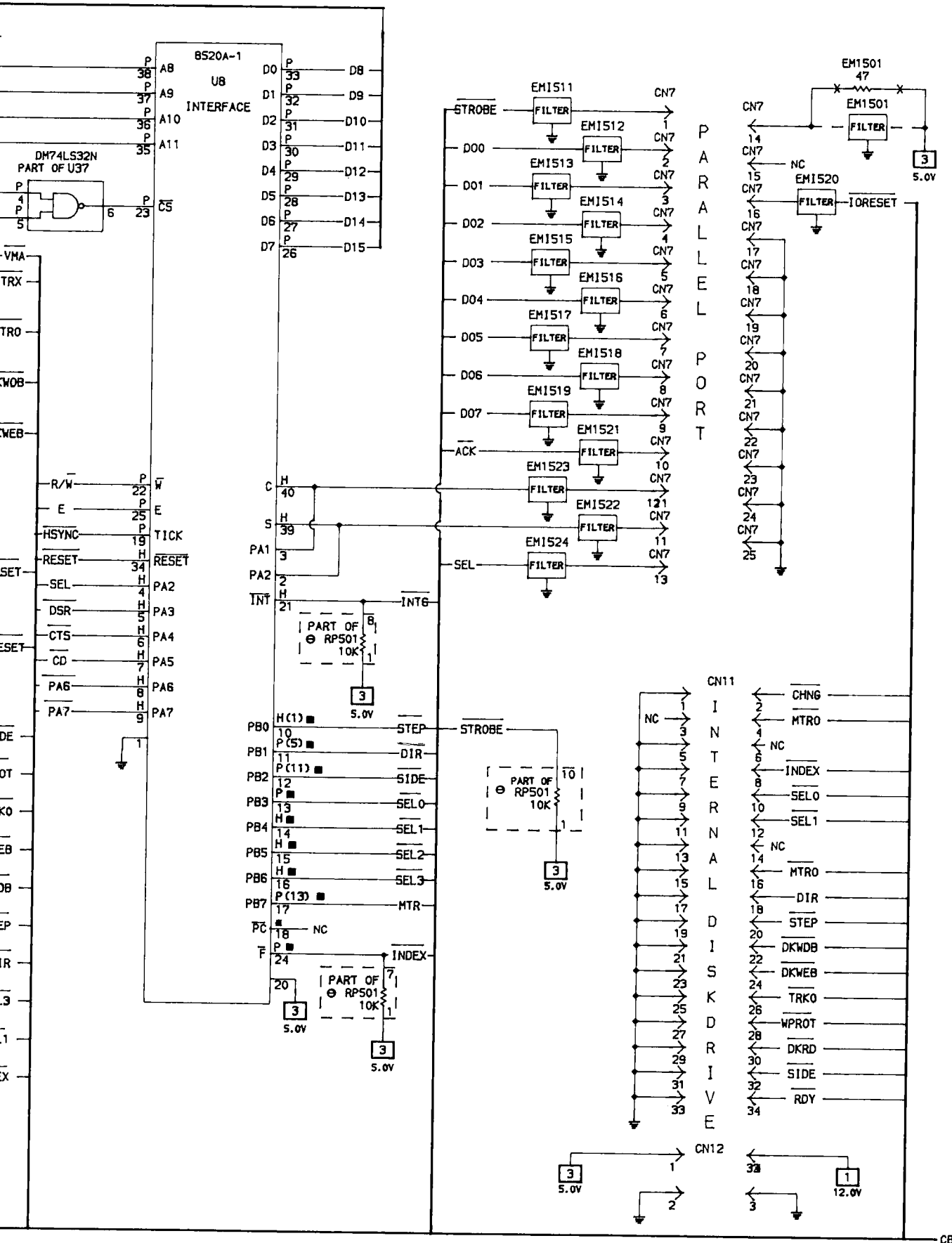
NOTE:

- LOGIC STATE NOT DETERMINABLE
- LOGIC STATE DETERMINED WHILE
RUNNING DISK DRIVE TEST PROGRAM

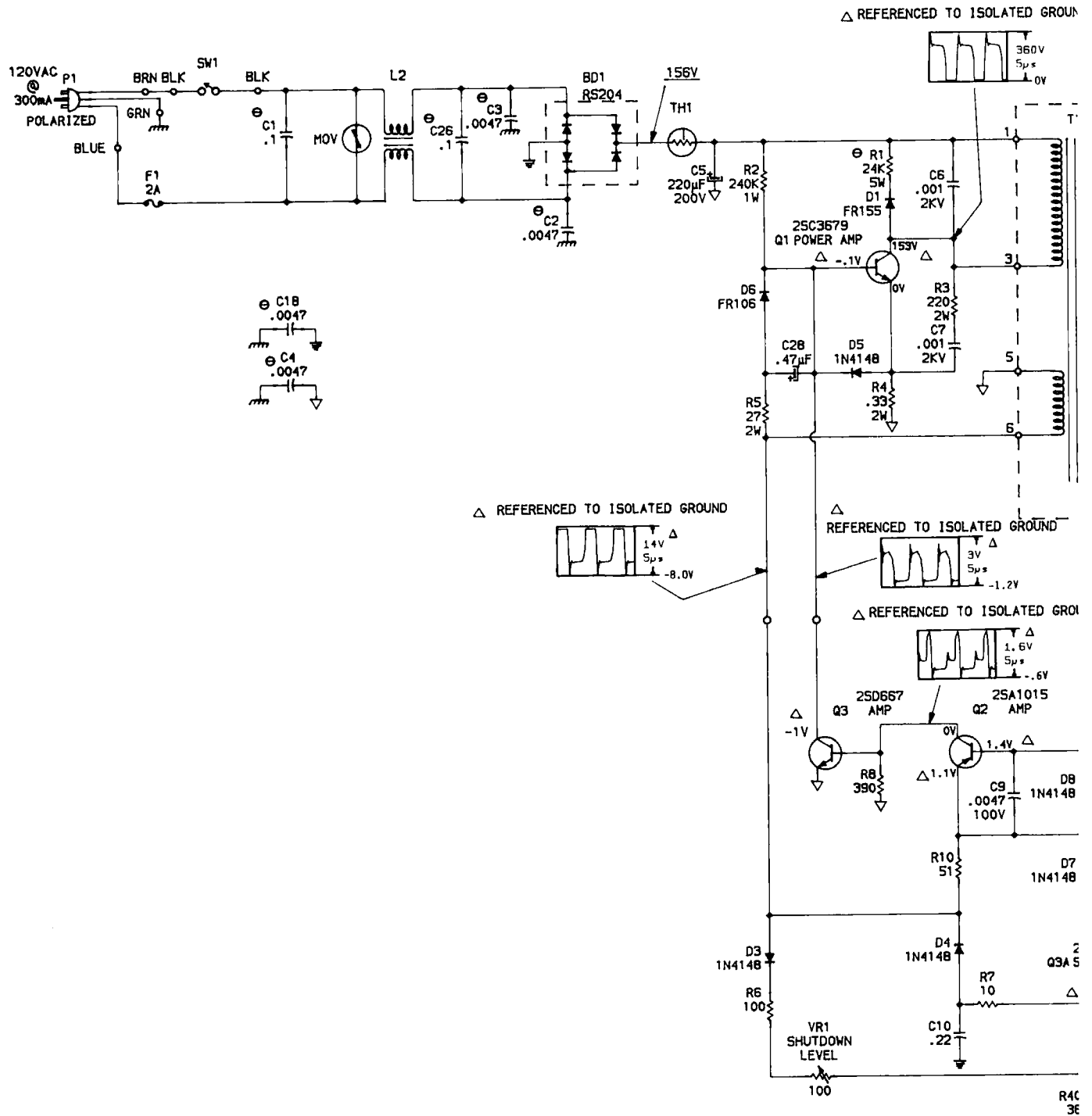


7.159 MHz





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A PHOTOFAC STANDARD NOTATION SCHEMATIC
WITH **CIRCUITRACE™**

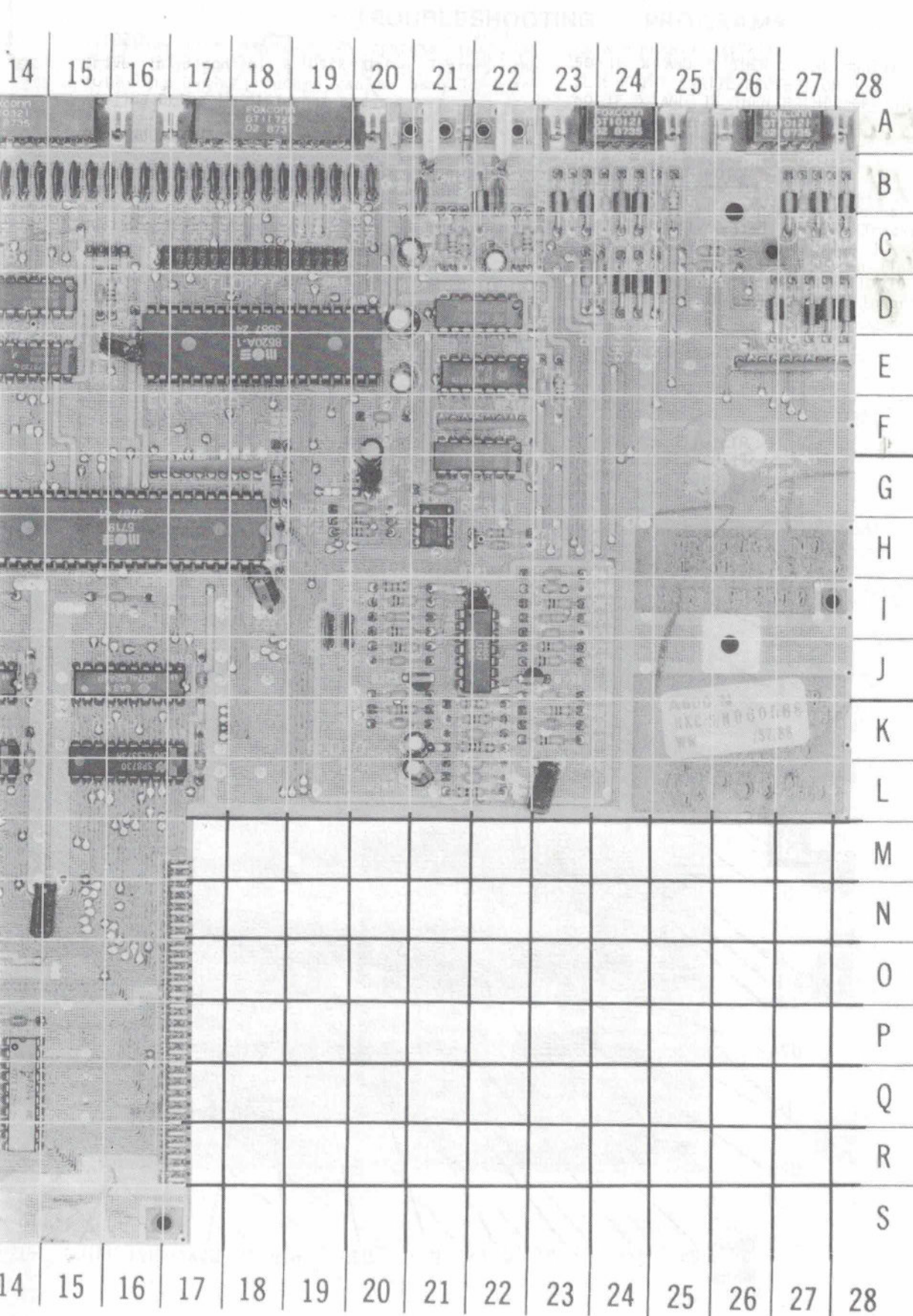
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POWER SUPPLY

SYSTEM BOARD GridTrace LOCATION GUIDE

C1	M-4	C422	B-23	EMI 520	B-7	R404	E-23
C2	K-11	C423	B-24	EMI 521	B-11	R405	C-6
C3	H-7	C501	H-22	EMI 522	B-11	R406	C-2
C4	E-1	C502	F-20	EMI 523	B-11	R409*	B-1
C5	H-18	C701	I-13	EMI 524	B-11	R501	E-12
C6	N-6	C711	G-20	EMI 531	B-12	R502	E-13
C7	D-8	C712	F-20	EMI 532	B-15	R503	E-13
C8	D-16	C713	H-22	EMI 533	B-14	R504	E-13
C10	J-14	C811	D-20	EMI 534	B-14	R505	E-13
C11	K-14	C812	N-15	EMI 535	B-14	R506	E-13
C12	J-17	C813	I-18	EMI 536	B-13	R711	H-20
C13	K-17	C814	P-3	EMI 537	B-13	R712	H-22
C14	M-1	C815	P-4	EMI 538	B-12	R713	H-20
C15	E-23	C821	E-16	EMI 601	B-19	RP101	G-18
C16	S-5	C822	E-20	EMI 602	B-19	RP102	J-4
C17	S-6	CN1	A-27	EMI 611	B-17	RP103	G-4
C18	S-7	CN2	A-24	EMI 612	B-17	RP104	Q-4
C19	S-8	CN3	A-22	EMI 613	B-17	RP201	Q-13
C20	S-9	CN4	A-21	EMI 614	B-18	RP202	Q-13
C21	S-10	CN5	A-18	EMI 615	B-18	RP203	O-13
C22	S-11	CN6	A-14	EMI 616	B-18	RP401	E-27
C23	S-12	CN7	A-9	EMI 617	B-17	RP402	C-4
C24	P-5	CN8	A-6	EMI 618	B-16	RP403	C-4
C25	Q-6	CN9	A-4	EMI 619	B-16	RP404	F-22
C26	P-7	CN10	A-1	EMI 620	B-16	RP405	C-4
C27	Q-8	CN11	C-19	EMI 621	B-15	RP501	C-11
C28	P-9	CN12	C-15	EMI 622	B-15	U1	M-3
C29	Q-10	CN13	C-13	EMI 623	B-15	U2	K-9
C30	P-11	CN14	M-17	EMI 624	B-20	U3	H-10
C31	Q-12	D501	E-12	EMI 625	B-20	U4	F-3
C33	G-4	EMI 101	L-11	EMI 626	B-19	U5	H-16
C34	P-14	EMI 301	H-7	EMI 702	H-2	U6	L-5
C35	O-13	EMI 302	B-21	EMI 703	I-2	U7	D-10
C36	D-23	EMI 303	B-22	FB101	I-11	U8	E-18
C37	G-22	EMI 305	I-19	FB802	B-22	U10	J-13
C39	D-15	EMI 306	I-19	HY1	D-1	U11	L-13
C40	D-1	EMI 401	B-25	JP1	G-19	U12	J-16
C41	D-3	EMI 402	B-5	JP2	M-4	U13	L-16
C42	G-21	EMI 403	B-2	JP3	O-12	U14	J-22
C97	C-14	EMI 404	B-2	LF1	B-6	U15	E-22
C98	C-7	EMI 405	B-2	P1	H-1	U16	R-5
C99	D-7	EMI 406	D-6	Q1	H-5	U17	R-6
C103	M-4	EMI 407	G-4	Q301	I-22	U18	R-7
C106	H-13	EMI 411	D-28	Q321	J-20	U19	R-8
C107	I-13	EMI 412	D-27	Q331	J-23	U20	R-9
C108	I-16	EMI 413	B-27	Q501	D-12	U21	R-10
C301	L-22	EMI 414	D-27	Q502	D-13	U22	R-11
C302	L-22	EMI 415	A-28	Q503	D-13	U23	R-12
C303	K-21	EMI 416	B-27	Q711	G-20	U24	O-5
C304	L-21	EMI 417	D-26	R101	G-18	U25	O-6
C305	K-22	EMI 421	D-24	R102	G-18	U26	O-7
C306	L-23	EMI 422	B-24	R301	K-22	U27	O-8
C307	G-7	EMI 423	D-24	R302	L-21	U28	O-9
C308	I-23	EMI 424	B-24	R303	K-22	U29	O-10
C311	C-25	EMI 425	D-25	R304	K-22	U30	O-11
C312	C-25	EMI 426	B-23	R305	D-16	U31	O-12
C313	C-24	EMI 427	B-23	R306	I-20	U33	G-4
C314	C-23	EMI 431	B-4	R307	I-20	U34	Q-14
C321	K-20	EMI 432	B-4	R308	I-23	U35	P-13
C322	J-20	EMI 433	B-3	R321	K-20	U36	D-22
C323	J-20	EMI 434	B-3	R322	I-20	U37	G-22
C324	C-20	EMI 435	B-1	R323	J-20	U38	E-14
C325	C-21	EMI 501	B-8	R324	C-21	U39	D-14
C331	K-23	EMI 502	B-13	R325	C-21	U40	D-2
C332	J-23	EMI 503	B-13	R326	I-20	U41	D-4
C333	I-23	EMI 511	B-8	R331	K-23	U42	H-21
C334	C-22	EMI 512	B-8	R332	J-23	X1	I-12
C335	C-22	EMI 513	B-9	R333	J-23		
C401	C-5	EMI 514	B-9	R334	C-22		
C402	C-1	EMI 515	B-9	R335	C-23		
C411	B-27	EMI 516	B-9	R336	I-23		
C412	D-27	EMI 517	B-10	R339	K-23		
C413	B-27	EMI 518	B-10	R402	B-5		
C421	B-25	EMI 519	B-10	R403	B-5		

*Located on bottom of board.

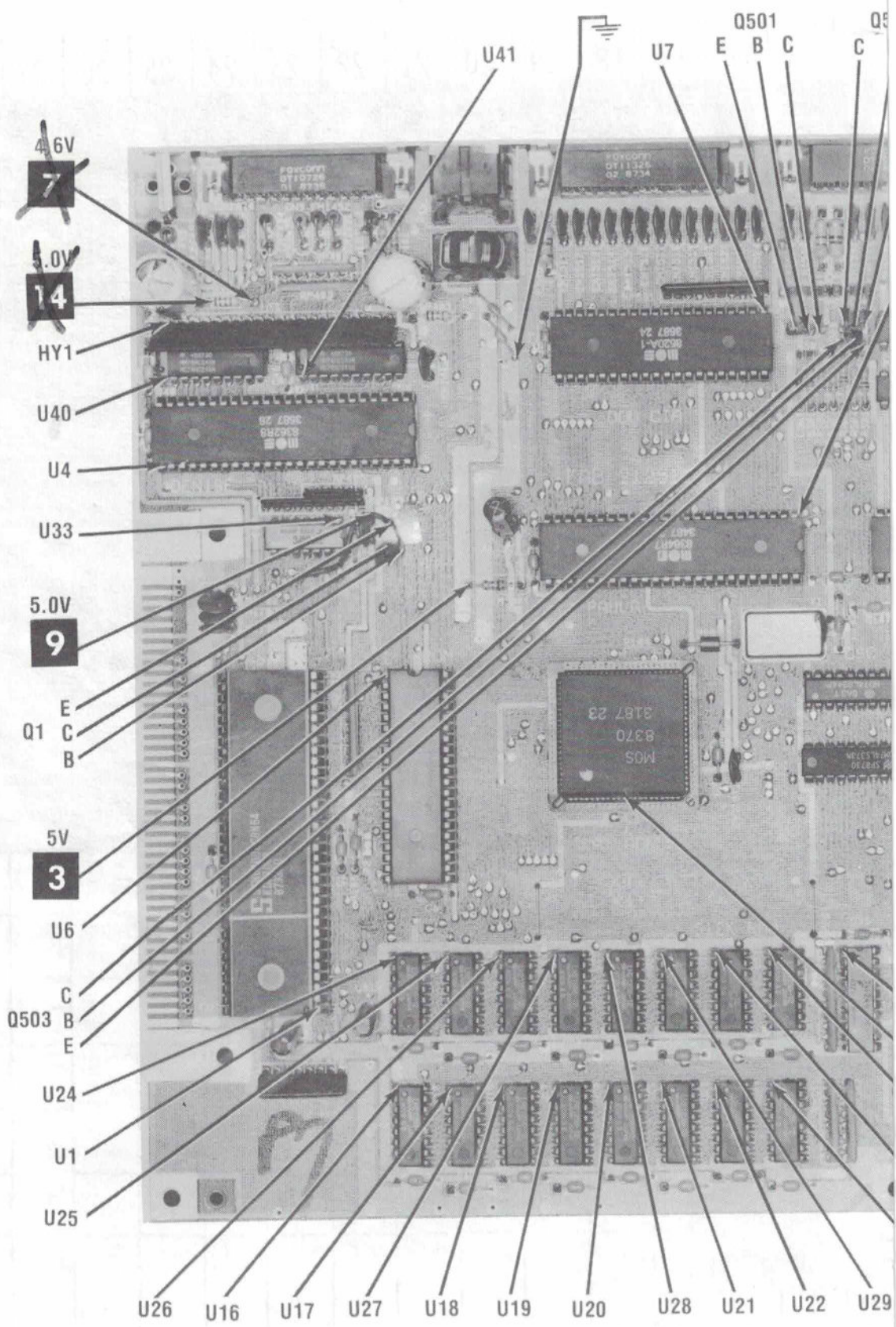


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**COMMODORE
AMIGA A500**

SYSTEM BOARD

5.0
14
4.6
7



SAFETY PRECAUTIONS

1. Use an isolation transformer for servicing.
2. Maintain AC line voltage at rated input.
3. Remove AC power from the Computer system before servicing or installing electrostatically sensitive devices. Examples of typical ES devices are integrated circuits and semiconductor "chip" components.
4. Use extreme caution when handling the printed circuit boards. Some semiconductor devices can be damaged easily by static electricity. Drain off any electrostatic charge on your body by touching a known earth ground. Wear a commercially available discharging wrist strap device. This should be removed prior to applying power to the unit under test.
5. Use a grounded-tip, low voltage soldering iron.
6. Use an Isolation (times 10) probe on scope.
7. Do not remove or install Boards, Floppy Disk Drives, Printers or other peripherals with Computer system AC power On.
8. Do not use freon-propelled sprays. These can generate electrical charges sufficient to damage semiconductor devices.
9. This Computer system is equipped with a grounded three-pronged AC plug. This plug must fit into a grounded AC power outlet. Do not defeat the AC plug safety feature.
10. Periodically examine the AC power cord for damaged or cracked insulation.
11. The Computer system cabinet is equipped with vents to prevent heat build-up. Never block, cover or obstruct these vents.
12. Instructions should be given, especially to children, that objects should not be dropped or pushed into the vents of the cabinet. This could cause shock or equipment damage.
13. Never expose the Computer system to water. If exposed to water, turn the unit Off. Do not place the Computer system near possible water sources.
14. Never leave the Computer system unattended or plugged into the AC outlet for long periods of time. Remove AC plug from AC outlet during lightning storms.
15. Do not allow anything to rest on AC power cord.
16. Unplug AC power cord from outlet before cleaning Computer system.
17. Never use liquids or aerosols directly on the Computer system. Spray on cloth and then apply to the Computer system cabinet. Make sure the Computer system is disconnected from the AC power line.

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**COMMODORE
AMIGA A500**

SCHEMATIC NOTES

- ▽ Isolated ground
- ✱ Circuitry not used in some versions
- Circuitry used in some versions
- See parts list
- ⊕ Ground
- ⏏ Chassis

Voltages, waveforms and logic readings taken with the computer in power up mode (turned On, no keys pressed, no programs loaded) unless otherwise noted.

Voltages measured with digital meter.

Waveforms and voltages taken from ground, unless noted otherwise.

Supply voltage maintained as shown at input.

Controls adjusted for normal operation.

Capacitors are 50 volts or less, 5% unless noted.

Electrolytic Capacitors are 50 volts or less, 20% unless noted.

Resistors are 1/2W or less, 5% unless noted.

Value in () used in some versions.

Measurements with switching as shown, unless noted.

Logic Probe Display

L = Low

H = High

P = Pulse

* = Open (No lights On)

LOGIC CHART

SYSTEM BOARD

PIN NO.	IC U1	PIN NO.	IC U1	PIN NO.	IC U1	PIN NO.	IC U1	PIN NO.	IC U2	PIN NO.	IC U2	PIN NO.	IC U2	PIN NO.	IC U2	PIN NO.	IC U2
1	P	21	P	41	P	61	P	1	P	21	P	41	L	61	P	81	P
2	P	22	H	42	P	62	P	2	P	22	P	42	L	62	P	82	L
3	P	23	H	43	P	63	P	3	P	23	P	43	P	63	P	83	P
4	P	24	P	44	P	64	P	4	P	24	P	44	P	64	P	84	P
5	P	25	P	45	P			5	P	25	P	45	P	65	P		
6	P	26	P	46	P			6	P	26	P	46	P	66	P		
7	P	27	P	47	P			7	P	27	P	47	P	67	P		
8	P	28	P	48	P			8	P	28	P	48	P	68	P		
9	P	29	P	49	H			9	P	29	P	49	P	69	P		
10	P	30	P	50	P			10	P	30	P	50	P	70	P		
11	H	31	P	51	P			11	P	31	P	51	P	71	P		
12	H	32	P	52	P			12	P	32	P	52	P	72	P		
13	H	33	P	53	L			13	P	33	P	53	P	73	P		
14	H	34	P	54	P			14	P	34	P	54	P	74	P		
15	P	35	P	55	P			15	H	35	L	55	P	75	P		
16	L	36	P	56	P			16	H	36	H	56	P	76	P		
17	H	37	P	57	P			17	H	37	P	57	P	77	P		
18	H	38	P	58	P			18	P	38	P	58	L	78	H		
19	P	39	P	59	P			19	P	39	P	59	P	79	P		
20	P	40	P	60	P			20	P	40	P	60	P	80	P		

LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO.	IC U3	PIN NO.	IC U3	PIN NO.	IC U3	PIN NO.	IC U4	PIN NO.	IC U4	PIN NO.	IC U4	PIN NO.	IC U5	PIN NO.	IC U5	PIN NO.	IC U5
1	P	21	P	41	H	1	P	21	P	41	P	1	L	21	P	41	H
2	P	22	P	42	P	2	P	22	P	42	P	2	P	22	H	42	H
3	P	23	P	43	P	3	P	23	P	43	P	3	P	23	H	43	P
4	P	24	P	44	P	4	P	24	P	44	P	4	P	24	L	44	†
5	P	25	P	45	P	5	P	25	P	45	P	5	H	25	P	45	†
6	P	26	P	46	P	6	P	26	P	46	P	6	H	26	P	46	†
7	P	27	H	47	P	7	P	27	P	47	P	7	†	27	P	47	†
8	L	28	P	48	P	8	*	28	P	48	P	8	†	28	P	48	H
9	P	29	P			9	L	29	P			9	†	29	H		
10	P	30	H			10	P	30	P			10	P	30	L		
11	H	31	H			11	P	31	P			11	P	31	H		
12	P	32	H			12	P	32	P			12	P	32	H		
13	P	33	H			13	P	33	P			13	P	33	P		
14	P	34	L			14	P	34	P			14	H	34	P		
15	H	35	*			15	P	35	P			15	P	35	P		
16	H	36	*			16	P	36	P			16	†	36	P		
17	H	37	H			17	P	37	L			17	H	37	P		
18	H	38	†			18	P	38	L			18	P	38	P		
19	P	39	†			19	H	39	*			19	P	39	P		
20	P	40	H			20	P	40	P			20	P	40	L		

† Refer To Disk Drive Interface Logic Chart.

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SYSTEM BOARD

PIN NO.	IC U6	PIN NO.	IC U6	PIN NO.	IC U7	PIN NO.	IC U7	PIN NO.	IC U8	PIN NO.	IC U8	PIN NO.	IC U10	IC U11	IC U12	IC U13	IC U15
1	*	21	H	1	L	21	H	1	L	21	H	1	P	P	P	P	P
2	P	22	P	2	L	22	P	2	H	22	P	2	P	P	P	P	L
3	P	23	P	3	L	23	P	3	H	23	P	3	P	P	P	P	L
4	P	24	P	4	†	24	H	4	H	24		4	P	P	P	P	L
5	P	25	P	5	†	25	P	5	H	25	P	5	P	P	P	P	L
6	P	26	P	6	†	26	P	6	H	26	P	6	P	P	P	P	L
7	P	27	P	7	†	27	P	7	H	27	P	7	P	P	P	P	L
8	P	28	P	8	H	28	P	8	H	28	P	8	P	P	P	P	L
9	P	29	P	9	H	29	P	9	H	29	P	9	P	P	P	P	H
10	L	30	L	10	H	30	P	10	†	30	P	10	L	L	L	L	H
11	L	31	P	11	H	31	P	11	†	31	P	11	P	P	P	P	H
12	P	32	P	12	H	32	P	12	†	32	P	12	P	P	P	P	H
13	P	33	P	13	H	33	P	13	†	33	P	13	P	P	P	P	H
14	P	34	P	14	H	34	H	14	†	34	H	14	P	P	P	P	H
15	P	35	P	15	H	35	P	15	†	35	P	15	P	P	P	P	L
16	P	36	P	16	H	36	P	16	†	36	P	16	P	P	P	P	H
17	P	37	P	17	H	37	P	17	†	37	P	17	P	P	P	P	
18	P	38	P	18	H	38	P	18	*	38	P	18	P	P	P	P	
19	P	39	P	19	P	39	H	19	P	39	H	19	P	P	P	P	
20	P	40	P	20	H	40	H	20	H	40	H	20	H	H	H	H	

† Refer To Disk Drive Interface Logic Chart.

LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO.	IC U16	IC U17	IC U18	IC U19	IC U20	IC U21	IC U22	IC U23	IC U24	IC U25	IC U26	IC U27	IC U28	IC U29	IC U30	IC U31	IC U33
1	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	H
2	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	L
3	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
4	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
5	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
6	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	L
7	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	H
8	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
9	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	L
10	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
11	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
12	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	L
13	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	*
14	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	H
15	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
16	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	
17																	
18																	
19																	
20																	

SYSTEM BOARD

PIN NO.	IC U34	IC U35	IC U37	IC U38	IC U39	IC U40	IC U41	IC U42	IC HY1	PIN NO.	IC HY1
1	L	L	P	L	L	H	H	L	L	21	H
2	P	P	P	L	L	P	P	H	H	22	L
3	P	P	P	H	H	P	P	L	P		
4	P	P	P	H	L	P	P	H	P		
5	P	P	P	H	L	P	P	H	P		
6	P	P	P	L	H	P	P	L	P		
7	P	P	L	L	L	P	P	L	P		
8	P	P	H	L	H	P	P	H	P		
9	P	P	H	H	L	P	P		P		
10	L	L	L	H	L	L	L		P		
11	P	P	H	L	H	P	P		P		
12	P	P	H	H	L	P	P		P		
13	P	P	L	H	L	P	P		P		
14	P	P	H	H	H	P	P		P		
15	P	P				P	P		P		
16	P	P				P	P		P		
17	P	P				P	P		P		
18	P	P				P	P		P		
19	L	L				L	L		P		
20	H	H				H	H		P		

LOGIC CHART (Continued)

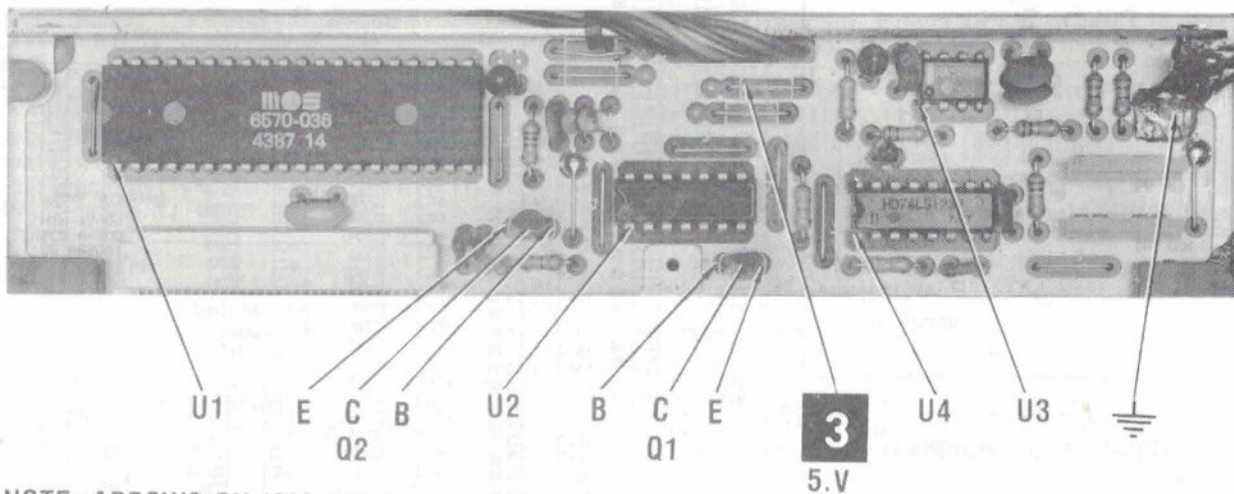
KEYBOARD

PIN NO.	IC U1	PIN NO.	IC U1	PIN NO.	IC U2
1	H	21	L	1	L
2	P	22	L	2	L
3	P	23	H	3	H
4	P	24	H	4	H
5	P	25	H	5	H
6	P	26	H	6	L
7	P	27	H	7	L
8	P	28	H	8	H
9	P	29	H	9	L
10	P	30	H	10	L
11	P	31	H	11	L
12	L	32	H	12	H
13	P	33	H	13	L
14	P	34	H	14	H
15	P	35	H	15	
16	P	36	H	16	
17	P	37	H(1)	17	
18	P	38	H	18	
19	P	39	H	19	
20	P	40	H	20	

(1) Probe Indicates P when any key is pressed.

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NOTE: ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED

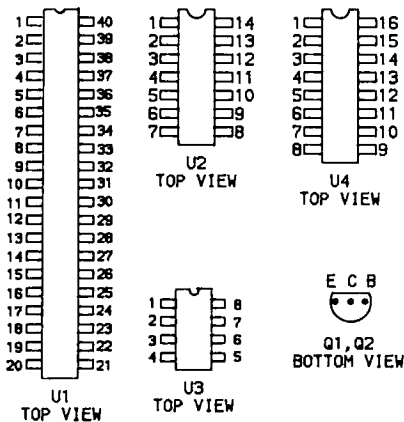
LOGIC CHART

DISK DRIVE INTERFACE

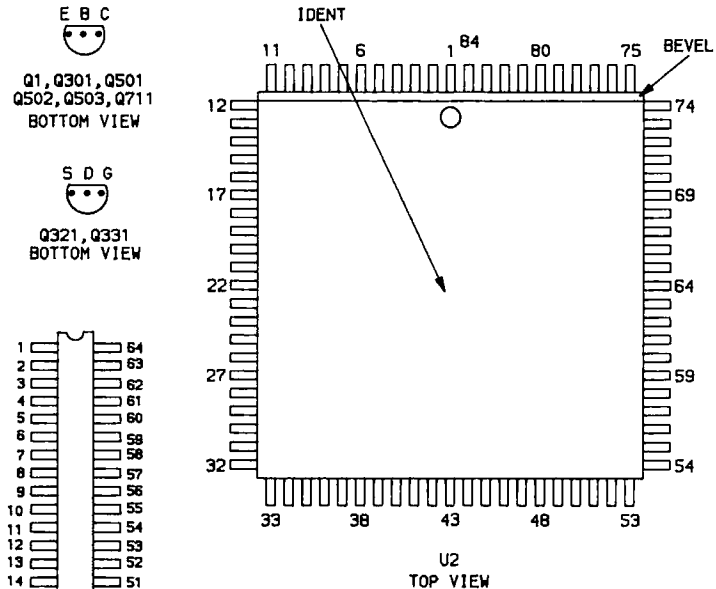
PIN NO.	IC U3	PIN NO.	IC U5	PIN NO.	IC U7	PIN NO.	IC U8	PIN NO.	IC U36
38	P	7	P(13)	4	H	10	H(1)	1	H
39	P(18)	8	P(18)	5	H(7)	11	P(5)	2	P
		9	P	6	H(9)	12	P(11)	3	P
		16	P	7	P	13	P	4	H
		44	P(18)			14	H	5	H(12)
		45	P			15	H	6	L(13)
		46	P(12)			16	H	7	L
		47	P			17	P(13)	8	P
						24	P	9	H
								10	P
								11	P(19)
								12	H
								13	P(18)
								14	H

IC PINOUTS & TERMINAL GUIDES

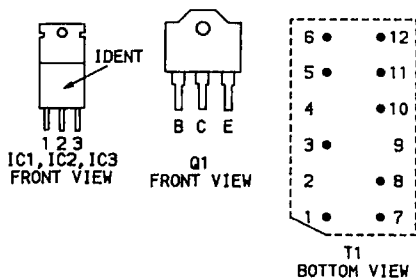
KEYBOARD



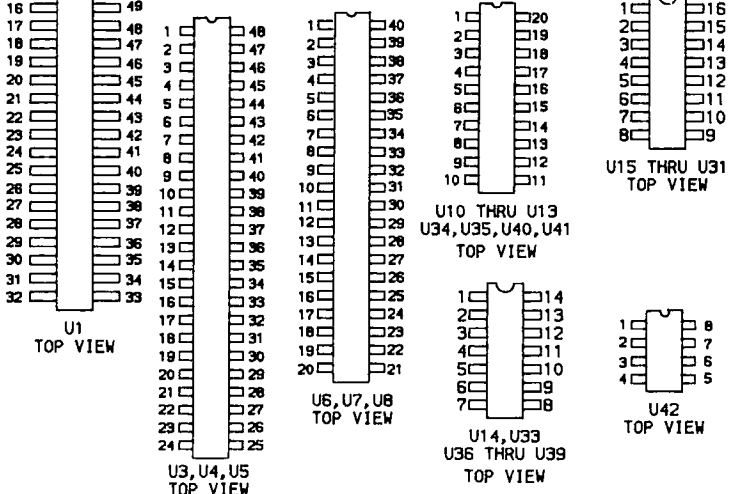
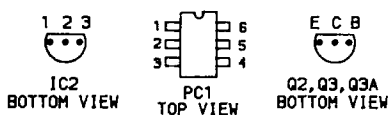
SYSTEM BOARD



POWER SUPPLY



REGULATOR BOARD



GENERAL OPERATING INSTRUCTIONS

BOOT UP

When the computer is turned On, a picture of the Amiga Workbench diskette appears on the Monitor screen. The Computer will automatically boot up on the Amiga Workbench Diskette when it is inserted in the Disk Drive and display an icon of the Workbench Diskette on the Monitor. To activate a window of files on any diskette, use the mouse to move the pointer to the icon and press the left mouse button twice.

MOUSE OPERATION

Move mouse on a smooth surface to move pointer on the Monitor screen. Move pointer to an icon and press left mouse button once to select icon or twice to activate icon. To view the pulldown menus at top of screen, hold right mouse button down and move pointer to desired menu. To select an item from the menu, move pointer to item and release right mouse button.

The keyboard can be used in place of mouse. Use right or left Amiga (A) keys, shift key and cursor keys to move pointer on screen. Use right or left Amiga keys and left Alt key in place of left mouse button. Use right or left Amiga keys and right Alt key in place of right mouse button.

BASIC

To load Basic into the Computer, insert a diskette with Basic on it in Drive. Click on Basic diskette icon twice to open the file window. Click on Amiga Basic icon twice to load Basic. A Basic Command and Output window will appear on Monitor screen along with a List window. To activate either window, move pointer to any point inside the window and press left mouse button once. To type in a Basic pro-

gram, activate List window and type the program in List window. NOTE: If line numbers are used, they must be entered in Computer in sequence. Amiga Basic will not automatically sort line numbers.

To save or load a program, activate Project menu at top of screen (press right mouse button and move pointer to Project) and select Save or Save As to save a program or Open to load a program. Follow instructions that appear on screen.

To save or load a program using the keyboard, activate Command window, type SAVE and program name enclosed in quotes and press Enter key to save the program. Type LOAD and program name enclosed in quotes and press Enter key to load the program.

To view a listing of a Basic program, select SHOW LIST from the WINDOWS menu or type LIST in the Command Window.

To View a list of files on a diskette, activate Command window, type FILES and press Enter key.

To run a program, select START from RUN menu or type RUN in Command window and press Enter key.

To stop a program, select STOP from RUN menu or press Ctrl and C keys.

To leave Basic, select QUIT from the PROJECT menu or type SYSTEM in the Command window and press Enter key.

RESETTING THE COMPUTER

Press Ctrl and Left and Right Amiga (A) keys at same time to reset computer.

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SCHEMATIC NOTES

DISK DRIVE INTERFACE

Voltages, waveforms, and logic readings for Disk Drive Interface taken while running the following Basic program to operate the Disk Drive. Readings were taken when the disk drive head is not moving (drive is in read or write mode) unless noted. NOTE: Insert a formatted diskette (not write protected) in the Drive before running the program.

```
10 OPEN " SAMS.DAT" FOR OUTPUT AS 1
20 FOR X=1 TO 1000
30 PRINT# 1, "HOWARD W SAMS"
40 NEXT X
50 CLOSE 1
60 GOTO 10
```

- (1) Probe indicates P when head is moving.
- (7) Probe indicates L if diskette is write protected.
- (9) Probe indicates L when the head is on track 00 and H when off track 00.
- (11) Probe indicates H when head 0 is selected, L when head 1 is selected.
- (12) Probe indicates L when drive motor is off.
- (13) Probe indicates H when drive motor is off.
- (18) Probe indicates H when in write mode, L when in read mode.
- (19) Probe indicates L when in write mode, H when in read mode.

DISASSEMBLY INSTRUCTIONS

CABINET TOP REMOVAL

Remove six T10 torx screws from bottom (front and rear edges) of cabinet and lift cabinet top off.

KEYBOARD REMOVAL

Remove cabinet top. Disconnect Keyboard Connector (CN13) from System Board and ground connector from Disk Drive. Lift Keyboard out of Cabinet.

DISK DRIVE REMOVAL

Remove cabinet top. Remove four T10 torx screws and straighten four tabs holding top shield and remove shield. Disconnect Keyboard

ground connector from Disk Drive. Remove three phillips screws from the bottom of the cabinet holding Disk Drive. Disconnect Disk Drive connector and power supply connector and remove Drive.

SYSTEM BOARD REMOVAL

Perform Disk Drive Removal procedures. Release catch at the front of the System Board. Lift up front of board and slide it forward to remove. Remove capture nuts on the ports on the back of the board to remove bottom shield.

POWER SUPPLY DISASSEMBLY

Remove four phillips screws from bottom of the Power Supply and remove supply from case.

MISCELLANEOUS ADJUSTMENTS

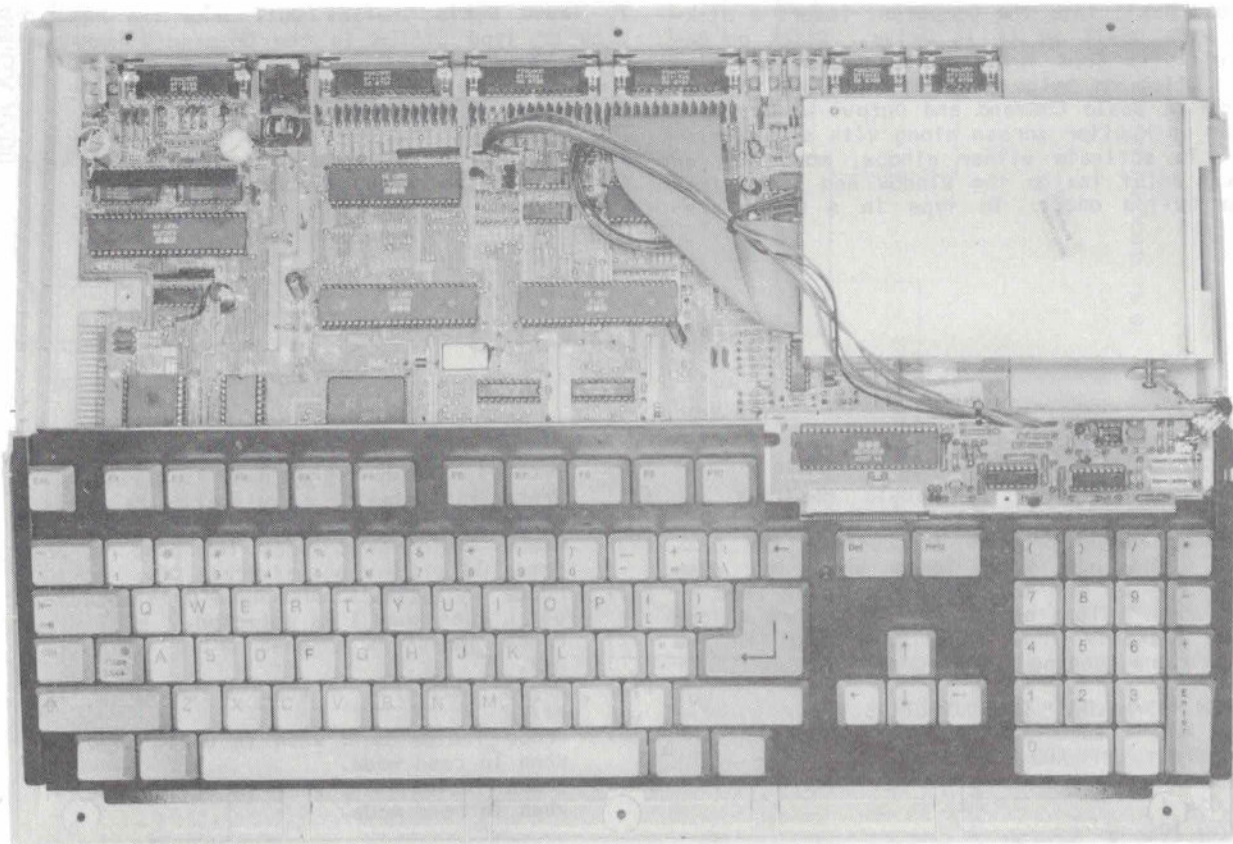
POWER SUPPLY

SHUTDOWN LEVEL ADJUST

Connect the positive input of a voltmeter to the base of Switch Transistor (Q3A) on the Regulator Board. Connect negative input of voltmeter to the emitter of Q3A. Adjust Shutdown Level Control for 2.1V.

5V ADJUST

Connect positive input of a voltmeter to the 5V Source (CircuitTrace 3). Connect negative lead to ground. Adjust 5V Adjust Control for 5.0V.



CHASSIS - OVERALL VIEW

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
KEYBOARD						
Q1, 2	2SC1815GR	NTE85	ECG85	SK3124A/289A	121-Z9065 *	
U1	6570-036					
U2	HD74LS27P	NTE74LS27	ECG74LS27	SK74LS27	HE-443-800	
U3	HA17555	NTE955M	ECG955M	SK3564/955M	221-Z9042	
U4	HD74LS123P	NTE74LS123	ECG74LS123	SK74LS123	HE-443-942	
POWER SUPPLY						
BD1	RS204	NTE168	ECG168	SK3648/168	212-Z9001	
D1	FR155	NTE580	ECG580	SK5036/580	212-Z9000	
D5	1N4148	NTE519	ECG519	SK3100/519	103-131	
D6	FR105	NTE552	ECG552	SK9000/552	103-287	
D9	GP308	NTE5801	ECG5801	SK9004/5801	903-334	
D10	FEP16BT	NTE6240	ECG6240	SK5060/6240		
D12	FR102	NTE552	ECG552	SK9000/552	103-287	
IC1	TYN410	NTE5465	ECG5465	SK9293/5465	185-Z9010	
IC2	L7912CV					
IC3	OA7812UC					
Q1	2SC3679	NTE2309	ECG2309			
REGULATOR BOARD						
D2, 3, 4, 7, 8	1N4148	NTE519	ECG519	SK3100/519	103-131	
IC2	UA431AWC					
PC1	NJL5121DC					
Q2	2SA1015GR	NTE290A	ECG290A	SK9132	121-Z9003 *	
Q3	2SD667C	NTE382	ECG382	SK9137/382	921-1114	
Q3A	2SC1815GR	NTE85	ECG85	SK3124A/289A	121-Z9065 *	
ZD1	5C3	NTE5010T1	ECG5010T1			
SYSTEM BOARD						
D501	1N4148	NTE519	ECG519	SK3100/519	103-131	
Q1	2N3906	NTE159	ECG159	SK3466/159	121-Z9003	

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PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
Q301	2N3906	NTE159	ECG159	SK3466/159	121-Z9003	
Q321, 331	MPF102	NTE451	ECG451	SK9164/451		
Q501	2N3904	NTE123AP	ECG123AP	SK3854/123AP	121-Z9000A *	
Q502, 3	2N3906	NTE159	ECG159	SK3466/159	121-Z9003	
Q711	2N3904	NTE123AP	ECG123AP	SK3854/123AP	121-Z9000A *	
U1	SCN68000C8N64					
U2	8370					
U3	8364R7					
U4	8362R8					
U5	5719					
U6	315093-01					
U7, 8	8520A-1					
U10	HD74LS244P	NTE74LS244	ECG74LS244	SK74LS244	HE-443-791	
U11	DM74LS373N	NTE74LS373	ECG74LS373	SK74LS373	HE-443-867	
U12	HD74LS244P	NTE74LS244	ECG74LS244	SK74LS244	HE-443-791	
U13	DM74LS373N	NTE74LS373	ECG74LS373	SK74LS373	HE-443-867	
U14	LF347	NTE859	ECG859			
U15	SN74LS157N	NTE74LS157	ECG74LS157	SK74LS157	HE-443-799	
U16 THRU U31	LH21256-12					
U33	74F04PC					
U34, 5	74F244PC					
U36	DM74LS38N	NTE74LS38	ECG74LS38	SK74LS38	HE-443-1034	
U37	DM74LS32N	NTE74LS32	ECG74LS32	SK74LS32	HE-443-875	
U38	DS1488N	NTE75188	ECG75188	SK5188/75188	HE-443-794	
	MC1488P	NTE75188	ECG75188	SK5188/75188	HE-443-794	
U39	DS1489N	NTE75189	ECG75189	SK5189/75189	HE-443-795	
U40, 41	MC1489P	NTE75189	ECG75189	SK5189/75189	HE-443-795	
	MM74HC245N					
	MC74HC245N					
U42	UA555TC	NTE955M	ECG955M	SK3564/955M	221-Z9042	

* Lead configuration may vary from original.

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
	KEYBOARD	
C3	22 16V	
C5	10 16V	
C10	1 16V	

Items Not Listed Are Normally Available At Local Distributors.

CAPACITORS

ITEM No.	RATING	MFGR. PART No.
	KEYBOARD	
C12	10 NPO 50V 5%	
C13	10 NPO 50V 5%	
	POWER SUPPLY	
C1	.1 250V AC 20%	
C2	.0047 250V AC 20%	
C3	.0047 250V AC 20%	
C4	.0047 250V AC 20%	
C18	.0047 250V AC 20%	
C26	.1 250V AC 20%	

Items Not Listed Are Normally Available At Local Distributors.

CONTROLS (All wattages 1/2 watt, or less, unless listed)

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
	POWER SUPPLY			
VR1	Shutdown	100		
VR2	5V Adjust	1000		

FUSE DEVICES

ITEM NO.	DESCRIPTION	MFGR. PART NO.		NOTES
		DEVICE	HOLDER	
F1	POWER SUPPLY 2A 250V AC Slow-Blow			

WIRING DATA

Shielded Hook-up Wire	Use BELDEN No. 8401 or 8421 (Single-Conductor) 8208 (Two-Conductor)
General-use Unshielded Hook-up Wire	Use BELDEN No. 8529 (Solid) Available In 13 Colors 8522 (Stranded) Available In 13 Colors
Shielded Hook-up Wire (Disk Drive Heads) ..	Use BELDEN No. 9534 (Four Conductor)

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PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	
	MAIN BOARD			
RP101	Resistor Network	(1)		
RP102	Resistor Network	(1)		
RP103	Resistor Network	(2)		
RP104	Resistor Network	(3)		
RP201	Resistor Network	(4)		
RP202	Resistor Network	(4)		
RP203	Resistor Network	(5)		
RP401	Resistor Network	(1)		
RP402	Resistor Network	(6)		
RP403	Resistor Network	(6)		
RP404	Resistor Network	(4)		
RP405	Resistor Network	(7)		
RP501	Resistor Network	(8)		
	POWER SUPPLY			
R1	24K 5% 5W W			
TH1	12.1 Cold NTC			

(1) 4700 10% x 9

(3) 470 5% x 7

(5) 68 10% x 5

(7) 120 2% x 5

(2) 22 5% x 5

(4) 68 2% x 4

(6) 47 2% x 4

(8) 10K 5% x 8, 4700 5% x 1

MISCELLANEOUS

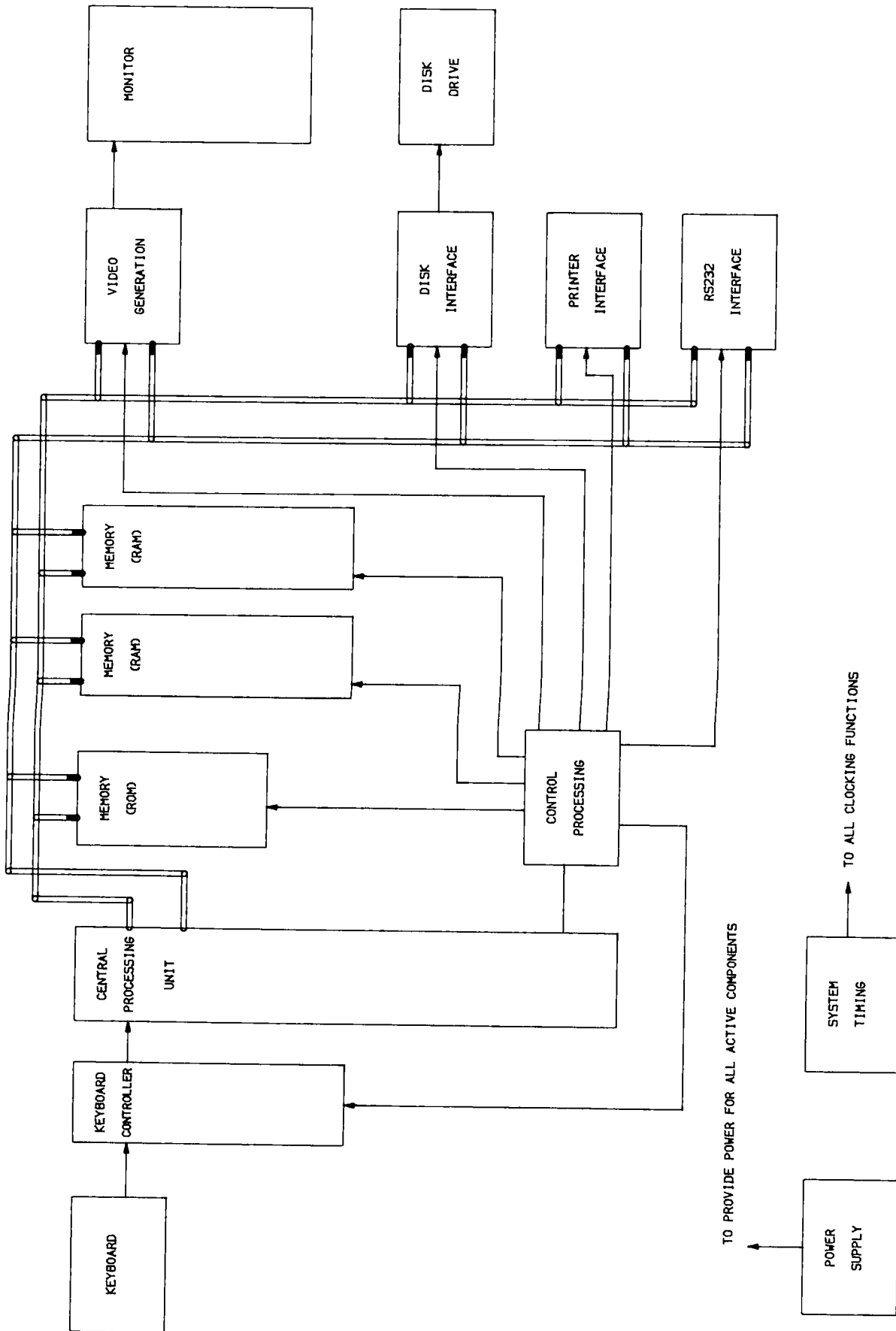
ITEM No.	PART NAME	MFGR. PART No.	NOTES
EMI411 thru 417, 421 thru 427, 402, 431 thru 435, FB101, FB802, EMI302 303, 305, 306, 403 thru 407, 511 thru 524, 531 thru 538, 601, 602, 611 thru 626, 701 thru 704	Ferrite Beads		
LF1 L701	Filters Line Filter RF Choke 3.3uH		100pF
M1	Detector		Trace 00
M2	Motor		Head Position
M3	P.C. Board		Motor Control
M4	Heads		
X1	Crystal Oscillator		28.63636MHz

LINE DEFINITIONS

7MHz CPU Clock
A1 THRU A23 Address Bits 1 Thru 23
ACK Acknowledge, Input Data Received
AS Address Strobe
AUDIN Audio In
AUDOUT Audio Out
BDO THRU BD3 Buffered Data Bits 0 Thru 3
BERR Bus Error
BG Bus Grant
BGACK Bus Grant Acknowledge
BR Bus Request
CAS,CAS(1),CAS(2) Column Address Strobe
CCK Clock
CCKB Clock
CCKQ Clock
CD Carrier Detect
CDAC Quadrature Clock
CHNG Floppy Disk Media Change
CLKRD Real Time Clock Read
CLKWR Real Time Clock Write
CSYNC Composite Sync
CTS Clear To Send
D0 THRU D15 Data Bits 0 Thru 15
DIR Direction, Disk Read Write Head
DKRD Disk Read Data
DKWEB Disk Write Enable
DRO0 THRU DRO5 Data Bits 0 Thru 15
DSR Data Set Ready
DTACK Data Transfer and Acknowledge
E Enable
EXRAM External Ram
FC0,FC1,FC2 Function Code 0, 1, 2
FC0,FC1,FC20 Function Code 0, 1, 2
FIRE0,FIRE1 Joystick Fire Switch 0, 1
HLT Halt
HSYNC Horizontal Sync
INDEX Index Sensor
INT2,INT3,INT6 Interrupts 2, 2, 6
IORESET Input Output Reset
IPL0,IPL1,IPL2 Processor Interrupt Requests 0,1,2
KB CLLOCK Keyboard Clock
KB DATA Keyboard Data
KBRESET Keyboard Reset

LDS Lower Data Strobe
LED Power On LED
LEFT Left Audio
MTR Disk Motor On
MTRON Motor On, Disk Drive
OVL Overlay Memory
OVR Decoding Override
PA2 THRU PA7 Port A Bits 2 Thru 7
PIXLSW(1) Video Pixel Switch
POT0X Potentiometer 0 X Axis Control
POT0Y Potentiometer 0 Y Axis Control
POT1X Potentiometer 1 X Axis Control
POT1Y Potentiometer 1 Y Axis Control
R/W Read Write
RA0 THRU RA8 RAM Address Bits 0 Thru 8
RAS ROW Address Strobe
RAS(1) ROW Address Strobe
RCAS(1) Column Address Strobe
RCAS(2) Column Address Strobe
RDY Ready
RESET Reset
ROMEN ROM Enable
RRAS ROW Address Strobe
RST Processor Reset
RWE1 Write Enable
RXD Received Data, Acknowledge
SEL Select
SEL0 THRU SEL3 Disk Drive Select 0 Thru 3
SIDE Disk Side
STEP Stepper Motor
STROBE Strobe Pulse For Read In Data
TRK0 Track 00 Sensor
TXD Transmitted Data
UDS Upper Data Strobe
VMA Valid Memory Address
VPA Valid Peripheral Address
VSYNC Vertical Sync
WE Write Enable
WPROT Write Protect Sensor
XCLK External Clock
XCLKEN External Clock Enable
XRDY External Ready

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BLOCK DIAGRAM

TEST EQUIPMENT

Test Equipment listed by Manufacturer illustrates typical or equivalent equipment used by SAMS' Engineers to obtain measurements and is compatible with most types used by field service technicians.

TEST EQUIPMENT (COMPUTERFACTS)

Equipment	B & K Precision Equipment No.	Sencore Equipment No.	Notes
OSCILLOSCOPE	1570A,1590A,1596	SC61	
LOGIC PROBE	DP51,DP21		
LOGIC PULSER	DP101,DP31		
DIGITAL VOM	2830,2806	DVM37,DVM56,SC61	
ANALOG VOM	277,111,116		
ISOLATION TRANSFORMER	TR110,1604,1653,1655	PR57	
FREQUENCY COUNTER	1803,1805	FC71,SC61	
COLOR BAR GENERATOR	1211A,1251,1260,1249	CG25,VA62	
RGB GENERATOR	1260,1249		
FUNCTION GENERATOR	3020,3011,3030		
HI-VOLTAGE PROBE VOM/DMM Accessory probes	HV-44 PR-28(HV)	HP200	
TEMPERATURE PROBE	TP-28,TP-30		
CRT ANALYZER	467,470	CR70	
DIGITAL IC TESTER	560,550,552		
CAPACITANCE ANALYZER		LC53,LC75,LC76 LC77	
INDUCTANCE ANALYZER		LC53,LC75,LC76 LC77	

TROUBLESHOOTING

POWER SUPPLY

NOTE: Disconnect the Power Supply from System Board to avoid possible damage to the System from high voltages that may occur while servicing Power Supply. Do not operate the Power Supply without a load. One #1129 lamp may be used as a load for the 5.0V Source. Connect a Jumper from pin 2 to pin 4 of the power supply plug (CN8). Use an Isolation Transformer that has a voltage stepdown control when servicing Power Supply.

Power supply is dead. Check Fuses (F1 and F2). If F1 is open, check for possible shorts at Bridge Rectifier (BD1) and Power Amp Transistor (Q1). If F2 is open, check for possible shorts at Diode D10. If fuses are good, apply AC power and check for 120 VAC at the AC Inputs of Rectifier BD1. If 120 VAC is missing, check Switch (SW1) and Coil (L1). If 120 VAC is present, check for 156V at the positive output of Rectifier BD1. If 156V is missing, check Rectifier BD1. If 156V is present, check waveforms, voltages and components associated with Transistors Q1 thru Q2 and check windings in Transformer T1 for continuity.

Shutdown Transistor (Q3A) and Overvoltage Shutdown SCR IC1 will shutdown the power supply if an overload or overvoltage condition exists. If power supply is in shutdown, check adjustment of the Shutdown Level Control (VR1). If Control has no affect, shutdown can be defeated by removing Transistor Q3A and SCR (IC1).

WARNING: Defeating the shutdown circuits may

cause further damage to the power supply if 120VAC is used. Use an Isolation Transformer that has voltage stepdown and current limiting controls and start with a low AC voltage and current when defeating the shutdown.

The Source voltages are not correct. Check adjustment of the 5V Adjust Control. If the Control has no affect, check voltages and components associated with Regulator IC (IC2) and Error Amp Optoisolator (PC1).

-12V Source is missing. Check for -18.3V at pin 2 of Voltage Regulator IC IC2A. If voltage is missing, check the winding from pin 7 to pin 11 of Transformer (T1) for continuity and check Diode (D12), Capacitor (C23) and Resistor (R14). If the voltage is present, check IC2A and Capacitor (C24).

12V Source is missing. Check for 19.8V at pin 1 of Voltage Regulator (IC3). If the voltage is missing, check the winding from pin 8 to pin 12 of Transformer (T1) for continuity and check Diode (D9), Capacitors (C11 and C26A) and Resistor (R18). If voltage is present, check IC3 and Capacitor (C19).

5.0V Source is missing. Check Fuse (F2). If fuse is open, check for possible shorts to ground at Diode (D10). If fuse is good, check the 5V winding on Transformer (T1) for continuity and check Diode (D10), Coil (L1) and Capacitors C13 and C15.

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TROUBLESHOOTING (Continued)

RESET CIRCUIT

Disconnect Keyboard Connector (CN1) from system board before performing the following checks. Check the operation of the CPU reset circuit by checking the logic reading at pin 18 of IC U1 while turning Computer On. The reading should be logic low for about .5 seconds after turning the Computer On, then go logic high and stay high. If reading is not correct, check logic reading at the collector of Reset Transistor (Q711) while turning the Computer On. The reading should be logic low for about .5 second, then go high and stay high. If reading is not correct, check voltages and components associated with Reset Timer IC (U42) and Transistor Q711. If logic reading is correct, check Controller IC (U5). If the CPU reset circuit checks good, check the operation of the IO reset circuit by checking the logic reading at pin 8 of IC U37 while turning Computer On. The reading should be logic low for about .5 seconds, then go high and stay high. If reading is not correct, check IC U37. If Computer does not reset when the Ctrl and Left and Right Amiga (A) keys are pressed, refer to the "Keyboard" section of this troubleshooting guide.

OSCILLATOR AND DIVIDERS

Verify that the OSC module X1 is working by checking for a 28.636 MHz signal at pin 34 of Animation IC (U2). If signal is missing or frequency is not correct, check the OSC Module X1 and IC U2. If signal is present, check for 7.159 MHz at pins 37 and 38 and 3.5795 MHz at pins 39 and 40 of IC U2. If any of the signals are missing or frequency not correct, check IC U2. If the signals are present, check for pulses at pins 4, 6 and 10 of IC U33. If pulses are missing, check IC U33.

KEYBOARD

Keyboard does not function. Disconnect Keyboard Connector (CN13) from system board. Connect a separate 5 volt power supply to keyboard (connect the 5V to pin 4 and the ground to pin 6 of connector CN13). Check for pulses at pins 37 and 39 of Keyboard Controller IC (U1). If pulses are present, go to the "Keyboard Interface does not function" section of this troubleshooting. If pulses are missing, check for a 3.0 MHz waveform at pin 11 of IC U1. If waveform is missing or the frequency not correct, check Crystal (Y1), Capacitors (C12 and C13 and IC U1). If waveform is present, check logic reading at pin 3 of Reset Timer IC (U3) while pressing the Ctrl and left and right Amiga (A) keys at the same time. The logic reading should be logic high while the keys are held down and go to logic low when the keys are released. If reading is not correct, check IC U2, Reset Switch Transistor (Q1) and check voltages and components associated with IC U3. If reading is correct, check logic readings at pins 8 and 12 of IC U2 while pressing the Ctrl and left and right Amiga keys at the same time. The readings should be logic low while the keys are held down and go to logic high when the keys are released. If reading is not correct at pin 8, check IC U2. If reading is not correct at pin

12 and pin 13 of IC U2 reads logic low, check IC U2. If pin 13 of IC U2 is not logic low, check voltages and components associated with IC U4 and check IC U1. If some keys do not work check connector CN1 on the keyboard for good connections and check the key contacts. Keyboard interface does not function. Check for pulses at pin 7 of Interface IC (U7). If pulses are missing, check IC U37. If pulses are present, check the Keyboard Connector (CN13) for good connections and check IC U7.

COMPOSITE VIDEO

No video on a Monitor connected to the Composite Video Jack (CN10). An RGB Analog Monitor connected to connector CN9 works. Check Video Module (HY1) and Resistor (R409).

RGB ANALOG VIDEO

No video or colors are not correct on an RGB Analog Monitor connected to the RGB Video Connector (CN9). Check for pulses at pins 2 thru 9 of Transceiver IC (U40) and pins 2 thru 5 and 7 of Transceiver IC (U41). If pulses are missing at any pin, check Graphics IC (U4). If pulses are present, check for pulses at pins 11 thru 18 of IC U40. If pulses are missing, check IC U40. If pulses are present, check for pulses at pin 13 and 15 thru 18 of IC U41. If pulses are missing, check IC U41. If pulses are present, use a scope to check for pulses of about 1.7V peak to peak at pins 7, 12 and 17 of Video Module (HY1). If pulses are missing, check Module HY1. If pulses are present, check pins 3, 4, 5 and 14 of connector CN9 for good connections.

RGB DIGITAL VIDEO

No video or colors are not correct on an RGB Digital Monitor connected to connector CN9. Check for pulses at pins 2 and 6 of Transceiver IC (U40) and pin 2 of Transceiver IC (U41). If pulses are missing at any pin, check Graphics IC (U4). If pulses are present, check for pulses at pins 14 and 18 of IC U40. If pulses are missing at either pin, check IC U40. If pulses are present, check for pulses at pin 18 of IC U41. If pulses are missing, check IC U41. If pulses are present, check pins 6, 7 and 8 of connector CN9 for good connections.

VIDEO SYNC

Horizontal or vertical sync is missing on a Monitor connected to the Composite Video Jack (CN10). Check for pulses at pin 8 of Transceiver IC (U41). If pulses are missing, check Animation IC (U2). If pulses are present, check for pulses at pin 11 of IC U41. If pulses are missing, check IC U41. If pulses are present, check Module (HY1) and Resistor (R409). Horizontal or vertical sync is missing on a Monitor connected to the RGB Video connector CN9. Check for horizontal pulses at pin 81 and vertical pulses at pin 79 of Animation IC (U2). If pulses are missing at either pin, check IC U2. If pulses are present, check pins 11 and 12 of connector CN9 for good connections.

TROUBLESHOOTING (Continued)

SOUND

No sound from Right (CN3) or Left (CN4) audio jacks. Type in and run the following Basic program:

```
10 POKE 12575233,3
20 POKE 12574721,2
30 POKE 12574721,0
40 SOUND 1000,10,255,0
50 SOUND 1000,10,255,1
60 GOTO 20
```

The program produces a .8 volt peak to peak 1000 Hz audio signal at the Right and Left Audio jacks. If there is no audio, check for a 3V peak to peak waveform at pins 30 and 31 of the Sound/Peripherals IC (U3). NOTE: The Intensity control on the scope must be at maximum to see the waveforms. If waveforms are missing, check IC U3. If waveforms are present, check for a 3V peak to peak waveform at pins 1 and 7 of IC U14. If waveforms are missing, check voltages and components associated with pins 1 thru 14 of IC U14 and Switch Transistors (Q321 and Q331). An audio filter (Resistors R332, R333 and Capacitor C332) is used to filter the waveforms to make them smoother. A signal from Interface IC (U7) is used to switch the audio filter in and out of the circuit (thru IC U38 and Transistors Q301, Q321 and Q331). The filter should be on while the above program is running. If waveforms at the Right and Left Audio jacks have a ragged look check for pulses at pin 3 of IC U7 while the above program is running. If pulses are missing, check IC U7. If pulses are present, check for pulses at pin 3 of IC U38. If pulses are missing, check IC U38. If pulses are present, check voltages and components associated with Switch Transistors (Q301, Q321 and Q331). Note: The voltages shown on the schematic were taken with the audio filter on.

SERIAL PORT

Serial port does not work. Make a loopback connector. Use a 25 pin female subminiature "D" (DB25) connector and connect pin 3 to pins 4 and 5, and pin 6 to pins 8, 20 and 22. Plug loopback connector into the serial connector (CN6). Type in and run the following Basic program:

```
10 CLS
20 POKE 12571136,192
30 POKE 12570624,192
40 PRINT PEEK(12570624) AND 60
50 POKE 12570624,192
60 PRINT PEEK(12570624) AND 60
70 LOCATE 1,1:GOTO 30
```

The program writes to and reads from Interface IC (U8) and displays the following numbers on the Monitor screen:

```
U8A= 60
U8B= 0
```

If the numbers are not correct, check for pulses at pins 8, 9 and 23 of IC U8 while the program is running. If pulses are missing at pin 23, check IC U37. If pulses are present

at pin 23 and missing at pins 8 or 9, check IC U8. If pulses are present at IC U8, check for pulses at pins 6 and 11 of IC U38. If pulses are missing, check IC U38. If pulses are present, check for pulses at pins 3, 6, 8 and 11 of IC U39. If pulses are missing at any of the pins, check Filters (EM1534 thru EM1537) and IC U39. If pulses are present, check IC U8. If no problem is found after performing the above checks, type in and run the following Basic program:

```
10 OPEN "COM1:300,N,7,1" FOR OUTPUT AS #1
20 FOR X = 1 TO 100
30 PRINT# 1,"SAMS"
40 NEXT X
50 CLOSE #1
60 GOTO 10
```

While the program is running, check for pulses at pins 8 and 9 of IC U38. If pulses are missing at pin 9, check the Sound/Peripherals IC (U3). If pulses are present at pin 9 and missing at pin 8, check IC U38. If pulses are present at pins 8 and 9, check IC U3.

PARALLEL PORT

Parallel port does not work. Make a loopback connector. Use a 25 pin male subminiature "D" (DB25) connector and connect pins 9 thru 13 together. Plug loopback connector into parallel connector CN7. Type in and run the following Basic program:

```
10 CLS
20 POKE 12575489,255
30 POKE 12571136,192
40 POKE 12574977,255
50 PRINT "U7A=";PEEK(12578849) AND 16
60 PRINT "U8A=";PEEK(12570624) AND 7
70 POKE 12574977,0
80 PRINT "U7B=";PEEK(12578849) AND 16
90 PRINT "U8B=";PEEK(12570624) AND 7
100 LOCATE 1,1:GOTO 40
```

The program writes to and reads from Interface IC's (U7 and U8) and displays the following numbers on the Monitor screen:

```
U7A= 0
U8A= 7
U7B= 16
U8B= 0
```

While the program is running, check for pulses at pins 10 thru 17 and 23 of IC U7. If pulses are missing at pin 23, check IC U37. If pulses are present at pin 23 and missing at pins 10 thru 17, check IC U7. If pulses are present at IC U7 and numbers U7A and U7B on the monitor screen are not correct, check IC U7. If IC U7 is good and numbers U8A and U8B are not correct, check for pulses at pin 23 of IC U8. If pulses are missing, check IC U8. If pulses are present, check IC U8.

JOYSTICK

Joystick B (in mouse port 2) does not work. Type in and run the following program:

```
10 CLS
20 LOCATE 1,1
```

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TROUBLESHOOTING (Continued)

```
30 PRINT "X=";STICK(2)
40 PRINT "Y=";STICK(3)
50 PRINT "BP=";STRIG(2)
60 PRINT "BD=";STRIG(3)
70 GOTO 20
```

The program reads the joystick B port and displays four numbers on the Monitor screen. All four numbers should be 0 when the joystick is not being operated. Number X should be -1 when the joystick is moved to the left and 1 when it is moved to the right. Number Y should be -1 when the joystick is moved to the up position and 1 when moved to the down position. Number BP should momentarily change to -1 when the joystick button is pressed. Number BD should be -1 whenever the button is down. If the X or Y numbers are not correct, check for a logic low at pin 10 of IC U15 when the joystick is moved to the left, low at pin 11 when moved to the up position, low at pin 13 when moved to the right and low at pin 14 when moved to the down position. If any of the readings are not correct, check connector CN2 for good connections and check the Joystick. If readings are correct, check for pulses at pin 1 of IC U15. If pulses are missing, check Animation IC (U2). If pulses are present, check for pulses at pin 9 of IC U15 when the joystick is operated in the left or up positions and at pin 12 when operated in the right and down positions. If readings are not correct, check IC U15. If the readings are correct, check Graphics IC (U4). If BP or BD numbers are not correct, check for a logic low at pin 9 of Interface IC U9 while pressing the joystick button. If reading is not correct, check pin 6 of connector CN2 for good connections and check the joystick button switch. If reading is correct, check IC U7. If a joystick in port A does not work, refer to the "Mouse" section of this Troubleshooting guide.

MOUSE PORT

Mouse Port (CN1) does not work. Type in and run the following Basic program:

```
10 CLS
20 LOCATE 1,1
30 FOR X = 0 TO 6
40 PRINT X+1,MOUSE(X)
50 NEXT X:GOTO 20
```

The program reads the mouse movement and the left button and displays seven numbers on the Monitor screen. The first number indicates the number of times (up to three) the left button is pressed within 2 seconds. The number should be -1 for one press, -2 for 2 presses, or -3 for 3 presses. Numbers 2 and 3 should change whenever the mouse is moved. Number 4 and 5 should change when the left button is pressed after the mouse is moved to a new position. Numbers 6 and 7 should change continuously when the left button is held down and the mouse moved. If numbers 2 and 3 do not change when the mouse is moved, check for pulses at pins 2, 3, 5 and 6 of Multiplexer IC (U15) while moving the mouse. If pulses are missing at any pin, check connector CN1 for good connections and check the mouse. If pulses are present, check for pulses at pin 1 of IC U15. If pulses are missing, check Animation IC (U2). If pulses are present, check for pulses at pins 4 and 7 of IC U15 while moving the mouse. If pulses are missing, check IC U15. If pulses are present, check Graphics IC (U4).

Left mouse button does not work. Check for a logic low at pin 8 of Interface IC (U7) while holding the left button down. If the reading is not correct, check pin 6 of connector CN1 for good connections and check the mouse. If the reading is correct, check IC U7.

Right mouse button does not work. Check for a logic low at pin 33 of Sound/Peripherals IC (U3) while holding the right button down. If reading is not correct, check pin 9 of connector CN1 for good connections and check the mouse. If reading is correct, check IC U3.

TROUBLESHOOTING (Continued)

DISK DRIVE INTERFACE TROUBLESHOOTING

If Disk Drive Interface is defective, it may not be possible to load programs on the Workbench diskette and Basic diskette so the Computer can be used to help troubleshoot the Drive. If programs won't load, disconnect Disk Drive signal cable and power connectors (with the Computer Off) and make the following checks immediately after resetting (by pressing Ctrl and left and right Amiga keys) Computer.

Disk Drive motor does not turn on. Check logic readings at pins 13 and 17 of IC U8 immediately after resetting Computer. Pin 13 should be logic high for about 3 seconds, pulse for about 3 seconds, go high for about 5 seconds then continuously pulse about two times a second. Pin 17 should be logic high for about 2 seconds, pulse for about 4 seconds, then go high and stay high. If readings are not correct, check IC U8. If readings are correct, check logic readings on pins 5 and 6 of IC U36 immediately after resetting Computer. Pin 5 should be logic low for about 3 seconds, go high for about 5 seconds, then go low and stay low. Pin 6 should be logic high for about 3 seconds, go low for about 5 seconds, then go high and stay high. If reading is not correct at pin 5, check IC U5. If reading is correct at pin 5 and not correct at pin 6, check IC U36.

Disk Drive motor turns On but Head Position Motor does not operate. Check logic readings

at pins 10 and 11 of IC U8 immediately after resetting Computer. Pin 10 and 11 should be logic high for about 3 seconds, pulse 3 times in 3 seconds, then go high and stay high. If readings are not correct, check IC U8.

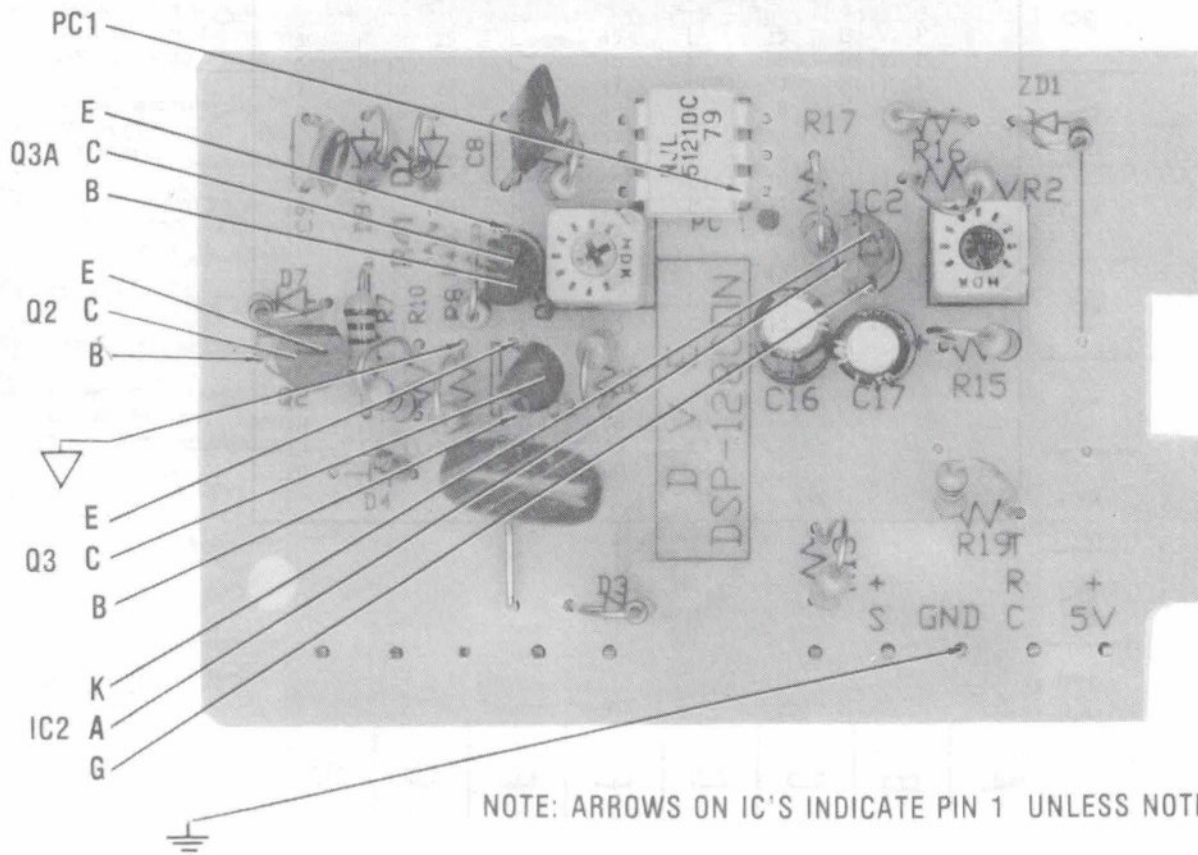
Disk Drive motor and Head Position motor works, disk read function is not working. Check Interface IC U8 and Sound/Peripherals IC (U3).

Programs will load from diskettes but Computer will not write to a diskette. Connect Disk Drive to Computer and load in Basic. Type in and run the following Basic program to check operation of the Write Protect circuit:

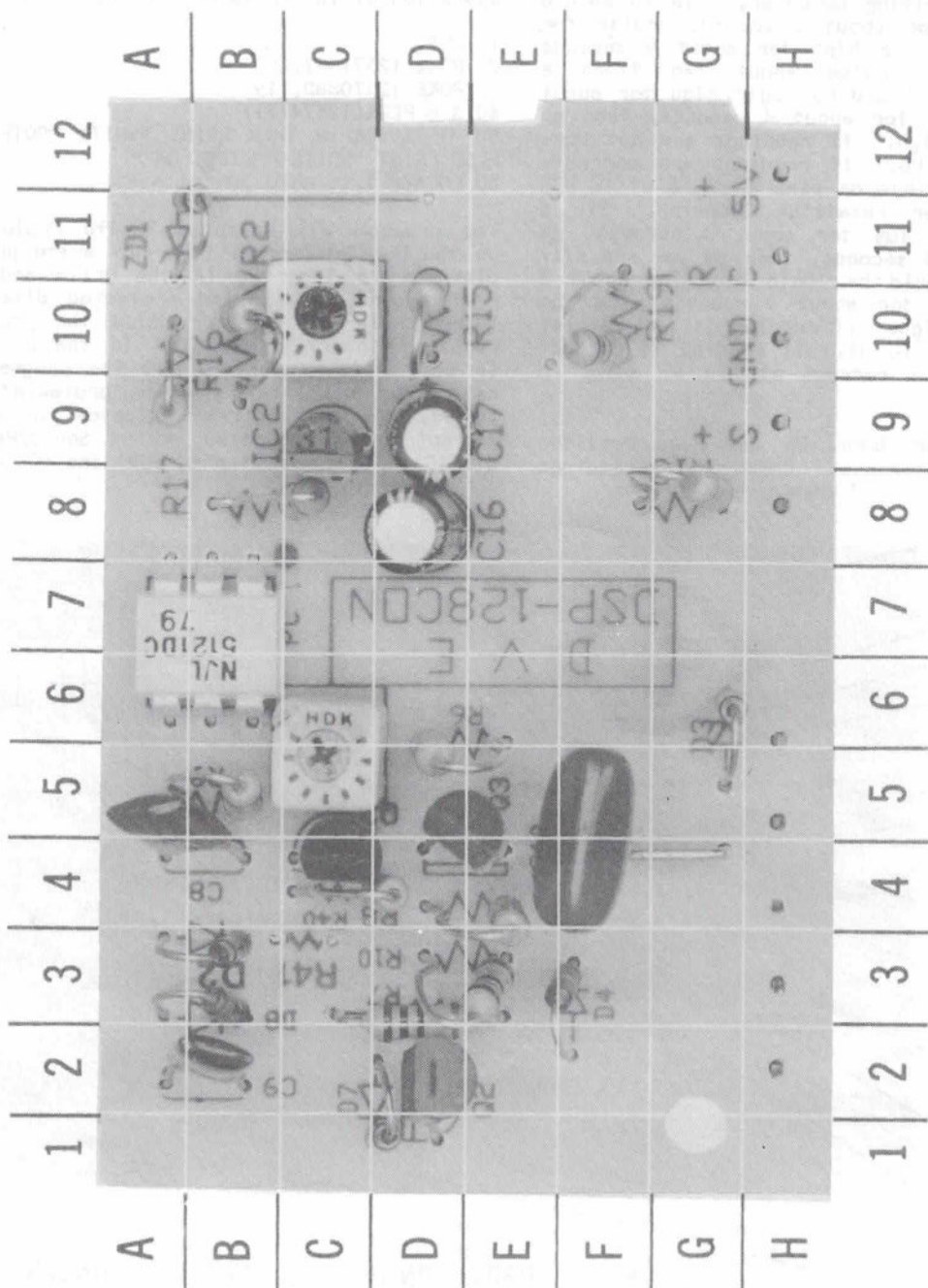
```
10 CLS
20 POKE 12571392,255
30 POKE 12570880,119
40 X = PEEK(12574721)
50 IF X AND 8 THEN PRINT "WRITE PROTECT OFF"
ELSE PRINT "WRITE PROTECT ON "
60 LOCATE 1,1: GOTO 30
```

The program will display "Write Protect Off" on the Monitor screen if a not write protected diskette is inserted in the Drive and "Write Protect On" if a write protected diskette is inserted in the Drive. While the program is running, insert a diskette in the Drive that is not write protected. If the program indicates the diskette is write protected, check IC U7. If the program indicates the diskette is not write protected, check Sound/Peripherals IC (U3), Controller IC (U5) and IC (U36).

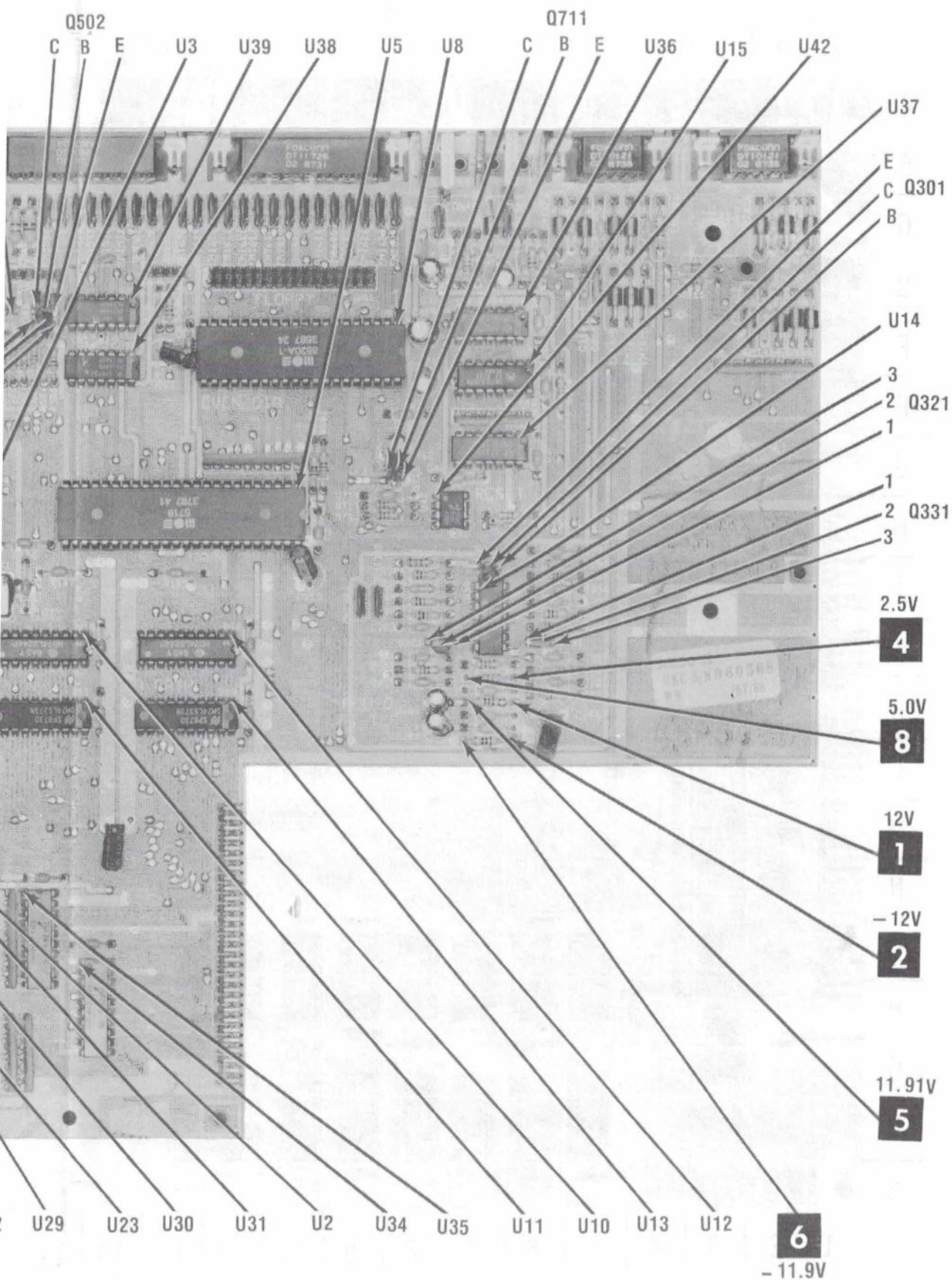
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AMIGA 500



GridTrace LOCATION GUIDE



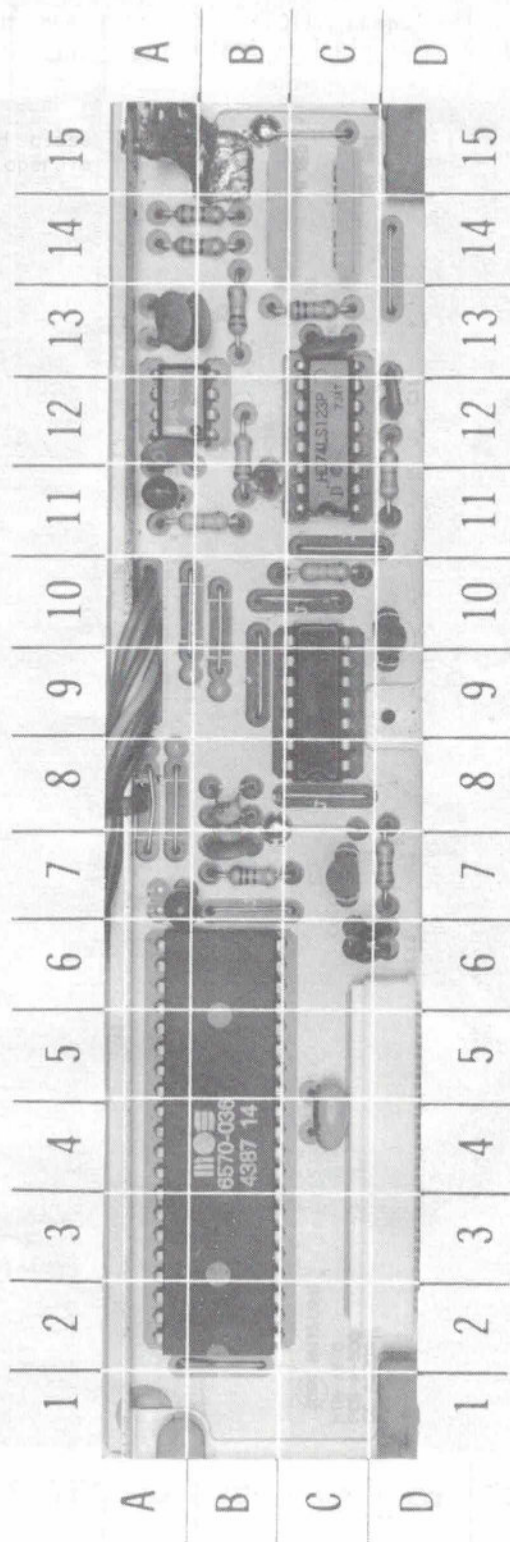
C8
 C9
 C10
 C15
 C16
 C17
 D2
 D3
 D4
 D7
 D8
 F2
 IC2
 PC1
 Q2
 Q3
 Q3A
 R6
 R7
 R8
 R9
 R10
 R11
 R13
 R14A
 R15
 R16
 R17
 R19
 R40
 VR1
 VR2
 A-5
 B-2
 F-4
 H-13
 D-8
 D-9
 D-3
 B-3
 G-6
 F-3
 D-1
 B-3
 C-14
 C-9
 B-7
 D-2
 D-5
 C-4
 D-5
 D-3
 E-4
 B-5
 E-3
 A-9
 G-8
 I-10
 D-10
 B-10
 C-8
 F-10
 D-4
 C-5
 C-10



GridTrace LOCATION GUIDE

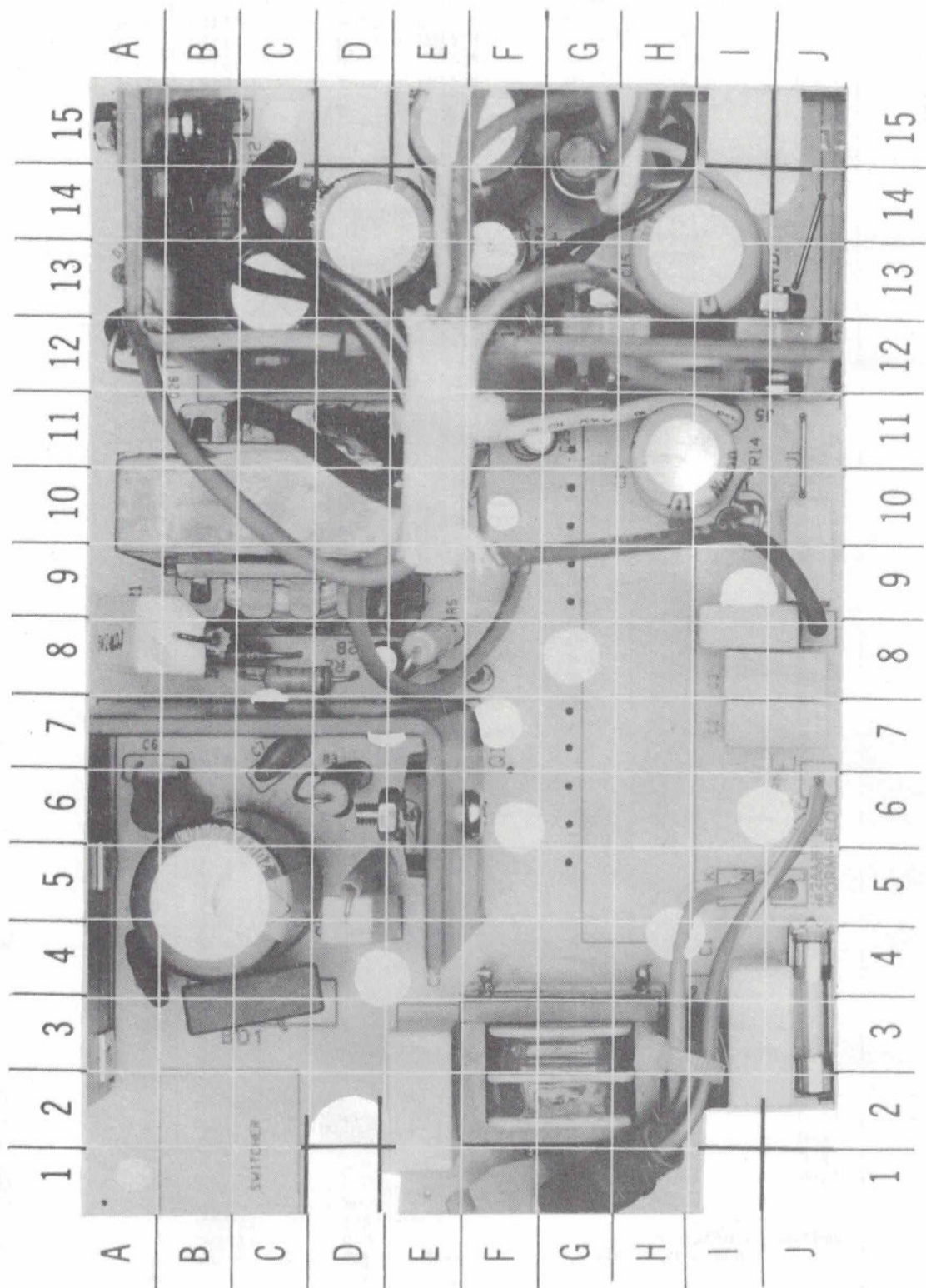
B-7
 B-8
 A-7
 A-11
 A-12
 C-13
 C-7
 C-8
 C-9
 C-10
 C-11
 C-12
 C-13
 C-6
 D-4
 B-14
 C-14
 D-10
 C-7
 C-10
 B-11
 B-13
 D-7
 B-14
 B-14
 B-12
 C-13
 D-11
 B-7
 B-4
 C-9
 A-12
 C-11
 C-4

C1
 C2
 C3
 C5
 C6
 C7
 C8
 C9
 C10
 C11
 C12
 C13
 CN1
 D2
 D3
 Q1
 Q2
 R1
 R2
 R3
 R4
 R5
 R6
 R7
 R8
 R9
 R10
 U1
 U2
 U3
 U4
 Y1

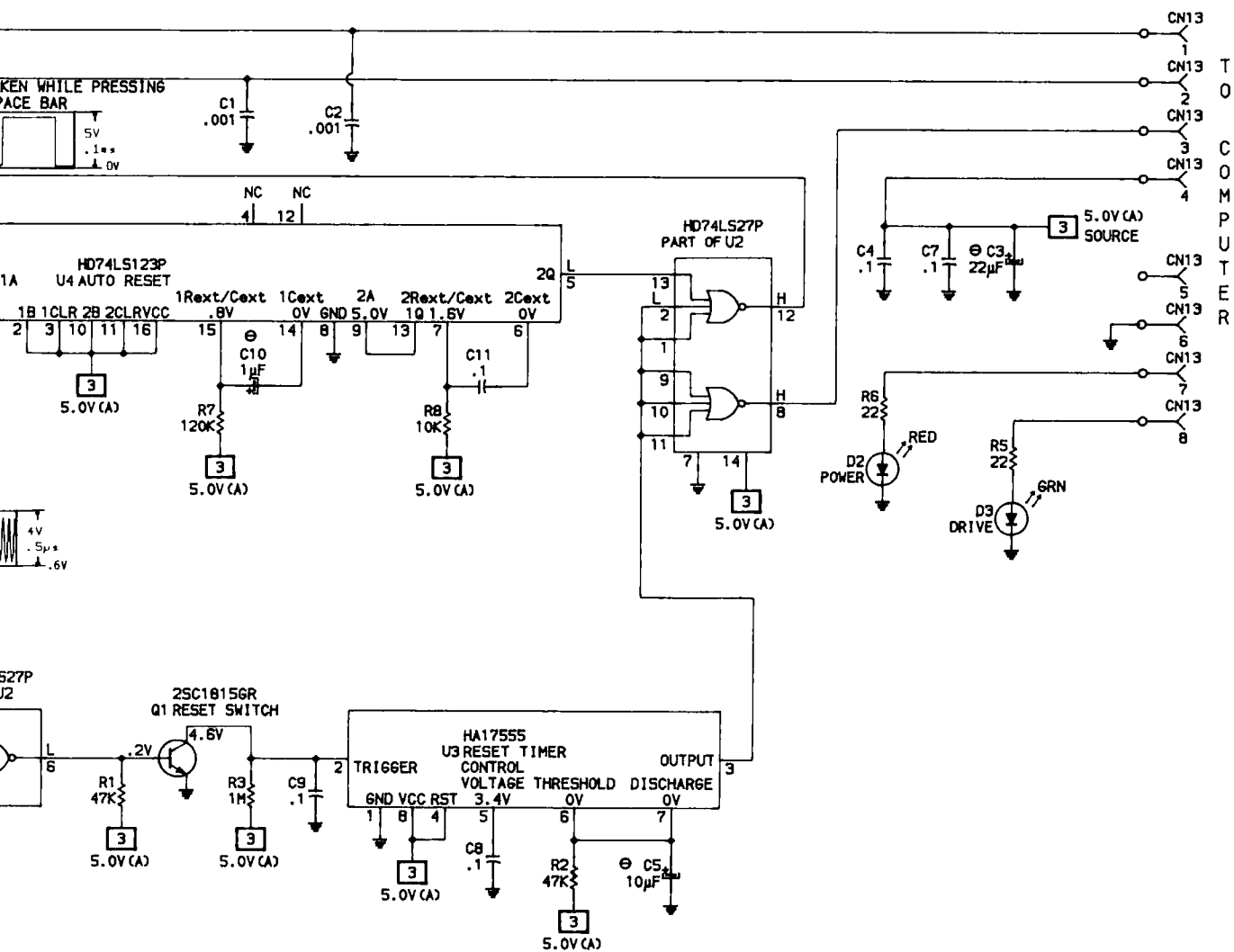


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GridTrace LOCATION GUIDE



BD1	C-3
C1	I-3
C2	J-7
C3	J-8
C4	I-8
C5	B-5
C6	A-6
C7	C-7
C11	C-13
C12	B-15
C13	D-14
C14	E-15
C18	J-9
C19	F-13
C23	H-11
C24	G-13
C25	F-11
C26	E-2
C26A	B-12
C28	D-8
D1	C-8
D5	E-6
D6	F-8
D9	A-12
D10	A-15
D12	A-13
F1	J-3
IC1	J-12
IC2	G-12
IC3	E-12
L1	G-15
L2	G-2
MOV	I-3
Q1	E-6
R1	B-8
R2	C-8
R3	D-6
R4	D-5
R5	E-8
R12	C-14
R14A	I-10
R14	F-13
R18	D-12
T1	C-10
TH1	A-4



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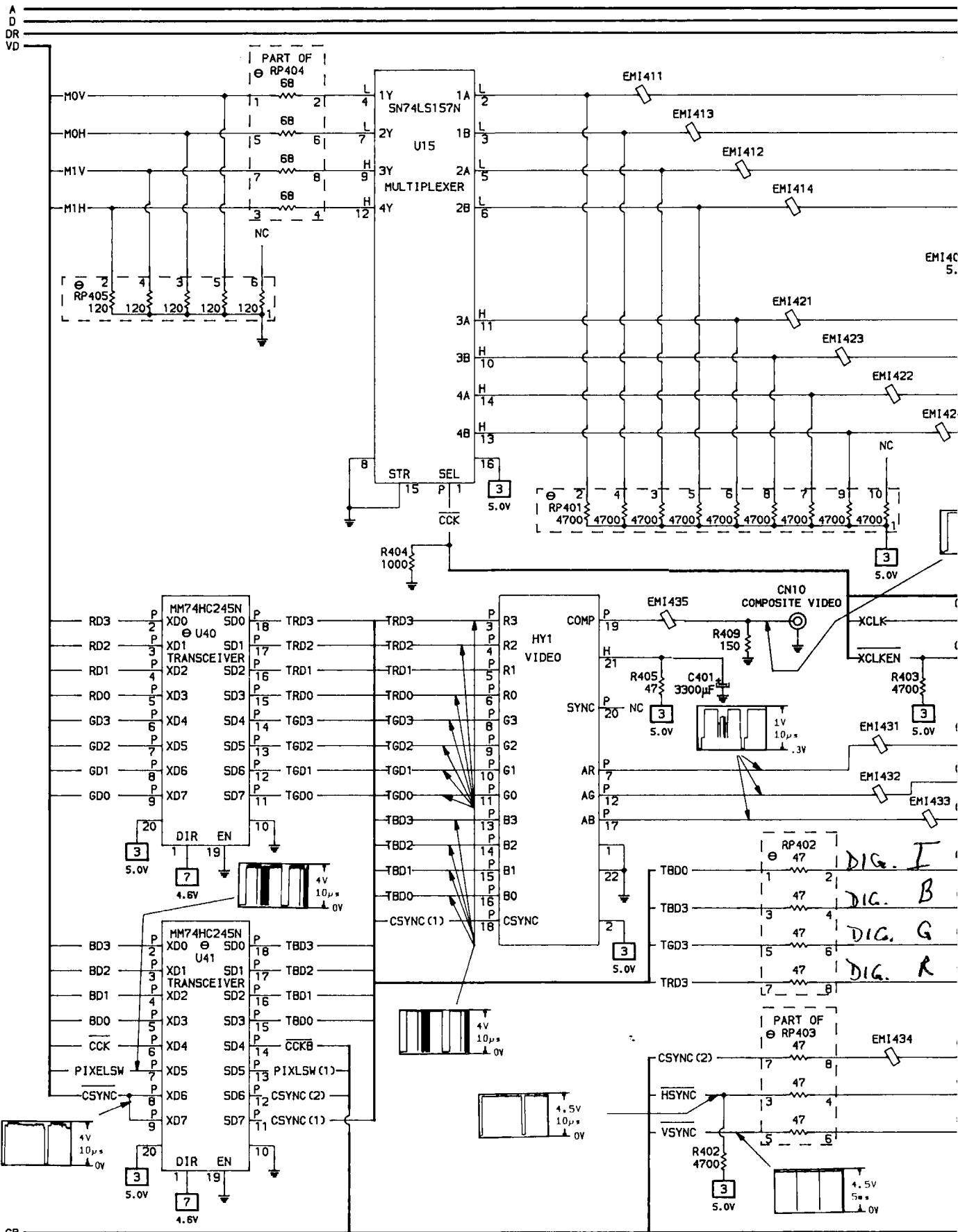
PHOTO CIRCUITRACE = 11
SCHEMATIC CIRCUITRACE = 11

RD NOTATION SCHEMATIC

CIRCUITRACE

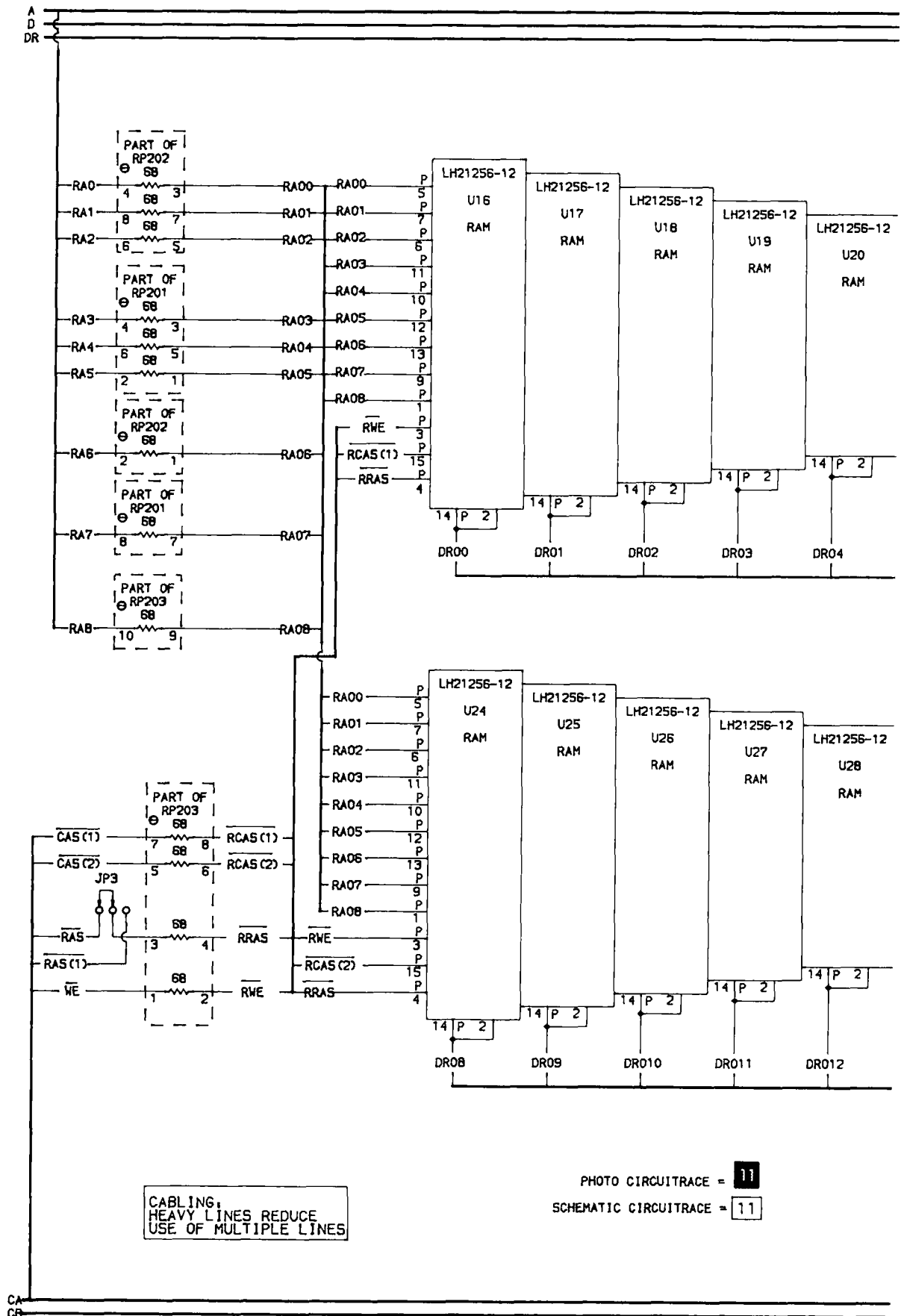
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KEYBOARD



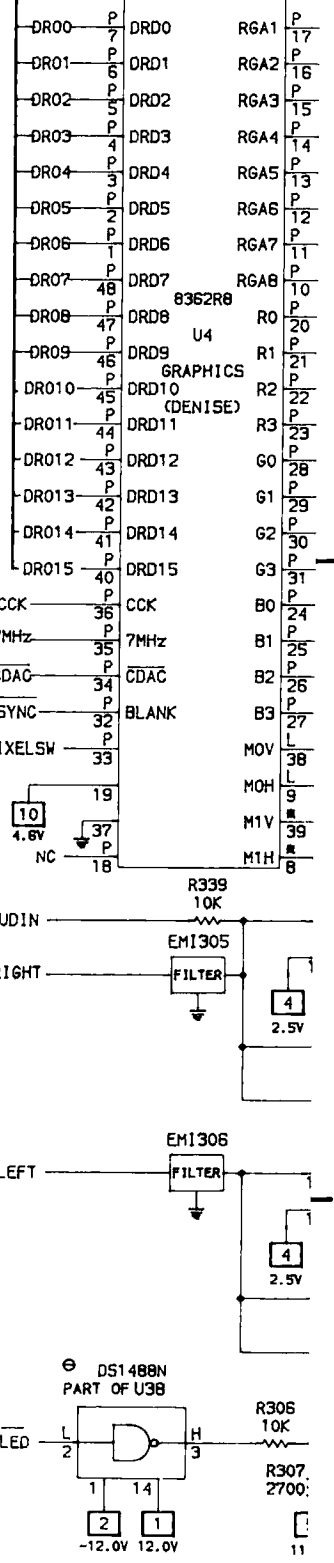
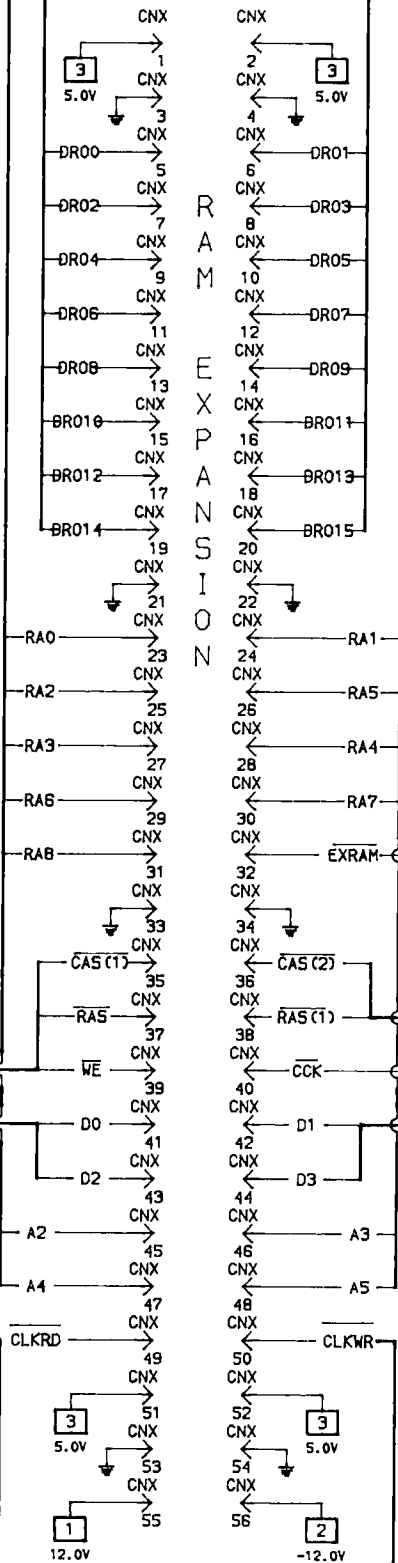
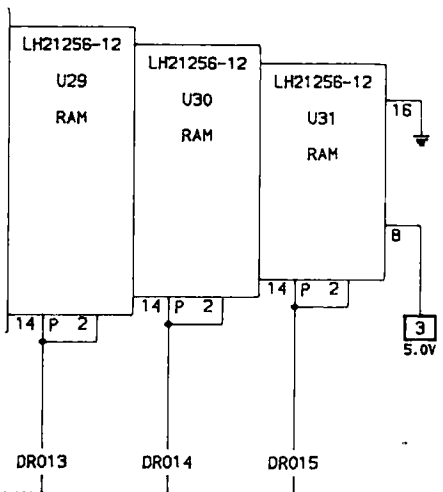
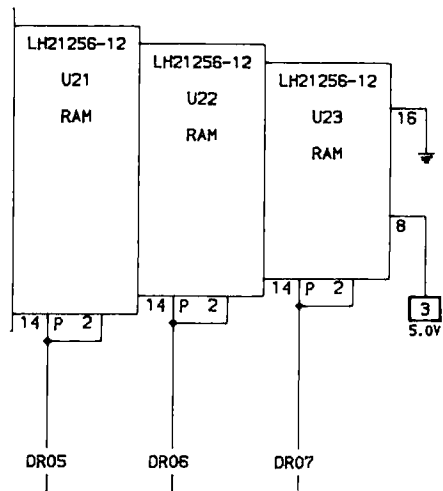
A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH **CIRCUITACE**

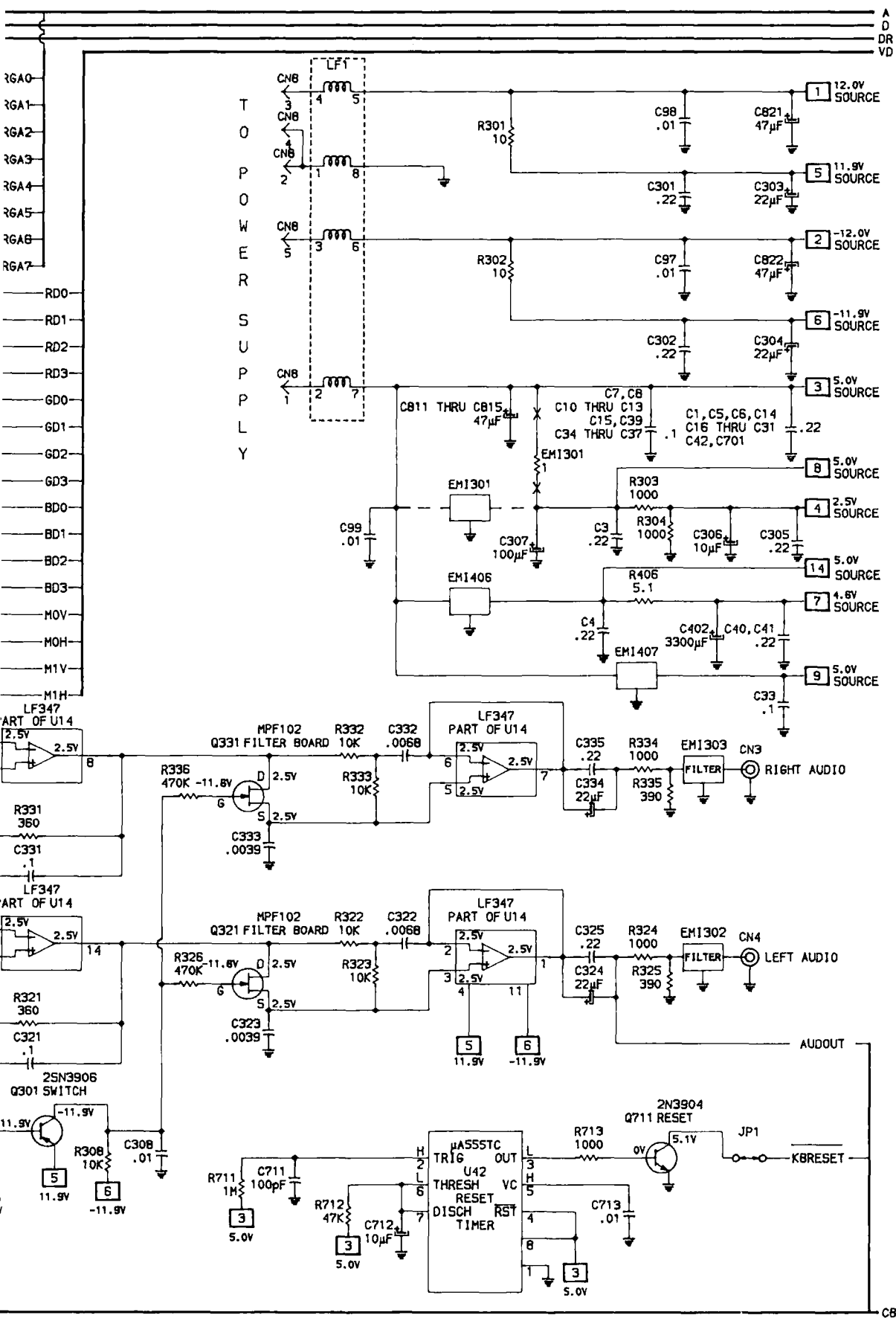
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A PHOTOFAC STANDARD NOTATION SCHEMATIC
WITH **Circuitrace**

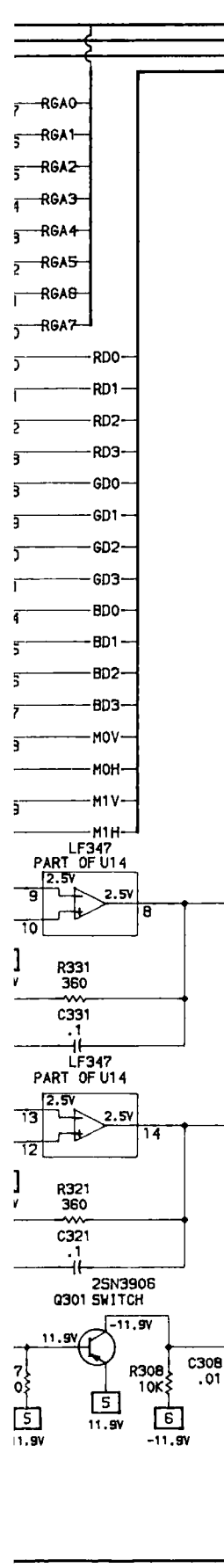
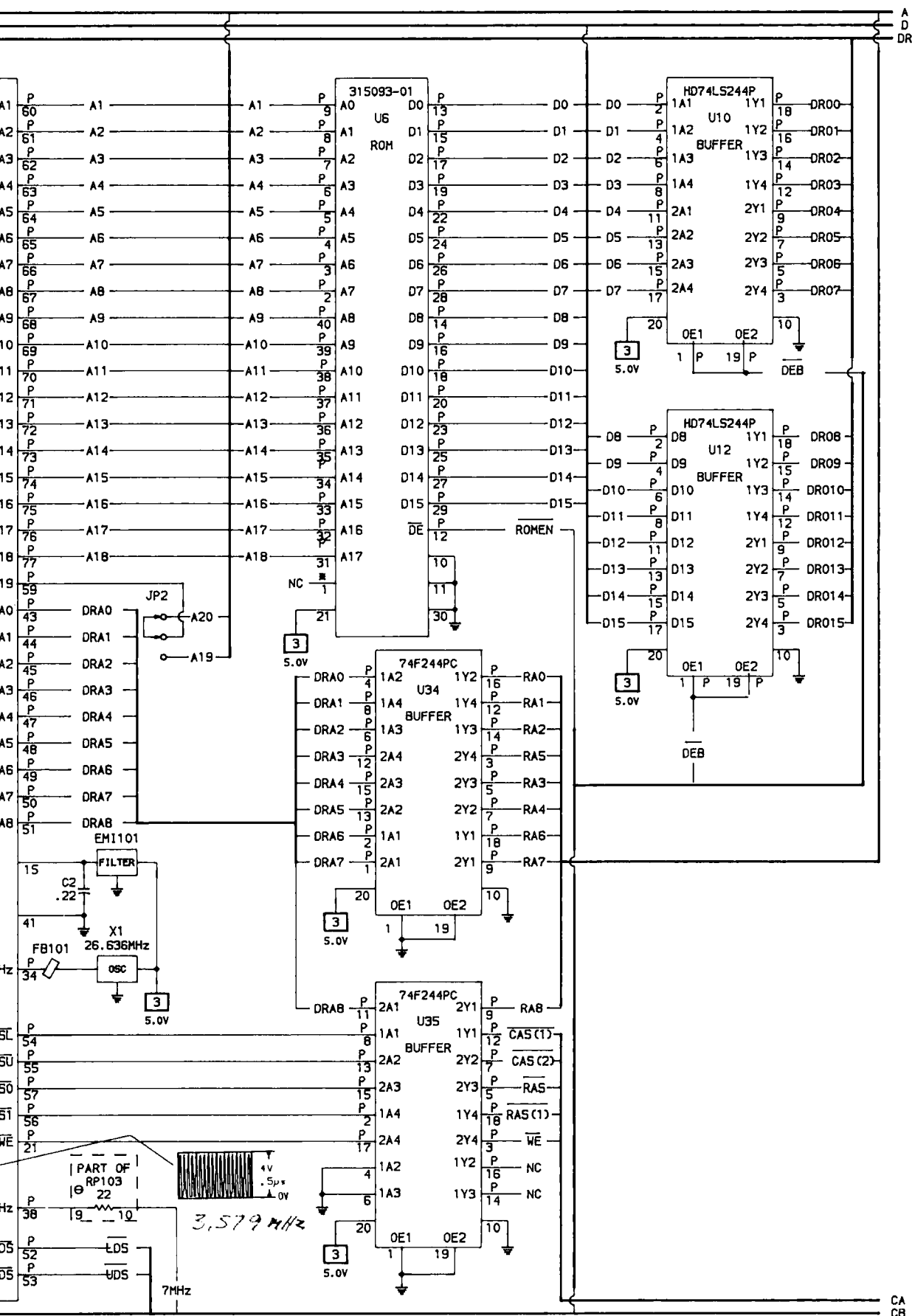
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SYSTEM BOARD

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SYSTEM BOARD

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PRELIMINARY SERVICE CHECKS

PRELIMINARY SERVICE CHECKS

This data provides the user with a time-saving service tool which is designed for quick isolation and repair of Computer System malfunctions.

Check all interconnecting cables for good connection and correct hook-up before making service checks.

Always turn the computer Off before connecting or disconnecting connectors, boards, or peripherals.

Disconnect all external peripherals from the Computer system to eliminate possible external malfunctions.

Replacement or repair of the Power Supply, System Board, Keyboard, Disk Drive or connectors may be necessary after the malfunction has been isolated.

TEST EQUIPMENT AND TOOLS

TEST EQUIPMENT

Digital Volt/Ohm Meter
Logic Probe
Monitor with audio input
Disk Drive Tester or Test Program

TOOLS

Head Cleaning Equipment
Contact and Switch Cleaner (non spray type)
Phillips Screwdriver
Flat Blade Screwdriver
IC Insertion and Removal Tools 40 pin, 48, 64, 84 pin
Low Wattage Soldering Iron
Desoldering Equipment
#1129 Lamp

HEAD CLEANING INSTRUCTIONS

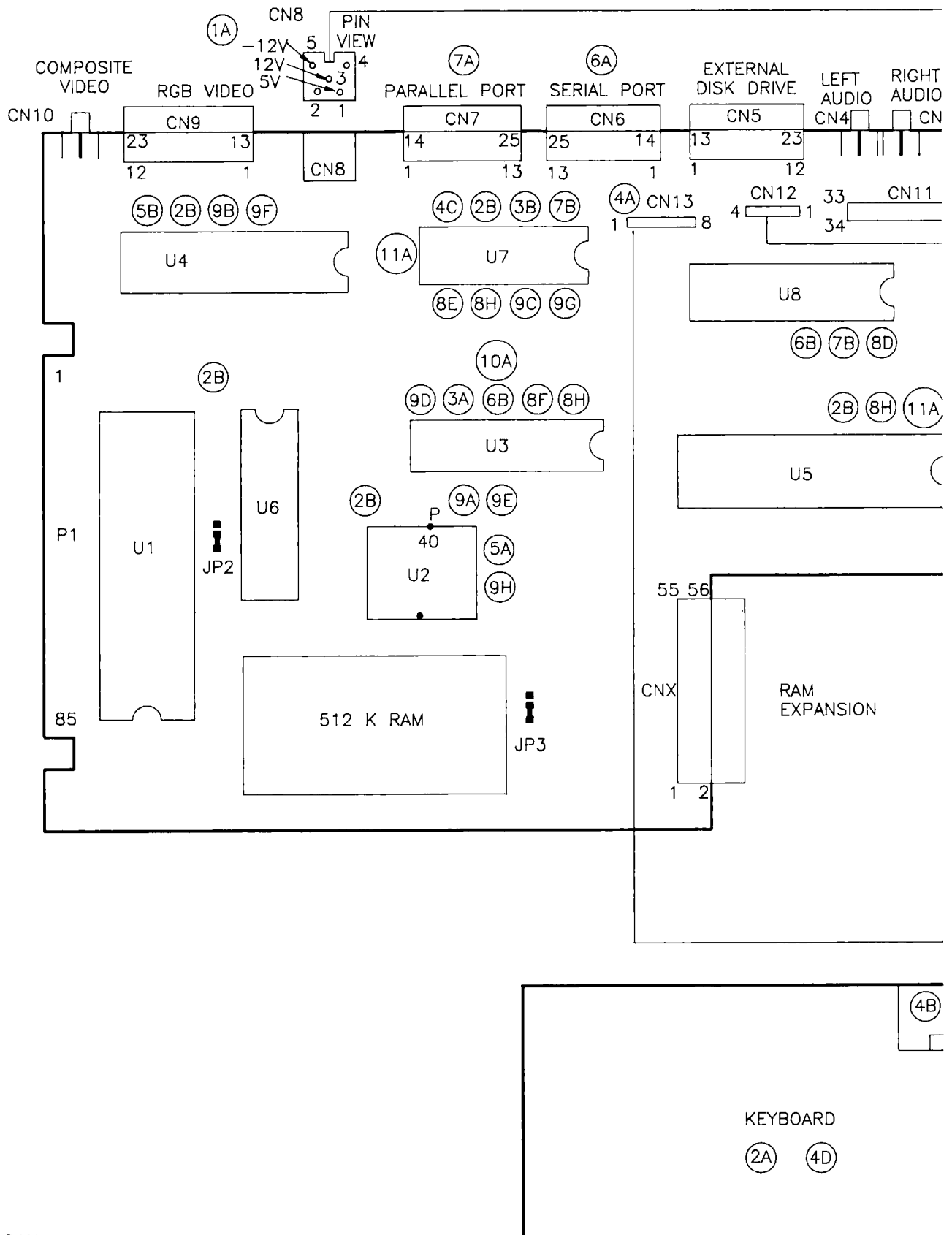
Use a cotton swab or lint-free cloth dampened with 91% Isopropyl alcohol and dry with a lint-free cloth or use a non-abrasive cleaning diskette.

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4300 West 62nd Street, P.O. Box 7092, Indianapolis, Indiana 46206 U.S.A.

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co. as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co. by the manufacturers of the particular type of replacement part listed. **88CS19055** **DATE 12-88**

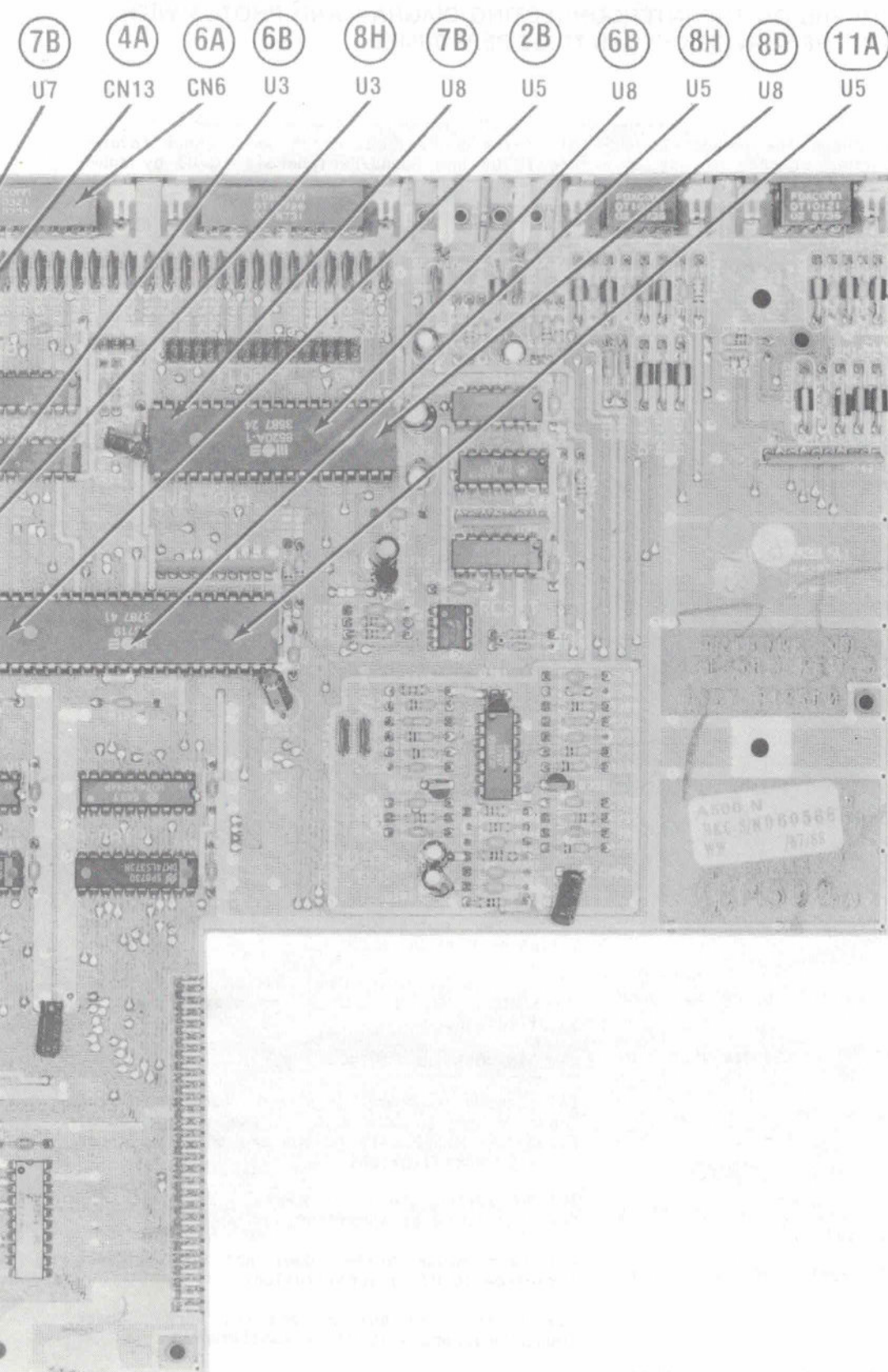
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INTERCONNECTING DIAGRAM

CHECKS (Continued)



CSCS26

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PRELIMINARY SERVICE CHECKS (Continued)

SERVICE CHECKS

MATCH THE NUMBERS ON THE INTERCONNECTING DIAGRAM AND PHOTOS WITH THE NUMBERS ON THE SERVICE CHECKS TO BE PERFORMED.

① POWER SUPPLY

(A) Power supply dead. Check the power supply voltages at Connector CN8. Check for 5V at pin 1, 12V at pin 3 and -12V at pin 5. If voltages are missing, disconnect the power supply from the System Board. Connect a jumper from pin 2 to pin 4 of Connector CN8 and connect a #1129 lamp from pin 1 to pin 2. Turn the power supply On and recheck the voltages. If they are still missing, check Fuses F1 and F2 on Power Supply board.

(B) If the Fuses check good, check the adjustment of Shutdown Level control (VR1). See "Miscellaneous Adjustments".

(C) Power supply voltages are not properly regulated. Check the adjustment of the 5V Adjust Control. See "Miscellaneous Adjustments".

② COMPUTER DEAD (Power Supply good)

(A) Disconnect the Keyboard from System Board and turn the Computer On. If the Computer starts working, troubleshoot the keyboard.

(B) If the Computer is still dead, check IC's U1 thru U7 by substitution.

③ SOUND

(A) No sound from left or right audio jacks (CN3 and CN4). Check the Sound/peripherals IC U3 by substitution.

(B) Sound waveforms are not being filtered. Check the Interface IC U7 by substitution.

④ KEYBOARD

(A) Keyboard dead. Check the keyboard cable for continuity and check Connector CN13 for good connections.

(B) Check Connector CN1 on keyboard for good connections.

(C) Check Interface IC U7 on System Board by substitution.

(D) One key does not work. Clean the key contacts.

⑤ RGB AND COMPOSITE VIDEO

(A) No horizontal or vertical sync. Check Animation IC U2 by substitution.

(B) No video. Check Graphics IC U4 by substitution.

⑥ SERIAL PORT

(A) Serial port does not work. Check Connector CN6 for good connections.

(B) If the connections check good, check Interface IC U8 and Sound/Peripherals IC U3 by substitution.

⑦ PARALLEL PORT

(A) Parallel port does not work. Check Connector CN7 for good connections.

(B) If the connector checks good, check Interface IC's U7 and U8 by substitution.

⑧ DISK DRIVE

(A) Disk Drive operation is erratic. Clean the Drive Heads.

(B) If the operation is still erratic, check the Spindle Speed. See "Miscellaneous Adjustments".

(C) Disk Drive motor will not turn On or will not turn Off. Make sure the SEL0 Jumper is installed on PJ3-0 on Drive.

(D) If the Jumper is installed, check Interface IC U8 on System Board by substitution.

(E) Disk Drive Head bangs against the Track 00 stop. Check Interface IC U7 on System Board by substitution.

(F) Disk Drive will not read from a diskette. Check the Sound/Peripherals IC U3 on System Board by substitution.

(G) Disk Drive will not write to a diskette. Check the operation of Write Protect Reed Switch on Disk Drive.

(H) If the Write Protect Switch checks good, check IC's U7, U5 and U3 on System Board by substitution.

⑨ MOUSE/JOYSTICK PORTS

(A) Screen pointer does not move when the Mouse is moved. Check for pulses at pin 40 of Animation IC U2. If pulses are missing, check IC U2 by substitution.

(B) If pulses are present at IC U2, check the Graphics IC U4 by substitution.

(C) Left mouse button does not work. Check Interface IC U7 by substitution.

(D) Right mouse button does not work. Check Sound/Peripherals IC U3 by substitution.

PRELIMINARY SERVICE CHECKS (Continued)

SERVICE CHECKS (Continued)

(E) Joystick 1 or Joystick 2 stick does not operate properly. Check for pulses at pin 40 of Animation IC U2. If pulses are missing, check IC U2 by substitution.

(F) If pulses are present at IC U2, check Graphics IC U4 by substitution.

(G) Joystick 1 button does not work. Check Interface IC U7 by substitution.

(H) Joystick 2 button does not work. Check Animation IC U2 by substitution.

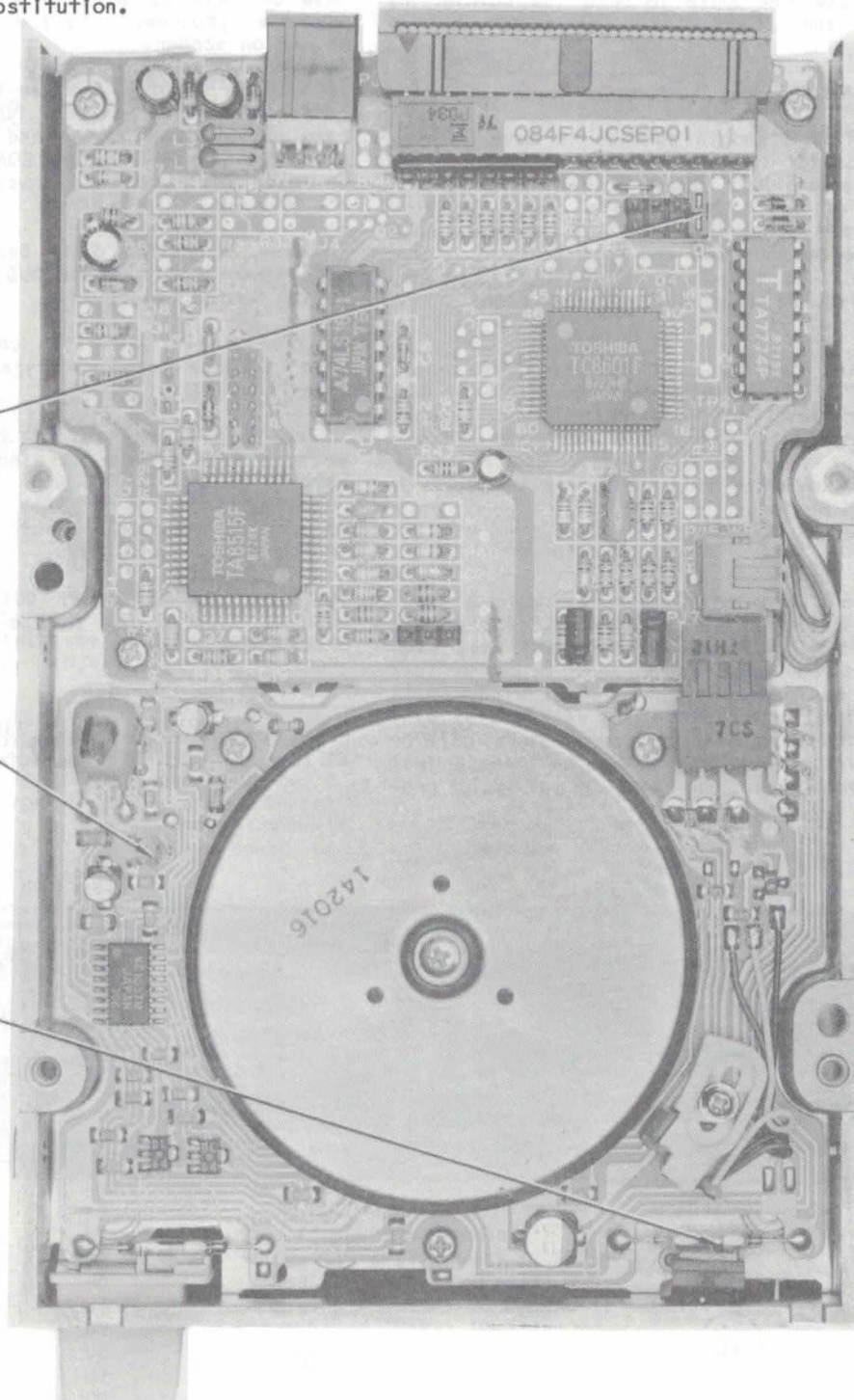
10 LIGHT PEN

(A) Light pen does not work. Check Sound/Peripherals IC U3 by substitution.

11 TIME OF DAY CLOCK

(A) Time of day clock does not work. Check Interface IC U7 and Controller IC U5 by substitution.

- 8C
PJ3-0
- 8B
SPINDLE
SPEED
VR1
- 8G
WRITE
PROTECT
SWITCH



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AMIGA 500

PRELIMINARY SERVICE CHECKS (Continued)

GENERAL OPERATING INSTRUCTIONS

BOOT UP

When the computer is turned On, a picture of the Amiga Workbench diskette appears on the Monitor screen. The Computer will automatically boot up on the Amiga Workbench Diskette when it is inserted in the Disk Drive and display an icon of the Workbench Diskette on the Monitor. To activate a window of files on any diskette, use the mouse to move the pointer to the icon and press the left mouse button twice.

MOUSE OPERATION

Move mouse on a smooth surface to move pointer on the Monitor screen. Move pointer to an icon and press left mouse button once to select icon or twice to activate icon. To view the pulldown menus at top of screen, hold right mouse button down and move pointer to desired menu. To select an item from the menu, move pointer to item and release right mouse button.

The keyboard can be used in place of mouse. Use right or left Amiga (A) keys, shift key and cursor keys to move pointer on screen. Use right or left Amiga keys and left Alt key in place of left mouse button. Use right or left Amiga keys and right Alt key in place of right mouse button.

BASIC

To load Basic into the Computer, insert a diskette with Basic on it in Drive. Click on Basic diskette icon twice to open the file window. Click on Amiga Basic icon twice to load Basic. A Basic Command and Output window will appear on Monitor screen along with a List window. To activate either window, move pointer to any point inside the window and press left mouse button once. To type in a Basic pro-

gram, activate List window and type the program in List window. NOTE: If line numbers are used, they must be entered in Computer in sequence. Amiga Basic will not automatically sort line numbers.

To save or load a program, activate Project menu at top of screen (press right mouse button and move pointer to Project) and select Save or Save As to save a program or Open to load a program. Follow instructions that appear on screen.

To save or load a program using the keyboard, activate Command window, type SAVE and program name enclosed in quotes and press Enter key to save the program. Type LOAD and program name enclosed in quotes and press Enter key to load the program.

To view a listing of a Basic program, select SHOW LIST from the WINDOWS menu or type LIST in the Command Window.

To view a list of files on a diskette, activate Command window, type FILES and press Enter key.

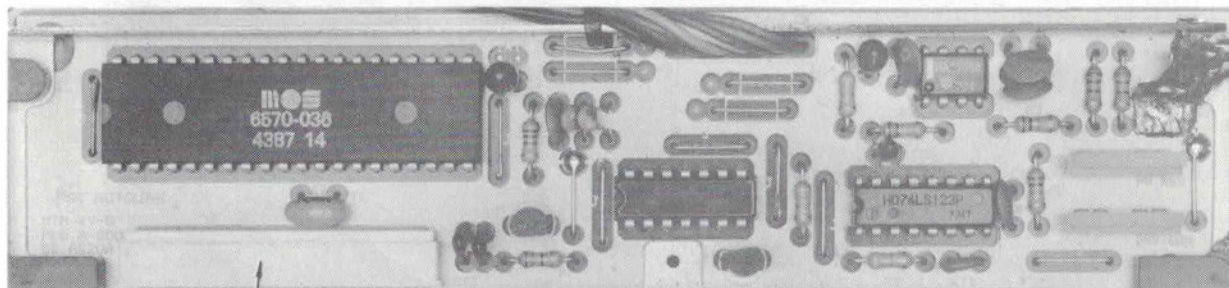
To run a program, select START from RUN menu or type RUN in Command window and press Enter key.

To stop a program, select STOP from RUN menu or press Ctrl and C keys.

To leave Basic, select QUIT from the PROJECT menu or type SYSTEM in the Command window and press Enter key.

RESETTING THE COMPUTER

Press Ctrl and Left and Right Amiga (A) keys at same time to reset computer.



CN1

4B

PRELIMINARY SERVICE CHECKS (Continued)

DISASSEMBLY INSTRUCTIONS

CABINET TOP REMOVAL

Remove six T10 torx screws from bottom (front and rear edges) of cabinet and lift cabinet top off.

KEYBOARD REMOVAL

Remove cabinet top. Disconnect Keyboard Connector CN13 from the System Board and ground connector from Disk Drive. Lift Keyboard out of cabinet.

DISK DRIVE REMOVAL

Remove cabinet top. Remove four T10 torx screws and straighten four tabs holding top shield and remove shield. Disconnect Keyboard

ground connector from Disk Drive. Remove three phillips screws from bottom of cabinet holding Disk Drive. Disconnect Disk Drive connector and power supply connector and remove Drive.

SYSTEM BOARD REMOVAL

Perform Disk Drive Removal procedures. Release catch at front of System Board. Lift up the front of board and slide it forward to remove. Remove capture nuts on ports on back of board to remove bottom shield.

POWER SUPPLY DISASSEMBLY

Remove four phillips screws from bottom of Power Supply and remove supply from case.

MISCELLANEOUS ADJUSTMENTS

POWER SUPPLY

SHUTDOWN LEVEL ADJUST

Connect the positive input of a voltmeter to base of Switch Transistor (Q3A) on Regulator Board. Connect the negative input of voltmeter to emitter of Q3A. Adjust the Shutdown Level Control for 2.1V.

5V ADJUST

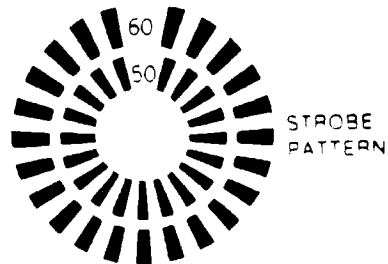
Connect the positive input of a voltmeter to the 5V Source (circuit trace 3). Connect the negative to ground. Adjust the 5V Adjust Control for 5.0V.

SPINDLE SPEED ADJUSTMENT

If a Disk Drive Tester that can provide a readout of speed in rpm is being used, insert a diskette in drive and adjust Speed Control (VR1) on Motor Control Board for a speed of 300 rpm $\pm$ 5rpm.

If a Disk Drive Tester is not available, center and paste the strobe pattern shown in Figure 1 on Drive Motor Flywheel on bottom of Drive. Insert a Diskette in Drive and close the drive door. Type in and run the program listed "Continuous Operation of Disk Drive" to keep the Drive running. View the pattern under a fluorescent light. View the inside pattern if a cycle light is being used and outside pattern if 60 cycle lights are being used. Adjust Speed Control (VR1) until the pattern appears to stand still.

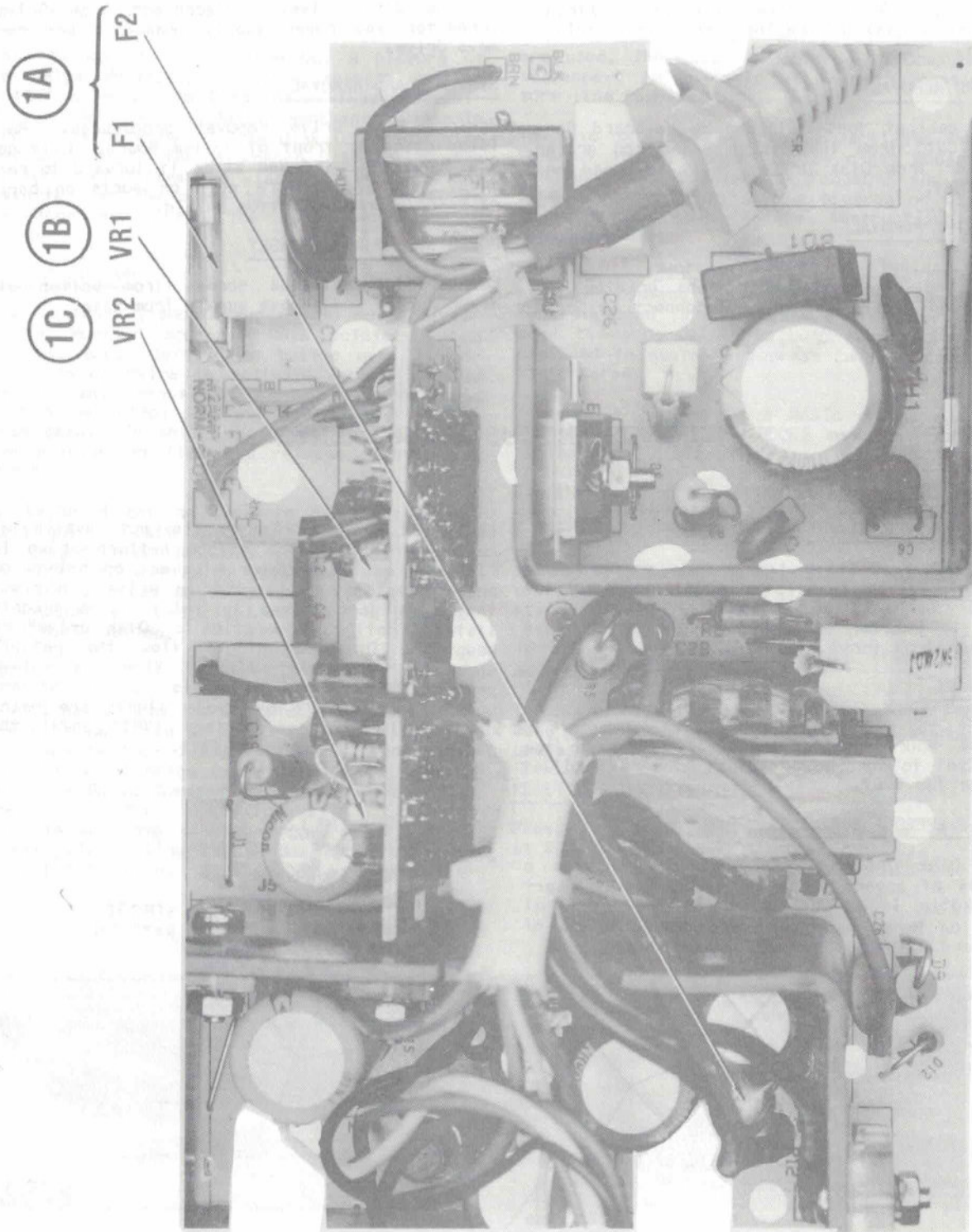
COMMODORE
AMIGA 4500



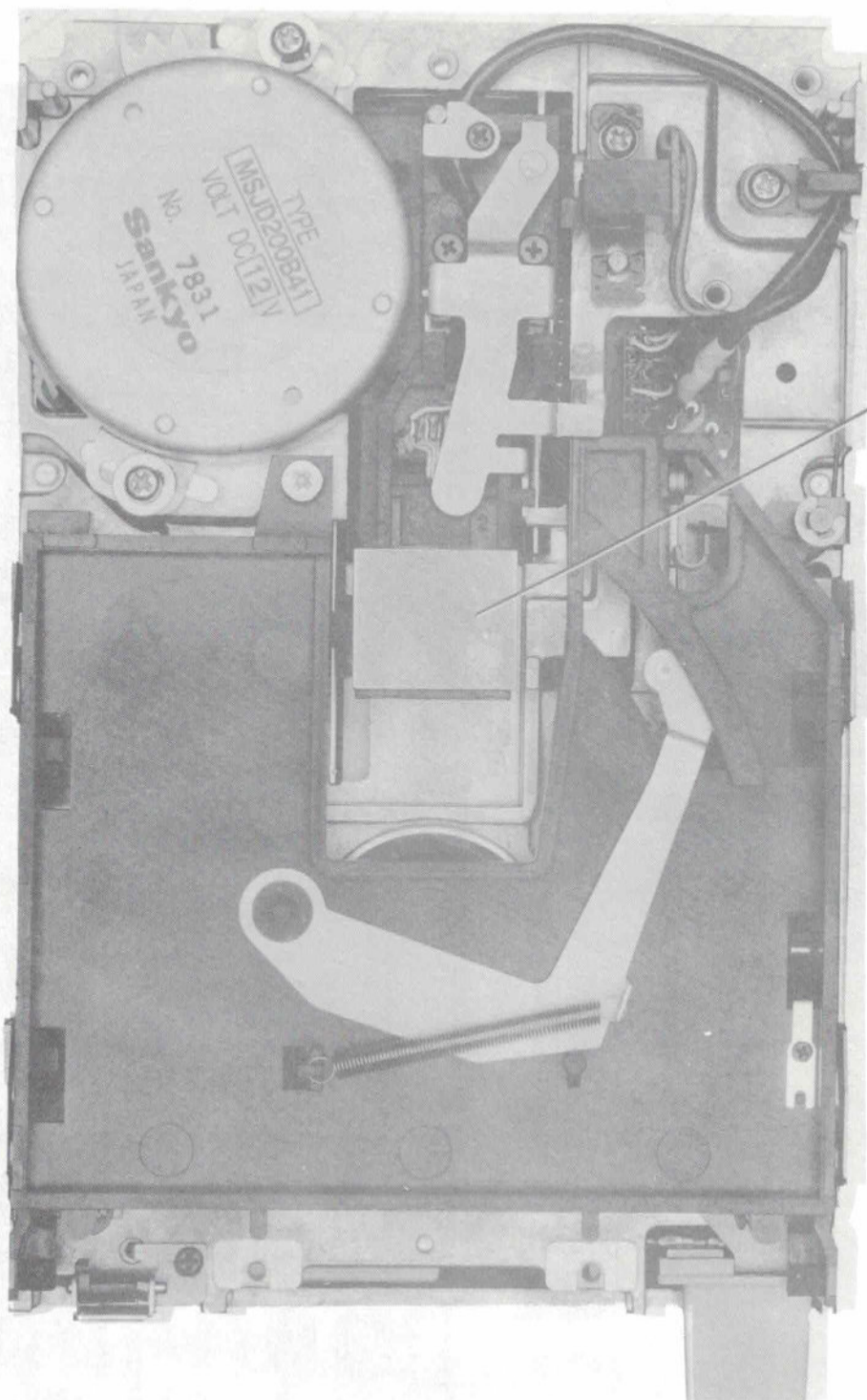
REPLACEMENTS PARTS AND DESCRIPTION

F1	2A Fuse
F2	5A Fuse
U1	CPU IC 5CN68000CBN64
U2	Animation (Fat Agnus) IC 8370
U3	Sound Peripherals (Paula) 8364R7
U4	Graphics (Denise) IC 8362R8
U5	Controller (Gary) IC 5719
U6	ROM IC HN62402
U7	Interface IC 8520A-1
U8	Interface IC 8520A-1

PRELIMINARY SERVICE CHECKS (Continued)



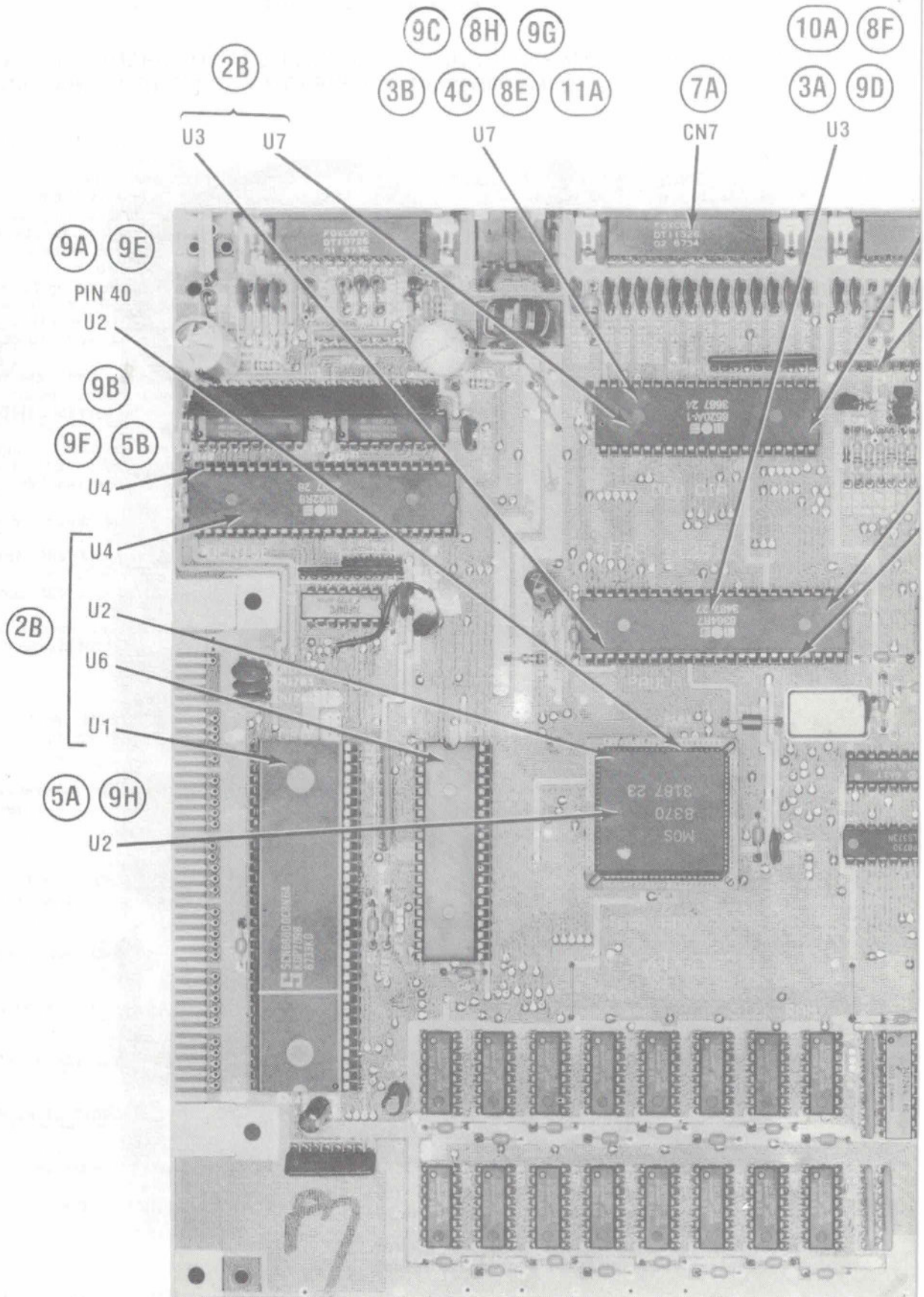
PRELIMINARY SERVICE CHECKS (Continued)



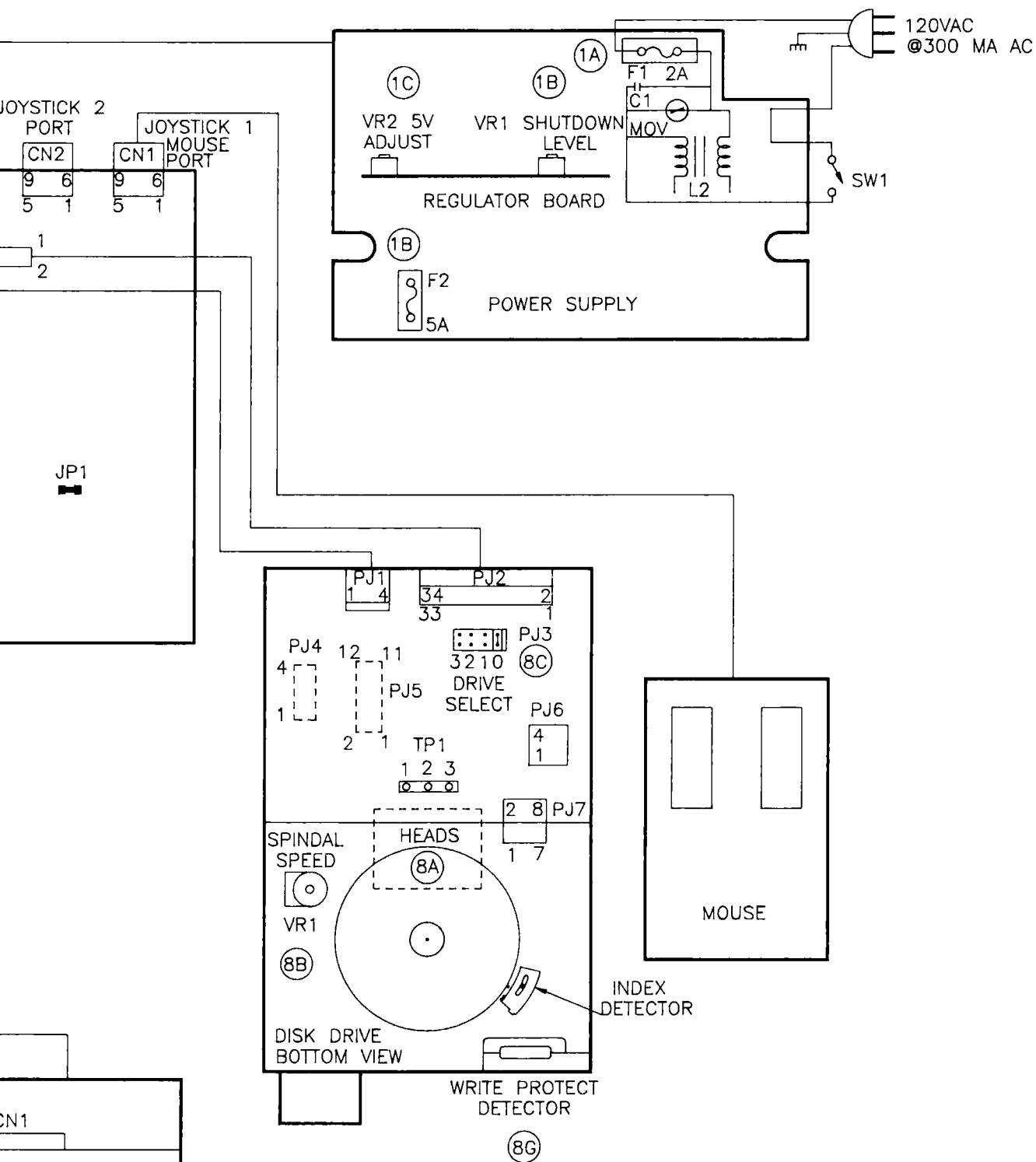
8A
HEADS

COMMODORE
AMIGA 4500

DISK DRIVE - TOP VIEW



E CHECKS (Continued)



COMMODORE
AMIGA 500

INTERCONNECTING DIAGRAM

PRELIMINARY SERVICE CHECKS (Continued)

PREVENTATIVE MAINTENANCE

ENVIRONMENT

Computers perform best in a clean, cool area that is below 80 degrees Fahrenheit and free of dust and smoke particles. Even though home Computers are not affected by cigarette smoke as much as commercial Computers are affected, it is better to maintain a smoke-free area around the Computer. Do not block cabinet vents of Computer, Monitor, Printer, or other power devices.

ELECTRICAL POWER

Variations in the line voltage can affect the Computer. Try to avoid these fluctuations by using an AC receptacle that is on a power line not used by appliances or other heavy current demand devices. A power-surge protector, power-line conditioner, or non-interruptible power supply may be needed to cure the problem. **Do not** switch power On and Off frequently.

KEYBOARD

Liquids spilled into the Keyboard can ruin it. Immediately after a spill occurs, disconnect the Computer power plug from AC power outlet. Then, if circuitry or contacts are contaminated, disassemble the Keyboard and carefully rinse the Keyboard printed circuit board with distilled water and let it dry. Use a cotton swab between the keys. Use a non-abrasive contact cleaner and lint-free wipers on accessible connectors and contacts.

DISK DRIVES

Clean the read/write heads of the Disk Drives about once a month or after 100 hours usage. Use only an approved head cleaning kit.

Handle carefully to preserve proper disk head alignment. A sudden bump or jolt to the Disk Drives can knock the disk head out of alignment. If Disk Drive must be transported, place an old disk in slot and close door during transport.

Store disks in their protective covers and never touch the disk surface. Observe the disk handling precautions usually found on the back of disk protective covers.

PRINTERS

Carefully vacuum the Printer regularly. Wipe surface areas clean using a light all-purpose cleaner. Do not clean the machine. The oil will collect abrasive grit and dust. The dust will act as a blanket. This can cause components to overheat and fail.

STATIC ELECTRICITY

Static electricity discharge can affect the Computer. In order to minimize the possibility, use anti-static mats, sprays, tools and materials, and maintain good humidity in the Computer environment.

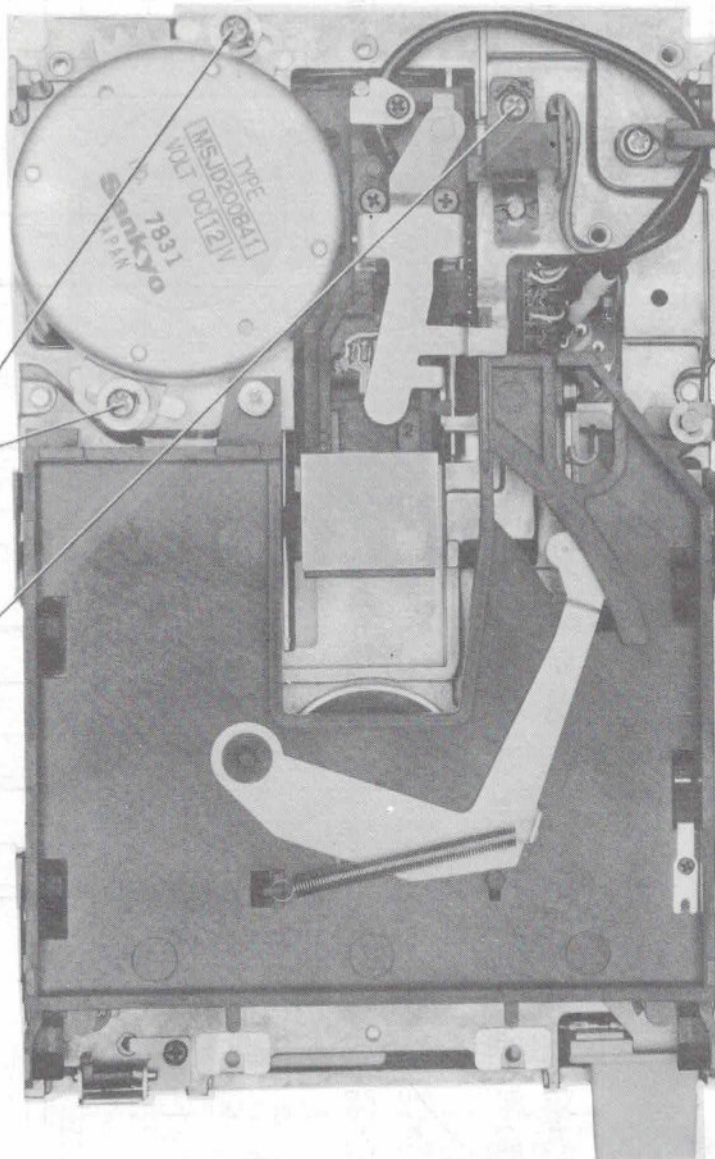
MONITOR

Use an isolation transformer with any Monitor that does not come as part of the system since some Monitors use a HOT chassis (chassis connected to one side of the AC line). The face of the Monitor should never be left on for long periods of time at high brightness level except when pattern is being changed periodically. Use caution when cleaning anti-glare screens, to preserve the glare-reduction feature.

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AMIGA A500

HEAD
POSITION
MOTOR
SCREWS

TRACK 00
DETECTOR
SCREW



CSCS26-A

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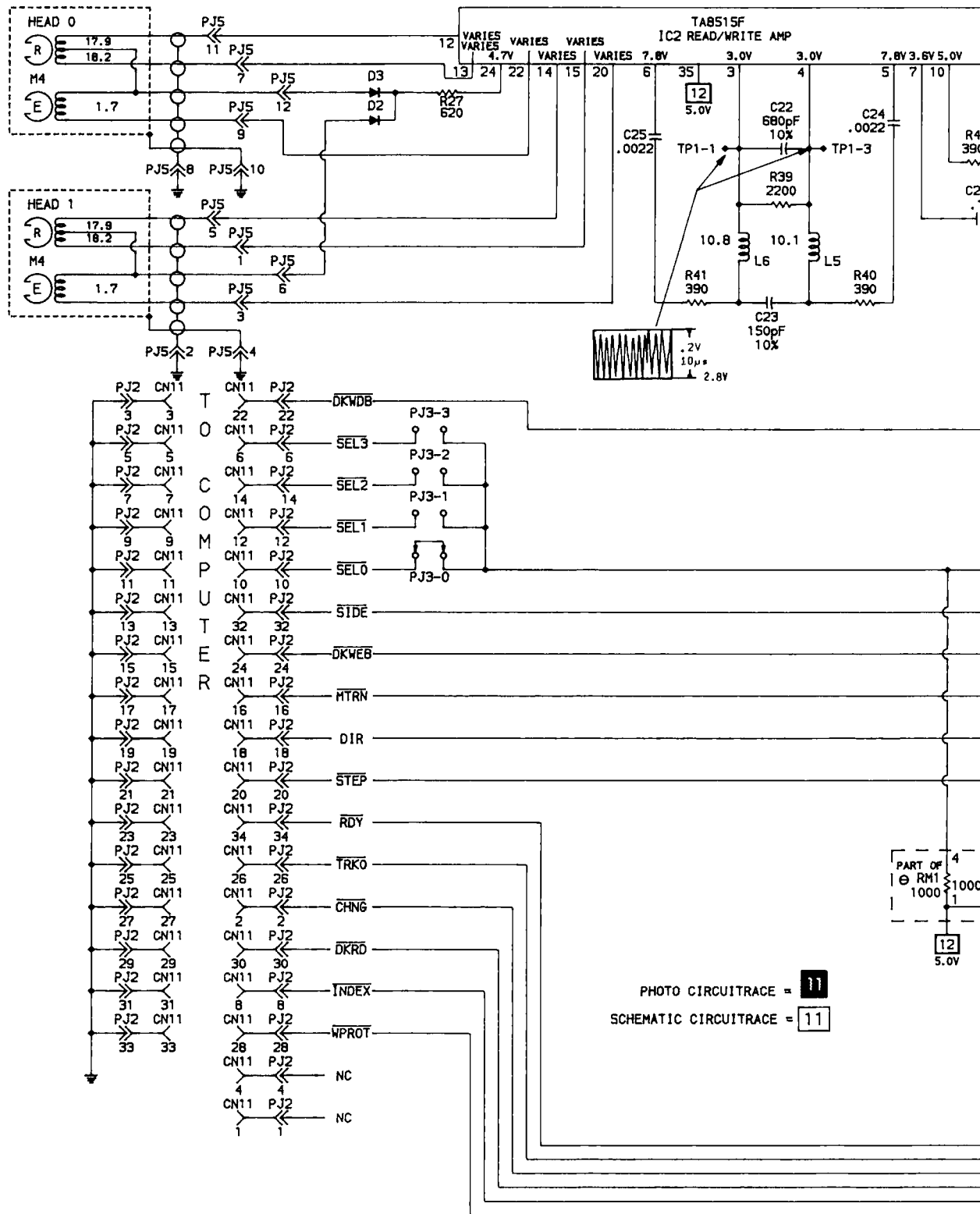
4300 West 62nd Street, P.O. Box 7092, Indianapolis, Indiana 46206 U.S.A.

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co. as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co. by the manufacturers of the particular type of replacement part listed. 88CS 19055 DATE 12-88

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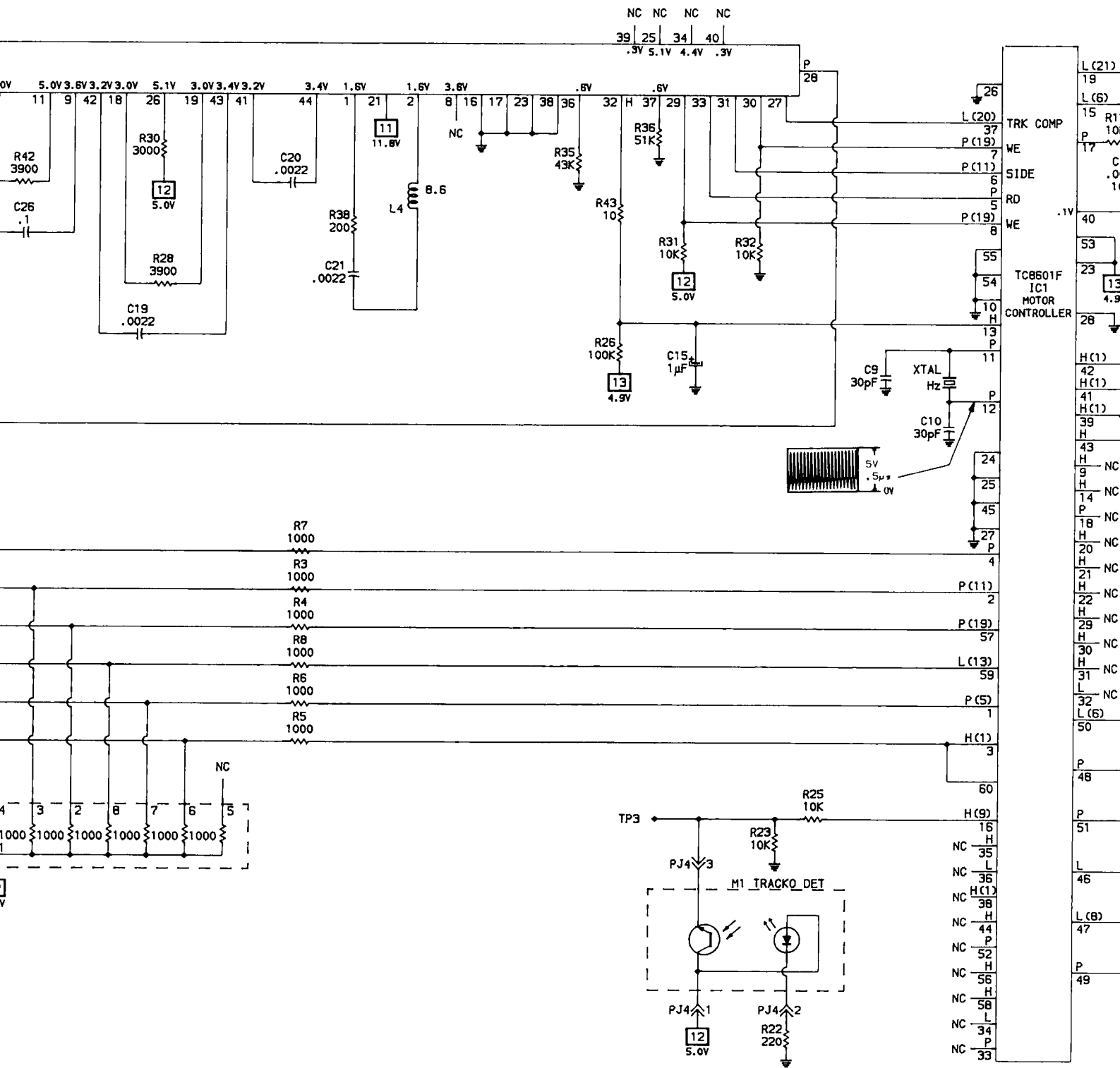
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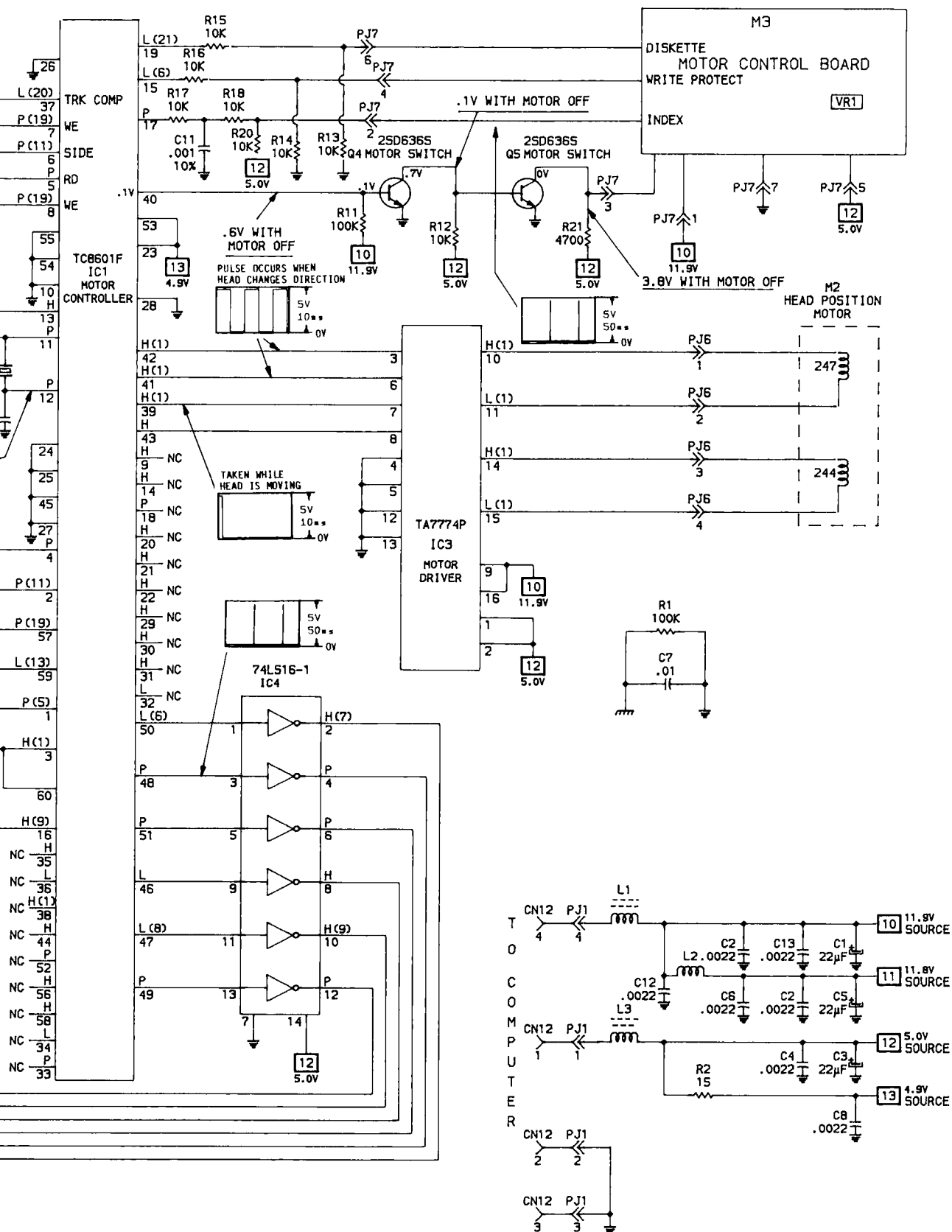
4300 West 62nd Street, P.O. Box 7092, Indianapolis, Indiana 46206 U.S.A. Printed in U.S. of America



A PHOTOFAC STANDARD NOTATION SCHEMATIC
WITH **CIRCUITTRACE**

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ALIGNMENT

EQUIPMENT REQUIRED

A test program or Disk Drive Tester is required which will turn On the Disk Drive, select side 0 or 1 and step the head to the track specified in the alignment procedures. Use Dysan Analog Alignment Diskette 350/2A when an Alignment Diskette is specified in the alignment procedures. NOTE: The Dysan Alignment Diskette has only alignment patterns on it and does not contain any alignment programs. WARNING: Do not leave the Alignment Diskette in the Drive while checking voltages or waveforms unless specified in the alignment procedures. The test equipment may cause the Disk Drive circuits to erase sections of the alignment diskette even if it is write protected.

DRIVE TRACK PROGRAM

The following Basic program can be used to select drive 0 or 1, side 0 or 1 and step the head to the desired track. To select a different drive or side, stop the program and re-run it.

```
10 CLS:POKE 12571392,255
20 INPUT "ENTER DRIVE NUMBER (0 or 1): ";D
30 INPUT "ENTER SIDE NUMBER (0 or 1): ";H
40 IF D = 1 AND H = 1 THEN L = 104:GOTO 70
50 IF D = 1 AND H = 0 THEN L = 108:GOTO 70
60 IF H = 1 THEN L = 112 ELSE L = 116
70 OTR = 0: CTR = 97: GOSUB 170
80 INPUT "ENTER TRACK NUMBER: ";TR
90 IF TR OTR THEN CTR = TR - OTR:OTR = TR:GOSUB 120
100 IF TR OTR THEN CTR = OTR - TR:OTR = TR:GOSUB 170
110 GOTO 220
120 FOR X = 1 TO CTR
130 POKE 12570880,L
140 POKE 12570880,L + 1
150 FOR T = 1 TO 10: NEXT T
160 NEXT X:RETURN
170 FOR X = 1 TO CTR
180 POKE 12570880,L + 2
190 POKE 12570880,L + 3
200 FOR T = 1 TO 10: NEXT T
210 NEXT X:RETURN
220 PRINT "PRESS ANY KEY TO STOP"
230 POKE 12570880,L + 3
240 AS = INKEY$:IF AS = "" THEN 230 ELSE 80
```

SPINDLE SPEED ADJUSTMENT

If a Disk Drive Tester that can provide a readout of the speed in rpm is being used, Insert a diskette in the drive and adjust Speed Control VR1 on the Motor Control board for a speed of 300 rpm. ± 5 rpm. If a Disk Drive Tester is not available, center and paste strobe pattern shown in Figure 1 on Drive Motor flywheel on the bottom of Drive. Insert a Diskette in Drive and close drive door. Type in and run the program listed under "Continuous Operation of Disk Drive" to keep Drive running. View pattern under a fluorescent light. View inside pattern if a 50 cycle light is being used and outside pattern if 60 cycle lights are being used. Adjust Speed Control VR1 until pattern appears to stand still.

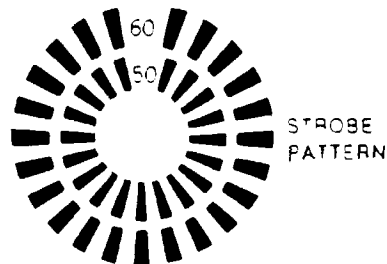


Figure 1

RADIAL HEAD ALIGNMENT

Connect the channel A input of a dual trace scope to TP1-1, channel B input to TP1-3 and scope ground to TP1-2. Connect external trigger input to pin 4 of IC IC4 and set trigger to negative slope. Set scope to add mode with one channel inverted, sweep time to 20 ms and voltage range to 50 mv. Set both scope inputs to AC coupling and probes to X1 attenuation. Insert Alignment Diskette into Disk Drive. Turn On Drive and step the Head to Track 40, Side 0. The cats-eye pattern shown in Figure 2 should be displayed on scope.

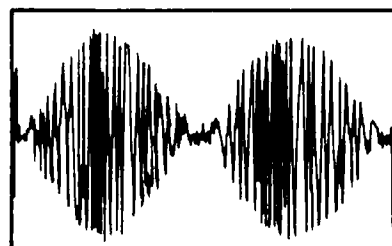


Figure 2

The amplitude of the two lobes must be within 70% of each other. If lobes are out of tolerance, loosen two screws holding the Head Position Motor (M1) (see the Disk Drive Mechanical top photo). Adjust the Motor until the two lobes are equal in amplitude and tighten motor mount screws. Check adjustment by stepping the Head to Track 80 and back to Track 40, then to Track 0 and back to Track 40, checking the lobes each time the head is on Track 40. Select side 1 and check the Radial alignment of Head 1 using the above procedures. Check Track 00 Detector adjustment after performing the Radial Head Alignment.

AZIMUTH CHECK

Use the same setup and connections used under "Radial Head Alignment". Set scope sweep to .5 ms. Insert Alignment Diskette in Drive, turn Drive On, select side 0 and step the Head to Track 40. Confirm that the pattern appears as shown in Figure 3. The amplitude of bursts 1 and 4 must be equal to or less than the amplitudes of bursts 2 and 3.



Figure 3

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ALIGNMENT (Continued)

TRACK 00 DETECTOR ADJUSTMENT

Connect a scope to TP1-1 and set sweep time to 10 μ s. Set voltage range to 50 mv with probe set to X1 attenuation. Insert Alignment Diskette Into Disk Drive. Turn Drive On and step Head to Track 00. A 62.5 kHz signal should be displayed on the scope. If the 62.5 kHz signal is not present, step Head forward or backward until the signal is present, indicating the Head is on Track 00. Connect Input of a voltmeter to TP3. Check for .1 volt when the Head is on Track 1 and more than 3 volts when the head is on Track 2. If readings are not correct, set Head to Track 1. Loosen Track 00 Detector mounting screw and adjust detector until the voltage jumps from 3 volts or more to .1 volts. Tighten mounting screw and recheck adjustment.

INDEX DETECTOR ADJUSTMENT

Connect channel A Input of a dual trace scope to TP1-1, channel B Input to pin 4 of IC IC4 (Index pulse). Set scope display to channel A, voltage range to 20 mv, probe to X1 attenuation and sweep to 50 μ s. Set channel B Input to noninverting mode and trigger scope on chan-

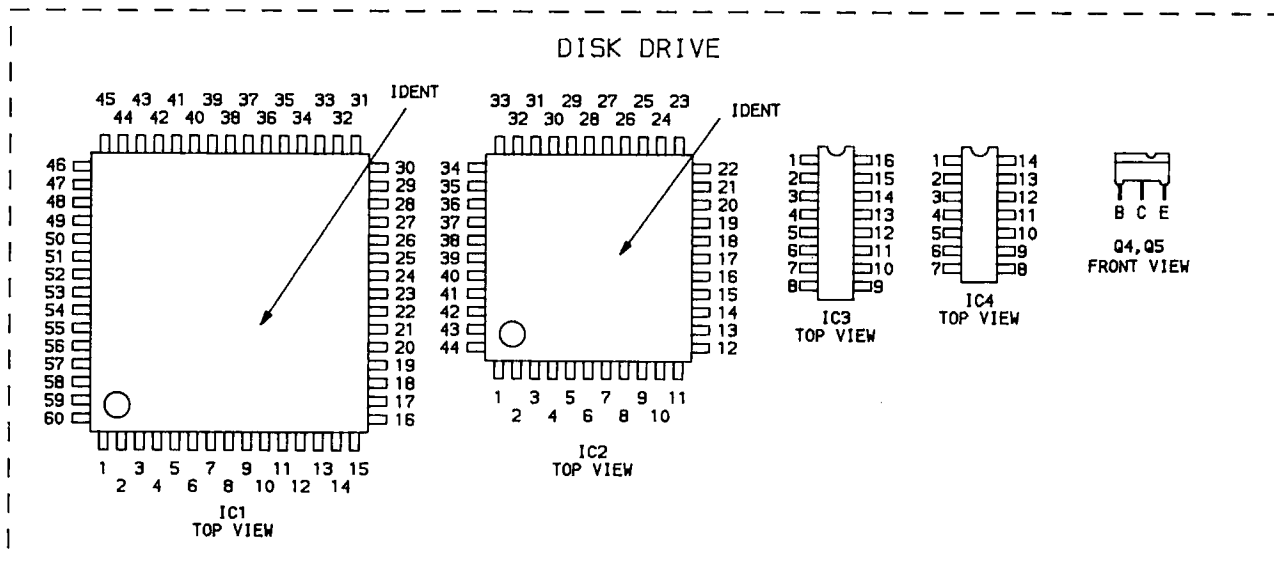
nel B with trigger set to negative slope (to trigger on the leading edge of the Index pulse).

Insert Alignment Diskette in Drive and close Drive door. Turn Drive On, select side 0 and set Head to Track 40. The waveform shown in Figure 4 should be displayed on the scope. Confirm that the first peak of the timing burst occurs 400 μ s $\pm$ 200 μ s after the start (leading edge of the Index pulse) of the sweep (see Figure 4). If Index Detector is out of adjustment, loosen the screw holding Index Detector for 400 μ s $\pm$ 200 μ s, see Disk Drive Mechanical Bottom View photo.



Figure 4

IC PINOUTS & TERMINAL GUIDES



TROUBLESHOOTING PROGRAMS

If a Computer is used to operate the Disk Drive in place of a Disk Drive Tester, the following Basic programs can be used to operate the Drive in different modes.

CONTINUOUS OPERATION OF DISK DRIVE

Use the following program to keep Drive 0 running in read mode. Change number 119 in line 20 to 111 to make Drive 1 run continuously. NOTE: A diskette must be inserted in the Drive for the program to operate properly.

```
10 POKE 12571392,255
20 POKE 12570880,119:GOTO 20
```

WRITE PROTECT/TRACK 00 CHECK

The following program can be used to check the operation of Write Protect and Track 00 Detectors in Drive 0. A diskette must be in the Drive for the program to operate properly. The program displays on the Monitor screen the Write Protect status of the diskette in the Drive and indicates whether the Head is on or off Track 00. The Track 00 indication should change when the Head is manually pushed off and on Track 00. Change number 119 in line 30 to 111 to check Drive 1.

```
10 CLS
20 POKE 12571392,255
30 POKE 12570880,119
```

```
40 X = PEEK(12574721)
50 IF X AND 8 THEN PRINT "WRITE PROTECT OFF"
ELSE PRINT "WRITE PROTECT ON "
60 IF X AND 16 THEN PRINT "OFF TRACK 00" ELSE
PRINT "ON TRACK 00"
70 LOCATE 1,1:GOTO 30
```

HEAD POSITION MOTOR

The following program continuously alternates the Disk Drive Head between Tracks 00 and 40 on Drive 0. To operate Drive 1, change number 116 in line 70 to 108, 117 in line 80 to 109, 118 in line 120 to 110 and 119 in line 130 to 111. It is not necessary to insert a diskette in the Drive.

```
10 CLS:POKE 12571392,255
20 CTR = 96:GOSUB 110
30 CTR = 40:GOSUB 60
40 GOSUB 110
50 GOTO 30
60 FOR X = 1 TO CTR
70 POKE 12570880,116
80 POKE 12570880,117
90 FOR T = 1 TO 10:NEXT T
100 NEXT X:RETURN
110 FOR X = 1 TO CTR
120 POKE 12570880,118
130 POKE 12570880,119
140 FOR T = 1 TO 10:NEXT T
150 NEXT X:RETURN
```

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6 PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	REPLACEMENT DATA				NOTES
		NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	
DISK DRIVE						
D2,3						
IC1	TC8601F					
IC2	TA8515F					
IC3	TA7774P					
IC4	74LS16-1					
Q4,5	2SD636-S	NTE16	ECG16	SK3911	121-Z9000A *	

* Lead configuration may vary from original.

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	WORKMAN PART No.
RM1	DISK DRIVE Resistor Network	(1)		

(1) 1000 5% x 7

SCHEMATIC NOTES

DISK DRIVE

Voltages, waveforms, and logic readings taken while using a Disk Drive Tester set-up to do a continuous Random Seek-Read/Write operation (head stepping rate set to 10 msec). Readings shown were taken when the disk drive head is not moving (drive is in read or write mode) unless noted.

NOTE: Insert a formatted diskette (not write protected) in the Drive.

- | | |
|---|--|
| <p>(1) Probe Indicates P when head is moving.</p> <p>(5) Probe Indicates L when head is moving in and H when head is moving out from the center of the diskette.</p> <p>(6) Probe Indicates H if diskette is write protected.</p> | <p>(7) Probe Indicates L if diskette is write protected.</p> <p>(8) Probe Indicates H when the head is on track 00 and L when off track 00.</p> <p>(9) Probe Indicates L when the head is on track 00 and H when off track 00.</p> <p>(11) Probe Indicates H when head 0 is selected, L when head 1 is selected.</p> <p>(13) Probe Indicates H when drive motor is off.</p> <p>(17) Probe Indicates * when drive motor is off.</p> <p>(19) Probe Indicates L when in write mode, H when in read mode.</p> <p>(20) Probe Indicates L when on tracks 0 thru 59, H on tracks 60 thru 79.</p> <p>(21) Probe Indicates H with no diskette in Drive.</p> |
|---|--|

LOGIC CHART

PIN NO.	IC1	PIN NO.	IC1	PIN NO.	IC1	PIN NO.	IC3	IC4
1	P(5)	21	H	41	H(1)	1	H	L(6)
2	P(11)	22	H	42	H(1)	2	H	H(7)
3	H(1)	23	H	43	H	3	H(1)	P
4	P	24	L	44	H	4	L	P
5	P	25	L	45	L	5	L	P
6	P(11)	26	L	46	L	6	H(1)	P
7	P(19)	27	L	47	L(8)	7	H(1)	L
8	P(19)	28	L	48	P	8	H	H
9	H	29	H	49	P	9	H	L
10	L	30	H	50	L(6)	10	H(1)	H(9)
11	P	31	H	51	P	11	L(1)	L(8)
12	P	32	L	52	P	12	L	P
13	H	33	P	53	H	13	L	P
14	H	34	L	54	L	14	H(1)	H
15	L(6)	35	H	55	L	15	L(1)	
16	H(9)	36	L	56	H	16	H	
17	P	37	L(20)	57	P(19)			
18	P	38	H(1)	58	H			
19	L(21)	39	H(1)	59	L(13)			
20	H	40	.1V	60	H(1)			

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TROUBLESHOOTING

TEST SETUP

Use a Disk Drive Tester capable of stepping Drive Head to a specific track and writing to and reading from a diskette. If a Computer is used, connect a known good Drive to the Computer as Drive 0. Connect the defective Drive as Drive 1. Use Drive 0 to load any programs needed to check the defective Drive. If a tester is not available the basic programs listed under "Disk Drive Programs" can be used to help troubleshoot the Drive.

WARNING: It is possible for a defective Disk Drive to write on or erase information on a diskette even if it is write protected. Check the Disk Drive by first using a diskette that has programs or data that have been backed up on another diskette.

Check all jumpers on the Disk Drive for correct positions and all connectors for good connections before starting the troubleshooting procedures.

HEAD CLEANING INSTRUCTIONS

Use a cotton swab or lint-free cloth dampened with 91% isopropyl alcohol and dry with a lint-free cloth or use a non-abrasive cleaning diskette.

OSCILLATOR

Verify that the Controller IC (IC1) oscillator is working by checking for a 4.0MHz waveform at pin 12 of IC1. If waveform is missing, check capacitors (C9 and C10), Crystal Xtal and IC1.

WILL NOT READ

Insert a diskette, with data on it, in the Drive and close Drive door. Set Drive Tester to operate Drive continuously in the read mode. While the Drive is running, check for index pulses at pin 4 of IC4. If pulses are missing, refer to the "Index Detector" section of this troubleshooting guide. If pulses are present, check the waveforms at test points TP1-1 and TP1-3. If waveforms are missing, check Drive Head (M4) windings for continuity, check voltages and components associated with pins 1 thru 26 and 34 thru 44 of Read/Write Amp (IC2) and check IC2. If waveforms are present, check the Read pulses at pin 33 of IC1 with a scope while opening and closing the Drive door. There should be a noticeable change in the waveform. If there is no change, check voltages and components associated with IC2. If the Read pulses check good, check for pulses at pins 5 and 6 of IC4. If pulses are missing at pin 5, check Controller (IC1). If pulses are present at pin 5 and missing at pin 6 check IC4.

WILL NOT WRITE

Insert a blank diskette (not write protected) in the Drive and set Drive Tester to do a continuous write operation. While Drive is running, check for index pulses at pin 4 of IC4. If pulses are missing, refer to the "Index Detector" section of this troubleshooting

guide. If pulses are present, check for a logic high at pin 2 of IC4. If reading is not correct, refer to the "Write Protect Does Not Function" section of this troubleshooting guide. If reading is correct, check for pulses at pins 7 and 8 of Controller (IC1). If pulses are missing, check IC1. If pulses are present, check voltages and components associated with Read/Write Amp (IC2) and check Head windings (M4) for continuity.

WRITE PROTECT DOES NOT FUNCTION

Check for a logic low at pin 15 of Controller (IC1) with a not write protected diskette inserted in the Drive and a logic high with a write protected diskette in the Drive. If readings are not correct, check pin 6 of Connector (PJ7) for good connections and check the operation of the write protect detector. If readings are correct, check for a logic low at pin 50 of IC1 with a not write protected diskette in the Drive and logic high with a write protected diskette in the Drive. If readings are not correct, check IC1. If readings are correct, check IC4.

HEAD POSITION MOTOR

Head Position Motor (M2) does not work. Set the Drive Tester to continuously move the Head between any two Tracks. While Head is moving, check for pulses at pins 1 and 3 of Controller IC1. If pulses are missing at pin 1, check Resistor (R6). If pulses are missing at pin 3, check Resistor (R5). If pulses are present, check for pulses at pins 39, 41 and 42 and a logic high at pin 43 of IC1. If readings are not correct, check IC1. If readings are correct, check Motor Driver (IC3), check pins 1 thru 4 of connector PJ6 for good connections and check Motor (M2) windings for continuity.

DRIVE MOTOR

The Drive motor will not turn On or will not turn Off. Use the Drive Tester to select the Drive and turn the Drive motor On. Check for a logic low at pins 4 and 59 of Controller (IC1). If reading is not correct at pin 4, check that the jumper is installed on the correct Drive Select pins (PJ3-0 thru PJ3-3) and the connections are good and check Resistor R7. If reading is not correct at pin 59, check Resistor (R8). If readings are correct, use the Drive Tester to turn the Drive On and Off and check for .1V at pin 40 of IC1 with the motor On and .6V with the motor On. If readings are not correct, check IC1. If readings are correct, check for 0V at the collector of Motor Switch Transistor (Q5) with the Drive On and 3.8V with the Drive Off. If readings are correct, check pins 3 and 7 of connector PJ7 for good connections and check the Motor Control Board. If readings are not correct, check voltages and components connected with Motor Switch Transistors (Q4 and Q5).

TRACK 00 DETECTOR

The Drive Head bangs against the Track 00 stop. Check for a logic low at TP3 with the Head pushed back to Track 00 and a logic high

TROUBLESHOOTING (Continued)

with the Head off Track 00. If readings are not correct, check Resistors (R23 and R25), check pins 1, 2 and 3 of Connector (PJ4) for good connections and check the operation of the Track 00 Detector (M1). If readings are correct, operate the Drive in continuous read mode and check for a logic high with the Head on Track 00 and logic low with the Head off Track 00. If readings are not correct, check Controller (IC1). If the readings are correct, check IC4.

Drive continuously in Read mode. While the Drive is running, check for pulses at pin 17 of Controller (IC1). If pulses are missing, check Capacitor (C11), Resistors (R17, R18 and R20), check pin 2 of Connector (PJ7) for good connections and check the Index Detector on the Motor Control Board. If pulses are present, check for pulses at pins 3 and 4 of IC4. If pulses are missing at pin 3, check Controller (IC1). If pulses are present at pin 3 and missing at pin 4, check IC4.

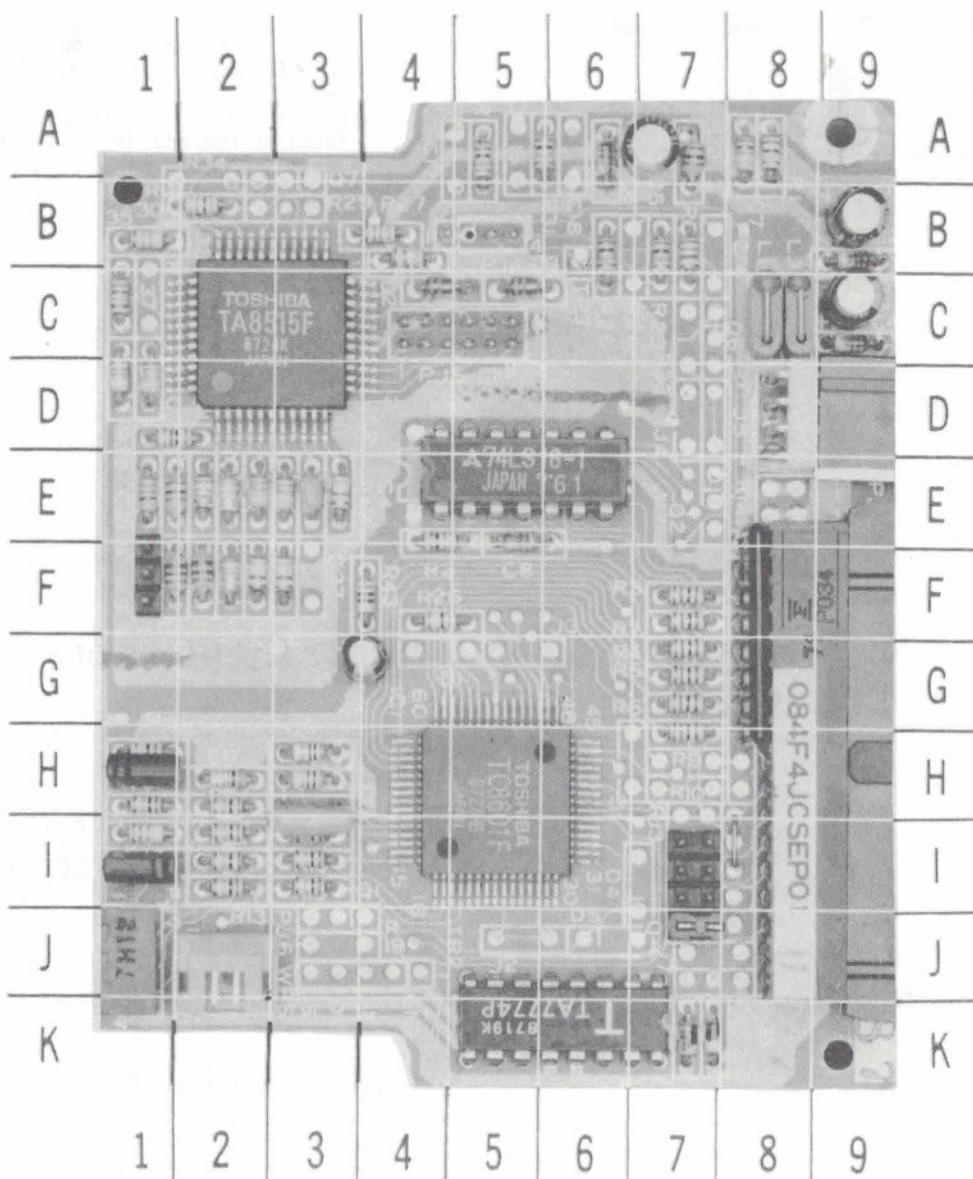
INDEX DETECTOR

Insert a diskette in the Drive and close the Drive door. Set Drive Tester to operate the

GridTrace LOCATION GUIDE

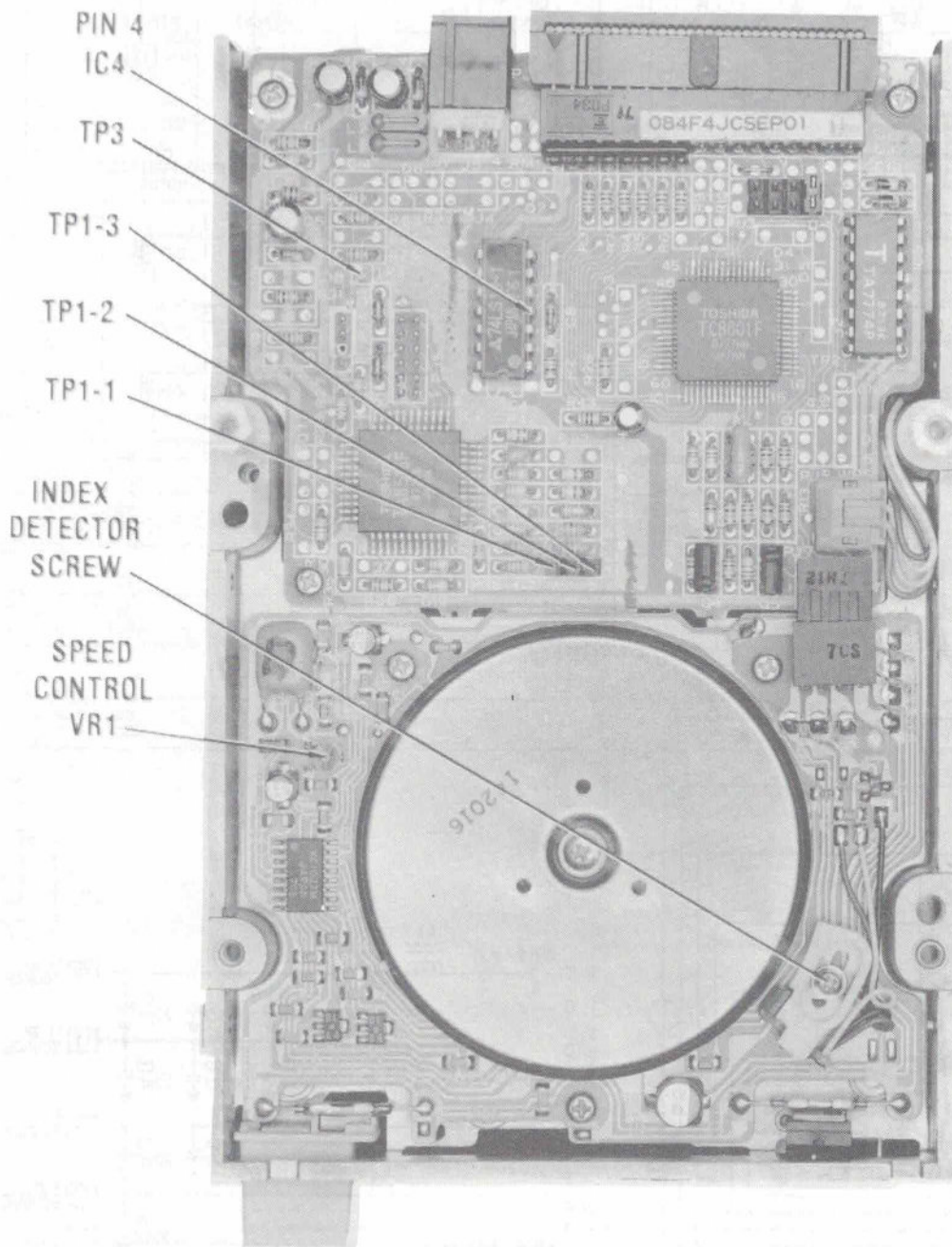
C1	B-9	R40	F-2
C2	B-9	R41	F-3
C3	C-9	R42	E-3
C4	C-9	R43	F-4
C5	A-7	RM1	F-8
C6	A-6	TP1-1	F-1
C7	A-8	TP1-2	F-1
C8	E-5	TP1-3	F-1
C9	H-3	TP3	B-6
C10	H-3		
C11	H-2		
C12	K-7		
C13	K-7		
C15	G-3		
C19	D-1		
C20	D-1		
C21	E-1		
C22	E-2		
C23	F-2		
C24	E-2		
C25	E-3		
C26	E-3		
D2	C-4		
D3	C-5		
IC1	H-5		
IC2	C-2		
IC3	K-6		
IC4	E-5		
L1	C-8		
L2	A-7		
L3	C-8		
L4	E-1		
L5	F-2		
L6	F-1		
PJ1	D-8		
PJ2	H-8		
PJ3	I-7		
PJ4*	B-5		
PJ5*	C-4		
PJ6	J-2		
PJ7	J-1		
Q4	H-1		
Q5	I-1		
R1	A-8		
R2	F-4		
R3	F-7		
R4	G-7		
R5	G-7		
R6	G-7		
R7	F-7		
R8	H-7		
R11	H-1		
R12	H-1		
R13	I-2		
R14	I-2		
R15	I-3		
R16	I-3		
R17	I-3		
R18	I-2		
R20	H-2		
R21	I-1		
R22	B-7		
R23	B-7		
R25	B-6		
R26	F-4		
R27	B-4		
R28	B-4		
R30	B-2		
R31	A-5		
R32	A-5		
R35	B-1		
R36	C-1		
R38	D-1		
R39	E-2		

*Located on Bottom of board.

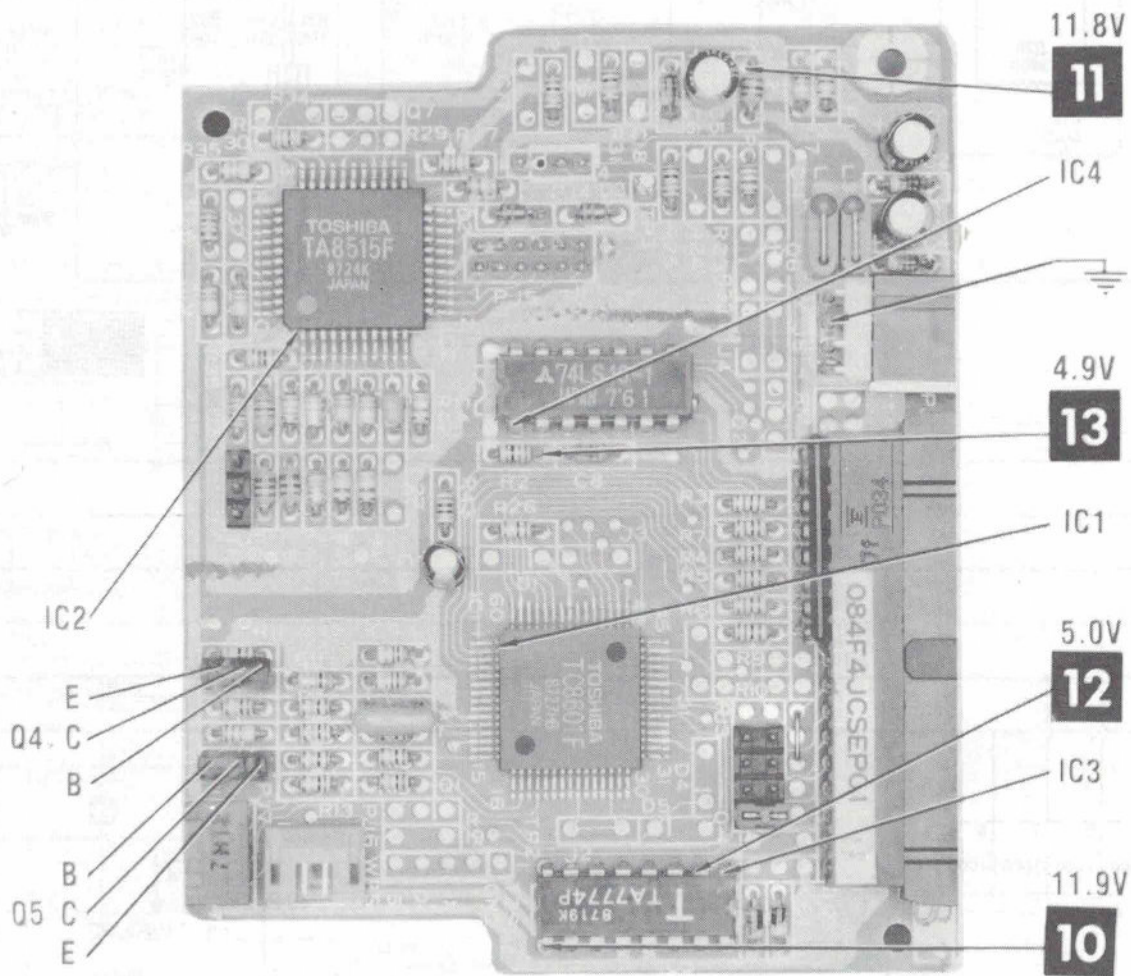


DISK DRIVE BOARD

A Howard W. Sams GRIDTRACE™ Photo



DISK DRIVE - BOTTOM VIEW



DISK DRIVE BOARD

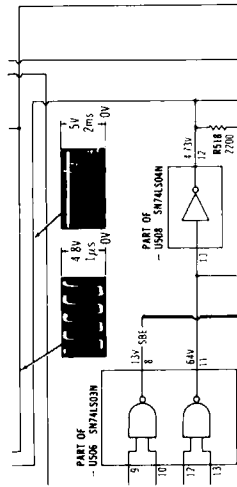
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COMPUTERFACTS™ put easy to use, informative technical data right at your fingertips. Each edition includes specific service information on the individual component, along with some overall troubleshooting hints.

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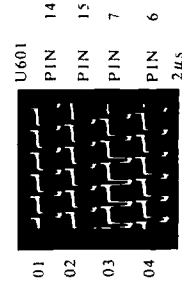


- Step by Step Troubleshooting guides the technician through the necessary procedures to quickly locate the problem.

TROUBLESHOOTING

MICROPROCESSOR CHIP (CPU) OPERATION

Verify the processor is functioning by checking the signals on the address lines (pins 10 thru 24 of IC U6000) and the data lines (pins 41 thru 56) using a logic probe or a scope if a logic probe is used, refer to the "Logic Chart" for the correct readings. If a scope is used, the waveforms on the address lines (except pins 22 and 23 which have no signal in Power Up mode) should be similar to Figure 1. The waveforms on the data lines should be similar to Figure 2.

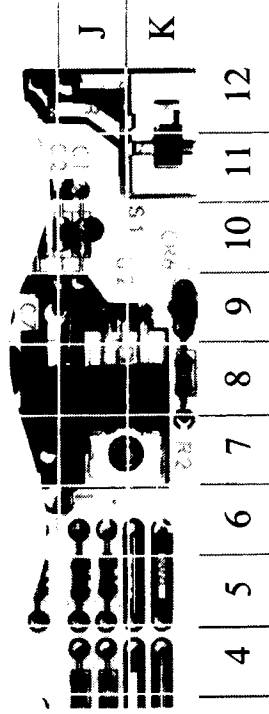


LOGIC

- Logic Chart containing logic probe readings to isolate defective circuitry and components.

PIN NO	IC U100	PIN NO	IC U100	PIN NO	IC U102	IC U103	IC U104	IC U105	IC U106	IC U107	IC U108	IC U109
1	P	21	P	1	L	L	L	L	L	L	L	L
2	P	22	P	2	P	P	P	P	P	P	P	P
3	P	23	P	3	H	H	H	H	H	H	H	H

- Quick Component Location using the SAMS exclusive GRIDTRACE, CIRCUITTRACE, and component photographs.



- **Complete Components Parts List** in an easy to use format with field replacements shown when possible. SAMS unique semiconductor, chip and IC cross-reference gives you many replacements to choose from and is available at your Electronic Distributor.

SEMICONDUCTORS (Select replacement for best results)

		REPLACEMENT DATA					
ITEM No.	TYPE No.	MFGR. Part No.	ECG Part No.	NTE Part No.	RCA Part No.	ZENITH Part No.	NOTES
D102	IS553	1149-2576	ECG519	NTE519	SK9091/177	103-131	
D103	2N601M	1149-2527	ECG109	NTE109	SK3088	103-29001	
D201	1N4004GP	1201-4205	ECG116	NTE116	SK3312	212-76-02	
D501 thru D503	IS553	1149-2576	ECG519	NTE519	SK9091/177	103-131	

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