

SAMS COMPUTERFACTS™

VDU CONTROLLER BOARD

See Folder CSCS15-A

DISK DRIVE

FLOPPY DISK/PRINTER ADAPTER

See Folder CSCS15-B

MONITOR

See Folder CSCS15-C

COMPAQ
MODEL PORTABLE (101709)

KEYBOARD, POWER SUPPLY, SYSTEM BOARD

COMPAQ
MODEL PORTABLE (101709)
CSCS15



COMPAQ
MODEL PORTABLE (101709)
CSCS15

SAFETY PRECAUTIONS

See Page 44

PRELIMINARY SERVICE CHECKS

ENCLOSED

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SAMS Howard W. Sams & Co.

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

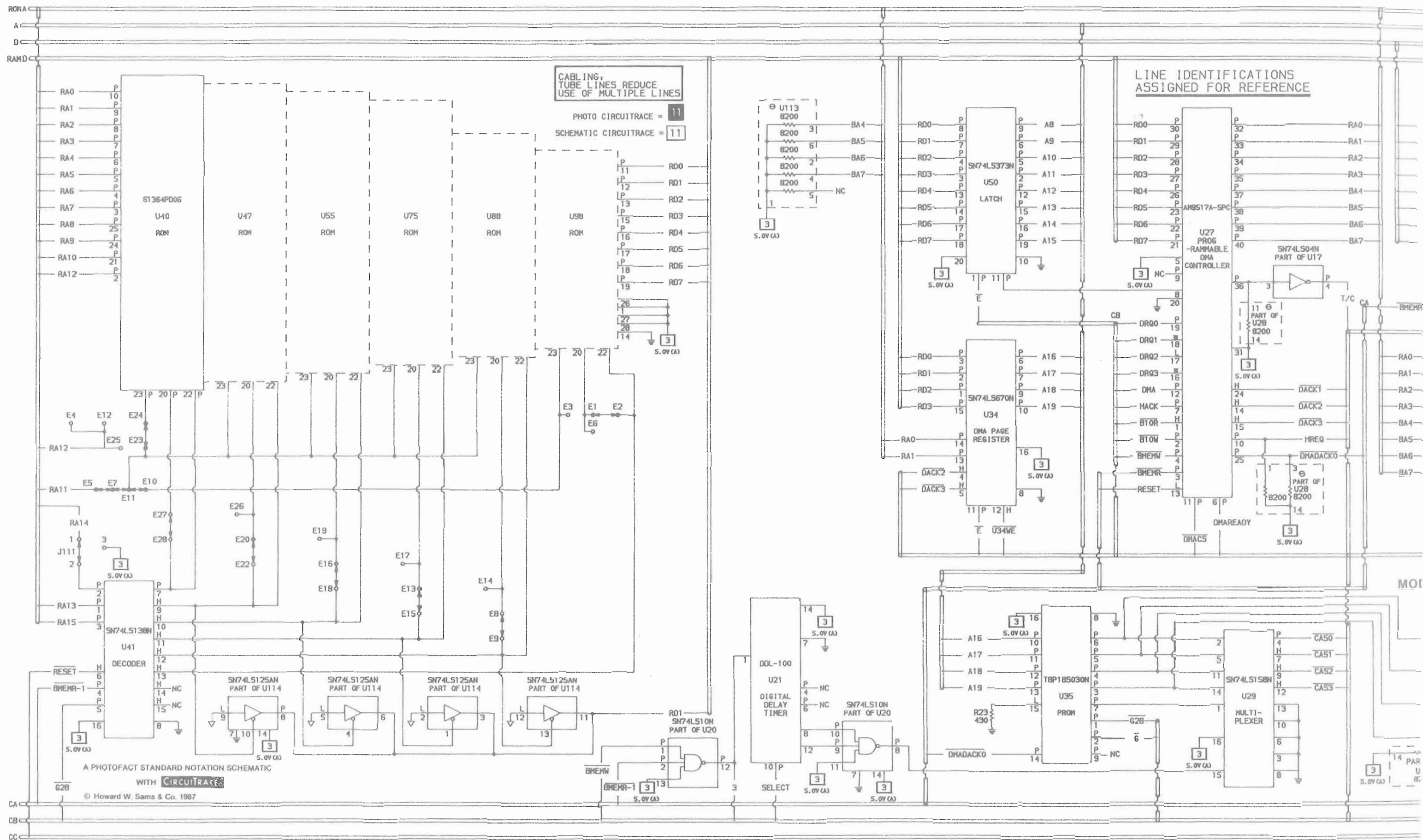
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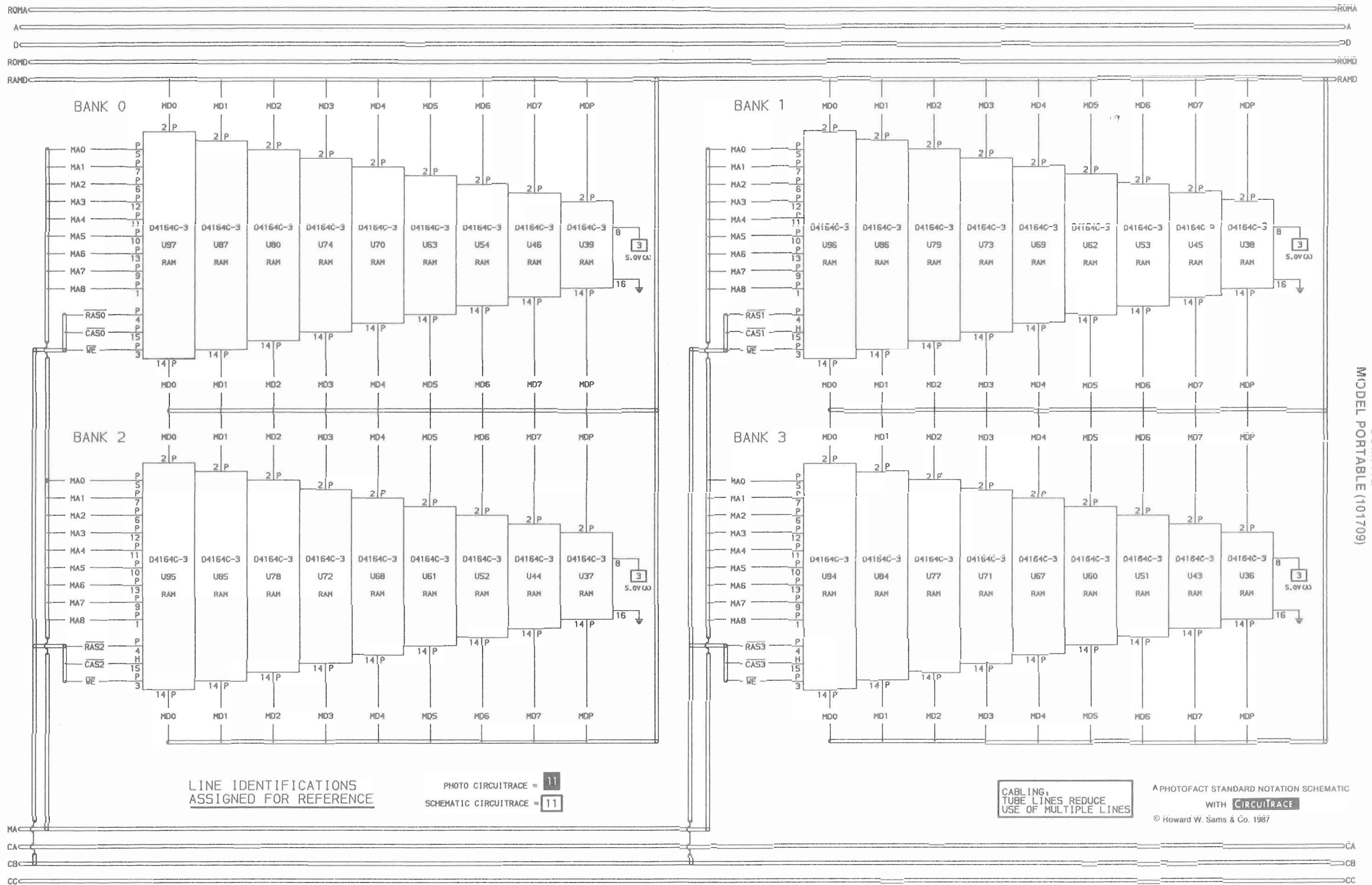
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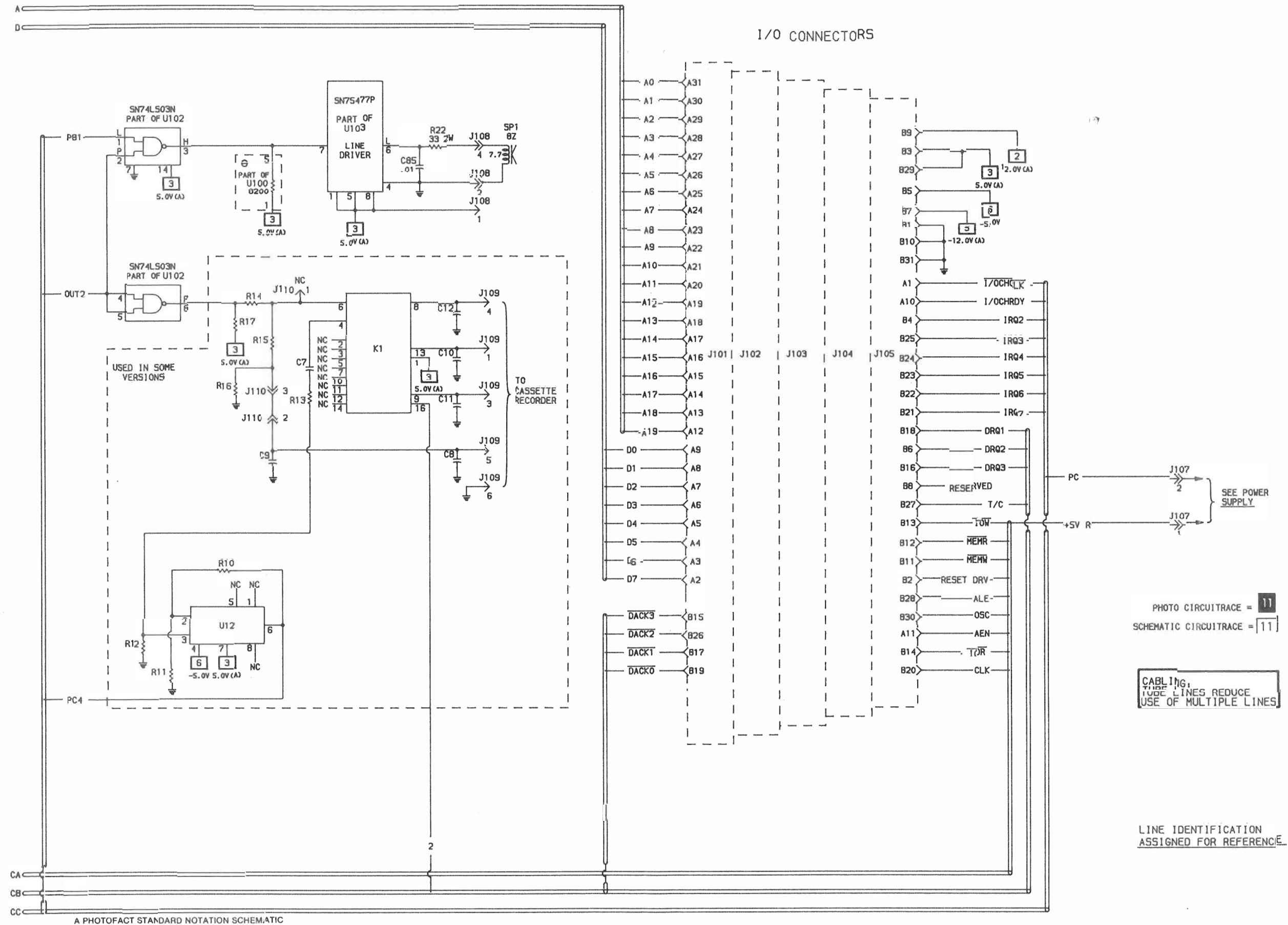




CABLING,
TUBE LINES REDUCE
USE OF MULTIPLE LINES

A PHOTOFAC STANDARD NOTATION SCHEMATIC
WITH **CIRCUITRACE**
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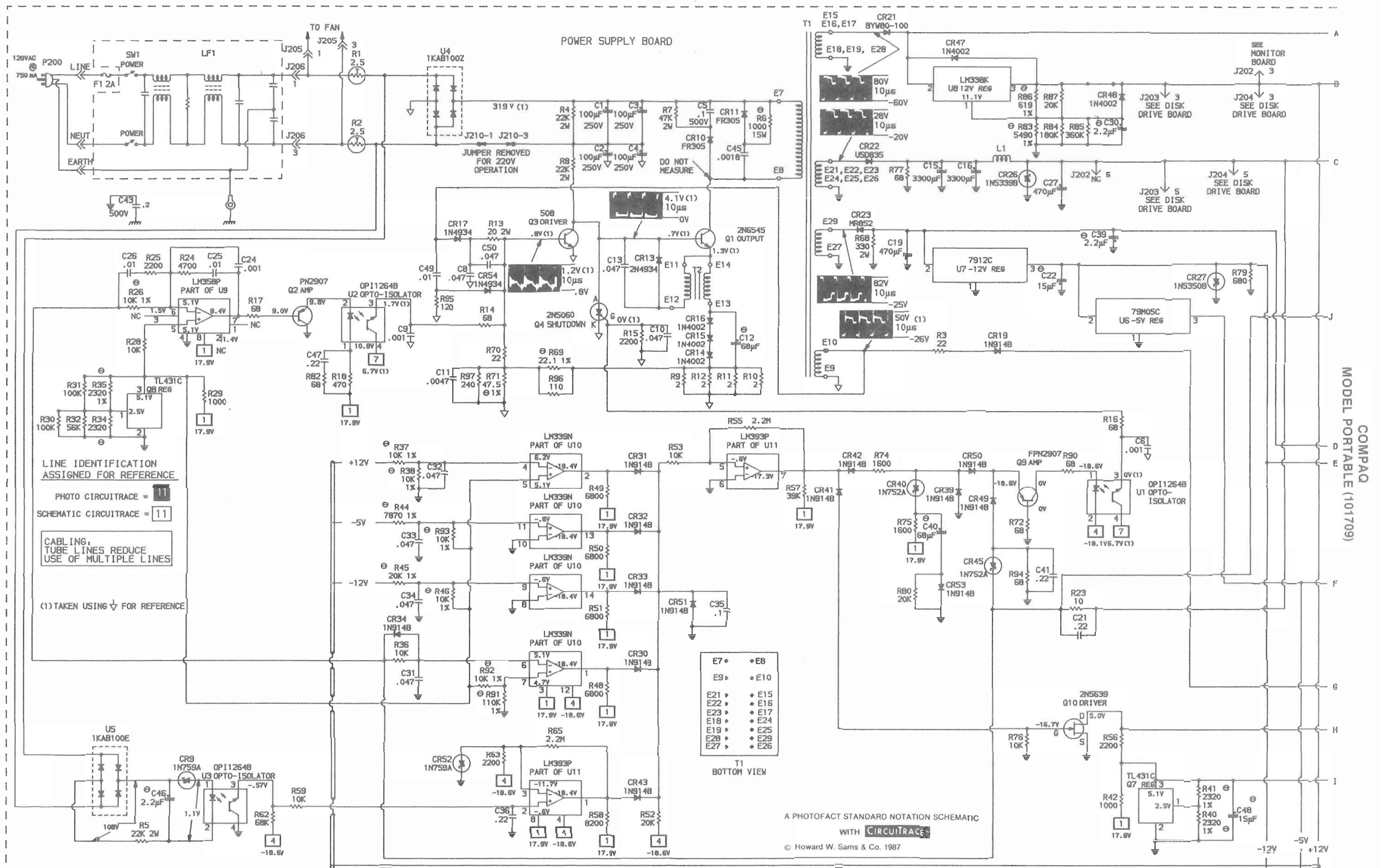


CS15
 MODEL PORTABLE (101709)

PHOTO CIRCUITTRACE = 11
 SCHEMATIC CIRCUITTRACE = 11

CABLING:
 THICK LINES REDUCE
 USE OF MULTIPLE LINES

LINE IDENTIFICATION
 ASSIGNED FOR REFERENCE

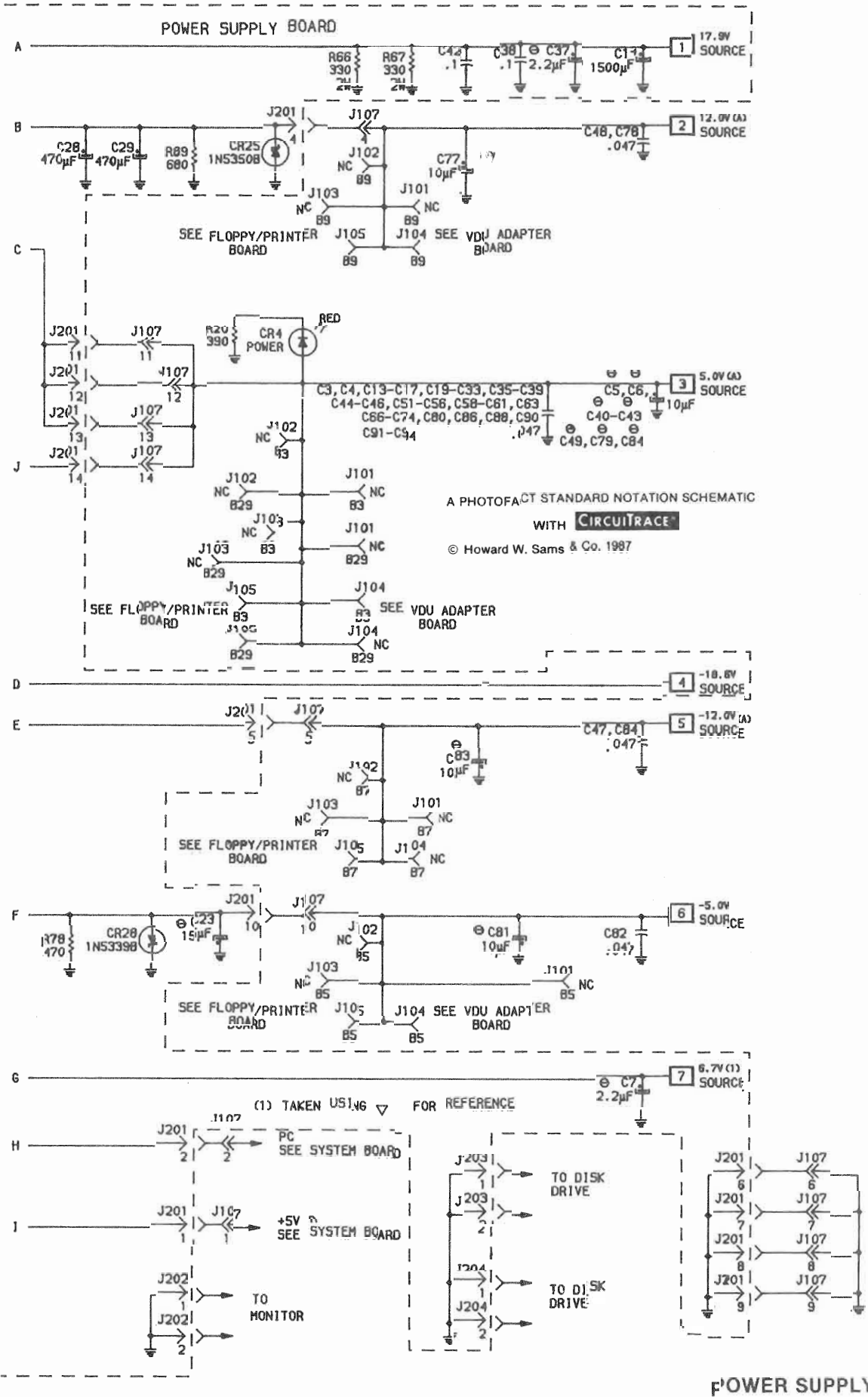


POWER SUPPLY

POWER SUPPLY

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.

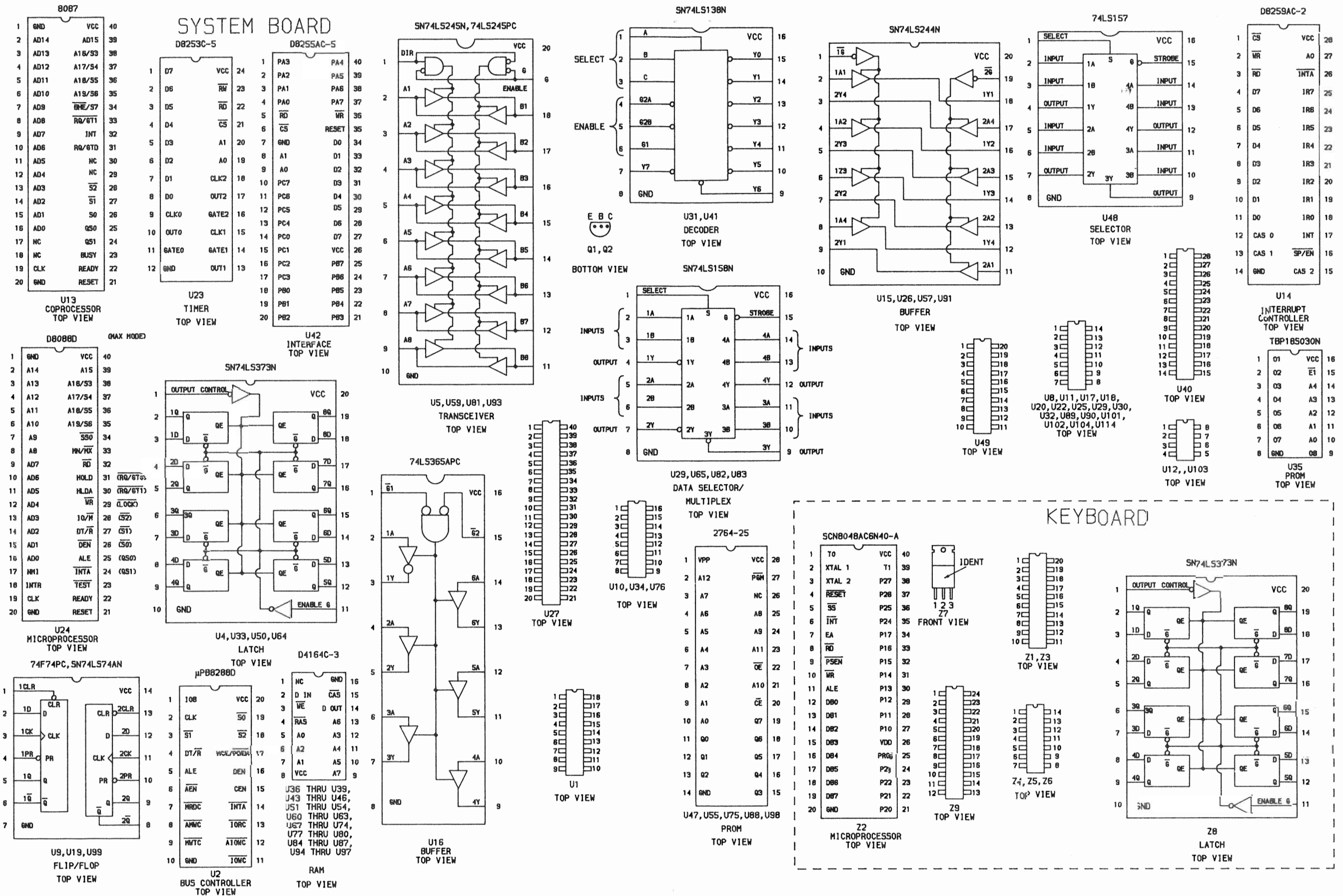


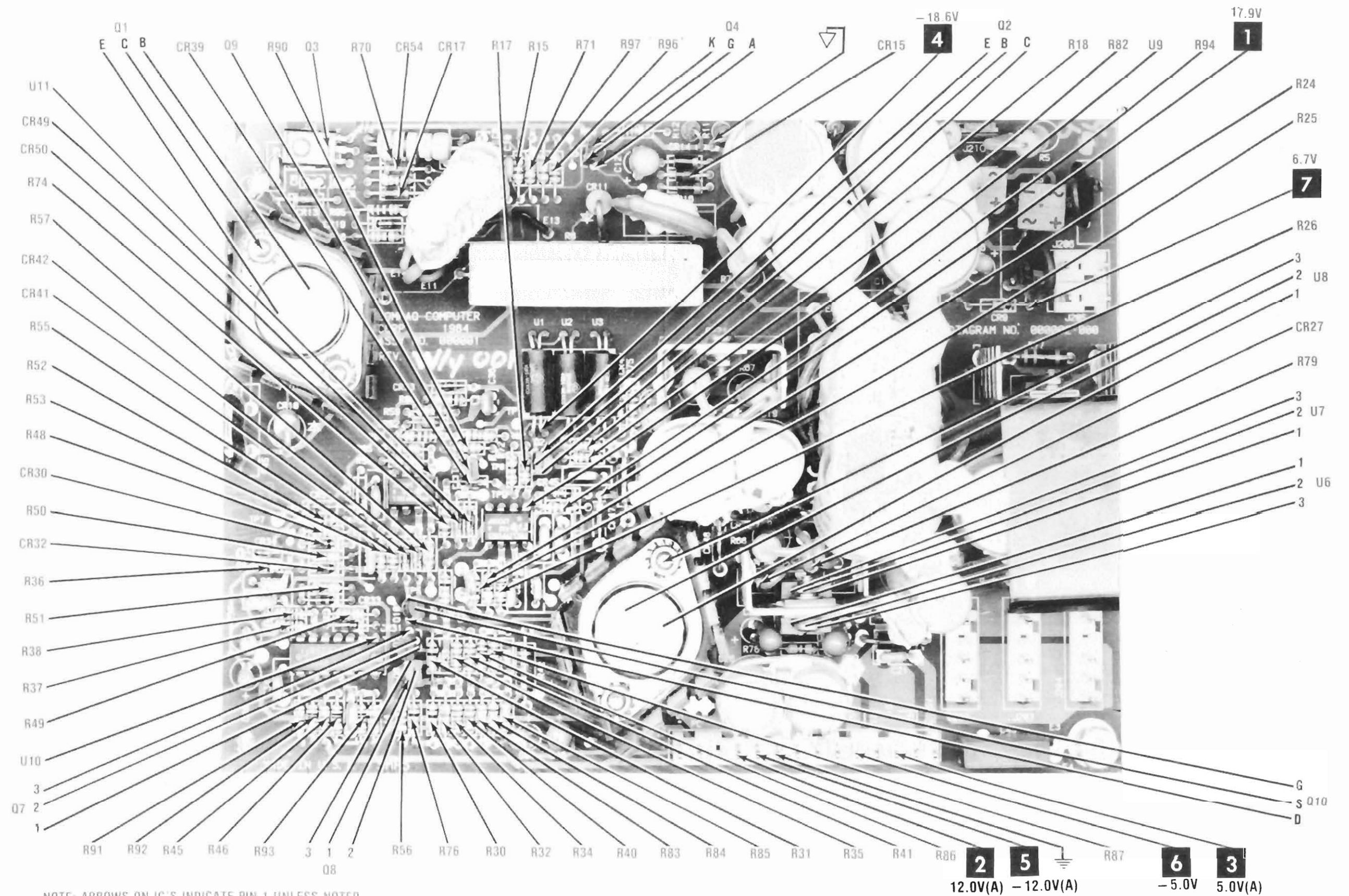
CSCS15
MODEL PORTABLE (101709)

COMPACT

POWER SUPPLY

IC PINOUTS & TERMINAL GUIDES

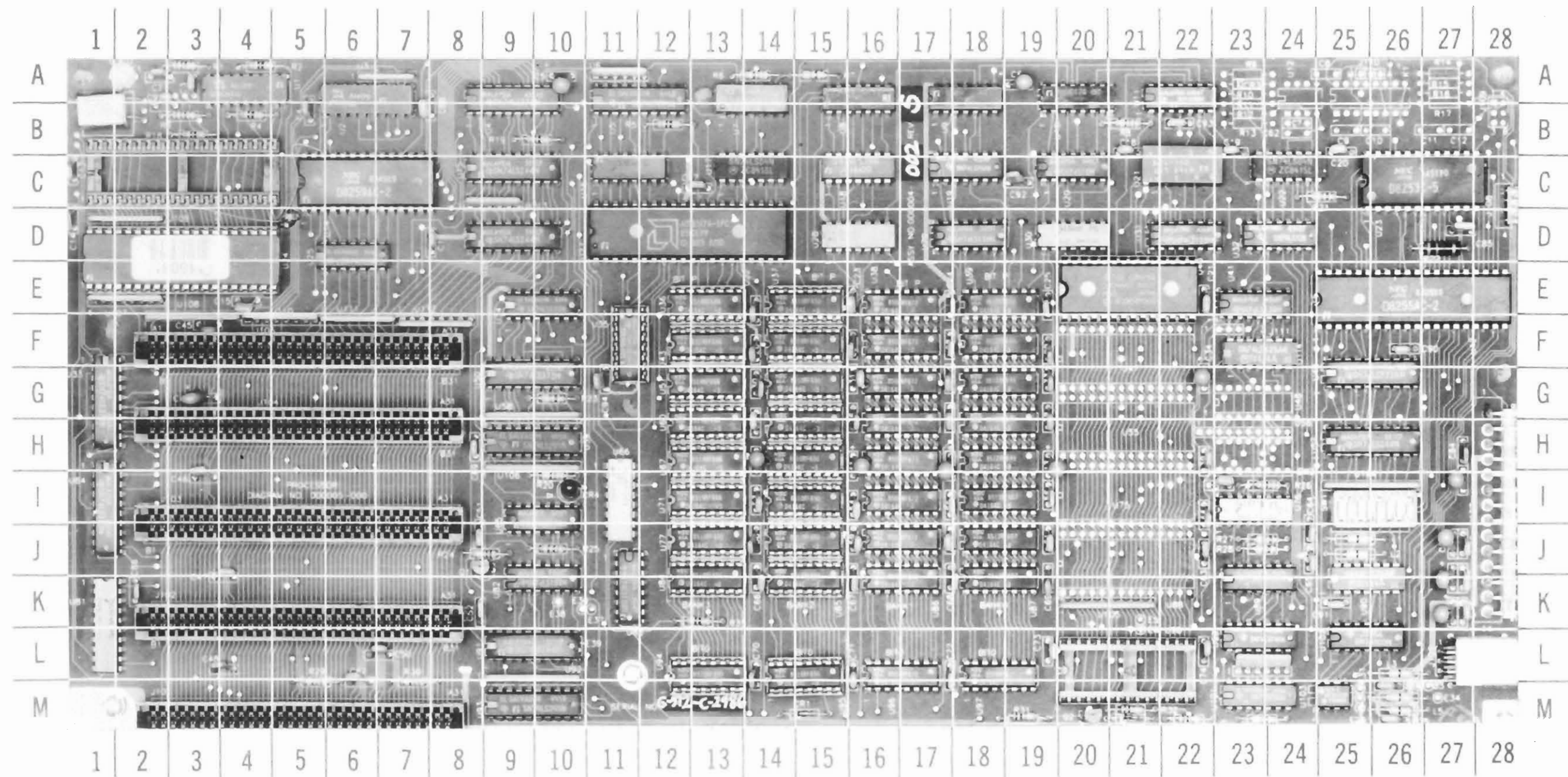




POWER SUPPLY BOARD

A Howard W. Sams CIRCUITRACE Photo

POWER SUPPLY BOARD



COMPAQ
MODEL PORTABLE (101709)

LINE DEFINITIONS

2GB	Chip Select, Select ROM	HREQ	Hold Request 8237
3	Row Address Strobe Enable	INTA	Interrupt Acknowledge
A0 THRU A19	Address	INTR	Interrupt Request
AA8 THRU AA19	Address Data	INTR-1	Interrupt
AD0 THRU AD7	Data	IOR	Input/Output Read
AEN	Address Enable	IOW	Input/Output Write
AEN-1	Command Enable	IRQ1	Interrupt Request, Keyboard
AEN1	Processor Ready	IRQ2 THRU IRQ7	Interrupt Request Priority 2 thru 7
ALE	Address Latch Enable	LOCK	Locks Out Other Busmasters While Active Low
BIOR	Buffered Input/Output Read	MEMR	Memory Read
BIOW	Input Output Write	MEMW	Memory Write
BMEMR	Memory Read	MD0 THRU MD7	RAM Data Bits 0 thru 7
BMEMW	Memory Write	MDP	Memory Data Parity
CAS0,1,2,3	Column Address Strobe Memory Banks 0,1,2,3	NMI	Non-Maskable Interrupt
CEN	Chip Enable	OSC	Oscillator
CLK	Clock	PA0 THRU PA7	Keyboard Data, Bits 0 thru 7
CLK-1	Timer Clock	PB1	Speaker On
CPUCLK	Clock	PB5	Enable Exterior Error
D0 THRU D7	Data	PB6,PB7	Port B, Bits 6 and 7
DACK1,DACK2,DACK3	Direct Memory Acknowledge Lines 1,2,3	PC	Power Good, Reset
DEN	Data Enable	PPICS	Select Peripheral Interface 8255
DMACLK	Direct Memory Access (DMA) Clock	QS0,QS1	Queue Status, CPU Tracking
DMACS	Select DMA Controller 8237	RA0 THRU RA12	ROM Address 1 thru 12
DMADACKO	Direct Memory Acknowledge 8237	RAS0,1,2,3	Row Address Strobe Memory Banks 0,1,2,3
DMAREADY	DMA Ready 8237	RD0 THRU RD7	ROM Data Bits 0 thru 7
DRQ0	Refresh Pulse Request	RDY1	Direct Memory Access Ready
DRQ1,DRQ2,DRQ3	Direct Memory Access Request Lines 1, 2 and 3	READY	Ready
DT/R	Data Transmit and Receive	RESET	Reset
G	Chip Select, Select RAM	RESET DRV	Reset Drive
HACK	Hold Acknowledge 8237	RQ/GT	Request Grant, Bus Control
		S0,S1,S2	Status Input
		T/C	Transmitting/Complete
		U14CS	Chip Select, Interrupt Controller 8259
		WE	Write Enable

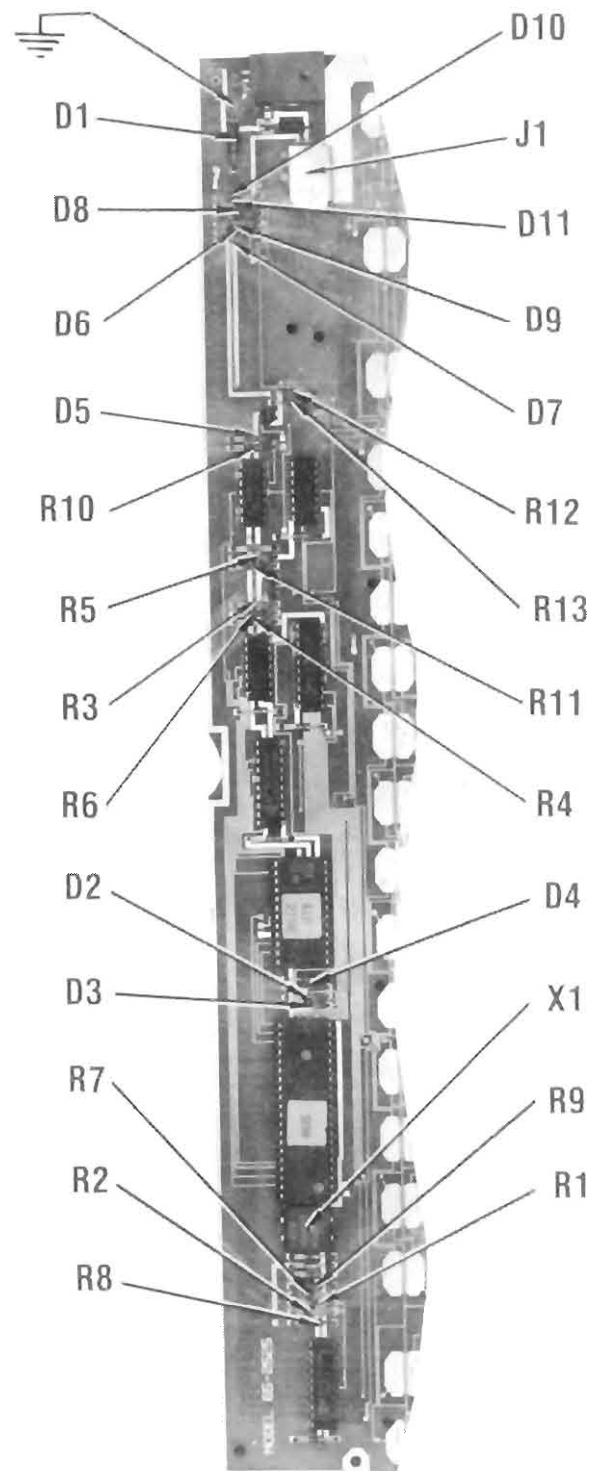
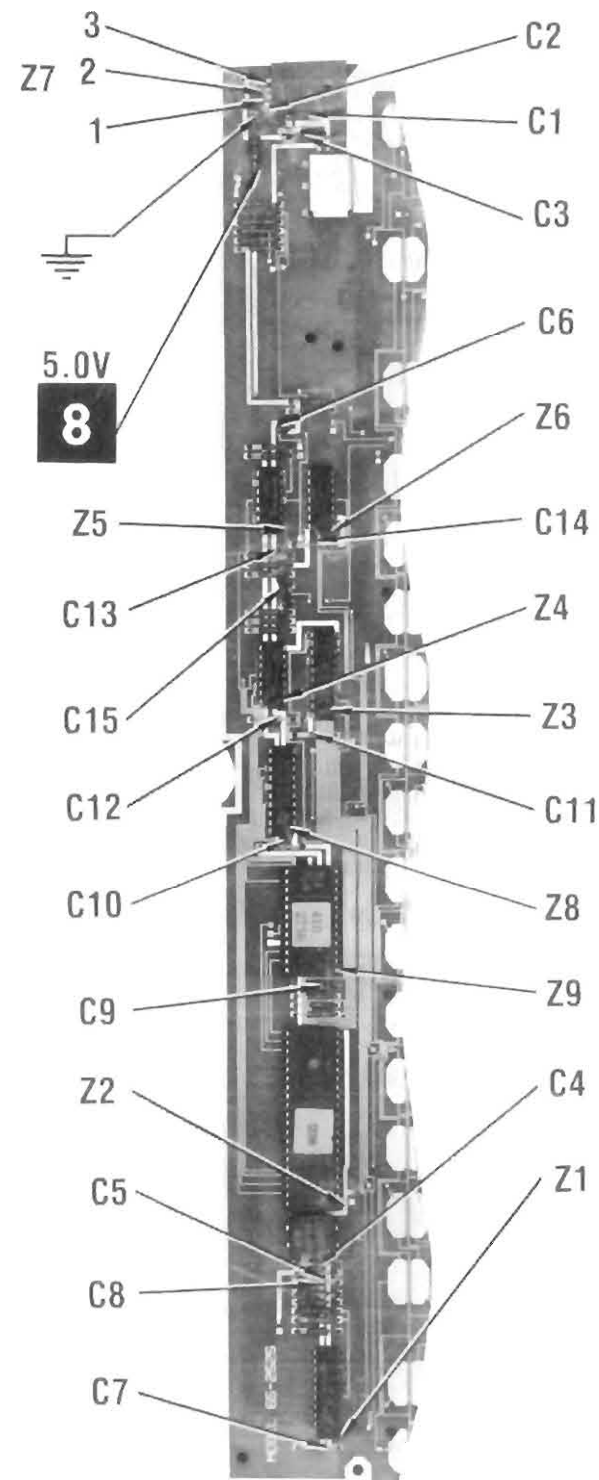
SYSTEM BOARD GridTrace LOCATION GUIDE

C1	A-2	C83	I-27	U19	C-18	U100	L-23
C2	A-2	C84	H-27	U20	C-20	U101	M-23
C3	A-3	C85	D-27	U21	C-22	U102	L-25
C4	B-5	C86	K-2	U22	C-24	U103	M-25
C6	A-19	C87	L-6	U23	C-27	U104	I-26
C13	C-1	C88	B-7	U24	D-3	U105	K-20
C14	D-1	C89	H-8	U25	D-6	U106	H-9
C15	E-4	C90	F-26	U26	D-9	U107	E-2
C16	D-8	C91	K-25	U27	D-12	U108	F-3
C17	C-13	C92	C-19	U28	D-16	U109	D-2
C18	B-21	C93	B-22	U29	D-18	U110	F-9
C19	B-23	C94	G-11	U30	D-20	U111	F-6
C20	B-25	C95	A-2	U31	D-22	U112	F-8
C21	E-22	CR1	M-15	U32	D-24	U113	C-9
C22	E-14	CR2	M-21	U33	G-1	U114	F-23
C23	E-16	CR4	I-10	U34	E-10		
C24	E-17	J101	M-5	U35	F-11		
C25	E-19	J102	K-5	U36	E-13		
C26	F-14	J103	J-5	U37	E-15		
C27	F-16	J104	H-5	U38	E-17		
C28	F-17	J105	F-5	U39	E-18		
C29	F-19	J106	L-28	U40	E-21		
C30	G-14	J107	I-28	U41	E-23		
C31	G-16	J108	C-28	U42	E-26		
C32	G-17	L1	J-25	U43	F-13		
C33	G-17	L2	J-25	U44	F-15		
C34	G-22	L3	L-26	U45	F-17		
C35	H-14	L4	M-26	U46	F-18		
C36	H-16	L5	M-26	U49	G-26		
C37	H-17	Q1	J-9	U50	G-9		
C38	H-19	Q2	M-20	U51	G-13		
C39	H-22	R1	A-3	U52	G-15		
C40	H-14	R2	A-4	U53	G-17		
C41	H-16	R3	B-3	U54	G-18		
C42	H-17	R4	B-4	U57	H-26		
C43	H-19	R5	B-12	U58	G-9		
C44	I-22	R6	A-14	U59	H-9		
C45	F-3	R7	A-15	U60	H-13		
C46	I-3	R8	B-21	U61	H-15		
C47	J-4	R18	B-3	U62	H-17		
C48	L-4	R19	B-10	U63	H-18		
C49	G-3	R20	I-10	U64	I-1		
C50	L-7	R21	C-25	U65	I-10		
C51	J-8	R22	D-27	U66	I-11		
C52	K-8	R23	G-10	U67	H-13		
C53	I-14	R24	J-9	U68	H-15		
C54	I-16	R25	J-10	U69	H-17		
C55	I-17	R26	I-24	U70	H-18		
C56	I-19	R27	J-24	U71	I-13		
C57	I-23	R28	J-24	U72	I-15		
C58	J-14	R29	M-5	U73	I-17		
C59	J-16	R30	M-7	U74	I-18		
C60	J-17	R31	M-19	U76	I-23		
C61	J-19	R32	M-21	U77	J-13		
C63	J-22	R33	M-22	U78	J-15		
C64	J-24	R34	M-23	U79	J-17		
C65	J-24	R35	K-13	U80	J-18		
C66	K-14	SW1	I-26	U81	K-1		
C67	K-16	U1	A-4	U82	K-10		
C68	K-18	U2	A-6	U83	K-11		
C69	K-19	U3	A-7	U84	K-13		
C70	L-14	U4	A-9	U85	K-15		
C71	L-16	U5	A-12	U86	K-17		
C72	L-17	U6	A-11	U87	K-18		
C73	L-19	U7	A-14	U89	K-23		
C74	L-22	U8	A-16	U90	K-25		
C75	M-26	U9	A-18	U91	L-9		
C76	M-26	U10	A-20	U92	L-9		
C77	K-27	U11	A-22	U93	M-9		
C78	K-27	U14	C-6	U94	L-13		
C79	K-27	U15	C-9	U95	L-15		
C80	K-27	U16	C-11	U96	L-17		
C81	J-27	U17	C-14	U97	L-18		
C82	J-27	U18	C-16	U99	L-23		

CSCS15

MODEL PORTABLE (101709)

COMPAQ



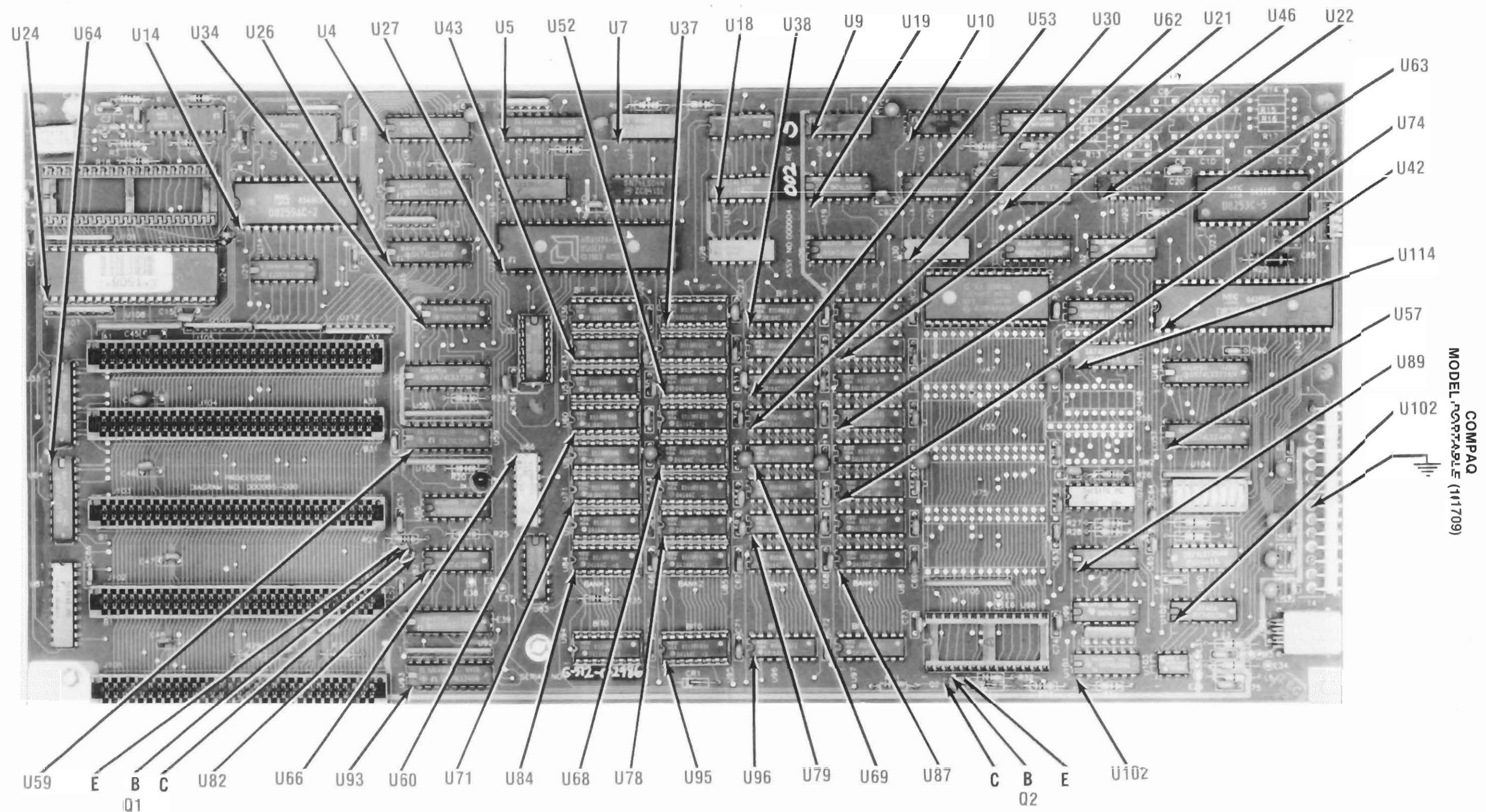
NOTE: ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED

KEYBOARD

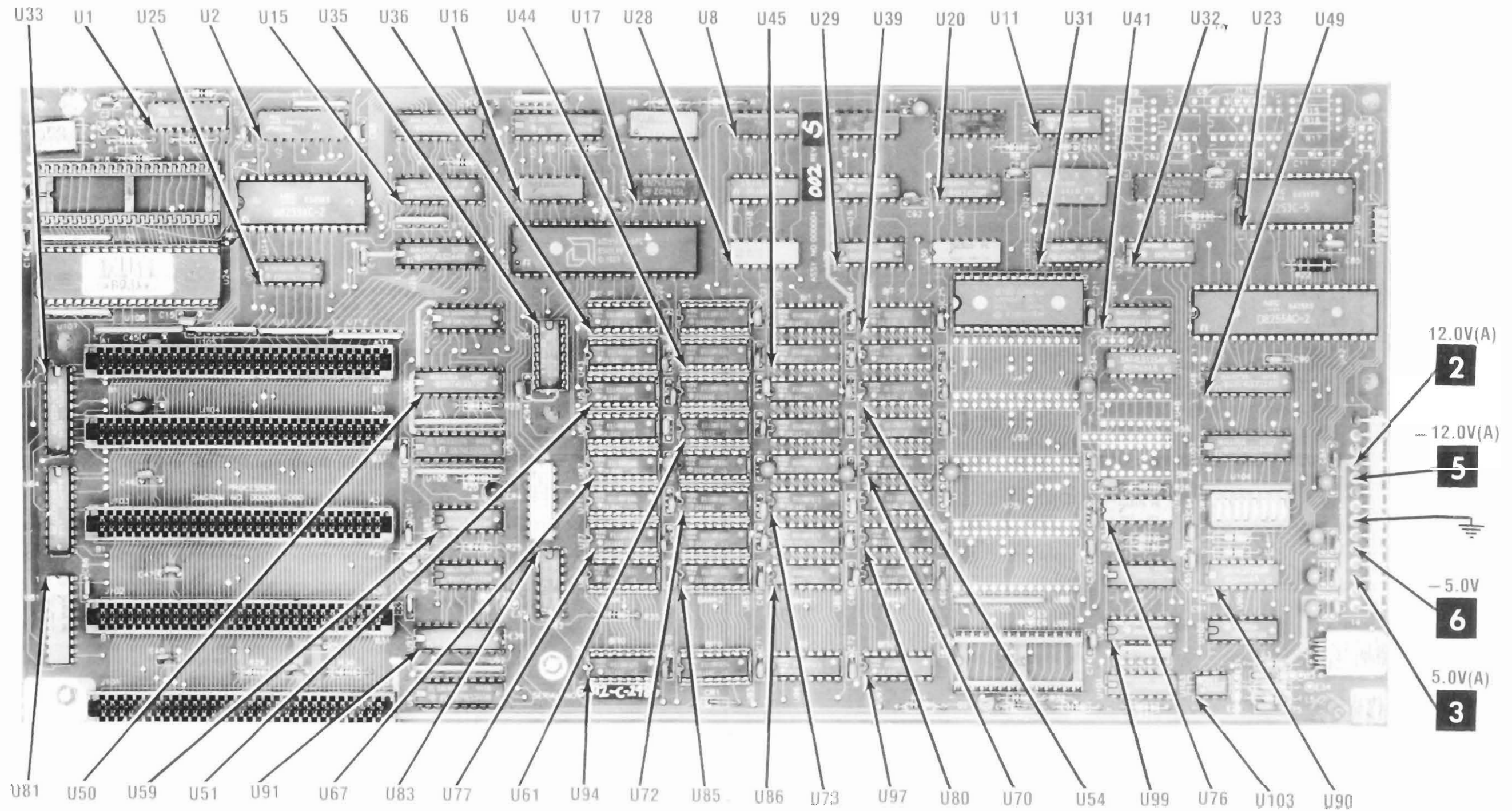
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POWER SUPPLY BOARD GridTrace LOCATION GUIDE

C1	D-21	CR49	L-8	R66	H-14
C2	B-20	CR50	L-7	R67	H-16
C3	D-18	CR51	L-3	R68	M-16
C4	B-16	CR52	I-7	R69	A-12
C5	C-13	CR53	H-7	R70	B-6
C6	B-3	CR54	B-6	R71	B-9
C7	B-2	J201	S-17	R72	K-9
C8	A-8	J202	P-22	R74	L-7
C9	B-4	J203	P-24	R75	I-12
C10	B-9	J204	P-25	R76	R-6
C11	A-8	J205	F-25	R77	G-24
C12	B-13	J206	E-5	R78	P-17
C13	B-2	J210	A-22	R79	M-17
C14	R-14	L1	M-25	R80	I-7
C15	J-26	Q1	F-3	R82	J-11
C16	L-23	Q2	J-10	R83	R-8
C19	K-16	Q3	A-3	R84	R-8
C21	P-20	Q4	A-11	R85	R-9
C22	O-16	Q7	P-6	R86	P-8
C23	O-18	Q8	P-6	R87	P-8
C24	N-9	Q9	K-8	R89	M-18
C25	N-10	Q10	N-6	R90	J-8
C26	N-8	R1	E-24	R91	R-3
C27	N-21	R2	C-25	R92	R-3
C28	Q-16	R3	C-8	R93	R-5
C29	Q-18	R4	A-21	R94	L-10
C30	R-9	R5	A-24	R95	C-5
C31	N-2	R6	E-11	R96	B-10
C32	N-2	R7	E-15	R97	B-10
C33	R-4	R8	D-16	T1	J-20
C34	Q-2	R9	A-18	T2	C-7
C35	M-5	R10	A-17	U1	H-10
C36	I-8	R11	A-15	U2	H-10
C37	O-1	R12	A-14	U3	H-11
C38	K-5	R13	A-6	U4	C-22
C39	P-1	R14	B-6	U5	C-24
C40	I-13	R15	B-9	U6	O-17
C41	M-10	R16	D-5	U7	N-17
C42	M-10	R17	K-9	U8	O-12
C43	S-23	R18	J-11	U9	L-9
C45	J-1	R23	O-20	U10	P-4
C46	E-22	R24	N-8	U11	K-6
C47	K-11	R25	N-8		
C48	R-10	R26	N-9		
C49	B-8	R28	N-7		
CR9	F-23	R29	K-12		
CR10	I-2	R30	R-7		
CR11	C-11	R31	P-7		
CR13	C-3	R32	R-7		
CR14	B-14	R34	R-7		
CR15	B-14	R35	P-7		
CR16	B-14	R36	M-2		
CR17	C-6	R37	O-2		
CR19	D-5	R38	O-2		
CR21	G-15	R40	R-8		
CR22	H-24	R41	P-8		
CR23	L-16	R42	P-9		
CR25	L-16	R44	R-5		
CR26	N-22	R45	R-3		
CR27	N-16	R46	R-4		
CR28	O-20	R48	L-3		
CR30	M-3	R49	O-4		
CR31	O-4	R50	M-3		
CR32	M-4	R51	N-4		
CR33	N-3	R52	L-3		
CR34	M-2	R53	M-5		
CR39	K-8	R55	M-5		
CR40	I-12	R56	R-6		
CR41	M-6	R57	M-6		
CR42	M-6	R58	J-6		
CR43	K-4	R59	I-7		
CR45	K-10	R62	J-8		
CR47	L-11	R63	J-6		
CR48	M-15	R65	J-6		



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



CSCS15

MODEL PORTABLE (101709)

COMPAQ

LOGIC CHART

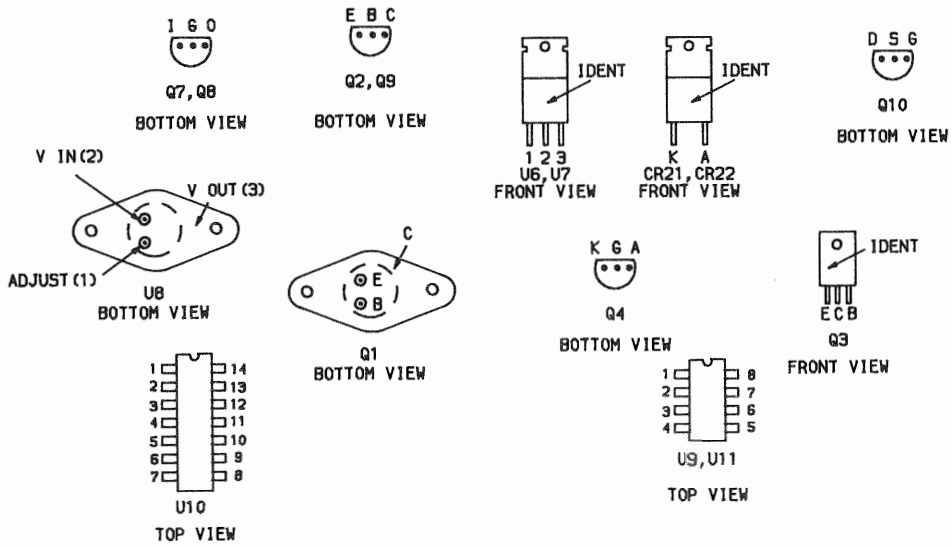
KEYBOARD

PIN NO.	IC Z1	IC Z2	PIN NO.	IC Z2	PI NO.	NIC Z3	IC Z4	IC Z5	IC Z6	IC Z8	IC Z9	PIN NO.	IC Z9	PIN NO.	IC X1
1	(2)	H	21	P	1	P	L	L	H(1)	L	P	21	H	1	P
2	(2)	P	22	P	2	P	*	L	L	P	P	22	P	2	P
3	(2)	P	23	P	3	P	L	H	H(1)	P	P	23	P	3	P
4	(2)	H	24	P	4	L	*	H	H(1)	P	P	24	H	4	P
5	P	H	25	P	5	P	H	H	L	P	P				
6	(2)	H(1)	26	H	6	P	L	L	H(1)	P	P				
7	(2)	H	27	P	7	P	L	L	L	P	P				
8	(2)	H	28	P	8	P	*	L(1)	H	P	P				
9	V(2)	P	29	P	9	P	L	H(1)	*	P	P				
10	L	H	30	P	10	L	L	H	L	L	P				
11	P	P	31	P	11	P	H	L(1)	H	P	P				
12	P	P	32	H(3)	12	P	H(1)	H(1)	*	P	L				
13	H(3)	P	33	P	13	P(3)	L(1)	H	L	P	P				
14	P	P	34	P	14	P	H	H	H	P	P				
15	P	P	35	H(1)	15	P				P	P				
16	P	P	36	H(1)	16	P				P	P				
17	P	P	37	H	17	P				P	P				
18	P	P	38	H	18	P				P	L				
19	P	P	39	L(1)	19	P				P	P				
20	H	L	40	H	20	H				H	P				

- (1) Probe indicates P when a key is pressed.
(2) Pulses appear when a key, that is connected to this pin, is held down. (Use a scope to check for pulses.)
(3) Probe indicates P when a key connected to pin 7 of IC Z1 is pressed.

IC PINOUTS & TERMINAL GUIDES (Continued)

POWER SUPPLY



COMPUTER SELF TESTS AND DIAGNOSTICS

COMPUTER SELF-TEST

The Computer performs a Self-Test every time it is turned On. If no problems are detected, the Computer will beep once and boot up from the Floppy Disk Drive or the Fixed Disk Drive.

If a problem is detected various audio beeps may occur and/or an error code number may appear on the Monitor screen. Use the following charts to determine the area of the problem.

AUDIO	AREA OF PROBLEM
No beep or display.	Power Supply
Beeps continuously.	Power Supply
Repeated short beeps	Power Supply
One long and two short beeps	VDU Adapter

The Self-Test that is in the Computer ROM checks the RAM automatically when the unit is turned On and momentarily displays an error code on the Monitor screen if a defective IC is found.

When a RAM failure occurs, a numeric code will be displayed at the top left corner of the Monitor screen. This code will be four characters followed by 201. The number 201 indicates it is a memory failure. The first number indicates which bank has the bad IC. The third and fourth numbers indicate which row in that bank is defective. Use the following charts to find the defective IC.

Third and Fourth Numbers

ROW	Parity	7	6	5	4	3	2	1	0
Numbers	00	80	40	20	10	08	04	02	01

Example: 3004 201 would be bank 3 row 2 (IC477).

If the third and fourth numbers do not match those given in the chart, substitute the entire nine ICs of that bank and recheck the memory. If an error code still appears, troubleshoot the RAM address decode and chip select circuits.

ERROR CODE	AREA OF PROBLEM
1XX	System Board
20X	Memory
30X	Keyboard
4XX	Printer Adapter (On Disk Drive Adapter)
5XX	VDU Adapter
6XX	Disk Drive
11XX	Asynchronous Communication (COM1)
12XX	Asynchronous Communication (COM2)
17XX	Hard (Fixed) Disk Drive

X = Any number
NOTE: The device tested good if the last two digits of the error code are zeros.

SWITCHES AND JUMPERS

SYSTEM BOARD DIP SWITCH

There is one DIP Switch (SW1) consisting of 8 Switches located on the System Board that must be set according to the equipment that is installed in the Computer. Use the following chart to determine the proper switch settings.

	SW ON	SW1 OFF
Always Off		1
Math Coprocessor (U13) Installed		2
Math Coprocessor (U13) Not Installed	2	
128K Memory Installed	4	3
192K Memory Installed	3	4
256K Memory Installed		3,4
VDU Adapter	6	5
(40 x 25) Model		
VDU Adapter	5	6
(80 x 25) Model)		
One 5 1/4" Disk Drive	7,8	
Two 5 1/4" Disk Drives	8	7

VDU ADAPTER BOARD JUMPERS

Jumper J3	Pins 1 and 2 connected	External Composite Video (J403) and RGB Sync (J404) Disabled. (Can be enabled by Ctrl, Alt and < keys)
	Pins 2 and 3 connected	External Composite Video (J403) and RGB Sync (J404) Enabled.
Jumper J5	Pins 1 and 2 connected	RGB Video (J404) Disabled (Can be enabled by Ctrl, Alt and < keys)
	Pins 2 and 3 connected	RGB Video (J404) Enabled.

See also "Using An External Monitor"

DISASSEMBLY INSTRUCTIONS

DISK DRIVE REMOVAL

Remove all plug-in boards in the five slots on the system board. Disconnect the Power and Disk Drive Cables from the Disk drives. Remove eight screws from the rubber mounts on the top and bottom of the drives. Loosen five screws holding metal plate that covers top of Disk drives and slide plate back and lift off. Carefully lift the Disk Drives out of cabinet.

POWER SUPPLY REMOVAL

Loosen two nuts and three screws holding metal plate that covers the Monitor and Power supply and remove plate. Disconnect AC Power Connector, Fan Connector, and four DC Power Connectors from Power Supply Board. Remove one nut from the lower rear corner of the board. Use a flat blade screwdriver to push back and hold the plastic tab located under upper front corner of board. While holding tab back, slide board back and lift out of cabinet.

KEYBOARD DISASSEMBLY

Remove six screws from bottom of Keyboard case and remove top of case. Remove four screws holding Keyboard to bottom case and lift Keyboard out of case.

TOP AND BOTTOM COVER REMOVAL

Set the unit with CRT face down (handle on top). Use a flat blade screwdriver to pry up five tabs near handle. At the same time slide cover away from handle. Continue moving cover away from handle until tabs on lower end of cover are clear and lift cover off. Both top and bottom covers are removed the same way.

ACCESSING PLUG-IN BOARDS

Remove top cover. Loosen one nut and four screws holding metal cover over plug-in board and lift metal cover off.

SYSTEM BOARD REMOVAL

Disconnect Power Supply, Keyboard, and Speaker Connectors from System Board. Remove all plug-in boards from the five slots on System Board. Set unit with CRT face down (handle on top). Remove four screws holding bracket that supports System Board. Slide board up about 3/8 inch and pull board away from bottom plate until the six plastic mounts are clear. Slide board out of cabinet.

REMOVING MONITOR FROM MAIN CHASSIS

Loosen two nuts and three screws holding metal plate that covers Monitor and Power Supply. Slide plate back and remove. Remove two screws from left rear side of Monitor. Remove two screws from top front and bottom front edge of Monitor. Disconnect Connectors S106 and S107. Lift Monitor out of Main Chassis.

REMOVING MONITOR BOARD FROM MONITOR CHASSIS

Remove one screw holding Monitor Board located at upper rear corner. Disconnect CRT Socket, Yoke Connector (S103), Horizontal Output Transformer Connector (S102), Connectors S106 and S107 and two ground leads. Lift board out of chassis.

CRT REMOVAL

Remove Monitor from Main Chassis and remove Monitor Board. Remove four screws from the front holding CRT to Monitor Chassis and lift CRT out of chassis. **Do not lift CRT by the neck.**

SCHEMATIC NOTES

- Circuitry not used in some versions
- - - Circuitry used in some versions
- ⊕ See parts list
- ⊕ Ground
- ⊕ Chassis
- ▽ Common tie point

Waveforms and voltages taken from ground, unless noted otherwise.

Waveforms taken with triggered scope and Sweep/Time switch in Calibrate position, scope input set for DC coupling on 0 reference voltage waveforms. Switch to AC input to view waveforms after DC reference is measured when necessary. Each waveform is 7 cm. width with DC reference voltage given at the bottom line of each waveform.

Time in μsec. per cm, given with p-p reading at the end of each waveform.

Item numbers in rectangles appear in the alignment/adjustment instructions.

Supply voltages maintained as shown at input.

Voltages measured with digital meter, no signal.

Controls adjusted for normal operation.

Terminal identification may not be found on unit.

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

Value in () used in some versions.

Measurements with switching as shown, unless noted.

Voltage readings, logic readings and waveforms taken with the Computer in Power Up Mode, no keys pressed, no diskette in the Disk Drive (diskette error replace and strike any key when Ready appears on the screen).

LOGIC CHART (Continued)

SYSTEM

PIN NO.	IC U1	IC U2	IC U4	IC U5	IC U7	IC U8	IC U9	IC U10	IC U11	IC U14	PIN NO.	IC U14	PIN NO.	IC U15	IC U16
1	L	L	P	P	P	*	P	H	P	P	21	H	1	P	L
2	P	P	P	H	*	L	P	P	P	P	22	H	2	P	P
3	P	P	P	P	*	H	P	P	P	H	23	H	3	P	P
4	P	P	P	P	*	P	P	P	P	P	24	L	4	P	P
5	P	P	P	P	*	P	P	P	H	P	25	H	5	P	P
6	L	P	P	H	*	P	P	P	P	P	26	P	6	P	P
7	H	P	P	H	P	L	L	L	L	P	27	P	7	P	P
8	P	P	P	H	L	H	P	P	L	P	28	H	8	P	L
9	L	P	P	H	*	H	P	P	H	P			9	P	P
10	L	L	L	L	*	L	H	P	L	P			10	L	P
11	H	P	P	H	*	L	P	P	P	P			11	P	P
12	P	P	P	H	*	H	P	P	P	L			12	P	P
13	L	H	P	H	*	H	P	P	P	L			13	P	H
14	*	P	P	H	L	H	H	H	H	L			14	P	*
15	L	P	P	P						L			15	P	L
16	P	P	P	P						P			16	P	H
17	P	P	P	P						P			17	P	
18	H	P	P	H						P			18	P	
19		P	P	L						L			19	P	
20		H	H	H						H			20	H	

PIN NO.	IC U17	IC U18	IC U19	IC U20	IC U21	IC U22	IC U23	PIN NO.	IC U23	PIN NO.	IC U24	PIN NO.	IC U24	PIN NO.	IC U25	IC U26
1	L	H	H	P	P	P	P	21	P	1	L	21	L	1	P	P
2	H	P	P	P	*	P	P	22	H	2	P	22	P	2	P	P
3	H	H	H	H	*	*	P	23	P	3	P	23	H	3	P	P
4	P	P	H	H	P	L	P	24	H	4	P	24	P	4	P	P
5	*	P	H	H	*	L	P			5	P	25	P	5	P	P
6	L	P	L	L	P	H	P			6	P	26	P	6	P	P
7	L	L	L	L	L	L	P			7	P	27	P	7	L	P
8	P	P	P	P	P	H	P			8	P	28	P	8	P	P
9	P	P	P	P	*	L	P			9	P	29	P	9	*	P
10	P	H	H	P	P	P	P			10	P	30	H	10	*	L
11	P	P	P	H	*	P	H			11	P	31	H	11	L	P
12	L	P	H	P	P	H	L			12	P	32	P	12	L	P
13	*	P	P	H	*	L	P			13	P	33	L	13	P	P
14	H	H	H	H	H	H	H			14	P	34	H	14	L	P
15							P			15	P	35	P	15		P
16							H			16	P	36	P	16		P
17							P			17	L	37	P	17		P
18							P			18	P	38	P	18		P
19							P			19	P	39	P	19		P
20							P			20	L	40	H	20		H

LOGIC CHART (Continued)

SYSTEM

PIN NO.	IC U27	PIN NO.	IC U27	PIN NO.	IC U29	IC U30	IC U31	IC U32	IC U33	IC U34	IC U35	IC U36	IC U37	IC U38	IC U39
1	H	21	P	1	P	P	P	P	P	P	P	P	P	P	P
2	P	22	P	2	P	P	P	P	P	P	P	P	P	P	P
3	P	23	P	3	L	P	P	H	P	P	P	P	P	P	P
4	P	24	H	4	P	P	P	*	P	H	P	P	P	P	P
5	H	25	P	5	P	P	P	*	P	H	P	P	P	P	P
6	P	26	P	6	L	P	P	H	P	P	P	P	P	P	P
7	P	27	P	7	H	L	P	L	P	P	P	P	P	P	P
8	P	28	P	8	L	P	L	H	P	L	L	H	H	H	H
9	P	29	P	9	H	P	P	*	P	P	P	P	P	P	P
10	P	30	P	10	L	P	P	*	L	P	P	P	P	P	P
11	P	31	H	11	P	P	P	H	P	P	P	P	P	P	P
12	P	32	P	12	H	P	P	P	P	H	P	P	P	P	P
13	L	33	P	13	L	P	P	P	P	P	P	P	P	P	P
14	H	34	P	14	P	H	P	H	P	P	P	P	P	P	P
15	H	35	P	15	P		P		P	P	L	H	H	H	P
16	*	36	P	16	H		H		P	H	H	L	L	L	L
17	L	37	P	17					P						
18	*	38	P	18					P						
19	P	39	P	19					P						
20	L	40	P	20					H						

PIN NO.	IC U40	PIN NO.	IC U40	PIN NO.	IC U41	IC U42	PIN NO.	IC U42	PIN NO.	IC U43	IC U44	IC U45	IC U46	IC U49	IC U50	IC U51
1	H	21	P	1	P	L	21	H	1	P	P	P	P	L(1)	P	P
2	P	22	P	2	P	L	22	L	2	P	P	P	P	H	P	P
3	P	23	P	3	P	L	23	L	3	P	P	P	P	H	P	P
4	P	24	P	4	P	L	24	H	4	P	P	P	P	L(1)	P	P
5	P	25	P	5	P	H	25	L	5	P	P	P	P	L(1)	P	P
6	P	26	H	6	H	P	26	H	6	P	P	P	P	L(1)	P	P
7	P	27	H	7	P	L	27	P	7	P	P	P	P	L(1)	P	P
8	P	28	H	8	L	P	28	P	8	L	L	L	L	L(1)	P	P
9	P			9	H	P	29	P	9	P	P	P	P	H(1)	P	P
10	P			10	H	L	30	P	10	P	P	P	P	L	L	P
11	P			11	H	L	31	P	11	P	P	P	P	L(1)	P	P
12	P			12	H	P	32	P	12	P	P	P	P	L(1)	P	P
13	P			13	H	*	33	P	13	P	P	P	P	L(1)	P	P
14	L			14	H	*	34	P	14	P	P	P	P	L(1)	P	P
15	P			15	H	*	35	L	15	H	H	H	P	L(1)	P	H
16	P			16	H	*	36	P	16	L	L	L	L	L(1)	P	L
17	P			17		*	37	L	17					H(1)	P	
18	P			18		H	38	L	18					H	P	
19	P			19		L	39	L	19					H	P	
20	P			20		H	40	L	20					H	H	

GENERAL OPERATING INSTRUCTIONS

POWER ON TEST

A Power On test is automatically performed each time the Computer is turned On. Several diagnostic tests are performed and if a problem is detected, an error code will be momentarily displayed on the Monitor screen. For an explanation of the various error codes, see the "Computer Self-Test" section.

BOOT UP

Insert a bootable diskette into Disk Drive A and turn On the Computer. The Computer will automatically boot up using the diskette in Disk Drive A. If a MS DOS (Microsoft Disk Operating System) diskette is used, the Computer will display the date and time and ask for a new date and time. After the date and time have been entered, the version of DOS will be displayed on the Monitor screen along with an A> which indicates the DOS is running. If Fixed (Hard) Disk Drive is installed, the Computer will boot up from the Fixed Drive if no diskette is inserted in the Floppy Disk Drive.

MS DOS

For a list of file names on the diskette in the current Disk Drive, type DIR and press the ENTER key. To specify Disk Drive that is not current (default), use DIR A: for Disk Drive A or DIR B: for Disk Drive B. If a Fixed (Hard) Disk Drive is installed, use DIR C:.

To return to MS DOS from Basic, type SYSTEM and press the ENTER key.

To load a (System) program from a diskette while in DOS, type the program name and press the ENTER key.

A blank diskette must be formatted before it can be used to save information which is in memory. A formatted diskette must contain a DOS or a Start-up program before the Computer can boot up using that diskette.

To format a blank diskette, insert a diskette containing a "Format Program" into Disk Drive A. Type FORMAT and press the ENTER key. Follow the instructions on the Monitor screen to format the unformatted diskette. NOTE: Formatting a diskette will wipe out any programs previously

placed on the diskette. The Computer automatically defaults to Disk Drive A if the destination Disk Drive is not specified. Be sure to specify the destination Disk Drive of the diskette to be formatted or the original diskette may be ruined by the default action.

BASIC

The manufacturer also supplies Disk Basic on diskette. To load Disk Basic, first boot up DOS. Insert a diskette with a Disk Basic program on it. Type BASIC or BASICA and press the ENTER key to load Disk Basic. To return to DOS from Basic, type SYSTEM and press the ENTER key.

To view a list and the names of programs on a diskette in the current Drive, type FILES and press the ENTER key. Type FILES "B: *.*" and press the ENTER key to list programs from Disk Drive B. Type FILES "A: *.*" to list programs from Disk Drive A if it is not the current (default) drive. Type FILES "C: *.*" to list programs from the Fixed Disk Drive, if it is not the current drive.

To load a program in Disk Basic from the diskette, type LOAD, the program name enclosed in quotes, and press the ENTER key.

To save a program, type SAVE, the program name enclosed in quotes and press the ENTER key.

To load or save a program using Drive B, add a B: in front of the program name with no space between the colon and the program name.

To run a program from Basic mode, type RUN and press the ENTER key. To stop a program, press the CTRL and BREAK (SCROLL LOCK) keys at the same time. NOTE: Some programs will disable or not recognize the CTRL and BREAK keys to prevent the user from stopping the program while it is running.

RESETTING COMPUTER

Press the CTRL, ALT, and DEL keys, all three at the same time, to reset the Computer.

COMPACT MODEL PORTABLE (101709)

TROUBLESHOOTING (Continued)

MICROPROCESSOR (CPU) OPERATION

CPU IC (U24) does not appear to be working. Check clock waveform at pin 19 of IC U24. If waveform is missing, refer to the "Oscillator and Dividers" section of this Troubleshooting guide. If waveform is good, turn Computer Off and check the logic reading at pin 21 of IC U24 while turning Computer On. The reading should be logic High the instant the Computer is turned On then go Low and stay Low. If the reading is not correct, check the Clock Geneator IC (U1).

OSCILLATOR AND DIVIDERS

Check the 14.31818MHz waveform at pin 17 of the Clock Generator IC (U1). If waveform is missing check Crystal Y1, Capacitors C1, C2, and C95 and IC U1. If the frequency is not correct, check the adjustment of Trimmer C1. If the waveform and frequency check good, check for a frequency of 2.386MHz at pin 2, 4.77MHz at pin 8, and 14.31818MHz at pin 12 of IC U1 and check the waveforms at pins 4 and 5 of IC U1. If any of the frequencies or waveforms are not correct, check IC U1.

KEYBOARD

Keyboard does not function. Check the Keyboard Connectors (J106 on the System board and J1 on the Keyboard) for good connections and check the Keyboard Cable for broken wires. If the connectors and cable check good, check for 12.0V at pin 5 of Connector J106. If 12.0V is missing, refer to the "Power Supply" section of this "Troubleshooting Guide". If 12.0V is present, check the logic readings at pins 1 and 2 of Connector J106 while turning the Computer On. Pin 1 should pulse momentarily when the Computer is turned On, then go High for about 18 seconds, pulse momentarily again, then go High and stay High. Pin 2 should pulse momentarily when the Computer is turned On, then go Low for about 16 seconds, then go High for about 2 seconds, pulse momentarily, then go High and stay High. If the pulse does not appear at pin 1 or 2 immediately after turn On refer to the "Keyboard Bad" section. If the pulse appears at turn On but does not appear after 18 seconds refer to the "Keyboard Interface Bad" section.

KEYBOARD BAD. Note: The Keyboard does not have to be connected to the Computer for servicing. It will operate by itself with a 12.0V regulated power supply connected to pin 5 of Connector J1 on the Keyboard. Connect the power supply ground lead to the ground end (Anode) of Diode D1. Check the 4.6MHz clock waveform at pin 2 of the Microcomputer IC Z2. If the waveform is missing or the frequency not correct, check Crystal X1, Capacitors C4 and C5 and IC Z2. If the waveform checks good, check the logic reading at pin 4 (Reset pin) of IC Z2 while turning the Computer On. The reading should be Low when the Computer is turned On, then immediately go to logic High and stay High. If the reading is not correct, check the voltage at pin 5 of IC Z5 while turning the Computer On. The voltage should be 0V when the Computer is turned On then gradually go up to 5.0V (takes about 5 seconds). If the voltage reading is not correct, check Capacitor C6, Diode D5, Resistor R10 and IC Z5. If the voltage reading is correct, check Resistor R9 and IC Z5. If the reading is correct at pin 4 of IC Z3, check for pulses at pins 9, 11, 12 thru 19, 21, 22 and 23 of IC Z2. If pulses are missing, check IC's Z2, Z8 and Z9. If pulses are present, check for pulses at pins 35 and 36 of IC Z2 while pressing a key. If pulses are missing, check IC's Z1, Z2 and Z3. If pulses are present, check IC Z6.

KEYBOARD INTERFACE BAD. Disconnect the Keyboard from the Computer. Check for pulses at pins 9 and 10 of the Flip/Flop IC (U76). If pulses are missing at pin 9, check the Clock Generator IC (U1). If pulses are missing at pin 10, check the Timer IC (U23). If pulses are present, check for a pulse at pins 24 and 25 of the Peripheral Interface IC (U42) about 18 seconds after turning the Computer On. If the pulse is missing, check IC U42. If the pulse is present, inject a 10kHz square wave signal (from the TTL output of a Function Generator) to pin 1 of Connector J106. Check for pulses at pin 6 of IC U76. If pulses are missing, check IC U76. If pulses are present, check for pulses at pins 1, 4 thru 7, and 12 thru 17 of IC U49. If pulses are missing, check IC's U49, U90 and U99. If pulses are present, check IC U42.

LOGIC CHART (Continued)

PIN NO.	IC U52	IC U53	IC U54	IC U57	IC U59	IC U60	IC U61	IC U62	IC U63	IC U64	IC U65	IC U67	IC U68	IC U69
1	P	P	P	H	P	P	P	P	P	P	P	P	P	P
2	P	P	P	H	P	P	P	P	P	P	P	P	P	P
3	P	P	P	L	P	P	P	P	P	P	P	P	P	P
4	P	P	P	H	P	P	P	P	P	P	P	P	P	P
5	P	P	P	L	P	P	P	P	P	P	P	P	P	P
6	P	P	P	L	P	P	P	P	P	H	P	P	P	P
7	P	P	P	L	P	P	P	P	P	*	P	P	P	P
8	H	H	H	H	P	H	H	H	H	P	L	H	H	H
9	P	P	P	L	P	P	P	P	P	P	P	P	P	P
10	P	P	P	L	L	P	P	P	P	L	P	P	P	P
11	P	P	P	L	P	P	P	P	P	P	P	P	P	P
12	P	P	P	L	P	P	P	P	P	H	P	P	P	P
13	P	P	P	H	P	P	P	P	P	*	P	P	P	P
14	P	P	P	L	P	P	P	P	P	*	P	P	P	P
15	H	H	P	H	P	H	H	H	P	H	L	H	H	H
16	L	L	L	L	P	L	L	L	L	H	H	L	L	L
17				L	P					*				
18				L	P					P				
19				H	P					P				
20				H	H					H				

PIN NO.	IC U70	IC U71	IC U72	IC U73	IC U74	IC U76	IC U77	IC U78	IC U79	IC U80	IC U81	IC U82	IC U83	IC U84
1	P	P	P	P	P	H	P	P	P	P	P	P	P	P
2	P	P	P	P	P	H(1)	P	P	P	P	P	P	P	P
3	P	P	P	P	P	L(1)	P	P	P	P	P	P	P	P
4	P	P	P	P	P	H(1)	P	P	P	P	P	P	P	P
5	P	P	P	P	P	H(1)	P	P	P	P	P	P	*	P
6	P	P	P	P	P	L(1)	P	P	P	P	P	P	*	P
7	P	P	P	P	P	H(1)	P	P	P	P	P	P	L	P
8	H	H	H	H	H	L	H	H	H	H	P	L	L	H
9	P	P	P	P	P	P	P	P	P	P	P	P	L	P
10	P	P	P	P	P	P	P	P	P	P	L	P	*	P
11	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	L	P
13	P	P	P	P	P	*	P	P	P	P	P	P	*	P
14	P	P	P	P	P	L	P	P	P	P	P	P	*	P
15	P	H	H	H	P	H	H	H	H	P	P	L	L	H
16	L	L	L	L	L	H	L	L	L	L	P	H	H	L
17											P			
18											P			
19											P			
20											H			

LOGIC CHART (Continued)

PIN NO.	IC U85	IC U86	IC U87	IC U89	IC U90	IC U91	IC U93	IC U94	IC U95	IC U96	IC U97	IC U99	IC U101	IC U102
1	P	P	P	P	L	L	P	P	P	P	P	H(1)	P	L
2	P	P	P	L	H	P	P	P	P	P	P	L(1)	P	P
3	P	P	P	P	H	P	P	P	P	P	P	L(1)	*	H
4	P	P	P	P	P	P	P	P	P	P	P	H(1)	P	P
5	P	P	P	P	P	P	P	P	P	P	P	L(1)	P	P
6	P	P	P	P	P	P	P	P	P	P	P	H(1)	P	P
7	P	P	P	L	L	P	P	P	P	P	P	L	L	L
8	H	H	H	P	H(1)	P	P	H	H	H	H	H	P	P
9	P	P	P	P	L	P	P	P	P	P	P	L	P	P
10	P	P	P	P	H(1)	L	L	P	P	P	P	H	P	P
11	P	P	P	P	H(1)	P	P	P	P	P	P	P	P	L
12	P	P	P	H	L	P	P	P	P	P	P	P	P	H
13	P	P	P	L	H	P	P	P	P	P	P	H	P	H
14	P	P	P	H	H	P	P	P	P	P	P	H	H	H
15	H	H	P			P	P	H	H	H	H			
16	L	L	L			P	P	L	L	L	L			
17						P	P							
18						P	P							
19						L	P							
20						H	H							

PIN NO.	IC U103	IC U114	IC Y1
1	L	H	P
2	H	L	L
3	*	P	P
4	L	H	
5	H	L	
6	L	P	
7	H	L	
8	H	P	
9		L	
10		H	
11		P	
12		L	
13		H	
14		H	

(1) Pulses appear when a key that is connected to this pin is held down. Use scope to check for pulses.

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 Name	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	HV-44	HP200	
VOM/DMM			
Accessory probes	PR-28(HV)		
TEMPERATURE PROBE	TP-28,TP-30		
CRT ANALYZER	467,470	CR70	
DIGITAL IC TESTER	560,550,552		

TROUBLESHOOTING

POWER SUPPLY

Note: Use an Isolation Transformer with a step down control when servicing power supply. Disconnect Connectors from Computer and Disk Drives to avoid possible damage to the Computer and Disk Drives from high voltages that may be produced while servicing Power Supply. Connect a load to 5V source (pins 4, 5 and 6 of Plug P9) and the 12V source (pin 3 of Plug P8). Two #1133 6 volt lamps in parallel may be used as a load for the 5V source and a #93 12 volt lamp may be used as a load for the 12V source. If lamps are used as a load use caution to avoid possible burns as lamps get very hot.

The Power Supply has an automatic power surge protection circuit to protect the Computer from power surges. If the Power Supply is turned On immediately after turning it Off, the power supply will enter shutdown condition. Wait 15 seconds after turning the Computer Off before tuning it back On. The Power Supply produces a PWR GOOD signal (5V) at pin 2 of Connector J201 which will go logic Low (0V) if source voltages drop too low for Computer to continue processing. The PWR GOOD signal disables the clock at pin 11 of Clock Generator IC (U1) on the System Board when it goes logic Low. If PWR GOOD signal is low and source voltages check normal, check voltages and components associated with Driver Transistor (Q10).

The Power Supply has a Shutdown SCR (Q4) that will shut down Power Supply if a problem is detected. To determine if Power Supply is in shutdown, check voltages on Q4, the voltages should measure about .76V on the Anode and .73V on the Gate of Q4 if Power Supply is in shutdown. The shutdown can be defeated by removing Q4 from circuit. WARNING: Defeating shutdown may allow high voltages and currents to occur that may do further damage to Power Supply. Use a current limiting voltage stepdown AC power supply to supply AC power to the defective Power Supply when shutdown is defeated.

Power supply dead. Check for 120VAC from pin 1 to pin 3 of Connector J206. If 120VAC is missing, check Fuse F1 and Line Filter LF1. If Fuse checks bad, check for a possible shorted Output Transistor (Q1) and check Capacitors C1 thru C4 and Bridge Rectifier U4 for possible shorts. If 120VAC is present at Connector J206, check for 319V at the junction of Bridge Rectifier U4 and Resistor R4. If 319V is absent, check Bridge Rectifier U4. If 319V is present, check the waveform at the Base of Output Transistor (Q1). If the waveform is missing, check for shutdown condition by checking the voltages on SCR Q4 (as mentioned above) and check the voltages and components associated with Transistors Q1 and Q3.

5V and 12V sources are not correct. Check the voltages and components associated with pins 5, 6, and 7 of IC U9, Transistors Q2, Q8, and Opto-Isolator U2.

SOUND

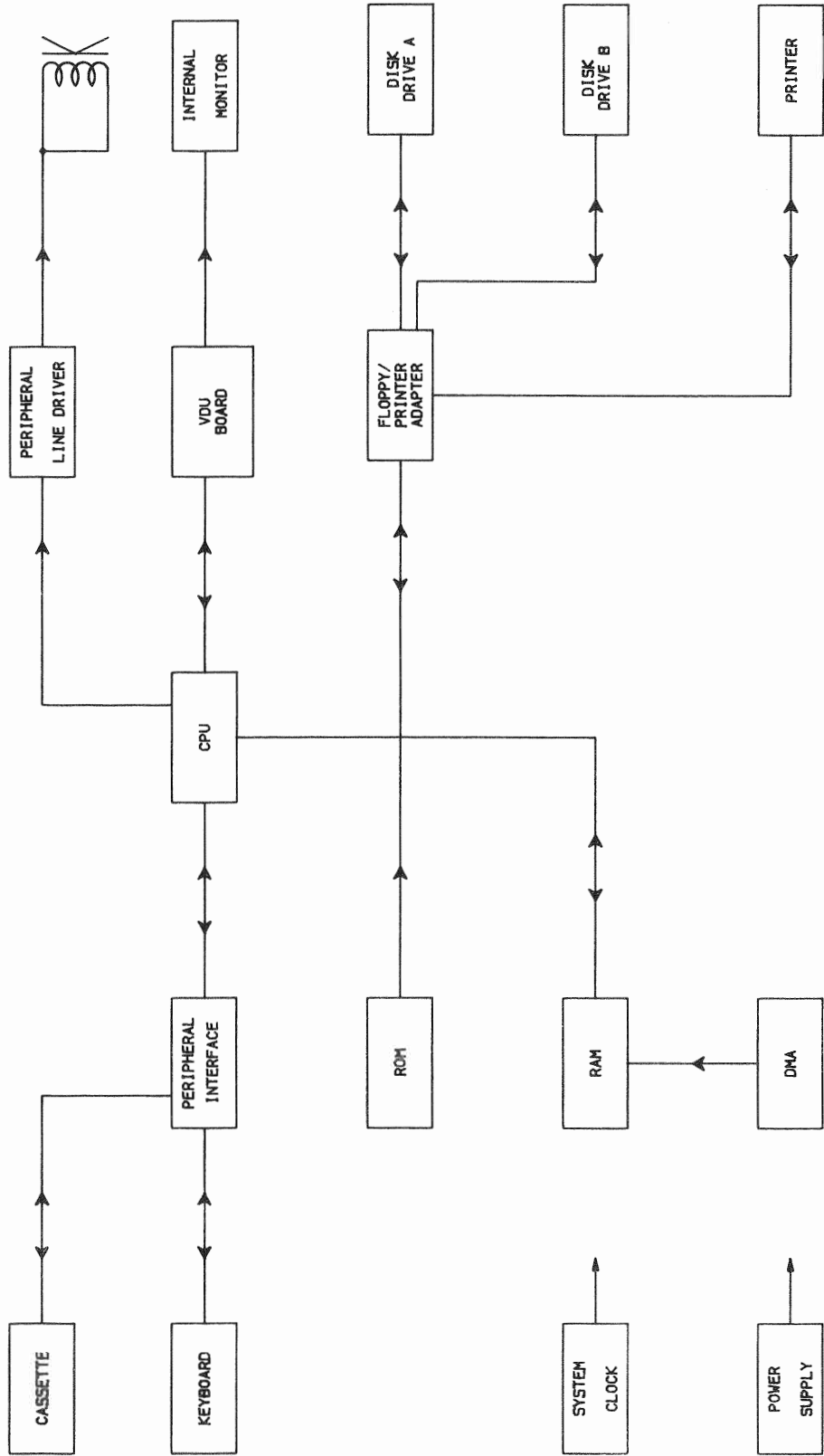
No sound from the internal speaker. Check the Speaker Connector (J108) for good connections and check the Speaker for continuity. If the connector and speaker check good, run the following Basic program:

10 SOUND 200,5
20 FOR T = 1 TO 1000:NEXT T:GOTO 10

While the program is running, check for pulses at pin 19 of IC U42. If pulses are missing, check IC U42. If pulses are present, check for pulses at pin 17 of Timer IC (U23). If pulses are missing, check IC U23. If pulses are present, check for pulses at pin 3 of IC U102. If pulses are missing, check IC U102. If pulses are present, check for pulses at pin 6 of Line Driver IC (U103). If pulses are missing check IC U103 and Capacitor C85. If pulses are present, check Resistor R22.

BLOCK DIAGRAM

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PARTS LIST AND DESCRIPTION

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFG. PART No.	REPLACEMENT DATA				NOTES
			NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	
CR9	POWER SUPPLY 1N759A FR305 1N4934 1N4002		NTE5021A	ECG5021A	SK12A/5021A	103-279-21	
CR10,1			NTE552	ECG552	SK9000/552	103-287	
CR13			NTE116	ECG116	SK3311	212-76-02	
CR14 thru CR16							
CR17	SAME AS CR13 1N914B BYW80-100 USD935 FR302 1N5350B		NTE519	ECG519	SK3100/519	103-131	
CR19							
CR21							
CR22							
CR23	1N5339B SAME AS CR25 SAME AS CR26 SAME AS CR19 SAME AS CR19		NTE5128A	ECG5128A	SK13X/5128A		
CR25			NTE5117A	ECG5117A	SK5X6/5117A		
CR26							
CR27							
CR28	1N752A SAME AS CR19 SAME AS CR19 SAME AS CR40 SAME AS CR14		NTE5011A	ECG5011A	SK5A6/5011A	103-Z9007	
CR30 thru CR34							
CR39							
CR40							
CR41 thru CR43	SAME AS CR9 SAME AS CR19 SAME AS CR13 1KAB100E 79M05C 7912C		NTE961	ECG961	SK3671/961	HE-442-630	
CR45			NTE967	ECG967	SK3673/967	HE-442-675	
CR47 thru CR51							
CR52							

24 PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFR. PART No.	REPLACEMENT DATA				NOTES
			NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	
U8	LM338K LM358P LM339N LM393P 2N6545 PN2907 50B 2N5060 TL431C FPN2907 2N5639		NTE935	ECG935	SK9344/935	221-121 905-420 121-Z9003 185-Z9004 121-Z9003	
U9			NTE928M	ECG928M	SK3692/928M		
U10			NTE834	ECG834	SK3569/834		
U11			NTE943M	ECG943M	SK9278 SK9261		
Q1							
Q2			NTE159	ECG159	SK3466/159		
Q3							
Q4			NTE5400	ECG5400	SK3950/5400		
Q7,8			NTE159	ECG159	SK3466/159		
Q9			NTE467	ECG467	SK9162/467		
Q10							

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFR. PART No.	REPLACEMENT DATA				NOTES
			NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	
D1	KEYBOARD 1N5339 1N4148 1N914B 22-908-03A SCN8048AC6N40-A 22-950-3B 7406N 74LS132N 74125N 78M05C SN74LS373N TMS216JL-45		NTE5117A	ECG5117A	SK5X6/5117A	103-131 103-131 HE-443-698 HE-443-792 221-Z9043 HE-443-867	
D2 thru D5			NTE519	ECG519	SK3100/519		
D6 thru D11							
Z1			NTE7406	ECG7406	SK7406		
Z2			NTE74LS132	ECG74LS132	SK7CT132		
Z3							
Z4			NTE74125	ECG74125	SK74125		
Z5			NTE960	ECG960	SK3591/960		
Z6			NTE74LS373	ECG74LS373	SK7CT373		
Z7			NTE2716##	ECG2716##	SK2716/2716##		
Z8							
Z9							

Requires Programming.

PARTS LIST AND DESCRIPTION (Continued)

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

CAPACITORS

ITEM No.	RATING	MFR. PART No.
C1	SYSTEM BOARD 5-25pF Trimmer	

ITEM No.	RATING	MFR. PART No.

COILS & TRANSFORMERS

ITEM No.	FUNCTION	MFR. PART No.	OTHER IDENTIFICATION	NOTES
LF1 T1 T2	POWER SUPPLY Line Filter Power Coupling			

SPEAKER

ITEM No.	TYPE	REPLACEMENT DATA		NOTES
		MFR. PART No.	QUAM PART No.	
SP1	2 1/4" PM 8 Ohms		22A05Z8	

MISCELLANEOUS

ITEM No.	PART NAME	MFR. PART No.	NOTES
SW1 thru SW82	KEYBOARD Switch		Key
X1	Crystal		4.6MHz
P200	POWER SUPPLY		
SW1	AC Power Cord		Power
U1	Switch		
U2	Opto-isolator		
U3	Opto-isolator		
	Opto-isolator		
CR4	SYSTEM BOARD		
K1	LED		Power, Red
SW1	Relay		Cassette, used in some versions
SW2	DIP Switch		
U7	DIP Switch		
U21	Delay		
Y1	Digital Delay Line		
	Crystal		14.31818MHz

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

PARTS LIST AND DESCRIPTION (Continued)

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

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.	ITEM No.	RATING	MFGR. PART No.
C3	KEYBOARD		C5	SYSTEM BOARD	
C6	4.7 35V 10% TAN		C6	10 16V TAN	
	33 10V TAN		C34	10 16V TAN	
	POWER SUPPLY		C40	10 16V TAN	
C7	2.2 25V 10% TAN		C41	10 16V TAN	
C12	68 16V 10% TAN		C42	10 16V TAN	
C22	15 25V TAN		C43	10 16V TAN	
C23	15 25V TAN		C49	10 16V TAN	
C30	2.2 25V 10% TAN		C77	10 16V TAN	
C37	2.2 25V 10% TAN		C79	10 16V TAN	
C39	2.2 25V 10% TAN		C81	10 16V TAN	
C40	68 10V TAN		C83	10 16V TAN	
C46	2.2 25V 10% TAN				
C48	15 25V 10% TAN				

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	WORKMAN PART No.
R2	KEYBOARD			
	806 1% 1/2W Metal Film			
	POWER SUPPLY			
R1	2.5 Cold NTC			
R2	2.5 Cold NTC			
R6	1000 10% 15W WW			
R26	10K 1% 1/2W Metal Film			
R34	2320 1% 1/2W Metal Film			
R35	2320 1% 1/2W Metal Film			
R37	10K 1% 1/2W Metal Film			
R38	10K 1% 1/2W Metal Film			
R40	2320 1% 1/2W Metal Film			
R41	2320 1% 1/2W Metal Film			
R44	7870 1% 1/2W Metal Film			
R45	20K 1% 1/2W Metal Film			
R46	10K 1% 1/2W Metal Film			
R69	22.1 1% 1/2W Metal Film			
R71	47.5 1% 1/2W Metal Film			
R83	5490 1% 1/2W Metal Film			
R86	619 1% 1/2W Metal Film			
R91	110K 1% 1/2W Metal Film			
R92	10K 1% 1/2W Metal Film			
R93	10K 1% 1/2W Metal Film			
	SYSTEM BOARD			
U3	Resistor Network (1)			
U6	Resistor Network (2)			
U28	Resistor Network (3)			
U58	Resistor Network (4)			
U66	Resistor Network (5)			
U92	Resistor Network (4)			
U100	Resistor Network (2)			
U104	Resistor Network (4)			
U105	Resistor Network (4)			
U106	Resistor Network (4)			
U107	Resistor Network (6)			
U108	Resistor Network (4)			
U109	Resistor Network (6)			
U110	Resistor Network (6)			
U111	Resistor Network (6)			
U112	Resistor Network (6)			
U113	Resistor Network (2)			

PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA				NOTES
			NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	
CR1	1N914	SYSTEM BOARD	NTE519	ECG519	SK3100/519	103-131	Used w/cassette tape drive
CR2	1N914B		NTE519	ECG519	SK3100/519	103-131	
CR3	1N914B		NTE519	ECG519	SK3100/519	103-131	
Q1	2222		NTE123A	ECG123A	SK3444/123A	121-Z9000A	
Q2	2907		NTE159	ECG159	SK3466/159	121-Z9003	
U1	UPB8284AD					HE-443-1011	
U2	UPB8284AD					HE-443-1169	
U4	UPB8288D		NTE74LS373	ECG74LS373	SK7CT373	HE-443-867	
U5	SN74LS373N		NTE74LS245	ECG74LS245	SK7CT245	HE-443-885	
U8	SN74LS245N						
U9	74LS132PC		NTE74LS132	ECG74LS132	SK7CT132	HE-443-792	Used w/cassette tape drive Optional
U10	74F74PC						
U11	74LS175PC		NTE74LS175	ECG74LS175	SK7CT175	HE-443-752	
U12	SN74S08N		NTE74S08	ECG74S08			
U13	8087					HE-44E-1168	
U14	D8259AC-2					HE-443-1012	
U15	SN74LS244N		NTE74LS244	ECG74LS244	SK7CT244	HE-443-791	
U16	74LS365APC		NTE74LS365A	ECG74LS365A	SK7CT365		
U17	SN74LS04N		NTE74LS04	ECG74LS04	SK7CT04	HE-443-755	
U18	SN74LS10N		NTE74LS10	ECG74LS10	SK7CT10	HE-443-797	
U19	SN74LS74AN		NTE74LS74A	ECG74LS74A	SK7CT74	HE-443-730	
U20	SAME AS U18						
U22	SAME AS U17						
U23	D8253C-5						
U24	D8088D						
U25	SN74LS30N						
U26	SAME AS U15		NTE74LS30	ECG74LS30	SK7CT30	HE-443-1066 HE-443-1228 HE-443-732	

PARTS LIST AND DESCRIPTION (Continued)
When ordering parts, state Model, Part Number, and Description
SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA				NOTES
			NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	
U27	AM95117A-5PC		NTE74LS158	ECG74LS158	SK7CT158	HE-443-1170	
U29	SN74LS158N		NTE74LS00	ECG74LS00	SK7CT00	HE-443-728	
U30	74LS00PC		NTE74LS138	ECG74LS138	SK7CT138	HE-443-877	
U31	SN74LS138N		NTE74LS32	ECG74LS32	SK7ACT32	HE-443-875	
U32	SN74LS32N						
U33	SAME AS U4						
U34	SN74LS670N		NTE74LS670	ECG74LS670	SK7CT670	HE-443-1173	
U35	TBP18S03ON			ECG74S288			
U36, 7, 8, 9	D4164C-3		NTE4164	ECG2164		HE-443-970	
U40	1006661REV.C						
U41	61364PD06						
U42	SAME AS U31						
U43	D8255AC-2		NTE8255	ECG8255		HE-443-1021	
U44, 5, 6	SAME AS U36	NTE2764##	ECG2764##			Optional	
U47	2764-25						
U48							
U49	SN74LS322AN			SK74LS322			
U50	SAME AS U4						
U51, 2, 3, 4	SAME AS U36						
U55	SAME AS U47						
U57	SAME AS U15					Optional	
U59	SAME AS U5						
U60, 1, 2, 3	SAME AS U36						
U64	SAME AS U4						
U65	SAME AS U29						
U67 thru	SAME AS U36						
U74							
U75	SAME AS U47						
U76	SAME AS U10						
U77, 8, 9, 80	SAME AS U36						
U81	74LS245PC	NTE74LS245	ECG74LS245		SK7CT245	HE-443-885	
U82, 3	SAME AS U29						

PARTS LIST AND DESCRIPTION (Continued)
When ordering parts, state Model, Part Number, and Description
SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA				NOTES
			NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	
U84, 5, 6, 7 U88 U89 U90 U91	SAME AS U36 SAME AS U47 SN74LS02N SN74LS125AN SAME AS U15		NTE74LS02 NTE74LS125A	ECG74LS02 ECG74LS125A	SK7CT02 SK7CT125	HE-443-779 HE-443-811	Optional
U93 U94, 5, 6, 7 U98 U99 U101	SAME AS U5 SAME AS U36 SAME AS U47 SAME AS U19 SN74LS280N		NTE74LS280 NTE74S03	ECG74LS280 ECG74S03	SK7CT280	HE-443-1001	Optional
U102 U103 U114	SN74S03N SN75477P SAME AS U90						

Programming required.

**DISK DRIVE
FLOPPY DISK/PRINTER ADAPTER**

**KEYBOARD, POWER SUPPLY,
SYSTEM BOARD**

See Folder CSCS15

VDU CONTROLLER BOARD

See Folder CSCS15-A

MONITOR

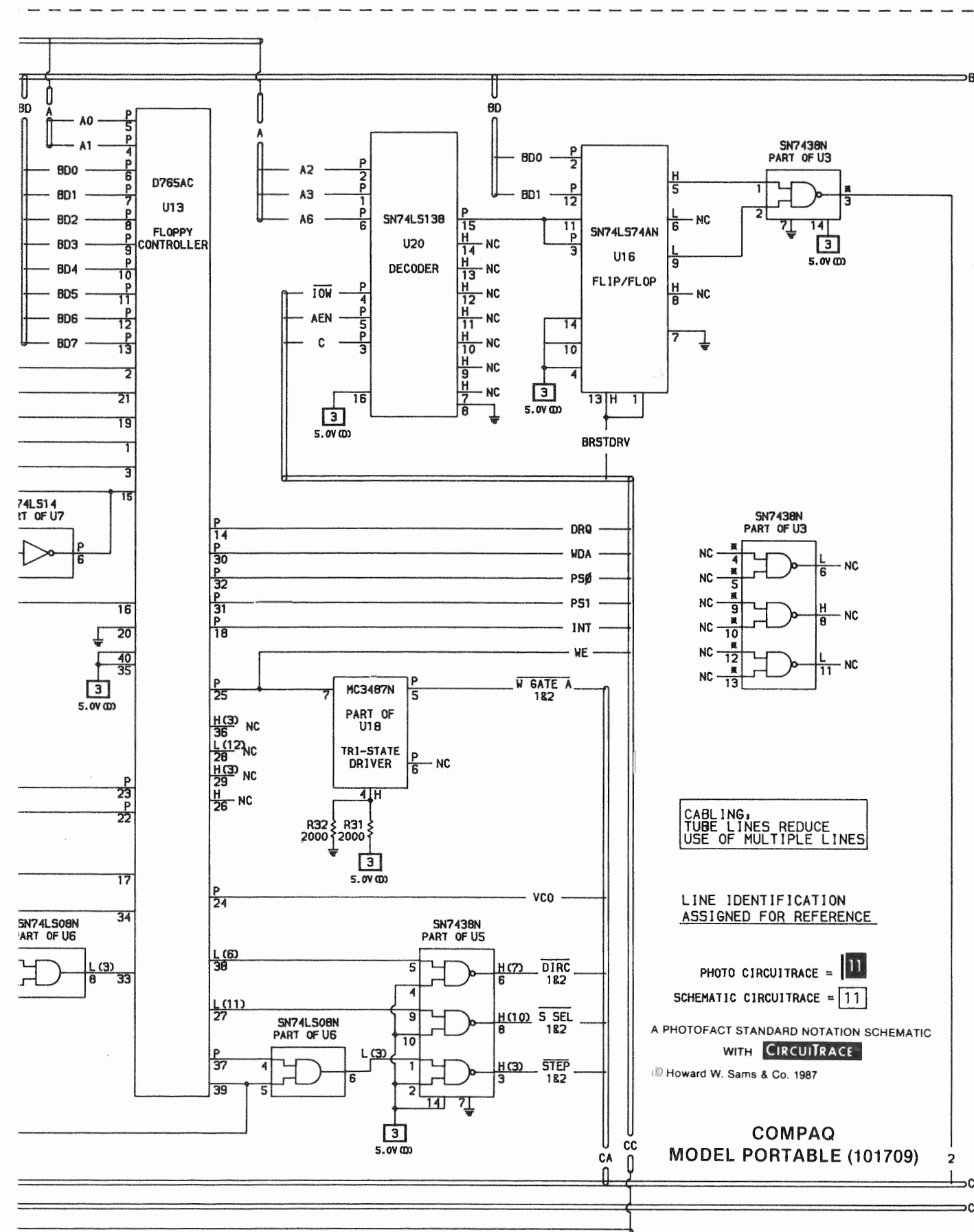
See Folder CSCS15-C

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COMPAQ
MODEL PORTABLE (101709)
CSCS15-B

COMPAQ
MODEL PORTABLE (101709)
CSCS15-B



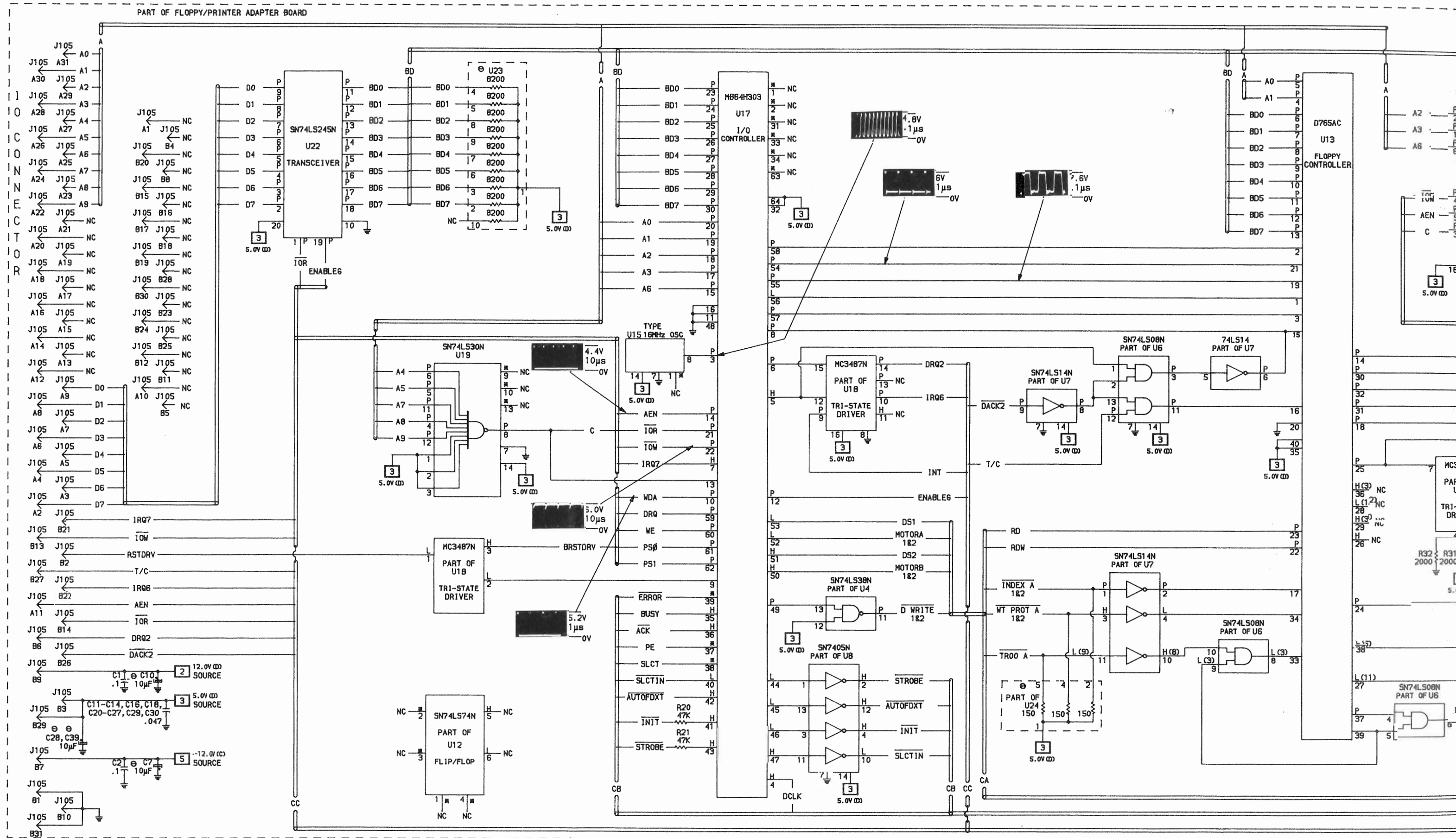
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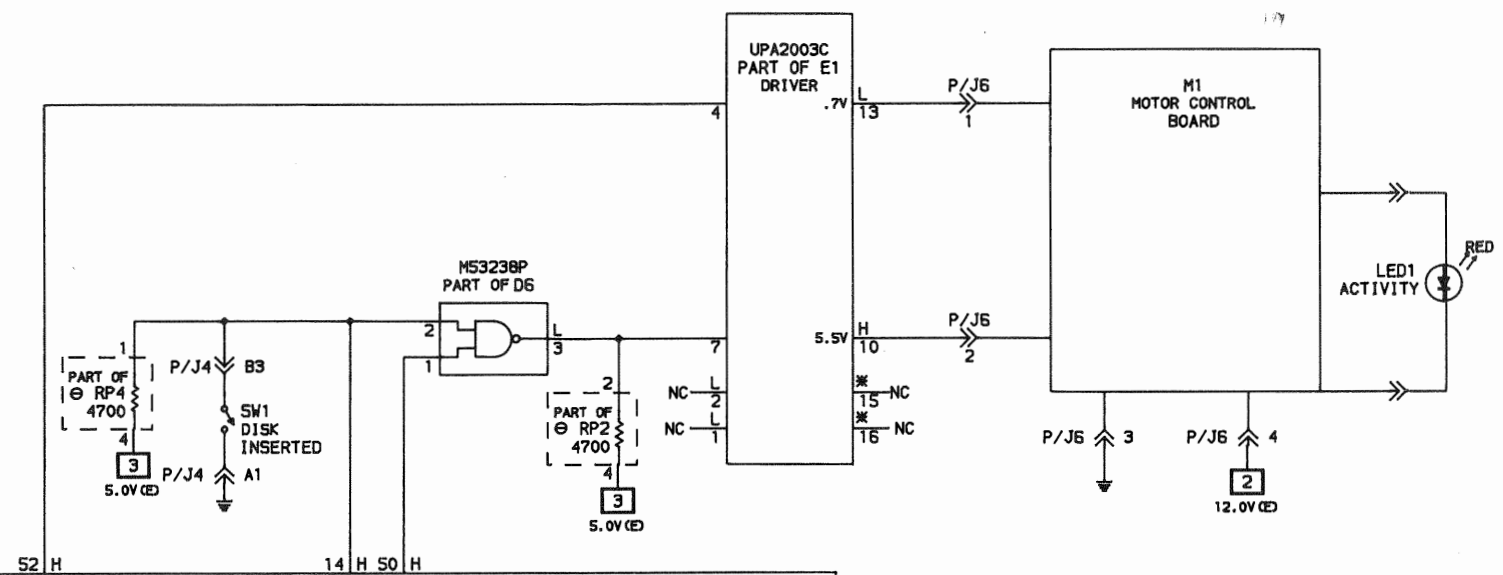
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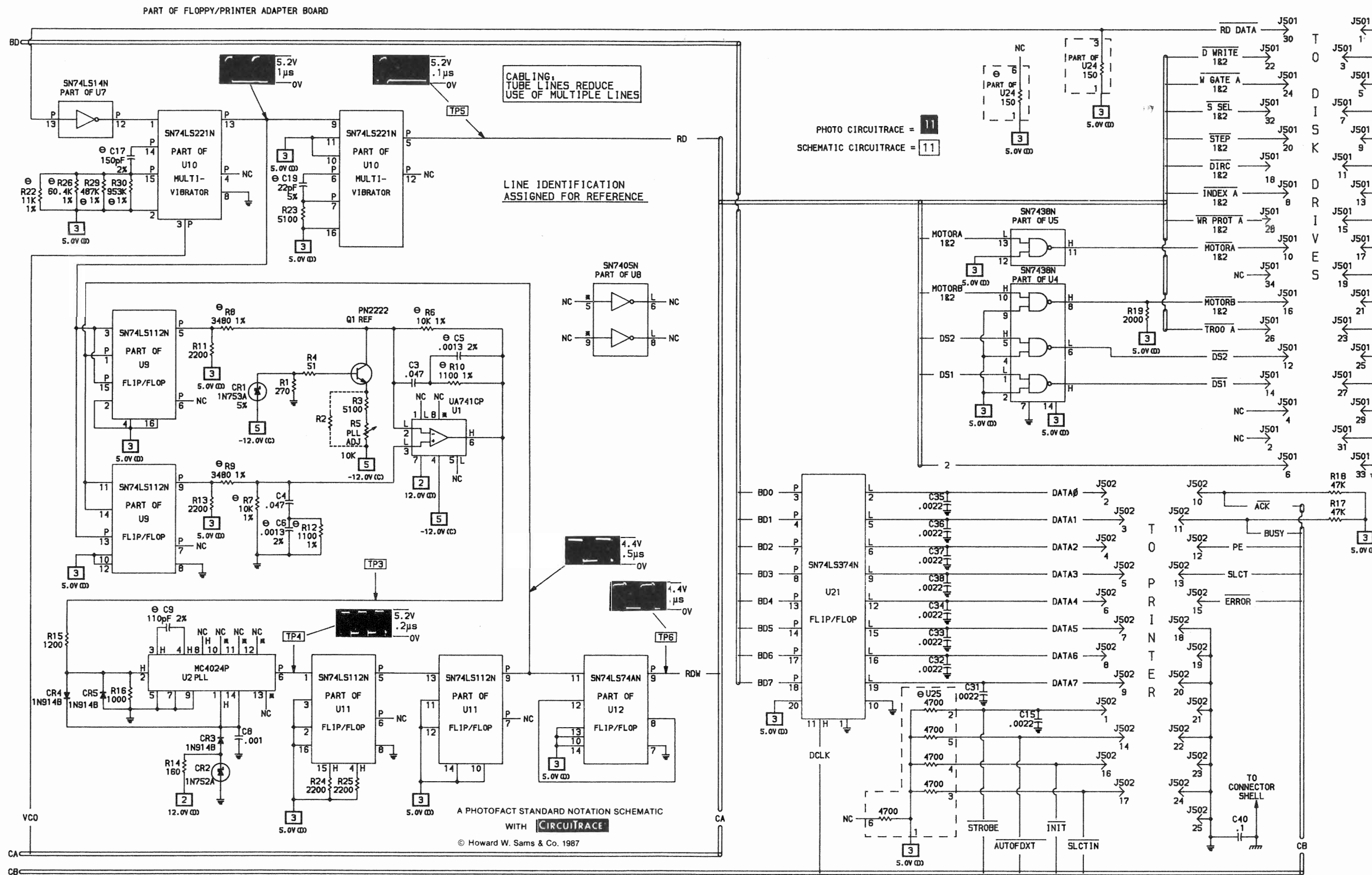
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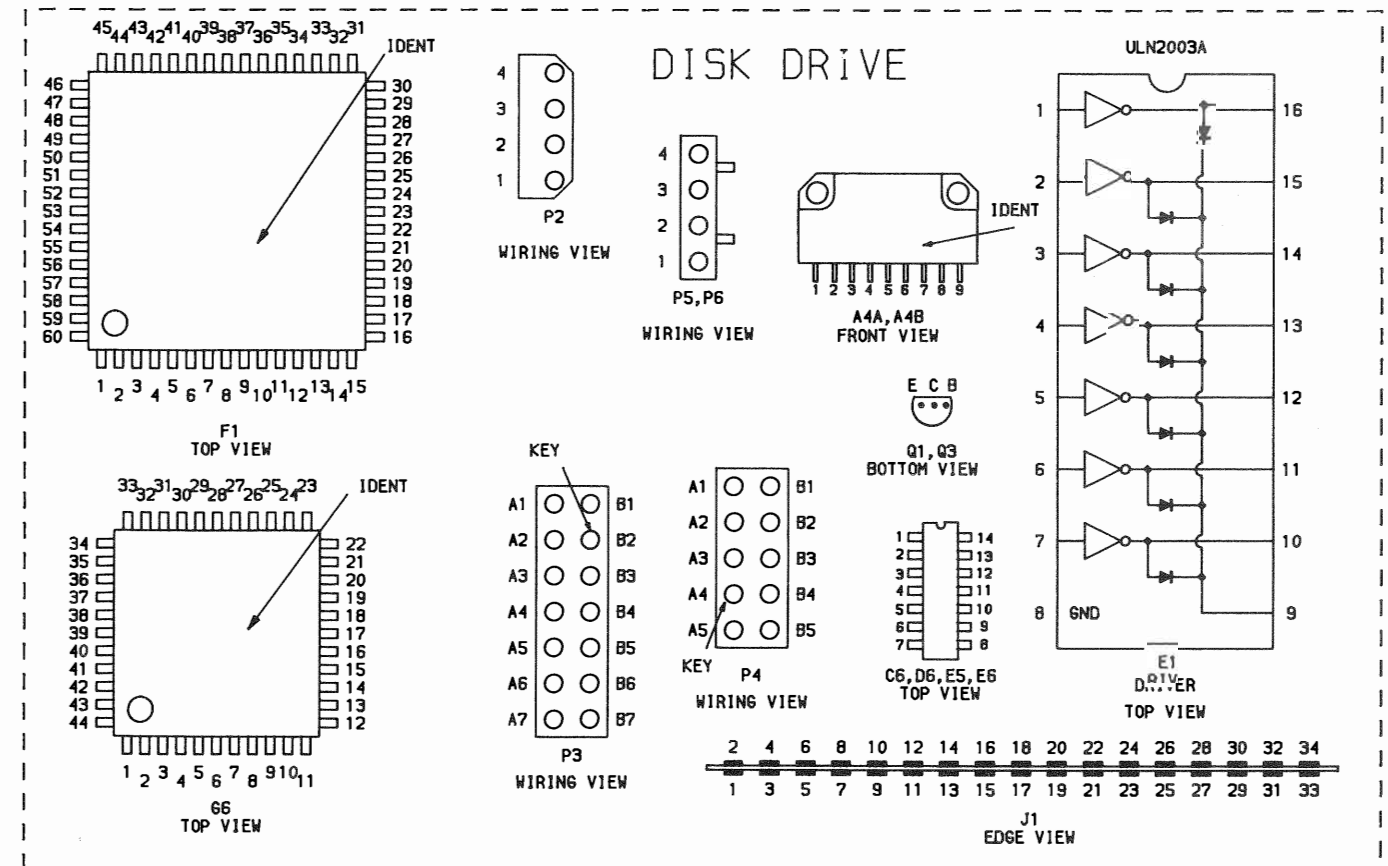
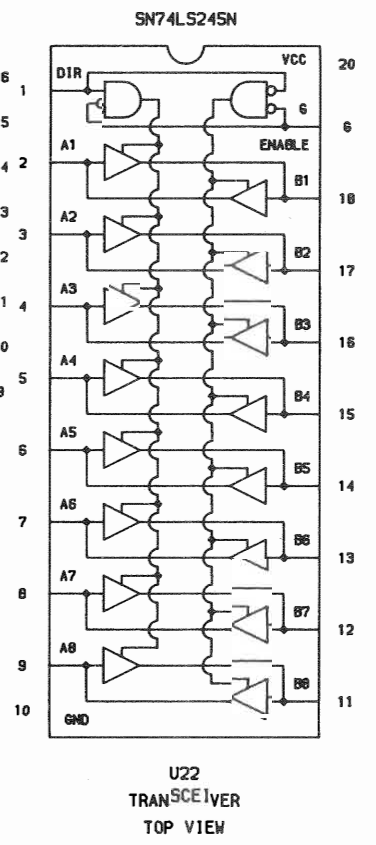
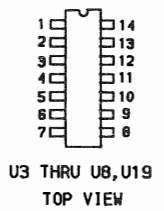
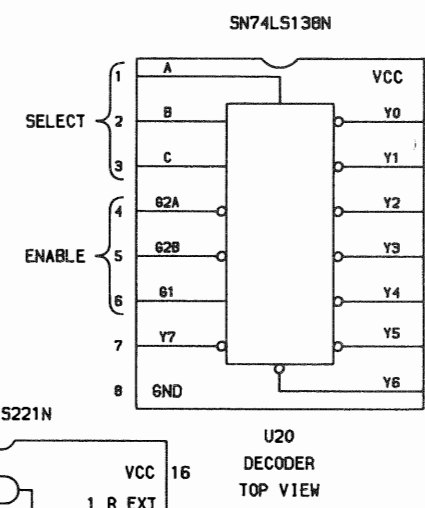
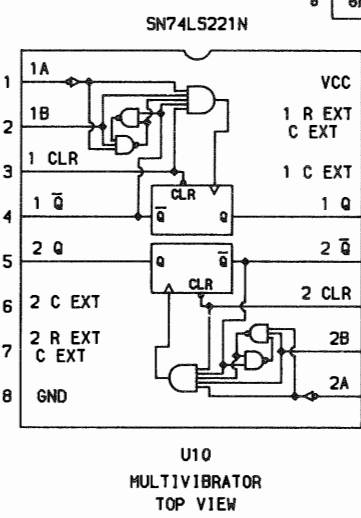
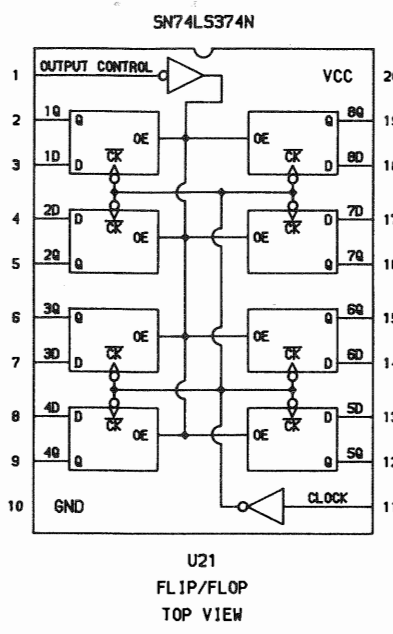
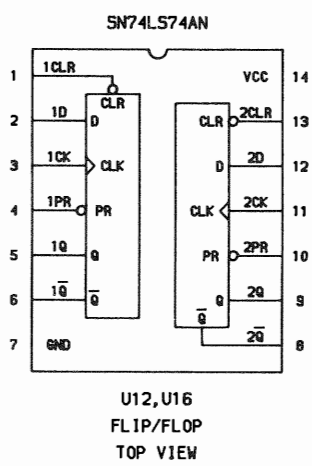
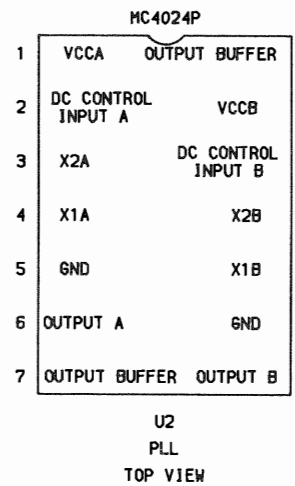
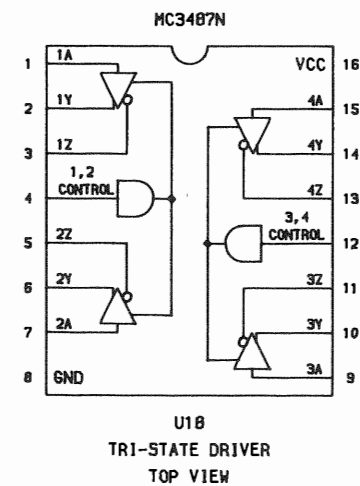
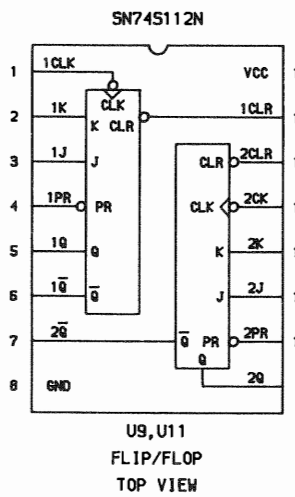
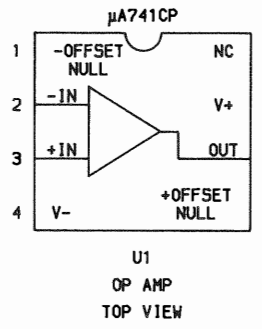
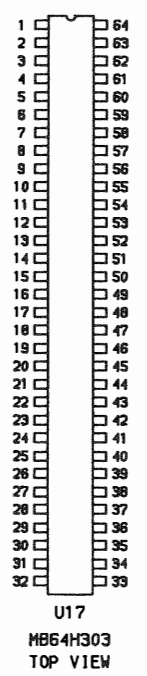
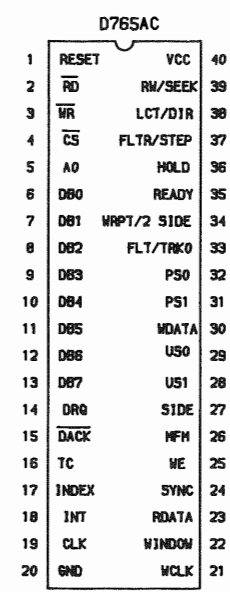
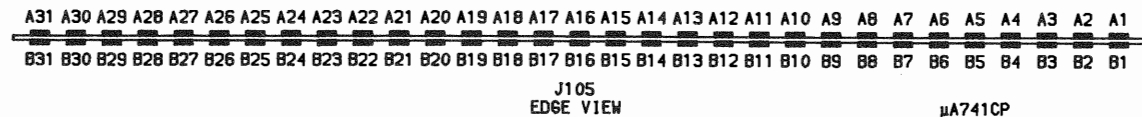
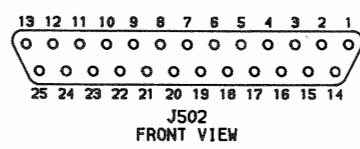
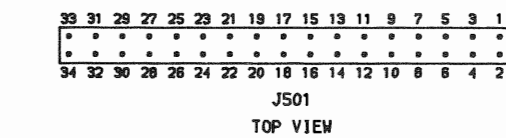
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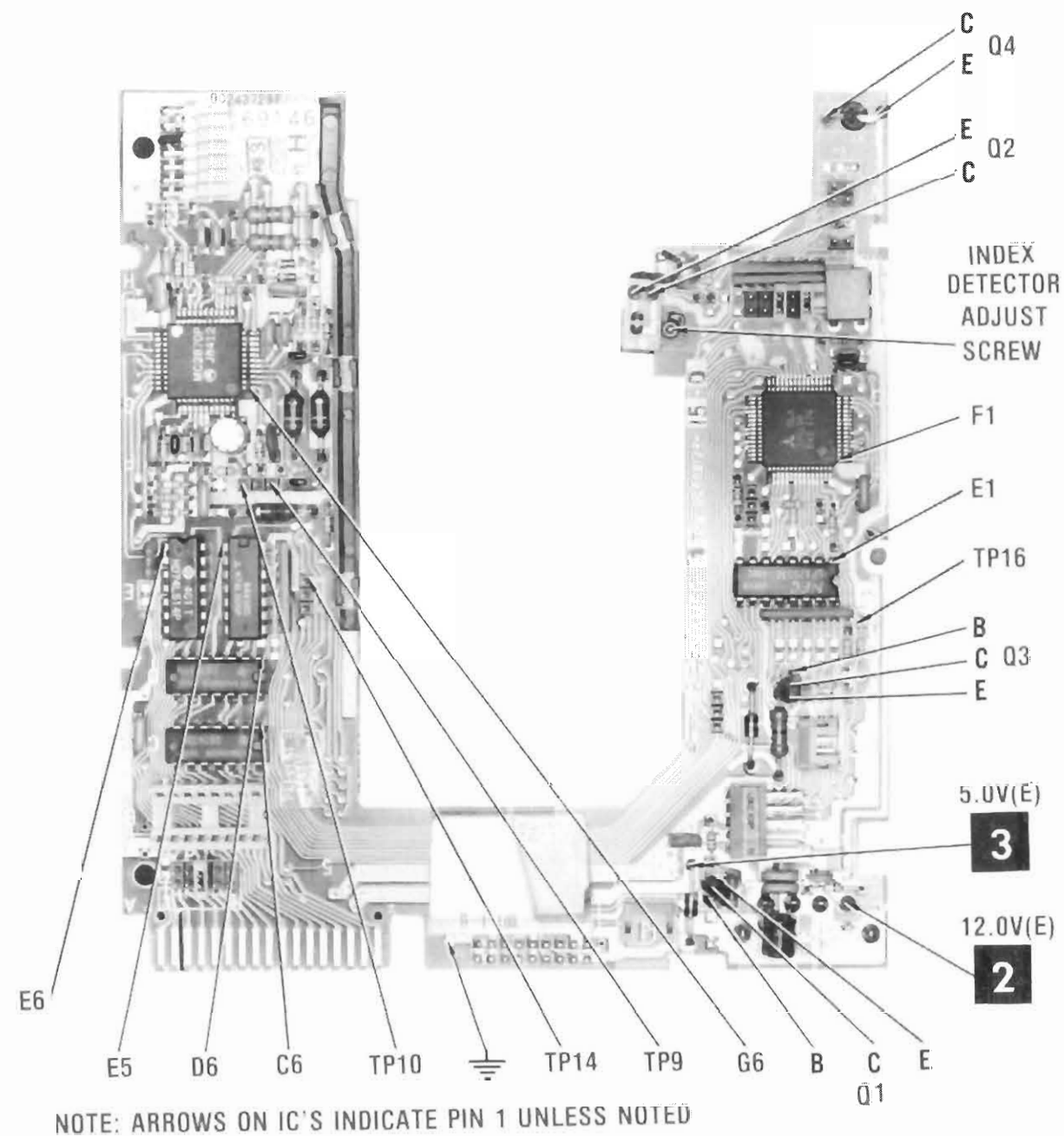




IC PINOUTS & TERMINAL GUIDES



COMPACT
MODEL PORTABLE (101709)



DISK DRIVE BOARD

A Howard W. Sams CIRCUITRACE Photo

MISCELLANEOUS ADJUSTMENTS

PLL ADJUSTMENT (R5)

Connect the input of a Voltmeter to TP3 (pin 6 of IC U1) and the input of a Frequency Counter to TP4 (pin 6 of IC U2) on the Floppy/Printer Board. Turn the Computer On and preset the PLL ADJ Control (R5) for a voltage of about 8.0V at TP3 and a frequency of about 2.0MHz at TP4. Connect the channel A input of a Dual Trace Scope to TP6 (pin 9 of IC U12) and the channel B input to TP5 (pin 5 of IC U10). Set the voltage range to 5V, horizontal sweep time to 1 μ Sec, trigger on channel A, positive slope and set the scope to Add mode. Insert a Dysan Analog Alignment Diskette (224/2A) in Drive B and close the drive door. Run the following Basic program which steps the Drive head to Track 00 and continuously reads the diskette.

```
10 OUT 1009,33:OUT 1009,37
20 S = INP(1012)
30 OUT 1013,7:S = INP(1012)
40 OUT 1013,2:S = INP(1012)
50 OUT 1013,8:S = INP(1012):S = INP(1013):S = INP(1012)
60 S = INP(1013):S = INP(1012)
70 FOR T = 1 TO 500: NEXT T
80 OUT 1009,33:OUT 1009,37
90 S = INP(1012)
```

```
100 OUT 1013,74:S = INP(1012)
110 OUT 1013,Y:S = INP(1012)
120 FOR X = 1 TO 7
130 S = INP(1013):S = INP(1012)
140 NEXT X
150 IF Y = 1 THEN Y = 5 ELSE Y = 1
160 GOTO 80
```

While the program is running, adjust the PLL Adj Control (R5) so the small pulses are centered on the large pulses (see Figure A).

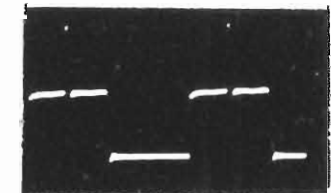


Figure A

ALIGNMENT

EQUIPMENT REQUIRED

A test program or a Disk Drive Tester is required which will turn On the Disk Drive and step the head to the track specified in the alignment procedures. Use a Dysan Analog Alignment Diskette 224/2A when an Alignment Diskette is specified in the alignment procedures. NOTE: This Alignment Diskette has only alignment patterns on it and does not contain any alignment programs.

DRIVE TRACK PROGRAMS

The following Basic programs can be used to step the Disk Drive head to a specific track. Press the CONTROL and BREAK keys at the same time to stop the program. NOTE: It is not necessary to insert a diskette into the Disk Drive before running this program.

```
FOR DRIVE A
10 CLS
20 OUT 1009,16:OUT 1009,20
30 S = INP(1012)
40 OUT 1013,7:S = INP(1012)
50 OUT 1013,1:S = INP(1012)
60 GOSUB 170
70 INPUT "ENTER TRACK NUMBER ";TR
80 IF TR>40 THEN 70
90 OUT 1009,20
100 GOSUB 170
110 OUT 1013,15:S = INP(1012)
120 OUT 1013,1:S = INP(1012)
130 OUT 1013,TR:S = INP(1012)
140 FOR T = 1 TO 400:NEXT T
150 PRINT"PRESS ANY KEY TO STOP"
160 A$ = INKEY$:OUT 1009,20:IF A$ = "" THEN 160
ELSE 70
170 OUT 1013,8:S = INP(1012):S = INP(1013):S = INP(1012)
180 S = INP(1013):S = INP(1012):RETURN
```

FOR DRIVE B

```
10 CLS
20 OUT 1009,33:OUT 1009,37
30 S = INP(1012)
40 OUT 1013,7:S = INP(1012)
50 OUT 1013,2:S = INP(1012)
60 GOSUB 170
70 INPUT "ENTER TRACK NUMBER ";TR
80 IF TR>40 THEN 70
90 OUT 1009,33:OUT 1009,37
100 S = INP(1012)
110 OUT 1013,15:S = INP(1012)
120 OUT 1013,2:S = INP(1012)
130 OUT 1013,TR:S = INP(1012)
140 FOR T = 1 TO 500:NEXT T
150 PRINT"PRESS ANY KEY TO STOP"
160 A$ = INKEY$:OUT 1009,37:IF A$ = "" THEN 160
ELSE 10
170 OUT 1013,8:S = INP(1012):S = INP(1013):S = INP(1012)
180 S = INP(1013):S = INP(1012):RETURN
```

SPINDLE SPEED ADJUSTMENT

If a Disk Drive Tester which provides a readout of the speed in rpm is being used, adjust the Spindle Speed Control (VR) on the Motor Control Board for a speed of 300 rpm \pm 4.5rm. (Make the adjustment with a diskette in the Drive and the Drive door closed).

If a Disk Drive Tester is not available, center and paste a strobe pattern on the Drive Motor on the bottom of the Disk Drive, see Figure 1. Insert a diskette into the Drive and close the door. Type in and run the program listed under "Continuous Operation of Disk Drive" to keep the Disk Drive running. Use the outside pattern when 60 cycle fluorescent lighting is used or the inside pattern for 50 cycle lights. Adjust the Motor Speed Control (VR) on the Motor Control Board until the strobe pattern appears to stand still.

ALIGNMENT (Continued)

READ CIRCUIT ADJUSTMENT

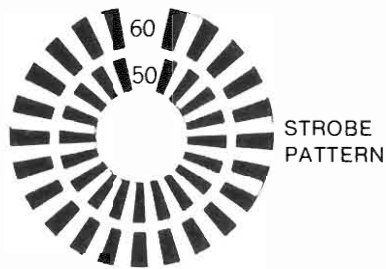


Figure 1

RADIAL HEAD ALIGNMENT

Connect the channel A input of a dual trace scope to TP9, channel B to TP10 and the external trigger input to TP14. Set the scope to add mode with one channel inverted, the sweep time to 20mSec and the voltage range to .3V. Set both scope inputs to AC. Insert the Alignment Diskette into the Disk Drive and close the door. Turn On the Disk Drive and step the head to Track 16. The cats-eye pattern shown in Figure 2 should be displayed on the scope.

EQUAL AMPLITUDE

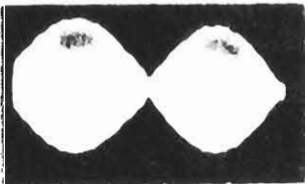


Figure 2

The amplitude of the two lobes displayed in the pattern must be within 70% of each other. If the lobes are out of tolerance, use a 2mm Hex driver to loosen the Radial Alignment screw (see Disk Drive Mechanical photo). Slide the Head Assembly forward or backward until the two lobes are of equal amplitude and tighten the screw. Check the adjustment by stepping the head to Track 39 and back to Track 16, then to Track 00 and back to Track 16, checking the lobes each time the head is on Track 16. Check the Track 00 Stop and Detector adjustments after performing the Radial Head Alignment.

TRACK 00 STOP AND DETECTOR

Connect a scope to TP9 and set the sweep time to 20μSec. Set the voltage range to .2V. Insert the Alignment Diskette into the Disk Drive and close the door. Turn On the Disk Drive and set the Head to Track 00. A 125kHz sine wave should be displayed on the scope. If the 125kHz signal is not present, step the head forward or back until the 125kHz signal is present. When the 125kHz signal is present on the scope, the head is on Track 00.

With the head set to Track 00, check for a gap of .01 inch between the Track 00 stop and the pin on the Head Position Motor pulley. If the gap is not correct loosen the Track 00 stop screw and adjust the stop for .01 inch gap.

Connect the input of a voltmeter to TP16 (junction of Resistor R27 and pin B5 of Plug P4). Check for 5.0V when the Head is on Track 00 or 01 and 0V when the Head is on Track 02. If the readings are not correct, set the Head to Track 01, loosen the Track 00 Detector (X2) screw (see Disk Drive Mechanical Photo) on the bottom of the Disk Drive and adjust the detector until the voltmeter reading jumps from 0V to 5.0V. Tighten the Track 00 screw and recheck the Track 00 Detector adjustment.

Connect the input of a scope to pin 13 of IC C6 and set the sweep time to 1μSec. Set the voltage range to .2V. Insert the Alignment Diskette into the Disk Drive and close the door. Turn On the Disk Drive and step the Head to Track 00. The 125kHz pattern on Track 00 of the Alignment Diskette should be displayed on the scope. If the Phase control (R21) is out of adjustment the second pulse in the waveform will appear as two overlapping pulses, see Figure D. Adjust the Phase control (R21) until the two overlapping pulses are in phase, see Figure E and appear to be one pulse.

TWO PULSES

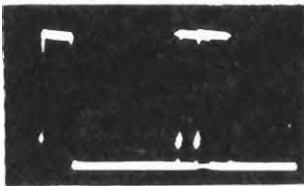


Figure D

ONE PULSE

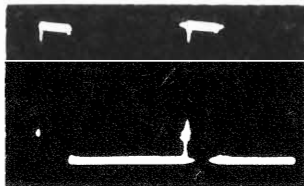


Figure E

INDEX SENSOR ADJUSTMENT

Connect the channel A input of a dual trace scope to TP9, channel B input to TP10 and the external trigger input to TP14. Set the sweep time to 50μSec, voltage range to .2V and trigger to positive slope. Set the scope to add mode with one channel inverted. Insert the Alignment Diskette in the Disk Drive and close the door. Turn On the Disk Drive and step the Head to Track 34. Confirm that the timing between the start of the sweep and the first pulse of the timing burst is 200μSec ± 100μSec. See Figure B. If the timing is not within tolerance, use a 1.5mm Hex driver to loosen the screw holding the Index Detector (Q2). Adjust the Index Detector until the timing is 200μSec ± 100μSec and tighten the screw.

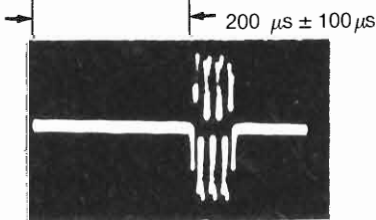


Figure B

AZIMUTH ADJUSTMENT

Connect the channel A input of a dual trace scope to TP9, channel B input to TP10 and the external trigger input to TP14. Set the sweep time to .5mSec, voltage range to .2V and trigger to positive slope. Set the scope to add mode with one channel inverted. Insert the Alignment Diskette in the Disk Drive and close the door. Turn On the Disk Drive and step the Head to Track 34. The pattern shown in Figure C should be displayed on the scope. The amplitude of bursts 1 and 4 must be equal to or less than the amplitude of bursts 2 and 3. If the azimuth is out of tolerance, loosen the two azimuth adjust screws on the Head assembly (see Disk Drive Mechanical photo) and adjust the head until the azimuth pattern is correct. Tighten the screws and recheck the azimuth.

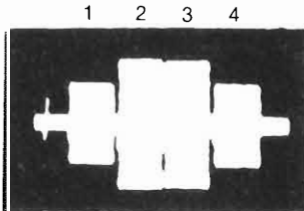
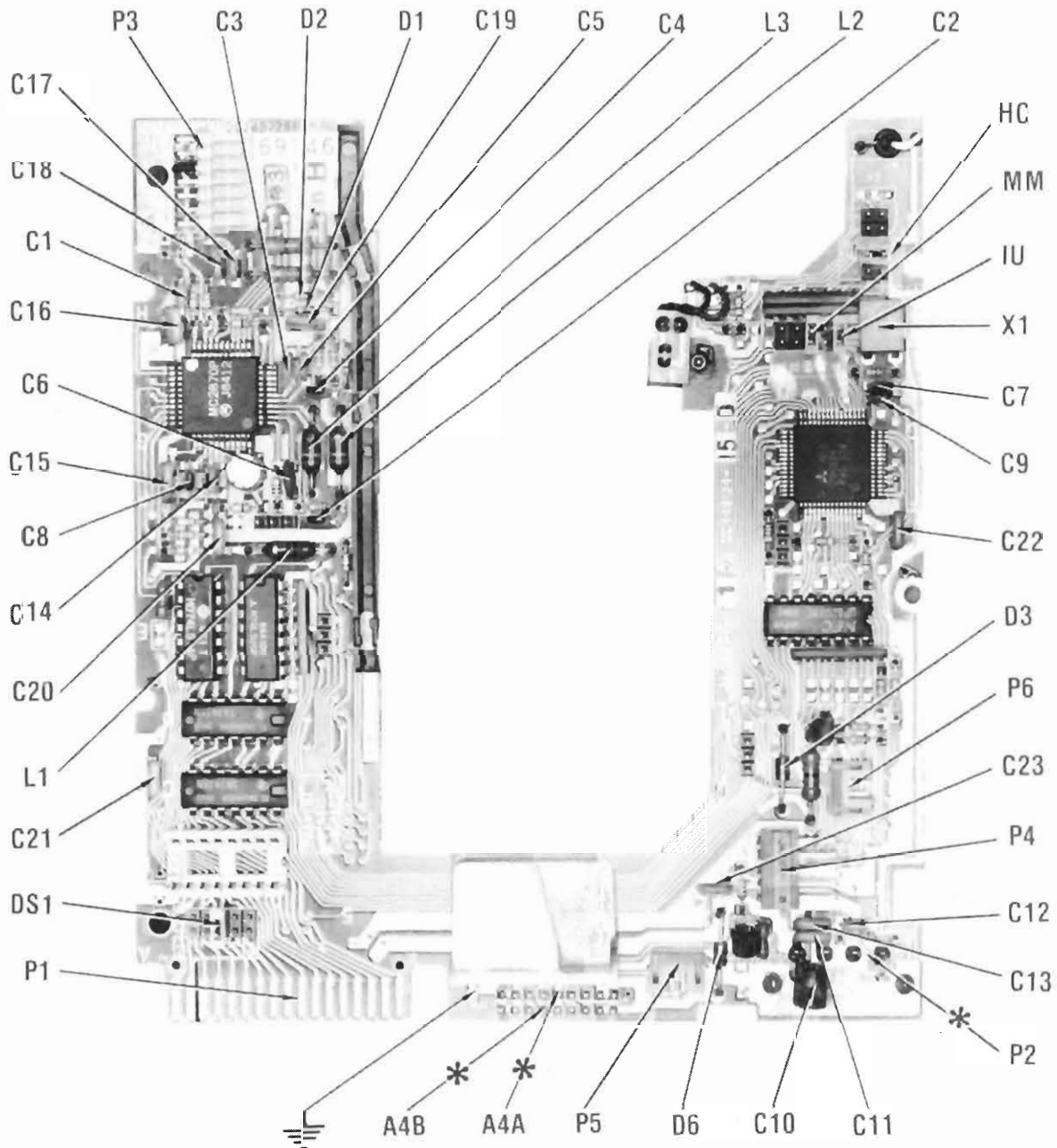


Figure C



* LOCATED OTHER SIDE OF BOARD

COMPAQ
MODEL PORTABLE (01709)

DISK DRIVE BOARD

TROUBLESHOOTING

TEST SETUP

Connect a Disk Drive known to be operating properly to the Computer as Disk Drive A. Connect the defective Disk Drive as Disk Drive B. Use Disk Drive A to load any alignment or test program needed to check the defective Disk Drive.

WARNING: It is possible for a defective Disk Drive to write on or erase information on a diskette, even if the diskette is write protected. Check the Disk Drive by first using a diskette that has programs that have been backed up on another diskette. Do not leave the alignment diskette in the drive while checking voltages and 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 the diskette is write protected.

Check all setup jumpers and switches for correct positions and check all interconnecting cables for good connections.

CONTINUOUS OPERATION OF DISK DRIVE

Use the following Basic program to keep Drive A running continuously in the read mode. Change the number 16 in the program to number 33 to make Drive B run continuously.

```
10 OUT 1009,16: GOTO 10
```

Note: A diskette must be inserted in the Drive (to close switch SW1) before the Drive motor will run.

HEAD CLEANING INSTRUCTIONS

Use a cotton swab or lint free cloth dampened with 91% isopropyl alcohol and dry with a lint free cloth.

OSCILLATOR AND DIVIDERS

Verify that the 16MHz Oscillator Module (U15) is working by checking the waveform at pin 3 of the I/O Controller IC (U17). If the waveform is missing, check the Oscillator U15. Check the Dividers in IC U17 by checking for a 500kHz signal at pin 54 and a 4.0MHz signal at pin 55 of IC U17. If either signal is missing, check IC U17.

WILL NOT READ

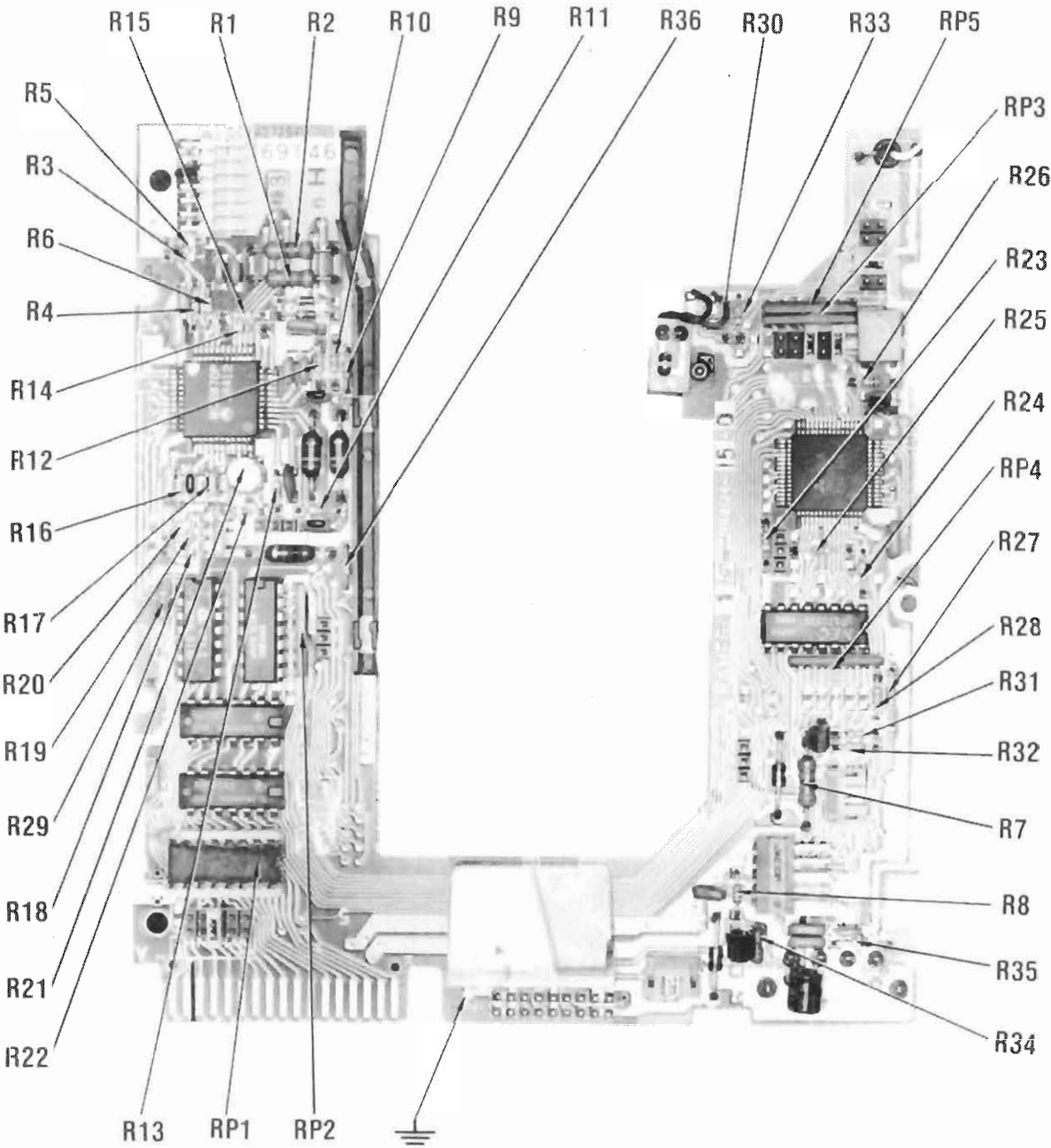
Verify that the Timing Oscillator and Dividers on the Floppy/Printer Board are working properly. See "Oscillators and Dividers". If the Oscillators and Dividers check good, run the following Basic program to keep Drive B running in the read mode. To operate Drive A, change line 10 to OUT 1009,16: OUT 1009,20

```
10 OUT 1009,33:OUT 1009,37
20 S = INP(1012)
30 OUT 1013,74:S = INP(1012)
40 OUT 1013,Y:S = INP(1012)
50 FOR X = 1 TO 7
60 S = INP(1013):S = INP(1012):PRINT S
70 NEXT X
80 IF Y = 1 THEN Y = 5 ELSE Y = 1
90 GOTO 10
```

The program also displays numbers on the Monitor screen. Some of the numbers should change continuously when a diskette (with data on it) is inserted in the Drive and the Drive door is closed. Leave the diskette in the drive while performing the following checks. While the program is running, check for Index pulses at pin 17 of the Floppy Controller IC (U13). 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 24 (Write Gate) of Connector P1 on the Disk Drive Board to verify the Disk Drive is in read mode. If the reading is not correct, check for a logic Low at pin 25 of IC U13. If the reading is not correct at pin 25, check IC U13. If the reading is correct, check IC U18.

If the logic reading is correct at pin 24 of Connector P1, check for a logic Low at pin 9 and a logic High at pin 8 of IC E5 on the Disk Drive Board. If the reading is not correct at pin 9 of IC E5, check IC E6. If the reading is correct at pin 9 and not correct at pin 8 of IC E5, check IC E5. If the reading is correct at pin 8 of IC E5, check for a logic High at pin 12 of IC C6. If the reading is not correct at pin 12 of IC C6, check the Drive Controller IC (F1). If the reading is correct at pin 12 of IC C6, check the waveform at pin 13 of IC C6. Note: The waveform should be present at pin 13 of IC C6 even when the Disk Drive is not running. There should be a noticeable change in the waveform when the Disk Drive door is opened and closed with a diskette in the drive and the drive running. If the waveform is missing at pin 13 of IC C6, check the Head 0 and Head 1 windings for continuity, check Connector J3 for good connections and check the voltages, waveforms and components associated with pins 1 thru 7, 9 thru 19, 26, 27, 29, 30, 31, 32, 33, 35, 36 and 37 of the Read/Write Amp IC (G6). If the waveform is present at pin 13 of IC C6, check for pulses at pin 11 of IC C6. If pulses are missing at pin 11 of IC C6, check IC C6.

If pulses are present at pin 11 of IC C6, check for pulses at pin 11 of IC U7 on the Floppy/Printer Board. If pulses are missing check IC U7. If pulses are present, check for pulses or a logic High at pin 3 of IC U10. If the reading is not correct, check IC U13. If the reading is correct, check the waveform at pin 13 of IC U10. If the waveform is missing or not correct, check Capacitor C17, Resistors R22, R26, R29, and R30 and IC U10. If the waveform is good, check the waveform at pin 5 of IC U10. If the waveform is missing or not correct, check Capacitor C19, Resistor R23 and IC U10. If the waveform is good at pin 5 of IC U10, check the waveform at pin 6 of IC U2 and check for about 8.0V at pin 6 of IC U1. If the waveform is missing at IC U2 and the voltage is correct at IC U1, check the voltages and components associated with pins 1 thru 4 of IC U2 and check IC U2. If the waveform is missing at pin 6 of IC U2 and the voltage is not correct at pin 6 of IC U1 check the voltages and components associated with IC U1 and Reference Transistor (Q1) and check IC's U1 and U9. If the waveform is good at pin 6 of IC U2, check the waveform at pin 9 of IC U11. If the waveform is missing, check IC U11. If the waveform is good, check the waveform at pin 9 of IC U12. If the waveform is missing, check IC U12. If the waveform is good, check IC U13.



DISK DRIVE BOARD

TROUBLESHOOTING (Continued)

WILL NOT WRITE

Verify that the Timing Oscillators and Dividers are working properly. See "Oscillators and Dividers". If the Oscillators and Dividers check good, run the following Basic program. The program writes continuously to a diskette in Drive B and displays a number on the upper left corner of the Monitor screen. The number should be 0 if the diskette is not write protected and 2 if the diskette is write protected.

```
10 CLS
20 OUT 1009,33:OUT 1009,37
30 S=INP(1012)
40 OUT 1013,77:S=INP(1012)
50 OUT 1013,Y:S=INP(1012)
60 OUT 1013,1:S=INP(1012)
70 OUT 1013,12:S=INP(1012)
80 OUT 1013,12:S=INP(1012)
90 OUT 1013,0:S=INP(1012)
100 S=INP(1013):S=INP(1012)
110 PRINT INP(1013) AND 2:S=INP(1012)
120 FOR X=1 TO 5
130 S=INP(1013):S=INP(1012)
140 NEXT X:LOCATE 1,1
150 IF Y=1 THEN Y=5 ELSE Y=1
160 GOTO 20
```

WARNING: This program will write over and destroy any data that is on the diskette. Do not use a diskette with important data on it.

While the program is running, check for Index pulses at pin 17 of the Floppy Controller IC (U13). If pulses are missing, refer to the "Index Detector" section of this Troubleshooting guide. If pulses are present at pin 17 of IC U13, insert a diskette that is not write protected into the Drive and check for the number 0 on the Monitor screen, then insert a write protected diskette into the Drive and check for the number 2 on the Monitor screen. If the numbers are not correct, refer to the "Write Protect Does Not Function" section of this Troubleshooting guide. If the Write Protect Circuits are working properly, insert a diskette that is not write protected in the Disk Drive and close the Drive door. Check for pulses at pins 25 and 30 of IC U13 on the Floppy/Printer Board. If pulses are missing at either pin, check IC U13. If pulses are present at both pins, check for pulses at pin 5 of IC U18. If pulses are missing, check IC U18. If pulses are present, check for pulses at pin 49 of IC U17. If pulses are missing, check IC U17. If pulses are present, check for pulses at pin 11 of IC U4. If pulses are missing, check IC U4. If pulses are present, check for pulses at pin 8 of IC's E5 and E6 on the Disk Drive Board. If pulses are missing at pin 8 of IC E7, check IC E6. If pulses are present at pin 8 of IC E6 and missing at pin 8 of IC E5, check IC E5. If pulses are present at pin 8 of IC's E5 and E6, check for pulses at pins 42 and 43 of the Drive Controller IC (F1). If pulses are missing at pin 42 and 43 of IC F1, check IC F1. If pulses are present at pins 42 and 43 of IC F1, check for pulses at pins A5, A6, A7, B5, B6 and B7 of Connector J3. If pulses are missing at any of the pins, check the Read/Write and Erase windings of Head 0 for continuity, check Connector J3 for good connections and check the voltages and components associated with pins 12 thru 15, 20, 22 and 24 of the Read/Write Amp IC (G6).

WRITE PROTECT DOES NOT FUNCTION

Type in and run the program listed under the "Will Not Write" section of this Troubleshooting Guide. The program

will display the number 0 on the left upper corner of the Monitor screen if a diskette that is not write protected is inserted into the Drive and the number 2 if the diskette is write protected.

Warning: This program also writes on the diskette. Do not use a diskette that has data on it that is important. Insert a blank write protected diskette into the Drive and close the door.

While the program is running insert a write protected diskette into the Drive and check for a logic High at collector of the Write Protect Sensor Transistor (M3) on the Disk Drive Board. If the reading is not correct check the Write Protect Sensor and Resistor R33. If the reading is correct at Sensor Transistor M3, check for a logic High at pin 5 of IC C6. If the reading is not correct at pin 5 of IC C6, check IC F1. If the reading is correct at pin 5 of IC C6, check for a logic Low at pin 6 of IC C6. If pin 6 of IC C6 does not check logic Low check IC C6. If pin 6 of IC C6 checks logic Low, check for a logic High at pin 5 of IC U7 on the Floppy/Printer Board. If the reading is correct and the number on the Monitor screen is not the number 2, check the Floppy Controller IC (U13).

INDEX DETECTOR

To check the Index Detector circuits, type in and run the program given under "Continuous Operation of Disk Drive" to keep the drive running. Insert a diskette in the Disk Drive and close the door. Check for pulses at the collector of the Index Sensor Transistor (M2). If pulses are missing, check Resistor R30 and Index Sensor M2. If pulses are present at the Sensor Transistor M2, check for pulses at pin 10 of IC D6. If pulses are missing at pin 10 of IC D6, check the Drive Controller IC (F1). If pulses are present at pin 10 of IC D6, check for a logic High at pin 9 and pulses at pin 8 of IC D6. If pin 9 of IC D6 does not read logic High, check the 4700 ohm resistor from pins 7 to 4 of Resistor Pack RP2. If pin 9 of IC D6 reads logic High and pulses are missing at pin 8 of IC D6, check IC D6. If pulses are present at pin 8 of IC D6, check for pulses at pin 2 of IC U7 on the Floppy/Printer Board. If pulses are missing, check IC U7.

TRACK 00 DETECTOR

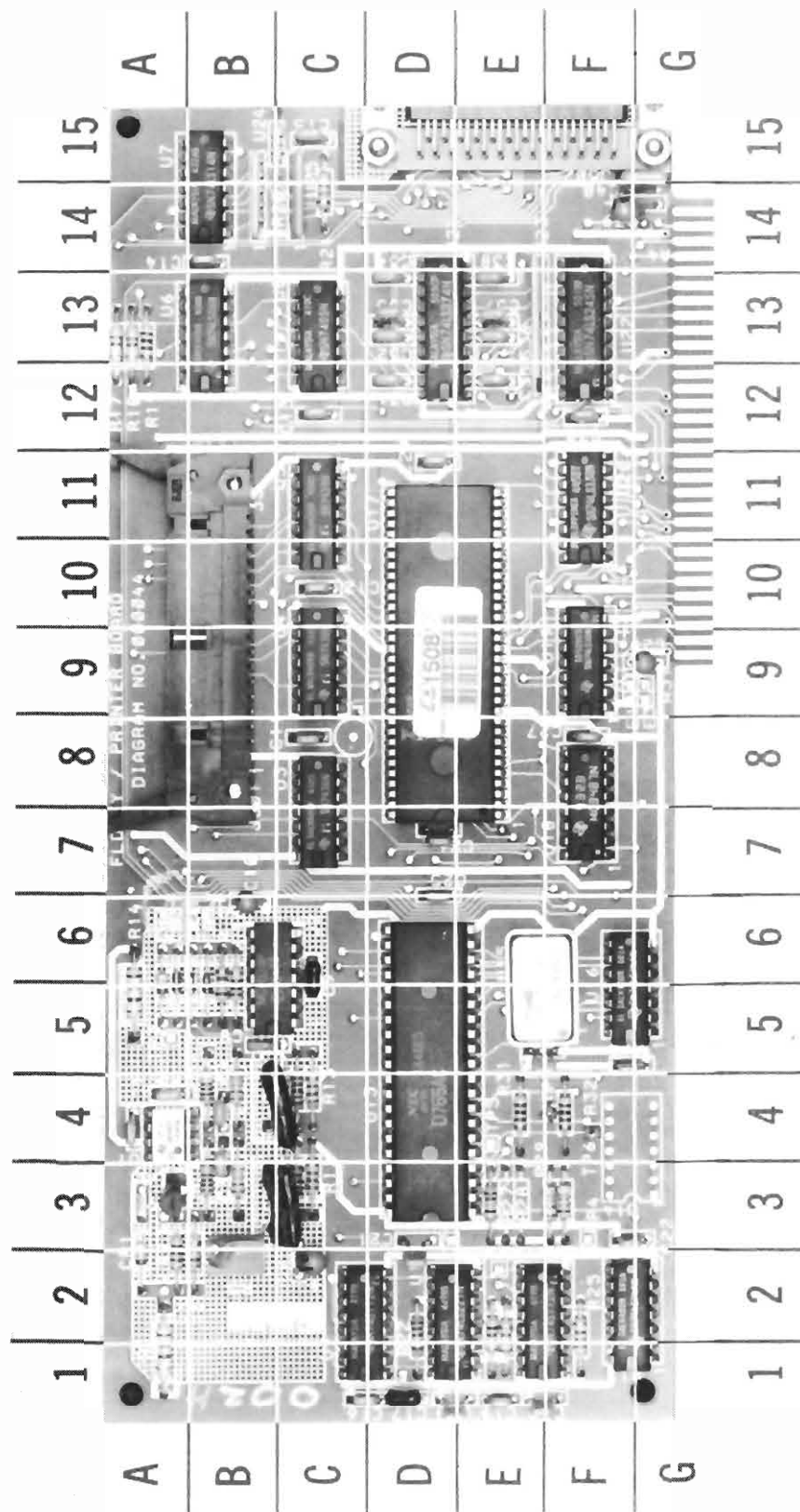
Disk Drive Head bangs against the Track 00 stop. Type in and run the following Basic program to check the Track 00 detector circuits. The program will step the Head back to Track 00 and display the number 16 on the Monitor screen to indicate the Head is On Track 00. If the Head is manually pushed Off Track 00 the number 16 should change to the number 0. The program operates Drive B. To operate Drive A change lines 10 and 70 to OUT 1009,16: OUT 1009,20.

```
10 OUT 1009,33:OUT 1009,37
20 S=INP(1012)
30 OUT 1013,7:S=INP(1012)
40 OUT 1013,1:S=INP(1012)
50 GOSUB 130
60 FOR T=1 TO 500:NEXT T
70 OUT 1009,33:OUT 1009,37
80 S=INP(1012)
90 OUT 1013,4:S=INP(1012)
100 OUT 1013,2:S=INP(1012)
110 CLS:PRINT INP(1013) AND 16:S=INP(1012)
120 GOTO 60
130 OUT 1013,8:S=INP(1012):S=INP(1013):S=INP(1012)
140 S=INP(1013):S=INP(1012):RETURN
```

FLOPPY DISK/PRINTER ADAPTER BOARD

GridTrace LOCATION GUIDE

C1	A-4	R29	F-3
C2	A-4	R30	F-3
C3	B-3	R31	E-4
C4	B-4	R32	F-4
C5	C-3	U1	A-4
C6	C-4	U2	B-5
C7	C-2	U3	C-7
C8	B-5	U4	C-9
C9	C-6	U5	C-11
C10	B-6	U6	B-13
C11	C-8	U7	B-14
C12	C-10	U8	C-13
C13	C-12	U9	C-2
C14	B-14	U10	D-2
C15	C-15	U11	E-2
C16	C-1	U12	F-2
C17	D-1	U13	D-14
C18	D-1	U15	E-6
C19	E-1	U16	F-5
C20	E-1	U17	D-9
C21	D-2	U18	F-8
C22	F-3	U19	F-9
C23	E-5	U20	F-11
C24	F-5	U21	D-13
C25	D-7	U22	F-13
C26	D-7	U23	E-13
C27	F-8	U24	B-15
C28	G-9	U25	C-14
C29	D-11		
C30	F-12		
C31	D-12		
C32	D-13		
C33	D-13		
C34	D-13		
C35	E-12		
C36	E-13		
C37	E-13		
C38	E-13		
C39	F-14		
C40	G-15		
CR1	A-2		
CR2	A-6		
CR3	A-6		
CR4	B-6		
CR5	B-6		
J501	B-9		
J502	E-15		
P1	G-12		
Q1	A-3		
R1	A-1		
R3	A-2		
R4	B-2		
R5	B-2		
R6	B-3		
R7	B-4		
R8	B-3		
R9	B-4		
R10	C-3		
R11	C-3		
R12	C-4		
R13	C-4		
R14	A-5		
R15	B-6		
R16	B-6		
R17	A-13		
R18	A-13		
R19	A-13		
R20	C-15		
R21	C-14		
R22	D-2		
R23	E-2		
R24	E-2		
R25	F-2		
R26	E-3		



FLOPPY DISK/PRINTER ADAPTER BOARD

A Howard W. Sams GRIDTRACE™ Photo

TROUBLESHOOTING (Continued)

If the number on the Monitor screen is not correct, check for a logic High at the collector of the Track 00 Detector Transistor (X2) when the Head is On Track 00 and a logic Low when the Head is Off Track 00. If the reading is not correct, check the Track 00 Detector assembly, Resistors R27 and R28 and check Plug J4 for good connections. If the reading is correct at the collector of the Track 00 Detector Transistor (X2), check for a logic High at pin 9 of IC C6 when the Head is On Track 00 and a logic Low when the Head is Off Track 00. If the readings are not correct at pin 8 of IC C6, check the Drive Controller IC (F1). If the readings are correct at pin 9 of IC C6, check for a logic Low at pin 8 of IC C6 when the Head is On Track 00 and logic High when the Head is Off Track 00 and check for a logic High at pin 10 of IC C6. If the reading is not correct at pin 10 of IC C6 check the 4700 ohm resistor from pin 7 to 4 of Resistor Pack RP2. If the reading is correct at pin 10 of IC C6 and not correct at pin 8 of IC C6, check IC C6. If the readings are correct at pins 8 and 10 of IC C6, check for a logic High with momentary pulses at pin 9 of IC U6 on the Floppy/Printer Board. If the reading is not correct, check the Floppy Controller IC (U13). If the reading is correct, check for a logic High with momentary pulses at pin 8 of IC U6 when the Head is On Track 00 and a logic Low when the Head is Off Track 00. If the readings are not correct, check IC U6. If the readings are correct, check IC U13.

HEAD SELECT

To verify that the Head Select Circuits are working properly on the Floppy/Printer Board, run the program listed under the "Will Not Read" section of this Troubleshooting Guide. While the program is running, check for pulses at pin 8 of IC U5. If pulses are missing check for pulses at pin 9 of IC U5. If pulses are present at pin 9, check IC U5. If pulses are missing at pin 9 of IC U5, check the Floppy Controller IC (U13).

HEAD POSITION MOTOR MALFUNCTION

Head Position Motor not working. Type in and run the following Basic program. The program continuously alternates the Head on Drive B between Tracks 00 and 16.

```
10 OUT 1009,33:OUT 1009,37
20 S = INP(1012)
30 OUT 1013,7:S = INP(1012)
40 OUT 1013,2:S = INP(1012)
50 FOR T = 1 TO 500:NEXT T
60 TR = 16
70 OUT 1009,33:OUT 1009,37
80 S = INP(1012)
90 OUT 1013,15:S = INP(1012)
100 OUT 1013,2:S = INP(1012)
110 OUT 1013,TR:S = INP(1012)
120 FOR T = 1 TO 500:NEXT T
130 GOTO 10
```

While the program is running, check for pulses at pins 37, 38, and 39 of the Floppy Controller IC (U13). If pulses are missing at any pin, check IC U13. If pulses are present, check for pulses at pins 3 and 6 of IC U5. If pulses are missing at either pin, check IC U5. If pulses are present, check for pulses at pins 10 and 12 of IC E6 on the Disk Drive Board. If pulses are missing at pin 10 or 12 of IC E6, check IC E6. If pulses are present at pins 10 and 12 of IC E6, check for pulses at pins 10 and 12 of IC E5. If pulses are missing at pins 10 and 12 of IC E5, check for pulses at pins 4 and 6 of the Head Position Motor Driver IC's (A4A and A4B) and pin 5

of the Driver IC (E1). If pulses are missing at any of the pins, check the Drive Controller IC (F1). If pulses are present at pins 4 and 6 of IC's A4A and A4B and pin 5 of IC E1, check for pulses at pin 12 of IC E1. If pulses are missing at pin 12 of IC E1, check IC E1. If pulses are present at pin 12 of IC E1, check for the waveform shown in Figure F at the collector of Switch Transistor (Q1). If the waveform is not correct, check Transistor Q1, Diode D6 and Resistors R8 and R34.

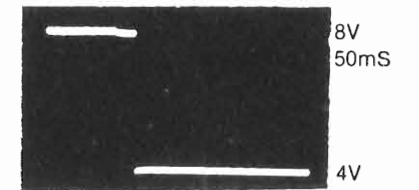


Figure F

If the waveform is correct at Transistor Q1, check the waveforms at pins 3 and 7 of IC's A4A and A4B. If any of the waveforms are not correct check the IC with the incorrect waveform, check pins 1 thru 4 of Plug J5 for good connections and check the Head Position Motor (X3) windings for continuity (60.7 ohms on each winding).

DRIVE SELECT

Type in and run the program given under "Continuous Operation of Disk Drive". Verify that the Drive Select Circuits are working properly by checking for a logic High at pin 6 of IC E5 on the Disk Drive Board before running the program and a logic Low while the program is running. If the readings are not correct, check for a logic High at pin 5 of IC E5 (while the program is running). If the reading is correct, check IC E5. If the reading is not correct, check for a logic Low at pin 5 of IC E6. If the reading is correct, check IC E6. If the reading is not correct, check to see if Jumper DS1 is installed. If the Jumper is installed, check for a logic High at pin 5 of IC U4 on the Floppy/Printer Board. If the reading is correct, check IC U4. If the reading is not correct, check the I/O Controller IC (U17).

DRIVE MOTOR

Drive Motor will not run. Verify that the Drive Select Circuits are working properly, refer to the "Drive Select" section. Type in and run the program given under "Continuous Operation of Disk Drive" to keep the Drive running. Check for a logic Low at pin 16 of Connector P1 on the Disk Drive Board. If the reading is correct at pin 16 of Connector P1 check for a logic Low at pin 11 of IC D6 on the Disk Drive Board. If the reading is not correct at pin 11 of IC D6 check IC D6. If the reading is correct at pin 11 of IC D6, insert a diskette in the Disk Drive, close the Drive door, and check for a logic High at pins 1 and 2 of IC D6 and pin 4 of the Driver IC (E1). If the logic reading is not correct at pin 1 of IC D6 or pin 4 of IC E1, check the Drive Controller IC (F1). If the reading is not correct at pin 2 of IC D6, check Disk Inserted Switch (SW1) and the 4700 ohm Resistor from pin 1 to 4 of Resistor Pack RP4. If the logic readings are correct at pins 1 and 2 of IC D6 and pin 4 of IC E1, check for a logic High at pin 10 and a logic Low at pin 13 of IC E1. If the logic reading is not correct at pin 10 or 13 of IC E1, check IC E1. If the logic readings are correct at pins 10 and 13 of IC E1, check the Motor Control Board (M1). If pin 16 of Connector P1 does not read logic Low, check for a logic High at pin 10 of IC U4 on the Floppy/Printer Board. If the reading is correct, check IC U4. If the reading is not correct, check the I/O Controller IC (U17).

TROUBLESHOOTING (Continued)

PARALLEL PORT

Parallel Port not working. Check Connector J502 for good connections. If the Connector checks good, plug a loopback plug, see "Test Plugs", into Connector J502. Run the following Basic program:

```

10 CLS
20 LOCATE 1,1
30 OUT 956,0:OUT 958,0
40 PRINT "A=";INP(956)
50 PRINT "B=";INP(957)
60 PRINT "C=";INP(958)
70 OUT 956,255:OUT 958,255
80 PRINT "D=";INP(956)
90 PRINT "E=";INP(957)
100 PRINT "F=";INP(958)
110 FOR T=1 TO 100:NEXT T:GOTO 20

```

The program continuously checks the Parallel Interface Circuits and displays six numbers (A thru F) on the Monitor screen. With Loopback Plug plugged into Connector J502, the following numbers should appear on the Monitor screen:

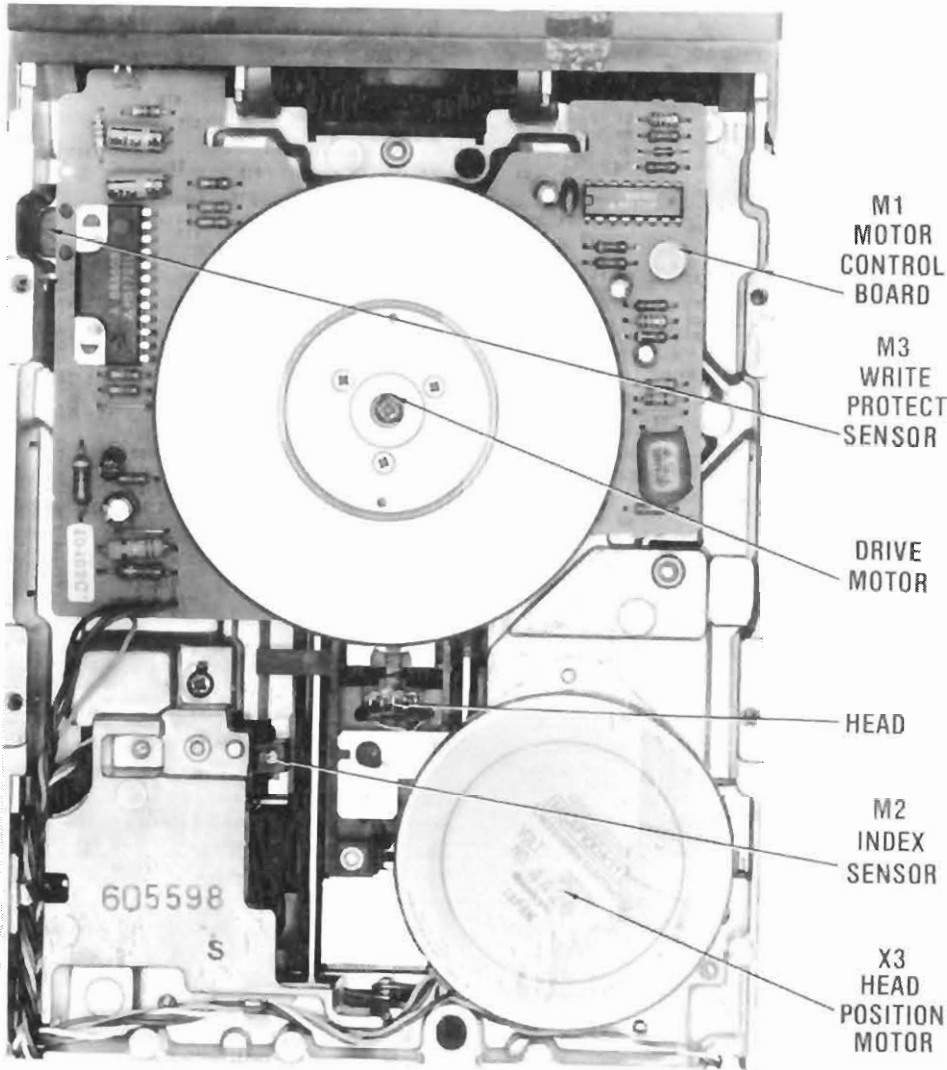
- A = 0
- B = 55
- C = 224
- D = 255
- E = 207
- F = 255

If any of the numbers are not correct, make the following checks with the loopback plug installed and the above program running. Check for pulses at pins 4 and 40 thru 47 of the I/O Controller IC (U17). If pulses are missing at any of the pins, check IC U17. If pulses are present, check for pulses at pins 2, 4, 10, and 12 of IC U8. If pulses are missing at any of the pins, check IC U8. If pulses are present, check for pulses at pins 2, 5, 6, 9, 12, 15, 16, and 19 of IC U21. If pulses are missing at any pin, check IC U21. If pulses are present, check IC U17.

TEST PLUGS

PARALLEL LOOPBACK PLUG

Use a male 25 pin subminiature "D" Connector (DB-25) and connect the following pins together: pin 1 to pin 13, pin 2 to pin 15, pin 12 to pin 14, pin 10 to pin 16, pin 11 to pin 17.



CHASSIS - BOTTOM VIEW

FLOPPY DISK/PRINTER ADAPTER (PRINTER SECTION)

PIN NO.	IC U8	PIN NO.	IC U17
1	L	35	H
2	H	36	H
3	L	37	*
4	H	38	*
5	*	39	*
6	L	40	L
7	L	41	H
8	L	42	H
9	*	43	H
10	L	44	L
11	H	45	L
12	H	46	L
13	L	47	H
14	H		

Logic readings on Printer Interface Circuit (IC's U8, pins 4 and 35 thru 47 of U17, and U21) taken with Computer in power up mode.

LOGIC CHART (Continued)

FLOPPY DISK/PRINTER ADAPTER BOARD

PIN NO.	IC U20	IC U21	IC U22
1	P	L	P
2	P	L	P
3	P	P	P
4	P	P	P
5	P	L	P
6	P	L	P
7	H	P	P
8	L	P	P
9	H	L	P
10	H	L	L
11	H	H	P
12	H	L	P
13	P	P	P
14	H	P	P
15	P	L	P
16	H	L	P
17		P	P
18		L	P
19		L	P
20		H	H

SCHEMATIC NOTES

- Circuitry not used in some versions
- - - Circuitry used in some versions
- See parts list
- ⊥ Ground
- ⏏ Chassis
- ▽ Common tie point

All measurements taken with Disk Drive "A" running the following program in GW Basic.

```

10 OPEN "A:SAMS.DAT" FOR OUTPUT AS #1
20 FOR X=1 TO 300
30 PRINT #1, "HOWARD W SAMS"
40 NEXT X
50 CLOSE #1
60 GOTO 10

```

Waveforms and voltages taken from ground, unless noted otherwise.

Waveforms taken with triggered scope and Sweep/Time switch in Calibrate position, scope input set for DC coupling on 0 reference voltage waveforms. Switch to AC input to view waveforms after DC reference is measured when necessary. Each waveform is 7 cm. width with DC reference voltage given at the bottom line of each waveform.

Time in μsec. per cm, given with p-p reading at the end of each waveform.

Item numbers in rectangles appear in the alignment/adjustment instructions. Supply voltages maintained as shown at input. Voltages measured with digital meter, no signal. Controls adjusted for normal operation. Terminal identification may not be found on unit. Capacitors are 50 volts 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 light On)

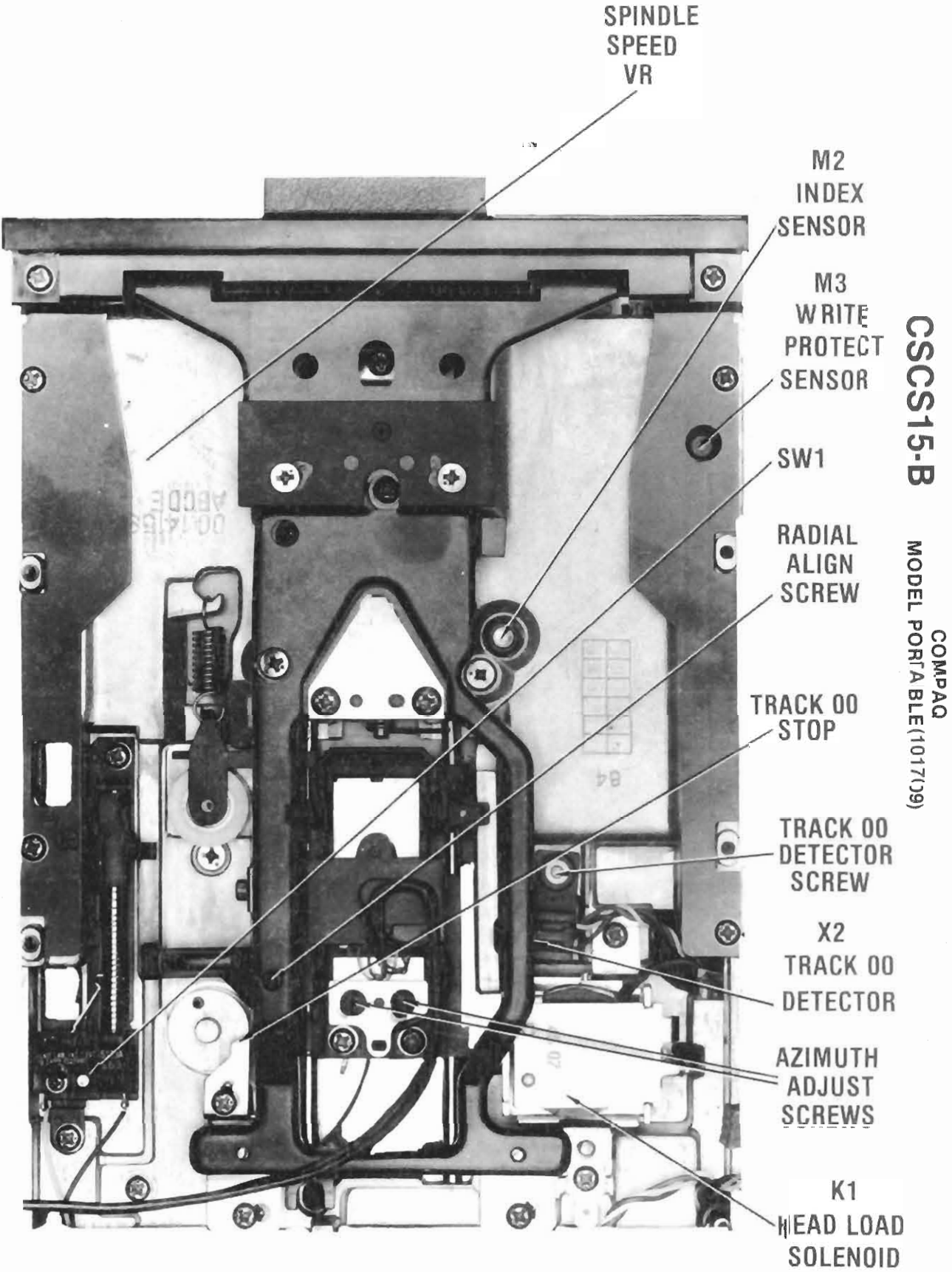
- (1) Probe indicates H if diskette is write protected.
- (2) Probe indicates L if diskette is write protected.
- (3) Probe indicates P when Head Position motor is operating.
- (6) Probe indicates H when Head is moving in and L when Head is moving out from the center of the diskette.
- (7) Probe indicates L when Head is moving in and H when Head is moving out from the center of the diskette.
- (8) Probe indicates H when the Head is on track 00 and L when off track 00.
- (9) Probe indicates L when the Head is on track 00 and H when off track 00.

LOGIC CHART (Continued)

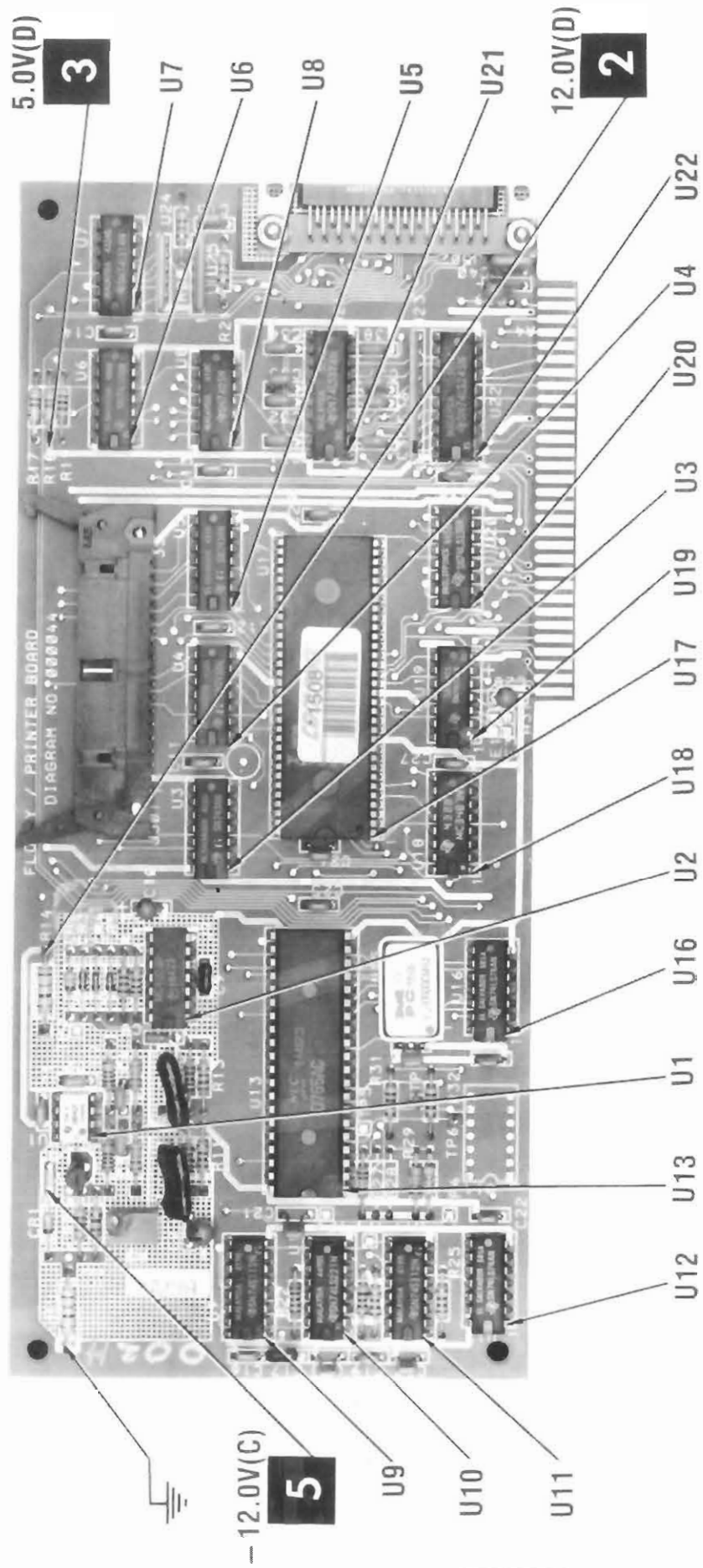
FLOPPY DISK/PRINTER ADAPTER BOARD

PIN NO.	IC U1	IC U2	IC U3	IC U4	IC U5	IC U6	IC U7	IC U8	IC U9	IC U10	IC U11	IC U12
1	L	H	H	L	L(3)	H	P		P	P	P	*
2	L	H	L	H	H	P	P		H	H	H	*
3	L	H	*	H	H(3)	P	H		P	P	H	*
4	L	H	*	H	H	P	L		H	P	H	*
5	L	L	*	H	L(6)	L(3)	P		P	P	P	H
6	H	P	L	L	H(7)	L(3)	P		P	P	P	L
7	H	L	L	L	L	L	L		P	P	P	L
8	*	H	H	L	H(10)	L(3)	P		L	L	L	L
9		L	*	H	L(11)	L(3)	P		P	P	P	P
10		*	*	H	H	H(8)	H(8)		H	H	H	H
11		*	L	P	H	P	L(9)		P	H	H	P
12		*	*	H	H	P	P		H	P	H	P
13		*	*	P	L	P	P		P	P	P	H
14		H	H	H	H	H	H		P	P	H	H
15									P	P	H	H
16									H	H	H	

PIN NO.	IC U13	PIN NO.	IC U13	PIN NO.	IC U15	IC U16	IC U17	PIN NO.	IC U17	PIN NO.	IC U17	PIN NO.	IC U17	PIN NO.	IC U18	IC U19
1	L	21	P	1	*	H	*	21	P	41		61	P	1	L	H
2	P	22	P	2	L	P	*	22	P	42		62	P	2	L	H
3	P	23	P	3	P	P	P	23	P	43		63	*	3	H	H
4	P	24	P	4	H	H	H	24	P	44		64	H	4	H	P
5	P	25	P	5		H	H	25	P	45				5	P	P
6	P	26	H	6		L	P	26	P	46				6	P	P
7	P	27	L(11)	7		L	H	27	P	47				7	P	L
8	P	28	L(12)	8		H	P	28	P	48	L			8	L	P
9	P	29	H(3)	9		L	L	29	P	49	P			9	P	*
10	P	30	P	10		H	P	30	P	50	H			10	P	*
11	P	31	P	11		P	L	31	*	51	H			11	H	P
12	P	32	P	12		P	P	32	H	52	L			12	H	P
13	P	33	L(3)	13		H	P	33	*	53	L			13	P	*
14	P	34	L	14		H	P	34	*	54	P			14	P	H
15	P	35	H	15			P	35		55	P			15	P	
16	P	36	H(3)	16			L	36		56	L			16	H	
17	P	37	P	17			P	37		57	P					
18	P	38	L(6)	18			P	38		58	P					
19	P	39	L(3)	19			P	39		59	P					
20	P	40	H	20			P	40		60	P					



CHASSIS - TOP VIEW



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

LOGIC CHART

DISK DRIVE							
PIN NO.	A4A	A4B	C6	D6	E1	E5	E6
1	H(3)	H(3)	H	H	L	L	H
2	H(3)	H(3)	H	H	L	*	L
3	L(3)	L(3)	L	L	L(3)	L	H
4	L(3)	L(3)	H	H	H	H	L
5	L	L	L(1)	L	L(3)	H	L
6	H(3)	H(3)	H(2)	H	H	L	H
7	H(3)	H(3)	L	L	L	L	L
8	H(3)	H(3)	H(9)	P	L	P	P
9	H(3)	H(3)	L(8)	H	H	P	P
10			H	P	H	H(3)	L(3)
11			P	L	(3)	L(3)	H(3)
12			H	H	(3)	L(7)	H(6)
13			P	H	L	H(6)	L(7)
14			H	H	(3)	H	H
15					*		
16					*		

PIN NO.	F1	PIN NO.	F1	PIN NO.	F1
1	H	21	L	41	H
2	L	22	P	42	P
3	L	23	L	43	P
4	L	24	L(7)	44	L(1)
5	L	25	H(3)	45	H
6	H	26	P	46	P
7	H	27	L(8)	47	L
8	H	28	L(1)	48	H
9	L	29	H	49	L(3)
10	L	30	H	50	H
11	H	31	L	51	L
12	P	32	L	52	H
13	P	33	H	53	L(3)
14	H	34	H	54	L(3)
15	L(8)	35	H	55	L(3)
16	H	36	L	56	H(3)
17	L	37	H	57	H(3)
18	H	38	H	58	H
19	H	39	H	59	L
20	H	40	L	60	H

PARTS LIST AND DESCRIPTION (Continued)

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

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

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
R21	DISK DRIVE BOARD Phase	50K		
R5	FLOPPY/PRINTER BOARD	10K		

COILS (RF-IF)

ITEM No.	FUNCTION	MFGR. PART No.	ITEM No.	FUNCTION	MFGR. PART No.
L1	DISK DRIVE				
L2	RF Choke				
L3	Peaking				
	Peaking				

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
HEAD 0	DISK DRIVE		
HEAD 1	R/W Erase Head		
K1	R/W Erase Head		Head Load
LED 1	Solenoid		Activity, Red
M1	LED		
M2	Motor Control Board		
M3	Index Sensor		
SW1	Write Protect Sensor		
X1	Switch		Disk Inserted
X2	Crystal		400KHz
X3	Track 00 Detector		Head Position
	Motor		
	FLOPPY/PRINTER BOARD		
U15	Oscillator		16MHz

PARTS LIST AND DESCRIPTION

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA				NOTES
			NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	
D1,2	DISK DRIVE						
D3	1S2473		NTE519	ECG519	SK3100/519	103-131	
D4							
D5							
D6							
A4A,B							
C6	M54542L		NTE7438	ECG7438	SK7438	HE-443-77	
D6	M53238P		NTE7438	ECG7438	SK7438	HE-443-77	
E1	UPA2003C						
E5	M74LS05P		NTE74LS05	ECG74LS05	SK74LS05	HE-443-818	
E6	M74LS14P		NTE74LS14	ECG74LS14	SK7CT14	HE-443-872	
F1	J20104A						
G6	MC2870P						
	M51018AP						
Q1	2SA952K		NTE290A	ECG290A	SK3114A/290A	121-79003	
Q2							
Q3							
Q4							
X2	SAME AS Q1						

14 PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA				NOTES
			NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	
	FLOPPY/PRINTER BOARD						
CR1	1N753A		NTE5046A	ECG5046A	SK75A/5046A	103-Z9007	
CR2	1N752A		NTE5011A	ECG5011A	SK5A6/5011A	103-131	
CR3 thru CR5	1N914B		NTE519	ECG519	SK3100/519		
Q1	PN2222		NTE123AP	ECG123AP	SK3854/123AP	121-Z9000A	
U1	UA741CP		NTE941M	ECG941M	SK3552/941M	HE-442-22	
U2 thru U5	MC4024P		NTE743B	ECG743B	SK7438	HE-443-77	
U6	SN74LS08N		NTE74LS08	ECG74LS08	SK7CT08	HE-443-780	
U7	SN74LS14N		NTE74LS14	ECG74LS14	SK7CT14	HE-443-872	
U8	SN7405N		NTE7405	ECG7405	SK7405	HE-443-642	
U9	SN74S112N		NTE74S112	ECG74S112	SK74S112		
U10	SN74LS221N		NTE74LS221	ECG74LS221	SK7CT221		
U11	SAME AS U9						
U12	SN74LS74AN		NTE74LS74A	ECG74LS74A	SK7CT74	HE-443-730	
U13	D765AC					HE-443-944	
U16	SAME AS U12						
U17	MB64H303					HE-443-1167	
U18	MC3487N						
U19	SN74LS30N		NTE74LS30	ECG74LS30	SK7CT30	HE-443-732	
U20	SN74LS138N		NTE74LS138	ECG74LS138	SK7CT138	HE-443-877	
U21	SN74LS374N		NTE74LS374	ECG74LS374	SK7CT374	HE-443-863	
U22	SN74LS245N		NTE74LS245	ECG74LS245	SK7CT245	HE-443-885	

PARTS LIST AND DESCRIPTION (Continued)

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

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
	FLOPPY/PRINTER BOARD	
C7	10 16V TAN	

ITEM No.	RATING	MFGR. PART No.
C10	10 16V TAN	
C28	10 16V TAN	
C39	10 16V TAN	

CAPACITORS

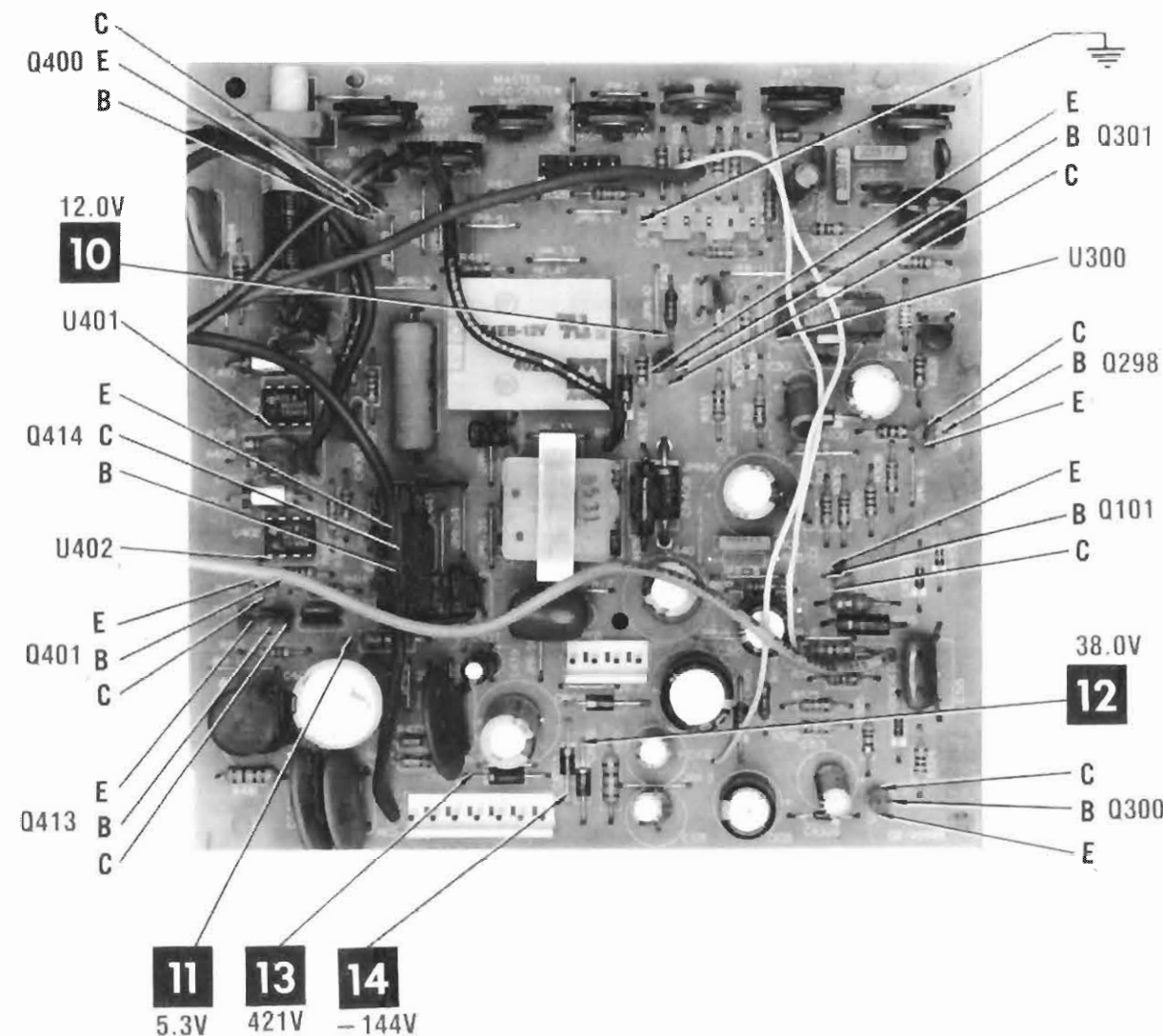
ITEM No.	RATING	MFGR. PART No.
	DISK DRIVE BOARD	
C2	.001 NPO 50V 5%	
C4	.001 NPO 50V 5%	
C7	470 NPO 50V 5%	
C8	220 NPO 50V 5%	
C9	150 NPO 50V 5%	
C14	470 NPO 50V 5%	

ITEM No.	RATING	MFGR. PART No.
	FLOPPY/PRINTER BOARD	
C5	.0013 500V 2%	
C6	.0013 500V 2%	
C9	11 100V 2%	
C17	15 100V 2%	

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	WORKMAN PART No.
	DISK DRIVE BOARD			
R10	470 2% 1/8W Carbon Film		EW147	
R12	470 2% 1/8W Carbon Film		EW147	
R16	6800 2% 1/8W Carbon Film		EW268	
R17	8200 2% 1/8W Carbon Film		EW282	
R19	8200 2% 1/8W Carbon Film		EW282	
R29	150 1% 1/2W Metal Film			
R30	47K 2% 1/8W Carbon Film		EW347	
R34	1500 1% 1/2W Metal Film			
RP1	Resistor Network (1)			
RP2	Resistor Network (2)			
RP3	Resistor Network (2)			
RP4	Resistor Network (2)			
RP5	Resistor Network (2)			
	FLOPPY/PRINTER BOARD			
R6	3480 1% 1/2W Metal Film			
R7	10K 1% 1/2W Metal Film			
R8	10K 1% 1/2W Metal Film			
R9	3480 1% 1/2W Metal Film			
R10	1100 1% 1/2W Metal Film			
R12	1100 1% 1/2W Metal Film			
R22	11K 1% 1/2W Metal Film			
R26	60.4K 1% 1/2W Metal Film			
R29	487K 1% 1/2W Metal Film			
R30	953K 1% 1/2W Metal Film			
U23	Resistor Network (1)			
U24	Resistor Network (2)			
U25	Resistor Network (3)			

- (1) Contains nine (9 ea.) 8200 Ohm 2%
(2) Contains five (5 ea.) 150 Ohm 2%
(3) Contains five (5 ea.) 4700 Ohm 5%



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

A Howard W. Sams CIRCUITRACE® Photo

COMPAQ
MODEL PORTABLE (101709)
CSCS15-C

KEYBOARD, POWER SUPPLY, SYSTEM BOARD

See Folder CSCS15

VDU CONTROLLER BOARD

See Folder CSCS15-A

DISK DRIVE FLOPPY DISK/PRINTER ADAPTER

See Folder CSCS15-B

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CSCS15-C
COMPAQ
MODEL PORTABLE (101709)

SAMS™ Howard W. Sams & Co., Inc.
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MISCELLANEOUS ADJUSTMENTS

Alignment Tools GC Electronics
L4039440,8282,8606

Type in and run the following Basic program to produce a crosshatch pattern with a white border on the CRT screen. Use the crosshatch pattern for all adjustments except the Brightness adjustment.

```
10 SCREEN 0,1:WIDTH 80
20 CLS:COLOR 7,0,7
30 FOR X = 1 TO 1919
40 PRINT CHR$(197);
50 NEXT X
60 GOTO 60
```

RASTER CENTERING ADJUSTMENT

Center the raster by adjusting the two magnetic rings located on rear of Deflection Yoke.

MASTER VIDEO CENTERING AND HEIGHT ADJUSTMENTS

Put the Monitor in Low Scan mode (hold Ctrl and Alt keys and press < key). Adjust the Master Video Center Control (R410) to center the crosshatch pattern on the screen. Adjust the Master Height Control (R303) for the desired height.

VIDEO CENTERING AND HEIGHT ADJUSTMENTS

Put the Monitor in the High Scan mode (hold Ctrl and Alt keys and press > key). Adjust the Video Centering Control (R485) to center the crosshatch pattern on the screen. Adjust the Height Control (R488) for the desired height.

HORIZONTAL WIDTH ADJUSTMENT

Adjust the Width Coil (L403) for the proper width.

VERTICAL LINEARITY

Adjust the Vertical Linearity Control (R307) to make the crosshatch pattern even at the top and bottom.

BRIGHTNESS ADJUSTMENT

Set the External Brightness Control (R114) to Maximum. Type in and run the following Basic program:

```
10 CLS: KEY OFF: COLOR 7,0,0
```

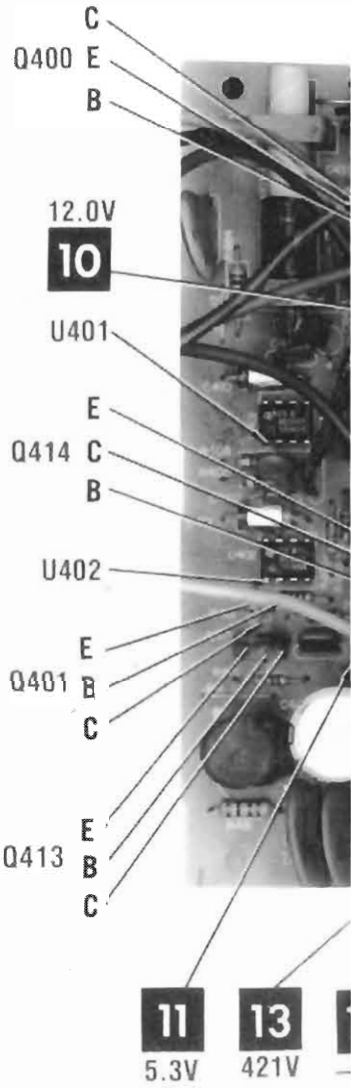
Turn the Brightness Control (R109) clockwise until the raster appears on the screen. Turn Control R109 counter-clockwise until the raster just disappears.

FOCUS

Adjust the Focus Control (R477) until the lines in the crosshatch pattern are in focus.

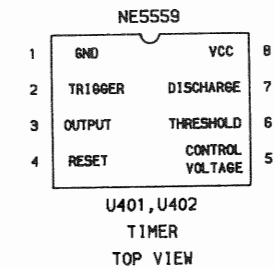
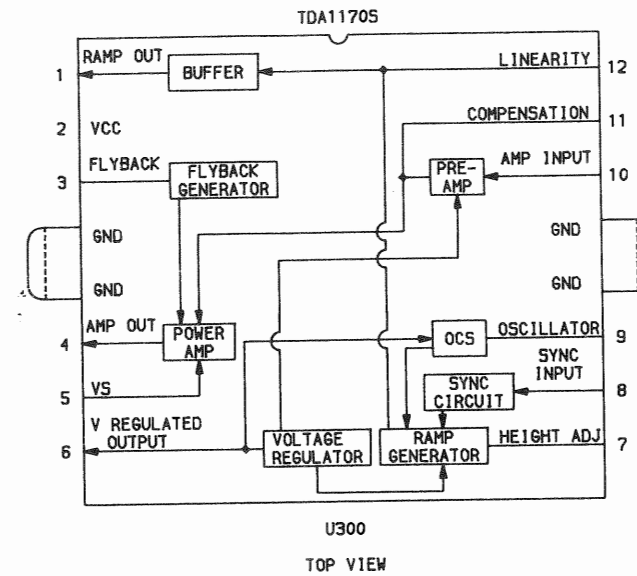
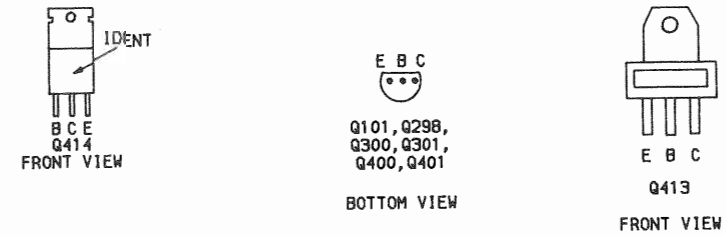
GridTrace LOCATION GUIDE

C101	G-9	R106	B-8
C102	J-7	R107	B-7
C103	K-7	R108	I-9
C104	H-4	R109	A-8
C105	K-8	R110	J-6
C107	H-8	R112	B-8
C200	B-9	R113	B-7
C300	D-11	R200	F-10
C301	E-9	R201	B-9
C302	E-10	R202	E-11
C303	B-9	R203	C-11
C304	C-11	R301	D-10
C306	B-10	R302	A-10
C307	B-9	R303	A-10
C308	D-8	R305	G-9
C309	G-8	R306	D-8
C310	I-7	R307	A-9
C311	G-8	R308	F-10
C312	B-10	R309	D-8
C313	K-9	R310	C-8
C314	B-11	R311	C-11
C315	I-11	R312	D-8
C401	G-2	R313	E-8
C402	F-2	R314	C-9
C405	D-2	R318	E-8
C406	F-3	R320	G-10
C410	E-2	R321	I-10
C411	D-2	R322	J-9
C412	F-2	R323	I-9
C435	B-3	R324	J-11
C436	F-5	R325	J-10
C437	I-5	R326	I-9
C438	H-5	R327	E-7
C439	J-5	R328	B-6
C440	H-7	R401	B-5
C441	I-2	R402	E-3
C442	K-2	R403	G-3
C443	G-4	R405	F-1
C449	K-3	R406	G-2
C450	H-2	R407	E-3
C486	J-4	R408	F-1
C487	K-2	R410	A-5
C488	C-1	R414	H-2
CR101	J-8	R415	I-2
CR102	K-6	R468	H-2
CR103	J-6	R470	E-4
CR104	I-6	R472	J-4
CR301	F-9	R473	J-4
CR302	G-11	R477	A-3
CR303	H-11	R478	G-7
CR304	J-10	R481	J-1
CR305	E-6	R482	I-3
CR306	K-9	R484	D-1
CR408	G-7	R485	B-4
CR409	J-5	R487	C-4
CR413	D-3	R488	A-6
F401	D-7	S102	K-4
J401	A-3	S103	I-6
K1	E-5	S106	C-7
L101	H-10	S107	B-6
L402	J-1	T403	G-5
L403	C-2	V300	D-9
Q101	H-9	V401	E-2
Q298	F-11	V402	G-2
Q300	K-10		
Q301	E-7		
Q400	B-3		
Q401	H-2		
Q413	H-2		
Q414	H-3		
R102	H-8		
R103	G-9		
R104	I-8		
R105	H-10		








NOTE: ARROWS ON IC'S

IC PINOUTS & TERMINAL GUIDES



SCHEMATIC NOTES

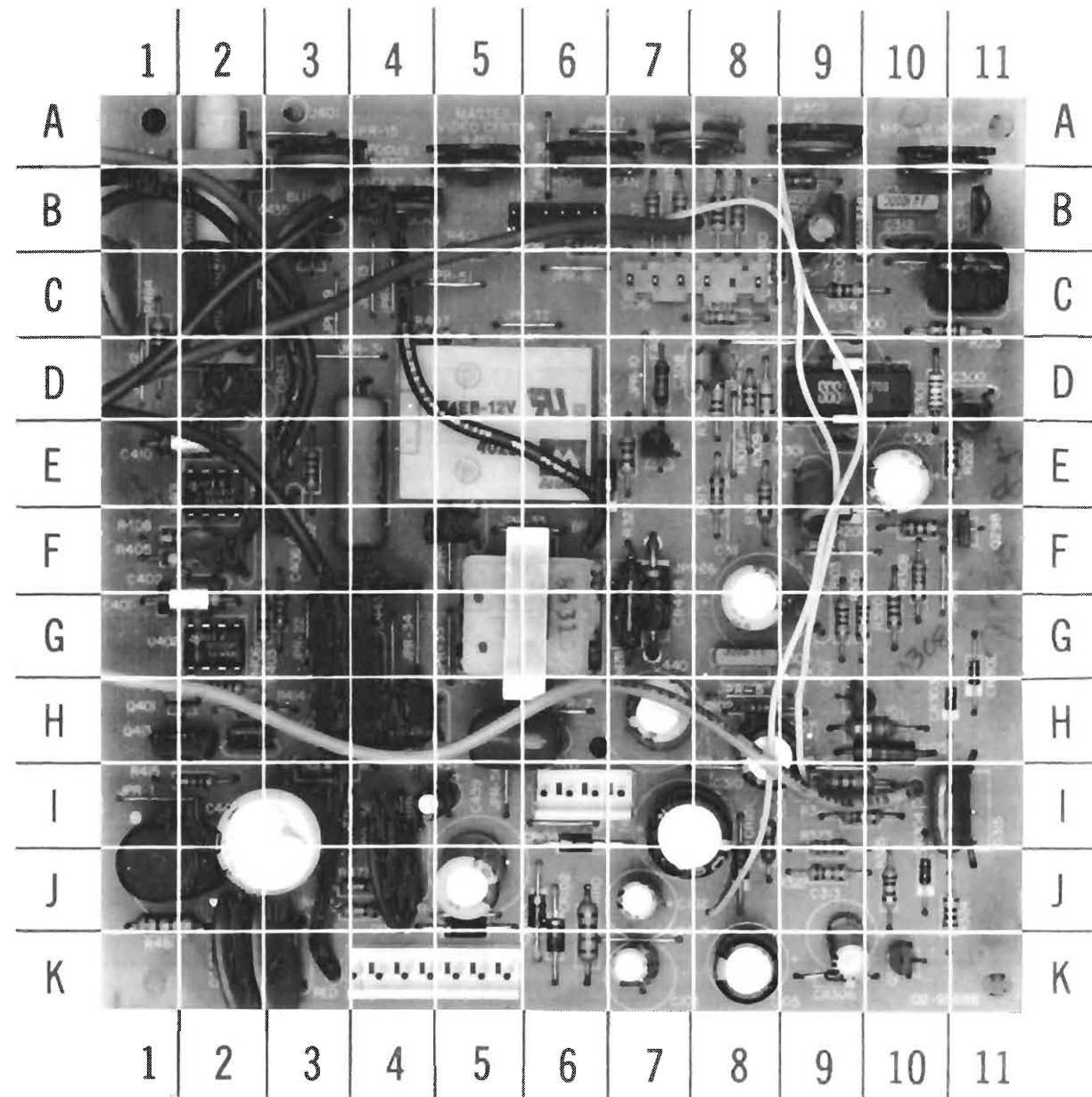
-  Ground
 -  Chassis
 -  Circuitry not used in some versions
 -  Circuitry used in some versions
 -  See parts list
- Waveforms and voltages taken from ground, unless noted otherwise.
- Waveforms: triggered scope.
- Item numbers in rectangles appear in the alignment/adjustment instructions
- Supply voltages maintained as shown at input.
- Voltages measured with digital meter, power up mode (Computer turned On, no keys pressed, no diskette in Disk Drive).
- Waveforms taken while running the following Basic Program.

```

10 DATA 0,1,2,3,4,5,6,15
20 KEY OFF:SCREEN 0,1
30 FOR B = 1 TO 24
40 FOR A = 0 TO 7
50 READ X:COLOR X,0
60 FOR Y = 1 TO 10
70 PRINT CHR$(219);
80 NEXT Y:NEXT A
90 RESTORE:NEXT B
100 GOTO 100

```

Controls adjusted for normal operation.
Terminal identification may not be found on unit.
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.



TROUBLESHOOTING

POWER SUPPLY

Check for 12.0V at Source 10. If 12.0V is missing, check Fuse F401 and check Connector S106 for good connections. If Fuse F401 is open, check for a resistance of about 19 ohms from Source 10 to ground. If the resistance reading is considerably lower than 19 ohms, check for possible shorts at the Horizontal Output Transistor (Q414) and at pins 4 and 11 of the Vertical Processor IC (U300). Also check Capacitors C301, C437, C439 and C440 for possible shorts.

If 12.0V is present at Source 10, check for 5.3V at Source 11. If 5.3V is missing, check Capacitor C405 and Resistor R482. If 5.3V is present, check for 38.0V at Source 12, 421V at Source 13, and -144V at Source 14. If 38.0V is missing at Source 12, check Diode CR102 and Capacitor C103. If 421V is missing at Source 13, check Diode CR409 and Capacitor C486. If -144V is missing at Source 14, check Diodes CR103 and CR104 and Capacitors C104 and C105.

VIDEO

No video. Check Brightness Control (R114) and Brite Control (R109) for proper adjustment, see "Miscellaneous Adjustments". Run the Basic program listed in the schematic notes. Check the waveform on the collector of the Video Amp Transistor (Q101). If the waveform is missing, check the voltages and components associated with Transistor Q101 and check pin 8 of Connector S107 for good connection. If the waveform is good, check the blanking waveform at pin 1 of the CRT (V101). If the waveform is not correct, check the voltages, waveforms and components associated with Blanking Transistor (Q300). If the waveform is good, check the voltages and components associated with pins 6 and 7 of the CRT (V101).

HORIZONTAL

No horizontal sweep. Check the waveform at the base of Horizontal Amp Transistor (Q400). If the waveform is missing, check pin 6 of Connector S107 for good connections and check Capacitor C435 and Resistor R401. If the waveform checks good, check the waveform at pin 2 of the Horizontal One Shot IC (U401). If the waveform is missing, check the voltages and components associated with Transistor Q400. If the waveform is good, check the waveform at pin 3 of the Horizontal One Shot IC (U402). If the waveform is missing, check the voltages and components associated with pins 2 thru 8 of IC U401. If the waveform is present, check the waveform at the base of the Horizontal Amp Transistor (Q401). If the waveform is missing, check the voltages and components associated with pins 2 thru 8 of Horizontal One Shot IC (U402). If the waveform is present,

check the waveform at the base of the Horizontal Driver Transistor (Q413). If the waveform is missing, check the voltages and components associated with Transistor Q401. If the waveform is present, check the waveform at the base of the Horizontal Output Transistor (Q414). If the waveform is missing, check the voltages and components associated with Transistor Q413 and check Transformer T403 for continuity. If the waveform is present, check the voltages and components associated with Transistor Q414 and check Transformer T101 and the components associated with Transformer T101.

VERTICAL

No vertical sweep. Check the waveform at pin 8 of the Vertical Processor IC (U300). If the waveform is missing, check pin 12 of Connector S107 for good connection and check the voltages and components associated with Vertical Amp Transistor (Q298). If the waveform is good, check the waveform at pin 4 of IC U300. If the waveform is missing, check the voltages and components associated with pins 1 thru 12 of IC U300. Check Connector S103 for good connections and check the Deflection Yoke (DY1) windings for continuity.

HIGH-LOW SCAN SWITCHING

Relay K1 switches between High Scan mode (18.5kHz Horiz, 50 Hz Vert) and Low Scan mode (15.7kHz Horiz, 60Hz Vert). Each mode can be selected by pressing the Ctrl, Alt, < and > keys on the Computer Keyboard. To select High Scan mode, hold the Ctrl and Alt keys down and press the > Key. To select Low Scan mode, hold the Ctrl and Alt Keys down and press the < Key. NOTE: The Ctrl, Alt, < or > Keys will not work if the video is in 40 column mode, the video must be in 80 column mode.

Low Scan mode does not work. Hold the Ctrl and Alt Key down and press the < key. Check for .7V at the base of the Hi-Lo Scan Switch Transistor (Q301). If the voltage is not correct check pin 10 of Connector S107 for good connection and check Resistor R327. If the voltage is correct, check for .1V at the collector of Transistor Q301. If the voltage is not correct, check Transistor Q301. If the voltage is correct, check Relay K1 winding for continuity (320 ohms from pin 6 to pin 11) and check Diode CR305.

High Scan mode does not work. Monitor always comes up in Low Scan mode. Check for a possible shorted Transistor Q301.

4 PARTS LIST AND DESCRIPTION

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA				NOTES
			NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	
CR101	MONITOR	1N4007	NTE125	ECG125	SK3081/125	212-Z9000	
CR102			NTE558	ECG558	SK3998/558		
CR103,4							
CR301							
CR302 thru CR304	SAME AS CR101	1N4148	NTE519	ECG519	SK3100/519	103-131	
CR305							
CR306							
CR408							
CR409	SAME AS CR101	MR818	NTE581	ECG581	SK5001/581	103-287	
CR413			NTE506	ECG506	SK3998/506		
			NTE5010A	ECG5010A	SK5A1/5010A	103-279-10	
Q101	1N5231B	2N5830	NTE287	ECG287	SK3433/287	121-Z9045	
Q298							
Q300							
Q301							
Q400,1	SAME AS Q101	SPS8870					
Q413							
Q414							
U300							
U401,2	MPSU05	BU407D	NTE188	ECG188	SK3199/188	121-Z9036	
			NTE379	ECG379	SK9085/379	121-Z9111	
			NTE1289	ECG1289	SK9182/1289		
			NTE955M	ECG955M	SK3564/955M	221-Z9042	

PARTS LIST AND DESCRIPTION (Continued)

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

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
C441	6.8 50V 100%-0% N.P.	

CAPACITORS

ITEM No.	RATING	MFGR. PART No.
C401	.0039 50V 3%	
C410	.0022 50V 3%	

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	WORKMAN PART No.
R301	133K 1% 1/2W Carbon Film			
R470	5 5% 3W Metal Oxide			

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

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
R109	Bright	100K		
R114	Brightness	100K		
R303	Master Height	250K		
R307	Vertical Linearity	250K		
R410	Master Video	10K		
R477	Focus	5M		
R485	Video Center	10K		
R488	Height	250K		

COILS & TRANSFORMERS

ITEM No.	FUNCTION	MFGR. PART No.	OTHER IDENTIFICATION	NOTES
DY1	Yoke			
L101	RF Choke			
L402	Linearity			
L403	Width			
R478	RF Choke			
T101	Horizontal Output			
T403	Horizontal Drive			

FUSE DEVICES

ITEM NO.	DESCRIPTION	MFGR. PART NO.		NOTES
		DEVICE	HOLDER	
F401	3A @ 125V Fast Blow			

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
K1	Relay		
V101	CRT	M24-308GR/P	Scan Selection

COMPAG
MODEL PORTABLE (101709)

LOGIC CHART (Continued)

PIN NO.	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 U32	IC U33
1	P	P	P	P	P	P	P	P	P	P	P	P	P	P
2	P	P	P	P	P	P	P	P	P	P	L	P	P	P
3	P	P	P	P	P	P	P	P	P	P	P	P	P	P
4	*	L	P	P	P	P	P	P	P	P	L	P	P	P
5	H	P	P	P	P	P	P	P	P	P	P	P	P	P
6	P	P	P	P	P	P	P	P	P	P	L	P	P	P
7	P	P	P	P	P	P	P	P	P	P	P	P	H	P
8	P	P	P	P	P	P	P	P	P	P	P	P	L	L
9	P	P	H	H	H	H	H	H	H	H	P	P	H	P
10	L	L	L	L	L	L	L	L	L	L	L	L	H	P
11	P	P	L	L	L	L	L	L	L	L	P	P	H	P
12	P	P	H	H	H	H	H	H	H	H	P	P	H	P
13	P	P	P	P	P	P	P	P	P	P	P	P	H	P
14	P	*	P	P	P	P	P	P	P	P	L	P	H	P
15	P	H	P	P	P	P	P	P	P	P	P	P	H	P
16	P	P	P	P	P	P	P	P	P	P	L	P	H	H
17	P	P	P	P	P	P	P	P	P	P	P	P		
18	*	P	P	P	P	P	P	P	P	P	L	P		
19	H	P	P	P	P	P	P	P	P	P	P	P		
20	H	H	H	H	H	H	H	H	H	H	H	H		

PIN NO.	IC U34	IC U35	IC U37
1	P	P	L
2	P	P	P
3	P	P	P
4	L	P	L
5	P	P	P
6	P	P	P
7	P	P	L
8	L	P	*
9	H	P	*
10	P	L	L
11	H	H	L
12	H	H	L
13	H	H	H
14	H	H	H
15	H	H	
16	H	H	
17		H	
18		H	
19		H	
20		H	

COMPAQ MODEL PORTABLE (101709)
CSCS15-A

DISK DRIVE
FLOPPY DISK/PRINTER ADAPTER
See Folder CSCS15-B

MONITOR
See Folder CSCS15-C

KEYBOARD, POWER SUPPLY,
SYSTEM BOARD
See Folder CSCS15

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IC Pinouts and Terminal Guides	3,14	Schematics	2,7
Logic	16,17	Schematic Notes	12
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CSCS15-A
MODEL PORTABLE (101709)
COMPAQ

NOTES

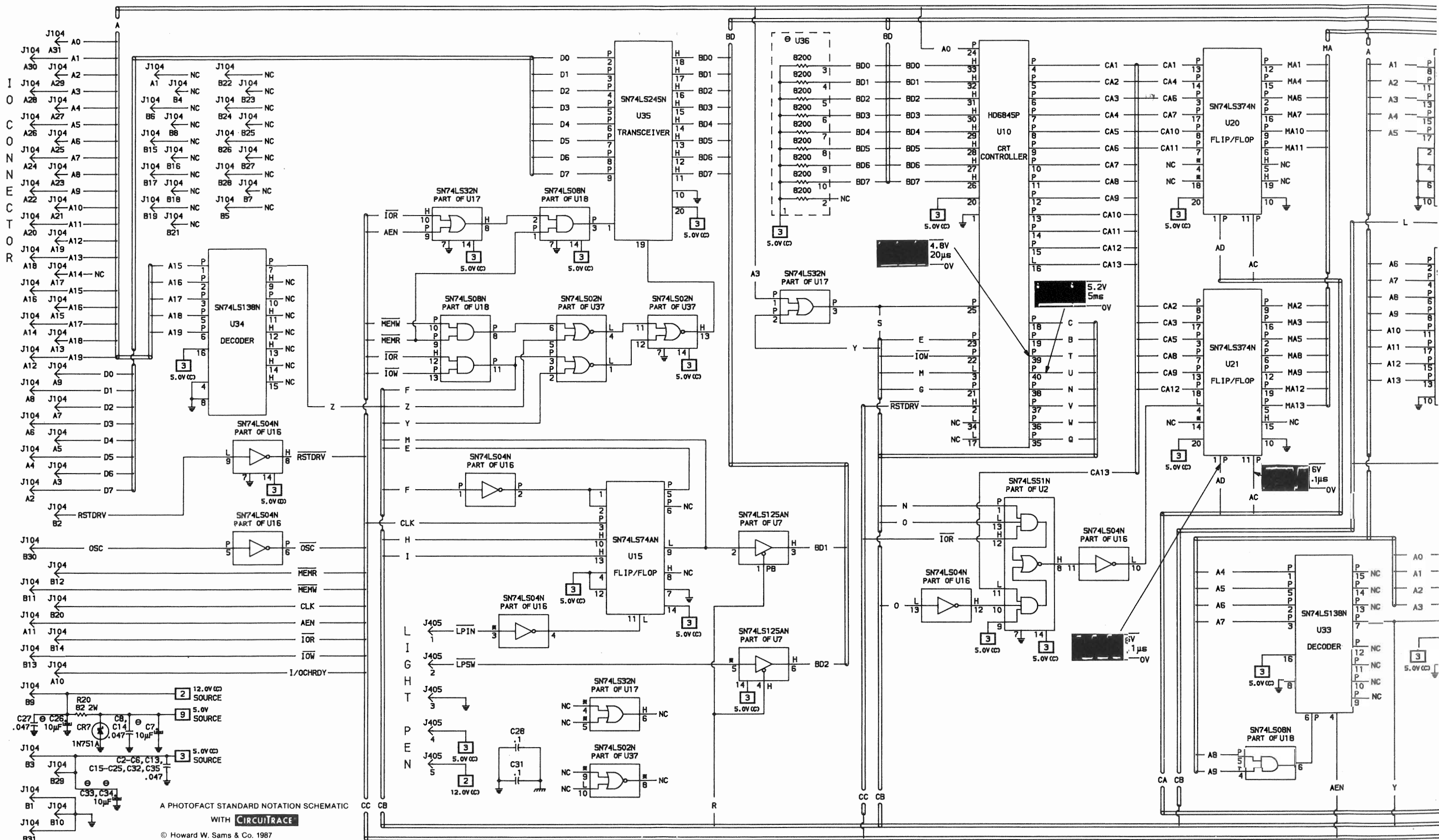
LOGIC CHART

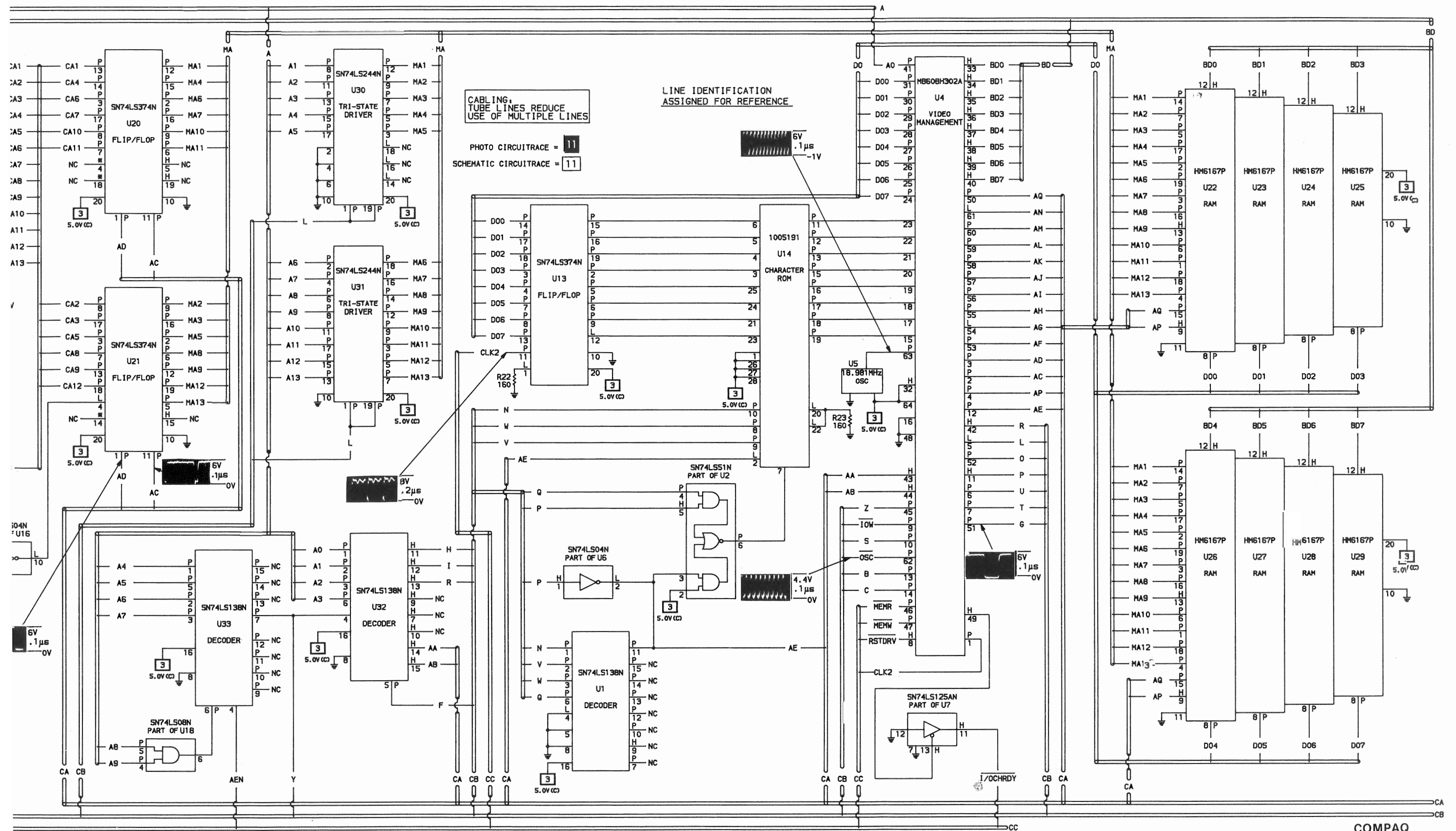
PIN NO.	IC U1	IC U2	IC U4	PIN NO.	IC U4	PIN NO.	IC U4	PIN NO.	IC U4	PIN NO.	IC U5	IC U6	IC U7	IC U9
1	P	P	P	21	P	42	P	61	L	1	*	H	H	L
2	P	H	P	22	P	42	H	62	P	2	L	L	L	H
3	P	L	P	23	P	43	H	63	P	3	P	P	H	L
4	L	P	H	24	P	44	H	64	H	4	H	P	H	P
5	L	H	P	25	P	45	P			5		P	*	L
6	P	P	P	26	P	46	P			6		P	H	P
7	P	L	P	27	P	47	P			7		L	L	L
8	L	H	H	28	P	48	L			8		L	*	P
9	H	H	P	29	P	49	H			9		H	P	L
10	P	H	P	30	P	50	P			10		P	H	L
11	P	L	H	31	P	51	P			11		P	H	P
12	P	H	P	32	H	52	L			12		H	L	P
13	P	L	P	33	H	53	P			13		L	H	P
14	P	H	P	34	H	54	L			14		H	H	P
15	P		P	35	H	55	P			15				P
16	H		L	36	H	56	P			16				P
17			P	37	H	57	P			17				H
18			P	38	H	58	P			18				L
19			P	39	H	59	P			19				H
20			P	40	H	60	P			20				H

PIN NO.	IC U10	PIN NO.	IC U10	PIN NO.	IC U11	IC U12	IC U13	IC U14	PIN NO.	IC U14	PIN NO.	IC U15	IC U16	IC U17	IC U18	IC U19
1	L	21	P	1	L	H	L	H	21	P	1	P	P	P	P	L
2	H	22	P	2	H	P	P	P	22	L	2	P	P	P	H	L
3	L	23	P	3	H	P	P	P	23	L	3	P	*	P	P	L
4	P	24	P	4	L	P	P	P	24	P	4	H	L	*	P	L
5	P	25	P	5	H	P	P	P	25	P	5	P	P	*	P	P
6	P	26	H	6	L	P	P	P	26	H	6	P	P	H	P	L
7	P	27	H	7	L	L	P	P	27	H	7	L	L	L	L	L
8	P	28	H	8	P	P	P	P	28	H	8	H	H	H	P	L
9	P	29	H	9	P	H	P	P			9	L	L	P	P	P
10	P	30	H	10	P	P	L	P			10	H	L	H	P	L
11	P	31	H	11	P	H	P	P			11	L	H	P	P	L
12	P	32	H	12	P	P	L	P			12	H	H	P	H	P
13	P	33	H	13	P	H	P	P			13	H	L	P	P	L
14	P	34	L	14	H	H	P	L			14	H	H	H	H	H
15	P	35	P	15			P	P								
16	L	36	P	16			P	P								
17	L	37	P	17			P	P								
18	P	38	P	18			P	P								
19	P	39	P	19			P	P								
20	H	40	P	20			H	L								

PIN NO.	IC U20	IC U21
1	P	P
2	P	P
3	P	P
4	*	L
5	H	P
6	P	P
7	P	P
8	P	P
9	P	P
10	L	L
11	P	P
12	P	P
13	P	P
14	P	*
15	P	H
16	P	P
17	P	P
18	*	P
19	H	P
20	H	H

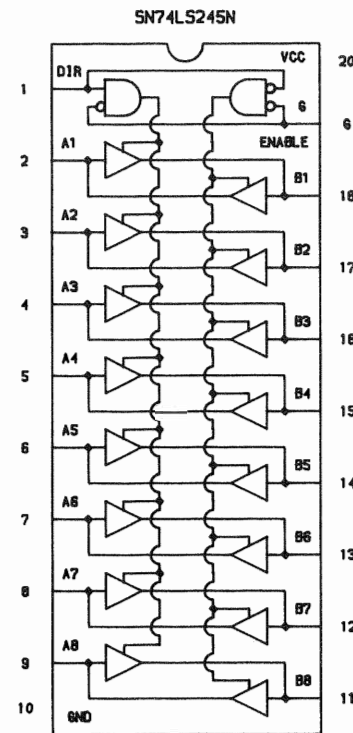
PIN NO.	IC U34	IC U35
1	P	P
2	P	P
3	P	P
4	L	P
5	P	P
6	P	P
7	P	P
8	L	P
9	H	P
10	P	L
11	H	H
12	H	H
13	H	H
14	H	H
15	H	H
16	H	H
17		H
18		H
19		H
20		H



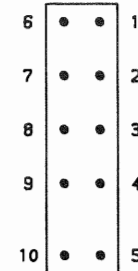


IC PINOUTS & TERMINAL GUIDES

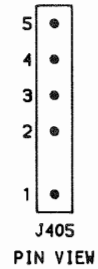
VDU CONTROLLER BOARD



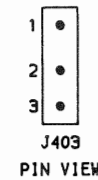
U35
TRANSCEIVER
TOP VIEW



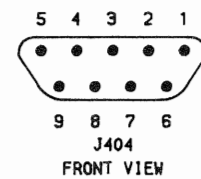
J401
PIN VIEW



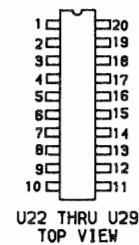
J405
PIN VIEW



J403
PIN VIEW



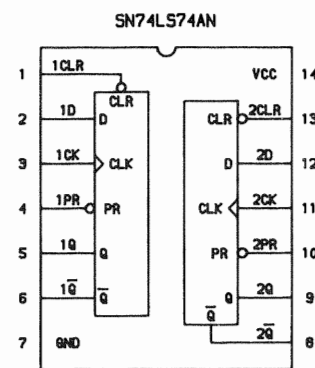
J404
FRONT VIEW



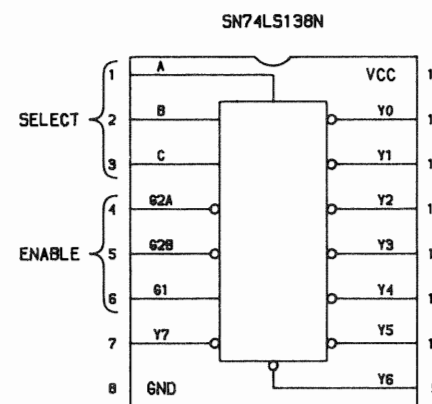
U22 THRU U29
TOP VIEW



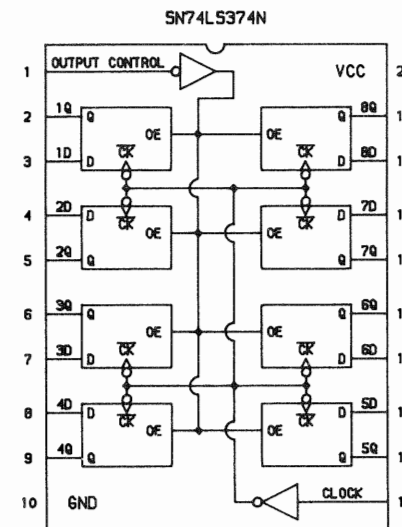
J104
EDGE VIEW



U15
FLIP/FLOP
TOP VIEW



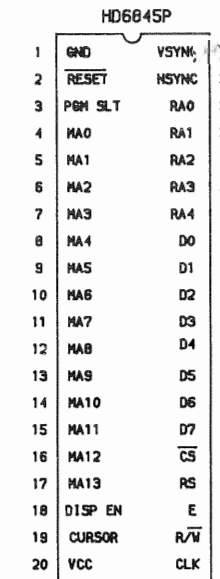
U1, U32, U33, U34
DECODER
TOP VIEW



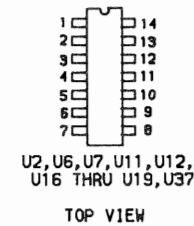
U13, U20, U21
FLIP/FLOP
TOP VIEW



U4
VIDEO CONTROLLER
TOP VIEW



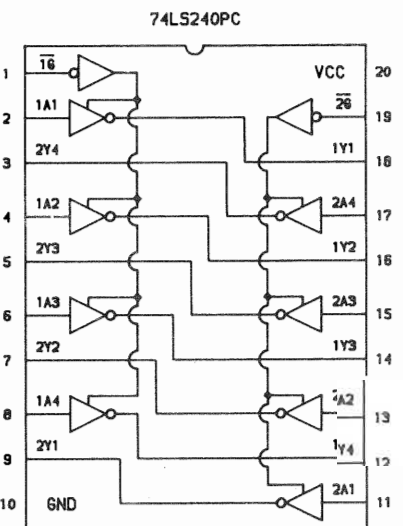
U10
CRT CONTROLLER
TOP VIEW



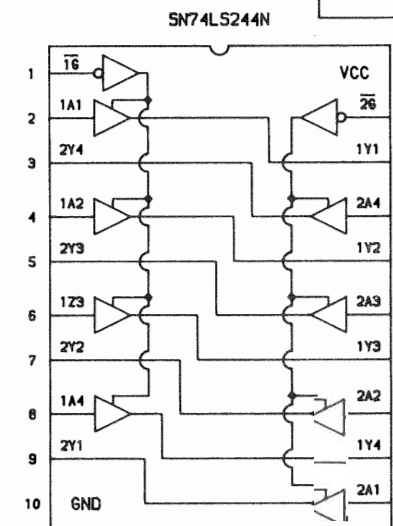
U2, U6, U7, U11, U12,
U16 THRU U19, U37
TOP VIEW



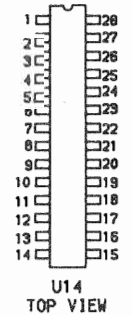
Q1, Q2
BOTTOM VIEW



U9
TRI-STATE
DRIVER
TOP VIEW



U30, U31
TRI-STATE
DRIVER
TOP VIEW

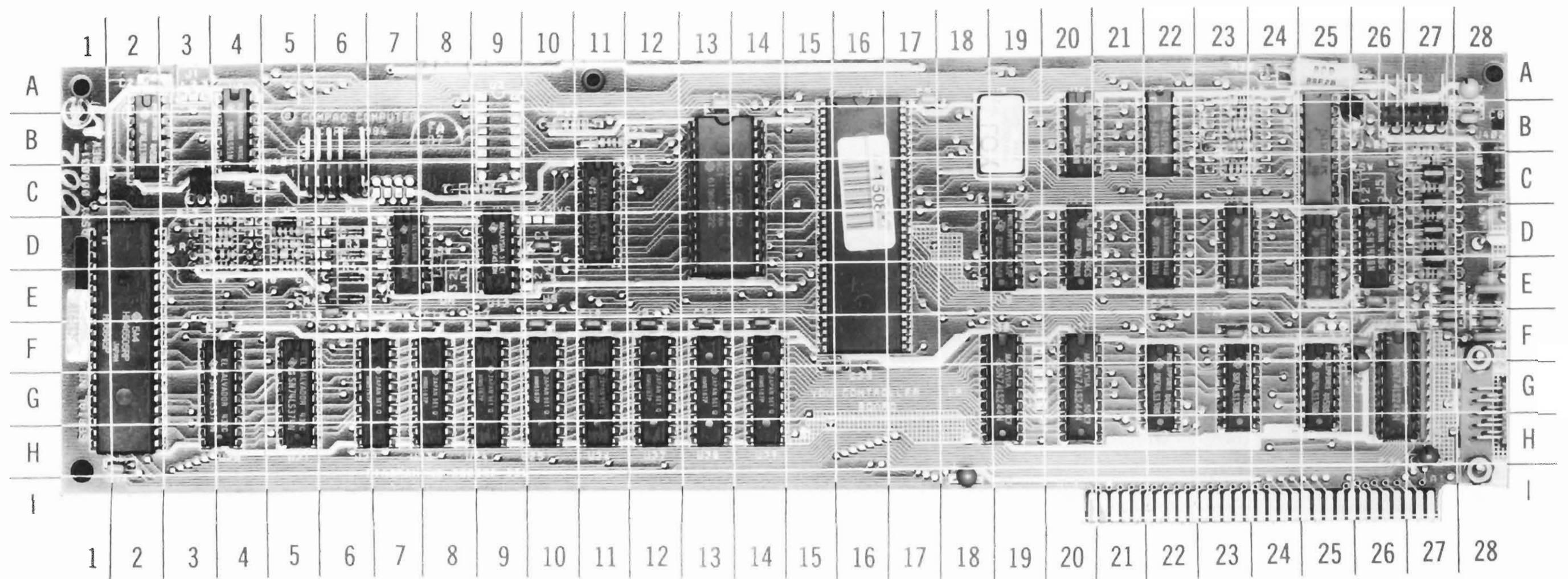


U14
TOP VIEW

CSCS15-A

MODEL PORTABLE (101709)

COMPACT



COMPAQ
MODEL PORTABLE (101709)

TROUBLESHOOTING (Continued)

VIDEO SYNC

No vertical sync. Check the waveform at pin 40 of the CRT Controller IC (U10). If the waveform is missing, check IC U10. If the waveform is present, check for pulses at pin 56 of Video Management IC (U4). If pulses are missing, check IC U4. If pulses are present, check for pulses at pin 16 of the Tri-State Driver IC (U9). If pulses are missing, check IC U9. If there is no vertical sync on a Monitor connected to the Composite Video Jack (J403), check the waveforms at pins 6 and 15 of IC U9 for vertical sync pulses. If the pulses are missing at pin 6, check IC U17. If the pulses are missing at pin 15, check IC U4. If there is no vertical sync on an RGB Monitor connected to the RGB Connector (J404), check for pulses at pin 12 of IC U12. If pulses are missing, check IC U12. If pulses are present, set Jumper J5 to short pins 2 and 3 and check for pulses at pin 7 of IC U9. If pulses are missing, check IC U9.

No horizontal sync. Check the waveform at pin 39 of IC U10. If the waveform is missing, check IC U10. If the waveform is present, check for pulses at pin 55 of IC U4. If pulses are missing, check IC U4. If pulses are present, check for pulses at pin 12 of IC U9. If pulses are missing, check IC U9. If there is no horizontal sync on a Monitor connected to the Composite Video Jack (J403), check the waveform at pin 11 of IC U17 for horizontal sync pulses. If the pulses are missing, check IC U17. If there is no horizontal sync on an RGB Monitor connected to RGB Connector (J404), check for pulses at pin 8 of IC U12. If pulses are missing, check IC U17. If pulses are present, set Jumper J3 to short pins 2 and 3 and check for pulses at pin 8 of IC U7. If pulses are missing, check IC U7.

VIDEO RAM

RAM IC's U22 thru U29 are used to store the video information that appears on the Monitor screen. The following program can be used to check the Video RAM. If a bad location is found in the RAM, the number of the RAM IC that may be bad is printed out on a Printer. (Connect a printer to the Computer before running the program).

```

10 DEF SEG = &HB800
20 SCREEN 2
30 FOR X = 0 TO 16191
40 FOR Y = 1 TO 8
50 READ Z:POKE X,Z
60 IF PEEK(X) AND Z THEN 80
70 GOTO 150
80 POKE X,0
90 IF PEEK(X) AND Z THEN 150
100 NEXT Y
110 RESTORE
120 NEXT X
130 DATA 1,2,4,8,16,32,64,128
140 PRINT "MEMORY CHECKS GOOD":END
150 LPRINT "IC U";21 + Y;" MAY BE BAD"
160 GOTO 100

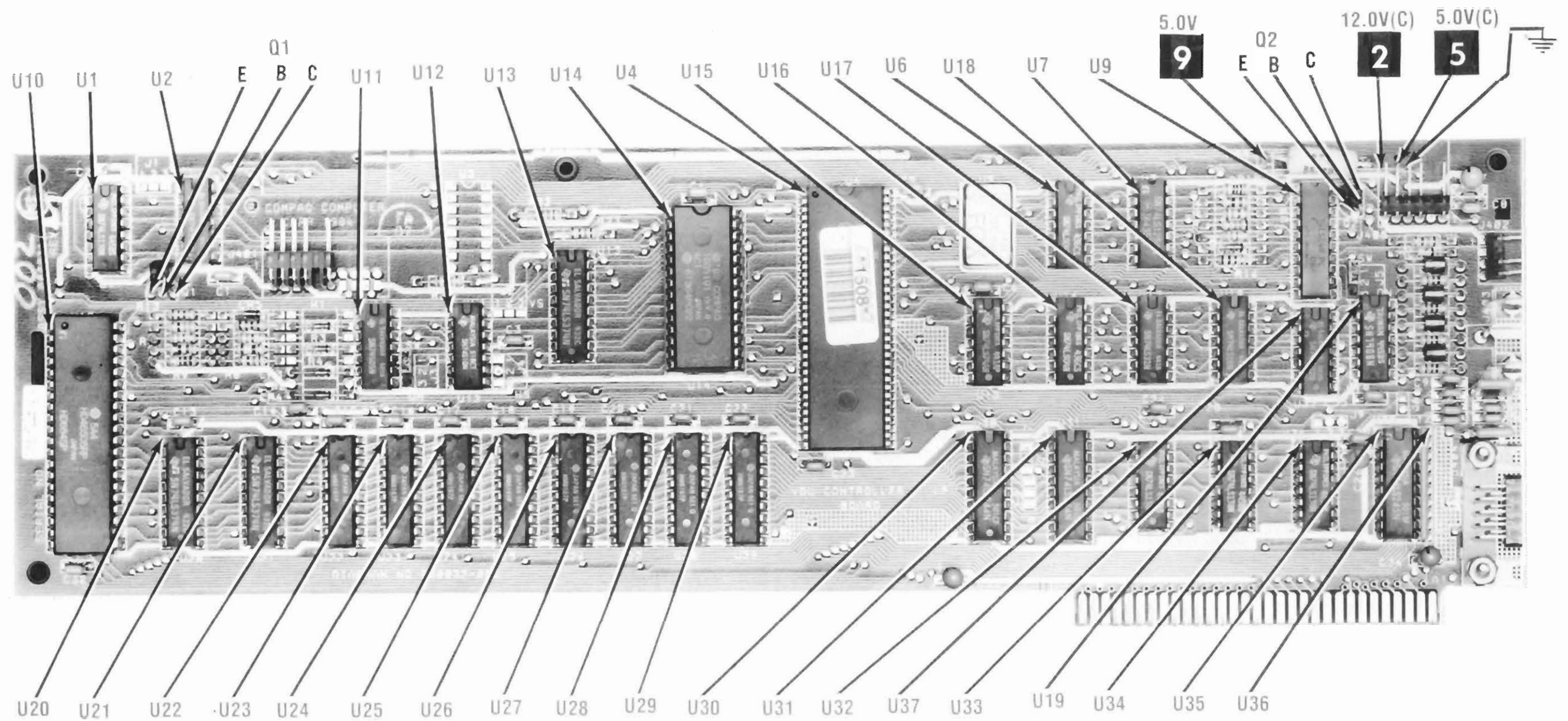
```

SCHEMATIC NOTES

- ⊥ Ground
- Chassis
- ✖ Circuitry not used in some versions
- Circuitry used in some versions
- See parts list
- Waveforms and voltages taken from ground, unless noted otherwise.
- Waveforms: triggered scope.
- Item numbers in rectangles appear in the alignment/adjustment instructions
- Supply voltages maintained as shown at input.
- Controls adjusted for normal operation.
- Terminal identification may not be found on unit.
- Capacitors are 50 volts or less, 5% unless noted.
- Electrolytic capacitors are 50 volts or less, 20% unless noted.
- Resistors are ½W or less, 5% unless noted.
- Value in () used in some versions.
- Voltage readings, logic readings and waveforms taken with the Computer in Power Up Mode, no keys pressed, no diskette in the Disk Drive (diskette error replace and strike any key when Ready appears on the screen).

GridTrace LOCATION GUIDE

C1	C-4	R9	D-4
C2	A-2	R10	D-4
C3	D-10	R11	D-4
C4	A-13	R12	D-4
C5	A-17	R13	D-4
C6	C-19	R14	B-23
C7	A-28	R15	B-23
C8	B-28	R16	C-23
C9	E-27	R17	B-23
C10	E-27	R18	B-23
C11	F-27	R19	A-23
C12	F-27	R20	A-25
C13	F-4	R21	C-9
C14	E-6	R22	B-10
C15	F-6	R23	B-11
C16	F-8	R24	B-27
C17	F-9	R25	C-27
C18	F-10	R26	D-27
C19	F-11	R28	E-27
C20	F-12	U1	B-2
C21	F-13	U2	B-4
C22	F-14	U4	D-16
C23	G-16	U5	B-19
C24	E-22	U6	B-20
C25	F-23	U7	B-22
C26	G-26	U9	B-25
C27	F-26	U10	F-2
C28	E-28	U11	D-7
C29	F-28	U12	D-9
C30	F-28	U13	C-11
C31	F-28	U14	C-13
C32	H-2	U15	D-19
C33	I-18	U16	D-20
C34	H-27	U17	D-22
C35	E-26	U18	D-23
CR1	D-6	U19	D-26
CR2	D-6	U20	G-4
CR3	E-6	U21	G-5
CR4	E-6	U22	G-7
CR5	D-5	U23	G-8
CR6	C-23	U24	G-9
CR7	C-27	U25	G-10
J3	E-8	U26	G-11
J5	C-26	U27	G-12
J104	I-24	U28	G-13
J401	C-5	U29	G-14
J402	B-28	U30	G-19
J403	D-28	U31	G-20
J404	G-28	U32	G-22
J405	B-27	U33	G-23
L1	C-27	U34	G-25
L2	C-27	U35	G-26
L3	D-27	U36	F-27
L4	E-27	U37	D-25
Q1	C-3		
Q2	B-26		
R5	D-5		
R6	D-5		
R7	D-5		
R8	D-5		



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

TROUBLESHOOTING

USING AN EXTERNAL MONITOR

An RGB or Composite Video Monitor can be connected to the rear of the VDU Controller board. If pins 1 and 2 of Jumpers J3 and J5 (on the VDU board) are connected, no video will appear on the External Monitor until the Ctrl and Alt keys are held down and the < key is pressed. Note: This also changes the character size on the Internal Monitor. To change the Internal Monitor back to normal, hold the Ctrl and Alt keys down and press the > key. The Ctrl-Alt-< or > keys will not work if the video is in 40 column mode. The video must be in 80 column mode. Jumper J3 controls the video to Composite Video Jack (J403) and the sync to RGB Connector J404, and Jumper J5 controls the video to the RGB Connector (J404). If pins 2 and 3 of Jumpers J3 and J5 are connected, video will appear on the External Monitor but may not be readable unless the sweep frequencies of the External Monitor match the sweep frequencies (50Hz vertical, 18.5kHz horizontal) of the Internal Monitor. To make the video readable, press the Ctrl, Alt, < keys as described above. (Pressing the Ctrl, Alt, < keys changes the sweep frequencies to 60Hz vertical and 15.7kHz horizontal).

Warning: Using a Monitor that requires different sweep frequencies than those available from the VDU Controller Board may damage the Monitor.

VDU CONVERTER BOARD JUMPERS

Jumper J3	Pins 1 and 2 connected	External Composite Video (J403) and RGB sync (J404) Disabled. (Can be enabled by Ctrl, Alt and < keys)
	Pins 2 and 3 connected	External Composite Video (J403) and RGB sync (J404) Enabled.
Jumper 5	Pins 1 and 2 connected	Disabled (Can be enabled by Ctrl, Alt and < keys)
	Pins 2 and 3 connected	RGB Video (J404) Enabled.
See also "Using An External Monitor"		

USING A PRINTER FOR DISPLAY

If there is a defect in the VDU Controller Board, information that is normally displayed on the Monitor screen may not be visible or readable. In such cases it may be possible to send the Monitor screen information to a Printer that is connected to the Computer. When the Computer is in MS-DOS or GWBasic the Printer output can be turned On by holding the Ctrl key down and pressing the PrtSc key. The Monitor screen information will continue to be printed out until the Ctrl and PrtSc keys are pressed again to turn the Printer Off. It is also possible to get a printout of the entire screen display by holding the shift (I) key down and pressing the PrtSc key.

Any Basic program that uses the PRINT command to send information to the Monitor screen can be made to send the information to a Printer by changing the PRINT command to LPRINT.

VDU OSCILLATOR AND DIVIDERS

Verify that the oscillator is working by checking for a 18.981Mhz signal at pin 63 of the Video Management IC (U4). If the signal is missing, check the Oscillator Module (U5).

Check for a 14.318MHz signal at pin 6 of IC U16. If the signal is missing, check IC U16. If the signal is present, check for a 894.87kHz signal at pin 51, 1.789MHz signal at pins 2, 3, and 5 and 894.75kHz signal at pin 1 of IC U4. If any of the signals are missing, check IC U4.

VIDEO AND COLOR

No video. Run the following program which produces blue, green and red horizontal bars on the Monitor screen (the bars will be shades of green on the Internal Monitor).

```

10 DATA 9,10,12
20 SCREEN 0,1:WIDTH 40
30 KEY OFF:CLS
40 FOR Y=1 TO 3
50 READ C
60 COLOR 0,C
70 FOR X=1 TO 320
80 PRINT " ";
90 NEXT X:NEXT Y
100 GOTO 100
    
```

While the program is running, check for pulses at pins 58, 59, and 60 of the Video Management IC (U4). If pulses are missing, check IC U4. If pulses are present, check for pulses at pins 4, 6, and 10 of IC U6. If pulses are missing, check IC U6. If pulses are present, check for pulses at pins 8, 10, and 12 of IC U11. If pulses are missing, check IC U11. If pulses are present, check the voltages and components associated with the Video Out Transistor (Q1).

Colors not correct on an RGB Monitor connected to the RGB Connector (J404). While the above program is running, check for pulses at pins 58, 59 and 60 of IC U4. If pulses are missing, check IC U4. If pulses are present, check for pulses at pins 6, 8, and 11 of IC U19. If pulses are missing, check IC U19.

Colors not correct or missing on a Composite Monitor connected to the Composite Video Jack (J403). While the above program is running, check for the waveform shown in Figure B at pin 11 of Tri-State Driver IC (U9). If the waveform is not correct, check IC U4. If the waveform is correct, check for the waveform shown in Figure C at the base of Video Amp Transistor (Q2). If the waveform is not correct, check Resistor R16, IC U9 and Transistor Q2.

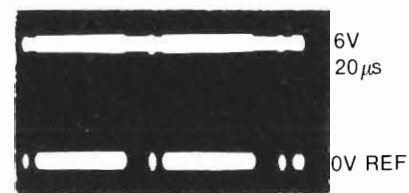


Figure B

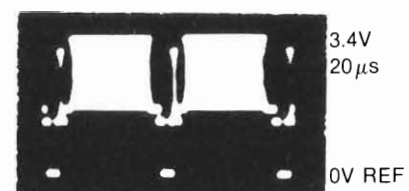
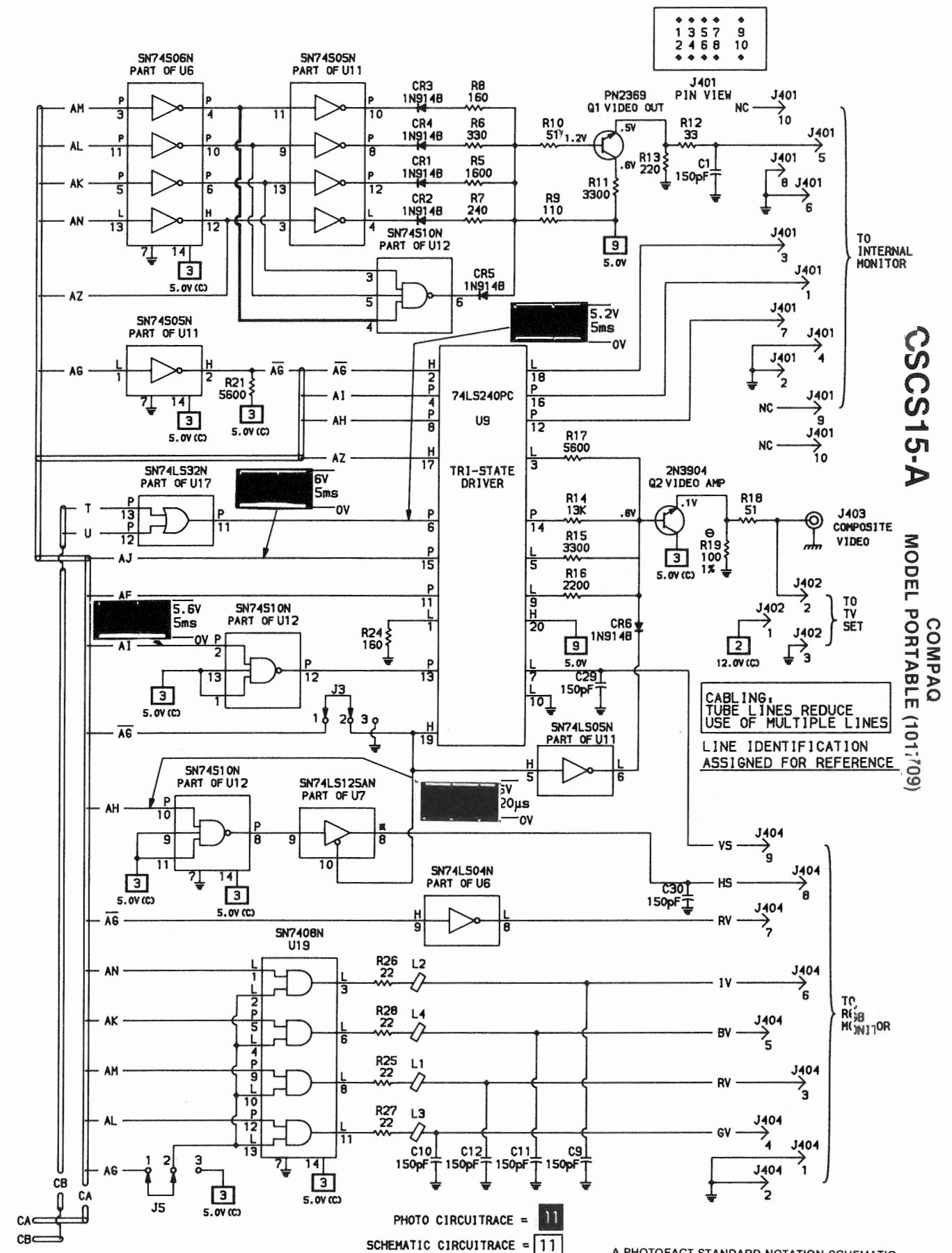


Figure C



A PHOTOFAC STANDARD NOTATION SCHEMATIC

WITH CIRCUITRACE

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CSCS15-A

MODEL PORTABLE (1017709)

COMPAQ

8 PARTS LIST AND DESCRIPTION

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFR. PART No.	REPLACEMENT DATA				NOTES
			NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	
CR1 thru CR6 CR7 Q1 Q2	VDU CONTROLLER BOARD 1N914B 1N751A PN2369 2N3904		NTE519	ECG519	SK3100/519	103-131	
			NTE5010A	ECG5010A	SK5A1/5010A	103-279-10	
			NTE123AP	ECG123AP	SK3854/123AP	121-Z9000A	
			NTE123AP	ECG123AP	SK3854/123AP	121-Z9000A	
U1 U2 U4 U6 U7	SN74LS138N SN74LS51N MB60BH302A SN74LS04N SN74LS125AN		NTE74LS138	ECG74LS138	SK7CT138	HE-443-877	
			NTE74LS51	ECG74LS51	SK74LS51		
			NTE74LS04	ECG74LS04	SK7CT04	HE-443-755	
			NTE74LS125A	ECG74LS125A	SK7CT125	HE-443-811	
U9 U10 U11 U12 U13	74LS240PC HD6845P SN74S05N SN74S10N SN74LS374N		NTE74LS240	ECG74LS240	SK7CT240	HE-443-754	
			NTE74S05	ECG74S05		HE-443-906	
			NTE74S10	ECG74S10			
			NTE74LS374	ECG74LS374	SK7CT374	HE-443-863	
U14 U15 U16 U17 U18	1005191 SN74LS74AN SAME AS U6 SN74LS32N SN74LS08N		NTE74LS74A	ECG74LS74A	SK7CT74	HE-443-730	
			NTE74LS32	ECG74LS32	SK74CT32	HE-443-875	
			NTE74LS08	ECG74LS08	SK7CT08	HE-443-780	
U19 U20, 1 U22 thru U29 U30, 1	SN7408N SAME AS U13 HM6167P SN74LS244N		NTE7408	ECG7408	SK7408	HE-443-45	
			NTE74LS244	ECG74LS244	SK7CT244	HE-443-791	
U32 thru U34 U35 U37	SAME AS U1 SN74LS245N SN74LS02N		NTE74LS245	ECG74LS245	SK7CT245	HE-443-885	
			NTE74LS02	ECG74LS02	SK7CT02	HE-443-779	

PARTS LIST AND DESCRIPTION (Continued)

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

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFR. PART No.
C7	VDU CONTROLLER BOARD	
	10 16V TAN	

ITEM No.	RATING	MFR. PART No.
C26 C33 C34	10 16V TAN 10 16V TAN 10 16V TAN	

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFR. PART No.	NTE PART No.	WORKMAN PART No.
R19 U36	VDU CONTROLLER BOARD 100 1% 1/4W Metal Film Resistor Network (1)			

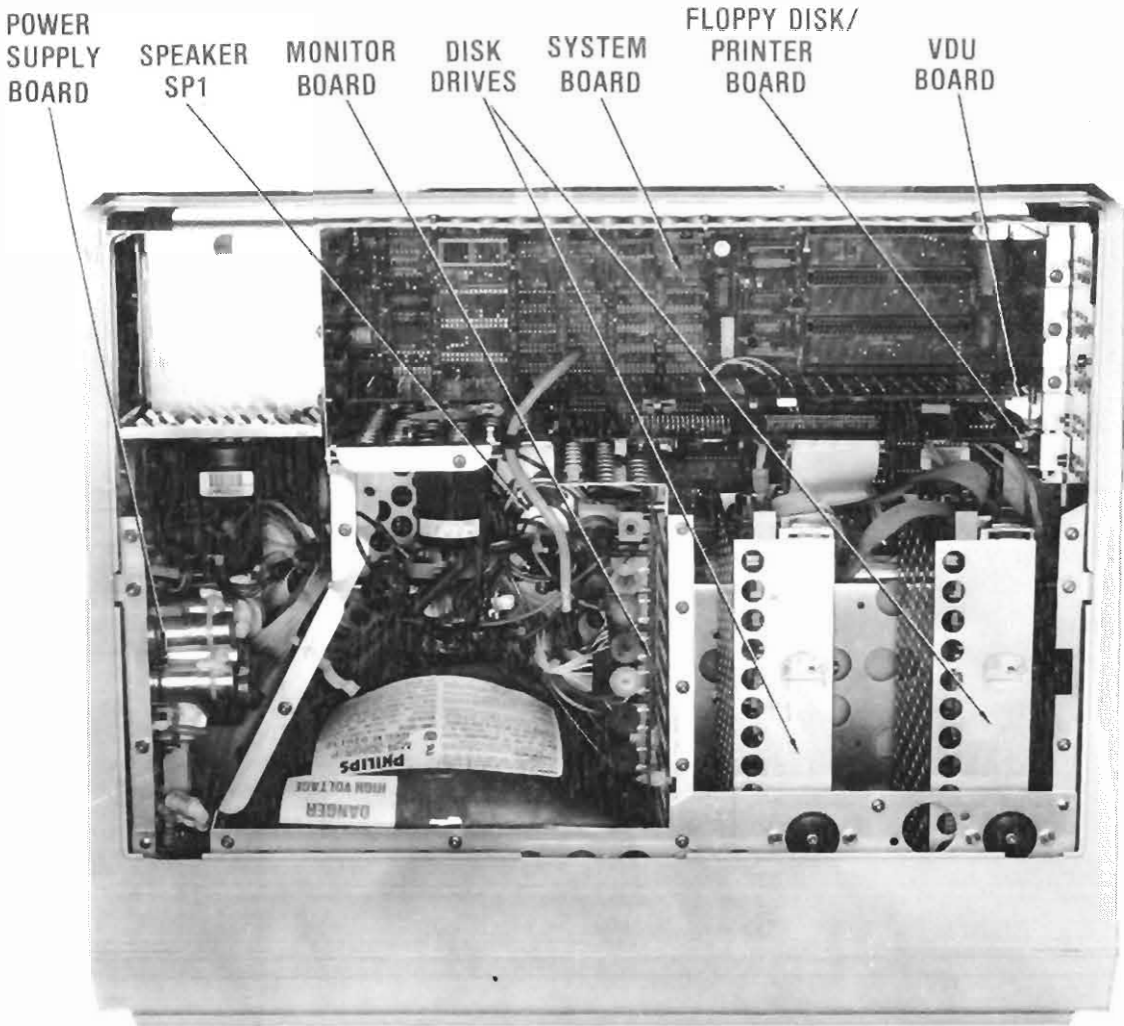
(1) Contains nine (9 each) 8200 Ohm 2%

MISCELLANEOUS

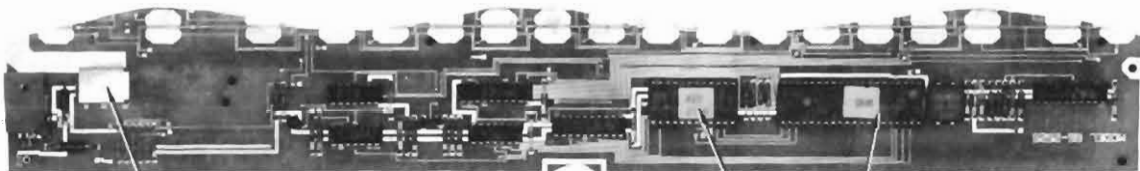
ITEM No.	PART NAME	MFR. PART No.	NOTES
L1 thru L4 U5	Ferrite Bead Oscillator		18.981MHz

COMPAQ
MODEL PORTABLE (101709)

PRELIMINARY SERVICE CHECKS (Continued)



CHASSIS - TOP VIEW



J1

4A

Z9

Z2

4B

KEYBOARD

SAMS

COMPUTERFACTS™

COMPAQ
MODEL PORTABLE (101709)

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, VDU Controller Board, Floppy/Printer Board, Disk Drives or Connectors may be necessary after the malfunction has been isolated.

TEST EQUIPMENT AND TOOLS

TEST EQUIPMENT

Digital Volt/Ohm Meter
Logic Probe
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 24, 28 and 40
T-10, T-15 Torque Screwdriver
Alignment Tools: GC Electronics 9440, 8282, 8606

REPLACEMENT PARTS AND DESCRIPTION

F1 3A Fuse (Power Supply)
U24 CPU IC System Bd
U40 ROM IC System Bd
F401 Fuse (Monitor)
U14 Character ROM IC (VDU Bd)
Z2 Microcomputer IC (Keyboard)
Z9 PROM IC (Keyboard)
SP1 Speaker 2 1/4" PM 8 Ohm (Quam 22A05Z8)

MISCELLANEOUS ADJUSTMENTS

COLOR ADJUST

Connect the input of a Frequency Counter to pin 12 of the Clock Generator IC (U1). Adjust the Color Adjust Trimmer (C1) for a frequency of 14.31818MHz.

HEAD CLEANING INSTRUCTIONS

Use a cotton swab or lint free cloth dampened with 91% isopropyl alcohol and dry with a lint free cloth.

SAMS

Howard W. Sams & Co.

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.

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Printed in U.S. of America

CSCS15

COMPAQ
MODEL PORTABLE (101709)

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 to clean 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 oil 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.

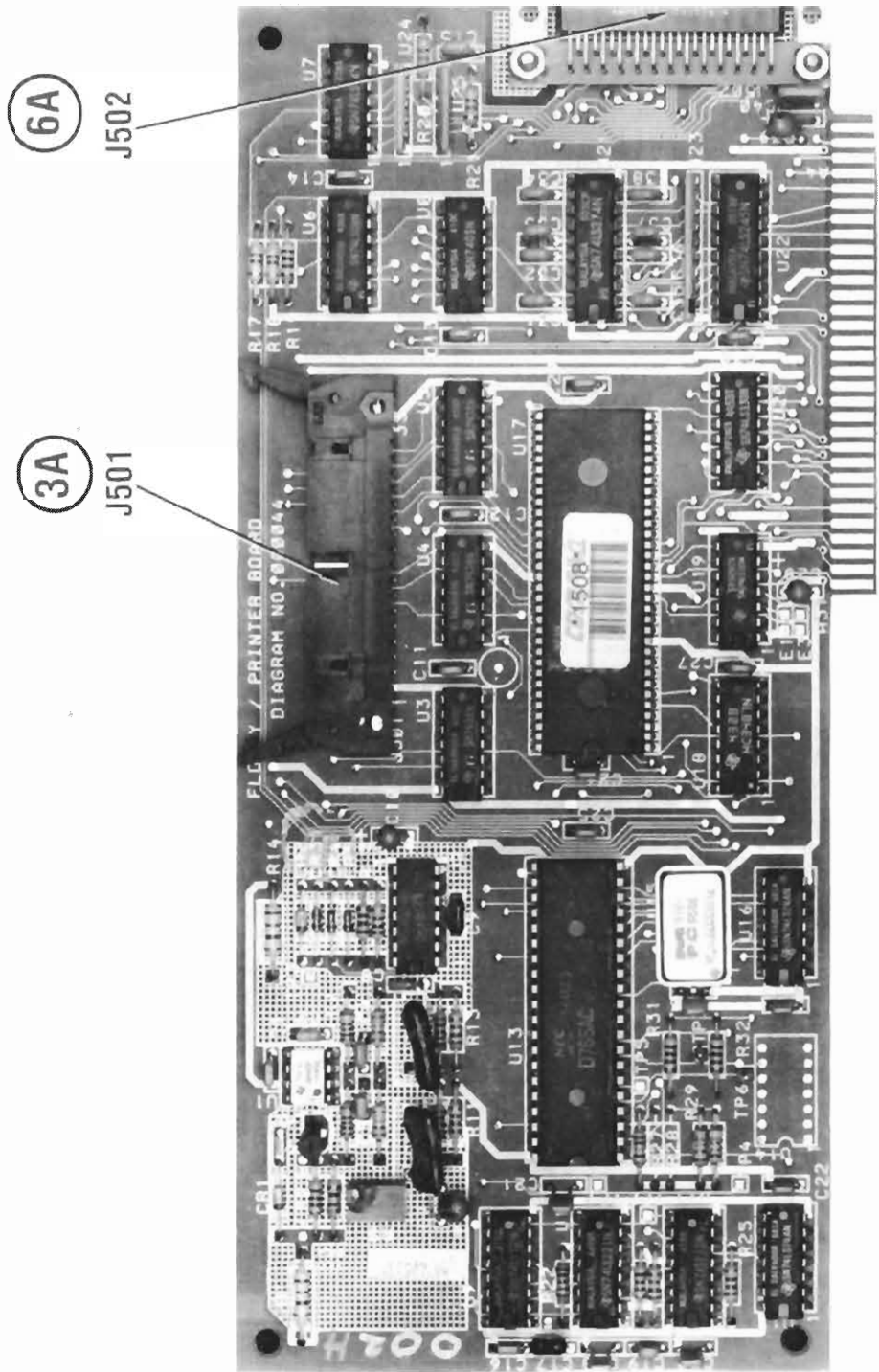
STATIC ELECTRICITY

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.

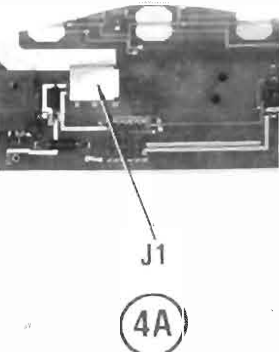
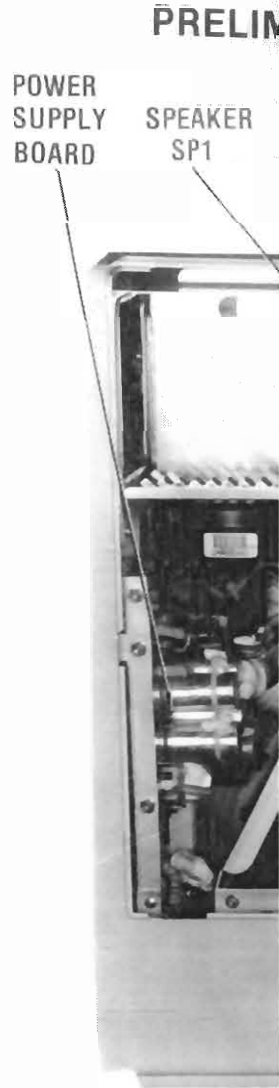
MONITOR

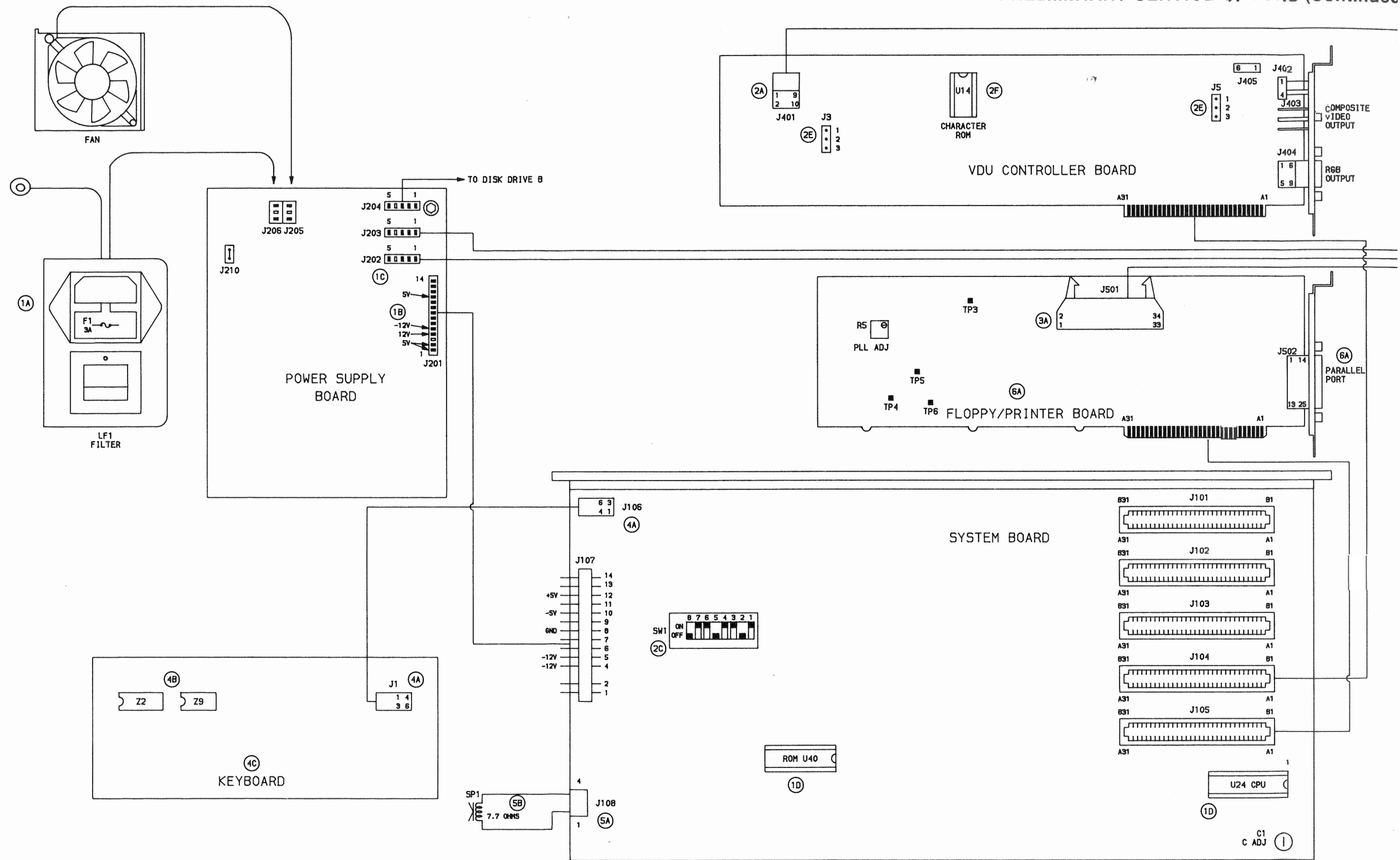
Use an isolation transformer with any Monitor that does not come as part of the system since some Monitors use a HOT chassis (chassis connected to one side of the AC line). The face of the Monitor should never be left on for long period of time at high brightness level except when pattern is being changed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

PRELIMINARY SERVICE CHECKS (Continued)

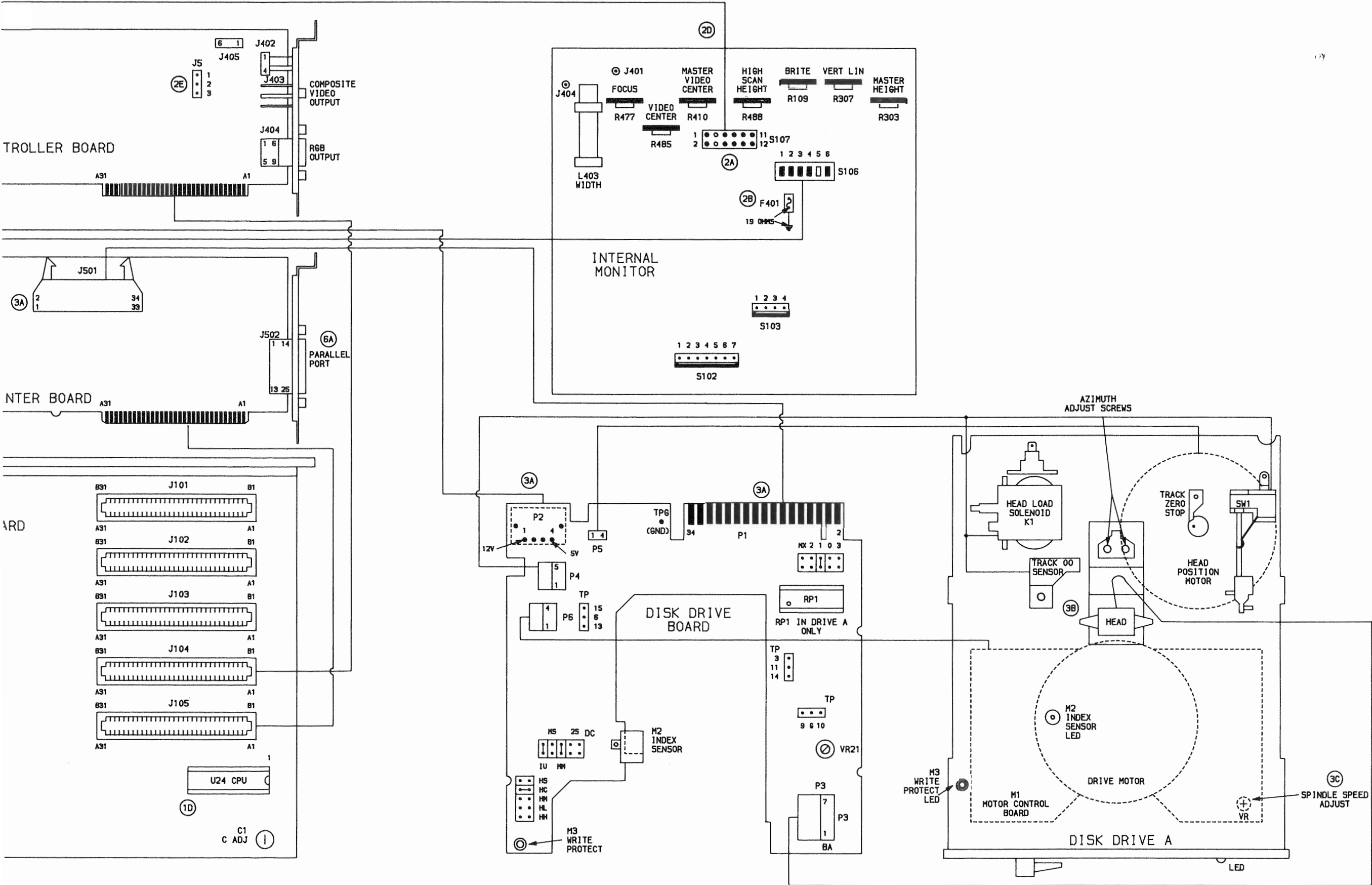


FLOPPY DISK/PRINTER ADAPTER BOARD



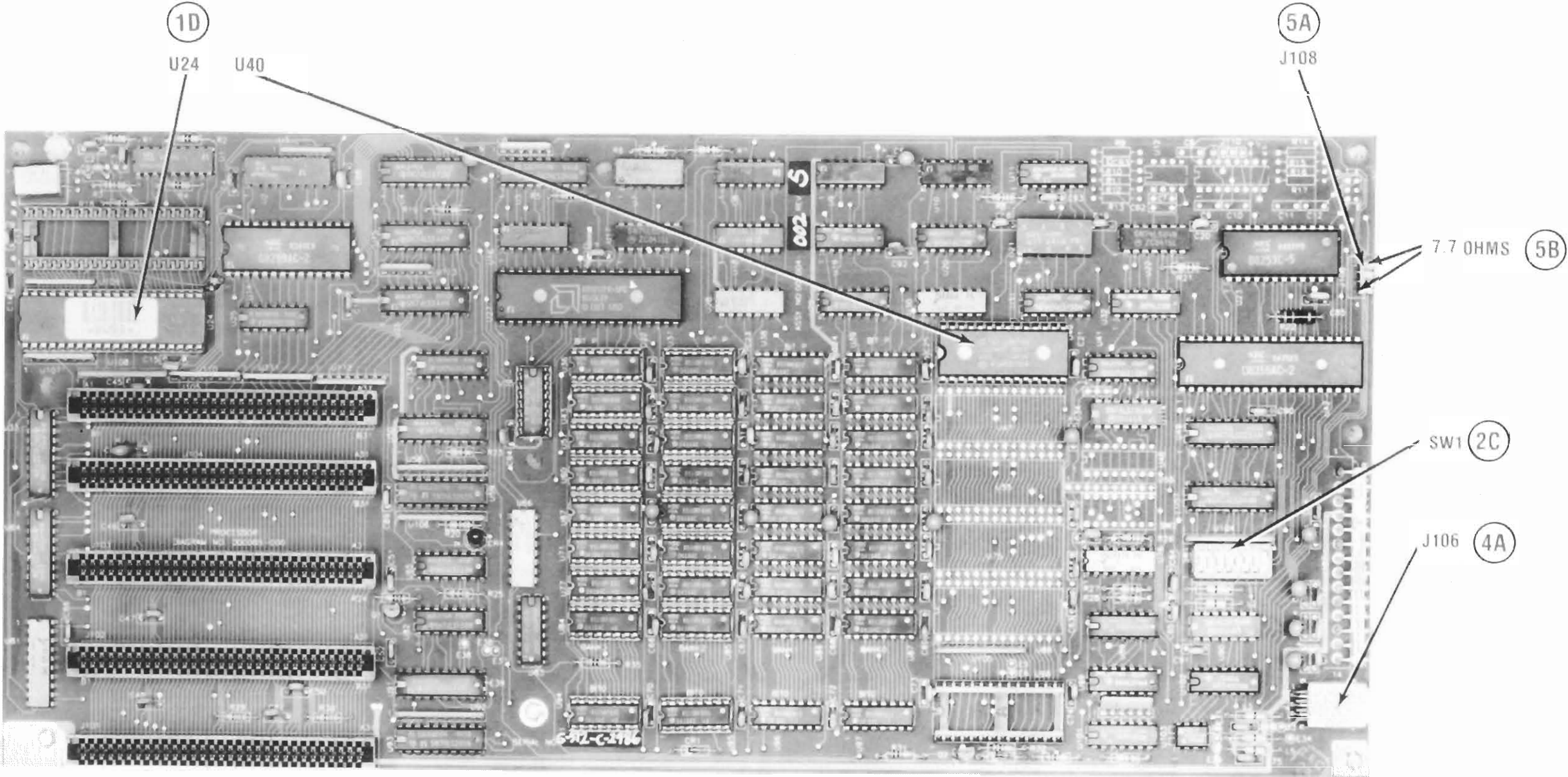


ELIMINARY SERVICE CHECKS (Continued)



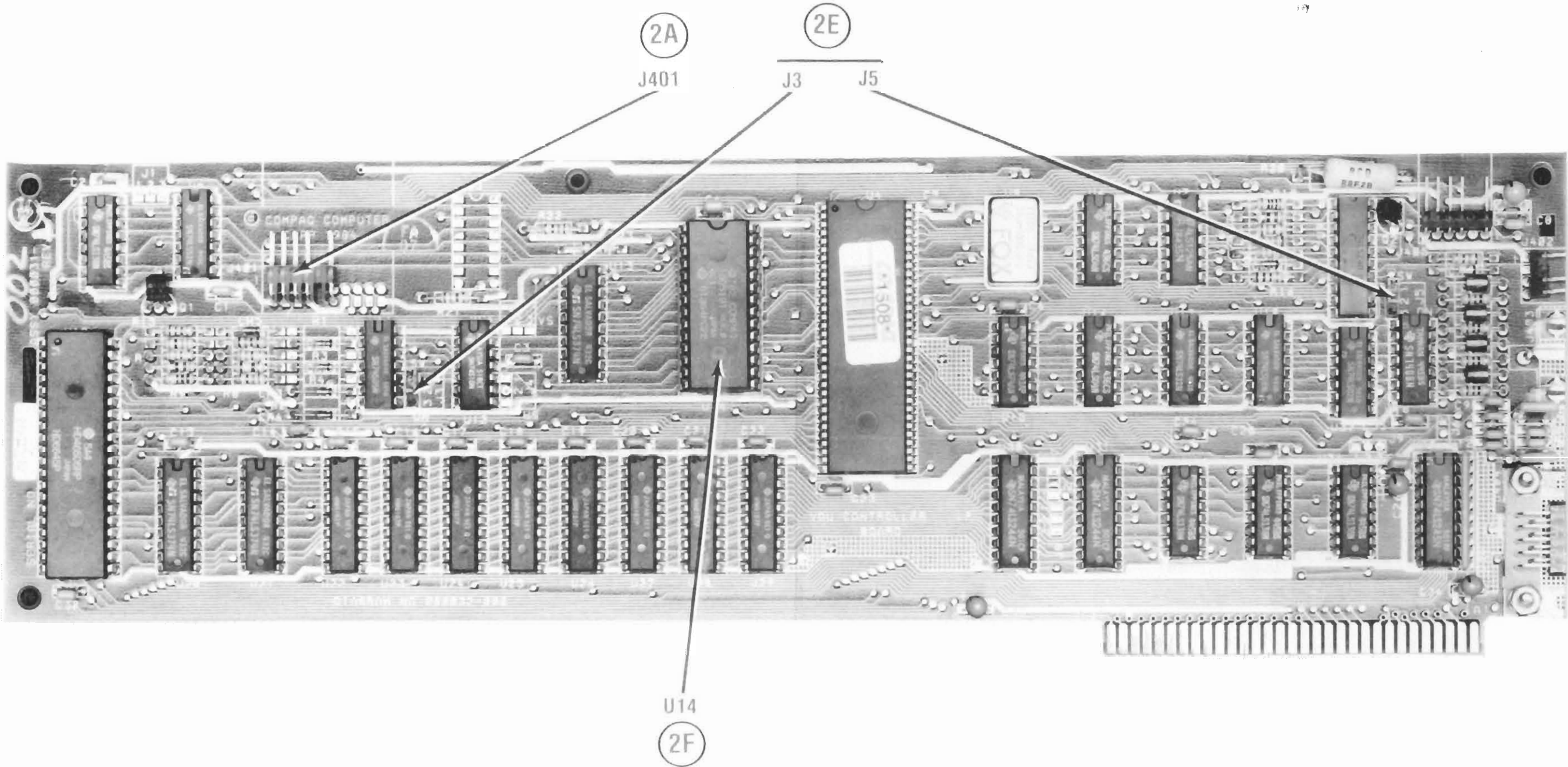
INTERCONNECTING DIAGRAM
COMPAQ
MODEL PORTABLE (101709)

PRELIMINARY SERVICE CHECKS (Continued)



COMPAQ
MODEL PORTABLE (101709)

PRELIMINARY SERVICE CHECKS (Continued)



CSCS15 COMPAQ
MODEL PORTABLE (101709)

PRELIMINARY SERVICE CHECKS (Continued)



DISK DRIVE - BOTTOM VIEW

PRELIMINARY SERVICE CHECKS (Continued)
COMPUTER SELF TESTS AND DIAGNOSTICS

COMPUTER SELF-TEST

The Computer performs a Self-Test every time it is turned On. If no problems are detected, the Computer will beep once and boot up from the Floppy Disk Drive or the Fixed Disk Drive.

If a problem is detected various audio beeps may occur and/or an error code number may appear on the Monitor screen. Use the following charts to determine the area of the problem.

AUDIO	AREA OF PROBLEM
No beep or display.	Power Supply
Beeps continuously.	Power Supply
Repeated short beeps	Power Supply
One long and two short beeps	VDU Adapter

The Self-Test that is in the Computer ROM checks the RAM automatically when the unit is turned On and momentarily displays an error code on the Monitor screen if a defective IC is found.

When a RAM failure occurs, a numeric code will be displayed at the top left corner of the Monitor screen. This code will be four characters followed by 201. The number 201 indicates it is a memory failure. The first number indicates which bank has the bad IC. The third and fourth numbers indicate which row in that bank is defective. Use the following charts to find the defective IC.

Third and Fourth Numbers

ROW	Parity	7	6	5	4	3	2	1	0
Numbers	00	80	40	20	10	08	04	02	01

Example: 3004 201 would be bank 3 row 2 (IC477).

If the third and fourth numbers do not match those given in the chart, substitute the entire nine ICs of that bank and recheck the memory. If an error code still appears, troubleshoot the RAM address decode and chip select circuits.

ERROR CODE	AREA OF PROBLEM
1XX	System Board
20X	Memory
30X	Keyboard
4XX	Printer Adapter
	(On Disk Drive Adapter)
5XX	VDU Adapter
6XX	Disk Drive
11XX	Asynchronous Communication (COM1)
12XX	Asynchronous Communication (COM2)
17XX	Hard (Fixed) Disk Drive

X = Any number

NOTE: The device tested good if the last two digits of the error code are zeros.

SWITCHES AND JUMPERS

SYSTEM BOARD DIP SWITCH

There is one DIP Switch (SW1) consisting of 8 Switches located on the System Board that must be set according to the equipment that is installed in the Computer. Use the following chart to determine the proper switch settings.

	SW ON	SW1 OFF
Always Off		1
Math Coprocessor (U13) Installed		2
Math Coprocessor (U13) Not Installed	2	
128K Memory Installed	4	3
192K Memory Installed	3	4
256K Memory Installed		3,4
VDU Adapter (40 x 25) Model	6	5
VDU Adapter (80 x 25 Model)	5	6
One 5 1/4" Disk Drive	7,8	
Two 5 1/4" Disk Drives	8	7

VDU ADAPTER BOARD JUMPERS

Jumper J3	Pins 1 and 2 connected	External Composite Video (J403) and RGB Sync (J404) Disabled. (Can be enabled by Ctrl, Alt and < keys)
	Pins 2 and 3 connected	External Composite Video (J403) and RGB Sync (J404) Enabled.
Jumper J5	Pins 1 and 2 connected	RGB Video (J404) Disabled (Can be enabled by Ctrl, Alt and < keys)
	Pins 2 and 3 connected	RGB Video (J404) Enabled.

See also "Using An External Monitor"

PRELIMINARY SERVICE CHECKS (Continued)

GENERAL OPERATING INSTRUCTIONS

POWER ON TEST

A Power On test is automatically performed each time the Computer is turned On. Several diagnostic tests are performed and if a problem is detected, an error code will be momentarily displayed on the Monitor screen. For an explanation of the various error codes, see the "Computer Self-Test" section.

BOOT UP

Insert a bootable diskette into Disk Drive A and turn On the Computer. The Computer will automatically boot up using the diskette in Disk Drive A. If a MS DOS (Microsoft Disk Operating System) diskette is used, the Computer will display the date and time and ask for a new date and time. After the date and time have been entered, the version of DOS will be displayed on the Monitor screen along with an A> which indicates the DOS is running. If Fixed (Hard) Disk Drive is installed, the Computer will boot up from the Fixed Drive if no diskette is inserted in the Floppy Disk Drive.

MS DOS

For a list of file names on the diskette in the current Disk Drive, type DIR and press the ENTER key. To specify Disk Drive that is not current (default), use DIR A: for Disk Drive A or DIR B: for Disk Drive B. If a Fixed (Hard) Disk Drive is installed, use DIR C:.

To return to MS DOS from Basic, type SYSTEM and press the ENTER key.

To load a (System) program from a diskette while in DOS, type the program name and press the ENTER key.

A blank diskette must be formatted before it can be used to save information which is in memory. A formatted diskette must contain a DOS or a Start-up program before the Computer can boot up using that diskette.

To format a blank diskette, insert a diskette containing a "Format Program" into Disk Drive A. Type FORMAT and press the ENTER key. Follow the instructions on the Monitor screen to format the unformatted diskette. NOTE: Formatting a diskette will wipe out any programs previously

placed on the diskette. The Computer automatically defaults to Disk Drive A if the destination Disk Drive is not specified. Be sure to specify the destination Disk Drive of the diskette to be formatted or the original diskette may be ruined by the default action.

BASIC

The manufacturer also supplies Disk Basic on diskette. To load Disk Basic, first boot up DOS. Insert a diskette with a Disk Basic program on it. Type BASIC or BASICA and press the ENTER key to load Disk Basic. To return to DOS from Basic, type SYSTEM and press the ENTER key.

To view a list and the names of programs on a diskette in the current Drive, type FILES and press the ENTER key. Type FILES "B: *.*" and press the ENTER key to list programs from Disk Drive B. Type FILES "A: *.*" to list programs from Disk Drive A if it is not the current (default) drive. Type FILES "C: *.*" to list programs from the Fixed Disk Drive, if it is not the current drive.

To load a program in Disk Basic from the diskette, type LOAD, the program name enclosed in quotes, and press the ENTER key.

To save a program, type SAVE, the program name enclosed in quotes and press the ENTER key.

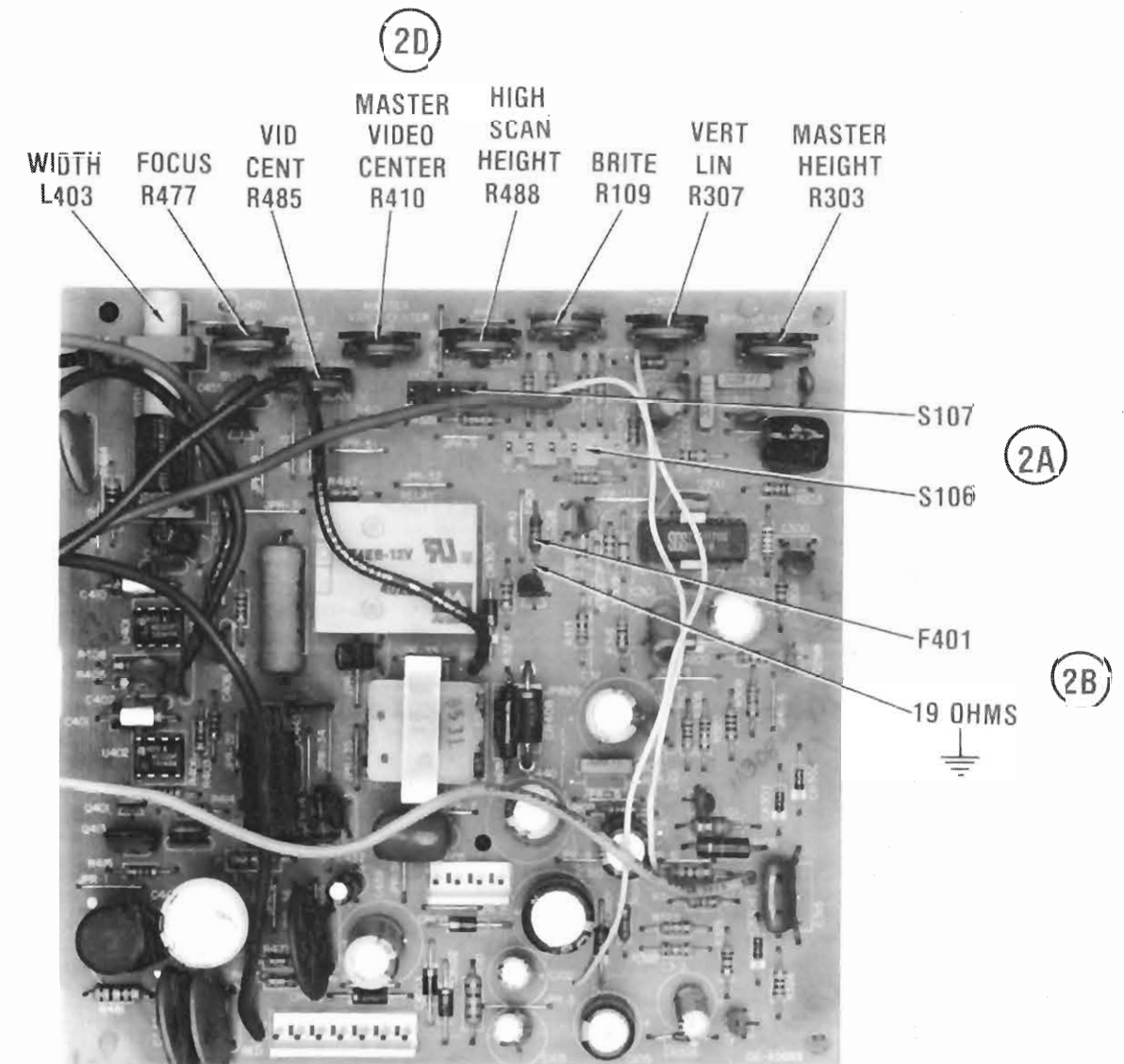
To load or save a program using Drive B, add a B: in front of the program name with no space between the colon and the program name.

To run a program from Basic mode, type RUN and press the ENTER key. To stop a program, press the CTRL and BREAK (SCROLL LOCK) keys at the same time. NOTE: Some programs will disable or not recognize the CTRL and BREAK keys to prevent the user from stopping the program while it is running.

RESETTING COMPUTER

Press the CTRL, ALT, and DEL keys, all three at the same time, to reset the Computer.

PRELIMINARY SERVICE CHECKS (Continued)



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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 COMPUTER DEAD

- (A) Check the Power Supply Fuse (F1) located next to the Power Cord Connector on the Line Filter (LF1).
- (B) Check for 5.0V at pins 1, 2 and 11, 12V at pin 4, and - 12V at pin 5 of Connector J201 on the Power Supply Board. If the voltages are missing, turn the Power Supply Off, disconnect Connectors J201 thru J204 and recheck the voltages. If the voltages are still missing, replace or troubleshoot the Power Supply Board.

Note: Always wait at least 15 seconds after turning the Computer Off before turning it back On to avoid activating the Power Surge Shutdown Circuit.

- (C) If the Power Supply voltages return with Connectors J201 thru J204 disconnected, turn the Power Supply Off and reconnect the Connectors one at a time. Recheck the voltages after connecting each connector until the connector is found that causes the Power Supply to shut down. Replace or troubleshoot the item that causes the Power Supply to shut down.
- (D) If the Power Supply voltages check good, check the CPU IC (U24) and ROM IC (U40) by substitution.

2 MONITOR

- (A) No video on Internal Monitor. Check Connector J401 on the VDU Controller Board and Connectors S106 and S107 on the Monitor Board for good connections.
- (B) If the connectors check good, check Fuse F401 for continuity. If the fuse checks bad, check for about 19 ohms from the 12.0V Source on the Monitor Board to ground. If the resistance is not correct, replace or troubleshoot the Monitor Board. If the resistance checks good, replace Fuse (F401) and check the operation of the Monitor. If the Fuse blows again, replace or troubleshoot the Monitor Board.
- (C) Cursor only appears on Internal Monitor screen. Check the settings of switches 5 and 6 on DIP Switch SW1, see "Switches and Jumpers".

- (D) Internal Monitor display is not centered, does not have the correct width, height, or is out of focus. Check the adjustment of the Centering, Height, Width, and Focus Controls, see "Miscellaneous Adjustments".
- (E) External Monitor does not work. Check the settings of jumpers J3 and J5 on the VDU Controller Board, see "Switches and Jumpers". Also see "Using an External Monitor".
- (F) The correct characters do not appear on the Monitor screen. Check the Character ROM IC (U14) on the VDU Controller Board.

3 DISK DRIVE

WARNING

It is possible for a defective Disk Drive to write on or erase information on a diskette even when the diskette is write protected. Check a questionable Disk Drive by first using a diskette that contains programs that have been duplicated on another diskette.

- (A) Disk Drive operation is erratic. Check the Disk Drive Connectors J501 on the Floppy/Printer Board and P1 and P2 on the Disk Drive Board for good connections.
- (B) If the connectors check good, clean the Disk Drive Heads.
- (C) Check the Drive Spindle Speed and the Drive Alignment.

4 KEYBOARD

- (A) Keyboard dead. Check the Keyboard Cable lines for continuity and check the Cable Connectors J106 on the System Board and J1 on the Keyboard for good connections.
- (B) Check the Microcomputer IC (Z2) and PROM IC (Z9) by substitution.
- (C) One key is erratic. Clean the key contacts.

5 NO SOUND

- (A) Check the Speaker Connector (J108) for good connections.
- (B) Check the Speaker (SP1) winding for continuity (7.7 ohms).

PRELIMINARY SERVICE CHECKS (Continued)

SERVICE CHECKS (Continued)

6 PARALLEL PORT

- (A) Printer connected to the parallel port does not work. Plug a "Parallel Loopback" plug, see "Test Plugs" into Connector J502. Run the following Basic program:

10 CLS
20 LOCATE 1,1
30 OUT 956,0:OUT 958,0
40 PRINT "A = ";INP(956)
50 PRINT "B = ";INP(957)
60 PRINT "C = ";INP(958)
70 OUT 956,255:OUT 958,255
80 PRINT "D = ";INP(956)
90 PRINT "E = ";INP(957)
100 PRINT "F = ";INP(958)
110 FOR T = 1 TO 100:NEXT T:GOTO 20

The program continuously checks the Parallel Interface circuits and displays six numbers (A thru F) on the Monitor screen. With Loopback Plug plugged into Connector J502, the following numbers should appear on the Monitor screen:

A = 0
B = 55
C = 224
D = 255
E = 207
F = 255

If the numbers are correct, the problem may be in the Printer or Printer Cable. If the numbers are not correct, the problem is in the Floppy/Printer Board.

DISASSEMBLY INSTRUCTIONS

DISK DRIVE REMOVAL

Remove all plug-in boards in the five slots on the system board. Disconnect the Power and Disk Drive Cables from the Disk drives. Remove eight screws from the rubber mounts on the top and bottom of the drives. Loosen five screws holding metal plate that covers top of Disk drives and slide plate back and lift off. Carefully lift the Disk Drives out of cabinet.

POWER SUPPLY REMOVAL

Loosen two nuts and three screws holding metal plate that covers the Monitor and Power supply and remove plate. Disconnect AC Power Connector, Fan Connector, and four DC Power Connectors from Power Supply Board. Remove one nut from the lower rear corner of the board. Use a flat blade screwdriver to push back and hold the plastic tab located under upper front corner of board. While holding tab back, slide board back and lift out of cabinet.

KEYBOARD DISASSEMBLY

Remove six screws from bottom of Keyboard case and remove top of case. Remove four screws holding Keyboard to bottom case and lift Keyboard out of case.

TOP AND BOTTOM COVER REMOVAL

Set the unit with CRT face down (handle on top). Use a flat blade screwdriver to pry up five tabs near handle. At the same time slide cover away from handle. Continue moving cover away from handle until tabs on lower end of cover are clear and lift cover off. Both top and bottom covers are removed the same way.

ACCESSING PLUG-IN BOARDS

Remove top cover. Loosen one nut and four screws holding metal cover over plug-in board and lift metal cover off.

SYSTEM BOARD REMOVAL

Disconnect Power Supply, Keyboard, and Speaker Connectors from System Board. Remove all plug-in boards from the five slots on System Board. Set unit with CRT face down (handle on top). Remove four screws holding bracket that supports System Board. Slide board up about 3/8 inch and pull board away from bottom plate until the six plastic mounts are clear. Slide board out of cabinet.

REMOVING MONITOR FROM MAIN CHASSIS

Loosen two nuts and three screws holding metal plate that covers Monitor and Power Supply. Slide plate back and remove. Remove two screws from left rear side of Monitor. Remove two screws from top front and bottom front edge of Monitor. Disconnect Connectors S106 and S107. Lift Monitor out of Main Chassis.

REMOVING MONITOR BOARD FROM MONITOR CHASSIS

Remove one screw holding Monitor Board located at upper rear corner. Disconnect CRT Socket, Yoke Connector (S103), Horizontal Output Transformer Connector (S102), Connectors S106 and S107 and two ground leads. Lift board out of chassis.

CRT REMOVAL

Remove Monitor from Main Chassis and remove Monitor Board. Remove four screws from the front holding CRT to Monitor Chassis and lift CRT out of chassis. Do not lift CRT by the neck.

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