

DISK DRIVE
See Folder CSCS14-A

**KEYBOARD, SYSTEM BOARD
BUS CONVERTER BOARD, POWER SUPPLY**

CRT CONTROLLER BOARD
See Folder CSCS14-B

MONITOR
See Folder CSCS14-C



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SAFETY PRECAUTIONS
See Page 45

PRELIMINARY SERVICE CHECKS
ENCLOSED

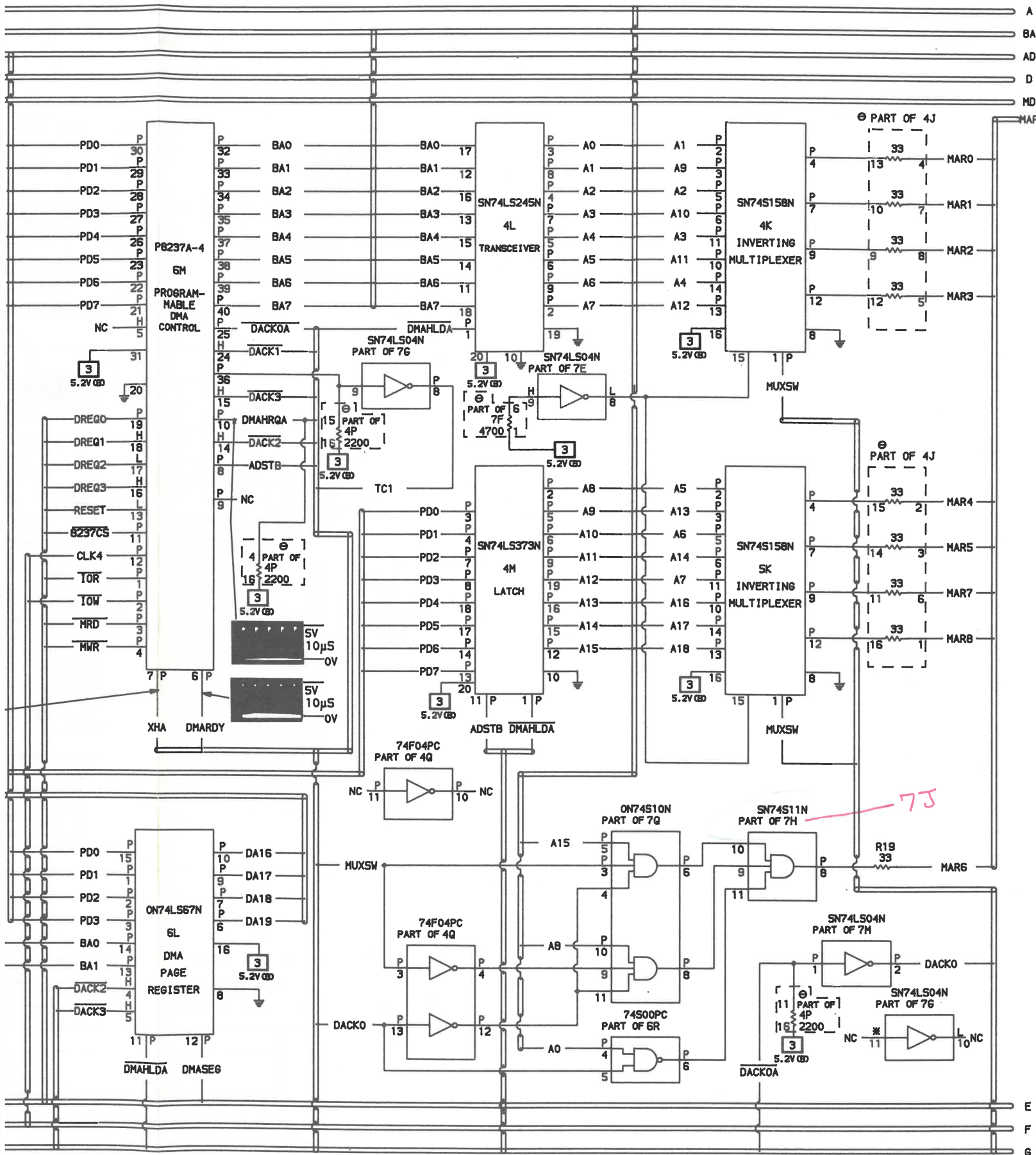
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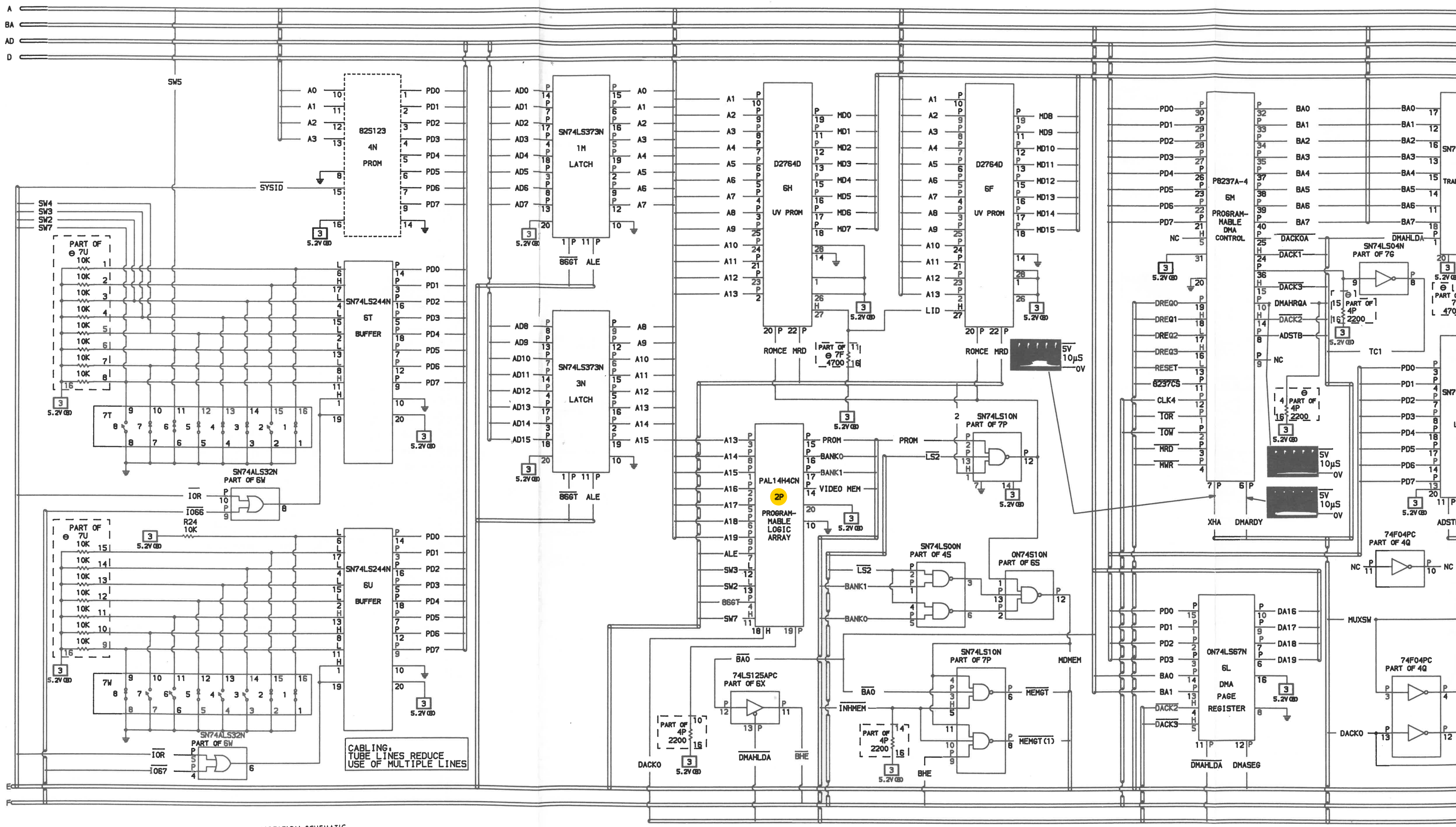
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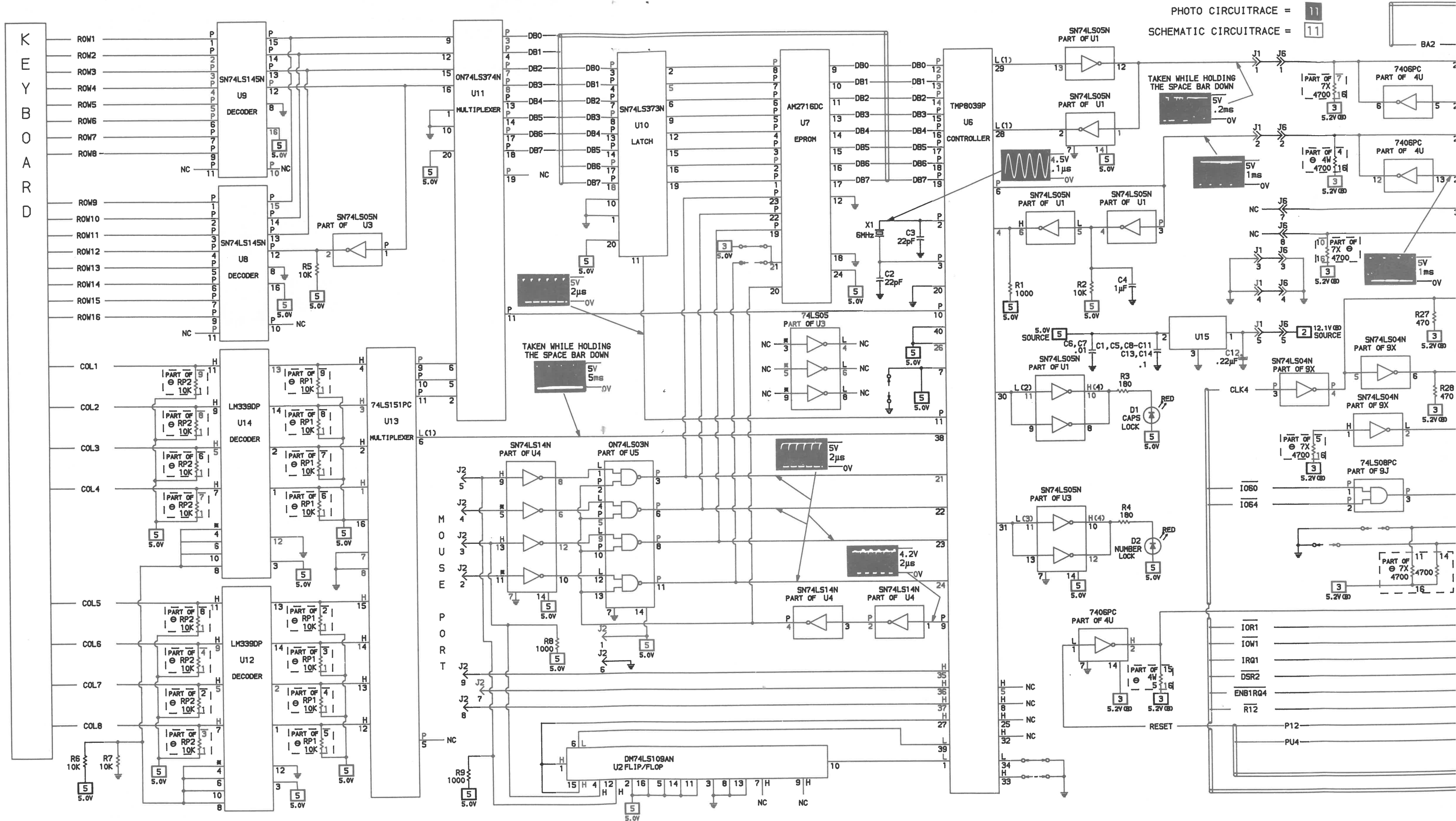


A PHOTOFAC STANDARD NOTATION SCHEMATIC

SYSTEM BOARD

WITH **CIRCUITTRACE**

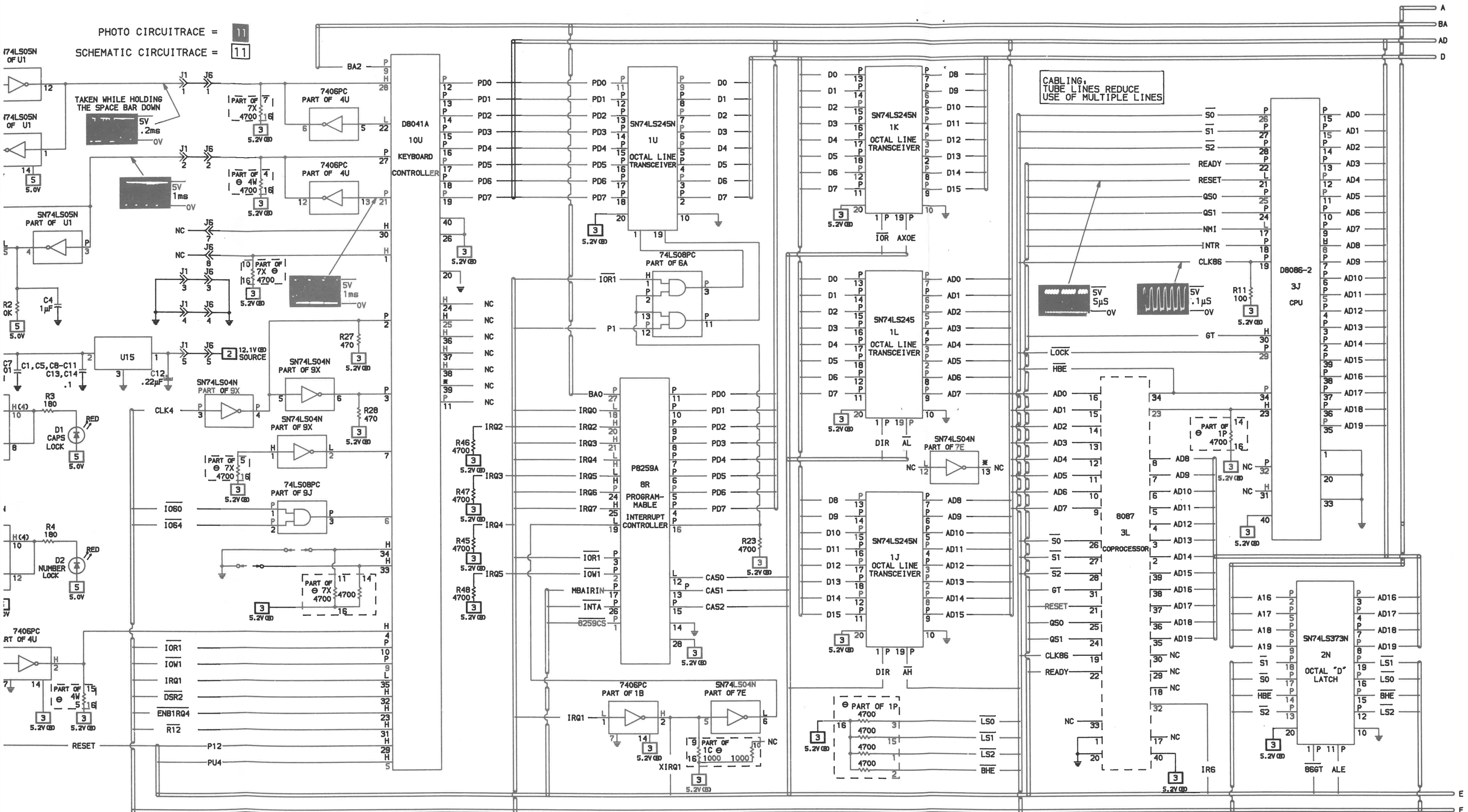
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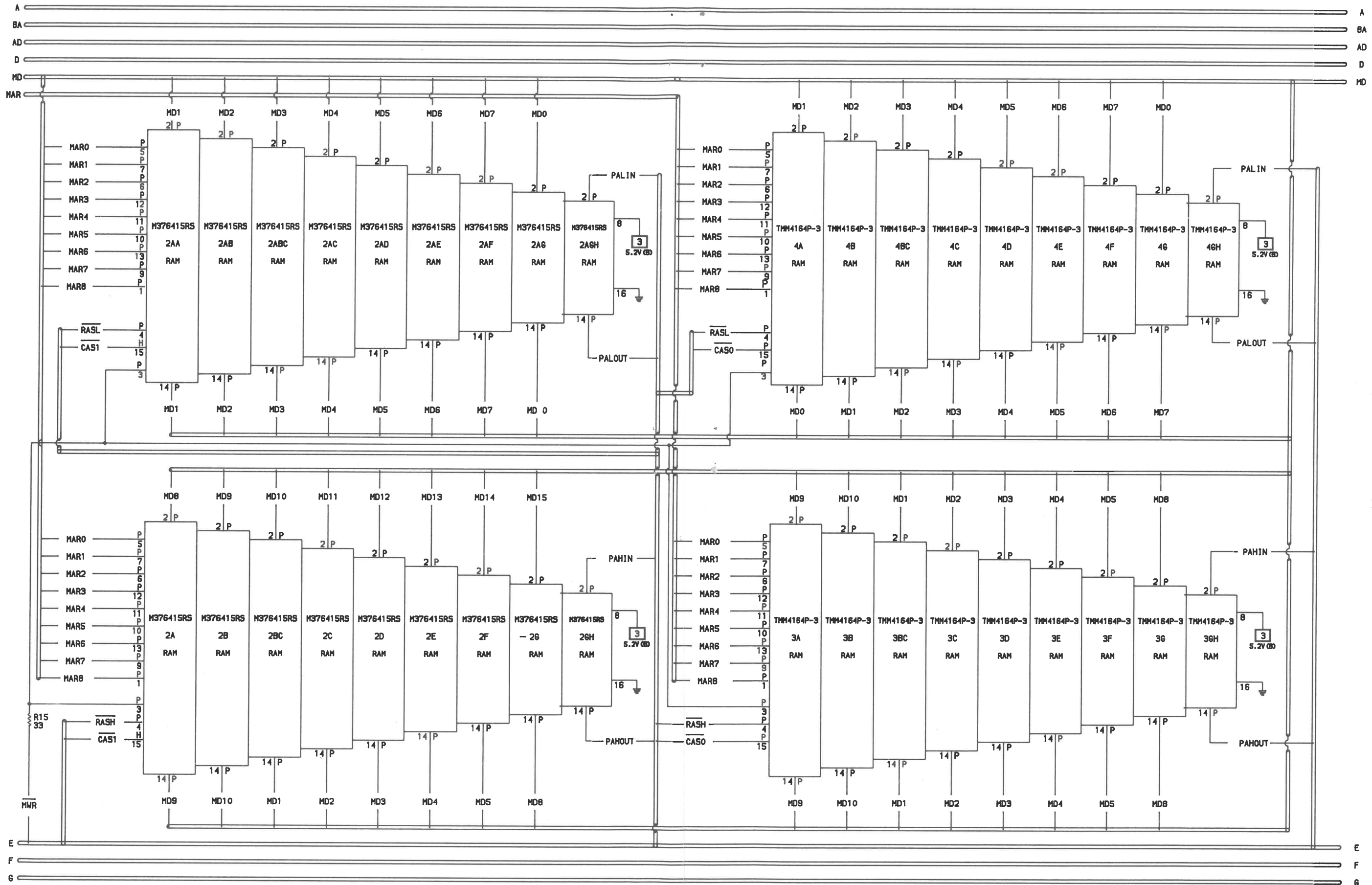


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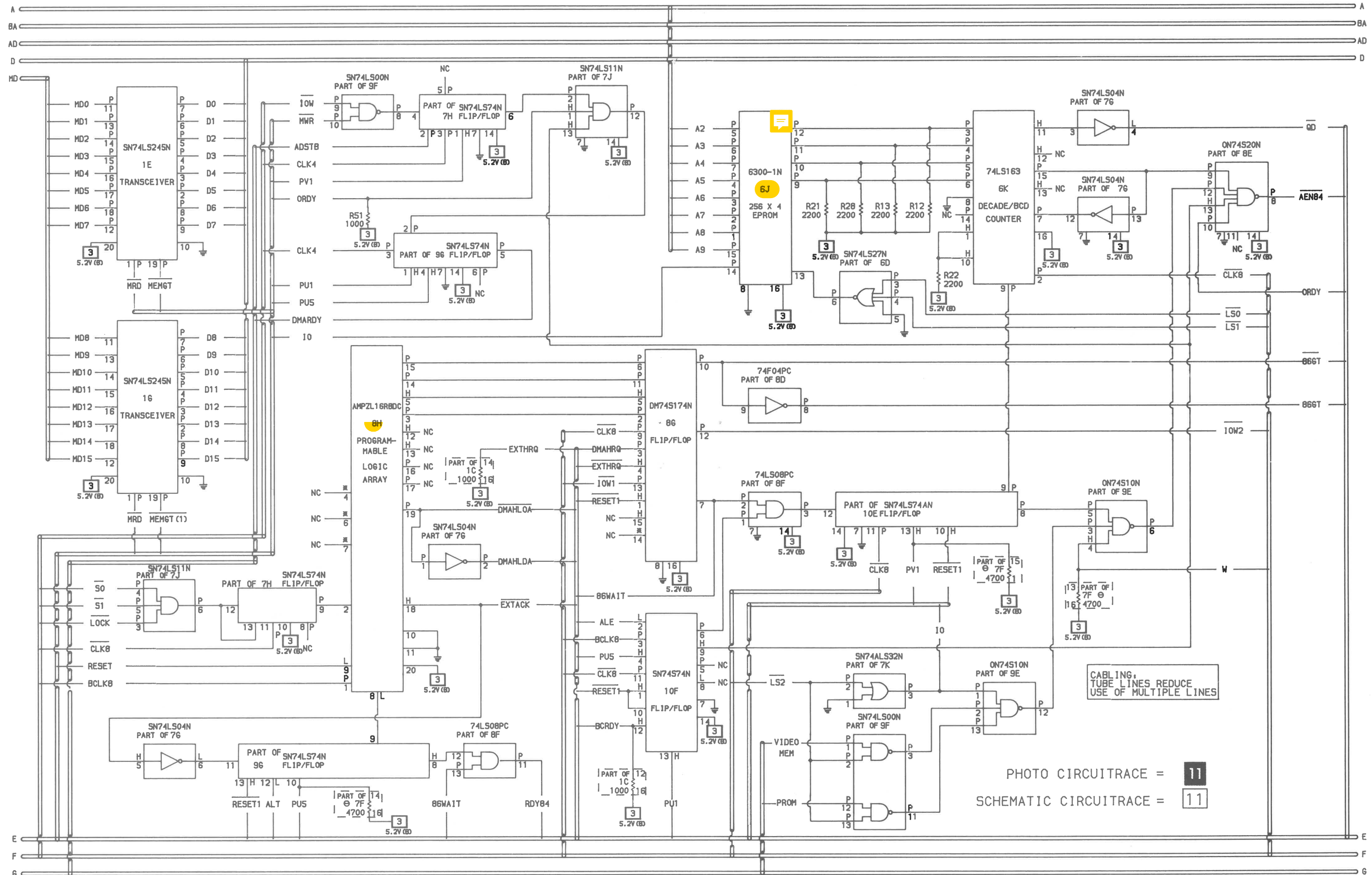


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SYSTEM BOARD

SYSTEM BOARD



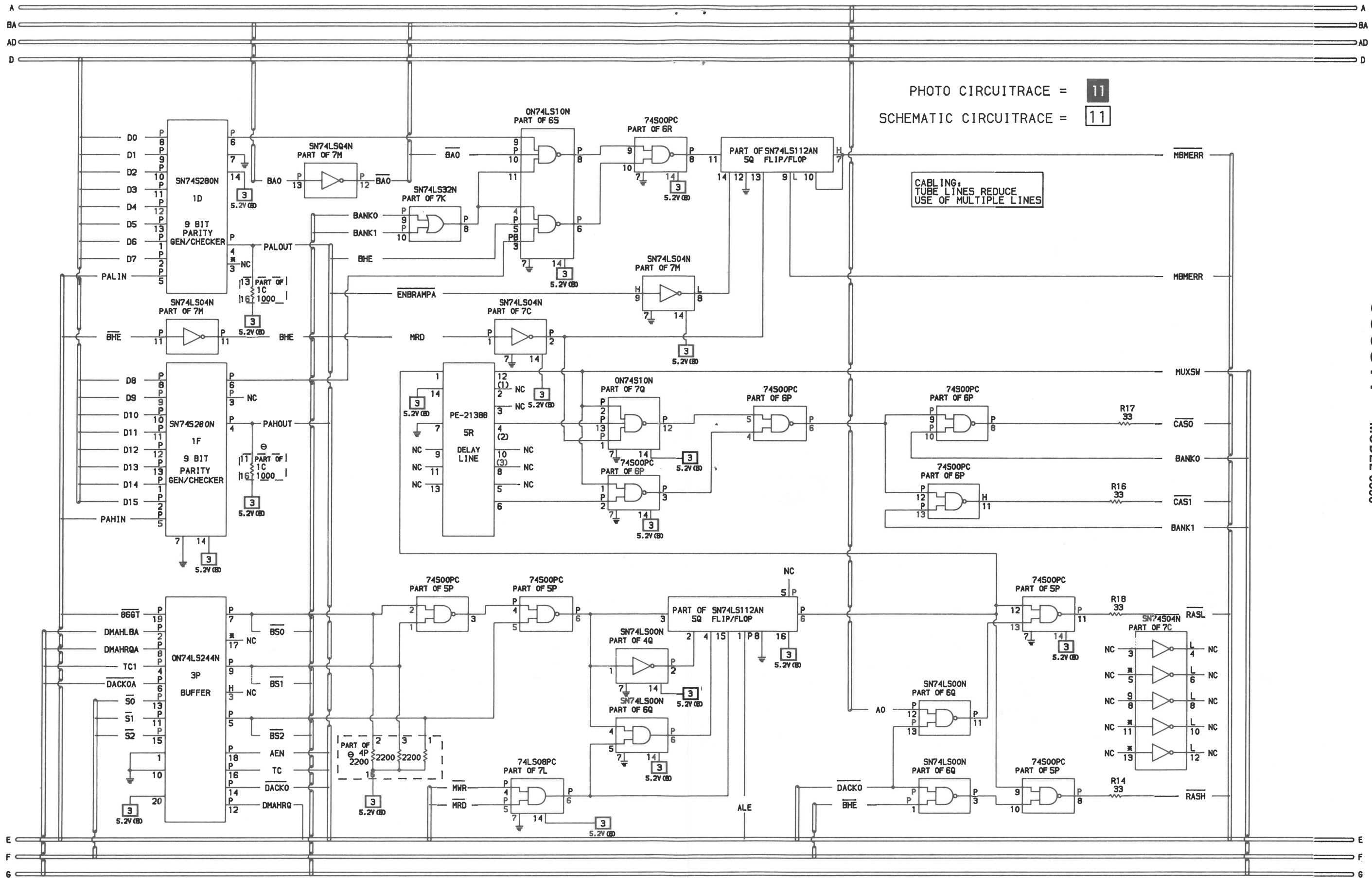
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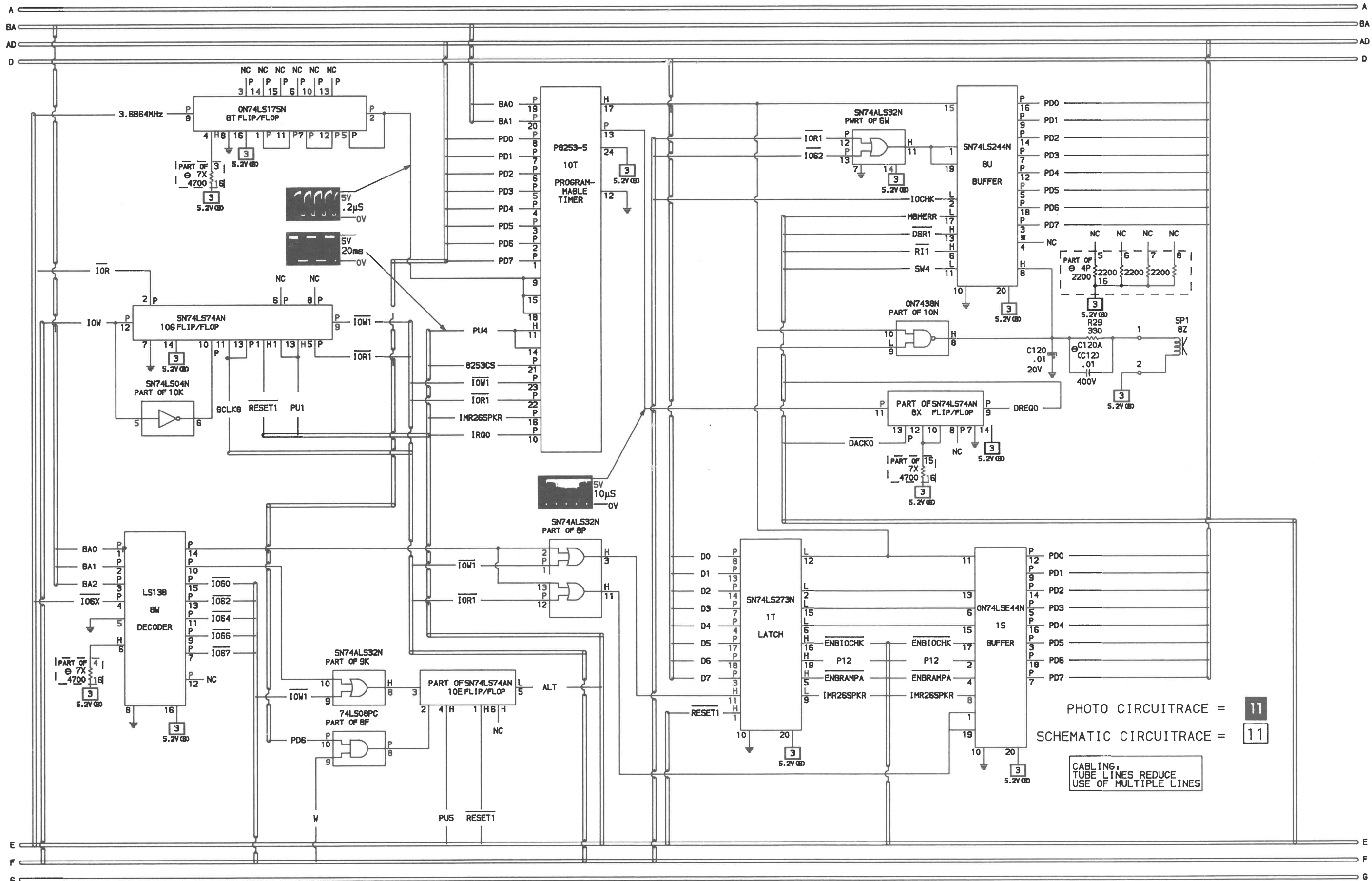


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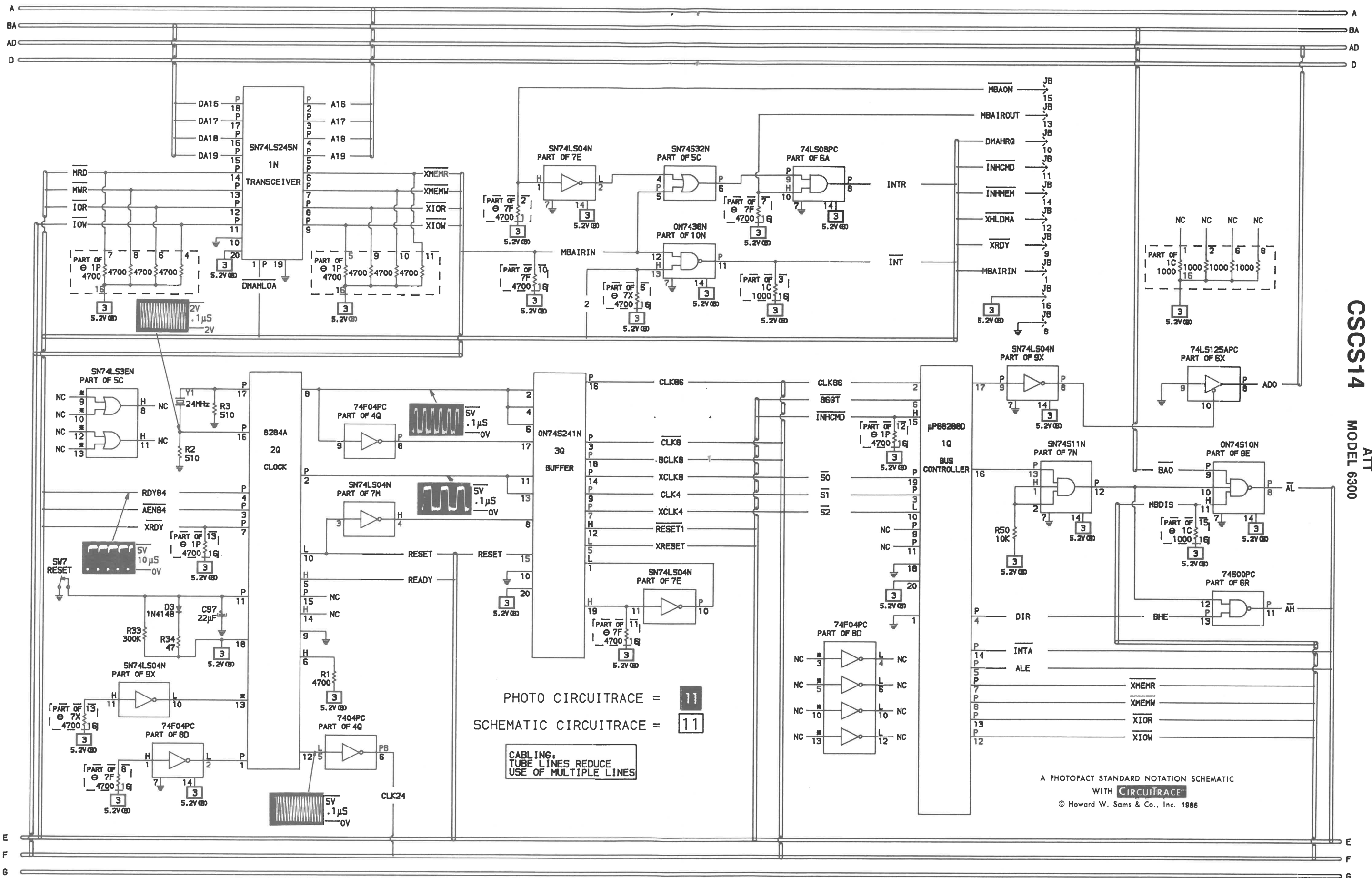


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PHOTO CIRCUITRACE = 11
SCHEMATIC CIRCUITRACE = 11

CABLING,
TUBE LINES REDUCE
USE OF MULTIPLE LINES

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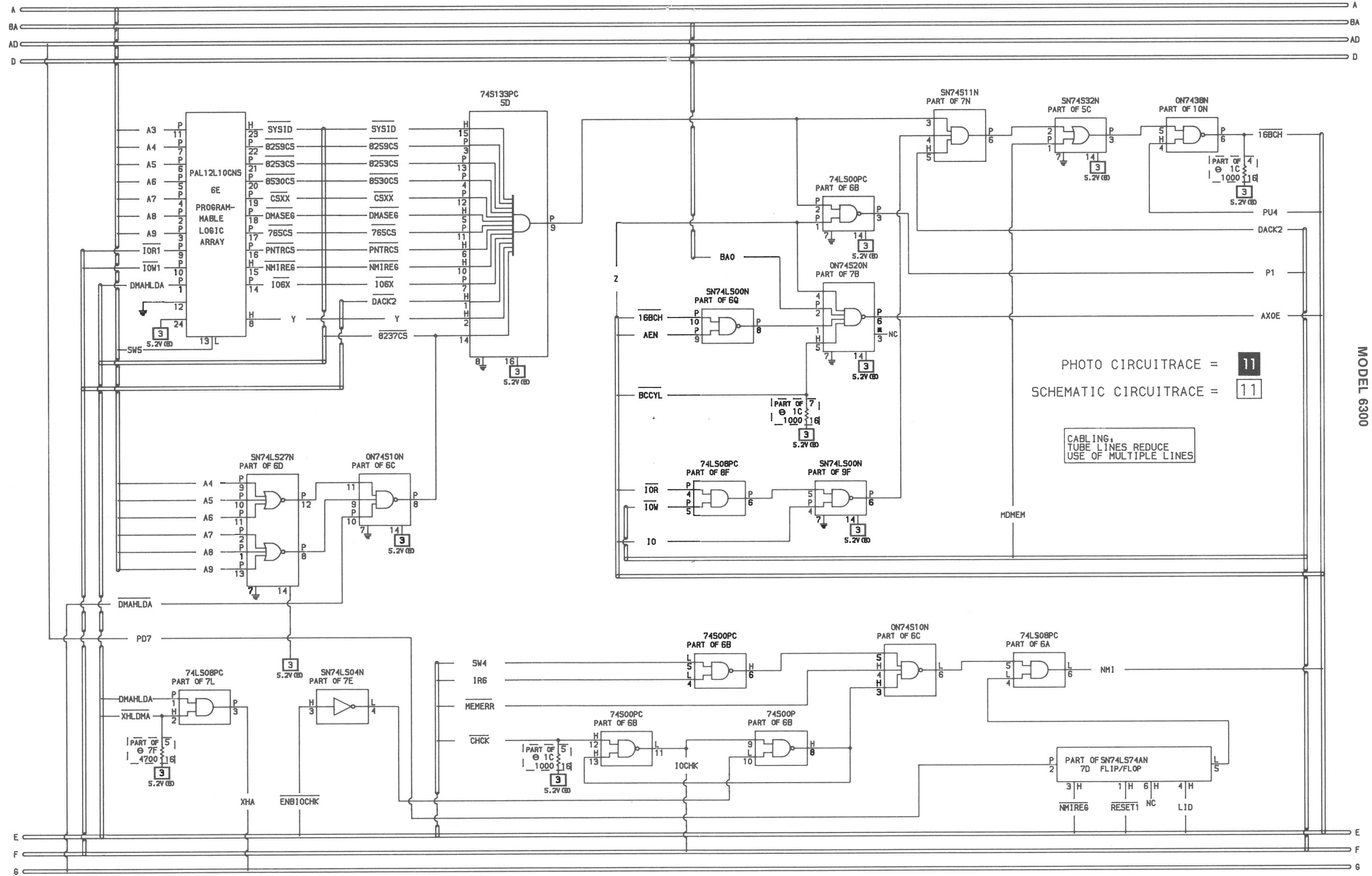


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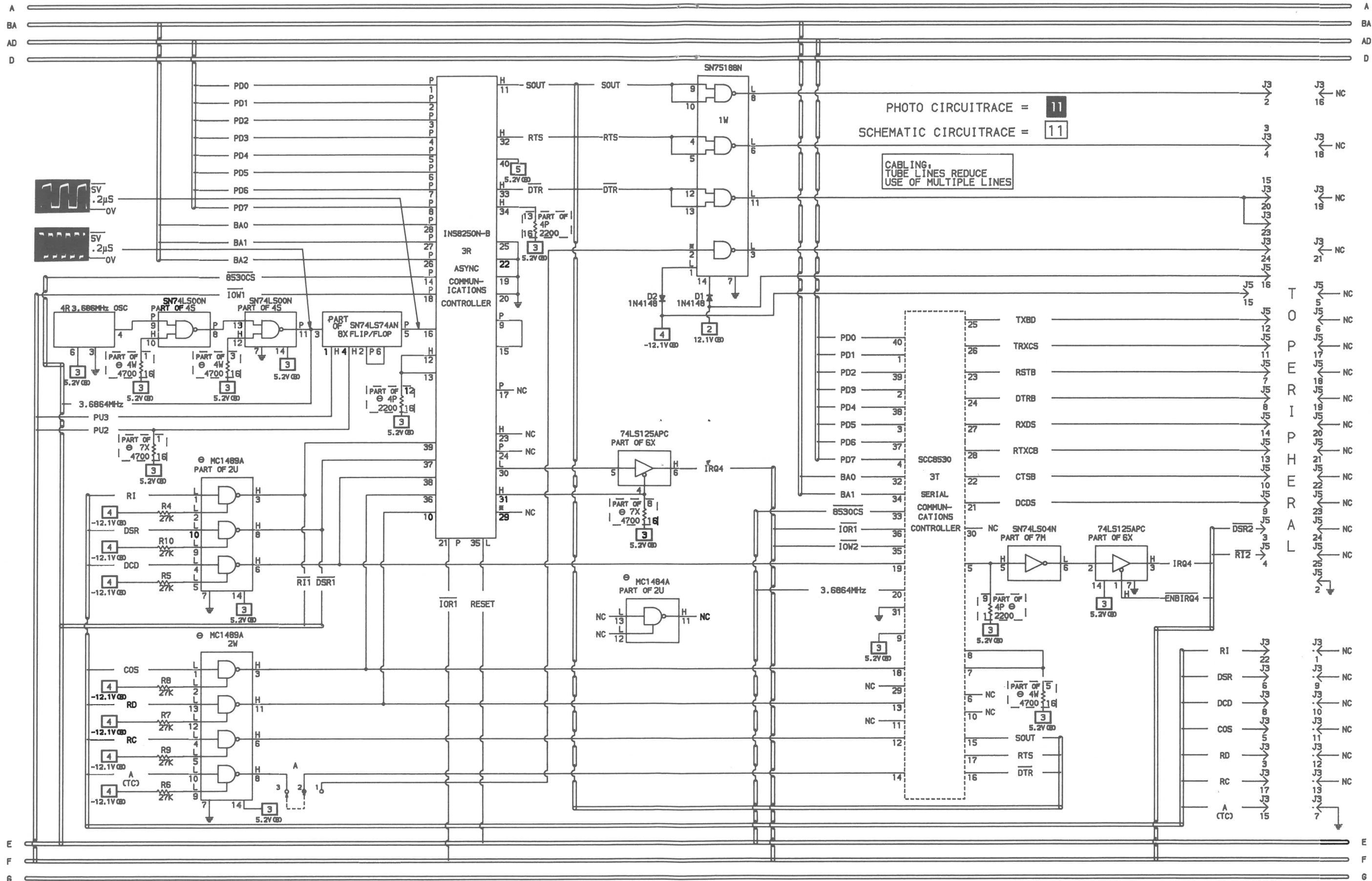
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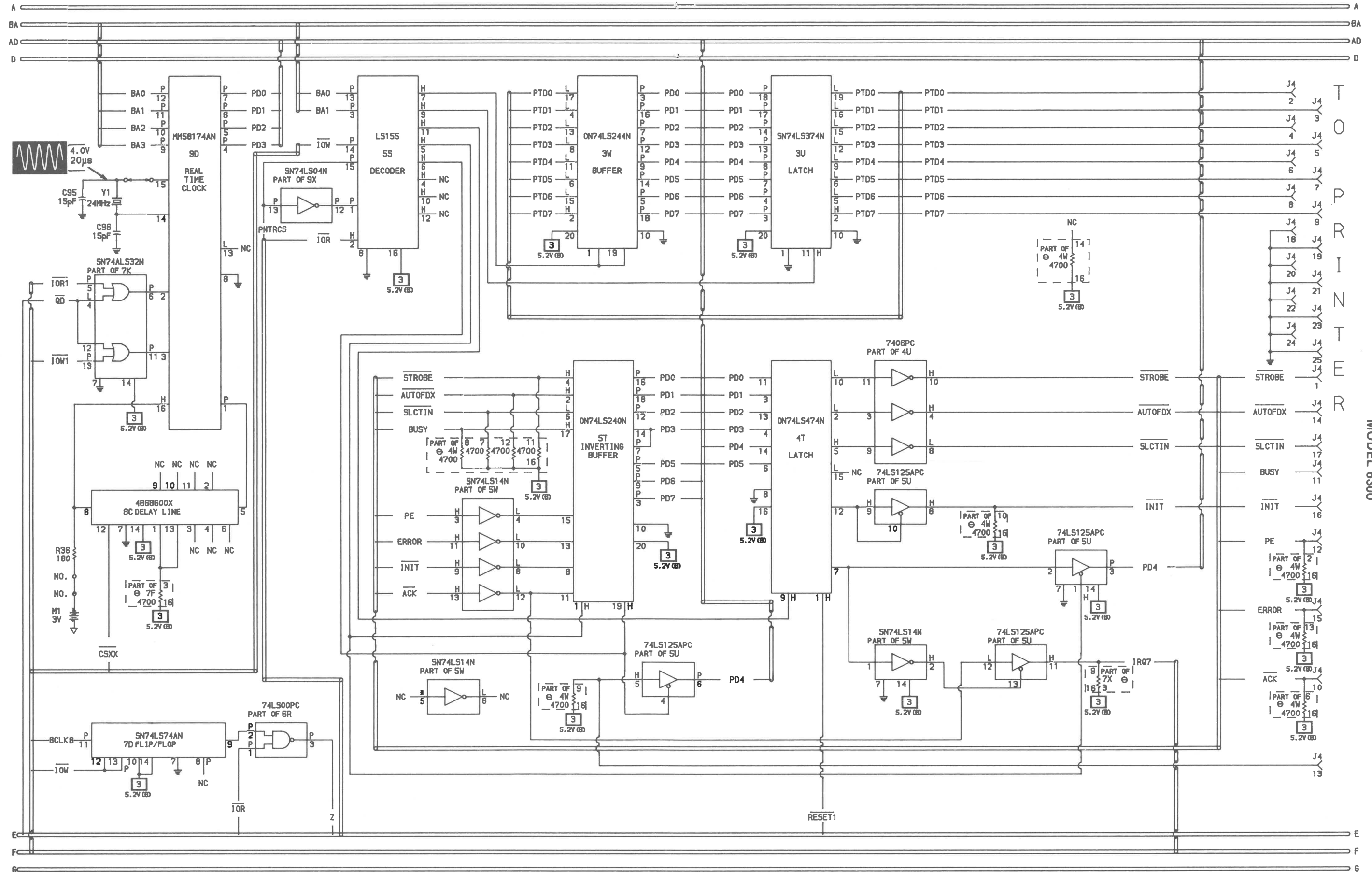
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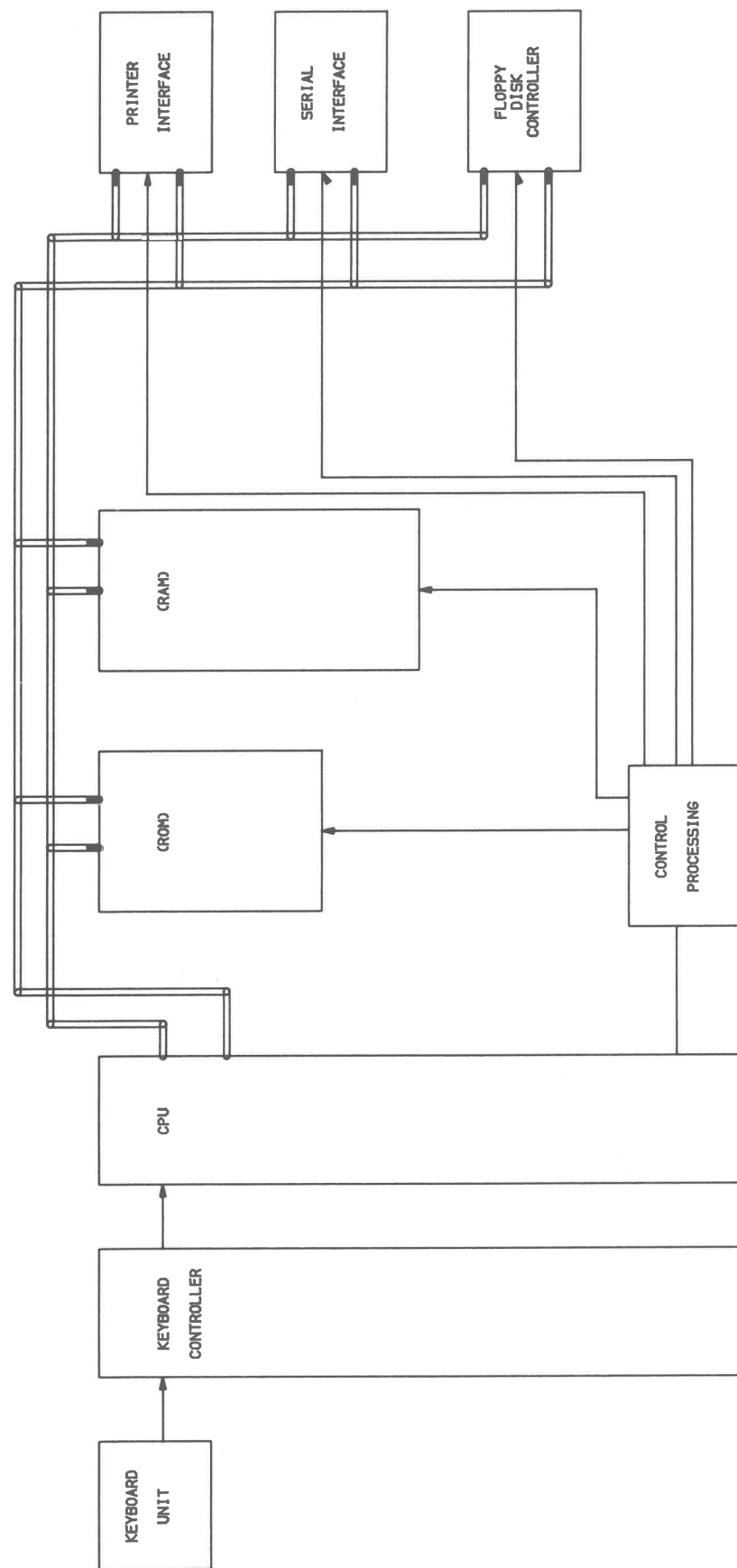
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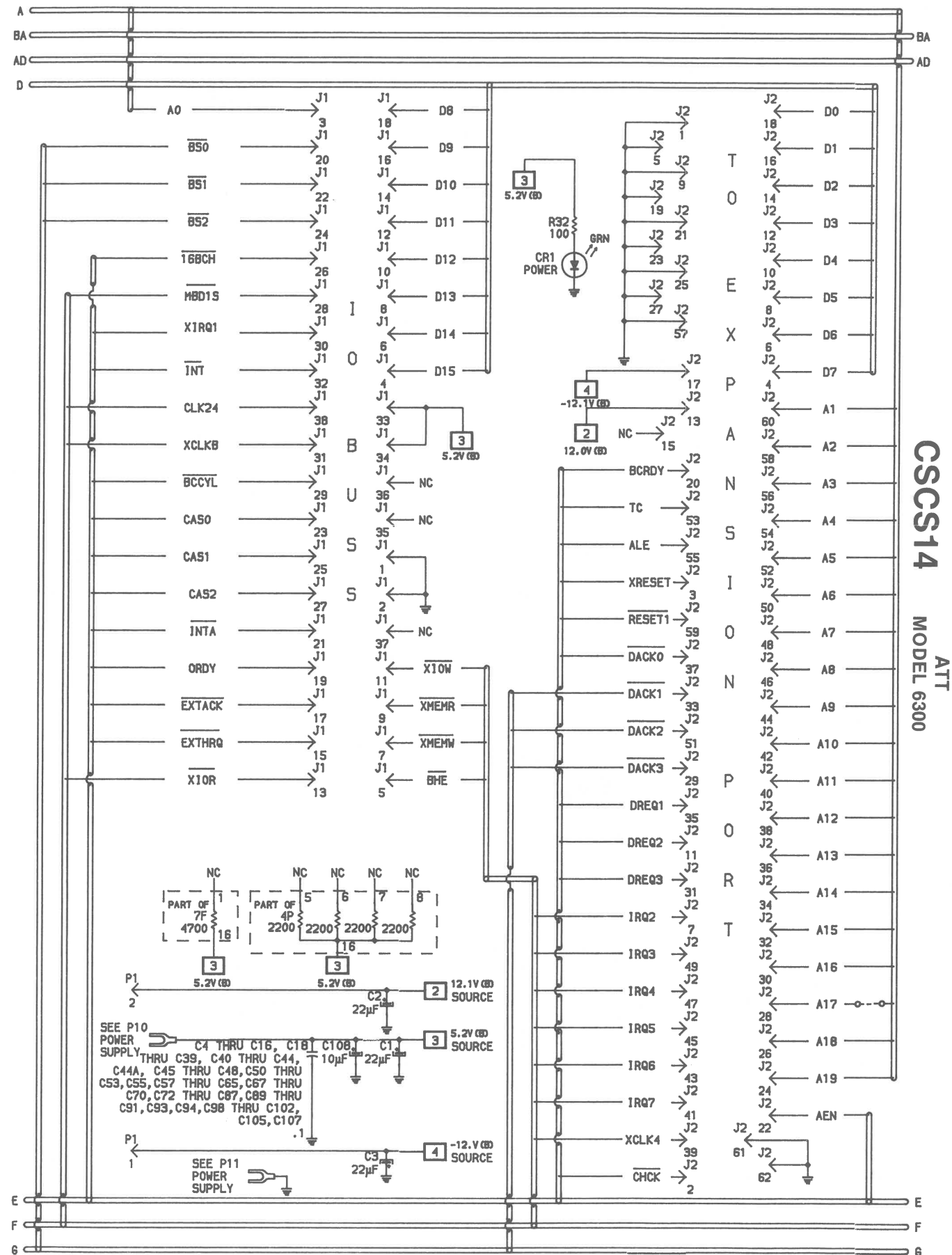
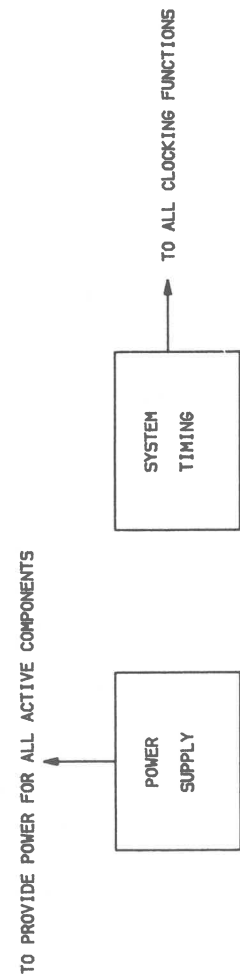
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SYSTEM BOARD

SYSTEM BOARD



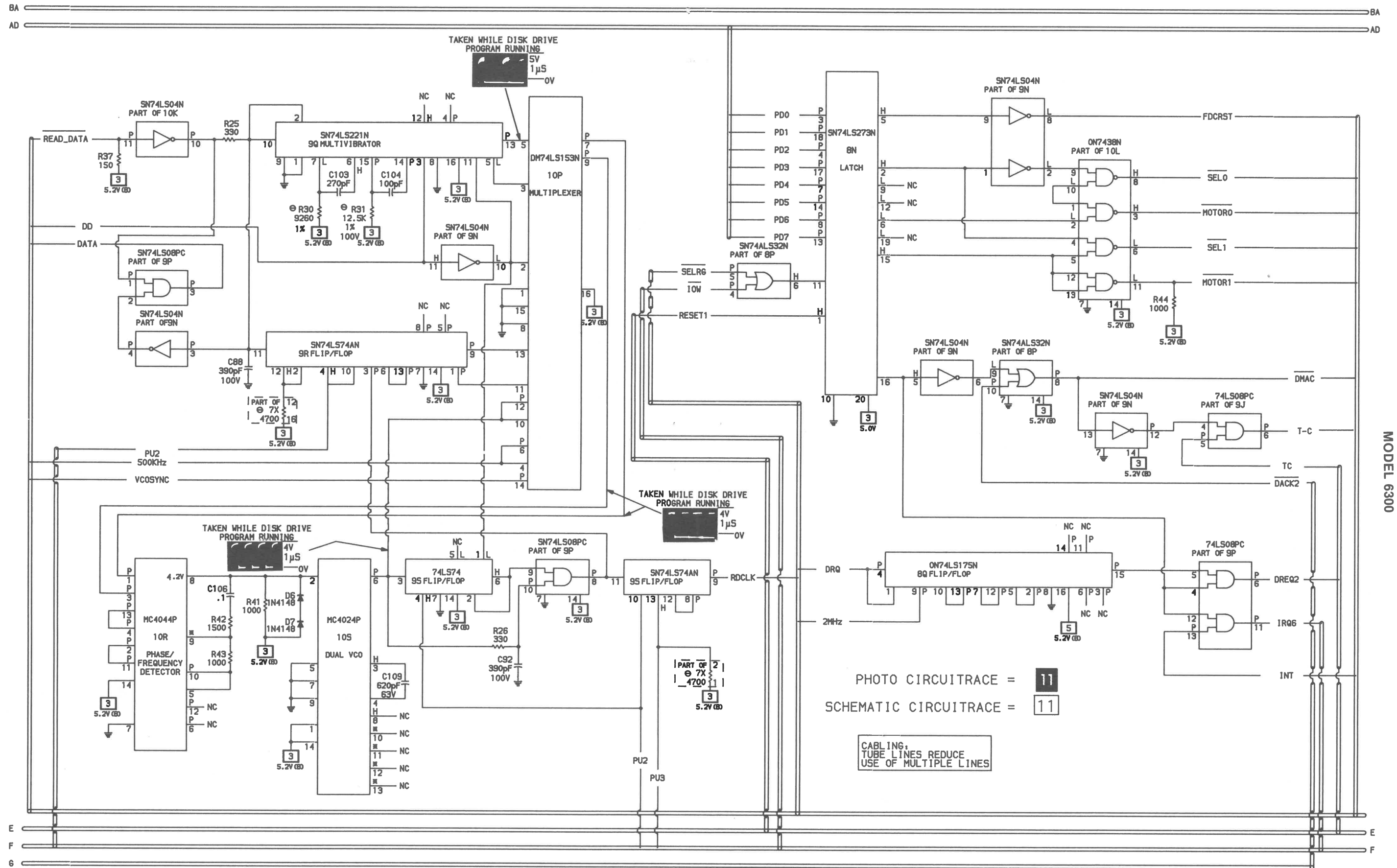
BLOCK DIAGRAM



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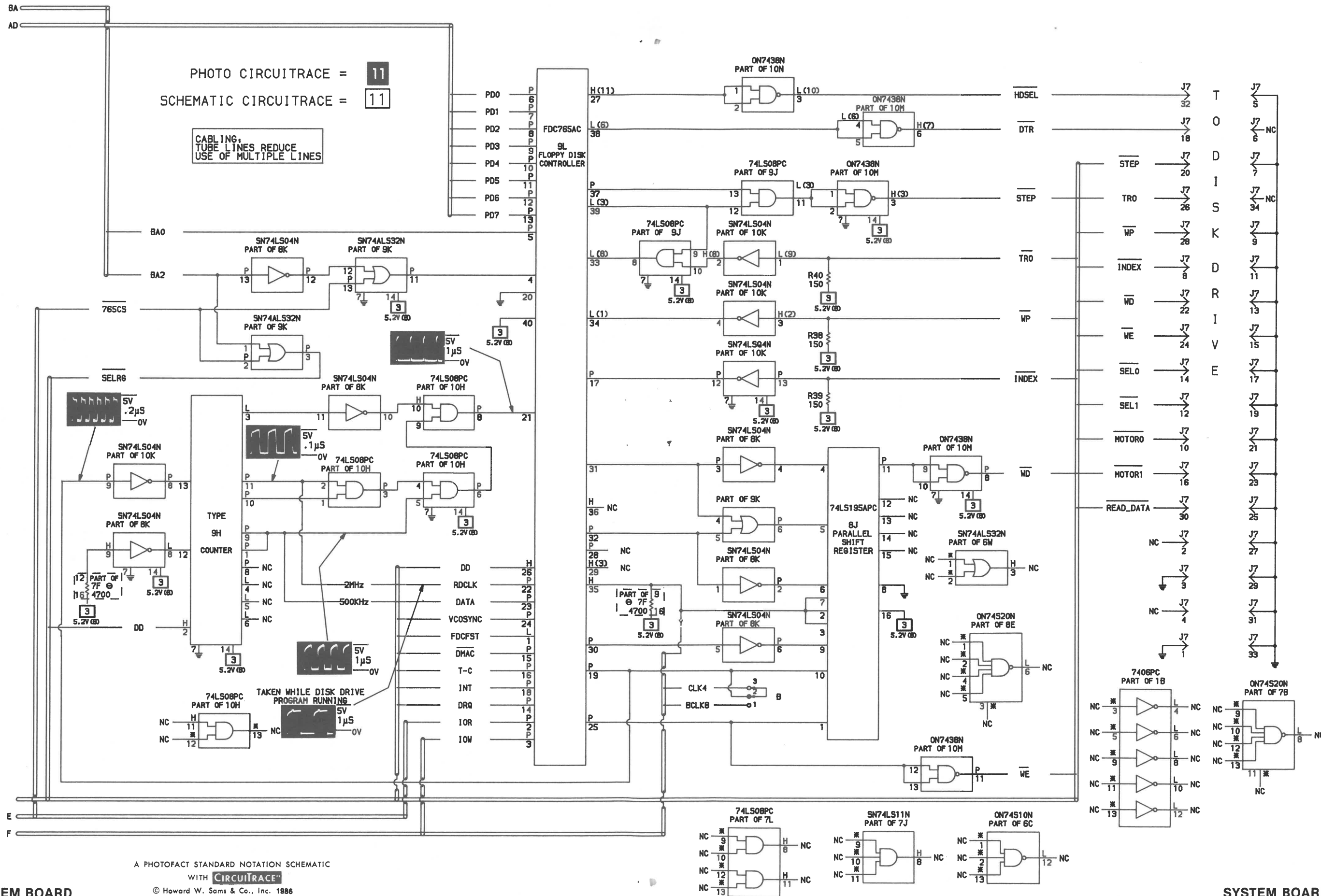
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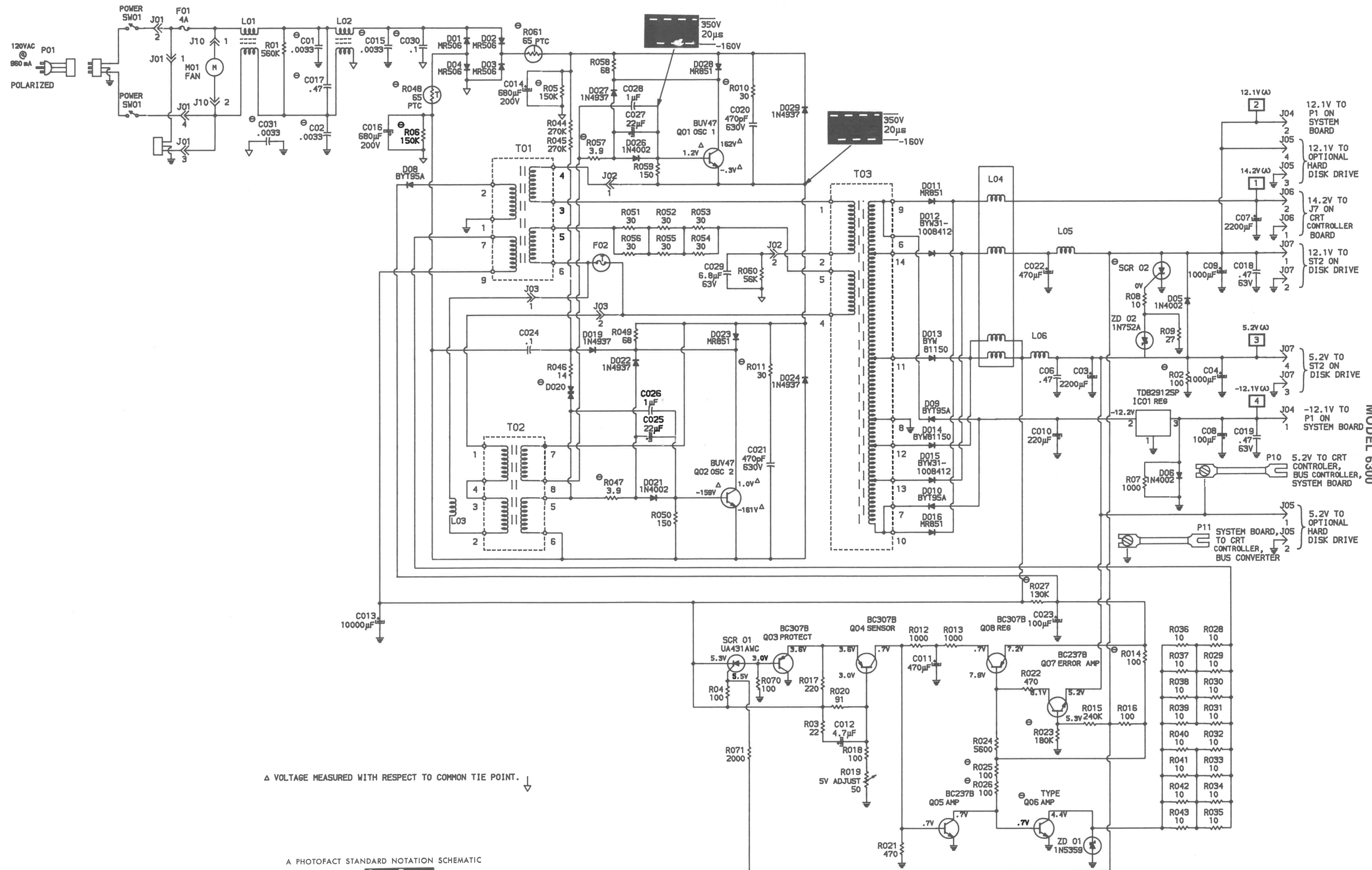
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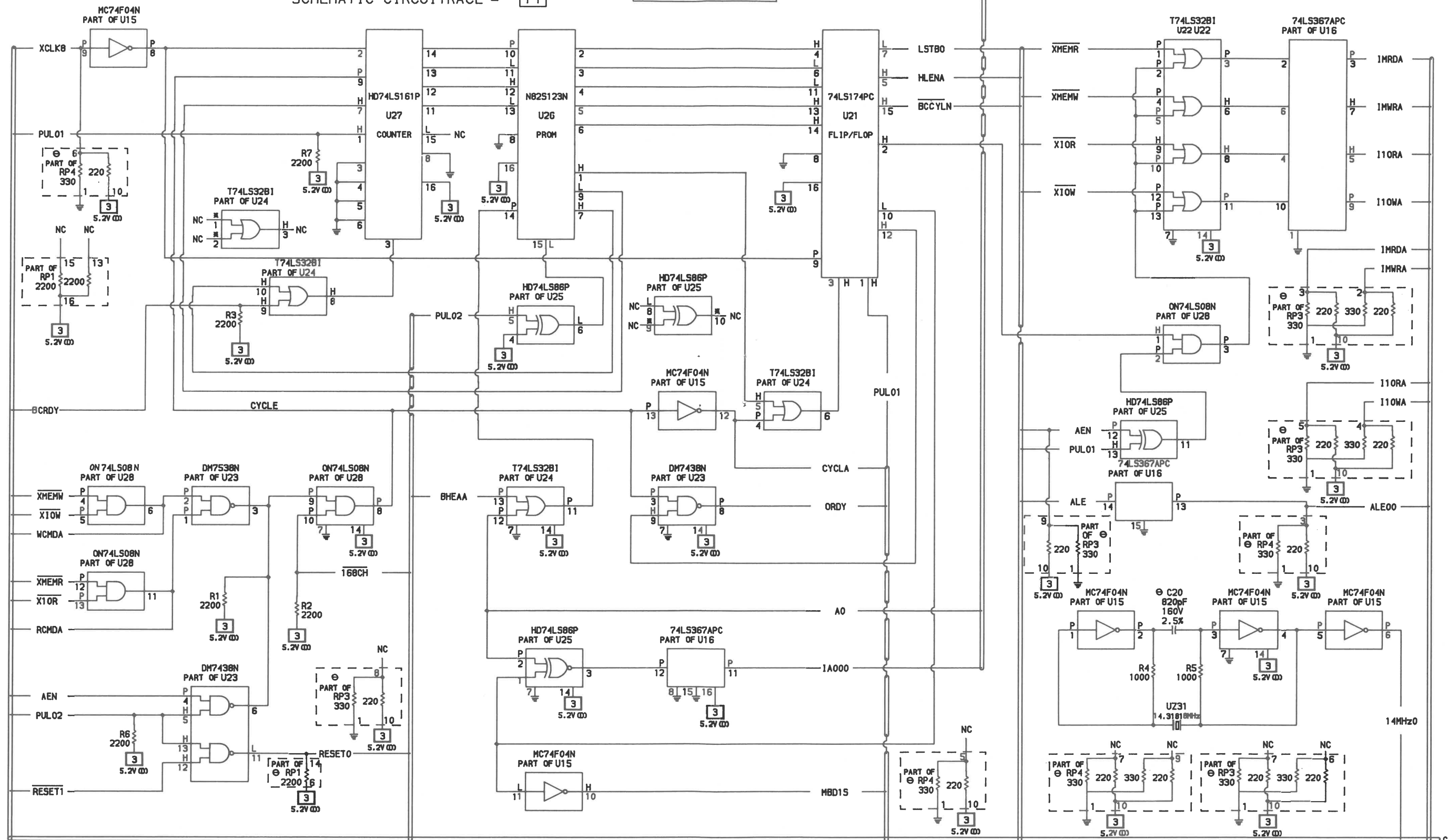


POWER SUPPLY

POWER SUPPLY

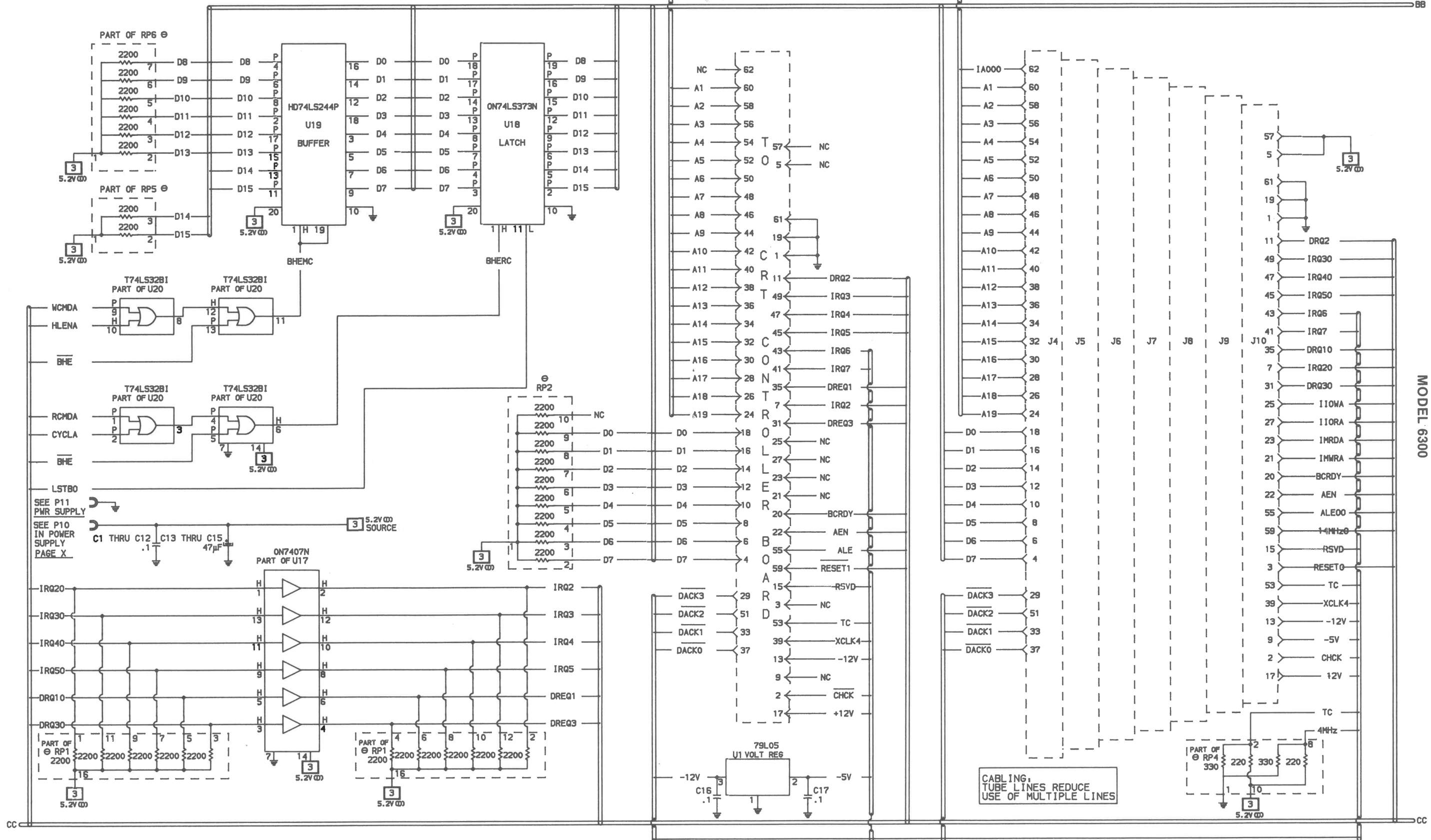
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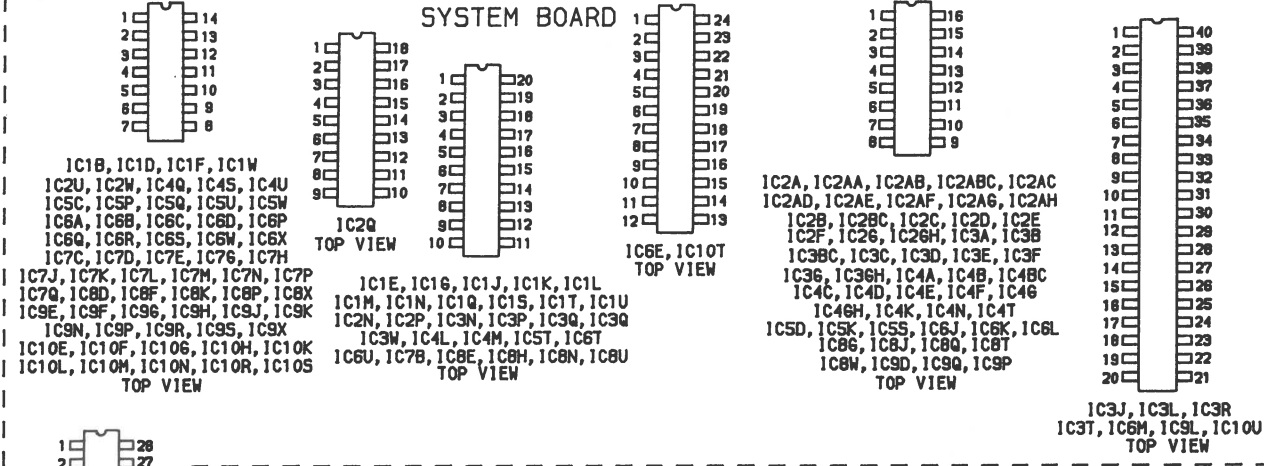
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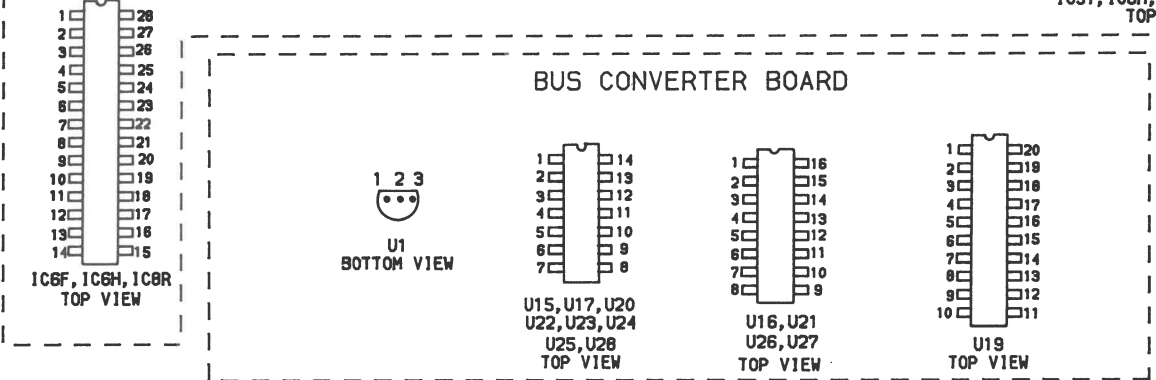
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TERMINAL GUIDES

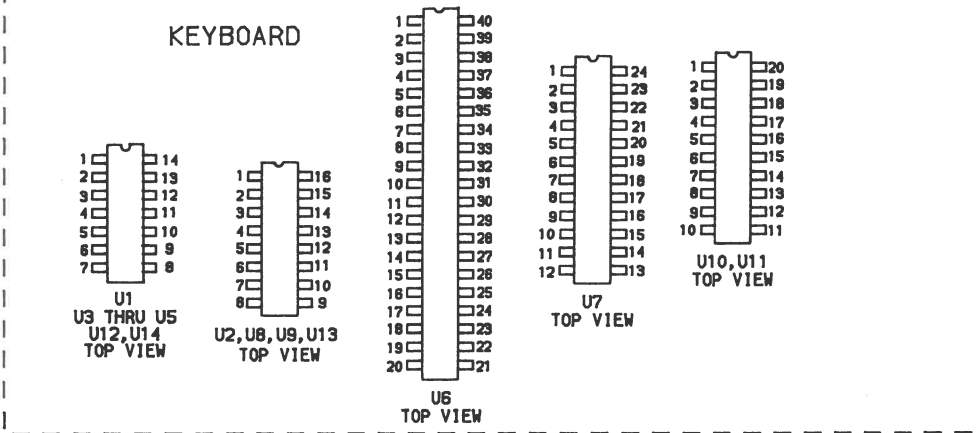
SYSTEM BOARD



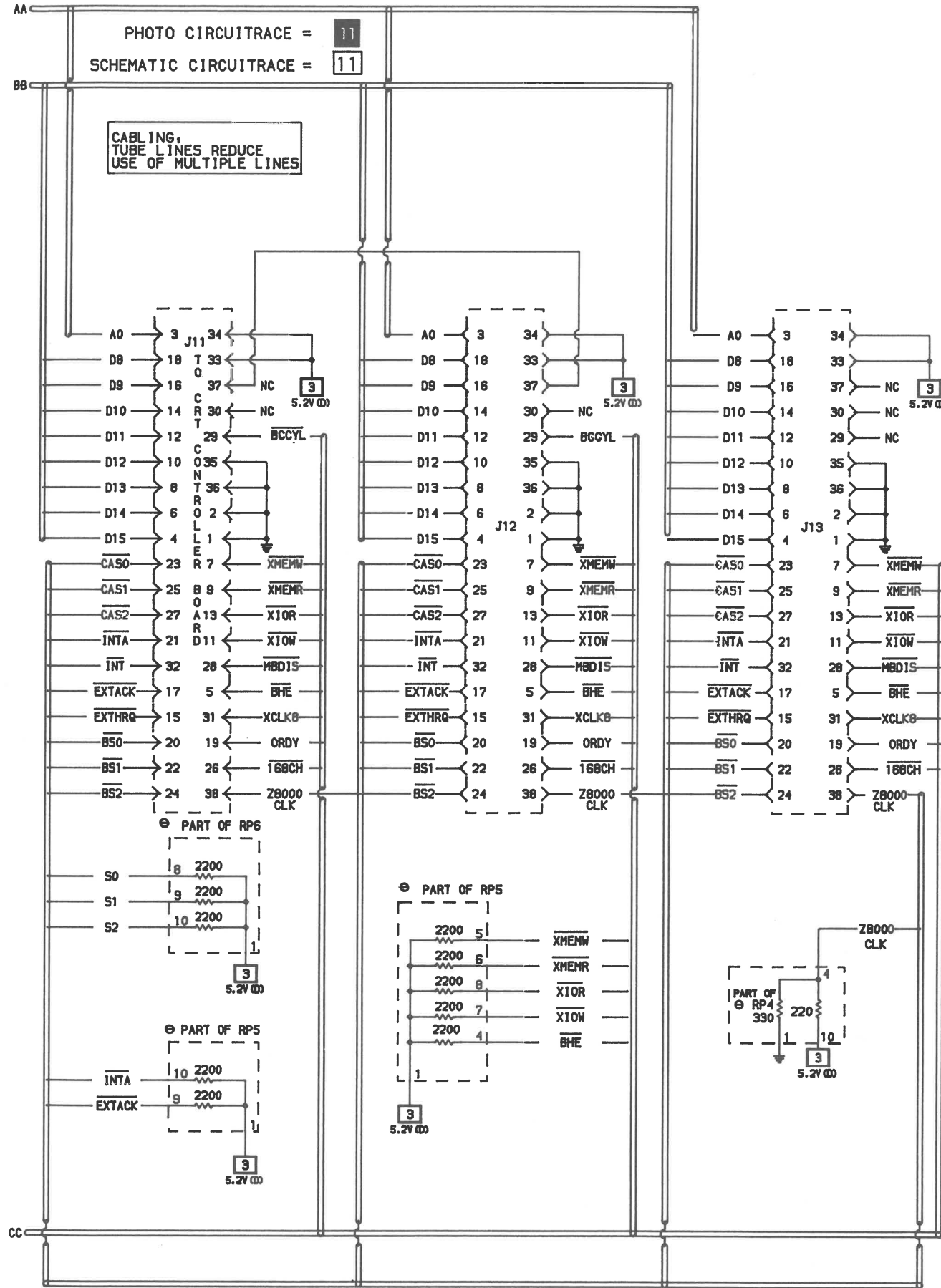
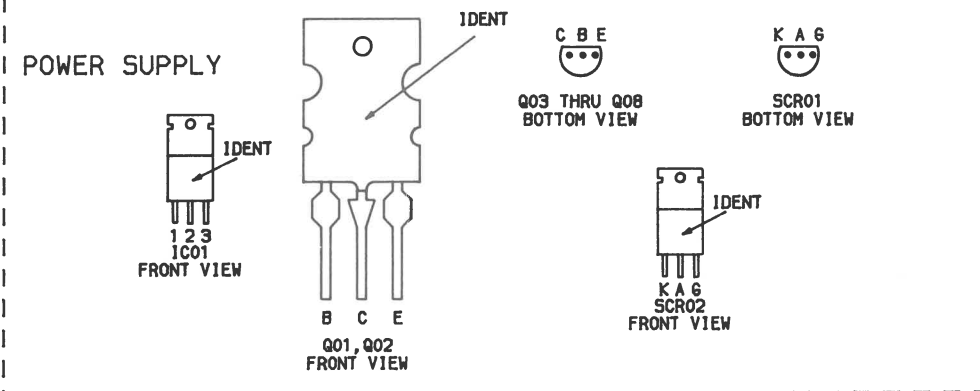
BUS CONVERTER BOARD



KEYBOARD



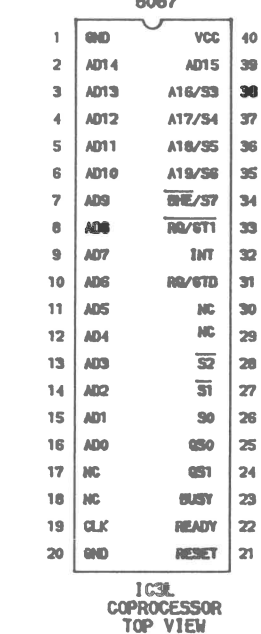
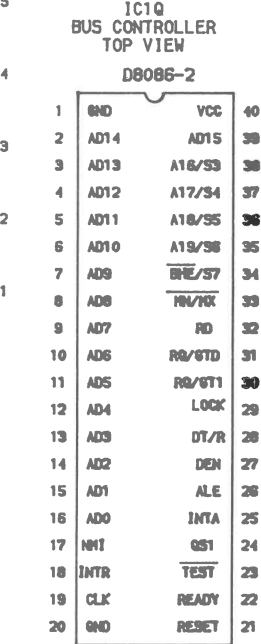
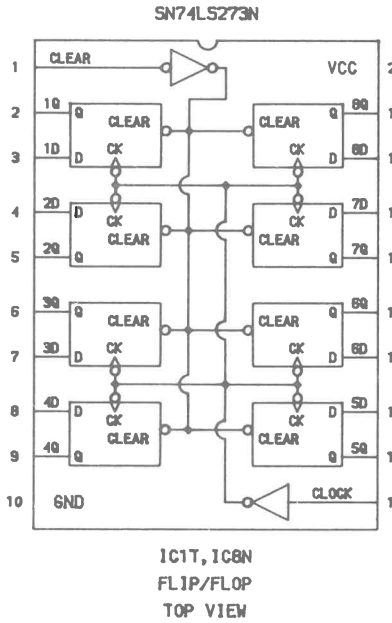
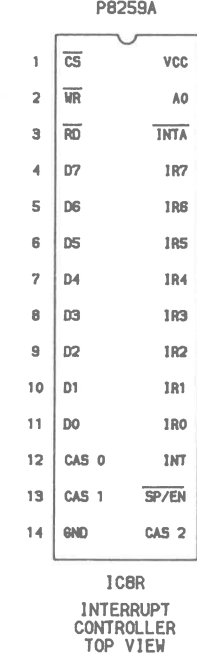
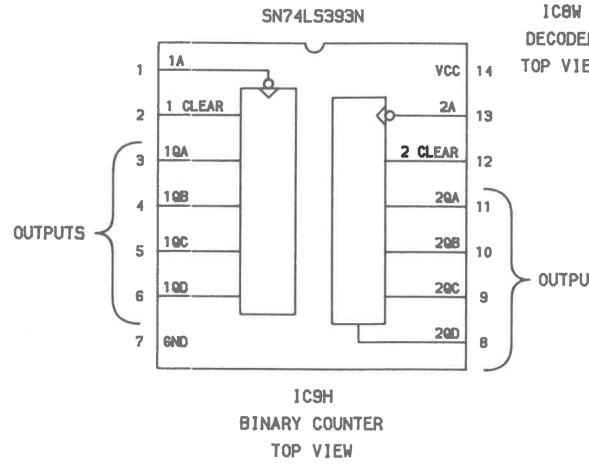
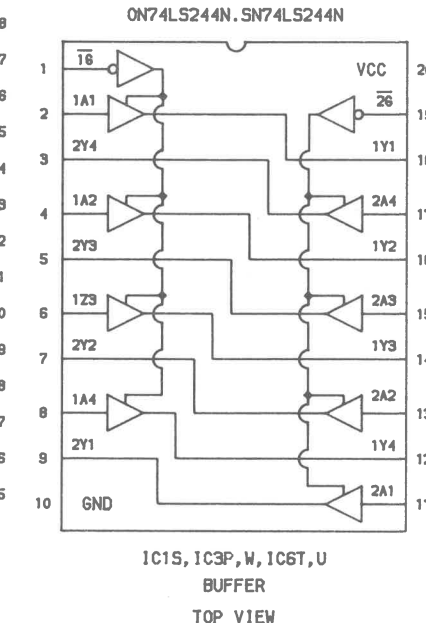
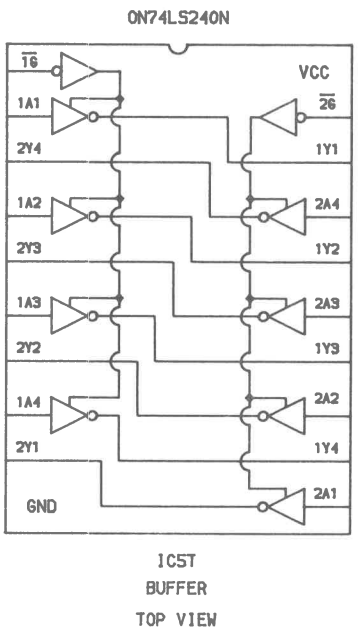
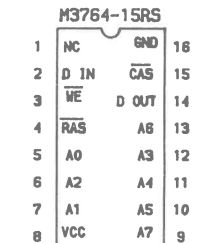
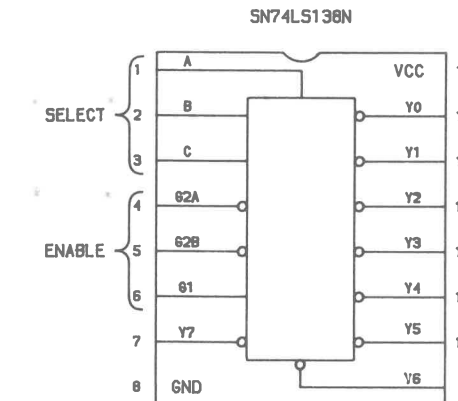
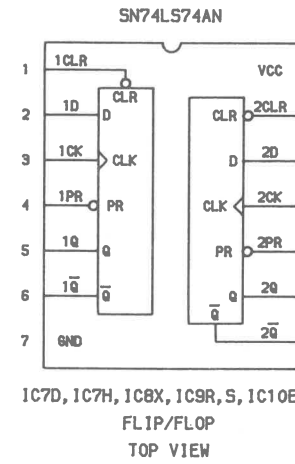
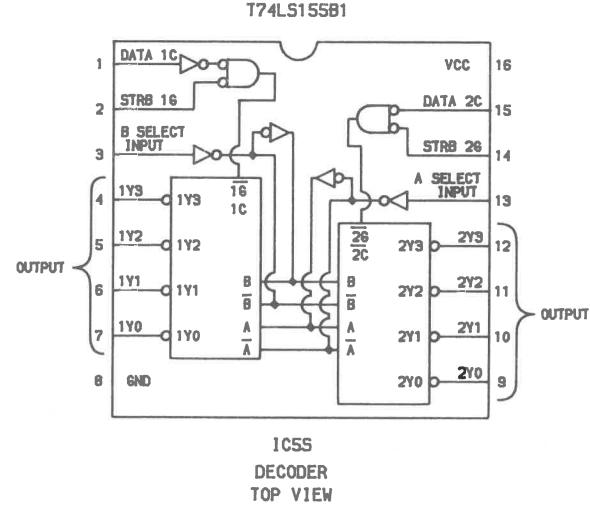
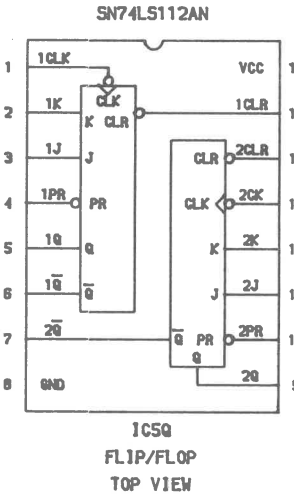
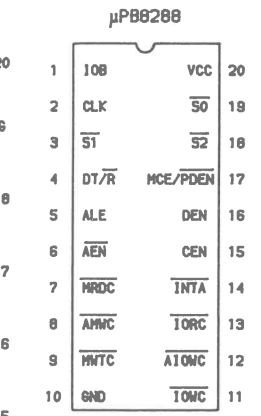
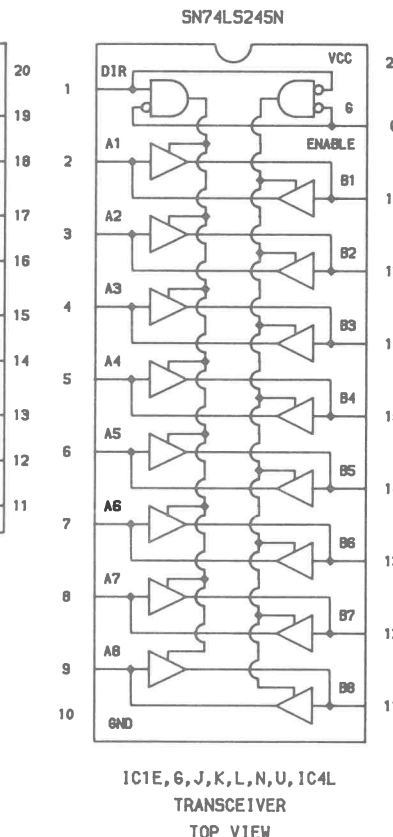
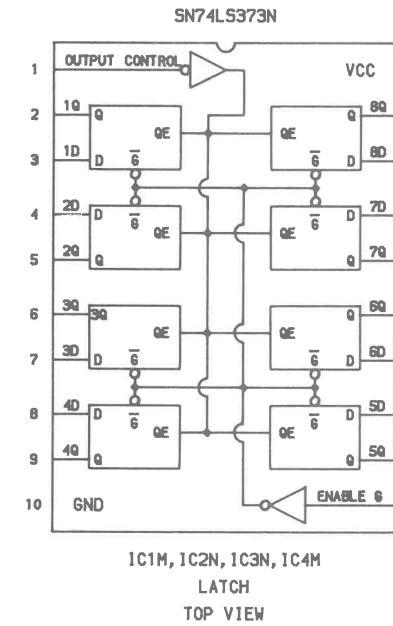
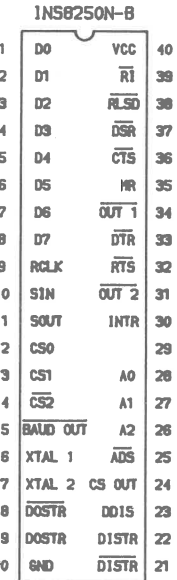
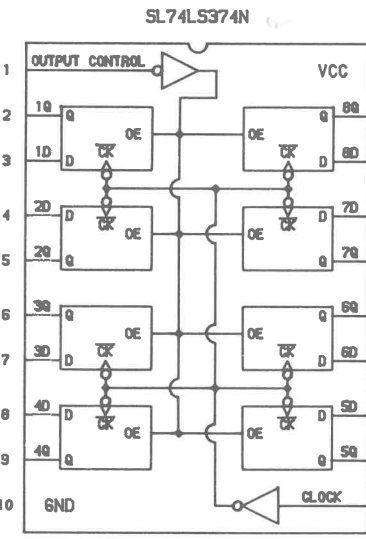
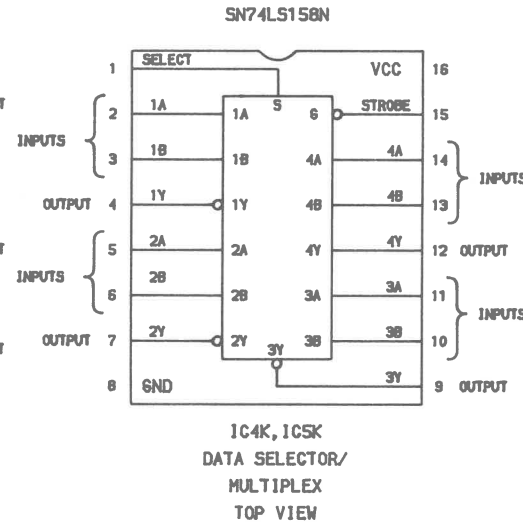
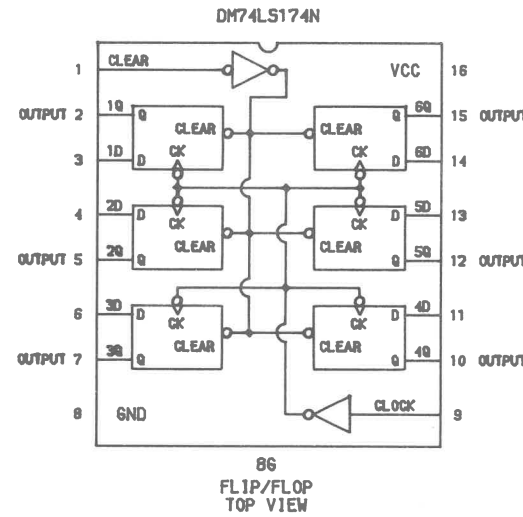
POWER SUPPLY



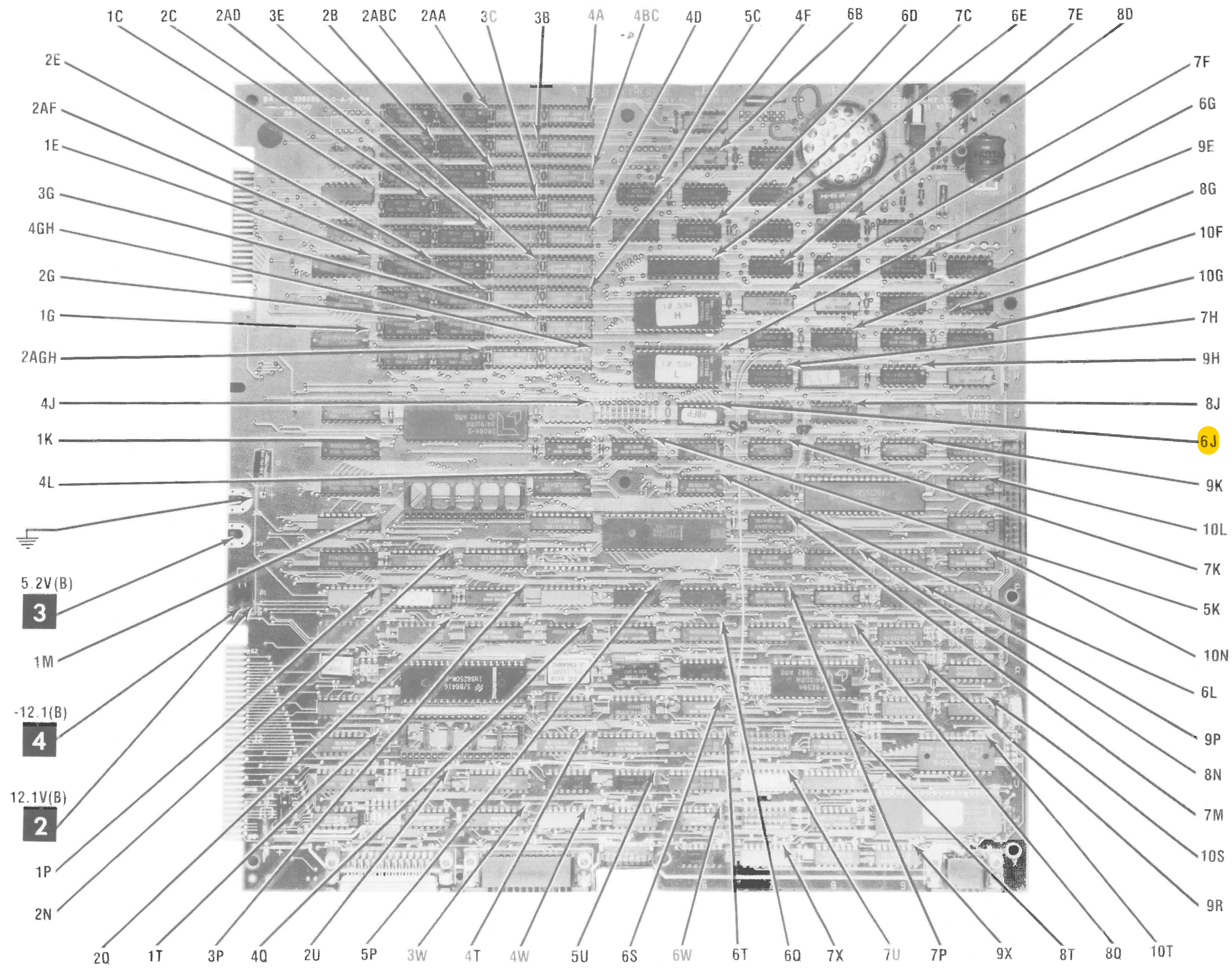
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IC PINOUTS

SYSTEM BOARD

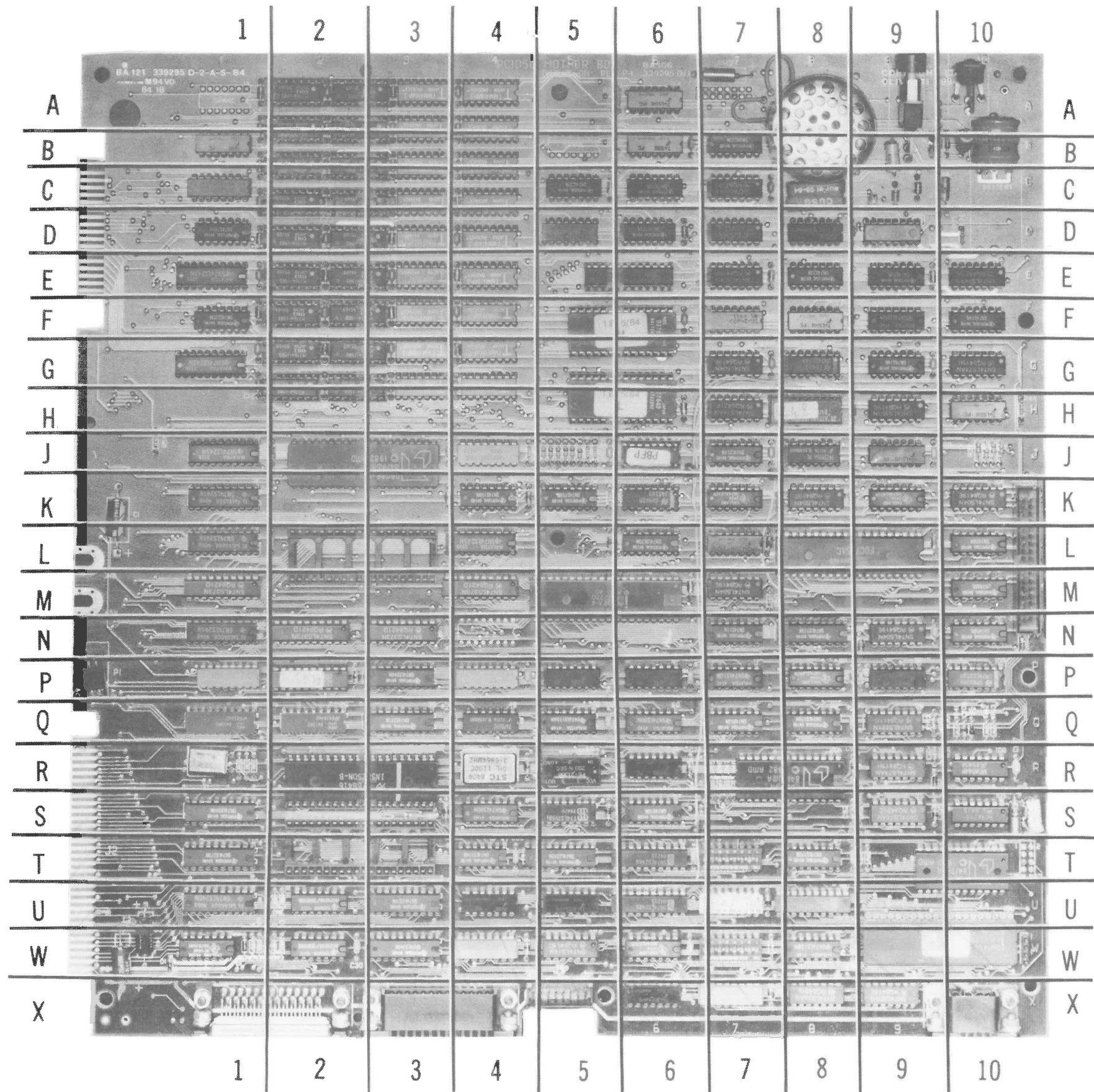


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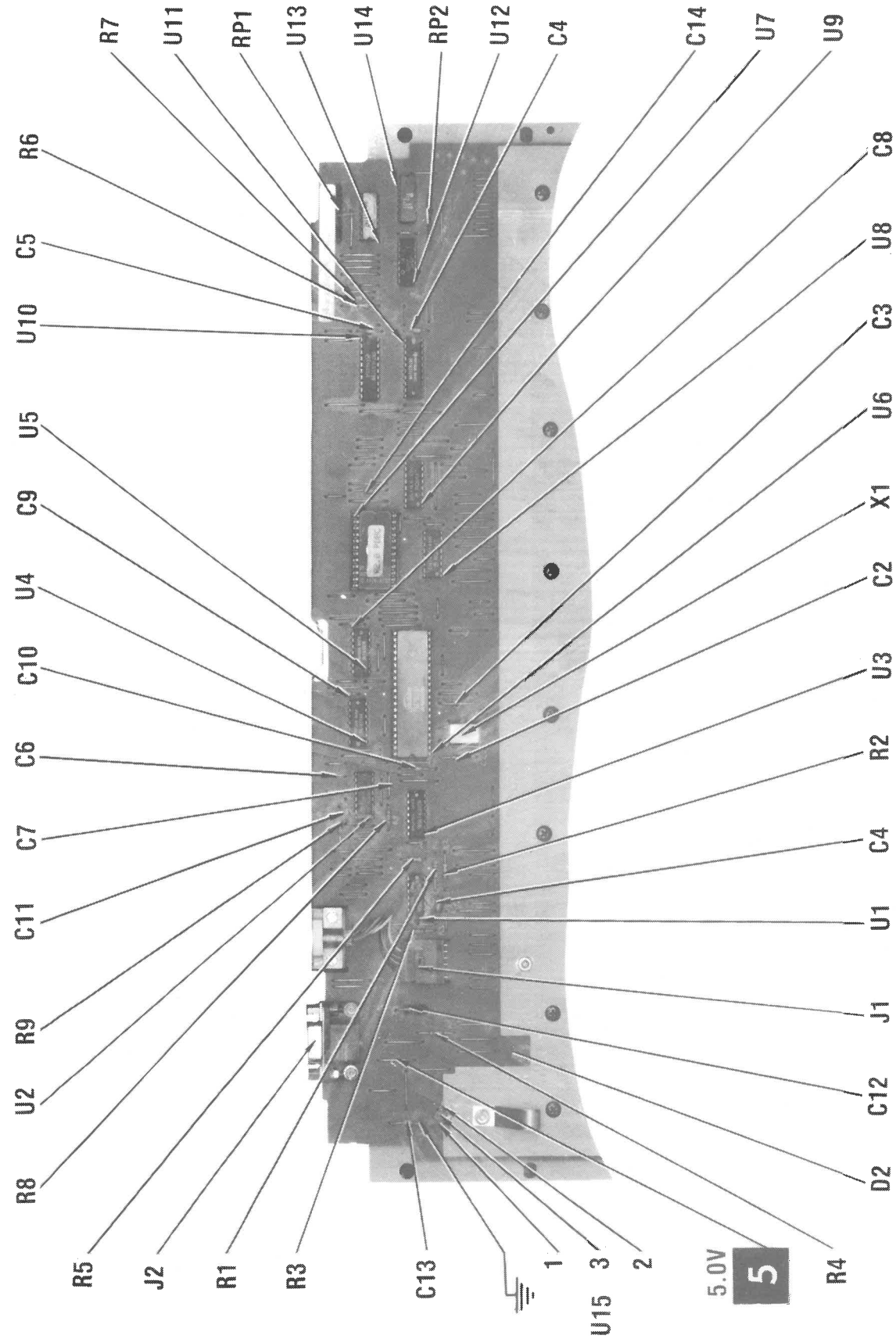


NOTE: ARROWS ON IC's INDICATE PIN 1 UNLESS NOTED

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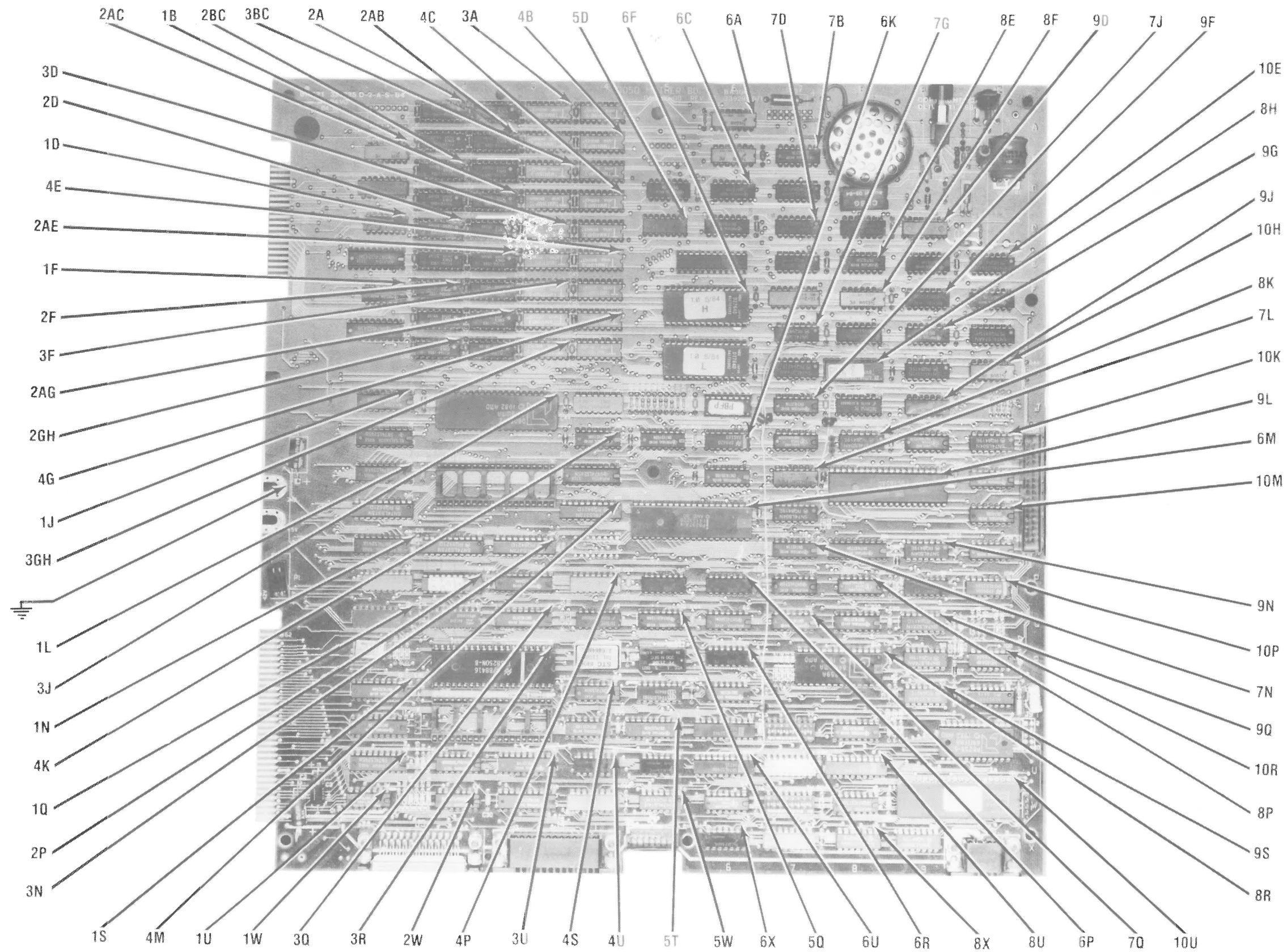


NOTE: ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED

SYSTEM BOARD GridTrace LOCATION GUIDE

A	T-2	C78	E-7	IC2P	P-2	IC7K	K-7	R18	J-5
B	K-8	C79	G-7	IC2Q	Q-2	IC7L	L-7	R19	J-5
C1	K-1	C80	J-7	IC2U	U-2	IC7M	M-7	R20	J-5
C2	W-1	C81	L-7	IC2W	W-2	IC7N	N-7	R21	J-5
C3	W-1	C82	U-7	IC3A	A-3	IC7P	P-7	R22	K-5
C4	A-1	C83	X-7	IC3B	B-3	IC7Q	Q-7	R23	A-6
C5	A-1	C84	D-9	IC3BC	B-3	IC8C	C-8	R24	W-7
C6	C-1	C85	F-9	IC3C	C-3	IC8D	D-8	R25	P-9
C7	C-1	C86	H-9	IC3D	D-3	IC8E	E-8	R26	S-9
C8	D-1	C87	K-9	IC3E	E-3	IC8F	F-8	R27	T-9
C9	E-1	C88	N-9	IC3F	F-3	IC8G	G-8	R28	T-9
C10	F-1	C89	P-8	IC3G	G-3	IC8H	H-8	R29	B-9
C11	G-1	C90	Q-9	IC3GH	H-3	IC8J	J-8	R30	Q-10
C12	H-1	C91	R-8	IC3J	J-3	IC8K	K-8	R31	R-10
C13	J-2	C92	S-8	IC3L	L-3	IC8N	N-8	R32	A-10
C14	L-2	C93	T-8	IC3N	N-3	IC8P	P-8	R33	B-9
C15	N-1	C94	W-8	IC3P	P-3	IC8Q	Q-8	R34	B-10
C16	Q-2	C95	C-9	IC3Q	Q-3	IC8R	R-8	R36	D-10
C18	S-1	C96	C-9	IC3R	R-3	IC8T	T-8	R37	J-10
C19	U-1	C97	B-10	IC3T	T-3	IC8U	U-8	R38	J-10
C20	A-2	C98	E-9	IC3U	U-3	IC8W	W-8	R39	J-10
C21	A-2	C99	G-9	IC3W	W-3	IC8X	X-8	R40	J-10
C22	B-2	C100	J-9	IC4A	A-4	IC9D	D-9	R41	Q-10
C23	C-2	C101	L-9	IC4B	B-4	IC9E	E-9	R42	Q-10
C24	D-2	C102	N-9	IC4BC	B-4	IC9F	F-9	R43	Q-10
C25	E-2	C103	Q-9	IC4C	C-4	IC9G	G-9	R44	H-10
C26	F-2	C104	R-9	IC4D	D-4	IC9H	H-9	R45	R-7
C27	G-2	C105	S-9	IC4E	E-4	IC9J	J-9	R46	R-7
C28	H-2	C106	Q-10	IC4F	F-4	IC9K	K-9	R47	R-7
C29	P-2	C107	R-10	IC4G	G-4	IC9L	L-9	R48	R-7
C30	W-2	C108	S-10	IC4GH	H-4	IC9N	N-9	R50	M-7
C31	A-3	C109	S-10	IC4K	K-4	IC9P	P-9	R51	J-1
C32	A-3	C120	A-7	IC4L	L-4	IC9Q	Q-9	RP1C	C-1
C33	B-3	C120A	B-9	IC4M	M-4	IC9R	R-9	RP1P	P-1
C34	C-3	CR1	A-10	IC4O	Q-4	IC9S	S-9	RP4J	J-4
C35	D-3	D1	W-1	IC4S	S-4	IC9X	X-9	RP4P	P-4
C36	E-3	D2	W-1	IC4T	T-4	IC10E	E-10	RP4W	W-4
C37	F-3	D3	B-10	IC4U	U-4	IC10F	F-10	RP7F	F-7
C38	G-3	D6	Q-10	IC5C	C-5	IC10G	G-10	RP7U	U-7
C39	H-3	D7	R-9	IC5D	D-5	IC10H	H-10	RP7X	X-7
C40	A-4	IC1B	B-1	IC5K	K-5	IC10K	K-10	SP1	A-8
C41	A-4	IC1D	D-1	IC5P	P-5	IC10L	L-10	SW7	A-9
C42	C-4	IC1E	E-1	IC5Q	Q-5	IC10M	M-10	SW7T	T-7
C43	C-4	IC1F	F-1	IC5R	R-5	IC10N	N-10	SW7U	U-7
C44	D-4	IC1G	G-1	IC5S	S-5	IC10P	P-10	X1	C-10
C44A	J-3	IC1J	J-1	IC5T	T-5	IC10R	R-10	Y1	R-1
C45	E-4	IC1K	K-1	IC5U	U-5	IC10S	S-10		
C46	F-4	IC1L	L-1	IC5W	W-5	IC10T	T-10		
C47	G-4	IC1M	M-1	IC6A	A-6	IC10U	U-10		
C48	H-4	IC1N	N-1	IC6B	B-6	J1	E-1		
C50	K-3	IC1Q	Q-1	IC6C	C-6	J2	W-1		
C51	N-3	IC1S	S-1	IC6D	D-6	J3	X-1		
C52	Q-3	IC1T	T-1	IC6E	E-6	J4	X-4		
C53	S-3	IC1U	U-1	IC6F	F-6	J5	X-5		
C55	K-4	IC1W	W-1	IC6H	H-6	J6	X-10		
C57	P-4	IC2A	A-2	IC6J	J-6	J7	K-10		
C58	R-4	IC2AA	A-2	IC6K	K-6	M1	B-10		
C59	T-4	IC2AB	B-2	IC6L	L-6	R1	R-1		
C60	W-4	IC2ABC	B-2	IC6M	M-6	R2	R-1		
C61	C-5	IC2AC	C-2	IC6P	P-6	R3	R-1		
C62	J-5	IC2AD	D-2	IC6Q	Q-6	R4	U-2		
C63	L-5	IC2AE	E-2	IC6R	R-6	R5	U-2		
C64	Q-5	IC2AF	F-2	IC6S	S-6	R6	W-1		
C65	S-5	IC2AG	G-2	IC6T	T-6	R7	W-1		
C67	B-6	IC2AGH	H-2	IC6U	U-6	R8	W-2		
C68	D-6	IC2B	B-2	IC6W	W-6	R9	W-2		
C69	F-6	IC2BC	C-2	IC6X	X-6	R10	W-2		
C70	H-6	IC2C	C-2	IC7B	B-7	R11	Q-4		
C72	M-6	IC2D	D-2	IC7C	C-7	R12	J-4		
C73	P-6	IC2E	E-2	IC7D	D-7	R13	J-4		
C74	R-6	IC2F	F-2	IC7E	E-7	R14	J-5		
C75	T-6	IC2G	G-2	IC7G	G-7	R15	J-5		
C76	W-6	IC2GH	H-2	IC7H	H-7	R16	J-5		
C77	C-7	IC2N	N-2	IC7J	J-7	R17	J-5		

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NOTE: ARROWS ON IC's INDICATED PIN 1 UNLESS NOTED

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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 message will be displayed on the Monitor screen and sent to the Printer if connected. For an explanation of the various error messages, see the "Computer Self-Test" section of the General Operating instructions.

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 MS DOS (Microsoft Disk Operating System) diskette is used, 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 the 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

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

To save a program, type SAVE, the program name enclosed in quotes and press the ENTER key. To save a program to Drive B, add 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 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. The Computer can also be reset by pressing the reset button located on the front lower right.

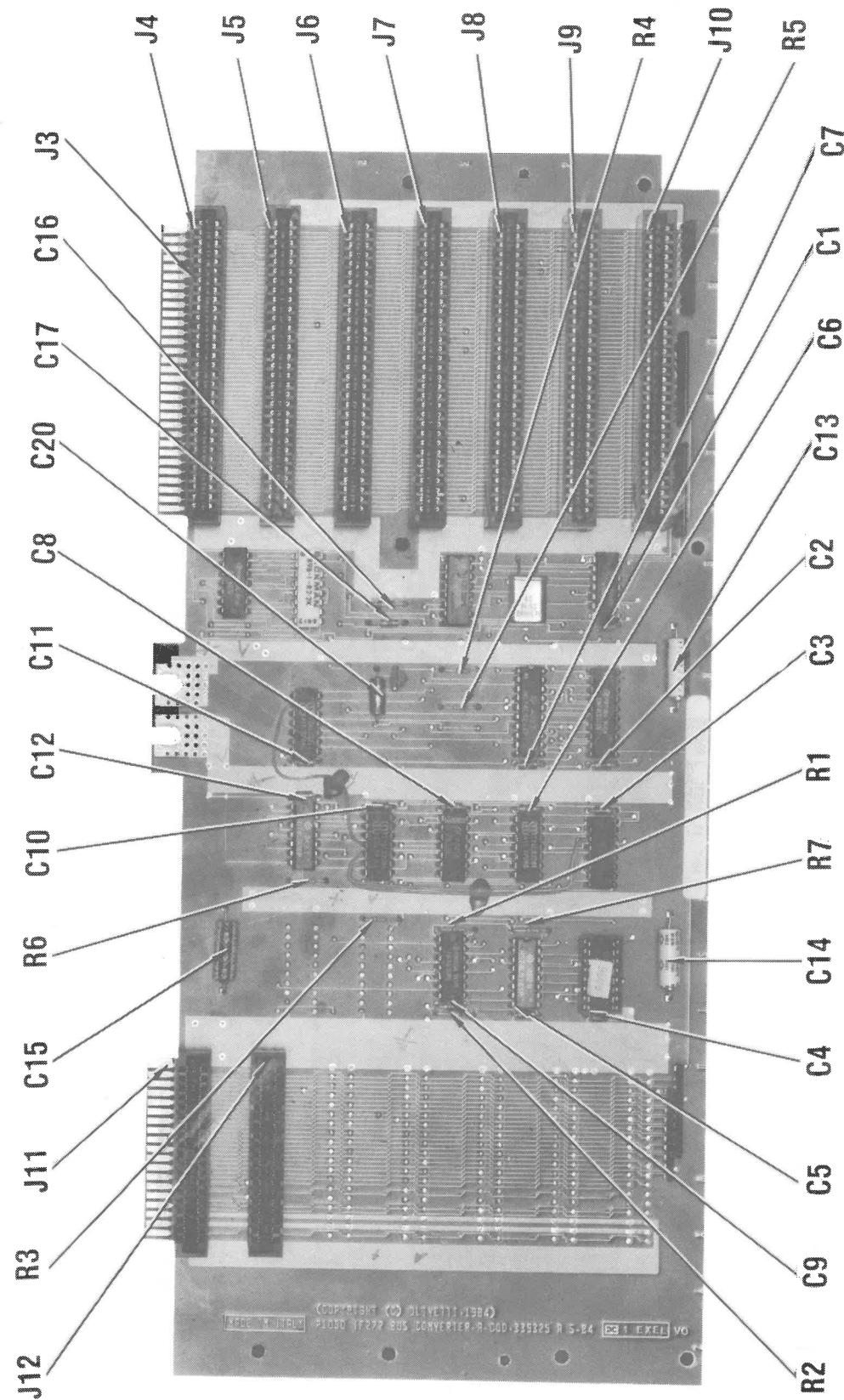
COMPUTER SELF-TEST

The Computer performs a Self-Test every time it is turned On. When the Self-Test is done, the results are displayed on the Monitor screen. The Computer then beeps once and boots up from a bootable diskette inserted in Drive A.

The Self-Test performs tests on the System Board, Floppy Disk Drive and Fixed (Hard) Disk Drive. The following chart is a list of possible error messages and their meaning.

Note: The IC's listed below may be the cause of the defect or the circuits associated with the IC may be defective.

ERROR MESSAGE	MEANING
CPU Fail	CPU IC (IC 3J) defective
ROM Module Fail	ROM IC (IC's 6F or 6H) defective
DMA Timer Fail	Timer (IC 10T) Channel 1 defective
DMA Control Fail	DMA Controller (IC 6M) defective
Interrupts Fail	Software interrupt circuit defective
Interrupt Fail H0	INT REQ0 from Timer Channel 0 (IC 10T) defective
Interrupt Fail H1	INT REQ1 from Keyboard Controller (IC 10U) defective
Interrupt Fail H2	INT REQ2 from I/O Board (plugged into an expansion slot) defective
Interrupt Fail H3	INT REQ3 from an I/O Board (plugged into an expansion slot) defective
Interrupt Fail H4	INT REQ4 from Serial Interface (IC 3R) defective
Interrupt Fail H5	INT REQ5 from an I/O Board (plugged into an expansion slot) defective



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GENERAL OPERATING INSTRUCTIONS (Continued)

Interrupt Fail H6	INT REQ6 from Floppy Disk Controller (IC 9L) defective	nnn kb RAM Fail: cc:Y000: zzz:www:rrrr nnn = last RAM bank test (decimal) cc = configuration of RAM
Interrupt Fail H7	INT REQ7 from Parallel Port defective	01 = 128 KB RAM (on System Board) 02 = 256 KB RAM (on System Board)
RT (Real Time) Clock Fail	Clock Calendar (IC 9D) registers defective	03 = 512 KB RAM (256 KB on System Board + 256 KB on Expansion Board)
RT Clock Fail: NR	Timer Interrupt (IC 10T) did not respond	05 = 640 KB RAM (256 KB on System Board + 384 KB on Expansion Board)
RT Clock Fail: LO	Timer Interrupt (IC 10T) low end is out of specification	Y = indicates which 128 KB bank has failure
RT Clock Fail: HI	Timer Interrupt (IC 10T) high end is out of specification	1 = Bank 0 on System Board 2 = Bank 1 on System Board 3 = Bank 0 on Expansion Board 4 = Bank 1 on Expansion Board 5 = Bank 2 on Expansion Board
Floppy (A:) Not Ready	Diskette not present or Disk Drive A defective	000 = Segment of failure
Floppy (B:) Not Ready:	Diskette not present or Disk Drive B defective	zzz = Offset of failure
Fixed (Hard) Disk Not Present	Fixed Disk Drive defective (if installed)	www = data that was written to RAM rrrr = data that was read from RAM

If a defective RAM IC is found the following message will appear.

SWITCHES AND JUMPERS

SYSTEM BOARD DIP SWITCHES

Two DIP Switches located on System Board must be set according to the equipment installed on Computer. Use the following charts to determine proper Switch settings.

	DIP SW-0 (7T) ON	DIP SW-0 (7T) OFF
128K RAM Installed	2,3,4	1
256K RAM Installed	1,3,4	2
512K RAM Installed	1,2,4	3
640K RAM Installed	2,4	1,3
64K RAM Chips Used	4	---
256K RAM Chips Used	---	4
8087 (3L) Installed	---	5
8087 (3L) Not Installed	5	---
8250 (3R) Installed	6	---
8350 (3R) Installed	---	6
2732 (6F,6H) Used	8	---
2764 (6F,6H) Used	---	8

	DIP SW-1(7W) ON	DIP SW-1(7W) OFF
48 TPI Disk Drive Used	1	---
96 TPI Disk Drive Used	---	1
Floppy Disk Drive Slow Start-Up	2	---
Floppy Disk Drive Fast Start-Up	---	2
Hard Disk Drive Type	---	3,4
80 Column Display	5	6
40 Column Display	6	5
One Disk Drive Installed	7,8	---
Two Disk Drives Installed	8	7

SYSTEM BOARD

JUMPER

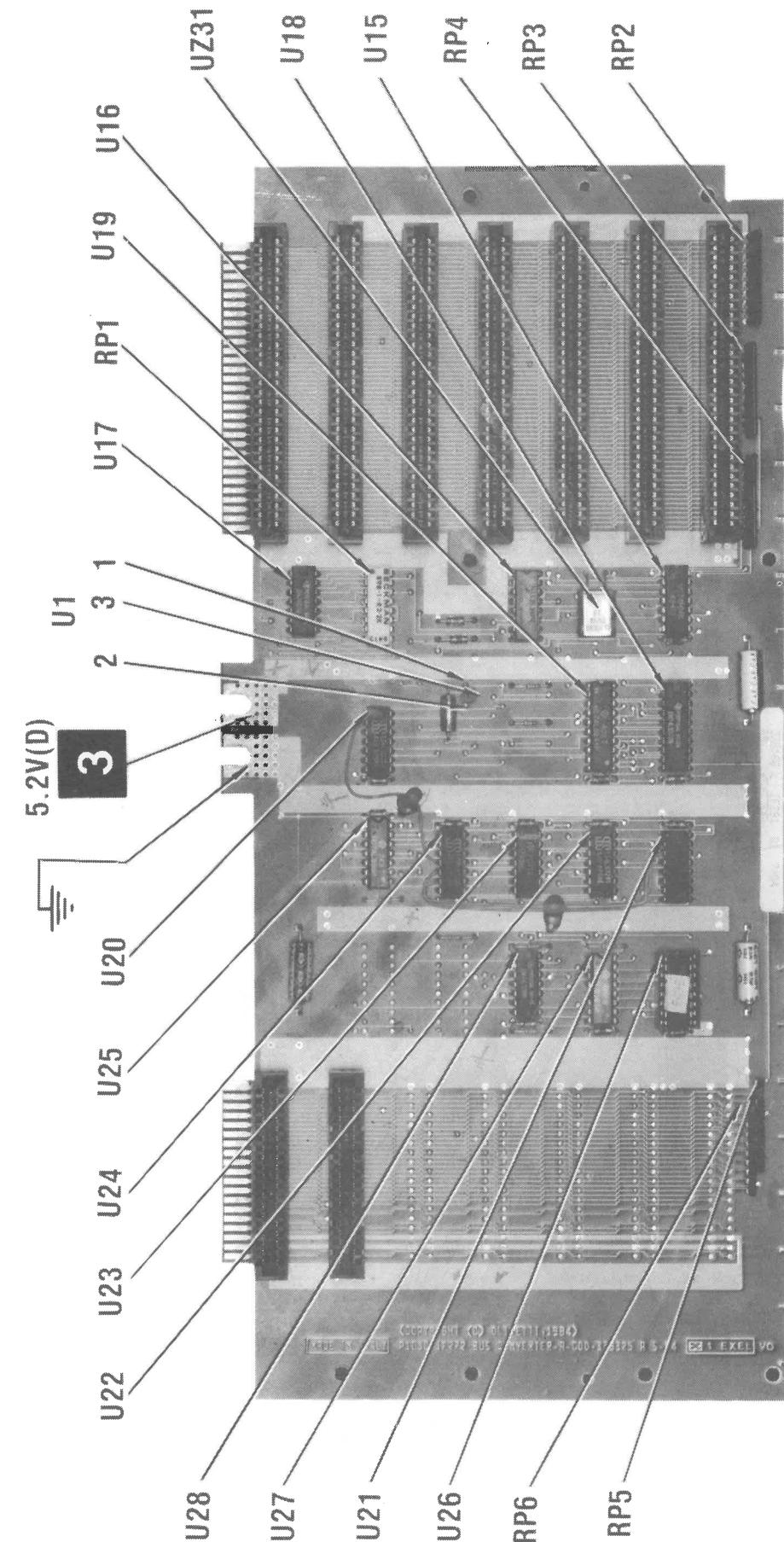
- A Not used. Defines clock to be used with 8350 (3T)
- B Not used. For production testing only.
- C Jumper installed to enable calendar IC (9D)
- D Not used. To be used in future to indicate presence of a "Mouse".
- E Jumper installed to connect the calendar IC (9D) battery (M1).

DISPLAY CONTROLLER BOARD JUMPER

JUMPER

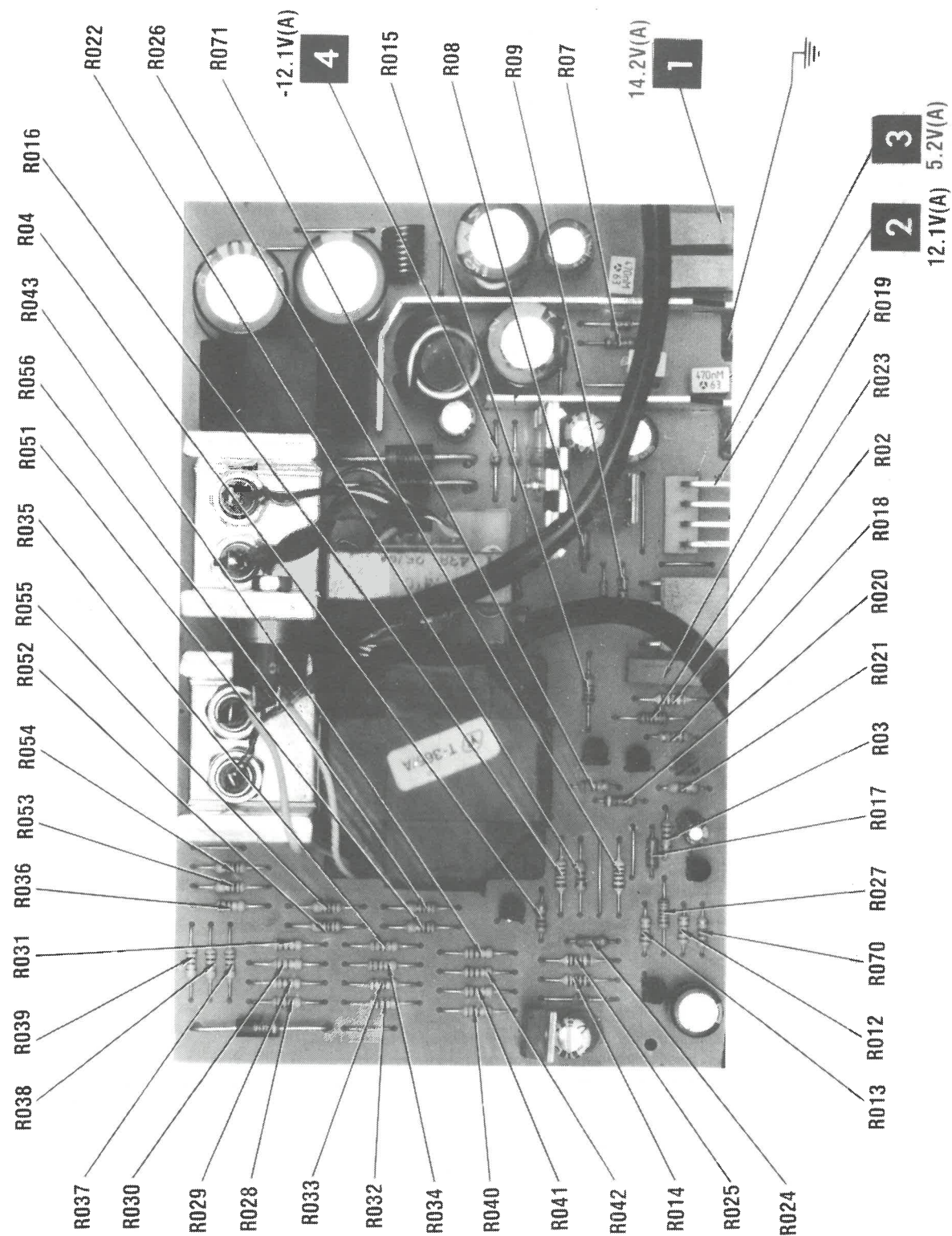
BLOCK

- 1,2 24MHz on board oscillator used
- 2,3 System Board oscillator used
- 4,5 High-Resolution board oscillator
- 5,6 Clock Selection



ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED

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DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL

CABINET TOP

Turn two screws located on the rear panel at the top corners until they become loose (they do not have to be completely removed). Slide the top cabinet forward about 1/2 inch and lift up to remove.

CABINET BOTTOM

Turn the unit upside down. Turn two screws located on the rear panel at the bottom corners until they become loose. Slide the bottom cabinet forward about 1/2 inch and lift up to remove.

BUS CONVERTER BOARD REMOVAL

Remove cabinet top. Remove all the expansion boards that are plugged into the Bus Converter Board. Loosen screws securing 5V DC and ground terminals. Remove 5V DC and ground power cables from the connect points. Remove four screws holding Bus Converter Board to chassis. Slide Bus Converter Board toward Power Supply to unplug board from Display Controller Board. Lift Bus Converter Board out of Computer.

DISPLAY CONTROLLER BOARD REMOVAL

Remove cabinet top and bottom. Unplug 15V DC power cable from the rear of Display Controller Board. Loosen two screws holding 5V and ground power terminals to Bus Converter Board. Remove two screws holding Display Controller Board retaining bracket to rear panel. Set Computer on its right side. Remove four screws (one located at front, one on side and two at rear of panel) holding left side metal panel to chassis and remove panel. Remove one screw (located next to 5V and ground power terminals) holding Display Controller Board to chassis. Loosen two screws that secure 5V and ground power terminals to System Board. Unplug Display Controller Board from Bus Converter Board and System Board.

SYSTEM BOARD REMOVAL

Disconnect all cables from rear panel. Remove cabinet top and bottom covers. Remove Display Controller Board. Unplug 12V power cable from System Board (located next to 5V and ground power terminals). Unplug Disk Drive Cable from right side of System Board. Remove five screws holding System Board to chassis. Squeeze plastic clip at front center of System Board and lift board out of chassis.

DISK DRIVE REMOVAL

To remove Drives from chassis use a screwdriver to push down metal tab located directly under Drives at center. While holding tab down slide Drives forward about 1 inch. Remove Disk Drive cables and power cables from rear of Drives. Turn Drives on their left side. Remove two screws holding grounding straps to Drives and unplug small grounding wire from rear of Drives.

To separate Disk Drives remove four screws holding metal plate on bottom of Drive A and remove plate. Remove two screws from each side of Drive A and remove Drive from holder. Remove four screws from bottom of Drive B and remove holder for Drive A. Remove two screws from each side of Drive B and remove holder from Drive B.

POWER SUPPLY REMOVAL

Unplug power cable from rear of Computer. Remove two screws holding fan cover located on bottom corners of cover. Push cover down and pull to remove it. Unplug fan Connectors and remove screw holding ground wire. Remove top cover. Remove Disk Drives. Disconnect power cables from front of power supply. Remove one screw from left side of Power Supply holding supply to chassis. Slide Power Supply towards Bus Converter Board. Remove one screw from chassis holding ground strap from Power Supply. Lift Power Supply out of chassis.

KEYBOARD DISASSEMBLY

Turn Keyboard upside down. Use a flat blade screwdriver to push back (one at a time) six plastic latches while lifting up on bottom cover. Remove bottom and top covers. To remove a key, pull Key cap off. Squeeze in two tabs holding Key in slot and lift Key out of Keyboard.

POWER SUPPLY DISASSEMBLY

Remove one screw from right side of Power Supply case. Remove three screws holding ground straps to right side. Remove two screws from top rear of case. Slide two boards out of case along with rear panel.

DISK DRIVE CLEANING

Use a lint free cloth or swab dampened with 91% isopropyl alcohol to clean the Disk Drive Heads and dry with a lint free cloth.

LINE DEFINITIONS

14MHZ Clock 14MHz
 16BCH 16 Bit Channel
 6845ADD Decoded CRT Controller Address
 765CS Mini Floppy Disk Controller Chip Select
 8253CS Timer Chip Select
 8259CS Interrupt Controller Chip Select
 8530CS Serial Controller Chip Select
 A0 Address Bit 0
 A0 THRU A19 Address Bits 0 thru 19
 ACK Acknowledge That Data Received
 ADSTB Address Strobe
 AEN Address Enable
 AEN84 Address Enable Clock Generator
 ALE Address Latch Enable
 ALTO THRU ALT7 Character Attributes Bits
 AMEMREQ Memory Request
 AUTOFDX Printer, Automatically Feeds Paper
 (One Line at a Time)
 BA0,BA1,BA ± Buffered Address, Bits 0,1,2
 BANK0 RAM Memory Storage Bank 0
 BANK1 RAM Memory Storage Bank 1
 BCCYL Bus Converter Cycle
 BCLKB Bus 8MHz Clock
 BCRDY Ready, I/O or Memory Cycle Lengthening
 BHE Bus High Enable
 BLINKBIT Character Attribute Blink Bit
 BLINKCLK Character Blink Timing
 BOARDRD Board Read, Low Byte A0 and Control Lines
 BOARDRDU Board Read, Upper Byte
 BOARDW Board Write Enable
 BS0,1,2 Status Bits, CPU Status Information
 BUSRD Bus Read Latch
 BUSY Busy, Cannot Accept Data
 CAS0 Column Address Strobe, Memory Bank 0
 CAS1 Column Address Strobe, Memory Bank 1
 CASL Column Address Strobe, Low Bank Byte
 Display RAM
 CASU Column Address Strobe, High Bank Byte
 Display RAM
 CHCK Channel Check, I/O Fault Check, Memory
 Parity Check
 CLK24 Clock 24MHz
 CLK4 Clock, 4MHz
 CLK8 Clock, 8MHz
 CLK86 Clock Timing Pulses for 8086 CPU
 COL1 THRU COL8 Column Input from Keyboard
 CPUEND Releases Memory After Access Cycle
 CPUSPOT CPU Timing Window, RAM Access
 CRT/CPU Memory Access
 CSXX Clock Chip Select
 CTSB Clear to Send
 CURSORCLK Cursor Flash Timing
 D0 THRU D7 Data Bits 0 Thru 7
 DACK0,2 Direct Memory Access Acknowledge 0,2
 DCD Data Carrier Detected
 DEGAUSS Degaussing Coil, Color Monitor
 DIR Direction of Data Flow
 DMAC Direct Memory Access Controller
 DMAHLDA Direct Memory Access Hold Data A
 DMAHRQ Direct Memory Access Hold Request
 DMARDY Direct Memory Access Ready
 DMASEG Direct Memory Access Segment Register
 DREQ0,1,2,3 Direct Memory Access Request Lines 0,1,2,3
 DSR,1,2 Data Set Ready
 DTR Data Terminal Ready

EXPANDO,1 Expansion Identification
 EXPH,R,G,B Expansion Highlight,Red,Green,Blue
 EXTACK External Acknowledge
 EXTHRQ External Hold Request
 HDSEL Head Select
 HSYNC Horizontal Sync
 IIORA I/O Read
 IOWA I/O Write
 IMRDA Memory Read
 IMWRA Memory Write
 INDEX Index Sensor Pulses
 INIT Initialize, Printer Resets and Clears Printing Memory
 INT Interrupt
 INTA Interrupt Acknowledge
 INTR Interrupt Request
 IO6X I/O Control Chip Select
 IOADD Decoded I/O Address
 IRQ Maskable Priority Interrupt
 IRQ0 Interrupt, Timer-Channel 0
 IRQ1 Interrupt, Keyboard Controller
 IRQ2,3,5 Interrupts, I/O
 IRQ4 Interrupt, Serial Controller
 IRQ6 Interrupt, Mini-Floppy Disk Controller
 IRQ7 Interrupt, Parallel Printer Interface
 LOCK Locks Control of Bus to CPU While Active
 LPCLR Light Pen Clear Timing
 LPSET Light Pen Set Timing
 LUTWSTB Look-Up Table Write Timing
 MBDIS Motherboard Disable
 MODEWSTB1,2 Mode Write Timing 1,2
 MONID0,1 Motor Identification
 MOTOR0,1 Spindle Motor Control for Drive 0 or 1
 MUXSWCH RAM Address Multiplexer
 NMI Nonmaskable Interrupt
 ORDY Ready
 PAHIN Parity Check, High Input
 PAHOUT Parity Check High Output
 PALIN Parity Check, Low Input
 PALOUT Parity Check, Low Output
 PCLK Pixel Clock
 PCLK2,3,4 Clock, Graphics (3 and 4 Mode Variable)
 PCLKIN Clock, External Display Enhancement
 PD0 Data Bit 0, Selects Drive
 PD2 Data Bit 2, Resets Mini Floppy Disk Controller
 PD3 Data Bit 3, Interrupt and Direct Memory Access
 Enable
 PD4 Data Bit 4, Motor Control Drive 0
 PD5 Data Bit 5, Motor Control Drive 1
 PE Paper End, Printer
 PLANE1 Addressing of Highest Address Space,
 Display RAM
 PROM Programmable Read Only Memory
 QS0,QS1 Queue Status, CPU Internal Instruction Queue
 RAMBUF Display Random Access Memory Write Enable
 RAS Row Address Strobe
 RASH Row Address Strobe, Highest Weighted Byte
 RASL Row Address Strobe, Low Weighted Byte
 RC Receiver Timing
 RD CPU Reading Memory or I/O
 RDY84 Ready Clock Generator
 READ DATA Read Data
 READY Ready to Send Information, From Memory or I/O
 RESET Resets All CPU Operations
 RESET1 Manual Reset
 RI Ring Indicator

LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO.	IC 10S	IC 10T	PIN NO.	IC 10T	PIN NO.	IC 10U	PIN NO.	IC 10U	PIN NO.	IC 2AA	IC 2AB	IC 2ABC	IC 2AC	IC 2AD
1	H	P	21	P	1	H	21	P	1	P	P	P	P	P
2	H	P	22	P	2	P	22	L	2	P	P	P	P	P
3	H	P	23	P	3	P	23	H	3	P	P	P	P	P
4	H	P	24	H	4	H	24	H	4	P	P	P	P	P
5	L	P			5	H	25	H	5	P	P	P	P	P
6	P	P			6	*	26	H	6	P	P	P	P	P
7	L	P			7	L	27	P	7	P	P	P	P	P
8	H	P			8	P	28	H	8	H	H	H	H	H
9	L	P			9	P	29	H	9	P	P	P	P	P
10	*	P			10	P	30	H	10	P	P	P	P	P
11	*	H			11	P	31	H	11	P	P	P	P	P
12	*	L			12	P	32	H	12	P	P	P	P	P
13	*	P			13	P	33	H	13	P	P	P	P	P
14	H	H			14	P	34	H	14	P	P	P	P	P
15		P			15	P	35	L	15	H	H	H	H	H
16		L			16	P	36	H	16	L	L	L	L	L
17		H			17	P	37	H	17					
18		P			18	P	38	H	18					
19		P			19	P	39	*	19					
20		P			20	L	40	H	20					

PIN NO.	IC 2AE	IC 2AF	IC 2AG	IC 2AGH	IC 2A Thru 2GH	IC 3A Thru 3AGH	IC 4A Thru 4AGH
1	P	P	P	P	P	P	P
2	P	P	P	P	P	P	P
3	P	P	P	P	P	P	P
4	P	P	P	P	P	P	P
5	P	P	P	P	P	P	P
6	P	P	P	P	P	P	P
7	P	P	P	P	P	P	P
8	H	H	H	H	H	H	H
9	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P
11	P	P	P	P	P	P	P
12	P	P	P	P	P	P	P
13	P	P	P	P	P	P	P
14	P	P	P	P	P	P	P
15	H	H	H	H	H	P	P
16	L	L	L	L	L	L	L

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LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO	IC 8X	IC 9D	IC 9E	IC 9F	IC 9G	IC 9J	IC 9K	IC 9N
1	H	P	P	P	H	P	P	
2	P	P	P	P	P	P	P	
3	P	P	P	P	P	P	P	
4	H	P	H	P	H			
5	P	P	P	P	P			
6	P	P	P	P	P			
7	L	P	L	L	L	L	L	L
8	P	L	P	P	H		H	
9	P	P	P	P	L		P	
10	H	P	P	P	H		P	P
11	P	P	H	P	L		P	P
12	H	P	P	P	L		P	
13	P	L	P	P	H		P	
14	H	P	H	H	H	H	H	H
15		P						
16		H						
17								
18								
19								
20								

PIN NO	IC 9X	IC 10E	IC 10F	IC 10G	IC 10H	IC 10K	IC 10L	IC 10N
1	H	H	H	H				
2	L	P	P	P				
3	P	H	P	P				
4	P	H	H	H			H	H
5	P	L	P	P		P	H	P
6	P	H	P	P		P	L	P
7	L	L	L	L	L	L	L	L
8	P	P	L	P				H
9	P	P	H	P				L
10	L	H	H	P				H
11	H	P	P	P	H			P
12	P	P	H	P	*			P
13	P	H	H	H	*			H
14	H	H	H	H	H	H	H	H

LINE DEFINITIONS (Continued)

RLAT0 THRU RLAT7 . . . RAM Latched Address Bits 0 Thru 7
ROW1 THRU ROW16 . . . Row Input from Keyboard
RTS . . . Request from Printer to Send Data
S0,S1,S2 . . . Status Lines, Interrupts and Memory Management
SEL0,1 . . . Drive Select 0 or 1
SETFOREV . . . Set Foreground, Character Underlining
SHFLD . . . Shift Load
SLCTIN . . . Select Input to Printer
STEP . . . Stepper Motor Direction Control Pulses
TC . . . Terminal Count, Direct Memory Access Channel
TR0 . . . Track 00 Sensor, Disk Location of First Track
VIDEO MEM . . . Video Memory Access
VRAMREQ . . . Video Random Access Memory Request
VSYNC . . . Vertical Sync

W . . . Display Random Access Memory Write
WD . . . Write Data
WE . . . Write Enable
WP . . . Write Protect Sensor Status, Overwrite Prevention
WRITEN . . . RAM Enable Write
XCLK4 . . . Clock 4MHz
XCLK8 . . . Clock 8MHz, Central Processing Unit Clock
XHLDMA . . . Hold Acknowledge for I/O Devices
XIOR . . . I/O Read
XIOW . . . I/O Write
XIRQ1 . . . I/O Interrupt Request
XMEMR . . . I/O Memory Read
XMEMW . . . I/O Memory Write
XRESET . . . I/O Reset
Z8000 . . . Clock Z8000, 19MHz

SCHEMATICS NOTES

--- Circuitry not used in some versions.
 - - - Circuitry used in some versions.
 e See parts list.
 ⊕ Ground
 Item numbers in rectangles appear in the alignment/adjustment instructions.
 Supply voltage maintained as shown at input.
 Voltages measured with digital meter.
 Logic readings, Voltages and Waveforms taken in Power Up mode. No diskette in Disk Drive. No Keys depressed. Diagnostics messages and Primary Boot-Strap DISK READ ERROR are displayed on the Monitor screen.
 Logic readings, Voltages and Waveforms taken for the Disk Drive Interface circuit while running the following Basic program. Readings taken while the Disk Drive Head was not moving unless noted.

```

10 OPEN "B: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
  
```

Note: Insert a formatted diskette in Drive B before running program.

Time in μ sec. per cm, given with p-p reading at the end of each waveform.
 Terminal identification may not be found on unit.
 Resistors are 1/2W or less, 5% unless noted.
 Value in () used in some versions.
 Logic Probe Display
 L = Low
 H = High
 P = Pulse
 * = Open (No lights On)

- (1) Probe indicates H if diskette is write protected.
- (2) Probe indicates L if diskette is write protected.
- (3) Probe indicates Pulse when Head is moving.
- (6) Probe indicates H when Head is moving in and L when Head is moving out from center of diskette.
- (7) Probe indicates L when Head is moving in and H when Head is moving out from center of diskette.
- (8) Probe indicates H when Head is On Track 00 and L when Off Track 00.
- (9) Probe indicates L when Head is On Track 00 and L when Off Track 00.
- (10) Probe indicates L when Head 0 is selected, H when Head 1 is selected.
- (11) Probe indicates H when Head 0 is selected, L when Head 1 is selected.

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 9 cm. width with DC reference voltage given at the bottom line of each waveform.

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

TROUBLESHOOTING

MICROPROCESSOR (CPU) OPERATION

Microprocessor IC (3J) not working. Check for a 8.0MHz clock waveform at pin 19 of IC 3J. If the waveform is missing, refer to the "Clock Generator" section of this Troubleshooting guide. If the waveform is good, turn Off the Computer and check the logic reading at pin 21 of IC 3J while the Computer is turned back On. The logic reading should be High for about 2 seconds, then go Low and stay Low. If the reading is not correct, check the voltage at pin 11 of the Clock Generator IC (2Q) immediately after pressing and releasing the Reset Button (SW1). The voltage should drop to 0V when SW1 is pressed and slowly rise (takes about 25 seconds) to 4.8V. If the voltage is not correct at pin 11 of IC 2Q, check Capacitor C97, Diode D3, Switch SW1 and Resistors R33 and R34. If the voltage is correct at pin 11 of IC 2Q, check IC 2Q.

If the logic reading is correct at pin 21 of IC 3J, check the logic reading at pin 4 of IC 7M after pressing the Reset Button (SW1). The reading should go Low when SW1 is pressed then go High about 2 seconds after SW1 is released. If the reading is not correct, check IC 7M. If the reading is correct, check the logic readings at pin 5 and 12 of IC 3Q after pressing SW1. The logic reading at pin 5 should go High when SW1 is pressed, then go Low after about 2 seconds. The logic reading at pin 12 should go Low when SW1 is pressed, then go High after about 2 seconds. If the reading is not correct at pin 12, check IC's 3Q and 7E.

CLOCK GENERATOR

Check the frequency (24.0MHz) at pin 16 of Clock Generator IC (2Q). If the frequency is not correct or the signal is missing, check Crystal (Y1), IC 2Q and Resistor R2 and R3. If the frequency is correct, check the waveforms at pins 2, 4, 8 and 12 of IC 2Q. If any of the waveforms are missing, check IC 2Q. If the waveforms check good, check for a 4.0MHz signal at pins 7 and 9 and an 8MHz signal at pins 3,

14, 16 and 18 of IC 3Q. If any of the signals are missing check IC 3Q and 7E.

KEYBOARD

Keyboard does not function. Check the Keyboard Connectors J6 on the System Board and J1 on the Keyboard for good connections and check the Keyboard Cable for broken wires. If the Keyboard Connectors and Cable check good, disconnect the Keyboard Connector from the System Board (Connector J6). Check for 12.0V at pin 5 of Connector J6. 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 J6 while turning the Computer On. Pin 1 should read logic Low when the Computer is turned On, go logic High after about two seconds then pulse twice after the Computer beeps once. Pin 2 should read logic Low when the Computer is turned On and start pulsing after about two seconds. If the logic readings are not correct at pins 1 or 2 of Connector J6, check the Keyboard Controller IC (10U) and IC 4U. If the readings are correct at Connector J6, turn the Computer Off and reconnect the Keyboard. Check for momentary pulses at pin 6 of IC U1 (on keyboard) about 2 seconds after turning the Computer On. If the pulses do not appear, check Capacitor C4 and IC U1. If pulses appear at pin 6 of IC U1, check for a 6MHz waveform at pin 2 of the Keyboard Controller IC (U6). If the waveform is missing or the frequency is not correct, check Capacitors C2 and C3, Crystal UZC8 and IC U6.

If the waveform is good at pin 2 of IC U6, check for pulses at pins 10 thru 19 of IC U6. If pulses are missing at any of the pins, check IC U6. If pulses are present at pins 10 thru 19 of IC U6, check for pulses at pin 38 of IC U6 while pressing a key. If pulses are missing at pin 38, check IC's U8, U9 and U11 thru U14.

One key is erratic. Clean the key contacts. To remove the Key, pull the cap off then remove the Key by squeezing in the two tabs holding the Key in the slot and lift the Key up.

LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO.	IC 7D	IC 7E	IC 7G	IC 7H	IC 7J	IC 7K	IC 7L	IC 7M	IC 7N	IC 7P	IC 7Q	IC 8D	IC 8E	IC 8F
1	H	H	P	H	H	L	P	P	H	H	P	H	*	P
2	P	L	P	P	P	P	H	P	H	P	P	L	*	P
3	H	H	H	P	P	P	P	L	P	P	P	L	*	P
4	H	L	L	P	P	L	P	H	P	P	P	L	*	P
5	L	H	H	P	P	P	P	H	H	H	P	*	*	P
6	H	L	L	P	P	P	P	L	P	P	P	L	L	P
7	L	L	L	L	L	L	L	L	L	L	L	L	L	L
8	P	L	P	P	H	P	H	L	P	P	P	P	P	P
9	P	H	P	P	*	P	*	H	P	P	P	P	P	H
10	H	L	L	H	*	P	*	P	P	H	P	L	P	P
11	P	H	*	P	*	P	H	P	P	P	P	*	*	P
12	P	L	P	P	P	L	*	P	P	P	P	L	H	H
13	P	*	P	P	H	P	*	P	P	P	P	*	P	P
14	H	H	H	H	H	H	H	H	H	H	H	H	H	H

PIN NO.	IC 8G	IC 8H	IC 8K	IC 8P	IC 8R	PIN NO.	IC 8R	PIN NO.	IC 8T	IC 8U	IC 8W
1	H	P	P	P	P	21	H	1	P	H	P
2	P	P	P	P	P	22	H	1	P	L	P
3	P	P		H	P	23	H	3	P	P	P
4	H	*			P	24	P	4	H	*	P
5	H	H			P	25	H	5	P	P	L
6	P	*			P	26	P	6	P	H	H
7	P	*	L	L	P	27	P	7	P	P	P
8	L	L			P	28	H	8	L	H	L
9	P	L			P			9	P	P	P
10	P	L			P			10	P	L	P
11	P	L		H	P			11	P	L	P
12	P	H	P	P	L			12	P	P	P
13	P	H	P	P	P			13	*	H	P
14	*	P	H	H	L			14	P	P	P
15	H	P			P			15	P	H	P
16	H	P			P			16	H	P	H
17		P			P			17		L	
18		H			P			18		P	
19		P			L			19		H	
20		H			H			20		H	

LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO.	IC 6F	PIN NO.	IC 6F	PIN NO.	IC 6H	PIN NO.	IC 6H	PIN NO.	IC 6J	IC 6K	IC 6L
1	H	21	P	1	H	21	P	1	P	H	P
2	P	22	P	2	P	22	P	2	P	P	P
3	P	23	P	3	P	23	P	3	P	P	P
4	P	24	P	4	P	24	P	4	P	P	H
5	P	25	P	5	P	25	P	5	P	P	H
6	P	26	H	6	P	26	H	6	P	P	P
7	P	27	H	7	P	27	H	7	P	P	P
8	P	28	H	8	P	28	H	8	L	L	L
9	P			9	P			9	P	P	P
10	P			10	P			10	P	H	P
11	P			11	P			11	P	H	P
12	P			12	P			12	P	H	P
13	P			13	P			13	P	H	P
14	L			14	L			14	P	P	P
15	P			15	P			15	P	P	P
16	P			16	P			16	H	H	H
17	P			17	P						
18	P			18	P						
19	P			19	P						
20	P			20	P						

PIN NO.	IC 6M	PIN NO.	IC 6M	PIN NO.	IC 6P	IC 6Q	IC 6R	IC 6S	IC 6T	IC 6U	IC 6W	IC 6X	IC 7B	IC 7C
1	P	21	P	1	P	P	P	P	H	H	*	H	P	P
2	P	22	P	2	P	P	P	P	L	L	*	L	P	P
3	P	23	P	3	P	P	P	P	P	P	H	H	*	*
4	P	24	H	4	P	P	P	P	L	L	P	H	P	L
5	H	25	P	5	P	P	P	P	P	P	P	L	H	*
6	P	26	P	6	P	P	P	P	L	H	H	P	L	L
7	P	27	P	7	L	L	L	L	P	P	L	L	L	L
8	P	28	P	8	P	P	P	P	L	H	H	P	L	L
9	P	29	P	9	P	P	P	P	P	P	P	L	*	*
10	P	30	P	10	P	P	P	P	L	L	P	P	*	L
11	P	31	H	11	H	P	P	P	H	L	H	P	*	*
12	P	32	P	12	P	P	P	P	P	P	P	P	*	L
13	L	33	P	13	P	P	P	P	L	H	P	P	*	*
14	H	34	P	14	H	H	H	H	P	P	H	H	H	H
15	H	35	P	15					L	L				
16	H	36	P	16					P	P				
17	L	37	P	17					H	L				
18	H	38	P	18					P	P				
19	P	39	P	19					H	P				
20	L	40	P	20					H	H				

TROUBLESHOOTING (Continued)

RAM

The following program can be used to check the 2nd 128KB bank (Bank 1) of RAM on the System Board. The program checks each bit of each byte in Bank 1. If a defective RAM is found the program will display on the Monitor Screen the address of the bad bit and indicate which bit (bit 0 thru 7) is bad. Use the following chart to determine which RAM IC is bad.

BIT	EVEN ADDRESS	ODD ADDRESS
BIT 0	2*A	2A
BIT 1	2*B	2B
BIT 2	2*BC	2BC
BIT 3	2*C	2C
BIT 4	2*D	2D
BIT 5	2*E	2E
BIT 6	2*F	2F
BIT 7	2*G	2G
		2GH

Note: This program does not check the parity RAM IC's.

To print out the addresses and bits numbers of any defective IC's change the word PRINT in line 170 to LPRINT.

```

10 DATA 1,2,4,8,16,32,64,128
20 DEF SEG = &H2000
30 A = 131072 : B = 0
40 FOR X = 0 TO 65535
50 FOR Y = 1 TO 8
60 READ Z:POKE X,Z
70 IF PEEK(X) AND Z THEN 90
80 GOTO 170
90 POKE X,0
100 IF PEEK(X) AND Z THEN 170
110 NEXT Y:RESTORE
120 NEXT X
130 IF A = 196608 THEN PRINT "MEMORY CHECKS GOOD"
140 IF A = 196608 THEN END
150 DEF SEG = &H3000
160 A = A + 65536 : GOTO 40
170 PRINT "BIT ";Y-1;" AT ADDRESS ";A+X;" CHECKS BAD"
180 GOTO 110

```

SOUND (INTERNAL SPEAKER)

No sound from the speaker. Check the Speaker SP1 voice coil for continuity. If the Speaker checks good, type in and run the following Basic program.

```

10 SOUND 200,5
20 FOR T = 1 TO 2000: NEXT T: GOTO 10

```

The program beeps the speaker about once every second. While the program is running, check for pulses at pin 3 of IC 8P. If pulses are missing check IC 8P. If pulses are present at IC 8P, check the logic readings at pins 9 and 12 of IC 1T. The logic readings should pulse high about once every second. If the readings are not correct at pin 9 or 12 of IC 1T, check IC 1T. If the readings are correct, check for pulses at pins 8 and 10 of IC 10N. If pulses are missing at pin 10, check the Timer IC (10T). If pulses are present at pin 10 and missing at pin 8 of IC 10N, check IC 10N and Capacitor C120. If pulses are present at pin 8 of IC 10N, check Capacitor C12 and Resistor R29.

PARALLEL PORT

Parallel port not functioning. Check Connector J4 for good connections. If the connector checks good, plug a loopback plug (see Parallel Loopback Plug section of TEST PLUGS) into Connector J4. Type in and run the following Basic program. The program can be stopped by pressing the Ctrl and Break keys at the same time.

```

10 CLS
20 LOCATE 1,1
30 OUT 888,0:OUT 890,0
40 PRINT "A = "; INP(888)
50 PRINT "B = "; INP(889)
60 PRINT "C = "; INP(890)
70 OUT 888,255:OUT 890,255
80 PRINT "D = "; INP(888)
90 PRINT "E = "; INP(889)
100 PRINT "F = "; INP(890)
110 FOR T = 1 TO 100: NEXT T:GOTO 20

```

The program continuously checks the Printer Interface circuits and displays six numbers (A thru F) on the Monitor screen. With Loopback Plug plugged into Connector J4, 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 loopback plug installed and the above program running. Check for pulses at pins 5, 6, 7, 9 and 11 of Decoder IC (5S). If pulses are missing at any of the pins check IC 5S. If pulses are present at IC 5S and numbers A and D that appear on the Monitor screen are not correct, check for pulses on pins 2, 5, 6, 9, 12, 15, 16 and 19 of Output Data Latch IC (3U). If pulses are missing at any of the pins, check IC 3U. If pulses are present at the pins listed, check the Input Data Buffer IC (3W).

If numbers A and D are correct and numbers B, C, E or F are not correct on the Monitor screen, check for pulses at pins 2, 5, 10, and 12 of the Output Control Latch IC (4T). If pulses are missing at pins 2, 5, 10 or 12 of IC 4T, check IC 4T. If pulses are present at pins 2, 5, 10 and 12 of IC 4T, check for pulses at pins 4, 8, and 10 of IC 4U and pin 8 of IC 5U. If pulses are missing at pins 4, 8 or 10 of IC 4U, check IC 4U. If pulses are missing at pin 8 of IC 5U, check IC 5U. If pulses are present at IC's 4U and 5U, check for pulses at pins 8, 11, 13 and 15 of IC 5T. If pulses are missing at pins 8, 11, 13 or 15 of IC 5T, check IC 5W. If pulses are present at pins 8, 11, 13 and 15 of IC 5T, check IC 5T.

This program can also be used to check the IRQ7 (Interrupt Request 7) signal at pin 11 of IC 5W. With the loopback test plug installed and the program running, check for pulses at pin 7 of IC 4T and pins 11 and 13 of IC 5U. If pulses are missing at pin 7 of IC 4T, check IC 4T. If pulses are missing at pin 13 of IC 5U, check IC 5W. If pulses are present at pin 13 of IC 5W and missing at pin 11, check IC 5U. Note: If any of the numbers that appear on the Monitor screen are not correct, perform the checks previously described and correct the problem before checking the IRQ7 signal.

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LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO.	IC 2W	IC 3A	IC 3B	IC 3BC	IC 3C	IC 3D	IC 3E	IC 3F	IC 3G	IC 3H	IC 3J	PIN NO.	IC 3J
1	L	P	P	P	P	P	P	P	P	P	L	21	L
2	L	P	P	P	P	P	P	P	P	P	P	22	P
3	H	P	P	P	P	P	P	P	P	P	P	23	H
4	L	P	P	P	P	P	P	P	P	P	P	24	P
5	L	P	P	P	P	P	P	P	P	P	P	25	P
6	H	P	P	P	P	P	P	P	P	P	P	26	P
7	L	P	P	P	P	P	P	P	P	P	P	27	P
8	H	H	H	H	H	H	H	H	H	H	H	28	P
9	L	P	P	P	P	P	P	P	P	P	P	29	P
10	L	P	P	P	P	P	P	P	P	P	P	30	H
11	H	P	P	P	P	P	P	P	P	P	P	31	H
12	L	P	P	P	P	P	P	P	P	P	P	32	P
13	L	P	P	P	P	P	P	P	P	P	P	33	L
14	H	P	P	P	P	P	P	P	P	P	P	34	P
15		P	P	P	P	P	P	P	P	P	P	35	P
16		L	L	L	L	L	L	L	L	L	P	36	P
17											L	37	P
18											P	38	P
19											P	39	P
20											L	40	H

PIN NO.	IC 3N	IC 3P	IC 3Q	IC 3R	PIN NO.	IC 3R	PIN NO.	IC 3U	IC 3W	IC 4A	IC 4B	IC 4BC	IC 4C	IC 4D
1	P	L	L	P	21	P	1	L	H	P	P	P	P	P
2	P	P	P	P	22	L	2	H	H	P	P	P	P	P
3	P	H	P	P	23	H	3	P	P	P	P	P	P	P
4	P	P	P	P	24	P	4	P	L	P	P	P	P	P
5	P	P	L	P	25	L	5	L	P	P	P	P	P	P
6	P	P	P	P	26	P	6	L	L	P	P	P	P	P
7	P	P	P	P	27	P	7	P	P	P	P	P	P	P
8	P	P	H	P	28	P	8	P	L	P	P	P	P	P
9	P	P	P	P	29	*	9	L	P	P	P	P	P	P
10	L	L	L	H	30	L	10	L	L	P	P	P	P	P
11	P	P	P	H	31	H	11	H	L	P	P	P	P	P
12	P	P	H	H	32	H	12	L	P	P	P	P	P	P
13	P	P	P	H	33	H	13	P	L	P	P	P	P	P
14	P	P	P	P	34	H	14	P	P	P	P	P	P	P
15	P	P	L	P	35	L	15	L	L	P	P	P	P	P
16	P	P	P	P	36	H	16	L	P	L	L	L	L	L
17	P	*	P	P	37	H	17	P	L					
18	P	P	P	P	38	H	18	P	L					
19	P	P	H	L	39	H	19	L	H					
20	H	H	H	L	40	H	20	H	H					

TROUBLESHOOTING (Continued)

POWER SUPPLY

Note: Use an isolation transformer with a step down control when servicing power supply. Disconnect power supply from Computer and Disk Drives to avoid possible damage from high voltages that may be produced while servicing power supply. Connect a load to the 5V source connector on the power supply. Two #1133 6 volt lamps in parallel may be used as a load for the 5V source. If lamps are used use caution to avoid possible burns as the lamps get very hot.

If there is no output from power supply, check AC Fuse (F01). If fuse is open, check Bridge Rectifier Diodes (D01 through D04), Transistors Q01, Q02, Electrolytics C014, C016, Capacitors C017 and C030. If fuse is good apply 120VAC and check for 173V* and -172V* at the collector of Transistor Q01 and the emitter of Q02 respectively. If these voltages are missing, check the power switch and thermistors R048 and R061. If the voltages are present disconnect J02 and J03 and check for -136V* at the emitter of Q01 and -136V* at the collector of Q02. If these voltages are missing, check the components associated with Transistors Q01 and Q02. If the proper voltages are present on Q01 and Q02, check Transformers T01, T02, T03 and associated components for defects.

POWER SUPPLY SHUTDOWN

The Power Supply will shutdown if the 5V source should increase beyond a certain value. Zener Diode ZD2 will be triggered into conduction, triggering SCR (SCR02) which shuts down the Power Supply. Should this condition exist remove all loads from the Power Supply and check the source voltages. If all voltages are normal or less than normal, check Zener Diode (ZD2) and SCR2. If the source voltages are more than 10% higher check voltages and components associated with Transistors Q06, Q05, Q04, Q08, Q03 and SCR01.

Voltages Taken in Shutdown

Q06		Q05		Q08		Q01		Q02	
E	0V	E	0V	E	7.3V	E	1.4V	E	-163V
B	.6V	B	.71V	B	6.2V	B	2.7V	B	-162V
C	0V	C	.64V	C	7.0V	C	165V	C	2.5V
SCR2									
K	0V								
G	0V								
A	2.5V								

TEST PLUGS

PARALLEL LOOPBACK PLUG

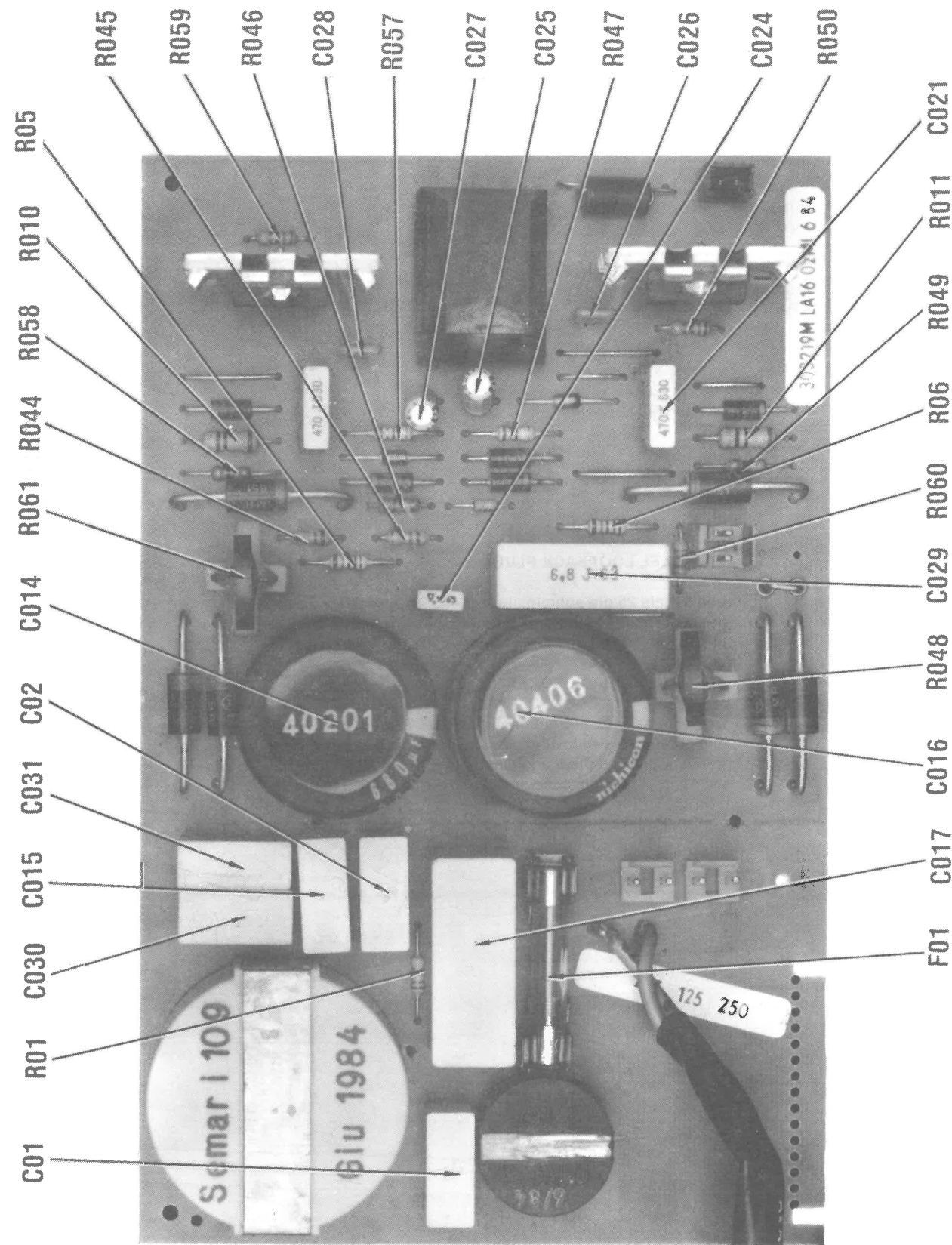
Use a male 25 pin subminiature "D" Connector (DB-25) and connect the following pins together: pin 1 to pin 13, pin 2 to pin 15, pin 12 to pin 14, pin 10 to pin 16, pin 11 to pin 17.

SERIAL LOOPBACK SOCKET

Use a female 25 pin subminiature "D" Connector (DB-25) and connect the following pins together: pin 1 to pin 7, pin 2 to pin 3, pin 4 to pin 5 and pin 8, pin 6 to pin 20 and pin 22, pin 11 to pin 21, pin 15 to pin 17 and pin 23, pin 18 to pin 25.

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LOGIC CHART (Continued)



POWER SUPPLY INPUT BOARD

SYSTEM BOARD

PIN NO	IC 1B	IC 1D	IC 1E	IC 1F	IC 1G	IC 1J	IC 1K	IC 1L	IC 1M	IC 1N	IC 1Q	IC 1S	IC 1T	IC 1U
1	L	P	P	P	P	P	P	P	P	P	L	H	H	P
2	H	P	P	P	P	P	P	P	P	P	P	H	L	P
3	*	*	P	*	P	P	P	P	P	P	P	H	P	P
4	L	P	P	P	P	P	P	P	P	P	P	H	P	P
5	*	P	P	P	P	P	P	P	P	P	P	P	H	P
6	L	P	P	P	P	P	P	P	P	P	P	L	L	P
7	L	L	P	L	P	P	P	P	P	P	P	L	P	P
8	L	P	P	P	P	P	P	P	P	P	P	L	P	P
9	*	P	P	P	P	P	P	P	P	P	P	P	L	P
10	L	P	L	P	L	L	L	L	L	L	L	L	L	L
11	*	P	P	P	P	P	P	P	P	P	P	L	H	P
12	L	P	P	P	P	P	P	P	P	P	P	P	L	P
13	*	P	P	P	P	P	P	P	P	P	P	L	P	P
14	H	H	P	H	P	P	P	P	P	P	P	P	P	P
15			P		P	P	P	P	P	P	H	L	L	P
16			P		P	P	P	P	P	P	P	P	H	P
17			P		P	P	P	P	P	P	P	H	P	P
18			P		P	P	P	P	P	P	P	P	P	P
19			P		P	P	P	P	P	P	L	P	H	P
20			H		H	H	H	H	H	H	H	H	H	H

PIN NO.	IC 1W	IC 2A	IC 2B	IC 2BC	IC 2C	IC 2D	IC 2E	IC 2F	IC 2G	IC 2GH	IC 2N	IC 2P	IC 2Q	IC 2U
1	L	P	P	P	P	P	P	P	P	P	P	P	P	L
2	*	P	P	P	P	P	P	P	P	P	P	P	P	L
3	L	P	P	P	P	P	P	P	P	P	P	P	P	H
4	H	P	P	P	P	P	P	P	P	P	P	P	P	L
5	H	P	P	P	P	P	P	P	P	P	P	P	H	L
6	L	P	P	P	P	P	P	P	P	P	P	P	H	H
7	L	P	P	P	P	P	P	P	P	P	P	P	P	L
8	L	H	H	H	H	H	H	H	H	H	P	P	L	H
9	H	P	P	P	P	P	P	P	P	P	P	P	L	L
10	H	P	P	P	P	P	P	P	P	P	L	L	H	L
11	L	P	P	P	P	P	P	P	P	P	P	L	P	L
12	H	P	P	P	P	P	P	P	P	P	P	L	L	L
13	H	P	P	P	P	P	P	P	P	P	P	L	*	L
14	H	P	P	P	P	P	P	P	P	P	P	P	H	H
15		H	H	H	H	H	H	H	H	H	P	P	P	
16		L	L	L	L	L	L	L	L	L	P	P	P	
17											P	P		
18											P	H		
19											P	P		
20											H	H		

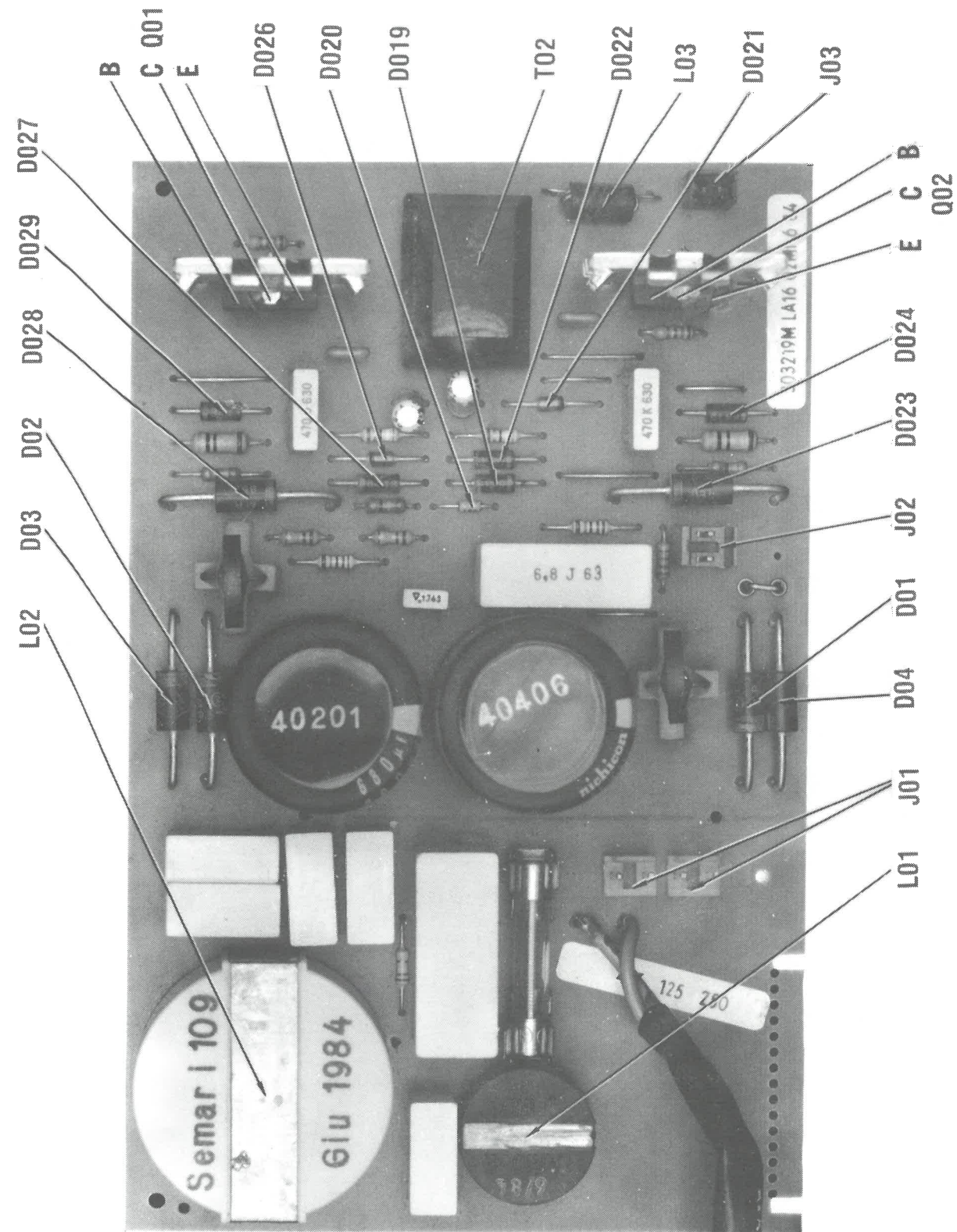
LOGIC CHART (Continued)

DISK DRIVE INTERFACE

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

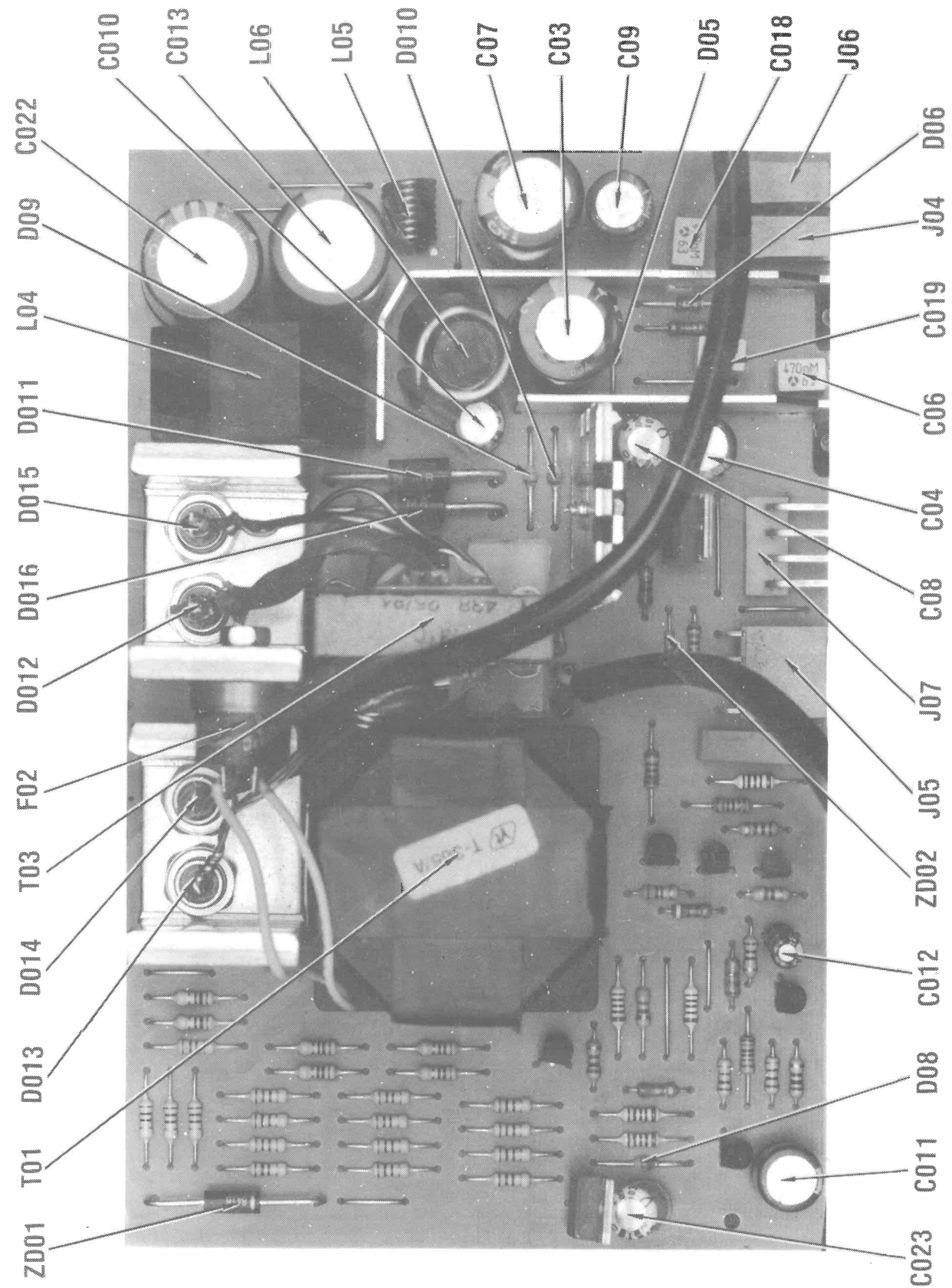
PIN NO.	IC 9P	IC 9Q	IC 9R	IC 9S	IC 10H	IC 10K	IC 10L	IC 10M	IC 10N	IC 10P	IC 10R	IC 10S
1	P	L	P	L	P	L(9)	L	L(3)	H(11)	L	P	H
2	P	P	H	H	P	H(8)	L	L(3)	H(11)	L	P	
3	P	H	P	P	P	H(2)	H	H(3)	L(10)	L	P	H
4	H	P	H	H	P	L(1)		L(6)	H	P	P	H
5	P	L	P	L	P			L(6)		P	P	L
6	P	H	P	H	P			H(7)		P	P	P
7	L	L	L	L	L			L		P	L	L
8	P	L	P	P	P	P	H	P		L		H
9	H	L	P	P	P	P	L	P		P	*	L
10	P	P	H	H	H	P	L	P		P	P	*
11	P	L	P	P		P	L	P		P	P	*
12	H	H	H	P		P	H	P		P	P	*
13	P	P	P	H		P	H	P		P	P	*
14	H	P	H	H				H		P	H	H
15		P								L		
16		H								H		

- (1) Probe Indicated H if diskette is write protected.
- (2) Probe Indicated L if diskette is write protected.
- (3) Probe Indicates P when Head is moving.
- (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.
- (10) Probe indicates L when Head 0 is selected, H when Head 1 is selected.
- (11) Probe indicates H when Head 0 is selected, L when Head 1 is selected.



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POWER SUPPLY INPUT BOARD



POWER SUPPLY REGULATOR BOARD

LOGIC CHART (Continued)

KEYBOARD

PIN NO.	IC U1	IC U2	IC U3	IC U4	IC U5	IC U6	PIN NO.	IC U6	PIN NO.	IC U7	PIN NO.	IC U7	PIN NO.	IC U8
1	H(1)	H	P	P	L	L	21	P	1	P	21	H	1	P
2	L(1)	H	P	P	P	P	22	P	2	P	22	H	2	P
3	P	L	*	P	P	P	23	P	3	P	23	P	3	P
4	L	H	L	P	L	H	24	P	4	P	24	H	4	P
5	L	H	*	*	P	H	25	H	5	P			5	P
6	H	L	L	L	P	P	26	H	6	P			6	P
7	L	H	L	L	L	H	27	H	7	P			7	P
8	H(4)	L	L	L	P	H	28	L(1)	8	P			8	L
9	L(2)	H	*	H	L	P	29	L(1)	9	P			9	P
10	H(4)	L	H(5)	L	P	P	30	L(2)	10	P			10	P
11	L(2)	H	L(3)	*	P	P	31	L(3)	11	P			11	P
12	H(1)	H	H(5)	L	L	P	32	H	12	L			12	P
13	L(1)	L	L(3)	H	P	P	33	H	13	P			13	P
14	H	H	H	H	H	P	34	L	14	P			14	P
15		H				P	35	H	15	P			15	P
16		H				P	36	H	16	P			16	H
17						P	37	H	17	P			17	
18						P	38	L(1)	18	L			18	
19						P	39	L	19	P			19	
20						L	40	H	20	P			20	

PIN NO.	IC U9	IC U10	IC U11	IC U12	IC U13	IC U14
1	P	L	L	H	H	H
2	P	P	P	H	H	H
3	P	P	P	H	H	H
4	P	P	P	*	H	*
5	P	P	P	H	P	H
6	P	P	P	*	L(1)	*
7	P	P	P	H	L	H
8	L	P	P	*	L	*
9	P	P	P	H	P	H
10	P	L	L	*	P	*
11	P	P	P	H	P	H
12	P	P	P	L	H	L
13	P	P	P	H	H	H
14	P	P	P	H	H	H
15	P	P	P		H	
16	H	P	P		H	
17		P	P			
18		P	P			
19		P	P			
20		H	H			

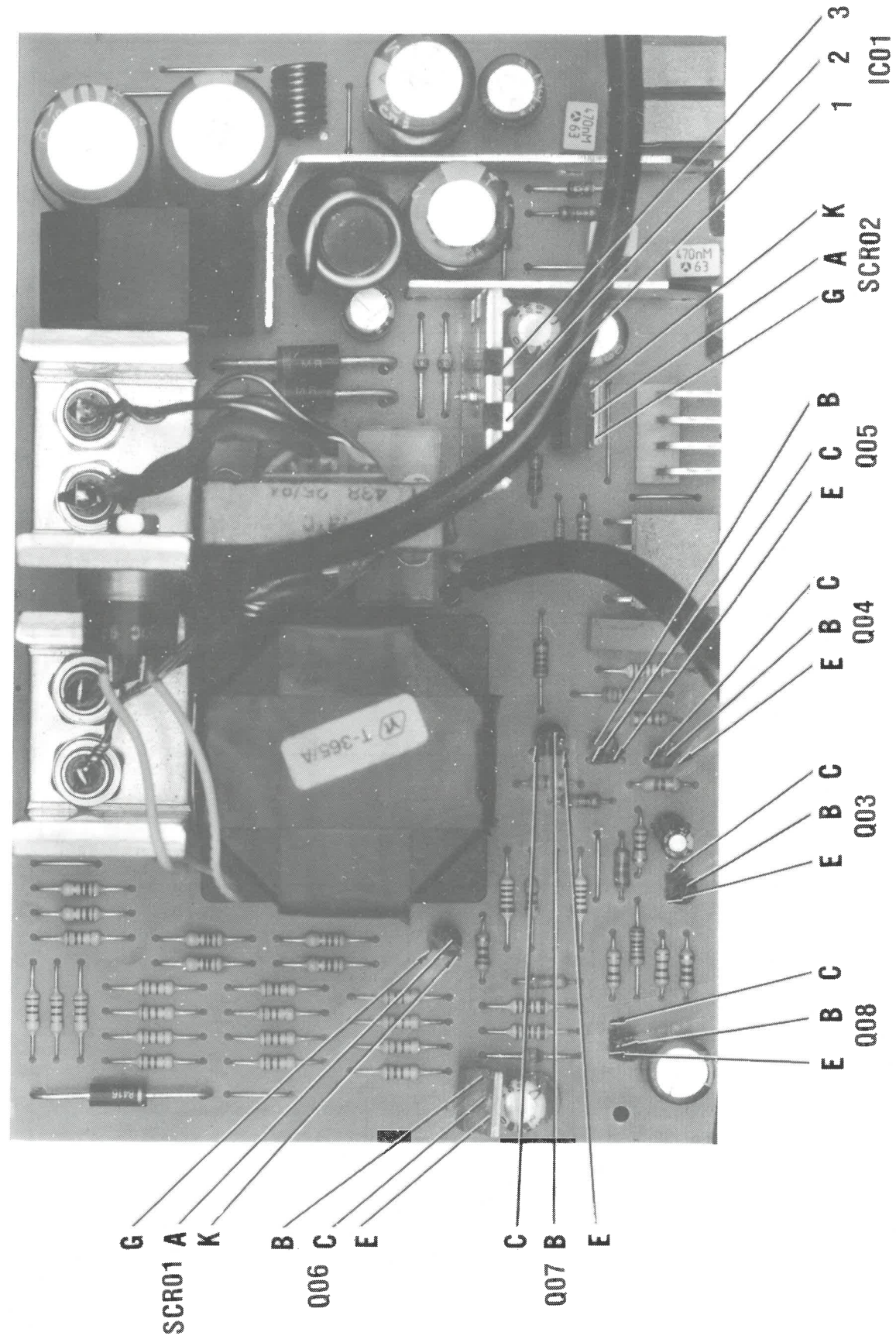
- (1) Probe indicates P when a key is pressed.
- (2) Probe indicates H if LED1 is on.
- (3) Probe indicates H if LED2 is on.
- (4) Probe indicates L if LED1 is on.
- (5) Probe indicates L if LED2 is on.

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LOGIC CHART

BUS CONVERTER BOARD

PIN NO.	IC U15	IC U16	IC U17	IC U18	IC U19	IC U20	IC U21	IC U22	IC U23	IC U24	IC U25	IC U26	IC U27	IC U28
1	P	L	H	H	H	P	H	P	P	*	L	H	H	H
2	P	P	H	P	P	P	H	P	P	*	P	H	L	P
3	P	P	H	P	P	P	H	P	P	H	P	L	L	P
4	P	H	H	P	P	P	H	P	P	P	H	L	L	P
5	P	H	H	P	P	P	H	P	H	H	H	H	L	P
6	P	H	H	P	P	H	L	P	P	H	L	H	L	P
7	L	H	L	P	P	L	L	L	L	L	L	H	L	L
8	P	L	H	P	P	H	L	H	P	H	L	L	L	P
9	P	P	H	P	P	P	P	H	H	H	*	L	P	P
10	H	P	H	L	L	H	L	P	P	H	*	P	H	P
11	L	P	H	L	P	H	L	H	H	H	P	L	L	P
12	P	P	H	P	P	H	L	P	H	P	P	H	L	P
13	P	P	H	P	P	P	H	H	H	P	H		L	P
14	H	L	H	P	P	H	H	P	H	H	H		L	H
15		P		P	P		H						P	
16		H		P	P		H						L	H
17				P	P									
18				P	P									
19				P	P									
20				H	H									



POWER SUPPLY REGULATOR BOARD

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MODEL 6300

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.	
	BUS CONVERTER BOARD						
U1	79L05		NTE1917	ECG1917	SK9219/1917	HE-442-665	
U15	MC74F04N		NTE74LS367	ECG74LS367	SK7CT367	HE-443-857	
U16	74LS367APC		NTE7407	ECG7407	SK7407	HE-443-1020	
U17	ON7407N		NTE74LS373	ECG74LS373	SK7CT373	HE-443-867	
U18	ON74LS373N		NTE74LS244	ECG74LS244	SK7CT244	HE-443-791	
U19	HD74LS244P		NTE74LS32	ECG74LS32	SK74CT32	HE-443-875	
U20	T74LS32B1		NTE74LS174	ECG74LS174	SK7CT174	HE-443-879	
U21	74LS174PC		NTE7438	ECG7438	SK7438	HE-443-77	
U22	SAME AS U20						
U23	DM7438N						
U24	SAME AS U20						
U25	HD74LS86P		NTE74LS86	ECG74LS86	SK7CT86	HE-443-891	
U26	N82S123N		NTE74LS161A	ECG74LS161A	SK7CT161	HE-443-757	
U27	HD74LS161P		NTE74LS08	ECG74LS08	SK7CT08	HE-443-780	
U28	ON74LS08N						
	KEYBOARD						
U1	SN74LS05N		NTE74LS05	ECG74LS05	SK74LS05	HE-443-818	
U2	DM74LS109AN		NTE74LS109A	ECG74LS109A	SK7CT109		
U3	SAME AS U1						
U4	SN74LS14N		NTE74LS14	ECG74LS14	SK7CT14	HE-443-872	
U5	ON74LS03N		NTE74LS03	ECG74LS03	SK7CT03	HE-443-745	
U6	TMP8039P						
U7	AM2716DC		NTE2716(12)	ECG2716(12)	SK2716/2716(12)		
U8,9	SN74LS145N		NTE74LS145	ECG74LS145		HE-443-889	
U10	SN74LS373N		NTE74LS373	ECG74LS373	SK7CT373	HE-443-867	
U11	ON74LS374N		NTE74LS374	ECG74LS374	SK7CT374	HE-443-863	
U12	LM539DP		NTE834	ECG834	SK3569/834	221-121	
U13	74LS151PC		NTE74LS151	ECG74LS151	SK7CT151		
U14	SAME AS U12						

(12) Programming Required.

PARTS LIST AND DESCRIPTION (Continued)

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

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
	BUS_CONVERTER BOARD		
0521 UZ31	Crystal	14.31818MHz	
	KEYBOARD		
D1	LED		Caps Lock, Red
D2	LED		
X1	Crystal		Number Lock, Red 6MHz <i>5000 Hz, red</i>
	POWER SUPPLY		
P01	AC Power Cord		Power
SW01	Switch		
	SYSTEM BOARD		
GR1	LED		Power, Grn
M1	Battery		
SW7	Switch		3V
Y1	Crystal		Reset
4R	Oscillator		24MHz <i>13.14MHz</i>
5R	Module		3.6864MHz
7T	DIP Switch		Delay Line
7W	DIP Switch		
8C	Module		Delay Line

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.

PARTS LIST AND DESCRIPTION (Continued)

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

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	WORKMAN PART No.
	BUS CONVERTER BOARD			
RP1	Resistor Network (1)			
RP2	Resistor Network (2)			
RP3	Resistor Network (3)			
RP4	Resistor Network (3)			
RP5	Resistor Network (2)			
RP6	Resistor Network (2)			
	KEYBOARD			
RP1	Resistor Network (4)			
RP2	Resistor Network (4)			
	POWER SUPPLY			
R2	100 1% 1/2W Metal Film			
R5	150K 1% 1/2W Metal Film			
R6	150K 1% 1/2W Metal Film			
R11	30 2% 1W Metal Film		1W030	
R14	100 1% 1/2W Metal Film			
R15	240K 2% 1/2W Metal Film		HW424	
R16	100 1% 1/2W Metal Film			
R23	180K 2% 1/2W Metal Film		HW418	
R25	100 1% 1/2W Metal Film			
R26	100 1% 1/2W Metal Film			
R27	130K 2% 1/2W Metal Film		HW413	
R47	3.9 2% 1/2W Metal Film		HW3D9	
R48	65 Ohm Cold PTC			
R57	3.9 1% 1W Metal Film			
R61	65 Ohm Cold PTC			
	SYSTEM BOARD			
R30	9260 1% 1/2W Metal Film			
R31	12.5K 1% 1/2W Metal Film			
1C	Resistor Network (5)			
1P	Resistor Network (6)			
4J	Resistor Network (7)			
4P	Resistor Network (1)			
4W	Resistor Network (6)			
7F	Resistor Network (6)			
7U	Resistor Network (4)			
7X	Resistor Network (6)			

- (1) Contains Fifteen (15 ea.) 2200 Ohm
- (2) Contains Nine (9 ea.) 2200 Ohm 5%
- (3) Contains Sixteen (16 ea.) 220 Ohm/330 Ohm 5%
- (4) Contains Eight (8 ea.) 10K Ohm 5%
- (5) Contains Fifteen (15 ea.) 1000 Ohm
- (6) Contains Fifteen (15 ea.) 4700 Ohm
- (7) Contains Eight (8 ea.) 33 Ohm

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

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.	
	POWER SUPPLY						
D01 thru D04	MR506		NTE5806	ECG5806	SK3848/5806	212-Z9000	
D05,6 D08 thru D010	1N4002 BYT95A		NTE116 NTE580	ECG116 ECG580	SK3311 SK5036/580	212-76-02 212-Z9000	
D011	MR851		NTE581	ECG581	SK5001/581		
D012	BYW31-1008412						
D013,14	BYW81150						
D015	SAME AS D012						
D016	SAME AS D011						
D019	1N4937						
D020	083		NTE552	ECG552	SK9000/552	103-287	
D021	SAME AS D05						
D022	SAME AS D019						
D023	SAME AS D011						
D024	SAME AS D019						
D026	SAME AS D05						
D027	SAME AS D019						
D028	SAME AS D011						
D029	SAME AS D019						
IC01	TDB2912SP						
Q01,2	BUV47		NTE967 NTE2311 NTE159+ NTE123AP+	ECG967 ECG2311 ECG159+ ECG123AP+	SK3673/967 SK9131 SK3466/159+ SK3854/123AP+	HE-442-675 121-Z9003+ 121-Z9000A+	
Q03,4	BC307B						
Q05	BC237B						
Q06							
Q07	SAME AS Q05						
Q08	SAME AS Q03						
SCR01	UA431AWC						
SCR02							
ZD01	1N5359		NTE137A	ECG5137A	SK24X/5137A		
ZD02	1N752A		NTE5011A	ECG5011A	SK5A6/5011A	103-Z9007	

+ Rotate 180° to conform with original lead configuration.

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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.
	SYSTEM BOARD				
C108	10 20V 10%				
C120	10 20V 10%				

CAPACITORS

ITEM No.	RATING	MFGR. PART No.	ITEM No.	RATING	MFGR. PART No.
	BUS CONVERTER BOARD				
C20	820 160V 2.5%		C2	.0033 250VAC 20%	
	POWER SUPPLY		C15	.0033 250VAC 20%	
C1	.0033 250VAC 10%		C17	.47 250VAC 10%	
			C30	.1 250VAC 10%	
			C31	.0033 250VAC 20%	

COILS & TRANSFORMERS

ITEM No.	FUNCTION	MFGR. PART No.	OTHER IDENTIFICATION	NOTES
	POWER SUPPLY			
L01	AC Line Filter			
L02	AC Line Filter			
L03	RF Choke			
L04	Choke			
L05	Choke			
L06	Choke			
T01	Switching Transformer			
T02	Switching Transformer			
T03	Power Transformer			

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

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
R19	POWER SUPPLY	50 Ohm		
	5V Adjust			

FUSE DEVICES

ITEM NO.	DESCRIPTION	MFGR. PART NO.		NOTES
		DEVICE	HOLDER	
F01	POWER SUPPLY 4A @ 250V Slow Blow Thermal Fuse			
F02				

SPEAKER

ITEM No.	TYPE	REPLACEMENT DATA		NOTES
		MFGR. PART No.	QUAM PART No.	
SP1	1.5" CM 8 Ohm			

ATT
MODEL 6300

38 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.	
	SYSTEM BOARD						
D1,2,3,6,7	1N4148		NTE519	ECG519	SK3100/519	103-131	
IC1B	7406PC		NTE7406	ECG7406	SK7406	HE-443-698	
IC1D	SN74S280N						
IC1E	SN74LS245N		NTE74LS245	ECG74LS245	SK7CT245	HE-443-885	
IC1F	SAME AS IC1D						
IC1G,J,K,L	SAME AS IC1E						
IC1M	SN74LS373N		NTE74LS373	ECG74LS373	SK7CT373	HE-443-867	
IC1N	SAME AS IC1E						
IC1Q	uPB8288D					HE-443-1169	
	UPB8288D						
IC1S	ON74LS244N		NTE74LS244	ECG74LS244	SK7CT244	HE-443-791	
IC1T	SN74LS273N		NTE74LS273	ECG74LS273	SK7CT273	HE-443-805	
IC1U	SAME AS IC1E						
IC1W	SN75188N		NTE75188	ECG75188	SK5188/75188	HE-443-794	
IC2A	M3764-15RS		NTE4164	ECG2164		HE-443-970	
IC2AA	SAME AS IC2A						
IC2AB	SAME AS IC2A						
IC2ABC	SAME AS IC2A						
IC2AC	SAME AS IC2A						
IC2AD	SAME AS IC2A						
IC2AE	SAME AS IC2A						
IC2AF	SAME AS IC2A						
IC2AG	SAME AS IC2A						
IC2AGH	SAME AS IC2A						
IC2B	SAME AS IC2A						
IC2BC	SAME AS IC2A						
IC2C	SAME AS IC2A						
IC2D	SAME AS IC2A						
IC2E	SAME AS IC2A						

38 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.	
IC8R IC8T IC8U IC8W IC8X	P8259A SAME AS IC8Q SAME AS IC6T SN74LS138N SAME AS IC7D					HE-443-1012	
IC9D IC9E IC9F IC9G IC9H	MM58174AN SAME AS IC6C SAME AS IC4S SN74S74N SN74LS393N		NTE74S74 NTE74LS393	ECG74S74 ECG74LS393	SK74S74 SK7CT393	HE-443-900 HE-443-973	
IC9J IC9K IC9L IC9N IC9P	SAME AS IC6A SAME AS IC6W FDC765AC SAME AS IC7C SAME AS IC6A					HE-443-944	
IC9Q IC9R,S IC9X IC10E IC10F	SN74LS221N SAME AS IC7D SAME AS IC7C SAME AS IC7D SAME AS IC9G						
IC10G IC10H IC10K IC10L,M,N IC10P	SAME AS IC7D SAME AS IC6A SAME AS IC7C ON7438N DM74LS153N		NTE7438 NTE74LS153	ECG7438 ECG74LS153	SK7438 SK7CT153	HE-443-77	
IC10R IC10S IC10T IC10U	MC4044P MC4024P P8253-5 D8741A		NTE974	ECG974	SK3965/974	HE-443-1066	

(3) Requires Programming.

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.	
IC2F IC2G IC2GH IC2N IC2P	SAME AS IC2A SAME AS IC2A SAME AS IC2A SAME AS IC1M PAL14H4CN						
IC2Q IC2U,W IC3A	uPB8284AD UPD8284AD MC1489A 75189AN TMM4164P-3		NTE75189 NTE75189 NTE4164	ECG75189 ECG75189 ECG2164	SK5189/75189 SK5189/75189	HE-443-1011 HE-443-795 HE-443-795 HE-443-970	
IC3B IC3BC IC3C IC3D IC3E	SAME AS IC3A SAME AS IC3A SAME AS IC3A SAME AS IC3A SAME AS IC3A						
IC3F IC3G IC3GH IC3J IC3L	SAME AS IC3A SAME AS IC3A SAME AS IC3A D8086-2 8087					HE-44E-1168	Optional
IC3N IC3P IC3Q IC3R IC3T	SAME AS IC1M SAME AS IC1S ON74S241N INS8250N-B SCC8530					HE-443-874	
IC3U IC3W IC4A IC4B IC4BC IC4C	SN74LS374N SAME AS IC1S SAME AS IC3A SAME AS IC3A SAME AS IC3A SAME AS IC3A		NTE74LS374	ECG74LS374	SK7CT374	HE-443-863	

40 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.	
IC4D IC4E IC4F IC4G IC4GH	SAME AS IC3A SAME AS IC3A SAME AS IC3A SAME AS IC3A SAME AS IC3A						
IC4K IC4L IC4M IC4N IC4Q	SN74S158N SAME AS IC1E SAME AS IC1M 82S123 74F04PC		NTE74S158	ECG74S158			Used in some versions
				ECG74S288			
IC4S IC4T IC4U IC5C IC5D	SN74LS00N ON74LS174N SAME AS IC1B SN74S32N 74S133PC		NTE74LS00 NTE74LS174	ECG74LS00 ECG74LS174	SK7CT00 SK7CT174	HE-443-728 HE-443-879	
			NTE74S133	ECG74S133	SK74S32		
IC5K IC5P IC5Q IC5S IC5T	SAME AS IC4K 74S00PC SN74LS112AN T74LS155B1 ON74LS240N		NTE74S00 NTE74LS112A NTE74LS155 NTE74LS240	ECG74S00 ECG74LS112A ECG74LS155 ECG74LS240	SK74S00 SK74LS155 SK7CT240	HE-443-26 HE-443-782 HE-443-754	
IC5U IC5W IC6A IC6B IC6C	74LS125APC SN74LS14N 74LS08PC SAME AS IC5P ON74S10N		NTE74LS125A NTE74LS14 NTE74LS08 NTE74S10	ECG74LS125A ECG74LS14 ECG74LS08 ECG74S10	SK7CT125 SK7CT14 SK7CT08 	HE-443-811 HE-443-872 HE-443-780	
IC6D IC6E IC6F,H IC6J IC6K IC6L	SN74LS27N PAL12L10CNS D2764D 6300-1N 74S163 ON74LS670N		NTE74LS27 NTE2764(3) NTE74LS163A NTE74LS670	ECG74LS27 ECG2764(3) ECG74LS163A ECG74LS670	SK7CT27 SK7CT163 SK7CT670	HE-443-800 HE-443-934 HE-443-1173	

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.	
IC6M IC6P IC6Q IC6R IC6S	P8237A-4 SAME AS IC5P SAME AS IC4S SAME AS IC5P SAME AS IC6C						
IC6T,U IC6W IC6X IC7B IC7C	SN74LS244N SN74ALS32N SAME AS IC5U ON74S20N SN74LS04N		NTE74LS244	ECG74LS244	SK7CT244	HE-443-791 HE-443-1072	
			NTE74S20 NTE74LS04	ECG74S20 ECG74LS04	SK74S20 SK7CT04	HE-443-755	
IC7D IC7E IC7G IC7H IC7J	SN74LS74AN SAME AS IC7C SAME AS IC7C SAME AS IC7D SN74LS11N		NTE74LS74A	ECG74LS74A	SK7CT74	HE-443-730	
			NTE74LS11	ECG74LS11	SK7CT11	HE-443-864	
IC7K IC7L IC7M IC7N IC7P	SAME AS IC6W SAME AS IC6A SAME AS IC7C SN74S11N SN74LS10N		NTE74S11 NTE74LS10	ECG74S11 ECG74LS10	SK74S11 SK7CT10	HE-443-797	
IC7Q IC8D IC8E IC8F IC8G	SAME AS IC6C SAME AS IC4Q SAME AS IC7B SAME AS IC6A DM74S174N		NTE74S174	ECG74S174	SK74S174	HE-443-1053	
IC8H IC8J IC8K IC8N IC8P IC8Q	AMPAL16R8DC 74LS195APC SAME AS IC7C SAME AS IC1T SAME AS IC6W ON74LS175N		NTE74LS195A	ECG74LS195A	SK7CT195	HE-443-718	
			NTE74LS175	ECG74LS175	SK7CT175	HE-443-752	

LOGIC CHART

DISK DRIVE B

PIN NO.	IC IC1	IC IC2	IC IC3	IC IC4	IC IC6	IC IC8	IC IC9	PIN NO.	IC IC9
1	L	P	H	L	P	L	L	21	L
2	L(1)	P	P	H	H	L	H	22	L
3	H(1)	H	P	L	P	L	L	23	P
4	H	P	P	H	H	L	L	24	P
5	L(1)	P	P	L	L(6)	H	H	25	P
6	H	H	P	H	H(7)	*	P	26	H(8)
7	H(1)	P	H	L	L	L	P	27	H(1)
8	L	H	H	P	P	L	P	28	L
9	H	L(6)	H	P	H	L	L	29	H(1)
10	H(1)	H(4)	*	H(1)	P	H	L	30	H(4)
11	H	H	H(3)	L(1)	L(5)	H	H	31	H
12	L(1)	L	L	H(1)	H	H(1)	*	32	L(5)
13	H(1)	L(5)	L(2)	L(1)	H(4)	H(1)	L	33	L(1)
14	L(1)	L(6)	L(2)	H	H	H	L	34	L(1)
15	L		P				H	35	*
16			P				L	36	*
17							H	37	*
18							H	38	P
19							L	39	L(6)
20							P	40	L

- (1) Probe indicates P when Head is moving
- (2) Probe indicates L when Head 0 is selected, H when Head 1 is selected.
- (3) Probe indicates L when Head 1 is selected, H when Head 0 is selected.
- (4) Probe indicates H when Head is on track 00 and L when off track 00.
- (5) Probe indicates L when Head is on track 00 and H when off track 00.
- (6) Probe indicates H if diskette is write protected.
- (7) Probe indicates L if diskette is write protected.
- (8) Probe indicates L when Head is moving in and H when moving out from center of diskette.

**KEYBOARD, SYSTEM BOARD,
BUS CONVERTER BOARD, POWER SUPPLY**
See Folder CSCS14

CRT CONTROLLER BOARD
See Folder CSCS14-B

MONITOR
See Folder CSCS14-C

CSCS14-A ATT MODEL 6300

INDEX

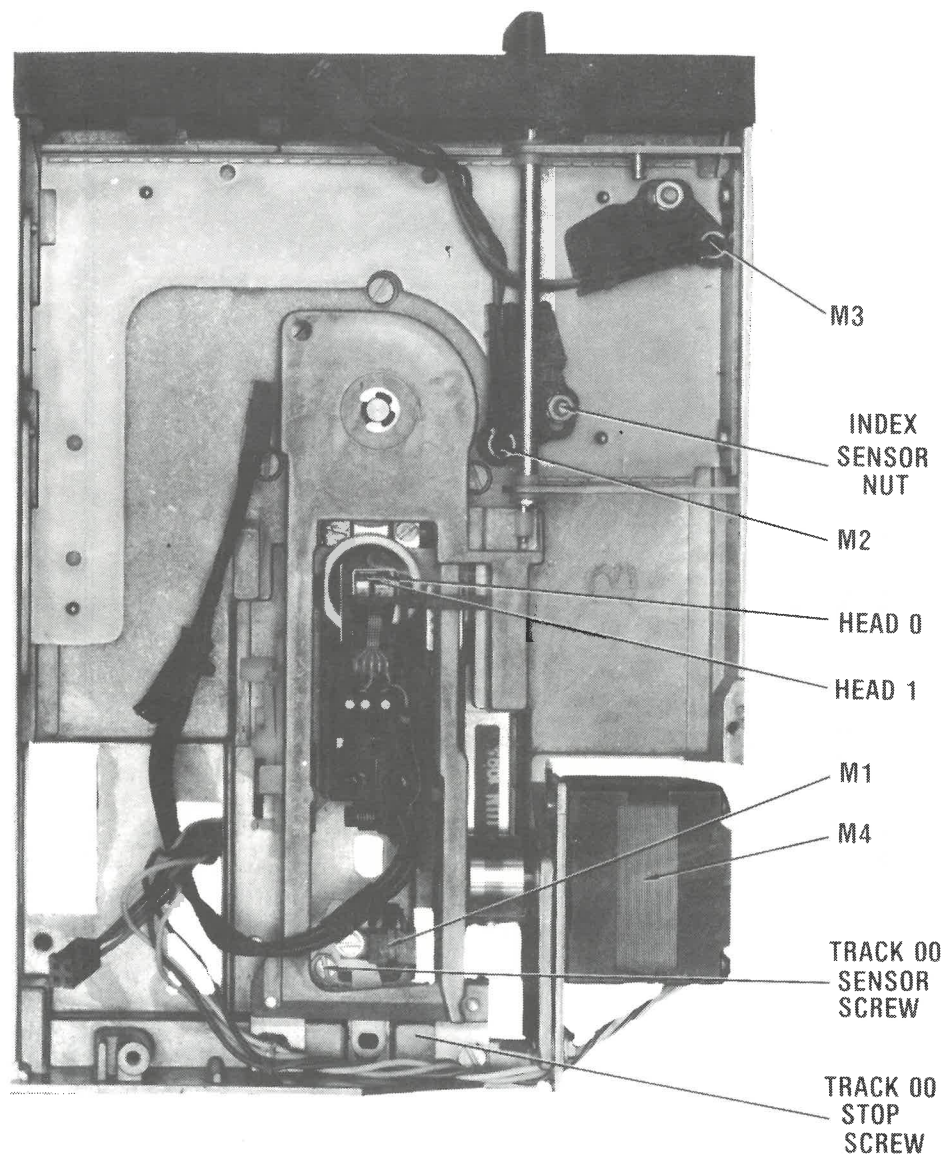
	Page	Page
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CSCS14-A ATT MODEL 6300

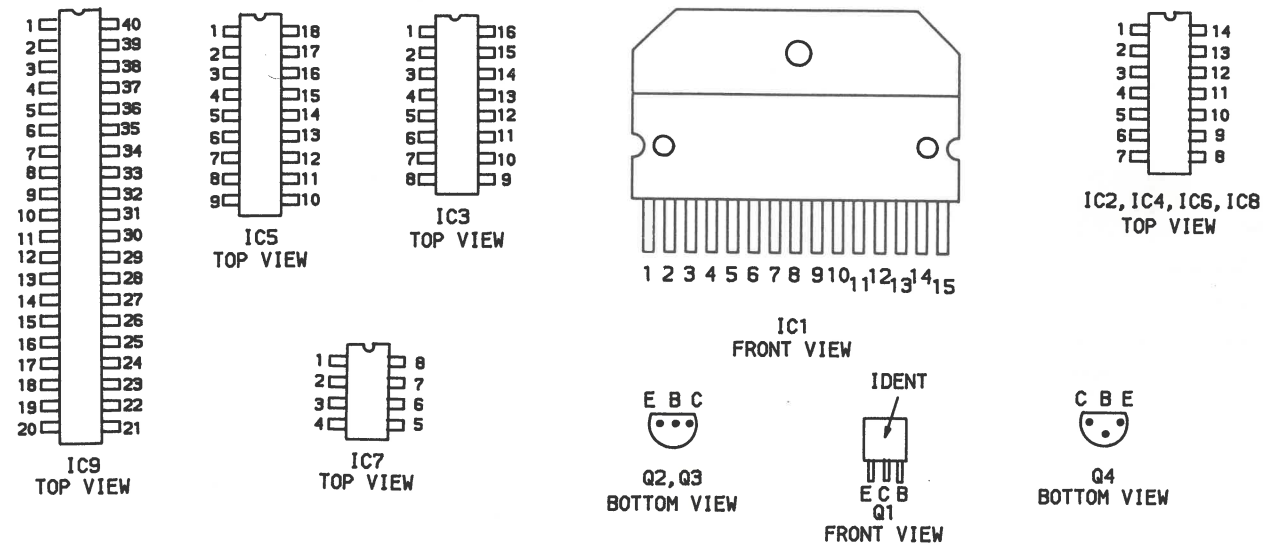
SAMS™ Howard W. Sams & Co.
4300 West 62nd Street, P.O. Box 7092, Indianapolis, Indiana 46206 U.S.A.

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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TERMINAL GUIDES



SCHEMATICS NOTES

- * Circuitry not used in some versions.
- Circuitry used in some versions.
- o See parts list.
- ≡ Ground

Item numbers in rectangles appear in the alignment/adjustment instructions.
 Supply voltage maintained as shown at input.
 Voltages measured with digital meter.
 Logic readings, Voltages and Waveforms taken while running the following Basic program.

```

10 OPEN "B: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
    
```

Note: Insert a formatted diskette in Drive B before running program.

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 9 cm. width with DC reference voltage given at the bottom line of each waveform.

Time in $\mu\text{sec.}$ per cm, given with p-p reading at the end of each waveform.

Terminal identification may not be found on unit.
 Resistors are $\frac{1}{2}W$ or less, 2% unless noted.

Value in () used in some versions.

Logic Probe Display

L = Low

H = High

P = Pulse

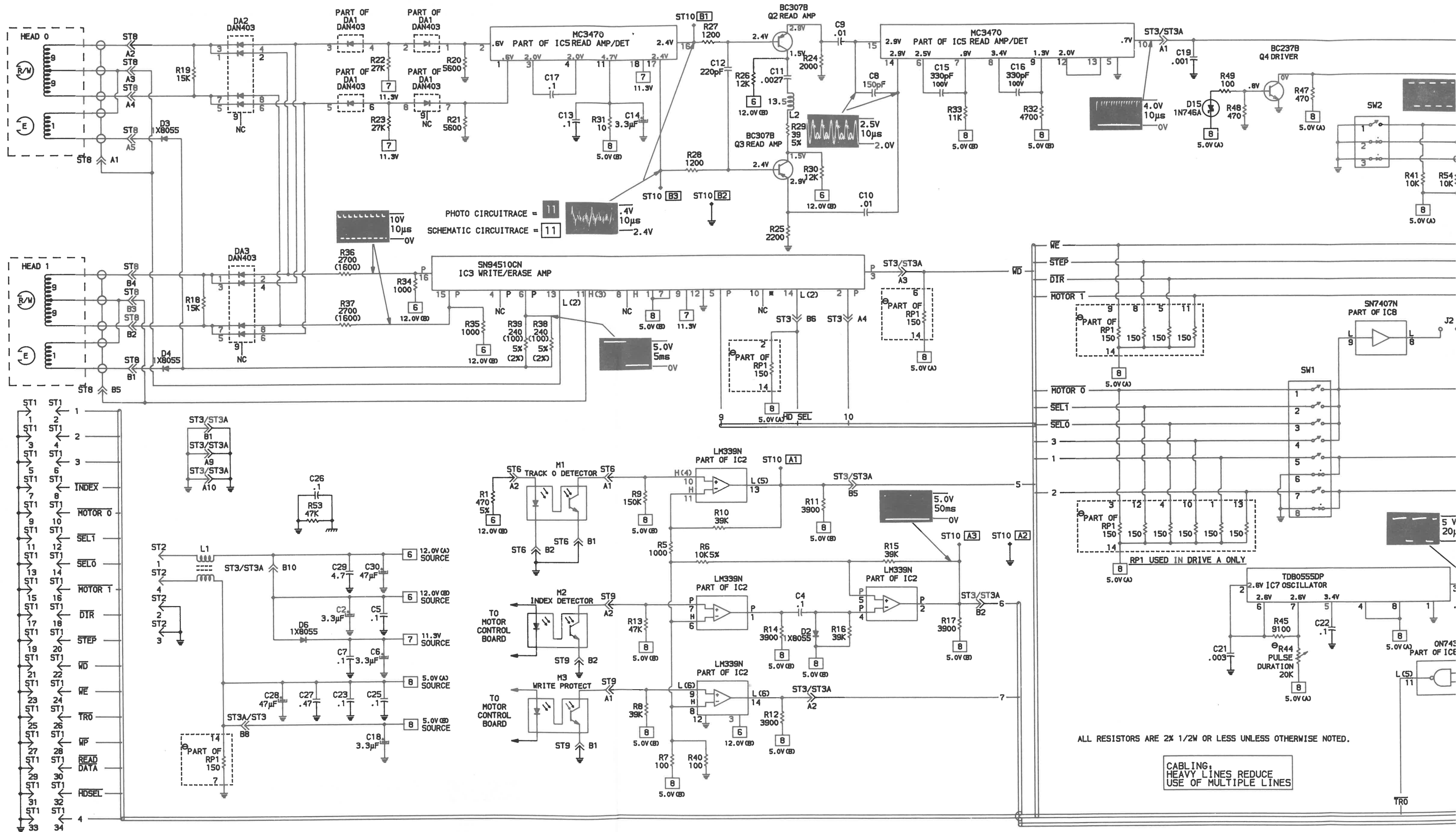
* = Open (No lights On)

- (1) Probe indicates H if diskette is write protected.
- (2) Probe indicates L if diskette is write protected.
- (3) Probe indicates Pulse when Head is moving.
- (6) Probe indicates H when Head is moving in and L when Head is moving out from center of diskette.
- (7) Probe indicates L when Head is moving in and H when Head is moving out from center of diskette.
- (8) Probe indicates H when Head is On Track 00 and L when Off Track 00.
- (9) Probe indicates L when Head is On Track 00 and L when Off Track 00.
- (10) Probe indicates L when Head 0 is selected, H when Head 1 is selected.
- (11) Probe indicates H when Head 0 is selected, L when Head 1 is selected.

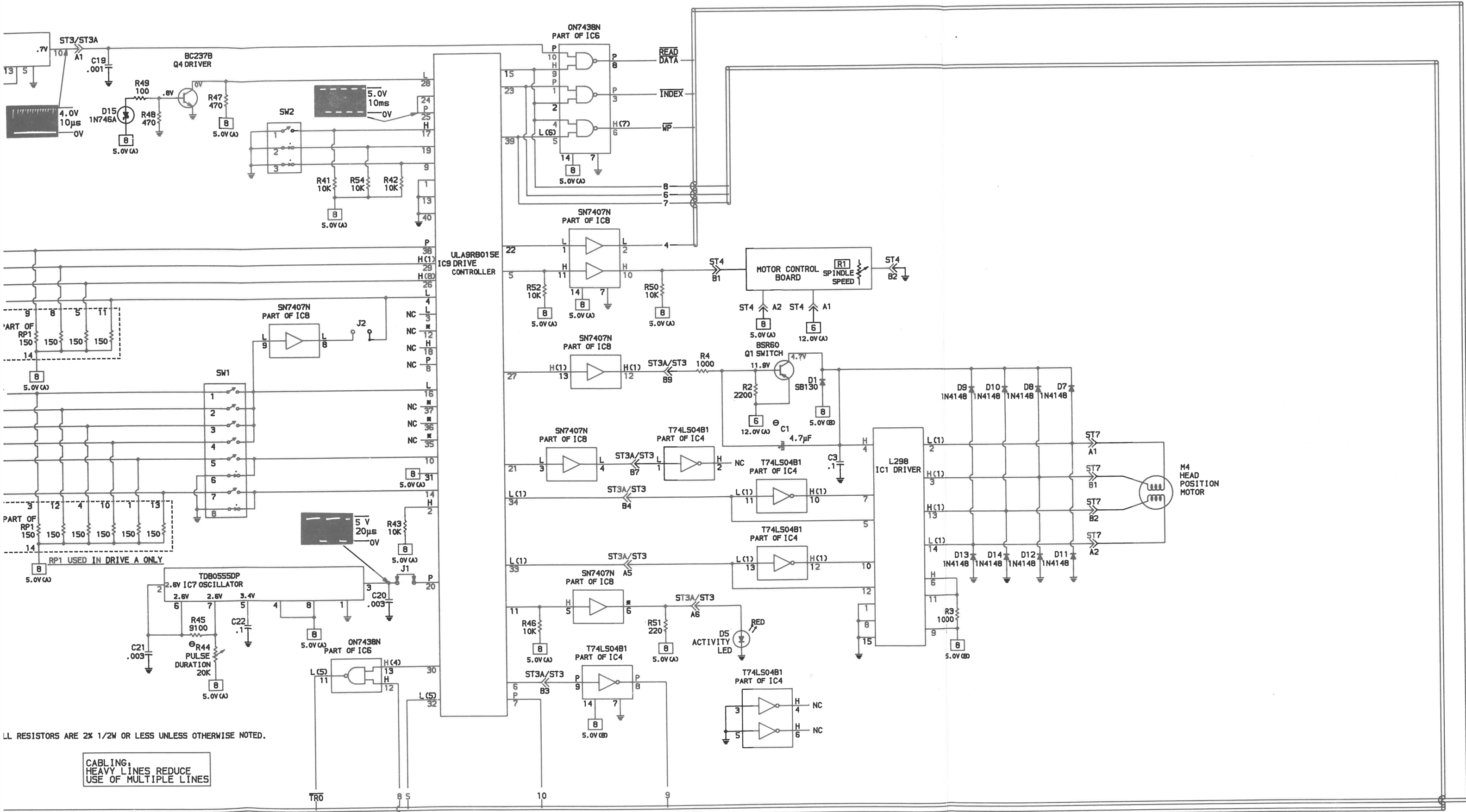
DISK DRIVE B

PIN NO.	IC IC1	IC IC2	IC IC3
1	L	P	H
2	L(1)	P	P
3	H(1)	H	P
4	H	P	P
5	L(1)	P	P
6	H	H	P
7	H(1)	P	H
8	L	H	H
9	H	L(6)	H
10	H(1)	H(4)	*
11	H	H	H(3)
12	L(1)	L	L
13	H(1)	L(5)	L(2)
14	L(1)	L(6)	L(2)
15	L		P
16			P
17			
18			
19			
20			

- (1) Probe indicates P when He
- (2) Probe indicates L when He
- (3) Probe indicates L when He
- (4) Probe indicates H when He
- (5) Probe indicates L when He
- (6) Probe indicates H if disk
- (7) Probe indicates L if disk
- (8) Probe indicates L when He



A PHOTOFAC STANDARD NOTATION SCHEMATIC
 WITH CIRCUITRACE™
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ALL RESISTORS ARE 2% 1/2W OR LESS UNLESS OTHERWISE NOTED.

CABLING:
HEAVY LINES REDUCE
USE OF MULTIPLE LINES

TROUBLESHOOTING

TEST SETUP

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

DISK DRIVE HEAD CLEANING

Use a lint free cloth or swab dampened with 91% isopropyl alcohol to clean the Disk Drive Heads and dry with a lint free cloth.

CONTINUOUS OPERATION OF DISK DRIVE

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

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

DRIVE OPERATION ERRATIC

Check for possible dirty Disk Drive Heads. If the heads are dirty refer to the "Disk Drive Head Cleaning" section. Check the rails that the heads move on for smooth operation. If the rails are dirty use a lint free cloth and 91% isopropyl alcohol to clean them. If the heads and head rails check good, check the Disk Drive Alignment, see "Disk Drive Alignment".

WILL NOT READ

Verify that the Disk Index Detector Circuit is working, see "INDEX DETECTOR". If the Index Detector Circuit is working properly, run the following Basic program. The program operates Disk Drive B. To operate Disk 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
```

Insert a diskette, with data on it, into the Disk Drive and close the door. The program continuously reads the diskette and displays a number on the Monitor screen. The displayed number should not change when there is no diskette in the drive and should change continuously when a diskette (with data on it) is inserted in the drive. While the program is running, check for a logic High at pin 38 of Drive Controller IC (IC9). If the reading is not correct check pin 24

of Connector ST1 for good connection and check the Disk Drive Cable. If the connector and cable check good, refer to the "Will Not Read" section of the Disk Drive Interface Troubleshooting. If the reading is correct at pin 38 of IC9, check the waveforms at pins 16 and 17 of the Read Amp IC (IC5).

If the waveforms are missing, check the head windings for continuity, check Connector ST8 for good connections, and check the voltages and components associated with pins 1 thru 4, 11, 16, 17 and 18 of IC 5. If the waveforms check good, check the waveforms at pins 14 and 15 of IC 5. If the waveforms are missing, check the voltages and components associated with the Read Amp Transistors (Q2 and Q3). If the waveforms check good, check the waveform at pin 10 of IC 5. If the waveform is missing, check the voltages and components associated with pins 6 thru 10, 13, 14 and 15 of IC 5. If the waveform checks good, check for a logic High at pin 15 of Drive Controller IC (IC 9). If the reading is correct, check the pulses at pin 8 of IC 6. If pulses are missing check IC 6.

WILL NOT WRITE

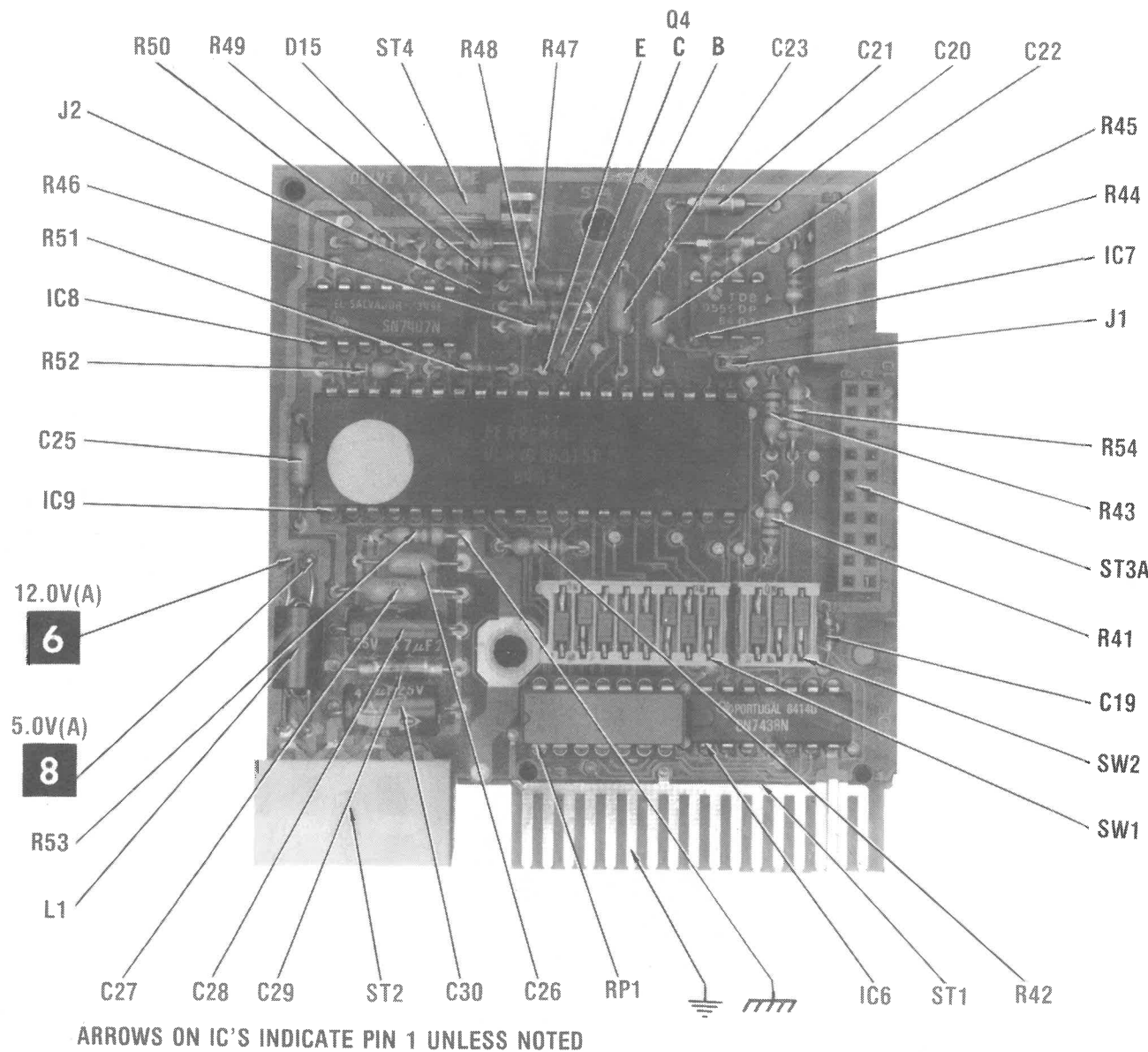
Verify that the Disk Index Detector Circuits are working, see "Index Detector". Run the following Basic program which writes continuously to a diskette inserted in Drive B and displays a number on the upper left corner of the Monitor screen. The number should be 0 if the diskette is not write protected and 2 if the diskette is write protected. To operate Drive A change line 10 to OUT 1009,16: OUT 1009,20.

WARNING: Do not use diskettes that have important data on them. This program will write over and destroy the data.

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

While program is running, insert a diskette that is not write protected into the Drive and check for the number 0 on Monitor screen, then insert a write protected diskette into Drive and check for the number 2 on Monitor screen. If numbers are not correct, refer to the "Write Protect Does Not Function" section of this Troubleshooting guide.

Insert a diskette that is not write protected into the drive and close the door. Run the above program. If the number 2 appears on the Monitor screen, refer to the "Write Protect Does Not Function" section of this Troubleshooting guide.



ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED

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ATT
MODEL 6300

TROUBLESHOOTING (Continued)

While the program is running, check for pulses at pin 38 of Drive Controller IC (IC 9) and pin 3 of the Write/Erase Amp IC (IC 3). If pulses are missing, check pins 24 and 22 of Connector ST1 for good connections and check the Disk Drive Cable. If the connector and cable check good, refer to the "Will Not Write" section of the "Disk Drive Interface" Troubleshooting. If pulses are present, check for pulses at pins 6 and 7 of IC 9. If pulses are missing, check IC 9. If pulses are present, check for pulses at pin 8 of IC 4. If pulses are missing, check IC 4. If pulses are present, check the waveforms at pins 6, 15, and 16 of IC 3. If the waveforms are missing, check IC 3. If the waveforms are present, check the Heads for continuity, check Connector ST8 for good connections and check Diodes D3, D4, DA2 and DA3.

WRITE PROTECT DOES NOT FUNCTION

To verify the operation of the write protect circuits, use the program and instructions given under the "Will Not Write" section of this Troubleshooting guide.

If the write protect circuit is not working properly, insert a write protected diskette (do not use a diskette with important data on it) into the Drive and close the door. While running the program listed under "Will Not Write", check for a logic High at pin 9 of IC 2. If the reading is not correct, check the Write Protect Detector (M3) and check pins A1 and B1 of Connector ST1 for good connection. If the reading is correct, check for a logic High at pin 14 of IC 2. If the reading is not correct, check IC 2. If the reading is correct, check for a logic Low at pin 6 of IC 6. If the reading is not correct, check IC 6.

DRIVE SELECT

Drive not being selected. Run the program listed under "Continuous Operation of Disk Drive". Check for a logic Low at pin 16 of Drive Controller IC (IC 9). If the reading is not correct, check Switch 2 of Dip Switch SW1 for continuity and check pin 12 of Connector ST1 for good connection. If the reading is correct check IC 9.

Drive is being selected but drive LED does not work. Insert a diskette in the drive and close the drive door. Run the program listed under "Continuous Operation of Disk Drive". Check for a logic High at pin 11 of IC 9. If the reading is not correct check IC 9. If the reading is correct check IC 8 and LED D5.

DRIVE MOTOR

Drive Motor is not running. Run the program listed under "Continuous Operation of Disk Drive". While the program is running check for a logic Low at pin 4 of Drive Controller IC (IC 9). If the reading is not correct, check pin 16 of Connector ST1 for good connection and check Drive Cable. If the reading is correct, check for a logic High at pins 11 and 10 of IC 8. If the reading is not correct at pin 11, check IC 9. If the reading is correct at pin 11 and not correct at pin 10, check IC 8. If the reading is correct at pin 10, check Connector ST4 for good connections. If Connector ST4 checks good, check Motor Control Board.

Drive Motor will not turn Off. Perform the above checks and check for readings that are the opposite of the reading given above. If no problem is found, check Jumper J1 for good connections. If Jumper J1 checks good, check the waveform at pin 3 of IC 7. If the waveform is missing check IC 7 and the components associated with IC 7.

INDEX DETECTOR

To verify that the Index Detector Circuits are working properly, insert a diskette in the drive and close the drive door. Run the program listed under "Continuous Operation of Disk Drive" to keep the drive running. Check for pulses at pin 3 of IC 6. If pulses are missing at pin 3 of IC 6, check for a logic High at pin 2 of IC 6. If the reading is not correct check IC 9. If the reading is correct at pin 2 of IC 6, check for pulses at pin 1 of IC 6. If pulses are present, check IC 6. If pulses are missing, check for pulses at pin 7 of IC 2. If pulses are present check IC 2, Capacitor C4, Diode D2 and Resistors R6 and R14 thru R17. If pulses are missing at pin 7 of IC 2, check Index Detector (M2) and check pin A2 of Connector ST9 for good connections.

TRACK 00 DETECTOR

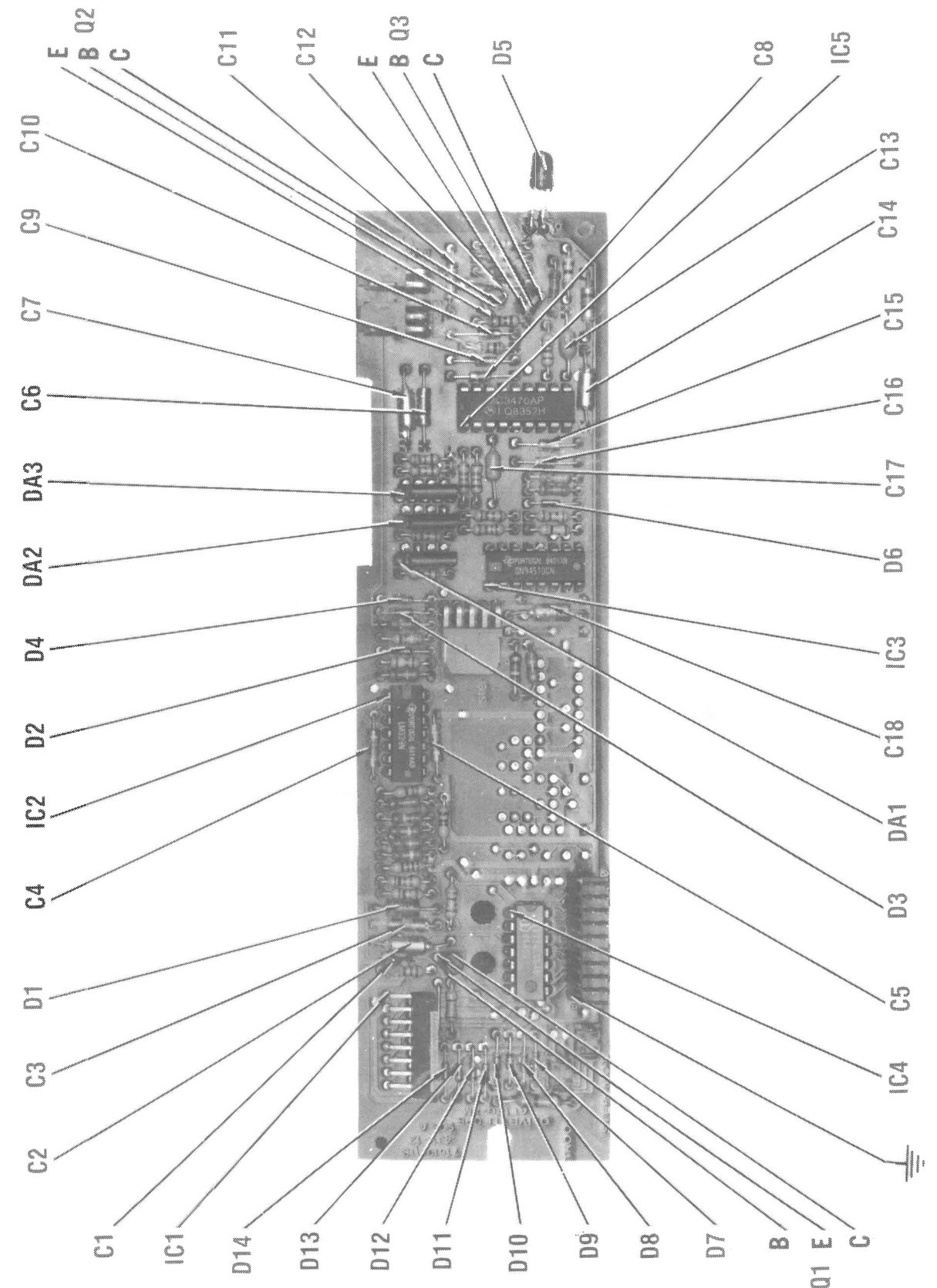
Disk Drive Head will not move back to Track 00 or bangs against the Track 00 stop. Type in and run the following Basic program to check the Track 00 Detector circuits. The program will step the head back to Track 00 and display the number 16 on the Monitor screen to indicate the Head is on Track 00. 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 line 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
    
```

If the number on the Monitor screen is not correct or does not change when the Head is moved On and Off Track 00, make the following checks while the above program is running.

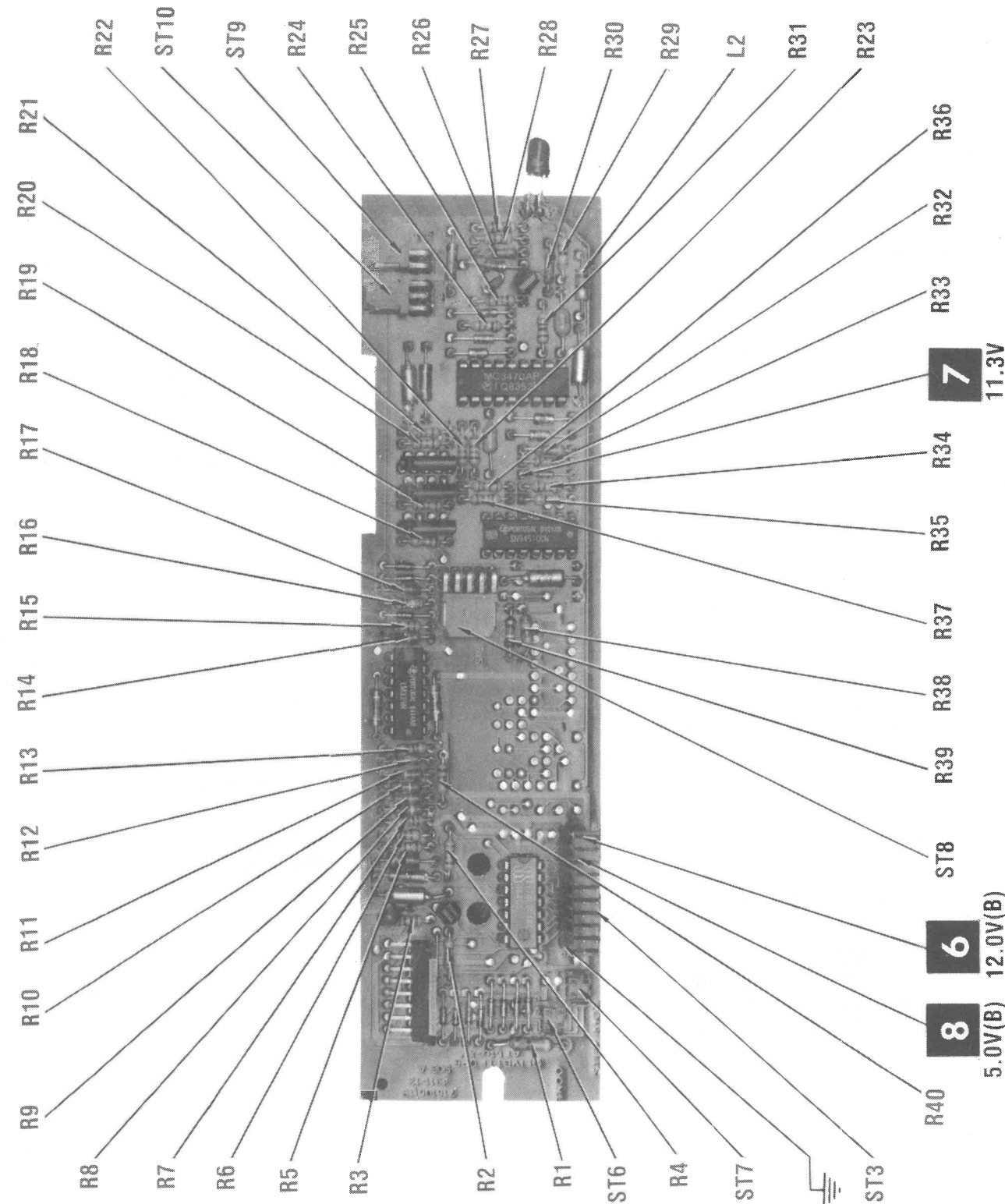
Check for a logic High at pin 10 of IC 2 when the Head is On Track 00 and logic Low when the Head is Off Track 00. If the readings are not correct, check Track 00 Detector (M1) and check pins A1 and A2 of Connector ST6 for good connections. If the readings are correct, check for a logic Low at pin 13 of IC 2 when the Head is On Track 00 and a logic High when the Head is Off Track 00. If the readings are not correct, check IC 2. If the readings are correct, check for a logic High at pin 12 of IC 6. If the reading is not correct check IC 9. If the reading is correct, check for a logic High at pin 13 of IC 6 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 9. If the readings are correct, check for a logic Low at pin 11 of IC 6 when the Head is On Track 00 and a logic High when the Head is Off Track 00. If the readings are not correct, check IC 6.



ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED

ATT
MODEL 6300

DISK DRIVE BOARD



TROUBLESHOOTING (Continued)

HEAD POSITION MOTOR

Head Position Motor does not work. Run the appropriate Basic program listed below for Disk Drive (A or B) that is not working. The programs continuously alternate the Disk Drive Head between Tracks 00 and 16.

For Drive A

```

10 OUT 1009,16:OUT 1009,20
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 400:NEXT T
70 TR = 16:OUT 1009,20
80 GOSUB 130
90 OUT 1013,15:S = INP(1012)
100 OUT 1013,1:S = INP(1012)
110 OUT 1013,TR:S = INP(1012)
120 FOR T = 1 TO 400:NEXT T:GOTO 10
130 OUT 1013,8:S = INP(1012):S = INP(1013):S = INP(1012)
140 S = INP(1013):S = INP(1012):RETURN
  
```

For Drive B

```

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 26 and 29 of IC 9. If pulses are missing, check pins 18 and 20 of Connector ST1 for good connections and check the Disk Drive Cable. If pulses are present, check for pulses at pins 27, 33 and 34 of IC 9. If pulses are missing, check IC 9. If the readings are correct at IC 9, check for pulses at pin 12 of IC 8. If pulses are missing, check IC 8. If pulses are present at IC 8, check for the waveform shown in Figure G at pin 4 of IC 1. If the waveform is not correct, check pin B9 of Connector ST3 for good connection and check Transistor Q1, Capacitors C1 and C3, Diode D1 and Resistors R2 and R4.

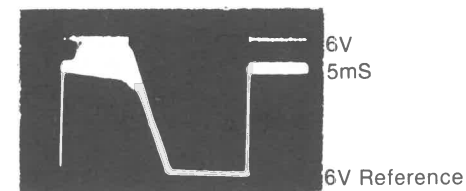


Figure G

If the waveform is good, check for pulses at pins 10 and 12 of IC 4. If pulses are missing, check IC 4. If pulses are present, check for pulses at pins 2, 3, 13, and 14 of IC 1. If pulses are missing, check IC 1, Diodes D7 thru D14, Head Position Motor M4, Resistor R3 and check Connector ST7 for good connections.

DISK DRIVE INTERFACE

(On Computer System Board)

CONTINUOUS OPERATION OF DISK DRIVE

The following Basic program can be used to keep Drive A running continuously in read mode. Change number 16 in program to number 33 to make Drive B run continuously.

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

DISK DRIVE INTERFACE TIMING CLOCKS

Check 4.0MHz waveform at pin 9 of IC 10K. If waveform is missing, refer to the "Clock Generator" section of this Troubleshooting Guide. If waveform is correct, check for a 4.0MHz signal at pin 8 of IC 10K. If signal is missing, check IC 10K. If signal is good at pin 8 of IC 10K, check for a logic low at pin 12 of IC 9H. If reading is not correct, check IC 8K. If reading is correct, check for a 500kHz waveform at pin 9 and a 2.0MHz waveform at pin 11 of IC 9H. If either waveform is missing, check IC 9H. If waveforms are good at pins 9 and 11, check waveform at pin 8 of IC 10H. If waveform is missing, check IC's 9H, 10H and 8K.

WILL NOT READ

Verify that the Disk Interface Timing Clocks are working, see "Disk Interface Timing Clocks". Verify that the Disk Index Detector Circuits are working, see "Index Detector".

If clock and Index Detector Circuits are working, run the following Basic program. The program operates Disk Drive B. To operate Disk 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
  
```

Note: If Disk Drive Interface Read Circuits are not working DOS and Basic cannot be loaded from the Floppy Disk Drive into the Computer in order to run the program listed above. If Disk Drive Interface Circuits are not working temporarily connect a Hard Disk Controller Board and Hard Disk Drive (with DOS and Basic already installed) to the Computer. DOS and Basic can then be loaded from the Hard Disk Drive.

Make all checks while above program is running unless noted otherwise. Insert a Diskette, with data on it, into Disk Drive and close door. The program continuously reads the Diskette and displays a number on the Monitor screen. The displayed number should not change when there is no diskette in the drive and should change continuously when a diskette (with data on it) is inserted in the drive. Check for a logic Low at pin 12 and a logic High at pin 11 of IC 10M. If reading is not correct at pin 12 check IC 9L. If reading is correct at pin 12 and not correct at pin 11, check IC 10M. If readings are correct at 10M, check for pulses at pin 11 of IC 10K. If pulses are missing, check pin 30 of Connector J7 for good connections and check Disk Drive Cable for possible

TROUBLESHOOTING (Continued)

breaks. If Connector and Cable check good, refer to the "Will Not Read" section of the "Disk Drive Troubleshooting". If pulses are present at pin 11 of IC 10K check for pulses at pin 10 of IC 10K. If pulses are missing check IC 10K. If pulses are present, check for pulses at pin 3 of IC 9H. If pulses are missing, check Capacitor C88 and Resistor R25. If pulses are present, check for pulses at pin 4 of IC 9H. If pulses are missing, check IC 9H. If pulses are present, check for pulses at pin 3 of IC 9P. If pulses are missing, check IC 9P. If pulses are present, check for pulses at pin 3 of IC 9Q. If pulses are missing, check IC 9L. If pulses are present, check for pulses at pin 11 of IC 9Q. If pulses are missing, check IC 9H. If pulses are present check for pulses at pin 5 of IC 9Q. If pulses are missing, check Capacitor C103, Resistor R30, and IC 9Q. If pulses are present, check for pulses at pin 13 of IC 9Q. If pulses are missing, check Capacitor C104, Resistor R31, and IC 9Q. If pulses are present, check for pulses at pin 14 of IC 10P. If pulses are missing, check IC 9L. If pulses are present, check for pulses at pin 7 of IC 10P. If pulses are missing check IC 10P. If pulses are present, check waveform at pin 22 of IC 9L. If waveform is missing or not correct, check IC's 9R, 9P, 9S, 10P, 10R and 10S and their associated components.

WILL NOT WRITE

Verify that the Disk Index Detector Circuits are working, see "Index Detector". Verify that the Disk Interface Timing Clocks are working, see "Disk Interface Timing Clocks". Run the following Basic program which writes continuously to a diskette inserted 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. To operate Drive A change line 10 to OUT 1009,16: OUT 1009,20.

WARNING: Do not use diskettes that have important data on them. This program will write over and destroy the data.

```

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

While program is running, insert a diskette that is not write protected into the Drive and check for the number 0 on Monitor screen, then insert a write protected diskette into Drive and check for the number 2 on Monitor screen. If numbers are not correct, refer to the "Write Protect Does Not Function" section of this Troubleshooting guide. Insert a diskette that is not write protected into the drive and close the door. Run the above program. If the number 2 appears on the Monitor screen, refer to the "Write Protect Does Not Function" section of this Troubleshooting guide. While the above program is running, check for pulses at pin 13 of IC 9K. If pulses are missing, check IC 6E. If pulses are present, check for pulses at pin 12 of IC 8K. If pulses are

missing, check IC 8K. If pulses are present, check for pulses at pin 11 of IC 9K. If pulses are missing, check IC 9K. If pulses are present, check for pulses at pins 25, 31, and 32 of IC 9L. If pulses are missing at pin 25, 31, or 32, check IC 9L. If pulses are present, check for pulses at pin 11 of IC 10M. If pulses are missing, check IC 10M. If pulses are present, check for a logic High at pin 2 of IC 8J. If the reading is not correct, check Resistor pack 7F. If the reading is correct, check for pulses at pins 2, 4, and 6 of IC 8K. If pulses are missing at pin 2, 4, or 6, check IC 8K. If pulses are present, check for pulses at pin 6 of IC 9K. If pulses are missing, check IC 9K. If pulses are present, check for pulses at pin 11 of IC 8J. If pulses are missing, check IC 8J. If pulses are present, check for pulses at pin 8 of IC 10M. If pulses are missing, check IC 10M. If pulses are present, check pins 22 and 24 of Connector J7 for good connections and check the Disk Drive Cable.

WRITE PROTECT DOES NOT FUNCTION

To verify the operation of the Write Protect Circuits, use the program and instructions given under the "Will Not Write" section of this Troubleshooting guide.

If the Write Protect Circuit is not working properly, insert a write protected diskette (do not use a diskette with important data on it) into the Drive and close the door. While running the program listed under "Will Not Write", check for a logic Low at pin 3 of IC 10K. If the reading is not correct, check pin 28 of Connector J7 for good connection and check the Disk Drive Cable. If the Connector and Cable check good refer to the "Write Protect Does Not Function" section of the Disk Drive Troubleshooting. If the logic reading is correct at pin 3 of IC 10K, check for a logic High at pin 4 of IC 10K. If the reading is not correct, check IC 10K. If the reading is correct, check IC 9L.

DRIVE SELECT AND DRIVE MOTOR

Drive A or Drive A and B not being selected or motors do not turn On. Run the following Basic program.

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

While the program is running, check for pulses at pin 3 of IC 9K. If pulses are missing, check IC 9K. If pulses are present, check for pulses at pin 6 of IC 8P. If pulses are not present check IC 8P. If pulses are present, check for a logic Low at pin 2 and a logic High at pin 6 of IC 8N. If either reading is not correct, check IC 8N. If the readings are correct at IC 8N, check for a logic High at pin 2 of IC 9N. If the reading is not correct, check IC 9N. If the reading is correct, check for a logic Low at pins 3 and 8 of IC 10L. If the readings are not correct, check IC 10L. If the readings are correct check pins 10, 12, 14, and 16 of Connector J7 for good connection and check the Disk Drive Cable.

Drive B is not being selected or motor does not turn On. Run the following Basic program.

```
10 OUT 1009,33: GOTO 10
```

While the program is running, check for a logic High at pins 2 and 15 of IC 8N. If the readings are not correct, check IC 8N. If the readings are correct, check for a logic Low at pins 6 and 11 of IC 10L. If the readings are not correct, check IC 10L. If the readings are correct check pins 12 and 16 of Connector J7 for good connections and check the Disk Drive Cable.

ALIGNMENT (Continued)

TRACK 00 STOP AND SENSOR

Connect a scope to pin B1 of Connector ST10 and set the sweep time to $20\mu\text{Sec}$. 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 head set to Track 00, check for a gap of .01 inch between Track 00 stop and rear of head assembly. If gap is not correct, loosen Track 00 stop screw and adjust stop for .01 inch gap.

Connect the input of a voltmeter to pin A1 of Connector ST10. Check for 0V when the Head is on Track 00 and 5.0V when the Head is on Track 02. If the readings are not correct, set the Head to Track 00, loosen the Track 00 Sensor (M2) screw (see Disk Drive Mechanical Photo) on the top of the Disk Drive and adjust the detector until the voltmeter reading jumps from 5.0V to 0V. Tighten the Track 00 screw and recheck the Track 00 Sensor adjustment.

INDEX SENSOR ADJUSTMENT

Connect the channel A input of a dual trace scope to TP3, channel B input to TP7 (index pulse) and the scope ground to TP6. Set the scope display to channel A with the voltage range set to 20mV and the sweep time set to $50\mu\text{s}$. Set the channel B input to noninverting mode and trigger the scope on channel B with the trigger set to positive slope.

Insert the Alignment Diskette in the Disk Drive and close the door. Turn On Disk Drive, select side 0 and set the head to track 01. Confirm that the leading edge of the burst occurs $200\mu\text{s} \pm 50\mu\text{s}$ after the leading edge of the index pulse, see Figure 3. If the Index Sensor (M2) is out of adjustment, loosen the index sensor retaining nut on the top of the Disk Drive and adjust the Index Sensor for $200\mu\text{s} \pm 50\mu\text{s}$, see Disk Drive Mechanical, Top View Photo. If side 0 checks good, select side 1 and repeat the above procedure to check Head 1.

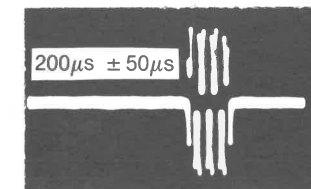


Figure 3

AZIMUTH CHECK

Connect the channel A input of a dual trace scope to pin B1 of Connector ST10, channel B input to pin B3 of Connector ST10, external trigger input to pin A3 of Connector ST10 and connect the scope ground to TP6. Set the scope to add mode with channel B inverted, sweep time to .5ms, AC input, trigger to positive slope and voltage to .1V range.

Insert the Alignment Diskette, turn On the Disk Drive, select side 0 and set the head to track 34. Confirm that the pattern appears as shown in Figure 4. The amplitude of bursts 1 and 4 must be equal to or less than the amplitudes of bursts 2 and 3.

If the azimuth of Head 0 checks good, select side 1 and repeat the above procedure to check the azimuth of Head 1.

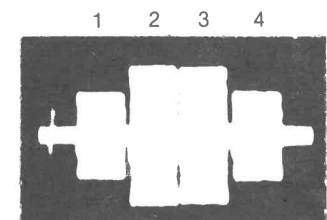


Figure 4

R44 ADJUSTMENT (PULSE DURATION)

Connect the input of a scope to pin 3 of IC7. Set the horizontal sweep time to $20\mu\text{s}$ and vertical voltage range to 2V. Turn the Computer On. Adjust R44 for a pulse width of $42\mu\text{Sec}$, see Figure 5.



Figure 5

DISK DRIVE CLEANING

Use a lint free cloth or swab dampened with 91% isopropyl alcohol to clean the Disk Drive Heads and dry with a lint free cloth.

ALIGNMENT

EQUIPMENT REQUIRED

A test program or a Disk Drive Tester is required which will turn On the Disk Drive, select side 0 or 1 and step the head to the track specified in the alignment procedures. Use 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 PROGRAM

The following Basic programs can be used to step the Disk Drive head to the track specified by the user. To stop the program, press the Ctrl and Break keys.

```
Operates 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
```

```
Operates 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 (R1) on the Motor Control Board for a speed of 300 rpm \pm 4.5rpm.

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 Spindle Speed Control (R1) on the Motor Control Board until the strobe pattern appears to stand still.

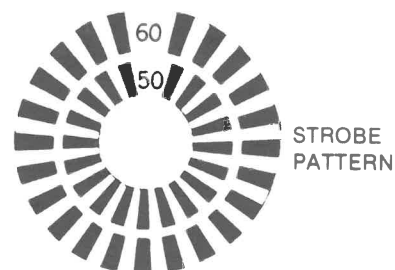


Figure 1

RADIAL HEAD ALIGNMENT

Connect the channel A input of a dual trace scope to pin B1 of Connector ST10, channel B to pin B3 of Connector ST10 and the external trigger input to pin A3 of Connector ST10. Set the scope to add mode with one channel inverted, the sweep time to 20mSec and the voltage range to .2V. 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, Side 0. The cats-eye pattern shown in Figure 2 should be displayed on the scope.

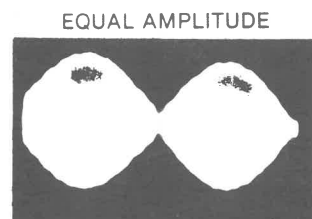


Figure 2

The amplitude of the two lobes displayed must be within 70% of each other. If the lobes are out of tolerance, loosen two screws holding Stepping Motor (M4). Adjust Motor until the two lobes are equal in amplitude and tighten Motor mount screws. 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. If Disk Drive is a double sided drive, select side 1 and check Radial alignment of Head 1 using the above procedures.

TROUBLESHOOTING (Continued)

INDEX DETECTOR

To check the Index Detector Circuits, insert a diskette into the Drive and close the door. Type in and run the Basic program listed under "Continuous Operation of Disk Drive" to keep the drive running. Check for pulses at pin 13 of IC 10K. If pulses are missing, check pin 8 of Connector J7 for good connection and check the Drive Cable. If the connector and cable check good, refer to the "Index Detector" section of the Disk Drive Troubleshooting. If pulses are present at pin 13 of IC 10K, check for pulses at pin 12 of IC 10K. If pulses are missing, check IC 10K.

TRACK 00 DETECTOR

Disk Drive Head will not move back to track 00 or 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
```

If the number on the Monitor screen is not correct or does not change when the Head is moved On and Off Track 00, make the following checks while the above program is running.

Check for a logic Low at pin 1 of IC 10K when the Head is On Track 00 and a logic High when the Head is Off Track 00. If the readings are not correct check pin 26 of Connector J7 for good connection and check the Disk Drive Cable. If the connector and cable check good refer to the "Track 00 Detector" section of the Disk Drive Troubleshooting. If the reading is correct at pin 1 of IC 10K, check for a logic High at pin 2 of IC 10K 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 IC 10K. If the reading is correct, check for a logic High with pulses at pin 8 of IC 9J. If the reading is not correct, check the Disk Drive Controller IC (9L). If the reading is correct, check for a logic High with pulses at pin 8 of IC 9J 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 IC 9J. If the reading is correct, check IC 9L.

HEAD POSITION MOTOR

Head Position Motor does not work on Drive A or B. Run the following Basic program listed below. The program continuously alternates the Disk Drive Head on Drive B between track 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 Disk Drive Controller IC (9L). If pulses are missing, check IC 9L. If pulses are present, check for pulses at pins 3 and 6 of IC 10M. If pulses are missing, check IC 10M. If pulses are present, check pins 18 and 20 of Connector J7 for good connections and check the Disk Drive Cable.

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ATT
MODEL 6300

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	DISK DRIVE		NTE116	ECG116	SK3311	212-76-02	
D2,3,4,6	SB130		NTE519	ECG519	SK3100/519	103-131	
D7 thru D14	1X8055		NTE5005A	ECG5005A	SK3A3/5005A		
D15	1N4148		NTE834	ECG834	SK3569/834	221-121	
DA1,2,3	1N746A		NTE74LS04	ECG74LS04	SK7CT04	HE-443-755	
IC1	DAN403		NTE7438	ECG7438	SK7438	HE-443-77	
IC2	L298		NTE955M	ECG955M	SK3564/955M	221-Z9042	
IC3	LM339N		NTE7407	ECG7407	SK7407	HE-443-1020	
IC4	SN94510CN		NTE159	ECG159	SK3466/159	121-Z9003	
IC5	T74LS04B1		NTE123AP+	ECG123AP+	SK3854/123AP+	121-Z9000A+	
IC6	MC3470N						
IC7	MC3470AP						
IC8	ON7438N						
IC9	TDB055DP						
Q1	SN7407N						
Q2,3	ULA9RB015E						
Q4	BSR60						
	BC307B						
	BC237B						

+ Rotate 180° to conform with original lead configuration.

PARTS LIST AND DESCRIPTION (Continued)

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

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
C1	DISK DRIVE 4.7 3% Tant	

ITEM No.	RATING	MFGR. PART No.

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	WORKMAN PART No.
RP1	DISK DRIVE Resistor Network (1)			

(1) Contains Thirteen (13 ea.) 150 Ohm. In Drive (A) Only.

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

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
R44	DISK DRIVE Pulse Duration	20K		

COILS (RF-IF)

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

ITEM No.	FUNCTION	MFGR. PART No.

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
D5	DISK DRIVE		
HEAD 0	LED		Activity, Red
HEAD 1	R/W Erase Head		
M1	R/W Erase Head		
M2	Track 0 Detector		
M3	Index Detector		
M4	Write Protect Sensor		
SW1	Head Position Motor		
SW2	DIP Switch		
	DIP Switch		

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DISASSEMBLY

CABINET REMOVAL

Insert 1/4" flat blade screwdriver into each of two slots located at the front underside of cabinet, press tabs down and out to remove cabinet faceplate. Remove four screws and clamps located at front corners of cabinet, remove cabinet front and slide cabinet back off.

MAIN BOARD REMOVAL

Remove two screws in brackets located at the rear of main board. Remove brackets, disconnect plugs from main board and slide main board backwards and out.

CRT REMOVAL

Disconnect CRT Socket, Yoke Connector and High Voltage Anode Lead and slide CRT forward out of chassis.

MISCELLANEOUS ADJUSTMENTS

NOTE: Run crosshatch program to display crosshatch pattern on CRT.

1 REM CROSSHAT, PUTS CROSSHATCH ON SCREEN
 2 REM IBM
 3 REM CHANGE 7 IN LINE 20 TO 15 TO GET HIGH INTENSITY LINES
 10 SCREEN 0,1:WIDTH 80
 20 CLS:COLOR 7,0:KEY OFF
 30 FOR X = 1 TO 1920
 40 PRINT CHR\$(197);
 50 NEXT X
 60 GOTO 60

B + ADJUSTMENT

Connect a voltmeter, negative side to ground, positive side to collector of Voltage Regulator Transistor (TR1). Adjust 12V Adjust Control (RV1) for 12.0V.

SCREEN

Adjust Screen Control (RV11) for the proper luminance level of display with brightness and contrast controls at maximum.

FOCUS

Adjust Focus Control (RV12) for sharpest display possible.

VERTICAL SIZE ADJUSTMENT

Adjust Vertical Size Control (RV5) for the desired height of display.

VERTICAL AND HORIZONTAL HOLD ADJUSTMENT

Adjust Vertical Hold Control (RV4) and Horizontal Frequency Control (RV9) for the most stable display.

HORIZONTAL SIZE ADJUSTMENT

Adjust Horizontal Size Coil (B2) for proper horizontal size.

VERTICAL LINEARITY

Adjust Vertical Linearity Control (RV6) for even spacing between horizontal lines on CRT.

HORIZONTAL CENTERING

Adjust Horizontal Phase Control (RV10) for proper horizontal centering on CRT.

HORIZONTAL LINEARITY ADJUSTMENT

Adjust Horizontal Linearity Coil (B3) for even spacing of vertical lines on CRT.

KEYBOARD, SYSTEM BOARD, BUS CONVERTER BOARD, POWER SUPPLY

See Folder CSCS14

DISK DRIVE

See Folder CSCS14-A

CRT CONTROLLER BOARD

See Folder CSCS14-B

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MODEL 6300
CSCS14-C

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CSCS14-C
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MODEL 6300

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86CS14989 DATE 12-86

SCHEMATICS NOTES

---* Circuitry not used in some versions.

--- Circuitry used in some versions.

o See parts list.

⊕ Ground

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

Supply voltage maintained as shown at input.

Voltages measured with digital meter.

Voltages taken with Computer in Power Up mode. No diskette in Disk Drive. No keys depressed. Diagnostics messages and Primary Boot-Strap DISK READ ERROR are displayed on the Monitor screen. Waveforms taken while running the following Basic program.

```
1 REM COLORBAR, PUTS VERTICAL COLOR BARS ON
  SCREEN
2 REM USE WHEN RUNNING MONITOR?
3 REM AT&T 6300
4 REM BLK, RED, MAGENTA, GREEN, CYAN, BROWN,
  BLUE, HI-INTENSITY WHITE
10 DATA 0,4,5,2,3,6,1,15
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
```

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 9 cm. width with DC reference voltage given at the bottom line of each waveform.

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

Terminal identification may not be found on unit.

Resistors are $\frac{1}{2}W$ or less, 5% unless noted.

Value in () used in some versions.

DISASSEMBLY

CABINET REMOVAL

Insert $\frac{1}{4}$ " flat blade screwdriver into each of two slots located at the front underside of cabinet, press tabs down and out to remove cabinet faceplate. Remove four screws and clamps located at front corners of cabinet, remove cabinet front and slide cabinet back off.

MAIN BOARD REMOVAL

Remove two screws in brackets located at the rear of main board. Remove brackets, disconnect plugs from main board and slide main board backwards and out.

CRT REMOVAL

Disconnect CRT Socket, Yoke Connector and High Voltage Anode Lead and slide CRT forward out of chassis.

MISCELLANEOUS ADJUSTMENTS

NOTE: Run crosshatch program to display crosshatch pattern on CRT.

```
1 REM CROSSHAT, PUTS CROSSHATCH ON SCREEN
2 REM IBM
3 REM CHANGE 7 IN LINE 20 TO 15 TO GET HIGH
  INTENSITY LINES
10 SCREEN 0,1:WIDTH 80
20 CLS:COLOR 7,0:KEY OFF
30 FOR X= 1 TO 1920
40 PRINT CHR$(197);
50 NEXT X
60 GOTO 60
```

B + ADJUSTMENT

Connect a voltmeter, negative side to ground, positive side to collector of Voltage Regulator Transistor (TR1). Adjust 12V Adjust Control (RV1) for 12.0V.

SCREEN

Adjust Screen Control (RV11) for the proper luminance level of display with brightness and contrast controls at maximum.

FOCUS

Adjust Focus Control (RV12) for sharpest display possible.

VERTICAL SIZE ADJUSTMENT

Adjust Vertical Size Control (RV5) for the desired height of display.

VERTICAL AND HORIZONTAL HOLD ADJUSTMENT

Adjust Vertical Hold Control (RV4) and Horizontal Frequency Control (RV9) for the most stable display.

HORIZONTAL SIZE ADJUSTMENT

Adjust Horizontal Size Coil (B2) for proper horizontal size.

VERTICAL LINEARITY

Adjust Vertical Linearity Control (RV6) for even spacing between horizontal lines on CRT.

HORIZONTAL CENTERING

Adjust Horizontal Phase Control (RV10) for proper horizontal centering on CRT.

HORIZONTAL LINEARITY ADJUSTMENT

Adjust Horizontal Linearity Coil (B3) for even spacing of vertical lines on CRT.

SAMS COMP

BUS

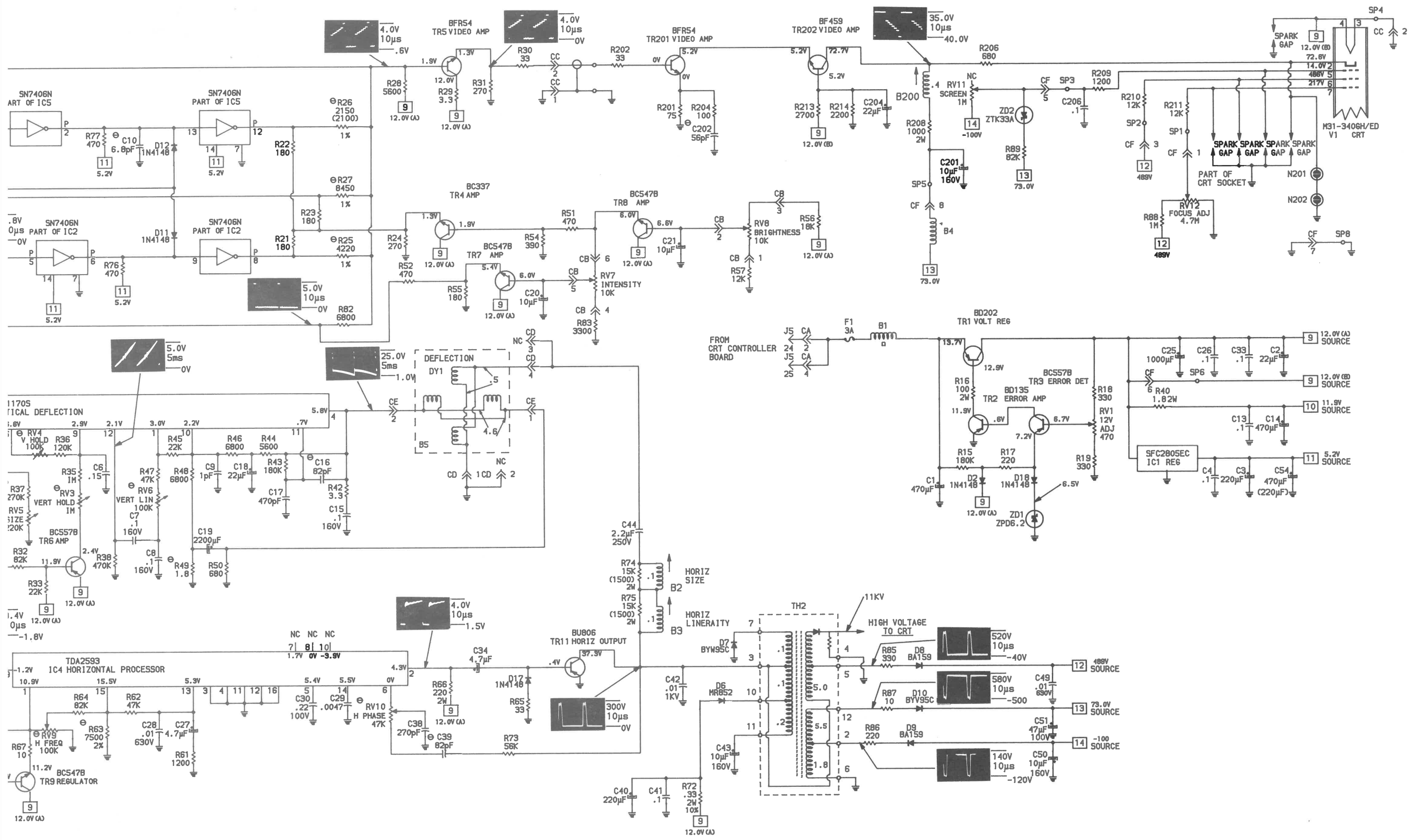
ATT
MODEL 6300
CSCS14-C

Disassembly Instructions ...
GridTrace Location Guide
Main Board
IC Terminal Guides
Miscellaneous Adjustments
Parts List
Photos
CRT Board

SAMS™ How
4300 V

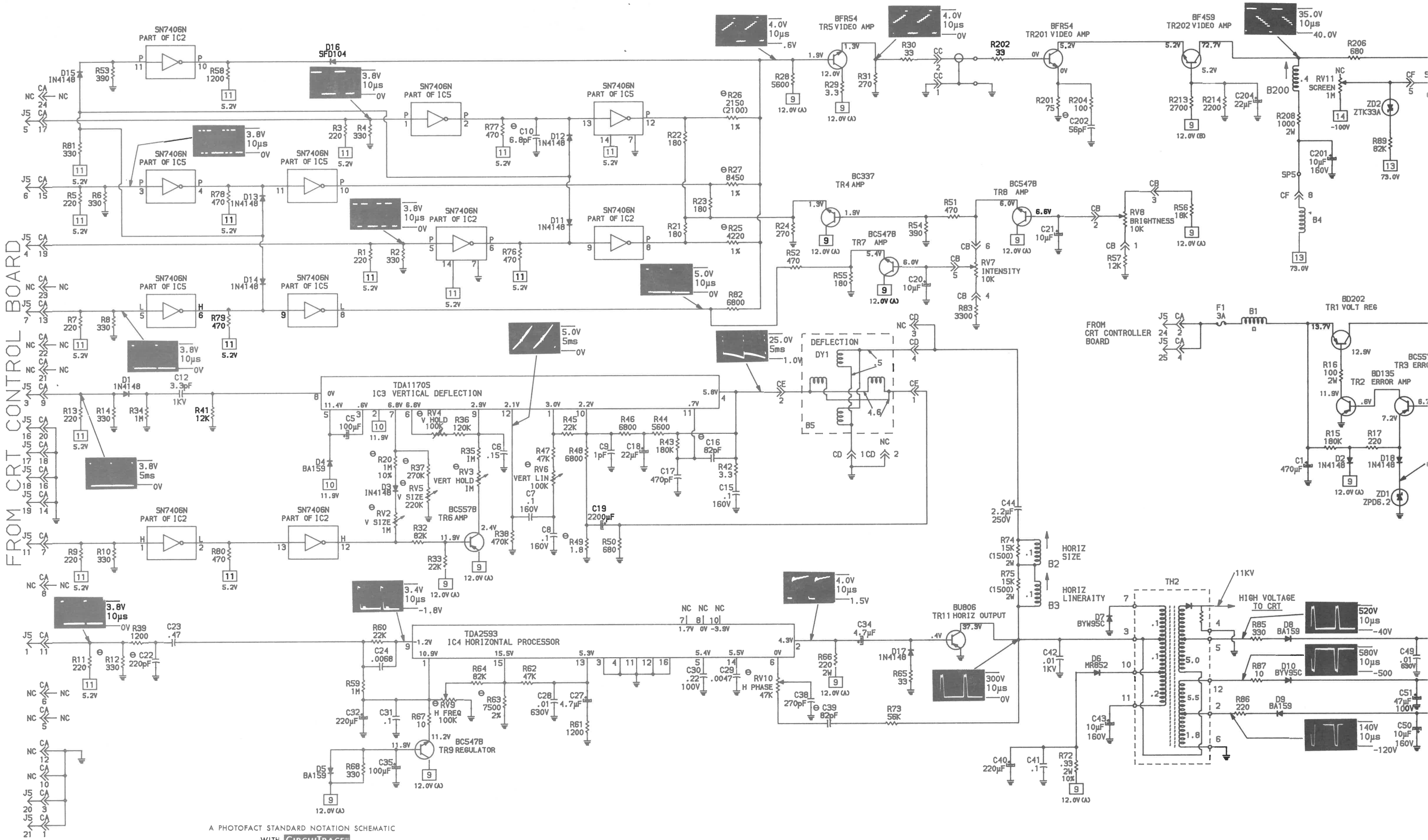
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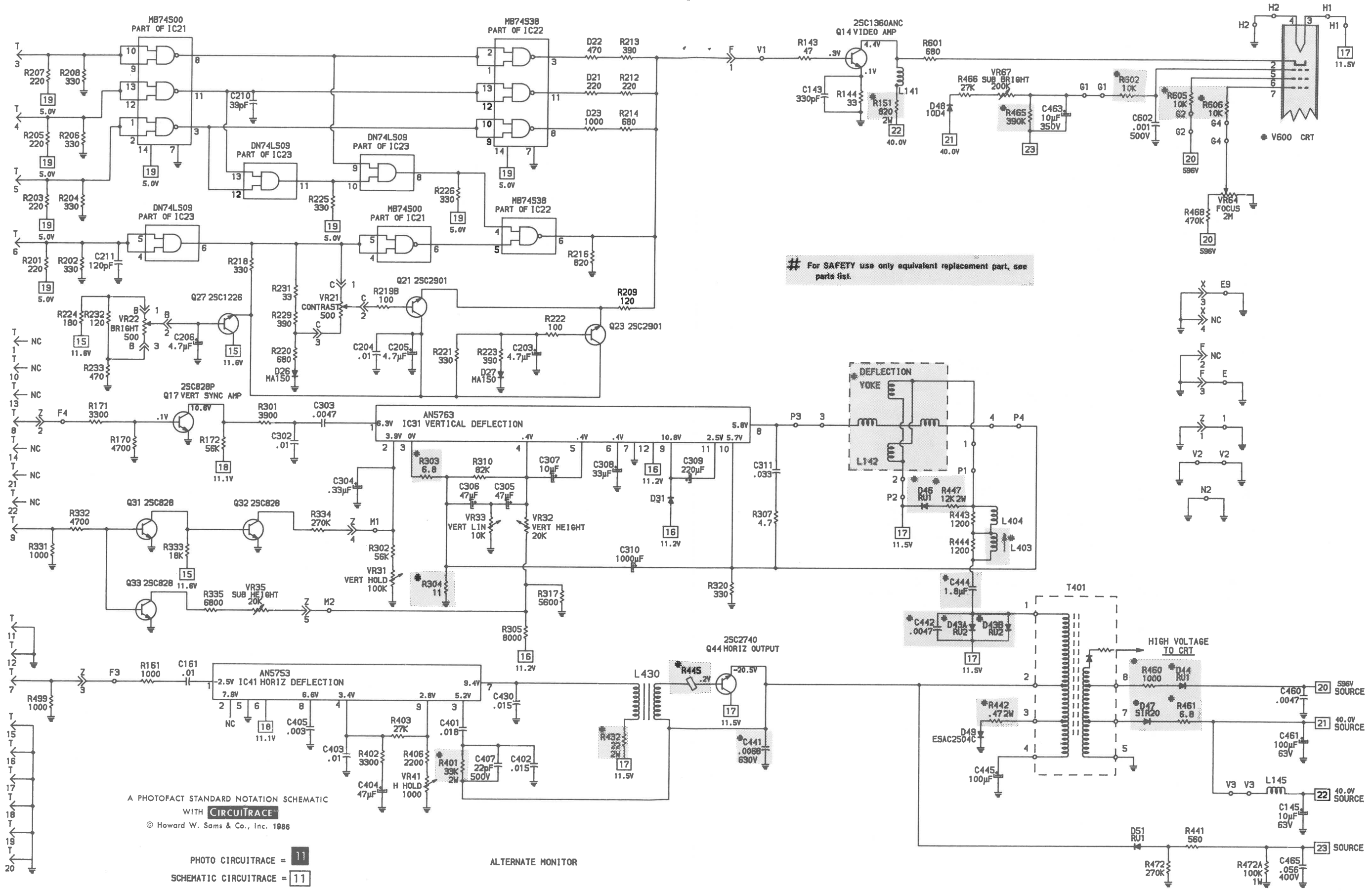
ATT
HANTREX MONITOR MODEL 6300

FROM CRT CONTROL BOARD

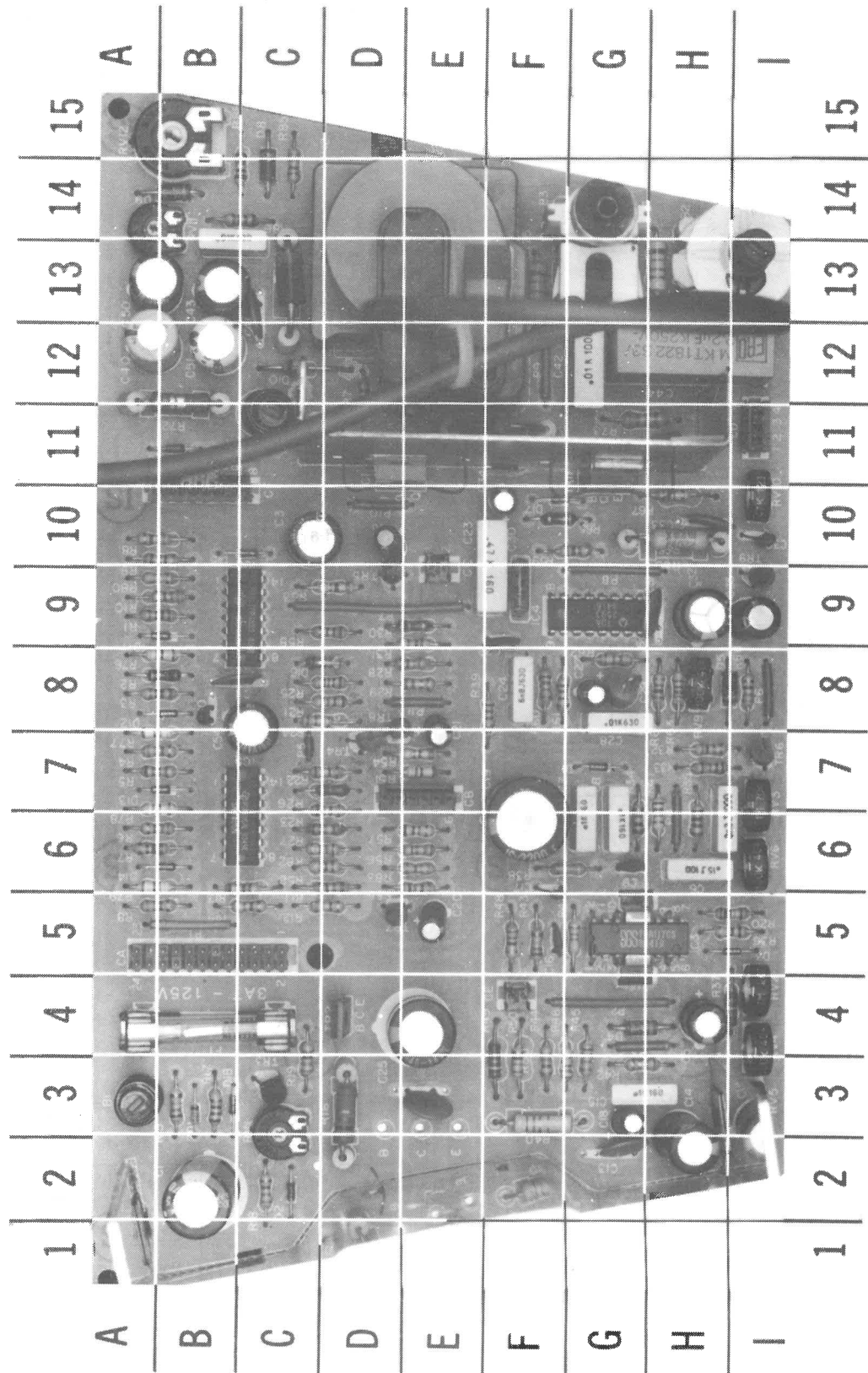


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HANTREX MONITOR

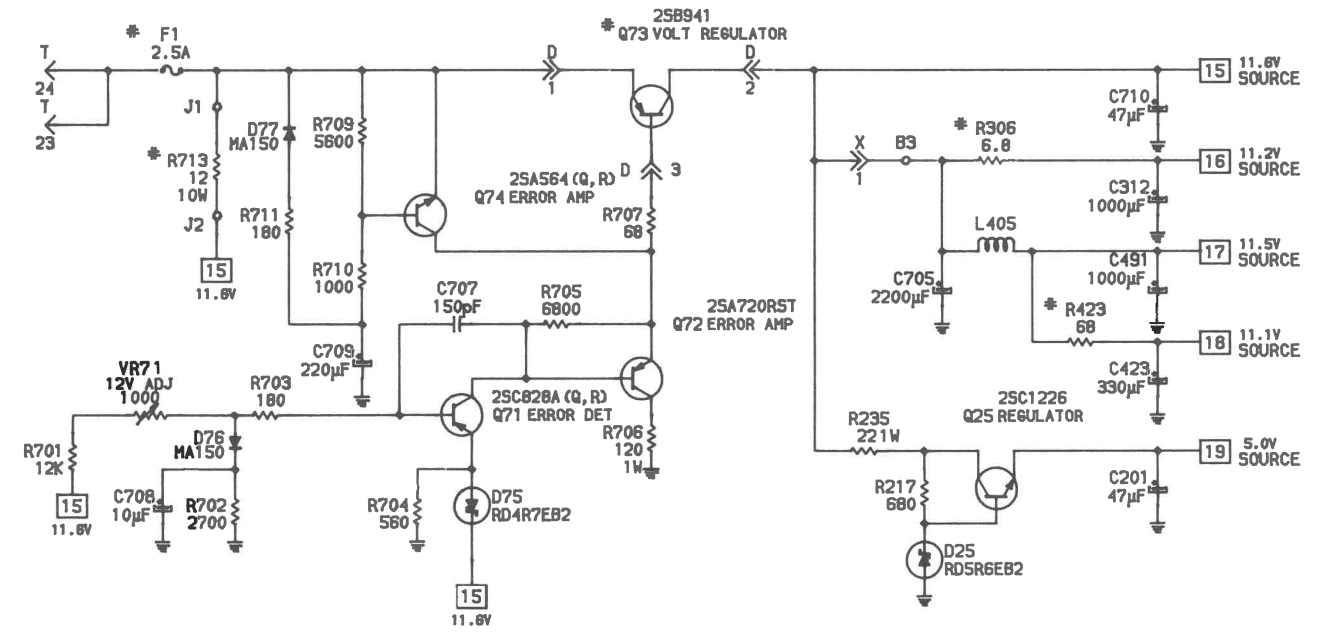


CSCS14-C
ATT
MODEL 6300



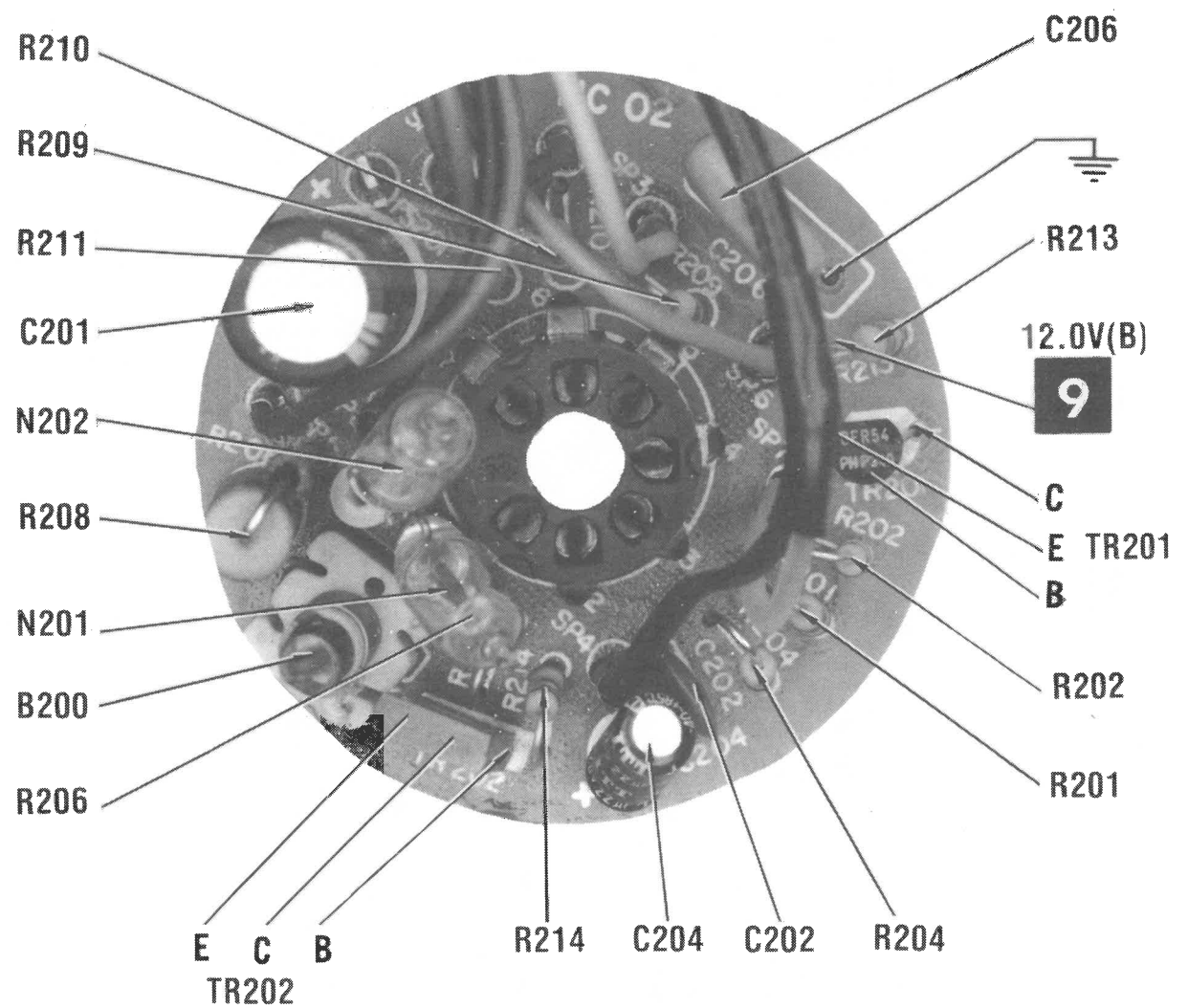
MAIN BOARD

A Howard W. Sams GRIDTRACE™ Photo



ALTERNATE MONITOR POWER SUPPLY

ATT
MODEL 6300



MAIN BOARD GridTrace LOCATION GUIDE

B1	A-3	IC1	D-11	R73	G-11
B2	I-13	IC2	C-9	R74	H-13
B3	G-14	IC3	G-5	R75	F-13
B4	C-11	IC4	G-9	R76	B-8
C1	B-2	IC5	C-6	R77	A-7
C2	D-10	R1	A-9	R78	B-7
C3	C-10	R2	B-8	R79	A-6
C4	B-8	R3	B-8	R80	B-9
C5	H-4	R4	B-7	R81	A-10
C6	H-6	R5	B-7	R82	D-6
C7	G-6	R6	B-6	R83	E-6
C8	G-6	R7	A-6	R85	C-14
C9	G-6	R8	A-5	R86	B-14
C10	B-8	R9	B-10	R87	D-12
C12	H-6	R10	B-9	R88	B-14
C13	G-2	R11	D-6	R89	C-11
C14	H-2	R12	D-5	RV1	C-2
C15	G-3	R13	C-6	RV2	I-3
C16	F-5	R14	C-5	RV3	I-7
C17	F-6	R15	B-3	RV4	I-3
C18	G-3	R16	D-3	RV5	I-3
C19	F-6	R17	B-3	RV6	I-6
C20	E-5	R18	C-2	RV9	H-8
C21	E-7	R19	C-3	RV10	I-10
C22	F-9	R20	I-5	RV11	A-14
C23	F-9	R21	D-8	RV12	B-15
C24	F-8	R22	D-7	TH2	E-13
C25	E-4	R23	D-7	TR1	E-2
C26	E-3	R24	C-8	TR2	D-4
C27	G-8	R25	D-8	TR3	C-3
C28	G-8	R26	D-7	TR4	D-7
C29	G-8	R27	D-6	TR5	D-9
C30	F-9	R28	E-8	TR6	I-7
C31	H-9	R29	E-8	TR7	D-5
C32	H-9	R30	E-9	TR8	D-8
C33	H-10	R31	E-9	TR9	I-9
C34	F-10	R32	H-7	TR11	G-11
C35	I-9	R33	H-7	ZD1	B-3
C38	I-10	R34	G-6	ZD2	B-11
C39	H-11	R35	H-6		
C40	A-12	R36	I-5		
C41	C-13	R37	I-4		
C42	G-12	R38	G-6		
C43	B-13	R39	F-8		
C44	H-12	R40	F-3		
C49	B-14	R41	H-6		
C50	A-13	R42	G-3		
C51	B-12	R43	F-5		
C54	C-8	R44	F-3		
CA	B-5	R45	G-3		
CB	E-7	R46	G-3		
CC	E-9	R47	G-5		
CD	I-11	R48	F-5		
CE	F-4	R49	F-3		
CF	B-10	R50	F-3		
D1	G-7	R51	E-7		
D2	C-2	R52	D-6		
D3	I-5	R53	D-9		
D4	G-4	R54	E-7		
D5	I-8	R55	E-6		
D6	C-13	R56	E-6		
D7	F-11	R57	E-6		
D8	C-14	R58	D-9		
D9	B-14	R59	G-10		
D10	C-12	R60	F-8		
D11	B-9	R61	F-8		
D12	B-8	R62	G-8		
D13	B-7	R63	H-8		
D14	B-6	R64	H-8		
D15	C-10	R65	F-10		
D16	C-8	R66	H-10		
D17	F-10	R67	H-10		
D18	B-3	R68	I-8		
F1	B-4	R72	B-12		

CSCS14-C
ATT
MODEL 6300

TROUBLESHOOTING

POWER SUPPLY

Check the DC Line Fuse (F1). If open, check Voltage Regulator Transistor (TR1) and Horizontal Output Transistor (TR11). If F1 is good check for 13.7V at the emitter of TR1. If this voltage is missing check Filter Choke (B1) for an open. If 13.7V is present at the emitter of TR1, check for 12.0V at the collector of TR1. If the 12.0V is missing at the collector of TR1, check the voltages and components associated with Transistors TR2, TR3 and TR11. If 12.0V is present at the collector of TR1, refer to the Horizontal section of this Troubleshooting guide.

HORIZONTAL

If there is no horizontal sweep, check for 37.3V at the collector of the Horizontal Output Transistor (TR11). If this voltage is missing check Resistor R72 and Diode D6. If the voltage at collector of TR11 is approximately 12V, inject a horizontal signal at the base of TR11. If horizontal deflection is now present check voltages, waveforms and components associated with Horizontal Processor IC (IC4) and Regulator Transistor (TR9). If there is still no horizontal deflection, check the voltages, waveforms and components associated with Transistor TR11 and Horizontal Output Transformer (TH2). Check Diodes D6, D7, D9, D10 and associated components for defects. The High Voltage Rectifier is part of Transformer TH2 and if defective will affect the performance of the horizontal circuit. Horizontal Linearity or Width problems may be caused by Coils B3 and B2 being defective.

The following programs may be used to display different patterns on the CRT when troubleshooting Monitor.

```

1 REM DOTS, PUTS DOTS ON SCREEN
2 REM IBM
3 REM CHANGE 7 IN LINE 20 TO 15 FOR HIGH
  INTENSITY DOTS
10 SCREEN 0,1: WIDTH 80
20 CLS:COLOR 7,0:KEY OFF
30 FOR X = 1 TO 1920
40 PRINT CHR$(250);
50 NEXT X
60 GOTO 60
  
```

```

1 REM CROSSHAT, PUTS CROSSHATCH ON SCREEN
2 REM IBM
3 REM CHANGE 7 IN LINE 20 TO 15 TO GET HIGH
  INTENSITY LINES
10 SCREEN 0,;WIDTH 80
20 CLS:COLOR 7,0:KEY OFF
30 FOR X = 1 TO 1920
40 PRINT CHR$(197);
50 NEXT X
60 GOTO 60
  
```

VIDEO

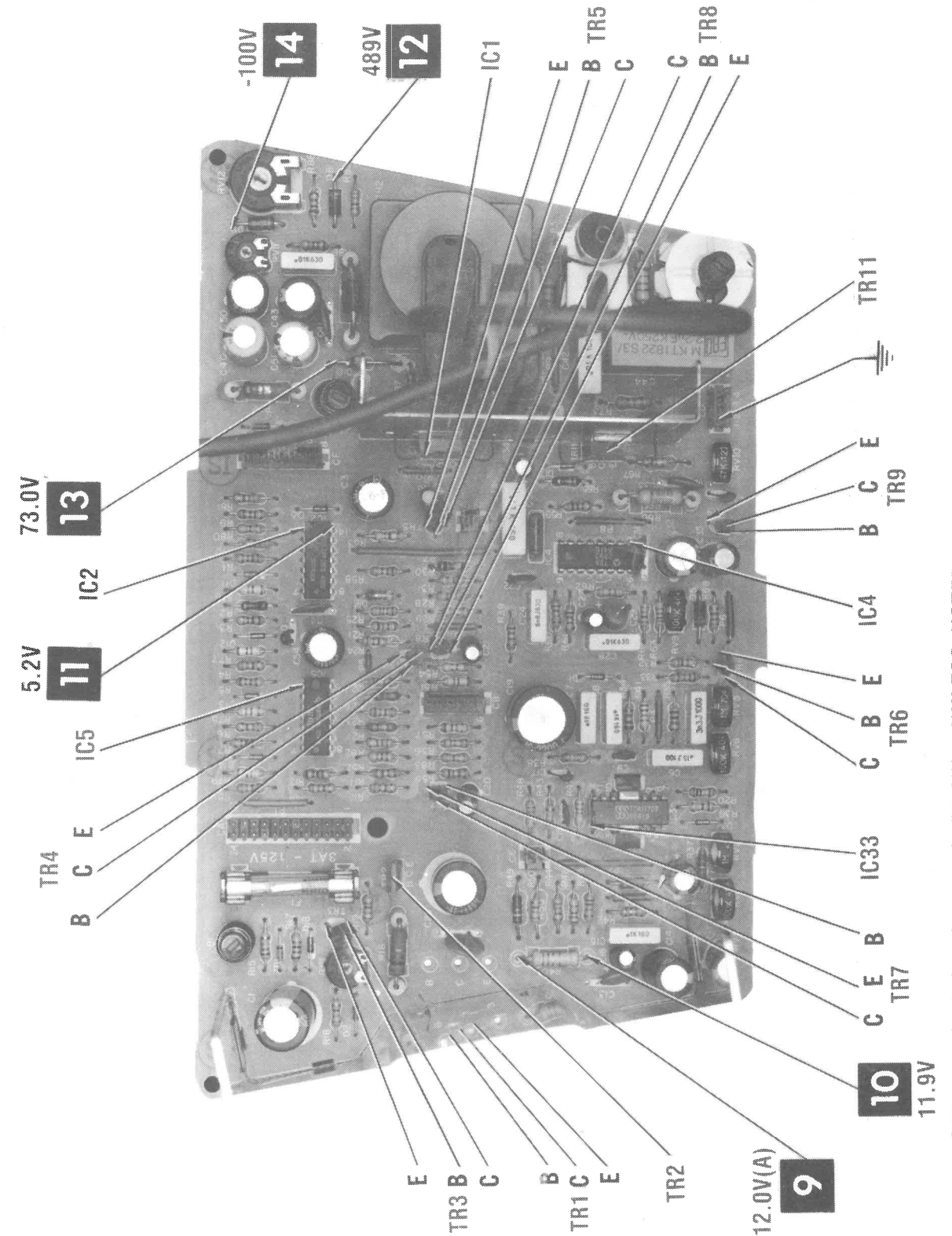
Check for the proper video information at pins 13, 15, 17 and 19 of Connector CA. If these signals are missing refer to the Computer section. If these signals are present check for the proper video information at the base of Video Amp Transistor (TR5). If missing check the voltages, waveforms and components associated with IC1, IC2, IC5 and Transistors TR4, TR7, TR8. If the proper video signals are present at the base of Transistor TR5, check the voltages, waveforms and components associated with Transistors TR5, TR201, TR202 and the CRT. If there is inadequate Brightness or Contrast on CRT check TR4, TR7 and TR8 and associated components for defects.

VERTICAL

If there is no vertical sweep check for the proper vertical waveform at pin 4 of Vertical Deflection IC (IC3). If this waveform is missing check the voltages, waveforms and components associated with IC3. Check the vertical winding of the Deflection Yoke (DY1) for an open. Vertical linearity or height problems may be caused by Electrolytics C5, C18, C19 and associated components being defective.

SYNC

Check for the proper vertical and horizontal sync signals at pins 9 and 11 of Connector CA. If these signals are missing refer to the Computer section. If there is no horizontal sync check the voltages, waveforms and components associated with pins 1, 9, and 15 of Horizontal Processor IC (IC4). If there is no vertical sync check the voltages, waveforms and components associated with pin 8 of the Vertical Deflection IC (IC3).



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

ATT
MODEL 6300

PARTS LIST AND DESCRIPTION (Continued)

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

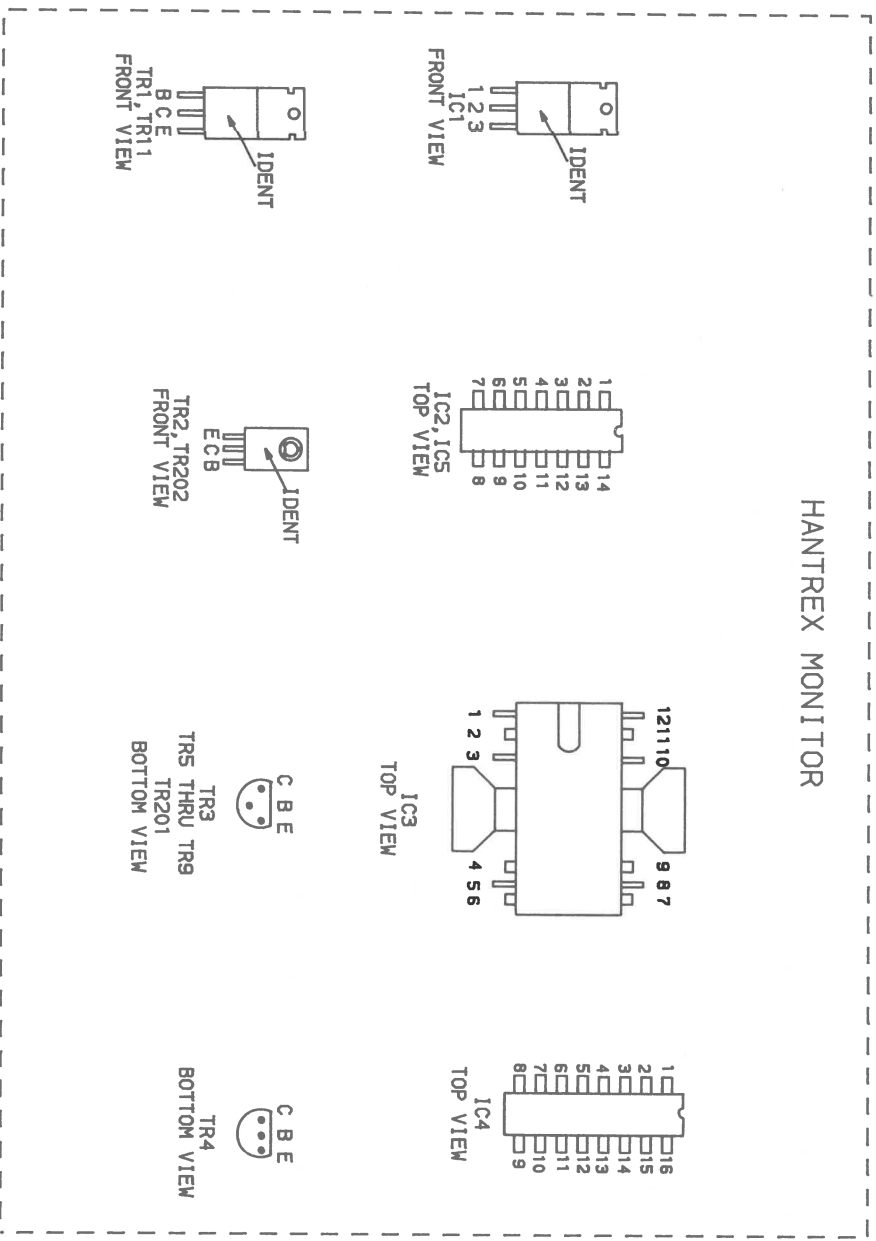
FUSE DEVICES # For SAFETY use only equivalent replacement part.

ITEM NO.	DESCRIPTION	MFG. PART NO.		NOTES
		DEVICE	HOLDER	
F1	3A @ 125V SLOW BLOW			

MISCELLANEOUS

ITEM No.	PART NAME	MFG. PART No.	NOTES
V1	CRT	M31-340GHED	(Alternates) E2710B31-SDHT, R5120B31SDHT, V31-FT911TGH
N201	Neon Lamp		
N202	Neon Lamp		

TERMINAL GUIDES



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.	
HANTREX MONITOR							
D1 thru D3	1N4148		NTE519	ECG519	SK3100/519	103-131	
D4,5	BA159		NTE558	ECG558	SK3998/558	103-287 212-Z9000	
D6	MR852		NTE552	ECG552	SK9000/552		
D7	BYW95C		NTE580	ECG580	SK5036/580		
D8,9	SAME AS D4						
D10	BYV95C		NTE580	ECG580	SK5036/580	212-Z9000	
D11 thru D15	SAME AS D1						
D16	SFD104		NTE109	ECG109	SK3088	103-Z9001	
D17	SAME AS D1						
IC1	SFC2805EC		NTE960	ECG960	SK3591/960	221-Z9043 HE-443-698	
IC2	SN7406N		NTE7406	ECG7406	SK7406		
IC3	TDA1170S		NTE1289	ECG1289	SK9182/1289		
IC4	TDA2593						
IC5	SAME AS IC2						
TR1	BD202		NTE332	ECG332	SK9236/332	121-Z9035 121-Z9003+ 121-Z9036+	
TR2	BD135		NTE184	ECG184	SK3190/184		
TR3	BC557B		NTE159+	ECG159+	SK3466/159+		
TR4	BC337		NTE188+	ECG188+	SK3199/188+		
TR5	BFR54						
TR6	SAME AS TR3						
TR7 thru TR9	BC547B		NTE123AP+	ECG123AP+	SK3854/123AP+	121-Z9000A+	
TR11	BU806		NTE2315	ECG2315			
TR201	SAME AS TR5						
TR202	BF459		NTE157	ECG157	SK3747/157	121-Z9016	
ZD1	ZPD6.2		NTE5013A	ECG5013A	SK6A2/5013A	103-Z9008	
ZD2	ZTK33A		NTE615P	ECG615A	SK9179/615A	905-190	

+ Rotate 180° to conform with original lead configuration.

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.	
D25	MATSUSHITA MONITOR						
D26,7	RD5R6EB2		NTE5011A	EGG5011A	SK5A6/5011A	103-Z9007	
D31	MA150		NTE519	EGG519	SK3100/519	103-131	
D43A,B	RU2		NTE552	EGG552	SK9000/552	103-287	
D44,6	RU1		NTE552	EGG552	SK9000/552	103-287	
D47	S1R20		NTE116	EGG116	SK3313/116	212-76-02	
D48	10D4		NTE125	EGG125	SK3081/125	212-Z9000	
D49	ESAC2504C						
D51	SAME AS D44						
D75	RD4R7EB2		NTE5009A	EGG5009A	SK4A7/5009A	103-279-09	
D76,7	SAME AS D26						
IC21	MB74S00		NTE74S00	EGG74S00	SK74S00	HE-443-26	
IC22	MB74S38		NTE74S38	EGG74LS09		HE-443-898	
IC23	DN74LS09		NTE74LS09			HE-443-816	
IC31	AN5763						
	AN5762						
IC41	AN5753			EGG1629			
	AN5752						
Q14	2SC1360ANC		NTE199	EGG199	SK3132	121-972	
Q17	2SC828(P,Q)		NTE85	EGG85	SK3931/90	121-972*	
Q21,3	2SC2901		NTE123AP	EGG123AP	SK9433	121-Z9000A	
Q25,7	2SC1226		NTE186A	EGG186A	SK3357/186A	121-Z9008	
Q31 thru	2SC828		NTE85	EGG85	SK3931/90	121-972*	
Q33	2SC2740		NTE2311	EGG2311	SK9131	121-972*	
Q44	2SC828A(R,S)		NTE85	EGG85	SK3931/90	121-972*	
Q71	2SA720RST		NTE290A	EGG290A	SK3114A/290A	121-879*	
Q72	2SB941		NTE55	EGG55	SK3441/292	121-879*	
Q73	2SA564(Q,R)		NTE290A	EGG290A	SK3932/91		
Q74							

* Lead configuration may vary from original.

PARTS LIST AND DESCRIPTION (Continued)

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

CAPACITORS

ITEM No.	RATING	MFGR. PART No.
C10	6.8 NPO 50V	
C16	82 NPO 50V 5%	

ITEM No.	RATING	MFGR. PART No.
C22	220 N750 50V 5%	
C39	82 NPO 50V 5%	
C202	56 N150 50V 5%	

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	WORKMAN PART No.
R20	1M 1% 1/2W Carbon Film			
R25	4220 1% 1/2W Metal Film			
R26	2150 2% 1/2W Metal Film			
R27	8450 1% 1/2W Carbon Film			
R37	270K 1% 1/2W Carbon Film			
R49	1.8 2% 1/2W Carbon Film		HW1D8	
R63	7500 2% 1/2W Carbon Film		HW227	

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

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
RV1	12V Adjust	470		
RV2	V Size	1M		
RV3	V Hold	1M		
RV4	V Hold	100K		
RV5	V Size	220K		
RV6	L Lin	100K		
RV7	Intensity	10K		
RV8	Brightness	10K		
RV9	H Frequency	100K		
RV10	H Phase	47K		
RV11	G1 Adjust	1M		
RV12	Focus Adjust	4.7M		

COILS & TRANSFORMERS

ITEM No.	FUNCTION	MFGR. PART No.	OTHER IDENTIFICATION	NOTES
B1	RF Choke			
B2	Horiz Size		28020290 (1)	
B3	Horizontal Lin		28040070 (1)	
B200	Choke			
DY1	Deflection Yoke		TMD2522 (1)	
TH2	Horizontal Output		28024430 (1)	

(1) Number on unit.

MODEL 6300
ATT

CRT CONTROLLER BOARD

**KEYBOARD, SYSTEM BOARD,
BUS CONVERTER BOARD, POWER SUPPLY**

See Folder CSCS14

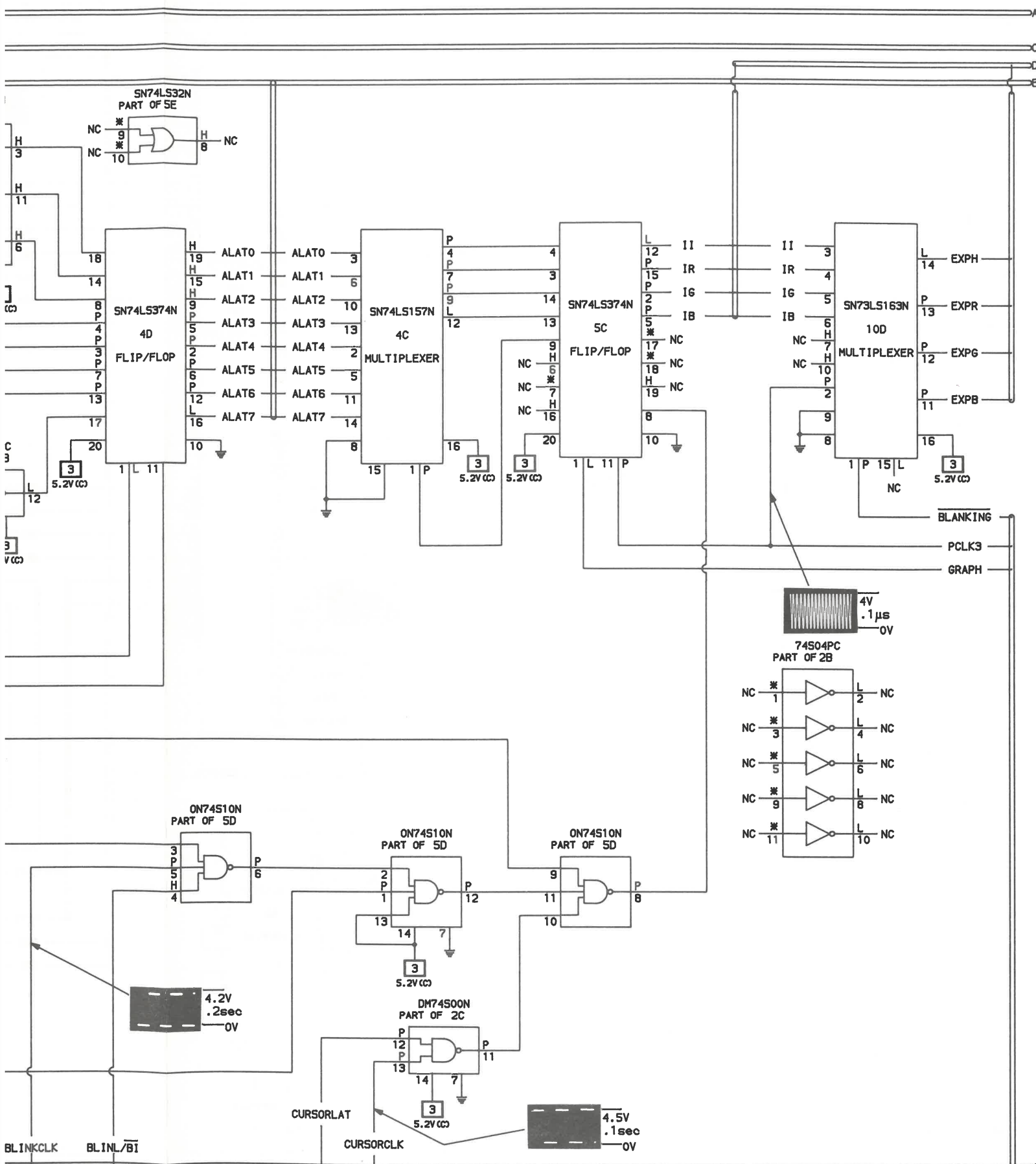
DISK DRIVE

See Folder CSCS14-A

MONITOR

See Folder CSCS14-C

CSCS14-B
ATT
MODEL 6300



ATT
MODEL 6300

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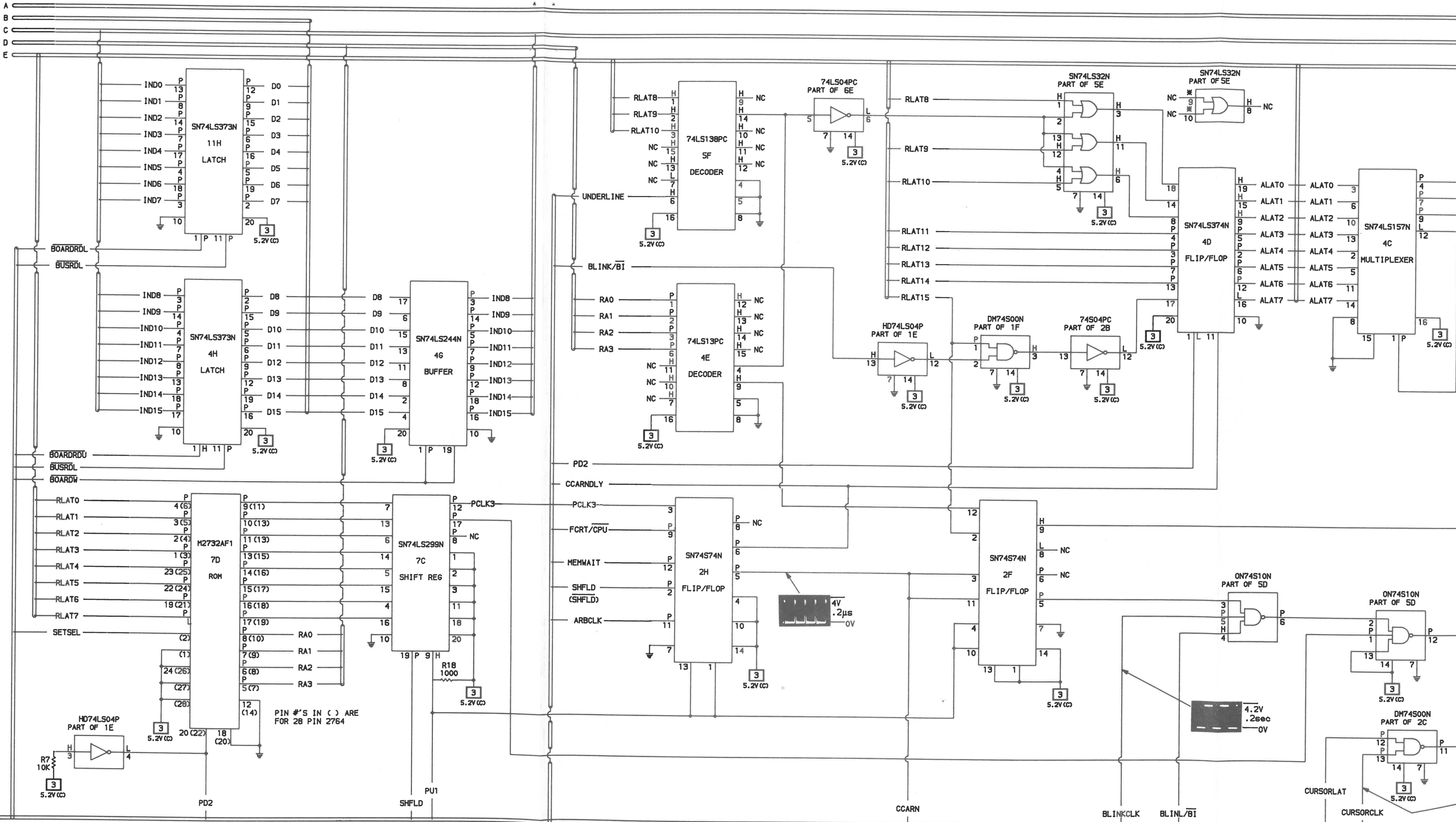
CSCS14-B
ATT
MODEL 6300

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CRT CONTROLLER BOARD

**KEYBOARD, SYSTEM BOARD,
BUS CONVERTER BOARD, POWER SUPPLY**

See Folder CSCS14

DISK DRIVE

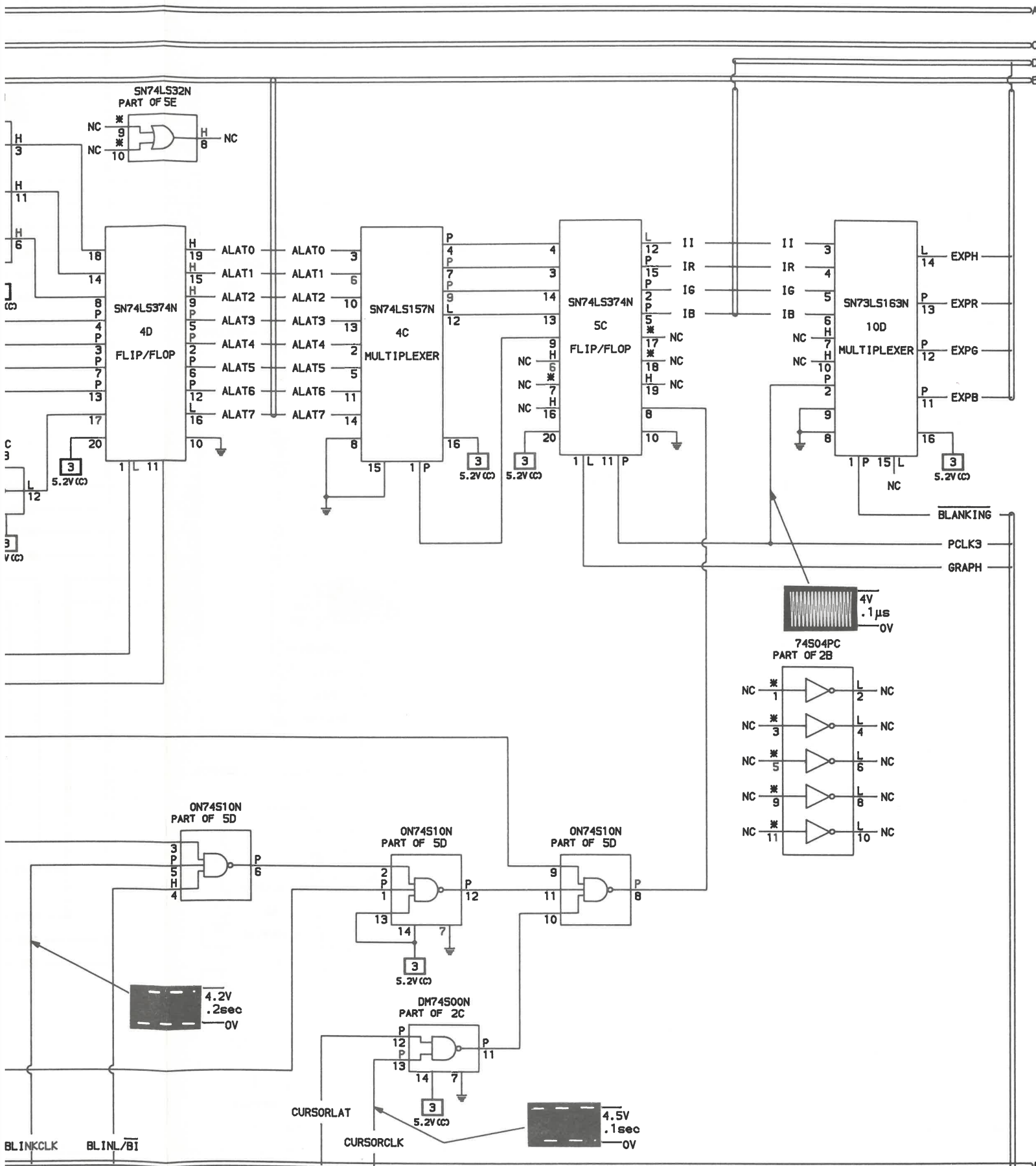
See Folder CSCS14-A

MONITOR

See Folder CSCS14-C

CSCS14-B
ATT MODEL 6300

CSCS14-B
ATT MODEL 6300



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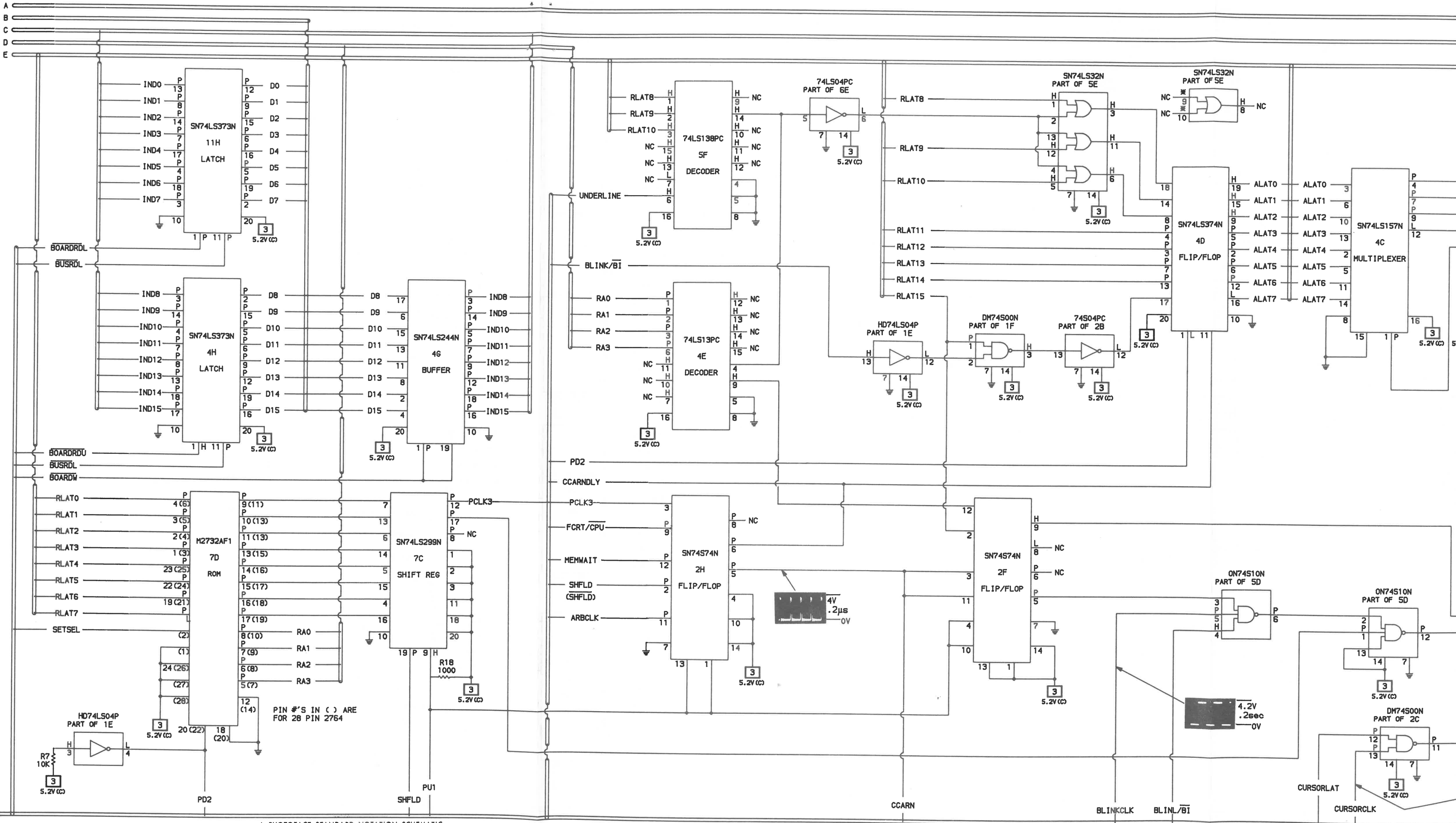
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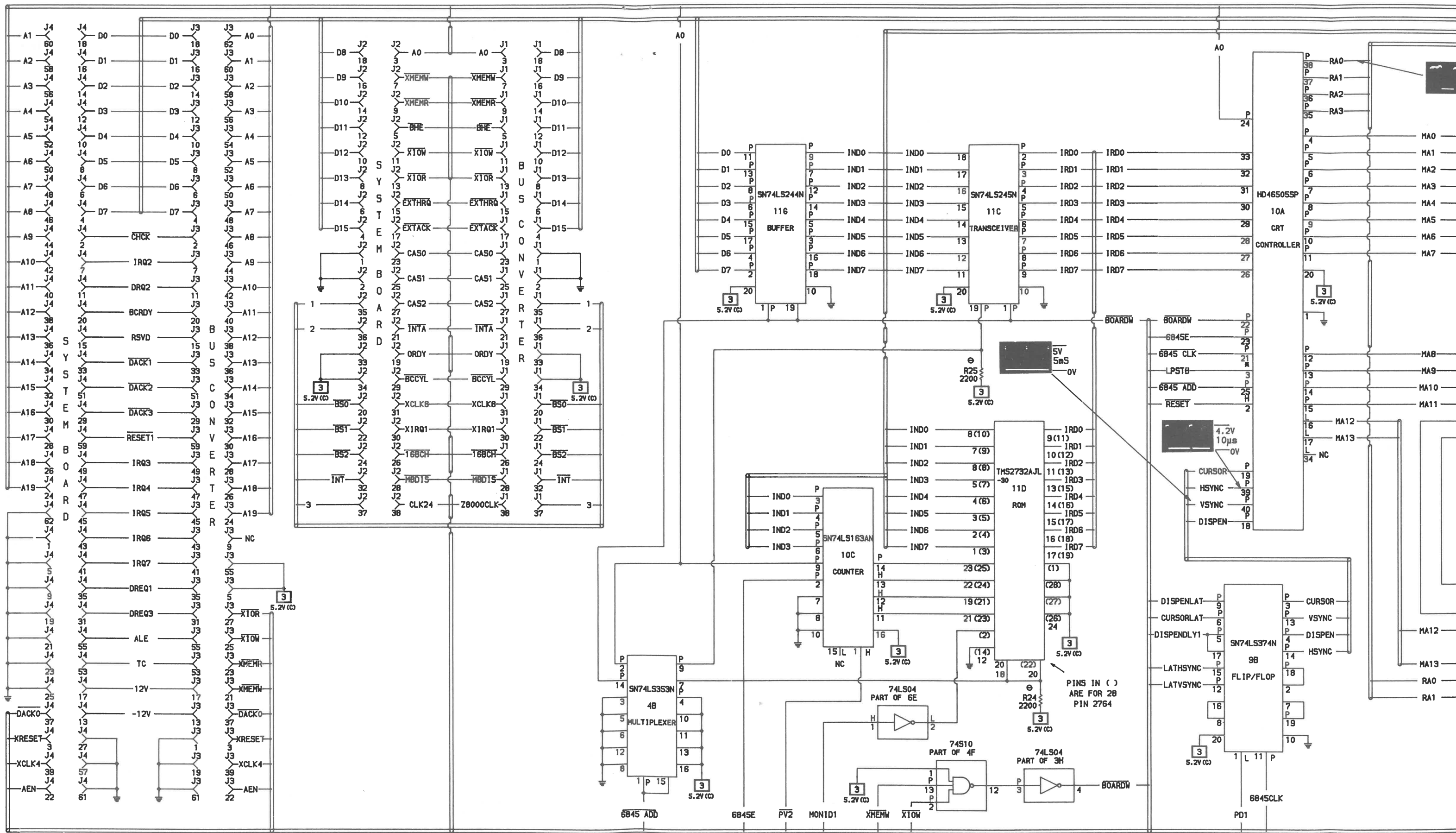
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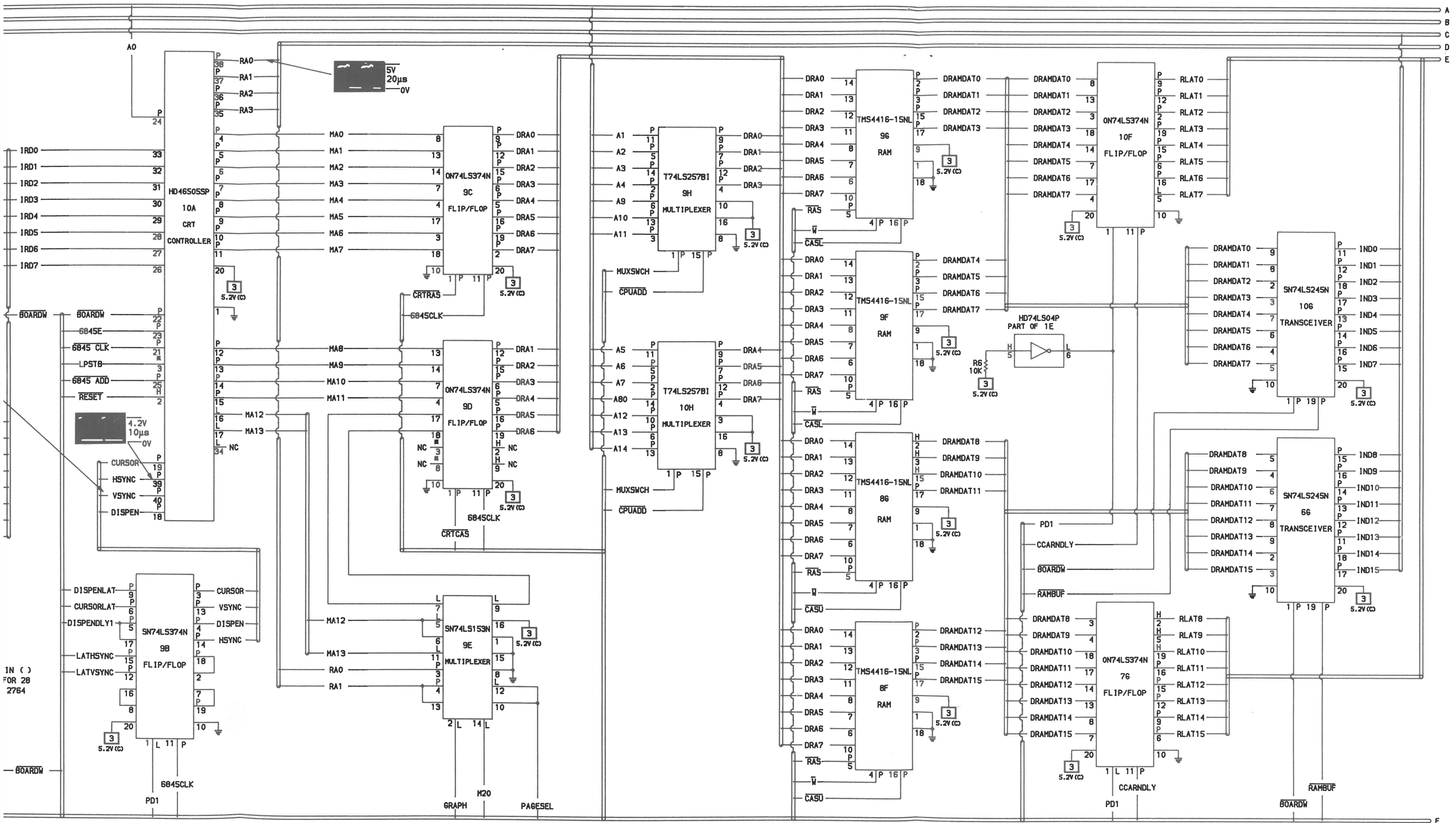


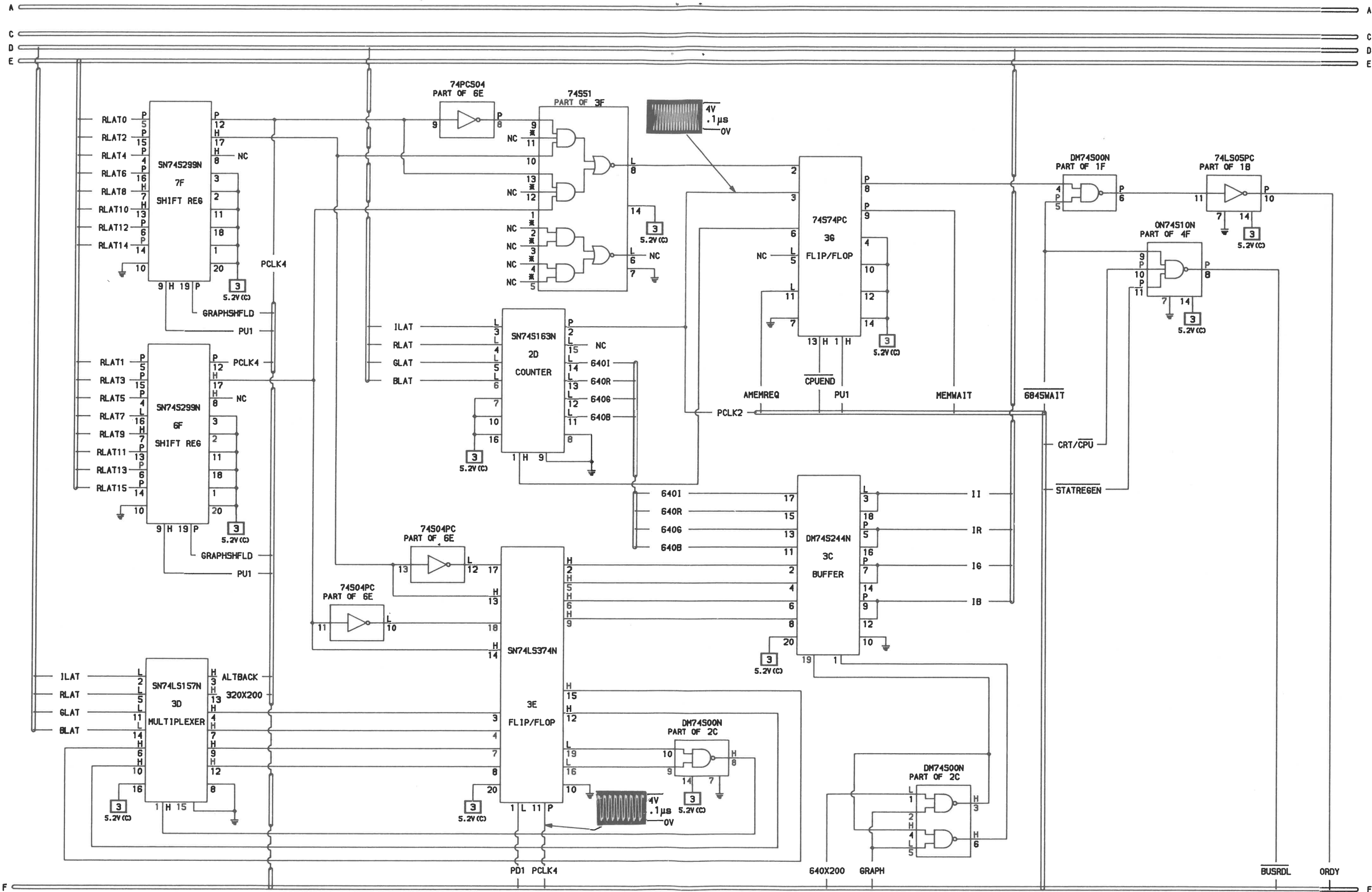
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CRT CONTROLLER BOARD



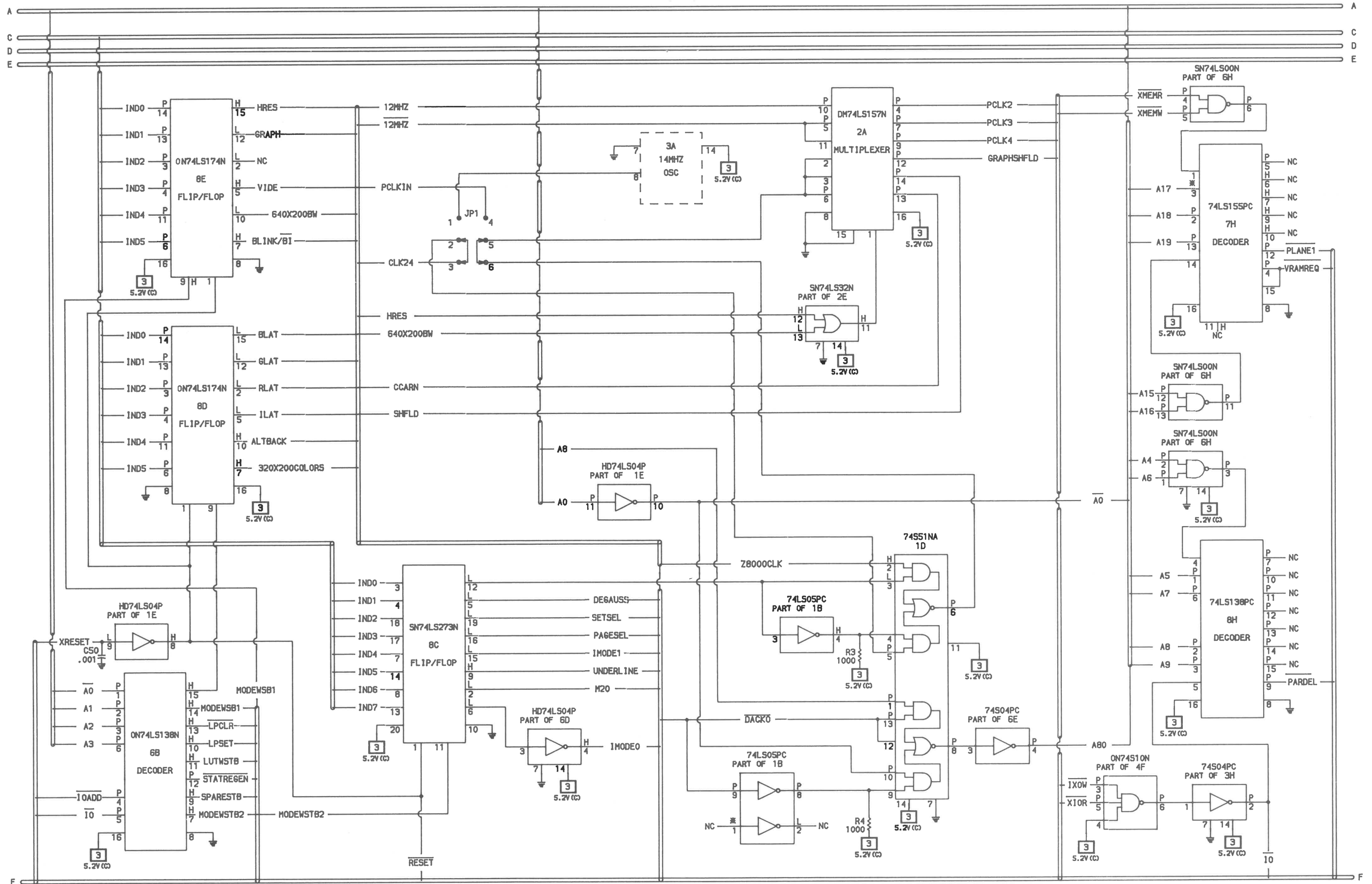
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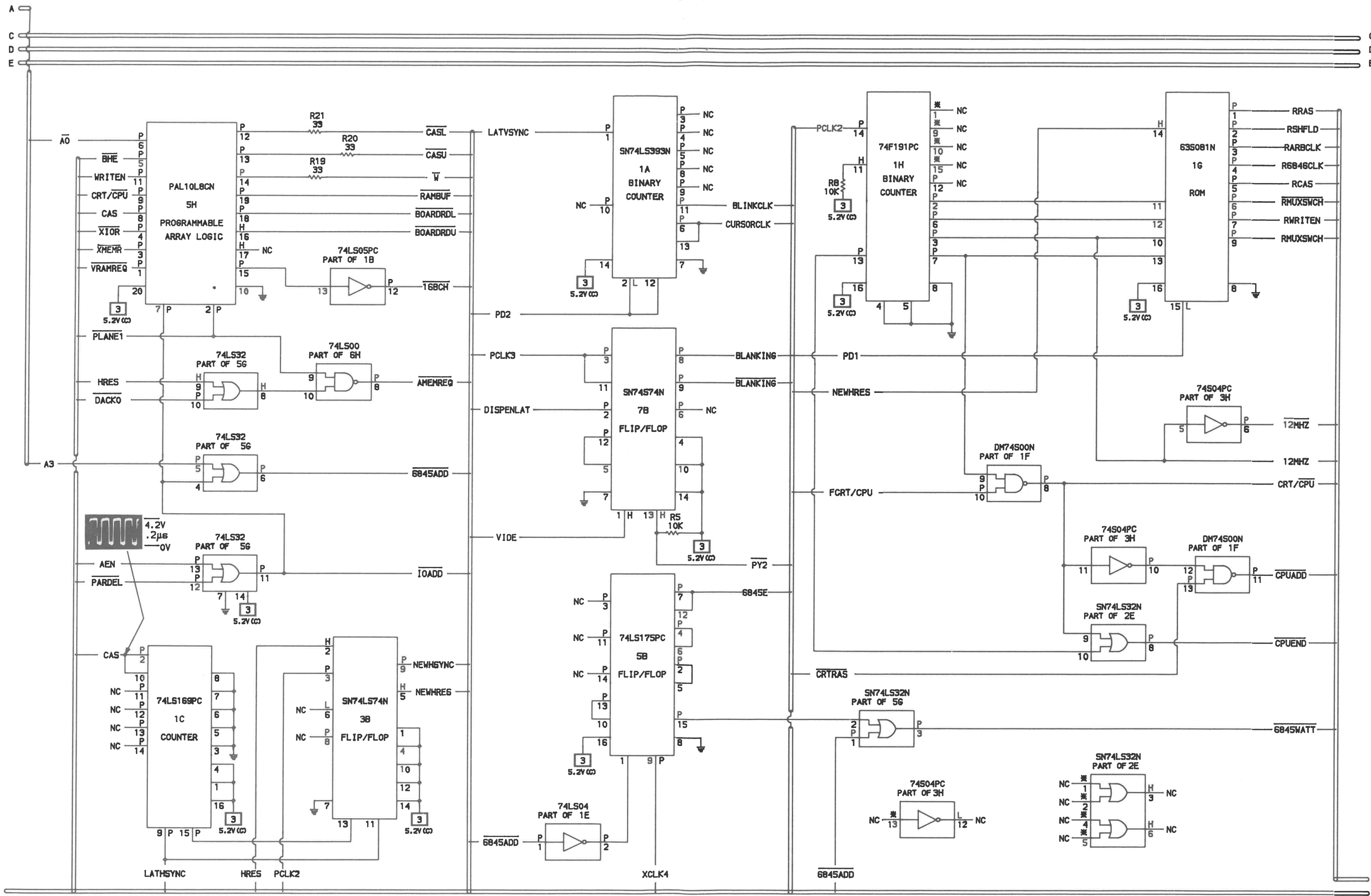


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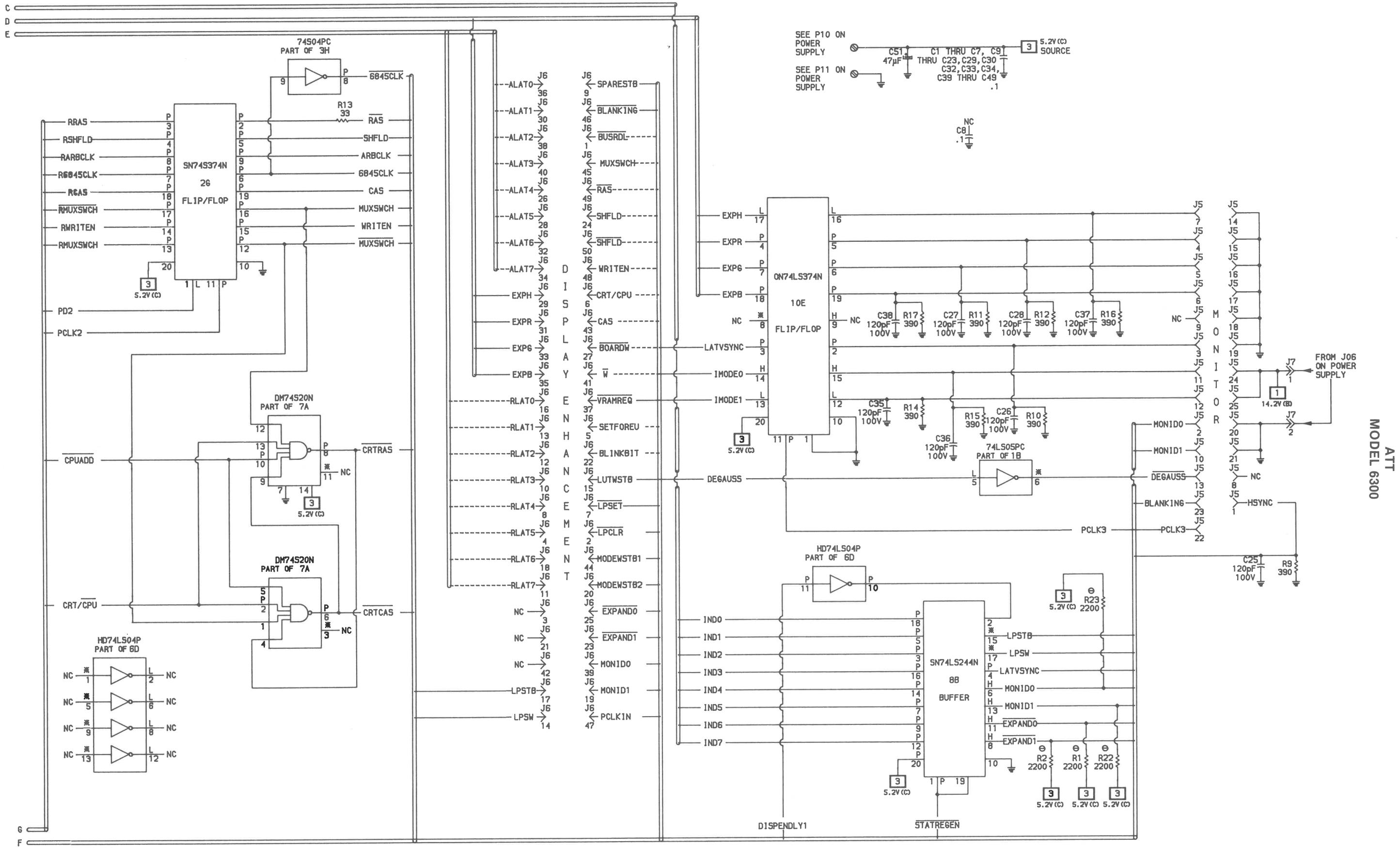
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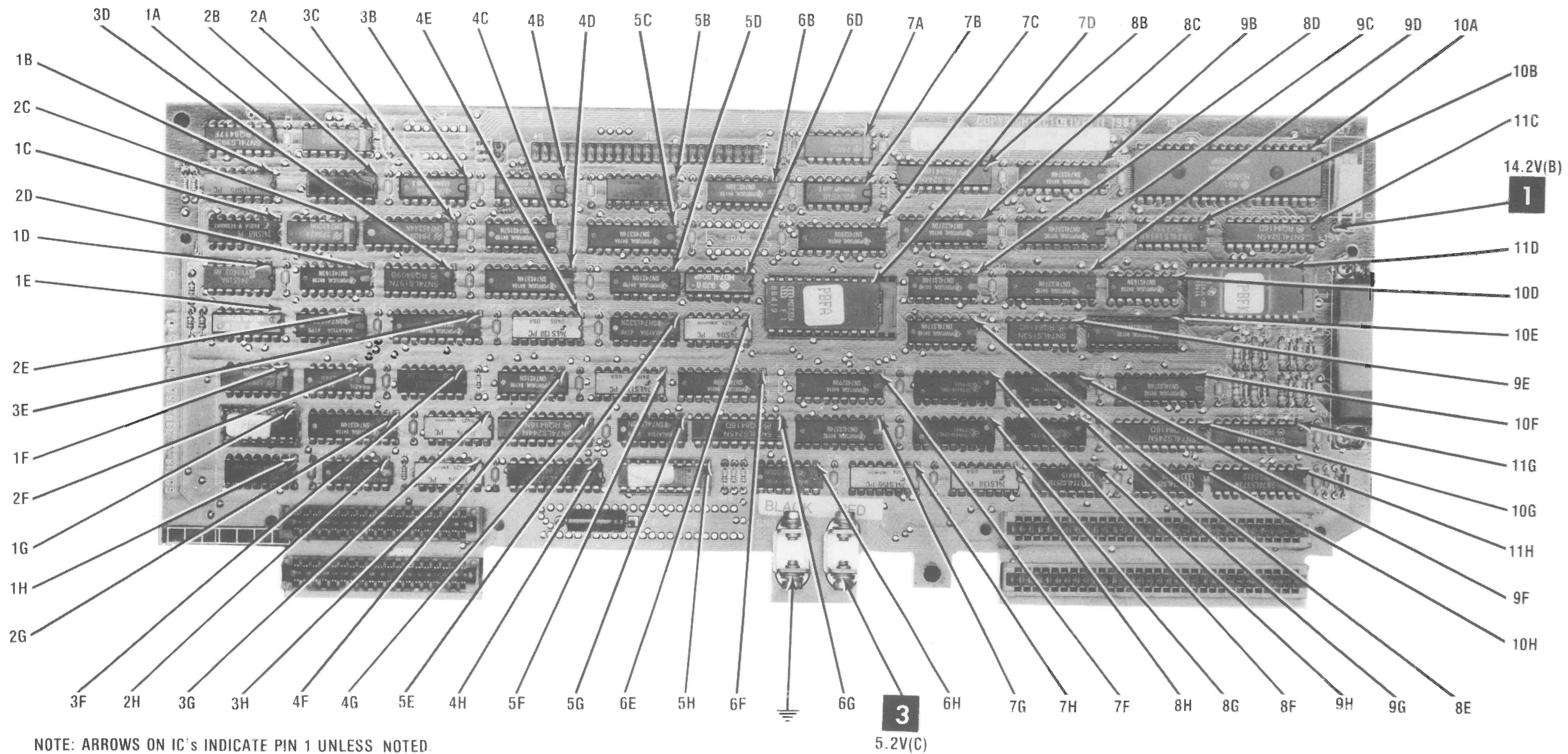


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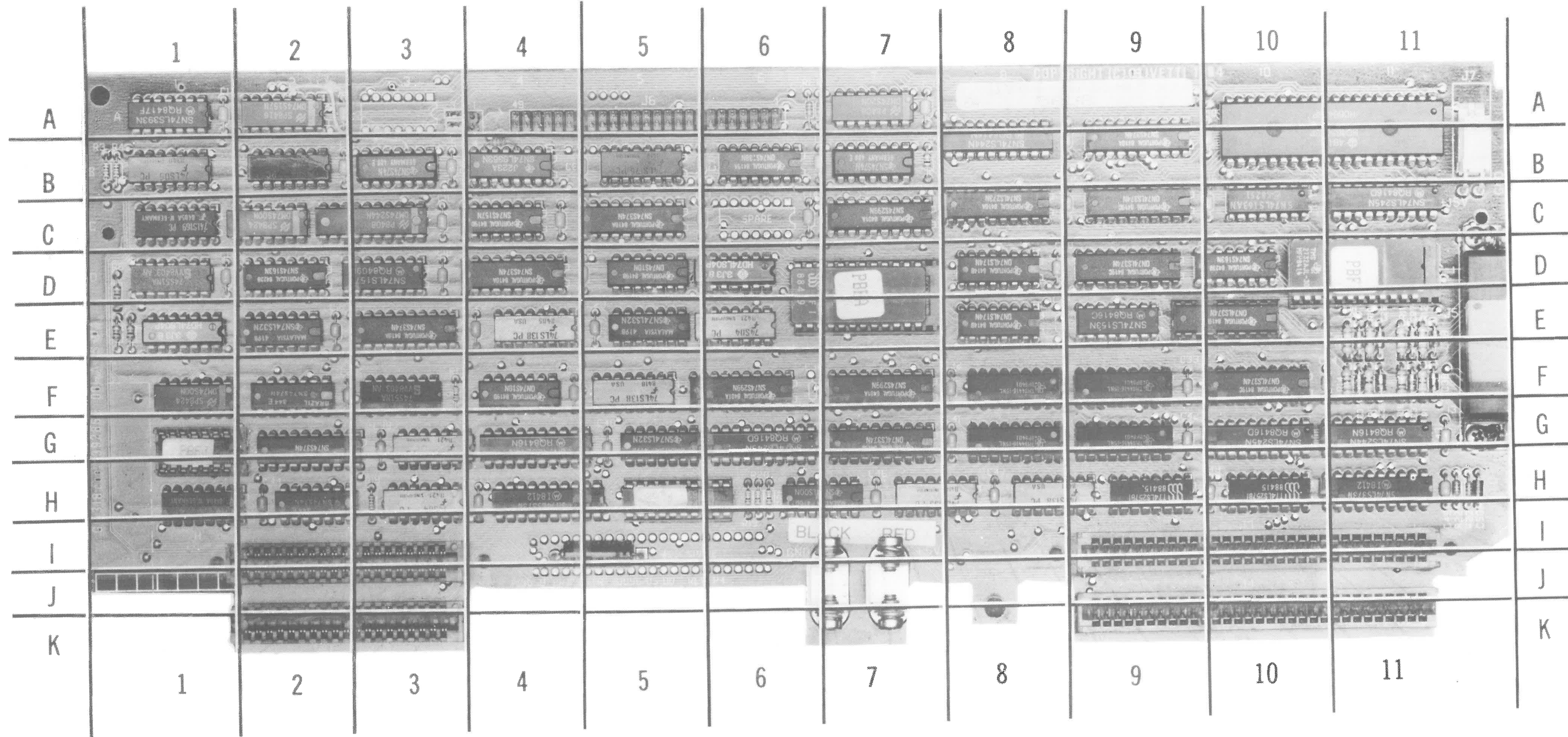


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NOTE: ARROWS ON IC's INDICATE PIN 1 UNLESS NOTED.

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SCHEMATICS NOTES

--- Circuitry not used in some versions.

--- Circuitry used in some versions.

⊙ See parts list.

⊕ Ground

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

Supply voltage maintained as shown at input.

Voltages measured with digital meter.

Logic readings, Voltages and Waveforms taken in Power Up mode. No diskette in Disk Drive. No Keys depressed. Diagnostics messages and Primary Boot-Strap DISK READ ERROR are displayed on the Monitor screen.

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 9 cm. width with DC reference voltage given at the bottom line of each waveform.

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

Terminal identification may not be found on unit.

Resistors are $\frac{1}{2}W$ or less, 5% unless noted.

Value in () used in some versions.

Logic Probe Display

L = Low

H = High

P = Pulse

* = Open (No lights On)

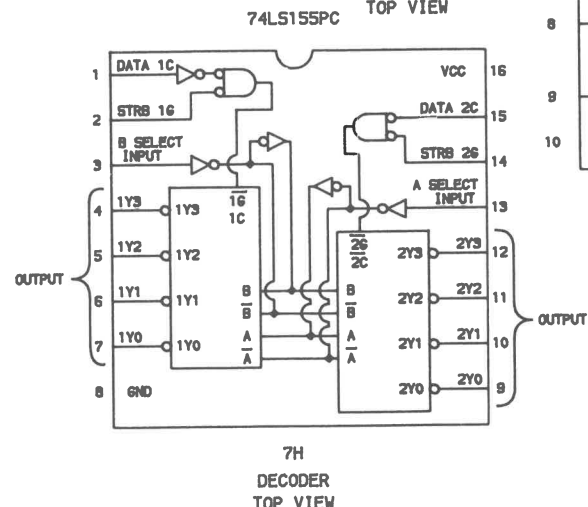
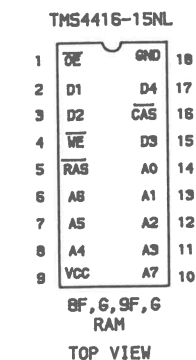
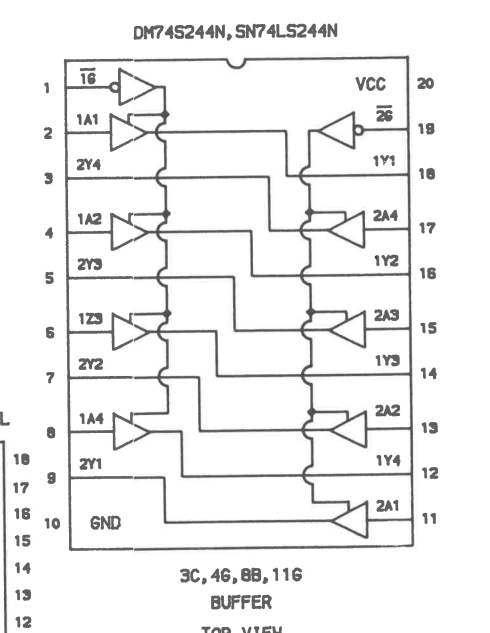
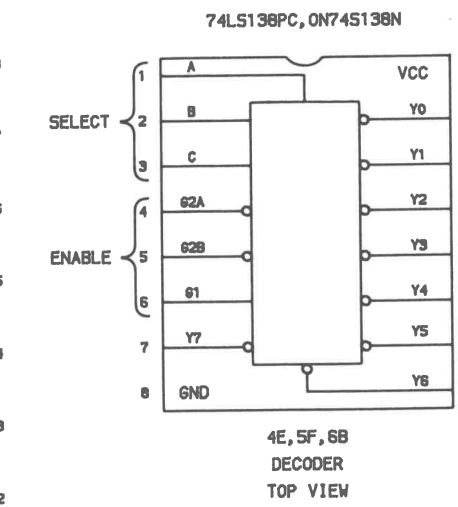
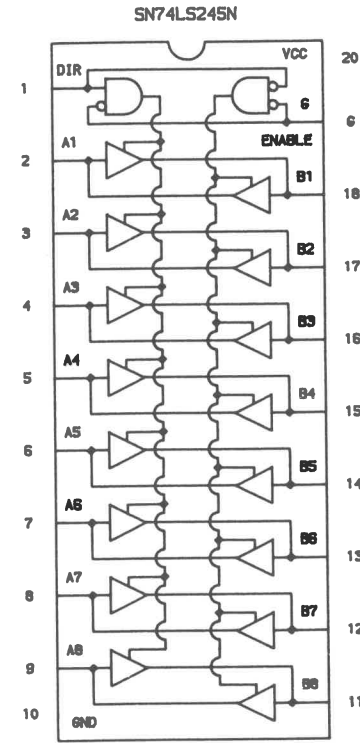
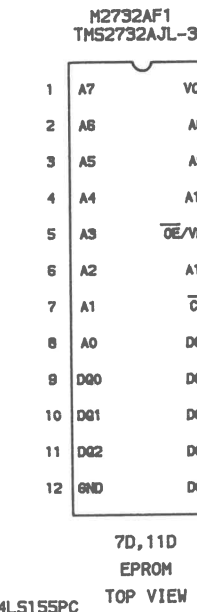
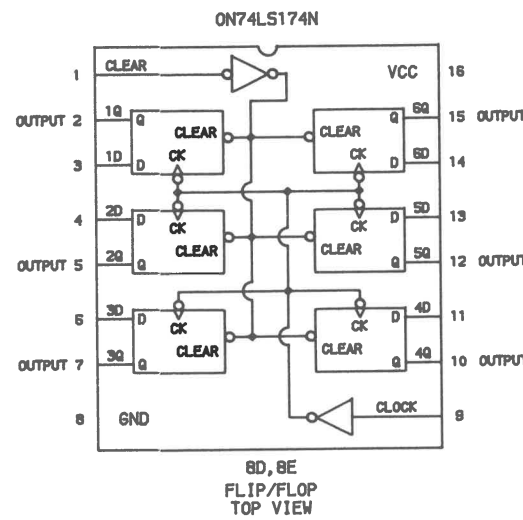
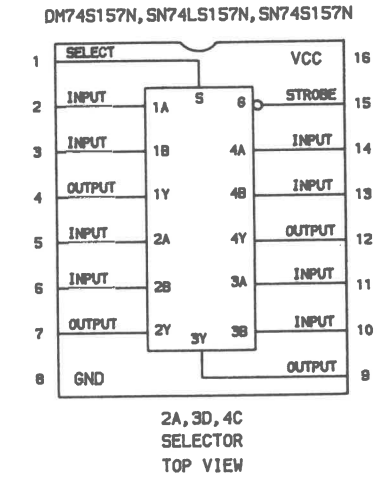
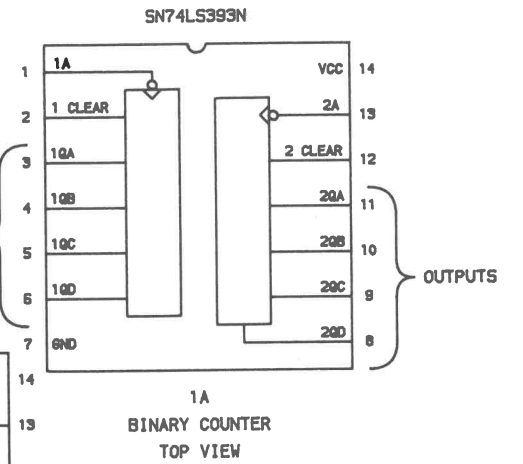
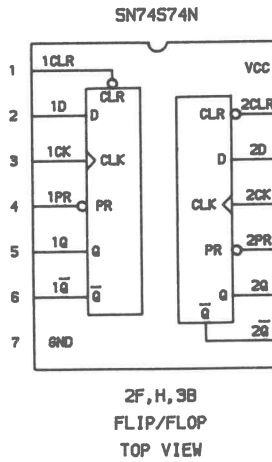
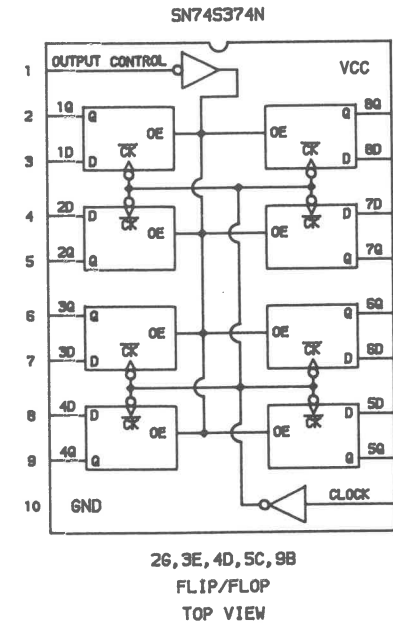
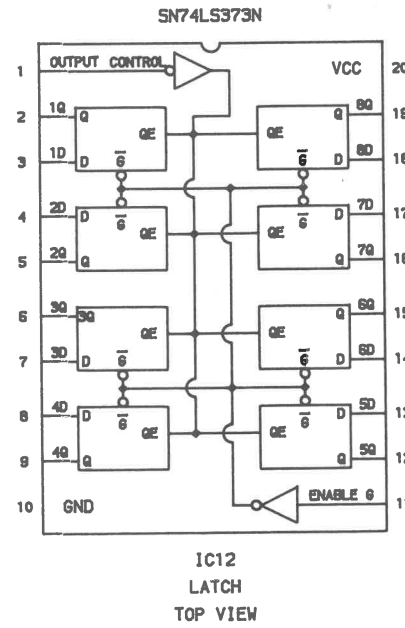
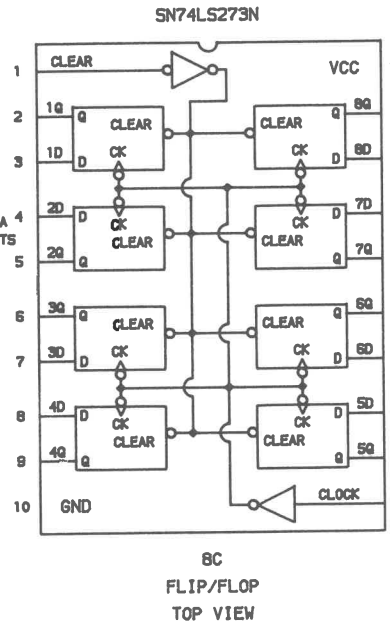
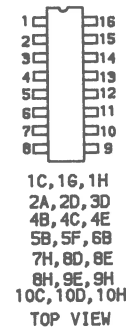
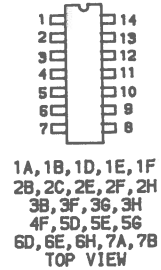
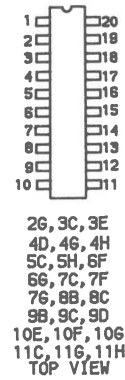
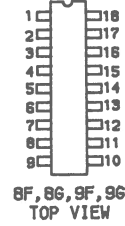
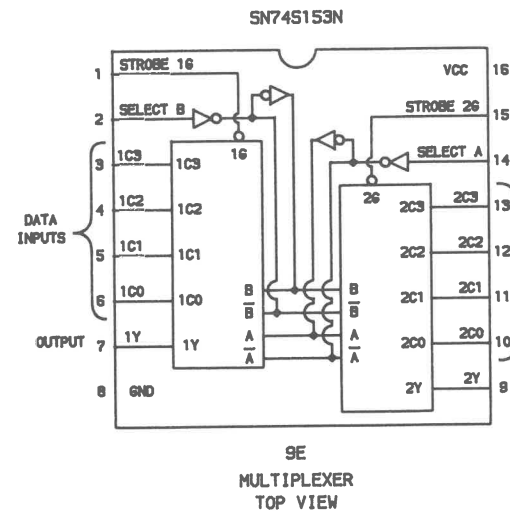
CRT CONTROLLER BOARD GridTrace LOCATION GUIDE

C1	A-1	R18	H-3	7G	G-7
C2	A-2	R19	H-6	7H	H-7
C3	A-7	R20	H-6	8B	B-8
C4	B-2	R21	H-6	8C	C-8
C5	B-3	R22	H-11	8D	D-8
C6	B-5	R23	H-11	8E	E-8
C7	B-6	R24	B-4	8F	F-8
C8	B-6	R25	B-4	8G	G-8
C9	B-9	R34	F-11	8H	H-8
C10	B-10	R35	F-11	9B	B-9
C11	C-3	R36	F-11	9C	C-9
C12	C-4	R37	F-11	9D	D-9
C13	C-5	R38	F-11	9E	E-9
C14	C-6	R39	G-3	9F	F-9
C15	C-9	R40	G-5	9G	G-9
C16	C-16	R41	G-8	9H	H-9
C17	D-1	R42	G-9	10A	A-10
C18	D-3	R43	G-11	10C	C-10
C19	D-5	R44	H-2	10D	D-10
C20	D-8	R45	H-4	10E	E-10
C21	E-2	R46	H-7	10F	F-10
C22	E-4	R47	H-8	10G	G-10
C23	E-5	R48	H-10	10H	H-10
C25	E-11	R49	H-11	11C	C-11
C26	E-11	R50	H-11	11D	D-11
C27	E-11	R51	I-5	11G	G-11
C28	E-11	1A	A-1	11H	H-11
C29	F-2	1B	B-1		
C30	F-4	1C	C-1		
C32	F-8	1D	D-1		
C33	F-9	1E	E-1		
C34	F-11	1F	F-1		
C35	F-11	1G	G-1		
C36	F-11	1H	H-1		
C37	F-11	2A	A-2		
C38	F-11	2B	B-2		
C39	G-3	2C	C-2		
C40	G-5	2D	D-2		
C41	G-8	2E	E-2		
C42	G-9	2F	F-2		
C43	G-11	2G	G-2		
C44	H-2	2H	H-2		
C45	H-2	3B	B-3		
C46	H-7	3C	C-3		
C47	H-8	3D	D-3		
C48	H-10	3E	E-3		
C49	H-11	3F	F-3		
C50	H-11	3G	G-3		
C51	I-5	3H	H-3		
J1	J-2	4B	B-4		
J2	K-3	4C	C-4		
J3	I-10	4D	D-4		
J4	K-10	4E	E-4		
J5	E-11	4F	F-4		
J6	A-5	4G	G-4		
J7	B-11	4H	H-4		
JP1	A-3	5B	B-5		
R1	A-6	5C	C-5		
R2	A-6	5D	D-5		
R3	B-1	5E	E-5		
R4	B-1	5F	F-5		
R5	B-7	5G	G-5		
R6	D-1	5H	H-5		
R7	E-1	6B	B-6		
R8	E-1	6D	D-6		
R9	E-11	6E	E-6		
R10	E-11	6F	F-6		
R11	E-11	6G	G-6		
R12	E-11	6H	H-6		
R13	F-3	7A	A-7		
R14	F-11	7B	B-7		
R15	F-11	7C	C-7		
R16	F-11	7D	D-7		
R17	F-11	7F	F-7		

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IC PINOUTS & TERMINAL GUIDES



LOGIC CHART (Continued)

DISPLAY CONTROLLER BOARD

PIN NO.	IC 8E	IC 8F	IC 8G	IC 8H	IC 9B	IC 9C	IC 9D	IC 9E	IC 9F	IC 9G	IC 9H	IC 10A	PIN NO.	IC 10A
1	H	L	L	P	L	P	P	L	L	L	P	L	21	P
2	L	P	H	P	P	P	H	L	P	P	P	H	22	P
3	P	P	H	P	P	P	*	P	P	P	P	*	23	P
4	P	P	P	P	P	P	P	P	P	P	P	P	24	P
5	H	P	P	P	P	P	P	L	P	P	P	P	25	P
6	P	P	P	P	P	P	P	L	P	P	P	P	26	P
7	H	P	P	P	P	P	P	L	P	P	P	P	27	P
8	L	P	P	L	P	P	*	L	P	P	L	P	28	P
9	H	H	H	P	P	P	H	L	H	H	P	P	29	P
10	L	P	P	P	L	L	L	L	P	P	H	P	30	P
11	P	P	P	P	P	P	P	L	P	P	P	P	31	P
12	L	P	P	P	P	P	P	L	P	P	P	P	32	P
13	P	P	P	P	P	P	P	P	P	P	P	P	33	P
14	P	P	P	P	P	P	P	L	P	P	P	P	34	L
15	H	P	H	P	P	P	P	L	P	P	P	P	35	P
16	H	P	P	H	P	P	P	H	P	P	H	L	36	P
17		P	P		P	P	L		L	P		L	37	P
18		L	L		P	P	L		L	L		P	38	P
19					P	P	P					P	39	P
20					H	H	H					H	40	P

PIN NO.	IC 10C	IC 10D	IC 10E	IC 10F	IC 10G	IC 10H	IC 11C	IC 11D	PIN NO.	IC 11D	PIN NO.	IC 11G	IC 11H
1	H	P	L	L	P	P	P	H	21	H	1	P	P
2	P	P	P	P	P	P	P	L	22	P	2	P	P
3	P	L	P	P	P	H	P	P	23	H	3	P	P
4	P	P	P	L	P	P	P	P	24	H	4	P	P
5	P	P	P	L	L	P	P	P	25	P	5	P	P
6	P	P	P	P	P	P	P	P	26	H	6	P	P
7	L	H	P	P	P	P	P	P	27	H	7	P	P
8	L	L	*	P	P	L	P	P	28	H	8	P	P
9	P	L	H	P	P	P	P	P			9	P	P
10	L	H	L	L	L	P	L	P			10	L	L
11	H	P	P	P	P	P	P	P			11	P	P
12	H	P	L	P	P	P	P	P			12	P	P
13	H	P	L	P	P	P	P	P			13	P	P
14	P	L	H	P	P	P	P	L			14	P	P
15	L	L	H	P	P	P	P	P			15	P	P
16	H	H	L	P	P	H	P	P			16	P	P
17			L	P	P		P	P			17	P	P
18			P	P	P		P	P			18	P	P
19			P	P	P		P	P			19	P	P
20			H	L	H		H	P			20	H	H

TROUBLESHOOTING

USING A PRINTER FOR DISPLAY

If there is a defect in the CRT 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. While 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 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.

VIDEO RAM

RAM IC's 8G, 8F, 9G and 9F are used to store the information which appears on the Monitor screen. The following Basic program can be used to check the Video RAM. The program checks each bit of each memory location in the Video RAM. If a bad location is found the bit (0 thru 7) that is bad and its address is printed out on a Printer (connect a Printer to the Computer before running the program).

```

10 DATA 1, 2, 4, 8, 16, 32, 64, 128
20 DEF SEG = &HB800
30 SCREEN 2:F = 0
40 FOR X = 0 TO 32767
50 FOR Y = 0 TO 7
60 READ Z:POKE X,Z
70 IF PEEK(X) AND Z THEN 90
80 GOTO 170
90 POKE X,0
100 IF PEEK(X) AND Z THEN 170
110 NEXT Y:RESTORE
120 IF X = 16191 THEN OUT 990,8
130 NEXT X
140 OUT 990,0
150 IF F = 1 THEN LPRINT"ERRORS FOUND" ELSE
    LPRINT "VIDEO RAM GOOD"
160 END
170 LPRINT "BIT ";Y;" CHECKS BAD AT ADDRESS
    ";X + 753664
180 F = 1:GOTO 110
    
```

If a bad bit is found the RAM IC that may be bad can be determined from the bit number and address that is printed out. If the address is an even number and the bit is 0 thru 3, IC 8G may be bad. If the bit is 4 thru 7 IC 8F may be bad. If the address is an odd number and the bit is 0 thru 3, IC 9G may be bad. If the bit is 4 thru 7 IC 9F may be bad.

VIDEO AND COLOR

No video or video with some colors missing while in text mode. Check Connector J5 for good connections. If J5 checks good, type in and run the following Basic program. Note: Put a space between the quotes in line 80.

```

10 DATA 9,10,12
20 SCREEN 0,1:WIDTH 80
30 KEY OFF:CLS
40 FOR Y = 1 TO 3
    
```

```

50 READ C
60 COLOR 0,C
70 FOR X = 1 TO 640
80 PRINT " ";
90 NEXT X:NEXT Y
100 GOTO 100
    
```

While the program is running check for pulses at pins 4, 7, and 9 of IC 4C. If pulses are missing, check IC 4C. If pulses are present at IC 4C, check the waveform at pin 11 and check for a logic Low at pin 1 of IC 5C. If the waveform is missing at pin 11, check IC 2A. If pin 1 does not read logic Low, check IC 8E. If the waveform and logic reading is correct, check for pulses at pins 2, 5, and 15 of IC 5C. If pulses are missing, check IC 5C. If pulses are present at IC 5C, check for pulses at pins 10, 11, and 12 of IC 10D. If pulses are missing, check IC 10D. If pulses are present at IC 10D, check for pulses at pins 5, 6, and 19 of IC 10E. If pulses are missing, check IC 10E.

No video or colors missing in medium resolution mode (text mode works). Type in and run the following Basic program.

```

10 SCREEN 1,0
20 KEY OFF:CLS
30 COLOR 9,0:COLOR 10,0:COLOR 12,0
40 GOTO 30
    
```

While the program is running, check the waveform at pin 11 of IC 3E. If the waveform is missing, check IC 2A. If the waveform is good, check for a logic High at pins 16 and 19 of IC 3E. If the logic readings are not correct, check IC's 3E and 6E. If the logic readings are correct at IC 3E, check for a logic Low at pin 8 of IC 2C. If the reading is not correct check IC 2C. If the reading is correct at IC 2C, check for pulses at pins 7, 9, and 12 of IC 3D. If pulses are missing, check IC 3D. If pulses are present at IC 3D, check for pulses at pins 5, 6 and 9 of IC 3E. If pulses are missing, check IC 3E. If pulses are present at IC 3E, check for a logic Low at pin 1 of IC 3C. If the reading is not correct, check IC 2C. If the reading is correct at pin 1 of IC 3C, check for pulses at pins 12, 14, and 16 of IC 3C. If pulses are missing, check IC 3C.

No video in high resolution or super high resolution modes (text mode works). Type in and run the following Basic program.

```

10 SCREEN 100:CLS
20 FOR X = 0 TO 2000
30 PRINT "-";
40 NEXT X
50 GOTO 50
    
```

While the program is running, check the waveform at pin 3 of IC 3G. If the waveform is missing, check IC 2A. If the waveform is good check for a logic Low at pin 2 and pulses at pin 6 of IC 3G. If the logic reading is not correct at pin 2, check IC's 5D and 6E. If the reading is correct at pin 2 and pulses are missing at pin 6, check IC 3G. If the readings are correct at IC 3G, check for pulses at pins 11, 12, and 13 of IC 2D. If pulses are missing at IC 2D, check IC 2D. If pulses are present at IC 2D, check for a logic Low at pin 19 and pulses and pins 5, 7, and 9 of IC 3C. If the reading is not correct at pin 19, check IC 2C. If the reading is correct at pin 19 and pulses are missing at pins 5, 7, and 9 of IC 3C, check IC 3C.

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TROUBLESHOOTING (Continued)

VIDEO SYNC

No horizontal sync. Check pin 1 of Connector J5 for good connection. If the connection is good, check the horizontal sync waveform at pin 39 of the CRT Controller IC (10A). If the waveform is missing or not correct, check IC 10A. If the waveform is good, check for a logic Low at pin 1 of IC 9B. If the reading is not correct, check IC 1E. If the reading is correct, check for pulses at pin 15 of IC 9B. If pulses are missing, check IC 9B. If pulses are present check the waveform at pin 2 of IC 1C. If the waveform is missing, check IC 2G. If the waveform is good check for pulses at pin 13 and 9 of IC 3B. If pulses are missing at pin 13 of IC 3B, check IC 1C. If pulses are present at pin 13 and missing at pin 9 of IC 3B, check IC 3B.

No vertical sync. Check pin 3 of Connector J5 for good connection. If the connection is good check the vertical waveform at pin 40 of IC 10A. If the waveform is missing or not correct, check IC 10A. If the waveform is good, check for pulses at pin 12 of IC 9B. If pulses are missing, check IC 9B. If pulses are present, check for pulses at pin 2 of IC 10E. If pulses are missing, check IC 10E.

VIDEO MODE LATCHES

Mode latch IC's 8C, 8D and 8E are used to control the various graphic modes (low resolution, high resolution, underline, color . . . etc) that are available. If there appears to be a problem with one or more of the graphics modes, type in and run the following Basic program.

```
10 OUT 984,0:OUT 985,0:OUT 990,0
20 OUT 984,63:OUT 985,127:OUT 990,126:GOTO 10
```

While the program is running, check for pulses at pin 7, 14 and 15 of IC 6B. If pulses are missing at pin 7, 14 or 15 of IC 6B, check IC 6B. If pulses are present at IC 6B, check for a logic Low at pins 2 and 12 and pulses at pins 5, 6, 9, 15, 16 and 19 of IC 8C. If any of the readings are not correct check IC 8C. If the readings are correct at IC 8C, check for pulses at pins 2, 5, 7, 10, 12 and 15 of IC 8D. If pulses are missing at any pin, check IC 8D. If pulses are present at IC 8D, check for pulses at pins 2, 5, 7, 10, 12 and 15 of IC 8E. If pulses are missing at any pin, check IC 8E.

BLINK AND HIGHLIGHT

If the blink or highlight feature does not operate at one or more locations on the Monitor screen, there may be a defect in one of the Video RAM IC's. Refer to the "Video RAM" section of this Troubleshooting guide.

If the blink feature does not operate, type in and run the following Basic program which fills the screen with underlined blinking highlighted characters.

```
10 DEF SEG = &HB800
20 FOR X = 0 TO 4000 STEP 2
30 POKE X,42:POKE X + 1,137
40 NEXT X
50 GOTO 50
```

While the program is running, check for the waveform shown in Figure D at pin 5 of IC 2F and the waveform shown in Figure E at pin 9 of IC 2F.

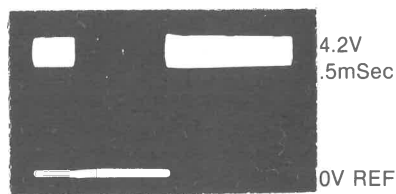


Figure D

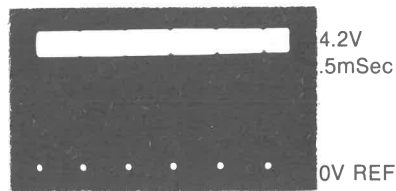


Figure E

If either waveform is missing, check IC 2F. If the waveforms check good at IC 2F, check the waveform at pin 5 of IC 5D. If the waveform is missing check IC 1A. If the waveform is present at pin 5 of IC 5D, check for a logic High at pin 4 of IC 5D. If the reading is not correct, check IC 8E. If the logic reading is correct at pin 4 of IC 5D, check for the waveform shown in Figure F at pin 12 of IC 5D (this waveform should be blinking On and Off). If the waveform is not correct check IC 5D.

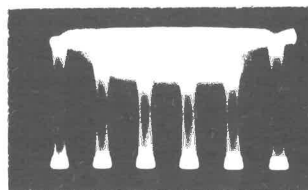


Figure F

Highlight feature does not work (no highlight or highlight always On). Check pin 7 of Connector J7 for good connections. If the connections check good, check for pulses at pin 12 of IC 4C while running the above program. If pulses are missing, check IC 4C. If pulses are present at IC 4C, check for pulses at pin 12 of IC 5C. If pulses are missing, check IC 5C. If pulses are present at IC 5C, check for pulses at pins 16 and 17 of IC 10E. If pulses are missing at pin 17, check IC 10D. If pulses are present at pin 17 and missing at pin 16, check IC 10E.

LOGIC CHART (Continued)

CRT CONTROLLER BOARD

PIN NO	IC 4G	IC 4H	IC 5B	IC 5C	IC 5D	IC 5E	IC 5F	IC 5G	IC 5H	IC 6B	IC 6D	IC 6E	IC 6F	IC 6G
1	P	H	P	L	P	H	H	P	P	P	*	H	H	P
2	P	P	P	P	P	L	H	P	P	P	L	L	H	P
3	P	P	P	P	P	H	H	P	P	P	L	P	H	P
4	P	P	P	P	H	L	L	P	P	P	H	P	P	H
5	P	P	P	P	P	H	L	P	P	P	*	H	P	H
6	P	P	P	H	P	H	H	P	P	P	L	L	P	H
7	P	P	P	*	L	L	L	L	P	H	L	L	H	P
8	P	P	L	P	P	H	L	H	P	L	L	P	H	P
9	P	P	P	P	H	*	H	H	P	H	*	P	H	P
10	L	L	P	L	P	*	H	H	P	L	H	L	L	P
11	P	P	P	P	P	H	H	P	P	H	P	H	H	P
12	P	P	P	L	P	H	H	P	P	P	L	L	P	P
13	P	P	P	L	H	L	H	P	P	H	*	H	P	P
14	P	P	P	P	H	H	H	H	P	H	H	H	P	P
15	P	P	P	P			H		P	H			P	P
16	P	P	H	H			H		H	H			L	P
17	P	P		*					H				H	P
18	P	P		*					P				H	P
19	P	P		H					P				P	P
20	H	H		H					H				H	H

PIN NO.	IC 6H	IC 7A	IC 7B	IC 7C	IC 7D(6)	PIN NO.	IC 7D(6)	PIN NO.	IC 7F	IC 7G	IC 7H	IC 8B	IC 8C	IC 8D
1	P	P	H	H	P	21	L	1	H	L	P	P	H	H
2	P	P	P	H	P	22	P	2	H	H	P	P	L	L
3	P	*	P	H	P	23	P	3	H	H	*	P	P	P
4	P	P	H	P	P	24	H	4	P	H	P	P	P	P
5	P	P	P	P	P			5	P	H	P	P	L	L
6	P	P	P	P	P			6	P	P	H	H	L	P
7	L	L	L	P	P			7	H	P	H	P	P	H
8	P	P	P	P	P			8	H	P	L	H	P	L
9	P	P	P	H	P			9	H	P	H	P	H	H
10	H	P	H	L	P			10	L	L	H	L	L	H
11	P	*	P	H	P			11	H	P	H	H	H	P
12	P	P	P	P	L			12	P	P	P	P	L	L
13	P	P	H	P	P			13	H	P	P	H	P	P
14	H	H	H	P	P			14	P	P	P	P	P	P
15				P	P			15	P	P	P	*	L	L
16				P	P			16	P	P	H	P	L	H
17				P	P			17	H	P		*	P	
18				H	L			18	H	H		P	P	
19				P	P			19	P	H		P	L	
20				H	L			20	H	H		H	H	

Note (6): Logic readings given for 24 Pin IC only. Following logic readings are for Extra 4 IC Socket Pins 1(H), 2(L), 27(H), 28(H).

LOGIC CHART

CRT CONTROLLER BOARD

PIN NO.	1A	1B	1C	1D	1E	1F	1G	1H	2A	2B	2C	2D	2E	2F
1	P	*	H	P	P	P	P	P	H	*	L	H	*	H
2	L	L	L	L	L	L	L	L	P	L	L	L	L	L
3	P	H	H	H	H	H	H	H	P	L	H	H	H	H
4	P	H	H	H	H	H	H	H	P	L	H	H	H	H
5	P	*	L	L	L	L	L	L	P	L	L	L	L	L
6	P	L	L	L	L	L	L	L	P	L	L	L	L	L
7	P	L	L	L	L	L	L	L	P	L	L	L	L	L
8	P	L	L	L	L	L	L	L	P	L	L	L	L	L
9	P	P	P	P	P	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P	P	P	P	P	P
11	L	H	H	H	H	H	H	H	P	L	L	L	L	L
12	P	H	H	H	H	H	H	H	P	L	L	L	L	L
13	P	H	H	H	H	H	H	H	P	L	L	L	L	L
14	P	H	H	H	H	H	H	H	P	L	L	L	L	L
15	P	H	H	H	H	H	H	H	P	L	L	L	L	L
16	P	H	H	H	H	H	H	H	P	L	L	L	L	L
17	P	H	H	H	H	H	H	H	P	L	L	L	L	L
18	P	H	H	H	H	H	H	H	P	L	L	L	L	L
19	P	H	H	H	H	H	H	H	P	L	L	L	L	L
20	H	H	H	H	H	H	H	H	P	L	L	L	L	L

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.	
CRT CONTROLLER BOARD							
1A	SN74LS393N		NTE74LS393	ECG74LS393	SK7CT393	HE-443-973	
1B	74LS05PC		NTE74LS05	ECG74LS05	SK74LS05	HE-443-818	
1C	74LS169PC		NTE74LS169A	ECG74LS169A			
1D	74S51NA		NTE74S51	ECG74S51			
1E	HD74LS04P		NTE74LS04	ECG74LS04	SK7CT04	HE-443-755	
1F	DM74S00N		NTE74S00	ECG74S00	SK74S00	HE-443-26	
1G	63S081N						
1H	74F191PC						
2A	DM74S157N		NTE74S157	ECG74S157			
2B	74S04PC		NTE74S04	ECG74S04	SK74S04	HE-443-897	
2C	SAME AS 1F						
2D	SN74S163N						
2E	SN74LS32N		NTE74LS32	ECG74LS32	SK74CT32	HE-443-875	
2F	SN74S74N		NTE74S74	ECG74S74	SK74S74	HE-443-900	
2G	SN74S374N						
2H, 3B	SAME AS 2F						
3C	DM74S244N						
3D	SN74LS157N		NTE74LS157	ECG74LS157	SK7CT157	HE-443-799	
3E	SAME AS 2G						
3F	SAME AS 1D						
3G	74S74PC		NTE74S74	ECG74S74	SK74S74	HE-443-900	
3H	74S04PC		NTE74S04	ECG74S04	SK74S04	HE-443-897	
4B	SN74LS353N		NTE74LS353	ECG74LS353			
4C	SN74S157N		NTE74S157	ECG74S157			
4D	SAME AS 2G						
4E	74LS138PC		NTE74LS138	ECG74LS138	SK7CT138	HE-443-877	
4F	ON74S10N		NTE74S10	ECG74S10			
4G	SN74LS244N		NTE74LS244	ECG74LS244	SK7CT244	HE-443-791	
4H	SN74LS373N		NTE74LS373	ECG74LS373	SK7CT373	HE-443-867	

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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.	
5B 5C 5D 5E 5F 5G	74LS175PC SAME AS 2G SAME AS 4F SAME AS 2E SAME AS 4E SAME AS 2E		NTE74LS175	ECG74LS175	SK7CT175	HE-443-752	
5H 6B 6D 6E 6F	PAL10L8CN ON74S138N SAME AS 1E SAME AS 3H SN74S299N		NTE74LS138	ECG74LS138	SK7CT138	HE-443-877	
6G 6H 7A 7B 7C	SN74LS245N SN74LS00N DM74S20N SN74S74N SAME AS 6F		NTE74LS245 NTE74LS00 NTE74S20 NTE74S74	ECG74LS245 ECG74LS00 ECG74S20 ECG74S74	SK7CT245 SK7CT00 SK74S20 SK74S74	HE-443-885 HE-443-728 HE-443-900	
7D 7F 7G 7H 8B	M2732AF1 SAME AS 6F ON74LS374N 74LS155PC SAME AS 4G		NTE2732 NTE74LS374 NTE74LS155	ECG2732 ECG74LS374 ECG74LS155	SK7CT374 SK74LS155	HE-443-863 HE-443-782	
8C 8D,8E 8F,8G 8H 9B	SN74LS273N ON74LS174N TMS4416-15NL 74LS138PC SAME AS 2G		NTE74LS273 NTE74LS174 NTE74LS138	ECG74LS273 ECG74LS174 ECG74LS138	SK7CT273 SK7CT174 SK7CT138	HE-443-805 HE-443-879 HE-443-1165 HE-443-877	
9C,9D 9E 9F,9G 9H 10A	SAME AS 7G SN74LS153N SAME AS 8F T74LS257B1 HD46505SP		NTE74LS153 NTE74LS257	ECG74LS153 ECG74LS257	SK7CT153 SK7CT257	HE-443-802	

PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

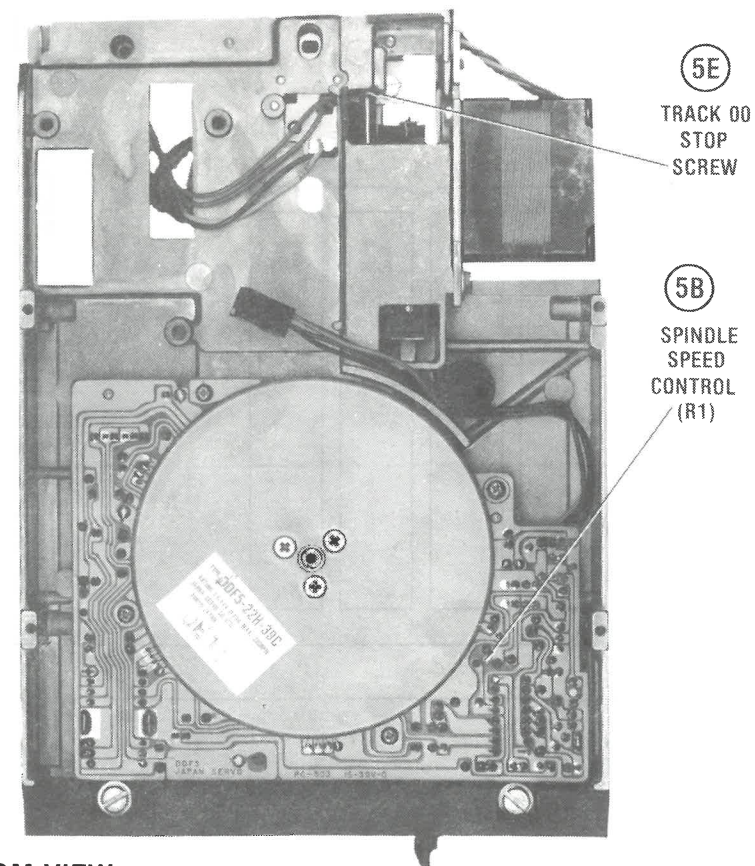
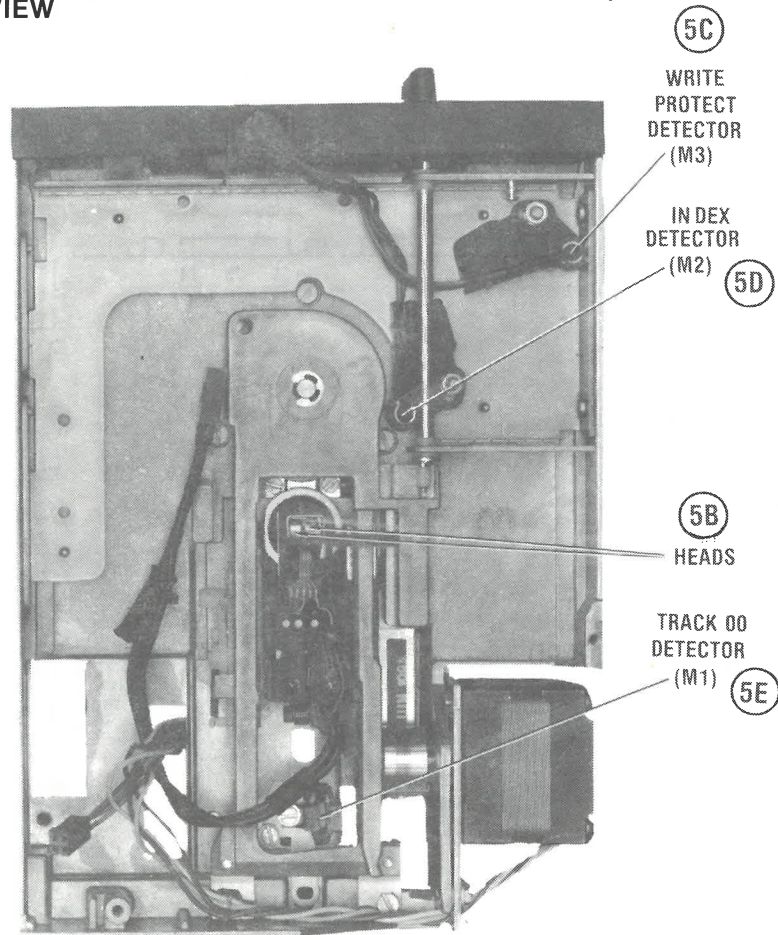
ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA				NOTES
			NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	
10C 10D 10E,10F 10G 10H	SN74LS163AN SAME AS 2D SAME AS 7G SAME AS 6G SAME AS 9H		NTE74LS163A	ECG74LS163A	SK7CT163	HE-443-934	
11C 11D 11G 11H	SAME AS 6G TMS2732AJL-30 SAME AS 4G SAME AS 4H		NTE2732(12)	ECG2732(12)			

(12) Programming Required.

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	WORKMAN PART No.
R1 R2 R22 R23 R24 R22	2200 2% 1/4W Metal Film 2200 2% 1/4W Metal Film 2200 2% 1/4W Metal Film 2200 2% 1/4W Metal Film 2200 2% 1/4W Metal Film 2200 2% 1/4W Metal Film		QW222 QW222 QW222 QW222 QW222 QW222	

PRELIMINARY SERVICE CHECKS (Continued)
DISK DRIVE - TOP VIEW



DISK DRIVE - BOTTOM VIEW
XVII

BOARD
XVI

PRELIMINARY SERVICE CHECKS

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

Check all interconnecting cables for good connection and correct hookup before making service checks.

Be sure the Power is OFF before connecting or disconnecting connectors, boards or other replaceable parts.

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

Replacement or repair of the Power Supply Board, Main Board, Disk II Interface Board, Keyboard, or Connectors may be necessary after the malfunction has been isolated.

TEST EQUIPMENT AND TOOLS

TEST EQUIPMENT

- Digital Volt/Ohm Meter
- Logic Probe
- Logic Pulser
- Frequency Counter
- Disk Drive Tester or Test Program

TOOLS

- Low Wattage Soldering Iron
- Desoldering Equipment
- Head Cleaning Equipment
- Contact and Switch Cleaner (non-spray type)
- Phillips Screwdriver
- Flat Blade Screwdriver
- IC Insertion and Removal Tools 14, 16, 24 and 40 pin

REPLACEMENT PARTS

- Power Supply Fuse
- IC 6F (System Board) ROM
- IC 6H (System Board) ROM
- IC 10E (Display Board)
- Fuse F1 (Monitor) 3A Fuse
- Capacitor C1 470 μ F, 25V
- IC 10U (System Board)
- IC U6 (Keyboard)
- IC U7 (Keyboard)
- M2 Index Detector (Disk Drive)
- M3 Write Protect Detector (Disk Drive)
- M1 Track 00 Detector (Disk Drive)
- SP1 Speaker 8 Ω z
- IC 3R (System Board)

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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-interruptable 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.

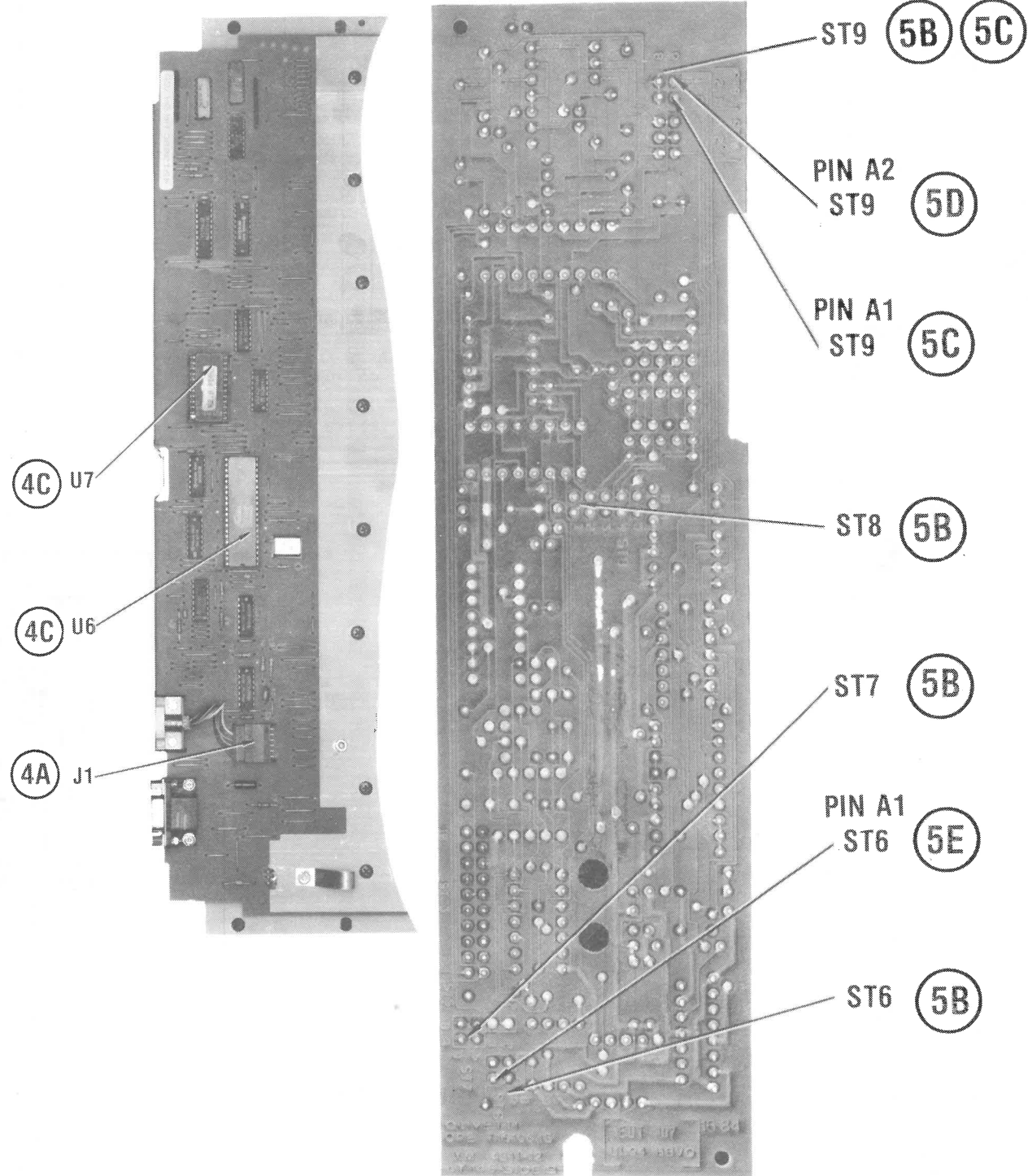
STATIC ELECTRICITY

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)

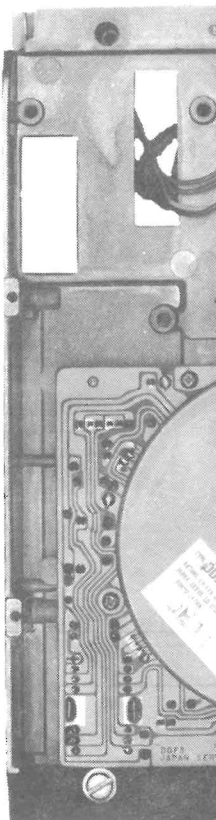
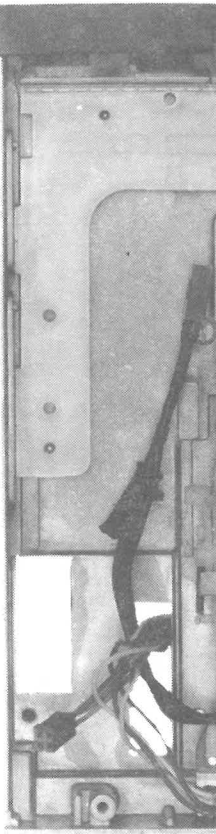


KEYBOARD

DISK DRIVE BOARD

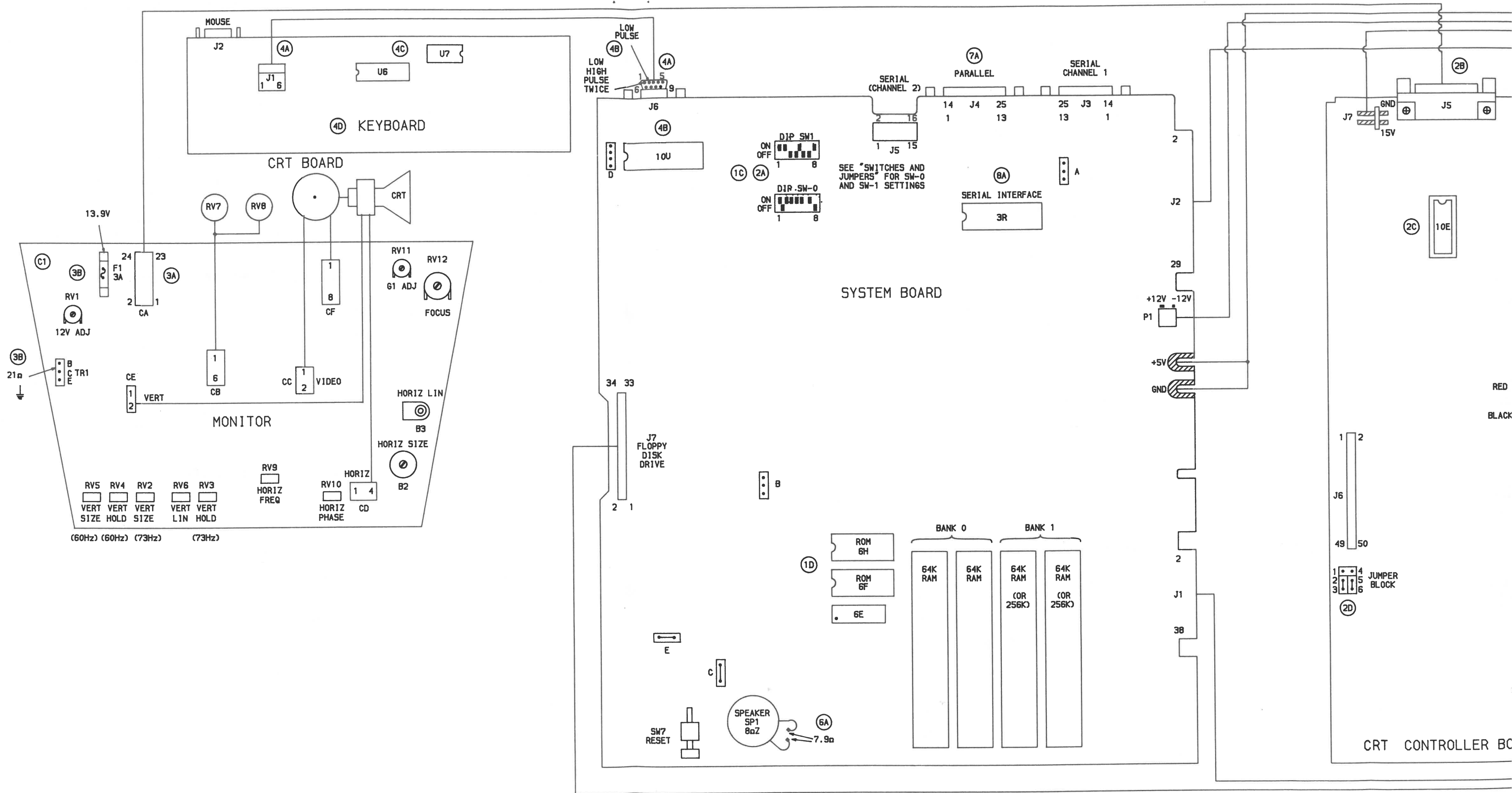
XVI

PRELIMINARY DISK DRIVE - TOP VIEW

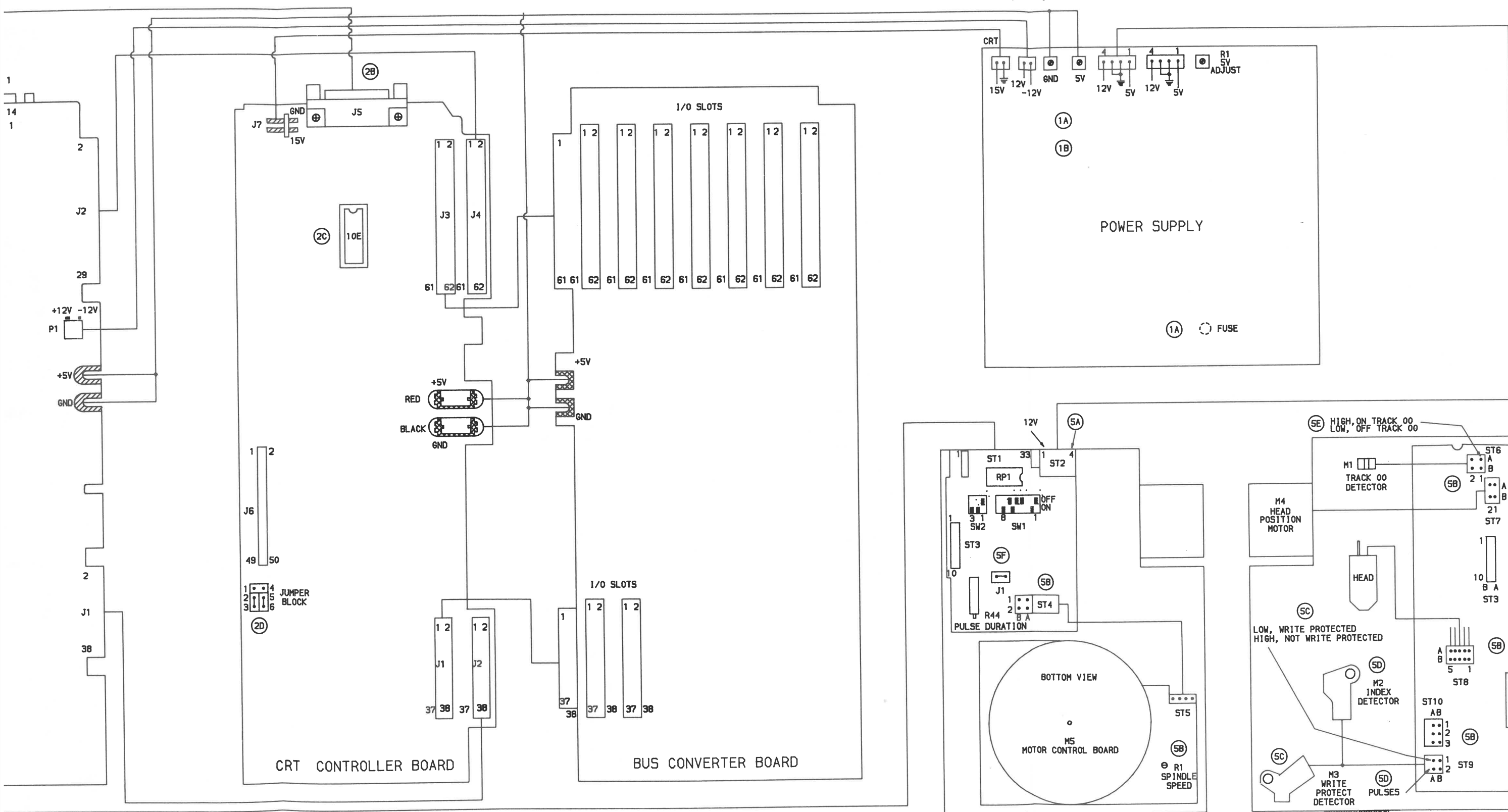


DISK DRIVE - BOTTOM VIEW

XVII



PRELIMINARY SERVICE CHECKS (Continued)

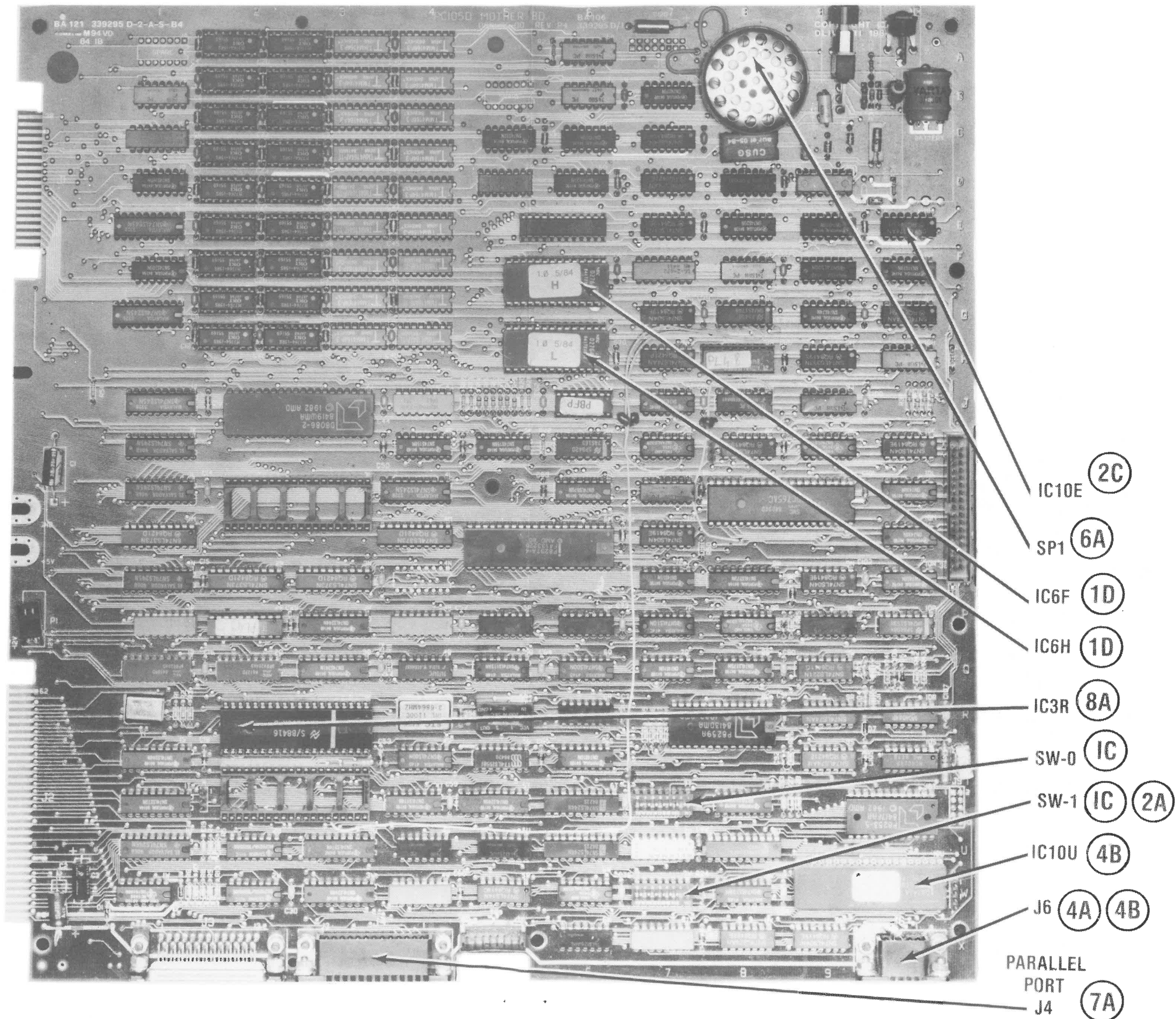


DISK DRIVE A
BOTTOM VIEW

NOTE: DISK DRIVE B SAME
AS DRIVE A EXCEPT RESISTOR
PACK RP1 NOT INSTALLED

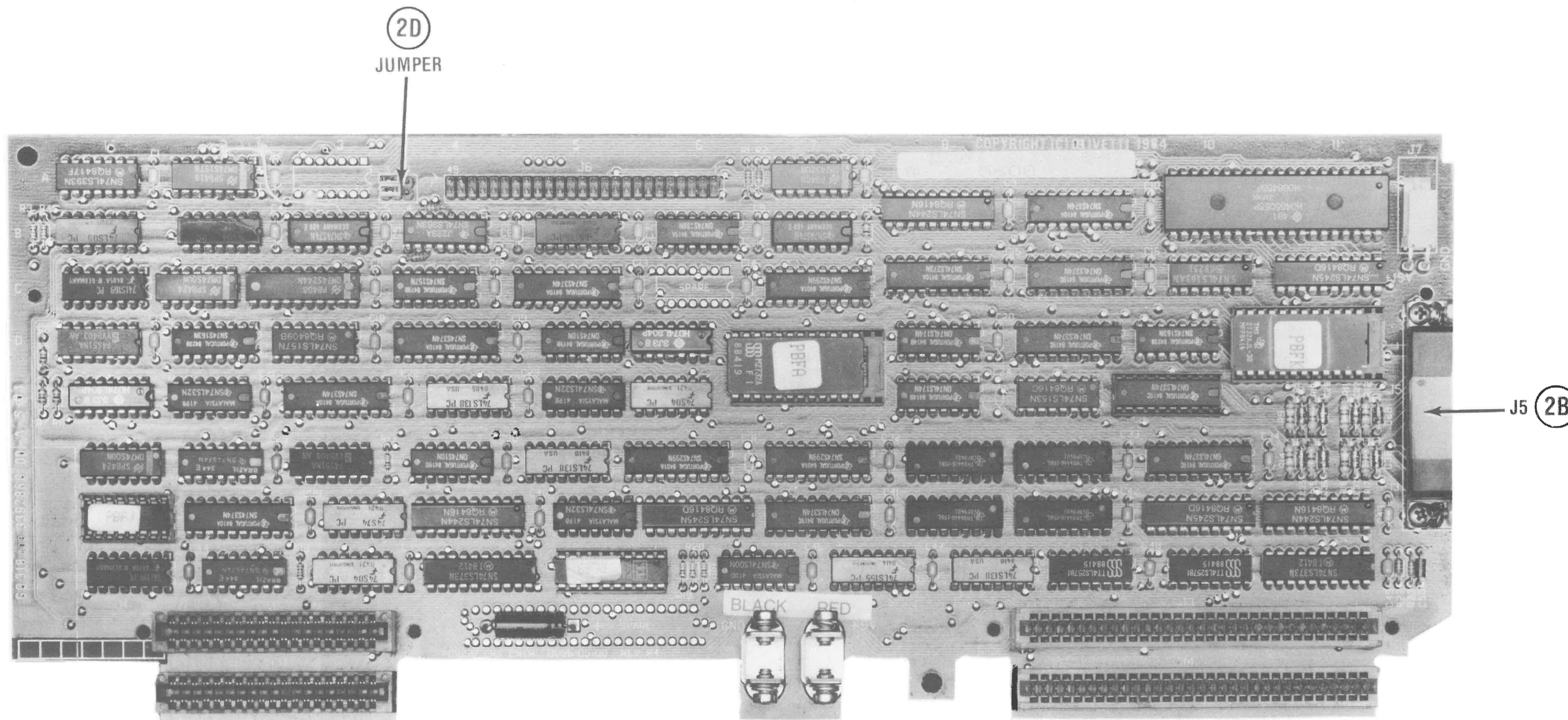
DISK DRIVE A
TOP VIEW

PRELIMINARY SERVICE CHECKS (Continued)



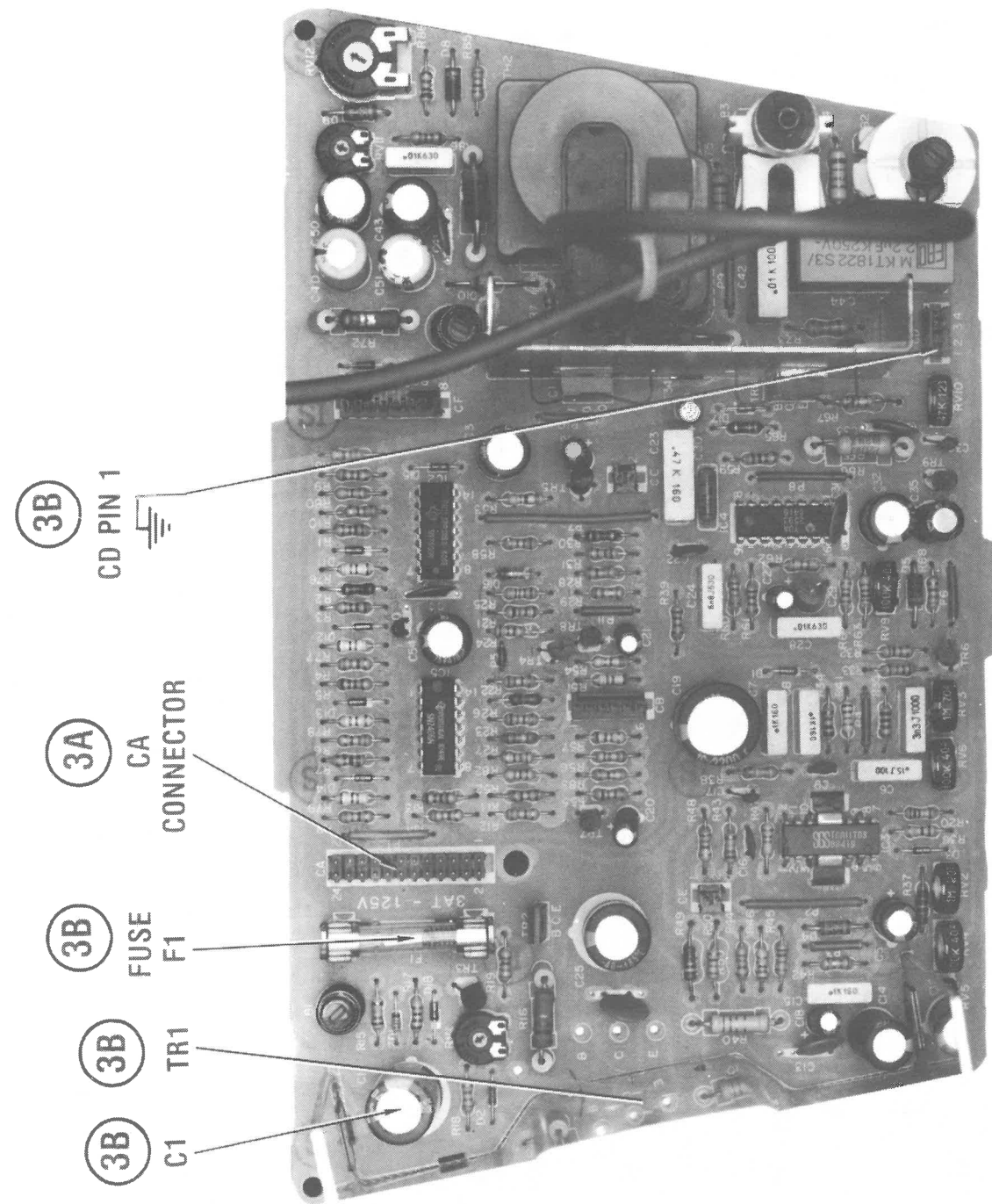
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PRELIMINARY SERVICE CHECKS (Continued)



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PRELIMINARY SERVICE CHECKS (Continued)



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 voltages at Power Supply Connectors. If voltages are missing, turn Computer Off and disconnect Connectors from Power Supply. Turn Power Supply On and recheck voltages if voltages are still missing, check Power Supply Fuse.
 - (B) If voltages return, turn Power Supply Off and reconnect Connectors one at a time. Turn Power Supply On and recheck voltages. Repeat process until problem area is isolated that shuts down Power Supply.
 - (C) If Power Supply is good, check DIP Switches SW-0 and SW-1 on System Board for correct settings. See "Switches and Jumpers".
 - (D) Check ROM IC's (6F and 6H) by substitution.
- ② **VIDEO DISPLAY (COMPUTER)**
 - (A) Display comes up in 40 column mode instead of 80 column mode. Check setting of Switches 5 and 6 of DIP Switch SW-1. See "Switches and Jumpers".
 - (B) No video, Computer appears to boot up properly. Check Connector J5 on Display Controller Board for good connections and check Monitor cable for open circuits.
 - (C) If Connector and cable check good, check IC 10E by substitution.
 - (D) Monitor has a bright raster with retrace lines showing and no video information. Check jumper block located on Display Controller Board (pins 2 and 3 and pins 5 and 6 should be jumpered).
- ③ **VIDEO DISPLAY (MONITOR)**
 - (A) Monitor dead. Check Connector CA for good connections and check cable for possible open circuits.
 - (B) If Connector CA and cable check good, check Fuse F1. If Fuse is blown, check for a possible shorted Capacitor C1 and check for about 21 ohms resistance from the collector of Transistor TR1 to ground before replacing Fuse and applying power to Monitor. If the collector of Transistor TR1 checks shorted to ground troubleshoot the Monitor Board.
- ④ **KEYBOARD**
 - (A) Keyboard does not function. Check Connectors J6 on the System Board and J1 on the Keyboard for good connections and check keyboard cable for open circuits.
 - (B) If connectors and cable check good, unplug Keyboard from Computer. Check logic readings at pins 1 and 2 of Connector J6 while turning Computer On. Pin 1 should read Low, then High, then Pulse twice. Pin 2 should read Low, then start Pulsing. If readings are not correct, check IC 10U by substitution.
 - (C) If logic readings are correct at pins 1 and 2 of Connector J6, check IC's U6 and U7 on Keyboard by substitution.
 - (D) One key is erratic in operation. Clean the key contacts. To remove key, pull cap off, then remove key by squeezing two tabs holding key in slot and lift key up.
- ⑤ **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) Drive is dead. Check for 12V at pin 1 and 5V at pin 4 of Connector ST2 on the Disk Drive. If voltages are missing, check Power Supply.
 - (B) Disk Drive Operation is erratic. Clean the Heads. Check Drive Spindle speed, see "Miscellaneous Adjustments". Check Connectors ST3 thru ST9 for good connections.
 - (C) Computer indicates diskette is write protected when it is not write protected. Check Connector ST9 for good connections. If connections check good, check for a logic Low at pin A1 of Connector ST9 when a diskette that is not write protected is inserted in the Drive and a logic High when the diskette is write protected. If readings are not correct, check Write Protect Detector (M3).
 - (D) Will not read or write. Insert a diskette in the Drive and close the drive door. Check for pulses at pin A2 of Connector ST9 while the Spindle Motor is turning, the Spindle Motor will stay On for about 30 seconds after inserting the Diskette. If pulses are missing, check the Index Detector (M2).

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PRELIMINARY SERVICE CHECKS (Continued) SERVICE CHECKS (Continued)

(E) Head bangs against Track 00 stop. Check the logic reading at pin A1 of Connector ST6 while manually pushing head back to Track 00 and forward away from Track 00. The reading should be logic High when on Track 00 and logic Low when off Track 00. If logic reading is not correct check the Track 00 Detector (M1) and check Connector ST6 for good connections.

(F) Drive spindle motor does not turn Off. Check jumper J1 for good connections.

6 INTERNAL SPEAKER

(A) No sound. Check the Speaker Coil (SP1) for continuity (7.9 ohms).

7 PARALLEL PORT

(A) Parallel port not functioning. Check Connector J4 for good connections. If Connector J4 checks good, plug a loopback plug (see Parallel Loopback Plug section of Test Plug) into Connector J4. Type in and run the following Basic program. The program can be stopped by pressing the Ctrl and Break keys at the same time.

```

10 CLS
20 LOCATE 1,1
30 OUT 888,0: OUT 890,0
40 PRINT "A = "; INP(888)
50 PRINT "B = "; INP(889)
60 PRINT "C = "; INP(890)
70 OUT 888,255:OUT 890,255
80 PRINT "D = "; INP(888)
90 PRINT "E = "; INP(889)
100 PRINT "F = "; INP(890)
110 FOR T = 1 TO 100:NEXT T:GOTO 20
    
```

MISCELLANEOUS ADJUSTMENTS

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 (R1) on the Motor Control Board for a speed of 300 rpm \pm 4.5rpm.

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 Spindle Speed Control (R1) on the Motor Control Board until the strobe pattern appears to stand still.

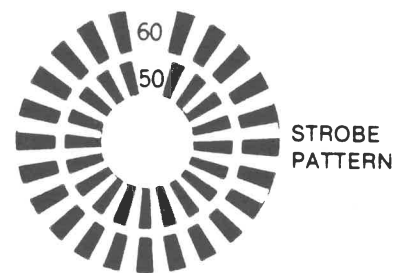


Figure 1

POWER SUPPLY

5V ADJUST

Connect input of DC voltmeter to 5V terminal on power supply. If power supply has no load connected to it, connect two #1133 6 volt lamps in parallel to the 5V terminal and a 10 ohm, 20W resistor to the 12V terminal. Turn power supply On and adjust 5V Adjust Control (R1) for a voltage of 5.0V. R1 is located next to the connector for the Hard Disk Drive and can be accessed without removing the power supply board from the case.

The program continuously checks the Printer interface circuits and displays six numbers (A thru F) on the Monitor screen. With Loopback Plug plugged into Connector J4, the following numbers should appear on the Monitor screen.

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

If numbers are not correct, troubleshoot Parallel Interface Circuits. If numbers are correct, check cable and peripheral that was connected to Parallel Port.

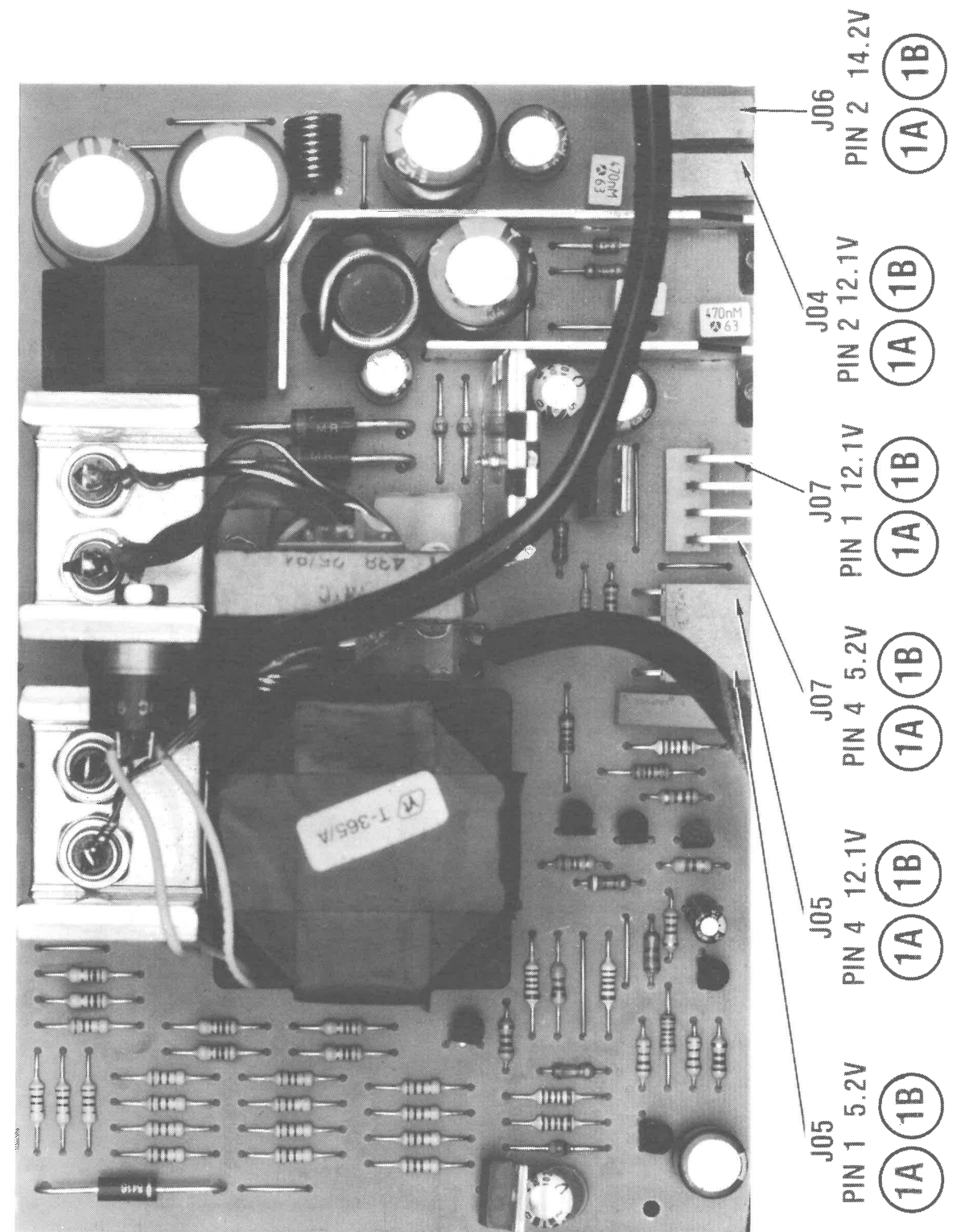
PARALLEL LOOPBACK PLUG

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.

8 SERIAL PORT

(A) Serial port does not work. Check Serial Interface IC (3R) by substitution.

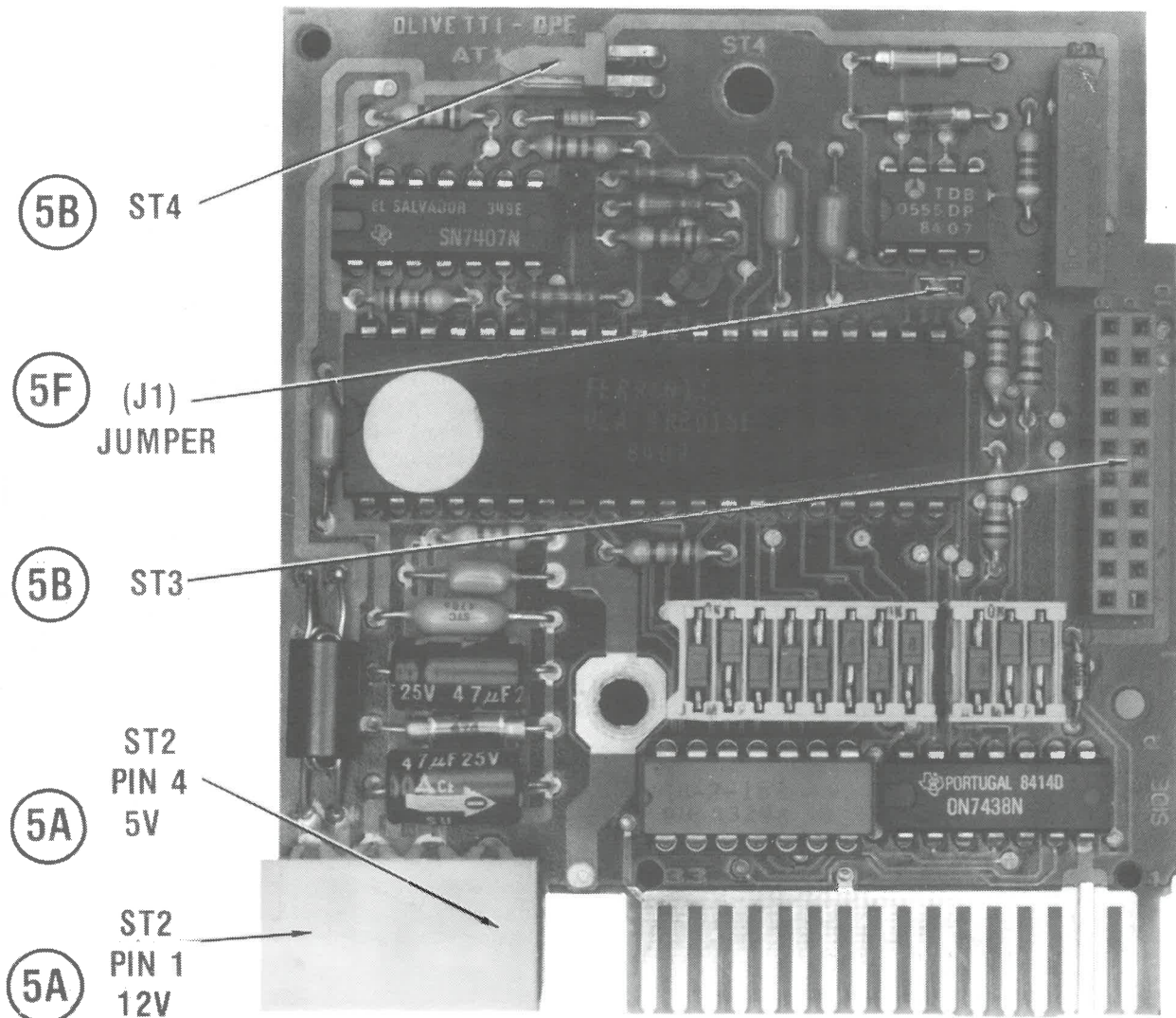
PRELIMINARY SERVICE CHECKS (Continued)



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POWER SUPPLY

PRELIMINARY SERVICE CHECKS (Continued)



DISK DRIVE BOARD

**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 message will be displayed on the Monitor screen and sent to the Printer if connected. For an explanation of the various error messages, see the "Computer Self-Test" section of the General Operating instructions.

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 MS DOS (Microsoft Disk Operating System) diskette is used, 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 the 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

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

To save a program, type SAVE, the program name enclosed in quotes and press the ENTER key. To save a program to Drive B, add 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 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. The Computer can also be reset by pressing the reset button located on the front lower right.

COMPUTER SELF-TEST

The Computer performs a Self-Test every time it is turned On. When the Self-Test is done, the results are displayed on the Monitor screen. The Computer then beeps once and boots up from a bootable diskette inserted in Drive A.

The Self-Test performs tests on the System Board, Floppy Disk Drive and Fixed (Hard) Disk Drive. The following chart is a list of possible error messages and their meaning.

Note: The IC's listed below may be the cause of the defect or the circuits associated with the IC may be defective.

ERROR MESSAGE	MEANING
CPU Fail	CPU IC (IC 3J) defective
ROM Module Fail	ROM IC (IC's 6F or 6H) defective
DMA Timer Fail	Timer (IC 10T) Channel 1 defective
DMA Control Fail	DMA Controller (IC 6M) defective
Interrupts Fail	Software interrupt circuit defective
Interrupt Fail H0	INT REQ0 from Timer Channel 0 (IC 10T) defective
Interrupt Fail H1	INT REQ1 from Keyboard Controller (IC 10U) defective
Interrupt Fail H2	INT REQ2 from I/O Board (plugged into an expansion slot) defective
Interrupt Fail H3	INT REQ3 from an I/O Board (plugged into an expansion slot) defective
Interrupt Fail H4	INT REQ4 from Serial Interface (IC 3R) defective

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PRELIMINARY SERVICE CHECKS (Continued) GENERAL OPERATING INSTRUCTIONS (Continued)

Interrupt Fail H5	INT REQ5 from an I/O Board (plugged into an expansion slot) defective	If a defective RAM IC is found the following message will appear.
Interrupt Fail H6	INT REQ6 from Floppy Disk Controller (IC 9L) defective	nnn kb RAM Fail: cc:Y000: zzz:www:rrrr nnn = last RAM bank test (decimal) cc = configuration of RAM
Interrupt Fail H7	INT REQ7 from Parallel Port defective	01 = 128 KB RAM (on System Board) 02 = 256 KB RAM (on System Board)
RT (Real Time) Clock Fail	Clock Calendar (IC 9D) registers defective	03 = 512 KB RAM (256 KB on System Board + 256 KB on Expansion Board)
RT Clock Fail: NR	Timer Interrupt (IC 10T) did not respond	05 = 640 KB RAM (256 KB on System Board + 384 KB on Expansion Board)
RT Clock Fail: LO	Timer Interrupt (IC 10T) low end is out of specification	Y = indicates which 128 KB bank has failure
RT Clock Fail: HI	Timer Interrupt (IC 10T) high end is out of specification	1 = Bank 0 on System Board 2 = Bank 1 on System Board 3 = Bank 0 on Expansion Board 4 = Bank 1 on Expansion Board 5 = Bank 2 on Expansion Board
Floppy (A:) Not Ready	Diskette not present or Disk Drive A defective	
Floppy (B:) Not Ready:	Diskette not present or Disk Drive B defective	000 = Segment of failure
Fixed (Hard) Disk Not Present	Fixed Disk Drive defective (if installed)	zzz = Offset of failure www = data that was written to RAM rrrr = data that was read from RAM

SWITCHES AND JUMPERS

SYSTEM BOARD DIP SWITCHES

Two DIP Switches located on System Board must be set according to the equipment installed on Computer. Use the following charts to determine proper Switch settings.

	DIP SW-0 (7T) ON	DIP SW-0 (7T) OFF
128K RAM Installed	2,3,4	1
256K RAM Installed	1,3,4	2
512K RAM Installed	1,2,4	3
640K RAM Installed	2,4	1,3
64K RAM Chips Used	4	---
256K RAM Chips Used	---	4
8087 (3L) Installed	---	5
8087 (3L) Not Installed	5	---
8250 (3R) Installed	6	---
8350 (3R) Installed	---	6
2732 (6F,6H) Used	8	---
2764 (6F,6H) Used	---	8

	DIP SW-1(7W) ON	DIP SW-1(7W) OFF
48 TPI Disk Drive Used	1	---
96 TPI Disk Drive Used	---	1
Floppy Disk Drive Slow Start-Up	2	---
Floppy Disk Drive Fast Start-Up	---	2
Hard Disk Drive Type	---	3,4
80 Column Display	5	6
40 Column Display	6	5
One Disk Drive Installed	7,8	---
Two Disk Drives Installed	8	7

SYSTEM BOARD

JUMPER

A	Not used. Defines clock to be used with 8350 (3T)
B	Not used. For production testing only.
C	Jumper installed to enable calendar IC (9D)
D	Not used. To be used in future to indicate presence of a "Mouse".
E	Jumper installed to connect the calendar IC (9D) battery (M1).

DISPLAY CONTROLLER BOARD JUMPER

JUMPER

BLOCK

1,2	24MHz on board oscillator used
2,3	System Board oscillator used
4,5	High-Resolution board oscillator
5,6	Clock Selection

PRELIMINARY SERVICE CHECKS (Continued) DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL

CABINET TOP

Turn two screws located on the rear panel at the top corners until they become loose (they do not have to be completely removed). Slide the top cabinet forward about 1/2 inch and lift up to remove.

CABINET BOTTOM

Turn the unit upside down. Turn two screws located on the rear panel at the bottom corners until they become loose. Slide the bottom cabinet forward about 1/2 inch and lift up to remove.

BUS CONVERTER BOARD REMOVAL

Remove cabinet top. Remove all the expansion boards that are plugged into the Bus Converter Board. Loosen screws securing 5V DC and ground terminals. Remove 5V DC and ground power cables from the connect points. Remove four screws holding Bus Converter Board to chassis. Slide Bus Converter Board toward Power Supply to unplug board from Display Controller Board. Lift Bus Converter Board out of Computer.

DISPLAY CONTROLLER BOARD REMOVAL

Remove cabinet top and bottom. Unplug 15V DC power cable from the rear of Display Controller Board. Loosen two screws holding 5V and ground power terminals to Bus Converter Board. Remove two screws holding Display Controller Board retaining bracket to rear panel. Set Computer on its right side. Remove four screws (one located at front, one on side and two at rear of panel) holding left side metal panel to chassis and remove panel. Remove one screw (located next to 5V and ground power terminals) holding Display Controller Board to chassis. Loosen two screws that secure 5V and ground power terminals to System Board. Unplug Display Controller Board from Bus Converter Board and System Board.

SYSTEM BOARD REMOVAL

Disconnect all cables from rear panel. Remove cabinet top and bottom covers. Remove Display Controller Board. Unplug 12V power cable from System Board (located next to 5V and ground power terminals). Unplug Disk Drive Cable from right side of System Board. Remove five screws holding System Board to chassis. Squeeze plastic clip at front center of System Board and lift board out of chassis.

DISK DRIVE REMOVAL

To remove Drives from chassis use a screwdriver to push down metal tab located directly under Drives at center. While holding tab down slide Drives forward about 1 inch. Remove Disk Drive cables and power cables from rear of Drives. Turn Drives on their left side. Remove two screws holding grounding straps to Drives and unplug small grounding wire from rear of Drives.

To separate Disk Drives remove four screws holding metal plate on bottom of Drive A and remove plate. Remove two screws from each side of Drive A and remove Drive from holder. Remove four screws from bottom of Drive B and remove holder for Drive A. Remove two screws from each side of Drive B and remove holder from Drive B.

POWER SUPPLY REMOVAL

Unplug power cable from rear of Computer. Remove two screws holding fan cover located on bottom corners of cover. Push cover down and pull to remove it. Unplug fan Connectors and remove screw holding ground wire. Remove top cover. Remove Disk Drives. Disconnect power cables from front of power supply. Remove one screw from left side of Power Supply holding supply to chassis. Slide Power Supply towards Bus Converter Board. Remove one screw from chassis holding ground strap from Power Supply. Lift Power Supply out of chassis.

KEYBOARD DISASSEMBLY

Turn Keyboard upside down. Use a flat blade screwdriver to push back (one at a time) six plastic latches while lifting up on bottom cover. Remove bottom and top covers. To remove a key, pull Key cap off. Squeeze in two tabs holding Key in slot and lift Key out of Keyboard.

POWER SUPPLY DISASSEMBLY

Remove one screw from right side of Power Supply case. Remove three screws holding ground straps to right side. Remove two screws from top rear of case. Slide two boards out of case along with rear panel.

DISK DRIVE CLEANING

Use a lint free cloth or swab dampened with 91% isopropyl alcohol to clean the Disk Drive Heads and dry with a lint free cloth.