HOWARD W. SAMS & COMPANY CSCS28 09047

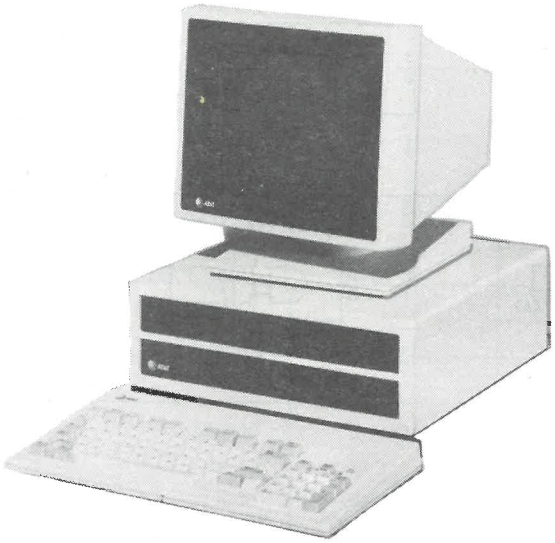
COMPUTERFACTS™

Technical Service Data

AT&T®
MODEL 6300 PLUS
COMPUTER

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

AT&T MODEL 6300 PLUS CSCS28



CSCS28 AT&T MODEL 6300 PLUS

SAFETY PRECAUTIONS

See Page 32

PRELIMINARY SERVICE CHECKS

ENCLOSED

INDEX

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

 89CS19065 DATE 5-89

TO KEYBOARD

LA2

J6 1 — F1 2A — 1 — 12.0V

J6 2 — R77 4700 — 3 — 5.2V (A)

J6 5 — R78 4700 — 3 — 5.2V (A)

J6 NC 9 — 3 — 5.2V (A)

J6 NC 8 — R72 4700 — 3 — 5.2V (A)

J6 3

J6 4

J6 NC 6

J6 NC 7 — EXTRESET — RESET

7438PC PART OF 11X

7438PC PART OF 11X

7406PC PART OF 7Z

SN74LS04N PART OF 8T

R76 4700 — 3 — 5.2V (A)

R74 4700 — 3 — 5.2V (A)

R75 4700 — 3 — 5.2V (A)

R73 4700

T74LS10BI PART OF 6V

SN74LS04N PART OF 8T

SN74LS04N PART OF 8T

SN74LS04N PART OF 8T

R12 470 — 3 — 5.2V (A)

R13 470 — 3 — 5.2V (A)

5V .5μs 10V

D8741A 8W KEYBOARD CONTROLLER

P20 P21 P22 P23 P24 P10 P11 P12 P13 P16 P17 P27 P26 P25 P14 P15 TEST0 RESET SYNC

P27/DACK P26/DRQ P25/IBF PROG

P0 P1 P2 P3 P4 P5 P6 P7

SD0 SD1 SD2 SD3 SD4 SD5 SD6 SD7

74LS245PC 5T TRANSCEIVER

B8 B7 B6 B5 B4 B3 B2 B1 — A8 A7 A6 A5 A4 A3 A2 A1

DIR EN — BDIR

LD0 LD1 LD2 LD3 LD4 LD5 LD6 LD7

74LS245PC 1D TRANSCEIVER

D8 D9 D10 D11 D12 D13 D14 D15

DD8 DD9 DD10 DD11 DD12 DD13 DD14 DD15

UBITS

UBDIR

7SN4S133N PART OF 3N

DMACS INTRCS TIMERCS Y3 Y4 Y5 PTRY3 AS8 SP/EN AS9 TIME SLICE EN DACK2

T74LS02BI PART OF 6L

OUT0 KBD TST INT IRQ2 IRQ3 IRQ4 IRQ5 IRQ6 IRQ7 INTINTR INTA MODRD MODWR SP/EN

SAB8259AP 1Q INTERRUPT CONTROLLER

A0 IR0 IR1 IR2 IR3 IR4 IR5 IR6 IR7 INT INTA RD WR SP/EN CS

D0 D1 D2 D3 D4 D5 D6 D7 CAS2 CAS1 CAS0

SD0 SD1 SD2 SD3 SD4 SD5 SD6 SD7 ICAS2 ICAS1 ICAS0

R138 4700 — 3 — 5.2V (A)

INTA — INTRCS

80287 2B COPROCESSOR

LA1 LA2 — CND0 CND1 — D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14 D15

CKM — NPS2

DD0 DD1 DD2 DD3 DD4 DD5 DD6 DD7 DD8 DD9 DD10 DD11 DD12 DD13 DD14 DD15

PEREQ PEACK CODINTA S0 S1 RESET READY CLK286 CLK BUSY ERROR HLDA NPWR NPRD NPS1

COD/IN S0 S1 CPURES READY CLK286 NPERROR HOLDA IOW IOR NPCS

NC NC

T74LS279B1 PART OF 7V

T74LS00B1 PART OF 2S

RESET MWT INTA HOLD

4MHZ — XTAL1 — XTAL2

KBINT — P24/OFB

P12 — P12

TEST1 — TEST1

RD — IOR

WR — IOW

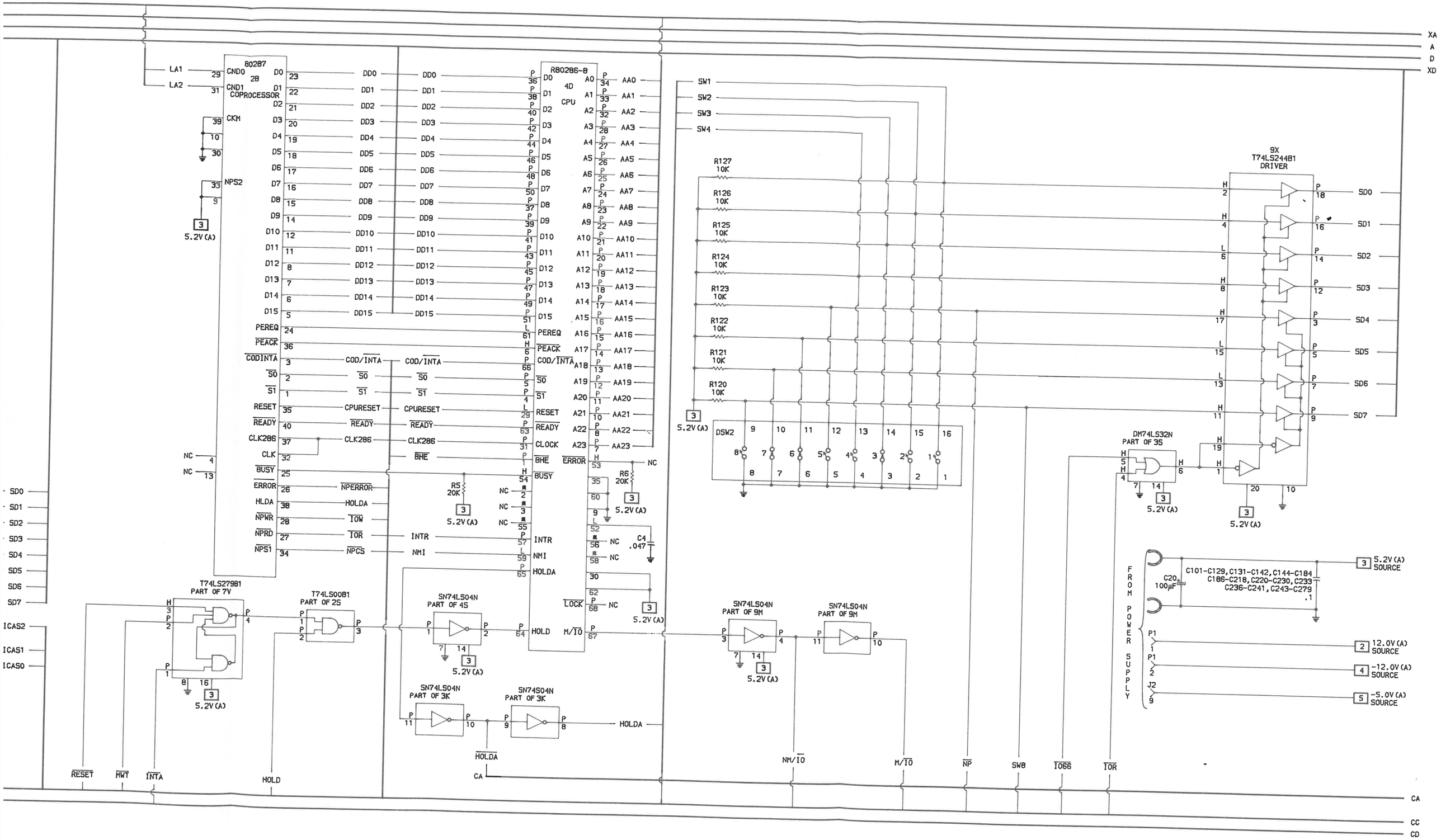
KBRD — CS

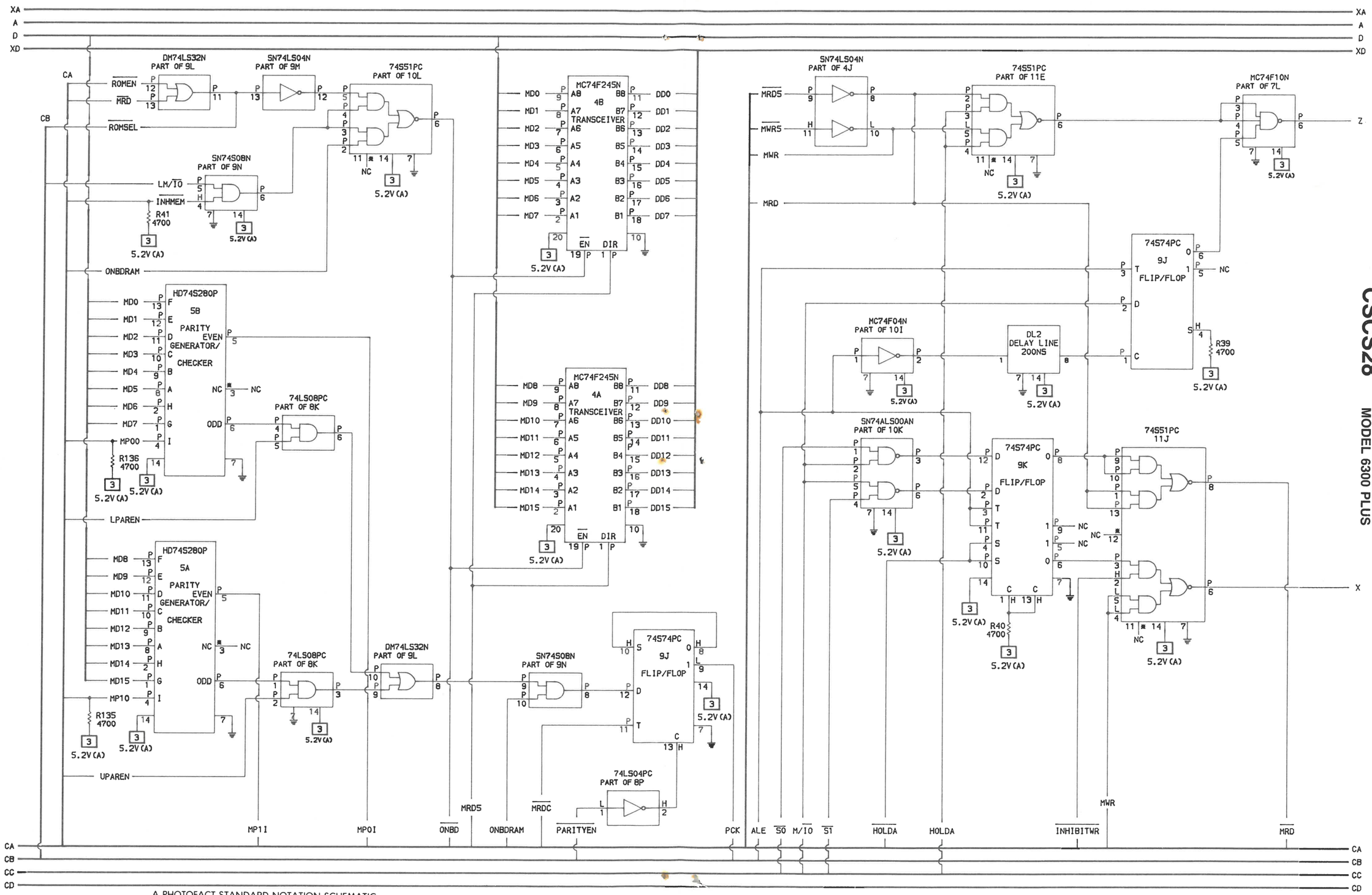
IO60 IO64

EA

E6 E7 E4 E5

A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®

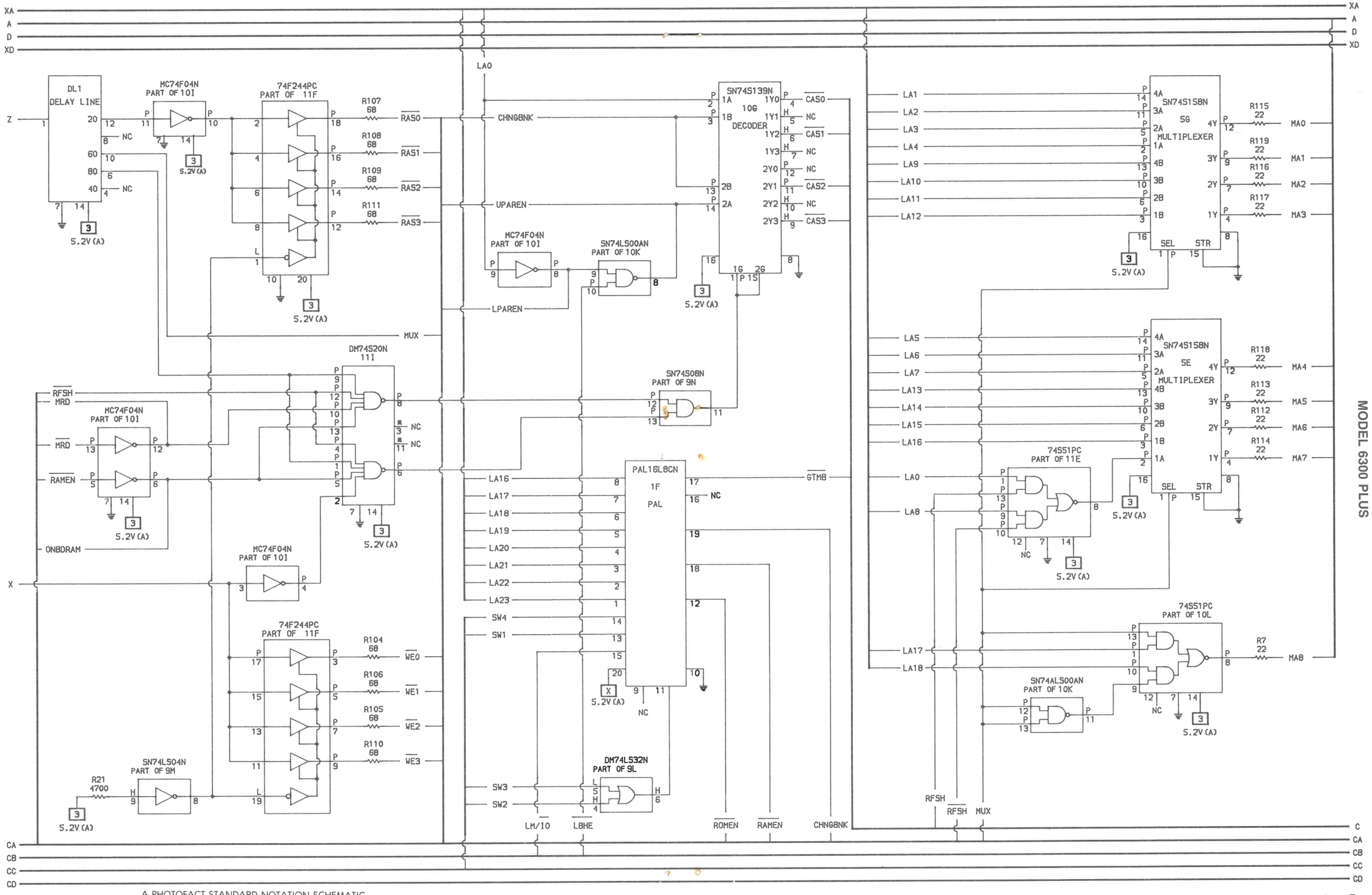

80287
2B
COPROCESSOR
CND0
CND1
CKM
NPS2
LA1
LA2
5.2V (A)
R80286-8
4D
CPU
DD0
DD1
DD2
DD3
DD4
DD5
DD6
DD7
DD8
DD9
DD10
DD11
DD12
DD13
DD14
DD15
PEREQ
PEACK
COD/INTA
S0
S1
RESET
READY
CLK286
CLK
BUSY
ERROR
HLDA
NPWR
NPRD
NPS1
CPURESET
IOW
IOR
NPCS
INTR
NMI
HOLDA
BHE
CLOCK
LOCK
HOLD
M/IO
AA0
AA1
AA2
AA3
AA4
AA5
AA6
AA7
AA8
AA9
AA10
AA11
AA12
AA13
AA14
AA15
AA16
AA17
AA18
AA19
AA20
AA21
AA22
AA23
NPERROR
NC
R5 20K
R6 20K
C4 .047
SW1
SW2
SW3
SW4
R127 10K
R126 10K
R125 10K
R124 10K
R123 10K
R122 10K
R121 10K
R120 10K
DSW2
9X
T74LS244B1
DRIVER
SD0
SD1
SD2
SD3
SD4
SD5
SD6
SD7
DM74LS32N
PART OF 3S
T74LS27981
PART OF 7V
T74LS00B1
PART OF 2S
SN74LS04N
PART OF 4S
PART OF 3K
PART OF 9M
ICAS2
ICAS1
ICAS0
C20 100µF
C101-C129, C131-C142, C144-C184
C186-C218, C220-C230, C233
C236-C241, C243-C279
.1
FROM POWER SUPPLY
5.2V (A) SOURCE
12.0V (A) SOURCE
-12.0V (A) SOURCE
-5.0V (A) SOURCE
XA
A
D
XD
CA
CC
CD



SYSTEM BOARD

A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH CIRCUITRACE®

SYSTEM BOARD



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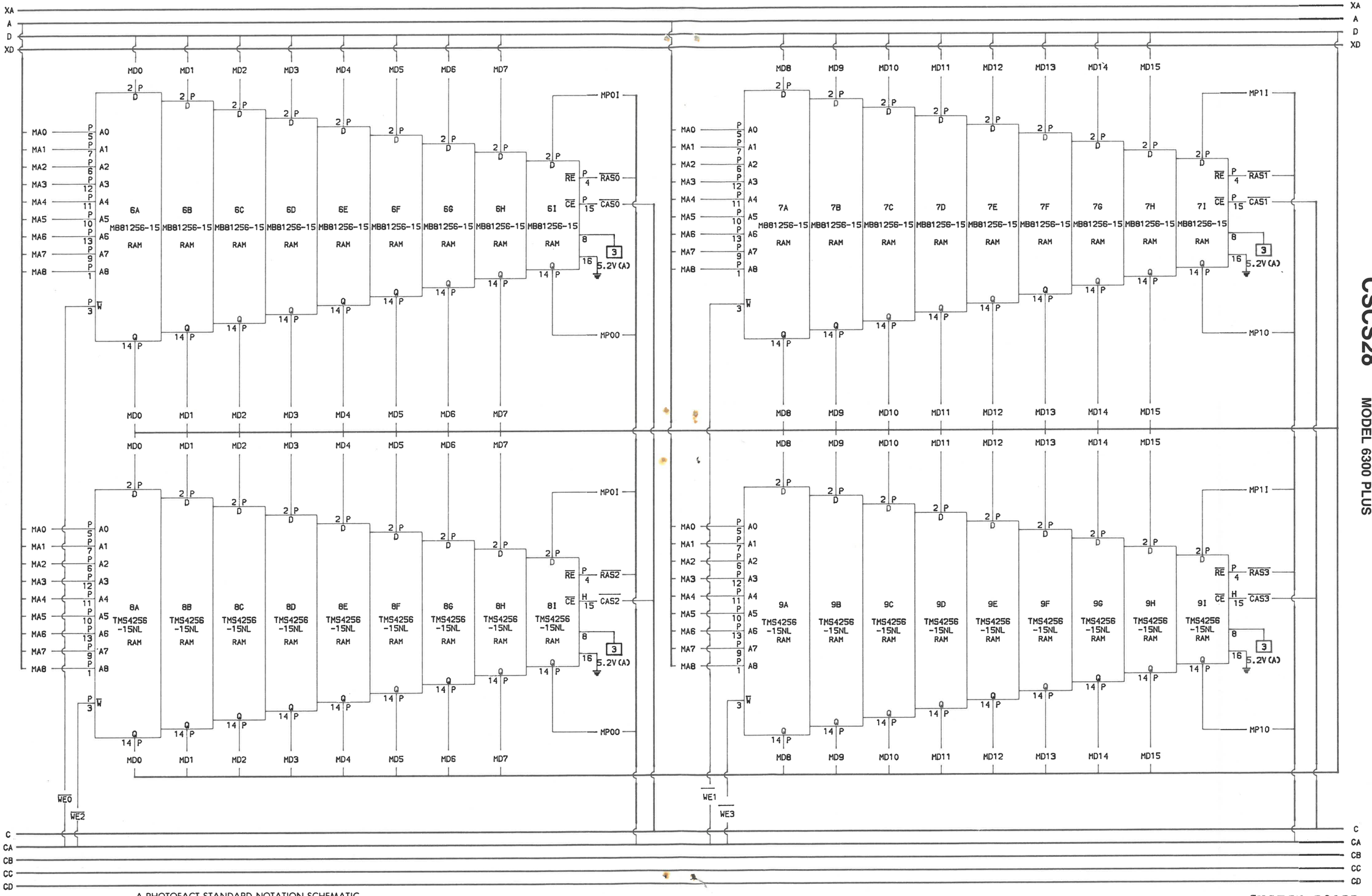
WITH CIRCUITRACE®

SYSTEM BOARD



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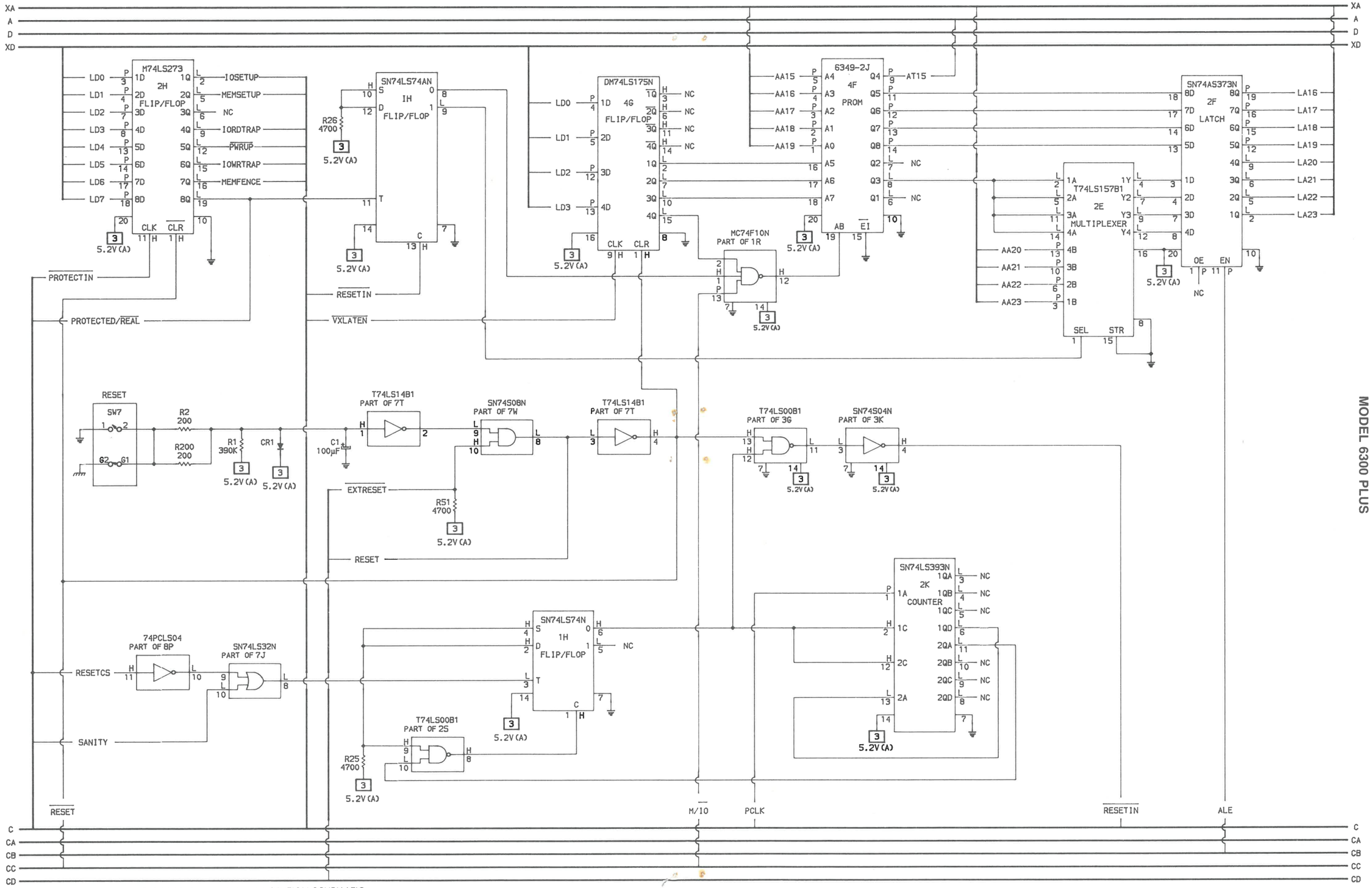

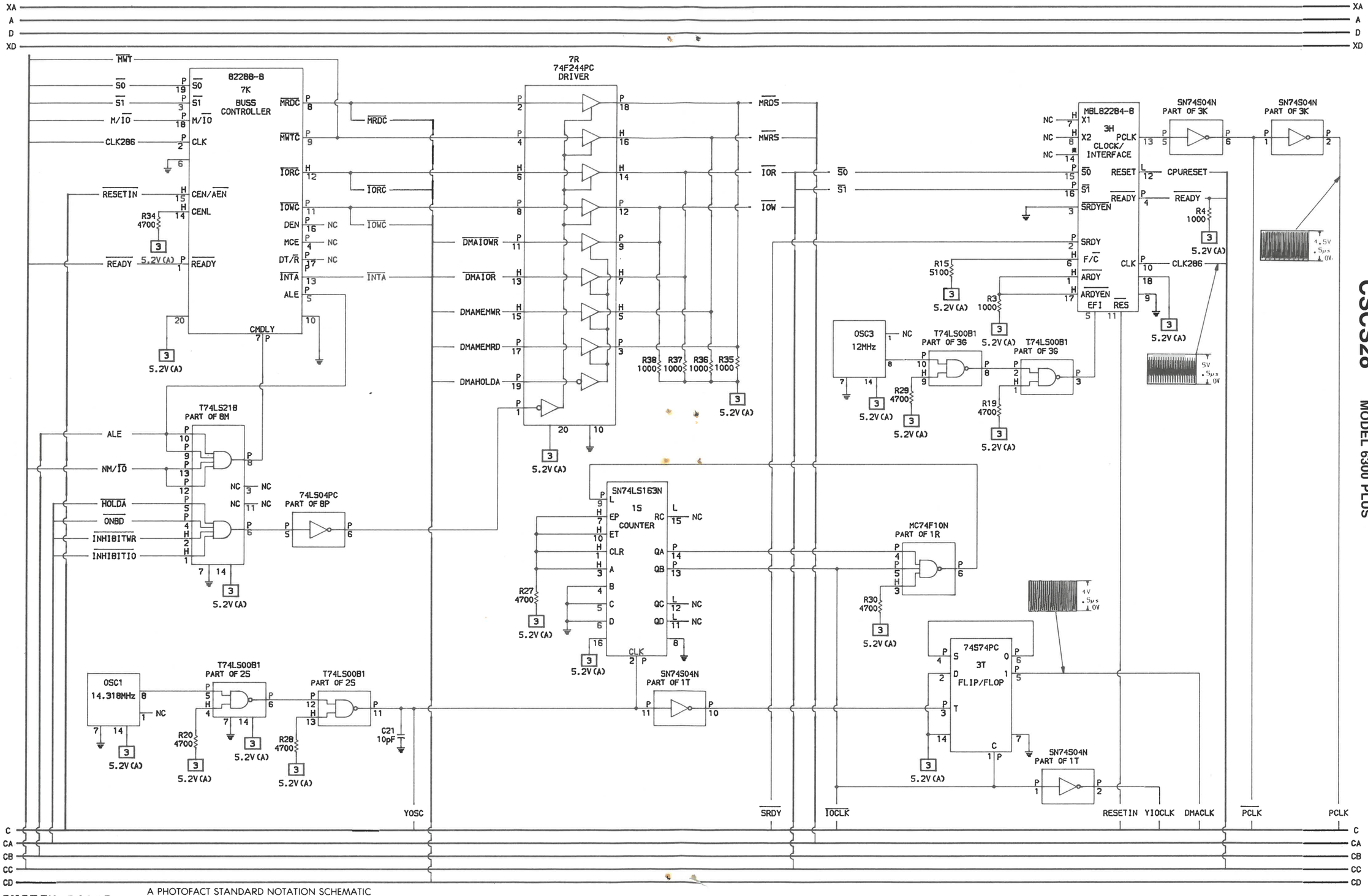

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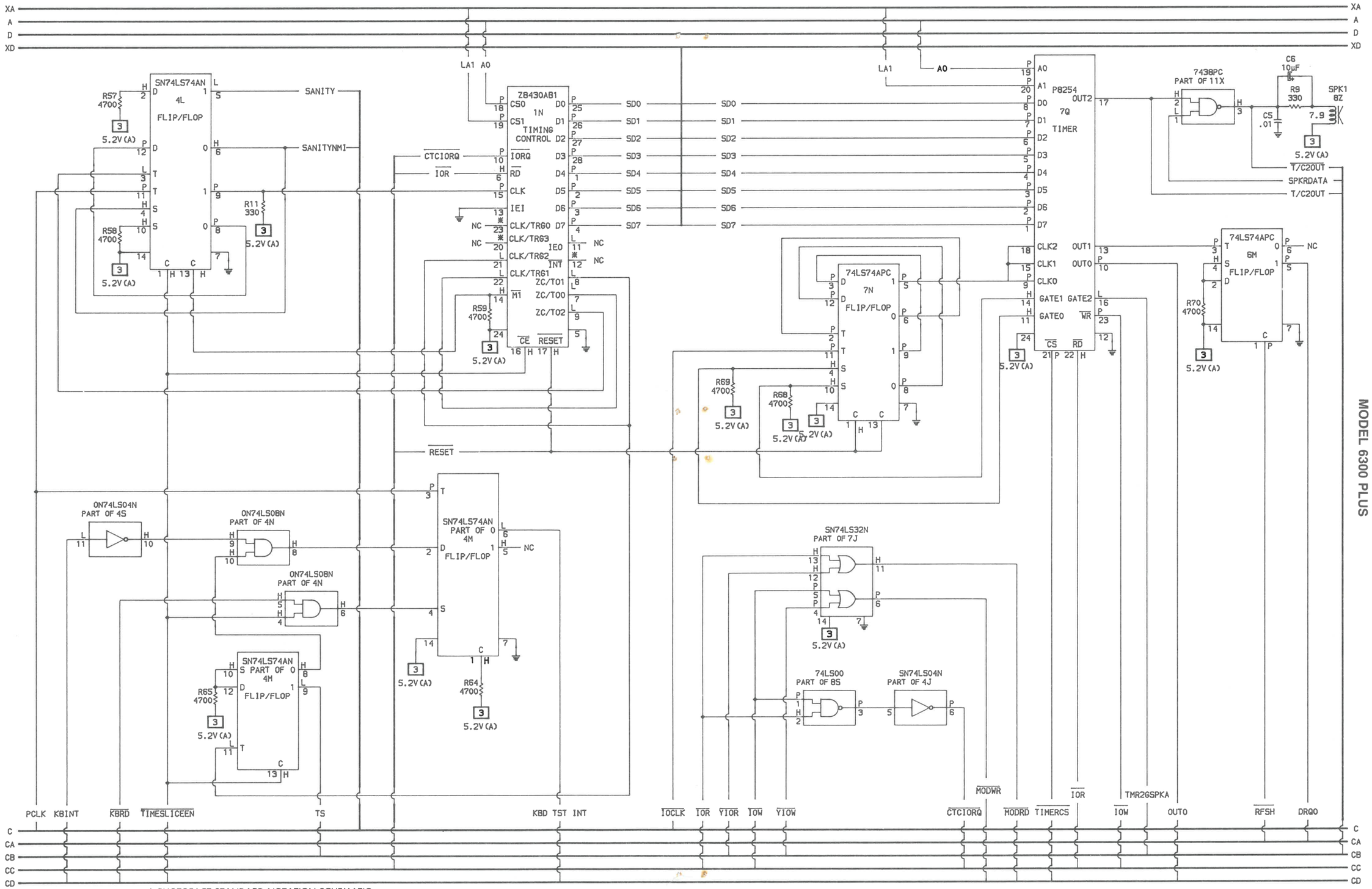
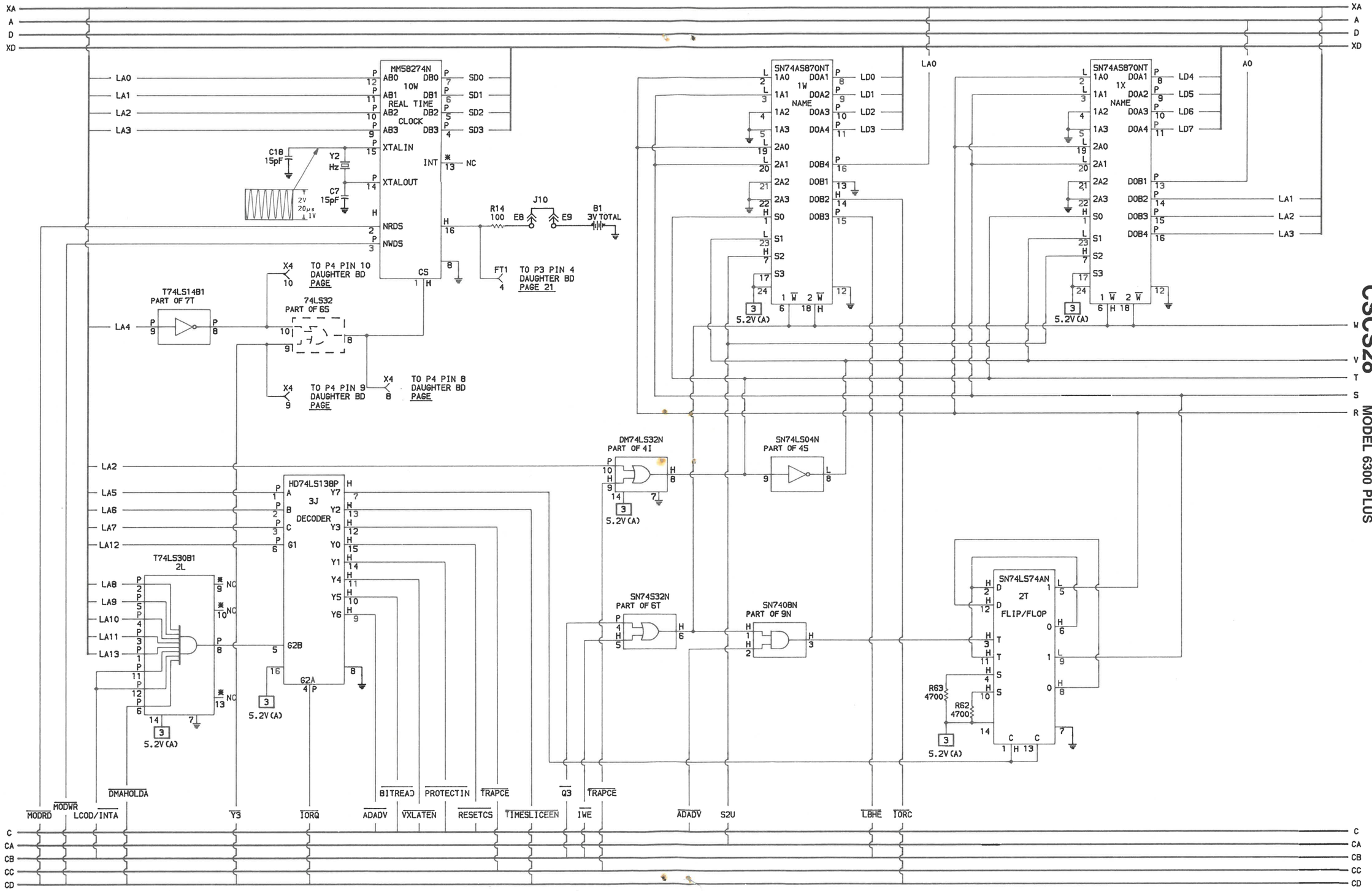
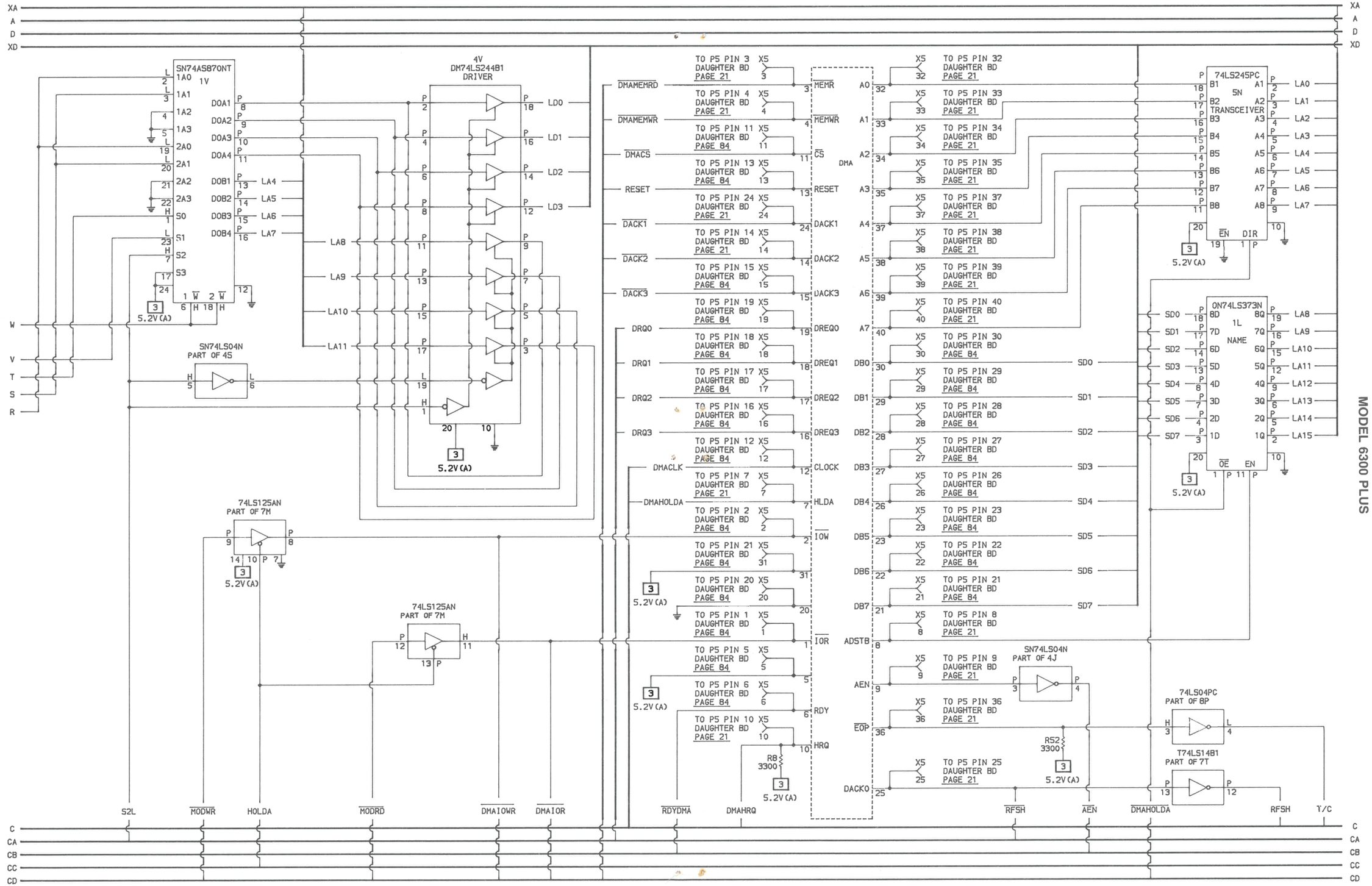
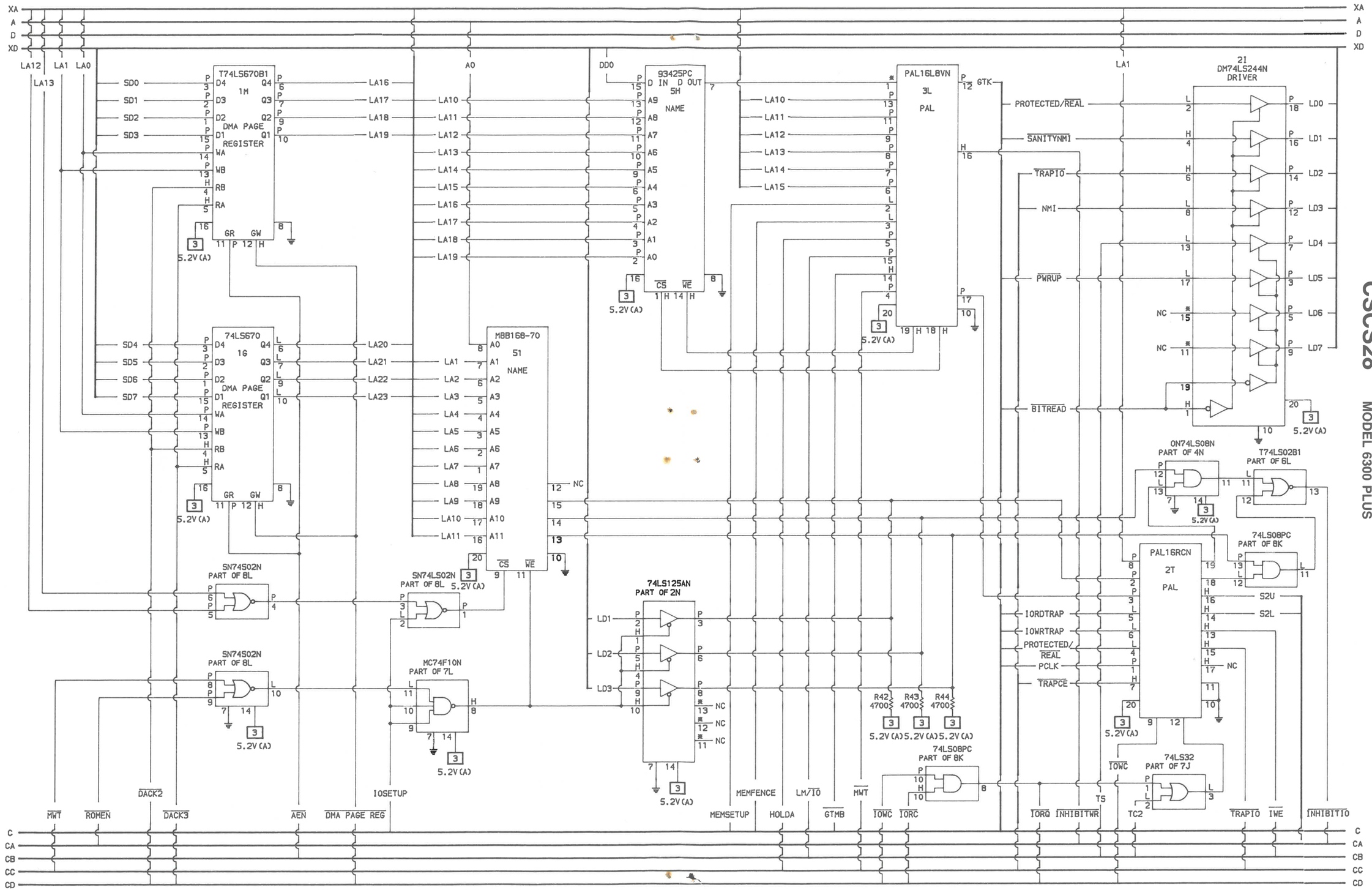






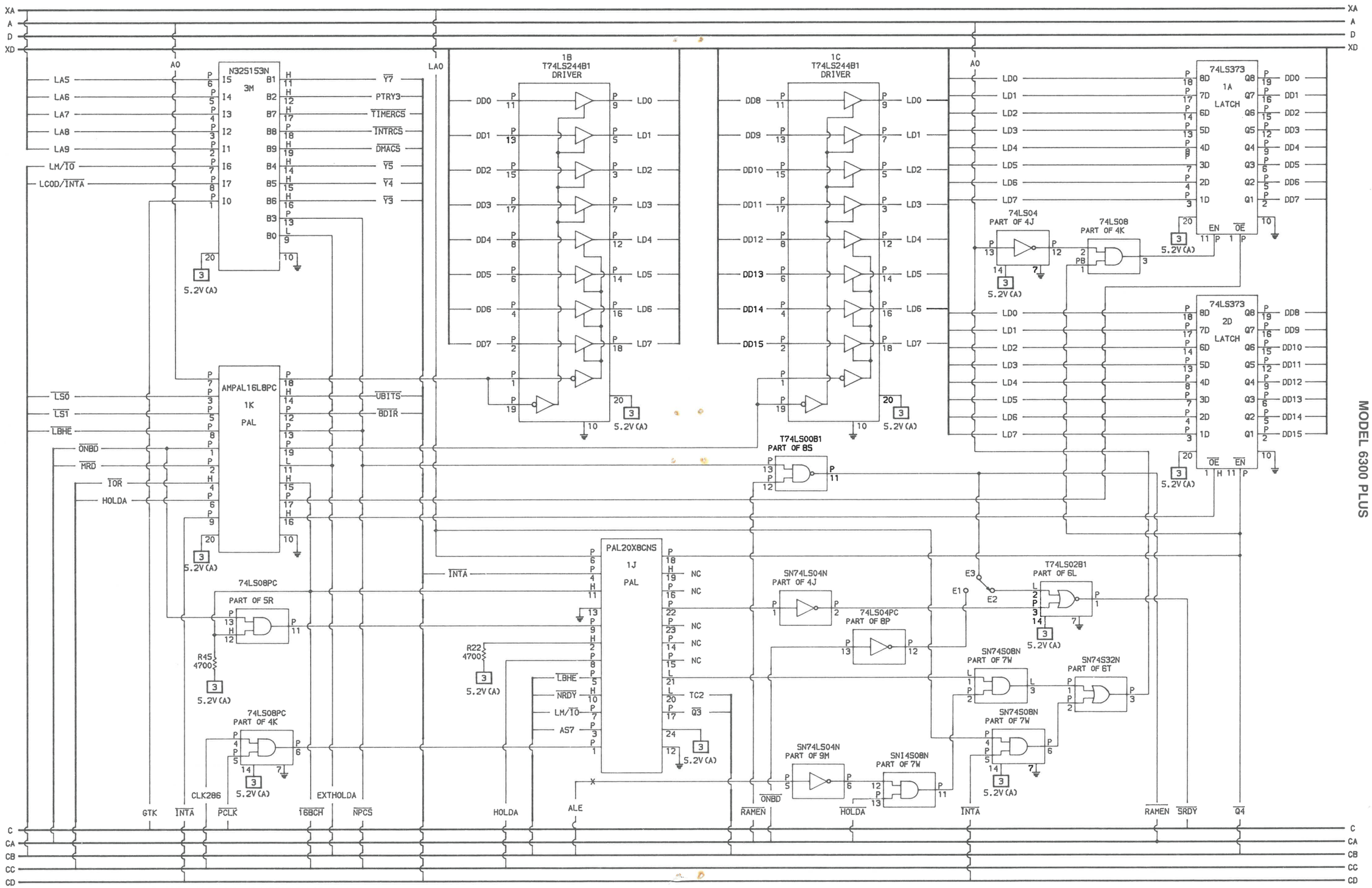
A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®



SYSTEM BOARD

A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®

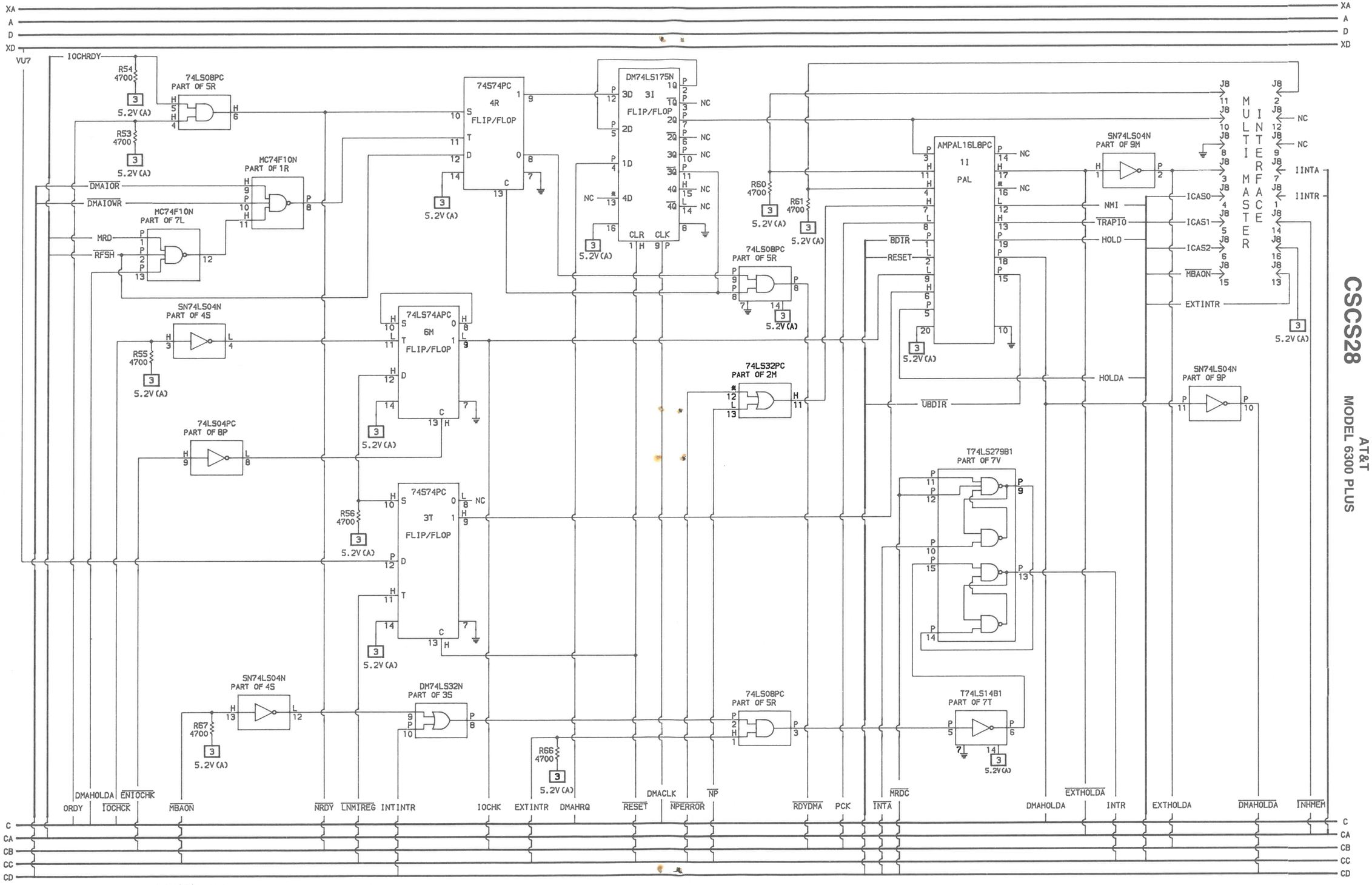
SYSTEM BOARD



SYSTEM BOARD

A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®

SYSTEM BOARD

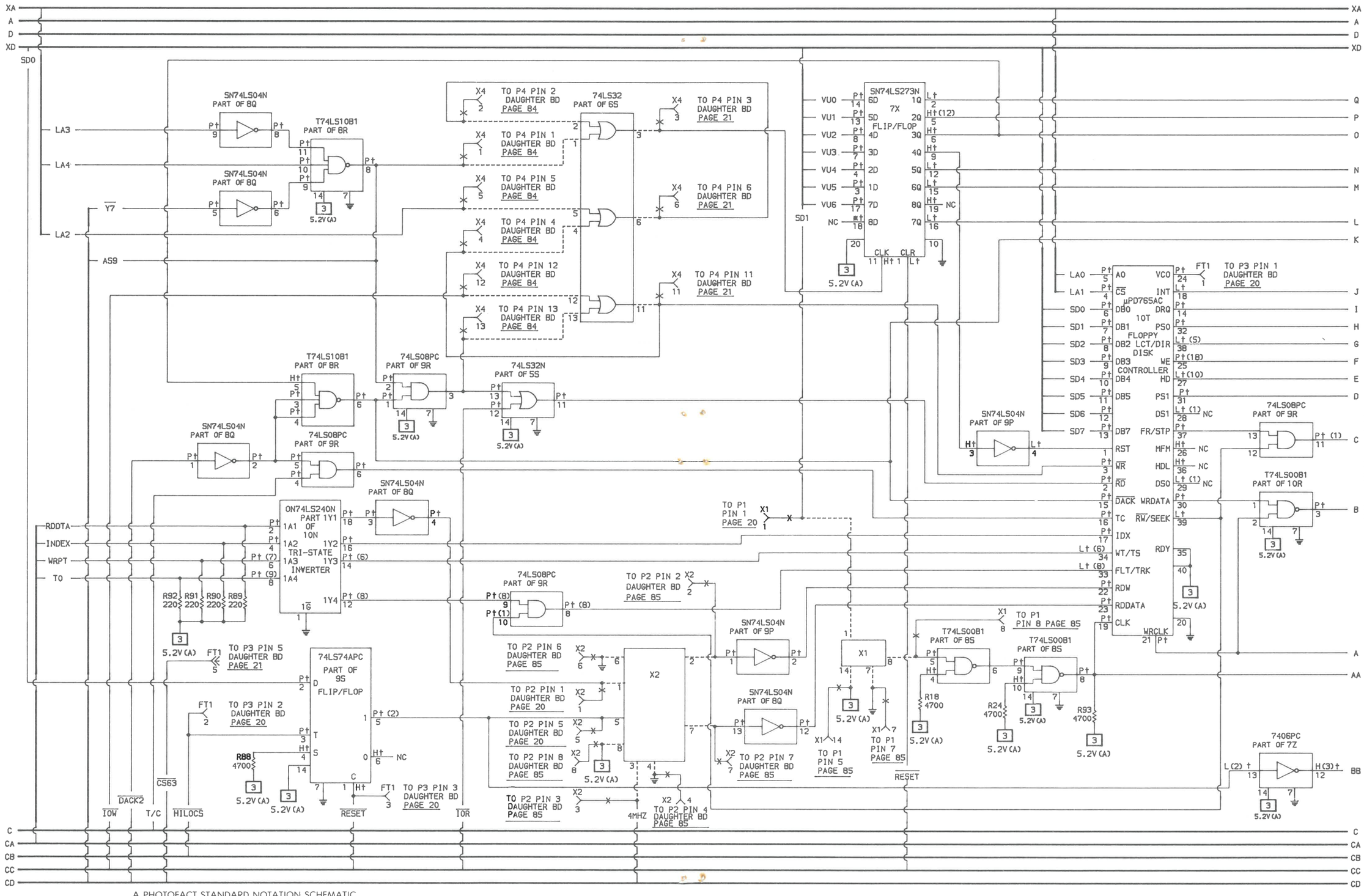


CSCS28

AT&T MODEL 6300 PLUS

SYSTEM BOARD

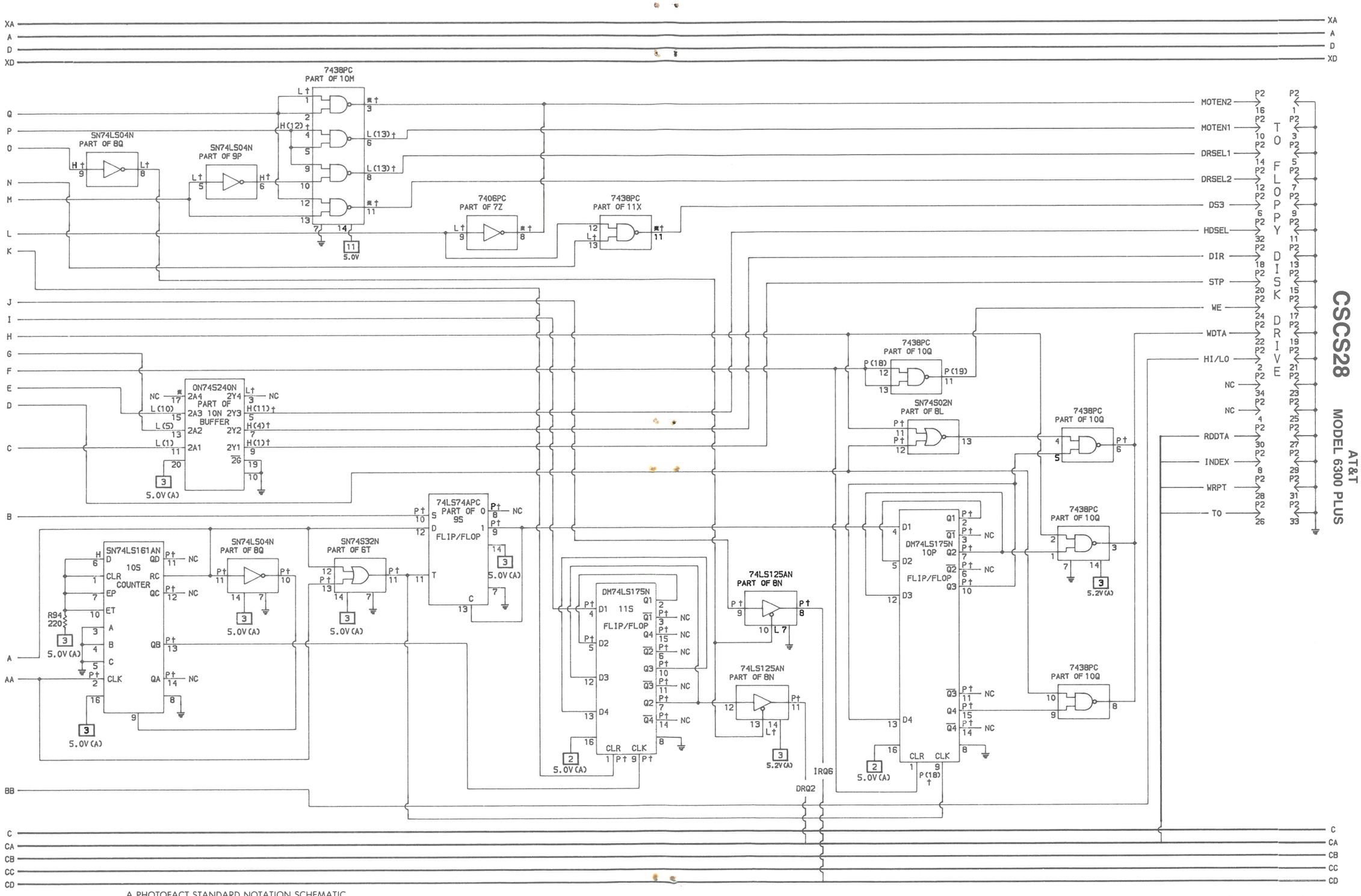
A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®

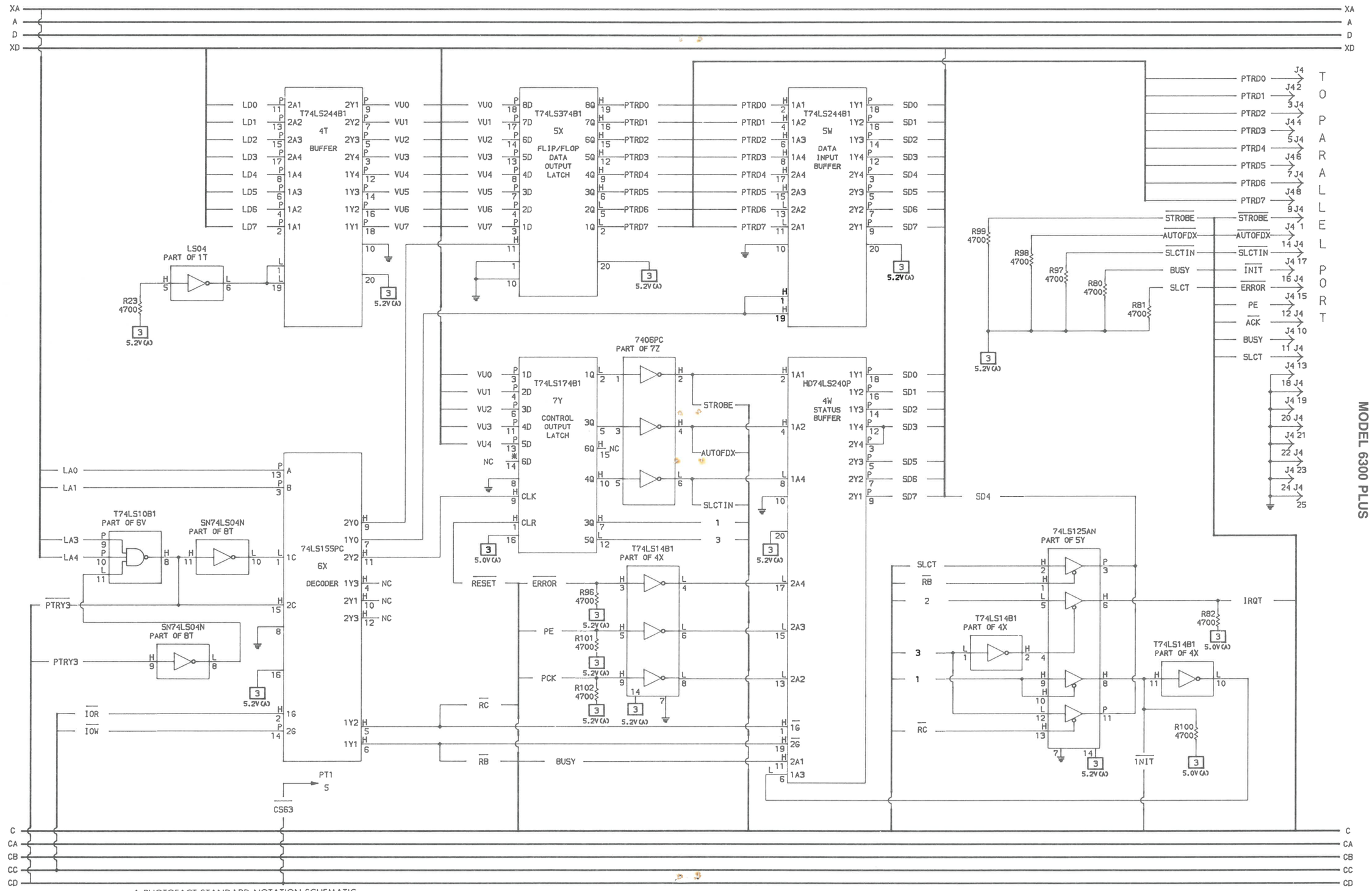


CSCS28

AT&T MODEL 6300 PLUS

TO FLOPPY DISK DRIVE

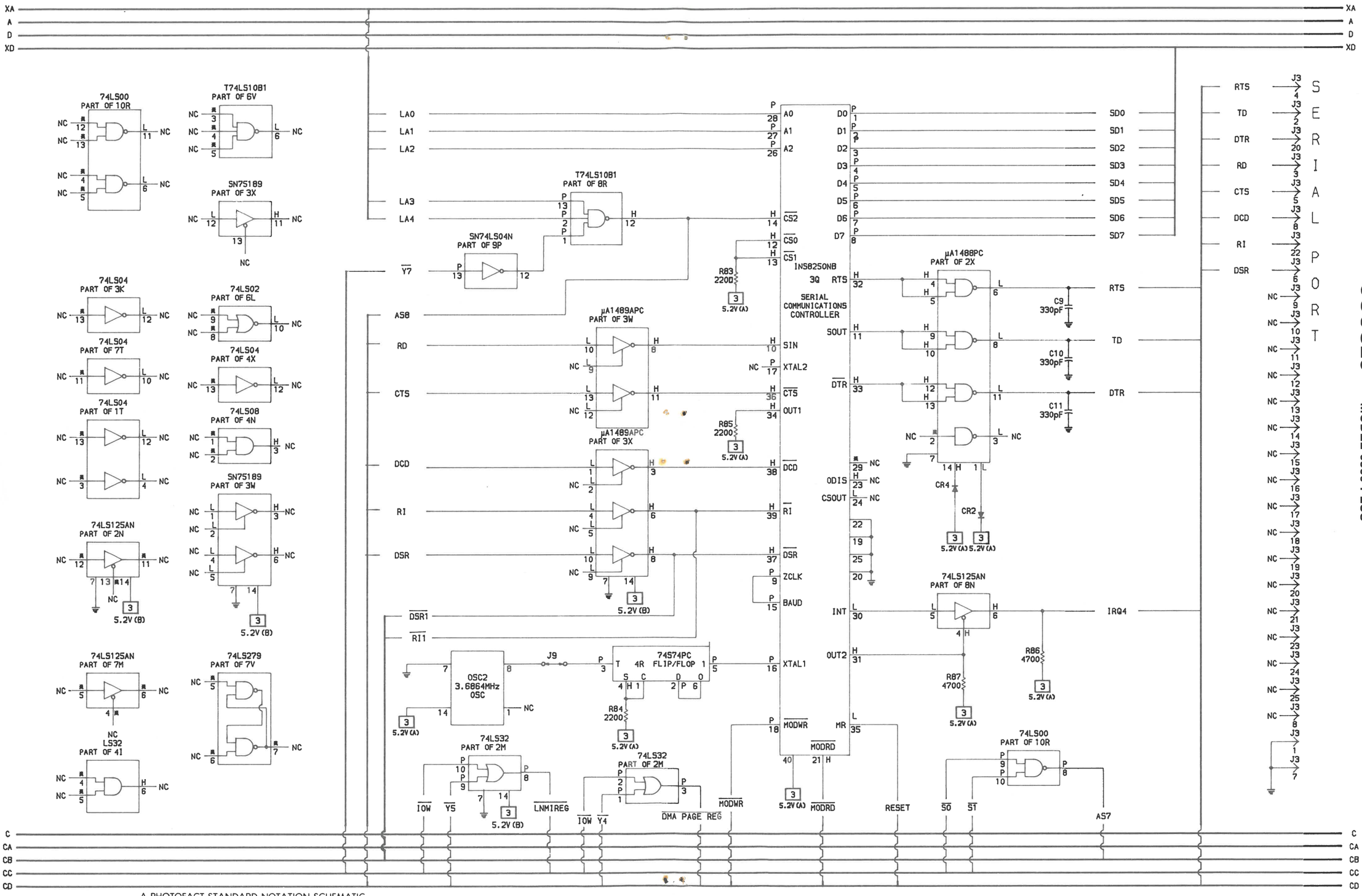




SYSTEM BOARD

A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH CIRCUITRACE®

SYSTEM BOARD



A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH CIRCUITRACE™

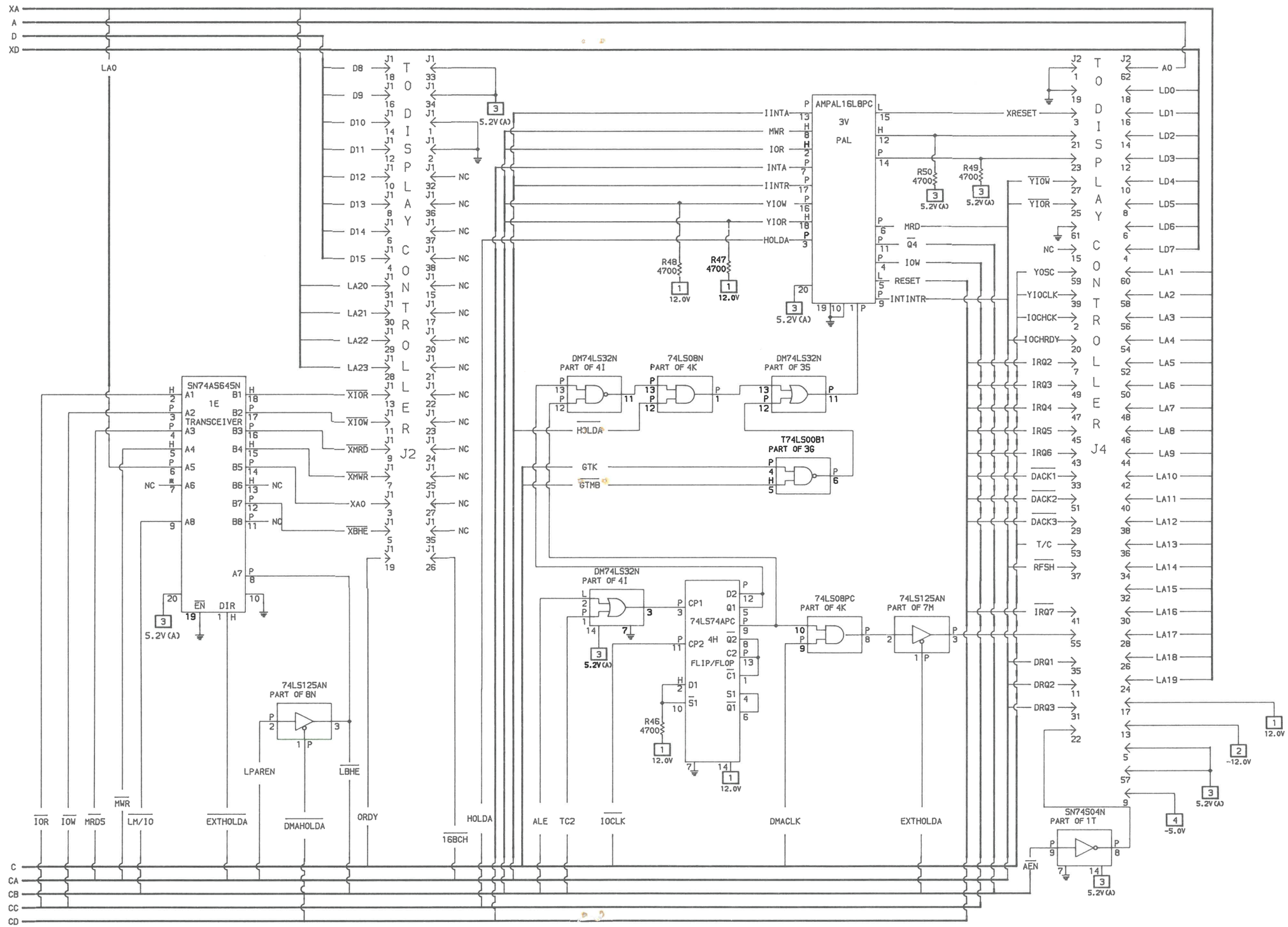
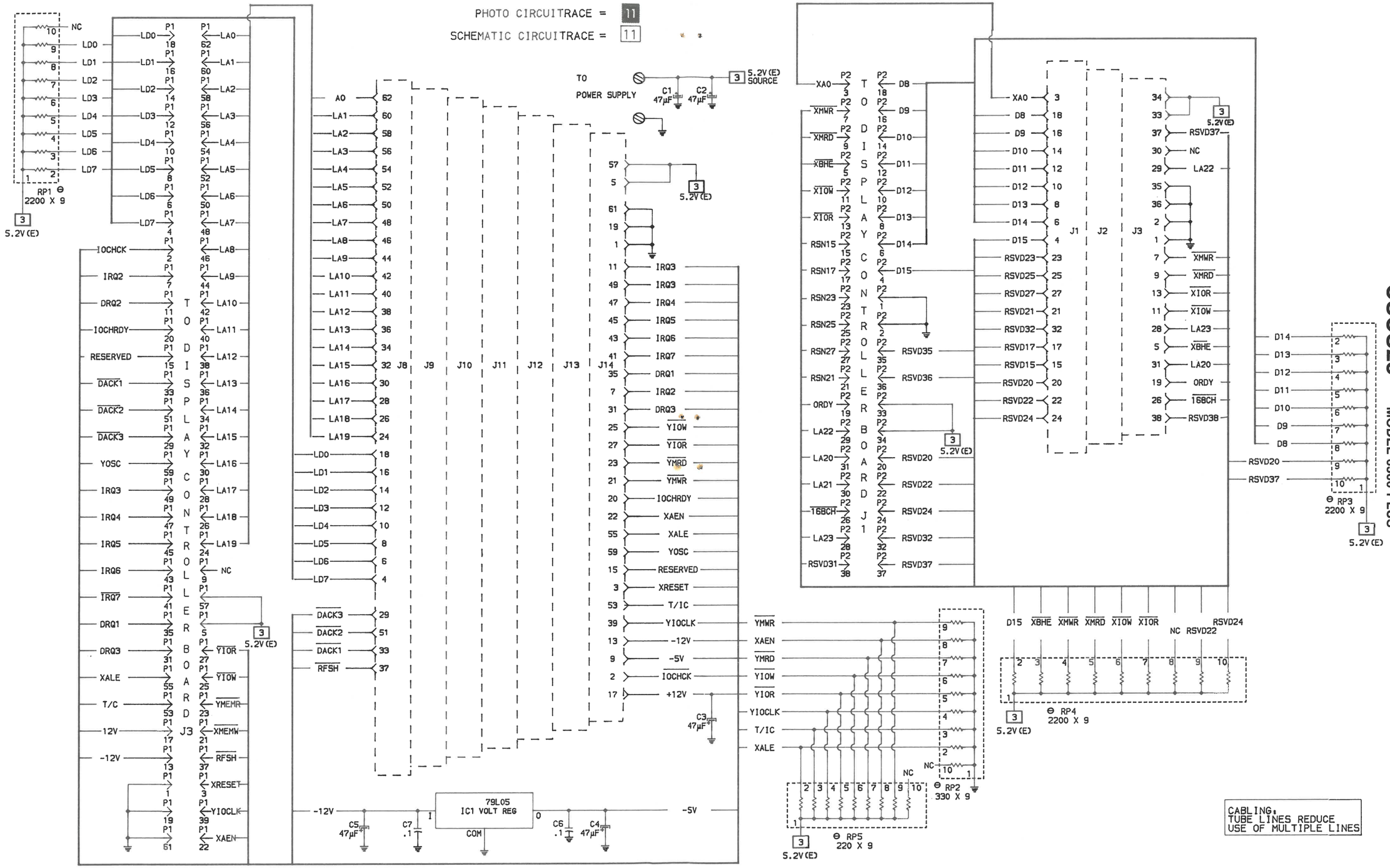
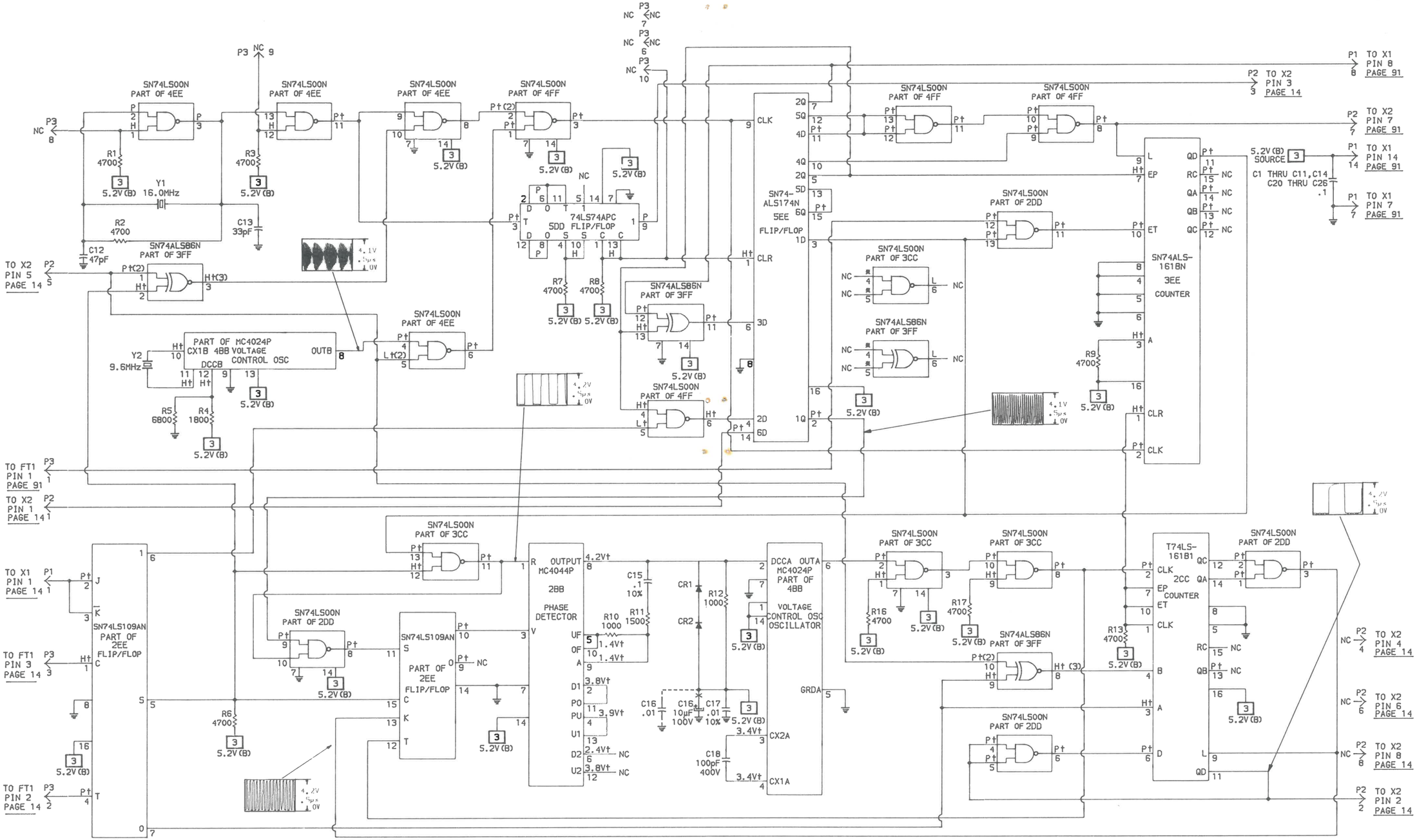


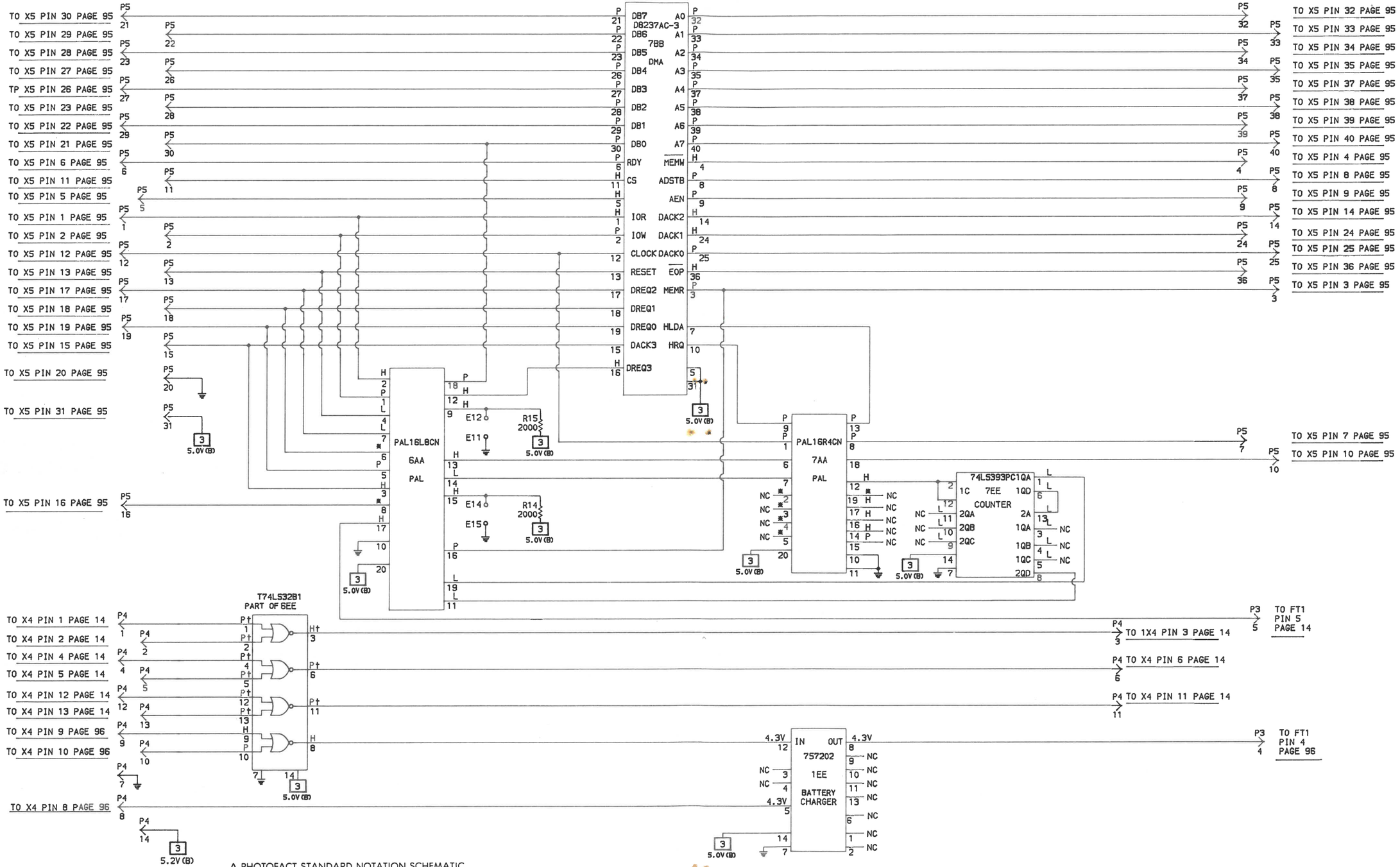
PHOTO CIRCUITRACE = 11
SCHEMATIC CIRCUITRACE = 11



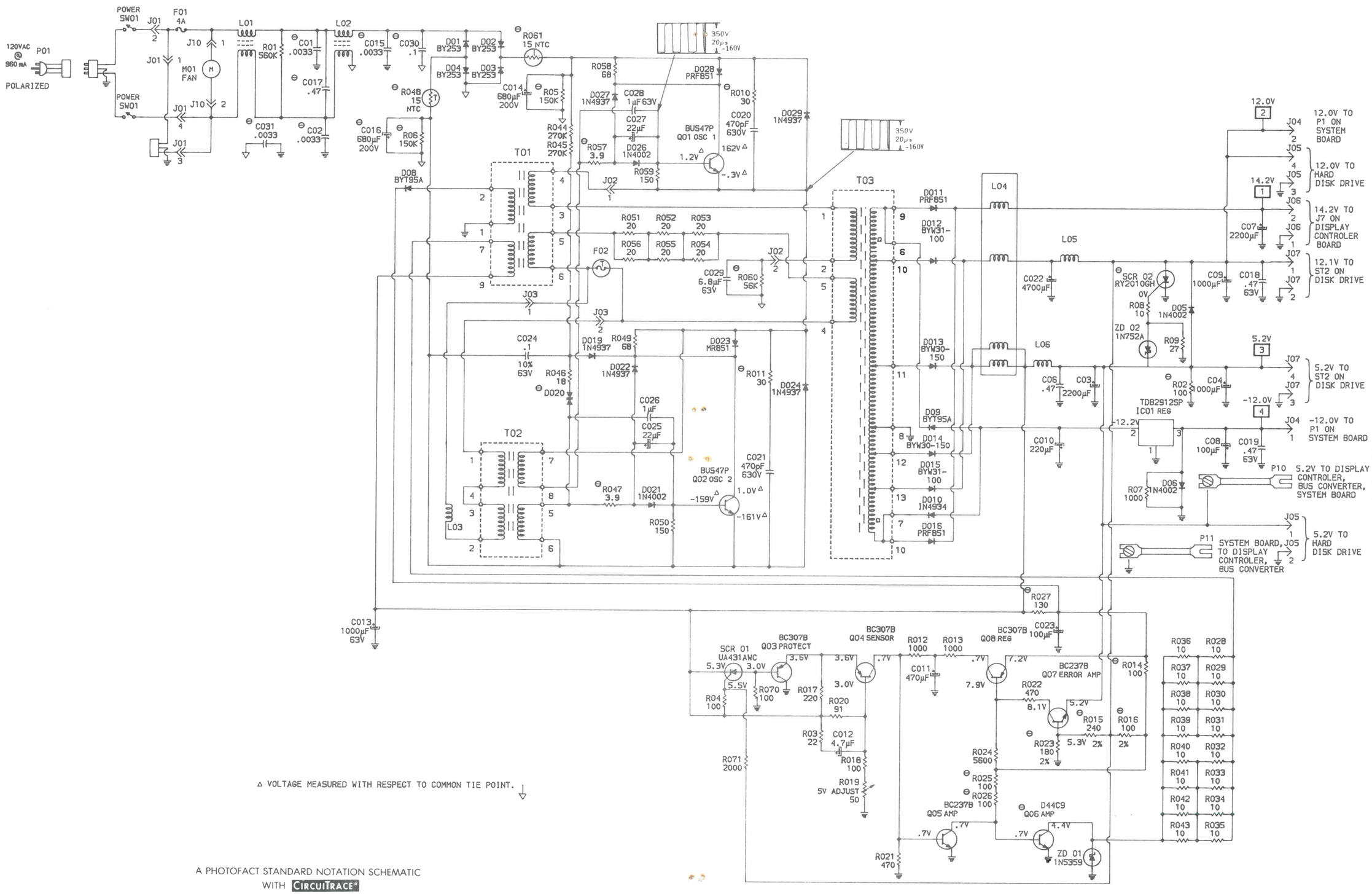
A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH CIRCUITRACE®



A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH CIRCUITRACE™

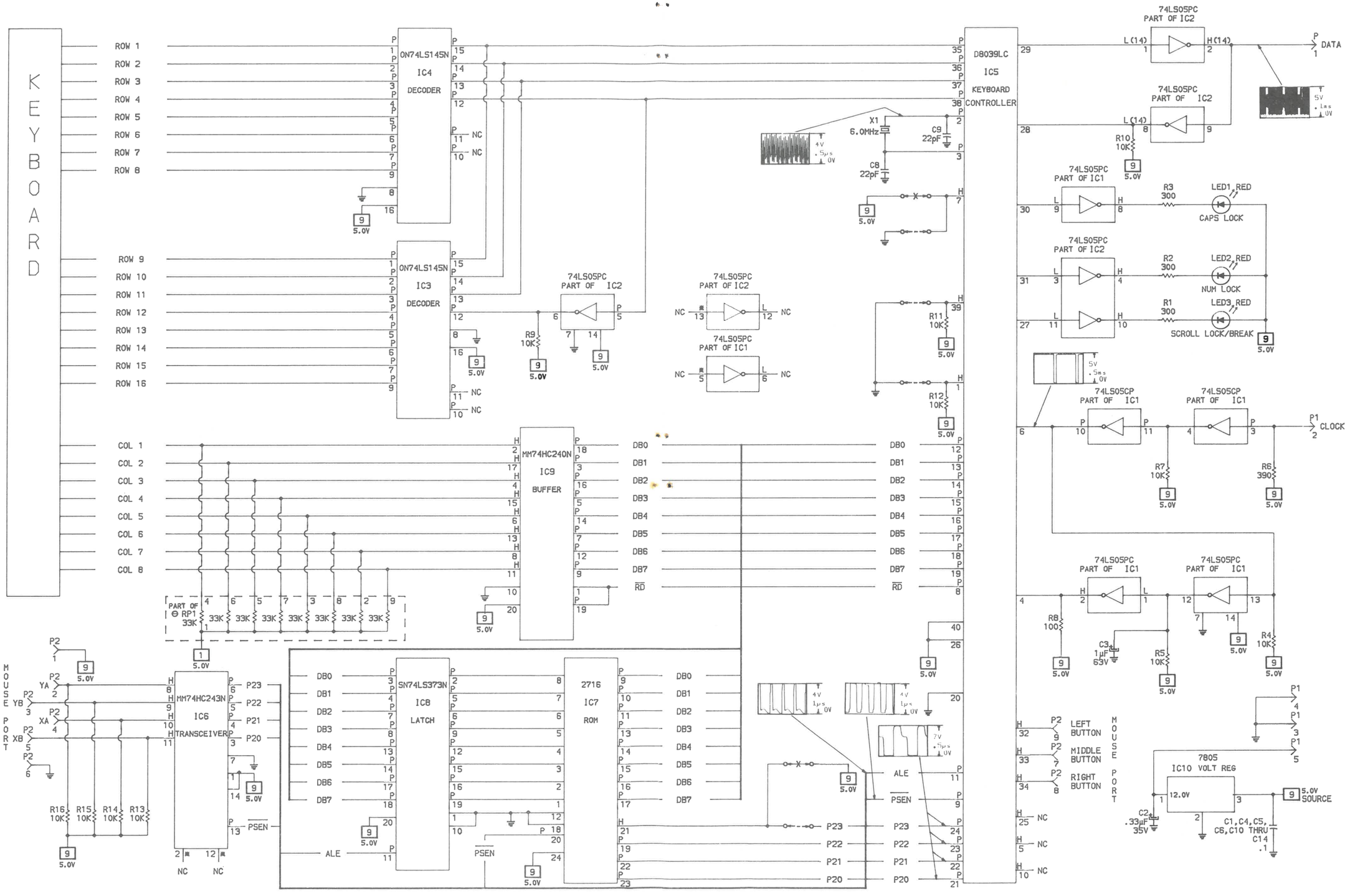


A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH CIRCUITRACE®



△ VOLTAGE MEASURED WITH RESPECT TO COMMON TIE POINT.

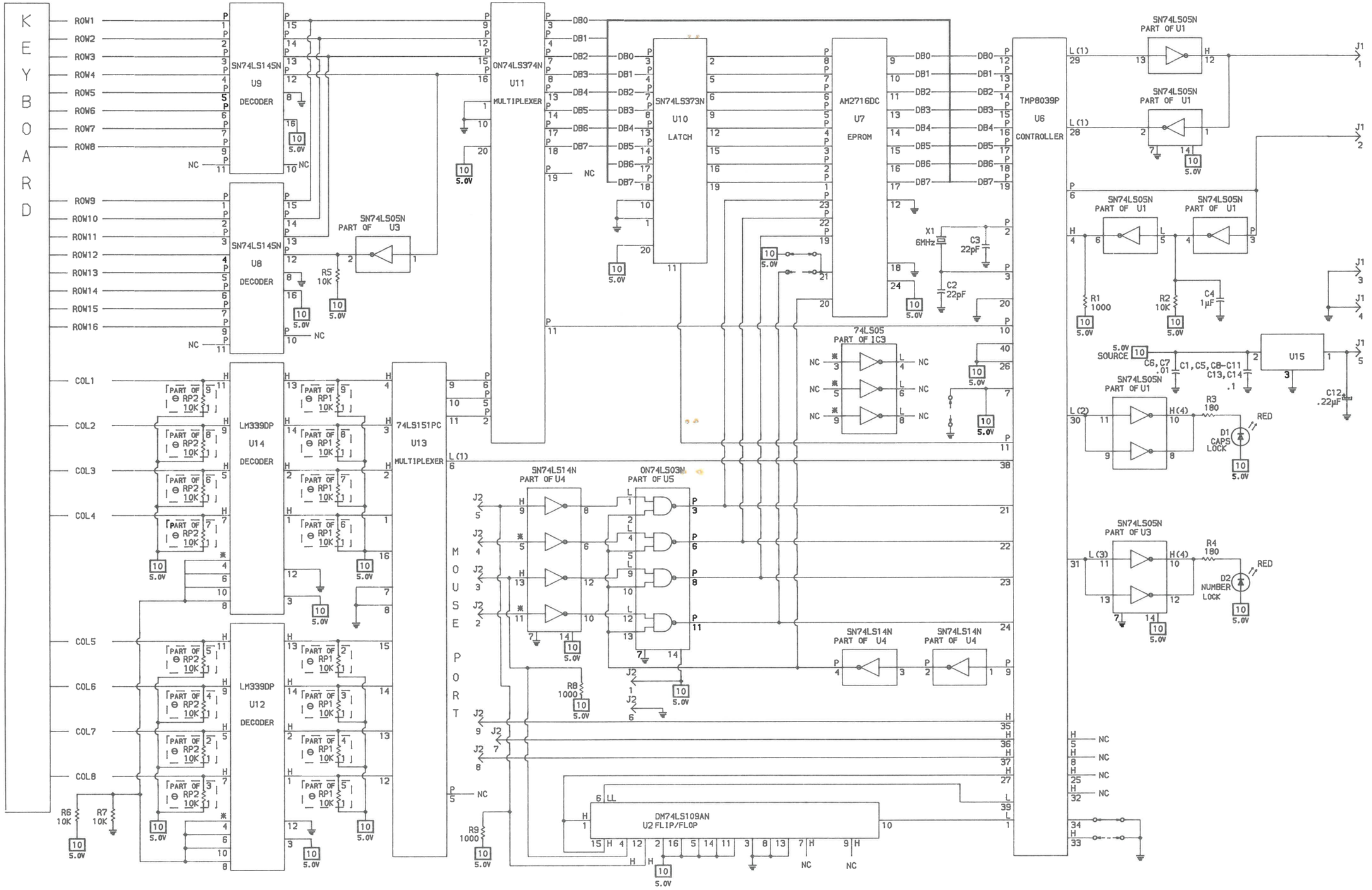
A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®



A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH CIRCUITRACE™

CSCS28

AT&T
MODEL 6300 PLUS



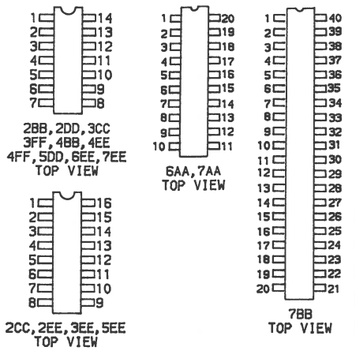
A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®

KEYBOARD MODEL 301 (ALTERNATE)

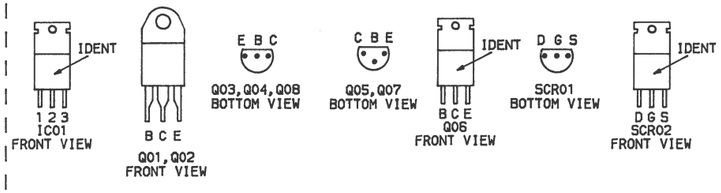
TERMINAL GUIDES

BUS EXPANSION BOARD

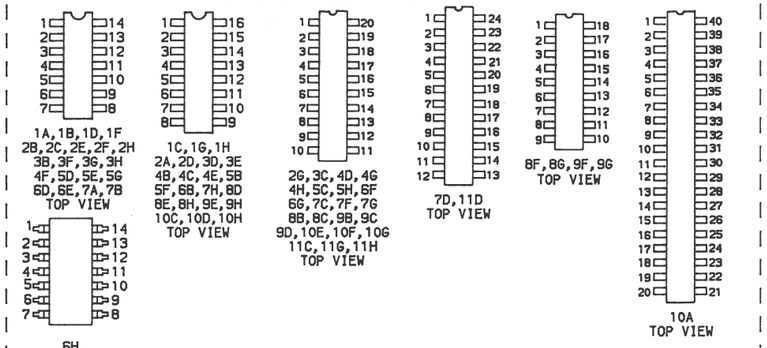
DAUGHTER BOARD



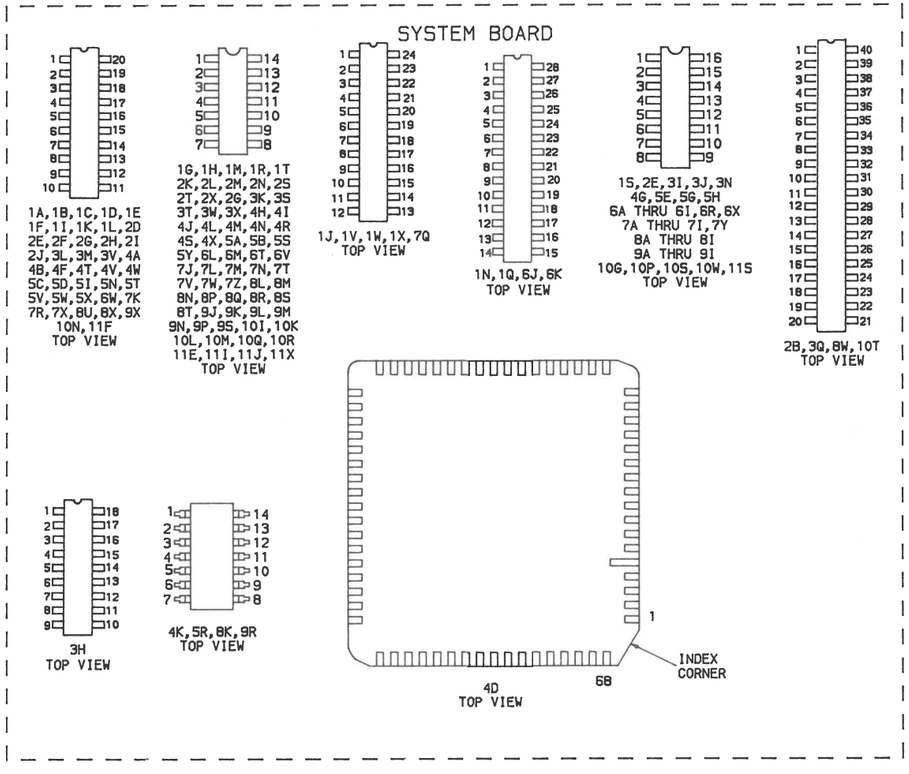
POWER SUPPLY



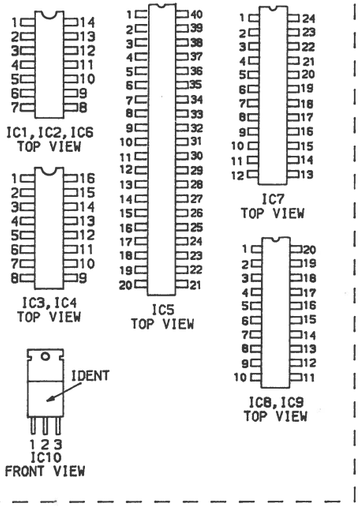
DISPLAY CONTROL BOARD



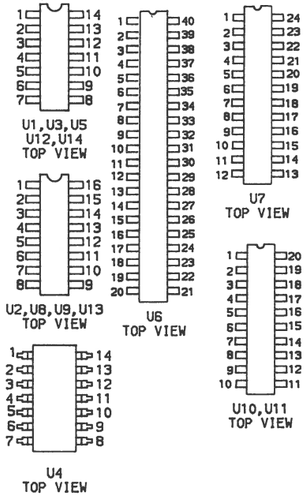
SYSTEM BOARD

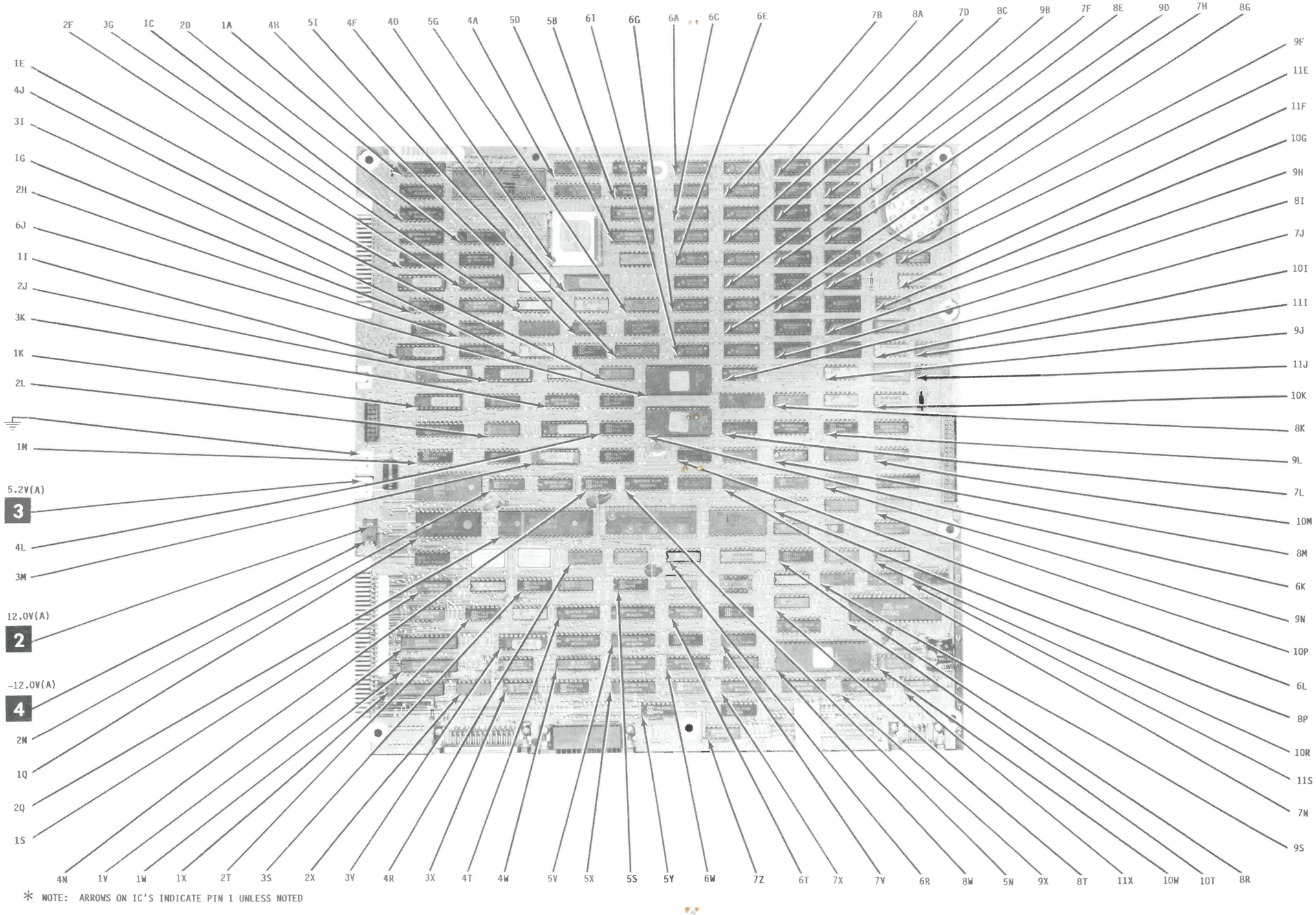


KEYBOARD



KEYBOARD MODEL 301



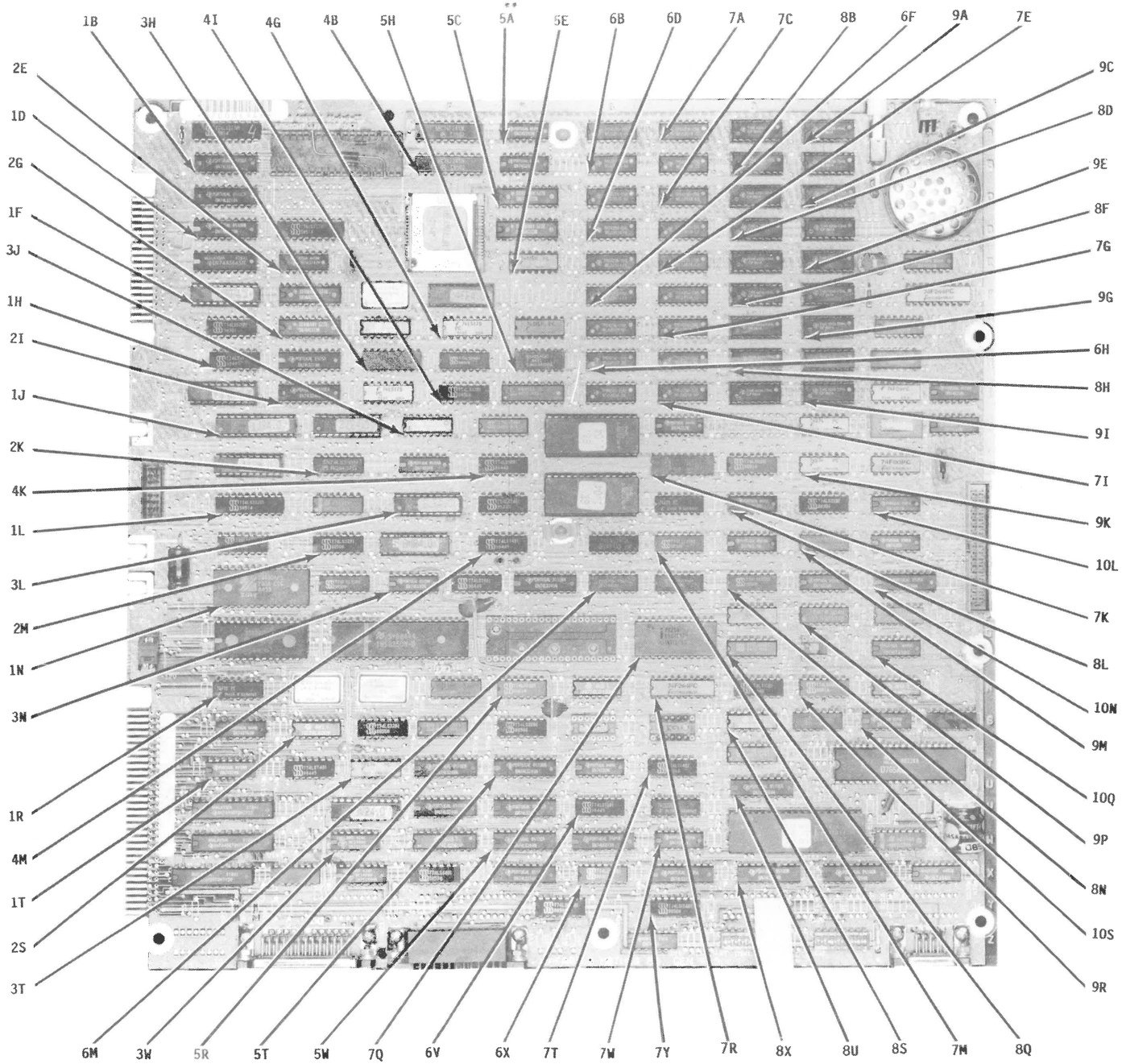


* NOTE: ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED

SYSTEM BOARD-TOP

A Howard W. Sams CIRCUITRACE® Photo

SYSTEM BOARD-TOP



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

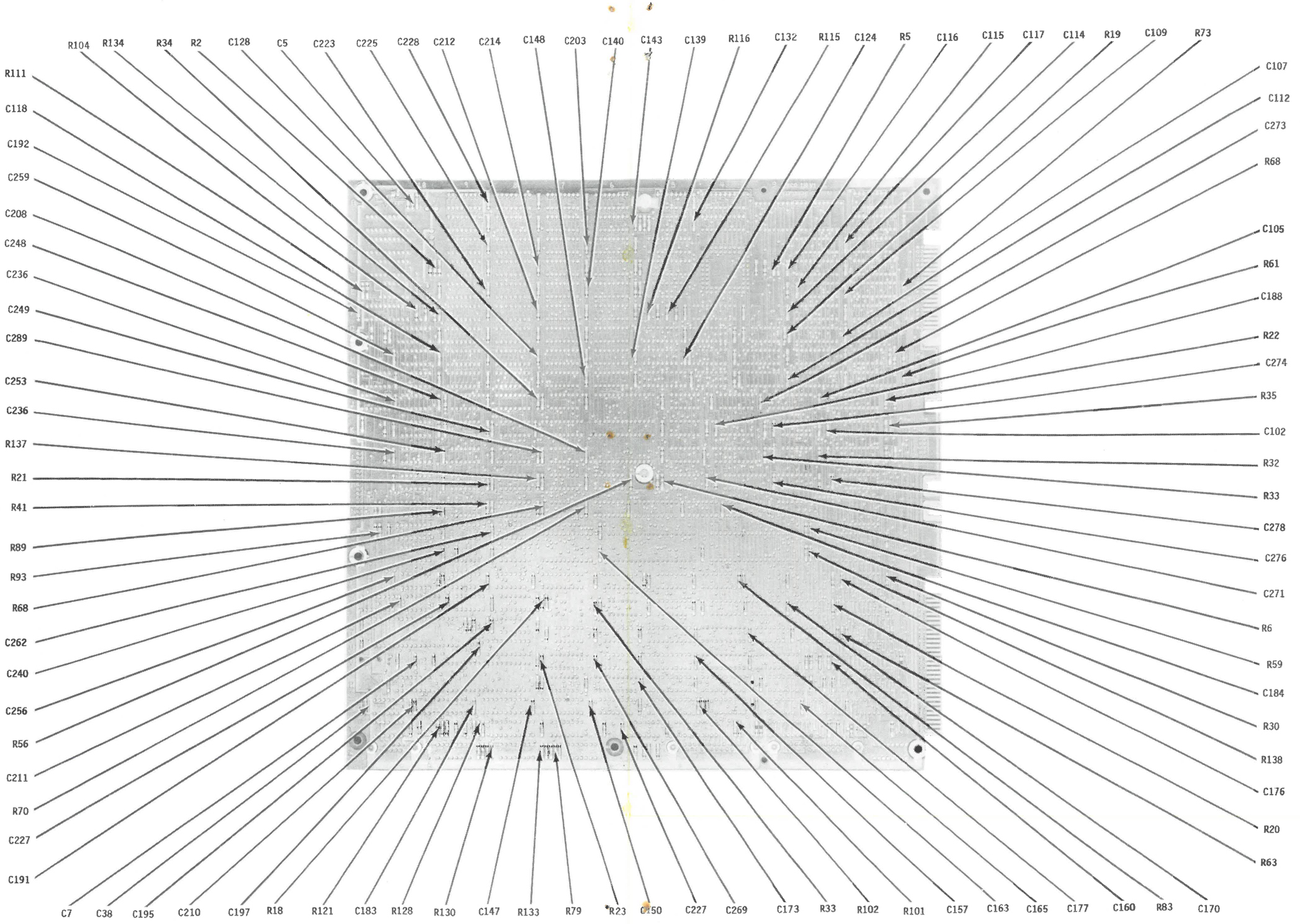
SYSTEM BOARD-BOTTOM

28

SYSTEM BOARD-BOTTOM

77

AT&T
MODEL 6300 PLUS

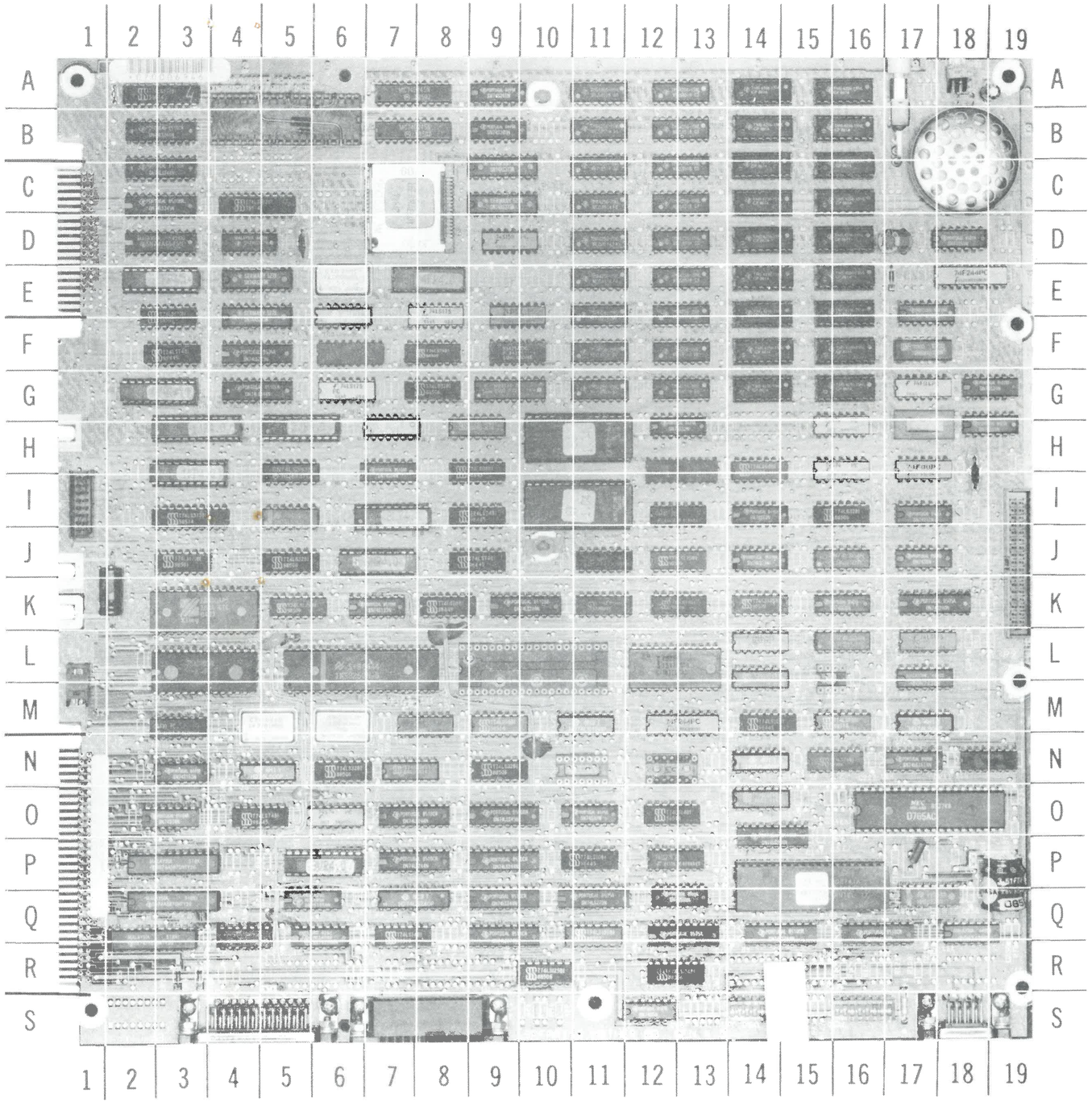


SYSTEM BOARD-BOTTOM

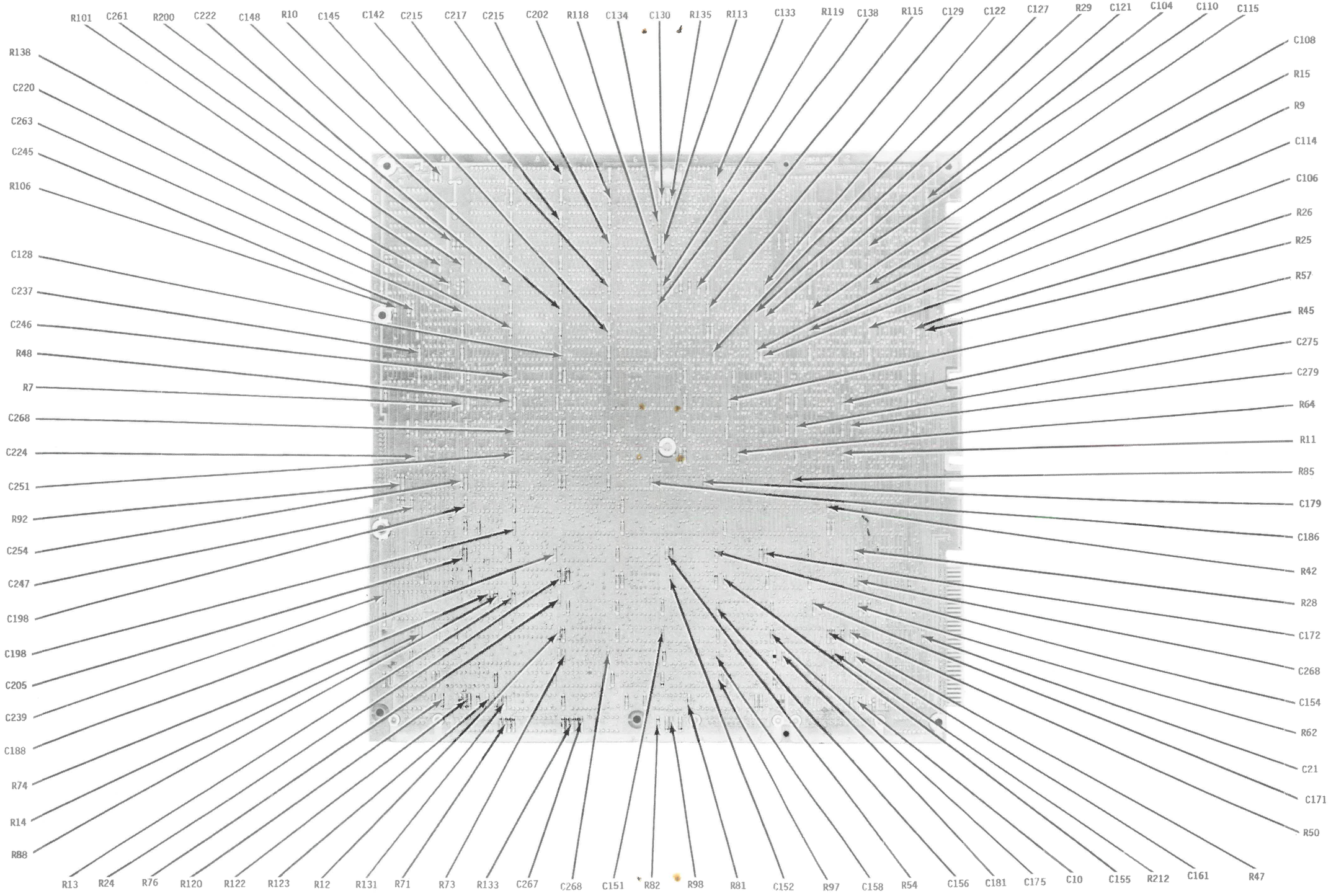
SYSTEM BOARD-BOTTOM

SYSTEM BOARD-GridTrace LOCATION GUIDE

B1	P-19	3X	Q-6	7Y	R-12
C1	D-17	4A	A-7	7Z	S-12
C6	A-19	4B	B-7	8A	A-14
C20	K-2	4D	D-7	8B	B-14
C111	B-2	4F	E-7	8C	C-14
CR1	E-17	4G	E-8	8D	C-14
CR2	R-3	4H	F-8	8E	D-14
CR4	R-3	4I	G-8	8F	E-14
CR99	B-5	4J	H-9	8G	E-14
D91	A-18	4K	H-9	8H	F-14
DL1	H-17	4L	I-9	8I	G-14
DL2	F-17	4M	J-9	8K	H-14
DSW1	S-14	4N	K-8	8L	I-14
DSW2	S-16	4R	M-8	8M	J-14
F1	S-17	4S	N-7	8N	K-14
OSC1	M-4	4T	O-7	8P	L-14
OSC2	M-6	4U	P-7	8Q	L-14
OSC3	E-6	4W	Q-7	8R	M-14
R16	D-5	4X	Q-7	8S	N-14
R17	H-18	5A	A-9	8T	O-14
R298	B-5	5B	B-9	8U	P-14
R299	A-6	5C	C-9	8W	P-14
SPK1	B-18	5D	C-9	8X	Q-14
SW7	B-17	5E	D-9	9A	A-16
Y2	P-17	5G	E-9	9B	B-16
1A	A-2	5H	F-9	9C	C-16
1B	B-2	5I	G-9	9D	C-16
1C	C-2	5N	K-9	9E	D-16
1D	C-2	5R	M-9	9F	E-16
1E	D-2	5S	N-0	9G	E-16
1F	E-2	5T	O-9	9H	F-16
1G	E-2	5V	P-9	9I	G-16
1H	F-3	5W	Q-9	9J	H-16
1I	G-3	5X	Q-9	9K	H-16
1J	H-3	5Y	R-10	9L	I-16
1K	I-3	6A	A-11	9M	J-16
1L	I-3	6B	B-11	9N	K-16
1M	J-3	6C	C-11	9P	L-16
1N	K-3	6D	C-11	9R	M-16
1Q	L-3	6E	D-11	9S	O-16
1R	M-3	6F	E-11	9X	Q-16
1S	N-3	6G	E-11	10G	E-17
1T	O-3	6H	F-11	10I	G-17
1V	P-3	6I	G-11	10K	H-17
1W	Q-3	6J	H-10	10L	I-17
1X	R-2	6K	I-10	10M	J-17
2D	C-4	6L	J-11	10N	K-17
2E	D-4	6M	K-11	10P	L-17
2F	E-4	6R	M-11	10Q	L-17
2G	E-4	6T	O-11	10R	M-17
2H	F-4	6V	P-11	10S	N-17
2I	G-4	6W	Q-11	10T	O-16
2J	H-5	6X	Q-11	10W	Q-17
2K	H-5	7A	A-12	11E	D-18
2L	I-5	7B	B-12	11F	E-18
2M	J-5	7C	C-12	11I	G-18
2N	K-5	7D	C-12	11J	H-18
2S	N-4	7E	D-12	11S	N-18
2T	O-4	7F	E-12	11X	Q-18
2X	Q-4	7G	E-12		
3G	E-6	7H	F-12		
3H	F-6	7I	G-12		
3I	G-6	7J	H-12		
3J	H-7	7K	H-12		
3K	H-7	7L	I-12		
3L	I-7	7M	J-12		
3M	J-7	7N	K-12		
3N	K-6	7Q	L-12		
3Q	L-6	7R	M-12		
3S	N-6	7T	O-12		
3T	O-6	TV	P-12		
3V	P-6	7W	Q-12		
3W	Q-6	7X	Q-12		



SYSTEM BOARD-TOP A Howard W. Sams GRIDTRACE™ Photo SYSTEM BOARD-TOP



SYSTEM BOARD-BOTTOM

SYSTEM BOARD-BOTTOM

SAFETY PRECAUTIONS

1. Use an isolation transformer for servicing.

2. Maintain AC line voltage at rated input.

3. Remove AC power from the Computer system before servicing or installing electrostatically sensitive devices. Examples of typical ES devices are integrated circuits and semiconductor "chip" components.

4. Use extreme caution when handling the printed circuit boards. Some semiconductor devices can be damaged easily by static electricity. Drain off any electrostatic charge on your body by touching a known earth ground. Wear a commercially available discharging wrist strap device. This should be removed prior to applying power to the unit under test.

5. Use a grounded-tip, low voltage soldering iron.

6. Use an isolation (times 10) probe on scope.

7. Do not remove or install Boards, Floppy Disk Drives, Printers or other peripherals with Computer system AC power On.

8. Do not use freon-propelled sprays. These can generate electrical charges sufficient to damage semiconductor devices.

9. This Computer system is equipped with a grounded three-pronged AC plug. This plug must fit into a grounded AC power outlet. Do not defeat the AC plug safety feature.

10. Periodically examine the AC power cord for damaged or cracked insulation.

11. The Computer system cabinet is equipped with vents to prevent heat build-up. Never block, cover or obstruct these vents.

12. Instructions should be given, especially to children, that objects should not be dropped or pushed into the vents of the cabinet. This could cause shock or equipment damage.

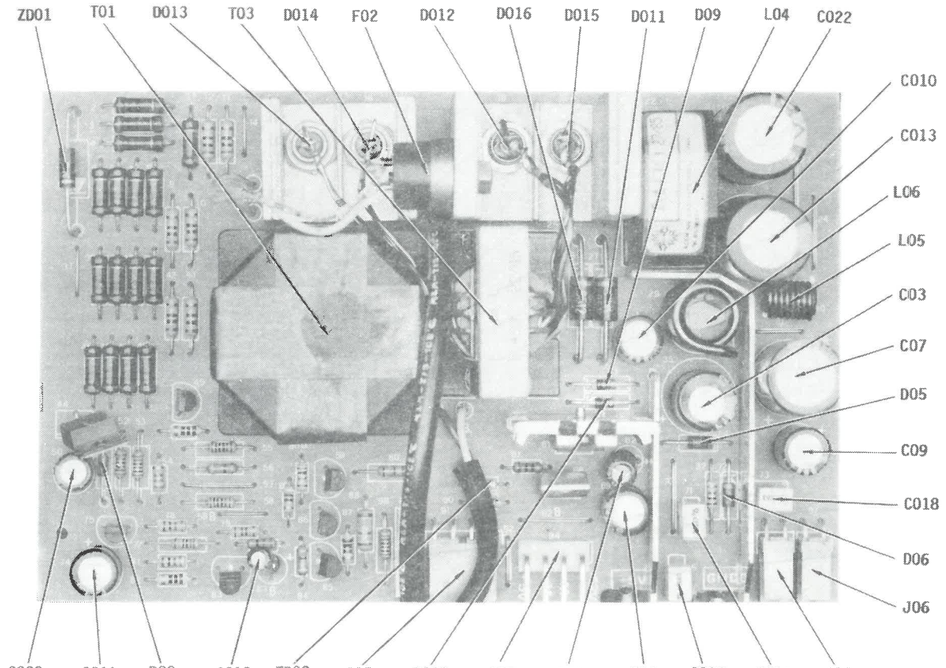
13. Never expose the Computer system to water. If exposed to water, turn the unit Off. Do not place the Computer system near possible water sources.

14. Never leave the Computer system unattended or plugged into the AC outlet for long periods of time. Remove AC plug from AC outlet during lightning storms.

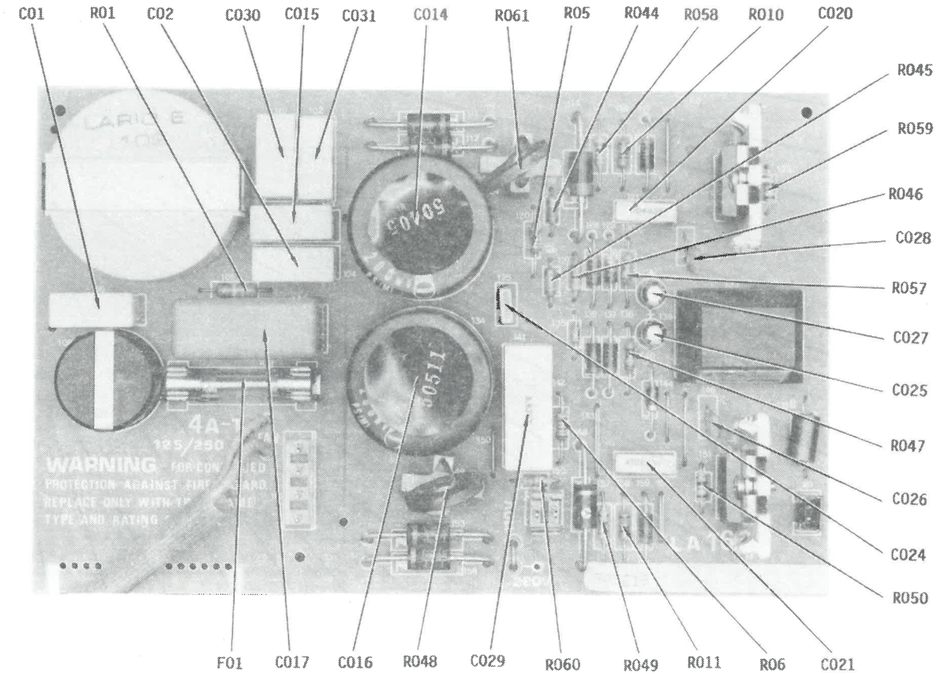
15. Do not allow anything to rest on AC power cord.

16. Unplug AC power cord from outlet before cleaning Computer system.

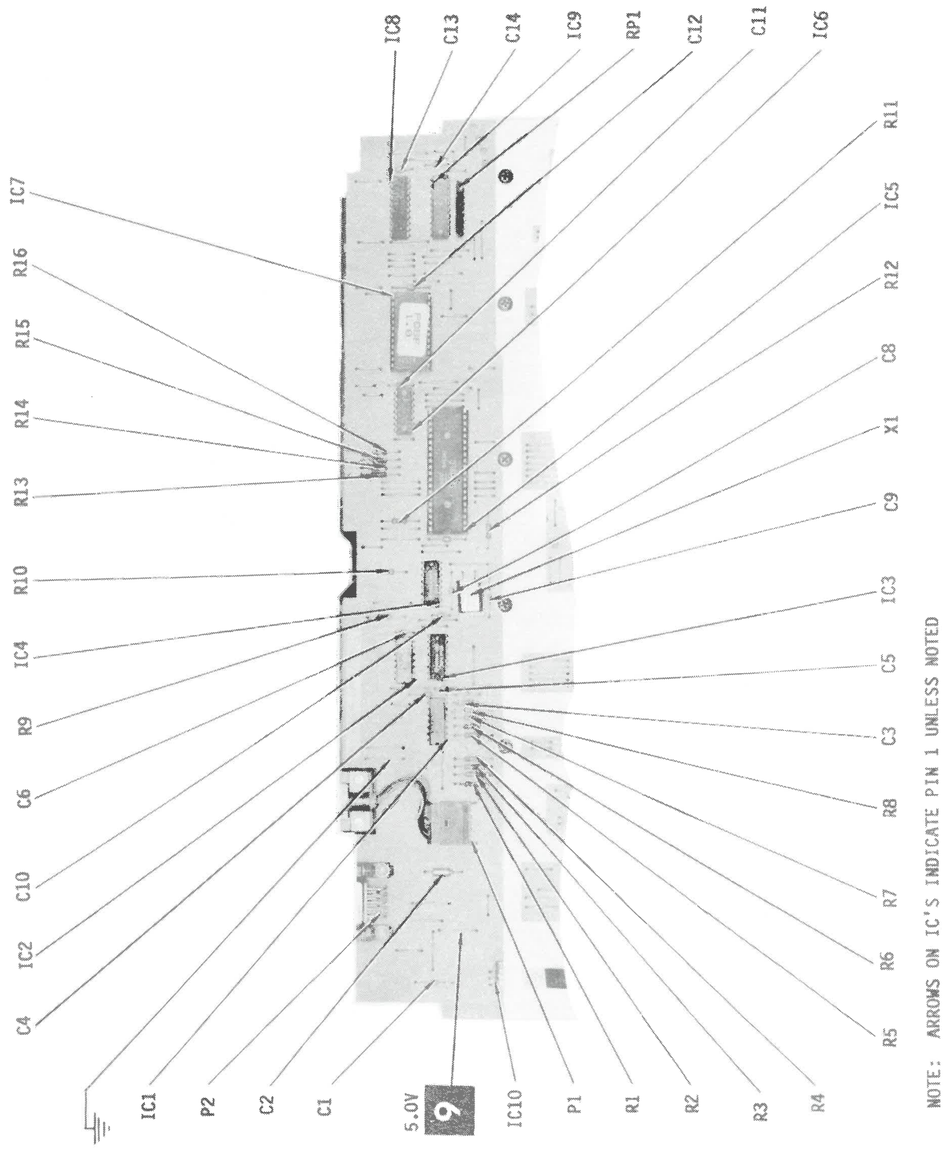
17. Never use liquids or aerosols directly on the Computer system. Spray on cloth and then apply to the Computer system cabinet. Make sure the Computer system is disconnected from the AC power line.



POWER SUPPLY REGULATOR BOARD



POWER SUPPLY AC INPUT BOARD



DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL

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 EXPANSION BOARD REMOVAL

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

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 Hard Disk and remove holder for Drive A.

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. Remove cabinet top. Unplug fan Connectors and remove screw holding ground wire. Remove Disk Drives. Disconnect power cables from front of power supply. Remove one screw from left side and one screw from in front of Power Supply holding supply to chassis. Slide Power Supply towards Bus Expansion Board. Lift Power Supply out of chassis.

KEYBOARD DISASSEMBLY

Turn Keyboard upside down. Remove three phillips screws. Use a flat blade screwdriver to push back (one at a time) three 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.

To remove the circuit board from the metal frame (with keys), remove two hex stacking bolts holding the game controller connector. Remove two nuts and 19 screws from the back of the Keyboard. Carefully lift the circuit board off the metal frame and note the type and position of the plastic spacers for the screws.

POWER SUPPLY DISASSEMBLY

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

GENERAL OPERATING INSTRUCTIONS

POWER ON SELF TEST

A Power On self-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. For an explanation of the various error codes, see the "Computer Self Test" section. If no problems are detected, a list of the areas tested are displayed on the Monitor screen with the word PASS, the Computer beeps once and boots from the Floppy or Hard Disk Drive.

BOOT UP

Insert a bootable diskette into Disk Drive A and turn the Computer On. The Computer will automatically boot up from the diskette in Drive A. If a Hard Disk is installed and it has DOS on it, the Computer will boot up from the Hard Disk if no diskette is inserted in the Floppy Disk Drive.

DOS (DISK OPERATING SYSTEM)

To get a list of file names on the diskette in the current Disk Drive, type DIR and press the ENTER key. To specify a Drive that is not the current (default) Drive, type the drive letter with a colon after DIR (DIR B:).

To run a program (with a .EXE or .COM extension) on a diskette, type the name of the program and press the ENTER key.

USING BLANK DISKETTES

A blank diskette must be formatted before it can be used to save programs or data. A formatted diskette must contain DOS or a Start-up program before the Computer will boot up using that diskette.

To format a diskette, insert a diskette containing a Format program into Drive A. While in DOS, type the name of the format program and press the ENTER key. Follow the instructions that appear on the Monitor screen to format blank diskettes.

NOTE: Formatting a diskette will wipe out any programs previously placed on the diskette. The Computer automatically defaults to the current Drive if the destination Drive is not specified. Be sure to specify the destination Drive that has the diskette to be formatted or the program diskette in the default Drive may be ruined by default action.

BASIC

To load Basic, first boot up on DOS. Insert a diskette with Basic on it into the Drive. Type the name of the Basic (usually BASIC or GWBASIC) and press the ENTER key. To return to DOS from Basic, type SYSTEM and press the ENTER key.

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

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

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

To run a program in Basic, type RUN and press the ENTER key. To stop a Basic program press the Ctrl and BREAK (SCROLL LOCK) keys at the same time.

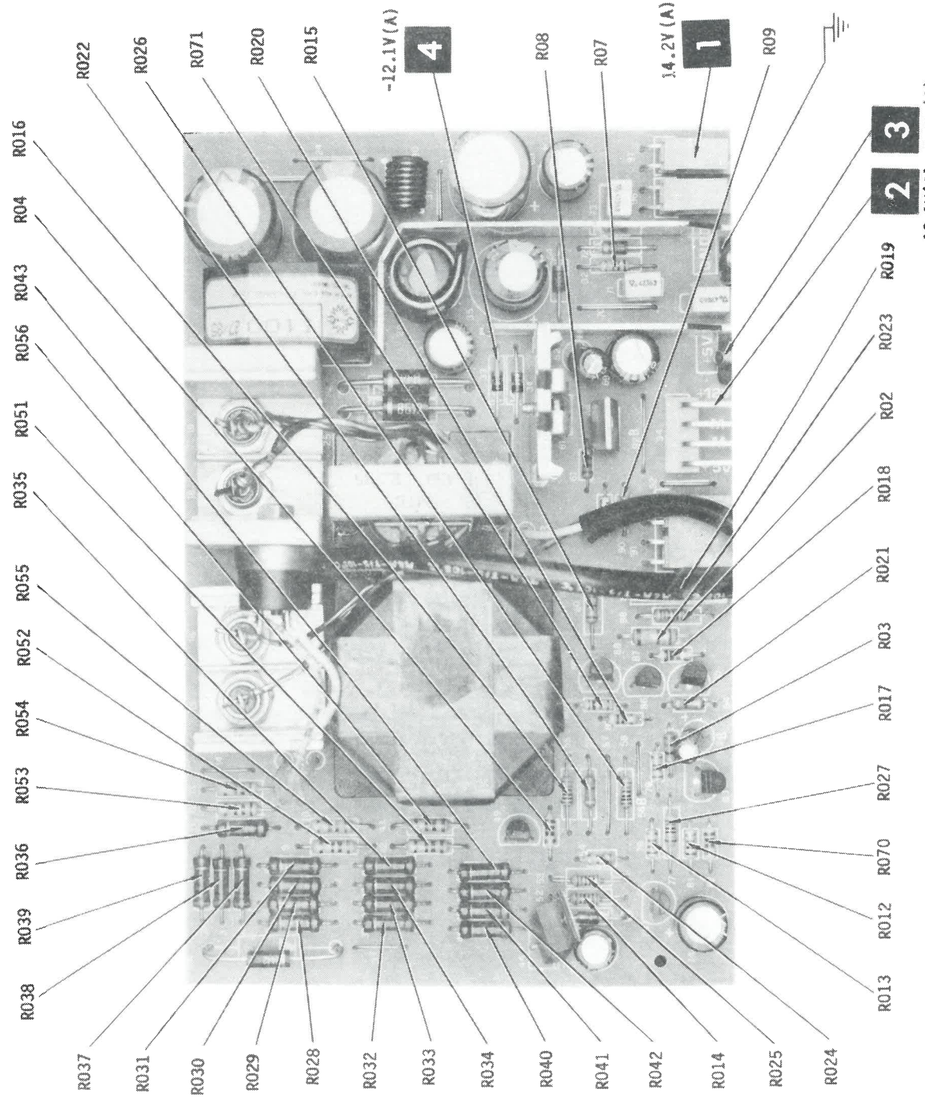
NOTE: Some programs will disable or not recognize the Ctrl and BREAK keys to prevent the user from stopping the program while it is running.

RESETTING THE COMPUTER

Press the Reset Button (located under the Disk Drives) or press the Ctrl, ALT and DEL keys on the keyboard at the same time to reset the Computer.

HARD DISK DRIVES

A physical (low level) format must be performed and DOS partitions set up on a new Hard Disk Drive before DOS can do a logical format on the Drive. A physical format program is included on the Systems Diagnostic Diskette that comes with the Service Manual on the 6300 Plus computer. The Service Manual (#845657113) is available from AT&T. A DOS partition program (FDISK) and logical format program (FORMAT) are normally included on the DOS diskette.

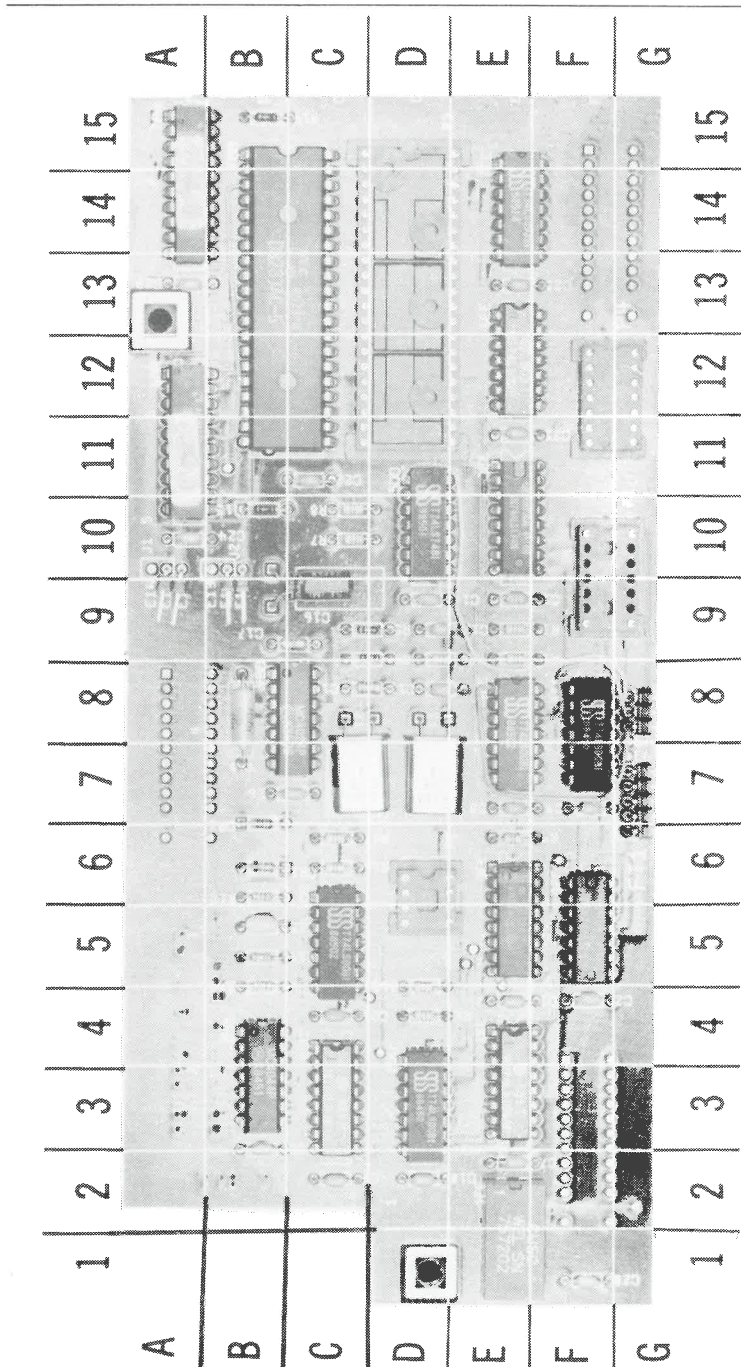


AT&T
MODEL 6300 PLUS

POWER SUPPLY REGULATOR BOARD

GridTrace LOCATION GUIDE

C1	E-9	R2	D-9
C2	F-4	R3	E-9
C3	E-4	R4	D-9
C4	C-2	R5	D-9
C5	B-3	R6	D-4
C6	C-7	R7	C-10
C7	E-2	R8	C-10
C8	E-7	R9	E-6
C9	F-7	R10	B-5
C10	D-2	R11	B-5
C11	D-9	R12	B-6
C12	D-9	R13	D-4
C13	D-8	R14	B-15
C14	C-8	R15	B-10
C15	B-5	R16	C-6
C16	C-9	R17	C-6
C17	C-9	Y1	D-7
C18	B-8	Y2	C-7
C20	F-1	1EE	E-2
C21	E-11	2BB	B-4
C22	C-11	2CC	C-4
C23	A-13	2DD	D-4
C24	A-10	2EE	E-4
C25	E-13	3CC	C-6
C26	C-4	3EE	E-6
CR1	B-6	3FF	F-6
CR2	B-6	4BB	B-8
E11	B-9	4EE	E-8
E12	B-9	4FF	F-8
E14	A-9	5DD	D-11
E15	A-9	5EE	E-11
P1	G-10	6AA	A-12
P2	E-6	6EE	E-12
P3	G-6	7AA	A-15
P4	G-12	7BB	C-15
P5	E-15	7EE	E-15
R1	E-9		



DAUGHTER BOARD

A Howard W. Sams GRIDTRACE™ Photo

COMPUTER SELF TEST

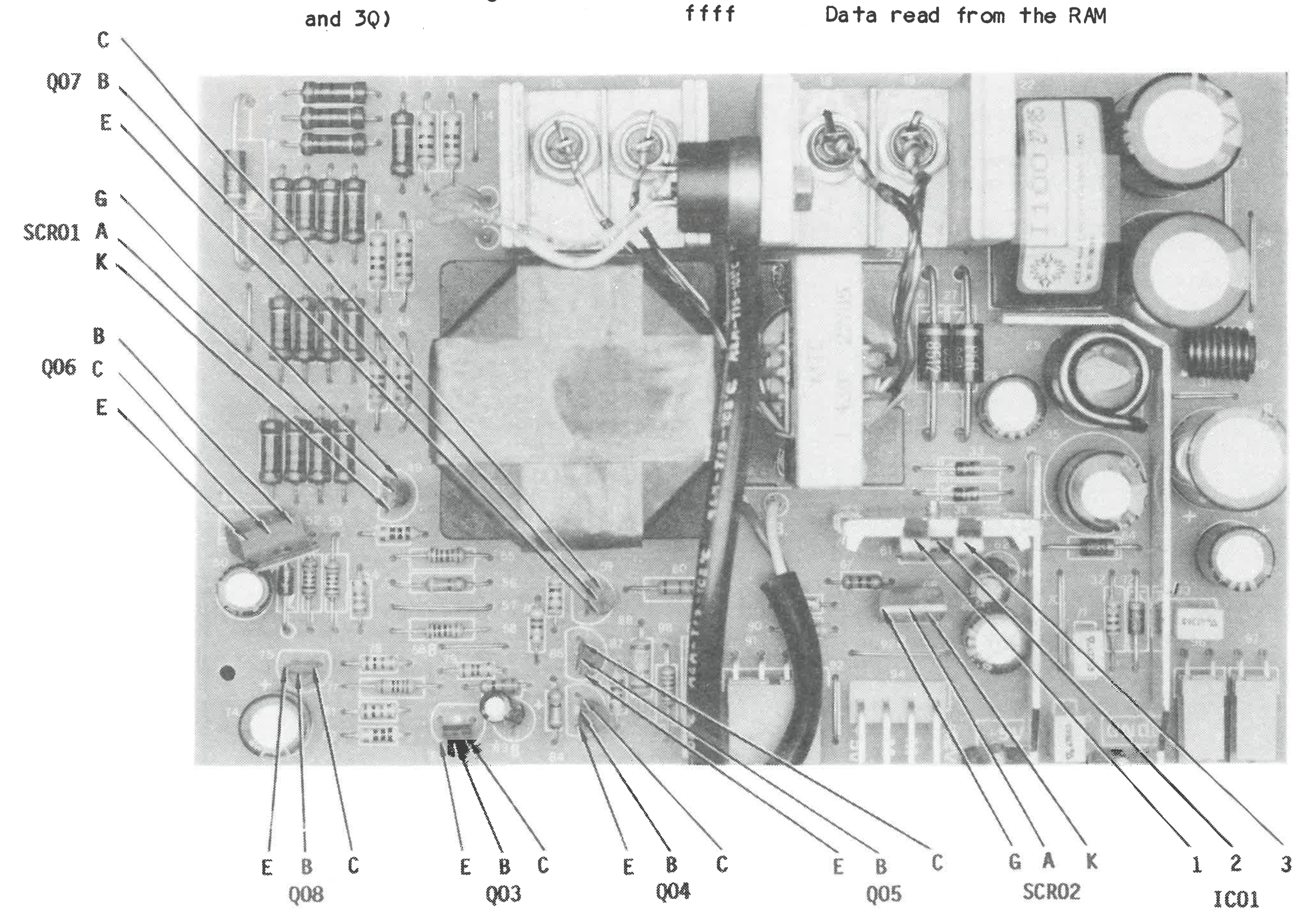
The Computer performs a self test every time it is turned On. If no problems are detected, the name of each section tested will be displayed on the Monitor screen along with the word PASS. The Computer will then beep once and start booting from the Floppy Disk Drive or the Hard Disk Drive. If a problem is detected, an error message will be displayed on the Monitor Screen and also sent to a printer connected to the Parallel Port. Use the following chart to determine the area of the problem and any possible IC's that may be bad:

ERROR MESSAGE	PROBLEM
CPU Fail	Bad CPU (IC 4D)
ROM Module Fail	Bad ROM (IC's 6J and 6K)
DMA Timer Fail	Bad Channel 1 Timer (IC 7Q)
DMA Control Fail	Bad DMA Controller (IC 7BB on Daughter Board)
Interrupts Fail	Software interrupt failure
Interrupt Fail H0	Timer Channel 0 INT REQ0 not functioning (IC 1Q)
Interrupt Fail H1	Keyboard Controller INT REQ1 not functioning (IC's 1Q and 8W)
Interrupt Fail H2	I/O Board INT REQ2 not functioning (IC 1Q)
Interrupt Fail H3	I/O Board INT REQ3 not functioning (IC 1Q)
Interrupt Fail H4	Serial Interface INT REQ4 not functioning (IC's 1Q and 3Q)
Interrupt Fail H5	I/O Board INT REQ5 not functioning (IC 1Q)
Interrupt Fail H6	Floppy Disk Controller INT REQ6 not functioning (IC's 1Q and 8T)
Interrupt Fail H7	Parallel port INT REQ7 not functioning (IC's 1Q, 5Y and 7Y)
RT Clock Fail	Real Time Clock registers not functioning (IC 10W)
RT Clock Fail:NR	No response from 8254 interrupt (IC 7Q)
RT Clock Fail:LO	Low end 8254 interrupt is out of specifications (IC 7Q)
RT Clock Fail:HI	High end 8254 interrupt is out of specifications (IC 7Q)

If a defect is found while testing the RAM, an error message in the following format should appear:

aaa kb RAM Fail:bb:yccc:dddd:eeee:ffff

aaa	Last bank tested in decimal
bb	Configuration of RAM 01 = 128 KB total RAM 02 = 256 KB total RAM 03 = 512 KB total RAM 05 = 640 KB total RAM
y	Bank (128 KB) with defective RAM 1 = Bank 1 on System Board 2 = Bank 2 on System Board 3 thru 4 are reserved
ccc	Segment of defective RAM
dddd	Offset of defective RAM
eeee	Data written to the RAM
ffff	Data read from the RAM



POWER SUPPLY REGULATOR BOARD

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.

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

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

Voltages, waveforms and logic readings taken with Computer in Power Up mode unless otherwise noted. No diskette in the Disk Drive. Hard Disk Drive formatted with no programs on it. No keys depressed. Diagnostic messages and "Non-System disk or disk error. Replace and strike any key when ready" are displayed on the Monitor screen.

DISK DRIVE INTERFACE NOTES

DISK DRIVE INTERFACE

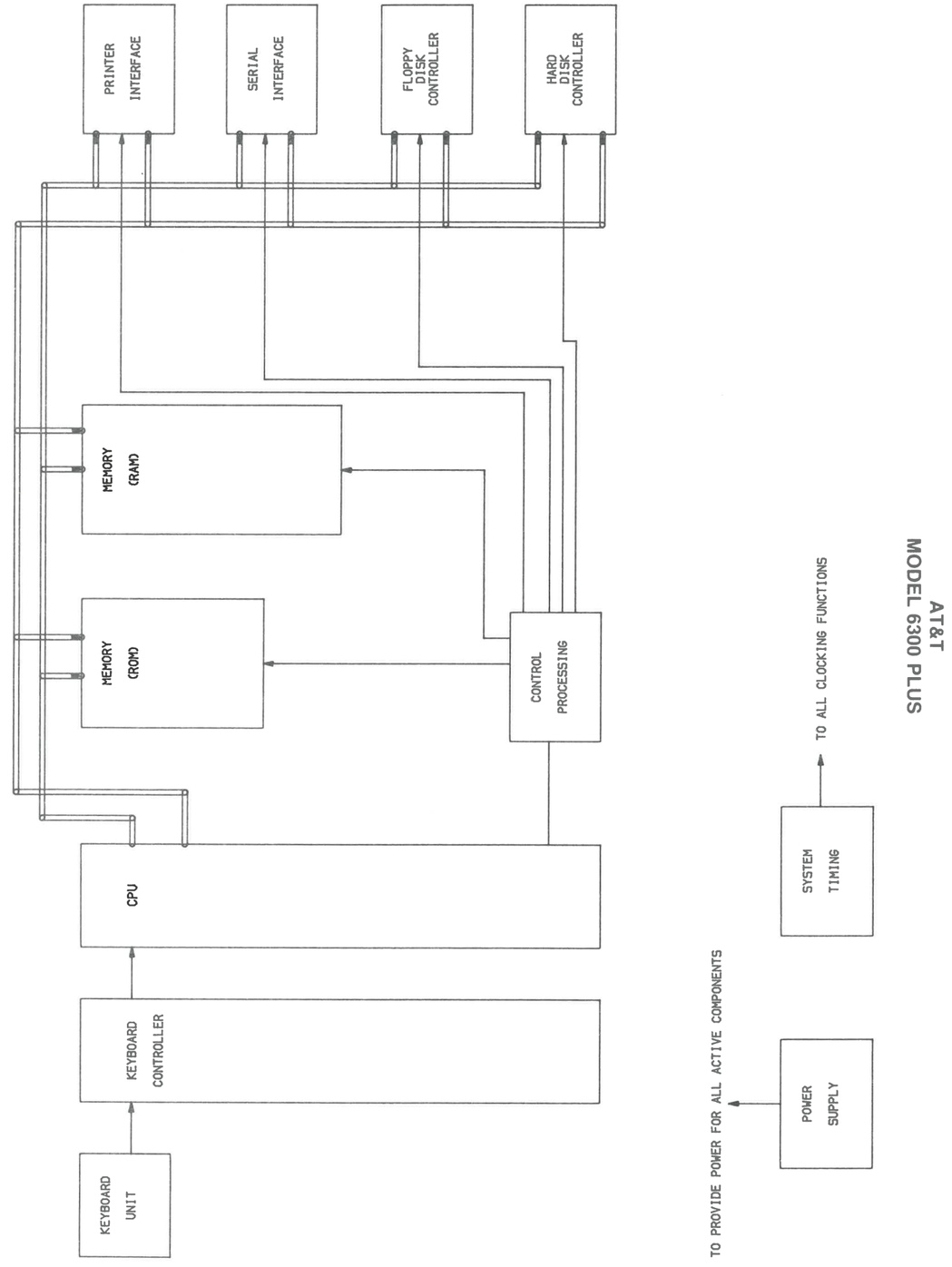
†Voltages, waveforms, and logic readings for the Disk Drive interface taken while running the following Basic program to operate Drive A. Readings were taken when the disk drive head is not moving (drive is in read or write mode) unless noted.

NOTE: Insert a high density (1.2MB) formatted diskette (not write protected) in Drive A before running the program.

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

(1) Probe indicates P when head is moving.
(2) Probe indicates H if a double density Diskette (360KB) is used.
(3) Probe indicated L if a double density Diskette (360KB) is used.
(4) Probe indicates H when head is moving in and L when head is moving out from the center of the diskette.
(5) Probe indicates L when head is moving in and H when head is moving out from the center of the diskette.
(6) Probe indicates H if diskette is write protected.
(7) Probe indicates L if diskette is write protected.
(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 hed 1 is selected.
(11) Probe indicates H when head 0 is selected, L when 1 is selected.
(12) Probe indicates L when drive motor is off.
(13) Probe indicates H when drive motor is off.
(14) Probe indicates P when a key is pressed.
(15) Probe indicates P if a double density Diskette (360KB) is used.
(18) Probe indicates H when in write mode, L when in read mode.
(19) Probe indicates L when in write mode, H when in read mode.

BLOCK DIAGRAM



SWITCHES AND JUMPERS

DIP SWITCH DSW1

FUNCTION	ON	OFF
96 TPI Disk Drive Installed as Drive B		1
48 TPI Disk Drive Installed as Drive B	1	
96 TPI Disk Drive Installed as Drive A		2
48 TPI Disk Drive Installed as Drive A	2	
80 X 25 line video display (AT&T Standard)	5	6
40 X 25 line video display	6	5
IBM monochrome video display		5,6
One Floppy Disk Drive Installed	7,8	
Two Floppy Disk Drives Installed	8	7
Three Floppy Disk Drives Installed	7	8

Switch 3 and 4 settings are determined by the type of Hard Disk Drive that is installed. Use switch 3 if the Drive is installed as Drive 1 and switch 4 if the Drive is installed as Drive 0. Use the following chart to determine the switch setting to use:

MANUFACTURER	MODEL	SIZE	ON	OFF
CDC	Wren	30 MB	3,4	
CMI	CM6426	20 MB	3,4	
Micropolis	1325	67 MB		3,4
Miniscribe	6086	80 MB		3,4
Multi	PC 6300 type	10 MB	3,4	
Seagate	ST225	20 MB		3,4
Seagate	ST4051	40 MB		3,4
Tandon	—	40 MB	3,4	

DIP Switch DSW2

FUNCTION	ON	OFF
128 KB RAM Installed (64 KB chips in Bank 1)	2,3,4	1
256 KB RAM Installed (64 KB chips in Banks 1 and 2)	1,3,4	2
256 KB RAM Installed (64 KB chips in Banks 1 and 2)	1,2,4	3
512 KB RAM Installed (256 KB chips in Bank 1)	1,2,3	4
640 KB RAM Installed (64 KB chips in Bank 1 and 256 KB chips in Bank 2)	2,3	1,4
640 KB RAM Installed (256 KB chips in Bank 1 and 64 KB chips in Bank 2)	1,3	2,4
640 KB RAM Installed (256 KB chips in Bank 1 and 64 KB chips in Bank 2)	1,2	3,4
1 MB RAM Installed (256 KB chips in Banks 1 and 2)	3	1,2,4
80287 coprocessor Installed	5	
80287 coprocessor not Installed		5
Hard Disk Controller ROM on System Board used	7	
Hard Disk Controller ROM on Hard Disk Controller card used		7
27256 ROM's Installed on System Board	8	
27128 ROM's Installed on System Board		8

NOTE: Switch 6 is reserved, leave in On position.

JUMPERS

Jumper J9 (E10 to E11) used during factory tests. Jumper should always be installed.

Jumper J10 (E8 to E9) installed to enable the Real Time Clock chip (IC 10W).

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.

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

LOGIC CHART

PIN NO.	IC 2CC	IC 2DD	IC 2EE	IC 3CC	IC 3EE	IC 3FF	IC 4BB	IC 4EE	IC 4FF
1	H†	P†	H†	H†	H†	L†(2)	H†	H	H†(15)
2	P†	P†	P†	P†	P†	H†		P	P†(2)
3	H†	P†	P†	P†	H†	H†(3)		P	P†
4	H†(3)	P†	P†	*	L†	*		P†	H†
5	L†	P†	H†	*	L†	*	L†	L†(2)	L†
6	P†	P†	L†	L	L†	L	P†	P†	H†
7	H†	L	H†	L	H†	L	L†	L	L
8	L†	P†	L†	P†	L†	H†(3)	P†	P†(2)	P†
9	P†	P†	P†	H†	P†	H†	L†	P†	P†
10	H†	P†	P†	P†	P†	L†(2)	H†	H†(3)	P†
11	P†	P†	P†	P†	P†	P†	H†	P	P†
12	P†	P†	P†	H†	P†	P†	H†	H	P†
13	P†	P†	P†	P†	P†	H†	H†	P	P†
14	P†	H	L†	H	P	H	H	H	H
15	L†		H†		P†				
16	H†		H		H†				

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

LOGIC CHART (Continued)

PIN NO.	IC IC1	IC IC2	IC IC3	IC IC4	IC IC5	PIN NO.	IC IC5
1	L	L(14)	P	P	H	21	P
2	H	H(14)	P	P	P	22	P
3	P	L	P	P	P	23	P
4	P	H	P	P	H	24	P
5	*	P	P	P	H	25	H
6	L	P	P	P	P	26	H
7	L	L	P	P	H	27	L
8	H	L(14)	L	L	P	28	L(14)
9	L	H(14)	P	P	P	29	L(14)
10	P	H	P	P	H	30	L
11	P	L	P	P	P	31	L
12	L	L	P	P	P	32	H
13	P	*	P	P	P	33	H
14	H	H	P	P	P	34	H
15			P	P	P	35	P
16			H	H	P	36	P
17					P	37	P
18					P	38	P
19					P	39	H
20					L	40	H

PIN NO.	IC IC6	IC IC7	PIN NO.	IC IC7	PIN NO.	IC IC8	IC IC9
1	H	P	21	H	1	L	P
2	*	P	22	P	2	P	H
3	P	P	23	P	3	P	P
4	P	P	24	H	4	P	H
5	P	P			5	P	P
6	P	P			6	P	H
7	L	P			7	P	P
8	H	P			8	P	H
9	H	P			9	P	P
10	H	P			10	L	L
11	H	P			11	P	H
12	*	L			12	P	P
13	P	P			13	P	H
14	H	P			14	P	P
15		P			15	P	H
16		P			16	P	P
17		P			17	P	H
18		L			18	P	P
19		P			19	P	P
20		P			20	H	H

LINE DEFINITIONS (Continued)

LPSTB.....LIGHT PEN STROBE
LPSW.....LIGHT PEN SWITCH
LUTWSTB.....LOOK-UP TABLE WRITE TIMING
M/IO.....MEMORY I/O SELECT
M20.....NON-IBM GRAPHICS BIT
MA0 THRU MA13.....MEMORY ADDRESS BITS 0 THRU 13
MBAON.....MOTHER BOARD ADDRESS ONLY
MD0 THRU MD15.....MEMORY DATA BITS 0 THRU 15
MEMSETUP.....MEMORY SETUP
MEMWATT.....MEMORY ACCESS WAIT
MFM READ 0,1.....MEMORY FM READ 0,1
MFM WRITE 0,1.....MEMORY FM WRITE 0,1
MODEWSTB1,2.....MODE WRITE TIMING 1,2
MODRD.....MODIFIED READ
MODWR.....MODIFIED WRITE
MONIDO,1.....MONITOR IDENTIFICATION
MOTOREN1,2.....MOTOR ENABLE FOR DRIVE 0 OR 1
MPOI.....PARITY BIT 0 IN
MPOO.....PARITY BIT 0 OUT
MP1I.....PARITY BIT 1 IN
MP1O.....PARITY BIT 1 OUT
MR.....MASTER RESET
MRD.....MEMORY READ
MRD5.....MEMORY READ
MRDC.....MEMORY READ COMMAND
MUX.....MULTIPLEXER
MUXSWCH.....RAM ADDRESS MULTIPLEXER
MWR.....MEMORY WRITE
MWR5.....MEMORY WRITE
MWT.....MEMORY WRITE
NEWHRES.....NEW HIGH RESOLUTION MODE
NEWHSYNC.....NEW HORIZONTAL SYNC PULSE
NM/IO.....MODIFIED MEMORY I/O SELECT
NMI.....NONMASKABLE INTERRUPT
NPCS.....NUMERIC PROCESSOR CHIP SELECT
NPERROR.....NUMERIC PROCESSOR ERROR
NRDY.....READY
ONBD.....ON BOARD MEMORY ENABLE
ONBDRAM.....ON BOARD RAM
ORDY.....READY
OUT0.....COUNTER OUTPUT 0
P10,11,12,14,15,17,20,25.....PORT BITS
PAGESEL.....DISPLAY RAM SELECT
PARITYEN.....PARITY CHECK ENABLE
PCK.....PERIPHERAL CLOCK
PCLK.....PIXEL CLOCK
PCLK2,3,4.....CLOCK, GRAPHICS
PCLKIN.....PIXEL CLOCK INPUT
PD1,PD2.....ENABLE LINES
PLANE1.....DISPLAY MEMORY PLANE REQUEST
PTRD0 THRU PTRD7.....PRINTER DATA BITS 0 THRU 7
PWRUP.....POWER UP
RA0 THRU RA3.....ADDRESS BITS 0 THRU 3
RA8,RA9,RA10.....ADDRESS BITS 8, 9, 10, HARD DISK CONTROLLER
RAMBUF..DISPLAY RANDOM ACCESS MEMORY WRITE ENABLE
RARBCLK.....MODIFIED ARBITRATION CLOCK PULSE
RAS.....ROW ADDRESS STROBE
RAS0 THRU RAS3..ROW ADDRESS STROBE LINES 0 THRU 3
RB.....OUTPUT BUFFER ENABLE
RC.....OUTPUT BUFFER ENABLE
RD.....CPU READING MEMORY OR I/O
RDDATA.....READ DATA
RDYDMA.....DIRECT MEMORY ACCESS READY
READY.....READY TO SEND INFORMATION, FROM MEMORY OR I/O
RESET.....RESETS ALL CPU OPERATIONS
RESETIN.....RESET INPUT
RESETCS.....RESET CHIP SELECT
RESET DRV.....RESET DRIVE
RFSH.....REFRESH
RI.....RING INDICATOR
RLAT.....GRAPHICS COLOR BIT
RLAT0 THRU RLAT15.....RAM LATCHED ADDRESS BITS 0 THRU 15
RMFM.....READ MEMORY FM
ROMEN.....ROM ENABLE
ROMSEL.....ROM SELECT
ROW1 THRU ROW16.....ROW INPUT FROM KEYBOARD
RTS.....REQUEST TO SEND DATA
S0,S1.....BUS CYCLE STATUS
SA0 THRU SA19....SECONDARY ADDRESS BITS 0 THRU 19
SD0 THRU SD7.....SECONDARY DATA BITS 0 THRU 7
SETFOREU.....SET FORGROUND, CHARACTER UNDERLINING
SETSEL.....CHARACTER SET SELECT
SHFLD.....SHIFT LOAD
SLCT.....SELECT
SLCTIN.....SELECT INPUT
SMEMR.....SYNCHRONOUS MEMORY READ
SP/EN.....SLAVE PROGRAM/ENABLE BUFFER
SPKRDATA.....SPEAKER DATA
SRDY.....SYNCHRONOUS READY ENABLE
STP.....STEPPER MOTOR DIRECTION CONTROL PULSES
STROBE.....STROBE PULSE FOR READ IN DATA
SW1 THRU SW4,SW8.....DIP SWITCH DATA
T/C.....TERMINAL COUNT
T0.....TRACK 00
TIMERCS.....SYSTEM TIMER CHIP SELECT
TIMESLICEEN.....TIME SLICE ENABLE
TMR2GSSPKR...SYSTEM TIMER TONE GENERATION SUPPORT
TRAPCE.....TRAP CHIP ENABLE
TRAPIO.....TRAP INPUT/OUTPUT
TRK00.....TRACK 00 SENSOR, DISK LOCATION OF FIRST TRACK
TS.....TIME SLICE
UBDIR.....UPPER BITS DIRECTION
UBITS.....UPPER BITS ENABLE
UNDERLINE.....UNDERLINE MODE SELECT
UPAREN.....UPPER BITS PARITY ENABLE
VIDE.....VIDEO ENABLE
VRAMREQ.....VIDEO RANDOM ACCESS MEMORY REQUEST
VU0 THRU VU7.....DATA BITS
VXLATEN.....VIDEO LATCH ENABLE
W.....DISPLAY RANDOM ACCESS MEMORY WRITE
WCLK.....WRITE CLOCK
WDTA.....WRITE DATA
WE.....WRITE ENABLE
WE0 THRU WE3.....WRITE ENABLE LINES 0 THRU 3
WMFM.....WRITE MEMORY FM
WRITEN.....RAM ENABLE WRITE
WRPT.....WRITE PROTECT
XA0..... MODIFIED ADDRESS BIT 0
XAEN.....I/O ADDRESS ENABLE
XALE.....I/O ADDRESS LATCH ENABLE
XBHE.....I/O BUS HIGH ENABLE
XMEMR.....I/O MEMORY READ
XMEMW.....I/O MEMORY WRITE
XMRD.....I/O MEMORY READ
XMWR.....I/O MEMORY WRITE
XRESET.....I/O RESET
YIOCLK.....I/O CLOCK
YIOR.....I/O READ
YIOW.....I/O WRITE
YMWR.....I/O MEMAORY WRITE
YOSC.....I/O OSCILLATOR

LINE DEFINITIONS

320X200.....300 BY 200 PIXELS COLOR
640X200.....640 BY 200 PIXELS MONOCHROME
4MHZ.....CLOCK 4MHZ
12MHZ.....CLOCK 12MHZ
16BCH.....16 BIT CHANNEL
24MHZ.....CLOCK 24MHZ
6845ADD.....DECODED CRT CONTROLLER ADDRESS
6845.....CRT CONTROLLER CLOCK
6845E.....6845 ENABLE
A0 THRU A19.....ADDRESS BITS 0 THRU 19
AA0 THRU AA23.....CPU ADDRESS BITS 0 THRU 23
ACK.....ACKNOWLEDGE
AD0 THRU AD7.....HDC DATA BITS 0 THRU 7
AEN.....ADDRESS ENABLE
ALAT0 THRU ALAT7.....DECODED CHARACTER ATTRIBUTE BITS 0 THRU 7
ALTBACK.....320 WIDE MODE FORGROUND INTENSITY BIT
ARBCLK.....ARBITRATION CLOCK
AUTOFX.....PRINTER, AUTOMATICALLY FEEDS PAPER (ONE LINE AT A TIME)
BCS.....BUFFERED CHIP SELECT
BDIR.....BUFFERED DIRECTION
BHE.....BUS HIGH ENABLE
BITREAD.....BITREAD
BLANKING.....DISPLAY BLANKING SIGNAL
BLAT.....GRAPHICS COLOR BIT
BLINKBIT.....CHARACTER BLINK BIT
BLINKCLK.....CHARACTER BLINK TIMING
BLINK/BI.....BLINK/BACKGROUND INTENSITY
BOARDRDL.....BOARD READ, LOW BYTE A0 AND CONTROL LINES
BOARDRDU.....BOARD READ, UPPER BYTE
BUSRDL.....BUS READ LATCH
BUSY.....BUSY, CANNOT EXCEPT DATA
CAS.....COLUMN ADDRESS STROBE
CAS0 THRU CAS3.....COLUMN ADDRESS STROBE, BANKS 0 THRU 3
CASL.....COLUMN ADDRESS STROBE, LOW BANK BYTE DISPLAY RAM
CASU.....COLUMN ADDRESS STROBE, HIGH BANK BYTE DISPLAY RAM
CCARNDLY.....DISPLAY GRAPHICS CLOCKING PULSE
CCARN.....GRAPHICS LATCH LOAD SIGNAL
CHNGBNK.....CHANGE BANKS
CLK286.....CLOCK TIMING FOR 80286 CPU
COD/INTA.....CODE/INTERRUPT ACKNOWLEDGE
COL1 THRU COL8.....COLUMN INPUT FROM KEYBOARD
CPUADD.....DECODED CPU ADDRESS BIT
CPUEND.....RELEASES MEMORY AFTER ACCESS CYCLE
CPUREST.....CPU RESET
CRT/CPU.....MEMORY ACCESS
CRTCAS.....CRT COLUMN ADDRESS STROBE
CRTRAS.....CRT ROW ADDRESS STROBE
CS.....CHIP SELECT
CTCIORQ.....CONTROL TIMING CIRCUIT I/O REQUEST
CTS.....CLEAR TO SEND
CURSORLAT.....LATCHED CURSOR CONTROL
D0 THRU D15.....DATA BITS 0 THRU 15
DACK1,2,3..DIRECT MEMORY ACCESS ACKNOWLEDGE 1,2,3
DB0 THRU DB7.....DATA BITS 0 THRU 7
DCD.....DATA CARRIER DETECTED
DD0 THRU DD15.....DATA BITS 0 THRU 15
DEGAUSS.....DEGAUSSING COIL, COLOR MONITOR
DIR.....DIRECTION OF DATA FLOW
DIRIN.....DIRECTION INPUT
DISPENDLY1.....DELAYED DISPLAY ENABLE
DISPENDLAT.....LATCHED DISPLAY ENABLE
DMACLK.....CLOCKTIMING FOR DMA CONTROLLER
DMACS.DIRECT MEMORY ACCESS CONTROLLER CHIP SELECT
DMAHOLDA.....DIRECT MEMORY ACCESS HOLD DATA
DMAHRQ.....DIRECT MEMORY ACCESS HOLD REQUEST
DMAIOWR...DIRECT MEMORY ACCESS INPUT/OUTPUT WRITE
DMAIOR.....DIRECT MEMORY ACCESS INPUT/OUTPUT READ
DMAMEMRD.....DIRECT MEMORY ACCESS MEMORY READ
DMAMEMWR.....DIRECT MEMORY ACCESS MEMORY WRITE
DMAPAGEREG.....DMA PAGE REGISTER ENABLE
DRA0 THRU DRA7...DISPLAY RAM ACCESS BITS 0 THRU 7
DRDY.....READY
DRQ0,1,2,3.....DIRECT MEMORY ACCESS CONTROL LINES 0,1,2,3
DRSEL1,2.....FLOPPY DISK DRIVE SELECT 1,2
DS3.....FLOPPY DISK DRIVE SELECT 3
DSEL0,1.....HARD DISK DRIVE SELECT 0,1
DSR.....DATA SET READY
DTR.....DATA TERMINAL READY
ENIOCHK.....ENABLE I/O CHANNEL CHECK
ERROR.....ERROR STATUS
EXPANDO,1.....EXPANSION IDENTIFICATION
EXH,R,G,B...EXPANSION HIGHLIGHT, RED, GREEN, BLUE
EXTHOLDA.....EXTERNAL HOLD DATA A
EXTINTR.....EXTERNAL INTERRUPT REQUEST
EXTRESET.....EXTERNAL RESET
GLAT.....GRAPHICS COLOR BIT
GRAPHSHFLD.....DISPLAY GRAPHICS SHIFT LOAD
GRAPH.....GRAPHICS MODE SELECT
HDSEL.....HEAD SELECT
HI/LO.....SPEED SELECT
HOLD.....HOLD REQUEST
HOLDA.....HOLD ACKNOWLEDGE
HRES.....HIGH RESOLUTION MODE SELECT
HS0,1,2.....HARD DISK HEAD SELECT 0, 1, 2
ICAS0,1,2.....CASCADE LINES, INTERRUPT CONTROLLER
ILAT.....GRAPHICS COLOR BIT
IMODE0,1.....DISPLAY MODE BITS
IND0 THRU IND15.....INTERNAL DATA BITS 0 THRU 15
INDEX.....INDEX SENSOR LAMPS
INHIBITWR.....INHIBIT WRITE
INHIBITIO.....INHIBIT INPUT/OUTPUT
INHMEM.....INHIBIT MEMORY
INTA.....INTERRUPT ACKNOWLEDGE
INTINTR...INTERRUPT REQUEST, INTERRUPT CONTROLLER
INTR.....INTERRUPT REQUEST
INTRCS.....INTERRUPT CONTROLLER CHIP SELECT
INTRQ.....INTERRUPT REQUEST
IO60,IO64,IO66.....I/O CHANNEL CHIP SELECTS
IOADD.....DECODED I/O CHIP SELECT
IOCHCK.....I/O CHANNEL CHECK
IOCLK.....I/O CLOCK
IOR.....I/O READ
IORC.....I/O READ COMMAND
IORDTRAP.....I/O READ TRAP
IORQ.....I/O REQUEST
IOSETUP.....INPUT/OUTPUT SETUP
IOW.....I/O WRITE
IOWC.....I/O WRITE COMMAND
IOWRTRAP.....I/O WRITE TRAP
IRQ2 THRU IRQ7.....INTERRUPT REQUEST
KBD TST INT.....KEYBOARD TEST INTERRUPT
KBINT.....KEYBOARD INTERRUPT
LA0 THRU LA23.....LATCHED ADDRESS BITS 0 THRU 23
LATHSYNC.....LATCHED HORIZONTAL SYNC
LATVSYNC.....LATCHED VERTICAL SYNC
LBHE.....LATCHED BUS HIGH ENABLE
LCOD/INTA.....LATCHED CODE/INTERRUPT ACKNOWLEDGE
LD0 THRU LD7.....LATCHED DATA BITS 0 THRU 7
LM/IO.....LATCHED MEMORY I/O SELECT
LNMIREG....LATCHED NONMASKABLE INTERRUPT REGISTER
LPAREN.....PARITY ENABLE, LOWER BYTE
LPCLR.....LIGHT PEN CLEAR TIMING
LPSET.....LIGHT PEN SET TIMING

LOGIC CHART (Continued)

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

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

LOGIC CHART (Continued)

PIN NO.	IC 1V	PIN NO.	IC 1V	PIN NO.	IC 1W	PIN NO.	IC 1W	PIN NO.	IC 1X	PIN NO.	IC 1X	PIN NO.	IC 2D
1	H	21	L	1	H	21	L	1	H	21	L	1	H
2	L	22	L	2	L	22	L	2	L	22	L	2	P
3	L	23	L	3	L	23	L	3	L	23	L	3	P
4	L	24	H	4	L	24	H	4	L	24	H	4	P
5	L			5	L			5	L			5	P
6	H			6	H			6	H			6	P
7	H			7	H			7	H			7	P
8	P			8	P			8	P			8	P
9	P			9	P			9	P			9	P
10	P			10	P			10	P			10	L
11	P			11	P			11	P			11	P
12	L			12	L			12	L			12	P
13	P			13	L			13	P			13	P
14	P			14	H			14	P			14	P
15	P			15	P			15	P			15	P
16	P			16	P			16	P			16	P
17	H			17	H			17	H			17	P
18	H			18	H			18	H			18	P
19	L			19	L			19	L			19	P
20	L			20	L			20	L			20	H

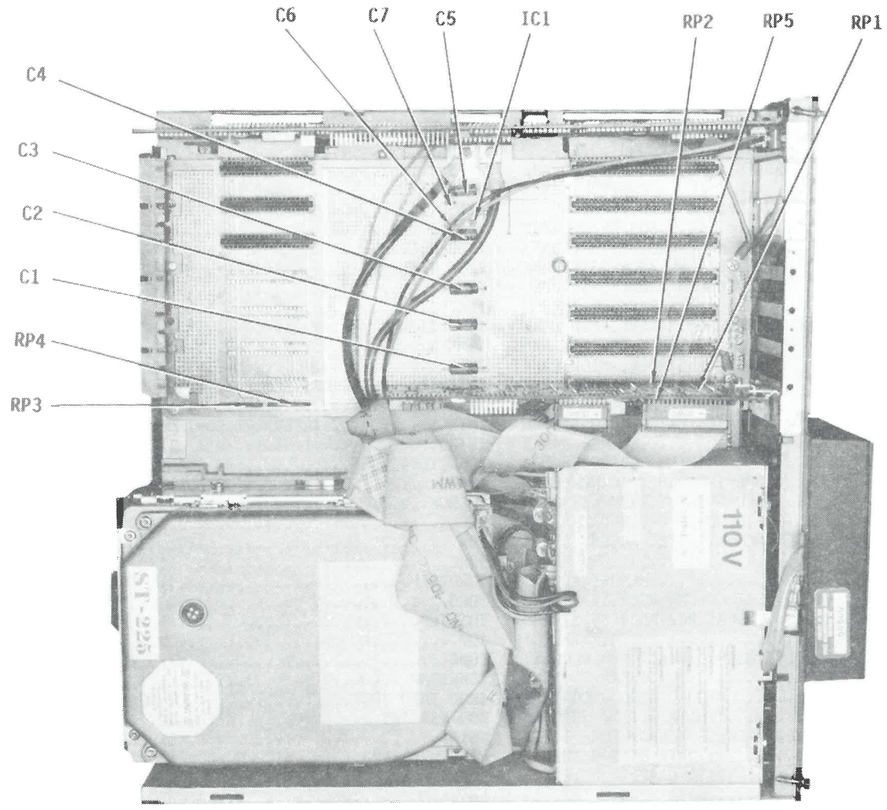
PIN NO.	IC 2E	IC 2F	IC 2G	IC 2H	IC 2I	IC 2J	IC 2K	IC 2L	IC 2M	IC 2N	IC 2S	IC 2T	IC 2X	IC 3G
1	L	P	P	H	H	P	P	P	H	H	P	H	L	H
2	L	L	P	L	L	P	H	P	P	P	P	H	*	P
3	P	L	P	P	P	P	L	P	H	P	P	H	L	P
4	L	L	P	P	H	L	L	P	H	P	H	H	H	P
5	L	L	P	L	P	L	L	P	P	P	P	L	H	P
6	P	L	P	L	H	L	L	P	H	P	P	H	L	L
7	L	L	P	P	P	L	H	L	H	L	L	H	L	P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

TROUBLESHOOTING (Continued)

The program continuously moves the Drive Head back and forth. While the program is running, check for pulses at pins 37, 38 and 39 of Floppy Disk Controller IC (10T). If pulses are missing at any of the pins, check IC 10T. If pulses are present, check for pulses at pin 11 of IC 9R. If pulses are missing, check IC 9R. If pulses are present, check for pulses at pins 7 and 9 of IC 10N. If pulses are missing, check IC 10N. If pulses are present, check pins 18 and 20 of Connector P2 for good connections and check the Drive cable for continuity.

HEAD SELECT

To verify that the Drive Head select circuit is working, type in and run the program listed under "Will Not Read" to operate Drive A. While the program is running, check for pulses at pin 32 of Connector P2. If pulses are missing, check for pulses at pin 27 of the Floppy Disk Controller IC (10T). If pulses are missing at pin 27, check IC 10T. If pulses are present at pin 10, check IC 10N.



CHASSIS-OVERALL VIEW

TROUBLESHOOTING (Continued)

is not working properly, insert a BLANK write protected diskette into the Drive and close the Drive door. While running the program listed under "Will Not Write", check for a logic low at pin 28 of Connector P2. If the reading is not correct, check pin 28 of Connector P2 for good connections and check the disk drive cable for continuity. If the connector and cable check good, refer to the troubleshooting on the Disk Drive. If the reading is correct, check for a logic high at pin 34 of the Floppy Disk Controller IC (10T). If the reading is not correct, check IC 10N. If the reading is correct and the number that appears on the Monitor screen is not correct, check IC 10T.

DRIVE MOTOR

Drive A motor does not turn On. Run the program for Drive A listed under "Continuous Operation of Disk Drive". While the program is running, check for a logic high at pin 1 of Floppy Disk Controller IC 10T. If the reading is not correct, check IC 8R. If the reading is correct, check for pulses at pins 1, 3 and 13 of IC 6EE on the Daughter Board. If pulses are missing at pin 1, check IC°s 8R and 8Q. If pulses are present at pin 1 and missing at pin 13, check IC 9R. If pulses are present at pins 1 and 13 and missing at pin 3, check IC 6EE. If pulses are present at IC 6EE, check for a logic high at pin 5 and a logic low at pin 15 of Flip/Flop IC 7X. If either reading is not correct, check IC 7X. If the readings are correct, check for a logic high at pin 6 of IC 9P. If the reading is not correct, check IC 9P. If the reading is correct, check for a logic low at pins 6 and 8 of IC 10M. If either reading is not correct, check IC 10M. If the readings are correct, check pins 10 and 14 of Connector P2 for good connections and check the Drive cable for continuity.

INDEX DETECTOR

To verify that the Index Detector circuits are working properly, insert a diskette into the Drive and close the Drive 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 17 of the Floppy Disk Controller IC (10T).

If pulses are missing, check for pulses at pin 8 of Connector P2. If pulses are present at pin 8, check IC 10N. If pulses are missing at pin 8, check pin 8 of Connector P2 for good connections and check the Disk Drive cable for continuity. If the connections and cable check good, refer to the troubleshooting for the Floppy Disk Drive.

TRACK 00 DETECTOR

Disk Drive Head bangs against the Track 00 stop. Type in and run the following Basic program:

```
10 OUT 1014,128:OUT 1010,16:OUT 1010,20
20 OUT 1013,7:S=INP(1012)
30 OUT 1013,1:S=INP(1012)
40 FOR T=1 TO 1000:NEXT T
50 OUT 1014,128:OUT 1010,16:OUT 1010,20
60 OUT 1013,7:S=INP(1012)
70 OUT 1013,1:S=INP(1012)
80 FOR T=1 TO 1000:NEXT T
90 OUT 1014,128:OUT 1010,20
100 S=INP(1012)
110 OUT 1013,4:S=INP(1012)
120 OUT 1013,2:S=INP(1012)
130 CLS:PRINT INP(1013) AND 16:S=INP(1012)
140 GOTO 80
```

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 should change to 0.

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 when the Head is on Track 00 and logic high with the Head off Track 00 at pn 26 of Connector P2. If the readings are not correct, check pin 26 of Connector P2 for good connections and check the Disk Drive cable for continuity. If the connections and cable check good, refer to the troubleshooting for the Floppy Disk Drive. If the readings check good at pin 26, check for a logic high with the Head on Track 00 and logic low with the Head off Track 00 at pin 12 of IC 10N. If the readings are not correct, check IC 10N. If the readings are correct, check for a logic high with a pulse about twice a second at pin 39 of the Floppy Disk Controller IC (10T). If the reading is not correct, check IC 10T. If the reading is correct, check for a logic high with a pulse about twice a second with the Head on Track 00 and a logic low with the Head off Track 00 at pin 33 of IC 10T. If the readings are not correct, check IC 9R. If the readings are correct, check IC 10T.

HEAD POSITION MOTOR

Head Position Motor on the Disk Drive does not operate. Type in and run the following Basic program:

```
10 OUT 1014,128:OUT 1010,16:OUT 1010,20
20 OUT 1013,7:S=INP(1012)
30 OUT 1013,1:S=INP(1012)
40 FOR T=1 TO 500:NEXT T
50 OUT 1010,20
60 OUT 1013,15:S=INP(1012)
70 OUT 1013,16:S=INP(1012)
80 OUT 1012,16:S=INP(1012)
90 FOR T=1 TO 500:NEXT T
100 GOTO 10
```


LOGIC CHART (Continued)

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

PIN NO.	IC 3W	IC 3X	IC 4A	IC 4B	IC 4D	PIN NO.	IC 4D	PIN NO.	IC 4D	PIN NO.	IC 4D	PIN NO.	IC 4F	IC 4G
1	L	L	P	P	P	**P21**	P	41	p	**61**	**L**	**1**	**P**	**H**
2	L	L	P	P	*	**22**	P	42	P	62	H	2	P	L
3	H	H	P	P	*	23	P	43	P	63	P	3	P	H
4	L	L	P	P	P	24	P	44	P	64	P	4	P	P
5	L	L	P	P	P	25	P	45	P	65	P	5	P	P
6	H	H	P	P	H	26	P	46	P	66	P	6	L	H
7	L	L	P	P	P	27	P	47	P	67	P	7	L	L
8	H	H	P	P	P	28	P	48	P	68	P	8	L	L
9	L	L	P	P	L	29	L	49	P			9	P	H
10	L	L	L	L	P	30	H	50	P			10	L	L
11	H	H	P	P	P	31	P	51	P			11	P	H
12	L	L	P	P	P	32	P	52	L			12	P	P
13	L	L	P	P	P	33	P	53	H			13	P	P
14	H	H	P	P	P	34	P	54	H			14	P	H
15			P	P	P	35	L	55	*			15	L	L
16			P	P	P	36	P	56	*			16	L	H
17			P	P	P	37	P	57	P			17	L	
18			P	P	P	38	P	58	*			18	L	
19			P	P	P	39	P	59	L			19	H	
20			H	H	P	40	P	60	L			20	H	

LOGIC CHART (Continued)

PIN NO.	IC 4H	IC 4I	IC 4J	IC 4K	IC 4L	IC 4M	IC 4N	IC 4R	IC 4S	IC 4T	IC 4V	IC 4W	IC 4X	IC 5A
1	P	L	P	P	H	H	*	H	P	L	H	H	L	P
2	H	P	P	P	H	H	*	P	P	P	P	H	H	P
3	P	P	P	P	L	P	H	P	H	P	P	P	H	*
4	P	*	P	P	H	H	H	H	L	P	P	H	L	P
5	P	*	P	P	L	H	H	P	H	P	P	P	H	P
6	P	H	P	P	H	L	H	P	L	P	P	L	L	P
7	L	L	L	L	L	L	L	L	L	P	P	P	L	L
8	P	H	P	P	P	H	H	P	L	P	P	L	L	P
9	P	H	P	P	P	L	H	P	H	P	P	P	H	P
10	H	P	L	P	H	H	H	H	H	L	L	L	L	P
11	P	P	H	P	P	L	L	P	L	P	P	H	H	P
12	P	P	P	P	P	H	P	P	L	P	P	P	L	P
13	P	P	P	P	H	H	L	P	H	P	P	L	*	P
14	H	H	H	H	H	H	H	H	H	P	P	P	H	H
15										P	P	L		
16										P	P	P		
17										P	P	L		
18										P	P	P		
19										L	L	H		
20										H	H	H		

PIN NO.	IC 5B	IC 5C	IC 5D	IC 5E	IC 5G	IC 5H	IC 5I	IC 5N	IC 5R	IC 5S	IC 5T	IC 5V	IC 5W	IC 5X
1	P	P	P	P	P	H	P	P	H	H	P	H	H	L
2	P	P	P	P	P	P	P	P	P	P	P	L	H	L
3	*	P	P	P	P	P	P	P	P	H	P	P	P	P
4	P	P	P	P	P	P	P	P	H	P	P	L	H	P
5	P	P	P	P	P	P	P	P	H	H	P	P	P	L
6	P	P	P	P	P	P	P	P	H	H	P	L	H	H
7	L	P	P	P	P	*	P	P	L	L	P	P	P	P
8	P	P	P	L	L	L	P	P	P	H	P	L	H	P
9	P	P	P	P	P	P	P	P	P	H	P	P	P	H
10	P	L	L	P	P	P	L	L	P	H	L	L	L	L
11	P	P	P	P	P	P	H	P	P	P†	P	L	L	H
12	P	P	P	P	P	P	P	P	H	P†	P	P	P	H
13	P	P	P	P	P	P	P	P	P	P†	P	H	L	P
14	H	P	P	P	P	H	P	P	H	H	P	P	P	P
15		P	P	L	L	P	P	P			P	L	H	H
16		P	P	H	H	H	P	P			P	P	P	H
17		P	P				P	P			P	L	H	P
18		P	P				P	P			P	P	P	P
19		P	P				P	L			P	H	H	H
20		H	H				H	H			H	H	H	H

TROUBLESHOOTING (Continued)

Connector P2 on the Daughter Board. If pulses are missing, check IC 8Q. If pulses are present, check for pulses at pins 10 and 12 of IC 5EE. If pulses are missing, check IC 5EE. If pulses are present, check for pulses at pin 8 of IC 4FF. If pulses are missing, check IC 4FF. If pulses are present, check for pulses at pin 23 of Floppy Disk Controller IC (10T) on the System Board. If pulses are missing, check IC 8Q. If pulses are present, check for pulses at pin 11 of Counter IC (3EE). If pulses are missing, check IC 3EE. If pulses are present, check for pulses at pin 2 of Flip/Flop IC (5EE). If pulses are missing, check IC 5EE. If pulses are present, check for pulses at pin 11 of IC 3CC. If pulses are missing, check IC 3CC and Resistor R16. If pulses are present, check for pulses at pin 8 of IC 2DD. If pulses are missing, check IC 2DD. If pulses are present, check for a logic high at pins 8 and 9 and logic low at pin 10 of IC 3FF. If the reading is not correct at pin 9, check IC 2EE. If the reading is not correct at pin 10, check IC 3FF. If the readings are correct at pins 9 and 10 and not correct at pin 8, check IC 3FF. If the readings are correct, check for pulses at pin 6 of Voltage Controlled IC (4BB). If pulses are missing, check IC 4BB and Capacitor C18. If pulses are present, check for pulses at pin 8 of IC 3CC. If pulses are missing, check IC 3CC. If pulses are present, check for pulses at pin 3 of IC 2DD. If pulses are missing, check IC's 2CC and 2DD. If pulses are present, check for pulses at pin 10 of Flip/Flop IC (2EE). If pulses are missing, check IC 2EE. If pulses are present, check for a voltage of about 4.2V at pin 8 of Phase Detector IC (2BB). If the voltage is not correct, check IC 2BB, Diodes CR1 and CR2, Capacitor C15 and Resistors R10, R11 and R12. If the voltage is correct, check for pulses at pin 11 of IC 2CC. If pulses are missing, check IC's 2CC and 2DD. If pulses are present, check for pulses at pin 2 of IC 9P. If pulses are missing, check IC 9P and check pin 2 of Connector P2 for good connections. If pulses are present, check IC 10T.

WILL NOT WRITE

Verify that the oscillators and dividers are working properly (see "Oscillators and Dividers"). If the oscillators and dividers check good, type in and run the following Basic program which writes continuously in high density mode to a diskette in the Disk Drive and also checks the write protect circuits:

WARNING: Do not insert diskettes in the Disk Drive that have important data on them while running this program. This program will write over and destroy any data on the diskette. Use a blank diskette in the Drive while running this program.

```
10 CLS:OUT 101,0
20 OUT 1014,128:OUT 1010,16:OUT 1010,20
30 S=INP(1012)
40 OUT 1013,77:S=INP(1012)
50 OUT 1013,Y:S=INP(1012)
60 OUT 1013,1:S=INP(1012)
70 OUT 1013,12:S=INP(1012)
80 OUT 1013,12:S=INP(1012)
90 OUT 1013,0:S=INP(1012)
100 S=INP(1013):S=INP(1012)
110 PRINT INP(1013) AND 2:S=INP(1012)
120 FOR X=1 TO 5
130 S=INP(1013):S=INP(1012)
140 NEXT X:LOCATE 1,1
150 IF Y=1 THEN Y=5 ELSE Y=1
160 GOTO 20
```

NOTE: The above program will not write to the diskette if the diskette index detector circuits are not working properly. Verify that the index detector circuits are working properly by checking for pulses at pin 17 of the Floppy Disk Controller IC (10T) while the above program is running with a diskette inserted in the Drive. If pulses are missing, refer to the "Index Detector" section of this troubleshooting guide.

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

While the above program is running, check for pulses at pin 11 of IC 6T. If pulses are missing, check IC 6T. If pulses are present, check for pulses at pins 25, 30, 31 and 32 of the Floppy Disk Controller IC (10T). If pulses are missing at any of the pins, check IC 10T. If pulses are present, check for pulses at pin 3 of IC 10R. If pulses are missing, check IC 10R. If pulses are present, check for pulses at pin 9 of Flip/Flop IC 9S. If pulses are missing, check IC (9S). If pulses are present, check for pulses at pins 7, 10 and 15 of Flip/Flop IC 11S. If pulses are missing, check IC (11S). If pulses are present, check for pulses at pin 13 of IC 8L. If pulses are missing, check IC 8L. If pulses are present, check for pulses at pins 3 and 11 of IC 10Q. If pulses are missing at either pin, check IC 10Q. If pulses are present, check pins 22 and 24 of Connector P2 for good connections.

WRITE PROTECT DOES NOT FUNCTION

To verify the operation of the Write Protect circuits, use the program and instructions in the "Will Not Write" section of this Trouble-shooting guide. If the write protect circuit

TROUBLESHOOTING (Continued)

TEST SETUP

If the Floppy Disk Drive Interface is defective it may not be possible to load programs to help in troubleshooting the Interface. If the Computer will boot up on the Hard Disk Drive, load the needed programs to the Hard Disk Drive and do all the operations from the Hard Drive when troubleshooting the Floppy Disk Drive Interface.

WARNING: It is possible for a defective Disk Drive or Disk Drive Interface circuit to write on or erase information on a diskette, even if it is write protected. Do not check a Disk Drive with a diskette that has important data or programs on it.

CONTINUOUS OPERATION OF DISK DRIVE

The following Basic program can be used to keep Drive A running continuously:

```
10 OUT 1014,128:OUT 1010,16:OUT 1010,20:GOTO
10
```

OSCILLATORS AND DIVIDERS

Check for a 9.6 MHz signal at pin 8 of voltage controlled oscillator IC (4BB) and a 16.0 Mhz signal at pin 11 of IC 4EE on the Daughter Board. If the 9.6 MHz signal is missing, check Crystal Y2, IC 4BB and Resistors R4 and R5. If the 16.0 MHz signal is missing, check Capacitors C12 and C13, Crystal Y1, IC 4EE and Resistors R1, R2 and R3.

The oscillator signal (9.6 MHz or 16.0 MHz) that will be used is determined by the format of the diskette currently in the Disk Drive. If the diskette is a 180KB/360KB formatted double density diskette, the 9.6 MHz oscillator signal will be used. If the diskette is a 1.2 MB formatted high density diskette, the 16.0 MHz oscillator signal will be used. The signal that switches the oscillator signals comes from pin 5 of IC 9S. Pin 5 will be logic high if a double density diskette is used and logic low if a high density diskette is used. To check the oscillator switching circuits, type in and run the following Basic program that continuously switches between the oscillators:

```
10 OUT 101,0:OUT 101,1:GOTO 10
```

While the program is running, check for pulses at pin 10 of Decoder IC (6R). If pulses are missing, check IC 6R. If pulses are present, check for pulses at pin 8 of IC 6T. If pulses are missing, check IC 6T. If pulses are present, check for pulses at pin 5 of IC 9S. If pulses are missing, check IC 9S. If pulses are present, check for pulses at pin 3 of IC 3FF. If pulses are missing, check IC 3FF.

Computer does not work with a high density diskette. Type in and run the following Basic program to select the high density mode:

```
10 OUT 101,0
```

After running the program, check for a logic high at pin 3 of IC 3FF. If the reading is not correct, check IC 3FF and Resistor R16. If the reading is correct, check for pulses at pin 8 of IC 4EE. If pulses are missing, check IC 4EE. If pulses are present, check for pulses at pin 3 of IC 4FF. If pulses are missing, check IC 4FF. If pulses are present, check for an 8 MHz signal at pin 7 of IC 5EE. If the signal is missing, check IC 5EE. If the signal is present, check for an 8 MHz signal at pin 19 of the Floppy Disk Controller IC (10T). If the signal is missing, check IC 8S and Resistors R18, R24 and R93. If the signal is present, check for a 2 MHz signal at pin 13 and a 1 MHz signal at pin 15 of IC 10S. If either signal is missing, check IC 10S.

If the Disk Drive works with a high density diskette but not with a double density diskette, type in and run the following Basic program to select the double density mode:

```
10 OUT 101,1
```

After running the program, check for a 9.6 MHz signal at pin 6 of IC 4EE. If the signal is missing, check IC's 4EE and 4BB, Crystal Y2 and Resistors R4 and R5. If the signal is present, check for a logic high at pin 2 and pulses at pin 3 of IC 4FF. If the reading is not correct at pin 2, check IC 4EE. If pulses are missing at pin 3, check IC 4FF.

WILL NOT READ

Verify that the oscillators and dividers are working properly (see "Oscillators and Dividers"). If the oscillators and dividers check good, type in and run the following Basic program to operate Drive A in high density read mode:

```
10 CLS:OUT 101,0
20 OUT 1014,128:OUT 1010,16:OUT 1010,20
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:LOCATE 1,1
80 IF Y=1 THEN Y=5 ELSE Y=1
90 GOTO 20
```

To operate Drive B, change line 20 to:

```
20 OUT 1014,128:OUT 1010,33:OUT 1010,37
```

The program continuously reads a diskette and displays seven numbers on the Monitor screen. The numbers should all be 16 with no diskette in the drive and should be continuously changing with a high density diskette with data on it in the drive. Insert a diskette with data on it in Drive A and close the drive door. While the program is running, check for pulses at pin 30 of Connector P2. If pulses are missing, check pin 30 of Connector P2 for good connections and check the Disk Drive Cable for continuity. If pulses are present, check for pulses at pin 18 of IC 10N. If pulses are missing, check IC 10N. If pulses are present, check for pulses at pin 1 of

LOGIC CHART (Continued)

PIN NO.	IC 5Y	IC 6A	IC 6B	IC 6C	IC 6D	IC 6E	IC 6F	IC 6G	IC 6H	IC 6I	IC 6J	PIN NO.	IC 6J
1	H	P	P	P	P	P	P	P	P	P	H	21	P
2	H	P	P	P	P	P	P	P	P	P	P	22	P
3	P	P	P	P	P	P	P	P	P	P	P	23	P
4	H	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	P	28	H
9	H	P	P	P	P	P	P	P	P	P	P		
10	H	P	P	P	P	P	P	P	P	P	P		
11	P	P	P	P	P	P	P	P	P	P	P		
12	L	P	P	P	P	P	P	P	P	P	P		
13	H	P	P	P	P	P	P	P	P	P	P		
14	H	P	P	P	P	P	P	P	P	P	L		
15		P	P	P	P	P	P	P	P	P	P		
16		L	L	L	L	L	L	L	L	L	P		
17											P		
18											P		
19											P		
20											L		

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

LOGIC CHART (Continued)

PIN NO.	IC 7D	IC 7E	IC 7F	IC 7G	IC 7H	IC 7I	IC 7J	IC 7K	IC 7L	IC 7M	IC 7N	IC 7Q	PIN NO.	IC 7Q
1	P	P	P	P	P	P	P	P	P	P	H	P	21	P
2	P	P	P	P	P	P	L	P	P	P	P	P	22	H
3	P	P	P	P	P	P	P	P	P	P	P	P	23	P
4	P	P	P	P	P	P	P	P	P	*	H	P	24	H
5	P	P	P	P	P	P	P	P	P	*	P	P		
6	P	P	P	P	P	P	P	L	P	*	P	P		
7	P	P	P	P	P	P	L	P	L	L	L	P		
8	H	H	H	H	H	H	L	P	H	P	P	P		
9	P	P	P	P	P	P	L	P	L	P	P	P		
10	P	P	P	P	P	P	L	L	L	P	H	P		
11	P	P	P	P	P	P	H	P	L	H	P	H		
12	P	P	P	P	P	P	H	H	H	P	P	L		
13	P	P	P	P	P	P	H	P	P	P	H	P		
14	P	P	P	P	P	P	H	H	H	H	H	H		
15	P	P	P	P	P	P		H				P		
16	L	L	L	L	L	L		P				L		
17								P				H		
18								P				P		
19								P				P		
20								H				P		

PIN NO.	IC 7R	IC 7T	IC 7V	IC 7W	IC 7X	IC 7Y	IC 7Z	IC 8A	IC 8B	IC 8C	IC 8D	IC 8E	IC 8F	IC 8G
1	P	H	P	L	L†	H	L	P	P	P	P	P	P	P
2	P	L	P	P	L†	L	H	P	P	P	P	P	P	P
3	P	L	H	L	P†	P	L	P	P	P	P	P	P	P
4	P	H	P	P	P†	P	H	P	P	P	P	P	P	P
5	H	P	*	P	H†(12)	L	H	P	P	P	P	P	P	P
6	H	P	*	P	H†	P	L	P	P	P	P	P	P	P
7	H	L	H	L	P†	H	L	P	P	P	P	P	P	P
8	P	P	L	L	P†	L	*†	H	H	H	H	H	H	H
9	P	P	P	L	H†	H	L†	P	P	P	P	P	P	P
10	L	L	P	H	L†	H	H	P	P	P	P	P	P	P
11	P	*	P	P	H†	P	L	P	P	P	P	P	P	P
12	P	P	P	P	L†	L	H†(3)	P	P	P	P	P	P	P
13	H	P	P	P	P†	P	L†(2)	P	P	P	P	P	P	P
14	H	H	P	H	P†	*	H	P	P	P	P	P	P	P
15	H		P		L†	H		H	H	H	H	H	H	H
16	H		H		L†	H		L	L	L	L	L	L	L
17	P				P†									
18	P				*†									
19	P				H†									
20	H				H†									

TROUBLESHOOTING (Continued)

Check for a 14.31818 MHz signal at pin 11 of IC 2S. If the signal is not present, check IC 1S and Oscillator Module (OS)C1. If the frequency is not correct, check Oscillator Module OSC1. If the signal is correct at IC 2S, check for a 4.77 MHz signal at pins 1 and 2 of IC 1T. If the signal is missing at pin 1, check IC's 1S and 1R. If the signal is present at pin 2, check IC 1T. If the signal is present at IC 1T, check for 4.77 MHz at pin 5 of IC 3T. If the signal is missing, check IC's 1T and 3T.

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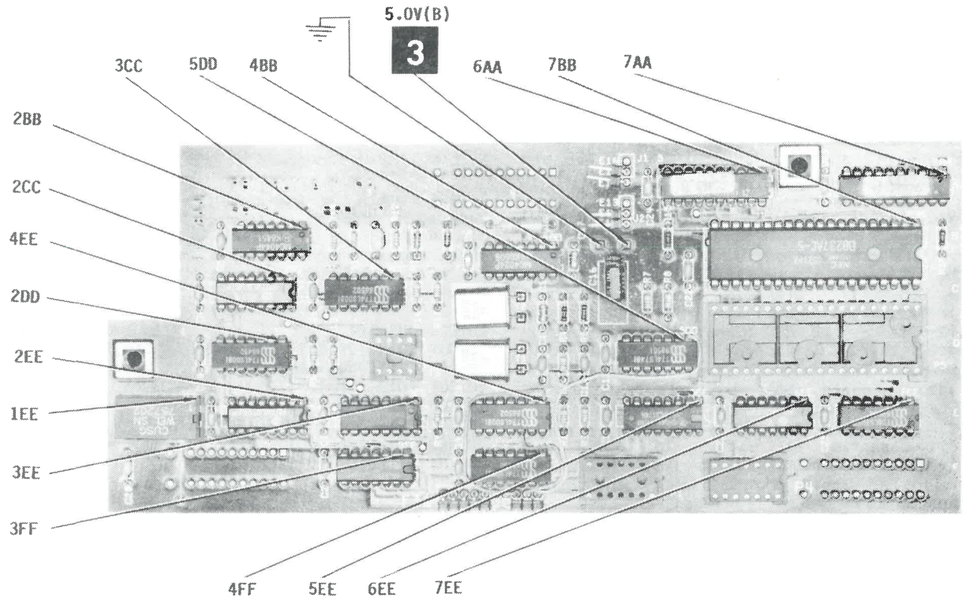
Check for a 9.60 MHz signal at pin 8 of IC 4BB. If the signal is missing, check IC 4BB, Crystal Y2 and Resistors R4 and R5. If the frequency is not correct, check Crystal Y2. Check for a 16.0 MHz signal at pin 11 of IC 4EE. If the signal is missing, check IC 4EE, Crystal Y1, Capacitors C12 and C13 and Resistors R1, R2, and R3. If the frequency is not correct, check Crystal Yi and Capacitors C12 and C13. If the signal is correct at IC 4EE, check for 4.0 MHz at pin 9 of IC 5DD. If the signal is correct, check IC 5DD and Resistors R7 and R8.



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

DAUGHTER BOARD

A Howard W. Sams CIRCUITRACE™ Photo

TROUBLESHOOTING (Continued)

voltage is missing, remove Jumper J10 and turn the Computer On. Check for about 4.3V at Jumper pin E8. If the voltage is missing, check Resistor R14 and check the Battery Charger IC (1EE) on the Daughter Board. If the voltage is present at Jumper pin E8, replace the battery. If the battery checks good, check for a frequency of 32.768 KHz at pin 14 of Real Time Clock IC (10W). If the signal is missing, check Capacitors C7 and C18, Crystal Y2 and IC 10W. If the signal is present, type in and run the following Basic program:

```
10 CLS
20 LOCATE 1,1:PRINT TIME$,DATE$:GOTO 20
```

While the program is running, check for pulses at pin 1 of IC 10W. If pulses are missing, check IC 7T on the System Board and IC's 1EE and 6EE on the Daughter Board. If pulses are present, check IC 10W.

PARALLEL PORT

Parallel port is not functioning. Check Connector J4 for good connections. If the connector checks good, plug a parallel loopback test plug (see "Test Plugs") into Connector J4. Type in and run the following Basic program. The program can be stopped by pressing the Crtl 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) AND 248)
60 PRINT "C=";(INP(890) AND 31)
70 OUT 888,255:OUT 890,255
80 PRINT "D=";INP(888)
90 PRINT "E=";(INP(889) AND 248)
100 PRINT "F=";(INP(890) AND 31):GOTO 20
```

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

```
A = 0
B = 48
C = 0
D = 255
E = 200
F = 31
```

If any of the numbers are not correct, make the following checks with the loopback test plug installed and the above program running. Check for pulses at pins 11 and 8 of IC 6V. If pulses are missing at pin 11, check IC 8T. If pulses are present at pin 11 and missing at pin 8, check IC 6V. If pulses are present, check for pulses at pin 1 of Decoder IC (6X). If pulses are missing, check IC 8T. If pulses are present, check for pulses at pins 5, 6, 7, 9 and 11 of IC 6X. If pulses are missing at any of the pins, check IC 6X. If pulses are present and numbers A and D are not correct on the Monitor screen, check for pulses at pins 2, 5, 6, 9, 12, 15, 16 and 19 of Data Output Latch IC (5X). If pulses are missing at any pin, check IC 5X. If pulses are present, check the Data Input Buffer IC (5W).

If numbers A and D are correct and numbers B, C, E or F are not correct, check for pulses at pins 2, 5, 7, 10 and 12 of Control Output Latch IC (7Y). If pulses are missing at any of the pins, check IC 7Y. If pulses are present, check for pulses at pins 2, 4 and 6 of IC 7Z. If pulses are missing, check IC 7Z. If pulses are present, check for pulses at pins 6 and 8 of IC 5Y. If pulses are missing, check IC 5Y. If pulses are present, check for pulses at pins 2, 4, 6, 8 and 10 of IC 4X. If pulses are missing, check IC 4X. If pulses are present, check Status Buffer IC (4W).

RESET CIRCUIT

Check the operation of the Reset circuit by checking the logic reading at pin 29 of CPU IC (4D) while turning the Computer On. The reading should be logic high when the Computer is turned On then go low and stay low. If the reading is not correct, check the voltage at pin 1 of IC 7T while turning the Computer On. The voltage should be 0V when the Computer is turned On and take about 23 seconds to reach 3.0V. If the reading is not correct, check Capacitor C1, Diode CR1 and Resistor R1. If the reading is correct, check the logic reading at pin 4 of IC 7T while pressing the Reset Button (SW7). The reading should be logic low for about one second after turning the Computer On, then go logic high and stay high. If the reading is not correct and pin 10 of IC 7W is logic high, check IC's 7T and 7W. If the reading at pin 10 of IC 7W is not logic high, check Resistor R51 and check pin 7 of the Keyboard Connector (J6) for possible shorts. If the reading is correct, check for a logic high at pin 12 of IC 3G. If the reading is not correct, check IC's 1H and 2K. If the reading is correct, check for a logic low at pin 4 of IC 3K for about one second after pressing the Reset Button. The reading should the go high and stay high. If the reading is not correct, check IC's 3G and 3K. If the reading is correct, check the logic reading at pin 12 of the Clock Generator IC (3H) while pressing the Reset Button. The reading should be logic high for about one second after pressing the Reset Button, then go logic low and stay low. If the reading is not correct, check IC 3H.

OSCILLATORS AND DIVIDERS

SYSTEM BOARD
Check for 12.0 MHz at pin 3 of IC 3G. If the signal is not present, check IC 3G and Oscillator Module (OSC3). If the frequency is not correct, check Oscillator Module OSC3. If the signal is correct at IC 3G, check for a 6.0 MHz signal at pin 13 and a 12.0 MHz signal at pin 10 of the Clock Generator IC (3H). If either signal is missing, check IC 3H. If the signals are correct, check for a 6.0 Mhz signal at pin 2 of IC 3K. If the signal is missing, check IC 3K.

LOGIC CHART (Continued)

PIN NO.	IC 8H	IC 8I	IC 8K	IC 8L	IC 8M	IC 8N	IC 8P	IC 8Q	IC 8R	IC 8S	IC 8T	IC 8U
1	P	P	P	P	H	P	L	P†	P	P	H	H
2	P	P	P	L	H	P	H	P†	P	H	L	H
3	P	P	P	P	*	P	H	P†	P†	P	P	P
4	P	P	P	P	P	H	L	P†	P†	H†	P	L
5	P	P	P	P	P	L	P	P†	H†	P†	P	P
6	P	P	P	P	P	H	P	P†	P†	P†	P	H
7	P	P	L	L	L	L	L	L	L	L	L	P
8	H	H	P	P	P	P†	H	P†	P†	P†	L	*
9	P	P	P	P	P	P†	L	P†	P†	P†	H	P
10	P	P	H	L	P	L†	L	P†	P†	H†	L	L
11	P	P	L	P†	*	P†	H	P†	P†	P	H	L
12	P	P	L	P†	P	P†	P	P†	H	P	H	P
13	P	P	P	P†	P	L†	P	P†	P	P	L	H
14	P	P	H	H	H	H	H	H	H	H	H	P
15	H	H										H
16	L	L										P
17												L
18												P
19												H
20												H

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

LOGIC CHART (Continued)

PIN NO.	IC 9J	IC 9K	IC 9L	IC 9M	IC 9N	IC 9P	IC 9R	IC 9S	IC 9X	IC 10G	IC 10I	IC 10K	IC 10L	IC 10M
1	P	H	L	H	H	P†	P†	H†	H	P	P	P	P	L†
2	P	P	P	P	H	P†	P†	P†	H	P	P	P	P	L†
3	P	P	P	P	H	H†	P†	P†	P	P	P	P	P	*†
4	H	P	H	P	H	L†	P†	H†	H	P	P	P	P	H†(12)
5	P	P	L	P	P	L†	P†	L†(2)	P	H	P	P	P	H†(12)
6	P	P	H	P	P	H†	P†	H†	L	H	P	P	P	L†(13)
7	L	L	L	L	L	L	L	L†	P	H	L	L	L	L†
8	H	P	P	L	P	L†	L†(8)	P†	H	L	P	P	P	L†(13)
9	L	P	P	H	P	H†	L†(8)	P†	P	H	P	P	P	H†(12)
10	H	P	P	P	P	P	L†(1)	P†	L	H	P	P	P	H†
11	P	P	P	P	P	P	L†(1)	P†	H	P	P	P	*	*†
12	P	P	P	P	P	P	L†(1)	P†	P	P	P	P	*	L†
13	H	H	P	P	P	P	P †	P†	L	P	P	P	P	L †
14	H	H	H	H	H	H	H	H†	P	P	H	H	H	H†
15									L	P				
16									P	H				
17									H					
18									P					
19									H					
20									H					

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

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

TROUBLESHOOTING (Continued)

KEYBOARD

Keyboard does not function. Check the Keyboard Connectors, J6 on the System Board and P1 on the Keyboard, for good connections and check the Keyboard Cable for broken wires. If the connectors and cable check good, disconnect the Keyboard from the System Board (Connector J6). NOTE: The power supply may shut down with the keyboard disconnected due to insufficient current being drawn from the 12.0V Source that supplies power to the keyboard. If the power supply shuts down, connect a 100 to 150 ohm, 2 watt load resistor from pin 3 to pin 5 of Connector J6 when disconnecting the keyboard. Check for 12.0V at pin 5 of Connector J6. If 12.0V is missing, check Fuse (F1). 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 one second, then pulse twice after the Computer beeps once (about 12 seconds after going high). Pin 2 should read logic low when the Computer is turned On, then start pulsing after about 1 second. The pulses should have a frequency of about 16 Hz for about 12 seconds, then change to about 436 Hz. If the readings are correct, go to the Keyboard Bad paragraph below. If there is no change at either pin, check the logic readings at pins 4 and 9 of IC 11X. The readings at pin 4 should be the inverse of the readings at pin 1 of Connector J6 and the readings at pin 9 should be the inverse of the readings at pin 2 of Connector J6. If the readings are correct, check IC 11X. If the readings are not correct, check for pulses at pins 2 and 3, logic high at pin 6 and logic low at pin 7 of Keyboard Controller IC (8W) (pin 6 should pulse twice about two seconds after turning the Computer On). If the readings are not correct at pins 2, 3 or 7, check IC 8T. If the reading is not correct at pin 6, check IC°s 6V and 8T. If the readings are correct, check IC 8W.

Keyboard bad. Turn the Computer off and reconnect the keyboard. Check for 5.0V at pin 3 of Voltage Regulator (IC10). If 5.0V is missing, check IC10 and Capacitors C1, C4 thru C7 and C10 thru C14. If 5.0V is present, check for a 6.0 MHz signal at pins 2 and 3 of the Keyboard Controller (IC5). If the signal is missing, check Capacitors C8 and C9, Crystal X1 and IC5. If the signal is present, check for pulses at pin 10 of IC1. If pulses are missing, check IC1. If pulses are present, check for pulses at pins 8, 12 thru 19 and 35 thru 38 of IC5. If pulses are missing, check IC5, IC7 and IC8. If pulses are present, check for pulses at pin 6 of IC2. If pulses are missing, check IC2. If pulses are present, check for pulses at pins 1 thru 7 and 9 of IC3 and IC4. If pulses are missing, check the IC with the missing pulses. If pulses are present, check IC9.

SOUND

No sound from the speaker. Check the Speaker (SPK1) 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 pins 2 and 5 of IC 6W. If pulses are missing, check IC 6W. If pulses are present, check for pulses at pin 2 of IC 11X. If pulses are missing, check Timer IC (7Q). If pulses are present, check IC 11X, Capacitors C5 and C6, Resistor R9 and Speaker SPK1.

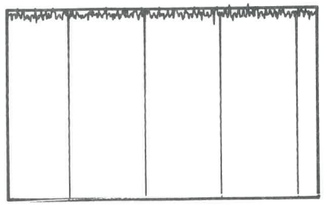
SERIAL PORT

Serial port does not work. Check Connector J3 for good connections. If the connector checks good, make sure Jumper J9 is installed on Jumper pins E10 and E11 and is making good connections. If the Jumper check's good, check for a 1.843 MHz signal at pin 16 of Serial Controller IC (3Q). If the signal is missing or the frequency not correct, check Oscillator Module (OSC2), IC 4R and Resistor R84. If the signal is present, type in and run the following Basic program:

```
10 OUT 1019,131
20 OUT 1016,128:OUT 1017,1
30 OUT 1019,3
40 OUT 1020,0:OUT 1020,15
50 OUT 1016,255:GOTO 40
```

The program sets the baud rate to 300 baud and causes pulses to appear at pins 11, 31, 32, 33 and 34 of IC 3Q. The baud clock waveform at pin 15 of IC 3Q should look like Figure G when the program is running.

Figure G



While the program is running, check for pulses at pin 14 of IC 3Q. If pulses are missing, check IC°s 8R and 9P. If pulses are present, check for pulses at pins 11, 32 and 33 of IC 3Q. If pulses are missing, check IC 3Q. If pulses are present, check for pulses at pins 6, 8 and 11 of IC 2X. If pulses are missing, check IC 2X. If pulses are present, turn the Computer off and plug a Serial Test Loopback plug (see "Test Plugs") into connector J3. Turn the Computer back On and run the above program. While the program is running, check for pulses at pins 8 and 11 of IC 3W. If pulses are missing, check IC 3W. If pulses are present, check for pulses at pins 3, 6 and 8 of IC 3X. If pulses are missing, check IC 3X. If pulses are present, check IC 3Q.

REAL TIME CLOCK

Clock or calendar function does not work. Make sure jumper J10 is installed on pins E8 and E9 on the System Board and is making good contact. Check for 3.0V across rechargeable Battery (B1) on the System Board. If the

TROUBLESHOOTING

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.

POWER SUPPLY DESCRIPTION

When the AC Power Switch is closed 120VAC is applied to the Bridge Rectifier Diodes (D01 thru D04), developing 161V* at the cathode of D02 and -161V* at the anode of D01. These voltages are applied to the collector of Transistor Q01 and the emitter of Transistor Q02 respectively. When this voltage is applied Transformers T01, T02 and T03 are pulsed into operation and continue to operate provided there are no defective components or defective circuitry. The pulses developed by Transformers T01, T02 and T03 are rectified by several diodes producing the desired source voltages. Windings on Transformers T01 and T02 inductively couple pulses to the base of Transistors Q01 and Q02 for turn On and turn Off signals. Should the AC voltage decrease Transistors Q01 and Q02 will remain turned On for a longer period of time causing a higher current. This increased current produces higher amplitude pulses which are rectified raintaining the desired output source voltages. If the AC voltage increases Transistors Q01 and Q02 will conduct for a shorter period of time causing less current. This produces lower amplitude pulses which keeps the output source voltage constant.

*Measured from isolated ground.

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 tgriggered into conduction, triggering SCR (SCR02) which shuts down the Power Supply. Should this condition exist remove all loads from the Power Supply and cehck 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

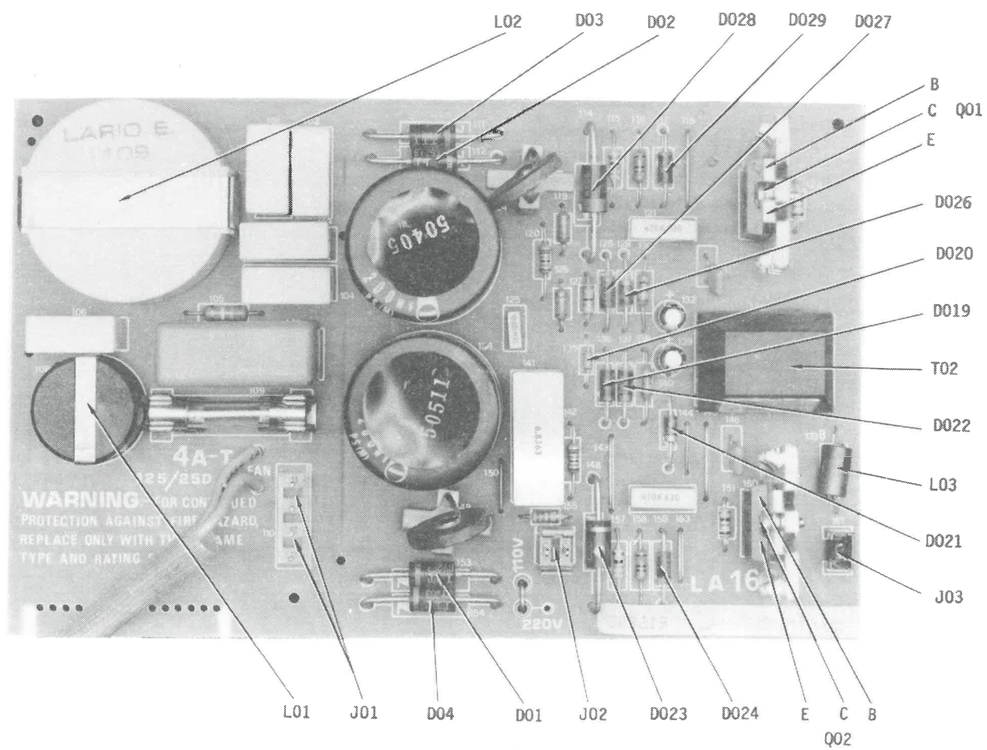
Use a male 25 pin subminiature "D" connector (DB-25) and connect following pins together: pin 1 to pin 13, pin 2 to pin 15, pin 12 to pin 14, pin 10 to pin 16, pin 11 to pin 17.

SERIAL LOOPBACK PLUG

Use a male 25 pin subminiature "D" Connector (DB-25) and connect the following pins together: pin 2 to pin 3, pin 4 to pins 5 and 8, pin 6 to pins 20 and 22.

LOGIC CHART (Continued)

PIN NO.	IC 11E	IC 11F	IC 11I	IC 11J	IC 11S	IC 11X
1	P	L	P	P	P†(18)	L
2	P	P	P	H	P†	H
3	L	P	*	P	P†	H
4	P	P	P	L	P†	L
5	L	P	P	L	P†	L
6	P	P	P	P	P†	H
7	L	P	L	L	P†	L
8	P	P	P	P	L†	P
9	P	P	P	P	P†	P
10	P	L	P	P	P†	P
11	*	P	*	*	P†	*†
12	*	P	P	*	P†	L†
13	P	P	P	P	P†	L†
14	H	P	H	H	P†	H
15		P			P†	
16		P			H†	
17		P				
18		P				
19		L				
20		H				



POWER SUPPLY AC INPUT BOARD

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
BUS EXPANSION BOARD						
IC1	79L05					
DAUGHTER BOARD						
2BB	MC4044P	NTE974	ECG974	SK3965/974		
2CC	T74LS161B1	NTE74LS161A	ECG74LS161A	SK74LS161		
2DD	SN74LS00N	NTE74LS00	ECG74LS00	SK74LS00		
2EE	SN74LS109AN	NTE74LS109A	ECG74LS109A	SK74LS109		
3CC	SN74LS00N	NTE74LS00	ECG74LS00	SK74LS00		
3EE	SN74ALS161BN					
3FF	SN74ALS86N					
4BB	MC4024P					
4EE,4FF	SN74LS00N	NTE74LS00	ECG74LS00	SK74LS00		
5DD	74LS74APC	NTE74LS74A	ECG74LS74A	SK74LS74A		
5EE	SN74ALS174N					
6AA	PAL16L8CN					
6EE	T74LS32B1	NTE74LS32	ECG74LS32	SK74LS32		
7AA	PAL16R4CN					
7BB	D8237AC-5					
7EE	74LS393PC	NTE74LS393	ECG74LS393	SK74LS393		

PARTS LIST AND DESCRIPTION (Continued)

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

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
POWER SUPPLY - AC INPUT BOARD		
C014	680 200V	
C016	680 200V	
C029	6.8 63V 10%	

CAPACITORS

ITEM No.	RATING	MFGR. PART No.
POWER SUPPLY - AC INPUT BOARD		
C01	.0033 250 VAC 20%	
C02	.0033 250 VAC 20%	

ITEM No.	RATING	MFGR. PART No.
C015	.0033 250 VAC 20%	
C017	.47 300V AC	
C030	.1 300VAC	
C031	.0033 250V AC	

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

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
POWER SUPPLY REGULATOR				
R019	5V Adj			

FUSE DEVICES

ITEM NO.	DESCRIPTION	MFGR. PART NO.		NOTES
		DEVICE	HOLDER	
POWER SUPPLY AC INPUT BOARD				
F01	4 Amp @ 250V AC Slow Blow			
SYSTEM (MOTHER BOARD)				
F1	2 Amp @ 125V AC			

COILS (RF-IF)

ITEM No.	FUNCTION	MFGR. PART No.
POWER SUPPLY REGULATOR		
L04	RF Choke	
L05	RF Choke	
L06	RF Choke	

SPEAKER

ITEM No.	TYPE	REPLACEMENT DATA		NOTES
		MFGR. PART No.	QUAM PART No.	
SPK1	1.5" CM 8 Ohm			

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.	WKMAN Γ No.
BUS EXPANSION BOARD				
RP1	Resistor Network 2200 5% x 9			
RP2	Resistor Network 330 5% x 9			
RP3	Resistor Network 2200 5% x 9			
RP4	Resistor Network 2200 5% x 9			
RP5	Resistor Network 220 5% x 9			
KEYBOARD				
RP1	Resistor Network 33K x 8			
KEYBOARD (ALT)				
RP1	Resistor Network 10K x 8			
RP2	Resistor Network 10K x 8			
POWER SUPPLY - AC INPUT BOARD				
R05	150K 2% 1/4W Carbon Film		QW415	
R06	150K 2% 1/4W Carbon Film		QW415	
R010	30 2% 1/4W Carbon Film		QW030	
R011	30 2% 1/4W Carbon Film		QW030	
R047	3.9 2% 1/4W Carbon Film		QW3D9	
R048	15 Ohm Cold NTC			
R057	3.9 2% 1/4W Carbon Film		QW3D9	
R061	15 Cold NTC			
POWER SUPPLY REGULATOR				
R02	100 2% 1/4W Carbon Film		QW110	
R014	100 2% 1/4W Carbon Film		QW110	
R015	240 1% 1W Carbon Film		1W124	
R016	100 2% 1/4W Carbon Film		QW110	
R023	180 2% 1W Carbon Film		1W118	
R025	100 2% 1/4W Carbon Film		QW110	
R026	100 2% 1/4W Carbon Film		QW110	
R027	130 2% 1/4W Carbon Film		QW113	

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
	KEYBOARD		
D1	LED		Caps Lock, Red
D2	LED		Number Lock, Red
D3	LED		Scroll Lock, Red
X1	Crystal		6MHz
	POWER SUPPLY		
P01	AC Power Cord		
SW01	Switch		Power
	SYSTEM BOARD		
B1	Battery		3V
DS1	LED		Power, Grn
DSW1	DIP Switch		
DSW2	DIP Switch		
OSC1	Crystal	14.31818MHz	
OSC2	Oscillator		3.6864MHz
OSC3	Crystal		12:MHz
SW7	Switch		Reset

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
KEYBOARD						
IC1,2	74LS05PC	NTE74LS05	ECG74LS05	SK74LS05		
IC3,4	ON74LS145N	NTE74LS145	ECG74LS145			
IC5	D8039LC			SK7C243		
IC6	MM74HC243N			SK7C243		
	MC74HC243N					
IC7	2716	NTE2716(12)	ECG2716(12)	SK2716/2716(12)		
IC8	SN74LS373N	NTE74LS373	ECG74LS373	SK74LS373		
IC9	MM74HC240N			SK7C240		
	MC74HC240N			SK7C240		
IC10	7805	NTE960	ECG960	SK3591/960		
KEYBOARD MODEL 301						
U1	SN74LS05N	NTE74LS05	ECG74LS05	SK74LS05		
U2	DM74LS109AN	NTE74LS109A	ECG74LS109A	SK74LS109		
U3	SN74LS05N	NTE74LS05	ECG74LS05	SK74LS05		
U4	SN74LS14N	NTE74LS14	ECG74LS14	SK74LS14		
U5	ON74LS03N	NTE74LS03	ECG74LS03	SK74LS03		
U6	TMP8039P			SK2716/2716		
U7	AM2716DC	NTE2716	ECG2716			
U8,9	SN74LS145N	NTE74LS145	ECG74LS145	SK74LS373		
U10	SN74LS373N	NTE74LS373	ECG74LS373			
U11	ON74LS374N	NTE74LS374	ECG74LS374	SK7CT374		
U12	LM339DP	NTE834	ECG834	SK3569/834		
U13	74LS151PC	NTE74LS151	ECG74LS151	SK74LS151		
U14	LM339DP	NTE834	ECG834	SK3569/834		

PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
POWER SUPPLY						
D01 THRU D04	BY253	NTE156	ECG156	SK3051/156		
D05,6	1N4002	NTE116	ECG116	SK3311		
D08 THRU D010	1N4934	NTE552	ECG552	SK9000/552		
D011	PRF851					
D012	BYW31-100					
D013,14	BYW30-150					
D015	BYW31-100					
D016	PRF851					
D019	1N4937	NTE552	ECG552	SK9000/552		
D020						
D021	1N4002	NTE116	ECG116	SK3311		
D022	1N4937	NTE552	ECG552	SK9000/552		
D023	PRF851					
D024	1N4937	NTE552	ECG552	SK9000/552		
D026	1N4002	NTE116	ECG116	SK3311		
D027	1N4937	NTE552	ECG552	SK9000/552		
D028	PRF851					
D029	1N4937	NTE552	ECG552	SK9000/552		
IC01	LM7912CT					
Q01,2	BUS47P					
Q03,4	BC307B	NTE159	ECG159	SK3466/159		
Q05	BC237B	NTE123AP	ECG123AP	SK3854/123AP		
Q06	D44C9	NTE377	ECG377	SK9112/377		
Q07	BC237B	NTE123AP	ECG123AP	SK3854/123AP		
Q08	BC307B	NTE159	ECG159	SK3466/159		
SCR01	UA431AWC					
SCR02	TY2010GH					
ZD01	1N5359	NTE5137A	ECG5137A	SK24X/5137A		
ZD02	1N752A	NTE5011A	ECG5011A	SK5A6/5011A		

PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
9P	SN74LS04N	NTE74LS04	ECG74LS04	SK74LS04		
9R	74LS08PC	NTE74LS08	ECG74LS08	SK74LS08		
9S	74LS74APC	NTE74LS74A	ECG74LS74A	SK74LS74A		
9X	T74LS244B1	NTE74LS244	ECG74LS244	SK74LS244		
10G	SN74S139N					
10I	MC74F04N					
10K	SN74ALS00AN					
10L	74S51PC	NTE74S51	ECG74S51			
10M	7438PC	NTE7438	ECG7438	SK7438		
10N	ON74S240N					
10P	DM74LS175N	NTE74LS175	ECG74LS175	SK74LS175		
10Q	7438PC	NTE7438	ECG7438	SK7438		
10R	T74LS00B1	NTE74LS00	ECG74LS00	SK74LS00		
10S	SN74LS161AN	NTE74LS161A	ECG74LS161A	SK74LS161		
10T	D765AC					
10W	MM58274N					
11E	74S51PC	NTE74S51	ECG74S51			
11F	74F244PC					
11I	DM74S20N	NTE74S20	ECG74S20	SK74S20		
11J	74S51PC	NTE74S51	ECG74S51			
11S	DM74LS175N	NTE74LS175	ECG74LS175	SK74LS175		
11X	7438PC	NTE7438	ECG7438	SK7438		

WIRING DATA

High Voltage Lead	Use BELDEN No. 8869 (17 KV) or 8868 (24 KV)
Shielded Hook-up Wire	Use BELDEN No. 8401 or 8421 (Single-Conductor) 8208 (Two-Conductor)
Shielded Hook-up Wire (Disk Drive Heads)..	Use BELDEN No. 9534 (Four-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.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
7J	SN74S32N			SK74S32		
7K	D82C288-8					
7L	MC74F10N					
7M	74LS125AN	NTE74LS125A	ECG74LS125A	SK74LS125A		
7N	74LS74APC	NTE74LS74A	ECG74LS74A	SK74LS74A		
7Q	P8254					
7R	74F244PC					
7T	T74LS14B1	NTE74LS14	ECG74LS14	SK74LS14		
7V	T74LS279B1	NTE74LS279	ECG74LS279			
7W	SN74S08N	NTE74S08	ECG74S08			
7X	SN74LS273N	NTE74LS273	ECG74LS273	SK74LS273		
7Y	T74LS174B1	NTE74LS174	ECG74LS174	SK74LS174		
7Z	7406PC	NTE7406	ECG7406	SK7406		
8A THRU 8I	TMS4256-15NL					
8K	74LS08PC	NTE74LS08	ECG74LS08	SK74LS08		
8L	SN74S02N	NTE74S02	ECG74S02	SK1917		
8M	T74LS21B1	NTE74LS21	ECG74LS21	SK7CT21		
8N	74LS125AN	NTE74LS125A	ECG74LS125A	SK74LS125A		
8P	74LS04PC	NTE74LS04	ECG74LS04	SK74LS04		
8Q	SN74LS04N	NTE74LS04	ECG74LS04	SK74LS04		
8R	T74LS10B1	NTE74LS10	ECG74LS10	SK74LS10		
8S	T74LS00B1	NTE74LS00	ECG74LS00	SK74LS00		
8T	SN74LS04N	NTE74LS04	ECG74LS04	SK74LS04		
8U	T74LS244B1	NTE74LS244	ECG74LS244	SK74LS244		
8W	D8741A					
8X	T74LS244B1	NTE74LS244	ECG74LS244	SK74LS244		
9A THRU 9I	TMS4256-15NL					
9J,9K	74S74PC	NTE74S74	ECG74S74	SK74S74		
9L	DM74LS32N	NTE74LS32	ECG74LS32	SK74LS32		
9M	SN74LS04N	NTE74LS04	ECG74LS04	SK74LS04		
9N	SN74S08N	NTE74S08	ECG74S08			

PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
SYSTEM BOARD						
CR1	1N4148	NTE519	ECG519	SK3100/519		
CR2						
CR4	1N4148	NTE519	ECG519	SK3100/519		
CR99						
1A	ON74LS373N	NTE74LS373	ECG74LS373	SK74LS373		
1B,1C	T74LS244B1	NTE74LS244	ECG74LS244	SK74LS244		
1D	74LS245PC	NTE74LS245	ECG74LS245	SK74LS245		
1E	SN74AS645N					
1F	PAL16L8CN					
1G	T74LS670B1	NTE74LS670	ECG74LS670	SK7CT670		
1H	SN74LS74AN	NTE74LS74A	ECG74LS74A	SK74LS74A		
1I	AMPAL16L8PC					
1J	PAL20X8CNS					
1K	AMPAL16L8PC					
1L	ON74LS373N	NTE74LS373	ECG74LS373	SK74LS373		
1M	T74LS670B1	NTE74LS670	ECG74LS670	SK7CT670		
1N	Z8430AB1					
1Q	SAB8259AP					
1R	MC74F10N					
1S	SN74S163N					
1T	SN74S04N	NTE74S04	ECG74S04	SK74S04		
1V,1W,1X	SN74AS870NT					
2B	80287					USED SOME VERSIONS
2D	ON74LS373N	NTE74LS373	ECG74LS373	SK74LS373		
2E	T74LS157B1	NTE74LS157	ECG74LS157	SK74LS157		
2F	SN74AS373N					
2G	SN74LS374N	NTE74LS374	ECG74LS374	SK7CT374		
2H	M74LS273P	NTE74LS273	ECG74LS273	SK74LS273		
2I	DM74LS244N	NTE74LS244	ECG74LS244	SK74LS244		

PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

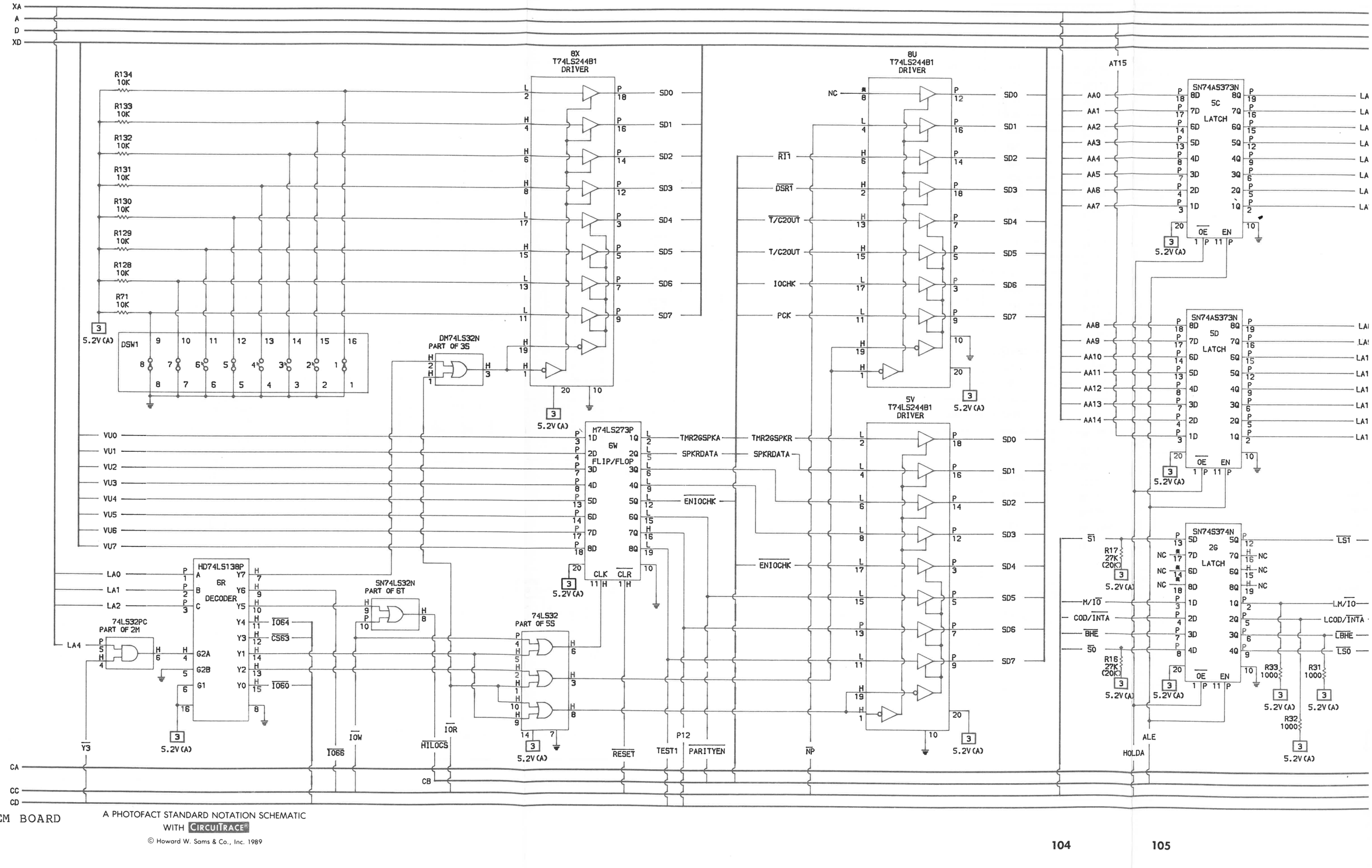
ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
2J	PAL16R4CN					
2K	SN74LS393N	NTE74LS393	ECG74LS393	SK74LS393		
2L	T74LS30B1	NTE74LS30	ECG74LS30	SK74LS30		
2M	74LS32PC	NTE74LS32	ECG74LS32	SK74LS32		
2N	74LS125AN	NTE74LS125A	ECG74LS125A	SK74LS125A		
2S	T74LS00B1	NTE74LS00	ECG74LS00	SK74LS00		
2T	SN74LS74AN	NTE74LS74A	ECG74LS74A	SK74LS74A		
2X	UA1488PC [uA1488PC]	NTE75188	ECG75188	SK5188/75188		
3G	T74LS00B1	NTE74LS00	ECG74LS00	SK74LS00		
3H	MBL82284-8					
3I	DM74LS175N	NTE74LS175	ECG74LS175	SK74LS175		
3J	HD74LS138P	NTE74LS138	ECG74LS138	SK74LS138		
3K	SN74S04N	NTE74S04	ECG74S04	SK74S04		
3L	PAL16L8CN					
3M	N82S153N					
3N	SN74S133N	NTE74S133	ECG74S133			
3Q	INS8250N-B					
3S	DM74LS32N	NTE74LS32	ECG74LS32	SK74LS32		
3T	74S74PC	NTE74S74	ECG74S74	SK74S74		
3V	AMPAL16L8PC					
3W,3X	UA1489APC [uA1489APC]	NTE75189	ECG75189	SK5189/75189		
4A,4B	MC74F245N					
4D	R80286-8					
4F	6349-2J					
4G	DM74LS175N	NTE74LS175	ECG74LS175	SK74LS175		
4H	74LS74APC	NTE74LS74A	ECG74LS74A	SK74LS74A		
4I	DM74LS32N	NTE74LS32	ECG74LS32	SK74LS32		
4J	SN74LS04N	NTE74LS04	ECG74LS04	SK74LS04		
4K	74LS08PC	NTE74LS08	ECG74LS08	SK74LS08		

PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
4L,4M	SN74LS74AN	NTE74LS74A	ECG74LS74A	SK74LS74A		
4N	ON74LS08N	NTE74LS08	ECG74LS08	SK74LS08		
4R	74S74PC	NTE74S74	ECG74S74	SK74S74		
4S	SN74LS04N	NTE74LS04	ECG74LS04	SK74LS04		
4T	T74LS244B1	NTE74LS244	ECG74LS244	SK74LS244		
4V	DM74LS244N	NTE74LS244	ECG74LS244	SK74LS244		
4W	HD74LS240P	NTE74LS240	ECG74LS240	SK74LS240		
4X	T74LS14B1	NTE74LS14	ECG74LS14	SK74LS14		
5A,5B	HD74S280P					
5C,5D	SN74AS373N					
5E,5G	SN74S158N	NTE74S158	ECG74S158			
5H	93425APC					
5I	MB8168-70					
5N	74LS245PC	NTE74LS245	ECG74LS245	SK74LS245		
5R	74LS08PC	NTE74LS08	ECG74LS08	SK74LS08		
5S	74LS32N	NTE74LS32	ECG74LS32	SK74LS32		
5T	74LS245PC	NTE74LS245	ECG74LS245	SK74LS245		
5V,5W	T74LS244B1	NTE74LS244	ECG74LS244	SK74LS244		
5X	T74LS374B1	NTE74LS374	ECG74LS374	SK7CT374		
5Y	74LS125AN	NTE74LS125A	ECG74LS125A	SK74LS125A		
6A THRU 6I	MB81256-15					
6J	M5L27128K-2					
6K	D27128D-2					
6L	T74LS02B1	NTE74LS02	ECG74LS02	SK74LS02		
6M	74LS74APC	NTE74LS74A	ECG74LS74A	SK74LS74A		
6R	HD74LS138P	NTE74LS138	ECG74LS138	SK74LS138		
6T	SN74S32N			SK74S32		
6V	T74LS10B1	NTE74LS10	ECG74LS10	SK74LS10		
6W	M74LS273P	NTE74LS273	ECG74LS273	SK74LS273		
6X	74LS155PC	NTE74LS155	ECG74LS155	SK74LS155		
7A THRU 7I	MB81256-15					



SYSTEM BOARD

A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®

XA
A
D
XD

8X
T74LS244B1
DRIVER

SD0
SD1
SD2
SD3
SD4
SD5
SD6
SD7

8U
T74LS244B1
DRIVER

NC
RI1
DSR1
T/C2OUT
T/C2OUT
IOCHK
PCK

5V
T74LS244B1
DRIVER

TMR2GSPKR
SPKRDATA
ENIOCHK

AT15

AA0
AA1
AA2
AA3
AA4
AA5
AA6
AA7
AA8
AA9
AA10
AA11
AA12
AA13
AA14

SN74AS373N
5C
LATCH

SN74AS373N
5D
LATCH

LA0
LA1
LA2
LA3
LA4
LA5
LA6
LA7
LA8
LA9
LA10
LA11
LA12
LA13
LA14
LA15

M5L27128K-2
6J
ROM

D27128D-2
6K
ROM

MD0
MD1
MD2
MD3
MD4
MD5
MD6
MD7
MD8
MD9
MD10
MD11
MD12
MD13
MD14
MD15

A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
PGM
VPP
CO
CE

5.2V(A)

DM74LS32N
PART OF 3S

M74LS273P
6W
FLIP/FLOP

CLK
CLR

SN74LS32N
PART OF 6T

74LS32
PART OF 5S

SN74S374N
2G
LATCH

S1
M/IO
COD/INTA
BHE
S0

R17
27K
(20K)

R16
27K
(20K)

R33
1000

R31
1000

R32
1000

LS1
LM/IO
LCOD/INTA
LBHE
LS0

DM74LS32N
PART OF 9L

IOW
IOR
HILOCS
RESET
TEST1
P12
PARITYEN
NP
ALE
HOLDA
SW8
ROMSEL

CA
CB
CC
CD

SYSTEM BOARD

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

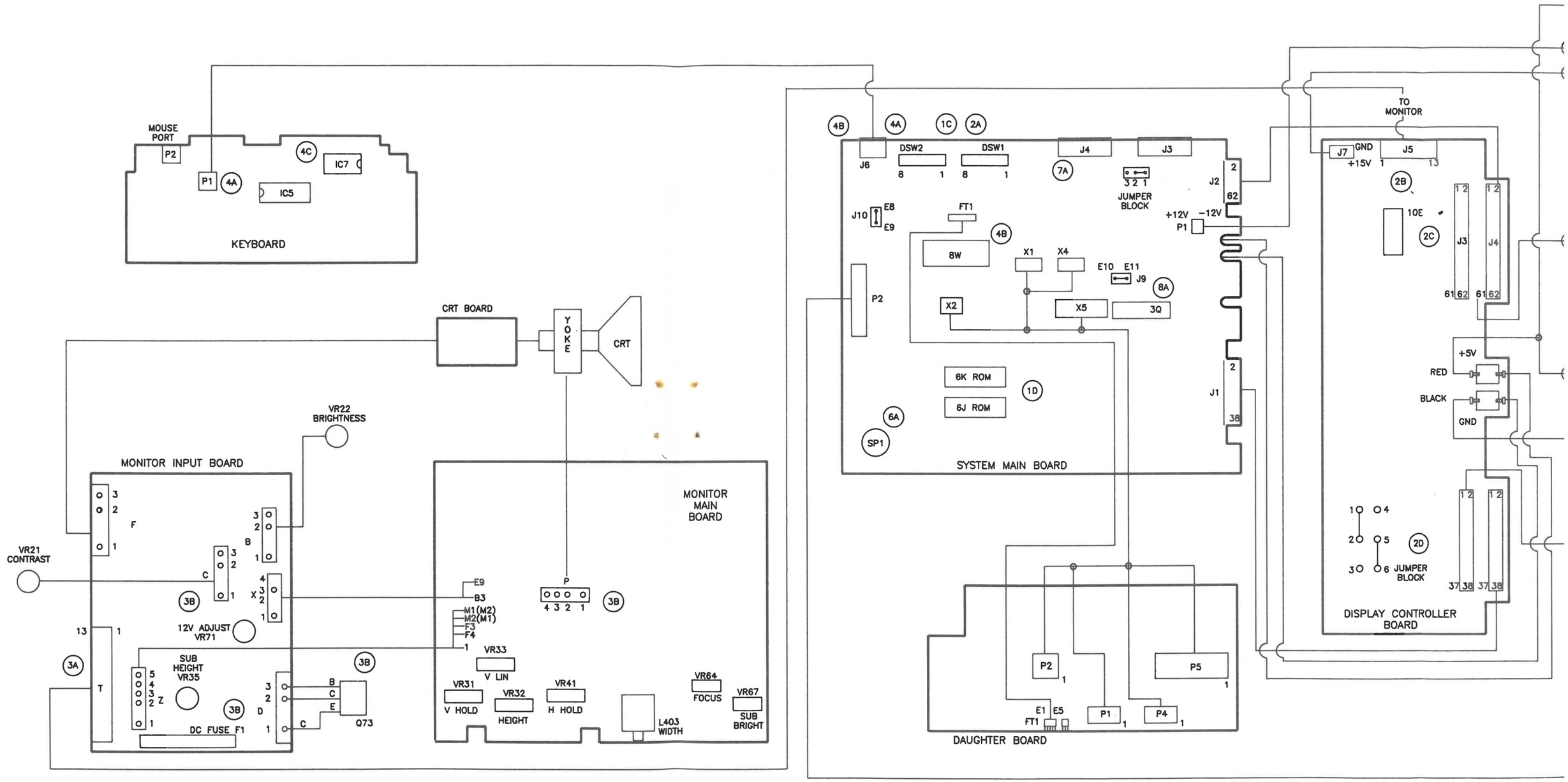
REPLACEMENT PARTS

Power Supply Fuse
IC 6J (System Board) ROM
IC 6K (System Board) ROM
IC 10E (Display Board)
Fuse F1 (Monitor) 2.5A Fuse
IC 8W (System Board)
IC IC5 (Keyboard)
IC (C7 (Keyboard)
M7,M8 Index Detector (Disk Drive)
M5,M6 Write Protect Detector (Disk Drive)
M9 Track 00 Detector (Disk Drive)
SP1 Speaker 8 Ohm z
IC 3Q (System Board)

AT&T MODEL 6300 PLUS CSCS28

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

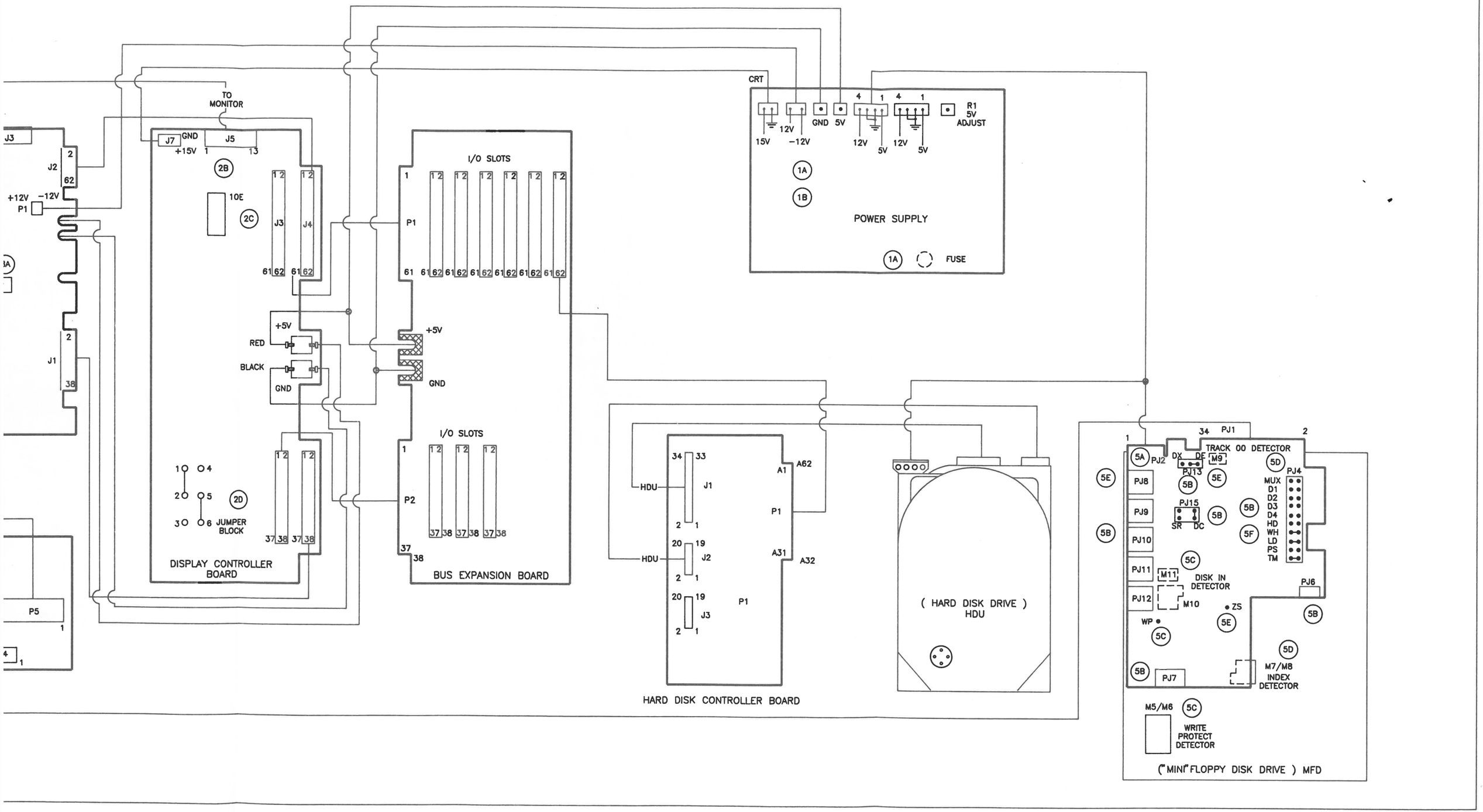
 89CS19065 DATE 5-89



INTERCONNECTING DIAGRAM

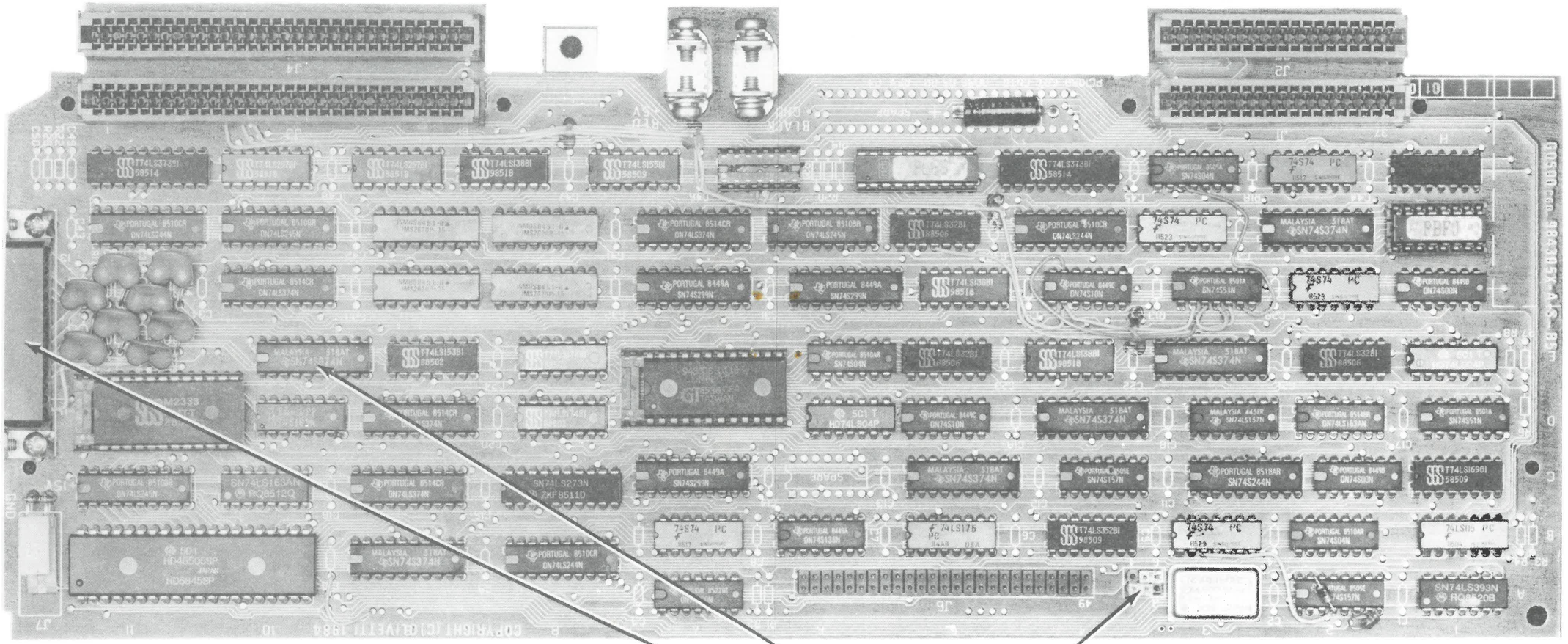
II

RVICE CHECKS (Continued)

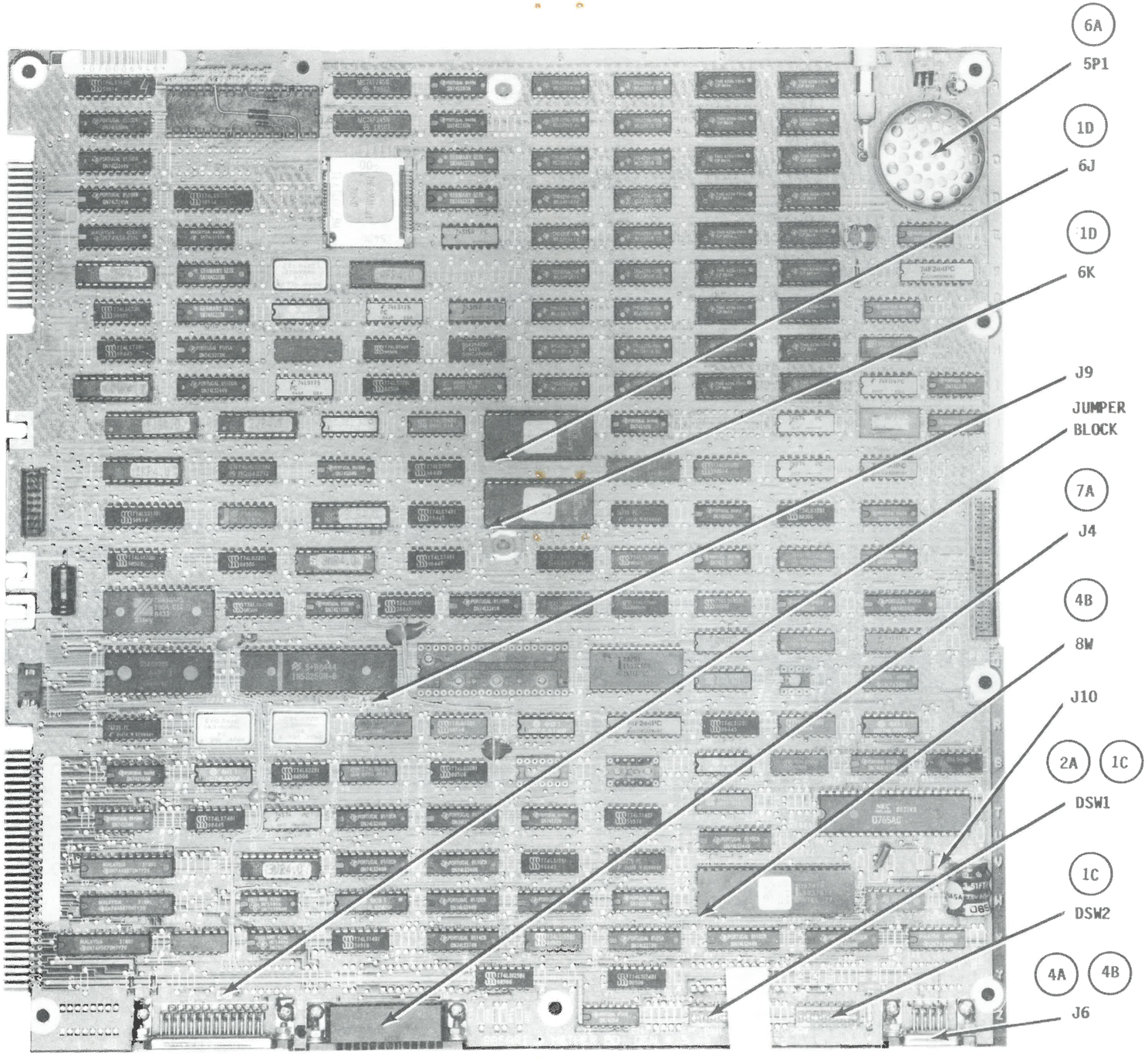


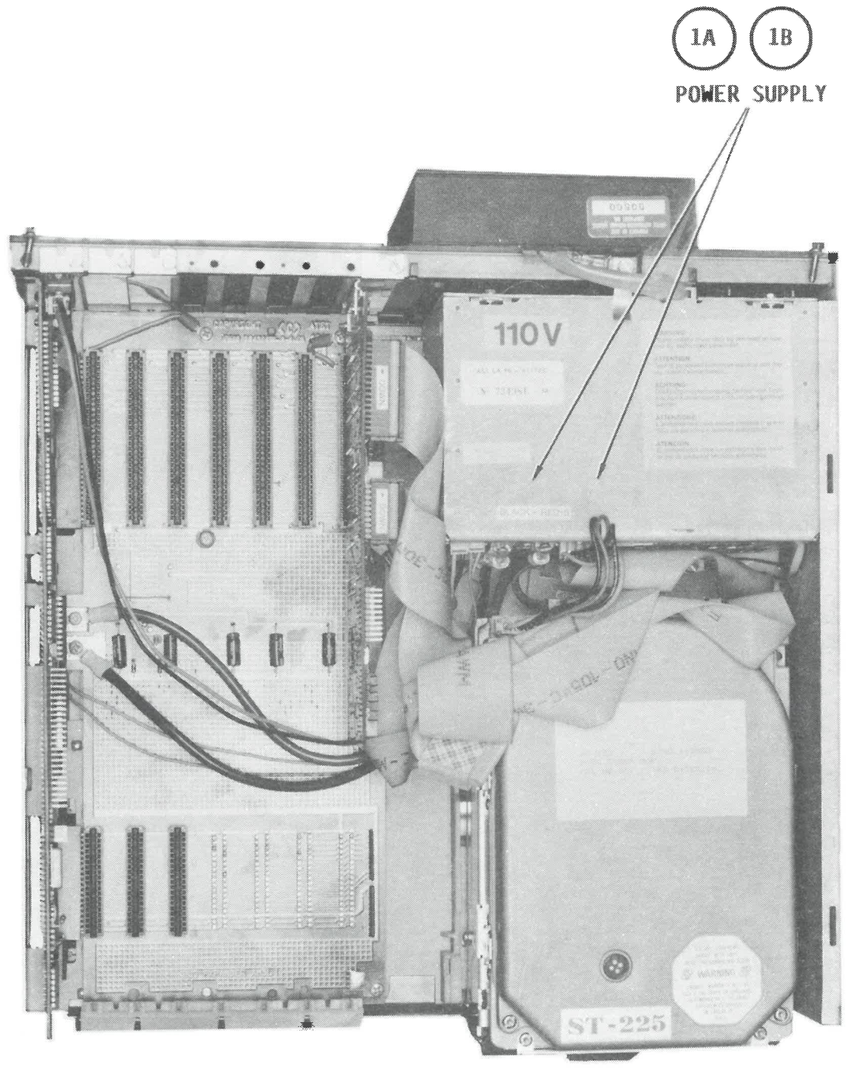
INTERCONNECTING DIAGRAM

PRELIMINARY SERVICE CHECKS (Continued)



PRELIMINARY SERVICE CHECKS (Continued)





CHASSIS - OVERALL VIEW

DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL

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 EXPANSION BOARD REMOVAL

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

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 Hard Disk and remove holder for Drive A.

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. Remove cabinet top. Unplug fan Connectors and remove screw holding ground wire. Remove Disk Drives. Disconnect power cables from front of power supply. Remove one screw from left side and one screw from in front of Power Supply holding supply to chassis. Slide Power Supply towards Bus Expansion Board. Lift Power Supply out of chassis.

KEYBOARD DISASSEMBLY

Turn Keyboard upside down. Remove three phillips screws. Use a flat blade screwdriver to push back (one at a time) three 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.

To remove the circuit board from the metal frame (with keys), remove two hex stacking bolts holding the game controller connector. Remove two nuts and 19 screws from the back of the Keyboard. Carefully lift the circuit board off the metal frame and note the type and position of the plastic spacers for the screws.

POWER SUPPLY DISASSEMBLY

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

GENERAL OPERATING INSTRUCTIONS

POWER ON SELF TEST

A Power On self-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. For an explanation of the various error codes, see the "Computer Self Test" section. If no problems are detected, a list of the areas tested are displayed on the Monitor screen with the word PASS, the Computer beeps once and boots from the Floppy or Hard Disk Drive.

BOOT UP

Insert a bootable diskette into Disk Drive A and turn the Computer On. The Computer will automatically boot up from the diskette in Drive A. If a Hard Disk is installed and it has DOS on it, the Computer will boot up from the Hard Disk if no diskette is inserted in the Floppy Disk Drive.

DOS (DISK OPERATING SYSTEM)

To get a list of file names on the diskette in the current Disk Drive, type DIR and press the ENTER key. To specify a Drive that is not the current (default) Drive, type the drive letter with a colon after DIR (DIR B:).

To run a program (with a .EXE or .COM extension) on a diskette, type the name of the program and press the ENTER key.

USING BLANK DISKETTES

A blank diskette must be formatted before it can be used to save programs or data. A formatted diskette must contain DOS or a Start-up program before the Computer will boot up using that diskette.

To format a diskette, insert a diskette containing a Format program into Drive A. While in DOS, type the name of the format program and press the ENTER key. Follow the instructions that appear on the Monitor screen to format blank diskettes.

NOTE: Formatting a diskette will wipe out any programs previously placed on the diskette. The Computer automatically defaults to the current Drive if the destination Drive is not specified. Be sure to specify the destination Drive that has the diskette to be formatted or the program diskette in the default Drive may be ruined by default action.

BASIC

To load Basic, first boot up on DOS. Insert a diskette with Basic on it into the Drive. Type the name of the Basic (usually BASIC or GWBASIC) and press the ENTER key. To return to DOS from Basic, type SYSTEM and press the ENTER key.

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

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

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

To run a program in Basic, type RUN and press the ENTER key. To stop a Basic program press the Ctrl and BREAK (SCROLL LOCK) keys at the same time.

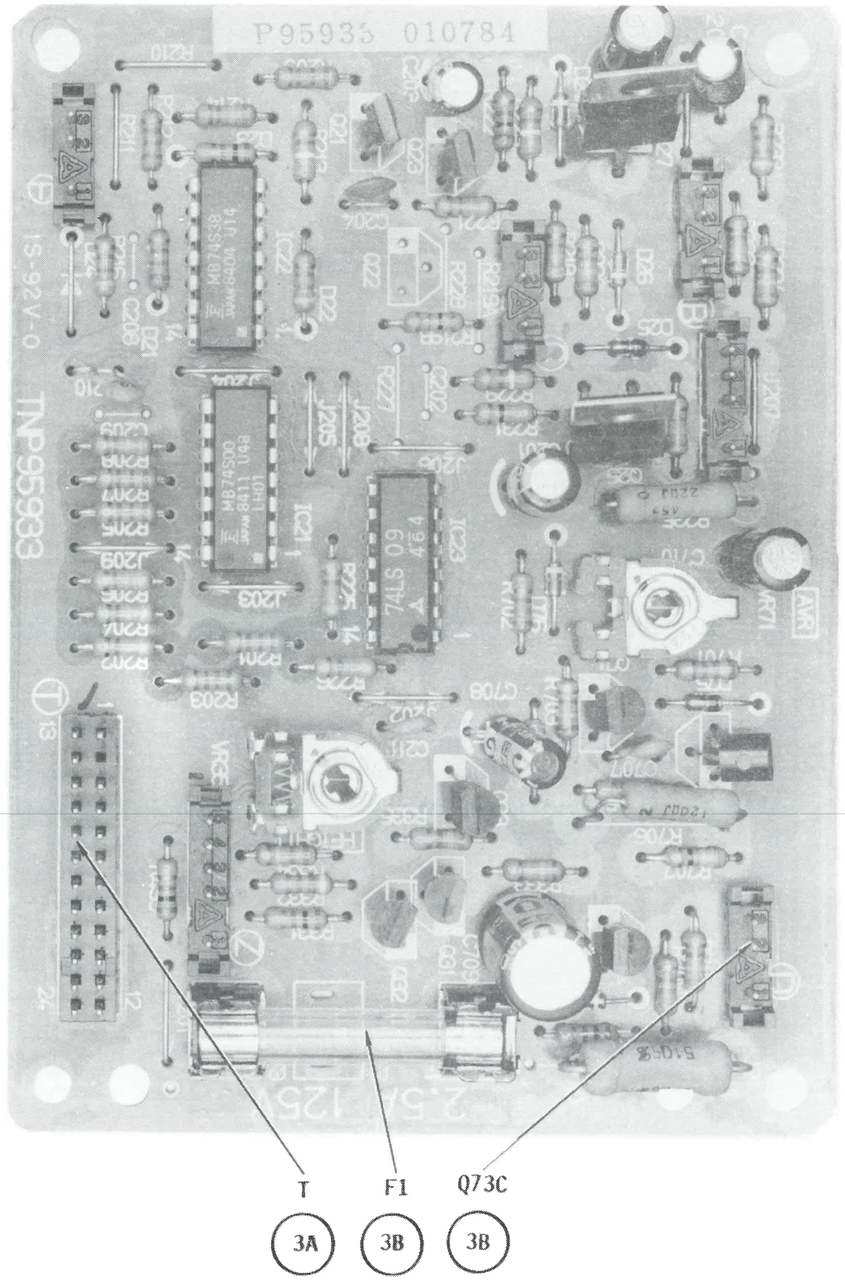
NOTE: Some programs will disable or not recognize the Ctrl and BREAK keys to prevent the user from stopping the program while it is running.

RESETTING THE COMPUTER

Press the Reset Button (located under the Disk Drives) or press the Ctrl, ALT and DEL keys on the keyboard at the same time to reset the Computer.

HARD DISK DRIVES

A physical (low level) format must be performed and DOS partitions set up on a new Hard Disk Drive before DOS can do a logical format on the Drive. A physical format program is included on the Systems Diagnostic Diskette that comes with the Service Manual on the 6300 Plus computer. The Service Manual (#845657113) is available from AT&T. A DOS partition program (FDISK) and logical format program (FORMAT) are normally included on the DOS diskette.



VIDEO INPUT BOARD

SWITCHES AND JUMPERS

DIP SWITCH DSW1

FUNCTION	ON	OFF
96 TPI Disk Drive Installed as Drive B		1
48 TPI Disk Drive Installed as Drive B	1	
96 TPI Disk Drive Installed as Drive A		2
48 TPI Disk Drive Installed as Drive A	2	
80 X 25 line video display (AT&T Standard)	5	6
40 X 25 line video display	6	5
IBM monochrome video display		5,6
One Floppy Disk Drive Installed	7,8	
Two Floppy Disk Drives Installed	8	7
Three Floppy Disk Drives Installed	7	8

Switch 3 and 4 settings are determined by the type of Hard Disk Drive that is installed. Use switch 3 if the Drive is installed as Drive 1 and switch 4 if the Drive is installed as Drive 0. Use the following chart to determine the switch setting to use:

MANUFACTURER	MODEL	SIZE	ON	OFF
CDC	Wren	30 MB	3,4	
CMI	CM6426	20 MB	3,4	
Micropolis	1325	67 MB		3,4
Miniscribe	6086	80 MB		3,4
Multi	PC 6300 type	10 MB	3,4	
Seagate	ST225	20 MB		3,4
Seagate	ST4051	40 MB		3,4
Tandon	—	40 MB	3,4	

DIP Switch DSW2

FUNCTION	ON	OFF
128 KB RAM Installed (64 KB chips in Bank 1)	2,3,4	1
256 KB RAM Installed (64 KB chips in Banks 1 and 2)	1,3,4	2
256 KB RAM Installed (64 KB chips in Banks 1 and 2)	1,2,4	3
512 KB RAM Installed (256 KB chips in Bank 1)	1,2,3	4
640 KB RAM Installed (64 KB chips in Bank 1 and 256 KB chips in Bank 2)	2,3	1,4
640 KB RAM Installed (256 KB chips in Bank 1 and 64 KB chips in Bank 2)	1,3	2,4
640 KB RAM Installed (256 KB chips in Bank 1 and 64 KB chips in Bank 2)	1,2	3,4
1 MB RAM Installed (256 KB chips in Banks 1 and 2)	3	1,2,4
80287 coprocessor Installed	5	
80287 coprocessor not Installed		5
Hard Disk Controller ROM on System Board used	7	
Hard Disk Controller ROM on Hard Disk Controller card used		7
27256 ROM's Installed on System Board	8	
27128 ROM's Installed on System Board		8

NOTE: Switch 6 is reserved, leave in On position.

JUMPERS

Jumper J9 (E10 to E11) used during factory tests. Jumper should always be installed.
Jumper J10 (E8 to E9) installed to enable the Real Time Clock chip (IC 10W).

GENERAL OPERATING INSTRUCTIONS (CONTINUED)

COMPUTER SELF TEST

The Computer performs a self test every time it is turned On. If no problems are detected, the name of each section tested will be displayed on the Monitor screen along with the word PASS. The Computer will then beep once and start booting from the Floppy Disk Drive or the Hard Disk Drive. If a problem is detected, an error message will be displayed on the Monitor Screen and also sent to a printer connected to the Parallel Port. Use the following chart to determine the area of the problem and any possible IC's that may be bad:

ERROR MESSAGE	PROBLEM
CPU Fail	Bad CPU (IC 4D)
ROM Module Fail	Bad ROM (IC's 6J and 6K)
DMA Timer Fail	Bad Channel 1 Timer (IC 7Q)
DMA Control Fail	Bad DMA Controller (IC 7BB on Daughter Board)
Interrupts Fail	Software Interrupt failure
Interrupt Fail H0	Timer Channel 0 INT REQ0 not functioning (IC 1Q)
Interrupt Fail H1	Keyboard Controller INT REQ1 not functioning (IC's 1Q and 8W)
Interrupt Fail H2	I/O Board INT REQ2 not functioning (IC 1Q)
Interrupt Fail H3	I/O Board INT REQ3 not functioning (IC 1Q)
Interrupt Fail H4	Serial Interface INT REQ4 not functioning (IC's 1Q and 3Q)
Interrupt Fail H5	I/O Board INT REQ5 not functioning (IC 1Q)
Interrupt Fail H6	Floppy Disk Controller INT REQ6 not functioning (IC's 1Q and 8T)
Interrupt Fail H7	Parallel port INT REQ7 not functioning (IC's 1Q, 5Y and 7Y)
RT Clock Fail	Real Time Clock registers not functioning (IC 10W)
RT Clock Fail:NR	No response from 8254 Interrupt (IC 7Q)
RT Clock Fail:LO	Low end 8254 Interrupt is out of specifications (IC 7Q)
RT Clock Fail:HI	High end 8254 Interrupt is out of specifications (IC 7Q)

If a defect is found while testing the RAM, an error message in the following format should appear:
aaa kb RAM Fail:bb:yccc:dddd:eeee:ffff

aaa	Last bank tested in decimal
bb	Configuration of RAM 01 = 128 KB total RAM 02 = 256 KB total RAM 03 = 512 KB total RAM 05 = 640 KB total RAM
y	Bank (128 KB) with defective RAM 1 = Bank 1 on System Board 2 = Bank 2 on System Board 3 thru 4 are reserved
ccc	Segment of defective RAM
dddd	Offset of defective RAM
eeee	Data written to the RAM
ffff	Data read from the RAM

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 untill problem area is isolated that shuts down Power Supply.

(C) If Power Supply is good, check DIP Switches DSW-1 and DSW-2 on System Board for correct settings. See "Switches and Jumpers".

(D) Check ROM IC's (6J and 6K) by substitution.

(2) VIDEO DISPLAY (COMPUTER)

(A) Display comes up in 40 column mode instead of 80 columen mode. Check setting of Switches 5 and 6 of DIP Switch DSW-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 1 and 2 and pins 5 and 6 should be jumpered).

(3) VIDEO DISPLAY (MONITOR)

(A) Monitor dead. Check Connector T for good connections and check cable for possible open circuits.

(B) If Connector T and cable check good, check Fuse F1. If Fuse is blown, check for about 28 ohms resistance from the collector of Transistor Q73 to ground before replacing Fuse and applying power to Monitor. If the collector of Transistor Q73 checks shorted to ground troubleshoot the Monitor Boards.

(4) KEYBOARD

(A) Keyboard does not function. Check Connectors J6 on the System Board and P1 on the Keyboard for good connections and check keyboard cable for open circuits.

(B) If connectors and cable check good, unplug Keyboard from Computer. If Power Supply refuses to start with Keyboard unplugged, connect a 100 ohm to 150 ohm, 2 watt resistor, between J6 pins 3 and 5.

Check logic readings at pins 1 and 2 of Connector J6 while turning Computer On. Pin 1 should read low, then High, then after about 12 seconds, Pulse twice. Pin 2 should read Low, then start Pulsing. If readings are not correct, check IC 8W by substitution.

(C) If logic readings are correct at pins 1 and 2 of Connector J6, check IC's IC5 and IC7 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 PJ2 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 Floppy Disk Drive Alignment, "Spindle Speed Check". Check Connectors PJ4, PJ6 thru PJ13, and PJ15 for good connections.

SERVICE CHECKS (Continued)

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

(C) Computer indicated diskette is write protected when it is not write protected. Check Connectors PJ11, PJ12 for good connections. If connections check good, check for a logic Low at Test Point WP when a diskette that is write protected is inserted in the Drive. If reading is not correct, check Write Protect LED (M5), and Write Protect Detector (M6).

(D) Will not read or write. Insert a diskette in the Drive and close the drive door. Check for pulses at pin 8 of Connector PJ1 while the Spindle Motor is turning. If pulses are missing, check the Index Detector (LED (M7) and Index Detector (M8).

(E) Head bangs against Track 00 stop. Check the logic reading at Test Point ZS while manually pushing head back to Track 00 and forward away from Track 00. The reading should be logic Low when on Track 00 and logic High when off Track 00. If logic reading is not correct check the Track 00 Detector (M9) and check Connector PJ8 for good connections.

(F) Drive spindle motor does not turn On. Check for jumpers correctly installed on PJ4, and making 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 in Test Plug section of Troubleshooting) 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) AND 248)
 60 PRINT "C=";(INP (890) AND 31)
 70 OUT 888,255:OUT 890,255
 80 PRINT "D=";INP(888)
 90 PRINT "E=";(INP(889) AND 248)
100 PRINT "F=";(INP(890) AND 31):
    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 = 48
C = 0
D = 225
E = 200
F = 31

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

(8) SERIAL PORT

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

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 commerical 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 noninterruptible power supply may be needed to cure the problem. DO NOT switch power On and Off frequently.

KEYBOARD

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

DISK DRIVES

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

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

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

PRINTERS

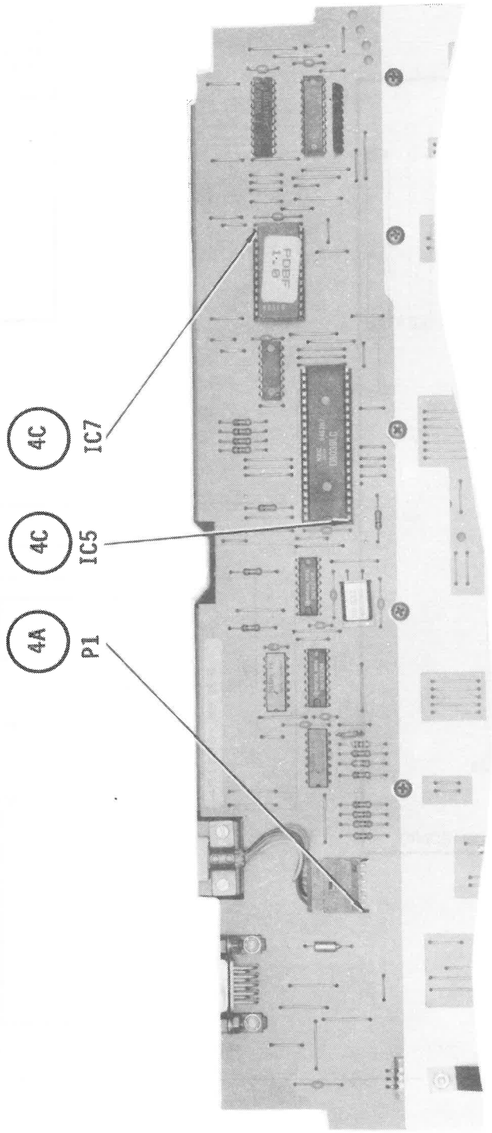
Carefully vacuum the Printer regularly. Wipe surface areas clean using a light all-purpose cleaner. Do not clean the machine. The oil will collect abrasive grit and dust. The dust will act as a blanket. This can cause components to overheat and fail.

STATIC ELECTRICITY

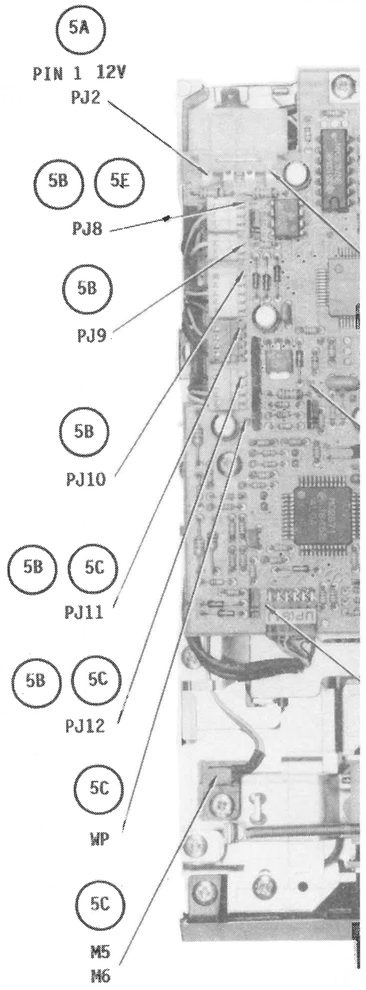
Static electricity discharge can affect the Computer. In order to minimize the possibility, use anti-static mats, sprays, tools and materials and maintain good humidity in the Computer environment.

MONITOR

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



KEYBOARD



DISK DRIVE

(Continued)
ICE

low 80 degrees Fahr-
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rical Computers are
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on a power line not
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s and contacts.

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The oil will col-
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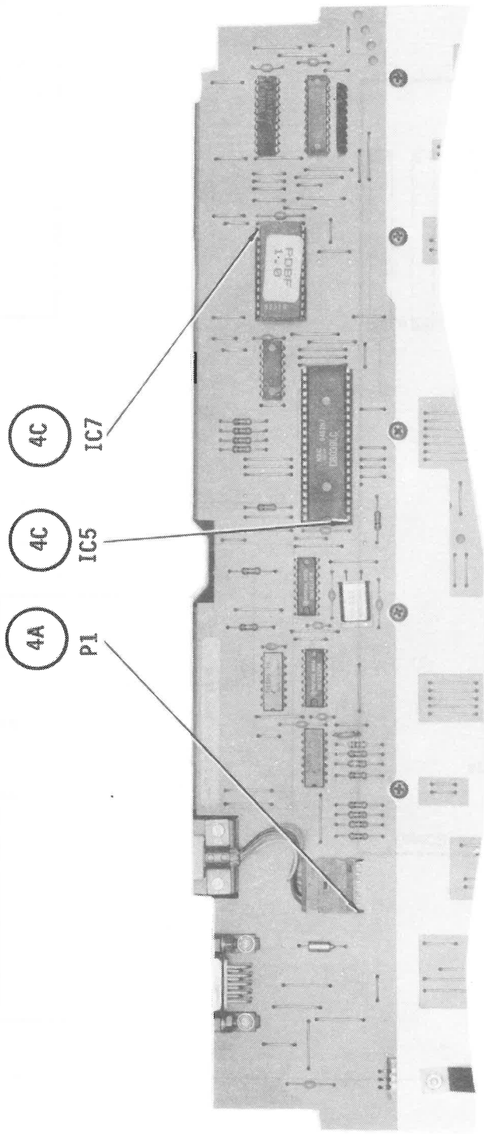
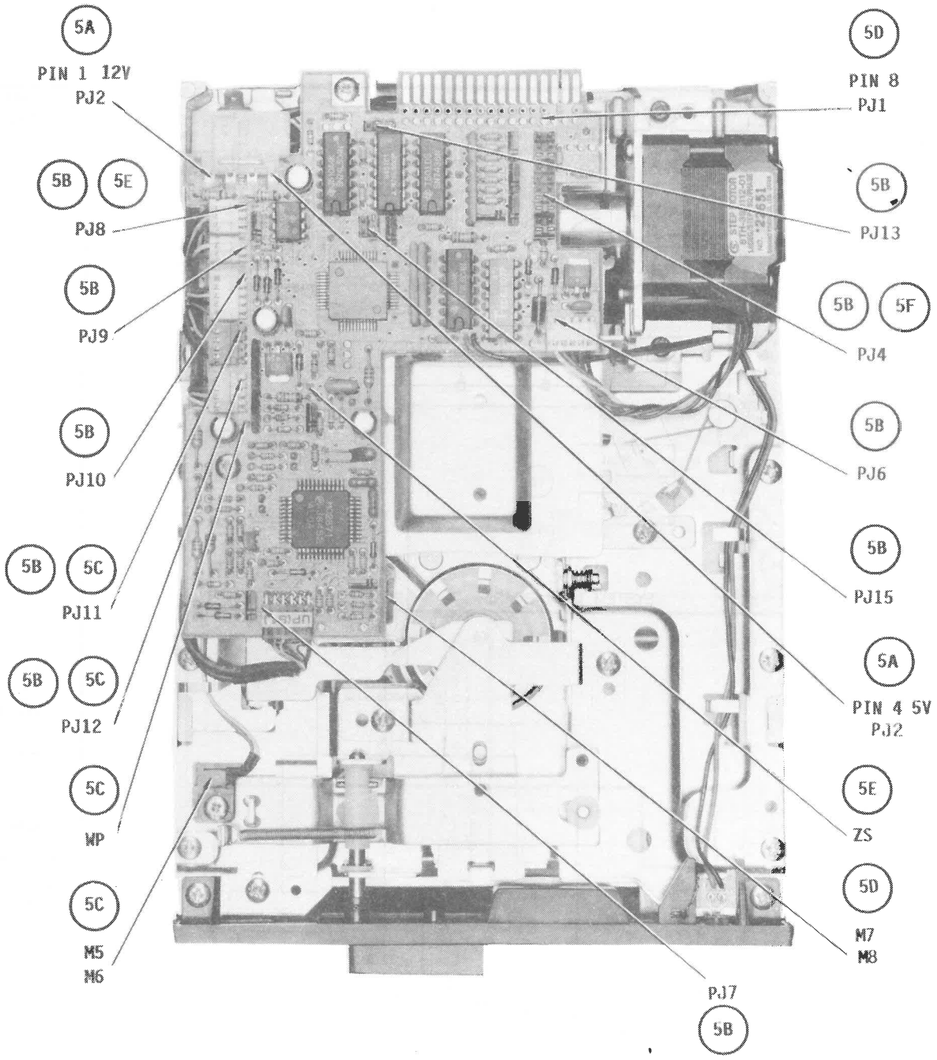
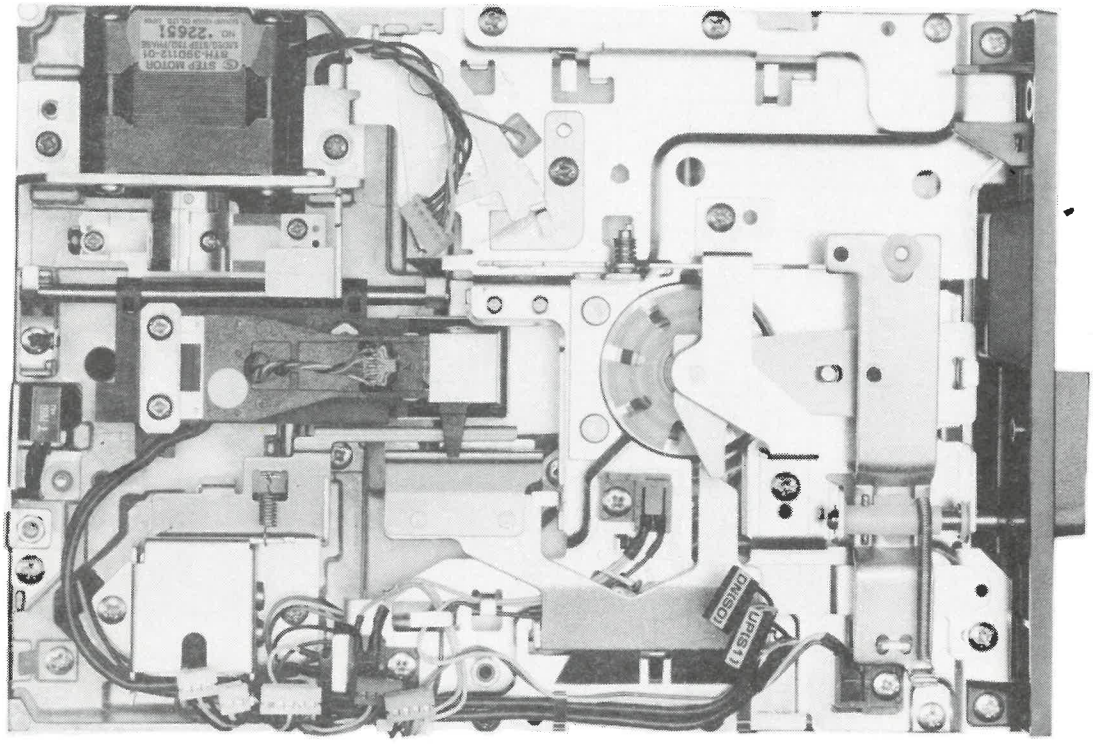




DISK DRIVE

AT&T MODEL 6300 PLUS
CSCS28-A



CSCS28-A
AT&T MODEL 6300 PLUS

INDEX

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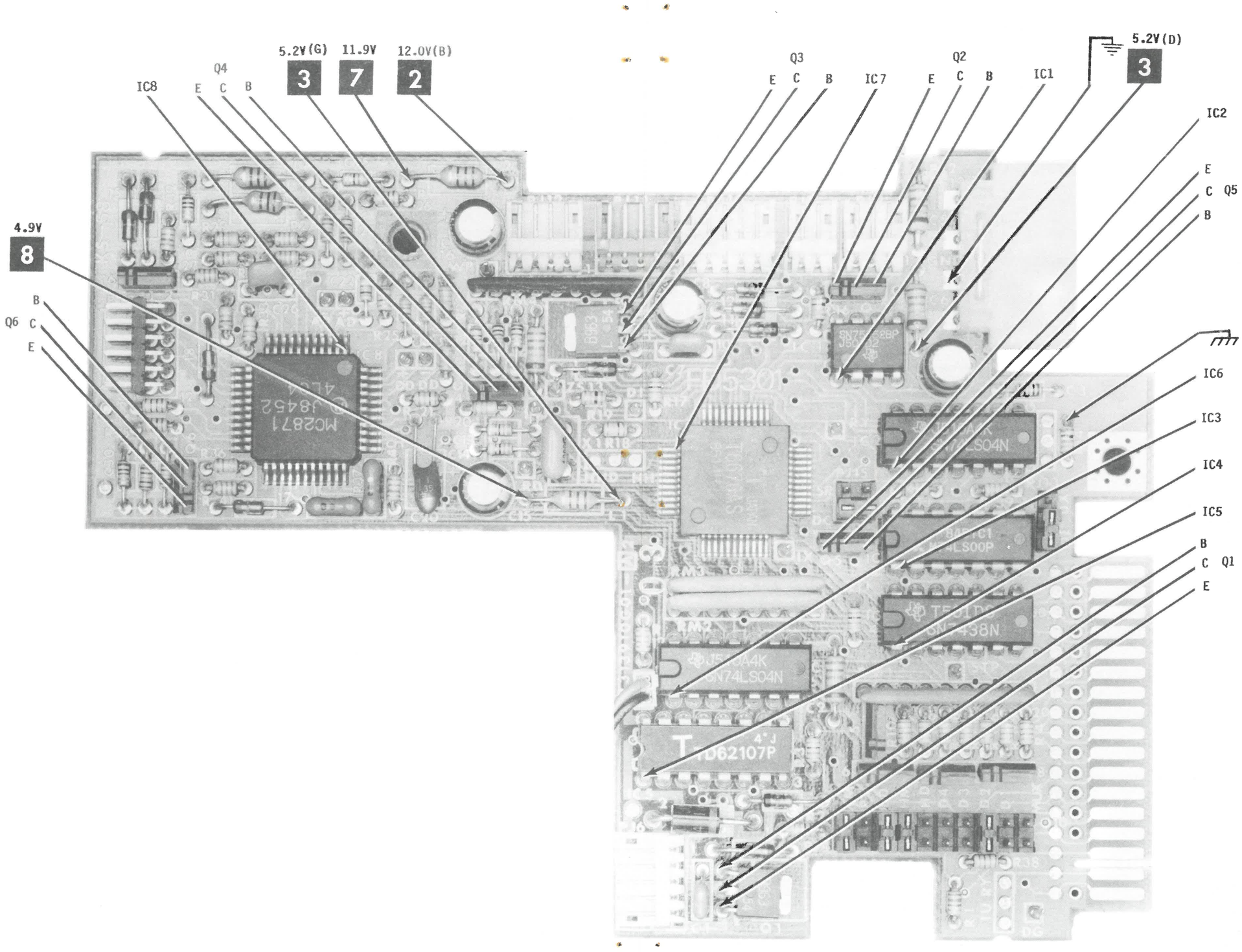


A Howard W. Sams CIRCUITRACE® Photo

ALIGNMENT

EQUIPMENT REQUIRED

A test program or Disk Drive Tester is required which will turn On the Disk Drive, select side 0 or 1, and step the Head to the track specified in the alignment procedures. Use a Dyan Analog Alignment Diskette (no. 206-34) when an Alignment Diskette is specified in the alignment procedures. NOTE: The alignment diskette has alignment patterns only on it and does not contain any alignment programs.

DRIVE TRACK PROGRAM

The following Basic program 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.

NOTE: This program selects side 0 only.

```
10 CLS
20 OUT 1014,128:OUT 1010,16:OUT 1010,20
30 OUT 1013,7:S=INP(1012)
40 OUT 1013,1:S=INP(1012)
50 FOR T=1 TO 1000: NEXT T
60 OUT 1014,128:OUT 1010,16:OUT 1010,20
70 OUT 1013,7:S=INP(1012)
80 OUT 1013,1:S=INP(1012)
90 INPUT "ENTER TRACK NUMBER ";TR
100 IF TR>80 THEN 90
110 OUT 1010,20
120 OUT 1013,15:S=INP(1012)
130 OUT 1013,1:S=INP(1012)
140 OUT 1013,TR:S=INP(1012)
150 FOR T=1 TO 400:NEXT T
160 PRINT "PRESS ANY KEY TO STOP"
170 A$=INKEY$:OUT 1010,20:IF A$="" THEN 170
ELSE 90
```

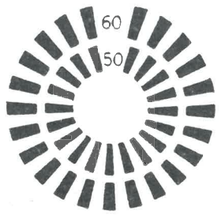
To operate Drive B, change the number 16 in lines 20 and 60 to 33 and change the number 20 in lines 20, 60, 110 and 170 to 37.

SPINDLE SPEED CHECK

If a Disk Drive Tester that provides a readout of the speed in RPM is being used, check for a speed of 360 RPM.

If a Disk Drive Tester is not available, cut out and paste the strobe pattern, shown in Figure 1, to the center of the flywheel on the bottom of the Disk Drive. Insert a diskette in the Drive and close the Drive door. Type in and run the program listed under the "Continuous Operation of Disk Drive" section of "Floppy Disk Drive Programs" to keep the Disk Drive running. View the pattern with a 60 cycle flourescent light. The speed is correct if the pattern appears to stand still.

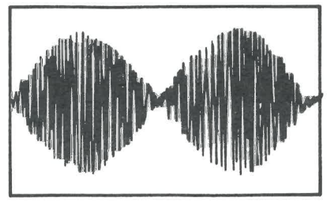
FIGURE 1



STROBE PATTERN

RADIAL HEAD ALIGNMENT

Connect the channel A input of a dual trace scope to Test Point DD- (pin 41 of IC8), channel B input to Test Point DD+ (pin 42 of IC8) and the external trigger input to Test Point IX (pin 1 of IC4). Set the scope to add mode with one channel inverted, the sweep time to 20 mSec, external trigger to negative slope and the voltage range to .2 volts/cm. Set both scope inputs to AC coupling. Insert the alignment diskette in the Drive. Turn the Drive On and step the Head to Track 32, side 0. The cats-eye pattern shown in Figure 2 should be displayed on the scope.



The amplitude of the two lobes displayed must be within 70% of each other. If the lobes are out of tolerance, loosen the two screws holding the Head Position Motor (M2) (see the Disk Drive Mechanical photo, bottom view). Adjust the Motor until the two lobes are equal in amplitude, then tighten the Motor mount screws. Check the adjustment by stepping the Head to Track 80 and back to Track 32, then to Track 00 and back to Track 32, checking the lobes each time the Head is on Track 32. Select side 1 and check the Radial alignment of Head 1 using the above procedures. Check the Track 00 Detector adjustment after performing the Radial Head Alignment.

TRACK 00 DETECTOR

Connect a scope to Test Point DD- (pin 41 of IC8) and set the sweep time to 20 uSec. Set the voltage range to .2 volts/cm. Insert the Alignment Diskette into the Drive. Turn the Drive On and set the Head to Track 00. A 250 KHz sine wave should be displayed on the scope. If the 250 KHz signal is not present, step the head forward or backward until the signal is present. When the 250 KHz signal is present on the scope, the Head is on Track 00.

Connect the input of a voltmeter to Test Point ZS (pin 41 of IC7). Check for 0 volts at Test Point ZS when the Head is on Tracks 0 and 1 and 3 volts or more when the Head is on Track 3. If the readings are not correct, set the Head to Track 1, loosen the Track 00 Detector (M9) screw (see the Disk Drive Mechanical photo, bottom view) and adjust the detector until the voltage drops from 3 volts to 0 volts. Tighten the Track 00 screw and recheck the adjustment.

INDEX DETECTOR ADJUSTMENT

Connect the channel A input of a dual trace scope to Test Point DD- (pin 41 of IC8), channel B input to Test Point IX (Index pulse, pin 1 of IC4). Set the scope display to channel A with the voltage range set to .2

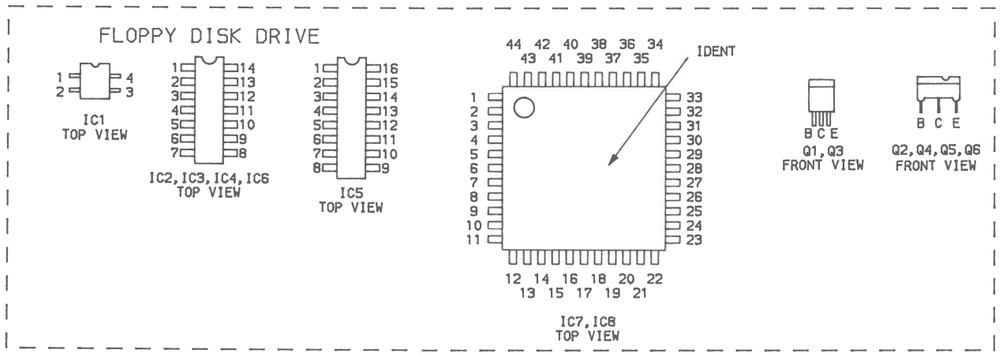
SWITCHES AND JUMPERS

FLOPPY DISK DRIVE

Jumpers are normally installed on the 1.2 Meg Disk Drive at terminals D2, HM, LD, TM, DC and DE. Use the following chart to determine the function of the terminals:

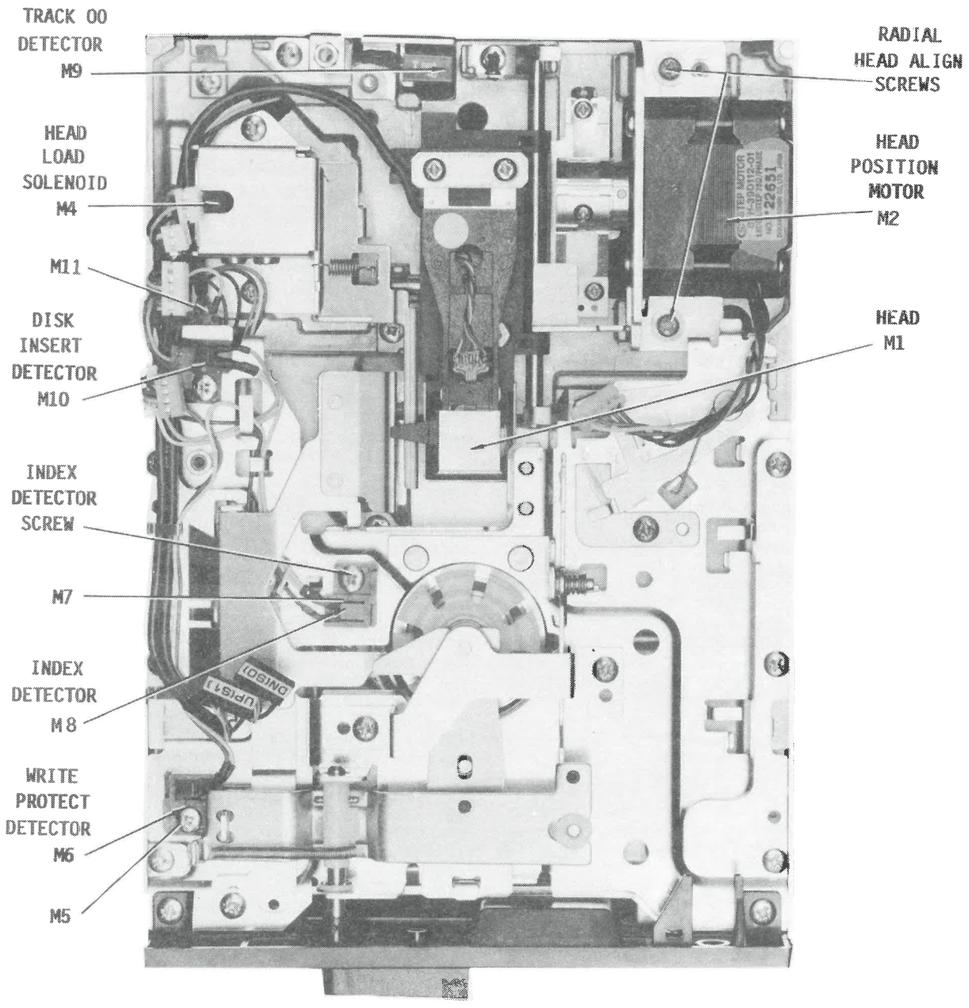
TERMINAL	FUNCTION
D1 to D4	Drive Select 1 thru 4.
DE	Motor speed fixed at 360 rpm.
DX	Motor speed controlled by the Density Mode signal.
HD	Head loading controlled by the Drive Select signal.
HM	Head loading controlled by the Motor On signal.
LD	Front panel LED controlled by the Drive Select signal.
P5	Front panel LED controlled by the Drive Select and Ready signals.
MUX	Drive is always selected.
TM	Termination of input signals.
DC	Ready signal is outputted at pin 34 of the interface connector.
SR	Disk Change signal is outputted at pin 34 of the interface connector.

TERMINAL GUIDES



SIDE SELECT

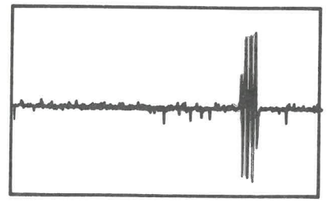
To verify if the side select circuits are working, set the Drive Tester to continuously alternate between Heads 0 and 1 or run the "Read Mode/Side Select" program under "Floppy Disk Drive Programs". Check for pulses at pins 20 and 24 of the Read/Write Amp IC (IC8). If pulses are missing, check for pulses at pin 31 of IC8. If pulses are present at pin 31, check IC8. If pulses are missing at pin 31, check for pulses at pin 18 of the Drive Controller IC (IC7). If pulses are present at pin 18, check IC7. If pulses are missing at pin 18, check Resistor RM3 from pin 5 to pin 6, Resistor RM1 from pin 7 to pin 1 and check pin 32 of Connector PJ1 for good connections.



DISK DRIVE-TOP VIEW

volts/cm and the sweep time to 50 uSec. Set the channel B input to noninverting mode and trigger the scope on channel B with the trigger set to positive slope (to trigger on the leading edge of the index pulse).

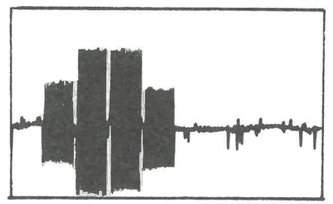
Insert the Alignment Diskette in the Drive. Turn the Drive On, select side 0 and set the Head to Track 68. Confirm that the leading edge of the burst waveform on channel A occurs 200 uSec ±100 uSec after the start of the sweep (after the leading edge of the index pulse), see Figure 3. If the reading is out of tolerance, loosen the screw holding the Index Detector (M8) (see the Disk Drive Mechanical photo, top view) and adjust the detector for 200 uSec ±100 uSec.



AZIMUTH CHECK

Connect the channel A input of a dual trace scope to Test Point DD- (pin 41 of IC8), channel B input to Test Point DD+ (pin 42 of IC8), external trigger input to Test Point IX (index pulse, pin 1 of IC4). Set the scope to add mode with channel B inverted, sweep time to .5 mSec, both inputs to AC coupling, trigger to negative slope and voltage range to .1 volt/cm.

Insert the Alignment Diskette in the Drive, turn the Drive On, select side 0 and set the Head to Track 68. 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 amplitude of bursts 2 and 3.



DISK DRIVE PROGRAMS

FLOPPY DISK DRIVE PROGRAMS

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

CONTINUOUS OPERATION OF DISK DRIVE

Use the following Basic program to keep Drive A running continuously in Read Mode. Change the number 20 in the program to number 37 to make Drive B run continuously.

```
10 OUT 1014,128:OUT 1010,20:GOTO 10
```

READ MODE/SIDE SELECT

The following Basic program keeps the Drive running in Read Mode and displays seven numbers on the Monitor screen which should change when reading a diskette with data on it. It also continuously alternates between Head 0 and Head 1.

```
10 CLS: OUT 101,0
20 OUT 1014,128:OUT 1010,33:OUT 1010,37
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:LOCATE 1,1
80 IF Y=1 THEN Y=5 ELSE Y=1
90 GOTO 20
```

To operate Drive A, change line 20 to:

```
20 OUT 1014, 128:1010,16:OUT 1010,20
```

WRITE MODE/WRITE PROTECT CHECK

The following Basic program writes continuously to a diskette (not write protected) inserted in Drive B and displays a number on the Monitor screen. The number should be 0 if the diskette is not write protected and 2 if it is write protected. If numbers are not correct, refer to the "Write Protect Does Not Function" section of this Troubleshooting guide.

WARNING: Do not use a diskette with important data on it. This program writes over any data on the diskette.

NOTE: This program will not write to the diskette if the diskette Index Detector circuits are not working. Check for Index pulses at pin 8 of Connector PJ1 while Drive is running with a blank diskette inserted. If pulses are missing, refer to the "Index Detector" section of this Troubleshooting guide.

```
10 CLS:OUT 101,0
20 OUT 1014,128:OUT 1010,33:OUT 1010,37
30 S=INP(1012)
40 OUT 1013,77:S=INP(1012)
50 OUT 1013,Y:S=INP(1012)
60 OUT 1013,1:S=INP(1012)
70 OUT 1013,12:S=INP(1012)
80 OUT 1013,12:S=INP(1012)
90 OUT 1013,0:S=INP(1012)
100 S=INP(1013):S=INP(1012)
110 PRINT INP(1013) AND 2:S=INP(1012)
120 FOR X=1 TO 5
130 S=INP(1013):S=INP(1012)
140 NEXT X:LOCATE 1,1
150 IF Y=1 THEN Y=5 ELSE Y=1
160 GOTO 2
```

To operate Drive A, change line 20 to:

```
20 OUT 1014,128:OUT 1010,16:OUT 1010,20
```

TRACK 00 DETECTOR CHECK

The following Basic program will step the Head back to Track 00 on Drive A and display the number 16 on the Monitor screen to indicate Head is On Track 00. If Head is manually pushed Off Track 00, the number should change to number 0.

```
10 OUT 1014,128:OUT 1010,16:OUT 1010,20
20 OUT 1013,7:S=INP(1012)
30 OUT 1013,1:S=INP(1012)
40 FOR T=1 TO 1000:NEXT T
50 OUT 1014,128:OUT 1010,16:OUT 1010,20
60 OUT 1013,7:S=INP(1012)
70 OUT 1013,1:S=INP(1012)
80 FOR T=1 TO 1000:NEXT T
90 OUT 1014,128:OUT 1010,20
100 S=INP(1012)
110 OUT 1013,4:S=INP(1012)
120 OUT 1013,2:S=INP(1012)
130 CLS:PRINT INP(1013) AND 16:S=INP(1012)
140 GOTO 80
```

To operate Drive B, change lines 10 and 50 to

```
OUT1014,128:OUT 1010,33: OUT 1010,37
```

and change the number 20 in line 90 to 37.

STEPPING MOTOR

The following Basic program continuously alternates the Head on Drive A between Tracks 00 and 16.

```
10 OUT 1014,128:OUT 1010,16:OUT 1010,20
20 OUT 1013,7:S=INP(1012)
30 OUT 1013,1:S=INP(1012)
40 FOR T=1 TO 500:NEXT T
50 OUT 1010,20
60 OUT 1013,15:S=INP(1012)
70 OUT 1013,1:S=INP(1012)
80 OUT 1013,16:S=INP(1012)
90 FOR T=1 TO 500:NEXT T
100 GOTO 10
```

To operate Drive B change line 10 to:

```
10 OUT 1014,128:OUT 1010,33:OUT 1010,37
```

and change line 50 to:

```
50 OUT 1010,37
```


TROUBLESHOOTING (Cont.)

DRIVE MOTOR/DRIVE SELECT/HEAD LOAD

Drive motor or Drive Selected LED (LED1) does not turn On. Use the Drive Tester to turn the Drive On and check for a logic low at pins 2 and 19 of the Drive Controller IC (IC7). If the reading is not correct at pin 2, check Resistor RM2 from pin 1 to pin 2 and check pin 16 of Connector PJ1 for good connections. If the reading is not correct at pin 19, check Resistor R3, check to make sure a jumper is correctly installed at pins D1 thru D4 of PJ4 and is making good connections and check pins 6, 10, 12 and 14 of Connector PJ1 for good connections. If the readings are correct, check for a logic high at pin 8 of IC6. If the reading is not correct, check IC6. If the reading is correct, check for a logic high at pins 27 and 33 of IC7. If the readings are not correct, check IC7. If the readings are correct, check for .01 volts at the Collector of Switch Transistor (Q2). If the voltage is not correct, check Transistor Q2 and Resistor R16. If the voltage is correct, check Connector PJ10 for good connections and check the Motor Control Board. If the Drive Selected LED is not turning On, check for a Jumper at position P5 or LD of PJ4 and make sure the jumper is making good connection. If the Jumper is present, check for .1 volts at the Collector of Switch Transistor (Q4). If the voltage is not correct, check Transistor Q4 and Resistor R19. If the voltage is correct, check the Drive Selected LED (LED1) and Resistor R12.

Drive Head does not load. Check the logic reading at pin 31 of IC7 while turning the Drive On. The reading should pulse logic low momentarily when the Drive is turned On, then go logic high and stay high. If the reading is not correct, check IC7. If the reading is correct, use a scope (with the input set to DC mode, voltage range to 5V/cm) to check the voltage at the Collector of Switch Transistor (Q3) while turning the Drive On. The voltage should momentarily go up to 12 volts when the Drive is turned On, then drop to about .1 volt and stay there. If the voltage reading is not correct, check Diode D13, Resistor R17, Capacitor C7 and Transistor Q3. If the voltage reading is correct, turn the Drive On and check for a logic high at pin 6 of IC1. If the reading is not correct, check IC7. If the reading is correct, check for a logic high at pin 10 of IC6. If the reading is not correct, check IC6. If the reading is correct, check for a logic low at pin 5 of IC1. If the reading is not correct, check IC1. If the reading is correct, check Connector PJ9 for good connections, check the Head Load Solenoid winding for continuity and check Diodes D10, D11 and D12.

INDEX DETECTOR

Insert a diskette in the Drive and close the Drive door. Set the Drive Tester to operate the Drive continuously in Read mode. Check for pulses at Test Point IP (pin 43 of Drive Controller IC7). If pulses are missing, check pins 1 and 4 of Connectors PJ11 and PJ12 for good connections, check the Index LED (M7), Index Detector (M8), Capacitor C9, Resistor RM4 from pin 9 to pin 1 and Resistor RM4 from pin 5 to pin 1. If pulses are present, check for pulses at Test Point IX (pin 1 of IC4). If pulses are missing, check IC7. If pulses are present, check for a logic high at pin 2 and pulses at pin 3 of IC4. If the readings is not correct at pin 2, check Resistor R11. If the reading is correct at pin 2 and not correct at pin 3, check IC4. If the readings are correct, check pin 8 of Connector PJ1 for good connections.

TRACK 00 DETECTOR

Drive Head bangs against the Track 00 stop. Check for a logic low at Test Point ZS with the Head on Track 00 and logic high with the Head off Track 00. If the readings are not correct, check Connector PJ8 for good connections, check the Track 00 Detector (M9), Capacitor C10 and Resistor RM4 from pins 4 and 6 to pin 1. If the readings are correct, set the Drive Tester to operate the Drive continuously in Read mode. While the Drive is running, check for a logic high at pin 4 of IC4 with the Head on Track 00 and logic low with the Head off Track 00. If the readings are not correct, check IC7. If the readings are correct, check for a logic high at pin 5 of IC4. If the reading is not correct, check Resistor R11. If the reading is correct, check for a logic low at pin 6 of IC4 with the Head on Track 00 and logic high with the Head off Track 00. If the readings are not correct, check IC4. If the readings are correct, check pin 26 of Connector PJ1 for good connections.

HEAD POSITION MOTOR

Head Position Motor (M2) does not work. Set the Drive Tester to continuously alternate the Head between any two tracks. Check for pulses at pins 20 and 21 of the Drive Controller IC (IC7). If pulses are missing at pin 20, check Resistor RM2 from pin 5 to pin 6, Resistor RM1 from pin 5 to pin 1 and check pin 18 of Connector PJ1 for good connections. If pulses are missing at pin 21, check Resistor RM1 from pin 6 to pin 1, Resistor RM2 from pin 8 to pin 7. If pulses are present, check for pulses at pins 26, 29 and 30 of IC7. If pulses are missing, check IC7. If pulses are present, check for pulses at pins 4 and 6 of IC6. If pulses are missing, check IC6. If pulses are present, check for pulses at pins 10, 11, 14 and 15 of IC5. If pulses are missing, check IC5. If pulses are present, check Connector PJ6 for good connections, check Motor M2 windings for continuity and check the voltages and components associated with Switch Transistor (Q1).

TROUBLESHOOTING

TEST SETUP

Use a Disk Drive tester capable of writing to and reading from a diskette and operating the Head Position Motor. If a computer is used, connect a good Disk Drive to the Computer as Disk Drive A. Connect the defective Disk Drive as Disk Drive B. Use Disk Drive A to load any programs needed to check the defective Disk Drive. Use the programs listed under "Floppy Disk Drive Programs" to operate the Drive in different modes for troubleshooting. All tests and measurements were made using a 1.2MB formatted diskette unless otherwise noted.

WARNING: It is possible for a defective Disk Drive to write on or erase information on a diskette even if it is write protected. Check the Disk Drive by first using a diskette that has programs that have been backed up on another diskette. Do not leave the alignment diskette in the drive while checking voltages or waveforms unless specified in the alignment procedures. The test equipment may cause the Disk Drive circuits to erase sections of the alignment diskette even if it is write protected.

HEAD CLEANING INSTRUCTIONS

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

OSCILLATOR

Verify that the 4 MHz oscillator is working properly by checking the 4 MHz waveform at pin 6 of Drive Controller (IC7). If the waveform is missing, check Crystal X1, Capacitors C13 and C14 and IC IC7.

WILL NOT READ

Insert a diskette with data on it in the Drive and close the Drive door. Set the Drive Tester to operate the Drive continuously in Read Mode. While the Drive is running, check for index pulses at pin 8 of Connector PJ1. If pulses are missing, refer to the "Index Detector" section of this Troubleshooting guide. If pulses are present, check for a logic high at pin 15 of Drive Controller IC (IC7). If the reading is not correct, check Resistor RM2 from pin 3 to pin 4, Resistor RM1 from pin 4 to pin 1 and check pin 24 of Connector PJ1 for good connections. If the reading is correct, check for a logic low at pins 1 and 13 of IC6. If the readings are not correct, check IC7. If the readings are correct, check for a logic high at pins 2 and 12 of IC6. If the readings are not correct, check IC6. If the readings are correct, check for a logic low at pin 8 of IC2. If the reading is not correct, check IC2. If the readings are correct, check the waveform at Test Point RD (pin 33 of IC8) while opening and closing the Drive door. There should be a noticable change in the waveform when the door is opened and closed. If there is no change, check the Head (M1) windings for continuity, check Connector PJ7 for good connections and check the voltages and components associated with Switch Transistor (Q6) and pins 1 thru 26, 32 and 34 thru 44 of IC8. If there is a change, check for pulses at pin 3 of IC1. If pulses are missing, check IC1. If pulses are present, check pin 30 of Connector PJ1 for good connections.

WILL NOT WRITE

Insert a diskette (not write protected) in the Drive (do not use a diskette with important data on it). Set the Drive Tester to do a continuous write operation. While the Drive is running in write mode, check for index pulses at pin 8 of Connector PJ1. If pulses are missing, refer to the "Index Detector" section of this Troubleshooting guide. If pulses are present, check for pulses or a logic low at pin 15 of Drive Controller (IC7). If the reading is not correct, check Resistor RM2 from pin 3 to pin 4 and check pin 24 of Connector PJ1 for good connections. If the reading is correct, check for pulses or a logic high at pins 1 and 13 of IC6. If the readings are not correct, check the Drive Controller IC IC7. If the readings are correct, check for pulses or a logic low at pins 2 and 12 of IC6. If the readings are not correct, check IC6. If the readings are correct, check the voltages and components associated with pins 1 thru 26, 32 and 34 thru 44 of the Read/Write Amp IC (IC8) and Switch Transistor (Q6), check the Head (M1) windings for continuity and check Connector PJ7.

WRITE PROTECT DOES NOT FUNCTION

Insert a write protected diskette in the Drive and check for a logic low at Test Point WP (pin 7 of IC7). If the reading is not correct, check pins 3 and 4 of Connector PJ11 and pins 2 and 4 of Connector PJ12 for good connections, check the Write Protect LED (M5) and the Write Protect Detector (M6), Capacitor C12 and Resistors RM4 from pin 7 to pin 1 and pin 2 to pin 1. If the reading is correct, check for a logic high at pin 12 of IC4. If the reading is not correct, check the Drive Controller IC (IC7). If the reading is correct, check for a logic high at pin 13 of IC4. If the reading is not correct, check Resistor R11. If the reading is correct, check for a logic low at pin 11 of IC4. If the reading is not correct, check IC4. If the reading is correct, check pin 28 of Connector PJ1 for good connections.

LOGIC CHART

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

SCHEMATIC NOTES

DISK DRIVE

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

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

1 Probe indicates P when head is moving.
3 Probe indicates L when head is moving.
5 Probe indicates L when head is moving in and H when head is moving out from the center of the diskette.
6 Probe indicates H if diskette is write protected.
7 Probe indicates L if diskette is write protected.
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.
11 Probe indicates H when head 0 is selected, L when head 1 is selected.
12 Probe indicates L when drive motor is off.
13 Probe indicates H when drive motor is off.
18 Probe indicates H when in write mode, L when in read mode.
19 Probe indicates L when in write mode, H when in read mode.
21 Probe indicates L with no diskette in the Drive.
23 Probe indicates H with no diskette in the Drive.

PARTS LIST AND DESCRIPTION

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
FLOPPY DISK DRIVE						
D1						
D2						
D3						
D5,6,7,8	DAP201	NTE519 N1	EG6591	SK3100/519 N1		
D10,11,12						
D13						
D14,15						
D16	DAN201K					
D17,18						
IC1	SN75452BP	NTE75452B	ECG75452B	SK74LS04		
IC2	SN74LS04N	NTE74LS04	ECG74LS04	SK74LS00		
IC3	M74LS00P	NTE74LS00	ECG74LS00	SK7438		
IC4	SN7438N	NTE7438	EG7438			
IC5	TD62107P					
IC6	SN74LS04N	NTE74LS04	ECG74LS04	SK74LS04		
IC7	T6676AS					
IC8	MC2871					
Q1	B963L	NTE16	ECG16	SK3911		
Q2	C2021Q					
Q3	B963L	NTE16	ECG16	SK3911		
Q4,5,6	C2021Q					

PARTS LIST AND DESCRIPTION (Continued)

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

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
AT & T	FLOPPY DISC DRIVE	
C20	1 35V	

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	
AT & T FLOPPY DISC DRIVE				
RM1	Resistor Network	(1)		
RM2	Resistor Network	(2)		
RM3	Resistor Network	(2)		
RM4	Resistor Network	(3)		

(1) 100K x 8
(2) 1000 5% x 4
(3) 220 x 2, 150 x 2, 10K x 2

COILS (RF-IF)

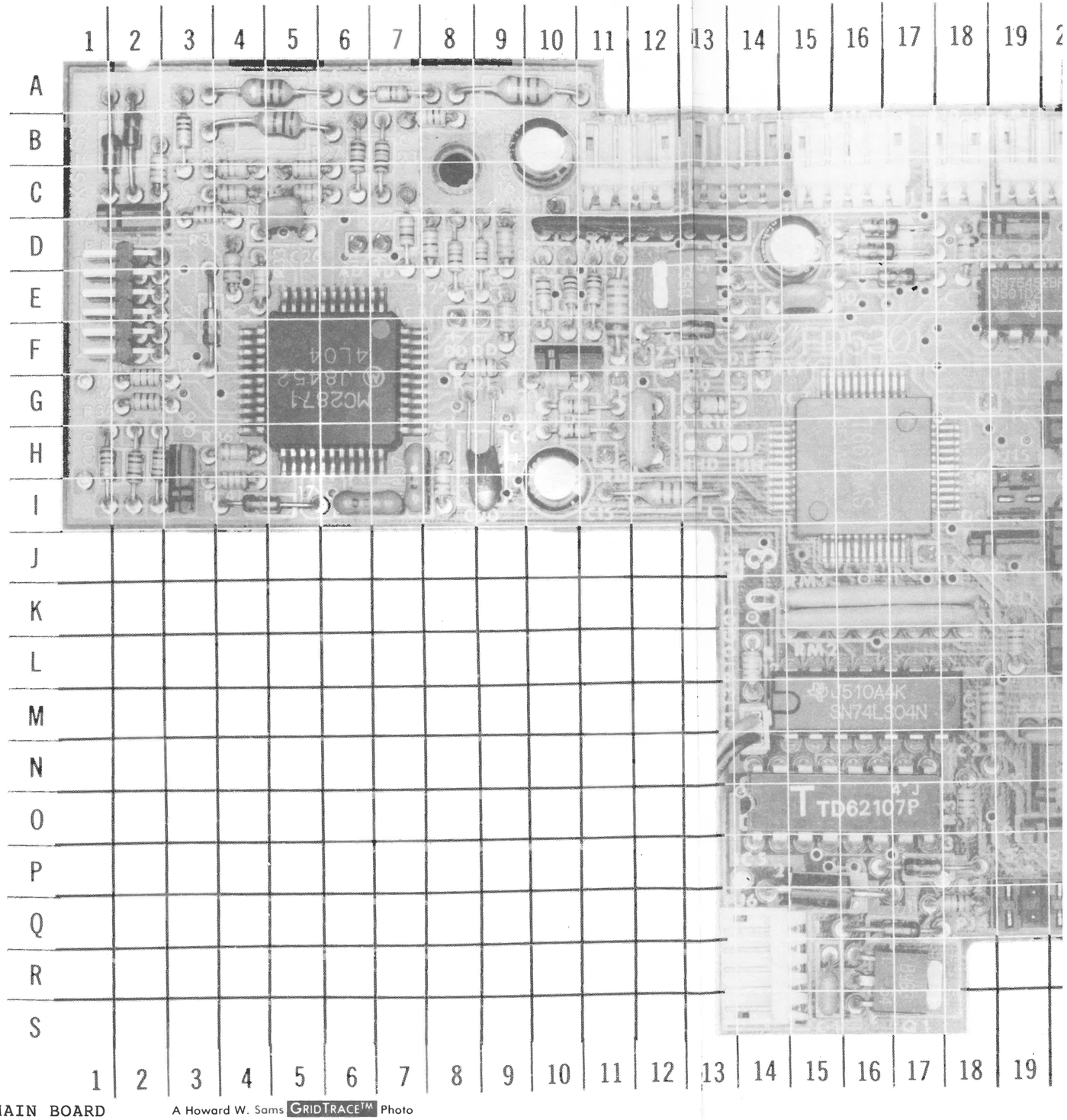
ITEM No.	FUNCTION	MFGR. PART No.
AT & T	FLOPPY DISC DRIVE	
L1	RF Choke (11.6uH)	
L2	RF Choke (11.6uH)	
L3	Peaking (8.8uH)	
L4	Peaking (8.8uH)	

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
AT & T	FLOPPY DISC DRIVE		
M1	Heads		
M2	Motor		Head Position
M3	PC Board		Motor Control
M4	Solenoid		Head Load
M5	LED		Write Protect
M6	Detector		Write Protect
M7	LED		Index
M8	Detector		Index
M9	Detector		Track 00
M10	Detector		Disk In
M11	LED		Disk In
LED 1	Driver Select		
X1	Crystal		(40MHz)

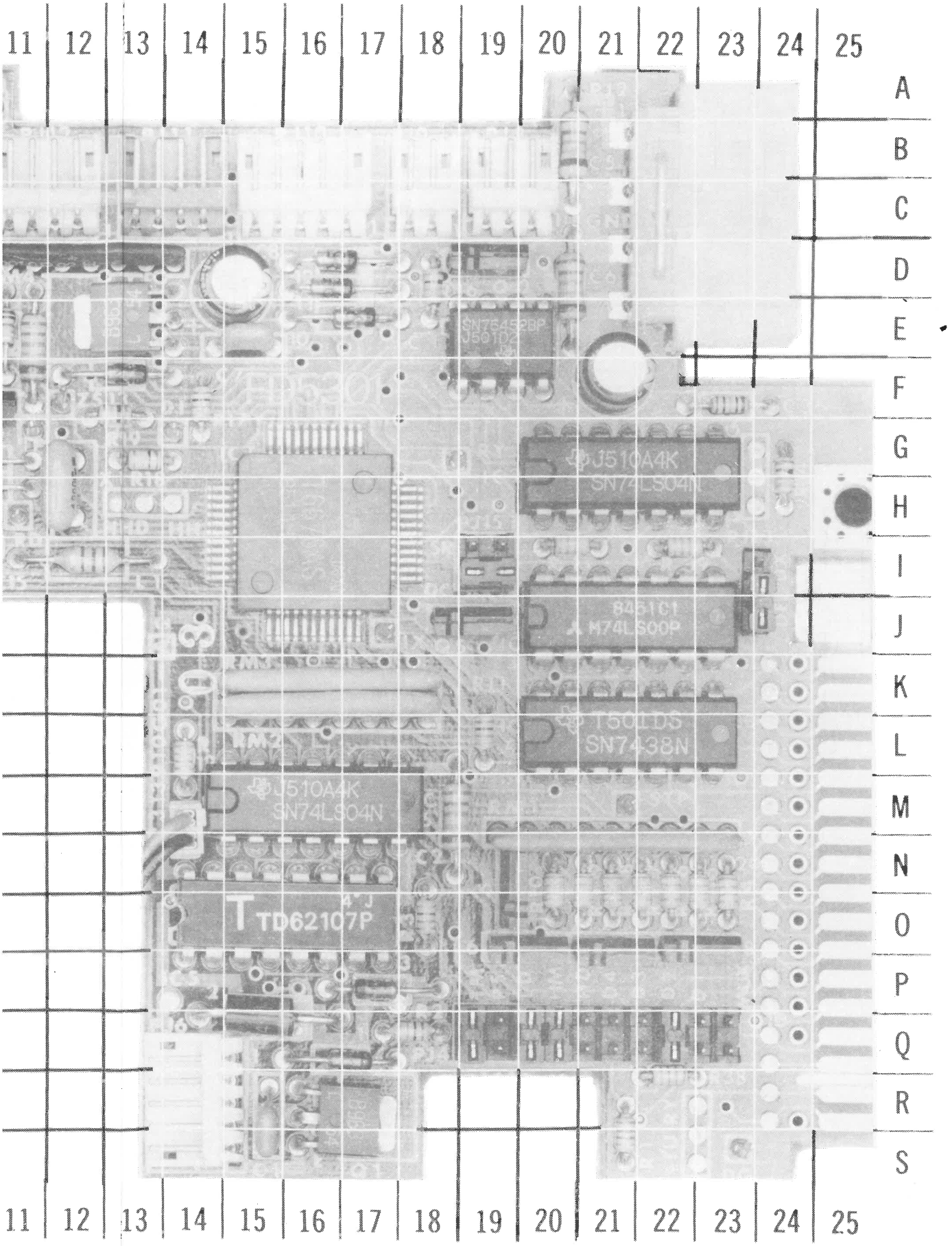
GridTrace LOCATION GUIDE

AD-	D-6	PJ6	R-14
AD+	D-7	PJ7	E-2
C1	S-15	PJ8	B-19
C2	M-18	PJ9	B-18
C3	F-23	PJ10	B-16
C4	F-21	PJ11	B-14
C5	B-20	PJ12	B-12
C6	D-20	PJ13	I-24
C7	E-15	PJ15	I-19
C8	D-15	Q1	R-17
C9	E-11	Q2	D-19
C10	E-11	Q3	E-13
C11	E-10	Q4	F-10
C12	E-10	Q5	J-19
C13	G-10	Q6	H-3
C14	H-10	R1	S-24
C15	I-10	R2	Q-18
C16	B-10	R3	O-18
C18	D-9	R4	N-23
C19	D-8	R5	N-23
C20	I-9	R6	N-22
C22	D-7	R7	N-22
C23	B-7	R8	N-21
C24	B-6	R9	N-21
C25	A-7	R10	N-28
C26	C-5	R11	L-19
C27	B-3	R12	L-14
C28	H-2	R13	I-20
C29	H-2	R14	H-24
C30	H-1	R16	D-18
D1	Q-17	R17	F-19
D2	Q-15	R18	G-13
D3	P-17	R19	E-13
D5	N-19	R20	G-10
D6	P-20	R21	F-9
D7	P-21	R22	D-9
D8	P-23	R23	E-9
D10	E-17	R24	I-6
D11	D-16	R25	D-5
D12	D-16	R26	B-8
D13	F-13	R27	C-5
D14	B-2	R28	C-5
D15	B-2	R29	C-4
D16	C-2	R30	C-4
D17	I-4	R31	C-3
D18	F-3	R32	C-2
DD-	F-9	R33	E-4
DD+	F-8	R34	G-2
IC1	E-19	R35	G-2
IC2	G-21	R36	H-4
IC3	J-21	R37	H-7
IC4	L-21	R38	R-22
IC5	O-16	R39	I-22
IC6	M-15	R40	I-8
IC7	H-16	R41	I-4
IC8	C-6	R43	D-4
IP	G-11	RD	H-11
IX	J-17	RM1	N-21
L1	I-12	RM2	K-16
L2	A-10	RM3	K-16
L3	B-5	RY	G-19
L4	A-5	STP	M-21
PJ1	N-25	WP	C-10
PJ2	C-23	X1	H-12
PJ4D1	Q-23	ZS	F-12
PJ4D2	Q-22		
PJ4D3	Q-22		
PJ4D4	Q-21		
PJ4HD	Q-21		
PJ4HM	Q-20		
PJ4LD	Q-20		
PJ4PS	Q-19		
PJ4TM	Q-19		



MAIN BOARD

A Howard W. Sams GRIDTRACE™ Photo


11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
A B C D E F G H I J K L M N O P Q R S
SN75452BP
J5510A4K
SN74LS04N
M74LS00P
SN7438N
TD62107P

MAIN BOARD

HARD DRIVE CONTROLLER

CSCS28-B
AT&T
MODEL 6300 PLUS

INDEX

CSCS28-B
AT&T
MODEL 6300 PLUS

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

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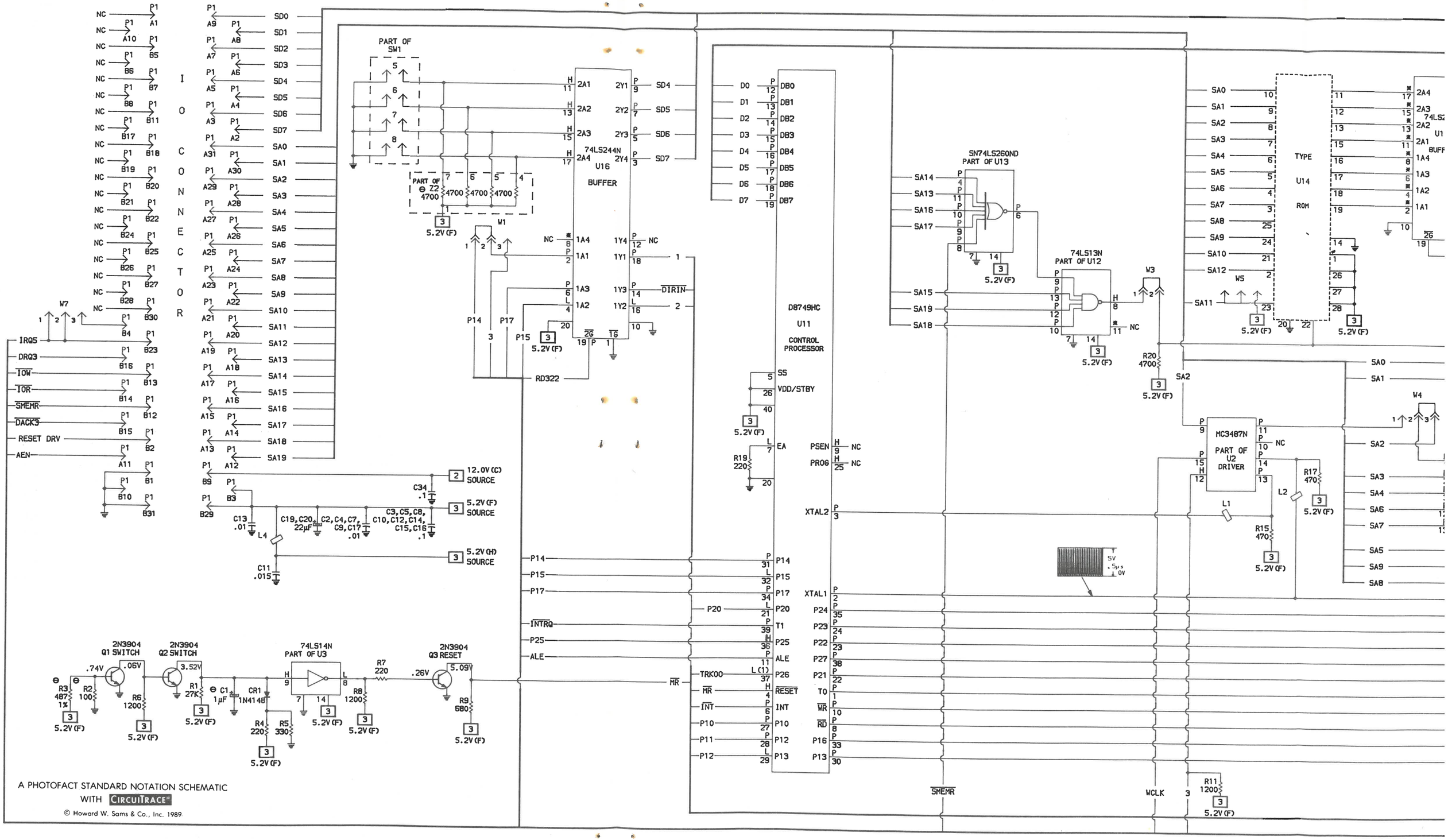


A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE™

TYPE U14 ROM

SA0 SA1 SA2 SA3 SA4 SA5 SA6 SA7 SA8 SA9 SA10 SA12 SA11

W5

74LS244N BUFFER U15

2A4 2A3 2A2 2A1 1A4 1A3 1A2 1A1 2Y4 2Y3 2Y2 2Y1 1Y4 1Y3 1Y2 1Y1

SD0 SD1 SD2 SD3 SD4 SD5 SD6 SD7

5.2V (F)

WD11C00-JT U4 INTERFACE

AD0 AD1 AD2 AD3 AD4 AD5 AD6 AD7

SD0 SD1 SD2 SD3 SD4 SD5 SD6 SD7

RA0 RA1 RA2 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA10

RAMCS RAMWR

TEST

RSTIME

CS1010 WE BCS RE BUSY MR LS AEN RD322 DACK3 RST IEQS DRQ3 IOW IOR ALE

DADD

WCLK CLCT CSECC MODE ECCNOTO IREQ REQ WR RD C-D IO

MB8128-15 RAM U5

A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 WE CS OE

I/01 I/02 I/03 I/04 I/05 I/06 I/07 I/08

D0 D1 D2 D3 D4 D5 D6 D7

DSP-565 DL1 DELAY LINE

WD10C20-PH U9 DATA SEPARATOR

DLYDR TNOMINAL THALFWIN TFUKLWIN TLATE TEARLY

DRUNRC IPUMP XTAKIN XTALOUT WDATA RCLK EARLY LATE PUMP ADJUST VCOIN VCOOUT WPCEN

WD1010A-PL U10 DIR CONTROLLER

DRUN RDATA WD RCLK EARLY LATE RG WCLK INTRQ RWC WG BCS MR RE WE CS BRDY BCR BDRQ NC STEP TRK00 INDEX WF DRDY SC

W2 W3 W4 W6

MC3487N PART OF U2 DRIVER

SN74LS260ND PART OF U13

74LS13N PART OF U12

74LS14N PART OF U7

SW1

OP0 OP1 OP2 OP3

R11 1200 R15 470 R17 470 R20 4700

C6 .0022 10% C18 1.3M C21 .1 C22 150pF C23 .0047 C24 180pF C25 .001 C26 180pF C27 68pF C28 .1 C30 120pF C31 .01 C32 10µF C33 1µF C29 100pF

R21 75 R22 1500 R23 100K R24 3570 R25 2870 R26 15K R27 220

Y101 10.0MHz

L1 L2 L3 LS CR2

5V .5µs 0V

5.8V .5µs -.5V

12.0V (C)

P17

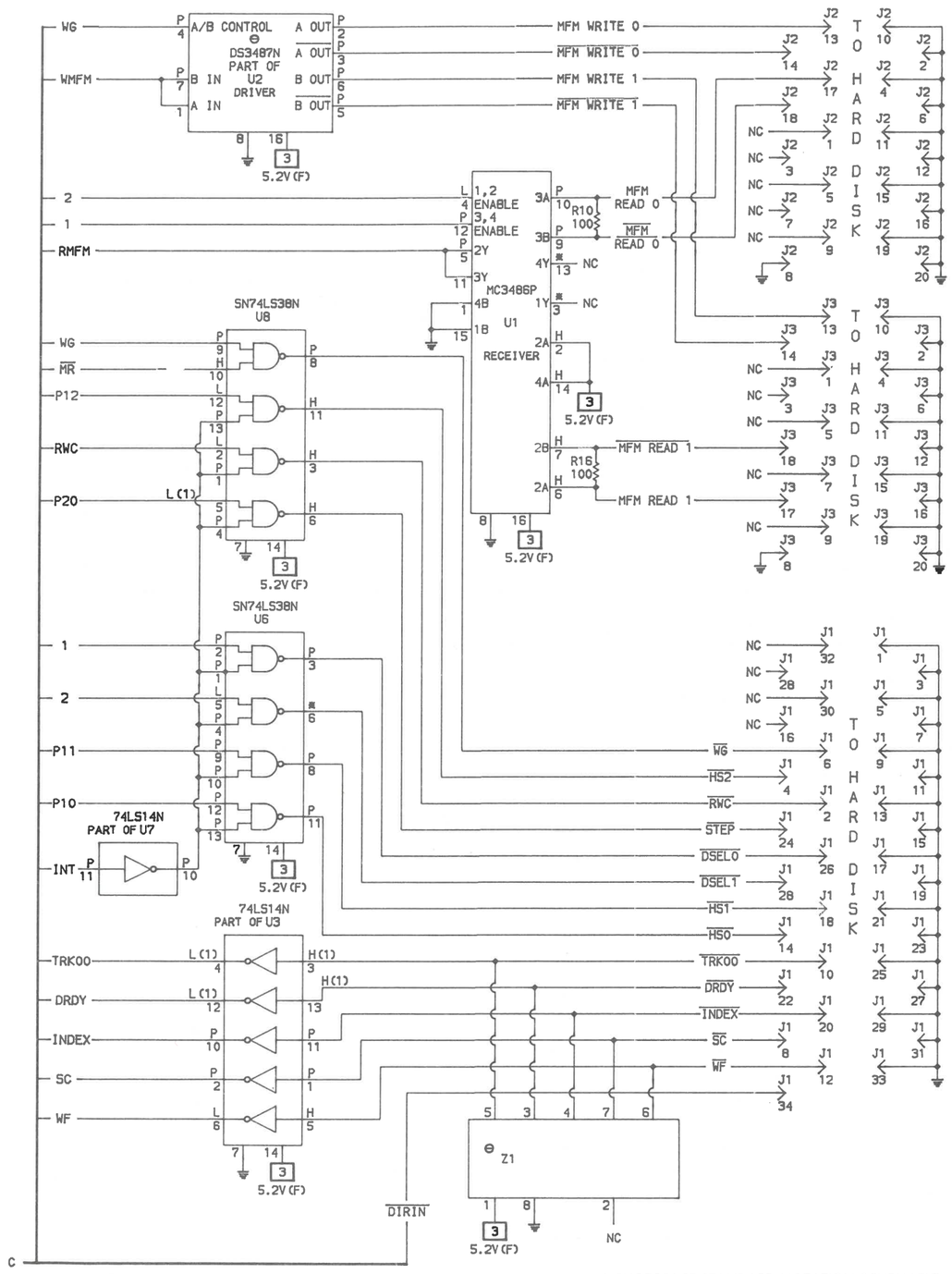
WCLK

AT&T
MODEL 6300 PLUS

LOGIC CHART

PIN NO.	IC U1	IC U2	IC U3	IC U4	PIN NO.	IC U4	PIN NO.	IC U4	PIN NO.	IC U4	PIN NO.	IC U5	PIN NO.	IC U5
1	L	P	P	P	21	H	41	H	61	P	1	P	21	P
2	H	P	P	P	22	P	42	H	62	P	2	P	22	P
3	*	P	H(1)	P	23	P	43	P	63	P	3	P	23	P
4	L	P	L(1)	L	24	P	44	P	64	P	4	P	24	H
5	P	P	H	P	25	P	45	P	65	P	5	P		
6	H	P	L	P	26	P	46	P	66	P	6	P		
7	H	P	L	P	27	L	47	P	67	P	7	P		
8	L	L	L	P	28	P	48	P	68	P	8	P		
9	P	P	H	P	29	P	49	P			9	P		
10	P	P	P	P	30	P	50	P			10	P		
11	P	P	P	P	31	P	51	P			11	P		
12	P	H	L(1)	P	32	P	52	P			12	L		
13	*	P	H(1)	P	33	P	53	P			13	P		
14	H	P	H	P	34	P	54	P			14	P		
15	L	P		P	35	P	55	P			15	P		
16	H	H		P	36	H	56	P			16	P		
17				P	37	H	57	P			17	P		
18				P	38	L	58	P			18	P		
19				P	39	H	59	P			19	L		
20				P	40	H	60	L			20	P		

PIN NO.	IC U6	IC U7	IC U8	IC U9	PIN NO.	IC U9	PIN NO.	IC U10	PIN NO.	IC U10	NO. U11
1	P	*	P	H	21	P	1	P	21	P	
2	P	L	L	L	22	P	2	P	22	P	
3	P	*	H	P	23	P	3	P	23	P	
4	P	L	P	P	24	H	4	*	24	P	
5	L	*	L(1)	P	25	P	5	H	25	P	
6	*	L	H	P	26	P	6	P	26	L	
7	L	L	L	P	27	P	7	P	27	L	
8	P	L	P	P	28	*	8	P	28	L(1)	
9	P	*	P	P			9	P	29	P	
10	P	P	H	P			10	P	30	L	
11	P	P	H	P			11	P	31	L(1)	
12	P	P	L	P			12	P	32	P	
13	P	P	P	P			13	P	33	L	
14	H	H	H	P			14	P	34	P	
15				P			15	P	35	P	
16				P			16	P	36	P	
17				P			17	P	37	P	
18				P			18	P	38	P	
19				P			19	P	39	P	
20				P			20	L	40	H	



CSCS28-B

AT&T MODEL 6300 PLUS

A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®

PARTS LIST AND DESCRIPTION

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

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
AT & T	HARD DISC CONTROLLER BOARD	
C1	1 35V 10%	
C33	1 35V 10%	

CAPACITORS

ITEM No.	RATING	MFGR. PART No.
AT & T	HARD DISC CONTROLLER BOARD	
C27	68 N750 50V 5%	

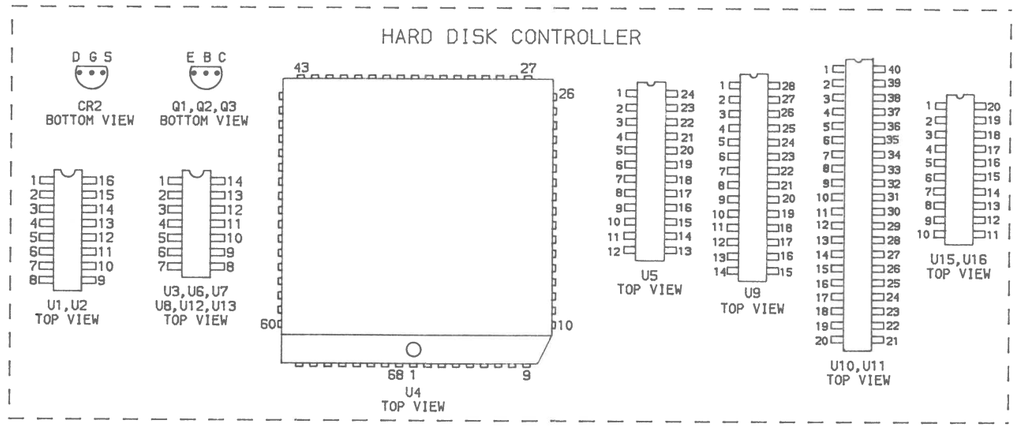
RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	
AT & T HARD	DISC CONTROLLER BOARD			
R2	100 1% 1/4W Carbon Film			
R3	487 1% 1/4W Carbon Film			
R21	75 1% 1/4W Carbon Film			
R22	1500 1% 1/4W Carbon Film			
R23	100K 1% 1/4W Carbon Film			
R24	3570 1% 1/4W Carbon Film			
R25	2870 1% 1/4W Carbon Film			
R26	15K 1% 1/4W Carbon Film			
Z1	Component Combination			
Z2	Resistor Array 4700 2% x 4			

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.
HARD DISK CONTROLLER					
CR1	1N4148	NTE519	ECG519	SK3100/519	
CR2					
Q1,2,3	2N3904	NTE123AP	ECG123AP	SK3854/123AP	
U1	MC3486P				
U2	DS3487N MC3487P				
U3	74LS14N	NTE74LS14	ECG74LS14	SK74LS14	
U4	WD11C00-JT				
U5	MB8128-15	NTE2128	ECG2128		
U6	SN74LS38N	NTE74LS38	ECG74LS38	SK74LS38	
U7	74LS14N	NTE74LS14	ECG74LS14	SK74LS14	
U8	SN74LS38N	NTE74LS38	ECG74LS38	SK74LS38	
U9	WD10C20-PH				
U10	WD1010A-PL				
U11	D8749HC				
U12	74LS13N				
U13	SN74LS260ND	NTE74LS260	ECG74LS260		
U14	USED SOME VERSIONS				
U15,16	74LS244N	NTE74LS244	ECG74LS244	SK74LS244	

TERMINAL GUIDES AND NOTES



SCHEMATICS NOTES

—x— 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 while running the following Basic program.

Readings were taken when the disk drive head is not moving (drive is in read or write mode) unless noted.

```
10 OPEN "C:SAMS.DAT" FOR OUTPUT AS #1
20 FOR X=1 TO 700
30 PRINT #1, "HOWARD W SAMS"
40 NEXT X
50 CLOSE #1
60 GOTO 10
```

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 wave–form.

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

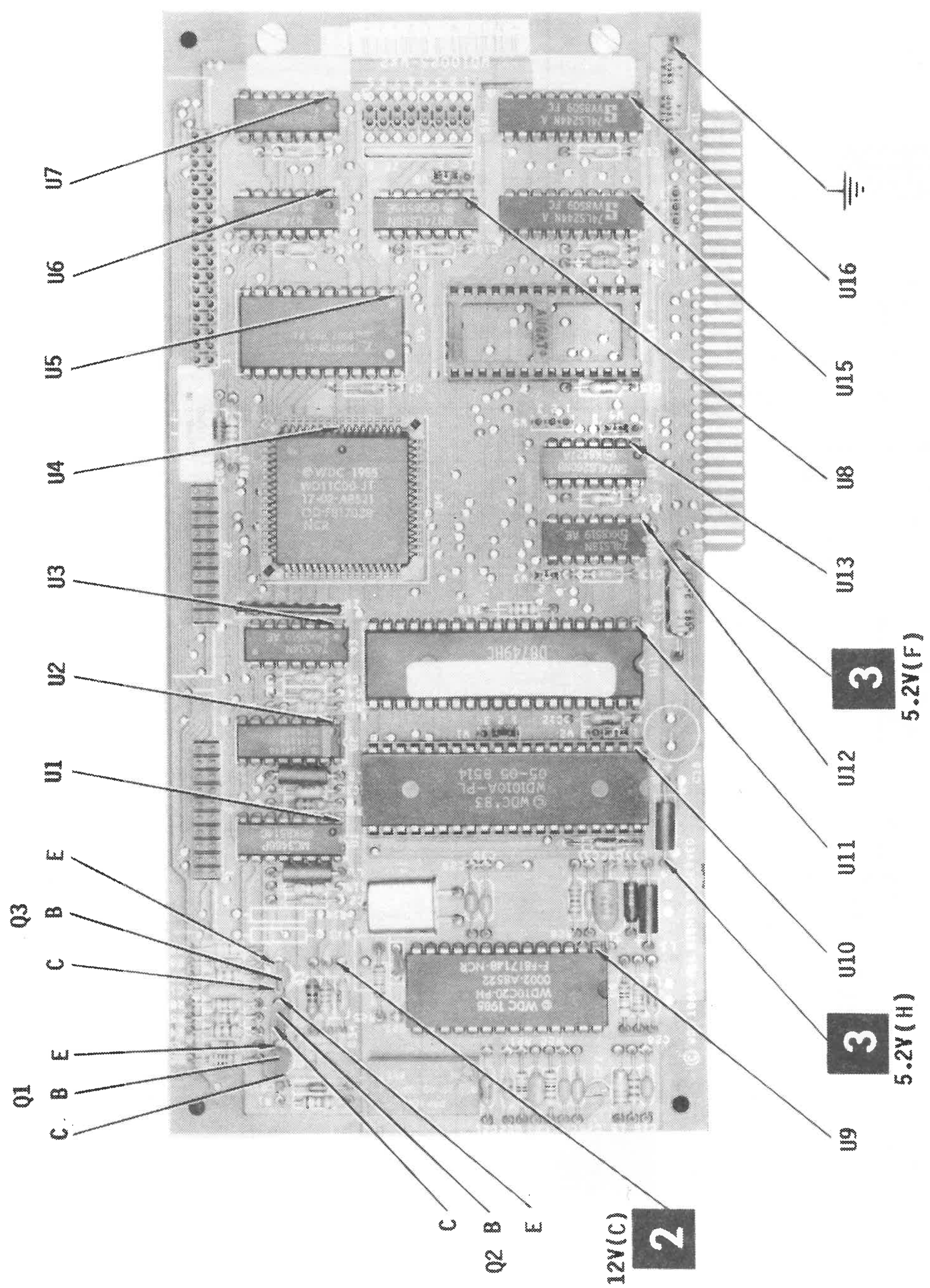
Terminal identification may not be found on unit.

Resistors are ½W 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 P when head is moving.



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

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LOGIC CHART (CONT.)

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

1 Probe indicates P when head is moving.

JUMPERS

HARD DISK CONTROLLER BOARD (WD1002S-WX2)

Jumpers are installed on SW1 pins (1 thru 8) according to the type of Hard Disk Drive installed. Positions 1 and 2 are used for a Hard Disk Drive installed as Drive 0 and positions 3 and 4 are used for a Hard Disk Drive installed as Drive 1. Use the following chart to determine which jumpers to install:

NOTE: The following chart is valid for BIOS ROM (ROM IC's 6J and 6K on the System Board) versions 1.04 and 1.06.

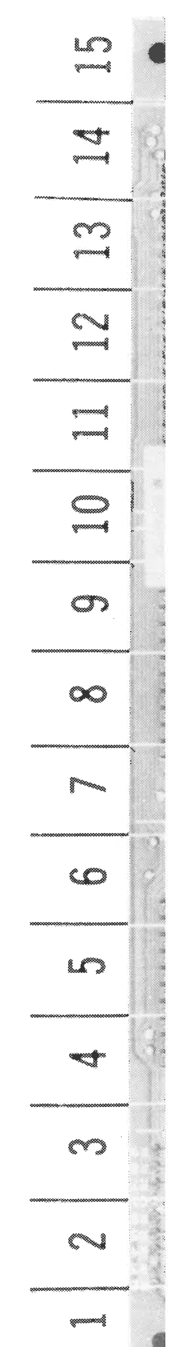
MANUFACTURER	MODEL	SIZE	INSTALL JUMPER AT POSITION (DRIVE 0)	(DRIVE 1)
CDC	Wren	30 MB	2	4
CMI	CM6426	20 MB	1	3
Micropolis	1325	67 MB	1	3
Miniscribe	6086	80 MB	2	4
Multi	PC 6300 type	10 MB	1 & 2	3 & 4
Seagate	ST225	20 MB	No Jumpers	No Jumpers
Seagate	ST4051	40 MB	1 & 2	3 & 4
Tandon	--	40 MB	No Jumpers	No Jumpers

When used with a 20 Meg Hard Disk Drive, the Western Digital WD1002S-WX2 controller board has the following jumpers installed:

W1	Pin 1 to pin 2
W2	Pin 1 to pin 2
W3	Pin 1 to pin 2
W4	Pin 2 to pin 3
W5	No Jumper installed
W6	Pin 2 to pin 3
W7	No Jumper installed
SW1	No Jumpers installed

GridTrace LOCATION GUIDE

C1	A-1
C2	B-4
C3	B-5
C4	C-6
C5	C-7
C6	A-10
C7	C-10
C8	B-12
C9	B-14
C10	D-12
C11	F-4
C12	F-6
C13	F-8
C14	F-9
C15	F-10
C16	F-12
C17	F-14
C19	G-8
C20	G-14
C21	E-1
C22	E-1
C23	E-1
C24	F-1
C25	F-1
C26	G-1
C27	D-3
C28	G-2
C29	E-4
C30	E-4
C31	F-4
C32	F-4
C33	G-4
C34	C-2
CR1	B-1
CR2	F-1
DL1	D-1
J1	A-12
J2	A-8
J3	A-5
L1	B-4
L2	B-5
L3	G-3
L4	G-5
L5	F-1
P1	H-11
Q1	B-1
Q2	B-2
Q3	B-3
R1	B-1
R2	A-1
R3	A-2
R4	A-2
R5	A-2
R6	A-2
R7	A-3
R8	A-3
R9	A-3
R10	B-2
R11	C-2
R15	B-4
R16	B-5
R17	B-6
R18	A-10



LOGIC CHART (CONT.)

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

1 Probe indicates P when head is moving.

JUMPERS

HARD DISK CONTROLLER BOARD (WD1002S-WX2)

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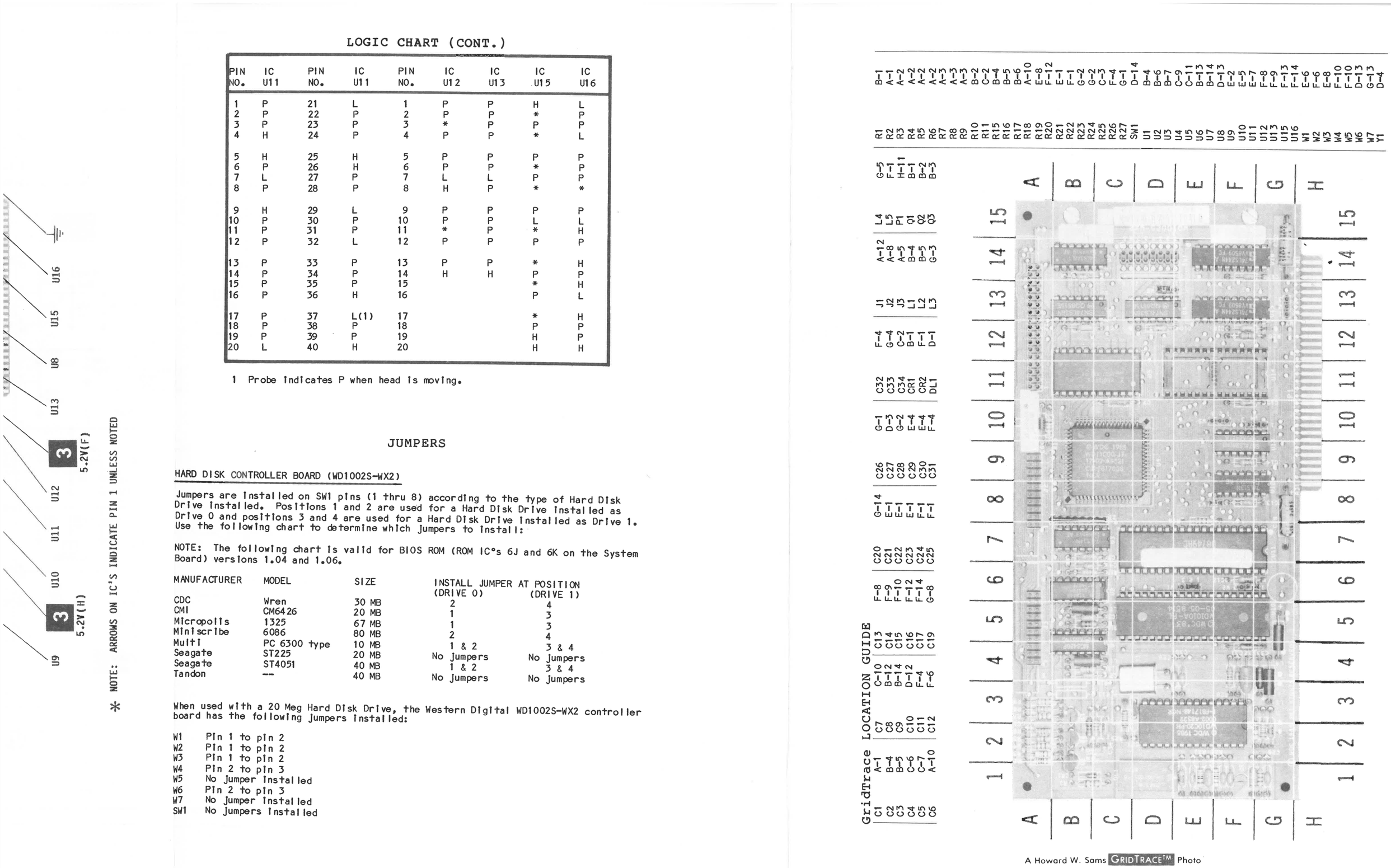
W1 Pin 1 to pin 2
W2 Pin 1 to pin 2
W3 Pin 1 to pin 2
W4 Pin 2 to pin 3
W5 No Jumper Installed
W6 Pin 2 to pin 3
W7 No Jumper Installed
SW1 No Jumpers Installed



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MONITOR

CSCS28-C AT&T MODEL 6300 PLUS

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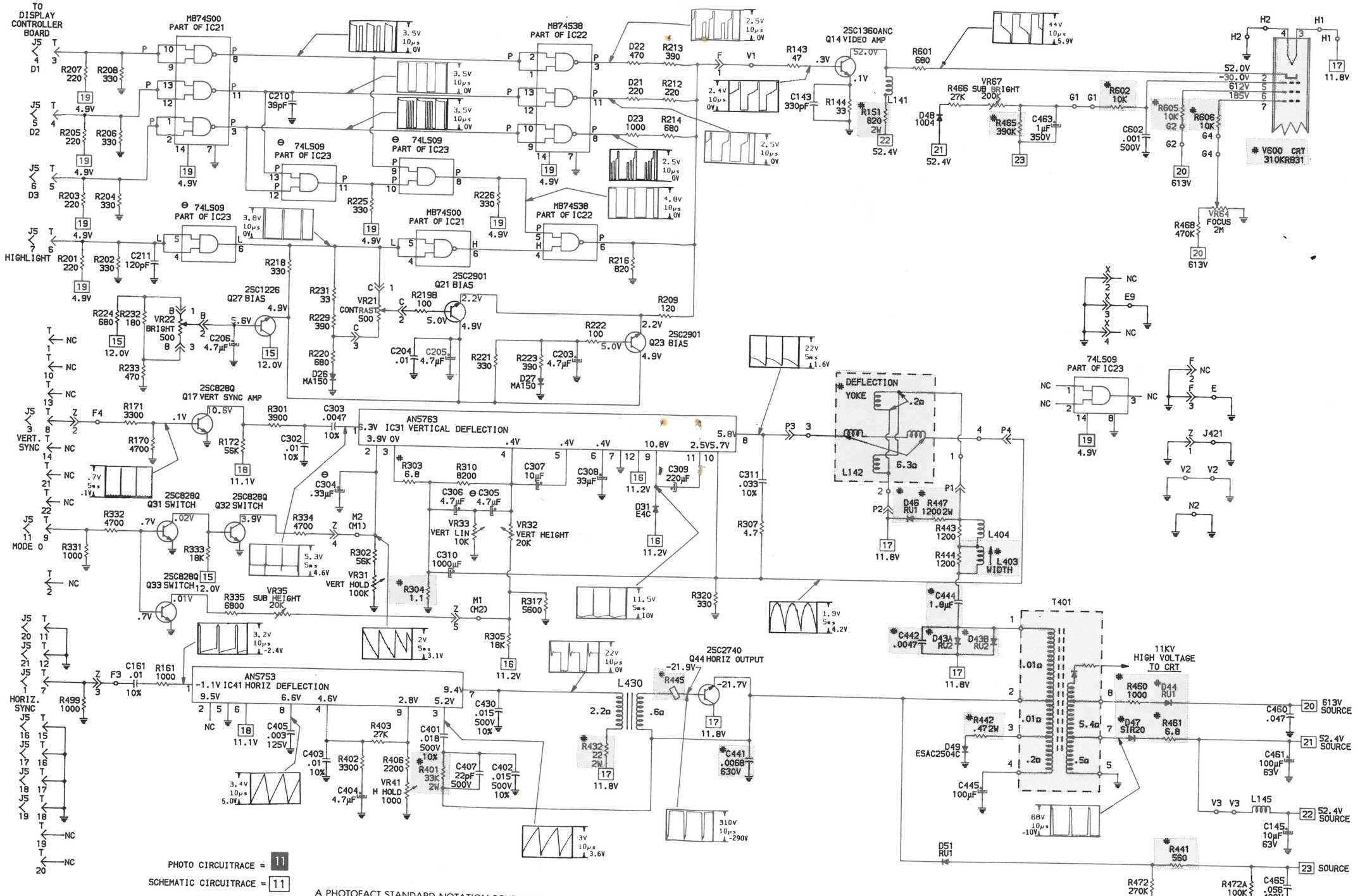


A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH CIRCUITRACE™

MAIN BOARD

CSCS28-C

AT&T MODEL 6300 PLUS

A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE™

DISASSEMBLY

CABINET REMOVAL

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

VIDEO INPUT BOARD REMOVAL

Disconnect six connectors from the board. Remove two screws holding the board to mounting bracket and remove board.

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.

```
10 KEY OFF: CLS: SCREEN 1: COLOR 0,7
20 PSET (0,0): DRAW "D199"
30 FOR X=19 to 319 STEP 20
40 PSET (X,0): DRAW "R319"
50 NEXT X
60 PSET (0,0): DRAW  "R319"
70 FOR Y=19 to 199 STEP 20
80 PSET (0,Y): DRAW "R319"
90 NEXT Y
100 GOTO 100
```

B+ ADJUSTMENT

Connect a voltmeter, negative side to ground, positive side to collector of Voltage Regulator Transistor (Q73). Adjust 12V Adjust Control (VR71) for 12.0V.

SCREEN

Adjust Sub Bright Control (VR67) for the proper luminance level of display with brightness and contrast controls at Maximum.

FOCUS

Adjust Focus control (VR64) for sharpest display possible.

VERTICAL HEIGHT ADJUSTMENT

Type in and run the following Basic program:

```
10 CLS: FOR X=1 to 2000
20 PRINT "*";: NEXT X
30 OUT 990,16
40 LOCATE 12,34: PRINT "ADJUST VR32"
50 A$=INKEY$: IF A$="" THEN 50
60 OUT 990,0
70 LOCATE 12,34: PRINT "ADJUST VR35"
80 A$=INKEY$: IF A$= "" THEN 80 ELSE 30
```

The program will fill the screen with asterisks and switch between 512 x 256 and 640 x 400 resolution modes each time the space bar is pressed. The number of the control to be adjusted will appear in the center of the screen. When VR32 is displayed (512 x 256 mode), adjust the Vertical Height Control (VR32) for the desired display height. When VR35 is displayed (640 x 400 mode), adjust the Sub Height Control (VR35) for the desired display height. NOTE: Adjust VR32 first, then VR35.

VERTICAL AND HORIZONTAL HOLD ADJUSTMENT

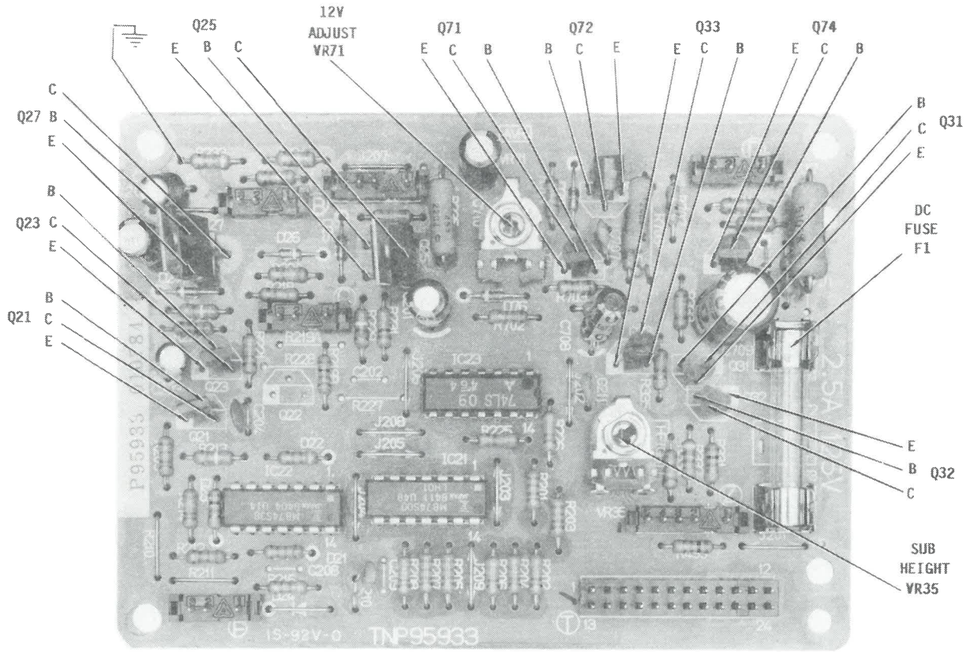
Adjust Vertical Hold Control (VR31) and Horizontal Hold Control (VA41) for the most stable display.

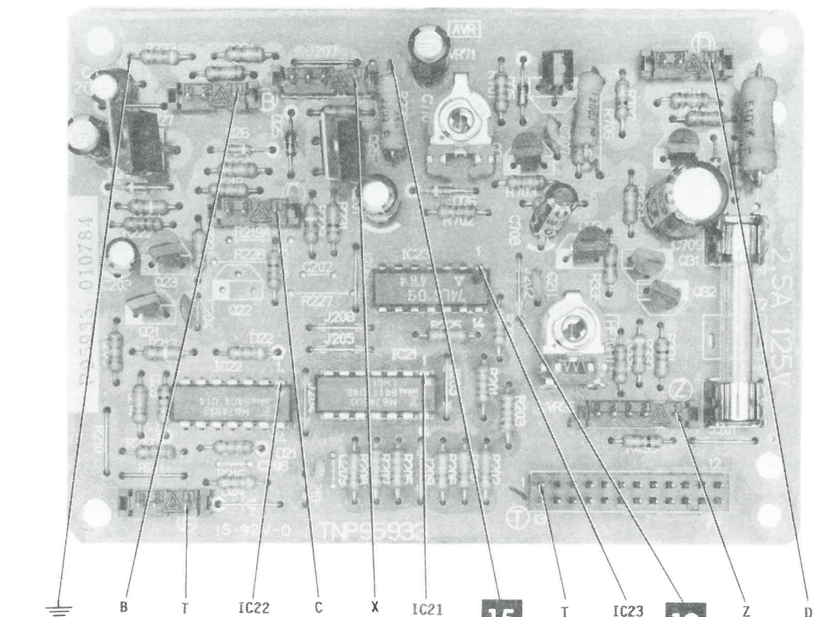
HORIZONTAL WIDTH ADJUSTMENT

Adjust Horizontal Width Coil (L403) for proper horizontal size.

VERTICAL LINEARITY

Adjust Vertical Linearity Control (VR33) for even spacing between horizontal lines on CRT.





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

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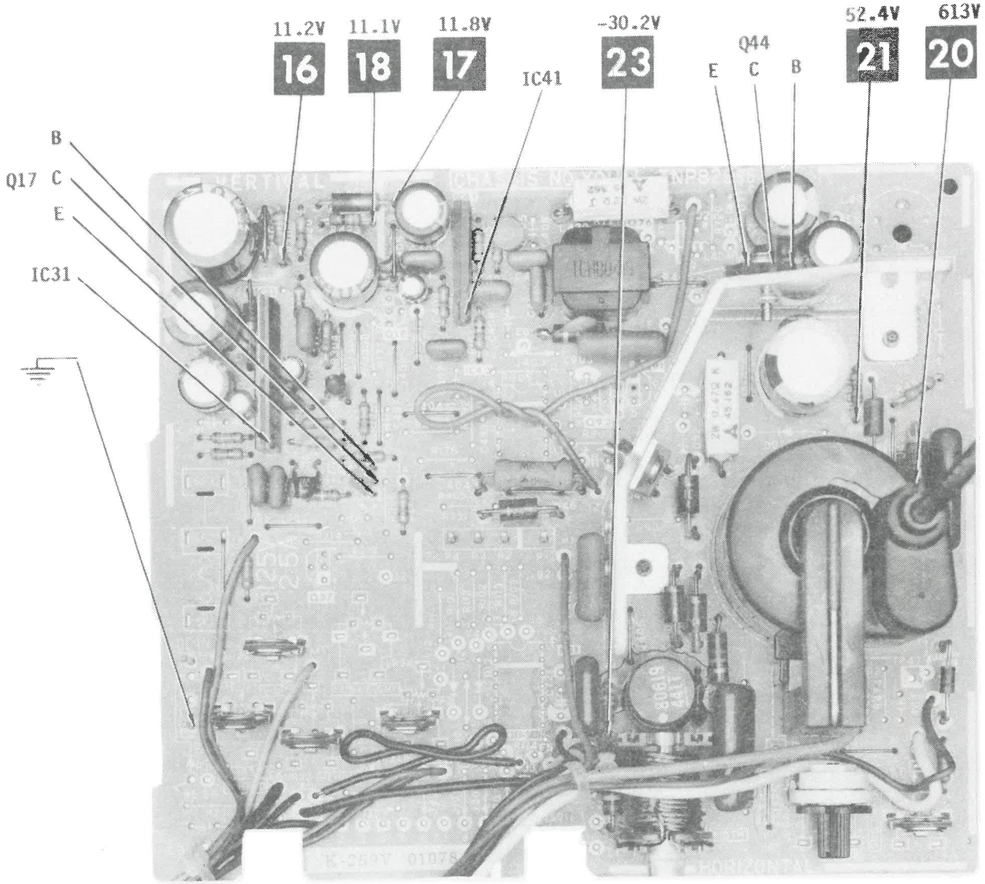
VIDEO INPUT BOARD



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

MAIN BOARD

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TROUBLESHOOTING

POWER SUPPLY

Monitor is dead. Check Fuse (F1). If the fuse is open, check for shorts at the Voltage Regulator Transistor (Q73) and Horizontal Output Transistor (Q44) and check Transistors Q73 and Q44. If the fuse is good, check for 13.6V at the emitter of Transistor Q73. If the voltage is missing, check pin 1 of Connector D and pins 23 and 24 of Connector T for good connections and check the Monitor cable for continuity. If 13.6V is present, check for 12.0V at the Collector of Transistor Q73. If the voltage is missing, check the adjustment of the 12V Adjust Control (VR71) (see "Miscellaneous Adjustments") and check the voltages and components associated with Error Amp Transistors (Q71, Q72 and A74) and Voltage Regulator Transistor Q73. If 12.0V is present, check for 4.9V at the emitter of Regulator Transistor Q25. If the voltage is missing, check Zener Diode D25, Transistor Q25, Capacitor C201 and Resistors R235 and R217. If the voltage is present, refer to the "Horizontal" section of this Troubleshooting guide.

HORIZONTAL

No horizontal sweep. Check the waveform at pin 1 of the Horizontal Deflection IC (IC41). If the waveform is missing, check Capacitor C161, Resistor R161 and check pin 3 of Connector Z and pin 7 of Connector T for good connections. Also check the Monitor cable for continuity. If the waveform is present, check for 11.1V at pin 6 of IC41 and 11.8V at the collector of the Horizontal Output Transistor (Q44). If either voltage is missing, refer to the "Power Supply" section of this troubleshooting guide. If the voltages are present, check the waveform at pin 7 of IC41. If the waveform is missing, check the voltages and components associated with pins 1 thru 9 of IC41. If the waveform is present, check the waveform at the base of Transistor Q44. If the waveform is missing, check Transformer L430, Capacitors C401, C402, C407 and C441 and Transistor Q44. If the waveform is present, check the voltages and components associated with Transistor Q44 and Horizontal Output Transformer (T401). The High Voltage Rectifier is part of Transformer T401 and, if defective, will affect the performance of the horizontal circuit. Horizontal linearity or width problems may be caused by Coils L403 or L404, Diodes D43A or D43B and Capacitors C442 or C444.

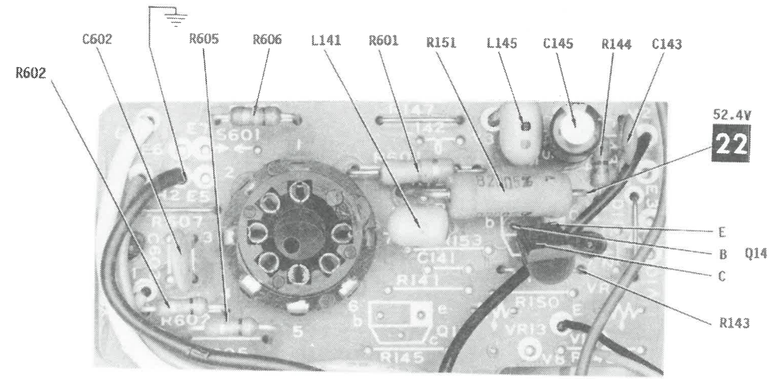
VERTICAL

No vertical sweep. Check the waveform at the base of the Vertical Sync Amp Transistor (Q17). If the waveform is missing, check Resistor R171, check pin 2 of Connector Z and pin 8 of Connector T for good connections and check the Monitor cable for continuity. If the waveform is present, check the waveform at pin 1 of the Vertical Deflection IC (IC31). If the waveform is missing, check the voltages and components associated with Transistor Q17. If the waveform is present, check the waveform at pin 8 of IC31. If the waveform is missing, check the voltages and components associated with pins 1 thru 12 of IC31, Switch Transistors (Q31, Q32 and Q33) and check the vertical windings of the Deflection Yoke (L142) for continuity. Vertical linearity or height problems may be caused by defective Electrolytic Capacitors C305, C306 or C310.

VIDEO

No video. Check for pulses at pins 1, 9 and 12 of IC21. If pulses are missing, check pins 3, 4 and 5 of Connector T for good connections and check the Monitor cable for continuity. If pulses are present, check the waveforms at pins 3, 8 and 11 of IC21. If any of the waveforms are missing, check IC21. If the waveforms are present, check the waveform at pin 8 of IC23. If the waveform is missing, check IC21. If the waveform is present, check the waveforms at pins 3, 8 and 11 of IC22. If any of the waveforms are missing, check IC22. If the waveforms are present, check the waveform at pin 6 of IC23. If the waveform is missing, check IC23. If the waveform is present, check the waveform at pin 2 of the CRT (V600). If the waveform is missing, check the voltages and components associated with Bias Transistors (Q21, Q23 and Q27) and Video Amp Transistor Q14. If the waveform is present, check the CRT.

If the brightness or contrast is inadequate, check the voltages and components associated with Transistors Q21, Q23, Q27 and Q14.



A Howard W. Sams CIRCUITRACE® Photo

CRT BOARD

MAIN BOARD

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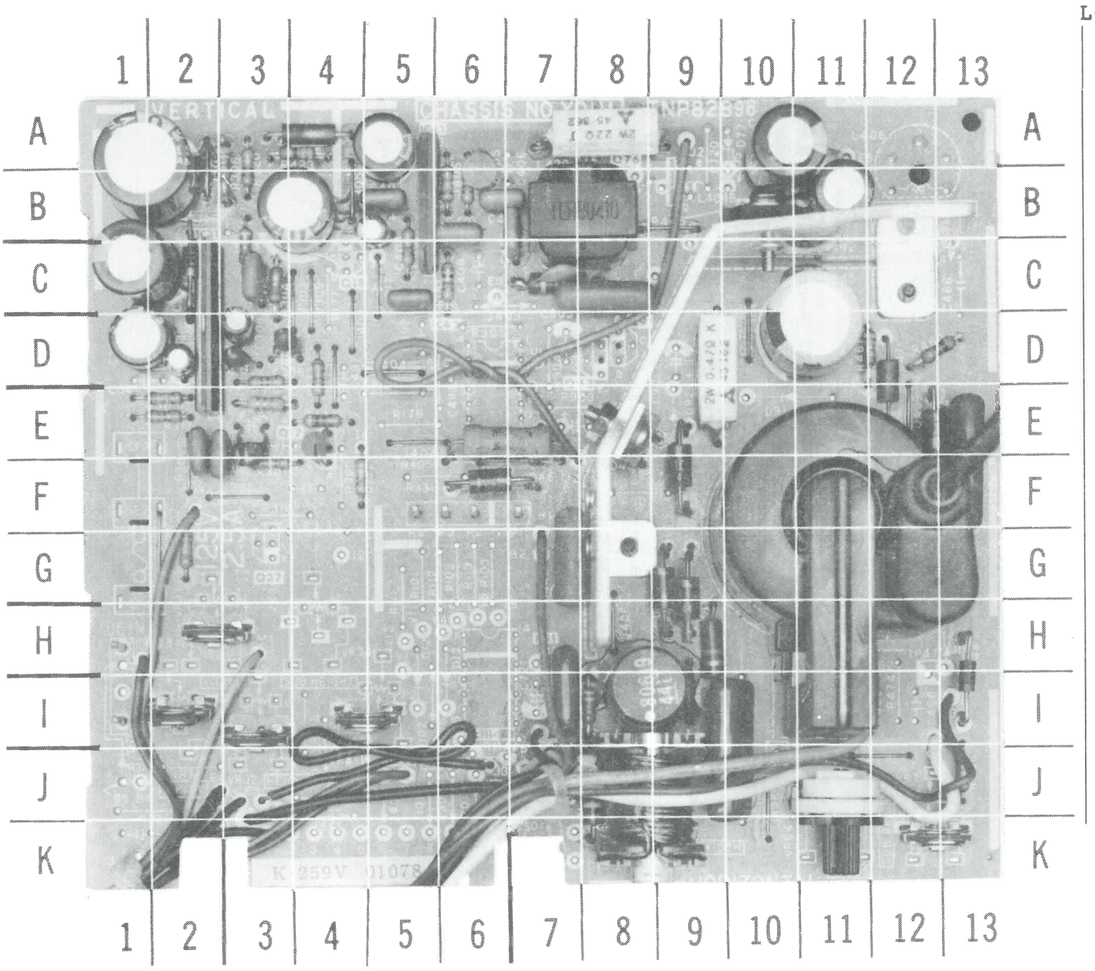

GridTrace LOCATION GUIDE

C161	C-5	L403	J-9
C302	E-2	L404	I-8
C303	E-2	L405	A-4
C304	E-3	L430	B-7
C305	D-3	Q17	E-4
C306	D-3	Q44	B-10
C307	D-2	R161	C-6
C308	D-3	R170	E-4
C309	D-1	R171	E-4
C310	B-4	R172	D-4
C311	C-3	R301	E-3
C312	B-1	R302	G-2
C401	B-6	R303	E-3
C402	B-7	R304	C-3
C403	B-5	R305	E-1
C404	B-5	R306	A-3
C405	A-6	R307	B-3
C407	C-7	R310	D-3
C423	A-5	R317	E-1
C430	B-6	R320	A-3
C441	C-8	R401	C-7
C442	G-7	R402	B-5
C444	I-10	R403	A-6
C445	C-11	R405	A-6
C460	E-13	R423	A-4
C461	B-11	R432	A-7
C463	J-8	R441	I-8
C465	H-7	R442	D-9
C491	A-10	R447	E-6
C705	A-1	R460	D-13
D31	C-2	R461	D-12
D43A	G-9	R465	J-8
D43B	G-9	R466	J-13
D44	E-12	R468	I-12
D46	F-6	R472	H-9
D47	D-12	T401	F-12
D48	H-13	VR31	I-2
D49	E-8	VR32	I-3
D51	E-9	VR33	H-2
H1	F-7	VR41	I-5
IC31	E-2	VR64	J-11
IC41	C-5	VR67	K-12

VIDEO INPUT BOARD

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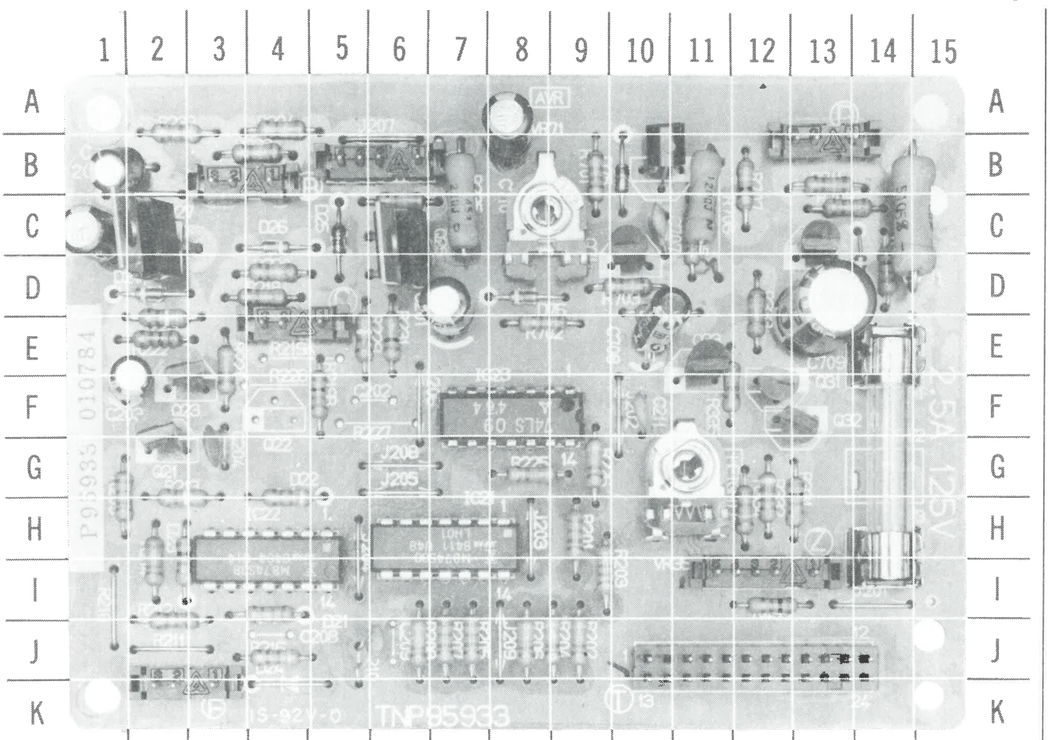


GridTrace LOCATION GUIDE

B	B-4	R204	J-9
C	E-5	R205	J-7
C201	D-7	R206	J-8
C203	E-2	R207	J-7
C204	F-3	R208	J-6
C205	C-1	R209	G-1
C206	B-1	R212	I-2
C210	J-6	R213	G-2
C211	F-10	R214	H-2
C499	I-12	R216	J-4
C707	C-10	R217	C-6
C708	D-11	R218	D-4
C709	D-13	R219	E-5
C710	A-8	R220	D-4
D	A-14	R221	E-3
D21	I-4	R222	E-2
D22	G-4	R223	E-2
D23	H-2	R224	A-4
D25	C-5	R225	G-8
D26	C-4	R226	G-9
D27	D-2	R229	D-5
D75	B-10	R231	D-6
D76	D-8	R232	B-3
D77	C-14	R233	A-2
F	K-3	R235	B-7
F1	E-14	R331	G-13
IC21	H-8	R332	G-12
IC22	H-5	R333	D-12
IC23	F-9	R334	G-12
Q21	F-2	R335	F-11
Q23	E-2	R499	I-12
Q25	C-6	R701	B-9
Q27	C-2	R702	E-8
Q31	F-12	R703	D-9
Q32	F-13	R704	D-10
Q33	E-11	R705	D-11
Q71	C-10	R706	B-11
Q72	A-10	R707	B-12
Q74	C-13	R709	C-13
R201	H-9	R710	C-14
R202	J-9	R711	B-13
R203	H-9	R713	B-15

PARTS LIST AND DESCRIPTION (Continued)

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

COILS (RF-IF)

ITEM No.	FUNCTION	MFGR. PART No.
AT & T	MONITOR CRT BOARD	
L141	RF Choke	
L145	RF Choke	

ITEM No.	FUNCTION	MFGR. PART No.
AT & T	MONITOR MAIN BOARD	
# L403	Width	
L404	Peaking	
L405	RF Choke	

For SAFETY use only equivalent replacement part.

FUSE DEVICES

ITEM NO.	DESCRIPTION	MFGR. PART NO.		NOTES
		DEVICE	HOLDER	
AT &T	MONITOR VIDEO OUTPUT BOARD			
# F1	2.5 Amp 125VAC			

For SAFETY use only equivalent replacement part.

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
AT & T	MONITOR CRT BOARD		
# V600	CRT	310KRB31 (1)	
L430	Horiz Drive		
T401	H.O.T.	TLF80614 (1)	
#	Deflection Yoke	TLY80336A (1)	

For SAFETY use only equivalent replacement part.

(1) Number on unit.

PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
MONITOR						
D25	RD5R6EB2	NTE5011A	ECG5011A	SK5A6/5011A		
D26,7	MA150	NTE519	ECG519	SK3100/519		
D31	E4C					
D43A,B	RU2	NTE552	ECG552	SK9000/552		
D44,6	RU1	NTE552	ECG552	SK9000/552		
D47	SIR20	NTE116	ECG116	SK3313/116		
D48	10D4	NTE125	ECG125	SK3081/125		
D49	ESAC2504C					
D51	RU1	NTE552	ECG552	SK9000/552		
D75	RD4R7EB2	NTE5009A	ECG5009A	SK4A7/5009A		
D76,7	MA150	NTE519	ECG519	SK3100/519		
IC21	MB74S00	NTE74S00	ECG74S00	SK74S00		
IC22	MB74S38	NTE74S38				
IC23	74LS09	NTE74LS09	ECG74LS09			
	DN74LS09	NTE74LS09	ECG74LS09			
IC31	AN5763					
	AN5762					
IC41	AN5753	NTE1629	ECG1629			
	AN5752	NTE1629	ECG1629			
Q14	C1360A	NTE199	ECG199	SK3132		
	2SC1360ANC	NTE199	ECG199	SK3132		
Q17	C828Q	NTE85	ECG85	SK3931/90		
	2SC828(P)	NTE85	ECG85	SK3931/90		
	2SC828(Q)	NTE85	ECG85	SK3931/90		
Q21,3	C2901L	NTE123AP	ECG216	SK9433		
	2SC2901	NTE123AP	ECG216	SK9433		
Q25,7	C1226AR	NTE186A	ECG186A	SK3357/186A		
	2SC1226	NTE186A	ECG186A	SK3357/186A		
Q31 THRU Q33	C828Q	NTE85	ECG85	SK3931/90		
	2SC828	NTE85	ECG85	SK3931/90		

PARTS LIST AND DESCRIPTION (Continued)

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

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
AT & T	MONITOR MAIN BOARD	
C304	.33 35V	
C305	4.7 16V	
C306	4.7 16V	

CAPACITORS

ITEM No.	RATING	MFGR. PART No.
AT & T	MONITOR MAIN BOARD	
# C441	.0068 630V	
# C442	.0047 630V	
# C444	1.8 100V 10%	

For SAFETY use only equivalent replacement part.

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

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
AT &T	MONITOR CHASSIS			
VR21	Contrast	500		
VR22	Bright	500		
AT &T	MONITOR MAIN BOARD			
VR31	Vert Hold	100K		
VR32	Vert Height	20K		
VR33	Vert Linearity	10K		
VR41	H Hold	1000		
VR64	Focus	2M		
VR67	Sub Bright	200K		
AT & T	MONITOR VIDEO OUTPUT	BOARD		
VR35	Height	20K		
VR71	12V Adj	1000		

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA MFGR. PART No.	REPLACEMENT DATA NTE PART No.	
AT & T	MONITOR MAIN BOARD			
# R303	6.8 5% 1/4W Carbon Film		QW6D8	
# R304	1.1 5% 1/4W Fuse			
# R306	6.8 5% 1/4W Carbon Film		QW6D8	
# R401	33K 10% 1W Carbon Comp		1W333	
# R423	68 5% 1/4W Carbon Film		QW068	
# R432	22 5% 2W WW			
# R441	560 5% 1/4W Fuse			
# R442	.47 10% 2W WW			
# R447	1200 5% 2W Metal Film		2W212	
# R460	1000 5% 1/4W Carbon Film		QW210	
# R461	6.8 5% 1/4W Fuse			
# R465	390K 10% 1W Carbon Comp		1W439	
AT & T	MONITOR CRT BOARD			
# R151	820 5% 2W Metal Film		2W182	
# R602	10K 5% 1/4W Carbon Film		QW310	
# R605	10K 5% 1/4W Carbon Film		QW310	
# R606	10K 5% 1/4W Carbon Film		QW310	
AT & T	MONITOR VIDEO OUTPUT BOARD			
# R713	51 5% 2W Metal Film		2W051	

For SAFETY use only equivalent replacement part.

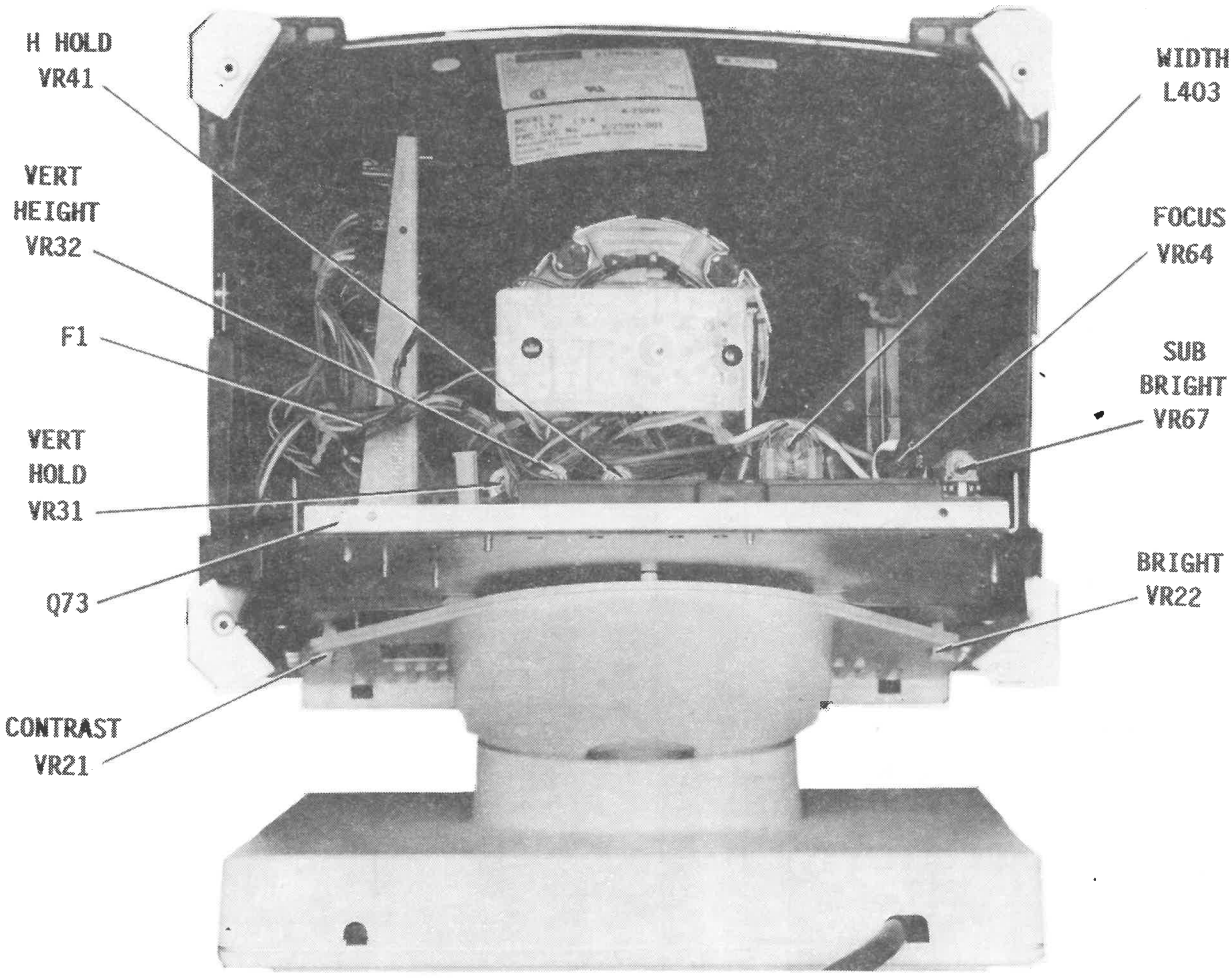
PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
Q44	2SC2740	NTE2308	ECG2308	SK9131/2311		
Q71	C828AR	NTE85	ECG85	SK3931/90		
	2SC828A(R)	NTE85	ECG85	SK3931/90		
	2SC828A(S)	NTE85	ECG85	SK3931/90		
Q72	A720R	NTE290A	ECG290A	SK3114A/290A		
	2SA720RST	NTE290A	ECG290A	SK3114A/290A		
Q73	B941Q	NTE55	ECG55	SK3441/292		
	2SB941	NTE55	ECG55	SK3441/292		
Q74	A564R	NTE290A	ECG290A	SK3932/91		
	2SA564(Q)	NTE290A	ECG290A	SK3932/91		
	2SA564(R)	NTE290A	ECG290A	SK3932/91		

CABINET-REAR VIEW



SCHEMATICS NOTES

—x— 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.

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 the following Basic program is running.

```
10 DATA 0,4,5,2,3,6,1,15
20 KEY OFF:SCREEN 0,1:WIDTH 80
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
100GOTO 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 9cm. width with DC reference voltage given at the bottom line of each waveform.

Time in 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.
Brightness (VR22) and Contrast (VR21) Controls set to maximum.

AT&T MODEL 6300 PLUS CSCS28-D

INDEX

CSCS28-D AT&T MODEL 6300 PLUS

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

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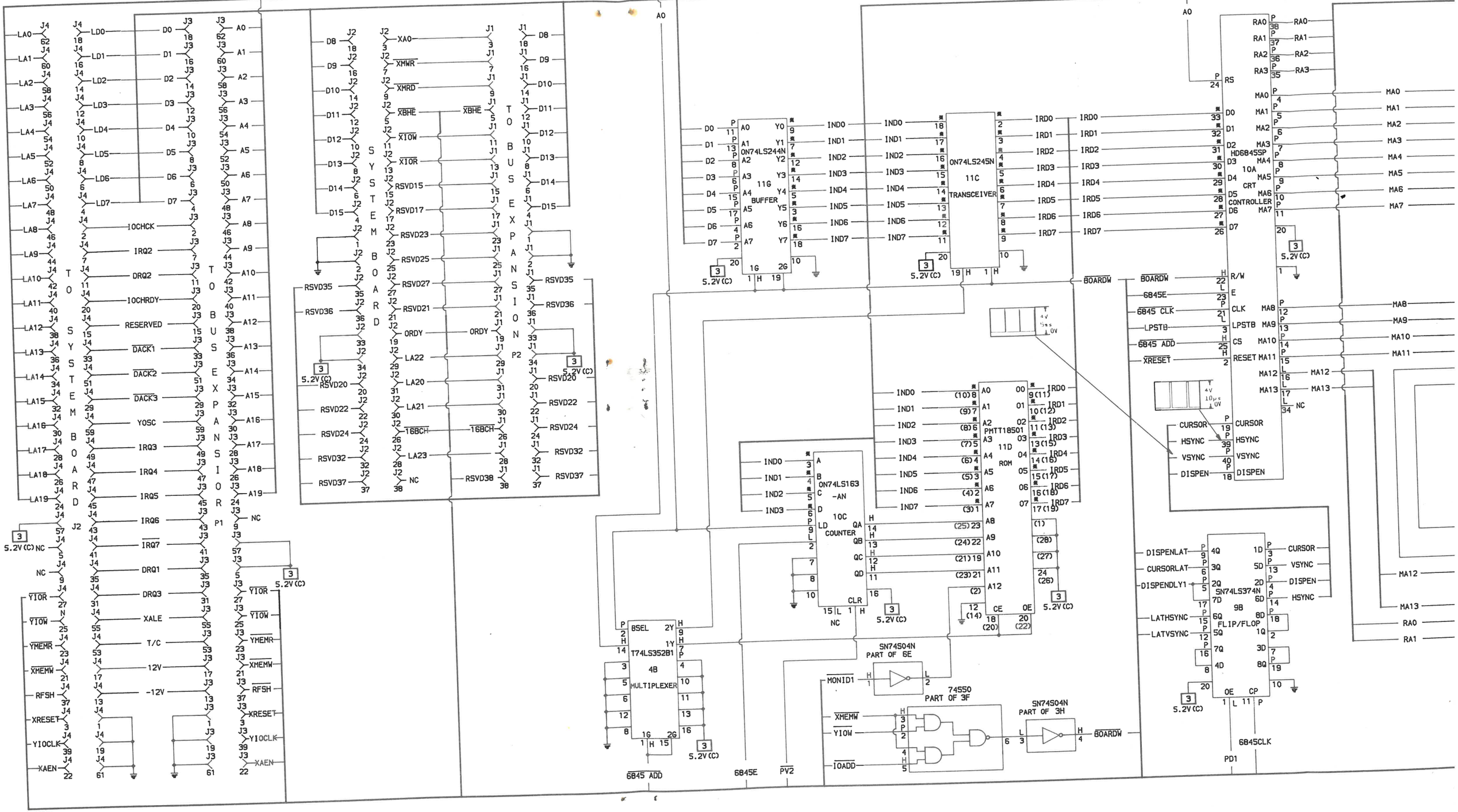

A PHOTOFACT STANDARD NOTATION SCHEMATIC WITH CIRCUITRACE®

A0
RS
HD6845SP
10A
CRT
CONTROLLER
IRD0
IRD1
IRD2
IRD3
IRD4
IRD5
IRD6
IRD7
D0
D1
D2
D3
D4
D5
D6
D7
BOARDW
R/W
6845E
E
6845 CLK
CLK
LPSTB
CS
6845 ADD
XRESET
RESET
RA0
RA1
RA2
RA3
MA0
MA1
MA2
MA3
MA4
MA5
MA6
MA7
MA8
MA9
MA10
MA11
MA12
MA13
NC
4V
10µs
0V
CURSOR
HSYNC
VSYNC
DISPEN
5.2V(C)
SN74LS374N
9C
FLIP/FLOP
CRTRAS
6845CLK
9D
CRTCAS
DISPENLAT
CURSORLAT
DISPENDLY1
LATHSYNC
LATVSYNC
9B
PD1
SN74LS153N
9E
MULTIPLEXER
RA0
RA1
BSEL
ASEL
GRAPH
M20
PAGESEL
A1
A2
A3
A4
A9
A10
A11
T74LS257B1
9H
MULTIPLEXER
SEL
OC
MUXSWCH
CPUADD
A5
A6
A7
A80
A12
A13
A14
10H
DRA0
DRA1
DRA2
DRA3
DRA4
DRA5
DRA6
DRA7
D41416C-15
9G
RAM
RAS
W
CASL
9F
8G
8F
CASU
DRAMDAT0
DRAMDAT1
DRAMDAT2
DRAMDAT3
DRAMDAT4
DRAMDAT5
DRAMDAT6
DRAMDAT7
DRAMDAT8
DRAMDAT9
DRAMDAT10
DRAMDAT11
DRAMDAT12
DRAMDAT13
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DRAMDAT15
SN74LS374N
10F
FLIP/FLOP
OE
CP
RLAT0
RLAT1
RLAT2
RLAT3
RLAT4
RLAT5
RLAT6
RLAT7
T74LS04B1
PART OF 1E
R6
10K
ON74LS245N
10G
TRANSCEIVER
IND0
IND1
IND2
IND3
IND4
IND5
IND6
IND7
IND8
IND9
IND10
IND11
IND12
IND13
IND14
IND15
76
RLAT8
RLAT9
RLAT10
RLAT11
RLAT12
RLAT13
RLAT14
RLAT15
CCARNDLY
RAMBUF
CABLING:
HEAVY LINES REDUCE
USE OF MULTIPLE LINES
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D
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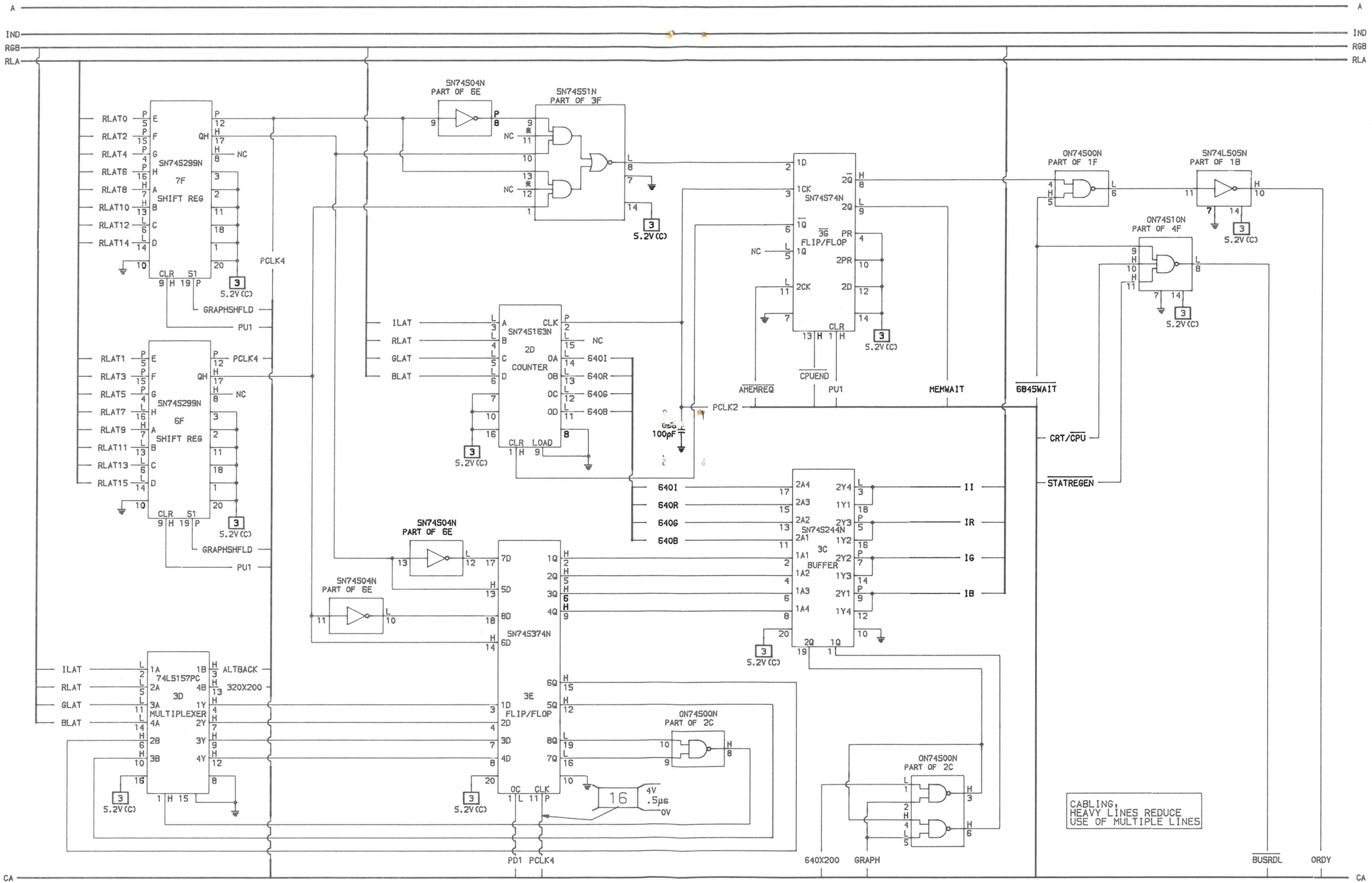
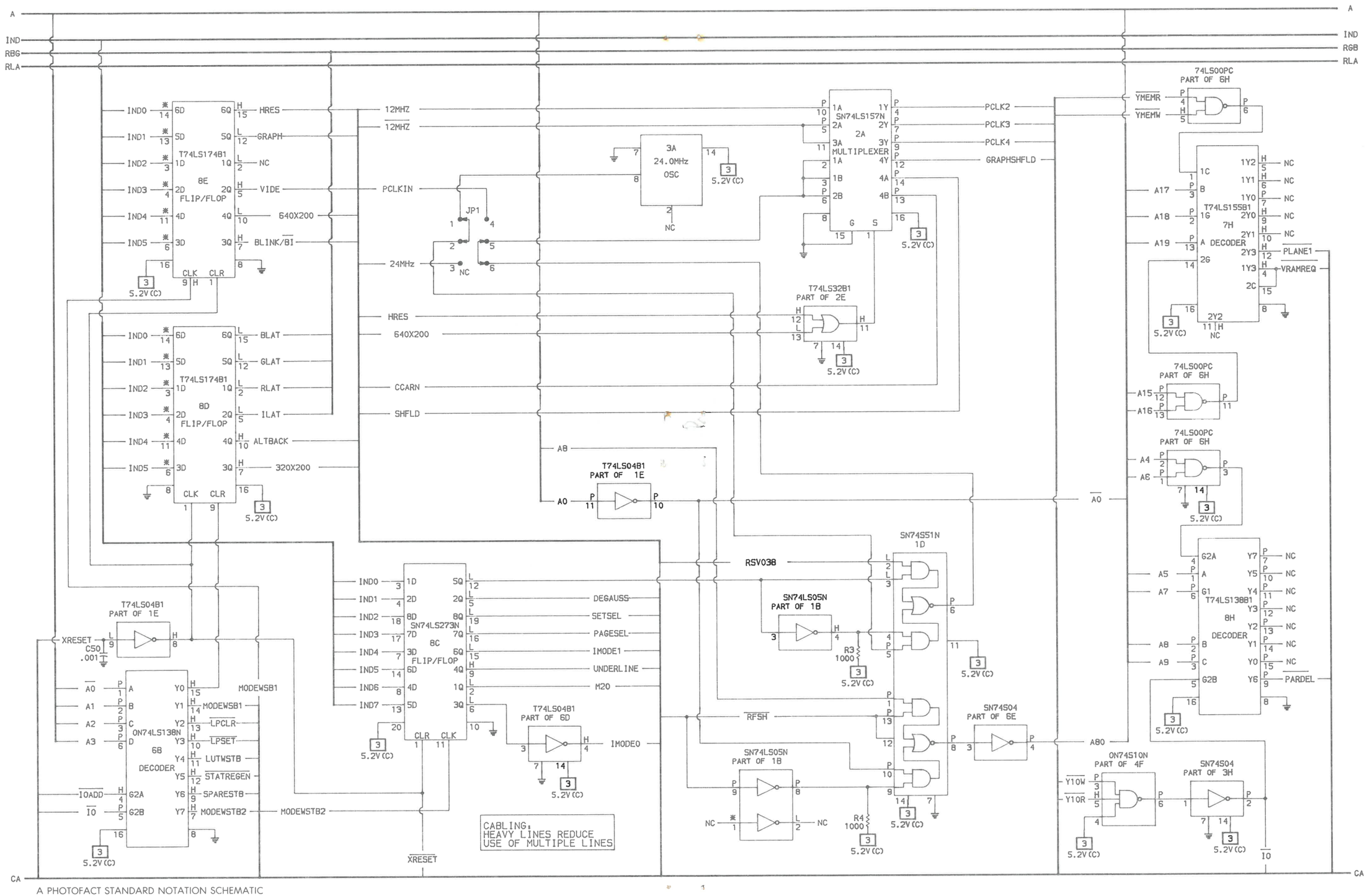
RLA
CA

AT&T
MODEL 6300 PLUS



A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH CIRCUITRACE®



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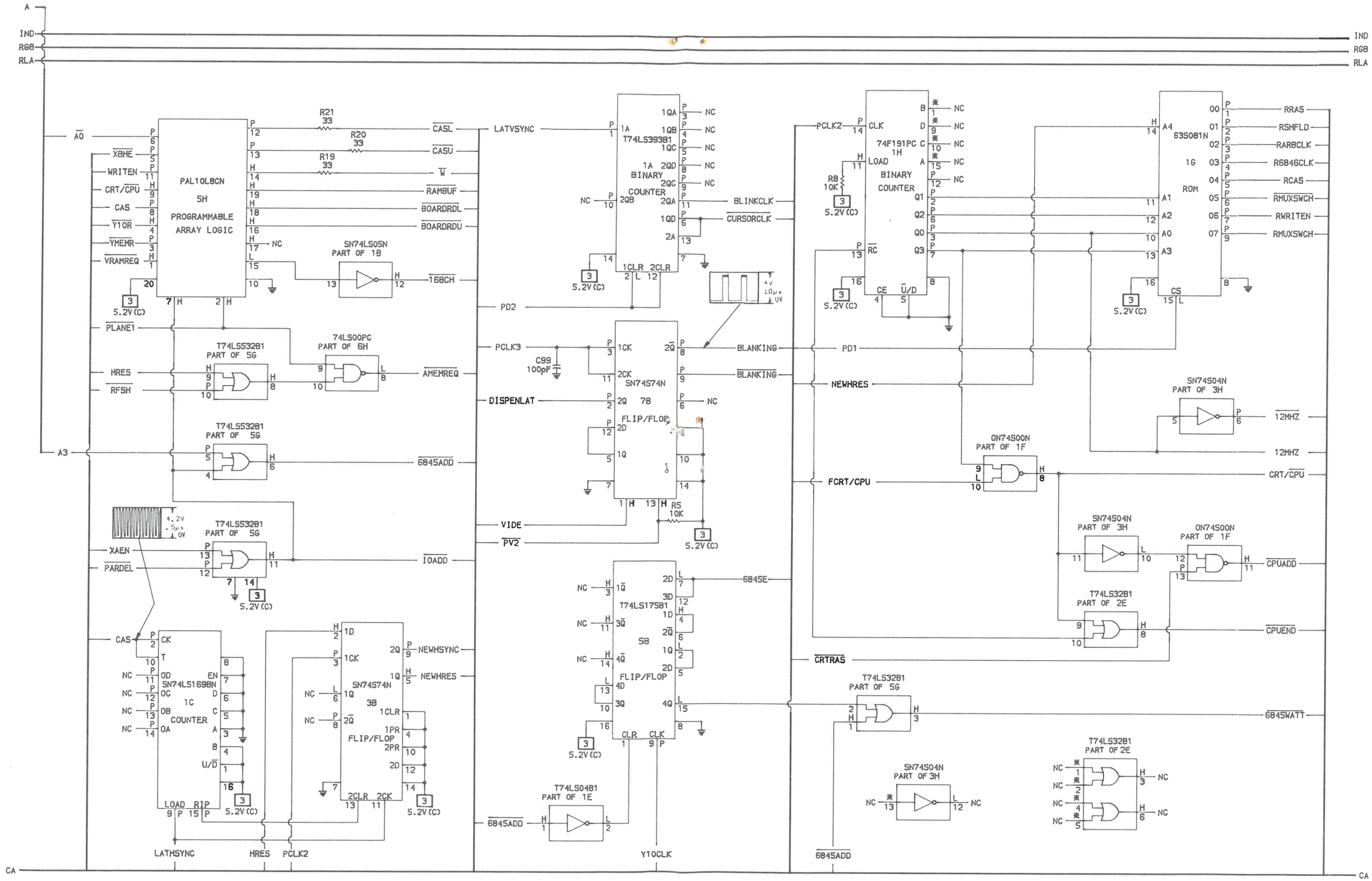

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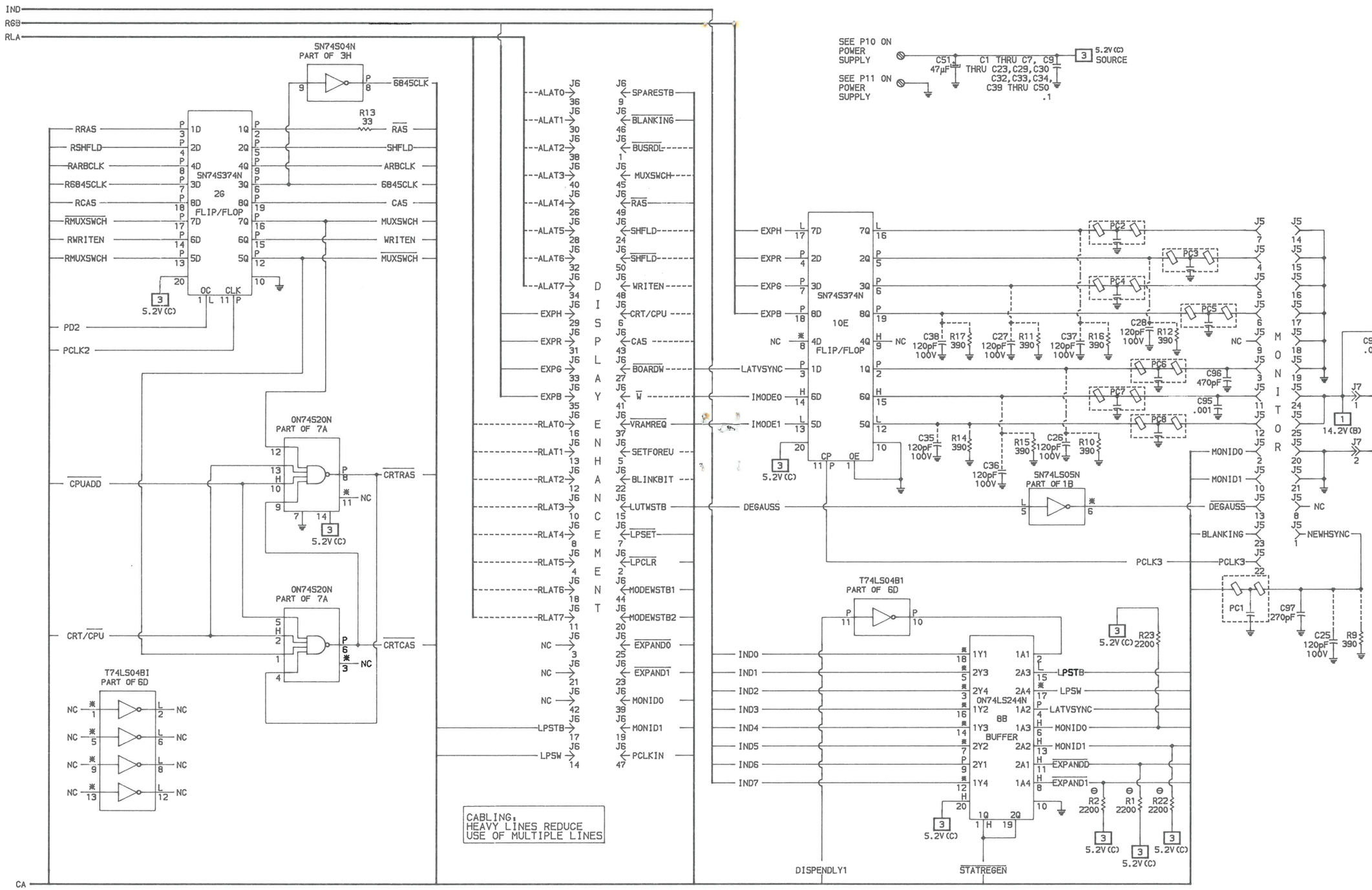
WITH CIRCUITRACE™



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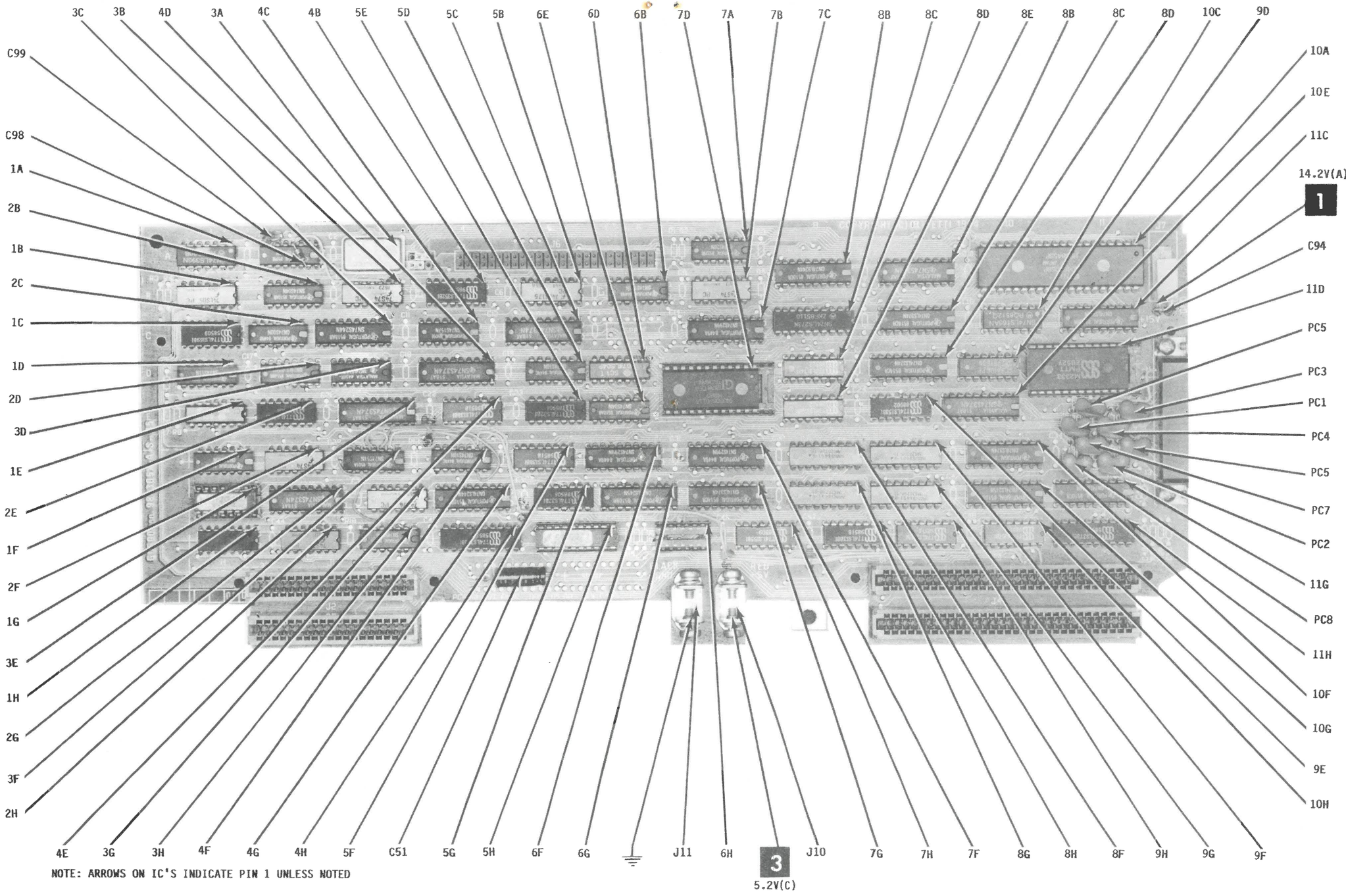
WITH CIRCUITRACE®



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

DISPLAY CONTROLLER BOARD-TOP

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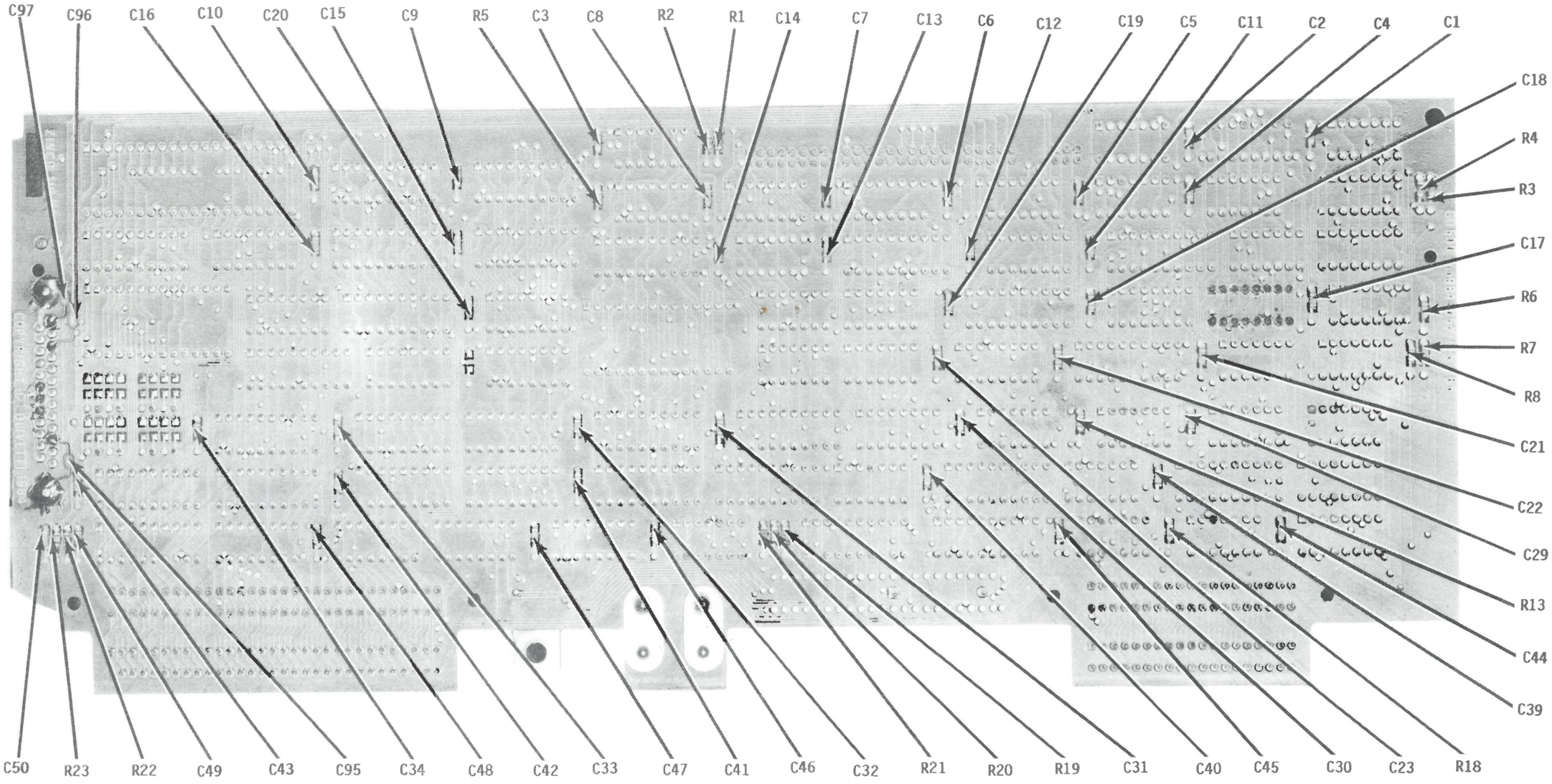
DISPLAY CONTROLLER BOARD-TOP



DISPLAY CONTROLLER BOARD-BOTTOM

8

DISPLAY CONTROLLER BOARD-BOTTOM

17

LOGIC CHART (Continued)

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	L	H	P	P	P	H	L	P	P	P	H	22	H
3	*	L	H	P	P	P	*	P	P	P	P	L	23	L
4	*	H	H	P	P	P	P	P	H	H	P	P	24	P
5	H	P	P	P	P	P	P	L	P	P	P	P	25	H
6	*	P	P	P	P	P	P	L	P	P	P	P	26	*
7	H	P	P	P	P	P	P	L	P	P	P	P	27	*
8	L	P	P	L	P	P	*	L	P	P	L	P	28	*
9	H	H	H	P	P	P	H	L	H	H	P	P	29	*
10	L	P	P	P	L	L	L	L	P	P	H	P	30	*
11	*	P	P	P	P	P	P	L	P	P	P	P	31	*
12	L	P	P	P	P	P	P	L	P	P	P	P	32	*
13	*	P	P	P	P	P	P	P	P	P	P	P	33	*
14	*	P	P	P	P	P	P	L	P	P	P	P	34	L
15	H	L	H	P	P	P	P	L	P	P	H	P	35	P
16	H	P	P	H	P	P	P	H	P	P	H	L	36	P
17		L	L		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	H	P	H	H	21	H	1	H	H
2	L	P	P	P	P	P	*	L	22	H	2	P	P
3	*	L	P	P	P	H	*	*	23	H	3	*	*
4	*	P	P	L	P	P	*	*	24	H	4	P	*
5	*	P	P	L	L	P	*	*	25	H	5	*	P
6	*	P	P	P	P	P	*	*	26	H	6	P	P
7	L	H	P	P	P	P	*	*	27	H	7	*	*
8	L	L	*	P	P	L	*	*	28	H	8	P	*
9	P	L	H	P	P	P	*	*			9	*	P
10	L	H	L	L	L	P	L	*			10	L	L
11	H	P	P	P	*	P	*	*			11	P	L
12	H	P	L	P	*	P	*	*			12	*	P
13	H	P	L	P	*	P	*	*			13	P	*
14	H	L	H	P	*	P	*	L			14	*	*
15	L	L	H	P	*	H	*	*			15	P	P
16	H	H	L	P	*	H	*	*			16	*	P
17			L	P	*		*	*			17	P	*
18			P	P	*		*	*			18	*	*
19			P	P	H		H	*			19	H	P
20			H	H	H		H	H			20	H	H

TROUBLESHOOTING

USING A PRINTER FOR DISPLAY

If there is a defect in the Display 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 MSDOS or GWBasic the Printer output can be turned On by holding the Ctrl Key down and pressing the Prt Sc 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 used 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 TO640
 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 pin 11, 12 and 13 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 15 of IC 3C. If pulses are missing, check IC 3C.

TROUBLESHOOTING (Continued)

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 pulses at pin 2 and 6 of IC 3G. If the logic reading is not correct at pin 2, check IC's 3F 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 at 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.

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 IC9B. 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 IC8C. 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 nay 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

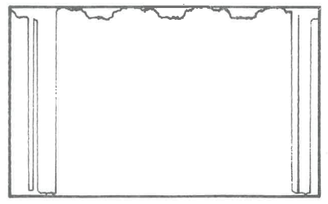
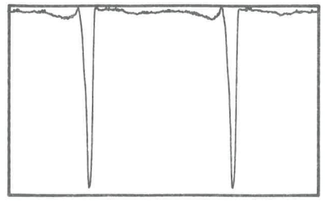


Figure E



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

LOGIC CHART (Continued)

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	H	H	L	L	P	H	H	H	H	P	*	H	H	H
2	H	H	L	P	H	L	H	L	H	P	L	L	H	L
3	*	*	H	P	L	H	H	H	P	P	L	P	H	L
4	H	*	H	P	H	L	L	H	H	H	H	P	P	H
5	*	H	L	P	P	H	L	P	P	P	*	H	P	H
6	H	H	H	H	H	H	H	H	P	P	L	L	L	H
7	*	*	L	*	L	L	L	L	H	H	L	L	H	L
8	H	*	L	P	P	H	L	H	P	L	L	P	H	L
9	*	H	P	P	H	*	H	H	H	H	*	P	H	L
10	L	L	L	L	P	*	H	P	L	H	P	L	L	L
11	H	L	H	P	P	H	H	H	P	H	P	H	H	*
12	*	H	L	L	P	H	H	P	P	H	L	L	P	*
13	H	*	L	L	H	L	H	P	P	H	*	H	L	*
14	*	*	H	P	H	H	H	H	H	H	H	H	L	*
15	H	H	L	P			H		L	H			P	*
16	*	H	H	H			H		H	H			L	*
17	H	*		*					H				H	*
18	*	*		*					H				H	*
19	H	H		H					H				P	H
20	H	H		H					H				H	H

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

Note (15): 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).

PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
9H	T74LS257B1	NTE74LS257	ECG74LS257	SK74LS257		
10A	HD6845SP					
10C	ON74LS163AN	NTE74LS163A	ECG74LS163A	SK74LS163		
10D	SN74S163N					
10E	SN74S374N					
10F	SN74LS374N	NTE74LS374	ECG74LS374	SK7CT374		
10G	ON74LS245N	NTE74LS245	ECG74LS245	SK74LS245		
10H	T74LS257B1	NTE74LS257	ECG74LS257	SK74LS257		
11C	ON74LS245N	NTE74LS245	ECG74LS245	SK74LS245		
11D	PMTT18501					
11G	ON74LS244N	NTE74LS244	ECG74LS244	SK74LS244		
11H	T74LS373B1	NTE74LS373	ECG74LS373	SK74LS373		

SWITCHES AND JUMPERS

DISPLAY CONTROLLER BOARD

The jumper block on the upper left section of the Display Controller Board is used to select the Oscillator used for the Display Controller Board. Use the following chart to determine where to install jumpers:

FUNCTION	INSTALL JUMPERS ON PINS
24 MHz on-board oscillator	1,2
System Board oscillator	2,3
High Resolution Board oscillator	4,5
Clock selection circuitry	5,6

NOTE: Jumpers are normally installed on pins 1 and 2 and pins 5 and 6.

TROUBLESHOOTING (Continued)

Highlight feature does not work (no highlight or highlight always On). Check pin 7 of Connector J5 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.

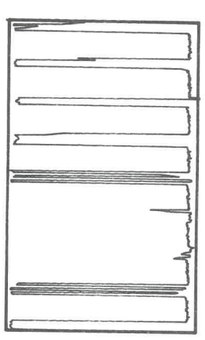


Figure F

for the waveform shown in Figure F at pin 12 of IC5 5D (this waveform should be blinking On and Off). If the waveform is not correct check IC 5D.

LOGIC CHART

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

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

PARTS LIST AND DESCRIPTION

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

SEMICONDUCTORS (Select replacement for best results)

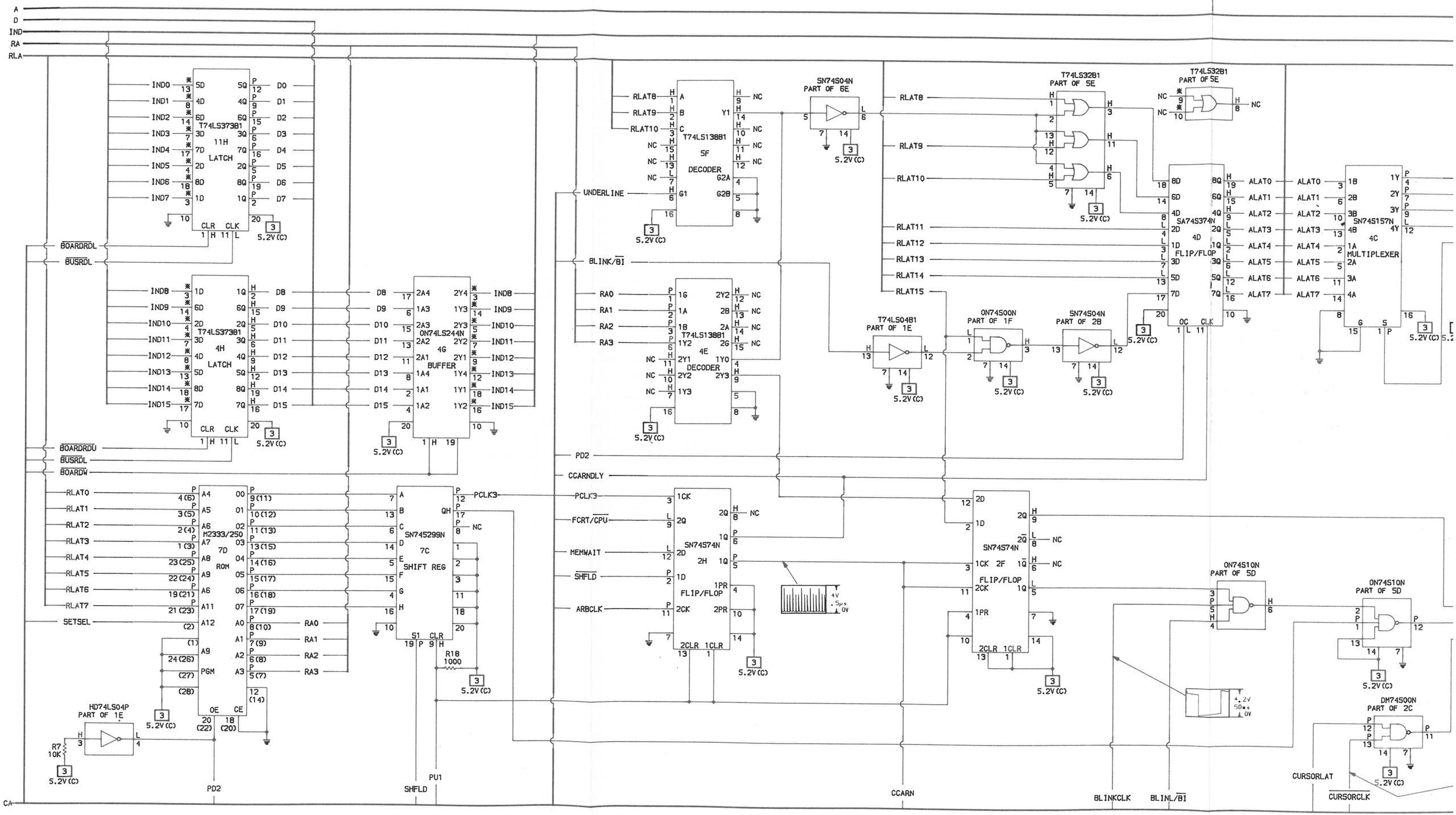
ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
DISPLAY CONTROL BOARD						
1A	T74LS393B1	NTE74LS393	ECG74LS393	SK74LS393		
1B	SN74LS05N	NTE74LS05	ECG74LS05	SK74LS05		
1C	SN74LS169BN					
1D	SN74S51N	NTE74S51	ECG74S51			
1E	T74LS04B1	NTE74LS04	ECG74LS04	SK74LS04		
1F	ON74S00N	NTE74S00	ECG74S00	SK74S00		
1G	63S081N					
1H	74F191PC					
2A	SN74S157N	NTE74S157	ECG74S157	SK1914		
2B	SN74S04N	NTE74S04	ECG74S04	SK74S04		
2C	ON74S00N	NTE74S00	ECG74S00	SK74S00		
2D	SN74S163N					
2E	T74LS32B1	NTE74LS32	ECG74LS32	SK74LS32		
2F	SN74S74N	NTE74S74	ECG74S74	SK74S74		
2G	SN74S374N					
2H	SN74S74N	NTE74S74	ECG74S74	SK74S74		
3B	SN74S74N	NTE74S74	ECG74S74	SK74S74		
3C	SN74S244N					
3D	74LS157PC	NTE74LS157	ECG74LS157	SK74LS157		
3E	SN74S374N					
3F	SN74S51N	NTE74S51	ECG74S51			
3G	SN74S74N	NTE74S74	ECG74S74	SK74S74		
3H	SN74S04N	NTE74S04	ECG74S04	SK74S04		
4B	T74LS352B1	NTE74LS352	ECG74LS352			
4C	SN74S157N	NTE74S157	ECG74S157	SK1914		
4D	SN74S374N					
4E	T74LS138B1	NTE74LS138	ECG74LS138	SK74LS138		
4F	ON74S10N	NTE74S10	ECG74S10			

PARTS LIST AND DESCRIPTION (Continued)

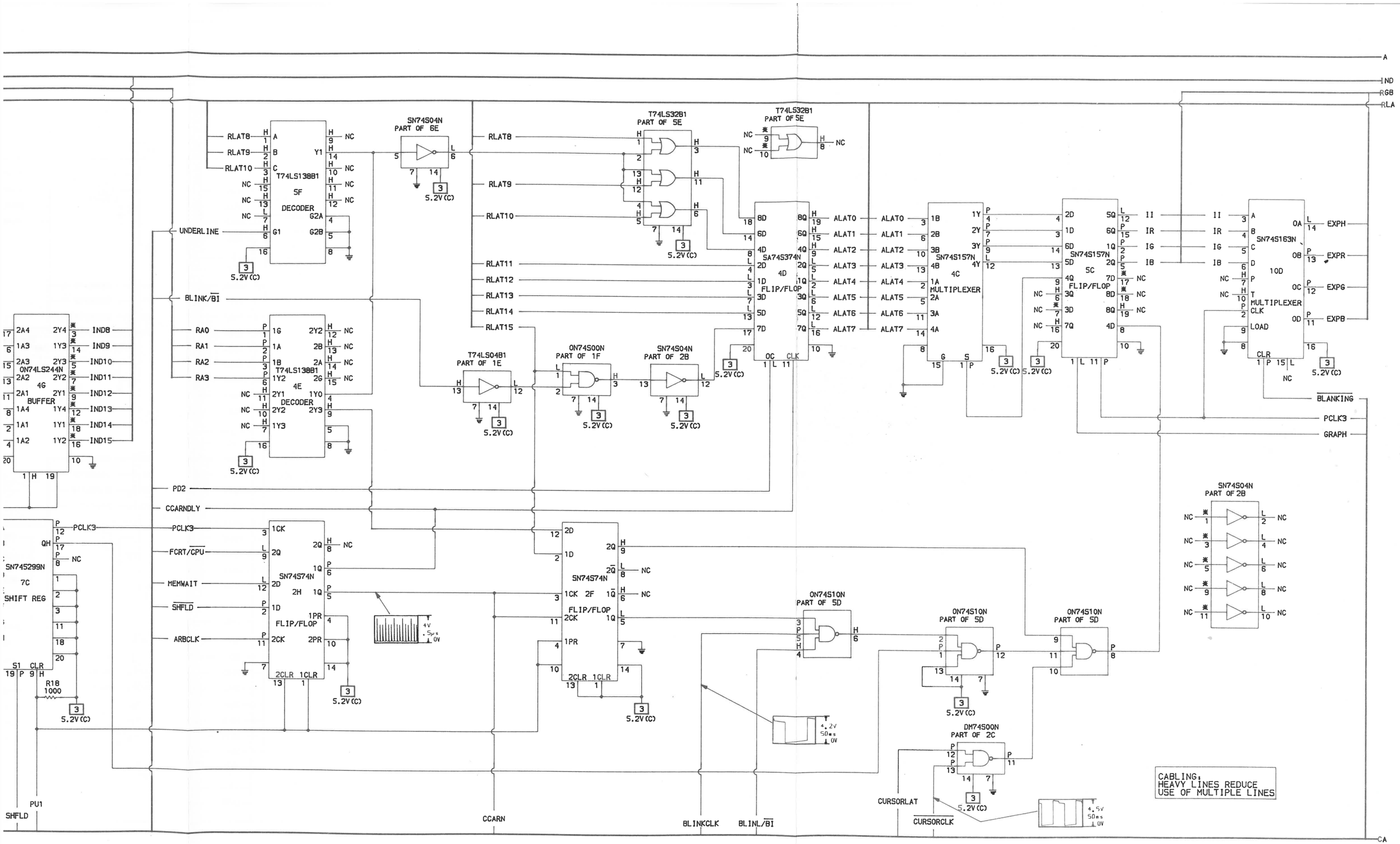
When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	TCE PART No.	ZENITH PART No.	NOTES
4G	ON74LS244N	NTE74LS244	ECG74LS244	SK74LS244		
4H	T74LS373B1	NTE74LS373	ECG74LS373	SK74LS373		
5B	T74LS175B1	NTE74LS175	ECG74LS175	SK74LS175		
5C	SN74S374N					
5D	ON74S10N	NTE74S10	ECG74S10			
5E	T74LS32B1	NTE74LS32	ECG74LS32	SK74LS32		
5F	T74LS138B1	NTE74LS138	ECG74LS138	SK74LS138		
5G	T74LS32B1	NTE74LS32	ECG74LS32	SK74LS32		
5H	PAL10L8CN					
6B	ON74S138N	NTE74LS138	ECG74LS138	SK74LS138		
6D	T74LS04B1	NTE74LS04	ECG74LS04	SK74LS04		
6E	SN74S04N	NTE74S04	ECG74S04	SK74S04		
6F	SN74S299N					
6G	ON74LS245N	NTE74LS245	ECG74LS245	SK74LS245		
6H	74LS00PC	NTE74LS00	ECG74LS00	SK74LS00		
7A	ON74S20N	NTE74S20	ECG74S20	SK74S20		
7B	SN74S74N	NTE74S74	ECG74S74	SK74S74		
7C	SN74S299N					
7D	M2333/250					
7F	SN74S299N					
7G	SN74LS374N	NTE74LS374	ECG74LS374	SK7CT374		
7H	T74LS155B1	NTE74LS155	ECG74LS155	SK74LS155		
8B	ON74LS244N	NTE74LS244	ECG74LS244	SK74LS244		
8C	SN74LS273N	NTE74LS273	ECG74LS273	SK74LS273		
8D,8E	T74LS174B1	NTE74LS174	ECG74LS174	SK74LS174		
8F,8G	D41416C-15					
8H	T74LS138B1	NTE74LS138	ECG74LS138	SK74LS138		
9B	SN74S374N					
9C,9D	SN74LS374N	NTE74LS374	ECG74LS374	SK7CT374		
9E	SN74LS153N	NTE74LS153	ECG74LS153	SK74LS153		
9F,9G	D41416C-15					



A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH CIRCUITRACE®


A
IND
RGB
RLA
T74LS138B1
5F
DECODER
SN74S04N
PART OF 6E
T74LS32B1
PART OF 5E
T74LS32B1
PART OF 5E
SA74S374N
4D
FLIP/FLOP
SN74S157N
4C
MULTIPLEXER
SN74S157N
5C
FLIP/FLOP
SN74S163N
10D
MULTIPLEXER
ON74S244N
4G
BUFFER
T74LS138B1
4E
DECODER
T74LS04B1
PART OF 1E
ON74S00N
PART OF 1F
SN74S04N
PART OF 2B
SN74S04N
PART OF 2B
SN74S74N
2H
FLIP/FLOP
SN74S74N
2F
FLIP/FLOP
SN745299N
7C
SHIFT REG
ON74S10N
PART OF 5D
ON74S10N
PART OF 5D
ON74S10N
PART OF 5D
DM74S00N
PART OF 2C
5.2V (C)
4V
.5µs
0V
4.2V
50ns
0V
4.5V
50ns
0V
UNDERLINE
BLINK/BI
PD2
CCARNDLY
PCLK3
FCRT/CPU
MEMWAIT
SHFLD
ARBCLK
RA0
RA1
RA2
RA3
RLAT8
RLAT9
RLAT10
RLAT11
RLAT12
RLAT13
RLAT14
RLAT15
ALAT0
ALAT1
ALAT2
ALAT3
ALAT4
ALAT5
ALAT6
ALAT7
IND8
IND9
IND10
IND11
IND12
IND13
IND14
IND15
R18
1000
S1
CLR
QH
PU1
SHFLD
CCARN
BLINKCLK
BLINL/BI
CURSORLAT
CURSORCLK
BLANKING
PCLK3
GRAPH
EXPH
EXPR
EXPG
EXPB
CABLING;
HEAVY LINES REDUCE
USE OF MULTIPLE LINES
CA

CSCS28 AT&T MODEL 6300 PLUS

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Remove staples and use cover for file folder.

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

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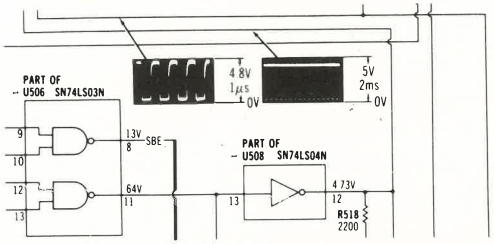
- SAMS famous industry accepted standardized notation schematics containing CIRCUITRACE® , GRIDTRACE™, waveforms, voltages and stage identification.

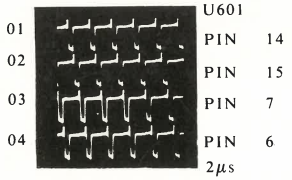


- Step by Step Troubleshooting guides the technician through the necessary procedures to quickly locate the problem.

TROUBLESHOOTING

MICROPROCESSOR CHIP (CPU) OPERATION

Verify the processor is functioning by checking the signals on the address lines (pins 10 thru 24 of IC U600) and the data lines (pins 41 thru 56) using a logic probe or a scope if a logic probe is used, refer to the "Logic Chart" for the correct readings. If a scope is used, the waveforms on the address lines (except pins 22 and 23 which have no signal in Power Up mode) should be similar to Figure 1. The waveforms on the data lines should be similar to Figure 2.

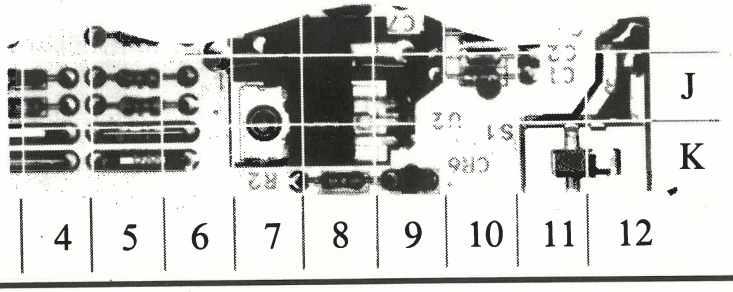


- Logic Chart containing logic probe readings to isolate defective circuitry and components.

LOGIC

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

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



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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFGR. Part No.	REPLACEMENT DATA ECG Part No.	NTE Part No.	RCA Part No.	ZENITH Part No.	NOTES
D102	1SS53	1149-2576	ECG519	NTE519	SK9091/177	103-131	
D103	2N60FM	1149-2527	ECG109	NTE109	SK3088	103-Z9001	
D201	1N4004GP	1201-4205	ECG116	NTE116	SK3312	212-76-02	
D501 thru D503	1SS53	1149-2576	ECG519	NTE519	SK9091/177	103-131	

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