

COMPUTERFACTS™

Technical Service Data

TANDY® MODEL 1000SX COMPUTER



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

PRELIMINARY SERVICE CHECKS

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

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

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

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

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

TEST EQUIPMENT AND TOOLS

TEST EQUIPMENT

Digital Volt/Ohm Meter
Logic Probe
Frequency Counter
Monitor with Audio Input
Disk Drive Tester or Test Program

TOOLS

Head Cleaning Equipment
Contact and Switch Cleaner (non-spray type)
Phillips Screwdriver
Flat Blade Screwdriver
1/4" Socket
IC Insertion and Removal Tools 20, 24 and 40 pin 14, 16, 28
Low Wattage Soldering Iron
Desoldering Equipment

SAMS™**Howard W. Sams & Co.**

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

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

87CS19008**DATE 9-87**

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POWER SUPPLY

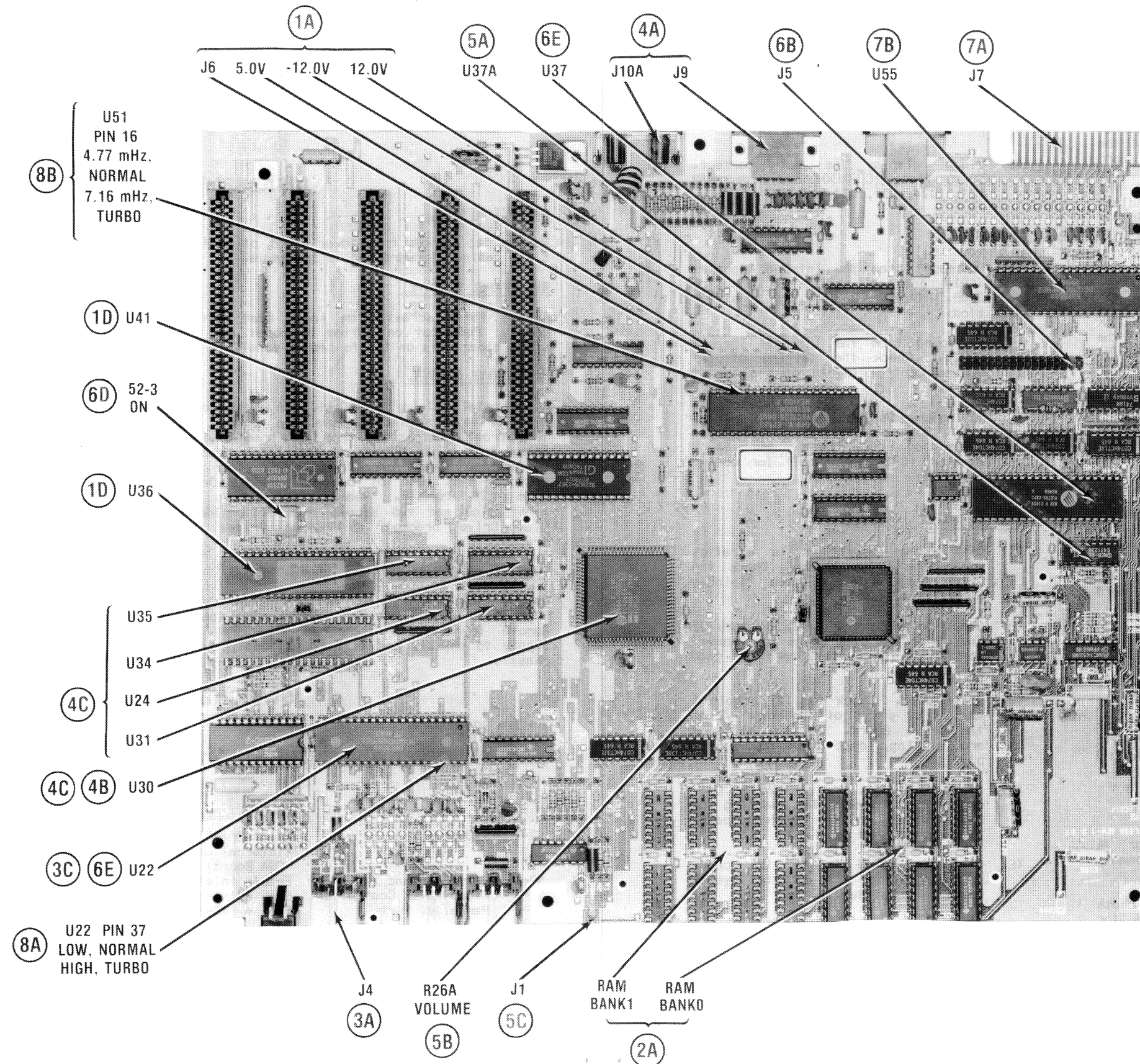
5V ADJUSTMENT

12V ADJUSTMENT

PRELIMINARY SERVICE CHECKS (Continued)



PRELIMINARY SERVICE CHECKS (Continued)



PRELIMINARY SERVICE CHECKS (Continued)

SERVICE CHECKS

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

①

COMPUTER DEAD

- (A) Check for 5.0V at pin 1, -12.0V at pin 8 and 12.0V at pin 9 of Connector J6 on the System Board. If the voltages are correct, go to part (D). If the voltages are not correct, check the adjustment of the 5V Adjust (VR1) and 12.0V Adjust (VR2) Controls on the Power Supply Board, see "Miscellaneous Adjustments."
- (B) If the voltages are missing at Connector J6, turn the Computer Off and disconnect the power connectors from the System Board and Disk Drive. Connect a #1129 lamp to the 5.0V Source (pin 1 of Connector J6) and a #93 lamp to the 12.0V Source (Pin 9 of Connector J6). WARNING: Operating the Power Supply without a load may damage it. Turn the Power Supply On and recheck the voltages. If the voltages are still missing, check Fuse F1.
- (C) If the correct voltages return, reconnect the Power Supply to the System Board and Disk Drives one at a time until the Board or Drive that is causing the Power Supply to shutdown is found. WARNING: Be sure Power supply is turned Off when connecting to the System Board or Disk Drive.
- (D) Check the CPU IC (U36) and ROM IC (U41) by substitution.

②

SYSTEM BOARD

- (A) A program runs for a while, then suddenly stops or becomes erratic in operation. Check RAM IC Banks 0 and 1 (IC's U1 thru U16).

③

KEYBOARD

- (A) Keyboard dead. Check Connector J4 on the System Board for good connections.
- (B) Check the Keyboard cable and check Connector CN on the Keyboard for good connections.
- (C) Check IC U22 on the System Board by substitution.

④

VIDEO

- (A) No video. Check Connectors J9 and J10A for good connections and check the Video cable going to the Monitor.

- (B) Check Video IC (U30) by substitution.

- (C) Video display is not correct. Check Video IC (U30) and Video RAM IC's (U24, U31, U34 and U35).

⑤

SOUND

- (A) No sound from the Internal Speaker (SP1) and no audio at Connector J10B. Check IC U37A by substitution.
- (B) No sound from the Internal Speaker (SP1). Check the setting of the Volume Control (R26A) on the System Board.
- (C) If Volume Control is set properly, check Connector J1 on System Board for good connections and check Speaker (SP1) voice coil for continuity.

⑥

DISK DRIVE

- (A) Disk Drive operation is erratic. Clean the Drive heads. Check the Drive Spindle Speed, see "Spindle Speed Check".
- (B) Check Connectors J1, J2, J4 thru J7 and J9 on the Disk Drive and Connector J5 on the System Board for good connections.
- (C) Drive dead. Check for 12V at pin 1 and 5V at pin 4 of Connector J2 on the Drive Board. If the voltages are missing, check the Power Supply.
- (D) If the voltages are present at Connector J2, check the setting of Switch S2-3 on the System Board. It should be set On.
- (E) If Switch S2-3 is set On, check IC's U22 and U37 on the System Board by substitution.

⑦

PARALLEL PORT

- (A) Parallel Port does not work. check Connector J7 for good connections.
- (B) Check IC U55 by substitution.

PRELIMINARY SERVICE CHECKS (Continued)

⑧

NORMAL/TURBO CPU CLOCK

- (A) Run the following program to switch the CPU clock speed each time a key is pressed:

```
10 OUT 98,32:PRINT "NORMAL (4.77MHz)"
20 AS=INKEYS:IF AS="" THEN 20
30 OUT 98,40:PRINT "TURBO (7.16MHz)"
40 AS=INKEYS:IF AS="" THEN 40 ELSE 10
```

Check for a logic Low at pin 37 of IC U22 with the speed set to "Normal" and logic High with the speed set to "Turbo". If the reading is not correct, check IC U22.

- (B) Check for a frequency of 4.77MHz at pin 16 of IC U51 with the speed set to "Normal" and 7.16MHz with the speed set to "Turbo". If the frequency does not switch, check IC U51.

DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL

Remove two screws from lower front of cabinet. Slide cabinet forward and up to remove.

REAR PANEL REMOVAL

Remove three screws from lower rear of rear panel. Pull out on bottom of panel and lift up to clear tabs on top to remove panel.

DISK DRIVE REMOVAL

Slide metal shield out of slot on left side of Disk Drive bracket. Remove two screws from left front, two screws from left rear and one screw from right bottom of Disk Drive bracket. Slide the Drives forward and unplug four connectors from rear of Drives. Remove Drives from Main Chassis. Remove four screws from right side and two screws from left side of Disk Drive bracket to remove Drives from bracket.

POWER SUPPLY REMOVAL

Unplug Power Supply Connectors from System Board and Disk Drives. Remove rear panel. Remove four screws from rear holding Power Supply to chassis and lift Power Supply out of chassis.

SYSTEM BOARD REMOVAL

Remove Disk Drives and Power Supply. Remove four screws holding left side of chassis and remove left side. Disconnect Speaker plug from System Board. Remove plug-in boards from System Board. Remove four screws holding System Board to bottom of chassis and lift board out of chassis.

POWER SUPPLY DISASSEMBLY

Remove four screws holding Fan. Unplug and remove Fan. Grip end of chassis next to AC Power Connector, pull out to clear the tabs, disconnect Connector SK1 and remove the end of chassis with On-Off Switch and AC Connector. Remove four screws holding board to chassis and remove board.

KEYBOARD DISASSEMBLY

Remove nine screws from bottom of Keyboard cabinet and remove bottom of cabinet. Lift Keyboard out of cabinet top.

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SWITCHES AND JUMPERS

SYSTEM BOARD

VIDEO AND INTERRUPT SWITCHES (S2)

	<u>ON</u>	<u>OFF</u>
S2-1 Video	Color Graphics Video (Internal or optional CGA Board)	Optional Monochrome Video Board
S2-2 Vertical Sync	Enable Interrupt 5	Disable Interrupt 5
S2-3 Floppy Disk Controller	Enable Interrupt 6	Disable Interrupt 6
S2-4 Parallel Port	Enable Interrupt 7	Disable Interrupt 7

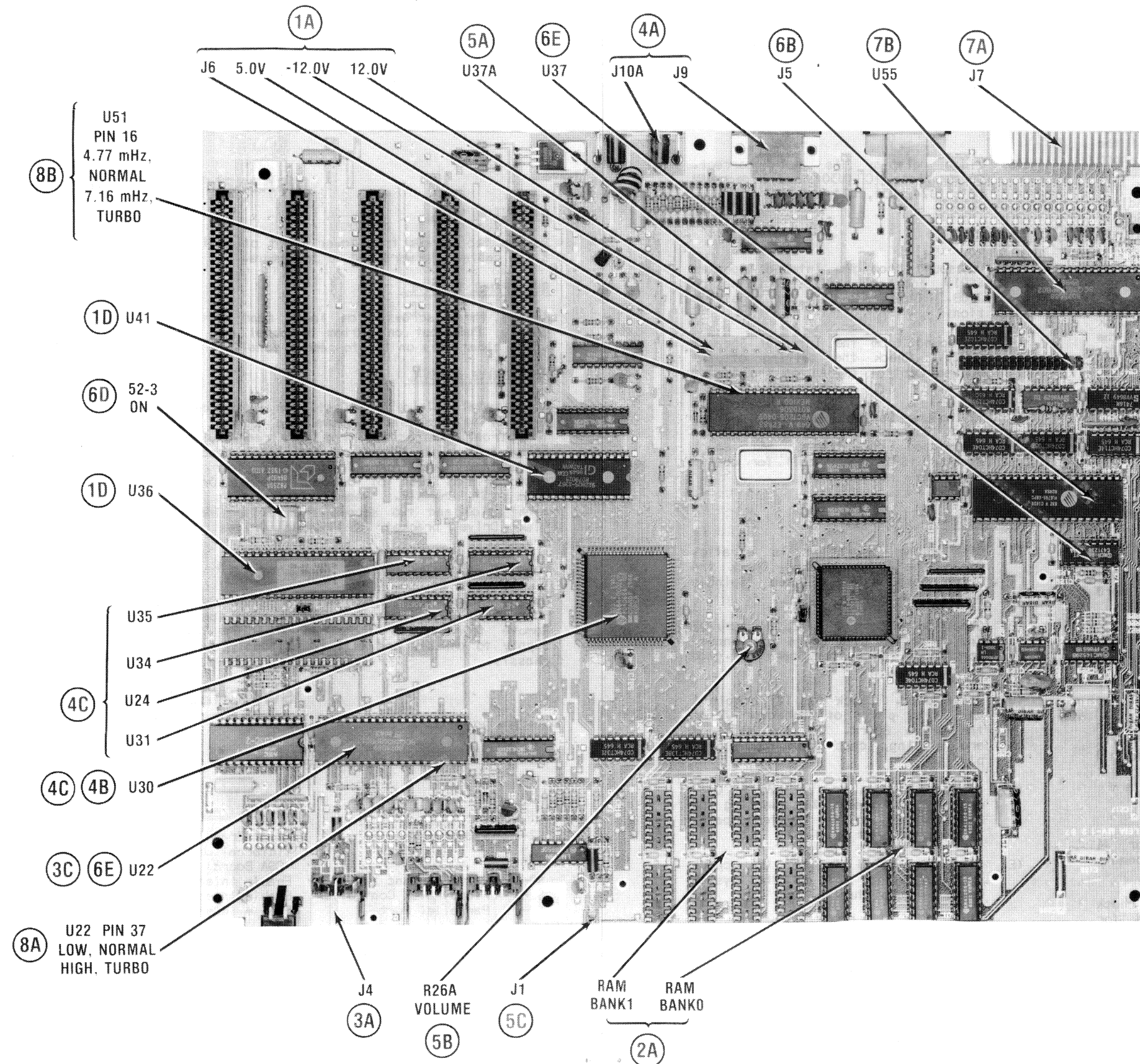
RAM JUMPER

Remove jumper from pins E1 and E2 when installing additional 256K RAM IC's. (U5 thru U8 and U13 thru U16.)

8047 MATH CO-PROCESSOR JUMPER

Remove jumper from pins E3 and E4 when installing on 8047 Math Co-Processor IC (U33).

PRELIMINARY SERVICE CHECKS (Continued)



PRELIMINARY SERVICE CHECKS (Continued)

PREVENTATIVE MAINTENANCE

ENVIRONMENT

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

ELECTRICAL POWER

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

KEYBOARD

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

DISK DRIVES

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

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

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

PRINTERS

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

STATIC ELECTRICITY

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

MONITOR

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

PRELIMINARY SERVICE CHECKS (Continued)

GENERAL OPERATING INSTRUCTIONS

BOOT UP

Insert a bootable diskette into Disk Drive A and turn On the Computer. The Computer will automatically boot up using the diskette in Disk Drive A. If a MS-DOS (Microsoft Disk Operating System) diskette is used, the Computer will display the date and time and ask for a new date and time. After the date and time have been entered, the version of DOS will be displayed on the Monitor screen along with an A which indicates the DOS is running.

If Function Key F3 is pressed immediately after the Computer beeps when turned On, the Computer will boot up from a diskette inserted in Drive B.

MS-DOS

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

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

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

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

Insert a diskette containing a "Format Program" into Disk Drive A. Type FORMAT and press the ENTER key. Follow the instructions on the Monitor screen to format the unformatted diskette. NOTE: Formatting a diskette will wipe out any programs previously placed on the diskette. The Computer automatically defaults to Disk Drive A if the destination Disk Drive is not specified. Be sure to specify the destination Disk Drive of the diskette to be formatted or the original diskette may be ruined by the default action.

BASIC

When turned On, the Computer will come up in MS-DOS as long as the MS-DOS diskette is in Drive A. The version of MS-DOS will appear at the top of the screen.

The manufacturer also supplies Disk Basic on diskette. To load Disk Basic, first boot up DOS. Insert a diskette with Disk Basic program on it. Type BASIC and press the RETURN

key or type BASICA and press the RETURN key to load Disk Basic. To return to DOS from Basic, type SYSTEM and press the ENTER key.

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

To load a program in Disk Basic or Advanced Disk Basic from the diskette, type LOAD, the program name enclosed in quotes, and press the Enter Key.

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

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

RESETTING COMPUTER

Press the CTRL, ALT, and DEL keys, all three at the same time, to reset the Computer. The Computer can also be reset by pressing the Reset button on lower left front panel.

CHANGING OPERATING MODES

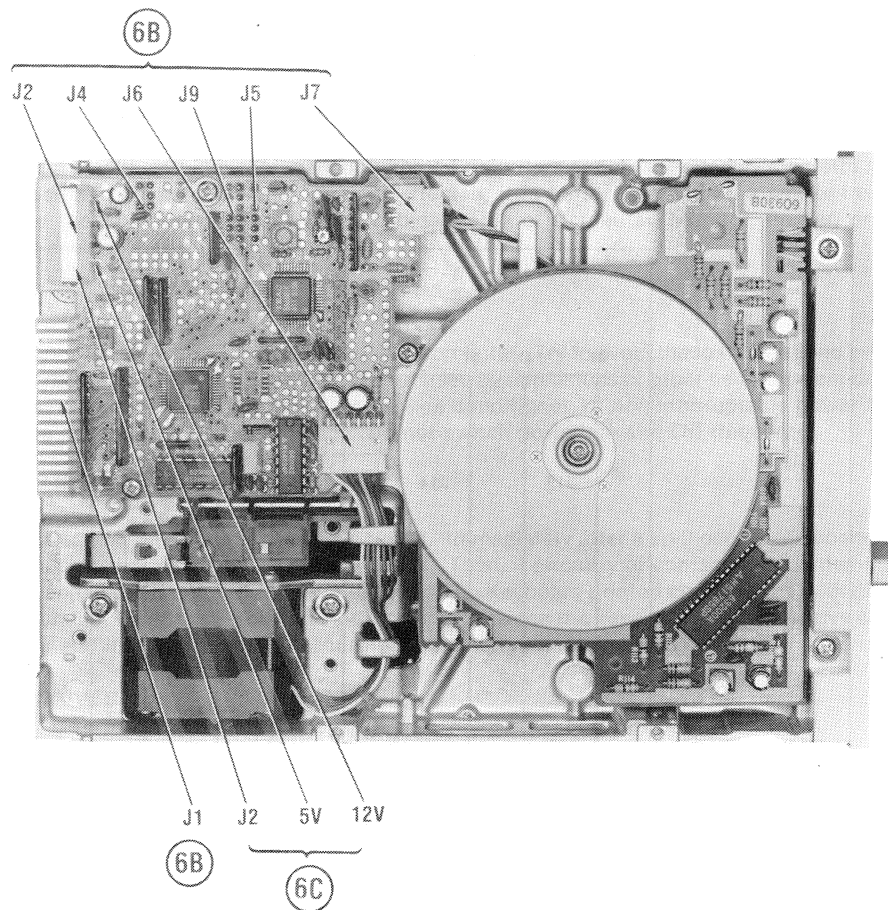
The Video, Disk Drive, and CPU speed modes can be changed by pressing Function Keys F1 thru F4 immediately after the Computer beeps when it is turned On. Use the following chart to determine the function of each Key:

- F1 - Changes the Video mode to Monochrome mode. (Computer normally comes up in Color Graphics mode.)
- F2 - Changes the Video mode to TV mode.
- F3 - Swaps Disk Drive references. Drive A becomes Drive B and Drive B becomes Drive A. The Computer will boot up from the top Drive (normally Drive B).
- F4 - Changes CPU speed to 4.77MHz. The Computer normally comes up with a CPU speed of 7.16MHz.

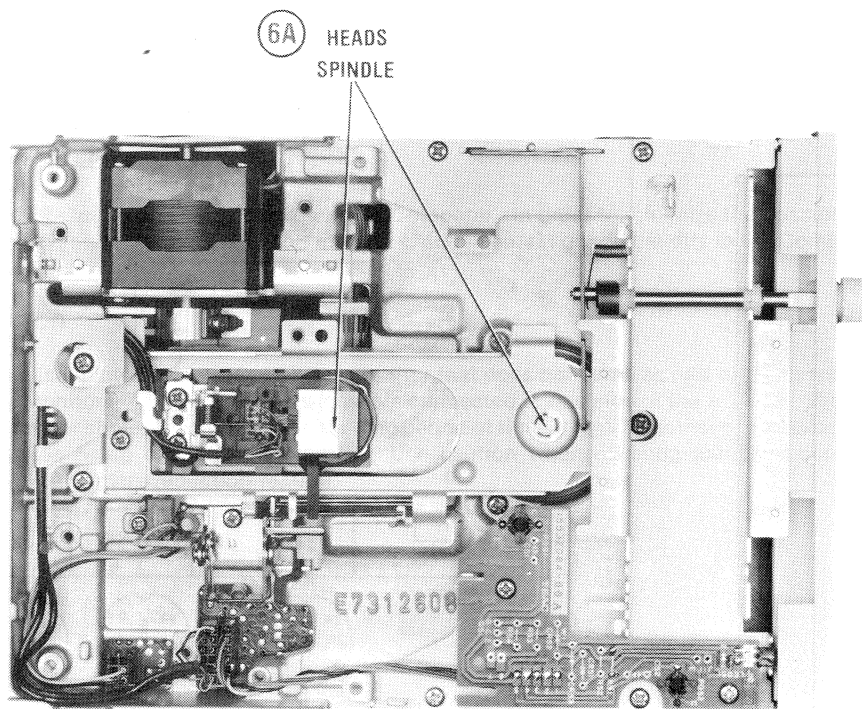
VOLUME CONTROL

A Volume Control (R26A) is provided on the Main System Board to set the volume of the internal speaker. The cabinet must be removed to gain access to the control.

PRELIMINARY SERVICE CHECKS (Continued)



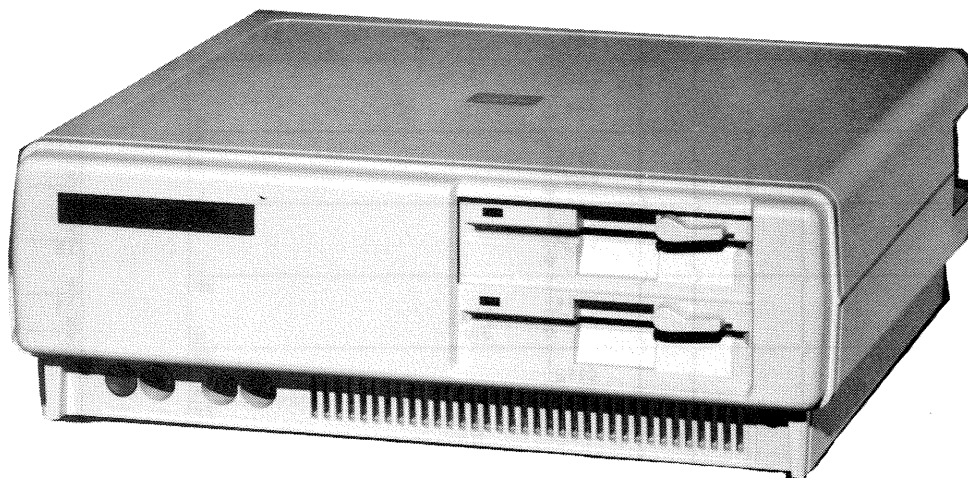
CHASSIS - BOTTOM VIEW



CHASSIS - TOP VIEW

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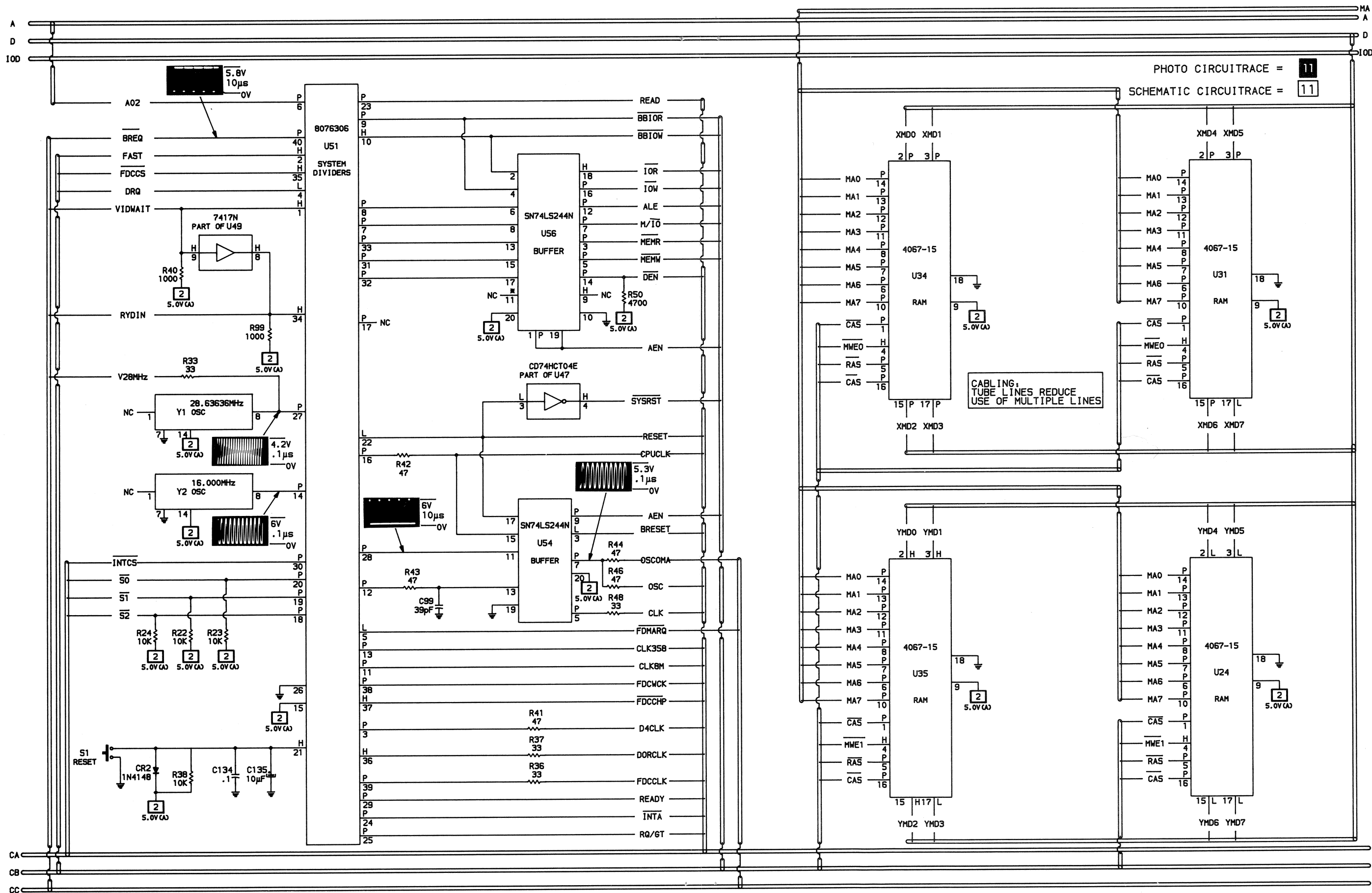
SAFETY PRECAUTIONS

See page 14

INDEX

	Page		Page
Block Diagram.....	41	Photos	
Disassembly Instructions.....	14	Keyboard.....	36
General Operating Instructions....	13	Power Supply Board.....	28,35
GridTrace Location Guide		System Board.....	10,12,37,39
Power Supply Board.....	29	Safety Precautions.....	14
System Board.....	11	Schematics.....	2 thru 8, 42 thru 49
IC Pinouts and Terminal Guides....	9,40	Schematic Notes.....	38
Line Definitions.....	34	Switches and Jumpers.....	38
Logic Charts.....	30 thru 33	Test Equipment.....	15
Miscellaneous Adjustments.....	38	Troubleshoot ing.....	15 thru 20
Parts List.....	21 thru 27		





A PHOTOFACIT STANDARD NOTATION SCHEMATIC

WITH **CIRCUITRACE**

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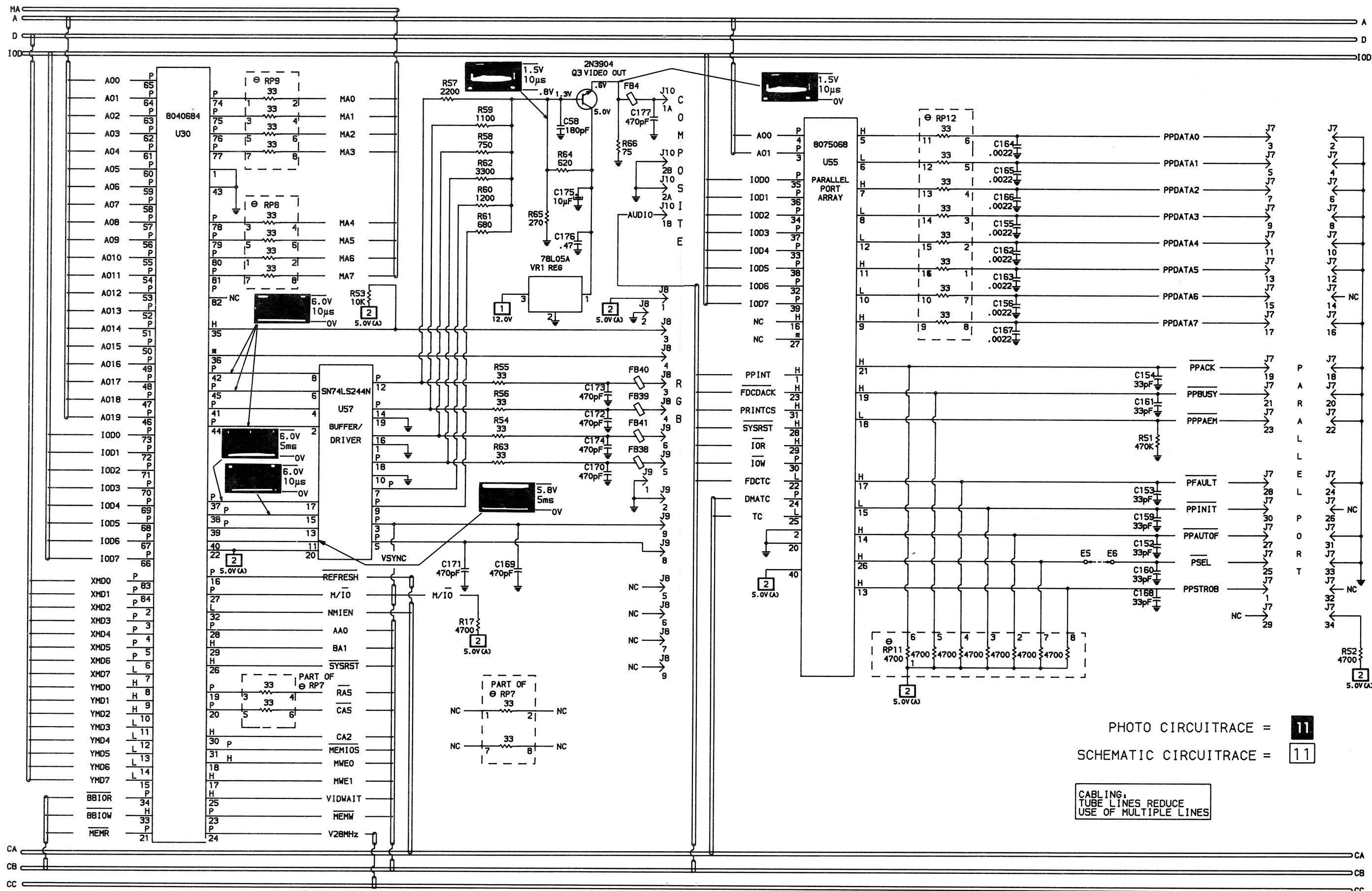
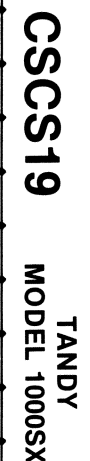


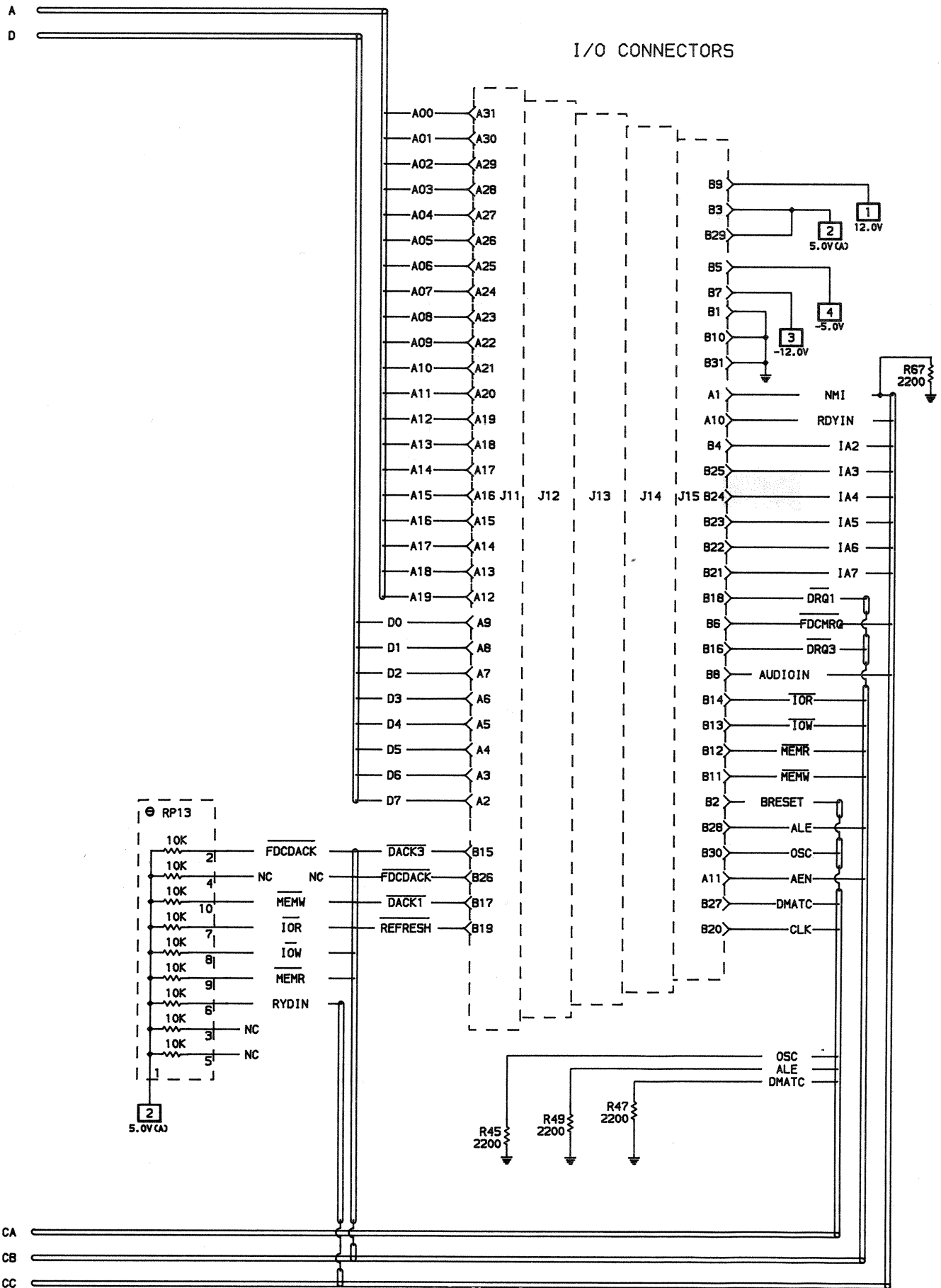
PHOTO CIRCUITRACE = 11
 SCHEMATIC CIRCUITRACE = 11

CABLING.
 TUBE LINES REDUCE
 USE OF MULTIPLE LINES

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 MODEL 1000SX



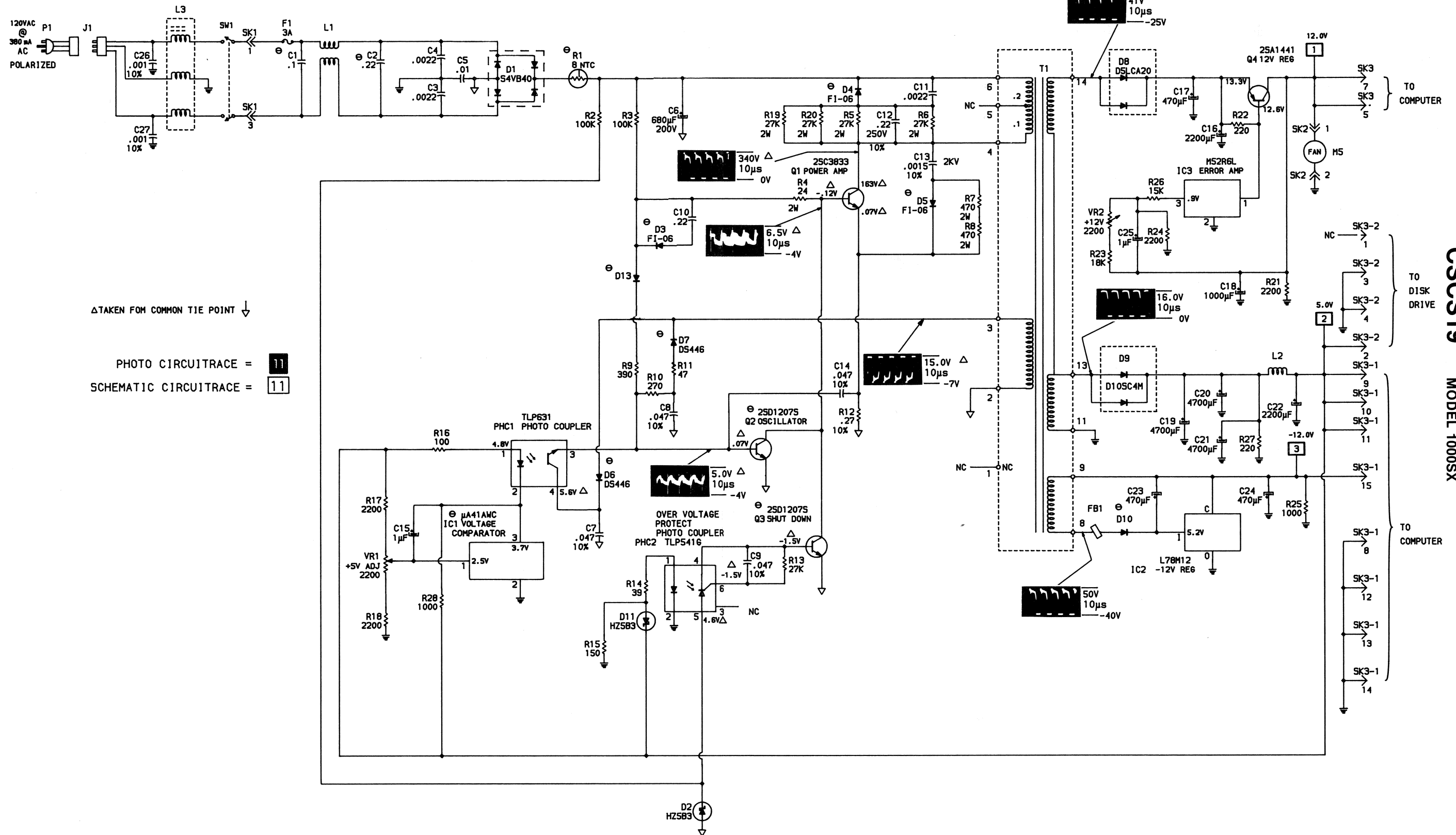
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A PHOTOFACT STANDARD NOTATION SCHEMATIC

WITH **CircuitTrace**

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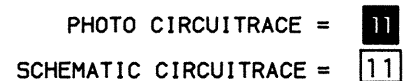
A PHOTOFAC STANDARD NOTATION SCHEMATIC

WITH CIRCUITRACE

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POWER SUPPLY

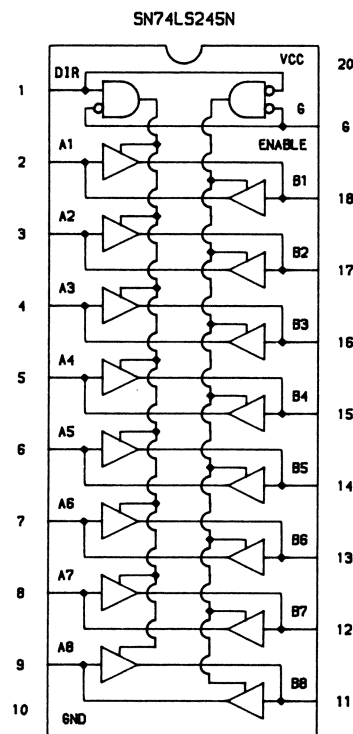
POWER SUPPLY



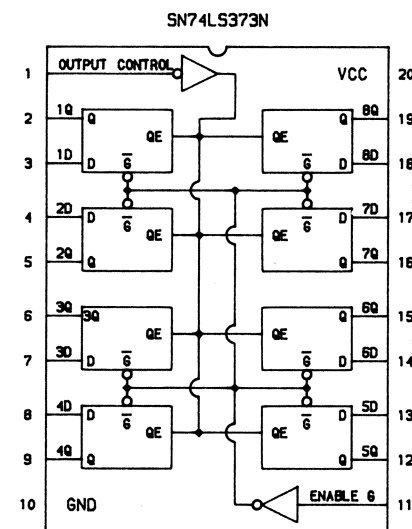
WITH **CIRCUITRACE™**

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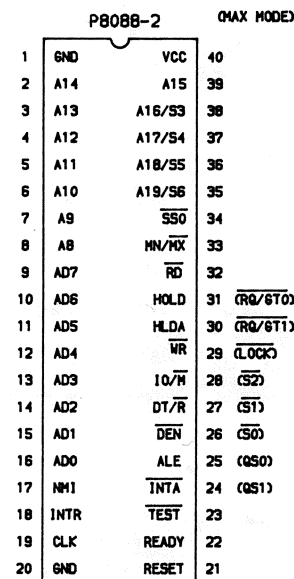
IC PINOUTS & TERMINAL GUIDES



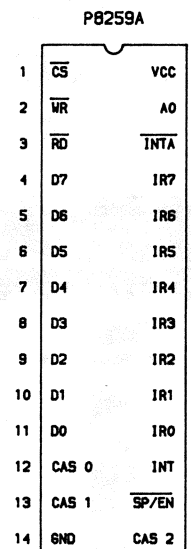
U39, U40, U52
TRANSCEIVER
TOP VIEW



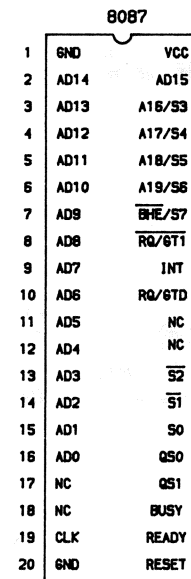
U42, U43
LATCH
TOP VIEW



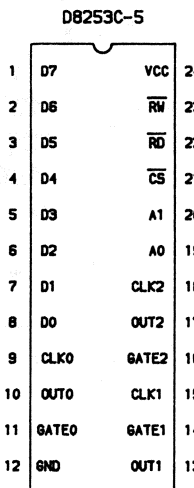
U36
CPU
TOP VIEW



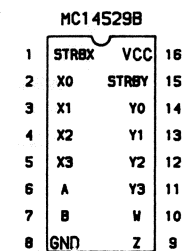
U44
INTERRUPT
CONTROLLER
TOP VIEW



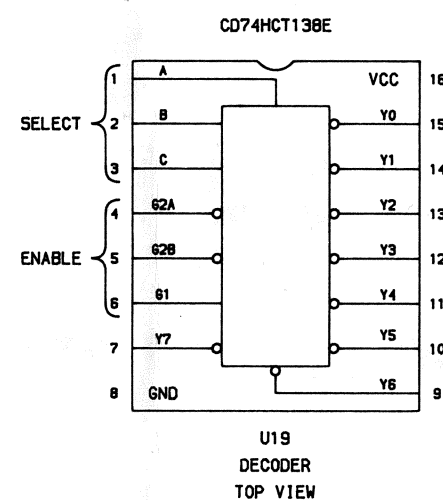
U33
COPROCESSOR
TOP VIEW



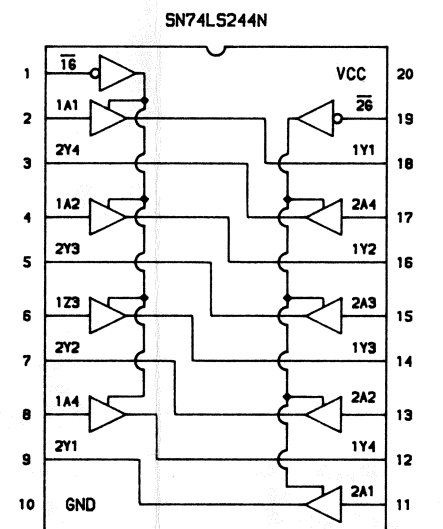
U23
TIMER
TOP VIEW



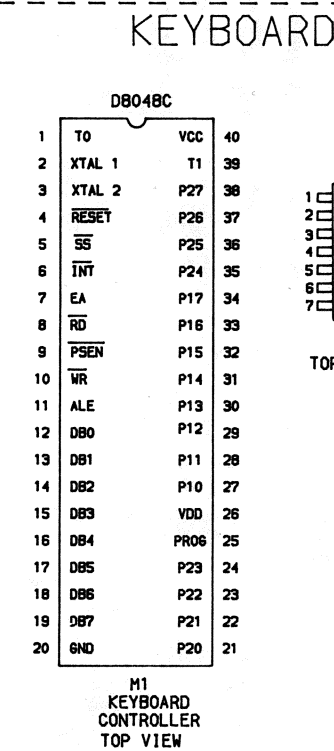
U25
INTERFACE
TOP VIEW



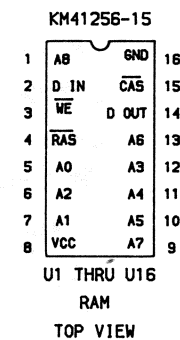
U19
DECODER
TOP VIEW



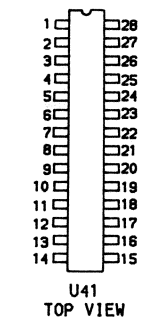
U21, U54, U56, U57
BUFFER
TOP VIEW



M1
KEYBOARD
CONTROLLER
TOP VIEW



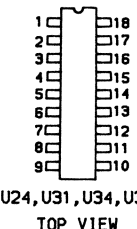
U1 THRU U16
RAM
TOP VIEW



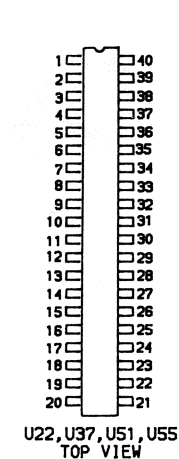
U41
TOP VIEW



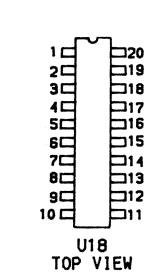
VR1
BOTTOM VIEW



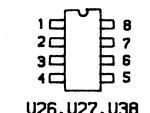
U24, U31, U34, U35
TOP VIEW



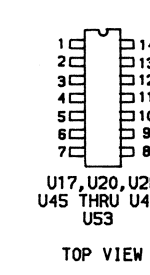
U22, U37, U51, U55
TOP VIEW



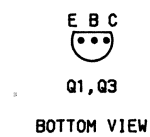
U18
TOP VIEW



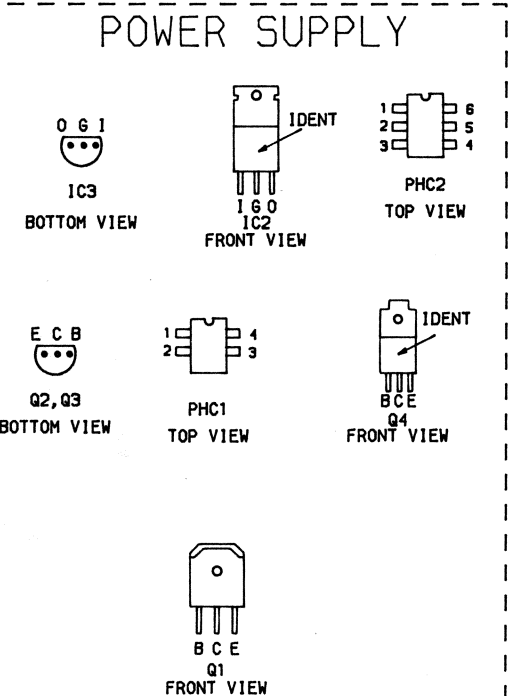
U26, U27, U38
TOP VIEW

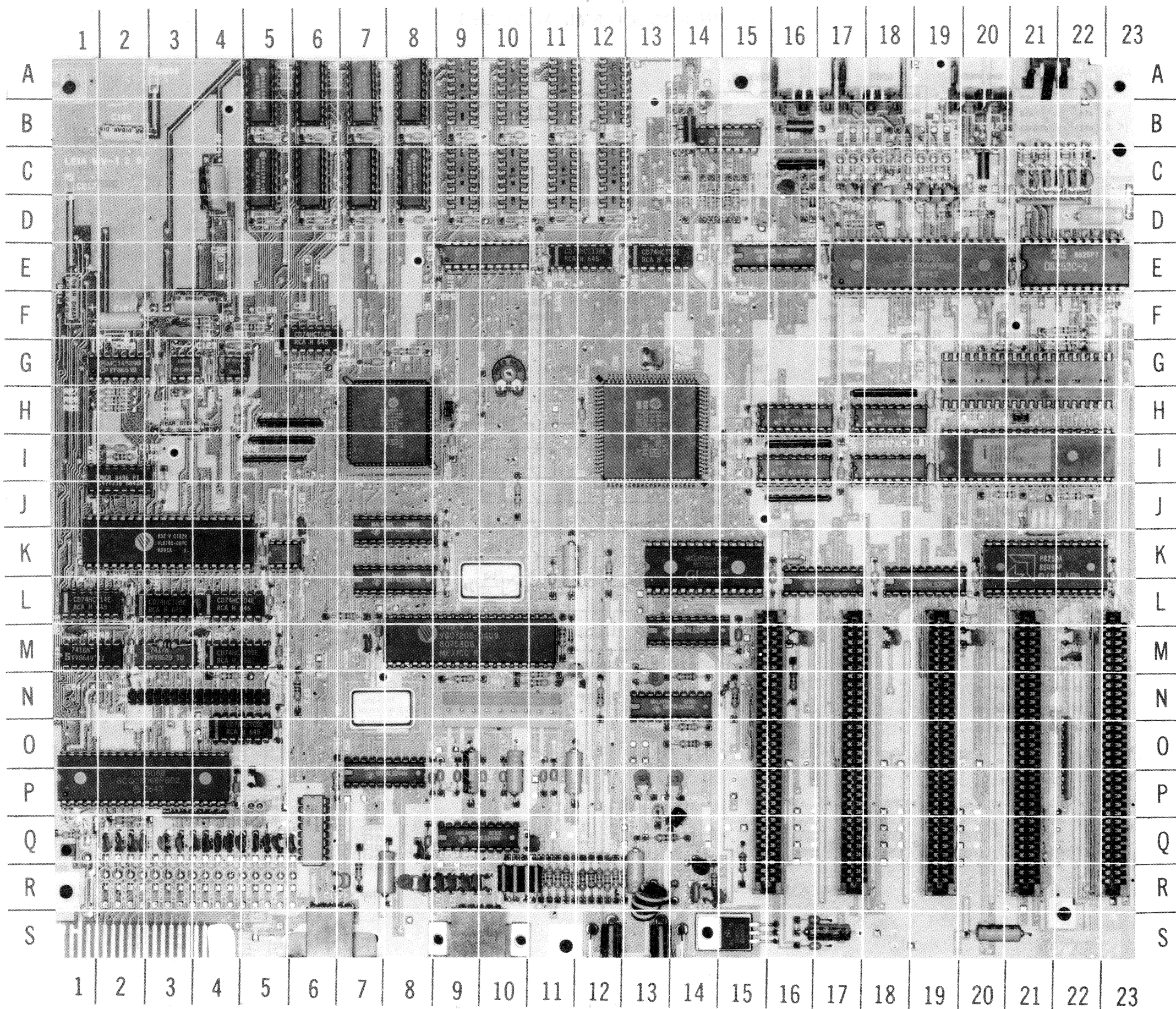


U17, U20, U28,
U45 THRU U49,
U53
TOP VIEW



Q1, Q3
BOTTOM VIEW





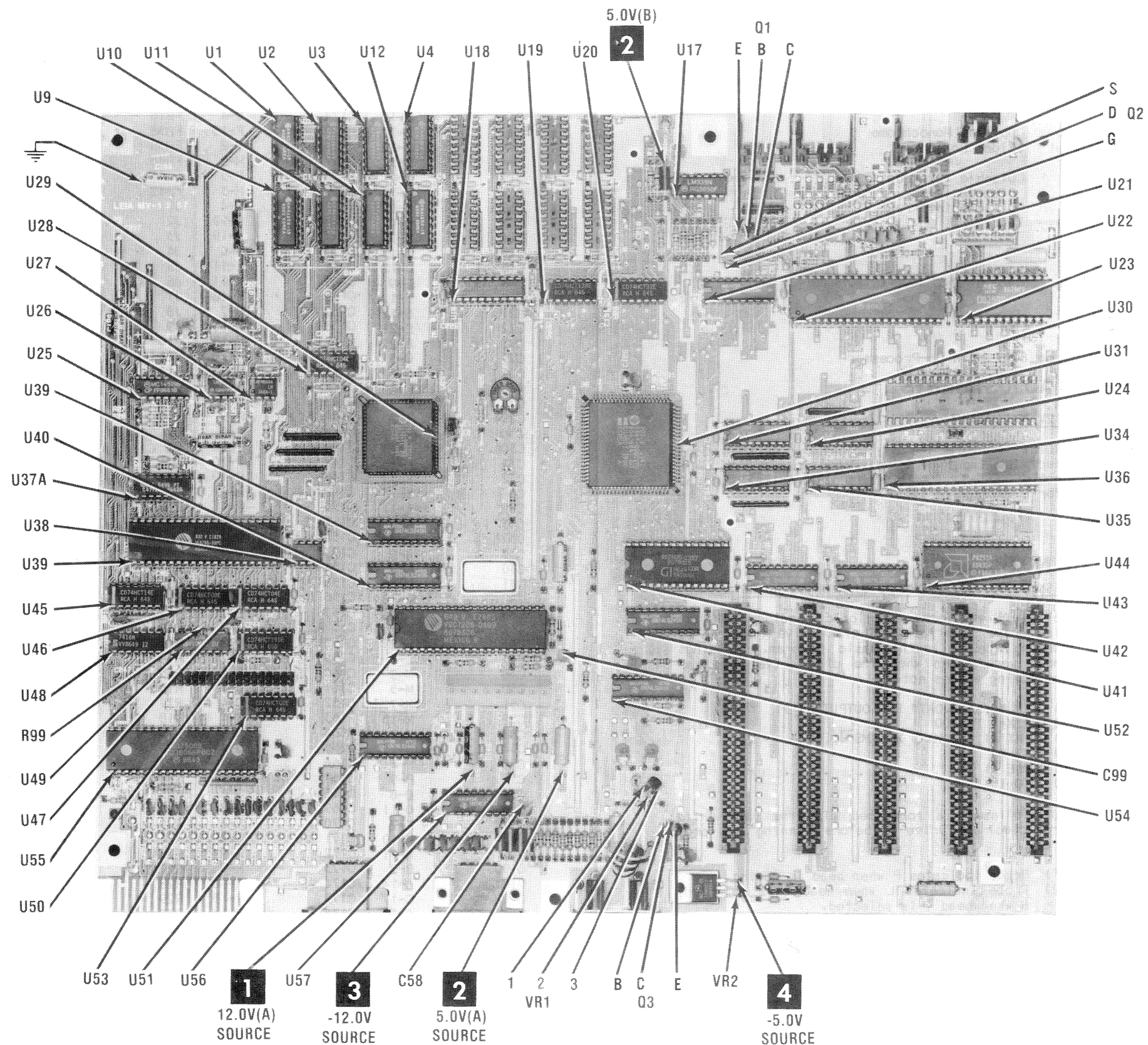
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SYSTEM BOARD GridTrace LOCATION GUIDE

C1	B-1	C119	D-22	CR1	D-16	R46	N-15	U47	L-4
C2	B-6	C120	F-1	CR2	M-11	R47	N-16	U48	M-1
C3	B-7	C121	F-2	FB1	B-14	R48	O-14	U49	M-2
C4	B-8	C122	F-3	FB2	B-16	R49	O-14	U50	M-4
C5	B-9	C123	G-3	FB13	C-20	R50	P-6	U51	M-8
C6	B-10	C124	G-4	FB16	C-21	R51	Q-2	U52	M-13
C7	B-11	C125	F-13	FB38	R-10	R52	Q-1	U53	O-4
C8	B-12	C126	I-2	FB39	R-10	R53	R-7	U54	N-13
C9	D-5	C127	H-3	FB40	R-10	R54	R-10	U55	P-1
C10	D-6	C128	F-5	FB41	R-11	R55	R-10	U56	P-7
C11	D-7	C129	H-3	FB42	Q-13	R56	R-10	U57	P-9
C12	D-8	C130	C-4	J1	A-14	R57	R-11	VR1	Q-14
C13	D-9	C131	H-19	J2	A-16	R58	R-11	VR2	S-15
C14	D-10	C132	I-19	J3	A-18	R59	R-11	Y1	K-10
C15	D-11	C133	J-6	J4	A-20	R60	R-11	Y2	N-7
C16	D-12	C134	L-11	J5	N-5	R61	R-11		
C18	E-9	C135	K-11	J6	N-11	R62	R-11		
C19	E-12	C136	K-16	J7	S-4	R63	R-11		
C21	E-17	C137	M-7	J8	S-7	R64	R-12		
C22	E-21	C138	M-16	J9	S-10	R65	Q-13		
C23	F-22	C139	M-18	J10	S-12	R66	R-14		
C25	G-3	C140	M-20	J11	R-16	R67	R-15		
C26	G-4	C141	M-22	J12	R-17	R99	M-3		
C28	F-6	C142	P-5	J13	R-19	RP1	C-16		
C29	G-7	C143	P-9	J14	R-21	RP2	C-16		
C29A	I-9	C144	P-9	J15	R-23	RP3	D-21		
C30	H-12	C145	P-9	Q1	C-16	RP4	H-5		
C30A	I-15	C146	P-10	Q2	D-15	RP5	I-5		
C31	H-15	C147	P-10	Q3	R-14	RP6	I-5		
C32	H-17	C148	P-10	R1	B-14	RP7	H-17		
C34	I-15	C149	P-11	R2	B-14	RP8	I-16		
C35	I-17	C150	P-11	R3	C-18	RP9	J-16		
C37	K-5	C151	P-11	R4	C-18	RP10	M-1		
C37A	J-3	C152	Q-2	R6	D-14	RP11	Q-3		
C39	J-9	C153	Q-2	R7	D-14	RP12	P-6		
C40	K-9	C154	Q-3	R8	D-14	RP13	P-22		
C41	L-16	C155	Q-5	R9	D-14	S1	A-21		
C42	K-18	C156	Q-5	R10	D-15	S2	J-20		
C43	K-20	C157	R-7	R11	D-15	U1	A-5		
C44	K-23	C157A	R-7	R12	D-15	U2	A-6		
C45	L-2	C158	Q-8	R13	D-16	U3	A-7		
C47	L-5	C159	Q-2	R14	D-17	U4	A-8		
C48	M-2	C160	Q-2	R15	D-17	U9	C-5		
C50	M-5	C161	Q-3	R16	D-20	U10	C-6		
C51	M-7	C162	Q-4	R17	E-11	U11	C-7		
C52	M-15	C163	Q-4	R18	F-4	U12	C-8		
C53	O-5	C164	Q-4	R19	F-4	U17	C-14		
C54	N-15	C165	Q-4	R20	G-8	U18	E-9		
C55	P-4	C166	Q-4	R21	G-20	U19	E-11		
C56	P-9	C167	Q-5	R22	F-22	U20	E-13		
C57	Q-8	C168	Q-6	R23	G-22	U21	E-15		
C58	Q-11	C169	R-8	R24	G-22	U22	E-17		
C97*	K-2	C170	R-8	R25	G-6	U23	E-21		
C98*	M-10	C171	R-9	R26	G-10	U24	H-17		
C99	N-11	C172	R-9	R26A	F-10	U25	G-1		
C100	B-2	C173	R-9	R27	H-2	U26	G-3		
C101	A-14	C174	R-10	R28	H-2	U27	G-4		
C102	C-17	C175	R-13	R29	H-2	U28	G-5		
C103	C-17	C176	R-14	R30	I-2	U29	H-8		
C104	C-18	C177	R-14	R31	F-5	U30	H-14		
C105	C-18	C178	S-17	R32	H-4	U31	H-15		
C106	C-19	C179	S-17	R33	J-10	U34	I-15		
C107	C-19	C180	S-17	R34	J-21	U35	I-17		
C108	C-19	C181	S-20	R35	J-22	U36	I-19		
C109	C-20	C206	B-19	R36	L-7	U37	K-1		
C110	A-22	C222	F-2	R37	K-12	U38	K-5		
C111	C-21	C242	L-3	R38	M-11	U39	K-7		
C112	C-21	C243	M-1	R39	N-4	U40	L-7		
C113	C-21	C244	M-4	R40	N-6	U41	L-13		
C114	C-22	C249	N-13	R41	N-9	U42	L-16		
C115	C-22	C251	M-22	R42	N-11	U43	L-18		
C116	C-22	C264	P-13	R43	N-11	U44	L-20		
C117	B-20	C265	P-14	R44	N-12	U45	L-1		
C118	C-15	CMC1	R-13	R45	N-14	U46	L-2		

* Located on bottom of board.

CSCS19
TANDY
MODEL 1000SX



GENERAL OPERATING INSTRUCTIONS

BOOT UP

Insert a bootable diskette into Disk Drive A and turn On the Computer. The Computer will automatically boot up using the diskette in Disk Drive A. If a MS-DOS (Microsoft Disk Operating System) diskette is used, the Computer will display the date and time and ask for a new date and time. After the date and time have been entered, the version of DOS will be displayed on the Monitor screen along with an A which indicates the DOS is running.

If Function Key F3 is pressed immediately after the Computer beeps when turned On, the Computer will boot up from a diskette inserted in Drive B.

MS-DOS

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

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

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

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

Insert a diskette containing a "Format Program" into Disk Drive A. Type FORMAT and press the ENTER key. Follow the instructions on the Monitor screen to format the unformatted diskette. NOTE: Formatting a diskette will wipe out any programs previously placed on the diskette. The Computer automatically defaults to Disk Drive A if the destination Disk Drive is not specified. Be sure to specify the destination Disk Drive of the diskette to be formatted or the original diskette may be ruined by the default action.

BASIC

When turned On, the Computer will come up in MS-DOS as long as the MS-DOS diskette is in Drive A. The version of MS-DOS will appear at the top of the screen.

The manufacturer also supplies Disk Basic on diskette. To load Disk Basic, first boot up DOS. Insert a diskette with Disk Basic program on it. Type BASIC and press the RETURN

key or type BASICA and press the RETURN key to load Disk Basic. To return to DOS from Basic, type SYSTEM and press the ENTER key.

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

To load a program in Disk Basic or Advanced Disk Basic from the diskette, type LOAD, the program name enclosed in quotes, and press the Enter Key.

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

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

RESETTING COMPUTER

Press the CTRL, ALT, and DEL keys, all three at the same time, to reset the Computer. The Computer can also be reset by pressing the Reset button on lower left front panel.

CHANGING OPERATING MODES

The Video, Disk Drive, and CPU speed modes can be changed by pressing Function Keys F1 thru F4 immediately after the Computer beeps when it is turned On. Use the following chart to determine the function of each Key:

- F1 - Changes the Video mode to Monochrome mode. (Computer normally comes up in Color Graphics mode.)
- F2 - Changes the Video mode to TV mode.
- F3 - Swaps Disk Drive references. Drive A becomes Drive B and Drive B becomes Drive A. The Computer will boot up from the top Drive (normally Drive B).
- F4 - Changes CPU speed to 4.77MHz. The Computer normally comes up with a CPU speed of 7.16MHz.

VOLUME CONTROL

A Volume Control (R26A) is provided on the Main System Board to set the volume of the internal speaker. The cabinet must be removed to gain access to the control.

CSCS19
TANDY
MODEL 100SX

DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL

Remove two screws from lower front of cabinet. Slide cabinet forward and up to remove.

REAR PANEL REMOVAL

Remove three screws from lower rear of rear panel. Pull out on bottom of panel and lift up to clear tabs on top to remove panel.

DISK DRIVE REMOVAL

Slide metal shield out of slot on left side of Disk Drive bracket. Remove two screws from left front, two screws from left rear and one screw from right bottom of Disk Drive bracket. Slide the Drives forward and unplug four connectors from rear of Drives. Remove Drives from Main Chassis. Remove four screws from right side and two screws from left side of Disk Drive bracket to remove Drives from bracket.

POWER SUPPLY REMOVAL

Unplug Power Supply Connectors from System Board and Disk Drives. Remove rear panel. Remove four screws from rear holding Power Supply to chassis and lift Power Supply out of chassis.

SYSTEM BOARD REMOVAL

Remove Disk Drives and Power Supply. Remove four screws holding left side of chassis and remove left side. Disconnect Speaker plug from System Board. Remove plug-in boards from System Board. Remove four screws holding System Board to bottom of chassis and lift board out of chassis.

POWER SUPPLY DISASSEMBLY

Remove four screws holding Fan. Unplug and remove Fan. Grip end of chassis next to AC Power Connector, pull out to clear the tabs, disconnect Connector SK1 and remove the end of chassis with On-Off Switch and AC Connector. Remove four screws holding board to chassis and remove board.

KEYBOARD DISASSEMBLY

Remove nine screws from bottom of Keyboard cabinet and remove bottom of cabinet. Lift Keyboard out of cabinet top.

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.

TEST EQUIPMENT

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

TEST EQUIPMENT (COMPUTERFACTS)

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

TROUBLESHOOTING

POWER SUPPLY

NOTE: Do not operate the Power Supply without a load. A #1129 lamp may be used as a load for the 5.0V Source and a #93 lamp used for the 12.0V Source. Use an Isolation Transformer with a stepdown control when servicing the Power Supply. Disconnect the Power Supply from the System Board and Disk Drives to avoid possible damage to the System from high voltages that may be produced while servicing Power Supply.

The Power Supply has a shutdown circuit, Zener Diode D11, Optoisolator PHC2 and Shutdown Transistor (Q3). The circuit will shut down the Power Supply if the 5.0V Source goes too high. To determine if the Power Supply is in shutdown, check for .67V at the base of Transistor Q3. The shutdown can be defeated by removing Zener Diode D11 from the circuit.

WARNING: Defeating shutdown may allow high voltages and currents to occur that may do further damage to Power Supply. Use a current limiting voltage stepdown AC Power Supply to supply AC power to the defective Power Supply when shutdown is defeated.

When shutdown occurs, the charge on Capacitor C9 will keep the Power Supply in shutdown if it is turned Off and immediately turned back On. Turn the Power Supply Off and wait at least two minutes before turning it back On to allow the charge on Capacitor C9 to discharge.

Power Supply Dead. Check Fuse F1. If F1 is open, check for possible shorts at Diode D1 and check for a possible shorted Power Amp Transistor (Q1). If Fuse F1 is good, apply AC power and check for 120V AC across the AC input pins of Diode D1. If 120V AC is missing, check Coils L1 and L3, Switch S1 and Connector SK1. If 120V AC is present, check for 163V at the collector of Transistor Q1. If 163V is missing, check Diode D1, Thermistor R1 and check the winding on Transformer T1 from pin 4 to pin 6 for continuity. If 163V is present, check the waveform at the base of Transistor Q1. If the waveform is missing, check the voltages and components associated with Oscillator Transistor (Q2) and Transistor Q1 and check the winding on Transformer T1 from pin 2 to pin 3 for continuity.

No -12.0V at pin 15 of Connector SK3-1. Check the winding on Transformer T1 from pin 8 to pin 9 for continuity and check the -12V Regulator IC (IC2), Diode D10, Capacitors C23, C24 and Resistor R25.

No 12.0V at pin 7 of Connector SK3-1. Check for 13.3V at the emitter of the 12V Regulator Transistor (Q4). If 13.3V is missing, check the winding on Transformer T1 from pin 13 to pin 14 for continuity and check Diode D8 and Capacitors C16 and C17. If 13.3V is present, check Error Amp IC (IC3), Transistor Q4, Capacitors C18, C25, Resistors R22 thru R26 and Control VR2.

CSCS19

TANDY
MODEL 1000SX

TROUBLESHOOTING (Continued)

No 5.0V at pin 9 of Connector SK3-1. Check the winding on Transformer T1 from pin 11 to pin 13 for continuity and check Diode D9, Capacitors C19 thru C22 and Coil L2.

MICROPROCESSOR (CPU) OPERATION

Microprocessor IC (U36) not working. Check for a 7.159MHz waveform at pin 19 of IC U36. If the waveform is missing, refer to the "Oscillators and Dividers" section of this Troubleshooting guide. If the waveform checks good, check the logic reading at pin 21 (Reset) of IC U36 while turning the Computer On. The reading should be High when the Computer is turned On, then go Low. If the reading is not correct, check the logic reading at pin 21 of IC U51 while turning the Computer On. The reading should be High when the Computer is turned On, then go Low. If the reading is not correct, check Capacitors C134 and C135, Diode CR2, Reset Switch S1 and Resistor R38. If the reading is correct at pin 21 of IC U51, check IC U51.

OSCILLATORS AND DIVIDERS

Verify Oscillator Modules (Y1 and Y2) are working properly by checking for a 28.636MHz signal at pin 27 and 16.0MHz signal at pin 14 of IC U51. If the 28.636MHz signal is missing or frequency is not correct, check Oscillator Module Y1. If the 16.0MHz signal is missing or frequency is not correct, check Oscillator Module Y2.

If the Oscillator Modules check good, check the dividers in IC U51 by checking for a 1.193MHz signal at pin 3, 8.0MHz signal at pin 11, 14.318MHz signal at pin 12, 3.5795MHz signal at pin 13, 7.16MHz (4.77MHz in normal speed mode) signal at pin 16, 500KHz signal at pin 38 and 4.0MHz signal at pin 39 of IC U51. If any of the signals are not correct, check IC U51.

KEYBOARD

Keyboard does not function. Check Keyboard Connector J4 on the System Board and Connector CN on the Keyboard for good connections and check the Keyboard Cable for broken wires. If the Connectors and cable check good, check the waveforms at pins 1 and 4 of Connector J4 on the System Board while pressing the Space Bar on the Keyboard. If the waveforms check good, check IC U22 on the System Board. If the waveforms are missing, check the waveforms at pins 2, 21 thru 24 and 27 thru 34 of Keyboard Controller IC (M1) on the Keyboard. If the waveform is missing at pin 22, check the 6.0MHz Crystal (XL) and IC M1. If any of the other waveforms are missing, check IC M1. If the waveforms check good, check for pulses at pins 37 and 38 of IC M1 while pressing a key. If pulses are missing, check IC M1. If pulses are present, check IC M2.

No Sound. If there is no sound from the internal speaker, check the setting of the Volume Control (R26A). The Control should be set to Maximum clockwise for Maximum volume.

If the Control is set properly, type in and run the following Basic program:

```
10 PRINT CHR$(7): GOTO 10
```

The program produces a continuous audio tone of about 1100 Hertz. While the program is running, check for pulses at pin 13 of IC U19. If pulses are missing, check IC U19. If pulses are present, check for pulses at pin 6 of IC U20. If pulses are missing, check IC U20. If pulses are present, check for pulses at pin 13 of IC U51. If pulses are missing, check IC U51. If pulses are present, check for the waveform shown in Figure A at pin 7 of IC U37A. If the waveform is missing, check IC U37A. If the waveform is present, check for a logic High at pins 26 and 27 and logic Low at pin 28 of IC U22. If any of the readings are not correct, check IC U22. If the readings are correct, check for a logic High at pin 2 of IC U47. If the reading is not correct, check IC U47. If the reading is correct, check for the waveform shown in Figure A at pins 9 and 10 of IC U25. If the waveform is missing



Figure A

at either pin, check IC U25. If the waveform is good at IC U25, check for the waveform shown in Figure B at pin 1 of IC U26. If the waveform is missing, check the voltages and components associated with IC U26. If the waveform checks good, check for the waveform shown in Figure C at pin 5 of IC U27 (with Volume Control R26A set at Maximum volume). If the waveform is missing, check the voltages and components associated with IC U27. If the waveform checks good, check Capacitor C130, Connector J1 and Speaker SP1.



Figure B

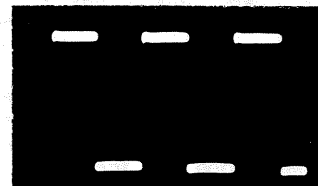


Figure C

NORMAL/TURBO CPU CLOCK

To check the CPU clock switching circuits, type in and run the following program:

```
10 OUT 98,32: PRINT "NORMAL (4.77MHz)"
20 AS=INKEY$: IF AS="" THEN 20
30 OUT 98,40: PRINT "TURBO (7.16MHz)"
40 AS=INKEY$: IF AS="" THEN 40 ELSE 10
```

TROUBLESHOOTING (Continued)

The program changes the clock speed each time a key is pressed. Set the speed to "Normal" and check for a logic Low at pin 2 and a frequency of 4.77MHz at pin 16 of IC U51. Then set the speed to "Turbo" and check for a logic High at pin 2 and a frequency of 7.16MHz at pin 16 of IC U51. If the readings are not correct at pin 2, check IC U22. If the frequency does not switch at pin 16, check IC U51.

PARALLEL PORT

Parallel Port does not work. Check Connector J7 for good connections. If the connector checks good, disconnect any equipment connected to Connector J7 and type in and run the following Basic program:

```
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)
70 OUT 888,255:OUT 890,255
80 PRINT"D=";INP(888)
90 PRINT"E=";(INP(889) AND 248)
100 PRINT"F=";INP(890)
110 GOTO 20
```

The program continuously checks the Parallel Port circuits and displays six numbers (A thru F) on the Monitor screen. With nothing connected to Connector J7, the following numbers should appear on the Monitor screen:

```
A=0
B=88
C=203
D=255
E=88
F=244
```

Make a parallel loopback test plug by connecting together pins 17, 19, 21, 23 and 28 of a 34-pin female edge connector. Connect the test plug to Connector J7 and run the above program. The following numbers should appear on the Monitor screen:

```
A=0
B=144
C=203
D=255
E=120
F=244
```

If any of the numbers are not correct, check for pulses at pin 15 of IC U19 while the above program is running. If pulses are missing, check IC U19. If pulses are present, check IC U55, Capacitors C152 thru C156 and C159 thru C168 and Resistor Packs RP11 and RP12.

JOYSTICK PORTS

Joystick Ports do not work. Type in and run the following Basic program:

```
10 CLS
20 LOCATE 2,2
30 OUT 512,255
40 PRINT INP(513)
50 GOTO 20
```

The program displays the number 240 on the Monitor screen when Joystick Connectors J2 or J3 are not being used. The number will change when pin 1 or 2 of Connector J2 or J3 is connected to 5.0V or when pin 4 or 6 of Connector J2 or J3 is connected to ground. Use the following charts to determine what the number will be.

Connected To 5.0V	Number	Connected To Ground	Number
J2-1	244	J2-4	176
J2-2	240	J2-6	112
J3-1	241	J3-4	224
J3-2	242	J3-6	208

If the numbers are not correct, make the following checks while the above program is running. Check for pulses at pin 12 of IC U19. If pulses are missing, check IC U19. If pulses are present, check for pulses at pin 8 of IC U20. If pulses are missing, check IC U20. If pulses are present, check for pulses at pin 10 of IC U53. If pulses are missing, check IC U53. If pulses are present, check for the waveform shown in Figure D at pin 4 of IC U17. If waveform is not correct, check Transistors Q1 and Q2, Zener Diode CR1, Capacitor C118 and Resistors R12, R13 and R14. If waveform is correct, connect pins 1 and 2 of



Figure D

Connectors J2 and J3 to 5.0V and check for pulses at pins 1, 2, 13, and 14 of IC U17. If pulses are missing, check the voltages and components associated with IC U17. If pulses are present, check IC U21, Capacitors C104, C105, C108 and C109 and Resistor Packs RP1 and RP2.

USING A PRINTER FOR DISPLAY

If there is a defect in the CRT Controller Board, information that is normally displayed on the Monitor screen may not be visible or readable. In such cases, it may be possible to send the Monitor screen information to a Printer that is connected to the Computer. While the Computer is in MS-DOS or GWBasic, the Printer output can be turned On by pressing the Print Key. The Monitor screen information will continue to be printed out until the Print Key is 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 Print Key.

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

TANDY
MODEL 1000SX
CSCS19

TROUBLESHOOTING (Continued)

VIDEO

No Video. Check waveforms at pins 2, 6, 8 and 11 of IC U57. If any waveforms are missing, check IC U30. If waveforms are good, check waveform at the base of Video Amp Transistor (Q3). If waveform is missing or not correct, check IC U57, Capacitor C58 and Resistors R57, R59, R61 and R62. If waveform is good, check waveform at the emitter of Transistor Q3. If waveform is missing, check the voltages and components associated with Transistor Q3.

VIDEO SYNC

No vertical or horizontal sync on an RGB Monitor. Check for a vertical waveform at pin 17 and a horizontal waveform at pin 15 of IC U57. If either waveform is missing, check IC U30. If waveforms are good, check IC U57, Capacitors C169 and C171 and check pins 8 and 9 of Connector J9 for good connections.

No vertical and horizontal sync on a Monitor connected to the Composite Video Jack (J10). Check composite sync waveform at pin 11 of IC U57. If waveform is missing, check IC U30. If waveform is present, check for sync pulses in waveform at the base of Video Amp Transistor (Q3). If pulses are missing, check IC U57 and Resistor R61. If sync pulses are present, check Transistor Q3, Capacitor C177, Resistor R66 and Jack J10.

VIDEO HIGHLIGHT

No Highlight. Type in and run the following Basic program:

```
10 DEF SEG=&HB00
20 FOR X=0 TO 4000 STEP 2
30 POKE X,42:POKE X+1,8
40 NEXT X
50 GOTO 50
```

The program fills the Monitor screen with highlighted characters. While the program is running, check for pulses at pins 4 and 16 of IC U57. If pulses are missing at pin 4, check IC U30. If pulses are present at pin 4 and missing at pin 16, check IC U57. If pulses are present at pin 16, check Resistors R58 and R54 and Capacitor C174.

COLOR

No color or some colors missing. Type in and run the following Basic program:

NOTE: Put four spaces between the quotes in line 70.

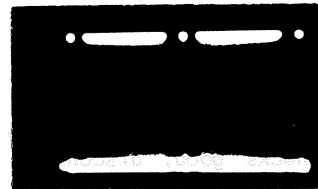
```
10 DATA 9, 10,12
20 SCREEN 0,1:WIDTH 80
30 KEY OFF:CLS
40 FOR Y=1 TO 3
50 READ C:COLOR 0,C
60 FOR X=1 TO 160
70 PRINT " ";
80 NEXT X:NEXT Y
90 GOTO 90
```

The program puts blue, green and red horizontal bars on the Monitor screen. While the program is running, check for the waveform shown in Figure E at pins 2, 6, 8, 12, 14 and 18 and the waveform shown in Figure F at pins 7 and 13 of IC U57.



5V
20uSec
0V REF

Figure E



5V
20uSec
0V REF

Figure F

If waveforms are missing at pin 2, 6, 8 or 13 of IC U57, check IC U30. If waveforms are present at pins 2, 6, 8 and 13 and missing at pins 7, 12, 14 and 18, check IC U57. If waveforms are good at pins 7, 12, 14 and 18, check Resistors R55 thru R58, R62 and R63, and Capacitors C58, C170, C172 and C173.

DISK DRIVE INTERFACE

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

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

WILL NOT READ

Insert a diskette containing data in Disk Drive B and close the door. Type in and run the following Basic program to keep the Disk Drive running in read mode.

```
10 CLS
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 10 to OUT 1014,128:OUT 1010,16:OUT 1010,20.

The program displays seven numbers on the Monitor screen. The numbers should change when a diskette with data on it is inserted in the Drive and the Drive door closed while the above program is running.

TROUBLESHOOTING (Continued)

If the numbers do not change, make the following checks, while the program is running with a diskette in the Drive. Check for Index pulses at pin 17 of Floppy Disk Controller IC (U37). If pulses are missing, refer to the "Index Sensor" section of this Troubleshooting guide. If pulses are present, check for a logic Low at pin 1 and logic High at pin 2 of IC U48. If reading is not correct at pin 1, check IC U37. If reading is correct at pin 1 and not correct at pin 2, check IC U48. If readings are correct at IC U40, check for pulses at pins 11 and pin 30 of Connector J5 for good connections and check the Drive cable. If the connector and cable check good, refer to the "Disk Drive Troubleshooting" in the Disk Drive Folder.

If pulses are present at pin 11 of IC U45 and missing at pin 12, check IC U45. If pulses are present at pin 12, check for pulses at pins 4, 19 and 26 of IC U37. If pulses are missing at pins 4 or 19, check IC U51. If pulses are present at pins 4 and 19 and missing at pin 26, check IC U37. If pulses are present at pin 26, check for pulses at pin 10 of IC U47. If pulses are missing, check IC U47. If pulses are present, check for pulses at pins 2 and 7 of IC U38. If pulses are missing, check IC U38 and Capacitor C133. If pulses are present, check for pulses at pins 12 of IC U47. If pulses are missing, check IC U47. If pulses are present, check IC U37.

WILL NOT WRITE

Insert a blank diskette into the Disk Drive and close the door. Type in and run the following Basic program which writes continuously to the Diskette and displays a number on the upper left corner of the Monitor screen. The number should be 0 when the Diskette is not write protected and change to 2 when a write protected Diskette is inserted into the Drive. If the numbers are not correct, refer to the "Write Protect Does Not function" section of this Troubleshooting guide.

```
10 CLS
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 20
```

NOTE: This program will not write to the diskette if the diskette index sensor circuits are not working. Check for index pulses at pin 11 of Buffer IC U4 while the Drive is running with a blank diskette inserted. If pulses are missing, refer to the "Index Sensor" section of this Troubleshooting guide.

While the above program is running, check for pulses at pins 4, 19, 25, 30, 31 and 32 of Floppy Disk Controller IC U37. If pulses are missing at pins 4 or 19, check IC U51. If pulses are present at pins 4 and 19 and missing at pins 25, 30 31 or 32, check IC U37. If all readings are correct, check for pulses at pin 8 of IC U47. If pulses are missing, check IC U47. If pulses are present, check for pulses at pin 1 of IC U53. If pulses are missing, check IC U53. If pulses are present, check for pulses at pins 9 and 8 of IC U48. If pulses are missing at pin 9, check IC U50. If pulses are present at pin 9 and missing at pin 8, check IC U48. If pulses are present at pin 8, check pin 22 of Connector J5 for good connections and check the Drive cable. If the connector and cable check good, refer to the "Disk Drive Troubleshooting" in the Disk Drive Folder.

WRITE PROTECT DOES NOT FUNCTION

Type in and run the program listed under the "Will Not Write" section of this Troubleshooting guide. The program will display the number 0 on the left upper corner of the Monitor screen if a diskette that is not write protected is inserted into the Drive and the number 2 if the diskette is write protected.

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

If the numbers on the Monitor screen are not correct, make the following checks with a blank write protected diskette in the Drive and the program running.

Check for a logic Low at pin 3 and logic High at pin 4 of IC U45. If reading is not correct at pin 3, check pin 28 of Connector J5 for good connections and check the Drive cable. If the connector and cable check good, refer to the "Disk Drive Troubleshooting" in the Disk Drive Folder. If reading is correct at pin 3 of IC U45 and not correct at pin 4, check IC U45. If reading is correct at pin 4 and the number on the Monitor screen is not correct, check the Floppy Disk Controller IC (U37).

INDEX SENSOR

To check the Index Detector circuits, insert a diskette into Drive A and close the door. Type in and run the following Basic program to keep the drive running or make all checks when the Drive starts running after turning the Computer On.

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

While the Drive is running, check for pulses at pins 5 and 6 of IC U45. If pulses are missing at pin 5, check pin 8 of Connector J5 for good connections and check the Drive cable. If pulses are present at pin 5 and missing at pin 6, check IC U45.

CSCS19
MODEL 100SX
TANDY

TROUBLESHOOTING (Continued)

TRACK 00 SENSOR

Disk Drive Head bangs against the Track 00 stop. Type in and run the following Basic program to check the Track 00 detector circuits. The program will step the Head back to Track 00 and display the number 16 on the Monitor screen to indicate the head is on Track 00. If the head is manually pushed off Track 00, the number should change to the number 0.

DRIVE A

```
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 1014,128:OUT 1010,16:OUT 1010,20
60 S=INP(1012)
70 OUT 1013,4:S=INP(1012)
80 OUT 1013,2:S=INP(1012)
90 CLS:PRINT INP(1013) AND 16:S=INP(1012)
100 GOTO 40
```

If the numbers are not correct on the Monitor screen, check (while program is running) for a logic Low at pin 9 of IC U45 when the head is On Track 00 and logic High when the head is Off Track 00. If readings are not correct, check pin 26 of Connector J5 for good connections and check the Drive cable. If readings are correct, check for a logic High at pin 8 of IC U45 with the head On Track 00 and logic Low with the head Off Track 00. If readings are not correct, check IC U45. If readings are correct, check for a logic High with momentary pulses at pin 39 of Floppy Disk Controller IC (U37). If reading is not correct, check IC U37. If reading is correct, check for a logic High with momentary pulses at pin 3 of IC U46 when the head is On Track 00 and logic Low when the head is Off Track 00. If readings are not correct, check IC U46. If readings are correct, check IC U37.

DRIVE SELECT AND DRIVE MOTOR

Drive A not being selected or Drive A and Drive B Motors do not turn On. Type in and run the following Basic program:

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

While the program is running, check for a logic Low at pins 30 and 34 of Interface IC (U22) and pins 2 and 6 of IC U49. If readings are not correct at pins 30 or 34, check IC U22. If readings are correct at pins 30 and 34 and not correct at pins 2 or 6, check IC U49. If readings are all correct, check pins 10 and 16 of Connector J5 for good connections and check the Drive cable. If the connector and cable check good, refer to the "Disk Drive Troubleshooting" in the Disk Drive Folder.

Drive B not being selected. Type in and run the following Basic program:

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

While the program is running, check for a logic Low at pin 3 and 4 of IC U49. If reading is not correct at pin 3, check IC U22. If

reading is correct at pin 3 and not correct at pin 4, check IC U49. If reading is correct at pin 4, check pin 12 of Connector J5 for good connections and check the Drive cable. If the connector and cable check good, refer to the "Disk Drive Troubleshooting" in the Disk Drive Folder.

HEAD POSITION MOTOR

Head position motor not working. Type in and run the following Basic program. The program continuously alternates the head on Drive B between tracks 00 and 16.

DRIVE B

```
10 OUT 1014,128:OUT 1010,33:OUT 1010,37
20 OUT 1013,7:S=INP(1012)
30 OUT 1013,1:S=INP(1012)
40 OUT T=1 TO 500:NEXT T
50 OUT 1010,37
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
```

While the program is running, check for pulses at pins 37, 38 and 39 of Floppy Disk Controller IC (U37). If pulses are missing, check IC U37. If pulses are present, check for pulses at pin 11 of IC U46. If pulses are missing, check IC U46. If pulses are present, check for pulses at pin 4 and 6 of IC U48. If pulses are missing, check IC U48. If pulses are present, check pins 18 and 20 of Connector J5 for good connections and check the Drive cable. If the connector and cable check good, refer to the "Disk Drive Troubleshooting" in the Disk Drive Folder.

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.	RCA PART No.	ZENITH PART No.	NOTES
KEYBOARD						
D1	D8048HC					
M1	M74LS04P	NTE74LS04	ECG74LS04	SK74LS04	HE-444-238 HE-443-755	
M2						
POWER SUPPLY						
D1	S4VB40	NTE5314	ECG5314	SK3987/5314		
	RB404	NTE5314	ECG5314	SK3987/5314		
	DBA40E	NTE5314	ECG5314	SK3987/5314		
D2	HZ5B3					
D3,4,5	F1-06					
	V19G	NTE558	ECG558	SK3998/558		
D6,7	DS446	NTE519	ECG519	SK3100/519	103-131	
	1S954	NTE519	ECG519	SK3100/519	103-131	
D8	D5LCA20					
	5CH2SM					
D9	D10SC4M					
	10CS04SM		ECG6240	SK5060/6240		
D10						
D11	HZ5B3					
D13	UA431AWC					
IC1	TL431CLPB					
IC2	L78M12	NTE966	ECG966	SK3592/966	HE-442-674	
	NJM78M12					
IC3	MP236L					
PHC1	P521					
PHC2	TLP521-1					
	TLP541G					
Q1	S22MD1					
	2SC3833					
	2SC2938					
Q2,3	2SD1207S					
	2SD1207					
	2SC2655					
	2SA1441					
Q4	2SB1019	NTE293	ECG293	SK3849/293	121-79066*	

CSCS19 TANDY
MODEL 1000SX

23 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.					NOTES
		NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	
SYSTEM BOARD						
CR1	1N5235 8150235	NTE5014A NTE5014A	ECG5014A ECG5014A	SK6A8/5014A SK6A8/5014A	103-Z9009 103-Z9009	
CR2	1N4148 8150148	NTE519 NTE519	ECG519 ECG519	SK3100/519 SK3100/519	103-131 103-131	
Q1	2N3906 8100906	NTE159 NTE159	ECG159 ECG159	SK3466/159 SK3466/159	121-Z9003 121-Z9003	
Q2	S1VN0104 VN0104N3 VN0104A					
Q3	8190104 2N3904 8110904					
U1 THRU U4	KM41256-15 8049008	NTE123AP NTE123AP	ECG123AP ECG123AP	SK3854/123AP SK3854/123AP	121-Z9000A 121-Z9000A	USED IN SOME VERSIONS
U5 THRU U8 U9 THRU U12	KM41256-15 KM41256-15 8049008					
U13 THRU U16 U17	KM41256-15 LM339N 8050339	NTE834 NTE834	ECG834 ECG834	SK3569/834 SK3569/834	221-121 221-121	USED IN SOME VERSIONS
U18	VP16RP8MPC PLS153					
U19	CD74HCT138E 74HCT138 8026138			SK7CT138 SK7CT138 SK7CT138		
U20	CD74HCT32E 74HCT32 8026032			SK7CT32 SK7CT32 SK7CT32		

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.					ZENITH PART No.	NOTES
		NTE PART No.	ECG PART No.	RCA PART No.			
U21	SN74LS244N 74LS244	NTE74LS244	ECG74LS244	SK74LS244	HE-443-791	USED IN SOME VERSIONS	
U22	8020244 SQ38068PB01 8075069	NTE74LS244 NTE74LS244	ECG74LS244 ECG74LS244	SK74LS244 SK74LS244	HE-443-791		
U23	D8253C-2 8253-5				HE-443-1066		
U24	8040253 4067-15 8040464				HE-443-1066 HE-443-1066		
U25	MC14529B 14529	NTE4529B	ECG4529B	SK4529B			
U26	8030529 LM358N LM358 8050358	NTE4529B NTE928M NTE928 NTE928M	ECG4529B ECG4529B ECG928M ECG928 ECG928M	SK4529B SK4529B SK3692/928M SK3691/928 SK3692/928M			
U27	LM386N-1 LM386	NTE823 NTE823	ECG823 ECG823	SK9210/823 SK9210/823			
U28	8050386 CD74HCT04E 74HCT04 8026004	NTE823	ECG823	SK9210/823 SK7CT04 SK7CT04 SK7CT04			
U29	8075711						
U30	8040684						
U31	4067-15						
U33	8040464 8087						
U34,5	4067-15 8040464						
U36	P8088-2 8088 8041088						

MODEL 1000SX
TANDY
61CS19

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.					NOTES
		NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	
U37	VL6765-08PC UPD765A 8040272 8496PT SN76496 8040496				HE-443-944 HE-443-944	
U37A						
U38	WD9216 FDC9216 8040216					
U39, 40	SN74LS245N 74LS245 8020245	NTE74LS245 NTE74LS245 NTE74LS245	ECG74LS245 ECG74LS245 ECG74LS245	SK74LS245 SK74LS245 SK74LS245	HE-443-885 HE-443-885 HE-443-885	
U41	8079015 8040328					
U42, 3	SN74LS373N 74LS373 8020373	NTE74LS373 NTE74LS373 NTE74LS373	ECG74LS373 ECG74LS373 ECG74LS373	SK74LS373 SK74LS373 SK74LS373	HE-443-867 HE-443-867 HE-443-867	
U44	P8259A 8259A 8040259				HE-443-1012 HE-443-1012 HE-443-1012	
U45	CD74HCT14E 74HCT14 8026014			SK7CT14 SK7CT14 SK7CT14		
U46	CD74HCT08E 74HCT08 8026008			SK7CT08 SK7CT08 SK7CT08		
U47	CD74HCT04E 74HCT04 8026004			SK7CT04 SK7CT04 SK7CT04		
U48	7416N 7416 8000016	NTE7416 NTE7416 NTE7416	ECG7416 ECG7416 ECG7416	SK7416 SK7416 SK7416	HE-443-73 HE-443-73 HE-443-73	

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.					ZENITH PART No.	NOTES
		NTE PART No.	ECG PART No.	RCA PART No.			
U49	7417N 7417	NTE7417	ECG7417	SK7417	HE-443-72		
U50	8000017	NTE7417	ECG7417	SK7417	HE-443-72		
	CD74HCT195E			SK7CT195	HE-443-72		
	74HCT195			SK7CT195			
U51	8026195			SK7CT195			
U52	8075306						
U53	SN74LS245N	NTE74LS245	ECG74LS245	SK74LS245	HE-443-885		
	74LS245	NTE74LS245	ECG74LS245	SK74LS245	HE-443-885		
	8020245	NTE74LS245	ECG74LS245	SK74LS245	HE-443-885		
	CD74HCT02E			SK7CT02			
U54	74HCT02			SK7CT02			
	8026002			SK7CT02			
	SN74LS244N	NTE74LS244	ECG74LS244	SK74LS244	HE-443-791		
U55	74LS244	NTE74LS244	ECG74LS244	SK74LS244	HE-443-791		
	8020244	NTE74LS244	ECG74LS244	SK74LS244	HE-443-791		
	8075068			SK74LS244	HE-443-791		
U56, 7	SN74LS244N	NTE74LS244	ECG74LS244	SK74LS244	HE-443-791		
	74LS244N	NTE74LS244	ECG74LS244	SK74LS244	HE-443-791		
	8020244	NTE74LS244	ECG74LS244	SK74LS244	HE-443-791		
VR1	78L05A	NTE977	ECG977	SK3462/977	221-Z9044		
VR2	78L05	NTE977	ECG977	SK3462/977	221-Z9044		
	8052805	NTE977	ECG977	SK3462/977	221-Z9044		
	79M05CT						
	8190005						

* Lead configuration may vary from original.

WIRING DATA

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

MODEL 1000SX
TANDY

PARTS LIST AND DESCRIPTION

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

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
C118	MAIN BOARD (SYSTEM) .22 63V 10%	8393225

CAPACITORS

ITEM No.	RATING	MFGR. PART No.
C1 C2	POWER SUPPLY BOARD .1 250VAC 20% .22 250VAC 20%	XE-224

ITEM No.	RATING	MFGR. PART No.
C99 C123	SYSTEM BOARD 39 NPO 500V 5% 330 NPO 500V 5%	8301332

COILS & TRANSFORMERS

ITEM No.	FUNCTION	MFGR. PART No.	OTHER IDENTIFICATION	NOTES
L1 L2 L3 T1	Filter RF Choke Line Filter Switching	T0-9161-1 PSC-156 T0-4342		

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	WORKMAN PART No.
RU1	KEYBOARD Resistor Network	(1)		
R1	POWER SUPPLY BOARD NTC 8 Cold	117-160-45201 16D-13 D4FFL160P		
R13	SYSTEM BOARD 82.5K 1% 1/4W Metal Film	8200382		
RP1	Resistor Network	8290210 (1)		
RP2	Resistor Network	8290032 (2)		
RP3	Resistor Network	8292310 (3)		
RP4	Resistor Network	8295033 (4)		
RP5	Resistor Network	8295033 (4)		
RP6	Resistor Network	8295033 (4)		
RP7	Resistor Network	8295033 (4)		
RP8	Resistor Network	8295033 (4)		
RP9	Resistor Network	8295033 (4)		
RP10	Resistor Network	8290016 (5)		
RP11	Resistor Network	8292246 (6)		
RP12	Resistor Network	8290044 (7)		
RP13	Resistor Network	8290010 (8)		

- (1) 1000 x 5
(2) 10K x 5
(3) 10K x 7
(4) 33 x 4

- (5) 150 x 7
(6) 4700 x 7
(7) 33 x 8
(8) 10K x 9

PARTS LIST AND DESCRIPTION (Continued)

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

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

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
VR1	POWER SUPPLY BOARD 5 Adjust	2200	VGEK-PV(1S) 202B H0615-222B	
VR2	12V Adjust	2200	VGEK-PV(1S) 202B H0615-222B	
R26A	SYSTEM BOARD Volume	1000	8279411	

FUSE DEVICES

ITEM NO.	DESCRIPTION	MFGR. PART NO.		NOTES
		DEVICE	HOLDER	
F1	POWER SUPPLY 3 Amp @ 250V Fast Acting	MT4 3A 250V	P#5722113	

SPEAKER

ITEM No.	TYPE	REPLACEMENT DATA		NOTES
		MFGR. PART No.	QUAM PART No.	
SP1	3" SQ PM 8 Ohms	8490010	30A05Z8	

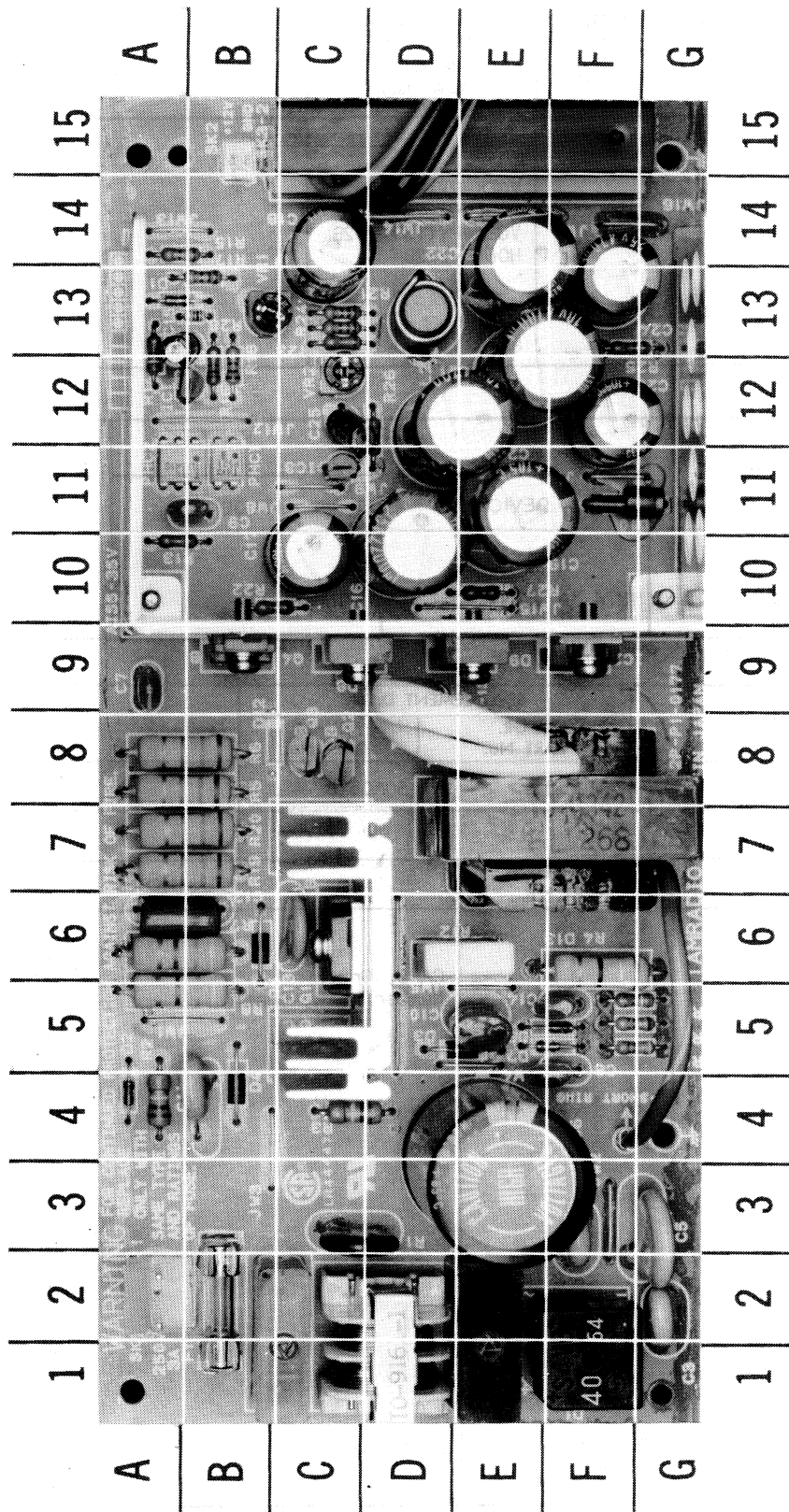
MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
L1	KEY BOARD		
L2	LED		CAPS, Green
	LED		Number Lock, Green
	POWER SUPPLY		
SW1	Switch		Power
M5	Fan		
	SYSTEM		
S1	Switch		Reset
S2	Switch		DIP
FB1	Ferrite Bead		
FB2	Ferrite Bead		
FB4	Ferrite Bead		
FB13	Ferrite Bead		
FB38	Ferrite Bead		
thru			
FB41			
Y1	Oscillator	8409039	28.63636MHz
Y2	Oscillator	8409034	16MHz

TANDY
MODEL 1000SX

CABINETS & CABINET PARTS (When ordering specify model, chassis & color)

ITEM	PART No.	ITEM	PART No.
Cabinet Top	8719527		
Rear Panel	8719526		



POWER SUPPLY GridTrace LOCATION GUIDE

C1	C-1	R26	D-12
C2	E-1	R27	E-10
C3	G-2	R28	B-13
C4	F-3	SK1	A-2
C5	G-3	SK2	B-15
C6	E-3	SK3	F-15
C7	A-9	T1	E-8
C8	F-4	VR1	B-13
C9	B-11	VR2	C-12
C10	E-5		
C11	B-4		
C12	B-6		
C13	C-6		
C14	F-5		
C15	A-13		
C16	D-10		
C17	C-10		
C18	C-14		
C19	E-11		
C20	E-12		
C21	E-12		
C22	E-14		
C23	F-12		
C24	F-13		
C25	C-12		
D1	F-1		
D2	A-4		
D3	E-5		
D4	B-4		
D5	B-6		
D6	F-5		
D7	F-5		
D8	C-9		
D9	E-9		
D10	G-11		
D11	A-13		
D13	F-6		
F1	B-1		
IC1	A-12		
IC2	F-9		
IC3	C-11		
L1	D-1		
L2	D-13		
PHC1	A-11		
PHC2	B-11		
Q1	C-6		
Q2	C-8		
Q3	C-8		
Q4	B-9		
R1	D-1		
R2	A-4		
R3	C-4		
R4	F-6		
R5	B-8		
R6	B-8		
R7	B-6		
R8	B-5		
R9	G-5		
R10	G-5		
R11	G-5		
R12	E-6		
R13	A-10		
R14	A-12		
R15	A-15		
R16	B-12		
R17	B-13		
R18	B-12		
R19	B-7		
R20	B-7		
R21	C-13		
R22	C-10		
R23	C-13		
R24	C-13		
R25	F-13		

TANDY
MODEL 1000SX

LOGIC CHART

SYSTEM BOARD

PIN NO.	IC U1	IC U2	IC U3	IC U4	IC U9	IC U10	IC U11	IC U12	IC U18	IC U19	IC U20	IC U21
1	P	P	P	P	P	P	P	P	P	P	L	H
2	P	P	P	P	P	P	P	P	P	H	L	H
3	P	P	P	P	P	P	P	P	P	H	L	P
4	P	P	P	P	P	P	P	P	P	L	P	H
5	P	P	P	P	P	P	P	P	P	P	H	P
6	P	P	P	P	P	P	P	P	P	H	H	L
7	P	P	P	P	P	P	P	P	H	P	L	P
8	H	H	H	H	H	H	H	H	H	L	H	L
9	P	P	P	P	P	P	P	P	P	P	H	P
10	P	P	P	P	P	P	P	P	L	H	H	L
11	P	P	P	P	P	P	P	P	L	H	H	L
12	P	P	P	P	P	P	P	P	L	H	*	P
13	P	P	P	P	P	P	P	P	P	H	*	L
14	P	P	P	P	P	P	P	P	P	H	H	P
15	P	P	P	P	P	P	P	P	L	H		H
16	L	L	L	L	L	L	L	L	P	H		P
17									P			H
18									P			P
19									P			H
20									H			H

PIN NO.	IC U22	PIN NO.	IC U22	PIN NO.	IC U23	PIN NO.	IC U23	PIN NO.	IC U24	IC U25	IC U28
1	L	21	H	1	P	21	H	1	P	H	P
2	H	22	H	2	P	22	H	2	L	L	P
3	H	23	H	3	P	23	P	3	L	L	P
4	L	24	L	4	P	24	H	4	H	*	P
5	L	25	H	5	P			5	P	H	L
6	*	26	L	6	P			6	P	L	L
7	P	27	L	7	P			7	P	L	L
8	P	28	L	8	P			8	P	L	P
9	P	29	L	9	P			9	H	L	*
10	P	30	H	10	P			10	P	H	*
11	P	31	H	11	H			11	P	H	*
12	P	32	H	12	L			12	P	H	L
13	P	33	H	13	P			13	P	H	*
14	P	34	H	14	H			14	P	H	H
15	H	35	L	15	P			15	L	H	
16	P	36	L	16	L			16	P	H	
17	P	37	H	17	H			17	L		
18	H	38	L	18	P			18	L		
19	P	39	L	19	P						
20	H	40	H	20	P						

LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO.	IC U29	PIN NO.	IC U29	PIN NO.	IC U29	PIN NO.	IC U29	PIN NO.	IC U30	PIN NO.	IC U30	PIN NO.	IC U30
1	L	21	P	41	P	61	P	1	L	21	P	41	L
2	P	22	H	42	P	62	P	2	P	22	H	42	P
3	P	23	P	43	P	63	P	3	P	23	P	43	L
4	L	24	P	44	P	64	P	4	P	24	P	44	P
5	H	25	P	45	P	65	P	5	P	25	H	45	P
6	P	26	H	46	P	66	P	6	P	26	H	46	P
7	H	27	P	47	P	67	P	7	L	27	P	47	P
8	H	28	P	48	P	68	P	8	H	28	P	48	P
9	H	29	P	49	P			9	H	29	H	49	P
10	P	30	P	50	P			10	H	30	H	50	P
11	L	31	P	51	P			11	L	31	P	51	P
12	*	32	P	52	P			12	L	32	L	52	P
13	*	33	P	53	P			13	L	33	H	53	P
14	P	34	P	54	P			14	L	34	P	54	P
15	P	35	H	55	P			15	L	35	H	55	P
16	L	36	P	56	P			16	P	36	*	56	P
17	P	37	P	57	P			17	H	37	P	57	P
18	L	38	P	58	P			18	H	38	P	58	P
19	P	39	P	59	P			19	P	39	P	59	P
20	L	40	P	60	P			20	P	40	P	60	P

PIN NO.	IC U30	PIN NO.	IC U30	PIN NO.	IC U31	IC U33	PIN NO.	IC U33	PIN NO.	IC U34	IC U35	IC U36	PIN NO.	IC U36
61	P	81	P	1	P	L	21	L	1	P	P	L	21	L
62	P	82	P	2	P	P	22	P	2	P	H	P	22	P
63	P	83	P	3	P	P	23	L	3	P	H	P	23	L
64	P	84	P	4	H	P	24	P	4	H	H	P	24	P
65	P			5	P	P	25	P	5	P	P	P	25	P
66	P			6	P	P	26	P	6	P	P	P	26	P
67	P			7	P	P	27	P	7	P	P	P	27	P
68	P			8	P	P	28	P	8	P	P	P	28	P
69	P			9	H	P	29	*	9	H	H	P	29	P
70	P			10	P	P	30	*	10	P	P	P	30	H
71	P			11	P	P	31	P	11	P	P	P	31	P
72	P			12	P	P	32	L	12	P	P	P	32	P
73	P			13	P	P	33	P	13	P	P	P	33	L
74	P			14	P	P	34	H	14	P	P	P	34	H
75	P			15	P	P	35	P	15	P	H	P	35	P
76	P			16	P	P	36	P	16	P	P	P	36	P
77	P			17	L	*	37	P	17	P	L	L	37	P
78	P			18	L	*	38	P	18	L	L	L	38	P
79	P			19		P	39	P	19			P	39	P
80	P			20		L	40	H	20			L	40	H

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MODEL 1000SX

LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO.	IC U37A	IC U37	PIN NO.	IC U37	PIN NO.	IC U38	IC U39	IC U40	IC U41	PIN NO.	IC U41	PIN NO.	IC U42	IC U43
1	P	L	21	P	1	P	P	P	H	21	P	1	P	P
2	P	P	22	P	2	P	P	P	P	22	L	2	P	P
3	P	P	23	P	3	P	P	P	P	23	P	3	P	P
4	H	P	24	P	4	L	P	P	P	24	P	4	P	P
5	P	P	25	P	5	L	P	P	P	25	P	5	P	P
6	H	P	26	H	6	L	P	P	P	26	P	6	P	P
7	H	P	27	L(3)	7	P	P	P	P	27	P	7	P	P
8	L	P	28	L(1)	8	H	P	P	P	28	H	8	P	P
9	L	P	29	H(1)	9		P	P	P	29		9	P	P
10	P	P	30	P	10		L	L	P	30		10	L	L
11	P	P	31	P	11		P	P	P	31		11	P	P
12	P	P	32	P	12		P	P	P	32		12	P	P
13	P	P	33	L(4)	13		P	P	P	33		13	P	P
14	P	P	34	L	14		P	P	L	34		14	P	P
15	P	P	35	H	15		P	P	P	35		15	P	P
16	H	P	36	H(1)	16		P	P	P	36		16	P	P
17		P	37	L(1)	17		P	P	P	37		17	P	P
18		P	38	L(6)	18		P	P	P	38		18	P	P
19		P	39	L(8)	19		P	P	P			19	P	P
20		L	40	H	20		H	H	P			20	H	H

PIN NO.	IC U44	PIN NO.	IC U44	PIN NO.	IC U45	IC U46	IC U47	IC U48	IC U49	IC U50
1	P	21	H	1	*	L(8)	L	P	H	P
2	P	22	H	2	L	L(4)	H	P	H	L
3	H	23	P	3	H	L(4)	L	L(6)	L	L
4	P	24	L	4	L	P	H	H(7)	L	P
5	P	25	H	5	P	H	H	L(1)	L(10)	P
6	P	26	P	6	P	P	L	H(1)	L(10)	P
7	P	27	P	7	L	L	L	L	L	L
8	P	28	H	8	L(4)	P	P	P	H	L
9	P			9	H(5)	H	P	P	H	P
10	P			10	P	P	L	H(2)	*	P
11	P			11	P	L(1)	H	L(3)	*	P
12	L			12	P	L(8)	P	L	*	P
13	L			13	P	L(1)	P	*	*	P
14	L			14	H	H	H	H	H	P
15	P			15						P
16	*			16						H
17	P									
18	P									
19	L									
20	H									

LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO.	IC U51	PIN NO.	IC U51	PIN NO.	IC U52	IC U53	IC U54	IC U55	PIN NO.	IC U55	PIN NO.	IC U57	IC U57
1	H	21	H	1	P	P	P	H	21	H	1	P	L
2	H	22	L	2	P	P	P	L	22	L	2	H	P
3	P	23	P	3	P	P	L	P	23	H	3	P	P
4	L	24	P	4	P	H	P	P	24	P	4	P	L
5	L	25	P	5	P	*	P	H	25	L	5	P	P
6	P	26	L	6	P	*	P	L	26	H	6	P	P
7	P	27	P	7	P	L	P	H	27	*	7	P	P
8	P	28	P	8	P	H	P	L	28	H	8	P	P
9	P	29	P	9	P	P	P	H	29	H	9	H	P
10	H	30	P	10	L	L	L	L	30	P	10	L	L
11	P	31	P	11	P	*	P	H	31	H	11	*	P
12	P	32	P	12	P	*	P	L	32	P	12	P	P
13	P	33	P	13	P	H	P	H	33	P	13	P	P
14	P	34	H	14	P	H	P	H	34	P	14	P	P
15	H	35	H	15	P		P	L	35	P	15	P	P
16	P	36	H	16	P		P	H	36	P	16	P	L
17	P	37	H	17	P		L	H	37	P	17	P	P
18	P	38	P	18	P		P	L	38	P	18	H	P
19	P	39	P	19	P		L	H	39	P	19	P	L
20	P	40	P	20	H		H	L	40	H	20	H	H

KEYBOARD

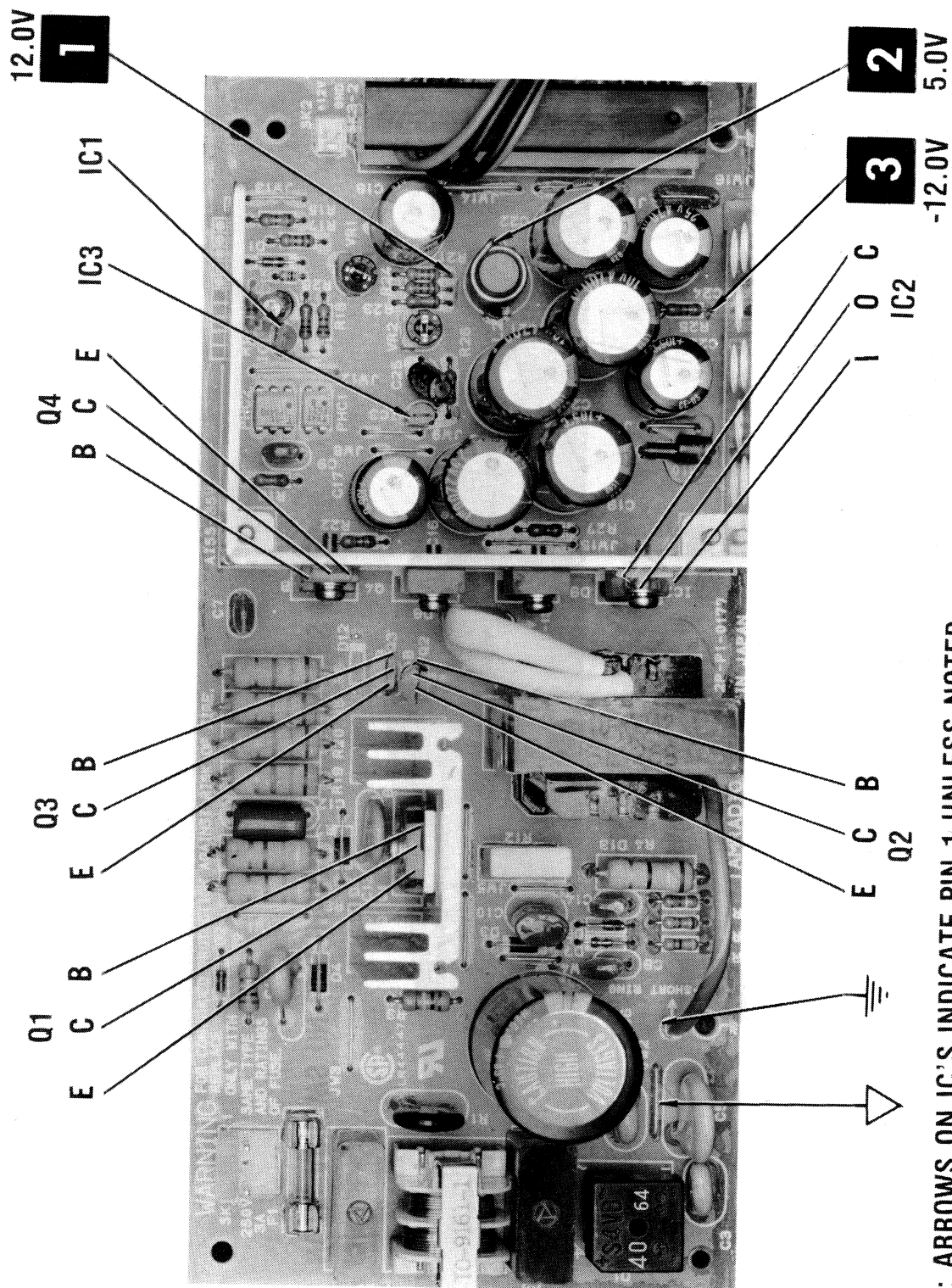
PIN NO.	IC M1	PIN NO.	IC M1	PIN NO.	IC M2
1	*	21	P	1	H(1)
2	P	22	P	2	L(1)
3	P	23	P	3	L(1)
4	H	24	P	4	H(1)
5	H	25	H	5	H(1)
6	L(1)	26	H	6	L(1)
7	L	27	P	7	L
8	P	28	P	8	L(1)
9	H	29	P	9	H(1)
10	H	30	P	10	H
11	P	31	P	11	L
12	H	32	P	12	H
13	H	33	P	13	L
14	H	34	P	14	H
15	H	35	L		
16	H	36	L		
17	H	37	H(1)		
18	H	38	H(1)		
19	H	39	*		
20	L	40	H		

(1) Probe Indicates pulse when a key is pressed.

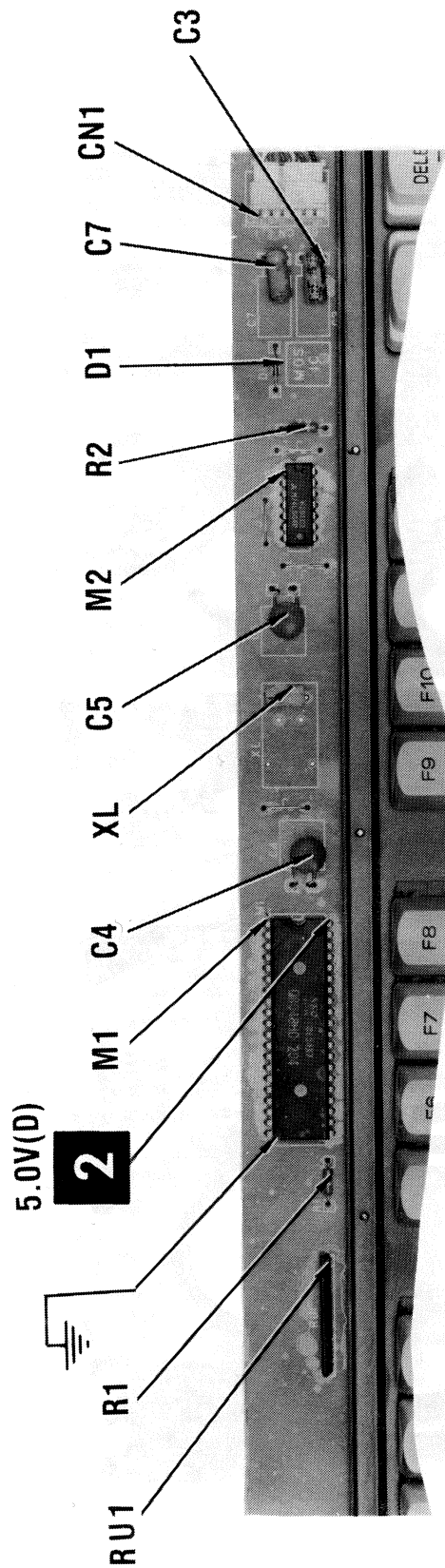
TANDY
MODEL 1000SX

LINE DEFINITIONS

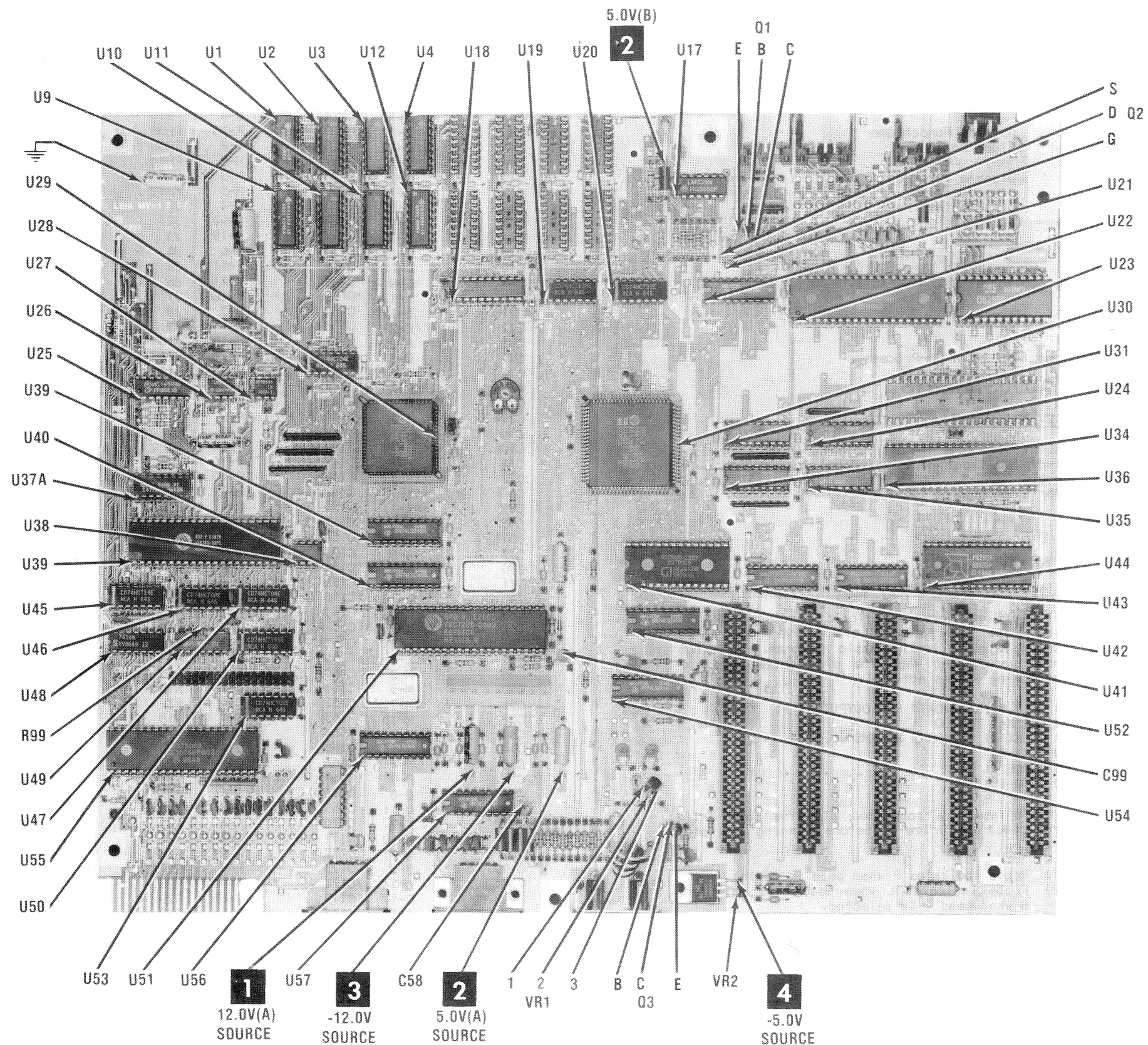
AA0 THRU AA7	Address	MOTOR ON	Disk Drive Motor On
AEN	Address Enable	MTREN	Motor Enable, Floppy Disk
ALE	Address Latch Enable	MTREN	Motor Enable, Floppy Disk
AUDIO	Audio Input Signal	MTRON	Motor On, Disk Drive
BBIOR	Input/Output Read	MWE0	Memory Write Enable, Bank 0
BBIOW	Input/Output Write	MWE1	Memory Write Enable, Bank 1
BREQ	Bus Request	NMI	Non-Maskable Interrupt
BRESET	Reset	NMIEN	Nonmaskable Interrupt Enable
BUFDIR	Buffer Data Direction	OSC	Oscillator
BUFENB	Buffer Enable	OSCOMA	Oscillator Timing 14MHZ
CAS	Column Address Strobe, Memory	PFAULT	Parallel Port Fault State
CLK	Clock Timing Pulses	PPACK	Parallel Port Acknowledge
CLK358	Clock	PPAUTOF	Parallel Port Automatic Feed
CLK8M	Clock	PPBUSY	Parallel Port Busy
COL/MNO	Color/Monochrome, Monitor Operating Mode	PPDATA0 THRU PPDATA7 ..	Parallel Port Data Bits 0 Thru 7
CPUA08 THRU CPUA19	CPU Address Bits 08 Thru 19	PPI/TIM	Video Signal Timing
CPUAD0 THRU CPUAD7	CPU Data Bits 0 Thru 7	PPINIT	Parallel Port Initialize, Set Up Sequence
CPUCLK	CPU Clock	PPINT	Parallel Port Interrupt
D4CLK	Clock Pulse, 477MHZ	PPPAEM	Parallel Port Paper Empty Sensor
DACK1, DACK3	Direct Memory Access Acknowledge	PPSTROB	Parallel Port Timing Strobe
DEN	Data Enable	PRINTCS	Chip Select
DIR	Direction, Disk Read/Write Head	PSEL	Port Select
DMA/INTE	Direct Memory Access Request/Floppy Disk Controller Enable	QS0, QS1	Queue Status, Provide External Tracking
DMATC	Direct Memory Access Terminal Count	RAS	Row Address Strobe
DORCLK	Decode Latch Timing Signal	RDDATA	Read Data
DRQ, DRQ1, DRQ3	Direct Memory Access Request	RDYIN	Ready
DS	Disk Select	READ DATA	Read Data
DSA, DSB	Disk Drive Select A, B	READY	Ready, Current Bus Cycle Is To Be Completed
ENBNMI	Enable Non-Maskable Interrupt	REFRESH	Refresh Dynamic Memory Pulses
FAST	Clock Timing Select	RESET	Reset
FDCCHP	Floppy Disk Controller Chip Select	RFSH	Refresh Address For Dynamic Memory
FDCCLK	Floppy Disk Controller Clock	RQ/GT	Request/Grant, Bus Control
FDCCS	Floppy Disk Controller Chip Select	S0, S1, S2	Function Status Characteristics
FDCDACK	Floppy Disk Controller DMA Acknowledge	SELECT	Select Line Indicates On Line Status
FDCDMRQ	Floppy Disk Controller DMA Request	SIDE ONE	Floppy Disk Side One Select
FDCINT	Floppy Disk Controller Interrupt	SIDSEL	Floppy Disk Side Select
FDCRST	Floppy Disk Controller Reset	SNDCNTL0, 1, 2	Sound Control Lines 0, 1, 2
FDCTC	Floppy Disk Controller Terminal Count	SS0	Status, Used For Decoding Current Bus Cycle
FDCWCK	Floppy Disk Controller Timing Pulse	STEP	Stepper Motor
IA2 THRU IA7	Interrupt Request Lines 2 Thru 7	SYSRST	System Reset
INDEX	Index Sensor	TC	Terminal Count
INT	Interrupt	TMRINT	Timer Interrupt Request
INTA	Interrupt Acknowledge	TRACK 00	Disk, Track 00 Sensor
IOD0 THRU IOD7	Input/Output Data Bits 0 Thru 7	V28MHZ	Clock Pulse 28MHZ
IOR	Input/Output Read	VIDWAIT	Video System Wait Signal
IOW	Input/Output Write	VSYNC	Vertical Sync
JOYSTKS	Joy Sticks	WEN	Write Enable
KBDINT	Keyboard Interrupt	WR	Write, Data Bus Info Stored In Memory Or I/O
M/IO	Select, Distinguishes Memory or I/O	WRDATA	Write Data
MEMIOS	Memory/Input-Output Select	WRITE DATA	Write Data
MEMR	Memory Read	WRITE GATE	Write Gate
MEMW	Memory Write	WRITE PROTECT	Disk Overwrite Protection Sensor
		WRPAT	Write Protect, Overwrite Protection



TANDY
MODEL 1000SX



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



SWITCHES AND JUMPERS

SYSTEM BOARD

VIDEO AND INTERRUPT SWITCHES (S2)

		<u>ON</u>	<u>OFF</u>
S2-1	Video	Color Graphics Video (Internal or optional CGA Board)	Optional Monochrome Video Board
S2-2	Vertical Sync	Enable Interrupt 5	Disable Interrupt 5
S2-3	Floppy Disk Controller	Enable Interrupt 6	Disable Interrupt 6
S2-4	Parallel Port	Enable Interrupt 7	Disable Interrupt 7

RAM JUMPER

Remove jumper from pins E1 and E2 when installing additional 256K RAM IC's.
(U5 thru U8 and U13 thru U16.)

8047 MATH CO-PROCESSOR JUMPER

Remove jumper from pins E3 and E4 when installing on 8047 Math Co-Processor IC (U33).

MISCELLANEOUS ADJUSTMENTS

POWER SUPPLY

NOTE: Do not operate the Power Supply without a load.

5V ADJUSTMENT

Connect the input of a voltmeter to pin 9 of Connector SK3-1. Adjust the 5V Adjust Control (VR1) for a voltage of 5.0V.

12V ADJUSTMENT

NOTE: Perform the 5V Adjustment first. Connect the input of a voltmeter to pin 7 of Connector SK3-1. Adjust the 12V Adjust Control for a voltage of 12.0V.

SCHEMATIC NOTES

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

Logic readings, voltages and waveforms taken in Power Up mode. No diskettes in Disk Drives. No keys depressed. Version of compatibility software displayed on screen along with "Insert System Diskette and Strike any Key when ready". All switches on DIP Switch S2 set On.

Voltages measured with digital meter.

Waveforms and voltages taken from ground, unless noted otherwise.

Supply voltage maintained as shown at input.

Controls adjusted for normal operation.

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

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

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

Value in () used in some versions.

Measurements with switching as shown, unless noted.

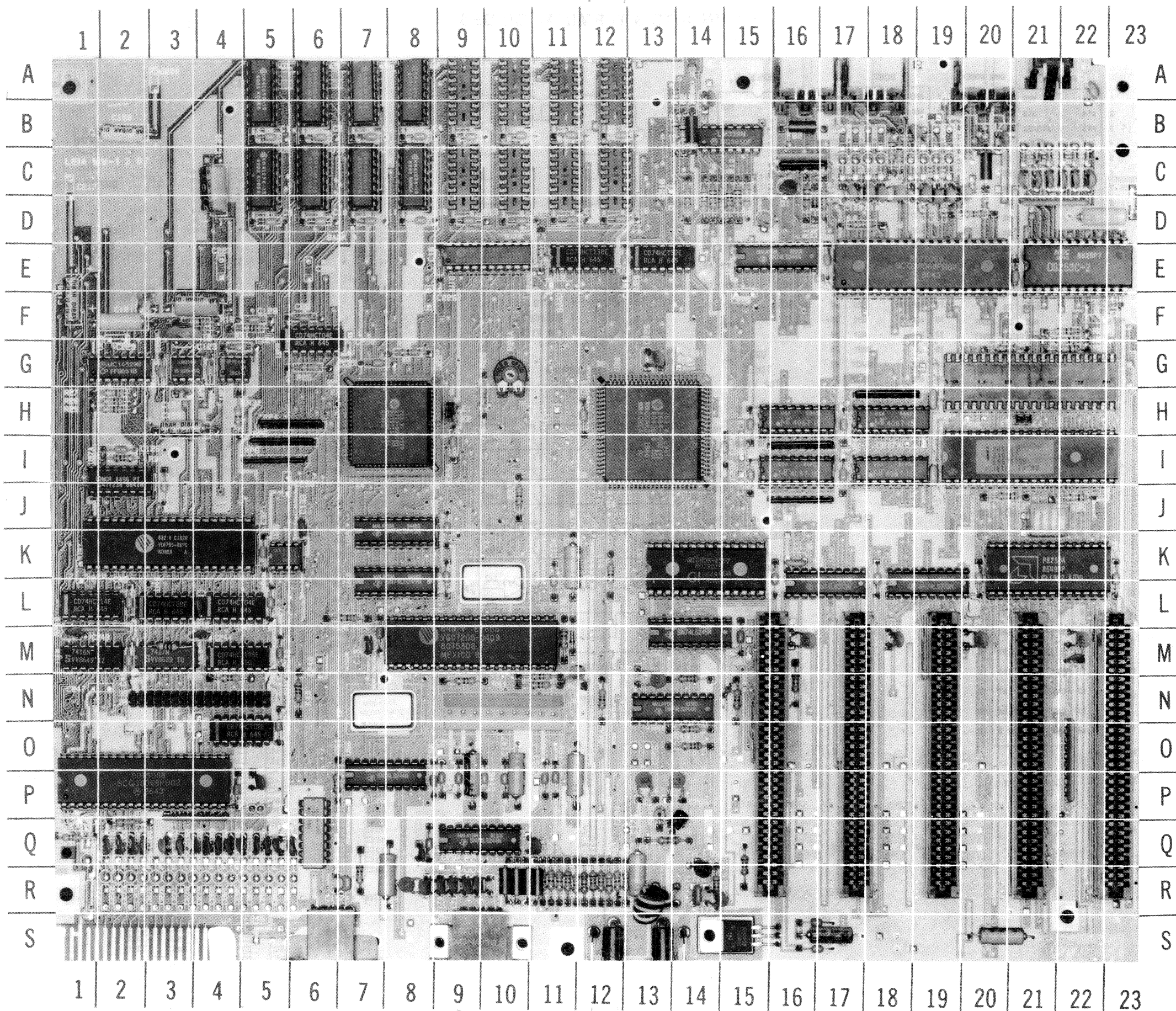
DISK DRIVE INTERFACE AND DISK DRIVE NOTES

Voltages, waveforms and logic readings for the disk drive interface and disk drive taken while running the following Basic program. Readings shown were taken when the disk drive head was not moving unless noted.

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

NOTE: Insert a formatted diskette (not write protected) in Drive B before running the program.

- (1) Probe indicates P when head is moving.
- (2) Probe indicates L when head 0 is selected, H when head 1 is selected.
- (3) Probe indicates H when head 0 is selected, L when head 1 is selected.
- (4) Probe indicates H when head is on track 00 and L when off track 00.
- (5) Probe indicates L when head is on track 00 and H when off track 00.
- (6) Probe indicates H when head is moving in and L when head is moving out from the center of the diskette.
- (7) Probe indicates L when head is moving in and H when head is moving out from the center of the diskette.
- (8) Probe indicates H when head is moving.
- (9) Probe indicates L when head is moving.
- (10) Probe indicates H when Drive Motor is off.



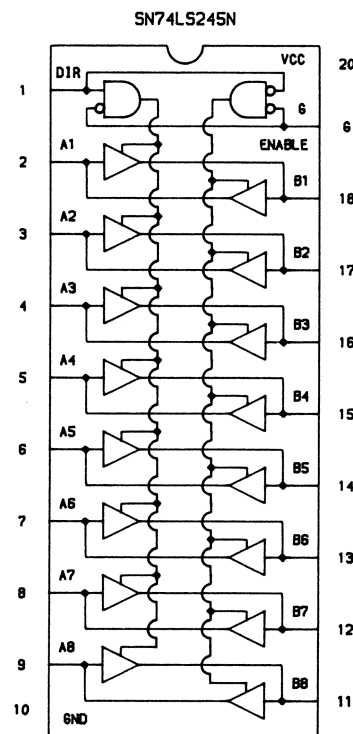
SYSTEM BOARD

A Howard W. Sams **GRIDTRACE™** Photo

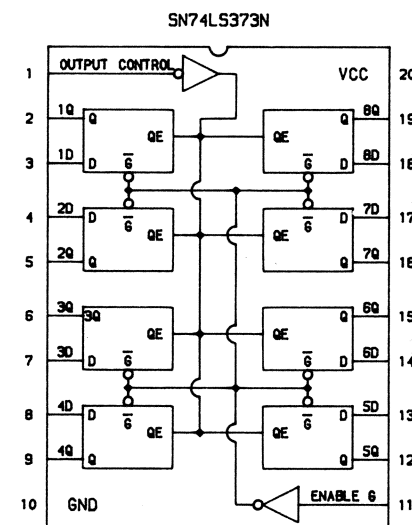
SYSTEM BOARD

**TANDY
MODEL 1000SX**

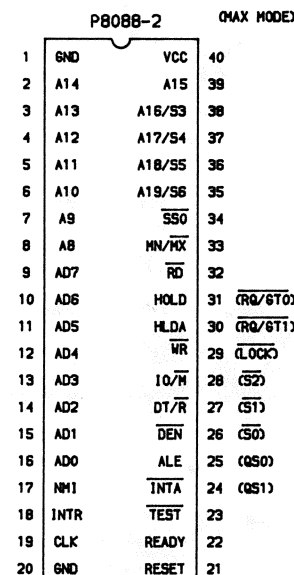
IC PINOUTS & TERMINAL GUIDES



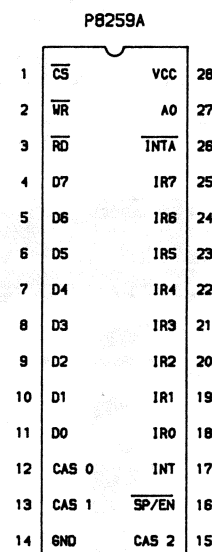
U39, U40, U52
TRANSCEIVER
TOP VIEW



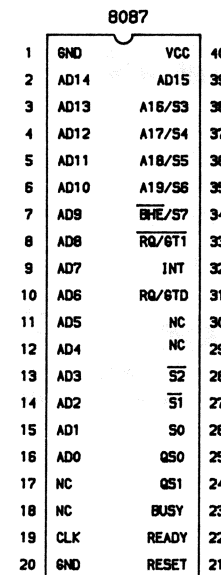
U42, U43
LATCH
TOP VIEW



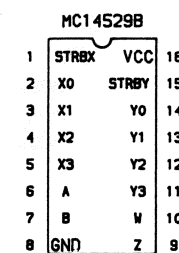
U36
CPU
TOP VIEW



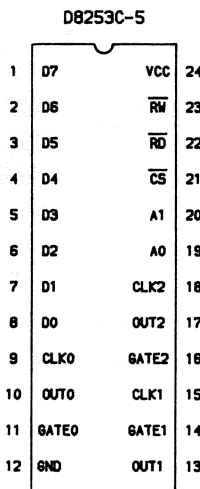
U44
INTERRUPT
CONTROLLER
TOP VIEW



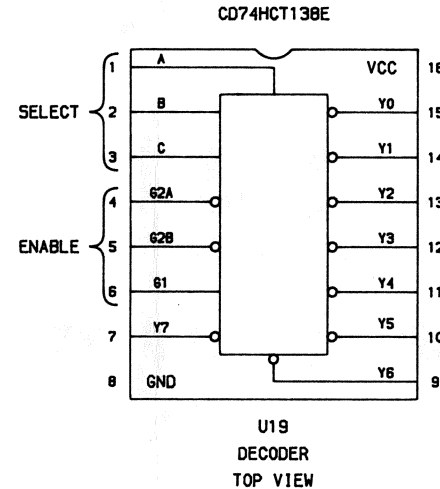
U33
COPROCESSOR
TOP VIEW



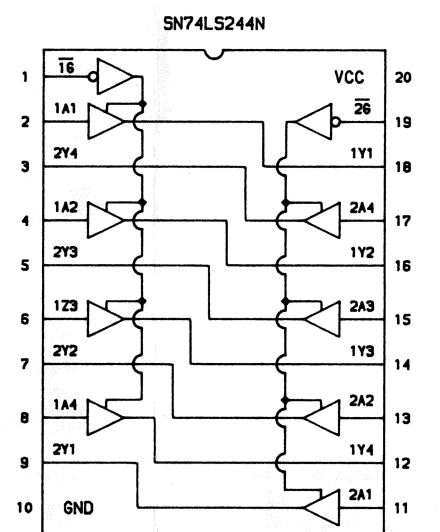
U25
INTERFACE
TOP VIEW



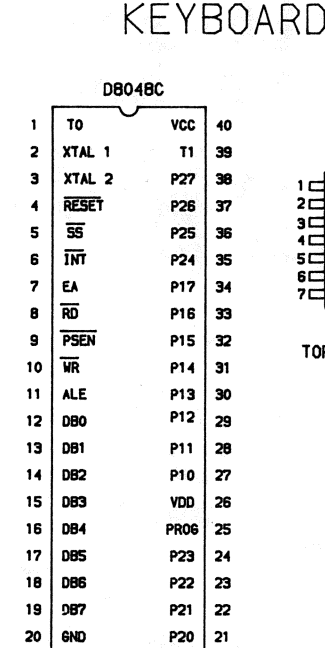
U23
TIMER
TOP VIEW



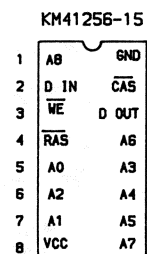
U19
DECODER
TOP VIEW



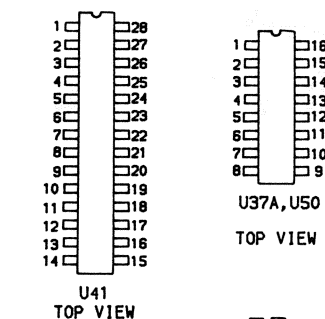
U21, U54, U56, U57
BUFFER
TOP VIEW



M1
KEYBOARD
CONTROLLER
TOP VIEW



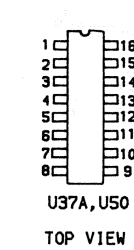
U1 THRU U16
RAM
TOP VIEW



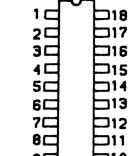
U41
TOP VIEW



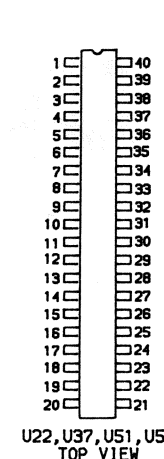
VR1
BOTTOM VIEW



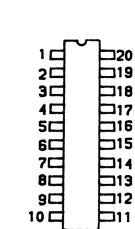
U37A, U50
TOP VIEW



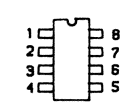
U24, U31, U34, U35
TOP VIEW



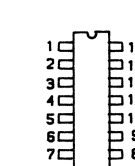
U22, U37, U51, U55
TOP VIEW



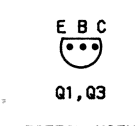
U18
TOP VIEW



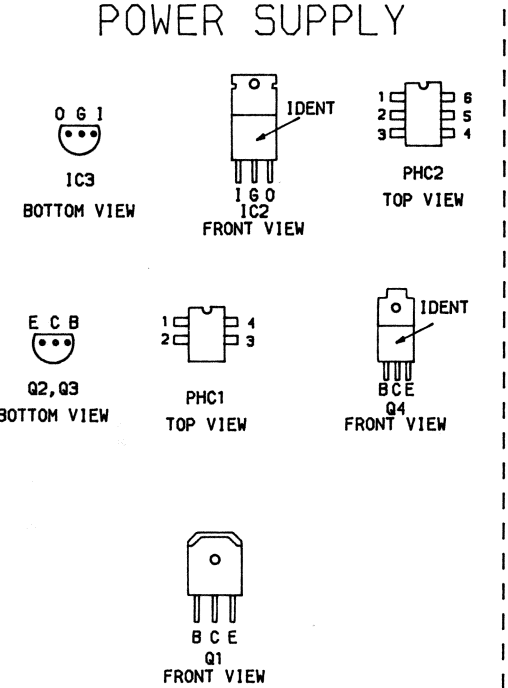
U26, U27, U38
TOP VIEW



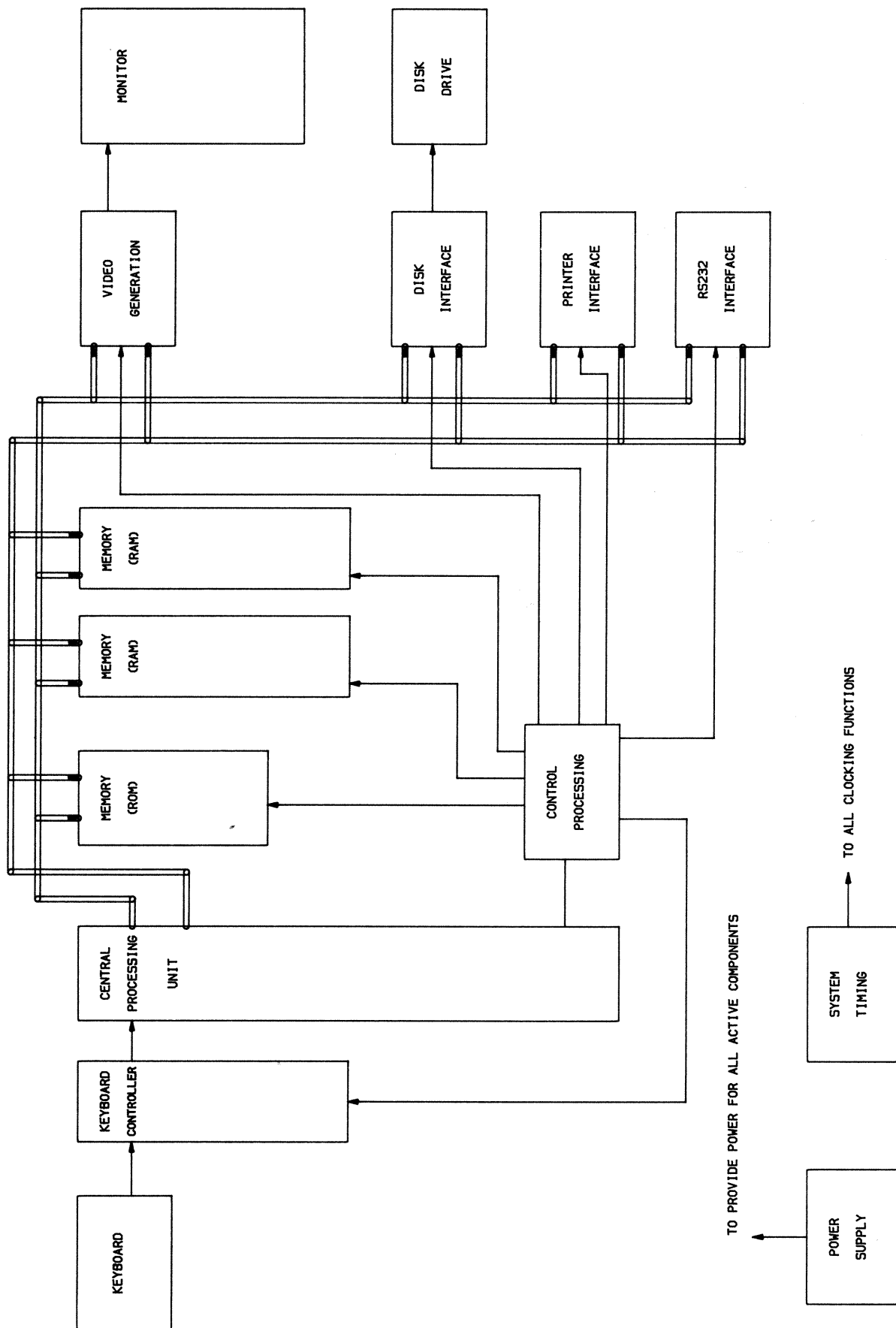
U17, U20, U28, U45 THRU U49, U53
TOP VIEW



Q1, Q3
BOTTOM VIEW



TANDY MODEL 1000SX



BLOCK DIAGRAM

T
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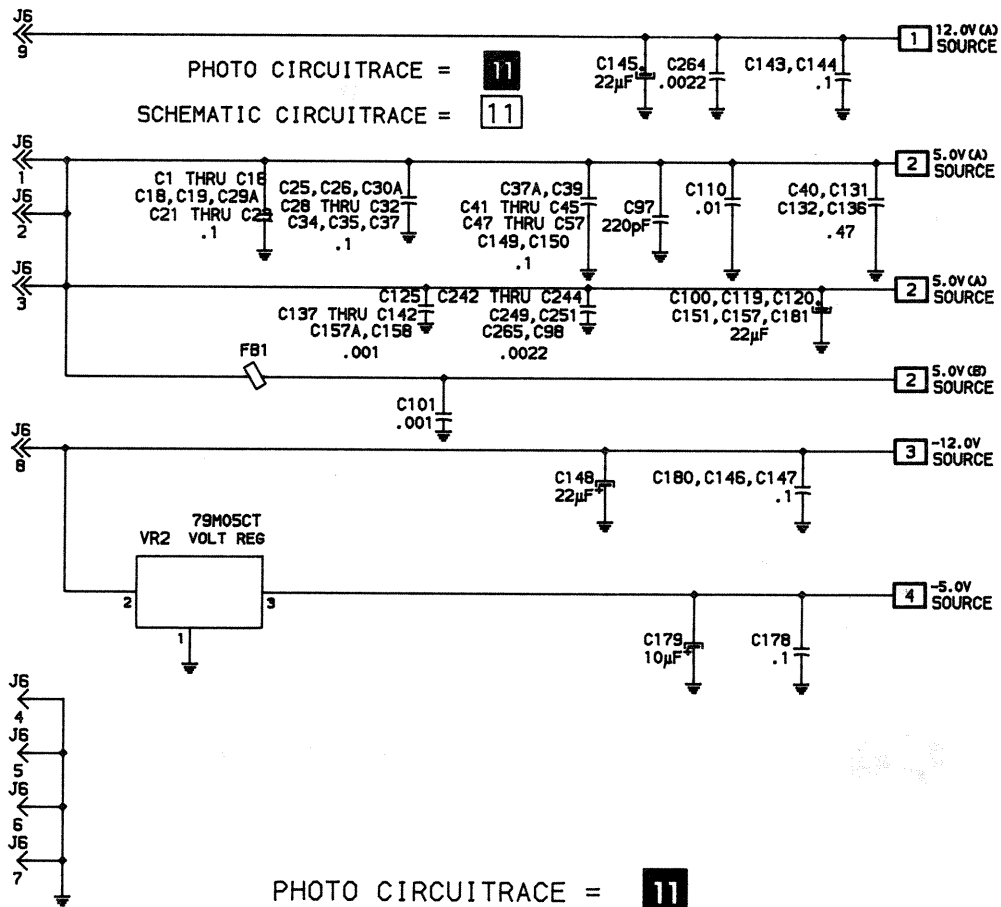
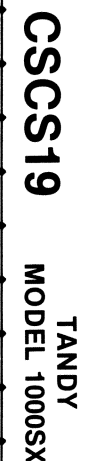


PHOTO CIRCUITTRACE = 11
SCHEMATIC CIRCUITTRACE = 11

TANDY
MODEL 1000SX



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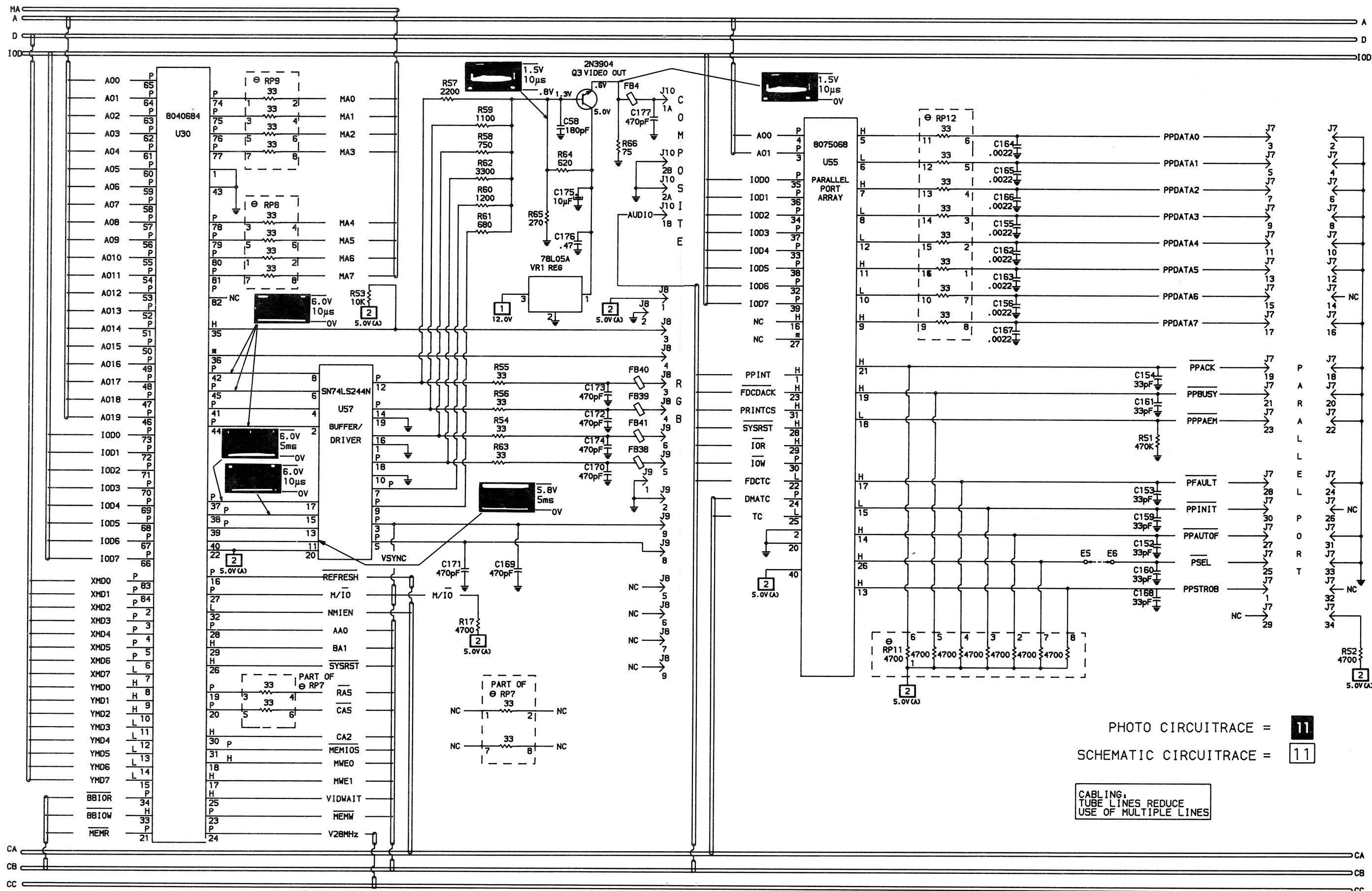
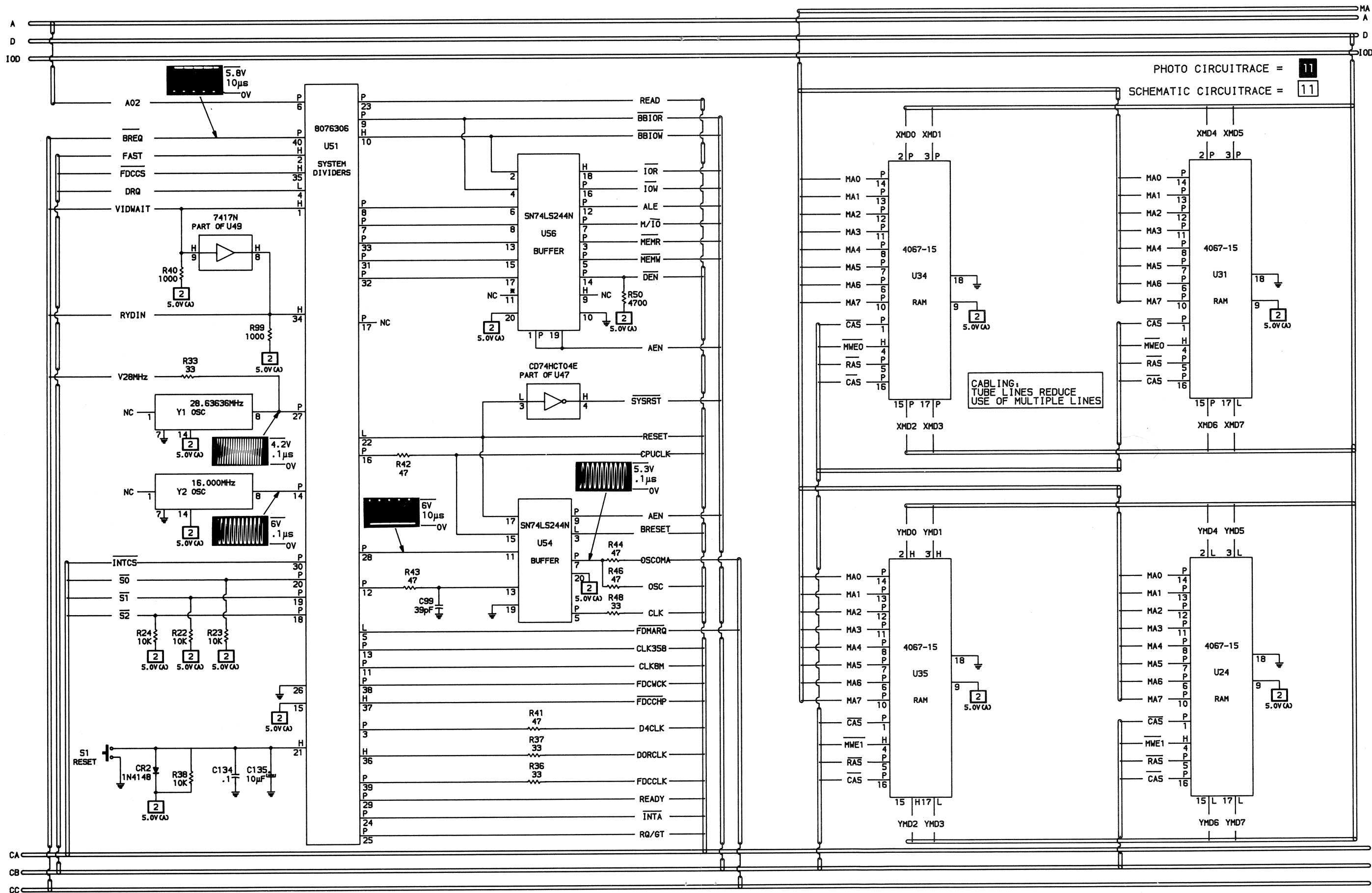


PHOTO CIRCUITRACE = 11
 SCHEMATIC CIRCUITRACE = 11

CABLING.
 TUBE LINES REDUCE
 USE OF MULTIPLE LINES

TANDY
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A PHOTOFACIT STANDARD NOTATION SCHEMATIC

WITH **CIRCUITRACE**

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MODEL 100SX



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MODEL 1000SX

INDEX

	Page		Page
Alignment.....	10,11	Photos	
GridTrace Location Guide		Chassis-Bottom View.....	16
Main Board.....	6	Chassis-Top View.....	14
IC Pinouts and Terminal Guides....	15	Index Board.....	13
Logic Chart.....	15	Main Board.....	6,12
Parts List.....	7,8,9	Schematic.....	2
		Schematic Notes.....	9
		Troubleshooting.....	3,4,5

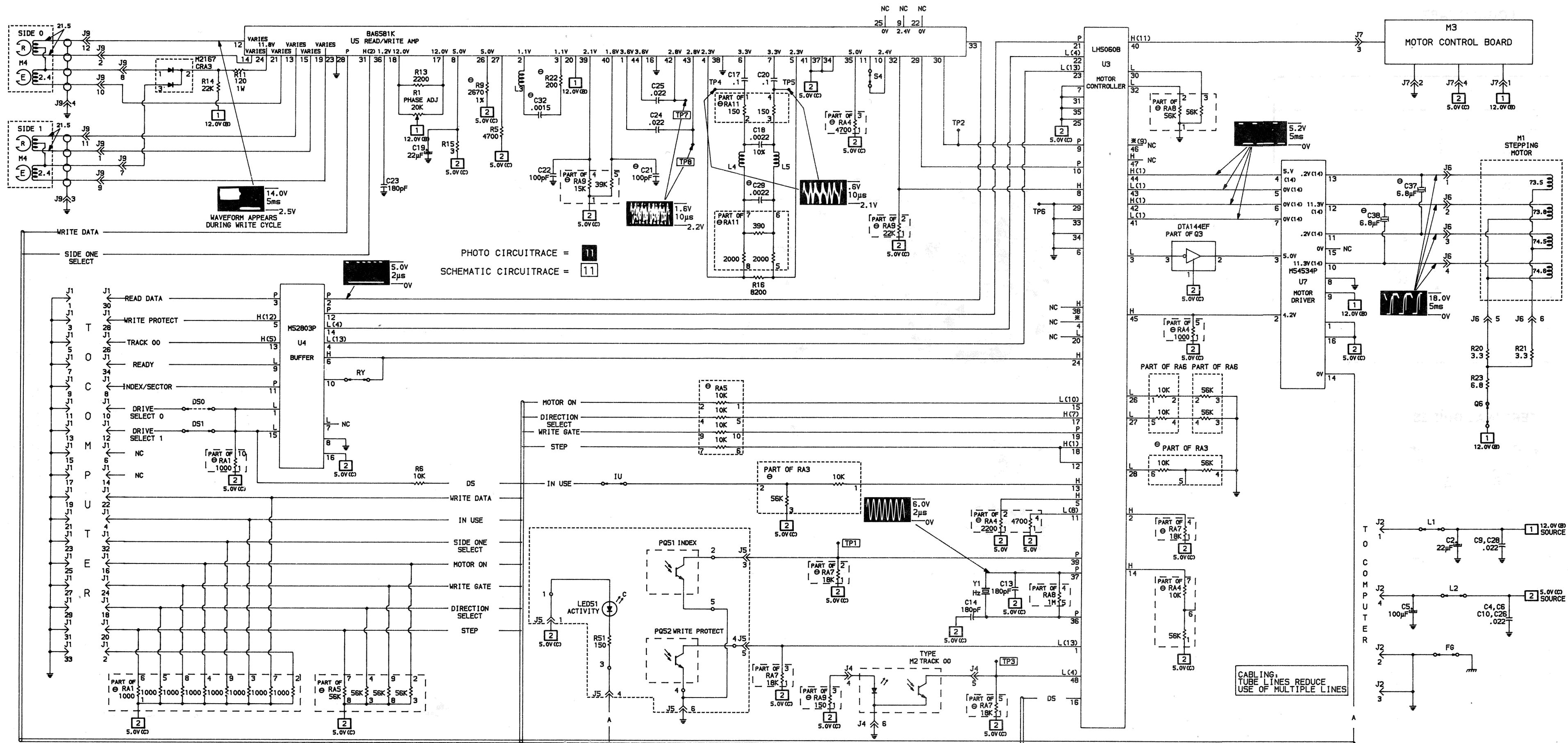
SAMS™ **Howard W. Sams & Co.**
4300 West 62nd Street, P.O. Box 7092, Indianapolis, Indiana 46206 U.S.A.

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

87CS19008 DATE 9-87

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A PHOTOFACT STANDARD NOTATION SCHEMATIC

WITH CIRCUITRACE

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TANDY
MODEL 1000SX

TROUBLESHOOTING

TEST SETUP

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

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

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

HEAD CLEANING INSTRUCTIONS

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

CONTINUOUS OPERATION OF DISK DRIVE

Use the following Basic program to keep Drive A running continuously in the 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
```

OSCILLATOR

Verify the oscillator is working properly by checking the 480KHz waveform at pin 37 of Drive Controller IC (U3). If waveform is missing or the frequency not correct, check Crystal Y1, Capacitors C13 and C14, Resistor RAB from pin 4 to pin 5, and IC U3.

WILL NOT READ

Insert a diskette containing data in Disk Drive B and close the door. Type in and run the following Basic program to keep the Disk Drive running in read mode.

```
10 CLS
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 10 to OUT 1014,128:OUT 1010,16:OUT 1010,20.

The program displays seven numbers on the Monitor screen. The numbers should change when a

diskette with data on it is inserted in the Drive and the Drive door closed. While the above program is running, check for a logic High on the Write gate (pin 24) of Connector J1 on the Disk Drive Board to verify the Disk Drive is in read mode.

If reading is not correct, check the Disk Drive Interface circuit on the Computer System Board. If reading is correct, check for a logic Low at pin 10 of Drive Controller IC (U3). If reading is not correct, check IC U3. If reading is correct, check the waveform at pin 2 of Buffer IC (U4) while opening and closing the Drive door (with diskette in Drive). There should be a noticeable change in the waveform as the Drive door is opened and closed. If there is no change, check the head winding for continuity, check Connector J9 for good connections, and check the voltages and components associated with pins 1 thru 26 and 34 thru 44 of Read/Write Amp IC (U5). If the waveform checks good at pin 2 of IC U4, check for pulses at pin 3 of IC U4. If pulses are missing, check IC U4. If pulses are present, check the Drive cable and check the Disk Drive Interface circuit on the Computer System Board.

WILL NOT WRITE

Insert a blank diskette into the Disk Drive and close the door. Type in and run the following Basic program which writes continuously to the Diskette and displays a number on the upper left corner of the Monitor screen. The number should be 0 when the Diskette is not write protected and change to 2 when a write protected Diskette is inserted into the Drive. If the numbers are not correct, refer to the "Write Protect Does Not Function" section of this Troubleshooting guide.

```
10 CLS
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 20
```

NOTE: this program will not write to the diskette if the diskette index sensor circuits are not working. Check for index pulses at pin 11 of Buffer IC (U4) while the Drive is running with a blank diskette inserted. If pulses are missing, refer to the "Index Sensor" section of this Troubleshooting guide.

While the above program is running, check for pulses at pins 22 and 24 of Connector J1. If pulses are missing, check the Drive cable and check the Disk Drive Interface circuits on the

CSCS19-A
TANDY
MODEL 1000SX

TROUBLESHOOTING (Continued)

Computer System Board. If pulses are present, check for pulses at pins 9 (TP2) and 10 of Drive Controller IC U3. If pulses are missing, check IC U3. If pulses are present, check the head windings for continuity, check Connector J9 for good connections, and check the voltages and components associated with pins 12 thru 27 of Read/Write Amp IC (U5).

WRITE PROTECT DOES NOT FUNCTION

Type in and run the program listed under the "Will Not Write" section of this Troubleshooting guide. The program will display the number 0 on the left upper corner of the Monitor screen if a diskette that is not write protected is inserted into the Drive and the number 2 if the diskette is write protected.

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

While the program is running, insert a write protected diskette into the Drive and check for a logic High at pin 5 of Connector J5. If reading is not correct, check Connector J5 for good connections and check the Write Protect Sensor (PQ52). If reading is correct, check for a logic High at pin 4 and logic Low at pin 5 of Buffer IC U4. If reading is not correct at pin 4, check Drive Controller IC (U3). If reading is correct at pin 4 and not correct at pin 5, check IC U4.

INDEX SENSOR

To check the Index Sensor circuits, type in and run the program given under "Continuous Operation of Disk Drive" to keep the drive running. Insert a diskette in the Disk Drive and close the door. Check for pulses at TP1 (pin 3 of Connector J5). If pulses are missing, check Connector J5 for good connections, Resistor RA7 from pin 2 to pin 1 and the Index Sensor (PQ51). If pulses are present, check for pulses at pin 12 of the Buffer IC (U4). If pulses are missing, check the Drive Controller IC (U3). If pulses are present, check for pulses at pin 11 of IC U4. If pulses are missing, check IC U4. If pulses are present, check pin 8 of Connector J1 for good connections.

TRACK 00 SENSOR

Disk Drive Head bangs against the Track 00 stop. Type in and run the following Basic program to check the Track 00 detector circuits. The program will step the Head back to Track 00 and display the number 16 on the Monitor screen to indicate the head is on Track 00. If the head is manually pushed off Track 00 the number should change to the number 0.

DRIVE A

```
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 1014,128:OUT 1010,16:OUT 1010,20
60 S=INP(1012)
70 OUT 1013,4:S=INP(1012)
80 OUT 1013,2:S=INP(1012)
90 CLS:PRINT INP(1013) AND 16:S=INP(1012)
100 GOTO 40
```

DRIVE B

```
10 OUT 1014,128:OUT 1010,33:OUT 1010,37
20 OUT 1013,7:S=INP(1012)
30 OUT 1013,1:S=INP(1012)
40 T=1 TO 500:NEXT T
50 OUT 1014,128:OUT 1010,33:OUT 1010,37
60 S=INP(1012)
70 OUT 1013,4:S=INP(1012)
80 OUT 1013,2:S=INP(1012)
90 CLS:PRINT INP(1013) AND 16:S=INP(1012)
100 GOTO 40
```

If the number on the Monitor screen is not correct, check for a logic High at TP3 when the head is On Track 00 and a logic Low when the head is Off Track 00. If readings are not correct, check Connector J4 for good connections, check the Track 00 Sensor (M2) and Resistor RA7 from pin 5 to pin 1. If readings are correct, check for a logic High at pin 14 and a logic Low at pin 13 of Buffer IC (U4) with the head On Track 00 and a logic Low at pin 14 and a logic High at pin 13 with the head Off Track 00. If readings are not correct at pin 14, check Drive Controller IC (U3). If readings are correct at pin 14 and not correct at pin 13, check IC U4.

DRIVE MOTOR

Drive Motor will not run. Check Connectors J1 and J7 on the Disk Drive Board for good connections. Check for 5.0V at pin 4 and 12.0V at pin 1 of Connector J2 on the Disk Drive Board. If the voltages are missing, check the power supply.

Type in and run the program given under "Continuous Operation of Disk Drive" to keep the Drive running. Check for a logic Low at pin 16 of Connector J1 on the Disk Drive Board. If reading is not correct, check the Drive cable and check the Disk Drive Interface on the Computer System Board. If reading is correct, check for a logic High at pin 3 of Connector J7. If reading is not correct, check the Drive Controller IC (U3). If reading is correct, check Connector J7 for good connections and check the Drive Motor Control Board.

STEPPING MOTOR

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

DRIVE A

```
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 OUT T=1 TO 500:NEXT T
```

TROUBLESHOOTING (Continued)

```
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
```

DRIVE B

```
10 OUT 1014,128:OUT 1010,33:OUT 1010,37
20 OUT 1013,7:S=INP(1012)
30 OUT 1013,1:S=INP(1012)
40 OUT T=1 TO 500:NEXT T
50 OUT 1010,37
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
```

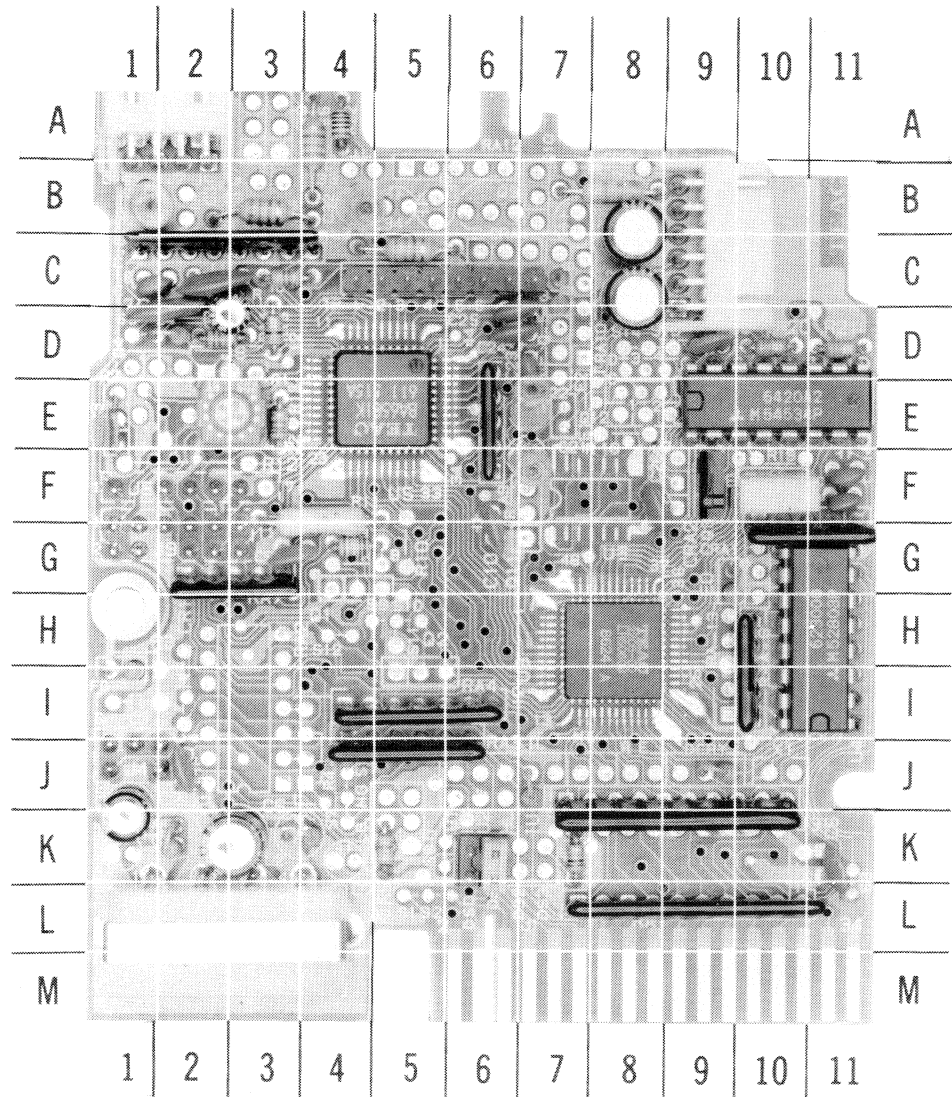
While the program is running, check for pulses at pins 18 and 20 of Connector J1. If pulses are missing, check the Drive cable and check the Disk Drive Interface circuit on the Computer System Board. If pulses are present, check for pulses at pins 4 thru 7 of Motor Driver IC (U7). If pulses are missing, check Drive Controller IC (U3). If pulses are present, check for pulses at pins 10 thru 13 of IC U7. If pulses are missing, check IC U7, Capacitors C37 and C38, Connector J6, and check the Stepping Motor (M1) windings for continuity.

CSCS19-A

**TANDY
MODEL 100SX**

GridTrace LOCATION GUIDE

C2	K-1
C4	J-3
C5	K-3
C6	K-11
C9	G-3
C10	G-6
C13	F-11
C14	F-11
C17	D-2
C18	C-1
C19	D-2
C20	C-2
C21	F-7
C22	E-7
C23	D-7
C24	D-6
C25	D-6
C26	F-8
C28	D-9
C29	B-1
C32	B-4
C37	C-8
C38	B-8
CRA3	E-1
DS0	K-6
DS1	K-6
J1	M-8
J2	L-3
J4	J-1
J5	F-1
J6	C-10
J7	A-2
J9	G-1
L3	C-5
L4	B-3
L5	A-4
Q3	F-9
R1	E-3
R5	K-5
R6	K-7
R9	G-4
R11	F-4
R13	E-3
R14	D-2
R15	D-3
R16	C-3
R20	D-10
R21	D-11
R22	A-4
R23	B-8
RA1	L-9
RA3	J-5
RA4	I-5
RA5	K-9
RA6	I-10
RA7	G-3
RA8	G-11
RA9	E-6
RA11	C-2
TP1	C-4
TP2	C-5
TP3	C-5
TP4	C-5
TP5	C-6
TP6	C-6
TP7	C-6
TP8	C-7
U3	H-8
U4	H-11
U5	E-5
U7	E-10
Y1	F-10



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.					NOTES
		NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	
DISK DRIVE						
CRA3	M2167					
Q3	1SS233F					
U3	DTA144EF					
	LH5060B					
U4	M52803P					
U5	BA6581K					
U7	M54534P	NTE2072	ECG2072			

CSCS19-A

**TANDY
MODEL 1000SX**

PARTS LIST AND DESCRIPTION (Continued)

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

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
C37 C38	DISK DRIVE 6.8 25V NP 6.8 25V NP	

ITEM No.	RATING	MFGR. PART No.

CAPACITORS

ITEM No.	RATING	MFGR. PART No.
C21 C29 C32	DISK DRIVE 100pF 500V 2% .0022 500V 2% .0015 500V 2%	

ITEM No.	RATING	MFGR. PART No.

COILS (RF-IF)

ITEM No.	FUNCTION	MFGR. PART No.
L3 L4 L5	DISK DRIVE Peaking Peaking Peaking	

ITEM No.	FUNCTION	MFGR. PART No.

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

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
R1	DISK DRIVE Balance	20K		

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	WORKMAN PART No.
R9 R22 RA1 RA3 RA4 RA5 RA6 RA7 RA8 RA9 RA11	DISK DRIVE 2670 1% 1/8W Carbon Film 200 1% 1/8W Carbon Film Resistor Network Resistor Network Resistor Network Resistor Network Resistor Network Resistor Network Resistor Network Resistor Network Resistor Network	(1) (2) (3) (4) (4) (5) (6) (7) (8)		

- (1) 1000 5% x 9
(2) 10K x 2, 56K x 2
(3) 56K, 10K, 1000, 2200 and 4700 x 2
(4) 10K x 4, 56K x 4

- (5) 18K x 4
(6) 56K x 2, 1M x 1
(7) 22K, 39K, 15K, 150
(8) 150 x 2, 2000 x 2, 390

PARTS LIST AND DESCRIPTION (Continued)

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

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
	DISK DRIVE		
LED51	LED		Activity, Red
M1	Motor		Stepping
M2	Sensor		Track 00
M3	Motor		Drive
M4	Head		Read/Write/Erase
PQ51	Sensor		Index
PQ52	Sensor		Write Protect

SCHEMATIC NOTES

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

Voltages, waveforms and logic readings for the disk drive interface and disk drive taken while running the following Basic program. Readings shown were taken when the disk drive head was not moving unless noted.

NOTE: Insert a formatted diskette (not write protected) in Drive B before running the program.

- (1) Probe indicates P when head is moving.
- (2) Probe indicates L when head 0 is selected, H when head 1 is selected.
- (3) Probe indicates H when head 0 is selected, L when head 1 is selected.
- (4) Probe indicates H when head is on track 00 and L when off track 00.
- (5) Probe indicates L when head is on track 00 and H when off track 00.
- (6) Probe indicates H when head is moving in and L when head is moving out from the center of the diskette.
- (7) Probe indicates L when head is moving in and H when head is moving out from the center of the diskette.
- (8) Probe indicates H when head is moving.
- (9) Probe indicates L when head is moving.
- (10) Probe indicates H when Drive Motor is off.
- (11) Probe indicates L when Drive Motor is off.
- (12) Probe indicates L if diskette is write protected.
- (13) Probe indicates H if diskette is write protected.
- (14) Voltage varies when head is moving.

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

Terminal identification may not be found on unit.

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

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

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

Value in () used in some versions.

Measurements with switching as shown, unless noted.

Logic Probe Display
 L = Low
 H = High
 P = Pulse
 * = Open (No lights On)

Voltages measured with digital meter.

Waveforms and voltages taken from ground, unless noted otherwise.

Supply voltage maintained as shown at input.

Controls adjusted for normal operation.

TANDY
MODEL 1000SX

ALIGNMENT

EQUIPMENT REQUIRED

A test program or a Disk Drive Tester is required which will turn On the Disk Drive, select side 0 or 1 and step the head to the track specified in the alignment procedures. Use a Dysan Analog Alignment Diskette 224/2A when an Alignment Diskette is specified in the alignment procedures. NOTE: This alignment diskette has only alignment patterns on it and does not contain any alignment programs.

DRIVE TRACK PROGRAM

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

NOTE: The programs select side 0 only.

Operates Drive A

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

Operates Drive B

```
10 CLS
20 OUT 1014,128:OUT 1010,33:OUT 1010,37
30 OUT 1013,7:S=INP(1012)
40 OUT 1013,1:S=INP(1012)
50 INPUT "ENTER TRACK NUMBER ";TR
60 IF TR>40 THEN 50
70 OUT 1010,37
80 OUT 1013,15:S=INP(1012)
90 OUT 1013,1:S=INP(1012)
100 OUT 1013,TR:S=INP(1012)
110 FOR T=1 TO 400:NEXT T
120 PRINT"PRESS ANY KEY TO STOP"
130 A$=INKEY$:OUT 1010,37:IF A$="" THEN 130
ELSE 50
```

SPINDLE SPEED CHECK

If a Disk Drive Tester which provides a readout of the speed in rpm is being used, check for a speed of 300 rpm \pm 4.5rpm.

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

The speed is correct if the pattern appears to stand still.

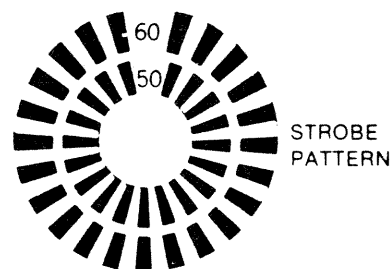


Figure 1

RADIAL HEAD ALIGNMENT

Connect the channel A input of a dual trace scope to TP7, channel B to TP8, and the external trigger input to TP1. Connect ground lead to TP6. Set the scope to add mode with one channel inverted, the sweep time to 20mSec and the voltage range to .2V. Set both scope inputs to AC. Insert the Alignment Diskette into the Disk Drive and close the door. Turn On the Disk Drive and step the head to track 16, Side 0. The cats-eye pattern shown in Figure 2 should be displayed on the scope.

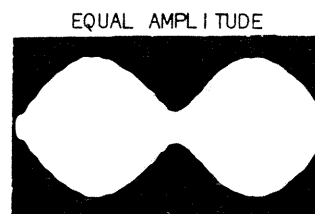


Figure 2

The amplitude of the two lobes displayed must be within 70% of each other. If the lobes are out of tolerance, loosen two screws holding Stepping Motor (M1). Adjust Motor until the two lobes are equal in amplitude and tighten Motor mount screws. Check the adjustment by stepping the head to Track 39 and back to Track 16, then to Track 00 and back to Track 16, checking the lobes each time the head is on Track 16. Check the Track 00 Stop and Detector adjustments after performing the Radial Head Alignment. Select side 1 and check Radial alignment of Head 1 using the above procedures.

TRACK 00 SENSOR

Connect a scope to TP8 and set the sweep time to 20uSec. Set the voltage range to .2V. Insert the Alignment Diskette into the Disk Drive and close the door. Turn On the Disk Drive and set the Head to Track 00. A 125KHz sine wave should be displayed on the scope.

ALIGNMENT (Continued)

If the 125kHz signal is not present, step the head forward or back until the 125kHz signal is present. When the 125kHz signal is present on the scope, the head is on Track 00.

Connect the input of a voltmeter to TP3. Check for 5V when the Head is on Track 00 and 0V when the Head is on Track 02. If the readings are not correct, set the Head to Track 01, loosen the Track 00 Sensor (M2) screw (see Disk Drive Mechanical Photo) on the top of the Disk Drive and adjust the detector until the voltmeter reading jumps from 0V to 5V. Tighten the Track 00 screw and recheck the Track 00 Sensor adjustment.

INDEX SENSOR ADJUSTMENT

Connect the channel A input of a dual trace scope to TP8, channel B input to TP1 (Index pulse) and the scope ground to TP6. Set the scope display to channel A with the voltage range set to 20mV and the sweep time set to 50uS. Set the channel B input to noninverting mode and trigger the scope on channel B with the trigger set to negative slope.

Insert the Alignment Diskette in the Disk Drive and close the door. Turn On Disk Drive, select side 0 and set the head to track 01. Confirm that the leading edge of the burst occurs 200uS \pm 200us after the leading edge of the Index pulse, see Figure 3. If the Index Sensor (PQ51) is out of adjustment, loosen two screws holding the board with the Index detector on the top of the Disk Drive and adjust the Board for 200us \pm 200us, see Disk Drive Mechanical, Top View Photo. If side 0 checks good, select side 1 and repeat the above procedure to check Head 1.

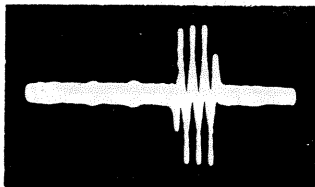


Figure 3

AZIMUTH CHECK

Connect the channel A input of a dual trace scope to TP7, channel B input to TP8, external trigger input to TP1 and connect the scope ground to TP6. Set the scope to add mode with channel B inverted, sweep time to .5ms, AC input, trigger to negative slope and voltage to .1V range.

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

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

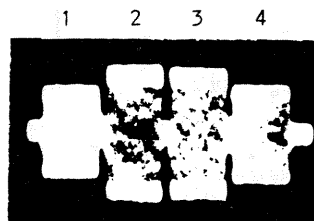


Figure 4

READ CIRCUIT ADJUSTMENT

To do this adjustment a Disk Drive Tester or program is required that will continuously write a 1F (62.5KHz) pattern on a blank diskette inserted in the Drive.

Connect the input of a scope to pin 3 of IC U4 (Read Data Line). Set the sweep time to 2u Sec, voltage range to 2V and trigger on negative slope. Insert a BLANK diskette in the Drive and close the Drive door. Continuously write a 1F pattern to the diskette. Two pulses should appear on the scope screen. If the Phase Adj Control (R1) is out of adjustment, the second pulse will appear to be two pulses out of phase, see Figure 5. If R1 is out of adjustment, adjust it until the second pulse appears to be one pulse, see Figure 6.

2 pulses

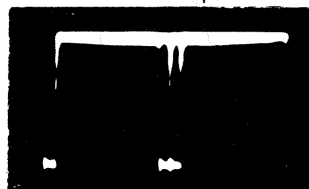


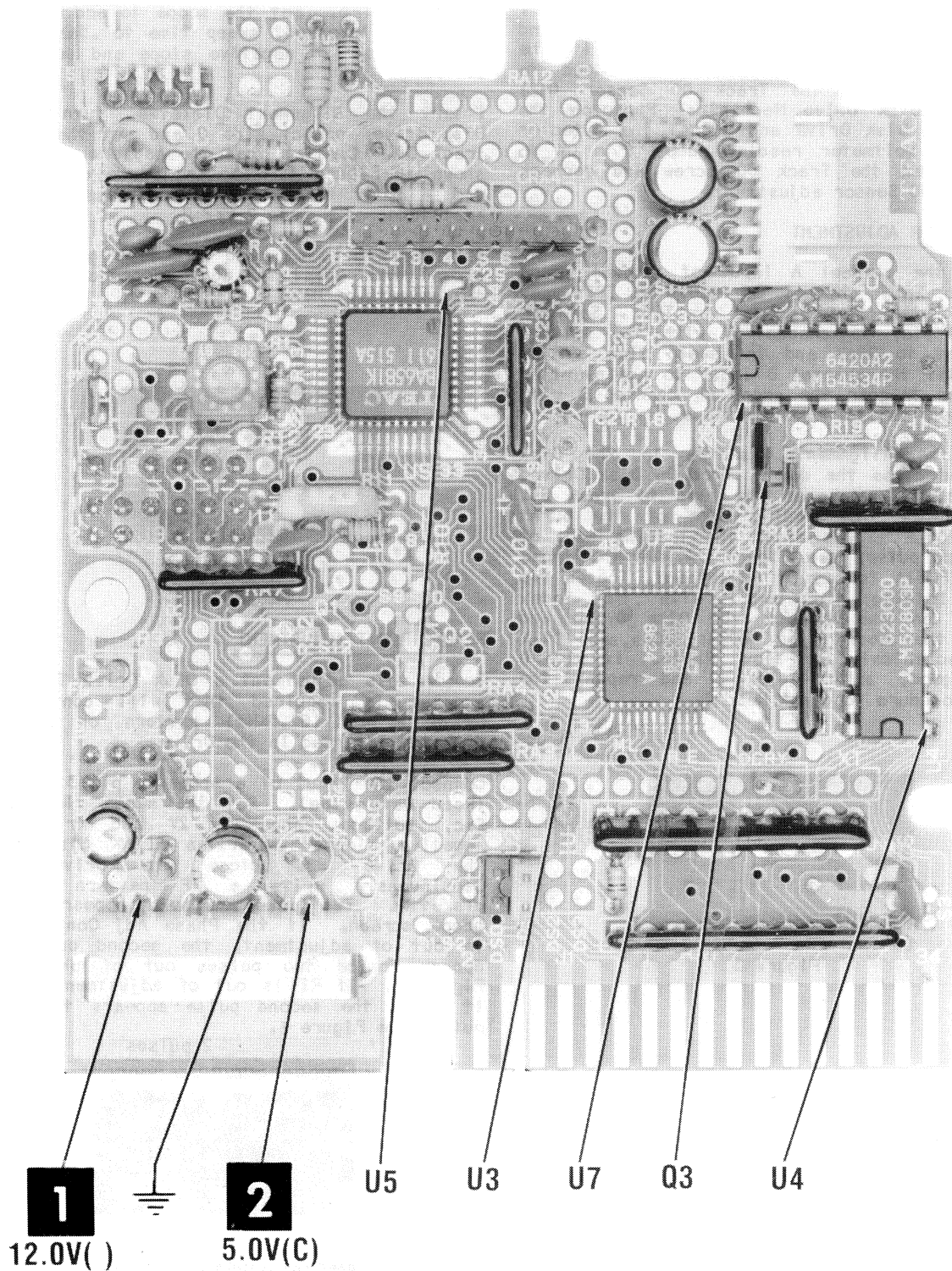
Figure 5

1 pulse

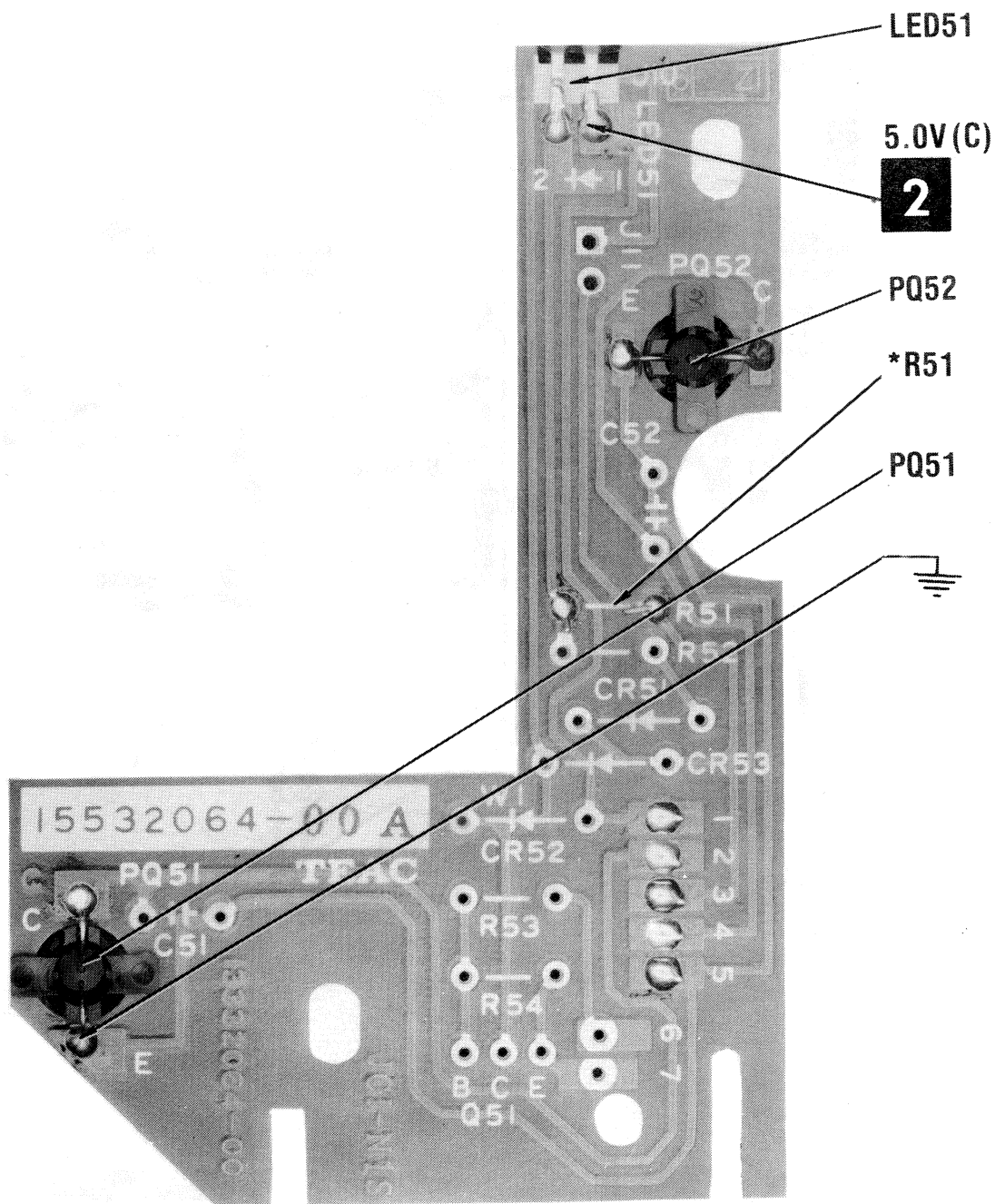


Figure 6

TANDY
MODEL 100SX

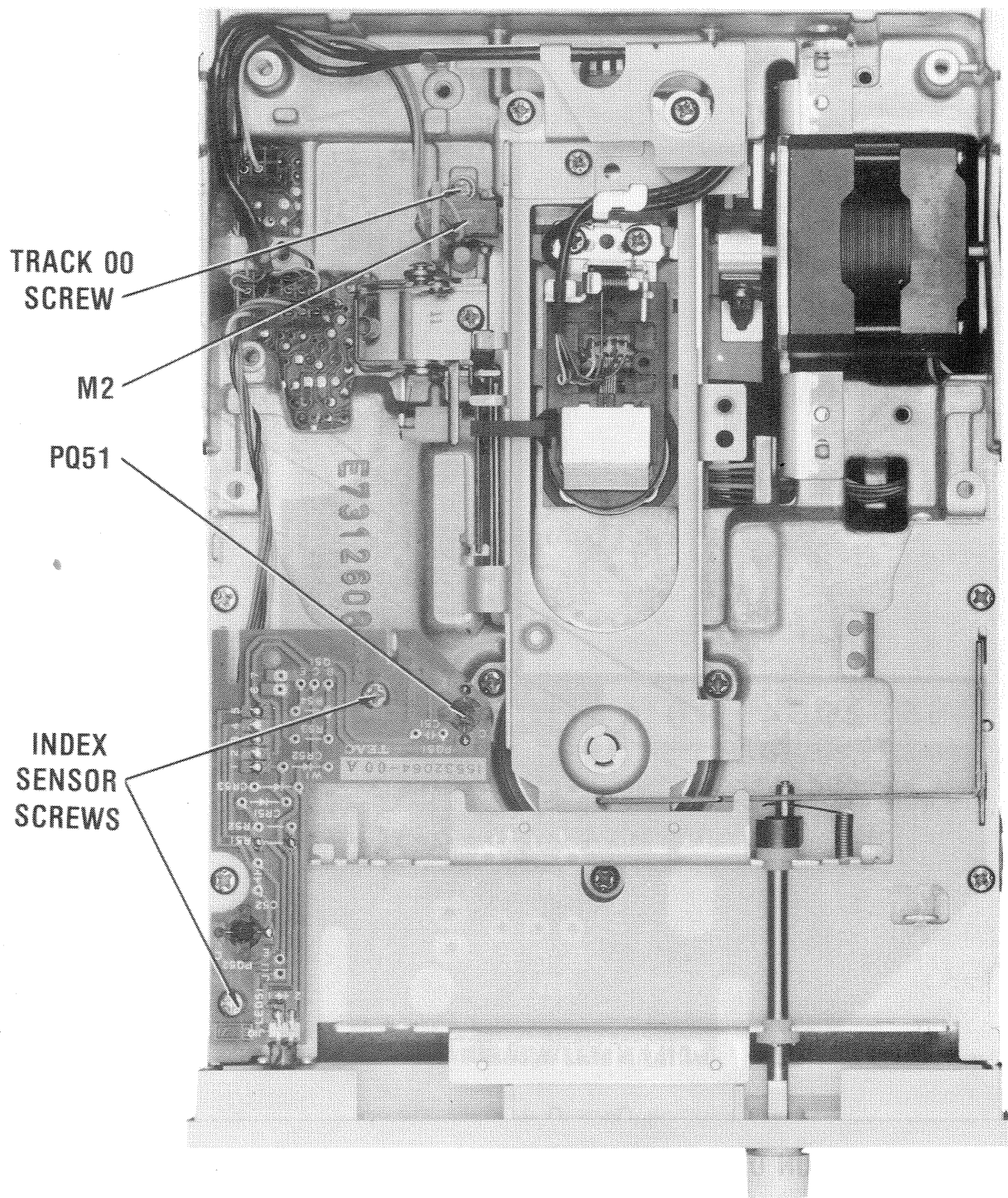


NOTE: ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED



TANDY
MODEL 1000SX

*LOCATED ON OTHER SIDE OF THE BOARD



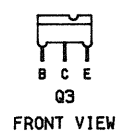
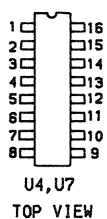
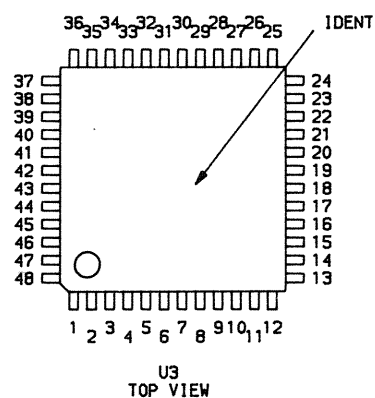
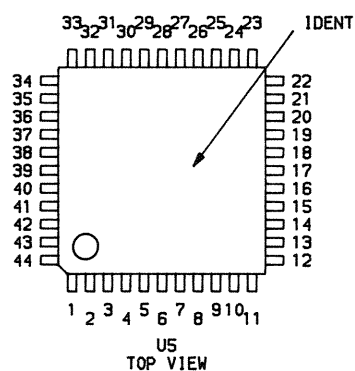
CHASSIS-TOP VIEW

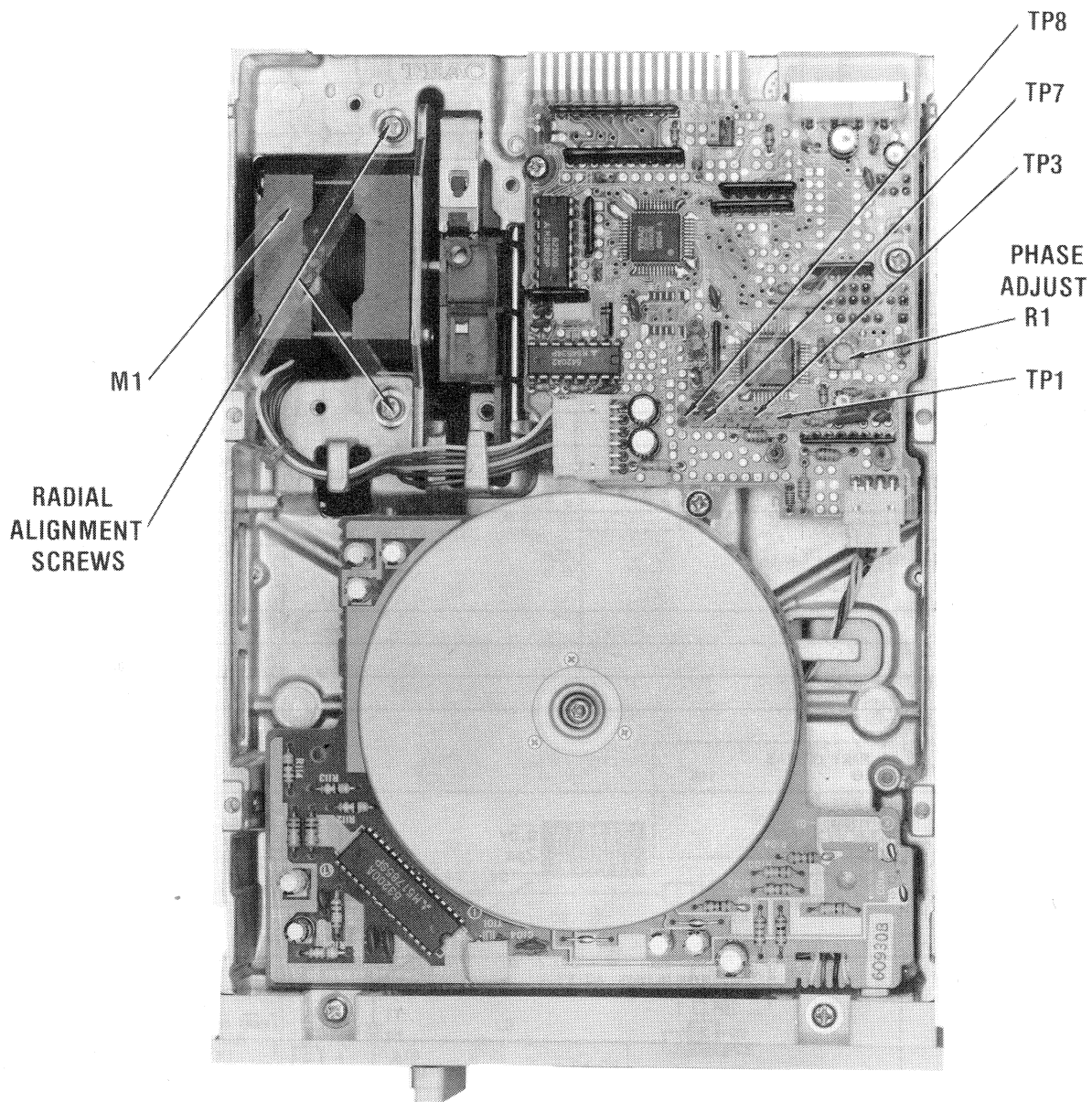
LOGIC CHART

FLOPPY DISK DRIVE

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

TERMINAL GUIDES





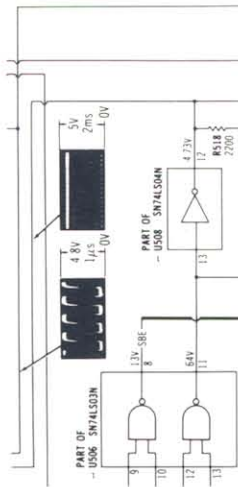
CHASSIS - BOTTOM VIEW

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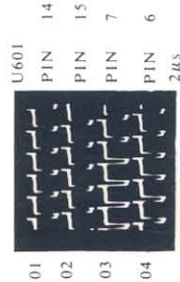


- **Step by Step Troubleshooting** guides the technician through the necessary procedures to quickly locate the problem.

TROUBLESHOOTING

MICROPROCESSOR CHIP (CPU) OPERATION

Verify the processor is functioning by checking the signals on the address lines (pins 10 thru 24 of IC 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.



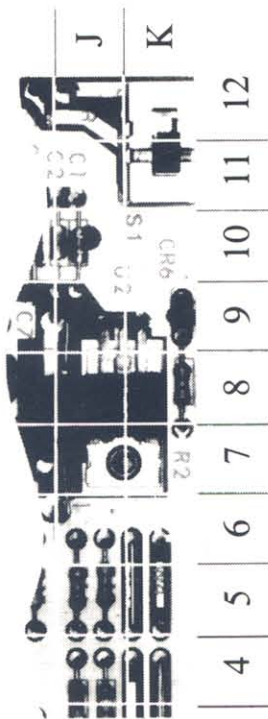
LOGIC

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

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

Remove staples and use cover for file folder.

- 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				NOTES
			ECG Part No.	NTE Part No.	RCA Part No.	ZENITH Part No.	
D102	1S553	1149-2576	ECG519	NTE519	SK9091/177	103-131	
D103	2N60FM	1149-2527	ECG109	NTE109	SK3088	103-29001	
D201	1N4004GP	1201-4205	ECG116	NTE116	SK3312	212-76-02	
D501 thru D503	1S553	1149-2576	ECG519	NTE519	SK9091/177	103-131	

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