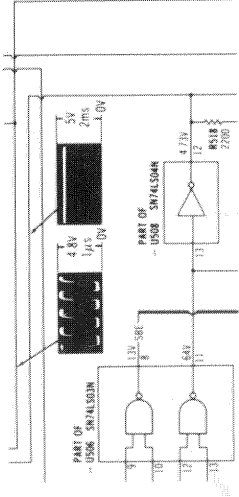


COMPUTERFACTS™ put easy to use, informative technical data right at your fingertips. Each edition includes specific service information on the individual component, along with some overall troubleshooting hints.

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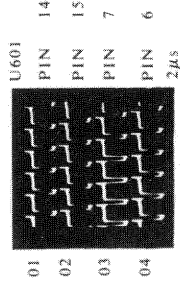


- Step by Step Troubleshooting guides the technician through the necessary procedures to quickly locate the problem.

TROUBLESHOOTING

MICROPROCESSOR CHIP (CPU) OPERATION

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



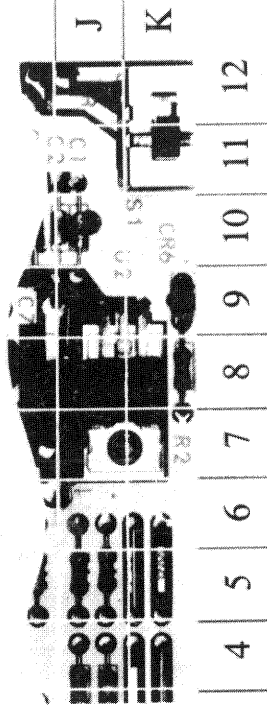
LOGIC

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

PIN NO	IC U100	PIN NO	IC U100	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
2	P	22	P	2	P	P	P	P	P	P	P
3	P	23	P	3	P	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.	ECC Part No.	NTE Part No.	RCA Part No.	ZENITH Part No.	REPLACEMENT DATA NOTES
D102	ISS53	1149-2576	ECC519	NTE519	SK9091/177	103-131	
D103	2N60FM	1149-2527	ECC109	NTE109	SK3088	103-29001	
D201	1N4004GP	1201-4205	ECC116	NTE116	SK3312	212-76-02	
D501 thru D503	ISS53	1149-2576	ECC519	NTE519	SK9091/177	103-131	

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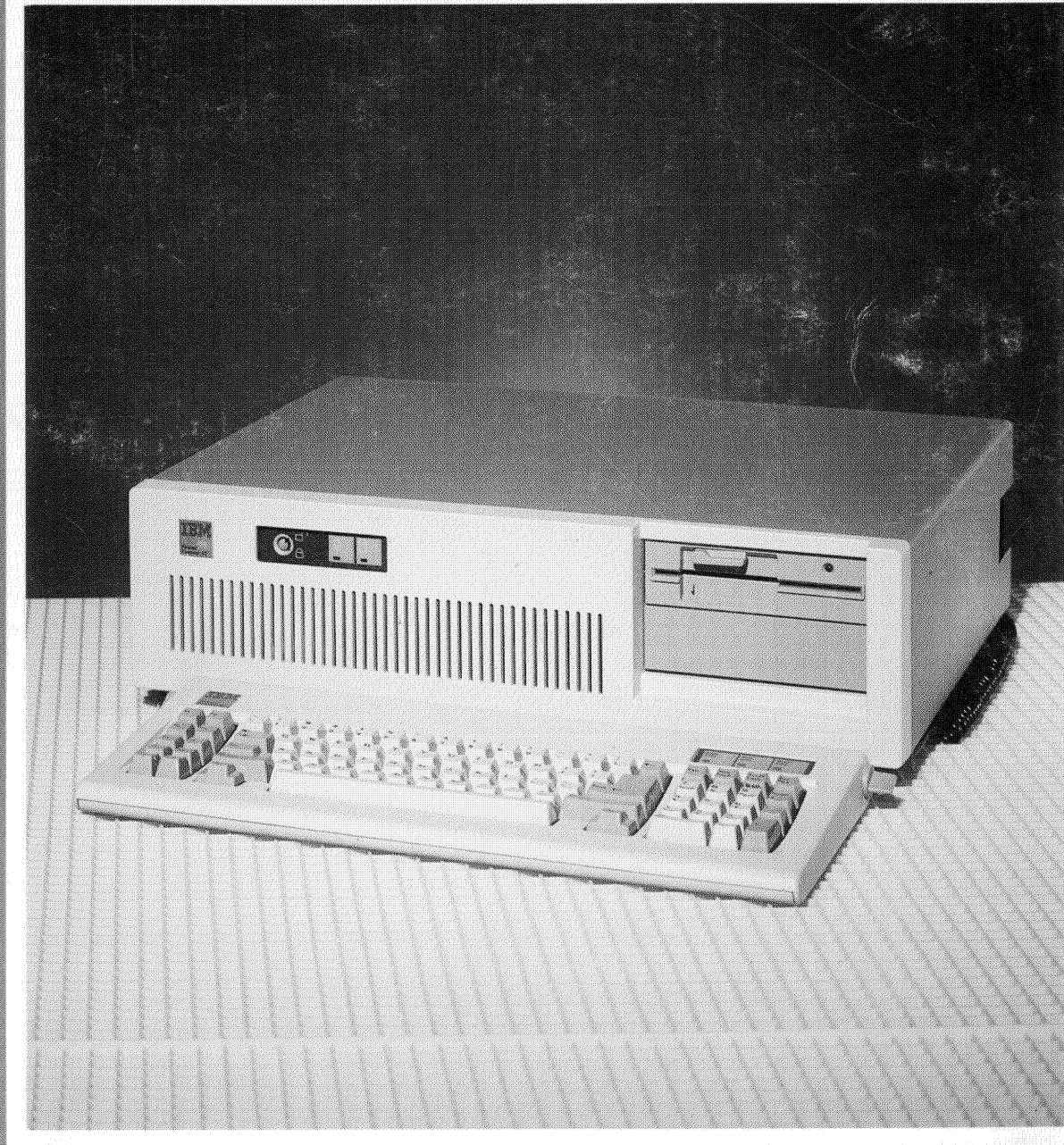


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Technical Service Data

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IBM® PC/AT
MODEL 5170-239
COMPUTER

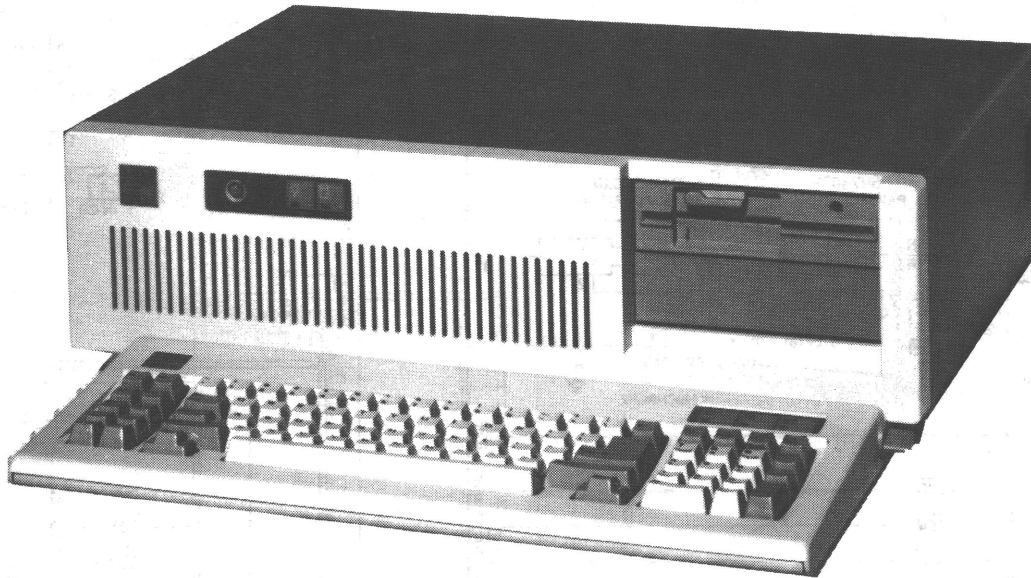
ENHANCED GRAPHICS ADAPTER

See Folder CSCS17-A

FIXED DISK/FLOPPY DISK ADAPTER FLOPPY DISK DRIVE

See Folder CSCS17-B

KEYBOARD, POWER SUPPLY, SERIAL/PARALLEL ADAPTER, SYSTEM BOARD



IBM PC/AT
MODEL 5170-239

CSCS17

CSCS17

IBM PC/AT
MODEL 5170-239

SAFETY PRECAUTIONS

See page 54.

INDEX

	Page		Page
Block Diagram.....	63	Photos (Continued)	
Computer Self Tests and Diagnostics.....	53,54	Keyboard.....	26,27
Disassembly Instructions.....	58	Keyboard Display.....	29
General Operating Instructions....	52	Power Supply.....	22,25
GridTrace Location Guide		Serial/Parallel Adapter.....	21,24
Power Supply Board.....	23	System Board.....	17,18,20,57,59,60
Serial/Parallel Adapter.....	24	Safety Precautions.....	54
System Board.....	19	Schematics	
IC Pinouts and Terminal Guides..	15,16, 61,62	Keyboard.....	3,74
Line Definitions.....	50,51	Power Supply.....	12,65,66
Logic Charts.....	43 thru 49	Serial/Parallel Adapter.....	13,14,64
Miscellaneous Adjustments.....	56	System Board.....	2,4, thru 11, 67 thru 73,75 thru 77
Parts List.....	34 thru 42	Schematic Notes.....	51
Photos		Switches and Jumpers.....	55,56
AC Input Board.....	28	Test Equipment.....	30
		Troubleshooting.....	30,31,32,33

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

MICROPROCESSOR (CPU) OPERATION

Microprocessor IC (U74) does not appear to be functioning. Check the 12MHz waveform at pin 10 of Clock Generator IC (U82). If the waveform is missing, refer to the "Oscillator and Dividers" section of this Troubleshooting Guide. If the waveform is good, check the operation of the Reset circuit. Check the logic reading at pin 12 of IC U82 while turning Computer On. The reading should be logic High immediately after turning Computer On, then go logic Low after about .2 seconds. If the reading is not correct, check IC U82. If the reading is correct, check for a logic Low, that goes High .2 seconds after turning Computer On, at pin 4 of IC U99 and pin 4 of IC U116. If the reading is not correct at IC U99, check IC U99. If the reading is correct at IC U99 and not correct at IC U116, check IC U116. If the reading is correct at IC's U99 and U116, check for a logic High at pin 9 of IC U94. If the reading is not correct, check IC's U105 and U106. If the reading is correct, check for a logic High, that goes Low .2 seconds after turning Computer On, at pin 8 of IC U94. If the reading is not correct, check IC U94.

OSCILLATOR AND DIVIDERS

12MHz Oscillator. Check for a logic High Power Good signal at pin 11 of Clock Generator

IC (U82). If the reading is not correct, refer to the "Power Supply" section of this Troubleshooting Guide. If the reading is correct, check for a 12.0MHz waveform at pin 10 of IC U82. If the waveform is missing, check Crystal Y2, Capacitors C71 and C72 and IC U82. If the waveform is good, check for 12.0 MHz pulses at pin 11 of IC U96. If pulses are missing, check IC U96. If pulses are present, check for a 6MHz waveform at pin 9 of IC U88 and pin 5 of IC U51. If the waveform is missing at IC U88, check IC U88. If the waveform is missing at IC U51, check IC U51.

14.318MHz Oscillator. Check for a 14.318 MHz waveform at pin 12 of IC U18. If the waveform is missing, check Crystal Y1, Trimmer Capacitor C26, IC U18 and Resistors R1 and R2. If the waveform is good, check for 2.38MHz pulses at pin 1 of IC U88. If pulses are missing, check IC U18. If pulses are present, check for 1.19MHz waveform at pin 5 of IC U88. If the waveform is missing, check IC U88.

32.768KHz Oscillator. Check for a 32.768KHz waveform at pin 10 of IC U108. If the waveform is missing, check Crystal Y3, Capacitor C83, IC U108 and Resistor R27.

KEYBOARD

Keyboard dead. Disconnect the keyboard and check the logic readings at pins 1 and 2 of

TROUBLESHOOTING (Continued)

Keyboard Connector (J22) while turning Computer On. Pin 1 of Connector J22 should pulse three times in 15 seconds after Computer is turned On and pin 2 should pulse once about 16 seconds after Computer is turned On. If the logic readings are not correct at pin 1 of Connector J22, check IC's U116, U120 and U126. If the logic readings are not correct at pin 2 of Connector J22, check IC's U116 and U126. If the logic readings are correct at Connector J22, turn Computer Off and connect the keyboard. NOTE: Keyboard will work by itself if a separate 5V power source is used to power Keyboard. Connect the 5V lead from Power Supply to pin B1 of Connector CD1 on the Keyboard and the ground lead to pin A2 of Connector CD1.

Check the 5.3MHz waveform at pin 3 of Keyboard Controller IC (M5). If the waveform is missing, check Capacitors C7 and C8, Coil L1 and IC M5. If the waveform is good, check the waveforms at pins 15 thru 18 and check for pulses at pin 19 of IC M5. If the waveforms or logic readings are not correct, check IC M5. If the waveforms and logic reading are correct, check for pulses at pins 4 thru 7 and 9 thru 12 of Buffer IC (M4). If the readings are not correct, check IC M4. If the reading is correct, check for pulses at pins 6 and 8 of IC M2 while pressing a key. If pulses are missing, check IC M2. If pulses are present, check for pulses at pins 2 and 10 of IC M2 and 37 and 38 of IC M5 while pressing a key. If pulses are present at pins 37 and 38 of IC M5 and missing at pins 2 and 10 of IC M2, check IC M2. If pulses are missing at pins 37 and 38 of IC M5, check IC's M1, M3, M5, M6, and M7 and Sense Amplifier Module (Z1).

SOUND (INTERNAL SPEAKER)

No sound from the Speaker. Check Speaker Connector J19 for good connections and check the Speaker (SP1). If the Speaker and Connector check good, type in the following Basic program:

```
10 SOUND 200,20:GOTO 10
```

Monitor the logic reading on pin 9 of Flip/Flop IC (U127) while starting the above program. A pulse should appear as soon as the program is started, then the reading should go High and stay High. If the reading is not correct, check IC U115. If the reading is correct, check for a logic High at pins 7 and 10 of IC U127 while the program is running. If the readings are not correct, check for pulses at pins 2 and 3 of IC U92 while the program is running. If pulses are missing at pin 2, check Timer IC (U103). If pulses are present at pin 2 and missing at pin 3, check IC U92. If pulses are present at pin 3, check Driver IC (U52), Capacitor C58 and Resistor R8.

REAL TIME CLOCK

Time has to be reset every time the Computer is turned On. Check the 6V Battery (M1), Diodes CR1 and CR2, Capacitor C84 and check Connector J21 for good connections.

Time function or Options Setup Program, see "General Operating Instructions", does not work. Check the 32.768KHz waveform at pin 10 of IC U108. If the waveform is good, check Crystal Y3, Capacitor C83, IC U108 and Resistor R27. If the waveform is good, check for a logic High at pin 1 and a logic Low at pin 2 of IC U108. If the reading is not correct at pin 1, refer to the "Power Supply" section of this Troubleshooting Guide. If the reading is not correct at pin 2 of IC U108, check IC U108. If the readings are correct, type in and run the following Basic program. The program reads the seconds registered in the Clock/RAM IC (U117) and displays the results on the Monitor screen. The number that appears on the Monitor should change once a second.

```
10 OUT 112,0:PRINT INP(113):GOTO 10
```

While the program is running, check for pulses at pins 2 and 9 and a logic Low at pin 3 of PROM IC (U115). If the readings are not correct, check IC U115. If the readings are correct, check for a logic Low at pin 2 of IC U80. If the reading is not correct, check IC U104. If the reading is correct, check for pulses at pins 1 and 3 of IC U80. If pulses are missing at pin 1, check IC U110. If pulses are present at pin 1 and missing at pin 3, check IC U80. If pulses are present at pin 3, check IC U117.

Battery Switch Transistor (Q2) prevents the Battery (M1) from powering all the circuits on the System Board except IC's U108 and U117 when Computer is turned Off. To check the operation of Transistor Q2, check for 0V on the emitter of Transistor Q2 when the Computer is turned Off and Battery M1 is connected. Then disconnect Battery M1, turn On Computer, and check for 5.0V on the collector of Transistor Q2. If the readings are not correct, check Transistors Q1 and Q2 and Resistors R24, R25, and R26.

NOTE: When Battery M1 is disconnected, information stored in IC U117 will be lost. An Options Setup program must be used to restore the information. See "General Operating Instructions" (Systems Option Setup) for more details.

PARALLEL PORT (Serial/Parallel Adapter)

Parallel Port not working. Check the Edge Connector and Connector P2 for good connections. If the connections check good, plug a parallel loopback plug, see "Test Plugs", into connector P2 and type in and run the following Basic program. NOTE: Set Jumper J2 to configure the parallel port as the primary parallel port, see "Switches and Jumpers".

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

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IBM PC/AT
MODEL 5170-239

TROUBLESHOOTING (Continued)

The program continuously checks the Parallel Interface Circuits and displays six numbers (A thru F) on the Monitor screen. With the loopback plug plugged into Connector P2, the following numbers should appear on the Monitor screen.

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

If any of the numbers are not correct, make the following checks with the loopback plug installed and the above program running. Check for pulses at pins 15 and 16 of Decoder IC (U14). If pulses are missing, check IC U14. If pulses are present, check for pulses at pins 11 thru 18 of Transceiver IC (U17). If pulses are missing, check IC U17. If pulses are present, check for pulses at pins 5, 6, 7, 9, and 11 of Decoder IC (U12). If pulses are missing, check IC U12. If pulses are present, check for pulses at pins 2, 5, 6, 9, 12, 15, 16, and 19 of Output Data Latch IC (U18). If pulses are missing, check IC U18. If pulses are present, check for a logic High at pin 10 of IC U15. If the reading is not correct, check IC U15. If the reading is correct, check for pulses at pins 2, 5, 7, 12, and 15 of Output Control Latch IC (U4). If pulses are missing, check IC U4. If pulses are present, check for pulses at pin 12 of IC U15. If pulses are missing, check IC U15. If pulses are present, check for pulses at pins 6, 8, 10, and 12 of IC U11. If pulses are missing, check IC U11. If pulses are present, check for pulses at pins 2, 4, 8, 10, and 12 of IC U16. If pulses are missing, check IC U16. If pulses are present and numbers A or D on the Monitor screen are not correct, check Input Data Latch IC (U9). If numbers B, C, E, or F are not correct, check the Input Control Latch IC (U8) and IC U1.

SERIAL PORT (Serial/Parallel Adapter)

Serial Port does not work. Check edge Connector and Connector P1 for good connections. Check for 1.8432MHz pulses at pin 16 of Serial Interface IC (U5). If pulses are missing, check 1.8432 MHz Oscillator Module (U10) and check IC U11. If the frequency is not correct, check Module U10. If pulses are present at pin 16 of IC U5, type in and run the following Basic program:

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

The program sets the baud rate to 300 baud and produces pulses at pins 11, 31, 32, 33, and 34 of IC U5. The waveform shown in Figure A should appear at pin 11 of IC U5. The waveform shown in Figure B should appear at pin 15 of IC U5, and the waveform shown in Figure C should appear at pins 31 thru 34 of IC U5.



Figure A

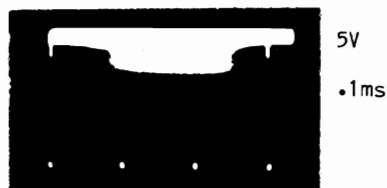


Figure B

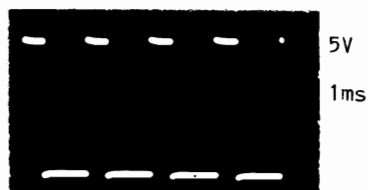


Figure C

While the program is running, check for pulses at pins 14 and 21 of IC U5. If pulses are missing at pin 14, check the Decoder IC (U14). If pulses are missing at pin 21, check IC's U15 and U16. If pulses are present, check for pulses at pins 11 thru 18 of Transceiver IC U17. If pulses are missing, check IC U17. If pulses are present, check the waveforms at pins 11, 15, and 31 thru 34 of IC U5. If any of the waveforms are missing or not correct, check IC U5. If the waveforms check good, check for pulses at pins 6 and 7 of IC U7. If pulses are missing, check IC U7. If pulses are present, check for pulses at pin 7 of IC U6. If pulses are missing, check IC U6.

For the following checks make a "Serial Loopback Socket", see "Test Plugs", and plug it into Connector P1. Run the above program and check for pulses at pin 13 of IC U3 and pins 10 thru 13 of IC U13. If pulses are missing at IC U3, check IC U3. If pulses are missing at IC U13, check IC U13.

To check the Interrupt Request pin (pin 30) of IC U5, remove the Serial Loopback Socket and type in and run the following program:

```
10 OUT 1020,15:OUT 1017,15
20 OUT 1016,255:GOTO 10
```

While the program is running, check for a logic Low at pin 1 of IC U1 and check for pulses at pins 2 and 3 of IC U1. If the readings are not correct at pins 1 or 2, check IC U5. If the readings are good at pins 1 and 2 and pulses are missing at pin 3, check IC U1.

TROUBLESHOOTING (Continued)

POWER SUPPLY

NOTE: Use an isolation transformer with a voltage step down control when servicing the Power Supply. Disconnect Power Supply from Computer and Disk Drives to avoid possible damage from high voltages that may be produced while servicing power supply.

A load must be connected to the Power Supply when it is being operated by itself. Three #1129 lamps may be used as a load for the 5V source and a #93 lamp may be used for the 12V source.

The power supply has an automatic shutdown feature. It will shut down whenever a no-load, over-current, or over-voltage condition exists. The following voltages change on IC's M1 and M2 when the power supply is turned On with no load:

M1		M2	
Pin 4	9.1V	Pin 14	5.7V
Pin 8	4.3V		
Pin 9	6.2V		
Pin 11	3.9V		
Pin 13	4.1V		
Pin 14	9.1V		

The voltages on IC's M5 and M6 all measure less than .3V.

Power Supply dead. Check for 120V AC from Connector E26 to Connector E27. If 120V AC is missing, check Coils L1A and L2A, On-Off Switch (SW2), and Line Filter T1A. If 120V AC

is present, check for 323V at the Collector of Power Amp Transistor (Q3). If 323V is missing, check Resistors R2 thru R5, Electrolytics C1 and C2, Thermister R1, and Bridge Rectifier M4. If 323V is present, check waveforms on the bases of Power Amp Transistors Q3 and Q4.

If the waveforms are missing, check the voltages and components associated with IC's M1 and M2, Amp Transistors (Q1), and Driver Transistor (Q2), and check windings on Transformer T1 for continuity. If the waveforms are present, check voltages and components associated with Transistors Q3 and Q4 and check windings on Transformer T2 for continuity.

No 12.0V at pin 1 of Connector P12. Check Rectifier CR15, Coil L1, Capacitors C13 thru C17, and check the winding on Transformer T2 from pin 7 to pin 8 for continuity.

No 5.0V at pin 2 of Connector P8, Check Rectifiers CR16 and CR17, Coil L2, Capacitors C18 thru C26 and check the windings on Transformer T2 on pins 9 thru 16 for continuity.

No -12.0V at pin 4 of Connector P8, check Rectifier CR19, Capacitor C28, and check the winding on Transformer T2 from pin 5 to pin 6 for continuity.

No -5.0V at pin 3 of Connector P9. Check Rectifier CR18, Capacitor C27, and check the winding on Transformer T2 from pin 3 to pin 4 for continuity.

TEST PLUGS

PARALLEL LOOPBACK PLUG

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

SERIAL LOOPBACK SOCKET

Use a female subminiature "D" Connector (DB-9) and connect the following pins together: pin 1 to 4 and 6, pin 2 to 3, pin 7 to 8 and 9.

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**IBM PC/AT
MODEL 5170-239**

PARTS LIST AND DESCRIPTION

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFR. PART No./ TYPE No.	PART No.				NOTES
		NTE	ECG	RCA	ZENITH	
KEYBOARD						
CR1	M60	NTE109	ECG109	SK3090/109	103-Z9001	
M1	7402N	NTE7402	ECG7402	SK7402	HE-443-46	
M2	SH779567					
M3	CD1324N					
M4	MJ338978					
M5	B8507OK					
M6,7	CD1324N					
U1	SH779567					
POWER SUPPLY						
CR1	1N5626	NTE5806	ECG5806	SK3848/5806	212-Z9000	
CR2						
CR3	1N4003	NTE116	ECG116	SK3311	212-76-02	
CR4						
CR5						
CR6						
CR7						
CR8						
CR9						
CR10	1N5626	NTE5806	ECG5806	SK3848/5806	212-Z9000	
CR11						
CR12						
CR13						
CR14						
CR15,6,7	D83-004					
CR18,9	SB840					
CR20						
CR21						
CR22						
CR23						

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.	ZENITH PART No.	
CR24						
CR25						
CR26						
CR27						
CR28						
M1,2	LM339N	NTE834	ECG834	SK3569/834	221-121	
M4	10G4B41					
M5	LM339N	NTE834	ECG834	SK3569/834	221-121	
M6	LM358N	NTE928M	ECG928M	SK3692/928M		
Q1	2222A	NTE123A	ECG123A	SK3444/123A	121-Z9000A	
Q2	2N5682	NTE282	ECG282		921-1090	
Q3,4	C3306 (JAPAN)	NTE2308	ECG2308			
SYSTEM BOARD						
CR1,2						
Q1	1N4148	NTE519	ECG519	SK3100/519	103-131	
Q2	2N3904	NTE123AP	ECG123AP	SK3854/123AP	121-Z9000A	
U1,2	2N3906	NTE159	ECG159	SK3466/159	121-Z9003	USED IN SOME VERSIONS.
U3,4	ZA1250NL					
U5	SN74ALS245AN				HE-443-1097	
U6	74F280PC					
U7,8	ZA1250NL					
U9,10						
U11	SN74ALS245AN				HE-443-1097	USED IN SOME VERSIONS.
U12	74F280PC					
U13,4	ZA1250NL					
U15,6						
U17						USED IN SOME VERSIONS.
U18	D8284A				HE-443-1011	USED IN SOME VERSIONS.

CSCS17

MODEL 5170-239

IBM PC/AT

36 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.	
U19,20	ZA1250NL					USED IN SOME VERSIONS.
U21,2	ZA1250NL					USED IN SOME VERSIONS.
U23,4	MK38097N-21					
U25,6	ZA1250NL					USED IN SOME VERSIONS.
U27						
U28,9	ZA1250NL					USED IN SOME VERSIONS.
U30,1	SN74LS590N					USED IN SOME VERSIONS.
U32	ZA1250NL					USED IN SOME VERSIONS.
U33,4						
U35,6						
U37	SN74ALS245AN				HE-443-1097	USED IN SOME VERSIONS.
U38	ZA1250NL					USED IN SOME VERSIONS.
U39,40						
U41,2						
U43,4						
U45,6						
U47	TMM23256P-5879				HE-443-1097	USED IN SOME VERSIONS.
U48	SN74ALS245AN					
U49	SN74ALS244AN					
U50	74F241PC					
U51	74F74PC					
U52	SN75477P					
U53	74F10PC					
U54,5	74F158PC					
U56	SN74ALS573N				HE-443-1070	USED IN SOME VERSIONS.
U57,8	74F10PC					
U59	74F08PC					
U60	SN74ALS573N					
U62	SN74S51N	NTE74S51	ECG74S51		HE-443-1070	USED IN SOME VERSIONS.
U63	74F20PC					

PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	NOTES
U64	SN74ALS573N	NTE74LS51	ECG74LS51	SK74LS51	HE-443-1070	
U65,6	SN74ALS245AN				HE-443-1097	
U67	SN74LS646NT				HE-443-1051	
U68	SN74ALS74AN					
U69	SN74LS51N					
U70	74F11PC					
U71	74F139PC					
U72	TBP28S42N					
U73	SN74ALS573N				HE-443-1070	
U74	CG80286-6C					
U75	SN74ALS244AN					
U77	74F74PC					
U78	SN74S51N	NTE74S51	ECG74S51	SK74LS125A	HE-443-811	
U79	SN74LS125AN	NTE74LS125A	ECG74LS125A		HE-443-1072	
U80	SN74ALS32N					
U81	SN74ALS04AN				HE-443-1082	
U82	D82284-6					
U83	D82288-6					
U84	SN74ALS27N					
U85	SN74LS51N		ECG74LS51	SK74LS51	HE-443-1230	
U86	74F74PC					
U87	1501824					
U88	SN74LS112AN	NTE74LS112A	ECG74LS112A	SK74LS245	HE-443-885	
U89	SN74LS245N	NTE74LS245	ECG74LS245		HE-443-1051	
U90	SN74ALS74AN					
U91	SN74ALS02N				HE-443-1045	
U92	74F08PC					
U93	74F74PC					
U94	SN74ALS00AN					
U95	74F175PC				HE-443-1080	

CSCS17

IBM PC/AT
MODEL 5170-239

PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFGR. PART No./ TYPE No.	NTE PART No.	ECG PART No.	RCA PART No.	ZENITH PART No.	NOTES
U96	74F00PC					
U97	74F10PC					
U98	SN74ALS10AN				HE-443-1047	
U99	SN74ALS02N				HE-443-1045	
U100	74F175PC					
U101	SN74ALS573N				HE-443-1070	
U102	SN74ALS245AN				HE-443-1097	
U103	P8254-2					
U104, 5, 6	SN74ALS74AN				HE-443-1051	
U107	SN74ALS04AN				HE-443-1082	
U108	MC14069U	NTE4069	ECG4069	SK4069UB	905-260	
U109	SN74ALS74AN				HE-443-1051	
U110	SN74ALS08N				HE-443-1073	
U111	AM9517A-5PC				HE-443-1170	
U112	SN74ALS573N				HE-443-1070	
U113	SN74ALS245AN					
U114	P8259A				HE-443-1097	
U115	63S081N				HE-443-1012	
U116	SN7407N					
U117	MC146818P	NTE7407	ECG7407	SK7407	HE-443-1020	
U118	SN74ALS74AN					
U119	74F174PC				HE-443-1051	
U120	SN74ALS00AN				HE-443-1080	
U121	SN74ALS04AN				HE-443-1082	
U122	AM9517A-5PC				HE-443-1170	
U123	SN74ALS138N					
U124	SN74ALS612N					
U125	P8259A					
U126	P86421505					
U127	SN74ALS175N					
U128	SN74ALS244AN				HE-443-1012	
U129	74F257PC					
U130	1503135					

PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	MFG. PART No./ TYPE No.	PART No.				NOTES
		NTE	EGG	RCA	ZENITH	
SERIAL/PARALLEL BOARD						
U1	SN74LS125AN	NTE74LS125A	EGG74LS125A	SK74LS125A	HE-443-811	
U3	SN75154N					
U4	SN74LS174N	NTE74LS174	EGG74LS174	SK74LS174	HE-443-879	
U5	NS16450N					
U6, 7	SN75150P					
U8	SN74LS240N	NTE74LS240	EGG74LS240	SK74LS240	HE-443-754	
U9	SN74LS244N	NTE74LS244	EGG74LS244	SK74LS244	HE-443-791	
U11	SN7405N	NTE7405	EGG7405	SK7405	HE-443-642	
U12	SN74LS155AN	NTE74LS155	EGG74LS155	SK74LS155	HE-443-782	
U13	SN75154N					
U14	1503085					
U15, 6	SN74LS04N	NTE74LS04	EGG74LS04	SK74LS04	HE-443-755	
J17	SN74LS245N	NTE74LS245	EGG74LS245	SK74LS245	HE-443-885	
U18	SN74LS374N	NTE74LS374	EGG74LS374	SK74LS374	HE-443-863	

PARTS LIST AND DESCRIPTION (Continued)

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

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	MFGR. PART No.
	KEYBOARD	
C1	56 6V 10%	
C2	56 6V 10%	
C4	22 15V 10%	
C11	56 6V 10%	
	SERIES/PARALLEL BOARD	
C11	10 16V 10% (1)	
C12	10 16V 10% (1)	
C21	10 16V 10% (1)	
	SYSTEM BOARD	
C1	10 16V 10% (1)	
C2	10 16V 10% (1)	
C3	10 16V 10% (1)	
C4	10 16V 10% (1)	
C6	10 16V 10% (1)	

ITEM No.	RATING	MFGR. PART No.
C15	10 16V 10% (1)	
C27	10 16V 10% (1)	
C37	10 16V 10% (1)	
C46	10 16V 10% (1)	
C52	10 16V 10% (1)	
C53	10 16V 10% (1)	
C54	10 16V 10% (1)	
C55	10 16V 10% (1)	
C56	10 16V 10% (1)	
C60	10 16V 10% (1)	
C62	10 16V 10% (1)	
C63	10 16V 10% (1)	
C68	10 16V 10% (1)	
C75	10 16V 10% (1)	
C79	10 16V 10% (1)	
C84	10 16V 10% (1)	
C89	10 16V 10% (1)	
C90	10 16V 10% (1)	
C92	10 16V 10% (1)	
C95	10 16V 10% (1)	

Items Not Listed Are Normally Available At Local Distributors.

(1) Two outside legs are ground.

CAPACITORS

ITEM No.	RATING	MFGR. PART No.
	SYSTEM BOARD	
C26	5 - 50pF Trimmer	

ITEM No.	RATING	MFGR. PART No.

COILS & TRANSFORMERS

ITEM No.	FUNCTION	MFGR. PART No.	OTHER IDENTIFICATION	NOTES
	POWER SUPPLY			
L1	RF Choke			
L1A	Filter			
L2	RF Choke			
L2A	Filter			
T1	Switching			
T1A	AC Line Filter			
T2	Power			

COILS (RF-IF)

ITEM No.	FUNCTION	MFGR. PART No.
	KEYBOARD	
L1	Filter	

ITEM No.	FUNCTION	MFGR. PART No.

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
P1 P2	POWER SUPPLY	500 250		

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NTE PART No.	WORKMAN PART No.
	KEYBOARD			
A1	Resistor Network	(1)		
A2	Resistor Network	(1)		
A3	Resistor Network	(1)		
	POWER SUPPLY			
A1	Resistor Network	(2)		
A2	Resistor Network	(2)		
A3	Resistor Network	(2)		
A4	Resistor Network	(2)		
A5	Resistor Network	(2)		
A6	Resistor Network	(2)		
R1	NTC 2.4 Cold			
R2	.65 5% 10W WW			
R3	1.3 5% 7W WW			
R6	16K 5% 10W WW			
R11	10K 5% 12.5W WW			
R15	50K 5% 5W Metal Film			
R16	.5 5% 5W WW			
R18	7.5 5% 5W WW			
R20	649 1% 1/8W Carbon Film			
R24	133K 1% 1/8W Carbon Film			
R25	301K 1% 1/8W Carbon Film			
R26	301K 1% 1/8W Carbon Film			
R28	100K 1% 1/8W Carbon Film			
R29	160 5% 3W Metal Film		3W116	
R99	PTC 91.4 Cold		FR605	
	SERIES/PARALLEL BOARD			
RN1	Resistor Network	(7)		
U2	Resistor Network	(5)		
U19	Resistor Network	(6)		
	SYSTEM BOARD			
RN1	Resistor Network	(3)		
RN2	Resistor Network	(3)		
RN3	Resistor Network	(3)		
RN4	Resistor Network	(4)		
RN5	Resistor Network	(4)		

(1) 4000 x 7

(2) No internal information available

(3) 30 ohm x 8 resistor

(4) 10K ohm x 13 resistor

(5) 4700 2% x 5

(6) 27 2% x 8

(7) 4700 x 4

IBM PC/AT
MODEL 5170-239

PARTS LIST AND DESCRIPTION (Continued)

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

SPEAKER

ITEM No.	TYPE	REPLACEMENT DATA		NOTES
		MFR. PART No.	QUAM PART No.	
SP1	2" PM, 8 Ohms	8529143	2A05Z8	

MISCELLANEOUS

ITEM No.	PART NAME	MFR. PART No.	NOTES
	CHASSIS		
LED1	LED		Power, Green
LED2	LED		Fixed Disk Drive, Red
SW1	Switch		Security
	KEYBOARD		
LED1	LED		Caps Lock, Green
LED2	LED		Num Lock, Green
LED3	LED		Scroll Lock, Green
	POWER SUPPLY		
FB1	Ferrite Bead		
M3	Opto-Isolator		
M7	Fan		
SW1	Switch		AC Voltage Selector
SW2	Switch		Power
	SYSTEM BOARD		
FB1	Ferrite Bead		
FB2	Ferrite Bead		
SW1	Switch		Monitor Select
Y1	Crystal		14.31818MHz
Y2	Crystal		12MHz
Y3	Crystal		32.768MHz

WIRING DATA

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

LOGIC CHART

SYSTEM BOARD

PIN NO.	IC U1	IC U2	IC U5	IC U6	IC U7	IC U8	IC U11	IC U12	IC U13	IC U14	IC U18	IC U19	IC U20	IC U23
1	P	P	P	P	P	P	P	P	P	P	L	P	P	P
2	P	P	P	P	P	P	P	P	P	P	P	P	P	P
3	P	P	P	*	P	P	P	*	P	P	*	P	P	P
4	P	P	P	P	P	P	P	P	P	P	L	P	P	P
5	P	P	P	P	P	P	P	P	P	P	L	P	P	P
6	P	P	P	P	P	P	P	P	P	P	L	P	P	P
7	P	P	P	L	P	P	P	L	P	P	*	P	P	P
8	H	H	P	P	H	H	P	P	H	H	P	H	H	H
9	P	P	P	P	P	P	P	P	P	P	L	P	P	P
10	P	P	L	P	P	P	L	P	P	P	L	P	P	P
11	P	P	P	P	P	P	P	P	P	P	*	P	P	P
12	P	P	P	P	P	P	P	P	P	P	P	P	P	P
13	P	P	P	P	P	P	P	P	P	P	L	P	P	P
14	P	P	P	H	P	P	P	H	P	P	*	P	P	P
15	P	P	P		P	P	P		P	P	L	P	P	P
16	L	L	P		L	L	P		L	L	H	L	L	L
17			P				P				P			
18			P				P				H			
19			P				P							
20			H				H							

PIN NO.	IC U24	IC U27	PIN NO.	IC U27	IC U28	IC U29	IC U32	IC U33	IC U34	IC U38	IC U39	IC U40	IC U43	IC U44
1	P	P	21	P	P	P	P	P	P	H	P	P	P	P
2	P	P	22	P	P	P	P	P	P	P	P	P	P	P
3	P	P	23	P	P	P	P	P	P	P	P	P	P	P
4	P	P	24	P	P	P	P	P	P	P	P	P	P	P
5	P	P	25	P	P	P	P	P	P	P	P	P	P	P
6	P	P	26	P	P	P	P	P	P	P	P	P	P	P
7	P	P	27	P	P	P	P	P	P	P	P	P	P	P
8	H	P	28	H	H	H	L	H	H	P	H	H	H	H
9	P	P			P	P	P	P	P	P	P	P	P	P
10	P	P			P	P	L	P	P	L	P	P	P	P
11	P	P			P	P	P	P	P	P	P	P	P	P
12	P	P			P	P	L	P	P	P	P	P	P	P
13	P	P			P	P	P	P	P	P	P	P	P	P
14	P	L			P	P	P	P	P	P	P	P	P	P
15	P	P			P	P	P	P	P	P	P	P	P	P
16	L	P			L	L	H	L	L	P	L	L	L	L
17		P								P				
18		P								P				
19		P								L				
20		P								H				

IBM PC/AT
MODEL 5170-239

LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO.	IC U47	PIN NO.	IC U47	IC U48	IC U49	IC U50	IC U51	IC U52	IC U53	IC U54	IC U55	IC U56	IC U57	IC U58
1	P	21	P	H	P	L	H	H	P	P	P	P	P	P
2	P	22	P	P	P	P	P	*	P	P	P	P	P	P
3	P	23	P	P	P	P	P	L	P	P	P	P	P	P
4	P	24	P	P	L	P	H	L	P	P	P	P	P	P
5	P	25	P	P	P	P	P	H	P	P	P	P	P	P
6	P	26	P	P	L	P	P	H	P	P	P	P	P	P
7	P	27	P	P	P	P	L	L	L	P	P	P	L	L
8	P	28	H	P	P	P	P	H	H	L	L	P	H	H
9	P			P	H	P	P		L	P	P	P	L	P
10	P			L	L	L	H		P	P	P	L	P	L
11	P			P	*	P	P		P	P	P	P	P	P
12	P			P	P	P	H		P	P	P	P	P	H
13	P			P	P	P	P		P	P	P	P	P	L
14	L			P	L	P	H		H	P	P	P	H	H
15	P			P	P	P				L	L	P		
16	P			P	L	P				H	H	P		
17	P			P	P	P						P		
18	P			P	P	P						P		
19	P			L	L	L						P		
20	P			H	H	H						H		

PIN NO.	IC U59	IC U60	IC U61	IC U62	IC U63	IC U64	IC U65	IC U66	IC U67	PIN NO.	IC U67	IC U68	IC U69	IC U70
1	P	P	P	L	H	L	H	P	L	21	P	P	P	H
2	P	P	*	P	P	P	*	P	L	22	P	H	P	H
3	P	P	*	P	*	P	P	P	P	23	L	P	H	P
4	P	P	P	P	P	P	P	P	P	24	H	H	P	L
5	P	P	*	P	H	P	P	P	P			P	P	P
6	P	P	P	P	P	L	P	P	P			P	P	L
7	L	P	L	L	L	H	L	P	P			L	L	L
8	P	P	P	P	P	L	P	P	P			P	P	H
9	P	P	*	P	P	P	P	P	P			P	P	H
10	P	L	P	P	H	L	L	L	P			H	H	H
11	L	P	*	*	*	P	P	P	P			P	P	H
12	L	P	P	*	H	P	P	P	L			P	H	H
13	P	P	*	H	H	L	L	P	P			P	H	H
14	H	P	H	H	H	H	P	P	P			H	H	H
15		P				L	P	P	P					
16		P				P	P	P	P					
17		P				P	P	P	P					
18		P				P	H	P	P					
19		P				P	L	P	P					
20		H				H	H	H	P					

LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO.	IC U71	IC U72	IC U73	IC U74	PIN NO.	IC U74	PIN NO.	IC U74	PIN NO.	IC U74	IC U75
1	*	P	P	P	21	P	41	P	61	*	P
2	*	P	P	*	22	P	42	P	62	H	P
3	*	P	*	*	23	P	43	P	63	P	P
4	H	L	L	P	24	P	44	P	64	P	P
5	H	P	P	P	25	P	45	P	64	P	P
6	H	P	P	H	26	P	46	P	66	P	P
7	H	P	P	P	27	P	47	P	67	P	P
8	L	L	P	P	28	P	48	P	68	P	L
9	P	L	P	L	29	L	49	P			L
10	P	L	L	P	30	H	40	P			L
11	P	P	P	P	31	P	51	P			L
12	H	H	P	P	32	P	52	L			L
13	P	P	P	P	33	P	53	H			P
14	P	P	P	P	34	P	54	H			P
15	P	L	P	P	35	L	55	*			P
16	H	P	P	P	36	P	56	*			P
17		P	L	P	37	P	57	P			P
18		P	H	P	38	P	58	*			P
19		L	P	P	39	P	59	L			L
20		H	H	P	40	P	60	L			H

PIN NO.	IC U77	IC U78	IC U79	IC U80	IC U81	IC U82	IC U83	IC U84	IC U85	IC U86	IC U87	IC U88	IC U89	IC U90
1	H	*	H	L	P	P	P	H	P	H	P	P	H	H
2	H	P	H	L	P	H	P	P	H	P	P	H	H	P
3	P	P	P	L	H	L	P	P	H	P	H	H	P	P
4	H	P	H	P	L	P	P	P	H	P	P	H	P	H
5	H	P	L	P	P	*	P	P	H	P	P	P	P	P
6	L	P	P	P	P	L	P	P	L	P	H	P	*	P
7	L	L	L	L	L	P	P	L	L	L	H	P	*	L
8	P	L	P	H	P	P	P	P	P	L	H	L	H	H
9	P	*	P	P	P	L	P	L	P	H	P	P	P	L
10	H	*	P	H	P	P	L	L	P	H	L	H	L	P
11	P	*	P	P	P	H	P	P	P	P	P	H	P	P
12	H	*	P	P	P	L	H	L	P	P	P	H	H	L
13	P	*	P	L	P	P	P	P	P	H	H	P	H	P
14	H	H	H	H	H	*	H	H	H	H	H	H	H	H
15						P	H							
16						P	P				P		P	
17						L	P				P		P	
18						H	P				P		P	
19							P				H		L	
20							H				H		H	

IBM PC/AT
MODEL 5170-239

LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO.	IC U91	IC U92	IC U93	IC U94	IC U95	IC U96	IC U97	IC U98	IC U99	IC U100	IC U101	IC U102
1	L	L	P	L	H	H	H	H	L	H	H	P
2	L	H	P	H	P	L	P	H	H	L	P	P
3	H	L	P	H	P	H	P	P	P	H	P	P
4	H	P	*	H	P	H	P	P	L	L	P	P
5	L	P	P	H	P	H	H	P	L	L	P	P
6	L	P	*	L	P	L	P	P	L	L	P	P
7	L	L	P	L	P	L	L	L	L	L	P	P
8	P	L	L	L	L	P	P	H	H	L	P	P
9	P	L	P	H	P	P	P	H	H	P	P	P
10	P	H	P	H	P	P	P	L	L	L	L	L
11	L	P	P	P	P	P	P	H	P	H	L	P
12	P	P	P	P	P	P	P	L	P	L	P	P
13	P	H	P	H	P	P	P	H	P	L	P	P
14	H	H	P	H	P	H	H	H	H	L	P	P
15			P		P					L	P	P
16			H		H					H	P	P
17											P	P
18											P	P
19											P	P
20											H	H

PIN NO.	IC U103	PIN NO.	IC U103	IC U104	IC U105	IC U106	IC U107	IC U108	IC U109	IC U110	IC U111	PIN NO.	IC U111	IC U112
1	P	21	P	H	H	H	L	H	H	H	H	21	P	H
2	P	22	H	P	L	H	H	L	H	H	P	22	P	P
3	P	23	P	P	P	P	H	L	H	H	H	23	P	P
4	P	24	H	H	H	H	L	H	H	H	P	24	H	P
5	P			P	L	H	L	L	L	H	H	25	H	P
6	P			P	H	L	H	H	H	H	H	26	P	P
7	P			L	L	L	L	L	L	L	L	27	P	P
8	P			H	H	H	L	P	H	L	L	28	P	P
9	P			L	L	L	H	P	L	P	L	29	P	P
10	P			H	H	H	L	P	H	P	L	30	P	L
11	H			P	P	P	H	P	L	P	P	31	H	L
12	L			P	P	L	P	P	H	H	P	32	P	P
13	P			L	H	H	P	H	L	P	L	33	P	P
14	H			H	H	H	H	H	H	H	H	34	P	P
15	P										H	35	P	P
16	L										*	36	H	P
17	H										L	37	P	P
18	P										*	38	P	P
19	P										*	39	P	P
20	P										L	40	P	H

LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO.	IC U113	IC U114	PIN NO.	IC U114	IC U115	IC U116	IC U117	PIN NO.	IC U117	IC U118	IC U119	IC U120	IC U121
1	P	P	21	H	H	P	*	21	P	H	L	L	L
2	P	P	22	H	H	P	P	22	H	P	P	L	H
3	P	H	23	H	H	H	P	23	L	P	P	H	P
4	P	P	24	H	P	H	P	24	H	H	P	H	P
5	P	P	25	H	H	H	P			P	P	P	P
6	P	P	26	P	H	H	P			P	*	P	P
7	P	P	27	P	H	L	P			L	H	L	L
8	P	P	28	H	L	H	P			L	L	P	P
9	P	P			P	H	P			H	P	P	P
10	L	P			P	P	P			H	H	P	L
11	P	P			P	P	P			H	*	P	H
12	P	L			P	P	L			P	L	P	P
13	P	L			H	P	L			H	L	P	P
14	P	L			P	H	L			H	L	H	H
15	P	L			L		H				L		
16	P	H			H		*				H		
17	P	P					H						
18	P	P					H						
19	P	L					H						
20	H	L					H						

PIN NO.	IC U122	PIN NO.	IC U122	IC U123	IC U124	PIN NO.	IC U124	IC U125	PIN NO.	IC U125	IC U126	PIN NO.	IC U126	IC U127
1	H	21	P	P	P	21	P	H	21	H	H	21	H	H
2	P	22	P	P	H	22	P	P	22	H	P	22	L	L
3	H	23	P	P	P	23	P	H	23	L	P	23	H	H
4	P	24	H	P	P	24	L	P	24	L	H	24	H	P
5	H	25	H	P	P	25	L	P	25	H	H	25	H	P
6	H	26	P	P	L	26	L	P	26	P	P	26	H	H
7	L	27	P	H	P	27	L	P	27	P	L	27	H	L
8	L	28	P	L	P	28	H	P	28	H	H	28	H	L
9	L	29	P	H	P	29	P	P			P	29	H	H
10	L	30	P	H	P	30	P	P			P	30	H	L
11	H	31	H	P	P	31	L	P			P	31	L	H
12	P	32	P	P	P	32	L	L			P	32	H	P
13	L	33	P	P	L	33	L	L			P	33	L	P
14	H	34	P	P	L	34	L	L			P	34	H	H
15	H	35	P	P	P	35	H	L			P	35	L	L
16	*	36	H	H	P	36	P	L			P	36	L	H
17	*	37	P		P	37	H	L			P	37	L	
18	*	38	P		L	38	P	L			P	38	H	
19	L	39	P		P	39	P	H			P	39	H	
20	L	40	P		L	40	H	H			L	40	H	

IBM PC/AT
MODEL 5170-239

LOGIC CHART (Continued)

SERIAL/PARALLEL ADAPTER

PIN NO.	IC U1	IC U3	IC U4	IC U5	PIN NO.	IC U5	IC U6	IC U7	IC U8	IC U9	IC U10	IC U11	IC U12	IC U13
1	H	L	H	P	21	H	H	H	H	H	*	P	L	H
2	L	L	L	P	22	L	H	H	H	H		P	H	H
3	H	H	P	P	23	H	*	H	P	P		P	P	H
4	H	L	P	P	24	P	L	L	L	L		P	H	L
5	*	L	H	P	25	L	L	L	P	P		L	H	L
6	P	L	P	P	26	P	L	L	L	L		L	H	L
7	L	L	L	P	27	P	L	L	P	P	L	L	H	L
8	P	L	L	P	28	P	H	H	H	H	P	L	L	L
9	L	H	H	P	29	*			P	P		H	H	H
10	H	H	L	H	30	L			L	L		H	H	H
11	H	H	P	H	31	H			*	L		L	H	H
12	H	H	H	H	32	H			P	P		H	H	H
13	H	H	P	H	33	H			L	H		L	P	H
14	H	L	P	P	34	H			P	P	H	H	P	H
15		H	L	P	35	L			L	H			H	H
16		L	H	P	36	H			P	P			H	L
17				P	37	H			L	L				
18				P	38	H			P	P				
19				L	39	H			H	H				
20				L	40	H			H	H				

PIN NO.	IC U14	IC U15	IC U16	IC U17	IC U18
1	P	P	H	H	L
2	P	P	L	P	H
3	P	H	L	P	P
4	P	L	H	P	P
5	P	P	L	P	L
6	P	P	H	P	L
7	P	L	L	P	P
8	L	L	L	P	P
9	L	*	*	P	H
10	L	H	L	L	L
11	L	L	H	P	H
12	*	L	L	P	L
13	*	H	*	P	P
14	P	H	H	P	P
15	H			P	H
16	H			P	H
17	P			P	P
18	P			P	P
19	*			L	L
20	H			H	H

LOGIC CHART (Continued)

SYSTEM BOARD

PIN NO.	IC U128	IC U129	IC U130
1	H	L	L *
2	L	L	
3	P	P	H
4	L	L	P
5	P	*	P
6	H	*	P
7	P	H	P
8	P	L	H
9	P	H	P
10	L	*	L
11	L	*	L
12	P	H	H
13	L	*	L
14	P	*	L
15	L	P	H
16	P	H	H
17	L		L
18	P		L
19	*		H
20	H		H

KEYBOARD

PIN NO.	IC U1	IC M1	IC M2	IC M3	IC M4	IC M5	PIN NO.	IC M5	IC M6	IC M7	IC Z1	IC A1	IC A2	IC A3
1	L	P	L(1)	P	P	L(1)	21	L	P	P	H	H	H	H
2	H	P	H(1)	P	P	P	22	L	P	P	P	H	P	P
3	L	P	H(1)	P	P	P	23	L	P	P	P	L	P	P
4	H	P	L(1)	P	P	H	24	H	P	P	L	L	P	P
5	L	P	P	P	P	H	25	H	P	P	H	P	P	P
6	H	P	P	P	P	L(1)	26	H	P	P	H	P	P	P
7	L	L	L	L	P	L	27	P	L	L	L	P	P	P
8	*	P	P	P	L	H	28	P	P	P	*	P	P	P
9	L	P	P	P	P	H	29	H	P	P	L			
10	*	P	H(1)	P	P	P	30	H	P	P	L			
11	L	P	L(1)	P	P	P	31	H	P	P	L			
12	*	P	L(1)	P	P	P	32	H	P	P	L			
13	L	P	H(1)	P	P	P	33	H	P	P	L			
14	H	H	H	H	P	P	34	H	H	H	*			
15					P	P	35	H			P			
16					H	P	36	H			P			
17						P	37	L(1)			P			
18						P	38	L(1)			H			
19						P	39	P			L			
20						L	40	H			L			

IBM PC/AT
MODEL 5170-239

LINE DEFINITIONS

258EN	258 Enable	FDSEL	Floppy Drive Select
258SEL	258 Select	FFD	Fixed and Floppy Disk
8042 CS	8042 Chip Select	FFD DATA	Fixed and Floppy Disk Data
A0 THRU A23	Address, Bits 0 Thru 23	FIN	Floppy Interrupt
A20 GATE	Address Bit 20 Gate	FRCLK	Floppy Read Clock
ACK	Acknowledge	FWCLK	Floppy Write Clock
ADDR DEL	Address Select	GATE ALE	Gate Address Latch Enable
AEN	Address Enable	HDMAEN	Direct Memory Access Enable
AEN1,2	Address Enables 1,2	HDRQ	Host Data Request
AIOW	Input/Output Write	HLDA,HLDA1	Hold Acknowledge
ALE	Address Latch Enable	HRQ1	Hold Request
ALT ALE	Alternate Address Latch Enable	HRST	Master Reset
ARDY	Asynchronous Ready, Terminate Current Bus Cycle	HS0,1,2,3	Head and Drive Select Bits 0,1,2,3
ARDYEN	Asynchronous Ready Enable	HS3/RWC	Drive Select
BCS	Buffer Chip Select	I/O CH CK	Input/Output Clock
BHE	Byte High Enable	I/O CH RDY	Input/Output Ready
BIOR	Input/Output Read	IN RDY	Input Ready
BUSY	Busy	IND	Index Sensor
BUSY286	Busy 286	INDEX A	Index Sensor
C CLR	Clear	INT	Interrupt
CASH0H,CAS1H	Column Address Strobe 0,1 High	INTA	Interrupt Acknowledge
CAS0L,CAS1L	Column Address Strobe 0,1 Low	INTR 1,2, CS	Interrupt Request 1,2 Chip Select
CINC	Clock Timing Pulses	IO CH RDY	Input/Output Ready
CLK	Clock Timing Pulses	IO CS 16	Input/Output Write
CLK1	Clock 1	IOR	Input/Output Read
CMDLY	Command Delay, Delays Start of a Command	IOW	Input/Output Write
CMR	Counter Master Reset	IRQ	Interrupt Request
CNTLOFF	Control Off, Command Enable/Address Enable	IRQ EN	Interrupt Request Enable
COMPLETE	Complete, Acknowledge	IRQ THRU IRQ14	Interrupt Request Lines 0 Thru 14
CONVALE	Address Latch Enable	LOW DENSITY	Low Density Operating Mode
CORRD	Read	M ON	Motor On
CPU HLDA	CPU Hold Acknowledge	M/I/O	Select, Distinguishes Memory or I/O
CS0,1	Chip Selects 0,1	MA0 THRU MA7	Memory Address Bits 0 Thru 7
CS16	Chip Select 16	MASTER	Master Reset
CS287	Chip Select 287	MD0 THRU MD15	Memory Data Bits 0 Thru 15
DO THRU D7	Data, Bits 0 Thru 7	MEMCS16	Memory Chip Select 16
DACK0,2,3,4,6,7	Direct Memory Access Acknowledge Lines	MEMR	Memory Read
DATA 1 THRU DATA 8	Parallel Bits 1 Thru 8	MEMW	Memory Write
DIR	Direction, Disk Read/Write Head	MINT	Interrupt Request, Activated by Master Reset
DIR 245	Direction, Data Control	MOT EN1,2	Motor Enable 1,2
DIR IN	Direction Input	MOT ON	Motor Enable
DISK CHANGE	Disk Change	MOTOR CONTROL	Drive Motor Control Pulses
DISK DET	Disk Detection	NMI	Non-Maskable Interrupt
DMA 1,2 CS	Direct Memory Access Chip Selects 1,2	NMICS	Nonmaskable Interrupt Chip Select
DMA AEN	Direct Memory Access Address Enable	NPCS	Numeric Processor Chip Select
DMA CLK	Direct Memory Access Clock	OUT1,2	Outputs of Counters 1 and 2
DMA RDY	Direct Memory Access Ready	OWS	Synchronous Ready
DRQ0,1,2,3	Direct Memory Access Request 0,1,2,3	PCLK	Peripheral Clock
DS	Disk Select	PG REG CS	Page Register Chip Select
DS0,1,2,3	Drive Select Bits 0,1,2,3	PORTB RD	Port B Read
DSB1	Hard or Floppy Disk Select	PORTB WR	Port B Write
DT/R	Data Transmit/Receive	POWER GOOD	Reset, Verifying Power On Situation
EIA CARRIER DET	Electronics Industries Association Carrier Detection	PPI CS	Peripheral Interface Chip Select
EIA CLR TO SEND	Electronics Industries Association Clear to Send	PRESET	Reset
EIA DATA SET RDY	Electronics Industries Association Data Set Ready	PROCCLK	Processor Clock
EN	Enable	R CLK	Clock
ENA IO	Enable Input/Output	RA6	Register Counter, Overflow Detection
ENA IO CK	Enable Input/Output Clock	RAM 0,1,2,3 CAS	RAM 0,1,2,3 Column Address Strobe
ENB RAM	Enable RAM	RAM 0,1,2,3 RAS	RAM 0,1,2,3 Row Address Strobe
ENB RAM PACK	Enable Random Access Memory Pack	RAMSEL	RAM Select
END CYC	Terminate Cycle	RAS	Row Address Strobe
ENDIR	Enable Direction	RCK	Reset Buffer Counters Request
ERROR	Error Status, Unmasked Error Condition	RCS	RAM Chip Select
FAULT	Error State	RD	Read
FDACK	Floppy Direct Memory Access Acknowledge	RD DATA	Read Data
FDMAEN	Floppy DMA Enable	RDY	Ready
		READ EN	Read Enable
		READY	Ready, Current Bus Cycle Is To Be Completed
		REFRESH	Refresh Dynamic Memory Pulses

LINE DEFINITIONS (Continued)

RESCPU	Reset CPU	U37CLK	U37 Clock
RESET	Reset	U3EN	U3 Enable
RESET 287	Reset 287	U42EN	U42 Enable
RESET DRV	Reset Drive	U49CLK	U49 Clock
RG	Request Grant, Bus Control	VCO EN	Voltage Controlled Oscillator Enable
S0,1	Status Lines	VCO SEL	Voltage Controlled Oscillator Select
SA0 THRU SA19	Address Bits 0 Thru 19	WAUP	Wake Up, Sector Buffer Full
SBEF	Sector Buffer Empty or Full	WD	Write Data, Clock and Data for Diskette Writing
SEEK	Disk Seek	WD1010CS	Chip Select
SEL	Select	WE	Write Enable
SER I/O	Serial Input/Output	WG	Write Gate, Validation Before Diskette Writing
SHT DWN	Shut Down	WR	Write, Data Bus Info Stored in Memory or I/O
SIDE	Disk Side	WRCP	Clock Pulse
SMEMR	Serial Memory Read	WRITE PROTECT	Write Protect, Disk Overwrite Protection
SMEMW	Serial Memory Write	WRT DATA	Write Data
STEP	Stepper Motor	WRT EN	Write Enable
STEP 12	Stepper Motor Pulses	WRT PROT	Write Protect
T/C	Transmitting/Complete	XA0 THRU XA16	Address Bits 0 Thru 16
T/C CS	Timer Chip Select	XBHE	Byte High Enable
TA0 THRU TA7	Address Bits 0 Thru 7	XD0 THRU XD7	Data Bits 0 Thru 7
TC/B	Terminal Count/Bidirectional End of Process	XIOR	Input/Output Read
TRACK 00	Track 00 Sensor	XIOW	Input/Output Write
U12EN	U12 Enable	XMEMR	Memory Read
U19EN	U19 Enable	XMEMW	Memory Write
U22EN	U22 Enable		

SCHEMATIC NOTES

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

Voltages, waveforms, and logic readings taken with Computer in Power-Up Mode, no keys pressed, no diskette in Drive A, Fixed Disk Formatted with no programs on it. The following messages appear on the Monitor screen:

```
00256KB OK
161-System Options Not Set-(Run SETUP)
(RESUME="F1" KEY)
```

NOTE: The "System Options Not Set" message will appear if the battery pack in the system is disconnected causing the setup information stored in CMOS RAM (U117) to be lost.

Waveforms and voltages taken from ground, unless noted otherwise.

Waveforms taken with triggered scope and Sweep/Time switch in Calibrate position, scope input set for DC coupling on "0" reference voltage waveforms. Switch to AC input to view waveforms after DC reference is measured when necessary. Each waveform is 7.5cm. width with DC reference voltage given at the bottom line of each waveform.

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

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

Supply voltage maintained as shown at input.

Voltages measured with digital meter, no signal.

Controls adjusted for normal operation.

Terminal identification may not be found on unit.

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

Value in () used in some versions.

Measurements with switching as shown, unless noted.

Logic Probe Display

L = Low

H = High

P = Pulse

* = Open (No lights On)

GENERAL OPERATING INSTRUCTIONS

POWER ON TEST

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

BOOT UP

Insert a bootable diskette into Disk Drive A and turn On the Computer. The Computer will automatically boot up using the diskette in Disk Drive A. If a PC DOS (Personal Computer 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 has been entered, the version of DOS will be displayed on the Monitor screen along with an A> which indicates the DOS is running. If Fixed (Hard) Disk Drive is installed, the Computer will boot up from the Fixed Drive if no diskette is inserted in the Floppy Disk Drive.

PC DOS

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

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

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

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

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

BASIC

When turned On, the Computer will come up in ROM Basic if there is not a bootable diskette in Disk Drive A and the Fixed (Hard) Disk Drive is not installed. If a Fixed Disk Drive is installed, the Computer will boot up from the Fixed Disk Drive if no diskette is inserted in the Floppy Disk Drive. If the

Fixed Disk Drive does not contain a bootable program the Computer will come up in ROM Basic.

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

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

To load a program in Disk Basic or Advanced Disk Basic from the diskette, type LOAD, the program name enclosed in quotes, and press the ENTER key. To load a program from a Disk Drive other than the default Drive, add the Drive letter with a colon in front of the program name.

```
LOAD"B:NAME"
```

To save a program, type SAVE, the program name enclosed in quotes and press the ENTER key. To save a program to a Disk Drive other than the default Drive, add the Drive letter with a colon in front of the program name.

```
SAVE"B:NAME"
```

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

RESETTING COMPUTER

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

SYSTEM OPTIONS SETUP

Information on the time, date and the options that are installed in the Computer is stored in CMOS RAM IC (U117) that is powered by a Battery (M1) when the Computer is turned Off. If any option is removed or added to the Computer or the Battery (M1) is replaced, a Setup program must be run to put the time, date, and option information in the CMOS RAM. A Setup program is included on the Diagnostic Disk in the "Guide To Operations" manual that comes with the Computer. Insert the Diagnostic Disk in Drive A and turn the Computer On. A menu will come up on the Monitor screen listing the functions available. Select the Set up function (number 4) and follow the instructions on the screen to set the time, date, and options.

COMPUTER SELF TESTS AND DIAGNOSTICS (Continued)

<u>Last Four Character</u>	<u>IC</u>	<u>Last Four Characters</u>	<u>IC</u>
0000	P	0100	8
0001	0	0200	9
0002	1	0400	10
0004	2	0800	11
0008	3	1000	12
0010	4	2000	13
0020	5	4000	14
0040	6	8000	15
0080	7		

SAFETY PRECAUTIONS

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

SWITCHES AND JUMPERS

SYSTEM BOARD

Switch SW1

Switch SW1 is set according to type of Monitor that is used in the System.

SW1 On (Towards Front)	Color Graphics Monitor
SW 1 Off (Towards Rear)	Monochrome Monitor

Jumper J18

Jumper J18 is set according to the amount of RAM that is installed on the System Board.

J18	Pins 1 and 2 jumpered	512 K RAM
J18	Pins 2 and 3 jumpered	256 K RAM

Jumper J131

Jumper J131 is set according to the size of ROMS U17, U27, U37, and U47.

Four 16K x 8 ROMS used	J131 pins 1 to 8 and 2 to 7 jumpered
Two 32K x 8 ROMS used	J131 pins 3 to 6 and 4 to 5 jumpered

SERIAL/PARALLEL ADAPTER

Jumpers J1 and J2 are used to determine if the board is used as a Primary Serial or Parallel Port or an alternate Serial or Parallel Port.

Primary Serial Port	Connect J1 Pin 3 to 6 and 4 to 5
Alternate Serial Port	Connect J1 Pin 1 to 8 and 2 to 7
Primary Parallel Port	Connect J2 Pin 3 to 6 and 4 to 5
Alternate Parallel Port	Connect J2 Pin 1 to 8 and 2 to 7

ENHANCED GRAPHICS ADAPTER

Jumpers P1 and P3

Jumpers P1 and P3 are set according to the type of Monitor connected to the EGA Adapter. Set the jumpers to short the pins indicated below for the Monitor being used.

<u>Monitor</u>	<u>P1</u>	<u>P3</u>
Enhanced Color Monitor	1,2	1,2
Color or Monochrome Monitor	2,3	1,2

DIP Switch SW1

DIP Switch SW1 is set according to the types of Display Adapter boards and Monitors that are used in the System. One or two Display Adapter Boards and one or two Monitors can be used on the System. If two monitors are used, one must be a Color Monitor and the other a Monochrome Monitor. Two Monitors of the same type cannot be used in the same System. Use the following charts to determine the Switch settings for SW1 for the Adapter Boards and Monitors.

Enhanced Graphics Adapter is the only adapter installed in the System.

EGA Adapter

	<u>SW1</u>			
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Monochrome	Open	Open	Closed	Open
Color (40 x 25)	Closed	Open	Open	Closed
Color (80 x 25)	Open	Open	Open	Closed
Enhanced Color (Normal Mode)	Closed	Closed	Closed	Open
Enhanced Color (Enhanced Mode)	Open	Closed	Closed	Open

SWITCHES AND JUMPERS (Continued)

Enhanced Graphics and Monochrome/Printer Adapters are Installed in the System.
Enhanced Graphics Adapter is the Primary Adapter.

<u>EGA Adapter</u>	<u>Monochrome/Printer Adapter</u>	<u>SW1</u>			
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Color (40 x 25)	Monochrome or none	Closed	Open	Open	Closed
Color (80 x 25)	Monochrome or none	Open	Open	Open	Closed
Enhanced Color (Normal Mode)	Monochrome or none	Closed	Closed	Closed	Open
Enhanced Color (Enhanced Mode)	Monochrome or none	Open	Closed	Closed	Open

Enhanced Graphics and Monochrome/Printer Adapters are Installed in the System.
Monochrome/Printer Adapter is the Primary Adapter.

<u>EGA Adapter</u>	<u>Monochrome/Printer Adapter</u>	<u>SW1</u>			
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
None	Monochrome	Open	Closed	Closed	Closed
Color (40 x 25)	Monochrome	Closed	Closed	Closed	Closed
Color (80 x 25)	Monochrome	Open	Closed	Closed	Closed
Enhanced Color (Normal Mode)	Monochrome	Closed	Open	Closed	Closed
Enhanced Color (Enhanced Mode)	Monochrome	Open	Open	Closed	Closed

Enhanced Graphics and Color Graphics Adapter are Installed on the System.
Enhanced Graphics Adapter is the Primary Adapter.

<u>EGA Adapter</u>	<u>Color Graphics Adapter</u>	<u>SW1</u>			
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Monochrome	None	Open	Open	Closed	Open
Monochrome	Color (40 x 25)	Closed	Open	Closed	Open
Monochrome	Color (80 x 25)	Open	Open	Closed	Open

Enhanced Graphics and Color Graphics Adapter are Installed in the System.
Color Graphics Adapter is the Primary Adapter.

<u>EGA Adapter</u>	<u>Color Graphics Adapter</u>	<u>SW1</u>			
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Monochrome	Color (40 x 25)	Closed	Closed	Open	Closed
Monochrome	Color (80 x 25)	Open	Closed	Open	Closed

MISCELLANEOUS ADJUSTMENTS

14MHz OSCILLATOR

Connect the input of a frequency counter to one end of Resistor R3. Adjust the 14MHz Adjust Trimmer (C26) for a frequency of 14.318MHz.

HEAD CLEANING INSTRUCTIONS

Use a lint-free cloth or cotton swab dampened with 91% isopropyl alcohol to clean the disk drive heads and dry with a lint-free cloth.

ALIGNMENT TOOLS

C26.....GC Electronics 5000, 8276, 8089

5V ADJUSTMENT

Connect input of a voltmeter to 5.0V Source (pin 4 of Connector P9). Adjust 5.0V Control (P2) for a voltage of 5.0V. Adjust

DISASSEMBLY INSTRUCTIONS

SYSTEM BOARD REMOVAL

CABINET REMOVAL

Remove five screws from rear of cabinet. Slide cabinet forward and remove from unit.

POWER SUPPLY REMOVAL

Disconnect Connectors P8 and P9 from System Board and Connectors P10 and P11 from Disk Drives. Remove four screws from rear of the Power Supply cabinet. Push Power Supply forward about 1/2 inch to clear mounting tabs on cabinet bottom and lift Power Supply from unit.

FLOPPY DISK DRIVE REMOVAL

Disconnect Disk Drive Adapter Connector and ground Connector. Disconnect Power Supply Connector P11 from the rear of the Disk Drive. Remove two screws from the front of Disk Drive A and slide Disk Drive out the front of cabinet.

FIXED DISK DRIVE REMOVAL

Disconnect two Fixed Disk Drive Adapter Connectors, ground Connector and Power Supply Connector (P10) from rear of Fixed Disk Drive. Remove two screws from the front of Drive and slide Drive out front of cabinet.

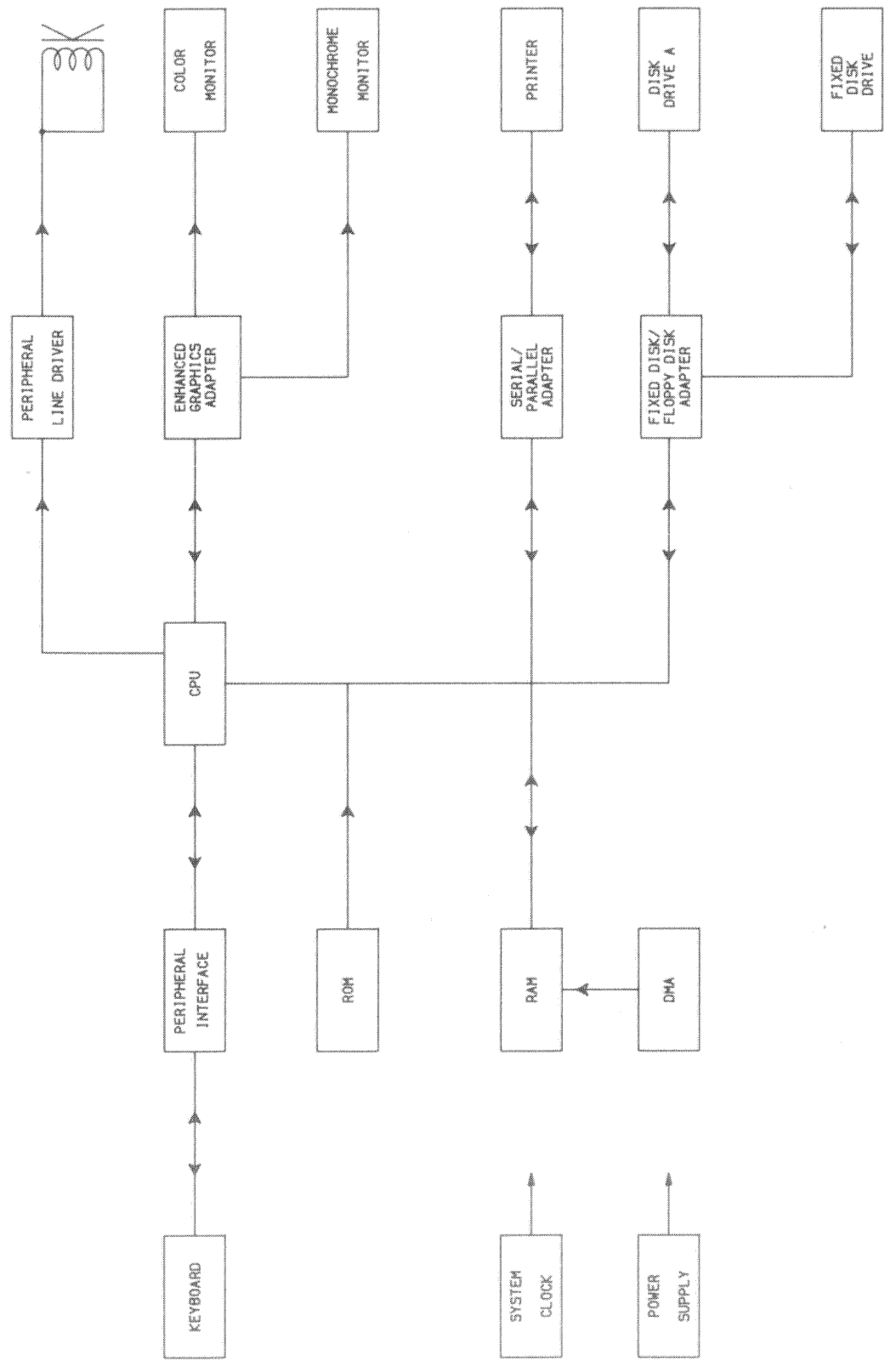
Remove all adapter boards from the expansion slots. Disconnect Battery Connector (J21), Power Supply Connectors (P8 and P9), Speaker Connector (J19) and security Key Lock Connector (J20). Remove two screws located at center top and center bottom on System Board. Slide System Board to left to clear plastic stand-offs on Chassis Bottom. Lift system board out of chassis.

KEYBOARD DISASSEMBLY

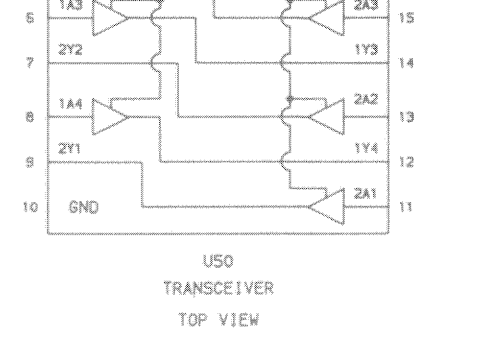
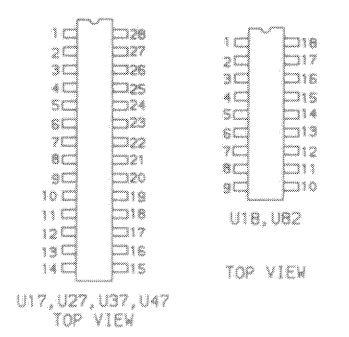
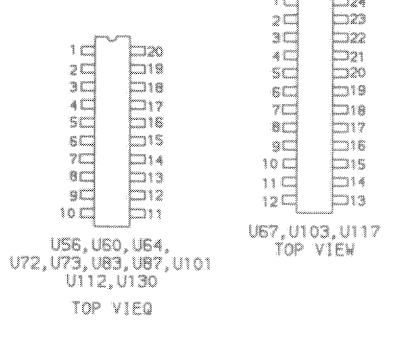
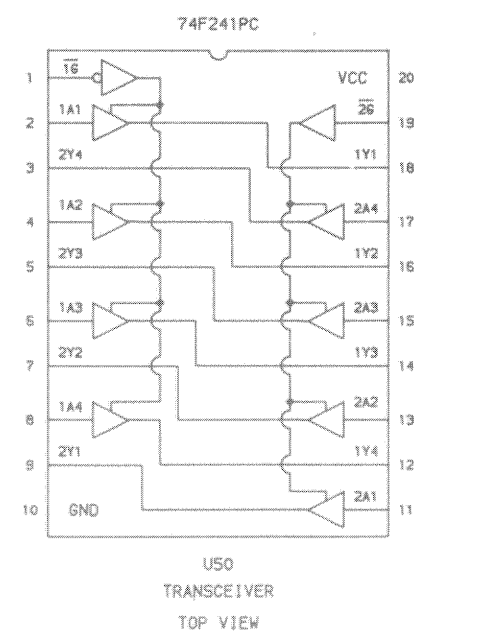
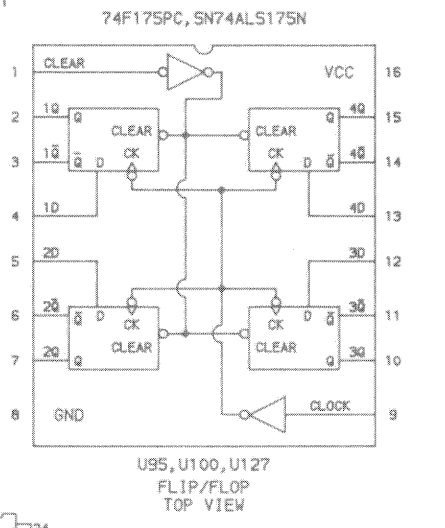
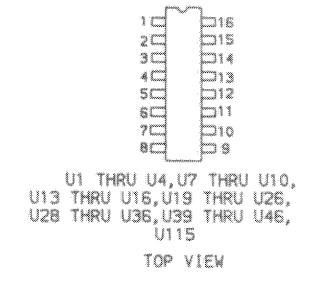
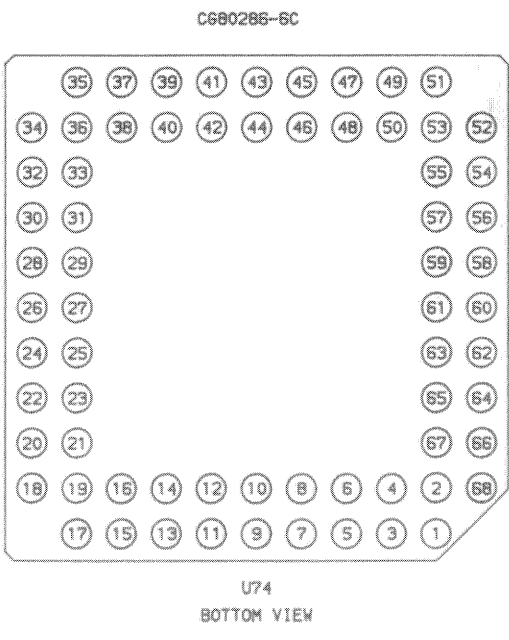
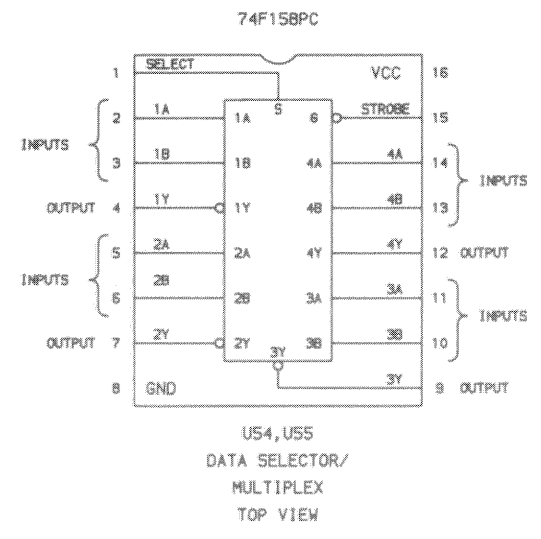
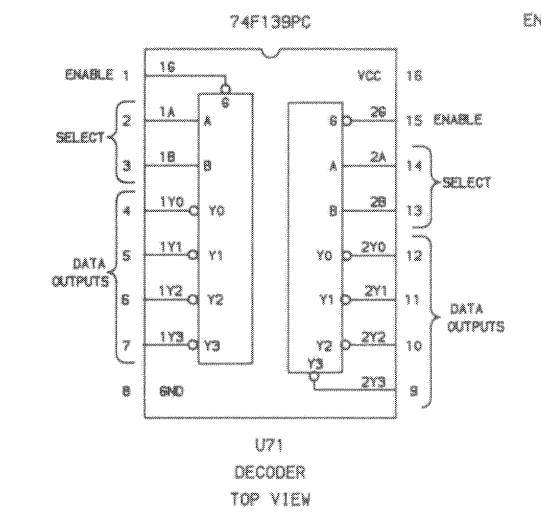
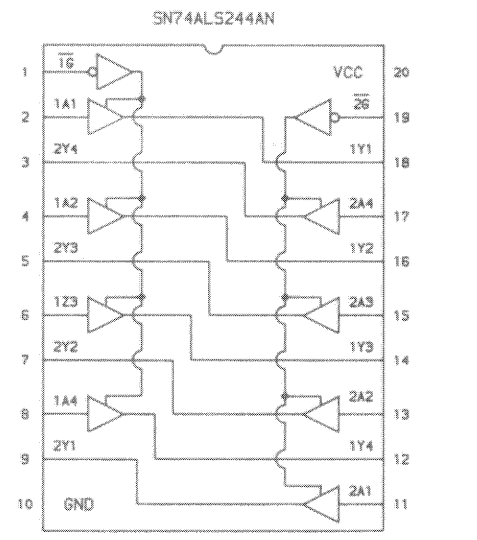
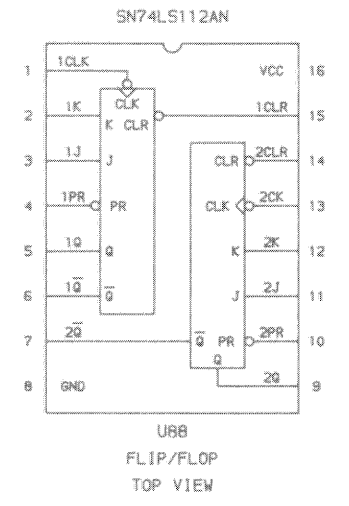
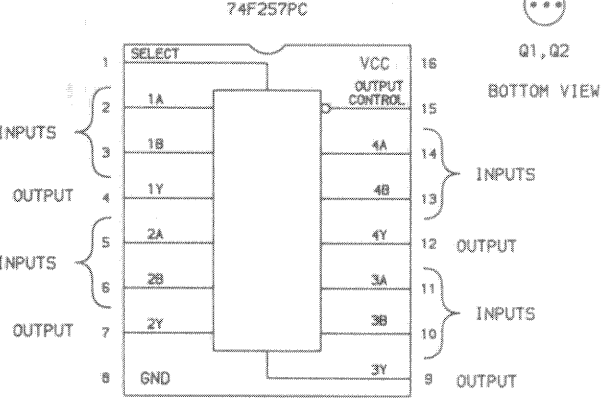
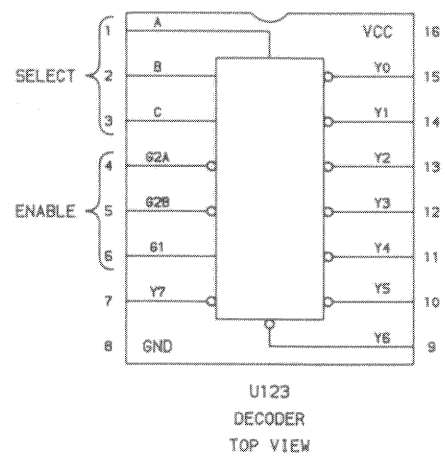
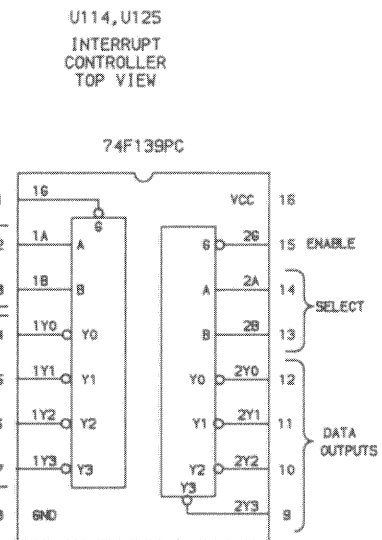
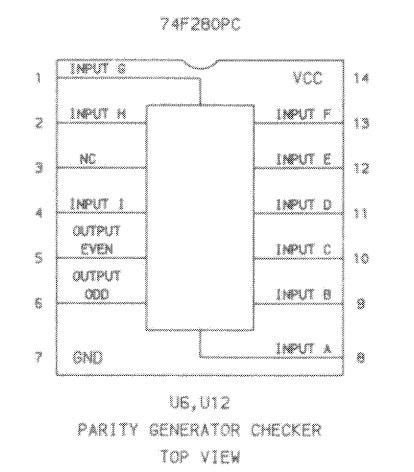
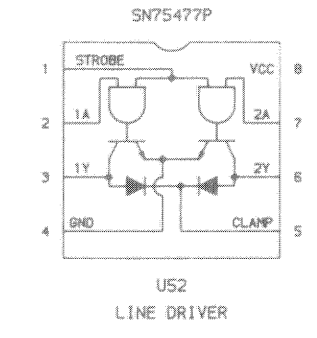
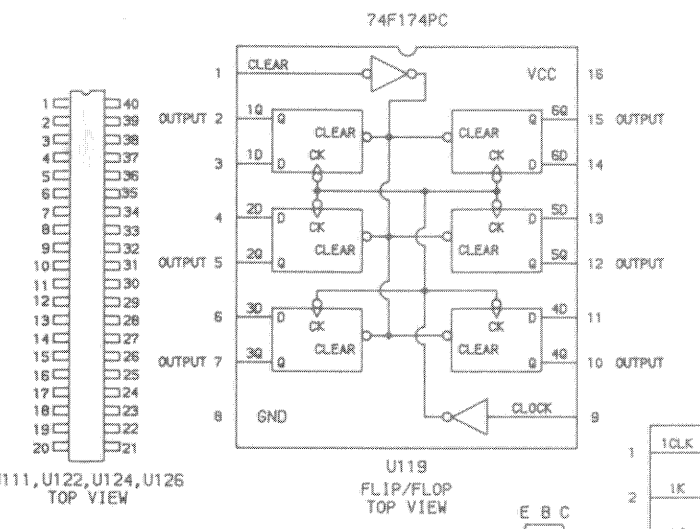
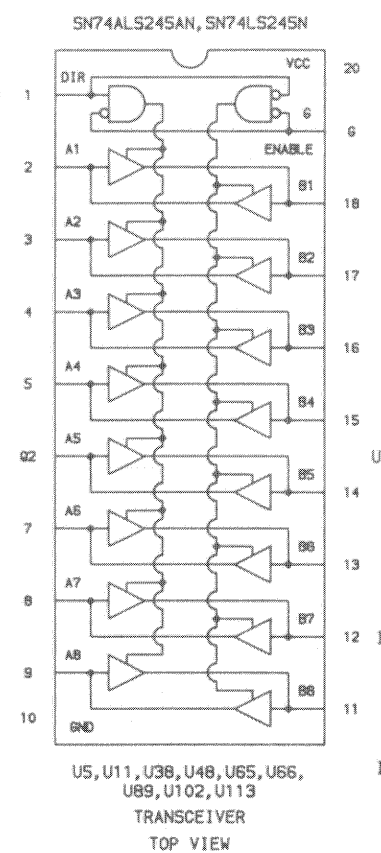
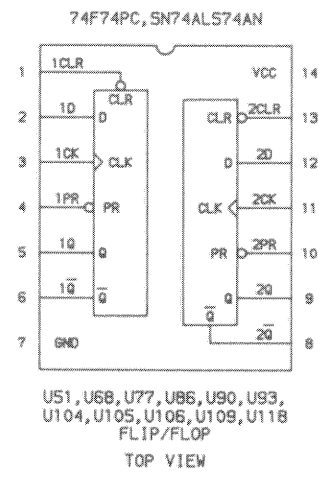
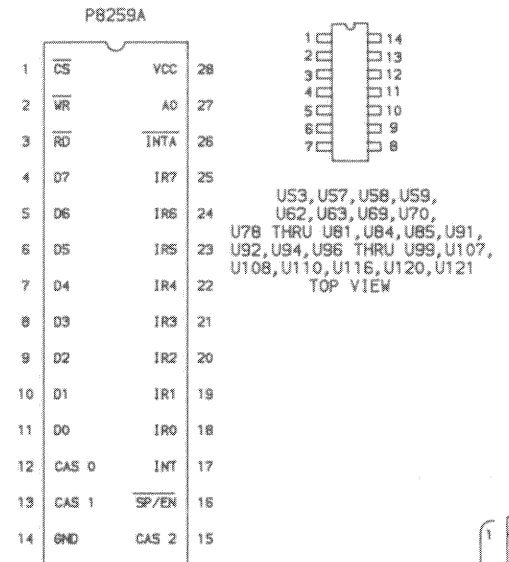
Lay Keyboard face down and remove four screws holding lower case. Carefully lift up on rear edge of lower case until it is high enough to slide keyboard cable out. Slide cable out of slot and continue lifting on rear edge until latching tabs on front edge release. The key caps may be removed by lifting up on cap from top of Keyboard.

POWER SUPPLY DISASSEMBLY

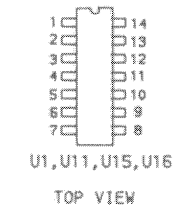
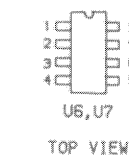
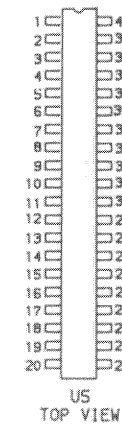
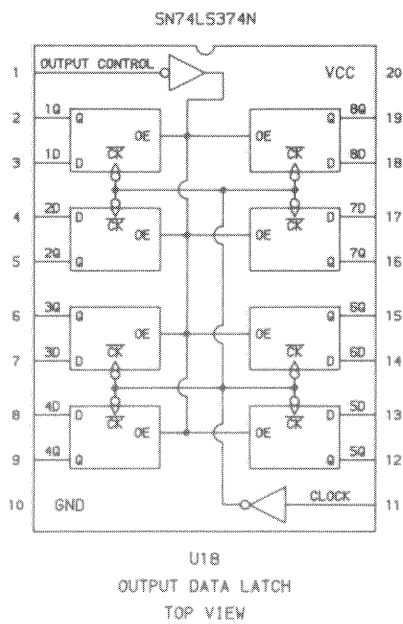
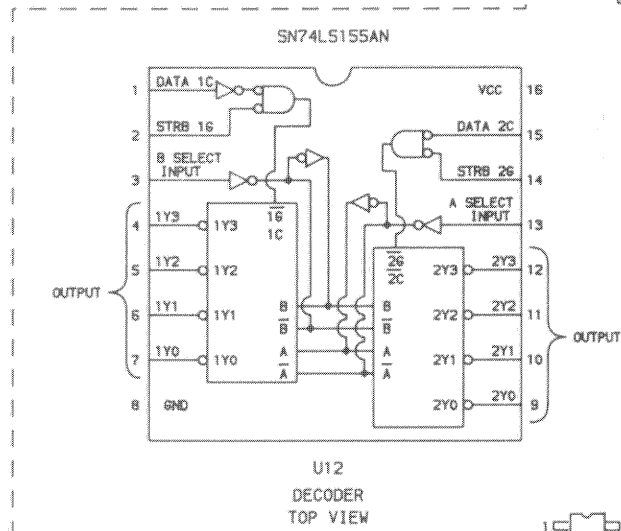
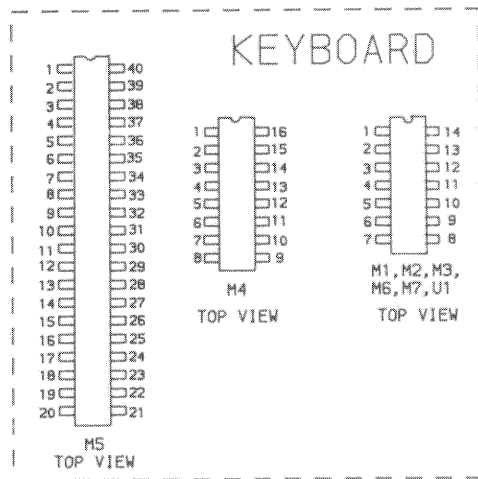
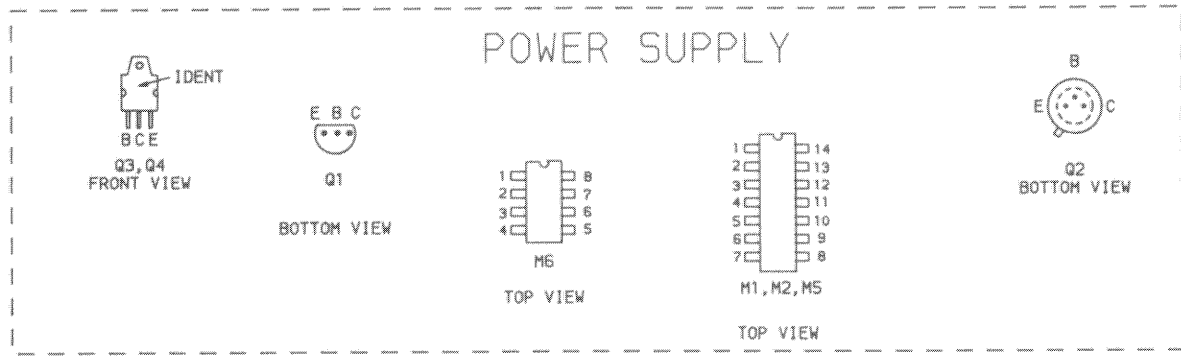
Drill out two rivets on front and top of Power Supply Cabinet. Remove one screw from top and three screws from front of cabinet and lift top off. Squeeze cable strain relief and slide out of cabinet. Remove four screws holding Fan. Disconnect AC power Connectors (E26 and E27) from Main Power Supply Board. Remove nut holding ground wire to cabinet. Remove three screws holding Main Power Supply Board and remove from cabinet. Unsolder five wires connected to AC Input Board. Remove three nuts holding AC Input Board and remove board.



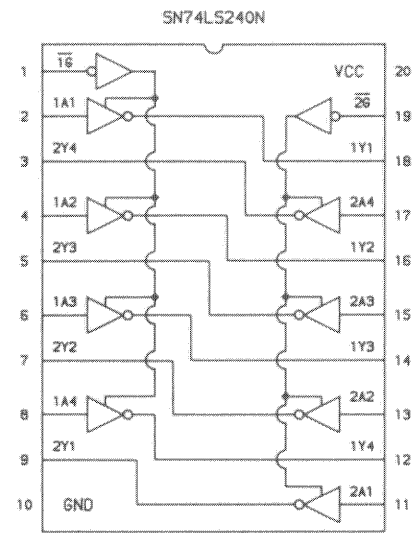
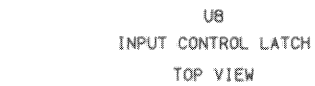
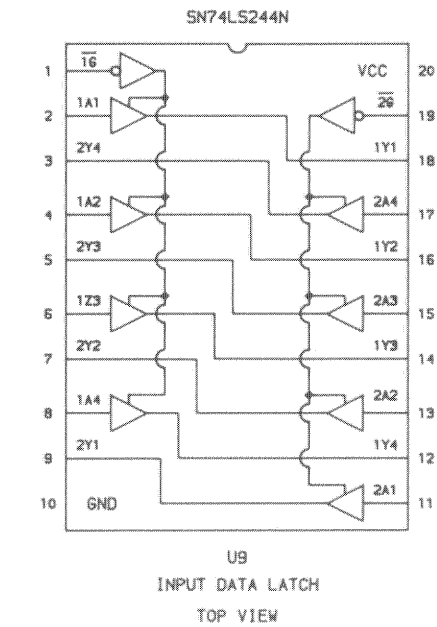
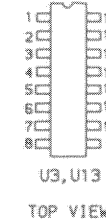
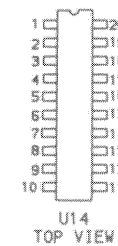
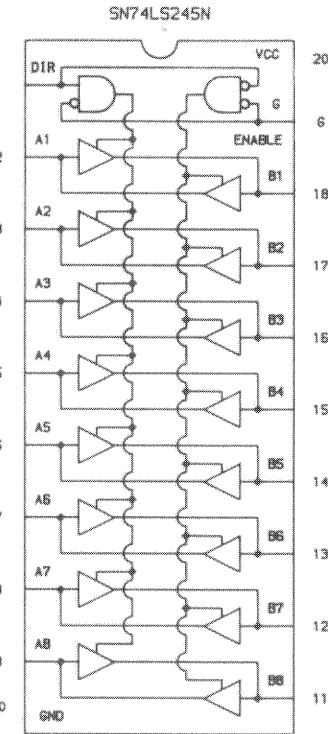
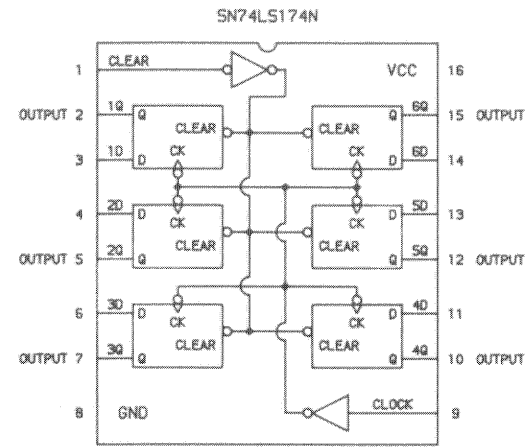
IC PINOUTS & TERMINAL GUIDES

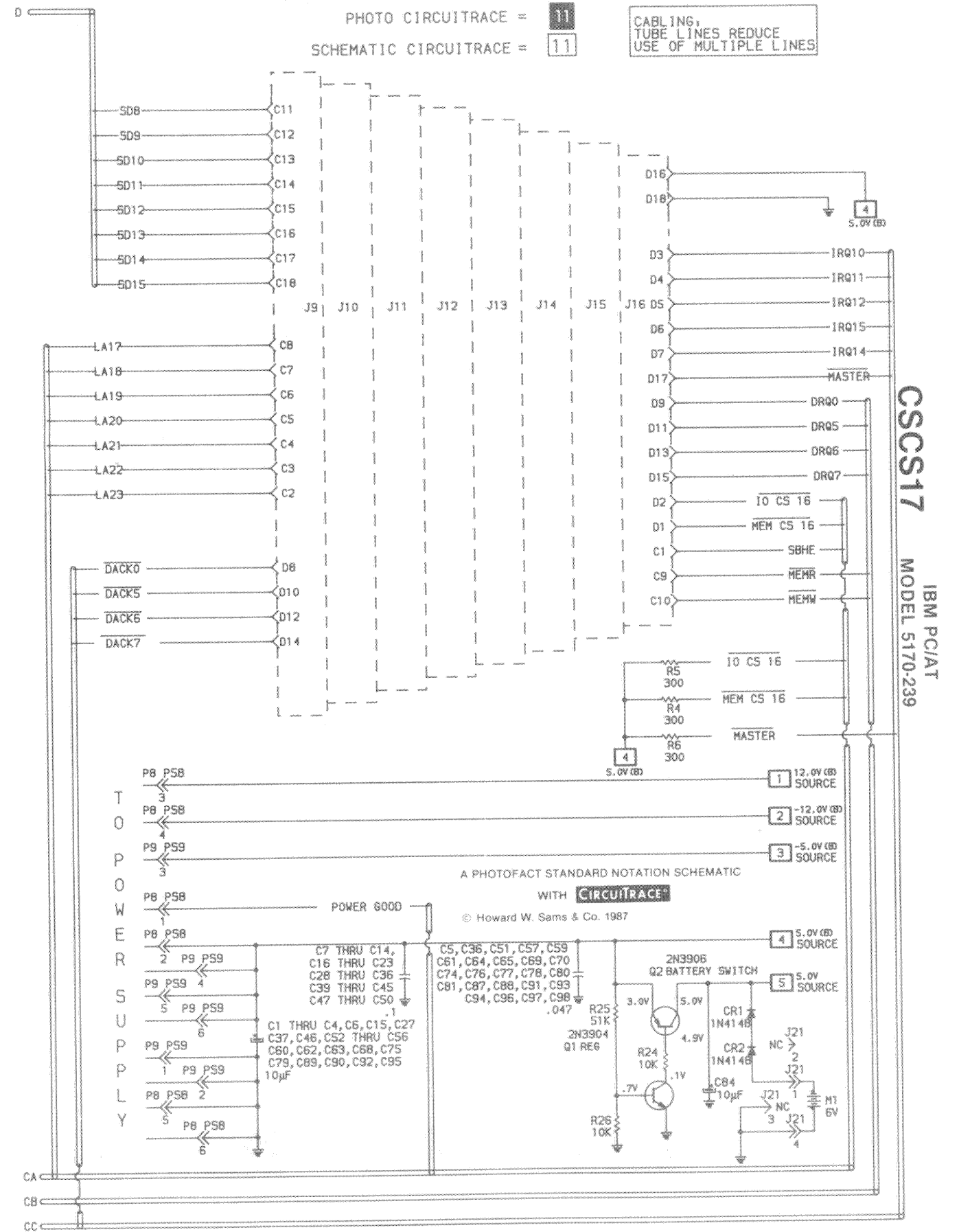


IC PINOUTS & TERMINAL GUIDES

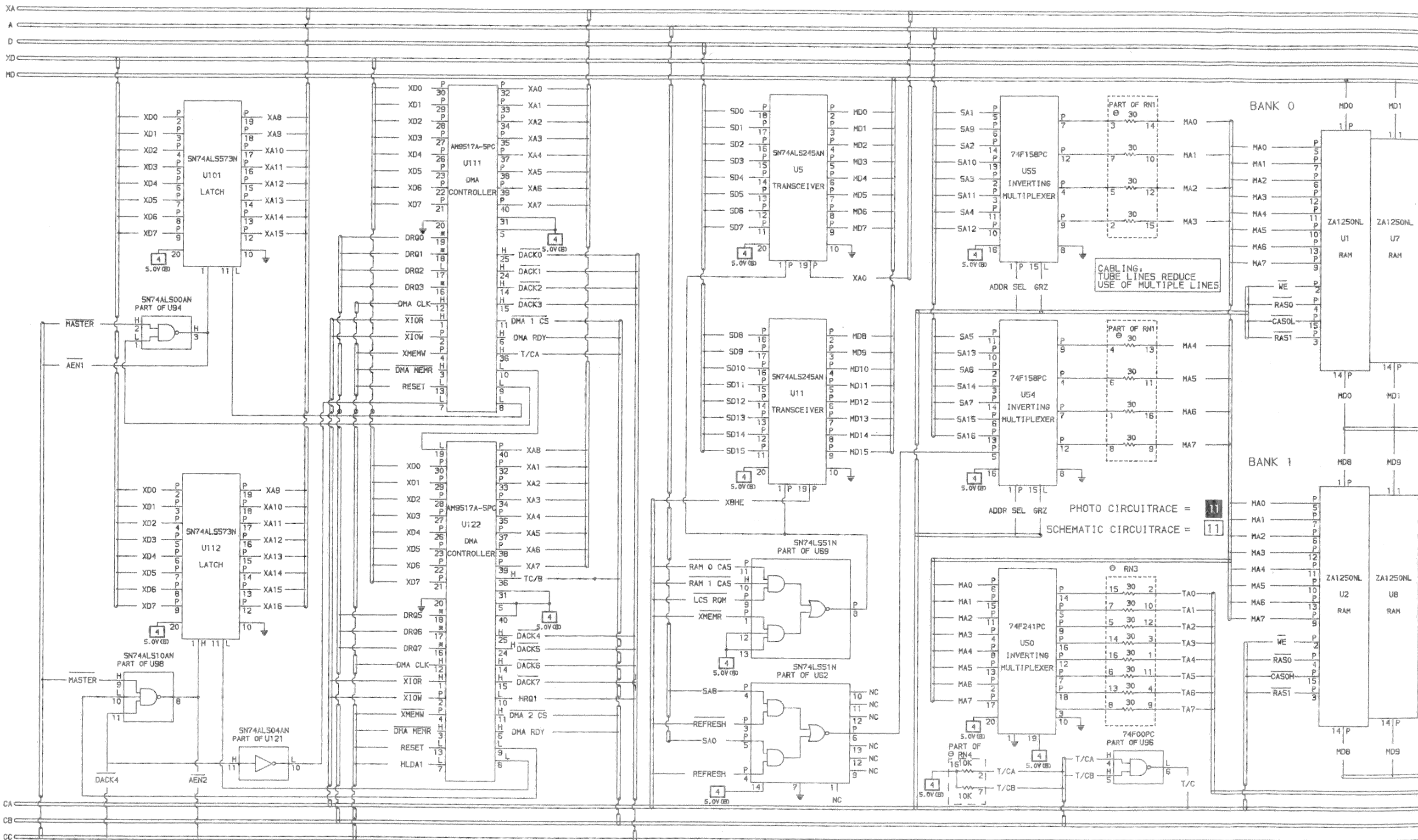


SERIAL/PARALLEL





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 MODEL 5170-239
 IBM PC/AT

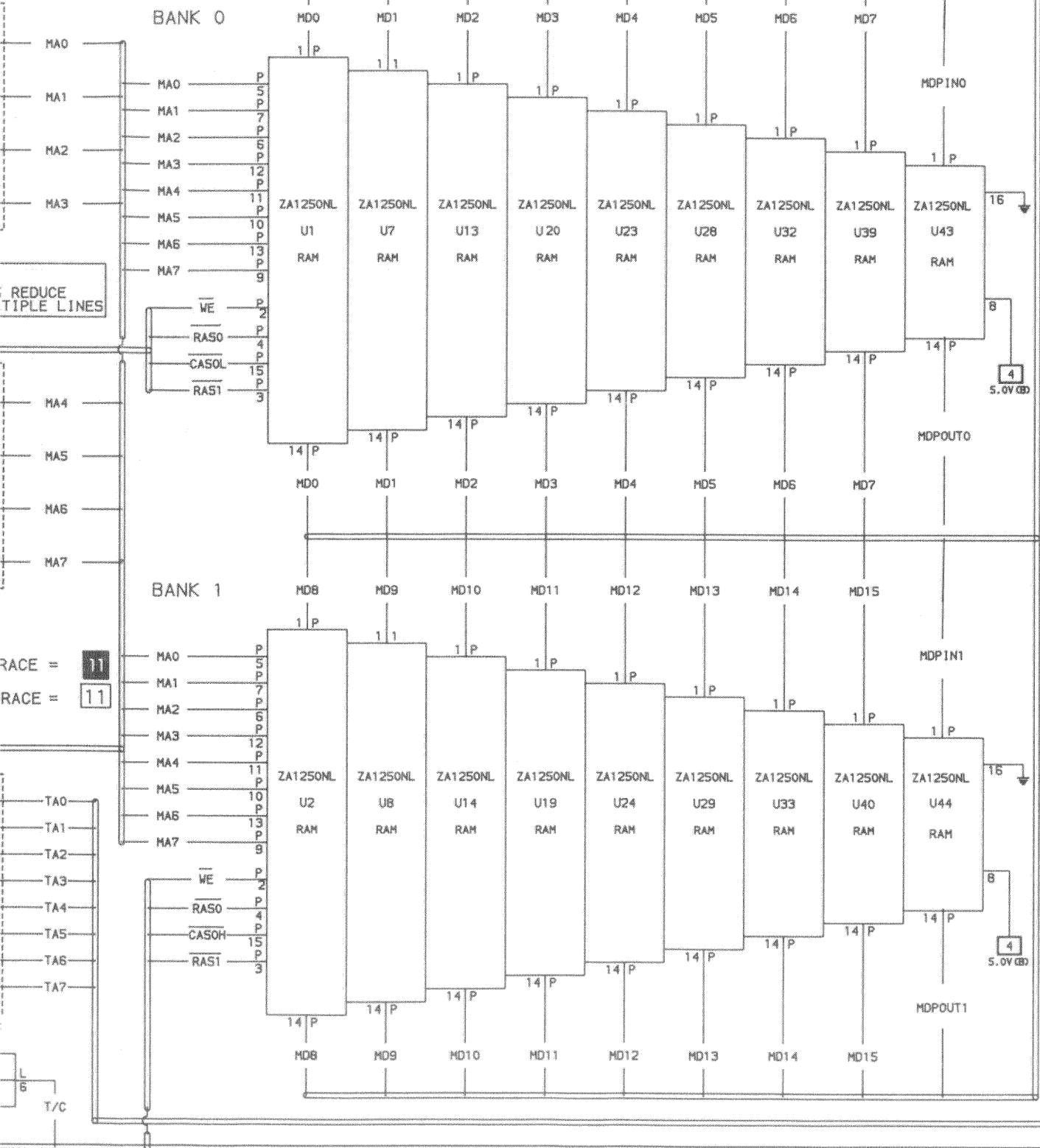


A PHOTOFACT STANDARD NOTATION SCHEMATIC

WITH **CIRCUITRACE**

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XA
A
D
XD
MD



REDUCE TRIPLE LINES

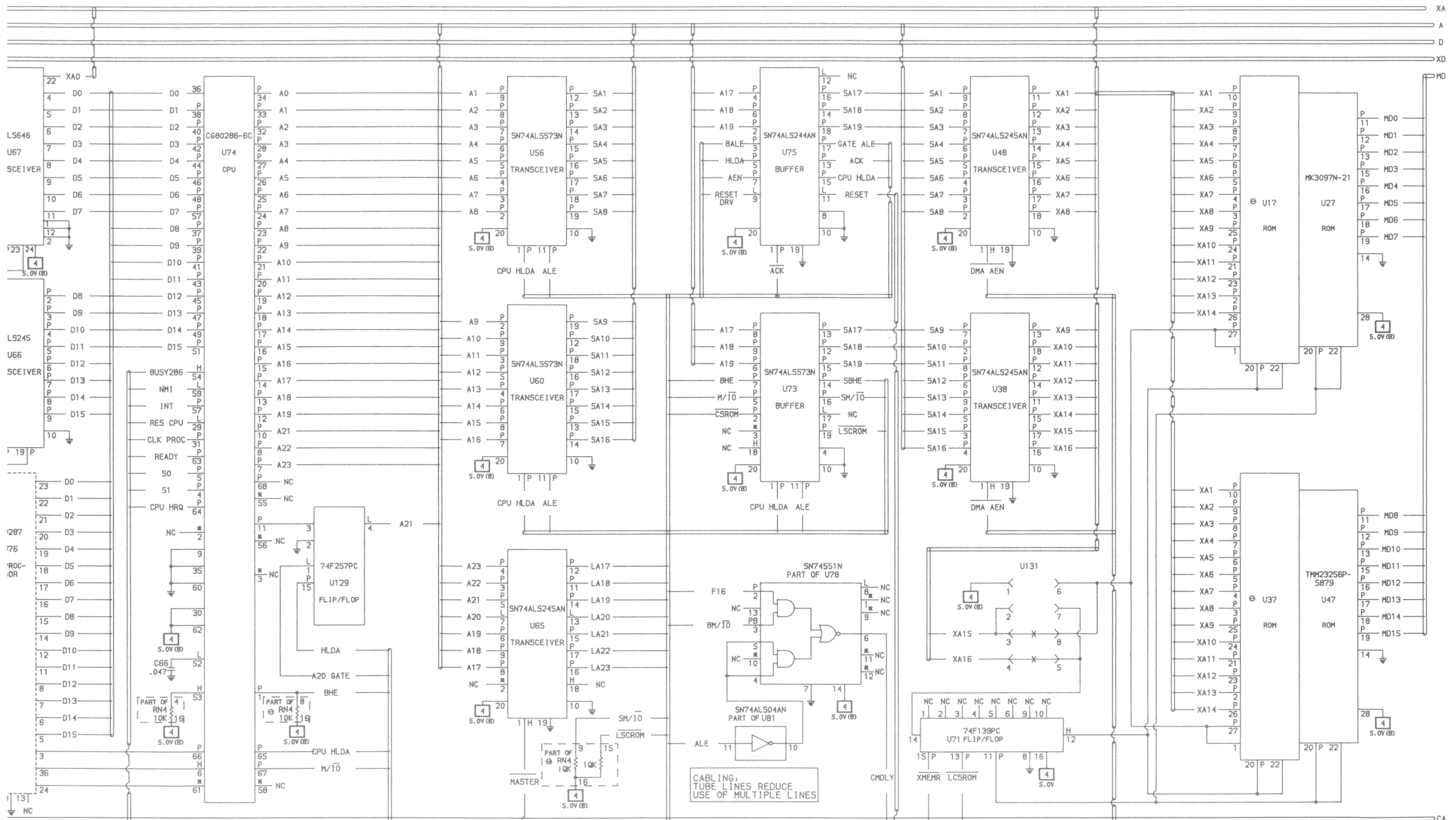
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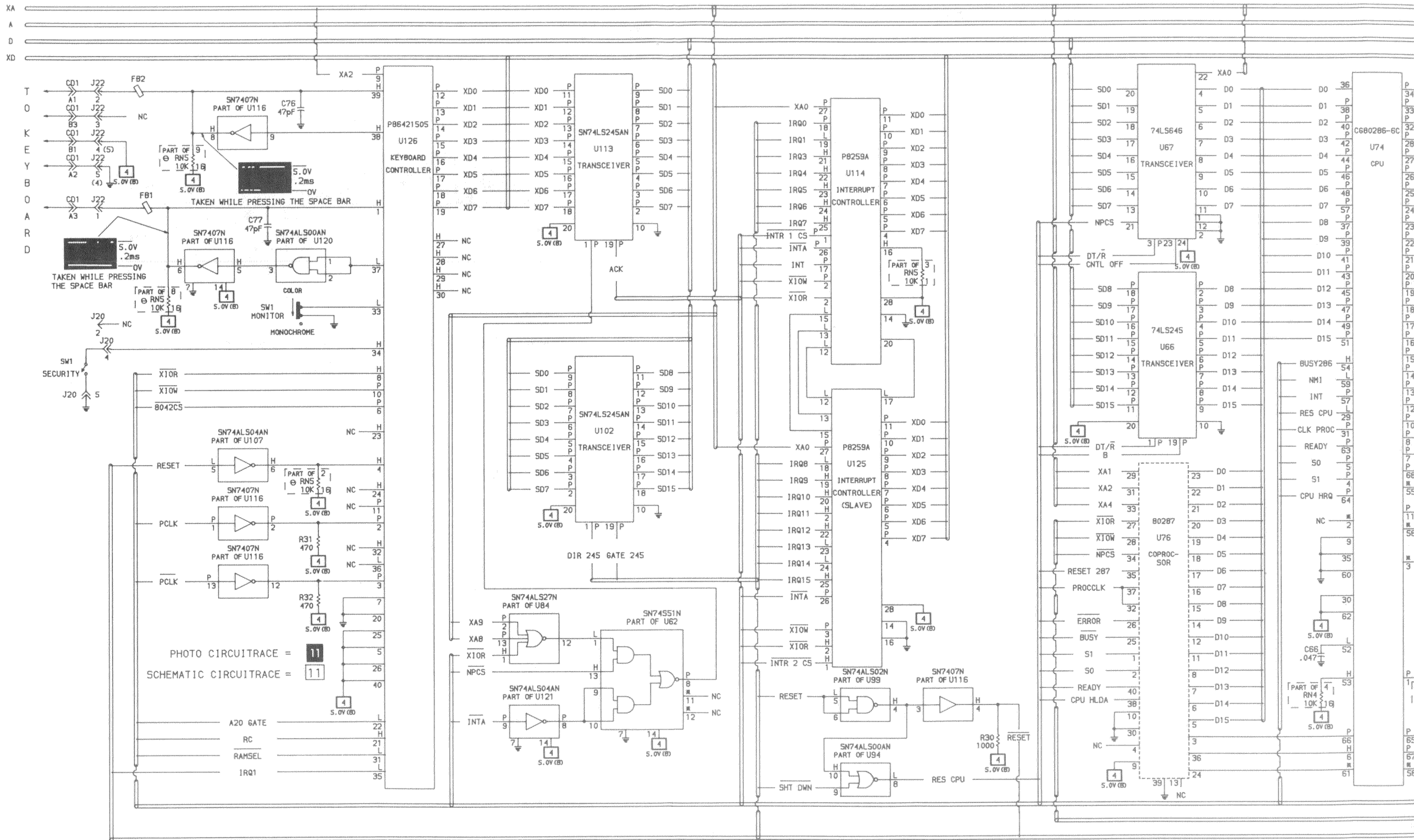
T/C

CD
CA
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SYSTEM BOARD

IBM PC/AT
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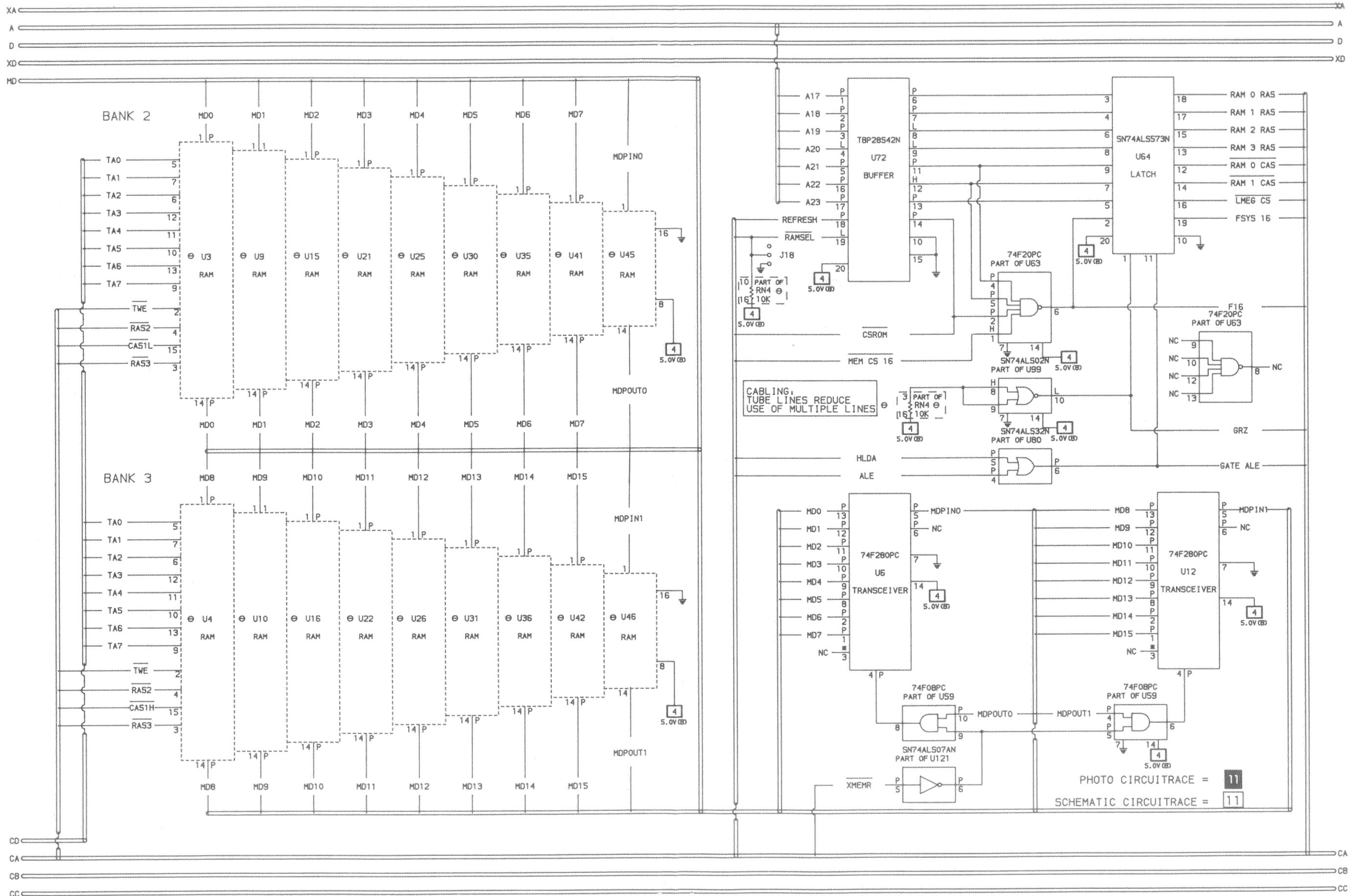




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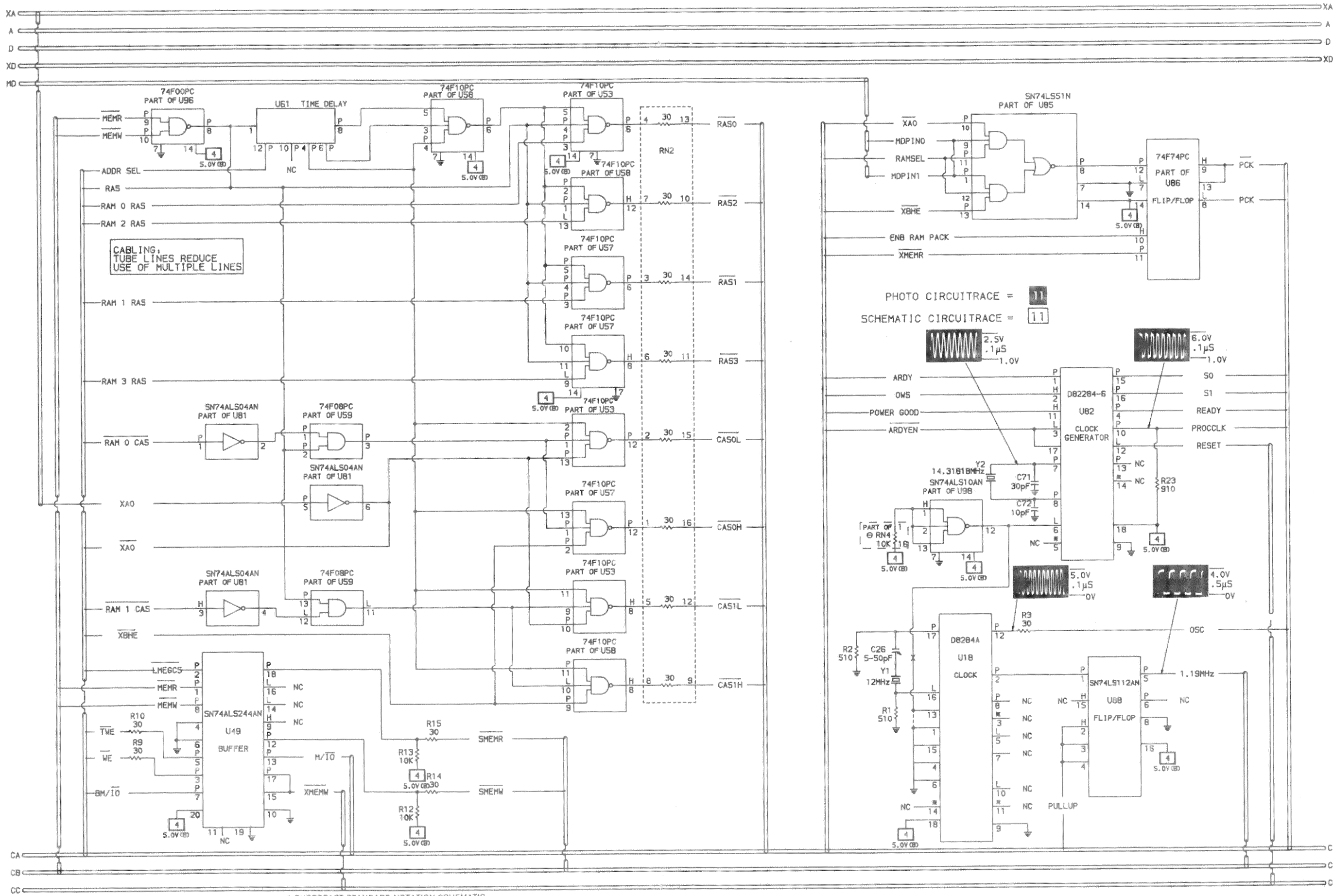
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SYSTEM BOARD

SYSTEM BOARD



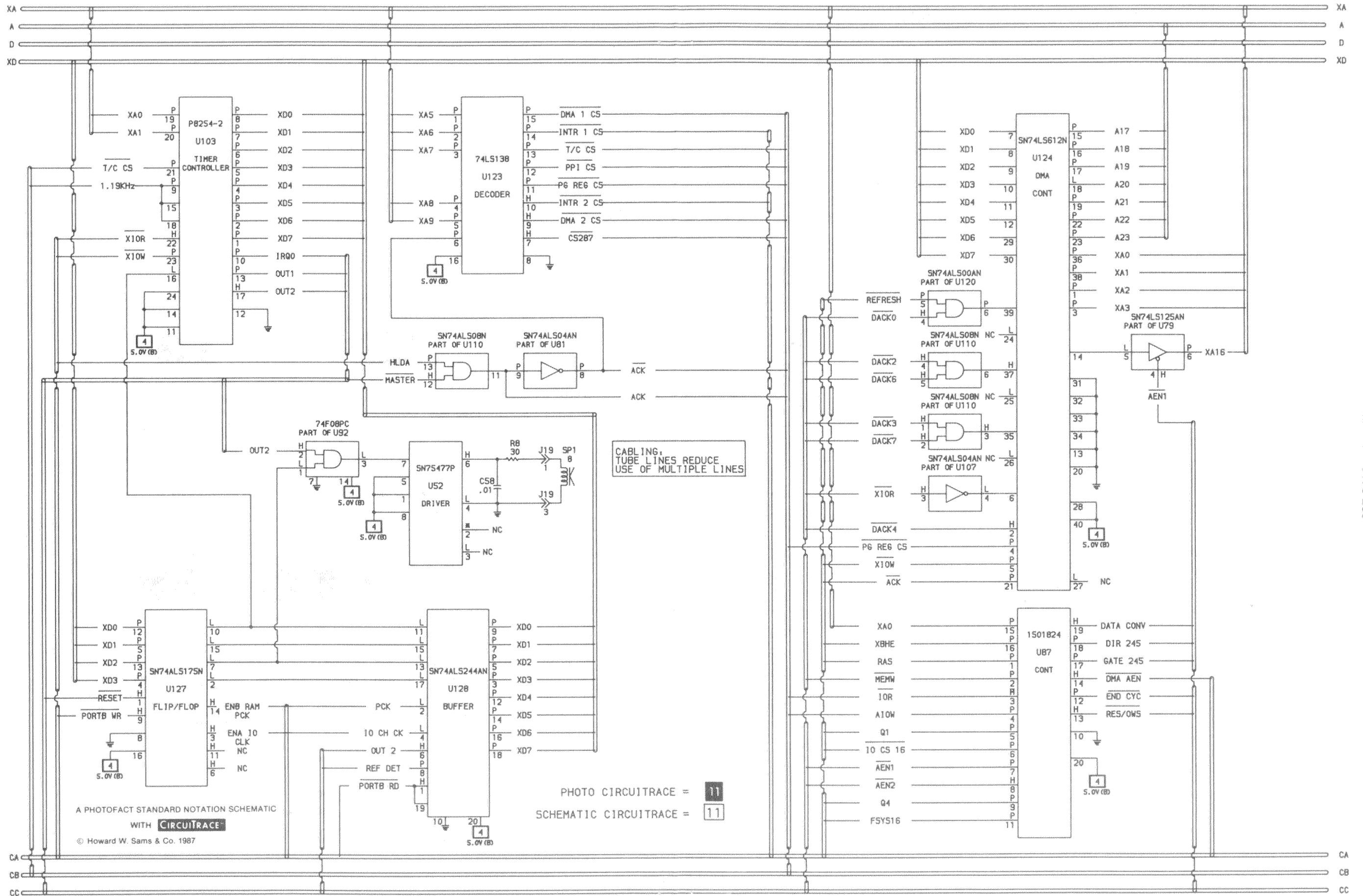
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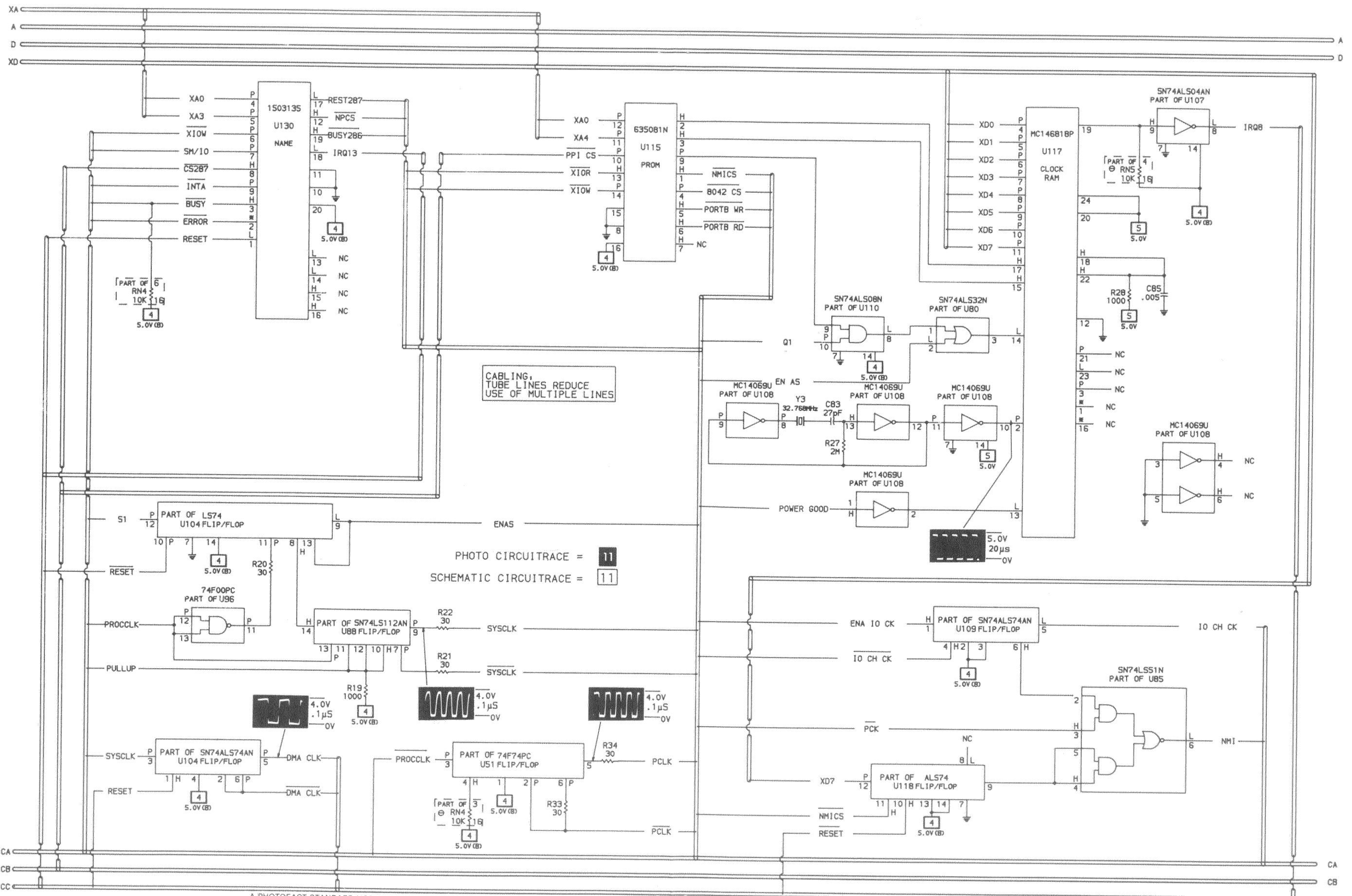
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SYSTEM BOARD

SYSTEM BOARD



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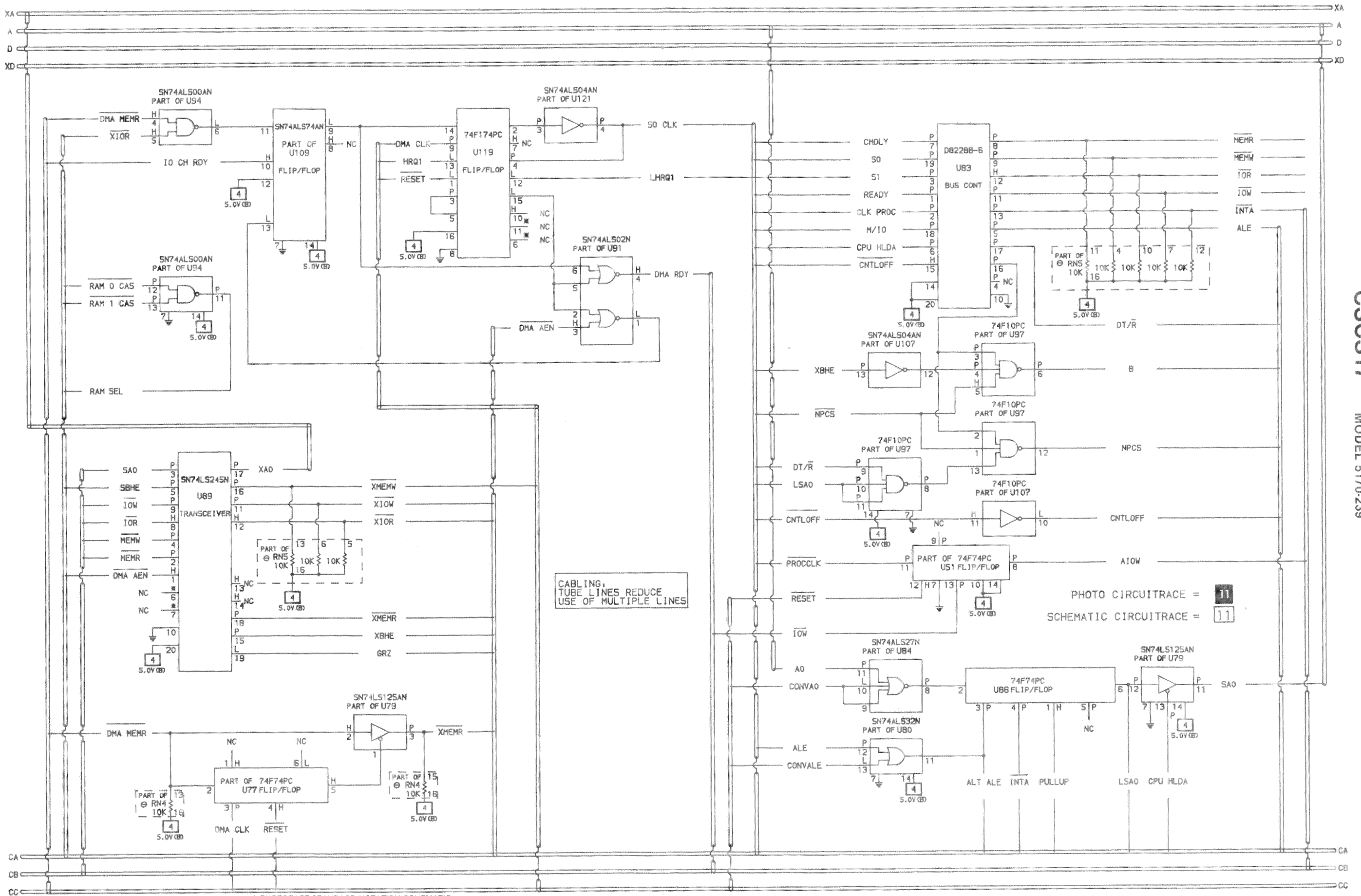


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SYSTEM BOARD

A PHOTOFACT STANDARD NOTATION SCHEMATIC
WITH CIRCUITRACE

SYSTEM BOARD



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SYSTEM BOARD

SYSTEM BOARD

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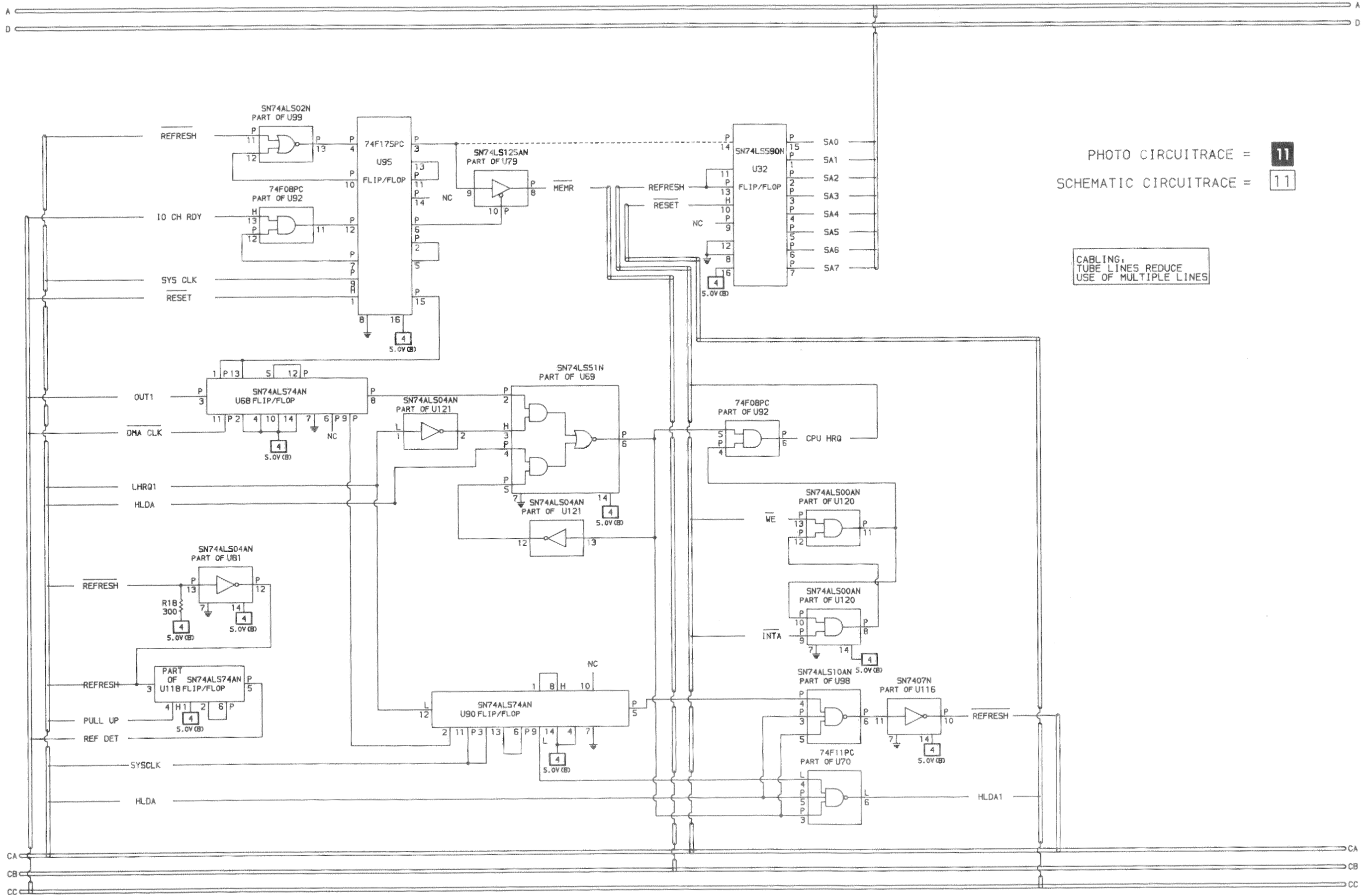


PHOTO CIRCUITRACE = **11**
 SCHEMATIC CIRCUITRACE = **11**

CABLING:
 TUBE LINES REDUCE
 USE OF MULTIPLE LINES

CSCS17
 IBM PC/AT
 MODEL 5170-239

A PHOTOFACIT STANDARD NOTATION SCHEMATIC

WITH **CIRCUITRACE**

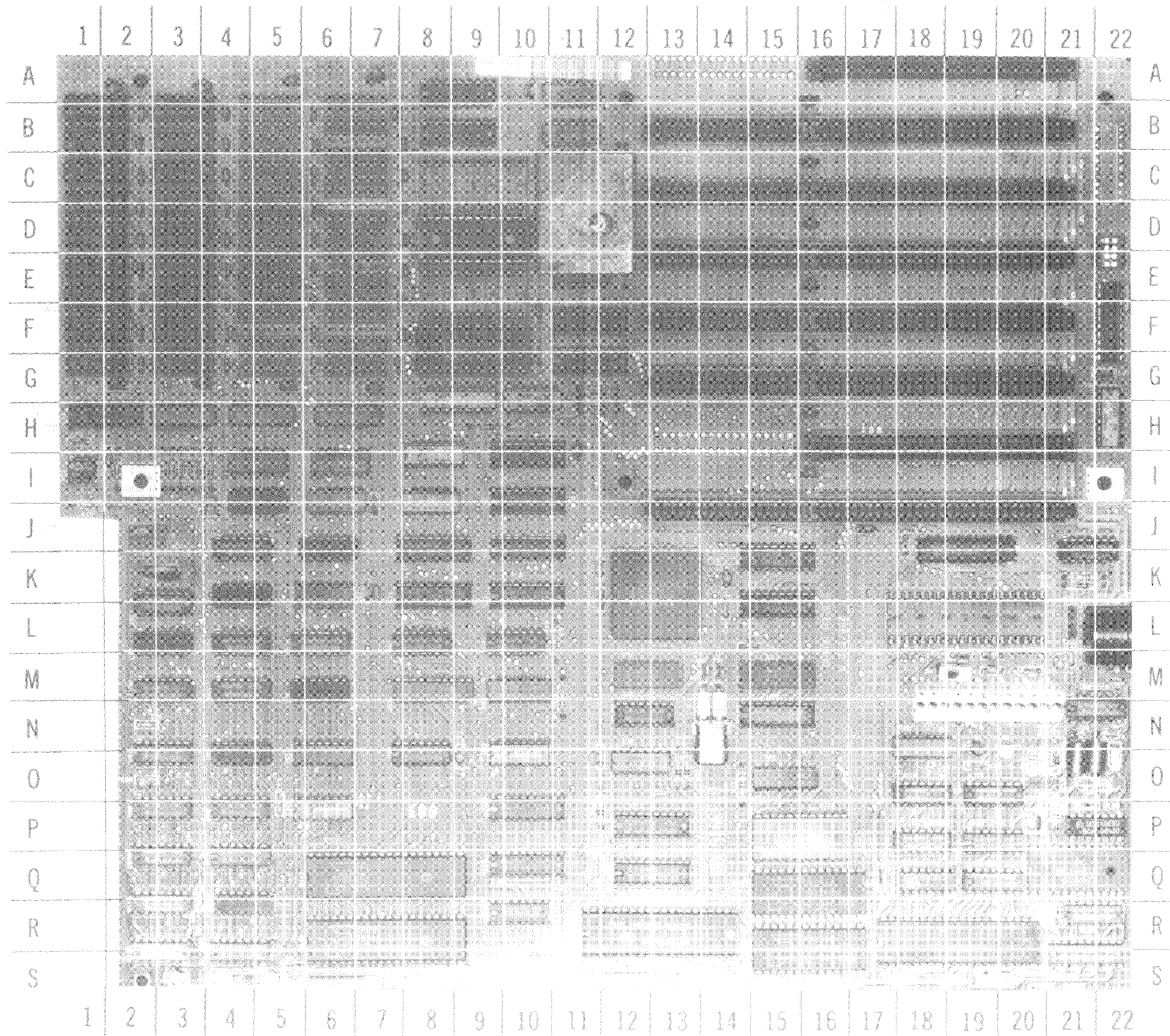
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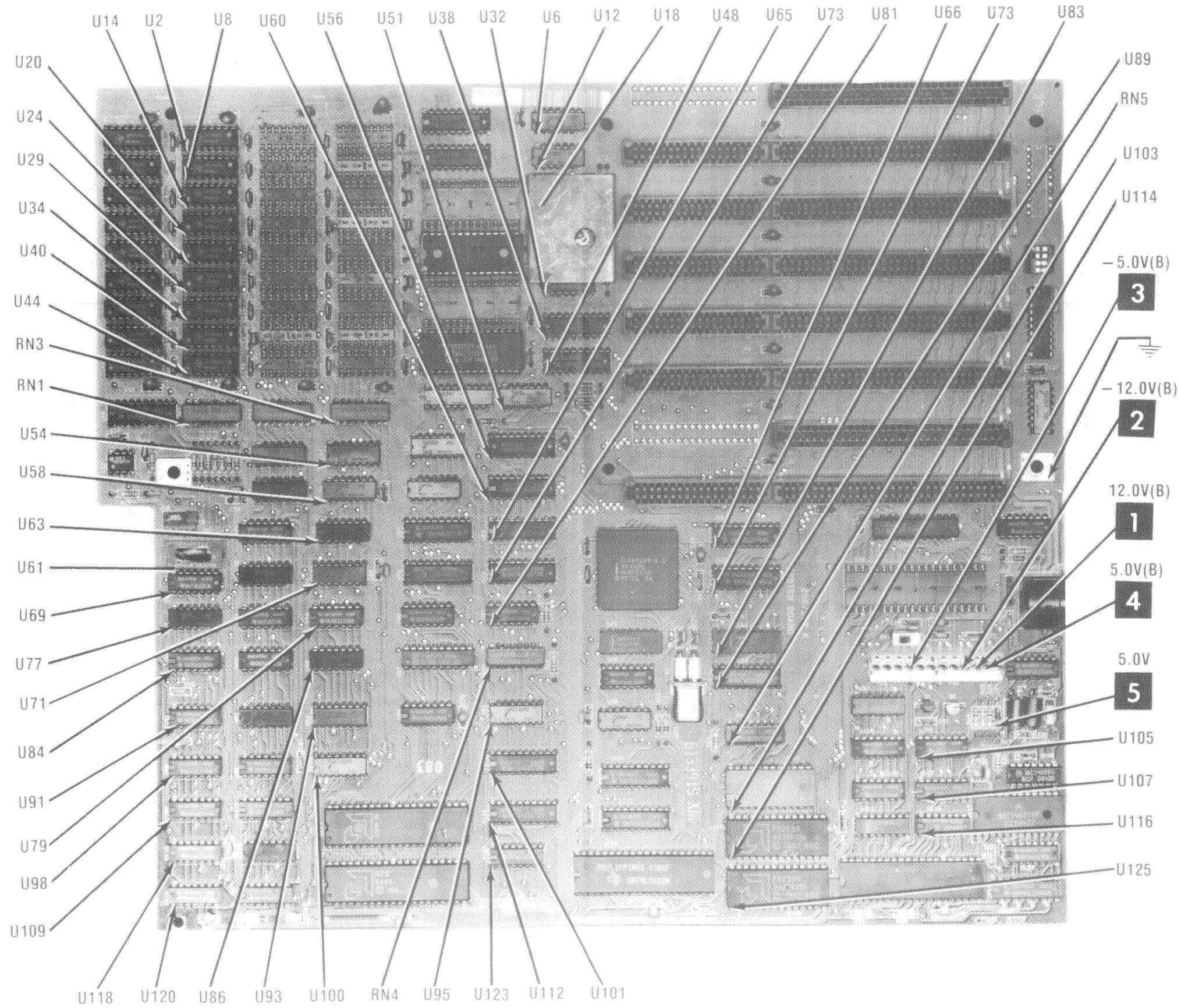
SYSTEM BOARD

SYSTEM BOARD GridTrace LOCATION GUIDE

C1	A-2	C77	M-20	R27	O-22	U82	M-2
C2	A-4	C78	M-21	R28	P-21	U83	M-14
C3	A-5	C79	O-9	R29	S-4	U84	N-2
C4	A-7	C80	O-11	R30	S-5	U85	N-4
C5	A-10	C81	O-19	R31	S-18	U86	N-5
C6	A-16	C83	P-21	R32	S-18	U87	N-7
C7	B-2	C84	P-20	R33	H-12	U88	N-12
C8	B-4	C85	P-20	R34	H-9	U89	N-14
C9	B-6	C86	O-2	RN1	H-3	U90	N-21
C10	B-7	C87	P-5	RN2	H-4	U91	O-2
C11	B-2	C88	R-3	RN3	H-6	U92	O-4
C12	B-4	C89	S-3	RN4	N-9	U93	O-5
C13	B-6	C90	S-7	RN5	O-15	U94	O-7
C14	B-8	C91	Q-12	SW1	M-19	U95	O-9
C15	C-16	C92	S-13	U1	B-1	U96	O-12
C16	C-2	C93	S-14	U2	B-3	U97	O-18
C17	C-4	C94	Q-17	U5	B-8	U98	P-2
C18	C-6	C95	S-19	U6	B-10	U99	P-4
C19	C-8	C96	R-2	U7	C-1	U100	P-5
C20	D-2	C97	G-22	U8	C-3	U101	P-9
C21	D-4	C98	C-11	U11	B-8	U102	P-12
C22	D-6	CR1	K-21	U12	B-10	U103	P-15
C23	D-8	CR2	O-21	U13	C-1	U104	P-18
C26	D-12	FB1	O-21	U14	C-3	U105	P-19
C27	D-16	FB2	O-21	U18	C-11	U106	Q-13
C28	D-2	J1	A-21	U19	D-1	U107	Q-19
C29	D-4	J2	B-21	U20	D-3	U108	P-21
C30	D-6	J3	C-21	U23	D-1	U109	Q-2
C31	D-8	J4	E-21	U24	D-3	U110	Q-4
C32	E-2	J5	F-21	U27	E-8	U111	R-6
C33	E-4	J6	G-21	U28	E-1	U112	Q-9
C34	E-6	J7	H-21	U29	E-3	U113	Q-12
C35	E-8	J8	J-21	U32	E-11	U114	R-15
C36	F-10	J10	B-15	U33	F-1	U115	Q-18
C37	E-16	J11	C-15	U34	F-3	U116	Q-19
C38	E-2	J12	E-15	U38	F-11	U117	Q-20
C39	E-4	J13	F-15	U39	F-1	U118	R-2
C40	E-6	J14	G-15	U40	F-3	U119	R-4
C41	E-8	J16	J-15	U43	G-1	U120	S-2
C42	F-2	J18	J-2	U44	G-3	U121	S-4
C43	F-4	J19	J-2	U47	G-8	U122	S-6
C44	F-6	J20	J-2	U48	G-11	U123	R-9
C45	F-8	J21	L-21	U49	H-1	U124	S-11
C46	F-16	J22	L-22	U50	H-8	U125	S-15
C47	G-2	P58	N-21	U51	H-10	U126	S-17
C48	G-4	P59	N-19	U52	I-1	U127	R-21
C49	G-6	Q1	O-19	U53	I-4	U128	S-21
C50	G-7	Q2	O-20	U54	I-6	U129	G-22
C51	G-10	R1	D-12	U55	I-8	U130	E-22
C52	G-2	R2	C-12	U56	I-9	Y1	D-11
C53	G-4	R3	C-12	U57	J-4	Y2	N-14
C54	G-5	R4	E-12	U58	J-6	Y3	O-22
C55	G-7	R5	G-12	U59	J-8		
C56	H-16	R6	G-12	U60	J-9		
C57	H-1	R7	H-12	U61	K-2		
C58	I-2	R8	I-2	U62	K-4		
C59	J-4	R9	I-3	U63	K-6		
C60	H-11	R10	I-3	U64	K-7		
C61	J-7	R11	I-3	U65	K-9		
C62	I-16	R12	I-3	U66	K-14		
C63	J-17	R13	I-3	U67	K-18		
C64	J-18	R14	I-4	U68	K-21		
C65	K-7	R15	I-4	U69	L-2		
C66	K-12	R16	J-1	U70	L-4		
C67	K-12	R17	K-21	U71	L-5		
C68	K-14	R18	L-11	U72	L-7		
C69	L-14	R19	M-11	U73	L-9		
C70	N-2	R20	P-12	U74	L-13		
C71	M-14	R21	O-13	U75	L-14		
C72	M-14	R22	O-13	U77	M-2		
C73	L-15	R23	O-14	U78	M-4		
C74	M-19	R24	O-20	U79	M-5		
C75	M-19	R25	O-20	U80	M-7		
C76	M-19	R26	O-21	U81	M-9		

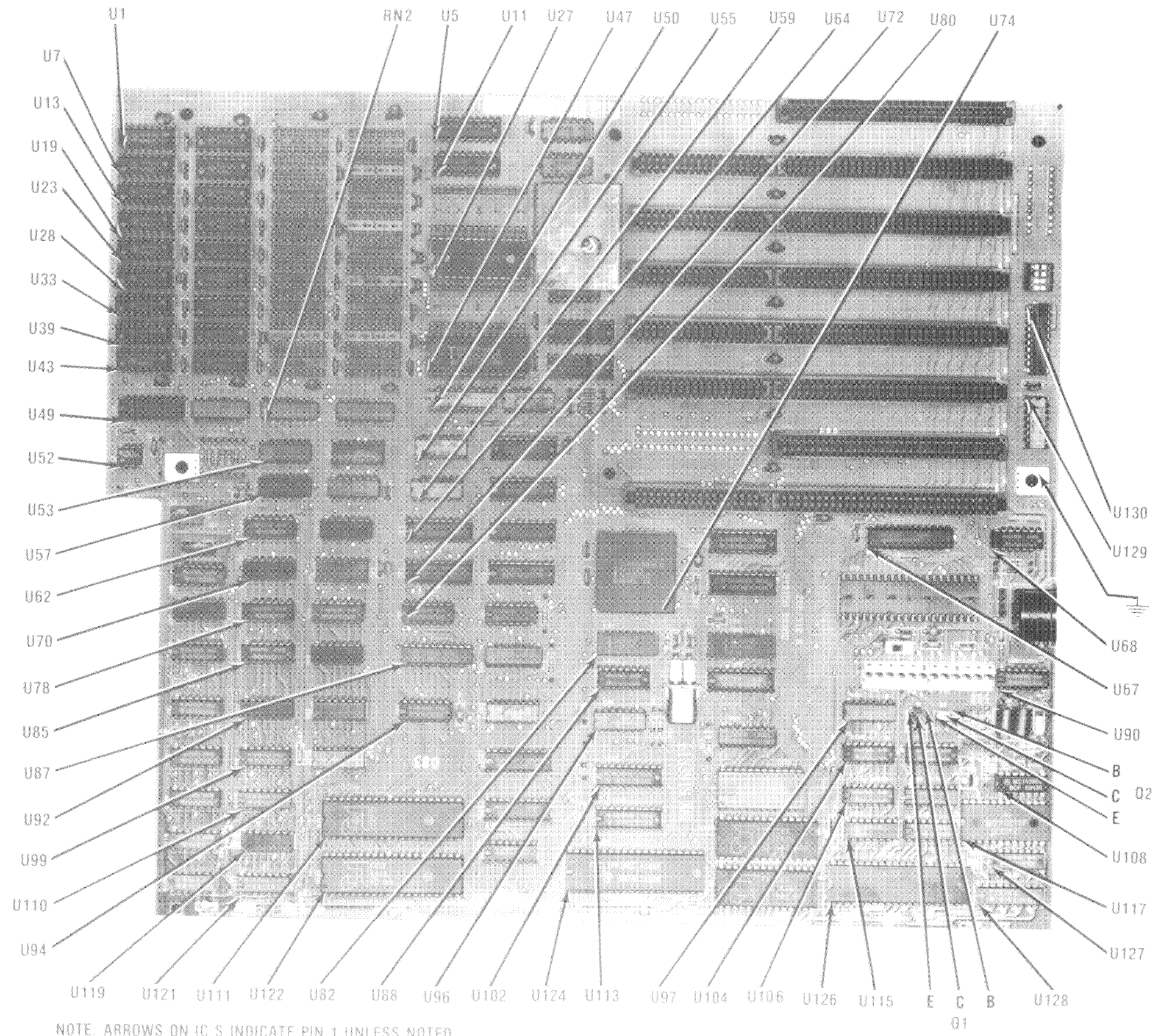


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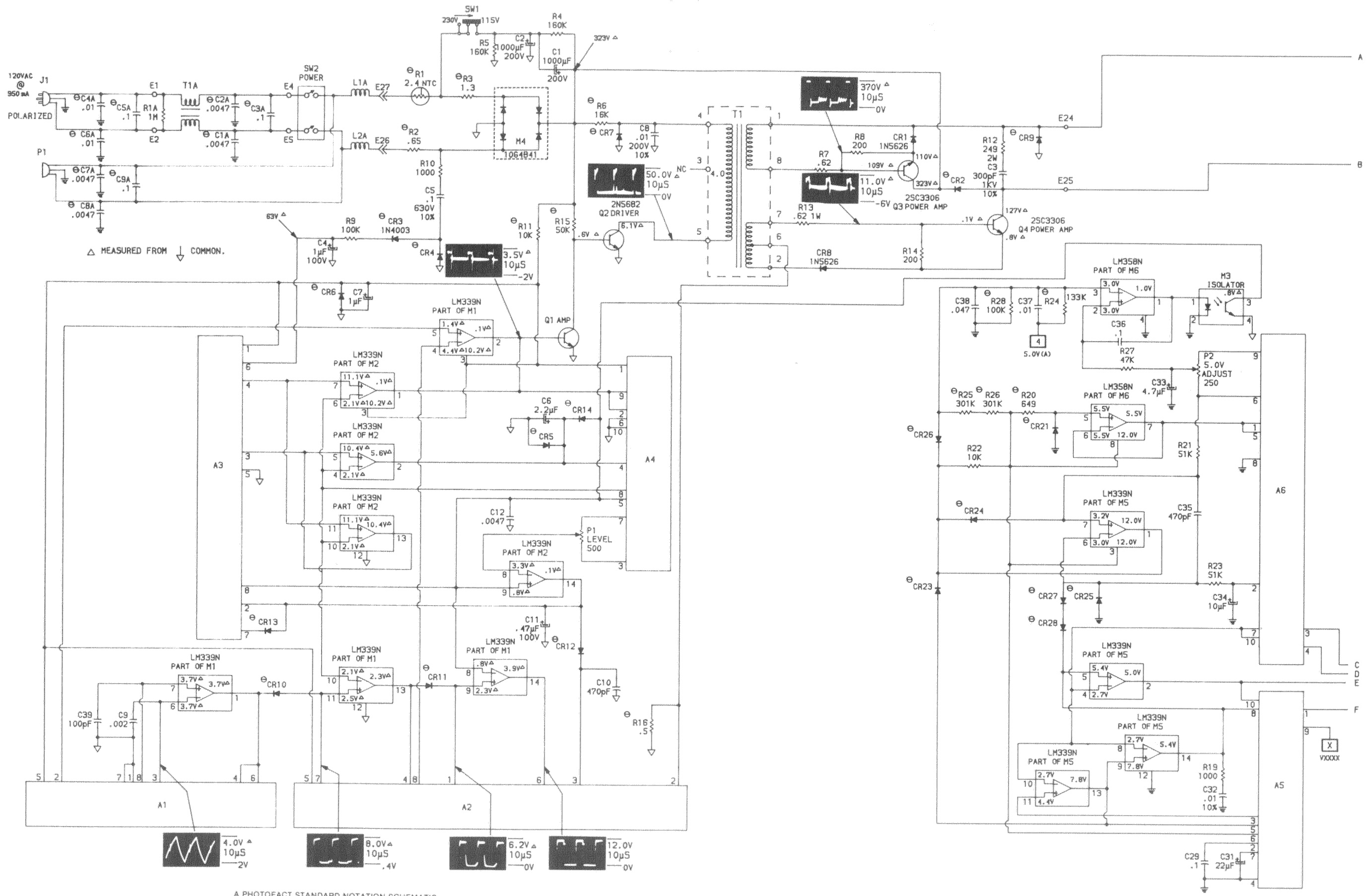


NOTE: ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED

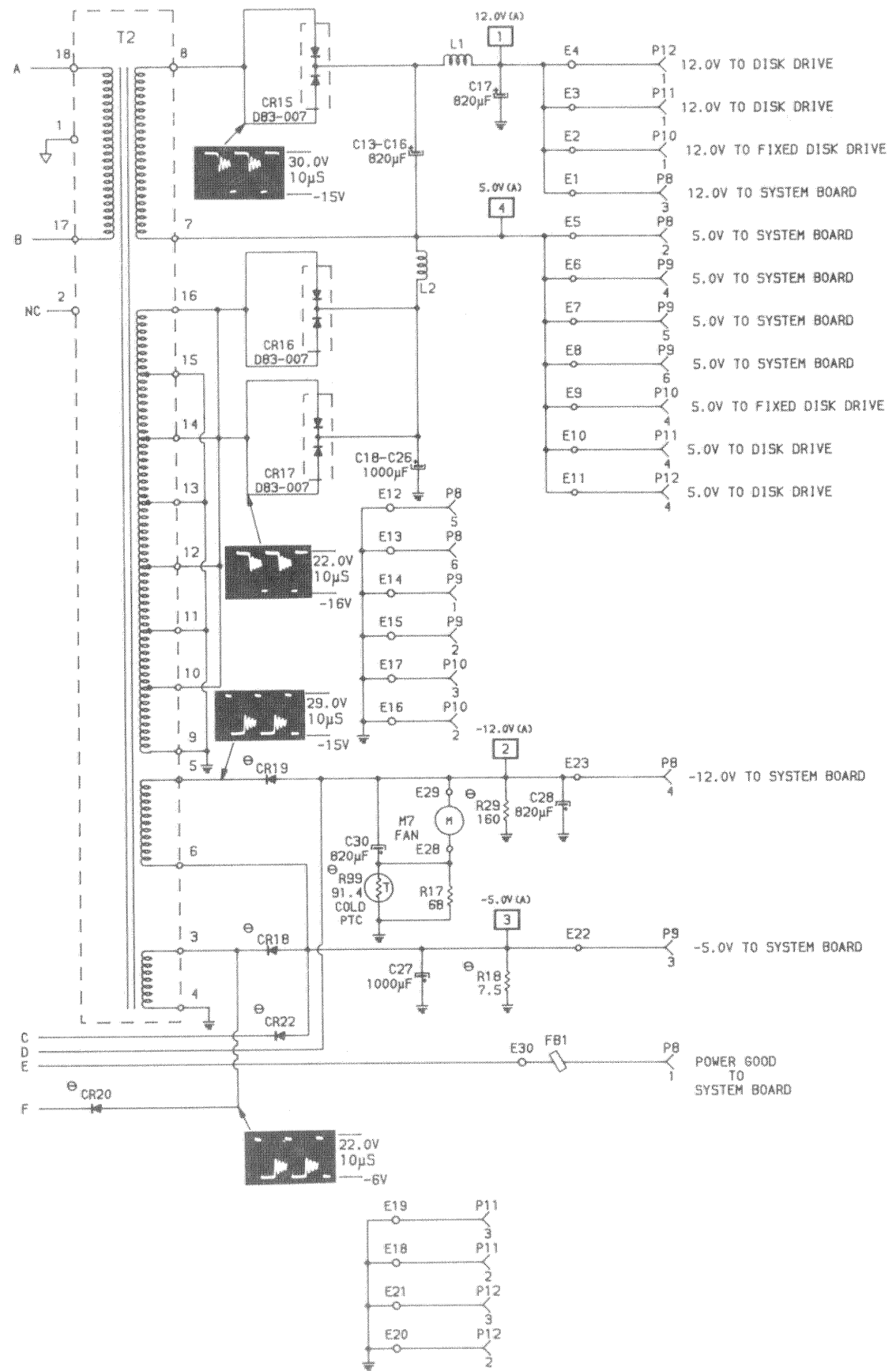
CSCS17
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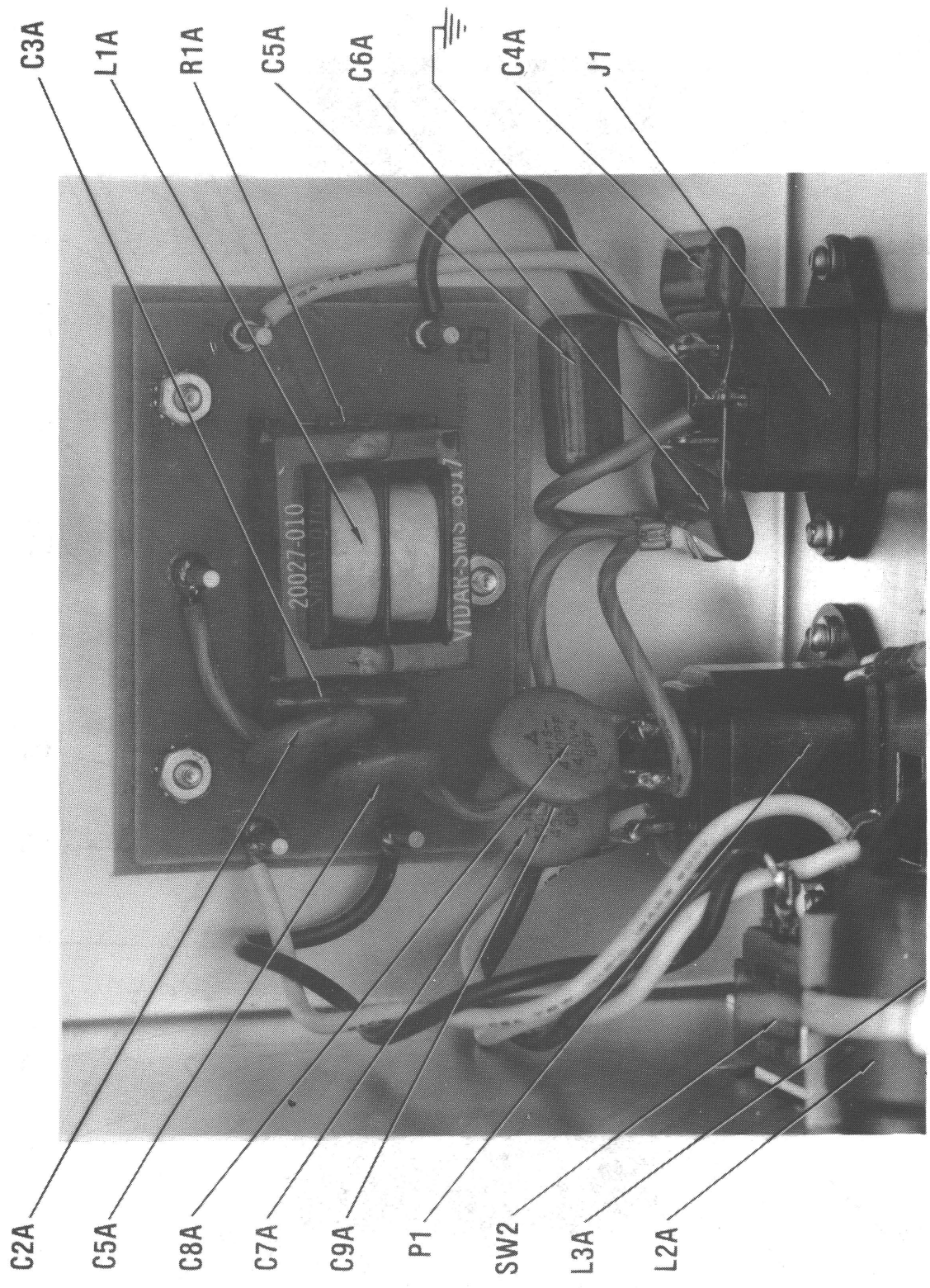


A PHOTOFAC STANDARD NOTATION SCHEMATIC

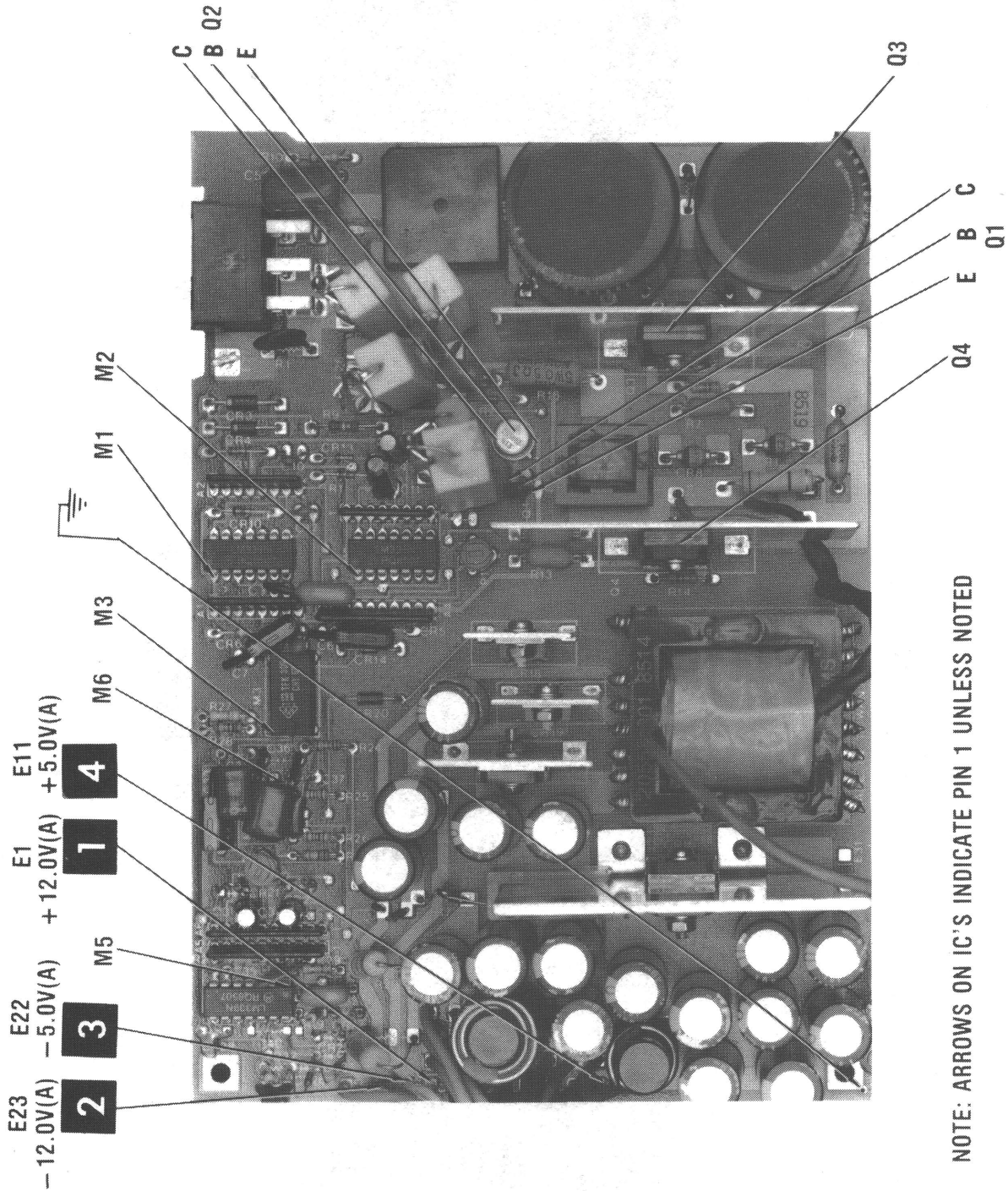
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POWER SUPPLY



AC INPUT BOARD



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

CSCS17

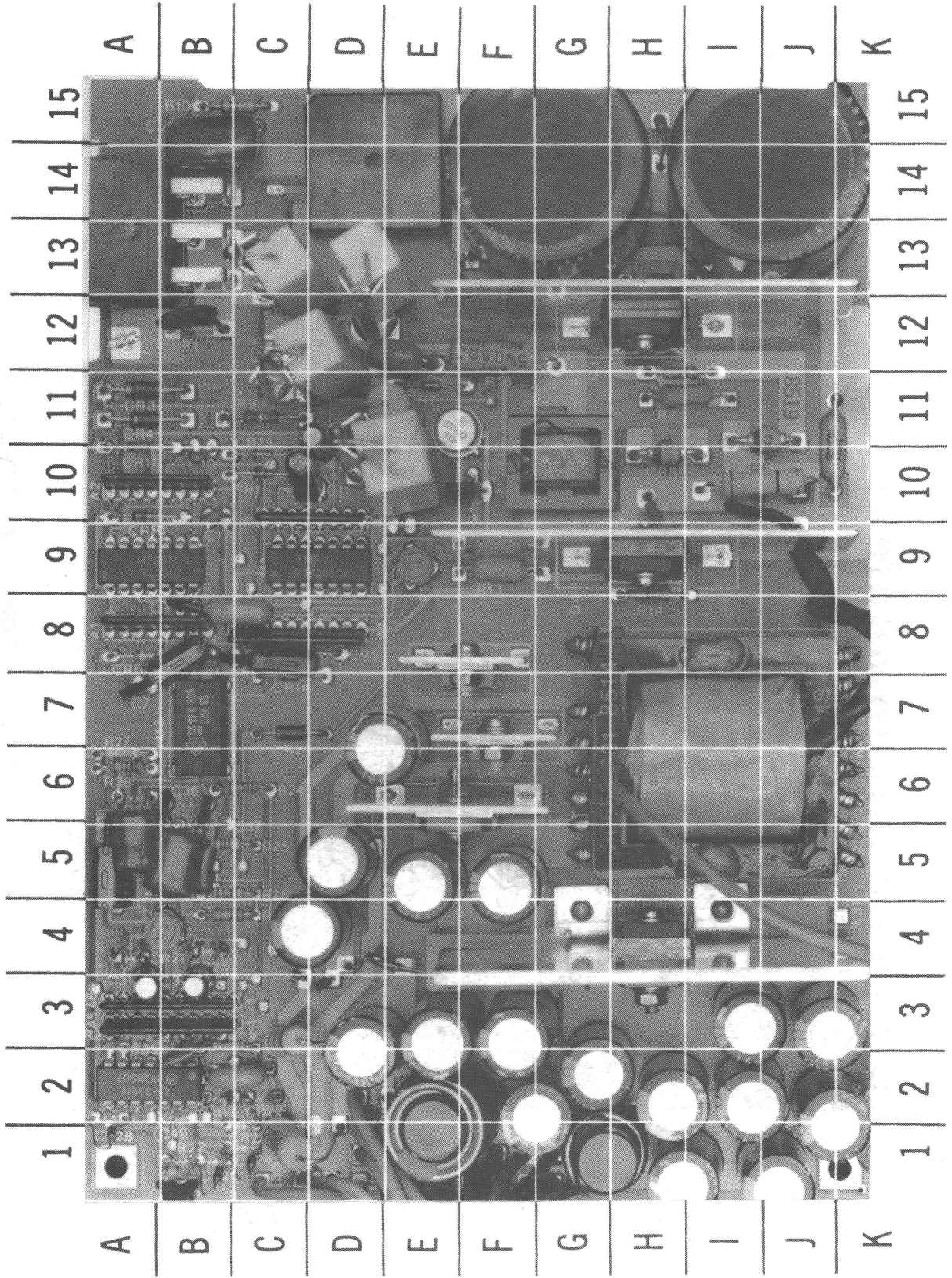
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POWER SUPPLY GridTrace LOCATION GUIDE

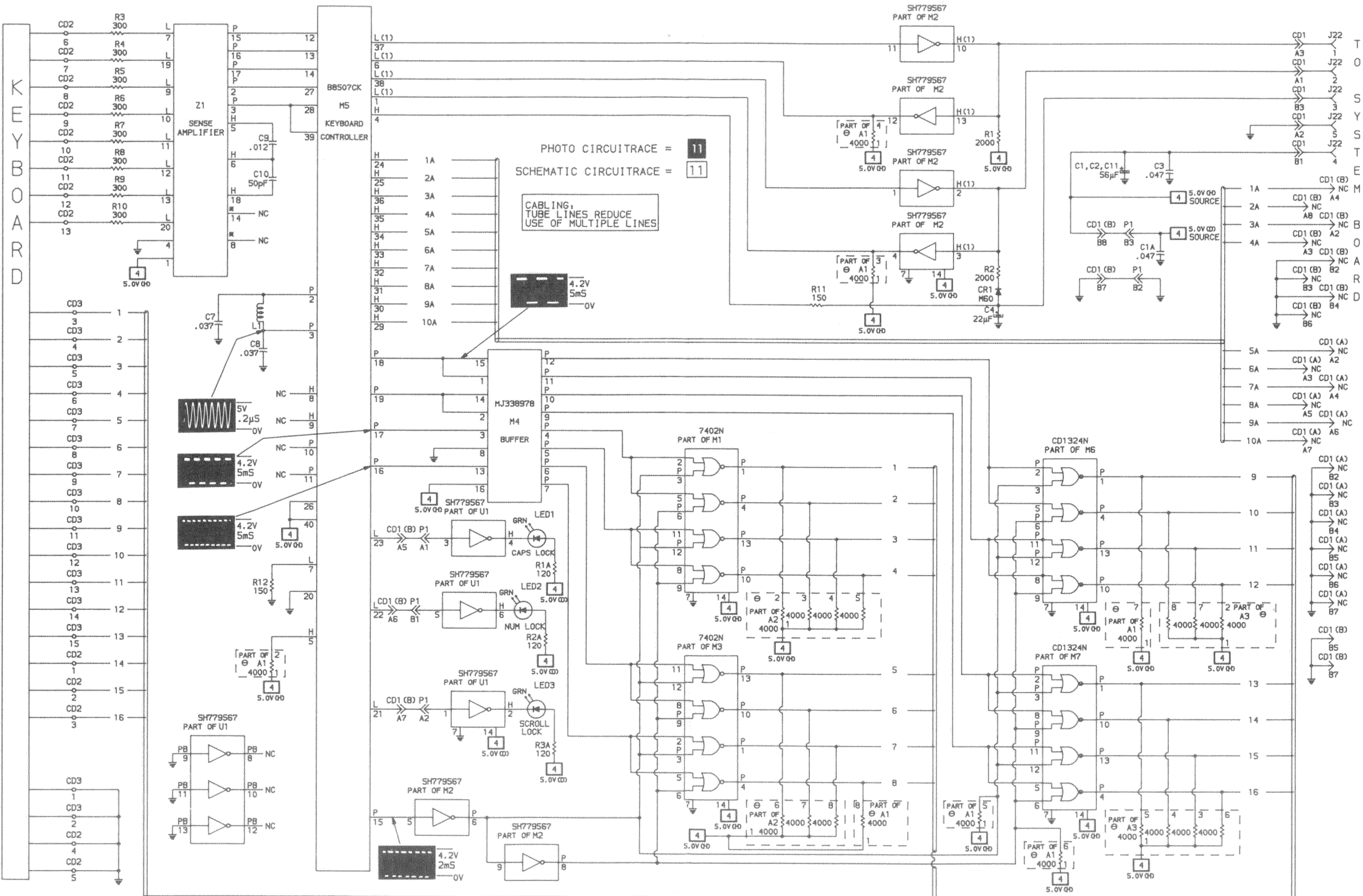
A1	A-8	E27	A-12
A2	A-10	L1	E-1
A3	D-10	L2	G-1
A4	C-8	M1	A-9
A5	B-3	M2	D-9
A6	B-3	M3	B-7
C1	J-14	M4	D-14
C2	G-14	M5	A-2
C3	J-11	M6	B-5
C4	D-11	P1	E-9
C5	B-15	P2	B-4
C6	C-8	Q1	F-10
C7	A-7	Q2	F-11
C8	E-12	Q3	H-12
C9	B-8	Q4	H-9
C10	B-10	R1	B-12
C11	C-10	R2	D-13
C12	B-10	R3	C-13
C13	F-5	R4	H-15
C14	E-5	R5	F-13
C15	F-3	R6	C-12
C16	E-3	R7	I-11
C17	D-2	R8	H-11
C18	J-1	R9	C-11
C19	J-3	R10	C-15
C20	J-1	R11	E-10
C21	I-2	R12	J-10
C22	I-3	R13	F-9
C23	H-1	R14	H-9
C24	H-2	R15	E-11
C25	G-2	R16	F-12
C26	F-2	R17	D-4
C27	D-2	R18	C-1
C28	D-5	R19	B-2
C29	B-2	R20	B-4
C30	C-4	R21	A-3
C31	A-3	R22	B-1
C32	C-2	R23	B-3
C33	A-5	R24	C-6
C34	B-3	R25	B-5
C35	A-3	R26	B-5
C36	B-5	R27	A-6
C37	B-5	R28	A-6
C38	A-5	R29	C-3
C39	B-8	R99	F-4
CR1	J-11	SW1	A-13
CR2	J-13	T1	G-10
CR3	A-11	T2	I-6
CR4	A-11		
CR5	D-8		
CR6	A-8		
CR7	E-11		
CR8	H-10		
CR9	H-13		
CR10	A-10		
CR11	A-11		
CR12	C-10		
CR13	C-10		
CR14	C-7		
CR15	E-6		
CR16	H-4		
CR17	H-3		
CR18	F-8		
CR19	F-7		
CR20	C-7		
CR21	A-4		
CR22	C-2		
CR23	C-2		
CR24	C-1		
CR25	B-4		
CR26	B-1		
CR27	B-1		
CR28	A-1		
E26	C-12		

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KEYBOARD



A PHOTOFACIT STANDARD NOTATION SCHEMATIC

WITH CIRCUITRACE

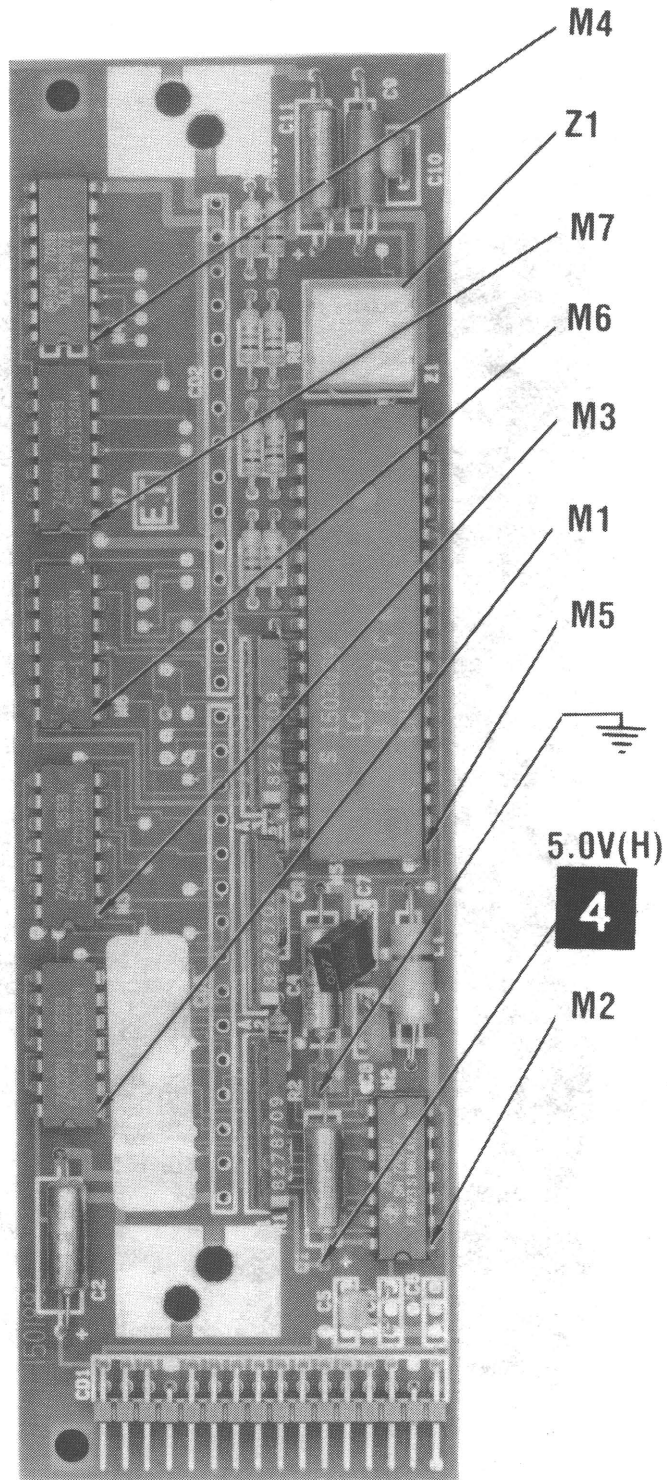
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KEYBOARD

KEYBOARD

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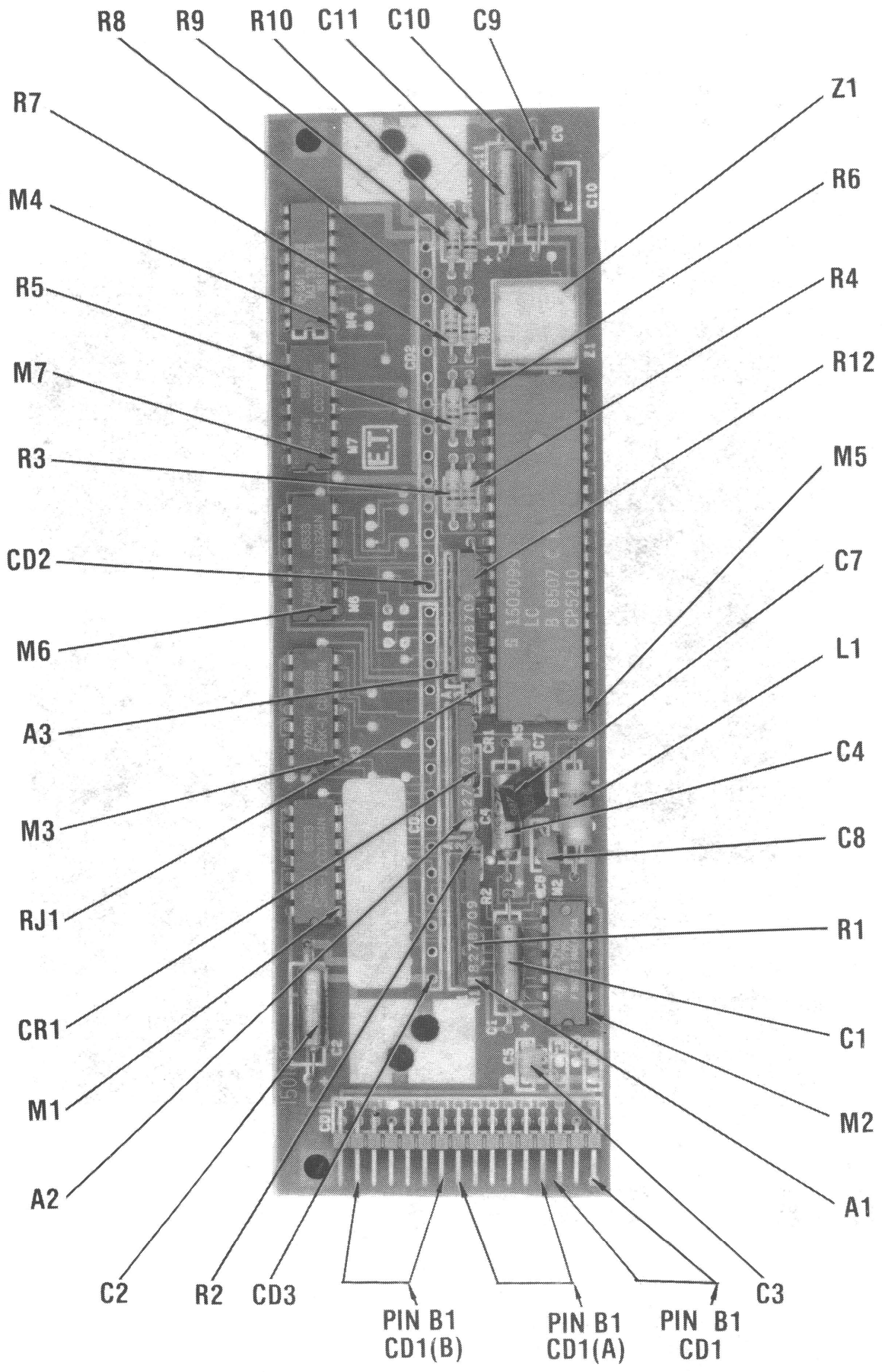
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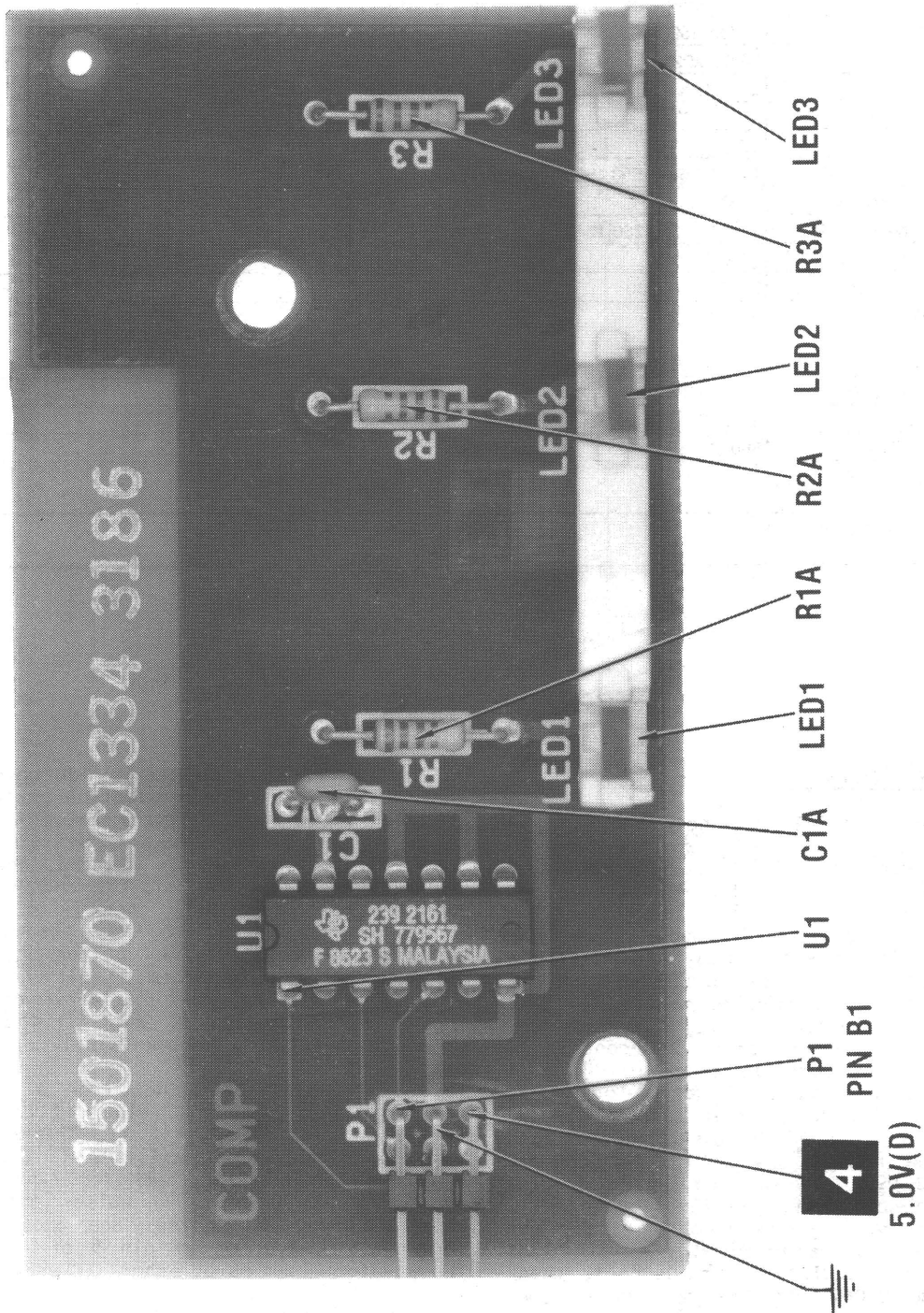


NOTE: ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED

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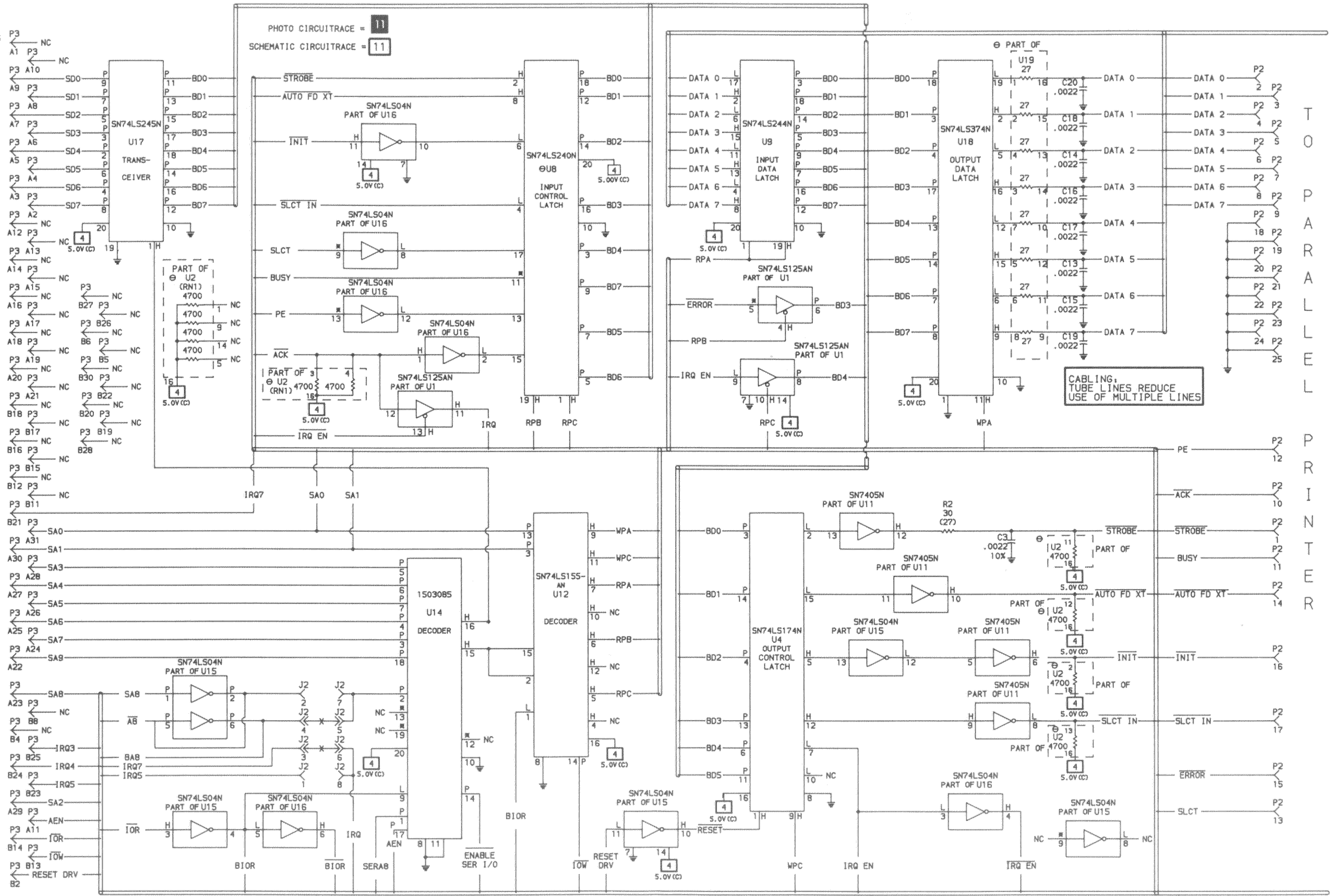
NOTE: ARROWS ON IC'S INDICATE PIN 1 UNLESS NOTED

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SEE J1 ON SYSTEMS BOARD

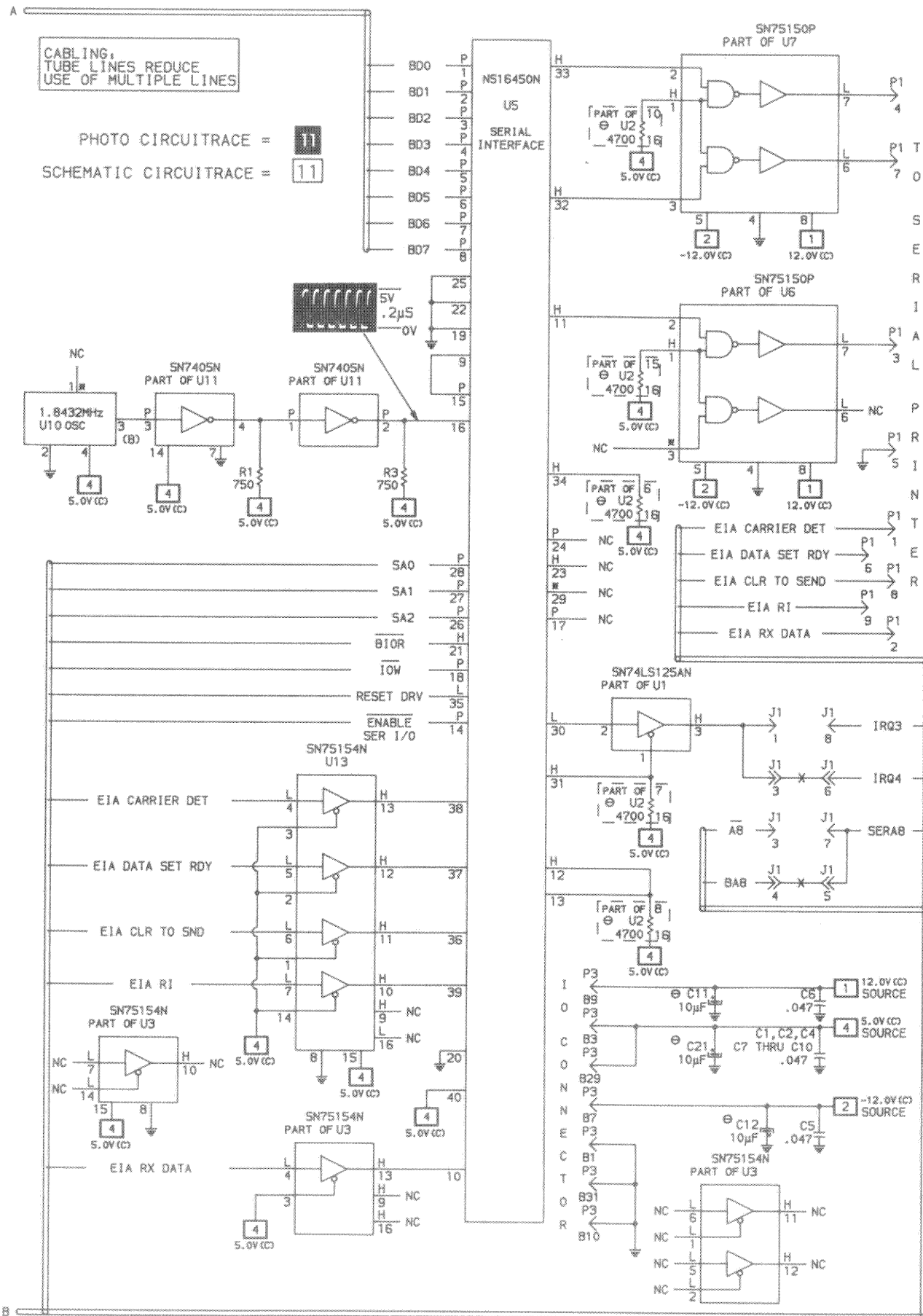
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CABLING, TUBE LINES REDUCE USE OF MULTIPLE LINES

TO PARALLEL PRINTER

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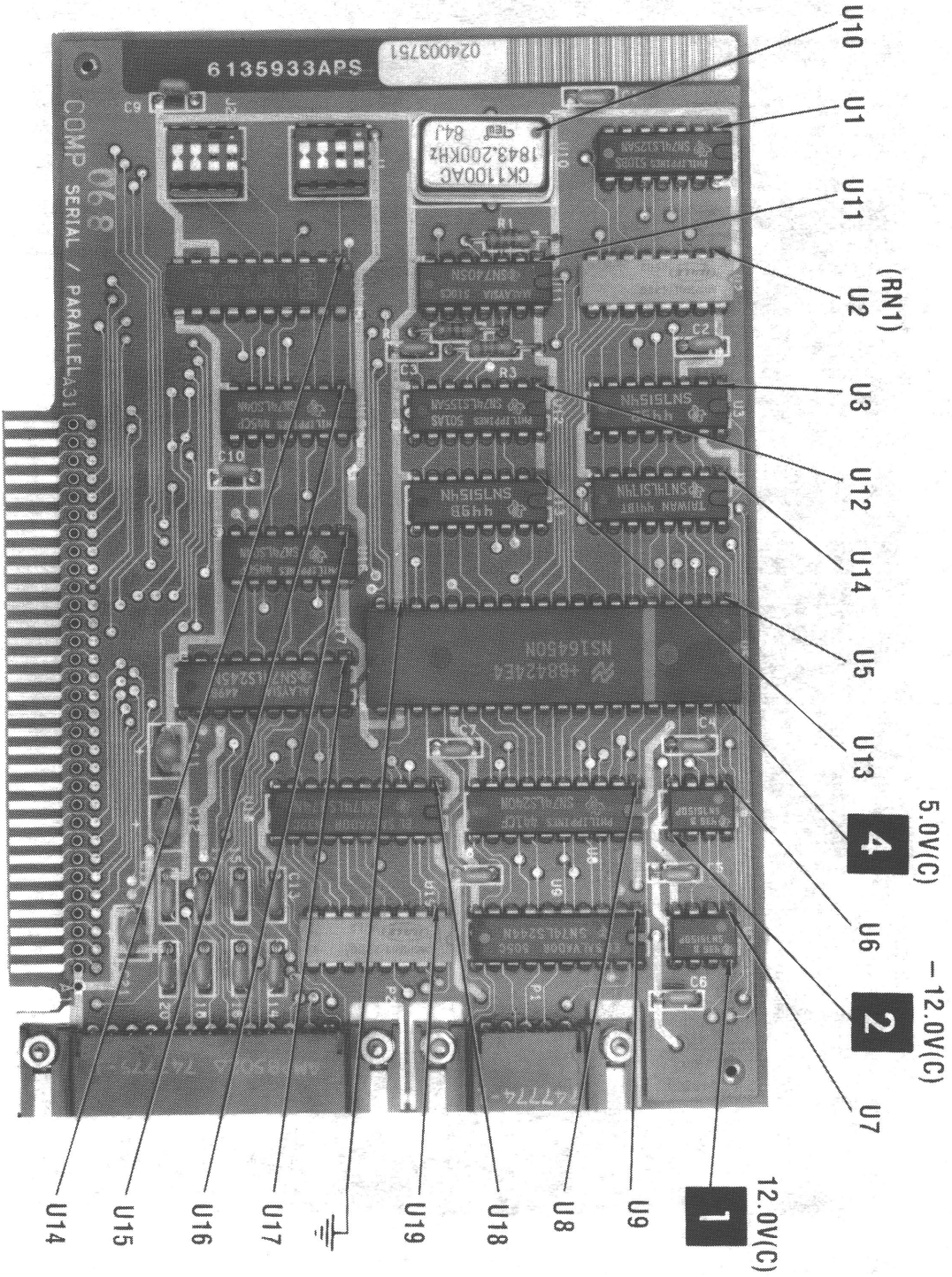
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WITH **CIRCUITRACE**

SERIAL/PARALLEL ADAPTER

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

