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COMPUTERFACTS™

TECHNICAL SERVICE DATA

APPLE® IIe
MODEL A2S2064
COMPUTER



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

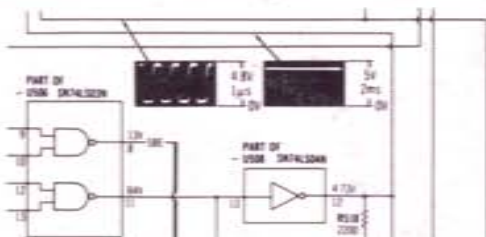
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Remove staples and use cover for file folder.

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

The following information is just a sample of the many valuable time saving features contained in this exclusive Sams COMPUTERFACTS publication:

- Preliminary Service Checks section is an easy to use, step by step guide for the experienced technician or hobbyist, and even beginners.
- SAMS famous industry accepted standardized notation schematics containing CIRCUITRACE®, GRIDTRACE™, waveforms, voltages and stage identification.



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

TROUBLESHOOTING

MICROPROCESSOR CHIP (CPU) OPERATION

Verify the processor is functioning by checking the signals on the address lines (pins 10 thru 24 of IC U800) and the data lines (pins 61 thru 96) using a logic probe or a scope. If a logic probe is used, refer to the "Logic Chart" for the correct readings. If a scope is used, the waveforms on the address lines (except pins 22 and 23 which have no signal in Power Up mode) should be similar to Figure 1. The waveforms on the data lines should be similar to Figure 2.

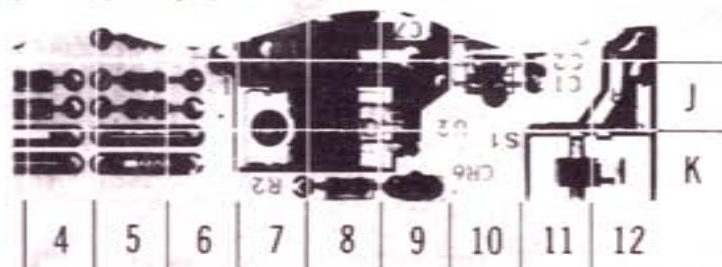


- Logic Chart containing logic probe readings to isolate defective circuitry and components.

LOGIC

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

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



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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFR PART No.	REPLACEMENT DATA						
			ECG PART No.	GENERAL ELECTRIC PART No.	MOTOROLA PART No.	NTE PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
D102	15553	1149-2576	ED0519	GE-514	1N4935	NTE319	SAK9091/177	MEP925/519	105-131
D103	1N607F	1149-2527	ED0109	1N60		NTE109	SAK3088	MEP134/109	105-29001
D201	1N4004GP	1201-4205	ED0116	GE-504A	1N4004	NTE116	SAK3312	MEP157	212-76-02
D501 thru D603	15553	1149-2576	ED0519	GE-514	1N4935	NTE319	SAK9091/177	MEP925/519	105-131

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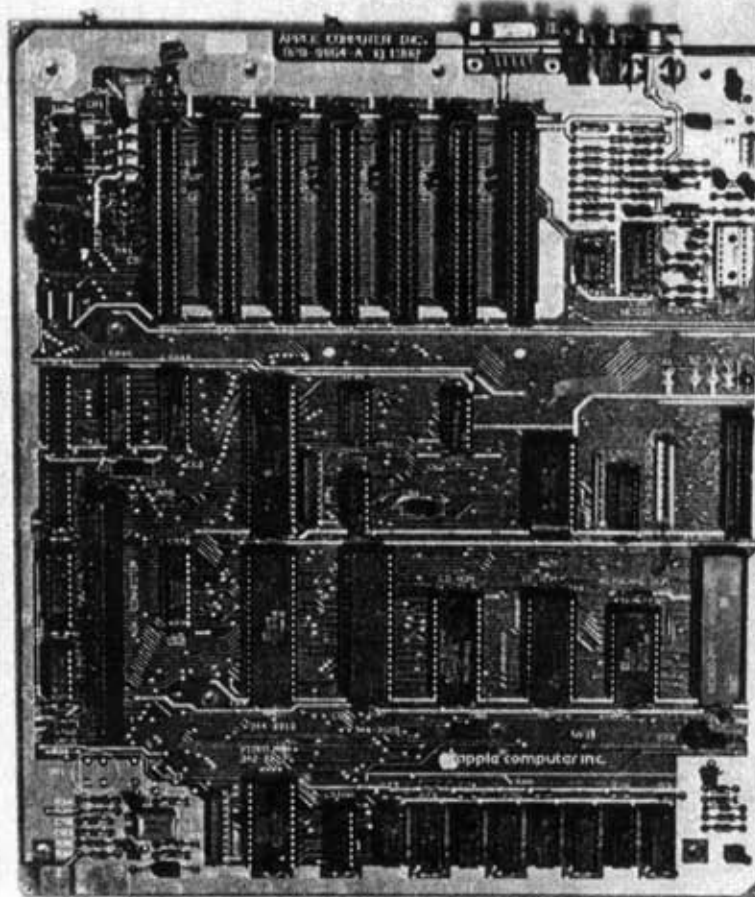
Apple IIe Main Logic Board Rev A

CPU PCB's

Apple P/N 661-94119

(Replaced by 91084)

See
Note

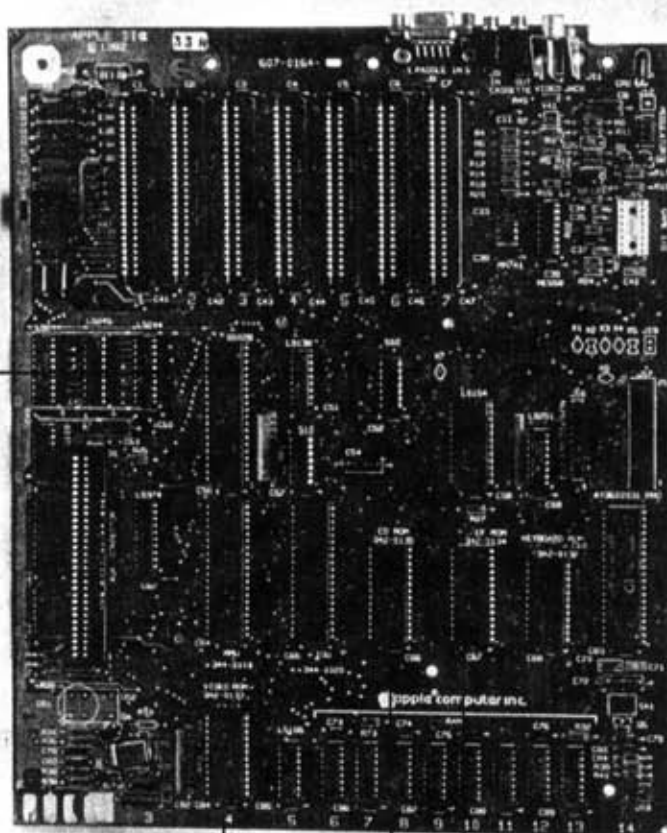


NOTE: 820-0064-A at the top middle of board is the revision number. This is the original Apple IIe board.

Apple IIe Logic Board Unenhanced

Apple P/N 661-91084

6502



VIDEO ROM 342-0133

EF ROM 342-0134

CD ROM 342-0135

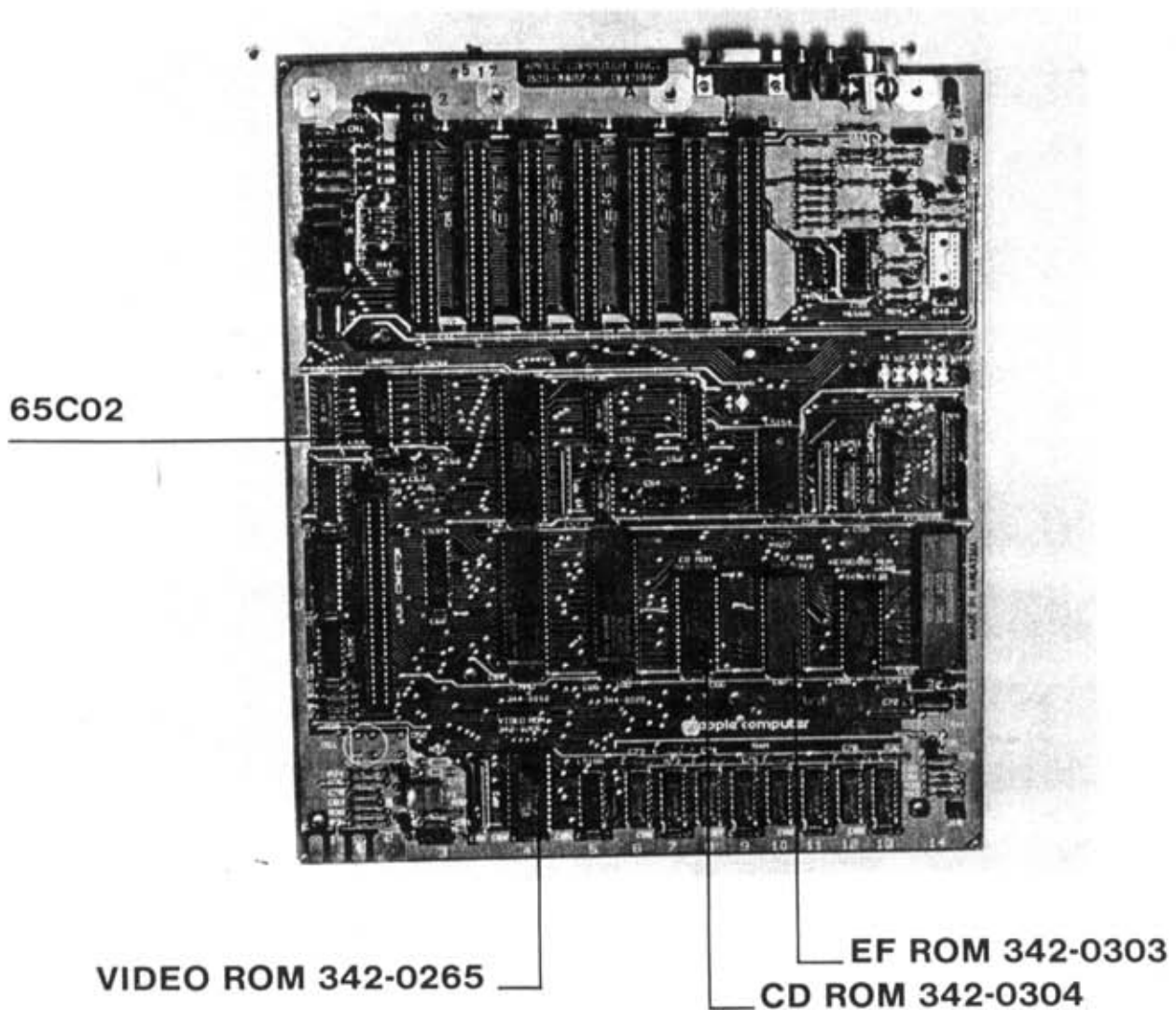
NOTE: If the 6502 has been replaced by a 65C02, the 342-0134 by the 342-0303, the 342-0135 by the 342-0304, and the 342-0133 by the 342-0265, the board has been upgraded to "Enhanced." Any other ROM configuration is NOT acceptable.



Apple IIe Logic Board Enhanced

CPU PCB

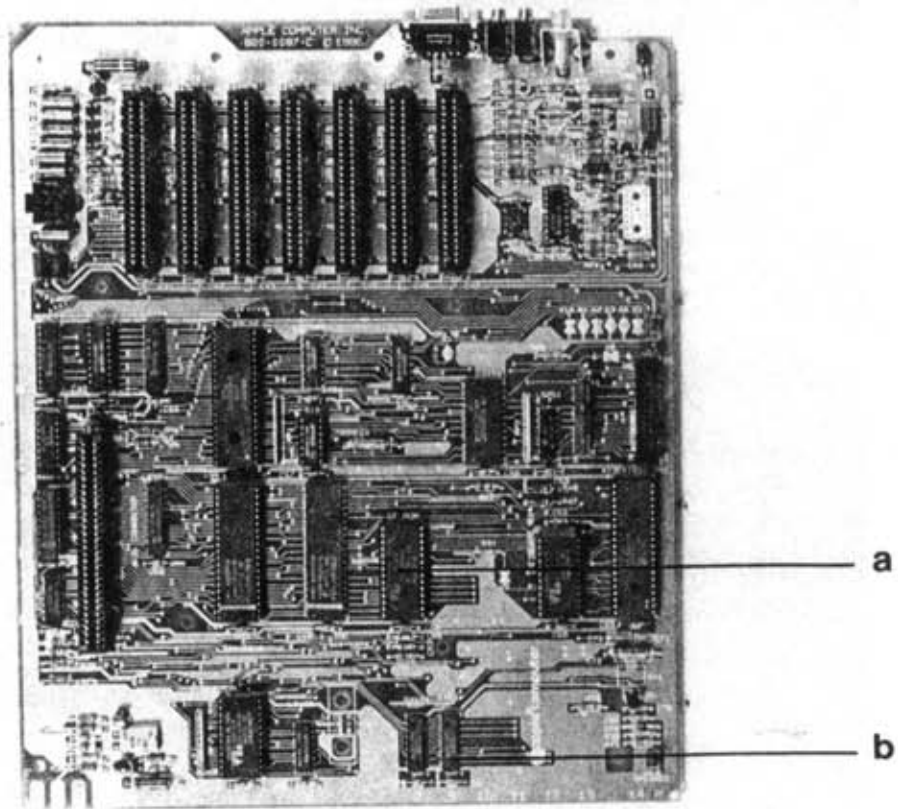
Apple P/N 661-0283



NOTE: If the 65C02 has been replaced by a 6502, the 342-0303 by the 342-0134, the 342-0304 by the 342-0135, and the 342-0265 by the 341-0133, the board has been downgraded to "Unenhanced." Any other ROM configuration is NOT acceptable.

Apple IIe Logic Board Enhanced

Apple P/N 661-0283



NOTE: This board can be identified by a) the CF ROM and
b) the 64 x 4 RAMs.

PRELIMINARY SERVICE CHECKS

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

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

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

Replacement or repair of the power supply board, main board, disk II interface board, keyboard, or connectors may be necessary after the malfunction has been isolated.

TEST EQUIPMENT AND TOOLS

TEST EQUIPMENT	TOOLS
Digital Volt/Ohm Meter	Phillips Screwdriver
Logic Probe	Low Voltage Soldering Iron
Frequency Counter	Desoldering Tool
Monitor	Contact Cleaner

REPLACEMENT PARTS AND DESCRIPTION

IDENT	PART NO.	DESCRIPTION	IDENT	PART NO.	DESCRIPTION
DISK II INTERFACE BOARD					
UA2		IC, SN74LS132N	UB5		IC, Decoder/Mux, 74LS138PC
UA3		IC, Flip/Flop, 74LS174PC	UB8		IC, SN74S02N
UB2		IC, 74LS05PC	UC1		IC, Flip/Flop, 74F109DC
UC2		IC, Latch, N9334N	UC4		IC, Microprocessor, R6502-40
UC3		IC, Shift Register, SN74LS323N	UC5		IC, HD74LS10P
UD2		IC, Timer, MC3456P	UC10		IC, Decoder/Demux, DM74LS154N
UD3		IC, PROM, 31-0127-A	UC12		IC, Mux, SN74LS251NDS
MAIN BOARD					
CR1		LED, Power	UD1		IC, Program Logic Array, HAL16R8CN
F1		Fuse, AC, 2.75A	UE1		IC, DM74LS125AN
S1		Switch, Power	UE4		IC, Memory Management Unit, 344-0010-B
SP1		Speaker	UE5		IC, Input/Output Unit, 344-0020-A
UA11		IC, RC741N	UE8		IC, CD-ROM, 342-0135-B
UA12		IC, Timer, NE558N	UE10		IC, EF-ROM, C19659
UB1		IC, Tri-State Buffer, SN74LS244N	UE12		IC, Keyboard ROM, 342-0132-B
UB2		IC, Transceiver, 74LS245N	UE14		IC, Decoder, AY-5-3600-PRO
			UF4		IC, Video ROM 342-0133-A
			UF5		IC, Shift Register, 74166N
			UF6 Thru		
			UF13		IC, RAM, TMS4164-15NLJ
			Y1		Crystal, 14.31818MHz

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The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., 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., Inc., by the manufacturers of the particular type of replacement part listed.

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PRELIMINARY SERVICE CHECKS (Continued)

SERVICE CHECKS

SEE INTERCONNECTING DIAGRAM AND PHOTOS TO MATCH THE NUMBER IN THE CIRCLES WITH THOSE IN THE FOLLOWING DATA FOR SERVICE CHECKS TO BE PERFORMED.

1 COMPUTER DEAD

- (A) If the Power LED (CR1) is not lit, disconnect the Power Supply from Connector J14 and check for 5.3V at pin 3, 12.5V at pin 4, -11.9V at pin 5 and -5.0V at pin 6 of Connector P14. If all the voltages are missing, check AC Fuse (F1), Power Switch (S1) and the AC Line Cord (P20).
- (B) If the Power Supply operates normally, turn Off the Computer and remove any boards plugged into the seven Peripheral Slots (J1 thru J7) or the Auxiliary Connector (J0). Turn the Computer On and check its operation. If the Computer starts functioning, turn the Computer Off and plug each board back into its respective peripheral slot, one board at a time. After each board is reinstalled, turn On the Computer and check its operation. Continue this process until the defective board is found.
- (C) If the Computer does not function with the peripheral boards removed, listen for a beep when turning On the Computer or while pressing the CONTROL and G keys at the same time. A beep indicates the Microprocessor IC (UC4) is working and the problem may be in the video circuits. If a beep is heard, refer to the "Video" section of this Service Checks guide. If there is no beep, check for a momentary Low logic reading, then a High logic reading at pin 40 of IC UC4 while turning On the Computer. If the logic reading is incorrect, check Input/Output Unit IC (UE5) by substitution.
- (D) If pin 40 of Microprocessor IC (UC4) is normal, check for clock pulses at pin 37 of IC UC4 and pin 12 of IC UE1. If pulses are present at IC UE1 and missing at IC UC4, check Flip/Flop IC (UC1), Program Logic Array (UD1), and ICs UE1 and UB8 by substitution.
- (E) If the clock pulses are normal, check the Microprocessor IC (UC4), CD-ROM IC (UE8), EF-ROM IC (UE10) and RAM ICs (UF6 thru UF13) by substitution.
- (F) If the Computer is still inoperative, check Tri-State Buffer IC (UB1), Transceiver IC (UB2), Memory Management Unit IC (UE4) and Input/Output Unit IC (UE5) by substitution.

2 VIDEO

- (A) No video display and no beep is heard when the Computer is turned On. Refer to the "Computer Dead" section of this Service Checks guide. If a beep is heard, check the video cable going to the Monitor for good connections and possible open circuits. Also, check the Monitor by substitution.
- (B) Check IC UC5, Input/Output Unit IC (UE5), Video ROM IC (UF4) and Shift Register IC (UF5).

3 NO VIDEO SYNC

- (A) Monitor display rolls vertically and tears horizontally. Check the Input/Output Unit IC (UE5) by substitution.

4 GRAPHICS MODE DOES NOT WORK

- (A) Check Input/Output Unit IC (UE5) and Video ROM IC (UF4) by substitution.

5 NO COLOR

- (A) Check the frequency of the 14.31818MHz Oscillator at pin 12 of IC UE1. If the Oscillator is off frequency, check the 14.31818MHz Crystal (Y1) by substitution.
- (B) If the Oscillator is on frequency, check Input/Output Unit IC (UE5) and IC UB8 by substitution.

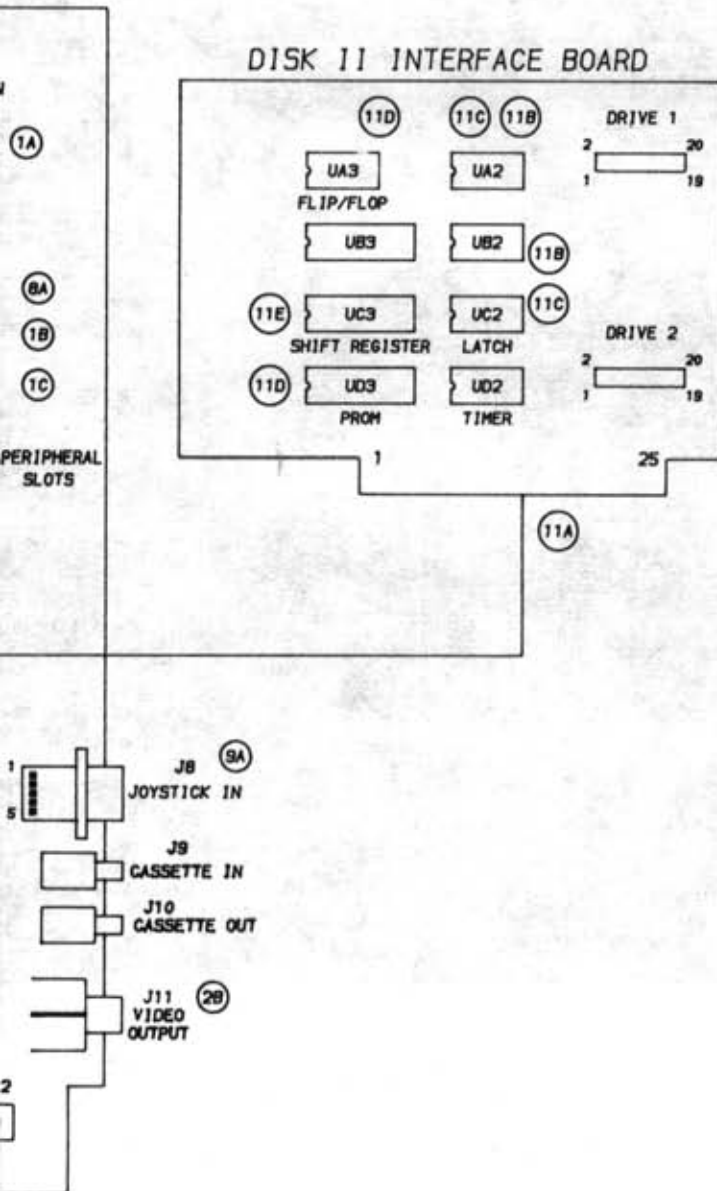
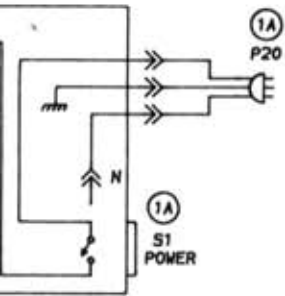
6 KEYBOARD

- (A) Keyboard is inoperative. Check the keyboard cable and connectors for good connections.
- (B) If the keyboard cable and connectors are good, check Memory Management Unit IC (UE4), Input/Output Unit IC (UE5), Keyboard ROM IC (UE12) and Decoder IC (UE14) by substitution.
- (C) Wrong character appears on Monitor screen when a key is pressed. Check Keyboard ROM IC (UE12) and Decoder IC (UE14) by substitution.
- (D) Character repeats itself when a key is pressed momentarily or will not repeat when a key is held down. Check Decoder IC (UE14) by substitution.
- (E) A group of keys do not work. Check the keyboard cable and Connector J17A for good connections and check Decoder IC (UE14) by substitution.
- (F) One key does not work or is erratic. Clean the key contacts. If the key still does not work, check the solder connections on the bad key and check the key contact with an ohmmeter.

7 NO BEEP FROM SPEAKER

- (A) Computer is functioning but there is no sound from the speaker when the CONTROL and G keys are pressed. Check the Speaker Connector (J18) for good connections and check the Speaker (SP1) voice coil for a resistance of 7.6 Ohms.
- (B) Check Input/Output Unit IC (UE5) by substitution.

PRELIMINARY SERVICE CHECKS (Continued)



SERVICE CHECKS (Continued)

8 BOARDS PLUGGED INTO PERIPHERAL SLOTS DO NOT FUNCTION

- (A) Check the edge connectors on the board for dirty contacts. Use a pencil eraser to clean the contacts if dirty.
- (B) Check Decoder/Mux (Multiplexer) IC (UB5), Decoder Demux (Demultiplexer) IC (UC10) and IC UC5 by substitution.

9 JOYSTICKS OR PADDLES DO NOT FUNCTION

- (A) Check Connectors J8 and J15 for good connections.
- (B) Check Timer IC (UA12), Transceiver IC (UB2), Decoder/Mux (Multiplexer) IC (UB5), Decoder/Demux (Demultiplexer) IC (UC10), Mux (Multiplexer) IC (UC12), Memory Management Unit IC (UE4) and IC UB8 by substitution.

10 CASSETTE

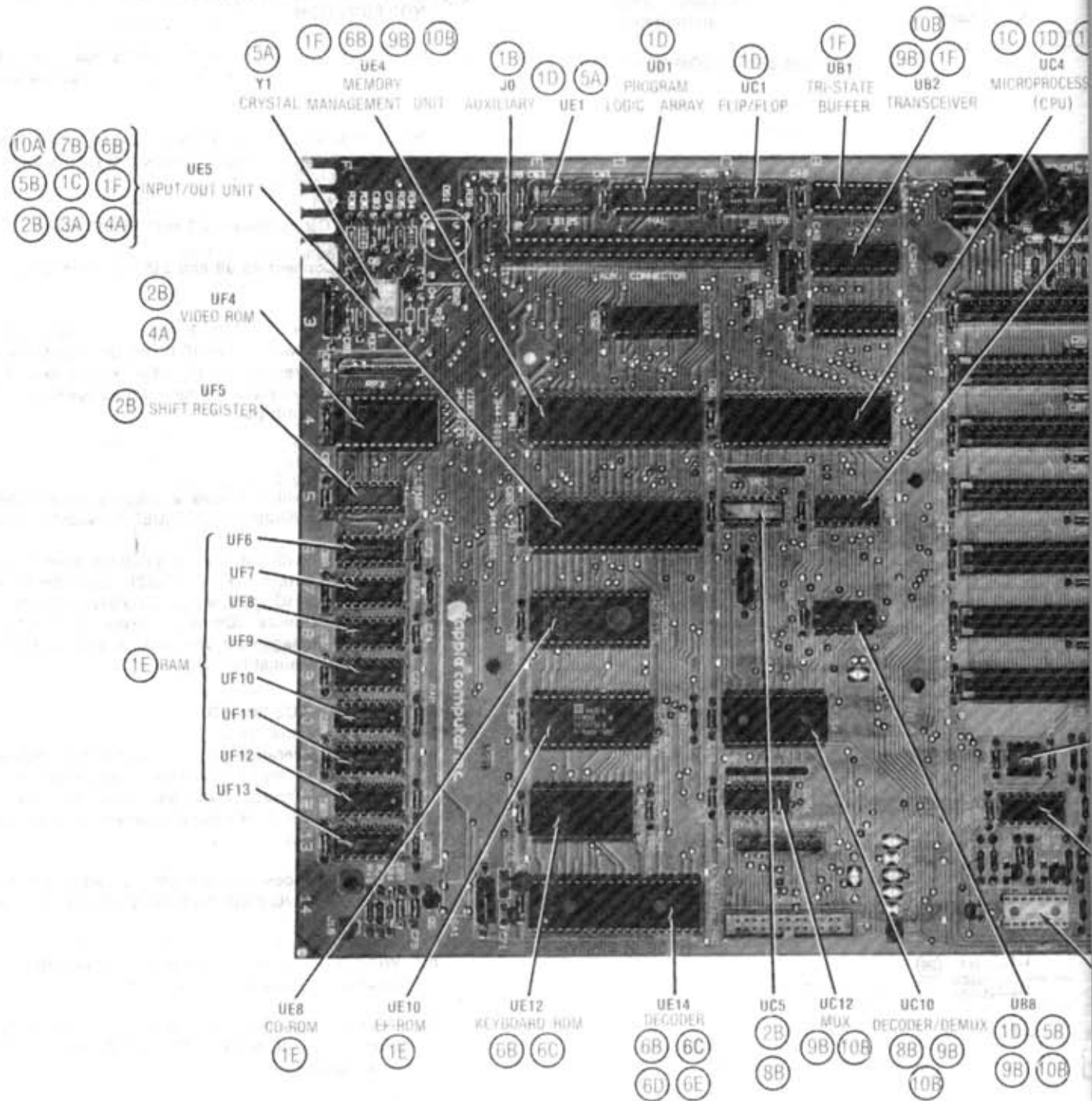
- (A) Computer will not save a program onto tape. Check Input/Output Unit IC (UE5) by substitution.
- (B) Computer will not load a program from tape. Check Transceiver IC (UB2), Decoder/Mux (Multiplexer) IC (UB5), Mux (Multiplexer) IC (UC12), Decoder/Demux (Demultiplexer) IC (UC10), Memory Management Unit IC (UE4) and ICs UA11 and UB8 by substitution.

11 DISK II INTERFACE BOARD

- (A) Disk Drive operation is erratic. Check the two Disk Drive connectors for good connections and check the Disk II interface board edge connector for dirty contacts. Clean the edge connector with a pencil eraser if dirty.
- (B) Disk Drive does not turn On. Check Latch IC (UC2), Timer IC (UD2) and ICs UA2 and UB2 by substitution.
- (C) Will not select proper Disk Drive. Check Latch IC (UC2) and IC UA2 by substitution.
- (D) Read or write problems. Check Flip/Flop IC (UA3), Shift Register IC (UC3), PROM IC (UD3) and IC UA2 by substitution.
- (E) Does not recognize the write protect signal. Check Shift Register IC (UC3) by substitution.

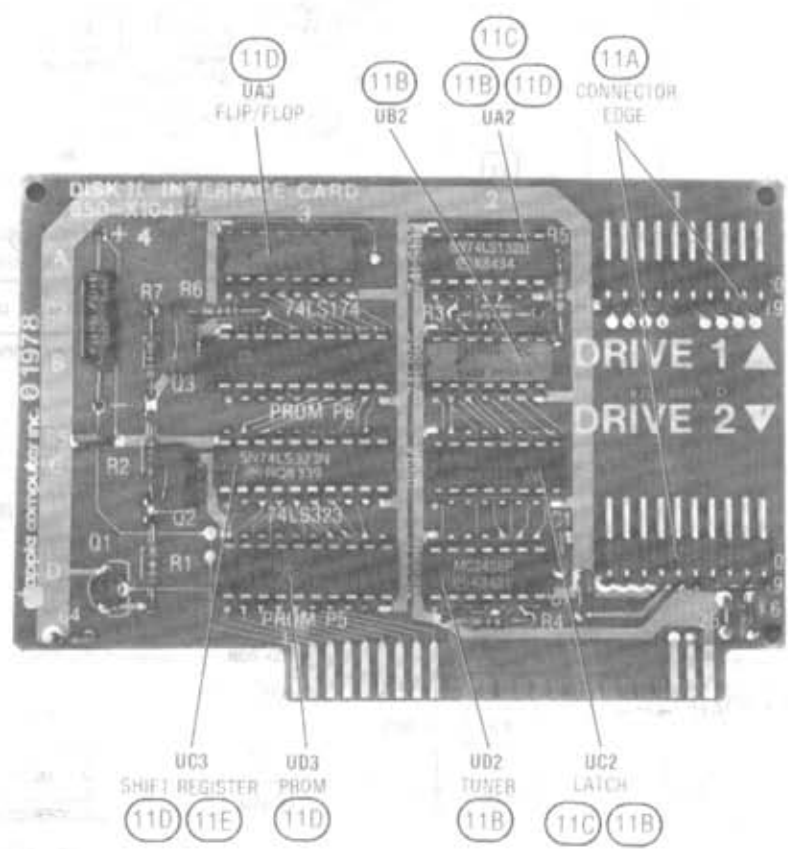
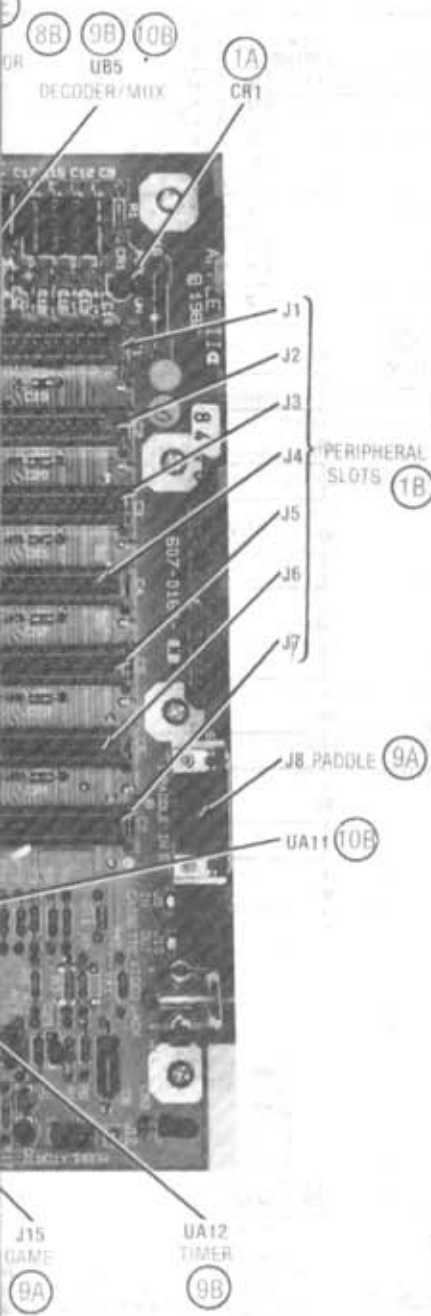
INTERCONNECTING DIAGRAM

PRELIMINARY SERVICE CHECKS (Continued)



REBNN

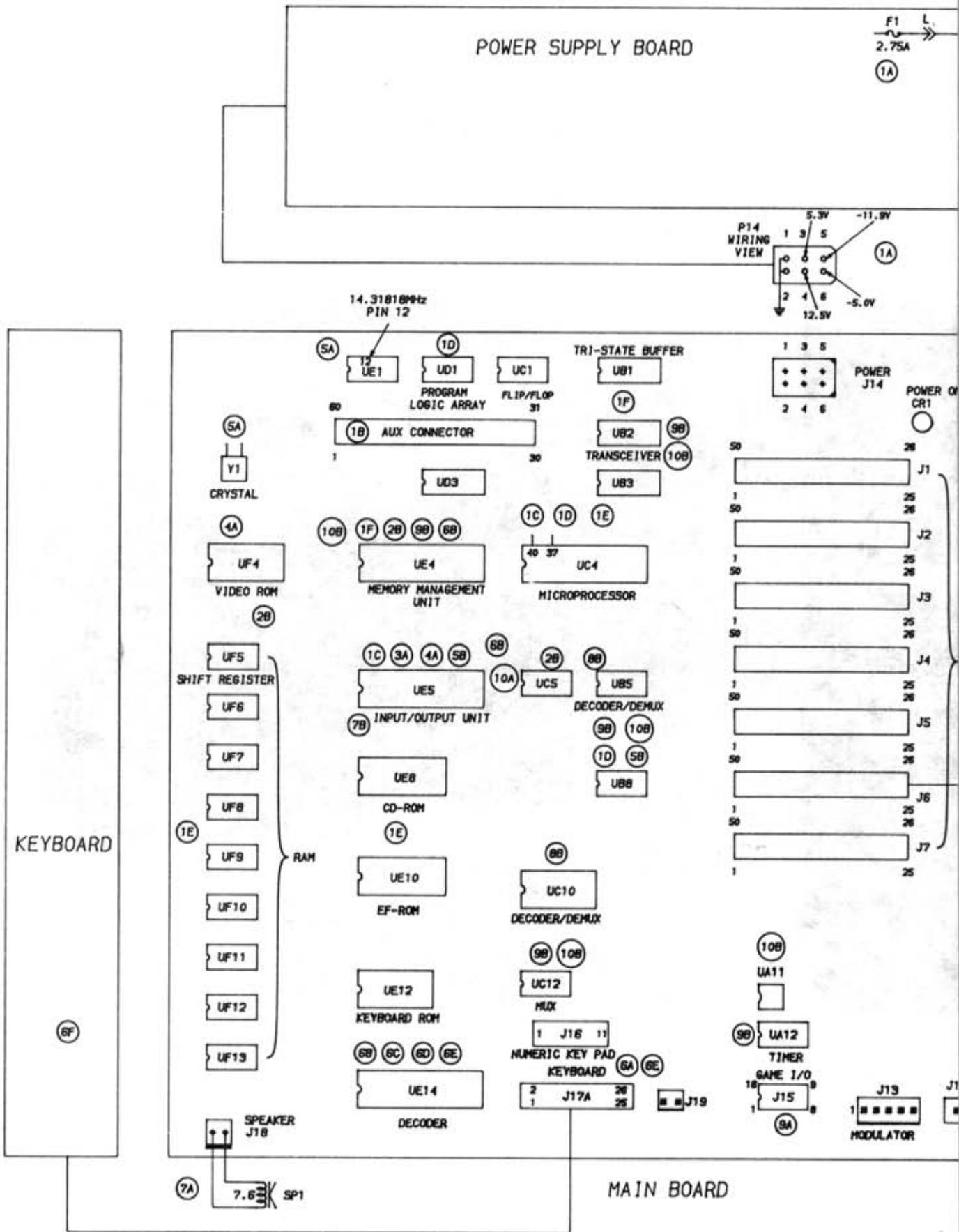
PRELIMINARY SERVICE CHECKS (Continued)



APPLE
MODEL Iie

DISK II INTERFACE BOARD

PRELIMINARY SERVICE CHECKS (Continued)



INTERCONNECTING DIAGRAM

RE64N

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 any of the Computer system; 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 the 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 periods of time at high brightness level except when pattern is being changed periodically. Use caution when cleaning anti-glare screens, to preserve the glare-reduction feature.

APPLE
MODEL IIe

PRELIMINARY SERVICE CHECKS (Continued)

GENERAL OPERATING INSTRUCTIONS

POWER UP

The Computer will come up in Basic mode when turned On with no Disk Drive connected. If a Disk Drive is connected the Computer will automatically boot up any bootable diskette that is inserted into the Disk Drive. If no diskette is in the Disk Drive, press the CONTROL and RESET keys at the same time to stop the Disk Drive and put the Computer in Basic mode.

SWITCHING FROM BASIC TO MONITOR MODE

Type CALL-151 and press RETURN key. An asterisk will appear on the Monitor screen indicating the Computer is in the Monitor mode.

SWITCHING FROM MONITOR TO BASIC MODE

Press the CONTROL and C keys at the same time, then press the RETURN key (any Basic program already in memory, before going to the Monitor mode, will remain in memory).

Press the CONTROL and B keys at the same time, then press the RETURN key (any Basic program in memory will be lost).

RESET

Press the CONTROL and RESET keys at the same time to reset the Computer to Basic mode. Press the OPEN APPLE key (located on the left side of SPACE bar), CONTROL key and RESET key at the same time to reboot the system on any bootable diskette in the Disk Drive.

OPERATING THE DISK SYSTEM FROM BASIC MODE (DOS3.3 OR PRODOS)

Type CATALOG and press the RETURN Key to get a list of the programs which are on the diskette. Type CATALOG, D1 for Disk Drive 1 or CATALOG, D2 for Disk Drive 2 if the current disk drive is not the one desired.

Type LOAD and the program name, then press the RETURN key to load a program from the diskette.

Type SAVE and the program name, then press the RETURN key to save a program on the diskette.

BOOTING UP THE DISK OPERATING SYSTEM (DOS)

Insert a diskette containing a DOS into the Disk Drive 1 and turn On the Computer. The Computer will automatically load the DOS and come up in Basic mode if DOS3.3 is used.

If PRODOS is used the Computer will come up with menu of PRODOS features on the Monitor screen.

To boot from Basic mode, type PR#6 or 1N#6 and press the RETURN key. If there is no diskette in the Disk Drive, the Disk Drive will continue to run until a diskette is inserted or the CONTROL and RESET keys are pressed at the same time.

DOS can also be rebooted by pressing the OPEN APPLE key (located on left side of SPACE bar), CONTROL key and RESET key at the same time.

USING BLANK DISKETTES

A blank diskette must be Initialized (DOS3.3) or Formatted (PRODOS) before it can be used to save data. To initialize a diskette using DOS3.3, boot the disk operating system from a diskette containing DOS3.3, remove the DOS3.3 diskette and put the blank diskette into Disk Drive 1. Type INIT HELLO and press the RETURN key. The diskette will be initialized when the drive stops. NOTE: Any previous information on diskette will be over written and lost when initialized.

If PRODOS is being used, select the PRODOS FILER (press F key) from the menu that comes up when PRODOS is booted up. Select Volume Commands (press V key) from the second menu that comes up and then select Format A Volume (press F key) from the third menu that comes up. Insert the blank diskette into the Disk Drive and follow the instructions on the Monitor screen to format the diskette.

CASSETTE OPERATION

NOTE: The following procedure will not work if PRODOS is loaded into the Computer. PRODOS does not support the Cassette input-output ports.

Connect the microphone cable from the Cassette to the Cassette Out Jack on the Computer.

Connect the speaker cable from the Cassette In Jack on the Computer.

To save a Basic program put the Cassette in Record mode, type SAVE and press the RETURN key. The program has been saved when the second beep is heard.

To load a Basic program set the tone control to the high end adjust the volume to just audible. Type LOAD and press the RETURN key. Set the Cassette to the beginning of the program and press the PLAY button on the Cassette. When second beep is heard, the program has been loaded.

DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL

Remove nine screws from cabinet bottom. Lift cabinet top and keyboard from chassis and disconnect keyboard plug.

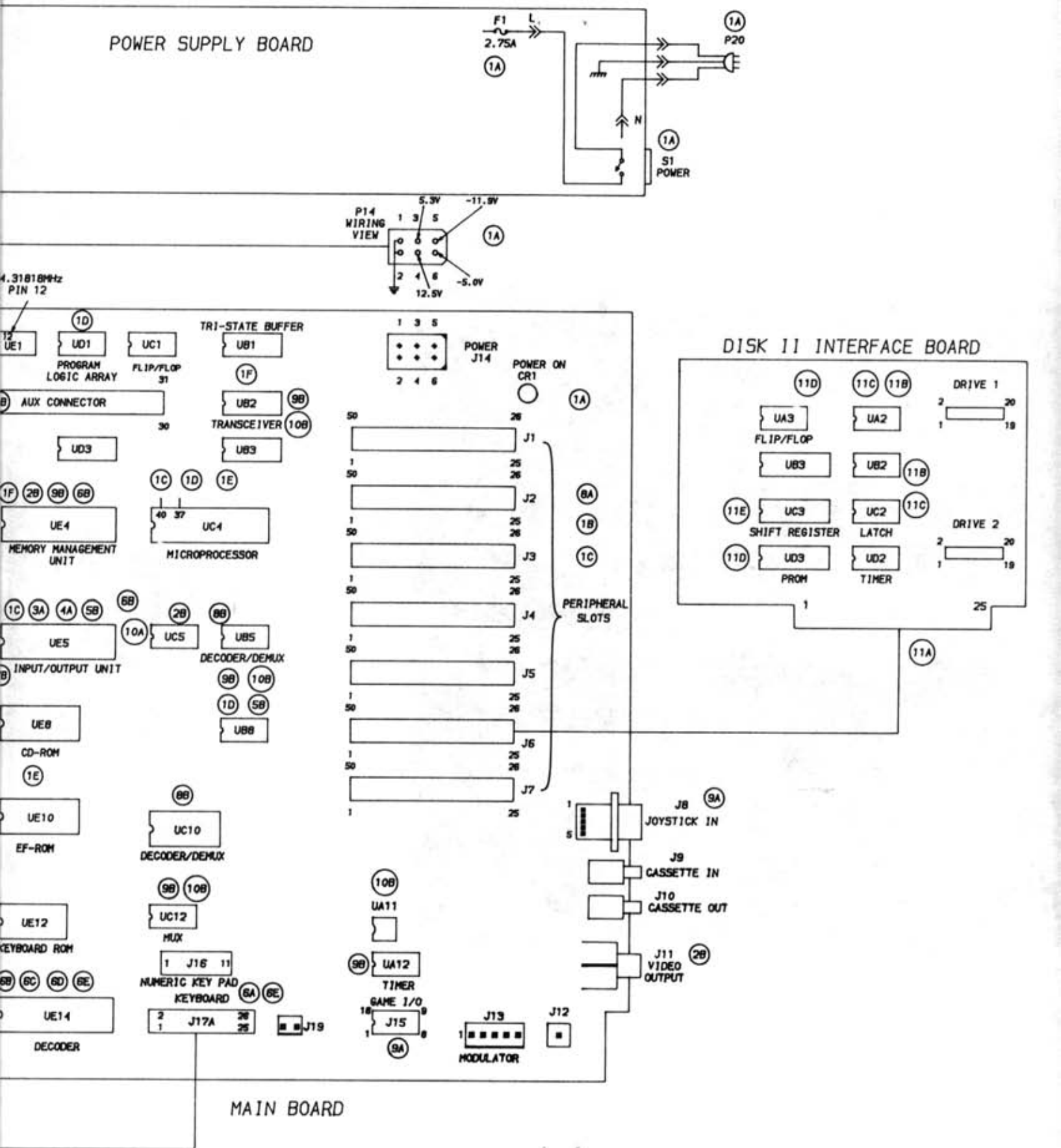
MAIN BOARD REMOVAL

Release six plastic locking pins and remove four screws holding main board to cabinet bottom. Disconnect speaker

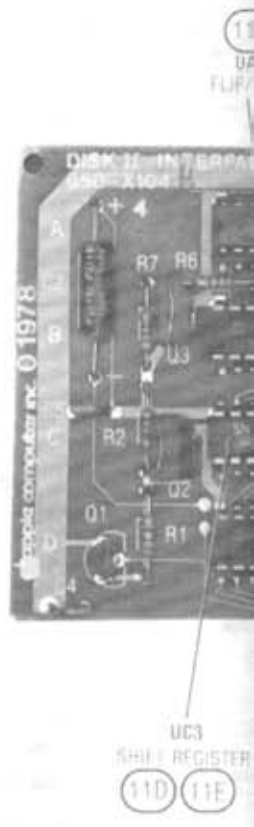
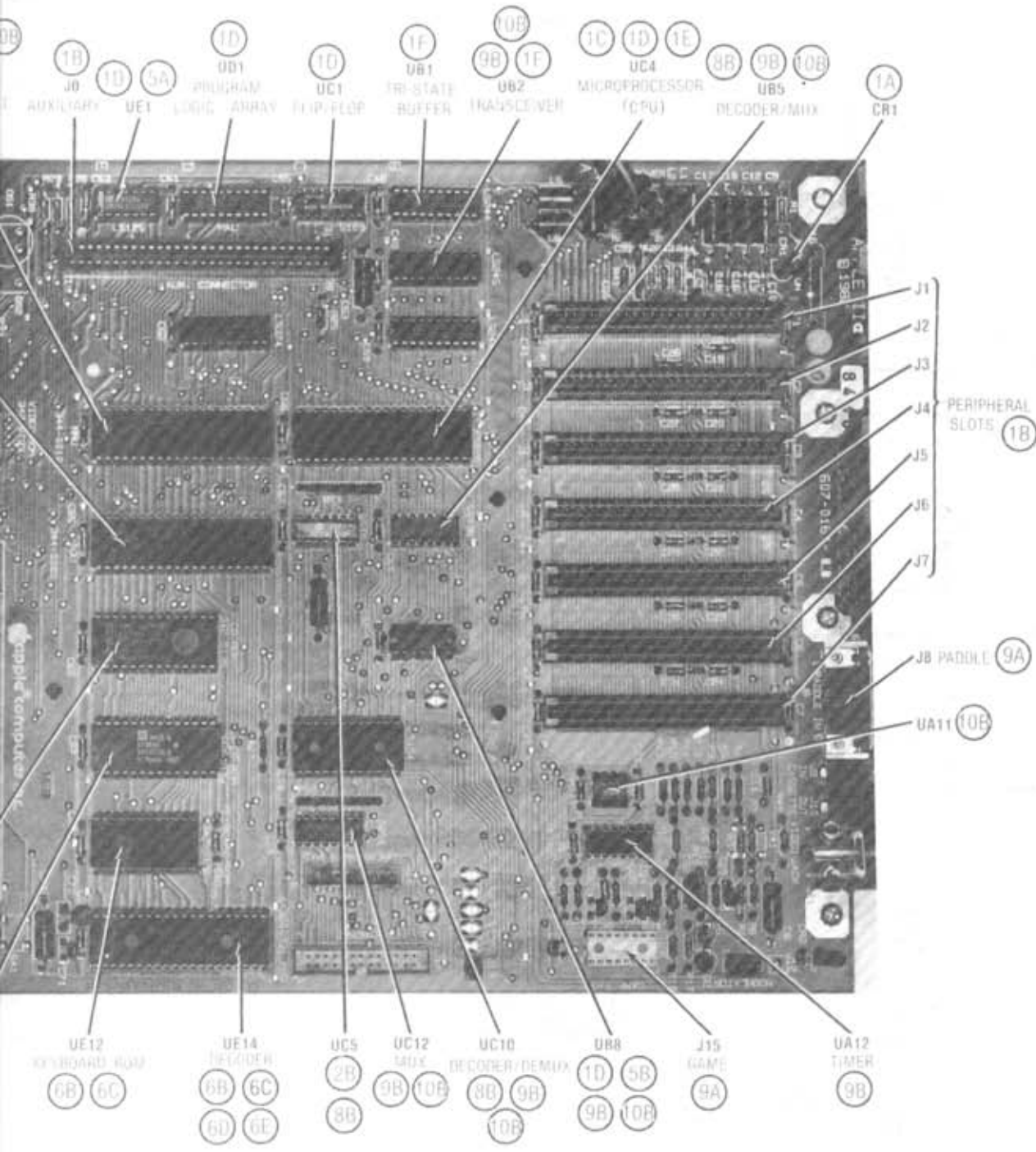
plug and power supply plug from main board and remove board from cabinet.

POWER SUPPLY BOARD REMOVAL

Remove four screws holding power supply to cabinet bottom and remove from cabinet. Remove ten screws, five from each side of power supply case for access to power supply board.



INTERCONNECTING DIAGRAM



REGAN

APPLE
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CC10



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MODEL IIe
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SAFETY PRECAUTIONS

See page 30.

PRELIMINARY SERVICE CHECKS

ENCLOSED

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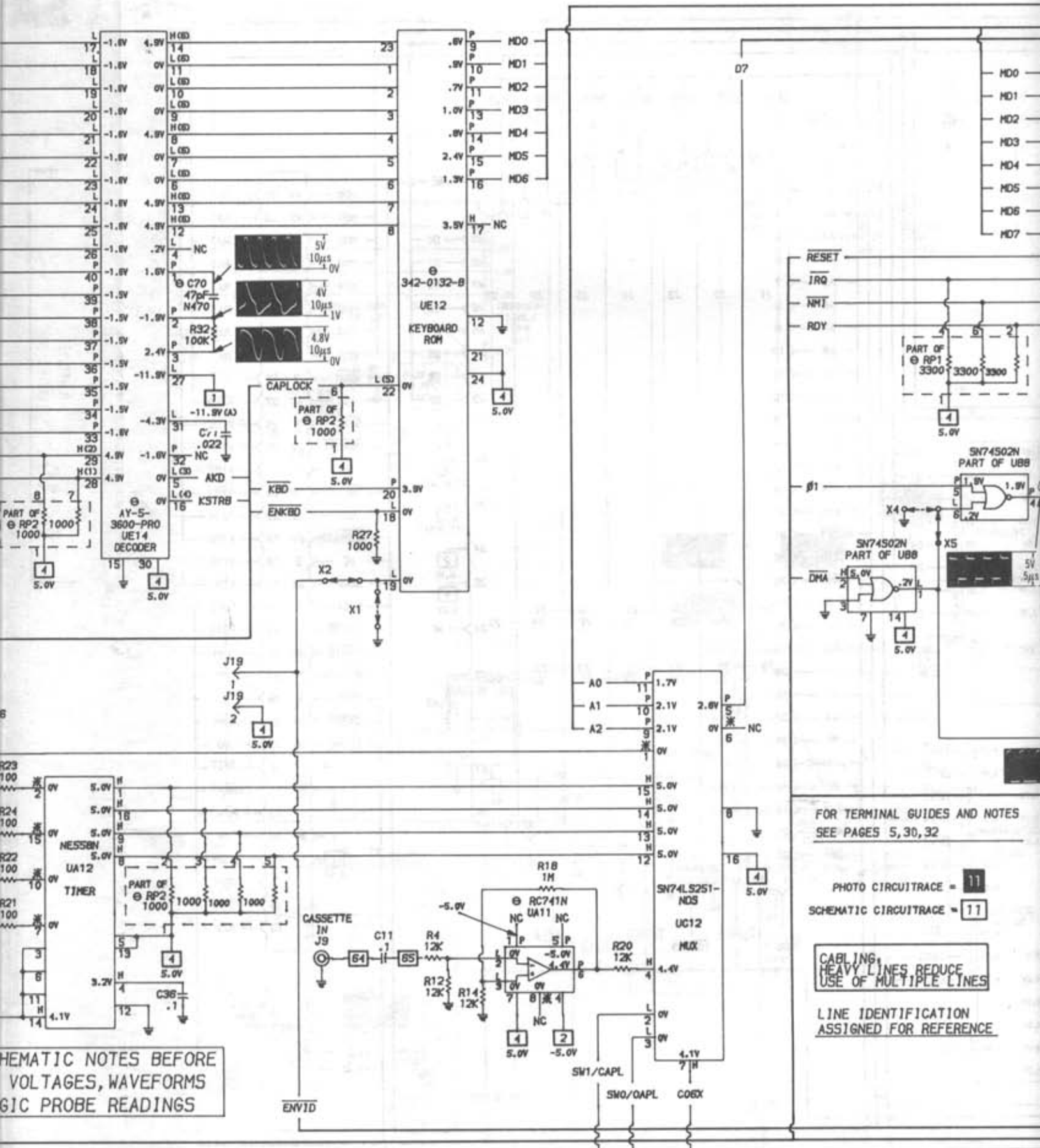
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SCHEMATIC NOTES BEFORE VOLTAGES, WAVEFORMS AND LOGIC PROBE READINGS

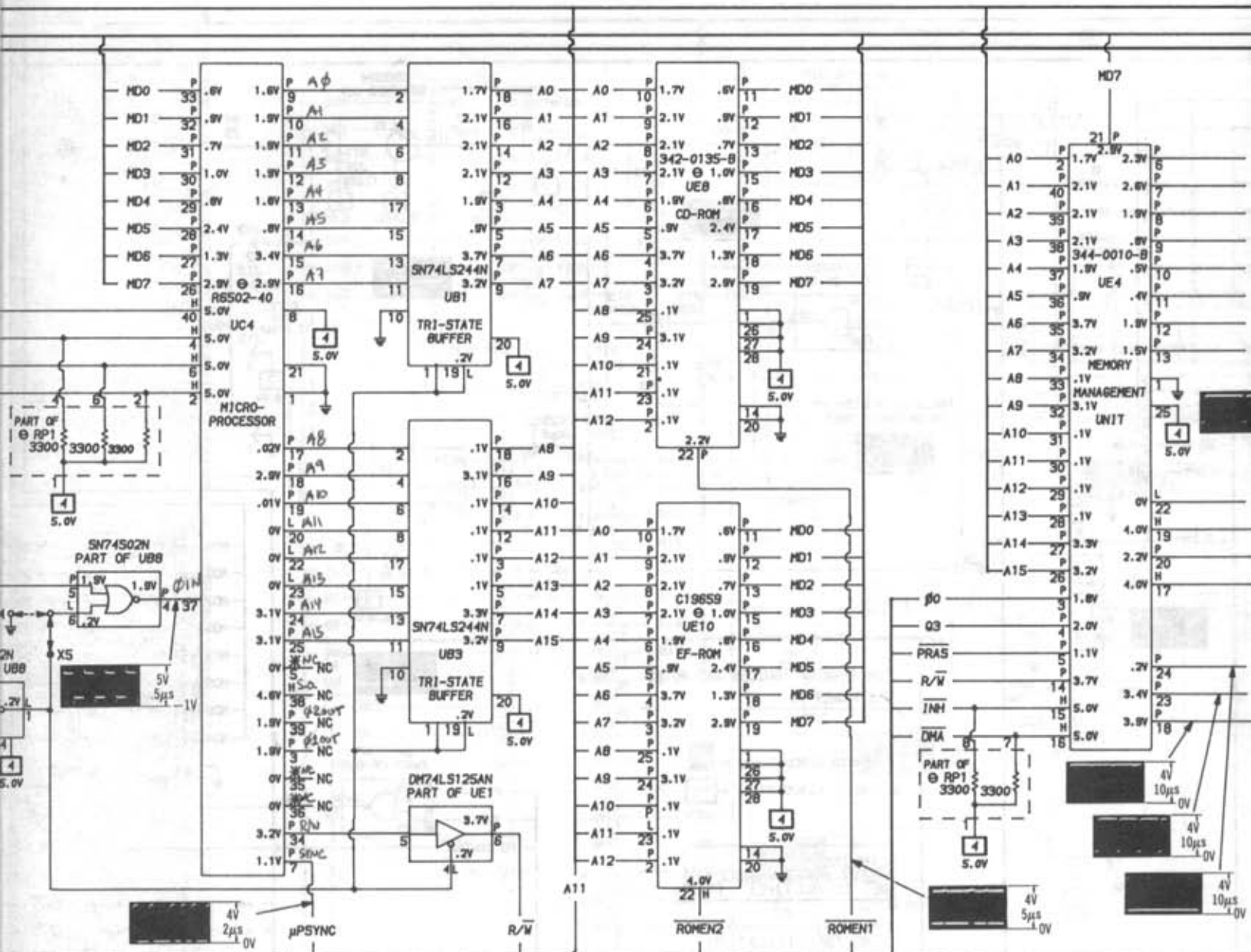
FOR TERMINAL GUIDES AND NOTES SEE PAGES 5,30,32

PHOTO CIRCUITRACE = 11
 SCHEMATIC CIRCUITRACE = 11

CABLING HEAVY LINES REDUCE USE OF MULTIPLE LINES

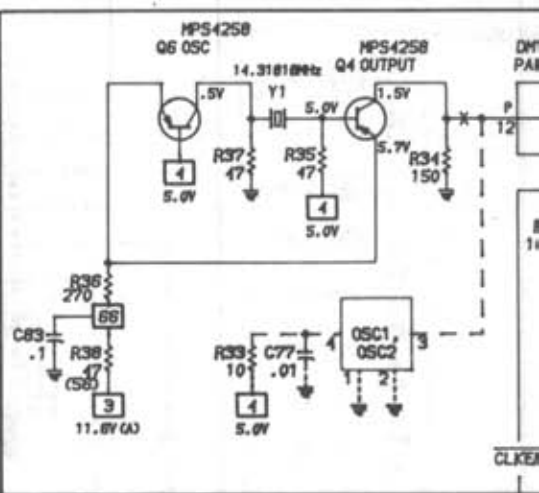
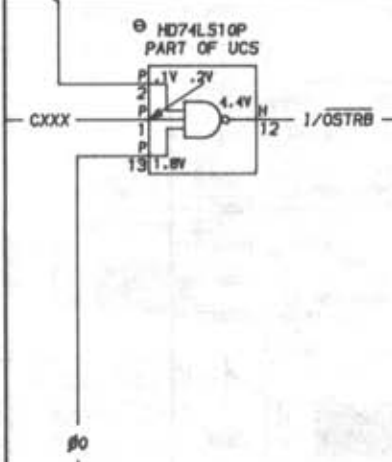
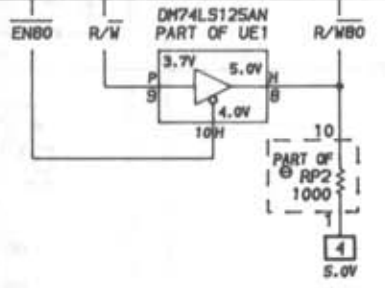
LINE IDENTIFICATION ASSIGNED FOR REFERENCE

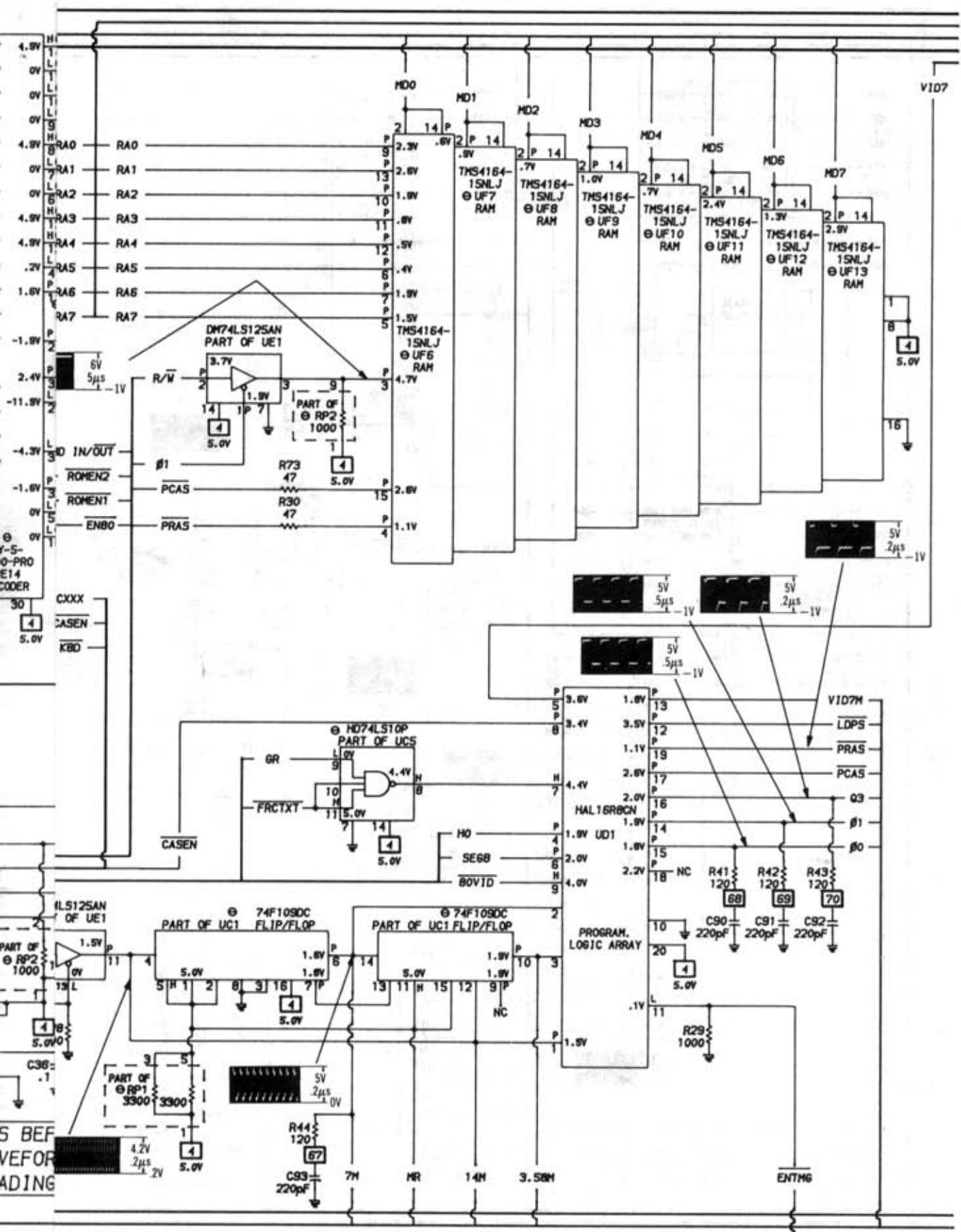
SEE LINE DEFINITIONS



GUIDES AND NOTES
 30, 32

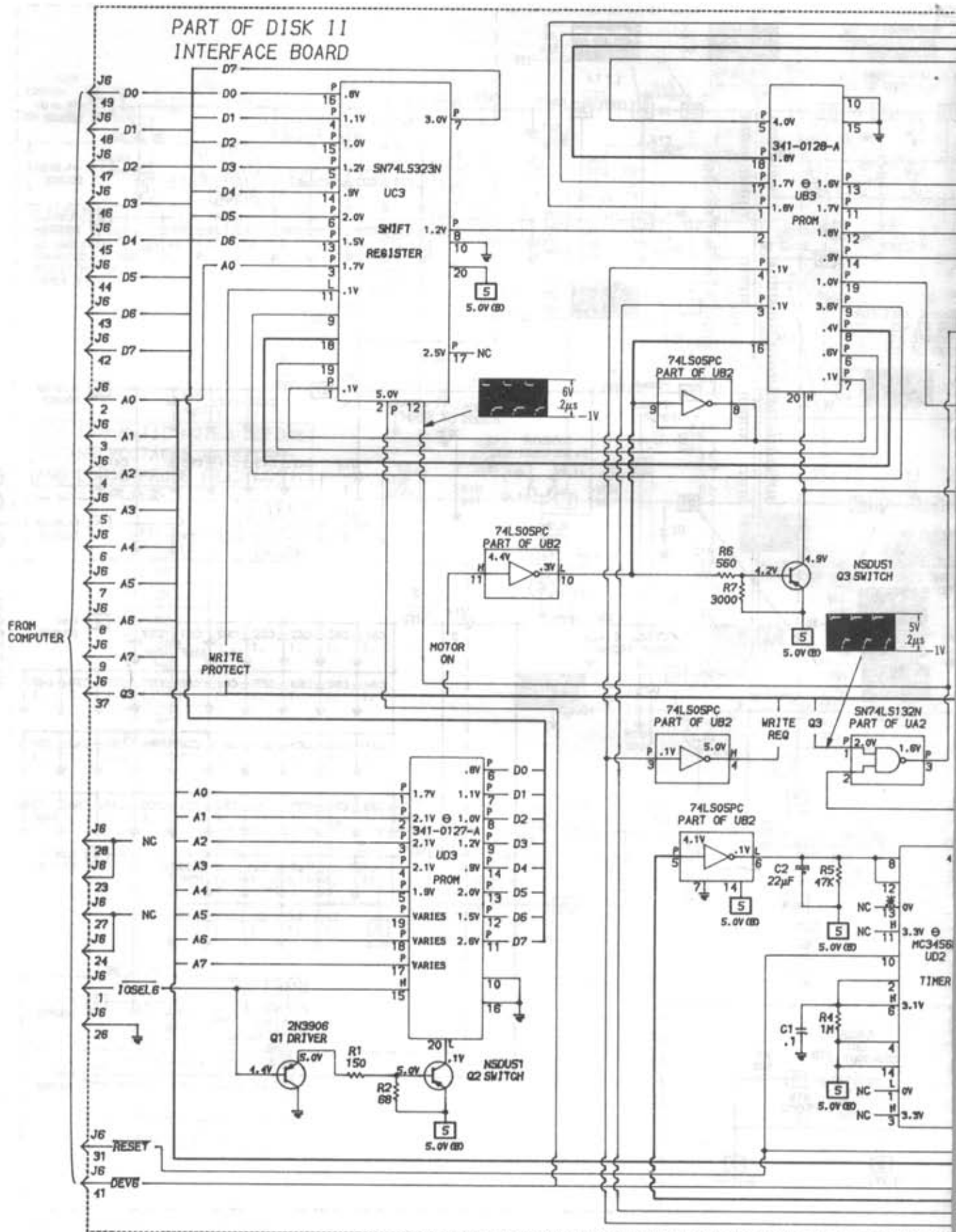
TRACE = 11
 TRACE = 11
 REDUCE MULTIPLE LINES
 IDENTIFICATION FOR REFERENCE





APPLE
MAIN BOARD MODEL IIe

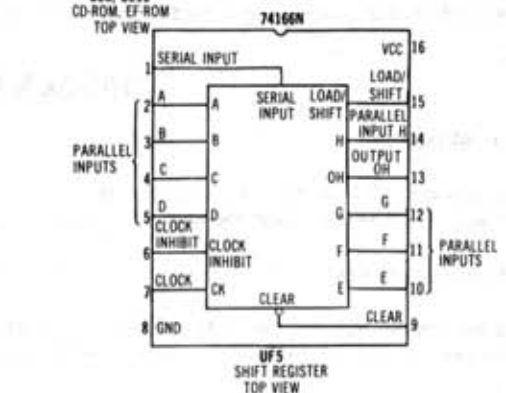
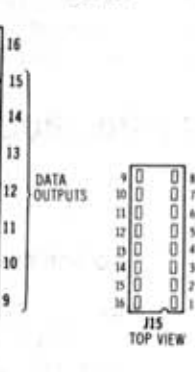
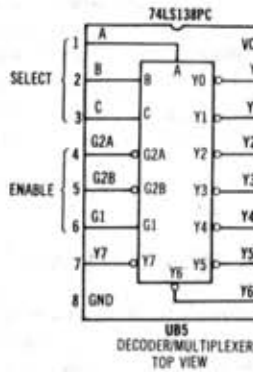
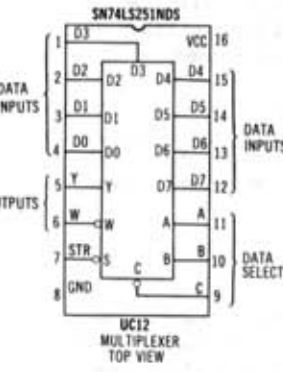
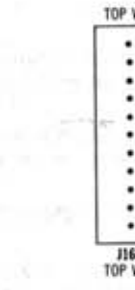
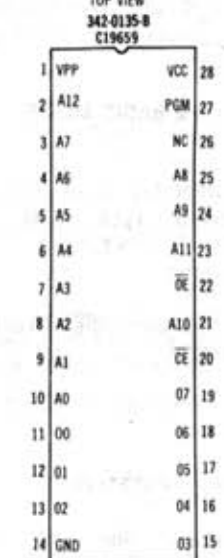
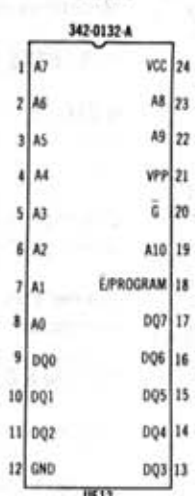
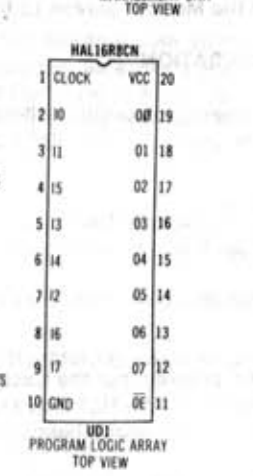
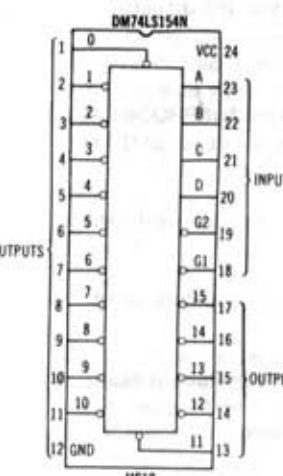
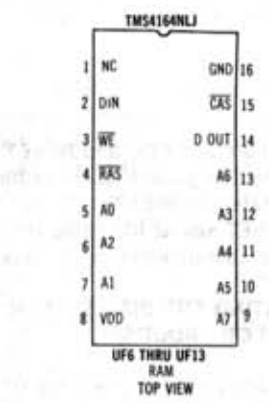
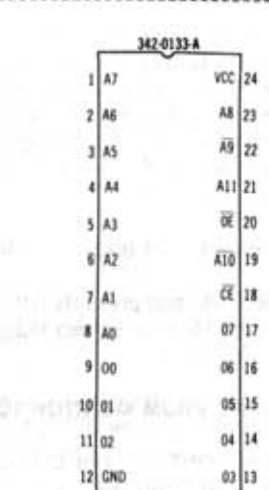
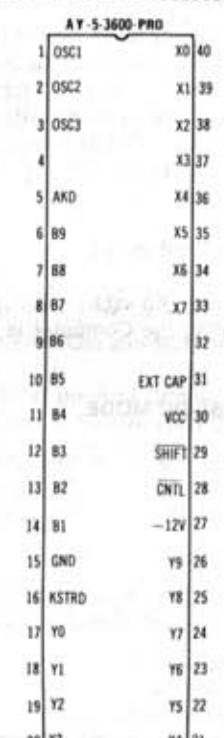
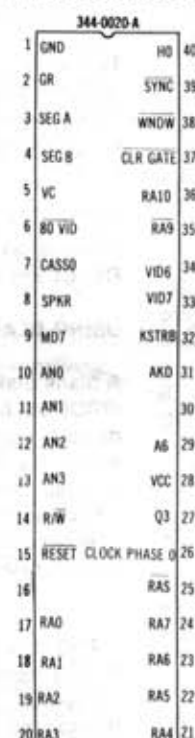
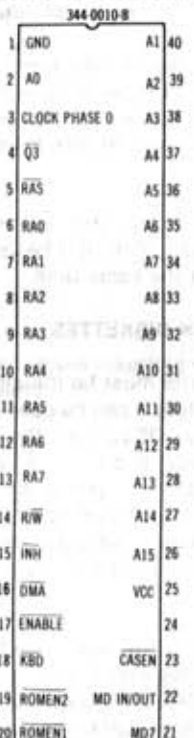
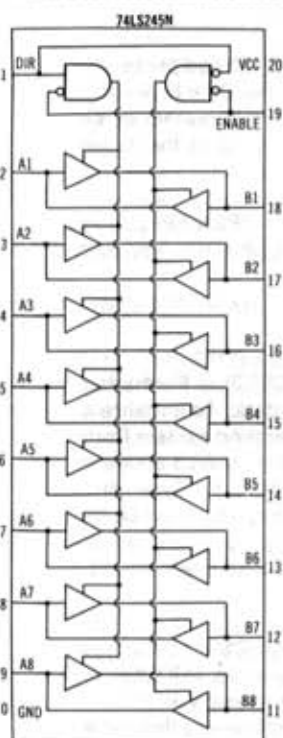
PART OF DISK II
INTERFACE BOARD



DISK II INTERFACE BOARD

SEE LINE DEFINITION

TERMINAL GUIDES



APPLE
MODEL IIe
CC10

GENERAL OPERATING INSTRUCTIONS

POWER UP

The Computer will come up in Basic mode when turned On with no Disk Drive connected. If a Disk Drive is connected the Computer will automatically boot up any bootable diskette that is inserted into the Disk Drive. If no diskette is in the Disk Drive, press the CONTROL and RESET keys at the same time to stop the Disk Drive and put the Computer in Basic mode.

SWITCHING FROM BASIC TO MONITOR MODE

Type CALL-151 and press RETURN key. An asterisk will appear on the Monitor screen indicating the Computer is in the Monitor mode.

SWITCHING FROM MONITOR TO BASIC MODE

Press the CONTROL and C keys at the same time, then press the RETURN key (any Basic program already in memory, before going to the Monitor mode, will remain in memory).

Press the CONTROL and B keys at the same time, then press the RETURN key (any Basic program in memory will be lost).

RESET

Press the CONTROL and RESET keys at the same time to reset the Computer to Basic mode. Press the OPEN APPLE key (located on the left side of SPACE bar), CONTROL key and RESET key at the same time to reboot the system on any bootable diskette in the Disk Drive.

OPERATING THE DISK SYSTEM FROM BASIC MODE (DOS3.3 OR PRODOS)

Type CATALOG and press the RETURN Key to get a list of the programs which are on the diskette. Type CATALOG, D1 for Disk Drive 1 or CATALOG, D2 for Disk Drive 2 if the current disk drive is not the one desired.

Type LOAD and the program name, then press the RETURN key to load a program from the diskette.

Type SAVE and the program name, then press the RETURN key to save a program on the diskette.

BOOTING UP THE DISK OPERATING SYSTEM (DOS)

Insert a diskette containing a DOS into the Disk Drive 1 and turn On the Computer. The Computer will automatically load the DOS and come up in Basic mode if DOS3.3 is used.

If PRODOS is used the Computer will come up with menu of PRODOS features on the Monitor screen.

To boot from Basic mode, type PR#6 or 1N#6 and press the RETURN key. If there is no diskette in the Disk Drive, the Disk Drive will continue to run until a diskette is inserted or the CONTROL and RESET keys are pressed at the same time.

DOS can also be rebooted by pressing the OPEN APPLE key (located on left side of SPACE bar), CONTROL key and RESET key at the same time.

USING BLANK DISKETTES

A blank diskette must be Initialized (DOS3.3) or Formatted (PRODOS) before it can be used to save data. To initialize a diskette using DOS3.3, boot the disk operating system from a diskette containing DOS3.3, remove the DOS3.3 diskette and put the blank diskette into Disk Drive 1. Type INIT HELLO and press the RETURN key. The diskette will be initialized when the drive stops. NOTE: Any previous information on diskette will be over written and lost when initialized.

If PRODOS is being used, select the PRODOS FILER (press F key) from the menu that comes up when PRODOS is booted up. Select Volume Commands (press V key) from the second menu that comes up and then select Format A Volume (press F key) from the third menu that comes up. Insert the blank diskette into the Disk Drive and follow the instructions on the Monitor screen to format the diskette.

CASSETTE OPERATION

NOTE: The following procedure will not work if PRODOS is loaded into the Computer. PRODOS does not support the Cassette input-output ports.

Connect the microphone cable from the Cassette to the Cassette Out Jack on the Computer.

Connect the speaker cable from the Cassette In Jack on the Computer.

To save a Basic program put the Cassette in-Record mode, type SAVE and press the RETURN key. The program has been saved when the second beep is heard.

To load a Basic program set the tone control to the high end adjust the volume to just audible. Type LOAD and press the RETURN key. Set the Cassette to the beginning of the program and press the PLAY button on the Cassette. When second beep is heard, the program has been loaded.

DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL

Remove nine screws from cabinet bottom. Lift cabinet top and keyboard from chassis and disconnect keyboard plug.

MAIN BOARD REMOVAL

Release six plastic locking pins and remove four screws holding main board to cabinet bottom. Disconnect speaker

plug and power supply plug from main board and remove board from cabinet.

POWER SUPPLY BOARD REMOVAL

Remove four screws holding power supply to cabinet bottom and remove from cabinet. Remove ten screws, five from each side of power supply case for access to power supply board.

TROUBLESHOOTING

SELF TEST

The Computer has a self test that disables any peripheral boards that are plugged into the main board and tests all programmable memory. To run the self test hold down the CONTROL and SOLID APPLE (located on the right side of space bar) keys and press the RESET key. The Monitor screen will turn white, then black, then white again, then black again and come up with the message "KERNAL OK" if no problems are found. An error message will be displayed on the Monitor screen if a problem is found.

COMPUTER DEAD

NOTE: Turn Off the Computer before inserting or removing boards from the peripheral slots.

No display on the Monitor screen when the Computer is turned On. Check the Power LED (CR1). If LED CR1 is not lit, disconnect the Power Supply Connector (J14) and check for 5.0V at pin 3, 11.7V at pin 4, -11.9V at pin 5 and -5V at pin 6 of Connector J14. If the voltages are incorrect, refer to the "Power Supply" section of this Troubleshooting guide.

If the power supply checks normal, remove all the boards plugged into the Auxiliary Connector Slot (J0) or the seven Peripheral Slots (J1 thru J7) and check the Computer operation. If the Computer starts functioning normally after removal of peripheral boards, turn Off the Computer and plug the boards into the peripheral slots one at a time. Recheck the operation until the defective board is found.

If the Computer does not function with all the peripheral boards removed from the slots, listen for a beep from the internal speaker when the Computer is turned On or when the CONTROL and G keys are pressed at the same time. If there is no beep, see the "Microprocessor (CPU) Operation" section of this Troubleshooting guide. If there is a beep, check the cable from the Computer to the Monitor for good connections. If the cable checks normal, refer to the "Video Display" section of this Troubleshooting guide.

POWER SUPPLY

NOTE: Use an isolation transformer when troubleshooting the power supply.

Check the AC Fuse (F1) and if Fuse F1 is open, check AC Line Choke Coil (T1) for a possible short. If Coil T1 is good, check associated components for shorts and check from each lead of Coil T1 to the chassis for shorts. Check for a possible shorted Driver Transistor (Q2).

If Fuse F1 is not open, apply AC power and check for 120VAC between Connector L and N. If 120VAC is missing, check the Power Switch (S1), Coil T1 and the AC Power cord Connector (P21). If 120VAC is present, check for 120VAC across the AC inputs of Diode DB1. If 120VAC is missing, check Coil T1 and Thermistor R1.

If 120VAC is present, check for 330V between the negative and positive output of Diode DB1 and if 330V is missing, replace Diode DB1. If 330V is present, check the waveform at the base of the Oscillator Transistor (Q1). If Transistor Q1 is not oscillating, check the voltages and components associated with the Regulator Transistor (Q3), Regulator IC

(IC1), Transistor Q1 and Driver Transistor (Q2). Also check the windings on Transformers T2 and T3 for continuity.

If the Transistor Q1 is oscillating properly, check the voltages at pins 3, 4, 5 and 6 of Connector J14. If 5.0V at pin 3 of Connector J14 is missing, check Diodes D7 and D8, Coil L5 and Capacitors C13 and C14. Also check the Transformer T2 windings between pin 11 and pin 12 and pin 13 and pin 14 of Transformer T2.

If 11.7V at pin 4 of Connector J14 is missing, check Diode D6, Coil L6, Electrolytics C12 and C20 and winding between pin 15 to pin 16 of Transformer T2 and check Shutdown Transistor (Q4) and SCR SCR1.

If -5V at pin 6 of Connector J14 is missing, check Diode D9, Coil L8, Electrolytics C15 and C22 and the winding between pin 7 and pin 8 of Transformer T2.

If the -11.9V at pin 5 of Connector J14 is missing, check Diode D10, Coil L7, Electrolytics C16 and C21 and the winding between pin 9 and pin 10 of Transformer T2.

MICROPROCESSOR (CPU) OPERATION

If the Computer is dead and the power supply is normal, check the logic reading on pin 40 of the Microprocessor (CPU) IC (UC4) when Computer is turned On. The logic reading will be Low for about .1 second then change to High. It should also read Low as long as the CONTROL and RESET keys are held down. If the logic reading is incorrect, check Input/Output Unit IC (UE5) by substitution.

If the reset circuit is working, check the 1MHz clock waveform at pin 37 of IC UC4. If the waveform is missing, check the waveform at pin 14 of Program Logic Array IC (UD1). If the waveform is present at pin 5 of IC UB8 and pin 6 of IC UB8 logic reading is Low, check IC UB8 by substitution. If the waveform is missing at pin 5 of IC UB8, refer to the "Crystal Oscillator and Dividers" section of this Troubleshooting guide.

If the clock waveform at pin 37 of IC UC4 is normal, check for clock pulses at pins 3 and 39 of IC UC4. If the pulses are missing, check IC UC4 by substitution. If the pulses are present, check for a High logic reading on pins 2, 4 and 6 of IC UC4. If any of the logic readings are Low, check the part of Resistor Network RP1 connected to the pin with the Low logic reading. Also check for a possible short to ground and check IC UC4 by substitution.

To check the address lines, turn Off the Computer, remove any peripheral boards plugged into the main board, connect a jumper from pin 2 of IC UB8 to ground, turn On the Computer and check for a Low logic reading on pins 9 thru 20 and 22 thru 25 of IC UC4. If any of the pins do not read correctly, check IC UC4 and the Tri-State Buffer ICs (UB1 or UB3) connected to the bad pin, by substitution. If the address lines on IC UC4 read logic Low, check the buffered address lines, pins 3, 5, 7, 9, 12, 14, 16 and 18 of ICs UB1 or UB3 for a logic Open (No lights On). If any of the buffered address lines read a logic High or Low check by substitution any IC associated with the defective line.

If no problems have been found at IC UC4, check CD-ROM IC (UE8) and EF-ROM IC (UE10), Memory Management Unit IC (UE4) and RAM ICs (UF6 thru UF13) by substitution.
ROM CHIP BAD HANGS I/O & GRAPHIC DISPLAY.

CC-10
MODEL IIe
APPLE

★ ADDRESS
LINE
FORCE
STATE

TROUBLESHOOTING (Continued)

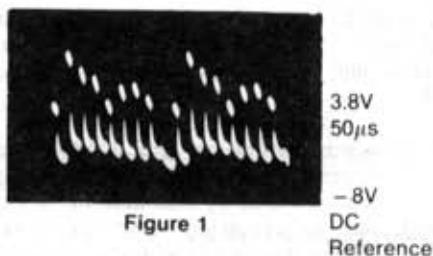
CRYSTAL OSCILLATOR AND DIVIDERS

Check the oscillator frequency (14.31818MHz) at pin 12 of IC UE1. If the oscillator is off frequency, check 14.31818MHz Crystal (Y1). If the oscillator is not working, check the voltages and components associated with Output Transistor (Q4) and Oscillator Transistor (Q6).

If the oscillator is working, check the waveform at pin 11 of IC UE1. If the waveform is missing and pin 13 of IC UE1 logic reading is Low, check IC UE1 by substitution. If the waveform is good, at pin 11 of IC UE1, check for a frequency of 3.5795MHz at pin 10 of Flip/Flop IC (UC1). If the signal is missing or the frequency is incorrect, check IC UC1 by substitution. If the frequency is correct at pin 10 of IC UC1, check the waveforms at pins 14 thru 16 and 19 of Program Logic Array IC (UD1) and pins 6 and 15 of Shift Register IC (UF5). If any of the waveforms are missing, check IC UD1 by substitution.

KEYBOARD

If Computer comes up properly but the keyboard is dead or has no response when any key is pressed, check Connector J14 and the cable from the keyboard to the main board for good connections. If the cable and connectors are normal, check for -11.9V at pin 27 of the Decoder IC (UE14). If -11.9V is missing, refer to the "Power Supply" section of this Troubleshooting guide. If -11.9V is present, check the waveform at pin 1 of IC UE14. If the waveform is missing, check Capacitor C70, Resistor R32 and check IC UE14 by substitution. If the waveform is present at pin 1 of IC UE14, check the waveforms on pins 16 thru 26 and 33 thru 40 of IC UE14. The waveforms on pins 17 thru 26 should look similar to the waveform shown in Figure 1 and the waveforms on pins 33 thru 40 should look similar to Figure 2.



If any waveform is missing, check IC UE14 by substitution. If the waveforms are present, check the logic readings on pins 5 and 16 of IC UE14. Pin 5 logic reading should be High and pin 16 should read a Pulse when any key is pressed except the CONTROL, SHIFT, CAPS LOCK, RESET and APPLE Keys. If either reading is incorrect, check IC UE14 by substitution. If the readings are correct, check waveform at pin 18 of the Memory Management Unit IC (UE4). If the waveform is missing at pin 18, check the IC UE4 by substitution. If the waveform is present at pin 18 of IC UE4, check IC UE12 and Input/Output Unit IC (UE5) by substitution.

If only one key does not work, check the solder connection on the defective key and check the key for continuity when the key is pressed.

If only one key is erratic, clean the contacts of the defective key. If a wrong character appears on the Monitor screen when a key is pressed, check ICs UE12 and UE14 by substitution.

If a character appears more than once on the Monitor screen when a key is pressed momentarily, check Capacitor C71 and check IC UE14 by substitution.

If a character does not repeat, when a key is held down, check Capacitor C70 and check IC UE14 by substitution.

If any one group of keys do not work, check the keyboard cable and Connector J17A and J17B for good connection and also check IC UE14 by substitution.

VIDEO DISPLAY

No video on the Monitor screen, check the Video Output Jack (J11) and the cable connecting the Computer to the Monitor for good connections. If the cable and connectors are good, check for a 2.5V pp video waveform at the base of Mixer Transistor (Q1). If the waveform is present, check the voltages and components associated with Transistor Q1 and Video Output Transistor (Q2). If the video portion of the waveform is missing, horizontal and vertical sync pulses appear, check for pulses at pin 3 of IC UC5. If pulses are present and pin 4 of IC UC5 logic reading is High, check Resistor R7 and check IC UC5 by substitution. If pulses are missing at pin 4 of IC UC5, check Shift Register IC (UF5), Video ROM IC (UF4) and Input/Output Unit IC (UE5) by substitution.

If a graphics function (low resolution) or flash and inverse video functions do not work, check ICs UE5 and UF4 by substitution.

If the cursor is defective or there is no cursor, check EPROM IC (UE10) and IC UF4 by substitution.

VIDEO SYNC

Monitor has no horizontal or vertical sync. Check the Input/Output Unit IC (UE5) by substitution and check Capacitor C25 and Resistors R5 and R10.

COLOR

No color, type and run the following Basic program and check for pulses at pins 11 and 13 of IC UB8.

```
1 GR: COLOR = 4: HLIN 0.39 AT 20
```

If pulses are missing at pin 11, check Input/Output Unit IC (UE5) by substitution. If pulses are missing from pin 13 of IC UB8, check Capacitor C32, Coil L3 and check the frequency of 14.31818MHz Crystal (Y1) at pin 12 of IC UE1. If Crystal Y1 is off frequency, check Crystal Y1 by substitution. If pulses are missing from pin 13 of IC UB8, check IC UB8 by substitution.

If colors are incorrect, the above program should produce a green horizontal bar on the Monitor screen. Check the frequency of Crystal Y1 at pin 12 of IC UE1. If Crystal Y1 is off frequency, check Crystal Y1 by substitution. If Crystal Y1 is normal, check ICs UD1 and UE5 by substitution.

0 1 2 3 4 5 6 7 8 9
BBROY6BU6W

TROUBLESHOOTING (Continued)

INTERNAL SPEAKER

If there is no sound from the internal speaker, check the Speaker (SP1). If the speaker checks normal, type and run the following Basic program.

```
1 PRINT CHR$(7): GOTO 1
```

Check for pulses at pin 8 of the Input/Output Unit IC (UE5). If pulses are missing, check IC UE5 by substitution. If pulses are present, check the voltages and components associated with Amp Transistor (Q5).

CASSETTE

Computer will not load a program from the tape but game paddles and switches are working normally. Check the voltages and components associated with IC UA11 and check Mux (Multiplexer) IC (UC12) by substitution.

Computer will not load and there are problems with the game paddles and switches. See "Game Paddles Do Not Function" or "Game Switches (Joysticks) Do Not Function" sections of this Troubleshooting guide.

Computer will not save a program on tape. Check Resistors R6 and R9 and check Input/Output Unit IC (UE5) by substitution.

PERIPHERAL SLOTS

If a board which is plugged into one of the seven Peripheral Slots (J1 thru J7) does not work, check that peripheral slot for damaged or dirty pins or for possible broken solder joints. Use a pencil eraser to clean the contacts of the board if they appear dirty.

See that the peripheral slots pins 1, 20 and 41 that may be used to select the board, are functioning. To do this, run the following Basic program and check for pulses at pins 1, 20 and 41 of the peripheral slots.

```
1 FOR X = - 16255 TO - 16127 STEP 16: Y = PEEK (X):  
NEXT X  
2 FOR X = - 16128 TO - 14336 STEP 256: Y = PEEK (X):  
NEXT X  
3 GOTO 1
```

If pulses are missing at pin 1 of any peripheral slot, check Decoder/Mux (Multiplexer) IC (UB5) by substitution. If pulses are missing at pin 20 of any peripheral slot, check IC UC5 by substitution. If pulses are missing at pin 41 of any peripheral slot, check Decoder/Demux (Demultiplexer) IC (UC10) by substitution.

GAME PADDLES DO NOT FUNCTION

Type and run the following Basic program to check the operation of the game paddle circuits.

```
10 FOR Y = 0 TO 3  
20 Z = PDL (Y)  
30 PRINT "PADDLE"; Y, Z  
40 NEXT Y  
50 PRINT  
60 FOR T = 1 TO 500: NEXT T  
70 GOTO 10
```

STARTUP PROBLEMS
• ROMs not insystemic power not to ROMs)
will lockup system & TEXT display
• '02 not working, will lock & Graphics display.

The program scans all four paddles and displays the paddle number (0 thru 3) on the Monitor screen along with a number that is read from each paddle. The number read from each paddle should vary between 0 and 255 as that paddle is varied from MINIMUM to Maximum positions. If paddles are not available, a 100K potentiometer can be used by connecting one end of the potentiometer to 5.0V (pin 1 of Connector J15) and the center tap to one of the paddle inputs (pins 6, 7, 10 and 11 of J15).

Check Connectors J8 or J15 for good connections. If none of the paddle inputs function, check for pulses at pin 3 of Timer IC (UA12) and pin 7 of Mux (Multiplexer) IC (UC12) while the above program is running. If pulses are missing, check ICs UB5 and UC10 and Memory Management Unit IC (UE4) by substitution. If pulses are present at pins 3 of IC UA12 and pin 7 of IC UC12, check for pulses at pins 1 and 19 of Transceiver IC (UB2) while the above program is running. If pulses are missing at pin 1 of IC UB2, check IC UE4 by substitution. If pulses are missing at pin 19 of IC UB2, check IC UB8 by substitution and check Capacitors C34, C35, C37 and C40 and Resistors R21 thru R24.

GAME SWITCHES (JOYSTICK) DO NOT FUNCTION

Game paddles function but game switches do not function, check the switch input pins, pins 2, 3 and 4 of Connector J15 and pins 1, 6 and 7 of Connector J8, for good connections. If the connections are good, check IC UC12 by substitution.

The following Basic program can be used to check the operation of the switch input circuit.

```
10 Z = 2  
20 PRINT "SOCKET", "X"  
30 FOR Y = - 16287 TO - 16285  
40 X = PEEK (Y)  
50 PRINT "J15 PIN"; Z, X  
60 Z = Z + 1: NEXT Y  
70 FOR T = 1 TO 500: NEXT T  
80 PRINT: GOTO 10
```

The program repeatedly displays on the Monitor screen the input pin number of Connector J15 being checked with a number X associated with the pin number given. The number X should be 127 or less if Connector J15 pin number shown on the Monitor screen is connected to ground (pin 8 of J15) and 128 or more if the pin is connected to 5.0V (pin 1 of J15).

CHECKING GAME I/O STROBE SIGNAL

Type and run the following Basic program and check for pulses at pin 5 of Connector J15. If pulses are missing, check Decoder/Mux (Multiplexer) IC (UB5), Decoder/Demux (Demultiplexer) IC (UC10), Memory Management Unit IC (UE4) by substitution.

```
1 X = PEEK (- 16320): GOTO 1
```

CC10
APPLE
MODEL Iie

TROUBLESHOOTING (Continued)

DISK II INTERFACE BOARD

If the disk II interface board is not working, check the Disk Drive Connectors (J1 and J2) and Edge Connector J6 for good connections. If the Edge Connector J6 contacts appear dirty, use a pencil eraser to clean them.

If the connectors are normal, check the logic reading at pin 5 of Timer IC (UD2) while turning On the Computer. The logic reading should be High for about .1 second then change to Low. If the reading is incorrect, check Capacitor C1, Resistor R4 and check IC UD2 by substitution.

If IC UD2 circuitry checks normal, turn Off the Computer. Disconnect the Disk Drives from the disk II interface board and plug the disk II interface board into Peripheral Slot (J6). Turn On the Computer, press the CONTROL and RESET keys at the same time to get the Computer into the Basic mode. Type and run the following Basic program. All tests made from this point should be made while the program is running. Press the CONTROL and RESET keys at the same time to stop the program.

DISK II INTERFACE TEST PROGRAM

```
10 X = PEEK (- 16151)
20 X = PEEK (- 16149)
30 X = PEEK (- 16148)
40 X = PEEK (- 16146)
50 X = PEEK (- 16145)
60 X = PEEK (- 16147)
70 FOR Y = - 16153 TO - 16160 STEP - 1
80 X = PEEK (Y)
90 NEXT Y
100 X = PEEK (- 14608): GOTO 20
```

Check for a High logic reading at pin 9 of IC UD2. If the logic reading is not High, check for a High logic reading at pin 9 of Latch IC (UC2). If the logic reading is not High at IC UC2, check IC UC2 by substitution. If the logic reading is High at IC UC2 check for a Low logic reading at pin 6 of IC UB2. If the logic reading is not Low at IC UB2, check IC UB2 by substitution. If the logic reading is Low at IC UB2, check IC UD2 by substitution.

If the logic reading is High at pin 9 of IC UD2, check for 4.9V at pin 16 of Flip/Flop IC (UA3). If 4.9V is missing, check for a Low logic reading at pin 10 of IC UB2. If the reading is not Low at IC UB2, check IC UB2 by substitution. If the reading is Low at IC UB2, check Resistor R6 and R7 and Switch Transistor (Q3).

If 4.9V is present at pin 16 of IC UA3, check for pulses at pin 20 of PROM IC (UD3). If pulses are missing, check Driver Transistor (Q1) and Switch Transistor (Q2) and Resistors R1 and R2.

- GRAPHIC DISPLAY WHEN OS IS BAD!
259 too.
- 74LS05 BAD IS THE MAIN PROBLEM.

If pulses are present at pin 20 of IC UD3, check the waveform at pin 3 of IC UA2. If the waveform is missing, check IC UA2 by substitution.

Check the Head Position Motor Outputs (pins 4, 5, 6 and 7 of IC UC2) by checking for the waveform shown in Figure 3 at pins 4, 5, 6 and 7 of IC UC2. If any of the waveforms are incorrect, check IC UC2 by substitution.

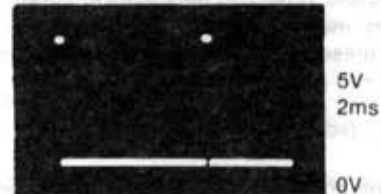


Figure 3

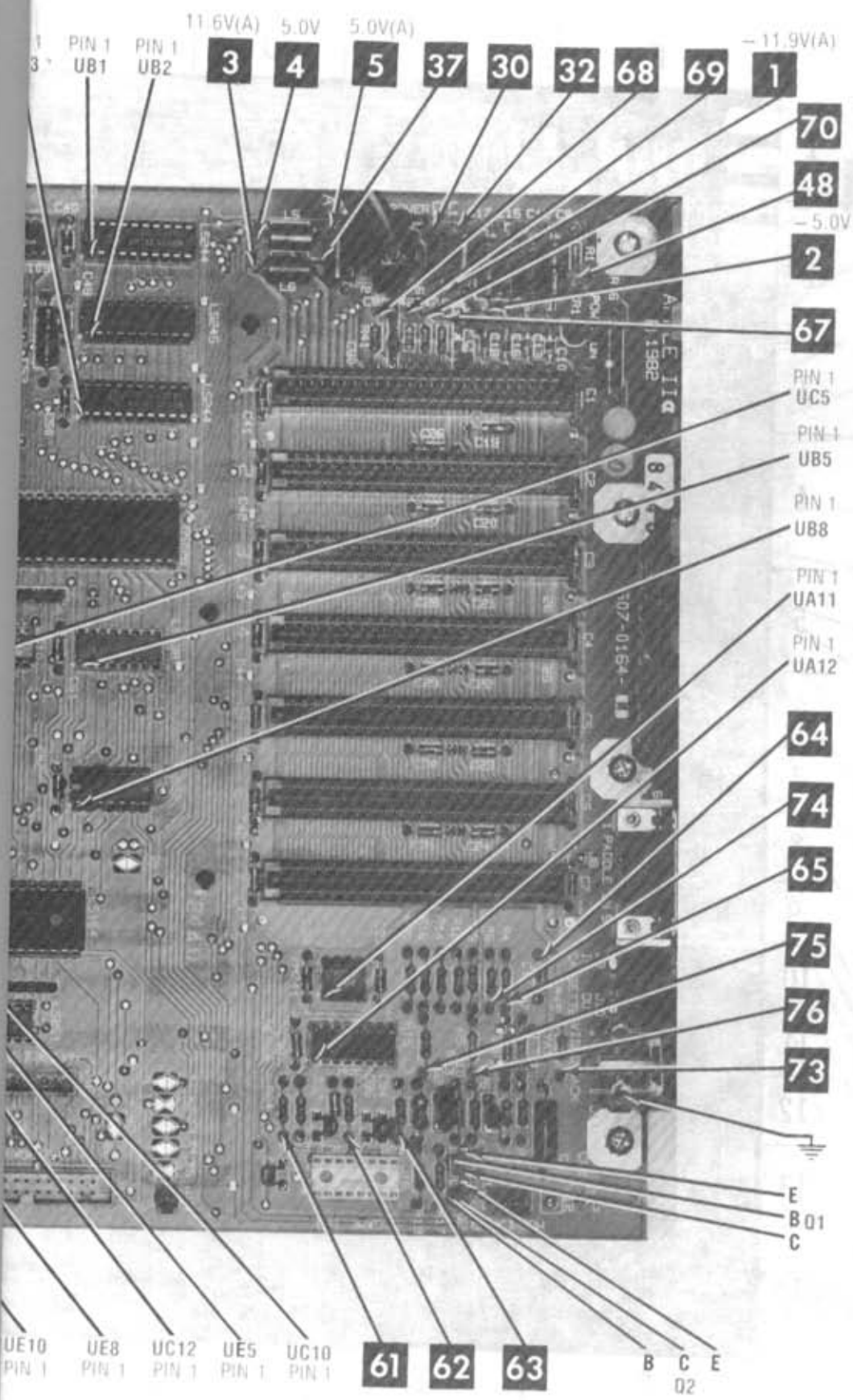
The Disk II Interface Test Program enables Disk Drive 2, pin 6 of IC UA2 logic reading should be Low and pin 10 of IC UC2 logic reading should be High. To enable Disk Drive 1, change the number - 16149 in line 20 to - 16150 and run the program. Pin 8 of IC UA2 and pin 10 of IC UC2 logic reading should be Low with Disk Drive 1 enabled. If the logic reading at pin 10 of IC UC2 is not Low, check IC UC2 by substitution. If the reading at pin 6 or pin 8 of IC UA2 is not Low, check ICs UA2, UD2 and UB2 by substitution.

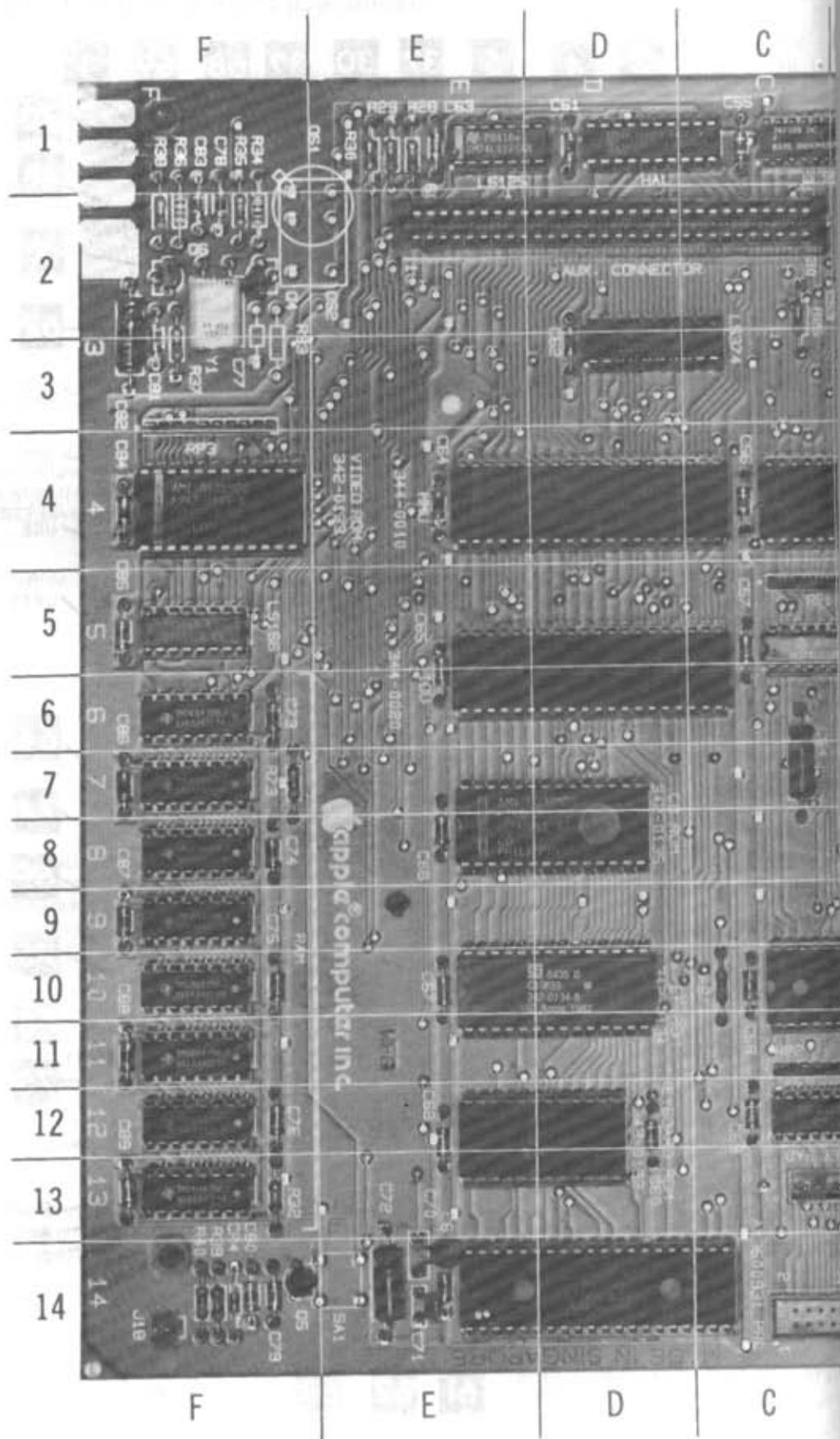
To check the write and read circuits, turn Off the Computer, connect two Disk Drives to the disk II interface board and plug the board into Peripheral Slot (J6). Type and run the Disk II Interface Test Program. Check for pulses on pin 4 of IC UB2 and at pins 11 and 12 of IC UC2. If pulses are missing at pin 4 of IC UB2 and present at pin 12 of IC UC2, check IC UB2 by substitution. If pulses are missing at pins 11 or 12 of IC UC2, check IC UC2 by substitution. If pulses are present at pins 11 and 12 of IC UC2 and the disk II interface board still has write problems, check A3 and PROM IC (UB3) by substitution.

If the disk II interface board has read problems, check for pulses at pins 10 and 11 of IC UA3. If pulses are missing at pins 10 or 11 of IC UA3, check IC UA3 by substitution. If pulses are present at pins 10 and 11 of IC UA3, check for pulses at pins 12 and 11 of IC UA2. If pulses are missing at pin 12 of IC UA2, check IC UB2 by substitution. If pulses are present at pin 12 and missing from pin 11 of IC UA2, check IC UA2 by substitution. If pulses are present at pin 11 of IC UA2, check IC UB3 and Shift Register IC (UC3) by substitution.

If the disk II interface board can not detect the Write Protect signal, pin 11 of IC UC3, when a write protected diskette is being used, check IC UC3 by substitution.

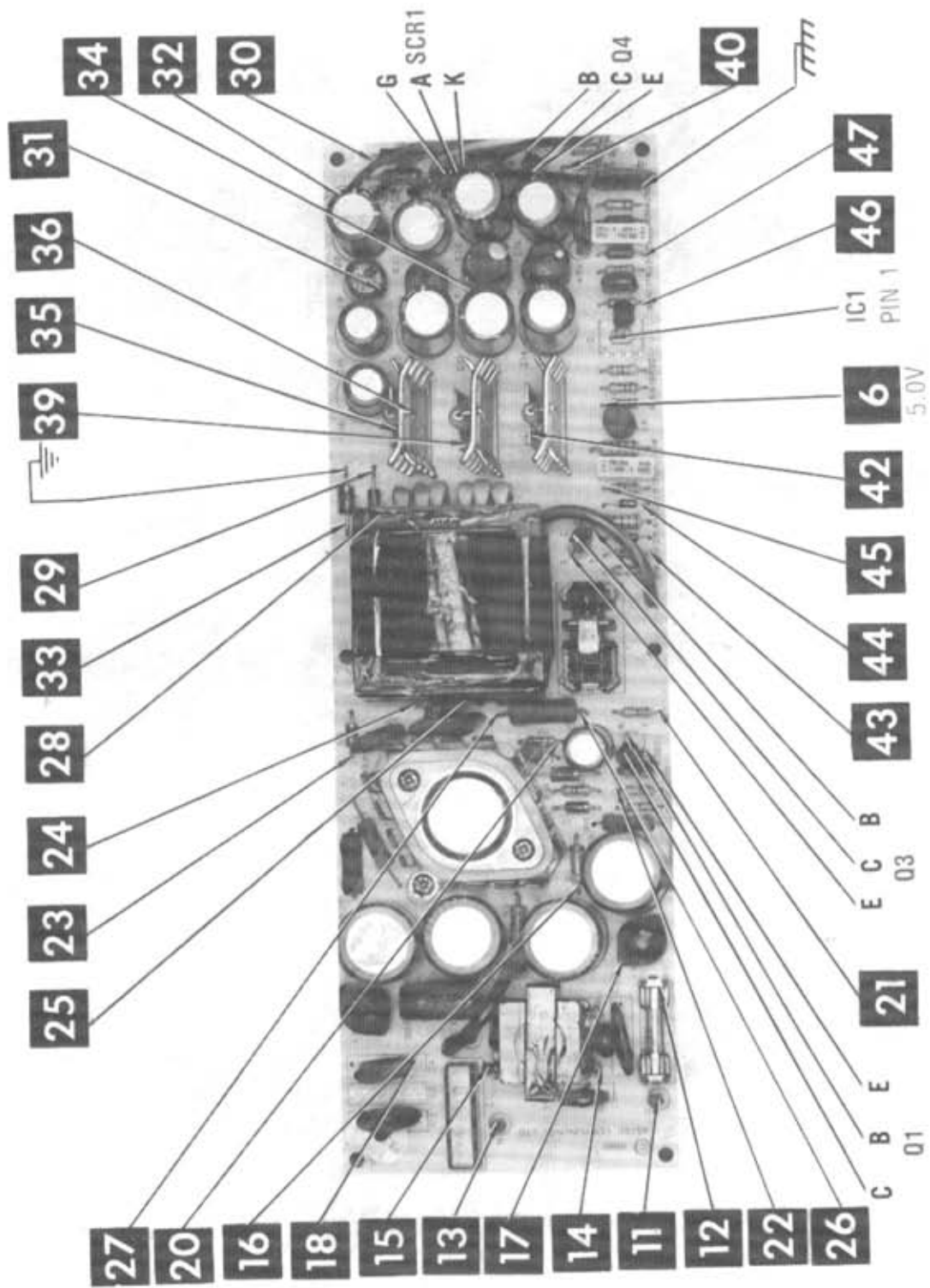
CC10
APPLE
MODEL IIe





MAIN BOARD

A Howard W. Sams **GRIDTRACE™** Photo

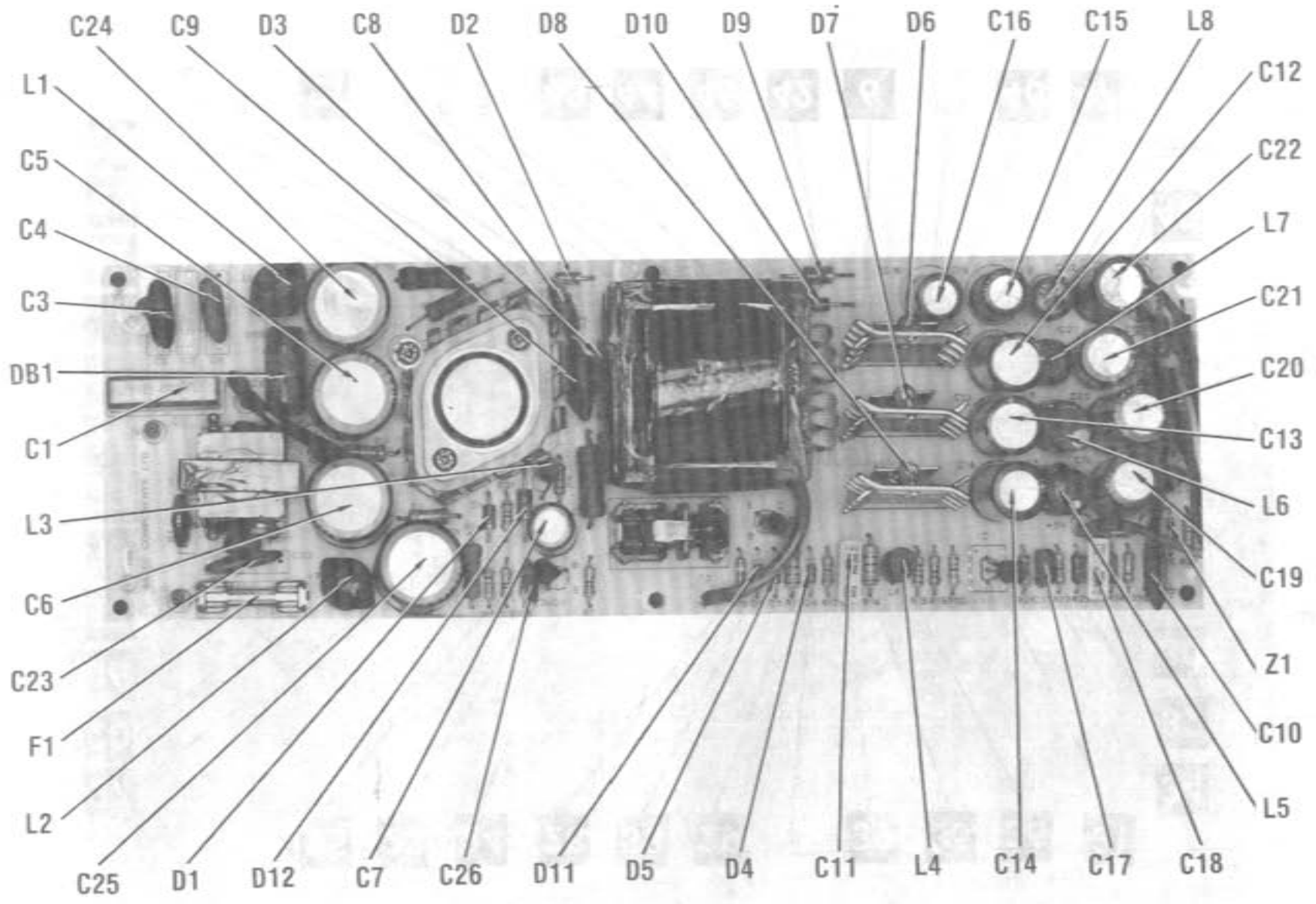


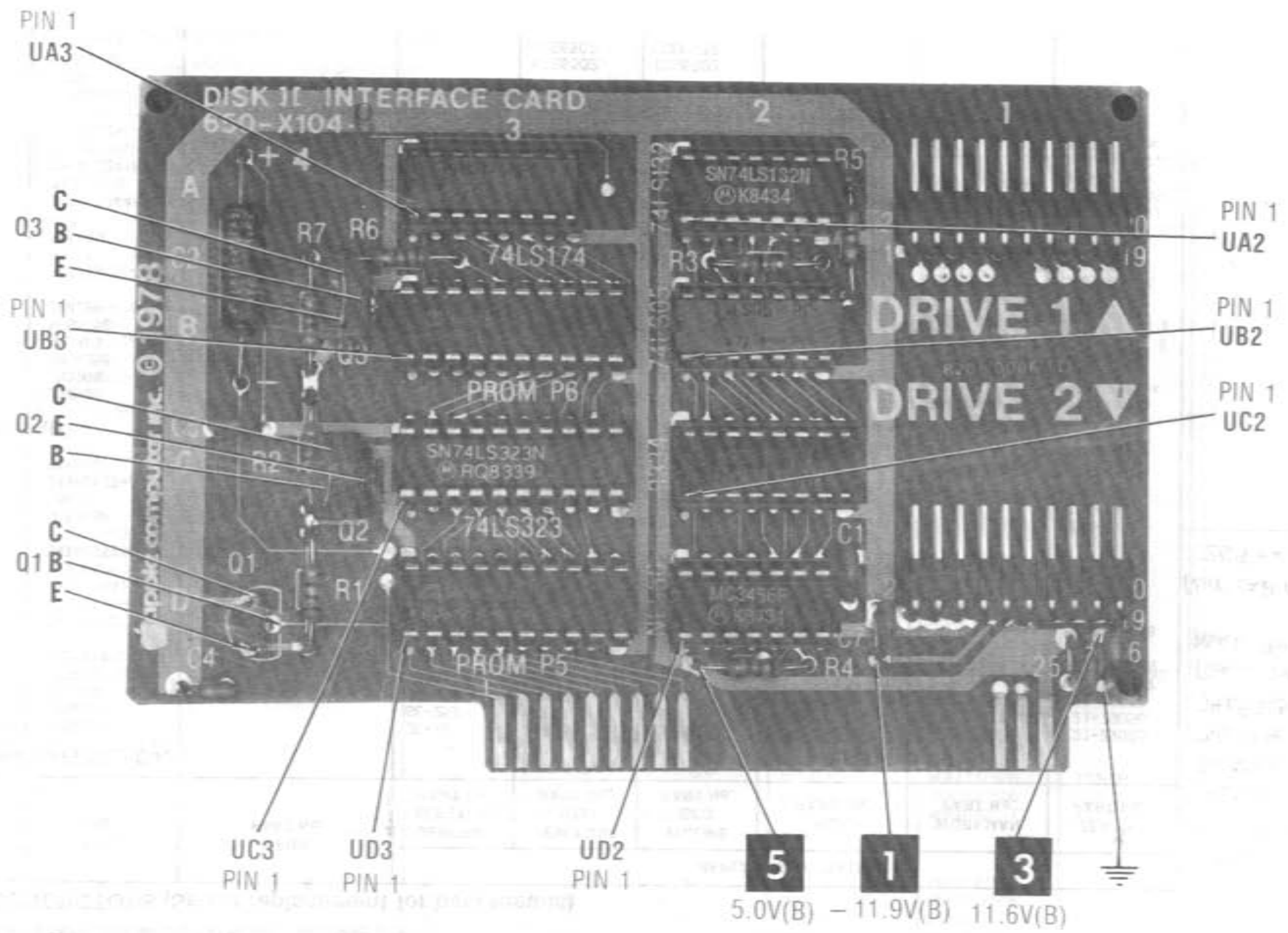
APPLE
MODEL IIe
CC10

3444
FORM 1
10-64

POWER SUPPLY BOARD

14





APPLE MODEL IIe **CC10**

6 PARTS LIST AND DESCRIPTION

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA					
			GENERAL ELECTRIC PART No.	NEW-TONE NTE PART No.	PHILIPS ECG PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
DISK II INTERFACE BOARD								
Q1 Q2,3	2N3906 NSDU51 MPSU51		GE-82 GE-253 GE-218 74LS132 74LS174	NTE159 NTE211 NTE189 NTE74LS132 NTE74LS174	ECG159 ECG211 ECG189 ECG74LS132 ECG74LS174	SK3466/159 SK3203/211 SK3200/189 SK74LS174	WEP62/159 WEP759/211 WEP857/189	121-29003 121-29056 121-C9053 HE-443-792 HE-443-879
UA2 UA3	SN74LS132N 74LS174PC							
UB2 UB3	74LS05PC 341-0128-A 6309 P6A		74LS05	NTE74LS05	ECG74LS05	SK74LS05		HE-443-818
UC2 UC3	N9334N SN74LS523N							
UD2 UD3	MC3456P 556 341-0127-A P5A			NTE978 NTE978	ECG978 ECG978	SK3689/978 SK3689/978		221-29152 221-29152
MAIN BOARD								
Q1 Q2 Q4 Q5 Q6	2N3906 2N3904 MPS4258 MPSA13 MPS4258 2N4258		GE-82 GE-123AP GE-64 GE-82	NTE159 NTE123AP NTE172 NTE159	ECG159 ECG123AP ECG172 ECG159	SK3466/159 SK3854/123AP SK3156/172A SK3466/159	WEP62/159 WEP736/123A WEP971/172 WEP62/159	121-29003 121-29000A 121-29024 121-29003
UA11 UA12	RC741N MM741 NE558N			NTE941M NTE941M NTE926	ECG941M ECG941M ECG926	SK3552/941M SK3552/941M	WEP933/941M WEP933/941M	HE-442-22 HE-442-22
UB1 UB2 UB3 UB5 UB8	SN74LS244N 74LS245N SN74LS244N 74LS138PC SN74S02N	<i>JOYSTICK TIMER</i> <i>CPU ADDR BUFFER</i> <i>CPU DATA BUFFER</i> <i>CPU ADDR BUFFER</i> <i>DECODED/MUX</i>	74LS244 74LS245 74LS244 74LS138 74LS02	NTE74LS244 NTE74LS245 NTE74LS244 NTE74LS138 NTE74LS02	ECG74LS244 ECG74LS245 ECG74LS244 ECG74LS138 ECG74LS02	SK74LS244 SK74LS245 SK74LS244 SK74LS138 SK74LS02		HE-443-791 HE-443-885 HE-443-791 HE-443-877 HE-443-779
UC1 UC4	74F109DC S109 R6502-40 6502B	<i>TIMING FF</i> <i>CPU</i>		NTE6502 NTE6502	ECG6502 ECG6502			

NE556
N9334/74LS259

74LS05
74LS132
74LS174
74LS323

PROG 5 341-027A
PROG 6 341-027A

BLUE CAP BRD =
25902

PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFR. PART No.	REPLACEMENT DATA					
			GENERAL ELECTRIC PART No.	NEW-TONE NTE PART No.	PHILIPS ECG PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
UC5 UC10 UC12	HD74LS10P DM74LS154N SN74LS251NDS	VIDEO ROM (ROM) MAX	74LS10	NTE74LS10 NTE74LS251	ECG74LS10 ECG74LS251	SK74LS10		HE-443-797
UD1 UD3 UE1 UE4 UE5	HAL16R8CN 74LS374N DM74LS125AN 344-0010-B 344-0020-A	341-0170-A(1) HAL VIDEO DATA LATCH MMU I/O	74LS374 74LS125A	NTE74LS374 NTE74LS125A	ECG74LS374 ECG74LS125A	SK74LS125A		HE-443-863 HE-443-811
UE8	342-0135-B 2365 2764	CO-ROM 1/2 CD 342-0135 EF 342-0135						
UE10	C19659 2365 2764	342-0134-B(1) EF-ROM 1/2 CD 342-0304 EF 342-0303						
UE12	342-0132-B 2716	KEYBOARD ROM						
UE14	AY-5-3600-PRO AY3600931PRO	PRO-050(1) KEY ENCODER						
UF4	342-0133-A 2732	VIDEO ROM 1/2 CD 342-0133 1/2 CD 342-0245						
UF5 UF6 Thru UF13	74166N LS166 TMS4164-15NLJ 6664	SHIFT REGISTER DRAM	74166 74LS166	NTE74166 NTE74LS166	ECG74166 ECG74LS166 ECG2164 ECG6664	SK74166		HE-443-892
POWER SUPPLY BOARD								
D1 D2,3 D4,5 D6 Thru D8	RGP10A RGP10J 1N4606		GE-511 GE-511 GE-300	NTE552 NTE552 NTE177	ECG552 ECG552 ECG177	SK5014 SK3318A SK9091/177	WEP172/506 WEP172/506 WEP1062/177	103-287 103-287 103-131
D9 D10 D11 D12	RGP15B RGP10B 1N4606 RGP15B		GE-511 GE-511 GE-300 GE-511	NTE552 NTE552 NTE177 NTE552	ECG552 ECG552 ECG177 ECG552	SK5014 SK9000/552 SK9091/177 SK5014	WEP172/506 WEP172/506 WEP1062/177 WEP172/506	103-287 103-287 103-131 103-287

APPLE
MODEL IIe

CC10

81 PARTS LIST AND DESCRIPTION (Continued)

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

SEMICONDUCTORS (Select replacement for best results)

ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA					
			GENERAL ELECTRIC PART No.	NEW-TONE NTE PART No.	PHILIPS ECG PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
DB1	KBPO8		GEBR-1000	NTE170	ECG170	SK3649/170	WEP1056/170	212-Z9002
IC1	T18231							
Q1	2SD467B		GE-243*	NTE85	ECG85	SK3449/297	WEP59/128*	121-792*
Q2								
Q3,4	2S8621R		GE-48	NTE294	ECG294	SK3841/294	WEP916/294	121-Z9067
SCR1	2N6395		2N6395	NTE5552	ECG5552	SK3574		
Z1	A211		GEZD-11	NTE5020A	ECG5020A	SK11A/5020A	WEP1421/5020	103-279-20

(1) Number on unit.

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

RETURN

PARTS LIST AND DESCRIPTION (Continued)

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

CAPACITORS

Item numbers not listed are normally available at local distributors.

ITEM No.	RATING	MFGR. PART No.
MAIN BOARD		
C70	47 N470 50V 5%	

ITEM No.	RATING	MFGR. PART No.
POWER SUPPLY BOARD		
C1	.1 125VAC	
C3	.0022 400VAC	
C4	.0022 400VAC	

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NEW-TONE PART No.	WORKMAN PART No.
MAIN BOARD				
RP1	Resistor Network (1)	111-0017 (3)		
RP2	Resistor Network (2)	CRL-HC3110102M		
		(3)		
RP3	Resistor Network (1)	111-0017 (3)		
POWER SUPPLY BOARD				
R1	NTC 5 Cold			
R23	2700 2% 1/4W Metal Film		QW227	22-2246
R24	2700 2% 1/4W Metal Film		QW227	22-2246
VDR1	VDR	TNRG471K (1)		

APPLE
MODEL Iie

(1) Number on unit.

COILS (RF-IF)

ITEM No.	FUNCTION	MFGR. PART No.
MAIN BOARD		
L1	RF Choke	
L2	RF Choke	
L3	RF Choke	
L4	RF Choke	
L5	RF Choke	
L6	RF Choke	

ITEM No.	FUNCTION	MFGR. PART No.
POWER SUPPLY BOARD		
L1	RF Choke	
L2	RF Choke	
L3	RF Choke	
L4	RF Choke	
L5	RF Choke	
L6	RF Choke	
L7	RF Choke	
L8	RF Choke	
L99	Line Choke	
T1	AC Line Choke	

PARTS LIST AND DESCRIPTION (Continued)

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

TRANSFORMERS

ITEM No.	FUNCTION	REPLACEMENT DATA		
		MFGR. PART No.	OTHER IDENTIFICATION	
POWER SUPPLY BOARD				
T2 T3	Switching Power Switching Driver			

SPEAKER

ITEM No.	TYPE	REPLACEMENT DATA		NOTES
		MFGR. PART No.	QUAM PART No.	
SP1	2 1/4" PM, 8 Ohms			

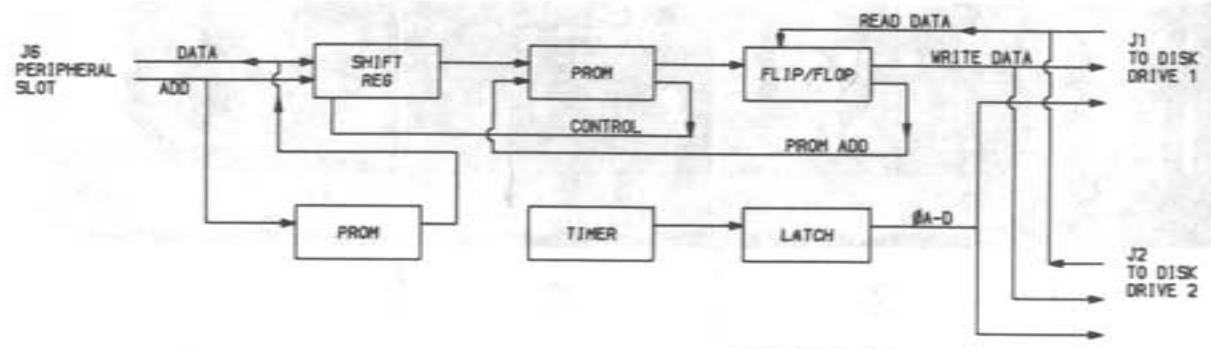
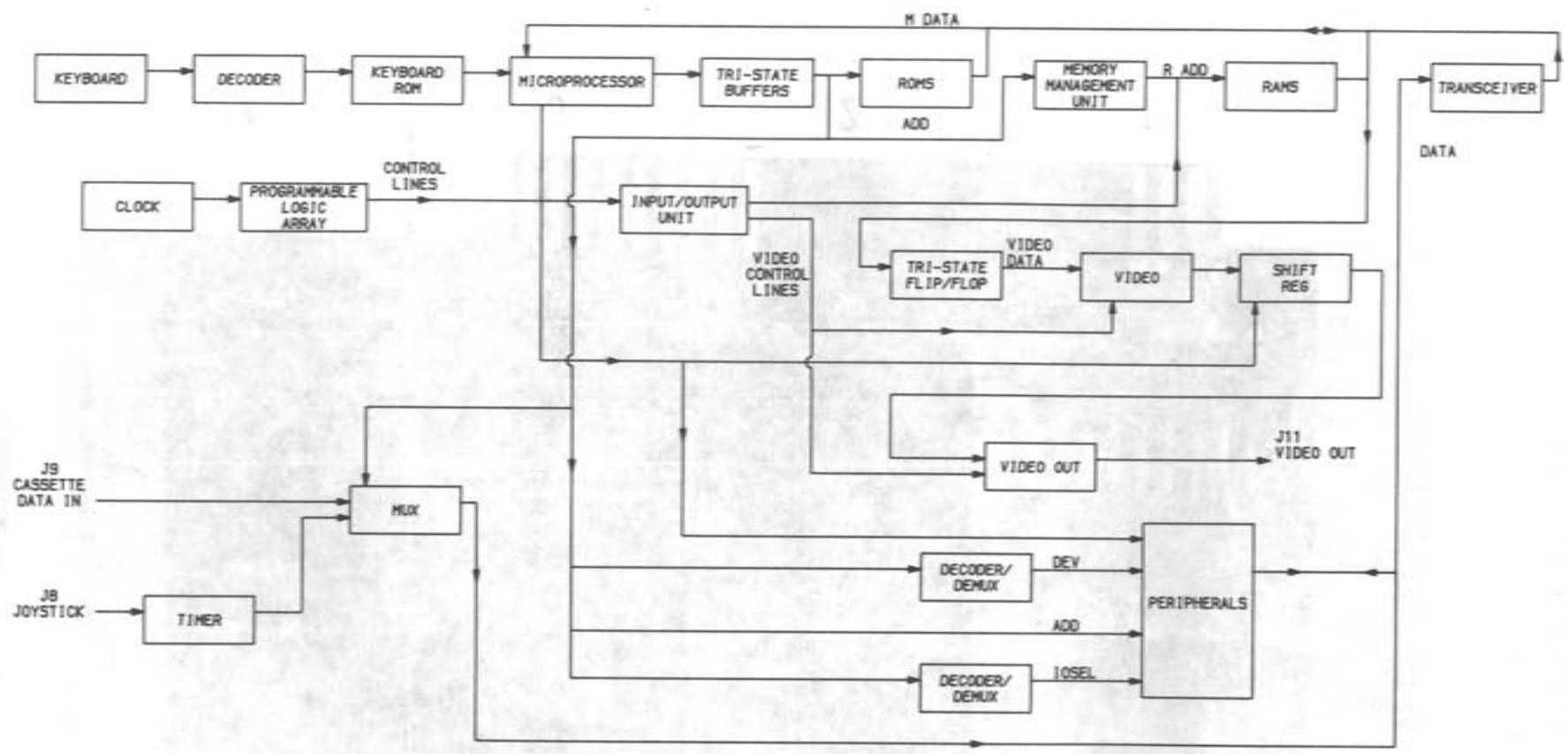
FUSE DEVICES

ITEM NO.	DESCRIPTION	MFGR. PART NO.		NOTES
		DEVICE	HOLDER	
F1	2.75A @ 125V Fast-Acting			

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
KEYBOARD			
PL1 S1 thru S63	Lamp Switch		Power Part of Keyboard
MAIN BOARD			
CR1 CR2 Y1	LED LED Crystal		Power, Red (1.8V @ 10mA) Audio Test, Red (1.8V @ 10mA) 14.31818MHz
POWER SUPPLY BOARD			
S1	Switch		Power

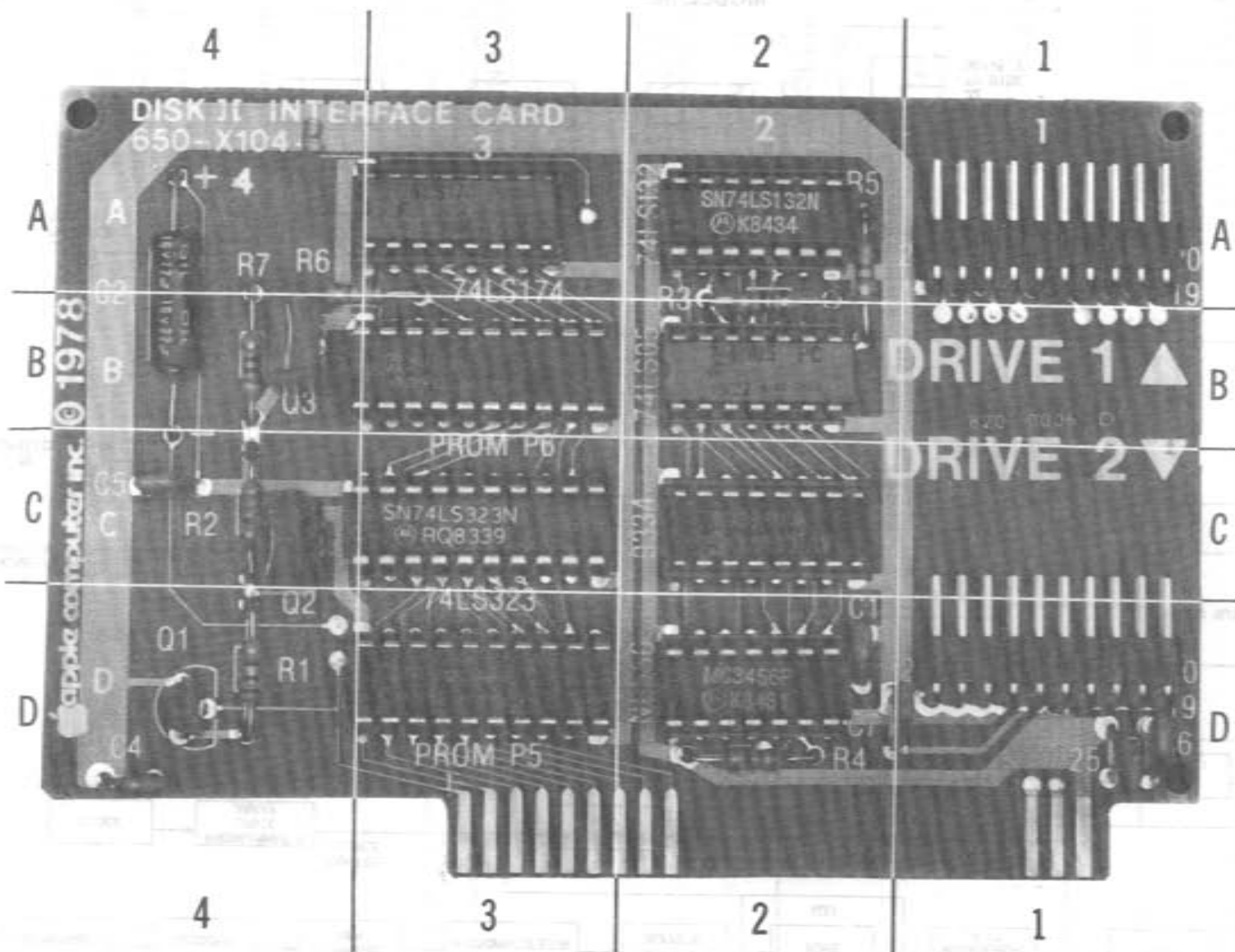
CABINET & CABINET PARTS (When ordering specify model, chassis & color)



APPLE
MODEL IIe

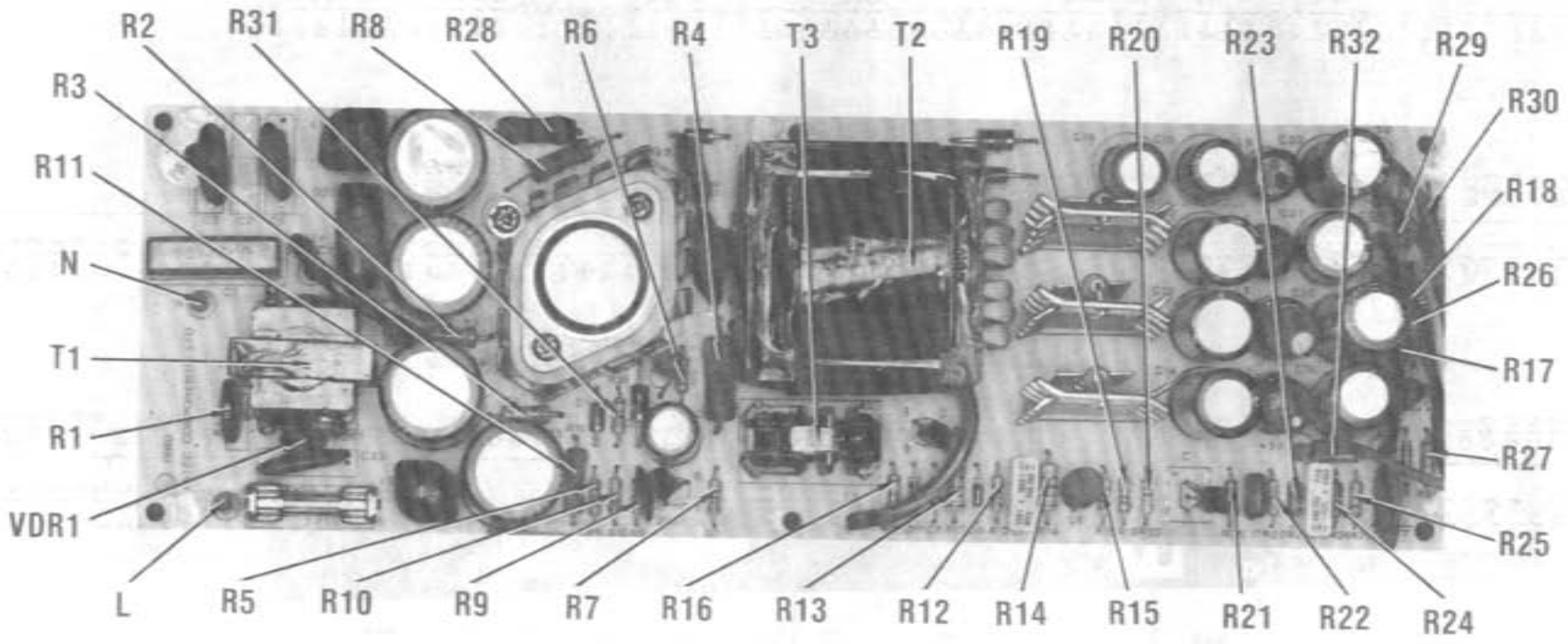
BLOCK DIAGRAM

REGAN



DISK II INTERFACE BOARD
GridTrace
LOCATION GUIDE

C1	D-2
C2	B-4
C3	D-1
C4	D-4
C5	C-4
C6	D-1
C7	D-1
J1	A-1
J2	D-1
J6	D-3
Q1	D-4
Q2	C-4
Q3	B-4
R1	D-4
R2	C-4
R3	B-2
R4	D-2
R5	A-2
R6	A-4
R7	B-4
UA2	A-2
UA3	A-3
UB2	B-2
UB3	B-3
UC2	C-2
UC3	C-3
UD2	D-2
UD3	D-3



POWER SUPPLY BOARD

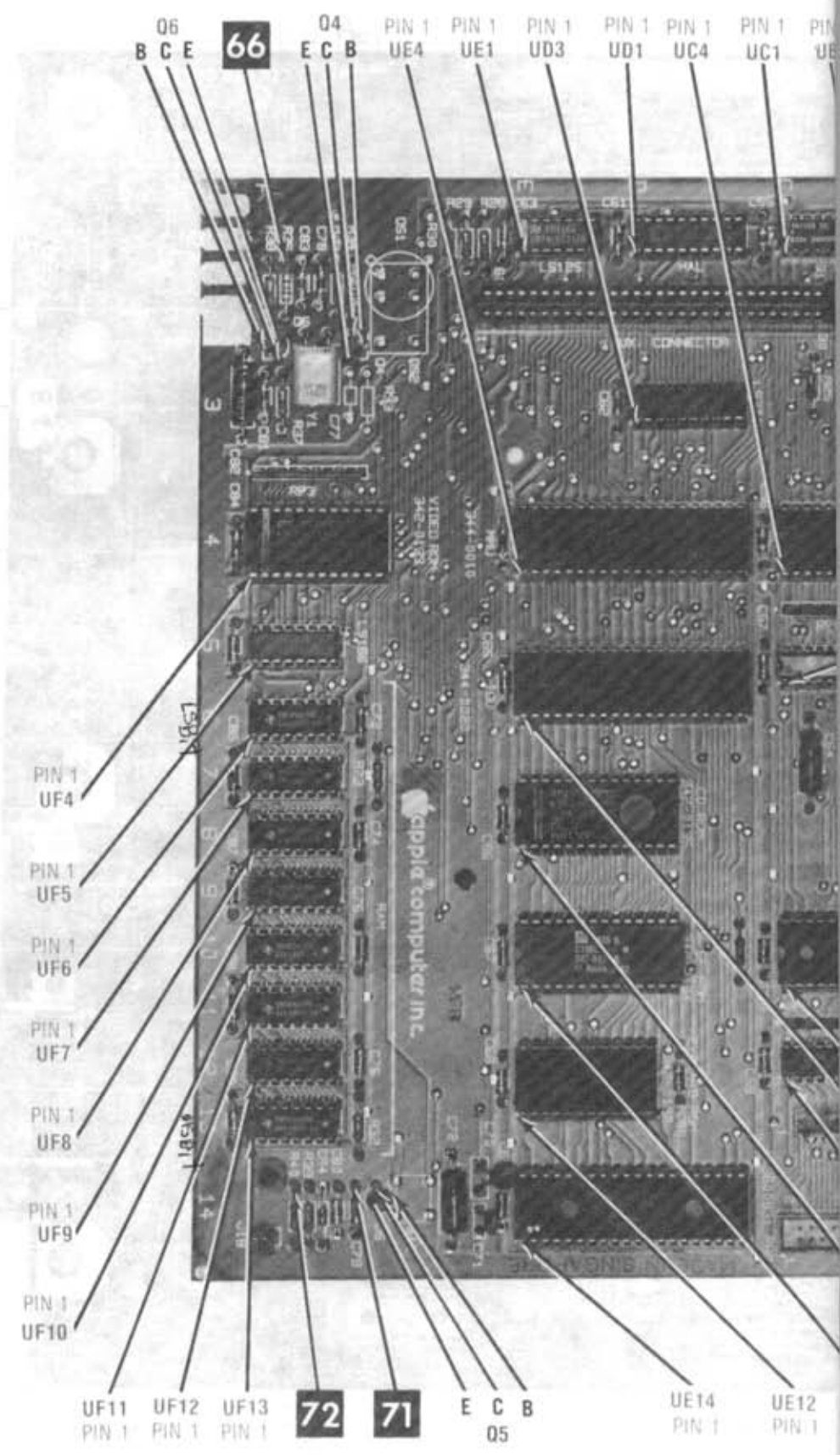
APPLE
MODEL IIe

REEMAN

MAIN BOARD GridTrace LOCATION GUIDE

C1	A-3	C76	F-12	R27	C-10
C2	A-3	C78	F-2	R28	E-1
C3	A-4	C79	F-14	R29	E-1
C4	A-5	C80	F-14	R30	E-1
C5	A-6	C81	F-3	R32	F-13
C6	A-8	C82	F-3	R34	F-2
C7	A-9	C83	F-2	R35	F-2
C8	A-14	C84	F-4	R36	F-2
C9	A-1	C85	F-5	R37	F-3
C10	A-1	C86	F-7	R38	F-2
C11	A-11	C87	F-9	R39	F-14
C12	A-1	C88	F-11	R40	F-14
C13	A-2	C89	F-13	R41	A-2
C15	A-1	C90	A-2	R42	A-2
C16	A-2	C91	A-2	R43	A-1
C17	A-1	C92	A-1	R44	A-1
C18	A-2	C93	A-1	R45	A-12
C19	A-3	CR1	A-2	R73	F-7
C20	A-4	CR2	A-14	RP1	C-5
C21	A-5	CR4	F-14	RP2	C-11
C22	A-6	J0	D-2	RP3	F-4
C23	A-7	J1	A-2	UA11	A-11
C24	A-8	J2	A-4	UA12	A-12
C25	A-13	J3	A-4	RB1	B-1
C26	A-3	J4	A-5	UB2	B-2
C27	A-4	J5	A-6	UB3	B-3
C28	A-5	J6	A-8	UB5	B-5
C29	A-6	J7	A-9	UB8	B-8
C30	A-7	J8	A-9	UC1	C-1
C31	A-8	J9	A-11	UC4	B-4
C32	A-13	J10	A-11	UC5	C-5
C33	A-11	J11	A-13	UC10	C-10
C34	A-14	J13	A-14	UC12	C-12
C35	A-15	J14	A-1	UD1	D-1
C36	A-13	J15	A-14	UD3	D-3
C37	A-13	J16	B-13	UE1	E-1
C38	A-11	J17A	B-14	UE4	D-4
C39	A-12	J18	F-14	UE5	D-6
C40	A-14	J19	B-14	UE8	D-8
C41	A-3	L1	A-1	UE10	D-10
C42	A-4	L2	A-1	UE12	E-12
C43	A-4	L3	A-13	UE14	D-14
C44	A-5	L4	A-1	UF4	F-4
C45	A-6	L5	A-1	UF5	F-5
C46	A-8	L6	A-1	UF6	F-6
C47	A-9	Q1	A-14	UF7	F-7
C48	B-1	Q2	A-14	UF8	F-8
C49	B-2	Q4	F-2	UF9	F-9
C50	B-3	Q5	F-14	UF10	F-10
C51	B-5	Q6	F-2	UF11	F-11
C52	B-7	R1	A-1	UF12	F-12
C53	B-2	R3	A-12	UF13	F-13
C54	C-6	R4	A-11	X1	B-13
C55	C-1	R5	A-12	X2	B-13
C56	C-4	R6	A-11	X3	B-14
C57	C-5	R7	A-12	X4	B-14
C58	C-10	R8	A-13	X5	B-15
C59	C-12	R9	A-11	X6	B-14
C60	D-12	R10	A-13	X7	B-9
C61	D-1	R11	A-13	Y1	F-2
C62	D-3	R12	A-11		
C63	E-1	R13	A-13		
C64	E-4	R14	A-11		
C65	E-5	R15	A-12		
C66	E-8	R16	A-1		
C67	E-10	R17	A-14		
C68	E-12	R18	A-11		
C69	E-14	R19	A-14		
C70	E-14	R20	A-11		
C71	E-14	R21	A-13		
C72	E-14	R22	A-13		
C73	F-6	R23	A-13		
C74	F-8	R24	A-13		
C75	F-10	R25	C-2		

W4059



MAIN BOARD

REGAN

LOGIC CHART MAIN BOARD LOGIC

PIN NO.	IC UA11	IC UA12	IC UB1	IC UB2	IC UB3	IC UB5	IC UB8	IC UC1	PIN NO.	IC UC4	PIN NO.	IC UC4	PIN NO.	IC UC5
1	P	H	L	L	L	P	L	H	1	L	21	L	1	P
2	L	*	P	P	P	P	H	H	2	H	22	L	2	P
3	L	H	P	P	P	P	L	L	3	P	23	L	3	P
4	P	H	P	P	P	P	P	P	4	H	24	P	4	H
5	P	H	P	P	P	P	P	H	5	*	25	P	5	H
6	P	H	P	P	P	P	L	P	6	H	26	P	6	P
7	H	*	P	P	P	P	L	P	7	P	27	P	7	L
8	*	H	P	P	L	L	L	L	8	H	28	P	8	H
9		H	P	P	P	H	P	P	9	P	29	P	9	L
10		*	L	L	L	H	H	P	10	P	30	P	10	H
11		H	P	P	P	H	H	H	11	P	31	P	11	H
12		L	P	P	P	H	H	P	12	P	32	P	12	H
13		H	P	P	P	H	L	P	13	P	33	P	13	P
14		H	P	P	P	H	H	P	14	P	34	P	14	H
15		*	P	P	L	H	P	H	15	P	35	*		
16		H	P	P	P	H		H	16	P	36	*		
17			P	P	L				17	P	37	P		
18			P	P	P				18	P	38	H		
19			L	P	L				19	P	39	P		
20			H	H	H				20	L	40	H		

PIN NO.	IC UC10	IC UC12	IC UD1	IC UD3	IC UE1	PIN NO.	IC UE4	PIN NO.	IC UE4	PIN NO.	IC UE5	PIN NO.	IC UE5
1	P	*	P	P	P	1	L	21	P	1	L	21	P
2	H	L	P	P	P	2	P	22	L	2	L	22	P
3	H	L	P	P	P	3	P	23	P	3	P	23	P
4	H	H	P	P	L	4	P	24	P	4	P	24	P
5	H	P	P	P	P	5	P	25	H	5	P	25	P
6	H	*	P	P	P	6	P	26	P	6	H	26	P
7	H	H	H	P	L	7	P	27	P	7	L	27	P
8	H	L	H	P	H	8	P	28	P	8	L	28	H
9	H	P	H	P	P	9	P	29	P	9	P	29	P
10	H	P	L	L	P	10	P	30	P	10	L	30	P
11	H	P	L	P	P	11	P	31	P	11	L	31	L
12	L	H	P	P	P	12	P	32	P	12	H	32	L
13	H	H	P	P	L	13	P	33	P	13	H	33	P
14	H	H	P	P	H	14	P	34	P	14	P	34	P
15	H	H	P	P		15	H	35	P	15	H	35	P
16	H	H	P	P		16	H	36	P	16	*	36	P
17	H		P	P		17	H	37	P	17	P	37	H
18	P		P	P		18	P	38	P	18	P	38	P
19	P		P	P		19	H	39	P	19	P	39	P
20	P		H	H		20	P	40	P	20	P	40	P
21	P												
22	P												
23	P												
24	H												

APPLE
MODEL IIe

NOTE: Logic probe readings taken in Power Up mode, without Disk II Interface Board inserted, no keys pressed unless otherwise noted.

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

(1) Probe indicates L when CONTROL key is pressed.

- (2) Probe indicates L when SHIFT key is pressed.
- (3) Probe indicates H when any key is pressed except the CONTROL, SHIFT, CAPS LOCK, RESET and APPLE keys.
- (4) Probe indicates P when any key is pressed except the CONTROL, SHIFT, CAPS LOCK, RESET and APPLE keys.
- (5) Probe indicates H when CAPS LOCK key is up.
- (6) Readings taken after pressing SPACE bar.

LOGIC CHART (Continued)
MAIN BOARD LOGIC (Continued)

PIN NO.	IC UE8	PIN NO.	IC UE8	PIN NO.	IC UE10	PIN NO.	IC UE10	PIN NO.	IC UE12	PIN NO.	IC UE12	PIN NO.	IC UE14	PIN NO.	IC UE14
1	H	15	P	1	H	15	P	1	L(6)	13	P	1	P	21	L
2	P	16	P	2	P	16	P	2	L(6)	14	P	2	P	22	L
3	P	17	P	3	P	17	P	3	L(6)	15	P	3	P	23	L
4	P	18	P	4	P	18	P	4	H(6)	16	P	4	L	24	L
5	P	19	P	5	P	19	P	5	L(6)	17	H	5	L(3)	25	L
6	P	20	L	6	P	20	L	6	L(6)	18	L	6	L(6)	26	L
7	P	21	P	7	P	21	P	7	H(6)	19	L	7	L(6)	27	L
8	P	22	P	8	P	22	H	8	H(6)	20	P	8	H(6)	28	H(1)
9	P	23	P	9	P	23	P	9	P	21	H	9	L(6)	29	H(2)
10	P	24	P	10	P	24	P	10	P	22	L(5)	10	L(6)	30	H
11	P	25	P	11	P	25	P	11	P	23	H(6)	11	L(6)	31	L
12	P	26	H	12	P	26	H	12	L	24	H	12	H(6)	32	P
13	P	27	H	13	P	27	H					13	H(6)	33	P
14	L	28	H	14	L	28	H					14	H(6)	34	P
												15	L	35	P
												16	L(4)	36	P
												17	L	37	P
												18	L	38	P
												19	L	39	P
												20	L	40	P

PIN NO.	IC UF4	PIN NO.	IC UF4	PIN NO.	IC UF5	IC UF6	IC UF7	IC UF8	IC UF9	IC UF10	IC UF11	IC UF12	IC UF13
1	P	13	P	1	P	H	H	H	H	H	H	H	H
2	P	14	P	2	P	P	P	P	P	P	P	P	P
3	P	15	P	3	P	P	P	P	P	P	P	P	P
4	P	16	P	4	P	P	P	P	P	P	P	P	P
5	P	17	P	5	P	P	P	P	P	P	P	P	P
6	P	18	L	6	P	P	P	P	P	P	P	P	P
7	P	19	P	7	P	P	P	P	P	P	P	P	P
8	P	20	P	8	L	H	H	H	H	H	H	H	H
9	P	21	L	9	H	P	P	P	P	P	P	P	P
10	P	22	P	10	P	P	P	P	P	P	P	P	P
11	P	23	P	11	P	P	P	P	P	P	P	P	P
12	L	24	H	12	P	P	P	P	P	P	P	P	P
				13	P	P	P	P	P	P	P	P	P
				14	P	P	P	P	P	P	P	P	P
				15	P	P	P	P	P	P	P	P	P
				16	H	L	L	L	L	L	L	L	L

NOTE: Logic probe readings taken in Power Up mode, without Disk II Interface Board inserted, no keys pressed unless otherwise noted.

Logic Probe Display

L = Low

H = High

P = Pulse

* = Open (No light On)

- (1) Probe indicates L when CONTROL key is pressed.
- (2) Probe indicates L when SHIFT key is pressed.
- (3) Probe indicates H when any key is pressed except the CONTROL, SHIFT, CAPS LOCK, RESET and APPLE keys.
- (4) Probe indicates P when any key is pressed except the CONTROL, SHIFT, CAPS LOCK, RESET and APPLE keys.
- (5) Probe indicates H when CAPS LOCK key is up.
- (6) Readings taken after pressing SPACE bar.

RELEANN

LOGIC CHART (Continued) DISK II INTERFACE BOARD LOGIC

PIN NO.	IC UA2	IC UA3	IC UB2	IC UB3	IC UC2	IC UC3	IC UD2	IC UD3
1	P	H	L	P	P	P	L	P
2	H	P	H	P	P	P	H	P
3	P	P	P	P	P	P	H	P
4	H	P	H	P	L	P	H	P
5	L	P	P	P	L	P	L	P
6	H	P	L	P	L	P	H	P
7	L	P	L	P	L	P	L	P
8	L	L	P	P	L	P	L	P
9	H	P	L	P	P	P	H	P
10	H	P	L	L	L	L	H	L
11	P	P	H	P	P	L	H	P
12	P	P	P	P	P	P	L	P
13	P	P	P	P	P	P	•	P
14	H	P	H	P	P	P	H	P
15		P		L	H	P		H
16		H		L		P		L
17				P		P		P
18				P		P		P
19				P		P		P
20				H		H		L

APPLE
MODEL IIe

NOTE: Logic probe readings taken while running the following program.

```

10 D$ = CHR$(4)
20 PRINT D$; "OPEN SAMS"
30 PRINT D$; "WRITE SAMS"
40 FOR X = 1 TO 50
50 PRINT "THIS IS A TEST"
60 NEXT X
70 PRINT D$; "CLOSE"
80 GOTO 20

```

Logic Probe Display
L = Low
H = High
P = Pulse
• = Open (No light On)

SAFETY PRECAUTIONS

1. Use an isolation transformer for servicing.
2. Maintain AC line voltage at rated input.
3. Remove power from the Computer 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 power On.
8. Do not use freon-propelled sprays. These can generate electrical charges sufficient to damage semiconductor devices.
9. The Computer cabinet is equipped with vents to prevent heat build-up. Never block, cover, or obstruct these vents.
10. 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.
11. Never expose the Computer to water. If exposed to water, turn the unit Off. Do not place the Computer near possible water sources.
12. Never leave the Computer unattended or plugged into the AC outlet for long periods of time. Remove AC plug from AC outlet during lightning storms.
13. Never use liquids or aerosols directly on the Computer. Spray on cloth and then apply to the Computer cabinet. Make sure the Computer is disconnected from the power line.

SCHEMATIC NOTES

—X— Circuitry not used in some versions

--- Circuitry used in some versions

• See parts list

⊕ Ground

/// Chassis

Waveforms and voltages taken from ground, unless noted otherwise

Voltages, Waveforms and Logic Probe readings for main board taken with Computer in Power Up mode, no keys pressed, unless otherwise noted.

Voltages, Waveforms and Logic Probe readings for disk II interface board taken while running the following Basic program.

```
10 DS = CHR$(4)
20 PRINT D$; "OPEN SAMS"
30 PRINT D$; "WRITE SAMS"
40 FOR X = 1 TO 50
50 PRINT "THIS IS A TEST"
60 NEXT X
70 PRINT D$; "CLOSE"
80 GOTO 20
```

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

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

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

Supply voltages maintained as shown at input.

Voltages measured with digital meter, no signal.

Controls adjusted for normal operation.

Terminal identification may not be found on unit.

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

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

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

Value in () used in some versions.

Measurements with switching as shown, unless noted.

Logic Probe Display

L = Low

H = High

P = Pulse

* = Open (No light On)

- (1) Probe indicates L when CONTROL Key is pressed.
- (2) Probe indicates L when SHIFT key is pressed.
- (3) Probe indicates H when any key is pressed except the CONTROL, SHIFT, CAPS LOCK, RESET and APPLE keys.
- (4) Probe indicates P when any key is pressed except the CONTROL, SHIFT, CAPS LOCK, RESET and APPLE keys.
- (5) Probe indicates H when CAPS LOCK key is up.
- (6) Readings taken after pressing SPACE bar.
- (7) Logic readings not taken.

R. E. ...

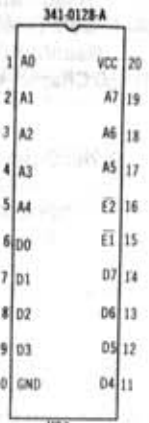
LINE DEFINITIONS

A0 Thru A15	Address Lines	Q3	General Purpose Clock
AKD	Acknowledge	RA0 Thru RA7, RA9, RA10	
ALTVID		RDY	Ready
AN0 Thru AN3		RESET	Reset
CASEN	Cassette Enable	READ DATA	Read Data
CAPLOCK	Capital (Letter) Lock	ROMEN1, ROMEN2	ROM Enable Lines
CLKEN	Clock Enable	R/W	Read/Write
CLRGATE	Clear Gate	R/W80	Read/Write 80 Character
CNTL	Control	SEGA	
COXX		SEGB	
CO6X, CO7X		SEROUT	Serial Output
CXXX		SHFT	Shift
DMA	Direct Memory Access	SPKR	Speaker
D0 Thru D7	Data Lines	STB	Strobe
DEV1 Thru DEV7	Peripheral Device Select	SW0/OAPL	
ENABLE1, ENABLE2	Enable	SW1/CAPL	Switch Capital
ENKBD	Enable Keyboard	SW2	
ENTMG		SYNC	Sync
ENVID	Enable Video	VC	
EN80	Enable 80 Character Width	VID0 Thru VID7	
FRCTXT		VID7M	
GR	Graphics	WNDW	Window
H0	Horizontal 0	WRITE DATA	Write Data
I/OSTROBE	Input/Output Strobe	WRITE PROTECT	Write Protect
INH		WRITE REQ	Write Request
IOSEL	Input/Output Select	X0 Thru X7	
IRQ	Input Request	Y0 Thru Y9	
KBD	Keyboard	3.58M	3.58MHz
KSTRB		7M	7MHz
LDPS	Load Parallel to Serial	14M	14MHz
MD0 Thru MD7	Buffered Data Lines	80VID	80 Character Video
MD IN/OUT	Buffered Data Input/Output	μ PSYNC	
MOTOR ON	Motor On	O0	Phase 0
MR	Memory Read	O1	Phase One
NMI	Non-Maskable Interrupt	OA	Phase A
PDL0 Thru PDL3	Game Paddle Lines	OB	Phase B
PCAS		OC	Phase C
PRAS		OD	Phase D

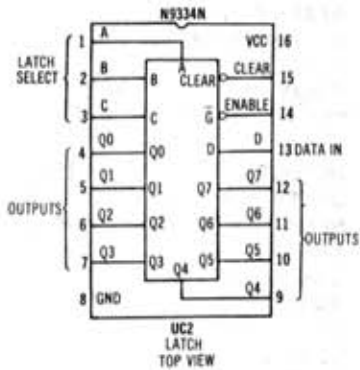
Any Bar above any alphabetical or numerical combination indicates line level in a low (0) state.

APPLE
MODEL IIe

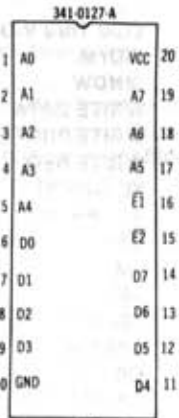
DISK II INTERFACE BOARD



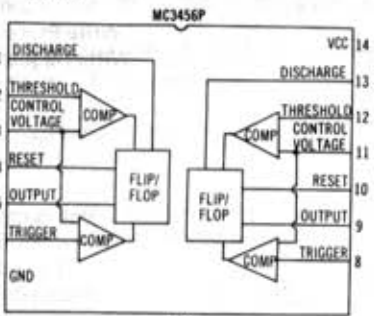
UB3 PROM TOP VIEW



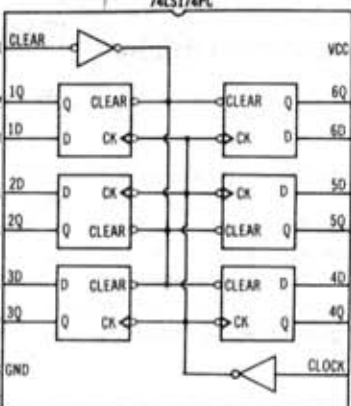
UC2 LATCH TOP VIEW



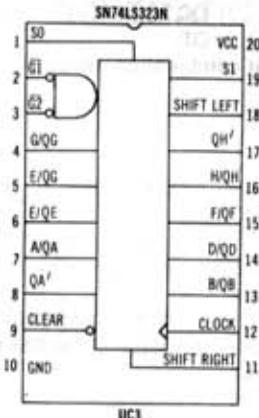
UB3 PROM TOP VIEW



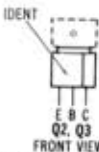
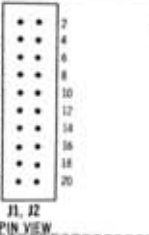
UD2 TIMER TOP VIEW



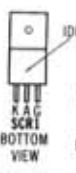
UA3 FLIP/FLOP TOP VIEW



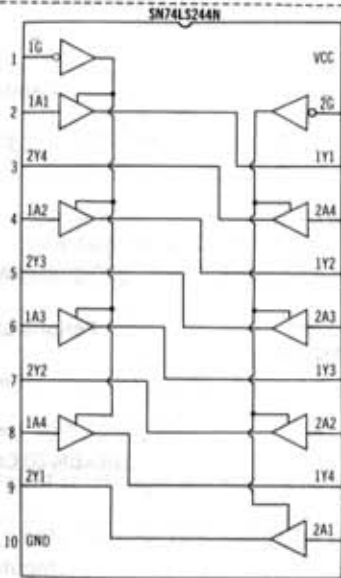
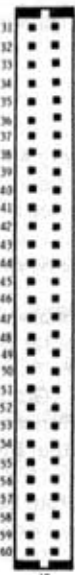
UC3 SHIFT REGISTER TOP VIEW



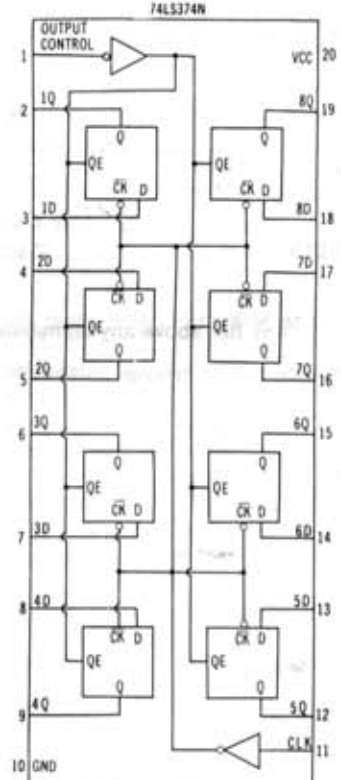
POWER SUPPLY



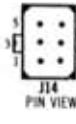
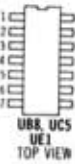
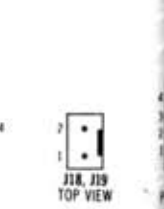
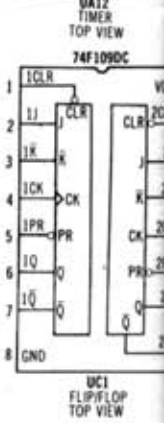
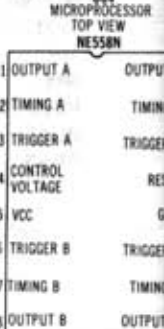
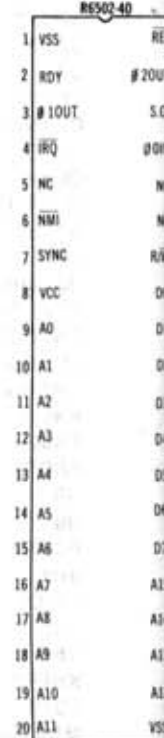
MAIN BOARD



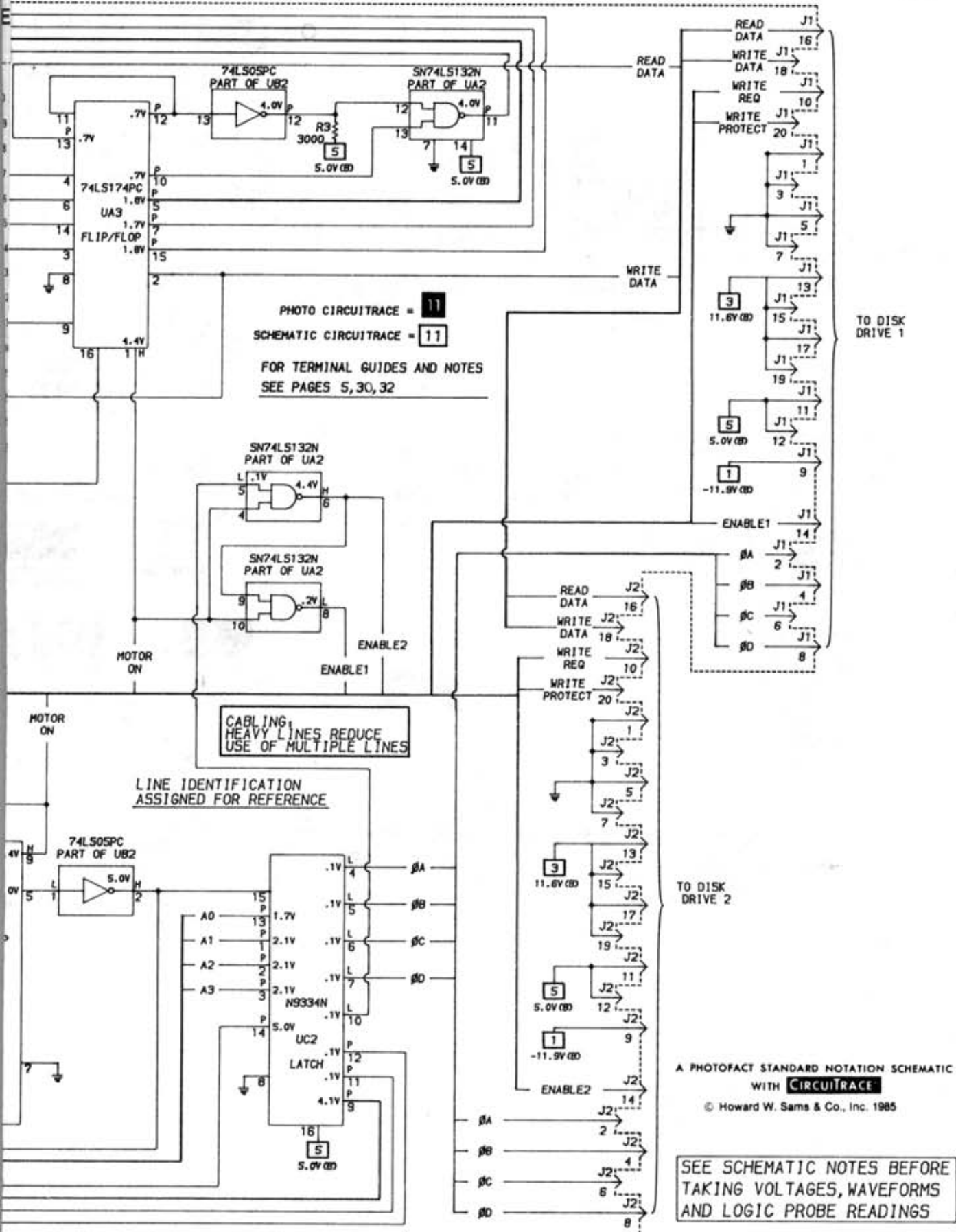
UB1, UB3 TRI-STATE BUFFER TOP VIEW



UA4 MICROPROCESSOR TOP VIEW



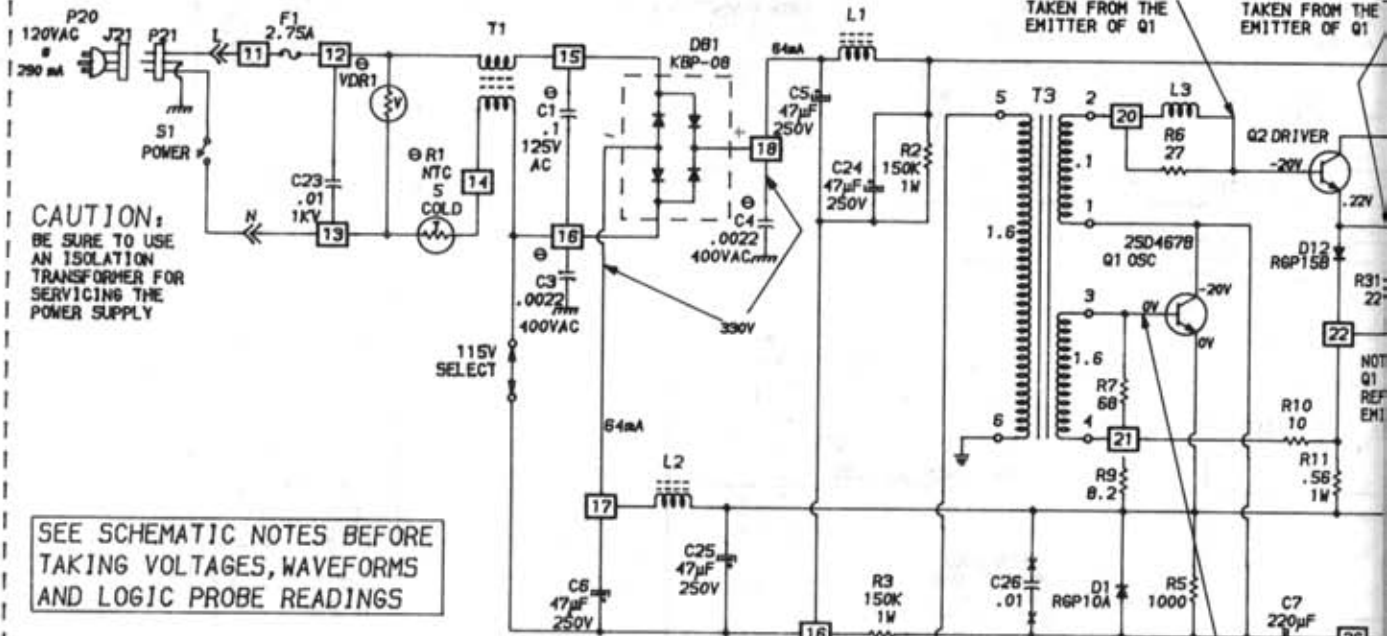
REBAN



APPLE
MODEL IIe

A PHOTOFAC STANDARD NOTATION SCHEMATIC
WITH **CIRCUITRACE**
© Howard W. Sams & Co., Inc. 1985

SEE SCHEMATIC NOTES BEFORE
TAKING VOLTAGES, WAVEFORMS
AND LOGIC PROBE READINGS



CAUTION:
BE SURE TO USE
AN ISOLATION
TRANSFORMER FOR
SERVICING THE
POWER SUPPLY

SEE SCHEMATIC NOTES BEFORE
TAKING VOLTAGES, WAVEFORMS
AND LOGIC PROBE READINGS

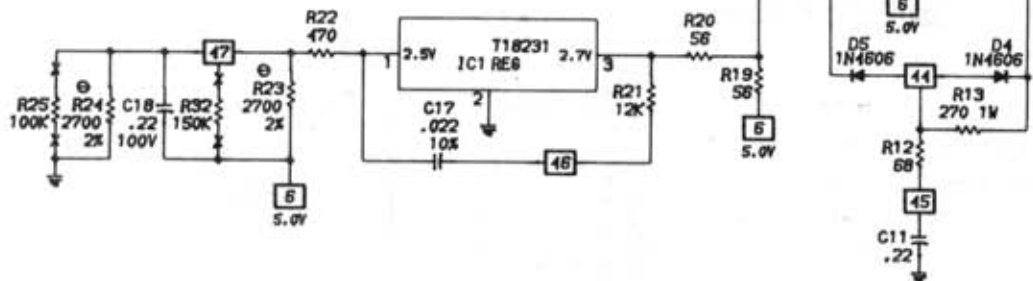
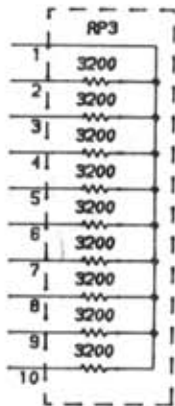
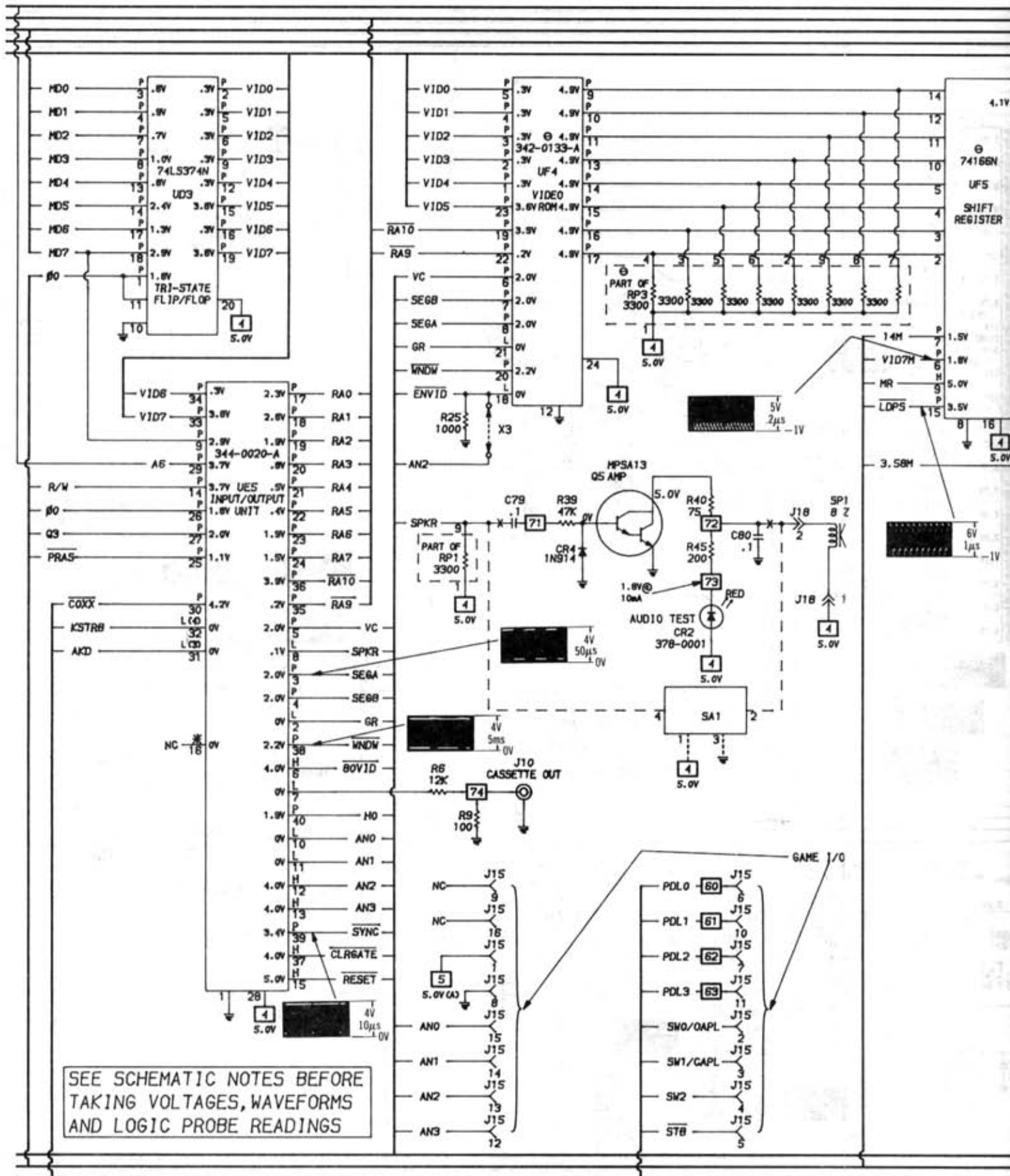
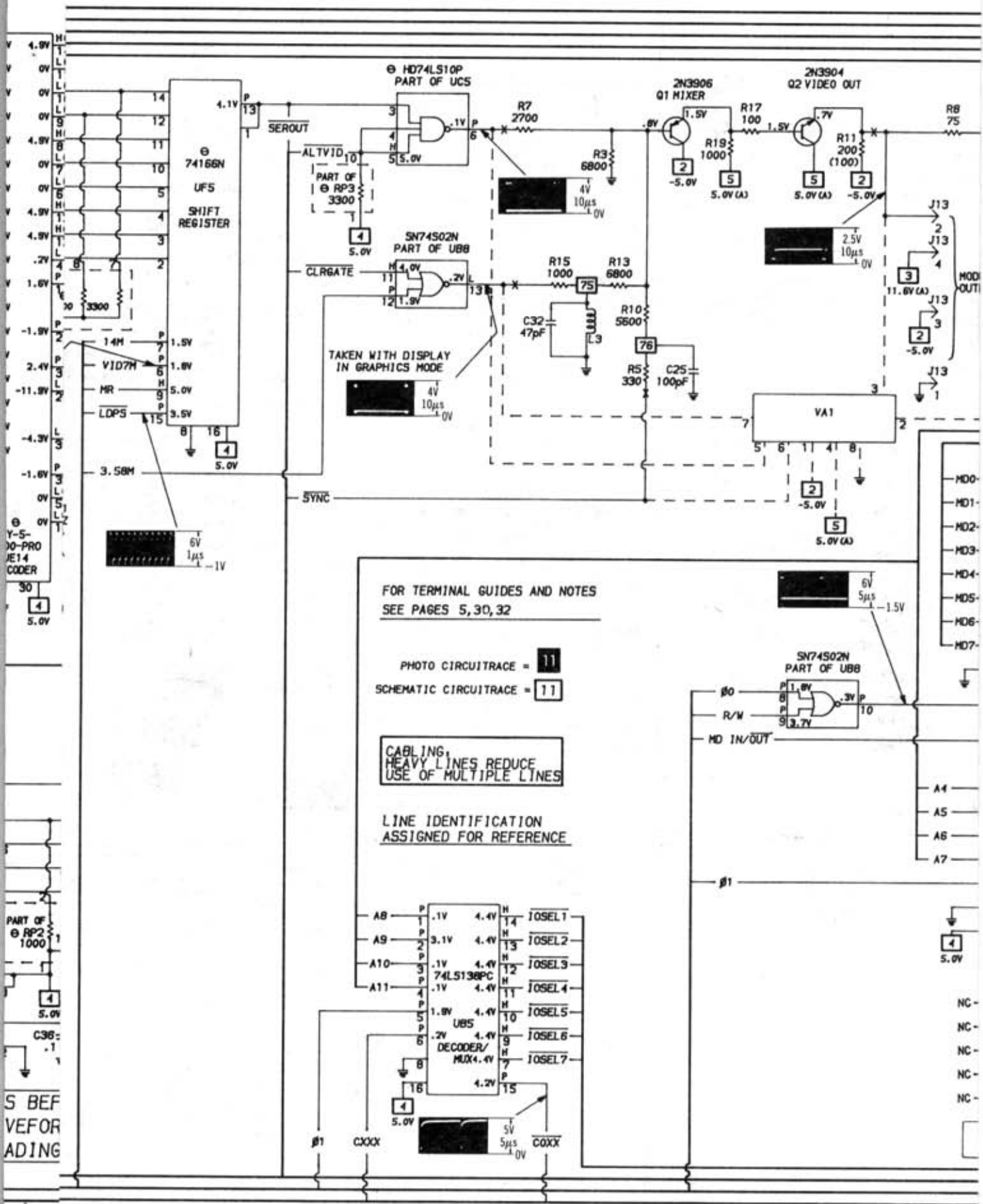


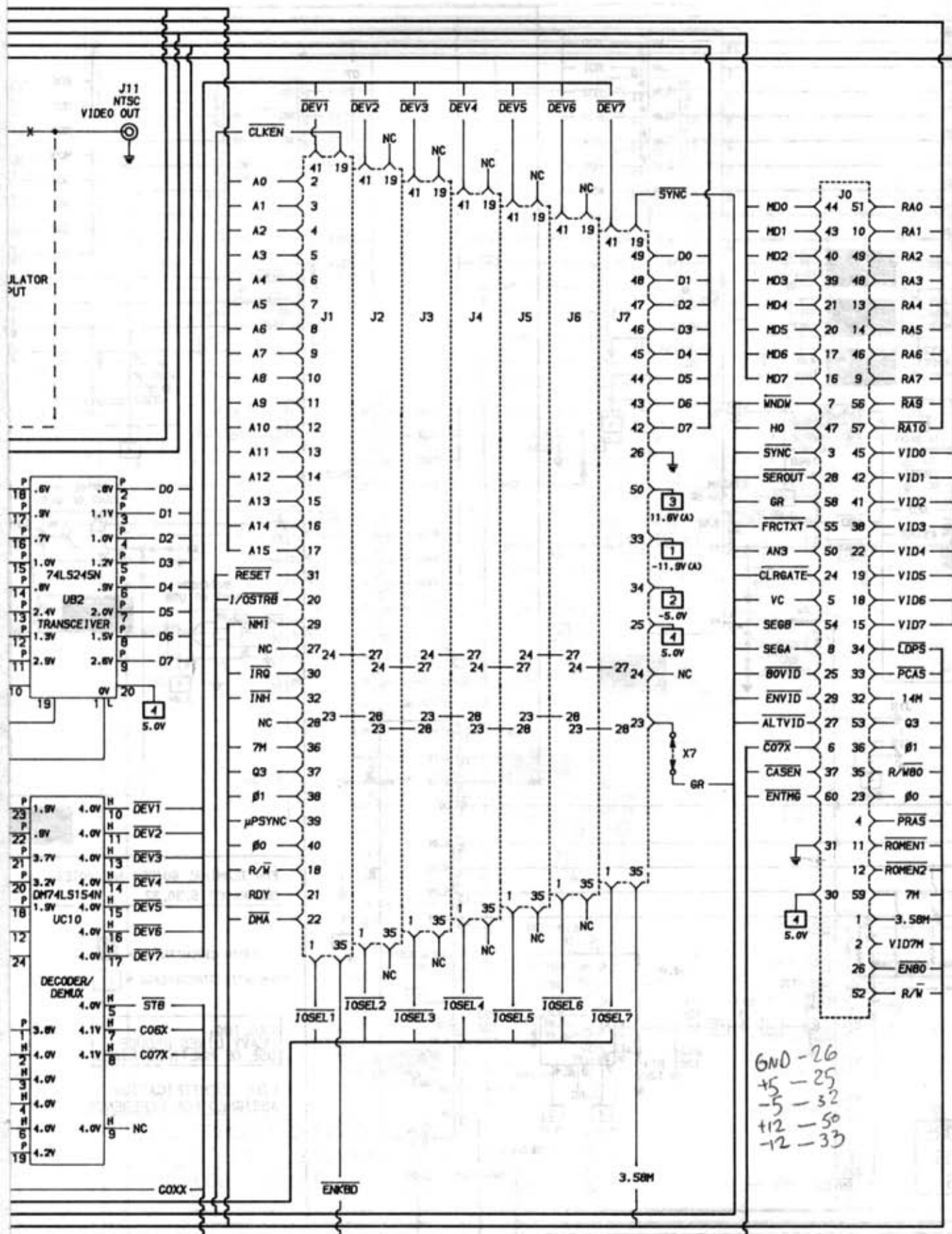
PHOTO CIRCUITRACE = **11**
SCHEMATIC CIRCUITRACE = **11**
FOR TERMINAL GUIDES AND NOTES
SEE PAGES 5, 30, 32



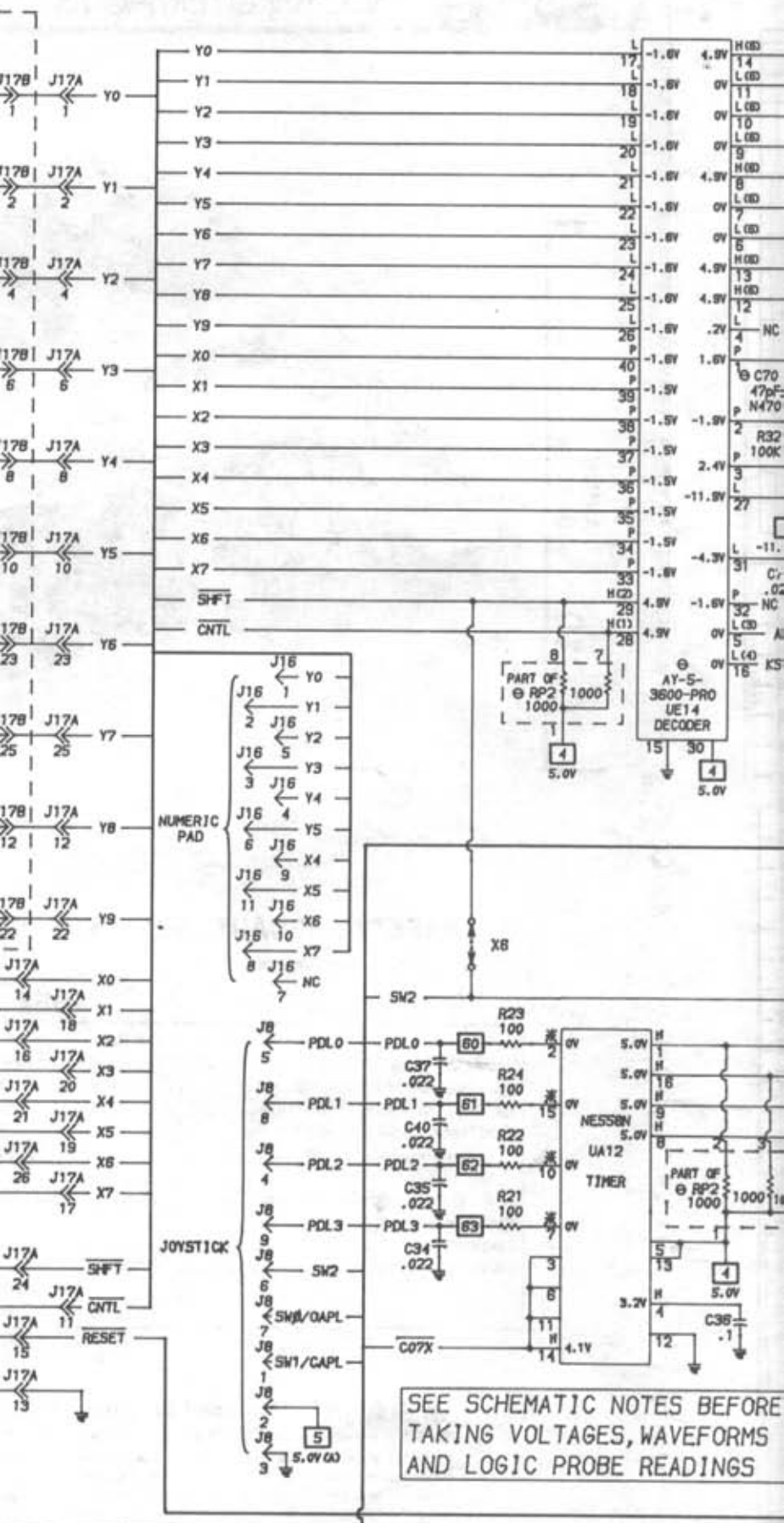
SEE SCHEMATIC NOTES BEFORE TAKING VOLTAGES, WAVEFORMS AND LOGIC PROBE READINGS



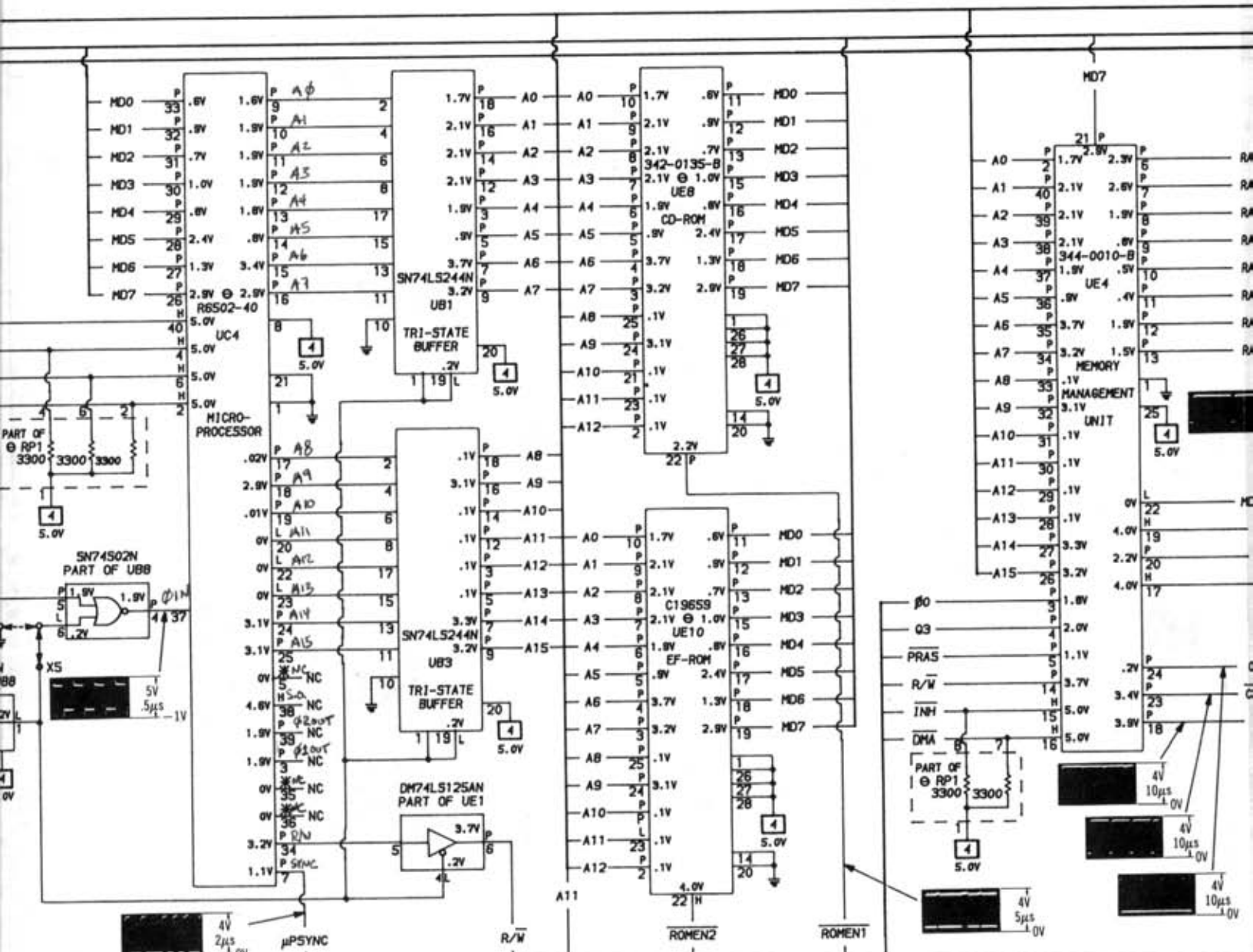
SEE LINE DEFINITIONS ON PAGE 31



APPLE
MAIN BOARD MODEL IIe



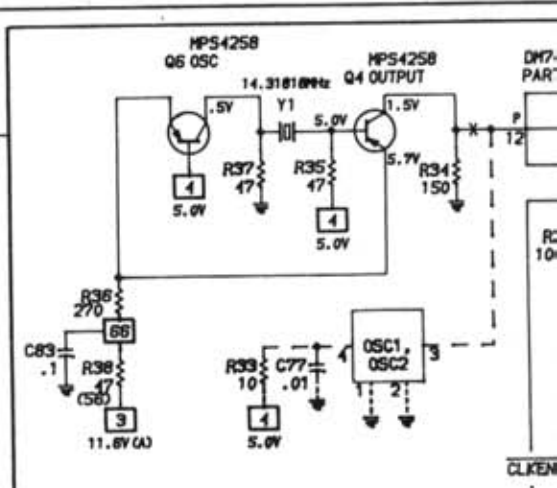
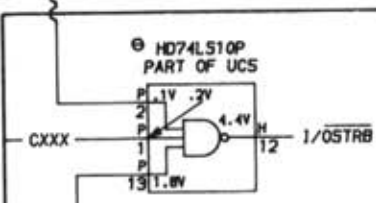
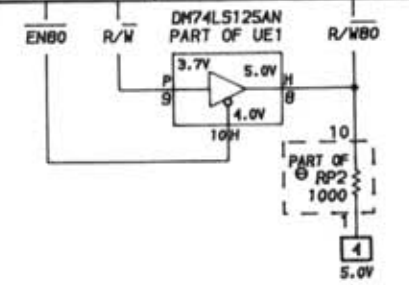
SEE SCHEMATIC NOTES BEFORE
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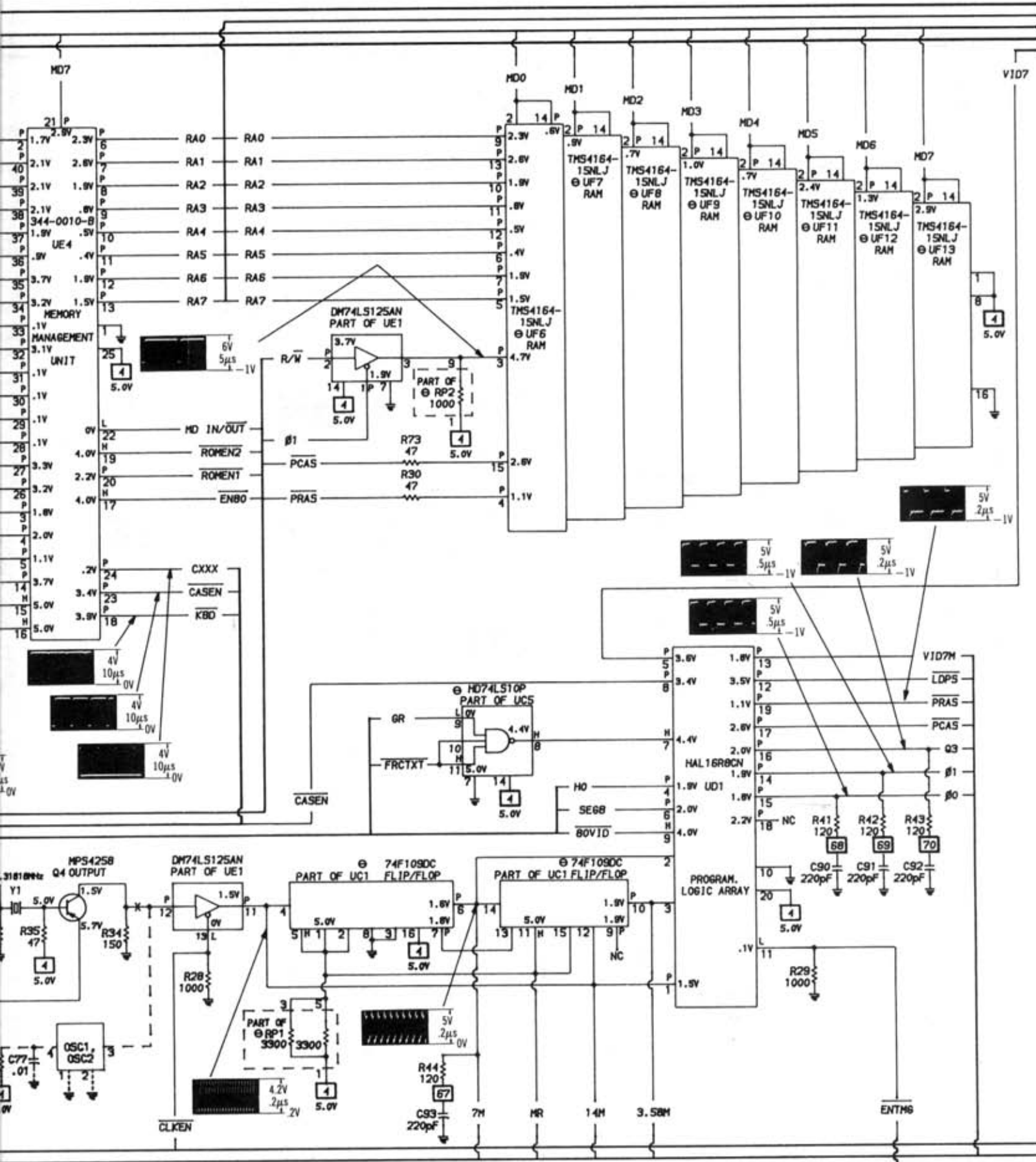


GUIDES AND NOTES
30, 32

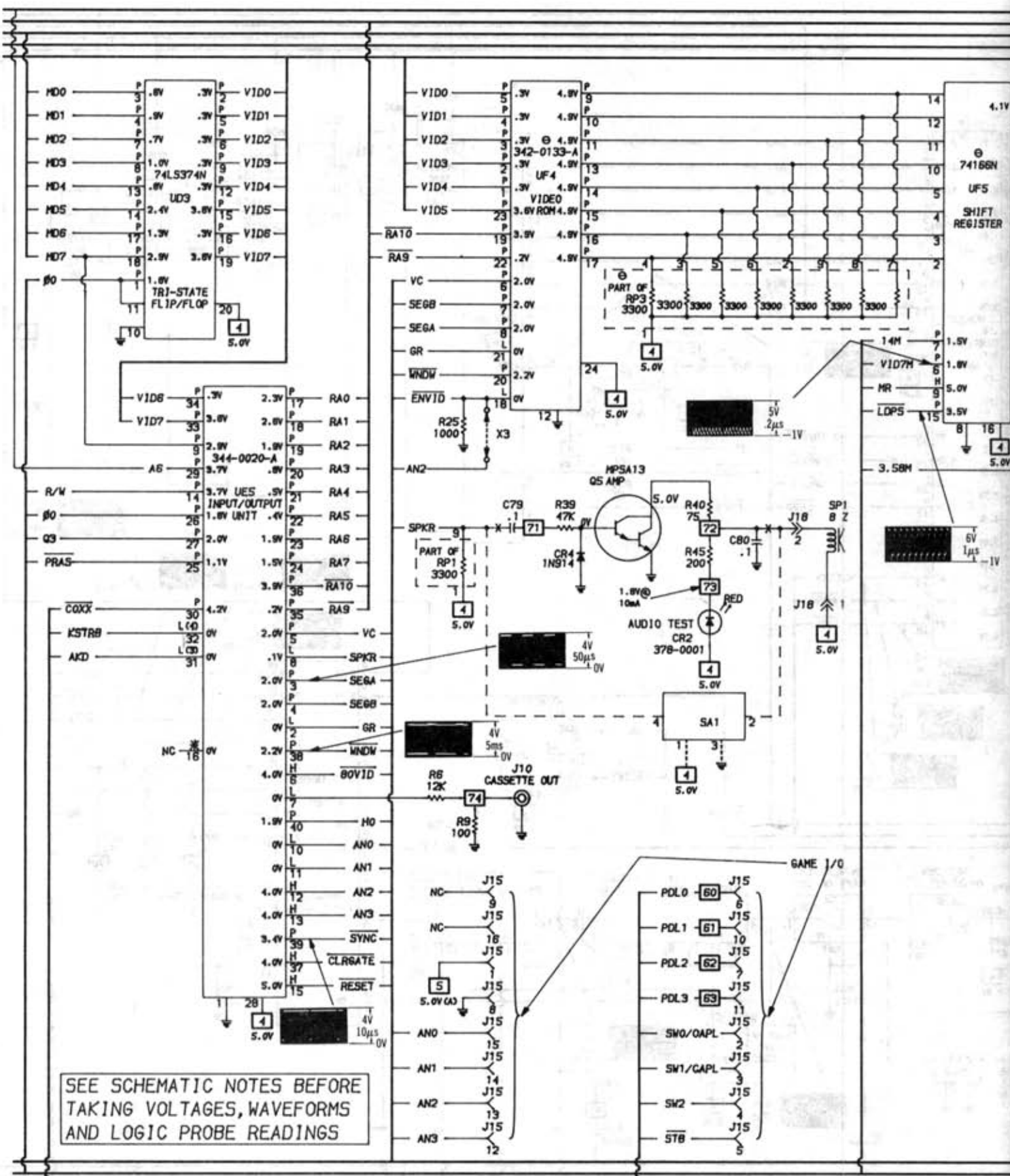
TRACE = 11
TRACE = 11

REDUCE
MULTIPLE LINES
DEFINITION
OR REFERENCE

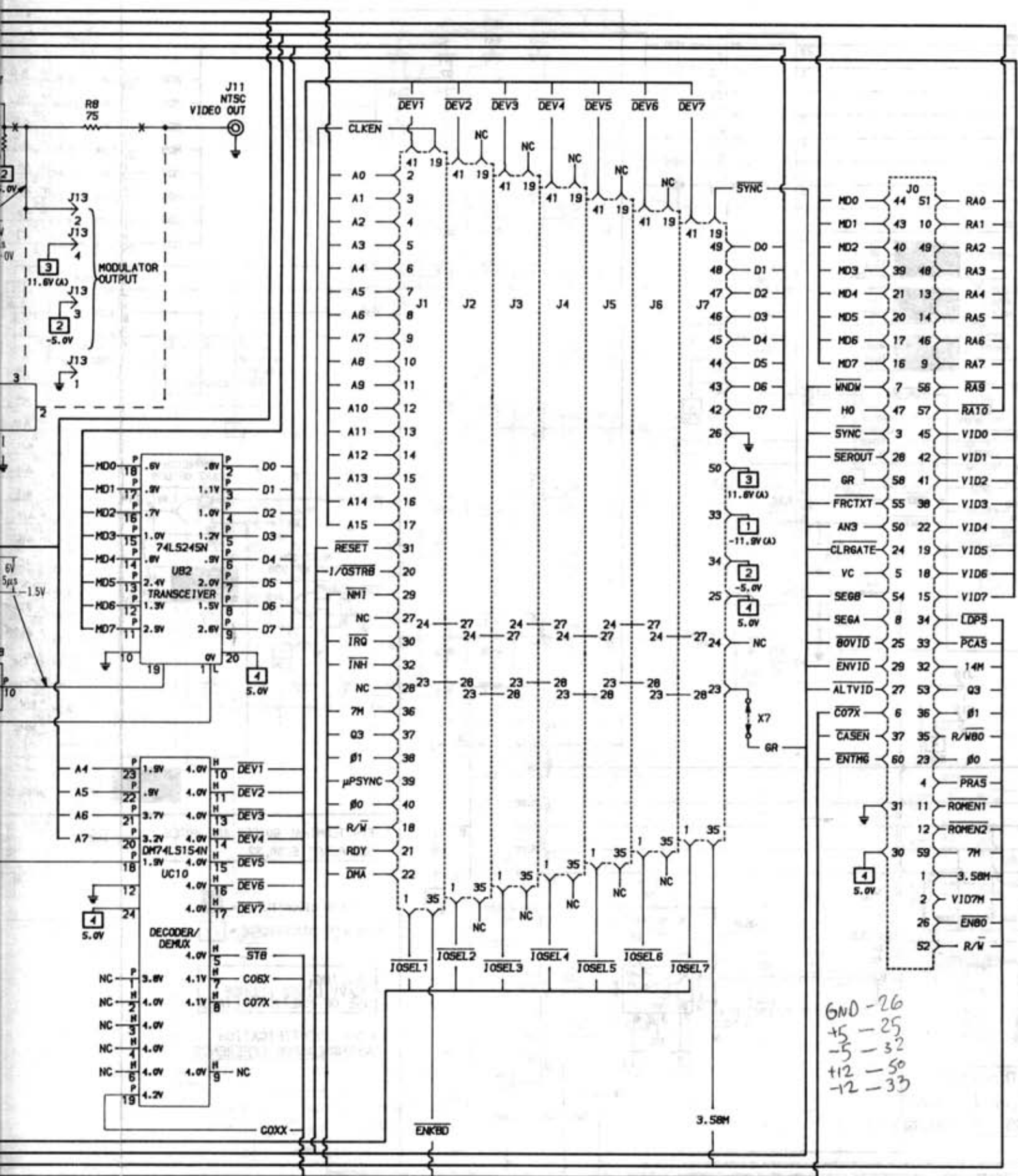




APPLE
MAIN BOARD MODEL IIe

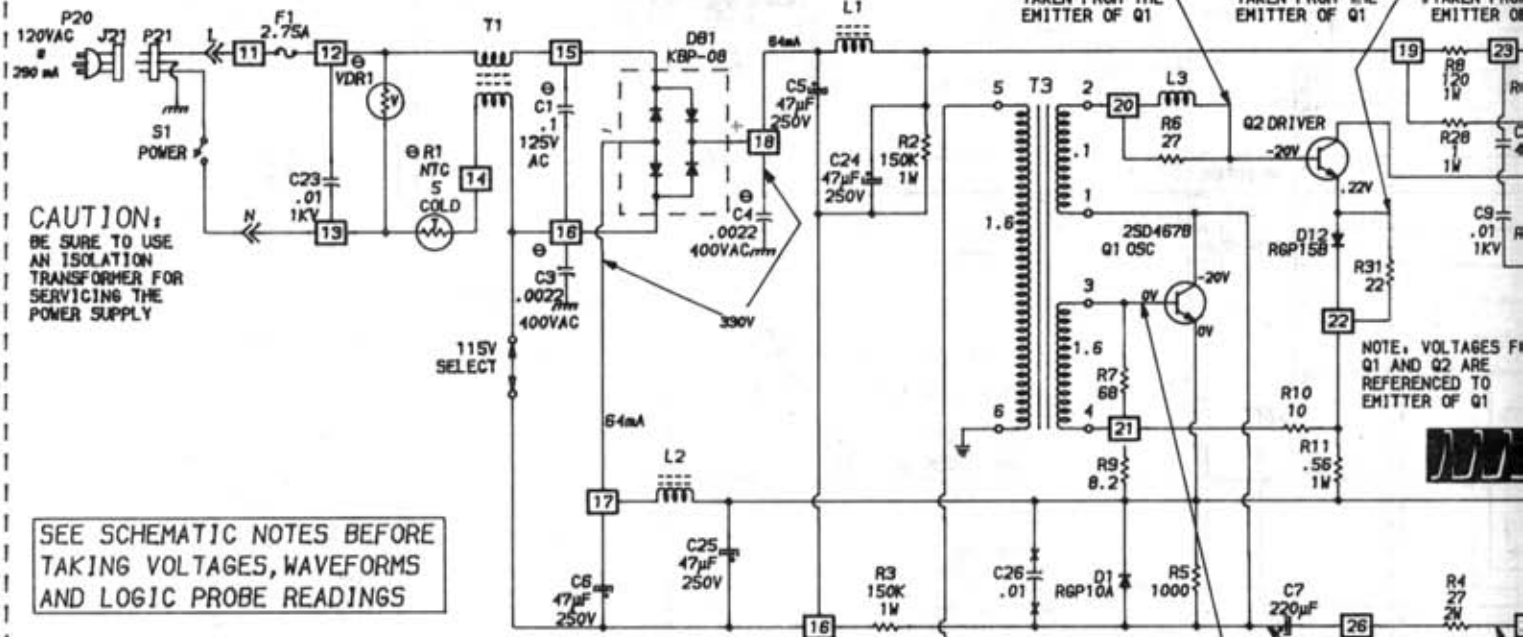


66AN



6N0-26
 +5-25
 -5-32
 +12-50
 -12-33

APPLE
 MAIN BOARD MODEL IIe



CAUTION:
BE SURE TO USE
AN ISOLATION
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SERVICING THE
POWER SUPPLY

SEE SCHEMATIC NOTES BEFORE
TAKING VOLTAGES, WAVEFORMS
AND LOGIC PROBE READINGS

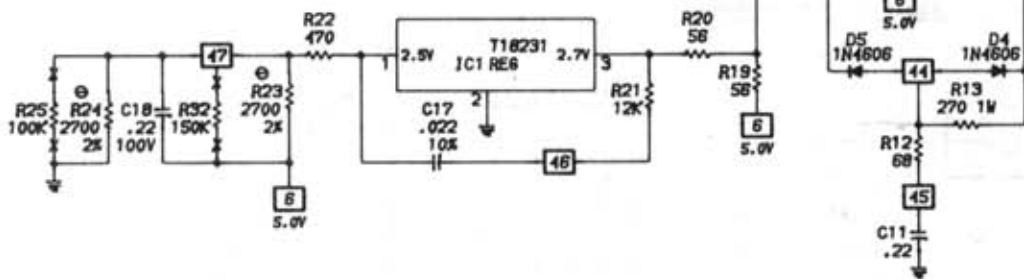
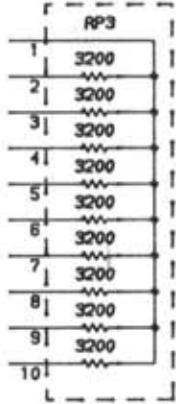
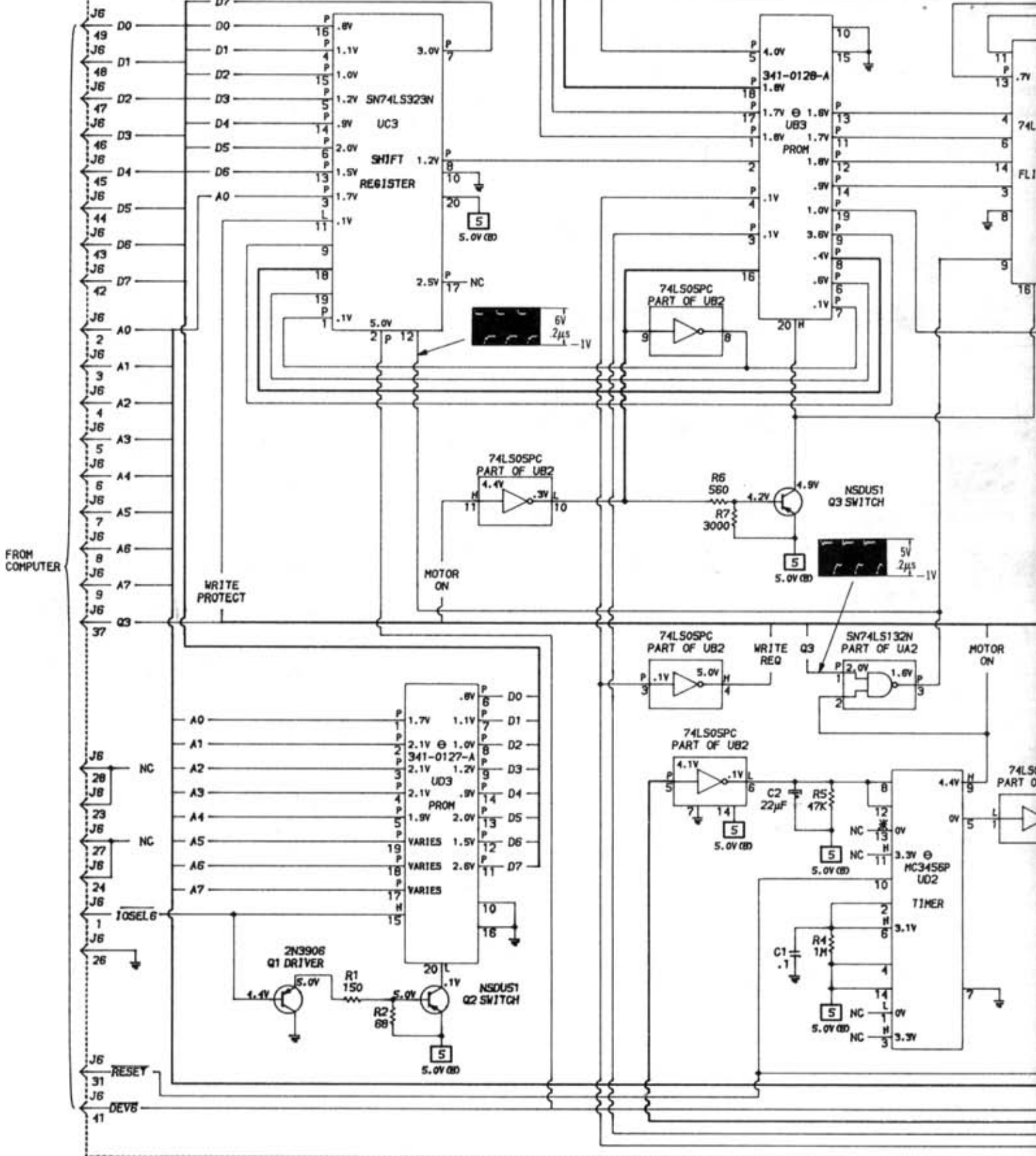


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SCHEMATIC CIRCUITRACE = **11**
FOR TERMINAL GUIDES AND NOTES
SEE PAGES 5, 30, 32

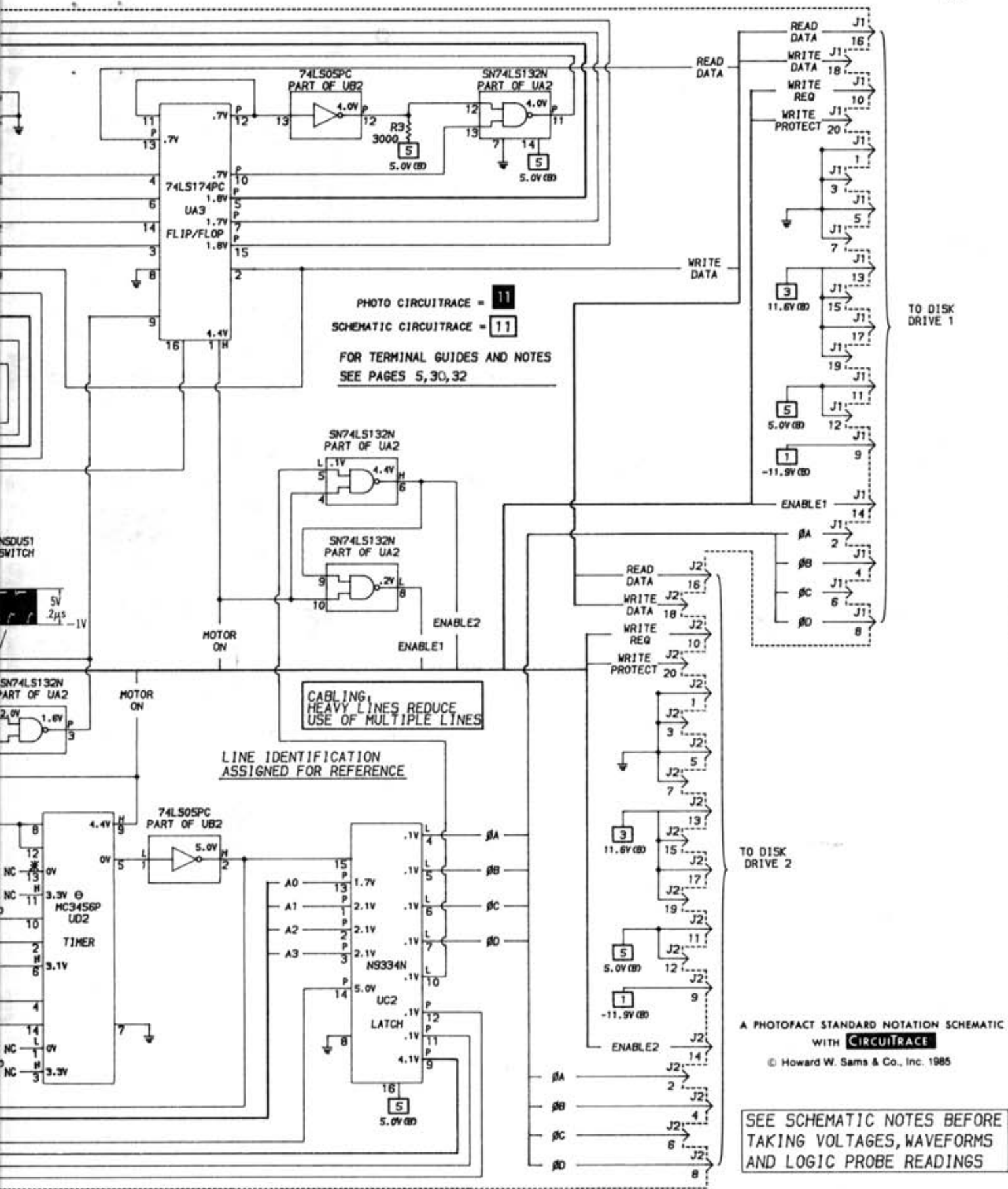
PART OF DISK II
INTERFACE BOARD



DISK II INTERFACE BOARD

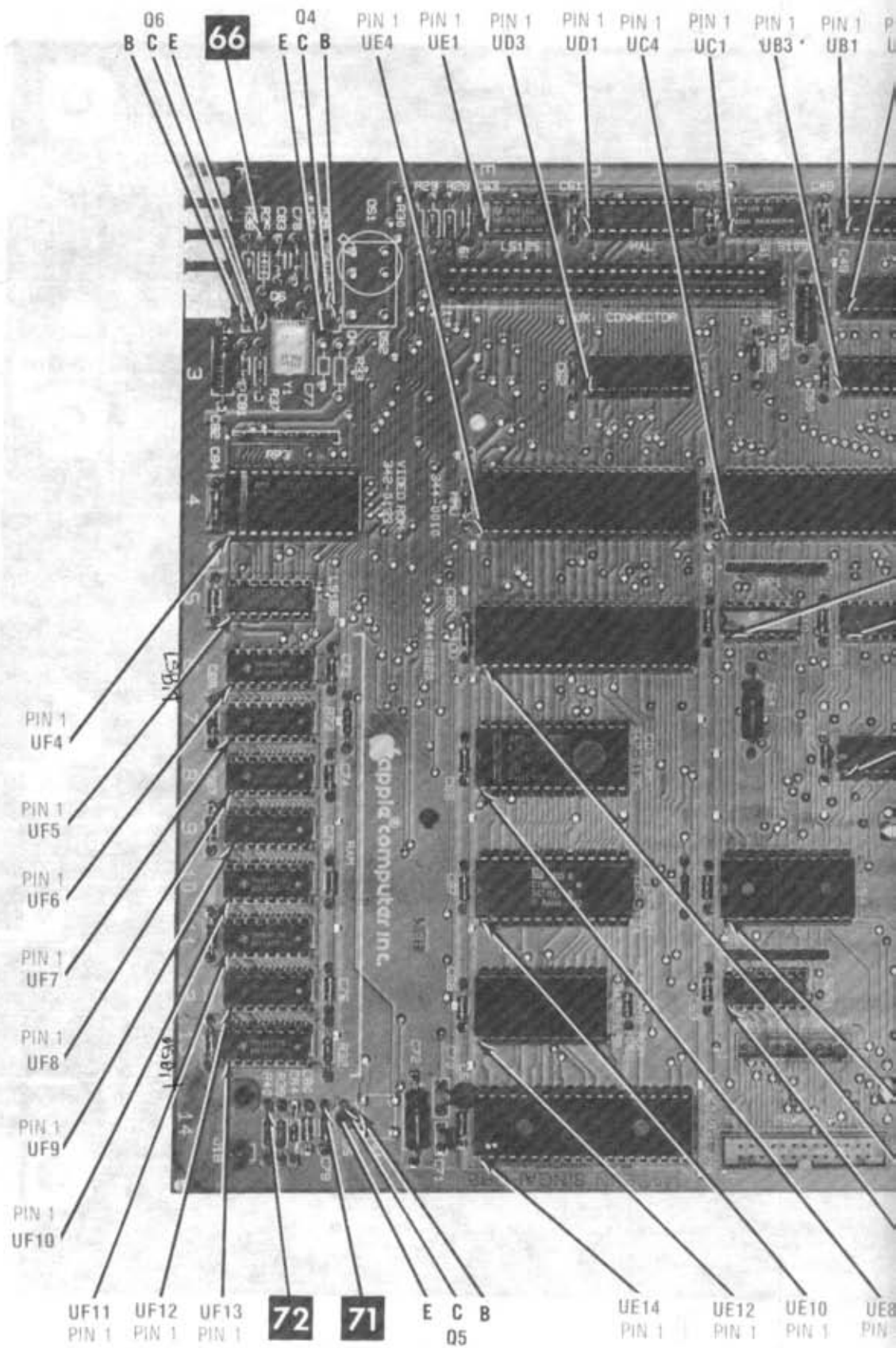
SEE LINE DEFINITIONS ON P.

REMAN

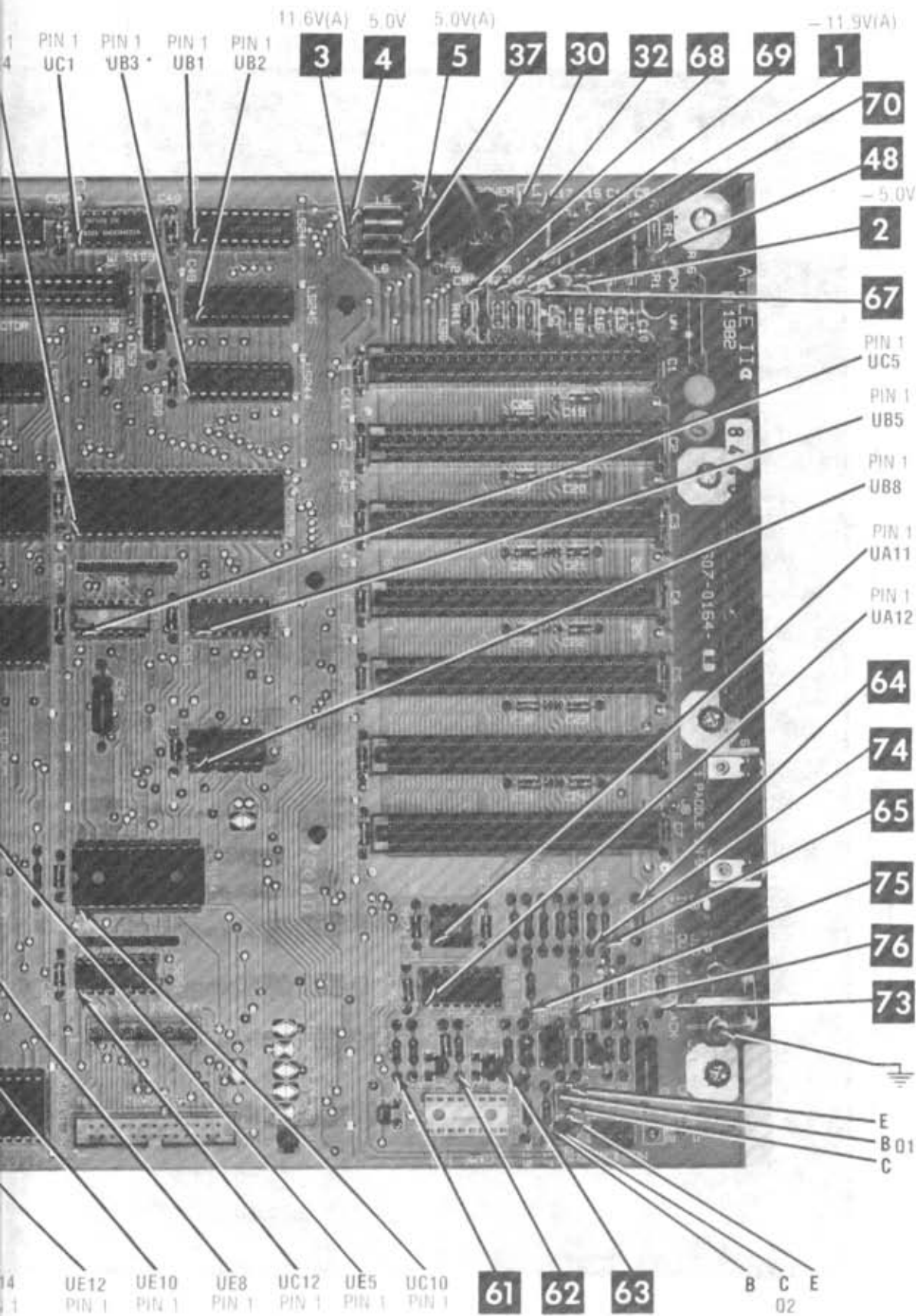


APPLE MODEL Iie

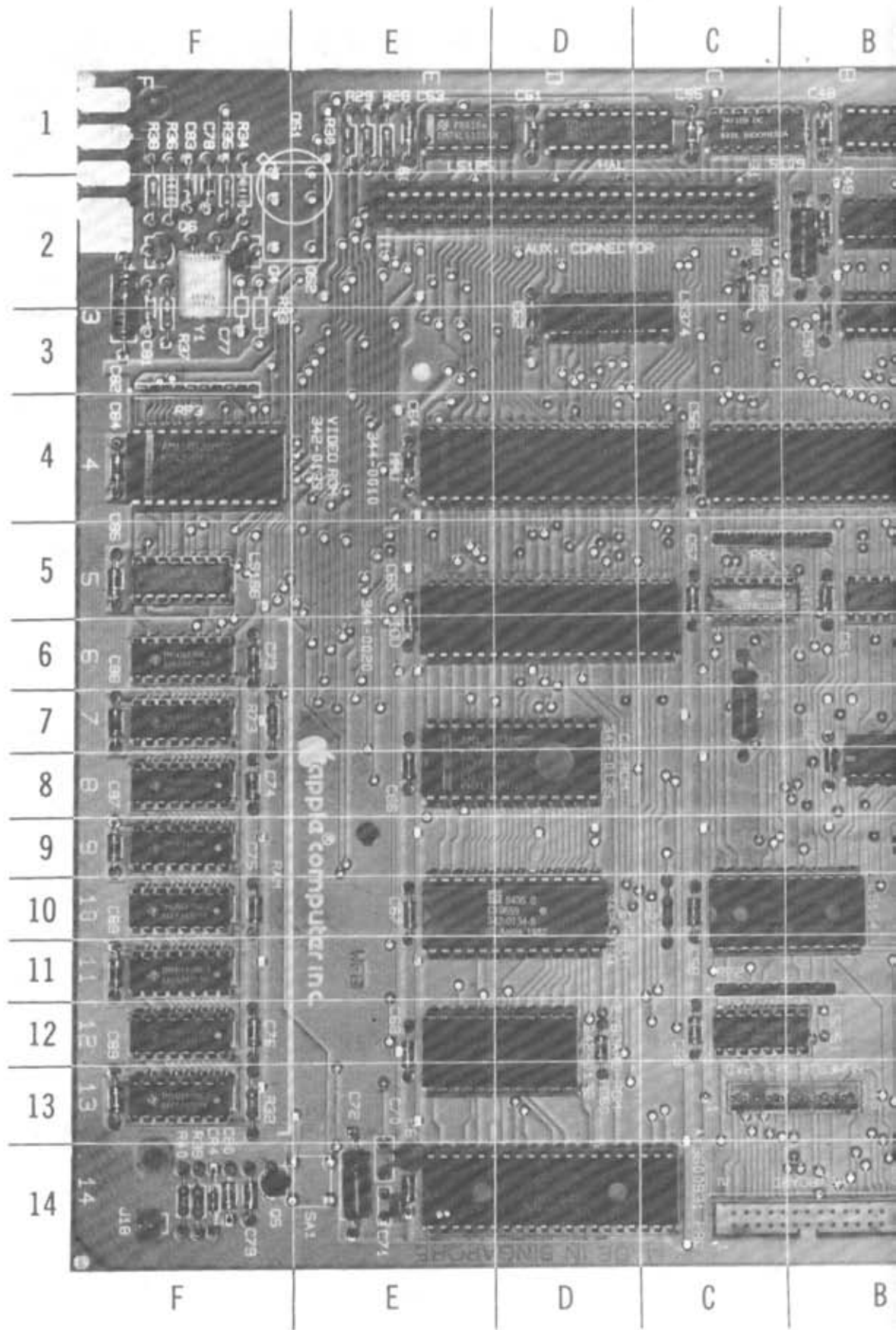
W00254



MAIN BOARD



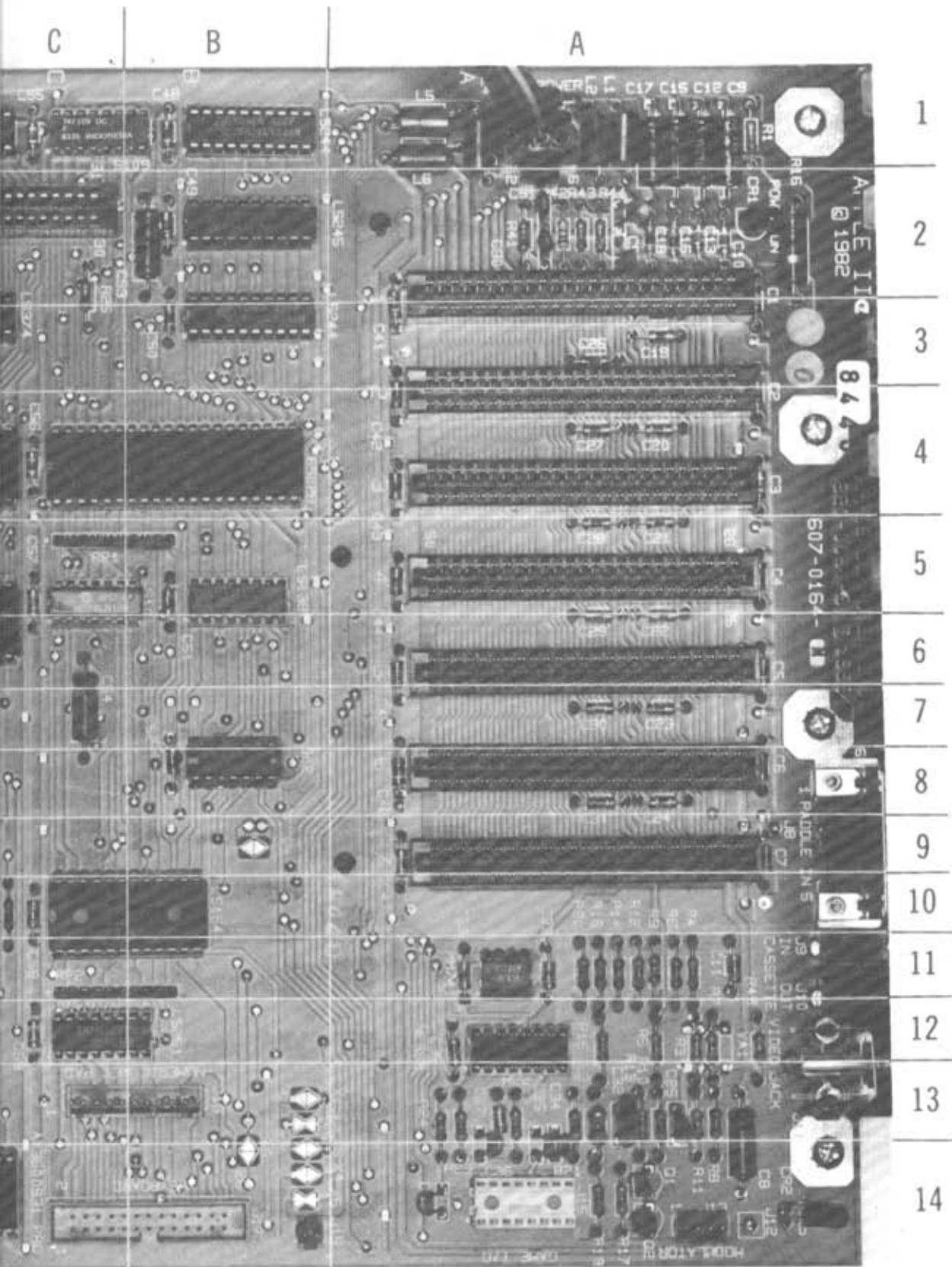
CC10
APPLE
MODEL IIe



MAIN BOARD

A Howard W. Sams GRIDTRACE™ Photo

REMAN



APPLE
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