

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 Pack, Switching Power Supply Module, System Board, Keyboard, or Connectors may be necessary after the malfunction has been isolated.

TEST EQUIPMENT AND TOOLS

TEST EQUIPMENT

Digital Volt/Ohm Meter
Logic Probe

TOOLS

Low Wattage Soldering Iron
Desoldering Equipment
Head Cleaning Equipment
Switch Cleaner (non spray type)
Phillips Screwdriver
Flat Blade Screwdriver
IC Insertion and Removal Tools 24, 28 and 40 pin

REPLACEMENT PARTS AND DESCRIPTION

ITEM PART NO. DESCRIPTION

DISK DRIVE

M1 Drive Motor

MONITOR

D701 thru D704 Rectifier Diode, G2GD1
F701 Fuse, 1.5A @250V
F771 Fuse, 750mA @250V
Q18 Horizontal Output Transistor, BU406
Q701 DC Voltage Regulator Transistor, BD534L

ITEM PART NO. DESCRIPTION

POWER SUPPLY

A2M4017 Power Pack
AA7341B Switching Power Supply

SYSTEM BOARD

C57 Electrolytic, 1000µF 25V
C59 Capacitor, .1µF 50V
CR1 Diode, 1N5400
F1 Fuse, 10A GFA Subminiature Pigtail
SP1 Speaker
SW1 Power Switch
UD18 342-0272-A IC, ROM, 27128A
UE4 342-0265-A IC, Character Generator
UE14 344-0021 IC, Input/Output Unit
UE16 344-0011 IC, Memory Management Unit
UE18 IC, CPU, 65C02

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) Unplug the Power Pack from the Computer and check for 18.2V between pins 2 and 6 of Power Pack Plug P1. If the 18.2V is missing, replace the Power Pack.
- (B) If 18.2V is present at Plug P1, plug the Power Pack back into the Computer. With the Computer turned Off, check for 17.5V at the junction of Fuse F1 and Capacitor C59. If the voltage is missing at the junction of F1 and C59, check Fuse F1.
- (C) If the fuse is open, unplug the Power Pack (P1) and check for a short to ground at the junction of F1 and C59. If there is a short, remove the Switching Power Supply Module and check the junction of F1 and C59 again for a short. If the short is removed, replace the Switching Power Supply Module.
- (D) If the short is still present after the Switching Power Supply is removed, check Diode CR1 and Capacitors C57 and C59 on the System board.
- (E) If 17.5V is present at the junction of F1 and C59, check Power Switch (S1). If the Power Switch checks good, replace the Switching Power Supply Module.
- (F) Check the CPU IC (UE18), the MON IC (UD18), the Memory Management Unit IC (UE16) and the Input/Output Unit IC (UE14) by substitution.

② VIDEO DISPLAY (Computer)

- (A) If there is no video, check Connector J4 on the System board and the video interface cable.
- (B) If there is no video or the characters displayed on the screen are not correct, check Character Generator ROM IC (UE4) by substitution.

③ VIDEO DISPLAY (Monitor)

- (A) If there is no video, check Connector J1 on the Monitor board and the video interface cable.
- (B) Turn the Monitor On and check for 120VAC across the primary winding of Power Transformer (T2). If 120VAC is missing, check Fuse F771, Power Switch (SW1) and Line Choke (L771). Also check for an open power cord.
- (C) If Fuse F771 is open, check for a shorted Diode (D701 thru D704) in the DC power supply on the Monitor board.

- (D) If 120VAC is present across the primary winding of Power Transformer T2, check for 12.0V on both sides of Fuse F701. If 12.0V is missing on one side of F701, check Fuse F701. If F701 is open, check for a possible short on the load side of the power supply. If no short is found, replace Fuse F701.
- (E) If 12.0V is missing from both sides of Fuse F701, check Power Transformer T2 for an open winding. Also check Diodes D701 thru D704 and Regulator Transistor Q701. Adjust B+ Control VR701 for 12.0V at Fuse F701.
- (F) Check the voltages on the CRT socket and on the HV anode. Make sure that the CRT socket is making good contact with the CRT pins, especially filament pins 3 and 4. If the CRT voltages are normal, check the CRT with a CRT tester.
- (G) If there is no high voltage at the HV anode, check Horizontal Output Transistor Q18.
- (H) Check the adjustment of the Sub-Brightness Control (VR503) and the Sub-Contrast Control (VR101).

④ KEYBOARD

- (A) If the keyboard is dead or one group of keys does not work, check Connector J9 on the System board and Connector J1 on the keyboard. Also check the keyboard interface cable.
- (B) If one key does not work or is erratic, clean the keyswitches with contact cleaner. Use an ohmmeter to check for an open keyswitch.
- (C) If the wrong character appears on the Monitor screen when a key is pressed, check the Character Generator ROM IC (UE4) by substitution.

⑤ DISK DRIVE

WARNING

It is possible for a defective Disk Drive to write on or erase information on a diskette even when the diskette is write protected. Check a questionable Disk Drive by first using a diskette that contains programs that have been duplicated on another diskette.

- (A) Disk Drive is dead. Check Connector J1 on the Disk Drive and Connector J8 on the System board. Also check the Disk Drive interface cable.
- (B) Check for 11.5V at pin 13 of Connector J1. 5.0V at pin 11 of Connector J1, and -11.25V at pin 9 of Connector J1. Also check for a logic Low reading at pin 14 of Connector J1. If the voltages and logic reading are normal, replace or repair the Disk Drive Analog board.

PRELIMINARY SERVICE CHECKS (Continued)

SERVICE CHECKS (Continued)

- (C) Disk Drive operation is erratic. Check Connector J8 on the System board and Connector J1 on the Disk Drive.
- (D) Clean the head and check the Spindle Speed Adjustment (VR1), see "Miscellaneous Adjustments".
- (E) Will not write or read. Check Connector J3 on the Disk Drive Analog board for good connections. It may be necessary to repair or replace the Disk Drive Analog board.
- (F) Writes on a write protected diskette. Check for a shorted write protect sensor. It may be necessary to repair or replace the Disk Drive Analog board.
- (G) Disk Drive will not run. Check for a broken drive belt. Check for approximately 6.3V at the red Drive Motor lead on the Motor Speed Control board. If the voltage is present, check the Drive Motor by substitution. If the voltage is missing, it may be necessary to replace or repair the Motor Speed Control board.

6 INTERNAL SPEAKER

- (A) No sound. Check the Speaker (SP1), Connector J10 and the Earphone jack (J7) for good connections.

7 SERIAL PORT 1 (PRINTER PORT)

- (A) If Serial Port 1 is not working, check Connector J6 for good connections.

8 SERIAL PORT 2 (MODEM)

- (A) If Serial Port 2 is not working, check Connector J12 for good connection.

9 GAME PADDLES

- (A) Type in and run the following Basic program to check the operation of the game paddle circuits.

```

10 HOME
20 PRINT "PADDLE 0", PDL(0)
30 PRINT "PADDLE 1", PDL(1)
40 FOR T = 1 TO 300: NEXT T
50 GOTO 10
    
```

This program scans the two paddles and displays the paddle numbers (0 and 1) on the Monitor screen along with a number that is read from each

paddle. The number that is read from each paddle should vary between 0 and 255 as the paddle is varied from MINIMUM to MAXIMUM.

- (B) If the paddles are not functioning, check Connector J3 for good connections.
- (C) Check for pulses at pin 6 of the Paddle IC (UF2) and at pin 7 of the MUX IC (UF3). If the pulses are missing at either pin 6 of UF2 or pin 7 of UF3, check the MMU (Memory Management Unit) IC (UE16) by substitution.
- (D) If the pulses are present at pin 6 of IC UF2 and pin 7 of IC 3F and the paddles are not functioning, check the IOU (Input/Output Unit) IC (UE14) by substitution.

10 MOUSE

- (A) Type in and run the following Basic program to check the Mouse circuits. NOTE: This program will not work with PRODOS.

```

10 PR#4: PRINT CHR$(1)
20 IN#4
30 INPUT " "; X,Y,B
40 IN#0: PR#0
50 HOME
60 PRINT "X", "Y", "BUTTON"
70 PRINT X,Y,B
80 FOR T = 1 TO 300: NEXT T
90 GOTO 30
    
```

This program will print the X and Y coordinates (0 to 1023) and the button Status (4 = button released, 3 = button just released, 2 = button just pressed, and 1 = button held down) on the Monitor screen. The button Status number will be negative if a key on the keyboard is pressed.

- (B) If the Mouse is not working, check Connector J3 for good connections. Also check the mouse cable.
- (C) With the above program running, check for pulses at pin 7 of MUX (Multiplexer) IC (UF3). If the pulses are missing at pin 7 of UF3, check the MMU (Memory Management Unit) IC (UE16) by substitution.
- (D) If the pulses are present at pin 7 of IC UF3, check IOU (Input/Output Unit) IC (UE14) by substitution.

PRELIMINARY SERVICE CHECKS (Continued)

SERVICE CHECKS (Continued)

⑪ JOYSTICKS

- (A) Type in and run the following Basic program to check the operation of the joystick circuits.

```

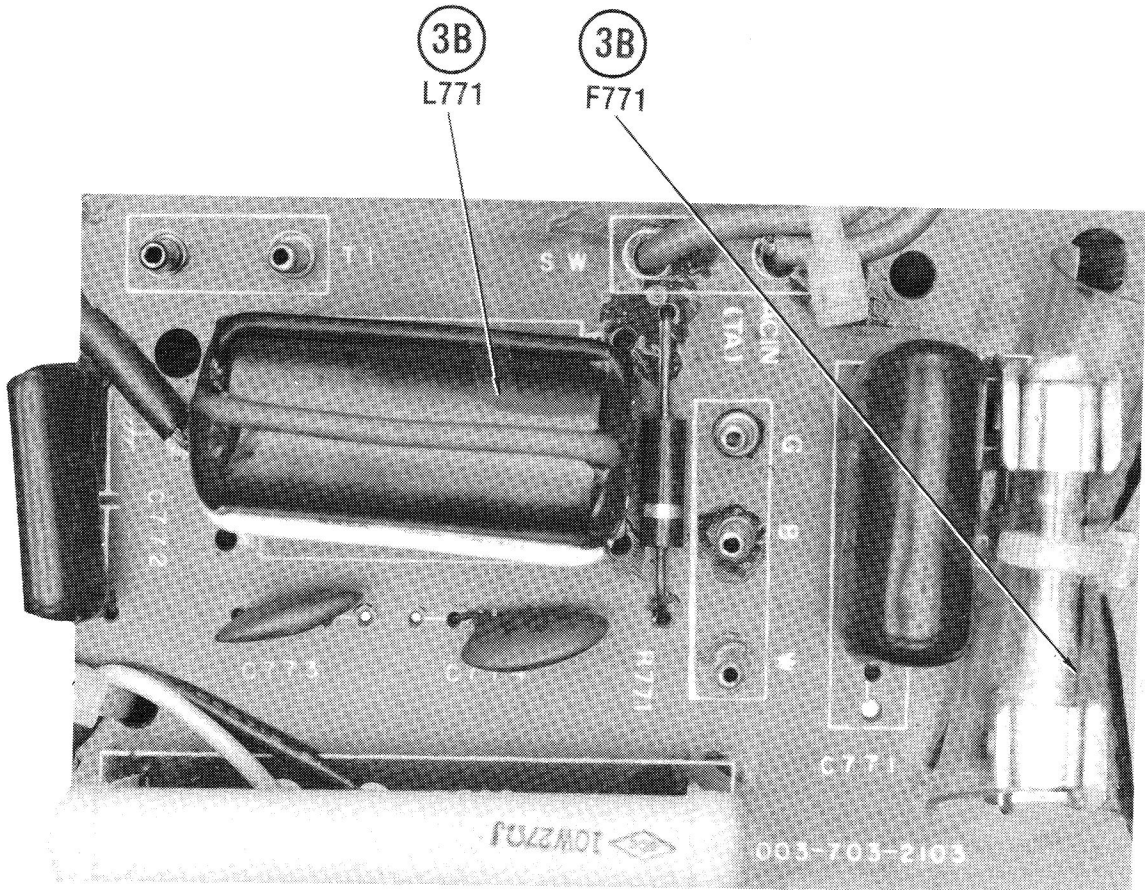
10 HOME
20 PRINT "X POSITION", PDL(0)
30 PRINT "Y POSITION", PDL(1)
40 PRINT "SWITCH 0 =", PEEK (- 16287)
50 PRINT "SWITCH 1 =", PEEK (- 16286)
60 FOR T = 1 TO 300: NEXT T
70 GOTO 10
    
```

This program scans the joystick circuit and displays "X POSITION" and "Y POSITION", each followed by a number from 0 to 255. Also displayed on the Monitor is "SWITCH 0" and "SWITCH 1", each followed by a number. When the joystick is moved to the extreme right, the "X POSITION" will read 255 and it will read 0 when the joystick is moved to the extreme left. When the joystick is moved to the extreme lower position, the "Y POSITION" will read 255 and will read 0 when the joystick is at the top. The number displayed after "SWITCH 0" and "SWITCH 1" will be 127 or less until the pushbutton is pressed. When the left pushbutton is pressed "SWITCH 0" will read 128 or more and "SWITCH 1" will read 128 or more when the top pushbutton is pressed.

- (B) If the joystick inputs are not functioning, check Connector J3 for good connections. Also check the joystick cable.
- (C) With the above program running, check for pulses at pin 6 of the Paddle IC (UF2) and at pin 7 of the MUX (Multiplexer) IC (UF3). If the pulses are missing at either pin 6 of UF2 or pin 7 of UF3, check the MMU (Memory Management Unit) IC (UE16) by substitution.
- (D) If pulses are present at pin 6 of IC UF2 and at pin 7 of IC UF3 and the joysticks are not functioning, check the IOU (Input/Output Unit) IC (UE14) by substitution.
- (E) With the above program running, check for pulses at pins 5 and 9 of Paddle IC (UF2). If the pulses are present at both pins 5 and 9 of IC UF2, check the IOU (Input/Output Unit) IC (UE14) by substitution.

⑫ LOW POWER MONITOR

- (A) If the green Power LED is flashing, check the DC power at pin 5 of Power Connector J1. If the voltage is below 10V, replace or repair the Power Pack. If the voltage is above 10V, the Low Power Detector circuit is defective.



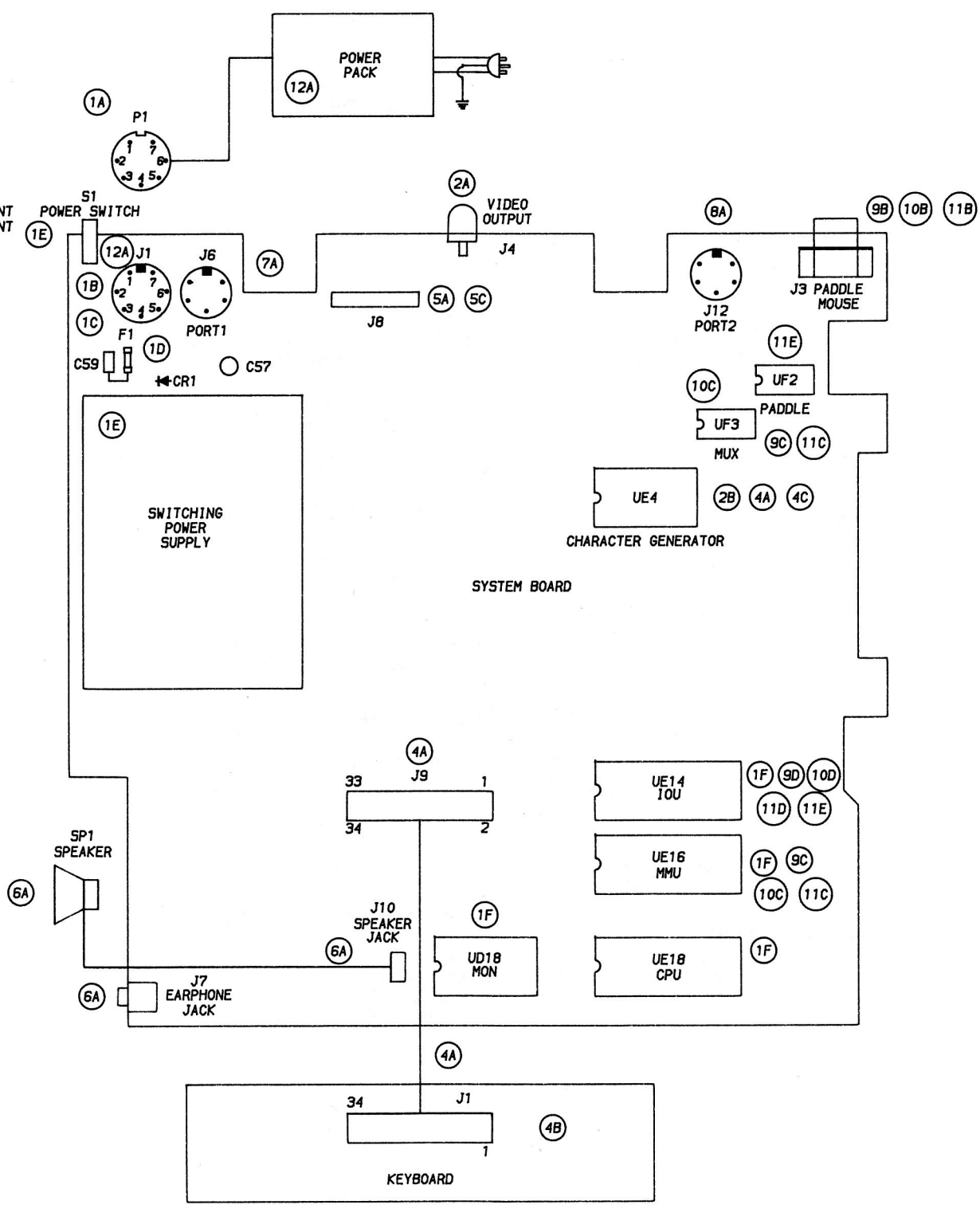
MONITOR POWER SUPPLY BOARD

PRELIMINARY SERVICE CHECKS (Continued)

AGE
5V
0V
1V
0V
5V
30V
78V

FILAMENT
FILAMENT

)-ARF-SB



CSCS7
APPLE
MODEL IIc

PRELIMINARY SERVICE CHECKS (Continued)

MISCELLANEOUS ADJUSTMENTS

DISK DRIVE

MOTOR SPEED ADJUSTMENT

Run the following program to keep the Disk Drive running continuously.

```
10 X = PEEK (- 16151): X = PEEK (- 16150)
```

Insert a diskette into the Disk Drive and close the door. Set the Disk Drive on its side so the strobe pattern on the spindle pulley is visible. Use a fluorescent light to view the strobe pattern. Use the outside pattern if a 60 cycle light is being used or the inside pattern if a 50 cycle light is being used. Adjust the Speed Control (VR1) until the strobe pattern appears to stand still.

MONITOR BOARD

ALIGNMENT TOOLS	GC ELECTRONICS
L503	5000, 5009, 8276
L505	9440, 8282, 8606

NOTE: Pattern generator with 1Vp-p into 75 ohms (VTR Standard) output used with appropriate pattern.

INITIAL MONITOR TEST

Connect a crosshatch generator to the Video In Jack. Turn the Monitor On and adjust the Brightness and Contrast controls for the best display. Check the adjustment of the Vert Hold, Horiz Hold, Vert Lin, Vert Size and Focus controls. If any of these controls produce erratic operation, clean that control with contact cleaner and recheck.

ADJUSTMENTS

NOTE: Connect a crosshatch generator to the Video In Jack for the following adjustments.

FOCUS ADJUSTMENT

Adjust the Focus Control (VR502) for sharp, well defined lines on the display.

VERT AND HORIZ HOLD ADJUSTMENT

Adjust the Vert Hold Control (VR401) and Horiz Hold Control (VR501) for the most stable display.

VERT SIZE ADJUSTMENT

Adjust the Vert Size Control (VR403) for the desired height on the display.

VERT LIN ADJUSTMENT

Adjust the Vert Lin Control (VR402) for even spacing between the vertical lines on the display.

VOLTAGE REGULATOR ADJUSTMENT

Connect a voltmeter to the collector of Voltage Regulator Transistor (Q701). Adjust the Voltage Regulator Control (VR701) for 12.0V.

SUB BRIGHTNESS ADJUSTMENT

Connect a crosshatch generator to the Video In Jack. Set the Brightness and Contrast Controls to Maximum clockwise position.

Adjust the Sub Brightness Control (VR503) for Maximum brightness without retrace lines.

CENTERING ADJUSTMENT

Center the CRT display by adjusting the two magnetic centering rings located on the deflection yoke rear cover.

HORIZ LIN ADJUSTMENT

Adjust the Horiz Lin Coil (L503) for even spacing between the horizontal lines on the display.

WIDTH ADJUSTMENT

Adjust the Width Coil (L505) for the desired width on the display.

SUB CONTRAST

Set the Brightness and Contrast Controls to Maximum clockwise position. Adjust the Sub Contrast Control for best display with no distortion.

SYSTEM BOARD

ALIGNMENT TOOLS

	GC ELECTRONICS
L2	9300, 9302, 9304

HUE ADJUST

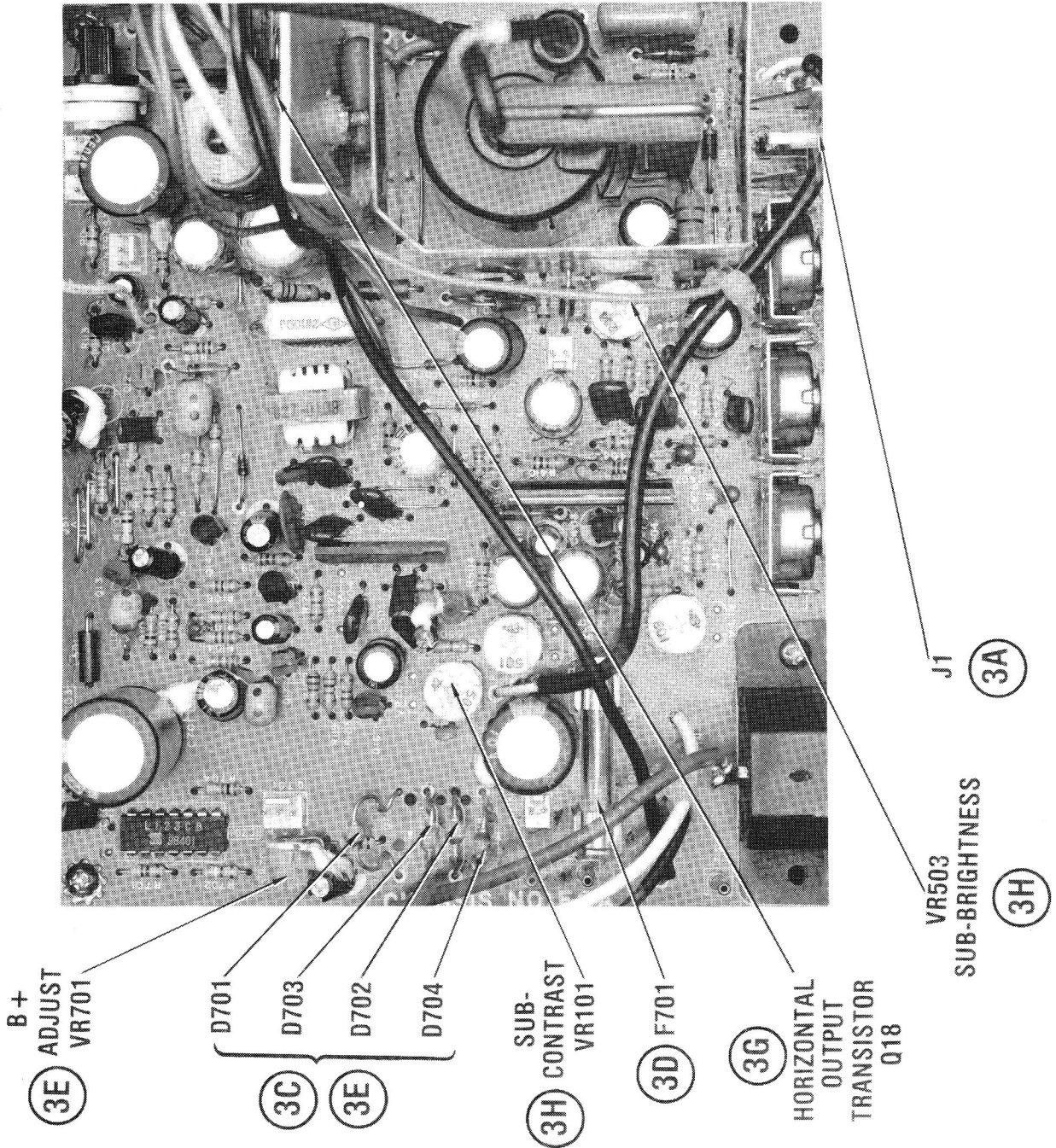
Type in and run the following Basic program.

```
10 GR
20 FOR X = 20 TO 22
30 READ Y: COLOR = Y
40 HLIN 0,39 AT X: NEXT X
50 DATA 2,9,12
```

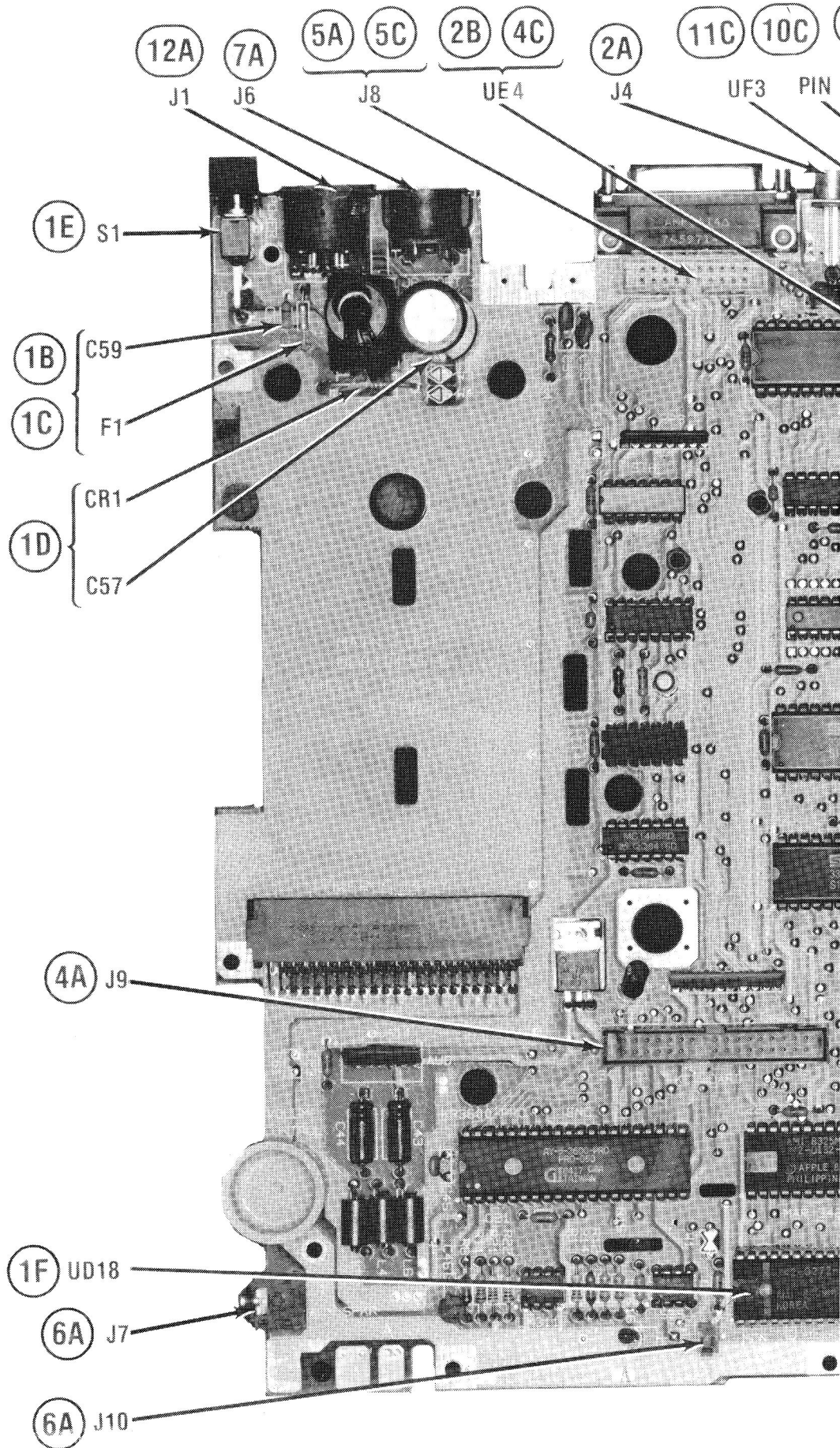
The program produces blue, orange and green lines on a color Monitor screen. Adjust Hue Adjust Coil (L2) for proper blue, orange and green hues.

PRELIMINARY SERVICE CHECKS (Continued)

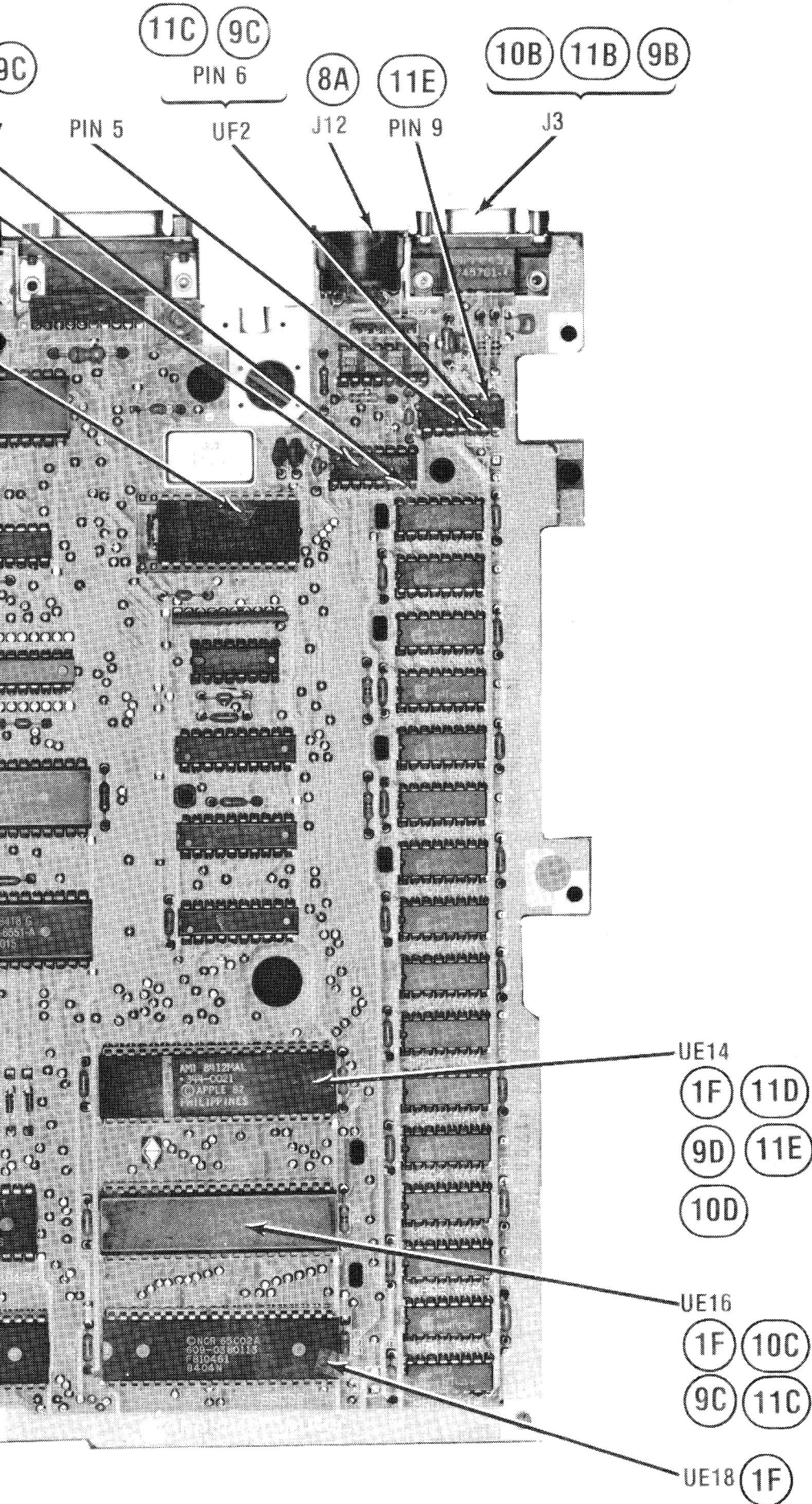
CS07
APPLE
MODEL IIc



PRELIMINARY SERVICE CHECKS (Continued)



PRELIMINARY SERVICE CHECKS (Continued)

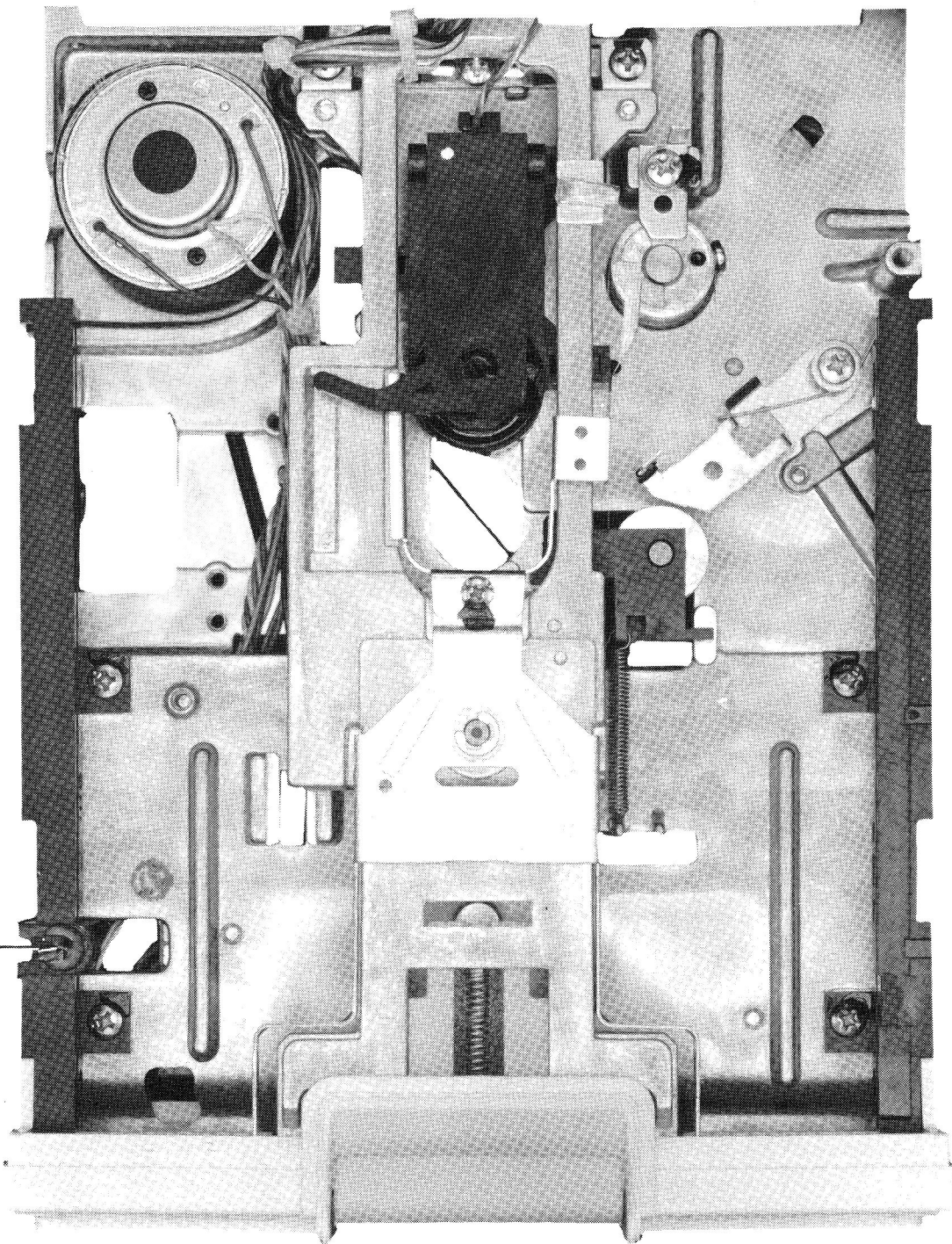


APPLE
MODEL IIc

SYSTEM BOARD

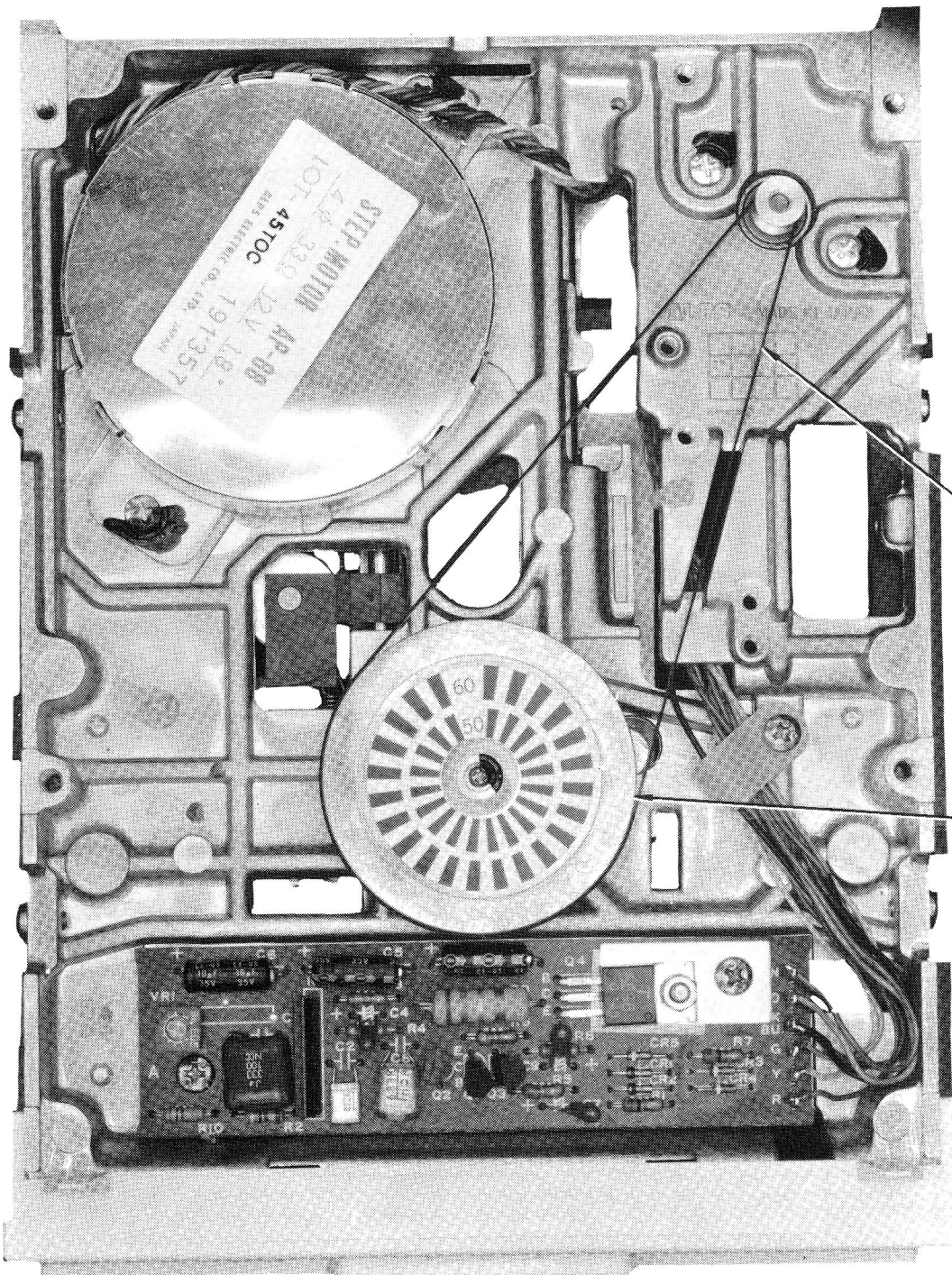
PRELIMINARY SERVICE CHECKS (Continued)

5F
WRITE
PROTECT
SENSOR



MECHANICAL-TOP VIEW

PRELIMINARY SERVICE CHECKS (Continued)



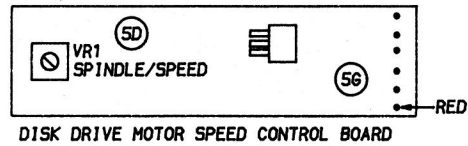
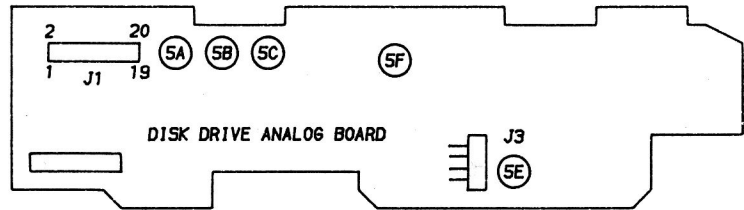
DRIVE BELT (5G)

M1 DRIVE MOTOR (5G)

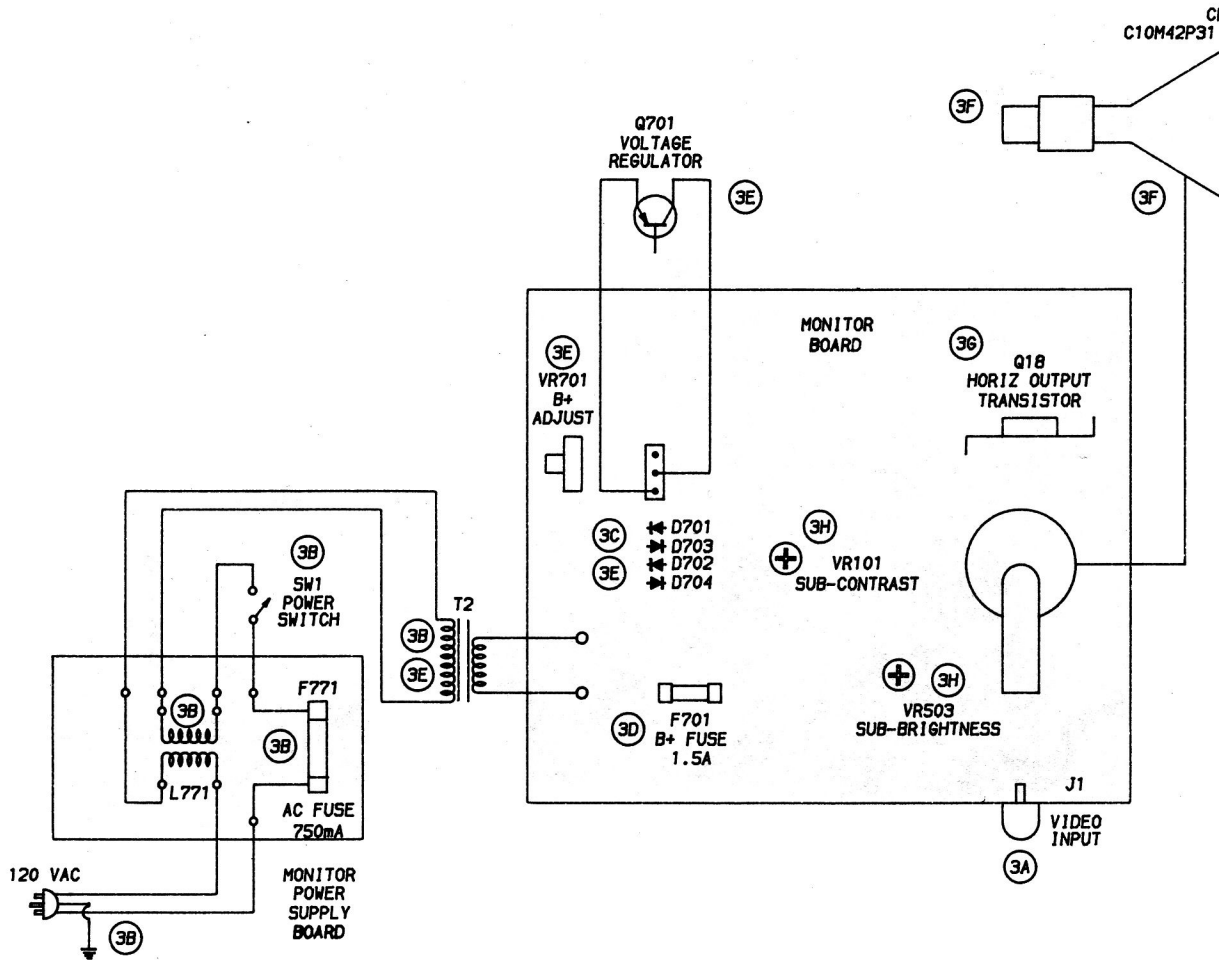
APPLE
MODEL IIc

MECHANICAL-BOTTOM VIEW

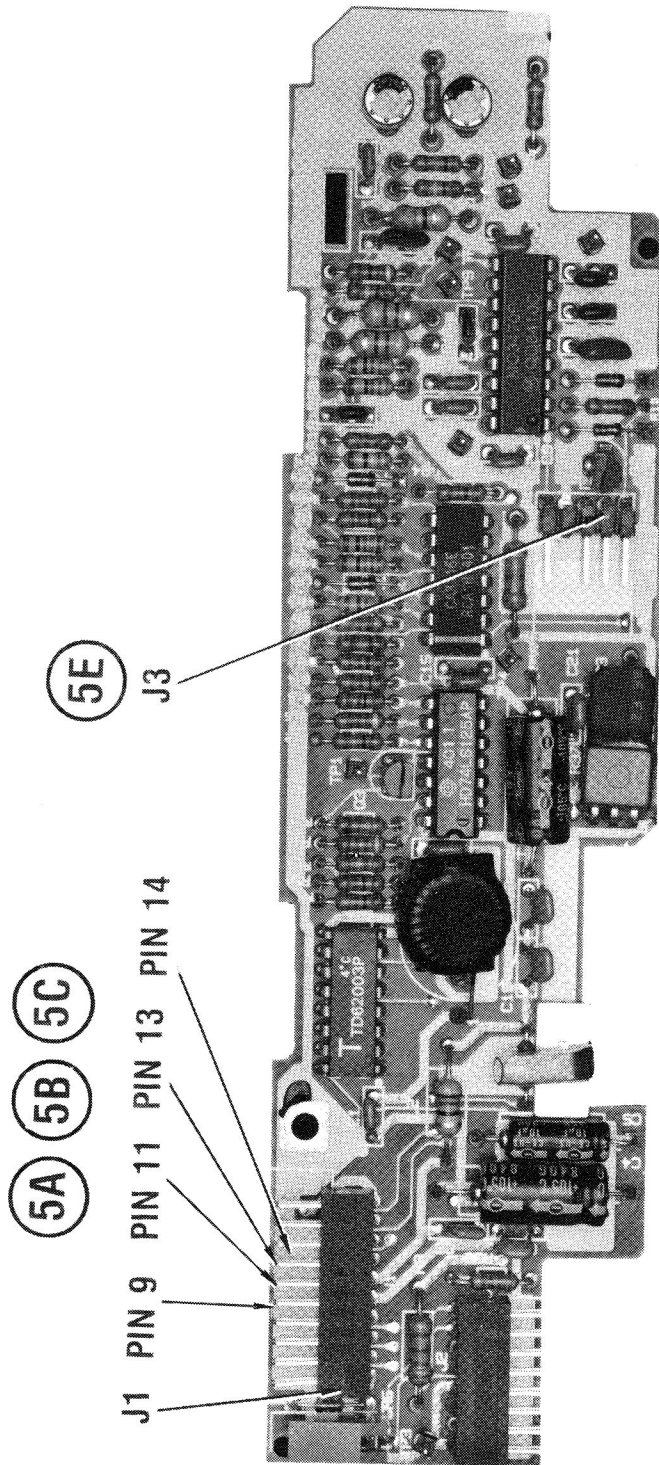
PRELIMINARY SERVICE CHECKS (Continued)



CRT PIN	VOL
1	-1
2	4
3	1
4	-1
5	
6	
7	

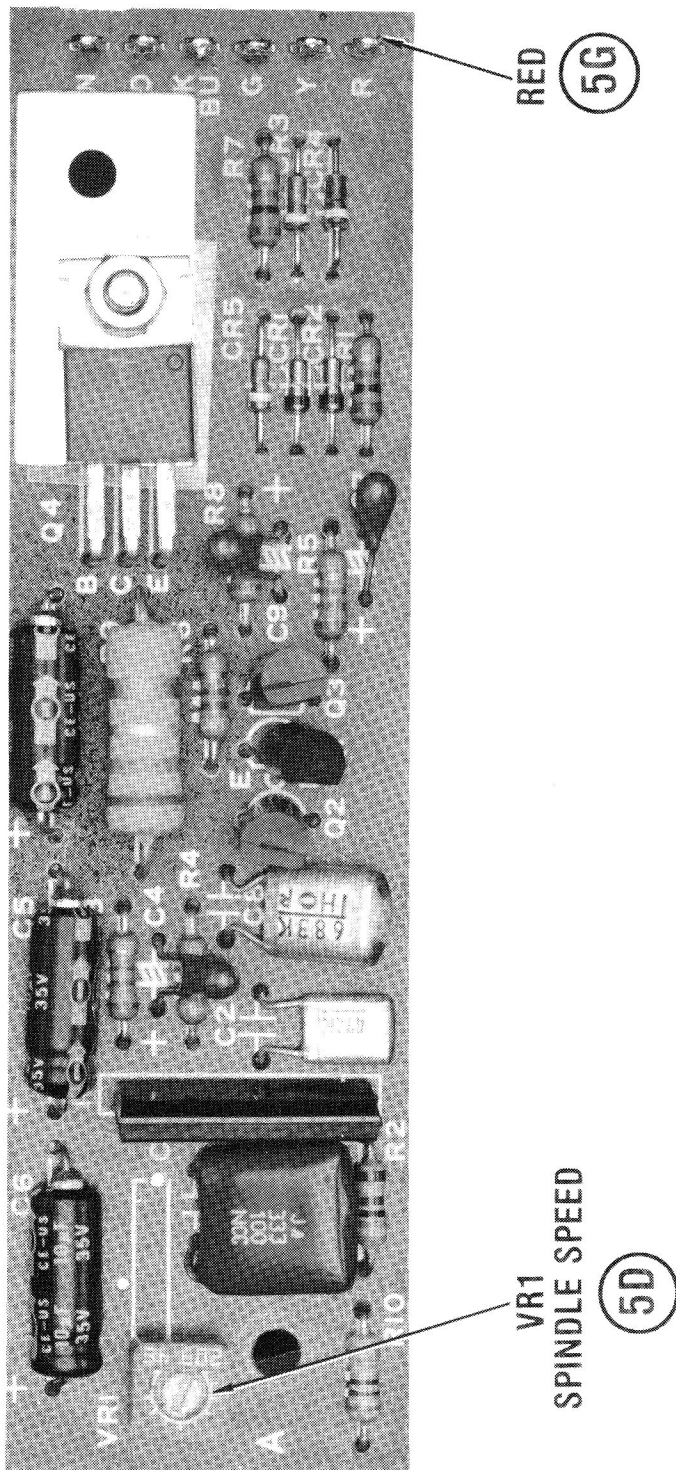


PRELIMINARY SERVICE CHECKS (Continued)



APPLE
MODEL IIC

PRELIMINARY SERVICE CHECKS (Continued)



DISK DRIVE MOTOR SPEED CONTROL BOARD

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.

PRELIMINARY SERVICE CHECKS (Continued)

GENERAL OPERATING INSTRUCTIONS

POWER UP

The Computer will boot up automatically on any bootable diskette that is in the Disk Drive when turned On. If no diskette is in the Disk Drive when the Computer is turned On, the Computer will come up with "Apple IIc" and "Check Disk Drive" on the Monitor screen. Press the Control and Reset keys at the same time to 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)

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 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 stop and the message "Check Disk Drive" will appear on the Monitor screen.

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 the Disk Drive. 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.

80/40 COLUMN SWITCH

This switch takes effect only if the program being used checks to see if the switch is down (40 column) or up (80 column). The program then automatically sets the 40 or 80 column mode according to the switch setting.

To select 80 column mode manually press the ESC key then press the 8 key or type PR#3 and press the Return key.

To select 40 column mode manually press the ESC key then press the Control and Q keys at the same time or type PR#0 and press the Return key.

DISASSEMBLY INSTRUCTIONS

CABINET REMOVAL

Turn the Computer upside down. Remove four screws from under the keyboard and two screws located in front of the handle. Turn the Computer right side up and extend the handle. Release the front latch tab. Lift the top front up and back to clear the rear panel.

DISK DRIVE REMOVAL

Remove four screws from cabinet bottom. Disconnect Disk Drive from System board and remove Disk Drive.

POWER SUPPLY REMOVAL

Remove two screws securing Switching Power Supply. Slide Switching Power Supply back and remove from Connector. To remove Switching Power Supply board from shield, remove the two screws near the edge connector and loosen the screw on the side of the shield. Slide the shield backward to free lock tabs and carefully separate from board.

SYSTEM BOARD REMOVAL

Disconnect the speaker. Remove nine screws holding System board and remove.