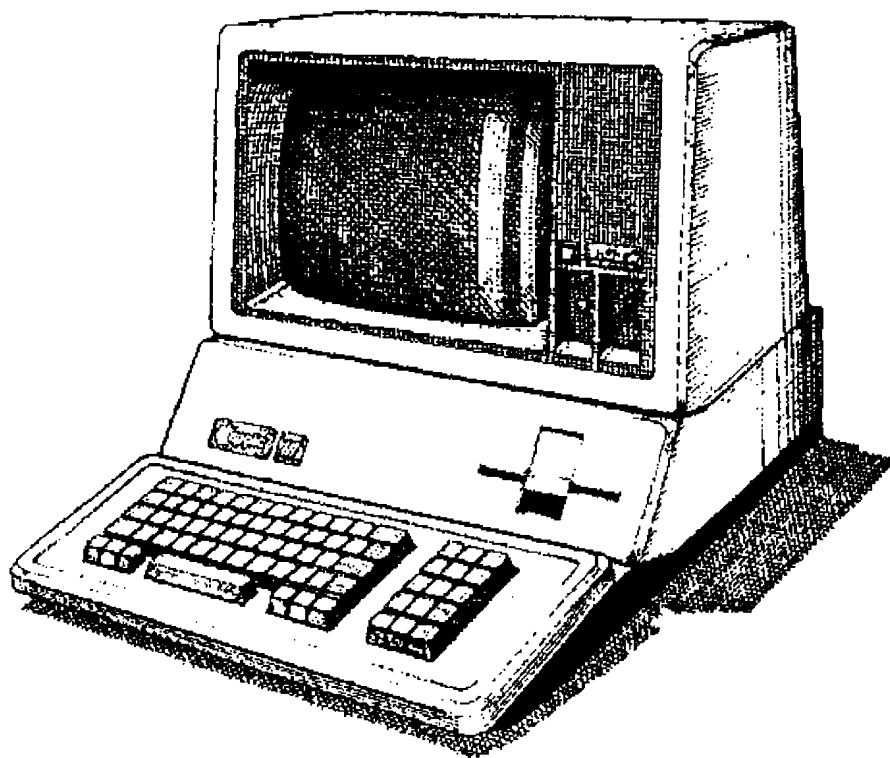Apple /// Computer Information

Apple ///
Service Reference Manual

Section II of II • Servicing Information

Chapter 16 • Module Replacement Procedures

Written by Apple Computer • 1982

apple comp. inc.

APPLE III

MODULE REPLACEMENT PROCEDURES

16.1

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16.2

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I. PERIPHERAL LOGIC ACCESS COVER REMOVAL

1. Power down the Apple ///. Disconnect the AC power cord from the source and then from the power supply receptacle of the Apple ///.

2. Disconnect all external cables. Refer to Figure 1.1.

3. Lift up the front edge of the Apple and tilt it up 90 degrees so that it rests on the back side of the casting.

4. Locate the 1/4 turn locking screw on each side of the Apple and, with a flat blade screw driver, turn each one 1/4 turn counterclockwise to loosen. Do not attempt to remove these screws as they are self capturing and will not normally come out. Refer to Figure 1.2 item A.

5. Lower the Apple /// to the operating position and with a hand on each side of the access cover lift up and pull forward to remove. Refer to Figure 1.3.

6. To replace the cover reverse the procedure as outlined in steps 1 through 5.

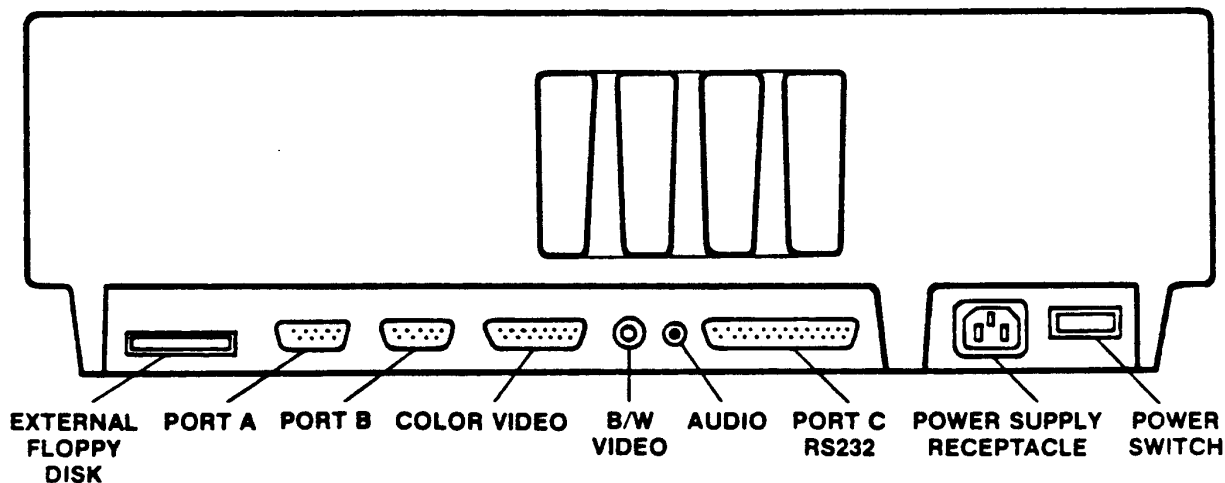EXTERNAL   PORT A   PORT B   COLOR VIDEO   B/W   AUDIO   PORT C   POWER SUPPLY   POWER
FLOPPY   VIDEO   RS232   RECEPTACLE   SWITCH
DISK

FIGURE 1.1

16.3

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FIGURE 1.2

FIGURE 1.3

16.4

apple computer inc.
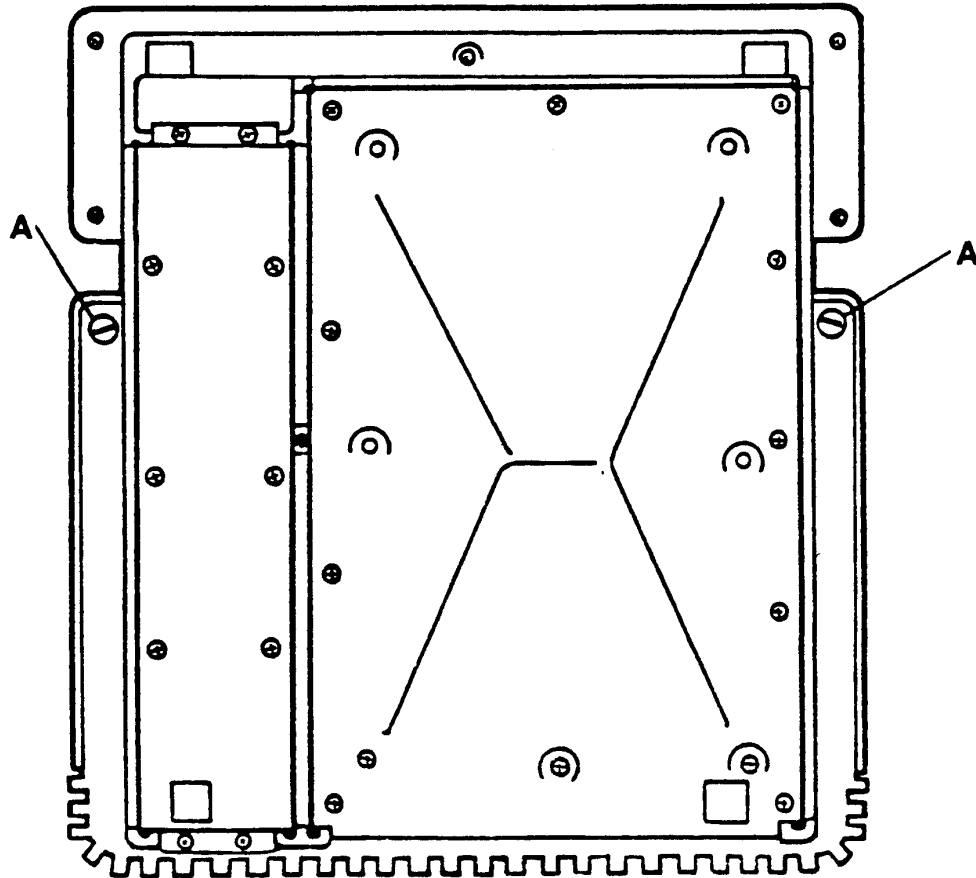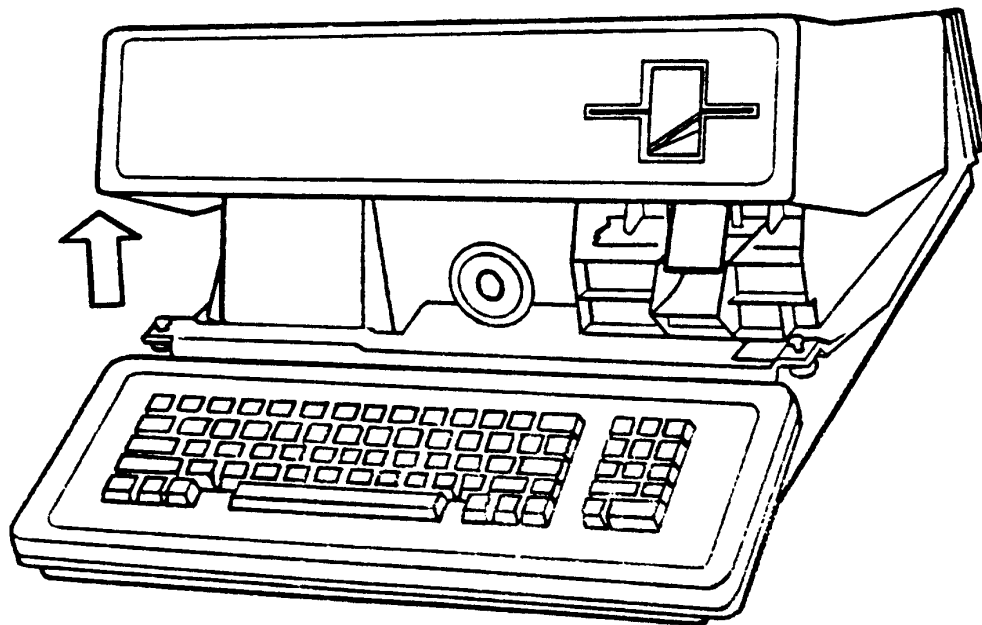
II. PERIPHERAL CARD REMOVAL/INSTALLATION

1. Power down the Apple ///. Disconnect the AC power cord from the source and then the power supply receptacle of the Apple ///.

2. Remove the peripheral logic access cover. Refer to Procedure I.

3. Locate the desired peripheral card. Refer to Figure 2.1 for slot number assignment. Disconnect all cords or cables connected to the peripheral card or cards to be removed.

4. Grasping the card firmly with both hands (using thumbs and forefingers) gently pull straight up on the card to free it from the connector and guide slots. Refer to Figure 2.2.

NOTE: If the card is too firmly captured to allow removal using just the fingers, a metal hook in the pilot hole near the top rear of the card may be used to gain a better grip on the card. Be careful not to tilt or rotate the card, or damage to the card and/or connector may occur.

CAUTION: Never remove or install any card or device with the power on or catastrophic shorting of signal to power supplies may occur.

5. To replace a peripheral card reverse the procedure as outlined in steps 1 through 4.

6. To install a new peripheral card, remove the RFI shield card (dummy card) from the desired slot and follow the detailed procedure enclosed with the new peripheral card.
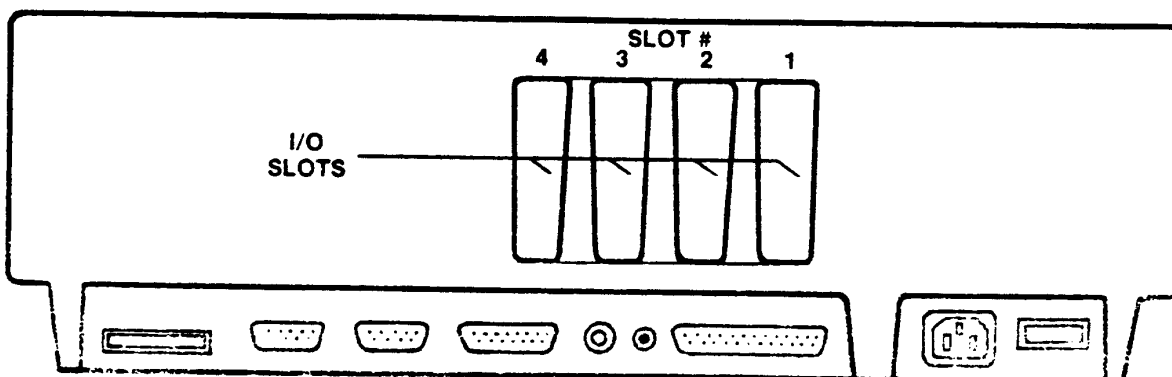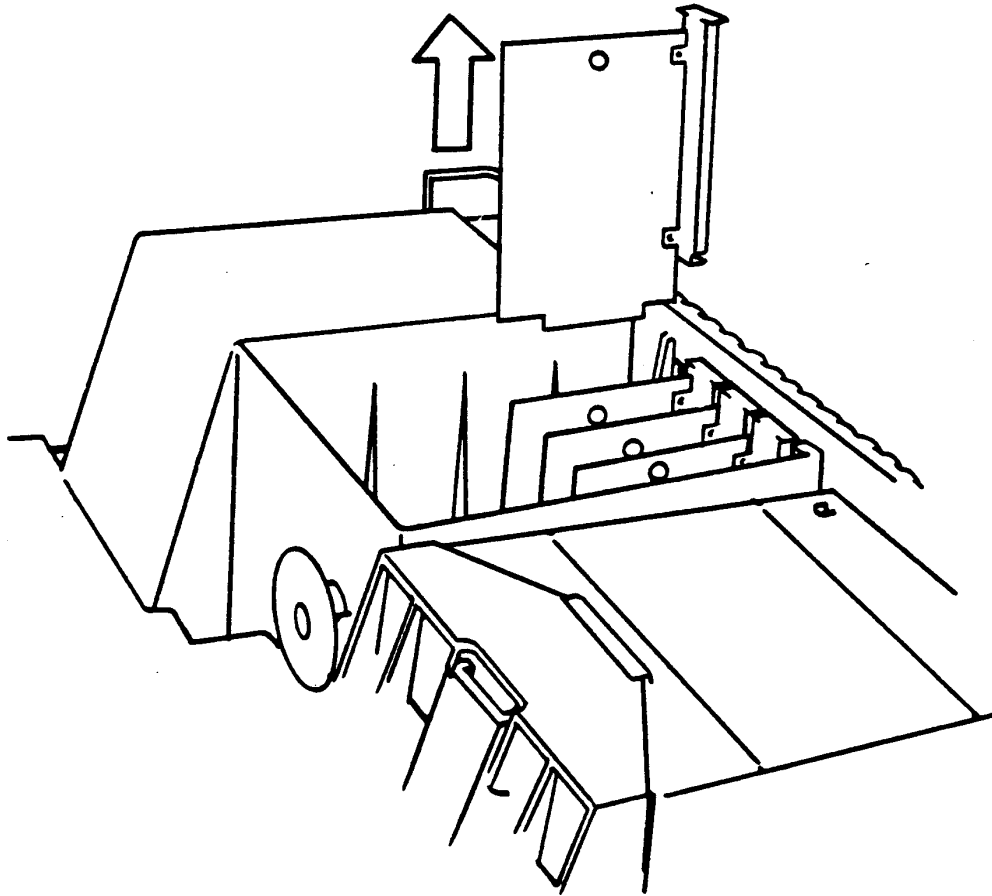
FIGURE 2.1

16.5

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FIGURE 2.2

16.6

apple computer inc.

III. KEYBOARD REPLACEMENT

1. Power down the Apple ///. Disconnect the AC power cord from the source and then from the power supply receptacle of the Apple ///.

2. Place the Apple on its right side with the bottom facing you.

3. Locate, remove and retain the five (5) keyboard cover mounting screws located two each on the right and left ends and one in the front center. Refer to Figure 3.1 item A.

4. Remove the keyboard cover.

5. Place the Apple back into its normal operating position.

6. Locate and remove the two (2) retaining screws on the left end of the keyboard. Refer to Figure 3.2 item A. Loosen the right two (2) retaining screws. Refer to Figure 3.2 item B.

7. Remove the keyboard by lifting the left end and sliding the right end from under the loosened screws. Refer to Figure 3.3.

8. Disconnect the keyboard cable, located on the middle rear edge of the exposed keyboard. Refer to Figure 3.2 item C. Do not pull on the cable. Disconnect by using a screwdriver to push on the tab on the cable connector. Refer to Figure 3.2 item D.

9. Install the replacement keyboard by reversing the steps as outlined in 1 through 8 above. Observe that the keyboard cable makes a tight turn where it wraps to the underside of the keyboard. This is necessary if the keyboard cover is to fit properly.

Caution: Exercise care when tightening the five (5) keyboard cover screws to keep from stripping the threads in the cover.
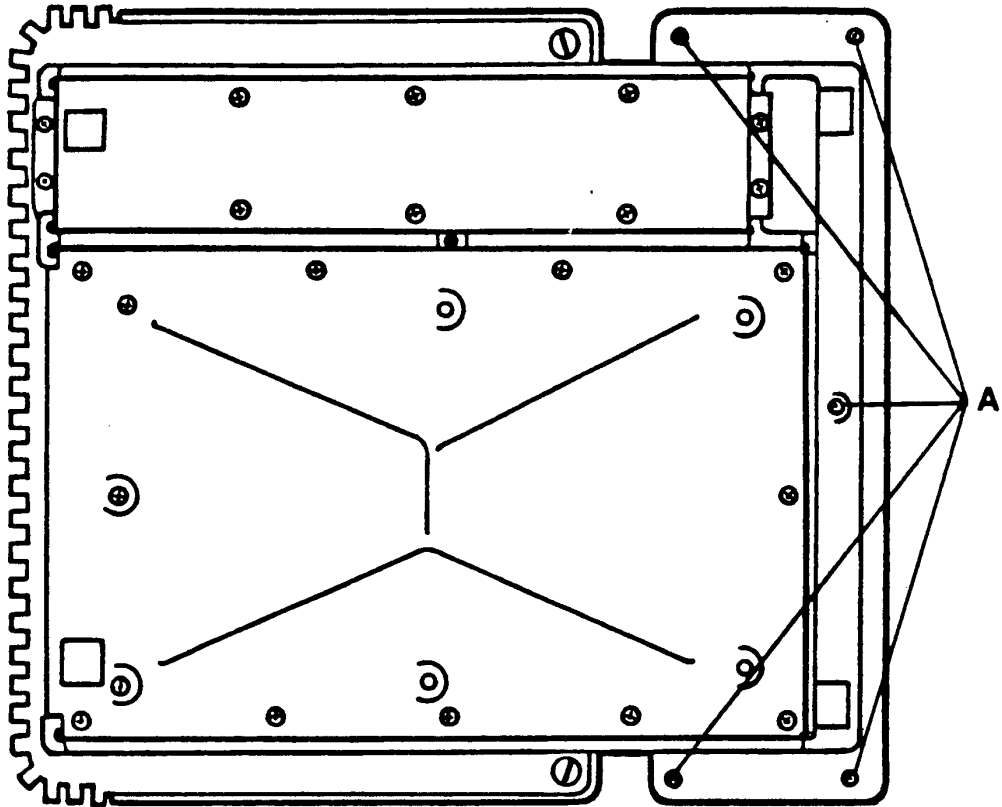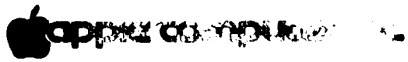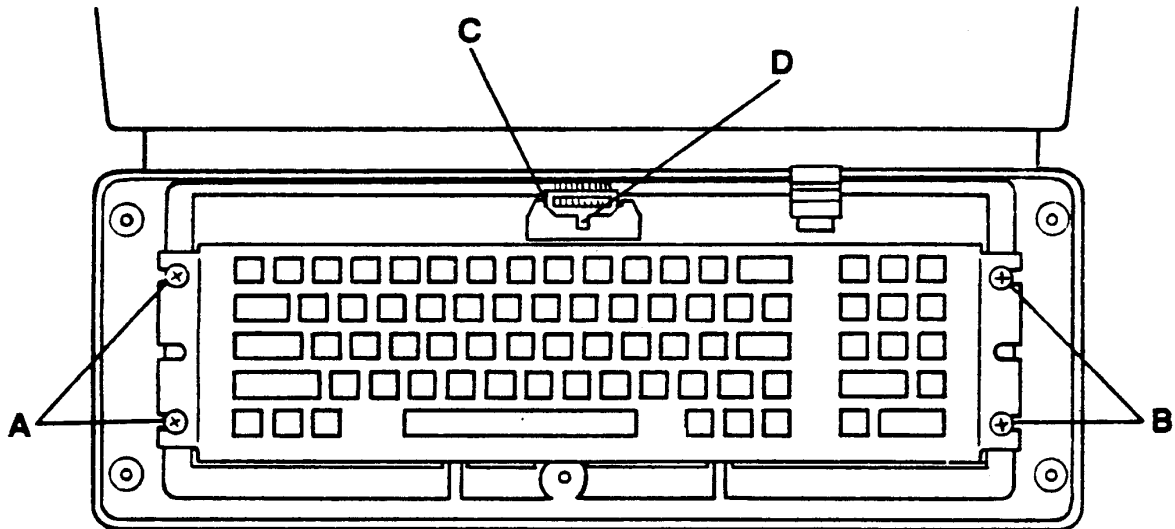
16.7

FIGURE 3.1

16.8

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FIGURE 3.2

FIGURE 3.3

16.9

apple comp.... ...
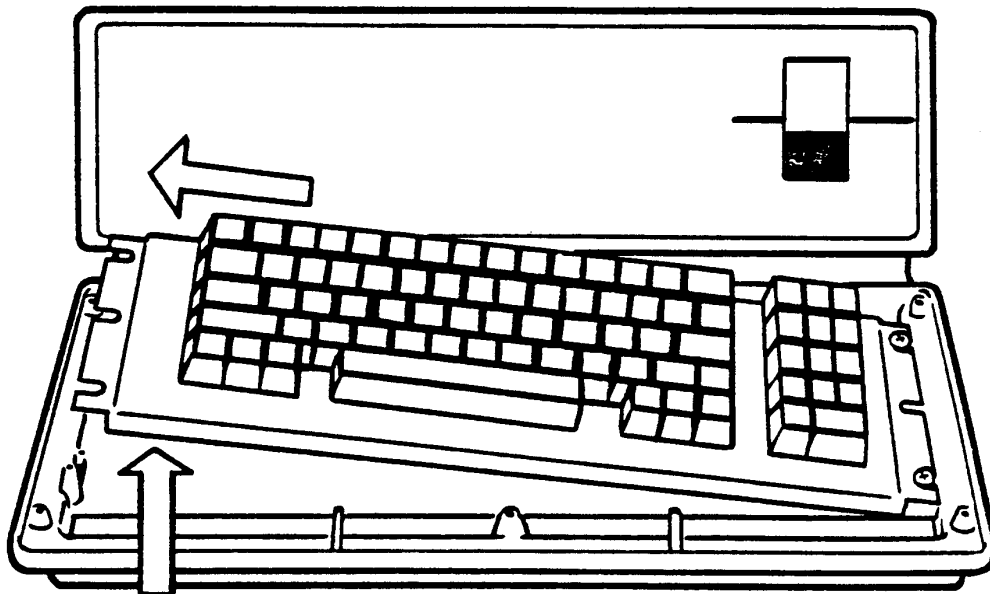
IV. ANALOG BOARD REPLACEMENT - DISK ASSEMBLY*

1. Power down the Apple ///. Disconnect the AC power cord from the source
and then from the power supply receptacle of the Apple ///.

2. Remove the peripheral logic access cover. Refer to Procedure I.

3. Locate the two Tinnerman retaining clips which hold down the Disk
Assembly shield. Refer to Figure 4.1 item A.

4. Using the blade of a screwdriver, slide the clips forward until the
enlarged slots of the clips are around the mounting posts.

5. Remove and retain the clips.

6. Remove and retain the Disk Assembly shield by flexing the side out
(Figure 4.1 item B) and lifting up on the shield. NOTE: The shield is only
retained by the spring tension of the sides and four dimples which fit into
depressions of the disk casting.

7. Disconnect the disk ribbon cable by pushing on the center tab of the plug
with a small screwdriver. Do not pull it out by the cable. Refer to Figure
4.2 item A. Disconnect the read/write head cable. Refer to Figure 4.2 item
B. Do not attempt to remove motor control cable yet. Refer to Figure 4.2
item D.

8. Remove and retain the two small Phillips head mounting screws which hold
the Analog board at the front of the casting. Refer to Figure 4.2 item C.

9. To remove the Analog board, gently slide the left front of the board
forward until it clears the guide holding the left edge. Then slide the
right rear of the board to the left until it clears the guide holding the
right edge. Refer to Figure 4.3. Tilt up the right rear of the board and
lift clear.

10. At this time disconnect the motor control cable. Refer to Figure 4.2
item D. Note there are four nylon locking pawls which engage two holes in
the board from both the top and bottom. These must be disengaged before the
connector can be disconnected.

11. Install the replacement Analog board by reversing the steps as outlined
in 1 through 10 above.

* The Disk Assembly is comprised of two modules, the Analog Board and the
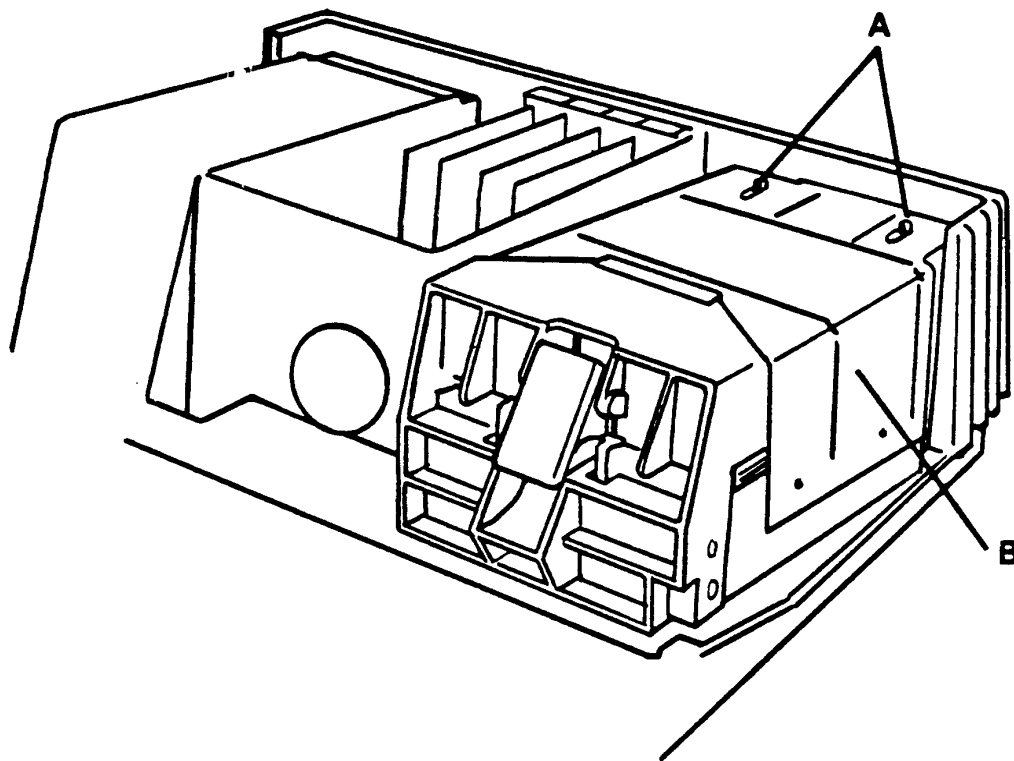Disk Mechanical Assembly.

16.10

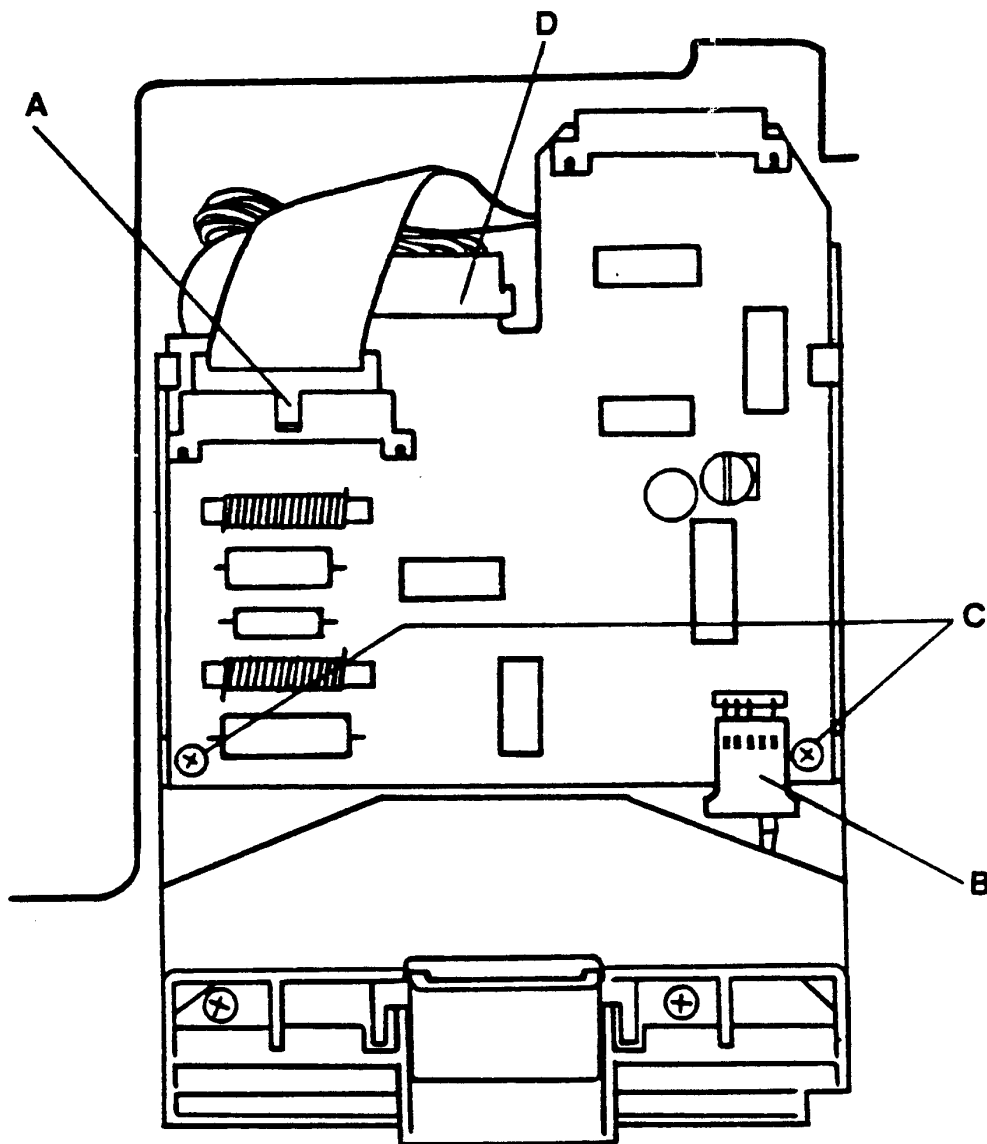**apple computer inc.**

FIGURE 4.1

16.11

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FIGURE 4.2

16.12

apple computer inc.

FIGURE 4.3

16.13

apple computer inc.
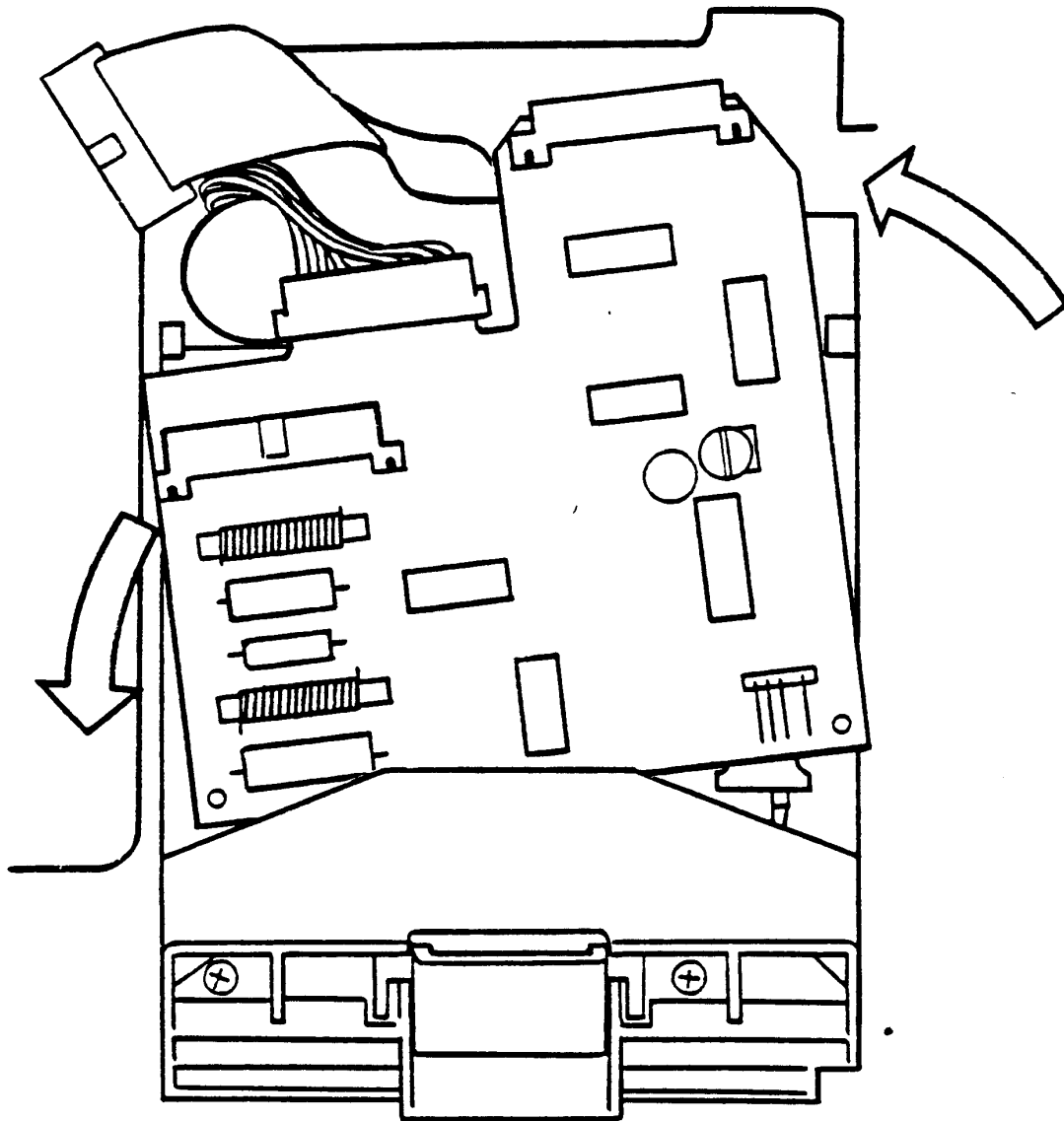
V. DISK MECHANICAL ASSEMBLY REPLACEMENT-DISK ASSEMBLY*

1. Power down the Apple ///. Disconnect the AC power cord from the source and then from the power supply receptacle of the Apple ///.

2. Remove the peripheral logic access cover. Refer to Procedure I.

3. Remove the disk shield. Refer to steps 3 through 6 in Procedure IV.

4. Disconnect the disk ribbon cable by pushing on the center tab of the plug with a small screwdriver. Refer to Figure 5.1 item A. Do not pull on the cable.

5. Scribe a line on the Apple /// chassis along the front (Figure 5.1 item B) and left side (Figure 5.1 item C) of the Disk Assembly bezel. This line will provide a location reference when the Disk Assembly is re-installed.

6. Locate the two Phillips head screws which mount the Disk Assembly to the Apple chassis. They can be seen by looking down through the front diskette guide and door assembly. Refer to Figure 5.1 item D.

7. Completely loosen the two mounting screws but let them remain sitting where they are.

8. Loosen (Don't Remove!) the Phillips head screw through the retaining clip which holds the lower left rear edge of the Disk casting. Refer to Figure 5.1 item E.

9. Remove the Disk Assembly by sliding it forward until it clears the retaining spring clip and then lift it from the chassis.

10. Recover the two front screws from the Disk Assembly.

11. Separate the Analog Board from the Disk Mechanical Assembly as outlined in Procedure IV step 9.

12. Install the replacement Disk Mechanical Assembly by reversing the steps as outlined in steps 1 through 11 above. Use the reference mark made in step 5 to insure proper alignment of the Disk Assembly.

* The Disk Assembly is comprised of two modules, the Analog Board and the Disk Mechanical assembly.
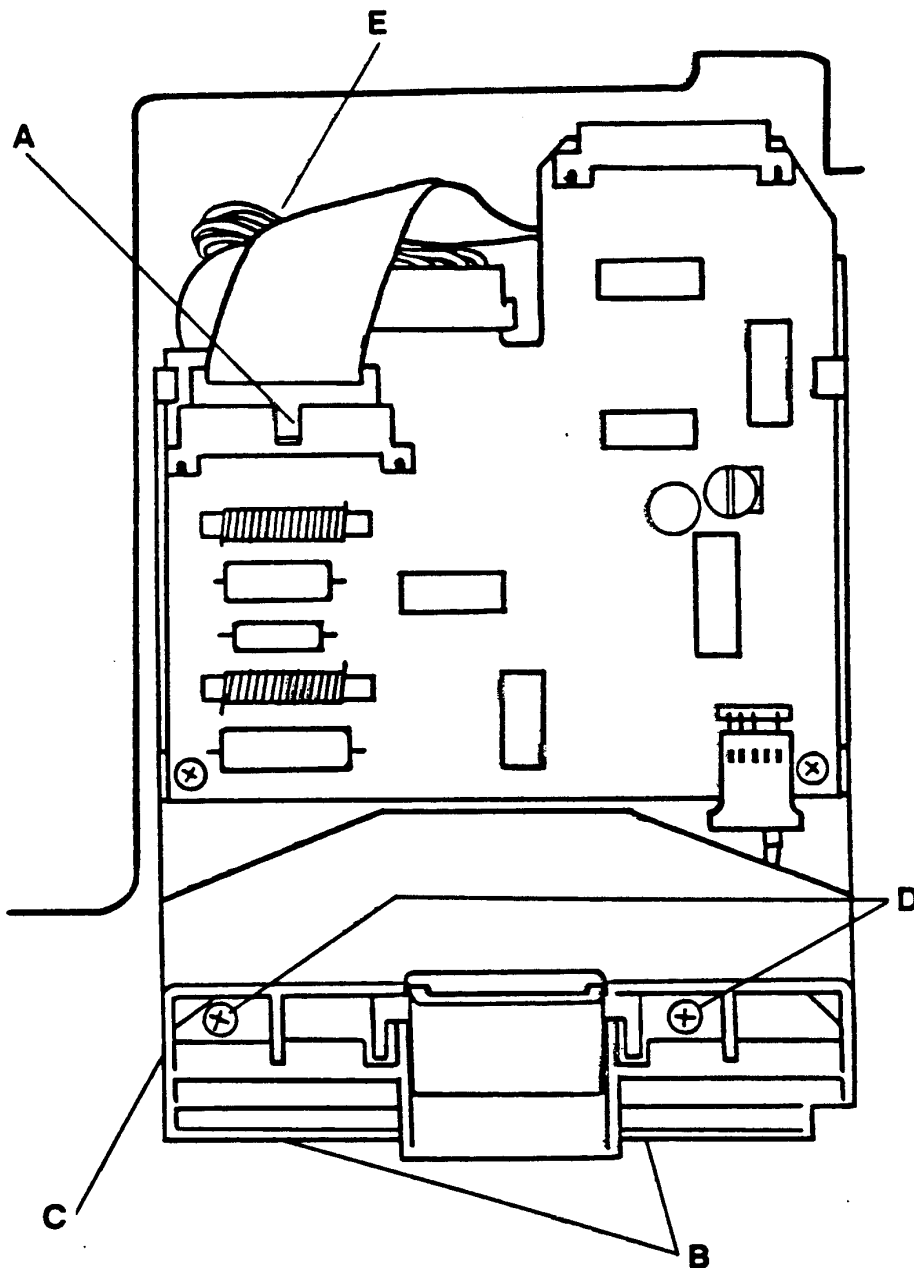
16.14

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FIGURE 5.1

16.15

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VI. POWER SUPPLY REPLACEMENT
----

1. Power down the Apple ///. Disconnect the AC power cord from the source and then remove it from the power supply receptacle of the Apple ///.

2. Disconnect all external cables.

3. Turn the Apple /// upside down with the keyboard facing you and place on a soft pad.

NOTE: You may want to place a foam block under the keyboard to keep the unit from rocking while it is upside down.

4. Loosen (Don't Remove!) the two Phillips head screws located on the rear edge of the power supply bottom cover, near the on/off switch and power supply receptacle. Refer to Figure 6.1 item A.

5. Locate and loosen the eight (8) screws securing the power supply bottom to the chassis. Refer to Figure 6.1 item B. These screws may be captured and if so should not come free of the assembly.

6. Lift up the front edge and slide the power supply forward until the rear edge clears the two rear mounting screws. Gently lift up the power supply assembly to gain access to the electrical connector. Refer to Figure 6.2.

7. Disconnect the power supply connector by pressing in the tabs while gently pulling. Refer to Figure 6.2 item A. If the leads are secured to the power supply by a wire tie, cut the tie. The power supply can now be removed.

8. Prior to replacing or re-installing the supply replace the wire tie, if one was removed.

9. When re-installing the power supply, insert the cover under the two rear most screws and lower the power supply into place.

10. Tighten all screws.

CAUTION: When re-installing the securing screws use only enough torque to rotate the screw. These screws will strip out the chassis, if excessive torque is applied. Also, be certain that the screw is not starting at an angle to avoid cross-threading. If it appears the screw is cross-threading, back it out and try again.
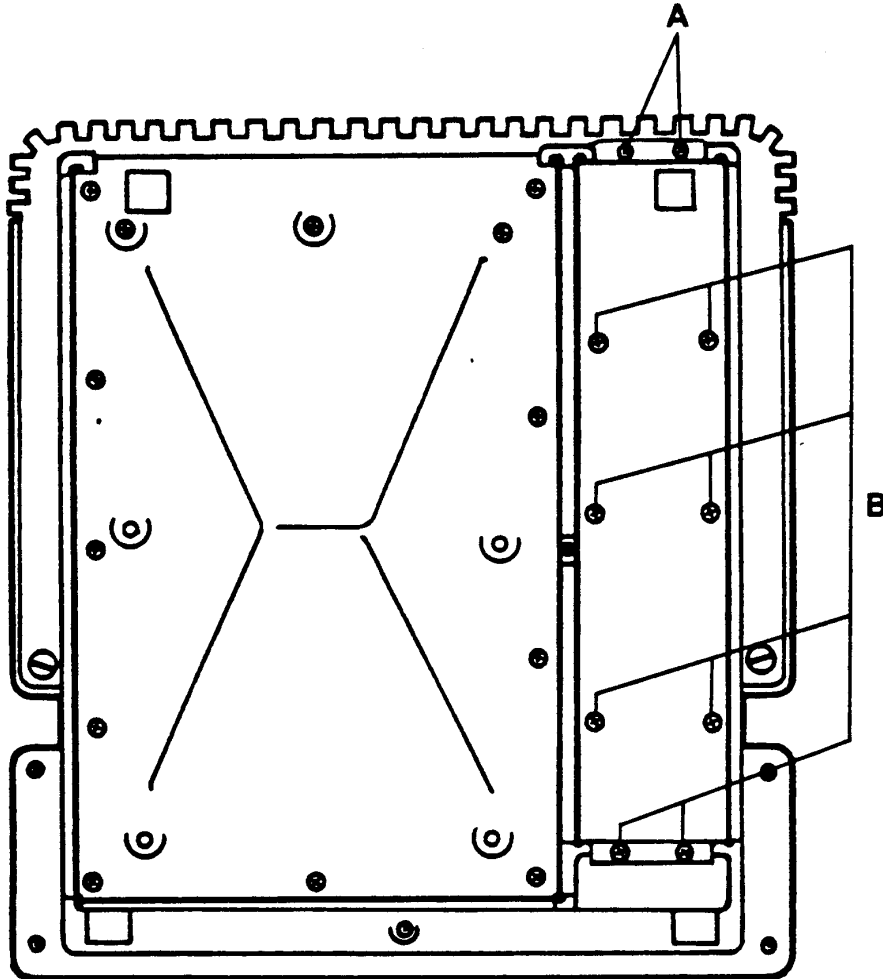
16.16

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A

B

FIGURE 6.1

16.17

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FIGURE 6.2

16.18

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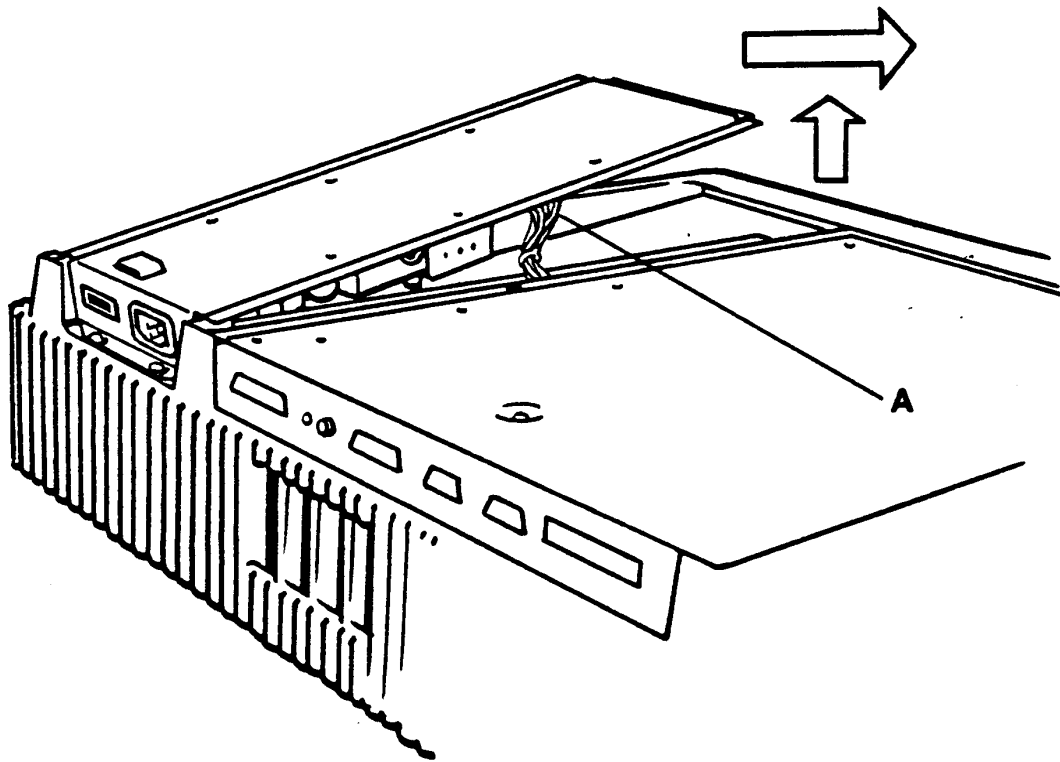
VII.   LOGIC ASSEMBLY REMOVAL*

1. Power down the Apple ///. Disconnect the AC power cord from the source and then from the power supply receptacle of the Apple ///.

2. Disconnect all external cables.

3. Remove the peripheral logic access cover and all peripheral cards, or RFI shield cards. Refer to Procedure I and II.

4. Replace the access cover to protect disk bezel.

5. Place the Apple upside down on a soft pad. The rear of the Apple should face you.

6. Locate the ten (10) Phillips screws around the edge of the Logic access panel. Refer to Figure 7.1 item A. Locate the two (2) additional recessed screws that are about one and one-half inches in from the rear edge of the panel. Refer to Figure 7.1 item B.

7. Loosen these twelve (12) securing screws. These screws may be captured and if so should not come free of the access panel.

CAUTION: The logic board is attached to the access panel, and is still connected electrically to the keyboard, disk, speaker and the power supply. Cable travel allows the access panel to be tilted from the chassis about 45 degrees.

8. Slowly tilt up the access panel from the right side. Allow the panel to remain resting on its edge nearest the power supply. Refer to Figure 7.2.

9. Note the orientation and routing of the cables. While supporting the logic board from the underside remove the speaker cable (Figure 7.2 item A), the keyboard cable (Figure 7.2 item B), the disk cable (Figure 7.2 item C), and the power supply cable (Figure 7.2 item D).

10. The logic assembly is now free from the Apple and can be accessed for testing and repair.

11. To re-install the logic assembly reverse the procedure as outlined in steps 1 through 10 above.

CAUTION: Make sure cables are installed correctly and are not crimped or punctured by the mounting hardware when re-installing the logic assembly.

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* The Logic Assembly is comprised of either three or four major elements, depending upon the time of manufacture. The earlier Logic Assemblies have four major elements: the access panel, the Main Logic board module, the Memory board module and the Encoder board module. The later Logic Assemblies have the Encoder board incorporated into the Main Logic board, and therefore, have three major elements: the access panel, the Main Logic board module and the Memory board module.
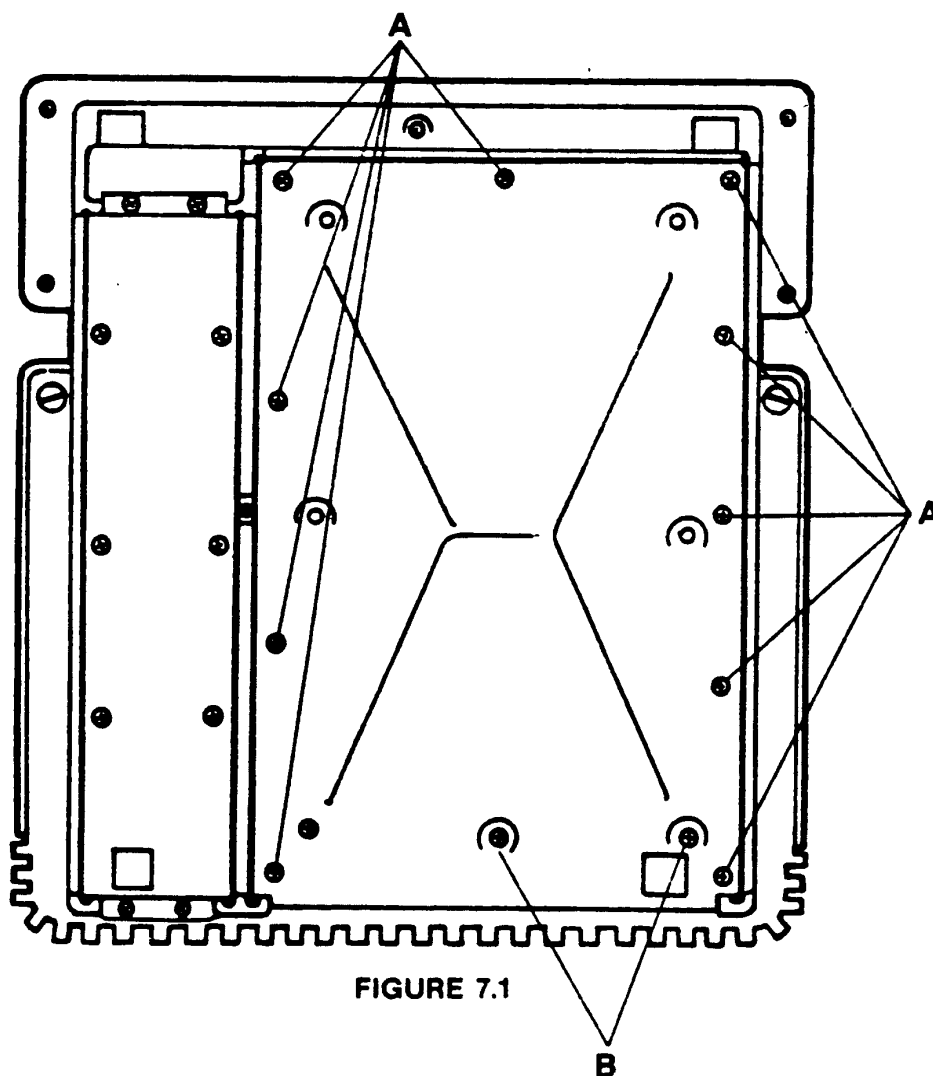
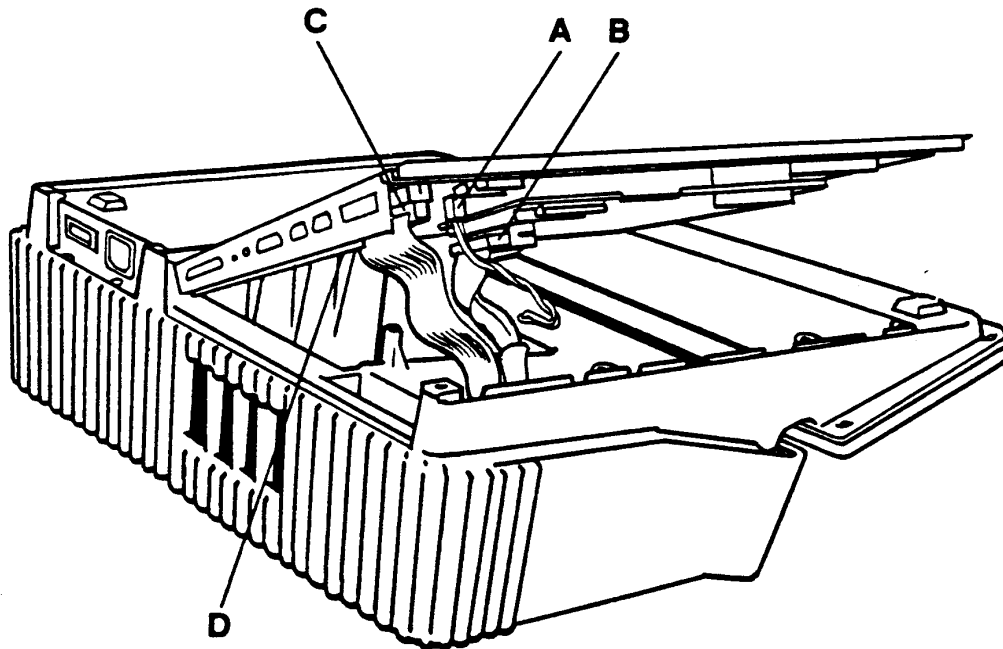**FIGURE 7.1**

16.20

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FIGURE 7.2

16.21

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VIII. LOGIC ASSEMBLY REPLACEMENT

Before implementing any of this procedure the Logic Assembly must first be removed from the Apple. Refer to Procedure VII.

A. MEMORY BOARD REMOVAL

1. With the Logic Assembly placed flat on the work surface, use both hands to lift off the Memory board (Figure 8.1 item A) from the Main Logic board.

NOTE: The mechanical connection is also the electrical connection. Take care and lift straight up, or bending/breaking of the male connector pins mounted in the Main Logic board will occur.

B. MEMORY BOARD INSTALLATION

1. Align the connectors of the replacement Memory board over the connectors of the Main Logic board. The best way to do this is to tilt the Memory board and align the first pins on each side and lower the raised edge slowly, starting the next pins on each side as it is lowered.

CAUTION: Make sure that the board is properly oriented. The reference notches on the Memory board IC should face to the rear of the Logic Assembly (towards the output connectors).

2. Check that all the male pins are started correctly into the female connector of the Memory board. If any of the male pins are not properly started, lift up the Memory board slightly and "wiggle" it until the pins are aligned.

3. Once the pins of the connectors are all aligned, gently push straight down on the connectors on both sides of the Memory board until the connectors are fully seated.

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C. ENCODER BOARD REMOVAL (early version of Logic Assembly only)

1. Locate Encoder board mount standoff. Refer to Figure 8.1 item B.

NOTE: The Encoder board connector on the Main Logic board has been
re-formed for clearance purposes. This repositioning does not allow the
standoff to match the pilot hole of the Encoder board. Therefore, the
standoff can be removed, if you choose.

2. Remove the Encoder board from its connector.

D. ENCODER BOARD INSTALLATION (early version of logic assembly only)

1. Engage the replacement Encoder board on the connector and press into
place.

E. MAIN LOGIC BOARD REPLACEMENT

1. Remove and retain the Memory board as detailed in Procedure VIII
section A.

2. Remove and retain the Encoder board as outlined in Procedure VIII
section C. (early version of logic assembly only)

3. Locate the retaining screw. Refer to Figure 8.1 item C. Remove and
retain. Slide the board out from the peripheral connector opening of the
access panel.

4. Lift off and set aside the Main Logic board.

CAUTION: Make sure that the insulating mylar shield (or substitute
insulator) located between the board and the access panel remains in
place before replacing the Main Logic board.

5. Place the replacement Main Logic board into the access panel, making
sure that the peripheral connectors are aligned into their respective
cutouts in the rear of the access panel.

6. Replace the retaining screw.

7. Replace the Encoder board. Refer to Procedure VIII section D.

8. Replace the Memory board. Refer to Procedure VIII section B.

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FIGURE 8.1

16.24

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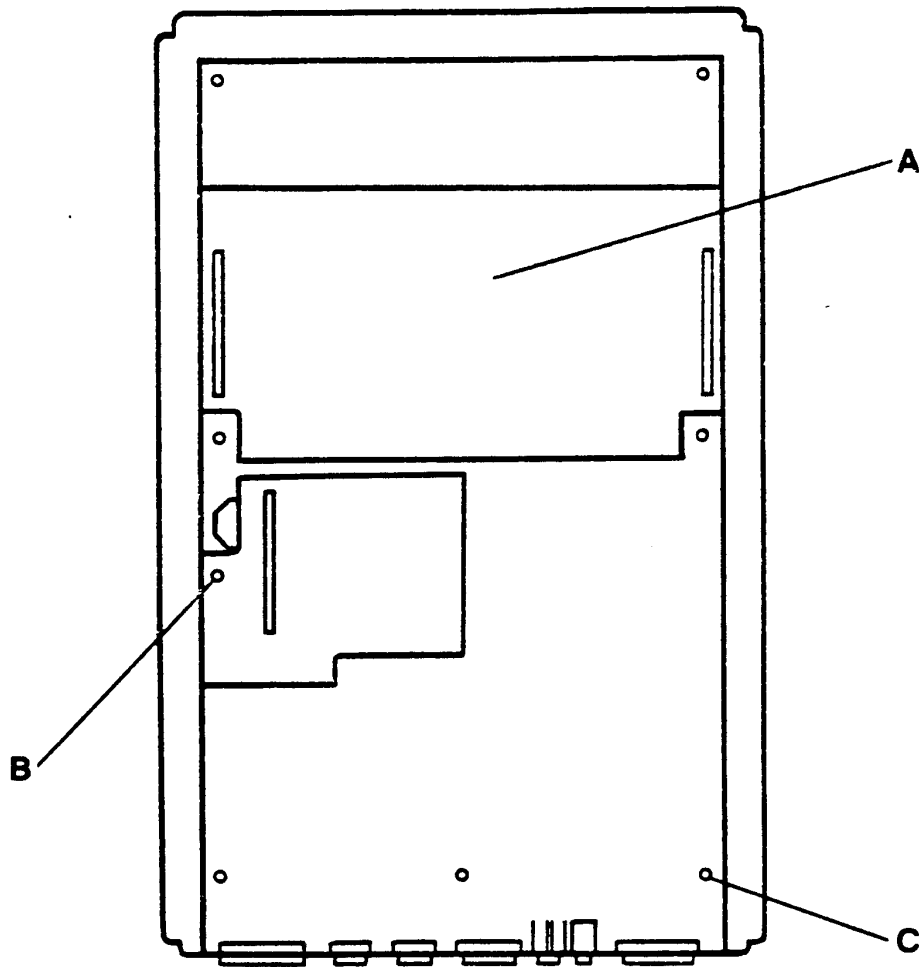
APPLE /// DEALER SERVICE DIAGNOSTICS REFERENCE

INTRODUCTION
The DIAGNOSTIC disk (part #652-0327), used in conjunction with this document
will allow you to diagnose Apple /// failure modes at the modular level.
Additionally, RAM failures may be diagnosed to the chip level.
The descriptions of the tests that follow contain information relative to the
specific test environment that you are using. For instance, it will be
necessary to evaluate test results differently when using color verses B&W
monitors.

EQUIPMENT REQUIRED
        Apple /// computer.
        External Disk /// drives native to system under test.
        B&W monitor w/ cable.
        Apple /// Diagnostic diskette.
        Apple /// External Test diskettes as required. *
        * See MAKE TEST DISKS.

OPTIONAL EQUIPMENT
        RGB Color Monitor, NTSC Color Monitor, or Color Receiver.
        Sup'r'mod'II, for Color Receiver.
        NTSC adapter, for Color Receiver and NTSC Color Monitor.
        Cables.

EQUIPMENT SETUP
As ALWAYS, insure that the Apple /// POWER is OFF BEFORE CONNECTING OR
DISCONNECTING ANYTHING from the Apple /// or any equipment connected to the
Apple ///.

        a. Connect external drives native to system under test.
        b. Connect B&W Monitor to J10 or,
        c. Where available: connect Color Monitor, NTSC adapter,
           and Sup'r'mod II to J5, as required.
        d. Connect power sources to system under test.
        e. Turn on monitor power.
        f. Install Diagnostic diskette in UUT internal drive.
        g. Install External Drive Test diskettes in external
           drives as required.

RUNNING DIAGNOSTICS
There are three critical operations that happen in order to run Apple ///
Diagnostics.
With proper test setup configured as above and Diagnostic diskette installed
in internal drive, turn on Apple /// power.
        1. Power on internal diagnostic.
           This fast internal diagnostic is described further in
           Apple /// owners guide. Refer to that document with
           questions on the start-up diagnostic. Let it suffice to
           say that these tests must be passed before the disk
           boot process may begin.

        2. Boot
           Disk boot is a several stage process that begins with the
           execution of a code block contained in ROM. On a successful

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boot, control is passed to code loaded from disk. Several
loads and transfers of control are made resulting in the
loading and execution of the Diagnostic program.

3. Diagnostic
   Having come this far is a vote of confidence for correct
   system operation. Now, under control of the Diagnostic, a
   thorough investigation of system hardware resources may begin.

DIAGNOSTIC MENU
After a sucessful boot load of the diagnostic program, the following menu
will be presented.

                    TEST ALL

                    VIDEO   (NOT TESTED)
                    SOUND   (NOT TESTED)
                    RAM MAP   (NOT TESTED)
                    DISK   (NOT TESTED)
                    KEYBOARD   (NOT TESTED)
                    ROM   (NOT TESTED)

                    RAM TEST
                    MAKE TEST DISKS

                    CHOOSE:

                    ESC(APE
                        A(CCEPT S(KIP

The menu you actually see on the screen will show the 'TEST ALL' option in
inverse video. This is to indicate that if the 'A' or A(CCEPT key is
depressed, the inverse menu option will be selected for execution. Individual
tests or the two special functions may be made candidates to A(CCEPT by
S(KIPing through the list of menu options, with the 'S' or S(KIP key. As a
menu option is S(KIPped, it is returned to normal video, and the next logical
menu option is inverted or highlighted.
Finally, the Diagnostic program itself may be exited by depressing the 'ESC',
or ESC(APE key. Actually the TAB key performs this function as well. This
feature allows diagnostics running on an Apple][that use the same menu
selection technique to 'feel' the same. ESC(CAPing the Diagnostic tests will
prompt the user to reboot.

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TEST ALL

A(CCEPTing this option will sequentially perform all of the diagnostic modules below:

        VIDEO
        SOUND
        RAM MAP
        DISK
        KEYBOARD
        ROM

Each of the Diagnostic modules operates in a manner identical to that encountered if each were A(CCEPTed individually. For a detailed discription of the various Diagnostic modules, consult the following sections for each module by name.

VIDEO

The VIDEO Diagnostic module will test all of the various screen and color modes available on the Apple ///. You will be asked to make a subjective evaluation of each of the video mode tests. Of course if you are not using a Color Monitor, you will not be able to verify that the colors used in the test are actually present. Users of B&W Monitors will only be able to observe the different colors used as 16 shades of grey. An additional inconvenience that B&W Monitor users will have to put up with is that many B&W Monitors are not capable of displaying 16 linearly arranged shades of grey with a single setting of the monitor controls. In the description of each of the video mode tests, a warning will be given if this problem is anticipated.

The responses used for all of the video mode tests uses the format below:

            SPACE BAR .... TEST PASSES
            RETURN KEY .... TEST FAILS
            ESCAPE KEY .... LEAVE VIDEO TESTS
            LEFT ARROW KEY .... RETRY THE TEST

Except for the text mode and 16 color tests, each of the tests will display the same pattern: A picture of Winston Curchill will appear in the upper left corner, and a grid of diagonal lines will appear in the upper right corner, followed by a prompt field at the bottom of the screen.

1. HIRES MODE 1 - B&W pattern.

2. HIRES MODE 2 - B&W pattern.

3. 280 x 192 COLOR HIRES MODE 1 - Will appear as a negative image. A color monitor will show red and black.

4. 280 x 192 COLOR HIRES MODE 2 - Will appear as a green and white/ or yellow pattern.

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5. SUPER HIRES MODE 1 - B&W pattern as in 1.

6. SUPER HIRES MODE 2 - B&W pattern as in 1.

7. AHIRES TEST 1 - On this and test 8, the screen will be divided into 4 horizontal sections, each a different color. The top half of Winston and the diagonal pattern are blue. The first two lines of the message are green, and the last two lines of the message are gold or orange. You may expect to have difficulty resolving the gray scale differences that represent these colors on a B&W Monitor on this and test 8.

8. AHIRES TEST 2 - pattern as in 7.

9. COLOR BAR & GRAY SCALE TEST - will display vertical bars of different colors. The border is blue. The colors, in order from left to right are: white, aqua, yellow ,green, pink, grey, orange, brown, light blue, medium blue, grey, dark green, light purple, dark blue, magenta, and black.
When viewed on a B&W Monitor, these colors will appear as a grey scale darkening from: white on left to black on right. You may expect to have difficulty resolving the gray scale differences that represent these colors on a B&W Monitor on this test. Although you will not be prompted for a response on this test, you must respond in the manner defined above. (That is... press space bar if test passes, etc.)

10. APPLE II TEXT MODE 1 - This screen will display:

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOGS

abcdefghijklmnopqrstuvwxyz   0123456789
                                 (inverse)

...
(flashing)

11. APPLE II TEXT MODE 2 - will display:

```
            2222222222222222222
            2222222222222222222
            2222222222222222222
                            222
                            222
                            222
            2222222222222222222
            2222222222222222222
            2222222222222222222
            222
            222
            222
            2222222222222222222
            2222222222222222222
            2222222222222222222
```

12. APPLE /// 40 COLUMN TEXT MODE - display will be divided into sixteen

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APPLE /// DEALER SERVICE DIAGNOSTICS REFERENCE

blocks each of one of the sixteen colors white through black. Each block will have a text phrase in a complementary color that describes the background color. You may expect to have difficulty resolving the gray scale differences that represent these colors on a B&W Monitor on this test. Although you will not be prompted for a response on this test, you are required to respond in the manner described above.

13. APPLE /// 80 COLUMN TEXT MODE - will display characters that are much smaller. In fact, you may expect to have difficulty reading these characters on a NTSC Color Monitor or Color Receiver due to the inherent 3.8 mhz bandwidth limitation of these types of displays. B&W composite video and RGB Color monitors will display this test screen in full splendor.

SOUND

1. SOFT BELL - The speaker will beep on and off. Press the space bar if you hear the sound. Press the return key of you do not.

2. HARD BELL - Same as 1. above but at a different pitch.

3. DAC OUTPUT - The digital to analog converter will produce a sound at the speaker output that periodically is of zero amplitude that grows in amplitude to be cut off again to zero amplitude. The change in amplitude should be regular and of constant pitch (except for the cut off of sound at max amplitude).

RAM MAP

This test does a cursory test of the ram to determine the configuration in the unit under test. The results will be displayed as a message discribing the ram map determined in the test. eg:

RAM MAP GOOD FOR A 128K SYSTEM

If the message does not correspond to the physical configuration determined by inspection, press press return key to reject test. If the message describes the true configuration, press the space bar.

DISK

At this time you will be prompted to remove the Apple /// Diagnostic Diskette, and to insert the Internal Drive Test Diskette. Previous to this point, you should have inserted any External Drive Test Diskettes in external drives as required. This setup is acknowledged by depressing the return key.
You will then be required to enter the number of external drives connected to the unit under test.
At this point the test runs automatically, terminated with a disk test summary for each drive specified above.

Upon completion of disk tests, you will be prompted to reinsert the Apple /// Diagnostic Diskette. You will acknowledge this operation by depressing the return key.

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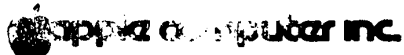
APPLE /// DEALER SERVICE DIAGNOSTICS REFERENCE

KEYBOARD

1. ALPHANUMERIC - depress each of the keys on the alphanumeric keyboard and verify that its representation on the display is removed.
Three keys require special key stroke sequences to test their function. These sequences are described at the top of the keyboard test screen. If, after depressing all alphanumeric keys, some key representations remain on the test display, then type the sequence CTRL-S.

2. SPECIAL FUNCTION KEYS - Depress the ALPHA LOCK key and note that the state of the ALPHA LOCK key changes. Leave the ALPHA LOCK key in the UP state.

Depress OPEN APPLE key and note that its state is reported as down.

Depress any key, (except SPACE or RETURN), and hold. Note the REPEAT SPEED. Anything from 5 to 15 / sec is acceptable. While holding a key down in repeat mode, depress the CLOSED APPLE key. Note that the REPEAT SPEED will increase to approximately double the normal rate.

Accept or reject this test as prompted at the bottom of the screen.

The SOLID APPLE key test will prompt you with a key stroke sequence that must be followed exactly. Perform the indicated operations as the test proceeds automatically.

3. NUMERIC KEYPAD - same as in 1. above.

ROM

This test is a straight forward go, no-go test, that reports the message: ROM PASSES... / ROM FAILS...

At this point, if you had selected the TEST ALL option, the main menu will appear with the test summary to the right of each of the test options.

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OTHER DIAGNOSTIC OPTIONS

The Diagnostic Diskette menu contains two other options that may be accepted
for execution. These options are separated from the options described above
because they are 'one way' trips, in that upon completion of the execution of
these modules, you will be required to reboot the unit under test. These
modules are described below.

RAM TEST

This test performs a thorough exercising of all ram contained in the system.
This test takes several seconds to complete and should not be interrupted. On
invocation of this module however, you are given the chance to return to main
menu.
Successful completion of this test module is indicated by the display of a
diagnostic message on the upper left hand corner of the display. This message
will contain a matrix of dots (.) and ones (1), if ram errors are encountered.
These are placed in the matrix in a logical fashion. Ram chip failures may be
determined by comparing ones (1) found in the displayed matrix against the ram
chip locator matrix below.

```
        B9   B8   B7   B6   B5   B4   B3   B2   *
        B17  B16  B15  B14  B13  B12  B11  B10  *
        B9   B8   B7   B6   B5   B4   B3   B2
        B17  B16  B15  B14  B13  B12  B11  B10
        C17  C16  C15  C14  C13  C12  C11  C10
        D9   D8   D7   D6   D5   D4   D3   D2
        D17  D16  D15  D14  D13  D12  D11  D10
        C9   C8   C7   C6   C5   C4   C3   C2
```

      * DISREGARD THESE TWO ROWS ON 96K SYSTEMS
      NOTE: All other diagnostic messages displayed shall be disregarded.
            No prompt will be given to reboot the system under test.

MAKE TEST DISKS

You will use this module to prepare Drive Test Diskettes used in the DISK test
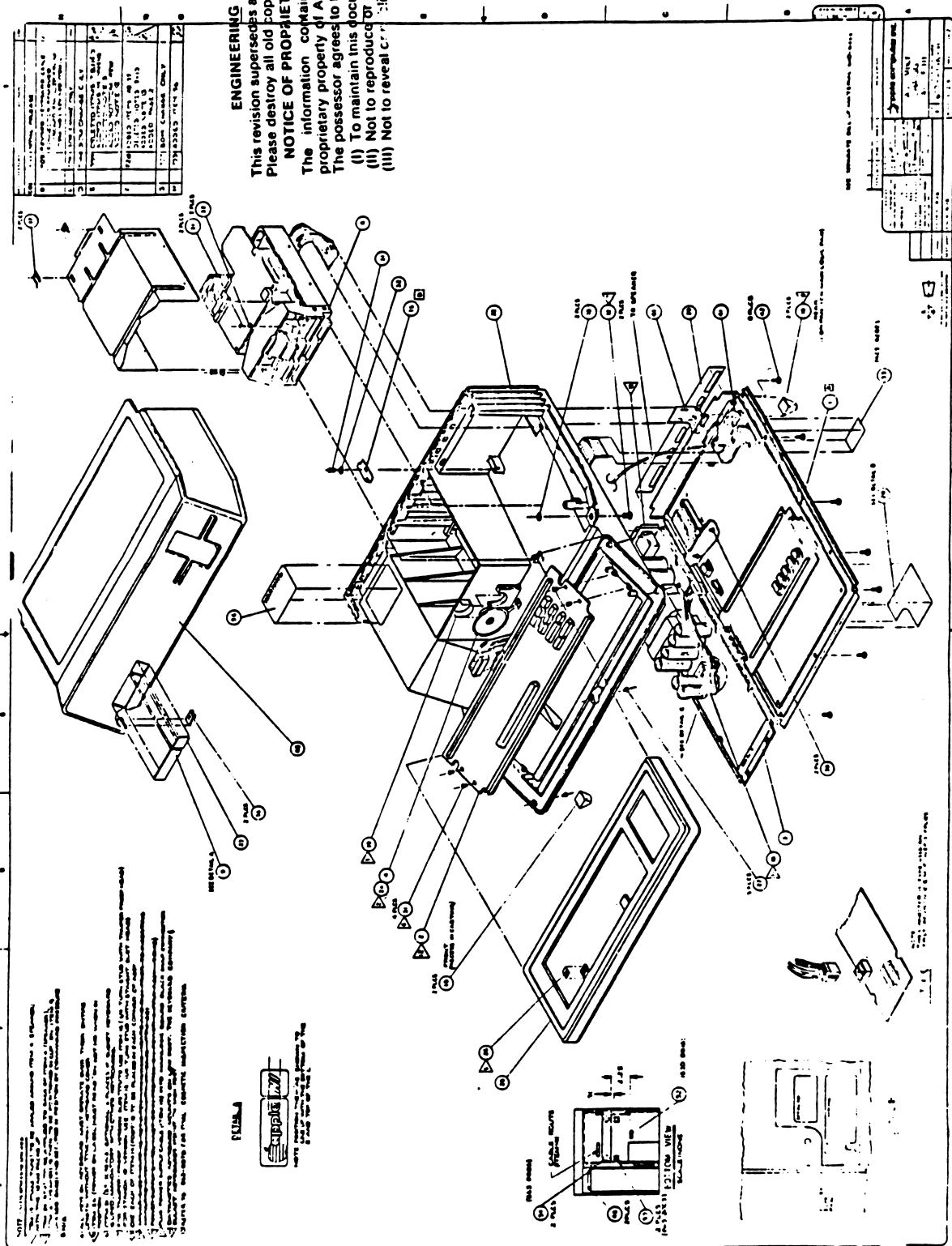module described above.
Upon accepting this module you will be prompted to remove the Diagnostic
Diskette.
You will then be prompted to enter the drive number corresponding to the test
diskette you wish to make. Enter this number <1 = internal , 2..4 = external>,
followed by depressing RETURN.
You will be asked to insert a blank diskette into internal drive and
acknowledge by depressing RETURN.
The utility will inform you that it is creating the test diskette for the
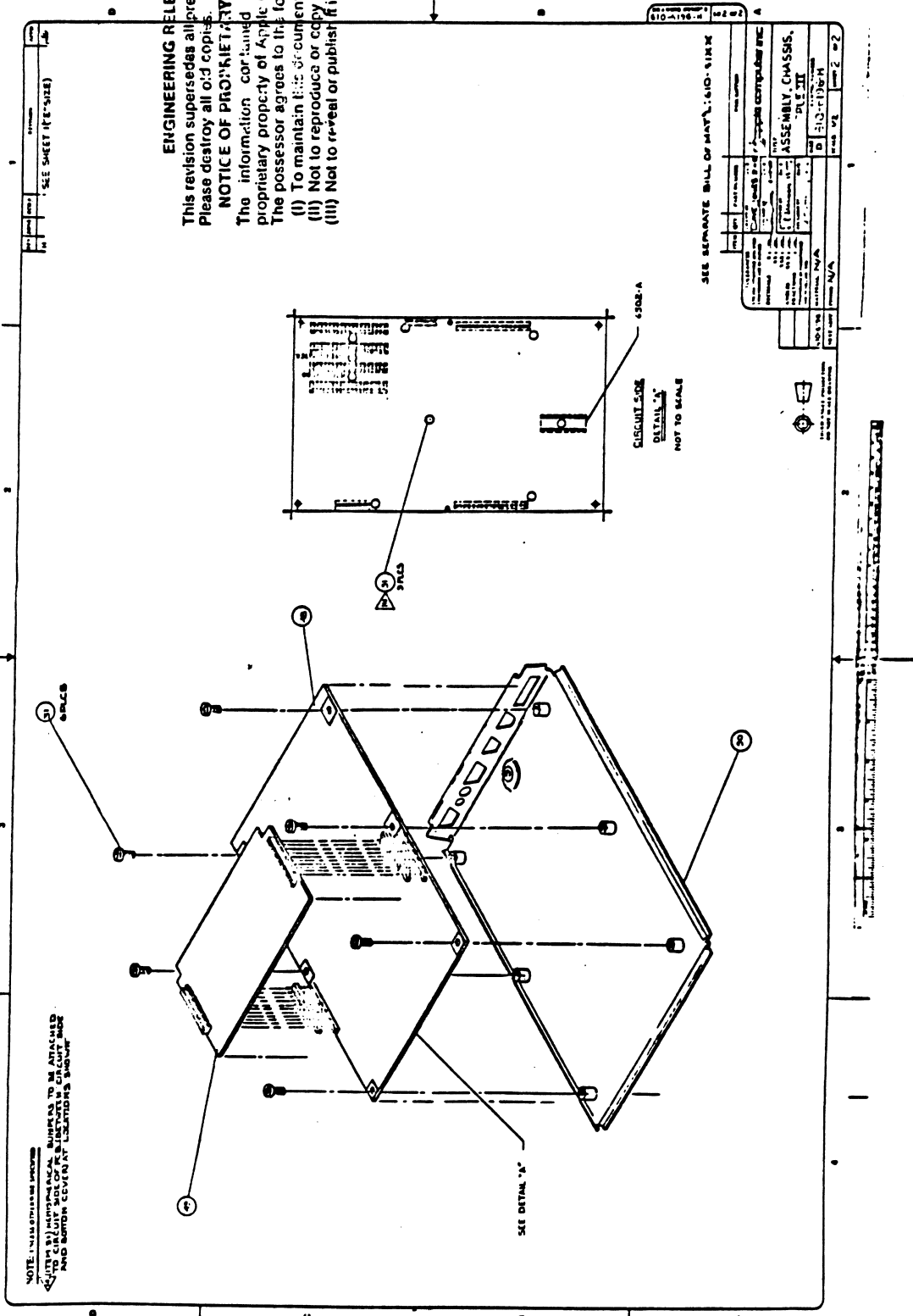drive that you specified in the operation above.
A 'DONE message' will be displayed on completion. You will be asked if you
want to make another diskette. If you reply 'y' the above process will be
repeated, otherwise you will be prompted to reboot.

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FIG. 1

BUMPER LOCATIONS

SCREW
6 PLCS

FIG. 2

LOGIC BOARD
ASSEMBLY

BOTTOM PAN
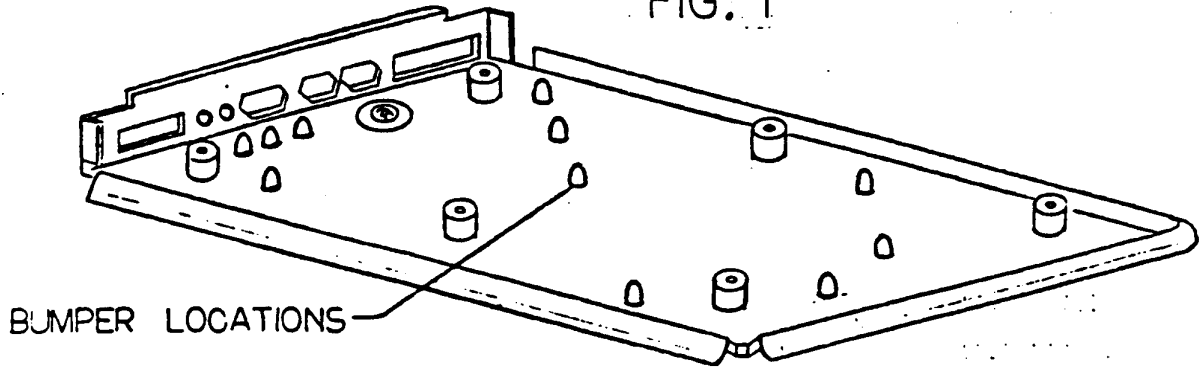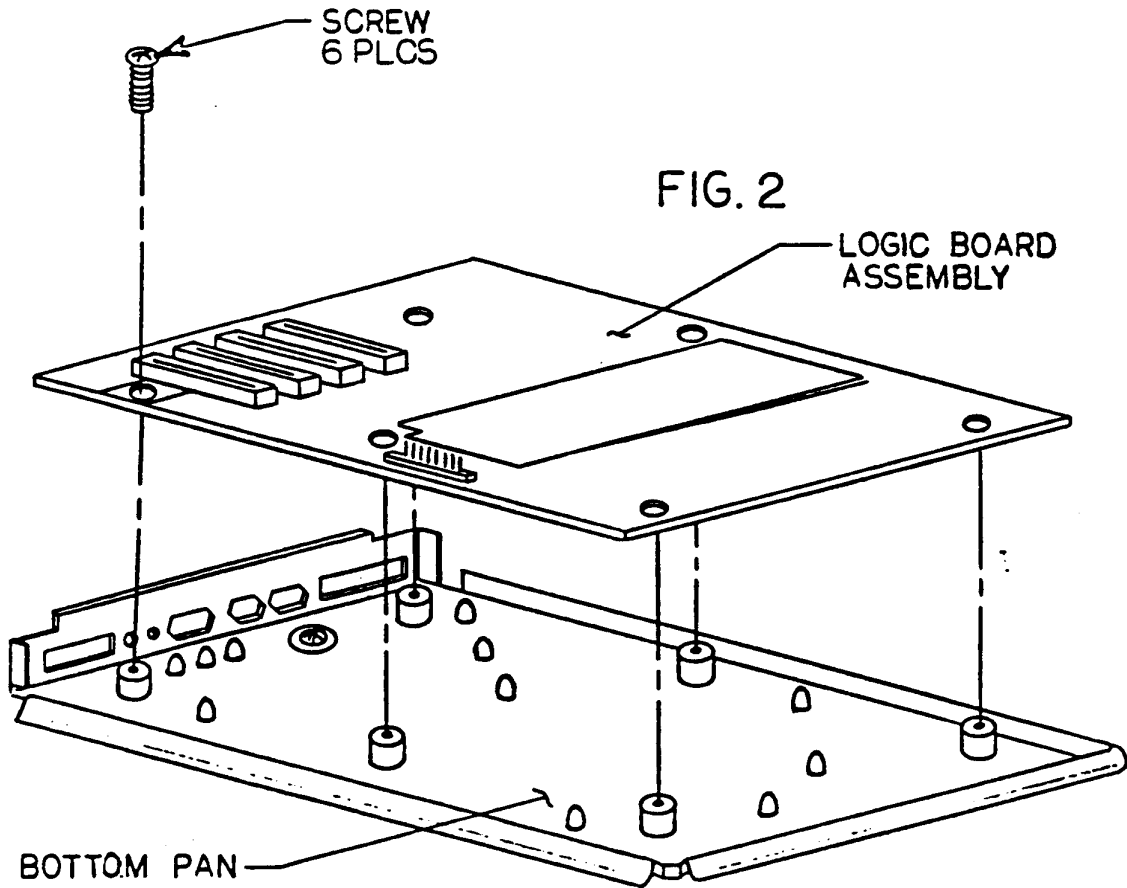
DRAWN BY	OPERATION NO.	TITLE
M. Castillo	A20	LOGIC BOARD PAN ASSY.

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FIG. 5

POWER SUPPLY ASSEMBLY

POWER SUPPLY CABLE

SCREWS 8 PL

SCREWS (2)

CASTING

"B"

"A"

REAR
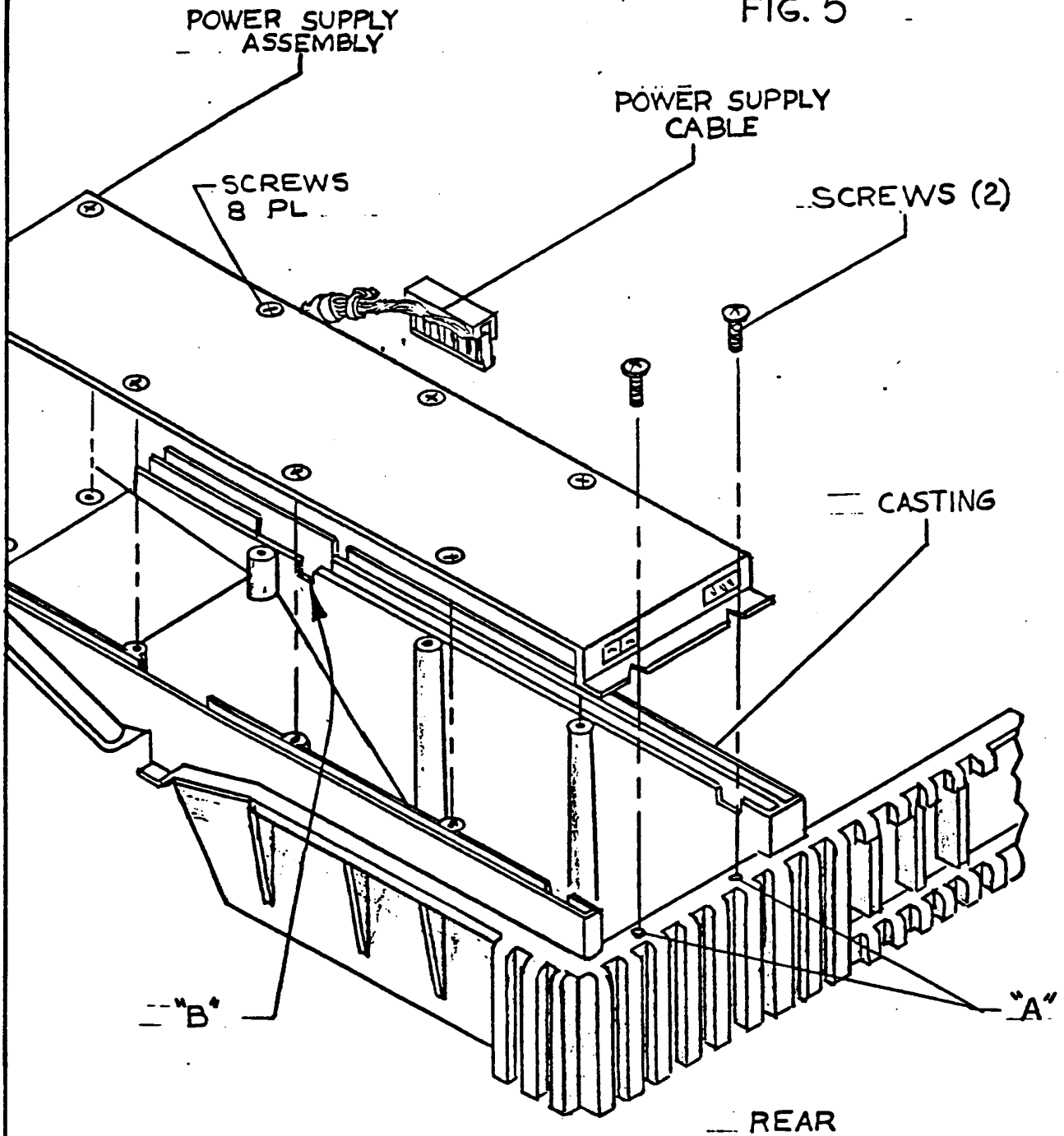
DRAWN BY

OPERATION NO.
040

TITLE
INSTALL POWER SUPPLY

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NO. 064-0022

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FIG. 1

KEYBOARD-
LOGIC BOARD
CABLE

SPEAKER
CABLE

LOGIC
BOARD
ASSEMBLY

DISK DRIVE-
LOGIC BOARD
CABLE

LOGIC
BOARD
PAN

POWER
SUPPLY
CABLE
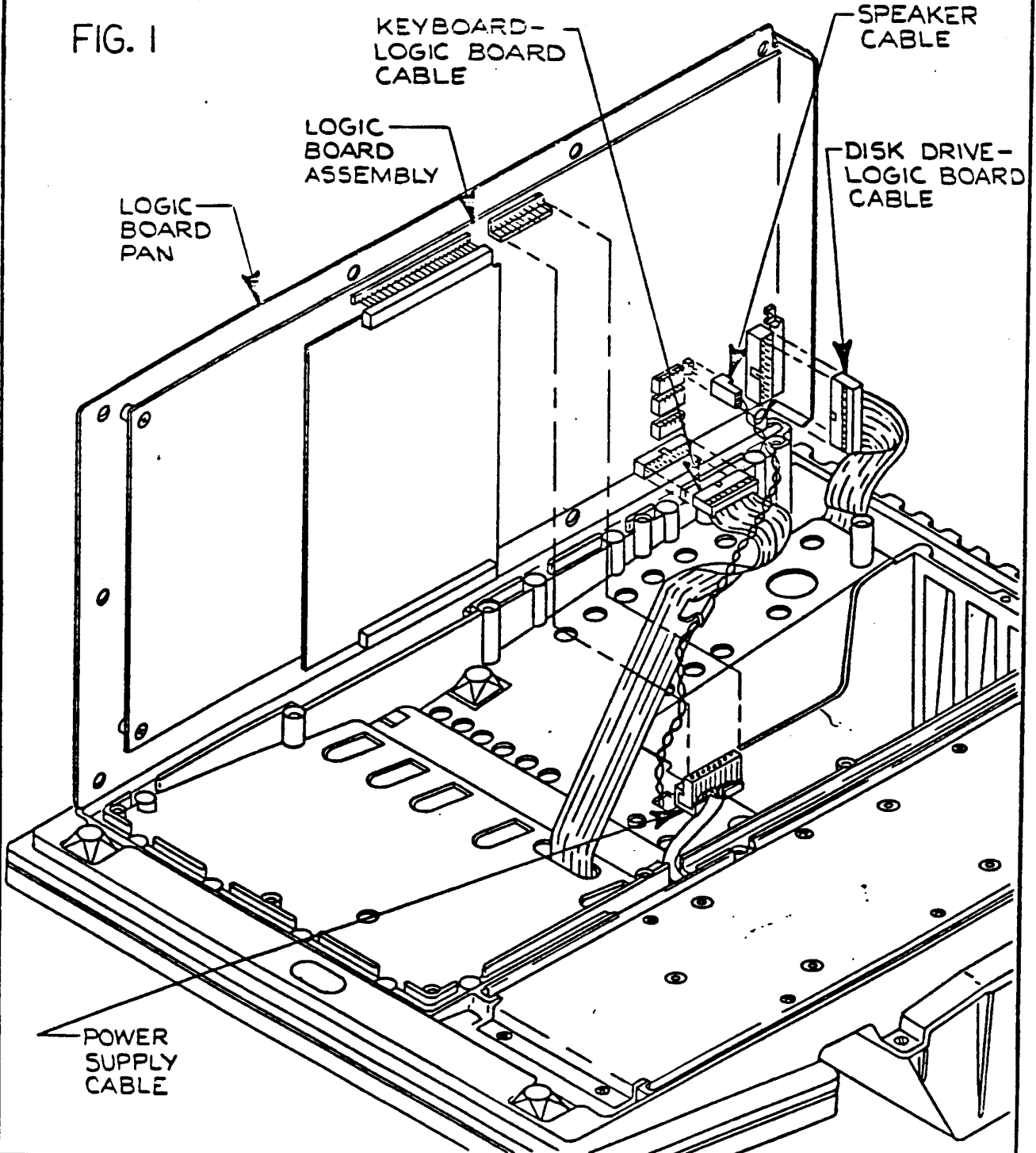
DRAWN BY
M. Bastillo

OPERATION NO.
050

TITLE
INSTALL LOGIC BOARD ASSY.

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