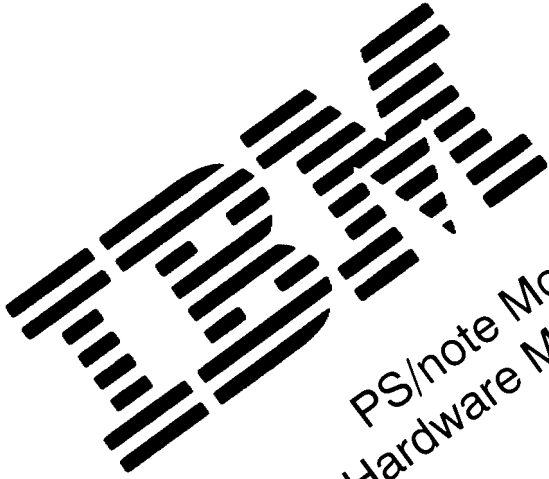**PS/note Model N45SL Hardware Maintenance Reference**

May 15, 1992

This pamphlet is intended to be used with the IBM Personal System/2 Hardware Maintenance Reference manual (part number 15F2190, form number S15F-2190-00) and the IBM Personal System/2 Hardware Maintenance Service manual (part number 15F2200, form number S15F-2200-00).

Part Number 42G0485

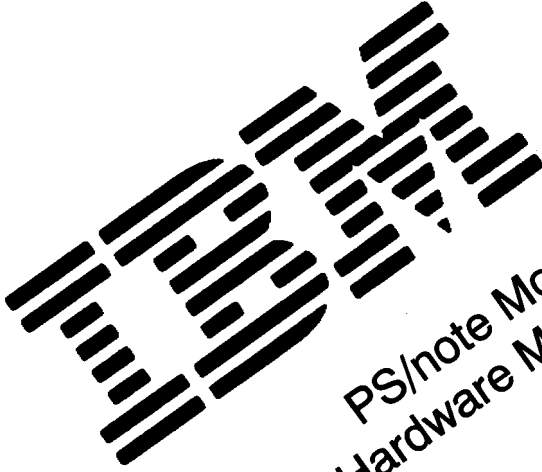Form Number S42G-0485-00

PS/note Model N45SL Hardware Maintenance Reference

May 15, 1992

This pamphlet is intended to be used with the IBM
Personal System/2 Hardware Maintenance Reference
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IBM

PS/note Model N45SL
Hardware Maintenance
Reference

First Edition (June 1992)

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Introduction

The PS/note Model N45SL is a Personal Computer AT™compatible notebook size computer.

Figure 1-1.
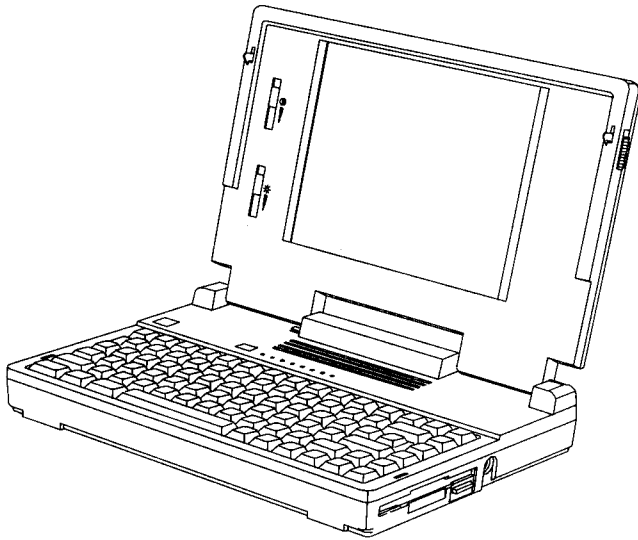
Related Materials

- Hardware Maintenance Service manual
- Guide to Operations
- Advanced Diagnostics diskette.

Tools

Use the following tools to service this computer:

- Small flat-bladed screwdriver
- #1 phillips screwdriver
- Small needle-nosed pliers
- Digital voltmeter
- Tri-Connector Wrap Plug.

Safety   Precautions

Avoid potential shock and personal injury by using the following precautions when servicing this computer:

- When operating the computer, use a grounded AC power source.

- Disconnect AC power and remove the battery pack before opening the cabinet.

Base   Computer

The computer consists of ten major assemblies:

- Main board
- DC-to-DC converter board
- Top cabinet assembly
- Expansion memory board
- Hard disk drive
- Diskette drive
- Keyboard
- Battery pack.

Main Board

The main board contains the:

- CPU (80386SL)
- Math coprocessor, if one is installed
- System RAM '
- Bootstrap ROM
- Flash BIOS ROM
- Serial and parallel ports
- Modem connector
- Keyboard interface
- Mouse/external keyboard assembly
- Real-time clock
- Diskette drive controller
- Hard disk drive interface.

DC-to-DC Converter Board

The internal DC-to-DC converter modifies the input voltage to supply the following outputs:

- +5 V dc
- −18 V dc for the LCD display
- 300 V ac for the cold cathode fluorescent (CCFL) backlight
- −10 V dc for the computer's internal components and subassemblies.

Top Cabinet Assembly

The top cabinet assembly contains the :

- LCD display panel
- Status indicators
- Power switch
- Brightness and contrast controls.

Expansion   Memory   Board

This board plugs into the main board, and provides three banks of sockets that allow the RAM to be expanded up to 8M. The lid switch is also located on this board.

Hard   Disk   Drive

Contains one internal, 2.5-inch hard disk drive.

Diskette   Drive

The internal diskette drive accepts 3.5-inch 1.4M floppy disks.

Keyboard

This keyboard offers all the functions and features of a full-size AT-compatible keyboard.

Battery   Pack

The battery pack contains the charge control circuitry, and provides approximately 3 hours of battery-powered computing.

Optional   Hardware

The following hardware options are available for this computer:

- Math coprocessor (not available from IBM)
- 2M memory expansion modules
- 300/1200/2400 bps modem
- FAX/data modem.

Operation

This chapter covers power up, reset, the Monitor program, and other operating information.

Power Up

Power up the computer by pressing the power button on the top of the cabinet.

When power is applied:

- The keyboard is reset (status LEDs blink)

- The power LED turns on

- The LCD panel blinks and comes on

- The hard disk drive LED flashes

- The NUM LOCK LED turns on (if configured in the Setup program)

- The diskette drive access LED flashes

- The hard disk drive LED flashes

- The computer attempts to autoboot (load the operating system from the device selected in the Setup program).

If the operating system is not installed, or it is not present on the disk, one of the following error messages appears:

```
+++ DISK ERROR: Drive not ready! +++
+++ DISK ERROR: No bootable partitions +++
No system
Not a bootable partition
```

Refer to the operating system documentation for installing operating system software.

If the computer detects faults during the power-up sequence, error messages may appear on the display (if the computer can drive the display). For further information on error messages, refer to the "Error Messages" section of the Hardware Maintenance Service manual.

Resetting   the   Computer

The computer can be reset in one of the following ways:

- Press and hold the CTRL+ALT+DEL keys, then release them. This reinitializes the computer and begins the autoboot   sequence.

- Press and hold the CTRL+ALT+INS keys, then release them. This reinitializes the computer and enters the Monitor program.

- Press and hold the lid switch and then press the power button. All circuits are reset to the power-on state.

- Turn the computer off, wait 15 seconds, then turn it back on. All circuits are reset to the power-on state.

The Monitor Program

The MFM-300 Monitor program contains:

- Power-up tests to detect problems that would prevent additional tests or an operating system from loading.

- The boot command to load the operating system into memory from any drive.

- User-selectable tests to check the disk drives, keyboard, and memory.

- Video commands to set video and scroll modes.

- A machine language debugger.

- The Setup program to set and store hardware configuration information.

- Flash BIOS reprogramming capability.

Entering the Monitor Program

There are two ways to enter the Monitor program:

CTRL+ALT+INS — Press and hold the CTRL+ALT+INS keys, and then release them. A message similar to the following appears:

```
MFM-300 Monitor, Version x.x
Memory size: 640K + xxxxK + 64K Cache
Enter "?" for help
->
```

The first line indicates the ROM version. The second line indicates how much memory is installed, including base, extended, and cache memory. The third line gives the syntax for the help command. The last line shows the Monitor prompt (—>).

CTRL+ALT+ENTER — If the CTRL+ALT+INS key combination does not force the computer to enter the Monitor program, press and hold the CTRL+ALT+ENTER keys, and then release them. The CPU register contents are displayed on the screen followed by the Monitor prompt.

Note: In some cases the CPU can lock up, preventing access to the Monitor program by either method. If this happens, turn off the computer, wait 15 seconds, then turn it back on. This clears the CPU and allows you to use the CTRL+ALT+INS key combination.

Once the computer has entered the Monitor program, type a question mark (?) and press ENTER to display the Monitor program command summary menu.

MFM-300 Command Summary

Cmd:	Explanation	Syntax
?:	Help	?
B:	Boot from disk	B[{Fl W}][{0l 1l 2l 3l }][< partition>]
C:	Color bar	C
D:	Display memory	D[<range>]
E:	Examine memory	E<addr>
F:	Fill memory	F<range>,{<byte>l"<string>"}...
G:	Execute (Go)	G[=<addr>][,<breakpoint>]...
H:	Hex math	H<number1>,<number2>
I:	Input from port	I<port>
M:	Move memory block	M<range>,<dest>
O:	Out to port	O<port>,<value>
R:	Examine Registers	R[<register>]
S:	Search memory	S<range>,{<byte>l"<string>"}...
T:	Trace program	T[<count>]
U:	Unassemble program	U[<range>]
V:	Video Scroll	V[M<mode>][S<scroll>}
	Where <range> is:	<addr>{,<addr>lL<length>}
TEST:	Extended diagnostics	TEST
SETUP:	Define hardware Setup	SETUP
NEWBIOS:	Reprogram Flash BIOS	NEWBIOS [filename]
->_		

Type the command, using the syntax (entry format) shown, and then press ENTER. If the syntax is wrong, the computer reports that an invalid command was entered. The command syntax uses the following conventions:

- Brackets [*option*] indicate optional entries
- Braces {*choice* *choice*} indicate a choice of entries
- Angle braces <*variable*> indicate variables.

The following sections describe booting from disk, running Monitor Diagnostics, and reprogramming the Flash BIOS. The other commands in the command summary are described in the Guide to Operations.

Booting from Disk

The boot process loads the operating system from a disk into computer memory. The command syntax is:

```
B[{F|W}][{0|1|2|3}][:<PARTITION>]
```

To boot the diskette drive, type BF (boot from floppy) and press ENTER. To boot the hard disk drive, type BW and press ENTER. If the drive is partitioned, add the appropriate drive or partition number to the boot command. Refer to the operating system documentation for additional information.

Error messages appear if an attempt is made to boot from a non-existent drive. To correct this, access the Monitor program and enter the correct boot command. For more information about error messages, refer to the Hardware Maintenance Service manual.

Running Monitor Diagnostics

The Monitor program contains five user-selectable tests. To access the test menu, type TEST at the Monitor prompt and press ENTER. The following menu appears:

```
CHOOSE ONE OF THE FOLLOWING:

1. DISK READ TEST
2. KEYBOARD TEST
3. BASE MEMORY TEST
4. EXTENDED MEMORY TEST
5. POWER-UP TEST
6. EXIT

ENTER YOUR CHOICE:
```

To run a test, type the number that corresponds to the test. With the exception of the keyboard test, each test continues to run until an error is detected or the test is halted.

To stop a test, press the ESC key once. Press the ESC key a second time to return to the test menu. Select another test or select EXIT to return to the Monitor prompt.

All tests, except for the keyboard test, display a test count similar to the following:

```
SAMPLE TEST


                                           TEST COUNT = X


     TYPE <ESC> TO ABORT
```

If an error is detected during the test, information about the error appears on the display.

Disk Read Test — This test continuously reads the first sector of track 0 on the test drive. To change the test drive, manually boot from the drive you want to test. It is not necessary for the boot operation to actually load the operating system. To run the test, there must be a formatted disk in the drive.

Successful completion of this test indicates only that the drive can read from the disk. If the computer still fails to boot, problems could exist with memory or related control circuits.

2-8

Keyboard Test — This test checks the operation of most keys on
the keyboard. Valid entries display an ASCII character or symbol and
a key scan code each time a key is pressed. The following keys cannot
be tested:

- PRT SCR
- SYSREQ
- NUMLOCK
- PADLOCK
- PAUSE
- SCROLLLOCK
- CAPSLOCK
- SHIFT
- CTRL
- ALT
- FN.

Base Memory Test — This test checks all memory in the first megabyte of the system memory map, including video memory.

While the test is running, a clicking sound can be heard. When the test reaches the video memory area, a series of moving patterns is displayed on the screen.

Extended Memory Test — This test checks all installed memory above the 1 megabyte base memory area. Since no video memory exists in this area, no patterns appear.

Power-Up Test — This test continuously repeats the power-up tests used during startup. This test checks the following:

- Crystal frequencies
- Interrupt controllers
- DMA controllers
- Disk drive controller
- Timer 1 interrupt
- CPU
- ROM
- RAM.

Reprogramming Flash BIOS

The NEWBIOS function in the Monitor program provides a means for reprogramming (or updating) the Flash ROM containing the system BIOS code.

Note: Perform the NEWBIOS function only while operating on AC power.

To reprogram the Flash ROM:

1. Access the Monitor program with the CTRL+ALT+INS key combination.

2. Insert the Advanced Diagnostics diskette in drive A.

3. Type NEWBIOS, then press ENTER.

If NEWBIOS is entered without an accompanying filename, NEWBIOS looks on the diskette in drive A for a file named ROMIMAGE.BIN. If NEWBIOS is followed by a space and a filename, then NEWBIOS looks for the designated file on drive A. The specified filename must include the extension. Any extension containing three valid characters is acceptable.

The NEWBIOS function performs three tests on the file before reprogramming the Flash ROM. The tests determine the size of the file, the computer type, and the checksum of the file. After all three tests are completed successfully, the Flash ROM is reprogrammed. The following prompt is displayed:

```
Programming success. Press ENTER key to reboot
system...
```

In order for the computer to read the new code, the system must be rebooted. Press ENTER to reboot the system.

If the NEWBIOS function fails and displays any error messages, turn the computer off, wait 15 seconds, then turn the computer back on. If the Flash ROM is corrupt, the computer will initiate the NEWBIOS function automatically. Refer to the Hardware Maintenance Service manual for information on Flash ROM-related error messages.

Disassembly and Options

This chapter provides computer disassembly procedures and optional hardware installation instructions.

Static   Precautions

To protect ICs (integrated circuits) and circuit boards:

- Do not remove any static-sensitive device from its protective packaging until you are ready to install it.
- Equalize static electricity between the work surface, the device, and you by touching the work surface with one hand and then picking up the device with the other hand.
- Once you remove the device from its protective packaging, do not set it down until it is either installed in the computer or returned to its protective packaging.

Note: An electrostatic discharge (ESD) strap should be used to establish personal grounding.

⚠ ⚡

Caution: Hazardous voltages are present inside the computer when it is connected to an AC power source, even when the power switch on the computer is turned off. **To prevent an electrical hazard during service, maintenance, or adding enhancements, disconnect the power cord from the AC outlet, disconnect the external AC adapter, and remove the NiCad battery pack before removing the computer cover.**
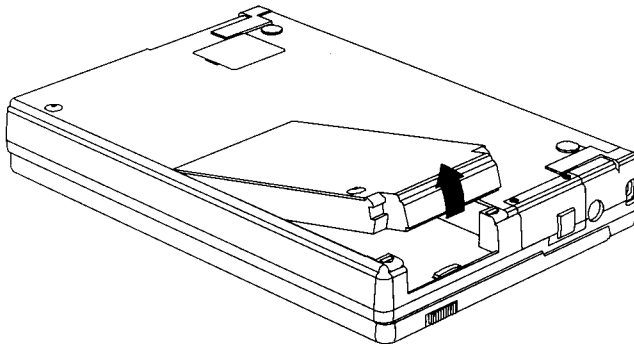
Disassembly

Battery   Pack

1.   Disconnect the AC adapter and all peripherals.

2.   Turn the computer over.

3.   Push the latches ① to release the battery pack.

Figure   3-1. Battery Pack Latches
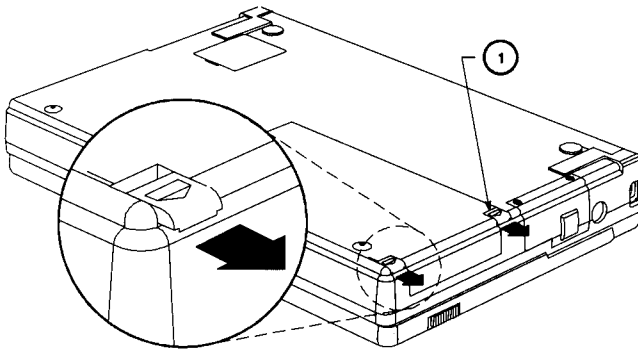
4.   Lift the battery pack from the computer.

Figure   3-2. Removing the Battery Pack
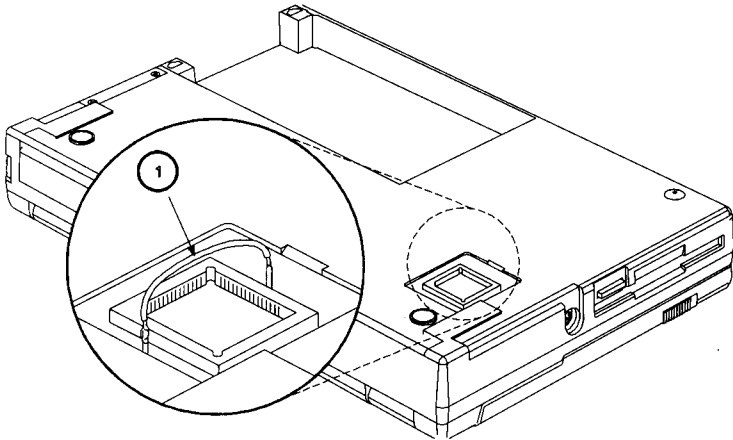

5.   To install the battery pack, reverse the process in the above steps.

Clearing   the   Passwords

1. Turn the computer upside down.

2. Remove the battery pack as described earlier.

3. Remove the math coprocessor access panel.

4. Using alligator clips, connect a jumper wire ① between the two pins on each side of the socket.

Figure 3-3. Connecting a Jumper Wire

5. Reinstall the battery pack.

6. Turn the computer on. Leave the computer on until the LEDs on the LED board blink and the computer locks up. This should not take over 20 seconds.

7. Remove the jumper wire.

8. Press and hold the lid switch, and press the power button to perform a cold reset.

9. Turn the computer off.

10. Replace the math coprocessor access panel.
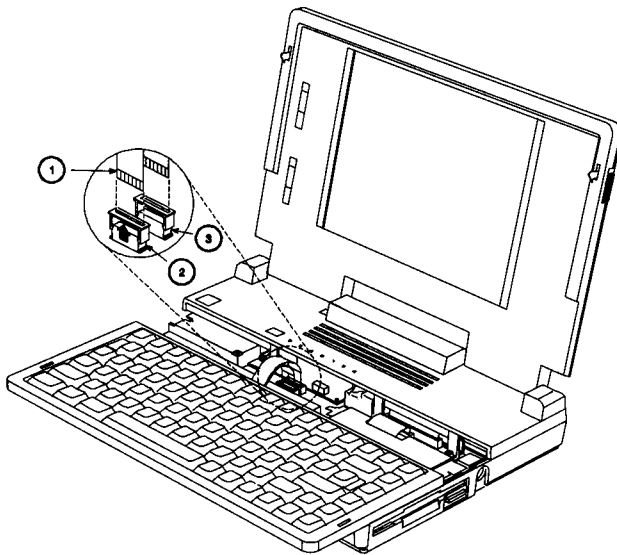
Keyboard Assembly

1. Remove the battery pack as described earlier.

2. Remove the modem cover as described later in the "Modem" section.

3. Remove the screws that secure the keyboard assembly to the cabinet bottom.

4. With a small flat-bladed screwdriver, separate the keyboard assembly ① from the cabinet bottom.

Figure 3-4. Separating the Keyboard Assembly from the Cabinet Bottom
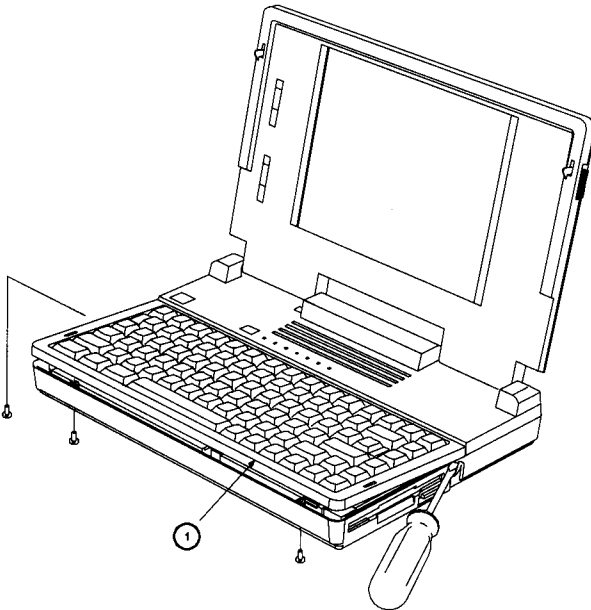
5. Disconnect the keyboard cables ① from CN8 ②and CN9 ③ on the main board.

6. Lift the keyboard assembly and keyboard cables from the computer.

Figure *3-5. Removing the Keyboard Assembly*


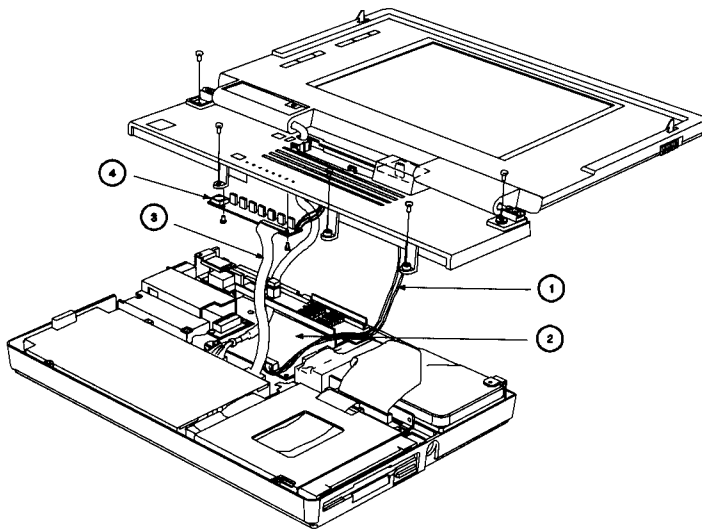**7.** To install the keyboard, reverse the process in the above steps.

Cabinet Top

1. Remove the battery pack as described earlier.

2. Remove the memory module access panel ⑥ as described later in the "Memory Modules" section.

3. Remove the modem cover as described later in the "Modem" section.

4. Remove the keyboard assembly as described earlier.

5. Tilt the LCD display all the way back.

6. Remove the hinge covers ① by applying pressure to the hinge cover sides and pulling them from the cabinet top ②.

7. Remove the base hinge screws ③ from the cabinet top.

8. Remove the screws ④ securing the cabinet top to the cabinet bottom.

9. Remove the left and right hinge ground plates ⑤ from the cabinet top.

Figure 3-6. Removing the Hinge Covers and Ground Plates
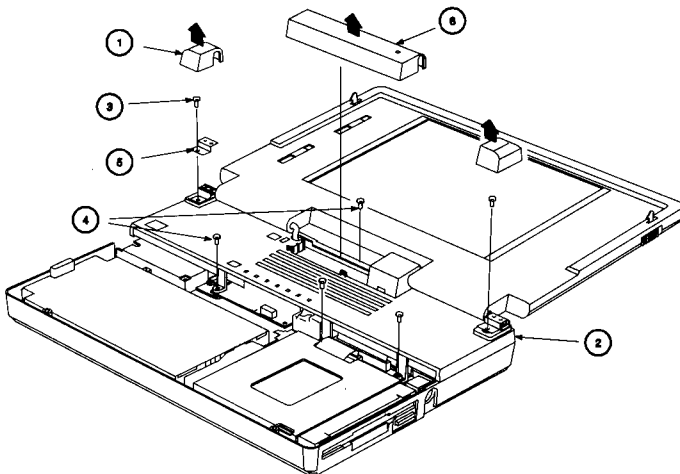
10. Disconnect the backlight power cable ① from CN4 on the DC-to-DC board ②.

11. Disconnect the LED/power switch board assembly cable ③ from CN16 on the main board.

12. Lift the cabinet top and shielding from the computer and set them aside.

Figure 3-7. Removing the Cabinet Top and Shielding

13. Disconnect the backup battery but do not remove.

14. Remove the expansion memory board as described later in the "Expansion Memory Board" section.

15. Remove the expansion memory mounting bracket ① as described later in the "Expansion Memory Mounting Bracket" section.

16. Remove the ground wire ② and disconnect the LCD drive cable ③ from CN12 ④ on the main board and remove the cabinet top.

17. To install the cabinet top, reverse the process in the above steps. Be sure to reroute the LCD drive cable exactly as shown.
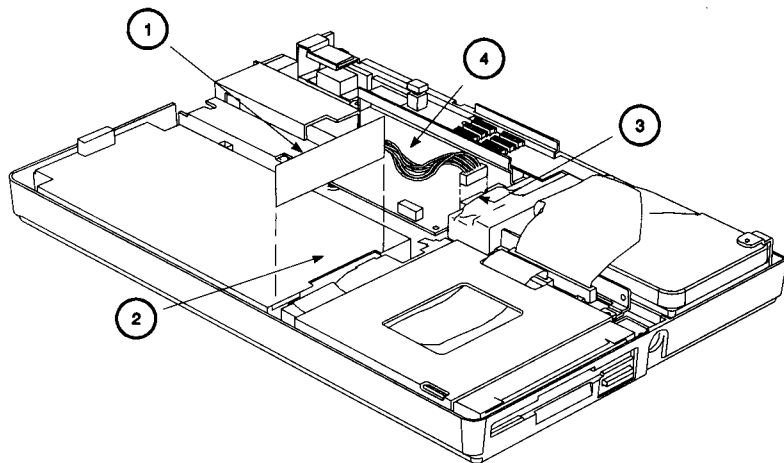
Figure   *3-8. Rerouting the LCD Drive Cable*
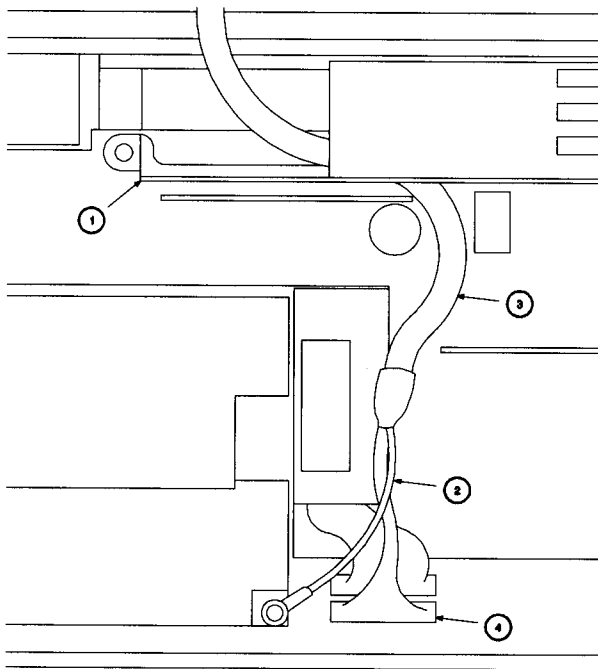
Battery   Cable/Contact   Assembly

1. Remove the battery pack as described earlier.

2. Remove the memory module access panel as described later in the "Memory Modules" section.

3. Remove the modem cover as described later in the "Modem" section.

4. Remove the keyboard assembly as described earlier.

5. Remove the cabinet top as described earlier, but do not remove the LCD display from the cabinet top.

6. Remove the battery contact assembly ① from between the compartment ② and the floppy disk drive assembly.

7. Disconnect the battery cable from CN1 ③ on the DC-to-DC board ④.

Figure *3-9. Removing the Battery Cable/Contact Assembly*

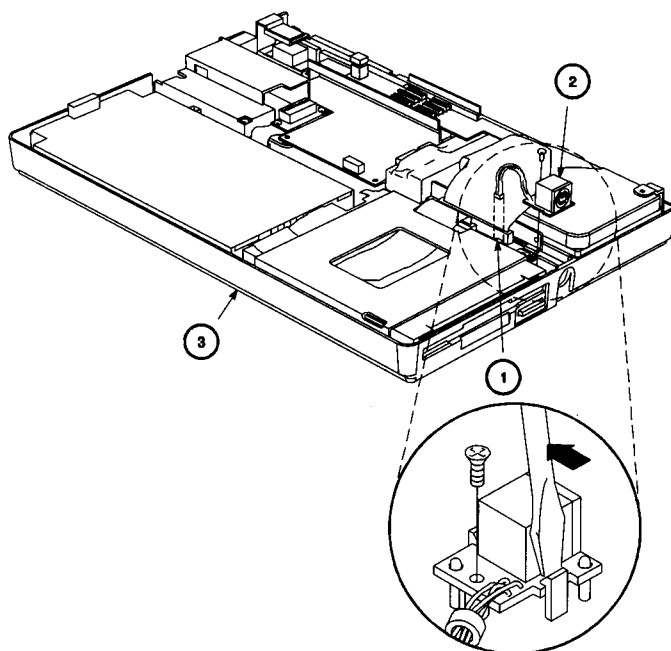8. To install the battery cable/contact assembly, reverse the process in the above steps.

PS/2™ Mouse Board

1. Remove the battery pack as described earlier.

2. Remove the memory module access panel as described later in the "Memory Modules" section.

3. Remove the modem cover as described later in the "Modem" section.

4. Remove the keyboard assembly as described earlier.

5. Remove the cabinet top as described earlier.

6. Disconnect the PS/2 mouse board cable from CN7 ① on the main board.

7. Remove the screw that secures the PS/2 mouse board ② to the cabinet bottom ③.

8. Spread the tabs apart with a small flat-bladed screwdriver and lift the board out of the computer.

Figure   3-10. Removing the PS/2 Mouse Board

9. To install the PS/2 mouse board, reverse the process in the above steps.

Diskette Drive Assembly

Notice: Use static precautions.

1. Remove the battery pack as described earlier.

2. Remove the memory module access panel as described later in the "Memory Modules" section.

3. Remove the modem cover as described later in the "Modem" section.

4. Remove the keyboard assembly as described earlier.

5. Remove the cabinet top as described earlier.

6. Remove the screws securing the diskette drive to the cabinet bottom.

7. Disconnect the diskette drive cable ① from CN5 ② on the main board located under copper shield tape.

8. Lift the diskette drive assembly ③ from the computer.

Figure *3-11. Removing the Diskette Drive Assembly*

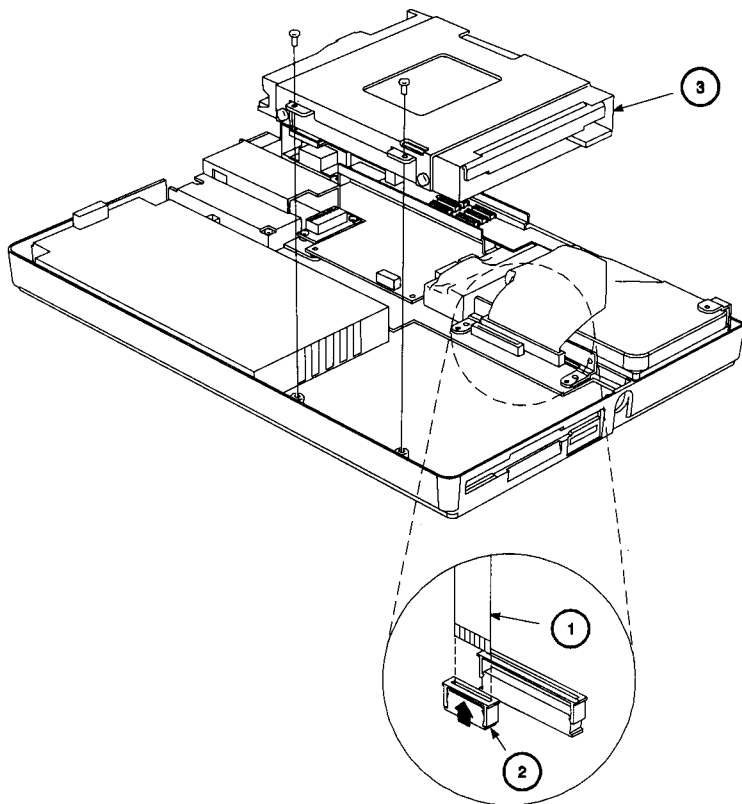**9.** To install the diskette drive, reverse the process in the above steps.

Hard Disk Drive Assembly

Notice: Use static precautions.

1. Remove the battery pack as described earlier.

2. Remove the memory module access panel as described later in the "Memory Modules" section.

3. Remove the modem cover as described later in the "Modem" section.

4. Remove the keyboard assembly as described earlier.

5. Remove the cabinet top as described earlier.

6. Remove the diskette drive assembly as described earlier.

7. Turn the computer over and remove the screw securing the hard disk drive assembly ① to the cabinet bottom.

8. Turn the computer right side up and disconnect the hard disk drive cable ② from CN6 ③ on the main board.

9.   Lift the hard disk drive assembly out of the computer.

Figure   3-12. Removing the Hard Disk Drive Assembly

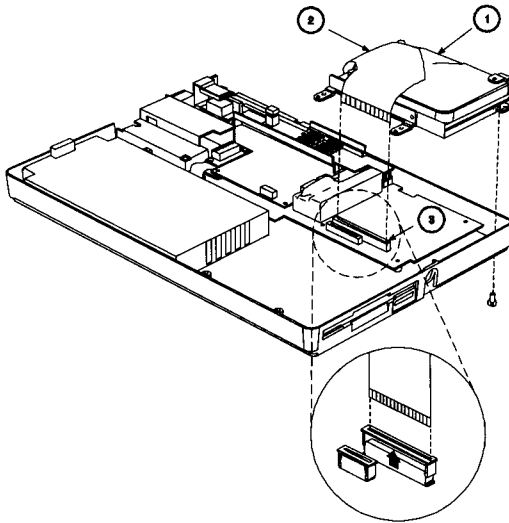10. To install the hard disk drive, reverse the process in the above step.

11. Run PREP (refer to Appendix A of the Hardware Maintenance Service manual).

12. Have the customer run DOS "FDISK" or equivalent command to partition the hard disk.

Expansion Memory Board

1. Remove the battery pack as described earlier.

2. Remove the memory module access panel as described later in the "Memory Modules" section.

3. Remove the modem cover as described later in the "Modem" section.

4. Remove the keyboard assembly as described earlier.

5. Remove the cabinet top as described earlier.

6. Remove the three screws from the expansion memory board ① and move the shielding ② out of the way.

Notice: Do not crease the shielding. This could break the foil conductor.

7. Lift the expansion memory board out of sockets CN2 ③ and CN3 ④ on the main board.

Figure *3-13.* Removing the Expansion Memory Board

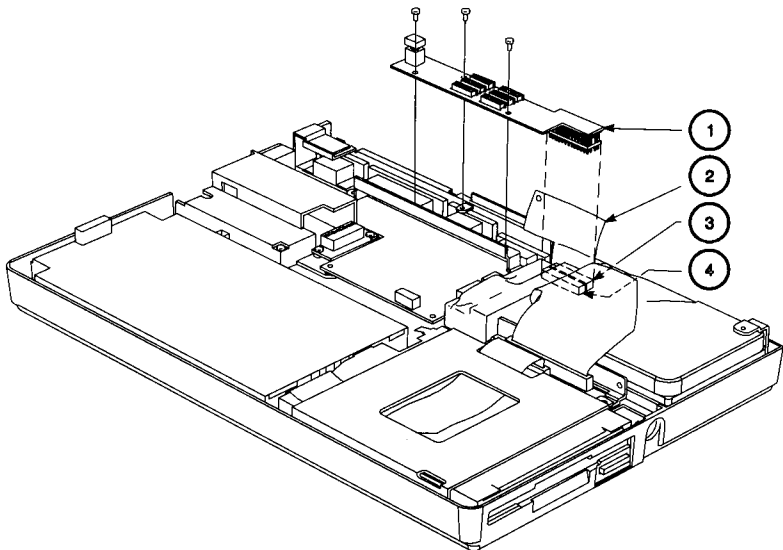8. To install the expansion memory board, reverse the process in the above steps.

Expansion Memory Mounting Bracket

1. Remove the battery pack as described earlier.

2. Remove the memory module access panel as described later in the "Memory Modules" section.

3. Remove the modem cover as described later in the "Modem" section.

4. Remove the keyboard assembly as described earlier.

5. Remove the cabinet top as described earlier.

6. Remove the expansion memory board as described earlier.

7. Remove the two screws ① from the expansion memory mounting bracket ② and lift the bracket out of the computer.

Figure 3-14. Removing the Expansion Memory Mounting Bracket
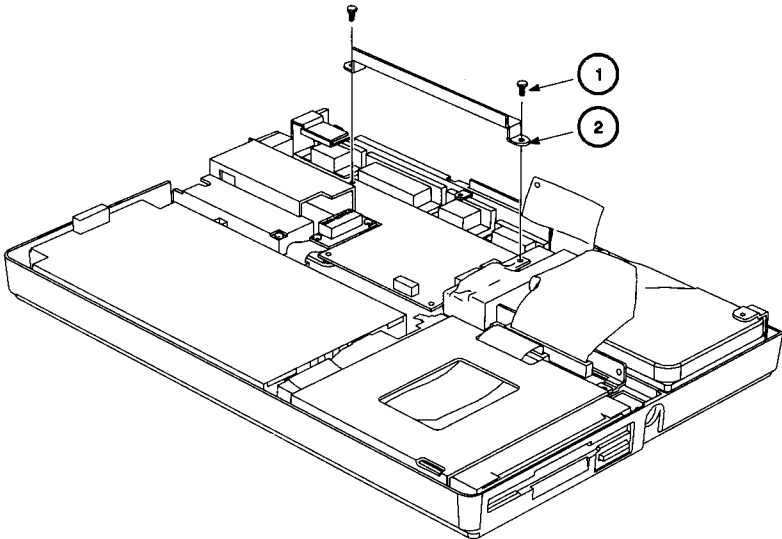
8. To install the expansion memory mounting bracket, reverse the process in the above steps.

Backup Battery

Notice: This procedure deletes all configuration information stored in CMOS RAM. Note the current Setup data before removing the backup battery so you can re-enter the correct information after installing the new battery.

1. Remove the battery pack as described earlier.

2. Remove the memory module access panel as described later in the "Memory Modules" section.

3. Remove the modem cover as described later in the "Modem" section.

4. Remove the keyboard assembly as described earlier.

5. Remove the cabinet top as described earlier.

Note: When removing the cabinet top, it is not necessary to disconnect the LCD drive cable from CN12 on the main board.

6. Remove the expansion memory board as described earlier.

7. Remove the expansion memory mounting bracket as described earlier.

8. Disconnect the backup battery cable ① from CN3 ② on the DC-to-DC board ③.

9. Lift the backup battery ④ and the double-sided tape ⑤ out of the computer.

Figure *3-15. Removing the Backup Battery*

Note: Dispose of the battery according to prevailing regulations.

10. To install the backup battery, reverse the process in the above steps. Make sure the battery is as far forward as possible to leave room for top cover.
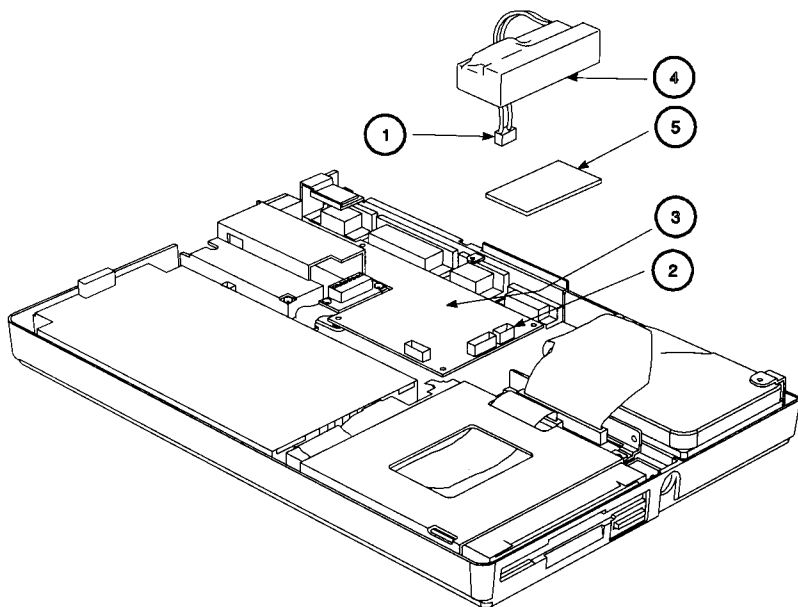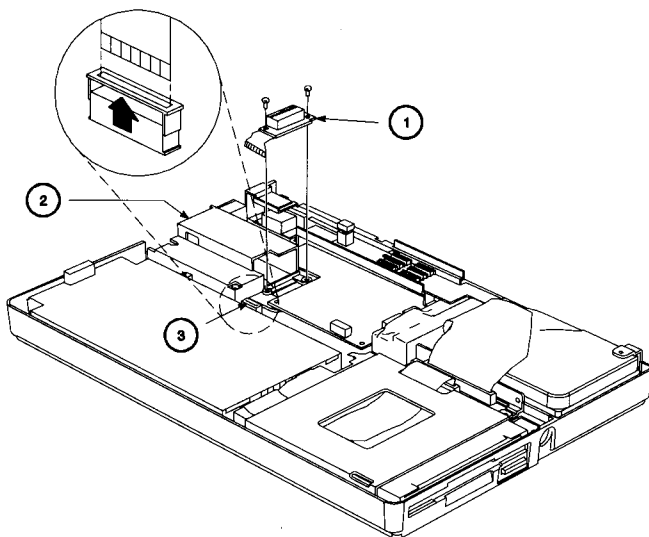
Modem   Cable/Connector

1. Remove the battery pack as described earlier.

2. Remove the memory module access panel as described later in the "Memory Modules" section.

3. Remove the modem cover as described later in the "Modem" section.

4. Remove the keyboard assembly as described earlier.

5. Remove the cabinet top as described earlier.

6. Remove the modem, if installed.

7. Remove the screws securing the modem cable/connector ① to the modem frame ②.

8. Disconnect the modem cable/connector from CN14 ③ on the main board, and lift the modem cable/connector out of the computer.

Figure *3-16. Removing the Modem Cable/Connector*

9. To install the modem cable/connector, reverse the process in the above steps.

DC-to-DC Board

Notice: Use static precautions.

1. Remove the battery pack as described earlier.

2. Remove the memory module access panel as described later in the "Memory Modules" section.

3. Remove the modem cover as described later in the "Modem" section.

4. Remove the keyboard assembly as described earlier.

5. Remove the cabinet top as described earlier.

6. Remove the expansion memory board as described earlier.

7. Remove the expansion memory mounting bracket as described earlier.

8. Disconnect the backup battery cable as described earlier.

9. Remove the modem cable/connector as described earlier.

10. Disconnect the battery cable ① from CN1 ② on the DC-to-DC board ③.

11. Remove the screws securing the DC-to-DC board to the main board.

12. Carefully lift up the front side of the DC-to-DC board to unplug it from the main board socket ④.

13. Remove the DC-to-DC board and the shielding ⑤ and insulator ⑥ from the computer.

***Figure* 3-17.** *Removing the DC-to-DC Board*

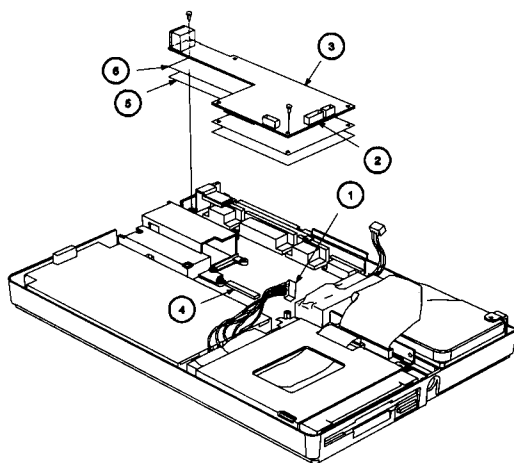14. To install the DC-to-DC board, reverse the process in the above steps.

Main Board

Notice: Use static precautions.

1. Remove the battery pack as described earlier.

2. Remove the memory module access panel as described later in the "Memory Modules" section.

3. Remove the modem cover as described later in the "Modem" section.

4. Remove the keyboard assembly as described earlier.

5. Remove the cabinet top as described earlier.

6. Remove the diskette drive as described earlier.

7. Remove the hard disk drive as described earlier.

8. Remove the expansion memory board as described earlier.

9. Remove the expansion memory mounting bracket as described earlier.

10. Remove the backup battery as described earlier.

11. Remove the modem cable/connector as described earlier.

12. Remove the DC-to-DC board as described earlier.

13. Remove the modem frame ① screws.

14. Lift the modem frame and the modem shield/insulator ② out of the computer.

***Figure* 3-18.** *Removing the Modem Frame*
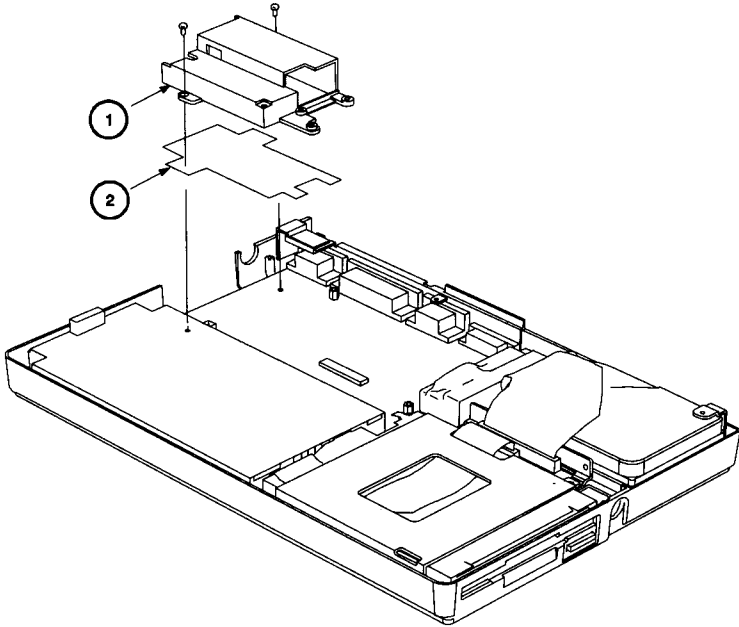
15. Disconnect the speaker cable from CN18 ① and the PS/2 mouse
    board cable from CN7 ② on the main board ③.

16. Turn the bottom assembly over and remove the screws below the
    port bay door ④.

17. Turn the bottom assembly over and remove the main board
    screws.

18. Lift the main board out of the bottom assembly.

Figure *3-19. Removing the Main Board*

19. To install the main board, reverse the process in the above steps.

Note: Make sure you transfer the math coprocessor (if installed) to
the new board.

Cabinet   Bottom

1. Remove the battery pack as described earlier.

2. Remove the memory module access panel as described later in the "Memory Modules" section.

3. Remove the math coprocessor access panel.

4. Remove the modem cover as described later in the "Modem" section.

5. Remove the keyboard assembly as described earlier.

6. Remove the cabinet top as described earlier.

7. Remove the PS/2 mouse board as described earlier.

8. Remove the diskette drive assembly as described earlier.

9. Remove the hard disk drive assembly as described earlier.

10. Remove the expansion memory board as described earlier.

11. Remove the expansion memory mounting bracket as described earlier.

12. Remove the backup battery as described earlier.

13. Remove the modem cable/connector as described earlier.

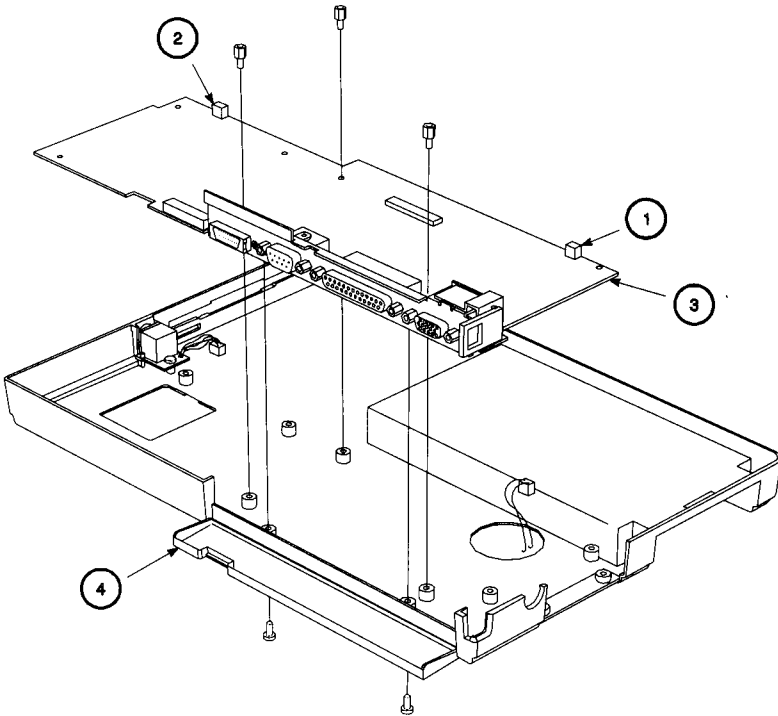14. Remove the DC-to-DC board as described earlier.

15. Remove the main board as described earlier.

16. Remove the port bay door as described later in the "Port Bay Door" section.

17. To install the cabinet bottom, reverse the process in the above steps.

Port Bay Door

1. Open the port bay door ① on the back of the computer.

2. Slightly bow the port bay door and remove it from the computer.

Figure 3-20. Removing the Port Bay Door
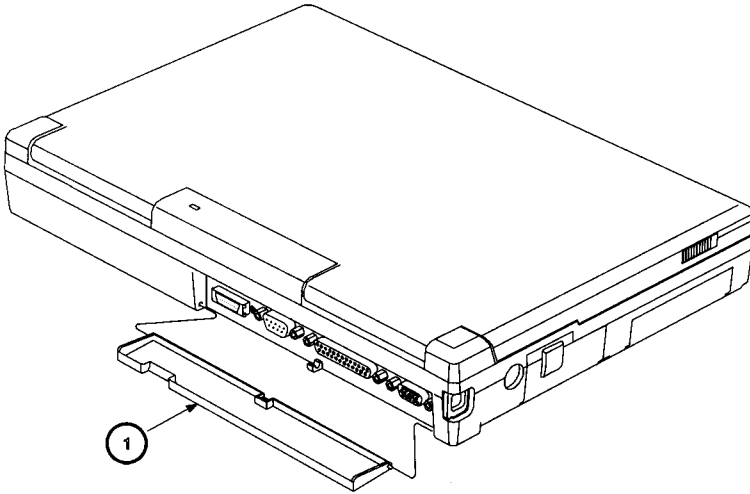
3. To install the port bay door, reverse the process in the above steps.

Option   Installation

Memory   Modules.

Notice: Use static precautions.

The computer's RAM can be expanded from 2M to 4M, 6M, or 8M by
installing one, two, or three 2M memory modules. The possible
memory configurations are listed in Table 3-1.

Table   3-1. *Possible Memory Configurations*

TOTAL MEMORY	BANK 1	BANK 2	BANK 3	DESCRIPTION
2M				Factory setting
4M	YES			First expansion
6M	YES	YES		Second expansion
8M	YES	YES	YES	Third expansion

1. Remove the battery pack as described earlier.

2. Remove the memory module access panel ① by pressing on the sides and lifting. A screwdriver, inserted into the slot on the rear of the cover, may be used to pry it off.

Figure *3-21.* Removing the Memory Module Access Panel
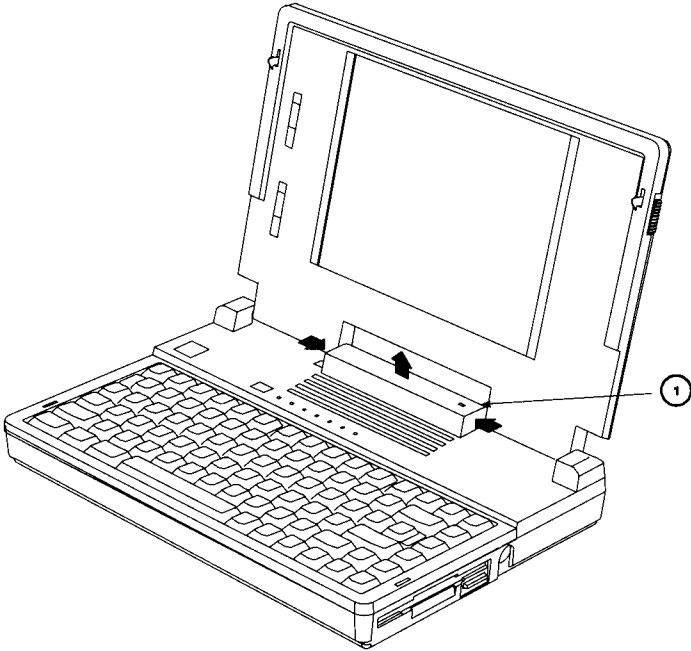
3. Select a memory module socket pair. Use the lowest bank numbered socket pair available.

Figure   *3-22. Selecting a Memory Module Socket Pair*
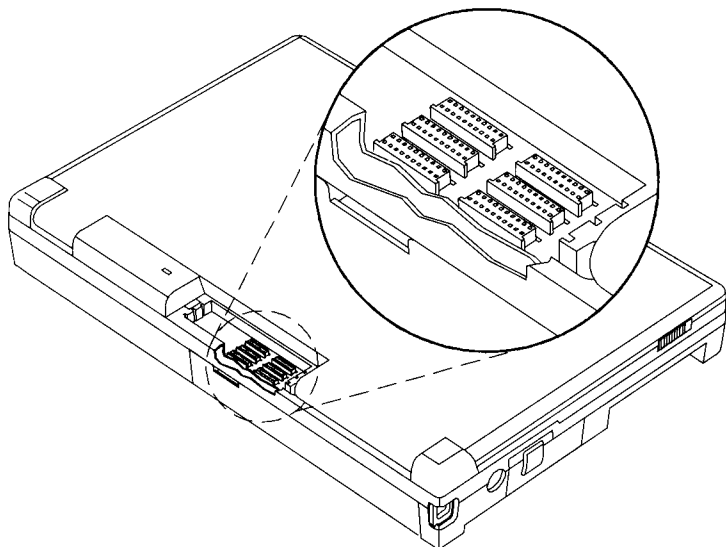
4. Align the memory module above the sockets, then firmly and evenly press it into place.

Figure 3-23. Installing a Memory Module
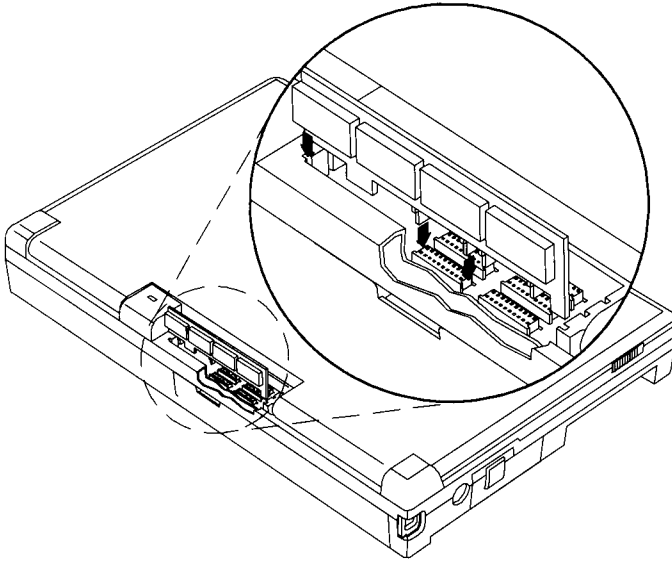
5. Replace the memory module access panel.

6. Update the memory size in the Setup program.

7. Run the Advanced Diagnostics memory tests to thoroughly check the memory module.

Math   Coprocessor

Notice: Use static precautions.

1.   Remove the battery pack as described earlier.

2.   Remove the math coprocessor access panel ① by prying it up
with a small flat-bladed screwdriver.

Figure   *3-24. Removing the Math Coprocessor Access Panel*
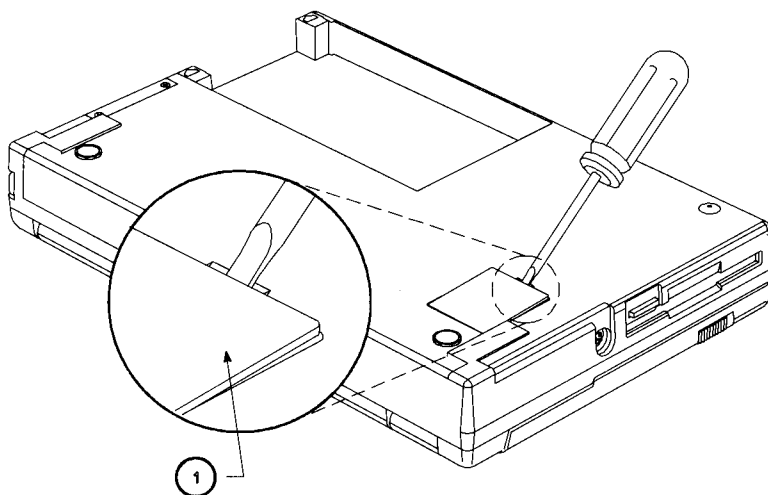
3. Carefully move the shielding to expose the coprocessor socket.

Notice: Do not crease the shielding. This could break the foil conductor.

---

4. Position the IC ① above the socket ② so that the notched corner of the IC and the notched corner of the socket are lined up, then press the IC firmly into the socket.

Figure *3-25. Installing the Math Coprocessor*
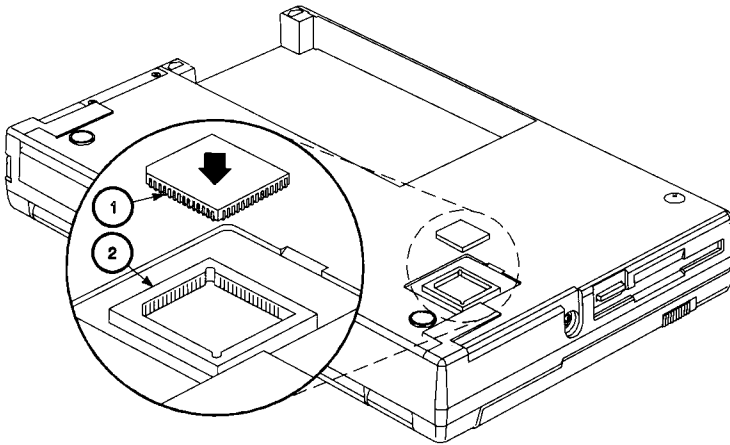
5. Replace the shielding and the math coprocessor access panel.

6. Turn the computer right side up.

7. To remove the math coprocessor, lift up on the corners with an IC extraction tool.

Modem

Notice: Use static precautions.

1. Make sure the computer is truly off and not just suspended.

2. Remove the battery pack as described earlier.

3. Remove the modem cover screws ① and pull the modem cover ② from the computer.

Figure *3-26.* Removing the Modem Cover
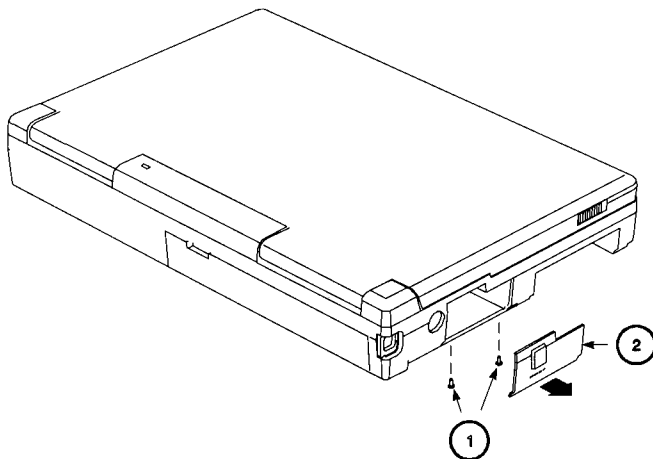
4. Press the tabs ③ and remove the plug from the phone line hole.

Figure *3-27.* Removing the Modem Cover Plug
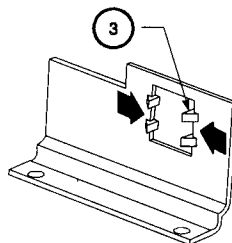
5.   Slide the modem ① into the computer. Be sure the modem is fully inserted in its connector.

6.   Replace the modem cover ②.

Figure   3-28. Installing a Modem
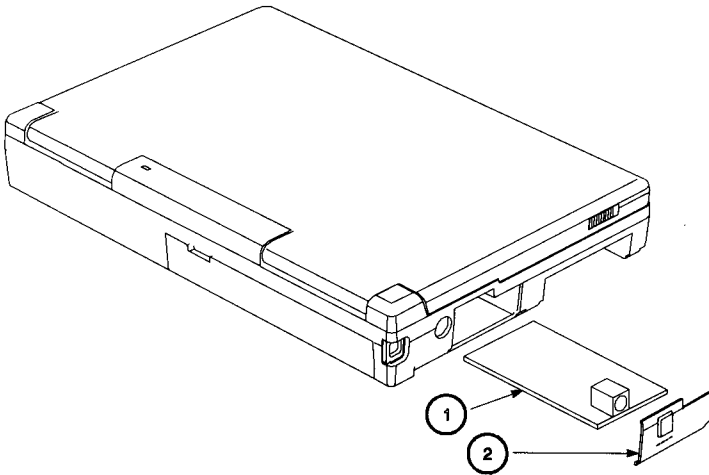
7.   Enter the new configuration information in the Setup program.

8.   To remove the modem, reverse the process in the above steps.
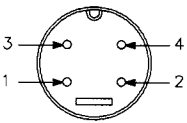
Specifications

Power

AC Adapter ────────────────────────────────────

    Input   90 to 264 V ac at 48 to 62 Hz,
                                   0.5A at 110 V ac,
                                   0.3A at 240 V ac.

    Output   22 V dc ±10% at 1.27A.

AC Adapter Connector

	PIN	SIGNAL
	1	Charge voltage
	2	System voltage
	3	Charge control
	4	Ground
	5	Ground

Internal DC Conversion ────────────────────────

    Input   AC Adapter: +22 V dc ±10% at 1.27A
                                   Battery Pack: +14.4 V dc at 1.70A.

    Output   + 5 V dc ± 5% at 2.00A
                                   −10 V dc ±20% at 0.05A
                                   −18 V dc ± 2 V dc at 0.03A
                                   300 V ac ±100 V ac 30kHz, 5 watts
                                   maximum.

Battery Pack————————————————————————
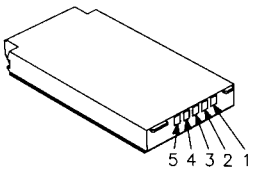
+14.4 V dc, 1.7 ampere hours, 24.48 watt hours, with overcharge and short circuit protection. Typical life is 1000 charge/discharge cycles.

Initial Charge Time   10 hours.

Normal Recharge
Time   3 hours.

Charge Current   Fast: 1.27A ±15%
Normal: 0.27A ±15%
Trickle: 0.08A ±30%.

Battery Pack Connector

	PIN	SIGNAL
	1	Output (14.4V/22V)
	2	Ground
	3	Error
	4	System monitor (8V/12V)
5 4 3 2 1	5	Trickle charge/fast charge (8V/12V)

Backup Battery ————————————————————————

+4.8 V dc, 0.6 amperes, 2.88 watt hours, NiCad backup battery provides backup power to real-time clock and CMOS memory. It also provides power to the computer while in rest mode.

Specifications

LED   Indicators

Power ——————————————————————————————————

AMBER — Indicates the computer is
operating under AC power.

GREEN — Indicates the computer is
operating under battery power.

RED (flashing) — Indicates the battery
pack is almost discharged.

RED (steady) — Indicates the battery pack is
fully discharged.

Diskette Drive —————————————————————————

GREEN — Indicates floppy disk drive
activity.

Hard Disk Drive ——————————————————————

GREEN — Indicates hard disk drive activity.

Charge Status —————————————————————————
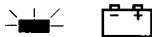
GREEN — Indicates the battery pack is
fully charged or not installed.

AMBER — Indicates the battery pack is
being charged.

RED — Indicates the battery pack may be
faulty.

Processors

Standard ——————————————————————————

Type   Intel 80386SL.

Clock Speed   25 MHz or 6.25 MHz. Slow mode runs at
                        6.25 MHz for compatibility and power
                        conservation.

Optional ——————————————————————————

Type   Intel 80387SX or 80387SL math
                        coprocessors.

Clock Speed   25 MHz.

Memory

System Board ───

RAM	2M dynamic RAM standard, expandable to 8M using 2M expansion modules.
EMS	0K LIM 4.0, expandable to 7M.
Cache	64K static RAM.
Bootstrap ROM	128K; stores startup code and initial hardware configuration information.
Flash ROM	128K; stores BIOS code and Monitor program code; functionality is transferred to RAM at power up.
EEPROM	Provides nonvolatile password and hardware configuration information storage.
CMOS	256 bytes in the 82360SL I/O controller IC; battery backup; used for storage of configuration data.

Memory Map

6M	10000: 0000
BOOTSTRAP ROM 128K	FE000: 0000
FLASH ROM 128K	FC00: 0000
EXTENDED OR EXPANDED USER MEMORY	1M
1M	
59K	
USER RAM AREA	
639K	
INTERRUPT VECTORS 1K	0000: 0400
	0000: 0000

SYSTEM BIOS CODE 60K (SLUSHED)	10000: 0000
SCRATCHPAD RAM 4K	F000: 1000
UNUSED 160K	F000: 0000
LITE BASIC 8K	C000: 8000
VIDEO BIOS CODE 24K (SLUSHED)	C000: 6000
VGA VIDEO RAM 128K	C000: 0000
EXTENDED BIOS DATA SEGMENT 1K	A000: 0000
	9000: FC00

Input/Output

Serial ————————————————————————————————
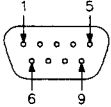
One RS-232C asynchronous, male, serial
port; configurable as COM1 or COM2;
supports baud rates of 50 to 19,200;
selectable protocols.
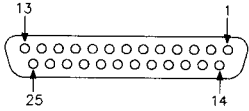
Serial Connector

	PIN	SIGNAL
	1	Carrier detect (CD)
	2	Receive data (RXD)
	3	Transmit data (TXD)
	4	Data terminal ready (DTR)
	5	Ground (GND)
	6	Data set ready (DSR)
	7	Request to send (RTS)
	8	Clear to send (CTS)
	9	Ring indicator (RI)

Parallel

One Centronics-type, female, bidirectional port; configurable as LPT1 or LPT2.
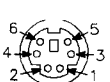
Parallel Connector

	PIN	SIGNAL
	1	Strobe
	2-9	Data bits 0-7
	10	Acknowledge
	11	Busy
	12	Paper out
	13	Select
	14	Auto feed
	15	Error
	16	Initialize
	17	Select input
	18-25	Ground

Mouse   Port

Connector

Interface connector provides 100% support for PS/2-compatible pointing device.

Adapter   (optional)

Permits the user to connect a full-size AT-compatible keyboard or a keypad.

Mouse Port Connector
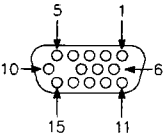
	PIN	SIGNAL
	1	Serial data
	2	Not connected
	3	Ground
	4	+5 V dc
	5	Clock
	6	+5 V dc

Video

Compatibility	100% VGA register- and BIOS-level compatible.
Video Display Memory	256K DRAM.
LCD Display	640 x 480 pixel black and white transmissive liquid crystal display with cold cathode fluorescent (CCFL) backlighting. 32 shades of gray supported.

External Monitor

Horizontal Scan	31.49 kHz.
Vertical Scan	60 to 70 Hz.
Signal Type	Analog RGB, 0 to 0.714 V; 75 Ω impedance 0 volts represents black.

External VGA Monitor Video Connector

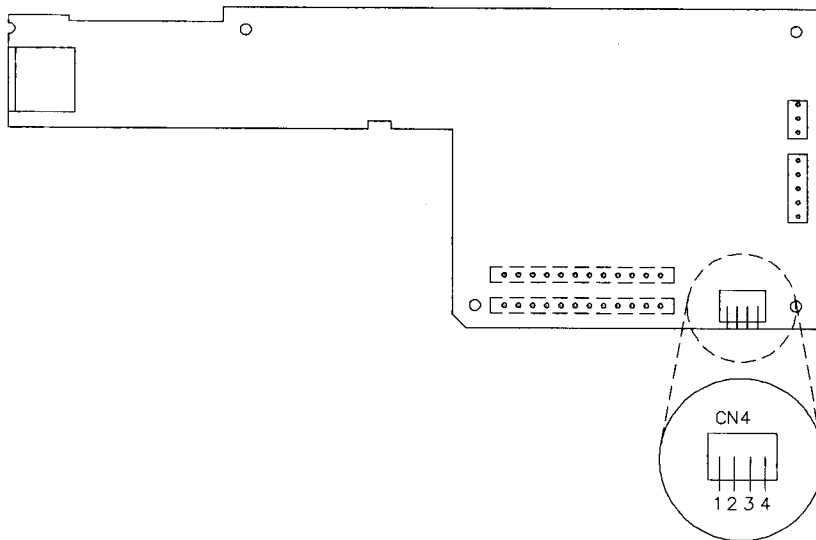|	PIN	SIGNAL
	1	Red analog video output
	2	Green analog video output
	3	Blue analog video output
	4	Not connected
	5	Ground
	6	Ground
	7	Ground
	8	Ground
	9	No pin in connector
	10	Ground
	11	Not connected
	12	Not connected
	13	Horizontal sync control
	14	Vertical sync control
	15	Not connected

Specifications

Disk   Drives

Hard Disk Drive   Supports one 2.5-inch 85M hard disk drive, type #102.

Diskette Drive   Supports one 3.5-inch 1.4M internal diskette drive.

Power   Connectors

Backlight Power Connector ———————————————————————

This connector is labeled CN4, and is located on the DC-to-DC board.

Backlight Power Connector

PIN	SIGNAL
1	AC (300V)
2	NC
3	NC
4	Ground

System Power Connector —————————————————————————

This connector is labeled CN604, and is located on the DC-to-DC board.
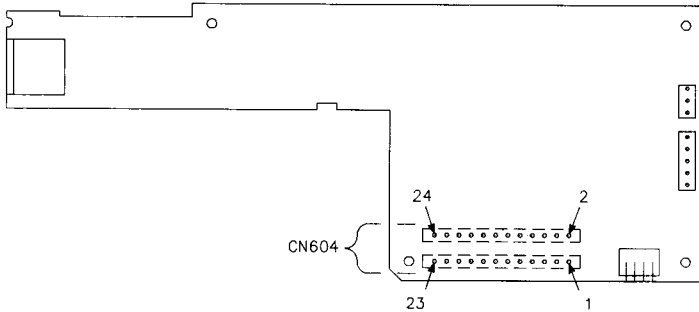
System Power Connector

PIN	SIGNAL
1	Battery dead
2	System VCC (5V normal, 0V rest)
3	Backlight on command
4	System VCC (5V normal, 0V rest)
5	Power management VCC On command
6	Power management VCC (5V)
7	System VCC on command
8	Power management VCC (5V)
9	Modem enable command
10	Modem (-10V)
11	LCD power command
12	Battery error
13	Contrast
14	VEE (-18V)
15	Brightness
16	DC in (22V)
17	Trickle charge/fast charge (8V/12V)
18	Battery voltage (14.4V normal, 22V charging)
19	2-hour charge command
20	Backup battery voltage (4.8V)
21	Ground
22	Ground
23	Ground
24	Ground

Keyboard

Keyboard LEDs ─────────────────────────────

CAPS   NUM   PAD   SCROLL
LOCK   LOCK   LOCK   LOCK

☐   ☐   ☐   ☐
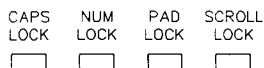
CAPS LOCK, NUM LOCK, PAD LOCK, and SCROLL LOCK. These green LEDs provide a visual indication of the status of the keys.

Cabinet

Dimensions ───────────────────────────────

Width   12.4 inches (315 mm).

Depth   8.27 inches (210 mm).

Height

    Lid Closed: 1.83 inches (46.5 cm).

Weight ──────────────────────────────────

Computer   6.8 lbs (3.08 kg) with battery pack.

Environmental

Temperature

    Operating   41 to 95°F (5 to 35°C).

    Non-operating   −4 to 140°F (−20 to 60°C).

    Gradient   20 C/hr maximum.

Humidity

    Operating   10% to 80% relative humidity (non-condensing).

    Non-operating   10% to 80% relative humidity (non-condensing).

Altitude

    Operating   −200 feet to 10,000 feet (−60 to 3,000 meters).

    Non-operating   −200 feet to 40,000 feet (−60 to 12,000 meters).

Audio

    Speaker   Single channel through a miniature piezo transducer.

Printed in the United States of America