Developer Note

Macintosh PowerBook 2400c Computer

Developer Note

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About This Developer Note

This developer note describes the Macintosh PowerBook 2400c computer, a new computer based on the same architecture as the PowerBook 3400 computer but smaller and lighter. This developer note describes only the changes that make the new models different from the PowerBook 3400. For information about the PowerBook 3400, see "Supplemental Reference Documents," later in this preface.

This developer note is intended to help hardware and software developers design products that are compatible with the Macintosh products described here. If you are not already familiar with Macintosh computers or if you would simply like additional technical information, you may wish to read the supplementary reference documents described in this preface.

This note is published only in electronic form, as an Adobe™ Acrobat™ PDF (portable document file). The file is available from two sources:

- on the World Wide Web at

http://devworld.apple.com/dev/dnotes3.shtml

- on the Reference Library Edition of the Developer CD Series, which is distributed as part of the monthly mailing to registered developers.

Contents of This Note

This note has only one chapter: a delta guide describing the differences between the Macintosh PowerBook 2400c computer and the PowerBook 3400 computer. Because the note is so short, it has no glossary or index.

Supplemental Reference Documents

For information about the PowerBook 3400 computer, developers should have the developer note for that computer. Adobe Acrobat PDF (portable document file) versions of all developer notes are available on the Developer CD and on the Internet at

http://dev.info.apple.com/reference.html

For a description of the versions of the Mac OS that come with the new models, developers should refer to Technote 1090, "Mac OS 7.6," and Technote 1096, "System 7.6.1." The technotes are available on the Technote web site at

http://devworld.apple.com/dev/technotes.shtml

Printed copies of the Technote are available from Field Copy and Printing, telephone 1-415-323-3155. The Technotes are also available on the reference library issues of the Developer CD.

For information about the latest version of the PC Card Manager, developers should refer to the PC Card Manager v3.0 SDK. The SDK is available on the March 1997 Reference Library edition of the Developer CD and on the Apple Developer World web site at

ftp://ftp.apple.com/devworld/Development_Kits/PC_Card_Manager/

Developers should also have copies of the relevant books of the *Inside Macintosh* series, available in technical bookstores.

Conventions and Abbreviations

This developer note uses the following typographical conventions and abbreviations.

Typographical Conventions

Note
A note like this contains information that is of interest but is not essential for an understanding of the text. ◆

IMPORTANT
A note like this contains important information that you should read before proceeding. ▲

Abbreviations

When unusual abbreviations appear in this developer note, the corresponding terms are also spelled out. Standard units of measure and other widely used abbreviations are not spelled out.
Here are the standard units of measure used in this developer note:

GB	gigabytes	MHz	megahertz
M	meg (1,048,576)	ns	nanoseconds
MB	megabytes	V	volts

Other abbreviations used in this note include:

ADB	Apple Desktop Bus
CD-ROM	compact disc read-only memory
DIMM	dual inline memory module
DRAM	dynamic RAM
EDO	extended data out
FDD	floppy disk drive
JEDEC	Joint Electron Device Engineering Council
PCI	Peripheral Component Interconnect, an industry-standard expansion bus
PCMCIA	Personal Computer Memory Card International Association
PDF	portable document file
PMU	power management unit
RAM	random-access memory
SCSI	Small Computer System Interface
SO DIMM	small outline dual inline memory module
SPD	Serial Presence Detect, a feature of the SO DIMM
SVGA	super video graphics adapter
TFT	thin film transistor (a type of LCD)
VGA	video graphics adapter

CHAPTER 1

Delta Guide to the PowerBook 2400c Computer

The Macintosh PowerBook 2400c computer is a small, light-weight notebook computer based on the architecture of the PowerBook 3400 computer. This chapter is a delta guide—it describes only the differences between the PowerBook 2400c computer and the PowerBook 3400. For a description of the PowerBook 3400 computer, please refer to the developer note for that model, as explained in “Supplemental Reference Documents” on page vii.

Appearance

The PowerBook 2400c computer is the smallest model in the PowerBook family. It is 10.5 inches wide, 8.4 inches deep, and 1.8 inches thick. It weighs 4.4 pounds with the battery installed.

Figure 1-1 and Figure 1-2 show the appearance of the computer and identify its external features.

Figure 1-1 Front view of the computer

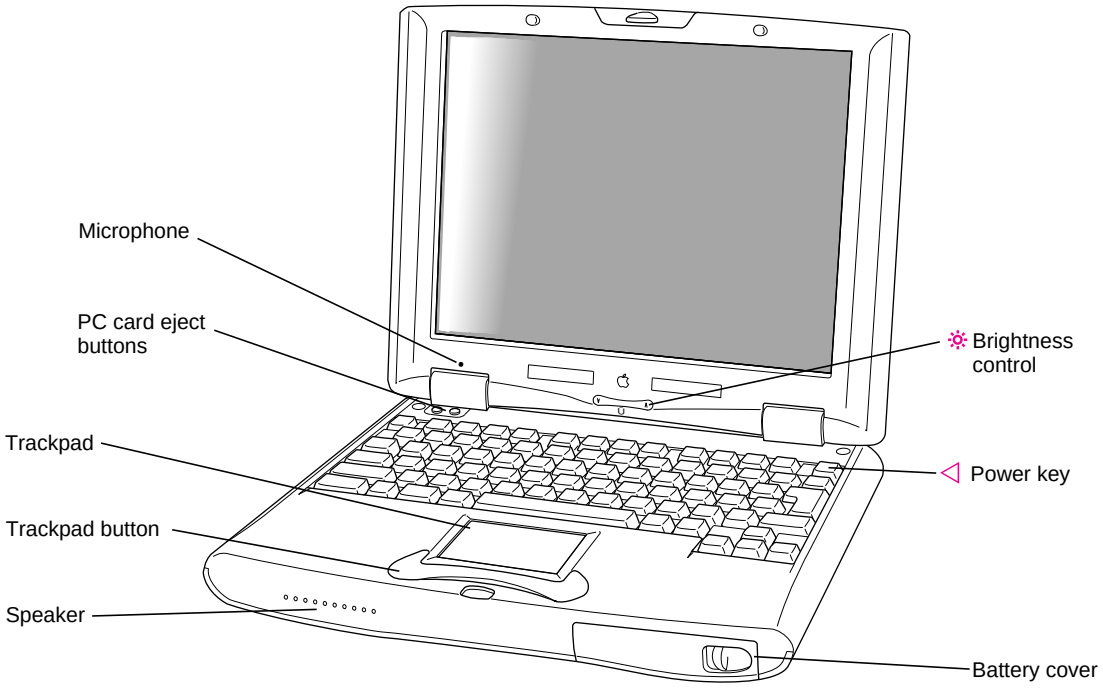
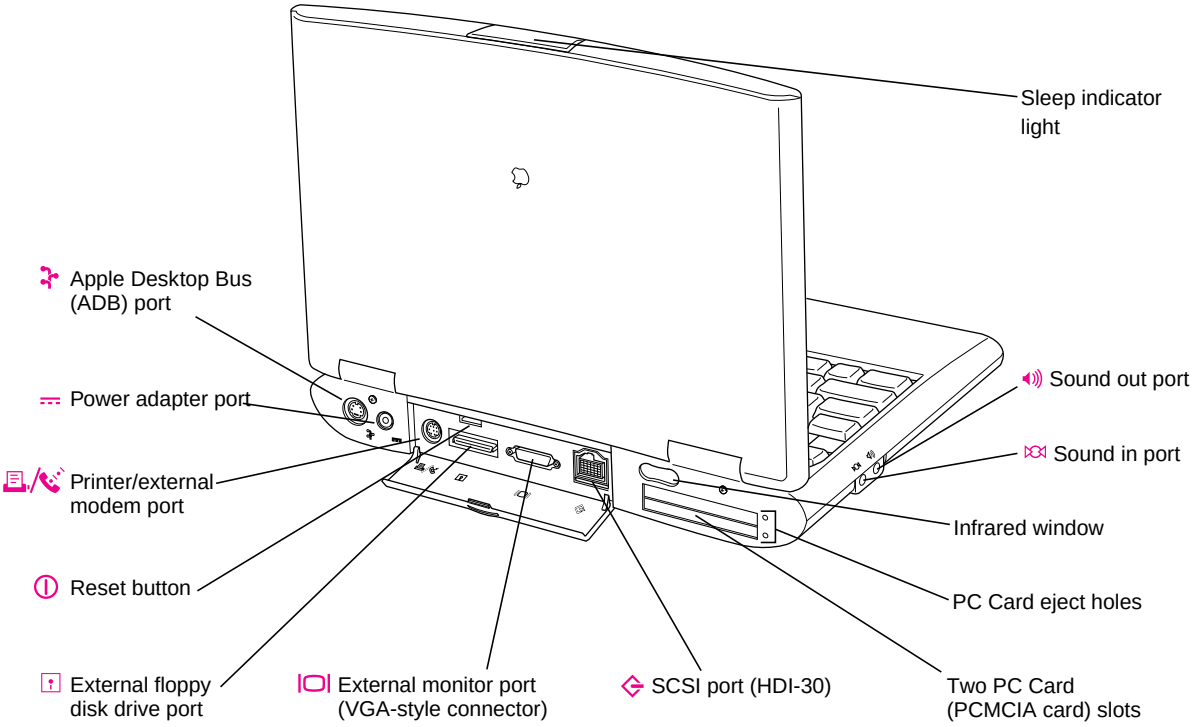


Figure 1-2 Back view of the computer



The Two Models

There are two models of the Macintosh PowerBook 2400c, one for sale in Japan and one for the US. The model sold in Japan is slightly different from the model sold in the US. Table 1-1 lists the differences.

Table 1-1 Model differences

Feature	Model sold in Japan	Model sold in US
Keyboard	Has Hiragana and Roman characters; has the Caps Lock key below the Control key	Has the Caps Lock Key above the Control key
Mac OS	Uses System 7.6	Uses System 7.6.1

Features

Most of the features of the PowerBook 2400c computer are the same as those of the PowerBook 3400 computer. Table 1-2 lists the features that are different; those features are described individually in the following sections of this developer note.

Table 1-2 Feature comparison

Feature	PowerBook 3400	PowerBook 2400c
Size	11.5 by 9.4 by 2.4 inches	10.5 by 8.4 by 1.9 inches
Weight	6.7 pounds including battery	4.4 pounds including battery
CPU clock speed	180, 200, or 240 MHz	180 MHz
RAM expansion	RAM expansion card; 144 MB maximum RAM	SO DIMM; 48 MB maximum RAM
Display	12.1-inch TFT, color, SVGA	10.4-inch TFT, color, SVGA
Battery type	lithium ion or nickel metal hydride battery	6-cell lithium ion battery
PC Card eject	Nitinol wire actuated	Motor driven
Keyboard size	Keys on 19-mm pitch	Keys on 16.5-mm pitch
Keyboard layout	US and ISO standard versions	Versions for the US and Japan
Hard disk size	1.3, 2.0, or 3.0 GB	1.3 GB
Internal I/O expansion	Expansion bay for internal FDD, CD-ROM, or hard disk drive; internal PCI slot	No expansion bay or PCI slot; ports for external floppy disk drive and external SCSI devices
Floppy disk drive	Expansion bay accepts an internal floppy disk drive	Port for connecting an external floppy disk drive
IR interface	Dual lens system	Single lens system
Microphone jack	Accepts Apple PlainTalk microphone	Accepts only Omni microphone
Speakers	Two speakers in bezel and two speakers behind display	One speaker, in bezel

RAM Expansion

The PowerBook 2400c computer accommodates one SO (small outline) DIMM for RAM expansion. The DIMM can have either 16 or 32 MB of additional RAM.

The mechanical characteristics of the RAM expansion DIMM are given in the JEDEC specification for the 144-pin 8-byte DRAM SO DIMM. The PowerBook 2400c computer can accommodate an SO DIMM with a height of 1.0, 1.25, or 1.5 inches.

While the JEDEC specification for the SO DIMM defines a Serial Presence Detect (SPD) feature that contains the attributes of the module, the Macintosh PowerBook 2400c computer does not support the SPD feature. The computer requires the DIMM to contain EDO DRAM devices with access times of 60 ns or less.

The electrical characteristics of the DIMM must be the same as those of the RAM expansion module for the PowerBook 3400 computer, as described in the PowerBook 3400 Developer Note. To obtain that developer note, please refer to “Supplemental Reference Documents” on page vii.

IMPORTANT

Unlike the RAM expansion module for the PowerBook 3400 computer, the SO DIMM for the PowerBook 2400c computer does not require an address buffer. ▲

Note

The PowerBook 2400c computer can accept a DIMM that uses 64-megabit DRAM devices. The electrical characteristics of such a DIMM must be the same as those of the corresponding expansion module for the PowerBook 3400 computer: the DRAM devices must be 4 M by 16-bit devices with 12-by-10 address multiplexing, and the connections to device address bits 9 and 10 must be swapped on the DIMM. ◆

Display

The Macintosh PowerBook 2400c computer has a built-in color flat panel display. The display is 10.4 inches across (measured diagonally) and is backlit by a cold-cathode fluorescent lamp. The display contains 800 by 600 pixels and can show up to thousands of colors.

Like the display in the PowerBook 3400, the display in the PowerBook 2400c computer uses active matrix (TFT) technology for high contrast and fast response.

PC Card Slot

The PC Card slot accepts either one Type III card or two Type II cards. The card eject mechanism uses a small motor, unlike the card eject mechanism in the PowerBook 3400, which uses a Nitinol wire.

For information about the latest version of the PC Card Manager, developers should refer to the PC Card Manager v3.0 SDK. The SDK is available on the March 1997 Reference Library edition of the Developer CD and on the Apple Developer World web page at:

ftp://ftp.apple.com/devworld/Development_Kits/PC_Card_Manager/

Keyboard

The keyboard in the Macintosh PowerBook 2400c has a compact design with key spacing of 16.5 mm. Figure 1-3 shows the keyboard layout for the PowerBook 2400c model sold in Japan, and Figure 1-4 shows the layout for the model sold in the US.

Note
The keyboard for the PowerBook 2400c model sold in Japan also has hiragana characters, not shown here, printed on the keys.

Figure 1-3 Keyboard layout for model sold in Japan

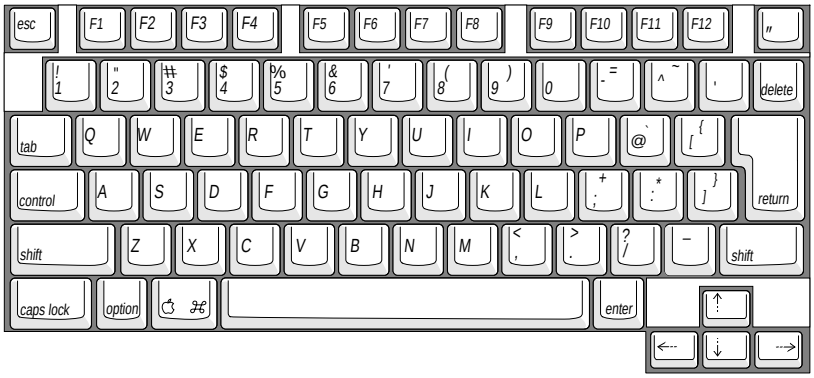
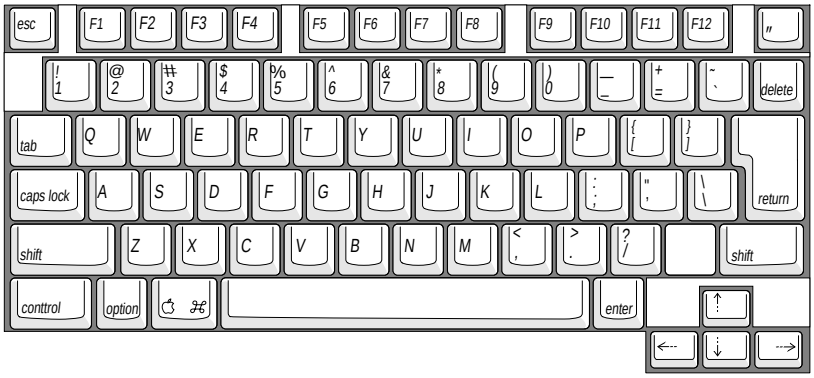


Figure 1-4 Keyboard layout for model sold in the US



Hard Disk Size

The storage capacity of the built-in hard disk in the Macintosh PowerBook 2400c computer is 1.3 GB.

I/O Expansion

Because of its small size, the PowerBook 2400c computer does not have an expansion bay, so it does not accept an internal CD-ROM drive or floppy-disk drive. The user can attach an external floppy disk drive to a port on the back of the computer. Other external drives can be connected to the SCSI port. Figure 1-2 on page 3 shows the locations of the ports.

Port for Floppy Disk Drive

The back of the Macintosh PowerBook 2400c computer has a separate port for connecting a Macintosh PowerBook external floppy disk drive.

The connector for the external floppy disk drive is a Molex type 52629-2611. Table 1-3 shows the signal assignments on the floppy disk drive connector. A slash character (/) before a signal name indicates an active-low signal.

Table 1-3 Signals on floppy disk drive connector

Pin	Signal	Pin	Signal
1	GND	2	FL_ENABLE
3	N.C.	4	HDSEL
5	GND	6	MB_+5V
7	GND	8	MB_+5V
9	WRDATA	10	/DEV_IN
11	PHASE(0)	12	PHASE(1)
13	PHASE(2)	14	MB_+5V
15	PHASE(3)	16	/WRREQ
17	N.C.	18	N.C.
19	GND	20	MB_+5V
21	FD_RD	22	GND
23	GND	24	GND
25	GND	26	GND

Peripheral Devices

Several peripheral devices are available for the Macintosh PowerBook 2400c computer:

- Macintosh PowerBook external floppy drive for Macintosh PowerBook 2400c, to be connected through its own port on the back of the computer.
- Macintosh PowerBook power adapter for Macintosh PowerBook 2400c, the same as the power adapter for the PowerBook 3400 computer.
- Macintosh PowerBook lithium-ion rechargeable battery for Macintosh PowerBook 2400c
- Macintosh PowerBook video adapter
- Apple HDI-30 SCSI disk adapter for SCSI disk mode
- Apple SCSI peripheral interface cable for SCSI to SCSI connection
- Apple HDI-30 SCSI system cable for PowerBook to SCSI connection

An external floppy drive (with cable), a power adapter (with cable), a battery, and a video adapter are included with the computer.

System Software

The version of the Mac OS for the PowerBook 2400c model sold in Japan is System 7.6; for the PowerBook 2400c model sold in the US, it is System 7.6.1. The system software has been modified to support the new hardware features.

For a list of the features of the system software, see Technote 1090, “System 7.6” and Technote 1096, “System 7.6.1.” To find out how to obtain Apple Computer’s Technotes, see “Supplemental Reference Documents” on page vii.

Software Modifications

The software on the CD-ROM for the model sold in Japan includes a new system extension, the PowerBook 2400c PMU Updater. The extension includes new code to support both types of PC Card eject mechanisms: the motor-driven eject mechanism used in the PowerBook 2400c and the Nitinol wire eject mechanism used in the PowerBook 3400. For the model sold in the US, the new code has been incorporated into the System file in System 7.6.1.

The software CD also includes an update for the Card and Socket Services software. For information about the latest version of the PC Card Manager, developers should refer to the PC Card Manager v3.0 SDK. The SDK is available on the March 1997 Reference Library edition of the Developer CD and on the Apple Developer World web page at

ftp://ftp.apple.com/devworld/Development_Kits/PC_Card_Manager/

Machine Identification

The Macintosh PowerBook 2400c computer has a new machine ID value, 307 (133 in hexadecimal). *Inside Macintosh: Overview* describes the Gestalt Manager and tells how to use the `gestaltMachineType` value to obtain the machine name string.

Compatibility

Except for the changes described in this developer note, the features of the Macintosh PowerBook 2400c models are the same as those of the PowerBook 3400 computer. There should be no compatibility problems with applications that operate correctly with the PowerBook 3400.

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