
Welcome

The *PC 97 Hardware Design Guide* presents information for engineers who build personal computers, expansion cards, and peripheral devices that will be used with the Microsoft® Windows® 95 and Windows NT® operating systems.

The requirements and recommendations for PC design in this guide will form the basis for requirements for the 1997 version of the “Designed for Microsoft Windows” logo program for hardware. This book supersedes requirements defined in the *Hardware Design Guide for Microsoft Windows 95* and *Hardware Design Guide Supplement* for PC 95. For information about when the requirements in this book take effect, please contact whqlinfo@microsoft.com.

Previous design requirements have provided guidelines for desktop and mobile PC systems. For PC 97, this guide includes requirements for basic (desktop and mobile) systems, workstations, and entertainment PCs. In this new version of hardware requirements for the “Designed for Microsoft Windows” logo, the following guidelines are defined:

- Design requirements for specific types of systems that will run either Windows 95 or Windows NT. Requirements are defined for PCs based on x86 architecture for Windows 95 and Windows NT and for PCs based on RISC architecture for Windows NT.
- Design requirements related to the OnNow design initiative, with new requirements related to the Advanced Configuration and Power Interface (ACPI) specification, which addresses Plug and Play device configuration and power management in PC systems. The related requirements include bus-class and device-class specifications for power management and Plug and Play capabilities.
- Design requirements for universal serial bus (USB) and IEEE 1394, new buses supported under the Microsoft Windows family of operating systems.
- Design requirements for new devices supported under Windows, including new graphics and video device capabilities, DVD, scanners and digital cameras, and other devices.

Important The system requirements defined in *PC 97 Hardware Design Guide* provide guidelines for designing PC systems that best run Windows 95 and Windows NT. These design requirements are not related to the basic system requirements for running the Windows family of operating systems. For information about the basic system requirements for running Windows 95 and Windows NT, see:

<http://www.microsoft.com/windows/mix/>

How to Use This Guide

This guide is divided into four parts, plus an appendix and an index.

You should read Part 1 and Part 2 for an introduction to the design issues for PC 97 and to review summaries of the design requirements for each system type. Part 3 and Part 4 present bus-class and device-class requirements that you should study to learn the actual design details in a particular area.

Part 1, Basic Design Issues. This section introduces the design issues for PC 97, including an overview of the system configuration and power management issues addressed by the OnNow design initiative and the Advanced Configuration and Power Interface specification.

Part 1	Description
Chapter 1, “PC 97 Design Issues”	A summary of issues and design initiatives for PC 97 hardware design
Chapter 2, “OnNow and WDM for PC 97”	A summary of design issues related to the OnNow design initiative and Win32® Driver Model

Part 2, System Types. This section presents requirements for several system types.

Part 2	Description
Chapter 3, “Basic PC 97”	Requirements for a basic PC system (desktop or mobile)
Chapter 4, “Workstation PC 97”	Requirements for network workstations
Chapter 5, “Entertainment PC 97”	Requirements for entertainment PCs

Part 3, Bus and I/O Controller Design. This section presents requirements for each bus type and I/O host controllers supported under Windows 95 and Windows NT.

Part 3	Description
Chapter 6, “USB”	Requirements for universal serial bus controllers and peripherals
Chapter 7, “IEEE 1394”	Requirements for IEEE 1394 controllers and peripherals
Chapter 8, “PCI”	Requirements for PCI controllers and peripherals
Chapter 9, “ISA”	Requirements for ISA bus and devices
Chapter 10, “ATA and ATAPI”	Requirements for IDE (ATA) host controllers and IDE/ATAPI peripherals
Chapter 11, “SCSI”	Requirements for SCSI host controllers and peripherals
Chapter 12, “PC Cards”	Requirements for PC Card 16 and CardBus

Part 4, Device Design. This section defines design requirements for each particular device type, whether the device is provided as an integral part of a PC system or designed as an add-on device.

Part 4	Description
Chapter 13, “Serial, Parallel, and Wireless Support”	Requirements for legacy ports and for wireless capabilities
Chapter 14, “Input Components”	Requirements for keyboard, mouse, and game devices
Chapter 15, “Graphics Adapters”	Requirements for graphics adapters, including TV output capabilities and hardware acceleration
Chapter 16, “Video Components”	Requirements for video components and monitors, including DVD playback
Chapter 17, “Audio Components”	Requirements for basic and advanced audio capabilities
Chapter 18, “Storage and Related Peripherals”	Requirements for hard disk, CD-ROM, DVD, and other peripheral storage devices
Chapter 19, “Modems”	Requirements for voice, fax, and data modems

continued

Part 4 (continued)	Description
Chapter 20, “Network Communications”	Requirements for network adapters, ISDN, cable modem, and other network devices
Chapter 21, “Printers”	Requirements for printers
Chapter 22, “Scanners and Digital Cameras”	Requirements for digital image input devices

Appendix. The appendixes include supplementary information for PC 97 design.

Appendix	Description
Glossary	Definitions of key technical terms used in this guide
Appendix A, “Icons”	Summary of suggested icons for cables and connectors
Appendix B, “Device Identifiers”	List of Plug and Play CompatibleIDs for device IDs
Appendix C, “Accessibility”	Information about accessibility issues for hardware design
Appendix D, “Legacy I/O Assignments”	Lists of assignments for ISA interrupts, DMA, and I/O addresses

Online Viewing and Updates for this Guide

PC 97 Hardware Design Guide includes a compact disc that contains the full text of this guide in MediaViewer format so that you can search and view topics online.

As revisions and new information become available for PC 97 requirements, you can update your CD version of *PC 97 Hardware Design Guide* by using your modem or Internet connection. For information about how to update the CD version of *PC 97 Hardware Design Guide*, see the Help that accompanies the CD.

Updates to *PC 97 Hardware Design Guide* will also be provided on a quarterly basis together with technical clarifications and answers to frequently asked questions on the Hardware Development web site:

<http://www.microsoft.com/hwdev/desguid/>

Required vs. Recommended Features for PC 97

Hardware features are described as *Required*, *Recommended*, or *Optional* in this guide. For the “Designed for Microsoft Windows” logo program, these terms are used to mean the following:

- **Required:** These are the basic hardware features that must be implemented to qualify for the “Designed for Microsoft Windows” logo.
- **Recommended:** These features add functionality supported by the Windows operating systems. Recommended features take advantage of the native capabilities of hardware device drivers included with the operating system usually without imposing major cost increases.

Notice that for “Designed for Microsoft Windows” logo testing, if a recommended feature is implemented, it must meet the standards for that feature as defined in this guide.

Some recommended features might become requirements under the logo program in the future.

- **Optional:** These features are neither required nor recommended, but if the feature is implemented in a PC 97 system, it must meet the specified requirements. These features will not become requirements under the logo program in the future.

In this guide, these terms have the following meanings with regard to the “Designed for Microsoft Windows” logo requirements:

- **Must** = Required
- **Should** = Recommended

Conventions Used in This Guide

The following conventional terms, symbols, abbreviations, and acronyms are used throughout this guide.

Convention	Meaning
Windows 95	Refers to the Microsoft Windows 95 operating system, including any add-on capabilities and any later versions of the operating system.
Windows NT	Refers to the Microsoft Windows NT Workstation version 4.0 operating system and also including any add-on capabilities and any later versions of the operating system.
x86-based	Refers to computers based on 32-bit microprocessors that use the x86 instruction set, such as Intel 80486, Intel Pentium-class, or Pentium Pro-class microprocessors, or the equivalent.
RISC-based	Refers to computers based on reduced instruction set (RISC) architecture, including computers with MIPS R4000 or Digital Alpha 21064 (EV4) or higher processors or based on IBM PowerPC Architecture. Note All requirements and recommendations for RISC-based PCs are for the Windows NT operating system only.
System device	Also, “system board devices.” Refers to devices on the system board such as interrupt controllers, keyboard controller, real-time clock, direct memory access (DMA) page registers, DMA controllers, memory controllers, floppy disk controller (FDC), IDE ports, serial and parallel ports, PCI bridges, and so on. In today’s PCs, these devices are typically integrated in the supporting chip set.
Add-on device	Refers to devices that are traditionally added to the base PC system to add functionality, such as audio, networking, graphics, SCSI controller, dedicated tape backup, uninterruptible power supply (UPS), and so on. Add-on devices fall into two categories: devices built onto the system board, or devices on expansion cards added to the system through a system board connector such as ISA or PCI.
PC 97	The collection of requirements for PC system design, bus implementation, and device design that make up the requirements for the next generation of the “Designed for Microsoft Windows” logo.

Acronym	Meaning	Acronym	Meaning
ACK	An acknowledgment signal	IRQ	Interrupt request lines
ACPI	Advanced Configuration and Power Interface	ISA	Industry standard achitecture
API	Application programming interface	K	Kilobyte
APM	Advanced power management	LAN	Local area network
ASIC	Application-specific integrated circuit	MB	Megabyte
ATA	AT Attachment	MPEG	Motion picture experts group
ATAPI	AT Attachment Packet Interface	MIS	Management information system
BIOS	Basic input/output system	NDIS	Network Driver Interface Specification
CDFS	Compact disc file system	NMI	Nonmaskable interrupt
CPU	Central processing unit	NTFS	Windows NT file system
CSN	Card select number	OEM	Original equipment manufacturer
DDC	Display data channel	PCI	Peripheral component interconnect
DDK	Device driver kit	PCMCIA	Personal Computer Memory Card International Association
DIB	Device-independent bitmap	PIC	Programmable interrupt controller
LL	Dynamic-link library	POST	Power on self test
DMA	Direct memory access	RAMDAC	Random access memory digital-to-analog converter
DSP	Digital signal processor	RLE	Run-length encoding
ECP	Extended capabilities port	SDK	Software development kit
EISA	Extended Industry Standard Architecture	SCSI	Small computer system interface
FAT	File allocation table	SPI	SCSI-3 parallel interface
FDC	Floppy disk drive controller	TAPI	Telephony API
FIFO	First in, first out	UNC	Universal naming convention
GB	Gigabyte or gigabytes	UART	Universal asynchronous receiver-transmitter
HCT	Hardware compatibility tests	UPS	Uninterruptible power supply
HDC	Disk I/O controller	USB	Universal serial bus
IDE	Integrated device electronics	VESA	Video Electronics Standards Assoc.
I/O	Input/output	VM	Virtual machine
IHV	Independent hardware vendor	VxD	Device driver, where x is the device
IPL	Initial program load	WAN	Wide area network
IrDA	Infrared Data Association		

Windows Hardware Quality Labs

The Windows Hardware Quality Labs (WHQL) provides compatibility testing services to test hardware and drivers for Windows 95 and Windows NT.

The WHQL administers testing for the “Designed for Microsoft Windows” logo programs, which provide customer assurance that the hardware works with the Windows 95 and Windows NT family of products. Hardware developers whose products pass the WHQL testing program also receive a detailed test report, inclusion of tested hardware on the Windows Hardware Compatibility List (HCL), and free distribution of drivers in the Windows Driver Library (WDL).

If you have questions about the program, contact WHQL:

Windows Hardware Quality Labs	http://www.microsoft.com/hwtest/
Microsoft Corporation	E-mail: whqlinfo@microsoft.com
One Microsoft Way	Fax: (206) 703-3872
Redmond, WA 98052-6399 USA	

References and Resources

The following table lists some of the information resources, services, and tools available from Microsoft to help build hardware that is compliant with the “Designed for Microsoft Windows” logo requirements. Each chapter in this guide contains additional information about resources for specific topics.

Information Resources

Resource	Contact
<i>PC 97 Hardware Design Guide</i>	Internet: http://www.microsoft.com/hwdev/pc97.htm
Information for hardware manufacturers	E-mail: ihv@microsoft.com Internet: http://www.microsoft.com/hwdev/
Windows 95 and Windows NT Driver Development Kits (DDK)	Provided with the Microsoft Developer Network (MSDN) Professional membership. To subscribe: Fax: (206) 936-7329, Attn: Developer Network E-mail: devnetwrk@microsoft.com
Plug and Play specifications	http://www.microsoft.com/hwdev/pnpspecs.htm
Hardware testing	Testing tools for Plug and Play and the “Designed for Microsoft Windows” logo program for hardware are available from http://www.microsoft.com/hwtest/

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We also are grateful to the software engineers, testers, and program managers at Microsoft who contributed feedback and technical content to ensure that the information in *PC 97 Hardware Design Guide* is accurate and timely for both Microsoft Windows 95 and Microsoft Windows NT.