Windows Logo Program

Guidelines for products that work well with the Microsoft® Windows® XP operating systems

Microsoft Windows Logo Program
System and Device Requirements

Design and testing requirements for server, desktop, and mobile systems and devices that run the Microsoft® Windows® family of operating system

Microsoft

Version 2.0
May 29, 2001

Designed for
Microsoft®
Windows®XP

Windows XP Home Edition (32-bit)
Windows XP Professional (64-bit and 32-bit)
Windows Whistler Server (64-bit and 32-bit)
Windows 2000 Server and Professional (32-bit)
Windows Millennium Edition
Windows 98 Second Edition

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This document contains quotations from the following documents, which are co-authored by Microsoft Corporation and Intel Corporation:

- *PC 2001 System Design Guide*, © 2000, Intel Corporation and Microsoft Corporation. Available at http://www.pcdesguide.org/pc2001/

- *Hardware Design Guide Version 3.0 for Microsoft Windows 2000 Server*, © 2000, Intel Corporation and Microsoft Corporation. Available at http://www.microsoft.com/hwdev/serverdg.htm

Microsoft Windows Logo Program System and Device Requirements is not for sale. To obtain additional copies of this document, please download the files from the web site at http://www.microsoft.com/winlogo/hardware/.

Contents

Chapter 1 - Introduction to Windows Logo Program for Hardware

Welcome to the *Microsoft Windows Logo Program System and Device Requirements, Version 2.0*. This document provides the authoritative source for information about requirements for the Windows Logo Program for hardware that must be met by hardware vendors and system manufacturers who want to license the Windows Logo. Note, however, that these Logo Program requirements do not represent the minimum system requirements for running any version of the Windows family of operating systems.

This document describes the scope and purpose of the Microsoft Windows Logo Program, and it tells how to obtain the Windows Logo for server, desktop, and mobile systems and components that run the Microsoft® Windows® XP, Windows "Whistler" Server (codename), Windows 2000, and Windows Millennium Edition (Windows Me) operating systems.

This document is revised for each new version of the Windows operating systems. To receive update information about the Windows Logo Program for hardware by e-mail, subscribe to the mail list as described at http://www.microsoft.com/winlogo/hardware/.

In This Document …

Chapter	Description
Chapter 1, Introduction to Windows Logo Program for Hardware	Presents a summary of the Windows Logo Program and resources.
Chapter 2, Hardware Requirements for Windows Logo	Describes requirements for consistent, stable functionality under Windows operating systems.
Chapter 3, Recommendations and Future Requirements	Presents specific design practices that Microsoft encourages, and highlights important design practices that will become Windows Logo Program requirements in the future.
Chapter 4, Getting the Windows Logo for Hardware	Describes the process of preparing for and submitting hardware for Windows Logo Program compliance testing.
Appendix A, System Requirements Checklist	Provides a checklist of requirements for desktop, mobile, and server systems, and for legacy-free and 64-bit systems.
Appendix B, Device Requirements Checklist	Provides a checklist of requirements per device class.
Appendix C, Designing for Success	Provides tips to help ensure that new designs are compatible with Microsoft operating systems and meet Windows Logo Program requirements.
References	Provides a comprehensive list with Internet resources for all specifications cited in the Windows Logo Program requirements.

About the Microsoft Windows Logo

Microsoft offers the Windows Logo Program to help customers identify systems and peripherals that meet a baseline definition of platform features and quality goals that ensure a good Windows experience for the end user. The Windows Logo is *not* intended to communicate the specific technical capabilities of any particular system.

Products that earn the Windows Logo have been tested to ensure that they meet Microsoft standards for compatibility on the Windows operating systems designated on the logo. System and peripheral manufacturers can license the Windows Logo for use on product packaging, advertising, collateral, and other marketing materials for all systems and components that pass compliance testing.

Manufacturer Benefits

Products that carry the Windows Logo for hardware include these characteristics:

- All components install and uninstall properly and do not interfere with other system components.
- Each component interoperates well with other system components.
- All components function normally after the operating system is upgraded to Windows XP/Windows 2000 or any later version of the operating systems for which the system or component carries the logo.

These characteristics yield these benefits for manufacturers:

- Increased customer satisfaction
- Lower support costs
- Fewer product returns

Customer Benefits

Windows Logo Program requirements are intended to support a good user experience with the Windows operating system. In this context, a "good user experience" means a reliable, consistent experience with system hardware, firmware, drivers, and related software components. In particular:

- The user is assured that a product that has the Windows Logo will be stable when running under the operating systems listed on the Windows Logo carried by that product or listed in the Hardware Compatibility List.
- The user can easily begin and complete component installation or removal. Installing and using a component that has the Windows Logo will not cause the system to stop working, or otherwise disrupt Windows or other Logo'd software running on the computer.

- The user's overall experience with the computer system and the operating system is the same or better after upgrading to a new Windows operating system.

IMPORTANT: The presence of the Windows Logo on a hardware product does ***not*** mean that Microsoft endorses or certifies a product. The Windows Logo is not a quality assurance seal. Microsoft does not test the quality of each hardware product or ensure that it is bug free.

"Designed for Windows" Logo Options

Microsoft licenses different versions of the "Designed for Windows" logo for specific operating systems on servers, desktop PCs, mobile PCs, and their components, as described in this section. The Windows Logo explicitly identifies the versions of the operating system for which the product passed compliance testing. Testing is conducted by Windows Hardware Quality Labs, as described in Chapter 4 of this guide.

The specific Windows Logo for the system or device indicates which operating system versions the manufacturer supports for the system or device. The current, comprehensive listing of available logos is provided at http://www.microsoft.com/winlogo/hardware/.

Windows Logo Program requirements vary for different classes of products (for example, server, desktop, or mobile) and for different market segments (for example, enterprise server, commercial desktop, or consumer desktop). Where system design guides and other references refer to consumer and business PC system types, the following meanings apply for the Windows Logo Program:

- **Business PC** (also referred to as office PC or commercial PC)**:** The system comes with Windows XP Professional or Windows 2000 Professional preinstalled.
- **Consumer PC:** The system comes with Windows XP Home Edition or Windows 98/Me preinstalled.

Note: Test logs for Windows XP are required for all logos.

Windows Logo Program Dates

Dates for specific Windows Logo Program requirements are defined on the web at http://www.microsoft.com/winlogo/hardware/.

Windows Logo Program requirements become effective in these ways:

- **Operating System Support.** Some requirements become part of the Windows Logo Program based on features in the operating system that the manufacturer preinstalls on the system.

For example, OnNow power management and multiple monitor support became Windows Logo Program requirements a few years ago when new support was introduced in Windows operating systems. These types of requirements depend on which operating system is preinstalled on the system. For example, in past years, a system with Windows NT 4.0 preinstalled was not required to fully support Windows Driver Model (WDM) requirements.

Another example is support for legacy-free designs, first introduced in the Windows 2000 and Windows Me operating systems. For this example, the OEM can choose whether to build legacy-free designs; however, if implemented, the system must meet the specific Windows Logo Program requirements for such systems.

- **Industry Advances.** Some technical requirements are market driven and take time to become broadly adopted because of cost or development time.

  Such technical advances are introduced as proposed guidelines in the Design Guides (jointly authored by Microsoft Corporation and Intel Corporation). Based on industry feedback about time-to-market issues identified during the Design Guide review cycle, these technical advances become part of the Windows Logo Program requirements on a timetable that the majority of the industry has agreed is technically possible and cost effective.

  Some technical advances proposed in the PC and Server Design Guides include support for features in yet-to-be-released versions of Windows operating systems. For example, Advanced Configuration and Power Interface (ACPI) support was required in the Design Guides before ACPI-capable versions of Windows were available.

  In special cases such as ACPI, the Logo Program requires design changes in advance of the availability of the operating system in order to ensure value in the installed base of PCs for future operating system upgrades. Actual requirements and effective dates under the Windows Logo Program are based on consensus from industry review to ensure that the platform advances can be made at an acceptable cost and in a reasonable time frame.

To plan for Windows Logo requirements based on new operating system features, participate in Microsoft design reviews and beta testing programs. For more information about how to plan and design systems that ensure operating system compatibility and that comply with Windows Logo Program requirements, see Appendix C, "Designing for Success."

What's New in This Version

This version supersedes Version 1.1, which summarized the Logo Program requirements for PCs and peripherals for Windows 98/Me and Windows 2000.

Version 2.0 of this document adds the following new information:

- New requirements in relation to Windows XP/Windows Whistler Server and advances in industry specifications, first presented in the "Future Requirements" sections of Version 1.1 of this document, or announced in the Windows Logo Program News and posted at http://www.microsoft.com/hwdev/winlogo/.

  Most of these requirements match design guidelines defined in *PC 2001 System Design Guide*.

- New checklists provide detailed requirements for servers and 64-bit systems. Most of these requirements match design guidelines defined in *Hardware Design Guide Version 3.0 for Microsoft Windows 2000 Server*.

Device and System "Quality" Requirements Notes

In previous versions of this document, the detailed lists of WHQL tests in the "Quality" sections in Appendixes A and B were provided to help designers identify the test requirements related to a specific system or component. However, Microsoft now publishes the WHQL Test Specification, which provides extensive details about many tests in the HCT. In addition, the HCT documentation has been revised extensively to help designers and testers easily identify the test requirements for every system and component.

Therefore, the "Quality" sections now include only WHQL Test Specification and HCT documentation cross references, rather than lists of specific tests.

In addition, some requirements were erroneously included in the "Quality" sections in earlier drafts. These have been placed in correct locations under "Compatibility" and "Windows Experience" sections, with cross-references retained in their original locations.

System-related Requirement Notes

Unless otherwise noted, the requirements apply for all versions of the Windows operating system, and general system requirements apply to PC desktops, mobile PCs, and server systems.

Mobile and Server Exceptions. In both the Mobile PC and Server sections in Appendix A, a specific list is provided of cross-references to exceptions for general device and system requirements. To view these lists, see:

A3.0 Mobile PC Client Requirements
A6.0 Server System Requirements

Client vs. Server Notations. Requirement titles clearly specify whether the item applies only for client PCs or servers. For example:

A1.4.2 x86-based client: System and all components correctly implement power management

A1.4.7 Peripherals included with client system offer a non-legacy interface such as PCI, USB, IEEE 1394, or CardBus

A5.4.12 System that provides headless server capabilities meets minimum requirements

Windows Version Notations. Requirement titles clearly specify whether the item applies only for specific versions of Windows. For example:

A1.4.10 Windows XP Home Edition/Professional: Audio is "digital ready"

B6.1.4.10 Windows Whistler Advanced Server: Data modem supports digital connection to support host-side V.90 operation

x86-based vs. Intel Itanium-based Notations. Requirement titles clearly specify whether the item applies only for 32-bit or 64-bit systems. For example:

A1.1.5 Multiprocessor system compatibility requirements
x86-based: Comply with ACPI 1.0b.
Itanium-based: Comply with Multiple APIC Description Table (MADT) in ACPI 2.0, Section 5.2.10.4.

Note: In earlier versions and in the server design guide, the terms IA-32 and IA-64 were used to differentiate 32-bit and 64-bit systems.

How to Use This Document

This document provides the **authoritative** compilation of references to all Windows compatibility and Logo Program requirements.

Chapter	Description
Chapter 2, Hardware Requirements for Windows Logo	Describes overall requirements for consistent, stable functionality under Windows operating systems.
Appendix A, System Requirements Checklist	Provides a checklist of requirements for desktop, mobile, and server systems, and for legacy-free and 64-bit systems.
Appendix B, Device Requirements Checklist	Provides a checklist of requirements for each device class and bus class.

To understand how Logo requirements are defined and organized, see:

- Conventions Used in This Document
- How to Use the Appendixes

Logo Requirements and Related Documents

This is a comprehensive checklist; however, *this is not a standalone document*.

To adequately review and design for the compatibility and design requirements for the Windows Logo Program for hardware, you must also have available these documents:

- Windows Driver Development Kits (DDKs; including DDKs for Windows XP, Windows Whistler Server, Windows 2000, Windows Me, and Windows 98), available at http://www.microsoft.com/ddk/

  All DDK topic references in this document are based on the current Windows DDK, published in conjunction with the Windows XP operating system.

  Tip: Search for the cited topic name in your local version of the DDK documentation.

- WHQL Test Specifications, available at http://www.microsoft.com/hwtest/

- *PC 2001 System Design Guide*, available at http://www.pcdesguide.org

- *Hardware Design Guide v. 3.0 for Microsoft Windows Server*, available at http://www.microsoft.com/hwdev/serverdg.htm

- Industry specifications, such as ACPI Specification, PCI Local Bus Specification 2.2, USB 1.1 and related device class specifications, MMC-2, and so on. For links to all specifications referred to in these requirements, see References.

Logo Requirements and the Windows HCTs

When you install the Windows XP HCT 10.0, this document is automatically installed with the HCT documentation, the WHQL Test Specifications, and the PC and server design guides.

The HTML Help (.CHM) versions of these documents are designed to work interactively.

We recommend that you review the Windows Logo Program requirements with the HTML Help versions of the test specifications and design guides for easy cross-referencing among the requirements and implementation guidelines.

TIP: If you download these documents from the web, place them in the same directory to ensure that the cross-reference links work. All links work automatically if you are running the versions installed the Windows HCT 10.0.
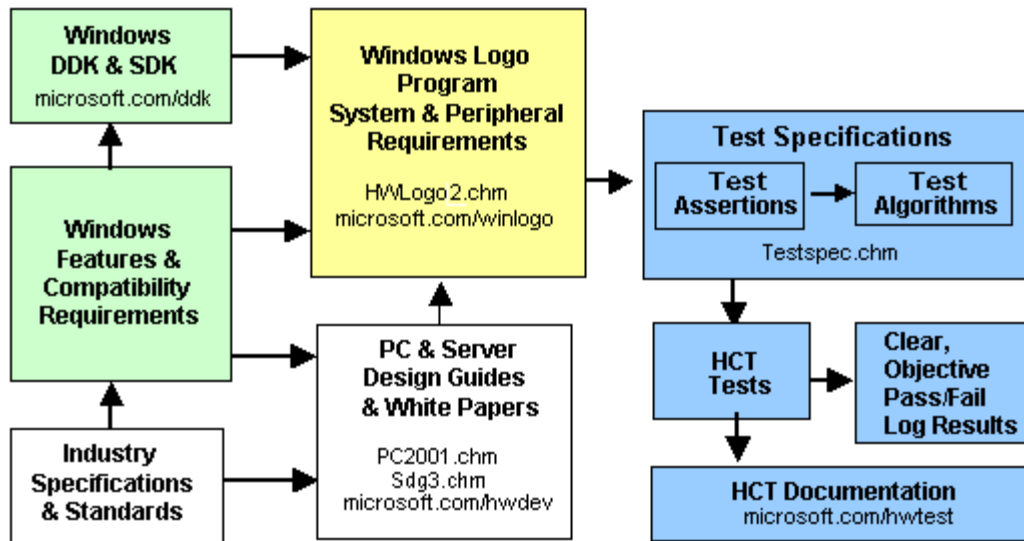
Resources for Meeting Logo Requirements

This section provides a list of Microsoft resources that can help you build hardware that meets the Windows Logo requirements. In this document, see also:

- Appendix C, Designing for Success, for steps to help ensure that new designs are Windows compatible.
- References, for a comprehensive list of specifications.

Resource	Address
Windows Logo Program web site	http://www.microsoft.com/winlogo/hardware/
Feedback on logo requirements and related issues	hwlogo@microsoft.com
Hardware testing tools and test submission information	http://www.microsoft.com/hwtest/
Digital signing for drivers	whqlds@microsoft.com
Windows Logo Program News mailing	Sign up at http://www.microsoft.com/winlogo/hardware/
WHQL Weekly News mailing	Sign up at http://www.microsoft.com/hwtest/
Logo artwork and other issues (after testing)	whqlinfo@microsoft.com
Knowledge Base	http://support.microsoft.com/support/
Information for manufacturers and driver developers	http://www.microsoft.com/hwdev/ E-mail: ihv@microsoft.com
General information for developers	http://msdn.microsoft.com/developer/

Resource	Address
Windows DDK	http://www.microsoft.com/ddk/
Microsoft Platform Software Development Kits (SDKs)	Provided with Microsoft Developer Network (MSDN) Professional Subscription. To subscribe: E-mail: msdn@microsoft.com Or: http://www.microsoft.com/msdn/subscribe/

Conventions Used in This Document

Requirement and Design Guideline References

Windows Logo Program requirement citations

Specific requirements for a general, system, or device are defined for the Windows Logo Program for hardware using this format:

WL-#	General Logo Program requirement, where # represents a number defined in Chapter 2.
A#.#.#	Logo Program requirement for PC or server systems, where # represents a number defined in Appendix A.
B#.#.#	Logo Program requirement for devices and buses, where # represents a number defined in Appendix B.

PC 2001 System Design Guide cross-references

These references indicate the implementation guidelines for PCs or peripherals. For any particular reference citation within these requirements, the entire text of the PC 2001 guideline applies (unless different information is defined in this document).

These citations are in the following format, where #### indicates the PC 2001 item number:

1394-####	INPT-####	PRNT-####
ATA-####	MOBL-####	SCSI-####
AUD-####	MOD-####	STOR-####
BTH-####	MON-####	SYS-####
BIOS-####	NET-####	USB-####
CBUS-####	PCI-####	VID-####
GRPH-####	PORT-####	WORK-####
IMAG-####		

Note: Appendix C in *PC 2001 System Design Guide* provides cross-references to PC 99 item numbers. -

Server Design Guide v.3.0 cross references

These references indicate the implementation guidelines for servers or related peripherals. For any particular reference citation within these requirements, the entire text guideline applies, as documented in *Hardware Design Guide Version 3.0 for Microsoft Windows 2000 Server*.

These citations are in the following format, where #### indicates the server design guide item number:

SDG3:####

Terms

Add-on device

Refers to devices that are traditionally added to the basic PC system to increase functionality. Examples include audio, networking, graphics, small computer system interface (SCSI) controller, and so on. Add-on devices fall into two categories: devices built onto the system board and devices on expansion cards added to the system through a system-board connector, such as Peripheral Component Interconnect (PCI).

Client

Refers to versions of the Windows XP and Windows 98/Me operating systems running on desktop or mobile PC systems.

Design Guidelines

Indicates the source reference where precise information is provided for implementing software or hardware that is compliant with industry standards and the Windows operating system.

Exception

Indications cases in which a requirement may not apply.

FAQ

Standard subsections for each system or component in Appendix A and Appendix B, listing clarifications and corrections published for Windows Logo Program requirements. FAQs are defined in subsections numbered #.#.5 in the appendixes.

FAQ are also listed at http://www.microsoft.com/winlogo/hardware/ and published in the Windows Logo Program News available by subscription on the Windows Logo Program web site.

Future Requirement

Standard subsections for each system or component in Appendix A and Appendix B, listing new features or capabilities that are planned for future versions of the Windows Logo Program for hardware. Future requirements are defined in subsections numbered #.#.R in the appendixes.

Future requirements are also listed at http://www.microsoft.com/winlogo/hardware/ and published in the Windows Logo Program News available by subscription on the Windows Logo Program web site.

Industry Standards

Standard subsections for each system or component in Appendix A and Appendix B, listing required industry specifications, upon which operating system support is based. These references include Internet links to the source document.

Mobile PC Note

Indicates that an exception or additional information is defined for Mobile PC systems. In most cases, the details for the exception are defined in a reference document (such as PC 2001).

Must

Indicates that the statement applies as a requirement for the Windows Logo Program.

Quality

Standard subsections for each system or component in Appendix A and Appendix B, listing requirements for testing the system to ensure Windows compatibility and reliability.

Required; Requirement

The feature must be supported as defined in these guidelines for the hardware to pass testing and receive the Windows Logo.

Server Note

Indicates that an exception or additional information is defined for server systems. In most cases, the exception is defined in *Hardware Design Guide V.3.0* for servers, where the complete implementation guidelines are defined.

Should

Indicates that the statement applies as a recommendation or implementation guideline for the Windows Logo Program.

Supported

Indicates that functionality is delivered in the end-user configuration. In a configure-to-order or build-to-order customer product specification scenario, this feature is the default if multiple options are presented.

System device

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 drive controller (FDC), hard disk controller (HDC), serial and parallel ports, PCI bridges, and so on. These devices are typically integrated with the supporting chip set in legacy PC designs.

Windows [version]

In bold type, used in this document to cite the specific versions of the Windows operating system for which a requirement applies. Unless otherwise stated, requirements apply for all versions of Windows tested under the Windows Logo Program.

Windows Compatibility

Standard subsections for each system or component in Appendix A and Appendix B, listing requirements that ensure the system will run correctly under Windows, based on DDK references for correct driver implementation and Microsoft white papers that describe implementation details.

Windows Experience

Standard subsections for each system or component in Appendix A and Appendix B, listing requirements that advance the Windows platform or enhance the quality of the Windows computing experience. This includes the items first described in Design Guides that are important to the success of the Windows experience.

x86-based, Itanium-based

In bold type, used in this document to cite specific types of computers based on 32-bit and 64-bit microprocessors, respectively, that use the Intel Architecture instruction set.

How to Use the Appendix

Appendix Sections and Subsections

In Appendix A, "System Requirements Checklist," and Appendix B, "Device Requirements Checklist," each system and device type is identified in a separate section. These section numbers do not necessarily correlate directly with WHQL test categories. For devices, these sections are not related to how the device is attached to the computer.

Each group of system-specific or device-specific requirements is divided into the following subsections.

Subsection	Description
#.#.1 Windows Compatibility	Requirements that ensure the system or component will run correctly under Windows, including: ▪ DDK references for correct driver implementation ▪ Links to Microsoft white papers that describe implementation details for Windows compatibility
#.#.2 Industry Standards	Industry specifications upon which operating system support is based. These are provided as Internet links for the convenience of designers and testers.
#.#.3 Quality	Requirements for testing the system, device, or driver to ensure the quality of implementation under Windows.
#.#.4 Windows Experience	Requirements that advance the Windows platform or enhance the quality of the Windows computing experience. This includes the items first described in Design Guides that are important to the success of the Windows experience.
#.#.5 FAQs	Requirements and clarifications published for the Windows Logo Program. These include compliance date and implementation issues, plus clarification of design guidelines published elsewhere. Each system or device topic on the http://www.microsoft.com/winlogo/hardware/ web site may contain additional clarifications and announcements of any new requirements defined after publication of this document.

#.#.R Future Requirements	Capabilities and features that may become new Logo requirements with the next release of the Windows operating system following Windows XP and Windows Whistler Server.
	Each system or device topic on the http://www.microsoft.com/winlogo/hardware/ web site may contain announcements of any additional future requirements planned for future versions of Windows.

Chapter 2 - Hardware Requirements for Windows Logo

These guidelines define the Windows Logo Program requirements for consistent, stable operating system functionality and help ensure a satisfactory customer experience.

Compliance dates for specific Windows Logo Program requirements are defined on the web at http://www.microsoft.com/winlogo/hardware/.

Note: These requirements apply to all systems and peripherals displaying the "Designed for Windows" Logo, in the configuration shipped to a customer

Statements in this document or in the HCT documentation related to "testing requirements" or "systems submitted for Microsoft Windows Logo Program Testing" indicate test submission requirements; such statements do *not* reduce or alter these Logo requirements.

A customer may request that the system supplier omit a particular component from a system configuration as shipped to that customer; however, such a customer request does not remove or reduce any related requirements for that system to support that component's functionality if the customer installs a Logo'd component of that class into the system.

Summary of Windows Logo Requirements

The Windows Logo Program requirements consist of the following for each operating system for which the vendor is seeking the "Designed for Windows" logo:

- Current Microsoft Hardware Compatibility Tests (HCTs) from WHQL, available on the web at http://www.microsoft.com/hwtest/testkits/.
- The requirements summarized in the following sources:
  - This chapter
  - Appendix A, "System Requirements Checklist"
  - Appendix B, "Device Requirements Checklist"
  - Any clarifications, corrections, or additions listed on the Windows Logo Program for Hardware web site at http://www.microsoft.com/winlogo/hardware/

Implementation guidelines for drivers are defined in the Microsoft Windows DDK. System and component design guidelines are defined in the *PC System Design Guide* series published on http://www.pcdesguide.org and the *Hardware Design Guide for Microsoft Windows Server* series, published at http://www.microsoft.com/hwdev/serverdg.htm.

Note that the PC and Server Design Guides do not define the Windows Logo Program requirements; rather, these publications provides feature guidelines for system and component design.

Windows Logo Program Requirements

WL-1. System and devices support required operating systems

WL-2. System memory provides a satisfactory user experience

WL-3. System includes required set of buses and devices

WL-4. All components and devices meet Windows compatibility and quality design guidelines

WL-5. System and components meet reduced legacy support goals

WL-6. System and components support operating system configuration and control of devices

WL-7. System and peripherals implement ease-of-use guidelines for a good end-user experience

WL-8. System components operate correctly upon installation of a later operating system

Rationale

- **For minimum memory and processor performance:** These minimum requirements ensure that the system will provide an adequate user experience when running applications designed for the targeted platform.

- **For configuration, installation, and ease-of-use requirements:** These requirements ensure that the hardware and drivers run in a stable, reliable manner and result in the optimal end-user experience when running under Windows operating systems.

- **For legacy removal:** Requirements for "no ISA devices or slots" are specified to reduce frustration for users, reduce total cost of ownership (TCO) in the enterprise, and reduce the support burden for vendors. Also, because the ISA bus is very slow and only supports 16 MB of addressable space, ISA removal may lead to improved performance. Reduced reliance on legacy buses and components means less time required to install new devices in the system, and the system won't stop running and devices won't fail because of resource conflicts.

- **For migration capabilities:** The goal of this requirement is to ensure that when a user upgrades the operating system, previously installed components will continue to function as before, with all preferences and privileges working after the upgrade.

WL-1. System and devices support required operating systems

At a minimum, a 32-bit system or device submitted for Windows Logo Program testing must provide 32-bit driver support for the Windows XP/Windows 2000 operating system, plus driver support for any other Windows operating systems that will be preinstalled on the system (Itanium-based systems must provide 64-bit driver support). For systems submitted for Microsoft Windows Logo Program testing, a Microsoft operating system must be preinstalled on the hard disk.

These requirements apply to all systems and peripherals displaying the "Designed for Windows" Logo, as the system or device/peripheral is shipped to a customer. Statements within this document relating to "testing requirements" or "systems submitted for Microsoft Windows Logo Program Testing" indicate test submission requirements; such statements do *not* reduce these Logo requirements.

A customer may request that the system supplier omit a particular component from a system configuration as shipped to that customer; however, such a customer request does not remove or reduce any related requirements for that system to support that component's functionality when and if the customer installs a Logo'd component of that class into the system.

Notes:

- The system manufacturer must provide the customer with drivers for all devices for all operating systems for which the system has received the Windows Logo, unless a particular device class is not supported on one of the operating systems. That is, if the system has the logo for Windows 98, Windows NT 4.0, and Windows 2000, the end user must have access to all compatible drivers and utilities for each version of the operating system.
- If the device class is supported under Windows Driver Model (WDM) in the operating system, the manufacturer-provided driver solution must use WDM.
- The manufacturer does not need to supply a driver if the device passes Logo testing using a driver provided with the operating system.

WL-2. System memory provides a satisfactory user experience

Because objective benchmarks are not available, the intent of this requirement is to define a memory size that represents the baseline of acceptable Windows performance.

The following summarizes the Windows Logo Program performance requirements.

2001-2002 Minimum Equivalent Performance Requirements

x86-based systems	RAM
Windows 98/Me Windows 2000 Professional	64 MB
Windows XP Professional Windows XP Home Edition	128 MB [note 1, 2]

Windows 2000 Server
Windows Whistler Server
    1-2 processors installed
    >2 processors installed
	[note 3]
	
	512 MB
	256 MB per processor

x86-based systems	RAM

Windows 2000 Advanced Server
Windows Whistler Advanced Server
    1-4 processors installed
    > 4 processors installed
	[note 3]
	
	1 GB
	256 MB per processor

Itanium-based systems	RAM
Windows XP Professional	1 GB

Windows Whistler Advanced Server
    1-4 processors installed
    >4 processors installed
	
	4 GB
	1 GB per processor

Note 1: For systems with shared memory architecture and 128-MB system RAM, collectively, the drivers supporting integrated chipset functionality must not lock more than 32 MB. It is acceptable to use up to 8 MB from the 64-MB minimum in desktop and mobile PCs running Windows 98/Me or Windows 2000 Professional.

These maximum-page-locked-memory limits apply during all phases of system startup and normal operation. Page-locked graphics memory includes all frame buffers and buffers for hardware acceleration, texture and lighting, Z, and AGP. Page-locked audio memory includes all memory locked by the audio driver including all wave tables, and so on.

Dynamic memory allocation under the Windows environment is allowed, subject to the paged-locked memory limit. The driver cannot advertise or switch into a graphics mode that cannot be supported within the maximum locked memory limit.

Note 2: PC client systems must have at least the minimum system memory installed.

Note 3: Server system memory configurations specify the minimum allowed system memory to run the HCT. It is recognized that OEMs supply systems with specific feature requirements to corporations, which can include providing servers that do not include any preinstalled memory or that meet specific customer requirements for installed memory.

WL-3. System includes required set of buses and devices

The system must include the following buses, connectors, and devices, with driver solutions implemented as defined in the Windows DDK:

- Primary storage host controller and primary hard drive.
- Support for installing the operating system (CD/DVD drive or network adapter on desktop system).
- Industry-standard internal buses and devices, excluding ISA slots and devices.

- Industry-standard connectors with icons or labels.

Note: WHQL System Test Submission logs must include results with both modem and network adapter installed. Systems are not required to include a modem or network adapter in their shipping configurations.

Configure to order / Build to order requirements: PC clients shipped into retail markets must have at least the minimum hardware support listed in these requirements. Retail markets include:

- Retail "on-shelf" configurations.
- Published advertisements.
- A default configure-to-order or build-to-order system configuration.

It is recognized that OEMs may configure PC systems to meet the requirements of a specific end-user or corporate customer. For systems built based on specific customer requests, where customers request systems without either a CD or DVD optical drive, the system may be configured without an optical storage drive. However, the system must support the addition of a CD or DVD optical drive, and the system firmware must support booting from a CD or DVD device using El Torito Version 1.0 No Emulation Mode if a supporting optical drive is added.

Furthermore, systems may be configured on request without a graphics adapter or network adapter. All retail market desktop systems must include a graphics adapter and support installation of an operating system by including either a CD/DVD drive or network adapter. [see A1.4.3, A1.1.4]

For more information about requirements for each type of system, see Appendix A, "System Requirements Checklist."

WL-4. All components and devices meet Windows compatibility and quality design guidelines

The compatibility and quality guidelines include requirements for devices, drivers, and software included with the system or retail component.

For specific feature and functionality requirements for each type of system, see Appendix A, "System Requirements Checklist."

Device Requirements

Any buses, devices, or other components offered with a Logo'd system or offered as a retail product carrying the "Designed for Windows" logo must pass related feature tests and operating system compatibility tests published by WHQL.

For the complete checklist of device and bus requirements, see Appendix B, "Device Requirements Checklist."

Driver and Software Requirements

These requirements ensure a good user experience when installing and using any component:

- **Windows-compatible driver support.** Each device must have drivers for Windows XP/Windows 2000, plus support for other operating systems that may be preinstalled, as cited in requirement WL-1, "System and devices support required operating systems."

- **Windows-based driver installation.** Driver installation and removal must use Windows-based methods, as defined in the Windows DDKs. For Windows XP/Windows 2000, this means only INF-based installation routines.

- **System component and installation integrity.** Driver or software installation must not replace any Microsoft-authored system components and the driver must not bypass any operating system components. See http://www.microsoft.com/hwdev/sfp/wfp.htm.

  Installation and loading of a driver must not reduce or eliminate the functionality of other devices installed on the system.

  The driver must support unattended installation. That is, it must be possible to install the driver using a script or special software for supplying required parameters without the user being present during driver installation.

- **Minimum driver compatibility.** Each driver must pass minimum compatibility, functionality, and stress testing as verified by the testing suites published by Microsoft WHQL for the related class.

- **Driver with special parameters includes Help file.** To ensure that the user can correctly change settings, a Windows Help file must be provided if special driver parameters are used. This help file must install as part of the driver installation routine.

- **Driver Verifier.** For each Windows XP/Windows 2000 driver, no errors can occur under the Driver Verifier facility provided with the operating system. Although Driver Verifier is not available for Windows 98/Me, every WDM driver should be tested with Driver Verifier on Windows XP/Windows 2000.

  Poorly written kernel-mode drivers have the potential to cause the system to become unstable or stop working. Therefore, it is critical that all kernel-mode drivers be thoroughly tested to minimize this risk. For information about using Driver Verifier and diagnosing driver problems, see http://www.microsoft.com/hwdev/driver/driververify.htm.

- **Driver signing.** All drivers installed on the system as shipped to the customer must be signed. Drivers submitted for Microsoft Windows Logo Program testing must meet the guidelines for

driver signing as defined at
http://www.microsoft.com/hwdev/desinit/digitsign.htm.

Other WHQL test programs that require digital signatures include the following:

▪ **Hardware Abstraction Layers (HALs):** The purpose of the HAL test kit is to test third-party (non-Microsoft) HALs intended for use in server-class systems.

   For details about what is tested for HALs, see Chapter 26, "HAL Test Specification," in *WHQL Test Specification*.

▪ **Anti-virus software:** WHQL launched a test program, related to the "Designed for Windows XP" Applications Logo Program, for anti-virus applications that include a kernel-mode file-system filter driver. Such applications that pass testing for Windows XP will receive a digital signature for their file-system filter driver, but not the entire application.

   For details about what is tested for anti-virus software, see Chapter 21, "Anti-virus File System Filter Test Specification," in *WHQL Test Specification*.

Note: Additional requirements related to driver and software quality may be added as tests become available.

Implementation Guidelines:
Windows DDKs at http://www.microsoft.com/ddk/

"New Technology" Requirements

For new or other technologies where specific compatibility tests have not been defined under the Windows Logo Program (as provided in the HCTs from WHQL), or where design guidelines have not been provided in a Design Guide, the following requirements apply:

▪ **Maintain system integrity.** The implementation of the technology must not adversely affect the performance or stability of all functionality provided under the preinstalled operating system and under Windows XP/Windows 2000.

▪ **Use native operating system support whenever possible.** If native support for the related feature is provided under a preinstalled version of Windows 98/Me or Windows XP/Windows 2000, comply with the related industry specification, create drivers based on Windows DDK guidelines, and meet the design requirements defined in *PC 2001 System Design Guide* or *Hardware Design Guide Version 3.0 for Microsoft Windows 2000 Server*.

For example, if the graphics adapter or monitor supports a digital video interface and is included on a system with Windows Me preinstalled, the implementation must follow the PC 2001 guidelines. Similarly, if the system supports IEEE 1394b and comes with Windows XP, comply with the industry specification, implement WDM minidriver support as defined in the Windows DDK, and follow the PC 2001 guidelines.

▪ **Follow the DDK and industry standards to ensure an upgrade path.** If the feature is *not* supported natively in the preinstalled Windows operating system, comply with the related industry specification (if industry standards have been developed), follow Windows DDK guidelines for related bus and device class driver implementations, follow general Plug and Play and power management guidelines as defined in the Windows DDK, and plan an upgrade path for end users.

For example, if you design a system to include a new wireless technology for which there is no native operating system support, you must still use the related Windows driver model for adding support. In this example, driver support must be implemented as a Network Driver Interface Specification (NDIS) 5.0 miniport, as defined in the Windows DDK and cited in the guidelines for wireless devices in *PC 2001 System Design Guide*.

WL-5. System and components meet reduced legacy support goals

The following legacy-reduction goals are defined for the Windows Logo Program for hardware.

Hardware Legacy Reduction Requirements

Retail components and components included with a system must not use the ISA expansion bus. The system must not include ISA expansion slots.

For desktop and mobile systems, peripherals that use the parallel or serial ports *cannot* be included with the system. The ports themselves are still allowed to allow connectivity for legacy hardware the user might already have.

Devices that use Super I/O and that are resource managed by ACPI are acceptable. The important issue is that Super I/O is not a legacy component in itself; however, fixing resources to Super I/O is a legacy implementation that was traditionally used before ACPI.

Software Legacy Reduction Requirements

All software included with a system or peripheral device must be Microsoft Win32®- or Win64™-based software. The software must not require MS-DOS®-based decompression or installers.

Windows Me Legacy Reduction Requirements

Drivers and utilities must not run in real mode under Windows Me, and must not use Config.sys or Autoexec.bat for configuration or for launching related software.

This requirement does not apply for the emergency recovery software, system or component pre-configuration software, or boot device software.

Legacy-Free PC System Requirements

A PC system is not required to be legacy-free to receive the "Designed for Windows" logo. A PC system is considered legacy free under the Windows Logo Program if it meets the following basic criteria:

- The LEGACY_DEVICES flag is set to 0 in the Fixed ACPI Description Table (FADT).
- Operating system detection software does not report the presence of Super I/O-dependent components (with exceptions for 8042 controllers).
- No components claim to use the restricted port addresses.

The complete hardware and BIOS requirements for Windows-compatible, legacy-free design are described in Appendix A, "System Requirements Checklist," including exceptions and issues for mobile PCs.

WL-6. System and components support operating system configuration and control of devices

The goal for this requirement is correct support for complete operating system management of system configuration and behavior. This requirement applies for all BIOS, bus, and device components in a system. In particular, this includes:

- Windows 2000-ready, ACPI-compliant BIOS.
- Correct implementation of Plug and Play and power management.

This requirement is based on fundamental operating system requirements, industry specifications, and Windows DDK implementation guidelines for Plug and Play and other functional capabilities of the operating system.

For details about operating system compatibility and design guidelines, see Appendix A, "System Requirements Checklist."

WL-7. System and peripherals implement ease-of-use guidelines for a good end-user experience

The following basic ease-of-use guidelines are cited for the Windows Logo:

- Connections use icons, plus keyed or shrouded connectors.

  Color-coding is not required. Suggestions for icons and color codes are listed at http://www.pcdesguide.org/documents/icons.htm.

- Minimal user interaction is needed to install and configure devices, which is ensured by following the device installation guidelines defined in the Windows DDKs.

- Driver and utility installation do not require a system reboot, unless required by the operating system.

  Installation of a component should not require a reboot when installed on a system where no applications are running.

Implementation Guidelines:

Installing Drivers and Utilities without Rebooting on Windows 2000 at http://www.microsoft.com/hwdev/PlugnPlay/no_reboot.htm

WL-8. System components operate correctly upon installation of a later operating system

- System manufacturers must clearly communicate their support commitments to their customers. Customers base purchase decisions on the operating systems listed on the logo; they expect that if a system carries a "Designed for Microsoft Windows" logo with two operating systems listed that the system will support both operating systems. The requirements defined here support that customer expectation.

- **Important:** System manufacturers must support the preinstalled operating system and any operating system listed on the "Designed for Microsoft Windows" Logo.

Basic Support and Best Practices

1. **System manufacturers must provide instructions for each of the supported Microsoft operating system installation-and-recovery scenarios.**

   If the manufacturer makes the commitment to support *only* system restoration from recovery media or the installation of an operating system on an empty hard drive, then this level of support must be clearly communicated.

The system manufacturer must provide an "operating system version support" status report for each model or model family; the report must include a list of the previously available preinstallations for each of the Windows operating systems since the time that model or model family was released to manufacturing. The "operating system version support" status report must clearly communicate the manufacturer's support commitment, including supported clean installs and upgrades, availability of drivers, and utilities required to maintain functionality after installation of an operating system.

2. **For operating system installations supported by the system manufacturer, a help file must be made available.**

   The help file must contain complete instructions for the end user about system preparation and changes to the BIOS, applications, and drivers that must be completed before installing an operating system on the PC.

3. **A Logo'd system and its components must be fully functional after installation of a supported operating system version.**

   This requirement is specific to installations in the same class of operating system, for example, desktop-to-desktop or server-to-server.

   In particular, consider a system that comes preinstalled with Windows Me. When Windows XP Home Edition is installed, all features present under Windows Me that are supported in Windows XP Home Edition must be fully operational.

Installing Windows XP or Windows 2000

OEMs must support installing Windows XP on systems that display any of the following "Designed for Microsoft Windows XP" logos:

"Designed for Windows XP" logo
"Designed for Windows XP and Windows 2000 Professional" logo
"Designed for Windows XP and Windows Me" logo
"Designed for Windows XP and Windows 98 Second Edition" logo

Similarly, OEMs must support installing Windows Whistler Server on systems that display any of the following the "Designed for Microsoft Windows Whistler Server" logos:

"Designed for Windows Whistler Server" logo
"Designed for Windows Whistler Server and Windows 2000 Server" logo

Customer Support Requirements

These requirements apply to systems that display the logos listed earlier in "Installing Windows XP or Windows 2000."

1. **System includes Windows 2000-ready, ACPI-compliant BIOS.**

   Related information is available at
   http://www.microsoft.com/hwdev/onnow/.

2. **Supported features are functional after installation.**

   - Features supported in Windows 2000 and present on a system must be fully operational after the installation of Windows XP.
   - Features supported in Windows Millennium and present on a system must be fully operational after the installation of Windows XP.
   - Features supported in Windows XP Home Edition and present on a system must be fully operational after the installation of Windows XP Professional.

3. **OEM preinstalled system applications and utilities are "Windows XP/Windows 2000 ready."**

   System applications, utilities and system tray applets that are included with a system must be capable of running after the system is installed with either Windows 2000 or Windows XP, unless that functionality is supported natively in the operating system.

   OEMs should provide access to up-to-date application files for customers who perform 'clean' operating system installations, or for customers who do not have access to internet-based help and support, as well as for customers who have access to the Internet.

   Internet Availability Requirement for Preinstalled Software. Customer-support must be provided by making available Internet downloads of migration DLLs, patches, or replacement software applications. In addition, preinstall a link to a URL for the manufacturer's support web site that contains the migration DLLs, patches, or replacement software which the user needs to ensure that all preinstalled applications run after installing Windows 2000 or Windows XP. This web site must be available and populated with correct files when the system is available to end users.

   Non-Internet Availability Recommendations for Preinstalled Software. Any one or more of the following solutions can be implemented to provide customer-support in non-Internet-connected scenarios:

   - Preinstalled application is already "Windows 2000 and Windows XP ready."
   - Place a new Windows 2000-compatible version of the application on the hard disk. The user can reinstall the application after migrating to either Windows 2000 or Windows XP.

- Place any necessary patch files on the hard disk. The user can run these "fixes" after migrating to Windows XP/Windows 2000.
- Place a migration dynamic-link library (DLL) on the hard disk. The Microsoft General Device Driver Pack Migration DLL is available at http://www.microsoft.com/hwdev/driver/.
  See also http://msdn.microsoft.com/library/techart/msdn_migdbg.htm.
- Provide application media to customers upon request.

Note: OEMs are not required to provide applications from third parties that were licensed for a particular preinstalled operating system version. In this case, the OEM must provide a notice to show where their customers can obtain versions for the later operating system.

4. **Preinstalled devices are "Windows 2000 ready" or "Windows XP ready."**

For any device that does not have a driver included as part of the Windows 2000 product, a signed Windows XP/Windows 2000 driver must be available to the user.

For those devices where it is not feasible to provide common Windows XP/Windows 2000 driver files, providing operating system-specific signed drivers is acceptable; drivers must be provided for each of the operating systems supported. OEMs should provide access to up-to-date signed driver files for customers who perform 'clean' operating system installations and for customers who do not have access to Internet-based help and support, as well as for customers who have access to the Internet.

Internet Availability Requirement for Preinstalled Drivers. Customer-support must be provided by making available Internet downloads of signed drivers. In addition, preinstall a link to a URL for the manufacturer's support web site that contains the drivers required during and after migrating to Windows 2000 or Windows XP. This web site must be available and populated with signed driver files when the system is available to end users.

Non-Internet Availability Recommendations for Preinstalled Drivers. Any one or more of the following solutions can be used to provide customer-support in non-Internet-connected scenarios:

- Place signed Windows 2000 and Windows XP drivers on the hard disk drive, so that the user can reinstall the driver after migrating to Windows 2000 or Windows XP.
  Note: If you provide drivers on the system hard disk drive, the drivers can be in any directory other than <winroot>\INF, <winroot>\system32, or <winroot>\system. Also, you must provide the end-user with a migration DLL, as described in the Windows DDK or on the web at http://www.microsoft.com/hwdev/driver/WinH2kDrv.htm.

- Provide signed drivers for Windows 2000 and Windows XP drivers for posting on Windows Update site.
- Provide media in the "as shipped" system's packaging to support migrating to Windows 2000 and Windows XP.
- Provide media to the customer upon request.

5. **All features in custom utilities are available after installation of Windows 2000 or Windows XP.**

For all manufacturer-provided utilities preinstalled on the system, one of the following conditions must be met:

- If no user functionality is lost after installing Windows 2000 or Windows XP, the utility can be removed or turned off. This case applies when built-in Windows 2000 or Windows XP features such as ACPI-based power management replace functionality that the manufacturer provided under Windows NT 4.0 through custom utilities.

- OR -

- If user functionality is lost, the manufacturer must provide customer support as described earlier in the item "Preinstalled applications and utilities are 'Windows XP/Windows 2000 ready.'"

Chapter 3 - Recommendations and Future Requirements

This chapter describes the processes that Microsoft follows for adding new requirements to the Windows Logo Program for hardware. This chapter also presents specific design practices that Microsoft encourages to provide an optimal end-user experience when running Microsoft Windows operating systems.

Note: Future requirements currently proposed for systems and devices based on industry specification advances and new capabilities planned for future Windows operating systems are defined in the "Future Requirements" sections in Appendixes A and B of this document.

New Requirements Process

This section summarizes the general processes by which new requirements are proposed and incorporated into the Windows Logo Program for hardware.

New Operating System Capabilities vs. Windows Logo Program

Microsoft presents preview information about new operating system capabilities related to the hardware platform in Design Previews. System and device manufacturers are invited to attend these private sessions, based on the degree of market involvement particular manufacturers have for the specific technologies. Presentations at Design Previews include sufficient detail for manufacturers to understand the technical requirements for implementing new support in hardware and firmware. Microsoft actively solicits manufacturers' feedback at Design Previews, and Microsoft also provides information about Logo Program requirements proposed in relation to the new system capabilities.

Action for New Operating System Capabilities and Logo Preview:
If you want to request to be considered for invitation to Design Previews for specific technologies in which your company has key technical and market investments, please complete the request form at http://www.hwdev.org/EventRequest.htm

Advances in Industry Specifications vs. Logo Program

Microsoft works with most standards bodies for PC and server technologies, and makes plans to advance operating system support based on the current industry specifications for these technologies.

When proposing new Logo Program requirements related to advances in existing specifications, Microsoft will survey Logo Program participants to determine when most manufacturers are intending to implement the advances.

Action for Advances in Industry Specifications and Logo Preview:

If you want to participate in defining or reviewing industry standards upon which operating system support is based, please join the related SIG or working groups for that technology. A list of many industry specification sources is provided at:
http://www.microsoft.com/hwdev/specs/

New Industry Specifications vs. Logo Program

When new technologies are being defined and proposed for general industry adoption, Microsoft typically works with the industry consortium that is defining the hardware and firmware implementation. For example, new technologies such as ACPI and Bluetooth wireless technology are defined in industry consortia. Microsoft develops the related operating system capabilities in conjunction with development of the new specification.

Adoption of such technologies as Logo Program requirements is usually defined in terms such as:

> *If you implement Bluetooth wireless technology, comply with the industry specification and implement driver support as defined in the Windows DDKs.*

The availability of Hardware Compatibility Tests (HCTs) to validate new technologies for the Logo Program typically require good availability of new hardware at Microsoft. The Microsoft development teams require a foundation of hardware implementations in order to create and validate compatibility tests.

Note also that it is rare for the Logo Program to define requirements such as ACPI, where the entire industry was required to change hardware/firmware support to advance PC platform capabilities. In cases where such universal changes are required, Microsoft will work within an industry consortium to define the technical standards and establish appropriate phases for implementing the new requirements in the Logo Program.

Action for New Industry Specifications and Logo Preview:

If you want to participate in defining new industry standard, please join the related working group. Note that typically the Logo Program does not allow driver implementations that do not follow DDK guidelines or that replace kernel Windows components.

Proposals for New Requirements

Proposals for new requirements are published in the Windows Logo Program newsletter, which is distributed by e-mail.

To receive weekly notification of any Logo Program proposals, subscribe to the mail list as described at http://www.microsoft.com/winlogo/hardware/.

Action for Comments on Future Windows Logo Requirements

Send e-mail to hwlogo@microsoft.com. Please be sure to include your name, title, company name, and company type.

Dates for New Requirements

As a rule, future requirements related to operating system features go into effect when the related operating system is available and the OEM begins shipping systems that contain features supported under the new operating system. See "Windows Logo Program Dates" in Chapter 1.

In general, Microsoft attempts to meet the following general guidelines for proposing new Logo Program requirements.

Change required	Advance notice
Chipset revision	12 - 18 months
Driver revision	6 months
Firmware revision	6 months

For example, future Logo Program requirements related to incorporation of a new driver stack within the operating system will not be required until Microsoft provides full technology support:

- Operating-system drivers are released.
- DDK support is released.
- Test kit is released by WHQL.

"Best Practices" for Systems and Devices

This section summarizes design and driver quality practices that Microsoft recommends to ensure reliable, quality experiences for end users.

Implement "Ease of Use" Recommendations from PC 2001

Chapter 2, "Easy PC Initiative," in *PC 2001 System Design Guide*, includes specific guidelines for making PCs easy to set up, easy to use, and easy to maintain. Designers should give high priority to implementing these recommendations in order to improve the end user experience and reduce support calls after sales.

Follow the "Designing for Success" Tips in Appendix C

Appendix C of this document provides a series of guidelines to help ensure that system and device manufacturers can create new design that are compatible with Microsoft operating systems.

Microsoft recommends that you follow these guidelines as part of the design process, to ensure that you receive news and feedback from Microsoft that can help ensure the success of new designs.

Ensure that Soft Devices Meet Resource Usage Guidelines

Several types of devices can be designed to migrate functions from peripheral hardware to Windows drivers, saving bill-of-materials costs at the expense of CPU resources. Examples of such devices include soft audio, soft Public Switched Telephone Network (PSTN) modems (V.34, V.90), and soft asymmetric digital subscriber line (ADSL) modems (G.992.2). There are several risks:

- Any soft device may undermine the system, depending on how it uses CPU and system resources.
- Any soft device may be vulnerable to failures or performance issues created by other parts of the system, depending on how other device drivers compete with it for CPU and system resources.
- A combination of soft devices may be much less stable than either device alone.

Requirements for soft modems are in development. These requirements will reference absolute CPU consumption rather than percentages of the available CPU.

Design Guidelines:
Guidelines for WDM-based Software Modems at
http://www.microsoft.com/hwdev/modem/softmodem.htm*Windows Management Instrumentation: International Support Overview* at
http://www.microsoft.com/technet/win2000/winigloba.asp

Ensure that Pre-installed Software Meets Guidelines for Globalization

These guidelines include the following:

- Use Unicode as the character encoding to represent text.
- Consider using a multilingual user interface: launch the application in the default user interface language, and offer the option to change to other languages.
- Use the Win32 application programming interface (API) National Language Support functions to handle locale-sensitive data.
- Watch for Windows messages that indicate changes in the input language, and use that information for the spell checker, selecting fonts, and so on.
- Use the Script APIs (Uniscribe) to lay out formatted text on a page, to allow display of multilingual text and complex scripts such as Arabic, Hebrew, Hindi, Tamil, and Thai.

- Test applications in multiple configurations, mixing the system locale, user locale, input locale, and user interface (UI) language.

Design Guidelines:

Developing International Software for Windows 95 and Windows NT, by Nadine Kano, available online at http://msdn.microsoft.com/library/books/devintl/s24ac.htm.

Preinstall Only Applications that Conform to "Designed for Windows XP Application Specification"

If any additional stand-alone software is bundled with a device that was not tested with the device submission (for example, a printer that ships with a paint program), that software should pass the requirements for either the "Designed for Windows" Application Logo, as defined at http://www.microsoft.com/winlogo/software/ or the "Certified for Windows" logo at http://www.msdn.microsoft.com/certification if the product packaging is to display the "Designed for Windows" logo.

In the future, this will be a Logo Program requirement.

Implement Best Practices in Consumer Desktop PC Design Checklist for Windows XP

"Consumer Desktop PC Design Checklist for Windows XP" is provided on the web at http://www.microsoft.com/hwdev/pcdesign/. This checklist provides manufacturers with a list of capabilities and components that deliver the best performance and reliability and that deliver the exciting new end-to-end personal computing experiences that characterize a consumer desktop PC optimized for Windows XP.

Best practices in from the PC Design Checklist include the following:

General Component Guidelines

- System does not statically lock UMA memory at boot
- All application software components included with the PC system meet the requirements for the "Designed for Windows XP" logo for software

Startup and Power Guidelines

- System BIOS and hardware meet Fast Boot/Fast Resume requirements
- Power switch implementation ensures ease of use

General Device Guidelines

- Control devices are HID compliant

Device Connectivity Guidelines

- System includes at least four USB 1.1-compliant ports
- System includes at least two IEEE 1394 ports
- System implements legacy-free design

Graphics Adapter Guidelines

- Graphics adapter supports Direct3D 8.0 features
- Graphics subsystem performance meets PC Design Checklist
- Graphics subsystem provides a DVI connector

Display Guidelines

- External monitor provides native sRGB support, enabled by default
- Monitor supports minimum resolution
- Monitor is a flat-panel display
- Monitor integrates auxiliary components and controls

Networking and Communications Guidelines

- System includes Logo-compliant Ethernet adapter

Storage Guidelines

- Hard disk is preformatted with NTFS
- System includes Logo-compliant CD-RW and DVD devices
- Hard disk capacity and performance meet PC Design Checklist guidelines

Physical Design Guidelines

- System is designed for the consumer's ease of use
- System meets PC Design Checklist guidelines for quiet operation
- System design features ultra small enclosure

Windows Desktop Guidelines

- Do not place icons on the Windows desktop
- Do not run applications at Windows startup
- Do not display application icons in the Notification area of the Taskbar
- Do not add multiple items to the All Programs list
- Add links using the OEM button and Most Frequently Used list
- Do not place multiple files in the root of the hard disk
- Ensure that file associations are appropriate
- Help information uses Windows XP Help and Support Services architecture

- System includes OEM-specific OOBE for Windows Setup, user registration, and Internet access

Digital Imaging Checklist

- System and components support digital imaging experiences
- Digital media components use built-in Windows XP support
- Color-capable devices provide native sRGB support, enabled by default
- System includes the largest-capacity hard disk available
- System without a camera includes device support for portable media
- System includes a USB flatbed color scanner
- System includes a photo-realistic USB printer
- System includes a powered USB hub
- System includes a USB or IEEE 1394 webcam

Audio Guidelines

- System includes Logo-compliant audio with support for DirectSound, DirectSound3D, and DLS acceleration
- Audio speaker system includes two speakers and a subwoofer
- System supports AC-3 out and mini-disk players

TV and Video Technologies

- Broadcast and video components use built-in Windows XP support
- System includes HDTV tuner card
- Graphics subsystem includes TV-out capabilities

Real-Time Communications Checklist

- System includes microphone or headset for voice input
- System with voice input capabilities supports AEC reference inputs
- System includes a USB or IEEE 1394 webcam

Chapter 4 - Getting the Windows Logo for Hardware

The guidelines for submitting systems for Windows Logo Program testing are defined on the web at http://www.microsoft.com/winlogo/submission/. This chapter provides a brief overview.

To submit a system for Logo Program testing

- Follow the submission rules at http://www.microsoft.com/hwtest/systems/

To submit a device for Logo Program testing

- Determine the Test Category and Logo Program for your device, based on the list at http://www.microsoft.com/hwtest/device/, and follow the related rules for submission.

When WHQL Receives a Submission

WHQL will acknowledge all Test Submissions within three days of when they receive the submission. If you send a test submission to WHQL and do not receive this confirmation e-mail, please contact whqlinfo@microsoft.com with **STATUS REQUEST** in the Subject line. Please include the following information in the body of the message: the type of equipment, date shipped, and how to contact you if there are any questions.

Customers can check the WHQL Submission Status web page at http://www.microsoft.com/hwtest/status/ for submission-related information during this time.

When your device or system completes WHQL processing, you will receive a Test Report that includes technical feedback on any problems that were found. If your device passes Windows Logo Program testing, you will also receive additional information, depending on the agreements you signed when you submitted your product for testing.

Information Contacts for Windows Logo Testing:

The up-to-date list of contacts is provided at http://www.microsoft.com/hwtest/support/ (including additional contacts for server-related submissions).

Appendix A - System Requirements Checklist

This appendix presents the detailed checklist of requirements for systems. The current versions of these requirements are provided on http://www.microsoft.com/winlogo/hardware/system/.

Requirements apply for all of the following tested operating systems unless otherwise indicated:

> Windows XP Home Edition (32-bit)
> Windows XP Professional (64-bit and 32-bit)
> Windows Whistler Server (64-bit and 32-bit)
> Windows 2000 Server and Professional (32-bit)
> Windows Millennium Edition
> Windows 98 Second Edition

Notes:

- Testing for all Windows versions must also include logs for Windows XP/Windows Whistler Server, even if the "Designed for Windows" Logo you are seeking does not specify Windows XP or Windows Whistler Server.
- There are no specific requirements for workstations or Entertainment PC systems in the Windows Logo Program. Instead, Windows Logo Program compliance is evaluated based on components present in the system submitted for testing.
- These requirements apply to all systems and peripherals displaying the "Designed for Windows" Logo, as the system or device/peripheral is shipped to a customer.

  Statements within this document relating to "testing requirements" or "systems submitted for Microsoft Windows Logo Program Testing" indicate test submission requirements; such statements do *not* reduce these Logo Program requirements.

  A customer may request that the system supplier omit a particular component from a system configuration as shipped to that customer; however, such a customer request does not remove or reduce any related requirements for that system to support that component's functionality when and if the customer installs a Logo'd component of that class into the system.

See also:

- Conventions Used in This Document
- How to Use the Appendixes

A1.0 General System Requirements

A1.1 General System - Windows Compatibility

A1.1.1 Devices meet all Windows compatibility requirements

As defined in Appendix B, "Device Requirements Checklist."

A1.1.2 ACPI system board and ACPI BIOS

[SYS-0002; SDG3:9; see FAQ A1.5.22]

ACPI BIOS must be Windows 2000-ready (for x86-based systems) or 64-bit Windows-ready (with additions for Itanium-based systems, see A5.4.1) as defined in ACPI Section 1.6 (x86-based: ACPI 1.0b; Itanium-based: ACPI 2.0).

- ACPI BIOS cannot be disabled by end user.
- Power management and Plug and Play capabilities are ACPI compliant.
- **Windows:** "Power Management" in the Windows DDK.
- **Windows 98/Me:** "OnNow Power Management for Display Device Class Drivers" and "Device Power Management for VxDs" in the Windows Me DDK.

A1.1.3 All components correctly implement Plug and Play

[SYS-0026; PCI-0126; SDG3.16]

Based on the related bus specifications; internal and legacy components meet requirements defined in Legacy Plug and Play Guidelines.

Note: PCI components implement System IDs (SIDs) and Subsystem Vendor IDs (SVIDs) as defined in PCI v.2.2. [PCI-0126; SDG3:45; see FAQ A1.5.13]

A1.1.4 System BIOS requirements

[BIOS-0005+; SDG3:12+]

For complete Itanium-based firmware requirements, see A5.0.

- Correctly configure PCI-to-PCI bridges if the system has a VGA device behind a bridge.
  [see FAQ A1.5.4]
- Support calendar dates correctly; BIOS and CMOS firmware support calendar dates from January 1, 1999 through December 31, 2098. [BIOS-0007; SDG3:1]
- Support booting from CD or DVD device per El Torito v. 1.0 No Emulation mode.

This applies to the primary optical storage provided and the primary bus to which the device is attached. [BIOS-0005.1; SDG3:12; SDG3:14 - Itanium-based]

- **Windows XP Professional/Windows Whistler Server:** Support Preboot Execution Environment (PXE) based on PXE Specification, v. 2.1 as follows:
  - **x86-based servers:** Provide PXE-based support if a network adapter with remote boot capabilities is provided with the system. [SDG3:13.1]
  - **x86-based clients, Itanium-based:** Provide PXE-based support in all cases. [BIOS-0014.1 -x86-based clients; SDG3:14 - Itanium-based]

  Note: This does not apply to systems preloaded with Windows XP Home Edition.

  System UUID must be provided for all system types, in accordance with the Open Group Common Application Environment (CAE) Specification - http://www.opengroup.org/onlinepubs/9629399/toc.htm.

  UUID is not required in print.

- **Windows XP Professional/Windows 2000:** If PXE is enabled on a client system, provide remote lockout capability. [BIOS-0014.5]

- **Windows XP Professional/Windows Whistler Server:** Support booting from network per Compaq-Intel-Phoenix BIOS Boot Specification, Version 1.01, Appendix C (x86-based systems) or EFI boot manager (Itanium-based systems). Include support for F12 (or alternative) key to force a network-based system boot. [BIOS-0014.2; SDG3:13 - x86-based servers; SDG3:14 - Itanium-based]

  For Windows XP Professional clients and x86-based servers, it is not required that the system include a network adapter that supports booting from the network, although such a network adapter must be available as an option at point of purchase; if the system does include such a network adapter, then it must meet the related requirements; see B7.1.4.5 for network adapter requirements.

  See A5.0 for complete Itanium-based firmware requirements.

- Support boot-drive determination in multiple-drive systems per Compaq-Intel-Phoenix BIOS Boot Specification, v. 1.01, Section 5 [BIOS-0005.4, SDG3:13, SDG3:150 - x86-based systems] or EFI boot manager capabilities [SDG3:14 - Itanium-based systems].

- **Windows XP/Windows Whistler Server/Windows 2000:** Support BIOS update, security such as pre-boot password, and SMBIOS 2.3 static table data. [BIOS-0005,0006, 0008, 0009; SDG3:12]

- Support console redirection of serial port or Debug Port Specification and FAQ A1.5.16. [BIOS–0010; SDG3:13.4, SDG3:15]

- **x86-based:** Support Int13h Extensions on BIOS boot-based system for correct support of high-capacity hard drives. [BIOS-0011; SDG3:147]

- **x86-based client:** Configure each PCI boot device IRQ to a PCI-based IRQ and write the IRQ into the interrupt line register 3Ch. [BIOS-0017]

- Provide PCI interrupt routing information using a _PRT object per ACPI 1.0b Section 6.2.3 for x86-based systems or ACPI 2.0 Section 6.2.8 for Itanium-based systems. [PCI-0127; SDG3:46]

- **x86-based**: Support logical block addressing (LBA) for ATA disks (if present in the system). [ATA-0117; SDG3:147]

- Provide boot support for USB keyboards and hubs. [BIOS-0005.2; SDG3:13.3 - x86-based servers; SDG3:14.2 - Itanium-based]

  For USB host controllers that provide only internally-accessible USB ports and that are not connected to a keyboard or hub: such controllers are not required to provide boot support for keyboards and hubs. If a downstream keyboard is attached to such a host controller, the keyboard and any intermediate hubs must be supported at boot time.

  See "Server Note" at A1.4.3 for systems that provide headless server support.

- Support bootable ATA Packet Interface (ATAPI) devices (if implemented) in compliance with *ATAPI Removable Media Device BIOS Specification, Version 1.0* and AT Attachment with Packet Interface – 5 (ATA/ATAPI-5). [BIOS-0018; 0019; SDG3-179]

- **x86-based client:** For a system board that supports a riser card, provide a unique identifier for the riser so that the Windows bus enumerator can detect it, and locate and install appropriate drivers. [SYS-0034; see FAQ A1.5.3]

A1.1.5 Multiprocessor system compatibility requirements

[SYS-0002.1; SDG3:2]

- **x86-based:** Comply with ACPI 1.0b.
  Itanium-based: Comply with Multiple APIC Description Table (MADT) in ACPI 2.0, Section 5.2.10.4.

- Use the lowest stepping processor as the bootstrap processor.

  Do not include processors from different processor manufacturers; do not include mixed speeds or mixed cache sizes.

  Systems designed to run the Windows 2000 Datacenter Server operating system must not contain mixed processor steppings. [see FAQ A1.5.5]

- Implement PCI IRQ routing as described in *PCI IRQ Routing on a Multiprocessor ACPI System* at http://www.microsoft.com/hwdev/onnow/acpi-mp.htm.

- Multiprocessor x86-based desktop systems support S1, S4, and S5. [SYS-0002.1]; wakeup solution implemented as described in FAQ A1.5.6.

  Future wakeup requirements for Itanium-based systems are defined at A5.R.1.

A1.1.6 All PCI adapters function properly in any system with more than 4 GB of memory

[SDG3:30]

This requirement applies to any 32-bit or 64-bit system (client or server) that has more than 4 GB of memory. For any system that supports more than 4 GB of system memory, all 32-bit PCI buses, host bridges, PCI-to-PCI bridges, and any 32-bit PCI adapters used on the primary data path must support the PCI Dual Address Cycle (DAC) command, with the exception of 10/100 Ethernet devices.

Mobile PC Note: PCI adapters for mobile PCs are excluded from this requirement.

A1.1.7 DELETED

A1.2 General System - Industry Standards

A1.2.1 Advanced Configuration and Power Interface Specification, Revision 1.0b and 2.0

[SYS-0002; SDG3:2]
http://www.teleport.com/~acpi/tech.htm

A1.2.2 Plug and Play specifications

[SYS-0026; SDG3:16]
http://www.microsoft.com/hwdev/respec/pnpspecs.htm, plus Legacy Plug and Play Guidelines

A1.2.3 Industry bus specifications

Links from http://www.microsoft.com/hwdev/specs/; see also detailed requirements in Appendix B, "Device Requirements Checklist."

A1.2.4 Windows Hardware Instrumentation Implementation Guidelines (WHIIG)

[SYS-0048; SDG3:229]
http://www.pcdesguide.org/whiig.htm

A1.2.5 Compaq-Intel-Phoenix BIOS Boot Specification, v. 1.01 El Torito— Bootable CD-ROM Format Specification, v. 1.0

[BIOS-0005; SDG3:12.4, 13.2]
http://www.phoenix.com/techs/specs.html

A1.2.6 Preboot Execution Environment (PXE) Specification, v. 2.1

[BIOS-0014.1; SDG3:13.1]
http://developer.intel.com/ial/wfm/wfmspecs.htm

A1.2.7 Debug Port Specification, V. 1.0

[BIOS-0010; SDG3:15]
http://www.microsoft.com/hwdev/NewPC/debugspec.htm

A1.2.8 Obsolete: MPS 1.4 specification

[SDG3:2.2]
Implementation of multiprocessor support must comply with ACPI under Windows 2000 and all later versions.

A1.2.9 System Management BIOS Reference Specification, Version 2.3

[BIOS-0006; SDG3:12.1]
http://www.phoenix.com/techs/specs.html

A1.2.10 Open Group Common Application Environment (CAE) Specification

[BIOS-0014.3]
http://www.opengroup.org/onlinepubs/9629399/toc.htm

A1.3 General System - Quality

WHQL Test Specification References:
Chapter 1: Introduction to HCT Test Specifications
Chapter 3: ACPI Test Specification
Chapter 22: Driver Quality Test Specification
Plus technology-specific test specifications

A1.3.1 Product passes related Windows Logo Program testing

Product is submitted to the appropriate WHQL test program and passes all testing for the Windows Logo Program for hardware:

- **Windows XP/Windows Whistler Server:** Pass tests in HCT 10.0 (or later), as described in detail in the WHQL Test Specification and the Microsoft Windows XP Hardware Compatibility Test Kit documentation.

- **Windows Me:** Pass tests in HCT 9.6, as described in the HCT documentation.

- **Windows 2000, Windows 98, Windows NT 4.0:** Pass tests in HCT 9.502, as described in the HCT documentation.

A1.3.2 SEE A1.4.11

A1.3.3 SEE A1.4.12

A1.3.4 DELETE

See A5.4.4.

A1.4 General System - Windows Experience

Design Guideline References:
OnNow and ACPI implementation notes - http://www.microsoft.com/hwdev/onnow/*PC 2001 System Design Guide*, Chapter 3, "PC System" -
Hardware Design Guide 3.0 for Windows 2000 Server, Chapter 2 -

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A1.4.1 Upgrade scenarios with minimal user interference

[WL-8]

Windows 98 > Windows XP/Windows 2000; Windows NT 4.0 > Windows XP/Windows 2000.

A1.4.2 x86-based client: System and all components correctly implement power management

[SYS-0003, 0004; SDG3-if implemented]

- ACPI firmware and hardware; ACPI-based power switch; USB controller that can wake the system; Fast POST; minimal start-up display; system appears "off" in any sleep state. [SYS-0003, 0004; SDG3:9, SDG3:10; SDG3:11; see FAQs A1.5.14 and A1.5.21]

  If a single-button design is used, it must be the user's primary switch interface and must be a power button as defined in ACPI 1.0b.

  If a two-button design is used, the sleep button must be the user's primary switch interface and be easily distinguishable from the power button.
  [SYS-0003.3; SDG3:10.3]

- System ensures optimal user experience for suspend and hibernate, including correct BIOS support for the supported sleep states plus a Fast POST implementation. [WL-6; SYS-0003, 0004]
  Windows XP x86-based client: Fast system startup and fast resume, as documented at http://www.microsoft.com/hwdev/fastboot/:

Important: After January 1, 2003, x86-based client systems must meet the fast system startup and resume times. Times are measured from the time the power switch is depressed until it is possible to start a program using a Windows Desktop shortcut.

x86-based desktop:

- Boot to a usable state in target time:
  English-language desktop systems: in 35 seconds or less
  Double-byte character-set desktop systems: in 40 seconds or less
- Resume from Hibernate (S4) in 25 seconds or less
- Resume from Standby (S3) in 5 seconds or less

Mobile PC Note:

- Boot to a usable state in target time:
  English-language mobile PCs: in 40 seconds or less
  Double-byte character-set mobile PCs: in 45 seconds or less

System Test Configuration Notes

Must be enabled	OK to disable
- Graphics adapter and audio. - Keyboard and mouse attached (on desktop system). - Boot options in default shipping configuration (unless excluded in this list).	- System integrity and security services, such as BIOS passwords requiring user input. - PXE boot options. - Network connection.

Excluded systems
- Systems with multiple processors.   - Systems using SCSI hard disk drives as primary hard disk.   - Systems with processors loading CPU firmware in excess of 1MB.   - Systems populated with ECC memory configurations.   - Itanium-based systems.

- **Windows XP/Windows 2000 clients:** Uniprocessor desktop system must support S1, S3, S4, S5. [see FAQs A1.5.15, A1.5.17]

  Windows XP Home Edition: Uniprocessor desktop systems must support S3 after April 1, 2002; until that date, support for S1 is sufficient.

  Windows XP Professional/2000: Uniprocessor desktop systems must support S3 after July 1, 2001; until that date, support for S1 is sufficient. [see FAQ A1.5.17]

  Windows 98/Me: Uniprocessor desktop systems must support S1, S4, S5. [see FAQ A1.5.17]

  Desktop systems must support wake from all supported sleep states, except S4 and S5. [SYS-0002]

If S3 is implemented, system power supply must provide standby power for system wake-up events. [SYS-0003.5; SDG3:10.5]

Note: For multiprocessor desktop sleep states and wake requirements, see A1.1.5.

- Devices must correctly implement D3 state such that the operating system can correctly hibernate and resume from all sleep states supported on the system. [SYS-0003; SDG3:10.2]

  For PC desktop and mobile systems only, any PCI devices that support wakeup capabilities must correctly support wake from D3cold. [SYS-0003; SDG3:10.2]

  Future wakeup requirements for Itanium-based systems are defined at A5.R.1.

A1.4.3 System contains required devices and buses

[WL-3]

- Keyboard and pointing device.
- Support for installing the operating system.
  [see FAQ A1.5.10]
- One or more USB ports accessible by the user (see related requirements for each system type), with USB standard connector and icons for all USB ports and devices.

  Server Note: If you implement headless support in one of the following ways, a USB controller and port in the server is not required:

  - System that implements headless capabilities without management service processor provides serial headless support. [SDG3.20]
  - System that implements management service processor and external serial headless capability supports required external serial port and remote system reset. [SDG3.21]
  - System that implements a management service processor but no external serial connection meets reset and display redirection requirements. [SDG3.22]
- All expansion slots in the system are accessible for users to insert cards. [SDG3:203; see FAQ A1.5.8]
- No ISA slots or devices. [SYS-0041; SDG3:64-66]
- Industry-standard connections and icons for external keyboard, mouse, parallel and serial devices (legacy systems only). [SDG3:202]

  Device and bus requirements are defined in Appendix B.

Note for Configure to order / Build to order requirements: PC clients shipped into retail markets must have at least the minimum hardware support listed in these requirements. Retail markets include:

- Retail "on-shelf" configurations.
- Published advertisements.
- A default configure-to-order or build-to-order system configuration.

It is recognized that OEMs may configure PC systems to meet the requirements of a specific end-user or corporate customer. For systems built based on specific customer requests, where customers request systems without either a CD or DVD optical drive, the system may be configured without an optical storage drive. However, the system must support the addition of a CD or DVD optical drive, and the system firmware must support booting from a CD or DVD device using El Torito Version 1.0 No Emulation Mode if a supporting optical drive is added.

Furthermore, systems may be configured on request without a graphics adapter or network adapter. All retail market desktop systems must include a graphics adapter and support installation of an operating system by including either a CD/DVD drive or network adapter. [see A1.4.3, A1.1.4]

A1.4.4 DELETED

A1.4.5 Windows XP clients: System and component design practices follow accessibility guidelines

[WL-7; SYS-0020; see also FAQ A1.5.18]

- Ensure that the keyboard and other input devices work correctly with the Microsoft Accessibility features in Windows. For example, StickyKeys should work with all keys in any keyboard design.
- Make all modifier keys capable of being read and operated by software. This capability allows users to access these keys and the functions that rely on them through operating system features, such as StickyKeys and SerialKeys, and through third-party software, such as voice recognition.

A1.4.6 System with DVD-Video correctly implements playback capabilities

[WL-3; SYS-0035; SDG3:194]

Related requirements are defined in Appendix B, "Device Requirements Checklist"

Note: If a system advertises DVD-Video playback capability or compatibility, then an MPEG decoder is required that meets all DVD requirements. However, if a system includes a DVD-ROM drive and is not capable of DVD-Video playback, then an MPEG-2 decoder is not required.

A1.4.7 Peripherals included with client system offer a non-legacy interface such as PCI, USB, IEEE 1394, or CardBus

[WL-5; SYS-0042]

Keyboards and mice are excluded.

Accessibility peripherals included with a system are excluded, provided that a non-legacy interface peripheral is not available to fulfill the same function.

A1.4.8 x86-based client: System is capable of recovery and upgrade of the hard drive image and upgrade of the BIOS, independent of an FDC-based floppy disk drive

[SYS-0067]

A1.4.9 x86-based client: ROM BIOS interrupt handlers preserve values in all registers

[BIOS-0012]

A1.4.10 Windows XP Home Edition/Professional: Audio is "digital ready"

[AUD-0323]

To be digital ready, the audio subsystem must not utilize analog mixing of audio sources for output. All audio sources should be available as digital audio streams accessible to the system-wide kernel mixer. This includes the CD/DVD drive, TV tuner, hardware synthesizer, and so on. All audio content should be available at both the analog jack and USB port.

Eliminating analog mixing is key to making PC audio easier to configure and easier to use, removing a major obstacle for USB audio rendering devices.

References:

- Digital Audio White Papers and "Windows Support for HID-based Audio Controls" at http://www.microsoft.com/hwdev/audio/
- *PC 2001 System Design Guide* "Audio" chapter -

A1.4.11 x86-based client: ROM BIOS ensures that the timer is on at system boot and timer interrupts are occurring as part of POST or RESET

[BIOS-0005.5]

A1.4.12 x86-based: Desktop or server system includes APIC support

[SYS-001.3; SDG3:24; see FAQ A1.5.2]

Implemented per Multiple APIC Description Table (ACPI 1.0b, Section 5.2.8).

- All hardware interrupts are connected to an IOAPIC.
- The IOAPIC is connected to the local APIC in the processor.

Mobile PC Note: This requirement does not apply for mobile systems.

Note: For SAPIC requirements for Itanium-based system, see A5.4.4.

A1.4.13 System includes headset microphone if system is speech capable

[AUD-0332]

If a system is represented as speech capable or includes speech-recognition software (not including Microsoft Office XP), the system must include a headset microphone that meets the requirements defined in B3.1.4.13.

A1.4.14 Onboard graphics device can be used as a primary VGA boot device

See B4.1.1.8.

A1.5 General System - FAQs

A1.5.1 Current general FAQs

See http://www.microsoft.com/winlogo/hardware/.

A1.5.2 APIC/SAPIC Requirement [Clarification]

[SYS-0001.3; SDG3.24, 25]

Implementation and design guidelines are defined in *PC 2001 System Design Guide* and *Hardware Design Guide 3.0*.

For background information about APIC, see *Key Benefits of the I/O APIC* at http://www.microsoft.com/hwdev/newpc/io-apic.htm.

For technical information about how to implement this requirement, see the related chip-set guide from your chip-set vendor.
FAQ date: new revision June 20, 2000

A1.5.3 Riser Cards [Logo Program Clarification]

The BIOS for a system board that supports any type of enumerable riser card, such as AMR, Advanced Communications Riser (ACR), and Communications and Networking Riser (CNR), must include the following support:

- Detecting and enumerating each function on that type of riser device.
  Representing each function on that device so the relevant Windows bus enumerator (such as a PCI bus enumerator) can detect it, and then locate and install appropriate drivers.

This is a Windows Logo Program compliance testing requirement as of July 1, 2000.
FAQ date: December 22, 1999; revised May 9, 2000

The system BIOS must provide a unique PCI SID for any riser card, assigned by the codec manufacturer. This is identical to current Logo Program requirements for audio and modem devices on a PCI add-on card—except these are system-board devices, so the PCI SID must reflect that of the system-board manufacturer.

If an OEM chooses a riser card and driver from any riser card driver manufacturer, the BIOS must populate the fields as follows:

- The PCI SVID must reflect the Vendor ID assigned by the PCI Special Interest Group (SIG) to that OEM.

- The SID must be unique for each AC '97 device configuration. For example, for a modem-on-motherboard (MoM), modem riser (MR), or audio modem riser (AMR) device, each SID must be unique.

If an OEM chooses a system board from a manufacturer that works with one or more codecs, the following applies:

- The SVID must reflect the Vendor ID assigned by the PCI SIG to that system-board manufacturer.

- The SID must be unique for each AC '97 codec/device configuration. For example, for a MoM, MR, or AMR device, each SID must be unique.

For an AMR riser, the system BIOS must properly implement the detection algorithm from Intel to verify that the hardware on an AMR/MR riser extension is actually present. The detection algorithm is available at ftp://download.intel.com/ial/scalableplatforms/audio/ac97bios.pdf.

Similar provisions exist in the CNR and ACR specifications.

For information about WHQL testing for riser cards, see http://www.microsoft.com/hwtest/.
See also AC '97 and AMR Plug and Play Design (http://www.microsoft.com/hwdev/audio/AMR.htm).
FAQ date: June 2, 1999; revised May 9, 2000

A1.5.4 PCI-to-PCI bridges [Clarification]

[PCI-0123; SDG3:37]

The system BIOS must correctly configure PCI-to-PCI bridges if the system has a VGA device behind a bridge.

Specifically, the BIOS must correctly set the VGA Enable and ISA Enable bits on the bridges, to avoid causing the bridges to be in conflict with each other. See

http://www.microsoft.com/hwdev/pci/pcibridge-cardbus.htm.
FAQ date: March 12, 1999

A1.5.5 Multiprocessor Systems Compatibility Testing [Clarification]

As of mid-1999, WHQL accepts multiprocessor submissions for Windows Logo Program and Windows XP/Windows 2000/Windows Whistler Server compatibility testing that contain mixed processor steppings. However, the following requirements for multiprocessor systems must be met:

- Systems must use the lowest stepping processor as the bootstrap processor.
- Systems must not contain processors from different processor manufacturers or with mixed speeds or mixed cache sizes.
- Systems designed to run the Windows 2000/Windows Whistler Datacenter Server operating system must not contain mixed processor steppings.

  Note, however, that inherent support for mixed steppings is not currently a design feature supported by Microsoft on either Windows NT-based or Windows 2000-based systems. See http://www.microsoft.com/hwdev/desguid/smp.htm.
  FAQ date: August 26, 1999

A1.5.6 Multiprocessor Wakeup [Clarification]

A problem has been uncovered with certain multiprocessor systems that will prevent them from properly waking up from a Sleep state under Windows 2000. This pertains to dual-processor or multiprocessor systems that transition all processors from an active state to a STPCLK state, and more specifically to systems where all processors receive their STPCLK# request from one source. For multiprocessor systems submitted for Windows Logo Program testing for 1999-2000, the vendor must implement a solution for this problem as described in this notice.

The following information has been provided by Intel to help manufacturers correct the problem. For technical questions regarding this issue, please contact Intel. For questions related to support under Microsoft Windows operating systems, please send e-mail to ihv@microsoft.com with **Multiprocessor Wakeup** in the Subject line.

Prior to transitioning from a STPCLK state to a Sleep state or lower power state, all processors must generate a Stop Grant bus cycle. It is essential that all processors have transitioned to the STPGNT state before it is safe to: 1) transition to a lower power state such as Sleep, or 2) externally shut off the processor clocks to allow for flushing buffers, cache maintenance, and other internal activities.

For dual-processor and multiprocessor systems using a single STPCLK to all processors and a single SLP pin to all processors, the transition to the Sleep state should not be used. Behavior of the system during

removal of the processor clock—such as transitions from STPCLK to Sleep state—cannot be guaranteed unless all STPGNT bus cycles are received.

For example, *Intel Xeon II Specification*, "Section 4.2.5 Sleep State-State 5," specifies that for a multiprocessor system, all processors are required to complete the Stop Grant bus cycle before the subsequent 100 BCLK waiting period and before the assertion of SLP# can occur. When multiple processors are serviced by a single STPCLK# request to all processors and a single SLP#, there is no provision to guarantee that all Stop Grant bus cycles are received before the assertion of SLP#.

As another example, in 450NX-based platforms from Intel, the STPCLK# from PIIX4E is connected to all processors, and SLP# from PIIX4E is connected to all processors. The following sequence occurs:

> t0. Operating system writes PMCNTRL register.
> t1. PIIX4E asserts STPCLK#, then waits for Stop Grant acknowledgment.
> t3. The processor acknowledges with Stop Grant ACK cycle.
> t4. PIIX4E asserts SLP# after receiving this.

This sequence works for uniprocessor systems (which is what the PIIX4E was originally designed for). However, in multiprocessor systems, SLP# might be asserted to a processor that is not in Processor Sleep State 3 (that is, not yet acknowledged). This premature SLP# assertion might result in a wakeup problem.

To work around this problem, processors are put to Processor Sleep State 3 (not State 5) during ACPI S1 state. That is, the OEM must remove SLP# assertion to all the processors in 450NX-based platforms.

Intel provides additional information about this issue through the Intel Technical Support Hotline at 1-800-628-8686 (outside North America at 916-377-7000).

Note: Please remove SLP# assertion to all the processors on multiprocessor PIIX4-based platforms. Disabling the Sleep Enable bit in the PIIX4 Processor Control Register does not actually disable the assertion of SLP# as documented in the PIIX4 specification.
FAQ date: March 19, 1999; revisions May 28, 1999

A1.5.7 BIOS support for preboot execution environment, with UUID provided in print [Clarification]

[BIOS-0014.1; SDG3:13.1]

References to PXENV system identifier in *Network PC System Design Guidelines, Version 1.0b*, are superseded by PXE. [see A1.1.4]

UUID is not required in print.

Mobile PC Note: See A3.4.2 for mobile BIOS PXE requirement.
FAQ date: March 19, 1999, revised January 15, 2001

A1.5.8 AGP and requirement for expansion slots to be accessible to end users [Clarification]

For designs implementing the Accelerated Graphics Port (AGP) Pro specification, the two PCI slots adjacent to the component side of the AGP Pro slot may be blocked and used by an AGP Pro Adapter. When the AGP Pro connector is used by a "standard" AGP board, the PCI connectors must be accessible and available for use with PCI cards.
FAQ date: December 7, 1998

A1.5.9 Color coding [Clarification]

Color-coding is only recommended, not required, for both systems and retail peripherals. Recommended color codes are listed at http://www.pcdesguide.org/documents/pc99icons.htm.

A1.5.10 Floppy disk support [Clarification]

The use of a legacy floppy drive is discouraged, but not disallowed; system designers are encouraged to seek other alternatives for both the installation boot drive and casual storage.
FAQ date: March 19, 1999

A1.5.11 DELETED

A1.5.12 USB mass storage [Logo program clarification]

USB-based mass storage devices cannot be the primary method of normal system booting. They are expected to be a replacement for booting to load an operating system on the primary boot drive, or as a replacement for legacy floppy drives.
FAQ date: August 26, 1999

A1.5.13 PCI SVID/SID for PCI functions on system boards [Clarification]

See "Specification for Use of PCI IDs with Windows Operating Systems" at http://www.microsoft.com/hwdev/pci/pciidspec.htm.

Note: For Windows XP, SIDs and SVIDs are *not* required for PCI-PCI bridges and some other core chipset classes. For the specific list of exceptions, see Appendix D of PCI 2.2.

A1.5.14 Resume from Sleep State Requirements [Logo Program Change]

Resume from sleep state (S1-S3) to operating system handoff occurs within 1 second (PC99a:3.4.2 previously stated S1-S4).

This requirement does not apply to servers.

For sleep states S1, S2, and S3, the time to operating system handoff is measured from when the processor starts running (first instruction) to the time that the BIOS jumps to the Waking Vector in the Firmware ACPI Control Structure table, as described in Section 5.2.6 in the ACPI 1.0b specification.

A1.5.15 Windows logo testing for S3 system state under Windows XP [Clarification]

[SYS-0002; SDG3:9]

For Windows XP, the Windows Logo Program for hardware includes the following requirements:

- System ensures optimal user experience for suspend and hibernate, including correct BIOS support for the supported sleep states.
- A uniprocessor desktop must support S1, S3, S4, and S5, and support wake from all supported sleep states, except from S4 and S5. [see A1.4.2]

Devices must correctly implement the D3 state such that the operating system can enter into and resume from all sleep states supported on the system, including S3. Devices must be fully functional upon resume from the S3 state. Any PCI devices that support wakeup capabilities must correctly support wake from D3cold.

To ensure that a device meets these requirements, it must be tested in an S3-capable system. This is a requirement for the Windows Logo Program with the release of Windows XP. Note that this is not a new requirement; earlier versions of HCTs didn't enforce this area of testing.

The device categories that will be affected by this requirement are: Audio, Modem, Network, Storage, USB/IEEE 1394, Video.

References:

S3 sleep state is defined in the ACPI specification: http://www.teleport.com/~acpi/

Related design guidelines are defined in *PC 2001 System Design Guide*.

Device Class Power Management Reference Specifications http://www.microsoft.com/hwdev/specs/Pmref/

Windows implementation guidelines, specifications, and white papers for power management http://www.microsoft.com/hwdev/onnow/

Driver support for power management: see A1.1.2.

See also "Display Adapter Drivers and Windows Millennium Hibernation" at http://www.microsoft.com/hwdev/video/Mill_D3display.htm.
FAQ date: June 30, 2000

A1.5.16 Debug Solutions for Legacy-Free PCs [Clarification]

Microsoft has defined possible debug solutions for Windows-based PCs in the *Debug Port Specification* at http://www.microsoft.com/hwdev/NewPC/debugspec.htm.

Windows Me and Windows XP support IEEE 1394-based debug solutions, as described at http://www.microsoft.com/hwdev/1394/.

Important: For any system design that does not include a built-in serial port, the debug solution must be shipped with the system. This is a requirement for the "Designed for Windows" logo for legacy-free and legacy-reduced systems. The solution must consist of one of the following:

- For serial ports with non-legacy addresses, the internal header must be exposed in such a way as to be available, but not obvious.
- For LPC solutions, the header for the dongle connection must be exposed.
- IEEE 1394 debug.

  Systems equipped with one or more standard OHCI-compliant, Windows Logo'd IEEE 1394 controllers can utilize a standard IEEE 1394 port for connecting a host machine with one or more targets (up to 62 on a single bus). The host controller can be on the motherboard or attached via PCI, Mini-PCI, or CardBus.

  If the IEEE 1394 controller is not on the motherboard, the system does not have to ship with the IEEE 1394 solution included. Rather, it must contain at least two slots for the addition of an IEEE 1394 card by the debug technician, which can be any combination of PCI, Mini-PCI and CardBus slots. This allows debugging of systems configured with another PCI-connected peripheral. Standard IEEE 1394 cables can be used for this purpose.

  Note: For legacy-free or legacy-reduced sub-notebooks that are designed to implement IEEE 1394 as the debug solution, a combination of a Mini-PCI slot and CardBus slot is one possible solution. However, debugging over a mobile docking station with a PCI bridge is not a viable solution.
  FAQ date: August 28, 2000; revised September 1; October 25, 2000

A1.5.17 S3 support and system test submissions (Revision)

A system preinstalled with either Windows 98 or Windows Me can provide a BIOS switch that disables S3. A system preinstalled with Windows XP/Windows 2000 must enable S3 by default in the BIOS.

System test submissions for Windows 98, Windows Me, or both and that also support Windows 2000, Windows XP, or both must use the same BIOS for all submissions. In this case, S3 may be disabled in the BIOS for the Windows 98 and Windows Me test passes but S3 must remain enabled in the BIOS for Windows XP/Windows 2000 test passes.

For information about the effective dates for the S3 requirement, see A1.4.2.

FAQ date: January 31, 2001

A1.5.18 Accessibility requirements and regulations (Clarification)

[SYS-0020]

PC 2001 System Design Guide specified keyboard keys F1-F12 as having to be capable of being read and operated by software. This is incorrect; the guideline should have referred to **the Fn key**, an OEM-specific key often used on mobile PCs to control mobile-specific functions such as backlight brightness, CRT/LCD display switching, and so on.

Windows does not provide a keyboard scan code for the Fn key. StickyKeys cannot provide support for OEM-specific keys. System designers should provide access to all system functionality, including those functions only available through keyboard sequences involving the Fn key. The system BIOS can provide this StickyKey-like functionality.

Note: On December 21, 2000, the U.S. Access Board issued final standards for electronic and information technology under Section 508 of the Rehabilitation Act. OEM and IHVs are encouraged to review these standards as they pertain to their hardware designs. See http://www.access-board.gov/.

FAQ date: February 28, 2001

A1.5.19 Headset microphone requirement [Clarification]

A system is considered "speech capable" when the offering to customers indicates that speech is a viable input method for that system, which would therefore require a microphone to make that capability available. For example, if the platform includes an application that has the sole purpose of adding speech functionality to the system, then the system will be considered "speech capable." However, if the system includes an application that merely supports speech input as an alternate input method, then that system is not considered "speech capable."

Note also that the inclusion of an array microphone that meets the microphone performance requirements in B3.1.4.13 also meets the requirement defined in A1.4.13.

FAQ date: April 30, 2001

A1.5.20 Number of USB ports required by system type [Clarification]

To facilitate migration away from legacy connections for keyboards, pointing devices, serial devices, and parallel devices, the logo program requirements identify how many USB ports are required for each system type. These requirements are defined in the various system type sections of Appendix A. This FAQ provides a summary:

- General system requirement: One or more USB ports accessible by the user (A1.4.3)
- Desktops: Two USB ports, with at least one accessible USB port supporting end-user expansion when keyboard and pointing device are attached (A2.4.1)
- Mobiles: One USB port (A3.4.4)
- Legacy-Free: Two USB ports, with at least one accessible USB port supporting end-user expansion when keyboard and pointing device are attached (A4.4.2)
- Servers: One USB port (A6.4.2)
  FAQ date: May 08, 2001

A1.5.21 System fans allowed to run in ACPI S1 state [Logo requirements change]

System fans may be run in the S1 state to cool the system. It is recommended that systems support advanced features like stopping the PCI clock when in S1 to allow the fans to be turned off.
FAQ date: May 08, 2001

A1.5.22 System board devices meet ACPI 1.0b [Clarification]

System board devices not power managed or configured via standard bus specifications must comply with ACPI 1.0b.
FAQ date: May 08, 2001

A1.R General System - Future Requirements

A1.R.1 Announcement of additional future requirements will be published on the Windows Logo Program web site

http://www.microsoft.com/winlogo/hardware/

A1.R.2 For systems that include integrity or authentication services for downloaded remote boot images, support BIS

[BIOS-0014.4; SDG3:12.3]

Support Boot Integrity Services (BIS); comply with Boot Integrity Services, Version 1.0.

A1.R.3 Consumer systems support IEEE 1394

IEEE 1394 has been supported in Microsoft operating systems since the release of Windows 98. This future requirement will add IEEE 1394 connectivity to the Windows experience on all consumer platforms.

A2.0 Desktop Client Requirements

This section describes additional requirements or exceptions to the requirements defined earlier in Section A1.0.

For Itanium-based desktop systems, all requirements in A5.0 are included by reference.

Design Guideline References:
PC 2001 System Design Guide, Chapter 3, "PC System"

A2.1 Desktop Client - Windows Compatibility

See A1.1.

A2.2 Desktop Client - Industry Standards

A2.2.1 USB specifications and other USB requirements

As defined in Section B2.6 in Appendix B, "Device Requirements Checklist."

A2.3 Desktop Client - Quality

See A1.3.

A2.3.1 SEE A2.4.7

A2.3.2 SEE A2.4.8

A2.4 Desktop Client - Windows Experience

A2.4.1 Two USB ports in all systems, with system BIOS boot support for USB input devices

[SYS-0021, BIOS-0005.2; SDG3:13.3]

If only two USB ports are provided, system provides at least one accessible USB port supporting end user expansion when keyboard and pointing device are attached.

A2.4.2 CD/DVD drive or network adapter (for installing the operating system)

[SYS-0039]

Desktop system includes CD or DVD device.

> **Note for configure-to-order/build-to-order requirements:**
> PC clients shipped into retail markets must have at least the minimum hardware support that is listed in these requirements. Retail markets include:
>
> - Retail "on-shelf" configurations.
> - Published advertisements.
> - A default configure-to-order or build-to-order system configuration.
>
> It is recognized that OEMs may configure PC systems to meet the requirements of a specific end-user or corporate customer. For systems built based on specific customer requests, where customers request systems without either a CD or DVD optical drive, the system may be configured without an optical storage drive. However, the system must support the addition of a CD or DVD optical drive, and the system firmware must support booting from a CD or DVD device using El Torito Version 1.0 No Emulation Mode if a supporting optical drive is added.
>
> Furthermore, systems may be configured on request without a graphics adapter or network adapter. All retail market desktop systems must include a graphics adapter and must support installation of an operating system by including either a CD/DVD drive or network adapter. [see A1.4.3, A1.1.4]

A2.4.3 SEE A1.3.3

A2.4.4 DELETED

A2.4.5 If IEEE 1394 is included in a system, at least two externally-accessible sockets are required

[SYS-0022]

A2.4.6 Windows XP Professional/Windows Whistler Server: Expansion devices on desktop systems can be remotely managed

[SYS-0049]

A2.4.7 BIOS correctly supports input and boot devices on system boot

See FAQ A2.5.2.

A2.4.8 BIOS correctly handles long descriptors read from any USB device attached to the system at boot time

[BIOS-0005.3; see FAQ A2.5.2]

A2.5 Desktop Client - FAQs

A2.5.1 Current general FAQs

See http://www.microsoft.com/winlogo/hardware/.

A2.5.2 BIOS support for USB

[BIOS-0005.2, 0005.3; SDG3:11]
Current requirements are defined at A1.1.4.

A2.R Desktop Client - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/system/.

A3.0 Mobile PC Client Requirements

This section describes additional requirements or exceptions to the requirements defined earlier in Section A1.0.

A3.0.1 General System Exceptions for Mobile PCs

In addition to requirements defined in Section A3.0, the following exceptions to General System requirements are defined for Mobile PC systems elsewhere in Appendix A:

- A1.4.12 Requirements for APIC support do not apply for mobile PCs.

A3.0.2 Legacy-free System Exceptions for Mobile PCs

The following exceptions to Legacy-Free PC System requirements are also defined for Mobile PC systems in elsewhere Appendix A:

- A4.1.3 No components claim to use the restricted port addresses – mobile exceptions:
  - Both desktop and mobile PCs can use the 8042 controller internally, but must not include external PS/2 connectors. Legacy-free systems that use the 8042 controller internally must set the **8042** flag to 1 in the ACPI FADT.
  - Systems can provide Super I/O-based Infrared Data Association (IrDA) support through the year 2001.
- A4.4.2 A mobile PC is required to provide only one free USB port.
- A4.4.8 MS-DOS must not be required to install or run any utilities, games, or other software provided with the system -- required for new docking stations designed for legacy-free mobile PCs.
- A4.5.3 CD or DVD drive requirement – exceptions for legacy-free mobile PCs.

A3.0.3 Device Exceptions and Notes for Mobile PCs

The following additional requirements, exceptions, and FAQs for Mobile PC systems, devices, and buses are defined in Appendix B:

- B2.3.4.4 **Windows XP:** Mobile PC IR devices, if supported, support D0 and D3 states.
- B3.1.4.4 Audio Record and Playback works properly—WHQL Audio test: Audio performance – mobile PC exceptions defined.
- B4.1.1.8 Onboard graphics device can be used as primary VGA boot device (additional BIOS setup utility requirement for mobile PCs).
- B4.1.4.13 Mobile PC system meets basic graphics requirements to reliably run Windows and applications, plus requirements for resolution capabilities. [GRPH-0393]
- B4.1.4.14 Mobile PC system 3-D capabilities, if implemented, meet minimum requirements.
- B4.2.1.5 **Windows XP/Windows 2000:** Windows Support for Mobile System Displays.
- B4.2.4.3 Minimum graphics resolution, based on monitor size.
- B5.1.4.6 Devices use USB or external bus connections rather than legacy serial or parallel (mobile PCs can expose the FDC bus).
- B5.3.4.1 Mobile PC external PS/2 pointing device detected at boot and installed correctly.
- B5.3.4.1 Mobile PC internal pointing device is disabled or dual operation enabled if external PS/2-compatible pointing device is present.
- B11.1.4.5 Mobile system meets standard video requirements for appropriate display panel resolution if resolution is 1024 × 768 × 24 bpp or higher.

A3.1 Mobile PC Client - Windows Compatibility

A3.1.1 ACPI 1.0b-compliant support for mobile PC docking station interface and state change notification

[MOBL-0073, 0078, 0079, 0080]

Including fail-safe docking based on capabilities and methods in ACPI Sections 6.3 and 5.6.4.

A3.2.1 Windows XP/Windows 2000: Windows 2000 Support for Mobile System Displays

http://www.microsoft.com/hwdev/video/mobiledisplay.htm

A3.2 Mobile PC Client - Industry Standards

A3.2.1 Smart Battery Specifications

[MOBL-0062]
http://www.sbs-forum.org

A3.2.2 ACPI Docking for Windows XP/Windows 2000

[MOBL-0078, 0079]
http://www.microsoft.com/hwdev/onnow/ACPIdock.htm

A3.2.3 ICC Profile Format Specification, Spec ICC.1:1988-09 and Addendum 2, ICC.1A:1999-04

[MON-0235; see FAQ A3.5.5]
http://www.color.org/profiles.html

A3.3 Mobile PC Client - Quality

See A1.3.

A3.4 Mobile PC Client - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 5, "Mobile"

A3.4.1 Power and power management requirements

[SYS-0002 ; MOBL-0062]

- Every device in a mobile PC system functions fully on both AC and DC power.
  [see FAQ A3.5.8]
- Mobile system implements either S1 or S3, S4, and S5 sleep states (no "wake from S3 or S4" requirement). [SYS-0002.1]
- Smart Battery or ACPI Control Method Battery. [MOBL-0062; see FAQ A3.5.8]
- Smart Battery systems that support battery calibration must use the Smart Battery System Manager optional calibrate support bits in the BatterySystemStateCont register. [MOBL-0062.1]
- **Windows XP:** Systems implementing processor performance states must use native Windows support. This means that all performance policy and switching must be done by the operating system. See "Windows XP Native Processor Performance Control" whitepaper at http://www.microsoft.com/hwdev/onnow/.

A3.4.2 BIOS requirements

- Support for external pointing device. [MOBL-0066; see FAQ A3.5.3]
- Support PXE if system includes integrated network adapter. [BIOS-0014.1; see FAQ A3.5.7]

A3.4.3 Connector icons on back of case, wrapped to the bottom of the unit, or placed inside an access door

Color-coding is not required.

A3.4.4 Mobile system contains required devices and buses

[MOBL-006x]

- Integrated keyboard and pointing devices use standard system-board devices; add-on devices meet Windows Logo requirements. [MOBL-0066]
- External mouse support uses a connector other than a serial port. [SYS-0042; INPT-0135]
- One USB port free for end-user expansion. [MOBL-0063]
- One 32-bit Type-2 CardBus slot. [MOBL-0065; SYS-0024]
- System maintains mapping of IRQ Routing Register bits to system interrupt vectors for CardBus. [PCCard-4; SYS-0024]
- IRQ connections for CardBus can be determined by using the 0805 register. [PCCard-5; SYS-0024]
- Integrated graphics device minimum requirements:

    2-D hardware acceleration, 640 × 480, low-resolution modes. [GRPH-0393.1]

    If 3-D is supported, 640 × 480 × 16 bpp; no minimum texture cache, alpha blending, hardware text mapping requirements. [GRPH-0393.3, 0393.4]

    No multiple adapter support required in mobile unit; multiple monitor support is optional. [GRPH-0393.7; see FAQ A3.5.4]

    Display Data Channel (DDC) monitor detection required only for external graphics interface. [MOBL-0069.3, GRPH-0393.6]

    PCI or AGP 1.x or later. For systems supporting 3-D graphics hardware, performance equivalent of AGP 1x with GART is required. [GRPH-0393.2]

    International Color Consortium (ICC) color profile and INF preinstalled if DDC detection cannot be used. [MON-0235; see FAQ A3.5.5]

A3.4.5 ATA controllers and devices on mobile unit support ATA/33 or better

[STOR-0350]

A3.4.6 CD drive, if present, supports transfer rate of at least 1200 KB per second when fully on

A3.4.7 Docking station requirements

[MOBL-007x]

- Docked mobile PC meets Mobile PC system and BIOS requirements. [MOBL-0074, MOBL-0076]
- Docked mobile PC can uniquely identify the dock. [MOBL-0073]
- Docking station supports warm docking and fail-safe docking. [MOBL-0079; MOBL-0080]
- Enumerate, configure, and disable non-Plug and Play devices using ACPI-based methods. [MOBL-0078]
- Docked mobile PC meets BIOS requirement for multiple adapters and multiple monitors. [MOBL-0076]
- Docked mobile PC allows user speaker selection. [AUD-0339; see also FAQ A3.5.9]
- Discrete PCI ATA controllers in mobile docking stations implement in PCI Native-Mode ATA. [ATA-0122]

A3.4.8 DELETED

A3.4.9 If mobile supports a docking station, mobile unit's BIOS supports docking-related ACPI functions

[MOBL-0078]

A3.4.10 If IEEE 1394 is included in a system, at least one externally-accessible socket is required

[MOBL-0064]

A3.5 Mobile PC Client - FAQs

A3.5.1 Current general FAQs

See http://www.microsoft.com/winlogo/hardware/system/.

A3.5.2 Manageability requirements [Clarification]

Current SMBIOS requirements are defined in A1.1.4.
FAQ Date: May 4, 2000

A3.5.3 BIOS support of external pointing device [Clarification]

[MOBL-0066]

The required default BIOS option is to provide an option to disable the internal pointing device when any external PS/2-type pointing device is detected at startup. In this case, the driver for the internal pointing

device must not load.
FAQ date: October 7, 1998

A3.5.4 DDC monitor detection [Clarification]

[GRPH-0393.6]

Because of the power limitations placed on mobile computers, they are not required to supply + 5V power via the external graphics adapter as is currently required by the VESA DDC specification.

Some display devices rely on the +5 V to power their DDC circuitry, for Plug and Play detection, or both. It is recommended that a mobile PC provide a means to enable the +5 V power when necessary.
FAQ date: March 19, 1999

A3.5.5 ICC profile for mobile PCs [Clarification]

Current requirements are defined at B4.2.4.2; design guidelines are provided in PC 2001. [MON-0235]

A3.5.6 DELETED

A3.5.7 BIOS support for PXE [Clarification]

[BIOS-0014.1]

Current requirements are defined in A1.1.4.

A3.5.8 Battery power requirements [Clarification]

Every device in a mobile PC system should function fully on both AC and DC power. It is not acceptable for hardware or system firmware to autonomously disable, remove, or force power down of devices on an AC > DC transition. This can cause situations that result in the system shutting down, lost data, operating system failure of subsequent power management events, or at the least, warning messages displayed to the user. Internal devices must only be powered down, disabled, or removed when commanded to do so by the operating system and device drivers in accordance with bus and device power management specifications.

This clarification does not require port replicators or docking stations to operate on battery power.
FAQ date: May 28, 1999

A3.5.9 Docking station/mobile audio [Clarification]

It is not required that a mobile/docking station pair implement audio. The following provides a clarification to the requirement:

The user must be able to select speakers in the mobile unit or the docking station. System vendors can choose to automate the process either in the docking station or the mobile PC to meet this requirement. For example, instead of offering a UI where the user can select speakers, the system manufacturer can configure the pair to automatically turn on the docking station speakers and turn off the mobile PC speakers when in the docked configuration.

This requirement is defined to ensure that users can access the highest quality audio output in any given configuration. If speakers are selected automatically, the vendor should prevent multiple outputs from occurring simultaneously. If speakers are not selected automatically, then a manual selection process must be offered to the user. Additionally, the speakers should be switched off if the headphone or line-out jacks are used.
FAQ date: December 22, 1998

A3.5.10 DELETED

FAQ date: January 31, 2001

A3.5.11 Docking Station and Port Replicator Definitions [Clarification]

Port Replicator: For the purposes of the Windows Logo Program, a Port Replicator physically mates to the Mobile PC and is an acceptable method for adding the following functionality to a mobile PC. All of the following features must be compliant with their respective Windows Logo Program requirements, specifications, and standards:

- USB hub.
- Power Supply (if needed).
- Cable management by passing through the following connectors and buses:
  Audio, including line-in, line-out, microphone, and headphone
  DVI
  Floppy drive
  Game port
  IEEE 1394 PHY
  LAN
  MIDI port
  Modem
  Parallel or LPT port
  PS/2 port
  Serial port
  USB connector: pass-through connector is allowed to be low power
  Video
  Any bus used exclusively for manageability

Docking Station: For the purposes of the Windows Logo Program, a Docking Station connects to the mobile PC's PCI bus and includes the functionality of a Port Replicator plus additional expansion in the form

of Plug and Play-enumerable devices or slots.
FAQ date: October 6, 2000

A3.R Mobile PC Client - Future Requirements

Announcement of additional future requirements will be published at
http://www.microsoft.com/winlogo/hardware/system/

A4.0 Legacy-Free PC System Requirements

This section describes additional requirements or exceptions to the
requirements defined earlier in Section A1.0.

A4.1 Legacy-Free PC System - Windows Compatibility

A4.1.1 ACPI legacy-free support is reported as described in "ACPI Changes for Legacy Free"

[BIOS-0015; SDG3:27, 28]
http://www.microsoft.com/hwdev/onnow/download/LFreeACPI.doc

- LEGACY_DEVICES flag is set to 0 in the ACPI FADT as defined in ACPI section 5.2.1.
- ACPI reset mechanism as defined in ACPI section 4.7.5.
- 8042 flag is set to 0 in systems that do not include an 8042 controller; value is set to 1 in a mobile or desktop system that includes an 8042 controller.
- Debug Port Table in the BIOS, as described in ACPI section 5.2.11.

A4.1.2 Plug and Play detection does not report the presence of Super I/O-dependent components

Based on addresses and exceptions listed in A4.1.3.

A4.1.3 No components claim to use the restricted port addresses

[BIOS-0045]

Restricted addresses:

COM = 2E8-2EF, 2F8-2FF, 3E8-3EF, 3F8-3FF
LPT = 278-27A, 378-37A, 3BC-3BE
Sound Blaster = 0220-022F
Joystick/game port = 0x200-0x20F
MPU-401 (MIDI) = 0330-0331
FDC = 3F0-3F7
Keyboard/mouse controller = 0060, 0064

The following exceptions apply:

- An internal COM port header can be used as a debug port solution if the COM port is not exposed to the end user and does not use the I/O addresses listed in this table; these listed addresses must be claimed in the BIOS but not used. The relocated I/O address must be reported in the ACPI Debug Port table.
- Systems that use the 8042 controller internally can use the related restricted addresses if the 8042 flag is set to 1 in the ACPI FADT. The 8042 flag must be set to 0 in systems that do not include an 8042 controller.
- Systems can provide Super I/O-based IrDA support through the year 2001. Both desktop and mobile PCs can use the 8042 controller internally, but must not include external PS/2 connectors. Legacy-free systems that use the 8042 controller internally must set the **8042** flag to 1 in the ACPI FADT.
- **Windows Me:** A system that does not have an 8042 controller must reserve I/O addresses 0060 and 0064 as reserved motherboard resources. Failure to reserve these I/O addresses will result in display of a false device in Device Manager.

A4.1.4 Support required interrupts

[BIOS-0043]

Required interrupts:

INT 8, INT 9, INT 10, INT 11, INT 13, INT 19, INT 1B, and INT 23
INT 15 subfunctions AH=C0, 4F, 87, 88 and AX=C2xx, E820, E801
INT 16 subfunctions AH=00h, 01h, 02h, 10h, 11h, 12h
INT 1A subfunctions AH=0x and AX=B1xx

See details in Table 2 at
http://www.microsoft.com/hwdev/NewPC/LF.htm.

A4.1.5 Legacy-free debug interface per Debug Port Specification and FAQ A1.5.16

[SYS-0046; SDG3:15; FAQ A1.5.16]

A4.1.6 When 8042 is not present, A20M# is de-asserted (pulled high) or removed, with no way to mask the A20 address line

[SYS-0047]

If A20M# generation logic (8042) is not present in the system, A20M# must be terminated in a deasserted state to the processor. If 8042 is present, connect in the standard legacy manner.

A4.1.7 Interrupt handlers preserve values in all registers

As described in A1.4.9.

A4.1.8 BIOS initializes USB Host Controller during boot process

The USB host controller must be in IRQ mode for keyboard and mouse input during real mode and safe mode. However, this can potentially cause the system to stop working when the system is running Windows 2000 if the interrupt is shared with the boot device and the host controller generates an IRQ before the USB ISR is chained.

The solution is for the BIOS to add logic to the ACPI Enable routine to turn off the IRQ-enable bit in PCI Config space for the USB host controller.

A4.2 Legacy-Free PC System - Industry Standards

A4.2.1 "ACPI Changes for Legacy-Free PCs"

[BIOS-0015; SDG3:27]
http://www.microsoft.com/hwdev/onnow/download/LFreeACPI.doc

A4.2.2 Debug Port Specification, V. 1.0 or later

[SYS-0046; SDG3:15]
http://www.microsoft.com/hwdev/NewPC/debugspec.htm

A4.3 Legacy-Free PC System - Quality

WHQL Test Specification References:
Chapter 18, Legacy-Free Test Specification

See A1.3.

A4.3.1 SEE A4.4.9

A4.3.2 SEE A4.4.10

A4.4 Legacy-Free PC System - Windows Experience

Design Guideline References:
http://www.microsoft.com/hwdev/NewPC/LF.htm.
PC 2001 System Design Guide, Chapter 3 -

New docking stations designed for legacy-free mobile PCs must follow these requirements.

A4.4.1 No external serial, parallel, or PS/2-compatible ports and no ISA-based game ports or MPU-401 (MIDI) ports available for external connection or detected by the operating system

[BIOS-0045; see also FAQ A4.5.2]

A4.4.2 Two USB ports in all desktop systems

See also A2.4.1.

If only two USB ports are provided, system provides at least one accessible USB port supporting end user expansion when keyboard and pointing device are attached.

Mobile PC Note: A mobile PC must provide at least one accessible USB port [MOBL-0063]

A4.4.3 System includes a bootable CD or DVD device

[BIOS-0005.1; SYS-0039; MOBL-0072]

Mobile PC Note: See FAQ A4.5.3.

A4.4.4 No FDC detected

[SYS-0040, BIOS-0045]

A4.4.5 DELETED

See A1.4.8.

A4.4.6 Peripherals provided with the system use non-legacy connectors and do not depend on real mode for installation or configuration

[WL-5; SYS-0042]

Keyboard and mouse must also use non-legacy interfaces.

A4.4.7 External input devices included with the system are HID compliant

[INPT-0133]

For example, keyboard, mouse, or game controller.

A4.4.8 MS-DOS is not required to install or run any utilities, games, or other software provided with the system

[SYS-0042]

Exception: Software on the recovery CD provided for Windows Me.

A4.4.9 No BIOS boot dependencies on ISA or other legacy devices, and no ISA-related components appear on BIOS setup screen

[BIOS-0013]

A4.4.10 BIOS supports USB input devices at boot, and does not include hardware emulation of the 8042 controller in systems where no 8042 controller is present

See details in Table 2 at http://www.microsoft.com/hwdev/NewPC/LF.htm or in Appendix A of PC 2001.

A4.5 Legacy-Free PC System - FAQs

A4.5.1 Current general FAQs

See http://www.microsoft.com/winlogo/hardware/system/.

A4.5.2 Early legacy-free systems [Clarification]

Removal of legacy components from the system involves two considerations:

- The component is removed from the user's perspective -- for example, slots, ports, and so on.
- The operating system doesn't detect the presence of the component.

  For example, "No FDC" means that the operating system does not detect the presence of the FDC and nothing uses the related restricted addresses.

  However, the physical internal part does not need to be removed -- for example, removal of the Super I/O chip is not required; however, the physical ports must not be present on the system or detected by the operating system.

A4.5.3 CD or DVD drive requirement [Clarification]

For legacy-free mobile PCs, form-factor/size issues may preclude providing a built-in CD or DVD drive. In such cases, the requirement to include a CD or DVD drive can be met by offering external CD/DVD products that the user can choose to purchase separately and that attach to the mobile PC, docking system, or port replicator through an interface that allows the CD or DVD drive to act as a boot device.

In addition, systems designed to exclude user access to removable media do not have to meet the requirement to include a CD or DVD device. However, all systems (including those that do not ship with a CD or DVD device) must still comply with the requirement for BIOS boot support.
FAQ date: September 1999

A4.5.4 Debug solutions for Non-Legacy PCs [Clarification]

See FAQ A1.5.16.

A4.R Legacy-Free PC System - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/system/

A5.0 Itanium-based System Requirements

This section describes additional requirements or exceptions to the requirements defined earlier in Section A1.0.
For desktop systems, all applicable requirements in A2.0 are included by reference.
For server systems, all applicable requirements in A6.0 are included by reference.

A5.1 Itanium-based System - Windows Compatibility

A5.1.1 Windows DDK: "64-Bit Issues"

[SYS-0058; SDG3:68]

A5.1.2 "Porting Your Driver to 64-Bit Windows" and other 64-bit implementation guidelines for Windows

http://www.microsoft.com/hwdev/64bitWindows/

A5.1.3 Windows Whistler Server, 64-bit Edition: Standard Error Record Format passed by the SAL to the operating system

All Error Records passed by the System Abstraction Layer (SAL) to the operating system for all fatal and corrected CPU and Platform Machine Check Architecture (MCA) Events must be, at a minimum, compliant with the Itanium Processor Family System Abstraction Layer Specification (SAL 3.0). The SAL must maintain the Error Records in non-volatile storage across system reboots and power cycles. See Appendix B, "Error Record Structures," in SAL 3.0 specification, dated January 2001.

A5.2 Itanium-based System - Industry Standards

A5.2.1 Advanced Configuration and Power Interface Specification, V. 2.0

[SYS-0002; SDG3:9]
http://www.teleport.com/~acpi/

A5.2.2 Extensible Firmware Interface Specifications

[SDG3:14]
http://developer.intel.com/technology/efi/download.htm

A5.2.3 EFI-related specifications and guidelines

http://www.microsoft.com/hwdev/efi/
Including:
*Microsoft Extensible Firmware Interface FAT32 File System
Specification*
Microsoft Extensible Firmware Interface Long File Name Specification
*Microsoft Portable Executable and Common Object File Format
Specification*

A5.2.4 Intel Itanium Processor Family System Abstraction Layer Specification (SAL 3.0)

http://developer.intel.com

A5.3 Itanium-based System - Quality

WHQL Test Specification References:
Chapter 2: EFI Test Specification;
Plus technology-specific test specifications

See A1.3.

A5.3.1 Pass Windows Logo Program testing for Itanium-based products

Product is submitted to the appropriate WHQL test program and passes all testing for the Windows Logo Program for hardware as described in detail in the WHQL Test Specification and the Microsoft Windows Hardware Compatibility Test Kit 10.0 documentation.

A5.4 Itanium-based System - Windows Experience

A5.4.1 Comply with ACPI 2.0

[SDG3:2.3]

To comply with this requirement, implement the ACPI 1.0b backward-compatible portion of ACPI 2.0, plus the 64-bit fixed tables. The fixed tables that must be supported include:

- RSDP Structure
- Extended System Description Table (XSDT)
- Fixed ACPI Description Table (FADT)
- Firmware ACPI Control Structure (FACS)
- Multiple APIC Description Table (MADT)

Itanium-based platforms must use the new Extensible Firmware Interface (EFI) GUID for the ACPI 2.0 RSDP Structure (see Section 5.2.4.2 in ACPI 2.0). The EFI GUID for the ACPI 2.0 RSDP Structure pointer is:

8868E871-E4F1-11d3-BC22-0080C73C8881

Future wakeup requirements for Itanium-based systems are defined at A5.R.1.

Note: Windows XP and Windows Whistler Server are not fully ACPI 2.0-compliant operating systems. The ACPI 2.0 Specification was written to be fully backward compatible with ACPI 1.0b.

A5.4.2 Comply with EFI 1.0, with support for USB boot devices, firmware update, and PXE_BC, SERIAL_IO, and SIMPLE_NETWORK protocols, plus *Hardware Design Guide* guidelines

[SDG3:14, SDG3:150.2]

See also: A1.1.4 - Support booting from CD or DVD device per El Torito v. 1.0 No Emulation mode.

A5.4.3 Provide serial port to use as debug port, using either 2F8h or 3F8h

[SDG3:15.2]

A5.4.4 Provide SAPIC support

[SDG3:25]

Implemented per Multiple APIC Description Table (MADT) (ACPI 2.0, Section 5.2.10.4).

A5.4.5 Provide 64-bit support in PCI subsystem

[SDG3:31, 32, 53]

See also:

- A1.1.4 Provide PCI interrupt routing information per ACPI 2.0 Section 6.2.8.
- B2.5.1.7 Adapters address full physical address space on a 64-bit platform; 32-bit PCI adapters used on the primary data path support the PCI DAC command, with the exception of 10/100 Ethernet devices.

A5.4.6 Provide correct device support, per Hardware Design Guide

[SDG3:Chapter 3]

A5.4.6.1 System does not include parallel port

[SDG3:71]

Note: 64-bit Windows does not provide native legacy parallel port support.

A5.4.6.2 Primary graphics adapter supports 800x600x256 color and complies with VESA timing standards

[SDG3:75]

A5.4.6.3 Server with no 8042 or other port 60h and port 64h based keyboard controller meets Hardware Design Guide requirements

[SDG3:27,28]

A5.4.7 Provide GPT-partitioned hard drive for boot

[SDG3:151-157]

A5.4.8 - A5.4.10 DELETED

A5.4.11 System includes 1 GB memory, minimum

[WL-2]

A5.4.12 System that provides headless server capabilities meets minimum requirements

[SDG3:19, 20, 21, 22, 13.4, 14.4; see also A6.4.5]

A5.5 Itanium-based System - FAQs

See http://www.microsoft.com/winlogo/hardware/system/.

A5.R Itanium-based System - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/system/.

A5.R.1 Server that supports S1-3 meets general Windows Logo Program power management requirements

[SDG3:10]

Note: 64-bit Windows (Professional and Server) does not currently support power management; power management may be added in a future operating system release.

A5.R.2 Future version of Windows Professional 64-bit Edition: Standard Error Record Format passed by the SAL to the operating system

All Error Records passed by the SAL to the operating system for all fatal and corrected, CPU and Platform MCA Events must be, at a minimum, compliant with SAL 3.0. The SAL must maintain the Error Records in non-volatile storage across system reboots and power cycles.

A6.0 Server System Requirements

This section describes additional requirements or exceptions to the requirements defined earlier in Section A1.0.

For Itanium-based server systems, all requirements in A5.0 are included by reference.

A6.0.1 System Exceptions and Notes for Servers

In addition to the requirements defined in A6.0, the following additional notes and exceptions are defined elsewhere in Appendix A:

- A1.4.2 Correct implementation of power management – for server systems, network adapters and other peripherals are not required to support wake from D3.
- A1.4.5 Servers and server components are *not* required to follow accessibility guidelines.
- A1.4.10 Servers do *not* have to provide "digital ready" audio.

A6.0.2 Device Exceptions and Notes for Servers

In addition to the requirements defined in A6.0, the following additional notes and exceptions are defined elsewhere in Appendix B:

- B6.1.4.10 Windows Whistler Advanced Server: Data modem supports digital connection to support host-side V.90 operation.
- B7.1.4.1 Windows Whistler Server:
    - Adapter supports filtering for at least 32 multicast addresses.
    - Adapter and driver support multicast promiscuous mode.
- B7.1.4.12 Windows Whistler Server: Additional adapter and driver support.
- B7.1.5.3 PCI adapters to support the PCI DAC.
- B10.4.4.5 Windows Whistler Server: SCSI and Fibre Channel hard drives implement complete identification strings.
- B10.4.4.4 Windows Whistler Server: Hot-swappable drive, if provided, includes a local disk drive replacement indicator.
- B10.7.4.3 Single-backup device meets minimum capacity requirements.
- B10.9 RAID requirements.
- B10.10 Fibre Channel requirements.

A6.1 Server System - Windows Compatibility

A6.1.1 SEE A1.1

A6.1.2 If legacy components have been removed, system includes correct FADT table entries and necessary ISR support for boot

[SDG3:27,28]

Legacy component include 8042 or 60h/64h keyboard controller. See also A4.1.1.

A6.2 Server System - Industry Standards

See A1.2.

A6.3 Server System - Quality

WHQL Test Specification References:
Chapter 22: Driver Quality Test Specification
Chapter 24: Cluster Test Specification
Chapter 27: WinSock Direct Test Specification
Chapter 29: Headless Test Specification
Chapter 30: Datacenter Server Test Specification
Plus technology-specific test specifications

See A1.3.

A6.3.1 SEE A6.4.1

A6.3.2 Product passes related Windows Logo Program testing

Product is submitted to the appropriate WHQL test program and passes all testing for the Windows Logo Program for hardware:

- **Windows Whistler Server and Advanced Server:** Pass tests in HCT 10.0 (or later), as described in detail in the WHQL Test Specification and the Microsoft Windows Hardware Compatibility Test Kit 10.0 documentation.
  See "Server Testing Overview" in the HCT documentation.

- **Windows 2000, Windows NT 4.0:** Pass tests in HCT 9.502, as described in the HCT documentation.

A6.4 Server System - Windows Experience

A6.4.1 Server supports additional requirements for PCI

[SDG3:32,39,48]

- Server that supports more than 4 GB of memory supports a 64-bit PCI bus architecture. [SDG3:32]
- All 66-MHz and 64-bit PCI buses in a server system comply with PCI 2.2 and other requirements. [SDG3:48]
- PCI devices do not use the <1 MB BAR type. [SDG3:39]

A6.4.2 Server includes USB controller with at least one USB port

[SDG3:56-61; see also B2.6.2]

With firmware, device, and driver support compliant with the USB specifications.

USB hubs, if used, must be self-powered.

A6.4.3 DELETED

A6.4.4 All memory visible to the operating system as system memory is cacheable; system memory includes ECC memory protection

[SDG3:7]

All system memory except for 4 MB must be completely available for the system to use at boot time and cannot be locked from use by the operating system.

Minimum system memory requirements for servers are defined in WL-2.

A6.4.5 System that provides headless server capabilities meets minimum requirements

[SDG3:19, 20, 21, 22, SDG3:13.4]

A6.4.6 Server system supports additional required devices and subsystem capabilities

[SDG3]

- Logo-compliant network adapter. [SDG3:77]
- Primary graphics adapter, if present on an x86-based system, supports 800x600x256 color and VESA timing standards. [SDG3:76]
  VGA-compatible devices must not use non-video I/O ports. [SDG3:41]

- CD or DVD drive or other method for installing the operating system and emergency repair support. [SDG3:184, 74]
- Parallel port design, if present on an x86-based system, provides sufficient space for connector assembly. [SDG3:207]

  No ECP support required for parallel ports on servers. [SDG3:72]
- **Windows Whistler Advanced Server:** System includes SCSI or Fibre Channel host controller and peripherals. [SDG3:161]
- **Windows Whistler Advanced Server:** System designed for deployment with MSCS clustering does not use ATA host controller or peripherals. [SDG3:175]

A6.4.7 Server system additional required capabilities

[SDG3:21x]

- Replacement of power supplies. [SDG3:213]
- Replacement of fans. [SDG3:214]
- Intelligent RAID controller with adequate storage capacity, supporting at least one of RAID 1, 5, or 1/0 (for servers designed for deployment with MSCS clustering). [SDG3:217, 218]
- Windows Whistler Advanced Server:
  - Local hot-swap power supply replacement indicators. [SDG3:215]
  - Support for multiple hard drives. [SDG3:216]
  - Protected forced dump switch or other mechanism for system diagnosis. [SDG3:222]
  - Alert indicators for occurrence of failure and imminent failure. [SDG3:223, 225]

A6.4.8 Server that supports Winsock Direct (WSD) connectivity meets requirements

[SDG3:67]

- Reliable transport through combination of WSD hardware and software.
- Hardware, software, and driver support to facilitate access via fast alternate paths.
- Hardware has page tables to translate user addresses to physical addresses.

A6.5 Server System - FAQs

See http://www.microsoft.com/winlogo/hardware/server/.

A6.R Server System - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/server/.

A6.R.1 InfiniBand fabric connections, fabrics, and devices, if present, meet requirements for device and driver support

[SDG3:55]

A6.R.2 Sever: Network adapter offloads TCP/IP checksum, IP Security encryption, and TCP message segmentation

[SDG3:91]

Server-side network adapters should support task-offload mechanisms to offload TCP/IP checksum calculation, IP Security encryption, and TCP message segmentation to intelligent hardware.

Appendix B - Device Requirements Checklist

This appendix presents the detailed checklist of requirements in support of the Windows Logo Program requirement WL-4: "All components and devices meet Windows compatibility and quality design guidelines."

The current versions of these requirements are provided on http://www.microsoft.com/winlogo/hardware/

Note that testing for all Windows versions must also include logs for Windows XP/Windows Whistler Server, even if the specific "Designed for Windows" you are seeking does not target Windows XP or Windows Whistler Server.

Requirements apply for all of the following tested operating systems unless otherwise indicated:

> Windows XP Home Edition (32-bit)
> Windows XP Professional (64-bit and 32-bit)
> Windows Whistler Server (64-bit and 32-bit)
> Windows 2000 Server and Professional (32-bit)
> Windows Millennium Edition
> Windows 98 Second Edition

See also:

- Conventions Used in This Document
- How to Use the Appendixes

B1.0 General Device and Driver Quality

All devices must comply with these general requirements for device and driver compatibility and quality.

B1.1 General Device/Driver - Windows Compatibility

B1.1.1 Device drivers comply with Windows DDK requirements

Including DDKs for Windows XP, Windows 2000, Windows Me, and Windows 98.

Third-party applications implemented as defined in the Microsoft Platform SDK.

B1.1.2 OnNow and ACPI compatibility and implementation notes

http://www.microsoft.com/hwdev/onnow/

B1.1.3 WDM driver implementation notes (for device classes supported under WDM)

http://www.microsoft.com/hwdev/wdm/

B1.2 General Device/Driver - Industry Standards

B1.2.1 Advanced Configuration and Power Interface Specification (ACPI)

http://www.teleport.com/~acpi/tech.htm

B1.2.2 Device Class Power Management Reference Specifications

http://www.microsoft.com/hwdev/specs/Pmref/

B1.2.3 Plug and Play specifications

[SYS-0026; SDG3:16]
http://www.microsoft.com/hwdev/respec/pnpspecs.htm
Legacy Plug and Play Guidelines

B1.2.4 Each device or connection meets requirements for its bus class

See B2.0.

B1.3 General Device/Driver - Quality

WHQL Test Specification References:
Chapter 1, Introduction to HCT Test Specifications
Chapter 3: ACPI Test Specification
Chapter 22: Driver Quality Test Specification
Plus technology-specific test specifications

B1.3.1 Hardware and its drivers pass Windows Logo Program testing

All hardware and associated drivers must be submitted to the appropriate WHQL test program and passes all testing for the Windows Logo Program for hardware:

- **Windows XP:** Pass tests in HCT 10.0 (or later), as described in detail in the WHQL Test Specification and the Microsoft Windows Hardware Compatibility Test Kit 10.0 documentation.
- **Windows Me:** Pass tests in HCT 9.6, as described in the HCT documentation.
- **Windows 2000, Windows 98, Windows NT 4.0:** Pass tests in HCT 9.502, as described in the HCT documentation.

B1.3.2 Windows XP/Windows 2000: Vendor-supplied drivers pass Driver Verifier test

B1.3.3 Device driver installs via an INF; tested via INFCatReady.exe

Windows XP/Windows 2000: "Creating an INF File" in the Windows DDK.

Windows 98/Me: "Installers, Device Manager, and Control Panel" in the Windows Me DDK.

B1.3.4 Vendor-supplied drivers have digital signatures

Requirements for digital signatures are defined at http://www.microsoft.com/hwdev/desinit/digitsign.htm.

WHQL guidelines and processes for digital signatures are defined at http://www.microsoft.com/hwtest/signatures/.

B1.4 General Device/Driver - Windows Experience

Design Guideline References:
PC 2001 System Design Guide - Chapter 3, "PC System" -
Hardware Design Guide 3.0 for Windows 2000 Server, Chapter 2 -

B1.4.1 Device can be enumerated and automatically disabled

[SYS-0027, SYS-0029.3; SDG3:17]

Device ID is present, device is properly enumerated, and correct driver is found; device can be disabled automatically by Windows. (see additional notes in specific device-class requirements).

B1.4.2 Software does not replace or bypass system components

[SYS-0025; SDG3:68]

Driver or software installation must not replace any Microsoft-authored operating system components, and the driver must not bypass any operating system components.

Windows XP: Notice that each Windows XP/Windows Whistler Server product has a unique set of files protected under system file protection; for information about operating system files protected in Windows XP, see **SfcGetNextProtectedFile** and **SfcIsFileProtected** APIs in the Microsoft Platform SDK.

If the manufacturer's INF copies any files supplied by the operating system, those files must be copied from the Windows product disk (or preinstalled source files), unless the component is a licensed, redistributable component.

Driver must not use initialization files (INI) for configuration settings.

B1.4.3 Installing and loading the driver does not reduce or eliminate functionality of other devices installed on the system

[SYS-0025.1; SDG3:68]

B1.4.4 Device is functional without restarting the system

[SYS-0029.1]

Device installation does not cause the system to stop running or reboot (unless reboot is required by the operating system) without user interaction.

B1.4.5 Device and driver comply with ACPI and power management specifications

[SYS-0002; SDG3:10]

Device and driver comply with ACPI specification, Default Device Class Power Management Reference Specification, and other relevant device class power management specification
(see additional notes in specific device-class requirements).

- **Windows 2000/Windows Me:** Graphics adapter and all other devices correctly implement D3 state such that the operating system can correctly hibernate and resume from all sleep states supported on the system.
- Any PCI devices that support wakeup capabilities correctly support wake from D3cold.
  Network adapters installed in mobile PCs, servers, and other special cases are not required to support wakeup, see B7.1.4.4 for details.
- **Windows XP client:** Uniprocessor desktops that run Windows XP are required to support S3; therefore, every device must be tested on an S3-compliant system to verify that the device allows the system to successfully enter and resume from the S3 sleep state.
  The device must be fully functional upon resume from S3.

B1.4.6 Driver supports unattended installation

[WL-4; SDG3:68.5]

It must be possible to install the driver using a script or special software for supplying required parameters without the user being present during driver installation.

B1.4.7 Windows Help file is provided if special driver parameters are used

[WL-4; SDG3:68.6]

B1.4.8 Hardware management instrumentation, if implemented, is provided per WHIIG

[BIOS-0014.3; SDG3:229]
http://www.pcdesguide.org/whiig.htm

B1.4.9 Device has an icon on any external connectors

[WL-7]

Color-coding is not required. [see FAQ A1.5.9]

B1.4.10 Any supporting software included with the device is installed using Windows-based installation methods, without any manual steps or file editing

All software used for installing device support or that runs with the device must be 32-bit or 64-bit Windows-based applications; no console applications (16-bit or 32-bit) are allowed.
[see FAQ B1.5.2]

B1.4.11 Software installed as part of device driver installation can be removed using Windows-based software

[SYS-0025.6; SDG3:68.4]

At a minimum, any "virtual drivers" and software components (such as control panel applets) installed with the driver must be capable of being removed.

B1.5 General Device/Driver - FAQs

B1.5.1 Current general FAQ

See http://www.microsoft.com/winlogo/hardware/general/.

B1.5.2 Windows 98/Me: Display Class and Other 16-bit Windows Software [Clarification]

A 16-bit Windows device driver or application must not load Setupx.dll every time the driver is loaded. Besides wasting memory, this exposes a problem when another application calls Setupx.dll, causing an invalid temp folder to be returned and prompting the user for an installation location. Testing at Microsoft has revealed this problem with display adapter drivers, some modem drivers, and some applications installed with drivers, such as status utilities that appear in the System Tray.

For Windows 98/Me, see "Graphics Device Interface" in the Windows Me DDK documentation for information about implementing driver setup functions in a separate installer to be used only during installation, instead of containing setup functions in the driver itself.

This clarification is related to the Windows Logo Program requirement that installation and loading of a driver must not interfere with other components on the system. As of July 1, 2000, this is part of Windows Logo Program compliance testing.
FAQ date: December 22, 1999

B1.R General Device/Driver Quality - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/general/.

B1.R.1 Applications meet "Designed for Windows XP Application Specification" requirements

If a retail device product included any additional standalone software that was not tested with the device submission (for example, a printer that ships with a paint program), that software must meet the requirements for either the "Designed for Windows" Application Logo at http://www.microsoft.com/winlogo/software/ or the "Certified for Windows" logo at http://www.msdn.microsoft.com/certification if the product packaging is to display the "Designed for Windows" logo.

B2.0 Bus/Device Controllers

B2.1 CardBus/PCMCIA Controllers and Devices

All general requirements in B1.0 are included by reference.

B2.1.1 CardBus/PCMCIA Controllers and Devices - Windows Compatibility

B2.1.1.1 Windows XP/Windows 2000: : "PCMCIA_INTERFACE_STANDARD Interface Memory Card Routines" in the Windows DDK

B2.1.1.2 Windows 98/Me: "PCMCIA Device Drivers" in the Windows Me DDK

B2.1.1.3 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/cardbus/
"Design Guidelines for PC Card and CardBus" at
http://www.pcdesguide.org/library/pccard.htm or in *PC 2001 System Design Guide*).

B2.1.1.4 CardBus Host Controllers and Windows Compatibility

http://www.microsoft.com/hwdev/busbios/CARDBUS1.HTM

B2.1.1.5 PC Card Voltage Requirements for Windows Operating Systems

http://www.microsoft.com/hwdev/cardbus/pccardvlt.htm
(implementing R2 version cards to use only 3.3 V)

B2.1.1.6 Windows XP/Windows 2000: Legacy PCI Interrupt Routing and CardBus in Windows 2000

http://www.microsoft.com/hwdev/cardbus/Spir.htm

B2.1.1.7 Windows 98/Me: Explanation of CardBus Registry Entries in Pcmcia.inf

http://support.microsoft.com/support/kb/articles/q201/0/18.asp

B2.1.2 CardBus/PCMCIA Controllers and Devices - Industry Standards

B2.1.2.1 PC Card Controller Device Class Power Management Reference Specification, V. 2.0

[PCCard-17; SYS-0024; SDG3:148]
http://www.microsoft.com/HWDev/specs/PMref/PMcard.htm

B2.1.2.2 PC Card Standard Guidelines

[PCCard-1, 14; SYS-0024; SDG3:148]
http://www.pc-card.com/bookstore.htm

B2.1.2.3 PCI Bus Power Management Interface Specification for PCI-to-CardBus Bridges

[PCCard-19; SYS-0024; SDG3:148; see also FAQ B2.1.5.3]

Provided in Volume 11, PC Card Standard, Release 7, http://www.pcmcia.org/bookstore.htm.

B2.1.2.4 PCI to PCMCIA CardBus Bridge Register Description

http://www.pc-card.com/bookstore.htm

B2.1.3 CardBus/PCMCIA Controllers and Devices - Quality

WHQL Test Specification References:
Chapter 14: PC Card Test Specification

B2.1.3.1 Pass WHQL tests

See B1.3.

Windows XP: See "CardBus/PCMCIA Controllers" and device-specific topics in the HCT documentation.

B2.1.4 CardBus/PCMCIA Controllers and Devices - Windows Experience

Design Guideline References:
Design Guidelines for PC Card and CardBus

B2.1.4.1 Controller complies with industry standards and Windows-compatible configuration

[PCCard-x; SYS-0024]

- Exchangeable Card Architecture register set. [PCCard-3; SYS-0024]
- CardBus bridges. [PCCard-7; SYS-0024; see also FAQ B2.1.5.4]
- ISA and PCI interrupts. [PCCard-6; SYS-0024; see FAQ B2.1.5.2]
- Writeable PCI Configuration Space bits are not shared. [PCCard-9; SYS-0024]
- Each 16-bit PC Card memory window has it own page register. [PCCard-10; SYS-0024]

B2.1.4.2 CardBus cards are configured correctly

[PCCard-14-16; SYS-0024]

B2.1.4.3 16-bit PC Cards are configured correctly; driver supports sharing of level-mode interrupts

[PCCard-11-13, PCCard-18; [PCCard-23; SYS-0024]

B2.1.4.4 No user intervention; no system restart occurs when installing devices, except when required by the operating system

[PCCard-20, 21; SYS-0024]

B2.1.4.5 ZV-compatible 16-bit PC Cards comply with ZV standard definitions, and driver uses DirectDraw VPE

[PCCard-2, PCCard-22; SYS-0024]

B2.1.4.6 CardBus controller designed to support wake-from-D3cold supports PME# assertion from D3cold, and socket supplies Vaux power to cards in D3cold state

[SYS-0024; see FAQ B2.1.5.3]

B2.1.5 CardBus/PCMCIA Controllers and Devices - FAQs

B2.1.5.1 Current PC Card/CardBus FAQs

See http://www.microsoft.com/winlogo/hardware/cardbus/.

B2.1.5.2 CardBus controllers support ISA and PCI interrupts [Clarification]

[PCCard-6; SYS-0024; SDG3:148]

To ensure that the Windows operating system can correctly assign ISA IRQs to 16-bit PC Cards, A CardBus controller with parallel ISA IRQ mode must have all ISA IRQs pins, except IRQ 0 (timer), 1 (keyboard), 6 (floppy), 8 (CMOS), and 13 (math coprocessor).

It is recommended that system vendors using parallel ISA IRQ mode always connect ISA IRQs 3, 4, 5, 7, 9, 10, 11, 12, 14, 15 and not cross wire them.

For vendors using serialized IRQ mode, the above is not relevant because they only need to connect the serial IRQ pin, and the ISA IRQ information will be sent to the PCI chip set serially; the ISA IRQ information can specify any of IRQ 0-15.

FAQ date: May 28, 1999

B2.1.5.3 Windows 2000: CardBus controllers and PCI bus power management [Clarification]

[PCCard-19; SYS-0024; SDG3:148]

CardBus cards (which are by definition PCI devices) must comply with *PCI Bus Power Management Interface Specification, Revision 1.1* or later, in order for power management to be implemented properly under Windows XP/Windows 2000, which uses PME# as the wake-up signal. This is the only industry specification that ensures compatibility with the power management capabilities of Windows XP/Windows 2000.

FAQ date: October 7, 1998

B2.1.5.4 PC Card Bridge header types [Correction]

[PCCard-3; SYS-0024]

PC Card and CardBus Guidelines, Version 1.1, is incorrect; it should also list header type 02h in addition to type 82h, which is listed as an acceptable header type for CardBus bridges.

FAQ date: February 28, 2001

B2.1.R CardBus/PCMCIA Controllers and Devices - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/cardbus/.

B2.2 IEEE 1394 Controllers and Devices

All general requirements in B1.0 are included by reference.

B2.2.1 1394 Controllers/Devices - Windows Compatibility

B2.2.1.1 WDM support for devices that use the IEEE 1394 bus

"IEEE 1394 Structures" in the Windows DDK.

B2.2.1.2 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/1394/

B2.2.1.3 Plug and Play Specification for IEEE 1394

[1394-0096]
http://www.microsoft.com/hwdev/respec/pnpspecs.htm#1394

B2.2.1.4 IEEE 1394 Support in Windows 98 and Windows XP/Windows 2000

http://www.microsoft.com/hwdev/busbios/1394support.htm

B2.2.2 1394 Controllers/Devices - Industry Standards

B2.2.2.1 Windows 98/Me/Windows XP: 1394 Open Host Controller Interface Specification, Revision 1.0

[1394-0091; SDG3:159]
ftp://ftp.austin.ibm.com/pub/chrptech/1394ohci/ohcir100.pd

B2.2.2.2 1394 Trade Association Power Specification, Part 1: Cable Power Distribution; 1394 Trade Association Power Specification, Part 3: Power State Management

[1394-0102, 0103; see also FAQ B2.2.5.2]
ftp://ftp.p1394pm.org/pub/p1394pm/

B2.2.2.3 IEEE 1394 Standards

[1394-0090]

- IEEE 1394-1995 or later standards, and IEEE 1394a.
- IEEE 1212-1991 and function discovery in IEEE 1212r
  Global Engineering Documents at http://global.ihs.com/.

B2.2.2.4 IEEE 1394 devices comply with appropriate industry-recognized transport and command standards

[1394-0094; 1394-0100]

- IEC 61883 Parts 1-6, including CIP (common isochronous packet) headers, CMP (connection management protocol), and FCP (function control protocol).

- 1394TA AV/C 3.0 and the AV/C subunit family of specifications, including AV/C Digital Interface Command Set VCR Subunit Specification, V. 2.0.1.

- National Committee for Information Technology Standards (NCITS) Serial Bus Protocol (SBP-2) transport protocols (ANSI NCITS 3.25-1998 [SBP-2).]

- National Committee for Information Technology Standards (NCITS) T10, Reduced Block Commands (RBC).

- National Committee for Information Technology Standards (NCITS) T10 Multimedia Command Set 2 (MMC-2).

- Storage class devices must conform to the ANSI standards for SBP-2 with the appropriate command set: RBC or MMC-2.

- Printing devices using the SBP-2 protocol must conform to the guidelines set in "SBP-2 Support and Windows 2000," available at http://www.microsoft.com/hwdev/print/sbp2_w2000.htm.

B2.2.3 1394 Controllers/Devices - Quality

WHQL Test Specification References:
Chapter 19: IEEE 1394 Test Specification

B2.2.3.1 Pass WHQL tests

See B1.3.

Specifically see "IEEE 1394 Controllers" and device-specific topics in the HCT documentation.

B2.2.4 1394 Controllers/Devices - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 6, "Buses and Interfaces"

B2.2.4.1 Windows 98/Me: Open HCI controllers and devices support advances defined in IEEE 1394a-1999

[1394-0095]

Including peak data rate requirements for Open Host Controller Interface.

B2.2.4.2 Device configuration ROM is correctly implemented

[1394-0098]

B2.2.4.3 Devices demonstrate interoperability with other devices

[1394-0096]

B2.2.4.4 Devices that initiate peer-to-peer communications support remote programming

[1394-0097]

B2.2.4.5 Devices use approved IEEE 1394 connectors and cables

[1394-0093]

B2.2.4.6 Self-powered devices propagate the power bus through each connector

[1394-0103]

B2.2.4.7 Vendor and model leafs support textual descriptor leaf format

[1394-0101]

B2.2.4.8 DELETED

B2.2.4.9 IEEE 1394-enabled system provides cable power source compliant with IEEE 1394a-1999

[1394-0090; see also FAQ B2.2.5.2]

B2.2.4.10 Support remote programming through a remote control interface

[1394-0097]

B2.2.4.11 A system with externally accessible sockets provides a method for connecting to devices that only support IEEE 1394-1995 or IEEE 1394a-2000

[1394-0093]

There must not be a mixture of IEEE 1394-like media socket types on the back panel.

B2.2.4.12 Descriptors are required for Vendor_ID and Model_ID entries in the Configuration Status Register (CSR) space

[1394-0101]

B2.2.5 1394 Controllers/Devices - FAQs

B2.2.5.1 Current IEEE 1394 FAQs

See http://www.microsoft.com/winlogo/hardware/1394/.

B2.2.5.2 Power management requirements [Logo clarification]

[1394-0090]

Devices and controllers are not required to comply with 1394 Trade Association Power Specification, Part 3: Power State Management. This standard version is required with the release of a future operating system.
FAQ date: May 28, 1999

B2.2.5.3 DELETED

FAQ Date: January 31, 2001

B2.2.R 1394 Controllers/Devices - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/1394/.

B2.2.R.1 Open HCI 1.1

http://www.microsoft.com/hwdev/1394/

B2.2.R.2 OHCI 1.1; host controller's PHY supports data rates of S100 Mb/s, S200 Mb/s and S400 Mb/s

[1394-0091-0092]

As specified in IEEE 1394-1995 and IEEE 1394a-2000.

B2.2.R.3:Networking adapters must support Remote NDIS over SBP-2

[NET-0288; SDG3:88]

B2.3 Infrared/Wireless

All general requirements in B1.0 are included by reference.

B2.3.1 Infrared/Wireless - Windows Compatibility

B2.3.1.1 Windows XP/Windows 2000, Windows 98/Me: "IrDA Miniport NIC Drivers" and "Wireless WAN Objects" in the Windows DDK

[INPT-0146; SDG3:141]

B2.3.1.2 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/infrared/

B2.3.1.3 Windows XP/Windows 2000: IrDA Plug and Play Issues and Windows 2000

http://www.microsoft.com/hwdev/infrared/IrDAPnP.htm

B2.3.1.4 Windows XP/Windows 2000: IrTran-P, IrLPT, and IrDA Networking Support under Windows 2000

http://www.microsoft.com/hwdev/infrared/IrCOMM.htm

B2.3.2 Infrared/Wireless - Industry Standards

B2.3.2.1 IrDA documents - Serial Infrared Physical Layer Specification; Control IR Specification

[INPT-0147; SDG3:141]
http://www.irda.org/

B2.3.3 Infrared/Wireless - Quality

WHQL Test Specification References:
Chapter 22: Driver Quality Test Specification
Plus technology-specific test specifications

B2.3.3.1 Pass WHQL tests

See B1.3.

Windows XP: See "Bluetooth Controllers," "Infrared (IrDA) Controllers," and device-specific topics in the HCT documentation.

B2.3.4 Infrared/Wireless - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 7, "Input Devices"

B2.3.4.1 Infrared (IR) device meets USB class specification for interfacing with IrDA Data and IrDA Control devices

[USB-0081; SDG3:145]

See also IrDA Bridge Device Definition, 1.0 at http://www.usb.org/developers.

B2.3.4.2 System supports standard input speeds of 4 Mb/s

[INPT-0148]

B2.3.4.3 System provides a separate, physically-isolated transceiver for each IR protocol supported

[INPT-0149]

B2.3.4.4 Windows XP: Mobile PC IR devices, if implemented, support D0 and D3 states

[MOBL-0152]

Mobile PC Note: As defined in Section 3.4 of ACPI 1.0b.

B2.3.4.5 Windows XP: Bluetooth wireless host controllers (radios with HCI) meet requirements

[BTH-0396, 0397]

- Support Plug and Play on the applicable bus (for example, USB).
- Support the Bluetooth H:1 specification for host controllers, including the mechanism for reporting the version supported.
- Support the bus-specific transport class extensions (for example, H:2-H:4) where applicable.

See FAQ B2.3.5.1

B2.3.4.6 Windows XP: Bluetooth-connected peripherals meet requirements

[BTH-0398, 0399; see also FAQ B2.3.5.1]

- Meet all device class-specific Windows Logo requirements (for example, Section B3.0 for audio, Section B5.1 for HID, Section B6.1 for modem, and so on).
- Comply with all applicable Bluetooth specifications, including design-applicable usage profiles.
- Support Bluetooth Simple Discovery Protocol (SDP) and the PnPInformation Service Class.

See FAQ B2.3.5.1

B2.3.5 Infrared/Wireless - FAQs

See http://www.microsoft.com/winlogo/hardware/wireless/.

B2.3.5.1 For systems that include Bluetooth, support Version 1.1 [Clarification]

After October 1, 2001, systems including Bluetooth host controllers, radios, or peripherals must comply with Specification of the Bluetooth System, Version 1.1.

The driver and firmware requirements in B2.3.4.5.and B2.3.4.6 will not be enforced until three months after release of the Microsoft's standard Version 1.1 Bluetooth stack. After this three-month transition period, Bluetooth driver submissions must use the standard Microsoft Version 1.1 stack.
FAQ date: May 08, 2001

B2.3.R Infrared/Wireless - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/wireless/.

B2.4 Parallel/Serial Devices

All general requirements in B1.0 are included by reference.

B2.4.1 Parallel/Serial Devices - Windows Compatibility

B2.4.1.1 Windows XP/Windows 2000: "Serial Port Devices" and Parallel Port Devices" in the Windows DDK

Windows 98/Me: "Virtual Communications Device Drivers" in the Windows Me DDK.

B2.4.1.2 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/comm/

B2.4.1.3 Windows XP/Windows 2000: Enumerating Serial Devices in Windows 2000

http://www.microsoft.com/hwdev/desinit/serddvr.htm

B2.4.1.4 Windows 98/Me: VCOMM Port Driver Power Management Interface

http://www.microsoft.com/hwdev/devdes/vcomm.htm

B2.4.2 Parallel/Serial Devices - Industry Standards

B2.4.2.1 Standard Signaling Method for a Bi-directional Parallel Peripheral Interface for Personal Computers (IEEE 1284 specification)

Global Engineering Documents at http://global.ihs.com/

B2.4.3 Parallel/Serial Devices - Quality

WHQL Test Specification References:
Chapter 1: Introduction to HCT Test Specifications

B2.4.3.1 Pass WHQL tests

See B1.3.

Windows XP: See the "Motherboard" topic in the HCT documentation.

B2.4.4 Parallel/Serial Devices - Windows Experience

Design Guideline References:
Legacy Plug and Play Guidelines

B2.4.4.1 Plug and Play capabilities and operating system compatibility

Implemented as defined in *Legacy Plug and Play Guidelines*

Note: The following summarizes these legacy requirements, based on *Legacy Plug and Play Guidelines*:

- Serial port meets device class specifications for its bus.
- Legacy serial port is implemented as 16550A UART or equivalent and supports 115.2K baud.
- Legacy serial port supports dynamic resource configuration.
- Conflict resolution for legacy serial port ensures availability of at least one serial port.
- Parallel port meets device class specifications for its bus.
- Flexible resource configuration supported for each parallel port.
- EPP support does not use restricted I/O addresses.
- Compatibility, nibble mode, and extended capabilities port (ECP) protocols meet IEEE 1284-1994 specifications.
- Port connectors meet IEEE 1284-I specifications, at minimum.
- IEEE 1284 peripherals have Plug and Play device IDs.
- Device identification string provides a Compatible ID key.
- Daisy-chained parallel port device is Plug and Play capable.

B2.4.5 Parallel/Serial Devices - FAQs

See http://www.microsoft.com/winlogo/hardware/comm/.

B2.4.R Parallel/Serial Devices - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/comm/.

B2.5 PCI Controllers and Devices

All general requirements in B1.0 are included by reference.

B2.5.1 PCI Controllers/Devices - Windows Compatibility

B2.5.1.1 Driver device class support in related DDKs

Bus driver support is built in to Windows; see device class-specific entries in the Windows DDK and Windows Me DDK.

B2.5.1.2 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/pci/

B2.5.1.3 PCI Device Subsystem IDs and Windows

http://www.microsoft.com/hwdev/devdes/pciids.htm

B2.5.1.4 Compatibility Testing for Hot-Plugging Support for PCI Devices

http://www.microsoft.com/hwdev/pci/hotplugpci.htm

B2.5.1.5 PCI Subsystem IDs and PCI-to-PCI bridge devices

http://www.microsoft.com/hwdev/pci/pcibridge.htm

B2.5.1.6 Windows XP/Windows 2000 PCI support

PCI IRQ Routing on a Multiprocessor ACPI System at
http://www.microsoft.com/hwdev/onnow/ACPI-MP.htm

B2.5.1.7 Correct PCI implementations

[PCI-012x; SDG3:4x]

- Device IDs include PCI Subsystem IDs. [PCI-0126; SDG3:45; see also FAQs A1.5.13, B2.5.5.3, B2.5.5.4]
- System does not contain ghost devices. [PCI-0123; SDG3:36]
- System uses standard method to close base address register (BAR) windows on nonsubtractive decode PCI bridges. [PCI-0124; SDG3:38]
- Bus master privileges are supported for all connectors. [PCI-0123; SDG3:42]
- Functions in a multifunction PCI device do not share writable PCI Configuration Space bit. [PCI-0123; SDG3:43]
- PCI devices complete memory write transaction within specified times. [PCI-0125; SDG3:49]
- Configuration Space is correctly populated. [PCI-0126; SDG3:44]
- Interrupt routing is supported using ACPI. [PCI-0127; SDG3:46]
- PCI-to-PCI bridges comply with PCI to PCI Bridge Specification 1.1. [PCI-0124; SDG3:37]
  See "Configuring PCI-PCI Bridges on Windows 2000 and Windows XP" at http://www.microsoft.com/hwdev/pci/.
- Adapters address full physical address space on a 64-bit platform; 32-bit PCI adapters used on the primary data path support the PCI DAC command, with the exception of 10/100 Ethernet devices.

See "Large Memory Enabled Device Driver Hardware and Software Requirements" in the Windows DDK. Design guidelines are summarized at http://www.microsoft.com/hwdev/newPC/PAEdrv.htm [see FAQ B2.5.5.2]

- Bus designs implement all bus requirements on expansion card connectors. [PCI-0123]
- PCI devices decode only resources found in the Devices BAR. [SDG3:40]

B2.5.2 PCI Controllers/Devices - Industry Standards

B2.5.2.1 PCI Bus Power Management Interface Specification, Revision 1.1 or later

[PCI-0130; SDG3:37; see also FAQ B2.5.5.5]

B2.5.2.2 PCI Bus Power Management Interface Specification for PCI-to-CardBus Bridges

[PCCard-19; SYS-0024]

Note: Support of the CSTSCHG interrupt line is required only for devices that support wakeup events as defined in the PC Card standard.

Provided in Volume 11, PC Card Standard, Release 7, http://www.pcmcia.org/bookstore.htm.

B2.5.2.3 PCI Local Bus Specification, Revision 2.2 (PCI 2.2) or later

[PCI-0123; SDG3:33]

B2.5.2.4 PCI to PCI Bridge Specification, Revision 1.1

[PCI-0124; SDG3:37]
http://www.pcisig.com/developers/specification/

B2.5.2.5 PCI-X Specification, Revision 1.0

[SDG3:54]
http://www.pcisig.com/data/news/1999/pci-x_v10.pdf

B2.5.2.6 Mini PCI Specification, Revision 1.0

http://www.pcisig.com/developers/specification/

B2.5.2.7 PCI Hot-Plug Specification, Revision 1.0

http://www.pcisig.com/developers/specification/

B2.5.3 PCI Controllers/Devices - Quality

WHQL Test Specification References:
Chapter 4: PCI Test Specification

B2.5.3.1 Pass WHQL tests

See B1.3.

Windows XP: Search for "PCI" to identify system-specific and device-specific topics in the HCT documentation.

B2.5.3.2 SEE B2.5.1.7

B2.5.4 PCI Controllers/Devices - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 6, "Buses and Interfaces"
Hardware Design Guide 3.0 for Windows 2000 Server, Chapter 2

B2.5.4.1 Power management supported as defined in PCI Bus Power Management Interface Specification, Rev. 1.1 (PCI-PM)

[PCI-0123; SDG3:28]

- System provides 3.3 V to all PCI connectors. [PCI-0123; SDG3:33)

  System supports 3.3 Vaux if a system supports S3 or S4 states for integrated devices that support waking the system and all PCI slots including MiniPCI. [PCI-0131; SDG3:51; see FAQ B2.5.5.5 and B2.5.5.6]

- PCI add-on cards that use 3.3 Vaux operate correctly, using a method such as the one described in Section 7.4.4 of PCI-PM 1.1. [PCI-0130.2]

- Bus power states are correctly implemented. [PCI-0130; SDG3:50]

- Local area network (LAN) and modem devices support wake-up per PCI-PM 1.1. [PCI-0132; SDG3:89]

  See FAQ B2.5.5.
  See also "PCI Power Management and Device Drivers" at http://www.microsoft.com/hwdev/desinit/pcipm.htm.

B2.5.4.2 DELETED

B2.5.4.3 Mini PCI devices support PCI 2.2, PCI-PM 1.1, and Mini PCI 1.0 specifications, and all other Logo requirements for PCI devices

B2.5.4.4 Hot-Plug PCI supported via compatible driver solutions or ACPI

[SDG3:47]

"Compatibility Testing for Hot-Plugging Support for PCI Devices" at http://www.microsoft.com/hwdev/pci/hotplugpci.htm.

"Hot-Plug PCI and Windows Operating Systems" at http://www.microsoft.com/hwdev/pci/hotplugpci.htm.

B2.5.4.5 BIOS does not configure I/O systems to share PCI interrupts when APIC is activated

[BIOS-0016]

When an I/O APIC is enabled in the platform, the BIOS must configure the I/O systems such that non-PCI interrupts are not shared with PCI interrupts. At least four of the separate interrupt inputs in the I/O APIC must be dedicated to support PCI interrupts. The system layout and BIOS must minimize sharing of the PCI interrupts.

Mobile PC Note: In mobile systems, the BIOS can configure the I/O system to share PCI interrupts.

B2.5.5 PCI Controllers/Devices - FAQs

B2.5.5.1 Current PCI-related FAQs

See http://www.microsoft.com/winlogo/hardware/pci/.

B2.5.5.2 DAC requirement [Clarification]

[SDG3:30-32]

Requirements for PCI adapters to support the PCI DAC command are defined in A1.1.6. See "Large Memory Enabled Device Driver Hardware and Software Requirements" in the Windows DDK. Design guidelines are summarized at http://www.microsoft.com/hwdev/newPC/PAEdrv.htm.

B2.5.5.3 AMR/MR PCI IDs [Clarification]

[PCI-0126]

AMR devices and MR devices on the system board are *not* exempt from the requirement for SID and SVID.
May 28, 1999

B2.5.5.4 Control Method for PCI IDs [Logo Program Clarification]

[PCI-0126; SDG3:30, 31]

PC 99 System Design Guide erroneously cited _PS0 as the control method to use. However, _PS0 moves a device from D*x* to D0. (The parent PCI bus is at issue in this case; thus, it is actually B*x* to B0.) The problem is that a bus must be powered on before it can be assigned a bus number. Therefore, _PS0 must be run before a bus number is guaranteed to exist. However, if power hasn't been cut to the bus, or if the bus has not been reset, there will be a bus number remaining from before the bus was placed in the B*x* state. This is why _PS0 seems to work in some systems. _REG runs immediately after Windows assigns the bus number and immediately before the PCI driver scans the bus for children. That is what makes _REG the appropriate vehicle for making the children coherent.

After the operating system has control of the system, the SVID and SID registers must not be directly writable—that is, implementations that write these registers before the operating system takes control must disable writing to the SVID and SID registers after the registers have been set and before Windows assumes control of the system. For details, see http://www.microsoft.com/hwdev/devdes/pciids.htm.
FAQ Date: August 26,1999

B2.5.5.5 PCI-PM 1.1 and PME# [Logo Program Clarification9]

[PCI-0130; PCI-0131; SDG3:50]

▪ **Device requirements:** *PCI Bus Power Management Interface Specification, Revision 1.1* or later, is the only industry specification that ensures compatibility with the power management capabilities of Windows XP/Windows 2000, which uses PME# as the wake-up signal.
FAQ Date: May 6, 1999; December 22, 1999

▪ **Bus and bridge requirements:** Requirements for supporting PCI-PM 1.1 and for correctly supporting 3.3 Vaux are defined at B2.5.4.

B2.5.5.6 3.3 Vaux power requirement [Clarification]

See the clarification on the PCI specification, "9.18 - 3.3 Vaux power delivery/consumption requirements FAQ," published by the PCI Special Interest Group (PCI SIG) at http://developer.intel.com/technology/iapc/pc99vqa.htm.
FAQ Date: March 19, 1999

B2.5.R PCI Controllers/Devices - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/pci/.

B2.6 USB Controllers and Devices

All general requirements in B1.0 are included by reference.

Note that related BIOS and system-level requirements are included with the Windows Logo Program requirements for systems, as defined in Appendix A.

B2.6.1 USB Controllers/Devices - Windows Compatibility

B2.6.1.1 WDM support for devices that use the USB bus: "Supporting USB Devices" in the Windows DDK

B2.6.1.2 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/usb/

B2.6.1.3 USB Plug and Play IDs and Selecting Device Drivers to Load

http://www.microsoft.com/hwdev/busbios/usbpnp.htm

B2.6.2 USB Controllers/Devices - Industry Standards

B2.6.2.1 OpenHCI: Open Host Controller Interface Specification for USB, Release 1.0a

[USB-0081]
http://www.microsoft.com/hwdev/respec/busspecs.htm
Universal HCI specification is also accepted.

B2.6.2.2 USB class specifications

[USB-0088; SDG3:60]
http://www.usb.org/developers/devclass.html

B2.6.2.3 USB 1.1 Specification (or later)

[USB-0081; SDG3:57]
http://www.usb.org/developers/docs.html

B2.6.3 USB Controllers/Devices - Quality

WHQL Test Specification References:
Chapter 9: USB Test Specification

See B1.3.

B2.6.3.1 Pass all applicable WHQL tests

This includes USB 1.1 Chapter 9 and Chapter 11 tests:

- Device or hub has unique VID/Program ID (PID) combination.
- Serial number, if implemented, is unique.
- Hub correctly reports the number of ports accessible by the user.

Windows XP: See "USB Controllers," "USB Hubs," and device-specific and system-specific topics in the HCT documentation.

B2.6.3.2 SEE B2.6.3.1

B2.6.4 USB Controllers/Devices - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 6, "Buses and Interfaces"
Hardware Design Guide Version 3.0 for Microsoft Windows 2000 Server, Chapter 2

B2.6.4.1 Devices comply with USB power management requirements

[USB-0087; SDG3:59]

B2.6.4.2 Connections use USB icon, per USB 1.1 specification

B2.6.4.3 USB host controller can wake the system

[USB-0085]

B2.6.4.4 Devices and drivers support maximum flexibility of hardware interface options

[USB-0084; SDG3:58]

B2.6.4.5 Devices meet requirements in related USB device class specifications

[USB-0088; SDG3:60; see also FAQ B2.6.5.2]

B2.6.4.6 Hub or device that supports USB 2.0 complies with USB 2.0 Specification

[USB-0081]

B2.6.4.7 USB devices install and perform at least some functions expected by end users for that class of device, without preloading software

[USB-0089; SDG3:62]

Without loading a specific driver, USB devices having native operating system class driver support provide the typical functions supported by

devices within each class, as defined in the USB device class specifications. After device specific driver installation, the device must be fully functional.

Driver packages can force re-enumeration by pointing to their INF file; see **UpdateDriverForPlugAndPlayDevices** in the Windows DDK for information.

B2.6.4.8 USB hubs are self-powered

[USB-0086; SDG3:61]

This requirement does not apply for hubs integrated into USB keyboards.

Mobile PC Note: This requirement does not apply for hubs integrated into mobile systems.

B2.6.5 USB Controllers/Devices - FAQs

B2.6.5.1 Current USB-related FAQs

See http://www.microsoft.com/winlogo/hardware/usb/.

B2.6.5.2 USB device definition [Logo Program clarification]

[USB-0088; SDG3:46]

Any device that plugs into a USB port is tested as a USB device—that is, the device provides the capabilities of one or more functions, a hub to the host, or both. As result, these requirements apply for any device that plugs into a USB port: the USB specification and any related USB device class specification, plus the Windows Logo Program requirements for USB and the related device class.
FAQ Date: October 7, 1998

B2.6.R USB Controllers/Devices - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/usb/.

B2.6.R.1 USB isochronous devices do not request more than 25 percent of the total bandwidth at any time

B3.0 Audio Devices

B3.1 General Audio

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.

B3.1.1 General Audio - Windows Compatibility

B3.1.1.1 WDM device driver support for audio

[AUD-0326; AUD-0337]

Device driver conforms to the WDM implementation guidelines and "Audio Drivers" reference in the Windows DDK.

See FAQ B3.1.5.8.

B3.1.1.2 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/audio/

B3.1.1.3 Audio Codec (AC) '97 and AMR Plug and Play Design

See FAQ B3.1.5.2.
http://www.microsoft.com/hwdev/audio/AMR.htm.

B3.1.1.4 WDM Audio Drivers for Windows XP/Windows 2000

http://www.microsoft.com/hwdev/devdes/wdmaudio.htm
DirectSound® driver support: see "DirectSound DDK" in the Windows DDK.

B3.1.1.5 Windows Me: USB MIDI takes advantage of built-in operating system support

See "Audio Drivers" in the Windows DDK.

B3.1.2 General Audio - Industry Standards

B3.1.2.1 AC '97 Component Specification

http://developer.intel.com/ial/scalableplatforms/audio/index.htm

B3.1.2.2 Audio Device Class Power Management Reference Specification, V. 2.0

[AUD-0336; see also see FAQ B3.1.5.7]
http://www.microsoft.com/hwdev/specs/pmref/pmaudio.htm

B3.1.2.3 DLS Specification, V. 1.0 or later

[AUD-0328]
http://www.midi.org/

B3.1.2.4 Personal Computer Audio Quality Measurements

http://www.cirrus.com/products/papers/meas/meas.html

B3.1.2.5 USB Device Class Definition for Audio Devices, V. 0.9 or later

[AUD-0335]
http://www.usb.org/developers/docs.html

B3.1.2.6 USB Device Class Definition for MIDI Devices, V. 0.9 or later

http://www.usb.org/developers/docs.html

See B5.1.5 for HID control requirements.

B3.1.3 General Audio - Quality

WHQL Test Specification References:
Chapter 16: Audio Test Specification

B3.1.3.1 Pass WHQL tests

See B1.3.
Windows XP: See "Audio" in the HCT documentation.

B3.1.3.2 SEE B1.3

B3.1.4 General Audio - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 11, "Audio"

B3.1.4.1 No legacy audio components

[SYS-0041; AUD-0322]

No ISA; no legacy hardware interfaces for MS-DOS-based applications.

B3.1.4.2 Full Duplex—Internet Telephony

[AUD-0324; AUD-0325; see also FAQ B3.1.5.9]

B3.1.4.3 Plays sounds before and after Suspend/Resume

[SYS-0003.4]

B3.1.4.4 Record and Playback works properly—WHQL Audio test: Audio performance

[AUD-0329; see also FAQ B3.1.5.3]

Mobile PC Note: Exceptions for mobile PCs are defined in the following table, "Minimum Performance Requirements."

Advances on previous requirements:

- Full duplex operation is supported for all sampling rates; sampling rates are time synchronized. [AUD-0325]
- Digital playback and recording values are increased from 20 Hz to 30 Hz Full-scale input voltage changed from ≥2.0 to ≥1.0. [AUD-0329]

Minimum Performance Requirements

Requirement	Value
Full-scale input voltage:	
FSIV (A-D-PC) line input	≥1.0 Vrms
FSIV (A-D-PC) microphone input	≥100 mVrms
Full-scale output voltage:	
FSOV (PC-D-A) line output	≥1.0 Vrms [note 1]
Digital playback (PC-D-A) for line output:	
Frequency response (-3 dB) 48.0 kHz source material	20 Hz to 19.2 kHz [note 4]
Dynamic range (DR)	≥80 dB FS A [note 3, 4]
THD+N (-3 dB FS)	≤-65 dB FS [note 4]
Digital playback (PC-D-A) for speaker output with 8-ohm load:	
Frequency response (-3 dB) 48.0 kHz source material	100 Hz to 19.2 kHz [note 4]
Dynamic range (DR)	≥80 dB FS A [note 3, 4]
THD+N (-3 dB FS)	≤-65 dB FS [note 4]
Digital recording (A-D-PC) for line input: [note 2]	
Frequency response 48.0 kHz destination	20 Hz to 19.2 kHz [note 4]
Passband ripple	<+/-0.5 dB
Dynamic range (DR)	≥70 dB FS A [note 4]
THD+N (-3 dB FS)	≤-60 dB FS (input referenced) [note 4]
Digital recording (A-D-PC) for microphone input:	
Frequency response (-3 dB) 22.05 kHz destination	100 Hz to 8.8 kHz
Passband ripple	<+/-0.5 dB
Dynamic range (DR)	≥70 dB FS A [note 4]
THD+N (-3 dB FS)	≤-60 dB FS (input referenced) [note 4]

Requirement	Value
Line output cross-talk:	
Channel separation between left and right line-out channels (measured at 10 kHz)	≥60 dB [note 4]
Sampling frequency accuracy:	
Playback	0.1%
Record	0.1%
Notes:	

Note 1: For 3.3 V audio codec, the required Full Scale Output Voltage for line output is ≥0.7 Vrms.

Note 2: Line input to speaker output is a requirement only if a line output is not supported.

Note 3: Decibels relative to full scale (FS), measured using "A weighting" filters.

Note 4 - Mobile PC Notes:

- The dynamic range requirements are relaxed from previous requirements by 10 dB FS.
- The THD+N requirements are relaxed by 10 dB FS.
- The required frequency response is 30 Hz to 15 kHz, measured using 3 dB corners.
- The cross-talk requirements are relaxed by 10 dB FS.

B3.1.4.5 Audio subsystem supports full-duplex operation at independent sampling rates

[AUD-0325]

B3.1.4.6 Analog microphone input meets jack and circuit specifications

[AUD-0331]

B3.1.4.7 Audio driver reports sample position for stream synchronization

[AUD-0326, AUD-0334]

Maximum allowable latency is 1 ms.

B3.1.4.8 PCI audio device meets minimum requirements

- Supports initiator, target, and block transfer. [AUD-0333]
- PCI device supports efficient audio buffer management. [AUD-0334
- Does not use ISA-based resources. [AUD-0322]
- Is digital ready. [AUD-0323]

B3.1.4.9 USB audio device uses HID controls

[AUD-0335]

B3.1.4.10 Support required for DirectX functions as specified in the DirectX DDK

Windows XP: Support Microsoft DirectX® 8 (DirectX DDK is included in the Windows DDK).

B3.1.4.11 Windows XP: Device implements DRM support as defined in Windows DDK

"Digital Rights Management Reference" in the Windows DDK.

[see FAQ B3.1.5.10]

Windows Me: If this support is implemented, see also http://www.microsoft.com/hwdev/audio/DRM.htm.

B3.1.4.12 Audio subsystem requirements

[AUD-0330, 0339]

- Supports acoustic echo cancellation reference inputs. [AUD-0330]
- Does not rely on analog mixing. [AUD-0339]

B3.1.4.13 Headset microphone used for speech recognition meets performance requirements

[AUD-0332]

B3.1.5 General Audio - FAQs

B3.1.5.1 Current related Audio FAQs

See http://www.microsoft.com/winlogo/hardware/audio/.

B3.1.5.2 AC '97 devices on riser cards [Logo Program clarification]

[SYS-0034]

AC '97 devices on riser cards such as AMR, CNR, and MR can be tested and receive the "Designed for Windows" Logo based on the following requirements:

- The system BIOS must provide a unique PCI SID for any riser card, assigned by the codec manufacturer. This is identical to current Logo Program requirements for audio and modem devices on a PCI add-on card—except these are system-board devices, so the PCI SID must reflect that of the system-board manufacturer.

  If an OEM chooses a riser card and driver from any riser card driver manufacturer, the BIOS must populate the fields as follows:

  - The PCI SVID must reflect the Vendor ID assigned by the PCI SIG to that OEM.

- The SID must be unique for each AC '97 device configuration. For example, for a MoM, MR, or AMR device, each SID must be unique.

If an OEM chooses a system board from a manufacturer that works with one or more codecs, the following applies:

- The SVID must reflect the Vendor ID assigned by the PCI SIG to that system-board manufacturer.
- The SID must be unique for each AC '97 codec/device configuration. For example, for a MoM, MR, or AMR device, each SID must be unique.
- The system BIOS must properly implement the detection algorithm from Intel to verify that the hardware on an AMR/MR riser extension is actually present.

For more information about WHQL testing for riser cards, see the WHQL web site at http://www.microsoft.com/hwtest/.

See *AC '97 and AMR Plug and Play Design* at http://www.microsoft.com/hwdev/audio/AMR.htm.
FAQ Date: June 2, 1999

B3.1.5.3 Audio Minimum Performance Requirements [Revision]

[AUD-0325-0329]

Data formats and performance requirements are defined at B3.1.4.4.

B3.1.5.4 Basic data formats for audio hardware [Revision]

[AUD-0325-0329]

Data formats and performance requirements are defined at B3.1.4.4.

B3.1.5.5 Analog microphone input [Revision]

[AUD-0331]

Requirements are now defined at B3.1.4.6.

B3.1.5.6 PCI device supports non-DWORD-aligned audio buffers [Clarification]

[AUD-0334]

This is a recommendation, not a requirement. Replaced in B3.1.4.8.
FAQ Date: December 22, 1998; June 16, 2000

B3.1.5.7 PCI power management requirements [Clarification]

[AUD-0336]

PCI Bus Power Management Interface Specification, Revision 1.1 or later, is the only industry specification that ensures compatibility with

the power management capabilities of Windows 2000 and Windows XP.
FAQ Date: November 12, 1999

B3.1.5.8 WDM Audio Driver Requirements [Logo Program Clarification]

[AUD-0337]

WDM audio driver requirements apply based on the preinstalled operating system:

- Windows XP/Windows 2000 and Windows Me Audio Drivers: All devices are required to use WDM drivers.

- **Audio drivers for Windows 98 Second Edition:** All audio devices are required to use WDM, with the exceptions noted below. There will be an operating system update released early next year that will address the technical deficiencies. As of July 1, 2000, devices in either of the following two categories cannot use VxD drivers:

  - **Exception #1: Audio devices that also contain a game port:** Windows 98 Second Edition does not support WDM game ports. Audio devices that use WDM drivers must provide a VxD module for the game port. Windows 98 Second Edition has known issues with the interconnection between WDM audio devices and the VxD game port services. The operating system update will address these issues.

  - **Exception #2: Audio devices that use WavePCI and provide hardware acceleration of Microsoft DirectSound:** There are two classes of WDM audio drivers, WaveCyclic and WavePCI. The former is intended for those devices that utilize looping memory buffers to transfer audio to the device. The latter is geared towards PCI devices that use scatter-gather to transfer data. Windows 98 Second Edition has known issues with WavePCI and DirectSound hardware acceleration. These issues have been addressed in later operating systems.

- **Audio drivers for the initial release of Windows 98:** Systems that ship with Windows 98 may use VxD audio drivers indefinitely (due to WDM audio issues in Windows 98). This does not apply to Windows 98 Second Edition.

- **Audio drivers for Windows NT 4.0:** Because Windows NT 4.0 does not support WDM, the WDM requirement does not apply for testing systems under Windows NT 4.0.
  FAQ Date: November 29, 1999

B3.1.5.9 Audio subsystem supports basic data formats [Revision]

[AUD-0324]

Hardware sample rate conversion (SRC) is not required when the Microsoft software SRC is used. Windows 98/Me and Windows 2000 provide software mixing and SRC, which eliminate the need for

hardware to support any sampling rate other than 48 kHz.
FAQ date: February 28, 2001

B3.1.5.10 DRM legacy function calls [Clarification]

Windows XP: to pass Windows Logo testing for Secure Audio Path for Digital Rights Management as DRM compliant with DRM Level = 1200 (which is the security level for Windows XP), audio drivers for Windows XP must not call DrmForwardContentToFileObject. If an audio driver calls DrmForwardContentToFileObject, it will be qualified as DRM compliant with DRM Level = 1100, which is the security level for Windows Me.

B3.1.R General Audio - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/audio/.

B4.0 Display

B4.1 Display Adapters/Chipsets

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.

B4.1.1 Display Adapters/Chipsets - Windows Compatibility

B4.1.1.1 Windows XP/Windows 2000: "Display and Video Miniport Drivers" and "Multiple Monitor Support in the Display Driver" in the Windows DDK

Software provided with graphics adapters must comply with the requirements defined in "Graphics Driver Design Guide" in the Windows DDK.

B4.1.1.2 Windows 98/Me: "Display Drivers" and "Multiple Monitor Support Implementation Design Notes" in the Windows Me DDK

Windows Me: Correct driver support for Get_Adapter_Power_State_Caps() and Set_Adapter_Power_State() interfaces in the Windows Me DDK.

B4.1.1.3 OpenGL support (if implemented): "Video Miniport Drivers" in the Windows DDK

B4.1.1.4 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/display/

B4.1.1.5 Windows XP/Windows 2000 Professional: Compatibility Testing Requirements for Display and Video Miniport Drivers

http://www.microsoft.com/hwdev/video/vidminiport.htm

B4.1.1.6 Windows 98/Me: Caution for Display Driver Dependencies on GDI

http://www.microsoft.com/hwdev/devdes/gdi.htm

B4.1.1.7 DirectX: Support per DirectX DDK and the DirectX SDK

The DirectX DDK is provided in the Windows DDK; the DirectX SDK is provided in the Microsoft Platform SDK.

Note: If hardware acceleration features are implemented beyond those specified in section B4.1, those features must be supported as defined in the DirectX DDK and SDK.

Microsoft Platform SDK - http://msdn.microsoft.com/directx/

B4.1.1.8 Onboard graphics device can be used as primary VGA boot device

[GRPH-0199; see also FAQ B4.1.5.7]

Mobile PC Note: Systems that have the graphics chip on the system board and mobile PCs that are capable of docking in a docking station with PCI slots must provide a means in the BIOS setup utility to force the system to boot using the onboard graphics device.

B4.1.1.9 x86-based graphics adapter with motion compensation or Inverse DCT hardware acceleration uses Microsoft DirectX VA API driver

[VID-0340]

See Microsoft Platform SDK and the DirectX DDK in the Windows DDK.

Note: This requirement does not apply to devices created for 64-bit systems.

B4.1.2 Display Adapters/Chipsets - Industry Standards

B4.1.2.1 Accelerated Graphics Port Interface Specification, Revision 1.0 or later

AGP 2.0: http://developer.intel.com/technology/agp/agp_index.htm.

B4.1.2.2 Digital Video Interface (DVI) Revision 1.0

[GRPH-0165; see also FAQ B4.1.5.3]
http://www.ddwg.org/

B4.1.2.3 Display Data Channel Standard, V. 3.0, Level 2B protocols

[GRPH-0204; see also FAQs B4.1.5.2, B4.1.5.3]

Video Electronics Standards Association (VESA) BIOS Extension Standard/Core Functions 2.0 (VBE/Core 2.0) at http://www.vesa.org/standards.html.

B4.1.2.4 Display Device Class Power Management Specification, V. 2.0

http://www.microsoft.com/hwdev/specs/PMref/PMdisplay.htm

B4.1.2.5 Ergonomic timings for supported resolutions, based on VESA standards

[GRPH-0169]

VESA Computer Display Monitor Timing Specification Version 1.0, Revision 0.8.
VESA Generalized Timing Formula Standard, Version 1.1.
Or DVI 1.0 (if DVI is implemented).

Optionally, 59.94 Hz variants of the 60 Hz timings.

B4.1.3 Display Adapters/Chipsets - Quality

WHQL Test Specification References:
Chapter 5: Graphics Adapter Test Specification

B4.1.3.1 Pass WHQL tests

See B1.3.

Windows XP: See "Display adapter/chipset" in the HCT documentation.

B4.1.4 Display Adapters/Chipsets - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 8, "Graphics Adapters"

B4.1.4.1 Multiple monitor/multiple display support

[GRPH-0167; GRPH-0180, 0181]

B4.1.4.2 Windows XP: DirectX 7 or later driver support for hardware acceleration

- Support CopyFourCC. The graphics adapter driver must correctly implement and act on the COPYFOURCC flag as defined by ddCaps.dwCaps2. The blt function is required to take less than 8 ms and must not be emulated in software.

- Properly handle Flip Buffer. The graphics adapter driver must handle YUV surface flipping properly. Specifically, it must be able to cope with either directed or non-directed flips.

- Create an RGB overlay as a 3D render target. If the hardware supports an RGB overlay, then the driver must provide the ability to render 3D content to RGB flipping overlay surfaces. All 3D drawing operations must be complete before the flip causes the surface to be visible on the screen.

- Support Nonpower of 2 textured surfaces. If the hardware does not support nonpower of 2 textures, then this must be properly reported by the nonpower2 flag. Because Video sizes are rarely powers of 2, there is an additional DirectDraw flag called D3DPTEXTURECAPS_NONPOW2CONDITIONAL that should be set if the hardware supports nonpower of 2 textures for the Clamp addressing mode when not using mip mapping and with D3DRS_WRAP(N) set to zero for the texture co-ordinates.

- Support for BLT_FOURCC. It is a requirement to be able to simultaneously do a BLT, stretch/shrink, and a color space conversion from a YUV surface to the current 15, 16, 24, or 32 bit desktop RGB formats.

- If the hardware supports YUV textures surfaces and it is reported as such, then the driver must be able to process these without any intermediate transforms and function correctly.

- **x86-based system:** Output of the DirectX VA MPEG acceleration process must be available as an input to the VMR renderer. This can either be in the form of a Direct3D texture or as an input to the color conversion BLTer.

  Note: This requirement does not apply to devices created for 64-bit systems.

B4.1.4.3 If digital video interface is supported, implementation follows Digital Visual Interface 1.0

[GRPH-0165]

B4.1.4.4 Adapter supports minimum screen resolution

[GRPH-0168]

Minimum resolution is 1024 × 768 × 32 bpp, double buffered in both 2-D and 3-D modes with a 32-bit Z-buffer in 3-D mode.

Adapter meets VESA specifications for ergonomic timing rates (optionally, 59.94 Hz variants of the 60 Hz timings); screen resolution and local memory capacity meet minimum requirements.

After July 1, 2002, integrated solutions must support this minimum requirement; until July 1, 2002, integrated solutions can have a minimum screen resolution of 1024 × 768 at a color depth of 24 bpp for 2-D, and 1024 × 768 at a color depth of 16 bpp with a 16-bit Z-buffer in 3-D mode.

Mobile PC Note: Requirements are defined in B4.1.4.13

B4.1.4.5 Color support

[GRPH-017x]

- All supported color depths are enumerated. [GRPH-0170]
- Adapter supports gamma correction performed in hardware at 24 bpp or 32 bpp without using VGA resources. [GRPH-0178]
- Driver supports dynamic color bit-depth change. [GRPH-0206]
- Graphics adapter operates properly and does not fail when Windows requests that it change the color depth or resolution; a restart must not be required to accomplish this. [GRPH-0206]

B4.1.4.6 Device configuration and detection requirements

[GRPH-01xx; SDG3]

- Graphics operations use relocatable registers only. [GRPH-0171]
- Primary graphics adapter works normally with default VGA mode driver. [GRPH-0166; SDG3:75, 76]
- Driver does not bypass any Microsoft-provided system components. [GRPH-0205; see FAQ B4.1.5.4]
- Adapter supports DDC monitor detection, and option ROM supports *VESA Enhanced Display Data Channel Standard* (EDDC), *Version 1.0,* Level 2B protocols (DDC2B). [GRPH-0179
  Mobile PC Note: Requirements are defined in B4.1.4.13.
- Frame buffer can be accessed directly by applications. [GRPH-0182]
- System supports conflict resolution, VGA compatibility, and extended registers. [GRPH-0196]
- BIOS supports large frame buffers for graphics adapters. [GRPH-0200]
- Graphics adapter complies with VESA BIOS Extensions/Core 2.0 extensions for power management. [GRPH-0204]

B4.1.4.7 Basic 2-D hardware acceleration requirements

[GRPH-018x]

- Hardware supports transparent blter. [GRPH-0183]
- Hardware provides support to prevent tearing. [GRPH-0184]
- Chips support linear packed-pixel frame buffer, relocatable above 16 MB. [GRPH-0197]

B4.1.4.8 Adapter supports hardware-accelerated 3-D graphics

[GRPH-018x]

Including these additional 3-D requirements for hardware support:

- Multi-texturing. [GRPH-0186]
- Source alpha blending and destination alpha blending; required texture size increases to 1024×1024 for all texture operations. [GRPH-0185, GRPH-0188]

  After July 1, 2002, integrated solutions must support destination alpha blending.

Alpha blend mode	Source factor	Destination factor
D3DBLEND_BOTHINVSRCALPHA	Required	-
D3DBLEND_BOTHSRCALPHA	Required	-
D3DBLEND_DESTALPHA	Required	Required
D3DBLEND_DESTCOLOR	Required	-
D3DBLEND_INVDESTALPHA	Required	Required
D3DBLEND_INVDESTCOLOR	Required	-
D3DBLEND_INVSRCALPHA	Required	Required
D3DBLEND_INVSRCCOLOR	-	Required
D3DBLEND_ONE	Required	Required
D3DBLEND_SRCALPHA	Required	Required
D3DBLEND_SRCALPHASAT	Required	-
D3DBLEND_SRCCOLOR	-	Required
D3DBLEND_ZERO	Required	Required

- Texture format 8:8:8:8 alpha RGB (ARGB). [GRPH-0187]

  After July 1, 2002, integrated solutions must support texture format 8:8:8:8 ARGB.
- Z comparison modes and Direct3D-compatible formats. [GRPH-0189]
- Fog blending term is calculated on a per-pixel basis rather than per vertex, and is either range-based (range-based fog) or depth-based (pixel fog).

  Driver support for triangle strips and fans. [GRPH-0185.3]

  After July 1, 2002, integrated solutions must support per-pixel fog; until January 1, 2002, integrated solutions can implement only per-vertex fog.

  After July 1, 2002, integrated solutions must support MODULATEALPHA texture combinations.

  Also, multitexture support with fogging and alpha blending are not required.
  [GRPH-0185, GRPH-0187, GRPH-0188]

  Mobile PC Note: Requirements are defined in
  B4.1.4.14.B4.1.4.9 Graphics adapter uses PCI, AGP, or another high-speed bus

[GRPH-0163]

- Equivalent of AGP 2X required for discrete solutions; AGP 1X or equivalent required for integrated solutions. [GRPH-0163]
- PCI device supports IRQ and correctly populates PCI BARs. [GRPH-0201]
- PCI system-board graphics device PCI configuration space must be visible to the Plug and Play enumeration software. [GRPH-0202; see also FAQ B4.1.5.7]

B4.1.4.10 TV output capability, if present, meets requirements

- Adapter supports underscan scaling. [GRPH-0190]

  Mobile PC Note: This requirement does not apply to mobile PC platforms.

- Adapter supports flicker filter and is required to take a 1024 x 768 32-bpp input and downscale it to the TV out resolution (NTSC or PAL). [GRPH-0192]
- Adapter with television output supports both 1024 x 768 at 32 bpp VGA and television output simultaneously. [GRPH-0194]
- Software supports positioning. [GRPH-0191]

  Mobile PC Note: This requirement does not apply to mobile PC platforms.

B4.1.4.11 Graphics subsystem support for TV or DVD-Video playback, if present, meets performance requirements

[GRPH-0207, 0208, GRPH-0395]

For the adapter to achieve the required performance when rendering Line21, the DDCAPS_CANBLTSYSMEM cap needs to be set in the display adapter.

Mobile PC Note: Mobile platforms must support video overlay up to their native resolution and color depth or XGA where native resolution is greater than XGA (1024x768).

B4.1.4.12 Graphics adapter driver properly supports D3 state such that Windows can hibernate and restore the system from any system-supported sleep state

[GRPH-0203, 0204]

Windows Me: This includes correct driver support for Get_Adapter_Power_State_Caps() and Set_Adapter_Power_State() interfaces, as defined in the Windows Me DDK.

B4.1.4.13 Mobile PC system meets basic graphics requirements to reliably run Windows and applications, plus requirements for resolution capabilities

[GRPH-0393]

B4.1.4.14 Mobile PC system 3-D capabilities, if implemented, meet minimum requirements

[GRPH-0393]

B4.1.5 Display Adapters/Chipsets - FAQs

B4.1.5.1 Current Display FAQs

See http://www.microsoft.com/winlogo/hardware/display/.

B4.1.5.2 DDC/EDID Standards [Clarification]

[GRPH-0179]

The required support defined in Version 3.0 of the DDC and Extended Display Identification Data (EDID) standards is also defined in the earlier version and revisions of these standards. As such, the Version 3.0 standards provide the correct references for Windows XP/Windows 2000 and Windows 98/Me.
FAQ Date: October 7, 1998

B4.1.5.3 Mobile PC system supports minimum +5V power requirements [Clarification]

[GRPH-0393.6]

Mobile PC Note: Mobile systems do not have to supply +5V to the VGA connector at any time. The DVI connector must supply +5V only during boot, when the user first enables external video, and when the system is actually outputting analog or digital video through the DVI connector.

Some display devices rely on the +5V to power their DDC circuitry, for Plug and Play detection, or both. It is recommended that a mobile PC provide a means to enable the +5V power when necessary.
FAQ Date: March 19, 1999

B4.1.5.4 Shrink and zoom requirements [Revision]

[GRPH-0207.4]

TV and DVD playback requirements are defined in B4.1.4.11.

B4.1.5.5 Color/color range requirements [Revision]

[GRPH-0395]

TV and DVD playback requirements are defined in B4.1.4.11.

B4.1.5.6 Source alpha blending requirement [Revision]

[GRPH-0185]

3-D graphics requirements are defined in B4.1.4.8.

B4.1.5.7 Integrated devices must support multiple monitors [Clarification]

PC 2001 System Design guidelines GRPH-0199 and GRPH-0202 state that when an add-on card is installed in the AGP slot, integrated devices must support multiple monitors. This is not a requirement of the Windows Logo Program for hardware.

B4.1.R Display Adapters/Chipsets - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/display/.

B4.2 Monitors

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.

B4.2.1 Monitors - Windows Compatibility

B4.2.1.1 Windows XP/Windows 2000—monitor INF: "Creating and INF File" in the Windows DDK

See also the "Monitor" sample application in the Windows DDK for information about USB monitor control using Hid.dll.

B4.2.1.2 Windows 98/Me—monitor INF: "Sample Display INF File" of "Windows 95 Documentation Programmers Guide" in the Windows Me DDK

B4.2.1.3 Image Color Management (ICM) APIs and functionality as defined in the Microsoft Platform SDK and "Color Management for Displays" in the Windows DDK

[MON-0235]

B4.2.1.4 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/video/

B4.2.1.5 Windows XP/Windows 2000: Windows Support for Mobile System Displays

Mobile PC Note:
http://www.microsoft.com/hwdev/video/mobiledisplay.htm

B4.2.1.6 Display Control Panel Extensions per DDK, with Advanced Properties tab

Windows XP/Windows 2000: "Control Panel Requirements" Windows DDK.
Windows 98/Me: "Custom Refresh Rates" and "Using Control Panel

Extensions" in the Windows Me DDK; see also
http://www.microsoft.com/hwdev/devdes/displaycpl.htm.

B4.2.2 Monitors - Industry Standards

B4.2.2.1 Related VESA standards

[MON-0232]
http://www.vesa.org/standards.html

Enhanced Extended Display Identification Data Standard (E-DID),
Release A
DDC2B.
EDID Standard, V. 3.0.
VESA Display Data Channel Standard.
VESA and Industry Standards and Guidelines for Computer Display
Monitor Timing.

B4.2.2.2 ICC Profile Format Specification, Spec ICC.1:1988-09 and Addendum 2, ICC.1A:1999-04

[MON-0235]
http://www.color.org/profiles.html

B4.2.2.3 USB Monitor Control Class Specification, Revision 1.0

[USB-0088]
http://www.usb.org/developers/docs.html

B4.2.2.4 DVI, Revision 1.0

http://www.ddwg.org/

B4.2.2.5 Display Device Class Power Management Specification, Version 2.0

[MON-0244; see also FAQ B4.2.5.5]
http://www.microsoft.com/hwdev/specs/Pmref/Pmdisplay.htm

B4.2.3 Monitors - Quality

WHQL Test Specification References:
Chapter 1: Introduction to HCT Test Specifications

B4.2.3.1 Pass WHQL tests

See B1.3.

Windows XP: See "Monitors" in the HCT documentation.

B4.2.4 Monitors - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 10, "Monitors"

B4.2.4.1 Color monitor is DDC2B-compliant and supports EDID 1.3 data structure

[MON-0232, 0233; see also see FAQs B4.2.5.2 and B4.2.5.4]

B4.2.4.2 Monitor associates an ICC profile

[MON-0235]

The Windows operating system will support devices that create standard RGB (sRGB) output by default. Devices with an output other than sRGB must install (via a monitor INF) an ICC profile appropriate to the preferred display resolution (as identified in the EDID data) at 32 bpp. For an LCD or other non-CRT display device, the profile should be based on the native display mode (resolution and color depth) for which the display is designed.

Mobile PC Note: Because most Mobile PCs do not support Plug and Play for their installed LCD panel, the ICC profile must be installed manually by using an appropriate monitor INF. OEMs should install the correct configuration as part of the operating system preinstall process. If necessary, the INF will be available to the user for manual reinstallation. Mobile PCs with Double Supertwisted Nematic (DSTN) or reflective LCD panels do not require ICC profiles.

B4.2.4.3 Minimum graphics resolution, based on monitor size

[MON-0237]

- 14-inch to 15-inch external monitor = 800 × 600, noninterlaced.
  Mobile PC Note: Built-in mobile PC display = 800 × 600, noninterlaced.

- 17-inch external monitor or 13-inch to 15-inch external LCD = 1024 × 768, noninterlaced.

- 19-inch and 21-inch external monitor or external LCDs larger than 16 inches = 1280 × 1024, noninterlaced.

- TV-style large-format monitors (larger than 23 inches) must be capable of scanning at 1024 x 768 progressive at 60 Hz (and 59.94 Hz) for the 4:3 case, and 1280 x 720 progressive at 60 Hz (and 59.94 Hz) for the 16:9 case.

B4.2.4.4 CRT-based monitor supports ergonomic timing standards

[MON-0240]
As defined in either the *VESA Generalized Timing Formula, V. 1.1* or

Computer Display Monitor Timing Specification, V. 1.0, Rev. 0, and a
59.94Hz variant of the 60Hz modes.

B4.2.4.5 SEE TV-style-large format monitors in B4.2.4.3

B4.2.4.6 Windows XP/Windows Me: Digital monitor (if implemented) supports DVI-related standards

[MON-0241, 0242, 0243]
Including DVI-compliant interface, hot-plug detection, VESA VGA Text
Mode 3 timings (specifically 720 x 400 at 70 Hz), and 640 × 480 at
60 Hz and 640 × 400 at 70 Hz.

B4.2.4.7 USB functionality from either a HID or USB hub, if implemented, is installed separately from the monitor INF

[MON-0236]

B4.2.4.8 USB hub included on a monitor is self powered or externally powered

[MON-0236]
It cannot be a bus-powered hub.

B4.2.4.9 CRT-based monitor synchronizes to a new format in less than three seconds

[MON-0238]

B4.2.4.10 LCD monitor or built-in LCD display contains display characterization data

[MON-0234]

B4.2.4.11 Windows XP: Monitor supports 59.94 Hz operation

B4.2.5 Monitors - FAQs

B4.2.5.1 Current Monitor FAQs

See http://www.microsoft.com/winlogo/hardware/display/.

B4.2.5.2 DDC standard [Clarification]

[MON-0232]
The required support defined in Version 3.0 of the DDC standards is
also defined in the earlier version and revisions of these standards. As
such, the Version 3.0 standards provide the correct references for
Windows XP/Windows 2000 and Windows 98/Me.
FAQ Date: October 7, 1998

B4.2.5.3 DELETED

See B4.2.4.2.

B4.2.5.4 EDID for analog CRTs [Correction]

[MON-0233]
For analog CRTs, EDID content must indicate at least one VESA mode at 75 Hz, or better, for each resolution supported.
FAQ Date: October 7, 1998

B4.2.5.5 Monitors support D0 and D3 states [Logo clarification]

[MON-0244]
Monitors are required to support only D0 and D3 states.
FAQ Date: March 20, 2000

B4.2.R Monitors - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/display/

B4.2.R.1 Cathode Ray Tube complies with Windows Color Quality Specifications

Color matching capabilities supported in a color cathode ray tube must comply with the requirements defined in Section 4 of "Windows Color Quality Specifications for Cathode Ray Tube OEMs," available at http://www.microsoft.com/hwdev/color/ In particular, the following color tolerances must be met.

Color element	Tolerance
Red primary	x=0.640 +0.020/-0.035 y=0.330 +0.030/-0.020
Green primary	x=0.300 +0.020/-0.035 y=0.600 +0.020/-0.020
Blue primary	x=0.150 +0.015/-0.015 y=0.060 +0.030/-0.015
White point	Where x(sRGB)=0.3127 and y(sRGB)=0.3290 $|dx|, |dy| < 0.02$ $|dx - dy| < 0.02$
Luminance(Y)	80 +20/-10 cd/m2
Gamma(S-g – simple gamma)	2.2 +0.2/-0.2

B4.2.R.2 Liquid Crystal Display (LCD) complies with Windows Color Quality Specifications

Color matching capabilities supported in a color liquid crystal display must comply with the requirements defined in Section 4 of "Windows Color Quality Specifications for Liquid Crystal Display OEMs," available

at http://www.microsoft.com/hwdev/color/. Standalone LCDs are required to use the in gamut patches specified for stand alone LCDs in Section 2 of "Windows Color Quality Specifications for Liquid Crystal Display OEMs." Integrated (laptop) LCDs are required to use the in gamut patches specified for integrated LCDs in Section 2 of "Windows Color Quality Specifications for Liquid Crystal Display OEMs." In particular, the following Delta E tolerances must be met:

Average CIE 1994 Delta E* less than or equal to 10 for in gamut colors.
Maximum CIE 1994 Delta E* less than or equal to 15 for in gamut colors.
Average CIE 1994 Delta E* less than or equal to 20 for IEC 61966-4 colors.

B5.0 Input and HID

B5.1 General Input

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.

B5.1.1 General Input - Windows Compatibility

B5.1.1.1 Windows XP/Windows 2000: "Human Input Devices" in the Windows DDK

B5.1.1.2 Windows 98/Me: Follow Windows DDK if HID device

B5.1.1.3 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/input/

B5.1.1.4 Windows XP/Windows 2000: Input Device Drivers and Windows 2000

http://www.microsoft.com/hwdev/input/drv.htm

B5.1.2 General Input - Industry Standards

B5.1.2.1 IBM Personal System/2 Common Interfaces

Part No. S84F-9809: Order from IBM Customer Publications Support: 1-800-879-2755.

B5.1.2.2 USB HID references

[INPT-0133; SDG3:69]
http://www.usb.org/developers/docs.htm

- USB Device Class Definition for Human Interface Devices (HID), V. 1.0 or later.
- USB HID Usage Tables, V. 1.0 or later.
- USB Usage Tables for HID Power Devices, Release 1.0 or later.

B5.1.2.3 Input Device Class Power Management Reference Specification, Version 2.0 or later

http://www.microsoft.com/HWDEV/specs/PMref/PMinput.htm

AB5.1.2.4 Legacy Plug and Play Guidelines

Legacy Plug and Play Guidelines

B5.1.3 General Input - Quality

WHQL Test Specification References:
Chapter 1: Introduction to HCT Test Specifications
plus technology-specific test specifications

B5.1.3.1 Pass WHQL tests

See B1.3.

Windows XP: See "Input and HID" in the HCT documentation.

B5.1.3.2 SEE B5.1.4.7

B5.1.4 General Input - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 7, "Input Devices"

B5.1.4.1 Any power management buttons implemented are ACPI compliant

[SYS-0003; SDG3:9]

B5.1.4.2 Hot-plugging does not damage system or device

[SYS-0030; SDG3:47]

B5.1.4.3 All input devices support Microsoft DirectInput® and work simultaneously

[INPT-0134; see FAQ B5.1.5.2]

See "Human Input Devices " in the Windows DDK.

B5.1.4.4 DELETED

B5.1.4.5 All Human Interface Devices (HIDs) meet USB HID specifications

[INPT-0133]

B5.1.4.6 Devices use USB or external bus connections rather than legacy serial or parallel

[INPT-0135]

Mobile Note
PS/2-compatible mouse and keyboard can use PS/2 connectors.

B5.1.4.7 All keys/buttons are functional at an end-user level after an INF installation

B5.1.5 General Input - FAQs

B5.1.5.1 Current input device FAQs

See http://www.microsoft.com/winlogo/hardware/input/.

B5.1.5.2 Simultaneous Input Requirement [Added reference]

The built-in class drivers support simultaneous operation of multiple input devices. For information about implementing support for other drivers, see "Human Input Devices" in the Windows DDK. See also the sample code and documentation in the Windows DDK at %NTDDK%\src\wdm\hid\.
FAQ Date: May 28, 1999; January 31, 2001 (Update DDK citation)

B5.1.R General Input - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/input/.

B5.2 Keyboard

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general input requirements in B5.1 are included by reference.

B5.2.1 Keyboard - Windows Compatibility

B5.2.1.1 Windows XP/Windows 2000: "Human Input Devices" in the Windows DDK

B5.2.1.2 Windows 98/Me: Follow Windows DDK if HID device

B5.2.1.3 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/input/

B5.2.1.4 Windows XP/Windows 2000: Scan Code Mapper for Windows 2000

http://www.microsoft.com/hwdev/input/W2kscan-map.htm

B5.2.1.5 Keyboard Scan Code Specification

http://www.microsoft.com/hwdev/desinit/scancode.htm

B5.2.1.6 Legacy Support for USB Keyboards and Mice and the Host Controller Driver

http://www.microsoft.com/hwdev/busbios/usbhost.htm

B5.2.2 Keyboard - Industry Standards

B5.2.2.1 Keyboard Scan Code Specification

[INPT-0144]
http://www.microsoft.com/hwdev/desinit/scancode.htm

B5.2.3 Keyboard - Quality

B5.2.3.1 Pass WHQL tests

See B1.3.

Windows XP: See "Keyboard" in the HCT documentation.

B5.2.3.2 SEE B5.1.4.7

B5.2.4 Keyboard - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 7, "Input Devices"

B5.2.4.1 Any power management buttons implemented are ACPI compliant

[SYS-0003; SDG3:9]

B5.2.4.2 Hot-plugging does not damage system or device; USB keyboard is immediately functional after hot-plugging

[SYS-0003; SDG3:47]

B5.2.4.3 USB keyboard installation does not require reboot

[SYS-0029.1]

B5.2.4.4 No interference occurs between multiple keyboards

[INPT-0143]

B5.2.4.5 Scan codes conform to industry standard

[INPT-0144; see FAQ B5.2.5.3]

B5.2.4.6 Keys for Internet browser and multimedia use Microsoft APIs

[INPT-0145]

See WM_APPCOMMAND in the Microsoft Platform SDK.

For information about using filter drivers to re-purpose keys, see FAQ B5.2.5.3.

B5.2.4.7 PIN data-entry keyboard

See B5.6.4.5.

B5.2.5 Keyboard - FAQs

B5.2.5.1 Current keyboard FAQs

See http://www.microsoft.com/winlogo/hardware/input/.

B5.2.5.2 USB HID to PS/2 keyboard scan codes

[INPT-0144]

The correct listing of all keyboard scan codes for Windows operating systems is available at http://www.pcdesguide.org/documents/keycode.htm.
FAQ Date: May 28, 1999

B5.2.5.3 Multimedia keyboards with extra hot buttons conform to the defined scan codes or HID usages

Microsoft has defined extended scan codes for PS/2-compatible multimedia keyboards, and the USB HID Device Working Group has defined the consumer controls page. Hardware vendors should conform to these defined values and use their default functionality in order to ensure a good user experience following an upgrade or if the user doesn't install any supplemental software. Additional software/drivers can be written to provide software remapping functionality.

Keyboard manufacturers must use consumer control or vendor-specific, top-level collections for HID hot buttons. For PS/2, vendors must use only the Extended Scancode set for hot buttons and must provide a filter driver or use a Keyboard DLL hook to perform hot-button remapping.

B5.2.R Keyboard - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/input/

B5.3 Input/Pointing

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general input requirements in B5.1 are included by reference.

B5.3.1 Input/Pointing - Windows Compatibility

B5.3.1.1 Windows XP/Windows 2000: "Human Input Devices" in the Windows DDK

B5.3.1.2 Windows 98/Me: Follow the Windows DDK if HID device

B5.3.1.3 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/input/

B5.3.1.4 Legacy Support for USB Keyboards and Mice and the Host Controller Driver

http://www.microsoft.com/hwdev/busbios/usbhost.htm

B5.3.2 Input/Pointing - Industry Standards

See B5.1.5.

B5.3.3 Input/Pointing - Quality

B5.3.3.1 SEE B5.3.4.1

B5.3.3.2 Pass WHQL tests

See B1.3.

Windows XP: See "Pointing and Drawing Devices" in the HCT documentation.

B5.3.3.3 - B5.3.3.5 SEE B5.3.4.1

B5.3.4 Input/Pointing - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 7, "Input Devices"

B5.3.4.1 Device functions correctly

- Wheel support (scroll, auto-scroll, pan, and zoom) in Microsoft Office 2000 and Windows Explorer.

- In multimedia applications that require mouse support, such as Microsoft Encarta® 99 and MS-DOS-based applications.
- When switching on-the-fly from MS-DOS-based applications to Windows.
- Plug and Play Device Manager validates serial devices.
- Hot-plugging does not damage system or device; USB devices are immediately functional after hot-plugging. [SYS-0030; SDG3:47]

Mobile PC Notes:

- Mobile PC external PS/2 pointing device detected at boot and installed correctly.
- Mobile PC internal pointing device disabled or dual operation enabled if external device is PS/2 -compatible.

B5.3.5 Input/Pointing - FAQs

See http://www.microsoft.com/winlogo/hardware/input/.

B5.3.R Input/Pointing - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/input/.

B5.4 Input/Game

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general input requirements in B5.1 are included by reference.

B5.4.1 Input/Game - Windows Compatibility

B5.4.1.1 Windows XP/Windows 2000: "Human Input Devices" in the Windows DDK

B5.4.1.2 Windows 98/Me: Follow the Windows DDK if HID device

B5.4.1.3 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/input/

B5.4.1.4 Designing HID Game Controllers for DirectInput

http://www.microsoft.com/hwdev/devdes/hidgame.htm

B5.4.2 Input/Game - Industry Standards

See B5.1.5.

B5.4.3 Input/Game - Quality

B5.4.3.1 SEE B5.4.4.3

B5.4.3.2 Pass WHQL tests

See B1.3.

Windows XP: See "Game Devices" in HCT documentation.

B5.4.4 Input/Game - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 7, "Input Devices"

B5.4.4.1 Hot-plugging does not damage system or device; USB devices are immediately functional after hot-plugging

[SYS-0030; SDG3:47]

B5.4.4.2 Device performs as expected with multimedia applications

B5.4.4.3 All input devices support Microsoft DirectInput® and work simultaneously

B5.4.5 Input/Game - FAQs

B5.4.5.1 Current game port FAQs

See http://www.microsoft.com/winlogo/hardware/input/.

B5.4.5.2 Game pad requirements for systems [Clarification]

[INPT-0135]

If a game pad or joystick is included in a system, it should be implemented using USB. It is *not* required to include any such devices on a system.

Note: No devices that use legacy or proprietary ports can be included in a system.
FAQ Date: October 7, 1998

B5.4.R Input/Game - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/input/.

B5.5 Input/Keyboard-Video-Mouse

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general input requirements in B5.1, B5.2, and B5.3 are included by reference.

B5.5.1 Keyboard/Video/Mouse - Windows Compatibility

B5.5.1.1 Windows XP/Windows 2000: "Human Input Devices" in the Windows DDK

B5.5.1.2 Windows 98/Me: Follow the Windows DDK if HID device

B5.5.1.3 Windows compatibility and implementation notes

http://www.microsoft.com/hwdev/input/

B5.5.2 Keyboard/Video/Mouse - Industry Standards

See B5.1.5.

B5.5.3 Keyboard/Video/Mouse – Quality

B5.5.3.1 SEE B5.5.4.7

B5.5.3.2 - B5.5.3.3 SEE B5.5.4.8

B5.3.3.4 Pass WHQL tests

See B1.3.

Windows XP: See "Keyboard-Video-Mouse Switch " in HCT documentation.

B5.5.4 Keyboard/Video/Mouse - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 7, "Input Devices"

B5.5.4.1 Cascading switch boxes

B5.5.4.2 On-screen display for switching between machines

B5.5.4.3 Ability to switch between machines using a keyboard

B5.5.4.4 System recognizes any Plug and Play keyboard, mouse, or monitor connected to the KVM

B5.5.4.5 System resets the device ports in case a corruption results in an incorrect output signal sent from a connected device to the operating system

B5.5.4.6 All devices and cables connected to the KVM are hot pluggable and have proper icons and colors

B5.5.4.7 All the commands listed in the device's user manual work correctly

B5.5.4.8 Only documented commands are provided

B5.5.4.9 All buttons on the Keyboard-Video-Mouse (KVM) work properly

B5.5.5 Keyboard/Video/Mouse - FAQs

See http://www.microsoft.com/winlogo/hardware/input/.

B5.5.R Keyboard/Video/Mouse - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/input/.

B5.6 Smart Card Readers

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general input requirements in B5.1 are included by reference.

B5.6.1 Smart Card - Windows Compatibility

B5.6.1.1 Windows XP/Windows 2000 and Windows 98/Me: "Smart Card Devices" in the Windows DDK

B5.6.1.2 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/smartcard/

Note: Smart Card base software components must be installed before the driver on Windows 98/Me; the base components are automatically installed on Windows 2000.

B5.6.2 Smart Card - Industry Standards

B5.6.2.1 ISO/IEC DIS 7816 Identification Cards—Integrated circuit(s) cards with contacts

[SMRT-0153; SDG3:196]

Part 1: Physical characteristics - http://www.iso.ch/cate/d29257.html.
Part 2: Dimensions and location of the contacts -
http://www.iso.ch/cate/d26536.html.
Part 3: Electronic signals and transmission protocols -
http://www.iso.ch/cate/d14735.html.

B5.6.2.2 Interoperability Specification for ICCs and Personal Computer Systems

http://www.pcscworkgroup.com/

B5.6.2.3 ISO/IEC 7811

[SMRT-0153]

Part 1: Embossing
Part 3: Location of embossed characters on ID-1 cards
ISO/IEC 7813:1995 Identification Cards—Financial transaction cards
ISO/IEC 10373:1993 Identification cards—Test methods

B5.6.3 Smart Card - Quality

B5.6.3.1 SEE B5.6.4.6

B5.6.3.2 Pass WHQL tests

See B1.3.

Windows XP: See "Smart Card Readers " in HCT documentation.

B5.6.4 Smart Card - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 7, "Input Devices" ;
SMRT-0162; SDG3:196
Smart Card for Windows web site at http://www.microsoft.com/smartcard/

B5.6.4.1 Driver does not cause system to stop running if required resources are not available

B5.6.4.2 Driver supports multiple instances of the same device on system without problems

B5.6.4.3 Windows XP/Windows 2000: Device works properly after system resumes from S3 or hibernation state

Note: Hibernation tests on Windows 98/Me are disabled.

B5.6.4.4 Reader supports required capabilities

[SMRT-0154-0159]

- Direct and Inverse-convention smart cards. [SMRT-0155]
- 258 byte packets in T=0 and 259 byte packets in T=1. [SMRT-0156]
- Smart card insertion/removal monitor. [SMRT-0157]
- PTS not required.
  Reader must support negotiable and specific modes according to ISO/IEC 7816-3 (1997-12-15) Sections 6 and 7. [SMRT-0158]
- 3.5795 MHz minimum clock frequency. [SMRT-0159]
- 9600 bps minimum data rate.
- Reset command [SMRT-0154]

B5.6.4.5 Input device implementing a PIN data-entry keyboard complies with ISO 13491-1

[SMRT-0162]

B5.6.4.6 Hot-plugging for PC Card does not cause system to stop running or other problems; USB reader is functional upon hot-plugging

[SYS-0030; SDG3:47]

B5.6.5 Smart Card - FAQs

B5.6.5.1 Current smart card FAQs

See http://www.microsoft.com/winlogo/hardware/input/.

B5.6.5.2 PTS and Power Down citations [Correction]

The correct citation for PTS support is ISO 7816-3 (1997-12-15) Section 7. The correct citation for Power Down command is ISO 7816-3 (1997-12-15) Section 5.4. Power Down command for ISO 7816-3 is optional, but Reset command is mandatory.
FAQ Date: October 7, 1998

B5.6.R Smart Card - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/input/.

B6.0 Modems

B6.1 General Modem

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.

B6.1.1 General Modem - Windows Compatibility

B6.1.1.1 Windows Modem Development Kit: "Modem Devices" in the Windows DDK

[MOD-0366; SDG3:92]

B6.1.1.2 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/modem/

B6.1.1.3 Unimodem Diagnostics Command Reference Specification

http://www.microsoft.com/hwdev/respec/commspec.htm

B6.1.1.4 Standard Modem Command Sets and Standard Modem INFs

http://www.microsoft.com/hwdev/modem/comndset.htm

B6.1.1.5 Guidelines for WDM-based Software Modems

[MOD-0383]
http://www.microsoft.com/hwdev/modem/softmodem.htm

See also FAQs B6.1.5.6, B6.1.5.7, B6.1.5.8.

B6.1.2 General Modem - Industry Standards

B6.1.2.1 No requirement

Note: The current version of "National ISDN Basic Rate Interface Terminal Equipment Generic Guidelines" provides a collection of industry specifications and standards for Integrated Services Digital Network (ISDN); see http://www.telcordia.com/index.html.

B6.1.2.2 Bellcore Technical References

http://www.telcordia.com/index.html

B6.1.2.3 Communications Device Class Power Management Reference Specification, V. 2.0

[MOD-0381, 0382]
http://www.microsoft.com/hwdev/specs/PMref/PMcom.htm

B6.1.2.4 EIA Standard #ANSI/EIA-516-88

Joint EIA/CVCC Recommended Practice for Teletext: North American Basic Teletext Specification (NABTS) - http://www.tiaonline.org/.

B6.1.2.5 ETSI (European Telecommunication Standards Institute)

http://www.etsi.org/

B6.1.2.6 ITU (International Telecommunication Union) communications standards

http://www.itu.int/publications/index.html

B6.1.2.7 USB Class Definitions for Communications Devices

[MOD-0380; SDG3:70]
http://www.usb.org/developers/docs.html

Version 1.1 for External Devices.

B6.1.2.8 PHS Internal Access Forum Specification (PIAFS)

http://mitf.arib.or.jp/e/menu.html

B6.1.2.9 SII NS-2482-30

http://www.sii.co.jp/js/nshp/product/index-e.html (English);
http://www.sii.co.jp/js/nshp/product/NS2482/ns2482_30.html
(Japanese).

B6.1.3 General Modem - Quality

WHQL Test Specification References:
Chapter 20: Modem Test Specification

B6.1.3.1 Pass WHQL tests

See B1.3.

Windows XP: See "Modem" in HCT documentation.

B6.1.4 General Modem - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 13, "Modems"
Hardware Design Guide 3.0 for Windows 2000 Server, Chapter 4

B6.1.4.1 Wake on Ring (if implemented) meets OnNow requirements

[MOD-0381, 0382; SDG3:103]

See FAQ B6.1.5.9.

B6.1.4.2 Analog modem supports standard capabilities

[MOD-036x; SDG3:10x]

- V.250 Extended AT Command Set (formerly V.25 *ter)*. [MOD-0368; SDG3:101; see also FAQ B6.1.5.3]
- modem supports country selection +GCI. [MOD-0368]
- If implemented, wireless/cellular modem supports appropriate control commands. [MOD-0368, MOD-0376, MOD-0386-0388; SDG3:100]
- V.90 connectivity, V.42 Link Access Protocol, Modem (LAPM), V.42 bis, and V. 80 Synchronous Access data protocols. [MOD-0369; SDG3:104]
- Connection to two distinct V.90 host modems (such as 3Com and Conexant) at 40 Kbps or better.
- Modem call control supports media detection using V.251. [MOD-0370]
- If implemented, modem supports caller ID reporting. [MOD-0376; see also FAQ B6.1.5.10]

- If implemented, voice modem supports ITU V.253. Voice modem optionally supports speakerphone. [MOD-0374; SDG3:110; see also FAQ B6.1.5.4]
- Fax—14.4 Kbps (V.17) with Class 1 (TIA-578-A) command set. [MOD-0371; SDG3:106]

B6.1.4.3 Controller-based modem supports additional capabilities

- 9.6 Kbps connectivity to analog modem.
- Connection to reference modem; see test documentation for list.
- Error control and blind dial.
- AT commands:
  ATA - accept ringing
  ATD - dial
  ATE - echo setting
  ATH - hangup
  ATI - get modem information
  S0 - S0 register (0 value is to disable to accept ringing)
  ATV - response code style
  ATZ - reset
  - - Initialize
  - - Hard/Soft flow control

B6.1.4.4 PIAFS modem supports additional capabilities

- 32 Kbps (PIAFS 1.0) connectivity to PIAFS modem.
- Connection to DC-6S in PIAFS 1.0 and to SII NS-2482-30 (dial-up).
- Modem generates appropriate error messages for delayed and blacklisted numbers (where applicable). [MOD-0372; SDG3:108]

B6.1.4.5 ISDN modem

See B7.4.

B6.1.4.6 DELETED

B6.1.4.7 Global System for mobile communications or digital cellular phone support, if implemented, includes required command and protocol support

[MOD-0387]

B6.1.4.8 Analog V.90 modem tested in conjunction with digital V.90 modems commonly deployed by ISPs

[MOD-0377, 0378, 0379]

Telecommunications Industry Association (TIA) TSB-38 provides detailed test procedures and criteria.

- Operation on impairment combination 2C4 as specified in ITU-T Recommendation V.56 *bis.*
- Modem must be able to repeatedly connect, with an overall call completion success ratio of 97 percent with a minimum of 50 iterations, and without the modem stalling in an unresponsive, inoperable state.
- Modem pair must be able to sustain the connection for at least 30 minutes, at no less than 90 percent of the initial connection rate, with no more than 1 retrain, using the same TSB-3800 line I01d-loop 3 specified for use under B6.1.4.
- E-mail: Microsoft Outlook® Express over Microsoft Hotmail®.
- Web browsing: Internet Explorer.
- Video teleconferencing using H.323: Microsoft NetMeeting®.

B6.1.4.9 Telephony applications meet communication and performance requirements

[MOD-0389, MOD-0390]

Note: If a future ITU recommendation equivalent to TIA-3800 for the testing of pulse-coded modulation (PCM) modem operation is developed, passing such tests could become a requirement in future versions the Windows Logo Program.

B6.1.4.10 Windows Whistler Advanced Server: Data modem supports digital connection to support host-side V.90 operation

[SDG3:105]

B6.1.5 General Modem - FAQs

B6.1.5.1 Current Modem FAQs

See http://www.microsoft.com/winlogo/hardware/modem/.

B6.1.5.2 DELETED

Modems are not required on any system.
FAQ Date: January 31, 2001

B6.1.5.3 Unimodem required commands [Clarification]

[MOD-0368; SDG3:101]

Windows Unimodem does not use the following commands directly; therefore, these are not in the sample INF and are not required: +ICF, +MA, +EB, +ESR, +ETBM. These commands are only required if the function is controllable in the modem by way of AT commands; in that case, the standard V.250 commands defined here must be included.
FAQ Date: October 7, 1998

B6.1.5.4 Voice recording and playback capabilities [Logo Program correction]

[MOD-0374; SDG3:110]

The capability for voice recording and playback (+VTX, +VRX) is not required.
FAQ Date: July 8, 1999

B6.1.5.5 DELETED

B6.1.5.6 WDM support for driver-based modems [Logo Program clarification]

[MOD-0383]

WDM support for driver-based modems is required for Windows Me and Windows XP/Windows 2000. For information about the Ccport.sys QFE for Windows 98, see
http://www.microsoft.com/hwdev/devdes/modem_up.htm.
FAQ Date: July 28, 1999; revisions August 26, 1999, March 3, 2000

B6.1.5.7 Total execution time for DPCs queued by a WDM modem [Clarifications]

At any instant in time, the total execution time required for all delayed procedure calls (DPCs) that have been queued by a WDM driver-based modem, but have not dequeued and started executing, should not exceed 500 milliseconds.

A WDM driver-based modem should not continuously disable thread preemption for more than 4.4 milliseconds. This guideline accommodates 400 microseconds of interrupts being disabled together with two back-to-back episodes of 2.0 milliseconds of extended processing at DISPATCH_LEVEL, as up to four 500-microsecond DPCs execute sequentially.
FAQ Date: October 7, 1998

B6.1.5.8 WDM modem latency tolerances [Clarifications]

A driver-based modem should be able to tolerate:

- A period of 4 milliseconds with interrupts disabled.
- A continuous period of 8 milliseconds during which a queued DPC is held off from execution, possibly by other DPCs.
- A 16-millisecond period when thread scheduling is continuously disabled.

See http://www.microsoft.com/hwdev/devdes/modem_up.htm.
FAQ Date: October 7, 1998

B6.1.5.9 Modem supports wake-up events [Clarification]

[MOD-0381, 0382; SDG3:102]

PCI modems must support power states D0 and D3. PCI devices are required to support the D3 state on a PCI 2.2-enabled system with auxiliary power. On all other power-managed buses (such as USB), support for either D2 or D3 state is acceptable. Modem drivers must accept power management IRPs.
FAQ Date: October 7, 1998; June 14, 2000

B6.1.5.10 Analog modem correctly reports caller ID [Clarification]

For hardware-based modems, see ITU-T V253 section 9.2.3.1 for details about correctly implementing caller ID reporting.

Note: Software-based modems are not required to capture caller ID while the system is either in ACPI S3 sleep state or resuming from S3 state.
FAQ Date: May 08, 2001

B6.1.R General Modem - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/modem/.

B7.0 Network Devices

Requirements for network components designed for servers running Windows 2000/Windows Whistler Datacenter Server, including LAN and wide area network (WAN) server network adapters, are *not* provided in this appendix, which focuses solely on components for desktop and mobile client PCs and servers running Windows 2000/Windows Whistler Server or Advanced Server.

B7.1 General Network

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.

B7.1.1 General Network - Windows Compatibility

B7.1.1.1 NDIS 5.0 miniport driver model: "Network Devices and Protocols" in the Windows DDK

[NET-0245, NET–0292; SDG3:78]

B7.1.1.2 Drivers for connection-oriented media: "Connection-Oriented NDIS" in the Windows DDK

NDIS 5.0 CoNDIS miniports are preferred, but NDIS 4 WAN miniports are acceptable.

B7.1.1.3 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/network/

B7.1.1.4 Windows XP/Windows Whistler Server/Windows 2000/Windows Me: Windows 2000 network INF format

[NET-0293; SDG3:78]

"Creating Network INF Files" in the Windows DDK; see also http://www.microsoft.com/hwdev/devdes/netinf.htm.

Note: Windows XP/Windows 2000/Windows Whistler Server and Windows Me share the same INF search path (that is, .nt in the decorated INF file).

B7.1.1.5 Driver works correctly with Microsoft network clients and protocols

[NET-0291; SDG3:78.4]

B7.1.2 General Network - Industry Standards

B7.1.2.1 Network Device Class Power Management Reference Specification, V. 2.0

[NET-0289; SDG3:81]
http://www.microsoft.com/hwdev/specs/PMref/PMnetwork.htm

B7.1.2.2 Home Phoneline Networking Alliance (HomePNA) 1.0 specification or later

[NET-0285]
http://www.homepna.org

B7.1.2.3 PCI Bus Power Management Interface Specification, Revision 1.1 or later

[PCI-0130; SDG3:37]
http://www.pcisig.com/specs.html

B7.1.2.4 USB Communications Class Device 1.1 or later

[USB-0088; SDG3:88]
http://www.usb.org/developers/devclass.html

B7.1.3 General Network - Quality

WHQL Test Specification References:
Chapter 23: Network Adapter Test Specification

B7.1.3.1 Pass WHQL tests

Windows XP: see "Network Devices" in the HCT documentation.

B7.1.3.2 - B7.1.3.5 SEE B7.1.4.1

B7.1.3.6 SEE B7.1.4.10

B7.1.4 General Network - Windows Experiences

Design Guideline References:
PC 2001 System Design Guide, Chapter 14, "Network Communications"
Hardware Design Guide Version 3.0 for Microsoft Windows 2000 Server, Chapter 4

B7.1.4.1 Basic device and driver requirements

- UI and strings are correct, and Help files exist and are correct for network device installed.
- Adapter automatically senses presence of functional network connection. [NET-0246; SDG3:81]
- Adapter automatically senses transceiver type. [NET-0247;SDG3:82]
- Adapter can transmit packets from buffers aligned on any boundary. [NET-0248; SDG3:83]
- Adapter communicates with driver across any bridge. [NET-0249; SDG3:84]
- **Windows Me/Windows XP:** Adapter supports filtering for at least 32 multicast addresses. [NET-0254]

  Windows Whistler Server: Adapter supports filtering for at least 32 multicast addresses. [NET-0254; SDG3:92]
- Adapter and driver support promiscuous mode. [NET-0255; SDG3:96]

  Windows Whistler Server: Adapter and driver support multicast promiscuous mode. [SDG3:97]
- Driver makes only NDIS library calls or WDM system calls. [NET–0292; SDG3:78.5]
- PCI network adapters are bus masters. [NET-0251; SDG3:87]

  Note: CardBus and Mini-PCI implementations do *not* need to be bus masters.

B7.1.4.2 Any included diagnostics or utilities work and can be accessed from the NCP Advanced Properties page

B7.1.4.3 ATM network devices

See B7.5.4.4.

B7.1.4.4 Features such as WOL and D0-D3 power states are available and device correctly wakes from D3cold

[NET-0290; SDG3:81]

Windows XP: PCI-based network adapters support wake from D3cold.

Note: Wake On LAN (WOL) support is *not* required in the following cases:

- Bus-powered USB devices.
- Multifunction, broadband (such as cable modems), LAN emulation, Wireless LAN, or Server LAN (such as multiport, FDDI, or Gigabit Ethernet) devices.
- **Windows 98/Me:** PC Card and CardBus devices; WOL Pattern Match capabilities.
- **Windows XP/Windows 2000:** PC Card and CardBus devices.

Mobile PC Note: For mobile PCs, WOL is not required.

B7.1.4.5 Remote boot and remote install options for connection-less LAN devices on PCI bus

[NET-0256; SDG3:94,95]

Windows XP Professional: Network adapters with PXE support must be available as an option at point of purchase for systems preinstalled with Windows XP Professional. See A1.1.4.

Windows 2000 Server/Windows Whistler Server: Server systems must provide PXE-based support if a network adapter with remote new system setup capabilities is provided with the system.

This is not a requirement for CardBus adapters or for Mini-PCI adapters that are not sold as a part of or with a PC system.

B7.1.4.6 Windows XP/Windows Me: HomePNA technology, if implemented, complies with HomePNA 1.0 or later, with NDIS 5.0 miniport driver

[NET-0285]

B7.1.4.7 Infrared device supports both fast IR and serial IR, and unattended driver installation requirements

[NET-0281, 0282; SDG3:140-142]

B7.1.4.8 Full-duplex adapter automatically detects and switches to full duplex mode

[NET-0253; SDG3:80]

B7.1.4.9 Plug and Play capabilities support multiple adapters; all resource settings are reported in the UI

[NET-0286, 0287; SDG3:89]

B7.1.4.10 Wireless networking requirements

[NET-0278,0279; SDG3:143-145]

- Media adapter drivers support wireless extensions to NDIS.
- IEEE 802.11 wireless networking adapters support 11 Mb/s signaling using Direct Sequence Spread Spectrum.
- **Windows XP:** Bluetooth Host Controllers (HCI) — Windows uses Bluetooth Wireless technology as a wireless local bus and cable replacement. Therefore, Bluetooth HCI (radios with PC interface) do not need NDIS miniports. Requirements for Bluetooth HCI are listed in B2.3.4.5.
- Network adapter and driver supports priority for IEEE 802-style networks. [NET–0257; SDG3:98]

B7.1.4.11 External networking devices support standard control interfaces as applicable

- All external USB networking devices support USB Communications Class Device 1.1. [NET-0288; SDG3:88]
- Intermediate NDIS 5.0 miniport driver provided adapters that connects using IEEE 1394 or USB buses. [NET–0246; SDG3:78.3]

B7.1.4.12 Windows Whistler Server: Additional adapter and driver support

[SDG3:7x,8x]

- NDIS 5.0 miniport driver supports high-performance send and receive calls. [SDG3:79]
- Network adapter supports configuration capabilities and registry settings for performance tuning. [SDG3:85]
- PCI network adapter properly supports higher-level PCI commands. [SDG3:86]
- If the network device is for connection-oriented media, it must meet connection-oriented miniport driver and call manager driver requirements. [SDG3:78.2]

B7.1.5 General Network - FAQs

B7.1.5.1 Current Network Device FAQs

See http://www.microsoft.com/winlogo/hardware/network/.

B7.1.5.2 NDIS status codes and indication mechanisms

See **NdisMIndicateStatus** in the Windows DDK.

B7.1.5.3 PCI network adapters for large-memory systems support the PCI DAC

[Server Design FAQs - SDG3:30-32]

Requirements for PCI adapters to support the PCI DAC command are defined in A1.1.6. For network devices, at a minimum this includes adapters implemented in or designed as high-speed network adapters -- Gb Ethernet and Gb+, ATM, and FDDI -- for systems that support more than 4 GB of system memory. The exceptions to this requirement are 10/100 Ethernet adapters and embedded 10/100 Ethernet devices.

See "Large Memory Enabled Device Driver Hardware and Software Requirements" in the Windows DDK; design guidelines are summarized at http://www.microsoft.com/hwdev/newPC/PAEdrv.htm

Requirements for systems that implement support for WinSock Direct (WSD) are now defined at A6.4.8. [For design guidelines, see SDG3:67]

B7.1.R General Network - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/network/.

B7.1.R.1 All external IEEE 1394 network adapters must support Remote NDIS over SBP-2

[NET-0288; SDG3:88]

B7.1.R.2 NDIS 5.0 miniport driver is deserialized

[NET–0252; SDG3:78.7]

B7.2 Cable Modem

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general network device requirements in B7.1 are included by reference, except for requirements specific to connection-less or LAN devices.

B7.2.1 Cable Modem - Windows Compatibility

B7.2.1.1 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/network/cable/

B7.2.2 Cable Modem - Industry Standards

B7.2.2.1 Cablelabs DOCSIS Data-Over-Cable Service Interface Specifications

[NET-0262; SDG3:90]
http://www.cablemodem.com/

B7.2.3 Cable Modem - Quality

B7.2.3.1 Pass WHQL tests

See B1.3.

Windows XP: See "Cable Modem" in HCT documentation.

B7.2.4 Cable Modem - Windows Experiences

B7.2.4.1 Performance meets minimal expectations on high-end broadband network devices

[NET-0266]

B7.2.4.2 Integrated cable modem meets Windows Logo Program network adapter requirements

[NET-0263; SDG3:127]

B7.2.4.3 Integrated cable modem exposes an ATM or Ethernet interface

[NET-0264; SDG3:128]

B7.2.5 Cable Modem - FAQs

See B7.1.5.

B7.2.R Cable Modem - Future Requirements

See B7.1.R.

B7.3 DSL Device

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general network device requirements in B7.1 are included by reference, except for requirements specific to connection-less or LAN devices.

B7.3.1 DSL Device - Windows Compatibility

B7.3.1.1 Windows compatibility and implementation notes

http://www.microsoft.com/hwdev/network/dsl/

B7.3.1.2 External DSL Modems Design Guidelines

http://www.microsoft.com/hwdev/network/dsl/extdslmodems.htm

B7.3.2 DSL Device - Industry Standards

B7.3.2.1 An Interoperable End-to-End Broadband Service Architecture over ADSL System

http://www.microsoft.com/hwdev/network/dsl/

B7.3.2.2 ATM User-Network Interface Specification, V. 3.1

http://www.atmforum.com/atmforum/specs/approved.html

B7.3.2.3 DSL modem industry standards

[NET-0273, 0274, 0275; SDG3:95]

- ITU-T G.994.1, G.991.1, G.992.2.
- T1.413 Issue 2 (G.992.1).
- U.S. T1 Committee Technical Report TR-59.

B7.3.3 DSL Device - Quality

B7.3.3.1 Pass WHQL tests

See B1.3.

Windows XP: See "DSL Devices" in HCT documentation.

B7.3.4 DSL Device - Windows Experiences

B7.3.4.1 All requirements in B7.1.3, except B7.1.3.4 (WOL and power management)

[NET-0266]

Performance meets minimal expectations on high-end broadband network devices.

ATM/DSL simultaneous connections require support for 32 or more connections.

B7.3.4.2 Integrated ADSL modem meets Windows Logo Program network adapter requirements

[NET-0273-0276; SDG3:122]

B7.3.5 DSL Device - FAQs

B7.3.5.1 SEE B7.1.5

B7.3.5.2 ATM/ADSL simultaneous connections

[NET-0266; SDG3:112]

Updated requirements are defined in B7.3.4.1.

B7.3.R DSL Device - Future Requirements

See B7.1.R.

B7.4 ISDN Net Device

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general network device requirements in B7.1 are included by reference, except for requirements specific to connection-less or LAN devices.

B7.4.1 ISDN Net Device - Windows Compatibility

See B7.1.1.

B7.4.2 ISDN Net Device - Industry Standards

See B7.1.2.

B7.4.3 ISDN Net Device - Quality

See B7.1.3.

Windows XP: See "WAN ISDN Network Devices" in HCT documentation.

B7.4.4 ISDN Net Device - Windows Experiences

B7.4.4.1 Performance meets minimal expectations on high-end broadband network devices

B7.4.4.2 Device meets Windows Logo network adapter requirements

[NET-0258; SDG3:134]

B7.4.4.3 Device supports synchronous high-level data link control framing

[NET-0259; SDG3:135]

B7.4.4.4 NDIS interface and driver support raw, unframed synchronous B channel I/O

[NET-0260; SDG3:136]

B7.4.4.5 Driver supports unattended installation, with limitations

[NET-0261; SDG3:137]

B7.4.4.6 Device includes software-selectable terminating resistors

[NET-0262; SDG3:139]

B7.4.4.7 ISDN modem supports asynchronous-to-synchronous conversion and RFC 1662

[MOD-0385; SDG3:131]

B7.4.4.8 ISDN modem supports required command set

[MOD-0384; SDG3:129]

B7.4.5 ISDN Net Device - FAQs

See B7.1.5.

B7.4.R ISDN Net Device - Future Requirements

See B7.1.R.

B7.5 ATM Device

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general network device requirements in B7.1 are included by reference, except for requirements specific to connection-less or LAN devices.

B7.5.1 ATM Device - Windows Compatibility

See B7.1.1.

B7.5.2 ATM Device - Industry Standards

See B7.1.2.

B7.5.3 ATM Device - Quality

B7.5.3.1 SEE B7.1.3

B7.5.3.2 Pass WHQL tests

Windows XP: See "ATM Devices" in HCT documentation.

B7.5.4 ATM Device - Windows Experiences

B7.5.4.1 DELETED

See B7.5.4.2, B7.5.4.3.

B7.5.4.2 ATM adapter can schedule calls on an unspecified bit rate (UBR) virtual circuit at a peak rate less than the line or link rate

[NET-0270; SDG3:117]

Asynchronous Transfer Mode (ATM) Adapter that supports call responds to F4 and F5 calls. [NET-0272; SDG3:119]

B7.5.4.3 ATM/DSL simultaneous connections require support for 32 or more connections

[NET-0266; SDG3:112]

B7.5.4.4 ATM network devices meet minimal expectations

[NET-0266-0272; SDG3:114-120]

- UBR service type. [NET-0267; SDG3:114]
- Minimum number of simultaneously active VBR or CBR connections. [NET-0268; SDG3:115]
- Traffic shaping. [NET-0269; SDG3:116]
- Enforces PCR on UBR virtual circuits. [NET-0270; SDG3:117]
- Dynamic link speed configuration. [NET-0271; SDG3:118]
- OAM. [NET-0272; SDG3:119]
- Buffer chaining (Tx + Rx). [SDG3:120]

B7.5.5 ATM Device - FAQs

See B7.1.5.

B7.5.R ATM Device - Future Requirements

See B7.1.R.

B8.0 Printers

B8.1 General Printers

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.

B8.1.1 Printers - Windows Compatibility

B8.1.1.1 Windows XP/Windows 2000: "Printer Drivers and Spooler Components" in the Windows DDK

B8.1.1.2 Windows 98/Me: "Printer INF File Extensions," "Printer-Specific INF File Extensions Reference," and DEVMODE function in the Windows Me DDK

B8.1.1.3 ICM APIs and functionality for Windows 98/Me and Windows XP/Windows 2000

Microsoft Platform SDK and "Color Management for Displays" in the Windows DDK.

B8.1.1.4 Windows compatibility and implementation notes

http://www.microsoft.com/hwdev/print/

B8.1.1.5 Windows XP/Windows 2000: IEEE 1394 printing devices using SBP-2 protocol conform to guidelines in "SBP-2 Support and Windows 2000"

[1394-0094]
http://www.microsoft.com/hwdev/print/sbp2_w2000.htmSee also "Identifiers for 1394 Devices" in the Windows DDK.

B8.1.2 Printers - Industry Standards

B8.1.2.1 Universal Serial Bus Device Class Definition for Printing Devices, V. 1.0 or later

[PRNT-0294; SDG3:73]
http://www.usb.org/developers/devclass.html

B8.1.2.2 Legacy Plug and Play Guidelines

[PRNT-0294]

For IEEE 1284 or serial port. See Legacy Plug and Play Guidelines.

B8.1.2.3 ICC Profile Format Specification, Spec ICC.1:1988-09 and Addendum 2, ICC.1A:1999-04

[PRNT-0300]
http://www.color.org/profiles.html

B8.1.2.4 Windows Color Quality Specifications for Printer OEMs

[PRNT-0301]
http://www.microsoft.com/hwdev/color/

B8.1.3 Printers - Quality

WHQL Test Specification References:
Chapter 25: Printer Test Specification

B8.1.3.1 Pass WHQL tests

See B1.3.

Windows XP: See "Printers" in HCT documentation.

B8.1.3.2 - B8.1.3.6 SEE B8.1.4.10

B8.1.4 Printers - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 15, "Printers"

B8.1.4.1 Network Point-and-Print capability accommodates file-number limits and other differences between operating systems that might run on the client and server

[PRNT-0303]

B8.1.4.2 Device associates an ICC profile

[PRNT-0300]

Devices that create sRGB output must associate the "sRGB Color Space Profile.icm" Windows default ICC profile with the device.

Devices using a vendor-supplied ICC profile or profiles must associate this profile or profiles with the device.

B8.1.4.3 Windows XP/Windows 2000: Network printer supports standard port monitor

[PRNT-0295]

B8.1.4.4 Port monitor software meets DDK guidelines

[PRNT-0302]

See "Port Monitors" in the Windows DDK and "Local Port Monitor Design and Implementation Notes" in the Windows Me DDK.

B8.1.4.5 Device is available immediately following installation

[PRNT-0304]

B8.1.4.6 Print device provides non-legacy port connection

[PRNT-0294, 0297; see FAQ B8.1.5.4]

USB-to-printer port adapters comply with USB specifications. [SDG3:73]

B8.1.4.7 Color printer complies with Windows Color Quality Specifications for Printer OEMs

[PRNT-0301]

B8.1.4.8 USB printer driver takes advantage of built-in operating system support for USB printers

Windows DDK - see "USB Printing" in the DDK

B8.1.4.9 Plug and Play IDs are specific, and INF [Install] sections only key off the most specific IDs

As described in the Windows DDK; see references in B8.1.1.

B8.1.4.10 Printer and driver capabilities requirements

- Printable regions accuracy. [PRNT-0305]
- Printer driver runs only in user mode. [PRNT-0307; see also FAQ B8.1.5.2]
  See "Choosing User Mode or Kernel Mode" in the Windows DDK.
- DevMode structure support [PRNT-0299]
  Windows XP/Windows 2000: "DEVMODEW" in the Windows DDK.
  Windows Me/98: "DEVMODE" in the Windows Me DDK.
- **Windows 98/Me:** Dynamic load/unload from RAM
- Printer INF file and installation. [PRNT-0298]
  Windows XP/Windows 2000: "Printer INF Files" in the Windows DDK.
  Windows Me/98: "Installing and Using USB Printers with Microsoft Windows" and "Printer INF File Extensions" in the Windows Me DDK.

B8.1.5 Printers - FAQs

B8.1.5.1 Current Print Device FAQs

See http://www.microsoft.com/winlogo/hardware/printer/.

B8.1.5.2 Windows XP/Windows 2000: Printer driver runs only in user mode [Clarification]

[PRNT-0307]

Testing applies as of March 31, 2000 on new drivers. Resubmissions of existing kernel mode drivers are exempt from this requirement.
FAQ Date: July 8, 1999; revisions July 12, 1999

B8.1.5.3 ECP mode [Logo Program Clarification]

[PRNT-0294]

Support for ECP mode is required; support for bi-direction mode is *not* required.
FAQ Date: May 4, 2000

B8.1.5.4 Printers provide a non-legacy port [Logo Program Clarification

[PRNT-0294, 0297]

Printers use non-legacy port connections such as USB, IEEE 1394, or Ethernet. Printers can also include a legacy parallel interface in addition to the required non-legacy port connections. USB-to-printer port adapters are not considered an alternative non-legacy interface.
FAQ Date: January 31, 2001

B8.1.R Printers - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/printer/.

B8.1.R.1 USB Printer reports unique serial number

USB printers must report a unique serial number to allow the operating system to differentiate between two identical printers attached to the same system and to support a printer that is moved from one USB port to another.

B9.0 Still Image Devices

B9.1 General Still Image Devices

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.

B9.1.1 Still Image Devices - Windows Compatibility

B9.1.1.1 Still image driver support

Note: Digital still cameras that stream video while tethered must have WDM stream class drivers. [IMAG-0318]

- **Windows Me:** Vendor provides a WIA driver or supports PIMA 15740 in camera firmware. [IMAG-0317]

- **Windows XP:** Scanner vendors must provide a WIA driver. Digital camera vendors can implement one of the following solutions:
  - Provide a camera-specific WIA driver.
  - Ensure the camera firmware adheres to the mandatory commands in the PIMA 15740 standard.
  - Implement support compliant with the USB Mass Storage Class Bulk-Only specification and use the Microsoft Usbstor.sys storage driver.

  See "Still Image Drivers" in the Windows DDK. See also FAQ B9.1.5.4.

- **Windows 2000/Windows 98:** Driver supports STI driver interface - "Still Image Drivers" in Windows DDK.

- Driver supports TWAIN 1.7, if TWAIN support is implemented. [IMAG-0319]

B9.1.1.2 "Color Management for Still Image Devices" in the Windows DDK

[IMAG-0310]

B9.1.1.3 Windows compatibility and implementation notes (general)

http://www.microsoft.com/hwdev/stillimage/

B9.1.1.4 Windows XP/Windows Me: Windows Image Acquisition (WIA) driver support

[IMAG-0312]
http://www.microsoft.com/hwdev/wia/

B9.1.1.5 Windows 2000: Still Image Architecture (STI)

http://www.microsoft.com/hwdev/stillimage/w2STI.htm

B9.1.2 Still Image Devices - Industry Standards

B9.1.2.1 Photographic and Imaging Manufacturers Association (PIMA) 15740, "Requirements for communication with digital photography devices"

[IMAG-0311, 0316]
http://www.pima.net/standards/it10a.htm#15740

B9.1.2.2 USB Still Image Capture Device Definition, V.0.9 or later

[IMAG-0311]
http://www.usb.org/developers/docs.html

B9.1.2.3 Legacy Plug and Play Guidelines

[Legacy Plug and Play Guidelines]

B9.1.2.4 ICC Profile Format Specification, Spec ICC.1:1988-09 and Addendum 2, ICC.1A:1999-04

[IMAG-0310]
http://www.color.org/profiles.html

B9.1.2.5 Design Rule for Camera File system (DCF) Specification

http://www.jeida.or.jp/document/standard/jeida49-2.html#English

B9.1.2.6 Specification for Exchangeable image file format (EXIF)

EXIF is used in the digital still cameras and related systems.

http://www.jeida.or.jp/document/standard/jeida49.html

B9.1.3 Still Image Devices - Quality

WHQL Test Specification References:
Chapter 13: Still Imaging/WIA Test Specification

B9.1.3.1 - B9.1.3.3 SEE B9.1.1.1

B9.1.3.4 Pass WHQL tests

See B1.3.

Windows XP: See "Scanners" and "Cameras" in HCT documentation.

B9.1.4 Still Image Devices - Windows Experience

Design Guidelines:
WIA at http://www.microsoft.com/hwdev/wia/
PC 2001 System Design Guide, Chapter 16, "Digital Still Image Peripherals"

B9.1.4.1 Device uses USB or IEEE 1394 connection

[IMAG-0309; see also FAQ B9.1.5.3]

B9.1.4.2 Device associates an ICC profile

[IMAG-0310]

Devices that create sRGB output must associate the "sRGB Color Space Profile.icm" Windows default ICC profile with the device.

Devices using a vendor-supplied ICC profile or profiles must associate this profile or profiles with the device.

B9.1.4.3- B9.1.4.5 DELETED

B9.1.4.6 Digital camera uses PC-compatible file system for removable storage

[IMAG-0313; see also FAQ B9.1.5.2]

- Media integrates an ATA controller
- Device file system installs via the Windows XP/Windows 2000 Installable File System.
- Device ships with a Windows Media Device Manager (WMDM) pluggable service provider.

B9.1.4.7 Daisy-chained parallel port imaging devices are Plug and Play capable

[INPT-0140]

As described in Legacy Plug and Play Guidelines.

B9.1.4.8 Imaging devices resolve at least 1/4 line per claimed pixel resolution in both directions

[IMAG-0315]

B9.1.4.9 Digital camera stores images in JPEG-compressed file format

[IMAG-0314]

B9.1.4.10 Asynchronous imaging device with an IEEE 1394 interface uses SBP2Port

[IMAG-0321]

B9.1.5 Still Image Devices - FAQs

B9.1.5.1 The current still image FAQs

See http://www.microsoft.com/winlogo/hardware/stillimage/.

B9.1.5.2 ATA Flash Cards [Logo Program clarification]

[IMAG-0313]

A PC Card ATA flash card must support at least one LogConfig with an IRQ resource. Under Windows Me, Configuration Manager (which is responsible for assigning resources) filters the LogConfigs of ATA cards. If an IRQ is not available, then that configuration is ignored. The operating system will not assign resources for a device that has no LogConfig with an IRQ. This requirement is effective July 1, 2000.
FAQ Date: December 22, 1999

B9.1.5.3 Windows Me: USB Mass Storage and Cameras [Clarification]

It is possible to create a camera that appears to the operating system to be a storage device (and not a camera) by supporting the USB Mass Storage Class specification in camera firmware. In this case, the device is a storage device and must adhere to storage specifications.

However, Microsoft will not grant a "Designed for Windows" logo to cameras that only appear as hard drives to Windows. The reason for this exclusion is that such a device is specifically *not* designed for Windows, and it loses functionality when attached to a Windows-based PC.

A camera that is designed for Windows retains camera functionality when attached, so the user can take advantage of the imaging feature sets in Windows Me and Windows XP.
FAQ Date: November 24, 1999

B9.1.5.4 Windows Me/Windows XP—Requirement for Still Image Devices [Clarification]

Still image devices are supported under WIA architecture or PIMA 15740. For the Windows Logo Program, the scanner vendor must provide a WIA driver. For digital cameras, however, vendors have theses options:

- Digital camera vendors can implement one of the following solutions:
  - Provide a camera-specific WIA driver.
  - Ensure the camera firmware adheres to the mandatory commands in the PIMA 15740 standard.
  - Implement support compliant with the USB Mass Storage Class Bulk-Only specification and use the Microsoft Usbstor.sys storage driver.

These choices are available because Windows Me and Windows XP provide a WIA driver for PIMA 15740 and USB Mass Storage Class devices, accomplishing the same functional purpose.

Note: Optimal user experience is seamless integration of the imaging peripheral with the Windows environment. In Windows 2000 and Windows 98, event-driven STI user-mode minidrivers remove unnecessary steps for device interaction with the operating system. In Windows XP and Windows Me, the operating system detects hot-pluggable WIA devices such as digital cameras, providing a seamless interface with the device. For persistent-connection devices, such as scanners, implementation of device events via buttons and sensors will deliver this functionality after initial installation.
FAQ Date: December 22, 1999

B9.1.R Still Image Devices - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/stillimage/.

B9.1.R.1 Digital camera design ensures the PC can both get and set camera properties using WIA driver interface

Future versions of the operating system will provide functionality that allows the user to change stored values on their digital cameras from the PC.

B10.0 Storage Controllers and Devices

B10.1 General Storage

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
BIOS support for boot devices: see A1.1.4.

B10.1.1 General Storage - Windows Compatibility

B10.1.1.1 Windows XP/Windows 2000: "Storage Devices" in the Windows DDK

[SYS-0025.2; SDG3:147]

B10.1.1.2 Windows 98/Me: "IOS" in the Windows Me DDK

[SYS-0025.6; SDG3:147]

B10.1.1.3 Int 13h Extensions

[BIOS-0011; SDG3:147]

"Int 13 Extension APIs" in the Windows Me DDK.

Option ROM or BIOS supports Int 13 for boot devices.

B10.1.1.4 Windows compatibility and implementation notes

http://www.microsoft.com/hwdev/storage/

B10.1.2 General Storage - Industry Standards

B10.1.2.1 DELETED

B10.1.2.2 ATA/ATAPI-5

[STOR-0347; SDG3:177]
ATA standards: Global Engineering Documents at
http://global.ihs.com/.

B10.1.2.3 ATAPI Removable Media Device BIOS Specification (ARMD), V. 1.0

http://www.phoenix.com/products/specs.html

B10.1.2.4 MMC-2 - Multi-Media Command Set-2

[STOR-0342; SDG3:149]
Global Engineering Documents at http://global.ihs.com/ (incorporates
information defined in Enhanced Music CD Specification).

B10.1.2.5 SCSI Reduced Block Commands (RBC), NCITS.330:2000)

[STOR-0342; SDG3:149]

Global Engineering Documents at http://global.ihs.com/.

B10.1.2.6 Small Computer Interface (SCSI-2)

[X3.131:1994] standard; Global Engineering Documents at
http://global.ihs.com/.

B10.1.2.7 Compaq-Intel-Phoenix BIOS Boot Specification, V.1.01; El Torito— Bootable CD-ROM Format Specification, V.1.0

[BIOS-0005.1; SDG3:12]
http://www.phoenix.com/techs/specs.html

B10.1.2.8 Media Status Notification Support Specification, V. 1.03

[STOR-0342; SDG3:149]
http://www.microsoft.com/hwdev/download/devdes/atamed.rtf; see
FAQ B10.1.5.5.

B10.1.2.9 IEEE 1394 storage class devices conform to ANSI standards for SBP-2 with appropriate command set

[1394-0094; SDG3.160]

Appropriate command sets are RBC (Reduced Block Commands) or MMC-2.

B10.1.2.10 Universal Serial Bus Mass Storage Class Specification Overview, Revision 1.0

[STOR-0343; SDG3:158; see also FAQ B10.1.5.6]

B10.1.2.11 NCITS Serial Bus Protocol-2 (SBP-2) transport protocols (ANSI NCITS 3.25-1998)

Global Engineering Documents at http://global.ihs.com/.

B10.1.2.12 SCSI Parallel Interface (SPI-3) [ANSI/NCITS T10-1302D] standard

[SCSI-0104]

Global Engineering Documents at http://global.ihs.com/.

B10.1.2.13 SCSI-3 Medium Changer Commands (SMC), ANSI NCITS.314:1998

Global Engineering Documents at http://global.ihs.com/.

B10.1.3 General Storage - Quality

WHQL Test Specification References:
Chapter 10: ATA/ATAPI Test Specification

B10.1.3.1 Pass all WHQL tests

See B1.3.

Windows XP: See "Storage Controllers and Devices" in the HCT documentation.

B10.1.3.2 SEE B10.1.3.1 and B10.1.4.7

B10.1.3.3 SEE B10.1.3.1

B10.1.4 General Storage - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 12, "Storage"
Hardware Design Guide Version 3.0 for Microsoft Windows 2000 Server, Chapter 5

B10.1.4.1 Configuring or adding a device to a system does not require changing jumpers or switches on either device or system board

[SYS-0029.2]

B10.1.4.2 Bootable controller supports El Torito No Emulation mode; option ROM supports Int 13h Extensions

[ATA-0116, 0117; SCSI-0106; SDG3:147]

B10.1.4.3 Removable media devices support media status notification

[STOR-0342; SDG3:149; see also FAQ B10.1.5.5]

B10.1.4.4 Dynamic resource configuration is supported for all devices

[SYS-0029; SDG3:9]

B10.1.4.5 Device driver for partitioned media supports all Windows and Windows 2000 partition types

[STOR-0365]

B10.1.4.6 Controller, hard drive, and CD/DVD devices support bus mastering and UDMA/DMA

[STOR-0341; SDG3:146; see also FAQ B10.1.5.4]

Programmed I/O (PIO) support is allowed only for Compact Flash format storage and similar flash-RAM devices.

All other storage and optical devices must support DMA bus mastering and cannot use PIO.

(Note that USB controls DMA on the host side).

B10.1.4.7 Devices, controllers, and drivers support upgrading the operating system and converting to any Windows-supported file system

- Windows NT 4.0 > Windows XP/Windows 2000 Upgrade.
- Windows 98/Me > Windows XP/Windows 2000 Upgrade.
- FAT16 > FAT32 upgrade; FAT32 > NTFS conversion. Removable media with MTBF similar to hard drives also can be converted to NTFS.

B10.1.5 General Storage - FAQs

B10.1.5.1 Current storage FAQs

See http://www.microsoft.com/winlogo/hardware/storage/.

B10.1.5.2 DAC support and PCI storage adapters for large-memory systems [Clarification]

SDG3:30-32]
Requirements for PCI adapters to support the PCI DAC command are defined in A1.1.6. For storage devices, at a minimum this includes adapters implemented in or designed as primary storage components -- RAID, Fibre Channel, high-speed SCSI, and so on -- for systems that support more than 4 GB of system memory.

See "Large Memory Enabled Device Driver Hardware and Software Requirements" in the Windows DDK; design guidelines are summarized at http://www.microsoft.com/hwdev/newPC/PAEdrv.htm

B10.1.5.3 DELETED

FAQ Date: January 31, 2001

B10.1.5.4 Support for ATA Bus Master DMA [Clarification]

[STOR-0341; SDG3:146]

- Required for ATA controllers.
- Required for ATA devices, and ATAPI-based hard drives.
- Recommended for ATAPI peripherals other than hard drives, including CD and DVD devices.

  In particular, non-hard disk ATAPI devices (CD, DVD, ZIP, Orb, and magneto-optical devices, and so on) are not required to support Ultra DMA transfers. However, non-hard disk ATAPI devices often share the bus with other devices. Therefore, non-hard-disk ATAPI devices must support ATAPI-5 bus termination schemes such that a device sharing the bus can achieve the bus timing necessary to perform Ultra DMA transfers.

- Recommended for ATAPI removable media drives.
  FAQ Date: March 5, 1999; June 24, 2000, May 21, 2001

B10.1.5.5 Media status notification [Correction]

[STOR-0342; SDG3:149]

The intent of the requirement for media status notification is for devices to support the commands of the implemented bus interface so the operating system can detect when a media event has taken place. The requirements for removable storage devices are defined in the following table; they apply either to single LUN devices or to devices that are part of a Multiple LUN device.

Device type	Media status notification implementation
All CD or DVD devices (independent of interconnect)	Required. Comply with ANSI NCITS T10 MMC-2 standard for Media Status Event Notification.
ATAPI floppy/optical direct access drives (PD, MO, removable magnetic floppy or rigid based, and so on)	Required. Comply with either MMC-2 standard or SFF 8070i Version 1.1.
IEEE 1394 storage devices (non-CD / DVD)	Required. Comply with *NCITS Reduced Block Commands* (RBC; T10/97-260r0) standard.
ATA and non-ATAPI (IDE interconnect) storage devices	Required. Comply with Media Status Notification Support, Version 1.03.
Other ATA/ATAPI devices, including tape drives	Recommended. If implemented, comply with Media Status Notification Support Specification, Version 1.03, or SFF 8070i.
Other types of SCSI removable devices	Recommended. If implemented, support based on *SCSI Reduced Block Commands (RBC), NCITS.330:2000* is recommended.

Windows XP: A CD-R/RW drive must support the following Get Event/Status Notification commands:

Operational Change Request/Notification

External Request

Media Request

Device Busy

[see also FAQ B10.5.5.4]

FAQ Date: March 19, 1999; May 24, 2001

B10.1.5.6 USB mass storage [Logo Program clarification]

USB-based mass storage devices cannot be the primary method of normal system booting. They are expected to be a replacement for booting to load an operating system on the primary boot drive, or as a replacement for legacy floppy drives.

FAQ Date: August 26, 1999

B10.1.R General Storage - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/storage/.

B10.1.R.1 Devices that write digital content to removable media are capable of both creating and modifying a Desktop.ini file on the media

This future requirement will address the Windows user experience with Autoplay technology.

B10.1.R.2 SCSI Block Commands – 2 (SBC-2), ANSI NCITS T10/1417-D

B10.1.R.3 SCSI Multimedia Commands – 3 (MMC-3), ANSI NCITS T10/1363-D

B10.2 ATA/ATAPI Controllers/Devices

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general storage requirements in B10.1 are included by reference.

B10.2.1 ATA/ATAPI Controllers/Devices - Windows Compatibility

B10.2.1.1 DELETED

B10.2.2 ATA/ATAPI Controllers/Devices - Industry Standards

B10.2.2.1 ATA/ATAPI-5 Standards

[ATA-0115; SDG3:177]
Global Engineering Documents at http://global.ihs.com/.

B10.2.3 ATA/ATAPI Controllers/Devices - Quality

B10.2.3.1 Pass WHQL tests

See B1.3, B10.1.3.2, and B10.1.4.7.

Windows XP: See "ATA/ATAPI Controllers" and device-specific topics in HCT documentation.

B10.2.3.2 SEE B10.1.3.2

B10.2.4 ATA/ATAPI Controllers/Devices - Windows Experience

B10.2.4.1 Windows 98/Me: Driver runs in 32-bit protected mode after installation

[SYS-0025]

B10.2.4.2 Windows XP/Windows 2000 Professional/Windows Me: Large partition support (>8 GB) and ability to boot from loader

[ATA-0116]

B10.2.4.3 Windows XP/Windows 2000 Professional/Windows Me: S3 and hibernation support

[SYS-0003.4; see A1.4.2]

B10.2.4.4 ATA controllers and devices support Ultra DMA, do not claim 3F7h and 377h

[ATA-0119; STOR-0350; SDG3:177]

B10.2.4.5 Dual ATA adapters use single FIFO with asynchronous access or dual FIFOs and channels; ATA disk drive supports

ATA-0118, 0117; SDG3:176 Standards

B10.2.4.6 Controller and peripheral connections include Pin 1 cable designation with keyed and shrouded connectors

[ATA-0120; SDG3:178]

B10.2.4.7 Peripherals comply with ATA/ATAPI-5

[STOR-0347; SDG3:179]

B10.2.4.8 ATAPI devices support DEVICE RESET command

[STOR-0348; SDG3:180]

B10.2.4.9 ATA device supports ATA STANDBY command

[STOR-0349; SDG3:181]

B10.2.4.10 To tolerate Ultra DMA, ATAPI devices support the termination scheme defined in ATA/ATAPI-5

[ATA-0119; see also FAQ B10.1.5.4]

B10.2.5 ATA/ATAPI Controllers/Devices - FAQs

See B10.1.5.

B10.2.R ATA/ATAPI Controllers/Devices - Future Requirements

See B10.1.R.

B10.2.R.1 ATA/ATAPI-6 proposal and its appendices are under consideration for future requirements

This includes proposals for raising the lower limit on UDMA cycle time, 48-bit LBA support, and other advanced features.

The latest draft of ATA/ATAPI-6 is available from the web site for the T13 Technical Committee for the National Committee on Information Technology Standards (NCITS) at http://www.t13.org/.

B10.3 SCSI Controllers/Devices

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general storage requirements in B10.1 are included by reference.

Note: Most SCSI controllers submitted as reference motherboard implementations can be submitted on a plug-in adapter card. However, if the reference motherboard implementation must be submitted on a motherboard, two different motherboard implementations are required for Windows Logo qualification.

B10.3.1 SCSI Controllers/Devices - Windows Compatibility

B10.3.1.1 SCSI Configured Automatically (SCAM) support is disabled by default

[SCSI-0113; SDG3:171]

B10.3.2 SCSI Controllers/Devices - Industry Standards

B10.3.2.1 Small Computer Interface (SCSI-2) [X3.131:1994] standard

Global Engineering Documents at http://global.ihs.com/.

B10.3.2.2 SCSI Parallel Interface (SPI-3) [NCITS.336:2000] standard

[SCSI-0104]

Global Engineering Documents at http://global.ihs.com/

B10.3.3 SCSI Controllers/Devices - Quality

B10.3.3.1 Passes WHQL tests

See B1.3, B10.1.3.2, and B10.1.4.7.

Windows XP: See "SCSI Controllers" and device-specific topics in HCT documentation.

B10.3.4 SCSI Controllers/Devices - Windows Experience

B10.3.4.1 Windows 98/Me: Driver runs in 32-bit protected mode after installation

[SYS-0025]

B10.3.4.2 Windows XP/Windows 2000: S3 and hibernation support

[SYS-0003.4]

Windows Me: Hibernate is *not* supported for SCSI.

B10.3.4.3 Windows XP/Windows 2000/Windows Me: Large partition support (>8 GB) and ability to boot from loader

B10.3.4.4 Adapter is capable of sharing IRQ and works behind a PCI-PCI bridge

[SCSI-0106; SDG3:35]

B10.3.4.5 Connector and terminator requirements

[SCSI-01xx; SDG3:16x,170]

- Bus type is clearly indicated using ANSI-approved icons on connectors for all adapters and peripherals. [SCSI-0108; SDG3:163]
- Differential devices support DIFFSENS as defined in SPI -3 standard. [SCSI-0109; SDG3:164]
- Automatic termination circuit and SCSI terminators meet SPI-3 standard. [SCSI-0110; SDG3:165]
- Terminator power is supplied to the SCSI bus with overcurrent protection. [SCSI-0111; SDG3:166]
- External connector meets SCSI-2 or later standard. [SCSI-0108; SDG3:167]
- Controller and peripheral connections include Pin 1 cable designation; shielded device connector meets SCSI-2 or later standard. [SCSI-0108; SDG3:169]
- External devices use automatic termination or an accessible on-board termination switch. [STOR-0345; SDG3:170]

  Note: Not required for Fault-Tolerant RAID devices where the terminators are considered to be a Field Replaceable Unit (FRU).
- SCSI devices that support hot-plugging comply with Annex D of SPI-3. [SCSI-0104; SDG3:174]

B10.3.4.6 Controller and peripherals implement SCSI bus data protection signal

[SDG3:168]

B10.3.4.7 Hardware supports the SCSI-3 START STOP UNIT command to decrease power consumption as defined in the SCSI Block Commands Specification

[STOR-0346; SDG3:172]

B10.3.4.8 Option ROM supports virtual DMA services

[SCSI-0105; SDG3:146]

B10.3.4.9 SCSI erasable drive supports SCSI commands

[SDG3:183]

B10.3.4.10 SCSI controller provides multi-initiator support if the controller provides external device connection capability for use as a cluster node

[SCSI-0114; SDG3:162]

B10.3.5 SCSI Controllers/Devices - FAQs

See B10.1.5.

B10.3.R SCSI Controllers/Devices - Future Requirements

See B10.1.R.

B10.3.R.1 Architectures are under consideration for future requirements

This includes raising the lower limit on parallel and serial timing, Persistent Reservations, and other advanced features contained at SCSI Parallel Interface 4 (SPI-4), ANSI NCITS T10/1365-D.

B10.4 Hard Disk Drives

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general storage requirements in B10.1 are included by reference.
All ATA/ATAPI device-specific requirements in B10.2 are included by reference.
All SCSI device-specific requirements in B10.3 are included by reference.

B10.4.1 Hard Disk Drives - Windows Compatibility

See B10.1.1.

B10.4.2 Hard Disk Drives - Industry Standards

B10.4.2.1 SMART IOCTL API Specification, v.1.1

http://www.microsoft.com/hwdev/download/respec/iocltapi.rtf
(if SMART drive support is implemented).

B10.4.2.2 SCSI Primary Commands (SPC), ANSI X3.301:1997

Global Engineering Documents at http://global.ihs.com/.

B10.4.2.3 SCSI-3 Block Commands (SBC), ANSI NCITS.306:1998

Global Engineering Documents at http://global.ihs.com/.

B10.4.3 Hard Disk Drives - Quality

B10.4.3.1 Pass WHQL tests

>See B1.3, B10.1.3.2, and B10.1.4.7.
>**Windows XP:** See "Hard Disk Drive" in the HCT documentation.

B10.4.3.2 - B10.4.3.3 SEE B10.4.3.1

B10.4.3.4 SEE B10.1.4.7

B10.4.3.5 SEE B10.4.3.1

B10.4.3.6 SEE B10.4.4.5

B10.4.4 Hard Disk Drives - Windows Experience

B10.4.4.1 Hard disk supports bus mastering and UDMA/DMA

>[STOR-0341; SDG3:146; see also FAQ B10.1.5.4]

B10.4.4.2 Windows XP/Windows 2000/Windows Me: Large partition support (>8 GB) and ability to boot from loader

B10.4.4.3 Device driver for block-mode device supports extended BIOS parameter blocks (BPBs)

>See "DCB (Device Control Block)" in the Windows Me DDK.

B10.4.4.4 Windows Whistler Server: Hot-swappable drive, if provided, includes a local disk drive replacement indicator

>[SDG3:224]

B10.4.4.5 Windows Whistler Server: SCSI and Fibre Channel hard drives implement complete identification strings

>Strings are defined in SCSI Primary Commands (SCSI-3 PC), Section 7.5.3, Vital Product Data.

>This support is used for unique ID of devices with host connection, in multipath, failover, and LUN ID.

B10.4.5 Hard Disk Drives - FAQs

>See B10.1.5.

B10.4.R Hard Disk Drives - Future Requirements

>See B10.1.R.

B10.5 CD/DVD Drives

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general storage requirements in B10.1 are included by reference.
All ATA/ATAPI device-specific requirements in B10.2 are included by reference.
All SCSI device-specific requirements in B10.3 are included by reference.

B10.5.1 CD/DVD Drives - Windows Compatibility

B10.5.1.1 DVD Multifunction Devices: Avoiding Multiple Logical Unit Devices

http://www.microsoft.com/hwdev/dvd/multiLUN.htm

B10.5.2 CD/DVD Drives - Industry Standards

B10.5.2.1 CD or DVD drive complies with MMC-2

[STOR-0354; SDG3:188]

DVD drives must support SFF 8090 ("Mt. Fuji 5" specification), submitted to the SCSI T10 MMC group at revision 0.9 (ftp://ftp.t10.org/t10/document.00/00-361r0.pdf; available in MMC-3 review draft (ftp://ftp.t10.org/t10/drafts/mmc3/mmc3r09.pdf).

B10.5.2.2 Optical Storage Technology Association (OSTA) MultiRead Specification for CD-ROM, CD-R, CD-R/RW, and DVD-ROM Devices, V.1.11

http://www.osta.org/

Note: MMC-2 and OSTA specifications replace former reference to Multisession Compact Disc Specification Enhanced Music CD Specification.

B10.5.2.3 SFF 8070i (ATAPI Removable Rewritable Media Devices specification) for block rewritable optical ATAPI devices

[STOR-0363; SDG3:148]

ftp://fission.dt.wdc.com/pub/standards/SFF/specs/INF-8070.PDF

B10.5.2.4 SFF 8090

B10.5.2.5 Universal Disk Format Specification, V.1.5 and 2.0

http://www.osta.org/

B10.5.2.6 ECMA Standards ECMA-267 (DVD-ROM), ECMA-274 (DVD+RW), and ECMA-273 (DVD-RAM)

http://www.ecma.ch/

B10.5.2.7 DVD Specifications for Rewritable Disc, Part 1: Physical Specifications

Global Engineering Documents at http://global.ihs.com/.

B10.5.2.8 Windows XP: DVD-RAM Specification

Global Engineering Documents at http://global.ihs.com/.

B10.5.3 CD/DVD Drives - Quality

B10.5.3.1 Pass WHQL tests

See B1.3, B10.1.3.2, and B10.1.4.7.

Windows XP: See "CD/DVD Drive" and "Recordable CD/DVD Drive" in the HCT documentation.

B10.5.3.2 SEE B10.5.4.3

B10.5.4 CD/DVD Drives - Windows Experience

B10.5.4.1 DMA capability on ATA/ATAPI CD-ROM, CD-R/CD-RW, and DVD-ROM drives

[STOR-0341; SDG3:146; see also FAQ B10.1.5.4]

B10.5.4.2 CD device requirements

[STOR-03xx; SDG3:18x; see also FAQ B10.5.5.4]

- Provides 8x minimum transfer rate or better performance. [STOR-0362; SDG3:185; see FAQ B10.5.5.2]
- CD-enhanced compatible. [STOR-0352; SDG3:186]
- Supports specified logical and physical CD formats. [STOR-0353; 0355; SDG3:187]
- Supports the READ CD-DA command as defined in the MMC-2 standard. [STOR-0354; SDG3:188; see also FAQ B10.5.5.4]
- Supports digital audio detection and digital audio quality on CD-ROM drive - see http://www.microsoft.com/hwdev/devdes/cddigital.htm. [STOR-0357; see FAQ B10.5.5.3]

B10.5.4.3 DVD storage device requirements

[STOR-036x; SDG3:19x]

- Provides 2 MB per second minimum transfer rate or better performance anywhere on the disc. [STOR-0360; SDG3:191; see FAQ B10.5.5.2]
- Supports logical and physical CD formats, MMC-2, and defect management where applicable. [STOR-0361; SDG3:192, 193; see FAQ B10.5.5.4]

B10.5.4.4 Windows 98/Me: Media Player functionality with .AVI and .MPG files

B10.5.5 CD/DVD Drives - FAQs

B10.5.5.1 SEE B10.1.5

B10.5.5.2 Minimum speed requirement for CD and DVD devices [Logo Program Clarification]

[STOR-036x; SDG3:165]

The design references for this requirement are now STOR-0362, STOR-0360, SDG3:165.
FAQ Date: June 16, 2000

B10.5.5.3 CD transfer speed on USB [Logo Program clarification]

Microsoft acknowledges that CD-ROM devices that otherwise meet the Windows Logo Program requirements for 8x or better transfer rate will likely achieve only about 6x transfer speed when the device is connected over USB, because of the transfer speed limitations of USB 1.x. Such configurations will be eligible for the Windows Logo.
FAQ Date: December 22, 1999

B10.5.5.4 CD Capabilities and CD Audio [Correction]

[STOR-0357]

CD and DVD drives must implement "CD Capabilities and Mechanical Status Page" (2Ah), as defined in the MMC-2 standard. The bit "CD-DA Commands Supported" must be set and the functionality must be implemented.

CD and DVD drives must also implement and set the bit "CD-DA Stream is Accurate" of "CD Capabilities and Mechanical Status Page." The READ_CD command and READ_RAW commands must provide sector-accurate reads, as defined in MMC-2. Data alignment accuracy must be equivalent to that of data reads. Because of the lack of error correction code (ECC) bytes used for data tracks, the data itself may contain inaccuracies due to physical defects of the media.

Windows XP: A CD-R/RW drive must support the following commands, as defined in SFF-8090 and MMC-2:

> Get Configuration
> Get Event/Status Notification
>> Operational Change Request/Notification
>> External Request
>> Media Request
>> Device Busy
> Mode sense10, Mode Select10
> Prevent/Allow Medium Removal
> ReadTOCPAMAATIP
> Read CD, Read CD MSF
> Read Disc Information
> Read Track Information
> Send OPC Information
> Set CD Speed
> Start/Stop Unit
> Blank
> Write 10, Read 10, Read 12
> Write 12, in the following cases:
>
>> DVD+RW Feature (2Ah)
>> DDCD-R Write Feature (31h)
>> DDCD-RW Write Feature (32h)
>> Real-Time Streaming Feature (107h)

A CD-R/RW drive that identifies itself as CD-RW capable must support the following capabilities:

Capability	Description
Profile List	A list of all profiles supported by the device.
Core	Basic functionality.
Morphing	Ability to notify Initiator about operational changes and accept Initiator requests to prevent operational changes.
Removable Medium	The medium may be removed from the device.
Random Readable	Read ability for storage devices with random addressing.
Multi-Read	The Logical Unit complies with OSTA Multi-read.
CD Read	The ability to read CD specific structure.
Incremental Streaming	Write support for sequential recording.
Formattable	Support for formatting the media.
Restricted Overwrite	Write support for media that shall be written in multiples of Logical blocks.
CD Track at once	Ability to write CD with track at once recording.

Capability	Description
Defect management	Ability of the drive/media system to provide an apparently defect-free space.
Power management	Initiator and device directed power management.
Timeout	Ability to respond to all commands within a specific time.
Real-Time Streaming	Ability to read and write using Initiator requested performance parameters.

FAQ Date: October 7, 1998; May 24, 2001

B10.5.5.5 Defect management for +RW media [Correction]

Defect management for +RW media is defined in ECMA-274.

FAQ Date: October 7, 1998; corrections March 1, 1999

B10.5.5.6 CSS copyright protection; DVD Regionalization [Logo Program Clarification]

CSS copyright protection is not a Logo Program requirement. Nor is DVD Regionalization. The related technical issue is addressed through proprietary licensing programs and is not a testing requirement for the Windows Logo Program. It is the responsibility of independent hardware and software vendors to ensure for themselves that they have met the necessary requirements in their products.

FAQ Date: January 18, 2000

B10.5.R CD/DVD Drives - Future Requirements

See B10.1.R.

B10.5.R.1 CD-RW drives will be required to support the Mt. Rainier initiative specification for support of Windows-based block addressing of CD-RW media

See http://www.mt-rainier.org.

B10.6 Removable Media Drives

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general storage requirements in B10.1 are included by reference.
All ATA/ATAPI device-specific requirements in B10.2 are included by reference.
All SCSI device-specific requirements in B10.3 are included by reference.

B10.6.1 Removable Media Drives - Windows Compatibility

B10.6.1.1 Windows XP/Windows 2000: Removable Storage Management
and Windows 2000

http://www.microsoft.com/hwdev/storage/RSM.htm

B10.6.2 Removable Media Drives - Industry Standards

See B10.1.2.

B10.6.3 Removable Media Drives - Quality

B10.6.3.1 Pass WHQL tests

See B1.3, B10.1.3.2, and B10.1.4.7.

Windows XP: See "Removable Media Drive" in the HCT
documentation.

B10.6.3.2 - B10.6.3.3 SEE B10.1.4.7

Removable media with MTBF similar to hard drives also can be
converted to NTFS.

B10.6.4 Removable Media Drives - Windows Experience

B10.6.4.1 Windows 98/Me: Driver runs in 32-bit protected mode after
installation

B10.6.4.2 SEE B10.2.4

B10.6.5 Removable Media Drives - FAQs

See B10.1.5.

B10.6.R Removable Media Drives - Future Requirements

See B10.1.R.

B10.7 Tape Drives

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general storage requirements in B10.1 are included by reference.
All ATA/ATAPI device-specific requirements in B10.2 are included by
reference.
All SCSI device-specific requirements in B10.3 are included by
reference.

B10.7.1 Tape Drives - Windows Compatibility

See B10.1.1.

B10.7.2 Tape Drives - Industry Standards

B10.7.2.1 Tape-related standards

[SDG3:197]

- Cartridge drives: QIC 157 Revision D, "Common SCSI/ATAPI Command Set For Streaming Tape" at http://www2.qic.org/qic/html/standards/15x.x/qic157d.pdf.
- ATA tape drive complies with packet passing protocol in ATA/ATAPI-5.
- SCSI tape drive complies with SCSI tape command set SCSI-3 Stream Commands (SSC), ANSI NCITS.335:2000.

B10.7.2.2 SEE B10.1.2

B10.7.3 Tape Drives - Quality

B10.7.3.1 SEE B10.7.3.2

B10.7.3.2 Pass WHQL tests

See B1.3, B10.1.3.2, and B10.1.4.7.
Windows XP: See "Tape Drive" in the HCT documentation.

B10.7.4 Tape Drives - Windows Experience

B10.7.4.1 To tolerate Ultra DMA, ATAPI devices support the termination scheme defined in ATA/ATAPI-5

[ATA-0119; see FAQ B10.1.5.4]

B10.7.4.2 Windows Whistler Server: Driver integrates with Removable Storage Manager

[SDG3:198]

B10.7.4.3 Windows Whistler Server: Single-backup device meets minimum capacity requirements

[SDG3:196]
Basic: Required.
Advanced Server: 20 GB required.

B10.7.5 Tape Drives - FAQs

See B10.1.5.

B10.7.R Tape Drives - Future Requirements

See B10.1.R.

B10.7.R.1 For support of larger storage farms and server installations, the minimum tape size is 40 GB

Due to the needs of even the lowest end systems.

B10.8 Media Changer Devices

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general storage requirements in B10.1 are included by reference.

B10.8.1 Media Changer Devices - Windows Compatibility

See B10.1.1.

B10.8.2 Media Changer Devices - Industry Standards

See B10.1.2.

B10.8.3 Media Changer Devices - Quality

B10.8.3.1 SEE B10.8.3.2

B10.8.3.2 Pass Windows Logo Program testing

See B1.3 and B10.1.3.2.

Windows XP: See "Media Changer Device" in the HCT documentation.

B10.8.3.3 DELETED

B10.8.4 Media Changer Devices - Windows Experience

Design Guideline References:
Hardware Design Guide Version 3.0 for Microsoft Windows 2000 Server, Chapter 5

B10.8.4.1 If CD changer device supports 7 discs or less, comply with MMC-2

[STOR-0356; SDG3:199]

B10.8.4.2 SCSI tape changer and drive support auto-configuration

[SDG3:200]

B10.8.4.3 SCSI tape and optical disk changer support auto-configuration

[SDG3:201]

B10.8.5 Media Changer Devices - FAQs

See B10.1.5.

B10.8.R Media Changer Devices - Future Requirements

See B10.1.R.

B10.9 RAID

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general storage requirements in B10.1 are included by reference.

Note: If this device is implemented on a client system, compatibility testing is required for Windows XP/Windows 2000.

B10.9.1 RAID - Windows Compatibility

B10.9.1.1 SCAM is disabled by default, if SCSI device

[SCSI-0113; SDG3:171]

B10.9.2 RAID - Industry Standards

See B10.1.2 and B10.3.2.

B10.9.3 RAID - Quality

B10.9.3.1 Pass WHQL tests

See B1.3, B10.1.3.2, and B10.1.4.7.

Windows XP/Windows Whistler Server: See "RAID Devices" and "RAID Controller" in the HCT documentation.

B10.9.3.2 SEE B10.9.3.1.

B10.9.3.3 RAID cluster device

See B10.9.3.1.

B10.9.3.4 RAID multi-cluster device

See B10.9.3.1.

B10.9.3.5 SEE B10.9.3.1

B10.9.4 RAID - Windows Experience

Design Guideline References:
Hardware Design Guide Version 3.0 for Microsoft Windows 2000 Server, Chapter 5

B10.9.4.1 All external SCSI connectors are labeled with ANSI approved icon for bus type

[SCSI-0108; SDG3:163]

B10.9.4.2 Requirements in B10.1.4 do not apply for RAID Cluster Devices

This program only verifies basic cluster failover functionality requirements; all features and Windows Experience testing is completed when the product goes through the prerequisite Logo testing for the device type.

B10.9.4.3 RAID support include notification of failed drive

[SDG3:219]

B10.9.4.4 RAID subsystem supports automatic replacement of failed drive

[SDG3:220]

B10.9.4.5 RAID subsystem supports manual replacement of failed drive

[SDG3:221]

B10.9.5 RAID - FAQs

B10.9.5.1 Option ROM requirements [Clarification]

[BIOS-0011; SDG3:147]

Option ROMs for RAID controllers implemented on systems or as add-in controller cards must fully support Int 13.
FAQ Date: March 19, 1999

B10.9.R RAID - Future Requirements

See B10.1.R.

B10.9.R.1 SCSI controller drivers follow the Microsoft miniport model, in order to enable implementation of advanced features such as multi-path failover, load balancing, or LUN masking

B10.10 Fibre Channel

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general storage requirements in B10.1 are included by reference.

Note: If this component is implemented on a client system, compatibility testing is required for Windows XP/Windows 2000.

B10.10.1 Fibre Channel - Windows Compatibility

See B10.1.1 and B10.3.1.

B10.10.2 Fibre Channel - Industry Standards

B10.10.2.1 Fibre Channel Physical and Signaling Interface (FC-PH), ANSI X3.230:1994; amendment PC-PH-AM1 (X3.230:1994/AM-1:1996)

Fibre Channel 2nd Generation Physical Interface, ANSI X3.297:1997

B10.10.2.3 Fibre Channel 3rd Generation Physical Interface, ANSI X3.303:1998

B10.10.2.4 SCSI-3 Fibre Channel Protocol (FCP), ANSI X3.269:1996

Global Engineering Documents at http://global.ihs.com/.

B10.10.3 Fibre Channel - Quality

B10.10.3.1 FC adapter and hard drives pass Windows Logo Program testing

See B1.3, B10.1.3.2, and B10.1.4.7.

Windows Whistler Server: See "Fibre Channel Controllers" and device-specific topics in the HCT documentation.

Note: The 3-day stress test run specified for "Designed for Windows 2000 Server" testing is not required for client testing.

B10.10.3.2 FC adapter

See B10.10.3.1.

B10.10.3.3 FC hard drive

See B10.10.3.1.

B10.10.4 Fibre Channel - Windows Experience

Design Guideline References: *Hardware Design Guide Version 3.0 for Microsoft Windows 2000 Server*, Chapter 5

B10.10.4.1 Option ROMs for FC bootable controllers support extended Int 13 functions

[SDG3:147]

El Torito support is not required for FC controllers.

B10.10.4.2 Use X3T11 Private Loop Direct Attach profile as storage base to use native operating system support

[SDG3:182]

B10.10.5 Fibre Channel - FAQs

See B10.1.5.

B10.10.R Fibre Channel - Future Requirements

See B10.1.R.

B10.10.R.1 Fibre Channel controllers comply with the FC-PH Specification, Version (TBD)

In order to take advantage of the Microsoft-defined FibrePort model.

B10.10.R.2 SCSI Fibre Channel Protocol –2 (FCP-2), ANSI NCITS T10/1144-D

B11.0 Streaming Media and Broadcast

B11.1 General Streaming

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.

B11.1.1 General Streaming - Windows Compatibility

B11.1.1.1 Device support is based on DirectX foundation class and WDM stream class

[VID-0210]

- WDM support: "Streaming Devices (Video and Audio)" in the Windows DDK.

- All video input sources and capture devices must implement driver support as defined for WDM Stream class in "Devices (Video and Audio)" in the Windows DDK.
- Minidriver implementation for subpicture decoder: Microsoft DirectX SDK and "DirectShow and DVD Support" in the Windows DDK.

B11.1.1.2 Windows compatibility and implementation notes—streaming

http://www.microsoft.com/hwdev/stream/

B11.1.1.3 Associated control, middleware, and application software use DirectShow

[VID-0213]

It is not required to use the DirectShow filters provided with the operating system, but any substitute filter used must be a superset of the equivalent filter provided with the operating system and must support the same inputs and output.
See FAQ B11.2.5.2.

B11.1.1.4 If present in the system, software MPEG decoders use the DirectX VA API to communicate with the graphics chip's video acceleration functions

[VID-0340]
See Microsoft Platform SDK and DirectX 8 DDK in the Windows DDK.

B11.1.2 General Streaming - Industry Standards

B11.1.2.1 ANSI/SMPTE standards

http://www.smpte.org/stds/stsubj.html

B11.1.2.2 DVB/DAVIC (Digital Video Broadcasting/Digital Audio-Visual Council)

http://www.davic.org; http://www.dvb.org

B11.1.2.3 IEC 61883 Digital Interface for Consumer Electronic Audio/Video Equipment

http://www.iec.ch/webstore/

B11.1.3 General Streaming - Quality

WHQL Test Specification References:
Chapter 1: Introduction to HCT Test Specifications
Chapter 6: Digital and Broadcast Video Test Specification

B11.1.3.1 SEE B11.1.4.4

B11.1.3.2 Pass WHQL tests

See B1.3.

Windows XP: See "Streaming Media and Broadcast" in the HCT documentation.

B11.1.4 General Streaming - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 9, "Video"

B11.1.4.1 Interoperability with operating system and Microsoft DirectShow

[VID-0221]

B11.1.4.2 Support subpicture compositing and closed captioning

[VID-0219]

B11.1.4.3 Device installation requirements

Dependent video device is not independently enumerated. [VID-0212]

B11.1.4.4 MPEG and video component requirements

[VID-0209, VID-0215, VID-0216,0217]

- For desktop system, TV-style MPEG-2 video stream playback consumes no more than an additional 45 percent of processor cycles, and no more than 45 percent of the memory, PCI, or AGP bandwidth during any given minute. [VID-0215.7]
- All MPEG-2 decoders can accept an MPEG-2 elementary stream. [VID-0216]
- All MPEG transport stream information is available to the central host processor. [VID-0217]
- De-interlacing of standard-definition video meets requirements. [VID-0215]
- MPEG sources support bus mastering; MPEG-2 MP@ML playback and video decode implementations meet requirements. [VID-0215]
  Mobile PC Note: Requirements are defined in B11.1.4.5.
- All graphics and video capabilities must be fully supported at 1024 × 768, 32 bpp mode or better. [VID-0209]
- Synchronized audio and video, no tearing or other artifacts (macroblocking, jaggies, and so on). [VID-0215; AUD-0326]

B11.1.4.5 Mobile system meets standard video requirements if video playback is supported

[MOBL-0231]

Mobile PC Note: Support required for up to native display resolution or XGA where native resolution is greater than XGA (1024x768). Mobile system has no CPU utilization limitations or bus bandwidth restrictions for MPEG-2 playback.

B11.1.5 General Streaming - FAQs

See http://www.microsoft.com/winlogo/hardware/video/.

B11.1.R General Streaming - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/video/.

B11.2 DVD Playback

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general requirements in B11.1 are included by reference.

Note: DVD playback is an optional feature, even for systems that include DVD drives.

B11.2.1 DVD Playback - Windows Compatibility

B11.2.1.1 "DirectShow and DVD Support" in the Windows DDK

B11.2.1.2 Windows compatibility and implementation notes—DVD Playback

http://www.microsoft.com/hwdev/dvd/

B11.2.2 DVD Playback - Industry Standards

B11.2.2.1 DVD Specification, V. 1.0

[VID-0219; SDG3:194]
http://www.mpeg.org/MPEG/DVD/

B11.2.2.2 DVD physical format documents

Global Engineering Documents at http://global.ihs.com/.

B11.2.3 DVD Playback - Quality

B11.2.3.1 Pass WHQL tests

See B1.3, B4.1.4.11.

Windows XP: See "DVD Playback" in the HCT documentation.

B11.2.3.2 SEE B11.2.4.5

B11.2.4 DVD Playback - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 9, "Video"

B11.2.4.1 Experience should be the same or better than with a stand-alone player

B11.2.4.2 Multiple aspect ratio content is displayed correctly, with the default being the information in the MPEG header

[VID-0215.5]

B11.2.4.3 DVD decoder requirements

[VID-0216, 0218, 0219, 0220, 0223, 0340]

- Driver correctly handles media types, time discontinuity, and decode-rate adjustment. [VID-0218]
- All DVD video decoders must support Line21 closed-caption data. [VID-0223; see FAQ B11.2.5.2]
- All MPEG-2 decoders can accept an MPEG-2 elementary Stream. [VID-0216]
- DVD decoder supports subpicture compositing and closed captioning. [VID-0219]
- Subpicture decoder correctly handles subpicture properties and other functions. [VID-0220]
- MPEG decoders with motion compensation or Inverse DCT hardware acceleration use Microsoft DirectX VA API. [VID-0340]
- **Windows XP:** DVD decoders must use the operating system's native file system support to read DVD drives; alternatively, for SCSI devices, requests can be passed using IOCTL_SCSI_PASS_THROUGH. The decoder must not use non-Microsoft drivers to read the content of DVD drives.

B11.2.4.4 DVD-Video player navigates chapter breaks seamlessly

[VID-0222]

Even if the underlying elementary streams were created as separate program chain (PGC) objects.

B11.2.4.5 Alpha blending of subpicture content on static menus

[VID-0219]

B11.2.5 DVD Playback - FAQs

B11.2.5.1 Current DVD-Video FAQs

See http://www.microsoft.com/winlogo/hardware/video/.

B11.2.5.2 DVD-Video navigation requirement [Logo Program Clarification]

The motivation for the requirement is that software vendors need a standard interface to DVD-style MPEG playback. This is necessary for such applications as games that include MPEG video, Microsoft PowerPoint® presentations with video, WebDVD applications, and encyclopedias such as Microsoft Encarta® or Compton, and to allow users to exchange MPEG files for display on different PCs.

Windows 98/Me: Windows Logo testing requirements:

- WHQL testing will ensure that software decoders work with the Microsoft Navigator and the Microsoft DVD Player application runs on OEM systems that support DVD playback.

- WHQL will not test OEM systems to determine whether a software DVD player is talking with the software decoder by way of the Microsoft Navigator. Any third-party navigator must use DirectShow and support the same interfaces as the Microsoft Navigator.

  A DVD player application can talk privately with a software decoder, provided that the decoder also works with the Microsoft Navigator.

Microsoft encourages implementers to provide Microsoft with details about additional required navigator features, so that those features can be added to the future API.

FAQ Date: August 26, 1999; revisions March 10, 2000; revised May 4, 2000; revised June 19, 2000

B11.2.5.3 CSS copyright protection [Logo Program Clarification]

Copy Scramble System (CSS) copyright protection is *not* a Logo Program requirement. The related technical issue is addressed through proprietary licensing programs and is not a testing requirement for the Windows Logo Program.

FAQ Date: January 18, 2000

B11.2.R DVD Playback - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/video/.

B11.3 TV Tuner

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general requirements in B11.1 are included by reference.

B11.3.1 TV Tuner - Windows Compatibility

B11.3.1.1 Microsoft TV platform

http://www.microsoft.com/tv/

B11.3.1.2 DELETED

B11.3.1.3 Windows XP: Broadcast Driver Architecture

All TV receiver modules for use with Windows XP must conform to the BDA architecture, as defined in the DirectX 8 DDK and in "Broadcast Driver Architecture Drivers" in the Windows DDK. Data streams along with video and audio streams are required to be passed into the Microsoft DirectShow environment. The IP Sink filter provided within the BDA architecture is the mechanism for getting the data to the IP software rather than using an NDIS driver for the TV tuner module.

WebTV for Windows and related DLLs are not part of the Windows XP product. All analog and digital video capture solutions must be based on published DirectShow interfaces, WDM Video Capture and Broadcast Driver Architectures.

B11.3.2 TV Tuner - Industry Standards

B11.3.2.1 ATSC Digital Television Standard, Amendment No. 1

http://www.atsc.org/Standards/stan_rps.html

B11.3.2.2 DVD specifications

[VID-0219; SDG3:194]
http://www.dvd.org

B11.3.2.3 OpenCable specification

http://www.opencable.com

B11.3.3 TV Tuner – Quality

B11.3.3.1 SEE B11.3.4.6

B11.3.3.2 - B11.3.3.4 DELETED

B11.3.3.5 Pass WHQL tests

See B1.3, B4.1.4.11.

Windows XP: See "Streaming Media and Broadcast" in the HCT documentation.

B11.3.4 TV Tuner - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 9, "Video"

B11.3.4.1 VBI capture samples VBI data exactly 4.7 or 5 times
[VID-0225]

B11.3.4.2 Digital broadcast module can receive
[VID-022x]

- All streams contained in the particular transport stream [VID-0226]
- Full bandwidth from each frequency [VID-0227]
- A minimum of 32 simultaneous elementary streams [VID-0228]

B11.3.4.3 - B11.3.4.5 DELETED

B11.3.4.6 No tearing or other artifacts (macroblocking, jaggies, and so on)
[VID-0215]

B11.3.5 TV Tuner - FAQs

See http://www.microsoft.com/winlogo/hardware/video/.

B11.3.R TV Tuner - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/video/.

B11.4 Video Input/Capture

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All general requirements in B11.1 are included by reference.

B11.4.1 Video Input/Capture - Windows Compatibility

B11.4.1.1 Windows compatibility and implementation notes—Video Capture

http://www.microsoft.com/hwdev/vidcap/

B11.4.1.2 Digital Video Camcorder Support

http://www.microsoft.com/hwdev/vidcap/DVCam.htm

B11.4.1.3 WDM Video Capture Overview

http://www.microsoft.com/hwdev/desinit/vidcap.htm

B11.4.2 Video Input/Capture - Industry Standards

B11.4.2.1 ATSC Digital Television Standard, Amendment No. 1

http://www.atsc.org/Standards/stan_rps.html

B11.4.2.2 AV/C Digital Interface Command Set VCR Subunit Specification, V. 2.0.1

http://www.1394TA.org

B11.4.3 Video Input/Capture - Quality

B11.4.3.1 SEE B11.4.4.8

B11.4.3.2 DELETED

B11.4.3.3 SEE B11.4.4.9

B11.4.3.4 SEE B11.4.4.10

B11.4.3.5 SEE B11.4.4.11

B11.4.3.6 Pass WHQL tests

See B1.3, B4.1.4.11.

Windows XP: See "Streaming Media and Broadcast" in the HCT documentation.

B11.4.4 Video Input/Capture - Windows Experience

Design Guideline References:
PC 2001 System Design Guide, Chapter 9, "Video"

B11.4.4.1 Analog video decoder such as NTSC/PAL/SECAM meets quality requirements

[VID-0215]

B11.4.4.2 Video input or capture device provides raw sampled VBI data

[VID-0224]

B11.4.4.3 DELETED

B11.4.4.4 Video input image orientation identification meets requirements

[PC99a:15.34]

B11.4.4.5 Windows Me—Requirement for IEEE 1394 camcorders

IEEE 1394 DV camcorders must implement mandatory VCR subunit commands. DV cameras must comply with the *AV/C Digital Interface Command Set VCR Subunit Specification, Version 2.0.1.*
[see http://www.1394TA.org]

At a minimum, the device must support VCR subunit commands labeled "mandatory" in this specification.

B11.4.4.6 Video implementation preserves source quality during playback, storage, or processing of video streams and does not adversely affect overall PC performance

[VID-0215]

B11.4.4.7 VBI data is not affected by any type of video operation the driver is performing on video frames

[VID-0224]

That is, any cropping, scaling, or frame dropping that the hardware or the driver is performing on the related video frames.

B11.4.4.8 No tearing or other artifacts (macroblocking, jaggies, and so on)

[VID-0215]

B11.4.4.9 IEEE 1394 DV camcorder implements mandatory VCR subunit commands

Digital video (DV) cameras must comply with the AV/C Digital Interface Command Set VCR Subunit Specification.

At a minimum, the device must support VCR subunit commands labeled as "mandatory" in this specification.

B11.4.4.10 Analog input supports 720 × 480 decode to 4:2:2

[VID-0215]

B11.4.4.11 Frame rate is within 0.2 percent of PAL 25.0fps or NTSC 29.97fps standard

[VID-0215.1]

B11.4.5 Video Input/Capture - FAQs

B11.4.5.1 Current video-related FAQs

See http://www.microsoft.com/winlogo/hardware/video/.

B11.4.5.2 Test Clarification

[VID-0215]

The compatibility tests for PC systems determine whether there is excessive cross color, hanging dots, or other artifacts that could degrade the viewer experience. A DVD player with the Joe Kane Video Essentials disk with the Snell and Wilcox Zone plate test pattern is used to assess the video quality.
FAQ Date: November 27, 1998

B11.4.R Video Input/Capture - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/video/.

B12.0 Miscellaneous

B12.1 Multifunction Devices

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.
All requirements for each specific device class implemented in the multifunction device are included by reference.

B12.1.1 Multifunction Devices - Windows Compatibility

B12.1.1.1 Device drivers comply with Windows DDK requirements for its operating system

Third-party applications implemented as defined in the Microsoft Platform SDK.

Windows XP/Windows 2000/Windows Me: "Driver Requirements for Multifunction Devices," "System-Supplied Setup Classes," "INF *DDInstall*.HW Section," and "MFCARD_DES" in the Windows DDK.

Windows 98: "Driver Requirements for Multifunction Devices" in the Windows Me DDK.

B12.1.1.2 Windows compatibility and implementation notes—multifunction devices

http://www.microsoft.com/hwdev/mf/

B12.1.1.3 Windows compatibility and implementation notes per bus and device class

See B1.0 and B2.0.

B12.1.1.4 Designing Multifunction Devices for Windows Operating Systems

http://www.microsoft.com/hwdev/mf/download/mfdesign10.zip

B12.1.2 Multifunction Devices - Industry Standards

B12.1.2.1 SEE related industry standards for each device class implemented on the multi-function device

See B1.0 and B2.0.

B12.1.3 Multifunction Devices - Quality

WHQL Test Specification References:
Chapter 1: Introduction to HCT Test Specifications
Chapter 22: Driver Quality Test Specification
Plus technology-specific test specifications

B12.1.3.1 - B12.1.3.4 SEE B12.1.4.2

B12.1.3.5 Pass WHQL tests

See B1.3.

Windows XP: See "Multifunction" in the HCT documentation.

B12.1.4 Multifunction Devices - Windows Experience

Design Guideline References:
PC 2001 System Design Guide: SYS-0032
Hardware Design Guide 3.0 for Windows 2000 Server, Chapter 3

B12.1.4.1 Separate drivers are required for separate functions with no start order dependencies between separate function drivers

[SYS-0032; SDG3:13]

The operating system must be able to configure and manage functions in any order, so no function on a multifunction device can depend on another function to be started before the function can be started by the operating system.

B12.1.4.2 MFP devices correctly implement driver and Plug and Play support

[SYS-0032]

- Functional units on a multifunction device do not have start-order dependencies.
- Resource requirements of one functional unit are not expressed in terms of another functional unit.
- Operation of one functional unit do not affect or interfere with the operation of another functional unit on the multifunction device or on the system as a whole.
- Each functional unit is enumerated and its resource requirements communicated to the operating system, so Windows can load the necessary drivers and assign resources to the different units in any order.

B12.1.4.3 Each independent function can be used concurrently, with no hidden dependencies

[SYS-0032]

Separate functional units must be able to operate concurrently, without interfering with each other or with other devices on the system.

B12.1.4.4 Each function can be power managed independently

[SYS-0032]

Each functional unit in a multifunction device must separately meet the power management device class specifications for its device class and be independently power managed. Each functional unit must be able to successfully complete a system sleep/wake transition (where the unit transitions from D0 to D3 to D0) without losing functionality and without requiring user intervention to restore functionality. All functional units on PCI devices that support wakeup capabilities must correctly support wake from D3cold.

B12.1.5 Multifunction Devices - FAQs

B12.1.5.1 Current general FAQs

See http://www.microsoft.com/winlogo/hardware/MF/.

B12.1.5.2 Resource requirements for MFD [Logo Program Clarification]

The PC 99 exception for multifunction PCI devices that use only a single set of relocatable resources refers solely to multifunction devices *of the same device class*. If different functions within a multiple-function device require separate class drivers—for example, a combination PCI network adapter and modem—then each function must provide a unique PCI SID and SVID that will allow the proper driver to be loaded for each separate function.

Multifunction devices that contain functions from separate classes will not be properly recognized during an operating system upgrade—and

therefore drivers will not be properly upgraded—unless unique IDs are provided for each device.

Note that a "supervisory" driver that loads different drivers for the individual functions does not work well with Windows. In particular, driver support is likely to be lost in cases of operating system re-installation or upgrade, or with distribution of new drivers via Windows Update. Therefore, these supervisory drivers should be avoided. The Logo Program requires separate drivers for separate functions.
FAQ Date: May 28, 1999

B12.1.5.3 Exceptions to individual ID requirement for MF devices [Logo Program Clarification]

- Multiple devices of the same device class, such as a multiline serial device.
- Dependent video devices, such as a graphics accelerator on a video card.
- Devices that are generated by an accelerator or auxiliary processor and that do not have independent hardware I/O. That processor must have an ID; under Windows XP/Windows 2000, Mf.sys must be used to enumerate the dependent devices.
  FAQ Date: May 28, 1999

B12.1.R Multifunction Devices - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/MF/.

B12.1.R.1 MFP devices using USB connectivity must appear as part of a composite device

Future requirements for USB connected multifunction print (MFP) device drivers supporting composite implementations are posted at "Multifunction Print Device Design Guidelines" at http://www.microsoft.com/hwdev/mf/mfp.htm.

B12.1.R.2 DELETED

B12.1.R.3 MFP device provides legacy-free interfaces

Future requirement - Legacy interfaces such as parallel (IEEE 1284) or serial are not allowed.

B12.2 UPS

All general requirements in B1.0 are included by reference.
All bus-specific requirements in B2.0 are included by reference.

Note: This document assumes that the device will be run with Windows XP/Windows 2000; however, for devices that are designed

to also run with Windows 98/Me, these items specify some requirements that are tested only under Windows 2000.

B12.2.1 UPS - Windows Compatibility

B12.2.1.1 Windows XP/Windows 2000: "Human Input Devices" in the Windows DDK

"UPS Applet for Windows 2000" at http://www.microsoft.com/hwdev/onnow/ups.htm

B12.2.1.2 Windows compatibility and implementation notes

http://www.microsoft.com/hwdev/onnow/ups.htm

B12.2.1.3 Device drivers comply with Windows DDK requirements

See "Overview of System Battery Management" and "BATTERY_INFORMATION" in the Windows DDK.

Third-party applications implemented as defined in the Microsoft Platform SDK.

B12.2.2 UPS - Industry Standards

See B1.2.

B12.2.3 UPS - Quality

B12.2.3.1 SEE B12.2.4.5

B12.2.3.2 Pass WHQL tests

See B1.3.

Windows Whistler Server/Windows XP: See "UPS" in the HCT documentation.

B12.2.4 UPS - Windows Experience

Design Guideline References:

UPS Applet for Windows 2000 at http://www.microsoft.com/hwdev/onnow/ups.htm

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B12.2.4.1 Device can take over and properly notify the user that the device is on battery and/or shut down applications and the system

B12.2.4.2 Device load is measured accurately

B12.2.4.3 Battery modules on larger units are hot swappable

B12.2.4.4 Device can notify the user via email and/or pager that the power is down

B12.2.4.5 Built-in functionality can properly support the device

B12.2.4.5 Device can correctly compensate for voltage irregularities

B12.2.5 UPS - FAQs

See http://www.microsoft.com/winlogo/hardware/unclassified/.

B12.2.R UPS - Future Requirements

Announcement of additional future requirements will be published at http://www.microsoft.com/winlogo/hardware/unclassified/.

Appendix C - Designing for Success

This appendix presents a series of guidelines to help you ensure that your new designs are compatible with Microsoft operating systems, and to help you ensure the design meets Windows Logo Program requirements and passes all HCTs and other Windows Logo Program testing.

Microsoft does not guarantee that complying with the Windows Logo Program requirements, or the related design guidelines provided in *PC System Design Guide* and similar publications, will ensure hardware or chipset compatibility with any versions of the Windows operating systems.

Manufacturers who are designing new system or component hardware, chip sets, or firmware are encouraged to work directly with Microsoft to ensure compatibility of new designs. To do this, manufacturers should work with their Microsoft program manager or technical evangelist to arrange design reviews. If you are not working with Microsoft, please send mail to ihv@microsoft.com with **"Program Contact Request"** in the Subject line. Note that Microsoft cannot guarantee that it can schedule reviews for all manufacturer requests.

Microsoft support to help manufacturers achieve device and application compatibility fall into these basic categories:

- Driver Development Kits (DDK)
  Installable File System Development Kit (IFS Kit)
  HAL Development Kit (HAL Kit)
- Microsoft device class-specific development team outreach.
  This includes "Windows Plugfests" hosted by Microsoft to test for hardware and driver compatibility during the development of the operating system
- Microsoft service organizations that support system and peripheral manufacturers
- Windows Hardware Quality Labs (WHQL), for testing through the Hardware Compatibility Tests (HCTs)

Microsoft provides the following guidelines for system and peripheral manufacturers to create hardware and drivers that are compatible with Windows operating systems and that meet Windows Logo Program requirements.

Design Hardware for Windows Compatibility

Design Using Current Information. Manufacturers can get up-to-date information about developing hardware and drivers for Windows:

Know the Current Windows Compatibility Guidelines. Read and understand *Guidelines for Bus and Device Specifications,* a paper

that clarifies what Windows needs from hardware so it can interoperate successfully: http://www.microsoft.com/hwdev/issues/SpecGuide1.htm

- For industry specifications upon which Microsoft designs support in Windows, plus the Plug and Play, power management, and other platform-related specifications from Microsoft, see: http://www.microsoft.com/hwdev/specs/

- Ensure that the system's ACPI BIOS is correctly implemented and passes the Microsoft ACPI HCT. OEMs must increase the **OEMRevision** field in the ACPI FACP to ensure that the system will run in ACPI mode under Windows. See http://www.microsoft.com/hwdev/onnow/.

- Properly implement Plug and Play and power management support for all devices—in particular, ensure that all PCI components properly implement unique SIDs and SVIDs: http://www.microsoft.com/hwdev/devdes/pciids.htm

Check the web site for Hardware and Driver Developers. This Web site provides tools, information, and services for driver developers and hardware designers who create products that work with the Microsoft Windows family of operating systems: http://www.microsoft.com/hwdev/

Submit Hardware Prototypes and New Systems and Devices to Windows Labs. Systems that pass testing in the Windows test labs receive the "compatible" designation on the Hardware Compatibility List. For information, write to: wintrack@microsoft.com.

Participate in Plugfests. Microsoft Plugfests, Meltdown compatibility testing, and industry events such as USB Implementers Forum Plugfests help identify firmware and driver issues.

Request Early Technical Design Reviews. Contact your Microsoft program manager or technical evangelist to request a technical review for new chipset or system designs; Microsoft architects can work with you in early phases to identify issues and ensure optimal design.

Subscribe to Windows Driver Services (WDS). WDS coordinates sign-up and access for Microsoft publications about driver development and testing for Windows (NDA required for some items) and Beta versions of Windows and the HCTs. If you are not currently working with Microsoft, subscribe to WDS services: http://www.microsoft.com/ddk/wds/

Design for the Windows Logo Program

Use the Windows Logo Program Requirements as a Design Guide. Confirm that all hardware and software components comply with the Windows Logo Program guidelines to ensure that all components in

the system work together to provide the optimal end-user experience under Windows.

Use the WHQL Test Specification as a Design Guide. The WHQL Test Specification defines the precise test assertions that are validated by the HCTs. Study the WHQL Test Specification to understand exactly what portions of industry specifications and DDK driver guidelines are required in the compatibility tests.

Use the HCTs to Design for Compatibility. Use the HCTs in your product test suites to ensure compatibility as part of your development process. Manufacturers can get current and beta versions of HCTs and WHQL Test Specifications.

Attend Microsoft Review Events for the Industry. Microsoft offers design reviews, the Windows Hardware Engineering Conference (WinHEC), and other events to provide system planners and designers with technical information to help keep their products in sync with Windows system and component architectures. Some events are by invitation only.

Review and Comment on Proposed New Requirements:

- Review draft versions of the Windows Logo Program requirements
- If you offer server products, register as a server design guide reviewer at: http://www.hwdev.org/desguide/sdgreq.htm
- To receive notice of review events related to proposed Logo Program requirements, subscribe to: WHQL-LOGO-SUBSCRIBE-REQUEST@list.hwdev.net

Participate in Industry Standards Efforts. Microsoft bases new capabilities in the operating system on industry standards and specifications. Participate in the industry forums, and in committees that develop strategic specifications and interfaces.

Design for Performance and Legacy Reduction:

- Implement a fast BIOS POST and follow the guidelines to create fast boot/fast resume PC systems: http://www.microsoft.com/hwdev/fastboot/
- Create and deliver only Windows-compatible, 32-bit software with any PC system or peripheral.
- OEMs should plan to migrate all bundled devices to non-legacy interfaces, such as USB and IEEE 1394.
- IHVs should build HID-compliant input devices and implement non-legacy interfaces for other device classes.

Develop, Test, and Distribute Compatible Windows Drivers

Develop Drivers Based on Windows DDK:
- Use the Windows DDK samples to develop your code.

- Use the Driver Verifier and other DDK Test tools.

Use the Current DDK. Receive the Windows DDK as part of the beta release, or download from the Web: http://www.microsoft.com/ddk/

Test to Ensure a Smooth Upgrade Path. Your test matrix should include upgrading your shipping client PC systems to Windows XP, which will help to identify constraints that might prevent a smooth transition for your customers.

Run Regular, Complete Testing Suites. Use the tools and guidelines from Microsoft to ensure that your testing suites exercise all the operating system features and functions used by your hardware and drivers. Run test tools on a regular basis to ensure drivers are free of errors.

Submit Bugs and Follow Up with Microsoft. Use the reporting mechanism defined in the beta package.

Ensure Users Can Get BIOS and Driver Updates

- Make updated ACPI BIOSes available on your web site.
- Submit drivers for inclusion on Windows Update:
  http://www.microsoft.com/hwdev/supportability/
  http://windowsupdate.microsoft.com/

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