Chapter 1 Executive Summary

PC 2001 System Design Guide contains hundreds of requirements for PC systems designed for 2001–2002. This chapter provides a summary of those requirements and of the areas that differ from PC 99.

PC 2001 System Design Guide provides OEMs with requirements for computer systems designed for delivery in the middle of 2001. Co-authored by Intel and Microsoft, the requirements in this guide indicate features that the hardware industry must consider when designing PCs and peripherals. These hardware designs provide the user with an optimal experience when the hardware is used with the Microsoft Windows family of operating systems.

The requirements apply to the platform as a whole and to the technologies that make up the complete system. The clarifications, changes, and additional requirements in this guide include extensions to and modifications of the requirements defined in *PC 99 System Design Guide*. General differences between PC 2001 and PC 99 guides are:

- PC 2001 contains only requirements, with no recommendations. Some requirements apply only if the manufacturer implements that technology in the system. Such requirements are identified by the words “If implemented” in the requirement. For example, a system is not required to include IEEE 1394 connectivity, only to follow the cited IEEE standards if it does.
- Requirements for mature or well-understood technologies have been removed to the library section of the PC Design Guide Web site. For example, the following topics have been repeated throughout the recent history of PC design guides and essentially would have been unchanged for this new edition, so they are now collected in a reference library at the following web sites:

  Legacy Plug and Play Guidelines
  http://www.pcdesguide.org/LegacyPnP/

  PC Card and CardBus Guidelines
  http://www.pcdesguide.org/library/pccard.htm
- Some requirements have been removed because those features are no longer important to the industry, or they are no longer relevant in defining the optimal user experience with the Windows operating system.
- New requirements describe technologies for which support is planned in the Windows family of operating systems.

- Requirements pertaining to specific PC market classifications have been minimized. PC 2001 identifies requirement differences for mobile PCs and workstations systems where applicable.

Platform Requirements Summary

This section provides a summary the PC system requirements for PC 2001. The complete requirements are in Chapters 3 through 5 of this guide.

The following table and list provide a summary of the requirements for the generic PC system, often a desktop computer, with variations for mobile and high performance systems, often called workstations. Mobile computers and workstations are based on the PC system requirements. Chapter 4, “Workstation,” and Chapter 5, “Mobile,” point out differences.

System Requirements

	PC System Requirements	Additions or Differences for: Workstation	Mobile
Processor complex	667 MHz	700 MHz Additional requirements for multiprocessor, if implemented	400 MHz Additional battery and docking requirements
	APIC enabled	No additional requirements	APIC not required
Cache	128 KB	256 KB	No additional requirements
Memory (RAM)	64 MB, 128 MB for systems designed for Windows 2000	128 MB RAM expandable to 2 GB	No additional requirements
Power management (see text following table)	ACPI 1.0b	No additional requirements	Mobile PC supports Smart Battery or ACPI Control Method battery
Expansion Bus	USB required PCI, SCSI, optional ISA prohibited	Additional requirements for 64-bit PCI bus, bridges, and adapters, if implemented PCI-X optional	No additional requirements
Ports	2 USB available to user	No additional requirements	1 USB available to user
Graphics subsystem	Video playback capability required DVI, analog video input, and capture requirements, if implemented	Larger screen size Follows AGP Pro Bus 1.1 specification, if implemented	Mobile PC has an integrated display
Storage subsystem	Hard disk and CD or DVD required	Multiple hard disk requirements, if implemented	Hard disk is primary boot device

The system board must support *Advanced Configuration and Power Interface Specification, Version 1.0b,* for power management and Plug and Play. If software fan control is implemented, thermal design and fan control comply with ACPI 1.0b.

Devices appear off when in the sleep state; indicators show whether the system is asleep or awake. The system must support S3, S4, and S5 states. The Universal Serial Bus (USB) host controller and all devices that support wakeup capabilities must support wakeup from all sleep states in the range of S1-S3. Mobile systems, however, are not required to wake from S3 or S4.

BIOS provides support for OnNow and Instantly Available capabilities. Requirements include support for local, network, and remote boot, all calendar dates, security, updates, and debugging. BIOS and option ROMs support Int 13h extensions.

System and devices must comply with requirements for accessibility, Plug and Play, and driver installation. Support for a local area network (LAN) connection and public network communications is required.

Required technologies, such as USB or graphics, follow published standards, as cited in those chapters.

Legacy Reduction and Removal

All PC 2001 computers accomplish some level of legacy reduction. With few exceptions, PC 2001 systems meet the following legacy reduction requirements:

- No ISA slots or devices
- Peripherals offer non-legacy connections
- No reliance on Microsoft MS-DOS® for any software components provided with the system

Systems that are identified by the operating system as “legacy free” must meet the following additional legacy-removal requirements:

- No boot dependencies on ISA or other legacy devices.
- No operating system detection or user-accessible connectors for external serial, parallel, legacy FDC, or PS/2 ports, and no use of related port addresses.
- BIOS support for ACPI changes to support legacy and 8042 flags, ACPI reset mechanism, and the debug port table.

Device Class Subsystem Requirements Summary

The following list provides a summary of the technology requirements for each device class supported under Windows 2000. The complete requirements are in chapters 6 through 16 of the guide.

Buses

The following requirements are introduced in *PC 2001 System Design Guide*.

- Bluetooth is introduced as a cable replacement technology.
- If a networking device is implemented with a Bluetooth interface, the *Network Driver Interface Specification 5.0* (NDIS) requirement for networking devices is relaxed.
- 1394 interfacing requirements are clarified.

The following requirements are unchanged from the *PC 99 System Design Guide*.

- Plug and Play requirements
- Power management requirements
- Device driver requirements

Input Devices

The following requirement is introduced in *PC 2001 System Design Guide*.

- All non-integrated USB input devices comply with the *Universal Serial Bus (USB) Device Class Definition for Human Interface Devices (HID), Version 1.1*.

The following requirements are unchanged from the *PC 99 System Design Guide*.

- Legacy ports are discouraged; USB replaces legacy serial and parallel ports as the dominant connector. If implemented, legacy ports adhere to strict requirements for PC 2001 systems.
- All devices meet the Plug and Play, power management, and other specifications for their device class and bus connectors.
- Smart card devices comply with International Organization for Standardization (ISO) 7816 requirements.
- The system must provide a separate, physically isolated transceiver for each infrared (IR) protocol supported.

Graphics

The following requirements are introduced in *PC 2001 System Design Guide*.

- If an external digital interface is implemented, it must comply with Digital Visual Interface (DVI) specifications, for both graphics adapters and monitors.
- Systems must support a minimum resolution of 1024 × 768, 32 bits per pixel (bpp), double buffered in 2-D mode, and 1024 × 768, 16-bit bpp, double buffered, 32-bit Z in 3-D mode. Desktop systems must support hardware-accelerated 3-D graphics.
- Clarifications are provided for external display interface, color management, and 2-D requirements for the graphics adapter.
- The 3-D acceleration requirements match current state of the industry and Microsoft DirectX® implementation.
- Clarifications are provided for TV output, if this is implemented in the system.
- Clarifications and quality advances are provided for graphics subsystem support for video, such as support for TV/DVD playback.
- Specific implementation guidelines are provided for mobile PC systems.

The following requirements are unchanged from the *PC 99 System Design Guide*.

- Plug and Play, power management, and multiple monitors and multiple adapter requirements.

Video

The following requirements are introduced in *PC 2001 System Design Guide*.

- For all desktop PC 2001 systems (including workstations), most graphics and video capabilities must be fully supported at 1024 × 768, 32 bpp mode or better.
- Systems with DVD-Video playback capabilities must correctly implement digital video disk (DVD) decoders to ensure seamless navigation and quality decoding.
- All streams (including data streams) received by receiver modules must be available to the host.
- Systems that support digital TV must have All Format Moving Picture Expert Group (MPEG) decode support (that is, decode support for up to six times standard definition rates).
- Clarifications are provided related to the ever-increasing demand for improved video quality on the PC platform.

Monitors

The following requirements are introduced in *PC 2001 System Design Guide*.

- Compliance with *VESA Enhanced Extended Display Data Channel Standard* (E-DDC), *Version 1*, Level 2B, and *VESA Enhanced Extended Display Identification Data Standard (E-EDID), Release A*, is required.
- Both digital and analog monitors must be compliant with the *VESA Enhanced Extended Display Data Channel Standard (E-DDC), Version 1*, Level 2B protocols (DDC2B) and support Image Color Management (ICM), with resolution requirements based on monitor size.
- Digital interface, if implemented, must be DVI compliant, with additional requirements for power state transitions and hot plug detection.
- Monitors must provide International Color Consortium (ICC) profile information.

Audio

The following requirements are introduced in *PC 2001 System Design Guide*.

- Some audio minimum performance requirements are increased from the levels in the *PC 99 System Design Guide*.
- Performance and feature requirements are defined for 2-D and 3-D hardware acceleration and Downloadable Sound (DLS) acceleration, if these capabilities are implemented.
- Clarifications and new requirements for microphone input to support voice-input applications.
- Mobile audio exceptions and adaptations for docked mobile PCs are added.

The following requirements are unchanged from *PC 99 System Design Guide*.

- Audio hardware does not use legacy interfaces.
- As defined in previous design guides, digital audio requirements specify audio buffer management guidelines and other features to ensure the system is digital ready.

Storage

The following requirements are introduced in *PC 2001 System Design Guide*.

- USB devices must comply with the USB mass storage specification.
- Discrete PCI AT Attachment (ATA) controllers implemented in docked mobile PCs provide native mode support as defined in the *PCI IDE Controller Specification, Version 1.0*.
- Clarifications for CD drives, which must comply with Multimedia Command Set 2 (MMC2), support multisession capabilities, and detect digital audio.
- Clarifications for DVD drives, which must meet CD drive read compatibility requirements.
- Requirements for CD and DVD read rates are altered to allow faster, broader acceptance of CD-Recordable (CD-R), CD-Re-Writable (CD-RW), and DVD rewriteable formats where error correction and defect management are imperative.

The following requirements are unchanged from *PC 99 System Design Guide*.

- Installation, power management, and driver requirements.
- Storage components and optical devices must support bus mastering, and most device types must support media status notification.

Modems

The following requirements are introduced in *PC 2001 System Design Guide*.

- Minimum modem support includes specified commands from the V.250 AT command set.
- Integrated Services Digital Network (ISDN) modem must support basic AT commands plus commands to select the end-to-end protocol, set switch type, and choose subscriber numbers. ISDN modems must also support Request for Comments (RFC) 1662.
- All external USB modems (including ISDN modems) must support *Universal Serial Bus Specification, Revision 1.1*, and *Universal Serial Bus Device Class Definitions for Communications Devices, Version 1.0*, or the standards for the bus to which they are attached.
- Requirements are provided for:
  - Telephone Device for the Deaf (TDD) support, voice mode, and Caller ID, if implemented
  - Mobile modems that implement wireless or digital cellular support
  - Telephony applications included with a PC 2001 system

The following requirements are unchanged from *PC 99 System Design Guide*.

- Requirements for Plug and Play, power management (including wake-on-ring), and installation.
- Modem drivers must include Unimodem support.
- Driver-based modems must use a Windows Driver Model (WDM) driver solution.

Networking

The following requirements are introduced in *PC 2001 System Design Guide*.

- Network adapters on a system with Windows 2000 preinstalled must provide *Preboot Execution Environment (PXE) Specification, Version 2.1*, remote boot support.
- Home networking guidelines specify which LAN adapter requirements apply for adapters intended for home markets. Home networking media must support IP and related specifications for media choice, such as Home Radio Frequency (HomeRF) or Home Phoneline Networking Alliance (HomePNA).
- New requirements cite specifications for wireless networking, Digital Subscriber Line (DSL) modems, and CAP/QAM Asymmetric Digital Subscriber Line (ADSL) modems.

The following requirements are retained from *PC 99 System Design Guide*:

- All network adapters must use an NDIS 5.0 miniport driver.
- The adapter must detect the network dynamically, sense transceiver type, and meet other standard requirements for data transmission when the technology supports detection.
- All external networking devices using USB or IEEE 1394 must use corresponding standard control protocols.
- Plug and Play, power management (including Wake-on-LAN), and driver installation are unchanged.
- Minimal changes were made to requirements for IEEE 802 LAN, ISDN, cable modems, asynchronous transfer mode (ATM) adapters, and ADSL.
- Infrared Data Association (IrDA) network devices must support Fast IR (FIR) and Serial IR (SIR).

Printers and Digital Still Imaging

The following requirements are introduced in *PC 2001 System Design Guide*.

- Printers must have a USB interface, an IEEE 1394 interface, or a network interface port, but are permitted to have a supplemental legacy connection, such as serial or IEEE 1284.
- Color matching requirements for digital imaging devices and printers include standard red-green-blue (sRGB) output and new Delta E tolerance requirements.
- A printer driver must not run in kernel mode.
- Still image device drivers must be implemented under Windows Image Acquisition (WIA) driver architecture.
- USB camera requirements are defined, including support for the *USB Still Image Device Definition Specification* and Photographic and Imaging Manufacturers Association (PIMA) protocols in PIMA 15740.
- Each printer and still image device must support sRGB output or have an ICC profile.

The following requirements are modified slightly or are unchanged from *PC 99 System Design Guide*:

- Printer and driver supports *Default Device Class Power Management Reference Specification, Version 1.0.*
- Still image devices must use USB, IEEE 1394, or SCSI (for scanners).
- Digital still cameras must meet throughput requirements, based on the type of connection.