Part 2 Platform Requirements

Contents

Chapter 3 PC System

This chapter summarizes the basic features required for all PC 2001 systems.

For definitions of common terms, acronyms, and abbreviations used in this guide, see the glossary; see also "Terms and Conventions Used" in "About the Design Guide."

PC 2001 General System Requirements

This section presents a summary of the general system requirements, including system board, memory, and power management requirements. For performance requirements and exceptions for workstation and mobile PCs, see Chapter 4, "Workstations," and Chapter 5, "Mobile."

Note: Mobile PC exceptions are found throughout this guide.

SYS–0001. System performance meets PC 2001 minimum requirements

The performance requirements for PC 2001 systems are based on the minimum computational capabilities and performance necessary to support the demands of Windows-based applications together with the estimated processing demand and processing capability of the lowest-end processor in mid-2001.

The minimum performance requirement consists of the following.

- **SYS–0001.1. System includes CPU and cache that meets PC 2001 minimum requirements.** The minimum microprocessor capability is specified to support the demands of rich media, Internet access, and conferencing. The performance requirement for these media enhancements is specified so that the system meets performance targets at minimum platform power.

The processor requirements for PC 2001 desktop systems are:

- Minimum 667 MHz processor
- Minimum 128 KB of cache present and enabled

- **SYS–0001.2. System memory meets PC 2001 minimum requirements.** A PC 2001 system must meet the following memory requirements:

  - 64 MB RAM minimum
  - 128 MB RAM minimum for computers that have Windows 2000 preinstalled

- **SYS–0054. If implemented, system memory includes ECC memory protection.** If error correction code (ECC) is implemented, system memory and external processor cache must be protected with ECC memory protection. All ECC RAM visible to the operating system must be cacheable. The ECC memory subsystem hardware must be able to detect at least a double-bit error in one word and to correct a single-bit error in one word, where word means the width in bits of the memory subsystem. A detected error that cannot be corrected must result in a system fault.

- **SYS–0001.3. APIC implemented and properly connected.** All desktop systems must be Advanced Programmable Interrupt Controller (APIC) enabled. This means:

  - The local APIC in the processor must be hardware enabled.

  - All hardware interrupts are connected to an input/output Advanced Programmable Interrupt Controller (IOAPIC).

  - The IOAPIC is connected to the local APIC in the processor. If an 8259 is present in the system, the system must be configured such that the 8259 interrupt controller functions correctly with an operating system that is not aware of the APIC.

  The BIOS must program and enable the system 8259 Programmable Interrupt Controller (PIC) for PC-AT compatible mode operation. The BIOS must program the APICs for Virtual Wire Mode operation. There are two Virtual Wire modes available: Virtual Wire Mode via the Local APIC and Virtual Wire Mode via the IOAPIC. Virtual Wire Mode via the IOAPIC is the preferred method of operation to be programmed by the BIOS.

Mobile PC Note Mobile systems that do not have an APIC present are excluded from this requirement.

SYS–0002. System design meets ACPI 1.0b specification and PC 2001 requirements

The system board and BIOS must support *Advanced Configuration and Power Interface Specification, Revision 1.0b*. This requirement permits the system to correctly support Plug and Play and power management.

ACPI support must include the following.

- **SYS–0002.1. System supports S3, S4, and S5 states.** Desktop and single-processor workstation systems must support the S5 (soft-off) state as required in the ACPI 1.0b specification, plus the S3 and S4 states. Support for S1, S2, and S4BIOS is optional. Every system must support wake from all implemented sleep states, except S4 and S5, for all wake-capable devices and buses.

  Multiprocessor systems are required to support S1, S4, and S5. Multiprocessor support for S3 is optional.

Mobile PC Note   Mobile PCs are required to support S1 or S3, in addition to S4 and S5. Mobile PCs are not required to wake from S3 or S4.

- **SYS–0002.3. System provides no user-accessible method for disabling ACPI in the BIOS.** If the system includes a BIOS setting that the manufacturer can use to switch between ACPI and Advanced Power Management (APM) modes, this setting must not be exposed to the end user in a CMOS setting or other means once a Microsoft ACPI-enabled operating system has been installed. Disabling ACPI will cause boot failures, because Windows 2000 relies on it for identification and initialization of system devices. Not having a user-accessible option to disable ACPI support does not impact the ability to properly load an operating system that is not ACPI compatible.

- **SYS–0002.4. If software fan control is implemented, thermal design and fan control comply with ACPI 1.0b.** A thermal model and fan control must be implemented as defined in Section 12 of the ACPI 1.0b specification as a means of running the PC quietly while it is working and of turning the fan off while it is sleeping. Notice that hardware override is permitted only to handle thermal conditions when the operating system is not running, the operating system has put the system in a sleep state, or safe operating parameters have been exceeded.

- **SYS–0002.5. All system-board power management or Plug and Play features comply with the ACPI 1.0b.** This requirement applies even if a particular feature is not a specific requirement or recommendation in ACPI 1.0b.

SYS–0003. Hardware design supports OnNow and Instantly Available PC initiatives

The OnNow and Instantly Available PC initiatives are based on these goals for the user experience:

- The user experiences the PC as off when it is in a sleep state.

- The user can easily see whether the PC is working or sleeping.

- The user can easily control power through switches and software.

These initiatives are described in the *Instantly Available Power Managed Desktop PC Design Guide*. OnNow initiative information is available on the OnNow and Power Management Web site. Both are listed in "PC System References."

The following items are required to support these initiatives.

- **SYS–0003.1. System and devices appear as off in the sleep state.** At a minimum, all media drives, display, sound, input devices, and fans must be perceived as off when the system has completed the transition to a sleep state, for example, no noise or lights other than the status indicator. It is acceptable for system fans to run for some period of time, provided these automatically turn off once sufficient cooling is achieved.

- **SYS–0003.2. System provides one or more indicators to show whether the system is in the working or sleep state.** System provides a unique indication for the working state (S0), the sleep states (S1, S2, and S3) and off (S5) system state.

  S4 must appear to the user as the off state (S5); therefore, S4 and S5 must have the same indication.

  Each indication must visible and unique.

- **SYS–0003.3. System provides software-controlled, ACPI-based power switch.** The system must provide an easily accessible power switch that can be controlled by software. This requirement for an easily-accessible power switch does not preclude power-control capabilities, such as closing the lid on a mobile PC.

  The following are requirements for power/sleep buttons:

  - The function of these buttons is determined by the operating system.

  - In case of a hardware or software failure that prevents normal operation of the software-controlled buttons, the switch capabilities must include an override mechanism for turning off the PC.

    A four-second override mechanism is recommended in Section 4.7.2.2.1 of the ACPI 1.0b specification. The override must be associated with the user's primary switch interface, in order to establish an industry-standard implementation.

    Notice that the override mechanism is not an alternative way for the user to turn off the PC in normal operation; it is only a fail-safe function for fault conditions.

  - If the power/sleep button is provided on the keyboard, the key must be clearly labeled and must consist of a single keystroke for turning on the PC, to provide accessibility for persons with disabilities. (Two keystrokes can be used to turn off the PC.) For information about scan codes for keyboard power switches, see the information listed in "PC System References."

The following are implementation requirements for the power/sleep button:

- A single-button design is preferred. This button must be the user's primary switch interface, and must be a power button as defined by the ACPI 1.0b specification.

- 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. The preferred implementation in a two-button design is to hide the power button behind a door or on the rear of the system.

- **SYS–0003.4. Each device and bus supports the power management specifications for its class.** All devices and drivers must support the D0 and D3 power states consistent with the definitions in the relevant device class power management reference specification and the *Default Device Class Power Management Reference Specification, Version 1.0* or later. Support of D1 and D2 states is optional, unless required in the relevant device class specification. Requirements referring to D3 assume that power is removed unless otherwise noted.

  Each device can successfully survive a system sleep/wake transition (where the device transitions from D0 to D3 to D0) without losing functionality and without requiring user intervention to restore functionality.

  This requirement includes no requirement to retain any device context because it will be preserved or restored by the driver when returning to the D0 power state.

  PCI, USB, IEEE 1394, and PC Card buses must support power management requirements as defined in their related bus standards. For information on PCI, USB and IEEE 1394, see Chapter 6, "Buses and Interfaces." For information on PC Card, see PC Card and CardBus Guidelines, Version 1.1.

- **SYS–0003.5. System power supply provides standby power for system wakeup events.** The system supplies adequate standby power to support wakeup events. At a minimum, the system must provide power for the core chipset, including memory and all integrated wake devices, for wakeup from the keyboard, a pointing device, and a single network device such as a LAN or wide area network (WAN) adapter connected via an external bus or open PCI slot when the system is in the ACPI S3 state. This requirement applies for S4 if the system supports wake from the ACPI S4 state.

  IEEE 1394 host interface does not have to provide standby power for system wakeup events.

  For more information, see the *Instantly Available PC System Power Delivery Requirements and Recommendations*, listed in "PC System References."

Mobile PC Note   This requirement for the system power supply does not apply to mobile PCs.

PC 2001 BIOS Requirements

This section states requirements for the BIOS. Remote boot is separate from general BIOS requirements to distinguish between other desktop or mobile computers.

For BIOS requirements related to legacy-free designs, see "PC 2001 Legacy Free Requirements."

BIOS–0004. BIOS meets PC 2001 requirements for OnNow and Instantly Available PC support

The intention of this requirement is to avoid presenting the end user with confusing information and unnecessary visual display, and to permit access to error information by using a hot key.

ACPI BIOS entries, as defined in Section 1.6 of the ACPI 1.0b specification, must be the same for supporting either Windows Me or Windows 2000.

The following BIOS capabilities are required for OnNow support.

- **BIOS–0004.1. BIOS supports Fast POST (S4, S5, or mechanical off).** Power on to the bootstrap loader handoff must occur in 12 seconds or less for systems not using SCSI as the primary storage connection. This time limit includes, if present, initialization of keyboard, graphics adapter, and a parallel ATA storage bus. For systems containing additional option ROMs, system integrity and security services, or user PXE boot option, an additional 4 seconds are allowed per instance. This time limit does not include hard disk spin-up time, time used for loading CPU firmware, multiprocessor systems, and time required for ECC scrubbing, if supported and enabled.

- **BIOS–0004.2. Resume from sleep state (S1–S3) to operating system handoff occurs within 1 second.** This requirement does not apply for the S4 state. 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.

BIOS–0005. BIOS includes local boot support

The BIOS boot support requirements include the following. Additional BIOS requirements to support legacy reduction are defined in "PC 2001 Legacy Reduction Requirements." For information about BIOS and ATA, see ATA–0119, "Controller supports Ultra DMA (ATA/33)," in Chapter 6.

- **BIOS–0005.1. BIOS supports booting the system from CD or DVD.** The system BIOS or option ROM must support the No Emulation mode in "*El Torito*"—*Bootable CD-ROM Format Specification*, *Version 1.0*, by IBM and

Phoenix Technologies, Limited, for installing Windows from optical media, such as bootable CD media.

The primary optical device must be bootable. This requirement applies to the primary optical storage provided and on the primary bus that the device is attached, in its shipping configuration.

- **BIOS–0005.2. BIOS provides boot support for USB keyboards and hubs.** This BIOS support, as defined in *Universal Serial Bus (USB) Device Class Definition for Human Interface Devices (HID), Version 1.1*, with particular attention to the Keyboard Boot Protocol, must provide the ability for the user to enter the BIOS setup utility and also provide enough functionality to install and boot an operating system that recognizes USB peripherals. USB keyboards built as stand-alone devices, part of a composite device, or part of a compound device must all be recognized and usable. The BIOS is required to support keyboards behind at least two levels of external hubs.

  For systems with multiple USB host controllers, BIOS support for USB keyboards and hubs is required for all host controllers that are integrated on the system board (that is, not add-on cards).

  Keyboard and pointing devices must be functional for all modes of the operating system, including booting, loading, safe mode, and operating system setup and installation.

  USB external connectors and USB input device support must be enabled by default in the BIOS, and the BIOS must make USB input devices, such as keyboards and pointing devices, available at boot time.

- **BIOS–0005.3. BIOS handles long descriptors read from USB device attached at boot time.** When a USB host requests the configuration descriptor for a device, the device returns the configuration descriptor, all interface descriptors, and endpoint descriptors for all interfaces in a single request (see section 9.4.3 of the USB 1.1 specification). The maximum size of the returned data is 64 KB.

  To enumerate the USB and configure boot devices, the BIOS must make a configuration request to every device encountered. Therefore, the BIOS must be capable of handling a maximum length descriptor if such a descriptor is returned. However, the BIOS is required to configure only boot devices. Nonboot devices can be left in the addressed USB-visible device state.

- **BIOS–0005.4. Operating system recognizes the boot drive in a multiple-drive system.** The BIOS must comply with the implementation of boot-drive determination in multiple-drive systems as defined in Section 5.0 of the *BIOS Boot Specification, Version 1.01*. Both Windows Me and Windows 2000 operating systems use this format for determining the boot drive when new bootable devices are introduced to a PC.

- **BIOS–0005.5. System timer is supported at system boot.** The ROM BIOS must make sure that the timer is on at system boot and that timer interrupts are occurring as part of power-on self-test (POST) or reset.

BIOS–0006. BIOS supports SMBIOS 2.3

Windows 2000 can present system management BIOS (SMBIOS) 2.2 or later static table data in Windows Management Instrumentation (WMI). System designers must provide platform-specific static information at boot time using this mechanism. For more information, see *System Management BIOS Reference Specification, Version 2.3.*

BIOS–0007. BIOS and CMOS properly accommodate dates

BIOS and CMOS firmware support calendar dates from January 1, 1999 through December 31, 2099.

BIOS–0008. BIOS supports security

All PC systems must provide some mechanism for security, such as a preboot password, to protect enable/disable capabilities for hardware components before the operating system boots.

BIOS–0009. BIOS supports BIOS updates and revisions

Capability for BIOS updates must be provided. The following methods can be used to meet this requirement:

- Through a remote new system setup mechanism downloaded and executed at boot time as described in NET–0256, "Adapter can be used as a boot device" in Chapter 14.
- Through normal file access and execution methods when the system is fully booted into the normal operating system environment.

If option ROMs are provided, they must also be capable of being upgraded.

BIOS–0010. System BIOS supports debug port

BIOS provides support for system debug port. The debug port can be used during system startup for debugging, troubleshooting, and software development.

If a legacy serial port is implemented, the BIOS must provide an option to configure at least one legacy serial port to use either 2F8h or 3F8h. This capability allows the port to be treated as a boot device by the BIOS and is required to be usable by components as a diagnostic port in the event that system debugging is required by either the BIOS or the operating system.

For a legacy-free system, the implementation must meet the requirements defined in requirement BIOS–0015, "BIOS supports ACPI legacy-free reporting mechanism," and SYS–0046, "System supports legacy-free debug capabilities."

The *Debug Port Specification* is available at on the Microsoft Web site listed in "PC System References."

BIOS–0011. System BIOS and option ROMs support Int 13h Extensions

BIOS and option ROMs support Int 13h Extensions as defined in the "Layered Block Device Drivers" section of the Windows 98 DDK. This requirement also applies for redundant array of inexpensive disks (RAID) controllers when implemented, to support booting from Int 13h Extension devices. For additional information about Int 13h Extension devices, see ATA–0117, "ATA controller supports Int 13h Extensions and Logical Block Addressing," and SCSI–0106, "Bootable SCSI controller supports El Torito No Emulation mode and Int 13h Extensions," in Chapter 6.

BIOS–0012. ROM BIOS interrupt handlers preserve values in all registers

ROM BIOS hardware interrupt handlers and system management interrupt (SMI) handlers must preserve the values in all registers, including the high 16-bits of 32-bit registers. ROM BIOS application programming interface (API) handlers must preserve the values in all registers, including the high 16-bits of 32-bit registers that the API is not documented to modify.

Any ROM BIOS API that is documented to modify only the low 16-bits of a 32-bit register must preserve the high 16-bits of that 32-bit register; when the bits are preserved there are less likely to be compatibility problems for applications that use that API.

If a ROM BIOS API is documented to modify the flags—for example, it is documented to return with the CARRY flag set or cleared—this restriction does not apply to individual arithmetic bits in the flags register. Any ROM BIOS API that is documented to modify the flags is assumed to modify all of the arithmetic flag bits: AUX-CARRY, CARRY, OVERFLOW, PARITY, and ZEROSIGN.

The values of the other bits in the flags register must be preserved unless the API is documented to modify them.

BIOS–0014. BIOS supports remote boot

Systems designed for use with Windows 2000 must meet these requirements.

Mobile PC Note   These requirements only apply to mobile PC systems that include either a system board LAN network interface or a preinstalled mini-PCI LAN adapter.

- **BIOS–0014.1. BIOS supports PXE.** The system must support remote boot as defined in *Preboot Execution Environment (PXE) Specification, Version 2.1.*
- **BIOS–0014.2. BIOS supports booting the system from the network and using F12 to force a system boot.** The system BIOS must comply with the requirements that apply to Plug and Play devices as defined in Sections 3 and 4 of the BIOS Boot Specification, Version 1.01. This specification describes the requirements for initial program load (IPL) devices.

Systems that do not have an F12 key or already use the F12 key for another OEM-defined BIOS function can use an alternate key for network boot.

- **BIOS–0014.2.1. BIOS allows boot devices to be configured in order of precedence for boot.** This feature must be implemented in accordance with Appendix C of the *BIOS Boot Specification, Version 1.01*. This feature is a PC 2001 requirement, even though it is optional in the BIOS boot specification.

- **BIOS–0014.2.2. Interface clearly shows boot order when users make configuration choices.** For example, in a system that permits booting from floppy disk drive, hard disk drive (HDD), CD drive, DVD drive, or network adapter, it must be clear to the end user how to set a boot order that favors a specific device, such as the network adapter.

- **BIOS–0014.2.3. F12 key forces a system boot initiated from the network adapter.** This key function must be enabled by default. Configuration of this feature can be provided through a BIOS configuration setting. When this feature is enabled, the boot display must indicate that F12 will invoke a network boot. This display must appear for a duration sufficient to be read by users, but must not lengthen the overall time needed to boot the machine.

- **BIOS–0014.3. System UUID is provided in print.** The system universal unique ID (UUID), in accordance with the Open Group's *Common Application Environment (CAE) Specification*, must be provided to the user in printed form for assistance in environments where it might be used as part of prestaging systems. This printed form is left up to the system manufacturer, but suggested means include posting the UUID on the system chassis or case, or printing the ID on the shipping carton.

- **BIOS–0014.4. BIOS supports BIS.** For systems that include integrity or authentication services for downloaded remote boot images, the BIOS must provide these capabilities as defined in *Boot Integrity Services Application Programming Interface, Version 1.0*.

  Boot Integrity Services (BIS) requires inclusion of structure type 31 (the BIS Entry Point) in the table of exported SMBIOS structures, in addition to the management data required by SMBIOS 2.3. See BIOS–0006, "BIOS supports SMBIOS 2.3." The BIS Entry Point requires that both 16-bit real-mode and 32-bit flat protected-mode entry points are nonzero. The overall structure checksum evaluates to zero.

- **BIOS–0014.5. System BIOS provides remote lockout capability.** During remote management of a PXE client, remote lockout is required to prevent an end user from interrupting sensitive operations like a BIOS update. The remote lockout interface (RLI) allows programmatic lockout of events that could interrupt such an operation. Software running on the client system uses the interface.

The RLI hides the details of the underlying hardware implementation. Thus, manufacturers can provide different lockout hardware implementations while providing a consistent control interface to system software.

For a full explanation of the RLI, see Appendix B, "Remote Lockout."

BIOS–0015. BIOS supports ACPI legacy-free reporting mechanism

Fixed ACPI Description Table (FADT) settings must be supported and correctly implemented, including support for reporting legacy-free and hard reset/boot capabilities. For more details, see the OnNow and Power Management Web page listed in "PC System References."

BIOS–0016. BIOS does not configure I/O systems to share PCI interrupts when APIC is activated

This applies to boot devices configured by the BIOS. The operating system should configure all other devices. For systems that will run the Windows family of operating systems and where the platform hardware can be configured to avoid sharing, OEMs must design the BIOS so that it does not configure the I/O systems in the PC to share PCI interrupts for boot devices.

Mobile PC Note   In mobile systems, the BIOS can configure the I/O system to share PCI interrupts.

BIOS–0017. BIOS configures boot device IRQ and writes to the interrupt line register

This requirement applies to boot devices configured by the BIOS. Windows must configure all other devices because, after an interrupt request (IRQ) is assigned by the system BIOS, Windows cannot change the IRQ. If the BIOS assigns the IRQ and Windows needs it for another device, a sharing problem occurs.

The BIOS must configure the boot device IRQ to a PCI-based IRQ and must write the IRQ into the interrupt line register 3Ch, even if the BIOS does not enable the device. This way, the operating system can still enable the device with the known IRQ at configuration time, if possible.

BIOS–0018. System BIOS supports ATA

ATA BIOS or option ROM must provide boot support for the primary ATA Packet Interface (ATAPI) bootable floppy disk drive in compliance with *ATAPI Removable Media Device BIOS Specification, Version 1.0*. Complying with this specification provides Int 13h and Int 40h support for bootable floppy drives as the primary or secondary floppy disk device.

The system BIOS must configure the drive and host controller so they are optimized for ATA operation. The programmed I/O mode must continue to work. The ATA/ATAPI device driver must also support restoration of these settings

using the ACPI control methods _GTM, _STM, and _GTF when the ATA controller is power managed across a suspend and resume cycle.

BIOS–0019. BIOS enumeration of all ATAPI devices complies with ATA/ATAPI-5

The *AT Attachment with Packet Interface – 5 (ATA/ATAPI-5)* standard defines the enumeration process for all ATAPI devices.

PC 2001 Physical Design Requirements

This section summarizes physical design requirements for PC 2001 systems. These requirements are in addition to those related to the OnNow and Instantly Available PC initiatives for power-state indicators and easily accessible power switches.

For requirements related to audible noise, see SYS–0003, "Hardware design supports OnNow and Instantly Available PC initiatives," and its supporting requirements.

SYS–0020. System and component design practices follow accessibility requirements

At a minimum, the OEM must do the following:

- Make sure that the keyboard and other input devices work correctly with the Microsoft Accessibility features in Windows. For example, StickyKeys must work with all keys in any keyboard design.
- Make all modifier keys, such as the CTRL and SHIFT keys, capable of being read and operated by software. This requirement includes the F1–F12 function keys and OEM-specific keys, such as Internet or Help keys. 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.

PC 2001 System Expansion Bus Requirements

This section provides requirements for all expansion buses included on PC 2001 systems.

SYS–0021. PC 2001 system includes USB with two user-accessible USB ports, minimum

System includes two user-accessible USB ports in addition to any used by the keyboard and pointing devices. USB must meet the requirements defined in Chapter 6, "Buses and Interfaces."

Mobile PC Note   For requirements to any implementation of USB on mobile PCs, see Chapter 5, "Mobile."

SYS–0022. If IEEE 1394 is implemented, all components meet PC 2001 requirements

If implemented, IEEE 1394 must meet the requirements defined in Chapter 6, "Buses and Interfaces" Notably, at least two externally accessible IEEE 1394 sockets are required when external access is provided. Internal-only IEEE 1394 implementations are also allowed.

Mobile PC Note   If implemented externally, mobile PCs require at least one externally accessible IEEE 1394 socket.

SYS–0023. System buses meet PC 2001 requirements

System buses must meet the requirements in Chapter 6, "Buses and Interfaces." This includes SCSI, ATA/ATAPI, and PCI, if implemented.

SYS–0024. If CardBus is implemented, all components meet PC 2001 requirements

If CardBus is implemented in a system, it must meet the requirements defined in *PC Card and CardBus Guidelines, Version 1.1*.

CardBus cards must comply with Section 3 "PCI Bus Power Management Interface Specification for PCI-to-CardBus Bridges," in Volume 11 of the *PC Card Standard, Release 7*.

If wake-from-D3cold is implemented in a platform, the following are required:

- Associated CardBus controller must support power management event (PME# assertion) from D3cold.
- Associated socket must supply sufficient Vaux power to support the card in its D3cold state.

PC 2001 General Device Requirements

This section contains requirements that apply for every device, whether present on the system board or as an expansion device provided by the OEM in a default system configuration. Most general device requirements are related to Plug and Play capabilities.

SYS–0025. Each device, device driver, and installation of either device or driver, meet PC 2001 requirements

Each device must comply with all requirements defined in this guide for the related device class, whether the device is provided in the PC system as an expansion card or as an external device.

In addition to the device requirements in this section, see also the specific requirements for each device class in this guide.

- **SYS–0025.1. Driver installation does not interfere with other devices.** The installation and loading of a driver must not reduce or eliminate functionality of other devices installed on the system.
- **SYS–0025.2. Devices with WDM support in Windows include WDM-based drivers.** Devices with WDM support in Windows include WDM-based drivers. If WDM support is provided in the operating system for a device type, the driver supplied by the manufacturer must be a WDM minidriver. This requirement applies whether the system is designed for use with Windows Me or Windows 2000.
- **SYS–0025.3. Driver supports Plug and Play and power management IRPs.** Every driver (or minidriver) must support Plug and Play and power management I/O request packets (IRPs). This requirement applies whether the system is designed for use with Windows Me or Windows 2000.

  For virtual device drivers (VxD) for Windows Me, the following requirements apply:

  - Every VxD must support Plug and Play and power management messages.
  - The driver must provide power management support as required by any related device class power management reference specification.

  For information about Plug and Play support under Windows 2000, see the Windows 2000 DDK.

- **SYS–0025.4. All configuration settings are stored in the registry.** The driver must not use INI files for configuration settings.

  The driver must also include correct provider, version, and copyright entries. This information is displayed in Device Manager in Windows.

- **SYS–0025.5. All INF and other file information is correct.** The correct minidriver, VxDs, or any other manufacturer-supplied files specified in the device's information file (INF) must be installed in the correct location.

  For manufacturer-provided files, the vendor must *not* be identified as Microsoft and all other copyright and version information must be correct for the manufacturer.

  Files provided by the vendor must not use the same file names as used by files included in Microsoft operating systems and provided as either retail or OEM products, unless specifically agreed upon with Microsoft.

  For information about creating correct INF files under Windows 2000, see "Creating Windows 2000 INF Files" in the Windows 2000 DDK.

- **SYS–0025.6. Installation uses methods defined in the DDK.** Driver installation and removal must use Windows-based methods, as defined in the Windows 98 DDK and Windows 2000 DDK.

  The device driver must be able to be removed using Windows-based software, which can be managed using either the Windows Control Panel option for removing devices or its own remove utility. For information, see the driver installation information in the \SRC\General directory in the Windows 2000 DDK; see also "Windows 95 Class Installers and Network Driver Installers" in the Windows 95 DDK.

  Also, any software components and registry entries installed during driver installation must be removed when the driver is removed.

SYS–0026. Each bus and device meets Plug and Play specifications

Each bus and device provided in a PC 2001 system must meet the current Plug and Play specifications related to its class, including requirements defined in Section 6 of the ACPI 1.0b specification and clarifications published for some Plug and Play specifications. This guideline includes requirements for automatic device configuration, resource allocation, and dynamic disable capabilities.

Any legacy components remaining in a legacy-reduced system must meet the requirements defined in *Legacy Plug and Play Guidelines*, which contains all the requirements for legacy Plug and Play as published in *PC 99 System Design Guide*.

The following list shows current version numbers for all Plug and Play specifications:

- *PCI Local Bus Specification, Revision 2.2.*
- *Plug and Play External COM Device Specification, Version 1.0.*
- *Plug and Play ISA Specification, Version 1.0a* and *Clarifications to Plug and Play ISA Specification, Version 1.0a.*
- *Plug and Play Parallel Port Device Specification, Version 1.0b.*

- *Universal Serial Bus Specification, Revision 1.1.*

Plug and Play specifications for IEEE 1394 are defined in this guide. For information, see "Plug and Play for IEEE 1394" in Chapter 6, "Buses and Interfaces."

SYS–0027. Unique Plug and Play device ID provided for each system device and add-on device

Each device connected to an expansion bus must be able to supply its own unique ID. The following are the specific requirements for Plug and Play device IDs:

- Each separate function or device on the system board must be separately enumerated; therefore, each must provide a device ID in the manner required in the current Plug and Play specification for the bus it uses.

- If a device on an expansion card is enumerated, it must have a unique ID and its own resources according to the current device ID requirements for the bus to which the card is connected.

In addition, for systems designed for use with Windows 2000, if an OEM uses a proprietary mechanism to assign asset or serial numbers to hardware, this information must be available to the operating system using Windows hardware instrumentation technology, as defined in the *Windows Hardware Instrumentation Implementation Guidelines*, *Version 1.0* (WHIIG).

Legacy devices attached to the ISA bus on the system board are not required to have unique Plug and Play IDs—for example, serial ports, parallel ports, or PS/2 compatible port devices. For information, see *Legacy Plug and Play Guidelines.*

SYS–0029. Minimal user interaction needed to install and configure devices

After physically installing the device, the user need not perform any action other than inserting the disks that contain drivers and other files. The user should only be required to restart the system for devices that do not support hot plugging.

The following requirements must be met.

- **SYS–0029.1. The device is immediately functional without restarting the system.** It is acceptable to require rebooting for the primary graphics adapter and the primary hard disk controller. ATA drives need not implement Cable Select (CS) settings. In all cases, however, changing configuration settings must not require the end user to make jumper changes.

- **SYS–0029.2. Software settings are available for configuring all resources.** All buses and devices on both the system board and all expansion cards must be capable of being configured by the operating system and by software such as the Device Manager in Windows, so that the user does not need to open the PC case to change the configuration. Dual in-line package (DIP) switches on

boot devices are allowed for an initial power-on default state or for non-Plug and Play system compatibility, but such settings must be capable of being overridden by software configuration after power on occurs under Plug and Play operating systems.

Note: This requirement does not apply for jumper settings used by the OEM to set CPU speed, select a keyboard, or make other basic system-related settings in the factory. This requirement applies only for settings that the end user must make to configure the hardware.

- **SYS–0029.3. Dynamic disable capabilities are supported for all devices.** All devices must be capable of being automatically disabled by the system. Also, disabling the device must result in the freeing of all its resources for use by other devices.

  The following devices are exempt from this requirement: all legacy devices using the I/O range under 100h, 8042 keyboard controller, legacy FDC, HDC, video graphics array (VGA) memory and I/O addresses, and any BIOS memory ranges required for legacy boot support.

SYS–0030. Hot-plugging capabilities for buses and devices meet PC 2001 requirements

To provide reliable support for hot-plugging capabilities, the following requirements must be met.

- **SYS–0030.1. USB, IEEE 1394, and PC Card devices and buses support hot-plugging.** USB, IEEE 1394, and PC Card specifications all support hot-plugging. A device designed to use any of these connections must support being added or removed while the system is fully powered on.

- **SYS–0030.2. System supports hot-plugging for any PCI devices that use ACPI-based methods.** Hot-plugging is not required for PCI devices. Windows Me and Windows 2000 support dynamic enumeration, installation, and removal of PCI devices only if there is a supported hardware insert/remove notification mechanism. An example of an appropriate notification mechanism such as a bus standard is that provided by CardBus bus controllers. Other implementations, such as those for docking stations and hot-plugging of PCI devices, must comply with the hardware insert/remove notification mechanism as defined in Section 5.6.3 of the ACPI 1.0b specification. It should be noted that systems implementing hot-pluggable PCI capabilities compliant with the *PCI Hot-Plug Specification, Revision 1.0,* must still provide the hardware insert/remove notification mechanism as defined in Section 5.6.3 of ACPI 1.0b.

  More information about Windows 2000 and PCI Hot-Plug can be found on the Web page listed in "PC System References."

- **SYS–0030.3. All removable media support media status notification.** For details and for design requirements, see Chapter 12, "Storage."

- **SYS–0030.4. If implemented, system supports smart card specifications.**
  If smart card is implemented, system must support ISO/IEC specifications.
  See SMRT–0153, "Smart card reader complies with ISO/IEC 7816," in
  Chapter 7.

For implementation details and additional design requirements, see "Supporting
Removable Devices under Windows," the section about hot-plugging, listed in
"PC System References."

SYS–0031. If implemented, Device Bay components comply with Device Bay 1.0

If implemented in a PC 2001 system, Device Bay capabilities must meet the
following requirements:

- The system includes a Device Bay Controller (DBC) compliant with *Device
  Bay Specification, Version 1.0* or later. If the DBC is implemented as a USB
  device, it must be compliant with *Universal Serial Bus Device Class
  Definition for Device Bay Controllers, Version 1.0.*
- The system includes one USB port and one IEEE 1394 port for each Device
  Bay-capable bay in the system.

Any Device Bay peripheral that is provided with a PC 2001 system must meet the
following requirements:

- Device complies with *Device Bay Specification*, *Version 1.0.*
- Device uses either the USB bus, the IEEE 1394 bus, or both.
- If the device uses the USB bus, it must also comply with the relevant USB
  device class specifications.

SYS–0032. Multifunction device meets PC 2001 device requirements for each device

Multifunction devices can contain more than one device. They must comply with
requirement SYS–0025, "Each device, device driver, and installation of either
device or driver, meet PC 2001 requirements," including the requirements for
automated software-only settings for device configuration, device drivers, and
Windows-based installation. In addition, multifunction devices must meet the
following requirements.

- **SYS–0032.1. Each enumerated device has a unique device ID.** Each
  function or device on the multifunction add-on device that is individually
  enumerated must provide a device ID for the bus it uses.
- **SYS–0032.2. Windows can separately access and configure each logical
  device.** Windows must be able to separately access each logical device that is
  individually enumerated, configure the device resources independently, and
  disable individual devices in the event of a conflict.

- **SYS–0032.3. Each enumerated device meets its own resource requirements.** For each individually enumerated device, resource configuration requirements are the same as for an equivalent device on a separate expansion card. This requirement means that registers cannot be shared among individually enumerated devices on a multifunction add-on device, but it does not supersede device requirements among different bus classes.

- **SYS–0032.4. For PC 2001, separate drivers are required for separate functions.** 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 must be avoided.

- **SYS–0032.5. There are no start order dependencies between drivers for separate functions.** The operating system must be able to configure and manage functions and devices in any order, so drivers for a multifunction device may not depend on another driver to be started before the function or device can be used.

- **SYS–0032.6. Independent functions and devices can be used concurrently, with no hidden dependencies.** Separate functional units in a multifunction device must be able to operate concurrently, without interfering with each other or with other devices in the system.

- **SYS–0032.7. Each function and device can be power managed independently.** Each function and device in a multifunction device must separately meet the power management device class specifications for its device class and be independently power managed. Each function and device must be able to successfully complete a system sleep/wake transition (where the unit transitions from D0 to D3 with power removed to D0) without losing functionality and without requiring user intervention to restore functionality. All functions and devices that support wakeup capabilities must correctly support wake from D3 with power removed.

SYS–0033. Each bus meets written specifications and PC 2001 requirements

Each bus and connector used in the system must meet all the requirements for that bus as defined in Chapter 6, "Buses and Interfaces." For CardBus, see PC Card and CardBus Guidelines, Version 1.1. See also SYS–0026, "Each bus and device meets Plug and Play specifications."

SYS–0034. If implemented as an industry-standard riser card, the riser device subsystem complies with applicable standard Plug and Play requirements

All industry standard riser cards must provide means for the device to uniquely identify each function, so that the system (including the BIOS) can generate

unique PCI Subsystem Vendor ID (SVID) and Subsystem Device IDs (SDIDs) as required in SYS–0027, "Unique Plug and Play device ID provided for each system device and add-on device."

Riser devices, including audio, modems, and network adapters, must supply a unique device ID for each version of the riser that needs a different driver. The device must also expose a different set of Plug and Play device IDs for each function as required in SYS–0032, "Multifunction device meets PC 2001 device requirements for each device."

Examples of these risers include:

- An audio modem riser (AMR) card that complies with the *Audio/Modem Riser Card Specification*, listed in "PC System References."
- Communications and networking riser. For more information, see the Communications and Networking Riser Web site, listed in "PC System References."
- Advanced communications riser.

PC 2001 Graphics and Video Requirements

The following requirements describe video requirements in a PC 2001 system.

SYS–0035. If DVD-Video playback is implemented, PC 2001 system provides video playback capabilities

Video playback capability is required in PC 2001 systems. PCs must be capable of decoding MPEG streams, however this is not a requirement to ship an MPEG decoder with the system. Systems must meet the requirements under "MPEG-2 Video Playback Requirements" and "DVD-Video Playback Requirements" in Chapter 9.

Mobile PC Note   Mobile PC 2001 systems require support of 640×480, 16 bpp mode only.

SYS–0036. If video capture is implemented, analog video input and capture capabilities comply with PC 2001 requirements

If video-capture capability is implemented in a PC 2001 system, it must meet the requirements VID–0210, "Video input, capture, and broadcast device support is based on DirectX foundation class and WDM Stream class or AV Stream class"; VID–0224, "If implemented, video input or capture device provides raw sampled VBI data to the host"; and VID–0225, "If implemented, VBI capture oversamples VBI data exactly 4.7 or 5 times," in Chapter 9.

**SYS–0037. If Digital Video Interface is implemented, components comply
with PC 2001 requirements**

Digital interfaces for monitors comply with Digital Visual Interface (DVI),
Revision 1.0. See MON–0241, "Digital display interface is DVI compliant," in
Chapter 10.

PC 2001 Storage Requirements

The following storage requirements apply to all PC 2001 systems.

SYS–0038. PC 2001 system includes hard disk and controller

The host controller for hard disk devices must support bus mastering. Bus master
capabilities must meet the related specification for the particular controller.

Storage bus devices must not use the ISA bus.

Hard disk and optical devices must meet the requirements defined in Chapter 12,
"Storage."

Note: This requirement does not apply for closed-case platforms that do not
include an HDD and are designed to boot from the network.

SYS–0039. PC 2001 system includes either CD or DVD drive and controller

The CD or DVD drive and controller must meet the requirements defined in
Chapter 12, "Storage."

Note: This requirement does not apply for closed-case platforms that do not
include an HDD and are designed to boot from the network.

Mobile PC Note   For requirements for mobile PC systems, see MOBL–0072, "If implemented, CD
or DVD drive meets PC 2001 requirements," in Chapter 5.

Legacy Removal Requirements

This section defines the hardware and BIOS requirements for legacy-reduced and
legacy-free systems. For background information about the goals of legacy
removal for PC 2001, see "Legacy Removal and Easy PC Goals" in Chapter 2,
"Easy PC Initiative."

All PC 2001 computers accomplish some level of legacy removal, as indicated in
the following subsection, "PC 2001 Legacy Reduction Requirements." For system
designers who want the operating system to identify the computer as a legacy-free
system, the "PC 2001 Legacy Free Requirements" section that appears later in this
chapter contains additional requirements.

PC 2001 Legacy-Reduced System Requirements

This section defines requirements for migration away from legacy architectures for all PC 2001 systems.

SYS–0041. System does not include ISA expansion devices or slots

PC 2001 systems do not include any ISA expansion devices or user-accessible ISA slots.

Systems that are not designed to meet PC 2001 legacy-free requirements can use ISA or ISA-like protocols and signaling for implementations of legacy devices such as the controllers for serial, parallel, 8042, floppy disk drive, and so on. For information, see *Legacy Plug and Play Guidelines*

SYS–0042. Preinstalled components and upgrades do not require MS-DOS or legacy interfaces

Peripherals included with the system must offer a non-legacy interface such as PCI, USB, USB 2.0, SCSI, IEEE 1394, or CardBus. Peripherals can include both a legacy interface and a non-legacy interface. Proprietary interfaces are not acceptable.

The keyboard and pointing devices can use a PS/2 compatible interface.

SYS–0067. Secondary boot and upgrade capability is independent of FDC-based floppy disk drive

The system must be capable of recovery and upgrade of the hard drive image and BIOS independent of an FDC-based floppy disk drive. Options include a CD or DVD drive attached to USB, ATA, IEEE 1394, or SCSI.

Note: This requirement does not apply to Windows NT 4.0 recovery media that ships or is offered with the system.

Recovery storage devices do not have to be CD- or DVD-based, but must include recovery media from the OEM that does not limit upgrades from production optical media.

PC 2001 Legacy-Free System Requirements

This section defines the hardware requirements for legacy-free systems that will be implemented under PC 2001 requirements.

The basic goal for the legacy-free system requirements is that the operating system and devices do not use any of the following:

- ISA slots or devices
- Legacy FDC
- PS/2, serial, parallel, and game ports

Revisions to the ACPI specification provide a mechanism that allows the BIOS to report whether a system provides the services of these components and interfaces. If the BIOS reports that the system is legacy free, the system must meet the requirements provided in this section.

Note: The requirements for legacy-free systems are additional to those defined in "PC 2001 Legacy Reduction Requirements."

BIOS–0043. BIOS supports required interrupts

The list in Appendix A, "Resource Mapping," shows the known BIOS dependencies for which support is required. All subfunctions must be present on a legacy-free PC 2001 system as described in Appendix A.

BIOS–0013. BIOS supports legacy removal

The BIOS does not include boot dependencies on ISA, and no ISA-related components appear on BIOS setup screen.

BIOS–0045. No legacy ports detected

The following ports are considered legacy ports and must be replaced by USB or other non-legacy equivalents:

- FDC
- Serial
- Parallel
- PS/2-compatible ports
- ISA-based game ports and MPU 401 (Musical Instrument Digital Interface [MIDI]) ports

These ports must not be available for external connection and must not be detected by the operating system as enabled.

In addition, the 8042 controller can be present and reported through ACPI, although PS/2-compatible ports cannot be provided for connecting external devices.

Systems can provide Super I/O-based IrDA support.

Mobile PC Note   New docking stations designed specifically for legacy-free mobile PCs must follow these requirements. This does not preclude existing docked mobile PC designs from being used with legacy-free mobile PCs.

The following table shows the I/O addresses and interrupts related to the restricted legacy devices. Do not use these resources except as noted in the table. If hardware is present and disabled, ACPI declaration must claim the resources so they cannot be freed.

Restricted Port Addresses

Device	I/O Address	Interrupts
COM [1]	2E8–2EF 2F8–2FF[2] 3E8–3EF 3F8–3FF	IRQ3[2], IRQ4
LPT	278–27A 378–37A 3BC–3BE	IRQ 7
Joystick/game port	0200–020F	
Sound Blaster	0220–022F	
MPU-401 (MIDI)	0330–0331	
FDC	3F0–3F7	IRQ 6

[1] An internal COM port header can be used as a debug port solution if the COM port is not exposed to the end user. In this case, the COM port must not use the I/O addresses listed in this table; the relocated COM I/O address must be reported in the ACPI Debug Port table.

[2] An IrDA controller is permitted to use these resources.

SYS–0040. If implemented, floppy disk capabilities do not use legacy FDC

To support migration away from legacy devices, floppy disk drives on PC 2001 systems must be based on a solution other than an FDC. Solutions include: ATAPI floppy disk drive compliant with SFF-8070i, USB, IEEE 1394, PC Card, or SCSI-based floppy disk drives.

The device and its controller must meet the general requirements defined in Chapter 12, "Storage."

SYS–0047. A20M# is always de-asserted (pulled high) at the processor

If A20M# generation logic is still present in the system, this logic must be terminated such that software writes to I/O port 92, bit 1, do not result in A20M# being asserted to the processor.

SYS–0046. System supports legacy-free debug capabilities

Legacy-free systems must implement a debug solution that complies with the *Debug Port Specification*, listed in "PC System References."

Manageability Component Instrumentation Requirements

This section presents new requirements for PC 2001 systems related to the Wired for Management (WfM) initiative and the Zero Administration initiative for Windows. The WfM initiative seeks to raise the level of management capabilities for mobile, desktop, and workstation platforms. The Zero Administration initiative seeks to provide a controlled, highly manageable enterprise.

The baseline for these requirements is *Windows Hardware Instrumentation Implementation Guidelines*, *Version 1.0*, which also defines the Windows-specific requirements of the *Wired for Management Baseline Specification*, *Version 2.0*, for hardware instrumentation.

Collectively, the items in this section represent the Manageability Baseline requirements for Windows 2000.

SYS–0048. System supports WHIIG

The related requirement is defined in *Windows Hardware Instrumentation Implementation Guidelines*, *Version 1.0*.

Mobile PC Note   Support for WHIIG, WMI, and enabling a management information service provider is required for mobile systems targeted for use with Windows 2000.

SYS–0049. Expansion devices on desktop systems can be remotely managed

Devices provided as expansion devices must be capable of being remotely managed so that control and Total Cost of Ownership (TCO) policies can be realized. For example, for any implementation of a floppy disk drive on a Windows 2000 system, the drive must be capable of being remotely disabled as a boot selection and provisions must be made for locking.

Certain devices are not required to be capable of being remotely disabled, including the primary HDD, the network adapter, and any standard devices that use legacy connections, such as a keyboard or pointing device that uses a PS/2-compatible connection. However, it must be possible that permissions, policies, or other methods can be used to remotely manage capabilities such as hard disk access or to control end-user ability to change the MAC address or configuration settings for the network adapter.

See also requirement BIOS–0014, "BIOS supports remote boot."

PC System References

Following are the references, services, and tools cited in this chapter that are available to help build hardware that works optimally with Windows operating systems.

Advanced Configuration and Power Interface Specification, Revision 1.0b
     http://www.teleport.com/~acpi/

AT Attachment with Packet Interface – 5 (ATA/ATAPI-5)
     ftp://fission.dt.wdc.com/pub/standards/x3t13/project/d1321r3.pdf

ATAPI Removal Rewriteable Media Devices (INF-8070i)
     ftp://fission.dt.wdc.com/pub/standards/SFF/specs/INF-8070.pdf

ATAPI Removable Media Device BIOS Specification, Version 1.0
     http://www.ptltd.com/techs/specs.html

BIOS Boot Specification, Version 1.01
     http://www.ptltd.com/techs/specs.html

Boot Integrity Services Application Programming Interface, Version 1.0
     http://developer.intel.com/ial/wfm/wfmspecs.htm

Common Application Environment (CAE) Specification
     http://www.opengroup.org/onlinepubs/9629399/toc.htm

Communications and Networking Riser Web site
     http://developer.intel.com/technology/cnr/

Debug Port Specification
     http://www.microsoft.com/hwdev/NewPC/debugspec.htm

Default Device Class Power Management Reference Specification, Version 1.0,
and other device class power management specifications
     http://www.microsoft.com/hwdev/onnow/

Device Bay Specification, Version 1.0
     http://www.device-bay.org

Digital Visual Interface (DVI), Revision 1.0
     http://www.ddwg.org

"El Torito"—Bootable CD-ROM Format Specification, Version 1.0
     http://www.ptltd.com/techs/specs.html

Hot-Plug PCI and Windows 2000 Web page
     http://www.microsoft.com/hwdev/pci/hotplugpci.htm

Instantly Available PC System Power Delivery Requirements and Recommendations
     http://developer.intel.com/design/power/supply98.htm

Instantly Available Power Managed Desktop PC Design Guide
　　http://developer.intel.com/technology/iapc/tech.htm

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

OnNow and Power Management Web page
　　http://www.microsoft.com/hwdev/onnow/

PC Card and CardBus Guidelines, Version 1.1
　　http://www.pcdesguide.org/documents/pccard.htm

PC Card Standard, Release 7
　　http://www.pcmcia.org/bookstore.htm

PCI Hot-Plug Specification, Revision 1.0
　　http://pcisig.com/tech/index.html

PCI Local Bus Specification, Revision 2.2 (PCI 2.2)
　　http://www.pcisig.com/developers/specification/

Plug and Play External COM Device Specification, Version 1.0
Plug and Play ISA Specification, Version 1.0a and *Clarifications to the Plug and Play ISA Specification, Version 1.0a*
Plug and Play Parallel Port Device Specification, Version 1.0b
　　http://www.microsoft.com/hwdev/respec/pnpspecs.htm

Preboot Execution Environment (PXE) Specification, Version 2.1
　　http://developer.intel.com/ial/wfm/wfmspecs.htm

"Scan Codes for Keyboard Power Switches"
　　http://www.microsoft.com/hwdev/desinit/scancode.htm

*"*Supporting Removable Devices under Windows"
　　http://www.microsoft.com/hwdev/busbios/rem_devs.htm

System Management BIOS Reference Specification, Version 2.3
　　ftp://download.intel.com/ial/wfm/smbios.pdf
　　http://www.phoenix.com/techs/specs.html

*Universal Serial Bus Device Class Definition for Device Bay Controllers, Version 1.0***; a**nd other USB device class specifications
　　http://www.usb.org/developers/devclass_docs.html

Universal Serial Bus (USB) Device Class Definition for Human Interface Devices (HID), Version 1.1
　　http://www.usb.org/developers/data/devclass/hid1_1.pdf

Universal Serial Bus Specification, Revision 1.1
　　http://www.usb.org/developers/docs.html

Windows 95 DDK, Windows 98 DDK, and Windows 2000 DDK
　　http://www.microsoft.com/ddk/

"Creating Windows 2000 INF Files"

http://www.microsoft.com/hwdev/NTDRIVERS/w2inf.htm

Windows Hardware Instrumentation Implementation Guidelines, *Version 1.0*
White papers and guidelines for WMI

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

Wired for Management Baseline, Version 2.0

http://developer.intel.com/ial/wfm/

Checklist for PC System

SYS–0001. System performance meets PC 2001 minimum requirements

SYS–0002. System design meets ACPI 1.0b specification and PC 2001 requirements

SYS–0003. Hardware design supports OnNow and Instantly Available PC initiatives

BIOS–0004. BIOS meets PC 2001 requirements for OnNow/Instantly Available PC support

BIOS–0005. BIOS includes local boot support

BIOS–0006. BIOS supports SMBIOS 2.3

BIOS–0007. BIOS and CMOS properly accommodate all dates

BIOS–0008. BIOS supports security

BIOS–0009. BIOS supports BIOS updates and revisions

BIOS–0010. System BIOS supports debug port

BIOS–0011. System BIOS and option ROMs support Int 13h Extensions

BIOS–0012. ROM BIOS interrupt handlers preserve values in all registers

BIOS–0014. BIOS supports remote boot

BIOS–0015. BIOS supports ACPI legacy-free reporting mechanism

BIOS–0016. BIOS does not configure I/O systems to share PCI interrupts

BIOS–0017. BIOS configures boot device IRQ and writes to the interrupt line register

BIOS–0018. System BIOS supports ATA

BIOS–0019. BIOS enumeration of all ATAPI devices complies with ATA/ATAPI-5

SYS–0020. System and component design practices follow accessibility requirements

SYS–0021. PC 2001 system includes USB with two user-accessible USB ports, minimum

SYS–0022. If IEEE 1394 is implemented, all components meet PC 2001 requirements

SYS–0023. System buses meet PC 2001 requirements

SYS–0024. If CardBus is implemented, all components meet PC 2001 requirements

SYS–0025. Each device, device driver, and installation of either device or driver, meet PC 2001 requirements

SYS–0026. Each bus and device meets Plug and Play specifications

SYS–0027. Unique Plug and Play device ID provided for each system device and add-on device

SYS–0029. Minimal user interaction needed to install and configure devices

SYS–0030. Hot-plugging capabilities for buses and devices meet PC 2001 requirements

SYS–0031. If implemented, Device Bay components comply with Device Bay 1.0

SYS–0032. Multifunction device meets PC 2001 device requirements for each device

SYS–0033. Each bus meets written specifications and PC 2001 requirements

SYS–0034. If implemented as an industry-standard riser card, the riser device subsystem complies with applicable standard Plug and Play requirements

SYS–0035. If DVD-Video playback is implemented, PC 2001 system provides video playback capabilities

SYS–0036. If video capture is implemented, analog video input and capture capabilities comply with PC 2001 requirements

SYS–0037. If Digital Video Interface is implemented, components comply with PC 2001 requirements

SYS–0038. PC 2001 system includes hard disk and controller

SYS–0039. PC 2001 system includes either CD or DVD drive and controller

SYS–0041. System does not include ISA expansion devices or slots

SYS–0042. Preinstalled components and upgrades do not require MS-DOS or legacy interfaces

SYS–0067. Secondary boot and upgrade capability is independent of FDC-based floppy disk drive

BIOS–0043. BIOS supports required interrupts

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SYS–0049. Expansion devices on desktop systems can be remotely managed