

# Input Components

This chapter presents the requirements and recommendations for standard input devices and connections under the Microsoft Windows family of operating systems.

Version 1.1

Includes changes to items 1, 2, 7, and References for Input Components, as previously published in the PC 97 FAQ on

<http://www.microsoft.com/hwdev/pc97.htm> and the PC 97 OnNow Requirements on <http://www.microsoft.com/hwdev/desguid/onnowpc97.htm>

See also: System FAQs for WHQL Testing on

[http://www.microsoft.com/hwtest/faqs/faq\\_system.stm](http://www.microsoft.com/hwtest/faqs/faq_system.stm)

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## Overview for Input Components

This section presents the key design issues for input components under Microsoft Windows.

These are the key issues for input devices for PC 97:

- Easy connectivity is important in common situations where devices might be interchanged on a regular basis. For this purpose, system designers are encouraged to take advantage of USB and to implement wireless capabilities for all input components.

USB support is required for PC 97 systems. If USB is implemented as the connection for any input device, the device must support the USB Human Input Device Class Specification.

- Non-USB input devices must have device drivers that support the Microsoft DirectInput 3.0 APIs. DirectInput provides low-latency support for analog and digital joysticks, along with support for alternate input devices for user interaction. Extended capabilities also provide support for rudder pedals, flight yokes, steering devices, virtual-reality headgear, and other devices.

Non-USB input devices that provide hardware acceleration should expose these features in their device drivers, so that these capabilities can be used to advantage in applications that use Microsoft DirectX features.

- Windows and Application Logo keys are recommended for keyboards.

## System Requirements for Input Components

This section summarizes the requirements for specific input components for PC 97 system designs.

For a mobile PC system, the required USB port can be used to support the requirement for external mouse and keyboard connections. However, two PS/2-style ports can be implemented for the mouse and keyboard, or a single PS/2-style port can be provided for both the mouse or keyboard on a mobile PC.

**1. External connection for keyboard**

| <i>Basic PC 97</i> | <i>Workstation PC 97</i> | <i>Entertainment PC 97</i> |
|--------------------|--------------------------|----------------------------|
| <i>Required</i>    | <i>Required</i>          | <i>Required</i>            |

Recommended: USB. This connection can also be implemented as a PS/2-style port or by using wireless capabilities in the system. For mobile PC systems, a single PS/2-style port can be provided for use by either the mouse or keyboard.

**Version 1.1 Clarification:**

The requirement for an external connection for the keyboard can be met by implementing either two standard PS/2-style ports or a single PS/2-style port that provides two separate clocks and two separate data lines, and by providing a special cable that allows both the external keyboard and pointing device to use the single port. (Clarification date: February 13, 1997)

**2. External connection for pointing device**

| <i>Basic PC 97</i> | <i>Workstation PC 97</i> | <i>Entertainment PC 97</i> |
|--------------------|--------------------------|----------------------------|
| <i>Required</i>    | <i>Required</i>          | <i>Required</i>            |

Recommended: USB or wireless. This connection can also be implemented using a PS/2-style port in the system.

**Version 1.1 Clarification:**

The requirement for an external connection for the pointing device can be met by implementing either two standard PS/2-style ports or a single PS/2-style port that provides two separate clocks and two separate data lines, and by providing a special cable that allows both the external keyboard and pointing device to use the single port. (Clarification date: February 13, 1997)

**3. Wireless capabilities**

| <i>Basic PC 97</i> | <i>Workstation PC 97</i> | <i>Entertainment PC 97</i> |
|--------------------|--------------------------|----------------------------|
| <i>Recommended</i> | <i>Recommended</i>       | <i>Recommended</i>         |

An infrared or radio-frequency (RF) remote-control device included with a PC system must meet the requirements defined in the “Mouse Port and Peripherals” section in this chapter and the requirements in the “Serial, Parallel, and Wireless Support” chapter in Part 4 of this guide.

**4. USB game pad or joystick**

| <i>Basic PC 97</i> | <i>Workstation PC 97</i> | <i>Entertainment PC 97</i> |
|--------------------|--------------------------|----------------------------|
| <i>Recommended</i> | <i>Recommended</i>       | <i>Required</i>            |

Recommended: Wireless for Entertainment PC 97.

This device must support the USB Human Input Device Class Specification. For more information about requirements for USB peripherals, see the “USB” chapter in Part 3 of this guide.

**Note** For PC 97, the recommended solution for game control input devices is to provide devices that use a USB connection rather than a proprietary or traditional game port. This is the required implementation for Entertainment PC 97.

An input device that uses a traditional or proprietary digital game port solution is not recommended for PC 97 systems and not allowed for Entertainment PC 97, because there are no defined standards for digital game ports, some digital game port designs are incompatible with some devices, and traditional game ports impose performance limitations on high-speed processors.

However, it is recognized that some legacy implementations include traditional or proprietary game port capabilities (this includes providing a MIDI port that can be used as a game control port). A system designer might choose to include such a port on a PC 97 system to allow users to connect their legacy devices. For information about PC 97 requirements related to such legacy ports, see “Legacy Game Control Port Requirements” later in this chapter.

## PC 97 Design for Input Devices

This section summarizes requirements related to the design initiatives for PC 97 defined in Part 1 of this guide.

## Plug and Play and Bus Design for Input Devices

The items in this section are requirements for Plug and Play capabilities.

### 5. Plug and Play device identifier

*Required*

- For a non-bus specific system board device, there must be a device-specific identifier.
- Each bus-specific device must provide a Plug and Play device identifier in the manner required for the bus it uses, as defined in Part 3 of this design guide. For example, a PCI device must comply with PCI 2.1 requirements and also provide a Subsystem ID and Subsystem Vendor ID, as defined in the “PCI” chapter in Part 3 of this guide. A device that uses USB must provide a unique identifier as defined in the Universal Serial Bus Specification v. 1.0 or higher.

### 6. Automatic resource assignment and dynamic disable capabilities

*Required*

The operating system must be capable of automatically assigning, disabling, and relocating the resources used by this device when necessary, using the method required for the related bus class. Changing or adding this device to the PC system must not require changing jumpers or switches on either the adapter or the system board. In the event of an irreconcilable conflict with other devices, the operating system must be able to disable the device to prevent the system from stalling.

If there is a conflict when more than one device of the same type is detected on the system, one of two methods can be used to resolve them:

- The first method is to completely disable a port. For example, if an expansion card, such as a display adapter with a built-in mouse port is added to a desktop system that has a system board mouse port, the expansion card overrides the system board mouse port. Using this method, the system disables the mouse port on the system board and only accepts mouse input from the expansion card.

- The second method allows both ports to remain active, while resolving any conflict by relocating the resources of one or both ports. For example, in a docking system, the mouse on the mobile PC and the mouse on the docking station can be allowed to share pointing responsibilities. Using this method, either mouse can be used as a pointing device, although only one mouse pointer will be used by the software.

**Note** Fixed (static) resource devices can exist to support standard devices, including the keyboard controller (8042). For an x86-based system, these fixed resources are located at I/O addresses under 100h. Standard system board devices should use their ISA-compatible addresses. For x86-based systems, this includes devices with I/O port addresses within the reserved range 0h through 0ffh. For more information about legacy resources and ISA-compatible addresses, see Appendix D, “Legacy I/O Assignments.”

## Power Management for Input Devices

This section summarizes the specific power management requirements for input devices.

### **7. Compliance with “Device Class Power Management Reference Specification” for input devices**

*Required*

The “Device Class Power Management Reference Specification” for input devices provides definitions of the OnNow device power states (D0–D3) for these devices. The specification also covers device functionality expected in each power state and the possible Wakeup event definitions for the class. Power states D0 and D3 are required. Other power states are recommended.

#### **Version 1.1 Clarification:**

As of **July 1, 1997**, the device must meet the requirements defined in the *Input Device Class Power Management Specification* and the *Default Device Class Power Management Specification*, as described in the the clarifications to item 5 of the “Basic PC 97” chapter.

### **8. Support Wakeup Events defined in “Device Class Power Management Reference Specification”**

*Optional*

For PC 97, the ability to cause a Wakeup event as defined in the “Device Class Power Management Reference Specification” for input devices is an optional feature.

## Device Drivers and Installation for Input Devices

This section summarizes requirements for device drivers for input devices. The items in this section are requirements for all PC 97 systems.

### **9. Device driver and installation meet Windows and Windows NT standards**

#### *Required*

The manufacturer does not need to supply a driver if a standard driver provided with the operating system can be used. If the manufacturer supplies drivers, the requirements include the following:

- All devices and drivers must pass testing by Microsoft WHQL.
- All configuration settings are stored in the registry.
- The correct minidriver or any other manufacturer-supplied files specified in the device's INF must be installed in the correct locations.

For input devices in PC 97, the correct Win32 Driver Model (WDM) minidriver or USB Human Input Device driver plus other WDM-compatible drivers and any other files specified in the device's INF must be installed in the correct locations.

- Driver installation and removal uses Windows-based methods as defined in the Windows 95 and Windows NT DDKs.
- Driver files provided by the vendor must not use the same file names as used by files included in Microsoft operating systems, unless specifically agreed with Microsoft.
- Only 32-bit protected-mode components are installed. No real-mode or 16-bit protected-mode components are provided in order to operate under Windows.
- Driver supports Plug and Play IRPs (for WDM drivers).
- If support using WDM drivers is provided on the operating system, the driver supplied by the manufacturer must be a WDM minidriver. Older Windows 95 VxD files must not be installed for PC 97 input devices that have WDM support under Windows 95 and Windows NT.

For complete details about standard installation requirements for drivers, see “Basic PC 97” in Part 2 of this guide.

## Mouse Port and Peripherals

This section defines the specific requirements for pointing device connections and peripherals. Because the Windows operating system requires a pointing device, a system board in a PC 97 system should include an auxiliary port for an external pointing device (most commonly, a mouse). For PC 97, it is recommended that systems designers use the USB port for the connection and also consider implementing wireless support for an external pointing device.

### **10. General device requirements**

*Required*

These include the standard requirements for a Plug and Play device identifier, automated software-only settings for device configuration, standard device drivers and Windows-based installation, and icons for external connectors. For more information, see the “Basic PC 97” chapter of this guide.

### **11. PS/2 port specifications, if PS/2-style port is used**

*Required*

The following requirements must be met if a PS/2-style port is used:

- Comply in full with Personal System/2 Specification requirements published by IBM.
- Use an 8042 chip (or equivalent) to ensure compatibility with Windows. (In most cases, the existing 8042 keyboard port is sufficient.) The 8042 initiates an IRQ 12 interrupt when the mouse is connected to the port.
- Support IRQ 12 to enable the proper functioning of software written for legacy systems that expect this IRQ signal to be used.
- Return expected codes, including send identifier (0F2h), response: ACK (0FAh) + 1-byte ID.

### **12. USB Specification and device class specifications, if USB is used**

*Required*

This device must comply with the Universal Serial Bus Specification v. 1.0 or higher, and the related USB device class specification. This ensures that all Plug and Play requirements are met and that Microsoft drivers support this device. For more information, see the “USB” chapter in Part 3 of this guide.

### **13. IR wireless specifications, if IR device is used**

*Required*

An infrared device must support IrDA codes and all other requirements specified in the IrDA specification.



**14. RF wireless specifications, if RF wireless device is used***Recommended*

Numerous consumer electronics remote controls use proprietary RF communications protocols to provide low-cost, one-way remote control functionality, often at relatively great distances (up to 10 meters).

For more information about support and standards being developed at Microsoft for RF devices, see <http://www.microsoft.com/hwdev/devdes/>.

**15. Remote control provides minimum support, if present***Recommended*

The range of functions implemented on the remote control device will depend on whether the remote control is designed for the business desktop or for Entertainment PC 97 use. There is no defined list of the functions that must be included on a remote control device, but such a device might provide the following types of functions and buttons:

- Power button that turns devices on and off
- Start button, with Windows Logo, that causes a Start menu to be displayed
- Menu button that causes an application-specific menu to be displayed
- Help button that causes application-specific help to be displayed
- South, North, East, and West direction capability which functions similarly to the Down-arrow, Up-arrow, Left-arrow, and Right-arrow keys on a keyboard
- Select button that functions similarly to the Enter key on a keyboard

The following functions and buttons can also be considered for a remote control used with an Entertainment PC 97 system:

- TV button that selects the TV as the device with focus
- Mute button
- Device control buttons, including Volume Up, Volume Down, Channel Up, Channel Down, Fast Forward, Rewind, Play, Stop, Pause, and Record
- Number keys equivalent to a telephone keypad

## Keyboard Ports and Peripherals

The primary input component for a PC is the keyboard. The keyboard connection on the system board has traditionally been controlled by an 8042 microcontroller or the equivalent. However, for PC 97, USB connections and wireless connections are important design considerations for PC keyboard connections. Also, these design requirements do not exclude (but do not encourage) implementing a legacy AT-style keyboard port.

This section summarizes the specific hardware features required for PC 97 keyboard ports and peripherals. Some keyboard port requirements differ, depending on what type of port is being used.

### **16. General device requirements**

#### *Required*

These include the standard requirements for a Plug and Play device identifier, automated software-only settings for device configuration, standard device drivers and Windows-based installation, and icons for external connectors. For more information, see the “Basic PC 97” chapter of this guide.

### **17. PS/2 specifications by IBM and 8042 chip (or equivalent), if PS/2 used**

#### *Required*

If a PS/2-style keyboard port is designed into the system, it must meet the following requirements:

- Support IRQ 1 to ensure the proper functioning of software written for legacy systems that expect to use this IRQ signal.
- Map the I/O address ports to 60h and 64h.

### **18. USB Specification and USB device class specification, if USB is used**

#### *Required*

This device must comply with the Universal Serial Bus Specification (v. 1.0 or higher) and the related USB device class specification. This ensures that all Plug and Play requirements are met and Microsoft drivers support this device. For information, see the “USB” chapter in Part 3 of this guide. The keyboard must also support the USB Human Input Device Class Specification.

If a USB keyboard is the sole keyboard implementation in the system, it must support the USB Boot Device specification, and the system BIOS must provide boot support, as specified in “Basic PC 97” in Part 2 of this guide and defined in “Universal Serial Bus PC Legacy Compatibility Specification,” v. 1.0 or higher, available from [http://www.teleport.com/~usb/data/usb\\_le9.pdf](http://www.teleport.com/~usb/data/usb_le9.pdf).

**19. Wireless specifications, if wireless device is used**

*Required*

An IR device must support IrDA codes and all other requirements specified in the IrDA specification.

**20. PS/2- style keyboard returns expected scan codes**

*Required*

This includes send identifier (0F2h), response: ACK (0FAh) + 2-byte ID.

**21. No interference between keyboards for multiple devices**

*Required*

For example, when a mobile PC is connected to a docking station, more than one keyboard can be attached to the system simultaneously. The keyboard ports on a mobile PC and the docking station must be able to resolve conflicts between the two ports when the mobile unit is docked. Windows supports multiple configurations through the registry and will determine which keyboard to enable.

For more information about managing resources and devices for a mobile PC and docking station pair, see the “Basic PC 97” chapter in Part 2 of this guide.

**22. Windows and Application Logo keys**

*Recommended*

If the keyboard includes any Windows Logo keys, it must meet the following requirements:

- The keyboard must be developed according to technical requirements in *New Key Support for Microsoft Windows Operating Systems and Applications*.
- The keyboard must be compatible at the Windows virtual key code level.
- The keyboard must pass the requirements in the Windows Logo Key Testing Software before being submitted to Microsoft WHQL for testing.
- The Windows Logo key must function as a modifier key (CTRL, SHIFT, OR ALT).
- The Windows Flag trademark must be clearly distinguished on the keytop per the guidelines provided in *New Key Support for Microsoft Windows Operating Systems and Applications*.

The following are recommendations if a keyboard design includes any Windows Logo keys:

- Both Left and Right Windows Logo keys are not required in order to have full functionality under the Windows operating system.
- The Application key can be a dual-function key and can be used to replace the FN key. In this case, a single press-and-release action sends the scan code for the Application key, and holding this key down while pressing another key will modify it and perform the FN function.
- Given the crowded nature of compact keyboards on mobile PCs and keyboards that support double-byte characters (such as Japanese language keyboards), it might be difficult to add three new keys. For mobile PCs, minimal implementation of the new keys includes the addition of one Windows Logo key and one Application key.

## PC 97 Game Pad Requirements

This section presents the minimum requirements for game control devices such as game pads for PC 97.

USB is a required port and is the recommended PC 97 solution for game input devices such as game pads, phasing out the standard DB15 game port. A proprietary “digital” game port on a PC 97 system is not recommended, because some digital joystick devices work only in analog mode with proprietary digital ports.

### **23. General device requirements**

#### *Required*

These include the standard requirements for a Plug and Play device identifier, automated software-only settings for device configuration, standard device drivers and Windows-based installation, and icons for external connectors. For more information, see the “Basic PC 97” chapter of this guide.

### **24. USB Human Input Device Class Specification support**

#### *Required*

PC 97 game control devices and drivers must support the USB Human Input Device Class Specification v. 1.0 or higher.

## Legacy Game Control Port Requirements

This section defines the minimum requirements for a legacy game control port that might be included on the system board, in an add-on card such as an audio card, or as a standalone add-on device.

For PC 97, the recommended solution for game control input devices is to provide devices that use a USB connection rather than a proprietary or traditional game port. Game controls that use traditional game ports are not acceptable solutions for PC 97, because these legacy ports impose performance limitations on high-speed processors and do not completely support Plug and Play.

However, a legacy game port can be included on a multifunction card or in a PC 97 system if the system designer wants to allow users to connect their existing legacy game control devices. In order to be eligible for the “Designed for Microsoft Windows” logo, a device or PC system that includes a legacy game port must meet the requirements defined in this section.

### 25. General device requirements

*Required*

Although it is recognized that traditional game devices do not support Plug and Play, for PC 97 it is required that the device use software-only settings for device configuration, standard device drivers, and Windows-based installation. For more information about general device requirements, see the “Basic PC 97” chapter of this guide.

### 26. Legacy game port complies with bus and device-class specifications

*Required*

If a game port uses a bus such as PCI or ISA, the port must fully comply with the specifications for the bus where it is installed. If the game port is implemented as a PCI device, it must meet all the PCI 2.1 requirements for PC 97 as defined in the “PCI” chapter in Part 3 of this guide.

### 27. Resource arbitration for non-PCI game port devices

*Required*

For devices that use expansion buses such as ISA, the following minimum resource configuration requirements must be met:

- Use standard I/O location in the range 200 through 20FH, and correctly report a unique device node for Plug and Play enumeration.
- Provide four unique IRQ signals, if used—that is, if IRQs are supported, then they must be mappable to seven unique IRQ signals.

Notice that, as for all ISA devices, ISA IRQ sharing is required if the minimum resource requirement cannot be met.

**28. Device driver meets Windows 95 driver requirements***Required*

The device driver for Windows 95 must not replace Microsoft VxDs and joystick drivers, and it must be compliant with the Windows 95 driver requirements for installable device drivers, as defined in the Windows 95 DDK.

**29. Device driver for non-USB device supports DirectInput 3.0 APIs***Required*

The upper edge of the device driver must support DirectInput 3.0 or higher, as defined in the Windows 95 DDK.

**30. MIDI-compatible legacy port uses Sound Blaster pin-out***Required*

Some legacy multifunction cards use a MIDI port as a game control port. If a MIDI port is implemented in the PC system, it must use the pin-12 and pin-15 standard and Transistor-Transistor Logic (TTL) level used in Sound Blaster-compatible designs.

**31. Legacy game port works with Windows-supplied drivers***Required*

The port must work unmodified with driver files provided with the Windows operating system.

**32. If present, proprietary port meets PC 97 requirements***Required*

If a game port is implemented as a proprietary port instead of the recommended PC 97 implementation for USB, the port must meet the following requirements:

- The device driver must support the DirectInput 3.0 APIs.
- The device driver for Windows 95 must not replace Microsoft VxDs and joystick drivers, and it must be compliant with the Windows 95 driver requirements for installable device drivers, as defined in the Windows 95 DDK.
- The minidriver must be dynamically loadable and unloadable, and therefore be immediately functional without rebooting the system.

The user must be able to go directly from installation, select the new game device from the Control Panel (or have it auto-selected by way of an installation disk), and then be available for use with any Windows 95-based game. If the device is provided with applications that require a reboot, the installation program must notify the user at the end of installation that these applications require a reboot. The

installation program must then give the user the option of rebooting or returning to Windows 95.

## References for Input Components

This section lists some of the publications, services, and tools available to help build hardware that works with Windows operating systems.

Device Class Power Management Reference Specification

<http://www.microsoft.com/hwdev/onnow.htm>

Plug and Play specifications

<http://www.microsoft.com/hwdev/pnpspecs.htm>

Windows 95 DDK, Windows NT DDK, DirectX DDK

MSDN Professional Membership

*IBM Personal System/2 Common Interfaces*, Part No. S84F-9809

*IBM Personal System/2 Mouse Technical Reference*, Part No. S68X-2229

International Business Machines Corporation

IBM Customer Publications Support: (800) 879-275

Or contact an IBM sales representative

Infrared Data Association Serial Infrared (SIR) Physical Layer Specification

Available only to IrDA members:

Infrared Data Association (IrDA)

P. O. Box 3883

Walnut Creek, CA 94598 USA

Phone: (510) 943-6546

Fax: (510) 943-5600

E-mail: [irda@netcom.com](mailto:irda@netcom.com)

*New Key Support for Microsoft Windows Operating Systems and Applications*

Newkeys.zip (self-extracting zip file)

[ftp://ftp.microsoft.com/PerOpSys/Win\\_News](ftp://ftp.microsoft.com/PerOpSys/Win_News)

Windows Logo Key testing software, documentation, and license agreement

<http://www.microsoft.com/hwtest/>

The license agreement can be obtained using the fax-back service:

(206) 635-2222—request document 859.

### **Version 1.1 References Update:**

Device class power management reference specifications

<http://www.microsoft.com/hwdev/onnow.htm>

*IBM Personal System/2 Common Interfaces*, Part No. S84F-9809

*IBM Personal System/2 Mouse Technical Reference*, Part No. S68X-2229

International Business Machines Corporation

IBM Customer Publications Support

Or contact an IBM sales representative



## IEEE specifications

ASK\*IEEE

Phone: (800) 949-4333

Fax: (212) 310-4091

E-mail: askieee@ieee.org

<http://www.ieee.org>

## Global Engineering Documents

Phone: (800) 854-7179 (US)

(613) 237-4250 (Canada)

(303) 792-2181 (Outside North America)

Fax: (303) 397-2740

<ftp://ftp.symbios.com/pub/standards/io/>

*Infrared Data Association Serial Infrared (SIR) Physical Layer Specification*

Available only to IrDA members:

Infrared Data Association

PO Box 3883

Walnut Creek, CA 94598 USA

Phone: (510) 943-6546

Fax: (510) 943-5600

E-mail: [irda@netcom.com](mailto:irda@netcom.com)

*New Key Support for Microsoft Windows Operating Systems and Applications*

Newkeys.zip (self-extracting zip file)

[ftp://ftp.microsoft.com/PerOpSys/Win\\_News](ftp://ftp.microsoft.com/PerOpSys/Win_News)

*Plug and Play specifications*

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

*USB specifications*

*USB HID Usages Table*

USB Implementers Forum

Phone: (503) 264-0590

Fax: (503) 693-7975

<http://www.usb.org>

*Universal Serial Bus PC Legacy Compatibility Specification, Version 0.9*

[http://www.teleport.com/~usb/data/usb\\_le9.pdf](http://www.teleport.com/~usb/data/usb_le9.pdf)

*Windows NT DDK, Windows DDK, and IR Communications for Windows DDK*

MSDN Professional membership

## Checklist for Input Devices

| <i>Basic PC 97</i>  | <i>Workstation PC 97</i> | <i>Entertainment PC 97</i> |
|---|--------------------------|----------------------------|
| <b>System Requirements for Input Components</b>   |                          |                            |
| 1. External connection for keyboard<br><i>Required</i>  | <i>Required</i>          | <i>Required</i>            |
| 2. External connection for pointing device<br><i>Required</i>   | <i>Required</i>          | <i>Required</i>            |
| 3. Wireless capabilities<br><i>Recommended</i>  | <i>Recommended</i>       | <i>Recommended</i>         |
| 4. USB game pad or joystick<br><i>Recommended</i>   | <i>Recommended</i>       | <i>Required</i>            |
| <b>PC 97 Design for Input Devices</b>   |                          |                            |
| <b>Plug and Play and Bus Design for Input Devices</b>   |                          |                            |
| 5. Plug and Play device identifier<br><i>Required</i>   |                          |                            |
| 6. Automatic resource assignment and dynamic disable capabilities<br><i>Required</i>                            |                          |                            |
| <b>Power Management for Input Devices</b>   |                          |                            |
| 7. Compliance with "Device Class Power Management Reference Specification" for input devices<br><i>Required</i> |                          |                            |
| 8. Support Wakeup Events defined in "Device Class Power Management Reference Specification"<br><i>Optional</i>  |                          |                            |
| <b>Device Drivers and Installation for Input Devices</b>  |                          |                            |
| 9. Device driver and installation meet Windows and Windows NT standards<br><i>Required</i>                      |                          |                            |
| <b>Mouse Port and Peripherals</b>   |                          |                            |
| 10. General device requirements<br><i>Required</i>  |                          |                            |
| 11. PS/2 port specifications, if PS/2-style port is used<br><i>Required</i>                                     |                          |                            |
| 12. USB Specification and device class specifications, if USB is used<br><i>Required</i>                        |                          |                            |
| 13. IR wireless specifications, if IR device is used<br><i>Required</i>   |                          |                            |
| 14. RF wireless specifications, if RF wireless device is used<br><i>Recommended</i>                             |                          |                            |
| 15. Remote control provides minimum support, if present<br><i>Recommended</i>                                   |                          |                            |
| <b>Keyboard Ports and Peripherals</b>   |                          |                            |
| 16. General device requirements<br><i>Required</i>  |                          |                            |
| 17. PS/2 specifications by IBM and 8042 chip (or equivalent), if PS/2 used<br><i>Required</i>                   |                          |                            |

18. *USB Specification and USB device class specification, if USB is used*  
Required

19. *Wireless specifications, if wireless device is used*  
Required

20. *PS/2- style keyboard returns expected scan codes*  
Required

21. *No interference between keyboards for multiple devices*  
Required

22. *Windows and Application Logo keys*  
Recommended

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#### **PC 97 Game Pad Requirements**

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23. *General device requirements*  
Required

24. *USB Human Input Device Class Specification support*  
Required

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#### **Legacy Game Control Port Requirements**

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25. *General device requirements*  
Required

26. *Legacy game port complies with bus and device-class specifications*  
Required

27. *Resource arbitration for non-PCI game port devices*  
Required

28. *Device driver meets Windows 95 driver requirements*  
Required

29. *Device driver for non-USB device supports DirectInput 3.0 APIs*  
Required

30. *MIDI-compatible legacy port uses Sound Blaster pin-out*  
Required

31. *Legacy game port works with Windows-supplied drivers*  
Required

32. *If present, proprietary port meets PC 97 requirements*  
Required

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