
Chapter 7 Input Devices

IMPORTANT: The requirements in this guide provide instructions for designing PC systems that will result in an optimal user experience with typical Windows-based applications running under either the Microsoft Windows Millennium Edition or Windows 2000 Professional or later operating systems. These design requirements are not the basic system requirements for running any version of Windows operating systems.

This chapter presents requirements for input devices, including legacy ports, wireless capabilities, and input device connectors. It also provides requirements for legacy port replacements such as USB-to-parallel adapters. PC 2001 discourages the use of legacy ports; for additional information about legacy-free and legacy-reduced system requirements, see “Legacy Removal Requirements” in Chapter 3, “PC System.”

Legacy Plug and Play requirements are available at *Legacy Plug and Play Guidelines*, listed in “Input Devices References.”

USB support is required for PC 2001 systems, and easy connectivity is important in situations where devices might be interchanged on a regular basis. USB replaces legacy serial and parallel ports as the dominant external connector.

Unless this chapter defines a specific requirement or exception, all requirements for input devices apply as presented in Chapter 3, “PC System,” and Chapter 6, “Buses and Interfaces.”

General Input Device Requirements

This section summarizes requirements for legacy ports.

INPT-0133. All non-integrated USB human input devices meet USB HID specifications

All USB keyboards, pointing devices, game pads, and their connections included with a PC 2001 system must comply with the *Universal Serial Bus (USB) Device Class Definition for Human Interface Devices (HID), Version 1.1*, and *USB HID Usage Tables, Version 1.1*. This is required whether the devices are implemented as wired or wireless.

For HID implementation requirements under the Windows family of operating systems, see the Windows 2000 DDK.

INPT–0134. All PC 2001 input devices support Microsoft DirectInput and work simultaneously

All input devices implemented in a PC 2001 system must have drivers that support Microsoft DirectInput® if they do not use drivers that are built into the operating system. Also, all input devices must be able to correctly provide simultaneous input. Thus, no input device is disabled automatically when another input device is in use.

Note: The built-in drivers provided with Windows Me and Windows 2000 meet this requirement.

For information about implementing drivers that support simultaneous use of devices, see the Microsoft DirectInput® DDK provided with the Windows 98 DDK, listed in “Input Devices References.”

INPT–0135. Devices use USB or external bus connections rather than legacy serial or parallel ports

Although legacy ports can be provided on a PC 2001 legacy-reduced system, no devices that use these ports can be provided with a system. Legacy ports include the serial and parallel ports on the PC. A legacy serial port cannot serve as a mouse, modem, PIN data-entry keyboard, or smart card reader connection. The FDC bus cannot be used for removable media other than standard floppy media. It is allowable to externally expose the FDC bus through the parallel port connector. For a complete list of legacy-related requirements, see “Legacy Removal Requirements” in Chapter 3.

INPT–0136. Serial port adapter meets device class specifications for its bus

As required for all PC 2001 devices, a serial port implementation must meet the specific device class requirements for that bus. An example of a serial port adapter is a USB-to-serial adapter. Such an implementation must comply with all related USB specifications, including:

- *Universal Serial Bus Specification, Revision 1.1* (also known as the USB core specification).
- *Universal Serial Bus Class Definitions for Communication Devices, Version 1.0*.

The “Standard Serial Interface Circuit Emulation” appendix in the *Universal Serial Bus Class Definitions for Communication Devices* specifically addresses serial-port compatibility.

INPT–0137. If implemented, legacy serial port is implemented as 16550A UART or equivalent and supports 115.2K baud

Legacy ports are discouraged for PC 2001 systems, but if implemented, a legacy serial port must comply with legacy the implementation requirements in *Legacy Plug and Play Guidelines*, listed in “Input Devices References.”

INPT–0138. Parallel port meets device class specifications for its bus

As required for all PC 2001 devices, a parallel port implementation that uses a nonlegacy bus must meet the specific device class requirements for that bus.

An example of a parallel port adapter is a USB-to-parallel adapter. Such an implementation must comply with all related USB specifications, including:

- *Universal Serial Bus Specification, Revision 1.1* (also known as the USB core specification).
- *Universal Serial Bus Device Class Definition for Printing Devices, Version 1.0*.

INPT–0139. If a legacy parallel port is implemented, flexible resource configuration is supported for each parallel port

Legacy ports are discouraged for PC 2001 systems, but if implemented, a legacy parallel port must comply with legacy implementation requirements in *Legacy Plug and Play Guidelines*, listed in “Input Devices References.”

INPT–0140. Daisy-chained legacy parallel port device is Plug and Play capable

Daisy-chained legacy parallel port devices must be Plug and Play capable. The daisy-chained parallel port device must be capable of answering Plug and Play requests from the host.

All pass-through devices must comply with IEEE 1284.3 because of end-of-chain issues with IEEE 1284 and IEEE 1284.3. Support for parallel ports and daisy-chained devices is provided in the “High-Level Operation of Parclass and Parport” section of the Windows 2000 DDK, listed in “Input Devices References.”

INPT–0141. Pointing-device connection meets requirements for its bus class

For implementation requirements for legacy devices such as PS/2-compatible mouse devices, see *Legacy Plug and Play Guidelines*, listed in “Input Devices References.”

If a USB connection is used, it must meet the following USB port requirements:

- *Universal Serial Bus Specification, Revision 1.1*

- *Universal Serial Bus (USB) Device Class Definition for Human Interface Devices (HID), Version 1.1*
- Minidriver support based on HID class support in the operating system

For information about implementing minidriver support based on HID class support in the operating system, see *HID Support Routines for MiniDrivers*, in the Windows 2000 DDK, which defines the implementation for both Windows Me and Windows 2000, listed in “Input Devices References.”

INPT–0142. Keyboard connection meets requirements for its bus class

Mobile PC Note

For implementation requirements for legacy devices such as PS/2-compatible keyboard devices, see *Legacy Plug and Play Guidelines*.

If a USB connection is used, it must meet the following requirements:

- *Universal Serial Bus Specification, Revision 1.1*
- *Universal Serial Bus (USB) Device Class Definition for Human Interface Devices (HID), Version 1.1*
- Minidriver support based on WDM HID class support in the operating system

USB keyboards must support the USB boot device specification. The system BIOS must provide boot support as specified in requirement BIOS–0005.2, “BIOS provides boot support for USB keyboards and hubs,” in Chapter 3.

INPT–0143. No interference occurs between multiple keyboards

Mobile PC Note

If the system includes more than one keyboard, there must be no conflicts. For example, a docked mobile PC can have more than one keyboard attached to the system. The keyboard ports on a mobile PC and a docking station must be able to resolve conflicts between the two ports when the mobile PC 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 docked mobile PC, see Chapter 5, “Mobile.”

INPT–0144. If implemented, Windows and Application logo keys meet Microsoft requirements

The following are requirements for a keyboard design that includes any Windows logo keys:

- The keyboard must be developed according to technical requirements in New Key Support for Windows Web page, listed in “Input Devices References.”
- The keyboard must be compatible at the Windows virtual key-code level.
- The Windows logo key must function as a modifier (CTRL, SHIFT, or ALT).

- The Windows Flag trademark must be clearly distinguished on the key top according to the requirements in Key Support and Keyboard Scan Codes for Windows Web page, listed in “Input Devices References.”

INPT-0145. If implemented, Internet browser and multimedia keys use Microsoft APIs

If a keyboard or peripheral implements multimedia or Internet browser keys, they must use the registry keys associated with the WM_APPCOMMAND API to access those functions as described in the Windows 2000 DDK. Registry keys can be programmed using INF files to install special entries as defaults or through a customized interface provided to the user.

Wireless Component Requirements

This section defines requirements for wireless components when they are included in a PC 2001 system, provided either as IR or radio frequency (RF) devices.

For information about requirements for wireless networking devices, see “IrDA Requirements for Network Communications” in Chapter 14, “Network Communications.”

INPT-0146. IR device uses NDIS 5.0 miniport driver

An NDIS 5.0 miniport driver is required for all IrDA data devices and wireless network devices. For documentation and sample source code for building a miniport driver, see Chapter 13, “IrDA Miniport NIC Drivers,” in the Windows 2000 DDK, listed in “Input Devices References.”

INPT-0147. IR device meets IrDA specifications

An IR device must be designed to comply with approved IrDA specifications. If the system is intended to run data transfer applications with other IrDA data devices, it must comply with the *IrDA Serial Infrared Data Link Standard Specifications*.

If an IrDA Control application is used in a PC 2001 system, it must comply with the *IrDA Control Specification*.

INPT-0148. System supports standard input speeds of 4 Mbps

Device support is required for FIR input speeds of 4 Mbps for all IrDA Data devices.

INPT–0149. System provides a separate, physically isolated transceiver for each IR protocol supported

This requirement provides for correct implementation for a system that includes IR support for any combination of devices that use the IrDA Data protocol, the IrDA Control protocol, or the universal consumer–IR approach to legacy remote control, each of which use different device signals. The system must also expose each separate transceiver to the operating system.

If multiple IR protocols are supported, controllers must provide separate data connections into the PC using USB. For more information, see Appendix F, “IrDA Control on a USB System,” of the *IrDA Control Specification*, listed in “Input Devices References.”

INPT–0150. If a legacy IR port is implemented, flexible resource configuration is supported for each port

A legacy IrDA port must be assigned hardware IDs PNP0510 or PNP0511 (generic IrDA–compatible device) by the BIOS and be enumerated in the ACPI Differentiated Description Table. It must also have a Plug and Play compatible register space as specified in the *Plug and Play ISA Specification, Version 1.0a*, listed in “Input Devices References.”

IMAG–0151. Digital still image device with an IR interface uses the Windows Sockets interface

Windows 2000 does not provide support for IrCOMM-based devices. For imaging devices that include an IR interface, the device manufacturer provides the driver that uses the Windows Sockets interface.

Cameras that comply with *Infrared Transfer Picture Specification (IrTran-P)*, Version 1.0 or later need not provide a Windows Sockets interface-based driver.

Mobile PC Wireless Design

This section defines requirements for wireless devices used with a mobile PC.

MOBL–0152. If implemented in a mobile PC, IR devices support power management

IR capabilities are not required for mobile PCs. IrDA devices must support D0 and D3 states, controlled by methods defined in Section 3.4 of the ACPI 1.0b specification or by the relevant bus-specific methods.

Smart Card Requirements

Smart cards are not required, but if implemented, must comply with the requirements defined in this section. The general device requirements are defined in “General Input Device Requirements.”

SMRT-0153. Smart card reader complies with ISO/IEC 7816

A smart card reader must comply with the following specifications:

- *ISO/IEC 7816-1:1998 Identification cards—Integrated circuit(s) cards with contacts—Part 1: Physical characteristics*
- *ISO/IEC 7816-2:1999 Identification cards—Integrated circuit(s) cards with contacts—Part 2: Dimensions and location of the contacts*
- *ISO/IEC 7816-3:1997 Information technology—Identification cards—Integrated circuit(s) cards with contacts—Part 3: Electronic signals and transmission protocols*
- *ISO/IEC 7811-1:1995 Identification Cards—Recording technique—Part 1: Embossing*
- *ISO/IEC 7811-3:1995 Identification Cards—Recording technique—Part 3: Location of embossed characters on ID-1 cards*
- *ISO/IEC 7813:1995 Identification Cards—Financial transaction cards*
- *ISO/IEC 10373:1993 Identification cards—Test methods*
- *Interoperability Specification for ICCs and Personal Computer Systems, Version 1.0 (PC/SC Specifications)*

SMRT-0154. Smart card reader supports ISO/IEC 7816-3 T=0 and T=1 protocols

A smart card reader must support the asynchronous protocols T=0 and T=1 as described in ISO/IEC 7816-3, either in hardware or in the driver. Both protocols must be supported fully. The smart card reader and the driver must support cards that can handle both protocols.

The following protocol rules apply for the T=1 protocol:

- A transmission is defined as sending a command to a smart card using one or more T=1 blocks and receiving the corresponding answer using one or more T=1 blocks as defined in ISO/IEC 7816-3.
- For cards that support Information Field Size integrated circuit Card (IFSC) requests, the first transmission—after a reset of the smart card—must start with an Information Field Size Device (IFSD) request, as defined in ISO/IEC 7816-3, Amendment 1, Section 9.5.1.2.

For cards that do not support an IFSD request (that is, the card replies with an R-Block indicating “Other error”), the transmission must continue with an I-Block.

After a successful RESYNCH request, the transmission must restart from the beginning with the first block with which the transmission originally started.

Support for protocols other than T=0 and T=1 is not required.

SMRT-0156. Smart card reader supports 258-byte packets in T=0 and 259-byte packets in T=1

A smart card reader must support the exchange of the following in a single transmission:

- 258 byte packets in T=0—that is, 256 data bytes plus the two status words SW1 and SW2.
- 259 byte packets in T=1—that is, 254 information bytes plus node address, packet control bytes, length, and two Error Detection Code bytes.

SMRT-0155. Smart card reader supports inverse-convention smart cards

A smart card reader must support both inverse and direct convention smart cards either in hardware or in the driver for the operating system.

SMRT-0157. Smart card reader supports a smart card insertion/removal monitor

A smart card reader must be able to detect and report smart card insertions and removals without any user intervention other than removing or inserting the smart card itself. The reader must use an interrupt mechanism to report the smart card insertion or removal to the system. A driver polling method to detect smart card insertion and removals is not an acceptable method for meeting this requirement.

SMRT-0158. Smart card reader supports negotiable and specific modes

To support multiprotocol smart cards and smart cards using higher data rates and higher clock frequencies, the reader must support negotiable and specific modes according to ISO/IEC 7816-3 (1997-12-15), Sections 6 and 7, listed in “Input Devices References.”

SMRT-0159. Smart card reader supports 3.5795 MHz minimum clock frequency

A smart card reader must support a minimum clock frequency of 3.5795 MHz.

SMRT–0161. Smart card reader supports the Power Down command

A smart card reader must support the Power Down command to turn off power of a smart card, as defined in ISO/IEC 7816-3 (1997-12-15), Section 5.4, listed in “Input Devices References.”

SMRT–0162. If input device implements a PIN data-entry keyboard, it must comply with ISO 13491-1

An input device that uses a keyboard for personal identification number (PIN) entry must comply with *ISO 13491-1:1998 Banking—Secure cryptographic devices (retail)—Part 1: Concepts, requirements and evaluation methods*, listed in “Input Devices References.”

Input Devices 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 (ACPI 1.0b)

<http://www.teleport.com/~acpi/>

“HID Support Routines for MiniDrivers”

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

Interoperability Specification for ICCs and Personal Computer Systems Specification, Revision 1.0 (PC/SC Specification)

<http://www.pcscworkgroup.com/>

IrDA Control Specification (formerly IrBus or the IrDA CIR (Control IR) Standard Final Revision 1.0)

IrDA Serial Infrared Data Link Standard Specifications

<http://www.irda.org/standards/specifications.asp>

Infrared Transfer Picture Specification (IrTran-P), Version 1.0

<http://www.irda.org/standards/specifications.asp>

ISO/IEC 7811-1:1995 Identification Cards—Recording technique—Part 1: Embossing

<http://www.iso.ch/cate/d14717.html>

ISO/IEC 7811-3:1995 Identification Cards—Recording technique—Part 3: Location of embossed characters on ID-1 cards

<http://www.iso.ch/cate/d14721.html>

ISO/IEC 7813:1995 Identification Cards—Financial transaction cards

<http://www.iso.ch/cate/d14731.html>

ISO/IEC 7816-1:1998 Identification cards—Integrated circuit(s) cards with contacts—Part 1: Physical characteristics

<http://www.iso.ch/cate/d29257.html>

ISO/IEC 7816-2:1999 Identification cards—Integrated circuit(s) cards with contacts—Part 2: Dimensions and location of the contacts

<http://www.iso.ch/cate/d26536.html>

ISO/IEC 7816-3:1997 Information technology—Identification cards—Integrated circuit(s) cards with contacts—Part 3: Electronic signals and transmission protocols

<http://www.iso.ch/cate/d14735.html>

ISO/IEC 10373:1993 Identification cards—Test methods

<http://www.iso.ch/cate/d18434.html>

ISO 13491-1:1998 Banking—Secure cryptographic devices (retail)—Part 1: Concepts, requirements and evaluation methods

<http://www.iso.ch/cate/d19521.html>

Catalog of available standards at:

<http://www.iso.ch/cate/cat.html>

Key Support and Keyboard Scan Codes for Windows

<http://www.microsoft.com/hwdev/desinit/scancode.htm>

Legacy Plug and Play Guidelines

<http://www.pcdesguide.org/LegacyPnP/>

Microsoft DirectInput DDK provided with the Windows 98 DDK

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

New Key Support for Windows

<http://www.pcdesguide.org/documents/keycode.htm>

Plug and Play ISA Specification, Version 1.0a

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

Universal Serial Bus Class Definitions for Communication Devices, Version 1.0

Universal Serial Bus Device Class Definition for Printing Devices, Version 1.09

http://www.usb.org/developers/devclass_docs.html

Universal Serial Bus Specification, Revision 1.1

<http://www.usb.org/developers/docs.html>

Universal Serial Bus (USB) Device Class Definition for Human Interface Devices (HID), Version 1.1

<http://www.usb.org/developers/hidpage.html>

USB HID Usage Tables, Version 1.1

Other USB specifications

<http://www.usb.org/developers/hidpage.html>

Windows 98 DDK and Windows 2000 DDK
<http://www.microsoft.com/ddk/>

Checklist for Input Devices

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- INPT-0138. Parallel port meets device class specifications for its bus
- INPT-0139. If a legacy parallel port is implemented, flexible resource configuration is supported for each parallel port
- INPT-0140. Daisy-chained legacy parallel port device is Plug and Play capable
- INPT-0141. Pointing-device connection meets requirements for its bus class
- INPT-0142. Keyboard connection meets requirements for its bus class
- INPT-0143. No interference occurs between multiple keyboards
- INPT-0144. If implemented, Windows and Application logo keys meet Microsoft requirements
- INPT-0145. If implemented, Internet browser and multimedia keys use Microsoft APIs
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