

USB

This chapter presents the PC 98 requirements and recommendations for Universal Serial Bus (USB).

USB provides an expandable, hot-attachable Plug and Play serial interface for adding external peripheral devices ranging from interactive HIDs such as joysticks and pointing devices to isochronous devices such as telephony, audio, and imaging devices. USB allows cascading hubs that can be integrated into desktop devices such as monitors and keyboards.

For PC 98, USB provides a standard, low-cost socket that accommodates volume emerging and legacy I/O devices. This feature is required on all PCs, and migration of I/O devices from legacy ports to USB is recommended. In particular, the joystick, pointing device, and keyboard devices that ship with PC systems should be USB.

For Windows and Windows NT support, devices can use the generic class drivers provided with the operating system, or manufacturers can create drivers or WDM minidrivers (depending on the device class) to exploit any additional unique hardware features. For details, see the “I/O Ports and Devices” chapter in Part 4 of this guide.

Manufacturers should ensure that their USB devices are tested at the compatibility workshops provided by the USB Implementers Forum.

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USB Basic Requirements

This section summarizes the basic USB design requirements.

1. USB included on PC 98 system

Required

This is required for all PC 98 system types. As noted in the “Basic PC 98” chapter in Part 2 of this guide, BIOS boot support is required when a USB keyboard is the sole keyboard support provided with the PC system.

2. All USB hardware complies with USB 1.0 specification

Required

All USB hardware must comply with *USB Specification, Version 1.0* or higher, published by Compaq, Digital Equipment, IBM, Intel, Microsoft, NEC, and Nortel. This ensures that USB hardware has complete Plug and Play capabilities and is implemented in a standard way.

For example, on any system with USB capabilities, a user must be able to dynamically attach any USB peripheral to any USB connector. The operating system should automatically recognize it, load and initialize the appropriate drivers, and make the device available for use.

3. Connections use USB icon

Required

The icon can be molded, printed, or affixed as a permanent sticker. Because the location and number of USB ports can vary, appropriate icons on both ports and cables are important ease-of-use factors. Therefore, USB icons are required for external cables, connecting cables, and connection ports.

Icons can be based on vendor designs, or vendors can use the recommended USB icon defined in Chapter 6 of the USB 1.0 specification and illustrated here:

The USB icon should be molded into the connector and also placed on the product for ease of identifying the USB port. It is recommended that the icon on the product and the one on the plug be adjacent to each other when the plug and receptacle are mated. This icon can be used for both series A and B connector schemes. On the plug, there should be a 0.635-mm rectangular recessed area around the icon such that there is a perceptible feel of the icon.



4. Devices and drivers support maximum flexibility of hardware interface options

Recommended

Device and driver designs must provide maximum flexibility of interface options in order to allow user-preference coordination by the operating system or other resource managers. This will allow graceful use of multiple simultaneous devices and applications in a dynamic environment.

Specifically, devices with configurations or interfaces that contain isochronous endpoints should not consume any USB bandwidth when the device is first configured. This can be done by having the zero AltSetting for any interface consume no bandwidth. When the device is put into operation, the device driver should switch the device to an AltSetting that allocates and consumes the required amount of bandwidth. When the device is no longer being used, the driver should return the device to an AltSetting where bandwidth is not consumed.

USB Host Controller Requirements

This section summarizes USB class specifications and standards for host controllers.

5. USB host controller meets either OpenHCI or UHCI specification

Required

The host controller must be compliant with the specifications for either OpenHCI (Open Host Controller Interface; published by Compaq, Microsoft, and National Semiconductor) or UHCI (Universal HCI; published by Intel). Hardware manufacturers who design to one of these specifications are not required to provide an additional device driver for their host controller under the Windows or Windows NT operating systems.

Multiple OpenHCI and UHCI USB controllers are supported concurrently by the operating system.

6. USB host controller can wake the system

Required

The USB host controller must support wake-up capabilities from at least one of the S1, S2 or S3 system sleep states.

USB Power Management

This section summarizes the specific USB power management requirements.

7. System and devices comply with USB power management requirements

Required

PC 98 systems and devices must implement the power descriptor in the USB 1.0 specification. Complete implementation guidelines for OnNow and USB are defined in the “OnNow requirements in the USB Core Specification” section of the article titled “OnNow Power Management and USB” on the web site at <http://www.microsoft.com/hwdev/pcfutur/>.

Design Features for USB Peripherals

This section summarizes requirements related to bus-class specifications and standards for peripherals that use USB.

8. USB devices meet requirements in related USB device class specification

Required

Every device must comply with the *USB Common Class Specification, Version 1.0* or higher. For any add-on device or peripheral that fits into one of the USB device class definitions, the device must comply with the related USB device class specification. USB class drivers in the operating system are implemented to support compliant devices in each particular class. Class driver extensions and WDM allow IHVs to innovate and differentiate their products while still meeting class compliance in their base operational modes.

USB References

The following represents some of the references, services, and tools available to help build hardware that is optimized to work with Windows operating systems.

Intel information about USB, including the UHCI design guide for USB

<http://developer.intel.com/design/litcentr/litweb/usb.htm>

<http://developer.intel.com/design/usb/>

OnNow Power Management and USB and other OnNow-related articles

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

Open Host Controller Interface, Version 1.0

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

USB Class Definition for Communications Devices, Version 0.9

USB Common Class Specification, Version 0.9

USB Device Class Definition for Audio Devices, Version 0.9

USB Device Class Definition for Human Interface Devices, Version 1.0

USB Device Class Definition for Mass Storage Devices, Version 0.9

USB Device Class Definition for Printing Devices, Version 1.0

USB HID Usages Tables, Version 0.9

USB Monitor Control Class Specification, Version 1.0

USB Power Devices Usages Table, Version 0.9

USB Specification, Version 1.0

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Windows NT DDK

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Checklist for USB

If a recommended feature is implemented, it must meet the PC 98 requirements for that feature as defined in this document.

1. USB included on PC 98 system

Required

2. All USB hardware complies with USB 1.0 specifications

Required

3. Connections use USB icon

Required

4. Devices and drivers support maximum flexibility of hardware interface options

Recommended

5. USB host controller meets either OpenHCI or UHCI specification

Required

6. USB host controller can wake the system

Required

7. System and devices comply with USB power management requirements

Required

8. USB devices meet requirements in related USB device class specification

Required