CHAPTER 5

Entertainment PC 97

This chapter presents the requirements and recommendations for entertainment PCs under the Microsoft Windows family of operating systems.

Version 1.1
Includes changes to item 24, References for Entertainment PC 97, and Checklist for Entertainment PC 97, as previously published in the PC 97 FAQ on http://www.micorsoft.com/hwdev/pc97.htm

Contents

Overview for Entertainment PC 97

This section presents the key design features for Entertainment PC 97 under Microsoft Windows.

PC 97 Hardware Design Guide provides the first definition of this PC category for the "Designed for Microsoft Windows" logo program. Notice that the Entertainment PC 97 system is not an expanded definition for the category of so-called "multimedia PCs." To identify the requirements for such a multimedia PC, see the "Basic PC 97" chapter, and also study the recommendations for audio and graphics subsystem components in Part 4 of this guide.

Entertainment PC 97 is an enhanced set of design guidelines for Windows-based PCs, based on a superset of the Basic PC 97 guidelines. For example, the graphics and audio subsystems for Entertainment PC 97 are designed to optimize the capabilities of software applications that use Microsoft ActiveX and DirectX interfaces.

The overall goal for the Entertainment PC is to expand the PC market by providing a PC system tailored for high-quality entertainment and communications capabilities with ease-of-use features that will help overcome barriers to adoption for new users. An Entertainment PC 97 system is optimized for the following uses:

- **Games** – the best titles, with the most complex, realistic graphics and audio.
- **Education** – the most engaging titles, with full-screen video, interactive animation, and so on.
- **Active Internet** – enhanced web communications capabilities, with personalized and animated web sites, chat rooms, and so on.
- **Personal communications** – multimedia e-mail, Internet audio phone, video phone, and so on.
- **Interactive, high-resolution TV and movie viewing** – higher video quality, real-time links to content producers, and so on.
- **Connection with traditional consumer electronics devices** – home theater surround audio for games and DVD movies (for example, Dolby AC-3); fast and easy capture, editing, and playback of personal video.

These are the key design issues for Entertainment PC 97:

- Combining high-performance 2-D and 3-D graphics subsystem designed for the best games with better-than-television quality, full-screen, MPEG-2 motion video to deliver DVD movies, cable and digital satellite television, and so on.
- Enabling connection to large-screen displays, including standard televisions, for much more a realistic graphics experience than smaller desktop monitors can provide.
- Implementing a high-fidelity audio subsystem on par with consumer stereo systems, able to deliver rich content such as games with positional 3-D audio, professionally mastered music CDs, and so on.
- Enabling PC connections via USB and IEEE 1394 to consumer electronic devices such as camcorders, VCRs, and home theater stereo systems.
- Providing home appliance usability for ease of use.
- Extending human input device support with remote control, game input controls, and other devices that use USB, IEEE 1394, and other external connections.

Microsoft expects OEMs will build PCs that conform to the Entertainment PC 97 guidelines in the traditional desktop multimedia PC form factor. So-called “living room” PCs that attach to televisions or large-screen VGA monitors are an additional opportunity for market expansion by OEMs. Microsoft supports and encourages investment in the living-room form factor as part of its SIPC initiative, and this chapter provides additional design notes and recommendations for living-room PC design. However, requirements such as the “sealed case,” graphics capabilities related to TV output, advanced audio capabilities, and other items apply for Entertainment PCs based on any form factor, including mobile PCs.

Important The system requirements defined in *PC 97 Hardware Design Guide* provide guidelines for designing PC systems that best run Windows 95 and Windows NT. These design requirements are not the basic system requirements for running the Windows operating system. Also, hardware features are described as Required, Recommended, or Optional for the “Designed for Microsoft Windows” logo program:

- **Required:** These basic hardware features must be implemented to qualify for the “Designed for Microsoft Windows” logo.

- **Recommended:** These features add functionality supported by the Windows operating systems. For "Designed for Microsoft Windows" logo testing, if a recommended feature is implemented, it must meet the standards for that feature as defined in this guide. Some recommended features might become requirements under the logo program in the future.
- **Optional:** These features are neither required nor recommended, but if the feature is implemented in a PC 97 system, it must meet the specified requirements. These features will not become requirements under the logo program in the future.

System Requirements for Entertainment PC 97

This section summarizes the requirements for the basic components of Entertainment PC 97 systems.

1. Minimum CPU: Pentium-class 166 MHz or equivalent
Required

This minimum computational capability is required to support the demands of the complex graphics- and media-intensive software and video titles that will be used on an Entertainment PC 97 system.

2. L2 cache with 256K minimum, for Pentium-class processor
Required

This minimum Level 2 cache is required for performance on Entertainment PC 97 systems. This requirement does not apply for a Pentium Pro-class system with a built-in L2 cache.

3. Entertainment PC 97 meets Basic PC 97 general system requirements
Required

This includes the following specific requirements, as defined in the "Basic PC 97" chapter in this guide:

- Minimum system memory: 16 MB
- Advanced Configuration and Power Interface (ACPI) support
- Hardware support for OnNow initiative
- BIOS support for OnNow initiative (for x86-based systems only)
- BIOS support for boot devices (for x86-based systems only)
- BIOS boot support for USB keyboard (for x86-based systems with only USB keyboards)

Industrial Design Requirements for Entertainment PC 97

This section summarizes the physical design requirements for Entertainment PC 97 systems. These requirements are in addition to those related to the OnNow initiative for power-state indicators and easily accessible power switches.

4. All expansion slots in the system accessible for users to insert cards
Required

The expansion slots cannot be physically blocked by components or devices provided with the system. This does not exclude configurations that allow space for only half-height cards for some slots or passive back planes used for connectors, and so on. (This requirement applies only if the system does not implement a "sealed case" design as described later in this section.)

5. Audible noise meets PC 97 standards
Required

An Entertainment PC 97 system must be "silent" in the Sleeping state and must also be quiet during active operations, including hard-disk seek activities.
Recommended test procedures and measurements will be documented by Microsoft.

The need to limit audible noise comes from the OnNow design initiative. A PC that uses OnNow technologies will be active even when not under direct operation by the user. For example, entertainment PCs are likely to perform scheduled and background tasks such as receiving faxes and voice mail, checking e-mail, and downloading TV program guide information and Internet web pages using a digital satellite connection or modem. These operations must happen silently so as not to interfere with other activities in the home.

6. "Sealed case" design with external expansion for all components
Recommended

The entire PC case can be "sealed," with no user-serviceable parts inside. It is recognized that computers will continue to need service and that literally sealing the case would prohibit servicing the PC. The term "sealed case" refers to a PC system designed with the assumption that the *user* will never need to open the case. All expansion capabilities should be made available using options such as USB or IEEE 1394, with support for removable devices provided using PC Card or other design options to allow adding more storage or other devices.

Modular designs can be used to support RAM and CPU upgrades; however, such designs are not required as part of the "sealed case" recommendation.

This recommendation is intended to make the PC more usable and accessible for end users by ensuring that system components can be upgraded or added without

using a screwdriver or other special tools. For more information about the “sealed case” concept, see “PC 97 Design Issues” in Part 1 of this guide.

General Device Requirements for Entertainment PC 97

This section defines the general requirements for devices on an Entertainment PC 97 system. The requirements in this section apply for every device, whether it is included in the PC system or provided as an add-on device.

7. Entertainment PC 97 meets Basic PC 97 general device requirements
Required

This includes the following specific requirements, as defined in the "Basic PC 97" chapter in this guide:

- Each device and driver meets PC 97 device requirements
- Each bus complies with written specifications and PC 97 requirements
- Each bus and device complies with current Plug and Play specifications
- Unique Plug and Play device ID for each system device and add-on device
- Option ROMs meet Plug and Play requirements (for x86-based systems only)
- "PNP" vendor code used only to define a legacy device's CompatibleID
- All devices support correct 16-bit decoding for I/O port addresses
- Devices and buses support hot plugging if using USB, IEEE 1394, or PC Card
- The user is protected from incorrectly connecting devices
- Minimal user interaction needed to install and configure devices
- Device driver and installation meet Windows and Windows NT standards
- Multifunction add-on devices meet general device requirements for each device
- Standard system board devices use ISA-compatible addresses

Buses and Devices for Entertainment PC 97

This section defines specific requirements for buses and devices provided in an Entertainment PC 97 system, in addition to the basic requirement for supporting Advanced Configuration and Power Interface (ACPI), as defined earlier in this chapter.

System Buses for Entertainment PC 97

This section summarizes the general requirements for system buses. Additional requirements are defined in Part 3 of this guide for particular buses.

8. USB, with two easily accessible connectors
Required

Universal Serial Bus (USB) provides a bidirectional, isochronous, dynamically attachable serial interface for adding peripheral devices such as game controllers, communications devices, and input devices on a single bus.

To ensure that it is as easy as possible for end users to add and remove devices, expansion capabilities must be provided by including USB in the PC system. The Entertainment PC 97 system must include two USB ports. At least one USB connector must be in an easily accessible location (not on the rear panel) to support connection of auxiliary input devices such as game pads, joysticks, and trackballs. The recommended location for an easily accessible connector is to place the port on the front of the PC system. It is also recommended that at least one USB connector be placed on the rear panel.

The USB must meet the requirements defined in USB specifications, plus any additional requirements for PC 97 defined in the “USB” chapter in Part 3 of this guide.

9. IEEE 1394 with easily accessible connector
Required

Recommended: 2 connectors. At least one 1394 port is required on the Entertainment PC 97 system to connect 1394-based camcorders and other digital consumer electronics. To be easily accessible, the connection must not be on the rear panel. The recommended location is to place a port on the front of the PC system. If a second port is included, this connector can be placed on the rear for static connections to devices such as home stereos. For information about PC 97 requirements for this bus, see the “IEEE 1394” chapter in Part 3 of this guide.

10. Support for other high-speed expansion capabilities
Recommended

Support for additional expansion capabilities can be provided using PCI v. 2.1, CardBus, or other high-speed expansion bus. Any expansion bus implemented in the system must meet the requirements defined in the related chapter in Part 3 of this guide.

Note For Entertainment PC 97, IEEE 1394 is required to support most high-speed expansion capabilities. PCI and ISA are not recommended buses for providing expansion capabilities, because such buses do not allow end users to easily add and remove devices without screwdrivers.

11. If present, PCI bus meets PCI v. 2.1 and higher, plus PC 97 requirements
Required

If PCI is used, the PCI bus must meet the requirements defined in PCI v. 2.1 or higher, plus any additional requirements for PC 97 defined in the "PCI" chapter in Part 3 of this guide.

I/O Devices for Entertainment PC 97

This section defines the general requirements for I/O devices. Additional requirements are defined in the sections titled "Graphics Adapter and Monitor for Entertainment PC 97" and "Storage and Related Peripherals for Entertainment PC 97" later in this chapter.

12. Keyboard connection and keyboard
Required

Recommended: USB or wireless connection.

In addition to recommended implementations, a PS/2-style port can be included. For complete requirements for keyboard ports and peripherals, see the "Input Components" chapter in Part 4 of this guide.

Note For living-room PC design, a wireless connection is strongly recommended.

13. Pointing device connection and pointing device
Required
Recommended: USB or wireless connection.

In addition to the recommended implementations, a PS/2-style port can also be included, but is not the recommended solution for Entertainment PC 97. For complete requirements for mouse ports and peripherals, see the "Input Components" chapter in Part 4 of this guide.

Note For living-room PC design, this requirement can be satisfied by using a remote control pointing device, or by using a wireless keyboard that includes a connector to enable a standard mouse to be attached. The ability for users to attach a standard two-button mouse is strongly encouraged, although the device itself does not need to be included with the PC.

14. USB game pad or joystick
Required
This device must support the USB Human Input Device class specification and its driver must support Microsoft DirectInput. For more information about requirements for USB peripherals, see the "USB" chapter in Part 3 of this guide. For more information about the requirements for input devices, see the "Input Components" chapter in Part 4 of this guide.

Note For living-room PC design, a wireless connection is strongly recommended to allow greater freedom of movement and location for game players.

15. Remote control pointing device
Recommended
To enhance the appliance experience, especially on PCs designed for use in the living room, a wireless (infrared or radio-frequency) remote-control pointing device should be included with Entertainment PC systems. The device must provide at least the following functions and buttons:

- Mouse pointer control with primary and secondary buttons (for example, trackball or mini-thumbstick)
- PC Suspend and Resume (1 button; recommended label is "On/Off" or "Power")
- Volume control (up/down) and mute

Some optional controls that might be included are the following:

- TV channel and radio station control (up/down)
- Number keys equivalent to numeric keypad of the PC keyboard
- Windows Logo key

- Recall previous channel
- Function selection (TV, radio, CD)

16. All pointing devices work simultaneously
Required

All pointing devices implemented in the system must have drivers that support Microsoft DirectInput. All pointing devices must also be able to provide input correctly at the same time. This means that the pointing devices must not use competing protocols and that no pointing device is automatically disabled when another pointing device is in use. This also applies to game input devices, in order to enable multi-player gaming.

For more information, see the "Input Components" and "Serial, Parallel, and Wireless Support" chapters in Part 4 of this guide.

17. Legacy serial and parallel ports meet PC 97 requirements, if present
Required

Any standard parallel or serial ports included in the Entertainment PC 97 system must meet the requirements defined in the "Serial, Parallel, and Wireless Support" chapter in Part 4 of this guide.

18. Support for installing the operating system
Required

For Entertainment PC 97, this requirement is met using the required DVD device, as described later in this chapter.

19. Audio support meets PC 97 Advanced audio requirements
Required

The PC 97 Advanced audio requirements are defined in the "Audio Components" chapter in Part 4 of this guide. This includes requirements for audio hardware capabilities and quality, plus external connections.

Note Audio is a key differentiating feature of Entertainment PC 97 designs vs. Basic PC 97 designs. Audio fidelity and functions must be significantly better—that is, on par with consumer electronics stereos. Positional 3-D audio and connection to home theater systems using IEEE 1394 enable more realistic game and video experiences. One opportunity for achieving this is to implement the audio subsystem as an external digital-to-analog converter attached to a secondary IEEE 1394 port on the rear of the PC. This isolates the analog audio stream from the RF noise of internal PC components while enabling easy connection to either legacy analog or new Plug and Play-compatible digital stereo components.

20. Data/fax/voice modem capabilities, 28.8 Kbps minimum
Required

Recommended: ISDN or cable modem for high-speed communications. For information about requirements for ISDN and cable modems, see the "Network

Communications” chapter in Part 4 of this guide. For more information about modem requirements, see the “Modems” chapter in Part 4 of this guide.

For the Entertainment PC 97 system, the modem must have telephone answering machine features compatible with Unimodem/V. The modem must also have the following feature:

- TIA-695 (AT+V); Speakerphone

The following voice and adaptive connection technologies are recommended:

- Adaptive connection support, V.25, V.8, and V.8bis call control signaling, with V.25ter Annex A modem commands
- Simultaneous voice/data integration capabilities

For a USB modem, the device must meet the related USB device class specifications. For information, see the “USB” chapter in Part 3 of this guide.

A system with a POTS-based video conferencing solution must supply an H.324−compatible modem. ISDN-based video conferencing solutions should be H.320−compatible.

21. Digital broadcast satellite subsystem
Optional
If this capability is included in the Entertainment PC 97, the implementation must include a digital broadcast satellite network card, SMART card, and drivers for the Windows operating system, in compliance with the Microsoft Broadcast PC specification.

Graphics Components for Entertainment PC 97

This section summarizes the Entertainment PC 97 requirements for graphic components, including graphics adapter, monitor, video capture, TV output, and DVD playback support in hardware.

22. Display adapter meets PC 97 minimum requirements
Required
As defined in the “Basic PC 97” chapter in this guide, the graphics subsystem must include the following support:

- Minimum resolution: 1024x768x16 bpp

  Recommended: 1280x1024x24 bpp

  For Entertainment PC 97, the graphics-intensive requirements for many applications require a higher minimum resolution than specified for Basic PC 97.

- Primary graphics adapter does not use legacy bus
- System operates normally with default VGA mode driver
- Support for multiple adapters and multiple monitors

For complete details related to basic graphics adapter requirements, see the "Graphics Adapters" chapter in Part 4 of this guide.

23. Hardware acceleration for 2-D and 3-D graphics

Required

Microsoft DirectDraw and Direct3D are used by applications to accelerate graphics display by providing direct manipulation of video display memory, hardware blters, hardware overlays, and page flipping. Various hardware acceleration features for 2-D and 3-D graphics can be implemented to improve overall graphics performance.

For information about required and recommended hardware features for 2-D and 3-D acceleration, see the "Graphics Adapters" chapter in Part 4 of this guide.

24. Support for NTSC or PAL TV output, if no large-screen monitor

Version 1.1 Change:

Recommended

This is recommended unless the system is bundled with a large-screen VGA monitor. For Entertainment PC 97, the ability to connect to a TV is key to its ability to delivering more realistic, large-screen TV, movie, and game viewing experiences. This capability must meet the PC 97 requirements for TV output for composite and S-Video connectors, parameter control, and hardware filtering and scaling capabilities. For more information, see the "Graphics Adapters" chapter in Part 4 of this guide.

25. Cable TV tuner

Recommended

The support provided with cable TV tuner capabilities should include electronic program guide (EPG) software.

If included in the Entertainment PC system, the NTSC/PAL decode component of the TV tuner and analog video input subsystems must properly support extraction of data transmitted during the vertical blanking interval (VBI). This includes allowing certain scan lines to be placed within a separate memory buffer.

26. System supports MPEG-1 playback

Required

Microsoft provides operating system support through Microsoft ActiveMovie. For information about performance and graphics hardware requirements to support video playback, see the "Video Components" chapter in Part 4 of this guide.

27. PC 97 DVD playback requirements
Required
DVD-Video support is required for Entertainment PC 97, and DVD playback capabilities must meet the requirements defined in the "Video Components" chapter in Part 4 of this guide. This requirement is in addition to the DVD-ROM requirements defined in the following section, "Storage and Related Peripherals for Entertainment PC 97."

28. Video input and capture
Recommended
An analog composite video input connector is recommended. The connector should be easily accessible on the Entertainment PC 97 system (that is, not on the rear panel). If this feature is implemented on the Entertainment PC 97 system, device support for video capture capabilities must meet the requirements defined in the "Video Components" chapter in Part 4 of this guide.

29. Large-screen DDC2B color entertainment monitor
Recommended
Support for NTSC/PAL TV output is required if the system does not include a large-screen VGA monitor. Games, movies, and other entertainment software experiences are greatly enhanced by display screens comparable to modern TV sizes, for example, 27 inches and above in the U.S. An Entertainment PC 97 system that includes a large-screen monitor must meet the requirements for entertainment monitors defined in the "Video Components" chapter in Part 4 of this guide.

Storage and Related Peripherals for Entertainment PC 97

This section summarizes the requirements for storage devices for Entertainment PC 97. For system requirements related to CD-ROM, see "System Buses and I/O Devices for Entertainment PC 97" earlier in this chapter.

30. System meets PC 97 storage requirements
Required
This includes the following specific requirements, as defined in the "Basic PC 97" chapter in this guide:

- Support Int 13h Extensions in system and option ROMs (for x86-based systems only)
- Host controller meets requirements defined for IEEE 1394, IDE, or SCSI in Part 3 of this guide
- Hard disk drive meets requirements defined in the "Storage and Related Peripherals" chapter in Part 4 of this guide
- Media status notification support for removable media

31. Primary host controller supports bus mastering
Required

The primary host controller must support bus mastering, whether using IEEE 1394, IDE, or SCSI.

32. DVD-ROM drive
Required

The DVD-ROM device included in an Entertainment PC 97 system must meet the requirements defined for DVD in the "Storage and Related Peripherals" chapter in Part 4 of this guide.

An Entertainment PC 97 system must also provide playback support for DVD content, as defined in the "Video Components" chapter in Part 4 of this guide.

References for Entertainment PC 97

The following table presents some of the references, services, and tools available to help build hardware that is compliant with Windows operating systems.

Plug and Play specifications
http://www.microsoft.com/hwdev/pnpspecs.htm

Microsoft Device Driver Kits (DDKs) for Windows operating systems
Microsoft Developer Network (MSDN) Professional membership

Advanced Configuration and Power Interface (ACPI) specification
http://www.teleport.com/~acpi/

Power management specifications for device and bus classes
Guidelines for audible noise and other OnNow technologies
http://www.microsoft.com/hwdev/onnow.htm

Version 1.1 References Update:
Display Data Channel Standard, Version 2.0 Level B (DDC2B)
Video Electronics Standards Association (VESA)
http://www.vesa.org

Windows and Windows NT DDKs
MSDN Professional membership

USB Device Class Definition for Human Interface Devices, Version 1.0
USB HID Usages Table
USB Implementers Forum
http://www.usb.org

Checklist for Entertainment PC 97

System Requirements for Entertainment PC 97

1. Minimum CPU: Pentium-class 166 MHz or equivalent
Required

2. L2 cache with 256K minimum, for Pentium-class processor
Required

3. Entertainment PC 97 meets Basic PC 97 general system requirements
Required

Industrial Design Requirements for Entertainment PC 97

4. All expansion slots in the system accessible for users to insert cards
Required

5. Audible noise meets PC 97 standards
Required

6. "Sealed case" design with external expansion for all components
Recommended

General Device Requirements for Entertainment PC 97

7. Entertainment PC 97 meets Basic PC 97 general device requirements
Required

Buses and Devices for Entertainment PC 97

System Buses for Entertainment PC 97

8. USB, with two easily accessible connectors
Required

9. IEEE 1394 with easily accessible connector
Required

10. Support for other high-speed expansion capabilities
Recommended

11. If present, PCI bus meets PCI v. 2.1 and higher, plus PC 97 requirements
Required

I/O Devices for Entertainment PC 97

12. Keyboard connection and keyboard
Required

13. Pointing device connection and pointing device
Required

14. USB game pad or joystick
Required

15. Remote control pointing device
Recommended

16. All pointing devices work simultaneously
Required

17. Legacy serial and parallel ports meet PC 97 requirements, if present
Required

18. Support for installing the operating system
Required

19. Audio support meets PC 97 Advanced audio requirements
Required

20. Data/fax/voice modem capabilities, 28.8 Kbps minimum
Required

21. Digital broadcast satellite subsystem
Optional

Graphics Components for Entertainment PC 97

22. Display adapter meets PC 97 minimum requirements
Required

23. Hardware acceleration for 2-D and 3-D graphics
Required

24. Support for NTSC or PAL TV output, if no large-screen monitor
Recommended

25. Cable TV tuner
Recommended

26. System supports MPEG-1 playback
Required

27. PC 97 DVD playback requirements
Required

28. Video input and capture
Recommended

29. Large-screen DDC2B color entertainment monitor
Recommended

Storage and Related Peripherals for Entertainment PC 97

30. System meets PC 97 storage requirements
Required

31. Primary host controller supports bus mastering
Required

32. DVD-ROM drive
Required