C H A P T E R 1 1

SCSI

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

Version 1.1
Includes changes to items 8, 15, 16, 19, 20, 23, Overview for SCSI, References for SCSI, andChecklist for SCSI, 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

Contents

Overview for SCSI

SCSI is a flexible I/O bus that is used in the design of a wide variety of peripherals, including disk drives, CD-ROM drives, tape drives, scanners, and magneto-optical drives. The SCSI host adapter is the circuitry that serves as an interface between the system and one or more SCSI peripherals. A host adapter can be a card that plugs into the system's expansion bus, such as a PCI card, or it can be designed directly into the system board.

The Plug and Play SCSI Specification lists the requirements for SCSI devices that create an easy-to-use environment for the user. In addition, enabling or disabling the termination on peripherals and other variables that require physically changing peripherals must be as simple as possible for the user.

The use of SCSI in a PC 97 system is optional, but if SCSI is used, all components must comply with the requirements defined in this chapter.

Version 1.1 Addition:
SCSI hardware should be developed to comply with the SCSI-2 specification, except when specifically directed in PC 97 to use the SCSI-3 specification. (Change date: April 24, 1997)

SCSI Host Adapter Requirements

This section summarizes SCSI class specifications and standards for SCSI host adapters.

1. Primary host controller supports bus mastering, if SCSI is present

Basic PC 97	*Workstation PC 97*	*Entertainment PC 97*
Recommended	*Required*	*Required*

The primary host controller should support bus mastering. For Basic PC 97, this will become a requirement in 1998.

2. Support Int 13h Extensions in option ROMs
Required

The Int 13h Extensions ensure correct support for high-capacity drives, consistent drive-letter mapping between real and protected mode, and other capabilities for both Windows 95 and future versions of Windows NT. Support for the "fixed disk access" subset of Int 13h Extensions must be provided in the system BIOS and in any option ROMs for storage devices that include BIOS support. The Int 13h Extensions are defined in "Int 13h Extension APIs" in the Layered Block Device Drivers section of the Windows 95 DDK.

3. Support virtual DMA services in option ROM, if bus mastering is supported

Required

Plug and Play SCSI host adapters that support bus mastering must support virtual DMA services (VDS) in the host-adapter option ROM. VDS supports scatter/gather capabilities, solving the problem of mapping linear addresses (segment: offset) into physical addresses. VDS is not applicable to host adapters that do not use bus mastering.

4. Bus type clearly indicated for all adapters, peripherals, and terminators

Required

Each SCSI adapter, peripheral, and terminator must be clearly marked to show the bus type. All external SCSI connectors must display the SCSI icon defined in SPI Annex F (and shown in Appendix A of this guide).

5. Differential devices support DIFFSENS as described in SCSI-3

Required

This requirement is especially important to PC systems running Windows NT. Without DIFFSENS, the differential bus drivers and/or a single-ended device will burn up if a single-ended device is put on a differential bus.

The specification for DIFFSENS is defined in section 5.4.2 of Small Computer Interface (SCSI-3) Parallel Interface (SPI) [X3T9.2].

6. Automatic termination circuit, per SCSI-3 standards

Required

SCSI implementations must use automatic termination that allows a user to add external devices without removing the PC case. Terminators used in the SCSI host adapter must be regulated terminators (also known as active, SCSI-3 SPI, SCSI-2 alternative-2, or Boulay terminators).

7. SCSI terminator built onto internal cables, per SCSI-3 standards

Required

For SCSI subsystem configurations, internal cables must be preconfigured with active termination at one end of the cable.

For device bays that have a SCSI bus built in, the terminator can be on the back plane rather than on the cable.

8. Supply terminator power to the SCSI bus, with overcurrent protection
Required

For system-board implementations using PCI or another expansion bus, the host adapter must supply terminator power (TERMPWR) to the SCSI bus. All terminators on the host adapter as well as on the internal and external SCSI bus must be powered from the TERMPWR lines in the SCSI bus.

Devices that provide TERMPWR must also provide some means of current limiting, such as a fuse or other protective device. For example, a positive-temperature-coefficient device or a circuit breaker can be designed into the circuit. These devices open during an overcurrent condition and close after the condition ends.

This item is a recommendation for battery-powered systems that implement the SCSI host adapter as a PC Card device, because of battery power consumption issues.

Version 1.1 Correction:

Devices that provide TERMPWR must also provide some means of current limiting through use of a self-resetting device. For example, a positive-temperature coefficient device or a circuit breaker can be designed into the circuit. These devices open during an overcurrent condition and close after the condition ends. (A fuse is not allowed.) (Change date: August 6, 1997)

9. High-density external connector meets SCSI-2 standards
Recommended

If an external connector is implemented, it should be a high-density connector and must meet SCSI-2 standards.

10. Internal terminator close to last peripheral on the cable
Recommended

The internal terminator should be as physically close as possible to the last peripheral on the cable. There should be some means, such as written instructions on the cable, to ensure that the user always plugs in internal peripherals starting with the plug closest to the terminator.

Plug and Play for SCSI Host Adapters and Peripherals

This section summarizes the Plug and Play requirements for SCSI devices.

11. All components comply with Plug and Play SCSI specifications
Required

Each component must comply with Plug and Play SCSI Specification 1.0 and the related Plug and Play host bus specification (for example, PCI v. 2.1 if the PCI bus is used).

Notice, however, that the SCAM specification is optional, not required.

12. Plug and Play device identifier

Required

- For a system board device, there must be a Plug and Play device-specific ID.
- The device must provide device identifiers as defined in the Plug and Play SCSI Specification.

13. Automatic resource assignment and dynamic disable capabilities
Required
For peripheral devices, the system must be capable of automatically assigning, disabling, and relocating the resources used by this device when necessary. Changing or adding this device to the 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 for assigning resources, the operating system must be able to disable the device to prevent the system from stalling.

14. Flexible resource configuration for each non-PCI device
Required
If the host adapter uses a non-PCI bus such as an ISA bus, the SCSI host adapter must be capable of supporting the following minimum resource configuration options:

- Support 2 I/O locations

  Recommended: 7 I/O locations
- Support 4 IRQ signals

  Recommended: 7 IRQ signals
- Support 3 DMA channel selections, if DMA is used

If the minimum resource requirements cannot be met, then IRQ sharing must be implemented, as specified in the “ISA” chapter in Part 3 of this guide.

Power Management for SCSI Devices

This section summarizes the specific power management requirements for this bus class. Power management requirements for specific device classes are defined in the related chapters in Part 4 of this guide.

15. Power requirements for bus and device
Required
Additional power management requirements are specified based on industry-defined standards for the bus used by the controller and for the device. For information, see the chapter for the related bus class in Part 3 in this guide. See also the chapter for the related device class for requirements based on compliance with “Device Class Power Management Reference Specification”; for example, see the “Storage and Related Peripherals” chapter in Part 4 for power management requirements for disk drives.

Version 1.1 Clarification:

There are no OnNow power management requirements specified for SCSI.

16. Implement the STOP/START UNIT command as defined in SCSI-2
Required
The hardware in SCSI peripherals must be able to fully recover from a software-initiated spin-down without rebooting the system or cycling power. To properly support power management on SCSI drives, be sure to implement the STOP/START UNIT command correctly as specified in SCSI-2 to ensure that the operating system responds to appropriate driver calls.

Version 1.1 Clarification:

There are no OnNow power management requirements specified for SCSI.

Design Features for SCSI Peripherals

This section summarizes requirements related to specifications and standards for SCSI peripherals.

17. SCSI bus parity signal defined in the SCSI-2 specifications
Required
All SCSI peripherals must implement the SCSI bus parity signal defined in the SCSI-2 specification.

18. Cables conform to requirements in clause 6 of SPI specification
Required
Clause 6 of the SPI specification defines the various characteristics of cables for SCSI devices. See Small Computer Interface (SCSI-3) Parallel Interface (SPI) [X3T9.2/91-10].

19. User cannot plug in cables incorrectly for internal connections
Required
For an internal configuration, one end of the internal SCSI bus cable is plugged into a shrouded or keyed connector on the host adapter, which ensures that the cable is positioned properly. This connector must comply with the SPI specification.

Version 1.1 Clarification:
The reference for connector compliance with the SPI specification applies specifically to SCSI-3 68-pin connectors. Fifty-pin connectors must comply with all SCSI-2 requirements and must comply with the PC 97 requirement for shrouded or keyed connectors. (Change date: April 24, 1997)

20. Internal SCSI peripherals do not terminate the SCSI bus

Required

Version 1.1 Correction:
Recommended

SCSI peripherals must not terminate the bus. Both internal and external cable ends are instead terminated by plug-in connectors. The requirement for automatic termination on the host adapter, as specified in the "SCSI Host Adapter Requirements" earlier in this chapter, ensures that the user is able to connect combinations of peripherals easily.

A design in which termination for peripherals can be set by jumpers or switches or by changing resistor packs is not acceptable for the "Designed for Microsoft Windows" logo.

21. External connectors use automatic termination or accessible onboard termination switch

Required

The preferred implementation for an external SCSI peripheral device is to provide automatic termination. In the absence of automatic termination, an external pluggable terminator must be connected to the last open device connector on the bus. If a mechanical means is provided for setting termination, the switch must be accessible to the user without opening the PC case.

22. High-density, shielded device connector meets SCSI-2 standards

Recommended

If a high-density connector is used, it must meet SCSI-2 standards.

23. Removable SCSI devices support for Media Status Notification Specification for SCSI and ATAPI Devices

Required

Version 1.1 Correction:

Recommended

The Microsoft specification for Media Status Notification Support for SCSI and ATAPI Devices (v. 1.0 or higher) defines the protocol for removable SCSI devices to use in communicating about the current state of removable media.

Version 1.1 Addition:

SCSI removable devices are not required to support Media Event Status Notification (MESN) or the *Media Status Notification specification*. (Change date: January 30, 1997; April 30, 1997, November 5, 1997)

References for SCSI

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

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

Media Status Notification Support Specification for SCSI and ATAPI Devices
http://www.microsoft.com/hwdev/respec/

Small Computer Interface (SCSI-2) [X3T9.2-375R]
Small Computer Interface (SCSI-3) Parallel Interface (SPI) [X3T9.2/91-10]
Global Engineering Documents
15 Inverness Way East
Englewood, CO 80112-5704
Phone: (800) 854-7179
Outside U.S. and Canada: (303) 792-2181
Fax: (303) 397-2740
ftp://ftp.symbios.com/pub/standards/io/x3t10.1

Version 1.1 References Update:

Device class power management reference specifications
http://www.microsoft.com/hwdev/onnow.htm

El Torito—Bootable CD-ROM Format Specification, Version 1.0
Compaq, Intel, Phoenix BIOS Boot Specification, Version 1.01
http://www.ptltd.com/techs/specs.html

PCI Local Bus Specification, Revision 2.1 (PCI 2.1)
PCI SIG
Phone: (800) 433-5177
http://www.pcisig.com

Plug and Play SCSI Specification, Version 1.0
http://www.microsoft.com/hwdev/respec/

Small Computer Interface (SCSI-2) [X3T9.2-375R] specification
Small Computer Interface (SCSI-3) *Parallel Interface* (SPI) [X3T9.2/91-10] specification
SFF Committee publications
FaxAccess: (408) 741-1600 (fax-back)
Fax: (408) 867-2115

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/

Windows and Windows NT DDK
MSDN Professional membership

Checklist for SCSI

Basic PC 97	*Workstation PC 97*	*Entertainment PC 97*

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Required

3. Support virtual DMA services in option ROM, if bus mastering is supported
Required

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Required

5. Differential devices support DIFFSENS as described in SCSI-3
Required

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Required

7. SCSI terminator built onto internal cables, per SCSI-3 standards
Required

8. Supply terminator power to the SCSI bus, with overcurrent protection
Required

9. High-density external connector meets SCSI-2 standards
Recommended

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Required

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Required

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Required

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Required

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