CHAPTER 8

IEEE 1394

This chapter summarizes PC 99 design requirements for hardware designed using the current IEEE 1394 standards. The IEEE 1394 high-speed serial bus complements USB by providing enhanced PC connectivity for a wide range of devices, including consumer audio/video (A/V) components, storage peripherals, other PCs, and portable devices.

IEEE 1394 has been adopted by the consumer-electronics industry and is expected to provide a volume, Plug and Play-compatible expansion interface for the PC. The 100-Mb/s, 200-Mb/s, and 400-Mb/s transfer rates currently specified in IEEE P1394.a and the proposed enhancements in IEEE P1394.b are well suited to multistreaming I/O requirements.

Contents

IEEE 1394 Basic Requirements

The following is a summary of the IEEE 1394 design considerations related to PC systems, as addressed in this chapter:

- Compliance with IEEE 1394 standards, specifically IEEE 1394-1995 and IEEE P1394.a
- Support for the 1394 Open Host Controller Interface (OpenHCI) specification for controllers, specifically OHCI Revision 1.0

- Plug and Play support for device configuration, control and status registers (CSRs), connectors and cabling, and connection fault handling
- Cable power distribution, including requirements for source devices, sink devices, self-powered devices, and supporting CSRs
- Device power management, CSRs, and soft-power protocols
- Device command protocols for audio, video imaging, still imaging, and storage device classes

This section defines the basic PC 99 requirements for IEEE 1394.

8.1. Controllers and devices support mandatory features in IEEE P1394.a with backward compatibility with IEEE 1394-1995

Required

Designs that interface to the IEEE 1394 bus must support the following industry standards and supplemental specifications:

- IEEE 1394-1995 standard
- IEEE P1394.a, an amendment to IEEE 1394-1995
- IEEE 1212-1991 and function discovery in IEEE 1212-199x

PC 99A correction: The reference to IEEE 1212-199x should instead be IEEE P1212r, which more properly reflects support implemented in Windows 98 and Windows 2000.

8.2. Controllers comply with OpenHCI for IEEE 1394

Required

The 1394 OpenHCI Revision 1.0 specification for IEEE 1394 defines standard hardware and software for PC connections to the IEEE 1394 bus. OpenHCI defines standard register addresses and functions, data structures, and DMA models. The benefits of this standard include improved performance, security, and error handling.

PC 99A correction: The specification citation should be "1394 OpenHCI, Revision 1.0 *or later*." Compliance with OpenHCI v.1.1 (when this version is available) is acceptable under Windows 98 and Windows 2000.

A 1394 OpenHCI device is bus manager-capable, including bus mastering for BANDWIDTH_AVAILABLE and CHANNELS_AVAILABLE registers.

Host adapters and host controllers must implement the mandatory features of 1394 OHCI Revision 1.0, including support for a minimum of four isochronous transmit contexts, four isochronous receive contexts, two asynch transmit contexts, two asynch receive contexts, self ID context, and physical DMA.

PC 99A correction: Replacement text: "Only computers running Windows 98, Windows 2000, or later versions of these operating systems are required to implement an OpenHCI-compliant Link."

This replaces the final paragraph in this requirement ("Devices besides bus managers and bus controllers that implement IEEE 1394 are not required to implement an OpenHCI-compliant host controller in their Link.")

8.3. OpenHCI controllers and devices support advances defined in IEEE P1394.a

Required

The advances in the IEEE P1394.a specification enhance system performance and integration of component systems. The mandatory features specified in IEEE P1394.a must be supported by all host controllers, peripherals, and Link and physical layer device (PHY) components. Mandatory IEEE P1394.a features that must be supported by all devices and controllers include:

- S100–S400 operation of all PHY ports in host controllers
- S100–S400 operation of all device-side PHYs
- PHY autonomous features for connection debounce and hysterisis
- Arbitration enhancements that promote a high quality of operation and end-user experience

8.4. Host supports peak data rate of 400 Mb/s, minimum

Required

The integration of component systems that enable concurrent applications demands minimum bandwidth for an effective user experience. A peak data rate of 400 Mb/s is required of all host controllers and PHY ports available externally in the system for 1999. The host controller must support 100-Mb/s, 200-Mb/s, and 400-Mb/s data rates as specified in IEEE 1394-1995 and IEEE P1394.a. All externally-accessible host controller ports must support S100-400 operation.

8.5. Design avoids excessive currents resulting from ground-fault potential among devices

Recommended

PC 99A correction: The entire text for this recommendation should be replaced with the following: "Devices should meet appropriate local regulatory approval (for example, UL, CSA, and so on)."

Requirements for IEEE 1394 Devices

This section summarizes additional requirements for IEEE 1394 peripherals such as consumer-electronics devices.

8.6. Device command protocols conform to standard device class interfaces

Required

PC 99A correction: IEEE 1394 devices must comply with appropriate industry-recognized transport and command standards, such as the following:

- IEC 61883 parts 1-6, including CIP (Common Isochronous Packet) headers, CMP (Connection management Procedures), and FCP (Function Command Protocol)
- 1394TA AV/C 3.0 and the AV/C subunit family of specifications
- National Committee for Information Technology Standards (NCITS) SBP-2 transport protocols
- National Committee for Information Technology Standards (NCITS) T10, Reduced Block Commands (RBC)
- National Committee for Information Technology Standards (NCITS) T10 MMC-2, or SFF 8090, Version 3

IEEE 1394 storage class devices must conform to the IEC 61883 standards for the CIP (Common Isochronous Packet) format, the CMP (Connection Management Procedures) procedures, and the FCP (Function Command Protocol) protocols.

PC 99A clarifications:

- Storage class devices must conform to the ANSI standards for SBP-2 (Serial Bus Protocol) with the appropriate command set: RBC (Reduced Block Commands) or MMC-2 (MultiMedia Commands).
- Printing devices using the SBP2 protocol must conform to the guidelines set in "SBP-2 Support and Windows 2000," available at http://www.microsoft.com/hwdev/print/sbp2_w2000.htm.
- Drivers for IEEE 1394 must take advantage of WDM-based driver support provided in the operating system.

8.7. Devices support peak data rate of 400 Mb/s, minimum

Required

For PC 99 designs, S400 IEEE 1394 devices are recommended; S100 devices are strongly discouraged; and S200 devices should limit their peak bus utilization to less than 50 percent.

For a device with more than one port, each port must support S100, S200, and S400 PHY operations. All new peripherals and systems should use S400 PHY ports. Existing devices using only S100 or S200 PHY ports are acceptable.

PC 99A clarification: The following paragraph has been deleted: "Also, application bandwidth can be limited by speed traps (a slow device separating two faster devices), which impose speed-dependent cabling considerations on the end user."

8.8. Devices requiring support for high-bandwidth data transfer use IEEE 1394

Recommended

For devices that require support for high-bandwidth data transfers and Plug and Play connectivity, the IEEE 1394 bus is recommended. Such devices include the following:

Archival storage (tape, high density disk, cartridge, or other removable memory media)

Component audio

Connectivity peripherals

Digital camcorder

Digital VCR

DTV

DVD and CD drives

Hard disk drives

High-resolution scanners Magneto-optical devices

PC docking stations

Printers

Set-top television controllers

Video conferencing cameras

Plug and Play for IEEE 1394

This section summarizes the Plug and Play requirements for IEEE 1394 peripheral devices and PC host controllers.

8.9. Plug and Play devices demonstrate interoperability with other devices

Required

All devices must support Plug and Play for intended applications in both a minimal and an extended bus configuration. A minimal configuration is the minimum number of devices necessary to demonstrate the primary application of the device. An extended configuration is an advanced application with at least two devices added to the minimal configuration. The added devices can be extraneous to the application.

The following is a summary of compliance testing guidelines for this requirement:

- Intended applications must be documented before testing.
- Both test configurations must consist of a core matrix of stable devices that have demonstrated full interoperability in the absence of the test device. To be included in the core test matrix, a device must have demonstrated compliance of its PHY, Link, and Transaction layers as specified in the IEEE 1394-1995 and P1394.a standards.
- The core matrix of devices must be established by an independent agency with actual testing performed by an independent third party or as part of an industry compatibility workshop.
- IEEE 1394 devices and systems must meet the Personal Computer Compatibility and Interoperability profile, independent of their additional use as peer-to-peer or non-PC devices.
- IEEE 1394 devices must conform to the Plug and Play guidelines as applied to IEEE 1394 devices. For a reference to the Plug and Play guidelines, see http://www.microsoft.com/hwdev/onnow.htm.

PC 99A errata: The correct URL for the Plug and Play guidelines is http://www.microsoft.com/hwdev/respec/pnpspecs.htm. This specification was

updated on March 2, 1999 (version 1.0c) to present the correct implementation under the Windows 2000 operating system, which also closely reflects the requirements in the IEEE 1394 standard.

8.10. Topology faults do not cause the bus to fail

Required

Standard IEEE 1394 protocols have been defined to eliminate topology faults. However, to ensure correct implementation, the following items describe test criteria for industry compatibility workshops. In each case, device connection or removal must not stall the bus, even if the device itself does not function. The PC must detect each fault. The compliance criteria include the following:

- Surprise removal. All isochronous-capable devices must support the Connection Management Protocol specified in IEC 61883, or the most recent specification, in order to resume streaming connections following a bus reset and to de-allocate channels upon surprise removal of a device.
- Safe removal. All devices that provide a front-panel power switch must signal the operating system in response to a local shut-down request, such as hot unplugging, in order to allow safe removal. Safe removal requires that the end user monitor the PC bus manager's response to the request before removing the device.
- Greater than 16 hops.

  PC 99A correction: This text has been deleted because these capabilities are not under the control of devices. These design issues must be addressed instead through revisions of the IEEE standard.
- Greater than 63 devices on a local IEEE 1394 bus.

  PC 99A correction: This text has been deleted because these capabilities are not under the control of devices. These design issues must be addressed instead through revisions of the IEEE standard.

8.11. Removable media devices support media status notification

Required

Removable media devices must use an electronic switch to notify the bus manager in the event of media change requests. This is necessary to enable device applications to lock, unlock, and eject media.

Removable devices must conform to either the National Committee for Information Technology Standards (NCITS) Reduced Block Command (RBC) set standard or to the SFF 8090, Revision 2.0 specification. The MMC-2 specification, when it is approved, will replace SFF 8090.

PC 99A note: See the clarifications for PC 99 18.2.

8.12. Devices that can initiate peer-to-peer communications also support remote programming

Required

To enhance systems integration, all devices capable of initiating peer-to-peer communications and designed for use with the PC must also support a programming language that enables remote control for PC applications. This allows a third device, such as a PC or device controller, to initiate data transmission between two devices.

Plug and Play for Device Configuration ROM

This section defines the Plug and Play requirements related to device configuration ROM.

8.13. Device provides a configuration ROM for unique device identification

Required

For Plug and Play device control, the device configuration ROM must provide configuration information as specified in the Revision 2.0 P1394.a standard and as outlined in the configuration ROM table. The configuration ROM is required for unique detection of the device and is used by the PC to enumerate the bus and to load the correct device driver.

For up-to-date information about the configuration ROM under Windows 98 and Windows 2000 Professional 5.0, see the information about IEEE 1394 on the web site at http://www.microsoft.com/hwdev/1394/.

8.14. Device configuration ROM implements general ROM format

Required

The general configuration ROM format is specified in the IEEE 1394-1995 and ISO/IEC 13213:1994 standards. The general ROM format is an extensible tree structure that enables a managed environment by providing node-specific and unit-specific information as required for Plug and Play, power management, and isochronous data transfers. The general ROM format also provides for definition of multifunction device units. The bus information block and root directory of the general ROM format are required as specified in configuration ROM table.

8.15. Bus information block implemented at a base address offset of 0404h

Required

The format of the bus information block is defined by the IEEE 1394-1995 standard. The first quadlet of the bus information block at offset 404h is the configuration ROM signature field used to identify an IEEE 1394 configuration ROM. This quadlet must contain the ASCII string "**1394**."

The second quadlet of the bus information block at offset 408h contains several bits that indicate node capabilities. These bits are defined as shown in the following table, together with their required values.

Note: All devices must support the *irmc*, *cmc*, *isc*, *bmc*, and *pmc* bits and, for host controllers, all these bits must be 1.

Bits Indicating Node Capabilities at Offset 408h

Bit or field	Value and description
irmc bit	Indicates that the node supports isochronous resource manager capabilities.
cmc bit	Must be 1 if the node supports cycle master capabilities; otherwise, this value must be 0.
isc bit	Must be 1 if the node supports isochronous operations; otherwise, this value must be 0.
bmc bit	Indicates that the node supports bus manager capabilities.
pmc bit	Indicates that the node is power manager capable. The *pmc* bit is not defined by the IEEE 1394-1995 standard and is an extension created by this specification.
cyc_clk_acc field	Specifies the accuracy of the node's cycle master clock in parts per million. If the *cmc* bit is 1, the field's value must be between 0 and 100. If the *cmc* bit is 0, this field must be all ones.
Max_rec field	Defines the maximum payload size of a block-write transaction addressed to the node. The range of the maximum payload size is from 4 to 2048 bytes. A *max_rec* value of 0 indicates that the maximum payload size is not specified. Otherwise, within the range of defined payload sizes, the maximum size is equal to $2^{max\_rec + 1}$. The *max_rec* field does not place any limits on the maximum payload size in asynchronous data packets—either requests or responses—that the node might transmit.

8.16. Configuration ROM provides globally unique device ID

Required

The third and fourth quadlets of the bus information block of the configuration ROM must provide a globally unique device ID, which appears in configuration ROM table beginning at offset 40Ch. This unique 64-bit node ID is the only way to recognize the presence of a given device, because the physical device addresses can change following a bus reset. The unique ID is required for device detection and PC device driver loading.

If a bus node supports multiple units, then the unique 64-bit ID must not be referential to any one unit directory in order to allow for unique identification of a unit in a multifunction device.

The globally unique device ID in the bus information block must be invariant when read with quadlet read requests—it must not be alterable in any way by software.

8.17. Root directory is located at a fixed address following the bus information block

Required

The root directory must be located at a fixed address following the bus information block. All other directories and leaves are addressed by entries in their parent directories, starting with the root directory. The root directory contains pointers to the root-dependent directory, a node-power directory as specified in *1394 Trade Association Power Specification, Part 3: Power State Management*, and unit directories for each independent device function.

8.18. Configuration ROM includes a unit directory for each independent device function

Required

A unit directory is required for independent function and control of each device unit. A valid pointer to a unit directory must be provided at offset 0x20h, in compliance with the general ROM format specified in IEEE 1394-1995 and the directory format specified in ISO/IEC 13213:1994.

8.19. Each unit directory provides a valid Unit_Spec_Id and Unit_Sw_Version

Required

Within a unit directory, Unit_Spec_Id identifies the specification authority and Unit_Sw_Version identifies the particular document describing the unit. When added to the beginning of Unit_Spec_Id, then Unit_Sw_Version uniquely identifies the unit's software interface.

8.20. Each unit directory provides a pointer to a unit-dependent directory

Required

The unit-dependent leaf directory must provide additional information about the device unit's vendor and model in associated leaf directories. The format of the information contained in the vendor and model leaves is specific to Unit_Spec_Id and Unit_Sw_Version.

A valid pointer to a unit-dependent directory must be in accordance with the generic directory format specified in ISO/IEC 13213:1994. The unit-dependent directory must provide valid pointers to vendor and model leaves.

8.21. Vendor and model leaves support textual descriptor leaf format

Required

Textual descriptors are required for Unit_Spec_ID and Unit_Sw_Version entries in the configuration ROM in order to display this information to the user. Textual descriptors are recommended for all other configuration ROM entries. Each textual descriptor points to a leaf that contains a single character string.

Alternately, the textual descriptor can point to a directory that points to one or more textual descriptor leaves corresponding to supported languages. Leaf format and textual descriptor leaves are specified in ISO/IEC 13213:1994.

Textual descriptor leaves must include the following:

- The spec_type field must be “0” to correspond to a 24-bit specifier_id for a standards body, or “1” to correspond to a 24-bit specifier_id for a defining vendor company_id.
- The language_id field must be derived from the Windows 2000 locale number (a quadlet), OR’d with 0x80000000.
- Text string_info must be in ASCII for any language_id in the range 0–7fffffff or in Unicode for any language_id in the range 0x80000000–0xffffffff.

8.22. Unit-dependent directory provides a pointer to the unit’s CSRs

Required

Each unit’s CSRs must be in separate, non-overlapping address spaces to maintain independent device control. If CSRs can be used to interact with a device unit, the unit-dependent directory must provide a pointer to the base address of the unit’s CSRs. This provides an easy way for an application or a device driver to access the unit’s CSRs.

Plug and Play for Cabling and Connectors

This section defines the Plug and Play requirements for IEEE 1394 cabling and connectors.

8.23. Device provides more than one connector port

Recommended

Devices should provide at least two (preferably three) 6-pin connector ports for optimum cabling options, subject to cable-power distribution constraints. Fewer than three ports promotes long daisy chains, increasing the potential for speed traps. Therefore, three-port IEEE 1394 device nodes are recommended, with exceptions noted in requirement 8.24, “Device uses the approved IEEE P1394.a connector.”

For internal-only devices, a minimum of two ports enables daisy chaining of devices. However, a limit of 15 hops (end-to-end distance) restricts total devices to 16, sufficient for most internal configurations.

Single-port devices are permissible, but it is recommended that devices provide more than one port to enable connectivity to other peripherals when the system does not provide multiple ports.

Devices that consume cable power should be limited to a single connector to encourage short source-to-sink power delivery while eliminating the build up of voltage drop associated with a long daisy chain of power consumers.

Mobile PC Note

Only one external port is recommended for mobile systems.

8.24. Device uses the approved IEEE 1394 connectors

Required

Recommended: Device uses a 6-pin connector.

If the device implements a 4-pin connector, it must be a single port, leaf device because the connector cannot pass cable power to other devices. The connector must conform to the 4-pin connector in the IEEE P1394.a specification.

If the device uses the 6-pin connector, it must also conform to the specifications for connectors in IEEE P1394.a. It is recommended that all PC peripheral devices implement the 6-pin connector. All host controller ports that are externally accessible should support the 6-pin connector.

Consistent use of the standard 6-pin IEEE 1394 connector eliminates an undesirable break in the power bus for power-dependent device applications. Other benefits include volume pricing and consistent electrical performance. Therefore, all external pluggable IEEE 1394 devices must use the standard 6-pin IEEE 1394 connector. The exception is an option to use the 4-pin IEEE P1394.a connector for miniature single-port (leaf-node) devices, as defined in requirement 8.26, “Only single-port leaf-node devices use 4-pin connectors.”

Device designers can decide to use the connector described in *Device Bay Specification, Version 1.0*. If so, the design must be compliant with all connector and electrical requirements of that specification.

8.25. Self-powered devices propagate the power bus through each connector

Required

Self-powered devices that provide their own power source and do not consume cable power must maintain the electrical integrity of the power bus for other devices dependent on it. Therefore, all self-powered devices must propagate the power bus through each connector.

8.26. Only single-port leaf-node devices use 4-pin connectors

Required

A 4-pin connector is not recommended because it adds an additional, and possibly confusing, cable choice for end users. Therefore, under these guidelines, a 4-pin (powerless) A/V connector can only be implemented for single-connector leaf-node devices.

8.27. Device connectors exhibit common speed and power characteristics

Required

Devices with multiple connectors must exhibit common characteristics at each connector to reduce end-user cabling choices. All connectors on a device must exhibit homogeneous speed, power, and mechanical characteristics such that:

- Multiconnector devices use the 6-pin connector
- All device connectors propagate the power bus
- All device connectors support a common peak data rate

Optionally, all devices providing cable power through 6-pin connectors must provide diode isolation as specified in the *1394 Trade Association Power Specification Part 1: Cable Power Distribution.*

8.28. Standard S400-rated IEEE 1394 cable is provided with devices

Required

For Plug and Play, it is important to use one standard-performance cable for all device configurations to eliminate cable choices for the end user. This is especially important given the range of devices possible on an IEEE 1394 bus. A mix of cable types and ratings creates an unfriendly user experience. Therefore, all cables must be have a minimum S400 rating and, if bundled, must be shipped with a standard cable.

Plug and Play Power Interfaces

This section summarizes Plug and Play requirements for cable power distribution.

For Plug and Play, all devices—whether cable or self-powered—must comply with the applicable requirements in *1394 Trade Association Power Specification, Part 3: Power State Management.* These requirements enable a power management-capable bus manager to provide instant-on application support while reducing system-wide device power consumption.

In addition, all devices must comply with the *1394 Trade Association Power Specification Part 1: Cable Power Distribution.* Although the requirements for devices that do not consume or produce cable power are minimal, all devices share responsibility for propagating the power bus as defined in the Cable Power Distribution specification.

A standard cable-power distribution model is necessary to reduce the likelihood of power-fault conditions, such as insufficient power for connection of a cable-powered device and surprise removal of a device power source. In addition, a bus manager that is power management-capable can allocate or de-allocate available power within diode-isolated power domains, accounting for the overall power budget and voltage drop.

Plug and Play requirements in this section highlight details specified in the applicable power specifications.

Mobile PC Note

Exceptions for power interfaces for mobile systems are defined in Chapter 6, "Mobile PC 99."

8.29. Devices provide sufficient power to their PHY at appropriate times

Required

The host controller and all devices that have more than one port must perform the bus repeater function when powered down as specified in the IEEE P1394.a specification. A device power switch must supply local power to the PHY when the standard and *1394 Trade Association Power Specification*.

8.30. Devices report power source and cable power consumption in Self_id packet

Deleted

PC 99A correction: This is no longer a PC 99 requirement, because this is a function of the IEEE standard.

8.31. Devices implement link power control

Required

The host controller and all cable-powered and self-powered devices must implement the Link_on packet and Link_off bit in the State_Clear register. These controls allow a power management-capable bus manager to control the node's power state. Access to the device configuration ROM must be possible following a Link_on. A device cannot increment its power consumption by more than 3 watts following a Link_on. Self-powered devices can power up with Link_on. However, cable-powered devices must rely on the power manager to enable their link.

8.32. Device requiring power increments in excess of Link_on implements unit-power CSRs

Required

The host controller and all cable-powered and self-powered devices that require power increments in excess of Link_on power must implement standard unit-power CSRs as specified in *1394 Trade Association Power Specification, Part 3: Power State Management.* This is necessary to allow for seamless integration of centralized power management capabilities when a device is connected to a mini-system.

In addition, all devices of a given device class must implement a standard set of unit power states as specified in the device class power management specification for that device class. For example, all VCRs must exhibit a consistent behavior with respect to power states and transitions between states. This is necessary to provide a consistent user experience.

Note: Please check with the 1394 Trade Association or send e-mail to 1394@microsoft.com to determine whether a power class specification exists for your device type. Alternatively, you are encouraged to draft a proposal for your device type and submit it to the 1394 Trade Association architecture working group for review and approval.

8.33. Devices that source cable power report this capability

Required

This reporting is necessary to enable centralized power management. A device that sources 20 volts or more of cable power at 15 watts minimum must report that it provides power in its Self_id packet as specified in IEEE 1394-1995. Devices that provide less than 20 volts at 15 watts can be discovered using configuration ROM information as described in *1394 Trade Association Power Specification, Part 3: Power State Management.*

8.34. IEEE 1394-enabled PC sources cable power compliant with IEEE 1394a-1999

Required

PC 99A correction: Note title change (from IEEE1394-enabled PC sources cable power).

An AC-powered PC must source cable power to the bus. Cable power, in turn, enhances Plug and Play with a single connection for low-cost cable-powered devices. Battery-powered mobile and notebook devices are exempt from this requirement, whether or not the device is connected to an AC adapter.

8.35. Power source supplies appropriate cable power

Deleted

PC 99A correction: This is not a PC 99 requirement. Changes to PC99:8.34 eliminate this clause.

8.36. Devices notify the power manager of power change requests

Deleted

PC 99A correction: This is not a PC 99 requirement. There is no defined way for this to occur in the PC 99 timeframe. The Power State and Power Distribution Specifications have not been published.

Power Management for IEEE 1394 Devices

All devices on the IEEE 1394 bus must comply with the power management requirements outlined in this section.

8.37. Devices and controllers comply with the 1394 Trade Association Power Specification, Part 1: Cable Power Distribution, Rev. 0.98

Required

PC 99A correction: Note title change (from "Devices and controllers comply with Cable Power Distribution specification").

The cable power distribution model has been defined to provide guidelines for implementation of devices that propagate, source, or sink cable power. Thus, all devices must satisfy power distribution requirements. *1394 Trade Association Power Specification Part 1: Cable Power Distribution* addresses interoperability and power distribution necessary for operation of both power-managed bus configurations and, with some restrictions, unmanaged bus configurations.

PC 99A correction: The correct specification is *1394 Trade Association Power Specification, Part 1: Cable Power Distribution, Rev. 0.98*.

8.38. Devices and controllers comply with IEEE 1394 power specification

Deleted

PC 99A correction: This is not a PC 99 requirement. This specification does not yet exist. An early revision of the specification will be *1394 Trade Association Power Specification, Part 3: Power State Management, Rev. 1.0*. It is believed that this specification will be published and adopted in October 1999. The IEEE standard version of this specification will be available for PC 2001, but not for PC 99.

IEEE 1394 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.

1394 Trade Association
E-mail: 1394-sig@1394ta.org
http://www.1394ta.org

1394 Glass Optical Fiber Specification: *Proposal to Extend the P1394.b S-800–S1600 100m Glass Optical Fiber (GOF) Link Specifications*
http://www.zayante.com/p1394b/GOFmedia/ts980709-GOF-Extension.pdf

1394 Trade Association Power Specification Part 1: Cable Power Distribution
1394 Trade Association Power Specification, Part 3: Power State Management
ftp://ftp.p1394pm.org/pub/p1394pm/

Device Bay Specification, Version 1.0
http://www.device-bay.org

IEC 61883 Digital Interface for Consumer Electronic Audio/Video Equipment
https://domino.iec.ch/webstore/webstore.nsf/Welcome?ReadForm

IEEE 1394 Standards
ASK*IEEE
Telephone: (800) 949-4333
Fax: (212) 310-4091
E-mail: askieee@ieee.org

Global Engineering Documents
Phone: (800) 854-7179 (US)
(613) 237-4250 (Canada)
(303) 792-2181 (Outside North America)
Fax: (303) 397-2740

ISO/IEC 13213:1994 Control and Status Registers (CSR) Architecture for Microcomputer Buses
http://www.iso.ch/cate/d21416.html

Intel information about IEEE 1394 implementations
http://developer.intel.com/technology/1394/

Microsoft Windows 98 DDK, Windows 2000 DDK, and DirectX 5.0 DDK
http://www.microsoft.com/ddk/
(or MSDN Professional subscription)

MMC-2 Multi-Media Command Set-2
ftp://ftp.symbios.com/pub/standards/io/t10/drafts/mmc2/

National Committee for Information Technology Standards (NCITS) Reduced Block Commands (RBC) Draft Proposal T10/97-260r0
ftp://ftp.symbios.com/pub/standards/io/t10/drafts/rbc/

OpenHCI: Open Host Controller Interface Specification for USB, Release 1.0a
http://www.microsoft.com/hwdev/respec/busspecs.htm

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

SFF Committee publications
FaxAccess: (408) 741-1600 (fax-back)
Fax: (408) 867-2115
ftp://fission.dt.wdc.com/pub/standards/SFF/specs/

White papers and guidelines for Microsoft operating systems
http://www.microsoft.com/hwdev/1394/

Checklist for IEEE 1394

If a recommended feature is implemented, it must meet the PC 99 requirements for that feature as defined in this document.

8.1. Controllers and devices support mandatory features in IEEE P1394.a with backward compatibility with IEEE 1394-1995
Required

8.2. Controllers comply with OpenHCI for IEEE 1394
Required

8.3. OpenHCI controllers and devices support advances defined in IEEE P1394.a
Required

8.4. Host supports peak data rate of 400 Mb/s, minimum
Required

8.5. Design avoids excessive currents resulting from ground-fault potential among devices
Recommended

8.6. Device command protocols conform to standard device class interfaces
Required

8.7. Devices support peak data rate of 400 Mb/s, minimum
Required

8.8. Devices requiring support for high-bandwidth data transfer use IEEE 1394
Recommended

8.9. Plug and Play devices demonstrate interoperability with other devices
Required

8.10. Topology faults do not cause the bus to fail
Required

8.11. Removable media devices support media status notification
Required

8.12. Devices that can initiate peer-to-peer communications also support remote programming
Required

8.13. Device provides a configuration ROM for unique device identification
Required

8.14. Device configuration ROM implements general ROM format
Required

8.15. Bus information block implemented at a base address offset of 0404h
Required

8.16. Configuration ROM provides globally unique device ID
Required

8.17. Root directory is located at a fixed address following the bus information block
Required

8.18. Configuration ROM includes a unit directory for each independent device function
Required

8.19. Each unit directory provides a valid Unit_Spec_Id and Unit_Sw_Version
Required

8.20. Each unit directory provides a pointer to a unit-dependent directory
Required

8.21. Vendor and model leaves support textual descriptor leaf format
Required

8.22. Unit-dependent directory provides a pointer to the unit's CSRs
Required

8.23. Device provides more than one connector port
Recommended

8.24. Device uses the approved IEEE 1394 connectors
Required

8.25. Self-powered devices propagate the power bus through each connector
Required

8.26. Only single-port leaf-node devices use 4-pin connectors
Required

8.27. Device connectors exhibit common speed and power characteristics
Required

8.28. Standard S400-rated IEEE 1394 cable is provided with devices
Required

8.29. Devices provide sufficient power to their PHY at appropriate times
Required

8.30. Devices report power source and cable power consumption in Self_id packet
Deleted

8.31. Devices implement link power control
Required

8.32. Device requiring power increments in excess of Link_on implements unit-power CSRs
Required

8.33. Devices that source cable power report this capability
Required

8.34. IEEE 1394-enabled PC sources cable power compliant with IEEE 1394a-1999
Required

8.35. Power source supplies appropriate cable power
Deleted

8.36. Devices notify the power manager of power change requests
Deleted

8.37. Devices and controllers comply with the 1394 Trade Association Power Specification, Part 1: Cable Power Distribution, Rev. 0.98
Required

8.38. Devices and controllers comply with IEEE 1394 power specification
Deleted