FIPS PUB **131**

**FEDERAL INFORMATION
PROCESSING STANDARDS PUBLICATION**

1987 JULY 16

PARTMENT OF COMMERCE/National Bureau of Standards

SMALL COMPUTER SYSTEM
INTERFACE (SCSI)

**CATEGORY: HARDWARE STANDARD
SUBCATEGORY: INTERFACE**

FIPS PUB 131

Foreword

The Federal Information Processing Standards Publication Series of the National Bureau of Standards is the official publication relating to standards, guidelines, and documents adopted and promulgated under the provisions of Public Law 89-306 (Brooks Act) and under Part 6 of Title 15, Code of Federal Regulations. These legislative and executive mandates have given the Secretary of Commerce important responsibilities for improving the utilization and management of computers and automatic data processing in the Federal Government. To carry out the Secretary's responsibilities, the NBS, through its Institute for Computer Sciences and Technology, provides leadership, technical guidance, and coordination of Government efforts in the development of standards, guidelines and documents in these areas.

Comments concerning Federal Information Processing Standards Publications are welcomed and should be addressed to the Director, Institute for Computer Sciences and Technology, National Bureau of Standards, Gaithersburg, MD 20899.

James H. Burrows, *Director*
Institute for Computer Sciences and Technology

Abstract

This standard defines the functional, electrical, and mechanical specifications for an 8-bit parallel bus, suitable for connecting physically small computers to each other and to mass storage peripherals. It also defines the operational specifications (command sets) for the following devices:

 a. Sequential-Access Devices (e.g., magnetic tape)
 b. Direct-Access Devices (e.g., magnetic disks)
 c. Printer Devices
 d. Write-once Read Multiple Devices (e.g., optical disks)
 e. Read-Only Direct-Access Devices (e.g., read only optical disks)
 f. Processor Devices

The Government's intent in employing this standard is to reduce the cost of satisfying its data processing requirements through increasing its available alternative sources of supply for computer system components at the time of initial system acquisition, as well as in system replacement and augmentation and in system component replacement. This standard is also expected to lead to improved reutilization of system components.

Key words: automatic data processing (ADP); computer peripherals; computers; Federal Information Processing Standard (FIPS); input/output; interfaces; magnetic disk; magnetic tape; mass storage interface; optical disk; Small Computer System Interface (SCSI).

**Federal Information
Processing Standards Publication 131**

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1987 July 16

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Announcing the Standard for

SMALL COMPUTER SYSTEM INTERFACE (SCSI)

Federal Information Processing Standards Publications (FIPS PUBS) are issued by the National Bureau of Standards pursuant to section 111 (f) (2) of the Federal Property and Administrative Services Act of 1949, as amended, Public Law 89-306 (79 Stat. 1127), Executive Order 11717 (38 FR 12315, dated May 11, 1973), and Part 6 of Title 15 Code of Federal Regulations (CFR).

1. **Name of Standard.** Small Computer System Interface (SCSI) (FIPS 131).

2. **Category of Standard.** Hardware Standard, Interface.

3. **Explanation.** This standard defines the functional, electrical, and mechanical specifications for an 8-bit parallel bus, suitable for connecting physically small computers to each other and to mass storage peripherals. It also defines the operational specifications (command sets) for the following devices:

   a. Sequential-Access Devices (e.g., magnetic tape)
   b. Direct-Access Devices (e.g., magnetic disks)
   c. Printer Devices
   d. Write-once Read Multiple Devices (e.g., optical disks)
   e. Read-only Direct-Access Devices (e.g., read only optical disks)
   f. Processor Devices.

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4. **Approving Authority.** Secretary of Commerce.

5. **Maintenance Agency.** U.S. Department of Commerce, National Bureau of Standards (Institute for Computer Sciences and Technology).

6. **Cross Index.**

   a. FIPS PUB 60-2, I/O Channel Interface.
   b. FIPS PUB 61-1, Channel Level Power Control Interface.
   c. FIPS PUB 62, Operational Specifications for Magnetic Tape Subsystems.
   d. FIPS PUB 63-1, Operational Specifications for Variable Block Rotating Mass Storage Subsystems.
   e. FIPS PUB 63-1 SUPPLEMENT, Additional Operational Specifications for Variable Block Rotating Mass Storage Subsystems.
   f. FIPS PUB 97, Operational Specifications for Fixed Block Rotating Mass Storage Subsystems.
   g. FIPS PUB 111, Storage Module Interfaces (with extensions for enhanced storage module interfaces).
   h. FIPS PUB 130, Intelligent Peripheral Interface.

7. **Objectives.** The objectives of this standard are to:

   – improve the interchangeability of storage equipment as part of computer systems
   – reduce the cost of computer equipment by increasing alternative sources of supply

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- improve the reutilization of system components
- facilitate the use of advanced technology by the Federal Government.

8. Applicability. This standard addresses the connection of small computers to peripheral devices with integral controllers. This standard is recommended for use in the acquisition of storage peripherals and small computer systems for office or laboratory use.

For the acquisition of magnetic disk subsystems, this standard may be cited as an alternative to specifying FIPS PUB 60 and FIPS PUB 61, and either FIPS PUB 63 or FIPS PUB 97, for those instances when FIPS PUB 60 would apply. This standard may also be cited as an alternative to specifying FIPS PUB 60, FIPS PUB 61, and FIPS PUB 62, for the acquisition of magnetic tape subsystems. In general, FIPS PUB 60 does not apply to most of the small systems using this standard, and the use of this standard is recommended but not required in these cases.

A procuring agency may require vendors to verify that the interface on their products conforms to this standard. Agencies may employ means of verification such as that prescribed for FIPS PUB 60 by the *Federal Register* notice published on December 11, 1979 (44 FR 71444). In special cases, NBS may assist agencies in evaluating conformance to this standard.

9. Specifications. Affixed. This standard shall be specified by American National Standard X3.131-1986.

Electrical Options

There are two incompatible electrical options in the specifications for the SCSI:

- Single-ended

This option is more common and less expensive and should be employed with systems where the peripherals are in very close physical proximity to the computer, preferably on or in the same rack, chassis, or desk top. The maximum length of the single-ended SCSI bus is 6 m. All peripherals and computers connected by a single-ended SCSI bus should be powered from the same branch circuit to avoid potentially unreliable operation caused by common mode noise.

- Differential

This option is recommended for use in electrically noisy environments, such as factories or laboratories, wherever peripherals and computers are separated by more than a few meters, and wherever it is possible that peripherals and computers may be powered from different branch circuits. The differential option is more tolerant of the effects of common mode noise and allows bus lengths of up to 25 m.

Bus Parity

It is recommended that agencies acquiring ADP equipment using the SCSI require implementation of bus parity.

Subsystems

Many vendors offer complete add-in storage subsystems using the SCSI for various personal and minicomputer systems. Such subsystems typically consist of:

a. An enclosure containing a power supply, one or more device controllers, and one or more Winchester disk or streaming tape drives.
b. A host adaptor which adapts the backplane bus of the host computer to the SCSI bus. This usually plugs into an expansion slot in the host computer.
c. A cable connecting the host adaptor to the subsystem.
d. A driver program which talks to the peripheral subsystem through the host adaptor. This driver frequently is included on read-only memory chips on the host adaptor.

There is no generally accepted standard for the interface between the computer and the host adaptor, and the driver program will be specific to a particular host adaptor. Moreover, many small computers support several operating systems; in general each operating system will require different driver software. The SCSI command sets offer a rich array of functionality and options. For this reason there is no guarantee that a driver program for direct-access device A will necessarily be able to properly operate direct-access device B, which implements a different set of options. It is usually possible, however, except in the case of emulating host adaptors (see below), for a knowledgeable user to write a driver program which can operate device B (usually by minor modification to the driver for A) if its source program is available. It is possible to write a driver which operates a wide range of SCSI products; however, such a driver may not take advantage of many optional features or may be quite complex.

There are two kinds of host adaptors: emulating or non-emulating. The emulating host adaptors are less common. They emulate a native peripheral controller of the host system, and do not, therefore require a special driver program. The host adaptor itself typically contains a microcomputer which translates native host system commands to SCSI bus commands. In general, such host adaptors are intended for particular SCSI peripheral products, and there is no user accessible driver program; therefore, it may be difficult to adapt such host adaptors to new SCSI peripheral subsystems.

Bus Arbitration Option

Both host adaptors and peripheral subsystems may or may not implement the bus arbitration option. A few older products may be incompatible with SCSI devices which do arbitrate. While there is no practical advantage to arbitration in many configurations where the SCSI is used to add an external disk drive to a personal computer, agencies may wish to require that all SCSI subsystems and host adaptors operate correctly with other arbitrating bus devices. With higher performance multi-programming systems, where several storage devices may share the SCSI bus, there can be considerable performance gains when storage devices disconnect from the bus during long access delays, and this requires that bus arbitration be implemented. If two or more host computers are to share a SCSI bus, then the bus arbitration capability is required of both.

Levels of Conformance

Appendix E of X3.131-1986 contains recommendations on specifying levels of conformance to the Small Computer System Interface Standard. Three levels of conformance are specified.

- *Level 0* is the most basic level of conformance, and products conforming to level 0 may be incompatible with bus arbitration. These devices are suitable for use with simple, single-user personal computer systems.
- *Level 1* devices are similar to level 0, but host adaptors support arbitration.
- *Level 2* host adaptors support arbitration and other features which are desirable for performance reasons, while peripherals support all Extended commands, which enhance the functionality of devices.

In general, with current SCSI protocol integrated circuits, most of the bus hardware required for conformance level 2 is available at no extra cost; however, controller microcode and driver software requirements for conformance level 2 are more complex, and this may reasonably be reflected in the prices of products conforming to level 2. In addition, devices conforming to level 2 are likely to offer a higher general performance level, and this too may be reflected in their prices. It is nevertheless expected that nearly all newly designed SCSI products will conform to level 2, and current products conforming only to levels 0 and 1 will in time be supplanted by products conforming to level 2.

It is recommended that agencies procuring products using SCSI require conformance level 2 whenever:

a. The products are to be used in multi-user time sharing systems;
b. The products are to be used in a shared bus multi-processor system;
c. The products are to be used in any other high performance system;
d. The products may be used with a wide range of systems; or
e. Maximum compatibility with future products is needed.

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Cables and Connectors

Many SCSI storage products, particularly those intended for use as personal computer add-ons, are suitable for use only on the end of a SCSI bus. That is they have only one external connector with no provision for extending the bus through the storage subsystem, and provide internal bus termination. For electrical reasons the bus should be appropriately terminated at its end. Agencies intending to attach several subsystems to one SCSI bus (which supports up to eight bus devices, including host adaptors) should require that subsystems pass the bus through the enclosure and provide two external connectors, one of which is equipped with a removable terminator block. Note that, when calculating actual bus length, the bus length inside enclosures (but not stubs off the bus), should be included. Host adaptors frequently must reside at one or the other end of the SCSI bus.

The SCSI bus uses 18 signals, plus optional Terminator Power. Three kinds of 50 conductor bus connectors are provided for in the SCSI standard. One unshielded circuit card type connector is specified in the body of the standard, while two recommended shielded cable connectors are described in Appendix D. The non-shielded device and cable connectors are normally employed to run as unshielded flat ribbon bus cable between circuit cards in a single shielding enclosure. Users are cautioned that the external use of an un-shielded cable between enclosures may result in a violation of FCC Regulations, Part 15, Subpart J, governing radio frequency radiation by computer equipment in the United States, and is generally unsound practice.

Two shielded connectors are described in Appendix D. Some products do not use either of these connectors with external cables. This may be for size reasons; i.e., there may not physically be space for the standard connectors.

In differential implementations, two separate conductors (preferably twisted pairs) are required per signal, plus a path for DIFFSENS (a signal which can be used to disable differential drivers if they are inadvertently plugged in a single-ended bus) and two paths for Terminator Power. No electrical compromise need be involved in reducing the number of paths identified as Ground in the SCSI standard.

In single-ended buses a total of 30 conductive paths are assigned to ground. Conservative design rules, followed by the SCSI standard, require that signal paths be separated by ground paths. This would imply a minimum 38 pin connector. Some products with limited room for connectors employ the common but nonstandard 25 pin subminiature D connector, allowing only 6 ground paths. Satisfactory operation may be achieved in such systems provided bus lengths are kept short and equipments are powered from a common outlet. With systems or subsystems using smaller, nonstandard connectors, Federal users are cautioned against substituting longer cables than those supplied by the vendor.

Special "T" tap external connectors are available allowing the SCSI bus to continue past products supporting only one external connector. Their use by Federal users is not recommended. The length of bus inside the enclosure may exceed the .1 m (single-ended) or .2 m (differential) maximum stub length allowed by the standard, causing unreliable bus operation.

Data Transfer Modes

Two data transfer modes, "asynchronous" and "synchronous," are defined in the standard. Most products use the asynchronous mode and all are capable of doing so. Each asynchronous transfer cycle uses a fully interlocked handshake which requires four signal propagation delays between the two SCSI ports. Where the bus length is short, on the order of 1 or 2 m, the asynchronous transfer can be as fast as the synchronous mode, however, at the maximum specified differential mode bus length of 25 m, signal propagation delays will limit the bus to a maximum transfer rate of about 1 Mbyte/sec. Synchronous mode transfers can achieve rates of 3 to 4 Mbytes/sec. across a 25 m bus. Only a few high performance storage products offer synchronous transfers and very few host adaptors can support them. More products are expected as the SCSI protocol integrated circuits supporting synchronous transfer become available.

The single-ended bus is limited to 6 m for electrical reasons. While RS-485 compatible differential drivers are able to drive lines considerably longer than the specified limit of 25 m, this 25 m constraint is due to the timings chosen for the distributed arbitration algorithm used for the SCSI. If the bus is used as a point-to-point connection between a host and one peripheral without arbitration, then operation at distances well over 25 m are possible, and fairly high transfer rates can be achieved with the synchronous transfer option.

10. Implementation. This standard is effective December 16, 1987. Agencies may use this standard prior to the effective date if they choose to do so. All equipment which is within the scope of the Applicability provision of FIPS PUB 60, and which is ordered on or after the effective date of this standard, or procurement actions for which solicitation documents have not been issued by that date, must conform to the provisions of this standard or to FIPS PUB 60 plus associated power control and operational specification standard, or to any other permitted alternative to FIPS PUB 60, unless a waiver has been granted in accordance with the procedure described elsewhere in this publication.

11. Waivers. Since this standard is an alternative to FIPS PUB 60, plus associated power control and operational specification standards, waiver procedures for this standard shall be as designated in FIPS PUB 60. Waivers of this standard are not required where FIPS PUB 60 does not apply. Any waiver of FIPS PUB 60 also is a waiver of this standard.

12. Where to Obtain Copies. Copies of this publication are for sale by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161. (Sale of the included specifications document is by arrangement with the American National Standards Institute.) When ordering, refer to Federal Information Processing Standards Publication 131 (FIPSPUB131), and title. Payment may be made by check, money order, purchase order, credit card, or deposit account.

NBS *Technical Publications*

Periodical

Journal of Research—The Journal of Research of the National Bureau of Standards reports NBS research and development in those disciplines of the physical and engineering sciences in which the Bureau is active. These include physics, chemistry, engineering, mathematics, and computer sciences. Papers cover a broad range of subjects, with major emphasis on measurement methodology and the basic technology underlying standardization. Also included from time to time are survey articles on topics closely related to the Bureau's technical and scientific programs. Issued six times a year.

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NOTE: The Journal of Physical and Chemical Reference Data (JPCRD) is published quarterly for NBS by the American Chemical Society (ACS) and the American Institute of Physics (AIP). Subscriptions, reprints, and supplements are available from ACS, 1155 Sixteenth St., NW, Washington, DC 20056.

Building Science Series—Disseminates technical information developed at the Bureau on building materials, components, systems, and whole structures. The series presents research results, test methods, and performance criteria related to the structural and environmental functions and the durability and safety characteristics of building elements and systems.

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Voluntary Product Standards—Developed under procedures published by the Department of Commerce in Part 10, Title 15, of the Code of Federal Regulations. The standards establish nationally recognized requirements for products, and provide all concerned interests with a basis for common understanding of the characteristics of the products. NBS administers this program as a supplement to the activities of the private sector standardizing organizations.

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Order the above *NBS publications from: Superintendent of Documents, Government Printing Office, Washington, DC 20402.*
Order the following *NBS publications—FIPS and NBSIR's—from the National Technical Information Service, Springfield, VA 22161.*

Federal Information Processing Standards Publications (FIPS PUB)—Publications in this series collectively constitute the Federal Information Processing Standards Register. The Register serves as the official source of information in the Federal Government regarding standards issued by NBS pursuant to the Federal Property and Administrative Services Act of 1949 as amended, Public Law 89-306 (79 Stat. 1127), and as implemented by Executive Order 11717 (38 FR 12315, dated May 11, 1973) and Part 6 of Title 15 CFR (Code of Federal Regulations).

NBS Interagency Reports (NBSIR)—A special series of interim or final reports on work performed by NBS for outside sponsors (both government and non-government). In general, initial distribution is handled by the sponsor; public distribution is by the National Technical Information Service, Springfield, VA 22161, in paper copy or microfiche form.

U.S. DEPARTMENT OF COMMERCE
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

CHANGE NUMBER	2 - FIPS 60-2 & 62
	1-FIPS 61-1,63-1,97,111,130&131
DATE OF CHANGE	
	1990 December 26
FIPS PUBLICATION NUMBER	
	See above.

FIPS PUBLICATION CHANGE NOTICE

PUBLICATION TITLE FIPS 60-2, I/O Channel Interface; 62, Operational Specifications for Magnetic Tape Subsystems; 61-1, Channel Level Power Control Interface; 63-1, Operational Specifications for Variable Block Rotating Mass Storage Subsystems; 97, Operational Specifications for Fixed Block Rotating Mass Storage Subsystems; 111, Storage Module Interfaces (w/extens. for enhanced storage module interface); 130, Intelligent Peripheral Interface (IPI); 131, Small Computer System Interface (SCSI).

THIS OFFICE HAS A RECORD OF YOUR INTEREST IN RECEIVING CHANGES TO THE ABOVE FIPS PUBLICATION. THE CHANGE(S) INDICATED BELOW HAVE BEEN PROVIDED BY THE MAINTENANCE AGENCY FOR THIS PUBLICATION AND WILL BE INCLUDED IN THE NEXT PUBLISHED REVISION TO THIS FIPS PUBLICATION. QUESTIONS OR REQUESTS FOR ADDITIONAL INFORMATION SHOULD BE ADDRESSED TO THE MAINTENANCE AGENCY:

Department of Commerce
National Institute of Standards and Technology
National Computer Systems Laboratory
Gaithersburg, MD 20899

CHANGE ITEM(S)

Attached is a reprint from the December 18, 1990, FEDERAL REGISTER (55 FR 51941) which provides approved revisions by the Secretary of Commerce to the FIPS family of input/output interface standards, and the approved discontinuation of the Exclusion and Verification Lists for these standards.

These approved revisions became effective on December 18, 1990, and become an integral part of FIPS 60-2, 61-1, 62, 63-1, 97, 111, 130 and 131, and, as such, are considered to be included whenever reference is made to them.

These approved revisions should be filed with each FIPS listed above.

Attachment

Copies of FIPS are available from:

National Technical Information Service (NTIS)
ATTN: Sales Office, Sills Building
5285 Port Royal Road
Springfield, Virginia 22161

Phone - 703/487-4650 Office Hours - 7:45 a.m. to 4:15 p.m.

federal register

National Institute of Standards and Technology
NOTICES
Information processing standards, Federal:
  Family of input/output interface standards, 51941

National Institute of Standards and Technology

[Docket No. 900101-0219]

RIN 0693-AA59

Approval of Revisions to Federal Information Processing Standards (FIPS) Family of Input/Output Interface Standards

AGENCY: National Institute of Standards and Technology (NIST), Commerce.
ACTION: The purpose of this notice is to announce that the Secretary of Commerce has approved revisions to the Federal Information Processing Standards (FIPS) family of input/output interface standards, and has approved discontinuation of the exclusion and verification lists for these standards.

SUMMARY: On March 20, 1990, notice was published in the Federal Register (55 FR 10272) proposing revision of Federal Information Processing Standards (FIPS) 60-2, 61-1, 62, 63-1, 97, 111, 130, and 131 to make them non-mandatory, and discontinue the exclusion and verification lists for these standards. This proposal superseded the proposal for revision of these standards announced in the Federal Register (52 FR 44462) of November 19, 1987. Procedures for the Exclusion List for FIPS 60, 61, 62, 63, and 97 were published in the Federal Register on

September 3, 1982 (47 FR 38959–38960). Procedures for the Verification List for FIPS 60, 61, 62, 63, and 97 were published in the **Federal Register** on December 11, 1979 (44 FR 71444–71445) and on April 7, 1981 (46 FR 20719–20720).

The written comments submitted by interested parties and other material available to the Department relevant to these proposed revisions were reviewed by NIST. On the basis of this review, NIST recommended that the Secretary approve revisions to the input/output family of standards and approve discontinuation of the exclusion and verification lists for these standards. NIST prepared a detailed justification document for the Secretary's review in support of those recommendations.

This notice provides only the changes to the revised standards.

EFFECTIVE DATE: These revisions are effective December 18, 1990.

ADDRESSES: Interested parties may obtain copies of FIPS PUBS 60–2, 61–1, 62, 63–1, 97, 111, 130, and 131 from the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

FOR FURTHER INFORMATION CONTACT: Ms. Shirley Radack, National Institute of Standards and Technology, Gaithersburg, MD 20899, telephone (301) 975–2833.

SUPPLEMENTARY INFORMATION: Under the provisions of 40 U.S.C. 759(d), the Secretary of Commerce is authorized to promulgate standards and guidelines for Federal computer systems, and to make such standards compulsory and binding to the extent to which the Secretary determines necessary to improve the efficiency of operation, or security and privacy of Federal computer systems.

The family of I/O interface standards currently includes:

a. FIPS 60–2, I/O Channel Interface, revised July 29, 1983.

b. FIPS 61–1, Channel Level Power Control Interface, revised July 13, 1982.

c. FIPS 62, Operational Specifications for Magnetic Tape Subsystems, revised December 30, 1980.

d. FIPS 63–1, Operational Specifications for Variable Block Rotating Mass Storage Subsystems, revised April 14, 1983; Supplement to FIPS PUB. 63–1, Additional Operational Specifications for Variable Block Rotating Mass Storage Subsystems, April 14, 1983.

e. FIPS 97, Operational Specifications for Fixed Block Rotating Mass Storage Subsystems, February 4, 1983.

f. FIPS 111, Storage Module Interfaces (with extensions for enhanced storage module interfaces), April 18, 1985.

g. FIPS 130, Intelligent Peripheral Interface (IPI), July 16, 1987.

h. FIPS 131, Small Computer System Interface (SCSI) July 16, 1987.

The following revisions are being made effective immediately upon publication. A delayed effective date is not required because these standards are exempt from the Administrative Procedure Act by U.S.C. 553(a)(2).

Revisions to Federal Information Processing Standards 60–2, 61–1, 62, 63–1, 97, 111, 130, and 131.

FIPS 60–2, I/O Channel Interface, is revised as follows:

Applicability. This standard addresses the interconnection of computer peripheral equipment as a part of ADP systems for the following types of peripherals: (1) Magnetic tape equipment employing open reel-to-reel magnetic tape storage devices, specifically excluding magnetic tape cassette and tape cartridge storage devices, (2) magnetic disk storage equipment employing disk drives each having a capacity greater than 7 megabytes per storage module, excluding flexible disk and disk cartridge devices having a smaller storage capacity per device, and (3) other peripheral equipment employing peripheral device types for which operational specifications standards have been issued as Federal Information Processing Standards. This standard is recommended for use in the acquisition of peripheral equipment for ADP systems with input/output channel interfaces as specified in the technical specifications, when it is determined that interchange of equipment between different systems is likely.

Implementation. The original version of this standard became effective December 13, 1979. The first revision became effective June 23, 1980, and the second revision became effective July 29, 1983. This revision becomes effective December 18, 1990.

Waivers. This standard is nonmandatory. No waivers are required.

FIPS 61–1, Channel Level Power Control Interface, is revised as follows:

Applicability. This standard addresses the power control interface in connecting computer peripheral equipment to ADP systems. It is recommended for use when FIPS 60–2 is used, when it is determined that interchange of equipment between different systems is likely.

Implementation. The original version of this standard became effective June 23, 1980, and the first revision became effective July 13, 1982. This revision becomes effective December 18, 1990.

Waivers. This standard is nonmandatory. No waivers are required.

FIPS 62, Operational Specifications for Magnetic Tape Subsystems, is revised as follows:

Applicability. This standard addresses magnetic tape equipment connected to ADP systems through FIPS 60 interfaces. It is recommended for use in the acquisition of such equipment, when it is determined that interchange of equipment between different systems is likely.

Implementation. The original version of this standard became effective June 23, 1980. This revision becomes effective December 18, 1990.

Waivers. This standard is nonmandatory. No waivers are required.

FIPS 63–1, Operational Specifications for Variable Block Rotating Mass Storage Subsystems, is revised as follows:

Applicability. This standard addresses peripheral device dependent operational interfaces for connecting variable block rotating mass storage equipment to ADP systems through FIPS 60 interfaces. It is recommended for use in the acquisition of such variable block rotating mass storage equipment for connection to ADP systems, when it is determined that interchange of equipment between different systems is likely.

Implementation. This standard became effective June 23, 1980, and the first revision became effective April 14, 1983. This revision becomes effective December 18, 1990.

Waivers. This standard is nonmandatory. No waivers are required.

FIPS 97, Operational Specifications for Fixed Block Rotating Mass Storage Subsystems, is revised as follows:

Applicability. This standard addresses the peripheral device dependent operational interface specifications for connecting fixed block rotating mass storage equipment to ADP systems through FIPS 60 interfaces. It is recommended for use in the acquisition of such fixed block rotating mass storage equipment for connection to ADP systems, when it is determined that interchange of equipment between different systems is likely.

Implementation. The original version of this standard became effective February 4, 1983. This revision becomes effective December 18, 1990.

Waivers. This standard is nonmandatory. No waivers are required.

FIPS 111, Storage Module Interfaces, is revised as follows:

Applicability. This standard addresses connection of a disk drive to a controller as part of an ADP system. This standard is recommended for use in the acquisition of disk systems that are

connected to small and medium sized computer systems, when it is determined that interchange of equipment between different systems is likely.

Implementation. This standard became effective May 18, 1985. This revision becomes effective December 18, 1990.

Waivers. This standard is non-mandatory. No waivers are required.

FIPS 130, Intelligent Peripheral Interface (IPI), is revised as follows:

Section 8, Applicability. This standard applies to the connection of computers to storage peripheral device controllers. This standard is recommended for use in the acquisition of magnetic disk drives, optical disk drives, and tape drives to be connected to minicomputer systems, when it is determined that interchange of equipment between different systems is likely.

Section 10, Implementation. This standard became effective December 16, 1987. This revision becomes effective December 18, 1990.

Section 11, Waivers. This standard is non-mandatory. No waivers are required.

FIPS 131, Small Computer System Interface (SCSI) is revised as follows:

Section 8, Applicability. This standard addresses the connection of small computers to peripheral devices with integral controllers. This standard is recommended for use in the acquisition of storage peripherals and small computer systems for office or laboratory use, when it is determined that interchange of equipment between different systems is likely.

Section 10, Implementation. This standard became effective December 16, 1987. This revision becomes effective December 18, 1990.

Section 11, Waivers. This standard is non-mandatory. No waivers are required.

Dated: December 12, 1990.

John W. Lyons,
Director.

[FR Doc. 90-29563 Filed 12-17-90; 8:45 am]
BILLING CODE 3510-CN-M