



FIPS PUB 111

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1985 April 18

U.S. DEPARTMENT OF COMMERCE/National Bureau of Standards



STORAGE MODULE INTERFACES (with extensions for enhanced storage module interfaces)

FIPS PUB 111

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1985

CATEGORY: HARDWARE STANDARD

SUBCATEGORY: INTERFACE

U.S. DEPARTMENT OF COMMERCE, Malcolm Baldrige, Secretary
NATIONAL BUREAU OF STANDARDS, Ernest Ambler, Director

Foreword

The Federal Information Processing Standards Publication Series of the National Bureau of Standards is the official publication relating to standards 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 guidelines and standards 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 Federal Information Processing Standard (FIPS) specifies the functional, electrical and mechanical properties of a "device level" interface between a magnetic disk drive and its controller. The Storage Module or "SMD" interface is very widely used in commerce, and this FIPS may be used to assist procuring agencies in the specification of interchangeable commodity magnetic disk drives and controllers. This FIPS adopts American National Standard, X3.91M-1982, "Storage Module Interfaces."

Key words: device interface; disk controller; Federal Information Processing Standard; magnetic disk; magnetic disk interface; SMD; Storage Module.

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 111 (FIPSPUB111), and title. Payment may be made by check, money order, purchase order, credit card, or deposit account.

Natl. Bur. Stand. (U.S.) Fed. Info. Process. Stand. Publ. (FIPS PUB) 111, 2 pages
(1985)

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For sale by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.



**Federal Information
Processing Standards Publication 111**

1985 April 18



Announcing the Standard for

**STORAGE MODULE INTERFACES
(with extensions for enhanced storage module interfaces)**

Federal Information Processing Standards Publications 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).

Name of Standard: Storage Module Interfaces (with extensions for enhanced storage module interfaces) (FIPS PUB 111).

Category of Standard: Hardware Standard, Interface.

Explanation: The Storage Module Drive (SMD) interface is an interface between a disk device and its controller which is widely used in disk subsystems that are employed with small to medium sized computer systems. (By contrast, the FIPS 60 type interface employed in large systems defines the interconnection between a peripheral controller and the I/O channel of a central processing unit.) These smaller sized computer systems are generally excluded from the provisions of FIPS 60, 61, 63, and 97. An American National Standard (ANS) for the SMD interface, entitled Storage Module Interfaces, has been approved by the American National Standards Institute as X3.91M-1982. Since the approval of this standard, a number of new SMD magnetic disk products have been introduced which use recording rates and storage densities much higher than were available when the standard was developed. Since the SMD interface is a device level interface, these newer storage products, with greatly improved capacities and performance, cannot conform to all the provisions of X3.91M-1982. However, with the extensions and modifications specified in the FIPS, higher performance products as well as the older SMD products which do conform to X3.91M-1982, may be competitively procured. These newer products, often referred to as Enhanced SMD disk drives, have recording rates of between 15 and 24 Mbits/s. While SMD drives have been traditionally used with minicomputers, many of the newer high performance drives are suitable for use with larger main frame computer systems. A very large and competitive marketplace exists for SMD and enhanced SMD drives and controllers with numerous suppliers. Federal users may therefore wish to employ SMD or Enhanced SMD type drives in main frame computer applications where FIPS 60 type interfaces have previously been required, and may, in some cases, realize significant savings by doing so. In other cases, where FIPS 60 has not been required, significant savings may still be realized.

The Government's intent in employing this standard prescribing the Storage Module Interfaces Standard is to reduce the cost of satisfying its data processing requirements through increasing its available alternative sources of supply for computer systems 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. When acquiring ADP systems and system components, Federal agencies may cite this standard as an alternative to specifying FIPS 60. Consideration should also be given to specifying this standard as the interface to be employed for connecting storage module devices as part of ADP systems, where FIPS 60 does not apply.

Approving Authority: Secretary of Commerce.

Maintenance Agency: Department of Commerce, National Bureau of Standards (Institute for Computer Sciences and Technology).

Cross Index: American National Standard X3.91M-1982, Enhanced Storage Module Interfaces.

Applicability: This standard addresses connection of a disk drive to a controller as part of an ADP system. For acquisition of magnetic disk drives or magnetic disk subsystems, this standard may be cited as an alternative to specifying the FIPS 60 channel level interface and FIPS 61, plus either FIPS 63 or FIPS 97 for those instances when FIPS 60 would otherwise be applicable. If FIPS 60 does not apply, consideration of this standard is recommended.

A procuring agency may require vendors to verify that the interface on their products conforms to this standard. In special cases, NBS may assist agencies in evaluating conformance to the SMD interface.

Specifications: Affixed. This standard shall be specified by ANSI X3.91M-1982, sections 1 through 5. Section 6, Interface Extensions, of ANSI X3.91M-1982 shall not be considered a part of this standard.

In addition, to permit the use of new higher performance and capacity "enhanced" drives than were contemplated in X3.91M-1982, the following extensions and modifications to X3.91M-1982 shall apply:

- a) Many new products exceed the maximum cylinder address space of 1024 cylinders. Such products may utilize either of two modes of extending addressing:
 - 1) While TAG 2 is asserted, BUS 7 shall signify 2^{10} cylinders, BUS 8 shall signify 2^{11} cylinders and BUS 9 shall signify 2^{12} cylinders, or
 - 2) TAG 4 shall signify 2^{10} cylinders, while TAG 1 is asserted.
- b) Drives which exceed a transfer rate of 10 Mbits/s need not observe the minimum setup and hold times specified in Figures 20 and 21, titled READ CLOCK and READ DATA, and WRITE CLOCK and WRITE DATA respectively, since these minimums are fundamentally inconsistent with higher transfer rates.
- c) To allow for higher performance drives, the minimum timing requirements of 5.8.3 HEAD SET to READ GATE, 5.8.4 WRITE GATE to READ GATE, 5.10.3 HEAD SET to READ ADDRESS MARK and 5.10.4 WRITE GATE to READ ADDRESS MARK need not be observed.
- d) To allow for higher performance drives, the 500 ns minimum timing requirements of 5.9.4 READ GATE to WRITE GATE need not be observed.
- e) A number of new products provide diagnostic status information which is not contemplated in X3.91M-1982. Drives may employ UNIT READY, ON CYLINDER, SEEK ERROR, FAULT, WRITE PROTECT, ADDRESS MARK, SECTOR MARK, all sourced by the drive, for additional status reporting when SELECT, and various other signals are asserted by the controller.

Note that these changes do not restrict the use of older, "unenanced" SMD drives. A revision of ANS X3.91M is in progress. When it is published, it is anticipated that this Federal Information Processing Standard will be revised to adopt the revised ANS.

Implementation: The provisions of this standard become effective May 18, 1985.

All equipment which is within the scope of the Applicability provision of FIPS 60, and which is ordered on or after the effective date of this SMD standard, or procurement actions for which solicitation documents have not been issued by that date, must conform to the provisions of this SMD standard or to FIPS 60 plus associated power control and operational specifications standards, or to any other permitted alternative to FIPS 60, unless a waiver has been granted in accordance with the procedure described elsewhere in this publication.

Regulations concerning the specific use of this standard in Federal procurement will be issued by the General Services Administration to be a part of the Federal Information Resources Management Regulations.

This standard shall be reviewed by NBS within 3 years after its date of issue, taking into account technological trends and other factors, to determine whether the standard should be affirmed, revised, or withdrawn.

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

FIPS PUBLICATION CHANGE NOTICE

DATE OF CHANGE
1990 December 26

FIPS PUBLICATION NUMBER
See above.

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.

Tuesday
December 18, 1990

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

51941
FIPS
60-2
61-1
62
63-1
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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, 83, 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 18, 1987.

h. FIPS 131, Small Computer System Interface (SCSI) July 18, 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 non-mandatory. 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 non-mandatory. 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 non-mandatory. 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 non-mandatory. 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 non-mandatory. 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

