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**FIPS PUB 159**

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**FEDERAL INFORMATION PROCESSING STANDARDS PUBLICATION**  
(Supersedes former draft Federal Standard 1070)

**DETAIL SPECIFICATION FOR 62.5- $\mu$ m CORE  
DIAMETER/125- $\mu$ m CLADDING DIAMETER  
CLASS IA MULTIMODE, GRADED-INDEX  
OPTICAL WAVEGUIDE FIBERS**

**CATEGORY: COMPUTER-RELATED TELECOMMUNICATIONS STANDARD**

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# DETAIL SPECIFICATION FOR 62.5- $\mu$ m CORE DIAMETER/125- $\mu$ m CLADDING DIAMETER CLASS IA MULTIMODE, GRADED-INDEX OPTICAL WAVEGUIDE FIBERS

**CATEGORY: COMPUTER-RELATED TELECOMMUNICATIONS STANDARD**

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Issued December 27, 1990



U.S. Department of Commerce  
Robert A. Mosbacher, Secretary  
National Institute of Standards  
and Technology  
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## Foreword

The Federal Information Processing Standards Publication Series of the National Institute of Standards and Technology (NIST) is the official publication relating to standards and guidelines adopted and promulgated under the provisions of Section 111(d) of the Federal Property and Administrative Services Act of 1949 as amended by the Computer Security Act of 1987, Public Law 100-235. These mandates have given the Secretary of Commerce and NIST important responsibilities for improving the utilization and management of computer and related telecommunications systems in the Federal Government. The NIST through its Computer Systems Laboratory provides leadership, technical guidance, and coordination of Government efforts in the development of standards and guidelines in these areas.

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

James H. Burrows, Director  
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## Abstract

This standard, by adoption of American National Standard/EIA/TIA-492AAAA-1989, defines the optical, geometrical, environmental, and mechanical specifications for glass (EIA/TIA-458-A-1984 Class Ia) multimode optical waveguide fibers. Minimum acceptable values for all characteristics are given, and applicable industry standards for their measurement are referenced. This standard supersedes former draft Federal Standard (FED-STD) 1070 in its entirety.

Key words: communication systems; Federal Information Processing Standard; fibers; multimode optical fiber waveguides; telecommunications.

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Announcing the Standard for

**DETAIL SPECIFICATION FOR 62.5- $\mu$ m CORE DIAMETER/125- $\mu$ m CLADDING  
DIAMETER CLASS 1A MULTIMODE, GRADED-INDEX OPTICAL  
WAVEGUIDE FIBERS**

Federal Information Processing Standards Publications (FIPS PUBS) are issued by the National Institute of Standards and Technology (NIST) after approval by the Secretary of Commerce pursuant to Section 111(d) of the Federal Property and Administrative Services Act of 1949 as amended by the Computer Security Act of 1987, Public Law 100-235.

**1. Name of Standard.** Detail Specification for 62.5- $\mu$ m Core Diameter/125- $\mu$ m Cladding Diameter Class 1a Multimode, Graded-Index Optical Waveguide Fibers (FIPS PUB 159) (Former Draft Federal Standard 1070).

**2. Category.** Computer-Related Telecommunications Standard.

**3. Explanation.** This standard, by adoption of American National Standard/EIA/TIA-492AAAA-1989, defines the optical, geometrical, environmental, and mechanical specifications for glass (EIA/TIA-458-A-1984 Class 1a) multimode optical waveguide fibers. Minimum acceptable values for all characteristics are given, and applicable industry standards for their measurement are referenced.

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

**5. Maintenance Agency.** National Communications System, Office of Technology and Standards.

**6. Related Documents.**

- a. EIA/TIA-458-A-1984, Optical Waveguide Fiber Material Classes and Preferred Sizes.
- b. EIA/TIA-472-Series.
- c. EIA/TIA-455-Series.

**7. Objectives.** The purpose of this standard is to facilitate interoperability among telecommunication facilities and systems of the Federal Government and compatibility of these facilities and systems at the computer-communications interface with data processing equipment (systems) of the Federal Government by specifying standard characteristics for multimode optical fiber waveguides (hereafter referred to as "fibers") for use in electro-optical communication systems applications.

**8. Applicability.** American National Standard/EIA/TIA-492AAAA-1989 shall be used by all departments and agencies of the Federal Government in the planning, design, and procurement, including lease and purchase, of all new communication systems that utilize multimode optical fiber. (Specific exceptions are the use of multimode fiber [a] in the DoD tactical arena and [b] in certain secure systems design, where, in both cases, other fiber sizes have been specified and qualified.) Primary applications include, but are not limited to, on-premises inter- and intrabuilding systems. This includes both the "wiring" of new buildings and the upgrading of existing plant. The standard is not intended to hasten the obsolescence of equipment currently existing in the Federal inventory; nor is it intended to provide systems engineering or applications guidelines.

**9. Specifications.** American National Standard/EIA/TIA-492AAAA-1989, Detail Specification for 62.5- $\mu$ m Core Diameter/125- $\mu$ m Cladding Diameter Class 1a Multimode, Graded-Index Optical Waveguide Fibers.

**10. Implementation.** This standard is effective July 1, 1991.

a. *General.* Adherence to a standard that specifies a single fiber size contributes to the economic and efficient use of resources by avoiding proliferation of local or vendor-unique standards, and is necessary to facilitate development of interoperable optical fiber communication systems and the associated components such as cables, connectors, and couplers, as well as light sources and detectors. Specification of minimum acceptable values for other basic performance parameters provides assistance to the user in multivendor procurement. For the user requiring state-of-the-art systems performance, these values may serve as benchmarks for use in cost/performance analyses when evaluating fibers whose specifications exceed those of this standard.

b. *Specified Fiber Characteristics.* The requirements of this standard are those values and inspection requirements specified in American National Standard/EIA/TIA-492AAAA-1989, "Detail Specification for 62.5- $\mu$ m Core Diameter/125- $\mu$ m Cladding Diameter Class Ia Multimode, Graded-Index Optical Waveguide Fibers." Minimum acceptable values, applicable standards for their measurement, and Qualification Approval/Quality Conformance Inspection Performance Testing requirements are summarized in tables I and II of that standard. The referenced measurement standards are EIA/TIA-adopted Fiber Optic Test Procedures (FOTPs), which are subsets of EIA/TIA-455, "Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Connecting and Terminating Devices."

c. *Graded Parameters and the EIA/TIA Detailed Specification Extension.* Three parameters specified in American National Standard/EIA/TIA-492AAAA-1989 are designated graded parameters: Two primary performance parameters (Attenuation Coefficient and Information Transmission Capacity, or bandwidth-length product) and Length. For these three attributes, a range of permissible values is given, comprising a "shopping list" permitting performance/cost tradeoff analyses for individual procurements. The user *must*, however, give specific acceptable values for each individual procurement—or accept the probability of receiving the lowest performance allowable within the graded range.

**11. Conflict with Referenced Documents.** Where the requirements stated in this document conflict with any requirements in a referenced document, the requirements of this standard shall apply. The nature of the conflict between this standard and a referenced document shall be submitted in duplicate to the Director, Computer Systems Laboratory, Technology Building, Room B-154, National Institute of Standards and Technology, Gaithersburg, MD 20899.

**12. Waivers.** Under certain exceptional circumstances, the heads of Federal departments and agencies may approve waivers to Federal Information Processing Standards (FIPS). The head of such agency may redelegate such authority only to a senior official designated pursuant to section 3506(b) of Title 44, U.S. Code. Waivers shall be granted only when:

- a. Compliance with a standard would adversely affect the accomplishment of the mission of an operator of a Federal computer system, or
- b. Cause a major adverse financial impact on the operator which is not offset by Government-wide savings.

Agency heads may act upon a written waiver request containing the information detailed above. Agency heads may also act without a written waiver request when they determine that conditions for meeting the standard cannot be met. Agency heads may approve waivers only by a written decision which explains the basis on which the agency head made the required finding(s). A copy of each such decision, with procurement sensitive or classified portions clearly identified, shall be sent to: National Institute of Standards and Technology, ATTN: FIPS Waiver Decisions, Technology Building, Room B-154, Gaithersburg, MD 20899.

In addition, notice of each waiver granted and each delegation of authority to approve waivers shall be sent promptly to the Committee on Government Operations of the House of Representatives and the Committee on Governmental Affairs of the Senate and shall be published promptly in the *Federal Register*.

When the determination on a waiver applies to the procurement of equipment and/or services, a notice of the waiver determination must be published in the *Commerce Business Daily* as a part of the notice of solicitation for offers of an acquisition or, if the waiver determination is made after that notice is published, by amendment to such notice.

A copy of the waiver, any supporting documents, the document approving the waiver and any supporting and accompanying documents, with such deletions as the agency is authorized and decides to make under 5 U.S.C. Sec. 552(b), shall be part of the procurement documentation and retained by the agency.

**13. Special Information.** This document provides Federal departments and agencies with standardized procurement specifications for multimode optical fibers targeted toward (but not limited to) on-premises applications, i.e., for use within buildings and building campuses, including local area network- and PBX-type systems, where optical fiber transmission is selected.

Restriction of these specifications to glass, graded-index, multimode fibers is deliberate; the technologies represented by multivendor commercial availability of such fibers have matured to the point where standardization is technologically feasible. This standardization will facilitate systems compatibility and transportability of terminals for Federal users, assure a quality of performance consistent with existing industry capabilities, eliminate inventory requirements for various fiber sizes and types, and provide a cost-effective basis for competitive procurement.

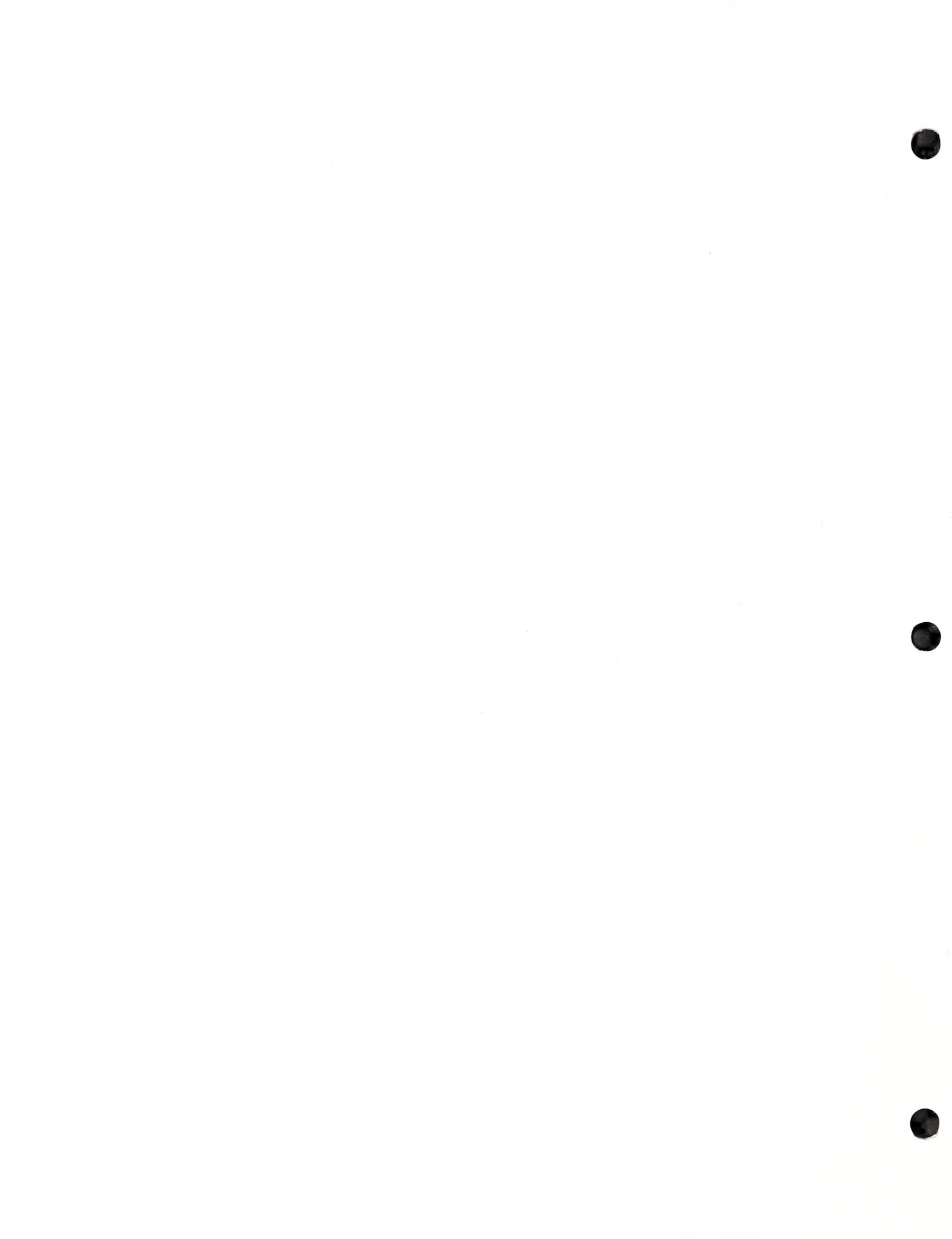
It is acknowledged that typical Federal procurement will be of cabled fiber, and this standard shall therefore be supplemented by future planned standard specification of cable jacketing, strength, and other pertinent characteristics. A family of optical fiber cable Detail Specifications in the EIA/TIA 472-Series is under preparation at the time of publication of this fiber standard, which will comprise the fiber specifications for those standards. Adoption of these voluntary industry standards as American National Standards and Federal standards is planned subsequently.

There is no intent that this standard should preclude future Federal specifications of other fiber types for applications such as on-premises use when component and systems technology evolution provides efficient and cost-effective alternatives. These may include single-mode fiber, use of materials other than glass, or different fiber designs resultant, for example, from maturation of coherent optical detection.

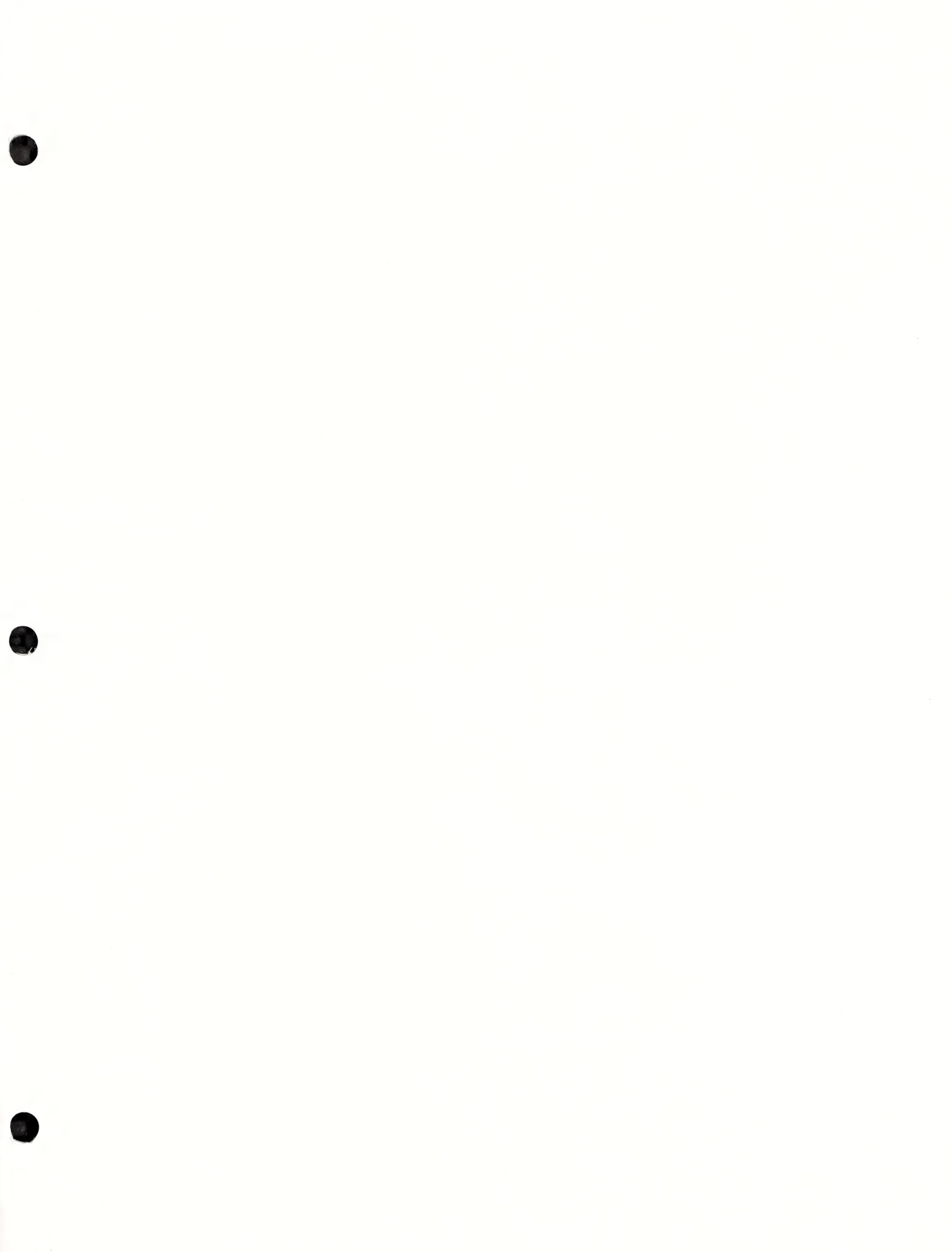
Single-mode fiber, with a mode diameter of 9 to 10  $\mu\text{m}$ , is the fiber of choice for long-distance applications because of its low loss and high information transfer capacity. However, for short-haul applications where Light Emitting Diodes (LEDs) are today's preferred optical sources because of cost efficiency, the single-mode fiber couples much less power compared to the multimode option. It also requires more precision, and therefore higher cost, in connectors and splices in a connection-intensive environment.

**14. 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 159 (FIPSPUB159), and title. Payment may be made by check, money order, purchase order, credit card, or deposit account.

Copies of the EIA standards can be obtained from the Electronic Industries Association, 2001 Pennsylvania Avenue, NW, Washington, DC 20006, (202) 457-4966.











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