MIL-STD-454M
NOTICE 3
30 October 1991

MILITARY STANDARD

STANDARD GENERAL REQUIREMENTS FOR ELECTRONIC EQUIPMENT

TO ALL HOLDERS OF MIL-STD-454M:

1. THE FOLLOWING PAGES OF MIL-STD-454M HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED.

NEW PAGES	DATE	SUPERSEDED PAGES	DATE
1-5	30 Jun 89	(REPRINTED WITHOUT CHANGE)	
1-6	30 Oct 91	1-6	3 May 91
5-1	30 Oct 91	5-1	15 Dec 89
61-1	30 Oct 91	61-1	15 Aug 90
64-1 thru 64-7	30 Oct 91	64-1 thru 64-6	20 Sep 88
76-1 thru 76-4	30 Oct 91	76-1 thru 76-4	10 May 91
I1-3 thru I1-8	30 Oct 91	I1-3 thru I1-8	10 May 91

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-STD-454M will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the Military Standard is completely revised or cancelled.

Custodians:
Army - ER
Navy - AS
Air Force - 11

Preparing activity:
Air Force - 10

Agent:
DLA-ES

Review activities:
Army - AR, AV, CR, ME, MI, PT
Navy - EC, OS, SH
Air Force - 17, 19, 85, 99
DLA - ES, IS
FAA

Project GDRQ-0101

AMSC N/A

FSC-GDRQ

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

4.4.5.2 Shorting rods. Shorting rods shall be provided with all transmitting equipment where voltages are in excess of 70 volts rms or dc. Where size permits, shorting rods shall be stored within the transmitting equipment, permanently attached, and readily accessible to maintenance personnel. The permanently attached rod shall be connected through a flexible stranded copper wire (covered with a transparent sleeving) to the stud provided at the transmitter main frame. Where size does not permit internal storage of the shorting rod, a grounding stud shall be provided to permit attachment of a portable shorting rod. The connection to the stud shall be such that accidental loosening or high resistance to the ground is prevented.

4.4.6 Connectors. Connectors used in multiple electric circuits shall be selected to preclude mismating. Where design considerations require plug and receptacles of similar configuration in close proximity, the mating plugs and receptacles shall be suitably coded or marked to clearly indicate the mating connectors. Plugs and receptacles shall not be of similar configuration if the major unit contains explosive items. The design of the connector shall be such that the operator is not exposed to electrical shock or burns when normal disconnect methods are used. Exposed pin contacts shall not be energized (hot) after being disconnected from the socket contacts.

4.5 Radiation. The design of all equipment for which a federal standard exists under 21 CFR 1000 - 1050, on the Radiation Control for Health and Safety Act of 1968, shall conform to the appropriate federal standard.

4.5.1 Microwave and rf radiation. All electronic equipment or electrical devices capable of emitting microwave or rf radiation between 300 KHz and 100 GHz shall be so designed, fabricated, shielded and operated as to avoid overexposure of personnel. In areas where unintended radiation levels exist, equipment design and installation in any unrestricted area accessible to personnel shall meet the requirements of ANSI C95.1. Shields, covers, doors, etc, which when opened or removed will allow microwave and rf radiation to exceed the above, shall be provided with nonbypassable interlocks.

4.5.2 X radiation. All electronic or electrical devices capable of producing X radiation shall be so designed, fabricated, shielded and operated as to keep personnel exposure as low as reasonably achievable. For equipment and installation design, shielding requirements shall be maintained at all times which limit radiation levels to not greater than 2 milliroentgens (mr) in any one hour and 100 mr in any 7 consecutive days at the operator position or within 5cm from the equipment (whichever is closer) in any unrestricted area accessible to personnel. In addition, these levels shall be reduced whenever necessary to ensure that exposed personnel never receive an absorbed dose to the whole body or any critical organ in excess of 125 millirem per calendar quarter or 500 millirem per year. Other exposure shall be based on application criteria and limits as required by Nuclear Regulatory Commission Rules and Regulations, 10 CFR 20; OSHA Regulations, 29 CFR 1910.96; and FDA Regulation, 21 CFR, Chapter I, Subchapter J, Radiological Health. Equipment which, when shields, covers, doors, etc, are removed, will allow X radiation to exceed 2.0 mr per hour shall be provided with nonbypassable interlocks.

4.5.3 Laser radiation. Laser equipment and system design, installation, and operational and maintenance procedures shall conform to 21 CFR 1040. If Title 21 cannot be met because of operational requirements, an exemption shall be requested from the procuring activity and applicable military laser safety regulations shall be used as a design requirement.

4.6 Mechanical. The design of the equipment shall provide personnel maximum access and safety while installing, operating, and maintaining the equipment. Equipment design shall include provisions to prevent accidental pulling out of drawers or rack mounted equipment components. Suitable protection shall be provided to prevent contact with moving mechanical parts such as gears, fans, and belts when the equipment is complete and operating. Sharp projections on cabinets, doors, and similar parts shall be avoided. Doors or hinged covers shall be rounded at the corners and provided with stops to hold them open.

4.6.1 Mechanical interconnection. The design shall provide positive means to prevent the inadvertent reversing or mismating of fittings; couplings; fuel, oil, hydraulic, and pneumatic lines; and mechanical linkage. When prevention of mismating by design consideration is not feasible, coding or marking shall be employed when approved by the procuring activity. Coding and marking will not be approved as a substitute for proper design or items involving explosive, emergency, or safety critical systems.

4.6.2 Power switch location. Equipment power switches shall be so selected and located that accidental contact by personnel will not place equipment in operation.

4.6.3 Cathode ray tubes. Provision shall be incorporated to protect personnel from injury due to implosion of cathode ray tubes.

4.7 Equipment safety markings. Danger, caution, etc, signs, labels and markings shall be used to warn of specific hazards such as voltage, current, thermal, or physical. The signs, labels, and markings shall be as permanent as the normal life expectancy of the equipment on which they are affixed. Guards, barriers, and access doors, covers or plates shall be marked to indicate the hazard which may *be present upon removal of such devices. When possible, marking shall be located such that it is not removed when the barrier or access door is removed. Additionally, hazards internal to a unit shall be marked adjacent to hazards if they are significantly different from those of surrounding items. Such a case would be a high voltage terminal in a group of low voltage devices.

a. Physical hazards shall be marked with color codes in accordance with ANSI Z53.1 where applicable to electronic equipment.

b. For potentials between 70 and 500 volts, warning signs or labels shall be in accordance with ANSI Z35.1, Class II, and ANSI Z35.4, and shall read, as a minimum, "*Caution* - (Insert maximum voltage applicable) *Volts.*"

c. For potentials in excess of 500 volts, warning signs or labels shall be in accordance with ANSI Z35.1, Class I and ANSI Z35.4, and shall read, as a minimum, "*Danger - High Voltage* - (Insert maximum voltage applicable) *Volts.*"

REQUIREMENT 5

SOLDERING

1. Purpose. This requirement establishes the basis for soldering of electrical and electronic equipment.

2. Document applicable to Requirement 5:

MIL-STD-2000	Standard Requirements for Soldered Electrical and Electronic Assemblies
DOD-STD-1866	Soldering Process, General (Non-Electrical) (Metric)

3. Definitions. Not applicable.

4. Requirements

4.1 General. Electrical and Electronic equipment shall be assembled, soldered, and cleaned in accordance with the requirements of MIL-STD-2000.

4.2 Structural Soldering. Non-Electrical soldered connections shall be in accordance with the requirements of DOD-STD-1866.

4.3 Workmanship. Workmanship of soldered assemblies shall be in accordance with MIL-STD-2000 or DOD-STD-1866 as appropriate.

5. Information for guidance only.

5.1 Application. MIL-STD-2000 expresses the minimum requirements appropriate to the manufacture of electrical and electronic equipment. It may be necessaary to supplement the requirements of MIL-STD-2000 in order to achieve higher reliability requirements associated with critical equipment applications (space, nuclear ordnance, command/control, etc.).

REQUIREMENT 61

ELECTROMAGNETIC INTERFERENCE CONTROL

1. Purpose. This requirement establishes criteria for electromagnetic interference control.

2. Documents applicable to Requirement 61:

MIL-STD-461	Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference
MIL-STD-462	Electromagnetic Interference Characteristics, Measurement of
MIL-STD-469	Radar Engineering Design Requirements, Electromagnetic Compatibility
NTIA Manual	National Telecommunications and Information Administration Manual of Regulations and Procedures for Radio Frequency Management

3. Definitions. Not applicable.

4. Requirements

4.1 General. Electromagnetic interference requirements shall be as specified in MIL-STD-461.

4.2 Radar equipment. Radar systems and equipment shall also conform to the provisions of section 5.3 of the NTIA Manual as specified in the contract and to MIL-STD-469 except that MIL-STD-469 shall not be used for Air Force applications. In the event of conflict, the following descending order of precedence shall prevail: NTIA Manual, MIL-STD-469, MIL-STD-461.

4.3 Tests. Tests and test methods shall be as specified in MIL-STD-462. For other than Air Force applications, MIL-STD-469 shall also apply for radar equipment and systems.

5. Information for guidance only. Not applicable.

MICROELECTRONIC DEVICES

1. Purpose. This requirement establishes criteria for the selection and application of microelectronic devices. These criteria are based on the objectives of achieving technological superiority, quality, reliability, and maintainability in military systems.

2. Documents applicable to Requirement 64:

MIL-M-38510	Microcircuits, General Specification for
MIL-H-38534	Hybrid Microcircuits, General Specification for
MIL-I-38535	Integrated Circuits (Microcircuits) Manufacturing, General Specification for
MIL-STD-785	Reliability Program for Systems and Equipment Development and Production
MIL-STD-883	Test Methods and Procedures for Microelectronics
MIL-STD-975	NASA Standard Electrical, Electronic and Electro-mechanical Parts List
MIL-STD-1547	Parts, Materials and Processes for Space and Launch Vehicles, Technical Requirements for
MIL-STD-1562	Lists of Standard Microcircuits
MIL-STD-1686	Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)
MIL-BUL-103	List of Standardized Military Drawings (SMDs)
MIL-HDBK-217	Reliability Prediction of Electronic Equipment

ANSI/IEEE 1076-1987 VHSIC Hardware Description Language (VHDL)

VHSIC Interoperability Standards. Includes specifications for the TM-bus, ETM bus, Pi bus, and VHSIC Electrical Specification. (Copies available from Naval Research Laboratory, Code 5305, Washington, DC 20375-5000).

Tester Independent Support Software System (TISSS) Specifications (Copies available from TISSS Program Office, RL/ERD, Griffiss Air Force Base, NY 13441-5700).

3. Definitions

3.1 Microelectronic devices. Monolithic, hybrid, rf and microwave (hybrid/integrated) circuits, multichip microcircuits, and microcircuit modules.

3.2 Very high speed integrated circuits (VHSIC). A technology development program (1980-1989) for the design and manufacture of high speed digital integrated circuits with 1.25 and 0.5 micrometer feature sizes for military applications. Many VHSIC's incorporate Built-In-Test and later VHSIC's will incorporate interoperability features. Table 64-II describes VHSIC characteristics.

3.3 Microwave/millimeter wave monolithic integrated circuits (MIMIC). Program to establish the capabilities to design, develop, manufacture and test analog microwave/ millimeter wave integrated circuits for use in military systems.

3.4 Advanced microcircuit technology. Microcircuit fabrication and design technology which is newly available for prototype designs and will be available for production in the near future (2-5 years). VHSIC and MIMIC are examples. For digital microcircuits, the performance capability can be approximately characterized by the minimum feature size, the clocking frequency, and the functional throughput rate. (See 5.1)

3.5 VHSIC hardware description language (VHDL). A high level computer language developed under the VHSIC program for describing the signal structure of electronic hardware (chips, modules, and subsystems). The language describes the signal flow and the structure of the device in terms of the basic circuit models, fundamental logic blocks, and higher level functional assemblies of logic blocks.

3.6 Qualified Device (Microcircuit). Any device or microcircuit which has met the requirements of MIL-M-35510, MIL-H-38534, or MIL-I-38535 and is listed on the associated QPL/QML listings.

3.7 Waveform and Vector Exchange Specification (WAVES). A high level computer language developed under the VHSIC and Advanced Tactical Fighter (ATF) programs for describing test vector and waveform stimuli for electronic hardware (chips, modules, and subsystems). The WAVES is compatible with the VHDL simulation language and simulation environments.

3.8 Application Specific Integrated Circuit (ASIC). Any microcircuit that is custom designed or any programmable microcircuit (e.g. EPROM, EEPROM, UVEPROM, PLA, PLD, gate array, sea of gates, standard cell library, etc.) that is programmed or personalized to perform a specific equipment or custom function.

4. Requirements

4.1 Selection

4.1.1 Technology. At each stage in new and re-engineered system designs, i.e., concept studies, demonstration and validation, and full scale development, the advanced microcircuit technologies which meet reliability, performance, and cost requirements of the application shall be evaluated for use in the production phase.

4.1.2 Reliability. Microelectronic devices in military systems in full scale development and production shall, as a minimum, conform to the applicable product assurance level of MIL-M-38510, MIL-H-38534, or MIL-I-38535.

4.1.3 Order of precedence. Unless otherwise specified, the order of precedence shall be as follows:

a. Microcircuits listed in table I of MIL-STD-1562.

b. Other MIL-M-38510, MIL-H-38534, or MIL-I-38535 microcircuits not listed in tables III, IV and V of
MIL-STD-1562.

c. Other microcircuits listed in table II of MIL-STD-1562 as preferred for new design, subject to procuring activity approval.

d. Active Standardized Military Drawing (SMD) or DESC drawing microcircuits not listed in tables III, IV and V of MIL-STD-1562, subject to procuring activity approval.

e. Other microcircuits (see 4.1.5), subject to procuring activity approval.

4.1.4 Qualified devices. When the contract or purchase order for new design redesign, or part level upgrade of military hardware specifies the use of MIL-STD-883 class B or S microcircuits, and there is a qualified device of the required generic chip and package type or case outline, the qualified device shall be the only device authorized in that design.

4.1.4.1 Space Applications. When qualified devices are not available or cannot be qualified by the manufacturer, the requirement of MIL-STD-965 or MIL-STD-1547 shall apply.

4.1.4.2 Other Applications. When a qualified device does not exist and a SMD device of the required generic chip and package type or case outline does exist, the SMD device shall be the preferred device authorized for that design.

4.1.5 Other microcircuits. For other than qualified devices, the following information shall be included in the nonstandard part approval request (except where identification of a military detail specification or SMD number satisfies this requirement or other direction is given):

a. Device nomenclature, marking, configuration, functional requirements, parameters and limits sufficient to insure the required form, functions and interchangeability.

b. Required environmental, endurance (life) and other design capability tests.

c. Quality assurance requirements, including screening and lot quality conformance (acceptance) tests. As a minimum, devices shall be procured to all the requirements of MIL-STD-883 paragraph 1.2.1. Hybrid or integrated microcircuits shall be procured to the requirements of MIL-M-38534 or MIL-I-38535. The applicable detail specification, SMD or vendor/contractor document shall be specified for electrical performance, mechanical, and final electrical test requirements.

d. An evaluation of the projected availability and product assurance status for the time of production and through the projected life of the system.

e. Device design and test documentation in the VHDL and WAVES format (see 4.5.3 and 4.5.4).

4.1.6 Electrostatic sensitive parts. Microcircuits are susceptible to electrostatic discharge (ESD) damage. Microcircuit susceptibility is classified in MIL-STD-1686 and Test Method 3015 of MIL-STD-883. When device susceptibility is not available, it can be determined using Test Method 3015 or Appendix B of MIL-STD-1686. Microcircuits from the ESDS Class necessary to

meet system ESD requirements shall be selected. ESD susceptibility of microcircuits are listed in the associated QPL/QML listings of MIL-M-38510 for JAN devices and MIL-H-38534 or MIL-I-38535 for the individual device.

4.2 Programmable devices. Use of programmable devices, regardless of type, requires approval of the procuring activity.

4.3 Fusible link devices. When fusible link devices (PROMs, PALs, PLDs, etc) are programmed by the user, parametric and functional electrical tests in accordance with MIL-STD-883, Method 5005, Group A, Subgroups 7 and 9 as a minimum, shall be performed after programming to verify the specific program configuration and effectiveness of link fusing. This testing shall be done on a 100% basis when performing board or subsystem/system simulations.

4.4 Packages. Microcircuit devices used in equipment shall be hermetically sealed in glass, metal or ceramic (or combinations of these) packages. No organic or polymeric materials such as lacquers, varnishes, coatings, adhesives, or greases shall be used inside the microcircuit package, unless otherwise specified. No desiccants shall be contained in the microcircuit package, unless otherwise specified.

4.5 Device design and test documentation

4.5.1 ASIC documentation in VHDL. Digital Application-Specific Integrated Circuits (ASICs) designed after 30 September 1988 shall be documented by means of structural and behavioral VHSIC Hardware Description Language (VHDL) descriptions in accordance with ANSI/IEEE 1076. (See paragraph 5.7) Behavioral VHDL descriptions shall include function and timing at the ports accurate enough to enable the performance of test generation and determination of fault detection/fault isolation levels at the integrated circuits pins when performing board or subsystem simulations.

4.5.2 Fault coverage. For all digital microcircuits developed or modified after 31 December 1991, fault coverage shall be documented in accordance with MIL-STD-883 Test Method 5012 for all manufacturing-level logic tests.

4.5.3 Qualified Device Documentation in VHDL. Digital qualified devices for use in board level designs after 31 December 1991 shall be documented by means of behavioral VHDL descriptions in accordance with ANSI/IEEE 1076. (See paragraph 5.7) Behavioral VHDL descriptions shall include function and timing at the port accurate enough to perform test generation and determine fault detection/fault isolation levels at the integrated circuit pins.

4.5.4 ASIC test stimuli documentation in WAVES. Digital ASICs designed after 31 December 1991 shall have all test vectors and test waveforms documented and delivered to the Government in the WAVES format.

4.6 Cost considerations. Microelectronic devices shall be selected on the basis of overall life cycle cost.

5. Information for guidance only

5.1 Technology progression. The use of advanced microcircuit technology should be considered and evaluated in the design of all systems/equipment. For critical weapon systems applications, and for system development schedules projected to be longer than four years, the performance advantages provided by advanced technologies, such as VHSIC and MIMIC, should be evaluated early in the system development phases for use in the procurement stage.

5.1.1 Projected availability. The projected availability of advanced digital (VHSIC) technologies for use in progressive stages of system development is provided in table 64-I to aid in performing this evaluation.

TABLE 64-I. Digital technology progression prediction.

Year	Concept I	D&V II	FSD III	P&D
1987	.5 - 1.0	1.0 - 1.25	1.0 - 1.25	1.25 - 1.5
1988	.5 - .8	.8 - 1.0	1.0 - 1.25	1.0 - 1.25
1989	.5 - .7	.7 - 1.0	.8 - 1.0	1.0 - 1.25
1990	.4 - .6	.5 - .8	.6 - 1.0	.8 - 1.0
1991	.4 - .5	.5 - .6	.6 - .8	.7 - .8
1992	.3 - .4	.4 - .6	.5 - .7	.6 - .7
1993	.25 - .3	.3 - .5	.4 - .6	.5 - .6
1994	.25 - .3	.4	.5	

D&V: Demonstration and Validation

FSD: Full Scale Development

P&D: Production and Deployment

I, II, III: System Development Milestones

5.1.2 Performance characteristics. The numbers in table 64-I represent the "minimum feature size" which generally characterizes the performance and characteristics of digital technology. (See table 64-II.)

5.2 Reliability

5.2.1 Reliability prediction. When required, microcircuit reliability predictions should be prepared in accordance with MIL-HDBK-217.

5.2.2 Reliability assurance. A plan should be in place to assure that microelectronic devices meet the reliability requirement of paragraph 4.1.2 at the time of full scale development. This plan should provide for resubmission of parts list, if so invoked by contract, through DESC/MPCAG prior to procurement of parts to be used in actual production to assure that all evaluations are based on the most recent standardization status.

5.3 Microcircuit obsolescence. Due to rapid technology advances, many military and commercial microcircuits listed in specifications and catalogs are either obsolete or are nearing obsolescence. The use of these devices will affect the mission objectives of the using equipment. For Navy equipment current information on microcircuits that may be nearing obsolescence may be obtained from the Naval Avionics Center, Code 435, Indianapolis, Indiana 46219-2189, telephone (317) 353-3767.

5.4 Use of non-hermetic microcircuits. Upon specific request and approval by the procuring activity to waive the requirements of 4.1, non-hermetic microcircuits may be considered for use in ground fixed (GF) or ground benign (GB) environments as defined in MIL-HDBK-217. They should meet all the requirements of the equipment specification, temperature and humidity should be completely controlled in transit, storage, and application. Provisions should be made for logistic availability.

TABLE 64-II. Performance characteristics - digital microelectronics.

Characteristic	Units		
Min feature size	micrometers	1.25	0.5
Temperature range	degrees Celsius	-55 to 125	-55 to 125
Min clock frequency	MHz	25	100 on chip
FTR	gate Hz/sq cm	5 exp 11	1 exp 13
Testability		98% of detec-table faults	98% of detec-table faults
BIT fault coverage			
stuck at	%	95*	95
stuck open (CMOS	%		75
Test bus		ETM or TM*	ETM or TM*
Interoperability		yes	yes

*IAW VHSIC Interoperability Standard

5.5 Testability. New and upgraded systems should exploit chip level built-in-test features to enhance the testability and operational availability of the module or system. When advanced digital modules or boards are developed, microcircuits incorporating the VHSIC ETM-BUS or VHSIC TM-BUS should be used. (See VHSIC Interoperability Standards.)

5.6 Life cycle cost evaluation. The following factors should be considered in estimating life cycle costs associated with selection of microcircuit devices or technologies: a) effect of built-in-test on repair, maintainability, operational availability, and reconfigurability; and b) value of VHDL descriptions of chips, modules, and boards in resupply, multiple source development, and design upgrade.

5.7 ASIC Documentation Reference. Data Item Description, DI-EGDS-80811, provides the documentation preparation and delivery instructions for ASIC documentation.

REQUIREMENT 76

FIBER OPTICS

1. Purpose. This requirement establishes the criteria for the selection, application and testing of fiber optic material, devices and accessories.

2. Documents applicable to Requirement 76:

MIL-STD-188-111	Subsystem Design and Engineering Standards for Common Long Haul and Tactical Fiber Optics Communications
MIL-STD-790	Product Assurance Program Requirements for Electronic and Fiber Optic Parts Specifications
DOD-STD-1678	Fiber Optic Test Methods and Instrumentation
DOD-STD-1863	Interface Designs and Dimensions for Fiber Optic Interconnection Devices
DOD-STD-1864	Fiber Optic Symbols
MIL-STD-2163	Insert Arrangements for MIL-C-28876 (Navy) Environment Resisting Fiber Optic Connectors
MIL-C-22520/10	Crimping Tool, Terminal, Hand
DOD-D-24620	Detector, PIN, Fiber Optic (Metric)
MIL-C-24621	Coupler, Passive, Fiber Optic, General Specification for (Metric)
DOD-S-24622	Sourses, LED, Fiber Optic (Metric)
MIL-S-24623	Splice, Fiber Optic Cable, General Specification for (Metric)
MIL-H-24626	Harness Assemblies, Cable, Pressure Proof, Fiber Optic
MIL-P-24627	Penetrators, Bulkhead, Connectorized, Fiber Optic (for Inboard Use on Navy Ships and Submarines)
MIL-P-24628	Penetrators, Hull, Connectorized, Connectors, Pressure Proof, Fiber Optic, Submarine
MIL-S-24725	Switches, Fiber Optic, Shipboard, Electrical Nonlatching, Bypass, Multimode Cable, Standalone (Metric)
MIL-A-24726	Attenuators, Fiber Optic, Shipboard, General Specification for

MIL-R-24727	Rotary Joints, Fiber Optic, Shipboard (Metric), General Specification for
MIL-I-24728	Interconnection Box, Fiber Optic, Metric, General Specification for
MIL-M-24731	Multiplexers, Demultiplexers, Multiplexers, Demultiplexers (Muldems), Frequency Division, Fiber Optic, Interfaceable, Shipboard (Metric), General Specification for
MIL-L-24732	Light Sources, Rigid and Flexible, Fiberscope, Fiber Optic (Metric), General Specification for
MIL-C-24733	Controllers, Interface Unit, Fiber Optic (Metric), General Specification for
MIL-F-24734	Fiberscope, Fiber Optic (Metric), General Specification for
MIL-T-24735	Transmitters, Light Signal, Analog, Fiber Optic (Metric), General Specification for
MIL-M-24736	Multiplexers, Demultiplexers, Multiplexers, Demultiplexers (Muldems), Time Division, Fiber Optic, Interfaceable, Shipboard (Metric), General Specification for
MIL-R-24737	Receivers, Light Signal, Analog, Fiber Optic, Shipboard (Metric), General Specification for
MIL-C-28876	Connectors, Fiber Optic, Environment Resisting (for Navy Shipboard Applications)
MIL-T-29504	Termini, Fiber Optic Connector, Removable
DOD-F-49291	Fiber, Optical, General Specification for
MIL-C-49292	Cable Assembly, Nonpressurized, General Specification for
MIL-I-81969	Installing and Removal Tools, Electrical Contact, General Specification for
MIL-C-83522	Connectors, Fiber Optic, Single Terminus, General Specification for
MIL-T-83523	Tools, Fiber Optic, General Specification for
MIL-M-83524	Microscope, Optical, for Field Inspection of Optical Fibers

MIL-K-83525	Kit, Portable Optical Microscope, Militarized, 200X Magnification for Field Inspection of Optical Fibers
MIL-C-83526	Connector, Fiber Optic, Circular, Environment Resisting, Hermaphroditic, General Specification for
MIL-M-83533	Maintenance Kit, Fiber Optic Components, General Specifiction for
DOD-C-85045	Cable, Fiber Optic, Environment Resisting (for Navy Shipboard Application), General Specification for
MIL-HDBK-277	Fiber Optic Checkout Procedure for Military Applications
MIL-HDBK-278	System Design Guide for Applying Fiber Optic Technology to Shipboard Systems
MIL-HDBK-282	Fiber Optic Cable Installation Procedures
MIL-HDBK-415	Design Handbook for Fiber Optic Communications Systems
IEC-693-80	Optical Fibers, Dimensions of
IEEE-STD-812-84	IEEE Standard Definitions of Terms Relating to Fiber Optics

3. Definitions.

3.1 Definitions of terminology used in fiber optics technology shall be as contained in IEEE-STD-812.

4. Requirements

4.1 Symbology. Graphic symbols for fiber optic parts for use on engineering drawings, specifications, etc, shall be as contained in DOD-STD-1864.

4.2 Dimensions. Dimensions for optical fibers shall be as specified in IEC-693-80 and MIL-F-49291.

4.3 Interface designs and dimensions. Standard interface designs, dimensions and termination types for use in fiber optic connectors and couplers shall be as specified in DOD-STD-1863.

4.4 System and subsystem design. Fiber optic system and subsystem designs shall be in accordance with the criteria specified in MIL-STD-188-111 (see 5.1 also).

4.5 Test procedures. Standardized test procedures for fiber optic components shall be as specified in DOD-STD-1678.

4.6 Light sources.

4.6.1 Light emitting diodes (LEDs). Fiber optic LED sources shall conform to the requirements of DOD-S-24622.

4.6.2 Fiberscope light sources. Fiber optic light sources for rigid and flexibie fiberscopes shall conform to the requirements of MIL-L-24732.

4.7 Splices. Fiber optic splices shall conform to the requirements of MIL-S-24623.

4.8 Cables. Fiber optic cables shall conform to the requirements of DOD-C-85045.

4.9 Cable assemblies. Cable assemblies shall conform to the requirements of MIL-C-49292.

4.10 Harness assemblies. Fiber optic harness assemblies shall conform to the requirements of MIL-H-24626.

4.11 Connectors. Fiber optic connectors shall conform to the requirements of MIL-C-28876, MIL-C-83522, or MIL-C-83526. Insert arrangements for MIL-C-28876 connectors shall conform to MIL-STD-2163. Removable terminals for fiber optic connectors shall conform to MIL-T-29504.

4.12 Penetrators. Fiber optic penetrators (hull or bulkhead) shall conform to the requirements of MIL-P-24627 or MIL-P-24628.

4.13 Detectors. Fiber optic detectors shall conform to the requirements of DOD-D-24620.

4.14 Couplers. Fiber optic couplers shall conform to the requirements of MIL-C-24621.

4.15 Rotary joints. Fiber optic rotary joints shall conform to the requirements of MIL-R-24727.

4.16 Interconnection boxes. Fiber optic interconnection boxes shall conform to the requirements of MIL-I-24728.

4.17 Multiplexers and demultiplexers.

4.17.1 Frequency division. Fiber optic frequency division multiplexers and demultiplexers shall conform to the requirements of MIL-M-24731.

4.17.2 Time division. Fiber optic time division multiplexers and demultiplexers shall conform to the requirements of MIL-M-24736.

4.18 Controllers, interface unit. Fiber optic controllers shall conform to the requirements of MIL-C-24733.

4.19 Fiberscopes. Fiber optic fiberscopes shall conform to the requirements of MIL-F-24734.

Document	Requirement
MIL-C-10544	10
MIL-B-11188	27
MIL-S-12285	58
MIL-C-12520	10
MIL-S-12883	60
MIL-T-13020	11
MIL-M-13231	67
MIL-S-13282	41
MIL-B-13506	6
MIL-S-13572	41
MIL-C-13777	66,71
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