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MIL-STD-2200

29 NOVEMBER 1991

MILITARY STANDARD

REQUIREMENTS FOR EMPLOYING STANDARD ENCLOSURE SYSTEMS

AMSC N5028

FSC 5975

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FOREWORD

1. This military standard is approved for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Naval Sea Systems Command (SEA 55Z3), Department of the Navy, Washington, DC 20362-5101, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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1. SCOPE

1.1 Scope. This standard addresses the requirements for the implementation of Standard Enclosure Systems (SES) hardware in the design and construction of military electronic systems. The Standard Hardware Acquisition and Reliability Program (SHARP) coordinates the development and use of SES, Standard Electronic Modules (SEM), Standard Power Supplies (SPS), and Standard Battery Systems (SBS). These four standard hardware elements under the SHARP program form a complete electronic systems hardware packaging methodology for military electronic systems which is fully consistent with the performance, supportability and cost-effective objectives of the Department of Defense.

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2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

MILITARY

MIL-A-24741	-	Assemblies, Metal Electrical Backplane, One and Two Layer, General Specification for.
MIL-P-24764	-	Power Supplies, Shipboard, Electronic, General Specification for.
MIL-C-28754	-	Connectors, Electrical, Modular, and Component Parts, General Specification for.
MIL-M-28787	-	Modules, Standard Electronic, General Specification for.
MIL-C-28859	-	Connector Component Parts, Electrical Backplane, Printed-Wiring, General Specification for.
MIL-A-28870	-	Assemblies, Electrical Backplane, Printed-Wiring, General Specification for.
MIL-P-29590	-	Power Supplies, Airborne, Electronic, General Specification for.
MIL-T-31000	-	Technical Data Packages, General Specification for.

STANDARDS

MILITARY

MIL-STD-1389	-	Design Requirements for Standard Electronic Modules.
MIL-STD-2119	-	Design Requirements for Printed-Wiring Electrical Backplane Assemblies.

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MIL-STD-2198 - Design Requirements for Metal Electrical Backplane Assemblies.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

PUBLICATIONS

Naval Avionics Center

TP-532 - Standard Hardware Acquisition and Reliability Program (SHARP) Hardware Catalog.

(Copies of TP-532 are available from the Naval Avionics Center, (ATTN: Code 814), 6000 E. 21st Street, Indianapolis, IN 46219-2189.)

2.2 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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3. DEFINITIONS

3.1 Acronyms used in this standard. The acronyms used in this standard are defined as follows:

(a) CDR - Critical Design Review.

(b) DID - Data Item Description.

(c) DRA - Design Review Activity.

(d) PDR - Preliminary Design Review.

(e) PM - Government Program Manager.

(f) SBS - Standard Battery Systems.

(g) SEM - Standard Electronic Modules.

(h) SES - Standard Enclosure Systems.

(i) SHARP - Standard Hardware Acquisition and Reliability Program.

(j) SPS - Standard Power Supplies.

3.2 SES backplane components. Connector components (such as female contacts, insulator housings, polarizing bushings, and grounding bushings), qualified within the SHARP program, which are installed in backplane assemblies for mating with and interconnecting SEM. SES backplane components are specified in MIL-C-28754 and MIL-C-28859.

3.3 SES backplane assemblies. The assemblies which contain backplane components that are installed in specifically designed baseplates or printed wiring boards for mating and interconnecting SEM within SES structures. Design and quality requirements for SES backplane assemblies are specified in MIL-STD-2198 and MIL-A-24741, or MIL-STD-2119 and MIL-A-28870.

3.4 SES support hardware. Qualified and non-qualified miscellaneous SES hardware designs (such as extender boards, module extractor tools, cable connector assemblies, and module retainers) which have been developed, tested, and sourced within the SHARP program for use in employing SEM within SES structures. SES support hardware designs are referenced in TP-532.

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3.5 SES enclosure hardware. SES hardware consisting of the basic enclosure structure and its integral components and assemblies, such as doors, coverplates, drawer structures, drawer slides, and cooling system components, but excluding SES backplane assemblies and SES support hardware.

3.6 SES hardware. The general category of SHARP hardware which consists of SES backplane components, SES backplane assemblies, SES support hardware, and SES enclosure hardware.

3.7 Standard electronic modules (SEM). Standardized functional circuit card assemblies which meet the design and quality requirements of MIL-STD-1389 and MIL-M-28787.

3.8 Standard power supplies (SPS). Families of standardized power supply assemblies which meet the design and quality requirements of MIL-P-24764 for shipboard use and MIL-P-29590 for airborne use.

3.9 Standard enclosure systems (SES). Families of standardized enclosure structures and supporting packaging elements which have been developed, tested and sourced within the SHARP program for use in conjunction with SEM and SPS. SES designs are referenced in TP-532.

3.10 Government program manager (PM). The Government contracting officer technical representative who is initiating the particular system/equipment application.

3.11 Equipment contractor. The term applies to the particular system/equipment contractor.

3.12 SES design review activity (DRA). The activity responsible for the hardware standardization review of the backplane component, backplane assembly, support hardware, and enclosure system implementation plans. These functions are performed jointly by the Naval Avionics Center, Code 814, 6000 E 21st Street, Indianapolis, IN 46219-2189 and the Naval Weapons Support Center, Code 6042, Crane, IN 47522-5060.

3.13 SES technical manager. The activity that directs the development, management, and implementation of SES hardware elements within the SHARP program. This function is performed by the Naval Weapons Support Center, Code 6042, Crane, IN 47522-5060.

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4. GENERAL REQUIREMENTS

4.1 General. All SES hardware, which consists of backplane components, backplane assemblies, support hardware, and enclosure hardware, shall be selected and designed according to the requirements herein.

4.2 Priority of hardware implementation. The equipment contractor shall implement all SES hardware in accordance with the priority sequence of 4.2.1 through 4.2.3.

4.2.1 Existing SES designs. The use of existing SES hardware designs shall be the first priority of hardware selection by the equipment contractor.

4.2.1.1 Existing SES backplane components. Existing SES backplane components are specified in MIL-C-28754 and MIL-C-28859. All such components shall be procured from sources which are qualified in accordance with the Qualified Products List (QPL) for the applicable specification.

4.2.1.2 Existing SES support hardware. The equipment contractor shall implement all requirements for SEM compatible support hardware requirements such as cable connector modules, module extractor tools, and extender boards from applicable SES hardware designs as referenced in TP-532.

4.2.1.3 Existing SES backplane assemblies. Existing SES backplane assemblies are those designs that conform with the requirements of MIL-STD-2119 and MIL-A-28870 for printed-wiring backplane assemblies and MIL-STD-2198 and MIL-A-24741 for metal backplane assemblies. All such assemblies shall be procured from sources qualified in accordance with the applicable specification.

4.2.1.4 Existing SES enclosure systems. The equipment contractor shall implement system enclosure requirements with existing enclosure designs as referenced in TP-532. Such hardware designs have been proven in previous SEM system development programs and will aid in reducing both development cost and schedule. Such designs can be modified as required to meet specific system requirements.

4.2.2 In-process SES designs. In the event that existing SES hardware is not applicable to specific system hardware requirements, the equipment contractor shall coordinate with the SES Technical Manager early in the system hardware definition phase to determine the availability and status of any in-process SES hardware that may be applicable.

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4.2.3 Other hardware designs. Subject to the approval of the SES DRA, the equipment contractor shall initiate hardware designs, other than the existing or in-process SES hardware designs, in the event of any of the following circumstances:

4.2.3.1 Unique system requirements. Specialized system performance or manufacturing process requirements beyond the functional capabilities of existing SES hardware may require other hardware designs.

4.2.3.2 Adequacy of performance. Other hardware designs may be proposed when significant technical advantages can be substantiated in lieu of existing SES hardware.

4.2.3.3 Availability. If sources for existing SES hardware are no longer available, other hardware designs may be proposed.

4.3 Other hardware design criteria. In addition to meeting specific system requirements, other hardware designs shall be developed in accordance with the following criteria.

4.3.1 Flexibility. Hardware designs shall strive to achieve maximum flexibility to enable use in a broad range of system applications.

4.3.2 Compatibility. Hardware designs shall strive to be compatible with existing SES hardware.

4.3.3 Nonproprietary parts or processes. The use of proprietary parts or processes which would preclude multi-source competition shall be prohibited.

4.3.4 Repairability. Hardware designs shall be readily repairable.

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5. DETAILED REQUIREMENTS

5.1 General. This section contains detailed requirements for implementing existing, in-process, and other design SES hardware.

5.2 SES backplane component implementation requirements.

5.2.1 Backplane component implementation plan. The equipment contractor shall submit an implementation plan detailing the proposed usage of backplane components. The plan shall address the proposed usage of existing designs, in-process designs, and other designs. Existing backplane components are those backplane component designs documented in specification sheets in MIL-C-28859 and MIL-C-28754. In-process designs are those designs being developed and being evaluated for inclusion in these military specifications. Information of in-process designs can be obtained from the SES Technical Manager. When any other designs are proposed, justification for their use shall be provided. Justification shall be provided only on the basis of technical adequacy and commercial availability. Submissions of the plan shall be made to the SES DRA at least 60 days prior to the equipment contractor convening the regularly scheduled system Preliminary Design Review (PDR) meeting (or its functional equivalent). The SES DRA will review the plan for hardware standardization purposes. The equipment contractor will receive notification of approval or disapproval of the plan from the SES DRA, via the PM, within 30 days after the PDR meeting.

5.2.2 Design requirements. Unless approval for other designs has been granted (see 5.2.1), backplane components shall be those specified in MIL-C-28859 or MIL-C-28754. The other designs shall meet the mechanical, electrical, and environmental requirements of MIL-C-28859 for printed-wiring backplane components and MIL-C-28754 for metal backplane components.

5.2.3 Quality assurance requirements. Quality assurance requirements for all backplane components shall conform to MIL-C-28859 for printed-wiring backplane components and MIL-C-28754 for metal backplane components.

5.2.4 Documentation requirements. Any backplane component designs not documented in MIL-C-28859 or MIL-C-28754 that the equipment contractor wants to be considered for inclusion in these documents shall be documented in accordance with MIL-T-31000 product drawings and submitted to the SES DRA.

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5.3 SES support hardware implementation requirements.

5.3.1 Support hardware implementation plan. The equipment contractor shall submit an implementation plan detailing the proposed usage of existing designs, in-process designs, and other designs. Existing support hardware designs are those support hardware designs documented in specification sheets in MIL-C-28754 or referenced in TP-532. In-process designs are those designs being developed and being evaluated for inclusion in these documents. Information on in-process designs can be obtained from the SES Technical Manager. When any other designs are proposed, justification for their use shall be provided. Justification shall be provided only on the basis of technical adequacy and commercial availability. Submissions of the plan shall be made to the SES DRA at least 60 days prior to the equipment contractor convening the regularly scheduled system PDR meeting (or its functional equivalent). The SES DRA will review the plan for hardware standardization purposes. The equipment contractor will receive notification of approval or disapproval of the plan from the SES DRA, via the PM, within 30 days after the PDR meeting.

5.3.2 Design requirements. Unless approval for other designs has been granted (see 5.3.1), support hardware shall be the support hardware designs documented in MIL-C-28754 or referenced in TP-532. The other designs shall meet the mechanical, electrical, and environmental requirements of MIL-C-28754 items with similar functions.

5.3.3 Quality assurance requirements. Quality assurance requirements for other design support hardware shall conform to the quality assurance requirements of MIL-C-28754 items with similar functions.

5.3.4 Documentation requirements. Any support hardware designs not documented in MIL-C-28754 or referenced in TP-532 that the equipment contractor wants to be considered for inclusion in these documents shall be documented in accordance with MIL-T-31000 product drawings and submitted to the SES DRA.

5.4 SES backplane assembly implementation requirements.

5.4.1 Backplane assembly implementation plan. The equipment contractor shall prepare an implementation plan defining the selection, design, fabrication, and testing of all backplane assemblies. The backplane assembly implementation plan shall be submitted to the SES DRA at least 60 days prior to the equipment contractor convening the regularly scheduled system PDR meeting (or its functional equivalent). The submittal for the PDR

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meeting shall address the items in 5.4.1.1. The SES DRA will review the plan for hardware standardization purposes. The equipment contractor will receive notification of approval or disapproval from the SES DRA, via the PM, within 30 days after the PDR meeting. The backplane assembly implementation plan shall be updated for the Critical Design Review (CDR) meeting (or its functional equivalent) to address the items in 5.4.1.2. The updated plan shall be submitted to the SES DRA at least 60 days prior to the equipment contractor convening the regularly scheduled system CDR meeting. The equipment contractor will receive notification of approval or disapproval from the SES DRA, via the PM, within 30 days after the CDR meeting. This plan must be approved by the PM prior to the release of backplane assembly design documentation for initial production.

5.4.1.1 Backplane assembly implementation plan for PDR meetings. The backplane assembly implementation plan for a specific system/equipment PDR meeting shall include the following:

(a) Proposed usage of backplane assemblies conforming to the requirements of MIL-STD-2119 and MIL-A-28870 for printed-wiring backplane assemblies, or MIL-STD-2198 and MIL-A-24741 for metal backplane assemblies.

(b) Proposed usage of backplane assemblies that deviate from requirements of MIL-STD-2119 and MIL-A-28870 for printed-wiring backplane assemblies and MIL-STD-2198 and MIL-A-24741 for metal backplane assemblies with justifications.

(c) Backplane assembly drawings in accordance with MIL-T-31000 developmental design drawings.

(d) Proposed utilization of backplane assemblies within the system/equipment.

(e) Electrical design information.

(f) Preliminary quality assurance plan.

(g) Development schedule and milestones.

(h) Identification of special or anticipated problems.

5.4.1.2 Backplane assembly implementation plan for CDR meetings. The backplane assembly implementation plan for a specific system/equipment CDR meeting shall include the following:

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(a) Updated backplane assembly drawings in accordance with MIL-T-31000 developmental design drawings.

(b) Electrical design information.

(c) Electrical analysis.

(d) Quality assurance plan.

(e) Updated development schedule and milestones.

(f) Resolution of PDR meeting problems.

(g) Identification of special or anticipated problems.

5.4.2 Backplane assembly design review meetings. The equipment contractor shall address proposed backplane assembly selection, design, fabrication, and testing as part of regularly scheduled system design review meetings. PDR meetings shall be conducted early in the system development phase to permit effective review and approval of the backplane assembly implementation plan. Critical Design Review (CDR) meetings shall be conducted prior to initial system production release to assure that all backplane design, fabrication, and testing requirements have been achieved.

5.4.3 Backplane assembly documentation. The equipment contractor shall document all backplane assemblies in accordance with MIL-T-31000 product drawings prior to the start of the production phase.

5.5 SES enclosure implementation requirements.

5.5.1 Enclosure system implementation plan. The equipment contractor shall prepare an implementation plan defining the selection, design modification, fabrication, and testing of all enclosure systems. Existing enclosure hardware designs are referenced in TP-532. These designs may require modification to accommodate a specific system application. In-process designs are those enclosure hardware designs being developed and being evaluated for use as a standard enclosure. Information on in-process designs can be obtained from the SES Technical Manager. When any other designs are proposed, justification for their use shall be provided. Justification shall be provided only on the basis of technical adequacy and commercial availability. The enclosure implementation plan shall be submitted to the SES DRA at least 60 days prior to the equipment contractor convening the regularly scheduled system PDR meeting (or its functional equivalent). The submittal for the PDR meeting shall address the items in 5.5.1.1. The SES DRA will review the plan for hardware

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standardization purposes. The equipment contractor will receive notification of approval or disapproval from the SES DRA, via the PM, within 30 days after the PDR meeting. The enclosure implementation plan shall be updated for the Critical Design Review (CDR) meeting (or its functional equivalent) to address the items in 5.5.1.2. The updated plan shall be submitted to the SES DRA at least 60 days prior to the equipment contractor convening the regularly scheduled system CDR meeting. The equipment contractor will receive notification of approval or disapproval from the SES DRA, via the PM, within 30 days after the CDR meeting. This plan must be approved by the PM prior to the release of enclosure system design documentation for initial production.

5.5.1.1 Enclosure system implementation plan for PDR meetings. The enclosure system implementation plan for a specific system/equipment PDR meeting shall include the following:

(a) Existing SES enclosure hardware proposed for use and degree of modification.

(b) In-process SES enclosure hardware proposed for use.

(c) Other enclosure systems proposed with justification for usage with developmental design drawings in accordance with MIL-T-31000.

(d) Proposed utilization of enclosures within the system/equipment.

(e) Module format and quantity per enclosure.

(f) Anticipated thermal load and proposed cooling technique.

(g) Preliminary quality assurance plan.

(h) Development schedule and milestones.

(i) Identification of special or anticipated problems.

5.5.1.2 Enclosure system implementation plan for CDR meetings. The enclosure system implementation plan for a specific system/equipment CDR meeting shall include the following:

(a) Updated enclosure drawings in accordance with MIL-T-31000 developmental design drawings.

(b) Thermal and structural analyses.

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(c) Final quality assurance plan.

(d) Updated development schedule and milestones.

(e) Resolution of PDR meeting problems.

(f) Identification of special or anticipated problems.

5.5.2 Enclosure system design review meetings. The equipment contractor shall address proposed enclosure system selection, design, fabrication, testing, and systems application as part of regularly scheduled system design review meetings. PDR meetings shall be conducted early in the system development phase to permit the effective review and approval of the enclosure system implementation plan. CDR meetings shall be conducted prior to initial system production release to assure that all enclosure system design, fabrication, and testing requirements have been achieved.

5.5.3 Enclosure system documentation. The equipment contractor shall document all enclosure system components and assemblies in accordance with MIL-T-31000 product drawings prior to the start of the production phase. All new enclosure designs will be evaluated by the SES DRA for inclusion in the SHARP program as a standard enclosure.

5.5.4 Enclosure system testing. The equipment contractor shall successfully complete enclosure system design evaluation testing in accordance with the requirements and procedures approved in the enclosure system implementation plan.

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6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. This standard contains requirements for employing standard enclosure system hardware within the SHARP program.

6.2 Issue of DODISS. When this standard is used in acquisition, the applicable issue of the DODISS must be cited in the solicitation (see 2.1.1 and 2.1.2).

6.3 Data requirements. The following Data Item Descriptions (DIDs) must be listed, as applicable, on the Contract Data Requirement List (DD Form 1423) when this standard is applied on a contract, in order to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
5.2.4 5.3.4 5.4.3 5.5.3	DI-DRPR-81000	Product Drawings and Associated Lists	---
5.4.1.1 5.4.1.2 5.5.1.1 5.5.1.2	DI-DRPR-81002	Developmental Design Drawings and Associated Lists	---
5.2.1	DI-MISC-81063	Backplane Component Implementation Plan	---
5.3.1	DI-MISC-81064	Support Hardware Implementation Plan	---
5.4.1	DI-MISC-81062	Backplane Assembly Implementation Plan	---
5.5.1	DI-MISC-81061	Enclosure System Implementation Plan	---

The above DID's were those cleared as of the date of this standard. The current issue of DOD 5010.12L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

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6.4 Subject term (key word) listing.

Backplane assemblies
Backplane components
SEM
SHARP
Standard Electronic Modules
Standard Hardware Acquisition and Reliability Program

CONCLUDING MATERIAL

Custodians:
Army - ER
Navy - SH
Air Force - 85

Review activity:
DLA - GS

Preparing activity:
Navy - SH

Agent: NW

(Project 5975-1043)

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER	2. DOCUMENT DATE (YYMMDD)
	MIL-STD-2200	

3. DOCUMENT TITLE
Requirements for Employing Standard Enclosure Systems

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME	b. TELEPHONE (Include Area Code)	
Technical Point of Contact (TPOC): Mr. Dan Geuder (Code 6043) PLEASE ADDRESS ALL CORRESPONDENCE AS FOLLOWS:	(1) Commercial TPOC: 812-854-3240	(2) AUTOVON 482-3240
c. ADDRESS (Include Zip Code) Commanding Officer Naval Weapons Support Center ATTN: Dan Geuder, Bldg. 2044, Code 6043 Crane, Indiana 47522-5060	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	

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