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Superseding ARP4242

Electromagnetic Compatibility Control Requirements Systems

RATIONALE

The document is still a valid standard which may benefit from a future update. The basic technology described in the document is still valid. The subcommittee designated to update the document is not currently active, so stabilization of the document is the best approach until such time as a committee can be established to open a WIP.

STABILIZED NOTICE

This document has been declared "Stabilized" by the SAE AE-4 Electromagnetic Environmental Effects (E3) Committee and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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1. SCOPE AND FIELD OF APPLICATION:

This SAE Aerospace Recommended Practice (ARP) establishes overall system electromagnetic compatibility (EMC) control requirements. EMC includes the following:

a. Electromagnetic Environmental Effects (E^3)
b. Electrostatic Discharge (ESD)
c. Electromagnetic Interference (EMI)
d. Electromagnetic Vulnerability (EMV)
e. Electromagnetic Pulse (EMP)
f. Hazards of Electromagnetic Radiation to Ordnance (HERO)
g. Hazards of Electromagnetic Radiation to Personnel (HERP)
h. Hazards of Electromagnetic Radiation to Fuels (HERF)
i. High Intensity Radiated Fields (HIRF)
j. Lightning Protection
k. Static Electricity
l. TEMPEST

This document is intended to be used for the procurement of land, sea, air, or space systems by any procurement activity. Tailoring of specific requirements is necessary and Appendix A has been provided for guidance.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The applicable issue of the publications, or their successors, should be the issue in effect on the date of the purchase order. In the event of conflict between the text of this specification and references cited herein, the text of this specification takes precedence. Nothing in this specification, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 ANSI Publications:

Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ANSI C95.1 Safety Levels With Respect to Human Exposure to Radio frequency Electromagnetic Fields, 300 kHz to 100 GHz

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2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-461	Electromagnetic Emission and Susceptibility, Requirements for the Control of Electromagnetic Interference
MIL-STD-462	Electromagnetic Interference Characteristics, Measurement of
MIL-STD-1385	Preclusion of Ordnance Hazards in Electromagnetic Field; General Requirements
MIL-STD-1512	Electro-explosive Subsystems, Electrically Initiated Test Methods and Design Requirements
MIL-STD-1686	Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment Excluding Electrically Initiated Explosive Devices (Metric)
MIL-STD-1757	Lightning Qualification Test Techniques for Aerospace Vehicles and Hardware
MIL-STD-1795	Lightning Protection of Aerospace Vehicles and Hardware
MIL-STD-1818	Electromagnetic Effects Requirements for Systems
MIL-STD-2169	High Altitude Electromagnetic Pulse (HEMP) Environment
MIL-HDBK-238	Electromagnetic Radiation Hazard
DOD-HDBK-263	Electrostatic Discharge Control Handbook for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices) Metric
MIL-HDBK-419	Grounding, Bonding, and Shielding for Basic Theory - Volume 1 Electronic Equipments and Facilities Applications - Volume 2

2.3 Applicable References:

NACSIM 5100A	Compromising Emanations Laboratory Test Requirements, Electromagnetics

2.4 Definitions:

2.4.1 EMCAB (Electromagnetic Compatibility Advisory Board): The EMCAB is an EMC Advisory Board, established by the procuring activity for the control, review, advice, technical consultation and other assistance as may be required on EMC matters during the design and procurement of major systems.

2.4.2 EME (Electromagnetic Environment): The power and time distribution, in appropriate frequency ranges, of the electromagnetic levels which may be encountered by an equipment, subsystem or system when performing its assigned mission. The EME is normally expressed in terms of field strength or power density.

2.4.3 EMC (Electromagnetic Compatibility): Ability of electronic/electrical equipments, subsystems, and systems to operate in their intended operational environments without suffering or causing unacceptable degradation due to EMI.

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2.4.4 EMI (Electromagnetic Interference): Conducted or radiated electromagnetic disturbance which interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics/ electrical equipments.

2.4.5 EMP (Electromagnetic Pulse): The radiated electromagnetic field which is generated by a nuclear detonation.

2.4.6 HERP,HERF AND HERO (Hazards of Electromagnetic Radiation to Personnel, Fuel and Ordnance): The potential for electromagnetic radiation to produce harmful biological effects in Personnel (HERP), to cause spark ignition of such volatile combustibles as aircraft Fuels (HERF), or to adversely affect Ordnance (HERO).

2.4.7 LIGHTNING: An electrical discharge in the atmosphere caused by static potential differences within a cloud, between clouds or between a cloud and the ground.

2.4.8 UNACCEPTABLE RESPONSE: The response of a system or subsystem/equipment to EMI which is beyond its design tolerances and is unacceptable due to its impact on the system safety or performance of its mission.

2.4.9 UNDESIRED RESPONSE: The response of a system or subsystem/equipment to EMI which is beyond its design tolerance but may be acceptable since it does not compromise system safety or mission performance.

2.4.10 HIRF (High Intensity Radiated Fields): HIRF represents the electromagnetic environment that exists due to the transmission of electromagnetic energy into free space. The HIRF envelope is the characterization of this electromagnetic environment in air space in which civil aircraft are permitted to operate.

3. REQUIREMENTS:

3.1 System EMC Control Program:

An integrated EMC control program should be established for the system at the concept stage and implemented throughout the system life cycle. The program should include the necessary approach, planning, technical design and management controls required to meet the requirements of this document. The requirements of this document should be tailored to meet the needs of the procuring activity. Appendix A is provided for guidance. Close coordination should be maintained throughout the program with system safety, maintainability, and reliability activities.

3.1.1 Electromagnetic Compatibility Advisory Board (EMCAB): If specified, an EMCAB may be established to monitor the EMC control program, provide means of expediting solution of EMC problems and establish high level channels of coordination. Details of a typical EMCAB operation, responsibilities and members are contained in Appendix B. The details of the organization and functioning of the EMCAB should be included in the EMC Control Plan unless otherwise specified.

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3.2 System EMC Control Plan:

The details of the system EMC control program should be included in the system EMC control plan. The initial submittal of the control plan should be submitted very early in the program for review and approval by the procuring activity. The control plan should be prepared and submitted in accordance with the requirements of the procuring document. The control plan should include but not be limited to the elements of the overall program as specified herein and the control plan data item description. It should be updated as required by the contract. All of the information required, but not available at the time of original submission, should be included in supplements or revisions.

3.3 System EMC Control Requirements:

The electromagnetic compatibility of the system should be controlled by design to meet the applicable system EMC requirements in the contract. This requires the electromagnetically compatible operation of all subsystems/equipments when performing their intended functions in the specified electromagnetic environment (EME). Equipment design and installation should utilize good electromagnetic protection design practices.

3.3.1 System EMC Performance Evaluation Requirements: The system should be evaluated during the earliest design stage to establish an overall approach to achieve the required level of EMC performance. This evaluation should include:

a. Definition of the expected operating electromagnetic environment (EME)
b. Establishment of criticality categories
c. Determination of system EMC operational degradation criteria
d. Determination of need for establishment of safety margins
e. Performance of supporting analyses

The results of this evaluation should be included in the EMC control plan. They should also be used to tailor subsystem/equipment EMC requirements.

3.3.1.1 Criticality Categories: All subsystems/equipments installed in or associated with the system should be assigned to one of the following EMC criticality categories. These assignments should be based on the impact of an electromagnetic interference (EMI) or susceptibility malfunction or degradation of performance on the assigned mission.

a. Category I (critical) - EMC problems that could result in personal injury or loss of life, loss of system, mission abort, costly operational delays or unacceptable reduction in system effectiveness.

b. Category II (essential) - EMC problems that could result in damage to the system or reduction in system effectiveness that would endanger success of the mission.

c. Category III (nonessential) - EMC problems that result only in annoyance, minor discomfort or loss of performance that does not reduce desired system effectiveness.

These assignments, along with the degradation criteria of 3.3.1.2, should be used to assess the need for EMC safety margins. See 3.3.1.3

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3.3.1.2 Degradation Criteria: Degradation criteria should be established by the developing activity for each subsystem/equipment after consultation with the procuring activity. These criteria should be used to evaluate system or subsystem/equipment EMC malfunctions or undesirable responses. When available, the results of subsystem/equipment laboratory interference tests should be used in establishing or defining the criteria.

3.3.1.3 Safety Margins: Consideration should be given to establishing safety margin for subsystems/equipments assigned to criticality categories I and II. Safety margins should be used only when required by the procuring activity or when an identified EMC problem justifies their use. System performance requirements, tolerances, repeatability and instrumentation requirements should be considered in establishing the safety margins.

3.3.1.4 Analyses and Prediction: Analyses and predictions should be performed to achieve system EMC, to specify degradation criteria and safety margins and to identify potential problem areas in the design, development, testing and production of the system. System EMC analyses should include mission EMC requirements, intended/expected operational EME and system EMI allocations to subsystem/equipment based on EMC criticality categories, degradation criteria, safety margins and the EME.

Subsystem/equipment analyses should include EMI emissions and susceptibility characteristics based on the EMI allocations established at the system level and applicable subsystem/equipment requirements.

3.3.2 Intrasystem EMC Control (Electromagnetic Interference): Unless otherwise specified, subsystems/equipments should be designed to meet the requirements of MIL-STD-461. The requirements of MIL-STD-461 should be tailored for subsystems/equipments based on the results of the EMC analyses required by 3.3.1.4 herein. Each subsystem/equipment should be designed to be electromagnetically compatible with all other subsystems/equipments contained in the system when operated in accordance with system mission requirements.

3.3.3 Intersystem EMC Control: The system design should be compatible with the external EME as specified in the system specification. Consideration should be given to the intended mission profiles, and the degree to which the external environment can reduce the desired effectiveness of the system. The system and its subsystems/equipments should meet all performance requirements when operating in the defined EME (friendly or hostile). Mission and safety requirements should be met during operations when electromagnetic energy is coupled to the system through equipment, subsystems/equipments, ground support equipment (GSE) and external electrical power, as applicable.

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3.3.4 Bonding and Grounding: Bonding provisions should be incorporated in the design of the system and subsystem/equipment to achieve the required level of electromagnetic compatibility as well as safety from such hazards as ESD, lightning, EMP, etc.

A plan for system grounding to achieve proper system operation should be established at the beginning of the program and necessary design criteria flowed down to subsystem /equipment designers.

Corrosion control should be implemented at all bond junctions to preclude degradation of the bond over the life of the system.

A complete description of the bonding and grounding requirements should be included in the EMC control plan.

3.3.5 Electromagnetic Pulse: The system should be designed to operate as required by the detailed specification when subjected to the EMP environment as defined in MIL-STD-2169.

3.3.6 Personnel Hazards: The system design should include provisions for protection of personnel from electromagnetic, electrostatic and electric shock hazards. Where possible, protection provisions should be designed into associated subsystems/equipments. When protection by design is not feasible, adequate safety precautions should be included in operating and maintenance manuals.

3.3.7 Radiation Hazards: The system should be designed to protect personnel, ordnance and fuel from damaging effects of electromagnetic or electrostatic energy as defined herein.

3.3.7.1 HERP: Personnel should be protected against HERP to the requirements of MIL-HDBK-238 and ANSI C95.1. System/equipment must also comply with all local and regional laws and regulations where applicable.

3.3.7.2 HERO: Ordnance and EEDs should be protected against HERO in accordance with the requirements of MIL-STD-1385 or MIL-STD-1512 as appropriate.

3.3.7.3 HERF: The system should be protected from hazards to fuel from the EME, the lightning threat, static discharges and arcing. All electromagnetic environmental hazards during loading, removal, storage and shipment must be considered.

3.3.8 Static Electricity: The system and subsystems/equipment should be designed to prevent static electricity from degrading system effectiveness. P-Static dischargers should be used on aircraft if not in conflict with other system requirements.

3.3.8.1 Electrostatic Discharge (ESD) Protection: Subsystems/equipment should be protected from ESD by implementation of DOD-HDBK-263 and MIL-STD-1686.

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3.3.8.2 Conductive Coatings: Consideration should be given to applying conductive coatings to all nonmetallic materials (such as radomes) on the external surface of airborne vehicles that are exposed to airflow unless otherwise indicated by other system requirements. In typical applications, coating resistivity should measure greater than 50 megohms per unit area at any given point.

3.3.9 Commercial Subsystems/Equipments: When commercial off-the-shelf subsystems/equipments are considered for use in a system, the following rules should be used in selecting and utilizing the equipment in the system:

a. The equipment may be considered adequate if the system requirements are not significantly more stringent than those to which the equipment was designed, and interference test reports are available to adequately demonstrate compliance; however, compliance with the requirements relating to subsystems/equipments shall not relieve the developing activity of the responsibility of providing system compatibility.

b. When compliance with interference requirements cannot be substantiated due to unavailability of test reports, either laboratory interference tests or a predictive analysis may be performed for qualification of the subsystem as negotiated with the procuring activity.

c. After evaluation of the data, if it is determined that more stringent requirements are necessary, it should be the responsibility of the developing activity to implement these requirements, or select another equipment with adequate characteristics as negotiated with the procuring activity.

3.3.10 Procuring Activity Furnished Subsystem/Equipments: Procuring activity furnished equipment (PFE) required for use in the system should be acceptable from an EMI viewpoint provided that the interference and susceptibility requirements as outlined below are met:

a. New subsystem/equipment designs should have met, as a minimum, the appropriate requirements of MIL-STD-461 and be supported by approved qualification test reports.

b. When compliance with EMI specifications cannot be substantiated, the developing activity may perform laboratory tests for qualification of the subsystem to the requirements as negotiated with the procuring activity.

c. PFE which is not compatible and for which external suppression measures are ineffective, may be modified in accordance with the terms of the procuring document if approved by the procuring activity. If such procedures are not specified in the procuring document, the developing activity should advise the procuring activity, by letter, of subsystems/equipments that cannot meet the requirement and details concerning the modifications required.

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3.3.11 Subsystem/Equipment Installation: The developing activity is responsible for the proper installation engineering of all subsystems/equipments to achieve a compatible system installation. The installation design should consider the results of the system EMC performance evaluation performed per 3.3.1.

Where it is demonstrated that an electromagnetic incompatibility caused by PFE cannot be eliminated either by proper installation, control of the system EME, or by reasonable modification to the subsystem/equipment as permitted by the procuring document, the procuring activity may consider waiving the requirement applicable to the particular equipment upon request from the developing activity if allowed by the terms of the procuring document.

3.3.12 Lightning Protection: The developing activity is responsible for developing lightning protection for the system in accordance with the applicable requirements of MIL-STD-1795 and MIL-HDBK-419. The performance of the system during and after the lightning event should be specified by the procuring activity.

3.3.13 Electromagnetic Spectrum Conservation: The developing activity should conserve the use of the electromagnetic spectrum by limiting system and subsystem/equipment intended radio frequency emissions occupied bandwidth to the minimum amount required to perform the specified system mission. The developing activity should collect and provide the necessary information and obtain (in conjunction with the procuring activity) all required frequency authorizations.

3.3.14 Wiring and Cabling: Wiring and cabling should be designed to minimize coupling, and obtain optimum separation and use of available wiring space. Cable design should include provisions for proper termination of individual wire shields and should use a conductive finish consistent with shield termination requirements between elements of the shield ground path (i.e., connector parts). When overall shields are required, use a connector backshell that provides for peripheral termination of the shield.

3.3.15 TEMPEST: When required by the contract, the system and applicable subsystems/equipments should be designed to meet the requirements of NACSIM 5100A.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

Unless otherwise specified, the developing activity is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the developing activity may utilize its own facilities or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the procuring activity. The procuring activity reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

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4.2 EMC Test Plan and Test Procedure:

An EMC test plan should be prepared by the developing activity and submitted for review and approval by the procuring activity. The test plan should provide for a system EMC test and a production acceptance EMC test. The test plan should include, but not be limited to, a description of the test sample, all necessary test equipment, facilities (customer, contractor or other) to be used, methods for determining compliance with applicable requirements, rf ambient profiles, sketches and diagrams of set-ups, test frequencies or frequency ranges, personnel (customer, contractor and other) required, consideration for regulations such as FCC or FAA, etc, expected accuracy of measurements, test sample operation during test and a test schedule.

When safety margins have been established, appropriate subsystem/equipment input and output monitoring criteria should be included in the test plan.

A test procedure should be prepared by the developing activity and submitted for review and approval by the procuring activity. The test procedure should provide the step-by-step procedures required to demonstrate the compliance of the test sample with the requirements of this document, as may be amended by the procurement document, and the approved test plan. The procedure should address both the system EMC test and the production acceptance EMC test.

4.3 Tests:

4.3.1 Subsystem/Equipment EMC Tests: Subsystems/Equipments should have been tested to show compliance with applicable requirements of MIL-STD-461 or have substantiating data showing compliance with system EMC requirements.

4.3.2 System EMC Test: The developing activity should perform a complete system EMC test in accordance with the approved test plan and test procedure to demonstrate compliance with the requirements of this specification on the system designated and approved by the procuring activity. The system tested should be typical of the production configuration and should preferably be the first article. Some requirements may be adequately demonstrated at the subsystem/equipment level. These selections should be so indicated in the test plan and the results of such tests should be discussed in the system test report.

4.3.2.1 Any changes or modifications required as a result of the EMC test should be incorporated into the system in accordance with the terms of the procuring document. The developing activity should then perform the minimum retesting deemed necessary by the procuring activity to demonstrate that the modifications enable the system to comply. The retest should be performed on a system acceptable to the procuring activity.

4.3.3 Production Acceptance EMC Test: Where required or appropriate, each production system should be given a limited EMC test as outlined in the developing activity's approved test plan and test procedure to ensure production compliance with the EMC requirements. This test may be included as part of the overall system acceptance test or at the subsystem/equipment level as specified in the approved test plan.

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4.4 Test Conditions:

All outstanding approved engineering orders, engineering change proposals (ECPs), modifications, and configuration changes should be incorporated and installed prior to start of test. All exceptions to these should be approved by the procuring activity and all such requests should identify that portion of the system that is not per the approved production configuration.

The following criteria should be complied with throughout all phases of the test program as specified in the approved test plan and test procedure.

4.4.1 All subsystems/equipments should be in accordance with the requirements of 3.3.2, or 3.3.9 or 3.3.10, or have approved deviation requests.

4.4.2 The EMC test plan and procedure for the system should have been approved and all required changes incorporated prior to start of tests.

4.4.3 External electrical power (where required) supplied to the system under test should meet the power quality requirements of the applicable specification.

4.4.4 Tests should not be conducted in any area or at any time when the EME at the test site would affect the validity of the tests. The ambient EME at the test site should be monitored, measured, analyzed, or controlled to the extent necessary to ensure that this ambient environment does not degrade test results or mask interference from the system. When possible, all support or site equipment that generates interference that is unacceptable should be suppressed, removed, or not operated. All ambient signals that may degrade test results should be identified and recorded.

4.4.5 During tests, all electronic subsystems/equipments under the control of test personnel should be adjusted, within the limits of the subsystem specification, for maximum indication of interference or susceptibility consistent with normal operation.

4.4.6 Tests should be designed to indicate compatible operation, undesirable responses, unacceptable responses, or malfunctioning while all applicable subsystems/equipments are operated. It should be the responsibility of the developing activity to determine, conclusively and correctly, the causes of all such indications of noncompatibility.

4.4.7 Each subsystem/equipment should be monitored by appropriate means to adequately evaluate the effects of system operation and, where required, to demonstrate applicable safety margins. Where possible, approved support equipment intended for use with the system should be used to monitor subsystems/equipments and provide data records. If the procuring activity agrees, special instrumentation may be used. All records should be provided with time or event correlation.

4.4.8 The overall system should be operated in representative normal modes of operation and under representative specified or simulated mission electromagnetic environments.

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4.4.9 When subsystems/equipments require special inputs such as Doppler, simulated stars or temperature, the means of simulating these inputs should be provided as described in the EMC test plan.

4.4.10 The EMC tests should demonstrate the required system compatibility when subsystems/ equipments, including support equipment, trainers and simulators are individually and collectively operated in representative modes of operation. Transmitters and receivers should be operated at those critical frequencies identified during system analysis and subsystem/equipment laboratory tests. For example, transmitter frequencies should be chosen so that harmonics occur at receiver tuned frequencies, and/or intermediate frequencies. If the system uses special frequencies for command channel, distress messages, or other purposes, they should be given special attention.

4.4.11 Intersystem compatibility should be demonstrated under simulated or actual use conditions.

4.5 Success Criteria:

Compliance with the procurement specification should be achieved when electromagnetically compatible operation, including any approved safety margins, is demonstrated in accordance with the requirements of 4.3 without unacceptable responses or malfunctions. If the procuring activity agrees that it is impractical, or not within the developing activity's ability to make corrections, or the undesirable responses are deemed minor, the system may be considered acceptable.

4.6 Test Report:

A complete test report, describing the EMC tests should be provided in accordance with the procuring document. The report shall contain complete information on all applicable tests and other information required by this document. System EMC requirements satisfied by test at the subsystem/equipment level shall have a discussion of such test results and a listing of documentation for them in this report.

5. PREPARATION FOR DELIVERY:

5.1 This section is not applicable to this document.

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PREPARED BY SAE COMMITTEE AE-4, ELECTROMAGNETIC COMPATIBILITY

APPENDIX A
TAILORING GUIDE FOR ARP4242

A.1 SCOPE:

This appendix provides guidance for the tailored application of the requirements of this document to be consistent with the needs of the intended procurement.

A.2 APPLICABLE DOCUMENTS:

DOD-HDBK-248 Guide for Application and Tailoring of Requirements for Defense Material Acquisitions

A.3 OBJECTIVES:

This document is intended for application to many different types of procurements of widely varying complexity. The requirements contained herein are intended to be adequate to define the most complex applications. However, many procurements will not require imposition of all of these requirements. This appendix provides guidance for the application of these requirements based upon the following factors:

a. The complexity of the procured system
b. The intended use of the system
c. The specific procurement phase
d. Any other contributing circumstances

Questions relative to the application of this guidance should be referred to the applicable office of primary responsibility for electromagnetic compatibility within the procuring activity. Requirements for complex procurements should not be released without prior review by that office.

A.4 DESCRIPTION AND USE:

The tailoring guide is formatted as a matrix (see Figure A1) which lists the respective paragraphs of this specification and indicates the applicability of that paragraph to different program procurement phases. General guidance for the tailoring of specific requirements is provided in the column entitled "Tailoring Notes". Finally, a column entitled "Guidance Documents" identifies other documents which provide useful information pertinent to the subject.

The legend utilized in the program phase headings is as follows:

C - Concept Definition
V - Validation
F - Full Scale Development
P - Production
D - Deployed (applicable to maintenance, modification or reprocurement activities.)

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A.4 (Continued):

The symbols utilized within these columns are to be interpreted as follows:

A -The referenced paragraph is fully applicable in the acquisition phase indicated.

N -The referenced paragraph is not applicable in the acquisition phase indicated.

T -The referenced paragraph may be applicable in the acquisition phase indicated, but should be tailored in its application. Guidance in how to tailor the paragraph is provided in the "Tailoring Notes" column. It is recognized that tailoring is a dynamic, continuing process throughout the life cycle of a system. It is recommended that the System EMC Control Plan, which is required by 3.2, be used as a mechanism for providing such tailoring. This requires that the request for proposal (RFP) for the concept definition phase contain a task to generate this plan and that all subsequent procurement phase RFPs require maintaining and updating that document. This will result in a self-tailoring EMC program that is cost effective, timely and visible to program management. The requirement for a control plan could be waived for procurement of very simple systems.

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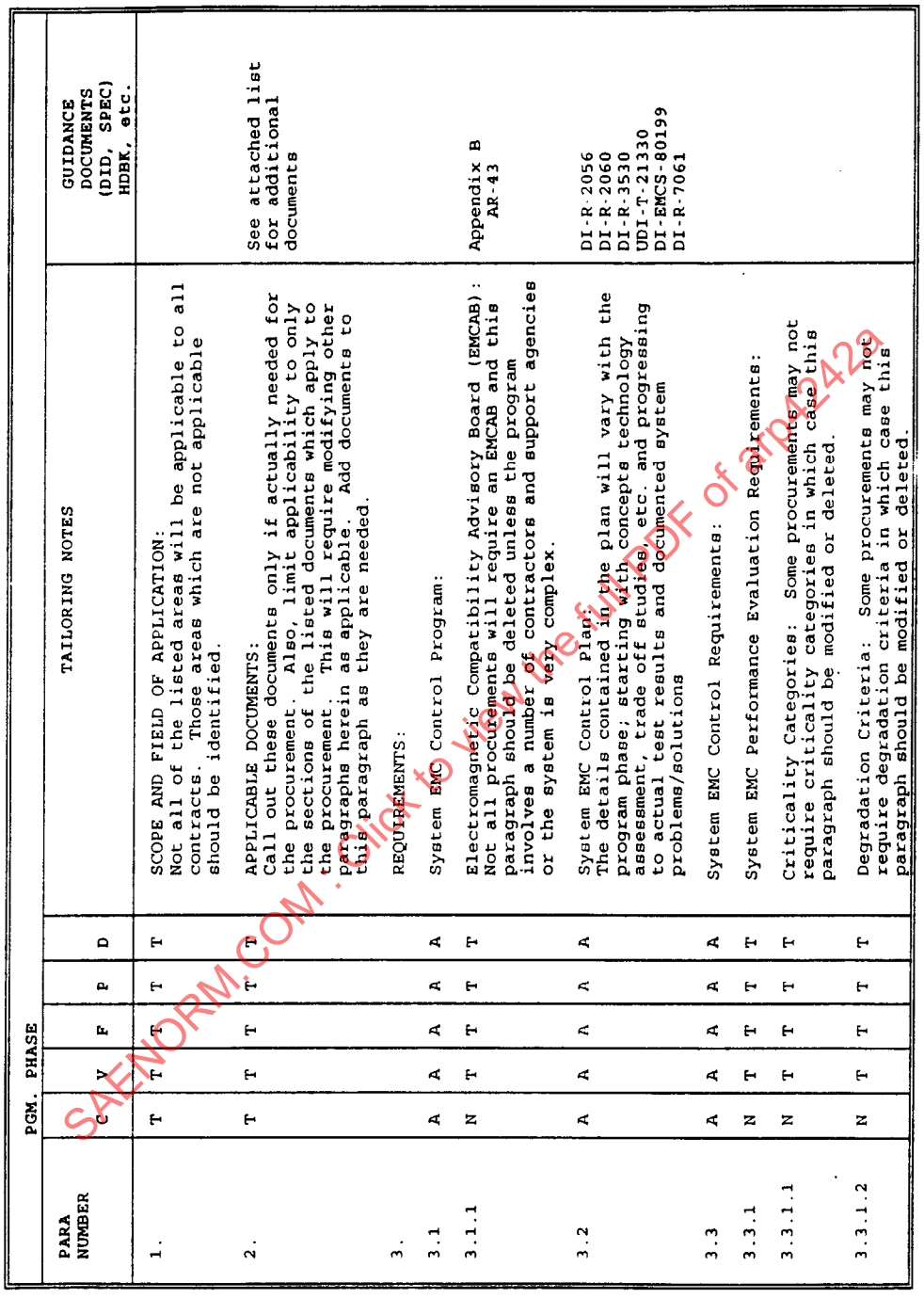

PARA NUMBER	PGM. PHASE C	V	F	P	D	TAILORING NOTES	GUIDANCE DOCUMENTS (DID, SPEC) HDBK, etc.
1.	T	T	T	T	T	SCOPE AND FIELD OF APPLICATION: Not all of the listed areas will be applicable to all contracts. Those areas which are not applicable should be identified.	
2.	T	T	T	T	T	APPLICABLE DOCUMENTS: Call out these documents only if actually needed for the procurement. Also, limit applicability to only the sections of the listed documents which apply to the procurement. This will require modifying other paragraphs herein as applicable. Add documents to this paragraph as they are needed.	See attached list for additional documents
3.						REQUIREMENTS:	
3.1	A	A	A	A	A	System EMC Control Program:	
3.1.1	N	T	T	T	T	Electromagnetic Compatibility Advisory Board (EMCAB): Not all procurements will require an EMCAB and this paragraph should be deleted unless the program involves a number of contractors and support agencies or the system is very complex.	Appendix B AR-43
3.2	A	A	A	A	A	System EMC Control Plan: The details contained in the plan will vary with the program phase; starting with concepts technology assessment, trade off studies, etc. and progressing to actual test results and documented system problems/solutions	DI-R-2056 DI-R-2060 DI-R-3530 UDI-T-21330 DI-EMCS-80199 DI-R-7061
3.3	A	A	A	A	A	System EMC Control Requirements:	
3.3.1	N	T	T	T	T	System EMC Performance Evaluation Requirements:	
3.3.1.1	N	T	T	T	T	Criticality Categories: Some procurements may not require criticality categories in which case this paragraph should be modified or deleted.	
3.3.1.2	N	T	T	T	T	Degradation Criteria: Some procurements may not require degradation criteria in which case this paragraph should be modified or deleted.	

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FIGURE A1

PARA NUMBER	PGM. PHASE C	V	F	P	D	TAILORING NOTES	GUIDANCE DOCUMENTS (DID, SPEC) HDBK, etc.
3.3.1.3	N	T	T	T	T	Safety Margins: Some procurements may elect to not require margins as provided by this paragraph.	
3.3.1.4	N	T	T	T	T	Analyses and Prediction: Not all procurements will require analysis and prediction and this paragraph should be deleted or modified to specify the analyses required.	DI-R-3524 UDI-R-22577B
3.3.2	T	T	T	T	T	Intersystem EMC Control (Electromagnetic Interference): Most systems will require tailoring of the limits of MIL-STD-461 to achieve system compatibility. This paragraph should be employed to provide appropriate tailoring of MIL-STD-461 requirements by the system contractor.	DI-EMCS-80199 DI-EMCS-80200 DI-EMCS-80201 MIL-STD-461 MIL-STD-1541 RTCA DO-160
3.3.3	T	T	T	T	T	Intersystem EMC Control: The RFP must specify the external EMI in which the system is required to operate or provide the contractor sufficient information to allow him to define that environment. For most procurements citing MIL-HDBK-235 is neither necessary nor sufficient.	MIL-HDBK-235 MIL-HDBK-237 DNA-2114 MIL-STD-2169
3.3.4	N	A	A	A	A	Bounding and Grounding: Pay special attention to this requirement! Proper compliance at all equipment levels will benefit final performance significantly.	MILD-STD-188-124 MIL-STD-1857 MIL-STD-1310 MIL-STD-1542 MIL-STD-8898 MIL-B-5087 MIL-HDBK-274 MIL-HDBK-419 TO-00-25-172 MIL-STD-1818

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FIGURE A1 (Continued)

PARA NUMBER	PGM PHASE C	V	F	P	D	TAILORING NOTES	GUIDANCE DOCUMENTS (DID, SPEC) HDBK, etc.
3.3.5	T	T	T	T	T	Electromagnetic Pulse: The RFP must define the degree of hardness to EMP required and the threat environment, if different from that of MIL-STD-2169. Some programs may not require this paragraph and it should be modified or deleted as required.	UDI-R-22550A UDI-R-STD-1857 MIL-STD-2169 DNA-2048H DNA-2114 NSWC/WOL/TR 75-193
3.3.6	A	A	A	A	A	Personnel Hazards:	NAVSEA OP-3565 OSHA MANUAL
3.3.7	T	T	T	T	T	Radiation Hazards: Some programs may not have sources of radiation hazards and this and the following three paragraphs should be modified or deleted as appropriate.	TO-31Z-10-4
3.3.7.1	T	T	T	T	T	HERP:	MIL-HDBK-238 ANSI C95.1-1982
3.3.7.2	T	T	T	T	T	HERO:	MIL-STD-1385 MIL-STD-1512 MIL-STD-1377 MIL-STD-1399-408 NAVY OD-30393 RD-TE-87-1
3.3.7.3	T	T	T	T	T	HERF:	TO-00-25-172 NAVSEA OP-3565 MIL-STD-1399-408 & 409
3.3.8	T	T	T	T	T	Static Electricity: These requirements are not applicable to all procurements and should be deleted as appropriate. This and the following two paragraphs should be modified or deleted as required	MIL-D-9129

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FIGURE A1 (Continued)

PARA NUMBER	PGM PHASE C	V	F	P	D	TAILORING NOTES	GUIDANCE DOCUMENTS (DID, SPEC) HDBK, etc.
3.3.8.1	T	T	T	T	T	Electrostatic Discharge (ESD) Protection:	DOD-HDBK-263 MIL-STD-1686 AIR-1208
3.3.8.2	T	T	T	T	T	Conductive Coatings:	
3.3.9	T	T	T	T	T	Commercial Subsystems/Equipment: The use of commercial equipment or nondevelopmental items (NDI) may require substantial modification of system EMC requirements.	
3.3.10	T	T	T	T	T	Procuring Activity Furnished Subsystem/Equipments: Some procurements may choose to modify this requirement.	
3.3.11	T	T	T	T	T	Subsystem/Equipment Installation: Some procurements may choose to modify this requirement.	
3.3.12	T	T	T	T	T	Lightning Protection: Some procurements may choose to modify or even eliminate this requirement.	MIL-STD-1795 MIL-B-5087 MIL-STD-1757 AIR-1406 MIL-A-9094 MIL-I-83456
3.3.13	N	T	T	N	T	Electromagnetic Spectrum Conservation. Responsibility for securing frequency allocations may be retained by the procurement office, delegated to the contractor or shared. The RFP should designate this responsibility and should define the test data required.	NAVAIR AR-29 MIL-STD-1377 NTIA MANUAL

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FIGURE A1 (Continued)

PARA NUMBER	PGM PHASE C	V	F	P	D	TAILORING NOTES	GUIDANCE DOCUMENTS (DID, SPEC) HDBK, etc.
3.3.14	N	A	A	A	A	Wiring and Cabling: Deviations from this requirement must be substantiated by analyses to show compliance with system compatibility requirements.	MIL-W-5088 MIL-STD-1377 DOD-STD-2133
3.3.15	N	T	T	T	T	TEMPEST: This requirement may not be appropriate for all programs and should be modified or deleted as required. Some electromagnetic security requirements may be met by proper design of the facility in which the system resides.	
4.						QUALITY ASSURANCE PROVISIONS:	
4.1	N	T	T	T	T	Responsibility for Inspection:	
4.2	N	T	T	T	T	EMC Test Plan and Test Procedures: Depending on the complexity of the system and test program required, the test plan and procedure may be combined into one document.	
4.3						Tests:	
4.3.1 and 4.3.1.1	N	N	A	N	N	Subsystem/Equipment EMC Tests:	
4.3.2	N	N	T	T	T	System EMC Test:	
4.3.3	N	T	A	N	N	Production Acceptance EMC Test:	
4.4 thru 4.4.11	N	T	A	A	T	Test Conditions:	

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FIGURE A1 (Continued)

PARA NUMBER	PGM PHASE C	V	F	P	D	TAILORING NOTES	GUIDANCE DOCUMENTS (DID, SPEC) HDBK, etc.)
4.5	N	T	T	A	T	Success Criteria:	
4.6	N	T	A	A	T	Test Report:	MIL-STD-831 UDI-T-23723A DI-T-3718 DI-R-2057 DI-R-2059
5.						PREPARATION FOR DELIVERY:	
6.						NOTES:	
6.1						Definitions: The RFP should contain any revised or added definitions applicable to the specific procurement	
6.1.1						EMCAB:	
6.1.2						EME:	
6.1.3						EMC:	
6.1.4						EMI:	
6.1.5						EMP:	
6.1.6						HERP, HERF AND HERO:	
6.1.7						Lightning:	
6.1.8						Unacceptable Response:	
6.1.9	T	T	T	T	T	Undesired Response:	
6.1.10						HIRF:	

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FIGURE A1 (Continued)

APPENDIX B
CHARTER FOR SYSTEM ELECTROMAGNETIC COMPATIBILITY ADVISORY BOARD (EMCAB)

B.1 INTRODUCTION:

B.1.1 Purpose:

B.1.1.1 This document describes the objectives, organization, responsibilities and actions of the Electromagnetic Compatibility Advisory Board (EMCAB). EMCABs have been used successfully on many military programs and this information is presented for use if, and when, an EMCAB type of organization is considered useful.

B.1.1.2 The EMCAB is an advisory body established to assist the Program Manager and the Assistant Program Manager in assuring that the system is electromagnetically compatible within its operational electromagnetic environment (EME).

B.1.2 Scope:

This charter delineates the general requirements applicable to the formation and operation of the EMCAB. The EMCAB is cognizant over all of the items of paragraph 1 of the ARP.

B.1.3 Responsibilities:

It is the responsibility of the EMCAB to make recommendations to assist in achieving EMC of the system in its operational EME. The EMCAB should be composed of members technically qualified to make appropriate recommendations on system and subsystem/equipment EMC problem solutions. EMCAB recommendations do not change any contractual obligations, but contractual changes may result from EMCAB recommendations. Any contractual changes will be processed through established management channels.

B.1.4 Objectives:

B.1.4.1 The objectives of the EMCAB should be to assist in the achievement of EMC throughout the life cycle of the system. This assistance should be provided by advising the developing activity of appropriate methods of assuring good EMC design. EMCAB activities should include, but not be limited to, the following:

a. Coordination of problems regarding EMC requirements and specifications

b. Recommendation of EMC requirement changes as appropriate

c. Coordination of problems regarding EMC program status

d. Coordination of problems regarding EMC documentation

e. Coordination of procuring activity furnished equipment EMC requirements with the system EMC requirements

f. Coordination of EMC tasks through appropriate management channels for action

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B.1.4.1 (Continued):

g. Coordination of problems regarding developing activity system and equipment EMC planning, design, test and data

h. Identification of EMC problems

i. Recommendation of solutions to EMC problems

j. Coordination of EMC Engineering Change Proposals (ECPs), and waivers/deviations (W/Ds)

B.1.4.2 The EMCAB procuring activity chairperson should ensure that each participating activity establishes an individual effort in consonance with the overall program EMC objectives, that effective methods of monitoring EMC efforts and progress are established and followed, that periodic EMC program design reviews are scheduled and conducted and that deficiencies noted are promptly reported.

B.2 ORGANIZATION:

The EMCAB should consist of representatives of the procuring activity, procuring activity subactivities, prime developing activity and their subactivities as required.

B.2.1 Membership:

B.2.1.1 The EMCAB should be chaired jointly by the procuring activity and the prime developing activity. The vice chairperson should be a procuring activity representative and developing activity representative. The secretary should be the prime developing activity or any other activity as designated by the procuring activity. Individual member responsibilities should include the following:

a. Chairperson - Procuring Activity: Co-chair all EMCABs with the developing activity chairperson and chair the procuring activity only meetings. Approves agenda, meeting dates, EMCAB documents and reviews EMCAB meeting minutes. Distributes agenda, meeting notices, EMCAB documents and EMCAB meeting minutes. Provides tri-service EMC point-of-contact.

b. Chairperson - Developing Activity: Co-chair all EMCABs with the procuring activity chairperson. Plans, organizes and implements developing activity participation at all EMCABs.

c. Vice-Chairperson - Procuring Activity Representative: Serves as alternate in the absence of the procuring activity chairperson.

d. Vice-Chairperson - Developing Activity Representative: Serves as the developing activity chairperson in the absence of the designated developing activity chairperson.

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B.2.1.1 (Continued):

e. Secretary - Designated Activity: Provides secretarial services. Prepares agendas, summary reports and minutes of the meetings.

f. Members - Permanent: Represent their organization and provide an interface between EMCAB and their organization. Participate in EMCAB activities specified in paragraph 1.4.1 above. Present EMC problems to the board. Provide agenda items. Participate in EMC problem-solving. Report EMC problem/solutions to their organization.

g. Members - Consulting: When invited, represent their organization and provide an interface between the EMCAB and their organization. Participate in EMCAB activities specified in B.1.4.1 as required by the procuring activity. Provide information on specialized EMC designs.

B.2.1.2 Members: The following organizations, as a minimum, are to have permanent members:

a. Procuring agency
b. Procuring agency support activities
c. Prime developing activity
d. Developing subactivities

B.3 MEETING DOCUMENTATION:

B.3.1 Agenda:

The final agenda should be approved and distributed at least fifteen days prior to the meeting and fully coordinated with the developing activity chairperson and procuring activity chairpersons.

B.3.1.1 Permanent Agenda Items: The following should be addressed at each EMCAB:

a. Previous meeting minutes
b. Review of outstanding action items
c. Review of EMC program schedule/milestones
d. Discussion of EMC designs and/or problem areas
e. New EMC activity
f. Review status of new action items and assigned responsibility
g. Tentative agenda, items, date and place of next EMCAB meeting

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B.3.1.2 Specialized Items: Technical items requiring an in-depth presentation or discussion will be scheduled on an as required basis and included as new EMC activity. Responsibility for the presentation or discussion will be assigned to the appropriate activity. Such specialized items include:

a. Support material for technical action items
b. Progress reports from specialized subcommittee chairmen
c. Discussion of EMC test plans, procedures, results
d. Discussion of EMC documentation
e. Identification of EMC problem areas
f. Recommended approaches for EMC problem solution

B.3.2 Action Items:

Action item assignments should be noted in the meeting minutes. The status of each open item will be reviewed at each meeting and recorded in the minutes. Reports, letters, data, etc., necessary to close the action item should be provided from those responsible for performing the action for publication in the minutes. Action Items should be designated to the responsible activity along with the proposed completion date.

B.3.3 Minutes:

Minutes of each EMCAB meeting should be recorded by the secretary. A copy of the minutes should be forwarded to all members within 30 days after each meeting. Any deficiencies noted are to be promptly reported and corrected before the next meeting. The published minutes should include:

a. Date and place of meeting
b. List of all attendees with the name of the person(s) chairing the meeting
c. Summary of topics discussed
d. Complete descriptions of action items and decisions
e. EMCAB recommendations
f. Tentative date and place of next EMCAB meeting
g. Action item summary
h. Copy of presentations
i. Executive summary not to exceed one page

B.4 MEETING SCHEDULE:

Meetings will be scheduled three months apart unless otherwise decided by the EMCAB. Tentative planning for the subsequent meeting should be accomplished at each meeting. Such planning should include date, time, location, and preliminary agenda items.

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APPENDIX C
EMC REFERENCE DOCUMENTS

C.1 PREFACE:

The documents listed herein are provided for information only. They represent a snapshot in time as far as their existence and revision level is concerned. It is not intended to be an exhaustive list of all possible documents. It does contain documents from many different organizations, but it is known that it is not a complete list. The SAE intends no disrespect toward any organization or document source (government, industry or professional society) whose documents may not be included.

Appendix C represents an area which will require constant attention with a need for fairly frequent updating. Suggestions, deletions, additions, etc. are welcome. Better organization and grouping or cross referencing of documents with similar functions have been considered and would be useful. However, at some point in time the document must be published and these remain as items for the first revision.

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MIL-C-12889A VALID NOTICE 1
CAPACITORS, BY-PASS, RADIO-INTERFERENCE REDUCTION, PAPER DIELECTRIC, AC AND DC, (HERMETICALLY SEALED IN METALLIC CASES), GENERAL SPECIFICATION FOR
V REV A NOTICE 1 17 AUG 88 1
E588-2762
REV A AMEND 3 30 MAR 79 3
E588-2763
REV A 30 AUG 57
16 E588-2766

MIL-C-24929A
CLOTH, LAMINATED, ALUMINIZED (PARA-ARAMID BASE)
REV A 30 SEP 88
19 X053-0569

MIL-C-24941
CLOTH, LAMINATED, ALUMINIZED (PARA-ARAMID/PBI BASE)
BASE 30 SEP 88
19 X051-2317

MIL-C-25694B VALID NOTICE 1
CLOTH, NYLON, METALIZED
V REV B NOTICE 1 30 JUL 87 1
X043-0796
REV B 24 SEP 79
17 X043-0797

MIL-C-83413A SUPP 1
CONNECTORS AND ASSEMBLIES, ELECTRICAL, AIRCRAFT GROUNDING, GENERAL SPECIFICATION FOR
REV A SUPP 23 MAR 84 1
E559-1692
REV A 23 MAR 84
17 E559-1693

MIL-C-85485
CABLE, ELECTRIC, FILTER LINE, RADIO FREQUENCY ABSORPTIVE

MIL-D-9129D SUPP 1
DISCHARGERS, ELECTROSTATIC GENERAL SPECIFICATION FOR
REV D SUPP 30 SEP 86 1
E563-2693
REV D 30 SEP 86 19
E563-2694

MIL-E-881A
ENCLOSURE, ELECTROMAGNETIC-SHIELDING, DEMOUNTABLE, PREFABRICATED GENERAL SPECIFICATION FOR
REV A 31 JAN 63
10 M406-3062

MIL-E-4158E (3)
ELECTRONIC EQUIPMENT, GROUND; GENERAL SPECIFICATION FOR
REV E AMEND 3 31 DEC 85 4
E012-3225
REV E 11 JAN 73
29 E012-3229

MIL-A-90940 VALID NOTICE 1
ARRESTER, LIGHTING, GENERAL SPECIFICATION FOR, DESIGN OF
V REV D NOTICE 1 13 FEB 87 1
E567-2036
REV D 17 MAR 69
13 E567-2037

MIL-B-5087B INT AMD 3
BONDING, ELECTRICAL, AND LIGHTNING PROTECTION, FOR AEROSPACE SYSTEMS
REV B INT AMD 3 24 DEC 84 2
E538-0369
REV B AMEND 2 31 AUG 70 4
E538-0371
REV B 15 OCT 64
26 E538-0375

MIL-C-5
CAPACITORS, FIXED, MICA-DIELECTRIC, GENERAL SPECIFICATIONS FOR

MIL-C-26074D
COATINGS, ELECTROLESS NICKEL, REQUIREMENTS FOR
REV D 27 FEB 89 9
M121-0731

MIL-C-81740
COATING, ALUMINUM AND ALUMINUM ALLOYS (METALLIC COMPOUND DECOMPOSITION)
BASE 15 AUG 69 12
M109-1338

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FIGURE C1

MIL-C-83439 VALID NOTICE 1
CAPACITOR, FIXED FEED THROUGH, ELECTROMAGNETIC INTERFERENCE SUPPRESSION, (AC, DC, AND AC-DC) (HERMETICALLY SEALED IN METALLIC CASES) GENERAL SPECIFICATION FOR
V NOTICE 1 27 FEB 87 1
E570-2139
AMEND 1 30 JUN 76 1
E570-2143
AMEND 3 16 APR 79 2
E570-2141
BASE 31 JUL 74 17
E570-2144
SUPP 1 31 JUL 74 1
E570-2140

MIL-C-11693C SUPP 1B
CAPACITORS, FEED THROUGH, RADIO-INTERFERENCE METAL CASES), ESTABLISHED AND NOT-ESTABLISHED RELIABILITY GENERAL SPECIFICATION FOR
REV C 08 OCT 71
28 E531-4095
REV C AMEND 1 28 MAR 77 1
E531-4094
REV C AMEND 4 06 AUG 82 6
E531-4088
REV C SUPP 1B 06 AUG 82 1
E531-4087

MIL-E-4957A (1)
ENCLOSURE, ELECTROMAGNETIC-SHIELDING, DEMOUNTABLE, PREFABRICATED FOR ELECTRONICS TEST PURPOSES
REV A AMEND 1 02 FEB 56 1
M406-2930
REV A 17 NOV 54
21 M406-2931

MIL-E-6051D VALID NOTICE 1
ELECTROMAGNETIC COMPATIBILITY REQUIREMENTS, SYSTEM
V REV D NOTICE 1 26 FEB 88
1 E318-3793
REV D AMEND 1 05 JUL 68 1
E318-3794
REV D 07 SEP
67 16 E318-3795

MIL-G-46898 (1)
GASKETING RF AND PRESSURE
AMEND 1 15 NOV 74 1
H001-3669
BASE 19 APR 74
6 H001-3670

MIL-F-15733G SUPP 1
FILTERS AND CAPACITORS, RADIO FREQUENCY INTERFERENCE GENERAL SPECIFICATION FOR
REV G SUPP 1 01 SEP 84 4
E580-2782
REV G AMEND 2 08 FEB 88 2
E580-2786
REV G 06 SEP 84
28 E580-2788

MIL-F-28861 SUPP 1B
FILTER, RADIO INTERFERENCE, TYPE F1245APX125
V REV B NOTICE 1 20 FEB 87 1
E567-2481
REV B 27 FEB 64
8 E567-2482

MIL-F-28861 SUPP 1B
FILTERS AND CAPACITORS, RADIO FREQUENCY/ELECTROMAGNETIC INTERFERENCE SUPPRESSION, GENERAL SPECIFICATION FOR
SUPP 1B 29 AUG 86 3
E594-3694
AMEND 6 16 JUN 89 10
E594-3697
BASE 17 DEC 81
38 E594-3707

MIL-F-49183
FILTER, DIRECT CURRENT, POWER F-1461()/VRC
BASE 12 SEP 78 31
E518-4310

MIL-G-47197B
GASKET, SHIELDING, ELECTRONIC-ORIENTED WIRES EMBEDDED IN SILICONE RUBBER, PRESSURE SEAL
REV B 27 APR 87
6 E572-4069

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FIGURE C1 (Continued)

MIL-G-83528A SUPP 1A
GASKETING MATERIAL, CONDUCTIVE, SHIELDING GASKET, ELECTRONIC, ELASTOMER, EMI/RFI GENERAL SPECIFICATION
FOR
REV A SUPP 1A 30 SEP 88 2
E590-2982
REV A AMEND 1 19 AUG 88 1
E590-2984
REV A 31 MAR 88
24 E590-2985

MIL-I-83456 VALID NOTICE 1
INSTALLATION OF SEGMENTED LIGHTNING DIVERTER STRIPS ON AIRCRAFT RADOMES, GENERAL SPECIFICATION FOR
V NOTICE 1 04 MAR 88 1
C525-2980
AMEND 2 02 JUN 76 5
C525-2981
BASE 02 DEC 74
18 C525-2986

MIL-I-83751
INDICATOR, SAFETY LEVEL, RF
BASE 01 MAR 67
11 M307-2559

MIL-L-13762B VALID NOTICE 1
LEAD ALLOY COATING, HOT DIP (FOR IRON AND STEEL PARTS)
V REV B NOTICE 1 31 JUL 89 1
M121-0117
REV B 31 AUG 83
8 M121-0118

MIL-M-47037 VALID NOTICE 1
NICKEL ALLOY, HIGH PERMEABILITY, SHIELDING GRADE
V NOTICE 1 06 JUN 86 1
M120-0613
BASE 19 APR 74
7 M120-0614

MIL-M-49158
MEASURING SETS, RADIO INTERFERENCE, GENERAL SPECIFICATION FOR
BASE 01 MAY 78
17 M306-1270

MIL-P-47226 NOTICE 2
PLATING, COPPER, ELECTROLESS (FOR NON-CONDUCTING MATERIAL)
NOTICE 2 30 AUG 85 1
M118-0562
BASE 12 JUL 74
4 M118-0563

MIL-S-29411B
SHELTER ASSEMBLIES: 10-FOOT AND 20-FOOT ELECTRO-MAGNETIC INTERFERENCE
REV B 20 JAN 88
25 C019-0398

A-A-1556
SEALING COMPOUND (ELASTOMERIC JOINT SEALANTS)
BASE 24 APR 81
1 AM002-1535

HH-T-29A
TAPE, ADHESIVE, LEAD FOIL
REV A 11 JUL 74
3 AP03-1896

L-T-80B
TAPE, PRESSURE SENSITIVE ADHESIVE (ALUMINUM-BACKED)
REV B 01 OCT 71
3 AM02-2246

QPL-83528-7
GASKET, SHIELDING, ELECTRONIC, ELASTOMER, EMI/RFI GENERAL SPECIFICATION FOR
REV 7 29 JUL 89
4 E596-2989

QQ-B-575B VALID NOTICE 1
BRAID, WIRE, (COPPER, TIN-COATED, OR SILVER COATED,
TUBLAR OR FLAT)
V REV B NOTICE 1 19 SEP 88 1
AE632031
REV B AMEND 1 01 AUG 80 2
AE63-2032
REV B 22 MAY 79
6 AE63-2034

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FIGURE C1 (Continued)

W-F-2190 SUPP 1
FILTER, RADIO FREQUENCY INTERFERENCE
SUPP 1 13 DEC 83
1 AE63-0448
BASE 13 DEC 83
12 AE63-0449

W-R-550A NOTICE 1
RODS, GROUND (WITH ATTACHMENTS)
REV A NOTICE 1 19 SEP 88 1
AE63-0322
REV A AMEND 1 18 AUG 77 6
AE63-0323
REV A 12 JUN 75
15 AE63-0329

MS3493
CONNECTOR, PLUG AND CAP, ELECTRIC, GROUNDING

MS25064 REV A
CONDUIT, FLEXIBLE, RADIO FREQUENCY SHIELDING
REV A 11 JUL 80
3 D100-1231

MS25065 REV A
FERRULE, FLEXIBLE CONDUIT, RADIO FREQUENCY SHIELDING
REV A 15 DEC 67
1 D100-1234

MS25066 REV A VALID NOTICE 1
NUT, FLEXIBLE CONDUIT, RADIO FREQUENCY SHIELDING
V REV A NOTICE 1 25 MAR 87 1
D104-1938
REV A 24 OCT 73
1 D104-1939

MS25067 REV A VALID NOTICE 1
CONDUIT ASSEMBLY, FLEXIBLE, RADIO FREQUENCY SHIELDING
V REV A NOTICE 01 JUL 89 1
D923-0916
REV A 15 DEC 67
3 D923-0917

MS25384
PLUG, FUEL NOZZLE, GROUNDING

MS33645
RECEPTACLE, GROUNDING, INSTALLATION OF

MS90298
CONNECTOR, RECEPTACLE, ELECTRIC, GROUNDING

MIL-S-46874 VALID NOTICE 1
SEAL, RF AND PRESSURE
V NOTICE 1 06 JUN 86 1
H014-3763
BASE 14 DEC 73
7 H014-3764

MIL-T-47012A
TAPE, PRESSURE-SENSITIVE ADHESIVE, COPPER FOIL
REV A 28 JUN 89
9 M014-2096

MIL-T-83284 (2)
TAPE, THERMAL RADIATION RESISTANT, PRESSURE-SENSITIVE ALUMINUM COATED FIBERGLASS CLOTH
AMEND 2 06 JUN 73 2
P006-0798
AMEND 1 23 MAR 71 1
P006-0800
BASE 23 JUL 70
6 P006-0801

MIL-W-5088
WIRING, AEROSPACE VEHICLE

MIL-W-87893
WORKSTATION, ELECTROSTATIC DISCHARGE (ESD) CONTROL
BASE 10 NOV 87
22 M421-0464

DOD-HDBK-263
ELECTROSTATIC DISCHARGE CONTROL HANDBOOK FOR PROTECTION OF ELECTRICAL AND ELECTRONIC PARTS, ASSEMBLIES AND EQUIPMENT (EXCLUDING ELECTRICALLY INITIATED EXPLOSIVE DEVICES) METRIC
BASE 02 MAY 80
76 MH42-3824

KSC-STD-E-0012A (1)
BONDING AND GROUNDING STANDARD FOR
REV A AMEND 1 29 SEP 78 1
D709-2092
REV A 01 MAR 74
35 D709-2093

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FIGURE C1 (Continued)