INCH-POUND

MIL-PRF-85725A(AS)
20 May 1998
SUPERSEDING
MIL-R-85725(AS)
25 July 1986

PERFORMANCE SPECIFICATION

RACK, INTEGRATED AVIONICS, FORCED AIR COOLED, GENERAL SPECIFICATION FOR

This specification is approved for use by the Naval Air Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers forced-air-cooled, integrated avionics racks, herein after referred to as racks, used for various military avionics systems. The racks are designed to accommodate Standard Electronic Modules (SEMs) using multiple tiers.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 414100B120-3, Highway 547, Lakehurst, NJ 08733-5100 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 5975

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

2.2.1 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

DEPARTMENT OF DEFENSE

MIL-C-28754	-	Connectors, Electrical, Modular, Component Parts, General Specification For
MIL-C-38999	-	Connector, Electrical, Circular, Miniature, High Density, Quick Disconnect, Bayonet, Threaded, and Breach Coupling, Environment Resistant, Removable Crimp and Hermetic Solder Contacts, General Specification For

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-130	-	Identification Marking of U.S. Military Property
MIL-STD-810	-	Environmental Test Methods and Engineering Guidelines
MIL-STD-1377	-	Effectiveness of Cable, Connector, and Weapon Enclosure Shielding and Filters in Precluding Hazards of Electromagnetic Radiation to Ordnance; Measurement of
MIL-STD-1389	-	Design Requirements for Standard Electronic Modules

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

2.3 Non-Government publications. The following document forms a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

ASQC-Z1.4	-	Sampling Procedures and Tables for Inspection by Attributes. (DoD adopted)

(Application for copies should be addressed to the American Society for Quality Control, 611 East Wisconsin Avenue, Milwaukee, WI 53202.)

2.4 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.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Materials. The materials used in the construction of racks shall be capable of meeting the performance requirements specified herein (see 3.3.11.2 and 4.5.1).

3.2.1 Corrosion prevention and control. The materials selected shall have corrosion resistance or shall be treated to resist corrosion during service life (see 6.2).

3.2.2 Dissimilar metals. Where dissimilar metals are used in contact with each other, protection against galvanic corrosion shall be provided. When dissimilar metals are used they shall not be susceptible to galvanic corrosion in accordance with table VII of MIL-C-28754. Dissimilar metals such as brass, copper or steel shall not be used in contact with aluminum or aluminum alloys.

3.2.3 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally safe materials shall be used, provided that the material meets the performance requirements specified herein.

3.3 Design.

3.3.1 Modularity. The rack shall accommodate two to seven tiers (see 6.2). Each tier shall be compatible with either Format B span 2, Format C, or Format E modules as specified in MIL-STD-1389. Each tier shall also contain a primary backplane. The individual tiers shall interconnect with a flexible secondary backplane. Each tier shall:

a. Have a primary backplane through which the SEMs are interconnected.

b. Have a combination module guide rail and air heat exchanger for module retention and heat dissipation.

c. Provide module retainer mechanisms to secure the modules firmly in place and provide for thermal contact with the guide rail.

d. Be removable as an assembly, complete with module guide rail and heat exchangers, from the front of the rack.

e. Provide a means to allow the escape of water or other fluids from the module equipment.

3.3.2 Backplanes. All electrical connections between modules, tiers, and input/output (I/O) connectors shall be through backplanes.

3.3.2.1 Primary backplane. The primary backplane shall provide the electrical and mechanical interconnection for the modules (see figure 1).

3.3.2.2 Secondary backplane. The secondary backplane shall provide an interconnection medium for rack I/O connectors, primary backplanes, and other associated electrical components.

3.3.3 Connectors. Electrical connections shall consist of the connector types specified in 3.3.3.1 and 3.3.3.2.

3.3.3.1 Input/output connectors. The rack shall accommodate connectors as specified in MIL-C-38999. Locations shall be provided at the ends which are not plenums of the rack for I/O connector mounting. The I/O connectors and secondary backplane shall be removable from the inside of the enclosure.

3.3.3.2 Secondary/primary backplane. An interface connector shall be provided between the primary backplane and secondary backplane for the purpose of simplifying the removal of an entire tier.

3.3.4 Mounting and support. Vibration isolators shall be the primary means of support with the exception of hard mounting applications when specified in the contract (see 6.2). Resonant frequencies of the rack or any of its components excluding the external isolators shall be not less than 45 Hertz (Hz).

3.3.5 Air inlet and outlet. The rack shall accommodate forced-air cooling. Cooling air shall not enter the module compartments or the compartment containing the primary or secondary backplane. The cooling air shall enter a plenum on one side of the rack, pass through the heat exchangers into the opposite side plenum, and then exhaust out of the rack. Location of the air inlet and exhaust outlet shall be optional, unless otherwise specified in the contract (see 6.2).

3.3.6 Module retainer. The retainer mechanism is permitted to be part of the enclosure or part of the module. The retainer mechanism shall be capable of securing SEMs firmly in place with a minimum contact pressure of 25 pounds per square inch (psi). This mechanism shall be shop and depot adjustable or replaceable. The retainers for the Format C or E modules shall not contribute to the insertion or extraction forces.

3.3.7 Escape of fluids. The enclosure shall contain a means of allowing the escape of fluids, such as drain holes. The rack shall be capable of being mounted in any orientation and shall be designed to avoid any feature which traps water or other fluids.

3.3.8 Heat exchanger. The heat load shall be removed by the heat exchangers through forced-air cooling.

3.3.9 Throttling. The rack shall provide a mechanism for throttling the air flow through each heat exchanger. This mechanism shall be shop and depot adjustable or replaceable.

3.3.10 Time elapsed meter. The rack shall accommodate installation of a time elapsed meter.

3.3.11 Interchangeability.

3.3.11.1 Design tolerances. Design tolerances shall permit parts, subassemblies, and assemblies, having the full range of dimensions, to be used in their parent assemblies without regard to the source of supply or manufacturer.

3.3.11.2 Parts and materials. When the specification for the part or material contains substitutability or supersession information, the design shall permit parts or materials to be used interchangeably.

3.3.11.3 Interchangeability conflicts. In event of a conflict between any of the requirements of this specification, the interchangeability requirement shall govern.

3.3.12 Dummy module. The rack shall be capable of accepting dummy modules.

3.4 Performance characteristics.

3.4.1 Environmental. The rack shall be designed for the environmental conditions specified in table I and shall operate in these conditions with no degradation of performance or change in physical form.

TABLE I. Environmental conditions.

Equipment operating					Equipment operating and nonoperating	Equipment nonoperating	
Temperature extremes for the chamber (without external cooling provisions)		Combined temperature-altitude		Temperature shock	Altitude	Temperature extremes	Temperature shock
(a) Continuous	(b) Intermittent	(c) Continuous	(d) Intermittent	(e) Range	(f) Range	(g) Range	(h) Range
-54 °C (-65 °F) to +71 °C (+160 °F)	30 min +95 °C (+203 °F)	Defined by curve A, figure 2	Defined by curve B, Figure 2	-54 °C (-65 °F) to +95 °C (+203 °F)	Sea level (30.0 in. Hg.) (1.32 in. Hg.) 70,000 ft.	-57 °C (-71 °F) to +95 °C (+203 °F)	-57 °C (-71 °F) to +95 °C (+203°F)

3.4.1.1 High temperature. The rack shall not bind, crack, craze, discolor, or bulge and the gaskets shall not lose their resiliency or become permanently distorted when tested as specified in 4.5.2.1. The operational requirements (temperature vs. altitude) are shown in figure 2. The performance of the vibration isolators shall not degrade.

3.4.1.2 Low temperature. The rack shall not bind, crack, craze, discolor, or bulge and the gaskets shall not lose their resiliency or become permanently distorted when tested as specified in 4.5.2.2. The performance of the vibration isolators shall not degrade.

3.4.1.3 Temperature shock. The rack shall withstand the temperature shock test as specified in 4.5.2.3 with no physical or performance degradations.

3.4.1.4 Humidity. The rack shall withstand the humidity test as specified in 4.5.2.4 with no change in mechanical properties, absorption of water, swelling, corrosion, or deterioration in performance.

3.4.1.5 Fungus. Racks covered by this specification shall be constructed of materials which are non-nutrient materials for biological growth. The rack shall pass the test of 4.5.2.5 without any degradation in performance (see 6.9).

3.4.1.6 Salt fog. The rack shall withstand the salt fog test as specified in 4.5.2.6 with no corrosion, deterioration, or performance degradation.

3.4.1.7 Acceleration. The rack shall withstand the acceleration test as specified in 4.5.2.7 with no material yield, failure, or loss of joint integrity.

3.4.1.8 Vibration. The rack shall withstand the vibration test as specified in 4.5.2.8 with no material yield, failure, or loss of joint integrity. In addition, the transmissibilities of the mounting system shall be not greater than the values shown on figure 3 in any direction of vibration.

3.4.1.9 Shock. The rack shall withstand the shock test as specified in 4.5.2.9 with no material yield, failure, or loss of joint integrity.

3.4.1.10 Crash safety. The rack shall withstand the crash safety test as specified in 4.5.2.10 with no failure of the mounting attachment.

3.4.2 Mechanical.

3.4.2.1 Guide rails. The guide rails shall not deform or crack when tested as specified in 4.5.3.1.

3.4.2.2 Tier insertion/extraction. The rack shall withstand the test specified in 4.5.3.2 with no physical or performance degradation. Each tier for Format B and C modules shall be capable of being removed without extracting any modules. This requirement is not applicable for Format E module racks.

3.4.2.3 Pressure drop. When tested in accordance with 4.5.3.3, the pressure drop from the inlet of each cold rail to its exit shall be not greater than the values given in figure 4 over the entire range of flows shown. Differences in pressure drops among different cold rails at the like flow rates shall be not greater than two percent. The pressure drop from the inlet of the rack enclosure to (and including) any of the exhaust ports, with no exhaust air collection, shall be not greater than the values shown on figure 5 over the entire range of flows. The variation in such values among the different exhaust ports shall be not greater than a one-percent flow rate differential between any two cold rails at the maximum anticipated flow rate. For the designs where all exhaust air is to be collected and exhausted through one single port, the pressure drop shall not be greater than the values shown on figure 5. Under this condition, the flow rate differential between any two cold rails shall be not greater than one percent at the maximum anticipated flow rate.

3.4.2.4 Leakage. The maximum allowable leakage rate shall be not greater than two percent of the maximum anticipated flow rate through the rack when tested as specified in 4.5.3.4.

3.4.3 Thermal. The rack shall be tested for thermal characteristics as specified in 4.5.4. The rack shall dissipate at least 250 watts per tier for 26 Format B Span 2 modules dissipating equal power. The racks shall dissipate at least 500 watts per tier for 26 Format C modules dissipating equal power. The racks shall dissipate at least 1500 watts per tier for 30 Format E modules dissipating equal power. The following conditions shall apply:

a. Cooling air inlet temperature: 27 °C ± 1 °C (81 °F ± 2 °F).

b. Ambient temperature: 71 °C ± 1 °C (160 °F ± 2 °F).

c. Maximum pressure drop across tier: 2 inches of water for Format B and designs; 2.75 inches of water for Format E designs.

d. Maximum module guide rib temperature: 85°C (185 °F).

e. Maximum outlet air temperature: 71°C (160 °F).

f. The minimum design goal for the air flow rate shall be 3 lb/min-kW of cooling air.

3.4.4 Electromagnetic interference.

3.4.4.1 Shielding effectiveness. The rack shall be designed to act as an effective shield against incident electric, magnetic, and electromagnetic field radiation.

3.4.4.1.1 Outside-to-inside. The outside-to-inside shielding effectiveness of the rack shall meet the minimal requirements shown on figure 6 when tested in accordance with 4.5.5.1.1.

3.4.4.1.2 Tier-to-tier. The shielding effectiveness between tiers shall meet the minimal requirements shown on figure 7 when tested in accordance with 4.5.5.1.2.

3.5 Dimensions. The cooling rack shall be capable of accommodating between 2 and 7 tiers and interfacing with the backplane shown in figure 1 (see 4.5.1).

3.6 Weight. The maximum system mass shall be 14.3 pounds/tier for Format B modules, 25.4 pounds/tier for Format C modules, and 82.7 pounds/tier for Format E modules. The tier mass includes all the mechanical structure of the tier and dummy modules (see 4.5.1.1).

3.7 Marking. Each rack and component shall be marked in accordance with MIL-STD-130 in a manner to ensure that the information remains intact and legible throughout the life of the item, and shall be located so that the marking is not obscured (see 6.2).

3.8 Workmanship. Painted surfaces shall be uniformly coated. Metal parts shall be free of burrs or sharp edges (see 4.5.1).

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.2).

b. Conformance inspection (see 4.3).

4.2 First article inspection. First article inspection shall be performed on two racks when a first article sample is required (see 3.1 and 6.2). This inspection shall consist of the examination and tests listed in table II.

TABLE II. First article inspection.

Inspection	Requirement paragraph	Method Paragraph
Examination		
Materials	3.2	4.5.1
Design	3.3	4.5.1
Dimensions	3.5	4.5.1
Weight	3.6	4.5.1.1
Marking	3.7	4.5.1
Workmanship	3.8	4.5.1
High temperature	3.4.1.1	4.5.2.1
Low temperature	3.4.1.2	4.5.2.2
Temperature shock	3.4.1.3	4.5.2.3
Humidity	3.4.1.4	4.5.2.4
Fungus	3.4.1.5	4.5.2.5
Salt fog	3.4.1.6	4.5.2.6
Acceleration	3.4.1.7	4.5.2.7
Vibration	3.4.1.8	4.5.2.8
Shock	3.4.1.9	4.5.2.9
Crash safety	3.4.1.10	4.5.2.10
Guide rails	3.4.2.1	4.5.3.1
Tier insertion/extraction 1/	3.4.2.2	4.5.3.2
Pressure drop	3.4.2.3	4.5.3.3
Leakage	3.4.2.4	4.5.3.4
Thermal	3.4.3	4.5.4
Shielding outside-to-inside	3.4.4.1.1	4.5.5.1.1
Shielding tier-to-tier	3.4.4.1.2	4.5.5.1.2

1/ This test is not applicable for Format E designs.

4.3 Conformance inspection. Conformance inspection shall consist of Groups A, B, and C inspections.

4.3.1 Group A inspection. Group A inspection shall consist of the examination shown in table III. Group A inspection shall be performed on those samples selected from an inspection lot in accordance with ASQC-Z1.4, general inspection level II. An inspection lot shall consist of all

units of the same size and design produced under the same conditions and offered for inspection at one time.

Table III. Group A inspection.

Inspection	Requirement paragraph	Method Paragraph
Examination		
Materials	3.2	4.5.1
Design	3.3	4.5.1
Marking	3.7	4.5.1
Workmanship	3.8	4.5.1

4.3.2 Group B inspection. Group B inspection shall consist of the inspections listed in table IV , performed in the order shown. Group B inspection shall be performed on sample units which have been subjected to and have passed the group A inspection. The sampling for Group B inspection shall be in accordance with ASQC-Z1.4, general inspection level II.

Table IV. Group B inspection.

Inspection	Requirement paragraph	Method Paragraph
Examination		
Dimensions	3.5	4.5.1
Weight	3.6	4.5.1.1
Mechanical performance		
Guide rails	3.4.2.1	4.5.3.1
Tier insertion/extraction 1/	3.4.2.2	4.5.3.2
Pressure drop	3.4.2.3	4.5.3.3
Leakage	3.4.2.4	4.5.3.4

1/ This test is not applicable for Format E designs.

4.3.3 Group C inspection. Group C inspection shall consist of the inspections listed in table V, performed in the order shown. Group C inspection shall be performed on nine units of the same design which have passed groups A and B inspections. The units shall not be subjected to any screening test prior to Group C inspection.

4.3.3.1 Failures. If one or more units fail to pass the group C inspection, the entire sample shall be considered to have failed.

TABLE V. Group C inspection.

Inspection	Requirement paragraph	Method Paragraph
High temperature	3.4.1.1	4.5.2.1
Low temperature	3.4.1.2	4.5.2.2
Temperature shock	3.4.1.3	4.5.2.3
Humidity	3.4.1.4	4.5.2.4
Fungus	3.4.1.5	4.5.2.5
Salt fog	3.4.1.6	4.5.2.6
Acceleration	3.4.1.7	4.5.2.7
Vibration	3.4.1.8	4.5.2.8
Shock	3.4.1.9	4.5.2.9
Crash safety	3.4.1.10	4.5.2.10
Guide rails	3.4.2.1	4.5.3.1
Tier insertion/extraction 1/	3.4.2.2	4.5.3.2
Pressure drop	3.4.2.3	4.5.3.3
Leakage	3.4.2.4	4.5.3.4
Thermal	3.4.3	4.5.4
Shielding outside-to-inside	3.4.4.1.1	4.5.5.1.1
Shielding tier-to-tier	3.4.4.1.2	4.5.5.1.2

1/ This test is not applicable for Format E designs.

4.4 Inspection conditions. The following conditions shall be used to establish normal performance characteristics under standard conditions and for making laboratory bench tests.

a. Temperature: room ambient (25 °C ± 10 °C (77 °F ± 18 °F)).

b. Altitude: normal ground.

c. Humidity: room ambient up to 90 percent relative humidity.

4.5 Inspection methods.

4.5.1 Examination. The racks shall be examined to determine compliance with the requirements of 3.2, 3.3, 3.5, 3.7, and 3.8.

4.5.1.1 Weight. There shall be no visual distortion when the maximum weight per tier is applied to the rack (see 3.6).

4.5.2 Environmental tests. All structural tests such as vibration, shock, crash safety, and acceleration, shall be performed with the rack at maximum system mass. Each tier shall be fully loaded with dummy modules or equal weight and dummy backplanes for the maximum system mass. The rack shall be restrained only by its hold-downs.

4.5.2.1 High temperature. The high temperature test shall be performed in accordance with MIL-STD-810, Method 501.3, Procedure II, including constant exposure and cyclic exposure. The temperature extremes for the chamber shall be as shown in table I, columns (a) and (b). The combined temperature-altitude requirements are shown on figure 2 (see 3.4.1.1).

4.5.2.2. Low temperature. The low temperature test shall be performed in accordance with MIL-STD-810, Method 502.3, Procedure II, at the temperature shown in table I, column (a) (see 3.4.1.2).

4.5.2.3 Temperature shock. The temperature shock test shall be performed in accordance with MIL-STD-810, Method 503.3, Procedure I, except that the diurnal cycle shall be replaced by a constant temperature. The five-minute maximum transfer time and the test duration of one hour or until stabilization, whichever is longer, shall apply to both hot and cold shocks. The test temperature extremes shall be as shown in table I, column (h) (see 3.4.1.3).

4.5.2.4 Humidity. The humidity test shall be performed in accordance with MIL-STD-810, Method 507.3, Procedure III. This test shall be performed with the enclosure resting on each of three mutually perpendicular surfaces (see 3.4.1.4).

4.5.2.5 Fungus. The fungus test shall be performed in accordance with MIL-STD-810, Method 508.4 (see 3.4.1.5 and 6.9).

4.5.2.6 Salt fog. The salt fog test shall be performed in accordance with MIL-STD-810, Method 509.3, Procedure I (see 3.4.1.6).

4.5.2.7 Acceleration. The acceleration test shall be performed as specified in MIL-STD-810, Method 513.4, Procedure I. Acceleration values shall be computed using table 513.4-I for aircraft with a forward acceleration value of 4 g’s (see 3.4.1.7).

4.5.2.8 Vibration test. The vibration test shall be performed in accordance with MIL-STD-810, Method 514.4, Procedure I, except for the following modifications:

a. Functional levels: The equipment shall be tested for one half hour in each of the three orthogonal axes at the levels shown in table VI (when mounted on vibration isolators) before and after applying the endurance levels specified in b.

b. Endurance levels: The equipment shall be tested for one and one half hours in each of the three orthogonal axes at the levels shown in table VI (when mounted on vibration isolators).

Table VI. Random vibration requirements.

Frequency range (Hz)	Functional levels (g^2/Hz)	Endurance levels (g^2/Hz)
20 to 178	.028	.112
178 to 350	+6.5 dB/octave	+6.5 dB/octave
350 to 1K	.12	.48
1K to 2K	-8 dB/octave	-8 dB/octave

c. In addition, the rack shall be designed to withstand a minimum rigidity endurance test without the isolators (hard mounted) as specified in Method 514.4 of MIL-STD-810. The following sinusoidal vibration levels shall apply:

(1) 5 to 20 Hz: 0.1 inch double amplitude

(2) 20 to 2000 Hz: 2 g's peak

4.5.2.9 Shock test. The shock test shall be performed in accordance with MIL-STD-810, Method 516, Procedure I. The peak acceleration shall be 40 g's for a duration of 6-9 milliseconds for flight equipment (see 3.4.1.9).

4.5.2.10 Crash safety. The crash safety test shall be performed in accordance with MIL-STD-810, Method 513, Procedure I when fully loaded with modules. The acceleration value shall be 40 g's along both directions of three mutually perpendicular axes. Test time shall be one minute for each direction. Bending and distortion are permitted; however, there shall be no failure to the attaching joints and the equipment shall remain in place (see 3.4.1.10).

4.5.3 Mechanical tests.

4.5.3.1 Guide rails. The dummy modules shall be inserted between every other guide rail and secured firmly in place with module retainers as specified in 3.3.6 in order to test the rigidity of the guide rails. The remaining modules shall then be inserted and secured (see 3.4.2.1).

4.5.3.2 Tier insertion/extraction. All of the dummy modules shall be secured firmly in place with module retainers (see 3.3.6). The tiers shall be extracted and then inserted prior to the leakage test (see 3.4.2.2).

4.5.3.3 Pressure drop. All requirements in 3.4.2.3 shall be tested for the specific rack design (single exhaust port or multiple exhaust ports). Pressure drop shall be tested with airlet temperature at both 27 °C and 71 °C (81 °F and 160 °F). Pressures monitored and recorded during testing shall be gage pressures. Entrance and exhaust pressure losses to and from the cold rail respectively, are to be considered part of the cold rail pressure loss.

4.5.3.4 Leakage. All requirements in 3.4.2.4 shall be tested using equipment and gauging which protect the rack from over pressures (8 inches water pressure or greater). Test set-up shall include valves to allow the cooling air passages to be isolated and the pressure monitored. The enclosure cooling air passages shall be pressurized to not less than two inches of water, at a temperature of 21 °C (70 °F). The pressure after 4 hours shall not decrease by more than 30 percent.

4.5.4 Thermal. The thermal requirements in 3.4.3 shall be tested with the rack insulated to exclude the influence of any method of cooling other than conduction to the cold rail and the cooling air flow. Dummy modules, each with heating source producing equal power dissipation, shall be placed in each module of the rack. The temperature of the rack's outer surface shall be at the ambient of 3.4.3 for at least 5 minutes prior to conducting the test. Temperatures for inlet air, outlet air, rack exterior surface ambient, and card guides shall be monitored. Card guide temperatures shall be monitored on either the dummy module rib surface or the card guide surface. A minimum of three card guides (both cold rails) in each tier shall be monitored: the first, last, and center module slot of the tier. Test measurements shall be taken once the dummy modules are powered, the air pressure drop and the module card guide temperatures have stabilized.

4.5.5 Electromagnetic interference tests.

4.5.5.1 Shielding effectiveness. These tests shall demonstrate that the shielding effectiveness of the rack complies with the requirements specified in 3.4.4.1.

4.5.5.1.1 Outside-to-inside. All requirements specified in 3.4.4.1.1 shall be tested in accordance MIL-STD-1377.

4.5.5.1.2 Tier-to-tier shielding effectiveness. All requirements specified in 3.4.4.1.2 shall be tested in accordance MIL-STD-1377.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DOD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's

packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. These racks are required to withstand forward acceleration values of 4g's and sudden temperature changes from -57 °C to +95 °C (–70 °F to +203 °F), which exceed the requirements for commercial aircraft. In addition, these racks must mate with modules and primary and secondary backplanes which are unique to military platforms. A sample of an integrated rack configuration is given in figure 8.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of specification.

b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1).

c. Whether first article testing is required (see 3.1).

d. Number, format, type and placement of modules (see 3.3.1).

e. Electrical connector types and position (see 3.3.3).

f. Mounting and support, if required (see 3.3.4).

g. Location of air inlet and exhaust outlet, if required (see 3.3.5).

h. Marking (see 3.7).

i. Packaging requirements (see 5.1).

6.3 Subject term (key word) listing.

Aircraft
Backplane
Electromagnetic
Enclosure
Modules

6.4 Mounting system for reducing vibration. MIL-C-172 may be used for guidance.

6.5 Maintenance of an integrated rack. Maintenance of an integrated rack can be performed at the module or tier level, where the tier consists of a removable set of modules and a primary backplane assembly.

6.6 Direct marking. When direct marking is used to identify end items, parts, and components, there should be no damage to the item marked. Examples of previously used marking methods include die or rubber stamping, etching, engraving, molding, casting, forging, dexalcomania transfer, stenciling, or silk screening.

6.7 Testing of racks and modules as a complete system. If the rack is acquired in conjunction with a specific functional system, the system modules should be inserted into the rack and tested as complete system.

6.8 Corrosion resistant materials. For use of corrosion resistant materials, MIL-HDBK-1568 may be used for guidance.

6.9 Fungus. Subject to approval by the contracting officer, certification that the rack has been constructed of materials which are not nutrients for biological growth may be accepted in lieu of the fungus test of 4.5.2.5.

6.10 Changes from previous issue. Marginal notations are not used in the revision to identify changes with respect to the previous issue due to the extent of the changes.

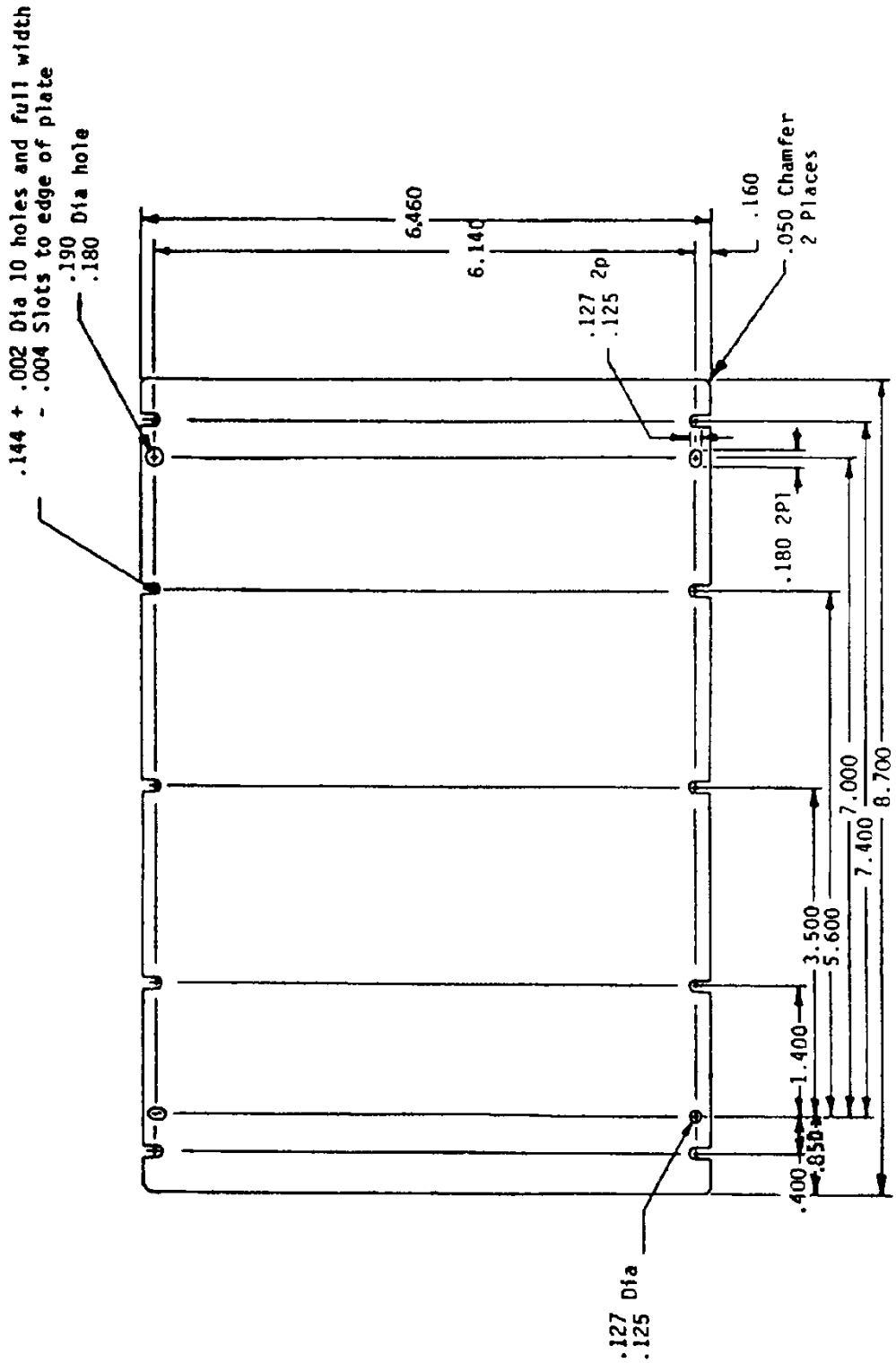

FIGURE 1. Backplane mechanical interfaces.

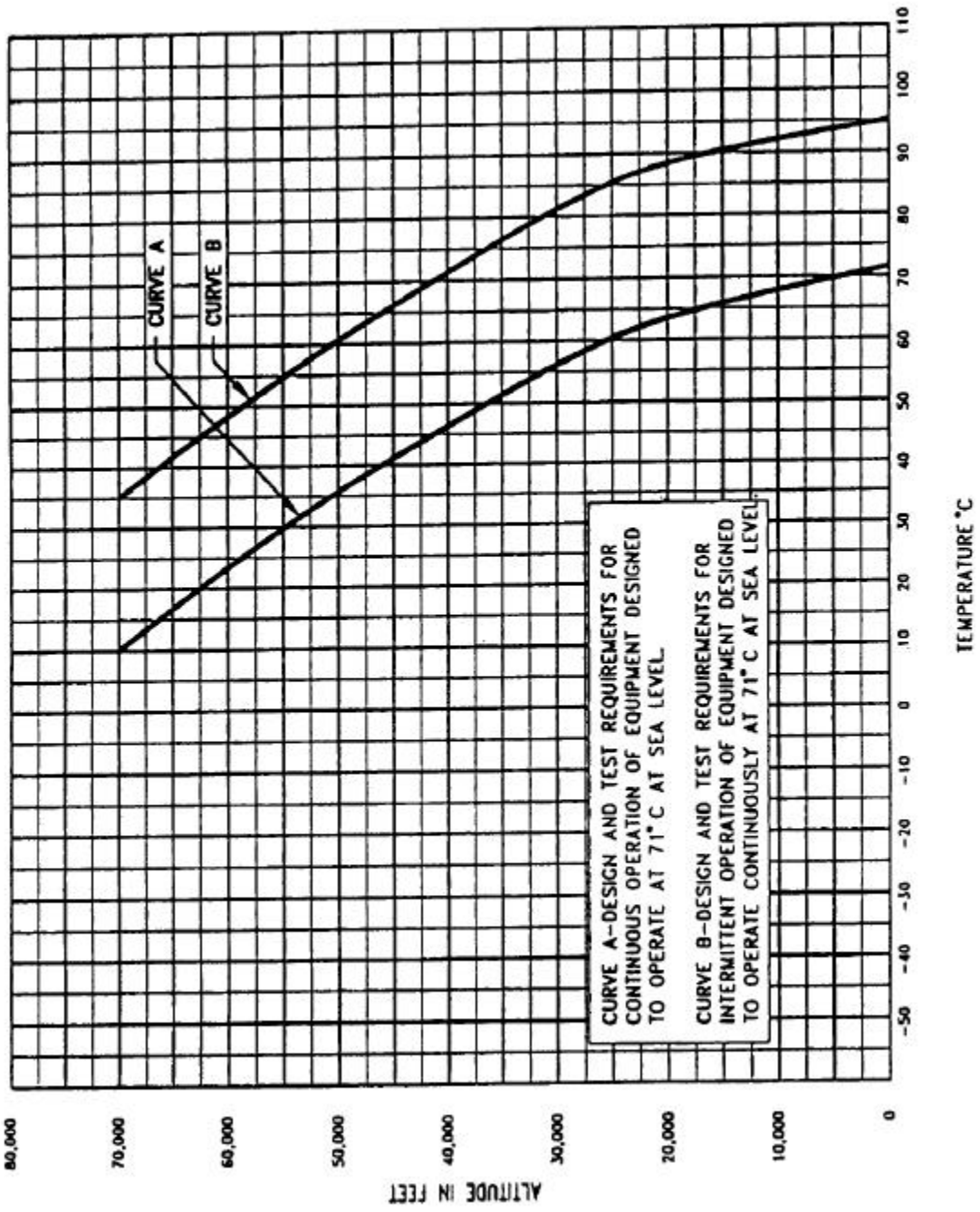

FIGURE 2. Operational requirements for rack enclosures (temperature vs. altitude).

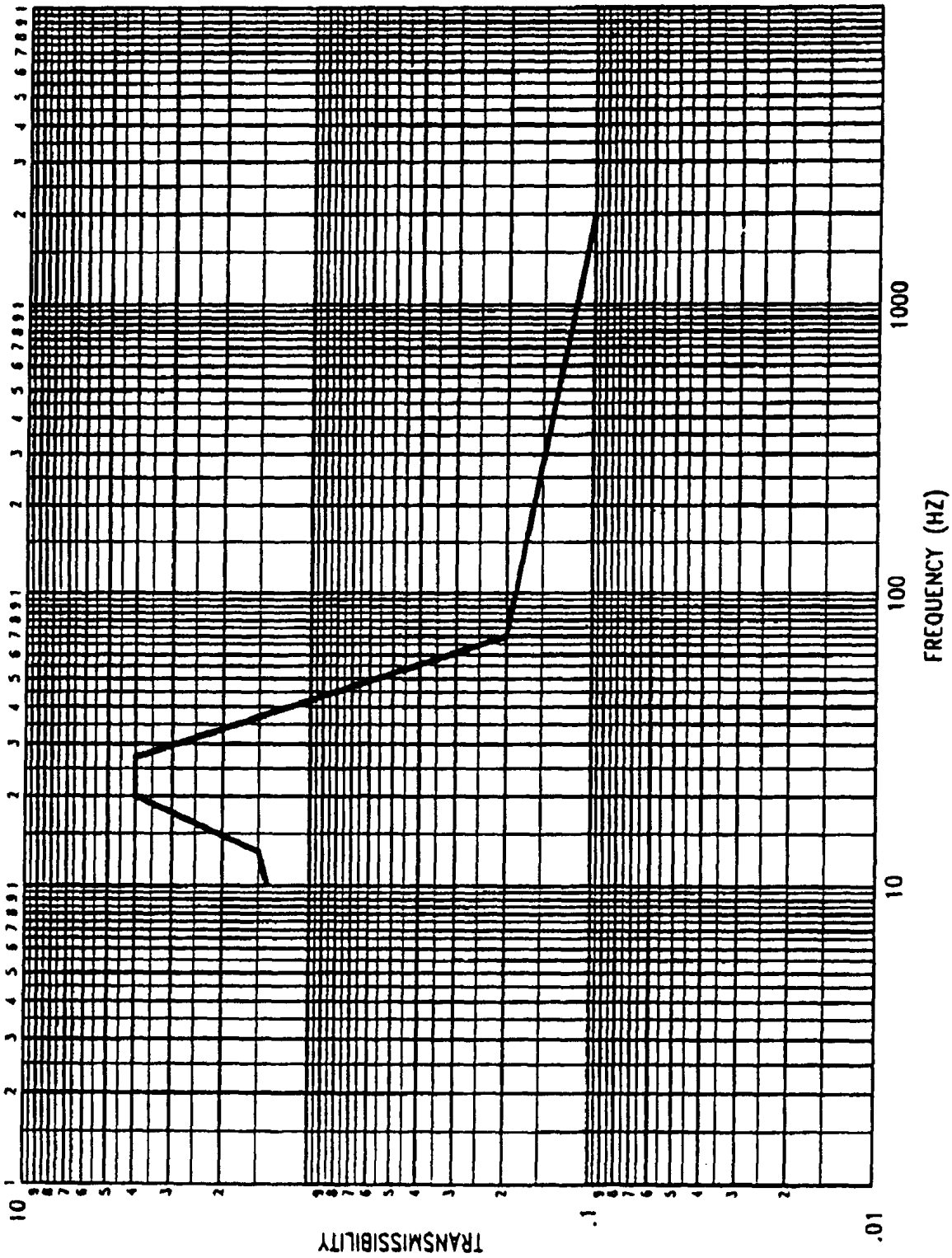

FIGURE 3. Envelope of allowable transmissibility.

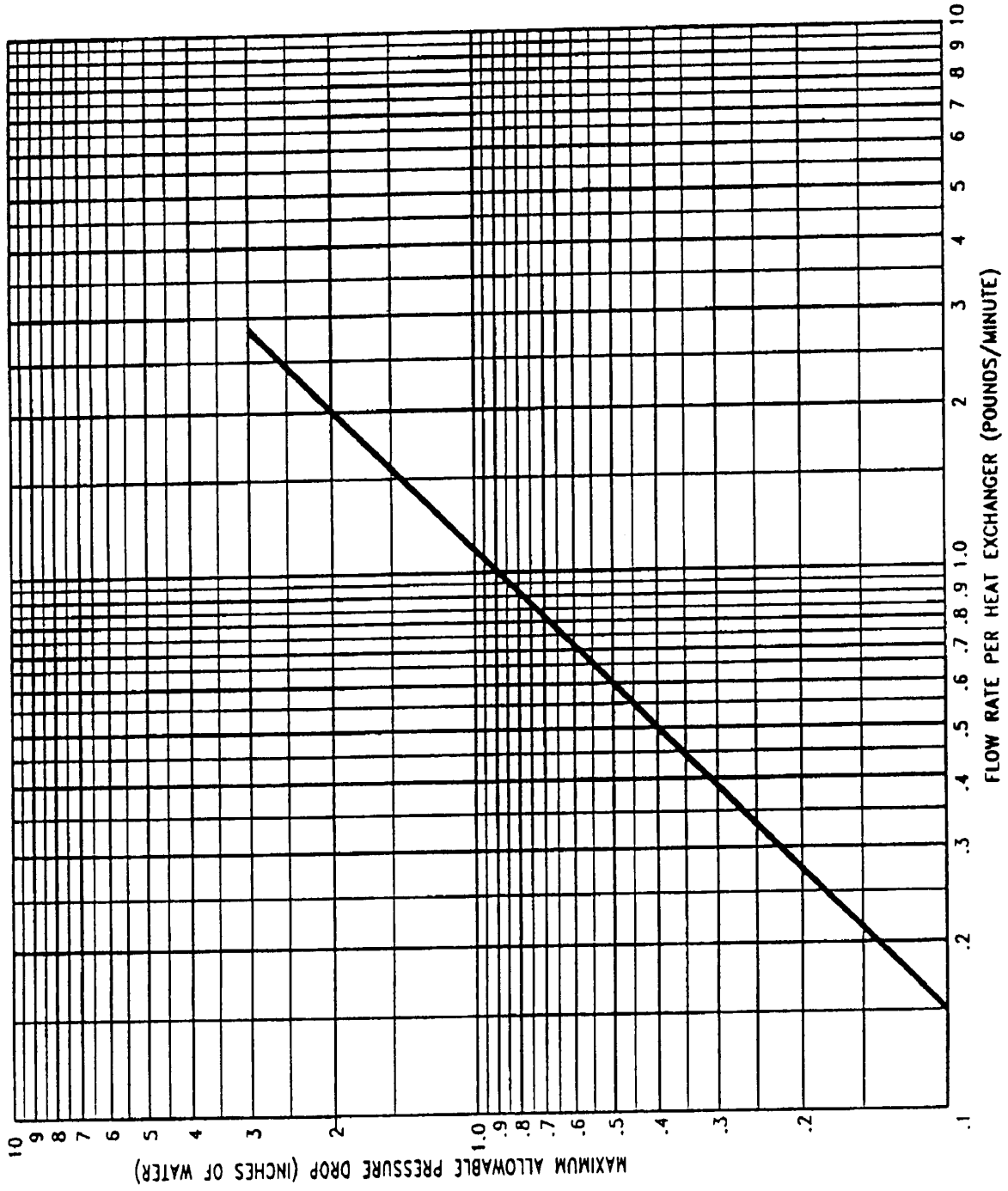

FIGURE 4. Heat exchanger pressure drop.

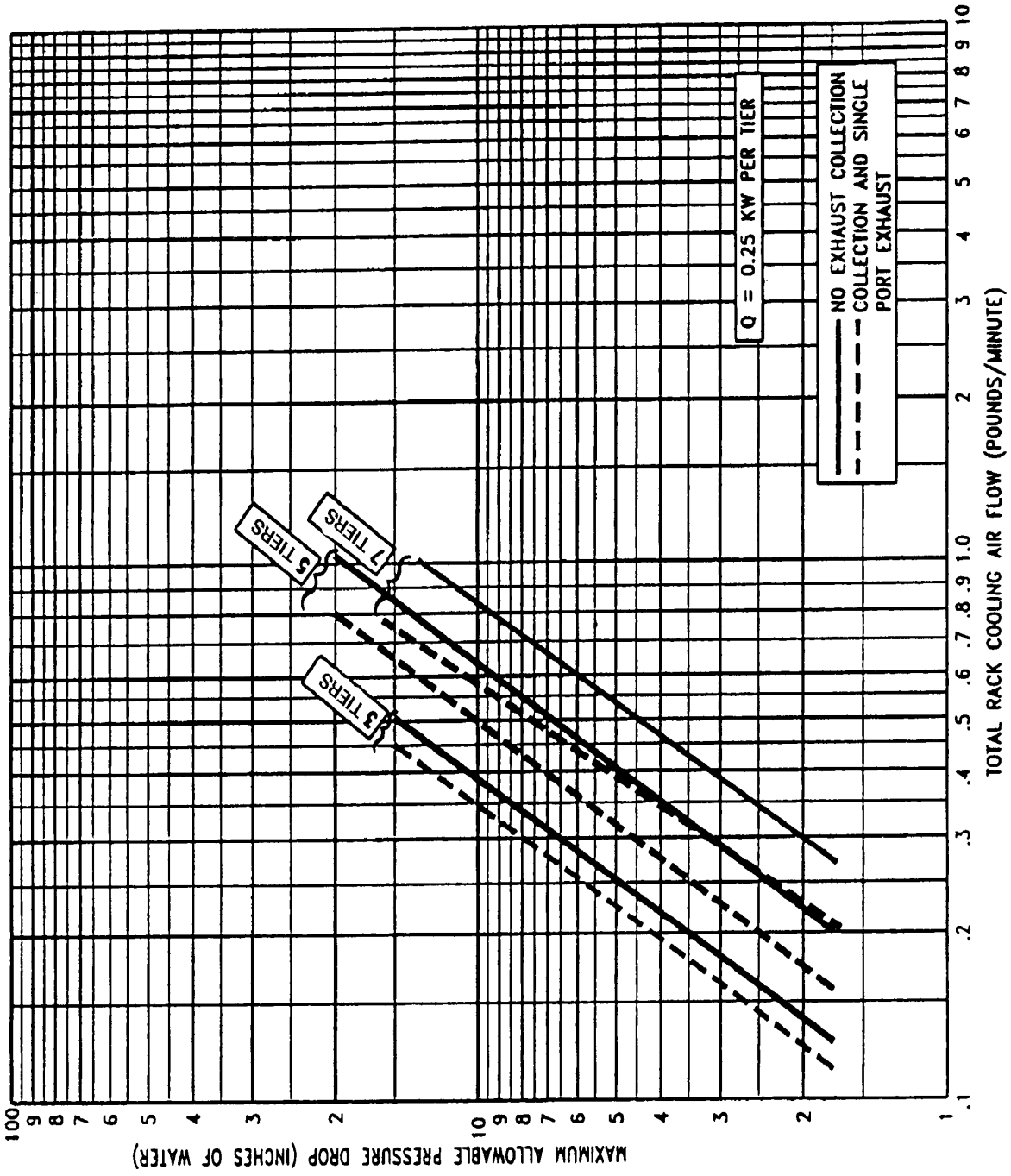

FIGURE 5. Total pressure drop.

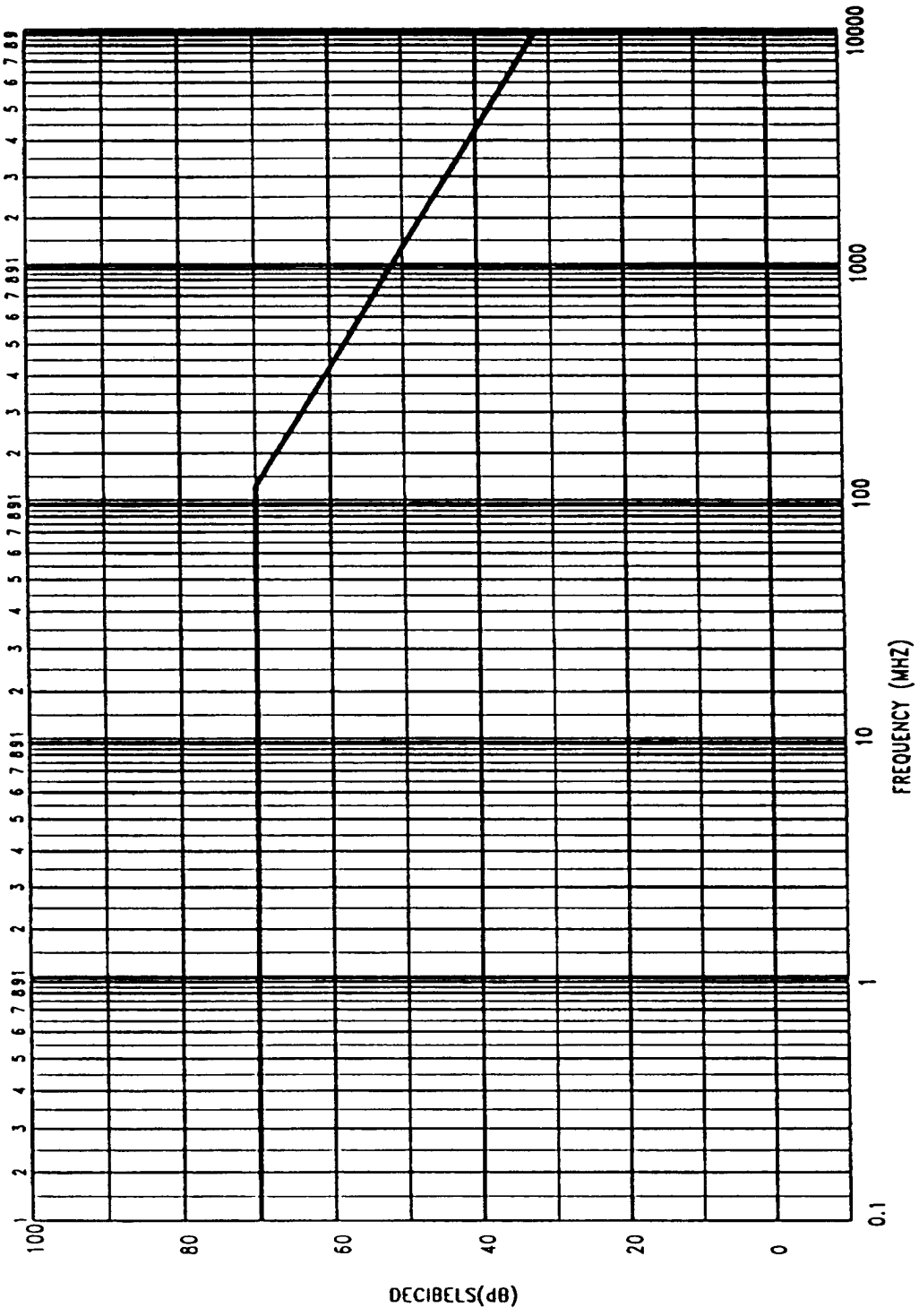

FIGURE 6. Shielding effectiveness, outside-to-inside.

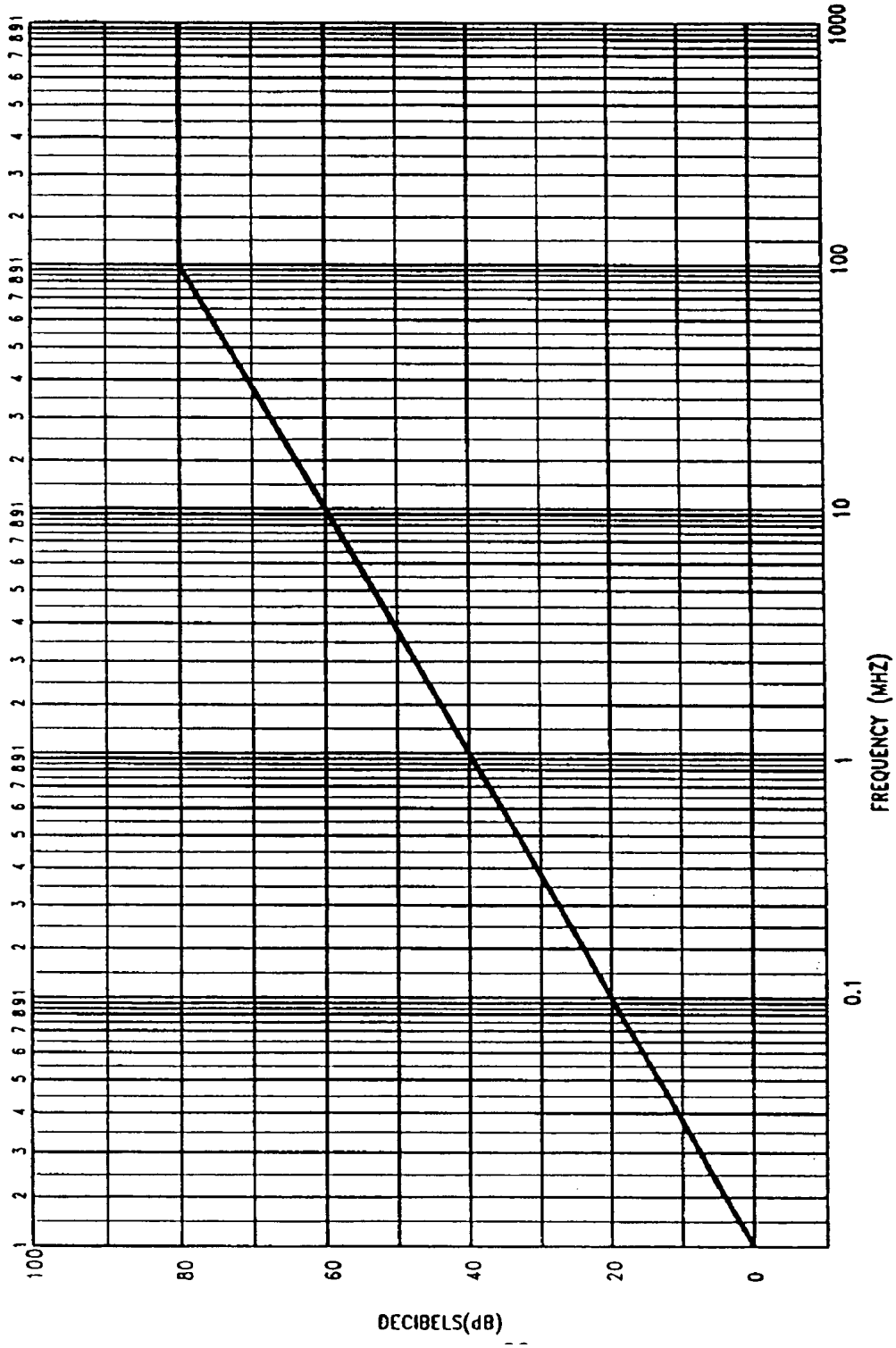

FIGURE 7. Shielding effectiveness between tiers.

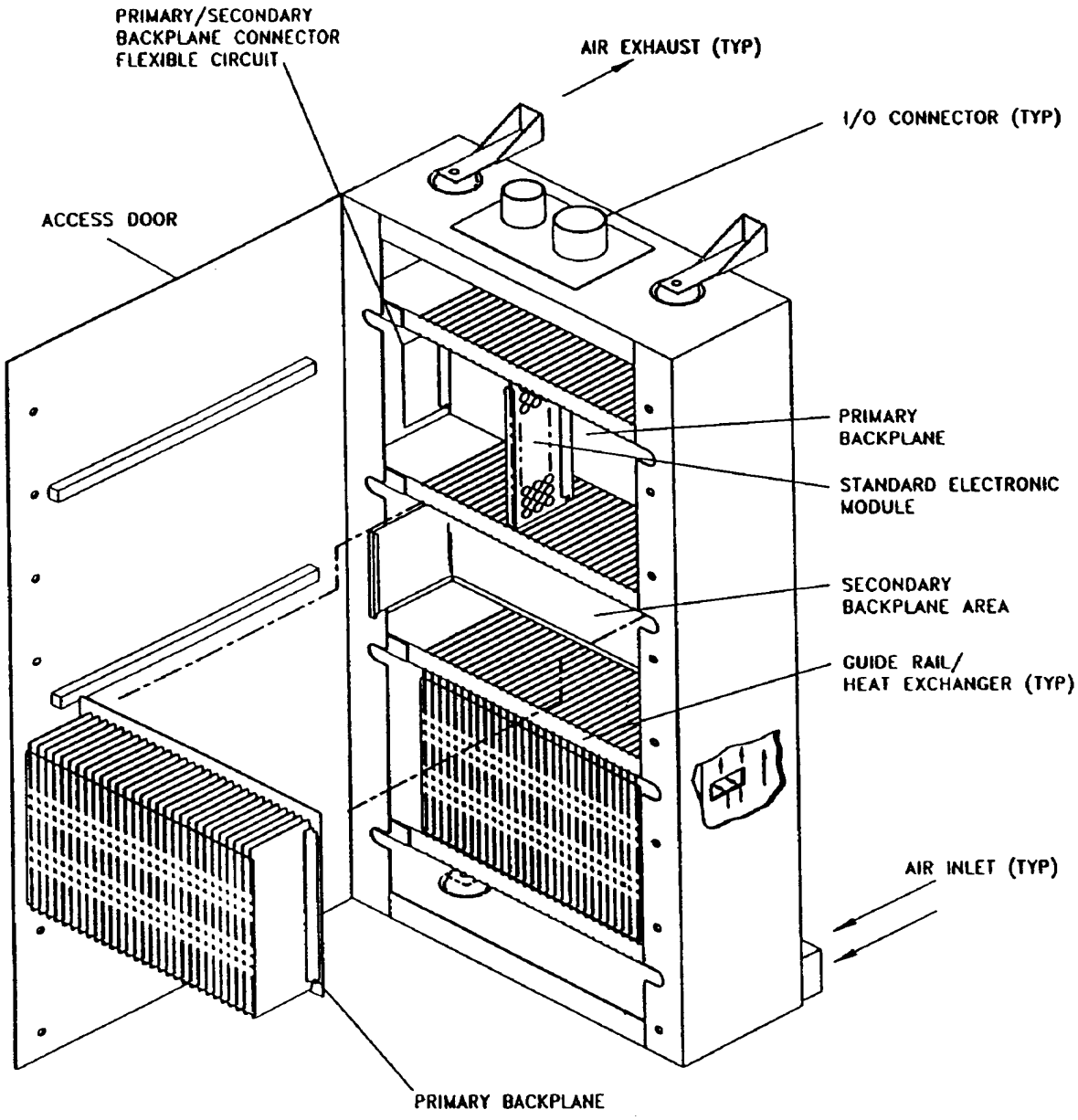

FIGURE 8. Sample integrated rack configuration.

CONCLUDING MATERIAL

Preparing activity:
Navy - AS

(Project 5975-N098)

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.
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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-PRF-85725A(AS)	2. DOCUMENT DATE (*YYMMDD*) 980520

3. DOCUMENT TITLE
RACK, INTEGRATED AVIONICS, FORCED AIR COOLED, SPECIFICATION FOR

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) DSN: (*If Applicable*)	7. DATE SUBMITTED (*YYMMDD*)

8. PREPARING ACTIVITY

a. NAME COMMANDER NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION	b. TELEPHONE NUMBER (*Include Area Code*) (1) Commercial: (732) 323-2947 (2) DSN: 624-2947
c. ADDRESS (*Include Zip Code*) CODE 414100B120-3 HIGHWAY 547 LAKEHURST, NJ 08733-5100	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Logistics Agency (DLSC-LM), Attn: Carla Jenkins/John Tascher 8725 John J. Kingman Road, Ste 2533 Fort Belvoir, VA 22060-6221 Telephone (703) 767-6874