

MIL-E-16400G (NAVY)  
AMENDMENT-1  
1 December 1976

MILITARY SPECIFICATION  
ELECTRONIC, INTERIOR COMMUNICATION, AND NAVIGATION EQUIPMENT  
NAVAL SHIP AND SHORE  
GENERAL SPECIFICATION FOR

This amendment forms a part of Military Specification MIL-E-16400G (NAVY), dated 24 December 1974, and is approved for use by all interested Commands of the Department of the Navy and the Marine Corps and is available for use by all Departments and Agencies of the Department of Defense.

PAGE 1

1.1: After first sentence, add "(see 6.1)"; in line 5, delete "as a whole", and delete the last sentence.

PAGES 1 through 4

2.1: Delete reference to Military Specification "MIL-P-15328", Military Standards "MIL-STD-749", "MIL-STD-781", and "MIL-STD-1600", Publications NAVSHIPS "0518-093-2500", "0901-006-0000", "0969-019-7000" and NAVELEX "0967-437-7010", and add the following specifications, standards, handbooks, drawings, and publications:

SPECIFICATIONS

FEDERAL

"TT-E-485 - Enamel, Semi-Gloss, Rust-Inhibiting."

MILITARY

"MIL-P-23377 - Primer Coating; Epoxy-Polyamide Chemical and Solvent Resistant.  
"MIL-C-24231 - Connectors, Plugs, Receptacles, Adapters, Hull Inserts, and Hull Insert Plugs, Pressure-Proof, General Specification for.  
"MIL-C-28790 - Circulators, Radio Frequency, General Specification for.  
"MIL-I-28791 - Isolators, Radio Frequency, General Specification for."

STANDARDS

FEDERAL

"FED-STD-141 - Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling and Testing."

MILITARY

"MIL-STD-1275 - Electrical Circuit, 28 Volt DC Transient Characteristics for Military Vehicles.  
"MIL-STD-1399 - Interface Standard for Shipboard Systems.  
Section 702 - Synchro Data Transmission.  
"MIL-STD-1631 - Procedure for Selection of Electronic and Electrical Parts and Materials During Design of Military Items.  
"MIL-STD-1652 - Procedures for Prescreening of Nonstandard Mechanical Fasteners and Bearings During Design of Military Items."

HANDBOOKS

MILITARY

"MIL-HDBK-239 - Navy Standard Hardware Program Application Handbook."

DRAWINGS

NAVAL SEA SYSTEMS COMMAND

NAVSHIPS

"9000-S6202-73724 - Salt Spraying Machine."

MIL-E-16400G (NAVY)  
AMENDMENT-1

PUBLICATIONS

NAVAL SEA SYSTEMS COMMAND

NAVSHIPS

- "0967-LP-283-5010 - Electromagnetic Shielding Practices, Submarine.
- "0969-LP-019-7000 - Electronic Test Equipment Application Guide  
(Formerly 91727(A)).

NAVAL ELECTRONICS SYSTEMS COMMAND

- "0101,106 - Electromagnetic Compatibility and Electromagnetic Radiation Hazards.
- "0101,113 - VLF, LF, and MF Communication Systems.
- "0967-LP-437-7010 - Reliability/Design Handbook Thermal Applications Vol. 1.
- "0967-LP-437-7020 - Reliability/Design Handbook Thermal Applications Vol. 2.
- "0967-LP-437-7030 - Reliability/Design Handbook Thermal Applications Vol. 3.
- "0967-LP-437-7040 - Reliability/Design Handbook Thermal Applications Vol. 4."

PAGE 5

2.2: Add the following publications:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- "ASTM-D-714-56 - Evaluating Degree of Blistering of Paints.
- "ASTM-D-1141 - Substitute Ocean Water, Specification for."

3.3.1.1: Delete.

3.3.2.2.4: Delete and substitute:

"3.3.2.2.4 Other installations. The maximum size limitations of equipment intended for other than surface ship or submarine installations shall be as specified in the individual equipment specification (see 6.2.1)."

PAGE 6

3.3.2.3: Delete and substitute:

"3.3.2.3 Modular construction. Equipment shall be designed by using modular constructional techniques conforming to the Standard Electronic Module requirements of MIL-STD-1378. MIL-HDBK-239 shall be used for design considerations and application information associated with the Standard Electronic Modules."

3.3.3.2, lines 3 and 4: Delete "MIL-STD-1600 and".

3.3.3.2, last line: After "specified" add "on the Contract Data Requirements List (CDRL)."

3.3.3.3, line 2: After "specified" add "in the individual equipment specification (see 6.2.1)."

3.3.4.2, first sentence: Delete and substitute: "A maintainability prediction shall be performed in accordance with MIL-HDBK-472. The applicable part of procedure II shall be as specified in the individual equipment specification (see 6.2.1)."

3.3.5.1.1, lines 3 and 4: Delete "temperature range I and II" and substitute "temperature ranges 1 and 2".

PAGE 7

Table I, under "Operating" column: For range 3, delete "+52" and substitute "+50" and for range 4, delete "-0" and substitute "0".

3.3.5.4 through 3.3.5.4.2: Delete and substitute:

"3.3.5.4 Salt fog (spray). When specified in the individual equipment specification, equipment or portions thereof, as specified herein, shall withstand a salt fog test specified in 4.8.3.5 (see 6.2.1)."

MIL-E-16400G (NAVY)  
AMENDMENT-1

3.3.5.6: Delete.

3.3.5.7, line 2: Delete "opperate" and substitute "operate".

PAGE 8

3.3.5.13: Delete and substitute:

"3.3.5.13 Shock. Shipboard equipment shall withstand the applicable shock test of 4.8.3.14. When specified in the individual equipment specification, equipment for other than shipboard use shall withstand the applicable test of 4.8.3.14 (see 6.2.1)."

3.3.5.14 Delete and substitute:

"3.3.5.14 Vibration.

"3.3.5.14.1 Environmental vibration. Shipboard equipment shall withstand the applicable vibration test of 4.8.3.15. When specified in the individual equipment specification, equipment for other than shipboard use shall withstand the applicable test of 4.8.3.15 (see 6.2.1)."

"3.3.5.14.2 Internally excited vibration. When specified in the individual equipment specification, rotary units of equipment shall meet the type II balance and vibration requirements of MIL-STD-167-1 (see 6.2.1)."

PAGE 9

"3.3.5.15 and 3.3.5.16: Delete and substitute:

"3.3.5.15 Inclination. Equipment shall withstand the inclination test of 4.8.3.16.

"3.3.5.16 Magnetic field environment. Shipboard equipment shall withstand the magnetic field environment test of 4.8.3.17."

Add new paragraphs 3.3.5.17 and 3.3.5.18:

"3.3.5.17 Dust (fine sand). When specified in the individual equipment specification, equipment shall withstand the dust (fine sand) test of 4.8.3.18 (see 6.2.1)."

"3.3.5.18 Accelerated life. When specified in the individual equipment specification, equipment shall withstand the accelerated life test of 4.8.3.19 (see 6.2.1)."

Add new paragraph 3.4.1.1.

"3.4.1.1 Selection procedure. The procedures of MIL-STD-1631 and MIL-STD-1652, as applicable, shall be followed prior to the use of, or request for the use of, nonstandard parts (see 3.4.3)."

3.4.3: Delete and substitute:

"3.4.3 Nonstandard parts. Nonstandard parts shall not be used without the approval of the command or agency concerned. Requests for approval of nonstandard parts shall be prepared in accordance with requirement 22 of MIL-STD-454 as specified in the CDRL (see 6.2.2)."

PAGE 10

3.4.8.4.1, line 2: Delete "3.10.11.2" and substitute "3.11.5".

3.4.8.5: Delete and substitute:

"3.4.8.5 Cable, radio frequency (RF). RF cable used within equipment shall conform to requirement 65 of MIL-STD-454 and shall be selected in accordance with MIL-STD-242."

3.4.8.6.2: Delete and substitute:

"3.4.8.6.2 Cable, multiconductor and communication. Multiconductor and communication cable used within equipment shall conform to requirement 66 of MIL-STD-454 and shall be selected in accordance with MIL-STD-242."

MIL-E-16400G (NAVY)  
AMENDMENT-1

Add new paragraphs 3.4.8.6.3 and 3.4.8.6.4:

"3.4.8.6.3 Cable, electrical, flat multiconductor. Flat multiconductor cable shall be selected from MIL-C-55543. Application guidance is provided in MIL-HDBK-176."

"3.4.8.6.4 Cable, telephone. Telephone cable for shipboard use shall be selected from and conform to MIL-C-915. Telephone cable for shore use shall be selected from MIL-STD-242."

PAGE 11

3.4.8.10: Delete and substitute:

"3.4.8.10 Connectors, electrical. Unless otherwise specified herein, electrical connectors shall conform to requirement 10 of MIL-STD-454 and shall be selected in accordance with MIL-STD-242. Connectors that may be used in conjunction with EMI shielding conduit and hardware, as specified in Publication 0967-LP-283-5010, shall be selected to withstand the additional loading when the equipment is subjected to service conditions, such as shock and vibration. Circuits that may require shielding conduit shall be as specified in the individual equipment specification (see 6.2.1)."

3.4.8.10.1.1: Delete and substitute:

"3.4.8.10.1.1 Connectors, flat multiconductor cable. Connectors for flat multiconductor cable shall be selected from MIL-C-55544. Application guidance is provided in MIL-HDBK-176."

3.4.8.10.3, first and second sentences: Delete and substitute: "Mating connector plugs, with backend accessory hardware including cable clamps, shall be furnished with inter-connection connector receptacles. The mating connector plug with backend accessory hardware and cable clamps shall be compatible with the specified interconnector cables required by 3.4.8.4 without modification to either the connector plug or the cable and without the use of special adapters."

PAGE 12

Add new paragraph 3.4.8.10.10:

"3.4.8.10.10 Connectors, pressure proof. Pressure proof connectors shall conform to MIL-C-24231."

3.4.8.14: Delete and substitute:

"3.4.8.14 Filters, air. Air filters shall be of the cleanable type (see 3.8.1.1)."

3.4.8.16: Delete and substitute:

"3.4.8.16 Filters, radio interference. When required (see 3.5.4), radio interference filters in primary power lines shall conform to MIL-F-15733 and shall be of a readily removable type. For three-phase systems, line-to-line filters are preferred to line-to-ground filters. When line-to-ground filters are used, the filters shall be capable of withstanding full line voltage and the line-to-ground capacitance shall not exceed 0.1  $\mu$ f for 60 Hz or 0.02  $\mu$ f for 400 Hz power."

PAGE 13

3.4.8.23: Delete second sentence.

3.4.8.25: Delete and substitute:

"3.4.8.25 Resistors. Resistors shall conform to requirement 33 of MIL-STD-454 and shall be selected in accordance with MIL-STD-242."

Add new paragraphs 3.4.8.25.1 and 3.4.8.25.2:

"3.4.8.25.1 Tapped. The use of tapped resistors shall be held to a minimum. Tapped resistors shall be considered to be nonstandard parts (see 3.4.3)."

"3.4.8.25.2 Wirewound precision variable. Wirewound precision variable resistors shall be selected from MIL-STD-242. When a resistor is required which is not listed in

MIL-E-16400G (NAVY)  
AMENDMENT-1

MIL-STD-242, the nonstandard resistor shall be selected from those types listed on specification sheets in accordance with MIL-R-12934. When a resistor is required which is not listed in either MIL-STD-242 or the specification sheets in accordance with MIL-R-12934, complete information on the nonstandard resistor using the format of the specification sheets as a guide shall be prepared. All nonstandard resistors shall be subject to first article testing of MIL-R-12934.

## PAGE 14

3.4.8.35, line 2: Delete "shall be as specified herein" and substitute "shall conform to requirement 53 of MIL-STD-454 and as specified herein."

Add new paragraphs 3.4.8.35.4 and 3.4.8.35.5:

"3.4.8.35.4 Circulators. Circulators shall conform to MIL-C-28790.

"3.4.8.35.5 Isolators. Isolators shall conform to MIL-I-28791."

Add new paragraph 3.4.8.38:

"3.4.8.38 Vibrators. Vibrators shall not be used for voltage conversion."

3.4.9.7: Delete and substitute:

"3.4.9.7 Fungus-inert and fungus nutrient. Unless otherwise specified herein, the use of fungus-inert and fungus nutrient material shall be in accordance with requirement 4 of MIL-STD-454. The equipment shall not show evidence of fungus growth or damage when tested in accordance with 4.8.3.7."

## PAGE 15

3.4.9.13, line 3: Add "or exposure."

3.4.9.13.2, fourth line: After "table II", add "(see 6.2.3)".

## PAGES 16, 17, 18, and 19

Table II, column and row headings:

Delete "Aluminum 52S" and substitute "Aluminum 5052".

Delete "Aluminum 2S" and substitute "Aluminum 1100".

Delete "Aluminum 3S" and substitute "Aluminum 3003".

Delete "Aluminum 53S-T" and substitute "Aluminum 5053".

Delete "Aluminum 61S-T" and substitute "Aluminum 6061".

Delete "Aluminum Al7S-T" and substitute "Aluminum 2017".

Delete "Aluminum 17S-T" and substitute "Aluminum 2017".

Delete "Aluminum 24S-T" and substitute "Aluminum 2024".

## PAGE 20

3.4.10.1, second sentence: Delete and substitute: "Such tubes and parts shall be used only upon approval of the command or agency concerned."

3.4.11.2(c): In line 7, delete "Castings" and substitute "Platings", in line 9, delete "coatings".

## PAGE 21

3.4.11.2(j): First sentence, delete and substitute "Anodizing of aluminum and aluminum alloys shall conform to MIL-A-8625" and in line 5, delete "anodized, the" and substitute "anodized or the".

MIL-E-16400G (NAVY)  
AMENDMENT-1

PAGES 21 and 22

3.4.11.3 through 3.4.11.3.2: Delete and substitute:

"3.4.11.3 Painting. The exterior and interior surfaces of metal equipment enclosures shall be painted as specified herein. Prior to painting, the applicable pretreatment and primer shall have been completed. Paint for equipment used in dark adapted spaces shall also meet the requirements of 3.7.8.5. Plastic enclosures normally will not be painted.

"3.4.11.3.1 Aluminum and aluminum alloy pretreatment. Aluminum and aluminum alloy pretreatment shall be as follows:

- (a) Cleaning. The basis metal shall be cleaned to remove grease, oil, welding flux, or other foreign matter.
- (b) Application:
  - (1) Protected equipment (interior use). For protected equipment (interior use), aluminum and aluminum alloy shall be anodized in accordance with MIL-A-8625, chemically treated in accordance with MIL-C-5541, or pretreated in accordance with type III of TT-C-490.
  - (2) Exposed equipment (exterior use). For exposed equipment (exterior use), aluminum and aluminum alloys shall be chemically treated in accordance with MIL-C-5541.

"3.4.11.3.2 Ferrous metal pretreatment. Ferrous metal pretreatment shall be as follows:

- (a) Cleaning. After all machining, welding, and brazing operations are completed, rust or other corrosion products and flux shall be removed by abrasive blasting, sanding, wire brushing, or other mechanical means. Surfaces shall be cleansed of all grease, oil, and dirt by solvent wiping and rinsing, vapor degreasing, or caustic washing followed by rinsing.
- (b) Application. Ferrous metals shall be pretreated in accordance with type I or III of TT-C-490.

"3.4.11.3.3 Protected equipment (interior use), (except Marine Corps).

"3.4.11.3.3.1 Primer. One coat of primer conforming to TT-P-1757 or TT-P-664 shall be applied. The primer shall have a dry film thickness of 0.0006 to 0.0008 inch.

"3.4.11.3.3.2 Enamel. Enclosures shall be painted with two continuous film coats of gray enamel conforming to MIL-E-15090. Each coat shall have a minimum thickness of 0.001 inch. Enamel for shipboard portable equipment enclosures shall conform to class 1 of MIL-E-15090. Enamel for other protected equipment enclosures shall conform to class 2 of MIL-E-15090.

"3.4.11.3.4 Exposed equipment (exterior use), (except Marine Corps). Equipment, or portions thereof, exposed to the weather shall be painted with three coats of epoxypolyamide paint in accordance with MIL-P-24441. The first coat shall be formula 150 (thickness of 3 to 4 mils), the second coat formula 155 (thickness of 2 to 3 mils), and the third coat formula 151 (thickness of 2 to 3 mils). The total dry film thickness shall be 7 to 9 mils.

"3.4.11.3.4.1 Adhesion and blister resistance. When specified in the individual equipment specification (see 6.2.1), paint systems prepared for exposed shipboard equipment shall show no blistering or adhesive failure after being subjected to the paint system test of 4.8.3.20.

"3.4.11.3.5 Marine Corps equipment.

"3.4.11.3.5.1 Primer. Prior to painting, primer conforming to MIL-P-23377 shall be applied to enclosures for Marine Corps equipment. The primer shall have a dry film thickness of 0.0006 to 0.0009 inch.

"3.4.11.3.5.2 Enamel. Two coats of Marine Corps green enamel conforming to TT-E-485 shall be applied. Each coat shall have a minimum thickness of 0.001 inch."



PAGE 22

Add new paragraph 3.4.11.7:

"3.4.11.7 Brazing. Brazing shall conform to requirement 59 of MIL-STD-454."

3.5.1.1 and 3.5.1.2: Delete and substitute:

"3.5.1.1 Shipboard a.c. power source. The design of shipboard equipment shall conform to the interface characteristics and constraints of Section 103 of MIL-STD-1399, except that, unless otherwise specified in the individual equipment specification, power shall be type I, 440 volts, 60 Hz (see 6.2.1).

"3.5.1.2 Fixed shore station a.c. power source. Equipment intended for fixed shore installations shall operate from the applicable type of a.c. power source shown in table VIII.

TABLE VIII. Ac power source types for fixed shore installations.

A.c. power source parameters	Equipment power rating		
	Less than 1 kVA	1 kVA to 100 kVA	Greater than 100 kVA
Nominal voltage (volts - rms)	115 or 220 single phase	220 3 phase	As specified in the individual equipment specification (see 6.2.1)
Nominal frequency (Hz)	50 or 60	50 or 60	
Voltage regulation (percent)	+10	+10	
Frequency regulation (percent)	+5	+5	

"3.5.1.2.1 Power source variations. The following power source variations shall not cause failure of any part, prevent resumption of normal operation, or require the equipment to recycle.

- (a) An interruption, with power restoration occurring within 3 to 30 seconds.
- (b) Voltage transients of 18 percent of nominal voltage recovering to the steady state voltage within 2 milliseconds (ms).
- (c) Frequency transients of 8 percent of nominal frequency recovering to the steady state band (plus or minus 5 percent of nominal) within 2 seconds.
- (d) Spike voltages with characteristics as specified in Section 103 of MIL-STD-1399.

"3.5.1.2.2 Load unbalance. The resulting kVA load unbalance (see 6.3.4) during normal operating conditions of an equipment, comprised of any combination of single-phase, two-phase, or three-phase loads, shall not exceed 5 percent.

"3.5.1.2.3 Power factor. Equipment shall operate with an overall power factor of 0.8 lagging to unity under steady state conditions.

"3.5.1.3 D.c. power source. D.c. power shall be as specified in the individual equipment specification (see 6.2.1).

"3.5.1.3.1 Vehicular power source. Equipment intended to utilize military vehicular electrical power shall function within performance limits over the steady state voltage range of 20 to 30 V, from electrical power having characteristics as specified in MIL-STD-1275."

3.5.2: Add "Protective devices shall not be installed in the neutral unless neutral power sensing is essential for proper operation of the equipment."

3.5.3.3: In line 7, delete "desired"; in line 8, delete "that they", and delete the last sentence.

MIL-E-16400G (NAVY)  
AMENDMENT-1

PAGE 23

3.5.4 and 3.5.4.1: Delete and substitute:

"3.5.4 Electromagnetic interference (EMI) control. Electromagnetic interference control shall conform to requirement 61 of MIL-STD-454. Publication 0967-LP-283-5010 shall be considered in the design of cable routing and shielding, and selection and layout of connectors."

3.5.5, line 3: Delete "IL" and substitute "I<sub>L</sub>".

PAGE 25

3.5.5.3: Delete and substitute:

"3.5.5.3 Leakage current calculation report. The leakage current calculation report shall be provided as specified on the CDRL (see 6.2.2)."

3.5.6 and 3.5.6.1: Delete and substitute:

"3.5.6 Bonding and grounding. Electrical continuity (bonding) shall be provided to maintain metallic chassis, shields, parts, and outer covers or enclosures of electronic equipment at a common potential. This continuity shall be provided by means of metal-to-metal contact or separate ground conductors in accordance with 3.11.4. Resilient mounted equipment shall be provided with grounding straps installed across at least two of the resilient mounts. Shipboard equipment shall include provisions for grounding as required in MIL-STD-1310. Equipment for other than shipboard use shall include provisions for grounding in accordance with Publications 0101,106 and 0101,113."

3.5.7.2: Delete and substitute:

"3.5.7.2 Protection. Protection for wire or cable passing through holes in metal shall be provided by fitting the hole with the following:

- (a) Grommets if the thickness of the metal is 1/8 inch, or less.
- (b) Grommets or rounded edges with a radius of one-half of the metal thickness if the metal thickness is greater than 1/8 inch.
- (c) Grommets of ceramic or plastic for wire or cables carrying radio frequencies, except for those cables with protective outer jackets, in which case rubber or neoprene grommets are acceptable."

3.5.7.3.3, first sentence: Delete and substitute: "Solderless crimp type lugs shall be utilized to terminate wires and parts on terminals and terminal boards and strips, except for wires and parts requiring solder connections."

PAGES 25 and 26

3.5.9 through 3.5.9.3: Delete and substitute:

"3.5.9 Synchro data transmission systems. Synchro data transmission systems shall conform to the interface characteristics and constraints of Section 702 of MIL-STD-1399. Units shall be aligned using electrical zeroing methods of MIL-HDBK-225. Synchro capacitors shall be rated at 600 volts d.c. for 60 Hz synchros and 1000 volts d.c. for 400 Hz synchros."

PAGE 26

Add new paragraphs 3.5.10 and 3.5.10.1:

"3.5.10 Harmonic current limitation. Each unit of the equipment which can be powered from the ship's electrical power distribution system shall be designed to minimize harmonic distortion effects on the electrical system. The operation of each such unit with ratings specified hereinafter shall not cause harmonic line currents to be generated that are greater than 3 percent of the units full load fundamental current between the 2nd and 32nd harmonic."



MIL-E-16400G (NAVY)  
AMENDMENT-1

Frequency of power source (Hz)	Rating of unit
60	1 kVA, or more
400	0.2 kVA, or more, on other than a single- phase 115-volt source
400	2 amperes or more on a single-phase 115- volt source

"3.5.10.1 Additionally, currents with frequencies from the 32nd harmonic through 20 kHz shall not exceed 100/n percent of the unit's rated full load fundamental current, where n is the harmonic multiple number. Units with power ratings less than those specified in 3.5.10 shall be current amplitude limited such that no individual harmonic line current from the 2nd harmonic through 20 kHz exceeds a magnitude of 100/n percent of the unit's full load fundamental current, where n is the harmonic multiple number. Harmonic line current requirements apply under the test conditions of 4.8.5.11."

3.6.2: Delete and substitute:

"3.6.2 Test equipment compatibility. The design of equipment shall be compatible with the use of test equipment selected in accordance with MIL-STD-1364 or Publication 0969-LP-019-7000."

3.6.6.1: Delete and substitute:

"3.6.6.1 Hinged covers, panels, and access doors. Hinged covers, panels, and access doors, when opened for servicing, shall be configured to minimize interference with adjacent equipment and shall be capable of being locked in the open position."

3.6.8, line 3: Delete "installed" and substitute "inserted".

PAGE 27

3.7.2.1, lines 5 and 6: Delete "3.10.11.4(a) and (b)" and substitute "3.11.7(a) and (b)".

3.7.2.3: Delete.

3.7.2.7, lines 4 and 5: Delete "bales" and substitute "bails".

3.7.2.8, line 4: Delete "and" and substitute "or".

3.7.2.8.1, line 2: Delete "NPT" and substitute "National Pipe Thread (NPT)".

3.7.2.8.2, line 4: Delete "ships".

PAGE 28

3.7.4.1(b): In line 4, delete "Federal" and substitute "National", and in line 6, delete "FSN 5340-000-0000" and substitute "NSN 5340-00-000-0000".

3.7.6 and 3.7.6.1: Delete and substitute:

"3.7.6 Magnetic requirements for minesweeper equipment. When specified in the individual equipment specification (see 6.2.1), equipment shall conform to the magnetic material, eddy current magnetism, and stray magnetic field requirements specified herein.

"3.7.6.1 Magnetic materials. The equipment shall employ no material which has a magnetic permeability greater than 2.0 after fabrication, except for material required to be magnetic for the electrical functioning of the equipment."

3.7.6.2: Delete.

MIL-E-16400G (NAVY)  
AMENDMENT-1

PAGE 29

3.7.6.4: Delete and substitute:

"3.7.6.4 Eddy current magnetism of enclosures. Enclosures shall conform to the dimensional requirements of table III or table IV, as applicable."

Table III: In first column, add "skin" before "material"; in footnote 1, line 1, delete "multiplying" and substitute "multiplying", and delete footnote 4.

3.7.6.4.2: Delete and substitute:

"3.7.6.4.2 Framework of enclosure. The metallic framework of enclosures with electrically nonconducting skin shall conform to the requirements shown in table IV."

Table IV, column 1, heading: Add "framework" before "material".

PAGE 30

3.7.8.1: Add: "When the use of tactile control knobs is specified in the individual equipment specification (see 6.2.1), the knobs shall be selected from MIL-STD-242."

PAGE 31

3.7.8.9, line 1: Insert "of" after "size".

3.7.8.10, sixth sentence: Delete and substitute: "Dial markings for interior communication order and indicating systems shall be in accordance with Drawing 9000-S6504-73687."

3.7.8.13, line 2: Insert "on the CDRL" after "specified".

3.8.1: In title, delete "methods" and in line 3, delete "Publication 0967-437-7010" and substitute "Publications 0967-LP-437-7010, 0967-LP-437-7020, 0967-LP-437-7030, and 0967-LP-437-7040".

3.8.1.1: Add: "Air filters (see 3.4.8.14) shall be located at all air intakes, shall be mounted so as to be capable of being readily examined, and shall be removable for cleaning without removing parts not associated with the filter."

3.8.1.3: In line 2, after "specification" add "(see 3.7.2.1)" and in line 3, delete "3.10.11.4" and substitute "3.11.7".

3.8.1.4: Delete.

3.8.2, line 2: Delete "predication" and substitute "prediction".

PAGE 32

3.8.4, line 2: Delete "forced air/liquid cooling" and substitute "forced air or liquid cooling".

3.8.5 through 3.8.5.2: Delete and substitute:

"3.8.5 Thermal performance. The thermal design shall ensure that heat sensitive parts are within the thermal stress identified in the reliability prediction report and the part derating requirement, and that the equipment conforms to thermal design requirements specified herein."

PAGE 35

3.10.11 through 3.11: Delete and substitute:

"3.11 Safety criteria. Safety criteria shall be applied during equipment hardware design, selection, and construction to eliminate hazards that could cause injury to operating and maintenance personnel. Hazards, such as sharp corners, projections, or moving parts that could cause injury directly or indirectly by catching onto clothing shall be eliminated, minimized by design effort, or provided with protective shields or guards."

MIL-E-16400G (NAVY)  
AMENDMENT-1

"3.11.1 Safety (personnel hazard). Safety (personnel hazard) shall conform to requirement 1 of MIL-STD-454 and as specified herein.

"3.11.2 Safety, electrical power. Switches for disconnecting equipment from electrical power systems shall break all power conductors of the circuit.

"3.11.3 Safety ground, internal. A ground terminal shall be provided on equipment that is connected to an a.c. power source. The ground terminal shall be located on the power input connector or on the equipment terminal board and shall connect to internal chassis by means of conductors at least equal in size to one of the power input conductors. Safety grounding within the equipment (see 3.5.6) shall terminate on the ground terminal.

"3.11.4 Safety ground, external. Where a.c. power is routed externally between individual units of an equipment, a ground conductor shall be included with the power conductors and shall connect to the ground terminal of individual units.

"3.11.5 Safety ground, cable assemblies. A safety ground shall be included in all power cable assemblies that connect to a.c. convenience outlets. The safety ground shall be provided by utilizing three-pin connectors and three-conductor cables having one black, one white, and one green color-coded conductors. The green wire shall be connected to the grounding blade or pin 'B' for the type connector used. Input power cable assemblies shall be fabricated in accordance with 3.4.8.4.1.

"3.11.6 Interlock indicator light. Interlock indicator lights shall be provided and located in a position clearly visible to personnel. The light shall be on the chassis associated with the safety interlock to indicate when the interlock has been disabled.

"3.11.7 Hazardous atmosphere. When specified in the individual equipment specification (see 6.2.1), the equipment or portions thereof shall be protected against a hazardous atmosphere (see 6.3.3) by one of the following methods:

- (a) Enclosed in a heavy-duty, explosion-proof housing as defined by MIL-STD-108.
- (b) Hermetically sealed conforming to the hermetic enclosure requirement of MIL-STD-108.
- (c) Embedded (potted).
- (d) Provided with pressurized ventilation ducting which prevents the hazardous atmosphere from coming in contact with the sparking mechanism.

"3.11.8 Reference and signal voltages. Equipment utilizing external reference or signal voltages in excess of 30 V shall have the provision for interrupting the reference and signal voltages during maintenance actions.

"3.11.9 Leakage current (equipment). When practicable, the leakage current of the equipment shall not exceed 5 mA to ground, whether or not such equipment contains radio interference filters or capacitors. On equipments which have an unavoidable leakage current in excess of 5 mA, a warning plate shall be attached to the front panel reading:

'DANGER - Do not energize this equipment unless frame and all exposed metal parts are grounded.'

"3.12 Workmanship. Workmanship shall conform to requirement 9 of MIL-STD-454."

PAGE 37

~~Page 37~~ Table V: Delete and substitute new table V:

MIL-E-16400G (NAVY)  
AMENDMENT-1

"TABLE V. Examination and tests.

Subject	Requirement	Test method	First article	Quality conformance inspection		
				Group (A)	Group (B)	Group (C)
Surface examination		4.8				
Weight	3.3.2.1	4.8.1(a)	X	X		
Size	3.3.2.2	4.8.1(b)	X	X		
Parts and materials	3.4	4.8.1(c)	X	X		
Finish	3.4.11.3	4.8.1(d)	X	X		
Marking	3.9	4.8.1(e)	X	X		
Safety	3.11	4.8.1(f)	X	X		
Workmanship	3.12	4.8.1(g)	X	X		
Pre-performance		4.7.2	X	X		
Performance	3.3.1	4.8.2	X	X		
Temperature						
Low temperature	3.3.5.1 and 3.3.5.2	4.8.3.2	X		X	X
High temperature	3.3.5.1 and 3.3.5.2	4.8.3.3	X		X	X
Humidity	3.3.5.3	4.8.3.4	X			X
Salt fog	3.3.5.4	4.8.3.5	X			X
Sunshine	3.3.5.5	4.8.3.6	X		X	
Fungus	3.4.9.7	4.8.3.7	X			
Wind velocity	3.3.5.7	4.8.3.8	X			
Icing	3.3.5.8	4.8.3.9	X			
Hydrostatic pressure	3.3.5.9	4.8.3.10	X			
Underwater explosion	3.3.5.10	4.8.3.11	X			
Gunblast	3.3.5.11	4.8.3.12	X			
Nuclear air blast	3.3.5.12	4.8.3.13	X			
Shock	3.3.5.13	4.8.3.14	X			X
Vibration	3.3.5.14	4.8.3.15	X			X
Inclination	3.3.5.15	4.8.3.16	X			X
Magnetic field	3.3.5.16	4.8.3.17	X			X
Dust (fine sand)	3.3.5.17	4.8.3.18	X			X
Harmonic current	3.5.10	4.8.5.11	X			X
Airborne and structureborne noise	3.7.5	4.8.4.2	X			X
Enclosure	3.7.2.1	4.8.4.3	X		X	
Magnetic	3.7.6.1	4.8.4.4	X		X	
Weld	3.4.11.5	4.8.4.5	X		X	
Steady state voltage and frequency	3.5.1	4.8.5.1	X		X	
Transient voltage	3.5.1	4.8.5.2	X			
Transient frequency	3.5.1	4.8.5.3	X			
Spike voltage	3.5.1	4.8.5.4	X			
Power interruption	3.5.1	4.8.5.5	X		X	
Power and power factor	3.5.1	4.8.5.6	X		X	
Insulation resistance	3.5.3.2	4.8.5.7	X		X	
Corona measurement	3.5.3	4.8.5.8	X			
Leakage current	3.11.9	4.8.5.9	X			
Dielectric withstanding voltage	3.5.3.1	4.8.5.10	X		X	
Electromagnetic interference	3.5.4	4.8.6.1, 4.8.6.2, and 4.8.6.3	X		X	
Thermal design	3.8	4.8.7.1	X		X	
Water cooling	3.8.1.2	4.8.7.2	X		X	
Accelerated life	3.3.5.18	4.8.3.19	X			X
Reliability test and demonstration	3.3.3.1	4.8.9	X			
Maintainability demonstration	3.3.4.1	4.8.10	X			
Paint system	3.4.11.3.4.1	4.8.3.20	X			

## PAGE 39

4.5.4, line 2: Delete "Atomsphere" and substitute "Atmosphere".

4.6(a): Delete "Temperature  $23^{\circ} \pm 1.4^{\circ}\text{C}$  ( $73^{\circ} \pm 2.5^{\circ}\text{F}$ )" and substitute "Temperature  $23^{\circ} \pm 10^{\circ}\text{C}$  ( $73^{\circ} \pm 18^{\circ}\text{F}$ )".

4.6(b): Delete "Relative humidity  $50 \pm 5$  percent" and substitute "Relative humidity  $50$  percent  $\pm 30$  percent."

4.6.2(b)(1): Delete "Sinusoidal".

4.7.4: Delete and substitute:

"4.7.4 Visual examination. Prior to, during, and after each test, the test item shall be visually examined and a record made of any damage or deterioration. If a test chamber is used for the test, a visual examination of the test item within the chamber shall be performed at test conditions when possible.

"4.7.5 Failure criteria. Unless otherwise specified herein or in the individual equipment specification, equipment, or portions thereof, subjected to a test specified herein shall be considered to have failed the test when any of the following occur:

- (a) Performance parameters exceed limits specified in the individual equipment specification.
- (b) Catastrophic or structural failure.
- (c) Distortion or displacement of mechanical parts that causes difficulty of servicing or replacing a part.
- (d) Any condition that results in a hazard to personnel safety.
- (e) Deterioration, corrosion, or change in performance limits causing failure to meet operational service or maintenance requirements.
- (f) Leakage or discoloration of impregnating compounds that would cause a decrease in service life or reliability."

## PAGE 40

4.8.1: In item (f), delete "3.10" and substitute "3.11", and in item (g), delete "3.11" and substitute "3.12".

4.8.3.2(b): Delete "Temperature range 4: minus  $0^{\circ}\text{C}$ " and substitute "Temperature range 4:  $0^{\circ}\text{C}$ ".

4.8.3.4(a): Delete and substitute:

- "(a) Step 5 - Equipment performance measurements for temperature ranges 3 and 4 shall be made at plus  $50^{\circ}\text{C}$  ( $122^{\circ}\text{F}$ )."

4.8.3.4(b), line 2: Delete "physical degradation in accordance with 4.7.4" and substitute "failure as defined in 4.7.5".

4.8.3.5.1: Delete and substitute:

"4.8.3.5.1 Exposed equipment. Equipment, or portions thereof, exposed to the weather, shall be subjected to a salt fog test, in accordance with one of the following procedures, as specified in the individual equipment specification (see 6.2.1):

- (a) Procedure I - Method 509 of MIL-STD-810.
- (b) Procedure II - The complete unit shall be subjected under continuous ultra-violet light to a 20 percent hot salt spray at  $131^{\circ}\text{F}$  ( $55^{\circ}\text{C}$ ) for a period of 3 minutes, followed by a hot air blast at  $131^{\circ}\text{F}$  ( $55^{\circ}\text{C}$ ) for a period of 2 minutes. The cycle shall be repeated continuously for 100 hours. Upon completion of the test, the unit shall be washed with fresh water, dried and examined. During test, all equipment shall be mounted in its normal installed position. Test equipment shall be equivalent to the Navy standard salt spraying machine (see Drawing 9000-S6202-73724)."

MIL-E-16400G (NAVY)  
AMENDMENT-1

## PAGE 41

4.8.3.12, line 7: Delete "employ" and substitute "employs".

4.8.3.14: Delete and substitute:

"4.8.3.14 Shock. Shipboard equipment shall be shock tested in accordance with the grade A, type A, class I shock test requirements of MIL-S-901. Equipment for other than shipboard use shall be shock tested in accordance with method 516 of MIL-STD-810; the applicable procedure shall be as specified in the individual equipment specification (see 6.2.1). The mounting fixture shall be as specified in the individual equipment specification (see 6.2.1). Simulated loads such as weights or other dummy masses shall not be used. The test shall be performed with the normal assemblies and units in their functionally operating positions. Equipment weighing more than 60,000 pounds, or which, for any reason cannot be tested to the requirements specified herein shall be analyzed in accordance with the requirements of the individual equipment specification (see 6.2.1)."

4.8.3.15: Delete and substitute:

"4.8.3.15 Vibration.

"4.8.3.15.1 Environmental vibration. Shipboard equipment shall be subjected to the type I vibration test of MIL-STD-167-I. The upper vibration frequency limit shall be as specified in the individual equipment specification (see 6.2.1). Equipment for other than shipboard use shall be subjected to the vibration test of method 514, procedure XIII of MIL-STD-810. Simulated loads, such as weights or other dummy masses, shall not be used. The test shall be performed with the normal assemblies and units in their functionally operating positions. Stand-mounted equipment shall be mounted on a stand for the test.

"4.8.3.15.2 Internally excited vibration. Rotary units of equipment shall be subjected to the type II vibration test of MIL-STD-167-I. Unless otherwise specified in the individual equipment specification, the measurement shall be limited to the evaluation of first order vibration."

4.8.3.16, line 1: Insert "applicable" between "the" and "test".

## PAGE 42

4.8.3.16.1: In title, delete "(surface ship installations)" and substitute "(except submarine installations)", and in line 9, delete "veritcal" and substitute "vertical".

4.8.3.17: Delete and substitute:

"4.8.3.17 Magnetic field test. The magnetic field test shall be in accordance with the test procedure of section 401 of MIL-STD-1399."

Add new paragraph 4.8.3.18:

"4.8.3.18 Dust (fine sand). When specified in the individual equipment specification (see 6.2.1), the equipment shall be subjected to the dust test of method 510, of MIL-STD-810, except that performance measurements shall be made following exposure to dust particles in the nonoperating condition (at the conclusion of step 2) and performance measurements shall be made continuously during exposure to dust particles in the operating condition (during step 3). Any change in orientation to the equipment during the test shall be as specified in the individual equipment specification (see 6.2.1)."

Add new paragraph 4.8.3.19:

"4.8.3.19 Accelerated life tests. Accelerated life tests shall be performed for a period of 360 hours, as specified herein."



MIL-E-16400G (NAVY)  
AMENDMENT-1

"4.8.3.19.1 Initial test conditions.

- (a) Equipment set up in a temperature-controlled chamber at  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and relative humidity of 45 to 55 percent.
- (b) Equipment energized and operating with:
  - (1) Nominal line voltage and frequency specified.
  - (2) Cooling system in normal operation.
  - (3) Fully operational for a period of 2 hours.
- (c) When equipment internal temperature has stabilized, performance parameters shall be measured and recorded as 'reference test data' for comparison with subsequent tests.

"4.8.3.19.2 Temperature conditions.

- (a) Reduce chamber temperature, at a uniform rate in not less than 4 hours to the lowest operating temperature of the range specified.
- (b) Maintain chamber temperature at the lowest operating temperature of the range for a period of 10 hours.
- (c) Near the end of the 10 hour period, measure and record the performance parameters.
- (d) Increase chamber temperature, at a uniform rate in not less than 6 hours, to the highest operating temperature of the range specified and maintain humidity at 45 to 55 percent.
- (e) Maintain chamber temperature at the highest operating temperature of the range specified for a period of 8 hours.
- (f) Near the end of the 8 hour period, measure and record the performance parameters.
- (g) Reduce chamber temperature, at a uniform rate in not less than 6 hours, to the lowest operating temperature of the range specified.
- (h) Maintain chamber temperature at the lowest operating temperature of the range specified for a period of 2 hours.

"4.8.3.19.3 Voltage and frequency cycling conditions.

- (a) After completion of the 2 hour low temperature conditioning period specified in 4.8.3.19.2(h), decrease the input voltage to 90 percent of nominal value.
- (b) Operate for a period of 1 hour and record performance parameters.
- (c) Return input voltage to nominal value. Decrease input frequency to 95 percent of nominal value.
- (d) Operate for a period of 1 hour and record performance parameters.
- (e) Return input frequency to nominal value.
- (f) Increase temperature to  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and maintain relative humidity at 45 to 55 percent. Maintain this condition for a period of 2 hours.
- (g) With equipment operating at  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and relative humidity at 45 to 55 percent, decrease input voltage to 90 percent and frequency to 95 percent of nominal value. Maintain this condition for a period of 1 hour and record performance parameters.
- (h) Repeat 4.8.3.19.3(g) with input voltage of 110 percent and frequency at 95 percent of nominal value.
- (i) Repeat 4.8.3.19.3(g) with input voltage of 110 percent and frequency at 105 percent of nominal value.
- (j) Repeat 4.8.3.19.3(g) with input voltage at 90 percent and frequency at 105 percent of nominal value.
- (k) Repeat uniform temperature rise test of 4.8.3.19.2(d).
- (l) Record performance parameters at the end of the uniform temperature rise test of 4.8.3.19.3(k).
- (m) With equipment operating at highest operating temperature of the range and relative humidity at 45 to 55 percent, increase input voltage to 110 percent of nominal value, maintaining frequency at 105 percent of nominal value.
- (n) Operate for a period of 8 hours and record performance parameters.
- (o) Maintain voltage, and frequency conditions of 4.8.3.19.3(m) and increase relative humidity to 90 to 100 percent.
- (p) Operate for a period of 2 hours and record performance parameters.
- (q) Maintain frequency at 105 percent of nominal value and relative humidity at 90 to 100 percent, but decrease input voltage to 90 percent of nominal value.
- (r) Operate for a period of 1 hour and record performance parameters.

MIL-E-16400G (NAVY)  
AMENDMENT-1

- (s) Maintain high temperature and humidity conditions but return input voltage and frequency to nominal value.
- (t) Operate for a period of 1 hour and record performance parameters.
- (u) Repeat high temperature voltage and frequency cycling tests of 4.8.3.19.3(o) through (t) for not less than 59 cycles.
- (v) Repeat high temperature voltage and frequency cycling tests of 4.8.3.19.3(o) through (t) with relative humidity at 10 to 20 percent for not less than 15 cycles."

Add new paragraph 4.8.3.20:

"4.8.3.20 Paint system test. Test panels composed of the same material as the exposed equipment shall be prepared and painted using the same methods that will be used on the equipment to be delivered. Where more than one type of material is used, test panels of each type shall be prepared and tested in accordance with one of the following procedures as specified in the individual equipment specification (see 6.2.1):

Procedure I:

- (a) Panels shall be subjected to the salt fog test of method 509 of MIL-STD-810, except that a 20 percent salt solution shall be used, the duration of exposure shall be five days, and the following shall be performed after the wash in running water.
- (b) Immerse panels in a 5 percent (by weight) solution of sulfuric acid for 30 minutes.
- (c) Remove panels from the sulfuric acid solution and place them in a dry heat oven at 93°C for 1 hour.
- (d) Remove panels from the oven and immediately immerse them in cold (9°C to 14°C) water for 10 minutes.
- (e) Remove panels from the cold water and immerse them for two days in hot (80°C) synthetic sea water, conforming to ASTM D1141.
- (f) Determine adhesion and degree of blistering, as specified herein, to determine compliance with 3.4.11.3.4.1.

Procedure II:

- (a) Condition panels for one week at 23°C  $\pm$  3°C (73.4°F  $\pm$  5°F) after application of the final coat.
- (b) Immerse panels for 12 weeks in hot synthetic sea water conforming to ASTM D1141.
- (c) Determine adhesion and degree of blistering as specified herein to determine conformance with 3.4.11.3.4.1.

"4.8.3.20.1 Blistering. The degree of blistering shall be determined in accordance with ASTM D714-56. Blisters appearing within 0.25 inch from the edge of the panel shall be disregarded.

"4.8.3.20.2 Adhesion. The loss of paint adhesion on both sides of each panel shall be determined using a crosscut scoring tool and masking tape peel test in accordance with method 6301 of FED-STD-141, except the requirement for panel immersion shall be omitted."

4.8.4.1: Delete.

4.8.4.3: In line 2, delete "and 3.10.11.4(b)" and substitute "or 3.11.7(b)", and in line 5, delete "structural integrity".

4.8.4.4 Delete and substitute:

"4.8.4.4 Magnetic material test. Magnetic material tests to determine compliance with magnetic permeability requirements (see 3.7.6.1) shall be performed with a low-mu permeability indicator of the go-no go type conforming to MIL-I-17214."

PAGE 43

4.8.5.2, title: Delete "2/".

MIL-E-16400G (NAVY)  
AMENDMENT-1

4.8.5.2.1, line 2: Delete "normal" and substitute "nominal".

4.8.5.2.2, line 2: Delete "transient voltage of minus 18 percent of normal" and substitute "a transient voltage of minus 18 percent of nominal".

4.8.5.2.3, line 4: Delete "normal" and substitute "nominal".

4.8.5.3.1, lines 1 and 3: Delete "normal" and substitute "nominal".

4.8.5.3.2: In line 1, delete "normal" and substitute "nominal" and in line 3 delete "(+ percent of normal)" and substitute "(+ 5 percent of nominal)".

4.8.5.4: In line 1, delete "<sup>2</sup>/", and in line 5, delete "normal" and substitute "nominal".

4.8.5.6: In line 2, delete "normal" and substitute "nominal", and in line 3, delete "pase" and substitute "phase".

Bottom of page: Delete footnote 2.

4.8.5.9, line 3: Delete "3.10.11.6" and substitute "3.11.9".

Add new paragraph 4.8.5.11:

"4.8.5.11 Harmonic current. Equipment shall be tested to determine conformance with 3.5.10, when operating in the mode that generates the highest input current harmonics. The power source shall not have a harmonic voltage content in percent rms at any frequency which is greater than 25 percent of the allowable harmonic current at any frequency. The accuracy of measurement of harmonic currents shall be plus or minus 5 percent of the harmonic being measured."

4.8.6.1: In line 2, delete "susceptability" and substitute "susceptibility", and in line 3, delete "or" and substitute "and".

4.8.6.2: Add:  
"(e) CS01 (where applicable)."

## PAGE 45

4.8.7.1, second sentence and items (a) through (e): Delete and substitute:

"The test shall include the measurement and recording of:

- (a) Operating temperature of parts that operate at 75 percent or more of rated value.
- (b) Operating temperature of parts that dissipate 10 percent or more of the total power dissipated by the unit in which they are installed.
- (c) Surface temperature of enclosures, front panels, and controls.
- (d) Inlet and outlet temperature differentials when forced air cooling is utilized.
- (e) Cooling system efficiency."

## PAGES 45 and 46

4.8.8 through 4.8.8.4.2: Delete.

## PAGE 47

6.1: Delete and substitute:

"6.1 Intended use. This specification covers general requirements applicable to electronic, interior communication, and navigational equipment designed to meet the operational conditions anticipated in Naval Ship and shore installations. General requirements applicable to test equipment for testing equipment designed to this specification are covered by MIL-T-28800. General requirements applicable to airborne electronic equipment are covered by MIL-E-5400."

MIL-E-16400G (NAVY)  
AMENDMENT-1

6.2.1, lines 1 through 3: Delete and substitute:

"6.2.1 Guidance for equipment specification. This specification is general in scope. Notwithstanding any provision of this specification to the contrary, Section 6.2.1 is not applicable to and is not incorporated by reference into the performance requirement of any contract in which this specification is incorporated by reference. The following items are provided for assistance during the preparation of the individual equipment specifications."

Add new paragraph 6.2.3:

"6.2.3 Sea water corrosion of galvanic couples. Since sea water is a good electrolytic conductor, and since it is common practice to combine dissimilar metals and alloys in structures exposed to sea water attack, galvanic corrosion is encountered quite frequently.

Galvanic action in sea water follows the general laws of galvanic corrosion. However, the calcium, magnesium, and strontium present in sea water tend to precipitate as carbonates on cathodic surfaces. The effect of such precipitated deposits, plus heavy growths of Marine organisms, is to stifle the galvanic effect and to distribute the galvanic protection over larger areas of cathodic surfaces than would be the case in their absence. Marine growths also tend to distribute galvanic action over the anodic surfaces by interposing a common resistance which reduces the relative importance of the initial resistance of the electrolyte.

On the basis of practical experience and experimental observations, the table (table II herein) has been constructed as a qualitative guide to what may be expected when different metals and alloys are combined with different area relationships in sea water exposure. The common materials have been arranged in a galvanic series with respect to sea water. In the case of active-passive materials, like the stainless steels, it has been assumed in the table that these alloys may suffer accelerated corrosion when in contact with all materials more noble than their active state and that they may accelerate corrosion of all materials less noble than their passive state. In other words, the table tends to err in the safe direction.

"Reproduced, by permission, from 'Corrosion Handbook' edited by H.H. Uhlig, published by John Wiley & Sons, Inc. 1948."

Add new paragraph 6.3.4:

"6.3.4 Load unbalance. The load unbalance for three-phase loads is defined as the ratio of the maximum difference between loads on any two phases to the total three-phase load in kilovolt-amperes (kVA), expressed in percent.

$$\text{Load unbalance (percent)} = \frac{\text{Max. kVA phase load} - \text{Min kVA phase load}}{\text{Total kVA three-phase load}} \times 100"$$

PAGES 47 through 49

Paragraph 6.2.1:

Item (f): Delete and substitute:

"(f) Size limitations for other than surface ship and submarine equipment (see 3.3.2.2)."

Items (g) and (h): Delete.

Item (l): Delete and substitute:

"(l) The applicable part of procedure II required (see 3.3.4.2)."

Items (v) and (w): Delete and substitute:

"(v) If applicable the shock requirement and test for other than shipboard equipment (see 3.3.5.13 and 4.8.3.14).

"(w) If applicable, the vibration test requirement for other than shipboard equipment (see 3.3.5.14.1) and when internally excited vibration test is required (see 3.3.5.14.2)."

Item (mm): Delete and substitute:

"(mm) Electrical power characteristics for shipboard, if other than specified (see 3.5.1.1)".

MIL-E-16400G (NAVY)  
AMENDMENT-1

Item (gg): Delete.

Item (hhhh): Delete "3.10.11.4" and substitute "3.11.7".

Item (iiii): Delete.

Item (ccccc): Delete and substitute:

"(ccccc) Shock analysis requirement for equipment weighing over 60,000 pounds (see 4.8.3.14)."

Item (hhhhh): Delete "4.8.8" and substitute "4.8.3.19".

Paragraph 6.2.1: Add the following items:

- "(lllll) Failure modes, effects and criticality analyses (see 3.3.3.3).
- "(mmmmm) When the accelerated life test is required (see 3.3.5.18).
- "(nnnnn) Circuits requiring shielding conduit (see 3.4.8.10).
- "(ooooo) AC power source for fixed shore equipment with power rating greater than 100 kVA (see 3.5.1.2).
- "(ppppp) D.C. power source (see 3.5.1.3).
- "(qqqqq) When tactile control knobs are required (see 3.7.8.1).
- "(rrrrr) Filure criteria, if other than specified (see 4.7.5).
- "(sssss) Applicable salt fog test method (see 4.8.3.5.1).
- "(ttttt) Upper vibration frequency limit for shipboard equipment (see 4.8.3.15).
- "(uuuuu) When dust test is required and change of orientation to the equipment during test (see 4.8.3.18).
- "(vvvvv) Applicable paint system test procedure (see 4.8.3.20)."

Paragraph 6.2.2:

Item (b): Delete.

Item (f): Delete "calculations" and substitute "calculation report".

PAGES 52 through 62

Index: Add the following listings:

	Paragraph	Page
"A.C. power source, shipboard-----	3.5.1.1	22
"A.C. power source, fixed shore station-----	3.5.1.2	22
"Adhesion and blister resistance-----	3.4.11.3.4.1	22
"Brazing-----	3.4.11.7	22
"Cable, communication-----	3.4.8.6.2	10
"Cable, telephone-----	3.4.8.6.2	10
"Circulators-----	3.4.8.3.5.4	10
"Connectors, pressure proof-----	3.4.8.10.10	12
"Doors, access-----	3.6.6.1	26
"Dust requirement-----	3.3.5.17	9
"Dust test-----	4.8.3.18	42
"Failure criteria-----	4.7.5	39
"Harmonic current limitation-----	3.5.10	26
"Harmonic current test-----	4.8.5.11	44
"Isolators-----	3.4.8.3.5.5	14
"Marine Corps equipment, painting-----	3.4.11.3.5	22
"Panels (for servicing)-----	3.6.6.1	26
"Vehicular power source-----	3.5.1.3.1	22
"Vibrators-----	3.4.8.38	14"

Index: Make the following changes:

Accelerated life test: Delete "4.8.8--45" and substitute "4.8.3.19--42".

Air filters (thermal design): Delete "3.8.1.4" and substitute "3.8.1.1".

Delete "Aluminum and aluminum alloys, painting of--3.4.11.3.1.1" and substitute "Aluminum and aluminum alloys, pretreatment--3.4.11.3.1".

Enamel: Delete "3.4.11.3.1.4--21" and substitute "3.4.11.3.3.2 and 3.4.11.3.5.2--22".

MIL-E-16400G (NAVY)  
AMENDMENT-1

Equipment leakage current: Delete "3.10.11.6" and substitute "3.11.9".

Exposed equipment (exterior use): Delete "3.4.11.3.2" and substitute "3.4.11.3.4".

Delete "Failure criteria, visual examination--4.7.4--39."

Delete "Ferrous metals, painting of--3.4.11.3.1.2", and substitute "Ferrous metals, pretreatment--3.4.11.3.2".

Delete "Fungus--3.3.5.6 and 4.8.3.7--7 and 41".

Delete "Fungus-inert material--3.4.9.7--14" and substitute "Fungus inert and fungus nutrient--3.4.9.7 and 4.8.3.7--14 and 41."

Delete "Ground, safety--3.10.11.2" and substitute:

"Ground, safety, internal--3.11.3  
"Ground, safety, external--3.11.4"

Hazardous atmosphere: Delete "3.10.11.4" and substitute "3.11.7".

Delete "Inclination test limits (surface ship installation" and substitute "Inclination test limits (except submarine installations)."

Indicator, interlock: Delete "3.10.11.3" and substitute "3.11.6".

Interlock indicator: Delete "3.10.11.3" and substitute "3.11.6".

Leakage current (equipment): Delete "3.10.11.6" and substitute "3.11.9".

Delete "Magnetic characteristics" and substitute "Magnetic materials".

Delete "Magnetic requirements--3.7.6" and "Magnetic shielding--3.7.6.2" and substitute "Magnetic requirements for minesweeper equipment--3.7.6".

Personnel hazard, safety: Delete "3.10.11.1" and substitute "3.11.1".

Primer: Delete "3.4.11.3.1.3--21" and substitute "3.4.11.3.3.1 and 3.4.11.3.5.1--22".

Delete "Protected equipment (interior use)--3.4.11.3.1--21" and substitute "Protected equipment (interior use), except Marine Corps--3.4.11.3.3--22".

Reference/signal voltages: Delete "3.10.11.5" and substitute "3.11.8".

Delete "Resistors, variable, wire-wound precision--3.4.8.25" and substitute:

"Resistors-----3.4.8.25  
"Resistors, tapped-----3.4.8.25.1  
"Resistors, wirewound, precision, variable-----3.4.8.25.2"

Delete "Safety ground--3.10.11.2" and substitute:

"Safety criteria-----3.11  
"Safety ground, cable assemblies-----3.11.5  
"Safety ground, external-----3.11.4  
"Safety ground, internal-----3.11.3"

Signal or reference voltages: Delete "3.10.11.5" and substitute "3.11.8".

Delete "Standard test conditions (accelerated life--4.8.8.1--45".

Delete "Structural integrity--3.7.2.3 and 4.8.4.1--27 and 42".



MIL-E-16400G (NAVY)  
AMENDMENT-1

Delete "Synchro capacitors--3.5.9.1--26", "Synchro capacitor values--3.5.9.1.1--26" and "Synchros--3.5.9--25" and substitute:

"Synchro capacitors--3.5.9--25  
"Synchro data transmission system--3.5.9--25".

Delete "Temperature cycling conditions (accelerated life)--4.8.8.2--45".

Test conditions, standard: Delete "and 4.8.8.1--and 45".

Delete "Visual examination and failure criteria" and substitute "Visual examination".

Voltage/frequency cycling conditions: Delete "4.8.8.3--46" and substitute "4.8.3.19.3--42".

Workmanship: Delete "3.11" and substitute "3.12".

Delete "Zero, electrical and mechanical--3.5.9.3--26".

Review activities:  
Navy - EC, AS, OS  
User activities:  
Navy - MC

Preparing activity:  
Navy - SH  
(Project MISC NB26)