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MILITARY SPECIFICATION

ELECTRONIC EQUIPMENT GROUND: GENERAL REQUIREMENTS FOR

1. SCOPE

1.1 This specification covers the general requirements of the design and manufacture of ground electronic equipment.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

Federal

TT-E-489	Enamel, Alkyd, Gloss (For Exterior and Interior Surfaces)
ZZ-R-765	Rubber, Silicone: Low and High Temperature and Tear Resistant

Military

MIL-V-173	Varnish, Moisture-and-Fungus-Resistant (For the Treatment of Communications, Electronic, and Associated Electrical Equipment)
MIL-R-3065	Rubber, Fabricated Parts
MIL-C-3133	Cellular Elastomeric Materials, Fabricated Parts
MIL-F-3541	Fittings, Lubrication

MIL-C-5541	Chemical Films For Aluminum and Aluminum Alloys
MIL-E-6051	Electromagnetic Compatibility Requirements, Systems
MIL-R-6855	Rubber, Synthetic, Sheet, Molded, and Extruded
MIL-C-13909	Conduit, Metal, Flexible; Electrical Shielded
MIL-F-14072	Finishes For Ground Signal Equipment
MIL-P-19834	Plates, Identification, Metal Foil, Adhesive Backed
MIL-C-38999	Connector, Electrical, Circular, Miniature, High Density Quick Disconnect
MIL-M-45202	Magnesium Alloys, ANODIC Treatment Of
MIL-C-83723	Connector, Electrical, Circular, Environment Resisting, General Specification For
MIL-C-83733	Connectors, Electrical, Miniature, Rectangular Type, Rack to Panel, Environmental Resisting, 200°C Total Continuous Operating Temperature, General Specification For

STANDARDS

Military

MIL-STD-143	Specifications and Standards Order Of Precedence For the Selection Of
MIL-STD-188	Military Communication System Technical Standards
MIL-STD-275	Printed Wiring For Electronic Equipment
MIL-STD-454	Standard General Requirements For Electronic Equipment
MIL-STD-461	Electromagnetic Interference Characteristics Requirements For Equipment
MIL-STD-633	Mobile Electric Power Engine Generator Standard Family Characteristics Data Sheets
MIL-STD-882	System Safety Program For Systems and Associated Subsystems and Equipment: Requirements For
MIL-STD-891	Contractor Parts Control and Standardization Program

PUBLICATIONS

Air Force Systems Command (AFSC)

AFSC Design Handbook DH 1-4	Electromagnetic Compatibility
AFSC DH 1-X	Checklist of General Design Criteria

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 General.- The equipment shall meet the pertinent requirements of the following as specified herein:

3.2 Design.- The design used in the construction of the equipment shall be as specified in the equipment specification or as specified herein. Approval shall be obtained from the procuring activity for any deviations from a specified design requirement (See 6.2.a).

3.2.1 Accessibility.- Accessibility shall be in accordance with MIL-STD-454, Requirement 36.

3.2.2 Adhesives.- The selection and use of adhesives shall be in accordance with MIL-STD-454, Requirement 23.

3.2.3 Application requirements.- When a subsidiary specification or standard includes application requirements, these requirements shall be adhered to during design and fabrication of the equipment.

3.2.4 Batteries.- The selection and use of batteries shall be in accordance with MIL-STD-454, Requirement 27.

3.2.5 Bearings.- The selection and use of bearings shall be in accordance with MIL-STD-454, Requirement 6.

3.2.6 Castings.- The general design and methods of classification, inspection, and repair of castings shall be in accordance with MIL-STD-454, Requirement 21.

3.2.7 Controls.- Controls shall be in accordance with MIL-STD-454, Requirement 28.

3.2.7.1 Tuning dial mechanisms.- Tuning dial mechanisms shall be in accordance with MIL-STD-454, Requirement 42.

3.2.8 Communications and data exchange.- All equipments generating electrical signals that are to be exchanged through any communications link or for any distance over local or long distance communications networks shall comply with MIL-STD-188 and the published military standards in the MIL-STD-188-100, -200 and -300 series.

3.2.9 Corona and electrical breakdown prevention.- Corona and electrical breakdown prevention shall be in accordance with MIL-STD-454, Requirement 45.

3.2.10 Dissimilar metals.- The selection and protection of dissimilar metal combinations shall be in accordance with MIL-STD-454, Requirement 16.

3.2.11 Electrical overload protection.- Criteria and philosophy for electrical overload protection shall be in accordance with MIL-STD-454, Requirement 8.

3.2.12 Electromagnetic interference control.- Electromagnetic interference (EMI) control shall be in accordance with MIL-STD-454, Requirement 61. Equipments integrated into a system or subsystem shall conform to MIL-E-6051.

3.2.12.1 Electromagnetic compatibility design considerations.- Electromagnetic compatibility design guidance may be obtained from Air Force Systems Command (AFSC) design handbook AFSC DH 1-4 and AFSC DH 1-X, Chapter 4.

3.2.12.2 Spike susceptibility.- The spike susceptibility requirements of MIL-STD-461 on electrical primary power input lines shall be in addition to the power transient requirements stated herein.

3.2.12.3 Electronic countermeasures (ECM) vulnerability.- Equipment with antennas or antenna ports or both shall be designed and constructed to provide maximum invulnerability to electronic countermeasure action (ECM or jamming). When anti-jamming techniques affect the operation of the equipment, the extent these techniques are used shall be controllable at the discretion of the operator. All tests to prove invulnerability shall be as specified in the individual equipment specification (See 6.2.b).

3.2.13 Encapsulation and embedment.- Encapsulation and embedment shall be in accordance with MIL-STD-454, Requirement 47.

3.2.14 Enclosures.- General design criteria for enclosures shall be in accordance with MIL-STD-454, Requirement 55.

3.2.15 Fastener hardware.- Engineering criteria and requirements for application of fastener hardware shall be in accordance with MIL-STD-454, Requirement 12.

3.2.16 Ferrous alloys, corrosion resistance.- The corrosion resistance requirement and selection and use of ferrous alloys shall be in accordance with MIL-STD-454, Requirement 15.

3.2.17 Gears and cams.- The criteria for gears and cams shall be in accordance with MIL-STD-454, Requirement 48.

3.2.18 Human engineering.- The principles and criteria for human engineering shall be in accordance with MIL-STD-454, Requirement 62.

3.2.19 Hydraulics.- The design and installation of hydraulic systems shall be in accordance with MIL-STD-454, Requirement 49.

3.2.20 Indicator lights.- Indicator lights and associated items shall be in accordance with MIL-STD-454, Requirement 50.

3.2.21 Interchangeability.- The selection and use of interchangeable items shall be in accordance with MIL-STD-454, Requirement 7.

3.2.22 Maintainability.- Maintainability requirements shall be in accordance with MIL-STD-454, Requirement 54.

3.2.23 Meters, electrical indicating and accessories.- The criteria for electrical meters and meter accessories shall be in accordance with MIL-STD-454, Requirement 51.

3.2.24 Microelectronic devices.- The selection and application of microelectronic devices shall be in accordance with MIL-STD-454, Requirement 64.

3.2.25 Moisture pockets.- The control and drainage of moisture pockets in equipment shall be in accordance with MIL-STD-454, Requirement 31.

3.2.26 Motors, dynamotors, rotary power converters and motor-generators.- The criteria for the choice of motors, dynamotors, rotary power converters and motor-generators shall be in accordance with MIL-STD-454, Requirement 46.

3.2.27 Printed wiring.- Printed wiring shall be in accordance with MIL-STD-454, Requirement 17. Unless otherwise specified in the detail equipment specification, conformal coatings for printed wiring and multilayer boards shall be required in all new design.

3.2.28 Reliability.- The implementation of reliability principles and techniques shall be in accordance with MIL-STD-454, Requirement 35.

3.2.29 Safety of personnel.- Safety considerations and design features shall be derived from MIL-STD-454, Requirement 1.

3.2.29.1 System Safety.- System safety and system safety program for systems, subsystems and associated equipment shall be in accordance with MIL-STD-882 (See 6.2q).

3.2.30 Service conditions.- The equipment shall be designed and constructed to withstand any combination of the service conditions listed in subparagraphs hereunder, without any mechanical or electrical damage, or any degradation in performance below that specified in the detailed equipment specification. (See 6.2.c).

3.2.30.1 Climatic.- When checking the equipment performance for compliance with the detailed equipment specification, under the combination of altitude (barometric pressure, operating) and high temperature, the specified maximum temperature may be reduced at a rate of 3.5°F per 1000 feet of elevation above sea level.

Example: Temp at 8000 ft. = Temp at sea level minus (3.5°F x 8)
= 125°F - 28°F
= 97°F

3.2.30.1.1 Ambient temperature.- Unless otherwise specified in the detailed equipment specification (See 6.2.c), the equipment shall meet the "operating" ambient temperature conditions for the temperate area (See Table I) and shall, be designed to be capable of conversion to meet the ambient temperature conditions specified for cold weather area by the addition of climatization kits after production. Equipment intended for use in extreme temperature areas shall also be capable of specified performance under the applicable extended ambient temperatures specified for cold weather area, desert, and tropical areas. All equipment, regardless of the area in which it is intended to operate, shall meet the "non-operating and storage" ambient temperature condition specified in Table I.

3.2.30.1.2 Solar radiation.- Outdoor equipment for desert and tropical use shall be designed to be capable of specified performance under the combined effects of temperature and solar radiation. The equipment design shall be based on a temperature of plus 52°C (plus 125°F) and the full impact of solar radiation of 360 British Thermal Units per square foot (105 watts per square foot) per hour for at least 4 hours. The maximum temperature of 71°C (160°F) specified in Table I, is assumed to result from a combination of a maximum ambient air temperature of 52°C (125°F) and the full impact of solar radiation.

3.2.30.1.3 Relative humidity

a. Operating: Up to 95 percent with a temperature of 26.7°C (80°F), including condensation due to temperature changes.

b. Nonoperating and storage: Up to 100 percent, including condensation due to temperature changes.

TABLE I
AMBIENT TEMPERATURE CONDITIONS

		AREA	LOW EXTREME	HIGH EXTREME (see 3.2.30.1)
Non-operating and Storage		All areas	-62°C(-80°F)	+71°C(+160°F)
Operating	Outdoor	Cold weather area	-54°C(-65°F)	+52°C(+125°F)
		Temperate area	-40°C(-40°F)	+52°C(+125°F)
		Desert and tropical areas	0°C(+32°F)	+71°C(+160°F) (see 3.2.30.1.2)
	Indoor	All areas	0°C(+32°F)	+52°C(+125°F)

3.2.30.1.4 Altitude

a. Operating: Sea level to approximately 10,000 feet above.

b. Nonoperating and storage: Sea level to approximately 50,000 feet above.

3.2.30.1.5 Other climatic service conditions.- The equipment shall be designed and constructed to meet the minimum performance requirements during and after, exposure to the following climatic service conditions, when and as specified in the detailed equipment specifications. (See 6.2.d).

a. Sunshine
b. Rain
c. Fungus
d. Salt fog
e. Dust
f. Wind
g. Ice load and wind
h. Temperature shock
i. Snow load.

3.2.30.2 Mechanical.- The equipment shall be constructed so that no fixed part shall become loose, no movable part or permanently set adjustment shall shift its setting or position, and no degradation shall be caused in the performance specified herein, when subjected to the following mechanical service conditions:

a. Orientation

(1) Operating:

(a) Fixed equipment: Inclination at any angle up to 10 degrees from the normal position

(b) Mobile equipment: Inclination as specified in detailed equipment specification (see 6.2.e).

(2) Nonoperating: Storage in any position for a period of two years

b. Vibration, bounce, shock and bench handling: As specified in the detailed equipment specification (see 6.2.f).

3.2.30.3 Electrical

3.2.30.3.1 Electrical power source.- The electrical power source shall be as established by MIL-STD-454, Requirement 25, except that 50 Hertz power shall also be a consideration. The specific values of nominal voltage and frequency (also number of phases and wires) required of the power source shall be as established by the individual equipment specification. (see 6.2.g).

3.2.30.3.2 Equipment design considerations

3.2.30.3.2.1 Equipment response versus condition of primary input power.- Subject to any exceptions called out in the individual equipment specification, the design of electronic equipment shall be such that under the various conditions of primary input power defined in Part A of Table II, the equipment response is in accordance with Part B of Table II. For definition of electrical terms used in Part A of Table II refer to 6.3.2.

Note: (1) The power characteristics and conditions detailed in Part A of Table II shall not be construed as design requirements for the power source.

Note: (2) For mobile applications only typical mobile electric power-prime power source characteristics can be found in MIL-STD-633.

3.2.30.3.2.2 Narrower tolerance limits or uninterrupted operation.- If the inherent design limitations of the equipment, or a major component thereof, will not permit specified equipment performance under the tolerance limits defined under Conditions I and II, Part A of Table II, or if uninterrupted operation is a requirement, the devices for accomplishing the improvement in the tolerance limits of the primary power, or for attaining uninterrupted operation, shall be considered part of the equipment group and shall be provided therewith, subject to the prior approval of the procuring activity. In the event that uninterrupted operation is required, care shall be taken that the rating of the recommended uninterruptible power unit be commensurate with the requirements of only that portion of the equipment group the function of which is actually critical.

TABLE II

EQUIPMENT PERFORMANCE REQUIREMENTS VERSUS

CONDITION OF A.C. PRIMARY INPUT POWER

	PART A		PART B
Cond	CONDITIONS OF ALTERNATING CURRENT (AC) PRIMARY INPUT POWER FOR EXAMPLES SEE FIGURE 1	See Note	EQUIPMENT PERFORMANCE REQUIREMENTS
I	Steady-State Condition		
	Voltage tolerance ±10% of nom.		
	Voltage variation ± 5% of nom. max.	1	Equipment shall deliver and maintain specified performance (normal operation) when operating from any probable combination of indicated limits of voltage, frequency and waveform.
	Frequency tolerance ± 5% of nominal		
	Frequency variation ± 1% of nom. max.	1	
	Voltage wave form, Deviation factor 10% maximum	2	
II	Transient-State Condition		
	Voltage Amplitude, maximum ±30% of nominal, from any point within ±10% steady state tolerance band		Momentary impairment of equipment performance during transient permissible, unless specified performance required by individual equipment specification.
	Frequency Amplitude maximum ±10% of nominal, from any point within ±5% steady state tolerance band		False operational or output signals shall not be generated.
	Duration of maximum amplitude 500 milliseconds maximum		Damage to equipment or alteration of equipment characteristics shall not occur
	Recovery time 5 seconds maximum	3	Automatic resumption of normal operation upon cessation of transient

TABLE II (Con't)

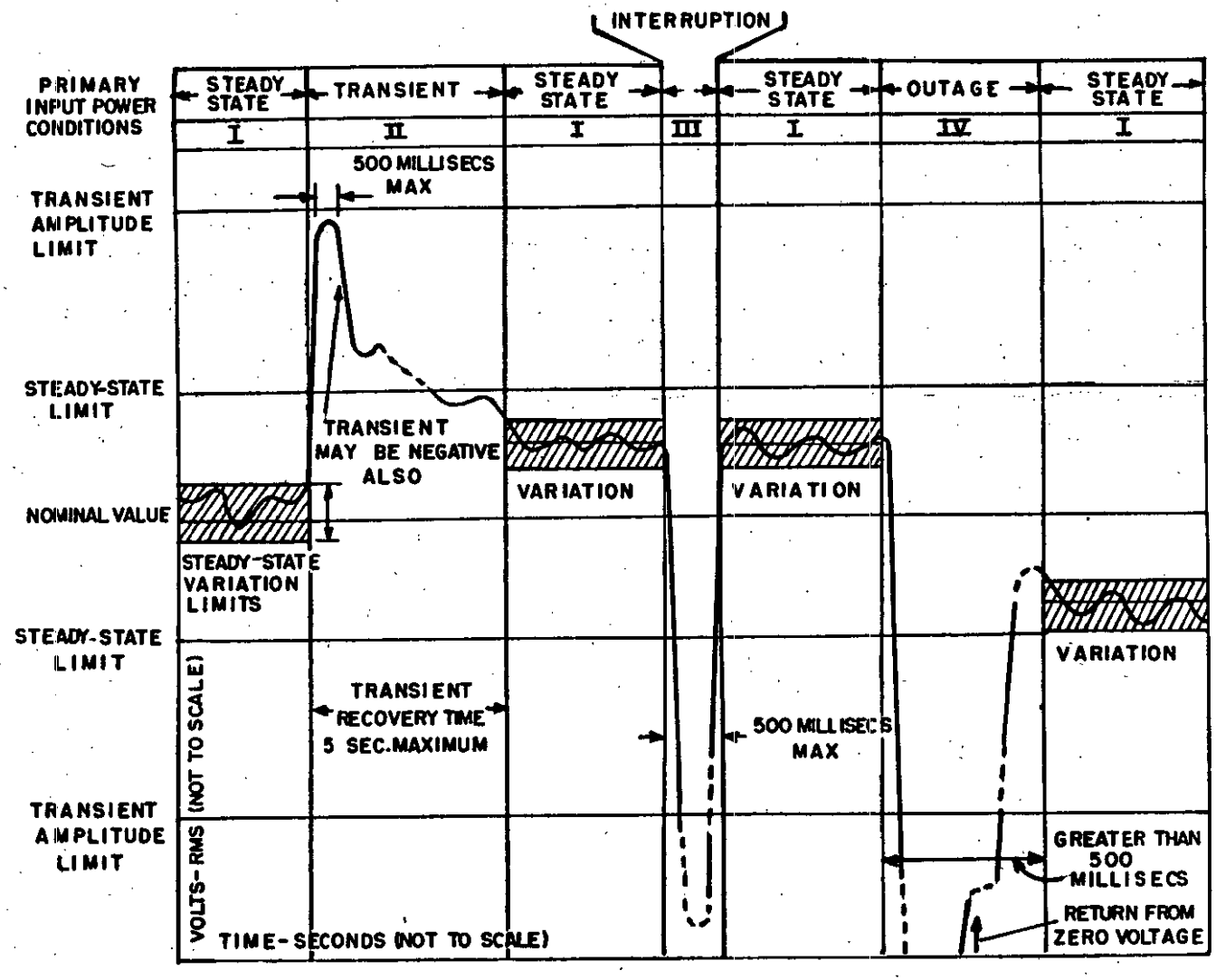
EQUIPMENT PERFORMANCE REQUIREMENTS VERSUS

CONDITION OF A.C. PRIMARY INPUT POWER

	PART A			PART B
Cond	CONDITIONS OF ALTERNATING CURRENT (AC) PRIMARY INPUT POWER FOR EXAMPLES SEE FIGURE 1		See Note	EQUIPMENT PERFORMANCE REQUIREMENTS
III	Power Interruption			
	Voltage/Frequency	Amplitude excursion greater than maximum transient amplitude	4	Specified performance not normally required during power interruption. False operational or output signals shall not be generated
	Interruption Time	500 milliseconds maximum		Damage to equipment or alteration of equipment characteristics shall not occur. Automatic resumption of normal operation at end of interruption period if required by individual equipment specification, otherwise fail safe.
IV	Power Outage			
	Voltage/Frequency	a. Power interruption of longer than 500 milliseconds duration. b. Loss of one or more phases of a 3-phase power input		Fail-safe. False operational or output signals shall not be generated. Damage to equipment or alteration of equipment characteristics shall not occur. Automatic resumption of normal operation in shortest time period possible after return of steady-state power (or restoration of phase power), if required by individual equipment specification.

NOTES:

1. Variations at any constant load. Variations confined to within steady-state tolerance limits.
2. Oper-circuit voltage, line-to-line and line-to-neutral.
3. For transient-state condition persisting longer than 5 seconds, the equipment response shall be as detailed under Condition IV (power outage).
4. Includes voltage excursion to zero.



EXAMPLES OF A.C. PRIMARY INPUT VOLTAGE CONDITIONS

REFER TO TABLE II

FIGURE 1.

3.2.30.3.2.3 Fail-safe, shut-down and start-up.- If required to permit compliance with the requirements of Part B of Table II, the devices for accomplishing fail-safe, shut-down and start-up control operations shall be considered a part of the equipment group and shall be provided therewith, subject to the prior approval of the procuring activity.

3.2.30.3.2.4 Electrical load balance.- When equipment requiring three-phase power is comprised of several single-phase subassemblies, the single-phase loads shall be balanced among the three phases as closely as possible, so that the total load on any one phase does not deviate from the average of the three phases by more than ten percent.

3.2.30.3.2.5 Power factor.- The equipment shall be designed so that it presents a power factor not less than 80 percent lagging when operating under steady-state conditions (Condition I, Part A of Table II).

3.2.31 Shock and vibration isolators.- Shock and vibration isolators shall not be used unless it is impracticable to design and construct the equipment to meet the shock and vibration requirements specified in the detailed equipment specification. If shock or vibration isolators are used, the amplitude of vibration on any isolated part, subassembly, or component shall not be more than three times the amplitude of the applied vibration at test frequencies from 10 to 20 cycles per second; and not more than six times the amplitude of the applied vibration at test frequencies from 20 to 55 cycles per second. There shall be no collision or electrical arc-over of any isolated part, subassembly, or component during the vibration test.

3.2.31.1 Design of isolators.- The isolators may be made from resilient material or metal. The isolators may employ damping. Isolators shall be designed so that failure of resilient material shall not set the supported part, subassembly, or component free.

3.2.31.2 Resilient material.- Resilient material used in isolators shall be ozone-resistant and capable of giving the required performance when exposed to any temperature within the range specified in the service conditions.

3.2.31.3 Installation of isolators.- Isolators shall be readily replaceable without major disassembly of the equipment. Electrical connections between a resiliently supported component and its foundation shall be as flexible as practicable. Sufficient clearance shall be provided between parts to preclude the possibility of a cushioned part striking any other part.

3.2.32 Sockets, shields, and clamps.- The criteria for sockets, clamps, and shields shall be in accordance with MIL-STD-454, Requirement 60.

3.2.33 Special tools.- The use of special tools in electronic equipment shall be in accordance with MIL-STD-454, Requirement 63.

3.2.34 Terminals (terminals, boards, and strips).- The selection and use of terminals, terminal boards and binding posts shall be in accordance with MIL-STD-454, Requirement 19.

3.2.35 Test provisions.- Test points, test facilities, and test equipment (internal and external) shall be in accordance with MIL-STD-454, Requirement 32.

3.2.36 Thermal design.- The criteria for thermal design shall be in accordance with MIL-STD-454, Requirement 52.

3.2.37 Weight limitation.- Equipment weighing more than 150 pounds shall be provided with pad eyes or equivalent, to facilitate the hoisting and lowering of the equipment. These pad eyes or equivalent shall be marked "Lift Here". When pad eyes or equivalent are not practical, approval shall be obtained from the procuring activity (See 6.2.h) to design the equipment for fork lifting. Equipment design shall include consideration for disassembly of equipment into units not exceeding 300 pounds in weight to facilitate material handling during emplacement for operation or preparation for transport. Clearly marked handgrips at lifting points shall be provided for each unit, and arranged, so that no crew member need lift more than 40 pounds.

3.2.38 Wiring and cabling

3.2.38.1 Cable, coaxial (RF).- The engineering criteria for selection of coaxial radio frequency (RF) transmission cable shall be in accordance with MIL-STD-454, Requirement 65.

3.2.38.2 Cable, multiconductor.- The engineering criteria for selection and application of electrical multiconductor cable shall be in accordance with MIL-STD-454, Requirement 66.

3.2.38.3 Cordage and cables.- After the terminals are attached to desired lengths of bulk cable or cordage when fabricating a cable or wire assembly, the connections shall be adequately touched up with a fungicidal varnish conforming to MIL-V-173.

3.2.38.4 Internal wiring practices.- Engineering design criteria for internal wiring practices shall be in accordance with MIL-STD-454, Requirement 69.

3.2.38.5 Wire, hookup, internal.- The engineering criteria for selection and application of electrical wire shall be in accordance with MIL-STD-454, Requirement 20.

3.3 Parts.- Electronic, electro-mechanical and other part requirements shall be as specified herein. (See 6.3.3 and 6.3.4 for definitions).

3.3.1 Selection.- The selection of parts shall be in accordance with the following order:

a. Parts specified in the detailed equipment specifications.

b. Parts specified herein.

c. Part specifications selected in the order specified in MIL-STD-143. (Parts selected in accordance with MIL-STD-143 and neither specified in the equipment specification, nor herein, shall be considered non-standard).

3.3.1.1 Approval of non-standard parts.- Approval of non-standard parts shall be in accordance with the procedure specified in MIL-STD-454, Requirement 22. When Parts Control Boards or Parts Advisory Groups are established for Air Force Programs, as required by the contract or work statement, the nonstandard parts procedure in accordance with MIL-STD-891 shall apply, if not otherwise specified (See 6.2.1).

3.3.1.2 Standard parts.- Standard parts shall conform to the requirements specified in their respective individual part specifications. Parts not covered under 3.2 herein shall be selected in accordance with the following:

Part	Specification	Notes
Capacitors: Fixed and variable	MIL-STD-454, Req. 2	
Circuit Breakers:	MIL-STD-454, Req. 37	
Conduit:	MIL-C-13909	
Connectors:	MIL-STD-454, Req. 10	See Note 1 and 2
Fuses and fuse holders:	MIL-STD-454, Req. 39	
Filters and networks:	MIL-STD-454, Req. 70	
Lubrication fittings:	MIL-F-3541	See Note 3
Quartz Crystal Units	MIL-STD-454, Req. 38	
Relays:	MIL-STD-454, Req. 57	
Readouts:	MIL-STD-454, Req. 68	
Resistors:	MIL-STD-454, Req. 33	
Rotary servo devices:	MIL-STD-454, Req. 56	
Semi-conductor devices:	MIL-STD-454, Req. 30	
Shunts:	MIL-STD-454, Req. 40	
Switches:	MIL-STD-454, Req. 58	
Tubes Electron:	MIL-STD-454, Req. 29	

Part	Specification	Notes
Transformers, inductors and coils	MIL-STD-454, Req. 14	
Waveguides and fittings	MIL-STD-454, Req. 53	

NOTES:

Note 1 - When circular connectors are used in the equipment they shall conform to MIL-C-38999 or MIL-C-83723. When rectangular rack and panel connectors are used, they shall conform to MIL-C-83733. The procuring activity may impose further limitations on connector types, varieties within specified types, and the application of these connectors.

Note 2 - To insure compatibility mating of connectors for printed circuit applications the design guidance criteria and restrictions called out in MIL-STD-275 shall apply.

Note 3 - For pressure type fittings.

3.3.2 Part and part nomenclature.- The contractor at his option, may use the latest version of the part as identified by its pertinent part nomenclature (for example: UG-260D/U may be used in lieu of UG-260C/U, provided the part has the same electrical and mechanical characteristics as applicable to the part identified by the superseded suffix letter designation and its parts specification. The contractor has the responsibility to assure that equivalency has been maintained between the old and the new item.

3.3.3 Tolerances.- Whenever a specification provides more than one grade, characteristic or tolerance of a part, the contractor shall use parts of the lowest grades, broadest characteristics, and widest tolerances which will enable the equipment to meet the performance and other requirements of the detailed equipment specification. The tolerances of parts in any case shall allow for long term drift to assure adequate performance of the equipment to the end of its intended service life.

3.3.4 Derating.- Derating of parts and materials shall be in accordance with MIL-STD-454, Requirement 18.

3.3.5 Qualification testing.- When qualification testing is a requirement of the part specification, the equipment contractor shall assure himself that the parts used in the equipment have current qualification approval.

3.4 Materials.- Materials used in the construction of each equipment and the method of application shall be as specified in the equipment specification or as specified herein. Material used in parts specified herein shall be in accordance with the applicable referenced specification. Materials which are not specified herein shall be approved by the procuring activity (see 6.2.j). Such material shall be of the best quality, of the lightest practicable weight consistent with strength, readily available in this country, and entirely suitable for the purpose intended.

3.4.1 Arc-resistant material.- Material used for insulation of electrical power circuits, where arcing is possible (connector inserts, relays, circuit breakers, et cetera) shall be in accordance with MIL-STD-454, Requirement 26.

3.4.2 Fibrous material, organic.- The selection and use of organic fibrous material shall be in accordance with MIL-STD-454, Requirement 44.

3.4.3 Fungus inert materials.- The selection of materials for the control of moisture and fungus resistance shall be in accordance with MIL-STD-454, Requirement 4.

3.4.4 Flammable materials.- Flammable materials shall not be used except as otherwise permitted by MIL-STD-454, Requirement 3.

3.4.5 Insulating materials, electrical.- Electrical insulating materials shall be selected and used in accordance with MIL-STD-454, Requirement 11.

3.4.6 Lubrication.- The criteria for the choice of lubricants shall be as established by MIL-STD-454, Requirement 43.

3.4.7 Magnesium.- All magnesium alloys shall be subject to approval by the procuring activity (see 6.2.k).

3.4.8 Rubber.- Rubber materials shall conform to the following specifications:

Material	Specification	Notes
Rubber, Fabricated Parts	MIL-R-3065	See Note 1
Cellular Rubber Products, General Purpose	MIL-C-3133	See Note 1
Rubber, Silicone High and Low Temperature Resistant	ZZ-R-765	See Note 2
Synthetic Rubber, Sheet, Molded and Extruded	MIL-R-6855	See Note 2

NOTES:

Note 1 - For absorption of noise, shock, or vibration or for applications where resilience is required.

Note 2 - For use where resistance to oil and fuel is required.

3.4.9 Springs.- The selection and application of materials for springs shall be in accordance with MIL-STD-454, Requirement 41.

3.5 Processes.- Processes used in the construction of each equipment shall be as specified in the equipment specification (see 6.2.1) or as specified herein. Processes for parts specified herein shall be in accordance with the applicable part specification.

3.5.1 Deviations from a specified process.- If a contractor desires to deviate from a specified process, he shall obtain the approval of the procuring activity (see 6.2.m).

3.5.2 Brazing.- Brazing shall be in accordance with MIL-STD-454, Requirement 59.

3.5.3 Finishing.- Surfaces shall be given a protective finish in accordance with MIL-F-14072 with the following exceptions:

a. Finishes shall not be of the wrinkle type.

b. Concerning magnesium alloys, when the use of magnetium alloys are approved, every consideration shall be given to the use of anodic treatments as specified in MIL-M-45202 instead of the processes required by MIL-F-14072. Wherever practicable, surfaces so treated shall also be

given a two-coat primer and two-coat baking enamel paint treatment. If magnesium and aluminum alloy surfaces are given surface treatments in accordance with MIL-F-14072, they shall be painted in accordance with that specification, wherever practicable.

c. On aluminum or aluminum alloy parts, where electrical bonding or grounding is required, and anodizing is not desirable, caustic dip treatment shall not be used. Instead, a chemical treatment, in accordance with MIL-C-5541, shall be used with the area to be bonded or grounded, masked off during the chemical treatment. No masking is required if resistance of less than 0.0001 ohm can be attained through the coating.

d. Strata-blue enamel, when required by the equipment specification (See 6.2.p) shall be color No. 15045 in accordance with TT-E-489.

3.5.4 Soldering.- Soldering shall be in accordance with MIL-STD-454, Requirement 5.

3.5.5 Welding

3.5.5.1 Structural welding.- Structural welding shall be in accordance with MIL-STD-454, Requirement 13.

3.5.5.2 Welds, resistance, electrical interconnections.- Welds, resistance, electrical interconnections shall be in accordance with MIL-STD-454, Requirement 24.

3.6 Nomenclature, identification marking, and labels.

3.6.1 Nomenclature (item name and type designation).- The criteria for standardized nomenclature (item name and type designation) shall be in accordance with MIL-STD-454, Requirement 34.

3.6.2 Identification marking.- The methods and procedures for identification marking shall be in accordance with MIL-STD-454, Requirement 67.

3.6.3 Labels

3.6.3.1 General.- Labels showing wiring and schematic diagrams, operating frequency, lubricating and operating instructions, safety notices, list of tools, list of contents, and similar information shall conform to the following.

3.6.3.1.1 Lettering.- Lettering shall be in gothic (upper case), with a minimum height of 3/64-inch.

3.6.3.1.2 Border.- Lettering or figures shall not be closer than 1/4 inch to the edge of the label.

3.6.3.1.3 Material and process.- Material and process for labels shall conform to the following (as applicable):

a. Aluminum, brass, or copper with markings applied by etching, machine engraving, die stamping, lithographing, printing, or silk screening.

b. Adhesive backed metal foil identification plates, shall be in accordance with MIL-P-19834.

c. Printed on white book paper laminated between two sheets of clear, transparent, polyvinylchloride plastic sheets. The two sheets shall be bonded together to seal against moisture and shall withstand the climatic conditions specified in the equipment specification.

d. Photo printed in light-dark color contrast on opaque polyethylene-tercophthalate plastic sheet and covered with a clear transparent sheet of the same material. Both sheets shall be adhesive-backed with adhesion characteristics resulting in a permanent moisture proof bond between mounting surface, label, and cover sheet and shall withstand the climatic conditions specified in the equipment specifications.

3.6.3.1.4 Legibility.- Labels shall be legible and shall be designed to retain legibility for the service life of the equipment.

3.6.3.1.5 Mounting.- Labels shall be securely and permanently mounted in a manner which shall not stain the labels under specified service conditions. They shall be mounted so that they are not obstructed from view by units or parts.

3.7 Workmanship.- Workmanship shall be in accordance with MIL-STD-454, Requirement 9.

4. QUALITY ASSURANCE PROVISIONS

4.1 Requirements for sampling, inspection, and test procedures shall be as specified in the detailed equipment specification or work statement (see 6.2.n).

5. PREPARATION FOR DELIVERY

5.1 Requirements for packaging, packing, and marking for shipment shall be as specified in the detailed equipment specifications or work statement (see 6.2.o).

6. NOTES

6.1 Intended use.- This specification is intended to cover the general requirements applicable to the majority of ground electronic equipment. Any additional general requirement or exceptions to these requirements for a particular electronic equipment shall be as specified in the specification for that equipment or in the documents covering its procurement.

6.2 Additional data required.- Attention of design engineers is invited to the items listed below which should be covered in the detailed equipment specifications or other appropriate procurement documents:

a. If design requirements are other than as specified herein, or approval is required for deviations from a specified design (see 3.2).

b. ECM invulnerability tests (see 3.2.12.3).

c. The areas (cold weather and desert and tropical), in addition to the temperate area, in which the equipment will be required to operate (see 3.2.30, 3.2.30.1.1).

d. Other climatic service conditions (see 3.2.30.1.5).

e. Inclination of mobile equipment (see 3.2.30.2).

f. The vibration, bounce, shock and bench handling requirements (see 3.2.30.2).

g. Requirements on primary input power and equipment response (see 3.2.30.3 and subparagraphs, also Table II):

(1) Nominal voltage and frequency, also number of phases and wires, required by equipment design. (see 3.2.30.3.1).

(2) Whether specified equipment performance during transient condition of primary input power is a requirement. (see Table II, Part B, Condition II).

(3) Whether automatic resumption of normal operation of the equipment at the end of a power interruption period or a power outage is a requirement. (see Table II, Part B, Conditions III and IV).

h. Approval of design for fork lifting (see 3.2.37).

i. Approval of non-standard parts (see 3.3.1.1).

j. Approval for materials not specified herein (see 3.4).

k. Approval for magnesium alloys (see 3.4.7).

l. Processes not specified herein (see 3.5).

m. Approval for deviations from a specified process (see 3.5.1).

n. Requirements for sampling, inspection and test procedures (See 4.1).

o. Requirements for packaging, packing and marking for shipment (See 5.1).

p. If strata-blue enamel is required (See 3.5.3.d).

q. Whether a system safety program will be required (see 3.2.29.1).

6.2.1 Contract data requirements.- Data conforming to Data Item Description will be required for delivery in connection with this specification. When so required, such data will be specified for delivery on a DD Form 1423 included in the contract.

6.3 Definitions

6.3.1 Climatic areas

a. Temperate area.- Temperate area is that portion of the earth's surface where the ground temperature extremes, specified in Table I for "cold weather area and desert and tropical areas", are not likely to be encountered. The nonoperating and storage low temperature limit of minus 62°C (minus 80°F) specified in Table I provides for high altitude transportation of ground electronic equipment.

b. Cold weather area.- Cold weather area is that portion of the earth's surface where minimum daily temperature of minus 23°C (minus 10°F) or less have been encountered for 30 or more days a year, or where the average temperature for the month of January is minus 7°C (plus 20°F) or less.

c. Desert area.- Any hot, dry area, where a combination of high temperature, low moisture and humidity, and blowing dust or sand presents problems that must be overcome by special equipment or special means of protecting equipment.

d. Tropical area.- Any hot, wet area, where a combination of high temperature and high moisture and humidity present problems that must be overcome by special equipment or special means of protecting equipment.

6.3.2 Electrical terms

a. Steady-state tolerances.- The limits of voltage and frequency within which primary input power is delivered to the equipment, the difference between such limits and the nominal value being expressed as a plus and minus percent of nominal value.

b. Steady-state variation.- The effect of periodic and random deviations of instantaneous voltage and frequency on the mean steady-state value, at any constant load, the limit of such effect being expressed as a plus and minus percent of nominal value.

c. Voltage waveform deviation factor.- Deviation factor of a wave is defined in ANSI Standard C42.10 as the ratio of the maximum difference between corresponding ordinates of the wave and of the equivalent sine wave to the maximum ordinate of the equivalent sine wave when the waves are superposed in such a way as to make this maximum difference as small as possible.

d. Maximum transient amplitude.- The maximum excursion of voltage or frequency transient from any initial point within the steady-state tolerance limits, expressed as a plus and minus percent of nominal voltage or frequency.

e. Transient recovery time.- The total elapsed time of the transient disturbance measured from the instant the voltage or frequency (or both) departs from the defined steady-state variation limits to the instant the voltage or frequency (or both) recovers to steady-state condition and stabilizes within the defined steady-state variation band. (See Figure 1).

6.3.3 Standard parts.- Standard parts are those parts specified herein or in the equipment specification which meet all requirements of applicable Federal, Military or industry standardization documents approved by the Government.

6.3.4 Non-standard parts.- All parts not meeting the definition for standard parts are defined as non-standard parts.

Custodian:
Air Force - 17

Preparing activity:
Air Force - 17

Reviewer:
Air Force - 11, 13, 15, 18, 19, 70, 71, 80

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