METRIC

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MILITARY STANDARD

ELECTROSTATIC DISCHARGE CONTROL PROGRAM FOR PROTECTION OF ELECTRICAL AND ELECTRONIC PARTS, ASSEMBLIES AND EQUIPMENT (EXCLUDING ELECTRICALLY INITIATED EXPLOSIVE DEVICES)

METRIC

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DEPARTMENT OF DEFENSE
Washington, D.C. 20362

ELECTROSTATIC DISCHARGE CONTROL PROGRAM FOR PROTECTION OF ELECTRICAL AND ELECTRONIC PARTS, ASSEMBLIES, AND EQUIPMENT (Excluding Electrically-Initiated Explosive Devices)

1. This Military Standard is approved for use by all Departments and agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, ATTN: Code 3112, Washington, D.C. 20362, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter.

FOREWORD

This standard covers the establishment and implementation of an Electrostatic Discharge (ESD) Control Program for any activity that designs, tests, inspects, services, manufactures, processes, assembles, installs, packages, labels, or otherwise handles electrical or electronic parts susceptible to damage caused by static electricity. This standard does not apply to electrically initiated explosive devices. DOD-HDBK-263 provides information for implementing the requirements of this standard.

ESD is generated by the relative motion or separation of materials or flow of liquids, vapors or gases. Common sources of ESD include personnel, items made of plain plastics, and processing equipment. ESD can damage parts by direct contact with a charged source or from charges induced by an electrostatic field. ESD sensitive (ESDS) parts include: microcircuits, discrete semiconductors, thick and thin film resistors, chips, hybrid devices and piezoelectric crystals depending upon the magnitude and shape of the ESD pulse.

This document limits the control program to only the more sensitive ESDS parts which are susceptible to damage from personnel discharges of up to 4,000 volts. Voltages greater than 4,000 volts can be generated resulting in damage to parts which are less sensitive to ESD. The contractor should consider added precautions where parts of lower ESD sensitivity (see DOD-HDBK-263 for parts susceptible to damage from personnel charged up to 15,000 volts) can be exposed to voltage levels in excess of 4,000 volts, or where experience or other requirements indicate undesirable risk of damage to these parts.

TABLE OF CONTENTS

TABLES

FIGURES

TABLE OF CONTENTS (Continued)

1. SCOPE

1.1 Scope. This standard covers the requirements for an Electrostatic Discharge (ESD) control program for electrical and electronic parts, assemblies, and equipment containing these parts, excluding electrically-initiated explosive devices. Parts as used herein applies to electrical and electronic parts. Assemblies as used herein applies to subassemblies and all higher assemblies up to but not including the equipment level. Parts, assemblies and equipment are collectively referred to herein as items. This standard covers ESD sensitive (ESDS) items, design criteria, protected work areas, handling procedures, training, marking of documentation and hardware, intra-plant protective covering, packaging for delivery, installations, quality assurance provisions, audits and reviews. For the purposes of this standard, only items sensitive to 4,000 volts or less are considered. DOD-HDBK-263, however, identifies parts sensitive to ESD voltage levels between 4,000 and 15,000 volts.

1.2 Purpose. The purpose of this standard is to minimize the impact of ESD on equipment reliability and life cycle cost. This standard may be tailored for various types of acquisitions and allows implementation options to users to effect a cost effective ESD control program.

1.3 Application. This standard may be applied to contractors, subcontractors, and suppliers, collectively referred to herein as contractors, who are engaged in any of the functions listed in table I where the function is applicable to any of the parts identified in appendix A in either electrical or electronic applications.

1.4 Classification. ESDS items are classified as follows:

Class 1: Items susceptible to damage from ESD voltage levels of 1,000 volts or less as determined in accordance with 5.1.1.

Class 2: Items susceptible to damage from ESD voltage levels greater than 1,000 volts but less than or equal to 4,000 volts as determined in accordance with 5.1.1.

2. REFERENCED DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on the date of invitation for bid or request for proposal form a part of this standard to the extent specified herein:

SPECIFICATIONS

MILITARY

MIL-M-38510	Microcircuits, General Specification for
MIL-B-81705	Barrier Materials, Flexible, Electrostatic Free, Heat Sealable

TABLE I. ESD control program

Functions Applicable to an Acquisition	Control Program Elements										
	See 5.1	See 5.2	See 5.3	See 5.4	See 5.5	See 5.6	See 5.7	See 5.8.1	See 5.8.2	See 5.9, 5.10	See 5.11
	Identification & Classification	Design Protection	Protected Areas	Handling Procedures	Protective Covering	Installation Site	Training	Marking Documentation	Marking Hardware	QA Provisions, Audits & Reviews	Packaging for Delivery
Design	X	X					X	X		X	
Manufacturing			X	X	X		X		X	X	
Inspection (Examination and Test)			X	X	X		X	X[1/]	X	X	
Packaging			X	X	X[2/]		X			X	X[3/]
Rework/Repair			X	X	X		X		X[1/]	X	
Failure Analysis			X	X	X		X			X	
Training Courses							X			X	
Field Installation						X[4/]					
Field Maintenance/ Test			X	X	X		X			X	

1/ If not previously performed.

2/ Internal to contractor's facility.

3/ External to contractor's facility.

4/ For a shipbuilding contract, unless otherwise specified in such contract, the installation site element is the only element of this table that applies to ships and shipyards.

STANDARDS

MILITARY

MIL-STD-129 Marking for Shipment and Storage

HANDBOOKS

MILITARY

DOD-HDBK-263 Electrostatic Discharge Control Handbook for Protection of Electrical and Electronic Parts, Assemblies, and Equipment (Excluding Electrically-Initiated Explosive Devices)

(Copies of specifications, standards, handbooks, drawings, and publications required by contractors in connection with specific acquisitions should be obtained from the acquiring activity or as directed by the contracting officer).

3. DEFINITIONS. The definitions of terms not defined herein shall comply with DOD-HDBK-263 and MIL-M-38510).

4. GENERAL REQUIREMENTS

4.1 General. The contractor shall establish and implement an ESD control program in accordance with table I as required. The applicable functions of table I shall also be applied to subcontractors and suppliers as required to provide a continium of protection for ESDS items. Detailed guidelines for establishing, implementing, and maintaining elements of an ESD control program are provided in DOD-HDBK-263.

5. DETAILED REQUIREMENTS. The contractor shall identify the functions applicable to the acquisitions and implement the ESD control program elements applicable to each function. For example, for an acquisition which requires the design, manufacture, and delivery of equipment, all the functions in table I are applicable and the associated ESD control program elements shall be implemented. Lesser acquisitions, such as for only spare parts, requires implementation of the elements applicable to manufacturing, inspection (examination/test), packaging, transportation, shipping, rework/repair, and failure analysis functions. The extent of the implementation of these requirements shall be based, as a minimum, upon the voltage sensitivity level of the most sensitive part applicable to the function or the lower voltage level of the part class of appendix A.

5.1 Identification and classification of ESDS items. The contractor shall determine whether each item applicable to the contract is Class 1 or Class 2.

5.1.1 Parts. Appendix A identifies Class 1 and Class 2 ESDS part types. When there are reasons to believe a part is less sensitive than indicated by appendix A, the part may be reclassified based upon:

a. ESD voltage level when specified in the applicable military part specification such as the MIL-M-38510 V-ZAP test levels, or

b. ESD voltage levels from test data obtained in accordance with appendix B or a test method similar to that of appendix B and approved by the acquiring activity. Copies of the test data and test procedures shall be available for review by the acquiring activity.

5.1.2 Assemblies and equipment. Assemblies and equipment containing Class 1 and Class 2 parts shall be categorized as Class 1 or Class 2 based upon the most sensitive class of parts used therein. The contractor may reclassify a Class 1 or Class 2 assembly or equipment by circuit analysis as a minimum. The circuit analysis shall be sufficiently detailed to verify that protective circuitry will protect all Class 1 and Class 2 parts from the higher ESD voltage level applicable to the proposed class designation. For example, to reclassify an assembly from Class 1 to Class 2, a determination shall be made analytically, as a minimum, that the assembly can withstand an ESD of greater than 1,000 volts from the test circuit of appendix B to any terminal without failure or degradation of electrical characteristics. Additionally, to reclassify an equipment above Class 2 a similar determination shall be made that the equipment external electrical terminals (see 5.2.2) can withstand greater than 4,000 volts at any terminal. The circuit analysis shall be documented and made available to the acquiring activity or its designated representative for review upon request.

5.2 Design protection

5.2.1 Protection of parts and assemblies. Class 1 parts shall not be used where Class 2 or less sensitive parts are available that will meet performance requirements. Where Class 1 parts must be used, protective circuitry shall be incorporated at the lowest practical level of assembly to limit the sensitivity of that assembly to Class 2 as a minimum. Where protective circuitry cannot be used to provide this protection the reasons shall be justified and subject to the approval of the acquiring activity.

5.2.2 Protection of equipment cabinet terminals. External equipment cabinet electrical terminals including test points located on the external surface of the equipment enclosure shall contain protective circuitry to limit equipment ESD sensitivty to 4,000 volts as a minimum. Where protective circuitry cannot be used to provide this protection the reasons shall be justified and subject to the approval of the acquiring activity.

5.3 Protected areas. Electrostatic voltages in areas where Class 1 and Class 2 items are handled without ESD protective covering shall be limited to the lowest voltage sensitivity level of these items as a minimum. For example, electrostatic voltages on operators and work areas shall be kept below 4,000 volts when an equipment cabinet with electrical terminals sensitive to 4,000 volts is being handled without ESD protective covering. Where access to Class 1 or Class 2 parts and assemblies within the equipment

cabinet is required, operator and work area electrostatic voltages shall be maintained below the sensitivity of those parts and assemblies to be handled. Protected areas shall extend, as a minimum, 1 meter from the periphery of a Class 1 or Class 2 item work area. Handling of Class 1 or Class 2 items without ESD protective covering (see 5.5) shall be performed in protected areas in accordance with detailed ESD protective handling procedures (see 5.4).

5.4 Handling procedures. Detailed procedures for handling Class 1 and Class 2 items shall be developed, documented, and implemented for all protected areas. The details of the procedures shall be related to the sensitivity of the Class 1 or Class 2 item being handled and the degree of controls afforded by the protected area. The more sensitive the item, and the fewer controls afforded by the protected area, the more detailed the procedures shall be to provide the required protection from damage due to ESD.

5.5 Protective covering. When not being worked on or when being transported outside protected areas within a contractor's facility, Class 1 and Class 2 items shall be enclosed in ESD protective packaging or contain shunting devices that short all pins to case for protection from triboelectric charging, direct contact with charged objects, and electrostatic fields. Protective covering for delivery of Class 1 and Class 3 items under the contract shall be in accordance with 5.11.

5.6 Installation site. For equipment level installation and storage functions only, the following minimum installation procedures shall be applied:

a. Where storage is required of ESD sensitive equipment prior to installation, the protective covering provided shall be maintained intact;

b. During equipment installation and until completion of required interconnecting cable and connector assemblies, protective covering on equipment receptacles shall not be removed;

c. Just prior to engaging a cable connector with a mating receptacle and prior to removing protective covering, connector and receptacle surfaces shall be momentarily contacted to discharge any electrostatic potentials on the cable or installer's body.

5.7 Training. Training in ESD awareness and proper handling shall be provided as needed to applicable personnel who specify, acquire, design, manufacture, assemble, process, inspect, test, package, repair, rework, install or maintain Class 1 or Class 2 items. Records of personnel training shall be made available to the acquiring activity or its designated representative upon request.

5.8 Marking

5.8.1 Documentation

5.8.1.1 Deliverables. Drawings and specifications and provisioning documentation shall identify Class 1 and Class 2 items collectively as ESDS.

Installation and interface drawings, technical manuals, and training course material shall identify items and external terminals which are ESDS as Class 1 or Class 2 ESDS as applicable. Additionally the above documentation shall include or refer to documented protective handling procedures.

5.8.1.2 Non-deliverables. Non-deliverable documentation used by the contractor for the handling of Class 1 and Class 2 items shall identify the items as Class 1 or Class 2 and shall include or refer to documented protective handling procedures as necessary.

5.8.2 Hardware

5.8.2.1 Assemblies. Unless otherwise specified or approved by the acquiring activity, Class 1 and Class 2 assemblies shall be marked with the MIL-STD-129 sensitive electronic device symbol. This symbol shall be located in a position readily visible to personnel when that assembly is incorporated in its next higher assembly level.

5.8.2.2 Equipment enclosures. Unless otherwise specified or approved by the acquiring activity, the MIL-STD-129 sensitive electronic device symbol and an ESD caution as shown below shall be readily visible to personnel prior to gaining access to Class 1 and Class 2 parts or assemblies.

CAUTION NOTE
THIS EQUIPMENT CONTAINS PARTS AND
ASSEMBLIES SENSITIVE TO DAMAGE BY
ELECTROSTATIC DISCHARGE (ESD). USE
ESD PRECAUTIONARY PROCEDURES WHEN
TOUCHING, REMOVING OR INSERTING.

5.9 Quality assurance provisions. A quality assurance program shall be established to assure conformance to the requirements specified herein. Prior to use, each protected area shall be certified to verify conformance to the requirements of 5.3 and shall be periodically monitored to assure its integrity. This program shall include monitoring and auditing of ESD requirements invoked on subcontractors and suppliers.

5.10 Audits and reviews. The acquiring activity reserves the right to perform audits and review documentation specified herein as required to determine conformance to the requirements specified in this standard. Also, the contractor's ESD control program shall include scheduled design and program reviews. The acquiring activity or designated representatives shall be accorded the option to attend such reviews. The minutes of these reviews shall be made available to the acquiring activity upon request.

5.10.1 Design reviews. Design decisions relating to the ESD control program shall be presented at design reviews and shall include the following:

a. Identification of Class 1 and Class 2 items (see 5.1);

b. Results of classification circuit analysis for assemblies and equipment when applicable (see 5.1.2);

c. Protective circuitry for parts and assemblies (see 5.2.1) and equipment external interfaces (see 5.2.2);

d. Marking of documentation including incorporation of protective handling procedures (see 5.8.1);

e. Marking of hardware (see 5.8.2);

f. Problem areas relevant to meeting the requirements of this standard and proposed corrective actions including tradeoffs.

5.10.2 Program reviews. Progress shall be assessed by the review of information such as:

a. General design, construction and maintenance requirements for protected areas (see 5.3);

b. Precautionary procedures used to control the handling of Class 1 and Class 2 items (see 5.4);

c. Methods and procedures for assuring adequacy of design of protective areas (see 5.9);

d. Quality assurance methods and procedures for monitoring the continued effectiveness of protective areas (see 5.9);

e. Quality assurance methods and procedures for performing audits of the ESD control program (see 5.9);

f. Contractor training program (see 5.7);

g. Protective covering, packaging and package marking for Class 1 and Class 2 items (see 5.5 and 5.11);

h. Problem areas in meeting the requirements of this standard and proposed corrective actions and tradeoffs.

5.11 Packaging for delivery. Unless ESD protective packaging requirements are otherwise specified, unit packs of Class 1 and Class 2 items shall conform to the following:

a. Protection shall be provided to prevent physical damage and to maintain leads and terminals in the manufactured condition under handling and transportation environments. Materials used for this protection shall be non-corrosive and provide protection against triboelectric generation of static electricity. Conductive shunting foam, bars or clips shall be applied on electrical connectors to short all connector pins and the connector shell together;

b. Unit packs shall then be enclosed in an ESD protective material, such as that conforming to MIL-B-81705 Type I, to provide protection from electrostatic voltage sources of at least 4,000 volts in the form of fields or direct discharge, if the packaging of 5.11a does not provide this protection;

c. Outer surface of the package shall be marked with the following caution statement or as otherwise approved by the acquiring activity.

CAUTION NOTE
OBSERVE PRECAUTIONS FOR
HANDLING ELECTROSTATIC
DISCHARGE SENSITIVE ITEMS

6. TAILORING. The acquiring activity may modify the requirements of table I by specifically identifying the functions considered applicable to the acquisition and delete or add an ESD control program element by reference in the contract.

6.1 High reliability or critical programs. For high reliability or critical programs the acquiring activity, as part of the ESD control program, should consider including items which are less sensitive than Class 1 or Class 2 (see DOD-HDBK-263 for part types sensitive from 4,000 to 15,000 volts).

6.2 Reacquisition. For reacquisition of equipment not previously subjected to an ESD control program the acquiring activity should consider imposing the requirements of 5.1 in addition to the other applicable elements of table I. For critical equipment, high reliability equipment and equipment exhibiting ESD problems in use the acquiring activity should consider a complete ESD control program including the requirements of 5.2.1. Additionally, considerations may be given to extending the program to less sensitive parts as provided by 6.1.

6.3 Applicability to government activities. The acquiring activity should impose the requirements of this standard on government activities which perform any of the functions of table I. In this area, the term contractor as used in this standard applies to the government activity.

Custodians:
Army - ER
Navy - SH
Air Force - 17
Review Activities:
Army - AT, CR, MI
Navy - AS, EC, OS
Air Force - 11, 15, 18, 19, 99
User Activities:
Army - AR, SM
Navy - MC, SA

Preparing Activity:
Navy - SH
(Project RELI-0014)

APPENDIX A
ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) ITEMS

10. GENERAL REQUIREMENTS

10.1 General. This appendix identifies the Class 1 and Class 2 parts applicable to the ESD control program of this standard.

20. REFERENCED DOCUMENTS

20.1 Issues of documents. The following documents of the issue in effect on the date of invitation for bid or request for proposal form a part of this appendix to the extent specified herein.

SPECIFICATIONS

Military

MIL-S-19500	Semiconductor Devices, General Specification for

STANDARDS

Military

MIL-STD-701	Lists of Standard Semiconductor Devices

(Copies of specifications, standards, handbooks, drawings, and publications required by contractors in connection with specific acquisitions should be obtained from the acquiring activity or as directed by the contracting officer).

30. DEFINITIONS.

The definition of terms not defined herein shall comply with DOD-HDBK-263, MIL-S-19500 and MIL-M-38510.

40. GENERAL REQUIREMENTS

40.1 Application. The ESDS parts applicable to this standard are listed in table II. These parts are categorized by part types traceable to MIL-M-38510, Supplement 1 for microelectronic devices, and MIL-S-19500, Supplement 1 for discrete semiconductor devices by comparison with the part types identified in the tables of MIL-STD-701. Non-JAN ESDS parts shall be identified by similarity to JAN ESDS part types. ESDS resistors are traceable by their style designation such as RN, RNR, or RZ.

50. DETAIL REQUIREMENTS

50.1 Class 1 and Class 2 parts. Table II identifies Class 1 and Class 2 part types (see 1.4). Classifications presented are based upon

TABLE II. List of ESDS parts by part type

CLASS 1: SENSITIVITY RANGE 0 TO ≤1000 VOLTS
• Metal Oxide Semiconductor (MOS) devices including C, D, N, P, V and other MOS technology without protective circuitry, or protective circuitry having Class 1 sensitivity
• Surface Acoustic Wave (SAW) devices
• Operational Amplifiers (OP AMP) with unprotected MOS capacitors
• Junction Field Effect Transistors (JFETs) (Ref.: Similarity to: MIL-STD-701: Junction field effect, transistors and junction field effect transistors, dual unitized)
• Silicon Controlled Rectifiers (SCRs) with Io< 0.175 amperes at 100° Celsius (°C) ambient temperature (Ref.: Similiarity to: MIL-STD-701: Thyristors (silicon controlled rectifiers))
• Precision Voltage Regulator Microcircuits: Line or Load Voltage Regulation < 0.5 percent
• Microwave and Ultra-High Frequency Semiconductors and Microcircuits: Frequency >1 gigahertz
• Thin Film Resistors (Type RN) with tolerance of ≤ 0.1 percent;power >0.05 watt
• Thin Film Resistors (Type RN) with tolerance of > 0.1 percent;power ≤0.05 watt
• Large Scale Integrated (LSI) Microcircuits including microprocessors and memories without protective circuitry, or protective circuitry having Class 1 sensitivity (Note: LSI devices usually have two to three layers of circuitry with metallization crossovers and small geometry active elements)
• Hybrids utilizing Class 1 parts
CLASS 2: SENSITIVITY RANGE >1000 TO ≤4000 VOLTS
• MOS devices or devices containing MOS constituents including C, D, N, P, V, or other MOS technology with protective circuitry having Class 2 sensitivity
• Schottky diodes (Ref.: Similiarity to: MIL-STD-701: Silicon switching diodes (listed in order of increasing trr))
• Precision Resistor Networks (Type RZ)
• High Speed Emitter Coupled Logic (ECL) Microcircuits with propagation delay ≤1 nanosecond
• Transistor-Transistor Logic (TTL) Microcircuits (Schottky, low power, high speed, and standard)
• Operational Amplifiers (OP AMP) with MOS capacitors with protective circuitry having Class 2 sensitivity
• LSI with input protection having Class 2 sensitivity
• Hybrids utilizing Class 2 parts

available test data and reports on representative parts of a given part type. Differences in part design, fabrication techniques, or protective circuitry could result in the sensitivity of a part being outside the range specified in table II.

50.2 Other parts. Part types which are susceptible to ESD voltage levels greater than 4,000 volts are listed in DOD-HDBK-263. The classification of parts not listed in table II or in DOD-HDBK-263 has not been determined to this date, and no classification assumptions should be made in regard to non-listed parts. As additional data becomes available, including data on new types, the applicable listings will be updated.

APPENDIX B
CLASSIFICATION TESTING

10. GENERAL REQUIREMENTS

10.1 General. This appendix establishes the criteria and procedure for identifying Class 1 and Class 2 parts by test (see 5.1.1).

20. REFERENCED DOCUMENTS. Not applicable.

30. DEFINITIONS. Definitions covered in the standard shall be applicable.

40. GENERAL REQUIREMENTS

40.1 General. ESD classification of a part by test (see 5.1.1.b) shall be determined as specified herein. The acquiring activity shall be notified of the schedule for testing and shall have the right to witness the testing and review the test data. Classification testing of a part shall be considered as destructive testing. Tested parts shall not be used in deliverable hardware.

50. DETAIL REQUIREMENTS

50.1 General

50.1.1 Test circuit. Testing shall be performed using the test circuit of figure 1.

50.1.2 Part function testing. Part electrical parameters applicable to the part pin combination being tested shall be measured prior to and after subjecting the part to an ESD from the test circuit of figure 1.

50.1.3 Part failure. A part shall be considered to have failed when the part functional test performed after an ESD indicates either the part fails to meet one or more of the electrical parameters covered by the applicable part specification, or the part has changed 10% or more where the electrical parameter has not been specified in the part specification. A failed part shall not be used in further testing since the failure could affect electrical parameters of other pin combinations.

50.2 Determination of critical failure path. The contractor shall determine the critical failure paths (see figure 2) using the pin combinations listed in table III. In addition to the pin combinations of table III where metallization crossovers exist in microelectronic devices, the pin combinations which could result in puncture of the dielectric between these crossovers should also be tested. If the part is Class 1 and the intent is to reclassify the part to Class 2, start at Step 1. If the part is Class 2 and the intent is to reclassify the part as less sensitive than Class 2, start at Step 4. Testing shall be performed as follows:

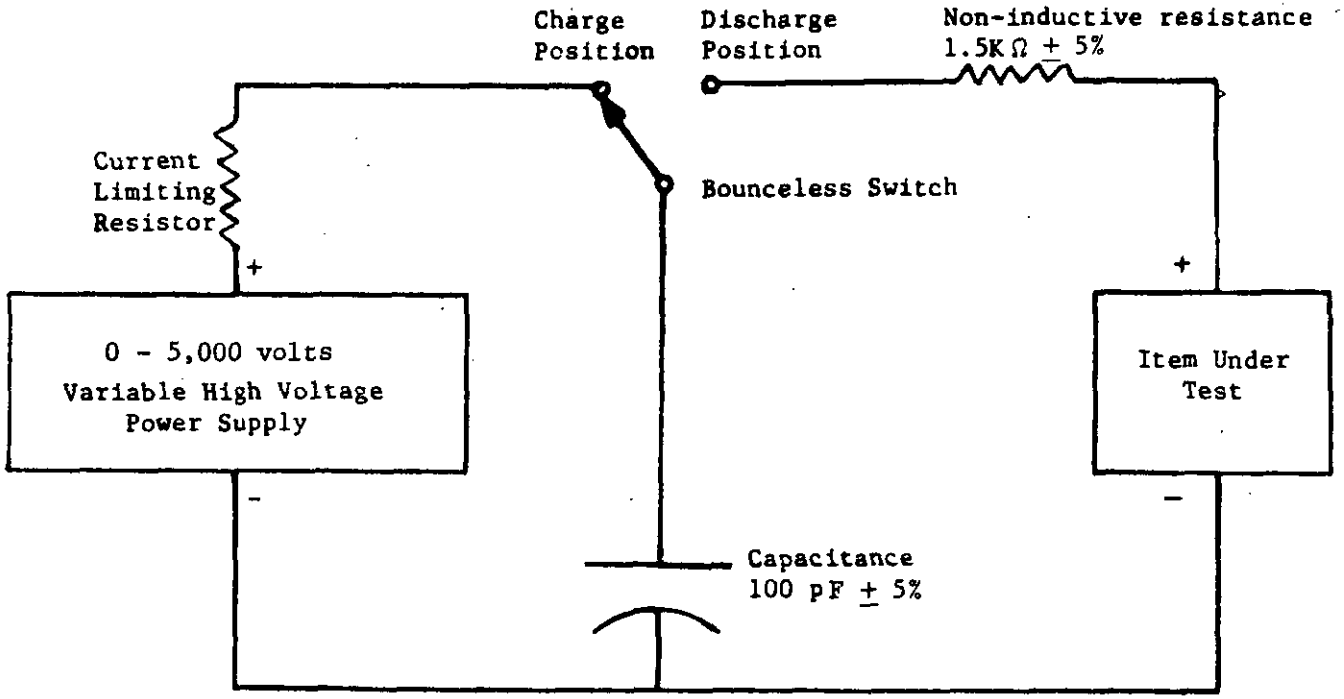

FIGURE 1. ESD test circuit

NOTE: Test voltages are measured across the capacitance. The capacitor shall be discharged through the series resistor into the item under test by maintaining the bounceless switch to the discharge position for a time no shorter than required to decay the capacitor voltage to less than 1 percent of the test voltage or 5 seconds, whichever is less. Power supply voltage shall be within a tolerance of ±5 percent of test voltage.

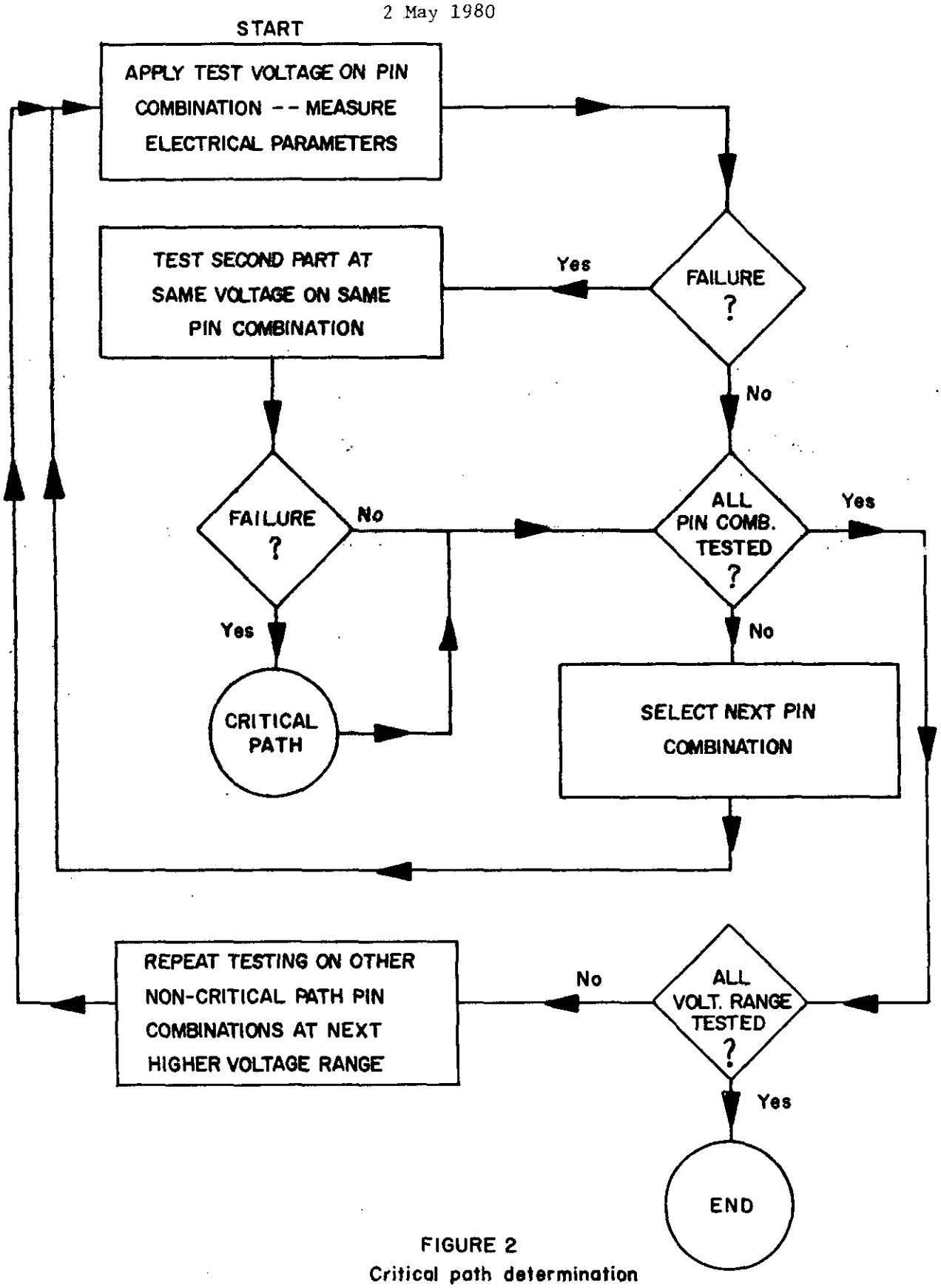

FIGURE 2
Critical path determination

TABLE III. Pin combinations for ESD testing

Part Types	Pin Combinations
All parts	• All pins tied together (+) to top center of case (-) • All pins tied together (-) to top center of case (+)
Resistors	• Terminal (+) to terminal (-)
Diodes	• Anode (+) to cathode (-) • Anode (-) to cathode (+)
Transistors	• Emitter to base* • Base to collector*
Digital Microcircuits	• Input (+) to common (-)** • Output (-) to common (+)** • Input (+) to output (-) • V+ (-) to common (+)
Linear Microcircuits	• Input (+) to common (-) • Input (+) to input (-) • Output (-) to common (+) • V+ (-) to common (+)
MOS FETs and JFETs	• Gate to source* • Gate to drain*

*Both polarity (+) to (-) and (-) to (+)
**Common - For NPN technology microcircuits common is the most negative terminal (i.e., V- or GND); for PNP technology common is GND.

a. Step 1. Test the part electrical parameters applicable to the pin combinations being tested. Test a part in accordance with the test setup of figure 1 applying a test voltage of 1,250 volts to each pin combination shown in table III. Measure the part's electrical parameters again after testing each pin combination. Test until a failure occurs or until all pin combinations have been tested without a failure. If a failure occurred, proceed to Step 2; if no failure occurred, proceed to Step 4.

b. Step 2. Test a second part using the same pin combination in which the first failure occurred using 1,250 volts. Measure the part's electrical parameters after testing at each voltage level. If a second failure occurs the pin combination tested shall be designated a critical path.

c. Step 3. Continue with Step 1 for the remaining pin combinations to determine whether other critical paths exist.

d. Step 4. Repeat the test of Step 1 followed by Steps 2 and 3, as applicable, for pin combinations not previously displaying the critical paths, using 5,000 volts in place of 1,250 volts.

e. Step 5. Rank critical paths in ascending order of their voltage sensitivity as determined by Steps 1 through 4.

f. Step 6. Proceed to the testing of 50.3.

50.3 Testing. Testing shall be performed as follows (see figure 3):

a. Step 1. Test a sample of parts using the test setup of figure 1 for each critical path determined in 5.2; continue testing until at least 10 parts have been tested, or until two failures have occurred on a critical path at a given voltage level. Start with the lowest voltage ranked critical path:

(1) If the critical path was determined in Step 1 and Step 2 use 1,000 volts as the test voltage;

(2) If the critical path was determined in Step 4 use 4,000 volts as the test voltage.

b. Step 2. Identify the sensitive critical paths which experienced a minimum of two failures. Classify these parts with respect to ESD sensitivity range as Class 1 or Class 2. Where no more than one failure has occurred, classification is not applicable.

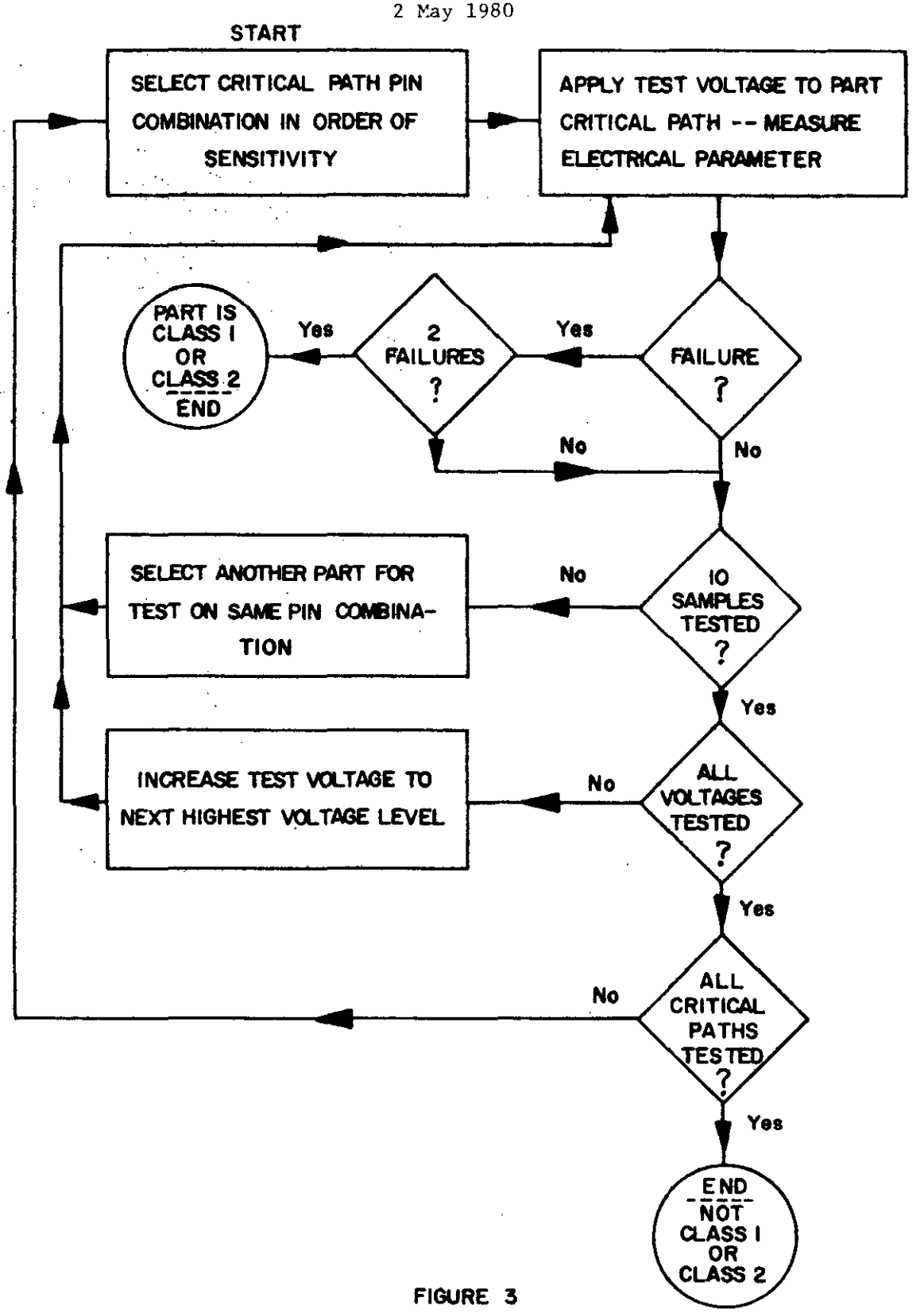

FIGURE 3
Classification testing

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge *(DO NOT STAPLE)*, and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document*(s)* or to amend contractual requirements.

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Commander
Naval Sea System Command (SEA 3112)
Department of the Navy
Washington, DC 20362

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*:

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

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DD FORM 82 MAR 1426

PREVIOUS EDITION IS OBSOLETE.