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MILITARY SPECIFICATION

SWITCH, STEPPING, DIRECT CURRENT, ELECTROMECHANICAL, AIRCRAFT, GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification establishes the requirements for the manufacture and inspection of two types of stepping switches.

1.2 Classification. Switches shall be of the following types, as specified (see 6.2):

Type I - 3 headers, 7 level, hermetically sealed, temperature range -55°C to 85°C

Type II - 3 switch decks, 12 positions, temperature range -55°C to 71°C

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

QQ-S-571	Solder, Tin Alloy: Tin-Lead Alloy; and Lead Alloy
ZZ-R-765	Rubber, Silicone

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

SPECIFICATIONS (Continued)

MILITARY

MIL-I-10	Insulating Materials, Electrical, Ceramic, Class L
MIL-M-14	Molding Plastics and Molded Plastic Parts, Thermosetting
MIL-P-997	Plastic Material, Laminated, Thermosetting, Electrical Insulation: Sheets, Glass Cloth Silicone Resin
MIL-E-5400	Electronic Equipment, Aerospace, General Specification for
MIL-F-14256	Flux, Soldering, Liquid (Rosin Base)
MIL-P-15037	Plastic Sheet, Laminated, Thermosetting, Glass-Cloth, Melamine-Resin
MIL-P-15047	Plastic Material, Laminated Thermosetting Sheets, Nylon Fabric Base, Phenolic-Resin
MIL-N-18307	Nomenclature and Identification for Electronic, Aeronautical, and Aeronautical Support Equipment, Including Ground Support Equipment
MIL-P-27418	Plating, Soft Nickel (Electrodeposited, Sulfamate Bath)
MIL-W-22248	Weldment, Aluminum and Aluminum Alloy
MIL-S-28786	Switches, Preparation for Delivery of
MIL-G-45204	Gold Plating, Electrodeposited
MIL-C-45662	Calibration System Requirements
MIL-S-45743	Soldering, Manual Type, High Reliability, Electrical and Electronic Equipment
MIL-S-85242/1	Switch, Stepping, 7 Level, Type I
MIL-S-85242/2	Switch, Stepping, Direct Current, Electro-mechanical, Aircraft, Type II (for Intervalometer, Type DTU-29/A)

STANDARDS

FEDERAL

FED-STD-H28	Screw Thread Standards for Federal Services

STANDARDS (Continued)

MILITARY

DOD-STD-100	Engineering Drawing Practices
MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-109	Quality Assurance Terms and Definitions
MIL-STD-130	Identification Marking of U. S. Military Property
MIL-STD-143	Standards and Specifications, Order of Precedence for the Selection of
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-STD-461	Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference
MIL-STD-704	Aircraft Electric Power Characteristics
MIL-STD-810	Environmental Test Methods
MIL-STD-831	Test Reports, Preparation of
MIL-STD-889	Dissimilar Metals

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

2.1.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between requirements of this specification and the specification sheet, the latter shall govern. (If a specific requirement specified herein is not required for an item, it shall be as indicated on the specification sheet (eg, Corona - N/A).)

3.2 First article. The switch furnished under this specification shall be a product which has been inspected and passed the first article inspection specified herein (see 4.3).

3.3 Selection of specifications and standards. Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143.

3.4 Interchangeability. All parts having the same part number shall be directly and completely interchangeable with each other with respect to installation and performance. The switch shall meet the interchangeability requirements of MIL-E-5400.

3.5 Identification of switches. All switches shall be marked as specified on the specification sheet for the switch being acquisitioned, or in accordance with MIL-STD-130, if not specified on the specification sheet. The item identification and part number requirements of DOD-STD-100 shall govern the part number and changes thereto.

3.5.1 Nomenclature, nameplates, and identification marking. Nomenclature and serial number assignment, nameplate approval, and identification markings shall be in accordance with MIL-N-18307.

3.6 Metals. All metal parts (other than current-carrying parts) exposed to environmental conditions shall be of corrosion-resistant material, or shall be suitably plated to resist corrosion during service life.

3.6.1 Dissimilar metals. Unless suitably protected against electrolytic corrosion, dissimilar metals, as defined in MIL-STD-889, shall not be used in contact with each other.

3.6.2 Fungus proof materials. All materials shall be non-nutrients for fungi.

3.7 Insulators.

3.7.1 Ceramic insulators. Ceramic insulation shall be Grade L411 or higher, in accordance with MIL-I-10.

3.7.2 Plastic insulators. Laminated-plastic sheets shall conform to MIL-P-997, MIL-P-15037, or MIL-P-15047.

3.7.3 Molded plastic. Molded plastic material shall conform to MIL-M-14, except that cotton, wood, or cellulose-filled molding materials shall not be used.

3.7.4 Silicone Rubber. All silicone rubber parts shall be in accordance with ZZ-R-765.

3.8 Switch.

3.8.1 Construction. The construction of the switch shall be as specified herein and in the individual specification sheets.

3.8.1.1 Spring embrittlement. Springs used in the fabrication of the switch shall not break when extended or distorted to the point of minimum permanent distortion.

3.8.1.2 Welding. Welding procedures shall be in accordance with MIL-W-22248, Class III.

3.8.2 Performance. The switches shall satisfy all performance requirements when subjected to the following inspections in the order specified in tables I and II.

a. Visual and mechanical examination (see 4.6.3).

b. Electrical characteristics (see 4.6.4).

c. Dielectric withstanding voltage (4.6.5).

d. Thermal shock (see 4.6.6).

e. Vibration (see 4.6.7).

f. Shock (see 4.6.8).

g. Salt spray (corrosion) (see 4.6.9).

h. Seal (see 4.6.10).

i. Terminal strength (see 4.6.11).

j. Intermediate current (wiper contacts) (see 4.6.12).

k. Humidity resistance (see 4.6.13).

l. High and low temperature operation (see 4.6.14).

m. Overload (includes contact resistance) (see 4.6.15).

n. Overvoltage (coil resistance test) (see 4.6.16).

o. Life (see 4.6.17).

p. Insulation resistance (see 4.6.18).

q. Solderability (see 4.6.19).

r. Corona (when applicable) (see 4.6.20).

s. Storage (see 4.6.21).

t. Electromagnetic compatibility (see 4.6.22).

u. Acceleration (see 4.6.23).

3.8.3 Threaded parts. All threaded parts shall be in accordance with FED-STD-H28.

3.8.3.1 Engagement of threaded parts. All threaded parts used for mounting means shall engage a minimum of three full threads.

3.8.4 Case. The case shall not be used for a current-carrying conductor but it may be used as part of the magnetic circuit or shield. The finish around the mounting holes shall provide positive electrical contact when the switch is mounted.

3.8.5 Gold plating. Where gold plating is specified, its thickness shall be a minimum of 50 millionths of an inch over 200 millionths nickel in accordance with MIL-P-27418. Gold plating shall conform to Type II of MIL-G-45204.

3.8.6 Terminals. Terminals shall be solder type.

3.8.6.1 Cabling and connections. The switch shall use internal cabling, printed wiring, and connections in accordance with MIL-E-5400.

3.8.6.2 Solder terminals. Solder terminals shall be treated to facilitate soldering. Water lacquer shall not be used as a protective finish. Solder terminals shall be designed to accept two AWG size No. 20 wires.

3.8.7 Soldering. All soldering must be done in accordance with MIL-S-45743.

3.8.7.1 Soldering and soldering flux. When soldering is employed, all flux shall be removed after soldering. Electrical connections shall be mechanically secure and electrically continuous before and after soldering. Solder, when used, shall be in accordance with QQ-S-571 and soldering flux shall be in accordance with MIL-F-14256.

3.8.8 Duty cycle.

Type I - The duty cycle shall be on-off time 50% maximum. Maximum continuous on time 30 seconds with $29 \begin{smallmatrix}+0.0\\-0.5\end{smallmatrix}$ volts across the coil.

Type II - The duty cycle shall be as specified in the specification sheet.

3.8.9 Weight.

Type I - The weight shall be not more than 2.80 pounds.

Type II - The weight shall be 5.2 ± 1.0 ounces.

3.8.10 Electrical characteristics (see 4.6.4).

3.8.10.1 Contact resistance.

Type I - The contact resistance shall be a maximum of 0.25 ohms (see 4.6.4.1).

Type II - The contact resistance shall be as follows (see 4.6.4.1):

a. Initial: 0.070 ohm max (after lubrication).

b. After 800 operations (5.0 amperes carry): 0.10 ohm.

3.8.10.2 Pickup (operate) and dropout (release) voltage. All switching circuits shall positively retain contact, or open, and the wiper assembly shall remain static or step to the next bank terminal position.

a. Pickup (Type I). (16 VDC maximum allowable voltage.) At 18 VDC, operational times shall not increase more than 10% above 25 milliseconds (see 4.6.4.2).

b. Dropout (Type I). (1.5 VDC minimum allowable voltage.) At 1.5 VDC, dropout times shall not increase more than 10% above 20 milliseconds (see 4.6.4.2).

3.8.10.3 Contact bounce.

Type I - When switches are tested as specified in 4.6.4.3, the duration of contact bounce shall not exceed the requirements in (a) and (b).

a. Interrupter contact bounce. The duration of contact bounce shall not exceed 2 milliseconds (ms).

b. Wiper bank terminal contacts. The duration of contact bounce of wiper bank terminal contacts shall not exceed 2 milliseconds.

Type II - When connected to the test circuit and subjected to tests in the specification sheet, a steady output shall occur within 23 milliseconds at application of step pulse (see 4.6.4.3).

3.8.10.4 Coil current (Type I). The coil current shall be as specified in the specification sheet.

3.8.10.5 Coil resistance.

Type I - The coil resistance shall be a minimum of 16 ohms at +25°C (see 4.6.4.5).

Type II - The coil resistance shall be 6.0 ohms ±10% at 20°C (3.0 to 10.0 ohms over temperature range -55°C to 71°C (see 4.6.4.5)).

3.8.10.6 Timing.

3.8.10.6.1 Interrupter contacts operate and release time (Type I). The operate time applies to normally open contacts and the release time applies to normally closed contacts. If both types of contacts are not provided, the available contacts will be used for both operate and release time. The operate and release time shall not include any contact bounce (see 4.6.4.6.1).

3.8.10.6.2 Wiper contacts operate time. The operate time is that interval between application of rated voltage (direct drive switch) or removal of rated voltage (indirect drive switch) until all wipers make contact with the succeeding bank contact. The operate time shall not include any contact bounce (see 4.6.4.6.2).

3.8.10.6.3 Wiper transfer time. The transfer time of non-bridging wipers shall not exceed 2 ms. Contacts may bridge during the transfer time not to exceed 1 ms, bridge time. Bridging wipers may open during transfer and the open time shall not exceed 1 ms (see 4.6.4.6.2).

3.8.10.6.4 Homing time (Type I). The homing time is that interval between the application of rated voltage to the coil via normal homing means, until all contacts designed to close (or open) in the home position have functioned. The homing time shall not include any contact bounce and shall be a maximum of 0.5 seconds (see 4.6.4.6.3).

3.8.10.6.5 Self-interrupted stepping speeds (Type I). Application of 21 through 29 VDC to the coil shall produce 40 through 70 steps per second, with a minimum dwell time of 12 milliseconds at each position. Tests shall be made at -55, +25 and +85 degrees Celsius (see 4.6.4.6.4).

3.8.10.6.6 Externally-pulsed stepping speeds.

Type I - The switch shall be capable of following an essentially square wave pulse at 21 through 29 VDC having a minimum on-time of 0.025 seconds and a minimum off-time of 0.020 seconds. Tests shall be made at -55, +25 and +85 degrees Celsius (see 4.6.4.6.5).

Type II - The externally-pulsed stepping speed shall be as specified in the specification sheet (see 4.6.4.6.5).

3.8.11 Dielectric withstanding voltage. There shall be no evidence of arcing, flashover, breakdown of insulation, damage, or leakage current in excess of 1 milliampere at sea level and 70,000 feet for Type I (see 4.6.5).

3.8.12 Thermal shock. There shall be no mechanical, electrical, or operational failure, and no cracking, peeling, or flaking of the finish (see 4.6.6).

3.8.13 Vibration. There shall be no opening of closed contacts or closing of open contacts in excess of 10 microseconds (μs) (see 4.6.7).

3.8.14 Shock. There shall be no opening of closed contacts or closing of open contacts in excess of 20 microseconds. At the conclusion of the test, the switches shall show no change in operation and there shall be no evidence of broken, loose, deformed, or displaced parts (see 4.6.8).

3.8.15 Salt spray (corrosion) (Type I). There shall be no evidence of excessive corrosion, peeling, chipping, or blistering of the finish, nor exposure of base metal (see 4.6.9).

3.8.16 Seal (Type I). The leakage rate shall not exceed 1×10^{-6} atmospheric cubic centimeters per second per cubic inch of net sealed volume; or for switches of two cubic inch volume or less, the leakage rate shall not exceed 1×10^{-8} atmospheric cubic centimeters per second. Switches shall be hermetically sealed immediately after backfilling. All switches shall have been tested within 30 minutes after sealing (see 4.6.10).

3.8.17 Terminal strength (Type I). The terminals shall not break, loosen, crack, or affect the operation of the switch (see 4.6.11).

3.8.18 Intermediate current (applicable to wiper contacts only).

Type I - Switch contacts shall satisfactorily make and break 100 ± 10.0 milliamperes at 3 to 10 volts dc for each operation. The contact resistance shall be not greater than 0.25 ohms (see 4.6.12).

Type II - Switch contacts shall satisfactorily make and break 4.0 milliamperes at 3 to 10 volts dc for each operation. The contact resistance shall be not greater than 0.07 ohms (see 4.6.12).

3.8.19 Humidity resistance (Type I). The insulation resistance immediately after conclusion of the test and while the switches are still in the humidity chamber shall not be less than 1 megohm. At the end of the 24-hour drying period, the insulation resistance shall be greater than 50 megohms. At the conclusion of the test, there shall be no evidence of corrosion, cracking, spalling, breaking, or loosening of terminals (see 4.6.13).

3.8.20 High and low temperature operation.

Type I - Switches shall be tested to determine operational times at high and low temperatures with supply voltage ranging from 21 VDC through 29 VDC.

Operate time shall not exceed 25 milliseconds.

Release time shall not exceed 20 milliseconds.

At temperature extremes (-55 and +85 degrees celsius) and with minimum voltage (21 volts) switches shall demonstrate self-interrupting operational capability for 3 cycles (see 4.6.14).

Type II - The high and low temperature operation shall be as specified in the specification sheet (see 4.6.14).

3.8.21 Overload (Type I). The contact resistance shall be not greater than 0.25 ohms. The switches shall remain mechanically and electrically operative (see 4.6.15).

3.8.22 Overvoltage (Type I). The insulation resistance shall be greater than 100 megohms (see 4.6.16).

3.8.23 Life.

Type I - Each loaded contact shall satisfactorily open and close a total of 100,000 times (33,333 revolutions) (see 4.6.17).

Type II - The life shall be 800 revolutions without maintenance (see 4.6.17).

3.8.24 Insulation resistance. The insulation resistance shall be greater than 100 megohms except that the insulation resistance between coil and case at high temperature shall be 50 megohms or greater (see 4.6.18).

3.8.25 Solderability. Ninety-five (95) percent of the total length of fillet, which is between the standard wrap wire and the terminal, shall be tangent to the surface of the terminal being tested. There shall be no pinholes, voids, etc. A ragged or interrupted line at the point of tangency between the fillet and the terminal under test shall be considered a defect. After the test, there shall be no evidence of fracture, loosening of parts, or any other mechanical failure of the switches (see 4.6.19).

3.8.26 Corona (Type I). There shall be no evidence of corona (see 4.6.20).

3.8.27 Storage. Contact resistance shall be not greater than 0.25 ohms for Type I switch and not greater than 0.070 ohms for Type II switch. Insulation resistance shall be 100 megohms or greater (see 4.6.21).

3.8.28 Electromagnetic compatibility (Type I). The test levels shall be 75 ±12 db above MIL-STD-461 limits (see 4.6.22).

3.8.29 Acceleration (Type II). Switches shall show no evidence of damage or defects and there shall be no change in operation after conclusion of test (see 4.6.23).

3.8.30 Operational stability. The switch shall operate to specified performance, continuously or intermittently, for a period equal to the operating life (see 3.8.23) without the necessity for readjustment.

3.9 Workmanship. The workmanship displayed in fabrication and assembly of the switch shall be such as to assure, within design limitations, the ability of the switch to meet performance requirements under all applicable environmental conditions specified herein. Unauthorized repair, welding, heavy burrs, or parts assembled by introduction of high stresses not prescribed in the drawing are typical signs of inferior workmanship and shall be cause for rejection. The standards of workmanship exhibited in the approved first article sample, subject to any qualification stated in the Government's Notice of Approval, shall be determinative of the requirements of the contract relative to workmanship.

4. QUALITY ASSURANCE PROVISIONS (see 6.4).

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification, where such inspections are deemed necessary to assure that the supplies and services conform to prescribed requirements.

4.2 Classification of inspection. The inspection of the switch shall be classified as follows:

a. First article inspection (see 4.3).

b. Quality conformance inspection (see 4.4).

4.3 First article inspection. First article inspection shall consist of all of the inspections listed in table I. First article inspection report format shall be in accordance with MIL-STD-831 (see 6.2.2).

4.3.1 Sampling for first article inspection. First article switch samples shall consist of ten (10) switches manufactured on contract. The switches shall be permanently labeled for ease of identification. Where first article approval for hermetically sealed switches is desired, two additional unsealed switches shall be submitted for the internal examination. All parts and materials, including packaging and packing, shall be obtained from the same source of supply as will be used in regular production. A first article sample, or portion thereof, as directed by the contracting officer, shall also be submitted whenever there is a lapse in production in excess of 90 days, or whenever a change occurs in manufacturing, material used, drawing or specification such as to significantly affect production uniformity as determined by the Government acquiring activity. Failure of any switch to pass any of the first article inspections shall be cause for rejection.

4.3.2 Scope of inspections. The scope of first article inspection shall include all tests listed in table I. The switch shall be operated at the beginning and conclusion of each service condition to determine whether a failure occurred during the service condition. Additional operation during testing shall be made when specified by table I or by the appropriate test method. The outputs shall be monitored during operation to verify that proper output voltages are present only when the prescribed inputs are present. The quantity of switches required for each test is listed in table I.

4.3.3 First article approval. Approval of the first article sample shall be by the acquiring activity upon satisfactory completion of all tests and examinations.

4.3.4 Production switches. Switches supplied under the contract shall, in all respects, including design, construction, workmanship, performance and quality, be equivalent to the approved first article sample. Each switch shall be capable of successfully passing the same tests as imposed on the first article sample. Evidence of noncompliance with the above shall constitute cause for rejection.

4.4 Quality conformance inspection. The contractor shall furnish all samples and shall be responsible for accomplishing the quality conformance inspection. All inspection and testing shall be under the supervision of the Government quality assurance representative/specialist. The contractor shall furnish test reports showing quantitative results for all quality conformance inspection tests. Such reports shall be signed by an authorized representative of the contractor or laboratory, as applicable. Quality conformance inspection shall consist of the following inspections:

a. Individual inspections (see 4.4.1).

b. Sampling inspections (see 4.4.2).

Quality conformance inspection report format shall be in accordance with MIL-STD-831 (see 6.2.2).

4.4.1 Individual inspections. Individual inspections are those inspections conducted on each switch. Individual inspections for the switches are shown in table II except as noted. Failure to pass any of these inspections shall be cause for rejection of the switch.

4.4.2 Sampling inspection. Sampling and inspection shall be in accordance with MIL-STD-105 for General Inspection Level II. The Acceptable Quality Levels (AQL) shall be as specified in table II. Major and minor defects shall be as defined in MIL-STD-105. Failure to pass any of these inspections shall be cause for rejection of the entire lot. Samples subjected to sampling inspection shall not be considered or accepted as part of the contract (see 6.2).

4.4.2.1 Inspection lot. An inspection lot shall consist of all switches of the same enclosure, temperature characteristic, shock type, vibration grade, and design and construction, produced under essentially the same conditions and offered for inspection at one time.

4.5 Inspection conditions. Unless otherwise specified, all inspections shall be performed under the following conditions:

a. Room temperature. Room ambient of 25 $\pm 10^{\circ}$C (77 $\pm 18^{\circ}$F) indicated.

b. Test temperature. All parts of the test item shall be stabilized at the specified temperature $\pm 2.8^{\circ}$C ($\pm 5^{\circ}$F) indicated prior to conducting any tests. Unless otherwise specified, temperature stabilization will have been attained when the indicated temperature of the surface of the largest mass of the test item does not change by more than $\pm 2.8^{\circ}$C ($\pm 5^{\circ}$F) in a period of 1 hour.

c. Input power requirements (Type 1). The switch shall perform satisfactorily under all applicable conditions specified herein from a 28 VDC rated voltage power source with characteristics and limits as defined in MIL-STD-704.

d. All inspections shall be performed in accordance with the test conditions specified in the "GENERAL REQUIREMENTS" of MIL-STD-202. During the test procedures, relubrication, mechanical contact adjustments, and contact cleaning shall not be permitted.

4.6 Inspection methods.

4.6.1 Switch inspection. Each switch shall be thoroughly examined to determine conformance to all of the requirements of this specification and applicable documents for which no specific tests are described (see 3.9).

4.6.2 Packaging inspection. Each switch shall be examined to ensure that the preparation for delivery conforms to this specification (see section 5).

4.6.3 Visual and mechanical examination. Switches shall be examined to verify that the materials, design, construction, physical dimensions, marking, and workmanship are as specified herein and in the individual specification sheets.

4.6.4 Electrical characteristics.

Type I - The electrical characteristics shall be determined as specified in 4.6.4.1 to 4.6.4.5, inclusive, in accordance with MIL-C-45662.

Type II - The electrical characteristics shall be determined as specified in 4.6.4.1, 4.6.4.3, 4.6.4.5 and in the specification sheet.

4.6.4.1 Contact resistance. Switches shall be tested in accordance with the direct current voltmeter-ammeter method.

a. Method of connection. Connection jigs or other suitable means.

b. Test current. 1.0 amperes for single contacts.
2.0 amperes for parallel (dual) contacts.

c. Maximum open-circuit test voltage shall be 6 volts-maintained.

d. Points of measurement. Between a minimum of five of each type of contact.

e. Number of activations prior to measurement. None.

f. Number of test activations. One.

g. Number of measurements per activation. One in each contact position.

The dc voltage drop across the current carrying contacts shall be measured at the terminals of the header for Type I and is the value to be used in calculating the contact resistance.

4.6.4.2 Pickup (operate) and dropout (release) voltage (Type I). The pickup and dropout voltage shall be measured with the switch mounted in each of three mutually perpendicular planes.

4.6.4.2.1 Pickup voltage (Type I). The energizing voltage shall be applied to the coil terminals at the header, raised to the rated voltage and gradually reduced to zero within one minute of application. The voltage shall then be gradually increased until the switch operates as defined in 3.8.10.2. The pickup voltage shall be determined by an ohmmeter or equivalent circuit across the BR terminal and the next open operational bank terminal position. Upon pickup the circuit shall close.

4.6.4.2.2 Dropout voltage (Type I). Rated voltage shall be applied to the coil terminals at the header. This voltage shall be reduced within one minute of application, with subsequent reduction until the switch operates as defined in 3.8.10.2. The dropout voltage shall be determined by an ohmmeter or equivalent circuit across the interrupter contacts. Upon dropout the circuit shall close.

4.6.4.3 Contact bounce.

Type I - A photographic record shall be made of an oscilloscope trace (see figure 1). This shall show the make of single level contact set(s) and/or interrupter contact(s) when the coil is externally pulsed (not self interrupted), energized with or de-energized from 28 volts DC and the contacts are carrying or will carry direct current loads as specified herein. The number of contact pairs per switch to be observed photographically shall be made in accordance with table III and figure 1.

Type II - A photographic record shall be made of an oscilloscope trace or other suitable means used to record contact bounce (see table III).

4.6.4.3.1 Electrical test circuit.

Type I - The electrical test circuit shown on figure 1 shall be utilized. Photographs shall show appropriate timing markers.

Type II - The electrical test circuit in the specification sheet shall be utilized.

4.6.4.4 Coil current (Type I). With rated voltage applied to the coil, the current flow shall be determined within 30 seconds and shall not exceed the value specified (see 3.8.10.4).

4.6.4.5 Coil resistance. The coil resistance shall be measured in accordance with Method 303 of MIL-STD-202 and shall not exceed the value specified using the minimum practical current (see 3.8.10.5).

4.6.4.6 Timing.

4.6.4.6.1 Interrupter contacts operate and release time (Type I). The operate and release time shall be measured using an oscilloscope or other suitable method. The source voltage shall be the rated coil

voltage. The applicable circuit shown on figure 2 or other suitable method may be used. For purposes of test, the operate and release time shall be exclusive of contact bounce. The number of contact pairs per switch to be observed shall be as specified in table III. Selected normally open contacts may be wired in series, and selected normally closed contacts may be wired in parallel.

4.6.4.6.2 Wiper contacts operate and transfer time. The contacts operate and transfer time shall be measured using an oscilloscope or other suitable method. The source voltage shall be the rated coil voltage for Type I switch. The applicable circuit shown on figure 2 or other suitable method may be used for Type I switch. Figure 5 of the specification sheet shall be used for Type II switch. For purpose of test, the operate time shall be exclusive of contact bounce. The number of contact pairs per switch to be observed shall be as specified in table III. Selected contacts may be wired in series.

4.6.4.6.3 Homing time (Type I). The homing time shall be measured using a counter or other suitable method with the switch initially at rest on a contact such that the maximum wiper rotation is required to reach home. The applicable circuit shown on figure 2 or other suitable method may be used. The number of contact pairs per switch to be observed shall be as specified in table III. Selected contacts may be wired in series.

4.6.4.6.4 Self-interrupted stepping speed (Type I). The self-interrupted stepping speed shall be measured using a watch with a sweep-second hand or other suitable means. With the switch running, the revolutions of the wiper per 10 seconds shall be counted. This count shall be made within 2 minutes of applied power. Revolutions can then be converted to steps per second.

4.6.4.6.5 Externally-pulsed stepping speed. The ability of the switch to meet the specified speed and percent make requirements when externally pulsed shall be measured using an oscilloscope or other suitable method.

4.6.5 Dielectric withstanding voltage. Switches shall be tested in accordance with 4.6.5.1 and, when specified, in accordance with 4.6.5.2.

4.6.5.1 At atmospheric pressure. Switches shall be tested in accordance with Method 301 of MIL-STD-202. The following details shall apply:

a. Test voltage.

Type I - 1000 volts plus twice the rated voltage of the coil or contacts, whichever is higher, for initial test and 1000 volts for subsequent tests.

Type II - The test voltage shall be as specified in the specification sheet.

b. Duration of applications. 1 minute for first article tests; 5 seconds for quality conformance tests.

c. Points of application:

(1) Between a minimum of five mutually insulated terminals.

(2) Between all adjacent contact terminals of different poles.

(3) Between all unconnected terminals of the same pole.

d. Examination after test. Switches shall be examined for evidence of arcing, flashover, breakdown of insulation, damage, and excess leakage current (see 3.8.11).

4.6.5.2 At reduced barometric pressure (Type I). Switches shall be tested as specified in 4.6.5.1 and in accordance with Method 105 of MIL-STD-202. The following details shall apply for Type I switch when specified:

a. Test voltage. 500 volts.

b. Test-condition letter. C (70,000 feet).

4.6.6 Thermal shock.

Type I - Switches shall be tested in accordance with Method 107 of MIL-STD-202. The following details and exceptions shall apply:

a. Test-condition letter. A, for Hermetic Seal Units, steps 1, 2, 3 and 4.

b. Measurements before and after cycling. Not applicable.

c. Examinations after test. Switches shall be examined for evidence of mechanical and electrical damage, loosening of rivets or other fastening devices, and cracking, peeling, or flaking of the finish.

Type II - Thermal shock testing shall be as specified in the specification sheet.

4.6.7 Vibration (20-2000 Hz).

Type I - Switches shall be tested in accordance with Method 514.2 of MIL-STD-810, Category b.2, table 514.2-IIA where the parameters are designated as:

M = .95 Mach K = 14×10^{-8}

N = 500 (Missions) Q = 1406

and T = 1 (Hour)

Test Conditions. Random Vibrations

Functional (Static-at-rest - full load) 0.2016 g^2 Hz

89.2 Hz

16.4 "g" RMS

Endurance (Static-at-rest - low level load) W_o = 0.7244 g^2 Hz

f_{VAR} = 0.3417

g RMS = 31.02

a. For a period of two hours, switches shall be tested as follows in each of the three mutually perpendicular axes according to the order, time periods and conditions that follow.

(1) 1/2 hour functional (full load).

(2) 1 hour endurance (low level load).

(3) 1/2 hour functional (full load).

b. Mounting of specimens. Specimens shall be securely mounted by normal fasteners upon a test fixture (see MIL-S-85242/1(AS), figure 3).

c. Electrical load. For the contact monitor circuit, full load as specified (see MIL-S-85242/1(AS) requirement 8(a) and (c)). Low level load as specified 8(b) and (c). (See MIL-S-85242/1(AS) requirement 8(b) and (c).)

d. Monitor. A dual trace memoscope (oscilloscope) or its equivalent shall be used to determine opening or closing of contacts.

e. Contacts to be Monitored.

Open contacts shall be connected in parallel.

Closed contacts shall be connected in series.

Type II - Vibration testing shall be as specified in the specification sheet.

4.6.8 Shock.

Type I - Switches shall be tested in accordance with the method in 4.6.8.1.

Type II - Shock testing shall be as specified in the specification sheet.

4.6.8.1 Method (Type I). Three shocks in each direction shall be applied along three mutually perpendicular axes of the mounting frame (total of 18 shocks).

a. Shock type: 100 g at 3-4 milliseconds rise time (approximately a sine curve) where rise time is time from zero to peak.

b. Mounting of specimens: (see 4.6.7(b)).

c. Electrical load: (see 4.6.7(c) full load).

d. Monitor: (see 4.6.7(d)).

e. Contacts to be monitored: Open contacts shall be connected in parallel. Closed contacts shall be connected in series.

4.6.9 Salt spray (corrosion) (Type I). Switches, with associated mounting hardware, shall be tested in accordance with Method 101 of MIL-STD-202. The following details and exceptions shall apply:

a. Test-condition letter. B (48 hours).

b. Switches shall be subjected to 10 cycles of operation of making and breaking the rated resistive current at the lowest voltage specified immediately after a 6-hour drying period in a forced-draft oven at a temperature of approximately 57°C.

4.6.10 Seal (Type I). Hermetically sealed switches shall be tested in accordance with Method 112 of MIL-STD-202. The following details shall apply:

a. Test-condition letter. C, procedure III or IV, as applicable.

b. Leakage-rate sensitivity. As specified in 3.8.16.

4.6.11 Terminal strength (Type I). Switches shall be tested in accordance with Method 211 of MIL-STD-202. The following details and exceptions shall apply:

a. Mounting. Switches shall be mounted by normal mounting means.

b. Test-condition letter. A.

c. Applied force. 4.5 pounds.

d. Directions of force. Parallel to the longitudinal axis of the terminal, perpendicular to the longitudinal axis of the terminal, or in any direction most likely to cause failure. No terminal shall be tested in more than one direction.

4.6.12 Intermediate current (applicable to wiper contacts only). Switches shall be tested in accordance with Method 312 of MIL-STD-202. The following details and exceptions shall apply:

a. Maximum contact resistance allowed. (See 3.8.18.)

b. Coil energizing voltage. Rated voltage 24V for Type I switch. Coil energizing voltage and duty cycle for Type II switch shall be as specified in the specification sheet.

c. Cycling rate. 1 step per minute.

d. Monitoring of contacts for sticking. Not applicable.

e. Rated maximum operating temperature +85°C for Type I switch, +71°C for Type II switch.

f. Duty cycle. 29 ±3 seconds on and off (contacts only - Type II).

4.6.13 Humidity resistance (Type I). Switches shall be tested in accordance with Method 507 Procedure 1 of MIL-STD-810. The following details and exceptions shall apply:

a. Mounting. On a corrosion-resistant metal panel, by normal mounting means.

b. Initial measurement. Insulation resistance shall be measured as specified in 4.6.18.

c. Final measurements. Upon completion of Step 6 of the final cycle, and while the switches are still in the humidity chamber, the insulation resistance shall be measured as specified in 4.6.18. After a 24-hour drying period at a relative humidity of 50 ±5 percent, switches shall be examined for evidence of corrosion, breaking, cracking, spalling, and loosening of the terminals.

4.6.14 High and low temperature operation.

Type I - Switches shall be de-energized for 10 hours minimum at +85°C and shall be conditioned de-energized for not less than 10 hours at -55°C. At the end of each temperature exposure, while the switches are still in the conditioning chamber at the temperature, extreme pick-up and drop-out voltage, and operate and release time (figure 2) shall be measured as in 4.6.4.2 and 4.6.4.6.1, respectively, and shall be subjected to the homing time of 4.6.4.6.3.

Type II - The high and low temperature shall be as specified in the specification sheet.

4.6.15 Overload (Type I). (Internal interrupter contacts are not to be used in this determination.) Switches shall be externally servo-actuated for 100 contact operations, without switch maintenance, at a coil voltage of 24 volts DC. Duty time cycles shall be 50 percent on - 50 percent off. Per table III, the switching contacts (BR and 1), at onset, shall bear twice the loads specified in MIL-S-85242/1(AS) requirements 8(b) and (c). After making and at rest, the contacts on all levels shall bear twice the loads specified in MIL-S-85242/1(AS) requirements 8(a) and (c). After 1 second minimum - 2 seconds maximum, these loads shall be removed. The servo shall pulse the switch to BR and 2 and repeat the foregoing operations. This sequencing shall continue until the total required contact operations are completed. Stationary contacts shall be loaded in accordance with 4.6.15.1. Moving contacts shall be connected to positive side of power supply. The negative, DC polarity only, shall be connected to the bank contacts through the specified loads. The switch enclosure shall be maintained at the electrical system ground or neutral through a suitable fuse rated at 0.30 amperes (5 percent of the lowest resistive load) but in no event greater than 3 amperes nor less than 100 milliamperes. At the conclusion of the test, all contact resistances shall be measured as specified in 4.6.4.1. Blowing of fuse between case and load system ground or neutral shall constitute a failure (3.8.21). (See MIL-S-85242/1(AS) figure 4.)

4.6.15.1 Resistive (Type I). When the rated load is specified as resistive, suitable resistors shall be used to provide two times the rated current. Switching rate shall be 20 ±2 steps per minute.

4.6.15.2 Overload carrying (Type I). Switching contacts at rest shall be subjected to twice the current value specified in MIL-S-85242/1(AS) requirement 8(a) and (c) for a period of 100 hours minimum. (See table III.) Contacts shall not weld. At the conclusion of this test, resistances of all contacts which were current carrying shall be measured as specified in 4.6.4.1.

4.6.16 Overvoltage (Type I). Switches shall be energized for 10 minutes with 33.6 volts applied to the (24.0 volt-rated) coil. The insulation resistance shall then be measured as specified in 4.6.18.

4.6.17 Life.

Type I - The life test requires that all bank terminal contacts, at all switch levels, be subjected to 25,000 operational cycles at each of four states for a total of 100,000 operational cycles. The switch of this specification has three (3) arm operational cycles per one (1) shaft revolution. Requirements common to all states are:

a. 50% duty cycle with continuous on time of 30 seconds, off time 30 seconds.

b. Coil voltage 24V.

c. "No Maintenance" Operations.

d. Post-test measurement of all contact resistances, at all levels, in accordance with 4.6.4.1.

(1) Test State 1. 25,000 cycles, self-interrupted, no electrical load.

(2) Test State 2. 25,000 cycles, self-interrupted, contact loading: stationary contacts per 4.6.17.1. Switching contacts, per table III and MIL-S-85242/1(AS) figure 5 requirement 8(b) and (c).

(3) Test State 3. 25,000 cycles, coil externally pulsed (not self-interrupted) stationary contacts per 4.6.17.1. Switching contacts per table III and MIL-S-85242/1(AS) figure 5 requirement 8:

(a) Carry load (b) and (c) (BR and 1).

(b) Made and at rest, automatically increase load(s) per (a) and (c).

(c) Delay one second minimum, two seconds maximum automatically remove load(s) (a) and (c), conform to loads (b) and (c).

(d) Under loads (b) and (c), switch automatically pulsed to next bank terminal position (BR and 2). Repeat the foregoing operations 2, 3 and 4.

(4) Test State 4. 25,000 cycles performed as 4.6.17(c) Test State 3.

Means shall be provided to assure wiper rotation. Any contact failure shall be cause for rejection.

Type II - The life test shall be as specified in the specification sheet.

4.6.17.1 Resistive load. Suitable resistors shall be used to provide rated current.

4.6.18 Insulation resistance. Switches shall be tested in accordance with Method 302 of MIL-STD-202. The following details shall apply:

a. Test-condition letter. A, for switches having a voltage rating of less than 60; B, for switches having a voltage rating of 60 or greater.

b. Points of measurement:

(1) Between a minimum of five mutually insulated terminals.

(2) Between coil and core.

(3) Between coil and case.

(4) Between contacts and case or frame.

4.6.19 Solderability. Switches with solder terminals shall be tested in accordance with Method 208 of MIL-STD-202. The following details and exceptions shall apply:

a. Number of terminals of each part to be tested. Two.

b. Dipping device. Need not be used.

c. Solder dip. Not applicable.

d. Examination of terminations. Method for evaluation of solder lug terminals.

This test may be performed on two terminals of each switch header (Type I) or switch deck (Type II) for a total of twelve (12) solder operations (see table I).

4.6.20 Corona (Type I). Switches shall be subjected to the following test at a maximum pressure of 1.3 inches of mercury (70,000 feet). The switch case shall be isolated from ground by a radio-frequency inductor of at least 20 mH for test power at 60 Hz or correspondingly lower inductance at higher test frequencies. Voltage across the radio-frequency inductor shall be coupled at a corona detector which shall be either an oscilloscope having a minimum sensitivity of 0.1 peak volt per inch up to at least 200 kilohertz (khz), or a radio receiver having a minimum sensitivity of 25 microvolts in the 100 kHz to 10 megahertz range. Noise-limiting and narrow-band filtering circuits in the receiver shall be disabled. A radio-noise-free and corona-free power-frequency test voltage of approximately 150 percent (rms value) of the specified rated voltage shall be applied to the switch. The test shall be conducted in a suitable radio-noise-free test location.

4.6.21 Storage. Switches shall be stored under standard laboratory conditions at 100°C for a period of ten hours. Upon return to laboratory ambient temperature (24 hours later) the switches shall be tested per 4.6.4.1 and 4.6.18.

4.6.22 Electromagnetic compatibility (Type I). Electromagnetic interference requirements shall be as specified in MIL-STD-461, Class 1D.

4.6.23 Acceleration (Type II). Switches shall be tested as specified in the specification sheet.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-S-28786.

6. NOTES AND CONCLUDING MATERIAL

6.1 Intended use.

Type I - The switch is intended for use with aircraft pylons and associated equipment.

Type II - The switch is intended for use in the intervalometer, type DTU-29/A.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number and date of this specification and the part number and applicable specification sheet.

b. Levels of preservation-packaging and packing (see 5.1).

c. Serialization requirements, if applicable.

d. Production lot acceptance, if other than specified in Section 4 of this specification.

e. Whether first article is required (see 3.2 and 6.3).

f. First article sample requirements, if other than specified in Section 4 of this specification.

g. Where first article samples are to be forwarded (see 4.3 and 6.3).

h. Samples subjected to sampling inspection shall not be considered or accepted as part of the contract (see 4.4.2).

i. Sampling inspection selection (see 4.4.2).

j. Name and location of Government quality assurance representative/specialist responsible for random selection of inspection samples (see 4.4).

k. Name and location of Government approved test laboratory.

6.2.2 Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DAR 7-104.9(n)(2) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraphs:

Paragraph No.	Data Requirement Title	Applicable DID No.
4.3, 4.4	Inspection and test reports	DI-T-5329

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5000.19L, Volume II, AMSDL. Copies of Data Item Descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.3 First article. When a first article is required for inspection and approval (see 3.2, 4.3, and 6.2.1), the contract shall

specify the following provision for first article inspection. When a contractor is in continuous production of switches from contract to contract, consideration should be given to waive the first article inspections. If inspection is required, indicate:

a. If first article inspections are conducted at the contractor's plant or a Government approved laboratory, an inspection report shall be forwarded to the acquiring activity for verification.

b. That the approval of first article samples or the waiving of the first article inspection shall not relieve the contractor of his obligation to fulfill all other requirements of the specification and contract.

6.3.1 First article inspection. Contracts shall specify the following provision for first article inspection. No production switches shall be delivered prior to the approval of the first article sample. Prefabrication of production switches prior to the approval of the first article sample is at the contractor's own risk. The approved first article sample shall be retained by the contractor for his own use in the fabrication and testing of switches to be submitted for acceptance. The first article sample shall not be considered as switches supplied under the contract for delivery as part of the production lot.

6.4 Quality assurance definitions. Definitions for quality assurance terms are in accordance with MIL-STD-109.

6.5 Definitions.

6.5.1 Stepping switch. A stepping switch is defined as an electromagnetic device capable of switching one or more poles to any one of a predetermined number of positions. This being accomplished by the remote controlled rotation of the wiper assembly in a manner such that any pole can be made to contact any one of its associated bank contacts. In addition, it may have interrupter contacts which operate and release once each rotary step and off-normal springs which operate at a prescribed point (or points) in the rotation.

6.5.2 Unidirectional, pulsed operation only. A unidirectional switch for pulsed operation only, is one designed to rotate in one direction only and is required to take one step for each application of operating power.

6.5.3 Unidirectional, pulsed and self-interrupted operation. A unidirectional switch for pulsed and self-interrupted operation is one designed to rotate in one direction only, required to take one step for each application of power, and having one pair of normally closed interrupter contacts capable of being arranged so that a steady power will cause the wiper to rotate continuously.

6.5.4 Bidirectional, pulsed operation only. Same as 6.5.2 except that the wiper will step in either direction.

6.5.5 Bidirectional, pulsed and self-interrupted operation. Same as 6.5.3 except capable of rotation in either direction.

6.5.6 Multidirectional. Multidirectional switch is one which can be stepped in two different planes of movement, usually longitudinally, with respect to the axis of the rotor, with wiper rotation along a selected row of contacts.

6.5.7 Direct drive. A directly-driven stepping switch is one designed to advance its wipers when the circuit is closed to the actuating motor magnet.

6.5.8 Indirect drive. An indirectly-driven stepping switch is one designed to advance its wipers when the pulse to the stepping electromagnet ceases.

6.5.9 Rated coil voltage. The design voltage which may be applied for the rated duty cycle.

6.5.10 Cycle. A cycle is that number of steps required for the wiper to make and break each contact on the bank, i.e., 10 steps for a switch having a 10 point bank: 26 steps for a switch having a 26 point bank.

6.5.11 Hermetic seal. A hermetic seal shall be a gas-tight enclosure which has been completely sealed by means of fusion of glass or ceramic to metal or bonding of metal to metal.

6.5.12 Parallel combinations. Parallel combinations are any two or more contacts of the same number and/or position on different levels connected together.

6.5.13 Bridging contacts. Bridging contacts are any two or more adjacent contacts of the same level connected together.

6.5.14 Switching contacts. Switching contacts are the contacts that are located on all levels and bank terminal positions that make or break due to wiper arm action or movement.

6.5.15 Interrupter contacts. Interrupter contacts are either auxiliary contacts or independent contacts and are utilized to self-interrupt the coil power for continuous cycling and are actuated by the coil solenoid.

6.5.16 Contractor. Unless otherwise specified, the word "contractor" used throughout this specification shall mean any supplier or producer of items or material to the Government. This shall include

commercial contractors, subcontractors, Government-owned, contractor-operated (GOCO) and Government-owned, Government-operated (GOGO) plants.

6.6 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodian:
Navy - AS

Review activity:
DLA - ES

Preparing Activity:
Navy - AS
(Project No. 5930-N573)

TABLE I. First article inspection.

Examination or test 2/	Requirement paragraph	Method paragraph
Sample Group I (all units)		
Visual and mechanical examination (external and internal) 1/.....	3.4 thru 3.7, 3.8.1, 3.8.3 thru 3.8.7, 3.8.9 and 3.9	4.6.3
Electrical characteristics.....	3.8.10	4.6.4
Dielectric withstanding voltage.....	3.8.11	4.6.5
Solderability (2 units).....	3.8.25	4.6.19
Sample Group II (3 units)		
Thermal Shock.....	3.8.12	4.6.6
Vibration.....	3.8.13	4.6.7
Shock.....	3.8.14	4.6.8
Acceleration (Type II).....	3.8.29	4.6.23
Salt spray (corrosion) (Type I).....	3.8.15	4.6.9
Seal (Type I).....	3.8.16	4.6.10
Electrical characteristics.....	3.8.10	4.6.4
Sample Group III (3 units)		
Terminal strength (Type I).....	3.8.17	4.6.11
Intermediate current (wiper contacts)..	3.8.18	4.6.12
Humidity resistance (Type I).....	3.8.19	4.6.13
Seal (Type I).....	3.8.16	4.6.10
Storage.....	3.8.27	4.6.21
Electromagnetic compatibility (Type I).	3.8.28	4.6.22
Sample Group IV (3 units)		
High- and low-temperature operation...	3.8.20	4.6.14
Overload (includes contact resistance) (Type I).....	3.8.21	4.6.15
Overvoltage (Type I).....	3.8.22	4.6.16
Life.....	3.8.23	4.6.17
Seal (Type I)	3.8.16	4.6.10
Insulation resistance.....	3.8.24	4.6.18
Dielectric withstanding voltage.....	3.8.11	4.6.5
Corona (Type I).....	3.8.26	4.6.20

1/ When hermetically sealed switches are submitted, the internal examination shall be conducted on an unsealed unit. This sample unit shall not be used for any subsequent test.

2/ Units shall successively, and in the order listed, undergo the tests required for the sample groups to which they have been assigned.

TABLE II. Group A inspection.

Examination or test	Requirement paragraph	Method paragraph	AQL (percent defective) Major	AQL (percent defective) Minor
Visual and mechanical examination (external and internal) 1/	3.4 thru 3.7, 3.8.4, 3.8.6 and 3.9	4.6.3	1.0	4.0
Electrical characteristics 1/	3.8.10	4.6.4	1.0	---
Seal (Type I)	3.8.16	4.6.10		
Dielectric withstanding voltage 2/ .	3.8.11	4.6.5		

1/ Individual inspection (Type II switch): Inspection shall consist of 100 percent visual and mechanical examinations and electrical inspection at room temperature. All tests listed in table II of the specification sheet shall be performed to check electrical characteristics and record adequate data to assure satisfactory switch operation. The test circuit shown in figure 5 of the specification sheet shall be utilized except connect only three wires, FA1, SL1 and GN1.

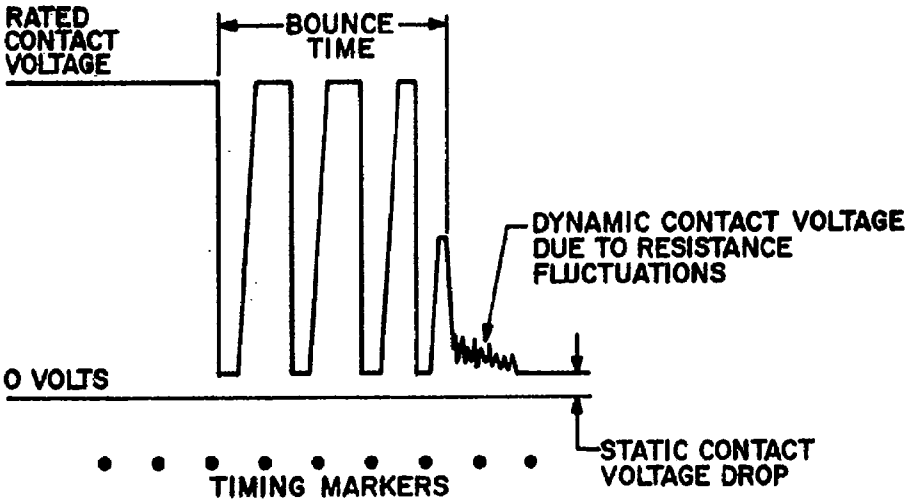
2/ Dielectric withstanding voltage test shall not be performed on individual inspection for Type II switch.

TABLE III. Switch contacts to be tested.

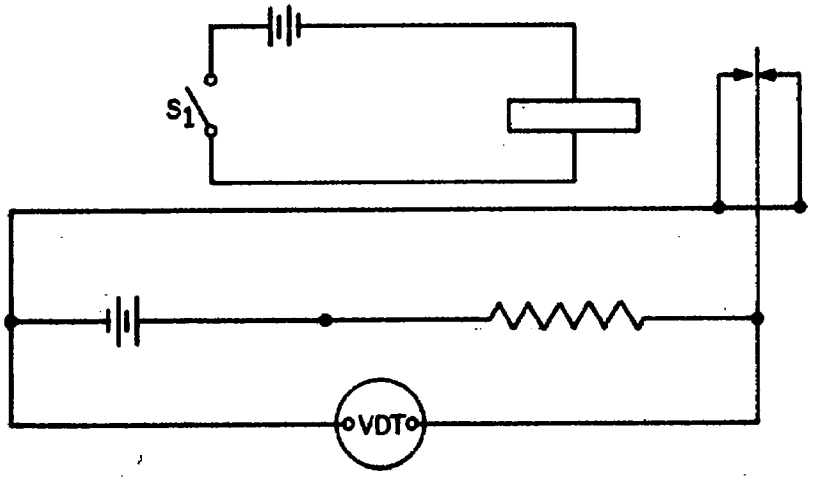
(a)	One set of contacts - Parallel combination (Type I).
(b)	One set of contacts - That are bridged.
(c)	One set of contacts - That are independent.
(d)*	Interrupter contacts - Make and Break (Type I).

*Refer to definitions.

All electrical connections are to be made at the headers for Type I (see MIL-S-85242/1(AS), figure 2).

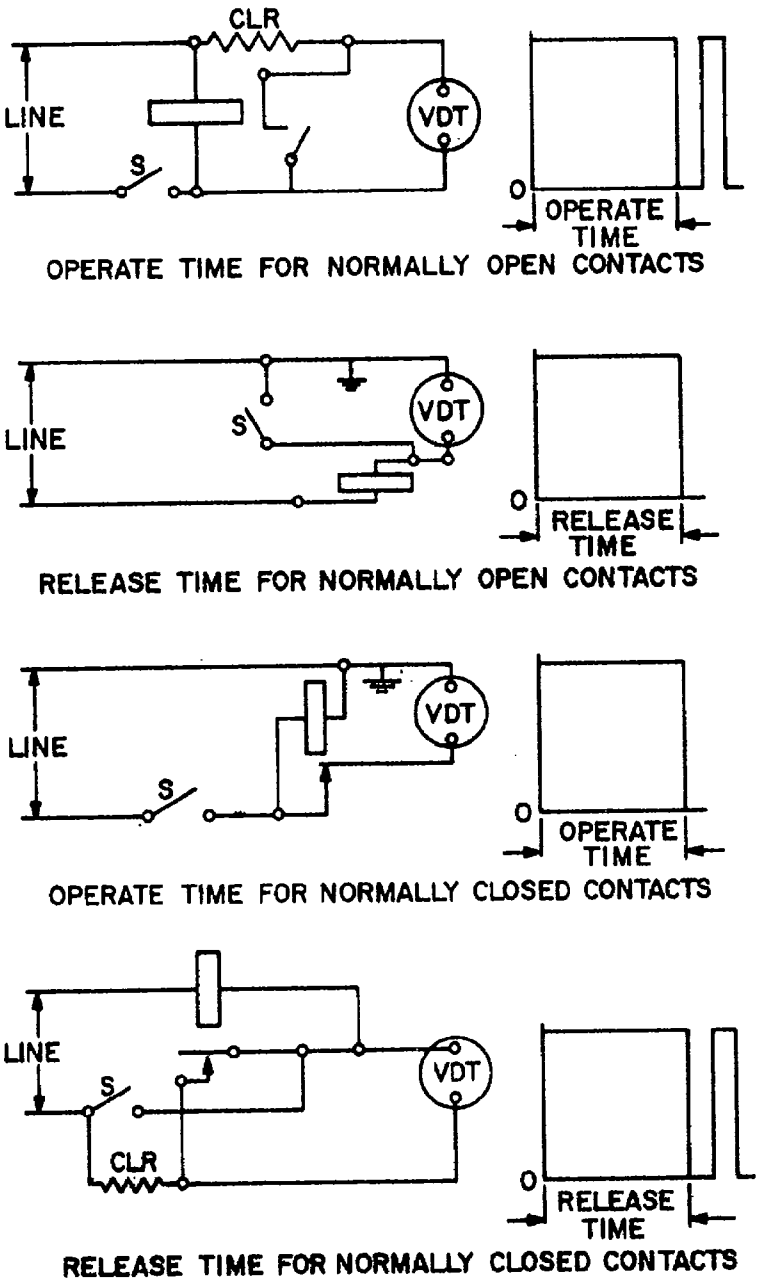


TYPICAL RECORDING OF CONTACT BOUNCE



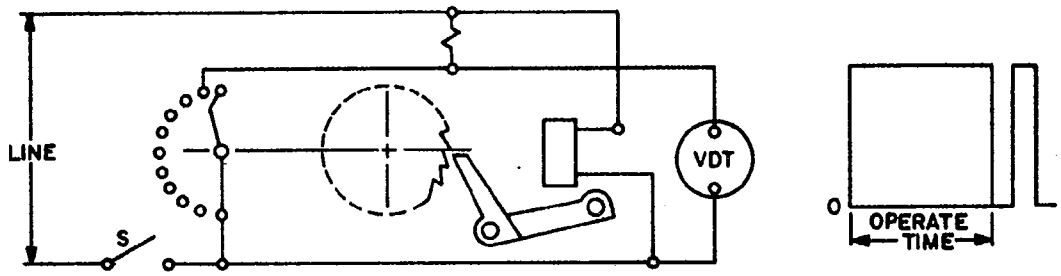
TEST CIRCUIT FOR CONTACT BOUNCE

FIGURE 1. Contact bounce (Type I).

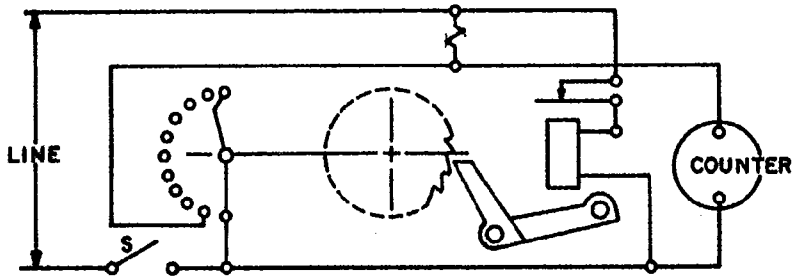


The switch(s) is shown in the position it would assume at the start of the test cycle. Upon operation of the switch(s), an impulse proportional to the line voltage will be transmitted to the vertical deflection terminals (VDT) of the oscilloscope and the applicable time can be determined. Where current-limiting resistors (CLR) are shown, appropriate values shall be used. Care should be taken not to include irregularities due to switching such as by use of a mercury switch.

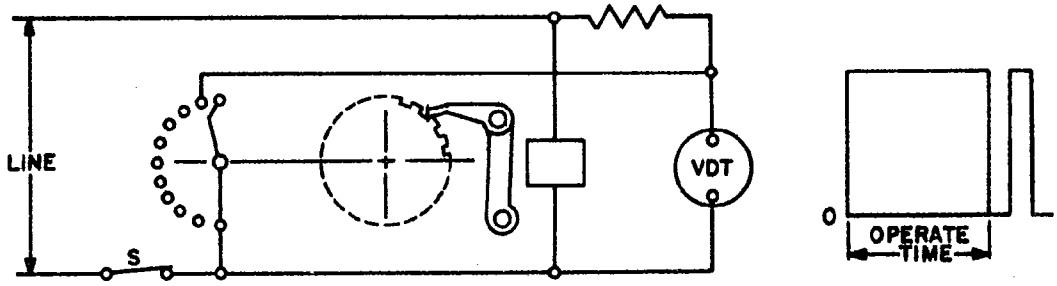
FIGURE 2. Operate and release time (Type I).



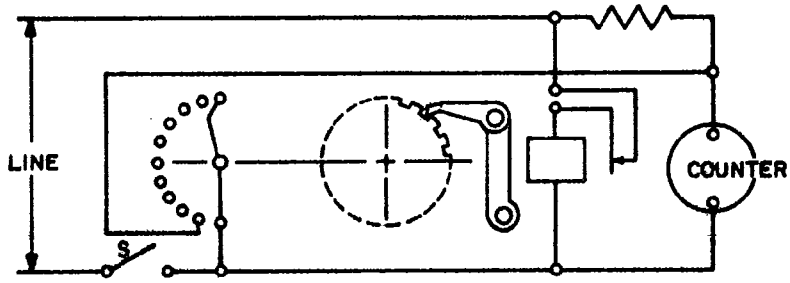
OPERATE TIME FOR DIRECT DRIVE SWITCH



HOMING TIME FOR DIRECT DRIVE SWITCH



OPERATE TIME FOR INDIRECT DRIVE SWITCH



HOMING TIME FOR INDIRECT DRIVE SWITCH

FIGURE 2. Operate and release time (Type I) - Continued.