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PRODUCTION SPECIFICATION

FOR

BAROSWITCH TESTER (T-1) BST

8/13/96
 R.T. Huff
 8-13-96
 W. Layne

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 Declassify

L. J. Biskner
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 Production Engineering
 Sandia Corporation

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SANDIA CORPORATION

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PRODUCTION SPECIFICATION
FOR
BAROSWITCH TESTER (T-1) BST
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A. APPLICABLE SPECIFICATIONS AND DRAWINGS.

A-1. The following specifications of issue designated form a part of this specification unless specific exceptions are made herein.

MILITARY SPECIFICATION

MIL-A-6863, Procurement Specification for Altimeter, Pressure.

AIR FORCE - NAVY AERONAUTICAL SPECIFICATION.

AN-576Q-4A, Altimeter, Pressure.

U. S. AIR FORCE SPECIFICATION

Spec. No. 21244-A, INDICATOR: Aircraft Synchro, Remote, General Specification for Revised Issue, April 4, 1949.

NATIONAL BUREAU OF STANDARDS SPECIFICATION
N.A.C.A. REPORT # 538, dated 1948.

SANDIA CORPORATION SPECIFICATION

CPS-3, Commercial Packaging Specification for Electrical Test Carrying Cases with or without Electrical Test Set, Original Issue, June 19, 1951.

A-2. Sandia Corporation Drawings. The following drawings shall form a part of this specification:

NY 108555 Numerical Index for T-1.
PL 108555 Parts List for T-1.

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A-3. Precedence. The order of the following indicates precedence whenever their requirements are in conflict.

- a. Contract.
- b. Drawings.
- c. This Specification.
- d. Reference Specifications.

B. PURPOSE AND SCOPE.

This specification covers the manufacturing information needed to build the T-1 (Baro Switch Tester) and the electrical and mechanical requirements that it must meet.

C. MATERIAL AND WORKMANSHIP.

C-1. Approved Materials. The materials for each part must be as specified herein. Where a definite material is not specified, a suitable material shall be used. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

C-2. Substitution. If the manufacturer desires to substitute for a specified or previously approved material or fabricated part, he shall submit to the procuring agency a request together with evidence to substantiate his claim that such a substitution is suitable. At the discretion of the procuring agency, test samples may be required to prove the suitability of the proposed substitution. NO SUBSTITUTION may be made without the written approval of the procurement agency.

C-3. Solder and Solder Flux.

C-3a. Cleaning. All joints shall be clean before solder is applied. Only a Non-Corrosive Cleaner may be used when a cleaner is required.

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C-3b. Soldering Flux. Only rosin, rosin and alcohol, or equivalent plastic rosin mixture may be used as a flux for soldering or for cleaning soldering irons. No acid or other corrosive material shall be used in any mixture.

C-3c. Soldering. Soldering shall be done so that good electrical and mechanical connections are obtained. There shall be no "Cold Joints". Sufficient heat shall be applied to the joints so that solder flows freely and completely over the joint. No damage to adjacent parts shall result from soldering operations.

C-4. Workmanship. The complete assembly shall be manufactured and processed in a careful and workmanlike manner in accordance with good shop and manufacturing practices. The workmanship shall be satisfactory to the procuring agency.

D. GENERAL REQUIREMENTS.

D-1. Description. The T-1 is a Baroswitch Tester designed for field use in testing remote control baroswitches.

D-2. Pressure Altitude Standards. The relation between pressure in mm Hg absolute and that expressed in feet of altitude pressure shall conform to the National Advisory Committee for Aeronautics, report No. 538, originally published September, 1935.

D-3. Storage Conditions. During storage the T-1 may be subjected to seasonal variations of temperature between -20° F and $+140^{\circ}$ F and relative humidities from 0 to 100 percent over a storage period up to five (5) years. Upon being withdrawn from storage, the T-1 shall be examined for failures and shall be capable of normal operation in accordance with the requirements of this specification.

D-4. Environmental Requirements. The requirements specified in the following paragraphs are mandatory requirements. It is considered that the design of the T-1 is such that when all electrical

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and mechanical specifications are met, the T-1 will be capable of meeting these detail requirements. It is not necessary that units be tested for compliance to these requirements according to any specific sampling plan or rate. The manufacturer should assure himself to his own satisfaction that the product complies with these requirements. Units may be tested at random by Sandia.

D-4a. Equipment Non-Operating. The T-1 shall be capable of withstanding the following environmental conditions when contained in its case with the lid closed:

(1). Barometric Pressure. The T-1 shall be placed in a chamber and the internal absolute pressure reduced to 11 inches of mercury ± 5 percent and the ambient temperature reduced to $-40^{\circ}\text{F} \pm 5^{\circ}$. The equipment shall be stabilized at that pressure and temperature for a period of one-half hour. When the Unit returns to normal room temperature and pressure, it shall be examined for failures and shall be capable of normal operation in accordance with the requirements of this specification.

(2). High Temperature. The T-1 shall be placed within a chamber and the internal temperature of the chamber shall be raised to $\neq 170^{\circ}\text{F} \pm 5^{\circ}$ with an internal relative humidity of not more than 10 percent. The source of heat for the chamber shall be arranged in such a manner that radiant heat shall not fall upon the test specimen. The total volume occupied by a single item of equipment, or by several items, shall not exceed 50 percent of the internal volume of the test chamber. The T-1 shall be maintained at $\neq 170^{\circ}\text{F} \pm 5^{\circ}$ for a period of 10 hours. Then the equipment shall be allowed to return to room temperature, examined for failures, and shall be capable of normal operation in accordance with the requirements of this specification.

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(3). Low Temperature. The T-1 shall be placed in a test chamber and cooled to and maintained at a temperature of $-65^{\circ} \pm 5^{\circ}$ for a minimum of 10 hours. The temperature of the equipment shall then be allowed to return to normal room temperature, after which the T-1 shall be examined for failures, and shall be capable of normal operation in accordance with the requirements of this specification.

(4). Vibration. The case containing the T-1 shall be secured to a vibration table and vibrated in three mutually perpendicular directions with the frequency varying between 10 and 55 cycles per second ± 2 percent at a total excursion of 0.06 inch ± 5 percent for a period of 45 minutes in each plane. The frequency in this test shall vary uniformly from 10 to 55 cycles per second and return to 10 cycles per second in approximately one minute. Upon completion of this test, the equipment shall be examined for failures, and shall be capable of normal operation in accordance with the requirements of this specification.

(5). Shock. The equipment shall be capable of withstanding the following shock tests:

(5)a. Drop Edge Wise Test. The T-1 in its case shall be supported at one end of its base on a sill six inches in height placed at right angles to the longitudinal axis of the base. The opposite end of the case shall then be raised and allowed to fall to a concrete or similarly hard surface from heights of 6, 12, 18, 24, 30, and 36 inches successively. This test shall be applied to each end of the case. If the size of the case and the location of the center of gravity are such that drop tests cannot be performed from all the prescribed heights, the greatest attainable height shall be the height for succeeding drops until a total of six drops have been performed. Upon completion of this test, the equipment shall be examined for failure, and shall be capable of normal operation in accordance with the requirements of this specification.

(5)b. Drop Cornerwise Test.

In addition to the six inch sill used in the Drop Edgewise Test above, a six inch block shall be placed under one corner of the supported end of the case containing the T-1 so that when allowed to fall, the case shall hit on just one corner of the opposite end of the base. The opposite end of the case shall then be raised and allowed to fall on concrete or other hard surface from heights of 6, 12, 18, 24, 30, and 36 inches successively. The height shall be measured from the concrete surface to the lowest corner that is being raised. The test shall be applied to all four bottom corners of the case. If the size of the case and the location of the center of gravity are such that drop tests cannot be performed from all the prescribed heights, the greatest attainable height shall be the height for succeeding drops until a total of six drops have been performed on each corner. Upon completion of this test, the equipment shall be examined for failure, and shall be capable of normal operation in accordance with the requirements of this specification.

(5)c. Tipover Test.

The case containing the T-1 shall be set on its base and then shall be tipped over in such a manner that it comes to rest in a horizontal position after falling freely and striking a concrete or other hard surface. This test shall be repeated until the T-1 has been tipped over on its front, back, and both of its sides. Upon completion of this test, the equipment shall be examined for failures, and shall be capable of normal operation in accordance with the requirements of this specification.

D-4b. Equipment Operating. The equipment shall be capable of withstanding the following conditions when contained within its case with the lid removed and all associated cables attached:

(1). Barometric Pressure. The T-1 shall be placed in a chamber with the internal pressure reduced to 21 inches of mercury \pm 5 percent and the ambient temperature reduced to 0° F \pm 5°.

The equipment shall be stabilized at this pressure and temperature for a period of two hours. The equipment shall be capable of normal operation, in accordance with the requirements of this specification, twice during the test and upon completion of the test.

(2). Temperature and Humidity.

The T-1 shall be placed in a chamber with the temperature reduced to $0^{\circ}\text{F} \pm 5^{\circ}$ and maintained at this temperature for 10 hours. The temperature shall then be raised to $\pm 130^{\circ}\text{F} \pm 5^{\circ}$ and maintained at this temperature for a period of 10 hours. The relative humidity at $\pm 130^{\circ}\text{F}$ shall be 95 percent (wet bulb $\pm 2^{\circ}\text{F}$ and the dry bulb $\pm 1^{\circ}\text{F}$ to produce the relative humidity as specified). The relative humidity at other temperatures need not be controlled. The equipment shall be examined for failures and shall be capable of normal operation, in accordance with the requirements of this specification, once every two hours during the test and upon completion of the test.

(3). Vibration.

The case containing the T-1 shall be secured to a vibration table and vibrated in three mutually perpendicular directions with the frequency varying between 10 and 55 cycles per second ± 2 percent at a total excursion of 0.03 inch ± 5 percent for a period of 45 minutes in each plane. The frequency in this test shall vary uniformly from 10 to 55 cycles per second and return to 10 cycles per second in approximately one minute. Upon completion of this test, the equipment shall be examined for failures, and shall be capable of normal operation in accordance with the requirements of this specification.

E. DETAIL REQUIREMENTS.

The detail requirements are as specified on the drawings and in this specification.

E-1. Functional Requirements.

E-1a. Functional Tests. The T-1 shall be removed from its case and tested with reference to "Schematic, T-1". A suitable test shall be applied to this unit which will test all components and determine correct pressure measurements, voltages, and currents. The following requirements shall be met:

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(1). Operation of Relays, Valves, and Switches. The opening or closing operation of every relay, valve, or switch shall be checked for correct operation.

(2). Altimeter. The altimeter, when adjusted, shall correctly indicate pressure altitude from zero feet (sea level) to 15,000 feet. Tolerance shall be according to MIL-A-6863 Procurement Specification for AN-5760-4B Altimeter, Pressure. (Ref. D-2.)

(3). Indicator, Synchro. The indicator shall be tested with a zero transformer in conformance to U.S.A.F. specification No. 21244-A.

(4). Power-On-Tests. With a power supply source of $\pm 28 \pm 1$ Volts D.C. supplied to the T-1, the following items shall be checked:

(4)a. Indicator Lamp Circuits. The operation of each indicator lamp shall be tested (Press to test). The DC PWR lamp shall be checked to light when the two clip leads of cable CT-544 are clipped together.

(4)b. Diodes. Each of the three diodes, CR-1, CR-2, and CR-3, shall be checked for correct installation with respect to polarity.

(4)c. Pressure Duty Cycle. The T-1, while operating at any station pressure from 31 to 21 inches of mercury (absolute), shall create a pressure of 29.92 inches of mercury (absolute) within a hundred cubic inch enclosure; it shall then reduce this pressure to 5.54 inches of mercury (absolute) and return the enclosure to station pressure.

(4)d. Pump Adjustment. The pump shall be adjusted with maximum load to a current of $12 \pm 0 - 1/2$ amperes, and checked for correct operation. (Maximum load occurs during the DESCEND operation.)

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(4)E. Rotary Converter.

The rotary converter shall be adjusted at no load for 28 ± 1 Volts AC by means of R-201, and checked for correct operation.

E-2. Continuity Test. With a suitable method, a point to point continuity test shall be made in accordance with the "Schematic, T-1" except those circuits already tested in "E-1a" above. This continuity test shall include all associated cables.

E-3. Insulation Resistance Test. The insulation resistance of the wiring and connectors shall be measured with a megohm bridge, or other approved method, at a potential between 100 and 500 Volts d-c with an electrification time not to exceed two minutes. The insulation resistance shall not be less than 50 megohms when measured between each circuit and the T-1 chassis with all remaining insulated circuits connected to the chassis.

E-4. Leakage Test. The manufacturer shall assure himself that the T-1 meets the test outlined in this paragraph. The T-1, including Hose Assembly #102943 and associated fittings, shall be capable of passing the following test: With the pneumatic system closed and the Altimeter indicating 40,000 feet, the leakage shall not be more than 100 feet per minute as indicated on the Altimeter. This test shall be performed at an Ambient Pressure as Specified for "0" altitude in Table III of M.A.C.A. Report #538 - Dated 1948.

F. METHODS OF TESTING, SAMPLING, AND INSPECTION.

F-1. Inspection. If an authorized representative is assigned by the procuring agency, he may be present at the point of manufacture during testing to determine compliance with the requirements of this specification.

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F-2. Test Facilities at the Place of Manufacture.
The manufacturer shall have available and maintain all necessary facilities and equipment at the point of manufacture for making all tests of section "E" of this specification. The test equipment shall be adequate in quantity to enable the inspection to keep up with production. The test equipment shall be of sufficient accuracy and quality to permit performance of the required tests.

F-3. Test Conditions. Unless otherwise specified, all measurements, tests, and calibrations shall be made for the complete section "E" with the equipment at an ambient temperature of $\pm 77^{\circ} \text{F} \pm 5^{\circ}$ and at ambient humidity and pressure.

F-4. Test Records. When test records are required by the procuring agency, records shall be made of all measurements required in all tests of this specification. The records shall be submitted to the procuring agency with the tested units.

F-5. Production Tests. Production tests shall be conducted by the contractor on each unit to determine whether the equipment is meeting the requirements of section "E" of this specification. The proposed production test procedure and a list of required test equipment shall be prepared by the Contractor and submitted to the procuring agency for approval.

F-6. Quality Assurance Tests. Quality assurance tests shall be conducted by the procuring agency at a point designated by the agency and on the basis of a sampling rate agreed upon by the procuring agency and the contractor. These tests shall be of such scope as to determine whether the equipment meets the requirements of sections "D" and "E" of this specification.

G. PACKING, PACKAGING, AND MARKING FOR SHIPMENT.

The T-1 shall be shipped individually in its own container. The case containing the T-1 shall be packaged according to Sandia Corporation Commercial Packaging Specifications for Electrical Test Carrying Cases with or without Electrical Test Set, CPS-3, Original Issue, dated June 19, 1951.

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H. NOTES

H-1. Copies of Joint Army-Navy Specifications and Federal Specifications may be obtained upon application to the Superintendent of Documents, Government Printing Office, Washington, 25, D.C. When requesting copies, give number, title, and the date.

H-2. Copies of Air Force-Navy Aeronautical Specifications may be obtained upon application to the Commanding General, Air Materiel Command, Wright Patterson Air Force Base, Dayton, Ohio. When requesting copies, give number, title, and the date.

H-3. Copies of Bureau of Ordnance Specifications may be obtained upon application to the Bureau of Ordnance, Navy Department, Washington, 25, D. C. When requesting copies, give number, title, and the date.

H-4. Copies of Sandia Corporation Specification may be obtained upon application to the procuring agency or its authorized representative. When requesting copies, give number, title, and the date.

H-5. Copies of Sandia Corporation Drawings may be obtained upon application to the procuring agency or its authorized representative. When requesting copies, give number, title, and the date.

H-6. Copies of request, requisitions, schedules, contracts, and orders may be obtained upon application to the procuring agency. When requesting copies, give number, title, and the date.

NOTICE: When Government Drawings, Specifications, or other data are used for any purpose other than in connection with the definitely related Government Procurement Operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded, by implication or otherwise, as in any manner licensing the holder or any other person or corporation or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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