SAE Aerospace
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AEROSPACE STANDARD

AS 8003

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MINIMUM PERFORMANCE STANDARD FOR AUTOMATIC PRESSURE ALTITUDE REPORTING CODE GENERATING EQUIPMENT

1. PURPOSE

1.1 This Aerospace Standard establishes the minimum safe performance requirements for 100 foot (30.48 metres), incremental automatic pressure altitude code generating equipment. It is intended that the code generator be operated by a pressure altitude device which may also operate the pressure altitude indicator normally used to maintain flight altitude.

1.2 This code generating equipment is defined as the combination of components needed to convert pressure altitude information into the digital code in accordance with the U.S. National Standard for Common System Component Characteristics for the IFF Mark X (SIF)/Air Traffic Control Radar Beacon System and the International (ICAO) Standard Code for S.S.R. Pressure Altitude Transmission contained in ICAO International Standards and Recommended Practices; Aeronautical Telecommunication, Annex 10, Volume I, Part I, Equipment and Systems.

2. SCOPE

This Aerospace Standard covers all automatic pressure altitude code generating equipment manufactured under this standard and complying with the requirements specified herein up to the maximum range of pressure altitude as indicated on the equipment nameplate. In those cases where the code generating equipment forms part of an aircraft system, such as a pressure altimeter, an air data computer or an ATC Transponder, this standard applies only to the code generating equipment as defined in paragraph 1.2.

3. GENERAL STANDARDS

3.1 Accessibility of Controls: Controls or adjustments which are not normally adjusted in flight shall not be readily accessible to flight personnel.

3.2 Compatibility of Components: The Automatic Pressure Altitude Code Generating Equipment defined herein may be qualified as part of other systems and equipment. If the code generation equipment contains components which require matching, they shall be identified in a manner that will assure proper performance in accordance with this standard.

3.3 Interchangeability: Instruments and components which are identified with the same part number and which do not require matching, shall be completely interchangeable.

3.4 Fail Safe Provision: No single failure or malfunction of the code generating equipment output shall cause a malfunctioning of the associated pressure altitude indication.

3.5 Digital Code Output: The digital pressure altitude output code which will be supplied to the ATC Transponder shall be in accordance with the International (ICAO) Standard Code for S.S.R. Pressure Altitude Transmission contained in ICAO International Standards and Recommended Practices; Aeronautical Telecommunications, Annex 10, Volume I, Part I, Equipment and Systems. This ICAO code is the same as specified in the U.S. National Standard for Common System Component Characteristics for IFF Mark X (SIF)/ Air Traffic Control Radar Beacon System SIF/ATCRBS as amended March 8, 1971.

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3.6 Pressure Datum: The code generator outputs shall be referenced to 29.9213 in. Hg absolute or 1013.25 millibars or 760.001 mm Hg absolute, for zero feet indication and shall supply the encoded output values in accordance with the U.S. Standard Pressure Altitude Tables 1962. If the code generation equipment forms part of an altimeter system, the altimeter's barometric setting system shall not affect the encoded outputs.

3.7 Operating Range: The operation range for all pressure altitude code generating devices shall start at or below -1000 feet (-304.8 metres) M.S.L. pressure altitude and shall continue to the upper pressure altitude limit as indicated on the equipment nameplate.

3.8 Power Loss: If electrical power is used to operate the pressure altitude code generating equipment, means shall be incorporated in the equipment to indicate the loss of electrical power or the effect thereof, unless the electrical power to operate the code generating equipment is supplied by an ATC Transponder which also supplies an indication of this power loss. Under the power loss condition, the equipment shall:

a) Provide for the deactivation of the generated digital code outpit in a manner which removes the altitude information supplied to the ATC Transponder.

b) Provide means to indicate the loss of electrical power in a positive manner.

Power from the ATC Transponder as related to the generated encoded output does not require power loss indications.

3.9 Encoded Altitude Return Lead, Common: The opening of the common lead or the equivalent thereto shall result in no encoded altitude information being transmitted to the ATC Transponder. If the code generator requires its own power supply to generate the code, the circuit design shall be such that this function of opening the common lead or the equivalent thereto is not impaired.

3.10 Overrange Operation: Appropriate means shall be incorporated within the code generating equipment to provide for encoded output for at least the extremes of the specified operating range of the instrument. Overrange of the instrument shall not cause the generation of any encoded output which is within the specified operating range of the instrument.

3.11 Correspondence: The pressure altitude generated encoded output shall correspond to the displayed pressure altitude indication used to maintain flight altitude to within ± 125 feet (38.1 metres) when the pressure datum is set for 29.921 inches of mercury absolute (1013.25 millibars or 760 mm Hg Abs.).

3.11.1 For any barometric setting within the operating range of barometric settings for the pressure altitude display, the generated encoded output which is transmitted to the ATC Transponder shall correspond to the displayed altitude value to within ± 125 feet (38.1 metres) when the displayed altitude value is corrected for the difference in feet as a result of the applied barometric setting and the value of the displayed pressure altitude based on the pressure datum of 29.921 inches of mercury absolute (1013.25 millibars or 760 mm Hg Abs.).

3.11.2 The requirements specified in 3.11 and 3.11.1 shall be applicable to both increasing and decreasing pressure altitude changes.

NOTE: For example, if the encoded output is 10,000 feet (3048 metres), the pressure altitude display (when corrected for the actual barometric setting in feet and the pressure datum) shall indicate 10,000 feet (3048 metres) ± 125 feet (38.1 metres) during the whole interval that the encoded output remains at 10,000 feet.

3.12 Transition Accuracy: When a transition from one encoded output to the next encoded output occurs, for both increasing and decreasing altitude changes, the displayed pressure altitude shall be within ± 75 feet (22.86 metres) of the nominal pressure altitude for that transition point, corrected for the differences in feet as a result of the applied barometric setting and the value of the displayed pressure altitude based on the pressure datum of 29.921 inches of mercury absolute (1013.25 millibars or 760 mm Hg Abs.).

3.12.1 Transition points for both the ON and OFF position for each output bit (channel) shall be checked in an increasing altitude direction and the transition at the same points shall be checked in a decreasing altitude direction.

3.12.2 Transition points for each bit (channel) shall be checked for all bits (channels) in accordance with the maximum operating altitude range defined for the equipment.

3.13 Fire Resistance: Except for small parts (such as knobs, fasteners, seals, grommets, and small electrical parts) that would not contribute significantly to the propagation of a fire, all combustible materials must be self extinguishing. When tested in an approved method, the average burn length must not exceed 3 inches (76.2 min) and the average flame time after removal of the flame source must not exceed 30 seconds. Drippings from the test specimen must not continue to flame for more than an average of 3 seconds after falling.

4. PERFORMANCE UNDER STANDARD CONDITIONS

4.1 Standard Atmospheric Conditions: Unless otherside specified herein, all tests required shall be made at atmospheric conditions specified in paragraph 3.4 of DO-138.

4.2 Attitude: Unless otherwise specified, herein, all tests shall be conducted with the instrument in its normal operating position as defined in the manufacturers installation instructions.

4.3 Performance Tests: The instrument shall be tested to demonstrate compliance with 3.8, 3.9, 3.10, 3.11 and/or 3.12 as applicable to the code generating equipment.

4.4. The performance tests specified above shall be conducted in accordance with the operational requirements specified by the manufacturer in the installation instructions and the installation instructions shall specify:

a) Code generator operating power requirements

b) ATC Transponder types and/or manufacturers with which the code generator shall interface (e.g., ARINC 532D) or the equivalent to the following information:

1. Minimum and maximum voltage and polarity that can be impressed on each encoded output lead.

2. Minimum and maximum current impressed on each encoded output lead.

3. Minimum and maximum impedance each encoded output lead will work into.

4. Minimum and maximum voltage to be measured between each encoded output lead and the encoder common for an ON signal output code (logical "1").

5. Maximum leakage current for (4) above.

6. Maximum voltage to be measured between each encoded output lead and the encoder common for an OFF signal output code (logical "O").

7. Maximum rate of altitude change for the code generating equipment.

8. The switching bandwidth in kilocycles for proper code transmission to the ATC Transponder.

9. And any other requirements which are unique to the subject code generating equipment which will affect the performance tests.