

MIL-STD-843

1 April 1965

MILITARY STANDARD

ALTIMETERS, PRESSURE,

GENERAL TEST REQUIREMENTS FOR



FSC 6610

Para.	CONTENTS	Page
1	GENERAL.....	1
1.1	Scope.....	1
2	APPLICABLE DOCUMENTS.....	1
3	DEFINITIONS.....	1
3.1	Diaphragm error or scale error.....	1
3.2	Hysteresis error.....	1
3.3	Drift error.....	1
3.4	Friction error.....	1
3.5	Temperature error.....	1
3.6	Backlash error.....	1
3.7	Static balance or position error.....	1
3.8	Coordination or barometric scale error.....	1
3.9	Instability error.....	1
3.10	Readability error.....	1
3.11	Tolerance.....	1
4	GENERAL TEST REQUIREMENTS.....	1
4.1	Standard atmosphere.....	1
4.2	Standard calibration barometer.....	1
4.3	Room temperature during tests.....	1
4.4	Pressure datum during tests.....	1 and 2
4.5	Rate of pressure change during tests.....	2
4.6	Vibration during tests.....	2
4.7	Tests to be completed.....	2
4.8	Sequence of tests.....	2
5	TEST PROCEDURES.....	2
5.1	Case leak.....	2
5.2	Static balance.....	2
5.3	Coordination or barometric pressure scale.....	2
5.4	Backlash.....	2
5.5	Friction.....	3
5.6	Diaphragm or scale error and hysteresis error.....	3
5.7	Temperature.....	3
		4

I	Pressure—altitude	3
II	Friction error	3
III	Scale error	4
IV	Hysteresis error	4

ALTIMETERS, PRESSURE, GENERAL TEST REQUIREMENTS FOR

1. GENERAL

1.1 Scope. This standard defines those tests which should be performed on pressure altimeters prior to acceptance, after extended periods of storage, or after servicing.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

MILITARY

MIL-A-23395—Altimeter, Pressure, Counter-Pointer, Type MC-3 and MC-4

PUBLICATIONS

ARDC Model Atmosphere, 1959

3. DEFINITIONS

3.1 Diaphragm error or scale error. The error in the indication due to imperfections in the construction and adjustment of the aneroid and linkage system.

3.2 Hysteresis error. The error in the indication introduced after a change in height, due to imperfectly elastic properties of the aneroid material.

3.3 Drift error. The error in the indication due to the recovery effect which occurs with time when the instrument is exposed to a fixed pressure. This is sometimes referred to as creep, lag, after-effect or time-effect.

3.4 Friction error. The error in the indication given due to friction in the mechanism.

3.5 Temperature error. The error or change of scale error attributed to the effect of a change in temperature.

3.6 Backlash error. The error in the indication due to lost motion in the transmission between the height scale and the pressure scale.

of the mechanism evidenced when the instrument is rotated from the reference position to any other position.

3.8 Coordination or barometric scale error. The error in the indication due to inability to obtain the correct relationship between the pointer indication on the height scale and the setting on the pressure scale.

3.9 Instability error. The variations in the scale error over an extended period of time. This error may be outside the limits specified for diaphragm drift tests. It may be due to the variable behavior of the instrument mechanism.

3.10 Readability error. The error due to the inability to read the altitude pointer position on the height scale due to parallax. Readability is also dependent upon the smallest graduation provided on the height scale. The readability of the barometric pressure setting scale or barometric setting counters is also affected by parallax and the smallest graduations provided.

3.11 Tolerance. The maximum permissible deviation from a stated reference datum adopted for a particular test, a positive tolerance being a permissible deviation above this datum, and a negative tolerance being a permissible deviation below this datum.

4. GENERAL TEST REQUIREMENTS

4.1 Standard atmosphere. The ARDC Model Atmosphere, 1959, shall be used as the standard atmosphere. The values shall be as listed in table III.

4.2 Standard calibration barometer. The calibration standard for atmospheric pressure should be a mercury barometer which is maintained in accordance with the manufacturer's recommendations and is accurate, with corrections, to within ± 0.005 inch. A calibration barometer newly introduced into service should be checked at intervals of approximately 3 months, until the stability of its calibration has been established.

MIL-STD-843

1 April 1965

carried out in an ambient temperature of $20^{\circ} \pm 5^{\circ}$ C. When tests are conducted with temperature substantially different from these values, temperature corrections shall be made to the barometer, if the barometer is not in a temperature controlled cabinet. When a barometer enclosed in a temperature controlled cabinet is employed, temperature corrections are not required.

4.4 Pressure datum during tests. Unless otherwise specified, all tests shall be carried out with the pressure scale of the altimeter set to 29.92 in. Hg. (1013.25 mb.).

4.5 Rate of pressure change during tests. The approximate rate of change in pressure during all tests shall be such as to produce the following change in height indication which has been selected to exceed slightly those normally encountered in actual flight operations:

when decreasing pressure—5,000 ft. per min.

when increasing pressure—6,000 ft. per min.

This rate shall be progressively reduced as the check points are approached to prevent passing the checkpoint.

4.6 Vibration during tests. Unless otherwise specified, all tests shall be made with the instrument subject to vibration to reduce friction error. This should be of the order of 0.2g and is, for instance, attainable with a vibration of 0.04 mm. total amplitude at a frequency of 20 cycles per second (cps). Frequencies less than 20 cps shall not be used. Counter-pointer altimeters shall be vibrated as specified in the detail specification.

4.7 Tests to be completed. Visual examination, static balance, a check of the baroset mechanism for binding, and the altimeter error, when the barometric pressure setting scale is set to the ambient temperature, shall be conducted as receiving tests.

4.7.1 Other tests specified in 5.1 through 5.6 shall be conducted as receiving tests unless they have been conducted by the manufacturer, and at regular time intervals once an instrument has been introduced into service or placed in storage or the mechanism has been removed from the case for any reason.

Note. This interval may vary according to the overhaul schedule adopted and the per-

formance of a particular type of instrument. New instruments will probably require more frequent testing than instruments which have been in service for some time. Relative to the maximum time interval between tests for stored instruments, the user should be guided by the recommendation of the manufacturer.

4.7.2 The low temperature test specified in 5.7 shall be conducted by a user as a receiving test unless it has been conducted by the manufacturer, and when any of the parts of the temperature-compensating mechanism have been replaced or adjusted or the diaphragm has been replaced.

4.8 Sequence of tests. The sequence of the tests listed is recommended but is not mandatory.

5. TEST PROCEDURES

5.1 Case leak. Adjust pressure to the instrument to obtain a height indication of 40,000 feet, and seal off the instrument case. The change in height indication shall not exceed 100 feet in 1 minute. Turn the pressure scale knob approximately 90 degrees and repeat the test. Repeat the test for the remaining two 90-degree positions of the knob.

5.2 Static balance. The altimeter static balance error readings shall be taken while the instrument is vented to atmosphere and in each of the following positions:

- (a) Normal operating position.
- (b) Rotated about the longitudinal axis 90 degrees.
- (c) Rotated about the longitudinal axis 180 degrees.
- (d) Rotated about the longitudinal axis 270 degrees.
- (e) Dial face up.

The readings in positions (b), (c), (d), and (e) shall not differ from the reading in the normal operating position by more than 20 feet.

5.3 Coordination or barometric pressure scale. Position the instrument so that it is in the normal operating position. With the ambient pressure held constant, various settings of the barometric pressure scale within its range shall cause the pointer to indicate the equivalent altitude differences shown in table I within a tolerance of 25 feet.

TABLE I. Pressure—altitude

Equivalent pressure (in. Hg.)	Millibars	Altitude difference (feet)
28.10.....	951.58	-1,727
28.50.....	965.12	-1,340
29.00.....	982.06	-863
29.50.....	998.99	-382
29.92.....	1013.25	0(Ref)
30.50.....	1032.85	+531
30.90.....	1046.40	+893
31.00.....	1049.79	+983

5.4 Backlash. This test may be made in conjunction with 5.3 by approaching three separate points (28.50, 29.50, and 30.50) from both directions. Turn the barometric pressure scale knob in a clockwise direction to a specific setting and note the height indication. Continue in a clockwise direction for approximately 200 feet. Slowly turn the knob in a counter-clockwise direction until the previous setting has been repeated and observe the height pointer. This setting shall cause the pointer to indicate the previous height within 20 feet, and the tolerance specified in 5.3 shall be met.

5.5 Friction. This test may be accomplished in conjunction with 5.6. With no vibration applied, adjust the pressure (see 4.5) until it has reached a value corresponding to the first height shown in the first column of table II. Read the instrument. Apply vibration and take a second reading. Repeat this procedure for each of the heights shown in the first column of table II. The difference between the two pointer indications, before and after vibration, shall not exceed the figures listed in the second column of table II. These tolerances pertain to three-pointer type proportionally higher friction tolerances.

5.6 Diaphragm or scale error and hysteresis error. No test involving pressures other than ambient shall be conducted for at least 8 hours prior to this test. Movement of the pointer during decreasing as well as increasing pressure shall be smooth and free from irregular motion when the pressure is changed uniformly. Starting with a height indication on the altimeter of

approximately -1,000 feet, the pressure shall be decreased to the first test point in table III, and consecutive height readings taken at decreasing and increasing pressures corresponding to each of the height check points shown in the first column of table III. The pressure shall be applied without overshoot of the barometer mercury column. The pressure shall be maintained at these points for a minimum of 1 minute and not more than 5 minutes before a reading is taken. The instrument reading shall be within the tolerance specified in the detail specifications. Not more than 15 minutes after the maximum range test point is reached, the pressure shall be increased to the test points indicated in table IV. The pressure shall be maintained at these points for a minimum of 1 minute and not more than 5 minutes before a reading is taken. The reading shall not differ from the reading of the scale error test during the up-scale reading by more than the listed permissible variation; however, the combined scale error and hysteresis error shall not exceed the scale error tolerance at room temperature of the detail specification.

TABLE II. Friction error

Height in geopotential feet, standard atmosphere	Maximum difference in feet after vibration
1,000.....	70
2,000.....	70
3,000.....	70
5,000.....	70
10,000.....	80
15,000.....	90
20,000.....	100
25,000.....	120
30,000.....	140
35,000.....	160
40,000.....	180
50,000.....	250
60,000.....	450
70,000.....	650
80,000.....	850

Counter-pointer altimeters shall be tested in accordance with MIL-A-23395.

MIL-STD-843
1 April 1965

TABLE III. Scale error
(Test range: 0-80,000 ft.)

Standard altitudes (feet)	Atmospheric pressure	
	MM	Inches
-1,000.....	787.86	31.018
0.....	760.00	29.921
500.....	746.37	29.385
1,000.....	732.93	28.856
1,500.....	719.70	28.335
2,000.....	706.65	27.821
2,500.....	693.80	27.315
3,000.....	681.14	26.817
4,000.....	656.38	25.842
5,000.....	632.36	24.896
6,000.....	609.05	23.978
8,000.....	564.51	22.224
10,000.....	522.65	20.577
12,000.....	483.34	19.029
14,000.....	446.46	17.577
15,000.....	428.90	16.886
16,000.....	411.90	16.216
18,000.....	379.53	14.942
20,000.....	349.25	13.750
22,000.....	320.96	12.636
25,000.....	282.03	11.103
30,000.....	225.69	8.885
35,000.....	178.83	7.041
40,000.....	140.66	5.538
45,000.....	110.62	4.355
50,000.....	86.99	3.425
55,000.....	68.40	2.693
60,000.....	53.79	2.118
70,000.....	33.26	1.3096
80,000.....	20.57	0.8099

5.7 Temperature. Repeat the test specified in 5.6 except, that the temperature shall be

stabilized at $-35^{\circ} \pm 2^{\circ} \text{C}$ for a minimum of 3 hours. For this test the scale errors shall be taken at the points specified in the detail specifications. Repeat this test with the temperature stabilized at $45^{\circ} \pm 2^{\circ} \text{C}$; repeat for $-54^{\circ} \pm 2^{\circ} \text{C}$; and repeat for $71^{\circ} \pm 2^{\circ} \text{C}$.

TABLE IV. Hysteresis error

Test points	Standard altitude (feet)	Equivalent atmospheric pressure (MM)	Permissible variation due to hysteresis (feet)
First point.....	25,000	282.03	100
Second point.....	20,000	349.25	100
Third point.....	Ground level		50

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

Copies of the ARDC Model Atmosphere, 1959, may be obtained from the Defense Documentation Center (DDC), Cameron Station, Alexandria, Virginia, 22314.

Custodians:

Army—MO

Navy—WP

Air Force—(11)

Reviewer activities:

Army—MO

Navy—WP

Air Force—(11), (67)

User activity:

Army—

Navy—

Air Force—(67)

Preparing activity:

Air Force—(11)

Project No. 6610-0087

Review/user information is current as of the date of this document. For future coordination of changes to this document, draft circulation should be based on the information in the current Federal Supply Classification Listing of DoD Standardization Documents.

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.

(Fold along this line)

(Fold along this line)

DEPARTMENT OF THE AIR FORCE



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

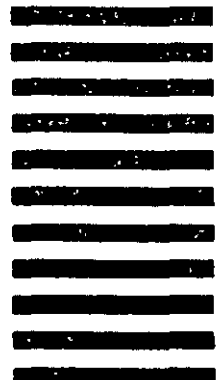
OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE \$300

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 73236 WASHINGTON D. C.

POSTAGE WILL BE PAID BY THE DEPARTMENT OF THE AIR FORCE

AFLC/LOLME
Wright-Patterson AFB, OH 45433



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☐ USER☐ MANUFACTURER☐ OTHER (Specify): _____

b. ADDRESS (Street, City, State, ZIP Code)

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)

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)