*TB 9-6660-270-40

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR ANEROID BAROMETERS ML-102( ), ML-333/TM, AND FA112150

Headquarters, Department of the Army, Washington, DC
26 August 2008

REPORTING OF ERRORS AND RECOMMDENDING IMPROVEMENTS

You can improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also send in your comments electronically to our E-mail address: 2028@redstone.army.mil or by fax 256-842-6546/DSN 788-6546. For the World Wide Web use: https://amcom2028.redstone.army.mil. Instructions for sending an electronic 2028 can be found at the back of this manual.

*This bulletin supersedes TB 9-6660-270-50, dated 22 January 1986.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Aneroid Barometers ML-102( ), ML-333/TM, and FA112150. TM 11-427, TM 11-2421, MIL-B11818B, and MIL-B-11839B were used as the prime data sources in compiling these instructions. The equipment being calibrated will be referred to as the TI (test instrument) throughout this bulletin.

a. Model Variations. Variations among models are described in text.

b. Time and Technique. The time required for this calibration is approximately 2 hours, using the physical technique.

2. Forms, Records, and Reports

a. Forms, records, and reports required for calibration personnel at all levels are prescribed by TB 750-25.

b. Adjustments to be reported are designated (R) at the end of the sentence in which they appear. When adjustments are in tables, the (R) follows the designated adjustment. Report only those adjustments made and designated with (R).

3. Calibration Description. TI parameters and performance specifications which pertain to this calibration are listed in table 1.

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Vacuum and pressure	Range: 540 to 1085 mbar, 22 to 31.5 in. Hg Accuracy: 540 to 745 ± 2.0 mbar 745 to 850 ± 1.6 mbar 850 to 925 ± 1.0 mbar 925 to 1085 ± 0.6 mbar 22 to 31.5 ± 0.0095 in. Hg
Repeatability	± 0.8 mbar (ML-102( )) ± 0.3 mbar (ML-333)

SECTION II
EQUIPMENT REQUIREMENTS

4. Equipment Required. Table 2 identifies the specific equipment to be used in this calibration procedure. This equipment is issued with Secondary Reference Calibration Standards Set NSN 4931-00-621-7878. Alternate items may be used by the calibrating activity when the equipment listed in table 2 is not available. The items selected must be verified to perform satisfactorily prior to use and must bear evidence of current calibration. The equipment must meet or exceed the minimum use specifications listed in table 2. The accuracies listed in table 2 provide a four-to-one ratio between the standard and TI. Where the four-to-one ratio cannot be met, the actual accuracy of the equipment selected is shown in parenthesis.

5. Accessories Required. The accessories listed in table 3 are issued as indicated in paragraph **4** above and are used in this calibration procedure. When necessary, these items may be substituted by equivalent items, unless specifically prohibited.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
PNEUMATIC PRESSURE STANDARD[1]	Range: 540 to 1085 mbar Accuracy: ± 0.5 mbar from 540 to 745 mbar ± 0.4 mbar from 745 to 850 mbar ± 0.25 mbar from 850 to 925 mbar ± 0.15 mbar from 925 to 1085 mbar ± 0.002375 in. Hg from 22 to 31.5 in. Hg	Druck, DPI145/R (MIS-45842)

[1]Equipment limitation: Accuracy: ± 0.025% of rdg, ±(0.231 to 0.271 mbar) on 925 to 1085 mbar range, ±(0.0055 to 0.0079 in. Hg) on 22 to 31.5 in. Hg range.

Table 3. Accessories Required

Common name	Description (part number)
ANEROID BAROMETER CALIBRATION CHAMBER	MIS-10283
NITROGEN PRESSURE KIT[1] (TEST KIT, NITROGEN PRESSURE)	7909189
PRESSURE ACCESSORY KIT[1]	7913310
PRESSURE REGULATOR	0 to 16 psi outlet (p/o 7910260)
VACUUM PUMP	7915882
VACUUM REGULATOR	P/o 7910260

[1]Secondary transfer item.

SECTION III
CALIBRATION PROCESS

6. Preliminary Instructions

a. The instructions outlined in paragraphs **6** and **7** are preparatory to the calibration process. Personnel should become familiar with the entire bulletin before beginning the calibration.

b. Items of equipment used in this procedure are referenced within the text by common name as listed in tables 2 and 3.

c. Unless otherwise specified, verify the result of each test and, whenever the test requirement is not met, take corrective action before continuing with the calibration. Adjustments required to calibrate the TI are included in this procedure. Additional maintenance information is contained in the manufacturer's manual, TM 11-427, and TM 11-2421 for this TI.

d. Unless otherwise specified, all controls and control settings refer to the TI.

7. Equipment Setup

NOTE

This calibration should be performed in an area with controlled temperature between 66°F and 85°F.

a. Remove TI from protective cover or mounting case (ML-102 from canvas case only, not from rigid mounting case).

b. Vent TI to atmosphere.

c. Place TI in aneroid barometer calibration chamber (required for ML-102 only).

d. Connect equipment as shown in figure 1. Use appropriate connections for model being calibrated.

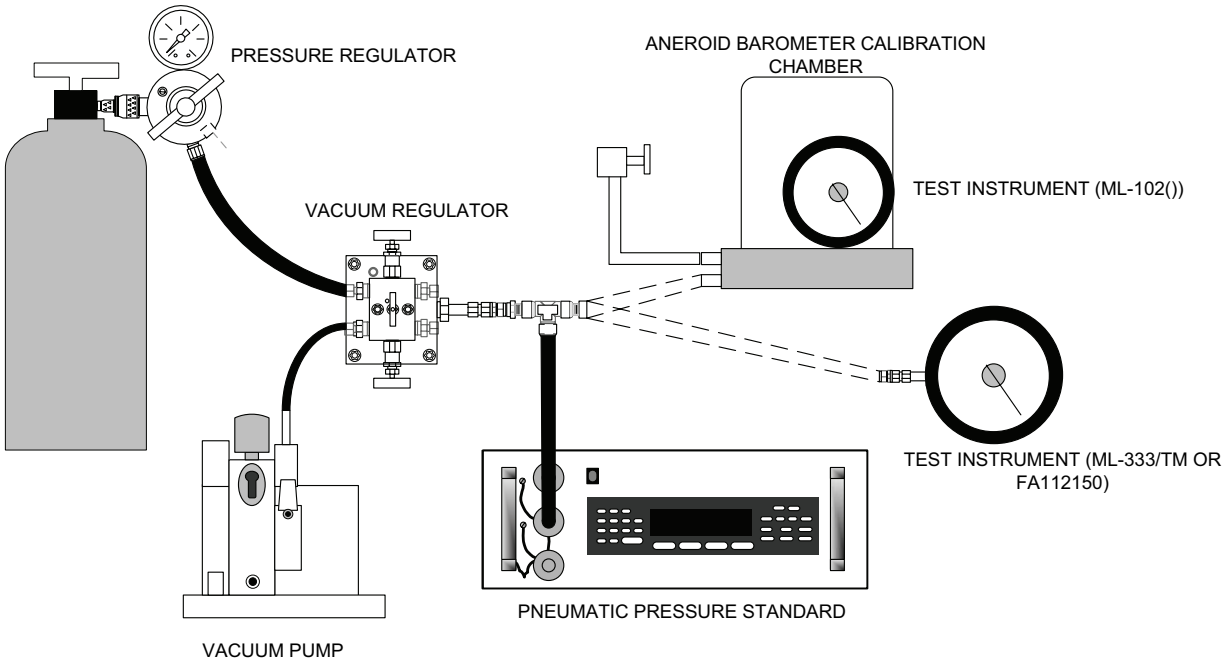

Figure 1. Test instrument - equipment setup.

8. Vacuum and Pressure

a. Performance Check

(1) Adjust pressure regulator on nitrogen cylinder for 16 psi and start vacuum pump.

(2) Adjust vacuum regulator as necessary to exercise TI 3 times from lowest to highest reading. Check for smooth operation of indicator.

(3) Determine correct ambient barometric pressure from pneumatic pressure standard.

(4) Adjust vacuum regulator for ambient pressure indication on TI and disconnect TI from vacuum regulator.

(5) If TI does not indicate ambient pressure as determined in (3) above, adjust TI mechanical ambient adjustment screw, if applicable.

(6) Connect TI to vacuum regulator and adjust vacuum regulator for TI indications listed in table 4 or 5.

Table 4. Barometer Accuracy, ML-102( ) and ML-333/TM

Test instrument indication (mbar)		Pneumatic pressure standard indication (mbar)	
ML-102 ( )	ML-333/TM	Min	Max
- - -	540	538	542
- - -	690	688	692
750	- - -	748.4	751.6
765	765	763.4	766.6
780	780	778.4	781.6
815	815	813.4	816.6
850	850	848.4	851.6
875	875	874.0	876.0
900	900	899.0	901.0
925	925	924.0	926.0
965	965	964.4	965.6
1000	1000	999.4	1000.6
- - -	1030	1029.4	1030.6
1040	- - -	1039.4	1040.6
1060	- - -	1059.4	1060.6

Table 5. Barometer Accuracy, FA112150

Test instrument indication (in. Hg)	Pneumatic pressure standard indication (in. Hg)	
	Min	Max
22	21.9905	22.0095
24	23.9905	24.0095
26	25.9905	26.0095
28	27.9905	28.0095
30	29.9905	30.0095
31	30.9905	31.0095

(7) If TI does not indicate within limits specified, perform **b** below.

(8) For applicable TI's, plot scale error on calibration correction chart and place chart in case cover (see sample, figure 2).

b. Adjustments

(1) Repeat **a** (6) above, recording pneumatic pressure standard indication for 6 to 10 TI calibration points evenly spaced throughout the range of the TI.

(2) Make a graph plotting the TI calibration points on the abscissa (x-axis) and the deviation (difference in pneumatic pressure standard indications and TI indications) on the ordinate (y-axis) (fig. 3).

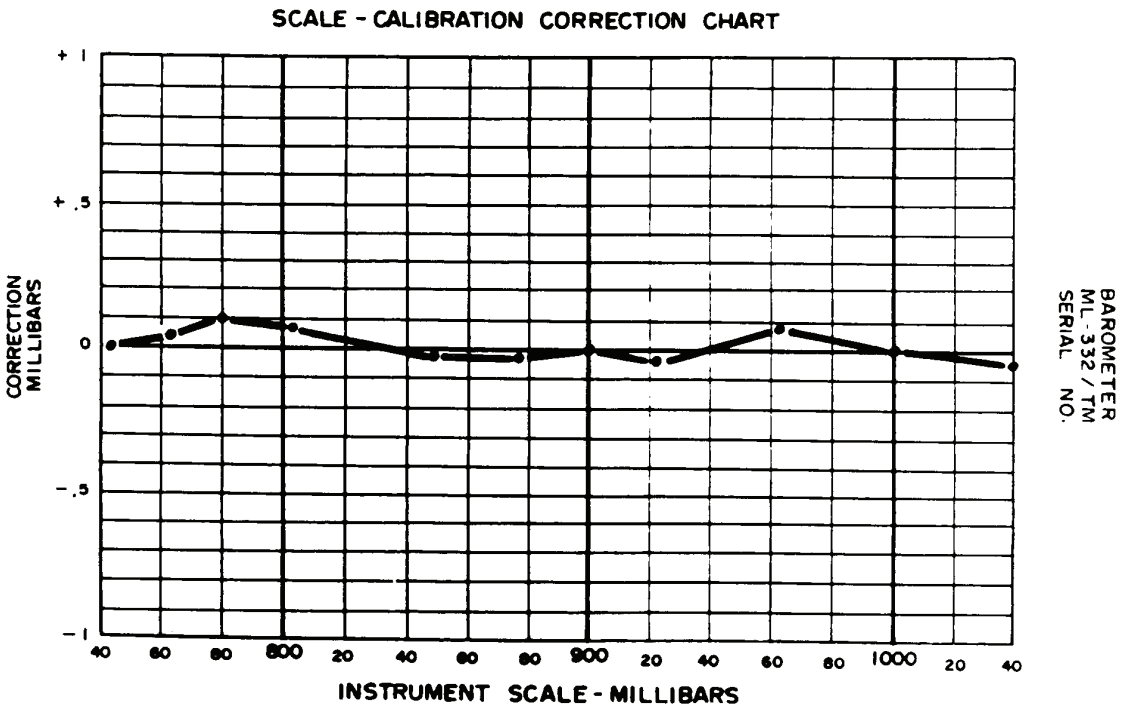

Figure 2. Sample - scale correction.

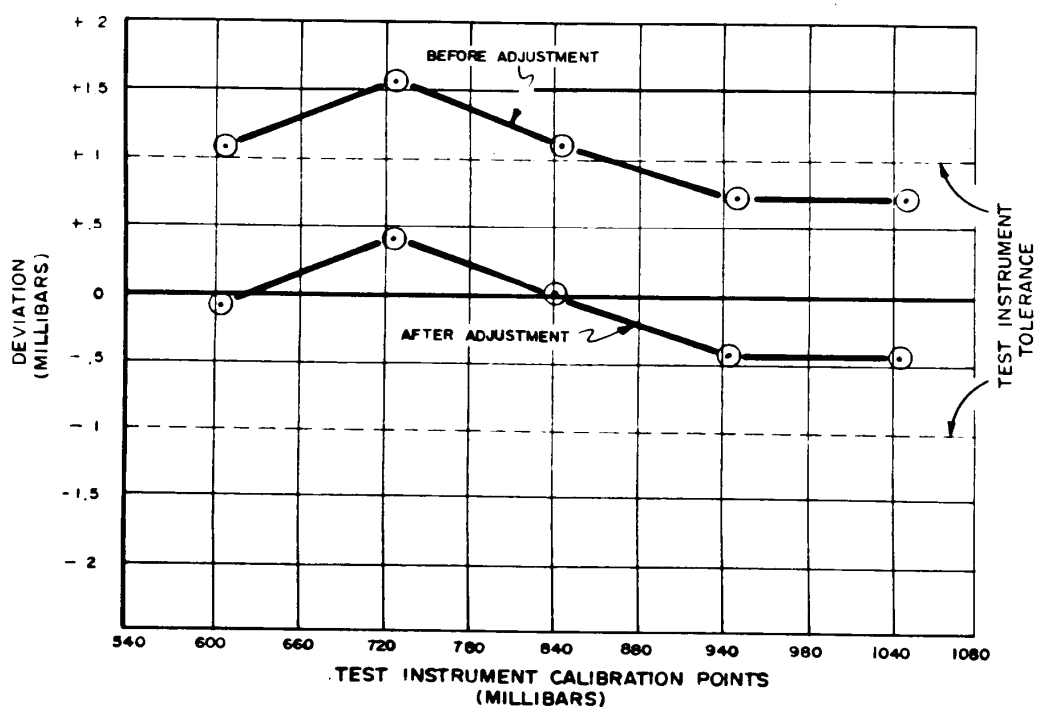

Figure 3. Test instrument adjustment.

(3) Draw 2 lines parallel to the x-axis with ordinates corresponding to the appropriate tolerance listed in table 1.

(4) Analyze the graph and make zero adjustments as required to bring all points between the parallel lines. Make zero adjustment with TI at ambient pressure (R).

9. Repeatability (ML-102( ) and ML-333/TM only)

a. Performance Check

(1) Connect equipment as shown in figure 1.

(2) Adjust vacuum regulator for a 900-millibar indication on TI. Record indication on pneumatic pressure standard.

(3) Adjust vacuum regulator for an 800-millibar indication on TI.

(4) Turn off vacuum pump and slowly vent TI until TI again indicates 900 millibars.

(5) Pneumatic pressure standard will indicate the value recorded in (2) above within the limits specified in table 1.

b. Adjustments. No adjustments can be made.

10. Final Procedure

a. Disconnect all equipment and replace TI with in protective cover.

b. Annotate and affix DA label/form in accordance with TB 750-25.

By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army

0818206

Distribution:

To be distributed in accordance with STD IDS No. RLC-1500, 2 January 2003, requirements for calibration procedure TB 9-6660-270-40.

Instructions for Submitting an Electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however, only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" whomever@redstone.army.mil
To: <2028@redstone.army.mil

Subject: DA Form 2028

1. **From**: Joe Smith
2. Unit: home
3. **Address**: 4300 Park
4. **City**: Hometown
5. **St**: MO
6. **Zip**: 77777
7. **Date Sent**: 19-OCT –93
8. **Pub no:** 55-2840-229-23
9. **Pub Title**: TM
10. **Publication Date**: 04-JUL-85
11. Change Number: 7
12. Submitter Rank: MSG
13. **Submitter FName**: Joe
14. Submitter MName: T
15. **Submitter LName**: Smith
16. **Submitter Phone**: 123-123-1234
17. **Problem**: 1
18. Page: 2
19. Paragraph: 3
20. Line: 4
21. NSN: 5
22. Reference: 6
23. Figure: 7
24. Table: 8
25. Item: 9
26. Total: 123
27. **Text**

This is the text for the problem below line 27.