

# **\*TB 9-6660-270-50**

**DEPARTMENT OF THE ARMY TECHNICAL BULLETIN**

## **CALIBRATION PROCEDURE FOR ANEROID BAROMETERS**

### **ML-102( ), ML-332/TM, ML-333/TM, AND FA112150**

Headquarters, Department of the Army, Washington, DC  
22 January 1986

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**SECTION I  
IDENTIFICATION AND DESCRIPTION**

**1. Test Instrument Identification.** This bulletin provides instructions for the calibration of Aneroid Barometers ML-102( ), ML-332/TM, 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. DA Form 2416 (Calibration Data Card)**

**a.** Forms, records, and reports required for calibration personnel at all levels are prescribed by TB 750-25. DA Form 2416 must be annotated in accordance with TB 750-25 for each calibration performed.

**b.** Adjustments to be reported on DA Form 2416 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-332 and 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

Item	Common name (official nomenclature)	Minimum use specifications	Manufacturer and model (part number)
A1	BAROMETER <sup>1</sup> (MERCURIAL METRIC BAROMETER)	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 ±0.002 in. Hg from 22 to 31.5 in. Hg	Haas, Model A1 modified (7913093)

<sup>1</sup>Equipment limitation: Accuracy: ±0.014% of reading, ±0.092 mm Hg (0.18 to 0.20 on 925 to 1085 mbar range); Range: Maximum indication around 1057 mbar.

Table 3. Accessories Required

Item	Common name (official nomenclature)	Description (part number)
B1	ANEROID BAROMETER CALIBRATION CHAMBER	MIS-10283
B2	NITROGEN PRESSURE KIT <sup>1</sup> (TEST KIT, NITROGEN PRESSURE)	7909189
B3	PRESSURE ACCESSORY KIT <sup>1</sup>	7913310
B4	PRESSURE REGULATOR	0 to 16 psi outlet (p/o 7910260)
B5	VACUUM PUMP	7915882
B6	VACUUM REGULATOR	P/o 7910260

<sup>1</sup>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 and item identification number as listed in tables 2 and 3. For the identification of equipment referenced by item numbers prefixed with A, see table 2, and for prefix B, see table 3.

**NOTE**

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.

**NOTE**

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 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 (B1) (required for ML-102 only).
- d. Connect equipment as shown in figure 1. Use appropriate connections for model being calibrated.

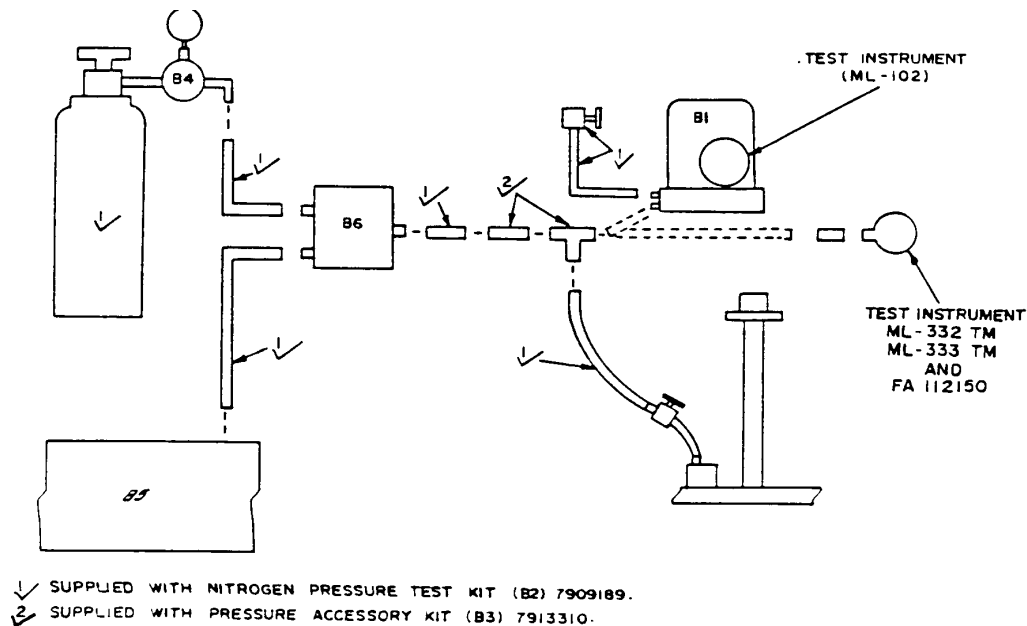


Figure 1. Test instrument - equipment setup.

## **8. Vacuum and Pressure**

### **a. Performance Check**

(1) Adjust pressure regulator (B4) on nitrogen cylinder for 16 psi and start vacuum pump (B5).

(2) Adjust vacuum regulator (B6) 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 barometer (A1).

(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.

#### **NOTE**

Change barometer to manometer function for indications above atmospheric pressure.

(7) If barometer 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 barometer (A1) 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 barometer and TI indications) on the ordinate (y-axis) (fig. 3).

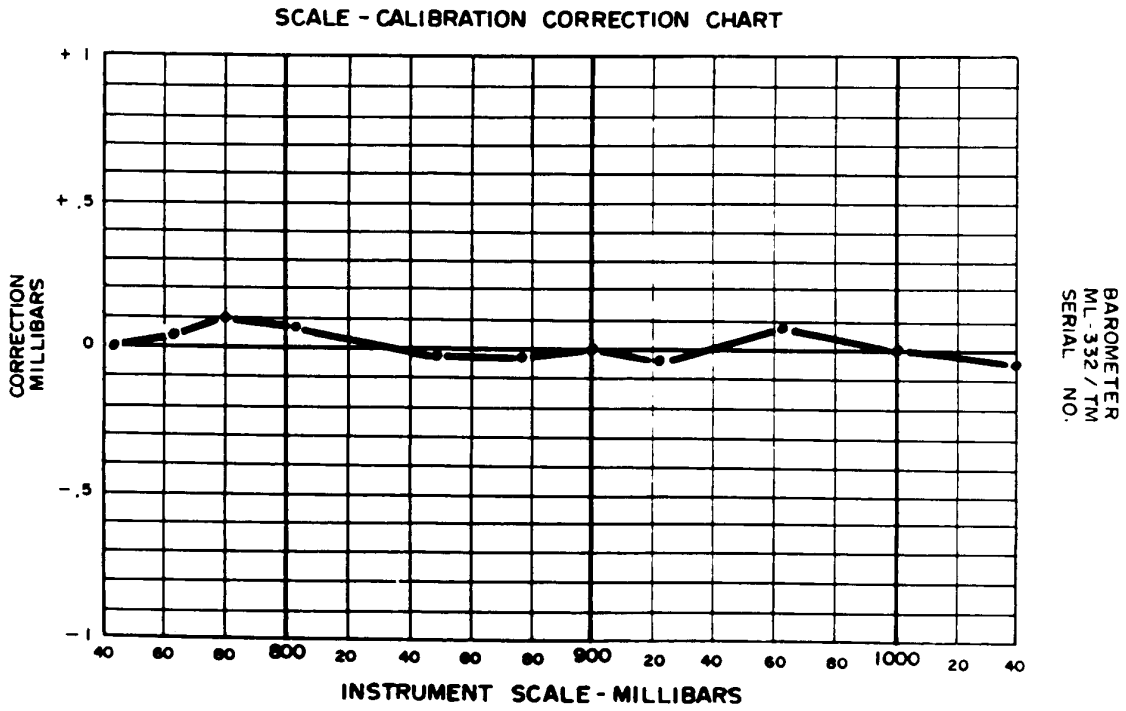


Figure 2. Sample - scale correction.

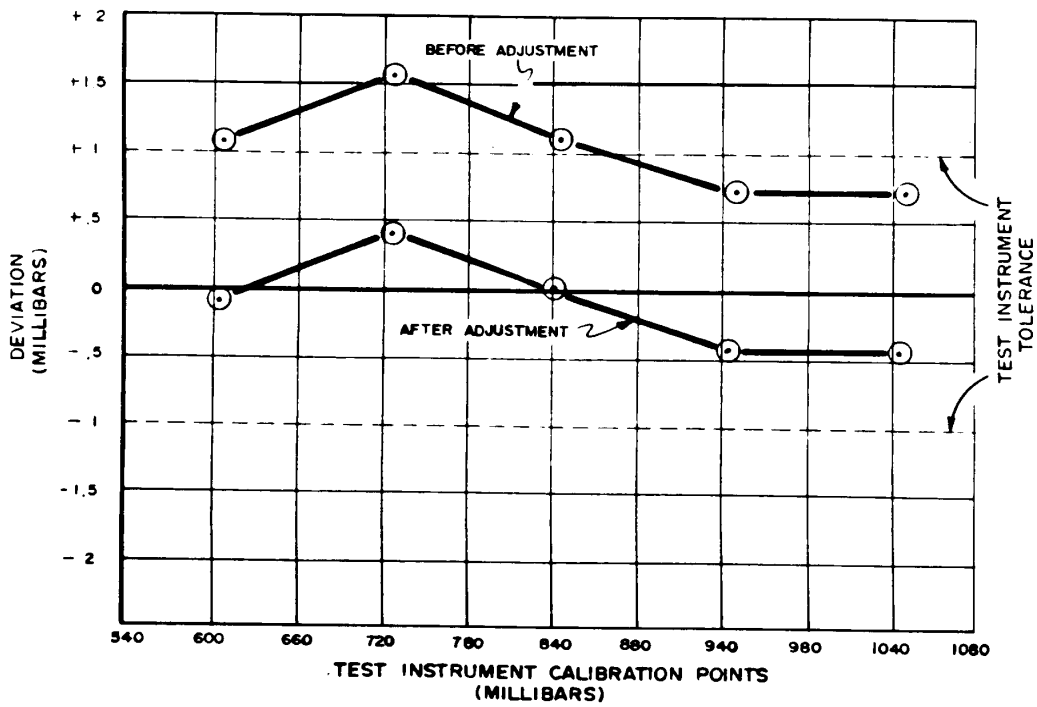


Figure 3. Test instrument adjustment.

(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( ), ML-332/TM, and ML-333/TM only)**

**a. Performance Check**

(1) Connect equipment as shown in figure 1.

(2) Adjust vacuum regulator (B6) for a 900-millibar indication on TI. Record indication on barometer (A1).

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

(4) Turn off vacuum pump (B5) and slowly vent TI until TI again indicates 900 millibars.

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

**b. Adjustments.** No adjustments can be made.

Table 4. Barometer Accuracy, ML-102( ), ML-332/TM, and ML-333/TM

Test instrument indications (mbar)			Barometer indications (mm Hg)	
ML-102 ( )	ML-332/TM	ML-333/TM	Min	Max
---	---	540	403	406
---	---	690	516	519
---	745	---	557.5	559.9
750	---	---	561.4	563.8
765	765	765	572.5	574.9
780	780	780	583.8	586.2
815	815	815	610.0	612.4
850	850	850	636	638
875	875	875	655	657
900	900	900	674	676
925	925	925	693.3	694.2
965	965	965	723.3	724.2
1000	1000	1000	749.6	750.5
---	---	1030	772.1	773.0
1040	1040	---	779.6	780.5
1060 <sup>1</sup>	---	---	794.6	795.5

<sup>1</sup>Beyond the range of some modified barometers.

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Table 5. Barometer Accuracy, FA112150

Test instrument indications (in. Hg)	Barometer indications (mm Hg)	
	Min	Max
22	558.55	559.04
24	609.35	609.84
26	660.15	660.64
28	710.95	711.44
30	761.75	762.24
31	787.15	787.64

**10. Final Procedure**

**a.** Deenergize and disconnect all equipment and reinstall protective cover on TI.

**b.** When all parameters are within tolerance, annotate and affix DA Label 80 (U.S. Army Calibrated Instrument). When the TI receives limited or special calibration, annotate and affix DA Label 163 (U.S. Army Limited or Special Calibration). When the TI cannot be adjusted within tolerance, repair the TI in accordance with the maintenance manual. When repair is delayed for any reason or the TI cannot be repaired with local resources, annotate and affix DA Form 2417 (U.S. Army Calibration System Rejected Instrument) and inform the owner/user accordingly in accordance with TB 750-25.



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