*TB 9-6670-249-40

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR SPECIFIC GRAVITY BALANCE (7909111)

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

REPORTING OF ERRORS AND RECOMMENDING 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 9-6670-249-50, dated 24 June 1982.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Specific Gravity Balance (7909111). The manufacturer's manual and MIL-B-15812A were used as 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. None.

b. Time and Technique. The time required for this calibration is approximately 3 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.

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
Balance weight	15 g ± 3 mg
Plummet	15 g ±3 mg
Thermometer [1]	9° to 30° C ±1° C
Specific gravity	Range: 0.7000 to 2.0000[1] Accuracy: ± 0.001 SG Sensitivity: ± 0.0003[1] Weights: 5.0 g ± 5 mg 0.5 g ± 1 mg 0.05 g ± 0.5 mg 0.005 g ± 0.3 mg

[1]This specification is for information only and is not verified in this bulletin.

SECTION II
EQUIPMENT REQUIREMENTS

4. Equipment Required. Table 2 identifies the specific equipment 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. 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 required for this calibration are common usage accessories, issued as indicated in paragraph **4** above, and are not listed in this calibration procedure. The following peculiar accessories are also required for this calibration: Ultrasonic cleaner, activated by electrostrictive transducers (7909966); distilled water.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
BALANCE	Range: 4.8 to 15,003 mg Accuracy: 0.1 mg	Voland, Model 200B (7907117)
THERMOMETER	Range: 9° to 30° c (48° to 86° F) Accuracy: ±0.25° C (0.5°F)	(7909077)
WEIGHT SET	Range: 5 mg to 15 mg Accuracy: Class S-1	(7907068)

SECTION III
CALIBRATION PROCESS

6. Preliminary Instructions

a. The instructions outlined in this paragraph 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 table 2.

c. Unless otherwise specified, verify the results 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 and MIL-B-15812A for this TI.

d. Place TI on a flat, level surface with balance arm (fig. 1) in place. If necessary, clean beaker and weights in console cleaner.

e. The adjustment screw in base should be oriented toward either front or rear of TI. Adjust column (fig. 1) to a convenient height.

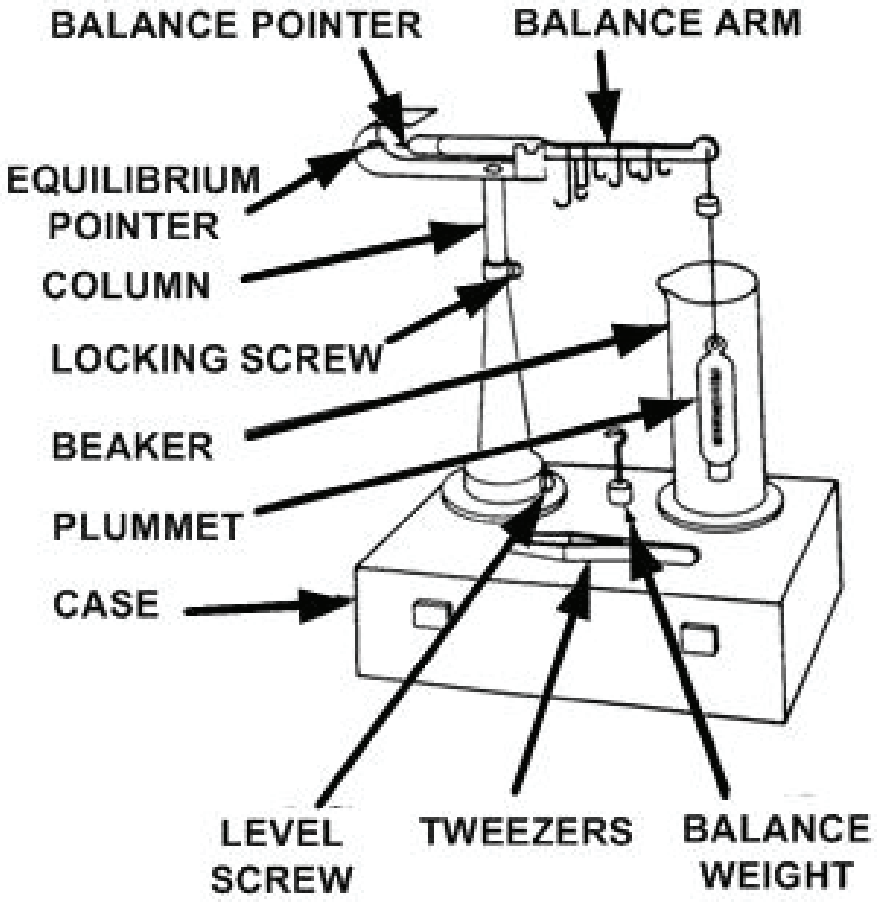

Figure 1. Specific gravity balance.

7. Plummet and Balance Weight

a. Performance Check

(1) Carefully place plummet (fig. 1) in center of left pan of balance.

(2) Place weights totaling 15 g from weight set on opposite balance pan.

(3) Add standard weights to appropriate pan to obtain a balance. After adding or subtracting values of standard weights used, if weight of plummet is not between 14.997 and 15.003 g, perform **b** (1) below.

(4) Repeat technique of (1) through (3) above, substituting balance weight (fig. 1) for plummet. If weight of balance is not between 14.997 and 15.003 g, perform **b** (2) below.

b. Adjustments

(1) Adjust weight of plummet by adding or removing mass above the waterline(R).

(2) Adjust weight of balance weight by adding or removing mass (R).

8. Weights

a. Performance Check

(1) Carefully place 5 g weight from TI in center of left balance pan of balance.

(2) Place 5 g weight from weight set on opposite balance pan. After adding or subtracting values of standard weights used, the TI weight will be between 4,995 and 5,005 mg.

(3) Repeat technique of (1) and (2) above, using weights listed in table 4. Indicated weight of TI weights will be within limits specified.

Table 4. Weight Tolerance

Test instrument weights (g)	Balance indication (mg)	
	Min	Max
0.5	499	501
0.05	49.5	50.5
0.005	4.7	5.3

b. Adjustments. No adjustments can be made.

9. Calibration

a. Performance Check

(1) Place balance weight (fig. 1) on hook at end of balance arm. If balance arm has an adjustable counterweight, adjust it until pointer is coincident with equilibrium pointer. If balance arm pointer not adjustable, adjust base leveling screw until pointers are coincident.

(2) Fill glass beaker (fig. 1) with distilled water and insert plummet (fig. 1) and thermometer.

NOTE

The plummet must be suspended in the liquid being measured. This can be accomplished by adjusting height of column (fig. 1) and locking it in place with locking screw.

(3) Place a 5 g weight on same hook from which plummet is suspended. If water temperature is higher than the reference temperature, the plummet should sing, indicating a specific gravity less than one. Remove weight form hook.

(4) Place 5 g weight in the number 9 notch of balance arm, and add one each of the other three sizes of weights (progressively by size 0.5 g, 0.005 g, and 0.005 g) to notches until a balance condition is achieved.

(5) Determine temperature of distilled water by observing thermometer. Consult table 5 for density of distilled water at that temperature. The TI will indicate within ±0.001 of specific gravity calculated form formula:

$$SG = \frac{\text{Density of water at test temperature}}{\text{Density of water at reference temperature}}$$

Table 5. Density of Water from 15° to 25° C

C Temperature	Density[1]
15	0.999099
16	0.998943
17	0.998774
18	0.998595
19	0.998405
20	0.998203
21	0.997992
22	0.997770
23	0.997538
24	0.997296
25	0.997044

[1]Density in grams per cubic centimeter and the absolute value at 3.98° C.

NOTE

Reference temperature for Grenier Model G1315 is normally specified on the plummet. Plummets labeled as displacing 5 cm^3 of water at a specified temperature have a reference temperature of 4°C. Plummets labeled as displacing 5 g of water at a specified temperature have their reference temperature at the specified temperature (usually 60°F or 20°C).

NOTE

Read specific gravity by progressively reading the notches in which the weights are placed, reading largest weight first and smallest weight last. Example: If the distilled water is exactly 25 °C., the 5.0 g and 0.5 g weights should be in the 9 notch, the 0.05 g and 0.005 g weights in the 8 notch, giving a specific gravity reading of 0.9988.

b. Adjustments. No adjustments can be made.

10. Final Procedure

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

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
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0817018

Distribution:

To be distributed in accordance with STD IDS No. RLC-1500, 2 January 2003, requirements for calibration procedure TB 9-6670-249-40.

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.