*TB 9-6630-201-40

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR HYDROMETER SET, FISHER SCIENTIFIC, MODELS 11-582, 11-555-01, ASTM 53HM, AND ASTM 54HM AND GREINER SCIENTIFIC, MODEL API 48-532

Headquarters, Department of the Army, Washington, DC
31 July 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 9-6630-201-50, dated 2 July 1985.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Hydrometer Set, Fisher Scientific, Models 11-582, 11-555-01, ASTM 53HM, and ASTM 54HM, and Greiner Scientific, Model API 48-532. The manufacturers' manuals 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 1 hour, 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 (specific gravity)
Hydrometer set, Fisher Scientific, Models 11-582, 11-555-01, ASTM 53HM, and ASTM 54HM	Range: 0.650 to 0.710, 0.700 to 0.810, 0.800 to 0.910, 0.900 to 1.010, 1.000 to 1.220, 1.200 to 1.420, 1.400 to 1.620, 1.600 to 1.820, 1.800 to 2.000 Accuracy: ±0.5 of smallest division[1]
Hydrometer, Greiner Scientific, Model API 48-532	Range: API gravity 9° to 21° Accuracy: ±0.1°[1]

[1] The manufacturer's accuracy is not necessarily met in this bulletin.

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)
WESTPHAL BALANCE (SPECIFIC GRAVITY)	Range: 0.650 to 2.000 specific gravity Accuracy: ± 0.0005 specific gravity	Greiner Scientific, Model G-1315 (7909111)

Table 3. Accessories Required

Common name	Description (part number)
CONSOLE CLEANER	Powertron;, ultrasonic; activated by electro-restrictive transducers; 42 x 42 x 35 in. (7909966)
HEAT SEALER	115 V ac
JAR	Glass; capacity 1 gal, 6 in. od, overall height 12 in., or equivalent
POLYETHYLENE	Saran Wrap or equivalent; 20 x 50 x 0.002-in. sheets

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 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. 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 manufacturers' manuals for this TI.

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

7. Equipment Setup

a. Clean TI for approximately 5 minutes, using console cleaner and a mixture of 1 ounce of common liquid detergent and 5 gallons of water.

b. Thoroughly rinse TI in rinse tank of cleaner.

c. Thoroughly dry TI with a lint-free cloth.

NOTE

After cleaning and drying, the TI should be inspected for internal moisture, scale shift, and loose particles of lead. If any of these conditions exist, the TI is to be replaced.

d. Assemble Westphal balance on a smooth level surface, as shown in figure 1.

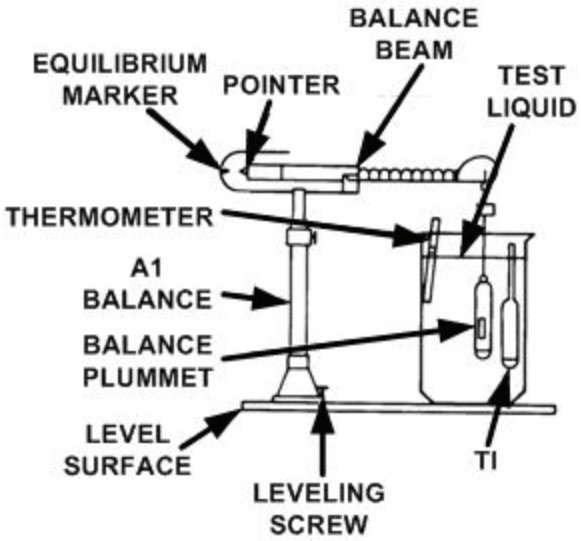

Figure 1. Specific gravity - equipment setup.

e. Attach 15 gram weight to the balance and adjust leveling screw until pointer on balance beam is coincident with the equilibrium marker (zero). Remove 15 gram weight.

f. Thoroughly clean jar in manner described in **a** and **b** above.

g. Select test liquid appropriate for TI to be calibrated from table 4.

Table 4. Test Liquids

Type test liquid	Known specific gravity[1]
MIL-F-7024B	0.700
Mineral oil or methyl alcohol	0.800
Distilled water	1.000
Thoulet's solution	1.2 to 2.000

[1] These values are for a given temperature and will change with laboratory environment. However, reagents will still provide a calibration point which is optional for each hydrometer.

WARNING

Preparation and use of Thoulet's solution involves handling potassium and mercuric iodides. Observe all precautions applicable to mercury and caustic acids.

NOTE

Data concerning formulation of Thoulet's solution is found on page 678/17 of NBS Handbook 77, Volume 11. To obtain desired specific gravity, dilute solution with distilled water.

h. Fill jar to approximately three fourths capacity and insert thermometer (supplied with TI). Allow test liquid to normalize in a controlled environment.

NOTE

Calibration of TI must be performed in same controlled environment.

8. Specific Gravity

a. Performance Check

NOTE

Some solutions prepared by the Area Calibration Laboratory (ACL) may be only slightly miscible. To prevent solution from separating into layers resulting in erroneous readings, stir solution immediately with TI and take reading as quickly as possible.

NOTE

Only one point on TI needs to be calibrated.

(1) Place jar under loop of balance beam and slowly immerse plummet into test liquid.

(2) Immerse TI into test liquid close to plummet, but still allowing it to float freely.

(3) After TI thermometer indication has stabilized, read and record balance and TI specific gravity (SG) indications. Multiply each recorded SG value by density of' water (table 5) at its respective reference temperature. The calculated densities will agree within ±0.2 percent, using the formula as follows:

$$\left[\frac{\text{NOMIAL - ACTUAL}}{\text{ACTUAL}}\right] \text{X 100 PERCENT}$$

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 absolute value at 3.98°C.

NOTE

Hydrometer set, Fisher Scientific, Model 11-582, has a reference temperature of 60°F. The Westphal balance plummet normally has a reference temperature specified on the plummet. The density of water is 0.9990 gm/cc at 60°F.

NOTE

When calibrating hydrometers, ASTM 53HM, ASTM 54HM, and Greiner Scientific, Model API 48-532, the conversion of API gravity to specific gravity with a 60°F reference temperature as follows:

SG = 141.5 API gravity + 131.5

NOTE

Add appropriate weights (supplied with balance) to the balance arm, aligning pointer and equilibrium marker.

(4) Repeat (2) and (3) above at least three times. In each instance, remove TI from test liquid, rinse in console cleaner and dry thoroughly with a lint-free cloth prior to repeating check. TI indication will be the same as in (3) above for each check.

NOTE

TI thermometer is calibrated using TB 9-6685-322-50.

b. Adjustments. No adjustments can be made.

9. Final Procedure

a. Seal TI as indicated in (1) through (4) below:

(1) Wrap TI in a sheet of polyethylene. The sheet should be large enough to completely sheathe TI and leave an overhang of about 1/4 inch.

(2) Press overhang together and, using heat sealer, seal polyethylene closely against TI.

(3) Trim excess overhang to within about 1/16 inch of seat line and check seams for effective sealing.

(4) Store TI in its case and attach the following note in a conspicuous position on case.

NOTE

The polyethylene cover on the hydrometers is a control measure. Break seal only on those hydrometers needed to perform an operation. Do not break any seal unless absolutely necessary. Only those hydrometers which have been used will require calibration. Those still sealed in polyethylene covers need not be calibrated.

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

0816405

Distribution:

To be distributed in accordance with STD IDS No. RLC-1500, 2 January 2003, requirements for calibration procedure TB 9-6630-201-40.

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.