*TB 9-5855-1890-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR THERMAL COLLIMATOR, SM-D-805691 (P/O AN/TAM-3 AND AN/TAM-3A) AND INFRARED COLLIMATOR, SM-D-969722

Headquarters, Department of the Army, Washington, DC
11 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 9-5855-1890-35, 14 May 1991, including all changes.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Thermal Collimator, SM-D-805691 (p/o AN/TAM-3 and AN/TAM-3A) and Infrared Collimator, SM-D-969722. TM 9-5855-255-14 was used as the prime data source in compiling these instructions. The equipment being calibrated will be referred to as the TI (test instrument) throughout this bulletin.

a. Model Variations. All models must have lights extinguished in bar target mode. Some models have a disabling switch; on other models the lights have been removed. If TI does not have a disabling switch and bar target is illuminated, corrective action must be taken by DS/GS unit.

b. Time and Technique. The time required for this calibration is approximately 4 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
Temperature differential	Temperature: 4.5 °C (ambient to heater) Deviation: ±0.45 ºC

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 Transfer Calibration Standards Set AN/GSM-286, AN/GSM-287 or AN/GSM-705. 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)
DIFFERENTIAL THERMOCOUPLE SET	Range: 0 to 5 °C differential Accuracy: ±0.11 °C	Omega Engineering 0.020 Type K (7917040)[1]
MULTIMETER NO. 1	Range: 0 to 200 µV Accuracy: ±2 µV	Hewlett Packard, Model 3458A (3458A)
MULTIMETER NO. 2	Range: 0 to 6 V dc Accuracy: ±0.2%	Fluke, Model 8840A/AF05 (AN/GSM-64D)

[1]Part of calibration kit 7917034, limited deployed.

Table 3. Accessories Required

Common name	Description (part number)
ADAPTER[1]	Offset voltage pin (7917036)[2]
COTTON TIP APPLICATOR[3]	Swap with cotton tip on one end
HOLDING CLAMP[1]	Mounting post clamp (7917039) [2]
LABORATORY CLAMP[1]	Laboratory clamp (MS-36012-1) [2]
LEAD	42-in., single banana to test hook (red) (7917035-2) [2]
LEAD	42-in., single banana to test hook (black) (7917035-1) [2]
PASTE REMOVAL SOLVENT[3]	WD40 or equivalent
THERMOCOUPLE MOUNTING POST[1]	Mounting post with base (7917037) [2]
THERMALLY CONDUCTIVE PASTE[3]	Omegatherm 201 or equivalent

[1]Two required.
[2]Component part of calibration kit 7917034, limited deployed.
[3]Additional equipment required.

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 TM 9-5855-255-14 for this TI.

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

7. Equipment Setup

NOTE

HIGH VOLTAGE is used or exposed during the performance of this calibration. DEATH ON CONTACT may result if personnel fail to observe safety precautions. REDUCE OUTPUT(S) to minimum after each step within the performance check where applicable.

a. Remove external cover and internal shroud from TI.

b. Set target select knob (fig. 1) to **BAR** position

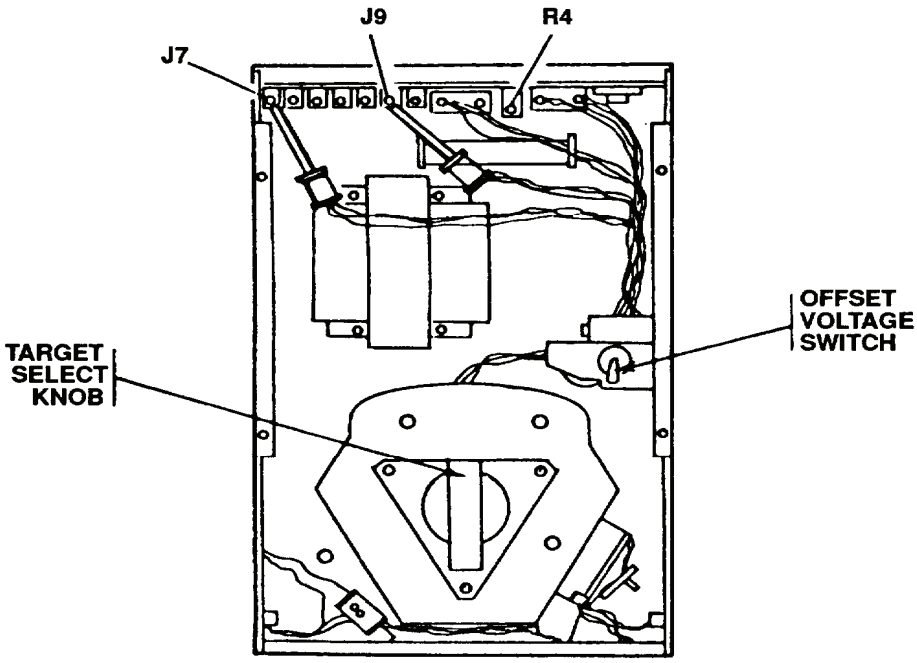

Figure 1. Temperature controller locations.

c. Connect equipment as shown in figure 2 and as described in (1) and (2) below:

(1) Install thermocouple mounting post (pair) on base of TI (approximately center of second slot pair from exit port).

(2) Clamp differential thermocouple set (pair) in laboratory clamps and install on thermocouple mounting posts, using mounting post clamps.

d. Using cotton tip applicator wood end, daub a small amount of thermally conducive paste on the extreme bottom of heater plate (fig. 3) on front of temperature controller.

e. Place tip of thermocouple TC1 (fig. 3) against bottom of heater plate, in the thermally conductive paste.

f. Loosen mounting post clamp slightly.

g. Increase tension on thermocouple TC1 (fig. 3) to produce a moderate bow in thermocouple wire by sliding laboratory clamp forward (toward temperature controller) in mounting post clamp; then tighten mounting post clamp.

h. If necessary, physically position thermocouple TC1 on heater plate to the position shown in figure 3.

i. Daub a small amount of thermally conductive paste on side of brass housing of **MRT** target housing (fig. 3) (on temperature controller) and place tip of thermocouple TC2 (fig. 3) in the thermally conductive paste.

j. Repeat technique of f through h above for thermocouple TC2 (fig. 3).

k. Place leads from differential thermocouple (fig. 2) on base of TI near exit port.

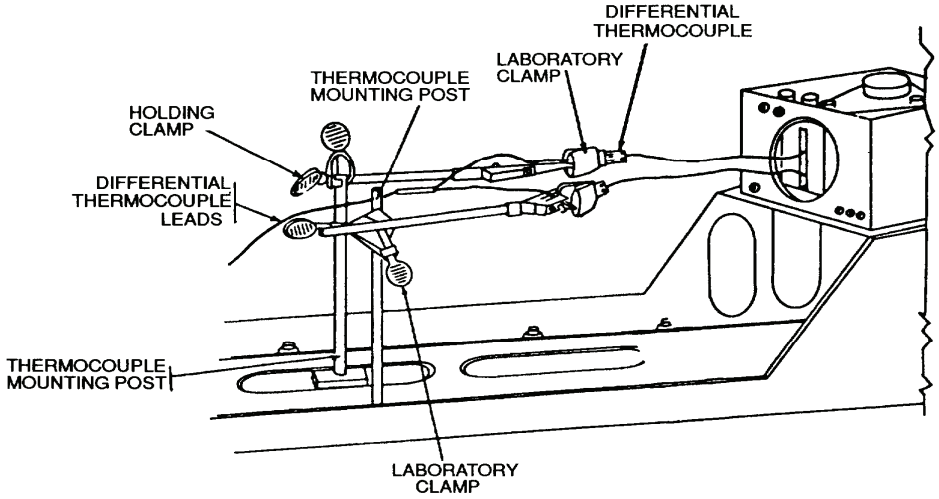

Figure 2. Equipment setup.

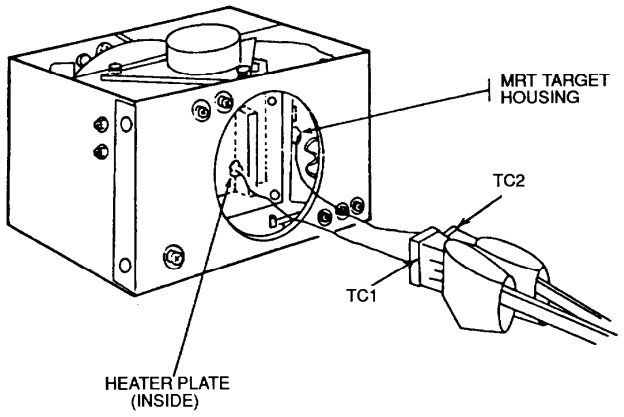

Figure 3. Temperature controller – heater plate.

l. Install shroud on TI.

m. Pull leads through exit port and connect to multimeter no. 1 observing indicated polarity.

n. Open shroud access door (top) and remove 4 screws from top of cover plate of TI temperature controller and remove cover plate.

o. Place offset voltage pin adapters on pin J7 (black) and J9 (red) (fig. 1). Connect leads to proper pin adapter (black to black, red to red).

p. Draw leads through side access port of shroud and connect to multimeter no. 2.

q. Connect temperature controller to 115 V ac power source.

NOTE

Ensure that power switch is in OFF position.

r. Connect multimeter no. 2 to 115 V ac power source, turn power on, and allow 15 minutes to warm-up.

s. Set offset voltage (toggle) switch to **ALIGN** (fig. 1).

t. Energize TI and observe indication on multimeter no. 2.

NOTE

If this is the initial calibration, adjust temperature controller potentiometer R4 (fig. 1) for an indication of 4.30 ±0.05 V dc on multimeter no. 2.

NOTE

Deenergize TI immediately after performing **u** below.

u. If necessary, adjust temperature controller potentiometer R4 (fig. 1) for multimeter no. 2 indication equal to previous offset voltage listed on TI offset voltage label (located on temperature controller) ±0.05 V dc. Record indication as Vo.

v. Set power switch to **OFF**.

w. Set offset voltage switch to **ON**.

x. Replace temperature controller cover plate but do not secure.

y. Close top access hatch of shroud. Set power switch to **ON** and record start time and allow TI to warm-up for 1 hour.

8. Calibration

a. Performance Check

(1) Observe and record indication on multimeter no. 1 in microvolts.

(2) Using differential thermocouple set calibration data and indication on multimeter no. 1, calculate the temperature difference indication and record as ΔT. If temperature difference is not between 4.05 °C and 4.95 °C, perform **b** below.

NOTE

Divide calibration factor, e.g., 40 μV/°C, into observed multimeter no. 1 indication. The result equals differential temperature.

b. Adjustments

(1) Open access hatch on shroud and remove cover plate from TI temperature controller.

(2) Set offset voltage switch to **ALIGN**.

(3) Adjust offset voltage potentiometer R4 (fig. 1) for an indication change of 0.1 V dc on multimeter no. 2.

NOTE

If ΔT is less than 4.05 °C, decrease offset voltage; if ΔT is greater than 4.95 °C, increase offset voltage.

NOTE

As temperature indication nears in-tolerance condition, it may be necessary to adjust offset voltage in 0.05 V dc increments.

(4) Set offset voltage switch to **ON**.

(5) Replace temperature controller cover plate, close shroud access hatch, and allow 15 minutes for temperature stabilization.

(6) Observe and record indication on multimeter no. 1.

(7) Using differential thermocouple set calibration data and indication on multimeter no. 1, calculate the temperature difference indication.

(8) Repeat (1) through (7) above as required to produce a temperature difference indication between 4.35 °C and 4.65 °C.

(9) Set power switch to **OFF,** but do not disconnect test setup. Allow TI to cool for 15 minutes.

(10) Set voltage offset switch to **ALIGN.**

(11) When multimeter no. 1 indicates 0 ± l0 μV, set power switch to **ON** and immediately observe multimeter no. 2 indication and record as Vo (new).

(12) Set power switch to **OFF**.

(13) Set voltage offset switch to **ON**.

9. Final Procedure

a. Annotate value of Vo (new) on offset voltage label located on TI temperature controller (R).

NOTE

If TI has not required adjustment, record previous offset voltage as Vo (new).

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

c. Remove shroud and remove remaining test equipment. Replace temperature controller cover and tighten 4 screws. Disconnect and stow TI ac power cord.

d. Using cotton tip applicator soaked with paste removal solvent, clean thermally conductive paste from TI heater plate surface. Remove solvent residue using dry cotton tip applicator.

NOTE

If residue is severe a cotton tip applicator soaked in contact cleaner (Krylon #1333) may be used, followed by application of a dry cotton tip applicator.

e. 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:

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0813508

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342084, requirements for calibration procedure TB 9-5855-1890-24.

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.