

*TB 9-4931-393-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR CALIBRATOR HEWLETT-PACKARD, MODEL 8402B

Headquarters, Department of the Army, Washington, DC
14 May 2008

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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.

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*This bulletin supersedes TB 9-4931-393-35, dated 5 June 1979, including all changes.

SECTION I IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Calibrator, Hewlett-Packard, Model 8402B. The manufacturer's instruction manual 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. TIs with serial numbers prefixed 610 or 613 use transistors A1Q4 and A1Q5. TIs prefixed 739 or 811A replace A/94 and A1Q5 with A1Q8 (A-B).

b. Time and Technique. The time required for this calibration is approximately 4 hours, using the dc and low frequency 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. 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
Line voltage regulation ¹	Satisfactory performance with any line voltage between 103.5 and 126.5 V ac
Calibration points Range Accuracy	0.01 to 2.0 mW ±0.05%
Thermistor operating resistance Range Accuracy	99.5 to 100.5 or 199 to 201Ω ±0.06%

¹Verified from 105 to 125 V ac.

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 Sets AN/GSM-286, AN/GSM-287 or AN/GSM-705. 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.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: $\pm 1\%$	Ridge, Model 9020A (9020A)
MULTIMETER	Range: 0.44699 to 30.05 V dc Accuracy: $\pm 0.0125\%$ Range: 99.44 to 200.12 Ω Accuracy: $\pm 0.015\%$	Hewlett-Packard, Model 3458A (3458A)

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 procedure 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 table 2.

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 for this TI.

d. When indications specified in paragraphs 8 and 9 are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs 8 and 9. Do not perform power supply check if all other parameters are within tolerance.

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

7. Equipment Setup

WARNING

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. Set TI 115-230 V switch (rear panel) to 115 V.

b. Remove TI covers as required for access to connections and adjustments.

- c. Connect TI to autotransformer.
- d. Connect autotransformer to 115 V ac source and adjust autotransformer for 115 V output.
- e. Short **POWER METER** terminals (rear panel). Leave short in place throughout calibration.
- f. Set **MOUNT RESISTANCE** switch to **100Ω** and **FUNCTION** switch to **CALIBRATE**. Allow 30 minutes for equipment to warm-up and stabilize.

8. Output and Stability

a. Performance Check

- (1) Connect multimeter to **DIFFERENTIAL VOLTMETER** terminals on rear panel of TI.
- (2) Set **RANGE (MW)** switch to **.01**.
- (3) If multimeter does not indicate between 632.14 and 632.78 mV, perform **b** below. Record indication.
- (4) While observing multimeter indication, vary autotransformer from 105 to 125 V and return to 115 V. The multimeter indication will remain within limits specified in (3) above.
- (5) Repeat technique of (2) and (3) above using settings, indications and adjustments listed in table 3.

Table 3. Range Switch

Test instrument RANGE (MW) switch positions	Multimeter indication (V dc)		Adjustments (fig. 1 or 2)	Adjustment multimeter indications (V dc)
	Min	Max		
0.03	1.09485	1.09595	A1 R29 (R)	1.09540
0.1	1.99900	2.00100	A1 R32 (R)	2.00000
0.3	3.46246	3.46594	A1 R33 (R)	3.46420
1	0.632143	0.632777	A1 R36 (R)	0.632460
3	1.09489	1.09599	A1 R37 (R)	1.09544
10	1.99900	2.00100	A1 R40 (R)	2.00000
8	1.78796	1.78976	A1 R43 (R)	1.78886
6	1.54842	1.54998	A1 R46 (R)	1.54920
4	1.26428	1.26556	A1 R48 (R)	1.26492
2	0.893972	0.894868	A1 R51 (R)	0.894420
0.01 ¹	0.446986	0.447434	- - -	- - -
10 ¹	1.41349	1.41491	- - -	- - -

¹Set **MOUNT RESISTANCE** switch to **200 Ω**. These two checks are for low and high ends of **RANGE (MW)** switch for **200 Ω** position of **MOUNT RESISTANCE** switch. If these checks are not within tolerance, it will be necessary to perform power supply adjustments in paragraph 10 and repeat paragraph 8. Due to the interaction of A1R17 and A1R19 with **RANGE (MW)** switch adjustments, it may be necessary to readjust these several times to obtain best indication in all positions.

- b. Adjustments.** Adjust A1R28 (fig. 1 or 2) to obtain an indication of 632.46 mV on multimeter (R).

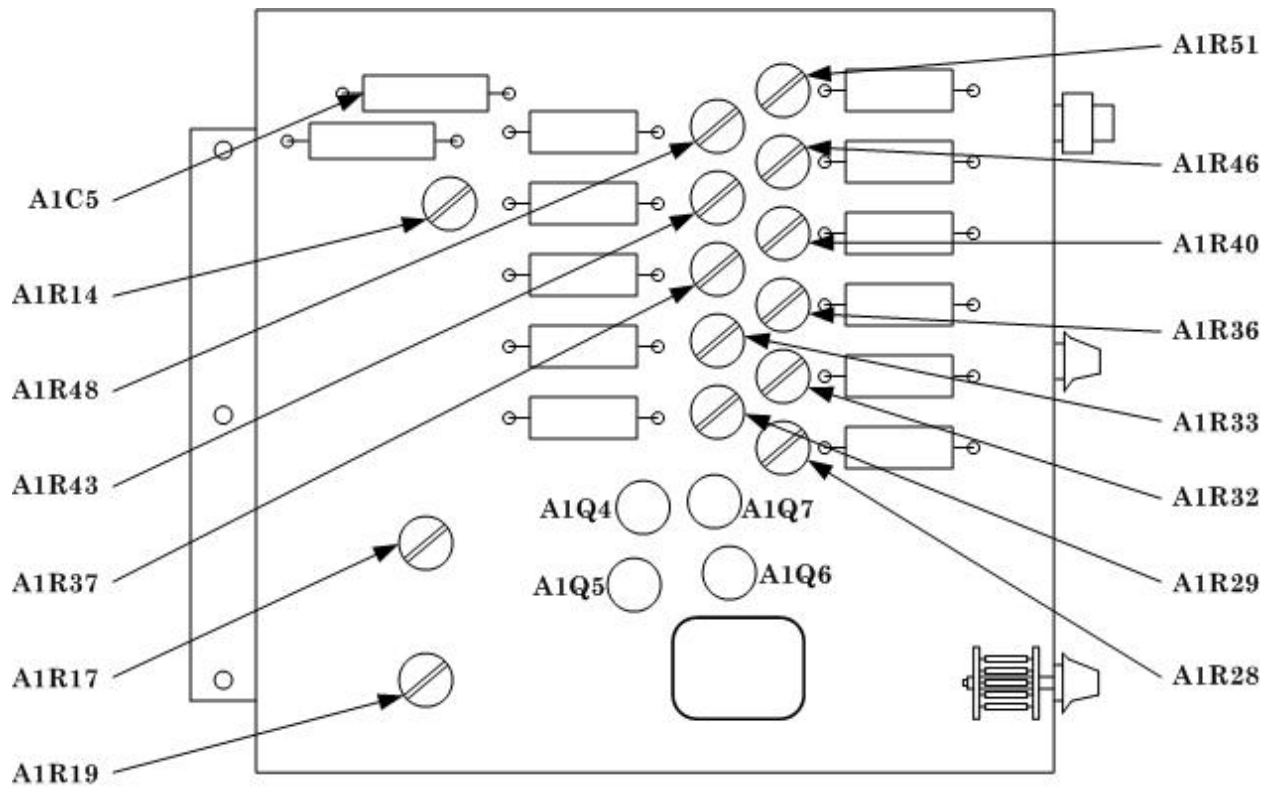


Figure 1. Calibrator assembly board A1 top view. (S/N prefixed 610 or 613).

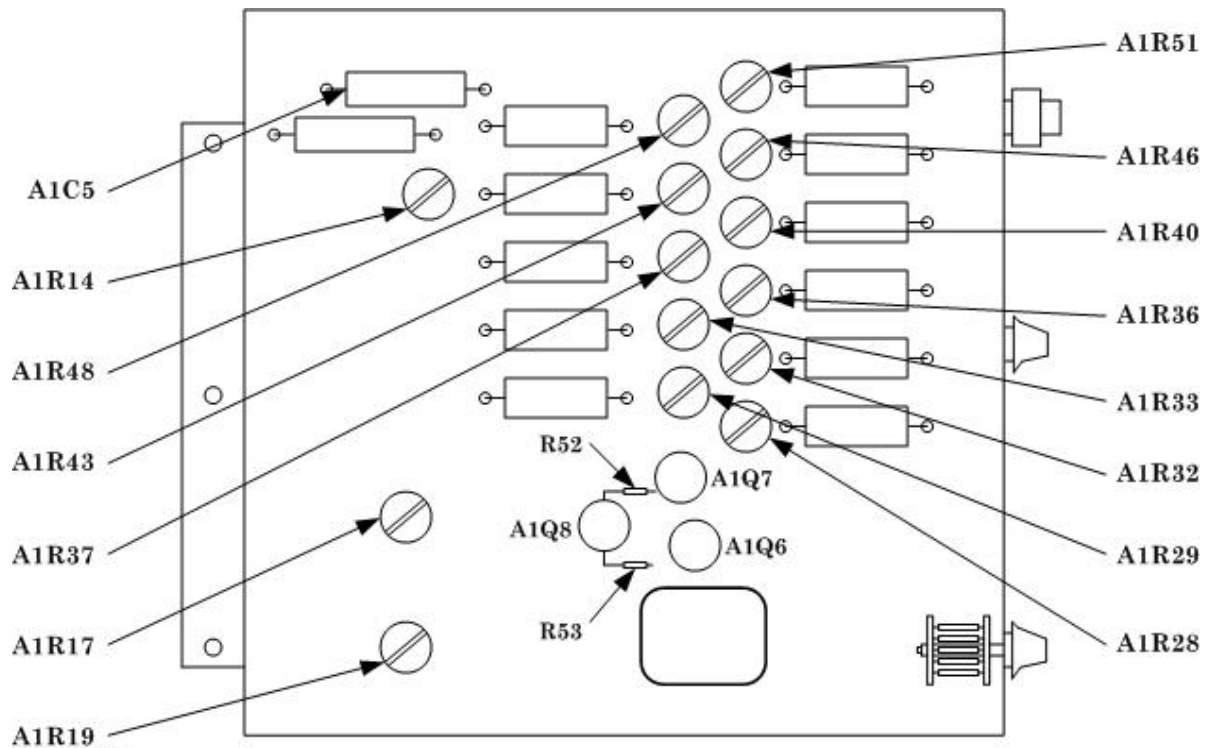


Figure 2. Calibrator assembly board A1 top view (S/N prefixed 739 or 811A).

9. Thermistor Resistance

a. Performance Check

- (1) Set **FUNCTION** switch to **LINE OFF**.
- (2) Disconnect TI from autotransformer.
- (3) Set **MOUNT RESISTANCE** switch to **100Ω** and **THERMISTOR RESISTANCE (PERCENT)** switch to **-.5**.
- (4) Connect multimeter between pins 1 and 2 of **TI RESISTANCE STANDARD** connector.
- (5) Measure resistance. Multimeter will indicate between 99.44 and 99.56 ohms.
- (6) Repeat technique of (5) above, using settings and indications listed in table 4.

Table 4. Thermistor Resistance

Test instrument THERMISTOR RESISTANCE (PERCENT) switch settings	Multimeter indications (ohms)	
	Min	Max
-0.4	99.54	99.66
-0.3	99.64	99.76
-0.2	99.74	99.86
-0.1	99.84	99.96
0	99.94	100.06
+0.1	100.04	100.16
+0.2	100.14	100.26
+0.3	100.24	100.36
+0.4	100.34	100.46
+0.5	100.44	100.56
0 ¹	199.88	200.12

¹Set **MOUNT RESISTANCE** switch to **200 Ω**.

b. Adjustments. No adjustments can be made.

10. Power Supply

a. Performance Check

NOTE

Do not perform power supply check if all other parameters are within tolerance.

- (1) Set **FUNCTION** switch to **CURRENT OFF**.
- (2) Connect multimeter across capacitor A1C5 (fig. 1 or 2). If multimeter does not indicate between -29.95 and -30.05 Vdc, perform **b** (1) below.
- (3) For TIs with serial numbers prefixed 610 or 613, connect multimeter between negative side of A1C5 (fig. 1) and base of Q5 (fig. 1). For TIs with serial numbers prefixed 739 or 811A, connect multimeter between negative side of A1C5 (fig. 2) and base of

Q8 (fig. 2) which is at junction with R53 (fig. 2). If multimeter does not indicate between +17.748 and 17.752 Vdc, perform **b** (2) below.

NOTE

Float multimeter. The negative side of A1C5 is at -30 Vdc.

(4) Set **MOUNT RESISTANCE** switch to **200Ω**. If multimeter does not indicate between +12.5495 and +12.5525 Vdc, perform **b** (3) below.

b. Adjustments

- (1) Adjust A1R14 (fig. 1 or 2) to obtain multimeter indication of -30.00 Vdc (R).
- (2) Adjust A1R17 (fig. 1 or 2) to obtain indication of +17.750 Vdc on multimeter (R).
- (3) Adjust A1R19 (fig. 1 or 2) to obtain indication of +12.551 V dc on multimeter (R).

NOTE

Resolution of potentiometers may not permit exact settings specified in (2) and (3) above. If the voltage is set to the high side within limits for the 100 ohm adjustment, set the voltage to the high side within limits for the 200 ohm adjustment, even if it is possible to obtain a setting closer to the exact setting on the low side.

11. Final Procedure

a. Deenergize and disconnect all equipment, remove short from **POWER METER** terminals and reinstall protective covers on TI if necessary.

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

By Order of the Secretary of the Army:

Official:



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Secretary of the Army*

0807912

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Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342843, requirements for calibration procedure TB 9-4931-393-24.

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.

