

*TB 9-6625-1956-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR CALIBRATOR AGILENT MODEL 8477A

Headquarters, Department of the Army, Washington, DC

19 March 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 9-6625-1956-35, dated 8 July 1988.

SECTION I IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Calibrator, Agilent Model 8477A. The manufacturer's 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. None.

b. Time and Technique. The time required for this calibration is approximately 2 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. 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 parameter	Performance specifications
Calibration points	Output: Voltages corresponding to meter indications of 0.01, 0.03, 0.1, 0.3, 1, 3, and 10 mV Accuracy: $\pm 0.5\%$ on 0.01 and 0.03 mW ranges from $+20^{\circ}$ to $+30^{\circ}\text{C}$ $\pm 0.2\%$ on 0.1 to 10 mW ranges
V comp, set and check	V comp: 200 Ω : 5.9 V on 0.01 through 3.0 mW ranges and 3.1 V on 10.0 mW range 100 Ω : 2.2 V on 0.01 through 10.0 mW ranges Tolerance: ± 0.003 V Set: 5.9 V dc Tolerance: ± 0.01 V Check: 2.2 V Tolerance: ± 0.01 V

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. 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 four-to one accuracy of the equipment selected is shown in parenthesis.

5. Accessories Required. 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 to 6 V dc Accuracy: $\pm 0.005\%$	Fluke, Model 8840A/AF05 (AN/GSM-64D)
POWER METER	Range: 10 μ W to 10 mW Accuracy: $\pm 1\%$ FS	Agilent, Model E12-432A (MIS-30525) w/thermistor mount, Agilent, Model 478A-H75 (7915907) or 8478B (8478B)

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 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. 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. Remove protective cover from TI only when necessary to make adjustments. Replace cover after completing the adjustments.
- b. Set TI 115-230 V switch (rear panel) to 115 V.
- c. Connect TI to autotransformer.
- d. Connect autotransformer to 115 V source and adjust for a 115 V ac output.
- e. Position TI controls as listed in (1) through (3) below:
 - (1) **ZERO/TEST** switch to **ZERO**.
 - (2) **FUNCTION** switch to **200Ω**.
 - (3) **POWER (mW)** switch to **.01**.
- f. Energize TI and allow 30 minutes for warm-up and stabilization.

8. Range Accuracy

a. Performance Check

- (1) Connect equipment as shown in figure 1, connection A.
- (2) Position power meter controls as listed in (a) through (d) below:
 - (a) **MOUNT RESISTANCE** switch to **200Ω**.
 - (b) **RANGE** switch to **10 mW**.
 - (c) **CALIBRATION FACTOR** switch to **100%**.
 - (d) If power meter serial number is 931-01751 or above, set **A2S1 OPERATE/CALIBRATE** switch located on A2 logic board (left side of power meter) to **CALIBRATE**.

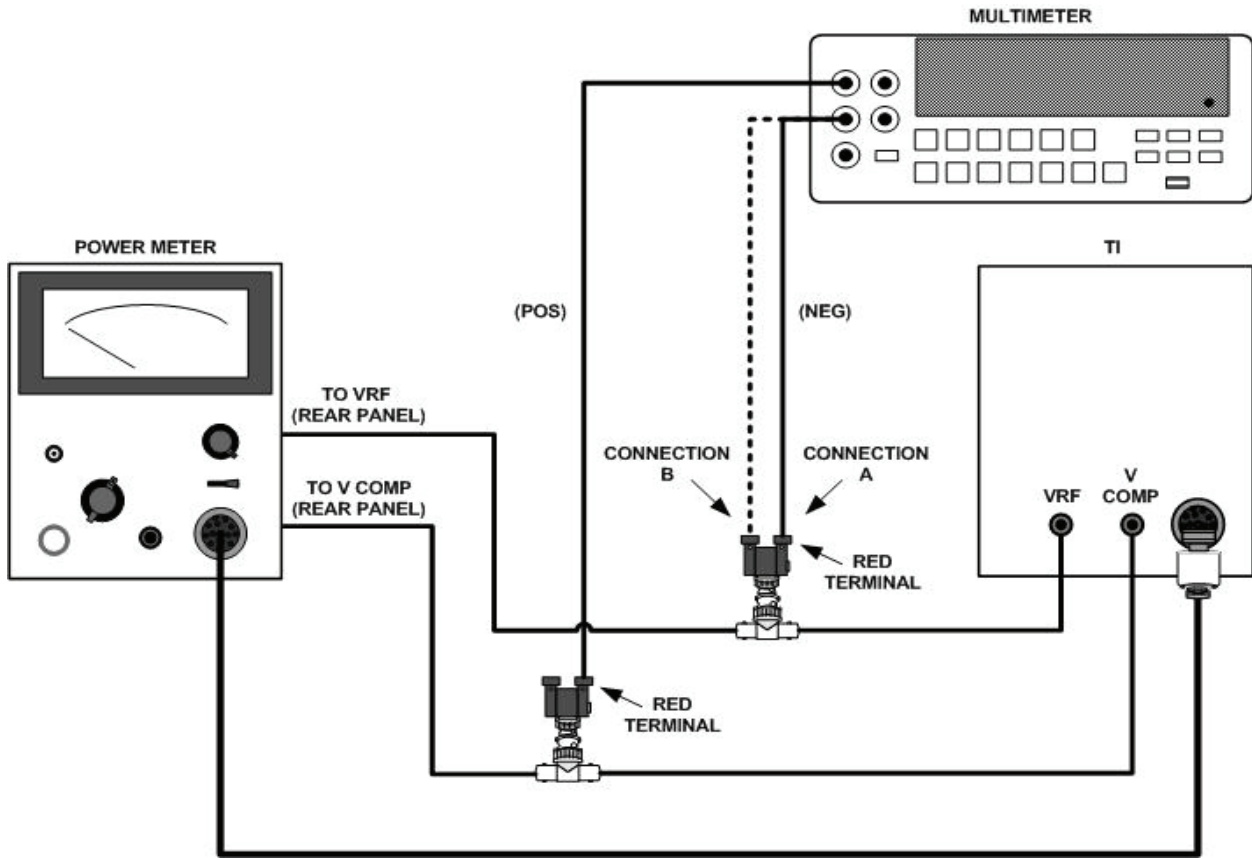


Figure 1. Range accuracy - equipment setup.

- (3) Adjust **ZERO** control to mechanical midrange. If multimeter does not indicate 0.0000 ± 0.050 mV dc, perform **b** below. Adjust **ZERO** control for a multimeter indication of 0.0000 ± 0.002 mV dc.
- (4) Set TI **ZERO/TEST** switch to **TEST**. If multimeter does not indicate between 0.674 and 0.682 mV dc, and **b** was not performed in (3) above, perform **b** below.
- (5) Vary autotransformer output between 105 and 125 V. Multimeter indication will remain within limits specified in (4) above. Return autotransformer output to 115 V.
- (6) Turn TI **POWER (mW)** switch to positions listed in table 4. Multimeter will indicate within limits specified.

Table 4. Range Accuracy (200Ω)

POWER (mW) switch setting	Nominal voltage TP3 To TP7 (mV dc)	Multimeter indication (mV dc)	
		Min -	Max +
0.03	2.034	2.024	2.044
0.1	6.784	6.770	6.798
0.3	20.370	20.329	20.411
1.0	68.190	68.053	68.326
2.0	137.200	136.92	137.47
3.0	207.000	206.59	207.41
10.0	1.83101 ¹	1.8273 ¹	1.8347 ¹

¹Unit of measure is volts dc.

NOTE

It is not necessary to position the power meter **RANGE** switch to correspond to the TI **POWER (mW)** switch positions.

- (7) Turn TI **POWER (mW)** switch to **.01**.
- (8) Set the power meter **MOUNT RESISTANCE** switch to **100Ω**.
- (9) Turn TI **FUNCTION** switch to **100Ω** and **ZERO/TEST** switch to **ZERO**.
- (10) Repeat (3) above.
- (11) Set **ZERO/TEST** switch to **TEST**.
- (12) Turn TI **POWER (mW)** switch to positions listed in table 5. Multimeter will indicate within limits specified.

Table 5. Range Accuracy (100Ω)

POWER (mW) switch setting	Nominal voltage TP3 To TP7 (mV dc)	Multimeter indication(mV dc)	
		Min	Max
0.01	0.909	0.9045	0.9135
0.03	2.729	2.716	2.742
0.1	9.110	9.092	9.128
0.3	27.440	27.385	27.494
1.0	92.870	92.685	93.055
2.0	190.00	189.62	190.38
3.0	292.10	291.52	292.68
10.0	1.2835 ¹	1.2809 ¹	1.2860 ¹

¹Unit of measure is volts dc.

b. Adjustments

- (1) Remove cover from TI for access to adjustments.
- (2) Return power meter **OPERATE/CALIBRATE** switch A2S1 to **OPERATE** if set in 8 a (2) (d) above.
- (3) Connect the multimeter positive lead to TP13 (fig. 2) and the negative lead to TI chassis.
- (4) Turn TI **POWER (mW)** switch and power meter **RANGE** switch to **3 mW**.
- (5) Set TI **ZERO/TEST** switch to **ZERO**.
- (6) Adjust TI **ZERO** control to midrange.
- (7) Adjust A1R21 (5.900 v ADJ) (fig. 2) for a multimeter indication of 5.900 V dc (R).

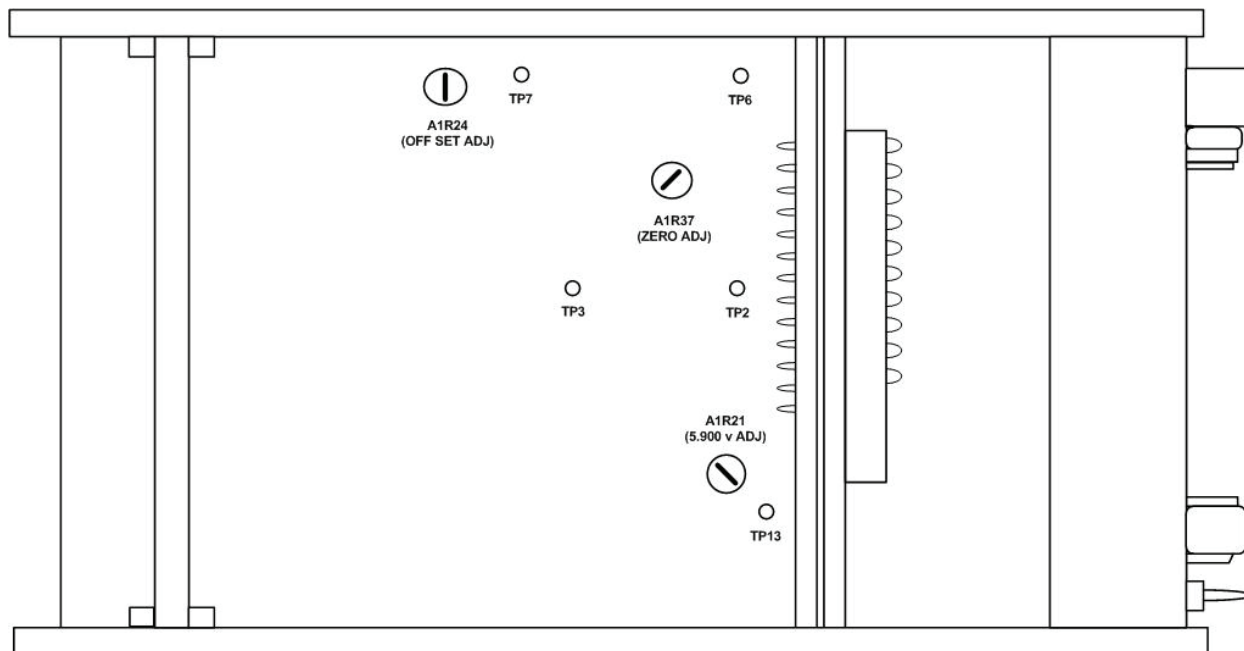


Figure 2. Calibrator A1 circuit board - component location.

- (8) Connect multimeter positive lead to TP2 (fig. 2) and the negative lead to TP3 (fig. 2).
- (9) Adjust A1R37 (ZERO ADJ) (fig. 2) for a multimeter indication of 0.0000 V dc (R).
- (10) Connect multimeter positive lead to TP7 (fig. 2) and the negative lead to TP 6 (fig. 2).
- (11) Adjust A1R24 (OFFSET ADJ) (fig. 2) for a multimeter indication of 0.0000 V dc (R).

9. Set, Check, and V Comp

a. Performance Check

- (1) Connect multimeter as shown in figure 1, connection B.
- (2) Turn TI **POWER (mW)** switch to **.01**.
- (3) Turn TI **FUNCTION** switch to **SET**.
- (4) Set power meter **MOUNT RESISTANCE** switch to **200Ω**. The multimeter will indicate between 5.890 and 5.910 V dc.
- (5) Turn TI **FUNCTION** switch to **CHECK**. The multimeter will indicate between 2.190 and 2.210 V dc.
- (6) Turn TI **FUNCTION** switch to **200Ω**. The multimeter will indicate between 5.897 and 5.903 V dc.
- (7) Turn TI **POWER (mW)** switch to **.03, .1, .3, 1, 2, and 3**. In each position the multimeter will indicate between 5.897 and 5.903 V dc.

(8) Turn TI **POWER (mW)** switch to **10**. The multimeter will indicate between 3.097 and 3.103 V dc.

(9) Turn TI **POWER (mW)** switch to **.01**.

(10) Set the power meter **MOUNT RESISTANCE** switch to **100 Ω** .

(11) Turn TI **FUNCTION** switch to **100 Ω** . The multimeter will indicate between 2.197 and 2.203 V dc.

(12) Turn TI **POWER (mW)** switch to **.03, .1, .3, 1, 2, and 3**. In each position, the multimeter will indicate between 2.197 and 2.203 V dc.

b. Adjustments. No adjustments can be made.

10. Final Procedure

a. Deenergize and disconnect all equipment and replace TI protective cover.

CAUTION

Return power meter **MOUNT RESISTANCE** switch to **200 Ω** or damage may result to meter if accidentally operated in the **100 Ω** position with a 200 Ω thermistor mount.

b. Return power meter **OPERATE/CALIBRATE** switch **A2S1** to **OPERATE** and replace protective cover.

c. 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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Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342154, requirements for calibration procedure TB 9-6625-1956-24.

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.

