

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR  
CALIBRATOR  
HEWLETT-PACKARD  
MODEL 8477A

Headquarters, Department-of the Army, Washington, DC  
8 July 1988

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\*This bulletin supersedes TB 9-6625-1956 50, 5 April 1977, including all changes

**SECTION I**

**IDENTIFICATION AND DESCRIPTION**

**1. Test Instrument Identification.** This bulletin provides instructions for the calibration of Calibrator, Hewlett- Packard, 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.

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.

**2. Forms, Records, and Reports.**

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° to +30°C $\pm 0.2\%$ on 0.1 to 10 mW ranges
V comp, set, and check	V comp: 200Ω: 5.9 V on 0.01 through 3.0 mW ranges and 3.1 V on 10.0 mW range 100Ω: 2.2 V on 0.01 through 10.0 mW ranges Tolerance: $\pm 0.003$ V Set: 5.9 V dc Tolerance: $\pm 0.01$ V Check: 2.2 V Tolerance: $\pm 0.01$ 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. 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.

**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**

Item	Common name	Minimum use specifications	Manufacturer and model (part number)
A1	AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: $\pm 1\%$	General Radio, Model W10MT3AS3 or Ridge, Model 9020F (7910809)
A2	DIGITAL VOLTMETER	Range: 0 to 6 V dc Accuracy: 0.05%	Hewlett-Packard, Model 3490AOPT060 (3490AOPT060) Dana, Model 5000, or Dana, Model 5000, w/641
A3	POWER METER	Range: 10 pW to 10 mW Accuracy: 1% FS	Hewlett-Packard, Model E12-432A (MIS-30525) w/thermistor mount, Hewlett-Packard, Model H75-478A (7915907) or 8478B (8478B)

Table 3. Accessories Required

Item	Common name	Description (part number)
B1	ADAPTER 1	BNC T-type, 2 jacks, 1 plug (MS35173-274C)
B2	ADAPTER 1	BNC jack terminations (MS35184-914)
B3	ADAPTER 1	BNC plug to double banana jacks (7909401)
B4	CABLE 2	30-in., RG-58/U; BNC plug terminations (7907467)
B5	CABLE	36-in., BNC plug to two alligator clips (7909410)
B6	CABLE	Thermistor mount cable (8120-1082)

1 Two required  
2 Four 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 and item identification number as listed in table 2 and table 3. For the identification of equipment referenced by item numbers prefixed with A, see table 2, and for prefix B, see table 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 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.

- a. Set TI 115-230 V switch (rear panel) to 115 V.
- b. Connect TI to autotransformer (AI).
- c. Connect autotransformer to 115-V source and adjust for a 115-V ac output.
- d. Position TI controls as listed in (1) through (3) below:

(1) ZERO/TEST switch to ZERO.

(2) FUNCTION switch to 200Q.

(3) POWER (mW) switch to .01.

- e. Energize TI and allow 30 minutes for warmup and stabilization

**8. Range Accuracy**

**a. Performance Check**

(1) Connect equipment as shown in figure 1, connection A.

(2) Position power meter (A3) controls as listed in (a) through (d) below:

(a) MOUNT RESISTANCE switch to 2000.

(b) RANGE switch to 10 mW.

(c) CALIBRATION FACTOR switch to 100%.

(d) If power meter is of serial number 931-01751 or above, set A2S1 OPERATE/CALIBRATE switch located on A2 logic board (left side of power meter) to CALIBRATE.

(3) Adjust ZERO control to mechanical midrange. If digital voltmeter (A2) does not indicate 0.0000 +0.050 mV de, perform b below. Adjust ZERO control for a digital voltmeter indication of 0.0000 +0.002 mV dc.

(4) Set TI ZERO/TEST switch to TEST. If digital voltmeter does not indicate between 0.674 and 0.682 mV de, and b was not performed in (3) above, perform b below.

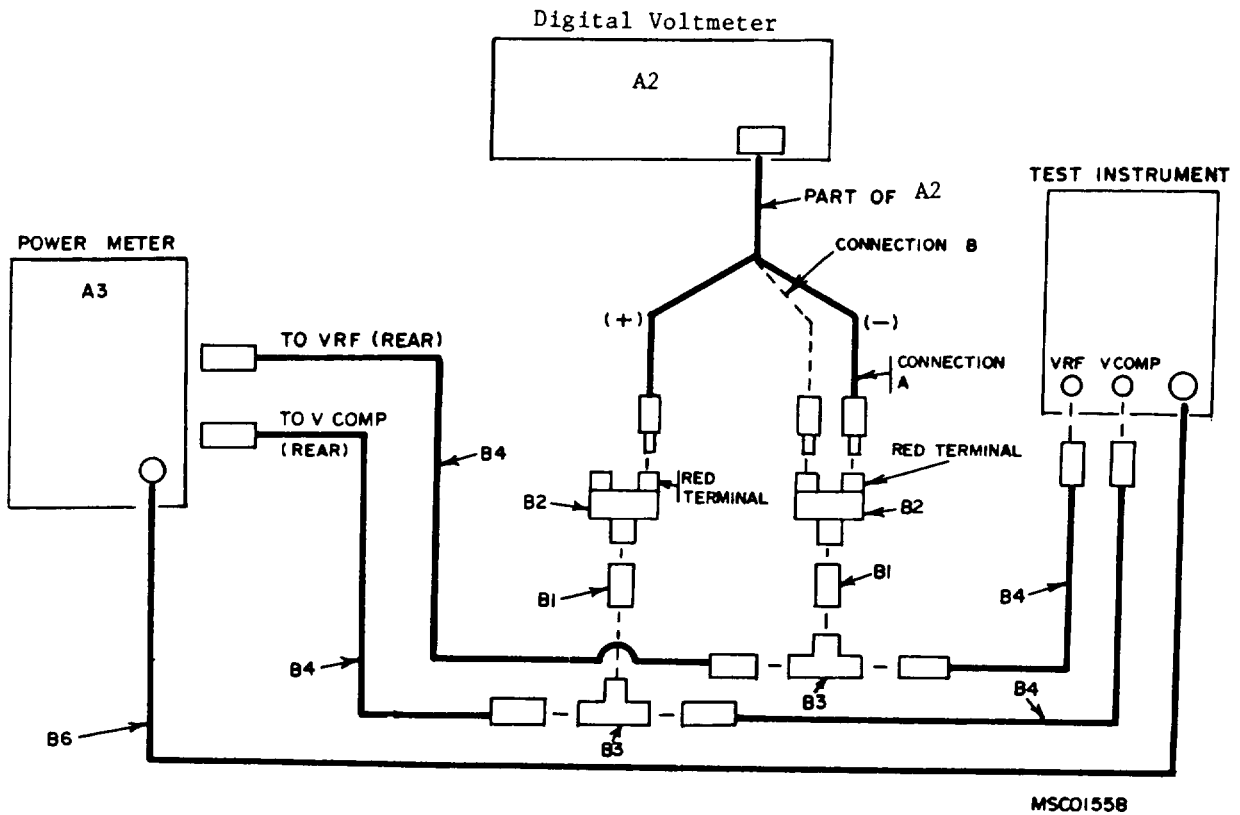


Figure 1. Range accuracy - equipment setup.

(5) Vary autotransformer (AI) output between 105 and 125 V. Digital voltmeter 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. Digital voltmeter will indicate within limits specified.

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

Table 4. Range Accuracy (2002)

POWER (mW) switch setting	Nominal voltage TP3 to TP7 (mV dc)	Digital voltmeter 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	1.82731	1.8347

1 Unit of measure is volts dc.

(8) Set the power meter MOUNT RESISTANCE switch to I000.

(9) Turn TI FUNCTION switch to I000 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. Digital voltmeter will indicate within limits specified.

**b. Adjustments**

(1) Remove cover from TI for access to

adjustments.

(2) Return power meter OPERATE/CALIBRATE switch A2S1 to OPERATE if set in 8a(2)(d) above.

(3) Connect the digital voltmeter positive lead to TP13 (fig. 2) and the negative lead to TI chassis, using adapters and cable (B1, B2, and B5).

(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 digital voltmeter indication of 5.900 V dc (R).

Table 5. Range Accuracy (100Q)

POWER (mW) switch setting	Nominal voltage TP3 to TP7 (mV dc)	Digital voltmeter indication (mV dc)	
		Min	Max
0.01	0.909	.9045	.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
10.01	1.28351	1.28091	1.28601

1 Unit of measure is volts dc.

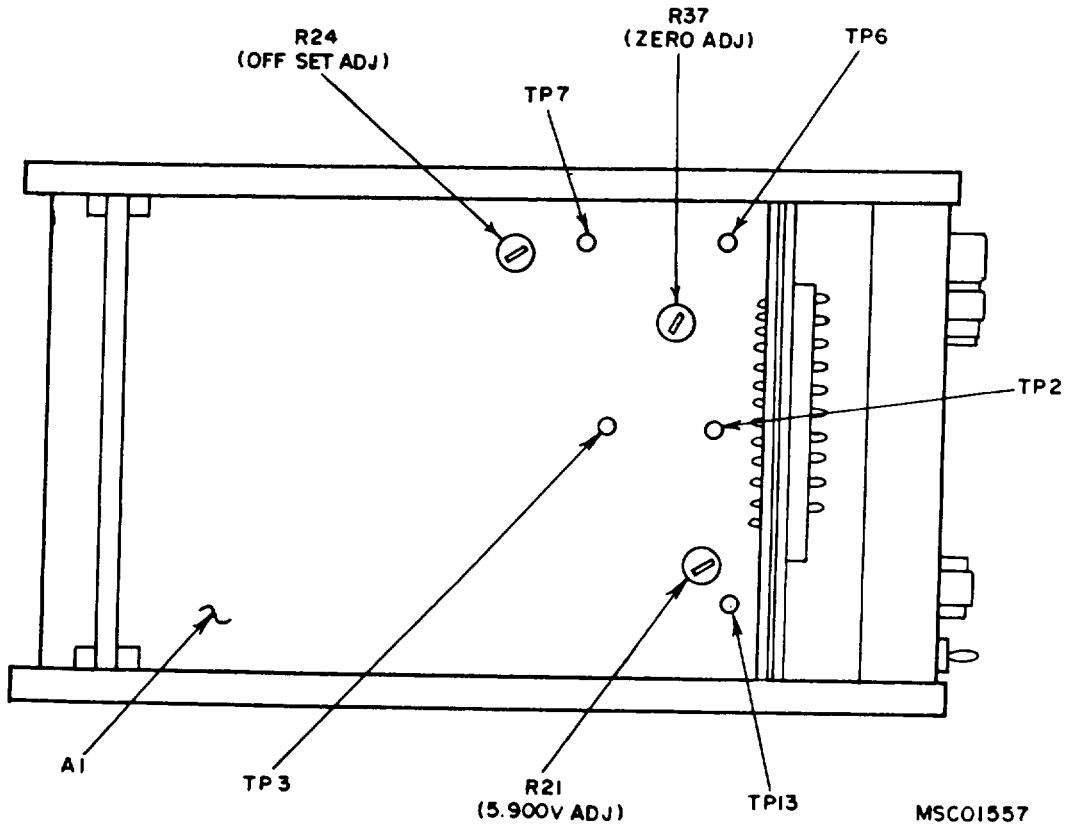


Figure 2. Calibrator A1 circuit board - component location.

(8) Connect digital voltmeter positive lead to TP2 (fig. 2) and the negative lead to TP3 (fig. 2), using adapters and cable (B1, B2, and B5).

(9) Adjust A1R37 (ZERO ADJ) (fig. 2) for a digital voltmeter indication of 0.0000 V de (R).

(10) Connect digital voltmeter positive lead to TP7 (fig. 2) and the negative lead to TP6 (fig. 2), using adapters and cable (B1, B2, and B5).

(11) Adjust A1R24 (OFFSET ADJ) (fig. 2) for a digital voltmeter indication of 0.0000 V dc (R).

**9. Set, Check, and V comp**

**a Performance Check**

(1) Connect digital voltmeter (A2) 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 (A3) MOUNT RESISTANCE switch to 200Q. The digital voltmeter will indicate between 5.890 and 5.91 V de.

(5) Turn TI FUNCTION switch to CHECK. The digital voltmeter will indicate between 2.190 and 2.210 V de.

(6) Turn TI FUNCTION switch to 200il. The digital voltmeter will indicate between 5.897 and 5.903 V de.

(7) Turn TI POWER (mW) switch to .03, .1, .3, 1, 2, and 3. In each position the digital voltmeter will indicate between 5.897 and 5.903 V dc.

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(8) Turn TI POWER (mW) switch to 10. The digital voltmeter 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 100I.

(11) Turn TI FUNCTION switch to 100I. The digital voltmeter will indicate between 2.197 and 2.203 V de.

(12) Turn T1 POWER (mW) switch to .03, .1, .3, 1, 2, and 3. In each position, the digital voltmeter 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 within protective cover.

**CAUTION**

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

CARL E. VUONO  
*General, United States Army  
Chief of Staff*



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