

TB 9-6625-2377-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR AMPLIFIER, AUDIO FREQUENCY-RADIO FREQUENCY AM-4825A/U (HEWLETT-PACKARD MODEL 461A)

Headquarters, Department of the Army, Washington, DC
28 October 2008

Distribution Statement A: Approved for public release; distribution is unlimited.

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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SECTION I IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Amplifier, Audio Frequency-Radio Frequency AM-4825A/U (Hewlett-Packard Model 461A). 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 1 hour, using 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 parameters	Performance specifications
Frequency range	1 kHz to 150 MHz
Frequency response	±1 dB, 1 kHz to 150 MHz, into 50 ohms (500 kHz reference)
Gain at 500 kHz	40 dB ±0.5 dB, 20 dB ± 1.0 dB
Output	0.5 volts rms into 50 ohms
Distortion	Less than 5% at maximum output and rated load
Maximum input ¹	1 volt rms or 2 volts p-p
Input impedance ¹	50 ohms, nominal
Equivalent input noise	Less than 40 microvolts (40 dB position)
Power requirements ¹	115 or 230 volts ± 10%, 50 to 100 Hz, 5 watts

¹For information only; not necessarily verified in this procedure.

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 and 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 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)
ATTENUATOR, VARIABLE	Range: 0 to 60 db Accuracy: ± 0.3 db, @ 1 kHz	Hewlett Packard, Model 355D (355D)
AUDIO ANALYZER	Freq: 100 kHz Accuracy: $\pm 1.25\%$	Boonton, Model 1121 (1121)
AUTOTRANSFORMER	Range: 105 to 125 vac Accuracy: $\pm 3\%$	Ridge, Model 9020A (9020A)
FUNCTION GENERATOR	Range: 1 kHz to 10 MHz	Agilent, Model 33250A (33250A)
POWER METER	Freq: 500 kHz to 150 MHz Accuracy: $\pm 2.1\%$ 500 kHz to 150 MHz $\pm 2.0\%$ 1 MHz to 10 MHz $\pm 2.7\%$ 10 MHz to 50 MHz $\pm 2.5\%$ 50 MHz to 150 MHz	Hewlett Packard, Model 437B (13440045) w/power sensor Hewlett Packard, Model 8482A (13440043)
SIGNAL GENERATOR	Range: 500 kHz to 512 MHz	Aeroflex, Model 2023B (2023B) or (SG-1207/U)
TRUE RMS VOLTMETER	Freq: 1 kHz to 500 kHz Range: -60 to + 10 db Accuracy: $\pm 1\%$	Fluke, Model 8922A/AA (8922A/AA)

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 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.

d. Unless otherwise specified, all controls and control settings refer to 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. Energize equipment and allow sufficient time for equipment to warm-up and stabilize.
- b. Adjust autotransformer output voltage control to minimum.
- c. Connect TI power cord to autotransformer.
- d. Adjust autotransformer output voltage control for a meter indication of 115 vac.
- e. Set TI **GAIN (DB)** switch to **40** and allow 10 minutes warm-up.

8. Gain And Output Voltage

a. Performance Check

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

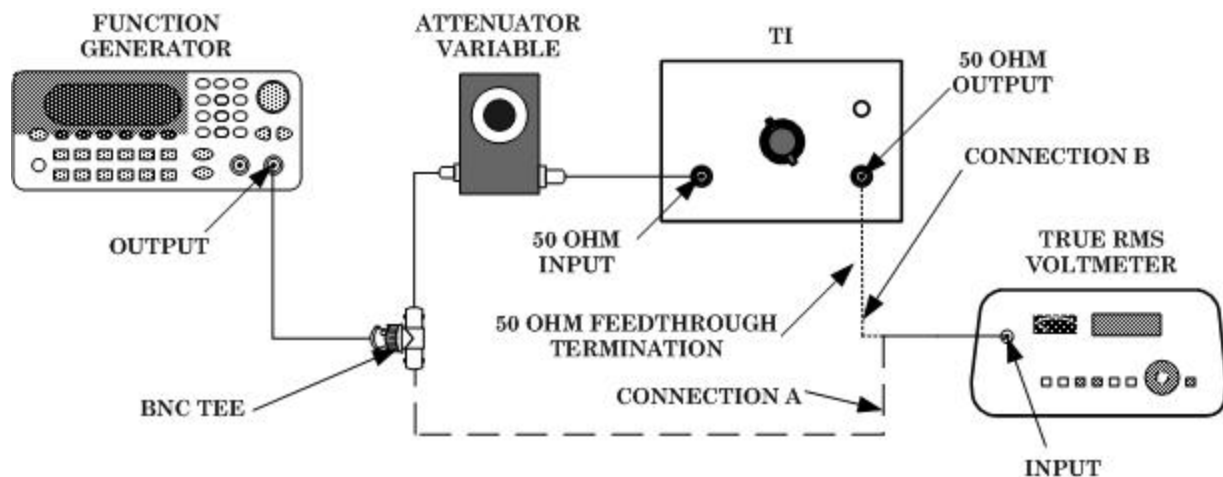


Figure 1. Gain setup.

- (2) Set step attenuator **dB** switch to **40**.
- (3) Set true rms voltmeter **RANGE** to **AUTO**, **DISPLAY** to **dB** and **dBm REFERENCE (Ω)** dial to **50**.
- (4) Adjust signal generator frequency for 500 kHz and output amplitude controls for true rms voltmeter indication of 0 on the **dB** scale.
- (5) Set function generator **Output** to off and connect equipment as shown in figure 1 connection B.

- (6) Set function generator **Output** to on. True rms voltmeter will indicate between -0.5 and +0.5 dB.
- (7) Set TI **GAIN (DB)** switch to **20**.
- (8) Set step attenuator **dB** switch to **20**.
- (9) True rms voltmeter will indicate between -1.0 and + 1.0 dB.
- (10) Adjust autotransformer output control for meter indication of 105, 125, and 115 vac. True rms voltmeter will indicate between -1.0 and +1.0 dB at each setting.
- (11) Set function generator **Output** to off. Connect equipment as shown in figure 1 connection A.
- (12) Set function generator **Output** to on and adjust function generator output amplitude controls for true rms voltmeter indication of -3.8 dB.
- (13) Set function generator **Output** to off. Connect equipment as shown in figure 1 connection B.
- (14) Set step attenuator **dB** switch to **40**.
- (15) Set TI **GAIN (DB)** switch to **40**.
- (16) Set function generator **Output** to on. True rms voltmeter will indicate between -2.8 and -4.8 dB.
- (17) Set function generator **Output** to off.

b. Adjustments. No adjustments can be made.

9. Distortion

a. Performance Check

- (1) Insert 50 Ω feedthrough termination between TI **50 Ω OUTPUT** and true rms voltmeter **INPUT**. Set true rms voltmeter for volts measurement.
- (2) Set function generator for an output frequency of 100 kHz and adjust function generator output amplitude for true rms voltmeter indication of 0.5 V rms.
- (3) Set function generator **Output** to off. Disconnect cable and 50 Ω feedthrough from true rms voltmeter and connect cable and 50 Ω feedthrough to audio analyzer **INPUT HIGH**.
- (4) Set function generator **Output** to on. Audio analyzer will indicate less than 5 percent distortion.
- (5) Set outputs to minimum and disconnect equipment.

b. Adjustments. No adjustments can be made.

10. Noise

a. Performance Check

(1) Connect TI **50 Ω OUTPUT** to true rms voltmeter using 50 Ω feedthrough termination.

(2) True rms voltmeter will indicate less than 4 mV rms.

b. Adjustments. No adjustments can be made.

11. Frequency Response

a. Performance Check

(1) Connect equipment as shown in figure 2.

(2) Set step attenuator **dB** switch to **40**.

(3) Set function generator for an output frequency of 500 kHz and adjust function generator output amplitude for true rms voltmeter indication of 0.3 V rms.

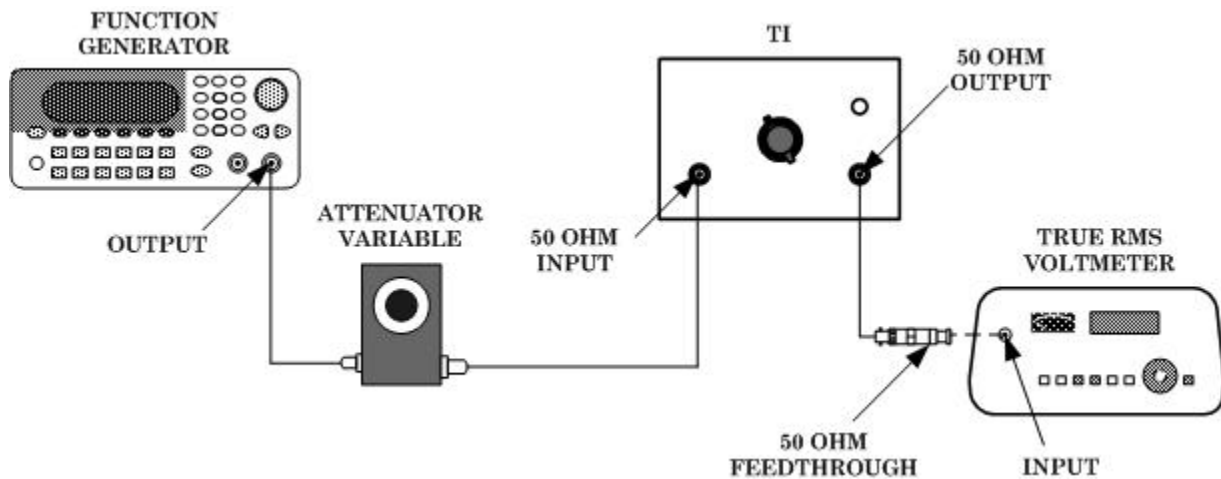


Figure 2. Low frequency response setup.

(4) Maintain constant function generator output amplitude and set for frequencies listed in table 3. At each frequency setting true rms voltmeter will indicate between 0.27 and 0.33 V rms.

Table 3. Frequency Response

Signal generator frequency
1 kHz
10 kHz
100 kHz
1 MHz

(5) Set outputs to minimum and disconnect equipment.

(6) Standardize power meter.

- (7) Connect signal generator rf output to power sensor.

NOTE

At each frequency set power meter cal factor, as required, to correct for power sensor calibration factor.

- (8) Set signal generator output frequency to 500 kHz and adjust output amplitude for a power meter indication of 0.0 dBm.

- (9) Set reference on power meter.

- (10) Set signal generator for output frequencies of 5, 10, 50, 100, and 150 MHz and record power meter deviations at each frequency.

- (11) Set signal generator output to minimum and disconnect power sensor from signal generator.

- (12) Connect equipment as shown in figure 3.

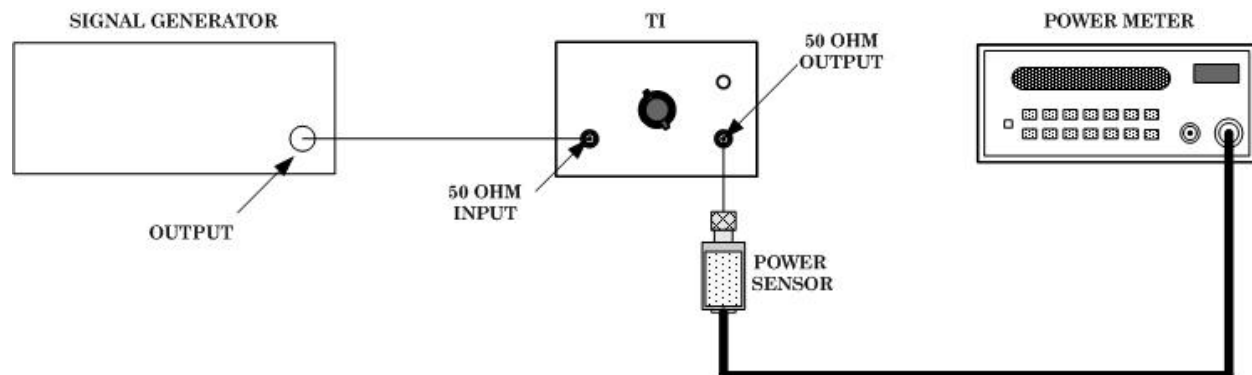


Figure 3. High Frequency Response Setup.

NOTE

Set power meter cal factor, as required, for power sensor calibration factor at each frequency being calibrated.

- (13) Set signal generator output frequency to 500 kHz and output amplitude to -40 dBm.
- (14) Set TI **GAIN (DB)** switch to **40**.
- (15) Slowly adjust signal generator output amplitude for a power meter indication of 0.0 dBm.
- (16) Set reference on power meter.
- (17) Set signal generator for output frequencies of 5, 10, 50, 100, and 150 MHz. Verify power meter indication is within ± 1.00 dB of values recorded in step (9) above.


b. Adjustments. No adjustments can be made.

12. Final Procedure

- a. Deenergize and disconnect all equipment.
- b. Annotate and affix DA label/form in accordance with TB 750-25.

By Order of the Secretary of the Army:

Official:


JOYCE E. MORROW
*Administrative Assistant to the
Secretary of the Army*

0823903

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Distribution:

To be distributed in accordance with the initial distribution number (IDN) 344932, requirements for calibration procedure TB 9-6625-2377-24.

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.

