*TB 9-6625-1097-35

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR OSCILLATOR, HEWLETT-PACKARD, MODEL 241A

Headquarters, Department of the Army, Washington, DC
30 July 2004

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, US Army Aviation and Missile Command, AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also provide DA Form 2028 information to AMCOM via e-mail, fax, or the World Wide Web. Our fax number is DSN 788-6546 or Commercial 256-842-6546. Our e-mail address is 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual. For the World Wide Web, use https://amcom2028.redstone.army.mil.

*This bulletin supersedes TB 9-6625-1097-35, dated 16 August 1988.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Oscillator, Hewlett-Packard, Model 241A. 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
Frequency	Range: 10 Hz to 1 MHz Accuracy: ±1%
Frequency response	± 2% into 600 Ω[1]
Distortion	≤1%[2]
Output	Range: 25 mV to 2.5 V into 600 Ω

[1]Not calibrated below 20 Hz.
[2]Not calibrated above 600 kHz.

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. 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 the calibration procedure. The following peculiar accessory is also required for this calibration: voltage divider 600 Ω (11047A) (7911560).

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
AUDIO ANALYZER	Range: 10 Hz to 600 kHz Distortion: <1%	Boonton, Model 1121 (1121)
FREQUENCY COUNTER	Range: 9.9 to 1,008,990 Hz Accuracy: ±0.25%	Fluke, PM6681/656 (PM6681/656)
MULTIMETER	Range: 20 Hz to 9 kHz 0.98 to 1.02 V ac Accuracy: ±0.5%	Fluke, Model 8840A/AF05 (AN/GSM-64D)
TRUE RMS VOLTMETER	Range: 1 to 999 kHz 25 mV to 2.5 V Accuracy: (±0. 7%)	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 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 TI protective cover as required for adjustment.

b. Connect TI to a 115 V ac source.

c. Press **1 FREQUENCY DIGITS 1ST** pushbutton and allow 30 minutes for warm-up and stabilization.

8. Frequency Accuracy

a. Performance Check

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

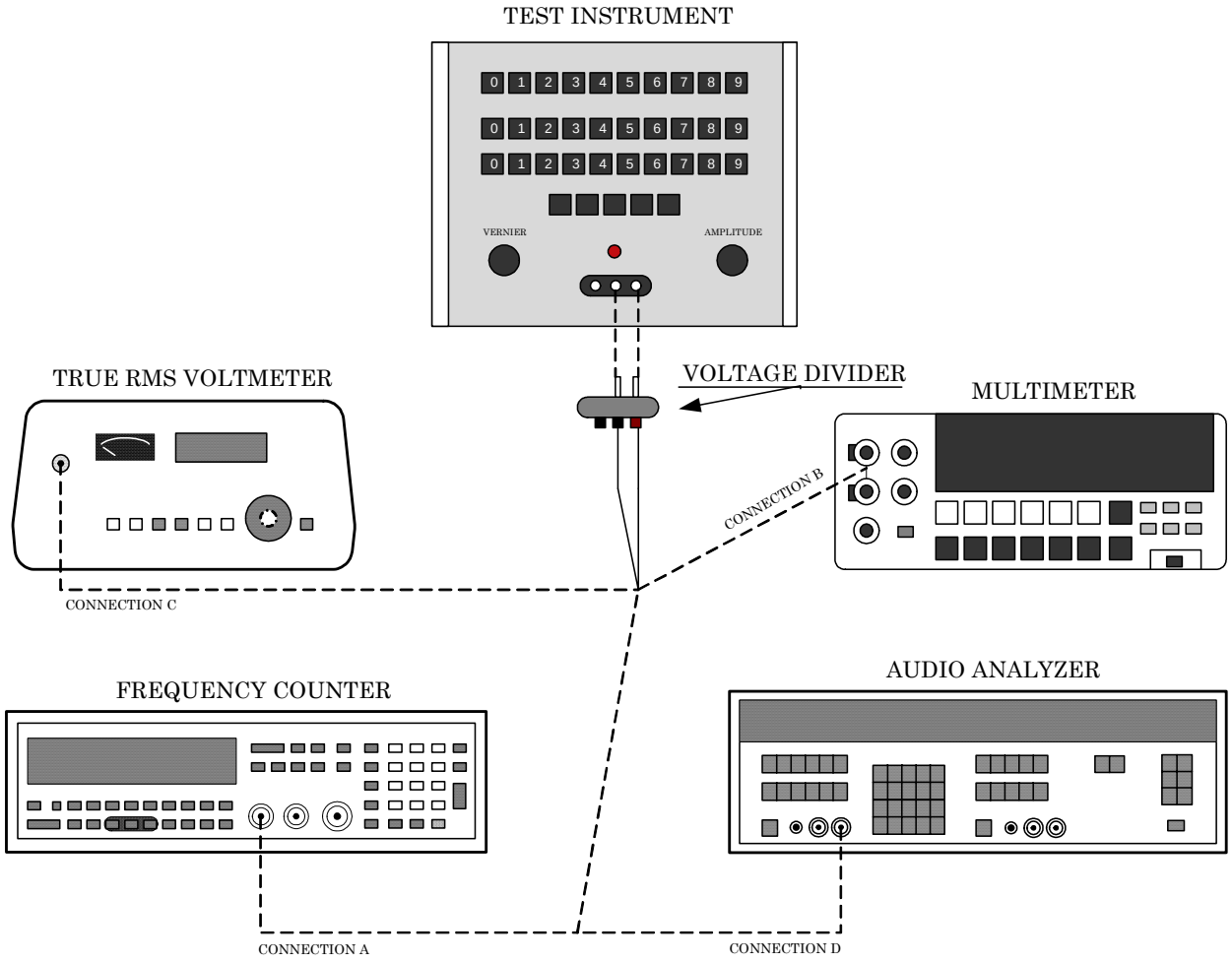

Figure 1. Equipment setup.

(2) Position controls as listed in (a) through (f) below:

(a) **X10 CPS MULTIPLIER** pushbutton pressed.

(b) **1 FREQUENCY DIGITS 1ST** pushbutton pressed.

(c) **0 FREQUENCY DIGITS 2D** pushbutton pressed.

(d) **0 FREQUENCY DIGITS 3D** pushbutton pressed.

(e) **AMPLITUDE** control to midposition.

(f) **VERNIER** control to **CAL**.

(3) Frequency counter will indicate between 9.9 and 10.1 Hz.

(4) Press **MULTIPLIER** and **FREQUENCY DIGITS** pushbuttons as listed in table 3. If frequency counter indications are not within limits specified, perform **b** below.

Table 3. Frequency Calibration

Test instrument pushbutton settings				Frequency counter indications (Hz)	
MULTIPLIER	**FREQUENCY DIGITS**				
	1ST	2D	3D	Min	Max
X10 CPS	5	0	0	49.5	50.5
X10 CPS	9	0	0	89.1	90.9
X100 CPS	1	0	0	99	101
X100 CPS	5	0	0	495	505
X100 CPS	9	0	0	891	909
X1 KC	1	0	0	990	1010
X1 KC	5	0	0	4950	5050
X1 KC	9	0	0	8910	9090
X10 KC	1	0	0	9900	10,100
X10 KC	5	0	0	49,500	50,500
X10 KC	9	0	0	89,100	90,900
X100 KC	1	0	0	99,000	101,000
X100 KC	5	0	0	495,000	505,000
X100 KC	9	0	0	891,000	909,000
X100 KC	9	9	9	989,010	1,008,990

(5) Adjust **VERNIER** control fully cw. Frequency counter will indicate at least 1 MHz.

b. Adjustments

(1) Press **1.00 FREQUENCY DIGITS** pushbuttons and **X100 KC MULTIPLIER** pushbutton.

(2) Connect true rms voltmeter to **TP1** and junction of **C31** and **C33** (fig. 2).

(3) Adjust **C112** and **C130** alternately for frequency counter indication of 100.2 kHz and true rms voltmeter indication of 115 mV (R).

NOTE

Frequency will decrease by approximately 0.2 percent when protective covers are reinstalled.

(4) Press **9.00 FREQUENCY DIGITS** pushbuttons and adjust **ADJ 1MC** (fig. 2) for frequency counter indication of 902 kHz (R).

NOTE

Frequency will decrease by approximately 0.2 percent when protective covers are reinstalled.

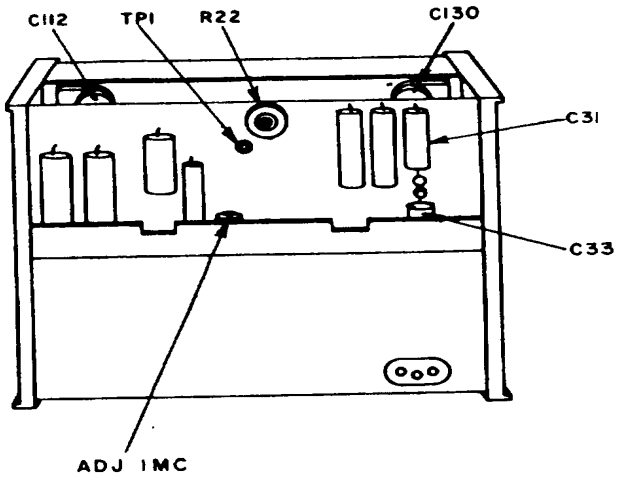

Figure 2. Oscillator - rear view.

(5) Check frequency and voltage at 100, 200, 700, and 900 kHz. Frequency counter will indicate within ±1% of selected frequency and true rms voltmeter will indicate between 90 and 125 mV. If necessary, adjust **ADJ 1MC**, **C112**, and **C130** for optimum performance.

9. Frequency Response and Output Voltage

a. Performance Check

(1) Connect equipment as shown in figure 1, CONNECTION B.

(2) Press **1.00 FREQUENCY DIGITS** pushbuttons and **X1 KC MULTIPLIER** pushbutton.

(3) Adjust **VERNIER** control to **CAL.**

(4) Adjust **AMPLITUDE** control for a 1.00 V ac indication on multimeter.

(5) Press **5.00 FREQUENCY DIGITS** pushbuttons. Multimeter will indicate between .98 and 1.02 V ac.

(6) Press **MULTIPLIER** and **FREQUENCY DIGITS** pushbuttons as listed in table 4. Multimeter will indicate between .98 and 1.02 V ac.

Table 4. Frequency Response - Low Frequency

Test instrument pushbutton settings			
Multiplier	Frequency digits		
	1st	2d	3d
X1 KC	9	0	0
X100 CPS	1	0	0
X100 CPS	5	0	0
X100 CPS	9	0	0
X10 CPS	2	0	0
X10 CPS	5	0	0
X10 CPS	9	0	0

(7) Connect equipment as shown in figure 1, CONNECTION C.

(8) Press **1.00 FREQUENCY DIGITS** pushbuttons and **X1 KC MULTIPLIER** pushbutton.

(9) Adjust **AMPLITUDE** control for a 1.00 V ac indication on true rms voltmeter.

(10) Press **9.00 FREQUENCY DIGITS** pushbuttons. True rms voltmeter will indicate between .98 and 1.02 V ac.

(11) Press **MULTIPLIER** and **FREQUENCY DIGITS** pushbuttons listed in table 5. True rms voltmeter will indicate between .98 and 1.02 V ac.

Table 5. Frequency Response - High Frequency

Test instrument pushbutton settings			
Multiplier	Frequency digits		
	1st	2d	3d
X10 KC	1	0	0
X10 KC	5	0	0
X10 KC	9	0	0
X100 KC	1	0	0
X100 KC	5	0	0
X100 KC	9	9	9

(12) Adjust **AMPLITUDE** control fully cw.

(13) Press **1.00 FREQUENCY DIGITS** pushbuttons and **X1 KC MULTIPLIER** pushbutton. True rms voltmeter will indicate at least 2.5 V.

(14) Adjust **AMPLITUDE** control fully ccw. True rms voltmeter will indicate less than 25 mV.

b. Adjustments. No adjustments can be made.

10. Distortion

a. Performance Check

(1) Connect equipment as shown in figure 1, CONNECTION D.

(2) Position controls as listed in (a) through (f) below:

(a) **X1 KC MULTIPLIER** pushbutton pressed.

(b) **1 FREQUENCY DIGITS 1ST** pushbutton pressed.

(c) **0 FREQUENCY DIGITS 2D** pushbutton pressed.

(d) **0 FREQUENCY DIGITS 3D** pushbutton pressed.

(e) **AMPLITUDE** control fully cw.

(f) **VERNIER** control to **CAL**.

(3) If audio analyzer does not indicate one percent or less distortion, perform **b** below.

(4) Repeat technique of (2) and (3) above for frequencies of 10 Hz and 600 kHz. Audio analyzer will indicate one percent or less distortion.

b. Adjustments. Adjust **R22** (fig. 2) for minimum distortion as indicated on audio analyzer (R).

11. 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:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army

0415501

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342117, requirements for calibration procedure TB 9-6625-1097-35.

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.