*TB 9-6625-2009-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR SPECTRUM ANALYZER HEWLETT-PACKARD, MODEL 3580A

Headquarters, Department of the Army, Washington, DC
3 January 2008

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, ATTN: 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 9-6625-2009-35, dated 23 July 2004.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Spectrum Analyzer, Hewlett-Packard, Model 3580A. 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 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. 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: 5 Hz to 50 kHz Accuracy: ± 100 Hz
Display	Range: Frequency error between any two points Accuracy: < ± 2% of indicated separation
Bandwidth	Range: 1, 3, 10, 30, 100, and 300 Hz Accuracy: ± 15% at 3 dB
Amplitude display	Range: 10 kHz CAL signal Accuracy: ± 2 dB LOG ± 2% LIN
Frequency response	Range: 20 Hz to 20 kHz Accuracy: ± 0.3 dB LOG ± 3% LIN Range: 5 Hz to 50 kHz Accuracy: ± 0.5 dB LOG ± 5% LIN
Amplitude reference level	Range: IF attenuator at 10 kHz Accuracy: ± l dB LOG ± 10% LIN

Table 1. Calibration Description - Continued

Test instrument parameters	Performance specifications
Bandwidth switching	Range: Between 3 to 300 Hz Accuracy: ± 0.5 dB LOG ± 5% LIN Range: 1 to 300 Hz Accuracy: ± l dB LOG ± 10% LIN
Input attenuator	Range: LIN, 0.2 mV to 1 V Accuracy: ± 3% of FS
Log sweep	Range: 20 Hz to 43 kHz Accuracy: ± 20%
Tracking oscillator output	Frequency range: 5 Hz to 50 kHz Output level: 0 to 2 V rms Accuracy: Response: ± 3% Frequency: ± 2.5 Hz Distortion: 1% or less
LO output	Range: 1 to 1.5 MHz Accuracy: ± 5 Hz

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)
AUDIO ANALYZER	Range: 10 Hz to 100 kHz Capability: >0.3% distortion measurement	Boonton, Model 1121 (1121)
AUTOTRANSFORMER	Range: 115 V ac Accuracy: ± 1%	General Radio, Type W10MT3AS3 (7910809) or Ridge, Model 9020A (9020A) or Ridge, Model 9020F (9020F)

Table 2. Minimum Specifications of Equipment Required - Continued

Common name	Minimum use specifications	Manufacturer and model (part number)
CALIBRATOR	Range: 0 to 50 kHz Accuracy: ± 1% Output level: 0.1 mV to 1.0 V rms Accuracy: ± 0.5%	Fluke, Model 5720A (5720A) (p/o MIS-35947); w amplifier, Fluke 5725A/AR (5725A/AR)
FREQUENCY COUNTER	Range: 0 to 1.5 MHz Accuracy: ± 0.001%	Fluke, Model PM6681/656 (PM6681/656)
MULTIMETER	Range: 0 to 5.05 V dc 0 to 2 V ac (rms) Accuracy: ± 0.1% dc ± 0.75% ac	Fluke, Model 8840A/AF05 (AN/GSM-64D)

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. Connect TI to autotransformer.

b. Connect autotransformer to a 115 V ac power source and adjust controls for a 115 V ac output.

c. Set **POWER** switch to **ON (AC)** and allow sufficient time for warm-up and stabilization.

d. Adjust **INTENSITY** and **FOCUS** controls as required for a bright, clear trace.

e. Position controls as listed in (1) through (22) below:

(1) **ADAPTIVE SWEEP** control to **OFF**.

(2) **DISPLAY STORE** pushbutton pressed and released.

(3) **DISPLAY BLANK STORE** pushbutton pressed and released.

(4) **AMPLITUDE MODE LOG 10 dB/DIV** pushbutton pressed.

(5) **AMPLITUDE REF LEVEL** switch to **NORMAL**.

(6) **DBv/LIN—dBm 600 Ω** (**dBm/LIN—900 Ω**) switch to **dBv/LIN** (**dBm/LIN** and set **UNBAL/BRDG/TERM** switch to **UNBAL** on some models).

(7) **INPUT SENSITIVITY** switch to **CAL**.

(8) **INPUT SENSITIVITY VERNIER** control to **CAL** (fully cw).

(9) **FREQUENCY** control to **0.00 kHz** on TI **FREQUENCY** dial.

(10) **START/CTR** switch to **START**.

(11) **RESOLUTION BANDWIDTH** control to **30 Hz**.

(12) **RESOLUTION BANDWIDTH DISPLAY SMOOTHING** switch to **MIN**.

(13) **SWEEP MODE** switch to **RESET**.

(14) **DISPLAY CLEAR WRITE** pushbutton pressed.

(15) **ZERO CAL** control for a peak zero response (zero response will appear at far left graticule line).

(16) **SWEEP MODE** switch to **LOG ZERO**.

(17) Repeat (14) and (15) above.

(18) **FREQUENCY** control to **10.0 kHz**.

(19) **RESOLUTION BANDWIDTH** control to **3 Hz**.

(20) **FREQ SPAN/DIV** control to **0 (zero) Hz**.

(21) **SWEEP MODE** switch to **MAN**.

(22) **ADAPTIVE SWEEP** control adjusted until sweep marker (gap) appears on horizontal trace.

f. Press and hold **DISPLAY CLEAR WRITE** pushbutton while adjusting **SWEEP MODE MANUAL VERNIER** control until sweep marker is centered. Release **DISPLAY CLEAR WRITE** pushbutton.

g. Turn **ADAPTIVE SWEEP** control to **OFF**.

h. Adjust **FREQUENCY** control for a 10 kHz peak response in center of TI display.

i. Adjust **CAL 10 kHz** control until 10 kHz response is full scale.

j. Press **AMPLITUDE MODE LOG 1 dB/DIV** pushbutton.

k. Repeat **h** and **i** above.

8. Frequency Calibration

a. Performance Check

(1) Connect equipment as shown in figure 1.

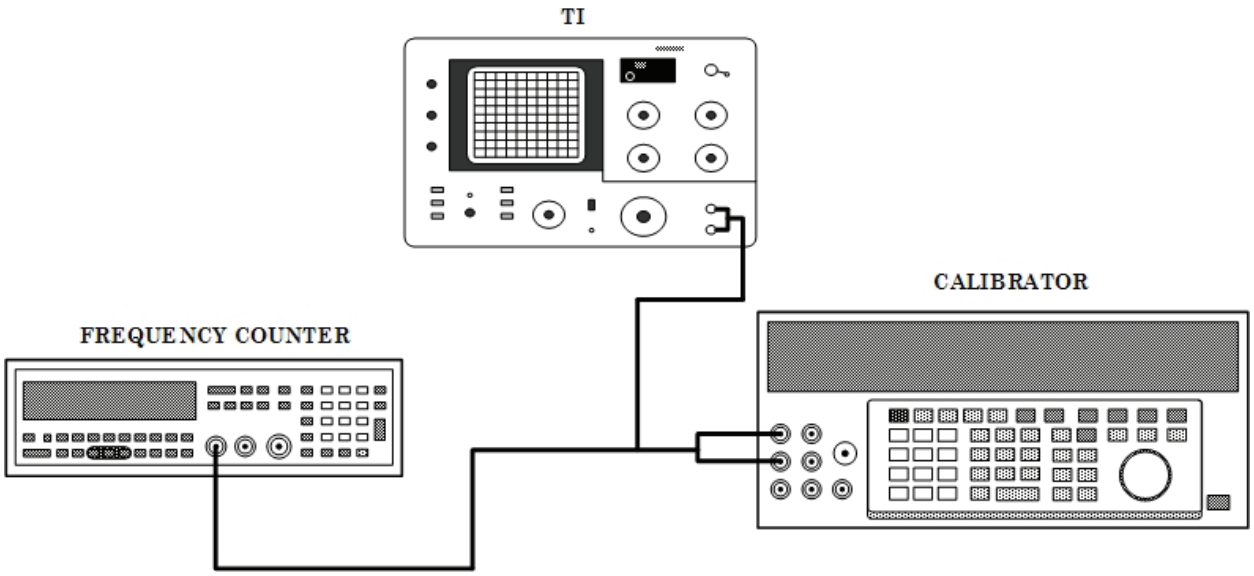

Figure 1. Frequency calibration - equipment setup.

(2) Position controls as listed in (a) through (h) below.

(a) **AMPLITUDE MODE LOG 10 dB/DIV** pushbutton pressed.

(b) **FREQUENCY** control to **00.0 Hz**.

(c) **RESOLUTION BANDWIDTH** control to **30 Hz** (or as required).

(d) **START/CTR** switch to **CTR**.

(e) **FREQ SPAN/DIV** control as required.

(f) **SWEEP TIME/DIV** control to **.2 SEC**.

(g) **ZERO CAL** control for maximum display at center line.

(h) **INPUT SENSITIVITY** switch to **0 (zero) dBv**.

(3) Adjust calibrator output control to 0.3 V rms (0 (zero) dBm).

(4) Position **FREQUENCY** control as listed in table 3. Repeat (3) above and adjust calibrator controls to peak signal pip on center of TI display. Frequency counter will indicate within limits specified.

NOTE

It may be necessary to increase **RESOLUTION BANDWIDTH** and **FREQ SPAN/DIV** when checking 30 kHz and above.

Table 3. Frequency Check

Test instrument **FREQUENCY** control settings (kHz)	Calibrator frequency settings (kHz)	Frequency counter indications (kHz)	
		Min	Max
0.1	0.1	0	0.2
1	1	0.9	1.1
10	10	9.9	10.1
20	20	19.9	20.1
30	30	29.9	30.1
40	40	39.9	40.1
50	50	49.9	50.1

b. Adjustments. No adjustments can be made.

9. Display Accuracy

a. Performance Check

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

(a) **FREQUENCY** control to **00.0 kHz**.

(b) **RESOLUTION BANDWIDTH** control to **300 Hz**.

(c) **FREQ SPAN/DIV** control to **5 kHz**.

(d) **START/CTR** switch to **START**.

(e) **SWEEP MODE** switch to **REP**.

(f) **INPUT SENSITIVITY** switch to **CAL**.

(2) The **10 kHz CAL** signal and its harmonics should be repetitively swept and appear on display as shown in figure 2. Separation between zero response and 50 kHz harmonic will be 10 major divisions ± 1 minor division, or any two adjacent signals will be 2 major divisions ± 0.2 minor division.

b. Adjustments. No adjustments can be made.

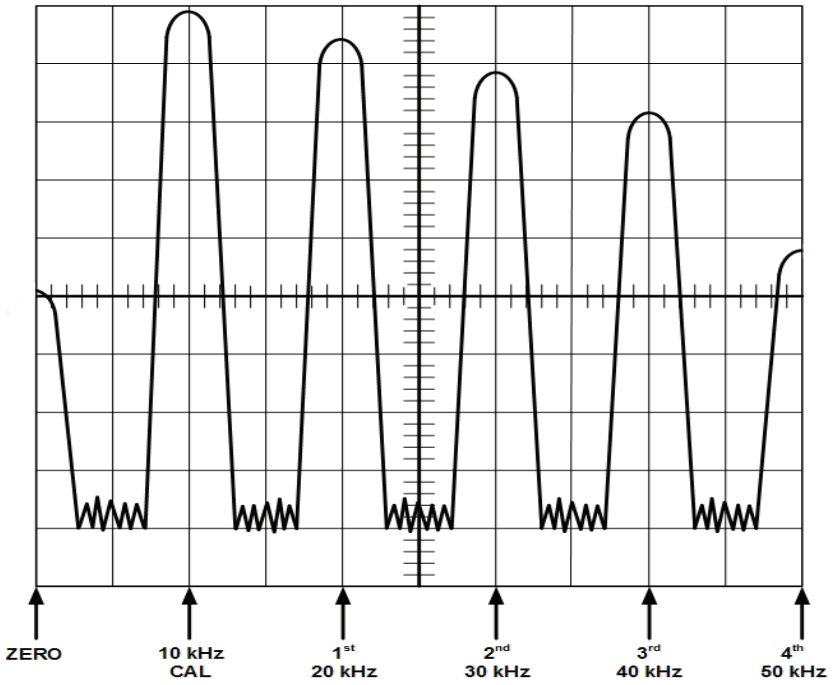

Figure 2. Display accuracy.

10. Frequency Span

a. Performance Check

(1) Position controls as listed in (a) through (d) below:

(a) **INPUT SENSITIVITY** switch to **0 (zero) dBv**.

(b) **FREQ SPAN/DIV** control to **5 Hz**.

(c) **SWEEP MODE** switch to **MAN**.

(d) **SWEEP MODE MANUAL VERNIER** control fully ccw.

(2) Adjust frequency counter for maximum sensitivity and connect to TI rear panel **LO OUTPUT**.

(3) Position controls as listed in (a) through (g) below:

(a) **ZERO CAL** control for an approximate 1000.00 kHz indication on frequency counter.

(b) **FREQUENCY** control for a 1000.00 kHz indication on frequency counter.

(c) **SWEEP MODE MANUAL VERNIER** control fully cw. Frequency counter will indicate between 1000.49 and 1000.51 kHz.

(d) **SWEEP MODE MANUAL VERNIER** control fully ccw.

(e) **FREQ SPAN/DIV** control to **10 Hz**.

(f) **FREQUENCY** control for a 1000.00 kHz indication on frequency counter.

(g) **SWEEP MODE MANUAL VERNIER** control fully cw. Frequency counter will indicate between 998.98 and 1001.02 kHz.

(4) Repeat technique of (3) (d) through (g) above for **FREQ SPAN/DIV** control positions listed in table 4. Frequency counter will indicate within limits specified.

(5) Disconnect and remove frequency counter from equipment setup.

Table 4. Frequency Span

Test instrument **FREQ SPAN/DIV** control positions	Frequency counter indications (kHz)	
	Min	Max
2 Hz	1001.96	1002.04
50 Hz	1004.90	1005.10
0.1 kHz	1009.80	1010.20
0.2 kHz	1019.60	1020.40
0.5 kHz	1049.00	1051.00
1 kHz	1098.00	1102.00
2 kHz	1196.00	1204.00

b. Adjustments. No adjustments can be made.

11. Log Sweep

a. Performance Check

(1) Position controls as listed in (a) through (g) below:

(a) **INPUT SENSITIVITY** switch to **CAL**.

(b) **RESOLUTION BANDWIDTH** control to **30 Hz**.

(c) **SWEEP MODE** switch to **LOG ZERO**.

(d) **DISPLAY CLEAR WRITE** pushbutton pressed.

(e) **ZERO CAL** control for a maximum indication on far left graticule on TI display.

(f) **RESOLUTION BANDWIDTH** control to **300 Hz**.

(g) **SWEEP MODE** switch to **LOG**.

(2) Allow time for three complete sweeps. The 20 kHz (1st) harmonic of CAL signal will be within ± 1 minor division of 20 kHz LOG SWEEP graticule (10th vertical line from left).

b. Adjustments. No adjustments can be made.

12. Bandwidth Switching

a. Performance Check

(1) Position controls as listed in (a) through (g) below:

(a) **AMPLITUDE MODE LOG 1 dB/DIV** pushbutton pressed.

(b) **INPUT SENSITIVITY** switch to **0 (zero) dBv**.

(c) **FREQUENCY** control to **10.0 kHz**.

(d) **START/CTR** switch to **CTR**.

(e) **FREQ SPAN/DIV** control to **5 Hz**.

(f) **SWEEP TIME/DIV** control to **.1 SEC**.

(g) **SWEEP MODE** switch to **MAN**.

(2) Connect calibrator to TI **INPUT**.

(3) Adjust calibrator frequency to 10 kHz at 1 V output amplitude.

(4) Alternately press and release **DISPLAY CLEAR WRITE** pushbutton while adjusting **SWEEP MODE MANUAL VERNIER** control until signal is centered.

(5) Position controls as listed in (a) through (i) below:

(a) **ZERO CAL** control for a peak display of signal spike.

(b) **CAL 10 kHz** control for a -1 dB reference indication on display (1.0 dB per major division).

(c) **RESOLUTION BANDWIDTH** control to **100 Hz**.

(d) **ZERO CAL** control for a peak display. Amplitude display will indicate between -1.5 and -0.5 dB.

(e) **RESOLUTION BANDWIDTH** control to **30 Hz**.

(f) **SWEEP MODE MANUAL VERNIER** control adjusted slowly for a peak display. Amplitude display will indicate between -1.5 and -0.5 dB.

(g) **DISPLAY CLEAR WRITE** pushbutton pressed.

(h) **RESOLUTION BANDWIDTH** control to **10 Hz**.

(i) **SWEEP MODE MANUAL VERNIER** control adjusted slowly for a peak display. Amplitude display will indicate between -1.5 and -0.5 dB.

(6) Repeat (5) (g) through (i) above with **RESOLUTION BANDWIDTH** control at **3 Hz**.

(7) Repeat technique of (5) (g) through (i) above with **RESOLUTION BANDWIDTH** control at **1 Hz**. Amplitude display will indicate between -2 and 0 (zero) dB.

b. Adjustments. No adjustments can be made.

13. Amplitude Accuracy

a. Performance Check

(1) Press **AMPLITUDE MODE LOG 10 dB/DIV** pushbutton and adjust **RESOLUTION BANDWIDTH** control to **10 Hz**.

(2) Alternately press and release **DISPLAY CLEAR WRITE** pushbutton while adjusting **SWEEP MODE MANUAL VERNIER** for a signal at center graticule line (a narrow spike).

(3) Adjust **CAL 10 kHz** control for a full scale 0 (zero) dB display of signal spike.

(4) Adjust calibrator frequency to 10 kHz and output amplitude to values listed in table 5. Display will indicate within limits specified.

Table 5. Amplitude Accuracy

Calibrator output amplitude values (dBm)	Test instrument display (dB)	
	Min	Max
Reference (1 V)	0 dB = FS	
+ 3 (0.316 V)	8	12
-6.99 (0.1 V)	18	22
-16.99 (0.0316 V)	28	32
-26.99 (0.01 V)	38	42
-36.99 (3.16 mV)	48	52
-46.99[1] (1 mV)	58	62
-56.99[1] (0.316 mV)	68	72
-66.99[1] (0.1 mV)	78	82

[1]**SWEEP MODE - MANUAL VERNIER** control must be readjusted for a peak indication.

(5) Press **AMPLITUDE MODE LINEAR** pushbutton.

(6) Adjust calibrator frequency to 10 kHz at 1 V (+13.01 dBm) output amplitude.

(7) Position controls as listed in (a) through (c) below:

(a) **SWEEP MODE MANUAL VERNIER** control for a peak display.

(b) **CAL 10 kHz** control for a full scale 1 V indication.

(c) **DISPLAY CLEAR WRITE** pushbutton pressed momentarily.

(8) Adjust calibrator output amplitude to values listed in table 6. TI display will indicate within limits specified.

Table 6. Linear Amplitude

Calibrator output amplitude values (dBm)	Test instrument indication (V) (1 V = FS)	
	Min	Max
+ 13.01 (1 V)	Reference	
+ 12.10 (0.9 V)	0.88	0.92
+ 11.07 (0.8 V)	0.78	0.82
+ 9.91 (0.7 V)	0.68	0.72
+ 8.51 (0.6 V)	0.58	0.62
+ 6.99 (0.5 V)	0.48	0.52
+ 5.05 (0.4 V)	0.38	0.42
+ 2.55 (0.3 V)	0.28	0.32
- 0.97 (0.2 V)	0.18	0.22
- 6.99 (0.1 V)	0.08	0.12

b. Adjustments. No adjustments can be made.

14. Amplitude Reference Level

a. Performance Check

(1) Set **RESOLUTION BANDWIDTH DISPLAY SMOOTHING** switch to **MAX**.

(2) Adjust calibrator frequency to 10 kHz at 1 V output amplitude.

(3) Adjust **SWEEP MODE MANUAL VERNIER** control for a peak display.

(4) Adjust **CAL 10 kHz** control for a display at 90 percent of full scale.

(5) Set **AMPLITUDE REF LEVEL** switch and adjust calibrator output amplitude as listed in table 7. Display will indicate within limits specified.

Table 7. Reference Amplitude (LIN)

Calibrator output amplitude values (dBm)	Test instrument	
	AMPLITUDE REF LEVEL switch settings	Display indications
+13.01 (1 V)	NORMAL	90% (CAL) reference
- 0.97 (200 mV)	-10	90% ± 1.5 minor div
- 6.99 (100 MV)	-20	90% ± 1.5 minor div
- 20.97 (20 mV)	-30	90% ± 1.5 minor div
- 26.99 (10 mV)	-40	90% ± 1.5 minor div
- 40.97 (2 mV)	-50	90% ± 1.5 minor div
- 46.99 (1 mV)	-60	90% ± 1.5 minor div
- 60.97 (0.2 mV)	-70	90% ± 1.0 major div

(6) Press **AMPLITUDE MODE LOG 10 dB/DIV** pushbutton and set **AMPLITUDE REF LEVEL** switch to **NORMAL**.

(7) Connect multimeter to TI **RECORDER Y-AXIS** (rear panel).

(8) Adjust calibrator output amplitude for -56.99 dBm (0.3162 mV).

(9) Adjust **SWEEP MODE MANUAL VERNIER** and **ZERO CAL** controls for a peak display.

(10) Adjust **CAL 10 kHz** control for a 1.5 V indication on multimeter.

(11) Set **AMPLITUDE REF LEVEL** switch to settings listed in table 8. Multimeter will indicate within limits specified.

Table 8. Amplitude Reference (LOG)

Test instrument **AMPLITUDE REF LEVEL** switch settings	Multimeter indications (V)	
	Min	Max
-10	1.98	2.02
-20	2.48	2.52
-30	2.97	3.03
-40	3.47	3.53
-50	3.96	4.04
-60	4.46	4.54
-70	4.95	5.05

b. Adjustments. No adjustments can be made.

15. Input Attenuator

a. Performance Check

(1) Position controls as listed in (a) through (d) below:

(a) **AMPLITUDE MODE LINEAR** pushbutton pressed.

(b) **AMPLITUDE REF LEVEL** switch to **-30 dB**.

(c) **INPUT SENSITIVITY** switch (white marker) to **1 V**.

(d) **RESOLUTION BANDWIDTH DISPLAY SMOOTHING** switch to **MIN**.

(2) Adjust calibrator frequency to 10 kHz at 1 V output amplitude.

(3) Position controls as listed in (a) through (c) below:

(a) **SWEEP MODE MANUAL VERNIER** control for a peak indication.

(b) **CAL 10 kHz** control for a full scale display.

(c) **DISPLAY CLEAR WRITE** pushbutton pressed momentarily.

(4) Set **INPUT SENSITIVITY** switch and adjust calibrator output amplitude to settings listed in table 9. Display will indicate within limited specified.

Table 9. Input Attenuator

Calibrator output amplitude values (dBm)	Test instrument		
	INPUT SENSITIVITY switch settings	Display indications (cm)	
		Min	Max
+13.01 (1 V)	1 V	Reference full scale (CAL) 10 cm	
-0.97 (0.2 V)	0.2 V	9.7	10.3
-6.99 (0.1 V)	0.1 V	9.7	10.3
-20.97 (20 mV)	20 mV	9.7	10.3
-26.99 (10 mV)	10 mV	9.7	10.3
-40.97 (2 mV)	2 mV	9.7	10.3
-46.99 (1 mV)	1 mV	9.7	10.3
-60.97 (0.2 mV)	0.2 mV	9.7	10.3

b. Adjustments. No adjustments can be made.

16. Frequency Response

a. Performance Check

(1) Position controls as listed in (a) through (c) below:

(a) **AMPLITUDE MODE LOG 10 dB/DIV** pushbutton pressed.

(b) **AMPLITUDE REF LEVEL** switch to **-30 dB**.

(c) **INPUT SENSITIVITY SWITCH** (white marker) to **0 (zero) dBv**.

(2) Adjust calibrator frequency to 10 kHz at +13.01 dBm (1.0 V) output amplitude.

(3) Alternately press and release **DISPLAY CLEAR WRITE** pushbutton while adjusting **SWEEP MODE MANUAL VERNIER** control to center display (a narrow spike).

(4) Position controls as listed in (a) through (e) below:

(a) **ZERO CAL** control for a peak display of spike.

(b) **AMPLITUDE MODE LOG 1 dB/DIV** pushbutton pressed.

(c) **ZERO CAL** control for a peak display.

(d) **CAL 10 kHz** control for a 9 division centered display.

(e) **FREQUENCY** control to **10 Hz**.

(5) Adjust calibrator frequency to 10 Hz.

(6) Adjust **ZERO CAL** control for a peak indication. Display will indicate between 8.5 and 9.5 divisions.

(7) Position controls as listed in table 10. Reestablish 10 kHz, 9 division reference level for each **INPUT SENSITIVITY** switch setting, using the calibrator output amplitude values given in table 10 and the **CAL 10 kHz** control. Display will indicate within specified limits.

Table 10. Frequency Response

Test instrument		Calibrator		Test instrument display indications (divisions reference at 9 div 10 kHz)	
Frequency control	**INPUT SENSITIVITY** switch settings (dB)	Frequency	Output amplitude values (V)	Min	Max
20 Hz	0	20 Hz	1	8.7	9.3
1 kHz	0	1 kHz	1	8.7	9.3
20 kHz	0	20 kHz	1	8.7	9.3
50 kHz	0	50 kHz	1	8.5	9.5
10 Hz	-10	10 Hz	0.3162	8.5	9.5
20 Hz	-10	20 Hz	0.3162	8.7	9.3
1 kHz	-10	1 kHz	0.3162	8.7	9.3
20 kHz	-10	20 kHz	0.3162	8.7	9.3
50 kHz	-10	50 kHz	0.3162	8.5	9.5
10 Hz	-20	10 Hz	0.1	8.5	9.5
20 Hz	-20	20 Hz	0.1	8.7	9.3
1 kHz	-20	1 kHz	0.1	8.7	9.3
20 kHz	-20	20 kHz	0.1	8.7	9.3
50 kHz	-20	50 kHz	0.1	8.5	9.5
10 Hz	-30	10 Hz	0.0316	8.5	9.5
20 Hz	-30	20 Hz	0.0316	8.7	9.3
1 kHz	-30	1 kHz	0.0316	8.7	9.3
20 kHz	-30	20 kHz	0.0316	8.7	9.3
50 kHz	-30	50 kHz	0.0316	8.5	9.5
10 Hz	-40	10 Hz	0.01	8.5	9.5
20 Hz	-40	20 Hz	0.01	8.7	9.3
1 kHz	-40	1 kHz	0.01	8.7	9.3
20 kHz	-40	20 kHz	0.01	8.7	9.3
50 kHz	-40	50 kHz	0.01	8.5	9.5

b. Adjustments. No adjustments can be made.

17. Bandwidth

a. Performance Check

(1) Position controls as listed in (a) through (g) below:

(a) **AMPLITUDE MODE LOG 10 dB/DIV** pushbutton pressed.

(b) **AMPLITUDE REF LEVEL** switch to **NORMAL**.

(c) **INPUT SENSITIVITY** switch to **-20 dB**.

(d) **FREQUENCY** control to **10.0 kHz**.

(e) **RESOLUTION BANDWIDTH** control to **300 Hz**.

(f) **FREQ SPAN/DIV** control to **50 Hz**.

(g) **SWEEP TIME/DIV** control to **.2 SEC**.

(2) Press and release **DISPLAY CLEAR WRITE** pushbutton while adjusting **SWEEP MODE MANUAL VERNIER** control for a centered, narrow-spike display.

(3) Adjust calibrator frequency for 10 kHz at 0.1 V output amplitude and repeat (2) above. Monitor frequency with frequency counter.

(4) Position controls as listed in (a) through (d) below:

(a) **FREQUENCY** control for a peak indication.

(b) **AMPLITUDE MODE LOG 1 dB/DIV** pushbutton pressed.

(c) **FREQUENCY** control for a peak indication of 10 kHz input signal.

(d) **CAL 10 kHz** control for a full scale 0 (zero) dB display.

(5) Slowly vary **SWEEP MODE MANUAL VERNIER** control cw until display dot drops 3 dB in amplitude (1 dB per division).

(6) Press and release **DISPLAY CLEAR WRITE** pushbutton. This is the upper 3 dB point.

(7) Slowly increase calibrator frequency until dot moves full scale then drops to 3 dB point again.

(8) Press and release **DISPLAY CLEAR WRITE** pushbutton. This is the lower 3 dB point. Record frequency counter indication. Recorded frequency less 10 kHz signal will be between 255 and 345 Hz.

(9) Repeat technique of (2) through (8) above, using settings and indications listed in table 11. Frequency counter indications will be within limits specified.

Table 11. Bandwidth

Calibrator frequency (kHz)	Test instrument		Frequency counter indications (computed limits (Hz))	
	FREQ SPAN/DIV control settings (Hz)	**RESOLUTION BANDWIDTH** control settings (Hz)	Min	Max
1	50	100	85.0	15.0
1	10	30	25.5	34.5
1	5	10	8.5	11.5
1[1]	5	3	25.5	34.5
1[1]	5	1	8.5	11.5

[1]Certified at -60 dB down. Press **LOG 10 dB/DIV** pushbutton and repeat **17 a** (2) through (9) for 60 db down points.

b. Adjustments. No adjustments can be made.

18. Tracking Oscillator Output

a. Performance Check

(1) Position controls as listed in (a) through (h) below:

(a) **INPUT SENSITIVITY** switch to **+20 dB**.

(b) **FREQUENCY** control to **00.0 kHz**.

(c) **START/CTR** switch to **START**.

(d) **RESOLUTION BANDWIDTH** control to **10 Hz**.

(e) **FREQ SPAN/DIV** control to **5 kHz**.

(f) **SWEEP TIME/DIV** control to **5 SEC**.

(g) **SWEEP MODE** switch to **RESET**.

(h) **TRACKING OSC EXT REF NORMAL** switch (rear panel) to **NORMAL**.

(2) Momentarily press **DISPLAY CLEAR WRITE** pushbutton and adjust **ZERO CAL** for a peak indication at far left graticule line.

(3) Connect multimeter to **TRACKING OSC OUT** (rear panel).

(4) Adjust **FREQUENCY** control to **50.0 Hz** and **TRACKING OSC LEVEL** control (rear panel) for a 2.00 V indication on multimeter.

(5) Adjust **FREQUENCY** control to **50.0 kHz**. Multimeter will indicate between 1.94 and 2.06 V.

(6) Position controls as listed in (a) through (e) below:

(a) **ADAPTIVE SWEEP** control to on.

(b) **INPUT SENSITIVITY** switch to **2 V**.

(c) **FREQUENCY** control to **00.0 Hz**.

(d) **RESOLUTION BANDWIDTH** control to **30 Hz**.

(e) **SWEEP MODE** switch to **MAN**.

(7) Disconnect cable from multimeter and connect to TI **INPUT** (front panel).

(8) Press and release **DISPLAY CLEAR WRITE** pushbutton while adjusting **SWEEP MODE MANUAL VERNIER** control for a centered narrow spike display.

(9) Adjust **TRACKING OSC LEVEL** control (rear panel) for a full scale 2 V display.

(10) Adjust **RESOLUTION BANDWIDTH** control to **3 Hz**. TI display will drop no more than 5 divisions.

(11) Adjust **FREQ SPAN/DIV** control to **0.1 kHz** and adjust **SWEEP MODE MANUAL VERNIER** control for a 1 kHz display on far right graticule line.

(12) Connect audio analyzer to TI **TRACKING OSC OUT** (rear panel).

(13) Rotate **TRACKING OSC LEVEL** control (rear panel) fully cw. Audio analyzer indication will be 1 percent or less.

b. Adjustments. No adjustments can be made.

19. 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:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:

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

0730504

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342180, requirements for calibration procedure TB 9-6625-2009-24.

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.