TB 9-4931-535-35

SUPERSEDED COPY DATED 30 DECEMBER 1996

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR SPECTRUM ANALYZER HEWLETT-PACKARD, MODEL 3585A

Headquarters, Department of the Army, Washington, DC
30 January 2001

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REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedure, please let us know. Mail your letter or DA Form 2028 to: Commander, U. S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-LS-LP, Redstone Arsenal, AL 35898-5230. A reply will be furnished to you. You may also send in your comments electronically to our e-mail address: ls-lp@redstone.army.mil or by FAX (256) 842-6546/DSN 788-6546.

*This bulletin supersedes TB 9-4931-535-35, dated 30 December 1996.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This procedure provides instructions for the calibration of Spectrum Analyzer, Hewlett-Packard, Model 3585A. 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. 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 marker	Range: 20 Hz to 40.1 MHz Counter accuracy: ±0.3 Hz Readout accuracy: ±0.2 % of frequency span ± resolution bandwidth setting
Range calibration	Frequency: 150 kHz Range: -25 to +30 dB Accuracy: ±0.7 dB
Amplitude linearity	Range: 0 to -95 dB Accuracy: 0 to -20 dB: ±0.3 dB -20 to -50 dB: ±0.6 dB -50 to -80 dB: ±1.0 dB -80 to -95 dB: ±2.0 dB
Reference level	Range: +10 to -90 dBm Accuracy: +10 to -50 dBm: ±0.4 dB -50 to -70 dBm: ±0.7 dB -70 to -90 dBm: ±1.5 dB
50/75Ω flatness	Frequency range: 20 Hz to 40.1 MHz Flatness: ±0.5 dB
1 MΩ flatness	Frequency range: 20 Hz to 10 MHz Flatness: ±0.7 dB Frequency range: 10 to 40.1 MHz Flatness: ±1.5 dB

Table 1. Calibration Description - Continued

Test instrument parameters	Performance specifications	
Noise	Resolution bandwidth setting	Average reading (dBm)
	30 kHz	<-100
	10 kHz	<-104
	3 kHz	<-108
	1 kHz	<-111
	300 Hz	<-115
	100 Hz	<-122
	30 Hz	<-127
	10 Hz	<-132
	3 Hz	<-137
Low frequency response	Frequencies: Pwr line freq., 5 kHz, 100 kHz, 1 MHz, and 10 MHz Accuracy: < -120 dBm	
Local oscillator sideband	Spurious responses: < -80 dB	
Harmonic distortion	Spurious responses: < -80 dB	
Bandwidth	Frequency range: 3 Hz to 30 kHz Accuracy: ±20% of BW settings at 3 dB points Selectivity (shape factor): <11:1 (60 dB BW/3 dB BW)	
Tracking generator flatness	Flatness: ±0.7 dB	

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 Set AN/GSM-287. 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.

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)
LOW PASS FILTER	Frequency: 13.31 MHz	TLC 14-3EF (TLC 14-3EF)
OSCILLATOR	Frequency range: 1 kHz Amplitude range: -20 dBm Distortion: <90 dB	Tektronix, Type SG505 (MIS-30526/11)
SYNTHESIZER/ LEVEL GENERATOR	Frequency range: 100 kHz to 40.1 MHz Amplitude range: -80 to +10 dBm Accuracy: ±0.075 dB	Hewlett-Packard, Model 3335AOPT 001-K06 (MIS-35958)

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 manuals for this TI.

d. When indications specified in paragraphs **8** through **19** are not within tolerance, refer to the manufacturer's manual and perform a complete alignment.

e. 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. Ensure TI rear panel **OVEN REF OUT** is connected to **EXT REF IN**.

b. Connect TI to a 115 V ac power source.

c. Press **LINE ON/OFF** pushbutton to **ON** and allow TI at least 20 minutes for warmup.

d. Connect TI rear panel **10 MHz REF OUTPUT** to synthesizer/level generator rear panel **40/N MHz REF INPUT**. Maintain connection for remainder of this procedure.

8. Frequency Counter and Marker

a. Performance Check

(1) Connect synthesizer/level generator **OUTPUT 50Ω** to TI **50-75Ω**.

(2) Press keys and enter values using **ENTRY** keys as listed in (a) through (c) below:

(a) **ENTRY INSTR PRESET**.

(b) **SWEEP ENTRY MANUAL** to **9 MHz**.

(c) **MARKER/CONTINUOUS ENTRY COUNTER** to on.

(3) Set synthesizer/level generator for a 9 MHz, 0 dBm output.

(4) TI counter frequency indication will be between 8999999.7 and 9000000.3 Hz.

(5) Press **ENTRY INSTR PRESET** key.

(6) Set synthesizer/level generator for a 20.08 MHz, -25 dBm output.

(7) Adjust **MARKER/CONTINUOUS ENTRY** knob to place marker on peak of displayed signal. TI marker frequency indication will be between 20000000 and 20160000 Hz.

b. Adjustments. Refer to paragraph **6d**.

9. Range Calibration

a. Performance Check

(1) Connect synthesizer/level generator **OUTPUT 50Ω** to TI **50-75Ω** input.

(2) Press keys and enter values using **ENTRY** keys as listed in (a) through (g) below:

(a) **ENTRY INSTR PRESET**.

(b) **ENTRY CENTER FREQUENCY** to **150 kHz**.

(c) **ENTRY REFERENCE LEVEL** controls to **-20 dBm**.

(d) **ENTRY dB/DIV** to **1 dB**.

(e) **RBW-VBW-ST ENTRY RES BW** to **10 Hz**.

(f) **MARKER/CONTINUOUS ENTRY MAN SWEEP** to on.

(g) **INPUT REF LVL TRACK** to off**.**

(3) Set synthesizer/level generator for a 150 kHz, -25 dBm output.

(4) Press keys as listed in (a) through (c) below:

(a) **MARKER/CONTINUOUS ENTRY OFFSET** to on.

(b) **MARKER/CONTINUOUS ENTRY ENTER OFFSET** key.

(c) **INPUT ENTRY RANGE** key.

(5) Press **ENTRY STEP** ⇑ key. TI marker indication will be between -0.7 and 0.7 dB.

(6) Repeat (5) above for remaining TI range settings.

b. Adjustments. Refer to paragraph **6d**.

10. Amplitude Linearity

a. Performance Check

(1) Connect synthesizer/level generator **OUTPUT 50Ω** to TI **50-75Ω** input.

(2) Press keys and enter values using **ENTRY** keys as listed in (a) through (e) below:

(a) **ENTRY INSTR PRESET**.

(b) **SWEEP ENTRY MANUAL** to **1 MHz**.

(c) **RWB-VBW-ST ENTRY RES BW** to **3 Hz**.

(d) **RBW-VBW-ST ENTRY VIDEO BW** to **1 Hz**.

(e) **INPUT ENTRY RANGE** to **10 dBm** using **ENTRY STEP** ⇑ or ⇓.

(3) Set synthesizer/level generator as listed in (a) through (c) below:

(a) **FREQUENCY** to **1 MHz**.

(b) **AMPLITUDE** to **10 dBm**.

(c) **AMPTD INCR** to **0.1 dBm**.

(4) Adjust synthesizer/level generator amplitude, using **INCR** ⇑ or ⇓ keys, until TI marker amplitude indicates 10.0 dBm.

(5) Press **MARKER/CONTINUOUS ENTRY OFFSET** key to on and then press **MARKER/CONTINUOUS ENTRY ENTER OFFSET** key.

(6) Set synthesizer/level generator **AMPTD INCR** to **10 dBm**.

(7) Press synthesizer/level generator **INCR** ⇓ key.

(8) TI marker amplitude indication will be between –9.7 and –10.3 dB.

(9) Repeat (7) above for remaining synthesizer/level generator settings listed in table 3. TI marker amplitude indications will be within limits specified in table 3.

Table 3. Amplitude Linearity

Synthesizer/level generator approximate settings (dBm)	Test instrument marker amplitude indications (dB)	
	Min	Max
-10	-19.4	-20.6
-20	-29.4	-30.6
-30	-39.4	-40.6
-40	-49.0	-51.0
-50	-59.0	-61.0
-60	-69.0	-71.0
-70	-78.0	-82.0
-80	-88.0	-92.0

b. Adjustments.

Refer to paragraph **6d**.

11. Reference Level

a. Performance Check

(1) Connect synthesizer/level generator **OUTPUT 50Ω** to TI **50-75Ω** input.

(2) Press keys and enter values using **ENTRY** keys as listed in (a) through (h) below:

(a) **ENTRY INSTR PRESET**.

(b) **INPUT ENTRY RANGE** to .**0 dBm** using **ENTRY STEP** ⇑ or ⇓.

(c) **ENTRY REFERENCE LEVEL** to **10 dBm**.

(d) **INPUT REF LVL TRACK** to off.

(e) **ENTRY dB/DIV** to **1 dB**.

(f) **RBW-VBW-ST ENTRY RES BW** to **100 Hz**.

(g) **RBW-VBW-ST ENTRY VIDEO BW** to **1 Hz**.

(h) MARKER**/CONTINUOUS ENTRY MAN SWEEP** to on.

(3) Set synthesizer/level generator as listed in (a) through (c) below:

(a) **FREQUENCY** to **20 MHz**.

(b) **AMPLITUDE** to **10 dBm**.

(c) **AMPTD INCR** to **10 dBm**.

(4) TI marker amplitude indication will be between 9.6 and 10.4 dBm.

(5) Press synthesizer/level generator **INCR** ⇓ key.

(6) Press TI **ENTRY REFERENCE LEVEL** key and enter **0 dBm** using **ENTRY** keys.

(7) TI marker amplitude indication will be between –0.4 and 0.4 dBm.

(8) Repeat technique of (5) through (7) above using settings and indications listed in table 4.

Table 4. Reference Level

Synthesizer/level generator amplitude settings (dBm)	Test instrument		
	ENTRY REFERENCE LEVEL settings (dBm)	Marker amplitude indications (dBm)	
		Min	Max
-10	-10	-9.6	-10.4
-20	-20	-19.6	-20.4
-30	-30	-29.6	-30.4
-40	-40	-39.6	-40.4
-50	-50	-49.3	-50.7
-60	-60	-59.3	-60.7
-70	-70	-68.5	-71.5
-80	-80	-78.5	-81.5

(9) Disconnect synthesizer/level generator **OUTPUT 50Ω** from TI **50-75Ω** input.

b. Adjustments. Refer to paragraph **6d**.

12. 50/75Ω Flatness

a. Performance Check

(1) Ensure TI front panel inputs are open.

(2) Press keys and enter values using **ENTRY** keys as listed in (a) through (i) below:

(a) **ENTRY RECALL** and then **604.**

(b) **ENTRY INSTR PRESET**.

(c) **ENTRY START FREQ** to **0.1 MHz**.

(d) **ENTRY STOP FREQ** to **40.1 MHz**.

(e) **INPUT ENTRY RANGE** to **-25 dBm** using **ENTRY STEP** ⇓.

(f) **ENTRY REFERENCE LEVEL** to **-20 dBm**.

(g) **ENTRY dB/DIV** to **1 dB.**

(h) **INPUT REF LVL TRACK** to off.

(i) **RBW-VBW-ST ENTRY VIDEO BW** to **300 Hz**.

(3) Press **SWEEP SINGLE** key and wait until sweep is completed.

(4) Adjust **MARKER/CONTINUOUS ENTRY** knob to move marker to the center of trace.

(5) Press **MARKER/CONTINUOUS ENTRY OFFSET** key to on and then press **MARKER/CONTINUOUS ENTRY ENTER OFFSET** key.

(6) Adjust **MARKER/CONTINUOUS ENTRY** knob to move marker to the point on trace with the most negative or positive deviation using TI marker amplitude indication. TI marker amplitude indication will be between -0.5 and 0.5 dB.

(7) Press **MARKER/CONTINUOUS ENTRY OFFSET** key to off.

(8) Press **INPUT ENTRY RANGE** key and then **ENTRY STEP** ⇑ key.

(9) Repeat (3) through (8) above for remaining TI range settings.

(10) Press keys as listed in (a) through (c) below:

(a) **MARKER/CONTINUOUS ENTRY OFFSET** to off

(b) **INPUT IMPEDANCE 75Ω**.

(c) **INPUT ENTRY RANGE** to **-25 dBm** using **ENTRY STEP** ⇓.

(11) Repeat (3) through (6) above.

b. Adjustments. Refer to paragraph **6d**.

13. 1 MΩ Flatness

a. Performance Test

(1) Press keys and enter values using **ENTRY** keys as listed in (a) through (g) below:

(a) **ENTRY INSTR PRESET**.

(b) **ENTRY STOP FREQ** to **10 MHz**.

(c) **ENTRY dB/DIV** to **1 dB**.

(d) **INPUT ENTRY RANGE** to **.0 dBm** using **ENTRY STEP** ⇑ or ⇓.

(e) **RBW-VBW-ST ENTRY RES BW** to **3 kHz**.

(f) **RBW-VBW-ST RES BW HOLD** to on.

(g) **ENTRY RECALL** and then **4**.

(2) Connect TI **TRACKING GENERATOR** output to **50-75Ω** input.

(3) Adjust **TRACKING GENERATOR AMPLITUDE** control to position trace in the middle of crt display.

(4) Allow one complete sweep to occur. Press **TRACE STORE A → B** key.

(5) Disconnect **TRACKING GENERATOR** output from **50-75Ω** input.

(6) Connect **TRACKING GENERATOR** output to **1 MΩ** input using a 50Ω feedthrough termination.

(7) Press keys as listed in (a) through (c) below:

(a) **INPUT IMPEDANCE 1 MΩ**.

(b) **TRACE VIEW B** to off.

(c) **TRACE A - B** to on.

NOTE

Ignore the LO feedthrough point at 0 Hz in (8) and (10) below.

(8) Adjust **MARKER/CONTINUOUS ENTRY** knob to move marker to the most negative point on trace using TI marker amplitude indication.

(9) Press **MARKER/CONTINUOUS ENTRY OFFSET** key to on and then **MARKER/CONTINUOUS ENTRY ENTER OFFSET** key.

(10) Adjust **MARKER/CONTINUOUS ENTRY** knob to move marker to the most positive point on trace using TI marker amplitude indication. TI marker amplitude indication will be between –0.7 and 0.7 dB.

(11) Disconnect **TRACKING GENERATOR** output from **1 MΩ** input and 50Ω feedthrough termination.

(12) Press keys and enter values using **ENTRY** keys as listed in (a) through (e) below:

(a) **MARKER/CONTINUOUS ENTRY OFFSET** key to off.

(b) **INPUT IMPEDANCE 50Ω**.

(c) **ENTRY START FREQ** to **10 MHz**.

(d) **ENTRY STOP FREQ** to **40 MHz**.

(e) **TRACE A - B** to off.

(13) Repeat (2) through (11) above. TI marker amplitude indication will be between –1.5 and 1.5 dB in (10) above.

b. Adjustments. Refer to paragraph **6d**.

14. Noise

a. Performance Check

(1) Ensure TI front panel inputs are open.

(2) Press keys and enter values using **ENTRY** keys as listed in (a) through (f) below:

(a) **ENTRY INSTR PRESET**.

(b) **ENTRY CENTER FREQUENCY** to **9.35 MHz**.

(c) **ENTRY REFERENCE LEVEL** to **-75 dBm**.

(d) **RBW-VBW-ST ENTRY RES BW** to **30 kHz**.

(e) **RBW-VBW-ST ENTRY VIDEO BW** to **30 Hz**.

(f) **MARKER/CONTINUOUS ENTRY MAN SWEEP** to on.

(3) Average TI marker amplitude indication will be <-100 dBm.

(4) Press **RBW-VBW-ST ENTRY RES BW** key.

(5) Press **ENTRY STEP** ⇓ key.

(6) Average TI marker amplitude indication will be <-104 dBm.

(7) Repeat technique of (5) and (6) above for the remaining TI settings and indications listed in table 5.

Table 5. Noise

Test instrument	
RBW-VBW-ST ENTRY RES BW settings	Average marker amplitude indications (dBm)
3 kHz	< -108
1 kHz	< -111
300 Hz	< -115
100 Hz	< -122
30 Hz	< -127
10 Hz	< -132
3 Hz	< -137

b. Adjustments. Refer to paragraph **6d**.

15. Low Frequency Response

a. Performance Check

(1) Ensure TI front panel inputs are open.

NOTE

60 Hz represents power line frequency; if power line frequency is different than 60 Hz, use current power line frequency in (2)(f) and (g) below.

(2) Press keys and enter values using **ENTRY** keys as listed in (a) through (g) below:

(a) **ENTRY INSTR PRESET**.

(b) **RBW-VBW-ST ENTRY RES BW** to **3 Hz**.

(c) **RBW-VBW-ST ENTRY VIDEO BW** to **1 Hz**.

(d) **MARKER/CONTINUOUS ENTRY MAN SWEEP** to on.

(e) **ENTRY REFERENCE LEVEL** to **-75 dBm**.

(f) **ENTRY CENTER FREQUENCY** to **60 Hz**.

(g) **ENTRY CF STEP SIZE** to **60 Hz**.

(3) Average TI marker amplitude indication will be <-120 dBm.

(4) Press **ENTRY CENTER FREQUENCY** key and then **ENTRY STEP** ⇑ key. Average TI marker amplitude indication will be <-120 dBm.

(5) Press **ENTRY STEP** ⇑ key. Average TI marker amplitude indication will be <-120 dBm.

(6) Press **ENTRY STEP** ⇑ key. Average TI marker amplitude indication will be <-120 dBm.

(7) Press **ENTRY STEP** ⇑ key. Average TI marker amplitude indication will be <-120 dBm.

(8) Press keys and enter values using **ENTRY** keys as listed in (a) and (b) below:

(a) **ENTRY CENTER FREQUENCY** to **5 kHz**.

(b) **ENTRY CF STEP SIZE** to **5 kHz**.

(9) Repeat (3) through (7) above.

(10) Press keys and enter values using **ENTRY** keys as listed in (a) and (b) below:

(a) **ENTRY CENTER FREQUENCY** to **100 kHz**.

(b) **ENTRY CF STEP SIZE** to **100 kHz**.

(11) Repeat (3) through (7) above.

(12) Press keys and enter values using **ENTRY** keys as listed in (a) and (b) below:

(a) **ENTRY CENTER FREQUENCY** to **1 MHz**.

(b) **ENTRY CF STEP SIZE** to **1 MHz**.

(13) Repeat (3) through (7) above.

(14) Press keys and enter values using **ENTRY** keys as listed in (a) and (b) below:

(a) **ENTRY CENTER FREQUENCY** to **10 MHz**.

(b) **ENTRY CF STEP SIZE** to **10 MHz**.

(15) Repeat (3) through (6) above.

b. Adjustments. Refer to paragraph **6d**.

16. Local Oscillator Sideband

a. Performance Check

(1) Disconnect rear panel **OVEN REF OUT** from **EXT REF IN**.

(2) Connect rear panel **OVEN REF OUT** to **50-75Ω** input.

(3) Press keys and enter values using **ENTRY** keys as listed in (a) through (c) below:

(a) **ENTRY INSTR PRESET**.

(b) **ENTRY CENTER FREQUENCY** to **10 MHz**.

(c) **MARKER/CONTINUOUS ENTRY COUNTER** to on.

NOTE

Proceed when TI counter frequency indication is stable.

NOTE

60 Hz represents power line frequency; if power line frequency is different than 60 Hz, use current power line frequency in (4)(j) below.

(4) Press keys and enter values using **ENTRY** keys as listed in (a) through (l) below:

(a) **MARKER/CONTINUOUS ENTRY MKR → CF**.

(b) **MARKER/CONTINUOUS ENTRY COUNTER** to off.

(c) **MARKER/CONTINUOUS ENTRY OFFSET** to on.

(d) **MARKER/CONTINUOUS ENTRY ENTER OFFSET**.

(e) **ENTRY REFERENCE LEVEL** to **-50 dBm**.

(f) **RBW-VBW-ST ENTRY RES BW** to **3 Hz**.

(g) **RBW-VBW-ST ENTRY VIDEO BW** to **3 Hz**.

(h) **MARKER/CONTINUOUS ENTRY MAN SWEEP** to on.

(i) **ENTRY SAVE** and then **1**.

(j) **ENTRY CF STEP SIZE** to **60 Hz**.

(k) **SWEEP ENTRY MANUAL**.

(l) **ENTRY STEP** ⇓.

(5) Average TI marker amplitude indication will be <-80 dB.

(6) Press **ENTRY STEP** ⇓ key. Average TI marker amplitude indication will be <-80 dB.

(7) Press **ENTRY STEP** ⇓ key. Average TI marker amplitude indication will be <-80 dB.

(8) Press **ENTRY STEP** ⇑ key four times. Average TI marker amplitude indication will be <-80 dB.

(9) Press **ENTRY STEP** ⇑ key. Average TI marker amplitude indication will be <-80 dB.

(10) Press **ENTRY STEP** ⇑ key. Average TI marker amplitude indication will be <-80 dB.

(11) Press keys and enter values using **ENTRY** keys as listed in (a) through (d) below:

(a) **ENTRY RECALL** and then **1**.

(b) **ENTRY CF STEP SIZE** to **5 kHz**.

(c) **SWEEP ENTRY MANUAL**.

(d) **ENTRY STEP** ⇓.

(12) Repeat (5) through (10) above.

(13) Press keys and enter values using **ENTRY** keys as listed in (a) through (d) below:

(a) **ENTRY RECALL** and then **1**.

(b) **ENTRY CF STEP SIZE** to **100 kHz**.

(c) **SWEEP ENTRY MANUAL**.

(d) **ENTRY STEP** ⇓.

(14) Repeat (5) through (10) above.

(15) Press keys and enter values using **ENTRY** keys as listed in (a) through (d) below:

(a) **ENTRY RECALL** and then **1**.
(b) **ENTRY CF STEP SIZE** to **1 MHz**.
(c) **SWEEP ENTRY MANUAL**.
(d) **ENTRY STEP** ⇓.

(16) Repeat (5) through (10) above.

(17) Disconnect rear panel **OVEN REF OUT** from **50-75Ω** input.

(18) Reconnect rear panel **OVEN REF OUT** to **EXT REF IN**.

b. Adjustments. Refer to paragraph **6d**.

17. Harmonic Distortion

a. Performance Check

(1) Press keys and enter values using **ENTRY** keys as listed in (a) through (f) below:

(a) **ENTRY INSTR PRESET**.
(b) **ENTRY CENTER FREQUENCY** to **13.31 MHz**.
(c) **ENTRY CF STEP SIZE** to **13.31 MHz**.
(d) **RBW-VBW-ST ENTRY RES BW** to **10 Hz**.
(e) **INPUT ENTRY RANGE** to **-25 dBm** using **ENTRY STEP** ⇓.
(f) **MARKER/CONTINUOUS ENTRY MAN SWEEP** to on.

(2) Connect synthesizer/level generator **OUTPUT 50Ω** to low pass filter input and connect low pass filter output to TI **50-75Ω** input.

(3) Set synthesizer/level generator for a 13.31 MHz, -25 dBm output.

(4) Press keys and enter values using **ENTRY** keys as listed in (a) through (d) below:

(a) **MARKER/CONTINUOUS ENTRY OFFSET** to on.
(b) **MARKER/CONTINUOUS ENTRY ENTER OFFSET**.
(c) **ENTRY REFERENCE LEVEL** to **-50 dBm**.
(d) **ENTRY CENTER FREQUENCY**.

(5) Press **ENTRY STEP** ⇑ key. TI marker amplitude indication will be <-80 dB.

(6) Press **ENTRY STEP** ⇑ key. TI marker amplitude indication will be <-80 dB.

(7) Disconnect low pass filter from TI and synthesizer/level generator.

(8) Connect oscillator **OUTPUT** to TI **50-75Ω** input.

(9) Press keys and enter values using **ENTRY** keys as listed in (a) through (e) below:

(a) **MARKER/CONTINUOUS ENTRY OFFSET** to off.
(b) **INPUT ENTRY RANGE** to **-20 dBm** using **ENTRY STEP** ⇑.
(c) **ENTRY REFERENCE LEVEL** to **-20 dBm**.
(d) **ENTRY CENTER FREQUENCY** to **1 kHz**.
(e) **MARKER/CONTINUOUS ENTRY COUNTER** to on.

(10) Adjust oscillator controls until TI counter frequency indication is as close as possible to 1000 Hz and amplitude indication is as close as possible to –20 dBm.

(11) Press keys as listed in (a) through (g) below:

(a) **MARKER/CONTINUOUS ENTRY MKR → CF**.
(b) **MARKER/CONTINUOUS ENTRY MKR OFS → STEP**.
(c) **MARKER/CONTINUOUS ENTRY COUNTER** to off.
(d) **MARKER/CONTINUOUS ENTRY OFFSET** to on.
(e) **MARKER/CONTINUOUS ENTRY ENTER OFFSET** key.
(f) **ENTRY REFERENCE LEVEL** to **-50 dBm**.
(g) **ENTRY CENTER FREQUENCY**.

(12) Press **ENTRY STEP** ⇑ key. TI marker amplitude indication will be <-80 dB.

(13) Repeat (12) above until fourth harmonic has been checked.

(14) Disconnect oscillator **OUTPUT** from TI **50-75Ω** input.

b. Adjustments. Refer to paragraph **6d**.

18. Bandwidth

a. Performance Check

(1) Ensure TI front panel inputs are open.

(2) Press keys and enter values **ENTRY** keys using as listed in (a) through (f) below:

(a) **ENTRY RECALL** and then **602**.

(b) **ENTRY INSTR PRESET**.

(c) **ENTRY CENTER FREQUENCY** to **10 MHz**.

(d) **ENTRY dB/DIV** to **1 dB**.

(e) **ENTRY REFERENCE LEVEL** to **-24.5 dBm**.

(f) **RBW-VBW-ST RES BW HOLD** to on.

(3) Press keys and enter values using **ENTRY** keys as listed in (a) and (b) below:

(a) **RBW-VBW-ST ENTRY RES BW** to **3 Hz**.

(b) **ENTRY FREQUENCY SPAN** to **10 Hz**.

(4) Allow one complete sweep to occur.

(5) Adjust **MARKER/CONTINUOUS ENTRY** knob to position marker on most positive point of trace using TI marker amplitude indication.

(6) Press **MARKER/CONTINUOUS ENTRY OFFSET** key to on and then **MARKER/CONTINUOUS ENTRY ENTER OFFSET** key.

NOTE

If TI offset frequency indication is not .0 Hz and amplitude indication is not .00 dB, press **MARKER/CONTINUOUS ENTRY OFFSET** key to off and repeat (6) above.

(7) Adjust **MARKER/CONTINUOUS ENTRY** knob to move marker down the left side of trace until TI marker offset amplitude indication is between -2.98 and -3.02 dB.

(8) Press **MARKER/CONTINUOUS ENTRY ENTER OFFSET** key.

(9) Adjust **MARKER/CONTINUOUS ENTRY** knob to move marker to the right side of trace until TI marker offset amplitude indication is between 0.02 and -0.02 dB.

(10) TI marker offset frequency indication will be within limits listed in table 6. Record TI actual marker offset frequency indication in table 6.

(11) Press **MARKER/CONTINUOUS ENTRY OFFSET** to off.

(12) Repeat (3) and (11) above for remaining TI settings listed in table 6.

Table 6. 3 dB Bandwidth

Test instrument				
RBW-VBW-ST ENTRY RES BW settings	**ENTRY FREQUENCY SPAN** settings	Marker offset frequency indication		Actual marker offset frequency indications
		Min	Max	
3 Hz	10 Hz	2.4 Hz	3.6 Hz	
10 Hz	30 Hz	8.0 Hz	12.0 Hz	
30 Hz	100 Hz	24.0 Hz	36.0 Hz	
100 Hz	200 Hz	80.0 Hz	120.0 Hz	
300 Hz	1 kHz	240.0 Hz	360.0 Hz	
1 kHz	2 kHz	800.0 Hz	1200.0 Hz	
3 kHz	10 kHz	2.40 kHz	3.60 kHz	
10 kHz	20 kHz	8.0 kHz	12.0 kHz	
30 kHz	100 kHz	24.0 kHz	36.0 kHz	

(13) Press keys and enter values using **ENTRY** keys as listed in (a) through (c) below:

(a) **ENTRY dB/DIV** to **10 dB**.

(b) **RBW-VBW-ST ENTRY RES BW** to **3 Hz**.

(c) **ENTRY FREQUENCY SPAN** to **100 Hz**.

(14) Allow one complete sweep to occur.

(15) Adjust **MARKER/CONTINUOUS ENTRY** knob to position marker on most positive point of trace using TI marker amplitude indication.

(16) Press **MARKER/CONTINUOUS ENTRY OFFSET** key to on and then **MARKER/CONTINUOUS ENTRY ENTER OFFSET** key.

NOTE

If TI offset frequency indication is not .0 Hz and amplitude indication is not .0 dB, press **MARKER/CONTINUOUS ENTRY OFFSET** key to off and repeat (16) above.

(17) Adjust **MARKER/CONTINUOUS ENTRY** knob to move marker down the left side of trace until TI marker offset amplitude indication is between -59.6 and -60.4 dB.

(18) Press **MARKER/CONTINUOUS ENTRY ENTER OFFSET** key.

(19) Adjust **MARKER/CONTINUOUS ENTRY** knob to move marker to the right side of trace until TI marker offset amplitude indication is between 0.4 and -0.4 dB.

(20) Record TI actual marker offset frequency indication in table 7.

(21) Press keys and enter values using **ENTRY** keys as listed in (a) through (d) below:

(a) **MARKER/CONTINUOUS ENTRY OFFSET** to off.

(b) **RBW-VBW-ST ENTRY RES BW** to **10 Hz**.

(c) **RBW-VBW-ST ENTRY VIDEO BW** to **10 Hz.**

(d) **ENTRY FREQUENCY SPAN** to **200 Hz**.

(22) Repeat (14) through (20) above.

(23) Repeat (21) and (22) above for remaining TI settings listed in table 7.

Table 7. 60 dB Bandwidth

Test instrument		
RBW-VBW-ST ENTRY RES BW settings	**ENTRY FREQUENCY SPAN** settings	Actual marker offset frequency indications
3 Hz	100 Hz	
10 Hz	200 Hz	
30 Hz	500 Hz	
100 Hz	2 kHz	
300 Hz	5 kHz	
1 kHz	20 kHz	
3 kHz	50 kHz	
10 kHz	100 kHz	
30 kHz	500 kHz	

(24) Divide first TI actual marker offset frequency indication recorded in table 7 by first TI actual marker offset frequency indication recorded in table 6. Results will be <11 to 1 ratio.

(25) Repeat (24) above for remaining TI actual marker offset frequency indications recorded in tables 7 and 6.

b. Adjustments. Refer to paragraph **6d**.

19. Tracking Generator Flatness

a. Performance Check

(1) Press keys and enter values using **ENTRY** keys as listed in (a) through (e) below:

(a) **ENTRY RECALL 604**.

(b) **ENTRY INSTR PRESET**.

(c) **ENTRY dB/DIV** to **1 dB**.

(d) **INPUT ENTRY RANGE** to **-20 dBm** using **ENTRY STEP** ⇑ or ⇓.

(e) **ENTRY REFERENCE LEVEL** to **-20 dBm**.

(2) Allow one complete sweep to occur.

(3) Press keys and enter values using **ENTRY** keys as listed in (a) through (d) below:

(a) **TRACE STORE A → B**.

(b) **ENTRY INSTR PRESET**.

(c) **ENTRY dB/DIV** to **1 dB**.

(d) **INPUT ENTRY RANGE** to **.0 dBm** using **ENTRY STEP** ⇑.

(4) Connect TI **TRACKING GENERATOR** output to **50-75Ω** input.

(5) Adjust **TRACKING GENERATOR AMPLITUDE** control to position trace in the middle of crt display.

(6) Press **TRACE A - B** key to on.

NOTE

Ignore the LO feedthrough point at 0 Hz in (7) and (9) below.

(7) Adjust **MARKER/CONTINUOUS ENTRY** knob to move marker to the most negative point on trace using TI marker amplitude indication.

(8) Press **MARKER/CONTINUOUS ENTRY OFFSET** key to on and then **MARKER/CONTINUOUS ENTRY ENTER OFFSET** key.

(9) Adjust **MARKER/CONTINUOUS ENTRY** knob to move marker to the most positive point on trace using TI marker amplitude indication. TI marker amplitude indication will be ≤1.4 dB.

b. Adjustments. Refer to paragraph **6d**.

20. 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:

ERIC K. SHINSEKI
General, United States Army
Chief of Staff

OFFICIAL:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
0035324

Distribution:
To be distributed in accordance with IDN 341123, requirements for calibration procedure TB 9-4931-535-35.