TB 9-6695-288-24

CHANGE 1

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR DISTORTION MEASUREMENT SET HEWLETT-PACKARD, MODEL 339A AND 339A OPTION 001

Headquarters, Department of the Army, Washington, DC
8 July 2008

TB 9-6695-288-24, 22 May 2008, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page.

Remove Pages	**Insert Pages**
11 and 12	11 and 12

2. File this change sheet in front of the publication for reference purposes.

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Headquarters, Department of the Army, Washington, DC
22 May 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, 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.

*This bulletin supersedes TB 9-6695-288-35, dated 18 July 2003, including all changes.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Distortion Measurement Set, Hewlett-Packard, Model 339A and 339A Option 001. 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. Variations among models are indicated in the text.

b. Time and Technique. The time required for this calibration is approximately 6 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
Voltmeter:	
Model 339A	Range: 0.001 to 300 V Accuracy: ±2% of range, 20 Hz to 20 kHz ±4% of range, 10 to 20 Hz and 20 to 110 kHz[1]
Model 339A Option 001	Range: 0.1 and 0.3 mV Accuracy: ±2% of range, 20 Hz to 30 kHz ±4% of range, 10 to 20 Hz and 20 to 30 kHz ±10%, -30% of range, 30 to 80 kHz Range: 0.001 to 300 V Accuracy: ±2% of range, 20 Hz to 20 kHz ±4% of range, 10 to 20 Hz and 20 to 110 kHz[1]
Filter	Range: 400 Hz Accuracy: +35 Hz, -40 Hz Range: 30 kHz Accuracy: +2.6 kHz, -3 kHz Range: 80 kHz Accuracy: +7 kHz, -7.9 kHz

See footnote at end of table.

Table 1. Calibration Description - Continued

Test instrument parameters	Performance specifications
Oscillator	Frequency range: 10 Hz to 110 kHz Accuracy: ±2% of selected frequency (with frequency vernier in cal position) Level flatness: ±0.1 dB, 20 Hz to 20 kHz ±0.2 dB, 10 to 20 Hz and 20 to 110 kHz[1]
Fundamental rejection	Range: 10 Hz to 110 kHz Accuracy: >-100 dB, 10 Hz to 20 kHz >-90 dB, 20 to 50 kHz >-83 dB, 50 to 110 kHz[1]
Induced distortion	Range: 10 Hz to 110 kHz Accuracy: <-95 dB, 10 Hz to 20 kHz <-90 dB, 20 to 30 kHz <-85 dB, 30 to 50 kHz <-70 dB, 50 to 110 kHz[1]
Oscillator total harmonic distortion	Range: 10 Hz to 110 kHz Accuracy: <-93 dB, 10 Hz to 20 kHz <-85 dB, 20 to 30 kHz <-80 dB, 30 to 50 kHz <-70 dB, 50 to 80 kHz <-65 dB, 80 to 110 kHz[1]
Distortion measurement accuracy	Frequency range: 10 Hz to 110 kHz Distortion measurement range: 0.01% FS to 100% FS (-80 to 0 dB) Accuracy: ±1 dB, 20 Hz to 20 kHz ±1, -2 dB, 10 to 20 Hz and 20 to 50 kHz ±1.5, -4 dB, 50 to 110 kHz[1]

[1]Not calibrated below 20 Hz and above 100 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; 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 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. The following peculiar accessories are also required for this calibration: Feedthrough termination, 600 Ω, ±1%; Feedthrough termination, 50 Ω, ±1%.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: ±1%	Ridge, Model 9020A (9020A)
CALIBRATION FIXTURE[1]	Range: 20 Hz to 100 kHz	Tektronix, Type 067-0938-00 (7917073)
CALIBRATOR	Range: 9.6 mV to 312 V 10 Hz to 100 kHz Accuracy: ±0.5%	Fluke, Model 5720A (5720A) (p/o MIS-35947); w amplifier, Fluke 5725A/AR (5725A/AR)
FREQUENCY COUNTER	Range: 9.8 ms to 112 kHz Accuracy: ±0.5%	Fluke, Model PM6681/656 (PM6681/656)
FUNCTION GENERATOR	Range: 10 Hz to 330 kHz Accuracy: ±2%	Agilent, Model 33250A (33250A)
MULTIMETER	Range: 0 to 3.162 V ac -0.3 to 0.5 V dc Accuracy: ±0.1%	Hewlett Packard, Model 3458A (3458A)
OSCILLATOR	Range: 20 Hz to 100 kHz Distortion: $\leq$0.0032%	Tektronix, Type SG 505OPT1 (MIS-30526/1)
RATIO TRANSFORMER	Ratio: 0.001 Accuracy: ±0.1%	ESI, Model DT72A (7915908)
SPECTRUM ANALYZER[1]	Range: 20 Hz to 500 kHz Accuracy: ±1.0 dB	Hewlett-Packard, Model 3585A (3585A)
TRUE RMS VOLTMETER	Range: 400 Hz to 80 kHz Accuracy: ±0.1 dB	Fluke, Model 8922A/AA (8922A/AA)

[1]Limited deployment transfer.

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 controls 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 protective cover from TI as necessary for access to adjustments.

b. Connect TI to autotransformer.

c. Connect autotransformer to a 115 V ac source and adjust for 115 V ac output.

d. Position controls as indicated in (1) through (7) below:

(1) **FUNCTION** switch to **INPUT LEVEL**.

(2) **METER RESPONSE** switch to **VU**.

(3) **FILTERS** pushbuttons to **OFF** (out).

(4) **INPUT RANGE** control to **.001 V** (**.1 mV** for OPT001).

(5) **FREQUENCY** switches to **1.0 x 10**.

(6) **INPUT/GND SELECT** switch to **DIS.AN. /1**(center position).

(7) **LINE** switch to **ON** and allow at least 20 minutes for warm-up.

e. Set **LINE** switch to **OFF**. Wait 30 seconds and verify an exact zero indication on TI meter and adjust as necessary. Set **LINE** switch to **ON**.

8. Voltmeter Accuracy

a. Performance Check

(1) Connect calibrator output to ratio transformer input and ratio transformer output to TI **DISTORTION ANALYZER** input.

(2) Adjust ratio transformer controls for 0.001 ratio.

(3) Adjust calibrator frequency for 10 Hz and output for a full-scale indication on TI meter. If calibrator does not indicate between 0.96 and 1.04 V (0.096 and 0.104 V OPT001), perform **b** below.

(4) Repeat technique of (3) above at settings and indications listed in table 3. If calibrator does not indicate within limits specified, perform **b** below.

Table 3. Voltmeter Accuracy

Test instrument		Calibrator indications		
Meter **INPUT RANGE** switch settings	Meter indications	Output frequency	Min	Max
0.1 mV[1]	1	10 Hz	0.098 V	0.102 V
		10 kHz	0.098 V	0.102 V
0.3 mV[1]	3	10 Hz	0.288 V	0.312 V
		10 kHz	0.294 V	0.306 V
0.001 V	1	20 Hz	0.98 V	1.02 V
		10 kHz	0.98 V	1.02 V
0.003 V	3	20 Hz	2.88 V	3.12 V
		10 kHz	2.94 V	3.06 V
0.010 V2	1	20 Hz	9.6 mV	10.4 V
		10 kHz	9.8 mV	10.2 mV
		100 kHz	9.6 mV	10.4 mV
0.030 V	3	20 Hz	28.8 mV	31.2 mV
		10 kHz	29.4 mV	30.6 mV
		100 kHz	28.8 mV	31.2 mV
0.1 V	1	20 Hz	96.0 mV	104.0 mV
		10 kHz	98.0 mV	102.0 mV
		100 kHz	96.0 mV	104.0 mV
0.3 V	3	20 Hz	288 mV	312 mV
		10 kHz	294 mV	206 mV
		100 kHz	288 mV	312 mV
1 V	1	20 Hz	0.96 V	1.04 V
	1	10 kHz	0.98 V	1.02 V
	1	100 kHz	0.96 V	1.04 V
	0.8	1 kHz	0.78 V	0.82 V
	0.6	1 kHz	0.58 V	0.62 V
	0.4	1 kHz	0.38 V	0.42 V
	0.2	1 kHz	0.18 V	0.22 V
3 V	3	20 Hz	2.88 V	3.12 V
		10 kHz	2.94 V	3.06 V
		100 kHz	2.88 V	3.12 V
10 V	1	20 Hz	9.60 V	10.4 V
		10 kHz	9.80 V	10.2 V
		100 kHz	9.60 V	10.4 V
30 V	3	20 Hz	28.8 V	31.2 V
		10 kHz	29.4 V	30.6 V
		100 kHz	28.8 V	31.2 V
100 V	1	20 Hz	96 V	104 V
		10 kHz	98 V	102 V
		100 kHz	96 V	104 V
300 V	3	50 Hz	288 V	312 V
		10 kHz	294 V	306 V
		100 kHz	288 V	312 V

[1]For Option 001 only.

[2]Remove ratio transformer from equipment setup for this and remaining checks.

b. Adjustments

NOTE

Remove ratio transformer from equipment.

(1) Set **INPUT RANGE** switch to **3 V**.

(2) Adjust calibrator output to 3 V and 1 kHz.

(3) Adjust A2R17 FULL SCALE ADJ (fig. 1) for TI meter indication of 3 V (R).

(4) Adjust calibrator output for 1 V.

(5) Adjust A2R37 1/3 SCALE ADJ (fig. 1) for a TI meter indication of 1 V on 3 V range (R).

(6) Repeat (2) through (5) above for best in-tolerance condition.

(7) Connect multimeter to A2TP2 (fig. 1) and chassis ground.

(8) Adjust calibrator output to 3.162 V and 1 kHz.

(9) Adjust A2R36 REFERENCE ADJUST (fig. 1) for a multimeter reading of 3.162 V dc (R).

(10) Reduce calibrator output to 0.94 V ac.

(11) Adjust A2R35 LOW LIMIT ADJUST (fig. 1) until **INPUT RANGE** low limit indicator (front panel) just lights (R).

(12) Increase calibrator output to 0.95 V ac. Low limit indicator should turn off. If not, repeat (7) through (11) above.

(13) Set **LINE** switch to **OFF**.

(14) Disconnect cable connector from A2J2 (fig. 1). Place cable in a place that will not short cable to chassis.

(15) Connect a jumper wire, using test lead between A2TP1 and A2TP8 (fig. 1).

(16) Connect multimeter between A2TP9 (+) (fig. 1) and chassis ground.

(17) Adjust output of calibrator to 3.0 V and 1 kHz.

(18) Set **LINE** switch to **ON**.

(19) Adjust A2R24 AUTO SET LEVEL FULL SCALE ADJ (fig. 1) for an indication of 3.162 V dc on multimeter (R).

(20) Reduce calibrator output to 1.0 V ac.

(21) Adjust A2R22 AUTO SET LEVEL 1/3 SCALE ADJ (fig. 1) for a multimeter indication of 3.1612 V dc (R).

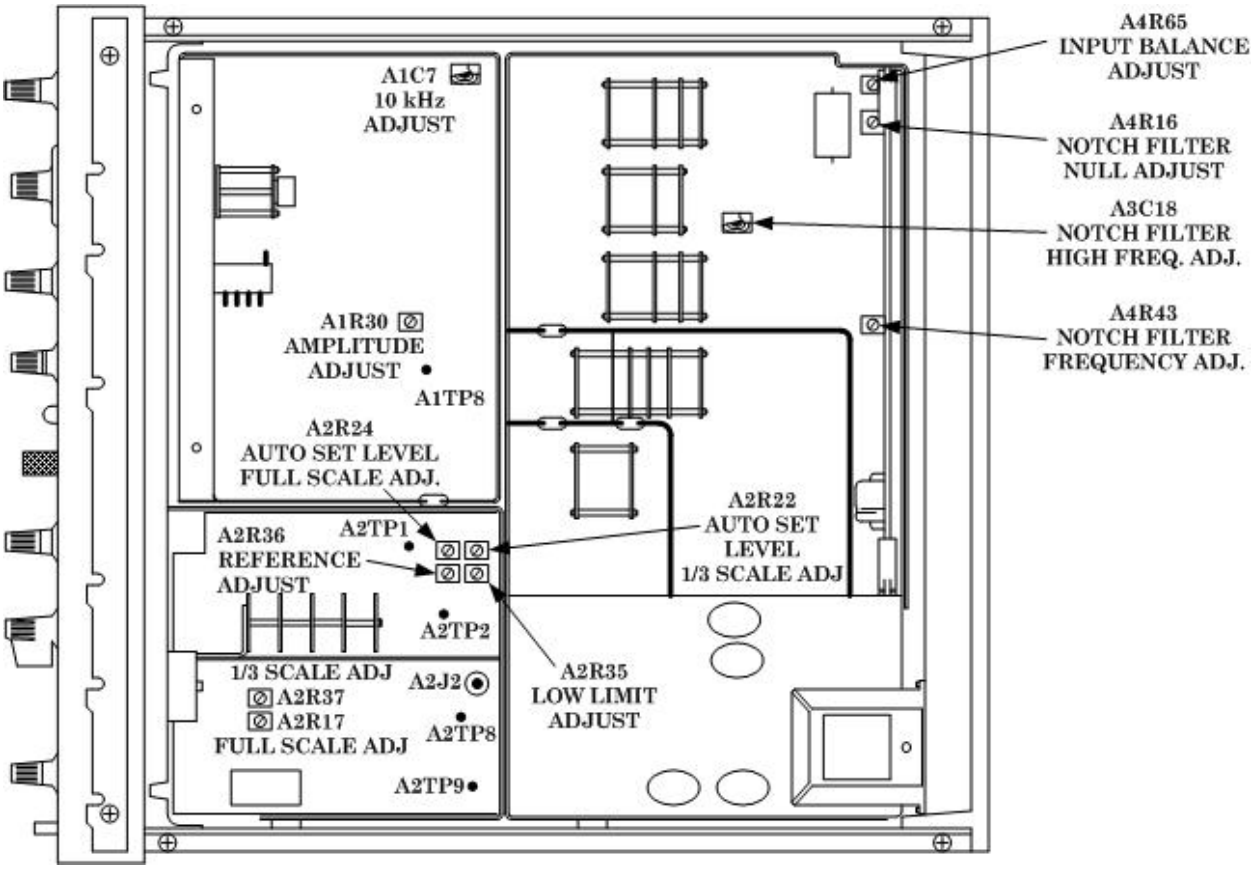

Figure 1. Test instrument - bottom view.

NOTE

A2R22 AUTO SET LEVEL 1/3 SCALE ADJ (fig. 1) and A2R24 AUTO SET LEVEL FULL SCALE ADJ. (fig. 1) adjustments interact. Repeat (15) through (21) above until no further adjustment is necessary.

(22) Set **LINE** switch to **OFF**.

(23) Reconnect TI cable connector to A2J2 (fig. 1) and disconnect jumper cable from A2TP1 and A2TP8 (fig. 1).

(24) Set **LINE** switch to **ON**.

9. Filter Accuracy

a. Performance Check

(1) Connect equipment as shown in figure 2 below.

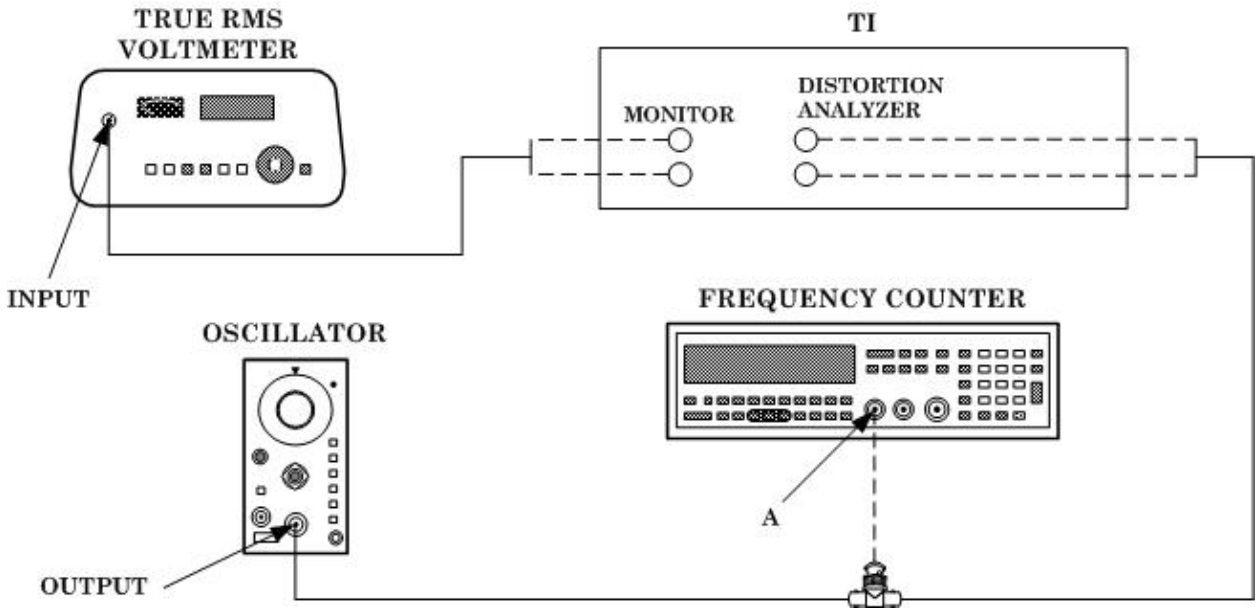

Figure 2. Filter accuracy equipment setup.

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

(a) **FUNCTION** switch to **INPUT LEVEL**.
(b) **FILTERS** pushbuttons to **OFF** (out).
(c) **METER RESPONSE** switch to **VU**.
(d) **INPUT RANGE** control to **1 V**.
(e) **INPUT/GND SELECT** to **DIS. AN. /1** (center position).

(3) Adjust oscillator for 400 Hz output and output level for full-scale indication on TI meter.

(4) Adjust true rms voltmeter for a 0.0 dB reference.

(5) Press **400 Hz FILTER** switch to **ON** (in).

(6) Adjust oscillator frequency dial until true rms voltmeter indicates -3.00 dB.

(7) Frequency counter will indicate between 360 and 435 Hz.

(8) Press **400 Hz FILTER** switch to **OFF** (out).

(9) Repeat (3) through (8) above for **30** and **80 kHz FILTERS**.

(10) Frequency counter will indicate between 27 and 32.6 kHz and 72.1 and 87 kHz.

b. Adjustments. No adjustments can be made.

10. Oscillator Output Level and Flatness

a. Performance Check

(1) Connect **OSCILLATOR OUTPUT** to multimeter using cable and 600 Ω feedthrough termination.

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

(a) **FREQUENCY** switches to **1.0 x 1K**.
(b) **OSCILLATOR FREQUENCY VERNIER** control to **CAL**.
(c) **OSCILLATOR LEVEL** switch to **3 V** and vernier control fully cw.

(3) If multimeter does not indicate greater than 3 V ac, perform **b** below.

(4) Adjust **OSCILLATOR LEVEL** vernier control for a reading of 3.00 V ac on multimeter.

(5) Set **FREQUENCY** switches to settings listed in table 4. Multimeter indications will be within values listed for each frequency.

Table 4. Oscillator Output Level and Flatness

Test instrument **FREQUENCY** switch settings (Hz)	Multimeter indications (V Ac)	
	Min	Max
2.0 x 10	2.96	3.04
1.0 x 100	2.96	3.04
1.0 x 10K	2.96	3.04
2.0 x 10K	2.96	3.04
10.0 x 10K	2.93	3.07

b. Adjustments

(1) Connect multimeter between test points A1TP8 (fig. 1) and shield of assembly A1 (fig. 1), using leads.

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

(a) **FREQUENCY** switches to **1.0 x 10**.
(b) **OSCILLATOR LEVEL** switch to **3 V**.
(c) **OSCILLATOR LEVEL** vernier control fully cw.

(3) Adjust A1R30 AMPLITUDE ADJUST (fig. 1) for multimeter indication between -0.3 and -0.5 V dc (R).

(4) Change **FREQUENCY** multiplier control to each range and verify that voltage level at A1TP8 (fig. 1) remains negative.

(5) Repeat **a** (1) through (5) above.

11. Oscillator Frequency Accuracy

a. Performance Check

(1) Connect **OSCILLATOR OUTPUT** to frequency counter.

(2) Set **FREQUENCY** switches to **1.0 x 10** and adjust **OSCILLATOR LEVEL** vernier control fully cw. If frequency counter does not indicate between 98.04 and 102.04 ms, perform **b** below.

(3) Set **FREQUENCY** switches to settings listed in table 5. If frequency counter does not indicate within limits specified, perform **b** below.

Table 5. Oscillator Frequency Accuracy

Test instrument **FREQUENCY** switch settings	Frequency counter indications	
	Min	Max
3.0 x 10	32.679 ms	34.014 ms
5.0 x 10	19.608 ms	20.408 ms
10.0 x 10	9.803 ms	10.204 ms
2.0 x 100	196 Hz	204 Hz
4.0 x 100	392 Hz	408 Hz
9.0 x 100	882 Hz	918 Hz
1.0 x 1K	980 Hz	1020 Hz
2.1 x 1K	2058 Hz	2142 Hz
3.2 x 1K	3136 Hz	3264 Hz
4.3 x 1K	4214 Hz	4386 Hz
5.4 x 1K	5292 Hz	5508 Hz
6.5 x 1K	6370 Hz	6630 Hz
7.6 x 1K	7448 Hz	7752 Hz
8.7 x 1K	8526 Hz	8874 Hz
9.8 x 1K	9604 Hz	9996 Hz
10.9 x 1K	10,682 Hz	11,118 Hz
1.0 x 10K	9800 Hz	10,200 Hz
5.0 x 10K	49,000 Hz	51,000 Hz
10.9 x 10K	106,820 Hz	111,180 Hz

b. Adjustments. Adjust A1C7 10 kHz ADJUST (fig. 1) for best in-tolerance indications between 1.0 x 10K and 10.0 x 10K settings (R).

12. Oscillator Total Harmonic Distortion

a. Performance Check

(1) Connect equipment as shown in figure 3 below.

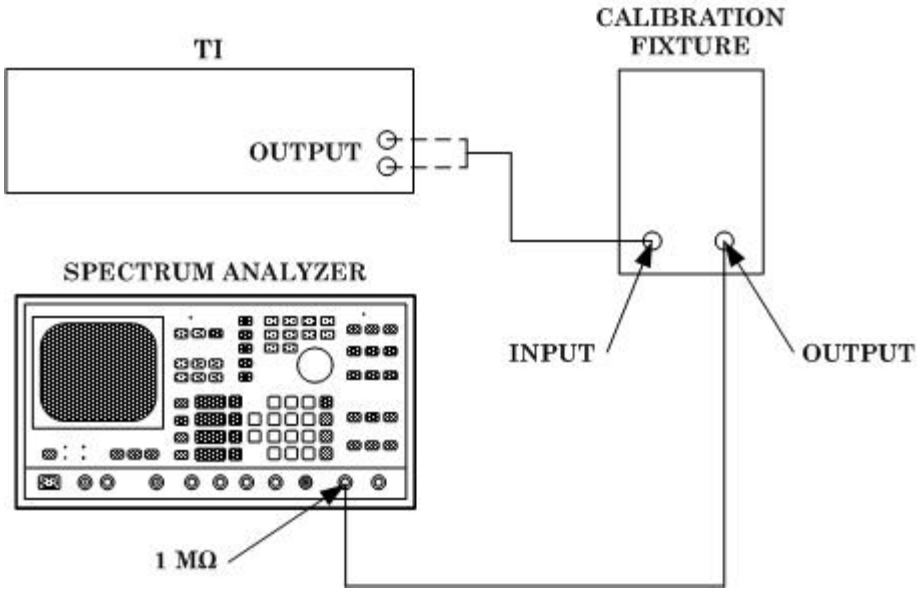

Figure 3. Total harmonic distortion

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

(a) **FUNCTION** switch to **OSC LEVEL**.
(b) **FREQUENCY** switches to **2.0 x 10**.
(c) **OSCILLATOR LEVEL** switch to **3 V** and vernier control for a 3 V indication on TI meter.

(3) Position calibration fixture controls as listed in (a) through (d) below:

(a) **NOTCH FREQUENCY** to **20 Hz**.
(b) **ADJUST FOR NULL-COARSE** and **FINE** controls centered.
(c) **MODE** pushbutton to **FLAT** (out).
(d) **ATTEN** pushbutton to **0 dB** (out).

(4) Set spectrum analyzer **CENTER FREQUENCY** to 20 Hz, **FREQUENCY SPAN** to 100 Hz, and **IMPEDANCE** to 1 MΩ.

(5) Adjust spectrum analyzer to indicate center frequency and record amplitude.

(6) Press calibration fixture **MODE** pushbutton to **NOTCH** (in).

(7) On 20 Hz measurements only, press calibration fixture **ATTEN** pushbutton to **-60 dB** (in).

(8) Adjust spectrum analyzer to indicate second harmonic. Record amplitude.

(9) Record difference between amplitude recorded in (8) above and amplitude recorded in (5) above. This is second harmonic amplitude.

(10) Adjust spectrum analyzer to indicate third harmonic. Record amplitude.

(11) Record difference between amplitude recorded in (10) above and amplitude recorded in (5) above. This is the third harmonic amplitude.

(12) Calculate total harmonic distortion using figure 4.

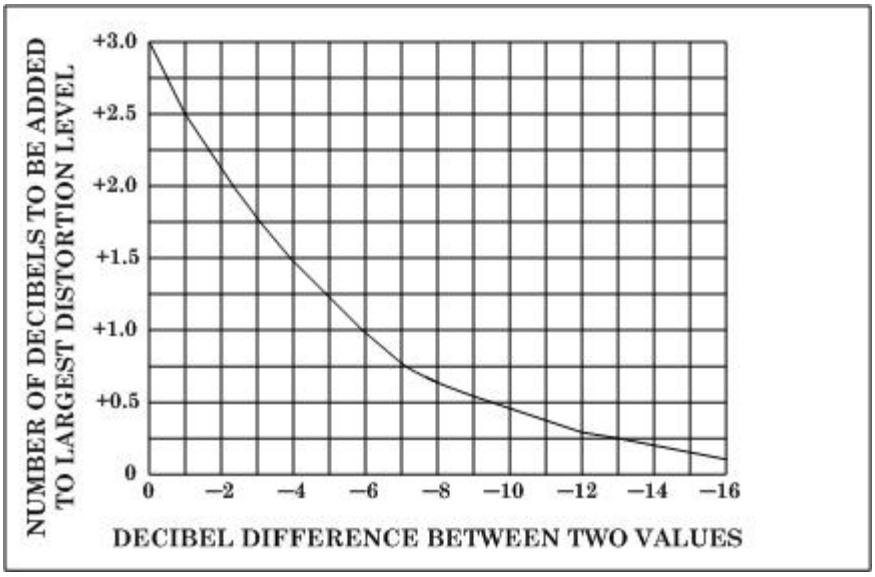

Figure 4. Addition of harmonic components.

Example

If second harmonic in (9) above, is -110 dB and third harmonic in (11) above is -114 dB, dB difference is -4 dB. In figure 4 this intersects the curve at +1.5 level. The total harmonic distortion is the largest harmonic amplitude plus number determined in figure 4, (-110 dB + 1.5 dB = -108.5 dB).

(13) Total harmonic distortion (THD) will be less than -93 dB.

(14) Repeat technique of (3) through (13) above for each setting listed in table 6. THD will be within limits specified.

Table 6. Total Harmonic Distortion

Test instrument **FREQUENCY** switch settings	Calibration Fixture **NOTCH** settings	Spectrum analyzer		THD specifications (dB)
		CENTER FREQUENCY settings	**FREQUENCY SPAN** settings	
1.0 x 100	100 Hz	100 Hz	500 Hz	<-93
1.0 x 1K	1 kHz	1 kHz	5 kHz	<-93
1.0 x 10K	10 kHz	10 kHz	50 kHz	<-93
2.0 x 10K	20 kHz	20 kHz	100 kHz	<-93
5.0 x 10K	50 kHz	50 kHz	250 kHz	<-80
10.0 x 10K	100 kHz	100 kHz	500 kHz	<-65

b. Adjustments. No adjustments can be made.

13. Fundamental Rejection and Induced Distortion

a. Performance Check

(1) Connect spectrum analyzer to TI front panel **MONITOR** connector.

(2) Connect oscillator to TI front panel **DISTORTION ANALYZER** connector.

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

(a) **FUNCTION** switch to **INPUT LEVEL**.
(b) **FREQUENCY** switches to **1.0 x 1K**.
(c) **METER RESPONSE** switch to **NORMAL**.
(d) **METER INPUT RANGE** switch to **3 V**.
(e) **DISTORTION RANGE** switch to **0 dB**.

(4) Adjust oscillator frequency to 1 kHz and output level to obtain TI meter indication of 0 dB.

(5) Adjust spectrum analyzer range to +10dB, sweep time to 20 Sec, and sweep to **CONT**.

(6) Adjust spectrum analyzer control knob to peak the marker amplitude and the frequency control for a 1 kHz center frequency. After a few sweeps, press **SINGLE**. Record spectrum analyzer dB indication.

(7) Set **FUNCTION** switch to **DISTORTION**.

(8) Adjust **DISTORTION RANGE** control for an upscale reading or until TI reaches -80 dB.

(9) Add **DISTORTION RANGE** switch setting and spectrum analyzer dB indication of center frequency. Total dB change will be greater than 100 dB below indication recorded in (6) above.

(10) If fundamental rejection is not >-100 dB, perform **b** below.

(11) Adjust spectrum analyzer to observe amplitude of second harmonic of center frequency.

(12) Add **DISTORTION RANGE** switch setting and spectrum analyzer dB indication. Subtract this value from indication recorded in (6) above and record.

(13) Adjust spectrum analyzer to observe amplitude of third harmonic of center frequency.

(14) Add **DISTORTION RANGE** switch setting and spectrum analyzer dB indication. Subtract this value from indication recorded in (6) above and record.

(15) Calculate the induced harmonic distortion using figure 4.

Example

Determine the difference in amplitude of second harmonic in (12) above and third harmonic in (13) above. Add dB number in figure 4 to largest value of harmonic amplitude.

(16) Induced distortion will be <-95 dB.

(17) Repeat technique of (1) through (16) above for fundamental rejection and induced distortion measurements using settings listed in table 7. Fundamental rejection and induced distortion indications will be within limits specified.

Table7. Fundamental Rejection and Induced Distortion

Test instrument **FREQUENCY** switch settings	Oscillator settings and spectrum analyzer center frequency	Fundamental rejection indications (dB)	Induced distortion indications (dB)
2.0 x 10	20 Hz	>-100	<-95
1.0 x 100	100 Hz	>-100	<-95
1.0 x 10K	10 kHz	>-100	<-95
2.0 x 10K	20 kHz	>-100	<-95
3.0 x 10K	30 kHz	>-90	<-90
5.0 x 10K	50 kHz	>-90	<-85
10.0 x 10K	100 kHz	>-83	<-70

b. Adjustments

(1) Adjust A4R16 NOTCH FILTER NULL ADJUST and A4R43 NOTCH FILTER FREQUENCY ADJ. (fig. 1) for maximum negative indication on spectrum analyzer (R).

(2) Set **FUNCTION** switch to **INPUT LEVEL** and **FREQUENCY** switches to **2.0 x 10**.

(3) Set oscillator to 20 Hz and a full scale indication on TI meter (1 on 0 - 1 scale).

(4) Adjust A4R65 INPUT BALANCE ADJUST (fig. 1) for maximum negative indication on spectrum analyzer (<-95 dB including **DISTORTION RANGE** switch setting) (R).

(5) Repeat **a** (1) through (10) above.

14. Distortion Accuracy

a. Performance Check

(1) Connect equipment as shown in figure 5 below.

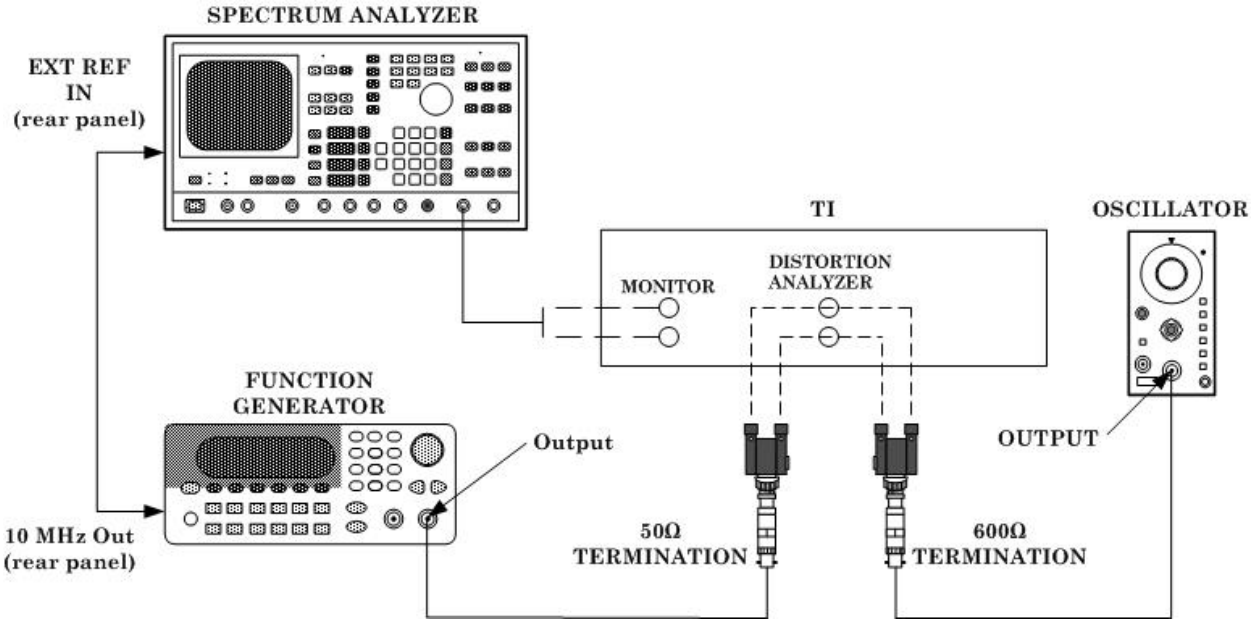

Figure 5. Distortion setup.

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

(a) **FUNCTION** switch to **INPUT LEVEL**.
(b) **FILTERS** pushbuttons to off (out).
(c) **DISTORTION RANGE** switch to **0 dB**.
(d) **INPUT RANGE** switch to **.1 V**.
(e) **INPUT/GND SELECT** switch to **DIS.AN/1** (center position).
(f) **FREQUENCY** switches to **1.0 x 10 K**.

(3) Set oscillator to 10 kHz and output level for an indication of 1 V on TI meter.

(4) Adjust function generator controls for an output frequency of 1 kHz and output amplitude to –42 dBm.

(5) Set **FUNCTION** switch to **DISTORTION**.

(6) Set **DISTORTION RANGE** switch to **-80 dB**.

(7) Adjust function generator amplitude control as necessary to obtain a distortion reading of –80 dB on TI meter (full scale indication).

(8) Set spectrum analyzer controls as indicated in (a) through (g) below.

(a) Press **INSTR PRESET**.
(b) Press **INPUT ENTRY RANGE** and **STEP** pushbuttons to step range to +25 dBm.
(c) Press **INPUT IMPEDANCE 1 MΩ** pushbutton to on.
(d) Enter **REFERENCE LEVEL +15 dBm**.
(e) Enter **CENTER FREQUENCY 1kHz**.
(f) Enter **FREQUENCY SPAN 10Hz**.
(g) Enter **dB/DIV 1dB**.

(9) Adjust marker on spectrum analyzer to peak of signal.

(10) Set reference on spectrum analyzer by pressing **MARKER OFFSET** and **ENTER OFFSET** pushbuttons.

(11) Set function generator frequency and spectrum analyzer center frequency to each frequency listed in table 8, and repeat (9) above. Offset amplitude readings on spectrum analyzer will be within limits listed in table 9. If not, perform **b** below.

Table 8. Distortion Accuracy

Function generator settings	Spectrum analyzer offset indications (dB)	
	Min	Max
10 Hz	-2	+1
20 Hz	-1	+1
100 Hz	-1	+1
20 kHz	-1	+1
50 kHz	-2	+1
100 kHz	-4	+1.5
330 kHz	-4	+1.5

b. Adjustments

(1) Adjust A3C18 NOTCH FILTER HIGH FREQ. ADJ. (fig. 1) for an indication between -1 dB and +1 dB (R).

15. 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

0808808

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342319, requirements for calibration procedure TB 9-6695-288-24.

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.