TB 9-4931-488-35

CHANGE 2

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR SIGNAL GENERATOR, SG1112VlU, SG1112V2U, AND MIS-28707TY2 (HEWLETT-PACKARD, MODEL 8640B, OPTIONS 001, 002, 003, 004, AND H66)

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

TB 9-4931-488-35, 26 August 2003, 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
5 thru 12	5 thru 12
19 thru 22	19 thru 22
39 and 40	39 and 40

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

By Order of the Secretary of the Army:

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

Official

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Administrative Assistant to the Secretary of the Army

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Distribution:

To be distributed in accordance with IDN 342064, requirements for calibration procedure TB 9-4931-488-35.

TB 9-4931-488-35

CHANGE 1

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Headquarters, Department of the Army, Washington, DC
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Remove Pages	Insert Pages
9 and 10	9 and 10
11 and 12	11 and 12
15 and 16	15 and 16

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

By Order of the Secretary of the Army:

Official:

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

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DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

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Headquarters, Department of the Army, Washington, DC
26 August 2003

Approved for public release; distribution is unlimited.

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms)directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also 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 technical bulletin supersedes TB 9-4931-488-35 dated 11 October 1989.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Signal Generator, SG1112V1U (8460BOPT004), SG1112V2U (8640BOPT001), MIS-28707TY2 (8640BH66) and Hewlett-Packard, Model 8640B, Options 001, 002, 003, 004, and H66. The manufacturers' manuals were used as the prime data sources in compiling these instructions. The equipment being calibrated will be referred to as the TI (test instrument) throughout this bulletin.

a. Model Variations. Option variations are as listed below in (1) through (5).

(1) Option 001 provides a modulation oscillator that is continuously adjustable from 20 Hz to 600 kHz. The oscillator can also be set for 400 Hz or 1 kHz fixed tones.

(2) Option 002 provides an internal, active frequency doubler that extends the frequency range of the generator to 1024 MHz (to 1100 MHz with over range).

(3) Option 003 protects the generator output circuits from accidental applications of reverse power up to 50 W.

(4) Option 004 provides a demodulated output and modified AM circuitry for setting very accurate AM depths. It also has a 1 dB output step attenuator in addition to the standard 10 dB output step attenuator.

(5) Option H66 which includes option 001 provides an additional control for very fine adjustment of the output level and improved harmonic content in the RF output signal.

b. Time and Technique. The time required for this calibration is approximately 8 hours, using the dc and low frequency and microwave 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[1]	
Internal reference		Range: 5 MHz Accuracy: +1 ppm Drift: <0.05 ppm per hr	
Frequency		Range: 0.5 to 512 MHz 0.5 to 1024 MHz (option 002) Accuracy: Counter resolution (±1 count) + reference error ± 2 ppm (locked mode) Stability: <10 ppm/10 minute (unlocked mode) <0.1 ppm for +5% to -10% line voltage change (locked mode	
Harmonics (at 1 V ,+ 10 dB output range and below)		≥30 dB below fundamental, 0.5 to 512 MHz) ≥12 dB below fundamental, 512 to 1024 MHz (option 002)	
Subharmonics (option 002)		≥20 dB below fundamental, 512 to 1024 MHz	
Output Level (Top 10 dB Of Vernier Range)			
Options	Frequency Range (MHz)	Output Level (dBm)	Accuracy (dB)
Basic, 001, and H66	0.5 to 512	+19 to -7 -7 to -47 -47 to -137[3]	±1.5 ±2.0 ±2.5
002	0.5 to 64	+18.5 to -7 -7 to -47 -47 to -137[3]	±1.5 ±2.0 ±2.5
	64 to 512	+18.5 to -7 -7 to -47 -47 to -137[3]	±2.0 ±2.5 ±3.0
	512 to 1024	+13 to -7 -7 to -47 -47 to -127[3]	±3.0 ±3.5 ±4.0
003	0.5 to 512	+18.5 to -7 -7 to -47 -47 to -137[3]	+1.75 -2.25 +2.25 -2.75 +2.75 -3.25

See footnotes at end of table

Table 1. Calibration Description - Continued

Test instrument parameters	Performance specifications[1]		
Output Level (Top 10 dB Of Vernier Range)[2] - Continued			
Options	Frequency Range (MHz)	Output Level (dBm)	Accuracy (dB)
002/003	0.5 to 512	+18 to -7	+2.0 -3.0
		-7 to -47	+2.5 -3.5
		-47 to -137[3]	+3.0 -4.0
	512 to 1024	+12 to -7	±3.5
		-7 to -47	±4.0
		-47 to -128[3]	±4.5
004	0.5 to 512	+15 to -10	±1.5
		-10 to -50	±2.0
		-50 to -142[3]	±2.5
Output Level Flatness (1 V Range And Top 10 dB Of Vernier Range)[2]			
Options	Frequency Range (MHz)	Flatness Accuracy (dBm)	Reference Frequency (MHz)
Basic, 001, and H66	0.5 to 512	±0.5	50
002	0.5 to 64	±0.75	50
	64 to 512	±1.0	---
	512 to 1024	±1.5	---
003	0.5 to 512	+0.75 -1.25	50 ---
002/003	0.5 to 512	+1.0	50
	512 to 1024	-2.0	---
		±2.0	---
004	0.5 to 512	±0.75	190
	108 to 336	±0.5	190

See footnotes at the end of table

Table 1. Calibration Description - Continued

Test instrument parameters	Performance specifications
Internal modulation oscillator	Range: 400 Hz and 1 kHz (fixed) 20 Hz to 600 kHz (variable option 001 & H66) Accuracy: ±3% (fixed); ±15% (variable) Distortion: <0.5%, 400 Hz and 1 kHz <0.5%, 20 Hz to 2 kHz <1.0%, 2 to 200 kHz <2.0%, 200 to 600 kHz
Amplitude modulation (400 Hz and 1 kHz rate)	Range: 0 to 100% depth Accuracy: ±(5.5% reading and 1.5% FS) 0.5 to 512 MHz Distortion: <1% (0 to 50% depth) 0.5 to 512 MHz <3% (50 to 90% depth) 0.5 to 512 MHz <10% (0 to 30% depth) 512 to 1024 MHz (option 002) <20% (30 to 90% depth) 512 to 1024 MHz (option 002) External sensitivity: 0.5 to 512 MHz: (0.100 ±0.005) AM per mV peak into 600Ω with AM vernier fully cw Frequency response (option 004): <0.04 dB 90 to 150 Hz rate[4] (108 to 118 and 329 to 335 MHz) <0.1 dB 9 to 11kHz rate (108 to 118 MHz)
Demodulated output (option 004)	Range: 20 to 80% AM (108 to 118 and 329 to 336 MHz) Ac output: %AM = (20 ±0.4%) per V rms Dc output: 1.414 ±0.010 V dc for 100% AM
Frequency modulation (400 Hz and 1 kHz rate)	Range: 0 to 2560 kHz deviation (5120 kHz option 002)[5] Accuracy: ±(7% reading +1.5% FS) 0 to 2560 kHz (except for maximum peak deviation position which is ± (10% reading ±1.5% FS) Distortion: <1% for deviations up to 1/8 maximum allowable <3% for deviations up to maximum allowable External sensitivity: 1 V into 600Ω yields maximum deviation indicated on peak deviation switch with FM vernier fully cw Accuracy: ±6% (0 to 2560 kHz)[5]

[1] Specifications apply to all options unless otherwise specified.
[2]When below top 10 dB of vernier range, add ±0.5 dB.
[3]Calibrated to 90 dB.
[4]Calibrated to <0.1 dB
[5]Calibrated to 320 kHz deviation.

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-287 or AN/GSM-705. 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. 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		Boonton, Model 1121 (1121)
Distortion:	Range: 0 to 20% distortion Accuracy: ±3% FS	
Frequency:	Range: 90 to 1000 Hz Accuracy: <1% distortion	
AUTOTRANSFORMER	Range: 105 to 123 V dc Accuracy: ±1%	Ridge, Model 9020A (9020A)
FREQUENCY COUNTER	Range: 20 Hz to 1100 MHz Accuracy: ±1.25 x 10^{-8}	Fluke, Model PM6681/656
MEASURING RECEIVER	Range: -112.5.0 to + 20.5 dBm Accuracy: ±0.37 dB Range: 9.5 to 96.5% (AM) 4.7 to 339 kHz (FM) Accuracy: ±1% (AM) ±1.5% (FM)	Hewlett-Packard, Model 8902A w/sensor, Model 11722A (11722A) and microwave converter, model 11793A (11793A)
MULTIMETER	Range: 0.196 to 4.08 V (ac) 0.000 to 44.70 V (dc) Accuracy: ±0.5% (ac) ±0.025% (dc)	Fluke, Model 8840A/AF05 (AN/GSM-64D)
OSCILLOSCOPE	Bandwidth: 50 MHz Sensitivity: 5 mV/div Accuracy: ±3%	(OS-303/G)
PULSE GENERATOR	Range: 1 kHz rate 0.5 ms width	LeCroy Model 9210 (9210) with plug-in, LeCroy Model 9211 (9211)

Table 2. Minimum Specifications of Equipment Required - Continued

Common name	Minimum use specifications	Manufacturer and model (part number)
SPECTRUM ANALYZER	Range: 0.5 to 1024 MHz Accuracy: +0.25 dB/dB but not more than +1.5 dB over 70 dB range	(AN/USM-677)
TRUE RMS VOLTMETER	Range: 0 to 3.1 V ac Accuracy: ±1% (20 to 50 Hz) ±.5% (50 Hz to 200 kHz) ±.7% (200 to 600 kHz)	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 procedure 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 manufacturers' manuals for this TI.

d. When indications specified in paragraphs **8** through **18** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **8** through **18.** Do not perform power supply check if all other parameters are within tolerance.

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.

NOTE

Remove TI covers only as required to perform adjustments or set internal switches.

a. Adjust meter mechanical zero adjustment (located above **MODULATION FREQUENCY** switch) until needle is over 0 line on TI meter.

b. Connect TI to autotransformer.

c. Connect autotransformer to a 115-V ac source and adjust autotransformer for a 117V output.

d. Press **LINE OFF ON** pushbutton to **ON** and allow 2 hours for temperature stabilization.

e. Position controls as listed in (1) through (17) below:

(1) **COUNTER MODE** pushbuttons as listed in (a) through (d) below:

(a) **EXPAND X10** and **X100** released.
(b) **LOCK** released.
(c) **INT EXT** pressed.
(d) **+1/2 DIGIT** released.

(2) **FM k/MHz** pushbutton pressed.

(3) **AM** switch to **OFF.**

(4) **AUDIO OUTPUT LEVEL** control fully ccw.

(5) **AM** control fully ccw.

(6) **MODULATION FREQUENCY RANGE** switch to **FREQ FIXED 1 kHz** (**1000 Hz** for opt 004).

(7) **FM** switch to **OFF.**

(8) **PEAK DEVIATION** switch to **5 kHz**.

(9) **FM** control fully ccw.

(10) **RANGE MHz** switch to **1-0.5**.

(11) **FINE TUNE** control centered.

(12) **OUTPUT LEVEL** switches to **-20 dBm**.

(13) **OUTPUT LEVEL** vernier controls centered.

(14) **TIME BASE** vernier control to **CAL.**

(15) **RF OFF/ON** switch to **OFF.**

(16) **TIME BASE** (rear panel) switch to **INT.**

(17) **FREQUENCY TUNE** control fully cw.

8. Internal Reference Accuracy

a. Performance Check. Connect **TIME BASE REF** (rear panel) to frequency counter. Adjust internal reference oscillator (located through hole on right-hand side of front panel window) for a frequency counter indication of 5.000000 MHz.

NOTE

Check reference oscillator frequency again after 2 hours. The reference will be between 4.9999995 and 5.0000005.

b. Adjustments. No further adjustments can be made.

9. Frequency Range, Accuracy, and Stability

a. Performance Check

(1) Connect frequency counter channel **A** to TI auxiliary output (rear panel).

(2) Frequency counter will indicate 1.070 MHz or greater.

(3) Turn **FREQUENCY TUNE** control fully ccw. Frequency counter will indicate 0.450 MHz or less.

(4) Set **RANGE MHz** switch to **64-32** and adjust **FREQUENCY TUNE** control for a frequency MHz display of 50 MHz.

(5) Press **COUNTER MODE EXPAND X100** pushbutton.

(6) Adjust frequency counter time base for 8 digits resolution. Difference between TI display and frequency counter indications will be less than 110 Hz.

(7) Press **COUNTER MODE EXPAND X100** released, **X10** and **COUNTER MODE LOCK** pushbuttons pressed.

(8) Allow 1 minute to acquire phase lock. Difference between frequency counter and TI display indications will be less than 100 Hz.

(9) Release **COUNTER MODE EXPAND X10** and **LOCK** pushbuttons.

(10) Observe frequency counter indication for 10 minutes. Frequency change will be less than 500 Hz.

(11) Press **COUNTER MODE LOCK ON** pushbutton. Vary autotransformer from 123 to 105 V. Frequency counter indication will not vary more than 50 Hz.

(12) Adjust autotransformer for a 117 V output. Release **COUNTER MODE LOCK ON** pushbutton.

(13) Release **COUNTER MODE LOCK ON** pushbutton and disconnect equipment setup.

b. Adjustments. No adjustments can be made.

10. Harmonic Distortion

a. Performance Check

(1) Connect TI **RF OUTPUT** to spectrum analyzer **INPUT 50 Ω**.

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

(a) **LEVEL VOLTS** pushbutton pressed.
(b) **RANGE MHz** switch to **1-0.5 MHz**.
(e) **OUTPUT LEVEL** switch to **+10 dBm**.
(d) **RF OFF/ON** switch to **ON**.
(e) **COUNTER MODE EXPAND X10** pushbutton pressed.

(3) Adjust **FREQUENCY TUNE** control for a frequency MHz display indication of 0.5 MHz and **OUTPUT LEVEL** vernier control(s) fully cw.

(4) Position spectrum analyzer controls as necessary to obtain conditions listed in (a) through (b) below.

(a) Attenuation 40 dB.
(b) Reference level to 15 dB.

(5) Set spectrum analyzer **Start Freq** and **Stop Freq** to values listed in table 3.

(6) Press the spectrum analyzer key sequence in (a) through (d) below:

(a) **Marker**.
(b) **Peak Search**.
(c) **Marker Delta**.
(d) **Peak Search**, **Next Peak**.

(7) Spectrum analyzer will be within **Mkr1** indication listed in table 3.

(8) Press spectrum analyzer **Next Peak** for each harmonic peak displayed, spectrum analyzer will be within **Mkr1** indication listed in table 3. Repeat technique of (2) through (8) for remaining frequencies in table 3.

Table 3. Harmonic Distortion Accuracy

Test instrument		Spectrum analyzer		
Range MHz switch setting	Frequency MHz display (MHz)	**Start Freq** (Hz)	**Stop Freq** (Hz)	Max **Mkr1** indication Harmonics ≥dB below fundamental
1 - 0.5	.5	400 K	2.6 M	-30
2 - 1	1	900 K	5.1 M	-30
4 - 2	2	1.9 M	11 M	-30
8 - 4	4	3.9 M	21 M	-30
16 - 8	8	7.9 M	41 M	-30
32 - 16	16	15 M	81 M	-30
64 - 32	32	31 M	161 M	-30
128 - 64	64	63 M	321 M	-30
256 - 128	128	127 M	640 M	-30
512 - 256	256	250 M	1.3 G	-30
512 - 256	512	500 M	2.6 G	-30

NOTE

For TI's containing option 002, perform (9) through (13) below. For all others set **RF OFF/ON** switch to **OFF** and proceed to paragraph 11 below.

(9) Press spectrum analyzer **Marker**, **[Off]**.

(10) Position controls as listed in (a) through (d) below.

(a) **RANGE MHz** switch to **1024-512 MHz**.
(b) **OUTPUT LEVEL** switch to **+10 dBm**.
(c) **RF OFF/ON** switch to **ON**.
(d) **COUNTER MODE EXPAND X10** pushbutton released.

(11) Adjust **FREQUENCY TUNE** control for a frequency MHz display indication of 1024 MHz and **OUTPUT LEVEL** vernier control(s) fully cw.

(12) Set spectrum analyzer to TI frequency, set power reference **Marker**, **Peak Search**, **Marker**, **[Delta]**, then tune to harmonic frequency listed in table 4. Harmonic frequency **Mkr1** indication will be within limits listed in table 4.

(13) Repeat technique of (9) through (12) above as necessary for remaining rows in table 4. **Mkr1** indication will be within limits listed in table 4.

Table 4. Harmonic Distortion Accuracy (TI Containing Option 002 Only)

Test instrument		Spectrum analyzer	
DATA Amplitude (dBm)	**DATA** Frequency (MHz)	Harmonic frequency (MHz)	Tolerance Limit Harmonics ≥dB below fundamental
+10	1024	2048	-12
+10	1024	3072	-12
+10	1024	4096	-12
+10	1024	5120	-12
+10	1024	2048	-12
-40[1]	512	256	-20
-40	512	768	-20

[1] Set **OUTPUT LEVEL** vernier for a meter reading of +3 dB, and set spectrum analyzer attenuation to0 dB.

(14) Set **RF OFF/ON** switch to **OFF**.

b. Adjustments. No adjustments can be made.

11. Output Level and Meter Accuracy (All Models Except Those Containing Option 004)

a. Performance Check

(1) Connect sensor module 11722A to measuring receiver **CALIBRATION RF POWER OUTPUT**. Set measuring receiver to measure RF power, press **RF Power CAL** and then save correction factors.

(2) Disconnect measuring receiver from **CALIBRATION RF POWER OUTPUT** and connect to **RF OUTPUT**.

NOTE

The maximum output of TI's with option 002 is +13 dBm and with options 002/003 is +12 dBm.

(3) Set **OUTPUT LEVEL** switch to +20 dBm and **RANGE MHz** switch to **512-256.**

(4) Adjust **FREQUENCY TUNE** control for a 512 MHz indication on **FREQUENCY MHz** display and press **COUNTER MODE LOCK ON** pushbutton.

(5) Set **RF OFF/ON** switch to **ON.**

(6) Select the table (5 through 8) that corresponds to the appropriate option(s) of the TI. Using the techniques of (3) and (4) above set **OUTPUT LEVEL, RANGE MHz,** and **FREQUENCY TUNE** switches to settings listed in table selected and adjust **OUTPUT LEVEL** vernier control(s) for meter indications as listed in table. If measuring receiver indications are not as specified, perform **b** below.

Table 5. Output Meter Accuracy (Standard, Options 001 and H66)

Test instrument		Measuring receiver indications (dBm)	
OUTPUT LEVEL switch settings (dBm)	Meter indications (dB)	Min	Max
+20	-1	+17.5	+20.5
+20	-7	+11.5	+14.5
+20	-10	+8.5	+11.5
+10	+3	+11.5	+14.5
+10	0	+8.5	+11.5
0	+3	+1.5	+4.5
0	0	-1.5	+1.5

Table 6. Output Meter Accuracy (Option 002)

Test instrument **OUTPUT LEVEL** switch settings (dBm)	Meter indications (dB)	Measuring receiver indications (dBm)					
		25 MHz		512 MHz		1000 MHz	
		Min	Max	Min	Max	Min	Max
+20	-2	+16.5	+19.5	+16.0	+20.0	---	---
+20	-7	+11.5	+14.5	+11.0	+15.0	---	---
+20	-10	+8.5	+11.5	+8.0	+12.0	+7.0	+13.0
+10	+3	+11.5	+14.5	+11.0	+15.0	+10.0	+16.0
+10	0	+8.5	+11.5	+8.0	+12.0	+7.0	+13.0
0	+3	+1.5	+4.5	+1.0	+5.0	0.0	+6.0
0	0	-1.5	+1.5	-2.0	+2.0	-3.0	+3.0

Table 7. Output Meter Accuracy (Option 002 with 003)

Test instrument **OUTPUT LEVEL** switch settings (dBm)	Meter indications (dB)	Measuring receiver indications (dBm)			
		25 And 512 MHz		1000 MHz	
		Min	Max	Min	Max
+20	-2	+15.0	+20.0	---	---
+20	-7	+10.0	+15.0	---	---
+20	-10	+6.5	+12.5	---	---
+10	+2	+9.0	+14.0	+8.5	+15.5
+10	0	+7.0	+12.0	+6.5	+13.5
0	+3	0.0	+5.0	-0.5	+6.5
0	0	-3.0	+2.0	-3.5	+3.5

Table 8. Output Meter Accuracy (Option 003)

Test Instrument		Measuring receiver Indications (dBm)	
OUTPUT LEVEL switch settings (dBm)	Meter indications (dB)	Min	Max
+20	-2	+15.75	+19.75
+20	-7	+10.75	+14.75
+20	-10	+7.75	+11.75
+10	+3	+10.75	+14.75
+10	0	+7.75	+11.75
+ 0	+3	+0.75	+4.75
+ 0	0	-2.25	+1.75

(7) Adjust **OUTPUT LEVEL** vernier control(s) for a 0.0-dBm measuring receiver indication.

(8) Set measuring receiver to measure tuned level and press the **RF Power CAL** button.

(9) Select the table (9 through 12) that corresponds to the appropriate option(s) of the TI. Using the techniques of (3) and (4) above set **OUTPUT LEVEL, RANGE MHz,** and **FREQUENCY TUNE** switches to settings listed in table selected and adjust **OUTPUT** switch to settings listed in table selected. The measuring receiver will indicate as specified.

NOTE

While performing the test in tables 9 through 11, press the measuring receiver **RF Power CAL** button each time the measuring receiver **RCAL** light illuminates.

Table 9. Output Level Accuracy (Basic, Option 001 and H66)

Test instrument **OUTPUT LEVEL** switch settings (dBm)	Measuring receiver indications (dBm)	
	Min	Max
-10	-12	-8
-20	-22	-18
-30	-32	-28
-40	-42	-38
-50	-52.5	-47.5
-60	-62.5	-57.5
-70	-72.5	-67.5
-80	-82.5	-77.5
-90	-92.5	-87.5
-100	-102.5	-97.5
-110	-112.5	-107.5

Table 10. Output Level Accuracy (Option 002)

Test instrument **OUTPUT LEVEL** switch settings (dBm)	Measuring receiver indications (dB)					
	25 MHz		512 MHz		1000 MHz	
	Min	Max	Min	Max	Min	Max
-10	-12.0	-8.0	-12.5	-7.5	-13.5	-6.5
-20	-22.0	-18.0	-22.5	-17.5	-23.5	-16.5
-30	-32.0	-28.0	-32.5	-27.5	-33.5	-26.5
-40	-42.0	-38.0	-42.5	-37.5	-43.5	-36.5
-50	-52.5	-47.5	-53.0	-47.0	-54.0	-46.0
-60	-62.5	-57.5	-63.0	-57.0	-64.0	-56.0
-70	-72.5	-67.5	-73.0	-67.0	-74.0	-66.0
-80	-82.5	-77.5	-83.0	-77.0	-84.0	-76.0
-90	-92.5	-87.5	-93.0	-87.0	-94.0	-86.0
-100	-102.5	-97.5	-103.0	-97.0	-104.0	-96.0
-110	-112.5	107.5	-113.0	-107.0	-114.0	-106.0

Table 11. Output Level Accuracy (Option 002 with 003)

Test instrument **OUTPUT LEVEL** switch settings (dBm)	Measuring receiver indications (dB)			
	25 and 512 MHz		1000 MHz	
	Min	Max	Min	Max
-10	-13.5	-7.5	-14.0	-6.0
-20	-23.5	-16.5	-24.0	-16.0
-30	-33.5	-27.5	-34.0	-26.0
-40	-43.5	-37.5	-44.0	-36.0
-50	-54.0	-47.0	-54.5	-45.5
-60	-64.0	-57.0	-64.5	-55.5
-70	-74.0	-67.0	-74.5	-65.5
-80	-84.0	-77.0	-84.5	-75.5
-90	-94.0	-87.0	-94.5	-85.5
-100	-104.0	-97.0	-104.5	-95.5
-110	-114.0	-107.0	-114.5	-105.5

Table 12. Output Level Accuracy (Option 003)

Test instrument **OUTPUT LEVEL** switch settings (dBm)	Measuring receiver indications (dB)	
	Min	Max
-10	-12.75	-7.75
-20	-22.75	-17.75
-30	-32.75	-27.75
-40	-42.75	-37.75
-50	-53.25	-47.25
-60	-63.25	-57.25
-70	-73.25	-67.25
-80	-83.25	-77.25
-90	-93.25	-87.25
-100	-103.25	-97.25
-110	-113.25	-107.25

(10) Release **COUNTER MODE LOCK ON** pushbutton.

b. Adjustments

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

(a) **AM X10%** pushbutton pressed.
(b) **AM** switch to **OFF**.
(c) **MODULATION FREQUENCY RANGE** switch to **FIXED FREQ 1 kHz**.
(d) **AM** control fully ccw.

(2) Connect multimeter **INPUT HI** to DC OUTPUT A2TP3 (fig. 1) and **INPUT LO** to GND A2TP1 (fig. 1). Adjust DET OFFSET A2R15 (fig. 1) for multimeter indication of 0.000 ±1 mV dc (R).

(3) Disconnect multimeter **INPUT HI** from DC OUTPUT A2TP3 and connect **INPUT HI** to METER ADJ A2TP4 (fig. 1).

(4) Adjust METER OFFSET A2R14 (fig. 1) for multimeter indication of 0.000 ±1 mV dc (R).

(5) Disconnect multimeter **INPUT HI** from METER ADJ A2TP4 (fig. 1) and connect **INPUT HI** to AM IN A26A2TP1 (fig. 2).

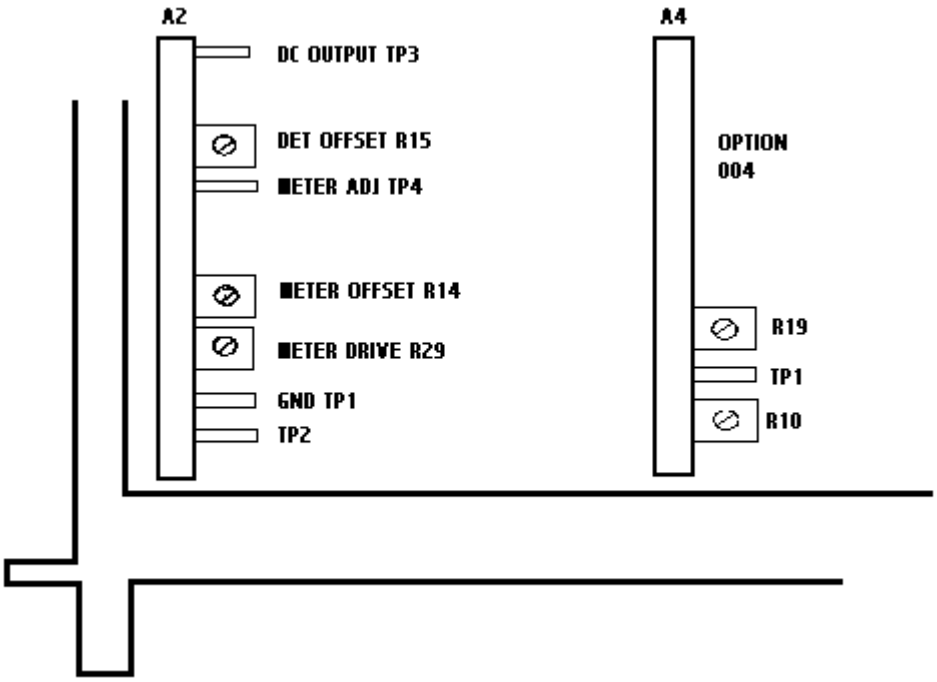

Figure 1. TEST instrument, top left hand side.

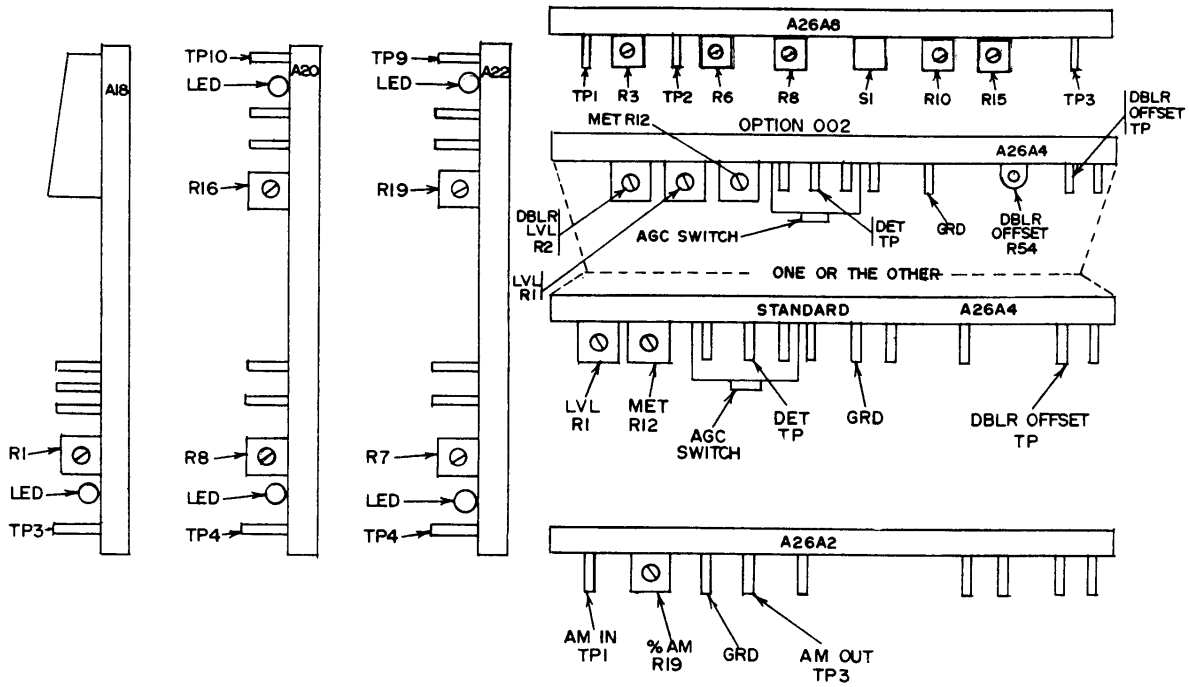

Figure 2. Test instrument - top back side.

(6) Set **AM** switch to **INT** and adjust **AM** control for a multimeter indication of 0.707 V ac. Adjust METER DRIVE A2R29 (fig. 1) for TI meter indication of 10 on 0 to 10 scale (R).

(7) Adjust **AM** control for TI meter indications listed in table 13. Multimeter will indicate as specified; if not, readjust METER DRIVE A2R29 (fig. 1) for best in-tolerance condition.

Table 13. Meter Accuracy

Test instrument meter indications (0 - 10 Scale)	Multimeter indications (V Rms)	
	Min	Max
7	0.487	0.503
5	0.345	0.362
3	0.205	0.220
10	0.697	0.718

(8) Disconnect multimeter from TI. Connect **RF OUTPUT** to measuring receiver sensor module.

(9) Position controls as listed in (a) through (i) below.

(a) **LEVEL VOLTS** pushbutton pressed.
(b) **AM** control fully ccw.
(c) **FM** switch to **OFF**.
(d) **COUNTER MODE LOCK ON** released.
(e) **RANGE MHz** switch **64-32**.
(f) **FREQUENCY TUNE** control for a **FREQUENCY MHz** display indication of 50 MHz.
(g) **OUTPUT LEVEL** switch to **+10 dBm**.
(h) **OUTPUT LEVEL** vernier control(s) fully cw.
(i) **RF OFF/ON** switch to **ON**.

(10) Set measuring receiver to measure AM with **AVG DETECTOR.**

(11) Adjust **AM** control for a measuring receiver indication of approximately 20%. Press measuring receiver **RATIO %** key.

(12) Adjust **OUTPUT LEVEL** vernier control(s) for a TI meter indication of **-7dB.**

(13) Adjust DET A26A1R19 (A26A1R34 for option 002) (fig. 3) for measuring receiver indication of 100% (R).

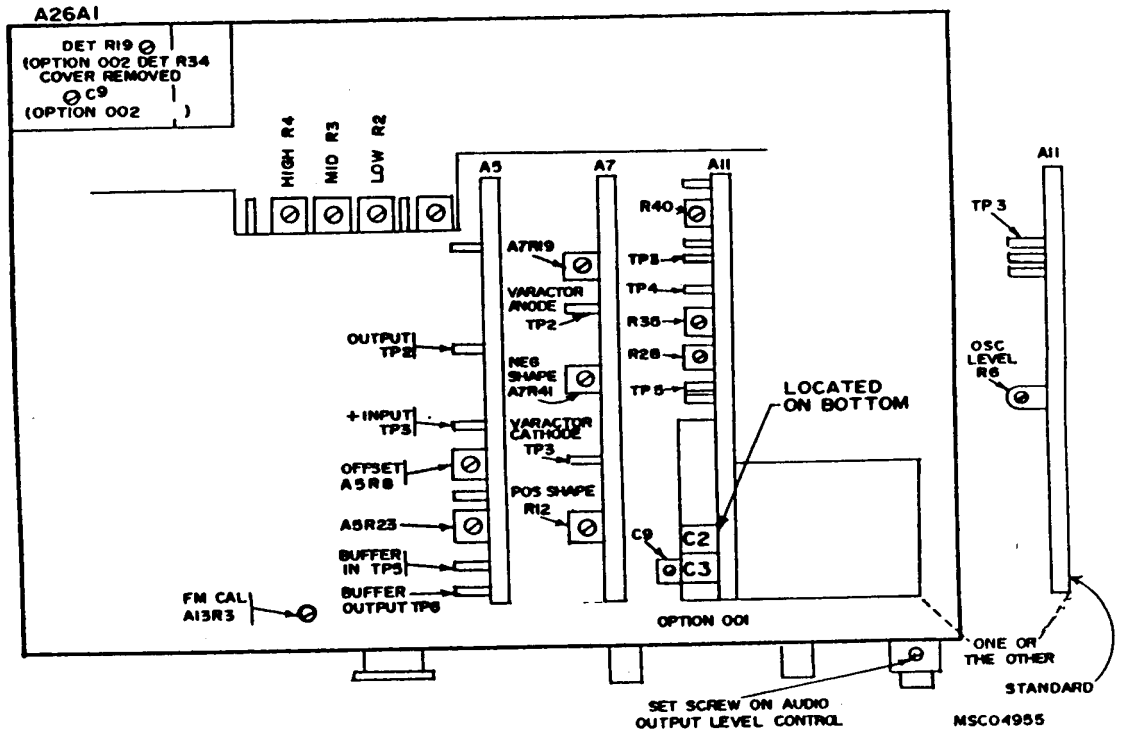

Figure 3. TEST instrument - bottom view.

(14) Set **OUTPUT LEVEL** vernier control(s) fully cw.

(15) Measuring receiver will indicate between 99.5 and 100.5%, if not, repeat (11) through (14) above while readjusting A26A1R19 (A26A1R34 for option 002) (fig. 3) for best in-tolerance condition.

(16) Set **AM** switch to **OFF.**

(17) Set measuring receiver to measure RF power.

(18) For option 002 only, set DBLR OFFSET A26A4R54 (fig. 2) to mid-range.

(19) Adjust LVL A26A4R1 (fig. 2) for a +13.2 dBm measuring receiver indication (R).

(20) Adjust **OUTPUT LEVEL** vernier control(s) for a +13.0 dBm measuring receiver indication. Adjust MET A26A4R12 (fig. 2) for TI meter indication of +3 dB (R).

(21) For option 002, proceed to (22) below. For all other models, repeat **a** above.

(22) Set **RANGE MHz** switch to **1024-512** and adjust **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of 800 MHz.

(23) Adjust DBLR LVL A26A4R2 (fig. 2) for a +13.0 dBm measuring receiver indication (R).

(24) Set **RANGE MHz** switch to **64-32** and **FREQUENCY TUNE** for 50-MHz display indication. Adjust **OUTPUT LEVEL** vernier control ccw for a +3-dBm measuring receiver indication.

(25) Set **RANGE MHz** switch to **1024-512.** Adjust DBLR OFFSET A26A4R54 (fig. 2) for a +3 dBm measuring receiver indication (R).

(26) Set **RANGE MHz** switch to **64-32** and adjust **OUTPUT LEVEL** vernier control fully cw. If measuring receiver does not indicate +13.2 dBm, repeat (19) above.

(27) Repeat (20) through (26) above until measuring receiver indication at 800 MHz is within ±.2 dBm of the 50 MHz indication.

(28) Set **RANGE MHz** switch to **1024-512** and adjust **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of 700 MHz.

(29) Set **OUTPUT LEVEL** switch to **+20 dBm** and set **OUTPUT LEVEL** vernier control(s) fully cw. Adjust A26A1C9 (fig. 3) for maximum measuring receiver indication (not to exceed +17 dBm) (R).

(30) Position controls as listed in **(a)** through **(e)** below.

(a) **AM 10X** pushbutton pressed.
(b) **AM** switch to **AC.**
(c) **AM** control fully cw.
(d) **OUTPUT LEVEL** switch to **+10 dBm**.
(e) **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of 800 MHz.

(31) Adjust **OUTPUT LEVEL** vernier control(s) for a 0 dB indication on TI meter.

(32) Connect equipment as shown in figure 4.

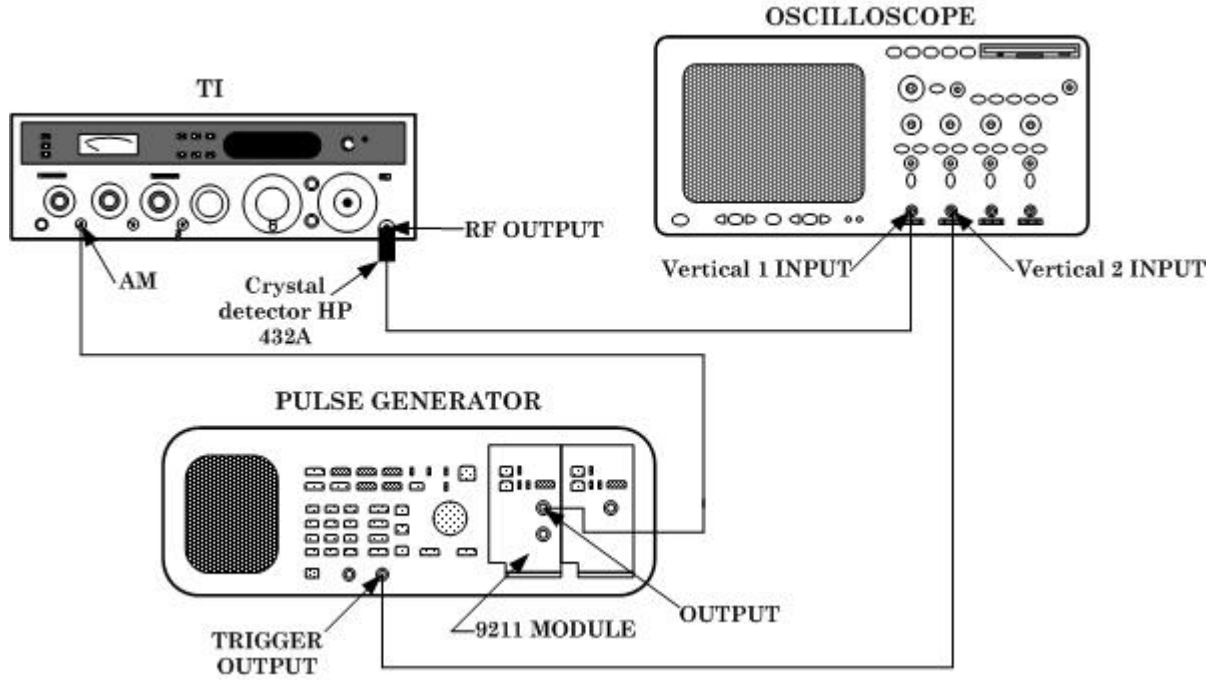

Figure 4. Doubler gain - adjustment setup

(34) Set pulse generator controls for a 0.5 ms pulse width with a 1 kHz rate. Adjust pulse generator output controls for TI meter indication of 40% (4 on 0-10 scale).

NOTE

REDUCE PEAK POWER annunciator should be off in (35) and (36) below.

(35) Adjust oscilloscope controls as necessary to display detected RF output signal. Readjust A26A1C9 (fig. 3) slightly (if required) to limit ringing and eliminate oscillations as indicated on oscilloscope display.

(36) While observing oscilloscope display, slowly vary TI frequency from 512 to 1024 MHz. Readjust A26A1C9 (fig. 3) for a stable square wave indication on oscilloscope display.

(37) Repeat (21) through (36) above until no further adjustment is necessary.

(38) Repeat **a** above.

12. Output Level and Meter Accuracy (Models Containing Option 004)

a. Performance Check

(1) Connect measuring receiver to **RF OUTPUT**.

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

(a) **RANGE MHz** switch to **512-256**.
(b) **OUTPUT LEVEL 10 dB** switch to **+16 dBm**.
(c) **OUTPUT LEVEL 1 dB** switch to **0 dBm**.

(3) Adjust **FREQUENCY TUNE** control for a 512 MHz indication on **FREQUENCY MHz** display, and press **LOCK ON** pushbutton.

(4) Set **RF OFF/ON** switch to **ON**

NOTE

In (5) and (6) below, the **OUTPUT LEVEL 1 dB** switch position must be changed, as necessary, to obtain required TI meter indications.

(5) Adjust **OUTPUT LEVEL** controls for a TI meter indication of -5 dB. Measuring receiver will indicate between +13.5 and +16.5 dB as listed in table 14; if not, perform **b** below.

(6) Repeat technique of (5) above for **OUTPUT LEVEL 10 dBm** switch settings and meter indications listed in table 14. Measuring receiver will indicate as specified; if not, perform **b** below.

Table 14. Output Meter Accuracy (Option 004)

Test Instrument		Measuring receiver indications (dBm)	
OUTPUT LEVEL 10 dbm switch settings	Meter indications (dB)	Min	Max
+16	-5	+13.5	+16.5
+16	-7	+11.5	+14.5
+16	-10	+8.5	+11.5
+10	0	+8.5	+10.5
+10	-1	+7.5	+10.5
0	0	-1.5	+1.5

(7) Set **OUTPUT LEVEL 1 dB** switch to **0 dB** and adjust **OUTPUT LEVEL** vernier control for a 0 dBm TI meter indications.

(8) Set measuring receiver to measure tuned level at 512 MHz then establish a 0.0 dB reference on measuring receiver.

(9) Set **OUTPUT LEVEL 10 dB** switch to **-10 dBm.** Measuring receiver will indicate between minimum and maximum limits listed in table 15.

(10) Repeat technique of (9) above for **OUTPUT LEVEL** switch positions listed in table 15. Receiver system will indicate as specified.

Table 15. Output Level Accuracy (Option 004)

Test Instrument		Measuring receiver indications (dB)	
OUTPUT LEVEL 10 dB switch settings	**OUTPUT LEVEL 1 dB** switch settings	Min	Max
-10	0	-12.0	-8.0
-10	-1	-13.0	-9.0
-10	-2	-14.0	-10.0
-10	-3	-15.0	-11.0
-10	-4	-16.0	-12.0
-10	-5	-17.0	-13.0
-10	-6	-18.0	-14.0
-10	-7	-19.0	-15.0
-10	-8	-20.0	-16.0
-10	-9	-21.0	-17.0
-10	-10	-22.0	-18.0
-10	-11	-23.0	-19.0
-10	-12	-24.0	-20.0
-20	0	-22.0	-18.0
-30	0	-32.0	-28.0
-40	0	-42.0	-38.0
-50	0	-52.5	-47.5
-60	0	-62.5	-57.5
-70	0	-72.5	-67.5
-80	0	-82.5	-77.5
-90	0	-92.5	-87.5
-100	0	-102.5	-97.5
-110	0	-112.5	-107.5

(11) Release **COUNTER MODE LOCK ON** pushbutton and set **RF OUTPUT OFF/ON** switch to **OFF**.

b. Adjustments

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

(a) **FM k/MHz** pushbutton pressed.
(b) **MODULATION FREQUENCY RANGE** switch to **FIXED FREQ 1 kHz**.
(c) **FM** switch to **OFF**.
(d) **PEAK DEVIATION** switch to **10 kHz**.
(e) **PEAK DEVIATION** vernier control fully ccw.
(f) **RANGE MHz** switch to **4-2**.

(2) Connect multimeter to A2TP2 (fig. 1) and chassis ground. Adjust DET OFFSET A2R15 (fig. 1) for a 0.000 ±1-mV dc multimeter indication (R).

(3) Disconnect multimeter from A2TP2 and connect to A4TP1 (fig. 1). Adjust A4R10 (fig. 1) for a 0.000 ±1 mV dc multimeter indication (R).

(4) Set **FM** switch to **INT** and adjust **PEAK DEVIATION** vernier control for a 9.766 V dc multimeter indication.

(5) Adjust A4R19 (fig. 1) for a TI meter indication of 10 on 0 to 10 scale (R).

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

(a) **LEVEL VOLTS** pushbutton pressed.
(b) **AM** switch to **INT**.
(c) **AM** control fully ccw.
(d) **RANGE MHz** switch to **256-128.**
(e) **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of 190 MHz.
(f) **OUTPUT LEVEL** vernier control to **CAL**.
(g) **OUTPUT LEVEL** switches to **+10 dBm**.

(7) Disconnect multimeter from TI and connect **RF OUTPUT** to measuring receiver input and set **RF OFF/ON** switch to **ON.**

(8) Set measuring receiver to measure AM with **AVG DETECTOR.**

(9) Adjust **AM** control for a measuring receiver indication of approximately 20%. Press measuring receiver **RATIO %** key.

(10) Set **OUTPUT LEVEL** switches to **0 dBm.** Adjust DET A26A1R19 (fig. 3) for a measuring receiver indication of 100% (R).

(11) Set **OUTPUT LEVEL** switches to **+10 dBm.** Measuring receiver will indicate between 99.5 and 100.5%; if not, repeat (9) and (10) above while adjusting A26A1R19 (fig. 1) for best in-tolerance condition.

(12) Set measuring receiver to measure RF power.

(13) Position controls as listed in (a) through **(**d) below.

(a) **AM** switch to **OFF**.
(b) **RANGE MHz** switch to **64-32**.
(c) **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of 50 MHz.
(d) **OUTPUT LEVEL** vernier control to **CAL**.

(14) Set **OUTPUT LEVEL 10 dB** switch to **+16 dBm** and **1 dB** switch to **-3 dB**.

(15) Adjust LVL A26A4R1 (fig. 2) for a +13 dBm indication on measuring receiver (R).

(16) Adjust MET A26A4R12 (fig. 2) for a –7 dB indication on TI meter (R).

(17) Repeat ((15) and (16) above for best in tolerance condition.

13. Output Level Flatness

a. Performance Check

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

(a) **LEVEL VOLTS** pushbutton pressed.
(b) **AM** switch to **OFF**.
(c) **FM** switch to **OFF**.
(d) **RF OFF/ON** switch to **OFF**.
(e) **OUTPUT LEVEL** switch to **+10 dBm**.

(2) Connect measuring receiver with power senor to **RF OUTPUT**.

NOTE
For TI models containing opt 004 proceed to (7) below.

(3) Set **RANGE MHz** switch to **64-32** and adjust **FREQUENCY TUNE** control for a 50 MHz indication on **FREQUENCY MHz** display.

(4) Set **RF OFF/ON** switch to **ON** and adjust **OUTPUT LEVEL** vernier control(s) for a +8.0 dBm indication on measuring receiver.

(5) While observing measuring receiver indication, slowly vary TI frequency from start to stop frequencies listed in table 16. Measuring receiver will indicate between minimum and maximum indications listed in table 16.

(6) Repeat technique of (3) through (5) above for remaining options and settings listed in table 16.

Table 16. Output level flatness (models without option 004).

Options	Start frequency (Hz)	Stop frequency (Hz)	Min indication (dB)	Max indication (dB)
Standard model 001, H66	16 M	512 M	+7.5	+8.5
003	16 M	512 M	+6.75	+8.75
002	16 M	64 M	+7.25	+8.25
002	64 M	512 M	+7.0	+9.0
002	512 M	1000 M	+6.5	+9.5
002 with 003	16 M	512 M	+6.0	+9.0
002 with 003	512 M	1000 M	+6.0	+10.0

NOTE

Perform (7) through 10 below for models containing opt 004 only. All other models proceed to (11) below.

(7) Set **RANGE MHz** switch to **256-128** and adjust **FREQUENCY TUNE** control for a 190 MHz indication on **FREQUENCY MHz** display.

(8) Set **RF OFF/ON** switch to **ON** and adjust **OUTPUT LEVEL 1 dB** switch and vernier control for a +8.0 dBm indication on measuring receiver.

(9) While observing measuring receiver indication, slowly vary TI frequency from start to stop frequencies listed in table 17. Measuring receiver will indicate between minimum and maximum indications listed in table 17.

(10) Repeat technique of (7) through (9) above for remaining options and settings listed in table 17.

Table 17. Output level flatness models contain option 004

Options	Start frequency (Hz)	Stop frequency (Hz)	Min indication (dB)	Max indication (dB)
004	16 M	108 M	+7.25	+8.75
004	108 M	336 M	+7.5	+8.5
004	336 M	512 M	+7.25	+8.75
004 with 003	16 M	108 M	+6.75	+9.25
004 with 003	108 M	336 M	+7.5	+8.5
004 with 003	336 M	512 M	+6.75	+9.25

(11) Disconnect measuring receiver from TI.

b. Adjustments. No adjustments can be made.

14. Internal Modulation Oscillator Frequency Accuracy, Output Voltage, and Distortion

a. Performance Check

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

(a) AM switch to INT.
(b) AUDIO OUTPUT LEVEL control fully cw.
(c) AM vernier fully cw.
(d) MODULATION FREQUENCY RANGE switch to FIXED FREQ 1 kHz (1000 Hz for opt 004).
(e) RF OFF/ON switch to ON.
(f) FM switch to OFF.

(2) Connect audio analyzer to **AM OUTPUT** using 600-Ω termination.

(3) Set audio analyzer and TI to the first functions and settings listed in table 18.

(4) Audio analyzer will indicate within limits specified in table 18.

(5) Set audio analyzer and TI to the remaining functions and settings listed in table 18 and repeat (4) above.

Table 18. Internal Modulation Oscillator Frequency Accuracy and Distortion

Test instrument		Audio analyzer				
Modulation frequency range switch settings	Modulation frequency vernier	Function	Distortion indication ≤	Volts indication >	Frequency	
					Minimum	Maximum
FIXED FREQ 1 kHz	----------	Level	----------	1 (3)[1]	----------	----------
FIXED FREQ 1 kHz	----------	Frequency	----------	----------	970	1030
FIXED FREQ 1 kHz	----------	Distortion	0.5%	----------	----------	----------
FIXED FREQ 400 Hz	----------	Frequency	----------	----------	388	412
FIXED FREQ 400 Hz	----------	Distortion	0.5%	----------	----------	----------
X1[2]	100	Frequency	----------	----------	85	115
X1	100	Distortion	0.5%	----------	----------	----------
X1	20	Frequency	----------	----------	17	23
X1	20	Distortion	0.5%	----------	----------	----------
X10	100	Frequency	----------	----------	850	1150
X10	100	Distortion	0.5%	----------	----------	----------
X10	200	Frequency	----------	----------	1700	2300
X10	200	Distortion	1.0%	----------	----------	----------
X100	200	Frequency	----------	----------	17,000	23,000
X100	200	Distortion	1.0%	----------	----------	----------
X100	100	Frequency	----------	----------	8,500	11,500
X100	100	Distortion	1.0%	----------	----------	----------
X1K	100	Frequency	----------	----------	85,000	115,000
X1K	100	Distortion	1.0%	----------	----------	----------
X1K[3]	200	Frequency	----------	----------	170,000	230,000
X3K	200	Frequency	----------	----------	510,000	690,000
X3K	20	Frequency	----------	----------	51,000	69,000

[1]Values in parenthesis are for option 001.
[2] Perform remaining test only for TI's containing option 001 & H66
[3] Replace audio analyzer with frequency counter before this measurement.

b. Adjustments. For TI's containing options 001 & H66, perform (3) through (19) below. For all other TI's, perform (1) and (2) below.

(1) Connect true rms voltmeter to A11TP3 (fig. 3) and chassis ground. Adjust OSC LEVEL A11R6 (fig. 3) for true rms voltmeter indication of 0.840 ±0.010 V ac (R).

(2) Repeat **a** (3) through (5) above.

(3) Set **MODULATION FREQUENCY RANGE** switch to X100 and adjust **MODULATION FREQUENCY** vernier dial fully ccw.

(4) Connect true rms voltmeter **INPUT** to A11TP4 (fig. 3) and chassis ground. Adjust A11R28 (fig. 3) for a 1.4-V ac true rms voltmeter indication. Record true rms voltmeter indication (R).

(5) Connect frequency counter **CHANNEL A** input to TI **AM OUTPUT.** Adjust **MODULATION FREQUENCY** vernier dial fully cw.

(6) Adjust A11C2 and A11C3 (fig. 3) until true rms voltmeter indicates within ± 0.1 V ac of value recorded in (4) above (R).

NOTE

Adjusting A11C2 (fig. 3) ccw decreases voltage while increasing frequency. Adjusting A11C3 (fig. 3) ccw increases both voltage and frequency.

(7) Adjust **MODULATION FREQUENCY** vernier dial to **20**. If frequency counter does not indicate 2.00 ±0.02 kHz, adjust vernier dial for a 2.00 kHz frequency counter indication. Loosen setscrews in vernier control shaft gear and position vernier dial to **20**. Tighten setscrews and, if necessary, readjust A11R28 (fig. 3) for true rms voltmeter indication between 1.37 and 1.48 V ac. Record true rms voltmeter indication.

(8) Adjust **MODULATION FREQUENCY** vernier dial to **200.** If true rms voltmeter does not indicate within ±0.01 V ac of value recorded in (7) and frequency counter indication is not 20 ±0.2 kHz, readjust A11C2 (fig. 3) and A11C3 (fig. 3) for desired indications.

(9) Adjust **MODULATION FREQUENCY** vernier dial to **20.** If true rms voltmeter does not indicate within ±0.01 V ac of value recorded in (7) above and frequency counter indication is not 2.00 ±0.02 kHz, repeat (7) and (8) above.

(10) Adjust **MODULATION FREQUENCY** vernier dial to **20.** True rms voltmeter will indicate between 1.37 and 1.48 V ac. Record true rms voltmeter indication.

(11) While observing true rms voltmeter indication, slowly vary TI modulation frequency from 2 kHz to 20 kHz. True rms voltmeter will indicate within ±0.03 V ac of indication recorded in (10) above.

(12) Set **MODULATION FREQUENCY RANGE** switch to **X3K** and adjust **MODULATION FREQUENCY** vernier dial to **200.** Adjust A11C9 (fig. 3) for a 600 ±6kHz frequency counter indication (R).

(13) Position controls as listed in (a) through (c) below.

(a) **FM** switch to **INT**.
(b) **MODULATION FREQUENCY RANGE** switch to **X100**.
(c) **MODULATION FREQUENCY** vernier dial to **20**.

(14) Connect true rms voltmeter **INPUT** to A11TP5 (fig. 3) and chassis ground. Adjust A11R35 (fig. 3) for a 0.840 ±0.010 V ac true rms voltmeter indication. Record true rms voltmeter indication (R).

(15) Disconnect true rms voltmeter from A11TP5 (fig. 3) and connect to A11TP3 (fig. 3). True rms voltmeter will indicate within ±0.005 V ac of value recorded in (14) above.

(16) While observing true rms voltmeter, slowly vary modulation frequency from 20 Hz to 100 kHz. True rms voltmeter will indicate within ±0.025 V ac of value recorded in (14) above.

(17) Repeat technique of (16) for 100 to 600 kHz. True rms voltmeter will indicate within ±0.050 V ac of value recorded in (14) above.

(18) Set **MODULATION FREQUENCY RANGE** switch to **X3K** and adjust **MODULATION FREQUENCY** vernier dial to **20**.

(19) Disconnect frequency counter and true rms voltmeter from TI. Connect true rms voltmeter to **AM OUTPUT**, using 600 Ω termination. Adjust A11R40 (fig. 3) for 3.10 ±0.03 V ac true rms voltmeter indication (R).

(20) Disconnect equipment setup.

15. AM Sensitivity, Accuracy, and Distortion (All Models Except Those Containing Option 004)

a. Performance Check

(1) Connect equipment as shown in figure 5.

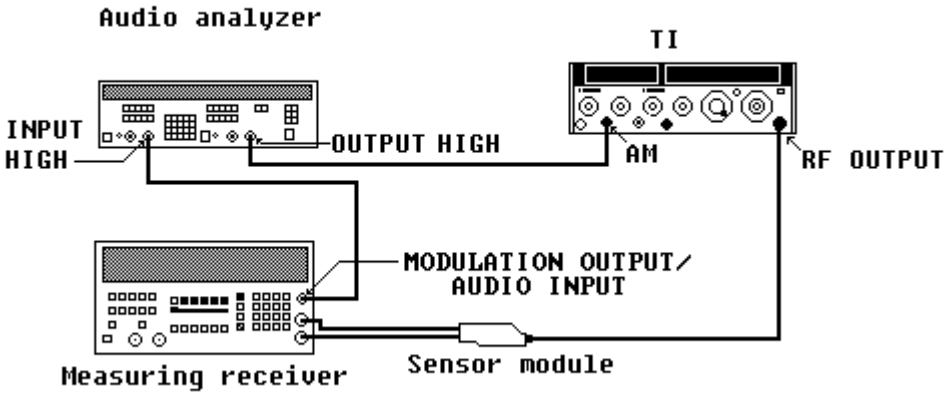

Figure 5. AM test setup.

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

(a) **COUNTER MODE INT EXT** pushbutton pressed.
(b) **COUNTER MODE EXPAND X10** and **X100** pushbuttons released.
(c) **COUNTER MODE LOCK ON** pushbutton released.
(d) **AM X10%** pushbutton pressed.
(e) **AM** switch to **DC.**
(f) **AM** control fully cw.
(g) **FM** switch to **OFF.**
(h) **RANGE MHz** switch to **512-256**.
(i) **FREQUENCY TUNE** control for a **FREQUENCY MHz** display indication of **500 MHz**.
(j) **OUTPUT LEVEL** switch to **+10 dBm** and vernier control(s) fully cw.
(k) **RF OFF/ON** switch to **ON**.

(3) Set measuring receiver to acquire the frequency then to measure AM with peak + detector. Set high-pass filter to 50 Hz and low-pass filter to 15 kHz

(4) Set audio analyzer controls for a 1 kHz 600 Ω output frequency.

NOTE

In (5) and (8) below, record measuring receiver **% AM** display indication using peak + detector and peak - detector. Average the indications and use the average for determining the results.

(5) Adjust audio analyzer output controls for a 1.272-V level. The measuring receiver will indicate between min and max limits listed in table 19; if not, perform **b** below.

(6) Repeat technique of (5) above for audio analyzer output levels listed in table 19. The measuring receiver will indicate as specified; if not, perform **b** below.

Table 19. AM Sensitivity

Audio analyzer Output levels (V ac)	Measuring receiver Indications (% AM)	
	Min	Max
1.272	85.5	94.5
.9898	66.5	73.5
.707	47.5	52.5
.4242	28.5	31.5
.2828	19.0	21.0
.1414	9.5	10.5

(7) Adjust audio analyzer output controls for a 1.414-V level.

(8) Adjust **AM** control for 90 % modulation (**9** on **0-10** scale) as indicated on TI meter. The measuring receiver will indicate between min and max limits listed in table 20.

(9) Repeat technique of (8) for TI meter indications listed in table 20. The modulation analyzer will indicate as specified.

Table 20. AM Accuracy

Test Instrument Meter Indications	Measuring receiver Indications (% AM)	
	Min	Max
90	83.6	96.5
70	64.7	75.4
50	45.8	54.3
30	26.9	33.2
20	17.4	22.6
10	7.95	12.1

(10) Press **LEVEL VOLTS** pushbutton and adjust **OUTPUT LEVEL** vernier control(s) for a +3 dB indication on TI meter.

(11) Adjust **AM** control for a 50% AM indication on measuring receiver. The distortion, as indicated on the audio analyzer will be within limits listed in table 21.

(12) Repeat technique of (10) and (11) above for TI meter dB indications and measuring receiver % AM indications listed in table 21. The audio analyzer distortion indications will be as specified.

Table 21. AM Distortion

Test instrument meter indications (dB)	Measuring receiver indications (% AM)	Audio analyzer indications (<%)
+3	50	1
+3	90	3
-7	90	3
-7	50	1
-7[1]	30	10
-7[1]	90	20

[1]Perform for option 002 only. Set **RANGE MHz** switch to **1024-512** and adjust **FREQUENCY TUNE** control for a **FREQUENCY MHz** display indication of 1024 MHz.

b. Adjustments

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

(a) **AM** switch to **AC.**
(b) **AM** control fully cw.
(c) **OUTPUT LEVEL** vernier control(s) fully cw.
(d) **RANGE MHz** switch to **64-32**.
(e) **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of 50 MHz.
(f) **RF OFF/ON** switch to **ON**.

(2) Set Audio analyzer for a 1 kHz .7072 V 600 Ω output signal.

(3) Set measuring receiver to measure peak AM with 50 Hz high-pass and 15 kHz low-pass filters. Adjust %AM A26A2R19 (fig. 2) for a 50.0 ±0.1% measuring receiver indication (R).

(4) Set **AM** and **RF OFF/ON** switches to **OFF** and repeat **a** above.

16. AM Sensitivity, Accuracy, Distortion, and Demodulated Output (Models Containing Option 004)

a. Performance Check

(1) Connect equipment as shown in figure 5.

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

(a) **COUNTER MODE INT EXT** pushbutton pressed.
(b) **COUNTER MODE EXPAND X10** and **X100** pushbuttons released.
(c) **COUNTER MODE LOCK ON** pushbutton released.
(d) **AM X10%** pushbutton pressed.
(e) **AM** switch to **DC.**
(f) **AM** control fully **cw.**
(g) **FM** switch to **OFF.**
(h) **RANGE MHz** switch to **512-256**.
(i) **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of **500 MHz**.
(j) **OUTPUT LEVEL 10 dB** switch to **+10 dBm**.
(k) **OUTPUT LEVEL 1 dB** switch to **0 dBm**.
(l) **OUTPUT LEVEL** vernier control fully cw.
(m) **RF OFF/ON** switch to **ON.**

(3) Set measuring receiver to measure AM with peak + detector. Set high-pass filter to 50 Hz and low-pass filter to 15 kHz.

(4) Adjust audio analyzer controls for a 1 kHz, 600 Ω output frequency.

NOTE

In (5) and (8) below, record measuring receiver % AM display indication using peak + detector and peak - detector. Average the indications and use the average for determining the results.

(5) Adjust audio analyzer output controls for a 0.827-V level. The measuring receiver will indicate between min and max limits listed in table 22; if not, perform **b** below.

(6) Repeat technique of (5) above for audio analyzer output levels listed in table 22. The measuring receiver will indicate as specified; if not, perform **b** below.

Table 22. OPT 004 AM Sensitivity

Audio analyzer output levels (V ac)	Measuring receiver indications (% AM)	
	Min	Max
0.827	85.5	94.5
0.643	66.5	73.5
0.459	47.5	52.5
0.276	28.5	31.5
0.184	19.0	21.0
0.092	9.5	10.5

(7) Adjust audio analyzer **OUTPUT** controls for a 1.000 V level.

(8) Adjust AM control for 90% modulation (**9** on **0-10** scale) as indicated on TI meter. The measuring receiver will indicate between min and max limits listed in table 23.

(9) Repeat technique of (8) above for TI meter indications listed in table 23. The measuring receiver will indicate as specified.

Table 23. OPT 004 AM Accuracy

Test instrument meter indications	Measuring receiver indications (% AM)	
	Min	Max
90	83.6	96.5
70	64.7	75.4
50	45.8	54.3
30	26.9	33.2
20	17.4	22.6
10	7.95	12.1

(10) Press **LEVEL VOLTS** pushbutton. Set **OUTPUT LEVEL 10 dB** switch to **+10 dBm** and **1 dB** switch to **-7 dB.** Adjust **OUTPUT LEVEL** vernier control for a -7dB indication on TI meter.

(11) Adjust **AM** control for a 50% AM indication on measuring receiver. The distortion, as indicated on the audio analyzer will be within limits listed in table 24.

(12) Repeat technique of (10) and (11) above for TI meter dB indications and measuring receiver % AM indications listed in table 24. The audio analyzer indications will be as specified.

Table 24. OPT 004 AM Distortion

Test instrument meter indications (dB)	Measuring receiver indications (% AM)	Audio analyzer indications (<%)
-7	50	1
-7	90	3

(13) Position controls as listed in (a) through (i) below.

(a) **AM X10%** pushbutton pressed.

(b) **AM SWITCH** to **AC**.

(c) **FM** switch to **OFF**.

(d) **RANGE MHz** switch to **128-64**.

(e) **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of 113 MHz.

(f) **AM** control fully ccw.

(g) **OUTPUT LEVEL 10 dB** switch to **0 dBm**.

(h) **OUTPUT LEVEL 1 dB** switch to **0**.

(i) **OUTPUT LEVEL** vernier to **CAL**.

(14) Reduce all outputs to minimum and reconnect equipment as shown in figure 6, leaving TI **RF OUTPUT** disconnected.

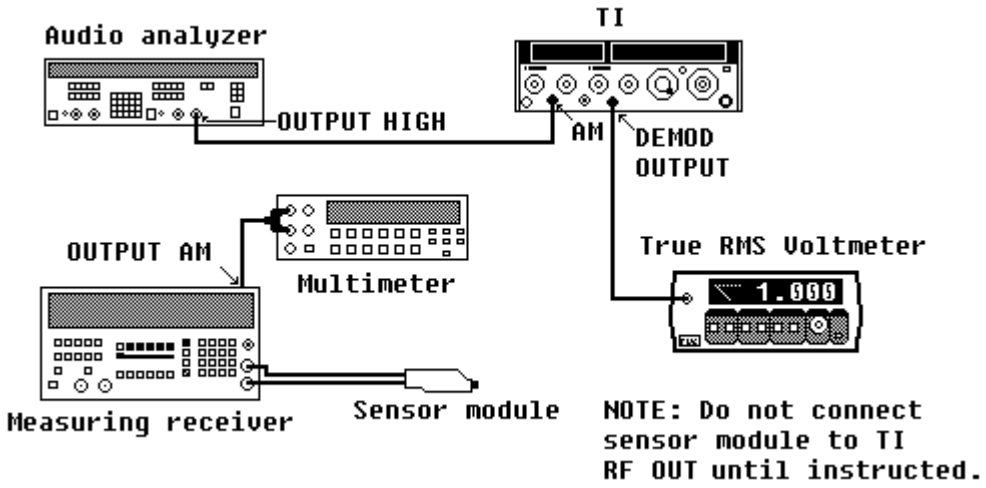

Figure 6. Demodulated output accuracy - test setup.

(15) Press measuring receiver **AUTOMATIC OPERATION** and **MHz (INPUT FREQ)** keys.

(16) Record multimeter dc indication as V_{off}.

(17) Connect TI **RF OUTPUT** to measuring receiver sensor module**.**

(18) Note position of switch A26A8S1 (fig. 2) and set to **AC** position. If necessary, turn **RF OUTPUT ON**.

(19) Adjust audio analyzer controls for a 1 V, 120 Hz output signal.

(20) Adjust AM control for a true RMS voltmeter indication of 1.000 V ac (if necessary use audio analyzer up/down arrows to fine adjust). Press 6.2 and **SPCL** keys on measuring receiver.

(21) Record multimeter dc indication as V dc.

(22) Set multimeter to measure ac volts and note V ac indication. Multiply this indication by 1.414 and record as V pk.

(23) Compute the TI % of amplitude modulation (AM), using the following formula. The computed result will be between min and max limits listed in table 25; if not perform **b** below.

$$\% \text{ AM} = \text{Absolute value of } \frac{V_{pk}}{(V_{dc}) - (V_{off})} \times 100$$

Where: V_{off} = value recorded in (16) above
V_{dc} = value recorded in (21) above
V_{pk} = value recorded in (22) above

NOTE

If an out-of-tolerance condition is noted in (24) through (27) below, disconnect input to measuring receiver and insure V_{off} value recorded in (16) above has not changed before performing **b** below

(24) Repeat technique of (20) through (23) above for multimeter indications listed in table 25. Computed results will be as specified; if not, perform **b** below.

(25) Adjust AM control fully ccw. Set switch A26A8S1 (fig. 2) to DC position. Repeat technique of (20) through (24) above for multimeter indications listed in table 26. Computed results will be as specified; if not, perform **b** below.

(26) Adjust AM control fully ccw. Set **RANGE MHz** switch to **512-256** and adjust **FREQUENCY TUNE** control for a **FREQUENCY MHz** display indication of **333 MHz.**

(27) Repeat technique of (15) through (25) above.

(28) Reduce all outputs to minimum.

Table 25. Demodulated Output Accuracy (A26A8Sl Set to AC)

True RMS voltmeter Indications (V Ac)	Computed results (%)	
	Min	Max
1.000	19.6	20.4
1.500	29.4	30.6
2.000	39.2	40.8
2.500	49.0	51.0
3.000	58.8	61.2
3.500	68.6	71.4
4.000	78.4	81.6

Table 26. Demodulated Output Accuracy (A26A8S1 set to DC)

True RMS voltmeter indications (V Ac)	Computed results (%)	
	Min	Max
0.200	19.6	20.4
0.300	29.4	30.6
0.400	39.2	40.8
0.500	49.0	51.0
0.600	58.8	61.2
0.700	68.6	71.4
0.800	78.4	81.6

b. Adjustments

NOTE
Disconnect all equipment before proceeding.

(1) Position controls as listed in (a) through (i) below.

(a) **LEVEL VOLTS** pushbutton pressed.
(b) **AM** switch to **OFF**.
(c) **RANGE MHz** switch to **256-128**.
(d) **FREQUENCY TUNE** control for a **FREQUENCY MHz** display indication of 190 MHz.
(e) **AM** control to midrange.
(f) **OUTPUT LEVEL 10 dB** switch to **0 dBm**.
(g) **OUTPUT LEVEL 1 dB** switch to **0 dB**.
(h) **OUTPUT LEVEL** vernier control to **CAL**.
(i) **RF OFF/ON** switch to **OFF**.

(2) Connect A26A8TP2 (fig. 2) to chassis ground. Set A26A8S1 switch (fig. 2) to AC.

(3) Connect multimeter to A26A8TP1 (fig. 2) and chassis ground. Adjust A26A8R3 (fig. 2) for a 0.000 ±0.001 V dc multimeter indication (R).

(4) Set A26A8S1 switch (fig. 2) to DC. Disconnect multimeter from A26A8TP1 (fig. 2) and connect to A26A8TP3 (fig. 2). Adjust A26A8Rl5 (fig. 2) for a 0.000 ±0.001 V dc multimeter indication (R).

(5) Disconnect ground from A26A8TP2 (fig. 2). Disconnect multimeter from A26A8TP3 (fig. 2). Set multimeter to measure AC voltage and connect to AM IN A26A2TP1 and GRD (fig. 2).

(6) Connect audio analyzer **OUTPUT HI** to TI **AM** input. Adjust audio analyzer controls for a 100 Hz output signal and adjust amplitude controls for a 0..52-V ac output level.

(7) Set **RF OFF/ON** switch to **ON** and **AM** switch to **DC.** Adjust **AM** control for a 0.3536 ±0.0005 V ac multimeter indication.

(8) Disconnect multimeter from A26A2TP1 (fig. 2). Set multimeter to measure dc voltage and connect to AM OUT A26A2TP3 (fig. 2). Record multimeter indication (should be 2.0 ±0.1 V dc).

(9) Multiply value recorded in (8) above by 0.3536. Set multimeter to measure ac voltage. Adjust % AM A26A2R19 (fig. 2) until multimeter indicates within ±0.001 V ac of value computed above (R).

(10) Disconnect multimeter from A26A2TP3 (fig. 2). Set multimeter to measure dc voltage and connect to **DEMOD OUT.** Adjust A26A8R10 (fig. 2) for a 1.414 ±0.001-V dc multimeter indication (R).

(11) Set A26A8S1 switch (fig. 2) to AC. Adjust A26A8R6 (fig. 2) for a 0.000 ±0.001-V dc multimeter indication (R).

(12) Set multimeter to measure ac voltage. Adjust A26A8R8 (fig. 2) for a 2.500 ±0.001 V ac multimeter indication (R).

(13) Return A26A8S1 switch (fig. 2) to position noted in **a** (18) above, provided **a** (18) was performed.

(14) Connect equipment as shown in figure 6 except do not connect the true RMS voltmeter.

(15) Set measuring receiver to measure AM with peak + detector. Set high-pass filter to 50 Hz and low-pass filter to 15 kHz.

(16) Press measuring receiver **AUTOMATIC OPERATION** and **FREQ MHz** keys.

(17) Record multimeter dc indication as $V_{off.}$

(18) Adjust audio analyzer controls for a 120-Hz, 600 Ω, 0.459 V output.

(19) Connect the measuring receiver sensor module to the TI **RF OUT**.

(20) Press **AM X10%** pushbutton and adjust **AM** vernier control fully cw.

(21) Adjust the audio analyzer output for a TI meter indication of 50%. Press **6.2** and **SPCL** keys on measuring receiver.

(22) Record multimeter dc indication as Vdc.

(23) Calculate the AC component (Vac) using the formula. Round the calculated value to 3 digits and record as Vac.

$$Vac = \text{absolute value of } (.5*(Vdc - V_{off})/1.414)$$

(24) Set multimeter to measure ac voltage and adjust the audio analyzer output for a multimeter indication as close as possible to the Vac value recorded in (23) above.

(25) Disconnect the multimeter from measuring receiver and connect it to TI **DEMOD OUT**.

(26) Adjust A26A8R8 (fig. 2) for a multimeter indication of 2.5 ±0.005 Vrms.

(27) Disconnect the multimeter from the TI and connect to measuring receiver rear panel **OUTPUT AM**.

(28) Set multimeter to measure dc voltage. Record multimeter dc indication as Vdc1.

(29) Set multimeter to measure ac voltage. Record multimeter dc indication as Vac1.

(30) Calculate the modulation output component (Modout) using the formula.

Modout = absolute value of (Vac1*1.414)/(Vdc1-Voff))*100

(31) Set multimeter to measure dc voltage.

(32) If Modout is not between 49.9 and 50.1 then record the multimeter indication as dcv and repeat (23) through (31) above.

(33) Set A26A8S1 switch (fig. 2) to DC.

(34) Set multimeter to measure dc voltage, adjust the audio analyzer output for a TI meter indication of 50%.

(35) Repeat technique of (22) through (25) above.

(36) Adjust A26A8R10 (fig. 2) for a multimeter indication of 0.50000 ±0.00005 Vrms.

(37) Repeat technique of (27) through (32) above.

(38) Disconnect multimeter from the measuring receiver and connect to the TI **DEMOD OUTPUT**.

(39) Adjust A26A8R15 (fig. 2) for a multimeter indication of 1.414 ±0.001 Vdc.

(40) Set **AM** and **RF OFF/ON** switch to **OFF**.

17. AM Flatness (Option 004 Only)

a. Performance Check

(1) Press **Instrument Preset** on measuring receiver, then set to measure **AM**.

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

(a) **AM** switch to **OFF**.
(b) **AM** control fully ccw.
(c) **RANGE MHz** switch to **128-64.**
(d) **FREQUENCY TUNE** control for a 113 MHz indication on **FREQUENCY MHz** display.
(e) **OUTPUT LEVEL** switches for a 0-dBm output.

(3) Connect equipment as shown in figure 7.

(4) Adjust audio analyzer amplitude and frequency controls for 1.0 V rms at 90 Hz level.

(5) Set **AM** switch to **DC** and adjust **AM** control for TI meter indication of 50% AM.

(6) Set audio analyzer to measure AC level in dB mode, then press the audio analyzer RATIO key.

(7) Set the audio analyzer output for a 150 Hz output then set to measure level.

(8) The audio analyzer will indicate between limits listed in table 27.

(9) Repeat technique of (7) and (8) above for remaining settings in table 27.

Table 27. AM Flatness 113 MHz Option 004 Only.

Audio analyzer			
Source		Level limits	
Level (V)	Frequency (Hz)	Min	Max
1	150	-.1	+.1
1[1]	10 k	-.1	+.1
1	11 k	-.1	+.1

[1] Repeat (3) through (5) above at 9 kHz source frequency before performing this step.

(10) Set audio analyzer **RATIO** off and source to 90 Hz.

(11) Adjust AM control fully ccw. Set **RANGE MHz** switch to **512-256** and adjust **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of 332 MHz.

(12) Adjust **AM** control for TI meter indication of 50% AM.

(13) Set audio analyzer to measure AC level in dB mode, then press the audio analyzer RATIO key.

(14) Set the audio analyzer output for a 150 Hz output then set to measure level.

(15) The audio analyzer will indicate between limits listed in table 28.

Table 28. AM Flatness 332 MHz Option 004 Only.

Audio analyzer			
Source		Level limits	
Level (V)	Frequency (Hz)	Min	Max
1	150	-.1	+.1

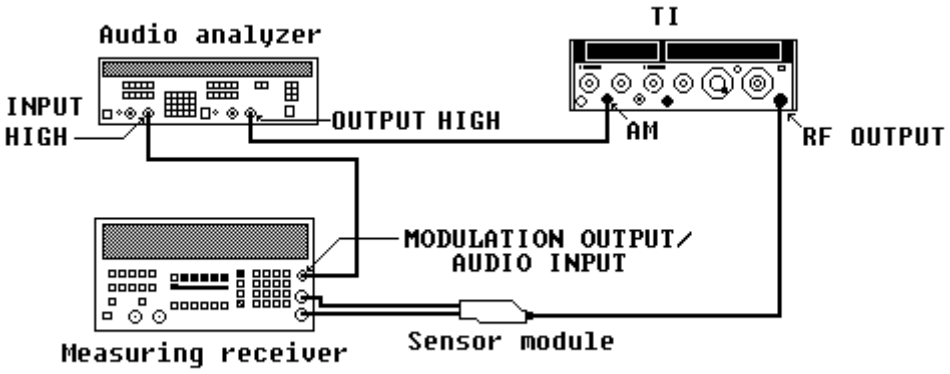

Figure 7. AM flatness - test setup.

b. Adjustments. No adjustments can be made.

18. FM Sensitivity, Accuracy, and Distortion

a. Performance Check

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

(a) **FM k/MHz** pushbutton pressed.
(b) **PEAK DEVIATION** switch to **320 kHz**.
(c) **FM** control fully cw.
(d) **RANGE MHz** switch to **128-64**.
(e) **FM** switch to **AC.**

(2) Connect equipment as shown in figure 8.

(3) Set measuring receiver to measure FM. Set the high-pass filter to 50 Hz and low-pass filter to 15 kHz and use peak + detector.

(4) Set audio analyzer for a 1-kHz 1.414-V ac output level.

(5) Adjust **FREQUENCY TUNE** control for a **FREQUENCY MHz** display indication of 64 MHz.

(6) Set **PEAK DEVIATION** switch to positions listed in table 29. The measuring receiver will indicate as specified; if not, perform **b** below.

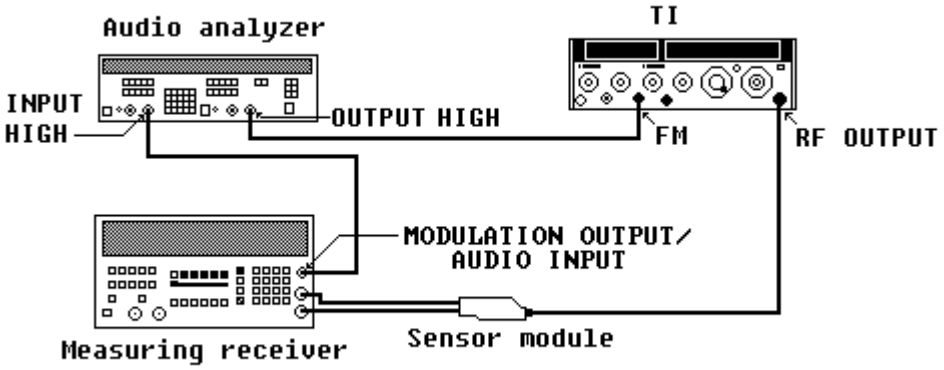

Figure 8. FM - test setup.

(7) Repeat (5) and (6) above remaining settings in table 29.

Table 29. FM Sensitivity

Test Instrument		Measuring receiver indications (kHz)	
FREQUENCY MHz display	**PEAK DEVIATION** switch settings	Min	Max
64	320	301	339
64	160	150	170
64	80	75.2	84.8
64	40	37.6	42.4
64	20	18.8	21.2
64	10	9.40	10.6
64	5	4.70	5.30
90	320	301	339
90	160	150	170
90	80	75.2	84.8
90	40	37.6	42.4
90	20	18.8	21.2
90	10	9.40	10.6
90	5	4.70	5.30
128	320	301	339
128	160	150	170
128	80	75.2	84.8
128	40	37.6	42.4
128	20	18.8	21.2
128	10	9.40	10.6
128	5	4.70	5.30

(8) Set **RANGE MHz** switch to **512-256** and adjust **FREQUENCY TUNE** for TI display indication of 512 MHz.

(9) Set measuring receiver for FM measurement in the automatic operation mode with peak + detector.

(10) Set **PEAK DEVIATION** switch to settings and adjust audio analyzer output level controls for TI meter indications listed in table 30. If measuring receiver does not indicate as specified, perform **b** below.

Table 30. FM Accuracy

Test instrument **PEAK DEVIATION** switch settings	Test instrument meter indications[1]	Measuring receiver indications (KHz)	
		Min	Max
5	5	4.58	5.43
10	10	9.15	10.8
20	20	18.1	21.9
40	40	36.5	43.5
80	80	72.9	87.1
160	160	144	176
320	320	293	347

[1]Use scale reference that is lit up under **SCALE** to left of TI meter.

(11) Set **RANGE MHz** switch to **64-32** and adjust **FREQUENCY TUNE** for **FREQUENCY MHz** display indication of 32 MHz.

(12) Set **PEAK DEVIATION** switch to **320 kHz** and adjust **FM** control fully cw.

(13) Adjust audio analyzer output level controls for 320 kHz measuring receiver indication. If distortion is not ≤ 3 %, perform **b** below.

(14) Repeat technique of (11) through (13) above, using settings listed in table 31. The distortion analyzer will indicate as specified; if not, perform **b** below.

Table 31. FM Distortion

Test instrument		Measuring receiver indications (kHz)	Audio analyzer distortion indication (≤%)
FREQUENCY TUNE and **FINE TUNE** control settings (MHz)	**PEAK DEVIATION** switch settings (kHz)		
32	320	320	3
32	40	40	1
45	40	40	1
45	320	320	3
64	320	320	3
64	40	40	1

(15) Set **RF OFF/ON** switch to **OFF.**

b. Adjustments

NOTE
Disconnect all equipment before proceeding.

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

(a) **COUNTER MODE** pushbuttons as listed in 1. through 3. below:
1. **EXPAND X10** and **X100** released.
2. **LOCK ON** released**.**
3. **INT** pressed**.**

(b) **FM k/MHz** pushbutton pressed.

(c) **PEAK DEVIATION** switch to **2.56 MHz**.

(d) **FM** control fully **cw.**

(e) **RANGE MHz** switch to **512-256**.

(f) **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of 300 MHz.

(g) **FM** switch to **DC**.

(h) **RF OFF/ON** switch to **ON**.

(2) Connect multimeter **INPUT HI** to BUFFER OUTPUT A5TP6 (fig. 3) and **INPUT LO** chassis ground. Adjust A5R23 (fig. 3) for a 0.000 ±0.0005V dc multimeter indication (R).

(3) Disconnect multimeter **INPUT HI** from A5TP6 (fig. 3) and connect to OUTPUT A5TP2 (fig. 3). Adjust OFFSET A5R8 (fig. 3) for a 0.000 ±0.001-V dc multimeter indication (R).

(4) Set **FM** switch to **CAL**. Disconnect multimeter **INPUT HI** from A5TP2 (fig. 3) and connect **INPUT HI** to BUFFER IN A5TP5 (fig. 3). Adjust FM CAL A13R3 (fig. 3) for a 1.000 ±0.001-V dc multimeter indication (R).

(5) Disconnect multimeter **INPUT HI** from A5TP5 (fig. 3) and connect to VARACTOR ANODE A7TP2 (fig. 3). Adjust A7R19 (fig. 3) for a -14.70 ±0.01-V dc multimeter indication (R).

(6) Connect equipment as shown in figure 8.

(7) Position controls as listed in (a) through (j) below.

NOTE

Some of these TI control settings are repeated from performance check because of their importance to adjustment procedure.

(a) **LEVEL VOLTS** pushbutton pressed.
(b) **AM** switch to **OFF**.
(c) **FM** switch to **INT**.
(d) **FM** control fully ccw.
(e) **MODULATION FREQUENCY RANGE** switch to **FIXED FREQ 1 kHz.**
(f) **PEAK DEVIATION** switch to **320 kHz**.
(g) **RANGE MHz** switch to **64-32**.
(h) **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of 50 MHz.
(i) **OUTPUT LEVEL** switch to **+10 dBm (10 dB** switch to **+10** and **1 dB** switch to **0** for option 004).
(j) **OUTPUT LEVEL** vernier control(s) fully cw.

(8) Set measuring receiver to measure peak FM with a 50 Hz high-pass and 15 kHz low-pass filter. Set tuning to track mode (key in **4.1 SPCL).**

(9) Adjust **FM** control for a 320 kHz measuring receiver indication. Set audio analyzer to measure distortion at 1 kHz.

(10) Adjust POS SHAPE A7R12 and NEG SHAPE A7R41 (fig. 3) for minimum indication (<3 %) on audio analyzer (R).

(11) Adjust **FREQUENCY TUNE** control slowly from **32** to **64 MHz** while observing audio analyzer. If audio analyzer does not indicate ≤3 %, repeat (9) and (10) above while adjusting for best intolerance condition across the band.

(12) Position controls as listed in (a) through (d) below.

(a) **FM** switch to **AC**.
(b) **PEAK DEVIATION** switch to **80 kHz**

(c) **FM** control fully cw.

(d) **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of 50 MHz.

(13) Set audio analyzer for a 1 kHz 1.414 V ac output level.

(14) Repeat (8) above.

(15) Adjust MID R3 (fig. 3) for a 80.0 ±0.1 kHz measuring receiver indication (R).

(16) Adjust **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of 32 MHz. Adjust LOW R2 (fig. 3) for a 80.0 ±0.1-kHz measuring receiver indication (R).

(17) Adjust **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of 64 MHz. Adjust HIGH R4 (fig. 3) for a 80.0 ±0.1 kHz measuring receiver indication (R).

(18) Adjust **FREQUENCY TUNE** control for **FREQUENCY MHz** display indication of 50 MHz and repeat (15) through (17) above until measuring receiver indication is 80.0 ±0.2 kHz at 32, 50, and 64 MHz.

(19) Set **FM** and **RF OFF/ON** switches to **OFF** and repeat **a** above.

19. Power Supply

a. Performance Check

(1) Remove top cover from TI.

(2) Check to see that the five LED's on supply boards (fig. 2) are on.

(3) Connect multimeter to test points listed in table 32 and chassis ground. If multimeter does not indicate within limits specified in table 32, perform adjustments listed.

Table 32. Power Supply Check

Test instrument test point locations (fig. 2)	Dc voltage limits		Adjustments locations (fig. 2) (R)	Multimeter indications (V Dc)
	Min	Max		
A18TP3[1]	-5.10	-5.30	A18R1[2]	-5.2
A20TP10	+5.10	+5.30	A20R16	+5.2
A22TP4	+19.90	+20.10	A22R7	+20
A22TP9	-19.90	-20.10	A22R19	-20
A20TP4	+44.50	+44.70	A20R8	+44.6

[1]For some models, this may be TP5.

[2]For some models, this may be A18R2.

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:

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

Official

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

0318209

Dstribution:

To be distributed in accordance with IDN 342064, requirements for calibration procedure TB 9-4931-488-35.

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.