TB 9-6625-2059-35

CHANGE 1

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR RADIO TEST SET, AN/GRM-114A (IFR, MODEL FM/AM-1100S)

Headquarters, Department of the Army, Washington, DC
24 September 2004

TB 9-6625-2059-35, 27 April 2004, 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
13 and 14	13 and 14
15 and 16	15 and 16

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

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Headquarters, Department of the Army, Washington, DC
27 April 2004

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REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Commander, US Army Aviation and Missile Command, AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also provide DA Form 2028 information to AMCOM via e-mail, fax, or the World Wide Web. Our fax number is DSN 788-6546 or Commercial 256-842-6546. Our e-mail address is 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual. For the World Wide Web, use https://amcom2028.redstone.army.mil.

*This technical bulletin supersedes TB 9-6625-2059-35, 24 October 1988, including all changes.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Radio Test Set, AN/GRM-114A (IFR, Model FM/AM-1100S). The manufacturers' manuals, TM 11-6625-3016-40-1, and TM 11-6625-3016-20-1 for AN/GRM-114A 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. None.

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
RF signal generator:	
Frequency	Range: 100 Hz to 999.9999 MHz[1] Accuracy: ±0.00005% (10 to 999 MHz) ±5 Hz (1 to 10 MHz)
Residual FM	≤100 Hz peak
Output level	
μV x 100	Range: -35 to -90 dBm Accuracy: ±2.5 dB to 199.9999 MHz ±4.0 dB from 200 to 399.9999 MHz ±6.0 dB from 400 MHz and above
HI LVL	Range: 0 to -35 dBm relative to 0 dBm indication Accuracy: ±2.5 dB, 20 kHz to 199.9999 MHz ±4.0 dB from 200 to 399.9999 MHz ±6.0 dB from 400 MHz and above
Norm[2]	Range: -75 to -120 dBm Accuracy: ±2.5 dB to 199.9999 MHz ±4.0 dB from 200 to 399.9999 MHz ±6.0 dB from 400 MHz and above
Power monitor:	
Frequency	Range: 1 to 1000 MHz
Power	0 to 4, 0 to 40, and 0 to 400 W Accuracy: ±7% of reading. ±3% FS from 1 to 600 MHz ±20% of reading ±3% FS from 600 to 1000 MHz
Oscilloscope:	
Vertical bandwidth	Range: Dc to 1 MHz at 3 dB bandwidth
External vertical input	10 and 100 mV/div; 1 and 10 V/div
Horizontal sweep	Accuracy: ±10% 10 and 1 ms/div; 100 and 10 μs/div
Dual tone generator:	
Frequency:	
Variable tone	Range: 10 to 20 kHz Accuracy: ±0.01%
Fixed tone	Range: 1 kHz Accuracy: ±20 Hz
Output level	0 to 2.5 V rms minimum either tone into 150 Ω
Distortion	≤1.5% 10 to 100 Hz ≤0.7%, 100 Hz to 20 kHz ≤2%, 1 kHz fixed tone
Spectrum analyzer:	
Dynamic range	Range: 70 dB from -30 to -100 dBm Accuracy: ±4 dB relative to -50 dBm
Dispersion	Continuous from ±0.5 to ±5 MHz from center frequency (1 to 10 MHz span)
Frequency error meter:	
Sensitivity	2.0 μV above 1 MHz Range: ±1.5 kHz, ±5 kHz, ±15 kHz FS Accuracy: ±0.5 kHz on 15 kHz range ±0.2 kHz on 5 kHz range ±0.1 kHz on 1.5 kHz range
Deviation kHz meter	Range: 2, 6, and 20 kHz ranges Accuracy: ±4% reading ±3% FS

See footnotes at end of table.

Table 1. Calibration Description - Continued

Test instrument parameters	Performance specifications
MM-100E multimeter:	
Ac load	Range: 3.2, 8, 150, 600Ω and HI-Z (1 MΩ) Accuracy: ±10%
Ac volts	Range: 0.1 to 300 V in 8 ranges Accuracy: ±5% FS Frequency: 50 Hz to 20 kHz
Dc volts	Range: 0.1 to ±300 V in 8 ranges Accuracy: ±3% FS
Distortion	Range: 0 to 10% and 0 to 30% Accuracy: ±1.5% on 0 to 10% ±3.5% on 0 to 30
Sinad	Range: 0 to 20 dB Accuracy: ±1.5 dB
Am %	Range: 0 to 100% Accuracy: ±10%
Resistance	Range: 0 to 100 MΩ Accuracy: ±5% at midscale

[1]Frequency not verified below 1 MHz.
[2]Output level below -80 dBm is indirectly verified.

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, and AN/GSM-705. Alternate items may be used by the calibrating activity. The items selected must be verified to perform satisfactorily prior to use and must bear evidence of current calibration. The equipment must meet or exceed the minimum use specifications listed in table 2. The accuracies listed in table 2 provide a four-to-one ratio between the standard and TI. Where the four-to-one ratio cannot be met, the actual accuracy of the equipment selected is shown in parenthesis.

5. Accessories Required. The accessories listed in table 3 are issued as indicated in paragraph **4** above and are used in this calibration procedure. When necessary, these items may be substituted by equivalent items, unless specifically prohibited.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
AMPLIFIER-POWER SUPPLY	Range: 10 to 50 W	ARA, Model 757LC (MIS-45845)
ATTENUATOR	Frequency range: 100 to 999 MHz Attenuation: 20 dB Accuracy: ±0.625 dB	Weinschel, Model 9918-20 dB (9918-20) (p/o Weinschel, Model 9918 set)
AUDIO ANALYZER	Capability: 0.7 to 50% from 20 to 9999.9 Hz	Boonton, 1121 (1121)
AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: ±1%	General Radio, Type W10MT3AS3 or Ridge, Model 9020F (9020F)

Table 2. Minimum Specifications of Equipment Required - Continued

Common name	Minimum use specifications	Manufacturer and model (part number)
CALIBRATOR	Range: 0.095 to 315 V ac Accuracy: ±1.25% Range: 0.097 to 309 V dc Accuracy: ±0.75%	Fluke, Model 5720A (5700A/EP) (p/o MIS-35947); w/ amplifier, Fluke 5725A/AR (5725A/AR)
FREQUENCY COUNTER	Range: 1 MHz to 1 GHz Accuracy: 0.0000125% Range: 999.9 to 20002 Hz Accuracy: 0.0025%	Fluke, Model PM6681/656 (PM6681/656)
MEASURING RECEIVER	Range: 1.8 to 10.3 kHz Accuracy: ±1.75% Measurement range: 0 to 90 dBm Accuracy: ±0.625 dB	Hewlett-Packard, Model 8902A w/sensors, Hewlett-Packard, Model 11722A (11722A) and 11792A (11792A), and microwave converter, model 11793A (11793A)
MULTIMETER	Range: 0 to 16.75 V dc Accuracy: ±0.16% Range: 0.054 to 3.5 V ac Accuracy: ±1.25% Range: 0 to 600 Ω Accuracy: ±2.5%	Hewlett-Packard, Model 3458A (3458A)
OSCILLOSCOPE	Range: 0.4 V p-p Accuracy: ±3%	Tektronix, Type 2465B-46 (2465B-46)
OSCILLOSCOPE CALIBRATOR	Range: 50 mV to 50 V p-p at 1 kHz sine wave Accuracy: ±1.25% Range: 10 μs to 1 ms markers Accuracy: 0.5% Range: 1 V p-p square wave	Fluke, Model 5820A-5C-GHZ (5820A-5C-GHZ)
POWER METER	Range: 10 to -10 dBm at 10 MHz to 1 GHz Accuracy: ±2.5%	Hewlett-Packard, Model E12-432A (MIS-30525) w/thermistor mount, Hewlett-Packard, Model H75-478A (7915907) or 8478B (8478B)
POWER SUPPLY	Range: 0 to 12 V	Kepco, Model HB525M20480 (7915935)
RESISTANCE STANDARD	Range: 28.5 to 315 kΩ Accuracy: ±1.25%	Biddle-Gray, Model 71-631 (7910328)
SIGNAL GENERATOR	Range: 100 KHz to 900 MHz Amplitude: 0 to -30 dBm Range: 60% MOD at 1 kHz	(SG1207/U)
SPECTRUM ANALYZER	Range: 120 to 900 MHz	(AN/USM-489A)
STEP ATTENUATOR	Frequency range: 100 to 999 MHz Attenuation: 0 to 80 dB	Hewlett-Packard, Model 355D (355D)
WATTMETER	Range: 30 to 600 MHz Accuracy: ±3%	Bird, Model 4421 (4421), w/ sensor, Bird, Model 4022 (4022)

Table 3. Accessories Required

Common name	Description (part number)
DECADE RESISTOR	150 Ω Winslow, Model 336 (7907234)
LOW PASS FILTER	Telonic, Model TLC700-6EF1
LOW PASS FILTER	Telonic, Model TLC125
LOW PASS FILTER	Telonic, Model TLC45-4EF
PROBE[1]	X1-X10 probe (supplied with multimeters MM-100E)

[1]Do not use probe AV-5388 supplied with some multimeters MM-100E.

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 tables 2 and 3.

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, TM 11-6625-3016-40-1, and TM 11-6625-3016-20-1.

d. When indications specified in paragraphs **8** through **21** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **8** through **21**. 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 checks where applicable.

a. Position controls as listed in (1) through (23) below:

(1) **INTENSITY** control fully ccw.

(2) **FOCUS** control to midrange.

(3) **VERT** (outer) control to midrange.

(4) **ANALY DISPR** (inner) control to **OFF** (detent).

(5) **HORIZ** control to midrange.

(6) **FREQ ERROR** switch to **15**.

(7) **SWEEP** outer control to **1 mS** and inner control to **CAL** (detent).

(8) **AC-OFF-DC** switch to **DC**.

(9) **DEV-VERT V/DIV** outer switch to **15 kHz** and inner control to **CAL** (detent).

(10) **MODULATION FREQ Hz** switches to indicate all zeros.

(11) **1 kHz** and **VAR** controls to **OFF** (detent).

(12) **AM-FM** switch to **FM**.

(13) **BFO-OFF** switch to **OFF**.

(14) **VOLUME** control fully ccw.

(15) **INT MOD-RCVR-RCVR (DET OFF)** switch to **RCVR**.

(16) **SQUELCH** control fully ccw (short of detent).

(17) **DEV/PWR** switch to **20 kHz**.

(18) **GEN-RCVR** switch to **GEN**.

(19) **RCVR WIDE-MID-NARROW** switch to **NARROW**.

NOTE

Verify that 10 μV aligns with -87 dBm on **BFO-RF LEVEL** control.

(20) **BFO-RF LEVEL** control fully cw.

(21) **HI LVL-μVx100-NORM** switch to **HI LVL**.

(22) **AUTO-ZERO-OFF-BATT** switch to **AUTO ZERO**.

(23) **PWR-OFF-BATT** switch to **OFF**.

b. If **FREQ ERROR**, **DEVIATION**, and **MM-100E** meters do not indicate zero, adjust to zero with adjustment screw located below each meter face.

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

d. Set **PWR OFF BATT** switch to **PWR** and allow at least 15 minutes for warm-up.

8. Frequency Accuracy

a. Performance Check

(1) Connect frequency counter to **10 MHz REF OUT**.

(2) Adjust **REF CAL** (front panel) until frequency counter indicates between 9,999,995 and 10,000,005 Hz. If indication cannot be obtained, perform **b** (1) and (2) below.

(3) Connect **TRANS-RCVR** output to frequency counter.

(4) Set **FREQUENCY MHz** switches to **111 111 1**. Frequency counter will indicate between 111,111,044 and 111,111,156 Hz.

(5) Repeat technique of (4) above for settings and indications listed in table 4.

Table 4. Frequency Accuracy Check

Test instrument **FREQUENCY MHz** switch settings	Frequency counter indications (Hz)	
	Min	Max
222 222 2	222,222,088	222,222,311
333 333 3	333,333,133	333,333,467
444 444 4	444,444,177	444,444,622
555 555 5	555,555,222	555,555,778
666 666 6	666,666,266	666,666,933
777 777 7	777,777,311	777,778,089
888 888 8	888,888,355	888,889,244
999 999 9	999,999,400	1,000,000,400
010 000 0	9,999,995	10,000,005
050 000 0	49,999,975	50,000,025
090 000 0	89,999,955	90,000,045
001 000 0	999,995	1,000,005
005 000 0	4,999,995	5,000,005
009 000 0	8,999,995	9,000,005

b. Adjustments

(1) Adjust **REF CAL** (front panel) to its mechanical center.

(2) Adjust TCXO (fig. 1) until frequency counter indicates 10,000,000 Hz.

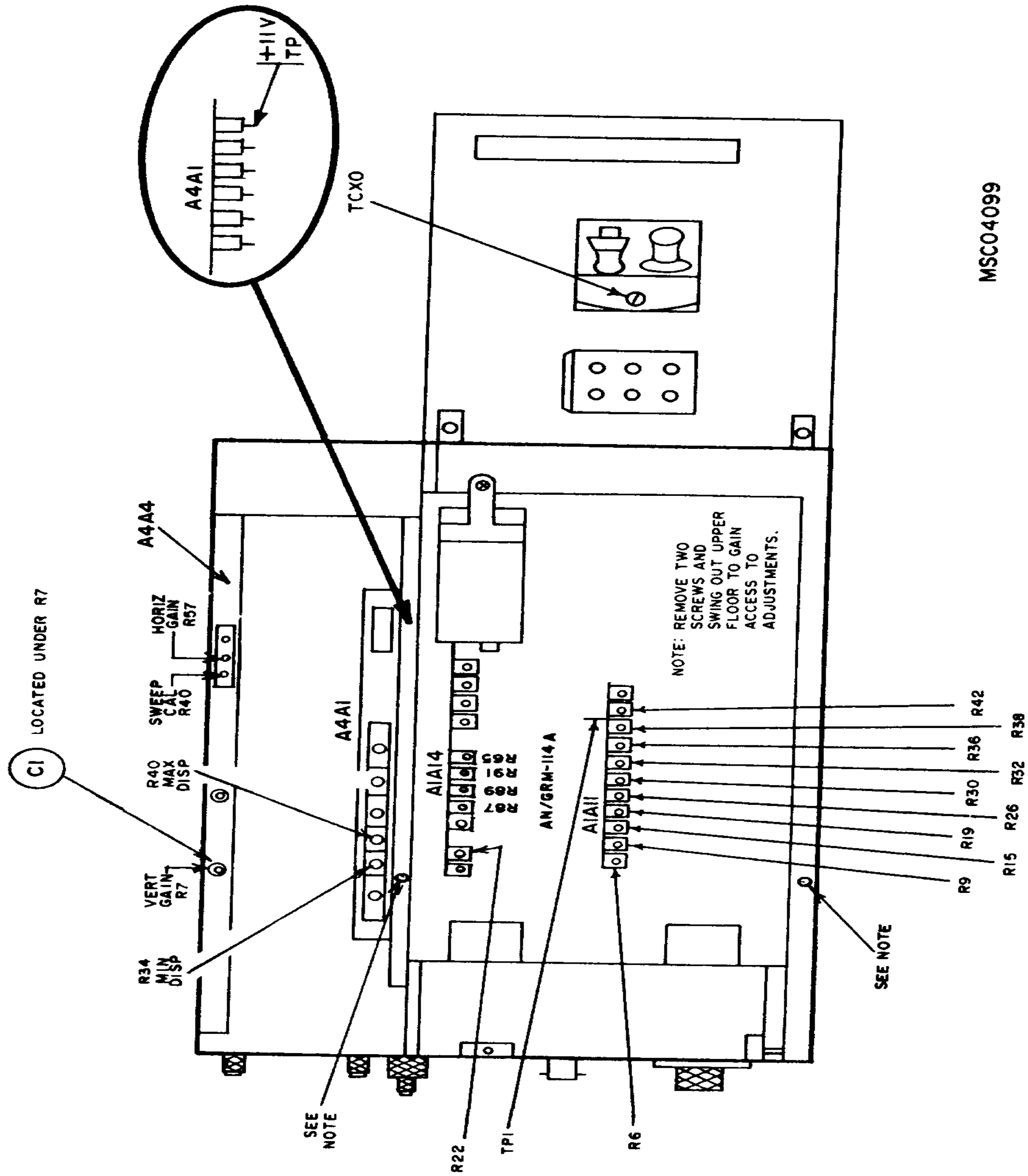

Figure 1. Test instrument - top view.

9. Dual Tone Generator

a. Performance Check

(1) Set **VAR** to midrange.

(2) Connect frequency counter to TI **INT MOD OUT**.

(3) Set **MODULATION FREQ Hz** switches to **01000.0**. If frequency counter does not indicate between 999.9000 and 1000.1000 Hz, perform **b** (1) below.

NOTE

If required, use dc coupling on frequency counter.

(4) Repeat technique of (3) above for **MODULATION FREQ Hz** switch settings listed in table 5. Frequency counter will indicate within limits specified.

Table 5. Modulation Frequency Accuracy

Test instrument **MODULATION FREQ Hz** switch settings	Frequency counter indications (Hz)	
	Min	Max
01111.1	1110.9889	1111.2111
02222.2	2221.9778	2222.4222
03333.3	3332.9667	3333.6333
04444.4	4443.9556	4444.8444
05555.5	5554.9445	5556.0555
06666.6	6665.9334	6667.2666
07777.7	7776.9223	7778.4777
08888.8	8887.9112	8889.6888
09999.9	9998.9001	10000.8999
10000.0	9999	10001
20000.0	19998	20002

(5) Set **VAR** control to **OFF** position.

(6) Set **1 kHz** control to midrange. If frequency counter does not indicate between 980 and 1020 Hz, perform **b** (2) below.

(7) Adjust decade resistor to 150 Ω and connect across TI **INT MOD OUT** with multimeter.

(8) Adjust **1 kHz** control fully cw. Multimeter will indicate at least 2.5 V ac.

(9) Set **MODULATION FREQ Hz** switches to **01000.0** and turn **1 kHz** control fully ccw to **OFF**.

(10) Turn **VAR** control fully cw. Multimeter will indicate at least 2.5 V ac.

(11) Connect audio analyzer to **INT MOD OUT**. Measure distortion at 1 kHz. Audio analyzer will indicate 0.7 percent distortion or less.

(12) Set **VAR** control fully ccw to **OFF** and **1 kHz** control fully cw. Measure distortion at 1 kHz. Audio analyzer will indicate 2 percent distortion or less.

(13) Set **1 kHz** control fully ccw to **OFF** and **VAR** control fully cw.

(14) Set **MODULATION FREQ Hz** switches to **09999.9.** Measure distortion at 9,999.9 Hz. Audio analyzer will indicate 0.7 percent distortion or less.

(15) Set **MODULATION FREQ Hz** switches to **00100.0**. Measure distortion at 100 Hz. Audio analyzer will indicate 0.7 percent distortion or less.

(16) Set **MODULATION FREQ Hz** switches to **00020.0**. Measure distortion at 20 Hz. Audio analyzer will indicate 1.5 percent distortion or less.

(17) Set **MODULATION FREQ Hz** switches to **19 999.9**. Measure distortion at 19,999.9 Hz. Audio analyzer will indicate 0.7 percent distortion or less.

(18) Disconnect equipment setup.

(19) Set **VAR** control to **OFF**.

b. Adjustments

(1) Adjust A1A12A5C1 (fig. 2) until frequency counter indicates 1000 Hz ±0.1 Hz (R).

(2) Adjust A1A2A5R15 (fig. 2) until frequency counter indicates 1000 Hz (R).

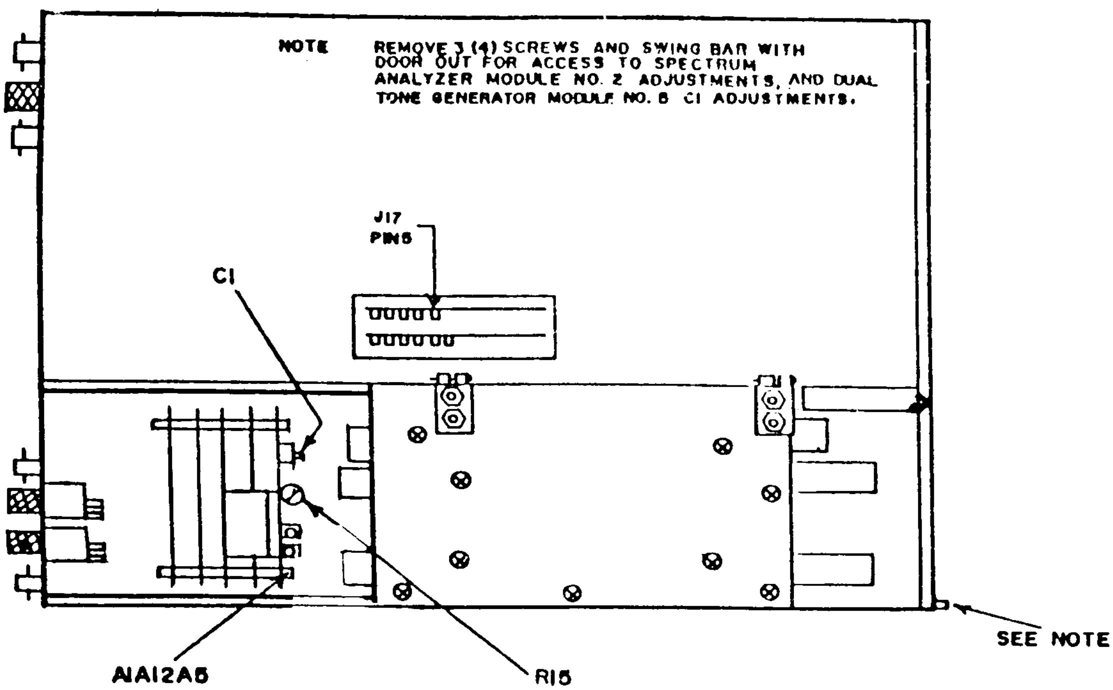

Figure 2. Test instrument - bottom view.

10. Output Level

a. Performance Check

(1) Set **FREQUENCY MHz** switches to **100 000 0** and **HI LVL - µV X100-NORM** switch to **HI LVL**.

(2) Adjust **BFO-RF LEVEL** control until TI 0 dBm light just illuminates.

(3) Connect measuring receiver to TI **TRANS-RCVR**.

(4) Set measuring receiver to read frequency and then for tuned level measurement.

(5) Measuring receiver will indicate between -2.5 and +2.5 dB in tuned level.

(6) Set **HI LVL - µVX100-NORM** switch to **µVX100** and adjust **BFO-RF LEVEL** control to **-100 dBm**. If measuring receiver does not indicate between -57.5 and -62.5 dBm, perform **b** below.

NOTE

If measuring receiver cannot maintain phase lock, check TI residual FM performance as outlined in paragraph **16** below. Rerun paragraph **10** using an appropriate low pass filter.

(7) Repeat technique of (6) above for **BFO-RF LEVEL** control settings and **FREQUENCY MHz** switch settings at **100 000 0** listed in table 6. Measuring receiver will indicate within limits specified.

Table 6. Output Level 100 MHz

Test instrument		Measuring receiver indications (dB)	
BFO-RF LEVEL control settings	FREQUENCY MHz switch settings	Min	Max
80	100 000 0	-37.5	-42.5
90	100 000 0	-47.5	-52.5
110	100 000 0	-67.5	-72.5
120	100 000 0	-77.5	-82.5

(8) Set **HI LVL - µVX100-NORM** switch to **NORM** and **BFO-RF LEVEL** control to **-80 dBm**. Measuring receiver will indicate between –77.5 and –82.5 dB.

(9) Set **FREQUENCY MHz** switches to **250 000 0** and **HI LVL - µVX100-NORM** switch to **HI LVL**.

(10) Adjust **BFO-RF LEVEL** control until TI 0-dBm light just illuminates.

(11) Repeat (4) above.

(12) Measuring receiver will indicate between -4.0 and +4.0 dB.

(13) Set **HI LVL - µVX100-NORM** switch to **µVX100** and adjust **BFO-RF LEVEL** control to **-100 dBm**. Measuring receiver will indicate between -56 and -64 dB.

(14) Repeat technique of (13) above for **BFO-RF LEVEL** control settings and **FREQUENCY MHz** switch settings at **250 000 0** listed in table 7. Measuring receiver will indicate within limits specified.

Table 7. Output Level 250 MHz

Test instrument		Measuring receiver indications (dB)	
BFO-RF LEVEL control settings	**FREQUENCY MHz** switch settings	Min	Max
80	250 000 0	-36	-44
90	250 000 0	-46	-54
110	250 000 0	-66	-74
120	250 000 0	-76	-84

(15) Set **HI LVL - µVX100-NORM** switch to **NORM** and **BFO-RF LEVEL** control to **-80 dBm**. Measuring receiver will indicate between -76 and -84 dB.

(16) Set **FREQUENCY MHz** switches to **500 000 0** and **HI LVL - µVX100-NORM** switch to **HI LVL**.

(17) Adjust **BFO-RF LEVEL** control until TI 0-dBm light just illuminates

(18) Repeat (4) above.

(19) Measuring receiver will indicate between –6.0 and +6.0 dB.

(20) Set **HI LVL - µVX100-NORM** switch to **µVX100** and adjust **BFO-RF LEVEL** control to **-100 dBm**. Measuring receiver will indicate between -54 and -66 dB.

(21) Repeat technique of (20) above for **BFO-RF LEVEL** control settings and **FREQUENCY MHz** switch settings at **500 000 0** listed in table 8. Measuring receiver will indicate within limits specified.

Table 8. Output Level 500 MHz

Test Instrument		Measuring receiver Indications (dB)	
BFO-RF LEVEL control settings	**FREQUENCY MHz** switch settings	Min	Max
80	500 000 0	-34	-46
90	500 000 0	-44	-56
110	500 000 0	-64	-76
120	500 000 0	-74	-86

(22) Set **HI LVL - µVX100-NORM** switch to **NORM** and **BFO-RF LEVEL** control to **-80 dBm**. Measuring receiver will indicate between -74 and -86 dB.

(23) Set **FREQUENCY MHz** switches to **900 000 0** and **HI LVL - µVX100-NORM** switch to **HI LVL**.

(24) Adjust **BFO-RF LEVEL** control until TI 0-dBm light just illuminates.

(25) Repeat (4) above.

(26) Measuring receiver will indicate between –6.0 and +6.0 dB.

(27) Set **HI LVL - μVX100-NORM** switch to **μVX100** and adjust **BFO-RF LEVEL** control to **-100 dB**m. Measuring receiver will indicate between -54 and -66 dB.

(28) Repeat technique of (27) above for **BFO-RF LEVEL** control settings and **FREQUENCY MHz** switch settings at **900 000 0** listed in table 9. Measuring receiver will indicate within limit specified.

Table 9. Output Level 900 MHz

Test instrument		Measuring receiver indications (dB)	
BFO-RF LEVEL control settings	**FREQUENCY MHz** switch settings	Min	Max
80	900 000 0	-34	-46
90	900 000 0	-44	-56
110	900 000 0	-64	-76
120	900 000 0	-74	-86

(29) Set **HI LVL - μVX100-NORM** switch to **NORM** and **BFO-RF LEVEL** control to **-80 dBm**. Measuring receiver will indicate between -74 and -86 dB.

b. Adjustments. Adjust A1A1R43 (fig. 3) until measuring receiver indicates -60 dB (R).

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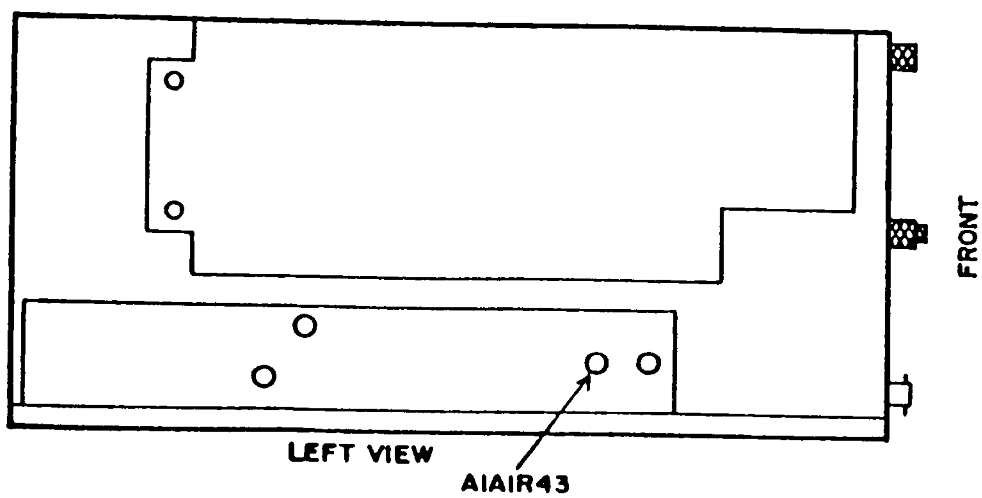

Figure 3. Test instrument - left view.

11. Output Level (Alternate Method)

NOTE

A test report generated in compliance with USATA SOP 742-1 is required for attenuator used in the test. The calibration interval uncertainty included in this test report is required to effect an accuracy transfer ratio of no less than 3 to 1 between the attenuator and the AN/GRM-114A output level specifications.

a. Performance Check

(1) Connect signal generator RF output to power meter.

(2) Adjust signal generator for 100 MHz and amplitude for 0 dBm indication on power meter.

(3) Connect equipment as shown in figure 4.

(4) Set step attenuator to 80 dB.

(5) Without adjusting signal generator, establish a reference indication on spectrum analyzer.

(6) Repeat technique of (1) through (5) above, for power meter reading of -2.5 and +2.5 dBm. Record reference on spectrum analyzer without changing setting on spectrum analyzer.

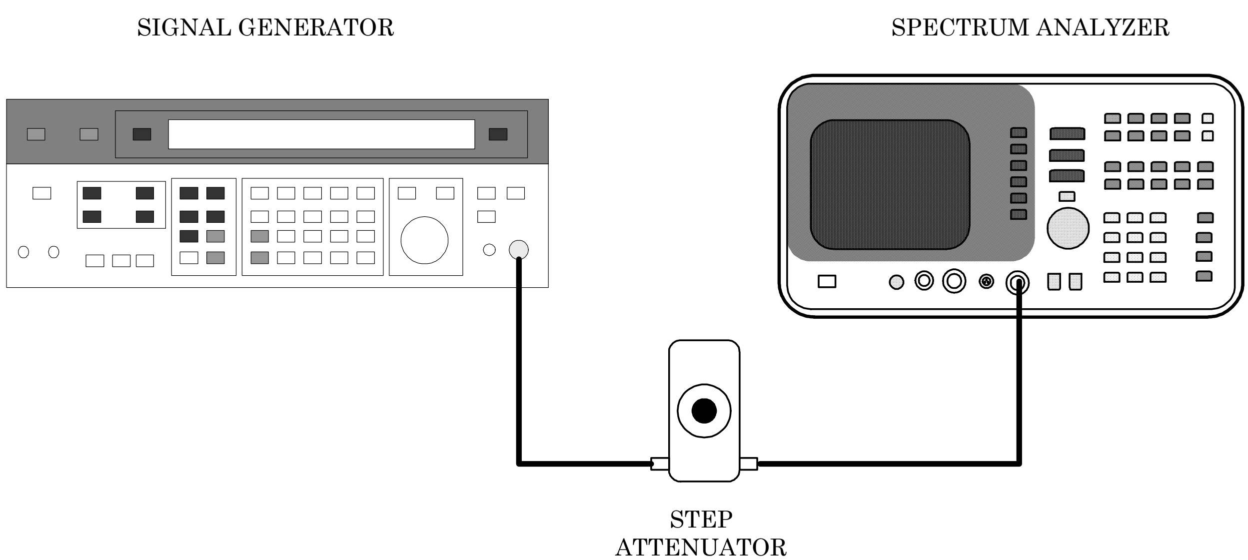

Figure 4. Output level (alternate method).

(7) Substitute TI for signal generator.

(8) Set TI **FREQUENCY MHz** switches to **100 000 0** and **HI LVL - μVX100 - NORM** switch to **HI LVL**.

(9) Adjust **BFO - RF LEVEL** control until TI **0-dBm** light just illuminates. Spectrum analyzer will indicate within the ±-2.5 dBm references established in (6) above.

(10) Set **HI LVL - μVX100 - NORM** switch to **μVX100** and adjust **BFO - RF LEVEL** control to **-80 dBm.**

(11) Set step attenuator to 40 dB. If spectrum analyzer does not indicate within ±2.5 dBm references established in (6) above, perform **b** below.

(12) Repeat technique of (10) and (11) above for **BFO - RF LEVEL** control settings listed in table 10. Spectrum analyzer will indicate within ±2.5 dBm references established in (6) above.

Table 10. Output Level Test Settings

Test instrument **BFO - RF LEVEL** control settings	Step attenuator settings
90	30
100	20
110	10
120	0

(13) Set **HI LVL - μVX100 - NORM** switch to **NORM** and **BFO -RF LEVEL** control to **-80 dBm**. Spectrum analyzer will indicate within ±2.5 dBm references established in (6) above.

(14) Repeat technique of (1) through (13) above for **FREQUENCY MHz** switch settings and spectrum analyzer indications listed in table 11.

Table 11. Frequency Response Indications

Test instrument **FREQUENCY MH**z switch settings	Spectrum analyzer indications	
	Min	Max
250	-4.0	+4.0
500	-6.0	+6.0
900	-6.0	+6.0

b. Adjustments

(1) Adjust A1A1R43 (fig. 3) until spectrum analyzer indicates signal at the reference established in **a** (5) above (R).

(2) This adjustment may have to be set for best in-tolerance compromise between 100 and 999 MHz.

12. Oscilloscope Alignment

a. Performance Check

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

(a) **MODULATION FREQ Hz** switches to **01000.0**.

(b) **VAR** control 1/4 turn cw from **OFF** position.

(c) **FOCUS** and **INTENSITY** controls for suitable display.

(d) **DEV-VERT V/DIV** switch to **6 kHz**.

(2) Adjust-**VAR** control until TI oscilloscope displays 4 major divisions of vertical deflection. Use **HORIZ** and **VERT** controls as required to center display.

(3) Adjust **HORIZ** control to align peak of first cycle with second vertical graticule line. If at least nine cycles do not appear on oscilloscope display, perform **b** (1) below.

(4) Set **DEV-VERT V/DIV** switch to **1.5 kHz** and adjust **VAR** control until oscilloscope display amplitude is 1 major division. If oscilloscope display fails to stay in sync, perform **b** (2) below.

(5) Set **VAR** control to **OFF** (detent).

b. Adjustments

NOTE

The adjustment in (1) and (2) below interact. Repeat as necessary for best compromise.

(1) Adjust SWEEP CALA4A4R40 (fig. 1) until nine cycles are displayed (R).

(2) Adjust SWEEP CAL A4A4R40 slightly until display is synchronized (R).

13. Oscilloscope Timing and Bandwidth

a. Performance Check

(1) Set **DEV-VERT V/DIV** outer switch to **1**.

(2) Connect oscilloscope calibrator **SOURCE/MEASURE CHAN 1** to **SCOPE IN**, using cable and 50 Ω termination.

(3) Press oscilloscope calibrator **MARKER** key and set for **1 ms** output.

(4) Align fifth time marker on center vertical graticule line, using **HORIZ** position control. If TI oscilloscope 6th marker does not align within ±1 minor division, perform **b** (1) below.

(5) Repeat technique of (3) and (4) above for switch setting listed in table 12. If TI oscilloscope 6th marker does not align within ±1 minor division, perform **b** (1) below while adjusting for best in-tolerance condition on all ranges.

Table 12. Timing Accuracy

Test instrument **SWEEP** switch settings	Oscilloscope calibrator marker settings
10 mS	10 mS
0.1 mS	0.1 mS
10 µS (.01 ms)	10 µS

(6) Press oscilloscope calibrator **LEVEL SINE** key.

(7) Set **DEV-VERT V/DIV** outer switch to **.1**.

(8) Adjust oscilloscope calibrator frequency to **50 kHz** and amplitude controls for 5 divisions of vertical deflection on TI display.

(9) Increase oscilloscope calibrator frequency to **1 MHz**. If the displayed amplitude is less than 3.5 major divisions, perform **b** (2) below.

b. Adjustments

(1) Adjust HORIZ GAIN A4A4R57 (fig. 1) for 1 marker per major division.

(2) Adjust A4A4C1 (fig. 1) for displayed amplitude greater than 3.5 major divisions.

14. Oscilloscope Gain

a. Performance Check

(1) Place oscilloscope calibrator to **STBY** and remove 50 Ω termination from cable. Reconnect cable to TI **SCOPE IN**.

(2) Press oscilloscope calibrator **VOLT** key and set for 1 kHz and 5 V output.

(3) Adjust oscilloscope calibrator **EDIT FIELD** knob control for 5 divisions of vertical deflection on TI oscilloscope. If oscilloscope calibrator error display readout does not indicate within ±10%, perform **b** below.

(4) Repeat technique of (3) above at switch settings listed in table 13. If error display readout does not indicate within ±10, perform **b** below while adjusting for best in-tolerance condition on all ranges.

Table 13. Vertical Accuracy

Test instrument **DEV-VERT V/DIV** switch settings (V)	Oscilloscope **VOLTS/DIV** switch settings
.01	50 mV
.1	0.5 V
10	50 V

b. Adjustments

(1) Adjust oscilloscope calibrator **EDIT FIELD** knob control until error display readout indicates ±**0.00**.

(2) Adjust VERT GAIN A4A4R7 (fig. 1) until TI oscilloscope indicates 5 divisions of vertical deflection (R).

15. Oscilloscope Deviation and Frequency Error

a. Performance Check

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

(a) **GEN-RCVR** switch to **RCVR**.
(b) **FREQUENCY MHz** switches to all zeroes. If, necessary, adjust **ZERO RCVR** (front panel) adjust for 0 indication on **FREQ ERROR** meter.
(c) **DEV-VERT V/DIV** outer switch to **15 kHz**.
(d) **VERT** control to center oscilloscope trace on horizontal center graticule line.

(2) Set **FREQUENCY MHz** switches to **000 010 0**. If oscilloscope trace is not between -9.5 and -10.5 kHz, perform **b** (1) below.

NOTE

Trace will appear approximately 2 major divisions below horizontal centerline.

(3) If **FREQ ERROR** meter does not indicate negative between 9.5 and 10.5 kHz perform **b** (2) below.

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

(a) **FREQUENCY MHz** switches to all zeroes.

(b) **EXT DEV-VERT V/DIV** outer switch to **6 kHz**.

(c) **FREQ ERROR** meter switch to **5**.

(d) **VERT** control to center oscilloscope trace on horizontal center graticule line.

(5) Set **FREQUENCY MHz** switches to **000 004 0**. If oscilloscope trace is not between -3.8 and -4.2 kHz, perform **b** (3) below. If **FREQ ERROR** meter does not indicate negative 3.8 and 4.2 kHz, perform **b** (4) below.

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

(a) **FREQUENCY MHz** switches to all zeroes.

(b) **DEV-VERT V/DIV** outer switch to **1.5 kHz**.

(c) **FREQ ERROR** meter switch to **1.5**.

(d) **VERT** position control to center oscilloscope trace on horizontal center graticule line.

(7) Set **FREQUENCY MHz** switches to **000 001 0.** If oscilloscope trace is not between -0.9 and -1.1 kHz, perform **b** (3) below. If **FREQ ERROR** meter does not indicate negative between 0.9 and 1.1 kHz, perform **b** (5) below.

(8) Set **FREQUENCY MHz** switches to **1255000**.

(9) Connect signal generator to **ANTENNA INPUT**.

(10) Adjust signal generator frequency for 125.500 MHz and amplitude for -70 dBm.

(11) Record frequency error indication of **FREQ ERROR** meter.

(12) Reduce signal generator amplitude until **FREQ ERROR** meter indicates a 100 Hz error from indication recorded in (11) above.

(13) If signal generator amplitude is greater than -101 dBm perform **b** (6) through (11) below.

b. Adjustments

(1) Adjust A1A13R44 (fig. 5) for an oscilloscope indication of -10 kHz (R).

(2) Adjust A1A13R39 (fig. 5) until **FREQ ERROR** meter indicates 10 kHz (R).

(3) Adjust A1A13R44 (fig. 5) for best in-tolerance condition while repeating **a** (1) through (7) above (R).

(4) Adjust A1A13R41 (fig. 5) until **FREQ ERROR** meter indicates 4 kHz (R).

(5) Adjust A1A13R42 (fig. 5) until **FREQ ERROR** meter indicates 1 kHz (R).

(6) Adjust signal generator amplitude for -107 dBm.

(7) Set **RCVR WIDE-MID-NARROW** switch to **WIDE**.

(8) Adjust A1A13R7 (fig. 5) until **INPUT LEVEL** lamp (front panel) just illuminates (R).

(9) Set **RCVR WIDE-MID-NARROW** switch to **NARROW**. Adjust A1A13R8 (fig. 5) until **INPUT LEVEL** lamp just illuminate (R).

(10) Set **DEV-PWR** switch to **SIG.** Adjust signal generator amplitude to -25 dBm. Adjust A1A13R91 (fig. 5) until **DEVIATION/WATTS** meter indicates FS (R).

(11) Repeat (6) through (10) above as necessary.

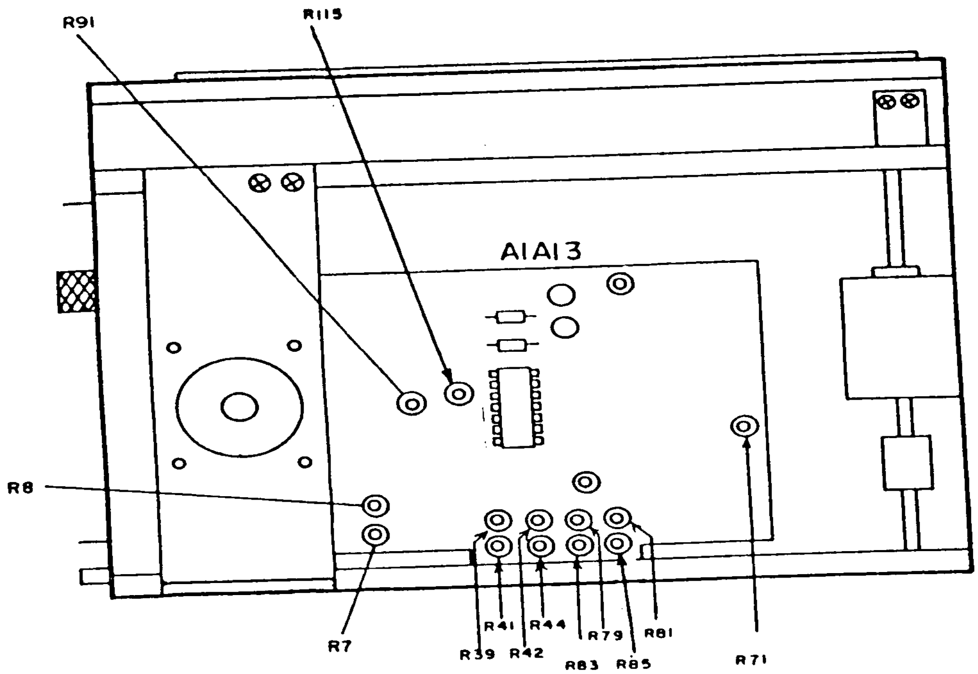

Figure 5. Test instrument - right view.

16. Deviation Meter and Residual FM

a. Performance Check

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

(a) **DEV-VERT V/DIV** outer to **6 kHz**.

(b) **FREQUENCY MHz** to all zeros.

(c) **GEN/RCVR** to **RCVR**.

(d) **HI LVL - μX100 - NORM** to **HI LVL**.

(e) **DEV-PWR** to **2 kHz**.

(2) If **DEVIATION (kHz)** meter does not indicate zero ±1 minor division, perform **b** (1) through (3) below.

(3) Set **GEN/RCVR** switch to **GEN**. If **DEVIATION (kHz)** meter does not indicate 0 ±1 minor division, perform **b** (1) through (3) below.

(4) Set **FREQUENCY MHz** switch to **125.500.0**. Connect measuring receiver to **TRANS-RCVR**.

(5) Adjust **BFO-RF LEVEL** control until 0 dBm light illuminates.

(6) Set measuring receiver to 125.5 MHz in manual tune mode.

(7) Set measuring receiver switches to measure peak deviation using **300 Hz HI PASS** and **3 kHz LOW PASS** filters. Measuring receiver will indicate less than 100 Hz.

(8) Adjust **VAR** control until **DEVIATION (kHz)** meter indicates 2 kHz. If measuring receiver does not indicate between 1.86 and 2.14 kHz, perform **b** (4) below.

(9) Set **DEV/PWR** switch to **6 kHz**.

(10) Adjust **VAR** control until **DEVIATION (kHz)** meter indicates **6 kHz**. If measuring receiver does not indicate between 5.58 and 6.42 kHz, perform **b** (5) below.

(11) Set **DEV/PWR** switch to **20 kHz** and **RCVR WIDE-MID-NARROW** switch to **MID.**

(12) Adjust **VAR** control until **DEVIATION (kHz)** meter indicates 20 kHz. If measuring receiver does not indicate between 18.6 and 21.4 kHz, perform **b** (6) below.

b. Adjustments

(1) Adjust A1A13R71 (fig. 5) until **DEVIATION (kHz)** meter indicates zero (R).

(2) Set **GEN-RCVR** switch to **GEN** and adjust A1A13R81 (fig. 5) until **DEVIATION (kHz)** meter indicates zero (R). Set **RCVR-GEN** switch to **RCVR**.

(3) Repeat (1) and (2) above as necessary.

(4) Adjust **VAR** control until measuring receiver indicates **2 kHz**. Adjust A1A13R85 (fig. 5) until **DEVIATION (kHz)** meter indicates **2 kHz** (R).

(5) Adjust **VAR** control until measuring receiver indicates 6 kHz. Adjust A1A13R83 (fig. 5) until **DEVIATION (kHz)** meter indicates **6 kHz** (R).

(6) Adjust **VAR** control until measuring receiver indicates 20 kHz. Adjust A1A13R79 (fig. 5) until **DEVIATION (kHz)** meter indicates **20 kHz** (R).

17. Spectrum Analyzer Signal Strength

a. Performance Check

(1) Set **GEN-RCVR** switch to **RCVR** and adjust **ANALY DISPR** control cw just out of detent. If bottom of trace on oscilloscope is not between -108 and -110 dBm, perform **b** (1) through (3) below.

CAUTION

Do not exceed signal strength greater than -30 dBm.

(2) Connect signal generator to **ANTENNA INPUT**.

(3) Adjust signal generator frequency for 125.500 MHz and amplitude for -50 dBm indication on TI display. If signal generator does not indicate between -45 and -55 dBm, perform **b** (1) through (17) below.

(4) Adjust signal generator amplitude in 10 dB steps from -30 to -100 dBm. If signal strength as displayed on TI does not indicate respective signal generator amplitude outputs ±4 dBm relative to reference set in **a** (3) above, perform **b** (1) through (17) below.

b. Adjustments

NOTE
See **NOTE** in figure 2, for access to adjustments.

(1) Connect multimeter to +11V TP (fig. 1) and chassis ground.

(2) Adjust +11 VOLT ADJ A4A2R43 (fig. 6) for an 11 V indication on multimeter (R).

(3) Adjust VERT CTR A4A2R30 (fig. 6) until bottom of trace indicates -109 dBm (R).

(4) Connect oscilloscope to INPUT TEST POINT (fig. 6).

(5) Adjust signal generator amplitude for -30 dBm.

(6) Adjust IF GAIN A4A2R4 (fig. 6) for 0.4 V p-p spike on oscilloscope (R).

(7) Adjust VERT GAIN A4A2R29 (fig. 6) for –30 dBm indication on TI (R).

(8) If bottom of trace does not indicate -109 dBm, repeat **b** (3) above.

(9) Adjust signal generator amplitude to -40 dBm.

(10) Adjust LOG LIN A4A2R5 (fig. 6) for a -40 dBm indication on TI. If a -40 dBm indication cannot be obtained go on to next step (R).

(11) Adjust signal generator to -30 dBm and repeat **b** (7) through (10) above until no further adjustments are required.

(12) Adjust signal generator amplitude for -60 dBm.

(13) Adjust AMP 1 GAIN A4A2R13 (fig. 6) for a -60-dBm indication on TI (R).

(14) Adjust signal generator amplitude for -90 dBm.

(15) Adjust AMP 2 GAIN A4A2R22 (fig. 6) for a -90-dBm indication on TI (R).

(16) Repeat **b** (12) through (15) above until no further adjustments are required.

(17) Adjust signal generator amplitude for -30 dBm and repeat **b** (7) through (16) until no further adjustments are required.

18. Spectrum Analyzer Centering and Bandwidth

a. Performance Check

(1) Adjust signal generator frequency for 125.500 MHz and amplitude for -50 dBm. If peak of signal strength is not aligned with center vertical graticule line ± 2 minor divisions and end of trace is not aligned with right edge of bezel (5.4 divisions from center), perform **b** (1) through (3) below.

(2) Adjust **ANALY DISPR** control fully cw. If peak of signal strength is not aligned with center vertical graticule line within ±2 minor divisions, perform **b** (1) below.

(3) Set **FREQUENCY MHz** switches to indicate **130 500 0**. If signal strength peak is not aligned with first vertical graticule line within ±2 minor divisions, perform **b** (4) below.

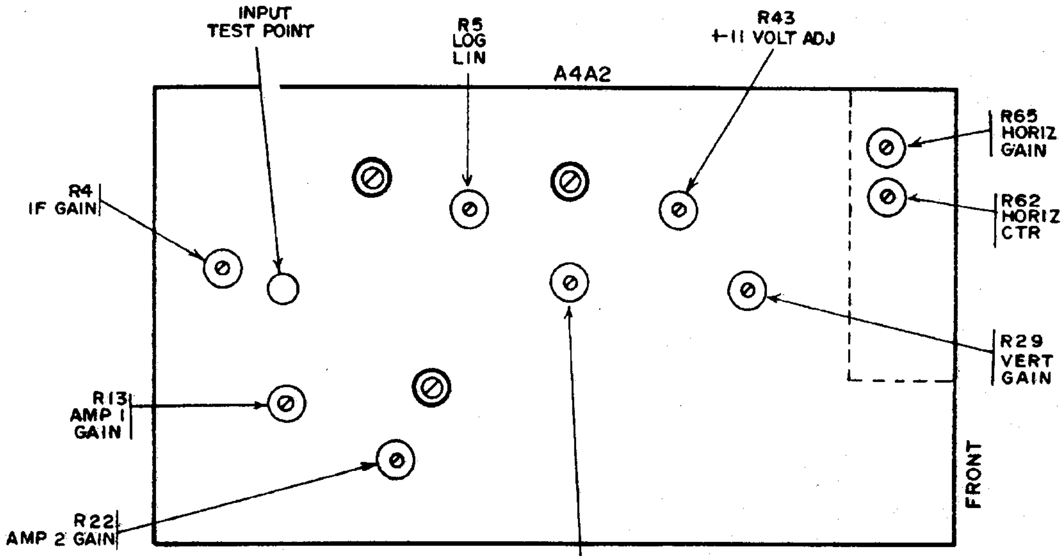

Figure 6. Spectrum analyzer No. 2 - adjustment locations.

(4) Decrease **FREQUENCY MHz** switches from **130 500 0** to **120 500 0** in increments of **001 000 0**. If signal strength does not move 1 major division per increment within ±2 minor divisions, perform **b** (5) through (7) below.

(5) Adjust **ANALY DISPR** control fully ccw but not to detent.

(6) Set **FREQUENCY MHz** switches to **126 000 0**. If signal strength peak is not aligned with first vertical graticule line ±2 minor divisions, perform **b** (8) below.

(7) Decrease **FREQUENCY MHz** switches from **126 000 0** to **125 000 0** in increments of **000 100 0**. If signal strength does not move 1 major division per increment within ±2 minor divisions, perform **b** (9) and (10) below.

(8) Set **ANALY DISPR** control to **OFF**.

b. Adjustments

(1) Adjust HORIZ CTR A4A2R62 (fig. 6) until peak of signal is centered on centerline (R).

(2) Adjust HORIZ GAIN A4A2R65 (fig. 6) until end of trace is aligned with right edge of bezel.

(3) Repeat (1) and (2) above until no further adjustments are required.

(4) Adjust MAX DISP A4A1R40 (fig. 1) until signal strength peak is aligned with first vertical graticule line (R).

(5) Set **FREQUENCY MHz** switches to **120 500 0**.

(6) Adjust MAX DISP A4A1R40 (fig. 1) until signal strength peak is aligned with 11th vertical graticule line (R).

(7) Repeat **a** (3) and (4) above and if required, adjust MAX DISP A4A1R40 (fig. 1) for best in-tolerance condition.

(8) Adjust MIN DISP A4A1R34 (fig. 1) until signal strength peak is aligned with first vertical graticule line (R).

(9) Adjust MIN DISP A4A1R34 (fig. 1) until signal strength peak is aligned with 11th vertical graticule line (R).

(10) Repeat **a** (6) and (7) above and if required, adjust MIN DISP A4A1R34 (fig. 1) for best in-tolerance compromise.

19. Power Meter

a. Performance Check

(1) Set **DEV/PWR** switch to **WATTS X1** and **GEN-RCVR** switch to **RCVR**. If **DEVIATION (kHz) WATTS** meter does not indicate **0**, adjust A1A14R65 (fig. 1) for 0 indication on **DEVIATION (kHz) WATTS** meter.

(2) Connect equipment as shown in figure 7.

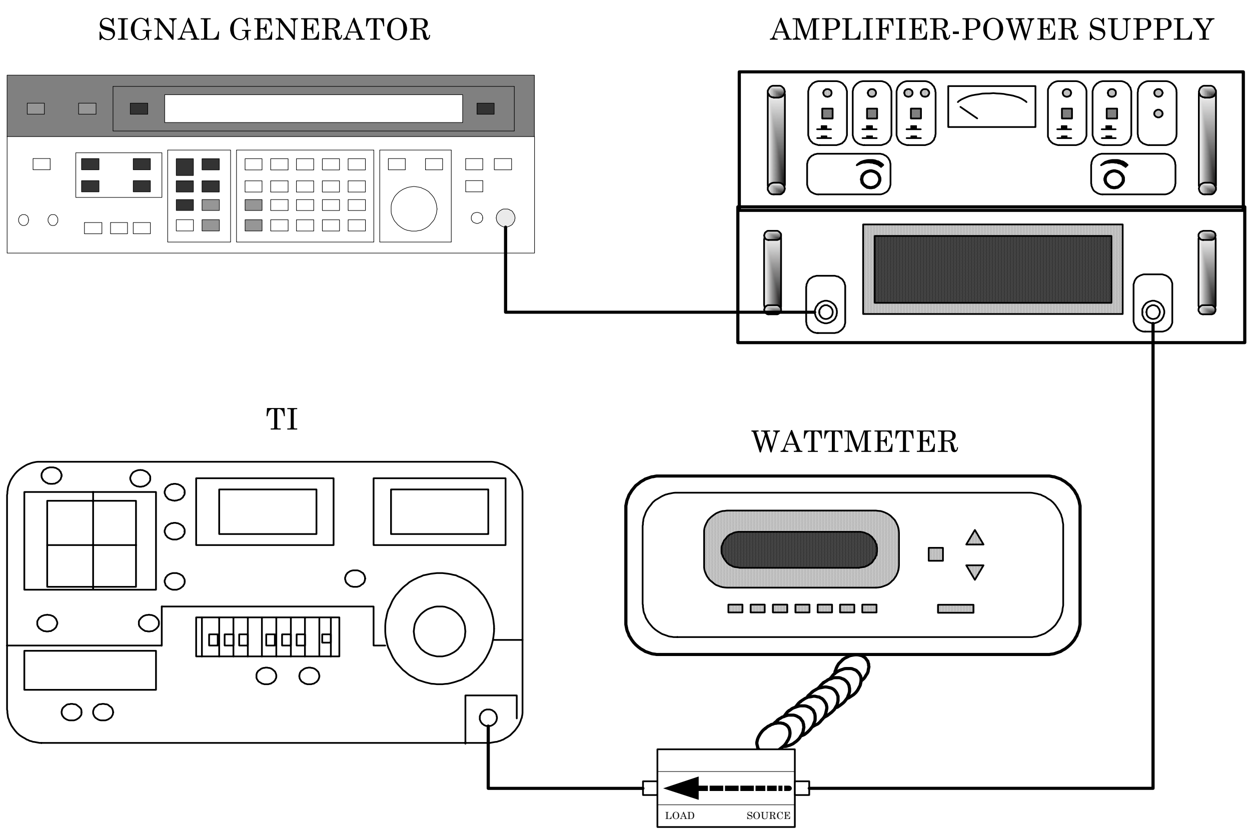

Figure 7. Power meter - equipment setup.

CAUTION

Before energizing or deenergizing amplifier-power supply, make sure that **RF POWER OUTPUT ADJ** control is set to **RF OFF**.

(3) Energize all equipment and allow at least 15 minutes for warm-up.

(4) Select a frequency of 30 MHz listed on wattmeter sensor test report.

(5) Compute wattmeter reading that corresponds to 4 W, using wattmeter output calibration factor at 30 MHz.

(6) Adjust signal generator to 30 MHz.

(7) Adjust amplifier-power supply for full-scale indication on **DEVIATION (kHz) WATTS** meter. If wattmeter does not indicate within 10 percent of reading computed in (5) above, perform **b** (1) and (2) below.

(8) Adjust output power to **0** and set **DEV/PWR** switch to **WATTS X10**.

(9) Repeat (5) above, except for 40 W. Record indication.

(10) Adjust amplifier-power supply for a 40 W indication on **DEVIATION (kHz) WATTS** meter. If wattmeter does not indicate within ±10 percent of reading recorded in (9) above, perform **b** (3) and (4) below.

(11) Set **DEV/PWR** switch to **WATTS X100** and repeat (5) above for 50 W. Record indication.

(12) Adjust amplifier-power supply for a 50 W indication on **DEVIATION (kHz) WATTS** meter. If wattmeter does not indicate within ±31 percent of reading recorded in (11) above, perform **b** (5) below.

(13) Repeat technique of (2) through (13) above at 600 MHz.

b. Adjustments

(1) Adjust amplifier-power supply for wattmeter reading computed in **a** (5) above.

(2) Adjust A1A14R87 (fig. 1) until **DEVIATION (kHz) WATTS** meter indicates **4 W** (R).

(3) Adjust amplifier-power supply for wattmeter reading computed in **a** (9) above.

(4) Adjust A1A14R89 (fig. 1) until **DEVIATION (kHz) WATTS** meter indicates **40 W** (R).

(5) Adjust amplifier-power supply for wattmeter reading computed in **a** (11) above. Adjust A1A14R91 (fig. 1) until **DEVIATION (kHz) WATTS** meter indicates **50 W** (R).

20. DE MOD Signal

a. Performance Check

(1) Connect multimeter cable to EXT ACC jack on TI.

(2) Connect multimeter to model MM-100E multimeter DE MOD jack.

(3) Set **RF FREQUENCY MHz** switches to **125 500 0** and **AM-FM** switch to **AM**.

CAUTION
Do not exceed -30 dBm into antenna input.

(4) Connect measuring receiver to signal generator output (set to minimum).

(5) Adjust signal generator frequency for 125.500 MHz and amplitude for -30 dBm at modulation of 1 kHz at 60 percent as indicated on the measuring receiver.

(6) Connect signal generator to TI **ANTENNA INPUT** jack using attenuator.

(7) If multimeter does not indicate between 95 and 105 mV ac, perform **b** below.

b. Adjustments. Adjust A1A13R115 (fig. 5) until multimeter indicates 100 mV ac (R).

21. MM-100E Multimeter

a. Performance Check

NOTE
The MM-100E multimeter will be referred to as “TI multimeter” throughout the check.

CAUTION
Do not exceed 300 V into TI multimeter INPUT.

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

(a) **RANGE** switch to **.1V**.

(b) **FUNCTION** switch to **DC+**.

(c) **DC ZERO OFFSET** control fully ccw (detent).

(d) **VOL** control fully ccw.

(2) Set **MODULATION FREQ Hz** switches to **04 000.0**.

(3) Connect multimeter to EXT ACC Jack on TI. If multimeter does not indicate zero, perform **b** (1) below.

(4) Set TI multimeter **FUNCTION** switch to **DC-**. If multimeter does not indicate 0, perform **b** (2) below.

(5) Set TI multimeter **FUNCTION** switch to **DC+** and **RANGE** switch to **1V**.

(6) Connect calibrator to TI multimeter **INPUT** using probe in table 3 (set to X1).

(7) Adjust calibrator for an indication of **10** on **0** to **10** scale. If calibrator does not indicate between 0.97 and 1.03 V dc, perform **b** (3) below.

(8) Repeat technique of (7) above for TI multimeter **RANGE** switch settings and meter indications listed in table 14. Calibrator will indicate within limits specified.

Table 14. Dc Voltage Check

TI multimeter			Calibrator indications (Vdc)	
RANGE switch settings	Meter indications 0 to 3 scale	Meter indications 0 to 10 scale	Min	Max
.1	- - -	10	0.097	0.103
.3	3	- - -	0.291	0.309
3	3	- - -	2.91	3.09
10	- - -	10	9.7	10.3
10	- - -	8	7.7	8.3
10	- - -	6	5.7	6.3
10	- - -	4	3.7	4.3
10	- - -	2	1.7	2.3
10[1]	- - -	10	97	103
30	3	- - -	29.1	30.9
100	- - -	10	97	103
300	3	- - -	291	309
10[2, 3]	- - -	10	9.7	10.3

[1]Set probe **X1-X10** switch to **X10** for this check only.

[2]Set **FUNCTION** switch to **DC** - (see **CAUTION** below) and reverse input at calibrator.

CAUTION

Before performing negative dc measurement, ensure that dc output of calibrator is floating from chassis ground. Failure to do so may result in serious damage to calibrator and/or multimeter.

[3]If out-of-tolerance, adjust calibrator for 10.0000 and adjust A2A1A1R82 (fig. 8) for 10 V indication on multimeter. (R)

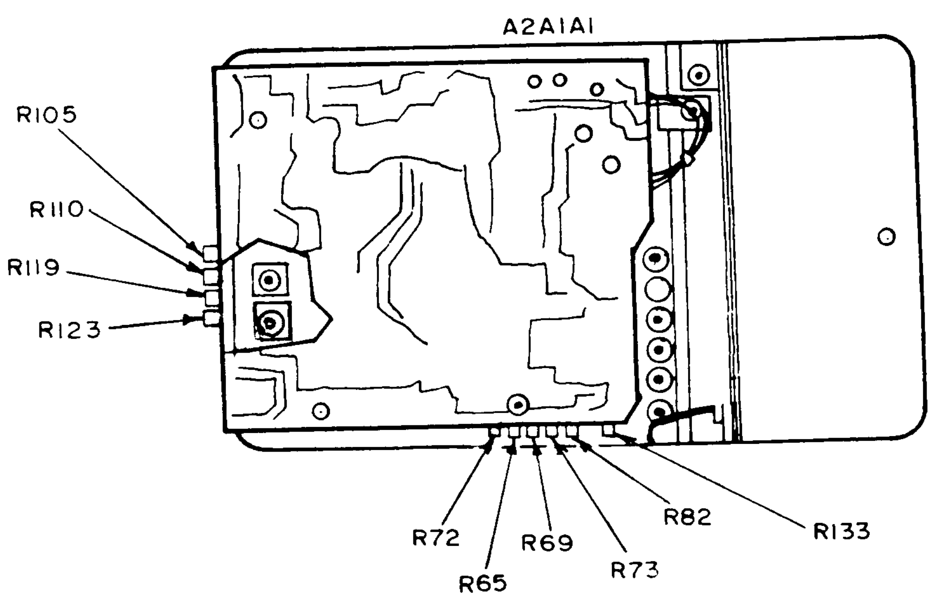

Figure 8. MM-100E multimeter - rear view.

(9) Set TI multimeter **FUNCTION** switch to **OHMS** and **RANGE** switch to **X1 Ω**. If meter does not indicate (infinity), perform **b** (4) below.

(10) Connect resistance standard to TI multimeter **INPUT**, using probe in table 3 (set to X1).

(11) Adjust resistance standard until TI multimeter indicates **30** on **OHMS** scale. If resistance standard does not indicate between 28.5 and 31.5 Ω, perform **b** (5) below.

(12) Repeat technique of (11) above for TI multimeter **RANGE** switch positions and indications listed in table 15. Resistance standard will indicate within limits specified.

Table 15. Resistance Check

TI multimeter		Resistance standard indications (Ω)	
RANGE switch positions	**OHMS** scale indications	Min	Max
X10 Ω	30	285	315
X100 Ω	30	2850	3150
X1K Ω[1]	30	28.5 k	31.5 k
X10K Ω[1]	30	285 k	315 k

[1]If required, readjust A2A1A1R123 (fig. 8) for best in-tolerance indication (R).

(13) Set TI multimeter **FUNCTION** switch to **HI-**Z and **RANGE** switch to **1V**.

(14) Connect calibrator to TI multimeter **INPUT**.

(15) Adjust calibrator frequency for 1 kHz frequency and output for a 1 V indication on TI multimeter. If calibrator does not indicate between 0.95 and 1.05 V ac, perform **b** (6) below.

(16) Repeat technique of (15) above for **RANGE** switch settings and calibrator frequencies listed in table 16. Calibrator will indicate within limits specified.

Table 16. Ac Voltage Accuracy.

TI multimeter **RANGE** switch settings		Calibrator indications (V Ac)	
(V)	Frequency	Min	Max
.1	1 kHz	0.095	0.105
.1	20 kHz	0.095	0.105
.3	20 kHz	0.285	0.315
.3	50 Hz	0.285	.315
1	50 Hz	0.95	1.05
1	20 kHz	0.95	1.05
3	20 kHz	2.85	3.15
3	1 kHz	2.85	3.15
3	50 Hz	2.85	3.15
10	50 Hz	9.5	10.5
10	20 kHz	9.5	10.5
30	20 kHz	28.5	31.5
30	50 Hz	28.5	31.5
100	50 Hz	95	105
300	20 kHz	285	315
300	50 Hz	285	315

(17) Connect multimeter to TI multimeter **INPUT**. Set **PWR-OFF-BATT** switch to **OFF**.

(18) Set TI multimeter **FUNCTION** switch to **600**. Multimeter will indicate between 504 and 616 Ω.

(19) Set TI multimeter **FUNCTION** switch to positions listed in table 17. Multimeter will indicate within limits specified.

Table 17. Ac Load Accuracy

TI Multimeter **FUNCTION** switch settings	Multimeter (Ω)	
	Min	Max
150	135	165
8	7.2	8.8
3.2	2.88	3.52

(20) Disconnect multimeter from equipment setup. Set **PWR-OFF-BAT** switch to **PWR**.

(21) Connect **INT MOD OUT** to TI multimeter **INPUT** and audio analyzer.

(22) Set TI multimeter **FUNCTION** switch to **HI-Z** and **RANGE** switch to **SINAD**.

(23) Adjust **VAR** control until audio analyzer voltmeter indicates 0.3 V.

(24) Adjust 1 kHz control until TI multimeter indicates 50 percent distortion (6 dB on **SINAD** scale).

(25) Measure distortion at 4 kHz, and then adjust 1 kHz control until audio analyzer indicates 50 percent distortion. If TI multimeter does not indicate between 4.5 and 7.5 dB on **SINAD** scale, perform **b** (7) below. Adjust 1 kHz control fully ccw.

(26) Set TI multimeter **RANGE** switch to **0-10%**.

(27) Adjust **1 kHz** control until TI multimeter indicates 10 percent distortion. If audio analyzer does not indicate between 8.5 and 11.5 percent distortion, perform **b** (8) and (9) below.

(28) Set TI multimeter **RANGE** switch to **0-30%**.

(29) Adjust **1 kHz** control until TI multimeter indicates 30 percent distortion. If audio analyzer does not indicate between 26.5 and 33.5 percent distortion, perform **b** (8) and (9) below and adjust for best in-tolerance condition.

CAUTION

Do not exceed -30 dBm input to antenna.

(30) Set **1 kHz** and **VAR** controls to **OFF**.

(31) Connect signal generator to measuring receiver input.

(32) Adjust signal generator frequency for 125.500 MHz and 60 percent AM (1 kHz) modulation at -30 dBm.

(33) Connect signal generator to TI **ANTENNA INPUT** using attenuator. Set **AM-FM** switch to **AM** and set TI multimeter **RANGE** switch to **AM%**. If TI multimeter does not indicate between 50 and 70 percent, perform **b** (10) below.

b. Adjustments

(1) Adjust A2A1A1R65 (fig. 8) for 0 indication on multimeter.

(2) Adjust A2A1A1R73 (fig. 8) for 0 indication on multimeter.

(3) Adjust calibrator output for a 1.00000 indication. Adjust A2A1A1R69 (fig. 8) for a 1V indication on TI multimeter (R).

(4) Adjust A2A1A1R119 (fig. 8) for ∞ (infinity) on TI multimeter (R).

(5) Set resistance standard to 30 Ω. Adjust A2A1A1R123 (fig. 8) for 30 Ω indication on TI multimeter (R).

(6) Adjust calibrator output for a 1 V indication. Adjust A2A1A1R72 (fig. 8) for a 1 V indication on TI multimeter (R).

(7) Adjust A2A1A1R110 (fig. 8) for 6 dB indication on **SINAD** scale (R).

(8 Adjust **1 kHz** control until audio analyzer indicates 10 percent distortion.

(9) Adjust A2A1A1R105 (fig. 8) for 10 percent indication on TI multimeter (R).

(10) Adjust A2A1A1R133 (fig. 8) for 60 percent indication on TI multimeter (R).

22. Power Supply

NOTE

Do not perform power supply check if all other parameters are within tolerance.

a. Performance Check

(1) Set **PWR-OFF-BATT** switch to **OFF** and remove battery from TI..

(2) Connect decade resistor across battery terminals.

(3) Set decade resistor for 150 Ω.

(4) Connect multimeter to +18V TP (fig. 9) and chassis ground.

(5) Set **PWR-OFF-BATT** switch to **PWR**. If multimeter does not indicate between 17.6 and 18.4 V dc, perform **b** (1) below.

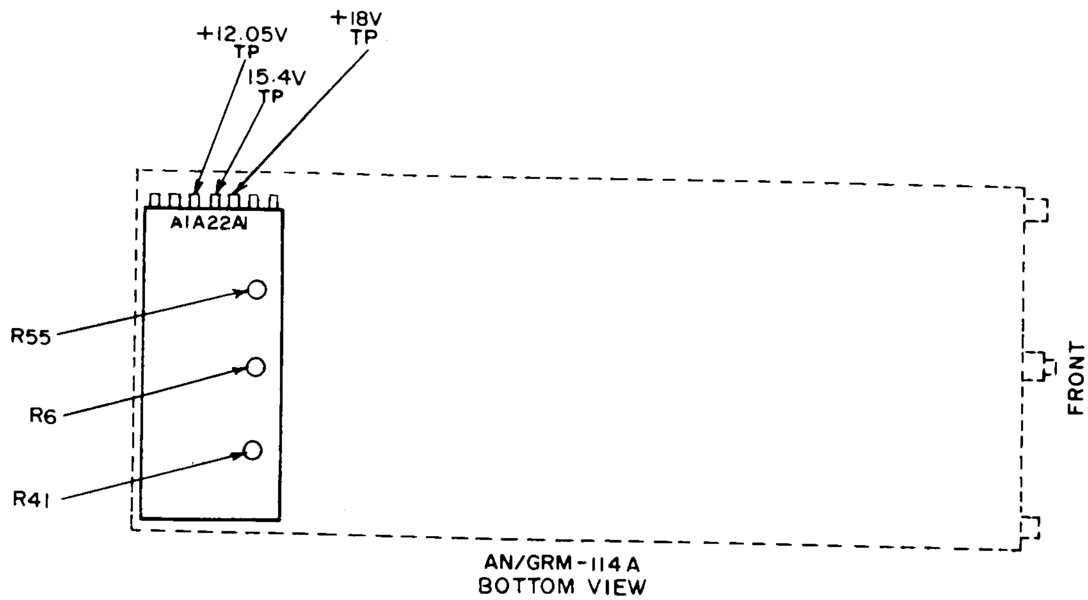

Figure 9. AN/GRM-114A - bottom view.

(6) Move multimeter positive lead to +15.4 V TP (fig. 9). If multimeter does not indicate between 15.55 and 15.25 V dc, perform **b** (2) below.

(7) Move multimeter positive lead to +12.05V TP (fig. 9). If multimeter does not indicate between 11.95 and 12.15 V dc, perform **b** (3) below.

(8) Set **PWR-OFF-BATT** switch to **OFF**, unplug from power and remove decade resistor from battery terminals.

(9) Connect dc power supply and multimeter across battery terminals.

(10) Set power supply voltage for a 12 V reading on multimeter.

(11) Set **PWR-OFF-BATT** switch to **BATT** and slowly reduce dc power supply voltage until TI just shuts off. If multimeter does not read between 10.9 and 11.1 V dc, perform **b** (4) below.

b. Adjustments

(1) Adjust A1A22A1R41 (fig. 9) for an 18 V indication on multimeter (R).

(2) Adjust A1A22A1R6 (fig. 9) for a 15.4 V indication on multimeter (R).

(3) Adjust A1A22A1R55 (fig. 9) for a 12.05 V indication on multimeter (R).

(4) Adjust A1A14R22 (fig. 1) for a TI cutoff voltage of 11 V dc (R).

23. Final Procedure

a. Deenergize and disconnect all equipment and reinstall protective cover on TI.

b. Annotate and affix DA label/form in accordance with TB 750-25.

By Order of the Secretary of the Army:

Official:

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

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

0406105

Distribution:
To be distributed in accordance with initial distribution number (IDN) 342208 requirements for calibration procedure TB 9-6625-2059-35.

<u>THESE ARE THE INSTRUCTIONS FOR SENDING AN ELECTRONIC 2028</u>

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@avma27.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**: TB 9-6625-xxxx-35
9. **Pub Title**: Calibration Procedure for …
10. **Publication Date**:
11. Change Number:
12. **Submitted Rank**: MSG
13. **Sumitter 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

PIN: 050302-000