TB 9-6625-2059-35

CHANGE 4

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
20 December 2000

TB 9-6625-2059-35, 24 October 1988, is changed as follows:

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7 and 8	7 and 8
15 and 16	15 and 16
23 and 24	23 and 24
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2. File this change sheet in front of the publication for reference purposes.

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TB 9-6625-2059-35
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Headquarters, Department of the Army, Washington, DC
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23 and 24	23 and 24

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*TB 9-6625-2059-35

SUPERSEDED COPY DATED 31 JULY 1987

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 October 1988

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REPORTING OF ERRORS AND RECOMMDENDED IMPROVEMENTS

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

*This bulletin supersedes TB 9-6625-2059-35, 31 July 1987.

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 manufacturer's 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 Accuracy: 10%
Horizontal sweep	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 150Ω
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 footnote 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. 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.

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

Item	Common name	Minimum use specifications	Manufacturer and model (part number)
A1	AC CALIBRATOR	Range: 0.095 to 315 V ac Accuracy: ±1.25%	Hewlett-Packard, Model 745AOPTC93 (745AOPTC93) w/HV amplifier C90-746A (C90-746C)
A2	ATTENUATOR	Frequency range: 100 to 999 MHz Attenuation: 20 dB Accuracy: ±0.625 dB	Weinschel, Model 9918-20 (9918-20) (p/o Weinschel, Model 9918 set)
A3	ATTENUATOR	Frequency range: 100 to 999 MHz Attenuation: 0 to 80 dB	Kay, Model 464A (464A)
A4	AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: ±1%	General Radio, Model W10MT3AS3 or Ridge, Model 9020F (7910809)

See footnote at end of table.

Table 2. Minimum Specifications of Equipment Required - Continued.

Item	Common name	Minimum use specifications	Manufacturer and model (part number)
A5	DC VOLTAGE STANDARD	Range: 0.097 to 309 V dc Accuracy: ±0.75%	John Fluke, Model 332B/AF (332B/AF)
A6	DIGITAL VOLTMETER	Range: 0 to 16.75 V dc Accuracy: ±0.16% Range: 0.054 to 3.5 V ac Accuracy: ±1.25% Range: 0 to 600Ω Accuracy: ±2.5%	Hewlett-Packard, Model 3490AOPT060 (3490AOPT060)
A7	DISTORTION ANALYZER	Capability: 0.7 to 50% from 20 to 9999.9 Hz	Hewlett-Packard, Model C41-334A (7911957)
A8	FREQUENCY COUNTER	Range: 1 MHz to 1 GHz Accuracy: 0.0000125% Range: 999.9 to 20002 Hz Accuracy: 0.0025%	Hewlett-Packard, Model 5345A (MIS-28754/1 Type 1) w/5355A
A9	MICROWAVE MEASUREMENT SYSTEM	Range: 120 to 900 MHz	Weinschel, Model 4312M16P-4312M16P-CA211 (4312M16P-CA211)
A10	MODULATION ANALYZER	Range: 1.8 to 10.3 kHz Accuracy: ±1.75%	Hewlett-Packard, Model 8901 (8901)
A11	OSCILLOSCOPE	Range: 0.4 V p-p Accuracy: ±3%	Tektronix, Type R5440 (MIS-28706/1 Type 1) (MIS-28706/3), 5B42 (MIS-28706/4)
A12	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	Ballantine, Model 6126M (MIS-28714 Type 1)
A13	POWER METER	Range: 10 to -10 dBm at 10 MHz to 1 GHz Accuracy: ±2.5%[1]	Hewlett-Packard, Model E12-432A (MIS-30525) w/thermistor mount, Hewlett-Packard, Model H75-478A (7915907) or 8478A (8478A)
A14	POWER STANDARD ASSEMBLY	Range: 600 MHz at 10 and 50 W Accuracy:[1]	(7913995)
A15	POWER STANDARD ASSEMBLY	Range: 30 MHz at 10 and 50 W Accuracy:[1]	Maury, Model 4098A, w/ Hewlett-Packard, Model 478A (7916259)
A16	POWER SUPPLY	Range: 0 to 12 V	Kepco, Model HB525M20480 (7915935)
A17	RECEIVER SYSTEM	Measurement range: 0 to 90 dBm Accuracy: ±0.625 dB	Weinschel, Model VM-4A (VM-4A)
A18	RESISTANCE STANDARD	Range: 28.5 to 315 kΩ Accuracy: ±1.25%	Biddle-Gray, Model 71-631 (71-631)
A19	RF POWER GENERATOR	Range: 10 to 50 W	Microdot, Model 447 (MIS-10240)
A20	SIGNAL GENERATOR	Range: 125.5 MHz Amplitude: 0 to -30 dBm Range: 60% MOD at 1 kHz	Hewlett-Packard, Model 8640B-OPTH66 (MIS-28707 Type 1)
A21	SPECTRUM ANALYZER	Range: 120 to 900 MHz	Tektronix, Type 492 (492)
A22	TEST OSCILLATOR	Range: 1 kHz to 1V	Hewlett-Packard, Model 652A (MIS-10224)

[1]Combined accuracy of A13 and A14: ±2.5% and A13 and A15: ±2.5%

Table 3. Accessories Required

Item	Common Name	Description (Part Number
B1	ADAPTER	BNC T-type, 2 jacks, 1 plug (MS35173-274C)
B2	ADAPTER	N plug to BNC jack (10519457) (UG201A/U)
B3	ADAPTER	N plug to N plug (MIS-10408-4)
B4	ADAPTER[1]	BNC plug to N jack (10519458)
B5	ADAPTER	BNC jack to double banana plug terminations (7907592)
B6	ATTENUATOR	20 dB N plug to N jack (777C-20 dB)
B7	CABLE[2]	36-in., RG-58/U; N plug terminations (7907468)
B8	CABLE[2]	36-in., RG-58/U; BNC plug to double banana plug terminations (7907471)
B9	CABLE[1]	24-in., RG-58/U; BNC plug terminations (10519141)
B10	DECADE RESISTOR	150Ω. Winslow, Model 336
B11	LEAD[2]	24-in. No. 18; single banana plug (black) (7907497-2)
B12	LEAD[2]	24-in. No. 18; single banana plug (red) (7907497-1)
B13	LEAD	36-in., BNC plug to 2 test hooks (7915942-1)
B14	LOW PASS FILTER	Telonic, Model TLC700-6EF1 and TLC45-4EF
B15	LOW PASS FILTER	Telonic, Model TLC125
B16	PROBE (TEST LEAD)	36-in., BNC plug to X10 probe, Tektronix, P6106 (11513202-1)
B17	PROBE[3]	X1-X10 probe (supplied with multimeters MM-100E)
B18	TERMINATION	50Ω feed-through BNC plug to BNC jack (011-0049-01)

[1]Three required.
[2]Two required.
[3]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 and item identification number as listed in tables 2 and 3. For the identification of equipment referenced by item numbers prefixed with A, see table 2, and for prefix B, see table 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 manufacturer's manual, 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.

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 warmup.

8. Frequency Accuracy

a. Performance Check

(1) Connect frequency counter (A8) to **10 MHz REF OUT**, using cable (B9).

(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, using cable (B9).

(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

Table 4. Frequency Accuracy Check - Continued.

Test instrument **FREQUENCY MHz** switch settings	Frequency counter indications (Hz)	
	Min	Max
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.

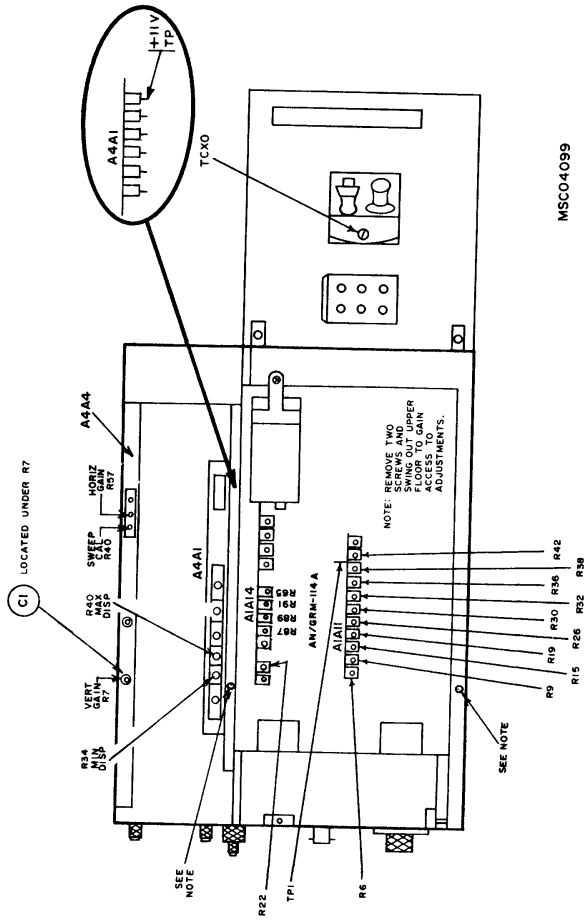

Figure 1. Test instrument - top view.

9. Dual Tone Generator

a. Performance Check

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

(2) Connect frequency counter (A8) to TI **INT MOD OUT,** using cable (B9).

(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 (B10) to 150Ω and connect across TI INT MOD OUT and to digital voltmeter (A6), using adapter and leads (B5, B11, and B12).

(8) Adjust **1 kHz** control fully cw. If digital voltmeter 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**.

(9) Deleted.

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

(11) Connect distortion analyzer (A7) to **INT MOD OUT,** using cable (B8). Measure distortion at 1 kHz. Distortion 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. Distortion 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. Distortion analyzer will indicate 0.7 percent distortion or less.

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

(16) Set **MODULATION FREQ Hz** switches to **00020.0.** Measure distortion at 20 Hz. Distortion 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. Distortion 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).

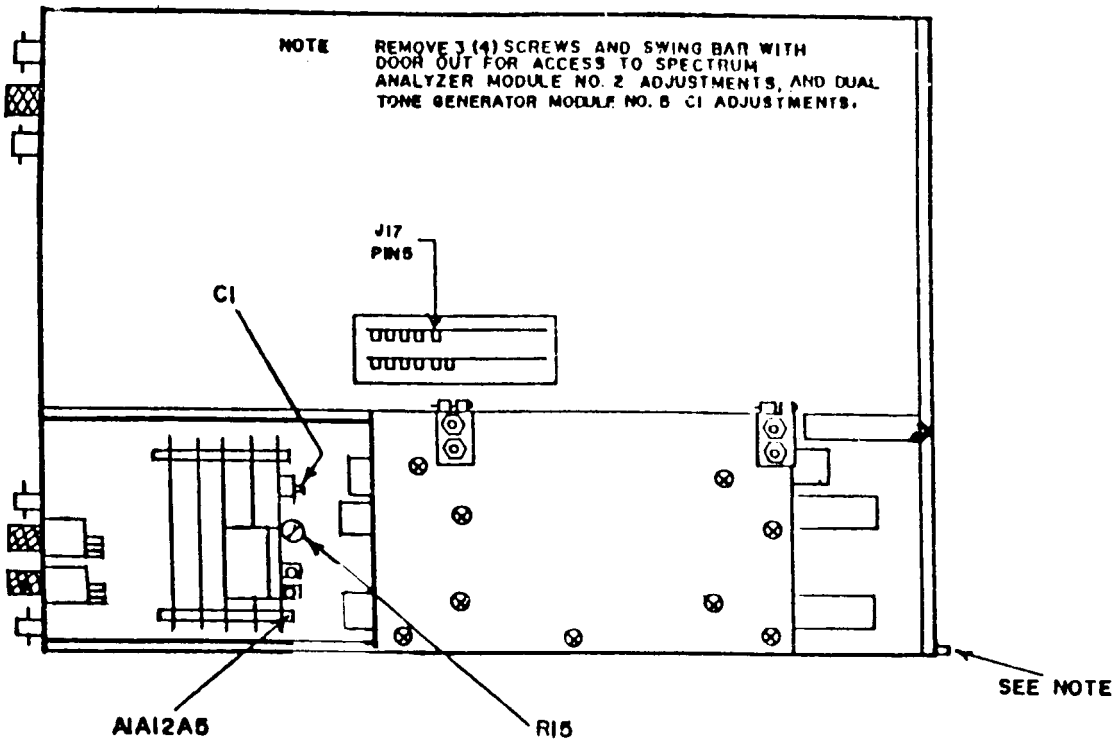

Figure 2. Test instrument - bottom view.

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) Connect microwave measurement system (A9) **RF OUTPUT** to power meter (A13), using attenuator (A2).

(3) Adjust microwave measurement system frequency for 100 MHz and amplitude for a -10 dBm indication on power meter.

(4) Substitute receiver system (A17) for power meter and establish a reference indication on receiver system.

(5) Disconnect microwave measurement system from setup and connect TI **TRANS-RCVR** to receiver measuring equipment, using attenuator (A2).

(6) Adjust **BFO-RF LEVEL** control until TI 0 dBm light just illuminates. Receiver system will indicate between 7.5 and 12.5 dB.

(7) Set **HI LEVEL - µVX100-NORM** switch to **µVX100** and adjust **BFO-RF LEVEL** control to **-100 dBm**. If receiver system does not indicate between 67.5 and 72.5 dBm, perform **b** below.

NOTE

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

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

Table 6. Output Level 100 MHz

Test instrument		Receiver system indications (dB)	
BFO-RF LEVEL control settings	FREQUENCY MHz switch settings	Min	Max
80	100 000 0	47.5	52.5
90	100 000 0	57.5	62.5
110	100 000 0	77.5	82.5
120	100 000 0	87.5	92.5

(9) Set HI **LVL VX100-NORM** switch to **NORM** and **BFO-RF LEVEL** control to **-80 dBm**. Receiver system will indicate between 87.5 and 92.5 dB.

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

(11) Connect microwave measurement system (A9) **RF OUTPUT** to power meter (A13), using attenuator (A2).

(12) Adjust microwave measurement system frequency for 250 MHz and amplitude for a -10 dBm indication on power meter.

(13) Substitute receiver system (A17) for power meter and establish a reference indication on receiver system.

(14) Disconnect microwave measurement system from setup and connect TI **TRANS-RCVR** output to attenuator.

(15) Adjust **BFO-RF LEVEL** control until TI **0-dBm** light just illuminates. Receiver system will indicate between 6.0 and 14.0 dB.

(16) Set **HI LEVEL - µVX100-NORM** switch to **µVX100** and adjust **BFO-RF LEVEL** control to **-100 dBm.** Receiver system will indicate between 66 and 74 dB.

(17) Repeat technique of (16) above for **BFO-RF LEVEL** control settings and **FREQUENCY MHz** switch settings at **250 000 0** listed in table 7. Receiver system will indicate within limits specified.

Table 7. Output Level 250 MHz

Test Instrument		Receiver system indications (dB)	
BFO-RF LEVEL control settings	**FREQUENCY MHz** switch settings	Min	Max
80	250 000 0	46	54
90	250 000 0	56	64
110	250 000 0	76	84
120	250 000 0	86	94

(18) Set **HI LVL VX100-NORM** switch to **NORM** and **BFO-RF LEVEL** control to **-80 dBm.** Receiver system will indicate between 86 and 94 dB.

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

(20) Connect microwave measurement system (A9) **RF OUTPUT** to power meter (A13), using attenuator (A2).

(21) Adjust microwave measurement system frequency for 500 MHz and amplitude for a -10 dBm indication on power meter.

(22) Substitute receiver system (A17) for power meter and establish a reference indication on receiver system.

(23) Disconnect microwave measurement system from setup and connect TI **TRANS-RCVR** output to attenuator.

(24) Adjust **BFO-RF LEVEL** control until TI **0-dBm** light just illuminates. Receiver system will indicate between 4.0 and 16.0 dB.

(25) Set **HI LEVEL - µVX100-NORM** switch to **µVX100** and adjust **BFO-RF LEVEL** control to **-100 dBm**. Receiver system will indicate between 64 and 76 dB.

Table 8. Output Level 500 MHz

Test Instrument		Receiver System Indications (dB)	
BFO-RF LEVEL control settings	**FREQUENCY MHz** switch settings	Min	Max
80	500 000 0	44	56
90	500 000 0	54	66
110	500 000 0	74	86
120	500 000 0	84	96

(26) Repeat technique of (16) above for **BFO-RF LEVEL** control settings and **FREQUENCY MHz** switch settings at **500 000 0** listed in table 8. Receiver system will indicate within limits specified**.**

(27) Set **HI LVL VX100-NORM** switch to **NORM** and **BFO-RF LEVEL** control to **-80 dBm.** Receiver system will indicate between 84 and 96 dB.

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

(29) Connect microwave measurement system **RF OUTPUT** to power meter, using attenuator.

(30) Adjust microwave measurement system frequency for 900 MHz and amplitude for a -10 dBm indication on power meter.

(31) Substitute receiver system for power meter and establish a reference indication on receiver system.

(32) Disconnect microwave measurement system from setup and connect TI **TRANS-RCVR** output to attenuator.

(33) Adjust **BFO-RF LEVEL** control until TI **0-dBm** light just illuminates. Receiver system will indicate between 4 and 16 dB.

(34) Set **HI LEVEL - μVX100-NORM** switch to **μVX100** and adjust **BFO-RF LEVEL** control to **-100 dBm**. Receiver system will indicate between 64 and 76 dB.

(35) Repeat technique of (7) above for **BFO-RF LEVEL** control settings and **FREQUENCY MHz** switch settings at **900 000 0** listed in table 9. Receiver system will indicate within limit specified.

Table 9. Output Level 900 MHz

Test Instrument		Receiver system indications (dB)	
BFO-RF LEVEL control settings	**FREQUENCY MHz** switch settings	Min	Max
80	900 000 0	44	56
90	900 000 0	54	66
110	900 000 0	74	86
120	900 000 0	84	96

(36) Set **HI LVL VX100-NORM** switch to **NORM** and **BFO-RF LEVEL** control to **-80 dBm**. Receiver system will indicate between 84 and 96 dB.

b. **Adjustments.** Adjust A1A1R43 (fig. 3) until receiver system indicates 70 dB (R).

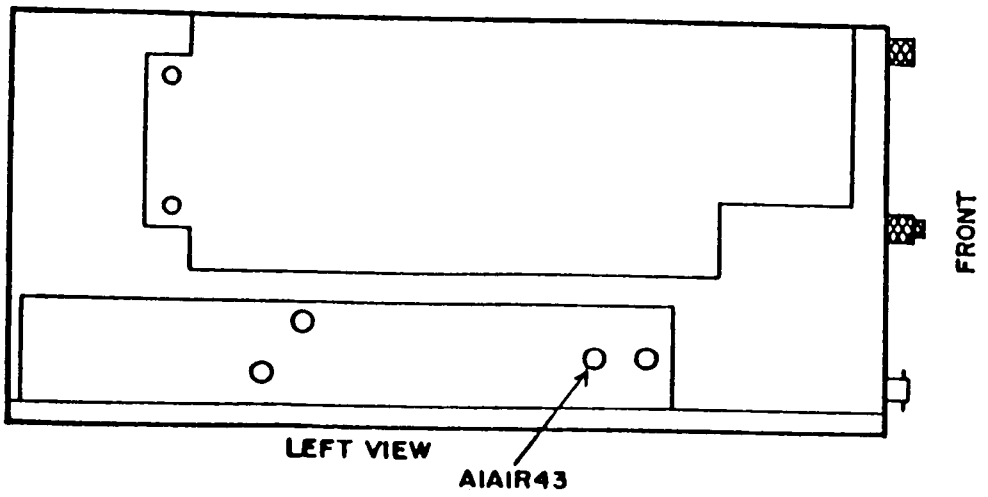

Figure 3. Test instrument - left view.

11. Output Level (Alternate Method)

NOTE

A test report generated in compliance with USATSG Policy Number 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 (A20) RF output to power meter (A13).

(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 (A3) to 80 dB.

(5) Without adjusting signal generator, establish a reference indication on spectrum analyzer (A21).

(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.

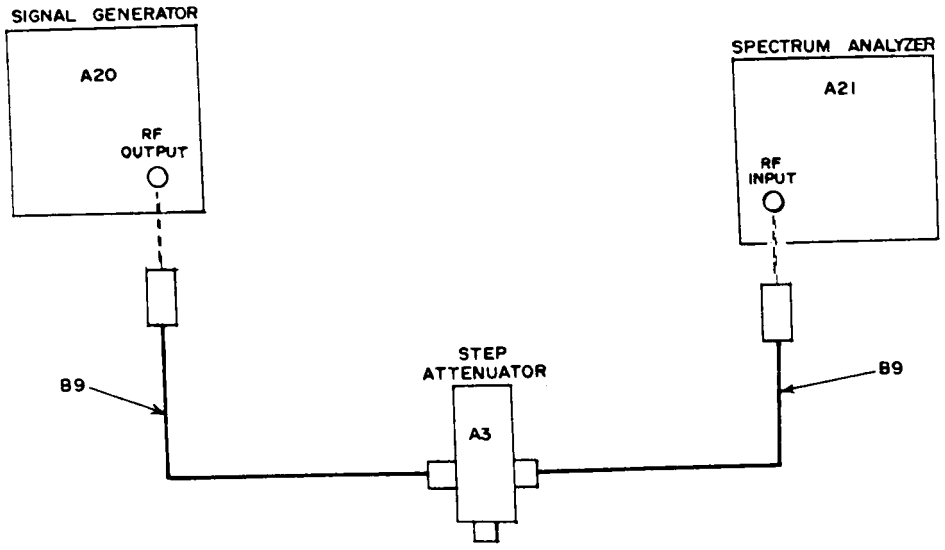

Figure 4. Output level (alternate method).

(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.

(l0) 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 VX100 - 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) for **FREQUENCY MHz** switch settings and spectrum analyzer indications listed in table 11.

Table 11. Frequency Response Indications

Test instrument **FREQUENCY MHz** 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 (A12) **MARKER OUT** to **SCOPE IN**, using cable and termination (B9 and B18).

(3) Set oscilloscope calibrator **TIME/DIV** switch to **1 mS, DEVIATION** switch to **TIME ±10%**, and adjust **TIME/DIV** variable control until **DEVIATION** readout indicates 0.00.

(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 ±l 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 **TIME/DIV** switch settings
10 mS	10 mS
0.1 mS	0.1 mS
10 µS (.01 ms)	10 µS

(6) Connect oscilloscope calibrator (A12) **LEVELED SINE WAVE GENERATOR OUTPUT** to **SCOPE IN,** using cable (012-0482-00) supplied with leveled sine wave generator and termination (B18).

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

(8) Adjust **LEVELED SINE WAVE GENERATOR OUTPUT AMPLITUDE** control for 5 divisions of vertical deflection at .05 MHz.

(9) Increase frequency of **LEVELED SINE WAVE GENERATOR** 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) Set **DEV-VERT V/DIV** outer switch to **1** and **SWEEP** outer control to **1 mS**.

(2) Connect oscilloscope calibrator (A12) **VOLTS OUT** to TI **SCOPE IN**, using cable (B9).

(3) Set oscilloscope calibrator for 1 kHz and 5 V output.

(4) Adjust oscilloscope calibrator **VOLTS/DIV** variable control for 5 divisions of vertical deflection on TI oscilloscope. If oscilloscope calibrator **DEVIATION** readout does not indicate within ±10%, perform **b** below.

(5) Repeat technique of (4) above at switch settings listed in table 13. If **DEVIATION** 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 **VOLTS/DIV** variable control until **DEVIATION** 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 (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 (A20) to **ANTENNA INPUT** using adapter and cable (B2 and B9).

(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).

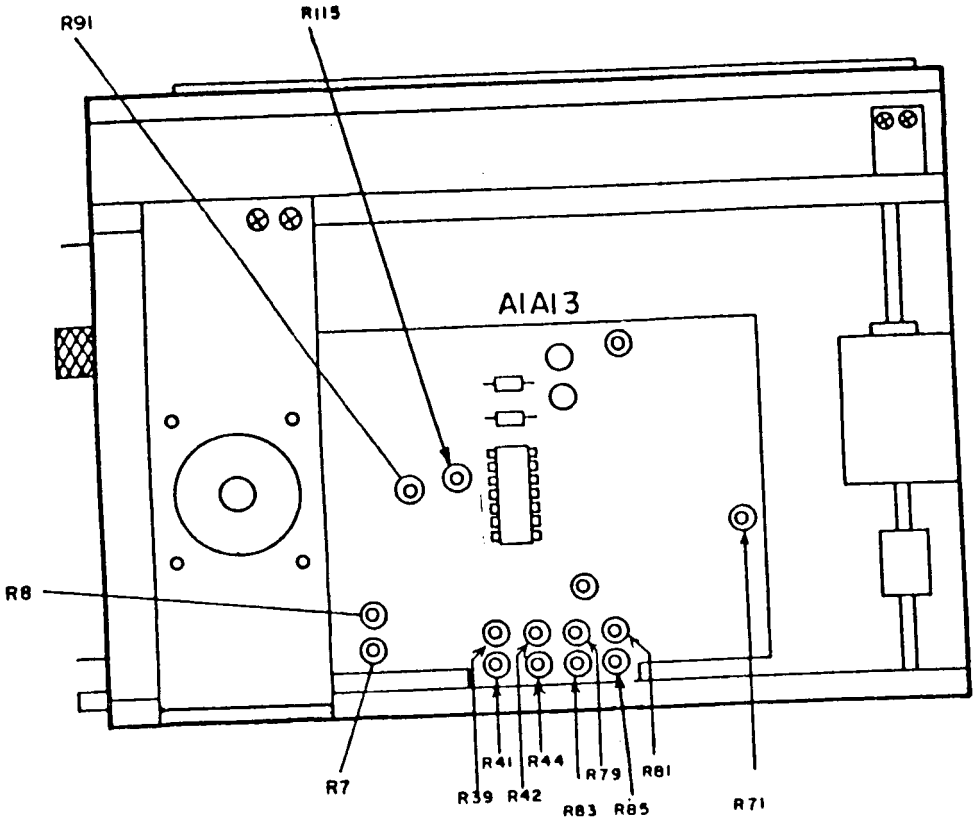

Figure 5. Test instrument - right view.

(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 WIDE BAND GAIN A1A13R7 (fig. 5) until **INPUT LEVEL** lamp (front panel) just illuminates (R)

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

16. Deviation Meter and Residual FM

a. Performance Check

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

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

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

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

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

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

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

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

(4) Set **FREQUENCY MHz** switch to **125.500.0.** Connect modulation analyzer (A10) to **TRANS-RCVP** using cable (B9).

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

(6) Set modulation analyzer (A10) to 125.5 MHz in manual tune mode.

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

(8) Adjust **VAR** control until **DEVIATION (kHz)** meter indicates 2 kHz. If modulation analyzer 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 modulation analyzer 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 modulation analyzer 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 modulation analyzer indicates **2 kHz**. Adjust A1A13R85 (fig. 5) until **DEVIATION (kHz)** meter indicates **2 kHz** (R).

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

(6) Adjust **VAR** control until modulation analyzer 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 (A20) to **ANTENNA INPUT,** using adapter and cable (B2 and B9).

(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

(1) Connect digital voltmeter (A6) to +11 V TP (fig. 1) and chassis ground using adapter and lead (B5 and B13).

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

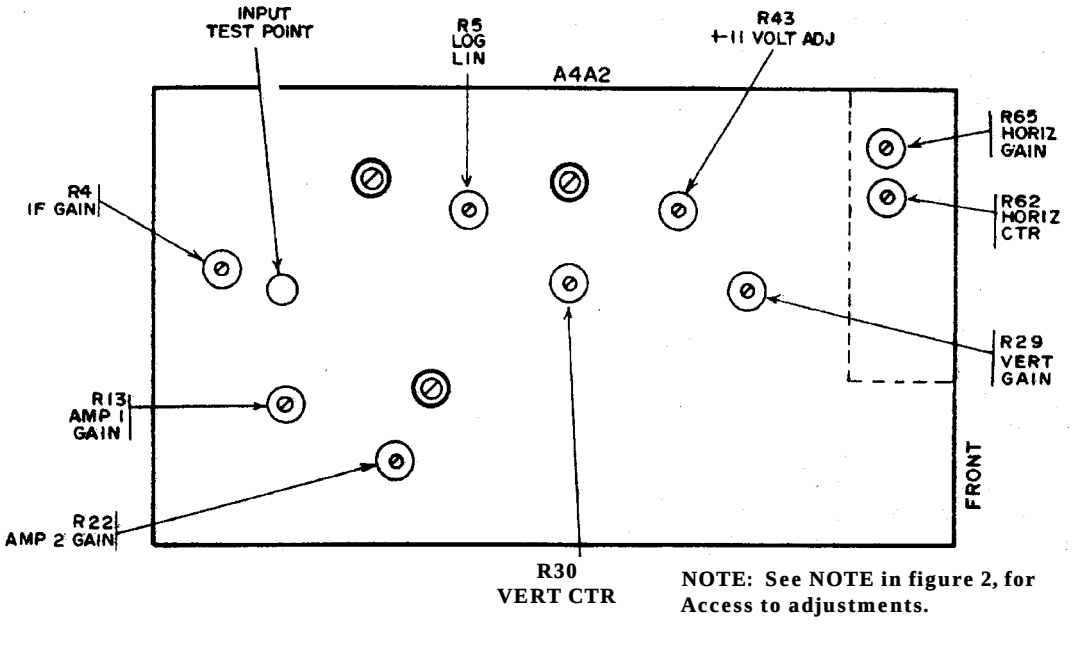

Figure 6. Spectrum analyzer No. 2 - adjustment Locations.

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

(4) Connect oscilloscope (A11) using probe (Bl6) 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 (A20) 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.

(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.

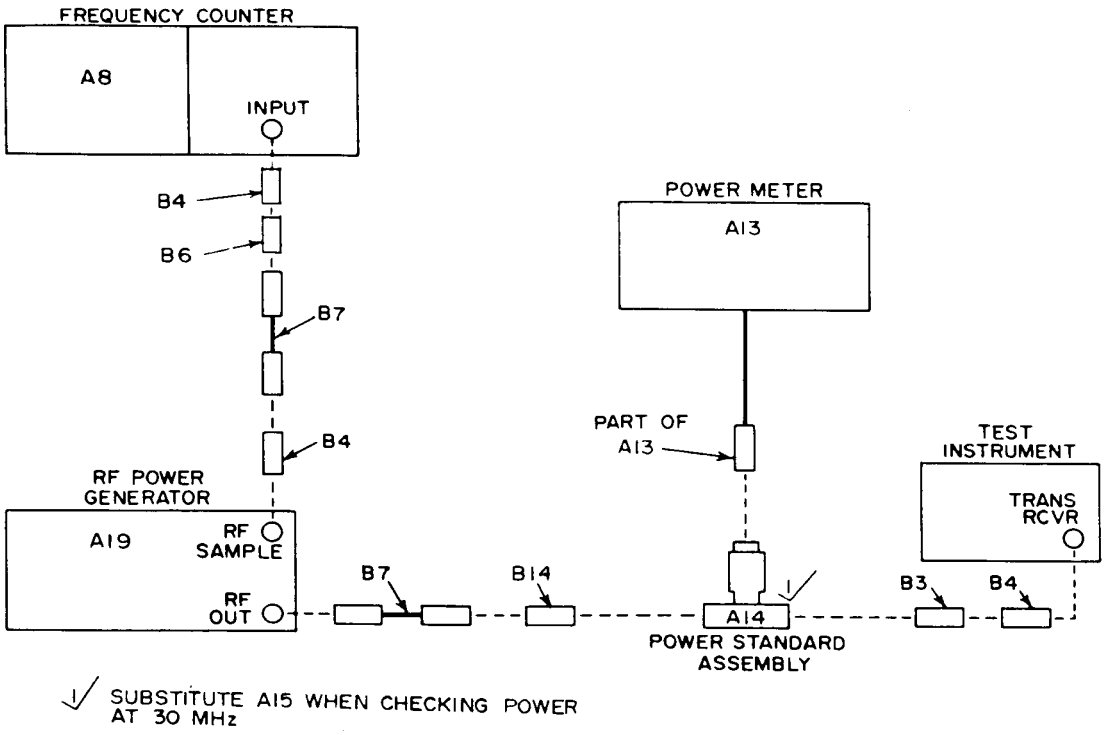

Figure 7. Power meter - equipment setup.

CAUTION

Before energizing or deenergizing RF power generator (A19), 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) Adjust power meter (A13) for null.

(5) Select a frequency of 30 MHz listed on power standard assembly (A14) test report.

(6) Compute power meter reading that corresponds to 4 W, using power standard assembly output calibration factor at 30 MHz.

(7) Adjust RF power generator to 30 MHz.

(8) Adjust RF power generator for full-scale indication on **DEVIATION (kHz) WATTS** meter. If power meter does not indicate within 10 percent of reading computed in (6) above, perform **b**(1) and (2) below.

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

(10) Repeat (6) above, except for 40 W. Record indication.

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

(12) Set **DEV/PWR** switch to **WATTS X100** and repeat (6) above for 50 W. Record indication.

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

(14) Repeat technique of (2) through (13) above at 600 MHz using power standard assembly (A14) in place of power standard assembly (A15).

b. Adjustments

(1) Adjust **RF** power generator for power meter reading computed in **a**(6) above.

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

(3) Adjust **RF** power generator for power meter reading computed in **a**(10) above.

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

(5) Adjust RF power generator for power meter reading computed in **a**(12) 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 digital voltmeter (A6) 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 modulation analyzer (A10) input jack to signal generator (A20) output (set to minimum), using cable and adapter (B9 and B2).

(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 modulation analyzer.

(6) Connect signal generator to TI ANTENNA INPUT jack using attenuator (A2).

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

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

21. MM-100E Multimeter

a. Performance Check

NOTE

The MM-100E multimeter will be referred to as multimeter throughout the check.

CAUTION

Do not exceed 300 V into multimeter INPUT.

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

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

(5) Set multimeter **FUNCTION** switch to **DC+** and **RANGE** switch to **1V**. Connect dc voltage standard (A5) to multimeter **INPUT**, using probe (B17) (set to X1).

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

(7) Repeat technique of (6) above for multimeter **RANGE** switch settings and meter indications listed in table 14. Dc voltage standard will indicate within limits specified.

Table 14. Dc Voltage Check

Multimeter			Dc voltage standard standard indications	
RANGE switch settings	Meter indications			
	0 to 3 Scale	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 dc voltage standard.

CAUTION

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

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

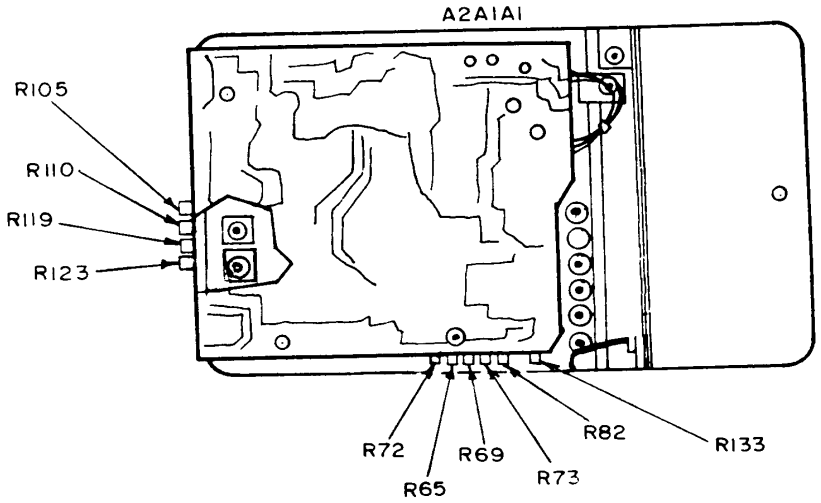

Figure 8. MM-100E multimeter - rear view.

(8) Set multimeter **FUNCTION** switch to **OHMS** and **RANGE** switch to **X1Ω**. If meter does not indicate (infinity), perform **b**(4) below.

(9) Connect resistance standard (A18) to multimeter **INPUT**, using probe (B17) (set to X1).

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

(11) Repeat technique of (10) above for multimeter **RANGE** switch positions and indications listed in table 15. Resistance standard will indicate within limits specified.

Table 15. Resistance Check

Multimeter		Resistance Standard indications (Ω)	
RANGE switch positions	**OHMS** scale indications	Min	Max
X10Ω	30	285	315
X100Ω	30	2850	3150
X1KΩ[1]	30	28.5 k	31.5 k
X10KΩ[1]	30	285 k	315 k

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

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

(13) Connect ac calibrator (A1) to multimeter **INPUT**, using cable (B8).

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

(15) Repeat technique of (14) above for **RANGE** switch settings and ac calibrator frequencies listed in table 16. Ac calibrator will indicate within limits specified.

Table 16. Multimeter Ac Voltage Accuracy.

Multimeter		Ac calibrator indications (V Ac)	
RANGE switch settings (V)	Frequency	Min	Max
.1	1kHz	0.095	0.105
.1	20kHz	0.095	0.105
.3	20kHz	0.285	0.315
.3	50Hz	0.285	.315
1	50Hz	0.95	1.05
1	20kHz	0.95	1.05
3	20kHz	2.85	3.15
3	1kHz	2.85	3.15
3	50Hz	2.85	3.15
10	50Hz	9.5	10.5

Table 16. Multimeter Ac Voltage Accuracy - Continued

Multimeter		Ac calibrator indications (V Ac)	
RANGE switch settings (V)	Frequency	Min	Max
10	20kHz	9.5	10.5
30	20kHz	28.5	31.5
30	50Hz	28.5	31.5
100	50Hz	95	105
300	20kHz	285	315
300	50Hz	285	315

(16) Connect digital voltmeter (A6) to multimeter **INPUT** using cable (B8). Set **PWR-OFF-BATT** switch to **OFF**.

(17) Set multimeter **FUNCTION** switch to **600**. Digital voltmeter will indicate between 504 and 616Ω.

(18) Set multimeter **FUNCTION** switch to positions listed in table 17. Digital voltmeter will indicate within limits specified.

Table 17. Multimeter Ac Load Accuracy

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

(19) Disconnect digital voltmeter from equipment setup. Set **PWR-OFF-BAT** switch to **PWR**.

(20) Connect **INT MOD OUT** to multimeter **INPUT** and distortion analyzer (A7), using adapter and cables (B1, B8, and B9).

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

(22) Adjust **VAR** control until distortion analyzer voltmeter indicates 0.3 V.

(23) Adjust 1 kHz control until multimeter indicates 50 percent distortion (6 dB on SINAD scale)

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

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

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

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

(28) Adjust **1 kHz** control until multimeter indicates 30 percent distortion. If distortion 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.

(29) Set **1 kHz** and **VAR** controls to **OFF**

(30) Connect signal generator (A20) to modulation analyzer (A10) input, using cable and adapter (B9 and B2).

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

(32) Connect signal generator to TI **ANTENNA INPUT** using attenuator (A2). Set **AM-FM** switch to **AM** and set multimeter **RANGE** switch to **AM%**. If 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 dc voltage standard output for a 1.00000 indication. Adjust A2A1A1R69 (fig. 8) for a 1 V indication on multimeter (R).

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

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

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

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

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

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

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

22. Power Supply

NOTE

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

a. Performance Check

(1) Remove battery from TI

(2) Connect decade resistor (B10) across battery terminals.

(3) Set decade resistor for 150Ω.

(4) Connect digital voltmeter (A6) to +18V TP (fig. 8) and chassis ground, using adapter and lead (B5 and B13). If digital voltmeter does not indicate between 17.6 and 18.4 V dc, perform **b**(1) below.

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

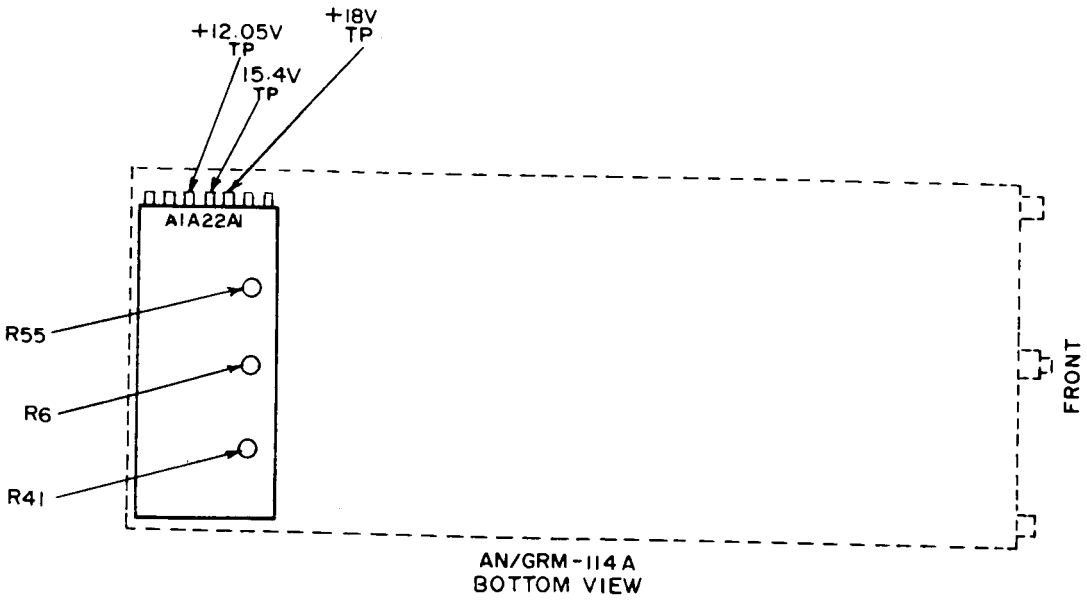

Figure 9. AN/GRM-114A - bottom view.

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

(7) Remove decade resistor from battery terminals.

(8) Connect dc power supply (A16) and digital voltmeter across battery terminals.

(9) Set power supply voltage for a 12 V reading on digital voltmeter.

(10) Slowly reduce dc power supply voltage until TI just shuts off. If digital voltmeter 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 digital voltmeter (R).

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

(3) Adjust A1A22A1R55 (fig. 9) for a 12.05 V indication on digital voltmeter (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:

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General, United States Army
Chief Of Staff

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Brigadier General, United States Army
The Adjutant General

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