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DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

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

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REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

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**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. Forms, records, and reports required for calibration personnel at all levels are prescribed by TB 750-25.

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) ≤100 Hz peak
Residual FM 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
Norm2	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

See footnotes at end of table.

Table 1. Calibration Description – Continued.

Test instrument parameters	Performance specifications
Power monitor: Frequency Power	Range: 1 to 1000 MHz 0 to 4, 0 to 40, and 0 to 400 W Accuracy: $\pm 7\%$ of reading, $\pm 3\%$ FS from 1 to 600 MHz $\pm 20\%$ of reading $\pm 3\%$ FS from 600 to 1000 MHz
Oscilloscope: Vertical bandwidth External vertical input Horizontal sweep	Range: Dc to 1 MHz at 3 dB bandwidth 10 and 100 mV/div; 1 and 10 V/div Accuracy: $\pm 10\%$ 10 and 1 ms/div; 100 and 10 μ s/div
Dual tone generator: Frequency: Variable tone Fixed tone Output level Distortion	Range: 10 to 20 kHz Accuracy: $\pm 0.01\%$ Range: 1 kHz Accuracy: ± 20 Hz 0 to 2.5 V rms minimum either tone into 150 Ω $\leq 1.5\%$ 10 to 100 Hz $\leq 0.7\%$, 100 Hz to 20 kHz $\leq 2\%$, 1 kHz fixed tone
Spectrum analyzer: Dynamic range Dispersion	Range: 70 dB from -30 to -100 dBm Accuracy: ± 4 dB relative to -50 dBm Continuous from ± 0.5 to ± 5 MHz from center frequency (1 to 10 MHz span)
Frequency error meter: Sensitivity	2.0 μ V 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: $\pm 4\%$ reading $\pm 3\%$ FS
MM-100E multimeter: Ac load Ac volts Dc volts	Range: 3.2, 8, 150, 600 Ω and HI-Z (1 M Ω) Accuracy: $\pm 10\%$ Range: 0.1 to 300 V in 8 ranges Accuracy: $\pm 5\%$ FS Frequency: 50 Hz to 20 kHz Range: 0.1 to ± 300 V in 8 ranges Accuracy: $\pm 3\%$ FS
Distortion Sinad Am % Resistance	Range: 0 to 10% and 0 to 30% Accuracy: $\pm 1.5\%$ on 0 to 10% $\pm 3.5\%$ on 0 to 30 Range: 0 to 20 dB Accuracy: ± 1.5 dB Range: 0 to 100% Accuracy: $\pm 10\%$ Range: 0 to 100 M Ω Accuracy: $\pm 5\%$ 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 Sets, AN/GSM-287 and AN/GSM-440, or Secondary Reference Set, NSN 4931-00-621-7878. 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 provided a four-to-one ratio between the standard and TI. Where the four-to-one ratio cannot be met, the actual accuracy of the equipment is shown in parentheses.

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)
ATTENUATOR	Frequency range: 100 to 999 MHz Attenuation: 0 to 80 dB	Hewlett-Packard, Model 355D (355D)
ATTENUATOR (FIXED)	Frequency range: 100 to 999 MHz Attenuation: 20 dB Accuracy: ± 0.625 dB	Weinschel, Model 9918-20dB (9918-20) (9918 Set)
AUDIO ANALYZER	Capability: 0.7 to 50% from 20 to 9999.9 Hz	Boonton, Model 1121 (1121)
AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: $\pm 1\%$	Ridge, Model 9020A (9020A),
CALIBRATOR	Range: 0.095 to 315 V ac Accuracy: $\pm 1.25\%$ Range: 0.097 to 309 V dc Accuracy: $\pm 0.75\%$	Fluke, Model 5720A (5720A) (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 k Hz to 900 MHz Accuracy: $\pm 1.75\%$ Measurement range: 0 to 90 dBm Accuracy: ± 0.625 dB Range: 10 to -10 dBm at 10 MHz to 1 GHz Accuracy: $\pm 2.5\%$	Measuring receiver system N5531S consisting of: Spectrum Analyzer, Agilent Model E4440A (E4440A), Power meter, Agilent Model E4419B (E4419B), or Power meter, Agilent Model N1911A (N1911A) and Sensor modules, Agilent Model N5532A opt. 504 (504), 518 (518), 526 (526)
MULTIMETER	Range: 0 to 16.75 V dc Accuracy: $\pm 0.16\%$ Range: 0.054 to 3.5 V Pac Accuracy: $\pm 1.25\%$ Range: 0 to 600 Ω Accuracy: $\pm 2.5\%$	Hewlett-Packard, Model 3458A (3458A)

Table 2. Minimum Specifications of Equipment Required – Continued.

Common name	Minimum use specifications	Manufacturer and model (part number)
OSCILLOSCOPE	Range: 0.4 V p-p Accuracy: ±3%	Agilent, Model 54831M (OS-303/G)
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 9500B/3200 (9500B/3200)
RESISTANCE STANDARD	Range: 28.5 to 315 kΩ Accuracy: ±1.25%	IET Labs, HARS-LX-9-0.001 (HARS-LX-9-0.001)
RF POWER METER	Frequency: 450 kHz to 1000 MHz Output: 7.5 to 85 W Accuracy: (± 3 %)	Bird, Model 4421 (4421) w/ Directional power sensors, Model 4021 and 4022 (4021 and 4022)
SIGNAL GENERATOR	Range: 100 kHz to 125 MHz Amplitude: 0 to -107 dBm Range: 60% MOD at 1 kHz	Aeroflex, Model 2023B (2023B OPT2/4/11/122)

Table 3. Accessories Required.

Common name	Description (part number)
DC POWER SUPPLY	Kepeco, Model HB525M (7915935)
DECADE RESISTOR	150 Ω Winslow, Model 336 (7907234)
LOW PASS FILTER	Telonic, Model TLC45-4EF
PROBE ¹	X1-X10 probe (supplied with multimeters MM-100E)
RF POWER AMPLIFIER	Ophir RF Inc, Model XRF733 (XRF733)

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 20 are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs 8 through 20. 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.

NOTE

Verify proper CAL FACTORS are loaded for measuring receiver sensor module.

- 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 10 μ V aligns with -87 dBm on **BFO-RF LEVEL** control.

- (20) **BFO-RF LEVEL** control fully cw.
- (21) **HI LVL- μ Vx100-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 TI **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 the first setting in table 4. Frequency counter will indicate within specifications listed in table 4.
- (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
111 111 1	111,111,044	111,111,156
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

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 the first setting in table 5. If frequency counter does not indicate within specifications listed for the first row in table 5 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
01000.0	999.9000	1000.1000
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 the first **MODULATION FREQ Hz** setting listed in table 6. Audio analyzer will indicate within limits specified in table 6.

(12) Repeat technique of (11) above for the remaining **MODULATION FREQ Hz**, **VAR** and **1 kHz** control settings listed in table 6. Audio analyzer will indicate within limits specified.

Table 6. Output Level Distortion.

Mod FREQ Hz	Test instrument		Audio Analyzer
	VAR control	1 kHz control	
01000.0	CW	OFF	≤0.7%
01000.0	CCW	CW	≤2.0%
09999.9	CW	OFF	≤0.7%
00100.0	CW	OFF	≤0.7%
00020.0	CW	OFF	≤1.5%
19999.9	CW	OFF	≤0.7%

(13) Disconnect equipment setup.

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

b. Adjustments

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

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

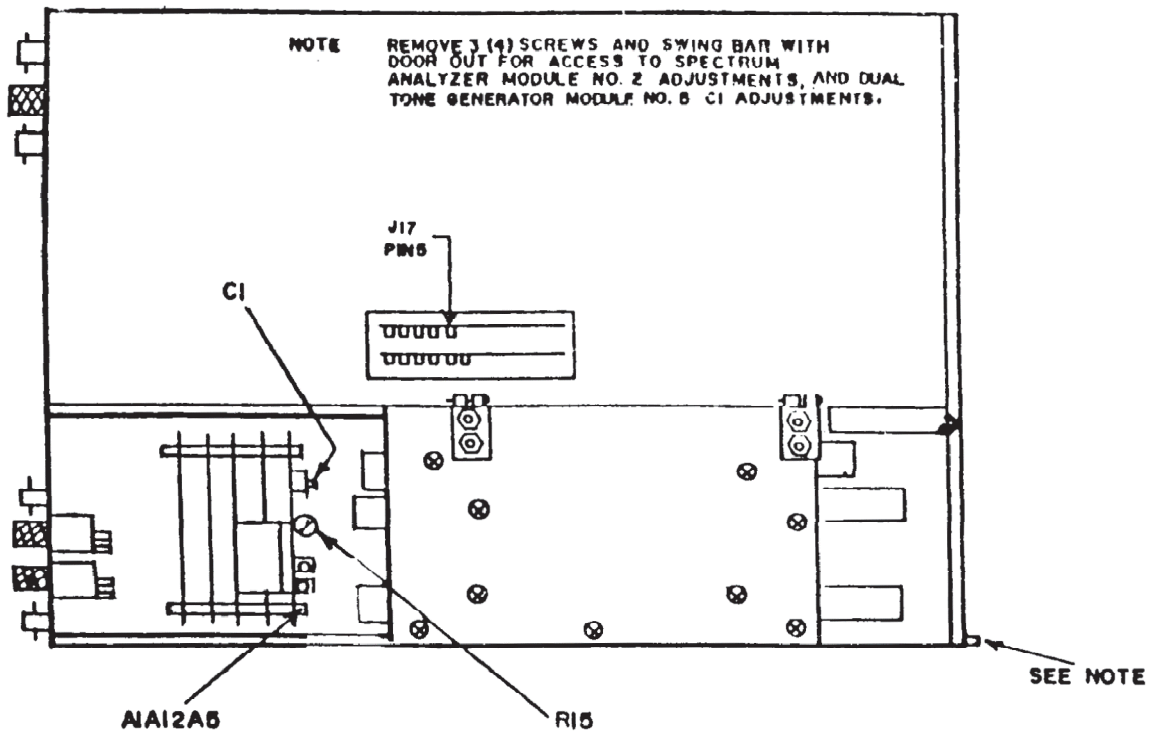


Figure 2. Test Instrument - Bottom View.

10. Output Level

a. Performance Check

- (1) Set **FREQUENCY MHz** switches to **100 000 0** and **HI LVL - μ V X100-NORM** switch to **HI LVL**.
- (2) Adjust **BFO-RF LEVEL** control until TI 0 dBm light just illuminates.
- (3) Configure measuring receiver to measure power. Zero and calibrate measuring receiver sensor module. Connect sensor module to TI **TRANS-RCVR**.
- (4) Set measuring receiver to read frequency and then for tuned RF level measurement.
- (5) Measuring receiver will indicate between -2.5 and +2.5 dB.
- (6) Set **HI LVL - μ VX100-NORM** switch to **μ VX100** and adjust **BFO-RF LEVEL** to the first setting in table 7. If measuring receiver does not indicate within limits specified in first row of table 7 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 7. Measuring receiver will indicate within limits specified.

Table 7. 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
100	100 000 0	-57.5	-62.5
110	100 000 0	-67.5	-72.5
120	100 000 0	-77.5	-82.5

- (8) Set **HI LVL - μ VX100-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 - μ VX100-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 - μ VX100-NORM** switch to **μ VX100** and adjust **BFO-RF LEVEL** control to the first setting in table 8. Measuring receiver will indicate within limits specified in first row of table 8.

(14) Repeat technique of (13) above for **BFO-RF LEVEL** control settings and **FREQUENCY MHz** switch settings at **250 000 0** listed in table 8. Measuring receiver will indicate within limits specified.

Table 8. 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
90	250 000 0	-46	-54
100	250 000 0	-56	-64
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 step (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 the first setting in table 9. Measuring receiver will indicate within limits specified in first row of table 9.

(21) Repeat technique of (20) above for **BFO-RF LEVEL** control settings and **FREQUENCY MHz** switch settings at **500 000 0** listed in table 9. Measuring receiver will indicate within limits specified.

Table 9. 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
90	500 000 0	-44	-56
100	500 000 0	-54	-66
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 - μ VX100-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 - μ VX100-NORM** switch to **μ VX100** and adjust **BFO-RF LEVEL** control to the first setting in table 10. Measuring receiver will indicate within limits specified in first row of table 10.

(28) Repeat technique of (27) above for **BFO-RF LEVEL** control settings and **FREQUENCY MHz** switch settings at **900 000 0** listed in table 10. Measuring receiver will indicate within limits specified.

Table 10. 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
100	900 000 0	-54	-66
110	900 000 0	-64	-76
120	900 000 0	-74	-86

(29) Set **HI LVL - μ VX100-NORM** switch to **NORM** and **BFO-RF LEVEL** control to **-80 dBm**. Measuring receiver will indicate between -74 and -86 dB.

b. Adjustments. Adjust **BFO-RF LEVEL** control to **-100 dBm**. Adjust A1A1R43 (fig. 3) until measuring receiver indicates -60 dB.

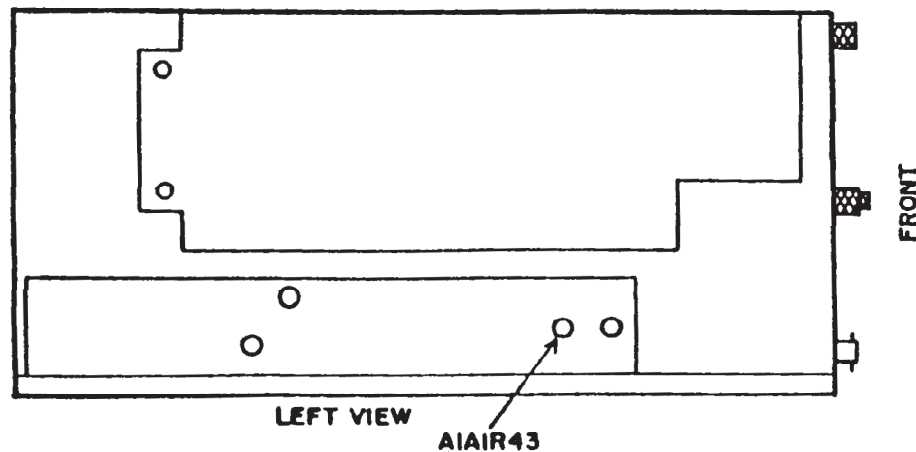


Figure 3. Test Instrument - Left View.

11. 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 adjustments in (1) and (2) below interact. Repeat as necessary for best compromise.

- (1) Adjust SWEEP CAL A4A4R40 (fig. 1) until nine cycles are displayed.
- (2) Adjust SWEEP CAL A4A4R40 slightly until display is synchronized.

12. Oscilloscope Timing and Bandwidth

a. Performance Check

- (1) Set **DEV-VERT V/DIV** outer switch to **1**.
- (2) Connect oscilloscope calibrator to **SCOPE IN**, using a 50 Ω termination.
- (3) Configure oscilloscope calibrator for 1 ms marker 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 13. 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 13. Timing Accuracy.

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

- (6) Configure oscilloscope calibrator for level sine output.
- (7) Set **DEV-VERT V/DIV** outer switch to **.1**.
- (8) Adjust oscilloscope calibrator frequency to 50 kHz and amplitude 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.

13. Oscilloscope Gain

a. Performance Check

- (1) Set oscilloscope calibrator output to off and remove 50 Ω termination. Reconnect to TI **SCOPE IN**.
- (2) Set **DEV-VERT V/DIV** outer switch to **1**, **SWEEP** outer control to **1 mS** and inner control to **CAL** (detent).
- (3) Configure oscilloscope calibrator for a voltage function, 1 kHz, 5 V output.
- (4) Adjust oscilloscope calibrator edit 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.
- (5) Repeat technique of (3) and (4) above at switch settings listed in table 14. If error display readout does not indicate within ±10%, perform **b** below while adjusting for best in-tolerance condition on all ranges.

Table 14. Vertical Accuracy.

Test instrument DEV-VERT V/DIV switch settings (V)	Oscilloscope volts switch settings	
0.01	50	mV
0.1	0.5	V
10	50	V

b. Adjustments

- (1) Adjust oscilloscope calibrator edit 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.

14. 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.
- (2) Adjust A1A13R39 (fig. 5) until **FREQ ERROR** meter indicates 10 kHz.
- (3) Adjust A1A13R44 (fig. 5) for best in-tolerance condition while repeating **a** (1) through (7) above.
- (4) Adjust A1A13R41 (fig. 5) until **FREQ ERROR** meter indicates 4 kHz.
- (5) Adjust A1A13R42 (fig. 5) until **FREQ ERROR** meter indicates 1 kHz.
- (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.
- (9) Set **RCVR WIDE-MID-NARROW** switch to **NARROW**. Adjust A1A13R8 (fig. 5) until **INPUT LEVEL** lamp just illuminates.
- (10) Set **DEV-PWR** switch to **SIG**. Adjust signal generator amplitude to -25 dBm. Adjust A1A13R91 (fig. 5) until **DEVIATION/WATTS** meter indicates FS.
- (11) Repeat (6) through (10) above as necessary.

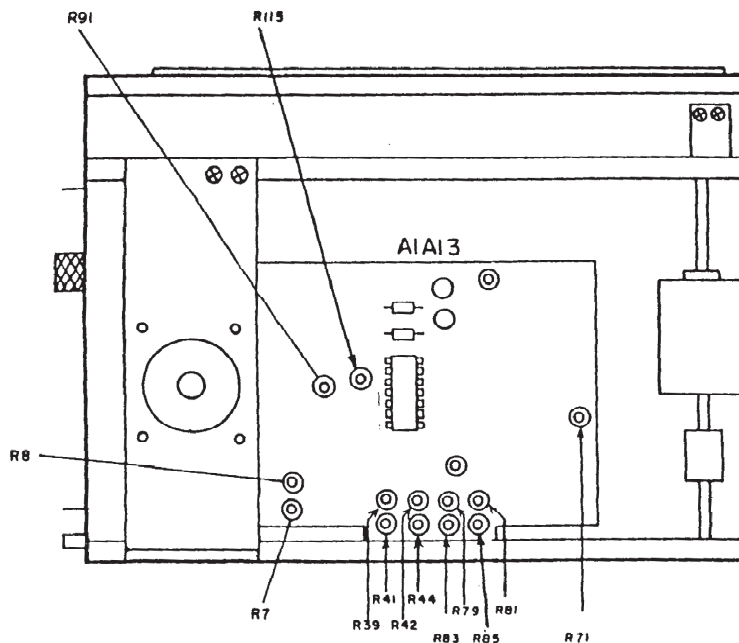


Figure 5. Test Instrument - Right View.

15. 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 - μ X100 - NORM** to **HI LVL**.
 - (e) **DEV-PWR** to **2 kHz**.
- (2) If **DEVIATION (kHz)** meter does not indicate zero \pm 1 minor division, perform **b** (1) through (3) below.
- (3) Set **GEN/RCVR** switch to **GEN**. If **DEVIATION (kHz)** meter does not indicate 0 \pm 1 minor division, perform **b** (1) through (3) below.
- (4) Set **FREQUENCY MHz** switch to **125.500.0**. Connect sensor module 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) Configure measuring receiver 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.
- (2) Set **GEN-RCVR** switch to **GEN** and adjust A1A13R81 (fig. 5) until **DEVIATION (kHz)** meter indicates zero. 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**.
- (5) Adjust **VAR** control until measuring receiver indicates 6 kHz. Adjust A1A13R83 (fig. 5) until **DEVIATION (kHz)** meter indicates **6 kHz**.

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

16. 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.
- (3) Adjust VERT CTR A4A2R30 (fig. 6) until bottom of trace indicates -109 dBm.
- (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.
- (7) Adjust VERT GAIN A4A2R29 (fig. 6) for -30 dBm indication on TI.
- (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.
- (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.

- (14) Adjust signal generator amplitude for -90 dBm.
- (15) Adjust AMP 2 GAIN A4A2R22 (fig. 6) for a -90-dBm indication on TI.
- (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) above until no further adjustments are required.

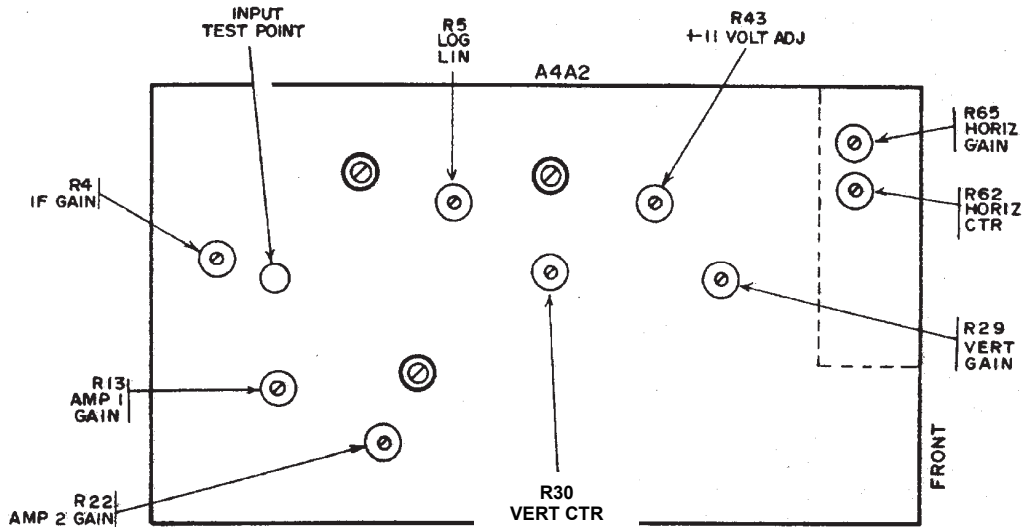


Figure 6. Spectrum Analyzer No. 2 - Adjustment Locations.

17. 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.

(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.

(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.

(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.

(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.

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

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

18. 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.

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

(4) Adjust signal generator to 30 MHz.

(5) Adjust signal generator amplitude control and RF gain control on the RF power amplifier for full-scale indication on **DEVIATION (kHz) WATTS** meter. If RF power meter does not indicate $4\text{ W} \pm 10$ percent perform **b** (1) and (2) below.

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

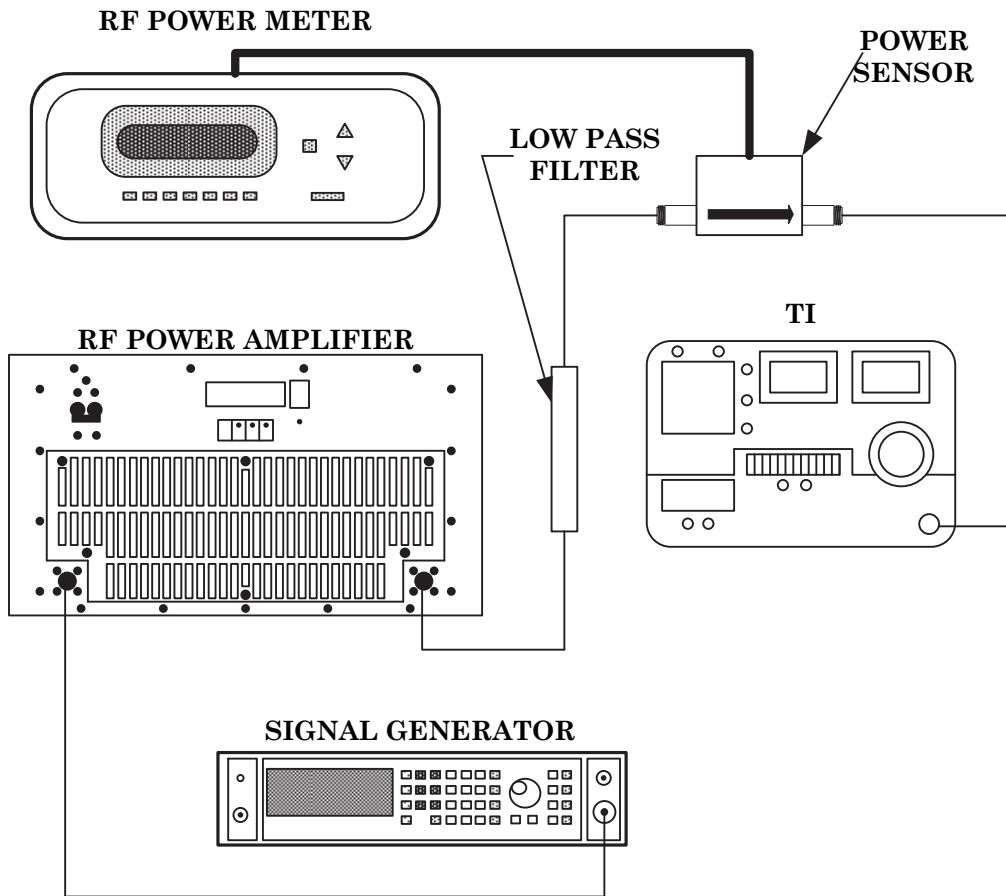


Figure 7. Power Meter - Equipment Setup.

(7) Adjust signal generator and RF power amplifier for a 40 W indication on **DEVIATION (kHz) WATTS** meter. If RF power meter does not indicate 40 W ± 10 percent perform **b** (3) and (4) below.

(8) Adjust output power to **0** and set **DEV/PWR** switch to **WATTS X100**.

(9) Adjust signal generator and RF power amplifier for a 50 W indication on **DEVIATION (kHz) WATTS** meter. If RF power meter does not indicate 50 W ± 31 percent perform **b** (5) below.

(10) Set signal generator and RF power amplifier outputs to minimum and repeat technique of (4) through (9) above at 600 MHz.

b. Adjustments

(1) Adjust signal generator and RF power amplifier for RF power meter reading in **a** (5) above.

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

(3) Adjust signal generator and RF power amplifier for RF power meter reading in **a** (7) above.

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

(5) Adjust signal generator and RF power amplifier for RF power meter reading in **a** (9) above. Adjust A1A14R91 (fig. 1) until **DEVIATION (kHz) WATTS** meter indicates **50 W**.

19. 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 (fixed).

(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.

20. MM-100E Multimeter

a. Performance Check

CAUTION

Do not exceed 300 V into TI multimeter INPUT.

NOTE

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

(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 within limits specified in first row of table 15, perform **b (3)** below.
- (8) Repeat technique of (7) above for settings and indications listed in table 15. Calibrator will indicate within limits specified in table 15.

Table 15. Dc Voltage Check.

RANGE switch settings	TI multimeter Meter indications		Calibrator indications (Vdc)	
	0 to 3 scale	0 to 10 scale	Min	Max
1	---	10	0.97	1.03
.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.

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

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.

- (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 within limits specified in first row of table 16, perform **b (5)** below.
- (12) Repeat technique of (11) above for settings and indications listed in table 16. Resistance standard will indicate within limits specified in table 16.

Table 16. Resistance Check.

TI multimeter		Resistance standard indications (Ω)	
RANGE switch positions	OHMS scale indications	Min	Max
X1 Ω	30	28.5	31.5
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.

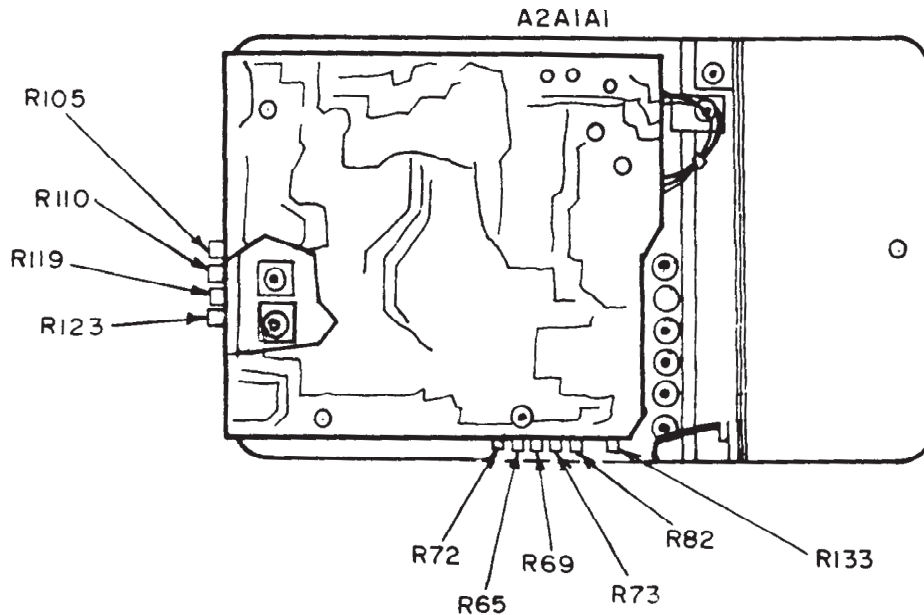


Figure 8. MM-100E Multimeter - Rear View.

- (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 within limits specified in first row of table 17, perform **b** (6) below.
- (16) Repeat technique of (15) above for remaining settings and indications listed in table 17. Calibrator will indicate within limits specified in table 17.

Table 17. Ac Voltage Accuracy.

TI multimeter RANGE switch settings		Calibrator indications (V Ac)	
(V)	Frequency	Min	Max
1	1 kHz	0.95	1.05
0.1	1 kHz	0.095	0.105
0.1	20 kHz	0.095	0.105
0.3	20 kHz	0.285	0.315
0.3	50 Hz	0.285	0.315
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 the first setting in table 18. Multimeter will indicate within limits specified in first row of table 18.

(19) Repeat technique of (18) above for settings and indications listed in table 18. Multimeter will indicate within limits specified in table 18.

Table 18. Ac Load Accuracy.

TI Multimeter FUNCTION switch settings	Multimeter (Ω)	
	Min	Max
600	504	616
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 **INPUT HIGH**.

(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 (fixed). 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.

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

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

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

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

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

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

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

21. 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.

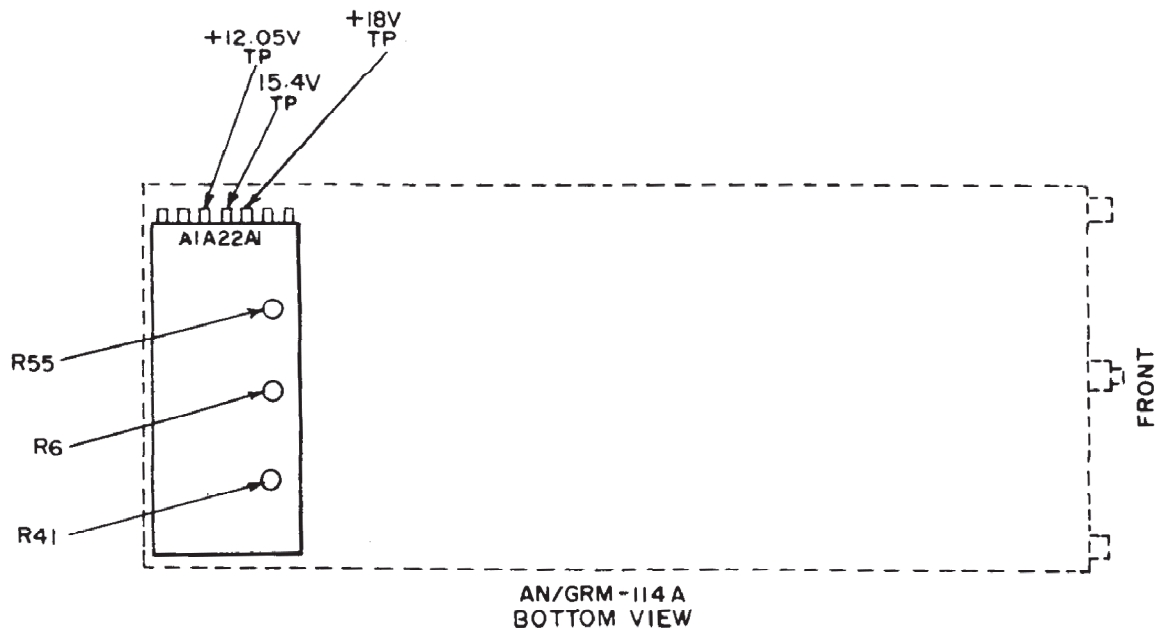


Figure 9. AN/GRM-114A - Bottom View.

- (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.
- (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 dc 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.
- (2) Adjust A1A22A1R6 (fig. 9) for a 15.4 V indication on multimeter.
- (3) Adjust A1A22A1R55 (fig. 9) for a 12.05 V indication on multimeter.
- (4) Adjust A1A14R22 (fig. 1) for a TI cutoff voltage of 11 V dc.

22. Final Procedure

- a.** Deenergize and disconnect all equipment and reinstall TI protective cover.
- b.** Annotate and affix DA label/form in accordance with TB 750-25.

By Order of the Secretary of the Army:

Official:

Handwritten signature of Gerald B. O'Keefe in black ink.

GERALD B. O'KEEFE
*Administrative Assistant to the
Secretary of the Army*

1411406

RAYMOND T. ODIERNO
*General, United States Army
Chief of Staff*

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To: <2028@redstone.army.mil

Subject: DA Form 2028

1. **From:** Joe Smith
2. **Unit:** home
3. **Address:** 4300 Park
4. **City:** Hometown
5. **St:** MO
6. **Zip:** 77777
7. **Date Sent:** 19-OCT-93
8. **Pub no:** 55-2840-229-23
9. **Pub Title:** TM
10. **Publication Date:** 04-JUL-85
11. **Change Number:** 7
12. **Submitter Rank:** MSG
13. **Submitter FName:** Joe
14. **Submitter MName:** T
15. **Submitter LName:** Smith
16. **Submitter Phone:** 123-123-1234
17. **Problem:** 1
18. **Page:** 2
19. **Paragraph:** 3
20. **Line:** 4
21. **NSN:** 5
22. **Reference:** 6
23. **Figure:** 7
24. **Table:** 8
25. **Item:** 9
26. **Total:** 123
27. **Text**

This is the text for the problem below line 27.