*TB 9-6625-1999-35

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR SIGNAL GENERATOR AN/GRM-50 (SG-479/U) and AN/GRM-50B (SG-479B/U)

Headquarters, Department of the Army, Washington, DC
3 November 2004

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also provide DA Form 2028 information to AMCOM via e-mail, fax, or the World Wide Web. Our fax number is DSN 788-6546 or Commercial 256-842-6546. Our e-mail address is: 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual. For the World Wide Web, use https://amcom2028.redstone.army.mil.

*This technical bulletin supersedes TB 9-6625-1999-35, dated 18 July 1986, including all changes.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Signal Generator AN/GRM-50 (SG-479/U) and AN/GRM-50B (SG-497B/U). The manufacturer's manual, TM 11-6625-573-14 and TM 11-6625-573-14-1 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. Variations among models are described in text, tables and figures.

b. Time and Technique. The time required for Sections III and IV is approximately 4 hours each, using the dc and low frequency technique.

2. Forms, Records, and Reports

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

b. Adjustments to be reported are designated (R) at the end of the sentence in which they appear. When adjustments are in tables, the (R) follows the designated adjustment. Report only those adjustments made and designated with (R).

3. Calibration Description. TI parameters and performance specifications which pertain to this calibration are listed in table 1.

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Audio oscillator	Range: 400 and 1000 Hz Accuracy: ±5%
Carrier zero	<80 mV p-p over entire range
Crystal calibrator	Range: 100 kHz and 1 MHz Accuracy: ±0.01%

Table 1. Calibration Description - Continued

Test instrument parameters	Performance specifications
Frequency	Range: 50 kHz to 65 MHz Accuracy: ±1% Drift: 50 parts 10^6 during a 10 minute interval
Maximum carrier set	≥1.05 V rms over entire range
Modulation	Range: 0 to 100% Accuracy: ±5% FS for modulation frequencies to 10 Hz Distortion: <1%
RF output	Within ±1 dB into 50 Ω over entire frequency range at any voltage setting

SECTION II
EQUIPMENT REQUIREMENTS

4. Equipment Required. Table 2 identifies the specific equipment to be used in this calibration procedure. This equipment is issued with Secondary Transfer Calibration Standards Set AN/GSM-286; AN/GSM-287; and AN/GSM-705. Alternate items may be used by the calibrating activity. The items selected must be verified to perform satisfactorily prior to use and must bear evidence of current calibration. The equipment must meet or exceed the minimum use specifications listed in table 2. The accuracies listed in table 2 provide a four-to-one ratio between the standard and TI. Where the four-to-one ratio cannot be met, the actual accuracy of the equipment selected is shown in parenthesis.

5. Accessories Required. The accessories required for this calibration are common usage accessories issued as indicated in paragraph **4** above, and are not listed in this calibration procedure.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
AUDIO ANALYZER	Range: 400 Hz and 1 kHz Capability: <1% distortion	Boonton, Model 1121 (1121)
AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: ±1%	Ridge, Model 9020A (9020A)
FREQUENCY COUNTER	Range: 380 Hz to 65.650 MHZ Accuracy: 0.0025%	Fluke, Model PM6681/656 (PM6681/656)
MEASURING RECEIVER	Modulation: 45 to 95% Accuracy: ±2%	Hewlett-Packard, Model 8902A w/sensor, Hewlett-Packard, Model 11722A (11722A)
MULTIMETER	Range: -208 to +312 V dc and 3.2 V ac Accuracy: ±1%	Fluke, Model 8840A/AF05 (AN/GSM-64D)
OSCILLOSCOPE	Range: 50 to 80 mV/div Accuracy: ±3%	(OS-303/G)
TRUE RMS VOLMETER	Range: 0.8 to 1.05 V ac Accuracy: ±2.5%	Fluke, Model 8922A/AA (8922A/AA)

SECTION III
CALIBRATION PROCESS FOR AN/GRM-50 (SG-479/U)

6. Preliminary Instructions

a. The instructions outlined in paragraphs **6** and **7** are preparatory to the calibration process. Personnel should become familiar with the applicable sections before beginning the calibration.

b. Items of equipment used in this procedure are referenced within the text by common name as listed in table 2.

c. Unless otherwise specified, verify the result of each test and, whenever the test requirement is not met, take corrective action before continuing with the calibration. Adjustments required to calibrate the TI are included in this procedure. Additional maintenance information is contained in the manufacturer's manual for this TI.

d. When indications specified in paragraphs **8** through **15** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **8** through **15**. Do not perform power supply check if all other parameters are within tolerance.

e. Unless otherwise specified, all controls and control settings refer to the TI.

7. Equipment Setup

WARNING

HIGH VOLTAGE is used or exposed during the performance of this calibration. DEATH ON CONTACT may result if personnel fail to observe safety precautions. REDUCE OUTPUT(S) to minimum after each step within the performance checks where applicable.

a. Remove protective cover from TI only when necessary to make adjustments. Replace cover after completing the adjustments.

b. Connect autotransformer to TI.

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

d. Set **POWER** switch to **ON** and allow at least 20 minutes for equipment to warm-up and stabilize.

e. Set **POWER** switch to off (down) and wait 30 seconds.

f. If necessary, adjust mechanical zero adjust screws for a zero indication on **R.M.S. VOLTS** and **PERCENT MODULATION** meters.

g. Set **POWER** switch to **ON** and allow 2 hours for equipment to warm-up and stabilize.

8. Audio Oscillator

a. Performance Check

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

(a) **RANGE** switch to **530 - 1800 KC**.

(b) **MODULATION AMPLITUDE** control fully ccw.

(c) **MODULATION SELECTOR** switch to **INT 400 ~**.

(2) Connect frequency counter to **MODULATION INPUT-OUTPUT**. If frequency counter does not indicate between 380 and 420 Hz, perform **b** below.

(3) Set **MODULATION SELECTOR** switch to **1000 ~**. If frequency counter does not indicate between 950 and 1050 Hz, perform **b** below.

(4) Vary autotransformer output between 105 and 125 V ac and back to 115 V ac. Frequency counter will indicate between 950 and 1050 Hz.

b. Adjustments

(1) Connect multimeter between **A1T1 AUDIO TRANSFORMER** (yellow lead on tie point) (fig. 1) and chassis ground.

(2) Adjust **MOD OSC SET R51** (fig. 1) for a 3.2 V ac indication on multimeter (R).

(3) Repeat **a** above.

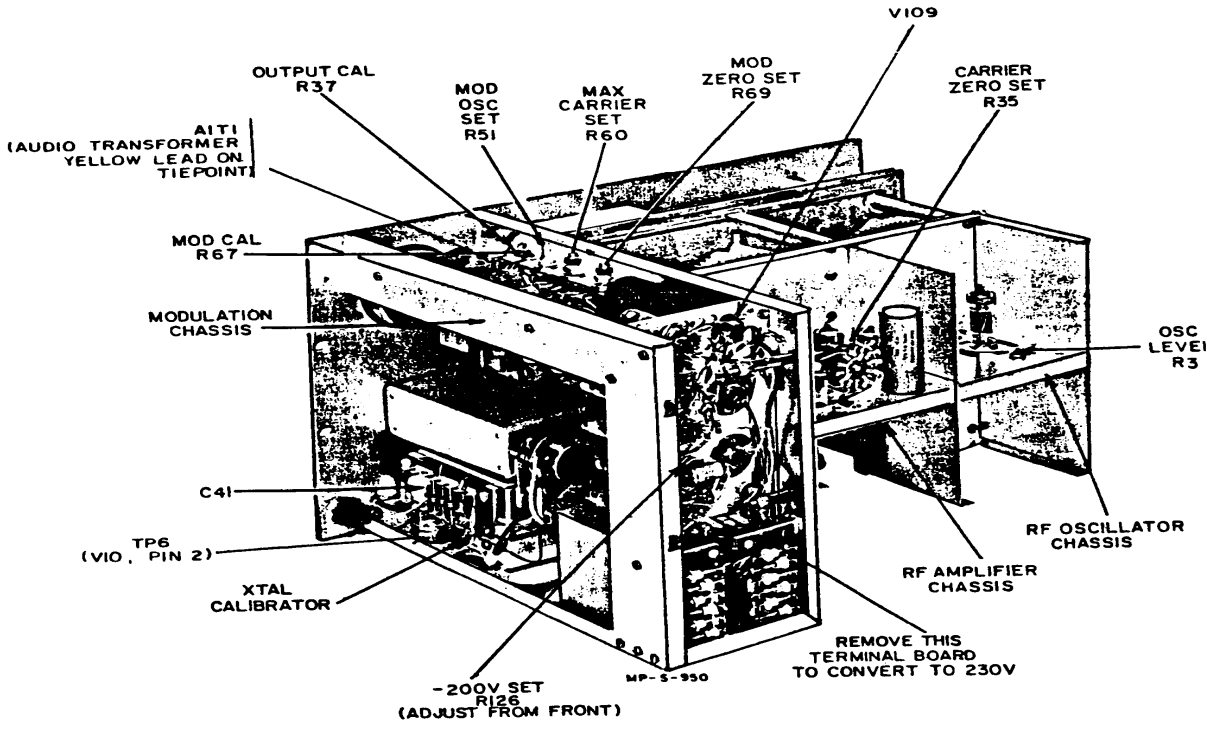

Figure 1. Test instrument - overall view.

9. Crystal Calibrator

a. Performance Check

(1) Connect frequency counter to **pin 2** of **V10** (fig. 1) and chassis ground.

(2) Set **CRYSTAL CALIBRATOR** switch to **1MC**. If frequency counter does not indicate between 999.900 and 1000.100 kHz, perform **b** below.

(3) Set **CRYSTAL CALIBRATOR** switch to **100 kHz**. If frequency counter does not indicate between 99.990 and 100.010 kHz, perform **b** below.

(4) Set **CRYSTAL CALIBRATOR** switch to **OFF**.

b. Adjustments. Adjust **C41** (fig. 1) for best compromise between allowable limits in **a** (2) and (3) above (R).

10. Frequency Dial Accuracy and Drift

a. Performance Check

(1) Connect frequency counter to **RF Output 50 Ω**.

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

(a) **MODULATION SELECTOR** switch to cw.

(b) **ATTENUATOR** switch to **.3 VOLTS**.

(c) **ATTENUATOR VERNIER** control for a full-scale indication on **R.M.S. VOLTS** meter.

(d) **CALIBRATE** control to align cursor to **FREQUENCY** centerline.

(3) Position controls to settings listed in table 3. Frequency counter will indicate within limits specified.

(4) Set **RANGE** switch to **530KC-1800KC** and adjust **FREQUENCY** dial for a 1 MHz indication on frequency counter. Wait 1 minute and record frequency counter indication.

(5) Wait an additional 10 minutes and read frequency counter. Frequency counter will indicate within 50 Hz of value recorded in (4) above.

Table 3. Frequency Dial Accuracy

Test instrument		Frequency counter indications	
RANGE switch settings	**FREQUENCY** dial settings	Min	Max
50KC - 170KC	50	49.5 kHz	50.5 kHz
	70	69.3 kHz	70.7 kHz
	90	89.1 kHz	90.9 kHz
	120	118.8 kHz	121.1 kHz
	150	148.5 kHz	151.5 kHz
	170	168.3 kHz	171.7 kHz
165KC - 560KC	560	554.4 kHz	565.6 kHz
	360	356.4 kHz	363.6 kHz
	165	163.35 kHz	166.65 kHz

Table 3. Frequency Dial Accuracy - Continued

Test instrument		Frequency counter indications	
RANGE switch settings	**FREQUENCY** dial settings	Min	Max
530KC - 180KC	530	524.7 kHz	535.3 kHz
	1200	118.0 kHz	1212.0 kHz
	1800	1782.0 kHz	1818.0 kHz
1.76MC-6.0MC	6.0	5.940 MHz	6.060 MHz
	4.0	3.960 MHz	4.040 MHz
	1.76	1.7424 MHz	1.776 MHz
5.8MC - 19.2MC	5.8	5.742 MHz	5.858 MHz
	12	11.880 MHz	12.120 MHz
	19.2	19.008 MHz	19.392 MHz
19MC - 65MC	65	64.350 MHz	65.650 MHz
	40	39.6 MHz	40.40 MHz
	19	18.810 MHz	19.190 MHz

b. Adjustments. No adjustments can be made.

11. Carrier Zero Set

a. Performance Check

(1) Connect oscilloscope to **RF OUTPUT 50 Ω**, using termination.

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

(a) **RANGE** switch to **50-170KC**.

(b) **ATTENUATOR VERNIER** control fully ccw.

(c) **ATTENUATOR** switch to **1.0 V**.

(d) **MODULATION SELECTOR** switch to **EXT DC**.

(e) **MODULATION AMPLITUDE** control fully ccw.

(3) Adjust oscilloscope vertical gain for calibrated 50 mV per division and horizontal sweep speed for a free-running condition so that indication will not disappear for lack of sync signal

(4) Slowly adjust TI output frequency over range. If oscilloscope peak-to-peak amplitude indication not less than 80 mV over entire range, perform **b** below.

(5) Repeat (4) above for remaining **RANGE** switch settings up to 10 MHz.

b. Adjustments

(1) Remove shield assembly from RF oscillator-RF amplifier portion of TI.

(2) Adjust TI output frequency control to frequency where amplitude is 80 mV or greater.

(3) Adjust **CARRIER ZERO SET R35** (fig. 1) until oscilloscope indication is slightly increased, then slowly adjust in opposite direction until oscilloscope indication just collapses (R).

(4) Repeat **a** above.

NOTE

Do not install RF oscillator-RF amplifier shield assembly until directed.

12. Maximum Carrier Set and Modulation Zero Set

a. Performance Check

(1) Connect true rms voltmeter to **RF OUTPUT 50Ω**.

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

(a) **MODULATION SELECTOR** switch to **EXT. AC**.

(b) **ATTENUATOR** switch to **1.0 VOLTS**.

(c) **RANGE** switch to **50-170KC**.

(d) **ATTENUATOR VERNIER** control for fully cw.

(3) Set frequency to 50 kHz and tune at a moderate speed over range to 170 kHz. Tune frequency control over each band up to 10 MHz. If true rms voltmeter does not indicate 1.05 V or greater throughout tuning range, perform **b** below.

(4) Set **MODULATION SELECTOR** switch to cw. If voltage indication on true rms voltmeter changes, perform **b** below.

(5) Adjust **MODULATOR AMPLITUDE** control throughout range. If true rms voltmeter indicates a voltage change, perform **b** below.

b. Adjustments

(1) Adjust output frequency to range and frequency having lowest output voltage.

(2) Set **MODULATION SELECTOR** switch to **CW**.

(3) Adjust **MAX CARRIER SET R60** (fig. 1) for a 1.05 V indication on true rms voltmeter.

(4) Set **MODULATION SELECTOR** switch to **EXT. AC**. If a voltage change is indicated on true rms voltmeter, adjust **MOD ZERO SET R69** (fig. 1) for a 1.05 V indication on true rms voltmeter.

(5) Repeat **a** (3) and (4) above. If necessary, slightly readjust **R60**.

(6) Repeat (1) through (5) above until RF output is 1.05 V or greater over entire frequency range and there is no change in output voltage when **MODULATION SELECTOR** switch is set from **EXT. AC** to **CW**.

13. Modulation Meter Accuracy

a. Performance Check

(1) Connect **RF OUTPUT 50 Ω** to measuring receiver.

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

(a) **RANGE** switch to **530KC-1800KC**.

(b) **FREQUENCY** dial to **1000KC**.

(c) **MODULATION SELECTOR** switch to **INT. 1000~**.

(d) **MODULATION AMPLITUDE** control for a 50 percent modulation indication on **PERCENT MODULATION** meter.

(e) **ATTENUATOR VERNIER** control for 1 V on **R.M.S. VOLTS** meter.

(3) If measuring receiver does not indicate between 45 and 55 percent modulation, perform **b** below.

(4) Adjust **MODULATION AMPLITUDE** control for 90 percent modulation indication on **MODULATION** meter. If measuring receiver does not indicate between 85 and 95 percent modulation, perform **b** below.

b. Adjustments

(1) Adjust **MODULATION AMPLITUDE** control for a 50 percent indication on measuring receiver. Adjust **MOD CAL R67** (fig. 1) for a 50 percent indication on **PERCENT MODULATION** meter (R).

(2) Adjust **ATTENUATOR VERNIER** control for a 0.2 V indication on R**.M.S. VOLTS** meter. If measuring receiver does not indicate between 45 and 55 percent modulation, adjust **CARRIER ZERO SET R35** (fig. 1) for 50 percent modulation on measuring receiver (R).

(3) Repeat **a** above.

NOTE

If **CARRIER ZERO SET R35** was adjusted in (2) above, repeat paragraphs **11** and **12** above.

14. Modulation Output Distortion

a. Performance Check

NOTE

Reinstall RF oscillator-RF amplifier shield assembly if removed in **11 b** above.

(1) Connect audio analyzer input to **MODULATION INPUT-OUTPUT**.

(2) Set **MODULATION SELECTOR** switch to **INT. 1000~**. Audio analyzer will indicate less than 1 percent distortion.

(3) Set **MODULATION SELECTOR** switch to **INT. 400~**. Audio analyzer will indicate less than 1 percent distortion.

b. Adjustments. No adjustments can be made.

15. RF Output, Response and Attenuator Accuracy

a. Performance Check

(1) Connect true rms voltmeter to **RF OUT 50 Ω**.

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

(a) **MODULATION SELECTOR** switch to **CW**.

(b) **ATTENUATOR** switch to **1.0 VOLTS**.

(c) **ATTENUATOR VERNIER** control for a 0.9 V indication on **R.M.S. VOLTS** meter.

(3) Set **RANGE** switch and adjust **FREQUENCY** controls throughout all frequency ranges up to 10 MHz while maintaining 0.9 V indication on R.M.S. VOLTS meter. If true rms voltmeter does not indicate between 0.8 and 1.0 V throughout frequency range, perform **b** below.

(4) Connect measuring receiver to **RF OUT 50 Ω**.

(5) Perform technique of step **a** (3) above for the remaining frequencies and ranges. If measuring receiver does not indicate between 0.8 and 1.0 V throughout frequency range, perform **b** below.

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

(a) **MODULATION SELECTOR** switch to **CW**.

(b) **RANGE** switch to **19MC-65MC**.

(c) **FREQUENCY** dial to **65MC**.

(7) Adjust **ATTENUATOR VERNIER** control while observing **R.M.S. VOLTS** meter. Meter pointer will sweep full range of meter.

(8) Set **ATTENUATOR** switch to **+20 DBM**.

(9) Adjust **ATTENUATOR VERNIER** control for a 0 dBm indication on **R.M.S. VOLTS** meter. Measuring receiver will indicate between 19 and 21 dB.

NOTE

If necessary, adjust **ATTENUATOR VERNIER** control to maintain a 0 (zero) DBM indication on **R.M.S. VOLTS** meter during remainder of check.

(10) Repeat technique of step (9) above for **ATTENUATOR** switch settings in table 4. Measuring receiver will indicate within limits specified. If not, perform **b** below.

Table 4. Attenuator Accuracy

Attenuator switch setting	Measuring receiver indication (dB)	
	Min	Max
+10	9	11
0	-1	1
-10	-11	-9
-20	-21	-19
-30	-31	-29
-40	-41	-39
-50	-51	-49
-60	-61	-59
-70	-71	-69
-80	-81	-79
-90	-91	-89
-100	-101	-99
-110	-111	-109

b. Adjustments

(1) Repeat **a** (3) above and determine average of maximum and minimum output voltage indications on true rms voltmeter. Record average value.

(2) Set **RANGE** switch and adjust **FREQUENCY** controls to a frequency that gives an output voltage indication equaling value recorded in (1) above on true rms voltmeter.

(3) Adjust **ATTENUATOR VERNIER** control for a 0.9 V indication on true rms voltmeter.

(4) Adjust **OUTPUT CAL R37** (fig. 1) for a 0.9-V indication on **R.M.S. VOLTS** meter (R).

(5) Repeat **a** above.

16. Power Supply

a. Performance Check

(1) Set **POWER** switch to off.

(2) Connect multimeter between **pin 2 of V109** (fig. 1) and chassis ground.

(3) Set **POWER** switch to **ON** and allow 10 minutes for warm-up and stabilization. If multimeter does not indicate between -192 and -208 V dc, perform **b** below.

b. Adjustment. Adjust **-200 V SET R126** (fig. 1) for a –200 V dc indication on multimeter (R).

17. Final Procedure

a. Deenergize and disconnect all equipment.

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

SECTION IV
CALIBRATION PROCESS FOR AN/GRM-50B (SG-479B/U)

18. Preliminary Instructions

a. The instructions outlined in paragraphs 18 and 19 are preparatory to the calibration process. Personnel should become familiar with Sections I, II, and IV before beginning the calibration.

b. Items of equipment used in this procedure are referenced within the text by common name as listed in table 2.

c. Unless otherwise specified, verify the result of each test and, whenever the test requirement is not met, take corrective action before continuing with the calibration. Adjustments required to calibrate the TI are included in this procedure. Additional maintenance information is contained in the manufacturer's manual for this TI.

d. When indications specified in paragraphs **20** through **28** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **20** through **28**. 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.

19. Equipment Setup

WARNING

HIGH VOLTAGE is used or exposed during the performance of this calibration. DEATH ON CONTACT may result if personnel fail to observe safety precautions. REDUCE OUTPUT(S) to minimum after each step within the performance check where applicable.

NOTE

Remove TI protective covers only for access to connections and adjustments. Reinstall covers immediately after connections or adjustments.

a. Connect autotransformer to TI.

b. Connect autotransformer to a 115 V ac power source and adjust controls for a 115 V ac output.

c. Set **POWER** switch to **ON** and allow at least 20 minutes for equipment to warm-up and stabilize.

d. Set **POWER** switch to off (down) and wait 30 seconds.

e. If necessary, adjust mechanical adjust screws for a 0 indication on **R.M.S. VOLTS** and **PERCENT MODULATION** meters.

f. Set **POWER** switch to **ON** and allow 1 hour for equipment to warm up and stabilize.

20. Crystal Calibrator

a. Performance Check

(1) Set **CRYSTAL CALIBRATOR** switch to **1 MC**.

(2) Connect frequency counter to **TP1** (fig. 2) and chassis ground. If frequency counter does not indicate between 999.9 and 1000.1 kHz, perform **b** (1) below.

(3) Vary autotransformer output between 105 and 125 and back to 115 V ac. Frequency counter indication will remain within limits specified in (2) above.

(4) Set **CRYSTAL CALIBRATOR** switch to **100KC**. If frequency counter does not indicate between 99.990 and 100.01 kHz, perform **b** (2) below.

b. Adjustments

(1) Adjust **A2C3** (fig. 2) for a 1 MHz indication on frequency counter (R).

(2) Adjust **A2R11** (fig. 2) for a 100 kHz indication on frequency counter (R).

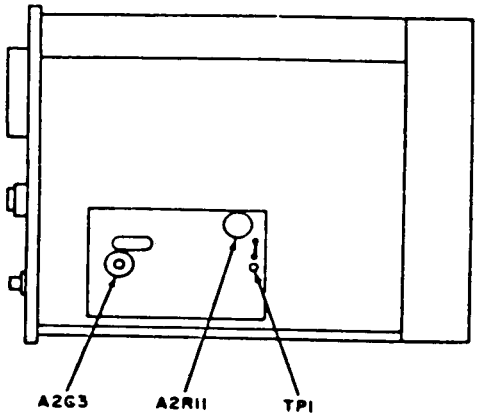

Figure 2. Test instrument - right side view.

21. Audio Oscillator

a. Performance Check

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

(a) **MODULATION SELECTOR** switch to **INT 400~**.

(b) **MODULATION AMPLITUDE** control fully ccw.

(c) **CRYSTAL CALIBRATOR** switch to **OFF**.

(d) **RANGE** switch to **530KC-1800K C**.

(2) Connect frequency counter to **MODULATION INPUT-OUTPUT**. If frequency counter does not indicate between 380 and 420 Hz, perform **b** below.

(3) Set **MODULATION SELECTOR** switch to **INT 1000~**. Frequency counter will indicate between 950 and 1050 Hz.

b. Adjustments

(1) Connect multimeter between output tap of audio transformer A1T1 (fig. 1) (yellow lead on tie point) and chassis ground.

(2) Adjust **MOD OSC SET R51** (fig. 1) for a 3.2 V ac indication on multimeter (R).

(3) Repeat **a** above.

22. RF Output Accuracy

a. Performance Check

(1) Connect measuring receiver to **RF OUT 50 Ω**.

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

(a) **MODULATION SELECTOR** switch to **CW**.

(b) **RANGE** switch to **19MC-65MC**.

(c) **FREQUENCY** dial to **65MC**.

(2) Adjust **ATTENUATOR VERNIER** control while observing **R.M.S. VOLTS** meter. Meter pointer will sweep full range of meter.

(3) Set **ATTENUATOR** switch to **+20 DBM**.

(4) Adjust **ATTENUATOR VERNIER** control for a 0 DBM indication on **R.M.S. VOLTS** meter. Measuring receiver will indicate between 19 and 21 dB.

(5) Repeat technique of step (5) above for **ATTENUATOR** switch settings in table 5. Measuring receiver will indicate within limits specified.

NOTE

If necessary, adjust **ATTENUATOR VERNIER** control to maintain a 0 (zero) DBM indication on **R.M.S. VOLTS** meter during remainder of check.

Table 5. RF Output Accuracy

Attenuator switch setting	Measuring receiver indication (dB)	
	Min	Max
+10	9	11
0	-1	1
-10	-11	-9
-20	-21	-19
-30	-31	-29
-40	-41	-39
-50	-51	-49
-60	-61	-59
-70	-71	-69
-80	-81	-79
-90	-91	-89
-100	-101	-99
-110	-111	-109

b. Adjustments. No adjustments can be made.

23. Frequency Output and Drift

a. Performance Check

NOTE

TI should be energized for at least 2 hours prior to performing this check.

CAUTION

Throughout procedure, adjust **ATTENUATOR VERNIER** control fully ccw before changing **RANGE** switch setting.

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

(a) **CALIBRATE** control until index line is aligned with **FREQUENCY** dial centerline.

(b) **ATTENUATOR** switch to **.3 VOLTS**.

(c) **RANGE** switch to **530KC-1800KC**.

(d) **AF** control to midrange.

(e) **VERNIER** control for a full-scale indication on **R.M.S. VOLTS** meter.

(f) **MODULATION AMPLITUDE** fully ccw.

(g) **MODULATION SELECTOR** to **CW**.

(2) Connect frequency counter to **RF OUTPUT 50 Ω**.

(3) Adjust **FREQUENCY** control for a 1,000,000 Hz indication on frequency counter and wait at least 10 minutes. Frequency counter will indicate between 999,950 and 1,000,050 Hz.

(4) Set **RANGE** switch to **50KC-170KC** and adjust **FREQUENCY** dial to **50KC**. Frequency counter will indicate between 49.5 and 50.5 kHz.

(5) Position controls as listed in table 6. Frequency counter will indicate within limits specified.

Table 6. Frequency Accuracy

Test Instrument		Frequency counter indications (MHz)	
RANGE switch settings	**FREQUENCY** dial settings	Min	Max
50KC - 170KC	50	0.0495	0.0505
	100	0.099	0.101
	170	0.1683	0.1717
165KC - 560KC	165	0.16335	0.16665
	300	0.297	0.303
	560	0.554	0.5656
530KC - 180KC	530	0.5247	0.5353

Table 6. Frequency Accuracy – Continued

Test Instrument		Frequency counter indications (MHz)	
530KC - 180KC Continued	900	0.891	0.909
	1800	1.782	1.818
1.76MC-6.0MC	1.76	1.7424	1.7776
	3.0	2.97	3.03
	6.0	5.94	6.06
5.8MC - 19.2MC	5.8	5.742	5.858
	9.0	8.91	9.09
	19.2	19.008	19.392
19MC - 65MC	19	18.81	19.19
	40	39.6	40.4
	65	64.35	65.65

b. Adjustments. No adjustments can be made.

24. Carrier Zero Set

a. Performance Check

CAUTION

Throughout procedure, adjust **ATTENUATOR VERNIER** control fully ccw before changing **RANGE** switch setting.

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

(a) **RANGE** switch to **50KC-170KC**.

(b) **ATTENUATOR VERNIER** control fully ccw.

(c) **ATTENUATOR** switch to **1.0 VOLTS**.

(d) **MODULATION SELECTOR** switch to **EXT. DC**.

(e) **MODULATION AMPLITUDE** control fully ccw.

(f) **FREQUENCY** control to low end of band.

(2) Connect oscilloscope vertical input to **RF OUTPUT 50Ω**, using termination.

(3) Adjust oscilloscope vertical gain for calibrated 50 mV per division and horizontal for a free-running condition so that indication will not disappear for lack of sync signal.

(4) Slowly adjust output frequency over range while observing waveform. If oscilloscope waveform peak-to-peak amplitude is not less than 80 mV over entire range, perform **b** below.

(5) Repeat (4) above for remaining **RANGE** switch settings up to 10 MHz.

b. Adjustments

(1) Adjust output frequency control to frequency where amplitude is 80 mV or greater.

(2) Adjust **A4R21** (fig. 3) until oscilloscope indication is slightly increased, then slowly adjust in opposite direction until oscilloscope indication just collapses (R).

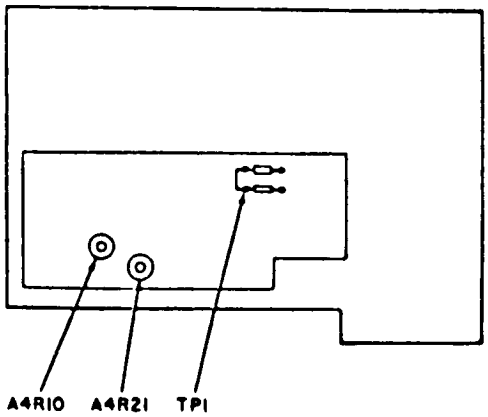

Figure 3. Test instrument - bottom view.

25. Maximum Carrier and Modulation Zero Set

a. Performance Check

(1) Connect true rms voltmeter to **RF OUTPUT 50Ω**.

CAUTION

Throughout procedure, adjust **ATTENUATOR VERNIER** control fully ccw before changing **RANGE** switch setting.

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

(a) **RANGE** switch to **50KC-170KC**.

(b) **ATTENUATOR VERNIER** control fully cw.

(c) **MODULATION SELECTOR** switch to **EXT. AC**.

(3) Rotate **FREQUENCY** control throughout range and record minimum voltage indicated on true rms voltmeter.

(4) Repeat technique of (3) above for all **RANGE** switch settings. Minimum voltage will be at least 1.05 V ac. Record minimum voltage.

(5) Set **RANGE** switch and adjust **FREQUENCY** control to value recorded in (4) above.

(6) Set **MODULATION SELECTOR** switch to **CW**. If true rms voltmeter indicates a change in voltage output, perform **b** below.

b. Adjustments

(1) Adjust **MAX CARRIER SET R60** (fig. 1) for a 1.05-V indication on voltmeter (R).

(2) Set **MODULATION SELECTOR** switch to **EXT. AC**.

(3) Adjust **MOD ZERO SET R69** (fig. 1) for a 1.05 V indication on voltmeter (R).

(4) Set **MODULATION SELECTOR** switch to **CW**.

(5) Repeat (1) through (3) above until there is no voltage variation.

26. Modulation Meter Accuracy

a. Performance Check

(1) Connect measuring receiver to **RF OUTPUT 50 Ω**.

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

(a) **RANGE** switch to **530KC-1800KC**.

(b) **FREQUENCY** dial to **1000KC**.

(c) **ATTENUATOR** switch to **1.0 VOLTS**.

(d) **MODULATION SELECTOR** switch to **INT. 1000~**.

(e) **MODULATION AMPLITUDE** control for a 50 percent modulation indication on **PERCENT MODULATION** meter.

(f) **ATTENUATOR VERNIER** control for 1-V indication on **R.M.S. VOLTS** meter.

(3) If measuring receiver does not indicate between 45 and 55 percent modulation, perform **b** below.

(4) Adjust **MODULATION AMPLITUDE** control for 90 percent modulation indication on **MODULATION** meter. If measuring receiver does not indicate between 85 and 95 percent, perform **b** below.

b. Adjustments

(1) Adjust **MODULATION AMPLITUDE** control for a 50-percent indication on measuring receiver. Adjust **MOD CAL R67** (fig. 1) for a 50 percent indication on **PERCENT MODULATION** meter.

(2) Adjust **ATTENUATOR VERNIER** control for a 0.2 V indication on **R.M.S. VOLTS** meter. If measuring receiver does not indicate between 45 and 55 percent modulation, adjust **A4R21** (fig. 3) for 50 percent modulation on measuring receiver (R).

(3) Repeat **a** above.

NOTE

If **A4R21** was adjusted in (2) above, repeat paragraph 25 above.

27. RF Output Meter

a. Performance Check

(1) Connect true rms voltmeter to **RF OUTPUT 50 Ω**.

(2) Set **MODULATION SELECTOR** switch to **CW**.

(3) Adjust **ATTENUATOR VERNIER** control for a 0 DBM indication on **R.M.S. VOLTS** meter. Record true rms voltmeter indication.

(4) Rotate **FREQUENCY** control throughout range while maintaining a constant output voltage indication on true rms voltmeter. Record maximum and minimum dBm indications on **R.M.S. VOLTS** meter. If recorded indications are not between -1 and +1 dBm perform **b** below.

(5) Repeat (3) and (4) above at each **RANGE** switch setting.

b. Adjustments

(1) Select maximum and minimum value from values recorded in **a** (4) and (5) above and determine average of the two values.

(2) Set **RANGE** switch and adjust **FREQUENCY** control until average value computed in (1) above is indicated on true rms voltmeter.

(3) Adjust **ATTENUATOR VERNIER** control for a 0.9 V indication on true rms voltmeter.

(4) Adjust **OUTPUT CAL R37** (fig. 1) for a 0.9-V indication on **R.M.S. VOLTS** meter (R).

28. Modulation Output Distortion

a. Performance Check

(1) Connect audio analyzer to **MODULATION INPUT-OUTPUT**.

(2) Set **MODULATION SELECTOR** switch to **INT. 1000~**. Audio analyzer will indicate less than 1 percent distortion.

(3) Set **MODULATION SELECTOR** switch to **INT. 400~**. Audio analyzer will indicate less than 1 percent distortion.

b. Adjustments. No adjustments can be made.

29. Power Supply

NOTE

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

a. Performance Check

(1) Set **POWER** switch to off.

(2) Connect multimeter to 300 V test point (fig. 4).

(3) Set **POWER** switch to **ON** and allow 10 minutes for warm-up and stabilization. If multimeter does not indicate between 288 and 312 V dc, perform **b** below.

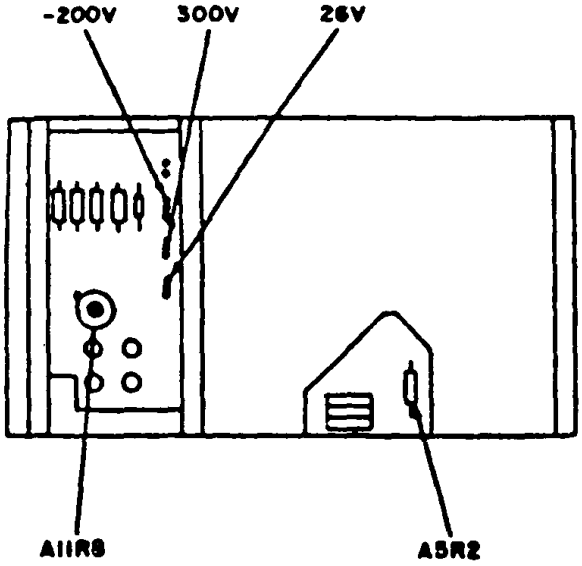

Figure 4. Test instrument - rear view.

b. Adjustments. Adjust **A11R8** (fig. 4) for a 300 V indication on multimeter (R).

30. 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:

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

Official:

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

0425104

Distribution:
To be distributed in accordance with IDN 342175, requirements for calibration procedure TB 9-6625-1999-35.

Instructions for Submitting an Electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however, only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" whomever@redstone.army.milT
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.