*TB 9-6625-2004-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR MODULATION METERS ME-57/U AND ME-57A/U

Headquarters, Department of the Army, Washington, DC
24 March 2009

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

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

*This bulletin supersedes TB 9-6625-2004-35, dated 31 May 2005.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Modulation Meters ME-57/U and ME-57A/U. TM 11-6625-400-12, TM 11-6625-400-35, and 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 3 hours, 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	
Deviation range	Modulating frequency range and accuracy (kHz)	
(kHz)	50 Hz to 20 kHz	20 to 70 kHz
0 to 20	± 0.75 kHz	±1.5 kHz
0 to 50	± 2 kHz	±4 kHz
0 to 100	± 5 kHz	±10 kHz
0 to 300	± 15 kHz	±30 kHz
0 to 1000	± 100 kHz	±100 kHz
Modulating frequencies	50 Hz to 20 kHz with carrier frequencies of 20 to 100 MHz	
Input sensitivity	0.005 V required for limiting	
Carrier shift accuracy	± 10% of indicated value	
Audio output	1 V rms corresponding to 40 kHz deviation on 0 to 50 kHz range	
RF oscillator	Range: 20 to 1000 MHz Accuracy: ± 10%	

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.

5. Accessories Required. The accessories required for the 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)
ATTENUATOR	Range: 0 to 120 dB	Hewlett-Packard, Model 355D (355D)
MEASURING RECEIVER	Frequency range: 50 to 750 MHz FM Deviation: 20 to 300 kHz Accuracy: ± 1% of reading 1 digit	Measuring Receiver system N5530S consisting of: Spectrum Analyzer Agilent, Model E4440A (E4440A), Power Meter Agilent, Model E4419B (E4419B), and Sensor Module Agilent, Model N5532A opt 504 (504)
MULTIMETER	Range: 189 to 201 V dc Accuracy: ± 0.75%	Fluke, Model 8840A/AF-05 (AN/GSM-64D)
SYNTHESIZED SIGNAL GENERATOR	Range: 18 to 990 MHz Accuracy: ± 2.5% Deviation: 1 to 20 kHz	Anritsu, Model 68369NV (68369NV)

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 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 TM 11-6625-400-35 for this TI.

7. Equipment Setup

WARNING

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

NOTE

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 TM 11-6625-400-12, TM 11-6625-400-35, and TM 11-6625-2629-14&P for this TI.

NOTE

When indications specified in paragraphs **8** through **12** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **8** through **12**. Do not perform power supply check if all other parameters are within tolerance.

NOTE

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

a. Remove TI protective cover.

b. Connect TI to a 115 V ac source.

c. Energize equipment and allow 30 minutes for warm-up and stabilization.

8. RF Oscillator Accuracy

a. Performance Check

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

(a) **TUNE-FINE TUNE** switch to **TUNE**.

(b) **FREQUENCY RANGE-MC** switch to **20-55**.

(c) **FREQUENCY-MC** dial to **20**.

(d) **DEVIATION RANGE-C** switch to **1000 TUNE**.

(2) Connect synthesized signal generator to TI input.

(3) Set synthesized signal generator frequency to 20 MHz and level to 5 mV.

(4) Fine tune synthesized signal generator frequency for a 0 indication on CARRIER SHIFT meter and a black line indication on LIMITING meter. Synthesized signal generator final indication will be between 18.00 and 22.00 MHz.

NOTE

If TI interference is encountered during this check, momentarily disconnect TI, verify generated frequency on frequency counter, and reconnect TI.

(5) Repeat technique of (3) and (4) above, using settings listed in table 4. If synthesized signal generator does not indicate within limits specified, perform **b** below.

Table 4. RF Oscillator

Test instrument		Synthesized signal generator		
FREQUENCY RANGE-MC switch settings	**FREQUENCY-MC** dial settings	Initial settings (MHz)	Final indications (MHz)	
			Min	Max
20-55	35	35	31.5	38.5
20-55	50	50	45	55
55-120	60	60	54	66
55-120	87.5	87.5	78.75	96.25
55-120	115	115	103.5	126.5
120-250	130	130	117	143
120-250	185	185	166.5	203.5
120-250	240	240	216	264
250-500	260	260	234	286
250-500	375	375	337.5	412.5
250-500	475	475	427.5	522.5
500-1000	550	550	495	605
500-1000	750	750	675	825
500-1000	900	900	810	990

b. Adjustments

(1) Set **FREQUENCY RANGE-MC** switch to **20-55**.

(2) Set synthesized signal generator frequency to 35 MHz.

(3) Loosen setscrew that holds **FREQUENCY-MC** dial to oscillator shaft and adjust oscillator shaft for a 0 indication on CARRIER SHIFT meter.

(4) Adjust **FREQUENCY-MC** dial to **35 MHz** and tighten setscrew.

(5) Repeat **a** above.

9. Input Sensitivity

a. Performance Check

(1) Set **FREQUENCY RANGE-MC** switch to **250-500** and adjust **FREQUENCY-MC** dial to **400**.

(2) Set synthesized signal generator frequency to 400 MHz and level to 5 mV.

(3) Adjust **TUNING** control for maximum indication on LIMITING meter while maintaining 5 mV level. If LIMITING meter pointer is not within the black area, perform **b** below.

b. Adjustments. Adjust LIMITING ADJ R51 (fig. 1) until TI LIMITING meter pointer is at beginning edge of black area (R).

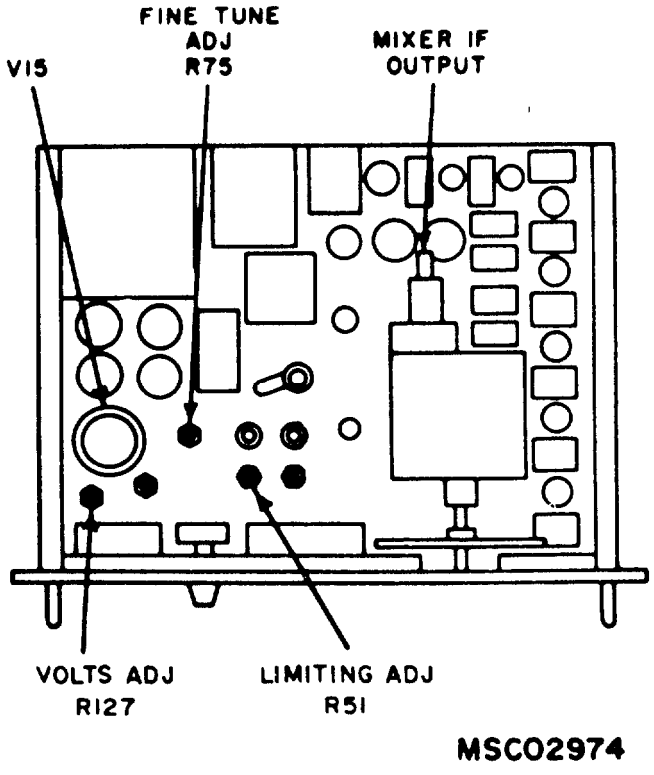

Figure 1. Modulation meter - top view.

10. Carrier Shift

a. Performance Check

(1) Set **FREQUENCY RANGE-MC** switch to **20-55** and adjust **FREQUENCY-MC** dial to **50**.

(2) Set synthesized signal generator frequency to 50 MHz and level to 100 mV.

(3) Adjust **TUNING** control for a **0** indication on CARRIER SHIFT meter.

(4) Set **TUNE-FINE TUNE** switch to **FINE TUNE** and adjust **TUNING** control for a **0** indication on CARRIER SHIFT meter. Record synthesized signal generator indication.

(5) Set synthesized signal generator frequency for a -250 kHz indication on CARRIER SHIFT meter. Record synthesized signal generator indication.

(6) Subtract lower from higher frequency value recorded in (4) and (5) above. If difference is not between 225 and 275 kHz, perform **b** below.

(7) Set synthesized signal generator frequency for +250 kHz indication on CARRIER SHIFT meter and subtract frequency counter indication from value recorded in (4) above. If difference is not between 225 and 275 kHz, perform **b** below.

b. Adjustments

(1) Set synthesized signal generator for an indication of 250 kHz above value recorded in **a** (4) above.

(2) Adjust FINE TUNE ADJ R75 (fig. 1) until CARRIER SHIFT meter indicates a negative shift of 250 kHz (R).

NOTE

If positive and negative shift are both high, adjustment of FINE TUNE ADJ R75 alone will not correct out-of-tolerance condition. Refer to TM 11-6625-2629-14&P for realignment procedures.

(3) Set synthesized signal generator for an indication of 250 kHz below value recorded in **a** (4) above.

(4) Adjust FINE TUNE ADJ R75 (fig. 1) until TI CARRIER SHIFT meter indicates a positive shift of 250 kHz (R).

(5) Repeat (1) through (4) above until no further adjustment is required.

11. Frequency Deviation

a. Performance Check

(1) Connect equipment as shown in figure 2.

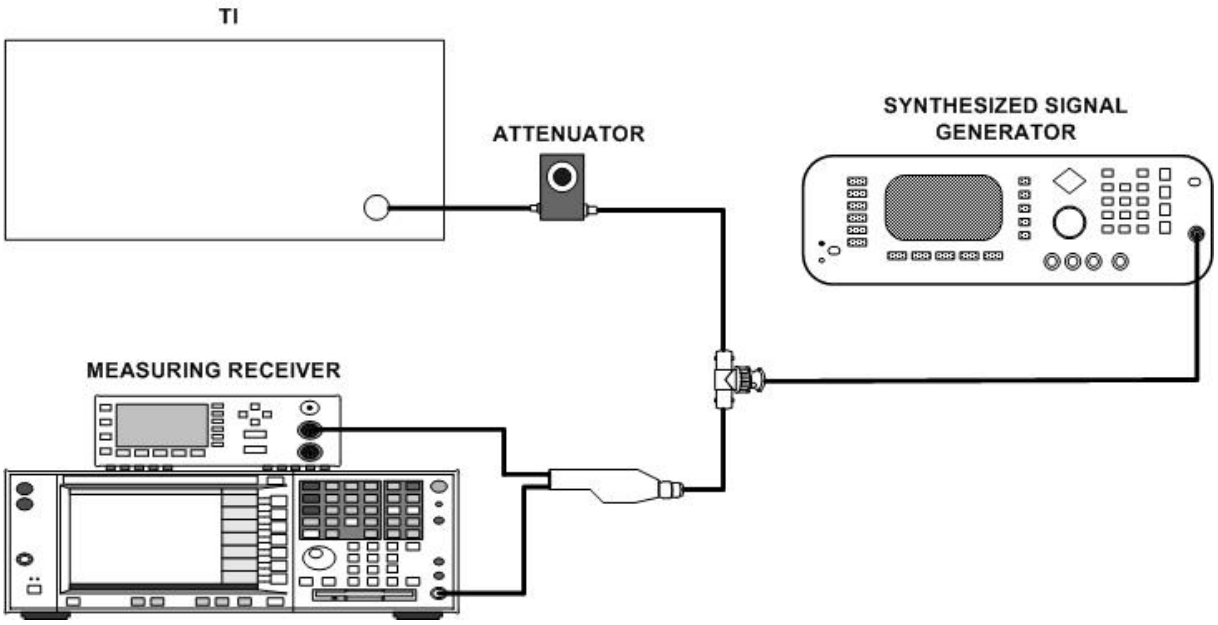

Figure 2. Frequency deviation - equipment setup.

(2) Set **DEVIATION RANGE-KC** switch to **20** and **FREQUENCY RANGE-MC** switch to **20-55**.

(3) Set measuring receiver for automatic operation to measure RF frequency.

(4) Set synthesized signal generator frequency to 50 MHz and level to 100 mV, adjust attenuator as necessary to limit signal to black section of TI limiting meter.

(5) Adjust TI **FREQUENCY-MC** dial for a **0** indication on CARRIER SHIFT meter.

(6) Set synthesized signal generator FM to INT and MOD FREQ to 1 kHz.

(7) Set measuring receiver to FM modulation.

(8) Set synthesized signal generator FM modulation frequency for 20 kHz full scale indication on TI DEVIATION meter. If measuring receiver does not indicate between 19.25 and 20.75 kHz deviation, perform **b** below.

(9) Repeat technique of (2) through (8) above for control settings and indications listed in table 5. If measuring receiver does not indicate within limits specified, perform **b** below.

Table 5. Frequency Deviation

Test instrument				Synthesized signal generator		Measuring receiver indications (kHz)	
FREQUENCY RANGE-MC switch settings	**FREQUENCY MC** dial settings	**DEVIATION RANGE-KC** switch settings	**DEVIATION** meter indications (kHz)	FREQUENCY (MHz)	MOD FREQ (kHz)	Min	Max
55-150	100	50	50	100	1	48	52
120-250	200	100	100	200	1	95	105
250-500	400	300	300	400	1	285	315
500-1000	750	1000	300[1]	750	1	200	400

[1]Deviation limitation of measuring receiver.

b. Adjustments

(1) Set **FREQUENCY RANGE-MC** switch to 55-120 and **DEVIATION RANGE-KC** switch to 50.

(2) Set synthesized signal generator for a 100 MHz CW output.

(3) Adjust **FREQUENCY-MC** dial for a 0 indication on TI CARRIER SHIFT meter.

(4) Set synthesized signal generator MOD FREQ for a 1 kHz indication on measuring receiver frequency counter.

(5) Set synthesized signal generator FM controls for a 50 kHz deviation indication on measuring receiver.

(6) Adjust CAL ADJUST (front panel) for a 50 kHz indication on TI DEVIATION meter (R).

(7) Repeat **a** above.

12. Audio Output

a. Performance Check

(1) Connect multimeter to AUDIO OUTPUT.

(2) Set **DEVIATION RANGE-KC** switch to **50** and **FREQUENCY RANGE-MC** switch to **20-55**.

(3) Set synthesized signal generator frequency for 50 MHz, level for 100 mV, modulation frequency (FM) of 20 kHz and FM for a TI DEVIATION meter indication of 40 kHz. If multimeter does not indicate 1 V rms, perform **b** below.

b. Adjustments. Adjust AUDIO ADJ (front panel) for a 1 V rms indication on multimeter (R).

13. Power Supply

NOTE

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

a. Performance Check. Connect multimeter between pin 6 of V15 (fig. 1) and chassis ground. If multimeter does not indicate between 189.15 and 200.85 V dc, perform **b** below.

b. Adjustments. Adjust VOLTS ADJ R127 (fig. 1) for a 195 V dc indication on digital voltmeter (R).

14. Final Procedure

a. Deenergize and disconnect all equipment.

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

By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

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Secretary of the Army
0719012

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 3421781, requirements for calibration procedure TB 9-9925-2004-35.

INSTRUCTIONS FOR SUBMITTING AN ELECTRONIC 2028

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

From: "Whomever" whomever@redstone.army.mil
To: <2028@redstone.army.mil

Subject: DA Form 2028

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

This is the text for the problem below line 27.