TB 9-6625-1998-35

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DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR SIGNAL GENERATOR AN/URM-127 (SG-377/U) AND AN/URM-127A (SG-377A/U)

Headquarters, Department of the Army, Washington, DC
20 January 1997

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*This bulletin supersedes TB 9-6625-1998-35, dated 6 February 1992.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Signal Generator, AN/URM-127 (SG-377/U) and AN/URM-127A (SG-377A/U). TMs 11-6625-683-14 and 11-6625-2725-14&P 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 within the text.

b. Time and Technique. The time required for this calibration is approximately 2 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
Frequency	Range: 20 Hz to 200 kHz Accuracy: ±2% indication
Output voltage	Range: 10 µV ac Accuracy: -30% to +20% FS Range: 100 µV to 10 V ac Accuracy: ±5% FS
Distortion[1]	1% maximum (AN/URM-127) 2% maximum (AN/URM-127A)
Frequency meter (AN/URM-127 only)	60 and 400 Hz ±l %

[1]Standard limited not checked above 100 kHz.

SECTION II
EQUIPMENT REQUIREMENTS

4. Equipment Required. Table 2 identifies the specific equipment to be used in this calibration procedure. This equipment is issued with Secondary Transfer Calibration Standards Set AN/GSM-287. Alternate items may be used by the calibrating activity. 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 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	Frequency measurement: Range: 19.6 Hz to 204 kHz Accuracy: ±.25% Ac level measurement: Range: 0.95 mV to 10.5 V Frequency: 1 kHz Accuracy: ±1.25% Distortion measurement: Range: 20 Hz to 100 kHz Capability: to 1 %	Boonton, Model 1120-S/10 (MIS-35954/2)
DIGITAL MULTIMETER	Dc voltage: Range: 46 to 52 V Accuracy: ±0.5%	John Fluke, Model 8506A /CT (p/o MIS-35947)
RESISTANCE STANDARD	Range: 1000Ω	Biddle-Gray, Model 71-631 (7910328)
SWR METER	Range: 21.5 dB down from 1 mV Accuracy: ± 1.25%	Hewlett-Packard, Model 415E (7910160-2)

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 results 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 TMs 11-6625-681-14 and 11-6625-2725-14&P for this TI.

d. When indications specified in paragraphs **8** through **11** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **8** through **11**. 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 the safety precautions. REDUCE OUTPUT(S) to minimum after each step within the performance check where applicable.

a. Set **POWER** switch to **OFF.**

b. If **OUTPUT RMS (VOLTS RMS)** meter does not indicate on mark or 0, adjust screw located below meter face until meter indicates on mark or 0.

c. Connect TI to a 115 V ac power source.

d. Position controls as listed in (1) through (6) below:

(1) **FREQ RANGE MULTIPLIER** switch to **X10**.

(2) Frequency dial to **100**.

(3) **OUTPUT CONTROL** fully ccw.

(4) **ATTENUATOR** switch to **X10 V**.

(5) **FREQ METER** switch to **OFF** (AN/URM-127 only).

(6) **1 kΩ LOAD** switch to **OUT** (AN/ URM-127A only).

e. Set **POWER** switch to **ON** and allow at least 15 minutes for TI to reach operating temperature.

8. Output Voltage

a. Performance Check

(1) Connect resistance standard (adjusted to 1000Ω) to **OUTPUT**. Connect audio analyzer **INPUT** to resistance standard.

(2) Adjust **OUTPUT CONTROL** until **OUTPUT RMS (VOLTS RMS)** meter indicates **1.0**. If audio analyzer does not indicate between 9.5 and 10.5 V ac, perform **b** below.

NOTE

Perform (3) through (6) below for AN/URM-127A only.

(3) Temporarily disconnect resistance standard from equipment setup by removing cables from resistance standard.

(4) Set **1 kΩ LOAD** switch to **IN.**

(5) Adjust **OUTPUT CONTROL** until TI **VOLTS RMS** meter indicates **1.0**. Audio analyzer will indicate between 9.5 and 10.5 V ac.

(6) Set 1 **kΩ LOAD** switch to **OUT** and reconnect cables to resistance standard.

(7) Repeat technique of (2) above at **ATTENUATOR** switch and meter indications listed in table 3. If audio analyzer does not indicate within limits specified, perform **b** below.

(8) Adjust **OUTPUT CONTROL** for 1.00 mV ac indication on audio analyzer.

(9) Substitute SWR meter for audio analyzer.

Table 3. Output Voltage

Test instrument			Audio analyzer indications			
ATTENUATOR switch positions		Meter indications **OUTPUT RMS** (**VOLTS RMS**)	Min		Max	
X10	V	.8	7.5	V ac	8.5	V ac
X10	V	.6	5.5	V ac	6.5	V ac
X10	V	.4	3.5	V ac	4.5	V ac
X1	V	1.0	0.95	Vac	1.05	V ac
X.1	V	1.0	95.0	mV ac	105.0	mV ac
X.01	V	1.0	9.50	mV ac	10.50	mV ac
X1000	μV	1.0	0.95	mV ac	1.05	mV ac

(10) Position controls on SWR meter as listed in (a) through (d) below:

(a) **INPUT** switch to **HIGH**.

(b) **RANGE** switch to **30.**

(c) **FREQ** adjust for peak indication on meter.

(d) **GAIN/VERNIER** control for **1 dB** on SWR meter.

(11) Set **ATTENUATOR** switch to **X100 μV**. SWR meter will indicate between 9.6 and 10.4 dB down from value established in (10)(d) above.

(12) Set **ATTENUATOR** switch to **X10 μV.** SWR meter will indicate between 17 and 21.5 dB down from value established in (10)(d) above.

b. Adjustments

(1) Set **ATTENUATOR** switch to **X10 V** and **OUTPUT CONTROL** fully cw.

NOTE

For AN/URM-127, perform (2) through (4) below. For AN/URM-127A, perform (5) through (7) below.

(2) Adjust R2 (fig. 1) until **OUTPUT RMS** meter indicates 1.15 (R).

(3) Adjust **OUTPUT CONTROL** until audio analyzer indicates 10 V.

(4) Adjust R29 (fig. 1) until **OUTPUT RMS** meter indicates 1.0 (R).

(5) Adjust A2R5 (fig. 2) until audio analyzer indicates 12.0 V ac (R).

(6) Adjust **OUTPUT CONTROL** until audio analyzer indicates 10.0 V ac.

(7) Adjust A2R12 (fig. 2) until **VOLTS RMS** meter indicates **1.0** (R).

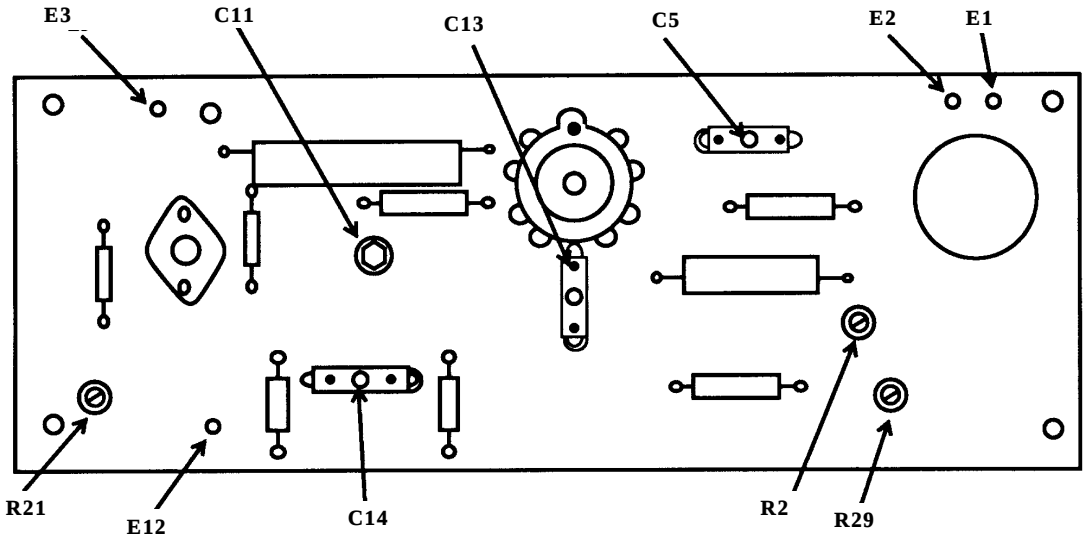

Figure 1. AN/URM-127 - adjustments

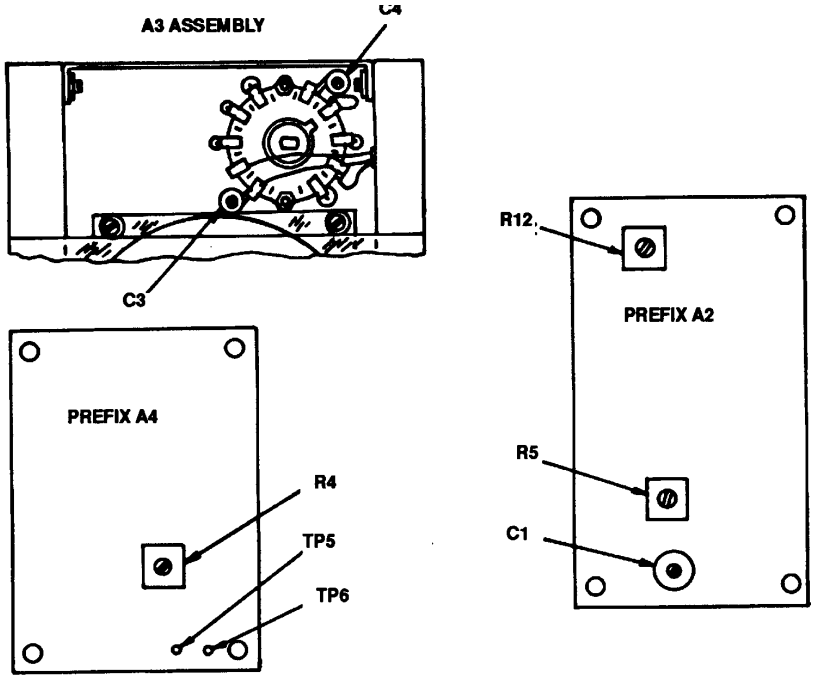

Figure 2. AN/URM-127A - adjustments

9. Frequency

a. Performance Check

(1) Connect **OUTPUT** to audio analyzer **INPUT** high.

(2) Set **ATTENUATOR** switch to **X1V** and adjust TI **OUTPUT CONTROL** for **1.0** on **OUTPUT RMS (VOLTS RMS)** meter.

(3) Set **FREQ RANGE MULTIPLIER** switch to **X1K** and frequency dial to **200**. If audio analyzer does not indicate between 196.000 and 204.00 kHz, perform **b** below.

(4) Repeat technique of (3) above at **FREQ RANGE MULTIPLIER** switch and frequency dial settings listed in table 4. If audio analyzer does not indicate within limits specified, perform **b** below.

Table 4. Frequency

Test instrument		Audio analyzer indications	
FREQ RANGE MULTIPLIER switch settings	Frequency dial settings	Min	Max
X1K	100	98.000 kHz	102.000 kHz
X1K	20	19600.0 Hz	20.400 kHz
X100	20	1960.00 Hz	2040.0 Hz
X100	100	9800.0 Hz	10200.0 Hz
X100	200	19600.0 Hz	20.400 kHz
X10	200	1960.00 Hz	2040.0 Hz
X10	100	980.00 Hz	1020.00 Hz
X10	20	196.000 Hz	204.00 Hz
X1	20	19.600 Hz	20.400 Hz
X1	100	98.000 Hz	102.000 Hz
X1	200	196.000 Hz	204.00 Hz

b. Adjustments

NOTE

Perform (1) through (15) for AN/URM-127. Perform (16) through (26) for AN/URM-127A.

(1) Set **FREQ RANGE MULTIPLIER** switch to **X100** and frequency dial fully ccw to mark on dial.

(2) Adjust C11 (fig. 1) until audio analyzer indicates between 21.400 and 21.500 kHz (R).

(3) Slowly rotate frequency dial cw until audio analyzer indicates 20.000 kHz.

(4) Reposition frequency dial to indicate **200.**

NOTE

Remove frequency dial knob and loosen set screws to reposition dial to **200.** Tighten set screws after repositioning dial.

(5) Set frequency dial in turn to **100**, **60, 40,** and **20.** If audio analyzer does not indicate within 2 percent of settings, repeat (1) through (4) above for best in-tolerance condition.

(6) Repeat **a**(4)above. If audio analyzer does not indicate within limits specified, perform (7) through (15) below.

(7) Set C14 (fig. 1) to the half-open position.

(8) Set **FREQ RANGE MULTIPLIER** switch to **X1K** and frequency dial to **20.**

(9) Adjust C5 and C13 (fig. 1) until audio analyzer indicates 20.000 kHz (R).

(10) Turn **OUTPUT CONTROL** fully cw.

(11) If required, readjust C5 and C13 (fig. 1) until **OUTPUT RMS** meter indicates at least 1.15 and audio analyzer indicates 20.000 kHz.

NOTE

Increase capacitance of C5 and decrease capacitance of C13 (fig. 1).

(12) Set frequency dial to **200.**

(13) Adjust C14 (fig. 1) until audio analyzer indicates 200.00 kHz (R).

(14) Set frequency dial to **20** and repeat (11) through (13) above for best in-tolerance condition.

(15) Repeat **a**(1) through (4) above and, if required, (1) through (14) above for best intolerance condition.

(16) Set **FREQ RANGE MULTIPLIER** switch to **X100** and frequency dial to **20.**

(17) Readjust frequency dial until audio analyzer indicates 2000.0 Hz.

(18) Reposition frequency dial to indicate **20.**

NOTE

Remove frequency dial knob and loosen set screws to reposition dial to **20**. Tighten set screws after repositioning dial.

(19) Set frequency dial to **200.**

(20) Adjust A3C3 and A3C4 (fig. 2) until audio analyzer indicates 20.000 kHz and **VOLTS RMS** meter indicates at least 1.0 (R).

(21) Repeat (16) through (20) above for best in-tolerance condition.

(22) Repeat **a**(4) and if audio analyzer does not indicate within limits specified, perform (23) through (26) below.

(23) Set **FREQ RANGE MULTIPLIER** switch to **X1K** and frequency dial to **200**.

(24) Adjust A2C1 (fig. 2) until audio analyzer indicates 200.00 kHz (R).

(25) If **VOLTS RMS** meter indicates more than 1.2, adjust A2R5 (fig. 2) for 1.2 indication on **VOLTS RMS** meter (R).

(26) Repeat **a**(1) through (4) and, if required, (16) through (25) above for best intolerance condition.

10. Frequency Meter (AN/URM-127 Only)

a. Performance Check

(1) Connect **OUTPUT** to audio analyzer **INPUT** high.

(2) Set **FREQ RANGE MULTIPLIER** switch to **X10** and **FREQ METER** switch to **ON**.

(3) Set frequency dial to **40**, and fine tune for maximum vibration on 400 window of **FREQ METER**. Audio analyzer will indicate between 396.00 and 404.00 Hz.

(4) Set **FREQ RANGE MULTIPLIER** switch to **X1** and frequency dial to **60**.

(5) Fine tune frequency dial for maximum vibration on 60 window of **FREQ METER**. Audio analyzer will indicate between 59.400 and 60.600 Hz.

b. Adjustments. No adjustments can be made.

11. Distortion

a. Performance Check

(1) Connect **OUTPUT** to audio analyzer **INPUT** high.

(2) Set **ATTENUATOR** switch to **X10V** and **OUTPUT CONTROL** for **1.0** on **OUTPUT RMS** (**VOLTS RMS**) meter.

(3) Set **FREQ RANGE MULTIPLIER** switch and frequency dial to positions listed in table 5 and measure distortion at each frequency. Audio analyzer will indicate within limits specified.

b. Adjustments. No adjustments can be made.

Table 5. Distortion

Test instrument		Audio analyzer indications	
FREQ RANGE MULTIPLIER switch settings	Frequency dial settings	AN/URM-127	AN/URM-127A
X1	20	≤ 1%	≤ 2%
X10	100	≤ 1%	≤ 2%
X100	200	≤ 1%	≤ 2%
X1K	100	≤ 1%	≤ 2%

12. Power Supply

NOTE

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

a. Performance Check. Connect digital multimeter between test points listed in table 6. If digital multimeter does not indicate within limits specified, perform **b** below.

b. Adjustments. Perform corresponding adjustments as listed in table 6.

Table 6. Power Supply

Model	Test points	Digital voltmeter indications (V dc)		Adjustments (R)
		Min	Max	
AN/URM-127	E3 and El2 (fig. 1)	46	48	R21 (fig. 1) for 47 V
AN/URM-127A	A4TP5 and A4TP6 (fig. 2)	48	52	A4R4 (fig. 2) for 50 V

13. 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:

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