D E P A R T M E N T O F T H E A R M Y T E C H N I C A L B U L L E T I N

CALIBRATION PROCEDURE FOR METER, FREQUENCY AN/URM-32 AND AN/URM-32A

Headquarters, Department of the Army, Washington, DC
2 May 1976

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Section I. INTRODUCTION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides information for the periodic calibration of Frequency Meter AN/URM-32 and AN/URM-32A and is to be used b) calibration personnel TM 11-5120 was used as the prime data source in compiling these instructions The frequency meter will be referred to as the TI (test instrument) throughout this bulletin

a. Model Variations. Some models contain Electronic Power Supply PP-1243/U In place of batteries There is no difference between model AN/URM-32 and AN/URM-32A

b. The time required for this calibration is approximately two hours, using the low frequency technique

2. Calibration Data Card (DA Form 2416). *a.* Forms, records, and reports required for calibration personnel at all levels are prescribed by TM 38-750 DA Form 2416 must be annotated in accordance with TM 38-750 for each calibration performed

b. Adjustments to be reported on DA Form 2416 are designated (R) at the end of the sentence in which they appear 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

* This bulletin supersedes TB 9-6625-110-50, 26 May 1966 including all changes.

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Input requirement *	
Battery operation	180±9 vdc, 6 3±0 3 vdc
Power supply operation	180±9 vdc, 6 3 ± 0.3 vac
Input to power supply	115/230 vac, 50-1000 Hz
Crystal oscillator	2.5 MHz (Y 1) and 1.0 MHz (Y2)
Variable frequency oscillator	Range A: 125 kHz to 2.5 MHz.±0.01%
	Range B: 2.5 MHz to 65 MHz,-±0.01%
	Range C: 65 MHz to 1000 MHz,± 0.01%
Audio power output	0.05 mw (minimum) with 0 1 volt rf input signal
Radiofrequency output	100 uv (minimum) across 50-ohm external load

*These specifications are for information only and are not necessarily verified in this procedure

Section II. EQUIPMENT REQUIREMENTS

4. Equipment Required. Table 2 identifies the specific equipment used In this calibration procedure This equipment is issued with secondary transfer calibration set, Calibration Set AN/CSM-256, or electronic maintenance shop sets In performing this procedure Alternate items may be used by the calibrating activity when the equipment listed in table 2 is not available The Items selected must be verified to perform satisfactorily prior to use and bear evidence of current calibration The equipment must meet or exceed the minimum use specifications listed in table 1 The accuracies listed in table 2 provide a four-to-one accuracy 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 listed in table 3 are issued with secondary transfer calibration set, Calibration Set AN/GSM-256, or electronic maintenance shop sets and are to be used In this calibration procedure When necessary, these items may be substituted by equivalent Items, unless specifically prohibited

Table 2. Equipment for Calibration Process

Item No	Common name	Minimum use specifications	Calibration equipment, manufacturer model and part number		
			Secondard transfer Calibration Set	Calibration Set ANIGSM 256	Electronic maintenance shop set
A1	Autotransformer	115 to 125 vac ±3%	GR WIOMT3AS3 (7910809)	GR W1OMT3AS3 (7910809)	CN-16( )/U
A2	Electronic counter	Range: 125 kHz to]000 MHz Accuracy: ±0.01%	S-D Model 1037M (7910823)	HP Model 5245L	AN/USM-207
A3	Oscilloscope	Range: 0.5 to 1.5 v/cm Accuracy: ±0.0025%	Tektronix Model RM 561 A/w plug-in (7911440)	HP 180D	AN/USM-28 1( )
A4	Power supply	Range: 0 to 200 vdc 0 to 7 vac Accuracy: ± 3%	J F Model 407DR (7911123-2)	J F Model HB 525M	PP-3 135/U
A5	Electronic voltmeter	Range: 0 to 200 vdc 0 to 7 vac Accuracy: ±3%	J F 887 AB/AN (887ABAN)	J F 887 AB/AN (887ABAN)	ME-202 ( )/U
A6	Decade resistor	50ohm	RDS-615B (MIS-10264)A7	GR 1433Y	ZM-16( )/U
	Signal generator	Range: 10 Hz to 50 MHz	HP Model 652A (MIS 10224)	HP 652A (MIS-10224)	AN/URM-25 ( )
A8	Signal generator	Range: 10 Hz to 135 MHz	HP Model 608C (8598927-1)	HP-8640	AN/USM-44 ( )

Table 3. Required Accessories

Item No	Common Name	Description and part number
B1	Lead, electrical *	24-inch, No 18 single banana plug terminations (red) (7907497)
B2	Lead, electrical *	24-inch, No 18 single banana plug terminations (black) (7907498)
B3	Adapter	Single banana jack to alligator clip (red) (7907566)
B4	Adapter	Single banana jack to alligator clip (black) (7907560)
BS5	Cable assembly, RF	30-inch, RG-58A/U, BNC plug terminations (7907467)
B6	Cable assembly, RF	36-inch, RG-58/U, BNC plug and double banana plug terminations (7907471)
B7	Adapter, connector	Double banana jack to phone plug (7907566)

Table 3. Required Accessories-Continued

Item No	Common Name	Description and part number
B8	Adapter, connector	BNC "T" type, I jacks, I plug (MIS 351 73-274B)
B9	Cable assembly, RF	BNC plug to alligator clips, RG-58C/U (7907410)
B10	Cable assembly, RF	30-inch,RG-58/U, double banana plug terminations(790 7470)
B 11	Adapter	Single banana jack to spade (red) (7907499)
B12	Adapter	Single banana jack to spade (black) (7907502)

* Two required

Section III. PRELIMINARY OPERATIONS

6. Preliminary Instructions. *a* The instructions outlined in this section are preparatory to the calibration process Personnel should become familiar with the entire bulletin before beginning the calibration.

b. Items of equipment used in this procedure are referenced within the text by common name and item identification number as listed In tables 2 and 3 For the identification of equipment referenced by item numbers prefixed with A, see table 2, and for prefix B, see table 3

WARNING

HIGH VOLTAGE is used during the performance of this calibration DEATH ON CONTACT may result if personnel fall to observe safety precautions

7. Equipment Setup *a.* Remove TI from protective cover as required for calibration

b. Use fresh batteries of known voltage (+ 180 and +6 volts dc) in TI or connect TI power cord to autotransformer (A1) Connect autotransformer power cord to 115 v 60 Hz-line Turn power switch to ON and adjust autotransformer control until panel meter indicates 115 vac

c. Turn TI RANGE SW switch to RANGE A 125 KC to 2 5 MC

d. Turn FUNCTION SW switch to OPER and allow approximately 15 minutes for equipment to warmup and stabilize

Section IV. CALIBRATION PROCESS

NOTE

Paragraphs 8 through 11 are divided into subparagraph a, performance check and subparagraph *b,* adjustments When the performance check is within tolerance, do not perform the corresponding adjustment When the performance check is not within tolerance, perform the corresponding adjustment before continuing with the calibration procedure When the performance check is not within tolerance and no adjustment is specified, the deficiency of the item must be corrected before continuing with the procedure

8. Input Power. a *Performance Check*

(1) Set FUNCTION SW switch of TI to OFF and disconnect center plug (P2) from power supply or batteries

(2) Connect equipment as shown in figure 1

(3) Adjust power supply (A4) for an output of + 171 vdc as indicated on electronic voltmeter (A5)

(4) Set FUNCTION SW switch to TI to OPER and allow equipment to warmup

(5) Hold VOLTAGE A-B switch to TI in B position and observe that voltmeter on TI indicates lower edge of acceptable region (green) on meter scale

(6) Adjust power supply for an output of + 189 vdc as indicated on electronic voltmeter

(7) Observe that voltmeter on TI indicates upper edge of acceptable region (green) of meter scale

(8) Release VOLTAGE A-B switch, remove power and disconnect all equipment, and reconnect P2 to power supply or batteries

b. Adjustments No adjustments can be made

9. Crystal Oscillator *a Performance Check*

(1) Remove frequency crystal oscillator tube V2 from TI, insert vector socket (part of tool kit), and reinstall V2 Apply 115-volt power

(2) Turn FUNCTION SW switch to CHK position Check voltage of batteries (or power supply) on meter of TI observing that, for both A and B positions of VOLTAGE switch, meter indicates in acceptable regions

NOTE

If Electronic Power Supply PP-1243/U is installed, no reading will be obtained in the A position of VOLTAGE switch

(3) Connect INPUT C connector of electronic counter (A2) to pin 3 of vector socket and chassis ground, using cable assembly, radiofrequency (B9)

(4) Observe that electronic counter indicates between 999 9 and 1000 1 kHz

(5) On TI, turn RANGE SW switch to RANGE C 65 MC to 1000 MC position

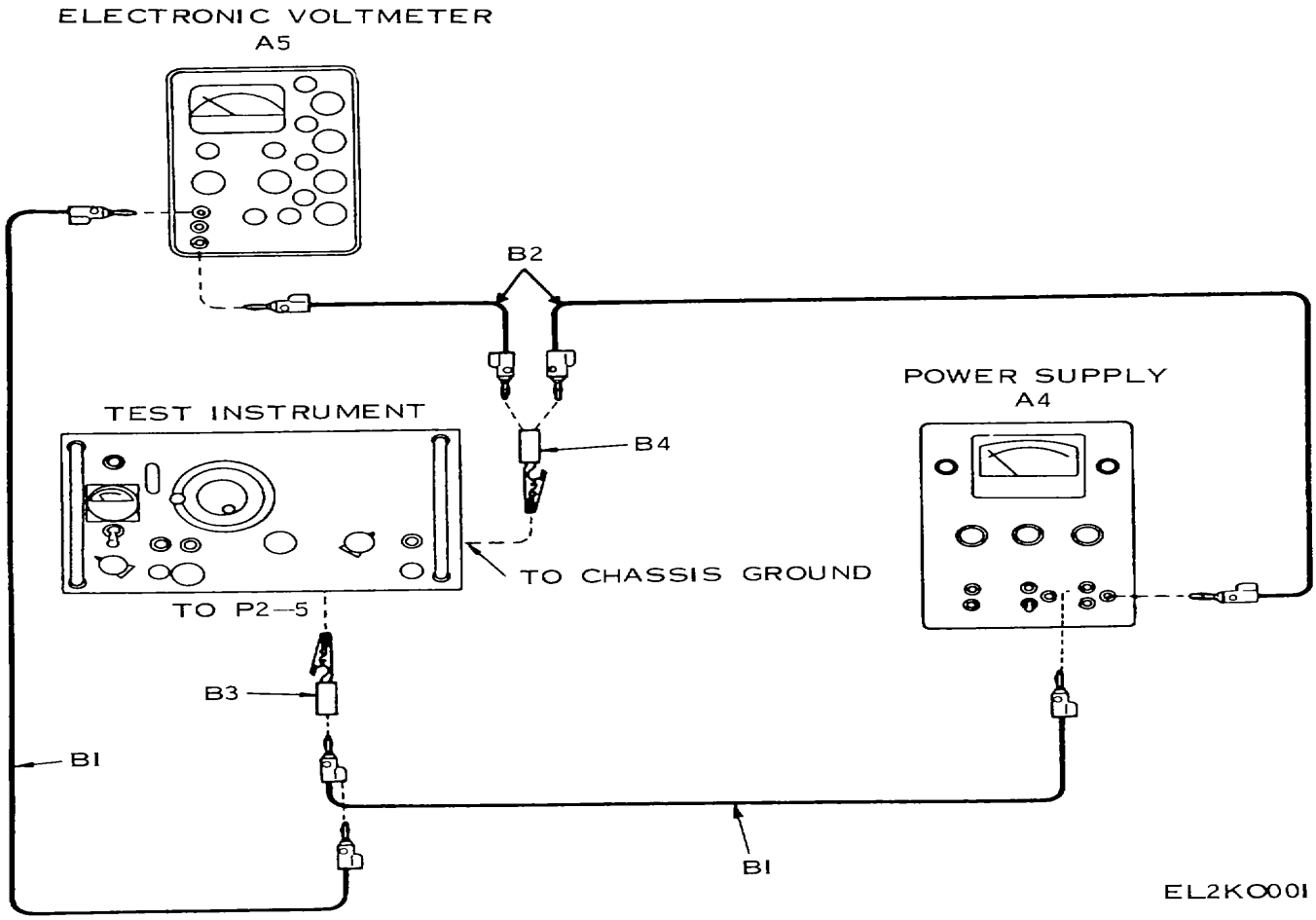

Figure 1. Input power check, equipment setup.

(6) Observe that electronic counter indicates between 2499 75 and 2500 25 kHz

b. Adjustment

(1) If RANGE A requires adjustment, turn RANGE switch to RANGE A

(2) Loosen locking nut and adjust C12 (fig 2) (1-MHz trimmer) of TI for a 1000-kHz indication on electronic counter Righten locking nut (R)

(3) If RANGE C requires adjustment, turn RANGE switch to RANGE C

(4) Loosen locking nut and adjust C 11 (fig 2) (2 5-MHz trimmer) of TI for a 2500-kHz indication on electronic counter Tighten locking nut (R) Remove vector socket and reinstall V2

10. Variable Frequency Oscillator. *a. Performance Check*

(1) Connect equipment as shown in figure 3

(2) Position TI controls as follows

(a) RANGE SW switch to RANGE A 125 kHz to 2 5 MHz

(b) AUDIO GAIN to midrange

(c) UNITS dial and HUNDREDS drum to 125 kHz, as determined by calibration book (supplied with TI)

(3) Adjust CORRECTOR control on TI until zero beat is observed on oscilloscope

(4) Turn FUNCTION switch on TI to OPER

(5) Adjust output of signal generator (A7) to approximate), 125 kHz at 0 5 volts

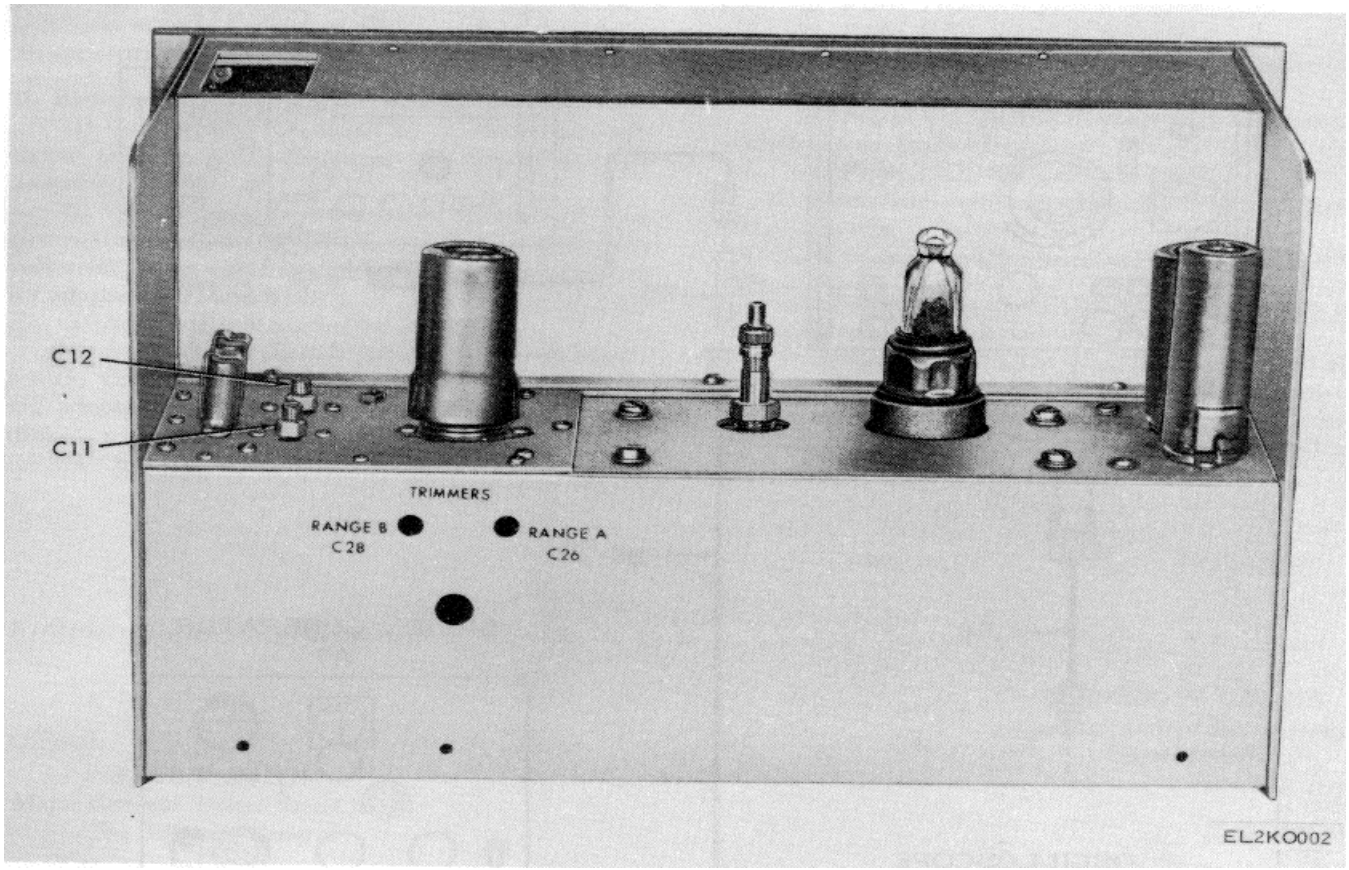

Figure 2. Frequency Meter AN/URM-32, rear view.

(6) Vary output frequency of signal generator until zero beat is observed on oscilloscope (A3)

(7) Observe electronic counter (A2) indicates between 124 9875 and 125 0125 kHz

(8) Turn signal generator output voltage control fully counterclockwise

(9) Turn UNITS dial and HUNDREDS drum to 187 5 kHz, as determined by calibration book, and FUNCTION switch to CHK

(10) Repeat (3) through (8) above, adjusting signal generator to approximately 187 5 kHz at 0 5-volt output, zero beating, and observing electronic counter indicates between 187 4812 and 187 5188 kHz

(11) Turn UNITS dial and HUNDREDS drum to 250 kHz, as determined by calibration book, and FUNCTION switch to CHK

(12) Repeat (3) through (8) above, adjusting signal generator to approximately 250 kHz at 0 5 volt output, zero beating, and observing electronic counter indicates between 249 9750 and 250 0250 kHz

(13) Turn RANGE switch on TI to RANGE B 2 5 MHz to 65 MHz

(14) Turn UNITS dial and HUNDREDS drum to 2 5 MHz, as determined by calibration book, and FUNCTION switch to CHK

(15) Repeat (3) through (8) above, adjusting signal generator to approximately 2 5 MHz at 1 0-volt output, zero beating, and observing electronic counter indicates between 2499 750 and 2500 250 kHz

(16) Turn UNITS dial and HUNDREDS drum to 3 75 MHz, as determined by calibration book, and FUNCTION switch to CHK

(17) Repeat (3) through (8) above, adjusting signal generator to approximately 3 75 MHz at 10-volt output, zero beating, and observing electronic counter indicates between 3749 625 and 3750 375 kHz

(18) Turn UNITS dial and HUNDREDS drum to 5 0 MHz, as determined by calibration book, and FUNCTION switch to CHK

(19) Repeat (3) through (8) above, adjusting signal generator to approximately 5 0 MHz at 1 0-volt output, zero beating, and observing electronic counter indicates between 4999 500 and 5000 500 kHz

(20) Disconnect signal generator, cable assembly, RF (B5) from TI Connect signal generator (A8) to TI, using cable assembly, RF (BS) and adapter, connector

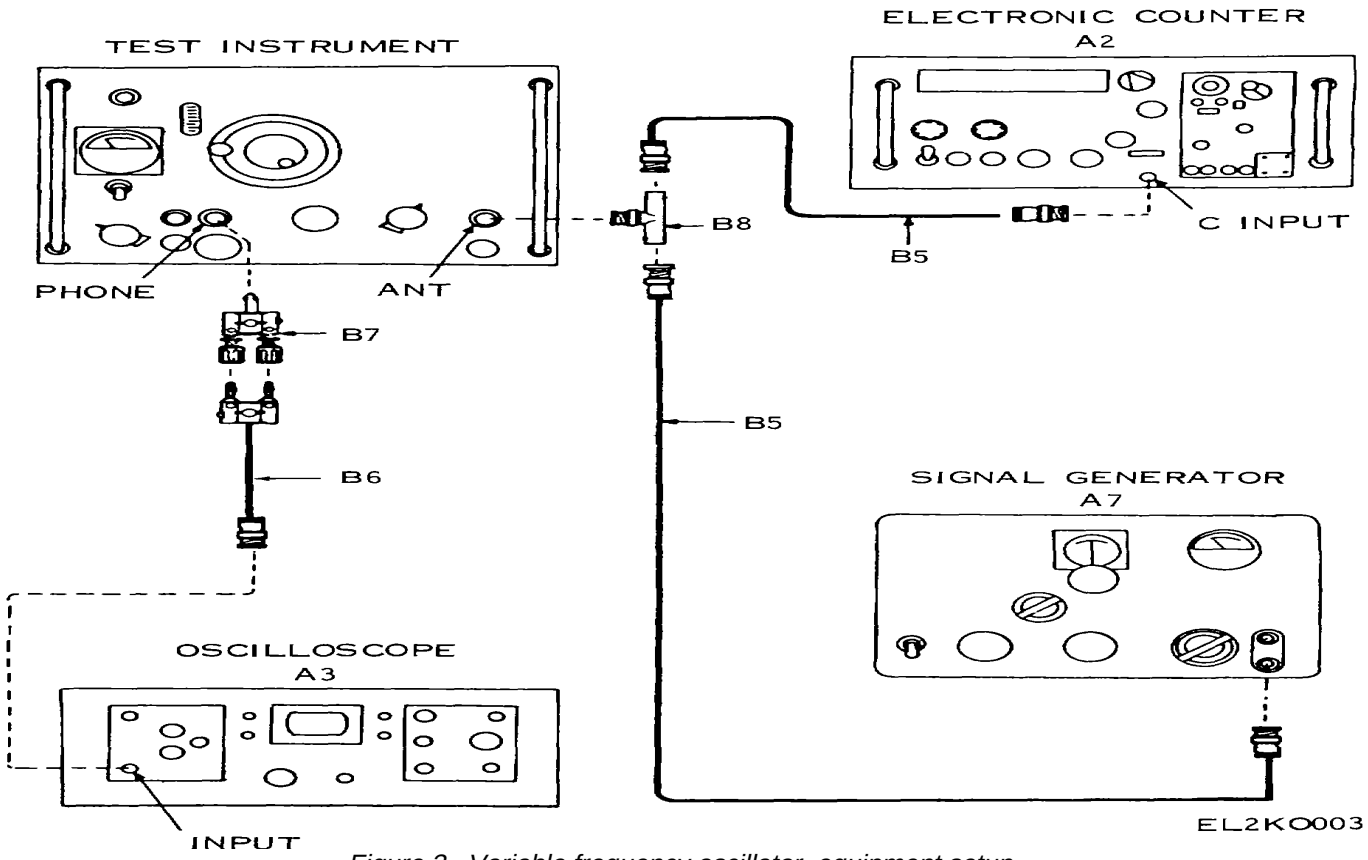

Figure 3. Variable frequency oscillator, equipment setup.

(B8).

(21) Disconnect cable assembly (B5) from electronic counter

(22) Turn RANGE switch on TI to RANGE C 65 to 1000 MHz

(23) Turn UNITS dial and HUNDREDS drum to 65 MHz, as determined by calibration book, and FUNCTION switch to CHK

(24) Adjust CORRECTOR control on TI until zero beat is observed on oscilloscope

(25) Turn FUNCTION switch to OPER, and using cable assembly (B5) and adapter, connector (B8), connect electronic counter to adapter, connector (B8) connected to ANT input connector of TI

(26) Repeat (5) through (8) above, adjusting signal generator output to approximately 65 MHz at maximum set level output, zero beating, and observing electronic counter indicates between 64 9935 and 65.0065 MHz

(27) Disconnect cable assembly (B5) from electronic counter, and turn attenuator dial on signal generator fully counterclockwise

(28) Repeat (23) through (27) above for 97 5 and 130 MHz, observing electronic counter indicates between 97 50957 and 97 49043 MHz and between 129 987 and 130 013 MHz, respectively

b. Adjustment. Adjustment of RANGE A, B and C may be accomplished in order to bring observed readings in line with the figures in the calibration booklet However, this is only authorized in order to correct a

linear up or down shift In all range frequencies If a nonlinear error is discovered, the TI must be shipped to an appropriate DEPOT to rewrite the booklet

11. Radiofrequency Output. *a. Performance Check*

(1) Connect INPUT terminals of electronic voltmeter (A5) to ANT connector of TI, using cable assembly, RF (B6)

(2) Connect decade resistor (A6) (in parallel with electronic voltmeter) to INPUT terminals of electronic voltmeter, using cable assembly RF (B10) and connector adapters (B 11 and B 12)

(3) Adjust decade resistor for 50 ohms.

(4) Adjust electronic voltmeter to 0.001-volt range

(5) Connect oscilloscope to PHONE jack on TI, using adapter, connector (B7) and cable assembly, RF (B6)

(6) On TI, set controls as follows

(a) FUNCTION SW switch to CHK.

(b) RANGE SW switch to RANGE A.

(c) UNITS dial to 125 kHz crystal checkpoint listed in calibration book.

(d) Adjust CORRECTOR control for a zero beat as observed on oscolloscope.

(e) FUNCTION SW switch to MOD.

(7) Electronic voltmeter should indicate at least 100 mlcrovolts.

b Adjustments No adjustments can be made.

12. Final Procedure. *a.* Set FUNCTION SW switch to OFF and replace TI in its cabinet.

b. In accordance with TM 38-750, annotate and affix calibration DA Label 80 (US Army Calibration System) When the TI cannot be adjusted to within tolerance, annotate and affix DA Form 2417 (red tag) (Unserviceable or Limited Use Tag).

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