*TB 9-4931-427-35

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DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR FREQUENCY DIFFERENCE METER, TRACOR MODELS 527A AND 527E AND HICKOK MODEL FDM 2100

Headquarters, Department of the Army, Washington, DC
25 September 2000

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*This bulletin supersedes TB 9-4931-427-50, dated 25 May 1979, including all changes.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Frequency Difference Meter, Tracor Models 527A and 527E and Hickok Model FDM 2100. The manufacturers' manuals 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. The Tracor Model 527E Frequency Difference Meter has a front panel phase meter instead of the cathode ray tube used on the Tracor Model 527A and Hickok Model FDM 2100. Information shown in parenthesis is for Hickok Model FDM 2100. Other variations among models are described in 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) will follow the designated adjustment. Report only those adjustments made and designated with (R).

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

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Input	Frequency: 100 kHz to 5 MHz Voltage: 0.5 to 10 V rms
Frequency Difference Meter	Range: -10 to +10 parts in 10^7, 10^8, 10^9, 10^{10}, or 10^{11} Accuracy: ±5% of full scale

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 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)
SYNTHESIZER/FUNCTION GENERATOR	Range: 9999991 to 10000000.009 Hz Amplitude: 1 V rms	Hewlett-Packard, Model 3325A (MIS-35932)
TIME/FREQUENCY WORKSTATION	Range: 1 and 10 MHz Accuracy: ± 1.25 parts in 10^{11}	Autek Systems Corp., Model 620 (MIS-38946)

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 the manufacturer's manual for this TI.

d. 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 check where applicable.

a. If necessary, adjust mechanical zero adjustment screw on **FREQUENCY DIFFERENCE** meter face for 0 indication.

b. Connect TI to a 115 V ac source.

c. Connect time/frequency workstation **OUTPUT 1 MHz** to TI **REF (TEST) INPUT**.

d. Set **TEST/OPERATE** switch to **TEST**.

e. Set **POWER ON/OFF** switch to **ON.**

f. If necessary, adjust **ZERO ADJ** for 0 indication on **FREQUENCY DIFFERENCE** meter.

g. For Tracor Model 527E only. Press **PHASE** meter **ZERO** pushbutton and if necessary, adjust mechanical zero adjustment screw on phase meter face for **0** indication. Press **PHASE** meter **FS** pushbutton and if necessary, adjust **FS ADJ** for full scale deflection.

h. Set **TEST/OPERATE** switch to **OPERATE.**

8. Frequency Difference Meter

a. Performance Check

(1) Connect equipment as shown in figure 1.

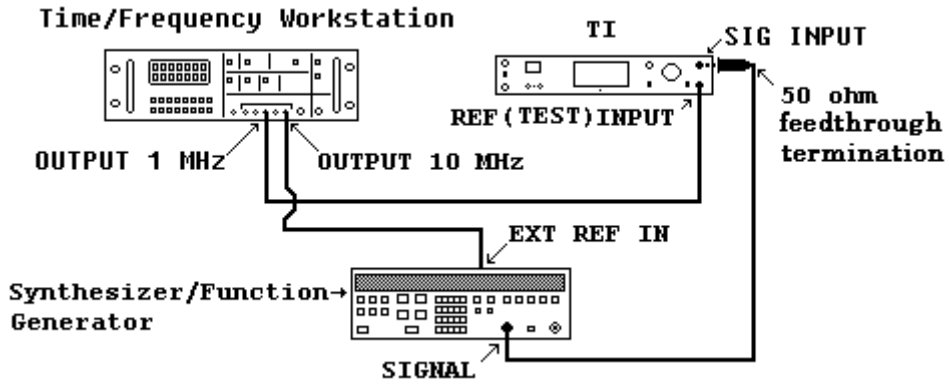

Figure 1. Frequency difference meter-equipment setup.

NOTE

Allow settling time. It may be necessary to take an average of TI indications.

(2) Set TI **METER RANGE/DIFF MULT** switch to **10^{10}**.

(3) Set synthesizer/function generator amplitude to 1 V rms and frequency to 10 000 000 .009 Hz. If TI does not indicate between +8.5 and +9.5, perform **b** (1) below.

(4) Repeat technique of (2) and (3) above using TI and synthesizer/function generator settings listed in table 3. If TI does not indicate within limits specified, perform **b** (1) below. Perform **b** (2) below for TI **METER RANGE/DIFF MULT** switch **10^{7}** settings.

Table 3. Frequency Difference Meter

Test instrument **METER RANGE/DIFF MULT** switch settings	Synthesizer/function generator frequency settings (Hz)	Test instrument indications	
		Min	Max
10^{10}	9 999 999 .991	-8.5	-9.5
10^{9}	10 000 000 .09	+8.5	+9.5
10^{9}	9 999 999 .91	-8.5	-9.5
10^{8}	10 000 000 .9	+8.5	+9.5
10^{8}	9 999 999 .1	-8.5	-9.5
10^{7}	10 000 009	+8.5	+9.5
10^{7}	9 999 991	-8.5	-9.5

b. Adjustments

(1) Adjust R12 (fig. 2) (R9 (fig. 3)) until TI indicates +9 (R).

(2) Adjust R13 (fig. 2) (R14 (fig. 3)) until TI indicates +9 (R).

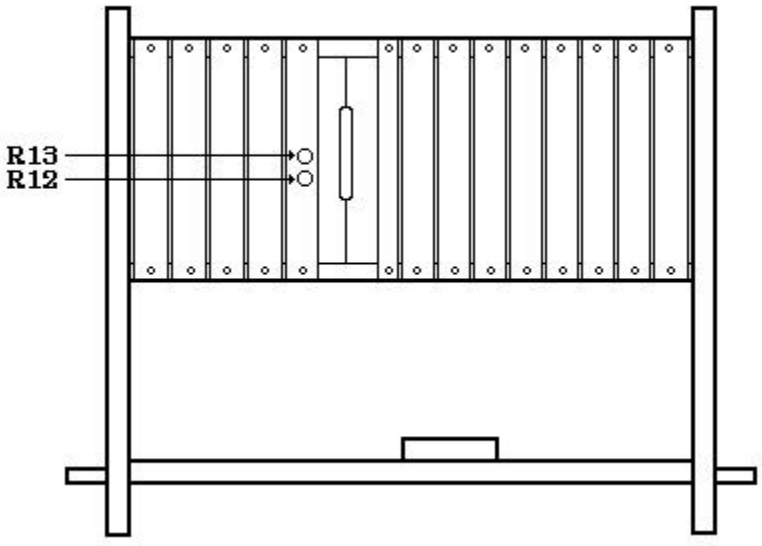

Figure 2. Tracor Models 527A and 527E-top view.

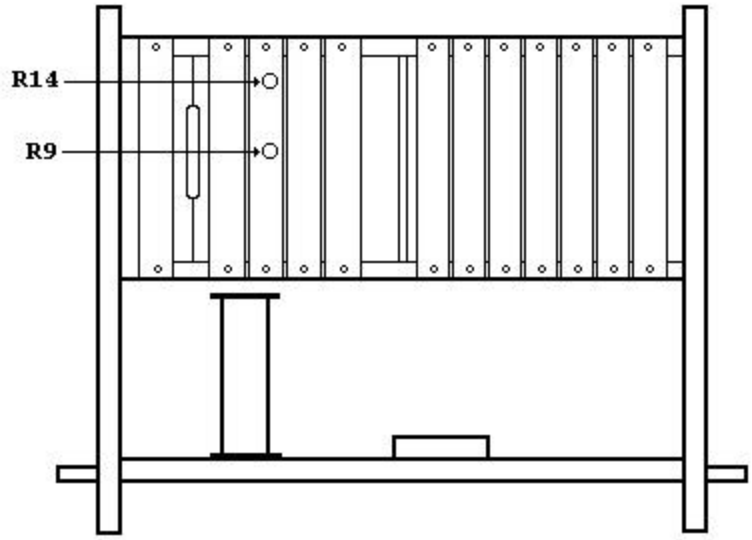

Figure 3. Hickok Model FDM 2100-top view.

9. 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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