*TB 9-6625-2080-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR CRYSTAL OSCILLATOR, FREQUENCY ELECTRONICS, MODEL FE2133A, VECTRON LABORATORIES, MODELS 244-4799 AND 207-6192, AND RUBIDIUM OSCILLATOR, EFRATOM, MODEL M-100

Headquarters, Department of the Army, Washington, DC
10 August 2007

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, US 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 bulletin supersedes TB 9-6625-2080-35, dated 2 January 1987, including all changes.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Crystal Oscillator, Frequency Electronics, Model FE2133A, Vectron Laboratories, Models 244-4799 and 207-6192, and Rubidium Oscillator, Efratom, Model M-100. 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. Variations among models are described in text.

b. Time and Technique. The time required for this calibration is approximately 1 hour, 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 in table 1.

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Frequency Electronics, model FE2133A and Vectron Laboratories, model 244-4799	
Frequency	Range: 10 MHz Stability: ±1 part in 10^9 over 24 hours
Output power	Range: +13 to 14.1 dBm into 50 Ω
Frequency Electronics, model 207-6192	
Frequency	Range: 10 MHz Stability: ±1 part in 10^{10} over 24 hours
Efratom, model M-100	
Frequency	Range: 10 MHz Stability[1]: ±1 part in 10^9 over 24 hours

[1]Stability specification based on limited application specification as stated on DA Form 3758, dated 12 December 1984.

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 Sets AN/GSM-286, AN/GSM-287, or 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)
DC POWER SUPPLY NO. 1	Range: 0 to 28 V dc	Elgar, Model DCS40-30EM10 (13589313)
DC POWER SUPPLY NO. 2	Range: 0 to 5 V dc	Tektronix, Type PS503A (MIS-30526/6)
FREQUENCY DIFFERENCE METER	Range: 10^7 to 10^{11} Resolution: 1 part in 10^{10}	Tracor, Model 527E (527E)
MULTIMETER	Range: 0 to 28 V dc Accuracy: ±1%	Hewlett-Packard, Model 3458A (3458A)
TIME/FREQUENCY WORKSTATION	Range: 1 MHz Accuracy: <6 parts in 10^{11} over 24 hours	Datum, Model ET6000-75 (13589305)
TRUE RMS VOLTMETER	Range: +13 to +14.1 dBm at 10 MHz Accuracy: ±5%	Fluke, Model 8922A/AA (8922A/AA)

SECTION III
CALIBRATION PROCESS FOR FREQUENCY ELECTRONICS, MODEL FE2133A AND VECTRON LABORATORIES, MODEL 244-4799

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 the manufacturer's manual for these TI's.

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. Place TI flat on level horizontal surface so that J1 is located above P1.

b. Connect dc power supply No. 1 positive output terminal to pin 3 of P1 on TI and negative output terminal to pin 1 of P1 on TI. (For model FE2133A, connect a second lead from negative output terminal to pin 6 of P1 on TI).

c. Adjust dc power supply No. 1 for a +28 Vdc output and allow at least 72 hours for TI stabilization.

8. Frequency Stability

a. Performance Check

(1) Connect a 1 MHz output signal from time frequency workstation to **REF INPUT** of frequency difference meter.

(2) Connect TI output jack to **SIG INPUT** of frequency difference meter.

(3) Remove protective bolt (on rear of TI) to gain access to adjustment and adjust FREQUENCY ADJUST for minimum difference indication on frequency difference meter.

(4) Allow at least 24 hours for oscillator stabilization. Frequency difference meter will not change more than 1 part in 10^9.

b. Adjustments. No further adjustments can be made.

9. Output Power

a. Performance Check

NOTE

Most TI's require a matching attenuator to achieve the desired power output. Matching attenuator must accompany TI when submitted for calibration.

(1) Disconnect frequency difference meter from TI output jack.

(2) Connect true rms voltmeter to TI output jack using a 50Ω feed through termination. True rms voltmeter will indicate between +13.0 and +14.1 dBm.

b. Adjustments. None.

10. 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 VECTRON LABORATORIES, MODEL 207-6192

11. Preliminary Instructions

a. The instructions outlined in paragraphs **11** and **12** 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 the manufacturer's manual for these TI's.

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

12. Equipment Setup

a. Connect dc power supply No. 1 positive output terminal to pin 4 of P1 on TI and negative output terminal to pin 3 of P1 on TI.

b. Connect dc power supply No. 2 positive output terminal to pin 2 of P1 on TI and negative output terminal to pin 3 of P1 on TI.

c. Adjust dc power supply No. 1 for a +24 Vdc output.

d. Connect multimeter to dc power supply No. 2 observing polarity.

e. Adjust dc power supply No. 2 for a +5.0 V output as indicated on multimeter and allow at least 72 hours for stabilization.

13. Frequency Stability

a. **Performance Check**

(1) Connect a 1 MHz output signal from time frequency workstation to **REF INPUT** of frequency difference meter.

(2) Connect TI output jack to **SIG INPUT** of frequency difference meter.

(3) Remove protective bolt (on rear of TI) to gain access to adjustment and adjust FREQUENCY ADJUST for minimum difference indication on frequency difference meter.

(4) Allow at least 24 hours for oscillator stabilization. Frequency difference meter will not change more than 1 part in 10^9.

b. **Adjustments**. No further adjustments can be made.

14. Final Procedure

a. Deenergize and disconnect all equipment.

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

SECTION V
CALIBRATION PROCESS FOR EFRATOM, MODEL M-100

15. Preliminary Instructions

a. The instructions outlined in paragraphs **15** and **16** 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 the manufacturer's manual for these TI's.

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

16. Equipment Setup

a. Connect dc power supply No. 1 positive output terminal to pin P of J2 on TI and negative output terminal to pin L of J2 on TI.

b. Adjust Dc power supply No. 1 for a +26.0 Vdc output and allow at least 72 hours for stabilization.

17. Frequency Stability

a. **Performance Check**.

(1) Connect a 1 MHz output signal from time frequency workstation to **REF INPUT** of frequency difference meter.

(2) Connect TI **J1 RF OUT** to **SIG INPUT** of frequency difference meter.

(3) Note indication on frequency difference meter. If indication is greater than 1 part in 10^9, perform **b** below.

b. **Adjustments**

(1) Adjust FREQ ADJ (located to right of J2) for an indication of 1 part in 10^{10} or less on frequency difference meter.

(2) Allow at least 24 hours for oscillator stabilization. Frequency difference meter will not change more than 1 part in 10^{10}.

18. 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

Official:

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0716505

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342222 requirements for calibration procedure TB 9-6625-2080-24.

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.