# *TB 9-4920-458-35

## DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

# CALIBRATION PROCEDURE FOR RUBIDIUM FREQUENCY STANDARD EFRATOM, MODEL FRT-GR-LA

Headquarters, Department of the Army, Washington, DC
8 June 2005



**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, 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 9-4920-458-35, dated 9 May 1994.

## SECTION I
## IDENTIFICATION AND DESCRIPTION

**1. Test Instrument Identification.** This bulletin provides instructions for the calibration of Rubidium Frequency Standard, Efratom, Model FRT-GR-LA. Calibration and Measurements Requirement Summary (CMRS) IFTE89P63031100, dated 26 June 1992, was used as the prime data source 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 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. 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: (J1, J2) 0.5 to 0.7 V rms into 50 Ω at l0 MHz<br>(J3, J4) 1.0 V rms into 50 Ω at 10 MHz<br>(J5 to J8) 1.0 V rms into 50 Ω at 10 MHz<br><br>Accuracy: ±0.02 Hz |

## 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. 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) |
|---|---|---|
| FREQUENCY DIFFERENCE METER | Resolution: ±5 parts in $10^{10}$ | Tracor, Model 527E (527E) |
| TIME/FREQUENCY WORKSTATION | Range: 10 MHz<br>Accuracy: ±5 parts in $10^{10}$ | Datum, Model ET6000-75 (13589305) |

## 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**. Connect TI to 115 V ac source and verify **POWER ON** indicator is illuminated.

**b**. Allow at least 1 hour for warm-up and verify **OPERATION** indicator is illuminated.

### 8. Frequency Accuracy

#### a. Performance Check

(1) Connect time/frequency workstation 1 MHz output to frequency difference meter **REF INPUT**.

(2) Connect TI **10 MHz OUTPUT J1 0.5-0.7 VRMS 50Ω** connector (rear panel) to frequency difference meter **SIG INPUT** using a 50 Ω feedthrough termination.

(3) If frequency difference meter does not indicate within ±2 parts in $10^9$, perform **b** below.

(4) Repeat (2) and (3) above for remaining TI **10 MHz OUTPUT** connectors.

**b. Adjustments**

(1) Remove TI top cover.

(2) Set TI **CONTROL VOLTAGE/RUBIDIUM LAMP/EXT DC SUPPLY** switch to **EXT DC SUPPLY.** If TI meter does not indicate 24 ±1 V dc, adjust R13 on power supply board (inside right of TI) (R).

(3) Set TI **CONTROL VOLTAGE/ RUBIDIUM LAMP/EXT DC SUPPLY** switch to **CONTROL VOLTAGE**.

**NOTE**

If crystal trim adj is adjusted too fast in (4) or (5) below, the control loop opens and a search circuit is automatically initiated to relock the atomic resonance. This may take up to 30 seconds.

(4) If TI meter indication is 1.5 V dc or less, remove screw to access hole on top of **RUBIDIUM OSCILLATOR** and adjust crystal trim adj slowly cw until meter indicates approximately 8 to 9 V dc. Replace screw (R).

(5) If TI meter indication is 12 V dc or greater, remove screw to access hole on top of **RUBIDIUM OSCILLATOR** and adjust crystal trip adj slowly ccw until meter indicates approximately 8 to 7 V dc. Replace screw (R).

(6) Adjust R1 dial (inside bottom of TI) for a minimum frequency difference meter indication (R).

(7) Replace TI top cover.

**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:

PETER J. SCHOOMAKER
*General, United States Army*
*Chief of Staff*

Official:

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0510305

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 344507, requirements for calibration procedure TB 9-4920-458-35.

## 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.