*TB 9-6695-300-40

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR RADAR GUN TUNING FORKS (GENERAL)

Headquarters, Department of the Army, Washington, DC
16 May 2008

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, U.S. 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 send in your comments electronically to our E-mail address: 2028@redstone.army.mil or by fax 256-842-6546/DSN 788-6546. For the World Wide Web use: https://amcom2028.redstone.army.mil. Instructions for sending an electronic 2028 can be found at the back of this manual.

*This bulletin supersedes TB 9-6695-300-50, dated 7 May 2004.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Radar Gun Tuning Forks (General). 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. 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. Forms, records, and reports required for calibration personnel at all levels are prescribed by TB 750-25.

3. Calibration Description. Some typical TI parameters and performance specifications for known tuning forks are listed in table 1 by manufacturer and model.

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Frequency: General X-Band	Range: X-Band (Carrier, 10.525 GHz) 35 MPH, 1099 Hz 50 MPH, 1569 Hz 65 MPH, 2040 Hz 80 MPH, 2511 Hz 88 MPH, 2762 Hz Accuracy: ±0.5 MPH or ± 15.6 Hz
Frequency: Specific X-Band (Kustom Electronics, Model KR-10SP)	Range: X Band 35 MPH, 1115 Hz 50 MPH, 1582 Hz 65 MPH, 2057 Hz Accuracy: ±10 Hz
Frequency: General K-Band	Range: K-Band (Carrier, 24.15 GHz) 35 MPH, 2521 Hz 50 MPH, 3601 Hz 65 MPH, 4681 Hz 65 MPH, 4732 Hz[1] 80 MPH, 5762 Hz 88 MPH, 6338 Hz Accuracy: ± 35.8 Hz or ± .5 MPH
Frequency: Specific K-Band (Kustom Electronics, Model 0640053, 0640054)	Range: K Band 35 MPH, 2542 Hz 50 MPH, 3650 Hz 65 MPH, 4732 Hz Accuracy: ± 10 Hz

See footnote at end of table.

Table 1. Calibration Description - Continued

Test instrument parameters	Performance specifications
Frequency: Specific K-Band (Targetron, Model 111724)	Range: K-Band 120 km/h, 5370.6 Hz Accuracy: ±10 Hz
Frequency: Specific K-Band (Decatur Electronics, Model GHS-77.6)	Range: K-Band (carrier, 24.15 GHz) 77.6 MPH, 5589 Hz Accuracy: ±5 Hz
Frequency: General Ka-Band	Range: Ka-Band (carrier 34.7 GHz) 25 MPH, 2587 Hz 40 MPH, 4139 Hz Accuracy: ±103.5 Hz
Frequency: Specific Ka-Band (Kustom Signal, Inc., Model Golden Eagle (Ka)	Range: Ka-Band (carrier, 33.4 to 36 GHz) 25 MPH, 2667 Hz 30 MPH, 3208 Hz 35 MPH, 3737 Hz 50 MPH, 5737 Hz 55 MPH, 5892 Hz 60 MPH, 6426 Hz 65 MPH, 6961 Hz Accuracy: ±10 Hz

[1]Specific Kustom Electronic Model HR12 tuning forks made from 1990 to present have frequencies of 4732 Hz ±10 Hz only at 65 MPH.

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 Reference Calibration Standards Set, NSN 4931-00-621-7878. 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)
FREQUENCY COUNTER	Range: 1 to 10 KHz Accuracy: ±0.25% of reading	Fluke, Model PM6681/656 (PM6681/656)
SOUND LEVEL METER	Range: 30 to 100 dBA, 70 to 140 dBC Sound level accuracy: Not applicable	Quest Technologies, Model 2400 (APN: 13534004)

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. Additional maintenance information is contained in the manufacturers' manuals 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 equipment as shown in figure 1.

b. Position sound level meter switches as listed in (1) through (4) below.

(1) **WEIGHTING** switch (**A** or **C**) to **C**.

(2) **dB RANGE** switch to **LOW** (**30-100 db**).

(3) **FAST/SLOW RESPONSE** switch to **SLOW**.

(4) **RUN/HOLD/RESET** switch to **RUN**.

NOTE

Set the **RUN/HOLD/RESET** switch in the **RUN** position to measure the tuning fork frequency each time the tuning fork is struck. After each frequency measurement during the calibration, use the **RESET** position to clear the readings and begin another measurement in the **RUN** position.

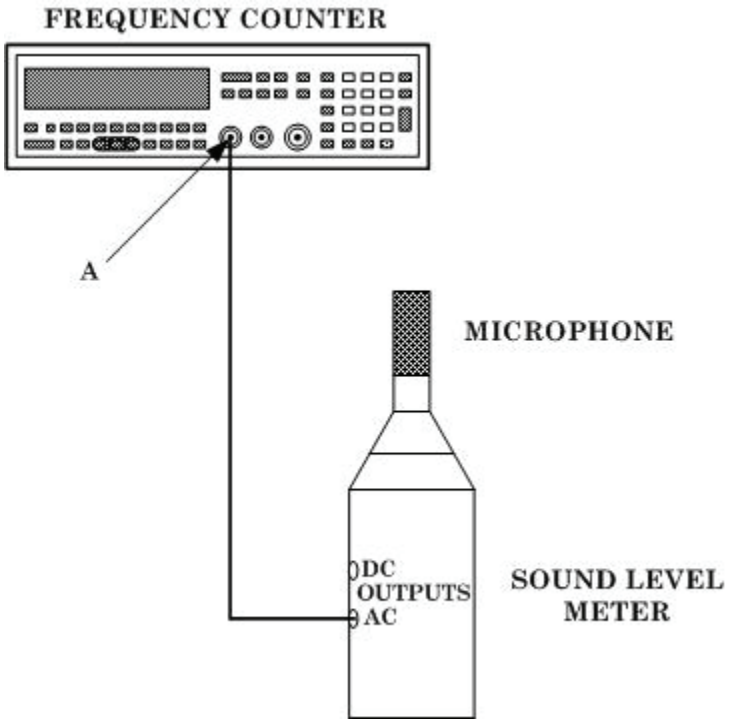

Figure 1. Sound level meter equipment.

8. Frequency Accuracy

NOTE

Calibration should be performed in an area relatively free of environmental noise.

a. Select a tuning fork.

b. Strike tuning fork sharply on the edge of wooden (or plastic) bench (or table) and hold approximately ¼ inch over microphone (fig. 1) while observing frequency counter indication. Record frequency counter indication.

c. Repeat **b** above several times (at least 5) and average the recorded indications. The average reading is the measured frequency of the tuning fork.

d. Repeat technique of **b** and **c** above for each tuning fork.

e. Provide the owner/user a test report stating the tuning fork frequency. If the RADAR frequency is known, calculate tuning fork frequency in MPH and include in test report.

NOTE

If the RADAR frequency is known, the tuning fork frequency in MPH can be calculated using the standard Doppler formula:

$$V = \frac{C \times f_d}{2 \times f_t}$$

Where:

V = Tuning fork frequency in MPH
f_d = Tuning fork frequency in (Hz)
C = Speed of light (MPH x 10^{+9})
f_t = Radar Transmitter frequency (GHz)

$$V = \frac{0.6706 \times f_d}{2 \times f_t}$$

Example 1: For X-band RADARS:

$$V = \frac{0.6706 \times 1883}{2 \times (10.525)}$$

V = 60 MPH

Example 2: For K-band RADARS:

$$V = \frac{0.6706 \times 4322}{2 \times (24.15)}$$

V=60 MPH

Example 3: For Ka-Bands RADARS:

$$V = \frac{0.6706 \times 6209}{2 \times (34.7)}$$

= 60 MPH

NOTE

Simpler formulas for calculating tuning fork frequencies other than those listed in table 1 can be used as follows:

X-Band	TFHz = V(31.389)
K-Band	TFHz = V(72.023)
Ka-Band	TFHz = V(103.48324)
Where:	TFHz = Tuning Fork Hz
	V = MPH

NOTE

Tuning fork frequencies for speed guns that measure in kilometers per hour may be calculated using the following formulas.

MPH = kph X 0.6214

X-Band = MPH X 31.389

K-Band = MPH X 72.023

NOTE

The OWNER/USER is responsible for calibration of the speed gun. Affix a certification label to the speed gun and annotate in the special block with the tuning fork/forks ID or serial number.

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:

Official:

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0808810

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To be distributed in accordance with STD IDS No. RLC-1500, 2 January 2003, requirements for calibration procedure TB 9-6695-300-40.

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1. **From**: Joe Smith
2. Unit: home
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4. **City**: Hometown
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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
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