*TB 9-5915-215-40

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR HIGH POWER TUNABLE BAND PASS FILTER RODALE ELECTRONICS, INC. MODEL 13589299

Headquarters, Department of the Army, Washington, DC
8 July 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.

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*This bulletin supersedes TB 9-5915-215-50, dated 17 May 2005.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of High Power Tunable Band Pass Filter, Rodale Electronics, Inc., Model 13589299. The manufacturer's manual 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 2 hours, using dc and low and microwave frequency techniques.

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
Insertion loss	≤2.0 dB at each center frequency
Harmonic rejection	> 50 dB down for second, third and fourth harmonics at each of the following center frequencies: 135 kHz, 300 kHz, 600 kHz, 1.0 MHz, 2.0 MHz, 3.2 MHz, 5.0 MHz, 6.3 MHz, 10.0 MHz, 16.0 MHz, 25.0 MHz, 40.0 MHz, 70.0 MHz, 100 MHz, 150 MHz, 270 MHz, 600 MHz, and 1000 MHz

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 4931-00-621-7877. 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)
ATTENUATOR	Attenuation: 6 dB	Weinschel, Model 9918 (9918-6dB)
MEASURING RECEIVER	Attenuation frequency range: 135 kHz to 1 GHz Attenuation range: 0.0 Attenuation accuracy: ±0.5 dB	Hewlett-Packard, Model 8902A w/sensor, Hewlett-Packard, Model 11722A (11722A)
SIGNAL GENERATOR	Frequency range: 135 kHz to 1000 MHz Power output range: 0 dBm	(SG1207U)
SPECTRUM ANALYZER	Frequency range: 135 kHz to 4000 MHz 0 to –60 dBm Accuracy: ±0.2% of the center frequency +20% of the span/div Range: Span 250k Hz Accuracy: ±5%	(AN/USM677)
SYNTHESIZED SIGNAL GENERATOR	Frequency range: 270 MHz to 4 GHz Power output range: 0 dBm	Anritsu, Model 68369NV

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. Set measuring receiver **LINE** switches to **ON** position and allow 1 hour for equipment to warm-up.

b. Prepare measuring receiver to measure RF power.

c. Connect TI to 115 V ac source and turn power on and allow sufficient warm-up time.

8. Insertion Loss and Rejection Test

a. Performance Check

(1) Connect POINT A (fig. 1) to the TI **RF INPUT** and POINT B (fig. 1) to TI **RF OUTPUT**. Set signal generator **RF OUTPUT** on.

NOTE

Ignore any faults/errors on the TI when setting the TI to **00** range.

(2) Set the TI **AUTO/MANUAL/SELECT** switch to the center position **MANUAL** (manual operation), and set the thumb wheels to select range **00**. Press the **AUTO/MANUAL/SELECT** switch down momentarily to activate the TI range.

(3) Set signal generator to produce a 135 kHz CW output at 0 dBm and establish a RF power reference on measuring receiver.

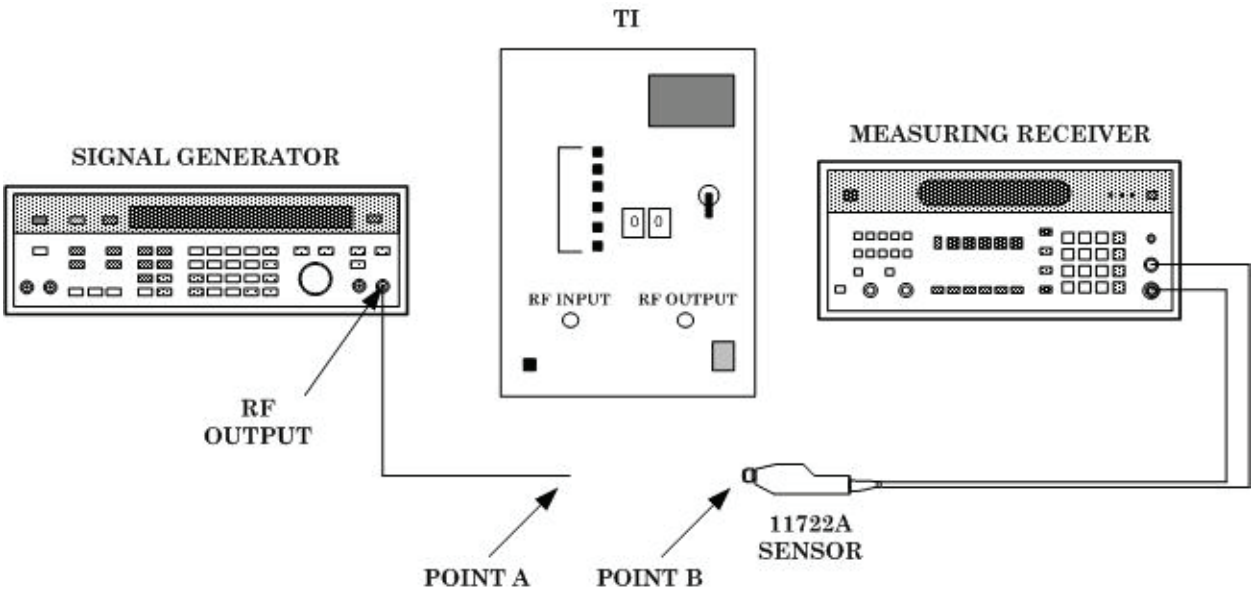

Figure 1. Equipment setup.

(4) Set TI **AUTO/MANUAL/SELECT** switch to the center position, **MANUAL** (manual operation), and set the thumb wheels to select range **01**. Press the **AUTO/MANUAL/SELECT** switch down momentarily to activate the TI range.

(5) Measuring receiver will indicate within the limits listed in table 3.

(6) Repeat technique of (2) through (5) above for remaining ranges and frequencies listed in table 3.

Table 3. Insertion Loss

Range	Signal generator frequency (Hz)	Measuring receiver indication (dB)
01	135 k	≤2
02	300 k	≤2
03	600 k	≤2
04	1.0 M	≤2
05	2.0 M	≤2
06	3.2 M	≤2
07	5.0 M	≤2
08	6.3 M	≤2
09	10.0 M	≤2
10	16.0 M	≤2
11	25.0 M	≤2
12	40.0 M	≤2
13	70.0 M	≤2
14	100.0 M	≤2
15	150.0 M	≤2
16	270.0 M	≤2
17	600.0 M	≤2
18	1000 M	≤2

(7) Set signal generator **RF OUTPUT** to off and disconnect measuring receiver from TI.

b. Adjustments. No adjustments can be made.

9. Harmonic Rejection

a. Performance Check

(1) Connect equipment as shown in figure 2.

(2) Set TI **AUTO/MANUAL/SELECT** switch to the center position, **MANUAL** (manual operation), and set the thumb wheels to select range **01**. Press the **AUTO/MANUAL/SELECT** switch down momentarily to activate the TI range.

(3) Set signal generator to produce a 135 kHz CW output at 0 dBm.

(4) Set spectrum analyzer center frequency to match signal generator output frequency and span to 250 kHz.

(5) Press the spectrum analyzer **Peak Search**, **Marker, Delta** keys.

(6) Set signal generator output frequency and spectrum analyzer center frequency for that of the 2d harmonic as listed in table 4 and press **Peak Search** key. Spectrum analyzer will indicate as listed in table 4.

(7) Repeat technique of (6) above for the 3d and 4th harmonics.

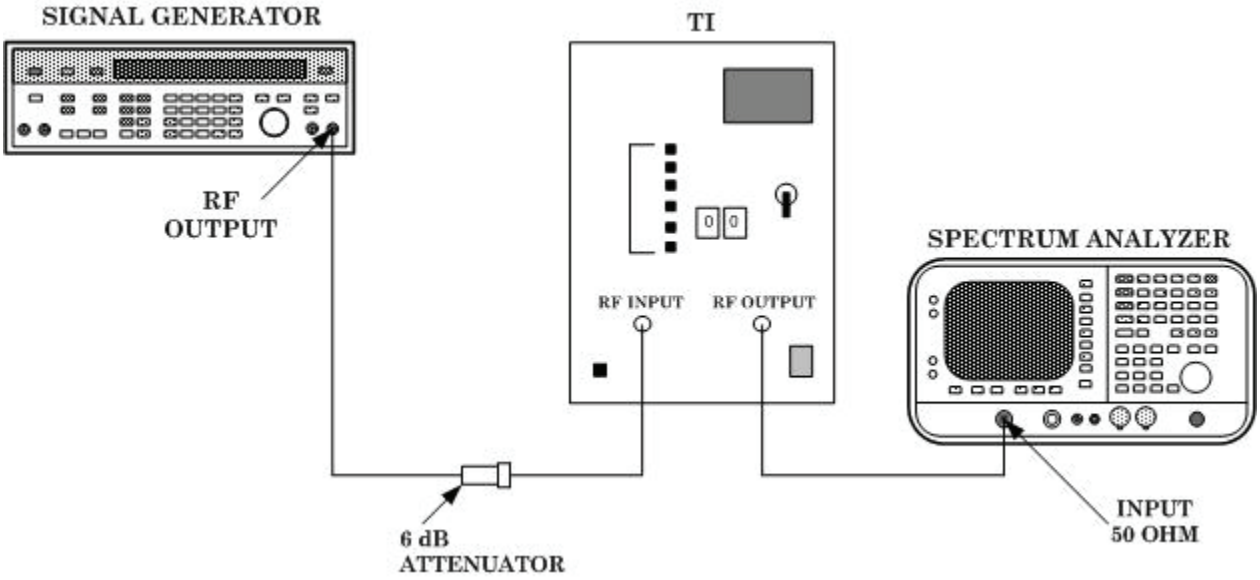

Figure 2. Harmonic rejection.

(8) Repeat technique of (2) through (7) above for the remaining thumb wheel and frequency setting listed in table 4.

Table 4. Harmonic Rejection

Test instrument		Signal generator	Spectrum analyzer	
Thumb wheel	Harmonic #	Frequency (Hz)	Center frequency (Hz)	Level indication (dB)
01	----------	135 k	135 k	Ref
----------	2	270 k	270 k	≥50
----------	3	405 k	405 k	≥50
----------	4	540 k	540 k	≥50
02	----------	300 k	300 k	Ref
----------	2	600 k	600 k	≥50
----------	3	900 k	900 k	≥50
----------	4	1.2 M	1.2 M	≥50
03	----------	600 k	600 k	Ref
----------	2	1.2 M	1.2 M	≥50
----------	3	1.8 M	1.8 M	≥50
----------	4	2.4 M	2.4 M	≥50
04	----------	1.0 M	1.0 M	Ref

Table 4. Harmonic Rejection - Continued

Test instrument		Signal generator	Spectrum analyzer	
Thumb wheel	Harmonic #	Frequency (Hz)	Center frequency (Hz)	Level indication (dB)
----------	2	2.0 M	2.0 M	≥50
----------	3	3.0 M	3.0 M	≥50
----------	4	4.0 M	4.0 M	≥50
05	----------	2.0 M	2.0 M	Ref
----------	2	4.0 M	4.0 M	≥50
----------	3	6.0 M	6.0 M	≥50
----------	4	8.0 M	8.0 M	≥50
06	----------	3.2 M	3.2 M	Ref
----------	2	6.4 M	6.4 M	≥50
----------	3	9.6 M	9.6 M	≥50
----------	4	12.8 M	12.8 M	≥50
07	----------	5.0 M	5.0 M	Ref
----------	2	10.0 M	10.0 M	≥50
----------	3	15.0 M	15.0 M	≥50
----------	4	20.0 M	20.0 M	≥50
08	----------	6.3 M	6.3 M	Ref
----------	2	12.6 M	12.6 M	≥50
----------	3	18.9 M	18.9 M	≥50
----------	4	25.2 M	25.2 M	≥50
09	----------	10.0 M	10.0 M	Ref
----------	2	20. 0M	20.0 M	≥50
----------	3	30.0 M	30.0 M	≥50
----------	4	40.0 M	40.0 M	≥50
10	----------	16.0 M	16.0 M	Ref
----------	2	32.0 M	32.0 M	≥50
----------	3	48.0 M	48.0 M	≥50
----------	4	62.0 M	64.0 M	≥50
11	----------	25.0 M	25.0 M	Ref
----------	2	50.0 M	50.0 M	≥50
----------	3	75.0 M	75.0 M	≥50
----------	4	100.0 M	100.0 M	≥50
12	----------	40.0 M	40.0 M	Ref
----------	2	80.0 M	80.0 M	≥50
----------	3	120.0 M	120.0 M	≥50
----------	4	160.0 M	160.0 M	≥50
13	----------	70.0 M	70.0 M	Ref
----------	2	140.0 M	140.0 M	≥50
----------	3	210.0 M	210.0 M	≥50
----------	4	280.0 M	280.0 M	≥50
14	----------	100.0 M	100.0 M	Ref
----------	2	200.0 M	200.0 M	≥50
----------	3	300.0 M	300.0 M	≥50
----------	4	400.0 M	400.0 M	≥50

Table 4. Harmonic Rejection - Continued

Test instrument		Signal generator or synthesized signal generator	Spectrum analyzer	
Thumb wheel	Harmonic #	Frequency (Hz)	Center frequency (Hz)	Level indication (dB)
15	----------	150.0 M	150.0 M	Ref
----------	2	300.0 M	300.0 M	≥50
----------	3	450.0 M	450.0 M	≥50
----------	4	600.0 M	600.0 M	≥50
16[1]	----------	270.0 M	270.0 M	Ref
----------	2	540.0 M	540.0 M	≥50
----------	3	810.0 M	810.0 M	≥50
----------	4	1.08 G	1.08 G	≥50
17	----------	600.0 M	600.0 M	Ref
----------	2	1.2 G	1.2 G	≥50
----------	3	1.8 G	1.8 G	≥50
----------	4	2.4 G	2.4 G	≥50
18	----------	1000 M	1000 M	Ref
----------	2	2.0 G	2.0 G	≥50
----------	3	3.0 G	3.0 G	≥50
----------	4	4.0 G	4.0 G	≥50

[1]Replace signal generator with synthesized signal generator.

(9) Set synthesized signal generator RF OUTPUT to off and disconnect equipment setup.

b. Adjustments. No adjustments can be made.

10. 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:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army

0812802

Distribution:

To be distributed in accordance with STD IDS No. RLC-1500, 2 January 2003, requirements for calibration procedure TB 9-5915-215-40.

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.