*TB 9-6625-2184-35

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR SIGNAL GENERATOR SG-71/FCC, SG-71A/FCC, SG-71B/FCC, SG-71C/FCC, AND HEWLETT-PACKARD, MODEL 233A

Headquarters, Department of the Army, Washington, DC
10 November 2004

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 technical bulletin supersedes TB 9-6625-2184-35, 14 September 1987.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Signal Generator, SG-71/FCC, SG-71A/FCC, SG-71B/FCC, SG-71C/FCC and (Hewlett-Packard, Model 233A). The manufacturer's manual and TM 11-6625-358-15 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 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) 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 listed in table 1.

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Meter	Range: 40 V at 10 kHz into 600 Ω Accuracy: ± 5% FS
Frequency, stability, and UNBAL response	Range: 50 Hz to 500 kHz Accuracy: ± 2% Output: ≥ 6 V ac into 600 Ω
Balanced output and frequency response	Range: 5 to 500 kHz Accuracy: ± 1 dB Output: ≥ 42.5 V ac into 600 Ω
Distortion	Range: 10 to 100 kHz balanced output Distortion: < 3% Range: 50 Hz to 100 kHz unbalanced output Distortion: < 1%

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 the calibration procedure. The following peculiar accessory is also required for this calibration: Voltage Divider, 600 Ω, double banana plug to triple banana jack, Hewlett-Packard, Model 11047A (7911560)

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
AUDIO ANALYZER	Range: 50 Hz to 100 kHz Accuracy: < 1%	Boonton, Model 1121 (1121)
AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: ± 1%	Ridge, Model 9020A (9020A)
FREQUENCY COUNTER	Range: 50 Hz to 500 kHz Accuracy: 0.5%	Fluke, Model PM6681/656 (PM6681/656)
MULTIMETER	Range: 230 to 250 V dc Accuracy: ± 1.04%	Fluke, Model 8840A/AF05 (AN/GSM-64D)
TRUE RMS VOLTMETER	Range: 6 to 42.5 V ac Accuracy: ± 1.25%	Fluke, Model 8922A/AA (8922A/AA)

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 applicable sections 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. When indications specified in paragraphs **8** through **11** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **8** through **11**. Do not perform power supply check if all other parameters are within tolerance.

e. 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 checks where applicable.

a. Remove protective covers from TI only when necessary to make adjustments. Replace cover after completing adjustments.

b. Connect TI to autotransformer.

c. Connect autotransformer to a 115 V ac power source and adjust for a 115 V ac output.

d. Set power switch to **ON** and allow at least 1 hour for warm-up and stabilization.

8. Meter Accuracy

a. Performance Check

(1) Connect true rms voltmeter to **BAL OUTPUT** using voltage divider.

NOTE

Reduce output promptly after making checks to avoid overheating voltage divider.

(2) Position controls as listed in (a) through (c) below:

(a) **MOD. BAL. - BAL. - UNBAL** switch to **BAL**.

(b) **RANGE** switch to **X100**.

(c) Frequency dial to **100**.

(3) Adjust **AMPLITUDE COARSE** and **FINE** controls until **OUTPUT LEVEL** meter indicates **40** on the **0** to **50** scale. If true rms voltmeter does not indicate between 37.5 and 42.5 V ac, perform **b** below.

(4) Repeat technique of (3) above for remaining **OUTPUT LEVEL** meter indications listed in table 3. True rms voltmeter will indicate within limits specified.

Table 3. Meter Accuracy

Test instrument **OUTPUT LEVEL** meter indications (V ac)	True rms voltmeter indications (Vac)	
	Min	Max
30	27.5	32.5
20	17.5	22.5
10	7.5	12.5

b. Adjustments

(1) Adjust **AMPLITUDE COARSE** and **FINE** controls until true rms voltmeter indicates 40 V ac.

(2) Adjust **R69** (fig. 1), (for SG-71C/FCC, (fig. 2)) until **OUTPUT LEVEL** meter indicates **40** on the **0** to **50** scale (R).

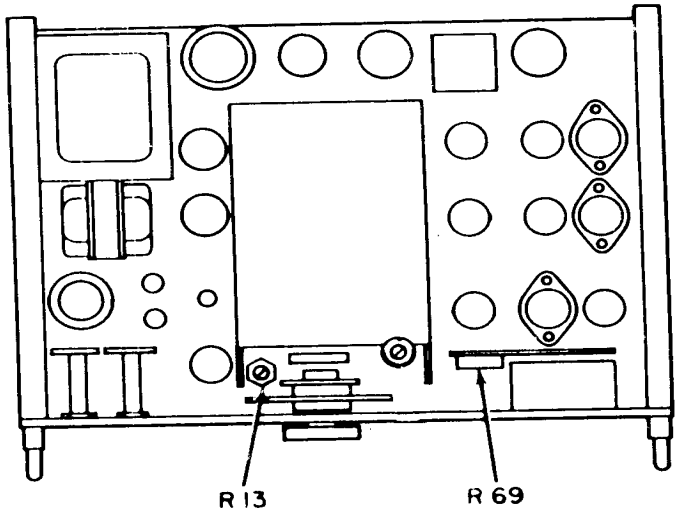

Figure 1. Signal generator - top interior view.
SG-71/FCC, SG-71A/FCC, and SG-71B/FCC (Hewlett-Packard, Model 233A)

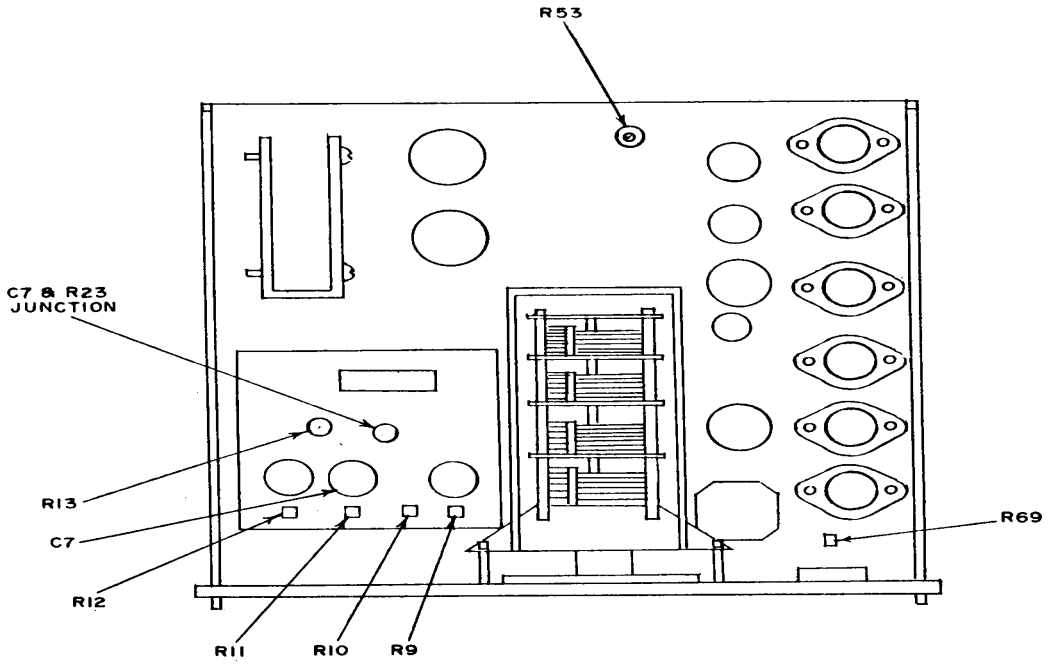

Figure 2. Signal generator - top interior view, SG-71C/FCC.

9. Frequency Accuracy, Stability and UNBAL Response

a. Performance Check

(1) Connect equipment as shown in figure 3.

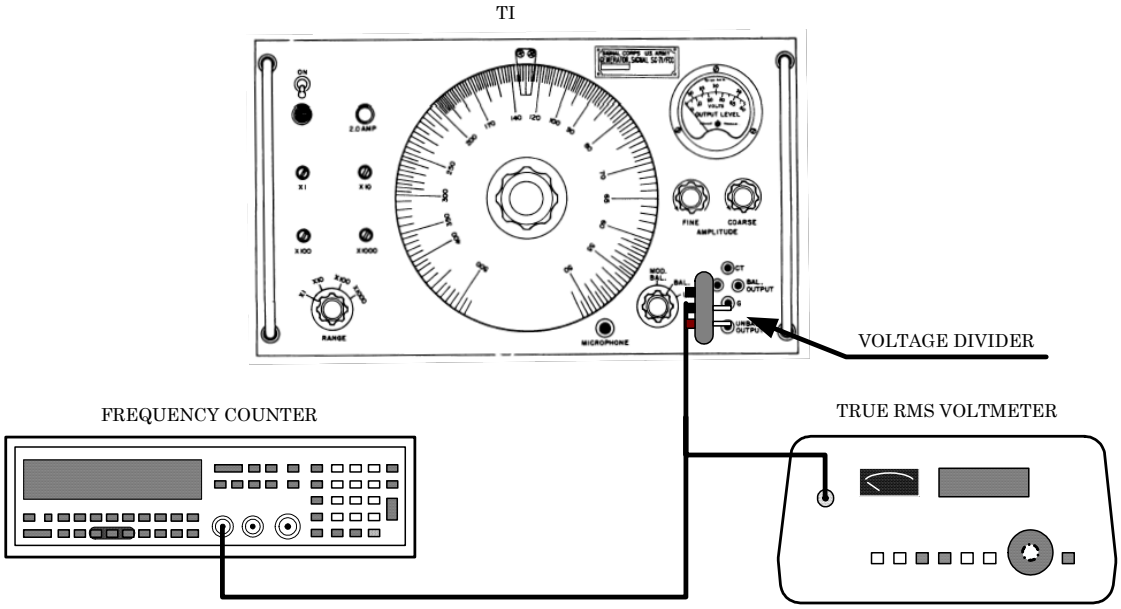

Figure 3. Frequency accuracy, stability and UNBAL response - equipment setup.

(2) Position controls as listed in (a) through (c) below:

(a) **MOD. BAL. - BAL. - UNBAL.** switch to **UNBAL**.

(b) **RANGE** switch to **X1**.

(c) **AMPLITUDE FINE** and **COARSE** controls fully cw.

(3) Adjust frequency dial to **50**. True rms voltmeter will indicate at least 6 V.

(4) Adjust frequency dial to **500**. If true rms voltmeter does not indicate at least 6 V perform **b** (1) through (3) below.

(5) Repeat (3) and (4) above with TI **RANGE** switch set to **X10, X100**, and **X1000**.

(6) Adjust **AMPLITUDE FINE** and **COARSE** controls fully ccw.

(7) Adjust frequency dial to **50** and set **RANGE** switch to **X1**.

(8) Readjust **AMPLITUDE COARSE** and **FINE** controls until true rms voltmeter indicates **0 dB**. Frequency counter will indicate between 19.60 and 20.40 mS.

(9) Adjust frequency dial to **500**. True rms voltmeter will indicate between -1 and +1 dB. If frequency counter does not indicate between 490 and 510 Hz, perform **b** (4) and (5) below.

(10) Repeat technique of (7) and (9) above for remaining frequencies listed in table 4. Frequency counter and true rms voltmeter will indicate within limits specified. If frequency counter does not indicate as specified, perform **b** (6) through (14) below.

Table 4. Frequency Accuracy and Response

Test instrument		Ac voltmeter indications (dB)		Frequency counter indications (Hz)	
RANGE switch positions	Frequency dial settings	Min	Max	Min	Max
X10	50	-1	+1	490	510
X10	70	-1	+1	686	714
X10	90	-1	+1	882	918
X10	120	-1	+1	1176	1224
X10	200	-1	+1	1960	2040
X10	300	-1	+1	2940	3060
X10	400	-1	+1	3920	4080
X10	500	-1	+1	4900	5100
X100	50	-1	+1	4900	5100
X100	500	-1	+1	49,000	51,000
X1000	50	-1	+1	49,000	51,000
X1000	500	-1	+1	490,000	510,000

(11) Vary autotransformer output between 105 and 125 V ac. Frequency counter will remain between 490,000 and 510,000 Hz.

b. Adjustments

NOTE

Adjustments in parenthesis pertain to SG-71C/FCC.

(1) Connect multimeter between **C7** and **R23** junction (fig. 4), (for SG-71C/FCC, fig. 2) and ground.

(2) Adjust **R13** (fig. 1) (for SG71C/FCC, fig. 2), until true rms voltmeter indicates 22.5 V ac (R).

(3) Repeat **a** (1) through (5) above.

(4) Set frequency dial to **500** and **RANGE** switch to **X1.**

(5) Adjust **X1** front panel control (for SG-71C/FCC, **R9**, fig. 2) until frequency counter indicates 500 Hz (R).

(6) Set **RANGE** switch to **X10**.

(7) Adjust **X10** front panel control (for SG-71C/FCC, **R10**, fig. 2) until frequency counter indicates 5000 Hz (R).

(8) Set frequency dial to **50** and **RANGE** switch to **X100**.

(9) Adjust **X100** front panel control (for SG-71C/FCC, **R11** fig. 2) until frequency counter indicates **5000 Hz** (R).

(10) Set **RANGE** switch to **X1000**.

(11) Adjust **X1000** front panel control (for SG-71C/FCC, **R12**, fig. 2) until frequency counter indicates 50,000 Hz (R).

(12) Turn frequency dial to **500.**

(13) Adjust **C4** (fig. 4) until frequency counter indicates 500,000 Hz (R).

(14) Repeat (4) through (13) above until no further adjustments are required.

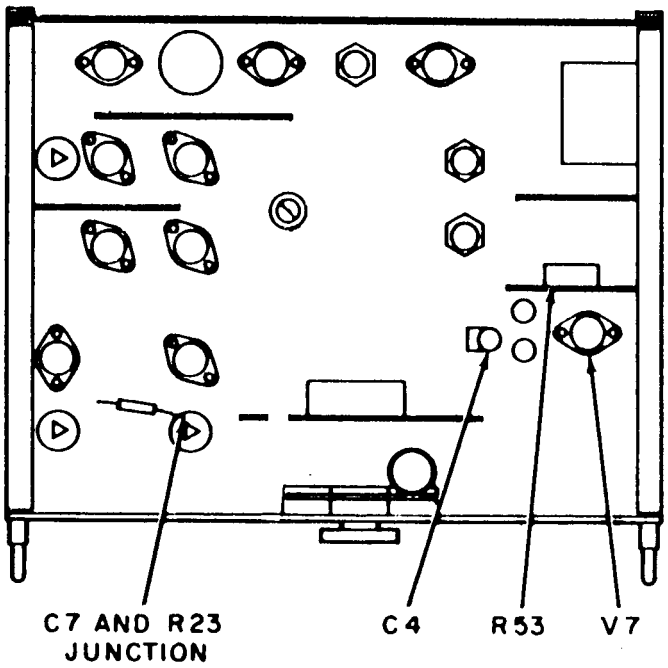

Figure 4. Signal generator - bottom interior view
SG-71/FCC, SG-71A/FCC, SG-71B/FCC (Hewlett-Packard, Model 233A)

10. Balanced Output and Frequency Response

a. Performance Check

(1) Connect true rms voltmeter to TI **BAL. OUTPUT** connector using voltage divider.

(2) Connect lead between left **BAL**. **OUTPUT** terminal and ground terminal.

(3) Set **MOD. BAL. - BAL. – UNBAL.** switch to **BAL.** and **RANGE** switch to **X100**.

(4) Adjust frequency dial to **50**.

(5) Adjust **AMPLITUDE COARSE** and **FINE** controls fully cw. True rms voltmeter will indicate at least 42.5 V ac.

(6) Adjust frequency dial to **500**. True rms voltmeter will indicate at least 42.5 V ac.

(7) Repeat (4) through (6) above with **RANGE** switch set to **X1000**.

(8) Set **RANGE** switch to **X100** and frequency dial to **50.**

(9) Adjust **AMPLITUDE COARSE** and **FINE** controls fully ccw.

(10) Readjust **AMPLITUDE COARSE** and **FINE** controls for an indication of 40 V on **OUTPUT LEVEL** meter. Record true rms voltmeter indication.

(11) Adjust frequency dial and **RANGE** switch through frequency range of **5** to **500 kHz**, maintains 40 on **OUTPUT LEVEL** meter.

(12) True rms voltmeter indication will remain between -1 and +1 dB of value recorded in (10) above.

b. Adjustments. No adjustments can be made.

11. Distortion

a. Performance Check

(1) Connect audio analyzer to **UNBAL**. **OUTPUT** connector using voltage divider.

(2) Set **MOD BAL. - BAL. - UNBAL.** switch to **UNBAL**.

(3) Set **RANGE** switch to **X100**, and frequency dial to **100**.

(4) Adjust **AMPLITUDE COARSE** and **FINE** controls for a 6 V ac indication on audio analyzer meter.

(5) Audio analyzer will indicate less than 1.0 percent at 10 kHz.

(6) Adjust **AMPLITUDE COARSE** and **FINE** controls fully ccw.

(7) Connect audio analyzer to **BAL**. **OUTPUT** connector using voltage divider.

(8) Set **MOD BAL. - BAL. - UNBAL.** to **BAL**.

(9) Set **RANGE** switch to **X100**, and frequency dial to **100**.

(10) Adjust **AMPLITUDE COARSE** and **FINE** controls for a 40 V ac indication on analyzer meter.

(11) Audio analyzer will indicate less than 3.0 percent at 10 kHz.

b. Adjustments. No adjustments can be made.

12. Power Supply

a. Performance Check

NOTE

Do not perform power supply check if all other parameters are within tolerance.

(1) Connect multimeter between **pin 8** of **V7** (fig. 4), and ground. Multimeter will indicate between 230.0 and 250.0 V dc, if not perform **b** below. Record indication.

(2) Vary autotransformer output between 105 and 125 V ac. Multimeter will indicate within 1.0 V of value recorded in (1) above.

b. Adjustments. Adjust **R53** (fig. 4) (for SC-71C/FCC, fig. 2) until multimeter indicates 240 V dc (R).

13. 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:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army

0425305

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342269, requirements for calibration procedure TB 9-6625-2184-35.

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.