TB 9-6625-396-50

Change 1

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR INDUCTANCE BRIDGE, GENERAL RADIO MODELS 1632-A AND 1632-AR

Headquarters, Department of the Army, Washington, DC
26 May 1980

TB 9-6625-396-50, 1 June 1978, is changed as follows:

Page 4. Insert the following note between paragraphs 8a(10) and (11).

NOTE

If the calibration certificate stated accuracy for the inductance standard exceeds ±0.1 percent, the calibration certificate stated accuracy must be used instead of the ±0.1 percent as stated in (11) and (13) below.

Page 6. Supercede paragraph 10b as follows: In accordance with TM 38-750, annotate and affix DA Label 80 (US Army Calibrated Instrument). When the TI receives limited or special calibration annotate and affix DA Label 163 (US Army Limited or Special Calibration). When the TI cannot be adjusted within tolerance, annotate and affix DA Form 2417 (US Army Calibration System Rejected Instrument).

By Order of the Secretary of the Army:

E.C. MEYER
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

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Headquarters, Department of the Army, Washington, DC
1 June 1978

REPORTING OF ERRORS

You can help improve this publication by calling attention to errors and by recommending improvements and stating your reasons for the recommendations. Your letter or DA Form 2028, Recommended Changes to Publications, should be mailed directly to Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-TMD-EP, Redstone Arsenal, AL 35898-5000. FAX to DSN 788-2313 (commercial 256-842-2313). A reply will be furnished directly to you.

*This bulletin supersedes TB 9-6625-396-50, 16 July 1974, including all changes.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Inductance Bridge, General Radio Models 1632-A and 1632-AR. The manufacturer's instruction 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 Variation. The model 1632-A is portable and the 1632-AR is rack mounted.

b. Time and Technique. The time required for this calibration is approximately 4 hours, using the dc (direct current) and low frequency technique.

2. Calibration Data Card, DA Form 2416

a. Forms records, and reports required for calibration personnel at all levels are prescribed by TM 38-750. DA From 2416 must be annotated in accordance with TM 38-750 for each calibration performed.

b. Adjustments to be reported on DA Form 2416 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 and Description

Test instrument parameters	Performance specifications
Inductance	Range: 0.0001 μH to 1111H Accuracy: "a" Range, ±1%; all others, ±0.1%
Conductance	Range: 0.001 μmho to 1111 mho Accuracy: ±1%

SECTION II
EQUIPMENT REQUIREMENTS

4. Equipment Required. Table 2 identifies the specific meet or exceed the minimum use specifications listed in equipment used in this calibration procedure. This table 2. The accuracies listed in table 2 provide a four-to equipment is issued with Secondary Reference Standards Calibration Set NSN 4931-00-621-7878 and is to be used in performing this procedure. Alternate items may be used by the calibrating activity when the equipment listed in table 2 is not available. The items selected must be verified to perform satisfactory 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 ration between the standard and TI.

5. Accessories Required. The accessories listed in table 3 are issued as indicated in paragraph 4 above and are to be used in this calibration procedure. When necessary, these items may be substituted by equivalent items unless specifically prohibited.

Table 2. Minimum Specifications of Equipment Required

Item	Common name	Minimum use specifications	Manufacturer and model (part number)
A1	AUDIO OSCILLATOR	Range: 30 V rms at 1 kHz Accuracy: ±1%	General Radio, Model 1311A (7910432)
A2	CAPACITANCE BRIDGE	Range: 0.1 to 1.1 µF Accuracy: ±0.025%	General Radio, Model 1615A (7910099-2)
A3	CAPACITANCE STANDARD[1]	Range: 0.1 to 0.5 µF Accuracy: Nominal	Arco, Model SS32 (7907233)
A4	NULL DETECTOR (TUNED AMPLIFIER)	Range: 1 kHz Sensitivity: ±0.1 µV	General Radio, Model 1232A (8616466-1)
A5a	STANDARD INDUCTOR (INDUCTANCE STANDARD)	Range: 100 µ H[2] Accuracy: [3]	General Radio, Model 1482B (8205515)
b	STANDARD INDUCTOR (INDUCTANCE STANDARD, FIXED)	Range: 1 mH[2] Accuracy: [3]	General Radio, Model 1482E (8205516)
c	STANDARD INDUCTOR (INDUCTANCE STANDARD)	Range: 10 mH[2] Accuracy: [3]	General Radio, Model 1482H (8205517)
d	STANDARD INDUCTOR (INDUCTANCE STANDARD, FIXED)	Range: 100 mH[2] Accuracy: [3]	General Radio, Model 1482L (8205518)
e	STANDARD INDUCTOR (INDUCTANCE STANDARD)	Range: 1 H[2] Accuracy: [3]	General Radio, Model 1482P (8505519)
f	STANDARD INDUCTOR (INDUCTANCE STANDARD)	Range: 10 H[2] Accuracy: [3]	General Radio, Model 1482T (8205520)

[1]Transfer item.
[2]Procedure limitation: range, 100 µH to 10 H: accuracy as stated on calibration certificate.
[3]Test report accuracy.

Table 3. Accessories Required

Item	Common name (official nomenclature)	Description (part number)
B1	ADAPTER[1]	GR connector to BNC jack (10528559)
B2	CABLE	36-in, RG-58( )/U; BNC plug to double banana plug terminations (7907471)
B3	CABLE	30-in, RG-58( )/U; BNC plug terminations (7907467)
B4	CABLE[1]	30-in, RG-58( )/U; double banana plug terminations (7907470)
B5	COPPER WIRE	Two 8-in lengths (approx.); No. 14-gage solid

[1]Two required.

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 procedure before beginning the calibration.

b. Items of equipment used in this procedure are referenced within the text by common name and item identification number as listed in tables 2 and 3. For the identification of equipment referenced by item numbers prefixed with A, see table 2, and for prefix B, see table 3.

WARNING

High VOLTAGE is used during the performance of this calibration. DEATH ON CONTACT may result if personnel fail to observe safety precautions.

NOTE

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

7. Equipment Setup

a. BRIDGE READS switch to SERIES INDUCTANCE.

b. MAXIMUM SENSITIVITY switch to LOW Z.

c. RANGE switch to e.

d. ALL G switches to zero positions.

SECTION IV
CALIBRATION PROCESS

NOTE

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.

8. Inductor Measurement Accuracy

a. Performance Check

(1) Connect equipment as shown in figure 1.

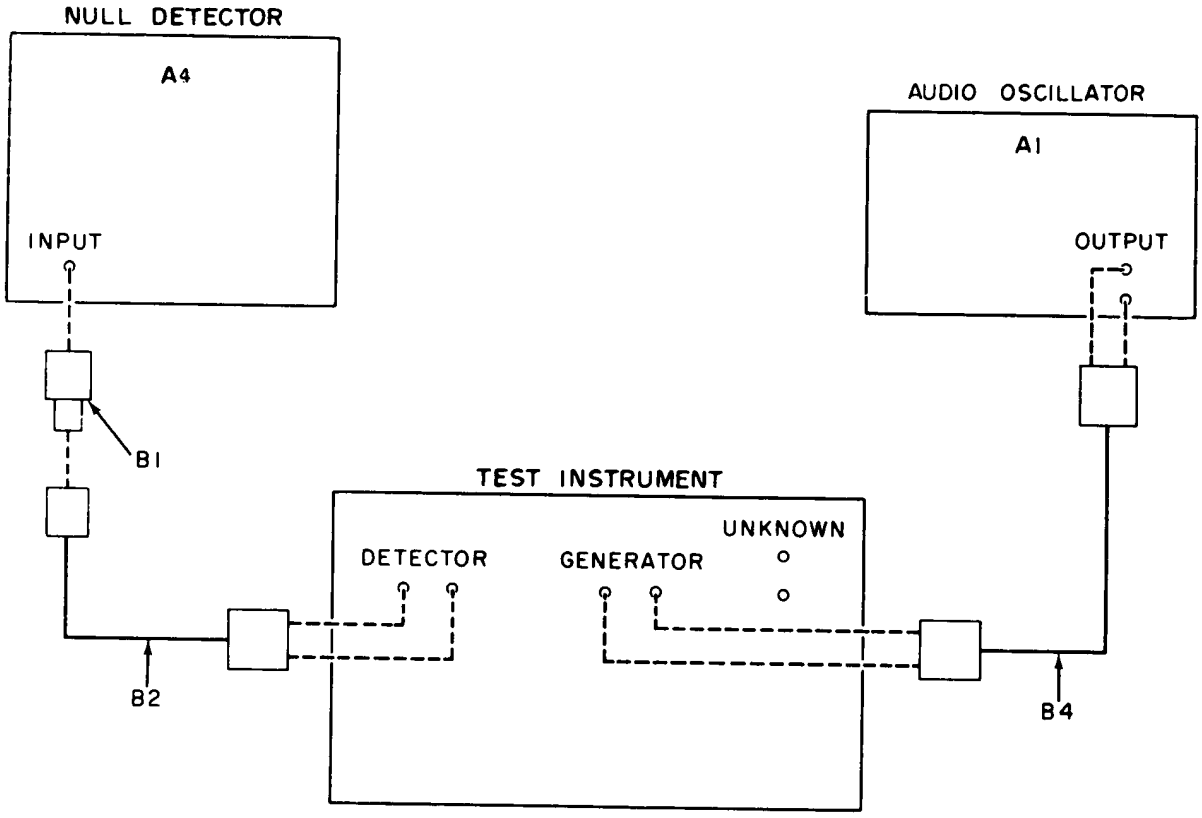

Figure 1. Inductor measurement - equipment setup.

(2) Set audio oscillator (A1) frequency switch to 1 kHz and adjust OUTPUT LEVEL control to minimum.

(3) Connect 100 mH standard inductor (A5d) to UNKNOWN terminals, using copper wire (B5).

(4) Adjust L switches for 100 mH indication.

(5) Slowly increase audio oscillator amplitude until an indication is obtained on null detector (A4).

CAUTION

Do not exceed generator voltages listed on front panel of the TI being tested.

(6) Adjust L and G switches for a null indication on null detector.

CAUTION

Reduce audio oscillator amplitude to zero prior to changing RANGE switch.

(7) Record L switch indications.

(8) Connect shorting bar between standard inductor terminals.

(9) Repeat (6) and (7) above.

(10) Subtract L switch indication recorded in (9) above from L switch indication recorded in (7) above. The difference will be the actual inductance.

NOTE

If the calibration certificate stated accuracy for the inductance standard exceeds ±0.1 percent, the calibration certificate stated accuracy must be used instead of the ±0.1 percent as stated in (11) and (13) below.

(11) If actual inductance is not within 0.1 percent of value listed on calibration certificate supplied with standard inductor being measured, perform **(b)** below.

(12) Reduce audio oscillator amplitude to minimum.

(13) Repeat technique of (3) through (12) above for each standard inductor and RANGE switch setting listed in table 4. Values obtained will be within 0.1 percent of value listed on calibration certificate supplied with standard inductor being measured.

NOTE

When values obtained in (9) above are less than 0.01 percent of standard inductor being measured, values may be disregarded and (8) through (10) above omitted.

Table 4. Inductor Measurement

Standard inductor (nominal) (see table 2 (A5a) through (A5F))	Test instrument **RANGE** switch setting
100 µ H[1]	a
1 mH	c
10 mH	d
1 H	f
10 H[2]	g
10 H[3]	h

[1]For RANGE switch setting a, the accuracy is ±1 percent of value listed on calibration certificate.

[2]Connect a 0.1 µF capacitor in parallel across the TI external capacitor terminals.

[3]Connect a 0.5 µF capacitor is parallel across the TI external capacitor terminals.

b. Adjustments

(1) Remove TI protective cover.

(2) Repeat **a**(3) above.

(3) Set RANGE switch to d position.

(4) Repeat **a**(5) and (6) above.

(5) Set L switches to value indicated on calibration certificate for 100 mH inductor plus value recorded in **a**(7) above.

(6) Adjust capacitor C10 (fig. 2) for minimum indication on null detector (R).

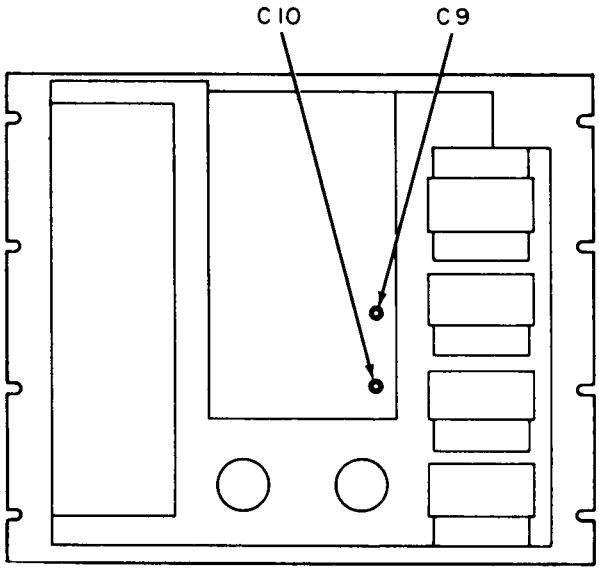

Figure 2. Inductance bridge - rear,.

(7) Set MAXIMUM SENSITIVITY switch to HIGH-Z position.

(8) Adjust L and G switches for a null on null detector.

(9) Repeat (5) above.

(10) Adjust capacitor C9 (fig. 2) for minimum indication on null detector (R).

(11) Replace protective cover.

(12) Set MAXIMUM SENSITIVITY switch to LOW-Z.

9. Conductance (CN) Decades

a. Performance Check

(1) Set G switches to 0000.

(2) Connect equipment as shown in figure 3.

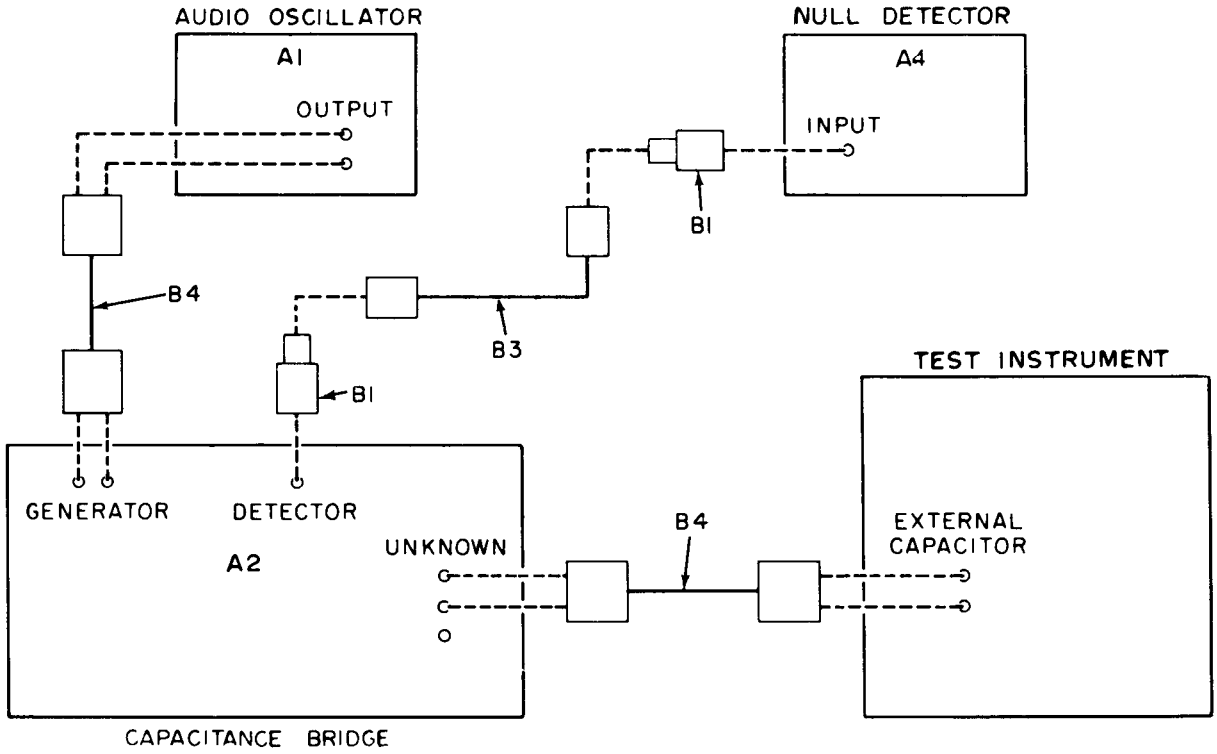

Figure 3. Conductance decade - equipment setup.

(3) Set BRIDGE READ switch to the middle unmarked position between SERIES INDUCTANCE and PARALLEL INDUCTANCE position.

(4) Measure and record capacitance value indicated on capacitance bridge (A2).

(5) Set G switches to 9999.

(6) Measure and record capacitance value indicated on capacitance bridge.

(7) Subtract value recorded in (4) above from value recorded in (6) above. Difference will be between 0.98770I and 1.009899 μF.

(8) Repeat technique of (5) through (7) above for G switch settings listed in table 5. Capacitance value will be within limits specified.

Table 5. Conductance decade - equipment setup.

Test instrument G switch settings	Capacitance value obtained in paragraph 10a(7) (μF)	
	Min	Max
8888	0.879912	0.897688
7777	0.769923	0.785477
6666	0.659934	0.673266
5555	0.549945	0.561055
4444	0.439956	0.448844
3333	0.329967	0.336633
2222	0.219978	0.224422
1111	0.109989	0.112211

b. Adjustments. No adjustments can be made.

10. Final Procedure

a. Deenergize and disconnect all equipment.

b. In accordance with TM 38-750, annotate and affix DA Label 80 (US Army Calibrated Instrument). When the TI receives limited or special calibration annotate and affix DA Label 163 (US Army Limited or Special Calibration). When the TI cannot be adjusted within tolerance, annotate and affix DA Form 2417 (US Army Calibration System Rejected Instrument).

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

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Major General, United States Army
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