*TB 9-6625-2013-50

SUPERSEDED COPY DATED 13 MARCH 1995

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR DECADE RESISTANCE STANDARD BIDDLE, MODEL 71-650

Headquarters, Department of the Army, Washington, DC
31 July 2000

Approved for public release; distribution is unlimited

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 Missile Command, ATTN: AMSAM-TMD-LP, Redstone Arsenal, AL 35898-5000. You may also contact this office electronically. FAX to DSN 788-2313 (commercial 256-842-2313). A reply will be furnished directly to you.

This bulletin supersedes TB 9-6625-2013-50, dated 13 March 1995.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Decade Resistance Standard, Biddle, Model 71-650. The manufacturer's manual and purchase specification MIS-10264A 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
Resistance	Zero resistance: <.010Ω Range: .010Ω to 1.2 MΩ Accuracy:[1] ±.001Ω; X0.1 decade and lower ±.01%; X1.0 decade ±.0025%; X10 decade and greater

[1]Obtained from purchase specification MIS-10264A.

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.

5. Accessories Required. The accessories required for this calibration are common usage accessories issued as indicated in **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)
MULTIMETER	Range: 10 mΩ to 1.2 MΩ Accuracy: ±.025 mΩ; 1Ω and lower ±.0025%; 1Ω to 1 MΩ	Hewlett-Packard, Model 3458A (3458A)
STANDARD RESISTOR	Range: 10,000Ω Accuracy: ±5 ppm w/test report	Leeds and Northrup, Model 4040B (8616293)

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 control and control settings refer to the TI.

7. Equipment Setup

a. Utilizing standard resistor, characterize multimeter to obtain 24-hour manufacturer specifications for resistance.

b. Turn each decade dial throughout its entire range at least three times.

c. Connect multimeter in a four-wire measurement configuration to TI.

8. Minimum Resistance Check

a. Performance Check

(1) Set TI decade dials to **000000.0100**.

(2) Multimeter will indicate between 0.0090Ω and 0.0110Ω.

b. Adjustments. No adjustments can be made.

9. Resistance Decade Dials X.0001Ω, X.01Ω, X0.1Ω, and X1Ω Accuracy

a. Performance Check

(1) Set TI decade dials to settings listed in table 3. Multimeter indications will be within limits specified in table 3.

Table 3. Resistance Accuracy

Test instrument decade dial settings[1]				Multimeter indications (Ω)	
X1	X0.1	X.01	X.0001	Min	Max
0	1	1	00	0.1090	0.1110
0	2	2	00	0.2190	0.2210
0	3	3	00	0.3290	0.3310
0	4	4	00	0.4390	0.4410
0	5	5	00	0.5490	0.5510
0	6	6	00	0.6590	0.6610
0	7	7	00	0.7690	0.7710
0	8	8	00	0.8790	0.8810
0	9	9	00	0.9890	0.9910
0	X	X	100	1.1090	1.1110
0	X	11	100	1.1190	1.1210
1	9	X	00	1.9989	2.0011
2	9	X	00	2.9988	3.0012
3	9	X	00	3.9987	4.0013
4	9	X	00	4.9986	5.0014
5	9	X	00	5.9985	6.0015
6	9	X	00	6.9984	7.0016
7	9	X	00	7.9983	8.0017
8	9	X	00	8.9982	9.0018
9	9	X	00	9.9981	10.0019
X	9	X	00	10.9980	11.0020

[1]TI decade dials not listed are set to zero.

b. Adjustments.

No adjustments can be made.

10. X10Ω Decade Dial Accuracy

a. Performance Check

(1) Set TI decade dials to **000010.0100**. If multimeter indication is not between 10.0087Ω and 10.0113Ω, perform **b** below.

(2) Repeat technique of (1) above for TI decade dial settings and multimeter indications listed in table 4. If multimeter indications are not within limits specified at each setting, perform corresponding adjustment listed in table 4.

Table 4. X10Ω Decade Dial Accuracy

Test instrument decade dial settings	Multimeter indications (Ω)		Adjustment for X10 (fig. 1) (R)
	Min	Max	
000020.0100	20.0085	20.0115	R2
000030.0100	30.0082	30.0118	R3
000040.0100	40.0080	40.0120	R4
000050.0100	50.0077	50.0123	R5
000060.0100	60.0075	60.0125	R6
000070.0100	70.0072	70.0128	R7
000080.0100	80.0070	80.0130	R8
000090.0100	90.0067	90.0133	R9
0000X0.0100	100.0065	100.0135	R10

b. Adjustments. Adjust X10 R1 (fig. 1) for a 10.010Ω multimeter indication (R).

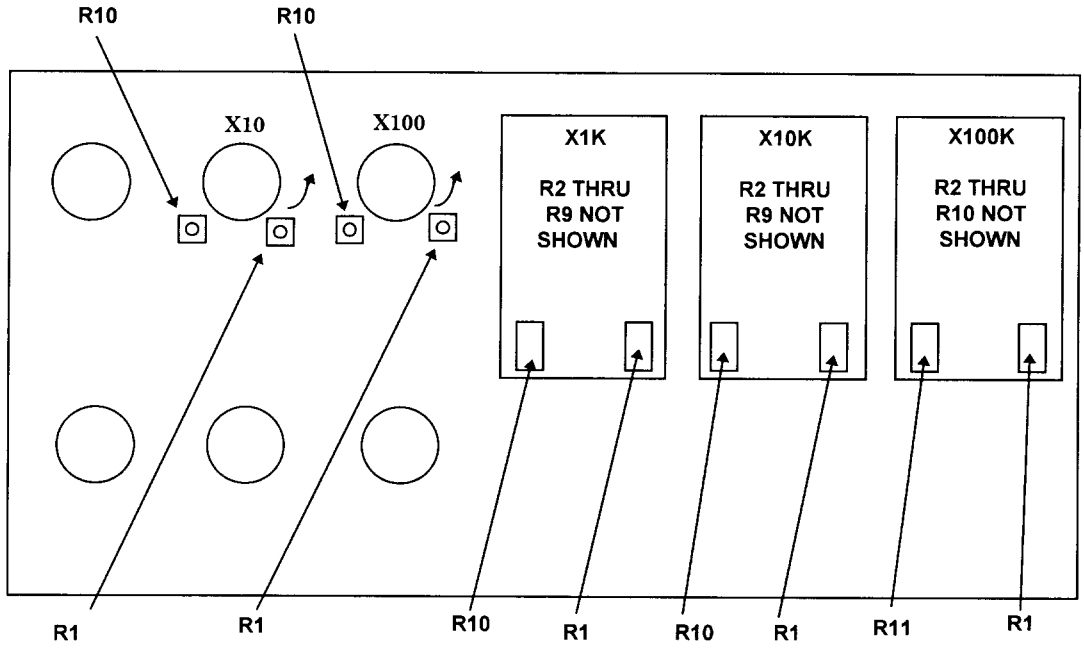

Figure 1. Test instrument - bottom internal view.

11. X100Ω Decade Dial Accuracy

a. Performance Check

(1) Set TI decade dials to **000100.0100**. If multimeter indication is not between 100.0065Ω and 100.0135Ω, perform **b** below.

(2) Repeat technique of (1) above for TI decade dial settings and multimeter indications listed in table 5. If multimeter indications are not within limits specified at each setting, perform corresponding adjustment listed in table 5.

Table 5. X100Ω Decade Dial Accuracy

Test instrument decade dial settings	Multimeter indications (kΩ)		Adjustments for X100 (fig. 1) (R)
	Min	Max	
000200.0100	.2000040	.2000160	R2
000300.0100	.3000015	.3000185	R3
000400.0100	.3999990	.4000210	R4
000500.0100	.4999965	.5000235	R5
000600.0100	.5999940	.6000260	R6
000700.0100	.6999915	.7000285	R7
000800.0100	.7999890	.8000310	R8
000900.0100	.8999865	.9000335	R9
000X00.0100	.9999840	1.0000360	R10

b. Adjustments. Adjust X100 R1 (fig. 1) for a 100.010Ω multimeter indication (R).

12. X1 kΩ Decade Dial Accuracy

a. Performance Check

(1) Set TI decade dials to **001000.0100**. If multimeter indication is not between .9999840 and 1.0000360 kΩ, perform **b** below.

(2) Repeat technique of (1) above for TI decade dial settings and multimeter indications listed in table 6. If multimeter indications are not within limits specified at each setting, perform corresponding adjustment listed in table 6.

Table 6. X1kΩ Decade Dial Accuracy

Test instrument decade dial settings	Multimeter indications (kΩ)		Adjustments for X1K (fig. 1) (R)
	Min	Max	
002000.0100	1.9999590	2.0000610	R2
003000.0100	2.9999340	3.0000860	R3
004000.0100	3.9999090	4.0001110	R4
005000.0100	4.9998840	5.0001360	R5
006000.0100	5.9998590	6.0001610	R6
007000.0100	6.9998340	7.0001860	R7
008000.0100	7.9998090	8.0002110	R8
009000.0100	8.9997840	9.0002360	R9
00X000.0100	9.9997590	10.0002610	R10

b. Adjustments. Adjust X1K R1 (fig. 1) for a 1.000010 kΩ indication on multimeter (R).

13. X10 kΩ Decade Dial Accuracy

a. Performance Check

(1) Set TI decade dials to **010000.0100**. If multimeter indication is not between 9.999759 and 10.000261 kΩ, perform **b** below.

(2) Repeat technique of (1) above for TI decade dial settings and multimeter indications listed in table 7. If multimeter indications are not within limits specified at each setting, perform corresponding adjustment listed in table 7.

Table 7. X10kΩ Decade Dial Accuracy

Test instrument decade dial settings	Multimeter indications (kΩ)		Adjustments for X10K (fig. 1) (R)
	Min	Max	
020000.0100	19.999509	20.000511	R2
030000.0100	29.999259	30.000761	R3
040000.0100	39.999009	40.001011	R4
050000.0100	49.998759	50.001261	R5
060000.0100	59.998509	60.001511	R6
070000.0100	69.998259	70.001761	R7
080000.0100	79.998009	80.002011	R8
090000.0100	89.997759	90.002261	R9
0X0000.0100	99.997509	100.002511	R10

b. Adjustments. Adjust resistor X10K R1 (fig. 1) for a 10.000010 kΩ multimeter indication (R).

14. X100 kΩ Decade Dial Accuracy

a. Performance Check

(1) Set TI decade dials to **100000.0100**. If multimeter indication is not between 99.99751 and 100.00251 kΩ, perform **b** below.

(2) Repeat technique of (1) above for TI decade dial settings and multimeter indications listed in table 8. If multimeter indications are not within limits specified at each setting, perform corresponding adjustment listed in table 8.

Table 8. X100kΩ Decade Dial Accuracy

Test instrument decade dial settings	Multimeter indications (MΩ)		Adjustment for X100K (fig. 1) (R)
	Min	Max	
200000.0100	.19999501	.20000501	R2
300000.0100	.29999251	.30000751	R3
400000.0100	.39999001	.40001001	R4
500000.0100	.49998751	.50001251	R5
600000.0100	.59998501	.60001501	R6
700000.0100	.69998251	.70001751	R7
800000.0100	.79998001	.80002001	R8
900000.0100	.89997751	.90002251	R9
X00000.0100	.99997501	1.00002501	R10
1100000.0100	1.09997251	1.10002751	R11

b. Adjustments. Adjust X100K R1 (fig. 1) for a 100.000010 kΩ multimeter indication (R).

15. Final Procedure

a. Deenergize and disconnect all equipment and reinstall protective covers on TI.

b. Annotate and affix DA label/form in accordance with TB 750-25.

By Order of the Secretary of the Army:

Official:

ERIC K. SHINSEKI
General, United States Army
Chief of Staff

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
0015707

DISTRIBUTION:
To be distributed in accordance with STD IDS No. RLC-500, 11 May 1992, requirements for calibration procedure TB 9-6625-2013-50.