*TB 9-6625-2257-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR DIGITAL MULTIMETER FLUKE, MODELS 8100A AND 8100B

Headquarters, Department of the Army, Washington, DC
12 December 2007

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 9-6625-2257-35, dated 14 May 1991.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Digital Multimeter, Fluke, Models 8100A and 8100B. 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. Models 8100A and 8100B are identical electrically except model 8100B does not have the GUARD terminal.

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	
Dc voltage	Range: 0 to 1000 V in 4 ranges Accuracy: ± (0.05% of input + 0.01% of range)	
Ac voltage	Range: 0 to 1000 V in 4 ranges Accuracy:	
	Midband	Extended
	50 Hz to 10 kHz ± (0.2% of input + 0.05% or range)	30 to 50 Hz and 10 to 20 kHz ± (0.5% of input + 0.1% of range)
Resistance	Range: 0 Ω to 10 MΩ in 5 ranges Accuracy: ± (0.1% of input + 0.02% of range)	

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 this calibration procedure.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
CALIBRATOR	Range: 0 to 1000 V dc Accuracy: ± 0.015% Range: 0 to 1000 V ac Accuracy: ± 0.0625% (30 Hz to 20 kHz) Range: 0 Ω to 10 MΩ Accuracy: ± 0.03%	Fluke, Model 5720A (5720A) (p/o MIS-35947); w amplifier, Fluke 5725A/AR (5725A/AR)
MULTIMETER	Resolution: ± 10 µV dc	Agilent, Model 3458A (3458A)

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 where applicable.

a. Remove protective cover from TI as necessary to gain access to adjustments.

b. On model 8100A connect a shorting bar between **LO** and **GUARD** terminals.

c. Connect TI to a 115 V ac source.

d. Press pushbuttons as listed in (1) through (4) below:

(1) **POWER ON-OFF** to **ON**.

(2) **VDC**.

(3) **RANGE 1**.

(4) **FILTER ON-OFF** to **ON**.

e. Allow 1 hour for warm-up.

8. Dc Voltage Accuracy

a. Performance Check

(1) Connect calibrator **OUTPUT HI** and **LO** to TI **HI** and **LO INPUT**.

(2) Set calibrator output to +100 mV dc. If TI does not indicate between +0.0999 and +0.1001, perform **b** (1) through (4) and respective model 8100A or 8100B procedure below.

(3) Set calibrator output to –l00 mV dc. If TI does not indicate between –0.0999 and –0.1001, perform **b** (1) through (4) and respective model 8100A or 8100B procedure below.

(4) Repeat technique of (2) and (3) above using settings and indications listed in table 3. If TI does not indicate within limits specified, perform **b** (14) through (17) below.

Table 3. Dc Voltage Accuracy

Calibrator settings	Test instrument indications (+ and –)		
(+ and –) V dc	**RANGE** pushbutton settings	Min	Max
1	1	0.9994	1.0006
10	10	9.994	10.006
100	100	99.94	100.06
1000	1000	999.4	1000.6

b. Adjustments

(1) Disconnect calibrator from TI and press **RANGE 1000** pushbutton.

(2) Connect multimeter to **TP1** and **LO INPUT**. Adjust ZERO (R175) for a 0 V dc ±10 μV indication on multimeter.

(3) Disconnect multimeter and press **RANGE 1** pushbutton.

(4) Connect calibrator **OUTPUT HI** and **LO** to TI **HI** and **LO INPUT**.

NOTE

For model 8100B perform steps (5) through (9) below. For model 8100A perform steps (10) through (13). Perform steps (14) through (17) for both models.

(5) Set calibrator output to +0.00055 V dc. Adjust A-D OFFSET (R206) for a TI indication alternating between +0.0005 and +0.0006.

(6) Set calibrator output to –1.00055 V dc. Adjust –DCV CAL (R23) for a TI indication alternating between –1.0005 and –1.0006.

(7) Set calibrator output to +1.00055 V dc. Adjust +DCV CAL (R50) for a TI indication alternating between +1.0005 and +1.0006.

NOTE

In (8) below X can be any number.

(8) Set calibrator output to –0.099965 V dc. Adjust DCV TRIP POINT ADJ (R208) for a TI indication alternating between –0.099X and –0.1000.

(9) Set calibrator output to –0.09965 V dc. Adjust REMAINDER ADJ (R149) for a TI indication alternating between –0.0996 and –0.0997.

(10) Set calibrator output to –1.0000 V dc. Adjust –DCV (R23) for a TI indication of –1.0000.

(11) Set calibrator output to +1.0000 V dc. Adjust +DCV (R50) for a TI indication of +1.0000.

(12) Set calibrator output to –0.0998 V dc. Adjust REMAINDER ADJ (R149) for a TI indication of –0.0998.

(13) Set calibrator output to +0.0998 V dc. TI should indicate +0.0998. Repeat steps (10) and (11), as required, until TI indication is correct for both polarities.

(14) Press **RANGE 100** pushbutton and set calibrator output to –100.00 V dc. Adjust INPUT DIV ADJ (R157) for a TI indication of –100.00 (R).

(15) Set calibrator output to –10.000 V dc. Adjust INPUT DIV ADJ (R157) for a TI indication of –10.000.

(16) Press **RANGE 1000** pushbutton and set calibrator output to –1000.0 V dc. Adjust INPUT DIV ADJ (R157) for a TI indication of –1000.0.

(17) Set calibrator to **STANDBY** and repeat (14) through (16) above as necessary for proper adjustment of INPUT DIV ADJ (R157).

9. Ac Voltage Accuracy

a. Performance Check

(1) Press pushbuttons as listed in (a) through (c) below:

(a) **VAC**.
(b) **RANGE 1**.
(c) **FILTER ON-OFF** to **ON**.

(2) Connect calibrator **HI** and **LO OUTPUT** to TI **HI** and **LO INPUT**.

(3) Set calibrator output to 1 V at 1 kHz. If TI does not indicate between 0.9975 and 1.0025, perform **b** (1) through (5) below.

(4) Set calibrator output to 1 V at 15 kHz. If TI does not indicate between 0.9940 and 1.0060, perform **b** (6) below.

(5) Repeat technique of (4) above using settings, indications, and adjustments listed in table 4.

Table 4. Ac Voltage Accuracy

Calibrator settings		Test instrument indications			
V	Frequency	**RANGE** pushbutton settings	Min	Max	Adjustments
1	10 kHz	1	0.9975	1.0025	**b**(7)
1	20 kHz	1	0.9940	1.0060	---
1	30 Hz	1	0.9940	1.0060	---
10	30 Hz	10	9.940	10.060	...
10	1 kHz	10	9.975	10.025	---
10	10 kHz	10	9.975	10.025	---
10	20 kHz	10	9.940	10.060	**b**(8)
100	20 kHz	100	99.40	100.60	---
100	10 kHz	100	99.75	100.25	---
100	1 kHz	100	99.75	100.25	---
100	30 Hz	100	99.40	100.60	---
1000	30 Hz	1000	994.0	1006.0	---
1000	1 kHz	1000	997.5	1002.5	---
1000	10 kHz	1000	997.5	1002.5	---
1000	20 kHz	1000	994.0	1006.0	---

b. Adjustments

(1) Disconnect TI from calibrator.

(2) Press **VDC** and **RANGE 1000** pushbuttons. If TI does not indicate +000.0, connect multimeter between TI **TP1** and **LO INPUT**. Adjust ZERO (R175) for a 0 V dc ±10 μV indication on multimeter. Disconnect multimeter.

(3) Press **VAC** pushbutton. TI will indicate between 000.0 and 000.3

(4) Connect calibrator **OUTPUT HI** and **LO** to TI **HI** and **LO INPUT**.

(5) Set calibrator output to 1 V at 1 kHz and press TI **RANGE 1** pushbutton. Adjust ACV CAL (R134) for a TI indication of 1.0000 (R).

(6) Set calibrator output to 1 V at 10 kHz.

(7) Adjust 1 V HF ADJ (C14) for a TI indication between 0.9993 and 1.0008 (R).

(8) Set calibrator output to 10 V at 20 kHz.

(9) Adjust 10 V HF ADJ (C15) for a TI indication of 10.000 (R).

10. Resistance Accuracy

a. Performance Check

(1) Press pushbuttons as listed in (a) through (c) below:

(a) **KΩ**
(b) **RANGE 100**.
(c) **FILTER ON-OFF** to **ON**.

(2) Connect TI **HI** and **LO INPUT** terminals to calibrator **HI** and **LO OUTPUT** terminals.

(3) Set calibrator for a 100 kΩ output then, using calibrator output adjustment controls, set calibrator control display **Reading** equal to TI indication. If calibrator control display **Error** indication is not within ±0.12 % perform **b** (1) below.

(4) Press **10 MΩ** pushbutton.

(5) Set calibrator for a 10 MΩ output then, using calibrator output adjustment controls, set calibrator control display **Reading** equal to TI indication. If calibrator control display **Error** indication is not within ±0.12 % perform **b** (2) below.

(6) Repeat technique of (5) above for settings listed in table 5. TI will indicate within limits specified in table 5.

Table 5. Resistance Accuracy

Test instrument range settings (Ω)	Calibrator	
	Output settings (Ω)	Control display **Error** indications ±(%)
1 K	1 k	0.12
10 K	10 k	0.12
1000 K	1 M	0.12

b. Adjustments

(1) Adjust KΩ CAL (R48) for TI indication within ± 0.12 percent of value on calibrator (R).

(2) Adjust 10 MED CAL (R153) for TI indication within ± 0.12 percent of value on calibrator (R).

11. Final Procedure

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

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:

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0728406

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 344368, requirements for calibration procedure TB 9-6625-2257-24.

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.