*TB 9-6625-2266-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR DIGITAL MULTIMETER FLUKE, MODELS 8020A AND 8020B

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 9-6625-2266-35, dated 7 April 2004, including all changes.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Digital Multimeter, Fluke, Models 8020A and 8020B. 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. Variations among models are described in text and tables.

b. Time and Technique. The time required for this calibration is approximately 1 hour 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

<table>
<tr><th>Test instrument parameters</th><th>Performance specifications
Fluke, Model 8020A</th></tr>
<tr><td>Dc voltage</td><td>Range: 0 to 1000 V (in 5 ranges)
Accuracy: ±(0.25% of reading + 1 digit)</td></tr>
<tr><td>Ac voltage</td><td>Range: 0 to 750 V (in 5 ranges)
Frequency: 45 Hz to 5 kHz
Accuracy: ±(% of reading + digits)
<table>
<tr><th colspan="2">Range</th><th colspan="3">Frequency</th></tr>
<tr><th></th><th></th><th>45 Hz to 1 kHz</th><th>1 to 2 kHz</th><th>2 to 5 kHz</th></tr>
<tr><td>200
2
20</td><td>mV
V
V</td><td>0.75 + 2</td><td>1.5 + 3</td><td>5.0 + 5</td></tr>
<tr><td>200</td><td>V</td><td>0.75 + 2</td><td>1.5 + 3</td><td>N/A</td></tr>
<tr><td>750</td><td>V</td><td>1.0 + 2</td><td>N/A</td><td>N/A</td></tr>
</table></td></tr>
</table>

Table 1. Calibration Description - Continued

<table>
<tr><th>Test instrument parameters</th><th>Performance specifications
Fluke, Model 8020A</th></tr>
<tr><td>Ac current[1]</td><td>Range: 0 to 2000 mA (in 4 ranges)
Accuracy: ±(% of reading + digits)
<table>
<tr><th>Range</th><th>Frequency</th><th>Frequency</th></tr>
<tr><td></td><td>45 to 450 Hz</td><td>450 Hz to 1 kHz</td></tr>
<tr><td>2 mA</td><td>2.0 + 2</td><td>N/A</td></tr>
<tr><td>20 through 2000 mA</td><td>1.5 + 2</td><td>1.5 + 2</td></tr>
</table></td></tr>
<tr><td>Dc current</td><td>Range: 0 to 2000 mA (in 4 ranges)
Accuracy: ±(0.75% of reading + 1 digit)</td></tr>
<tr><td>Resistance</td><td>Range: 0 to 20 MΩ (in 6 ranges)
Accuracy: ±(% of reading + digits)
<u>Range</u>:
200 Ω 0.3 + 3
2 through 2000 kΩ 0.2 + 1
20 MΩ 2.0 + 1</td></tr>
<tr><td colspan="2">John Fluke, Model 8020B</td></tr>
<tr><td>Dc voltage</td><td>Range: 0 to 1000 V (in 5 ranges)
Accuracy: ±(0.1 % of reading + 1 digit)</td></tr>
<tr><td>Ac voltage</td><td>Range: 0 to 750 V (in 5 ranges)
Frequency: 45 Hz to 5 kHz
Accuracy: ±(% of reading + digits)
<table>
<tr><th>Range</th><th colspan="3">Frequency</th></tr>
<tr><td></td><td>45 Hz to 1 kHz</td><td>1 to 2 kHz</td><td>2 to 5 kHz</td></tr>
<tr><td>200 mV
2 V
20 V</td><td>0.75 + 2</td><td>1.5 + 3</td><td>5.0 + 5</td></tr>
<tr><td>200 V</td><td>0.75 + 2</td><td>1.5 + 3</td><td>N/A</td></tr>
<tr><td>750 V</td><td>1.0 + 2</td><td>N/A</td><td>N/A</td></tr>
</table></td></tr>
<tr><td>Ac current[1]</td><td>Range: 0 to 2000 mA (in 4 ranges)
Accuracy: ±(% of reading + digits)
<table>
<tr><th>Range</th><th colspan="2">Frequency</th></tr>
<tr><td></td><td>45 to 450 Hz</td><td>450 Hz to 1 kHz</td></tr>
<tr><td>2 mA</td><td>3.0 + 2</td><td>N/A</td></tr>
<tr><td>20 through 2000 mA</td><td>1.5 + 2</td><td>1.5 + 2</td></tr>
</table></td></tr>
<tr><td>Dc current</td><td>Range: 0 to 2000 mA (in 4 ranges)
Accuracy: ±(.75% of reading + 1 digit)</td></tr>
<tr><td>Resistance</td><td>Range: 0 to 20 MΩ (in 6 ranges)
Accuracy: ±(% of reading + digits)
<u>Range</u>:
200 Ω 0.2 + 3
2 through 200 kΩ 0.1 + 1
2000 kΩ and 20 MΩ 2.0 + 1</td></tr>
</table>

[1]Ac current verified during dc current check since same shunt resistors are utilized for both functions.

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 AN/GSM-286, AN/GSM-287 and 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, 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	Dc voltage: Range: 0.19 to 1000 V Accuracy: ± (%) 8020A / 8020B 0.19 to 190 V: 0.079 / 0.039 1000 V: 0.075 / 0.050 Ac voltage: Range: 190 mV to 750 V Frequency: 45 Hz to 5 kHz Accuracy: ± (%) Frequency / Voltage 40Hz and 1.0 kHz: 190 mV through 190 V: 0.211 2.0kHz: 190 mV through 190 V: 0.408 5.0 kHz: 190 mV through 190 V: 1.316 50 Hz and 1.0 kHz: 750 V: 0.317 Resistance: Range: 190 Ω to 19 MΩ Accuracy: ± (%) Resistance: 8020A / 8020B 190 Ω: 0.115 / 0.090 1.9 through 190 kΩ: 0.063 / 0.038 1.9 MΩ: 0.063 / 0.513 19 MΩ: 0.513 / 0.513 Dc current: Range: 1.9 mA to 1.9 A Accuracy: ±0.197%	Fluke, Model 5720A (5720A) (p/o MIS-35947); w amplifier, Fluke 5725A/AR (5725A/AR)

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 and item identification number 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 manufacturers' manuals and/or technical manuals for the TI.

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

e. Values enclosed within parenthesis apply to model 8020B.

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. Remove protective cover from TI only to make adjustments and replace upon completion.

b. Set **ON - OFF** switch to **ON**.

c. Set **DC/AC** pushbutton to **DC** (out) position.

d. Set function pushbutton to **V** (out) position.

8. Dc Voltage

a. Performance Check

(1) Connect TI **V** input to calibrator **OUTPUT HI** and TI **COM** input to calibrator **OUTPUT LO**.

(2) Press TI **200 mV** range pushbutton.

(3) Set calibrator for an output amplitude of 190 mV dc. If TI does not indicate within limits specified in first row of table 3, perform **b** below.

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

Table 3. Dc Voltage

Calibrator	Test instrument		
Output	Range setting	Indication limits[1] Min	Max
190 mV	200 mV	189.4 (189.7)	190.6 (190.3)
–190 mV	200 mV	–189.4 (–189.7)	–190.6 (–190.3)
1.9 V	2 V	1.894 (1.897)	1.906 (1.903)
19 V	20 V	18.94 (18.97)	19.06 (19.03)
190 V	200 V	189.4 (189.7)	190.6 (190.3)
1000 V	1000 V	997 (998)	1003 (1002)

[1] Values in parenthesis apply to model 8020B.

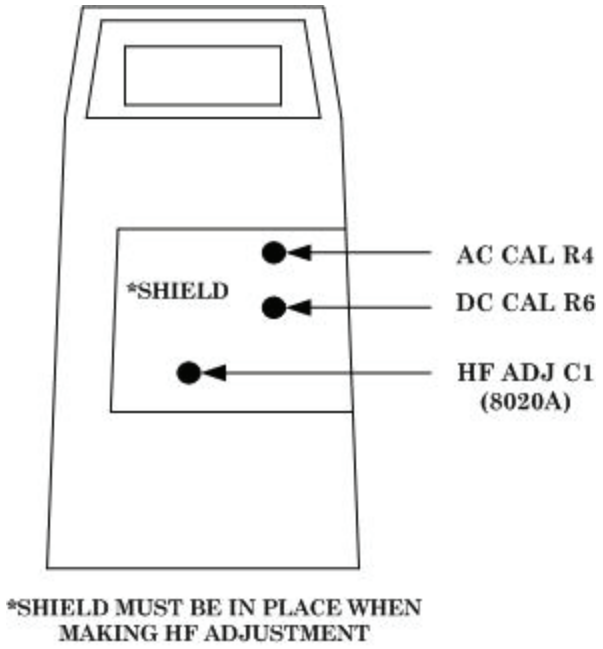

Figure 1. Adjustment locations.

b. Adjustments. Set TI range to 200 mV and calibrator for a 190 mV dc output. Adjust DC CAL R6 (fig. 1) for a TI indication of 190.0 (R).

9. Ac Voltage

a. Performance Check

(1) Press **DC/AC** pushbutton to **AC** (in).

(2) Press TI **200 mV** range pushbutton.

(3) Set calibrator for an output amplitude of 190 mV and an output frequency of 45 Hz. If TI does not indicate within limits specified in first row of table 4, perform **b** below.

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

Table 4. Ac Voltage

Calibrator		Test instrument		
Output amplitude	Output frequency	Range	Indication limits	
			Min	Max
190 mV	45 Hz	200 mV	188.4	191.6
190 mV	1.0 kHz	200 mV	188.4	191.6
190 mV	2.0 kHz	200 mV	186.9	193.1
190 mV	5.0 kHz	200 mV	180.0	199.9
1.9 V	45 Hz	2 V	1.884	1.916
1.9 V	1.0 kHz	2 V	1.884	1.916
1.9 V	2.0 kHz	2 V	1.869	1.931
1.9 V	5.0 kHz	2 V	1.800	1.999
19 V	45 Hz	20 V	18.84	19.16
19 V	1.0 kHz	20 V	18.84	19.16
19 V	2.0 kHz	20 V	18.69	19.31
19 V	5.0 kHz	20 V	18.00	19.99
190 V	45 Hz	200 V	188.4	191.6
190 V	1.0 kHz	200 V	188.4	191.6
190 V	2.0 kHz	200 V	186.9	193.1
750 V	45 Hz	750 V	740	760
750 V	1.0 kHz	750 V	740	760

b. Adjustments

(1) Set TI range to **200 mV** and calibrator for a 190 mV, 45 Hz output. Adjust AC CAL R4 (fig. 1) for a TI indication of 190.0(R).

NOTE

Perform (2) below for model 8020A only.

(2) Set TI range to **2** and calibrator for a 1.9 V, 2 kHz output. Adjust HF ADJ C1 (8020A) (fig. 1) for a TI indication of 1.900 (R).

10. Dc Current

a. Performance Check

(1) Connect TI **mA** input to calibrator **OUTPUT HI** and TI **COM** input to calibrator **OUTPUT LO**.

(2) Press **DC/AC** pushbutton to **DC** (out).

(3) Press TI **2 mA** range pushbutton.

(4) Set calibrator for an output amplitude of 1.9 mA. If TI does not indicate within limits specified in first row of table 5, perform **b** below.

(5) Repeat technique of (3) and (4) above using settings listed in table 5 below. If TI does not indicate within limits specified in table 5, perform **b** below.

Table 5. Dc Current

Test instrument range pushbutton settings	Calibrator output (dc current)	Test instrument indications	
		Min	Max
2 mA	1.9 mA	1.885	1.915
20 mA	19 mA	18.85	19.15
200 mA	190 mA	188.5	191.5
2000 mA	1.9 A	1.885	1.915

b. Adjustments. No adjustments can be made.

11. Resistance

a. Performance Check

(1) Connect TI **KΩ** input to calibrator **OUTPUT HI** and TI **COM** input to calibrator **OUTPUT LO**.

(2) Press TI **mA/V**, **KΩ/nS** pushbutton to **KΩ/nS** (in).

(3) Press TI **200 Ω** range pushbutton.

(4) Set calibrator for a 190 Ω nominal output.

(5) Rotate calibrator knob below **EDIT FIELD** pushbutton to adjust calibrator display indication to equal TI indication. Calibrator **err** display will indicate within limits specified in first row of table 6.

(6) Repeat technique of (3) through (5) above, using calibrator outputs and TI indications listed in table 12. Calibrator **err** display will indicate within limits specified in table 6.

Table 6. Resistance

Test instrument	Calibrator	
Range pushbutton settings	Output nominal resistance value	**err** display indication ±(%)[1]
200 Ω	190 Ω	0.458 (0.358)
2 (2K)	1.9 kΩ	0.253 (0.153)
20 (20K)	19 kΩ	0.253 (0.153)
200 (200K)	190 kΩ	0.253 (0.153)
2000 (2000K)	1.9 MΩ	0.253 (2.05)
20 MΩ (20M)	19 MΩ	2.05 (2.05)

[1] Values in parenthesis apply to model 8020B.

b. Adjustments. No adjustments can be made.

12. 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
0728807

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 344417, requirements for calibration procedure TB 9-6625-2266-24.

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.