*TB 9-6625-2230-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR DIGITAL MULTIMETER FLUKE, MODEL 8060A

Headquarters, Department of the Army, Washington, DC
6 July 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, US 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 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 bulletin supersedes TB 9-6625-2230-24, dated 25 May 2007.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Digital Multimeter, Fluke, Model 8060A. The manufacturer's 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 Variations. None

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 applications that pertain to this calibration are in table 1.

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Dc voltage	Range: 0 to ±1000 V (in 5 ranges) Accuracy:[1] 200 mV and 2 V (0.04% + 2) 20, 200, and 1000 V ranges (0.05% + 2)
Ac voltage	Range: 0 to 750 V in 5 ranges Frequency: 20 Hz to 100 kHz Accuracy:[1] 20 to 45 Hz: 200 mV, 2, 20, and 200 V (1% + 10) 45 Hz to 1 kHz: 200 mV (0.2% + 10) 2, 20, 200, and 750 V (to 499.9 V) (0.5% + 10) 750 V (500.0 and up) (1% + 10) 1 to 10 kHz: 200 mV (0.2% + 20) 2, 20, and 200 V (0.5% + 20) 10 to 30 kHz: 200 mV (0.5% + 40) 2, 20, and 200 V (1.0% + 40) 30 to 50 kHz: 200 mV (1.0% + 100) 2, 20, and 200 V (2.0% + 100) 50 to 100 kHz: 200 mV, 2, 20, and 200 V (3% + 200)
Dc current	Range: 0 to 2000 mA in 5 ranges Accuracy:[1] 200 μA and 2 mA (0.2% + 2) 20, 200, and 2000 mA (0.3% + 2)
Ac voltage, dB mode	The dB mode is a mathematical function of the 5 ac voltage ranges. 7.79 dBm (0.10 dB) is checked to verify function capability
Frequency	Range: 200 Hz, 2000 Hz, 20 kHz, and 200 kHz (fully autoranging) Accuracy:[1] (0.05% + 1)

See footnote at end of table

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Resistance	Range: 0 to MΩ in 5 ranges; autoranging MΩ Accuracy:[1] 200 (0.07% + 0.02 Ω) 2, 20, and 200 kΩ (0.07% + 2) auto ranging MΩ, 0 to 1.9999 MΩ (0.15% +2) 2 to19.99 MΩ (0.2% + 3) 20 to 99.9 MΩ (1% + 3) 100 to 300 MΩ (2% + 3)

[1]Accuracy stated as ± (% of reading + number of digits).

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 or AN/GSM-705. Alternate items may be used by the calibrating activity. The item 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 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: 20 mV to 750 V ac Accuracy: ±0.0625% Frequency: 20 Hz to 100 kHz Range: 0.190 to 900 V dc Accuracy: ± 0.0118% Range: 190 μA to 1.9 A dc Accuracy: ±05% Range: 0 to 1 MΩ ± 0.0225% 10 MΩ ± 0.125%	Fluke, Model 5720A (5700A/EP) (p/o MIS-35947); w amplifier, Fluke 5725A/AR (5725A/AR)
RESISTANCE STANDARD	Range: 50 MΩ Accuracy: ± 0.125%	Beckman, Model CR100M (8598966)
RESISTANCE STANDARD	Range: 200 MΩ Accuracy: ± 0.875%	Beckman, Model CR1000M (8579478)

SECTION III
CALIBRATION PROCESS

6. Preliminary Instructions

a. The instructions outlined in paragraph **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 within the performance check where applicable.

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

b. Set TI to measure dc voltage.

c. Press **200 mV** pushbutton.

8. Dc Voltage

a. Performance Check

(1) Connect calibrator output terminals to TI **VΩS** and **COMMON** terminals.

(2) Press TI range pushbutton settings and set calibrator output as specified in table 3. TI will indicate within the specified limits.

Table 3. Dc Voltage

Test instrument range pushbutton settings	Calibrator output settings	Test instrument indications		Adjustments (fig. 1)
		Min	Max	
200 mV	190 mV	189.91 mV	190.09 mV	**b**(1)

Table 3. Dc Voltage - Continued

Test instrument range pushbutton settings	Calibrator output settings	Test instrument indications		Adjustments (fig. 1)
2 V	1.90 V	1.8991 V	1.9009 V	**b**(2) & (3)
20 V	19.000 V	18.989 V	19.011 V	
200 V	190.00 V	189.89 V	190.11 V	
1000 V	900 V	899.4 V	900.6 V	

b. Adjustments

(1) Set calibrator to 190 mV. Press TI **200 mV** pushbutton and adjust R8 (fig. 1) for a TI indication of 190.00 (R).

(2) Press **2V** pushbutton. Adjust R6 (fig. 1) fully cw and adjust R5 (fig. 1) ccw.

(3) Set calibrator output to 1.9000 V. Adjust R5 (fig. 1) for a TI indication slightly greater than 1.9000. Adjust R6 (fig. 1) for a TI indication of 1.9000 (R).

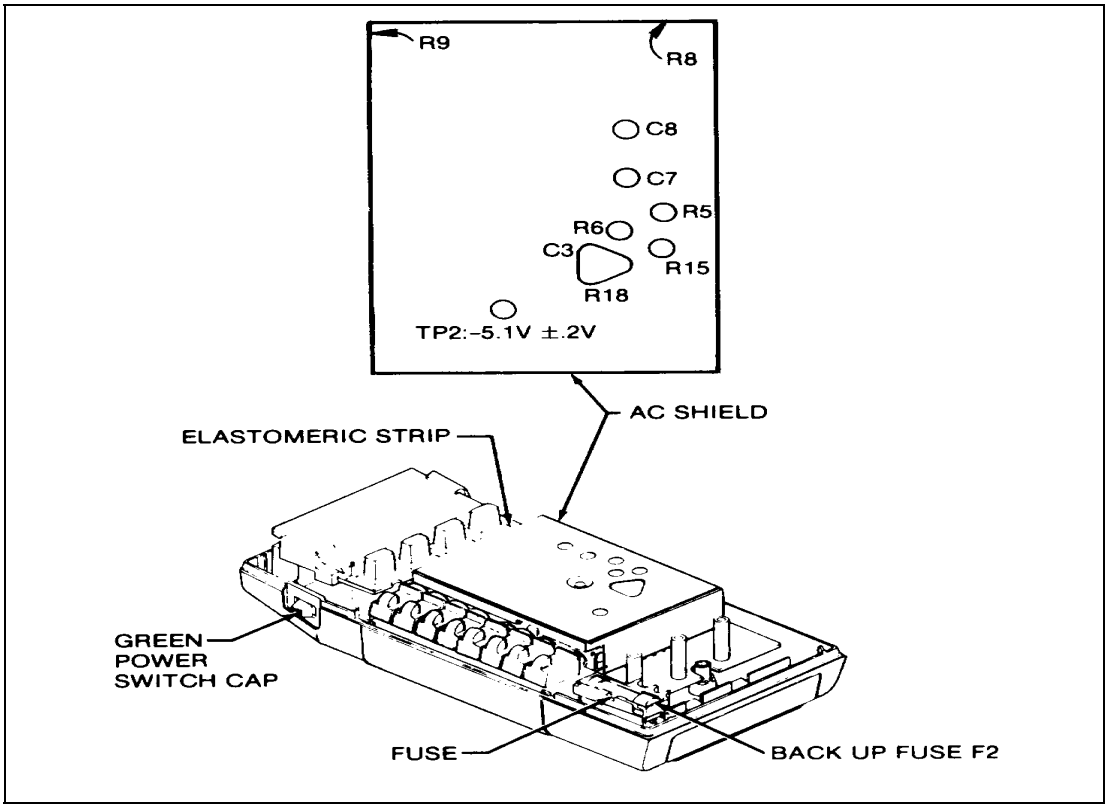

Figure 1. Access and adjustments.

9. Dc Current

a. Performance Check

(1) Connect calibrator output to TI **A** and **COMMON** terminals.

(2) Press TI range pushbutton settings and set calibrator output as specified in table 4. TI will indicate within the specified limits.

b. Adjustments. No adjustments can be made.

Table 4. Dc Current

Range pushbutton settings	Calibrator output settings	Test instrument indications	
		Min	Max
200 μA	190.00 μA	189.60 μA	190.40 μA
2 mA	1.900 mA	1.8960 mA	1.9040 mA
20 mA	19.000 mA	18.941 mA	19.059 mA
200 mA	190.00 mA	189.41 mA	190.59 mA
2000 mA	1900.0 mA	1894.1 mA	1905.9 mA

10. Ac Voltage

a. Performance Check

(1) Connect TI **VΩS** and **COMMON** terminals to calibrator.

(2) Press TI range pushbutton settings and set calibrator output as specified in table 5. TI will indicate within the specified limits.

b. Adjustments

(1) Adjust R18 (fig. 1) fully cw and adjust R15 (fig. 1) ccw.

(2) Set calibrator output to 100.00 mV. Adjust R15 (fig. 1) for a TI indication slightly greater than 100.00 mV. Adjust R18 (fig. 1) for a TI indication of 100.00 mV (R).

Table 5. Ac Voltage

Test instrument range pushbutton settings	Calibrator		Test instrument indications		
	Voltage settings	Frequency settings	Indications		Adjustments (fig. 1)
			Min	Max	
200 mV	100.00 mV	200 Hz	99.70 mV	100.30 mV	**b**(1) & (2)-
200 mV	100.00 mV	50 Hz	99.70 mV	100.30 mV	- -
200 mV	100.00 mV	10 kHz	99.60 mV	100.40 mV	- - -
200 mV	100.00 mV	40 kHz	98.00 mV	102.00 mV	- - -
2 V	1.9000 V[1]	50 Hz	7.69 dB	7.89 dB	- - -

See footnote at end of table.

Table 5. Ac Voltage - Continued

Test instrument range pushbutton settings	Calibrator		Test instrument		
	Voltage Settings	Frequency Settings	Indications		Adjustments (fig. 1)
			Min	Max	
2 V	1.0000 V	50 Hz	0.9940 V	1.0060 V	- - -
2 V	1.0000 V	1 kHz	0.9940 V	1.0060 V	- - -
2 V	1.0000 V	10 kHz	0.9930 V	1.0070 V	C7(R)
2 V	1.0000 V	30 kHz	0.9860 V	1.0140 V	- - -
2 V	1.0000 V	40 kHz	0.9700 V	1.0300 V	- - -
2 V	1.0000 V	100 kHz	0.9500 V	1.0500 V	- - -
2 V	1.0000 V	20 Hz	0.9890 V	1.0110 V	- - -
2 V	200.0 mV	50 Hz	0.1986 V	0.2020 V	- - -
2 V	200.0 mV	30 kHz	0.1950 V	0.2060 V	- - -
2 V	200.0 mV	40 kHz	0.1880 V	0.2140 V	- - -
2 V	200.0 mV	100 kHz	0.1740 V	0.2260 V	- - -
20 V	10.000 V	50 Hz	9.940 V	10.060 V	- - -
20 V	10.000 V	10 kHz	9.930 V	10.070 V	C8(R)
20 V	10.000 V	30 kHz	9.860 V	10.140 V	- - -
20 V	10.000 V	40 kHz	9.700 V	10.300 V	- - -
20 V	10.000 V	100 kHz	9.500 V	10.500 V	- - -
200 V	100.00 V	50 Hz	99.40 V	100.60 V	- - -
200 V	100.00 V	10 kHz	99.30 V	100.70 V	C3(R)
200 V	100.00 V	30 kHz	98.60 V	101.40 V	- - -
200 V	100.00 V	40 kHz	97.00 V	103.00 V	- - -
200 V	100.00 V	100 kHz	95.00 V	105.00 V	- - -
750 V	750.0 V	100 Hz	741.5 V	758.5 V	- - -
750 V	750.0 V	1 kHz	741.5 V	758.5 V	- - -

[1]Press TI db pushbutton to obtain reading. After reading is obtained, press db pushbutton again to return to volts mode.

11. Resistance

a. Performance Check

(1) Set TI to measure resistance on 200 Ω range.

(2) Short test leads together. TI will indicate between 0.00 Ω and 0.04 Ω.

(3) Connect TI **VΩS** and **COMMON** to calibrator **HI** and **LO** terminals. Set calibrator to 100 Ω (nominal) with **2 wire comp ON**.

(4) Use the output adjustment controls of the calibrator to adjust the output display to match the reading on the TI. Calibrator percent error display will not exceed ± 0.09%.

(5) Repeat technique of (3) above using settings and indications listed in table 6.

Table 6. Resistance

Test instrument range pushbutton settings	Calibrator nominal settings	Calibrator error display indication	
		Min	Max
2 kΩ	1.000 kΩ	-0.09%	+0.09%
200 kΩ[1]	100.00 kΩ	-0.09%	+0.09%
MΩ	1.0000 MΩ	-0.17%	+0.17%
MΩ	10.00 MΩ	-0.5%	+0.5%
MΩ[2]	50.0 MΩ	49.2 MΩ	50.8 MΩ
MΩ[3]	200 MΩ	193 MΩ	207 MΩ
20 kΩ	10.000 kΩ	-0.09%	+0.09%

[1]Set Calibrator **2 wire comp OFF**.
[2]Connect resistance standard CR100M to TI.
[3]Connect resistance standard CR1000M to TI.

b. Adjustments. No adjustments can be made.

12. Frequency

a. Performance Check

(1) Set TI to measure frequency by selecting ac voltage mode and pressing **HZ** pushbutton.

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

(3) Adjust calibrator for output settings listed in table 7.

(4) TI will indicate within limits listed.

Table 7. Resistance

Test instrument range pushbutton settings	Calibrator		Test instrument indications	
	Voltage settings	Frequency settings	Indications	
			Min	Max
200 mV	20.00 mV	100 Hz	99.94 Hz	100.06 Hz
200 mV	200.00 mV	19.000 kHz	18.990 kHz	19.010 kHz
200 mV	200.00 mV	190.00 kHz	189.90 kHz	190.10 kHz

b. Adjustments. No adjustments can be made.

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:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army

0712802

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 343642, requirements for calibration procedure TB 9-6625-2230-24.

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.