*TB 9-6625-2268-35

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR DIGITAL MULTIMETER JOHN FLUKE, MODELS 8050A AND 8050A-01

Headquarters, Department of the Army, Washington, DC
20 September 2001

Approved for public release; distribution is unlimited

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of any way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), direct to: Commander U. S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5230. A reply will be furnished to you. You may also send in your comment electronically to our e-mail address: 2028@redstone.army.mil or by fax 256-842-6546/DSN 788-6546. Instructions for sending an electronic 2028 may be found at the back of this procedure.

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*This bulletin supersedes TB 9-6625-2268-35, dated 31 October 1991.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Digital Multimeter, John Fluke, Models 8050A and 8050A-01. 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. Model 8050A-01 has rechargeable batteries; otherwise, both models are the same.

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. 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><td>Test instrument parameters</td><td colspan="6">Performance specifications
(4 1/2 digit display)</td></tr>
<tr><td>Dc voltage</td><td colspan="6">Range: 0 to 1000 V (in 5 ranges)
Accuracy: ±(.03% of reading + 2 digits)</td></tr>
<tr><td rowspan="5">Ac voltage</td><td colspan="6">Range: 0 to 750 V (in 5 ranges)
Frequency: 20 Hz to 50 kHz[1]
Accuracy: ±(% of reading + digits)</td></tr>
<tr><td>Range</td><td colspan="5">Frequency</td></tr>
<tr><td></td><td>20 Hz</td><td>45 Hz</td><td>1 kHz</td><td>10 kHz</td><td>20 kHz</td><td>50 kHz</td></tr>
<tr><td>200 mV through 200 V</td><td>1.0 + 10</td><td colspan="2">.5 + 10</td><td>1.0 + 10</td><td>5.0 + 30</td></tr>
<tr><td>750 V</td><td></td><td></td><td colspan="3">NOT SPECIFIED</td></tr>
</table>

See footnotes at end of table.

Table 1. Calibration Description - Continued

<table>
<tr><th>Test instrument parameters</th><th>Performance specifications (4 1/2 digit display)</th></tr>
<tr><td>dB display</td><td>
Range: .77 mV to 750 V (-60 to +60 dBm with 600Ω reference)
Frequency: 20 Hz to 50 kHz
Accuracy: ±(dBm)
<table>
<tr><th rowspan="2">Input</th><th rowspan="2">dBm</th><th rowspan="2">Range</th><th colspan="6">Frequency (in kHz)</th></tr>
<tr><th>.020</th><th>.045</th><th>1.0</th><th>10</th><th>20</th><th>50</th></tr>
<tr><td>.77 to 2.0 mV</td><td>-60 to -52</td><td>200 mV</td><td colspan="5">.5</td><td>N/A</td></tr>
<tr><td>2 mV to 2.0 V</td><td>-52 to +8</td><td>200 mV</td><td rowspan="5">.25</td><td rowspan="5">.15</td><td rowspan="5">.25</td><td rowspan="5">.75</td></tr>
<tr><td>.01 to 2.0 V</td><td>-18 to +8</td><td>2 V</td></tr>
<tr><td>1.0 to 20 V</td><td>+2 to +28</td><td>20 V</td></tr>
<tr><td>10 to 200 V</td><td>+22 to +48</td><td>200 V</td></tr>
<tr><td>100 to 750 V</td><td>+42 to +60</td><td>750 V</td><td colspan="3">NOT SPECIFIED</td></tr>
</table>
</td></tr>
<tr><td>Ac current[2]</td><td>
Range: 0 to 2000 mA (in 5 ranges)
Frequency: 20 Hz to 20 kHz
Accuracy: ±(% of reading + digits)
<table>
<tr><th rowspan="2">Range</th><th colspan="5">Frequency</th></tr>
<tr><th>20 Hz</th><th>45Hz</th><th>2kHz</th><th>10kHz</th><th>20kHz</th></tr>
<tr><td>200 µA through 200 mA</td><td>2 + 10</td><td colspan="2">1 + 10</td><td colspan="2">2 + 10</td></tr>
<tr><td>2000 mA</td><td colspan="3"></td><td colspan="2">NOT SPECIFIED</td></tr>
</table>
</td></tr>
<tr><td>Dc current</td><td>Range: 0 to 2000 mA (in 5 ranges)
Accuracy: ±(0.3% of reading + 2 digits)</td></tr>
<tr><td>Resistance</td><td>Range: 0 to 20 MΩ (in 6 ranges)
Accuracy: ±(% of reading + digits)
200Ω and 2 kΩ..... 0.1 + 2 + 0.02Ω
20 and 200 kΩ..... .05 + 2
2000 kΩ and 20 MΩ..... .25 + 3</td></tr>
<tr><td>Conductance</td><td>Range: 2 ms; Accuracy: ±(0.1% of reading + 5 digits)
Range: 200 ns; Accuracy: ±(0.5% of reading + 20 digits)</td></tr>
</table>

[1]Volts/hertz product not to exceed 10^7

[2]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. 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.

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: 190 mV to 1 000 V Accuracy: ±0.0105% Ac voltage: Range: 190 mV to 750 V Frequency: 30 Hz to 50 kHz Accuracy: ±(%) 30 Hz 1 kHz 15 kHz 50 kHz 190 mV through 190 V 0.263 0.138 0.263 1.289 40 Hz 1 kHz 750 V 0.263 0.138 Resistance: Range: 190Ω to 19 MΩ Accuracy: 190Ω ±0.030% 1.9 kΩ ±0.028% 19 and 190 kΩ ±0.015% 1.9 and 19 MΩ ±0.066% Dc current: Range: 190 µA to 1.9 A Accuracy: ±0.0776% dBm: Range: -55 to +45 dBm Frequency: 1 kHz Accuracy: -55 dBm ±0.125 dBm -20 through +45 dBm ±0.0375 dBm	John Fluke, Model 5700A/CT (p/o MIS-35947), w/ amplifier, John Fluke, Model 5725A (5725A)

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 results of each test and, whenever the test requirement is not met, take corrective action before continuing with the calibration. 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 with the performance check where applicable.

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

b. Connect TI to a 115 V ac power source.

c. Press **POWER ON/OFF** pushbutton to **ON** and allow at least 15 minutes for stabilization.

d. Press and release **AC/DC** pushbutton to **DC**.

e. Press **V** function pushbutton.

8. Dc Voltage

a. Performance Check

(1) Connect calibrator **OUTPUT HI** and **LO** to TI **V/k**W**/S** and **COMMON**.

(2) Press TI range pushbutton and set calibrator output to settings listed in table 3. If TI does not indicate within limits specified, perform corresponding adjustment.

Table 3. Dc Voltage

Test instrument range pushbutton settings	Calibrator output settings	Test instrument		
		Indications		
		Min	Max	Adjustments
200 mV	190 mV	189.92	190.08	**b**(1)
200 mV	-190 mV	-189.92	-190.08	
2	1.9 V	1.8992	1.9008	**b**(2)
2	-1.9 V	-1.8992	-1.9008	
20	19 V	18.992	19.008	
200	190 V	189.92	190.08	**b**(3)
1000V DC	1000 V	999.5	1000.5	**b**(4)

b. Adjustments

(1) Adjust R12 (fig. 1) for a TI indication of 190.00 (R).

(2) Adjust R11 (fig. 1) for a TI indication of 1.9000 (R).

(3) Adjust R5 (fig. 1) for a TI indication of 190.00 (R).

(4) Adjust R6 (fig. 1) for a TI indication of 1000.0 (R).

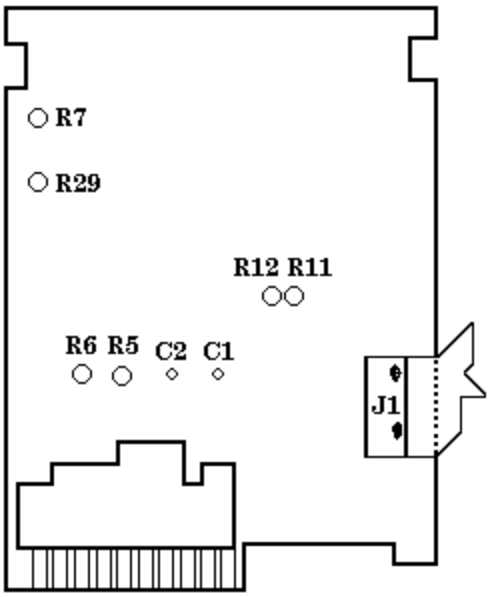

Figure 1. Adjustment locations.

9. Ac Voltage

a. Performance Check

(1) Connect calibrator **OUTPUT HI** and **LO** to TI **V/k**W**/S** and **COMMON**.

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

(3) Press TI range pushbutton and set calibrator output to settings listed in table 4. If TI indications are not within limits specified, perform **b** below.

Table 4. Ac Voltage

Test instrument range pushbutton settings	Calibrator output settings		Test instrument indications	
	Voltage	Frequency	Min	Max
200 mV	190 mV	30 Hz	188.00	192.00
200 mV	190 mV	5 kHz	188.95	191.05
200 mV	190 mV	15 kHz	188.00	192.00
200 mV	190 mV	50 kHz	180.20	199.80
2	1.9 V	30 Hz	1.8800	1.9200
2	1.9 V	5 kHz	1.8895	1.9105
2	1.9 V	15 kHz	1.8800	1.9200
2	1.9 V	50 kHz	1.8020	1.9980
20	1.9 V	30 Hz	18.800	19.200
20	1.9 V	5 kHz	18.895	19.105
20	1.9 V	15 kHz	18.800	19.200
20	1.9 V	50 kHz	18.020	19.980
200	190 V	30 Hz	188.00	192.00
200	190 V	5 kHz	188.95	191.05
200	190 V	15 kHz	188.00	192.00
200	190 V	50 kHz	180.20	199.80
750V AC	750 V	40 Hz	741.5	758.5
750V AC	750 V	1 kHz	745.3	754.7

b. Adjustments

(1) Press TI **2** range pushbutton and set calibrator for a 1.9 V, 45 Hz output. Adjust R7 (fig.1) for a TI indication of 1.9000 (±5 digits) (R).

(2) Set calibrator for a 100 mV, 45 Hz output. Adjust R29 (fig. 1) for a TI indication of .1000 (±l digit) (R).

(3) Repeat (1) and (2) above until no further adjustments are required.

(4) Press TI **20** range pushbutton and set calibrator for a 19 V, 10 kHz output. Adjust C1 (fig. 1) for a TI indication of 19.000 (±10 digits) (R).

(5) Press TI **200** range pushbutton and set calibrator for a 100 V, 10 kHz output. Adjust C2 (fig. 1) for a TI indication of 100.00 (±5 digits) (R).

(6) Repeat (4) and (5) above until no further adjustments are required.

10. dB Display

a. Performance Check

(1) Connect calibrator **OUTPUT HI** and **LO** to TI **V/k**W**/S** and **COMMON**.

(2) Simultaneously press **V** and **mA** function pushbuttons to select **dB** function.

(3) Press TI range pushbutton and set calibrator output to settings listed in table 5. TI indications will be within limits specified.

Table 5. dB Display

Test instrument range pushbutton settings	Calibrator output settings		Test instrument indications	
	dBm	Frequency (kHz)	Min	Max
200 mV	-55	1	-54.50	-55.50
200 mV	-20	1	-19.85	-20.15
2	-10	1	-9.85	-10.15
20	+15	1	+14.85	+15.15
200	+40	1	+39.85	+40.15
750V AC	+45	1	+44.85	+45.15

b. Adjustments. No adjustments can be made.

11. Dc Current

a. Performance Check

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

(2) Press and release **AC/DC** pushbutton to **DC**.

(3) Press **mA** function pushbutton.

(4) Press TI range pushbutton and set calibrator output to settings listed in table 6. TI indications will be within limits specified.

Table 6. Dc Current

Test instrument range pushbutton settings	Calibrator output settings	Test instrument indications	
		Min	Max
200 µA	190 µA	189.41	190.59
2	1.9 mA	1.8941	1.9059
20	19 mA	18.941	19.059
200	190 mA	189.41	190.59
2000	1.9 A	1894.1	1905.9

b. Adjustments. No adjustments can be made.

12. Resistance

a. Performance Check

(1) Connect calibrator **OUTPUT HI** and **LO** to TI **V/k**W**/S** and **COMMON**.

(2) Press **k**W function pushbutton.

(3) Press TI range pushbutton and set calibrator output to settings listed in table 7. At each setting, use calibrator output adjustment controls to set calibrator control display **Reading** equal to TI indication. Calibrator control display **Error** indications will be within limits specified in table 7.

Table 7. Resistance

Test instrument range pushbutton settings	Calibrator	
	Output settings	**Error** indications ±(%)
200 Ω	190 Ω[1]	0.121
2	1.9 kΩ	0.111
20	19 kΩ	0.061
200[2]	190 kΩ	0.061
2000	1.9 MΩ	0.266
20 MΩ	19 MΩ	0.266

[1]Set calibrator **2 wire Comp** to **ON**.
[2]Set calibrator **2 wire Comp** to **OFF**.

(4) Simultaneously press **200**W and **2** range pushbuttons to select **2 mS** range.

(5) Set calibrator for a 1 kΩ output.

(6) Divide TI indication into 1 and record results after rounding to 5 digits. Use calibrator output adjustment controls to set calibrator control display **Reading** equal to recorded value. Calibrator control display **Error** indication will be within ±0.15%.

(7) Simultaneously press **2000** and **20 M**Ω range pushbuttons to select **200 nS** range.

(8) Set calibrator for a 10 MΩ output and repeat technique of (6) above. Calibrator control display **Error** indication will be within ±0.7%.

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.

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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.

By Order of the Secretary of the Army:

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

OFFICIAL:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
0121913

Distribution:
To be distributed in accordance with IDN 344419, requirements for calibration procedure TB 9-6625-2268-35.