*TB 9-6625-2208-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR DIGITAL MULTIMETER, MIS-28709D (BECKMAN, MODEL 310) AND CATERPILLAR, MODEL 6V7070

Headquarters, Department of the Army, Washington, DC
4 January 2008

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 9-6625-2208-35, dated 4 May 2004.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Digital Multimeter, MIS-28709D (Beckman, Model 310) and Caterpillar, Model 6V7070. The manufacturers' manuals and/or technical 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, tables, and figures.

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 in table 1.

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Dc voltage	Range: 0 to 1500 V in 5 ranges Accuracy: ± (0.25% of reading + 1 digit)
Dc current	Range: 0 to 10 A in 6 ranges Accuracy: 0 to 2 A (± 0.75% of reading + 1 digit) 10 A (± 1.5% of reading + 1 digit)
Ac voltage 310	Range: 0 to 1000 V in 5 ranges Accuracy: All ranges, 45 Hz to 2 kHz ± (0.75% of reading + 3 digits) All ranges, 2 kHz to 5 kHz ± (1.5% of reading + 5 digits) All ranges, 5 kHz to 10 kHz ± (2.5% of reading + 9 digits)
6V7070	Range: 0 to 1000 V in 5 ranges Accuracy: 200mV, 2V, 20V, 45 Hz to 5 kHz ± (0.75% of reading + 3 digits) 200V, 45 Hz to 1 kHz ± (0.75% of reading + 3 digits) 1000V, 45 Hz to 500 Hz ± (0.75% of reading + 3 digits) 1000V, 500 Hz to 1 kHz ± (1.5% of reading + 5 digits)
Ac current[1]	Range: 0 to 10 A in 6 ranges Accuracy: 0 to 2 A, 45 Hz to 2 kHz ± (1.5% of reading + 3 digits) 10 A range, 45 Hz to 400 Hz ± (2.0% of reading + 3 digits)
Resistance	Range: 0 to 20 MΩ in 6 ranges Accuracy: 200 Ω to 2 MΩ ± (0.5% of reading + 1 digit) 20 MΩ range ± (1.5% of reading + 1 digit)

[1]Ac current specifications are for information only (not checked in this procedure).

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 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	Dc voltage: Range: 0 to 1000 V dc Accuracy: ±0.079% Ac Voltage: Range: 0 to 1000 V Frequency: 0 to 10 kHz Accuracy: ± 0.222% Dc current: Range: 0 to 2 A Accuracy: ±0.196% Range: 10 A Accuracy: ±0.394% Resistance: Range: 0 to 19 MΩ Accuracy: ±0.144%	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 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.

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 when necessary to make adjustments. Replace cover after completing the adjustments.

b. Connect TI **V-Ω** input to calibrator **OUTPUT HI** and TI **COM** input to calibrator **OUTPUT LO**.

8. Dc Voltage

a. Performance Check

(1) Set the function/range switch to **DCV 200 m** position.

(2) 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.

(3) Repeat technique of (1) and (2) above using outputs and settings listed in table 3. TI will indicate within limits specified in table 3.

Table 3. Dc Voltage Accuracy

Calibrator output	Test instrument		
	Range setting (DCV)	Indication limits	
		Min	Max
190 mV	200 m	189.4	190.6
1.9 V	2	1.894	1.906
19 V	20	18.94	19.06
190 V	200	189.4	190.6
1000 V	1500	997	1003

(4) Reduce all outputs to minimum.

b. Adjustments

(1) Set calibrator for an output amplitude of 190.00 mV.

(2) Adjust potentiometer DC VOLT ADJ R5 range, (fig. 1) until TI indicates 190.0 mV (R).

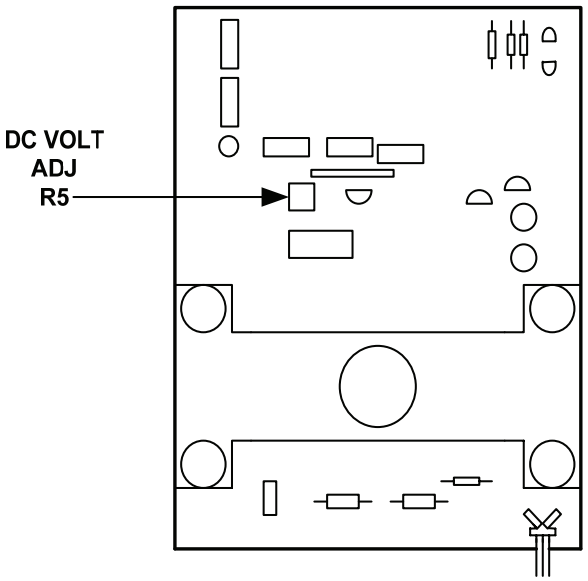

Figure 1. Adjustment location.

9. Ac Voltage

a. Performance Check

(1) Set the function/ range switch to **ACV 200 m** position.

(2) Set calibrator for an output amplitude of 190 mV and an output frequency of 45 Hz. TI will indicate within limits specified in first row of table 4.

(3) Repeat technique of (1) and (2) above using settings listed in table 4. TI will indicate within limits specified in table 4.

Table 4. Ac Voltage

Calibrator		Test instrument[1]		
Output amplitude	Output frequency	Range setting (ACV)	Indication limits	
			Min	Max
190.0 mV	45 Hz	200 m	188.3	191.7
190.0 mV	1 kHz	200 m	188.3	191.7
1.9 V	45 Hz	2	1.883	1.917
1.9 V	1 kHz	2	1.883	1.917
1.9 V	3 kHz	2	1.867 (1.883)	1.934 (1.917)
1.9 V	5 kHz	2	1.844 (1.883)	1.957 (1.917)
19.0 V	1 kHz	20	18.83	19.17
190.0 V	1 kHz	200	188.3	191.7
1000 V	1 kHz	1000	990 (980)	1011 (1020)

[1] Values in parenthesis are for model 6V-7070.

(4) Reduce all outputs to minimum.

b. Adjustments.

No adjustments can be made.

10. Dc Current

a. Performance Check

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

(2) Set the function/ range switch to **DCA 200 µ** position.

(3) Set calibrator for an output of 190 µA. TI will indicate within limits specified in first row of table 5.

(4) Repeat technique of (2) and (3) above using settings listed in table 5. TI will indicate within limits specified in table 5.

Table 5. Dc Current Accuracy

Calibrator output	Test instrument		
	Range setting (DCA)	Indication limits	
		Min	Max
190 µA	200 µ	188.5	191.5
1.9 mA	2 m	1.885	1.915
19 mA	20 m	18.85	19.15
190 mA	200 m	188.5	191.5
1.9 A	2 A	1.885	1.915
10 A[1]	10 A	9.84	10.16

[1] Move positive test lead to TI **10 A** input.

(5) Reduce all outputs to minimum.

b. Adjustments.

No adjustments can be made.

11. Resistance

a. Performance Check

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

(2) Set the function/range switch to **200 Ω** position.

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

(4) 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.

(5) Repeat technique of (2) through (4) above, using calibrator outputs and TI indications listed in table 6. Calibrator **err** display will indicate within limits specified in table 6.

Table 6. Resistance

Test instrument	Calibrator	
Function/range switch settings	Nominal output	**err** display indication ±(%)
200 Ω	190 Ω	0.576
2 kΩ	1.9 kΩ	0.576
20 kΩ	19 kΩ	0.576
200 kΩ	190 kΩ	0.576
2 MΩ	1.9 MΩ	0.576
20 MΩ	19 MΩ	1.53

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

0730501

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342287, requirements for calibration procedure TB 9-6625-2208-24.

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.