*TB 9-6625-2263-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR DIGITAL MULTIMETER FLUKE, MODEL 8520A

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 9-6625-2263-35 dated 13 August 2003.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Digital Multimeter, Fluke, Model 8520A. 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 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

<table>
<tr><th>Test Instrument Parameters</th><th>Performance Specifications</th></tr>
<tr><td>Dc voltage</td><td>
<table>
<tr><th>Range</th><th>Full-scale</th><th>Accuracy
±(% of input
+ digits)</th></tr>
<tr><td>100 mV</td><td>199.999</td><td>0.011 + 10</td></tr>
<tr><td>1 V</td><td>1.99999</td><td>0.011 + 2</td></tr>
<tr><td>10 V</td><td>16.0100</td><td>0.009 + 1</td></tr>
<tr><td>100 V</td><td>130.100</td><td>0.012 + 2</td></tr>
<tr><td>1000 V</td><td>1024.00</td><td>0.011 + 1</td></tr>
</table>
</td></tr>
<tr><td>Ac voltage</td><td>
<table>
<tr><th>Range</th><th>Full-scale</th></tr>
<tr><td>1 V</td><td>1.99999</td></tr>
<tr><td>10 V</td><td>16.0100</td></tr>
<tr><td>100 V</td><td>130.100</td></tr>
<tr><td>650 V</td><td>650.00</td></tr>
</table>
<table>
<tr><th>Accuracy[1]
±(% of input + % of FS)</th></tr>
<tr><td>10 to 20 Hz 3.5 + 0.6</td></tr>
<tr><td>20 to 40 Hz 0.6 + 0.6</td></tr>
<tr><td>40 Hz to 20 kHz 0.15+ 0.05</td></tr>
<tr><td>20 to 100 kHz 2.0 + 0.6</td></tr>
<tr><td>100 to 300 kHz 4.0 + 1.0</td></tr>
<tr><td>300 kHz to 1 MHz 15.0 + 5.0</td></tr>
</table>
</td></tr>
</table>

See footnotes at end of table.

Table 1. Calibration Description - Continued

Resistance	<table><tr><th>Range</th><th>Full-scale</th><th>Accuracy ±(% of input + digits)</th></tr><tr><td>10 Ω</td><td>19.9999</td><td>0.0140 + 12</td></tr><tr><td>100 Ω</td><td>199.999</td><td>0.0125 + 3</td></tr><tr><td>1000 Ω</td><td>1999.99</td><td>0.0125 + 3</td></tr><tr><td>10 kΩ</td><td>19.9999</td><td>0.0125 + 3</td></tr><tr><td>100 kΩ</td><td>199.999</td><td>0.0140 + 3</td></tr><tr><td>1 MΩ</td><td>1.99999</td><td>0.0200 + 3</td></tr><tr><td>10 MΩ</td><td>19.999</td><td>0.0450 + 3</td></tr></table>
Conductance	Range: 100 nS Full scale: 202.00 nS Accuracy: ±(0.06% of input + 5 digits)

[1]From 0.1% of range to FS. For 650 V range multiply % of FS by 1.6. Maximum Volts-Hertz product is 2 X 10^7.

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 the 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: –8.1 to +1000 V Accuracy: ±0.0025% Resistance: <table><tr><th>Range</th><th>Accuracy (±%)</th></tr><tr><td>0Ω</td><td>300 μΩ</td></tr><tr><td>10Ω</td><td>0.006</td></tr><tr><td>100Ω, 1 kΩ, 10 kΩ</td><td>0.004</td></tr><tr><td>100 kΩ</td><td>0.004</td></tr><tr><td>1 MΩ</td><td>0.006</td></tr><tr><td>10 MΩ</td><td>0.019</td></tr></table>	Fluke, Model 5720A (5720A) (p/o MIS-35947); w amplifier, Fluke 5725A/AR (5725A/AR)

Table 2. Minimum Specifications of Equipment Required - Continued

<table>
<tr><th>Common name</th><th>Minimum use specifications</th><th>Manufacturer and model (part number)</th></tr>
<tr><td>CALIBRATOR (continued)</td><td>Ac voltage:
<table>
<tr><th>Range</th><th>Frequency</th><th>Accuracy ±(%)</th></tr>
<tr><td>1 V</td><td>15 Hz</td><td>1.18</td></tr>
<tr><td>1 V</td><td>30 Hz</td><td>0.45</td></tr>
<tr><td>1 V</td><td>200 Hz</td><td>0.0625</td></tr>
<tr><td>1 V</td><td>15 kHz</td><td>0.0625</td></tr>
<tr><td>1 V</td><td>90 kHz</td><td>0.8</td></tr>
<tr><td>1 V</td><td>200 kHz</td><td>1.5</td></tr>
<tr><td>1 V</td><td>1 MHz</td><td>6.25</td></tr>
<tr><td>10 V</td><td>15 Hz</td><td>1.12</td></tr>
<tr><td>10 V</td><td>30 Hz</td><td>0.39</td></tr>
<tr><td>10 V</td><td>200 Hz</td><td>0.058</td></tr>
<tr><td>10 V</td><td>15 kHz</td><td>0.058</td></tr>
<tr><td>10 V</td><td>90 kHz</td><td>0.74</td></tr>
<tr><td>10 V</td><td>200 kHz</td><td>1.4</td></tr>
<tr><td>10 V</td><td>1 MHz</td><td>5.75</td></tr>
<tr><td>50 V</td><td>200 kHz</td><td>1.65</td></tr>
<tr><td>100 V</td><td>15 Hz</td><td>1.07</td></tr>
<tr><td>100 V</td><td>30 Hz</td><td>0.345</td></tr>
<tr><td>100 V</td><td>200 Hz</td><td>0.538</td></tr>
<tr><td>100 V</td><td>15 kHz</td><td>0.538</td></tr>
<tr><td>100 V</td><td>90 kHz</td><td>0.718</td></tr>
<tr><td>600 V</td><td>200 Hz</td><td>0.059</td></tr>
<tr><td>600 V</td><td>15 kHz</td><td>0.059</td></tr>
<tr><td>600 V</td><td>30 kHz</td><td>0.76</td></tr>
</table></td><td></td></tr>
<tr><td>MULTIMETER</td><td>Range: 4.9 to 5.2 V dc
Accuracy: ±0.74%</td><td>Fluke, Model 8840A/AF05 (AN/GSM-64D)</td></tr>
<tr><td>RESISTANCE STANDARD</td><td>Range: 10 MΩ
Accuracy: ±0.0275%</td><td>Beckman, Model CR10M (8598965)</td></tr>
</table>

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. When indications specified in paragraphs **8** through **10** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **8** through **10**. Do not perform power supply check if all other parameters are within tolerance.

e. Unless otherwise specified, all controls are 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 available.

a. Remove protective covers from TI only when necessary to make adjustments. Replace cover after completing the adjustments.

b. Connect TI to a 115 V ac source.

c. Release **INPUT REAR/FRONT** pushbutton to **FRONT**, and **EXTERNAL GUARD/NORMAL** pushbutton to **NORMAL**.

d. Press **POWER ON/OFF** pushbutton to **ON** and allow at least 2 hours for warm-up.

8. Dc Voltage

a. Performance Check

(1) Press **VDC** pushbutton and **RANGE Δ** or **∇** pushbutton to select 100 mV dc range.

(2) Short TI **V/Ω INPUT HI** and **LO**. If TI does not indicate between –0.010 and +0.010 mVdc, perform **b** (1) through (4) below.

(3) Remove short and connect calibrator **OUTPUT HI** and **LO** to TI **V/Ω INPUT HI** and **LO**.

(4) Set calibrator for a 100 mV dc output. If TI does not indicate between 99.979 and 100.021 mV dc, perform **b** (5) below.

(5) Repeat technique of (1) and (4) above for TI and calibrator settings listed in table 3. If TI does not indicate within limits specified, perform adjustments listed in table 3.

Table 3. Dc Voltage

Test instrument range settings (VDC)	Calibrator output settings (V)	Test instrument		
		Indications VDC		Adjustments[1]
		Min	Max	
1	1	0.99987	1.00013	**b**(6) through **b**(8)
10	1	0.9998	1.0002	**b**(9) through **b**(20)
10	2	1.9997	2.0003	**b**(9) through **b**(20)

Table 3. Dc Voltage - Continued

Test instrument range settings (VDC)	Calibrator output settings (V)	Test instrument		
		Indications VDC		
		Min	Max	Adjustments[1]
10	4	3.9995	4.0005	**b**(9) through **b**(20)
10	8	7.9992	8.0008	**b**(9) through **b**(20)
10	–8	–7.9992	–8.0008	**b**(9) through **b**(20)
10	10	9.9990	10.0010	**b**(9) through **b**(20)
100	100	99.986	100.014	**b**(21) through **b**(23)
1000	1000	999.88	1000.12	- - -

[1]If adjustments are made, verify all checks affected by each adjustment.

b. Adjustments

(1) Adjust DC BUFFER C231 SLOW DC (fig. 1) for TI indication between –0.001 and +0.001 mV dc (R).

(2) Press **READING RATE** Δ or ∇ pushbutton to select **10/SEC** rate.

(3) Adjust DC BUFFER C225 FAST DC (fig. 1) for TI indication of 0.000 mV dc with the + and – signs alternating (R).

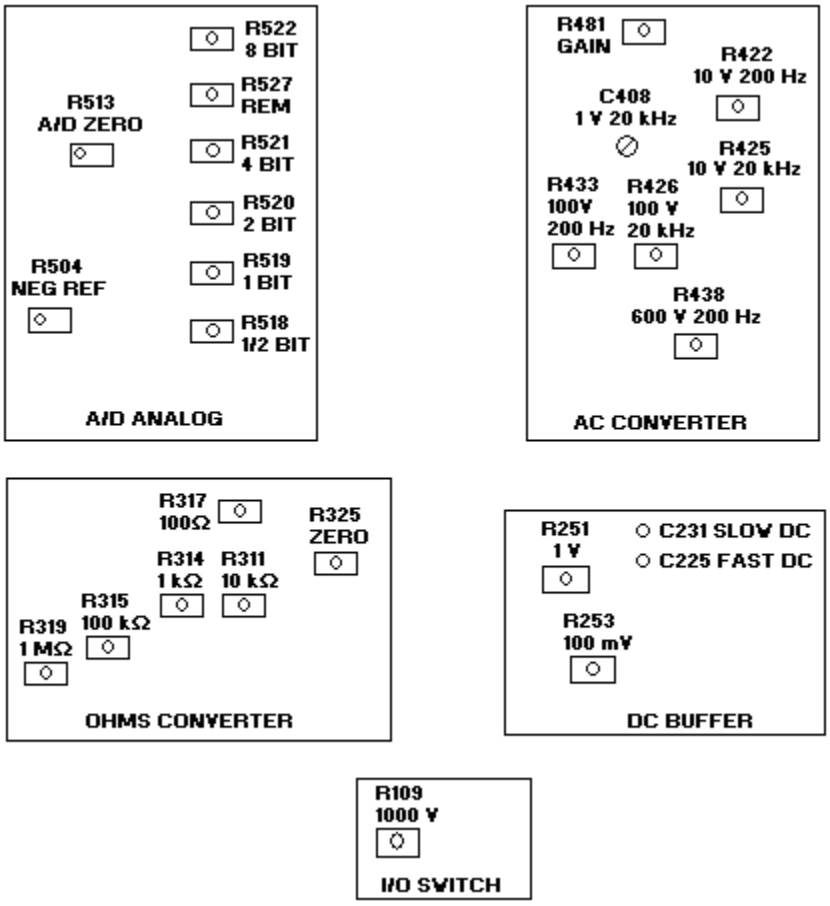

Figure 1. Adjustment locations.

(4) Press **READING RATE** Δ or ∇ pushbutton to select **10/SEC** rate.

(5) Set calibrator for a 190 mV output. Adjust DC BUFFER R253 100 mV (fig. 1) for TI indication between 189.998 and 190.002 mV dc (R).

(6) Press S1 (fig. 2) to select cal digit mode.

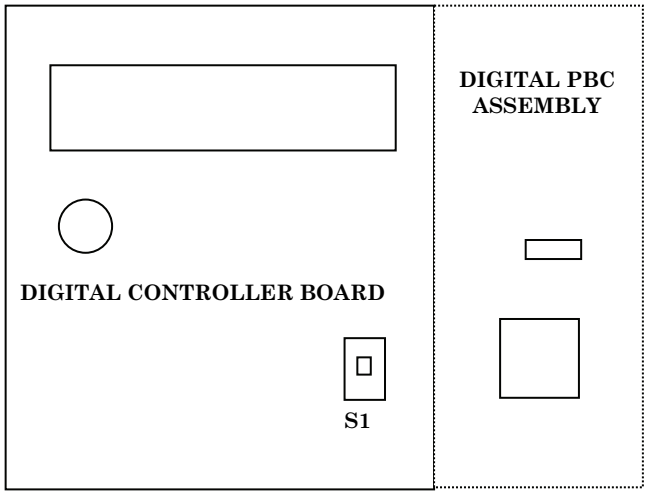

Figure 2. Cal digit switch – S1 location.

(7) Set calibrator for a 1.9 V output. Adjust DC BUFFER R251 1V (fig. 1) for TI indication between 1.89999 4 and 1.90000 6 VD (R).

(8) Press S1 (fig. 2) to return to normal mode.

(9) Press S1 (fig. 2) to select cal digit mode.

(10) Set calibrator to **STANDBY** and disconnect calibrator from TI.

(11) Short TI **V/Ω INPUT HI** and **LO**. Adjust A/D ANALOG R513 A/D ZERO (fig. 1) for TI indication between –0.0000 2 and +0.0000 2 VD (R).

(12) Remove short and connect calibrator **OUTPUT HI** and **LO** to TI **V/Ω INPUT HI** and **LO**.

(13) Set calibrator for a –8.1 V output. Adjust A/D ANALOG R522 8 BIT (fig. 1) for TI indication between –8.0999 8 and –8.1000 2 VD (R).

(14) Set calibrator for a +8.1 V output. Adjust A/D ANALOG R504 NEG REF (fig. 1) for TI indication between 8.0999 8 and 8.1000 2 VD (R).

(15) Set calibrator for a 4.1 V output. Adjust A/D ANALOG R521 4 BIT (fig. 1) for TI indication between 4.0999 8 and 4.1000 2 VD (R).

(16) Set calibrator for a 2.1 V output. Adjust A/D ANALOG R520 2 BIT (fig. 1) for TI indication between 2.0999 8 and 2.1000 2 VD (R).

(17) Set calibrator for a 1.1 V output. Adjust A/D ANALOG R519 1 BIT (fig. 1) for TI indication between 1.0999 8 and 1.1000 2 VD (R).

(18) Set calibrator for a 0.6 V output. Adjust A/D ANALOG R518 1/2 BIT (fig. 1) for TI indication between 0.5999 8 and 0.6000 2 VD (R).

(19) Set calibrator for a 0.3 V output. Adjust A/D ANALOG R527 REM (fig. 1) for TI indication between 0.2999 8 and 0.3000 2 VD (R).

(20) Press S1 (fig 2) to return to normal mode.

(21) Press S1 (fig. 2) to select cal digit mode.

(22) Set calibrator for a 120 V output. Adjust I/O SWITCH R109 1000 V (fig. 1) for TI indication between 119.999 4 and 120.000 6 VD (R).

(23) Press S1 (fig. 2) to return to normal mode.

9. Resistance

a. Performance Check

(1) Press **Ω4-WIRE** pushbutton and **RANGE Δ** or **∇** pushbutton to select 10 Ω range.

(2) Press **READING RATE Δ** or **∇** pushbutton to select **1/SEC** rate.

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

(4) Connect calibrator **SENSE HI** and **LO** to TI **Ω SOURCE HI** and **LO**.

(5) Set calibrator for a 0 Ω output, **EX SNS** on and **2 wire Comp** off. If TI does not indicate 0.0000Ω ±12 digits, perform **b** (1) through (4) below.

(6) Press **READING RATE Δ** or **∇** pushbutton to select **2/SEC** rate.

(7) Set calibrator for a 10 Ω output then, using calibrator output adjustment controls, set calibrator control display **Reading** equal to TI indication. Calibrator control display **Error** will indicate within ±0.026 %.

(8) Repeat technique of (1) and (7) above for TI and calibrator settings listed in table 4. If calibrator control **Error** display does not indicate within limits specified, perform adjustments listed in table 4.

Table 4. Resistance

Test instrument range settings (Ω)	Calibrator		Test instrument adjustments
	Output settings (Ω)	Control display **Error** indications ±(%)	
100	100	0.0155	**b**(5) through **b**(7)
1 k	1 k	0.0155	**b**(8) through **b**(10)
10 k	10 k	0.0155	**b**(11) through **b**(13)
100 k	100 k	0.017	**b**(14) through **b**(18)
1 M	1 M	0.023	**b**(19) through **b**(25)
10 M[1]	10 M	0.075	- - -

[1]On some TIs the decimal point may align with 100 on the front panel when in the 10 MΩ range.

(9) Set calibrator to **STANDBY** and disconnect from TI. Connect resistance standard set for 10 MΩ to TI **VΩ/INPUT HI** and **LO**.

(10) Press **nS** pushbutton. TI will indicate between 99.89 and 100.11 nS.

b. Adjustments

(1) Press **READING RATE** Δ or ∇ pushbutton to select **2/SEC** rate.

(2) Press S1 (fig. 2) to select cal digit mode.

(3) Adjust OHMS CONVERTER R325 ZERO (fig. 1) for TI indication of –0.0000 0 ±20 cal digits (R).

(4) Press S1 (fig. 2) to return to normal mode.

(5) Press S1 (fig. 2) to select cal digit mode.

(6) Adjust OHMS CONVERTER R317 100Ω (fig. 1) for TI indication equal to calibrator output display rounded to TI digits of resolution ±15 cal digits (R).

(7) Press S1 (fig. 2) to return to normal mode.

(8) Press S1 (fig. 2) to select cal digit mode.

(9) Adjust OHMS CONVERTER R314 1 kΩ (fig. 1) for a TI indication equal to calibrator output display rounded to TI digits of resolution ±15 cal digits (R).

(10) Press S1 (fig. 2) to return to normal mode.

(11) Press S1 (fig. 2) to select cal digit mode.

(12) Adjust OHMS CONVERTER R311 10 kΩ (fig. 1) for TI indication equal to calibrator output display rounded to TI digits of resolution ±15 cal digits (R).

(13) Press S1 (fig. 2) to return to normal mode.

(14) Press **Ω2-WIRE** pushbutton and set calibrator **EX SNS** off.

(15) Press S1 (fig. 2) to select cal digit mode.

(16) Adjust OHMS CONVERTER R315 100 kΩ (fig. 1) for TI indication equal to calibrator output display rounded to TI digits of resolution ±15 cal digits (R).

(17) Press **Ω4-WIRE** pushbutton and set calibrator **EX SNS** on.

(18) Press S1 (fig. 2) to return to normal mode.

(19) Press **Ω2-WIRE** pushbutton and set calibrator **EX SNS** off.

(20) Press **READING RATE** Δ or ∇ pushbutton to select **1/SEC** rate and **FILTER** Δ or ∇ pushbutton to select **SLOW** filter.

(21) Press S1 (fig. 2) to select cal digit mode.

(22) Adjust OHMS CONVERTER R319 1 MΩ (fig. 1) for TI indication equal to calibrator output display rounded to TI digits of resolution ±20 cal digits (R).

(23) Press **READING RATE** Δ or ∇ pushbutton to select **2/SEC** rate and **FILTER** Δ or ∇ pushbutton to select **FAST** filter.

(24) Press **Ω4-WIRE** pushbutton and set calibrator **EX SNS** on.

(25) Press S1 (fig. 2) to return to normal mode.

10. Ac Voltage

a. Performance Check

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

(2) Press **VAC** pushbutton.

(3) Press **RANGE Δ** or **∇** pushbutton to select TI range settings and set calibrator for output settings listed in table 5. If TI does not indicate within limits specified, perform adjustments listed in table 5.

Table 5. Ac Voltage

Test instrument range settings (VAC)	Calibrator output settings		Test instrument Indications (VAC)		
	Voltage	Frequency	Min	Max	Adjustments[1]
1	1 V	15 Hz	0.953	1.047	**b**(1)
1	1 V	30 Hz	0.982	1.018	**b**(1)
1	1 V	200 Hz	0.9975	1.0025	**b**(1)
1	1 V	15 kHz	0.9975	1.0025	**b**(2)
1	1 V	90 kHz	0.968	1.032	**b**(2)
1	1 V	200 kHz	0.94	1.06	**b**(2)
1	1 V	1 MHz	0.75	1.25	**b**(2)
10	10 V	1 MHz	7.6995	12.3005	**b**(3)
10	10 V	200 kHz	9.4399	10.5601	**b**(3)
10	10 V	90 kHz	9.7039	10.2961	**b**(3)
10	10 V	15 kHz	9.9852	10.023	**b**(3)
10	10 V	200 Hz	9.9852	10.023	**b**(4)
10	10 V	30 Hz	9.8439	10.1561	**b**(4)
10	10 V	15 Hz	9.5539	10.4461	**b**(4)
100	100 V	15 Hz	95.719	104.281	**b**(5)
100	100 V	30 Hz	98.619	101.381	**b**(5)
100	100 V	200 Hz	99.785	100.215	**b**(5)
100	100 V	15 kHz	99.785	100.215	**b**(6)
100	100 V	90 kHz	97.129	102.871	**b**(6)
100	50 V	200 kHz	46.699	53.301	- - -
1000	600 V	200 Hz	598.58	601.42	**b**(7)
1000	600 V	15 kHz	598.58	601.42	- - -
1000	600 V	30 kHz	581.76	618.24	- - -
1000	100 V	90 kHz	91.76	108.24	- - -

[1]If adjustments are made, verify all checks affected by each adjustment.

b. Adjustments

(1) Set calibrator for a 1.6 V, 200 Hz output. Adjust AC CONVERTER R481 GAIN (fig. 1) for TI indication between 1.59992 and 1.60008 VAC (R).

(2) Set calibrator for a 1.6 V, 20 kHz output. Adjust AC CONVERTER C408 1 V 20 kHz (fig. 1) for TI indication between 1.5988 and 1.60012 VAC (R).

(3) Set calibrator for an 11 V, 20 kHz output. Adjust AC CONVERTER R425 10 V 20 kHz (fig. 1) for TI indication between 10.9988 and 11.0012 VAC (R).

(4) Set calibrator for an 11 V, 200 Hz output. Adjust AC CONVERTER R422 10 V 200 Hz (fig. 1) for TI indication between 10.9994 and 11.0006 VAC (R).

(5) Set calibrator for a 100 V, 200 Hz output. Adjust AC CONVERTER R433 100 V 200 Hz (fig. 1) for TI indication between 99.994 and 100.006 VAC (R).

(6) Set calibrator for a 100 V, 20 kHz output. Adjust AC CONVERTER R426 100 V 20 kHz (fig. 1) for TI indication between 109.988 and 110.012 VAC (R).

(7) Set calibrator for a 600 V, 200 Hz output. Adjust AC CONVERTER R438 600 V 200 Hz (fig. 1) for TI indication between 599.94 and 600.06 VAC (R).

11. Power Supply

a. Performance Check

NOTE

Do not perform power supply checks if all other parameters are in tolerance.

(1) Connect multimeter **INPUT HI** to TP201 VCC and **LO** to TP202 VSS (fig. 3). If multimeter does not indicate between +4.9 and +5.2 V dc, perform **b** (1) below.

(2) Connect multimeter **INPUT HI** to TP701 and **LO** to TP702 (fig. 3). If multimeter does not indicate between +4.9 and +5.2 V dc, perform **b** (2) below.

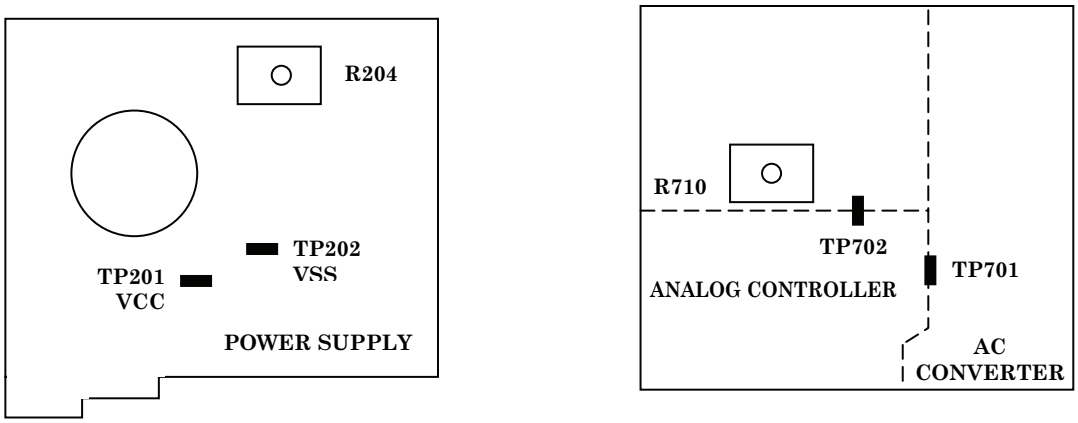

Figure 3. Power supply - adjustment locations.

b. Adjustments

(1) Adjust R204 (fig. 3) for a multimeter indication between +4.9 and +5.2 V dc (R).

(2) Adjust R710 (fig. 3) for a multimeter indication between +4.9 and +5.2 V dc (R).

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

0728403

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 344374, requirements for calibration procedure TB 9-6625-2263-24.

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.

PIN: 084383-000