TB 9-6625-2097-35

CHANGE 2

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR RECORDERS, INK WRITING, GOULD, MODEL 2200S (SERIES); WITH RMS CONVERTER, GOULD, MODEL 13-4618-10; AND FREQUENCY DEVIATION CONVERTER, GOULD, MODEL 13-4618-00

Headquarters, Department of the Army, Washington, DC
30 June 1987

TB 9-6625-2097-35, 22 November 1983, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page.

Remove pages	Insert pages
3 and 4	3 and 4
11 and 12	11 and 12

2. File this change sheet in front of the publication for reference purposes.

By Order of the Secretary of the Army:

Official:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-34C, Block No. 319, requirements for calibration procedures publications.

PIN: 054514-002

♦

TB 9-6625-2097-35

CHANGE 1

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR RECORDERS, INK WRITING, GOULD, MODEL 2200S (SERIES); WITH RMS CONVERTER, GOULD, MODEL 13-4618-10; AND FREQUENCY DEVIATION CONVERTER, GOULD, MODEL 13-4618-00

Headquarters, Department of the Army, Washington, DC
16 April 1986

TB 9-6625-2097-35, 22 November 1983, is changed as follows:

1. Removed old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page.

Remove pages	***Insert pages***
1 and 2	1 and 2
7 through 12	7 through 12

2. File this change sheet in front of the publication for reference purposes.

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REPRINT INCLUDES CHANGES 1 AND 2

TB 9-6625-2097-35

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR RECORDERS, INK WRITING, GOULD, MODEL 2200S (SERIES); WITH RMS CONVERTER, GOULD, MODEL 13-4618-10; AND FREQUENCY DEVIATION CONVERTER, GOULD, MODEL 13-4618-00

Headquarters, Department of the Army, Washington, DC
22 November 1983

♦REPORTING OF ERRORS♦

You can help improve this publication by calling attention to errors and by recommending improvements and stating your reasons for the recommendations. Your letter or DA Form 2028, Recommended Changes to Publications, should be mailed directly to Commander, U. S. Army Aviation and Missile Command, ATTN: AMSAM-TMD-EP, Redstone Arsenal, AL 35898-5000. FAX to DSN 788-2313 (205-842-2313). A reply will be furnished directly to you.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Recorders, Ink Writing, Gould, Model 2200S (Series); with RMS Converter, Gould, Model 13-4618-10; and Frequency Deviation Converter, Gould, Model 13-4618-00. The manufacturer's 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. None.

b. Time and Technique. The time required for this calibration is approximately 3 hours, using the dc and low frequency technique.

2. DA Form 2416 (Calibration Data Card)

a. Forms, records, and reports required for calibration personnel at all levels are prescribed by TB 750-25. DA Form 2416 must be annotated in accordance with TB 750-25 for each calibration performed.

b. Adjustments to be reported on DA Form 2416 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

Test instrument parameters	Performance specifications
Recorders, Ink Writing, Model 2200S (Series)	
Input signal	Range: 0 to 5 V at dc to 50 Hz
Frequency response	Range: 100 div at 100 mm amplitude, dc to 30 Hz Accuracy: ±1 div Range: 50 div at 50 mm amplitude, dc to 50 Hz Accuracy: ±1 div
Overshoot	Range: 100 mm amplitude Accuracy: Less than 8 ms Range: 50 mm amplitude Accuracy: Less than 5 ms overshoot less than 1% between 10 to 90% FS
Input power	100, 115, 200, and 230 V, ±10%, 50 to 400 Hz
RMS Converter, Model 13-4618-10	
Converter output	Range: 0 to 5 V dc linear Accuracy: ±0.2% of reading when reference to input voltage with accuracy of ±0.05%
Converter input	Range: X1 V .05 to 10 V X100 V 5 to 1000 V
Frequency Deviation Converter, Model 13-4618-00	
Frequency Deviation	Range: ±.5, 1, 2.5, and 5 Hz at 50 or 60 Hz center frequency ±5, 10, 25, and 50 Hz at 400 Hz center frequency Output voltage: 2.5 V dc FS proportional to frequency deviation at each range switch setting Accuracy: ±0.3% when input frequency is ±0.075%

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 when the equipment listed in table 2 is not available. 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.

5. Accessories Required. The accessories listed in table 5 are issued as indicated in paragraph **4** above and are used in this calibration procedure. When necessary, these items may be substituted by equivalent items, unless specifically prohibited.

Table 2. Minimum Specifications of Equipment Required

Item	Common name	Minimum use specifications	Manufacturer and model (part number)
A1	AC CALIBRATOR	Range: 50 to 400 Hz at 10 V ac	Hewlett-Packard, Model 745AOPTC93 (745AOPTC93) w/HV amplifier C90-746A (C90-746A)
A2	AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: ±1%	General Radio, Model W10MT3AS3 (7910809)
A3	DC VOLTAGE STANDARD	Range: 0.1998 to 5.0005 V dc Accuracy: ±0.025%	John Fluke, Model 332B/AF (332B/AF)
A4	DIGITAL VOLTMETER	Range: 0 to 5.025 V Accuracy: 0.1%	Hewlett-Packard, Model 3490AOPT060 (3490AOPT060)
A5	FREQUENCY COUNTER	Range: 50 to 400 Hz Accuracy: ±0.00625%	Hewlett-Packard, Model 5345A (MIS-28754/1 Type 1)
A6	RECORDER	Must be compatible with TI	Gould, Model 2200S (Series)
A7	SIGNAL GENERATOR	Range: 1 to 400 Hz	Wavetek, Model 145 (7915944)
A8	TEST OSCILLATOR	Range: 10 to 50 Hz, at 3 V	Hewlett-Packard, Model 652A (MIS-10224)

Table 3. Accessories Required

Item	Common name (official nomenclature)	Description (part number)
B1	ADAPTER	BNC plug to double banana jacks (7907401)
B2	CABLE	30-in., RG-58/U; double banana plug to phone plug (7907407)
B3	EXTENDER	Extender card and assembly, Gould, P/N 887291 (supplied with TI)
B4	LEAD[1]	Single banana plug to test hook (7913288)
B5	LEAD[1]	Pin jack to single banana plug (7921032)
B6	TERMINATION DUMMY LOAD)	50Ω feed-through; BNC plug to BNC jack (11048B)

[1]Two required.

SECTION III
CALIBRATION PROCESS FOR RECORDERS, INK WRITING GOULD, MODEL 2200S (SERIES)

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 tables 2 and 3. For the identification of equipment referenced by item numbers prefixed with A, see table 2, and for prefix B, see table 3.

NOTE

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

7. Equipment Setup

a. Remove top protective cover from TI.

b. Slide all manual ink valves with tubing attached to ON position.

c. Remove preamplifiers from CH. 1 and CH. 2 of TI.

d. Press STOP pushbutton.

e. Connect TI to autotransformer (A2).

f. Connect autotransformer to 115 V ac source and adjust for 115 V.

g. Energize equipment and allow 15 minutes for warmup and stabilization.

h. Press 5 mm/sec CHART SPEED pushbutton and VARIABLE SPEED control fully ccw.

i. Turn CH. 1 POSITION control fully ccw. Adjust CH. 1 R202, LIMIT LEFT (CH. 2 R202) (fig. 1) for 1.5 mm pen deflection beyond the left channel margin.

j. Turn CH. 1 POSITION control fully cw. Adjust CH. 1 R203 LIMIT RIGHT (CH. 2 R203) (fig. 1) for 1.5 mm pen deflection beyond the right channel margin.

k. Adjust CH. 1 POSITION control to center pen on chart (0, line).

1. Repeat technique of (i) through (k) above for CH. 2 POSITION control.

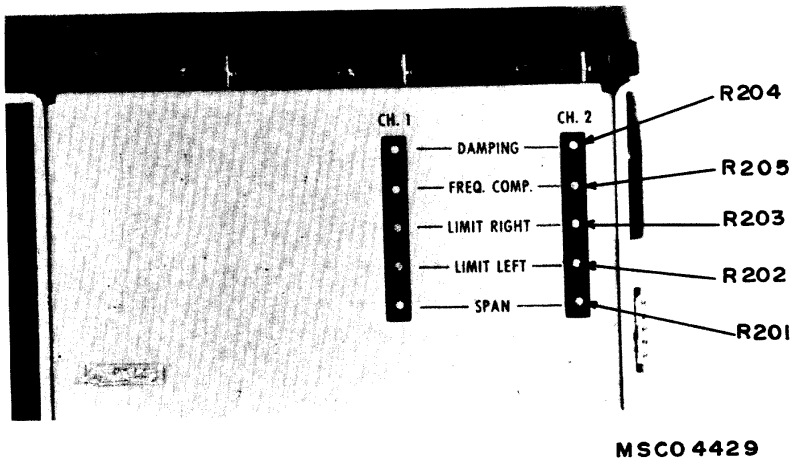

Figure 1. Model 2200S (Series) - top view.

NOTE

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.

8. Channel Span Gain

a. Performance Check

(1) Connect dc voltage standard (A3) to SIGNAL INPUT I (fig. 2), using cable (B2).

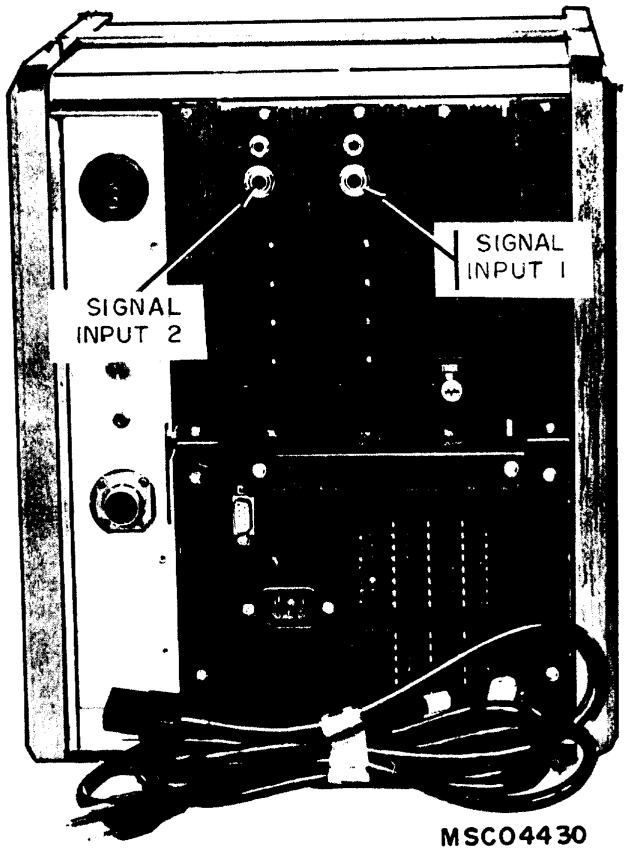

Figure 2. Model 2200S (Series) - rear view

(2) Adjust dc voltage standard output for 25 mm pen deflection to the left on TI. If dc voltage standard does not indicate between 2.490 and 2.510 V dc, perform **b** below.

(3) Vary autotransformer (A2) between 105 and 125 V while maintaining a 25 mm pen deflection on TI with dc voltage standard. If dc voltage standard indication does not remain between 2.490 and 2.510 V dc and **b** was not performed in (2) above, perform **b** below.

(4) Set dc voltage standard for 25 mm pen deflection to the right on TI. Dc voltage standard will indicate between -2.490 and -2.510 V dc.

(5) Repeat techniques of (1) through (4) above for SIGNAL INPUT 2 .

b. Adjustments

(1) Set dc voltage standard output for +2.500 V dc.

(2) Adjust CH. 1 R201 SPAN (CH. 2 R201) (fig. 1) for a 25 mm pen deflection to the left on TI.

9. Overshoot

a. Performance Check

(1) Adjust signal generator (A7) for 1 Hz square wave at 4 V p-p.

(2) Connect signal generator to SIGNAL INPUT 1 (fig. 2), using adapter and cable (B1 and B2). Turn VARIABLE SPEED control to fully cw. If waveform on TI does not indicate less than 1 percent overshoot, perform **b** below.

(3) Repeat technique of (2) above for SIGNAL INPUT 2.

b. Adjustments. Adjust CH. 1 R204 DAMPING (CH. 2 R204) (fig. 1) for minimum overshoot or undershoot.

10. Frequency Response

a. Performance Check

(1) Press 25 mm/sec pushbutton.

(2) Connect test oscillator (A8) to SIGNAL INPUT 1 (fig. 2), using adapter, cable, and termination (B1, B2, and B6).

(3) Adjust test oscillator frequency for 10 Hz and output for 30 mm pen deflection on TI.

(4) Set test oscillator EXPAND-NORMAL switch to EXPAND and adjust REF SET for 0 reference on test oscillator.

(5) Adjust test oscillator frequency to 50 Hz while adjusting amplitude as necessary to maintain 0 reference on test oscillator. If pen deflection does not remain between 29.1 and 30.9 mm, perform **b** below.

(6) Repeat techniques of (2) through (5) above for SIGNAL INPUT 2.

b. Adjustments. Adjust CH. 1 R205 FREQ. COMP. (CH. 2 R205) (fig. 1) for a 30 mm pen deflection (R).

11. Final Procedure

a. Slide all manual ink valves with tubing attached to OFF position.

b. Deenergize and disconnect all equipment and reinstall protective cover on TI.

c. When all parameters are within tolerance, annotate and affix DA Label 80 (U. S. Army Calibrated Instrument). When the TI receives limited or special calibration, annotate and affix DA Label 163 (U. S. Army Limited or Special Calibration). When the TI cannot be adjusted within tolerance, repair the TI in accordance with the maintenance manual. When repair is delayed for any reason or the TI cannot be repaired with local resources, annotate and affix DA form 2417 (U. S. Army Calibration System Rejected Instrument) and inform the owner/user accordingly in accordance with TB 750-25.

SECTION IV
CALIBRATION PROCESS FOR RMS CONVERTER, MODEL 13-4618-10

12. Preliminary Instructions

a. The instructions outlined in paragraphs **12** and **13** are preparatory to the calibration process. Personnel should become familiar with the applicable sections 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 tables 2 and 3. For the identification of equipment referenced by item numbers prefixed with A, see table 2, and for prefix B, see table 3.

NOTE

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.

NOTE

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

13. Equipment Setup

a. Remove protective cover from TI.

b. Slide all manual ink valves with tubing attached to ON position on recorder (A6).

c. Connect TI to recorder, using extender (B3).

d. Set front panel controls as listed in (1) through (7) below:

(1) FULL SCALE switch to 1.

(2) ZERO SUPPRESSION switch OFF.

(3) ZERO SUPPRESSION control ccw to 0.

(4) FILTER switch OFF.

(5) MODE switch to X1 VOLTS.

(6) SENSITIVITY control fully cw.

(7) RANGE switch to X1.

e. Set DC INPUT switch S-201 to left (fig. 3).

f. Energize equipment and allow 15 minutes for warmup and stabilization.

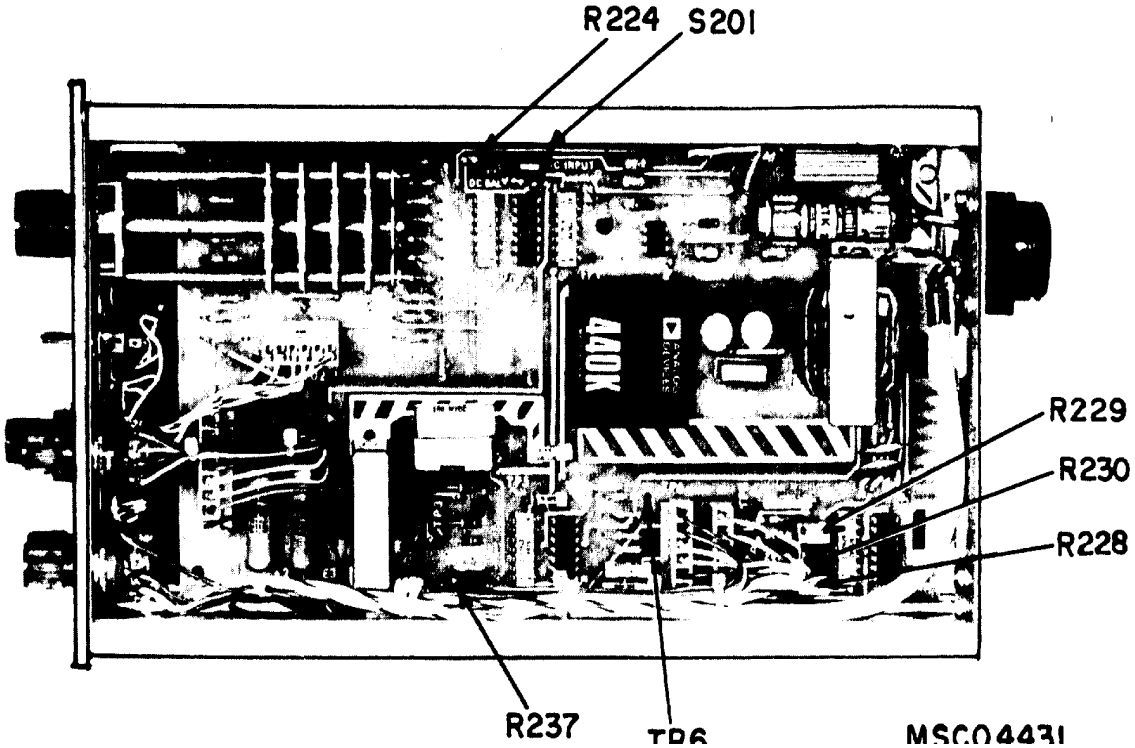

Figure 3. Model 13-4618-10 - right side view.

f. Energize equipment and allow 15 minutes for warmup and stabilization.

14. Converter Output

a. Performance Check

(1) Connect dc voltage standard (A3) to pins 1 and 2 of J-101, input connector on rear of TI, using two leads (B5).

(2) Set CHART SPEED to 5, VARIABLE SPEED control fully ccw, and adjust CH. 1 POSITION control for pen deflection to right zero line on chart paper.

(3) Set dc voltage standard for a pen deflection of 50 mm on recorder (A6). If dc voltage standard does not indicate between 0.999 and 1.001 V dc, perform **b** below.

(4) Set dc voltage standard for a pen deflection of 10 mm on recorder. If dc voltage standard does not indicate between 0.1998 and 0.2002 V dc, perform **b** below.

b. Adjustments

(1) Disconnect dc voltage standard.

(2) Set RANGE switch to X.1.

(3) Connect digital voltmeter (A4) negative lead to TP7 and positive lead to TP6 (fig. 3) on TI, using two leads (B4).

(4) Turn SENSITIVITY control on front panel fully ccw. Adjust R230 ZERO (fig. 3) for 0 +.005 V indication on digital voltmeter.

(5) Turn SENSITIVITY control on front panel fully cw, set S201 to DC INPUT (right) (fig. 3), and short pins 1 and 2 of 101, using two leads (B5). Adjust R237 OFFSET (fig. 3) for 0 ±.005 V indication on digital voltmeter.

(6) Set RANGE switch to X1 on front panel and set S201 to DC BAL (left) (fig. 3).

(7) Connect dc voltage standard to pins 1 and 2 of J-101, using two leads (B5). Set dc voltage standard for 1.000 output. Record digital voltmeter indication.

(8) Reverse connection on dc voltage standard. If digital voltmeter does not indicate voltage recorded in (7) above, adjust R224 DC BAL (fig. 3) for same reading within ±0.002 V. Repeat (7) and (8) above until no further adjustment is needed (R).

(9) Adjust R229 SPAN (fig. 3) for digital voltmeter reading of 5 ±0.005 V (R).

(10) Adjust ZERO SUPPRESSION control cw to 100 percent, set ZERO SUPPRESSION switch ON, and RANGE switch to X.1. Adjust R228 SUP ADJ (fig. 3) for 0 ±.005V indication on digital voltmeter.

(11) Repeat (1) through (10) above to eliminate interaction.

15. Final Procedure

a. Slide all manual ink valves with tubing attached to OFF position on recorder (A6).

b. Deenergize and disconnect all equipment and reinstall protective cover on TI.

c. When all parameters are within tolerance, annotate and affix DA Label 80 (U. S. Army Calibrated Instrument). When the TI receives limited or special calibration, annotate and affix DA Label 163 (U. S. Army Limited or Special Calibration). When the TI cannot be adjusted within tolerance, repair the TI in accordance with the maintenance manual. When repair is delayed for any reason or the TI cannot be repaired with local

resources, annotate and affix DA Form 2417 (U. S. Army Calibration System Rejected Instrument) and inform the owner/user accordingly in accordance with TB 750-25.

SECTION V
CALIBRATION PROCESS FOR FREQUENCY DEVIATION CONVERTER MODEL 13-4618-00

16. Preliminary Instructions

a. The instructions outlined in paragraphs **16** and **17** are preparatory to the calibration process. Personnel should become familiar with the applicable sections 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 tables 2 and 3. For the identification of equipment referenced by item numbers prefixed with A, see table 2, and for prefix B, see table 3.

NOTE

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.

NOTE

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

17. Equipment Setup

a. Remove protective cover from TI.

b. Slide all manual ink valves with tubing attached to ON position on recorder (A6).

c. Connect TI to recorder, using extender (B3).

d. Set CENTER FREQUENCY switch to 50.

e. Energize equipment and allow 30 minutes for warmup and stabilization.

18. Span Gain

a. Performance Check

(1) Connect digital voltmeter (A4) negative lead to TP3 and positive lead to TP4 (fig. 4), using two leads (B4).

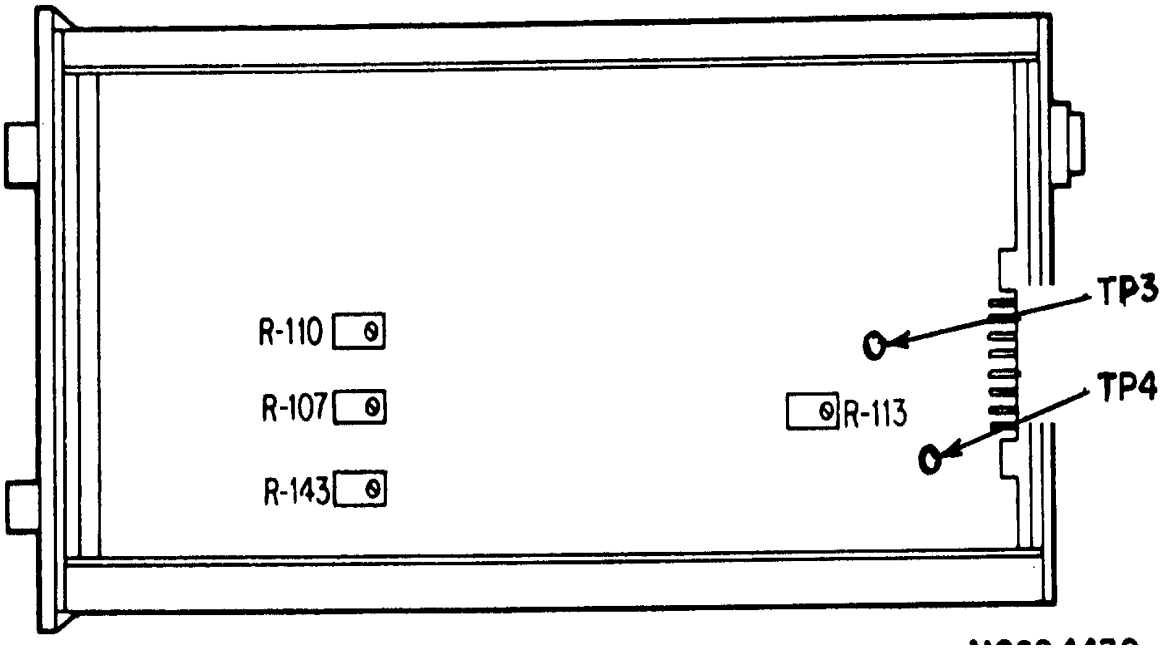

Figure 4. Model 13-4618-00 - side view.

(2) Set DEVIATION RANGE switch to OFF. If digital voltmeter does not indicate 0 ± 10 mV, perform **b**(1) below.

(3) Connect ac calibrator (Al) to TI input (rear) connector pins 1 and 2, using two leads (B5). Monitor output of ac calibrator with frequency counter (A5).

(4) Set DEVIATION RANGE switch to .5.

(5) Adjust ac calibrator frequency for 20.0000 ms as indicated on frequency counter at 10 V. If digital voltmeter does not indicate 0 ±100 mV, perform **b**(2) below.

(6) Set CENTER FREQUENCY switch to 60.

(7) Adjust ac calibrator frequency for 16.6666 ms. If digital voltmeter does not indicate 0 ±100 mV, perform **b**(3) below. Record digital voltmeter indication.

(8) Adjust ac calibrator frequency for 16.9492 ms. Record digital voltmeter indication.

(9) Subtract value recorded in (7) above from value recorded in (8) above. If the difference is not between 4.975 and 5.025 V, perform **b**(4) through (7) below.

(10) Repeat technique of (7) through (9) above for DEVIATION RANGE switch positions listed in table 4. Digital voltmeter will indicate within limits specified.

Table 4. Span Gain Accuracy

Test instrument DEVIATION RANGE switch settings	Digital voltmeter indications (V)	
	Min	Max
1	-2.4875	-2.5125
2.5	-0.9950	-1.0050
5	-0.4975	-0.5025
5[1]	-4.9700	-5.0300
10	-2.4850	-2.5150
25	-0.9925	-1.0075
50	-0.4970	-0.5030

[1]Adjust ac calibrator frequency for 2.5641 ms. Set TI CENTER FREQUENCY switch to 400 and DEVIATION RANGE switch to blue range.

b. Adjustments

(1) Adjust R-113 ZERO (fig. 4) for 0.0 V indication on digital voltmeter (R).

(2) Adjust R-110 50 HZ (fig. 4) for 0.0 V indication on digital voltmeter (R).

(3) Adjust R-107 60 HZ (fig. 4) for 0.0 V indication on digital voltmeter (R).

(4) Set DEVIATION RANGE switch to 5.

(5) Adjust ac calibrator frequency for 18.1818 ms at 10 V and adjust R-107 60 HZ (fig. 4) for a digital voltmeter reading of -2.500 V (R).

(6) Adjust ac calibrator frequency for 15.3846 ms at 10 V and adjust R-143 SPAN (fig. 4) for a digital voltmeter reading of +2.500 V (R).

(7) Repeat (5) and (6) above to eliminate interaction.

19. Final Procedure

a. Slide all manual ink valves with tubing attached to OFF position on recorder (A6).

b. Deenergize and disconnect all equipment and reinstall protective cover on TI.

c. When all parameters are within tolerance, annotate and affix DA Label 80 (U. S. Army Calibrated Instrument). When the TI receives limited or special calibration, annotate and affix DA Label 163 (U. S. Army Limited or Special Calibration). When the TI cannot be adjusted within tolerance, repair the TI in accordance with the maintenance manual. When repair is delayed for any reason or the TI cannot be repaired with local resources, annotate and affix DA Form 2417 (U. S. Army Calibration System Rejected Instrument) and inform the owner/user accordingly in accordance with TB 750-25.

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