*TB 9-6695-261-35

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR OSCILLATOR KROHN-HITE, MODEL 4100AR-8

Headquarters, Department of the Army, Washington, DC
7 May 2004

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, 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 technical bulletin supersedes TB 9-6695-261-35, dated 12 June 1987, including all changes.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Oscillator, Krohn-Hite, Model 4100AR-8. 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 6 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

Test Instrument Parameters	Performance Specifications
Frequency[1]	Range: 10 Hz to 1 Mhz Accuracy: ± 1% of setting
Distortion	<0.5% 10 Hz to 20kHz at full load <1.0% 20 to 100 kHz at full load
Attenuation	Range: 1 to 10 V rms Accuracy: ± (2% +2 mV) w/vernier fully ccw
Frequency response [1]	± 0.25% 10 Hz to 100kHz ± 2% 100kHz to 1MHz
Square wave	Rise and falltime: <20ns Overshoot: <5% with 50 Ω cable and load Symmetry: ± 2%

[1]Specifications per APN 7915951, revision B.

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 for to use and must bear evidence of current calibration. The equipment must meet or exceed tie 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)
AUDIO ANALYZER	Range: 10 Hz to 100kHz Distortion: <0.05%	Boonton, Model 1121 (1121)
AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: ± 1%	General Radio, Type W10MT3AS3 (7910809) or Ridge, Model 9020A (9020A)
DIFFERENTIAL VOLTMETER	Range: 8.973 to 9.027 at 10 Hz Accuracy: ±0.0625% (± 0.3%) Range: 8.9775 to 9.0225 V ac at 100 Hz to 10 kHz Accuracy: ± 0.0625% (± 0.0756%)	Fluke, Model 887AB/AN (887/AB/AN)
FREQUENCY COUNTER	Range: 9.9 ms to 1,008,990 Hz Accuracy: ± 0.25%	Fluke, Model PM6681/656 (PM6681/656)
MULTIMETER	Range: -23 to +23 V dc Accuracy: ± 1%	Hewlett-Packard, Model 3458A (3458A)
OSCILLOSCOPE	Range: 10mV to 2.5 V p-p Accuracy: ± 3% Risetime: < 20ns	Tektronix, Type 2465BOPT46 (2465BOPT46)
TRUE RMS VOLTMETER	Range: 0.978 to 9.182 V rms at 1kHz Accuracy: 0.5% Range 8.82 to 9.18 V rms at 100kHz and 999 kHz Accuracy: 0.5% (0.7% at 999 kHz)	Fluke, Model 8922A/AA (8922A/AA)

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 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 **12** are not within tolerance, perform the power supply check prior to making adjustments. After adjustments are made, repeat paragraphs **8** through **12**. Do not perform power supply check if all other parameters are within tolerance.

e. 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 **RMS VOLTS** switch to **5-6**.

b. Turn **RMS VOLTS** vernier control fully ccw.

c. Set **FLOATING/CHASSIS** grounding switch (on earlier models, located on rear of chassis) to **CHASSIS** position.

d. Turn **FREQUENCY VERNIER CAL** control fully ccw.

e. Turn **SQUARE WAVE P-P VOLTS** control fully ccw.

f. Connect TI to autotransformer.

g. Connect autotransformer to a 115 V ac source and adjust for a 115 V output.

h. Set **POWER** switch to **ON** and allow sufficient time for warm-up and stabilization.

8. Frequency

a. Performance Check

NOTE

TI covers must be in place during performance checks. Slide covers back to make connections or adjustments, then slide covers back in place before continuing.

(1) Connect frequency counter to ~ **OUTPUT** connector using 50 Ω termination.

(2) Press **FREQUENCY Hz** pushbuttons to indicate 1-0-0 and press **MULTIPLIER 1000** pushbutton. If frequency counter does not indicate between 99,000 and 101,000 Hz, perform **b** (2) below.

(3) Press **FREQUENCY Hz** pushbuttons to indicate 4-0-0. If frequency counter does not indicate between 396,000 and 404,000 Hz, perform **b** (4) below.

(4) Press **FREQUENCY Hz** pushbuttons to indicate 9-9-9. If frequency counter does not indicate between 989,010 and 1,008,990 Hz, perform **b** (6) below.

(5) Repeat technique of (2) above, using **FREQUENCY Hz** and **MULTIPLIER** pushbutton settings listed in table 3. If frequency counter does not indicate within limits specified perform **b** below.

Table 3. Frequency Check

Test instrument		Frequency counter indications (Hz)	
FREQUENCY Hz pushbuttons	**MULTIPLIER** pushbuttons	Min	Max
1-0-0	.1	99 ms	101 ms
1-0-0	1	9.9 ms	10.1 ms
1-0-0	10	990	1010
1-0-0	100	9900	10,100
1-1-1	100	10,989	11,211
2-2-2	100	21,978	22,422
3-3-3	100	32,967	33,633
4-4-4	100	43,956	44,844
5-5-5	100	54,945	56,055
6-6-6	100	65,934	67,266
7-7-7	100	76,923	78,477
8-8-8	100	87,912	89,688
9-9-9	100	98,901	100,899

b. Adjustments

(1) Press **FREQUENCY Hz** pushbuttons to indicate 1-0-0 and press **MULTIPLIER 1000** pushbutton.

(2) Adjust C365 (fig. 1) until frequency counter indicates 100,000 Hz (R).

(3) Position **FREQUENCY Hz** pushbuttons to indicate 4-0-0.

(4) Adjust C204 (fig. 1) until frequency counter indicates 400,000 Hz (R).

(5) Position **FREQUENCY Hz** pushbuttons to indicate 9-9-9.

(6) Adjust R215B (fig. 1) until frequency counter indicates 999,000 Hz (R).

9. Distortion

a. Performance Check

(1) Connect **~ OUTPUT** to audio analyzer using 50Ω termination.

(2) Set **RMS VOLTS** switch to **9-10** and vernier control fully cw.

(3) Set **FLOATING/CHASSIS** switch to **FLOATING**.

(4) Measure distortion at frequencies listed in table 4. If distortion analyzer does not indicate within limits specified, perform **b** below.

Table 4. Distortion Check

FREQUENCY Hz pushbuttons	**MULTIPLIER** pushbuttons	Frequencies	Distortion analyzer indications (%)
1-0-0	0.1	10 Hz	<0.05
1-0-0	1	100 Hz	<0.05
1-0-0	10	1 kHz	<0.05
2-0-0	100	20 kHz	<0.05
1-0-0	1000	100 kHz	<1.0

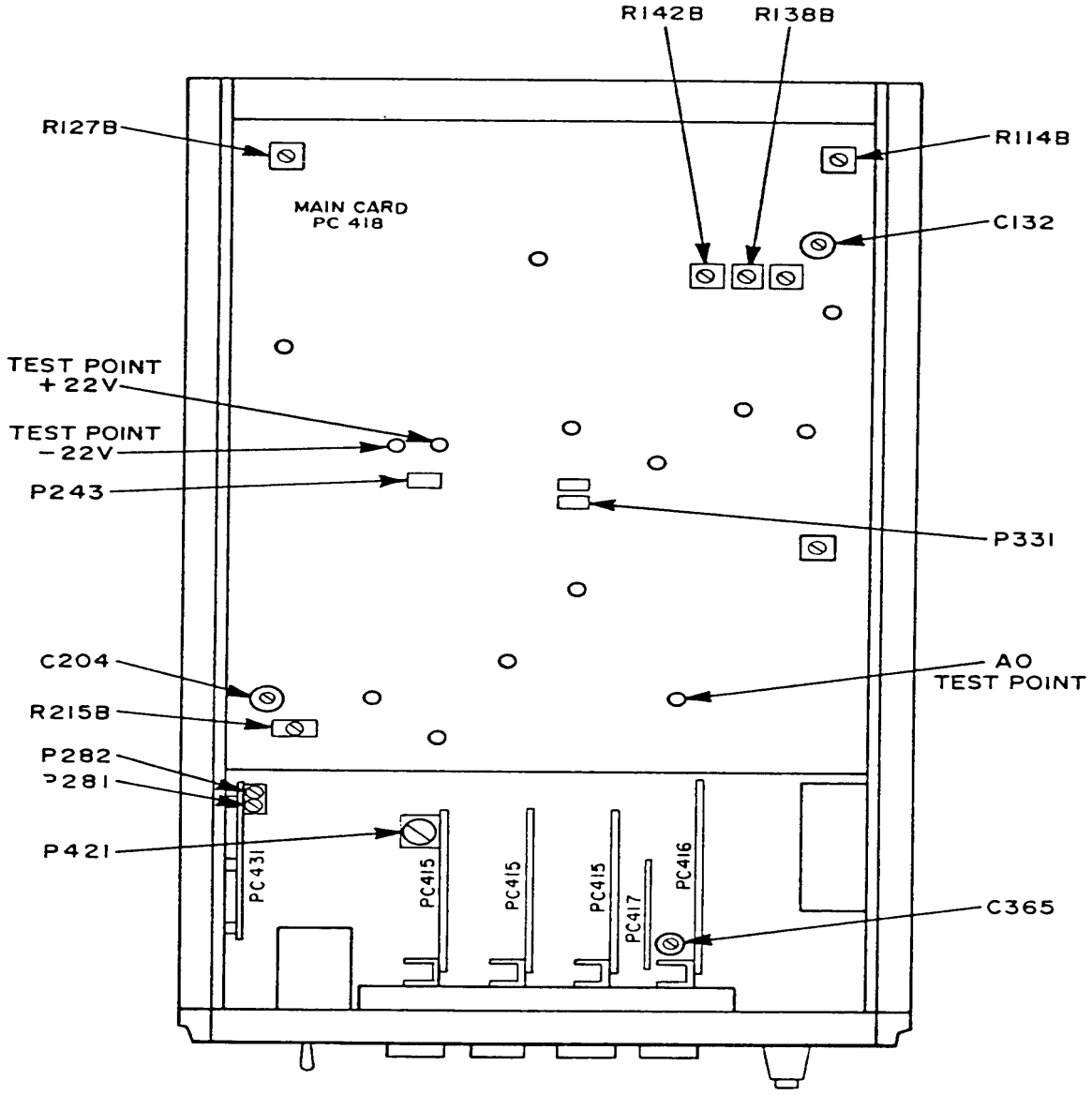

Figure 1. Test instrument - top view.

b. Adjustments

(1) Connect oscilloscope to test point AO (fig. 1) located on PC418 card using probe.

(2) Position **FREQUENCY Hz** pushbuttons to indicate 1-0-0 and press **MULTIPLIER 1** pushbutton. If square wave component in the signal present at test point AO is not less than 10 mV, adjust P331 (fig. 1) for minimum signal (R). Typical oscilloscope presentation is shown in figure 2.

(3) Position **FREQUENCY Hz** pushbuttons to indicate 0-9-0 and press **MULTIPLIER .1** pushbutton. If square wave component (fig. 3) in the signal present at test point AO is not less than 100 mV p-p, adjust P421 (fig. 1) for minimum signal (R).

(4) Press **MULTIPLIER 10** pushbutton, and adjust R142B (fig. 1) for a 0 V dc output level (R).

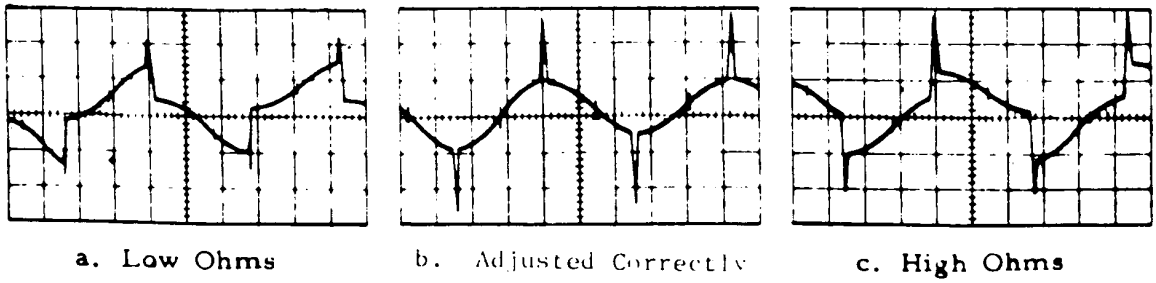

Figure 2. AO at 100 Hz (vertical sensitivity - 20 mV/cm).

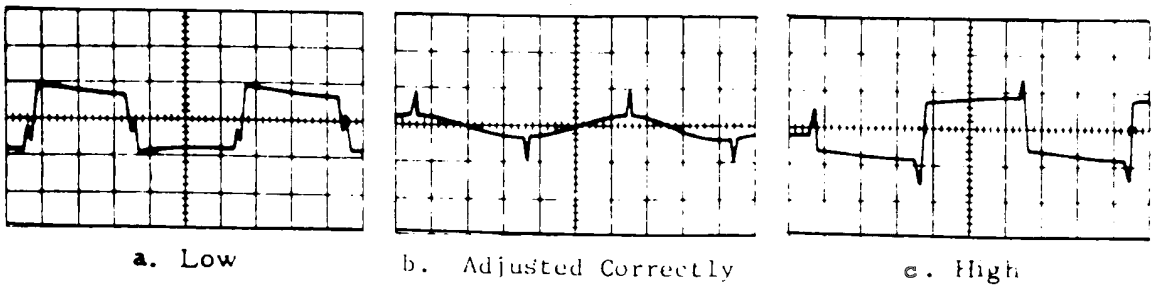

Figure 3. AO at 9 Hz (vertical sensitivity 50 mV/cm).

10. Attenuation

a. Performance Check

(1) Connect **~ OUTPUT** to true rms voltmeter.

(2) Turn **RMS VOLTS** vernier control fully ccw.

(3) Press **FREQUENCY Hz** pushbuttons to indicate 1-0-0 and press **MULTIPLIER 10** pushbutton. If true rms voltmeter does not indicate between 8.818 and 9.182 V rms, perform **b** below.

(4) Set **RMS VOLTS** switch and control to settings listed in table 5. True rms voltmeter will indicate within limits specified.

Table 5. Attenuation

Test instrument **RMS VOLTS** switch and control settings	True rms voltmeter indication (V rms)	
	Min	Max
8-9	7.838	8.162
7-8	6.858	7.142
6-7	5.878	6.122
5-6	4.898	5.102
4-5	3.918	4.082
3-4	2.938	3.062
2-3	1.958	2.042
1-2	0.978	1.022

b. Adjustments. Adjust R138B (fig. 1) until true rms voltmeter indicates 9.000 V (R).

11. Frequency Response

a. Performance Check

(1) Connect **~ OUTPUT** to differential voltmeter.

(2) Position controls as listed in (a) through (c) below:

(a) **FREQUENCY Hz** pushbuttons to indicate 1-0-0.

(b) **MULTIPLIER 10** pushbutton pressed.

(c) **RMS VOLTS** switch to **9-10** and vernier control for a 9-V indication on differential voltmeter.

(3) Position **FREQUENCY Hz** and **MULTIPLIER** pushbuttons as indicated in table 6. If differential voltmeter does not indicate within limits specified, perform **b** below.

Table 6. Frequency Response

Test instrument		Differential voltmeter indication (V)	
FREQUENCY Hz pushbuttons	**MULTIPLIER** pushbuttons	Min	Max
1-0-0	.1	8.973	9.027
1-0-0	1	8.9775	9.0225
1-0-0	100	8.9775	9.0225
1-0-0[1]	10	9.00	9.00
1-0-0	1000	8.82	9.18
9-9-9	1000	8.82	9.18

[1]Substitute true RMS voltmeter for differential voltmeter. Adjust **RMS VOLTS** vernier for a 9 V reference.

b. Adjustments

(1) Connect **~ OUTPUT** to true rms voltmeter.

(2) Set **RMS VOLTS** vernier control fully ccw.

(3) Press **FREQUENCY Hz** pushbuttons to indicate 9-9-9 and press **MULTIPLIER 1000** pushbutton.

(4) Adjust C132 (fig. 1) until true rms voltmeter indicates 9.00 V (R).

(5) Press **FREQUENCY Hz** pushbutton to indicate 1-0-0 and press **MULTIPLIER 10** pushbutton.

(6) Adjust **RMS VOLTS** vernier control for a 9 V indication on true rms voltmeter.

(7) Press **MULTIPLIER 1000** pushbutton.

(8) Adjust P243 until rms voltmeter indicates 9.00 V (R).

12. Square Wave

a. Performance Check

(1) Connect **OUTPUT** (may be located on front panel of some models), to oscilloscope using 50 Ω termination.

(2) Position controls as listed in (a) through (c) below:

(a) **SQUARE WAVE P-P VOLTS** control fully cw.
(b) **FREQUENCY** Hz pushbuttons to indicate 1-0-0.
(c) **MULTIPLIER 10** pushbutton pressed.

(3) Adjust oscilloscope time base, triggering, and horizontal position controls for two complete square waves. If symmetry is not within 2 percent, perform **b** (1) below.

(4) Press **FREQUENCY Hz** pushbuttons to indicate 9-9-9 and press **MULTIPLIER 1000** pushbutton. Risetime and falltime will be less than 20 ns and overshoot less than 5 percent.

(5) Connect ⎍ **OUTPUT** to multimeter.

(6) Set **FREQUENCY Hz** pushbuttons to indicate 1-0-0 and press **MULTIPLIER 10** pushbutton.

(7) If multimeter does not indicate 0 ± 10 mV dc, perform **b** (2) below.

b. Adjustments

(1) Adjust P281 (fig. 1) for a symmetrical waveform (R).

(2) Adjust P282 (fig. 1) for optimum 0 dc level (R).

13. Power Supply

a. Performance Check

NOTE

Do not perform power supply check if all other parameters are within tolerance.

(1) Position controls as listed in (a) through (c) below:

(a) **FLOATING/CHASSIS** grounding switch to **CHASSIS**.
(b) **FREQUENCY Hz** pushbuttons to indicate 1-0-0.
(c) Press **MULTIPLIER 10** pushbutton.

(2) Connect multimeter between +22 V test point and ground (fig. 1). If multimeter does not indicate between 21 and 23 V dc, perform **b** (1) below.

(3) Repeat (2) above for -22 V test point (fig. 1). If multimeter does not indicate between -21 and -23 V dc, perform **b** (2) below.

b. **Adjustments**

(1) Adjust R114B (fig. 1) to obtain +22 V indication on multimeter (R).

(2) Adjust R127B (fig. 1) to obtain –22 V indication on multimeter (R).

14. Final Procedure

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

b. Annotate and affix DA label/form in accordance with TB 750-25.

By Order of the Secretary of the Army:

Official:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

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

0407002

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To be distributed in accordance with the initial distribution number (IDN) 342310, requirements for calibration procedure TB 9-6695-261-35.

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.