

# \*TB 9-6625-357-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

## CALIBRATION PROCEDURE FOR VARIABLE FILTER, KROHN-HITE, MODEL 3202(R)

Headquarters, Department of the Army, Washington, DC  
18 March 2008

*Distribution Statement A: Approved for public release; distribution is unlimited.*

### 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](mailto: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.

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\*This technical bulletin supersedes TB 9-6625-357-35, dated 23 November 2004, including all changes.

## SECTION I IDENTIFICATION AND DESCRIPTION

**1. Test Instrument Identification.** This bulletin provides instructions for the calibration of Variable Filter, Krohn-Hite, Model 3202(R). The manufacturers' 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.** Variations among models are described in text.

**b. Time and Technique.** The time required for this calibration is approximately 8 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 for Spencer-Kennedy Model 3202(R)

Test instrument parameters	Performance specifications
Power supply <sup>1</sup>	105 to 125 V ac or 210 to 250 V ac; 50 to 400 Hz, 15 W
Frequency range	20 Hz to 2 MHz
Cutoff frequency accuracy	±5%, 20 Hz to 200 kHz; ±10%, 200 kHz to 2 MHz, (response switch in max flat position)
Rate of attenuation	24 dB ±10.5 dB per octave
Insertion loss	0 ± 0.5 dB, 0 to 2 MHz; 3 dB at 10 MHz
Noise and hum level	Less than 100 μV for a detector bandwidth of 2 MHz, rising to 150 μV at 10 MHz
Maximum attenuation	Greater than 80 dB
Power supply <sup>1</sup>	105 to 125 V ac or 210 to 250 V ac; 50 to 400 Hz, 15 W

<sup>1</sup>This specification is for information only and is not verified in this bulletin.

## 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)
AUTOTRANSFORMER	Range: 105 to 125 V ac Accuracy: $\pm 1\%$	Ridge, Model 9020A (9020A),
FREQUENCY COUNTER	Range: 20 Hz to 3 MHz Accuracy: $\pm 0.75\%$	Fluke, Model PM6681/656 (PM6681/656)
FUNCTION GENERATOR	Range: 20 Hz to 3 MHz Accuracy: $\pm 0.01\%$	Agilent, Model 33250A (33250A)
MULTIMETER	Range: 0 to 0.1 V dc Accuracy: $\pm 0.01\%$ Range: 0 to 1.06 V ac, 240 to 360 V dc Accuracy: $\pm 1\%$	Fluke, Model 8840A/AF05 (AN/GSM-64D)
TRUE RMS VOLTMETER	Range: 0 to 2 Vac, 20 Hz to 2 MHz Accuracy: ( $\pm 3\%$ )	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 applicable sections 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.** 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 or gain access to test points.
- b. Connect TI to autotransformer.
- c. Connect autotransformer to a 115 V ac source, and adjust for 115 V ac output.
- d. Position TI controls (both sections) as listed in (1) through (3) below:
  - (1) Selector switch to **LOW PASS X100**.
  - (2) **RESPONSE** switch to **MAX FLAT**.
  - (3) **FLOATING/CHASSIS GROUND** switch to **CHASSIS**.
- e. Energize TI and allow at least 30 minutes for TI to warm-up and stabilize.

**NOTE**

Perform **f** through **k** below for left section and then repeat for right section.

- f. Short TI **INPUT** terminal.
- g. Connect TI **OUTPUT** terminal to multimeter.
- h. Adjust **DC LEVEL** control for minimum indication on multimeter.
- i. Remove short connected in **f** above.
- j. Adjust P201 (fig. 1) for minimum dc voltage indication on multimeter.

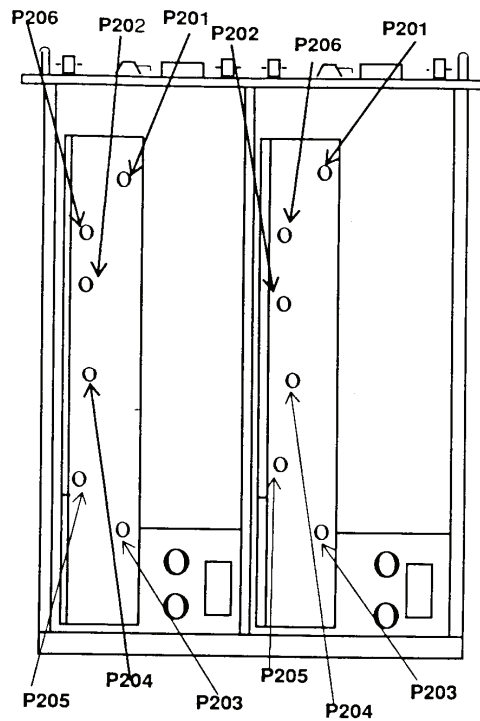


Figure 1. Model 3202 (R) adjustment - top view

k. Adjust P206 (fig. 1) for minimum dc voltage indication on multimeter while turning **CUTOFF FREQ Hz** dial from **200** to **20**.

l. Repeat **f** and **h** above.

## 8. Noise Level and Stability

### NOTE

Perform paragraphs **16** through **19**, using left section and then repeat for right section.

### a. Performance Check

- (1) Set **CUTOFF FREQ Hz** dial to **20** and selector switch to **HIGH PASS X1**.
- (2) Short **INPUT** connector.
- (3) Connect multimeter to **OUTPUT** connector. Noise level, as indicated on multimeter, will not exceed  $150 \mu\text{V ac}$ .

### NOTE

All TI covers must be in place. It may be necessary to use isolation plug on multimeter.

- (4) Repeat (3) above with autotransformer output settings of 105 and 125 V.
- (5) Return autotransformer output setting to 115 V.

b. **Adjustments.** No adjustments can be made.

## 9. Low Pass Dial Accuracy and Unity Gain

### a. Performance Check

- (1) Connect equipment as shown in figure 2, using termination.

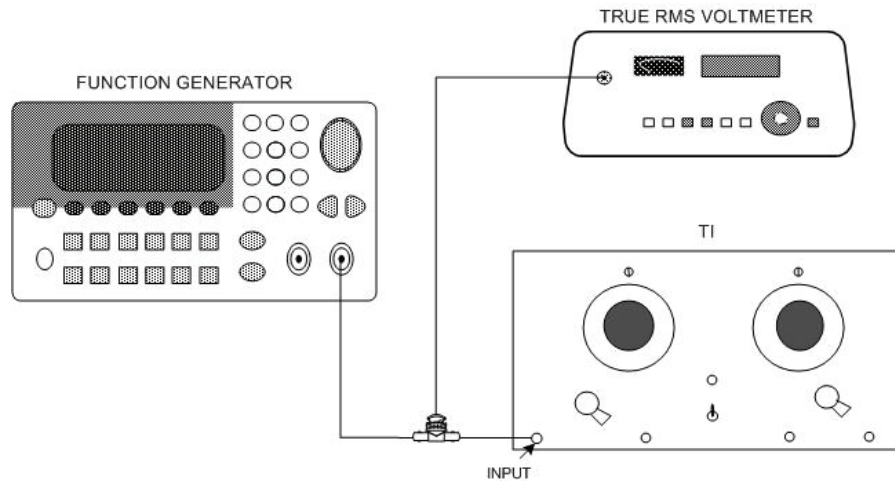


Figure 2. Unity gain check - equipment setup.

- (2) Set **CUTOFF FREQ Hz** dial to **35** and selector switch to **LOW PASS X10K**.
- (3) Adjust function generator frequency to 5000 Hz and amplitude to 1 V as indicated on true rms voltmeter.
- (4) Move true rms voltmeter connection from **INPUT** to **OUTPUT**. If true rms voltmeter does not indicate between 0.94 and 1.06 V, perform **b** (1) below.
- (5) Set **CUTOFF FREQ Hz** dial to **100** and selector switch to **HIGH PASS X1**. If true rms voltmeter does not indicate between 0.94 and 1.06 V, perform **b** (2) below.
- (6) Connect frequency counter to **INPUT** connector.
- (7) Set **CUTOFF FREQ Hz** dial to **60** and selector switch to **LOW PASS X100**.
- (8) Adjust function generator frequency to 600 Hz and amplitude for 1 V indication on true rms voltmeter.
- (9) Set selector switch to **LOW PASS X10**.
- (10) Adjust function generator frequency until true rms voltmeter indicates 0.708 V. If frequency counter does not indicate between 1.5873 and 1.7543 ms, perform **b** (3) below.
- (11) Repeat technique of (7) through (10) above, using **TI** dial settings and function generator frequencies listed in table 3. If frequency counter does not indicate within limits specified, perform **b** (3) below.

Table 3. Frequency Dial Tracking

Test instrument <b>CUTOFF FREQ Hz</b> dial settings	Function generator frequency (Hz)	Frequency counter indications (ms)	
		Min	Max
20	200	4.7619	5.2632
30	300	3.1746	3.5087
40	400	2.3809	2.6316
80	800	1.1904	1.3158
100	1000	0.95238	1.0526
140	1400	1330 Hz	1470 Hz
200	2000	1900 Hz	2100 Hz

- (12) Set **CUTOFF FREQ Hz** dial to **60** and selector switch to **LOW PASS X10K**.
- (13) Adjust function generator frequency to 60 kHz and amplitude until true rms voltmeter indicates 1 V.
- (14) Adjust function generator frequency until true rms voltmeter indicates 0.708 V. If frequency counter does not indicate between 540 and 660 kHz, perform **b** (4) and (5) below.
- (15) Repeat technique of (12) through (14) above at settings listed in table 4. If frequency counter does not indicate within limits specified, perform **b** (6) through (10) below.

Table 4. Low Pass Frequency Dial Accuracy

Test instrument		Function generator frequency		Frequency counter indications	
CUTOFF FREQ Hz dial settings	LOW PASS switch settings	Initial	Final	Min	Max
22	X10K	22 kHz	220 kHz	198 kHz	242 kHz
180	X10K	180 kHz	1.8 MHz	1.62 MHz	1.98 MHz
20	X1K	2 kHz	20 kHz	19 kHz	21 kHz
60	X1K	6 kHz	60 kHz	57 kHz	63 kHz
200	X1K	20 kHz	200 kHz	190 kHz	210 kHz
200	X100	2 kHz	20 kHz	19 kHz	21 kHz
60	X100	600 Hz	6 kHz	5.7 kHz	6.3 kHz
20	X100	200 Hz	2 kHz	1.9 kHz	2.1 kHz
20	X1	10 Hz	20 Hz	47.619 ms	52.6316 ms
60	X1	30 Hz	60 Hz	15.873 ms	17.544 ms
200	X1	20 Hz	200 Hz	4.7619 ms	5.2632 ms

### b. Adjustments

- (1) Adjust P202 (fig. 1) until true rms voltmeter indicates 1 V (R).
- (2) Adjust P204 (fig. 1) until true rms voltmeter indicates 1 V (R).
- (3) Perform tracking check in table 3. If error exists and is constant, perform (a) through (e) below. If error is not constant, perform (a) through (c) and (f) below.
  - (a) Set **CUTOFF FREQ Hz** dial to **60** and selector switch to **LOW PASS X100**.
  - (b) Adjust oscillator frequency to 600 Hz as indicated on frequency counter and amplitude for a 1 V indication on true rms voltmeter.
  - (c) Set selector switch to **LOW PASS X10**.
  - (d) Adjust **CUTOFF FREQ Hz** dial until true rms voltmeter indicates 0.708 V.
  - (e) Loosen and slip **CUTOFF FREQ Hz** dial until **60** is aligned with indicating mark. Retighten dial.
  - (f) Adjust P205 (fig. 1) until true rms voltmeter indicates 0.708 V (R).
- (4) Adjust function generator frequency to 600 kHz as indicated on frequency counter.
- (5) Adjust C322 (fig. 3) until true rms voltmeter indicates 0.708 V (R).

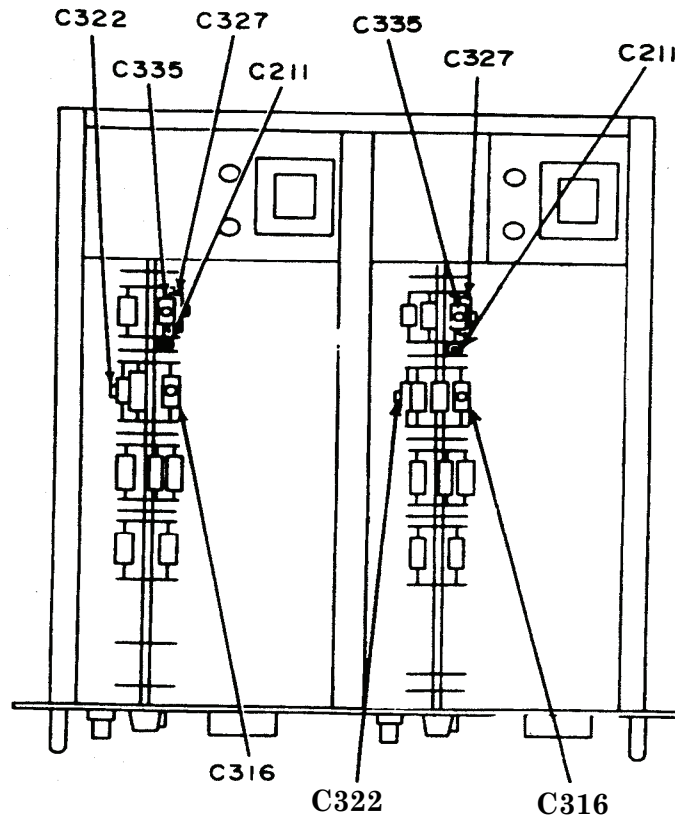


Figure 3. Model 3202(R) adjustments - top view.

- (6) Set **CUTOFF FREQ Hz** dial to **180** and selector switch to **X10K**.
- (7) Adjust function generator frequency to 180 kHz and amplitude for 1 V indication on true rms voltmeter.
- (8) Maintain amplitude and adjust function generator frequency to 1.8 MHz as indicated on frequency counter.
- (9) Adjust C335 (fig. 3) until true rms voltmeter indicates 0.708 V (R).
- (10) Repeat a (12) through (15) above.

## 10. High Pass Dial Accuracy and Unity Gain

### a. Performance Check

- (1) Connect equipment as shown in figure 2.
- (2) Set **CUTOFF FREQ Hz** dial to **20** and selector switch to **HIGH PASS X1**.
- (3) Adjust function generator frequency to 2 MHz and amplitude for a 0.03 V indication on true rms voltmeter.
- (4) Move true rms voltmeter connection from **INPUT** to **OUTPUT** connector. If true rms voltmeter does not indicate between 0.0282 and 0.0318 V, perform **b** (1) below.



- (5) Set selector switch to **HIGH PASS X10K**. True rms voltmeter will indicate between 0.0318 and 0.0282 V.
- (6) Set **CUTOFF FREQ Hz** dial to **22** and selector switch to **HIGH PASS X100**.
- (7) Adjust function generator frequency to 600 kHz and amplitude for a 0.3 V indication on true rms voltmeter.
- (8) Connect frequency counter to **INPUT** connector.
- (9) Set selector switch to **HIGH PASS X10K**. If true rms voltmeter does not indicate between 0.289 and 0.310 V, perform **b** (2) and (3) below.
- (10) Set selector switch to **HIGH PASS X100**.
- (11) Adjust function generator frequency to 110 kHz as indicated on frequency counter and amplitude for a 1 V indication on true rms voltmeter.
- (12) Set selector switch to **HIGH PASS X10K**. If true rms voltmeter does not indicate between 0.05623 and 0.07079 V, perform **b** (4) and (5) below.
- (13) Set selector switch to **HIGH PASS X1K**.
- (14) Adjust function generator frequency to 220 kHz as indicated on frequency counter and amplitude for a 1 V indication on true rms voltmeter.
- (15) Set selector switch to **HIGH PASS X10K**.
- (16) Adjust function generator frequency until true rms voltmeter indicates 0.708 V. If frequency counter does not indicate between 198 and 242 kHz, perform **b** (6) through (8) below.
- (17) Repeat technique of (13) through (16) above, using values listed in table 5. If frequency counter does not indicate within limits specified, no adjustments can be made.

Table 5. High Pass Frequency Dial Accuracy

Test instrument		Function generator frequency	Final <b>HIGH PASS</b> switch settings	Frequency counter indications	
<b>CUTOFF FREQ Hz</b> dial settings	Initial <b>HIGH PASS</b> switch settings			Max	Min
60	X1K	600 kHz	X10K	540 kHz	660 kHz
180	X1K	1.8 MHz	X10K	1.62 MHz	1.98 MHz
200	X100	200 kHz	X1K	190 kHz	210 kHz
60	X100	60 kHz	X1K	57 kHz	63 kHz
20	X100	20 kHz	X1K	19 kHz	21 kHz
20	X10	2 kHz	X100	1.9 kHz	2.1 kHz
60	X10	6 kHz	X100	5.7 kHz	6.3 kHz
200	X10	20 kHz	X100	19 kHz	21 kHz
200	X1	2 kHz	X10	1.9 kHz	2.1 kHz
60	X1	600 Hz	X10	1.5873 ms	1.7544 ms
20	X1	200 Hz	X10	4.7619 ms	5.2632 ms
20	X1	200 Hz <sup>1</sup> 20 Hz <sup>2</sup>	X1	47.619 ms	52.632 ms
60	X1	600 Hz <sup>1</sup> 60 Hz <sup>2</sup>	X1	15.873 ms	17.544 ms
200	X1	2 kHz <sup>1</sup> 200 Hz <sup>2</sup>	X1	4.7619 ms	5.2632 ms

<sup>1</sup>Adjust function generator to this frequency in step (14) above.

<sup>2</sup>Adjust function generator to this frequency in step (16) above and then fine tune for indication.

**b. Adjustments**

- (1) Adjust C211 (fig. 3) until true rms voltmeter indicates at least 0.03 V (R).
- (2) Adjust P203 (fig. 1) until true rms voltmeter indicates at least 0.3 V (R).
- (3) Repeat **a** (6) through (10) above.
- (4) Adjust C316 (fig. 3) until true rms voltmeter indicates 0.0631 V (R).
- (5) Repeat **a** (6) through (13) above.
- (6) Adjust function generator frequency to 200 kHz as indicated on frequency counter.
- (7) Increase C327 (fig. 3) and decrease C316 (fig. 3), or decrease C327 (fig. 3) and increase C316 (fig. 3), until true rms voltmeter indicates 0.708 V (R).
- (8) Repeat **a** (6) through (16) above.

**11. Maximum Attenuation and Rate of Attenuation**

**a. Performance Check**

- (1) Set selector switch to **LOW PASS X100**.
- (2) Set **CUTOFF FREQ Hz** dial to **20**.
- (3) Adjust function generator frequency to 25 kHz and amplitude for 3 V. True rms voltmeter will indicate 300  $\mu$ V or less.

**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:

Official:



JOYCE E. MORROW  
*Administrative Assistant to the  
Secretary of the Army*

0802803

GEORGE W. CASEY, JR.  
*General, United States Army  
Chief of Staff*

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342099, requirements for calibration procedure TB 9-6625-357-24.



### 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](mailto: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.





