

*TB 9-4931-228-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR COMPOUND AND VACUUM GAGES MARSH, TYPES 2 AND 3, AND SCHROEDER BROTHERS CORPORATION, MODEL GS-5

Headquarters, Department of the Army, Washington, DC
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REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

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*This bulletin supersedes TB 9-4931-228-35, 15 October 1990, including all changes.

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**SECTION I
IDENTIFICATION AND DESCRIPTION**

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Compound and Vacuum Gages, Marsh, Types 2 and 3, and Schroeder Brothers Corporation, Model GS-5. The manufacturers' 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. Models vary mainly in scales. When calibrating, check cardinal points applicable to TI. Similar instruments may be calibrated using the technique described in this bulletin. In cases where accuracy of TI cannot be determined, the TI will be certified to one-half of one minor scale division.

b. Time and Technique. The time required for this calibration is approximately 2 hours, using the physical 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 |
|--|---|
| Vacuum gage (Marsh, Type 2) | Range: 0 to 30 inHg Accuracy: ±2% of FS |
| Compound gage (Marsh, Type 3) | Range: 0 to 30 inHg vacuum 0 to 60 psi pressure Accuracy: ±2% of FS |
| Compound gage (multiple gage) Schroeder Brothers Corporation, Model GS-5) | Range: 30 inHg vacuum to 150 psi 0 to 600 psi 0 to 5000 psi Accuracy: ±5% of FS on each range (gage) |

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, and Secondary Reference Calibration Standards Set NSN 4931-00-621-7878. 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 4 to 1 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 listed in table 3 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

| Common name | Minimum use specifications | Manufacturer and model (part number) |
|-----------------------------|---|--------------------------------------|
| DIGITAL PRESSURE CONTROLLER | Range: 0 to 60 psi 0 to 3000 psi Accuracy: ±0.3 psi ±1.8 psi | Druck, Model DPI-515 |
| HYDRAULIC PRESSURE STANDARD | Range: 0 to 10,000 psig Accuracy: ±1.875% psi | DHI, RPM3D-A10000 (13534030) |

Table 3. Accessories Required

| Common name | Description (part number) |
|-----------------------------|--|
| HYDRAULIC COMPARATOR | King Nutronics, Model 3712-4-3 (13534038) |
| LOW-PRESSURE PNEUMATIC HOSE | 48" Low-pressure metal flexible hose 1/2" tube ends (SS-FL8-TA8TA8-48) |
| MANIFOLD BRACKET | (13643327) |
| PNEUMATIC HOSE | 36" Braided hose assembly with green quick connect stem (FRANK-QCHOSE-9) |
| MANIFOLD, AIR LINE | (13608989) |
| VACUUM PUMP, RECIPROCATING | SH01001UNIV |

**SECTION III
CALIBRATION PROCESS FOR
MARSH, TYPES 2 AND 3**

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

To prevent injury to personnel or damage to equipment, make certain that all components are within the range of the unit to be calibrated and all connections are securely sealed prior to applying pressure to TI. Never attempt to tighten connections with pressure applied. Close all valves, and vent all pressure lines before disconnecting equipment.

WARNING

Always use digital pressure controller control mode to reduce system pressure. Using the vent function to reduce pressure may damage rate-sensitive equipment. Only use vent function when system pressure is close to local atmospheric pressure. Local atmospheric pressure may vary, but the value should be 0 psi gage; approximately 29.7 inHg or 14.7 psi absolute.

NOTE

Zero digital pressure controller before performing measurements.

a. Energize digital pressure controller and allow 30 minutes for warm-up.

b. Connect equipment as shown in figure 1.

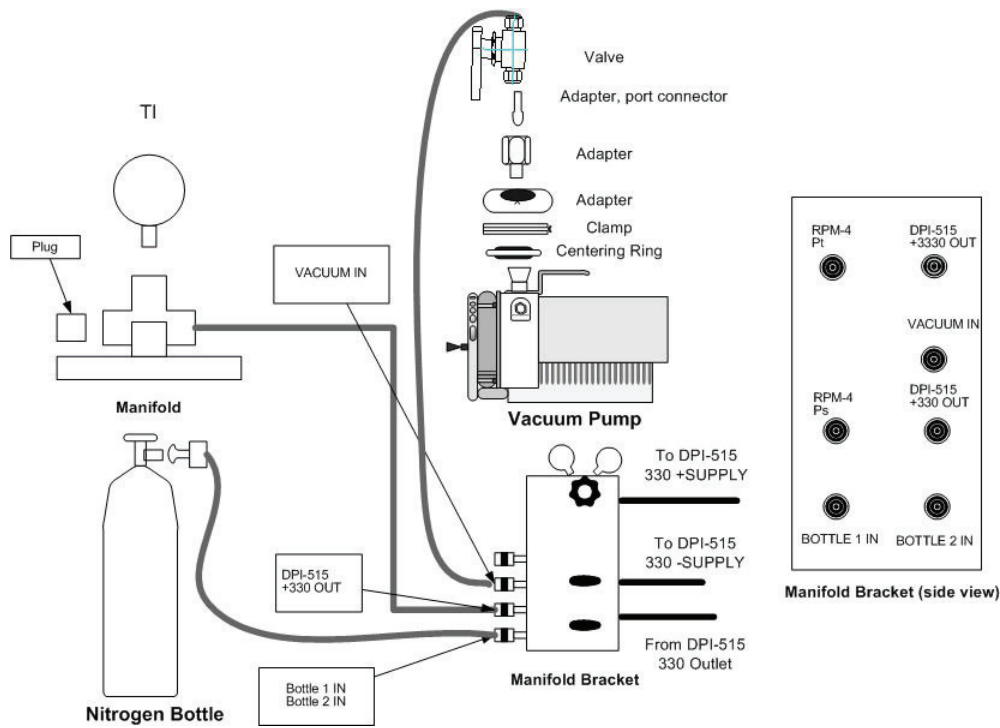


Figure 1. Pressure and vacuum check setup.

NOTE

Place TI in normal operating position (vertical or horizontal) during the following procedure.

- c. Configure digital pressure controller as indicated in (1) through (5) below.
 - (1) Units to inHg.
 - (2) Select Gage operation.
 - (3) Select 300psig range.
 - (4) Press **control** button. Enter set point of -28.0 inHg, and rate of 0.5 inHg/s.
 - (5) Press **set-up** button. Select User menu and zero the 300 psig range.
- d. Observe TI. If TI does not indicate zero, adjust recalibration screw to obtain zero indication.
- e. Open nitrogen bottle valve. Adjust manifold bracket regulator to apply 10 psi to digital pressure controller +300 Supply.
- f. Energize vacuum pump.

8. Vacuum

a. Performance Check

NOTE

Operate digital pressure controller in Negative Gage mode for these vacuum checks, i.e., enter Set points as negative numbers.

(1) Operate digital pressure controller for TI indications listed in table 3. The digital pressure controller will indicate within limits specified.

NOTE

Gently tap TI before each reading to reduce error due to friction.

Table 3. Vacuum Check

| Test instrument indications | Pneumatic pressure standard indications (inHg) Marsh, types 2 and 3 | |
|-----------------------------|--|-------|
| | Min | Max |
| 5 | -4.4 | -5.6 |
| 10 | -9.4 | -10.6 |
| 15 | -14.4 | -15.6 |
| 20 | -19.4 | -20.6 |
| 25 ¹ | -24.4 | -25.6 |

¹Location and atmospheric conditions may prohibit calibration at this test point.

(2) Adjust digital pressure controller for zero indication on TI. Set digital pressure controller to measured pressure.

(3) Deenergize vacuum pump.

(4) Close nitrogen bottle valve, and bleed pressure from all lines. Perform vent operation on digital pressure controller.

b. Adjustments. No adjustments can be made.

9. Pressure

a. Performance Check

WARNING

To prevent injury to personnel or damage to equipment, make certain that all components are within range of unit to be calibrated and all connections are securely sealed prior to applying pressure to TI. Never attempt to tighten or remove connections with pressure applied.

WARNING

Always use digital pressure controller control mode to reduce system pressure. Using the vent function to reduce pressure may damage rate-sensitive equipment. Only use vent function when system pressure is close to local atmospheric pressure. Local atmospheric pressure may vary, but the value should be 0 psi gage; approximately 29.7 inHg or 14.7 psi absolute.

- (1) Configure digital pressure controller as indicated in (a) through (d) below:
 - (a) Select psi units.
 - (b) Select Gage mode and 300 psig range.
 - (c) Press **set-up** button. Select User menu and zero the 300 psig range.
 - (d) Press **task** button. Select Basic to return to Task:Basic menu.
- (2) Open nitrogen tank valve and adjust manifold bracket regulator until output gage indicates 70 psi.
- (3) Operate digital pressure controller to exercise TI three times over range of 0 to 60 psi.
- (4) Operate digital pressure controller for TI indications listed in table 4. Digital pressure controller will indicate within limits specified.

Table 4. Pressure Check

| Test instrument Indications | Pneumatic pressure standard indications (psi) Marsh, type 3 | |
|--------------------------------|---|------|
| | Min | Max |
| 10 | 8.8 | 11.2 |
| 20 | 18.8 | 21.2 |
| 30 | 28.8 | 31.2 |
| 40 | 38.8 | 41.2 |
| 50 | 48.8 | 51.2 |
| 60 | 58.8 | 61.2 |

- (5) Adjust digital pressure controller for zero indication on TI.
 - (6) Close nitrogen tank valve and bleed pressure from lines using manifold bracket vent valve.
 - (7) Perform vent operation on digital pressure controller.
- b. Adjustment.** No adjustments can be made.

10. Final Procedure

- a. Deenergize and disconnect all equipment.
- b. Annotate and affix DA label/form in accordance with TB 750-25.

**SECTION IV
CALIBRATION PROCESS FOR
SCHROEDER BROTHERS CORPORATION, MODEL GS-5**

11. Preliminary Instructions

a. The instructions outlined in paragraphs 11 and 12 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 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.

12. Equipment Setup

CAUTION

Schroeder Brothers Corporation, Model GS-5 is a hydraulic compound gage. Clean any residual hydraulic fluid out of gage before calibration. Hydraulic fluid could damage digital pressure controller transducer.

NOTE

Zero digital pressure controller before performing measurements.

- a. Energize digital pressure controller and allow 30 minutes for warm-up.
- b. Connect equipment as shown in figure 1.

NOTE

Place TI in normal operating position (vertical or horizontal) during the following procedure.

- c. Configure digital pressure controller as indicated in (1) through (6) below.
 - (1) Units to inHg.
 - (2) Select Gage operation.
 - (3) Select 300psig range.
 - (4) Select control menu. Enter Set point of -28.0 inHg.
 - (5) Enter Rate of .5 inHg/s.
 - (6) Press **set-up** button. Select User menu and zero the 300psig range.

- d. Observe TI scale, if TI does not indicate zero, adjust recalibration screw to obtain zero indication.
- e. Adjust regulator to apply 10 psi to digital pressure controller +300 Supply.
- f. Energize vacuum pump.
- g. Operate digital pressure controller to exercise TI three times over range of 0 to 28 inHg (-28 inHg indication on digital pressure controller.)

13. Vacuum

a. Performance Check

NOTE

Operate digital pressure controller in Negative Gage mode for these vacuum checks, i.e., enter Set points as negative numbers.

- (1) Operate digital pressure controller for TI indications listed in table 5. The digital pressure controller will indicate within limits specified.

NOTE

Gently tap TI before each reading to reduce error due to friction.

- (2) Adjust digital pressure controller for zero indication on TI.
- (3) Deenergize vacuum source.
- (4) Close nitrogen tank and bleed pressure from lines using manifold bracket vent valve.
- (5) Perform vent operation on digital pressure controller.

b. Adjustments. No adjustments can be made.

Table 5. Vacuum Check

| Test instrument indications | Pneumatic pressure standard indications (inHg) | |
|-----------------------------|--|-------|
| | Min | Max |
| 5 | -3.5 | -6.5 |
| 10 | -8.5 | -11.5 |
| 15 | -13.5 | -16.5 |
| 20 | -18.5 | -21.5 |
| 25 ¹ | -23.5 | -26.5 |

¹Location and atmospheric conditions may prohibit calibration at this test point.

14. Pressure

a. Performance Check

- (1) Remove hydraulic comparator from carrying case.

(2) Remove filler plug and fill hydraulic comparator with sebacate or hydraulic oil (MIL-L-7870A).

(3) Reinstall filler plug and secure hydraulic comparator to an adequate workbench. Level comparator.

(4) Connect TI to one port of hydraulic comparator. Connect other port of comparator to appropriate input of hydraulic pressure standard.

NOTE

The TI and the hydraulic pressure standard should be located so that reference plane of each instrument is the same height to eliminate an error caused by hydraulic head pressure.

(5) Operate hydraulic comparator to obtain TI indications listed in table 5. The hydraulic pressure standard will indicate within limits specified.

(6) Adjust hydraulic comparator for zero indication on TI.

b. Adjustments. No adjustments can be made.

Table 6. Pressure Check

| TI (psi) | Hydraulic pressure standard | |
|-------------|-----------------------------|--------|
| | Min | Max |
| 90 | 82.5 | 97.5 |
| 150 | 142.5 | 157.5 |
| 200 | 170.0 | 230.0 |
| 400 | 370.0 | 430.0 |
| 600 | 570.0 | 630.0 |
| 1000 | 750.0 | 1250.0 |
| 3000 | 2750.0 | 3250.0 |
| 5000 | 4750.0 | 5250.0 |

15. Final Procedure

a. Release any applied pressure before disconnecting hoses.

b. Deenergize and disconnect all equipment.

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

By Order of the Secretary of the Army:

Official:



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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.

