TB 9-4920-459-35

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR PITOT AND STATIC SYSTEMS TESTER DRUCK, MODEL TS-4463( )/P

Headquarters, Department of the Army, Washington, DC
1 October 2001

REPORTING OF ERRORS AND RECOMMENDING CHANGES

You can help improve this publication. If you find any mistakes or if you know of a way to improve the procedure, please let us know. Mail your letter or DA Form 2028 to: Commander, U. S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5230. 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 FAX 256-842-6546/DSN 788-6546.

This bulletin supersedes TB 9-4920-459-35, dated 14 October 1997.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Pitot and Static Systems Tester, Druck Model TS-4463( )/P. 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 3 hours, using the physical techniques.

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 a 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
Altitude	Range: –1,500 to 50,000 ft Resolution: 1 ft Accuracy: ±10 feet or ±0.1% of command
Airspeed	Range: 20 to 400 knots Resolution: 0.1 knots Accuracy: 1.5 knots from 20 to 60 knots 1.0 knots above 60 knots

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 Reference Calibration Standards Set, NSN 4931-00-621-7878. 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.

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. 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)
Pneumatic pressure standard	Range: 1.5 to 16 psi	Druck, Model DPI-145 (MIS-45842)

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 manufacturers' manuals 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.

NOTE

Scheduled maintenance checks and services (PMCS) are limited to 1000 and 3000 hours maintenance service. The owning units track the operating hours and when due will request PMCS performance in addition to calibration services. Refer to TM-43-4920-910-40, section V, for service checks and component replacement.

a. Connect the equipment as shown in figure 1.

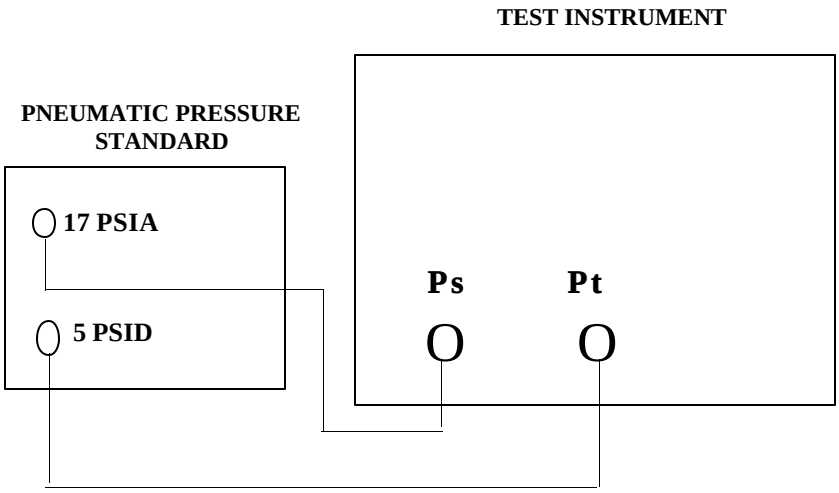

Figure 1. Calibration check (No. 1).

b. Set TI main power switch and pump power switch to on (allow 1 hour for warmup).

NOTE

Ensure that pneumatic pressure standard is at the same altitude reference as the TI.

NOTE

Protect the TI and the pneumatic pressure standard connections from drafts and rapidly changing temperatures.

NOTE

Ensure that TI is used in the **CONTROL MODE** when adjusting and checking the calibration.

NOTE

Ensure that the pneumatic pressure standard 5-psid transducer has been zeroed.

NOTE

Ensure that hose connections are tight, but do not force tighten.

c. Set pneumatic pressure standard to read altitude in feet and airspeed in knots.

d. Set TI controls for a leak check as follows.

(1) Press **LEAK MEASURE/CONTROL** key then press **SPEED** key and enter a speed aim of 200 kts.

(2) Press **ALT** key and enter an altitude of aim of 35000 ft.

(3) Press **ROC** key and enter a rate of climb of 6000 ft/min.

(4) Press **SPEED** key and wait for the altitude and speed aims to be achieved then wait 1 minute.

(5) Press **LEAK MEASURE/CONTROL** key to select **MEASURE MODE**.

(6) Press **RATE TIMER** key and select **F3**; wait 5 minutes, time 1 minute.

(7) Wait until the waiting and timing is complete and check that the rate of climb is less than 90 ft/min.

(8) If leak rate is greater then 90 ft/min, repeat the rate timing using 5 minute wait, 1 minute time. If still >90 ft/min., then check the integrity of the pneumatic connections and leak test the pneumatic pressure standard and the TI.

(9) Press **LEAK MEASURE/CONTROL** key to regain control, then press **ALT** key.

(10) Enter an altitude aim of 0 ft.

(11) Press **SPEED** key and enter a speed aim of 400 kts.

(12) Wait for the altitude and speed aim to be achieved then wait 1 minute.

(13) Press **LEAK MEASURE/CONTROL** key to select **MEASURE MODE**.

(14) Press **RATE TIMER** key and select **F3**; wait 5 minutes, time 1 minute.

(15) Wait until the waiting and timing is complete and check that the rate of speed (RATE CAS) is less than 2 kts/min.

(16) If the leak rate is greater than 2 kts/min. repeat the rate timing using the 5 minute wait, 1 minute time. If still >2 kts/min., then check the integrity of the pneumatic connections, leak test the pneumatic pressure standard, and leak test the TI.

(17) Press **LEAK MEASURE/CONTROL** key then press the **GROUND** key and select **F1** to select ground, then press the **ALT** key.

8. Altitude

a. Performance Check

NOTE

If TI is out of calibration at any point go to ground and enter calibration adjustment mode.

(1) Press **LEAK MEASURE/CONTROL** key and select **CONTROL MODE**.

(2) Press **SPEED** key and enter a speed aim of 0 kts.

(3) Press **ALT** key to enter the first altitude aim from table 3.

Table 3. Altitude Accuracy Check

Test instrument indications (ft)	Pneumatic pressure standard indications (ft)	
	Min	Max
50,000	49,950	50,050
40,000	39,960	40,040
30,000	29,970	30,030
20,000	19,980	20,020
10,000	9,990	10,010
5,000	4,990	5,010
0	−10	+10
−1,500	−1,510	−1,490

(4) Allow the aim to be achieved and wait 1 minute to stabilize. Check that the displayed reading of altitude on the pneumatic pressure standard is within the tolerance shown in table 3. If outside of tolerance, go to ground and perform calibration adjustment.

(5) Repeat (4) above for remaining altitudes listed in table 3.

(6) Press **GROUND** key and select **F1**.

b. Adjustments

NOTE

Perform **9b**(1) through (26) below

9. Airspeed

NOTE

If TI is out of tolerance at any point go to ground and enter calibration adjustment mode, then perform **9b**(1) through (26) below.

a. Performance Check

(1) Press **LEAK MEASURE/CONTROL** key and select **CONTROL MODE**.

(2) Press **SPEED** key, and enter a speed aim of 0 kts.

(3) Enter an altitude aim of 0 ft., wait for aim to be achieved, and allow 1 minute to stabilize.

(4) Press **SPEED** key and enter the first speed aim in table 4.

Table 4. Airspeed Accuracy Check

Test instrument indications (knots)	Pneumatic pressure standard indications (knots)	
	Min	Max
20	18.5	21.5
40	38.5	41.5
60	58.5	61.5
80	79.0	81.0
100	99.0	101.0
200	199.0	201.0
300	299.0	301.0
400	399.0	401.0

(5) Allow the aim to be achieved and wait 1 minute to stabilize. Check that the displayed reading of altitude on the pneumatic pressure standard is within the tolerance shown in table 4. If outside of tolerance, perform calibration adjustment.

(6) Repeat (5) above for remaining air speeds listed in table 4.

(7) Press **GROUND** key, press **F1** key and select ground.

(8) When safe at ground remove all connections.

(9) If out-of-tolerance readings occur, perform **b** (adjustments) below. If no out-of-tolerance readings occur, perform the following non-reportable adjustment to update the calibration date displayed upon startup of the TI, then perform paragraph **10** below.

(a) Replace blanking caps on Ps and Pt outputs on the TI.

(b) Press **LEAK MEASURE/CONTROL** key then press the **GROUND** key and select **F1** key to select ground.

(c) Remove calibration label that covers the calibration enable screw on the TI and unscrew the calibration enable screw counterclockwise until it is free to rotate.

(d) Press **CLEAR/QUIT** key and select **CALIBRATION MODE** by pressing **F1** and **F4** keys simultaneously.

(e) When the last calibration date and the current calibration date are displayed, press the **ENTER** key, and accept the current calibration date, or re-enter the date if incorrect.

(f) The main calibration menu will be displayed. Press **F1** key to select **MAIN CALIBRATION**.

(g) Press **F1** key to select **INTERNAL PRESSURE SOURCE**.

(h) Press **F4** key to select **Ps** and **Pt** absolute calibration. The calibration screen will be displayed.

(i) Press **RATE** key and enter 10 psi/min.

(j) Press **F1** key to select **AIM** and enter the value 1.6800.

(k) Allow the aim to be achieved, wait 1 minute, select **ACTUAL VALUE** and enter the same value that was entered in the previous step.

NOTE

After entering the value, there is a short pause before returning to the calibration screen.

(l) Repeat steps **j** and **k** with the aim value of 15.5000.

(m) Press **F4** key to select **END Ps**. Check reported span and zero shifts for abnormally large errors which could indicate data entry errors. Zero adjustment is expected to be within ± 0.015 psi. Slope adjustment is expected to be within ± 0.1 percent reading.

(n) Press **F1** key to accept the reported span and zero shifts, if accurate. If not accurate, repeat the non-reportable adjustment.

(o) Press **F4** key to select **END CAL**. Check reported span and zero shifts for abnormally large errors which could indicate data entry errors. Zero adjustment is expected to be within ± 0.015 psi.

(p) Press **F1** and select **YES** to accept the reported span and shifts if accurate. If not accurate, repeat the non-reportable adjustment.

(q) Press **CLEAR/QUIT** key repeatedly until the display reads **BACK UP NEW CALIBRATION DATA?** Press **F1** key to select **YES**. When **GO TO GROUND**? is displayed, press **F1** key to select **YES**. When **SAFE AT GROUND** is displayed press **CLEAR/QUIT** key.

(r) Replace the calibration screw to its normal position.

b. Adjustments

(1) Connect equipment as in figure 2.

NOTE

Ensure that the Ps output on the TI is capped.

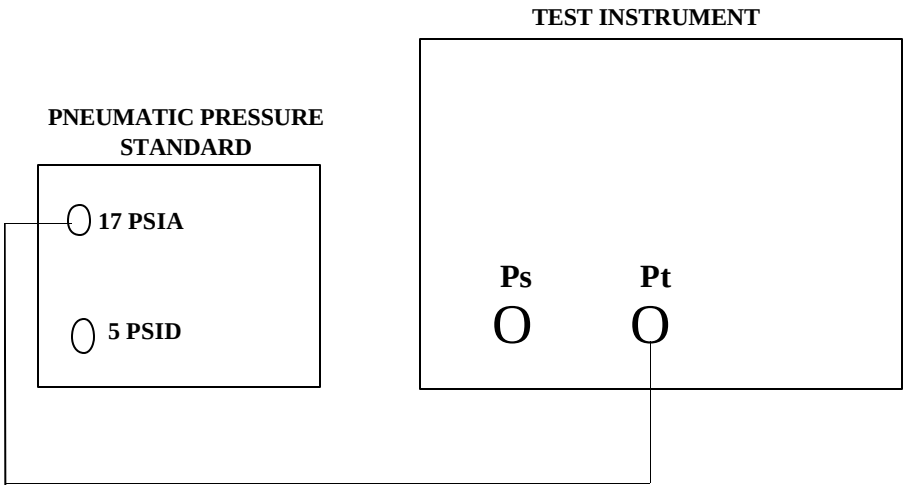

Figure 2. Calibration check (No.2).

(2) Configure the pneumatic pressure standard to read psi absolute on the 17 psia channel.

(3) Remove calibration label that covers the calibration enable screw on the TI and unscrew the calibration enable screw counterclockwise until it is free to rotate.

(4) Press **CLEAR/QUIT** key and select **CALIBRATION MODE** by pressing **F1** and **F4** keys simultaneously.

(5) When the last calibration date and the current calibration date are displayed, press the **ENTER** key, and accept the current calibration date, or re-enter the date if incorrect.

(6) The main calibration menu will be displayed. Press **F2** key to select **CALIBRATION CHECK.**

(7) Press **F1** to select **INTERNAL**.

(8) Press **F4** to select **Ps** and **Pt** (abs).

(9) Press **F2** to select **RATE** and enter **10 psi/min**.

(10) Press **F1** to select **AIM** and enter **5 psi**. Wait for aim to be achieved. (wait 1 minute).

(11) Press **F3** to select **OFF** to select **MEASURE MODE**. (Wait for 5 minutes).

(12) Note the Ps pressure displayed on the TI then note the Ps pressure again 1 minute later. Check that the difference between the readings (leak rate) is less than 0.015 psi. If the leak rate is greater than 0.015 psi/min., repeat the 5 minute wait and retest. If still >0.015 psi, then check the integrity of the pneumatic connections. Leak test the pneumatic pressure standard and leak test the TI.

(13) With the leak rate less than 0.015 psi/min, press **F3** to select **ON** to regain control, then press **F1** then enter an aim of 14.5 psi and wait for it to be achieved.

(14) Press **CLEAR/QUIT** key repeatedly to return to the main calibration menu. Press **F1** key to select **MAIN CALIBRATION**.

(15) Press **F1** key to select **INTERNAL PRESSURE SOURCE**.

(16) Press **F4** key to select **Ps** and **Pt** absolute calibration. The calibration screen will be displayed.

(17) Press **RATE** key and enter **10 psi/min**.

(18) Press **F1** to select **AIM** and enter the first aim in table 5.

Table 5. Ps and Pt Aim Accuracy Check

Aim (psi)
1.68
4.0
7.0
10.0
13.0
15.5

(19) Allow the aim to be achieved, wait 1 minute, then select **ACTUAL VALUE** and enter the reading from the pneumatic pressure standard.

NOTE

After entering the value, there is a short pause before returning to the calibration screen.

(20) Repeat same procedure above for remaining pressures listed in table 5, in ascending order.

(21) Press **F4** key to select **END Ps.** Check reported span and zero shifts for abnormally large errors which could indicate data entry errors. Zero adjustment is expected to be within ±0.015 psi. Slope adjustment is expected to be within ±0.1 percent reading.

(22) Press **F1** key to accept the reported span and zero shifts, if accurate. If not accurate, return to step **9b**.(14).

(23) Press **F4** key to select **END CAL**. Check reported span and zero shifts for abnormally large errors which could indicate data entry errors. Zero adjustment is expected to be within ±0.015 psi. Slope adjustment is expected to be within ±0.1 percent reading.

(24) Press **F1** and select **YES** to accept the reported span and zero shifts, if accurate. If not accurate, return to step **9b**(14).

(25) Press **CLEAR/QUIT** key repeatedly until the tester ask **BACK UP NEW CALIBRATION DATA**. Press **F1** key to select **YES**. When **GO TO GROUND**? is displayed, **p**ress **F1** key to select **YES**. When **SAFE AT GROUND** is displayed, press **CLEAR/QUIT** key.

(26) Replace the calibration screw to its normal position.

NOTE

Ensure that DA label/form is affixed over calibration screw.

10. Final Procedure

a. Deenergize and disconnect all equipment.

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

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THESE ARE THE INSTRUCTIONS FOR SENDING 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@avma27.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**: TB 9-6625-xxxx-35
9. **Pub Title**: Calibration Procedure for ...
10. **Publication Date**:
11. Change Number:
12. **Submitted Rank**: MSG
13. **Sumitter 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.

By Order of the Secretary of the Army:

ERIC K. SHINSEKI
General, United States Army
Chief of Staff

OFFICIAL:

JOEL B. HUDSON
Administrative Assistant to the Secretary of the Army
0121912

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