*TB 9-4920-459-24

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
10 August 2006

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 9-4920-459-35, dated 1 October 2001, including all changes.

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 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
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 Transfer Calibration Standards Set AN/GSM-287, AN/GSM-705, and 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. 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 the 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)
Pneumatic pressure standard	Range: 1.5 to 16 psi Accuracy: 1.5-5 psia: (±0.05%) 5-17 psia: ±0.02% 0-5 psid: (±0.05%)	Druck, Model DPI-145R (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 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 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 pneumatic pressure standard 17 PSIA inlet port and 5 PSID inlet port to TI **Ps** and **Pt** outlet port respectively.

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 than 90 ft/min, repeat the rate timing using 5 minute wait, 1 minute time. If still greater than 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 greater than 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 then perform paragraph **9 b** below.

(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 paragraph **9 b** below.

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

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

b. Adjustments. Perform paragraph **9 b** below.

9. Airspeed

NOTE

If TI is out of tolerance at any point go to ground and perform paragraph **9 b** 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 paragraph **9 b** below.

(6) Repeat (4) and (5) above for remaining airspeeds 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 paragraph **b** 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 **F2** key to select **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, press **F3** to 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

NOTE

If adjustment does not correct TI accuracy, restoration of corrupt data files in TI may be required. Restoration requires the use of Special Type Test Equipment (STTE), PN GTE405-1936-01-M0, 6625-01-448-6678. This STTE is at Secondary Reference Level. The alignment procedures may be accomplished at Transfer Level with TM 43-4920-910-40, paragraph 3-53, by transferring the STTE via temporary hand receipt to Transfer Level facility as applicable to restore data files to TI.

(1) Connect pneumatic pressure standard 17 PSIA inlet port to the **Pt** outlet port of the TI.

(2) Tightly cap closed the **Ps** outlet port of the TI.

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

(4) 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.

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

(6) 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.

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

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

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

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

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

(12) Press **F3** to select **OFF** to select **MEASURE MODE**, wait for 5 minutes.

(13) 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 greater than 0.015 psi, then check the integrity of the pneumatic connections. Leak test the pneumatic pressure standard and leak test the TI.

(14) 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.

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

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

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

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

(19) 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

(20) 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.

(21) Repeat steps (19) and (20) above for remaining pressures listed in table 5, in ascending order.

(22) 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.

(23) Press **F1** key to accept the reported span and zero shifts, if accurate. If not accurate, repeat step (15) through (23) above.

(24) 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.

(25) Press **F1** and select **YES** to accept the reported span and zero shifts, if accurate. If not accurate, repeat step (15) through (24) above (R).

(26) 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.

(27) 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 in accordance with TB 750-25.

By Order of the Secretary of the Army:

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

Official

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Distribution:

To be distributed in accordance with the initial distribution number (IDN) 344621 requirements for calibration procedure TB 9-4920-459-24.

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
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.