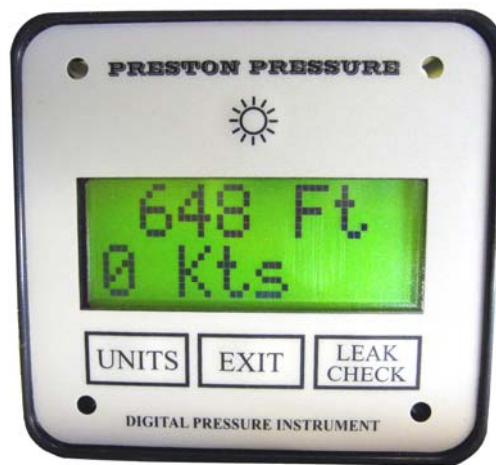


TST-621

Dual Altimeter & Airspeed Digital Indicator

Models TST-621-50 and TST-621-35



OPERATION AND MAINTENANCE MANUAL

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PRESTON PRESSURE

TST-621

USER AND MAINTENANCE MANUAL

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WARRANTY AND LIABILITY STATEMENT

Preston Pressure warrants its products against defects in workmanship and material under normal, intended use for a period of two years from the date of purchase.

Preston Pressure's limit of liability shall be to repair or replace the product at their discretion. Transportation shall be pre-paid to the Preston Pressure factory or authorized service facility. Preston Pressure shall not be liable for any consequential damage expense.

This warranty shall be void if the product has been repaired or altered in any way that adversely affects its performance or reliability. This warranty shall be void if the product has been subject to abuse, misuse, contamination, negligence, accident, shipping damage, or improper operation.

Preston Pressure reserves the right, at its own discretion, to make changes in materials, designs, finish, or specifications, without obligation to install or incorporate such changes in products previously manufactured.

This warranty shall, at Preston Pressure's option, become void if the ownership is changed, unless the prior owner or proposed owner obtains written approval of continuation of coverage prior to the change of ownership.

Preston Pressure reserves the right to revise this manual and to make changes to content from time to time in the content thereof, without obligation to notify any person of such revision.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CHAPTER 1

GENERAL INFORMATION

The **TST-621** is a digital display tester used to test aircraft altimeters, airspeed indicators, and aircraft pitot-static systems. Altitude is displayed in feet and meters, with increments of 2, and 5 feet. Airspeed is displayed in knots. Vertical speed is indicated in feet per minute.

This manual is valid for models TST-621-50 and TST-621-35

SPECIFICATIONS

Digital Altimeter:

Range for TST-621-50: -1000 to 50,000 feet (-305 to 15,240 meters) 0-500 Knots

Range for TST-621-35: -1000 to 35,00 50,000 feet (-305 to 10,670 meters) 0-500 Knots

Maximum airspeed altitude: 40,000 feet

Resolution: from -1500 to 30,000 feet resolution is in 2-foot increments
from 30,005 to 50,000 feet resolution is in 5-foot increments
all metric resolution is in 1-meter increments
airspeed is indicated in 1-knot increments

Units Displayed: Feet, Feet/Minute, Knots

Sensor Accuracy: 0.03 %

Temperature range: 30 degrees F to 125 degrees F (-1 C to 51 C) limited by LCD display

Display Type: LCD

Display Size: 2.53" X 0.53" (64.5mm X 13.5mm)

Physical dimensions: 3.3" (8.4cm) wide x 3.5" (8.9cm) tall x 0.7" (1.8cm) deep on face; rear can is 3.15" (7.7cm) diameter x 3.05" (7.75cm) deep
Mounting hole pattern: 2.5" x 2.5" (6.35x6.35cm)

Weight: 0.7 lb (320 grams)

Voltage: 12VDC, positive center

Current draw: 120 mA

Other Features:

Leak test feature: 2 minutes, selectable down to 30 seconds

VSI (vertical speed indicator) +/- 0 to 9900 ft/min (+/- 0 to 9900 mt/min)

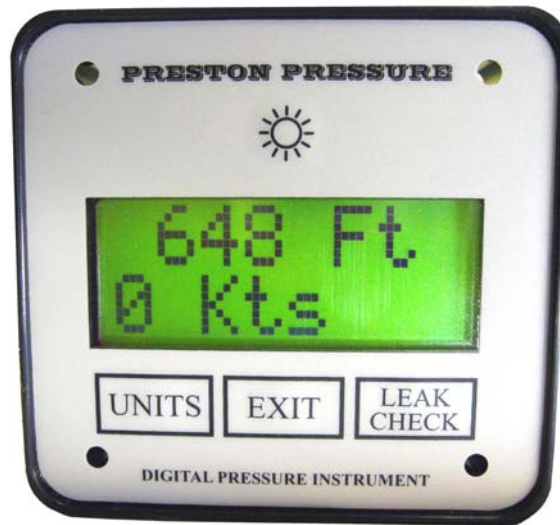
The TST-621 indicators can be mounted in any position, at any angle.

Note: The TST-621 indicators do NOT have the precision required to test RVSM altimeter systems.

The TST-621 indicators are NOT intended for flight or use in aircraft.

CHAPTER 2

OPERATION



The **UNITS** button is used to toggle between the two primary displays. Upon powering up, the display indicates altitude in feet and airspeed in knots. Pressing the UNITS button will switch the display to indicate altitude in feet and vertical speed per minute in feet. Pressing the UNITS button again will toggle back to the original display.

The **LEAK CHECK** will begin a 120 second timer, and the display will also show the gain or loss of altitude or airspeed experienced during the displayed time period.

If the Leak Check button is pressed while in the altitude/airspeed mode, the leak check will enter the airspeed leak test mode.

If the Leak Check button is pressed while in the altitude/VSI mode, the leak check will enter the altitude leak test mode.

If the operator wishes to select a different length of testing time, the Leak Check button may be pressed repeatedly, which will cause a reduction in the timer counter in 30-second increments. The timer will not toggle above 120 seconds nor under 30 seconds. Once the time is selected, press the Units button to start the timer.

The **EXIT** button is used to exit out of the leak check mode.

The **LIGHT** button will toggle the display backlight ON or OFF.

Note: there is no method provided to turn the power on or off. If this function is necessary, an external switch will have to be added.

Altitude - The altitude is measured based on a reference point of 29.92 (sea level). This is pre-set at calibration and cannot be changed by the operator. The altitude is displayed in increments of 2 feet up to 30,000 feet, and 5 feet at altitudes above 30,000 feet.

Airspeed – The airspeed is calculated based on the pressure differential between the static sensor and the pressure sensor. The two sensors are identical but independent. A pressure difference between the two sensors will not cause damage, even if they are at a high vacuum on one sensor and a high pressure on the other. (Either sensor may be damaged if its pressure exceeds 20 psi.)

If the pitot pressure is lower than the static pressure, the airspeed reading will show “**InvertdP**”. **An inverted pressure situation will not damage the TST-621 instrument, but it may damage instruments in the aircraft!**

If the airspeed exceeds 500 knots, or if the altitude range exceeds 40,000 feet, the display will indicate “ ---- ”. This condition will not damage the TST-621 instrument, but the display serves to indicate that the pressure differential has exceeded the airspeed calculations.

CHAPTER 3

CALIBRATION PROCEDURES

The recommended calibration interval for the TST-621 indicators is one year. If at any time during regular use the unit becomes unreliable or out of correct operating calibration, it must be repaired and/or re-calibrated before continuing its use.

The TST-621 is easy to calibrate. There are 4 set points used in the calibration of the altimeter (the TST-621-50 has 3 additional set points). This enables the altimeter to have a greater degree of accuracy, allowing it to self-correct to the nearest calibrated set point.

The calibration factors are stored in the microcontroller's EEPROM memory and does not need battery back-up. The calibration will not be lost when power is removed.

Altimeter Calibration Procedures

1. Apply power to the TST-621 and allow a warm up for a *minimum* of 15 minutes.
2. Connect a known altitude pressure standard to the Static and Pitot ports, (both ports connected together, sensing the same pressure).
3. Press the Exit and Leak Check buttons simultaneously. The display will change to:

Cal? No Yes

4. Press the Leak Check button to proceed with calibration, or press the Exit button to exit out of the calibration mode without any changes being made.
5. At this point the display will read:

**Goto
0 Feet**

This is to notify the technician that the current calibration point is 0 feet (29.92 inHg). To select a different calibration point, press the backlight button (the button will not activate the light while in Cal mode).

There are 4 calibration points: 0, 10,000, 20,000, 30,000 (the TST-621-50 has 3 additional set points at 40,000, 45,000, 50,000). When the desired calibration point is displayed, press the Units button.

The first calibration point display will read:

P Altitude (in feet)
In ^ xxx v

The letter P indicates that the sensor being calibrated in this step is the Pitot sensor.

(Where Altitude is the sensed altitude in feet, and xxx is the current calibration value.)

Write down the calibration value so it can be re-set if needed!

The word “**In**” is displayed above the Units button. Press the Units button when ready to input the selected correction value.

6. Go to a pressure that corresponds to the selected calibration point (referenced from 29.92 inHg), as read from a pressure standard. When the altitude is stable for approximately 30 seconds, note the altitude displayed on the TST-621 display in calibration mode.

If the displayed altitude is lower than the standard, press the Exit button as needed to incrementally raise the altitude to be equivalent to the standard.

If the displayed altitude is higher than the standard, press the Leak Check button as needed to incrementally lower the altitude to be equivalent to the standard.

As the altitude is adjusted, note that the displayed correction factor also changes, and the change is in increments smaller than the altitude. Use this to fine-tune the altitude as close as you can to the standard.

When the TST-621 altitude matches the standard as close as possible, wait another 30 seconds to ensure that the internal mathematical filtering corrections have been done. If satisfied with the results, press the Units button to Input the selected correction, and the display will automatically proceed to the next calibration level.

Note: at calibration altitudes of 0 and 30,000 feet, the pitot sensor is also calibrated. The sensor being calibrated is indicated by a display of an S or a P in the upper left-hand corner of the display. The pitot sensor is calibrated in altitude, just as the static sensor.

7. Repeat the procedure in step 7 at each requested altitude: 10000, 20000, 30000, 40000, 45000, and 50000 feet as needed

8. After the last calibration point has been entered, the display will briefly read “**Storing**” and then re-start. There is no need to re-cycle power.

9. While bringing the TST-621 back down to ground level pressure, test each calibration point as specified in the chart. Enter the corrected value at each point. (The correction chart may be photocopied, cut out, and fixed to the test box for handy reference.)

Helpful Notes: When the display is indicating “Go To XX Feet”, pressing the Light button will cycle through the various calibration points of 0, 10,000, 20,000 feet, etc. After 35,000 (or 50,000) feet it will cycle back to 0 feet. This is handy for use in those cases when only one range is in need of calibration. Note, however, that the TST-621 unit’s pressure must be within less than 2,500 feet of the selected range in order to save the new value. This eliminates accidentally saving a value when in the incorrect pressure range.

Note: Allowable error tolerances are as follows:

Altitude	+/-Error	Altitude	+/-Error
-1000	5	14000	25
0	5	16000	27
500	5	18000	30
1000	5	20000	32
1500	6	22000	35
2000	7	25000	38
3000	7	30000	45
4000	8	35000	51
6000	10	40000	57
8000	15	45000	63
10000	20	50000	70
12000	22		

TST-621-50 S/N

FOR TEST ALTITUDE	DISPLAY ALTITUDE	FOR TEST ALTITUDE	DISPLAY ALTITUDE
- 1000		14000	
0		16000	
500		18000	
1000		20000	
1500		22000	
2000		25000	
3000		30000	
4000		35000	
6000		40000	
8000		45000	
10000		50000	
12000		n/a	n/a

Cal Date:

Expires:

TST-621-35 S/N

FOR TEST ALTITUDE	DISPLAY ALTITUDE	FOR TEST ALTITUDE	DISPLAY ALTITUDE
- 1000		10000	
0		12000	
500		14000	
1000		16000	
1500		18000	
2000		20000	
3000		22000	
4000		25000	
6000		30000	
8000		35000	

Cal Date:

Expires:

Original Calibration Correction Values
(for reference during calibration):

<u>Calibration Point</u>	<u>Correction value</u>
0 Ft	
10,000 Ft	
20,000 Ft	
30,000 Ft	

Airspeed Calibration Procedures

1. Perform the altimeter calibration described in the previous section. The pitot sensor is calibrated in this process, along with the static sensor.

2. When a satisfactory altitude calibration is obtained, go through each test point in the following chart, and enter the corrected value at each point. (The correction chart may be photocopied, cut out, and fixed to the test box for handy reference.)

Note: if the airspeed calibration needs additional adjustment after being calibrated in the altitude calibration procedures, the adjustment can be done by entering the calibration process described in steps 1-6 of the previous section. Then adjust only the P sensor up or down to increase or decrease the calibration point. Unplug the unit, and power up again. Repeat as needed to achieve the desired correction.

TEST AIRSPEED	DISPLAY AIRSPEED	TEST AIRSPEED	DISPLAY AIRSPEED
40 Kts		250 Kts	
60 Kts		275 Kts	
80 Kts		300 Kts	
100 Kts		325 Kts	
120 Kts		350 Kts	
140 Kts		375 Kts	
160 Kts		400 Kts	
180 Kts		425 Kts	
200 Kts		450 Kts	
225 Kts		500 Kts	

Calibrated by: _____ Date: _____
 Next Calibration Due Date: _____

CHAPTER 4

MAINTENANCE AND TROUBLESHOOTING

The following annual maintenance is recommended:

Perform calibration checks, and re-calibrate if necessary.

Troubleshooting

Refer to the following chart of symptoms, causes, and repair comments:

SYMPTOMS	POSSIBLE CAUSES	COMMENTARY
Display shows garbage	Microcontroller had a power brown-out	Re-cycle power.
Display never finishes initializing	Bad solder joint or sensor	Return unit to factory.
Displays do not turn on	Low voltage	Verify power to unit.