



# PX-1 Porosity Tester

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## Operating Instructions



# Contents

1	General Information .....	4
2	Description .....	4
3	Test Procedure .....	5
3.1	Set Up.....	5
3.2	Calibration Check .....	6
3.3	Testing.....	7
3.4	Gauge Adjustments.....	8
4	Verification of the Calibration Plate.....	9

## Change History

<b>Date</b>	<b>Description</b>
9-16-2013	Reformatted to fit current style; provided DCN.

## 1 General Information

The PX-1 Porosity Tester was developed to answer a growing need to be able to perform porosity testing on Aerostar / Raven Hot Air Balloon systems in the field, as part of periodic maintenance and the required 100-hr. and annual inspections. The only other currently available method to check porosity is with expensive laboratory equipment which is capable of measuring porosity in a localized area to a high degree of accuracy.

The PX-1 was designed to be a low-cost alternative and provides the following features:

- Easy to use
- Virtually maintenance free
- Accurate to approximately +/- 10%
- Highly portable for use in FAA Repair Stations
- Designed to take multiple readings over large areas of a hot air balloon envelope

## 2 Description

The PX-1 Porosity Tester is a fully self-contained system, consisting of a PX-1 vacuum unit, a gauge unit and a Calibration plate, which is designed to test the porosity of light-weight fabrics in field/non-laboratory applications where an accuracy of + or -10% is acceptable.

The PX-1 system includes a carrying and storage case. Always store and transport the unit in this case to prevent damage to the equipment. If the equipment is subjected to any severe shocks or jolts, carefully examine each piece of the system to ensure that no damage has occurred, especially to the gauge unit.

Figure 1 on the next page shows the PX-1 system ready for use.

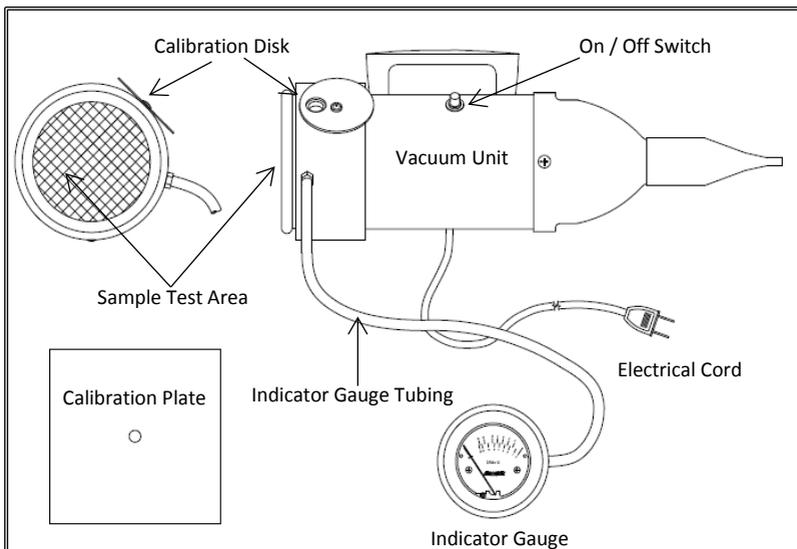


Figure 1: PX-1 Porosity Tester

### 3 Test Procedure

#### **WARNING**

*To prevent electrical shock, do not use the porosity tester outdoors or on wet surfaces.*

#### 3.1 Set Up

Before using the PX-1, ensure that the location for testing is indoors and no water is present on either the material to be tested or the floor.

1. Inspect the Calibration Plate (see section 4).
2. Plug the PX-1 vacuum unit into a standard 110 volt circuit.

3. Place the gauge on a level surface. Ensure that the needle is pointing to the "REF" mark on the gauge face (see section 3.4).
4. On the PX-1, turn the power switch on and then allow ten seconds for the motor to stabilize at full speed.
5. Place the PX-1 unit's sample test area on a smooth surface such as a table top or place a smooth piece of plastic or metal over the sample test area. Press firmly to ensure there is no leakage (zero air flow) around the rubber seal.
6. Rotate the calibration disk so the needle on the gauge face points to zero (0).

**NOTE**

*Fluctuations in voltage at the outlet may cause the gauge readings to fluctuate. Observe any such indications of unstable power.*

7. Turn the PX-1 off. It is now adjusted to the correct level of vacuum to conduct testing.

### **3.2 Calibration Check**

To ensure that the PX-1 is providing accurate readings, always perform a calibration check prior to initiating porosity testing on a hot air balloon envelope. Perform additional calibration checks during testing, as the performance of the vacuum motor may change as the motor warms. The following calibration check procedure is performed using the calibration plate provided.

1. Turn the vacuum unit switch on and then allow ten seconds for the motor to stabilize at full speed.
2. Place the calibration plate, with the foam side facing the PX-1 vacuum unit, over the sample test area.

3. Press the calibration plate firmly against the sample test area. Ensure that there is no restriction of air flow at the hole in the calibration plate or the calibration disk.
4. Note the reading on the gauge.
5. Compare this reading with the number which is stamped on the bottom of the calibration plate. The reading should be within 10% of the reading stamped on the plate.
6. If the unit is determined to be out of calibration, it should be returned for repair and re-calibration.

### 3.3 Testing

#### NOTE

*Perform occasional calibration checks during testing, as the performance of the vacuum motor may change as the motor warms (see section 3.2).*

1. If not already done, perform the Setup and Calibration procedures in section 3.1 and 3.2 of this document.
2. Consult the Aerostar Continued Airworthiness Instructions (ACAI) manual for the envelope fabric areas to be tested.
3. Locate the area of the balloon envelope to be tested, and then spread out the material as needed to perform the required tests on a single layer of fabric.
4. Turn on the PX-1 vacuum unit and then allow ten seconds for the motor to stabilize at full speed. No adjustments are needed if the procedures in sections 3.1 and 3.2 above were completed.

5. Place the PX-1 sample test area on the fabric area to be tested. Keep the fabric smooth, with no folds or puckers, to minimize leakage at the edges of the sample test area.

**NOTE**

*Ensure only a single layer of fabric is tested. A second layer will distort the test results.*

6. Observe the reading of the gauge. Gauge readings must be multiplied by 10 as indicated on the gauge face.
  - As stated previously, the accuracy of this device is +/- 10%. If the reading is borderline pass/fail and a more accurate reading is desired, samples should be sent to the aircraft manufacturer or a fabric test lab for more accurate testing.

**NOTE**

*Consult the Aerostar Continued Airworthiness Instructions (ACAI) manual to determine whether the reading is within acceptable limits for continued operation or return to service.*

### **3.4 Gauge Adjustments**

If the gauge needle is not pointing to “REF” when the tester is unplugged, perform the following steps.

1. Verify the tester is unplugged.
2. Remove the gauge from the protective foam cover.
3. Remove the small Allen wrench stored inside.
4. Locate the Allen screw located immediately to the left of the base of the needle.
5. With the Allen wrench, adjust the needle until it points to “REF”. Jostle the gauge slightly to ensure the gauge indication does not change.

6. Replace the wrench and the foam cover.

## 4 Verification of the Calibration Plate

The calibration plate is used to calibrate the PX-1 Porosity Tester prior to use. The calibration plate allows a specific amount of air to flow through the center hole of the plate. With the PX-1 operating at its optimal performance level, the vacuum will pull air at a rate of 75 cubic feet per minute (CFM) through the calibration plate. If the hole in the center of the calibration plate is deformed, damaged, or altered in any way the accuracy of the calibration of the PX-1 and all subsequent tests performed will be invalid.

Perform the following procedure to verify the condition of the calibration plate.

1. Inspect the overall condition of the calibration plate. Are there signs of damage that may affect the use of the plate to calibrate the PX-1?
  - a. Verify the foam on the back of the plate is in good condition.
    - I. Verify the foam is soft, allowing for a firm, tight seal when pressed against the sample test area of the PX-1.
    - II. Verify there are no signs of deformation of the foam that may affect the seal when pressed against the sample test area of the PX-1.

### NOTE

*If the foam is damaged in a manner that will affect the ability of the calibration plate to give an accurate test, contact the manufacturer for repair or replacement.*

- b. Verify there are no signs of damage around or near the hole in the center of the calibration plate.

- I. Verify there are no dents or gouges near the hole that may deform or misshape the opening.
- II. Verify there are no signs of damage to the inside diameter of the hole that may affect the size of the opening.

**NOTE**

*If damage is found that changes the size or shape of the center hole from the original dimensions, the calibration plate MUST be discarded and a new plate obtained from the manufacturer.*

2. Measure the inside diameter of the hole at the center of the calibration plate. The correct inside diameter of the hole is 0.344 inch (+/- .006 inch). If the inside diameter of the center hole is not within this tolerance the calibration plate MUST be discarded and a new plate obtained from the manufacturer.

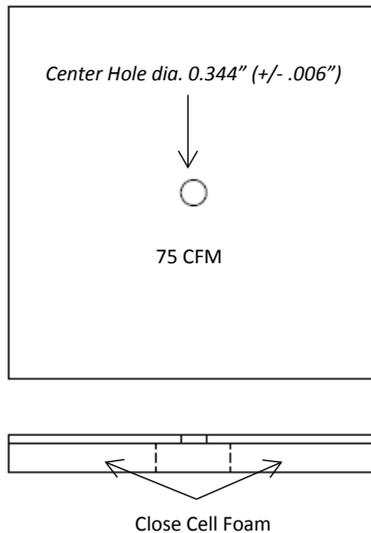


Figure 2: Calibration Plate