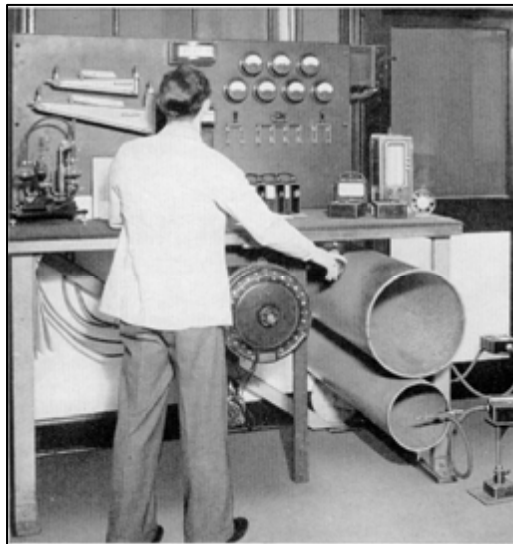


Field Calibration for Select TSI®, Alnor®, and Airflow™ Instruments Products

Application Note TSI-146



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TSI Incorporated products can be easily adjusted by the end user by performing a field calibration. Field adjustments are intended to make minor changes in calibration to match a user's calibration standards. These are simple linear multipliers or offset adjustments, and are **NOT** intended as a complete calibration capability.

The field calibration data will not be saved unless the whole calibration procedure is completed. To abort the field calibration process at any time, press the **ESC** key. Field calibrations can be set back to the Factory Default on all models. For the most accurate, complete, multiple-point calibration and certification, the instrument should be returned to the factory.

The procedures described in this document apply to the following TSI®, Alnor®, and Airflow™ Instruments products:

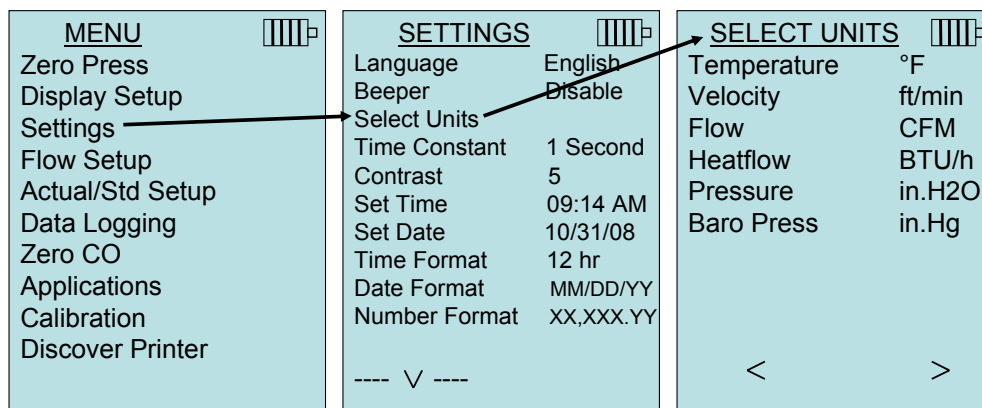
Measurement Type	TSI	Alnor	Airflow
Thermoanemometer	9535	AVM430	TA430
	9545	AVM440	TA440
	9555	—	TA460
	9555-A	—	TA460-A
Micromanometer	5825	AXD620	PVM620
	9555-P	—	TA460-P
Rotating Vane	5725	RVA501	LCA501
IAQ	7425	TH720	RH720
	7515	CF910	IAQ910
	7525	CF920	IAQ920
	7535	CF930	—
	7545	—	—
	7565	—	—

Detachable Probes used with multi-purpose meter models 9555, 7565, and TA460.
Note: calibrations for detachable probes are stored in the probe.

Measurement Type	TSI	Airflow
Thermoanemometer	960	480
	962	482
	964	484
	966	486
Rotating Vane	496	496
	995	495
IAQ	980	450
	982	452

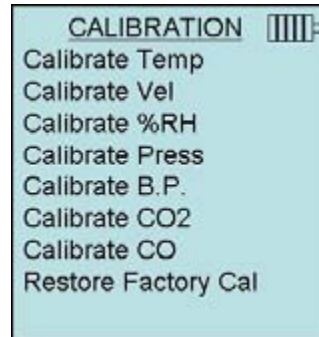
Units of Measurement

Calibrations can be performed in either imperial or metric units of measurement. To change the units of measurement, go into the **SETTINGS** menu, choose **SELECT UNITS**, and adjust units of measurement as necessary. Press **ENTER** to accept.



Accessing the Calibration Menu

To access the CALIBRATION menu, press the **MENU** key and scroll down to CALIBRATION and press **ENTER**. Highlight the measurement parameter to be adjusted and then press **ENTER**.

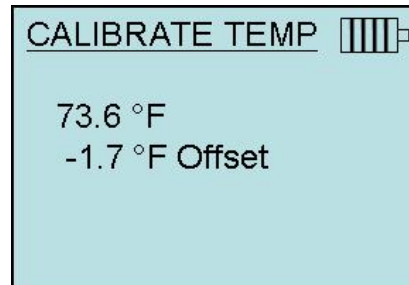
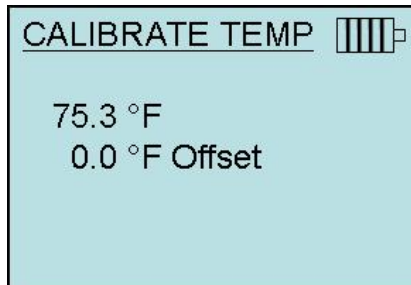


Note: The measurement capabilities of the instrument and probe will determine what appears in the main MENU and CALIBRATION menu. Instrument models using detachable probes must have the probe attached to perform field calibrations. The screen displays used in this document are from the 9555 series VELOCICALC® Multi-Function Ventilation Meter.

Calibrate Temp

This calibration option applies to all meters and probes capable of measuring temperature. The temperature calibration can be adjusted $\pm 6.0^{\circ}\text{F}$ ($\pm 3.3^{\circ}\text{C}$). Compare the instruments temperature reading to a reference standard and make changes as required.

1. Use the UP or DOWN arrow keys to adjust offset.
2. Press **ENTER** to accept and to return to CALIBRATION menu.



In this example, the temperature measured by the probe is 75.3°F and the reference temperature is 73.6°F. Adjusting the offset by -1.7°F allows the probe match the reference standard.

Calibrate Vel

This calibration option applies to meters and probes capable of measuring air velocity using a thermoanemometer or rotating vane anemometer probe. This is a two part calibration which requires two air velocity settings (low and high). To perform a velocity calibration, a wind tunnel is highly recommended. See [Appendix A](#) for wind tunnel information.

Thermoanemometers

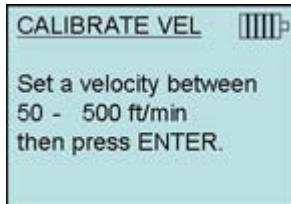
For the low velocity calibration, the tunnel or reference velocity should be between 50 to 500 ft/min (0.254 to 2.54 m/s). For the high velocity calibration, the tunnel should be between 2000 to 10,000 ft/min (10.16 to 50.8 m/s).

Note: Not all TSI thermoanemometers measure up to 10,000 ft/min. Check the velocity specification of your instrument to determine the maximum velocity limit and adjust wind tunnel to suit your instrument.

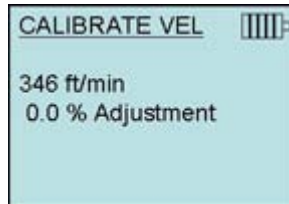
Follow the on screen instructions on setting a tunnel velocity.

1. Use the UP or DOWN arrow keys to adjust offset ($\pm 12\%$) to match tunnel velocity.
2. Press **ENTER** to accept and to advance to next step.

Low Velocity Calibration



Set tunnel within the range indicated

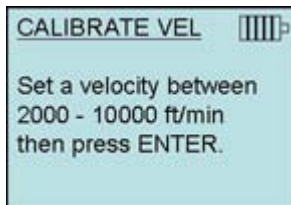


Instrument reading

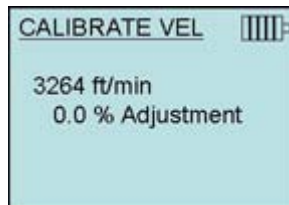


Instrument adjustment using up and down keys. Press **ENTER** to accept.

High Velocity Calibration



Set tunnel within the range indicated



Instrument reading



Instrument adjustment using up and down keys. Press **ENTER** to accept.

Rotating Vane Anemometers

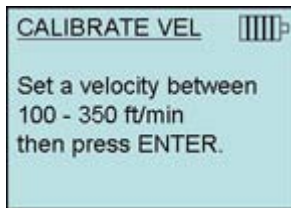
For the low velocity calibration, the tunnel or reference velocity should be between 100 to 350 ft/min (0.51 to 1.78 m/s). For the high velocity calibration, the tunnel should be between 1000 to 3500 ft/min (0.508 to 17.78 m/s).

Note: Not all TSI rotating vanes measure up to 6000 ft/min (30 m/s). Check the velocity specification of your instrument to determine the maximum velocity limit and adjust wind tunnel accordingly.

Follow the on screen instructions on setting a tunnel velocity.

1. Use the UP or DOWN arrow keys to adjust offset ($\pm 12\%$) to match tunnel velocity.
2. Press **ENTER** to accept and to advance to next step.

Low Velocity Calibration



Set tunnel within the range indicated

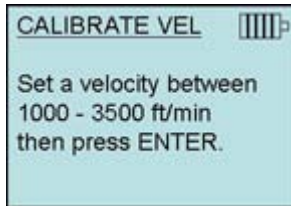


Instrument reading

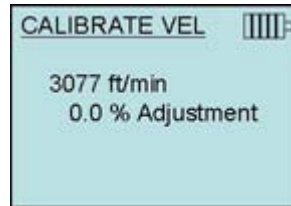


Instrument adjustment using up and down keys. Press **ENTER** to accept.

High Velocity Calibration



Set tunnel within the range indicated



Instrument reading

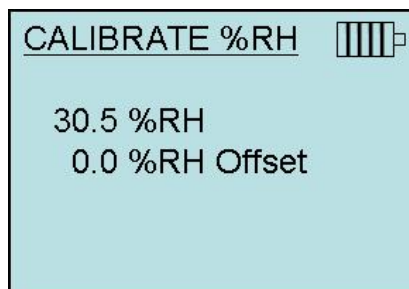


Instrument adjustment using up and down keys. Press **ENTER** to accept.

CALIBRATE %RH

This calibration option applies to meters and probes capable of measuring relative humidity. Compare the instruments relative humidity reading to a reference standard and make changes as required. The Offset can be adjusted $\pm 12.0\%$ RH.

1. Use the UP or DOWN arrow keys to adjust offset.
2. Press **ENTER** to accept and to return to CALIBRATION menu.



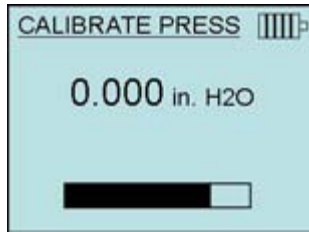
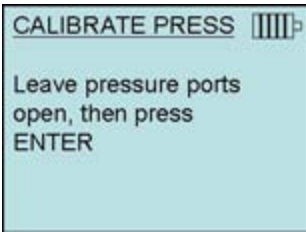
In this example, the relative humidity measured by the probe is 30.5 %RH and the reference humidity is 31.6 %RH. Adjusting the offset by 1.1% allows the probe match the reference standard.

CALIBRATE PRESS

This calibration option applies to meters capable of measuring differential and static pressures. A pressure generator and reference standard are required to perform this multi-point pressure calibration. See [Appendix B](#) for pressure generator and reference standard information. The offset can be adjusted $\pm 12\%$.

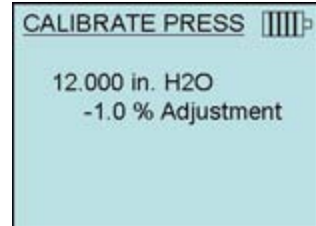
1. Follow the on screen instruction.
2. Use the UP or DOWN arrow keys to adjust offset to match tunnel velocity.
3. Press **ENTER** to accept and to advance to next step.

Zero Pressure Calibration



After pressing **ENTER**, the instrument will begin to take data. A bar graph appears showing the time remaining for the zero calibration.

+12 in. H₂O Pressure Calibration

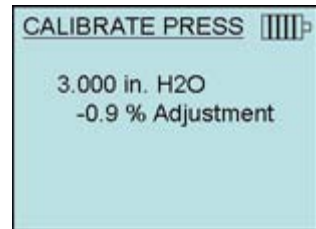
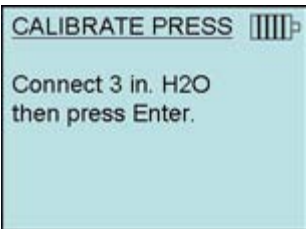


Apply +12 in. H₂O to the “+” port on the meter under test

Instrument reading

Instrument adjustment

+3 in. H₂O Pressure Calibration

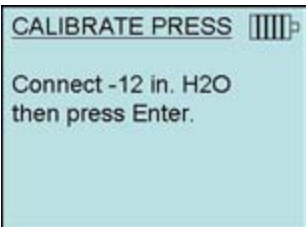


Apply +3 in. H₂O to the “+” port on the meter under test

Instrument reading

Instrument adjustment

-12 in. H₂O Pressure Calibration

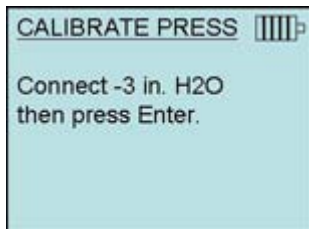


Apply -12 in. H₂O to the “+” port on the meter under test **OR** apply +12 in. H₂O to the “-” port

Instrument reading

Instrument adjustment

-3 in. H₂O Pressure Calibration



Apply -3 in. H₂O to the “+” port on the meter under test **OR** apply +3 in. H₂O to the “-” port

Instrument reading

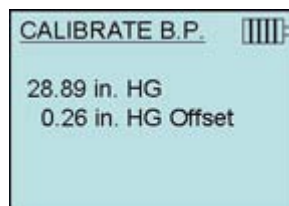
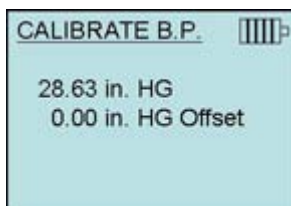
Instrument adjustment

CALIBRATE BP

This calibration option applies to meters capable of measuring barometric pressure. Compare the instruments barometric pressure reading to a reference standard and make changes as required. The Offset can be adjusted ± 6.0 in.Hg. (20 kPa).

*Note: Do **not** connect tubing or apply pressure to the instrument ports, the negative port on the meter must be open to atmosphere.*

1. Use the UP or DOWN arrow keys to adjust offset.
2. Press **ENTER** to accept and to return to CALIBRATION menu.



In this example, the barometric pressure measured by the instrument is 28.63 in. Hg and the reference pressure is 28.89 in. Hg. Adjusting the offset by 0.26 allows the instrument match the reference standard.

CALIBRATE CO₂

This calibration option applies to meters and probes capable of measuring CO. A probe calibration collar, zero calibration gas, span calibration gas, gas regulator and tubing are required to perform the calibration. The gas regulator used to control the flow should be capable of providing 0.3 L/min. Follow the on-screen instructions to complete the calibration.

Requirements

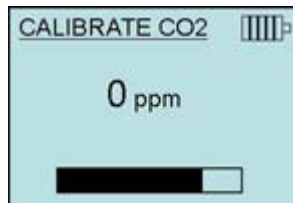
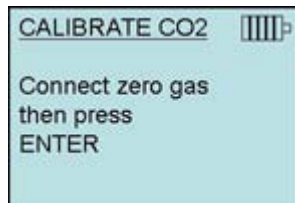
- Probe calibration collar p/n 801679
- Gas regulator (0.3 L/min)
- Tubing 0.250 in. (6.35 mm) OD, 0.125 in. (3.175 mm) ID
- Zero calibration gas
- Span calibration gas, 5000 ppm maximum

Step 1 – Slide calibration collar onto probe

Step 2 – Connect tubing to the calibration collar

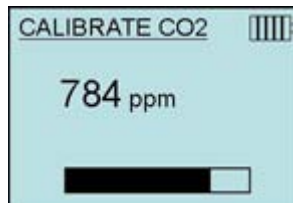
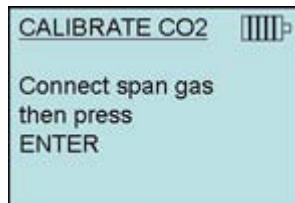


Step 3 – Zero Calibration



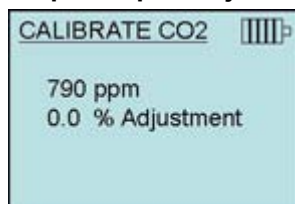
After pressing **ENTER** with the zero calibration gas connected, the instrument will begin to take data. A bar graph will appear showing the time remaining.

Step 4 – Span Calibration

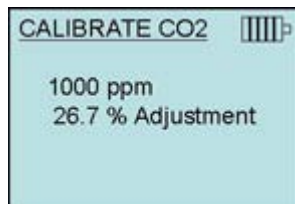


After pressing **ENTER** with the span calibration gas connected, the instrument will begin to take data. A bar graph will appear showing the time remaining.

Step 5 – Span Adjustment



Once the countdown is complete, the CO₂ concentration as measured by the probe is displayed along with the percent of adjustment.



In this example, the span gas is rated at 1000 ppm. Use the UP or DOWN arrow keys to adjust offset to match the span gas concentration. Press **ENTER** to accept and to return to the CALIBRATION menu.

CALIBRATE CO

This calibration option applies to meters and probes capable of measuring CO. A probe calibration collar, zero calibration gas, span calibration gas, gas regulator and tubing are required to perform the calibration. The gas regulator used to control the flow should be capable of providing 0.3 L/min. Follow the on-screen instructions to complete the calibration.

Requirements:

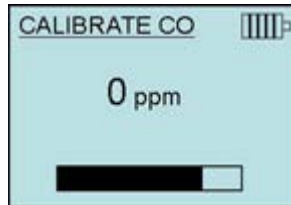
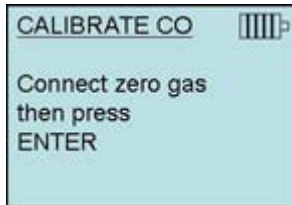
- Probe calibration collar p/n 801679
- Gas regulator (0.3 L/min)
- Tubing 0.250 in. (6.35 mm) OD, 0.125 in. (3.175 mm) ID
- Zero calibration gas
- Span calibration gas, 500 ppm maximum

Step 1 – Slide calibration collar onto probe

Step 2 – Connect tubing to the calibration collar

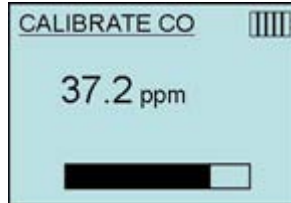


Step 3 – Zero Calibration



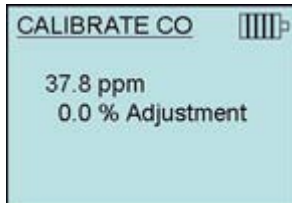
After pressing **ENTER** with the zero calibration gas connected, the instrument begins to take data. A bar graph will appear showing the time remaining.

Step 4 – Span Calibration

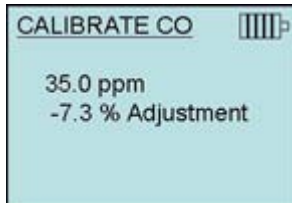


After pressing **ENTER** with the span calibration gas connected, the instrument begins to take data. A bar graph will appear showing the time remaining.

Step 5 – Span Adjustment



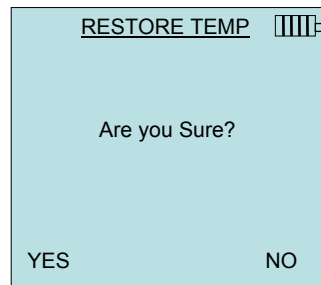
Once the countdown is complete, the CO concentration as measured by the probe is displayed along with the percent of adjustment.



In this example, the span gas is rated at 35 ppm. Use the UP or DOWN arrow keys to adjust offset to match the span gas concentration. Press **ENTER** to accept and to return to the CALIBRATION menu.

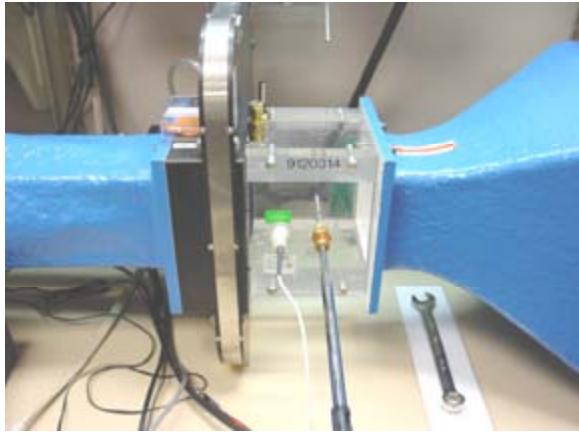
RESTORE FACTORY CAL

This option resets the field calibration for any measurement parameter back to the last factory calibration. To restore the last factory calibration any measurement parameter, the probe must be attached to the meter on models with detachable probe.



Appendix A

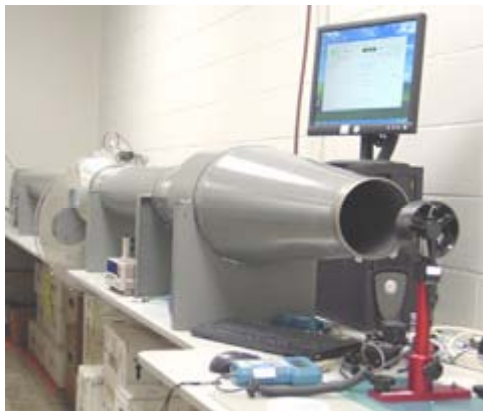
Wind Tunnels used for Velocity Calibration for Thermoanemometers and Rotating Vane Anemometers



TSI Certifier® Model 8392

The TSI Certifier® wind tunnel is a closed wind tunnel used to calibrate thermoanemometer probes. The Certifier® wind tunnel uses interchangeable orifice plates and a differential pressure standard to measure the tunnel air velocity. Tunnel velocity is adjusted using a motor speed controller.

The probe is centered in a 4" x 4" (101.6 mm x 101.6 mm) clear tunnel section and is locked down in place. This ensures consistent placement and orientation when a thermoanemometer is returned for annual calibration.



Airflow™ Instruments Open Jet Wind Tunnel (OJWT)

The Airflow™ Instruments open jet wind tunnel can be used to calibrate thermoanemometer or rotating vane anemometer probes. The outlet is designed to produce a jet of laminar air at the exit of the tunnel.

Rotating vane anemometers are generally mounted at 3" (76 mm) from the tunnel outlet for velocities below 150 fpm (0.762 m/s), and 6" (152 mm) from the tunnel outlet for velocities above 150 fpm (0.762 m/s).

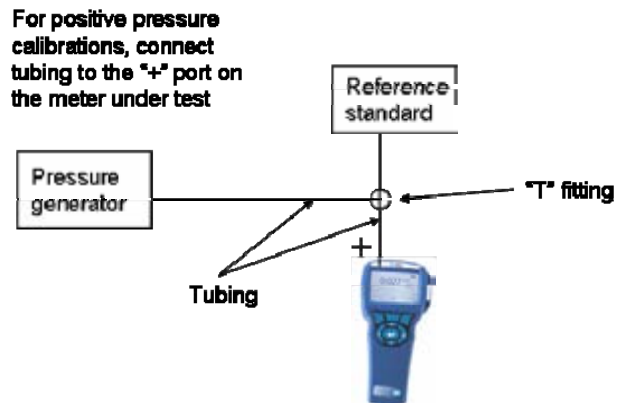
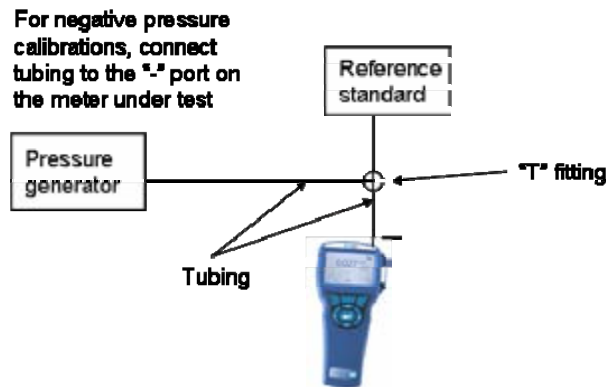
Appendix B Pressure Calibration Fixture

A pressure generator, reference standard, and tubing are required to perform this multi-point pressure calibration. A basic system could use a squeeze bulb and shut off valve for the pressure generator, and the reference standard could be a second manometer with equal or greater accuracy that has been recently calibrated.

Connect a piece of tubing to the pressure generator and put a T-shaped fitting at the other end of the tubing. Connect two more pieces of tubing to the T-shaped fitting. One piece will be connected to the instrument and the other to the pressure reference standard.

Requirements

- Pressure generator
- Tubing 0.3125 in. (7.938 mm) OD, 0.1875 in. (4.763 mm) ID
- T-fitting
- Pressure reference standard



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Contact your local TSI Distributor or visit our website www.tsi.com for more detailed specifications.