

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair or calibration,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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2. Fill in the ambient barometric pressure and ambient temperature in the space provided on the Calibration Report. Using the "K" formula on the sheets and a calculator, figure out the K factor. Take each value in column 2 and multiply it by K and write the values in column 3.

Column 3 is the differential pressures that will correspond to the given flow rates in column 1. The values in column 3 will be used in the wind tunnel setup. The top part of a calibration report is shown on the next page. If you do not have a barometer, refer to **Barometer Pressure Calculations**.

3. Turn on the electronics box. If you need to zero the display, press the TARE button (on the Deluxe Electronics Box the only display that is zeroed is the Differential Pressure display).
4. Turn on the motor by flipping on the ON/OFF switch and turning the potentiometer slowly clockwise and increase the motor speed until the actual differential pressure in column 3 is achieved.

At high speed, you will notice that the differential display tends to jump around a little which makes it tough to get the exact same ΔP as indicated in column 3. Refer to Appendix A for this effect.

5. Record the velocity from the air probe under calibration in column 4.
6. Continue increasing the flow rates until you have covered the complete range you wish to calibrate.

CALIBRATION REPORT

Report Number: _____ Correction Factor: $K = (29.92 \text{ P}) \times (460 / 530) =$ _____
 Serial Number: _____ Where Test is Atmospheric Conditions: _____
 Model Number: _____ Barometric Pressure = _____ (in Hg)
 Range: _____ Test Pressure = _____ (P)
 Date Calibrated: _____
 Due Date: _____

STANDARD	ACTUAL = P_g (K)		UNIT UNDER TEST
VELOCITY (FP)	P_g (mmHg)	P_a (mmHg)	
column 1	column 2	column 3	column 4

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Differential Pressure Fluctuation Errors

To determine the ΔP that corresponds to the desired flow rate use the following formula:

$$P_2 = P_1 \left[\frac{V_2}{V_1} \right]^2$$

where: P1 is the delta P corresponding to velocity 1

P2 is the delta P corresponding to velocity 2

V1 is a known velocity from the Calibration tables

V2 is a desired velocity not listed in the Calibration tables

Sometimes a given delta P is observed and you would like to know what flow rate it corresponds to (use the following formula):

$$V_2 = V_1 \sqrt{\frac{P_2}{P_1}}$$

where: P1 is the known actual delta P from column 4 in tables

P2 is the measured ΔP

V1 is the velocity from the tables corresponding to ΔP_1

V2 is the velocity that corresponds to ΔP_2 .

Barometric Pressure Calculations

Barometric pressure will affect the air density which influences the velocity readings. The deluxe electronics box will give the barometric pressure reading directly to you. If you do not have a barometer and wish to correct for the barometric pressure, an airport or a local weather station can provide a standard barometric reading. Please note that the reading they give you is standardized to sea level and 70°F.

The following correction formula can be used to determine the actual pressure at your location:

$$BP_a = BP_s \left(e^{\frac{-ALT}{53.3 \times T}} \right)$$

Where:

BP_a = Actual barometric pressure

BP_s = Standard barometric pressure

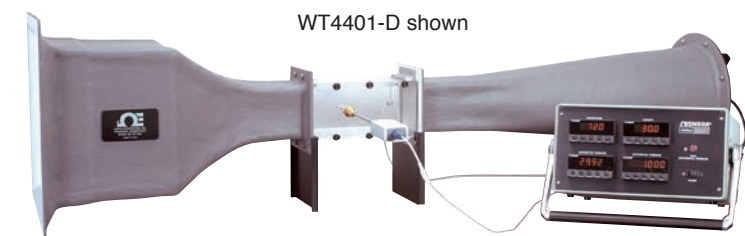
ALT = Altitude above sea level

T = Temperature in Rankine

53.3 ft-lbf/lbm-R = Specific air constant

QUICK START

For complete product manual:
www.omega.com/manuals/manualpdf/M1776.pdf



WT4401-D shown

WT4401-S and WT4401-D

Benchtop Wind Tunnels

OMEGA

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U.S.A.:

Servicing North America:

OMEGA Engineering, Inc., One Omega Dr.
 P.O. Box 4047, Stamford, CT 06907-0047 USA
 Toll-Free: 1-800-826-6342 (USA & Canada Only)
 Customer Service: 1-800-622-2378 (USA & Canada Only)
 Engineering Service: 1-800-872-9436 (USA & Canada Only)
 Tel: (203) 359-1660 Fax: (203) 359-7700
 e-mail: info@omega.com

For Other Locations Visit omega.com/worldwide

The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.
WARNING: These products are not designed for use in, and should not be used for, human applications.

Using This Quick Start Manual

Use this Quick Start Manual with your WT4401-S or WT4401-D benchtop wind tunnel for quick installation and basic operation. For detailed information, refer to the User's Guide (Manual # M1776).

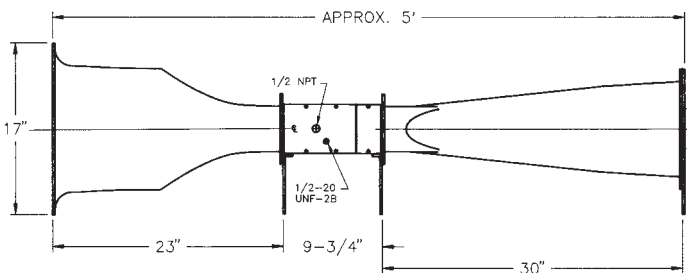
PRECAUTIONS:

A wind tunnel's performance can be severely diminished if not used with the following considerations in mind.

- Do not use the wind tunnel in small rooms with less than 1,800 cubic feet. The air flow creates currents that undermine the wind tunnel's accuracy.
- Avoid locating the intake and exhaust toward open windows, doorways or corridors where people are walking. The effect of air current changes across the intake has a severe effect on the flow rate changing in the wind tunnel.
- Locate the exhaust towards the largest open area of the room to minimize room air currents. Naturally the higher the flow rate, the more chance of creating currents exists.

General Information

The WT4401-S and WT4401-D wind tunnels are designed to give a uniform flow rate over a 4 x 4" test cross section. A powerful 12 amp motor varying from 0 to 10,000 RPM is adjusted to give a particular flow rate by a precision motor control unit. Once a known flow rate is established the air probe under test is read or calibrated. Each wind tunnel is supplied with NIST traceable certificates. The uniform flow rate is determined by monitoring a differential pressure between taps (tubing connections) provided. OMEGA offers a complete line of differential pressure transducers. The one model most commonly used with this wind tunnel is model PX657-5DI. Panel meters and bench top meters also come with the wind tunnel in comprehensive electronics boxes.



Dimensions

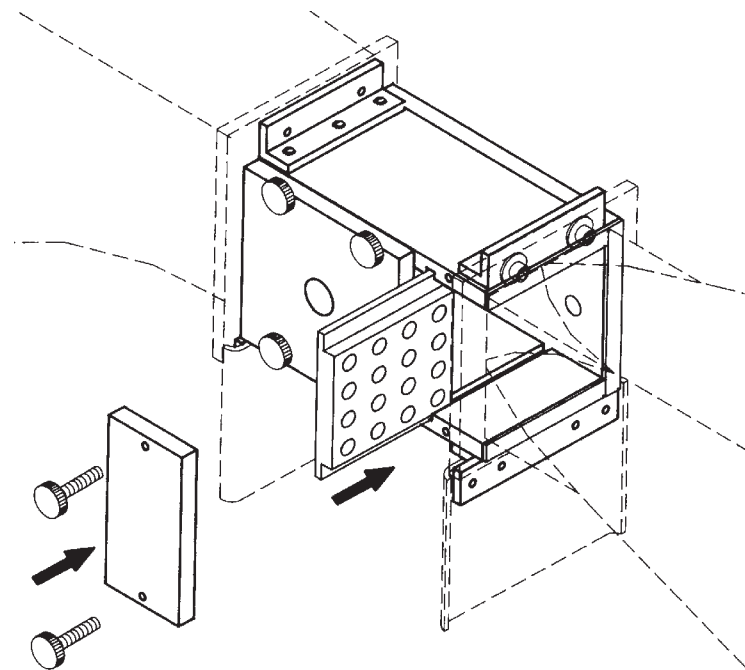
Setup Procedure

WIND TUNNEL CONFIGURATION	FLOW RANGES	ACCURACY
No restrictive plate used	1000 to 7500 fpm	1% reading
Restrictive Plate A used	250 to 1500 fpm	2% reading
Restrictive Plate B used	25 to 300 fpm	2% reading

Flow Ranges

After determining which flow range you wish to calibrate at, and whether you need a restrictive plate, go through the following procedure to install it or remove it.

1. Remove two thumbscrews and remove the small plexiglass cover.
2. Inspect the gasket around the four sides of restrictive plate first. The gasket should provide a good seal when the plate is inserted into the slots. If not, replace it. It would be a good idea to have extra gaskets on hand.
3. Slide restrictive plate into the slots in the center of the wind tunnel. Keep the flat side upstream. Refer to the "Restrictive Plate Placement" diagram for the proper orientation of the restrictive plate. Or remove the plate if you don't need it.
4. Replace plexiglass cover and screws.



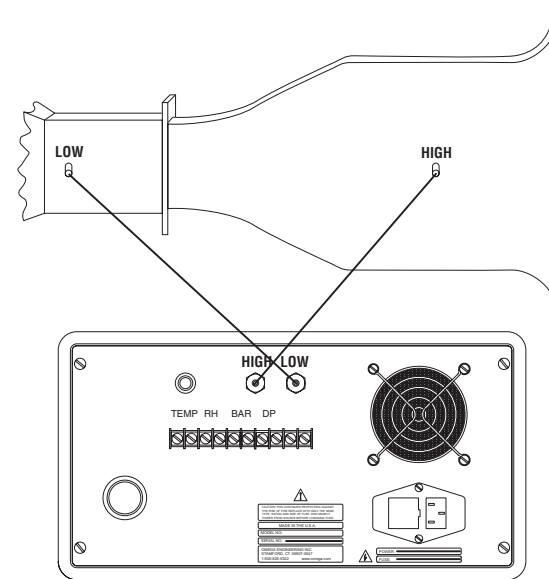
Restrictive Plate Placement

Installing the Wind Tunnel

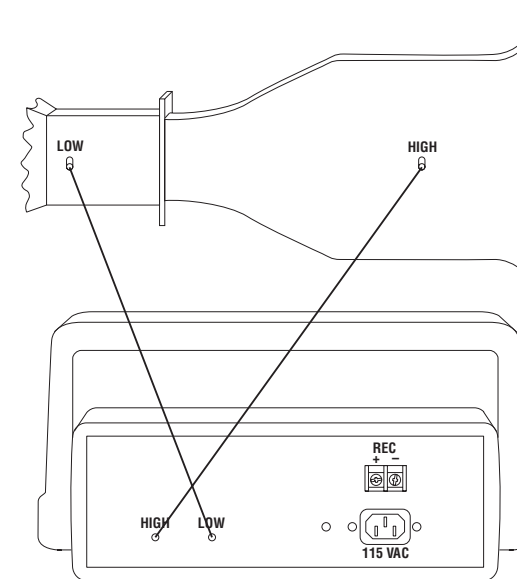
1. After unpacking the box, place the wind tunnel on a level table top. Refer to the Precautions on how to select the correct size room and how to orient the wind tunnel correctly in the room.

2. Set up the motor controller. To do this, examine that the ON/OFF switch on the controller box is in the OFF position and be certain that the potentiometer is fully counter-clockwise. Connect the two elongated connectors together to hook up the motor and plug the motor controller into a live 120VAC outlet. **DO NOT TURN ON THE CONTROLLER.**

3. Place the electronics box next to the tunnel. Attach the two (2) pieces of tubing from the wind tunnel to the rear of the electronics box as shown in the following diagram. Also attach the power cord to the rear of the box. **DO NOT TURN ON THE ELECTRONICS BOX YET EITHER.**

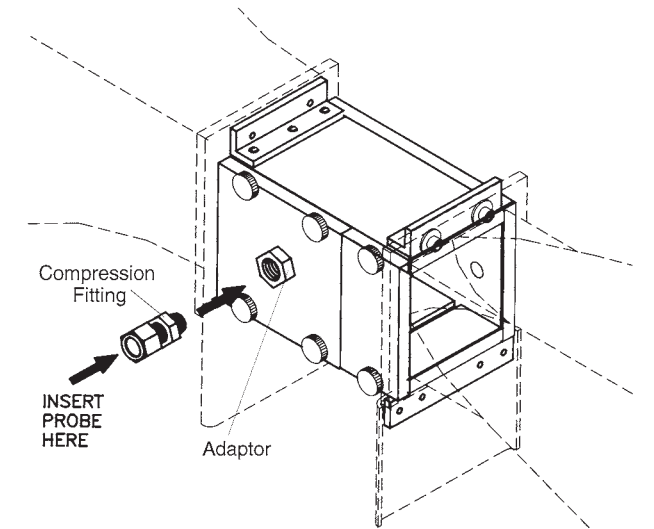


Tubing Placement With Deluxe Electronic Box And Wind Tunnel



Tubing Placement With Deluxe Electronic Box And Wind Tunnel

4. Using the compressing fittings provided, mount the probe to be calibrated in the wind tunnel. Some probes have directional air flow for upstream and downstream sides. Make sure the probe is installed without any leaks. Refer to the following diagram.



Probe Placement

Operating Instructions

WARNING

Always keep your original calibration reports in good, clean condition for future copying. Make duplicate copies of the calibration reports you desire.

The differential pressures recorded in column 2 of the calibration report are at lab conditions (ΔP_s). Standard conditions are at 70°F (21.1°C) and 29.92 in Hg. Since your test will not be at the same conditions you need to calculate what the actual differential pressures (ΔP_a) will be during your operating conditions. A correction factor for air density (K) needs to be determined.

1. Supplied with the wind tunnel are Calibration Report sheets. Your wind tunnel can be used in different applications: with no Restrictive Plate, with Restrictive Plate A or with Restrictive Plate B. Each pair of sheets for each plate style is further broken down to two different units of measure – feet per minute and meters per second. Examine the differences between the sheets and obtain the applicable Calibration Report sheet for your application and photocopy it.