Ventilation Testing/Balancing

Model 8371
AccuBalance® Air Capture Hood

Operation and Service Manual

1980335, Revision C
October 2002

TSI®

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AccuBalance®
Air Capture Hood

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Knowing that inoperative or defective instruments are as detrimental to TSI as they are to our customers, our service policy is designed to give prompt attention to any problems. If any malfunction is discovered, please contact your nearest sales office or representative, or call TSI's Customer Service department at (651) 490-2811 or (800) 874-2811.

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About this manual

This manual explains how to set up, operate and maintain the Model 8371 ACCUBALANCE® Air Capture Hood. Read it thoroughly before using the instrument.

Formatting and Typography

Note that step-by-step instructions are numbered in boldface type: **1**, **2**, **3**, etc., set flush-left against the margin.

References to the front panel keys on the ACCUBALANCE, along with the instrument's displayed readout, are represented in this manual by the typeface called Helvetica Narrow. In addition to the different typeface, displayed messages appear in quotes.

When reference is made to other sections of the manual, the section title is italicized.

Example: The "SAMPLE" message will appear along with a flow value after you have activated the SAMPLE button (from *Display* in Chapter 1).

HELP!

If you need technical assistance with this instrument, have questions about the manual, or your air capture hood needs repair or recalibration please call TSI's Environmental Measurements and Control Division at (651) 490-2811 or (800) 874-2811. Product application notes are designed to provide more information on the product to the user. Application notes, as well as other related material, can be obtained by calling TSI or by visiting the TSI web site at http://www.tsi.com.

Introduction

The TSI Model 8371 ACCUBALANCE® is an instrument designed to measure the air flow from diffusers and grilles or the air flow entering exhaust outlets. The ACCUBALANCE is lightweight and easy to use. The instrument can display the measured air flow in four different units: standard cubic feet per minute (SCFM), standard liters per second (Std l/s), standard cubic meters per hour (Std m^3/hr), and standard cubic meters per minute (Std m^3/min). All readings may also be displayed in actual flow conditions.

The ACCUBALANCE consists of a fabric hood, a molded plastic base which contains an electronic meter, and a flow sensing manifold located within the base. Air flowing through the hood is measured by a hot-film sensor located in the central hub of the flow sensing manifold. The twenty-four pairs of flow sensing ports in the manifold are strategically located so that the ACCUBALANCE provides the highest degree of measurement accuracy, even in non-uniform flow conditions.

The ACCUBALANCE is temperature-compensated to display a standard flow rate: SCFM, Std l/s, Std m^3/hr, and Std m^3/min. Standard flow rate is defined as the volumetric flow rate at standard conditions of 70°F (21.1°C) and 14.7 pounds per square inch (760 mmHg) barometric pressure. Standard flow rate is the measurement used most often in ventilation applications.

Chapter 1

Set Up

This chapter guides you through unpacking, setting up, and getting started using your ACCUBALANCE. See Chapter 2 for a detailed description of all operating features.

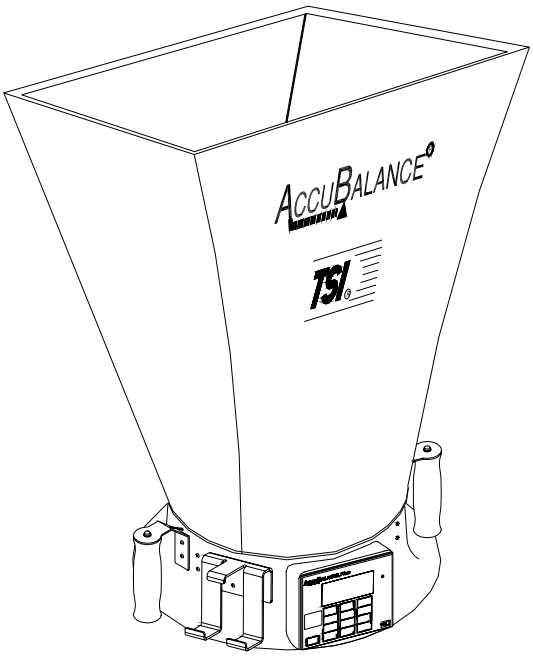


Figure 1: The ACCUBALANCE

Unpacking

Carefully unpack the instrument and accessories from the carrying case. Check the individual parts against the list of components in Tables 1 through 3. If any are missing or damaged, notify TSI immediately.

Table 1 List of components

Qty	Item	Part No.
1	Model 8371 base	N/A
1	2 ft x 2 ft (610 mm x 610 mm) hood fabric	1307060
6	Frame support poles	1081390
4	2 ft (610 mm) frame tubing*	1081262
6	Right angle tubing connectors*	1081584
1	Battery holder	1081279
4	C-size batteries	1208018
1	Battery compartment cover	1081458
1	Carrying case	1319067
1	Operation and Service Manual	1980335

*Four 2 ft frame tubings and four of the right angle connectors are shipped assembled inside the top of the hood fabric.

Table 2 List of components: -3 Hood Kit (adds 2 hoods to the base kit)

Qty	Item	Part No.
1	2 ft x 4 ft (610 mm x 1220 mm) hood fabric	1801065
1	1 ft x 4 ft (305 mm x 1220 mm) hood fabric	1801066
6	2 ft (610 mm) frame tubing	1081262
4	1 ft (305 mm) frame tubing	1081260
6	Right angle tubing connectors	1081584
6	Straight tubing connectors	1302833

Table 3 List of components: -5 Hood Kit (adds 4 hoods to the base kit)

Qty	Item	Part No.
1	2 ft x 4 ft (610 mm x 1220 mm) hood fabric	1801065
1	1 ft x 4 ft (305 mm x 1220 mm) hood fabric	1801066
1	1 ft x 5 ft (305 mm x 1525 mm) hood fabric	1801067
1	3 ft x 3 ft (915 mm x 915 mm) hood fabric	1801068
6	2 ft (610 mm) frame tubing	1081262
4	1 ft (305 mm) frame tubing	1081260
6	Right angle tubing connectors	1081584
6	Straight tubing connectors	1302833
2	1x tube connectors	1081580

Included with every manual is a registration card. Look for yours at the front of this manual. Please complete and mail it promptly; it allows TSI to inform you of product updates. You may also register on line by visiting the TSI web site.

Parts Identification

Before proceeding with assembly and use of the ACCUBALANCE, please familiarize yourself with the various parts of the instrument. Refer to tables 1 through 3 for part descriptions and Figure 2 for general location of major items.

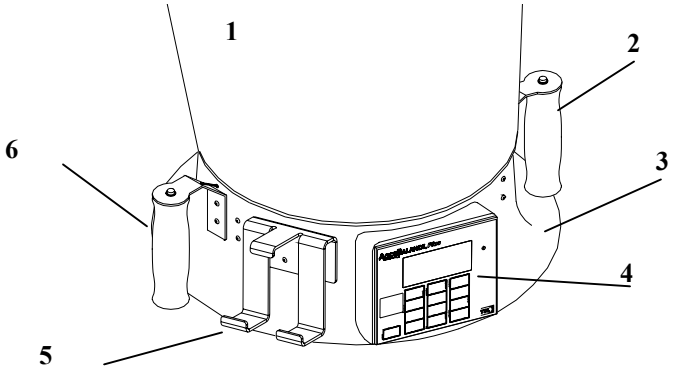


Figure 2: ACCUBALANCE components

1 Fabric hood - Basic hood assembly is covered later in this chapter, other hoods are discussed in Chapter 2.

2 Right handle with SAMPLE button - used for capturing information on the display.

3 Meter base

4 Electronic meter and display - Detailed keypad functions are covered in Chapter 2.

5 Printer bracket - Allows the Model 8925 to be attached to the ACCUBALANCE base for ease of use and printing of data.

6 Left handle with PRINT button - Used to print that which is on the display value to the portable printer.

Display

Each time the ACCUBALANCE is turned on, all segments of the display will be shown momentarily. Below is a list of items that will appear on the display and their use.

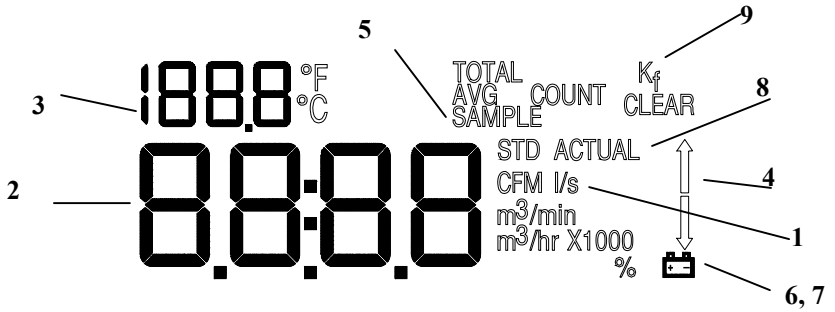


Figure 3: Display of the Model 8371

1 Flow units: CFM (cubic feet per minute), l/s (liters per second), m^3/hr (cubic meters per hour), and m^3/min (cubic meters per minute). The ACCUBALANCE indicates flow already corrected to "standard" conditions. Actual flow conditions can be shown by pressing the ACTUAL/STANDARD key (See Chapter 2 for more detail operation)

2 Flow value: Large digits. See specifications for range and resolution.

3 Message area: Small digits.

4 Flow direction arrows: Indicates if supply or return air flow calibration is being utilized by the ACCUBALANCE.

Notice:	Be sure this arrow points in the direction of flow through the ACCUBALANCE, otherwise the measurements made will be inaccurate. To change the direction of the arrow, press the RETURN/SUPPLY key.

5 "SAMPLE" will appear every time you press the SAMPLE button or the button on the top of the right handle.

6 "% + -" will appear along with a value on the display during power-up to indicate the percent of battery life remaining.

7 The + - symbol will flash when the batteries have only about 10% life remaining. When the battery is too low to power the instrument, "LO + -" is displayed momentarily before the instrument is automatically turned off.

8 "STD" or "ACTUAL" will be displayed at all times. "STD" refers to readings that are based on standard conditions of 29.92 in.

Hg (760 mm Hg) and 70 °F (21.1 °C). "ACTUAL" refers to readings that are converted to local conditions based on temperature and barometric pressure. (See Chapter 2 for more details.)

9 "K_f": K factor symbol to indicate that the readings have an adjustment factored in.

Display Units

The ACCUBALANCE is shipped with cubic feet per minute (CFM) as the default flow unit (unless the metric version was ordered). If you wish to change the units to l/s (liters per second), m^3/hr (cubic meters per hour), or m^3/min (cubic meters per minute), see *Changing **DIP** Switch Settings* in Chapter 2.

Keypad

Below is a drawing of the keypad, Figure 4, for the Model 8371. The keys are referenced in the *Basic Operation* section of this chapter and in *Chapter 2 - Operations in More Detail.*

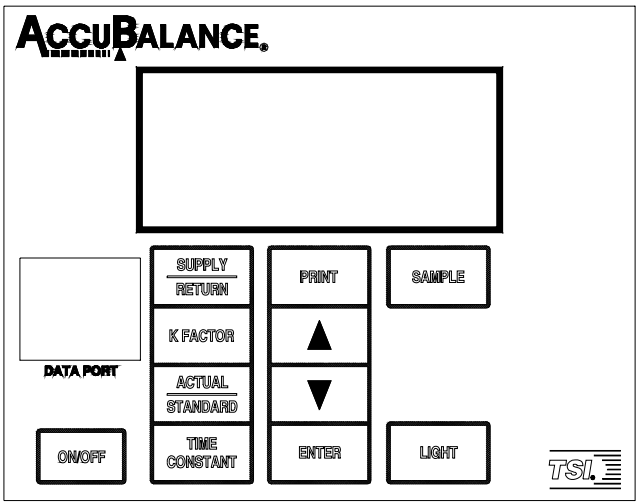


Figure 4: Keypad for the Model 8371

Preparing the Instrument for Use

Installing the Batteries

The ACCUBALANCE requires four C-size batteries to operate. For your convenience, four alkaline batteries are included with the ACCUBALANCE.

To install the batteries, follow these three steps:

1 Remove the battery cover located behind the electronic meter on the inner side of the ACCUBALANCE base. To remove the battery cover, pull up on the latches located on the top and bottom of the cover.

2 Place batteries in the battery holder located inside the battery compartment. Follow the illustration on the battery holder for correct battery orientation.

3 Replace the battery cover. Notice that the battery cover is designed to fit only one way, with the tab pointing toward the fabric. Engage the latches by pressing down on them.

Notice: Remove batteries from the battery compartment during shipping, travel and transport. Jostling may jar the batteries loose and cause damage to the ACCUBALANCE.

If fresh, new alkaline batteries are used, the value will be near 100-percent when first turned on. Other batteries, such as NiCd batteries, may show a lower value even when they are fully charged.

Notice: The percent power remaining will not be accurate for NiCd batteries because they do not discharge linearly with power use.

Hood Assembly

The ACCUBALANCE is shipped from the factory partially assembled with the 2 ft x 2 ft nylon hood attached to the base. If you wish to use another hood size, see *Changing Hoods* in Chapter 2.

To complete the assembly of the 2 ft x 2 ft hood, follow these six steps:

1 Place the base of the ACCUBALANCE on the floor.

2 Lift the top of the fabric. Insert one end of a support pole into its pole mount in the base of the ACCUBALANCE. There is a cup in each corner of the frame to accept the other end of each support pole. Helpful Hint: This step is made simpler by temporarily resting the opposite corner of the fabric top on a table edge.

3 Grasp the support pole. Bend the pole slightly to insert the top end of the pole into the support pole cup located in the corner of the fabric frame as shown in Figure 5.

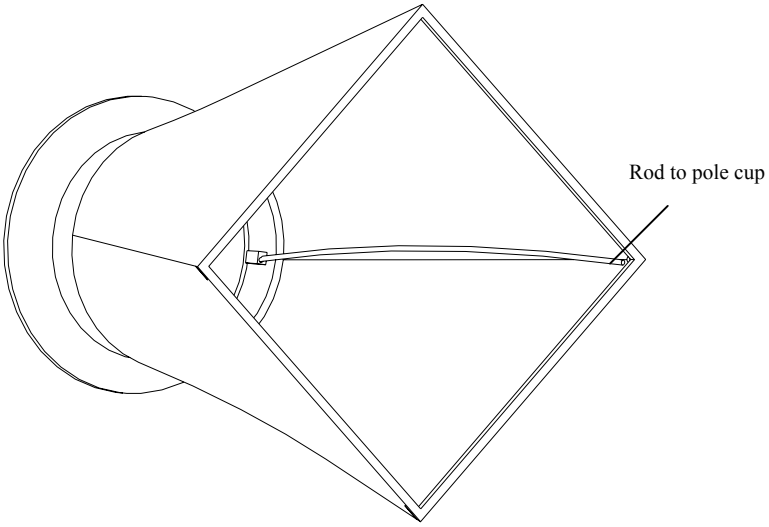


Figure 5: Installing a support pole

4 Insert the second support pole into the pole mount on the opposite side of the ACCUBALANCE base.

5 Repeat step 3 for the second support pole.

6 Repeat steps 4 and 5 for the remaining two support poles.

Basic Operation

Start-Up

Press the ON/OFF button on the meter to turn on the power. The display will initially indicate the percent of battery power remaining.

During start-up the ACCUBALANCE performs a self test of its electronic functions. If an error is found, an error message will appear on the display. Refer to Chapter 4, *Troubleshooting*, if an error message appears. If no errors are found, the ACCUBALANCE will proceed to the continuous measurement mode.

Selecting Flow Direction

Each ACCUBALANCE is calibrated for supply and return air separately for increased accuracy. The ACCUBALANCE will assume that air is flowing in the same direction as the arrow on the right-hand side of the display. Be sure this arrow points in the direction of flow through the

ACCUBALANCE, otherwise measurements will be inaccurate. To change the direction of the arrow press the RETURN/SUPPLY button.

Taking a Flow Measurement

You are now ready to start measuring flow rates. First, turn on the ACCUBALANCE and select the appropriate flow direction. For measuring supply air flow, the arrow must point down away from the hood fabric; for return air flow measurements, the arrow must point up toward the hood fabric.

Press the top of the ACCUBALANCE against the perimeter edge of the diffuser or grille so as to form a seal.

The ACCUBALANCE will begin to display values on a continuous basis. When you are ready to read a value press the SAMPLE button or the button on the top of the right handle. The display will show the word "SAMPLE" for the length of time as determined by the TIME CONSTANT. When the sample is complete the unit will beep and the value will remain on the display until SAMPLE is pressed again and the meter will return to continuous measuring mode.

If the readings are fluctuating, adjust the TIME CONSTANT to a slower value. Changing the TIME CONSTANT is detailed in *the Keypad Function Section* of Chapter 2

When making a flow measurement, keep objects out of the flow path at the base of the ACCUBALANCE (one foot clearance minimum). However, it is acceptable to have a hand supporting the air capture hood at the bottom of the base.

Notice:	You ***must*** keep the ACCUBALANCE in place during the entire sample interval and until the time-averaged measurement appears on the display.

Turning the ACCUBALANCE Off

To turn off the ACCUBALANCE, simply press the ON/OFF button.

Automatic Shut-off

The ACCUBALANCE will automatically shut itself off if no switches or buttons have been pressed for 10 minutes. This feature minimizes accidental loss of battery power. This feature may be disabled by changing the factory settings. This is discussed in the *DIP Switch Setting* section of the next chapter.

Chapter 2

Operations in More Detail

This chapter presents more detail on the various features of the ACCUBALANCE and explains how to change fabrics and assemble different hood sizes. The ACCUBALANCE will acknowledge that a key has been pushed by producing a beep. This beep can be disabled as explained in the *DIP Switch Settings* Section of this chapter.

Keypad Functions

ON/OFF
Press to toggle between having the instrument on and off.

SUPPLY/RETURN
Press to toggle between measuring supply flow and return flow. The arrows on the display will indicate the direction of the flow (▲ for return, ▼ for supply).

K FACTOR
Volume measurements with the ACCUBALANCE is a means to take readings more quickly than methods used in the past. However, all capture hood devices are affected by various types of diffusers, means of connecting the diffuser to the duct work, and the type of duct work. The ACCUBALANCE is calibrated by attaching it to a 2 foot x 2 foot, 4 way throw diffuser. In some circumstances it is necessary to traverse the ductwork to determine the "true" flow value. This true value is then compared to the ACCUBALANCE. This comparison is a K Factor or correction factor.

Press the K FACTOR button to toggle the K factor on or off. The "K_f" symbol is shown on the display when the K factor is being used in the calculation. Press and hold the K FACTOR button until the current K factor is displayed. Release the button and use the ▲ or ▼ button to change the factor. Press ENTER to accept it and return to measuring mode. The range of K factors allowed will be 0.1 to 2.00. The default value is 1.00.

ACTUAL/STANDARD
Press the ACTUAL/STANDARD button to toggle between displaying actual and standard flow rate. "STD" or "ACTUAL" will light up on the display (standard is the default). Press and hold this button to view, enter, or change the barometric pressure and ambient temperature. When the button is pressed and held, the barometric pressure entered will be displayed. Release the button, use the ▲▼ buttons to change the value and ENTER to accept it.

The ambient temperature will then be displayed. Press the ▲ or ▼ button to change the value and ENTER to accept it and return to measuring mode. Ambient temperature and barometric pressure can also be set by pressing either ▲▼ when the parameter is displayed during power-up.

TIME CONSTANT
Press to display the current time constant. Press ▲▼ to scroll through the time constant choices, which are 1 s, 3 s, 5 s, 10 s, 15 s, 20 s. Press ENTER to accept choice and return to measuring mode. The default value is 1 s.

PRINT or LEFT HANDLE BUTTON
Press to print the reading on the display to the portable printer.

▲▼
Press to scroll through choices. Press either ▲ or ▼ to set barometric pressure and temperature when they are displayed during power-up. Used in field calibration mode for flow.

SAMPLE or RIGHT HANDLE BUTTON
Press to take a sample averaged over the length of the time constant. "SAMPLE" will flash on the display while the reading is being taken, and then the value and "SAMPLE" will be held on the display until SAMPLE is pressed again, at which time the instrument will return to measuring mode. This also prints the result to the portable printer if connected.

LIGHT
Press to toggle between having the back-lit display turn on and off. When the instrument is turned off, the backlight turns off and does not automatically turn on the next time the instrument is turned on.

Field Calibration
Turn DIP switch 7 to the on position, see DIP *Switch Settings Section* later in the chapter. To adjust the flow value, press both the ▲ and ▼ buttons simultaneously. When "CAL" is displayed, release the buttons. Press either the ▲ or ▼ buttons to change to a desired percentage adjustment and press ENTER to accept it. The percentage adjustment ranges from 0% to plus or minus 12.5%. To use the instrument with the adjusted values, DIP switch 7 must remain in the ON position. All adjustment values and offsets are stored in the instrument and will remain the same until changed again. To return to all factory settings, turn DIP switch 7 off.

Changing Hoods
The ACCUBALANCE is shipped with a 2 ft x 2 ft hood attached to the base. Four other hood sizes are available from TSI and can be purchased separately. Available hood sizes are identified by the dimensions of the

frame structure at the top of the hood and include 2 ft x 4 ft, 1 ft x 4 ft, 1 ft x 5 ft and 3 ft x 3 ft .

To change hood sizes, first remove the hood currently attached to the base. To remove the attached hood, first unlatch the cinch belt where the fabric is attached to the base. Then remove the fabric from its frame structure by peeling back the Velcro® from the aluminum frame tubing. Notice that the fabric stretches around the outside, then up and over the frame structure. The Velcro on the fabric reaches down to mate with the Velcro on the frame structure. Notice also that all Velcro surfaces on the frame tubing face inward. Finally, fold up the fabric you just removed so that it can fit into one of the accessory pockets inside the ACCUBALANCE carrying case. It is a good idea to fold the fabric so that the tag identifying its size remains visible for future reference.

2 ft x 4 ft Hood

To assemble and attach the 2 ft x 4 ft hood, carefully follow these 10 steps:

1 Build the 2 ft x 4 ft frame structure as shown in Figure 6 using six 2 ft aluminum frame tubing pieces, four right-angle tubing connectors, and two straight tubing connectors. Remember to construct the frame so that all Velcro surfaces face in (toward the center of the structure).

Notice: Make sure that all support pole cups in the aluminum frame tubing pieces are facing downward.

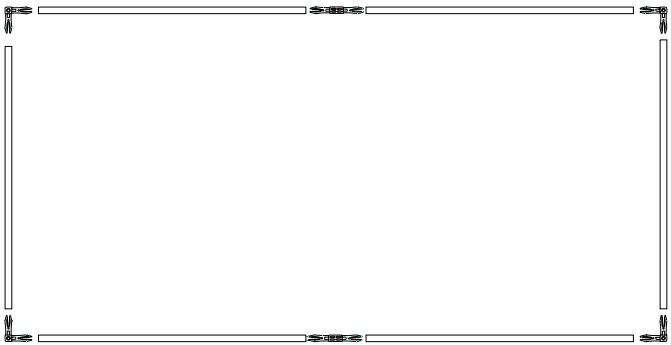


Figure 6: Diagram of 2 ft x 4 ft frame

2 Unfold the 2 ft x 4 ft hood fabric.

3 Insert the frame into the fabric and fasten the fabric to the frame using the Velcro surfaces. The fabric stretches around the outside, then up and over the frame structure. The Velcro on the fabric reaches down to

mate with the Velcro on the inner surface of the frame structure. When completed, the soft rubber gasket material should lie in a straight line along the top surface of all four sides of the frame.

Notice: Be sure to press the Velcro surfaces firmly together. When completed, the hood fabric will be stretched fairly taut and will require good bonding of the fabric to the frame.

4 Stretch the cinch belt at the bottom of the fabric over the lip around the top of the molded plastic base of the ACCUBALANCE. Align the seams of the fabric panels with the pairs of screw heads that hold the four pole mounts to the ACCUBALANCE base. Align so that the cinch belt latch is on the side of the base opposite the electronics meter.

5 Pull the strap at the latch very tight to attach the fabric to the base. Make sure that the strap stays tucked under the protruding lip all around the top of the base. Pay particular attention to where the strap passes the handles.

6 Now it is time to install the support poles. You will find four white marks on the inside top edge of the fabric. These marks identify the location of cups on the underside of the frame tubing that will accept the ends of the support poles.

At this time it is helpful to be near a table or some other thigh-high surface to help hold up the fabric while you install the first support pole.

7 With the base of the ACCUBALANCE on the floor, lift the fabric frame up so that a white mark is directly in front of you. Support the opposite side of the frame structure on a nearby table or other level surface.

Take one support pole and insert one end into its pole mount in the ACCUBALANCE base.

Bend the pole slightly to guide the other end into the corresponding support pole cup located on the underside of the frame near the white mark on the fabric.

8 Repeat step 7 until all four support poles are installed.

9 Now that the hood is assembled and the fabric is stretched tight, it is a good practice to check the rubber gasket around the top edge of the ACCUBALANCE fabric. In order to achieve a good straight alignment

of the rubber gasket along the top of the frame structure, you may need to peel back and re-attach small portions of the Velcro surfaces.

10 Finally, at the corners, tuck the straight rubber gasket flaps under the edges cut at an angle. This will create a virtually leak-free, soft, pliant seal.

1 ft x 4 ft Hood
To assemble and attach the 1 ft x 4 ft hood, carefully follow these 10 steps:

1 Build the 1 ft x 4 ft frame structure as shown in Figure 7 using four 2 ft aluminum frame tubing pieces, two 1 ft aluminum frame tubing pieces, four right-angle tubing connectors, and two straight tubing connectors. Remember to construct the frame so that all Velcro surfaces face in (toward the center of the structure).

Notice: Make sure that all support pole cups in the aluminum frame tubing pieces are facing downward.

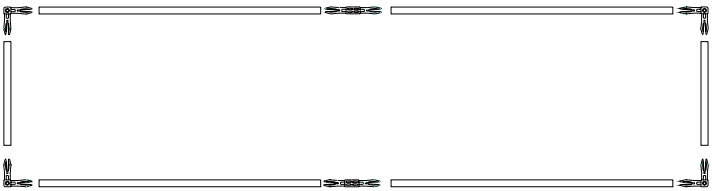


Figure 7: Diagram of 1 ft x 4 ft frame

2 Unfold the 1 ft x 4 ft fabric hood.

Continue with steps 3 through 10, beginning on page 11.

1 ft x 5 ft Hood
To assemble and attach the 1 ft x 5 ft hood, carefully follow these 10 steps:

1 Build the 1 ft x 5 ft frame structure as shown in Figure 8 using four 2 ft aluminum frame tubing pieces, two 1x tube connectors, two 1 ft aluminum frame tubing pieces, and four right-angle tubing connectors. Remember to construct the frame so that all Velcro surfaces face in (toward the center of the structure).

Notice: Make sure that all support pole cups in the aluminum frame tubing pieces are facing downward.

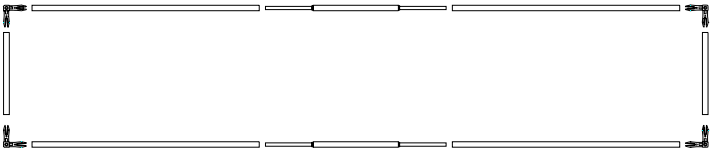


Figure 8: Diagram of 1 ft x 5 ft frame

2 Unfold the 1 ft x 5 ft fabric hood.

Continue with steps 3 through 10, beginning on page 11.

3 ft x 3 ft Hood
To assemble and attach the 3 ft x 3 ft hood, carefully follow these 10 steps:

1 Build the 3 ft x 3 ft frame structure as shown in Figure 9 using four 2 ft aluminum frame tubing pieces, four 1 ft aluminum frame tubing pieces, four right-angle tubing connectors, and four straight tubing connectors. Remember to construct the frame so that all Velcro surfaces face in (toward the center of the structure).

Notice: Make sure that all support pole cups in the aluminum frame tubing pieces are facing downward.

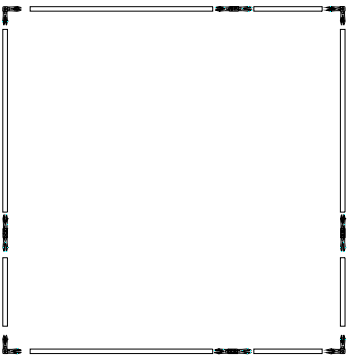


Figure 9: Diagram of 3 ft x 3 ft frame

2 Unfold the 3 ft x 3 ft fabric hood.

Continue with steps 3 through 10, beginning on page 11.

Changing DIP Switch Settings

You can change flow units and time constants by adjusting the settings of the DIP switches located inside the battery compartment. To gain access to

the DIP switches, first turn off the ACCUBALANCE and lay down the instrument with the electronic meter facing down.

Remove the battery compartment cover by pulling up on the two latches. You will see the switches numbered 1 through 8 in the corner of the battery compartment. You may wish to remove or tilt up the battery pack to allow easier access to the switches. The DIP switches are shown in Figure 10.

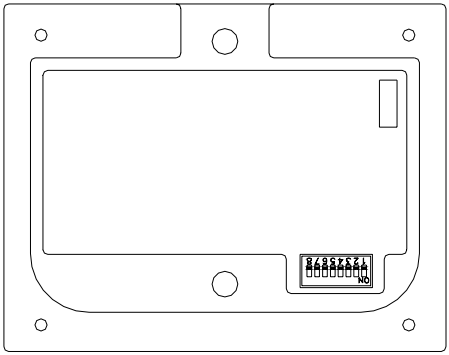


Figure 10: Location of DIP Switches

You may change the switch settings using the tip of a ball-point pen, pencil, compass, small screwdriver, or other small, pointed object. Refer to Table 4 for switch settings.

Table 4: DIP Switch Settings

Switch Number	Setting: Function
1,2	1 OFF, 2 OFF: Flow units = CFM 1 OFF, 2 ON: Flow units = m3/hr 1 ON, 2 OFF: Flow units = l/s 1 ON, 2 ON: Flow units = m3/min
3	OFF: Pressure units = in. Hg ON: Pressure units = mm Hg
4	OFF: Temperature units = °F ON: Temperature units = °C
5	OFF: Auto shut off = on ON: Auto shut off = off
6	OFF: Decimal for fractions ON: Comma for fractions
7	OFF: Field calibration disabled ON: Field calibration enabled
8	OFF: Audible buzzer on ON: Audible buzzer off

Connecting the Optional Printer

To connect the Model 8925 printer to the ACCUBALANCE, locate the Printer Interface Cable (supplied with the optional printer) and connect the 9-pin end labeled "PRINTER" to the printer and the other end to the data port of the ACCUBALANCE. The printer can be attached to the base of the ACCUBALANCE by clipping it into the printer bracket located to the left of the display. The printer can also be easily used by clipping it to the belt of the user. The printer must be set to the same baud rate as the ACCUBALANCE. Always turn the ACCUBALANCE on ***before*** the printer. If the printer prints question marks (??????), asterisks (******), or random characters, reset it by turning it off and then on again. If necessary, refer to the *Model 8925 Portable Printer Operation and Service Manual.*



Caution: This symbol is used to indicate that the data port of the ACCUBALANCE is not intended for connection to a public telecommunications network. Connect the data port only to another RS232 port.

Chapter 3

Maintenance

The ACCUBALANCE is designed for long-term field use. If the ACCUBALANCE is used with reasonable care, it should be able to make precise measurements over a long time period. Some of the components can be cleaned periodically. When cleaning the components, please follow the instructions given below.

Fabric Hood

The hoods can be washed with mild detergent and cold water. When washing the hood, keep the hood away from objects with sharp corners or sharp edges. Careless cleaning may cause damage.

If the fabric gets ripped it should be replaced or repaired. Duct tape can be placed over the rip on both sides of the fabric for temporary repair.

To replace a damaged fabric or to order a different fabric size, contact TSI for replacement fabric information.

If you wish to order a new hood fabric, use the following part numbers shown in Table 5.

Table 5: Hood Fabric Part Numbers

Fabric Hood Size	Part Number
2 ft x 2 ft (610 mm x 610 mm)	800590
2 ft x 4 ft (610 mm x 1220 mm)	800591
1 ft x 4 ft (305 mm x 1220 mm)	800592
3 ft x 3 ft (915 mm x 915 mm)	800593
1 ft x 5 ft (305 mm x 1525 mm)	800594
Frame Kit	1081263

It is recommended that you purchase a frame kit whenever you purchase a hood other than the 2 ft x 2 ft size. The frame kit contains all extra frame tubing and connectors required to build frames for the various size hoods. The frame kit consists of the following parts:

4 pieces 1-foot frame tubing
2 pieces 2-foot frame tubing
6 pieces straight tubing connectors

Meter

The ACCUBALANCE has a built-in electronic flow meter. Do not try to detach the meter from the base. The ACCUBALANCE should be used and stored within the specified temperature range, 32 – 140°F (0-60°C). The meter case, display screen and membrane switch can be cleaned using a damp cloth with mild detergent solution. Do not immerse the meter in water. Wipe the meter dry before use.

Manifold

If you observe the flow sensing taps of the manifold becoming clogged with dust or other material, clean them with a damp cloth. The manifold should be kept in place during cleaning. Do **not** apply excessive forces on the grid of the manifold. If any part of the grid becomes damaged, please contact TSI for repair information.

Cases

If the instrument case or storage case needs cleaning, wipe it off with a soft cloth and isopropyl alcohol or a mild detergent. Never immerse the AccuBalance. If the meter face of the ACCUBALANCE becomes broken, it must be replaced immediately to prevent access to hazardous voltage.

Calibration

TSI recommends an annual calibration for the ACCUBALANCE. For a nominal fee, TSI will calibrate the unit and return it to you with a certificate of calibration and NIST traceability. This 'annual checkup' assures you of consistently accurate readings. To calibrate the ACCUBALANCE, please ship TSI the complete package that includes the meter, the base, the manifold and any fabrics used. Everything should be packed carefully within the ACCUBALANCE carrying case and then inside a proper shipping box, such as the original shipping box.

Ship directly to: TSI, Inc.
ATTN: Customer Service
500 Cardigan Road
Shoreview, MN 55126-3996

Chapter 4

Troubleshooting

Table 6 lists the symptoms, possible causes, and recommended solutions for common problems encountered with the ACCUBALANCE. If your symptom is not listed, or if none of the solutions solves your problem, please contact TSI.

Table 6. Troubleshooting the ACCUBALANCE

Symptom	Possible Causes	Corrective Action
No display	Unit not switched on	Press ON/OFF button
	Low or dead batteries	Replace the batteries
	Dirty battery contacts	Clean the battery contacts
	Battery holder not connected	Plug in battery holder
""flashing on the display	Low battery charge	Replace the batteries.
	Dirty battery contacts	Clean the battery contacts
"0" (Flow is under range)	Trying to read too low a flow	Flow may not be measurable using the ACCUBALANCE
	Object is blocking flow through ACCUBALANCE	Remove obstruction
	Sensor grid tubes are plugged	Clean the tubes
	ACCUBALANCE is not sealing around diffuser	Reposition the ACCUBALANCE to form a seal
"OVER" (Flow is over range)	Trying to read too high a flow	Flow may not be measurable using the ACCUBALANCE

Symptom	Possible Causes	Corrective Action
Flow reading fluctuates badly	The flow is fluctuating	Use a longer time constant
"ERR1" appears	Unit is or was recently in ambient temperature outside of operating temperature Temperature compensation sensor is damaged	Allow unit to stabilize in the operating temperature range of 32 - 140ºF (0 - 60ºC) Return to the factory for service
"ERR2" appears	The flow sensor is giving an erroneous reading	Return to the factory for service
"ERR3" appears	The ACCUBALANCE has detected a calibration fault	Return to the factory for service

Appendix A

Back Pressure

It is commonly known that an air capture hood may induce a back pressure. In general, back pressures are caused by restrictions in the flow path as well as frictional pressure losses. In order to improve accuracy and sensitivity, all air capture hoods incorporate a contracted flow section. The contracted section restricts the flow through the hood which induces a back pressure. A hood having a more abrupt contraction than the ACCUBALANCE may induce greater back pressure due to the turbulence caused by the abrupt contraction. In addition any apparatus within the hood, such as supporting poles and the flow manifold, also induces some frictional pressure drop.

Back pressure may cause slight errors in the flow measurements. Figure 11 shows the pressure drop through the ACCUBALANCE over its entire flow range. As shown in the Figure, the back pressure is only 0.05 in. H_2O at a flow rate as high as 1000 CFM.

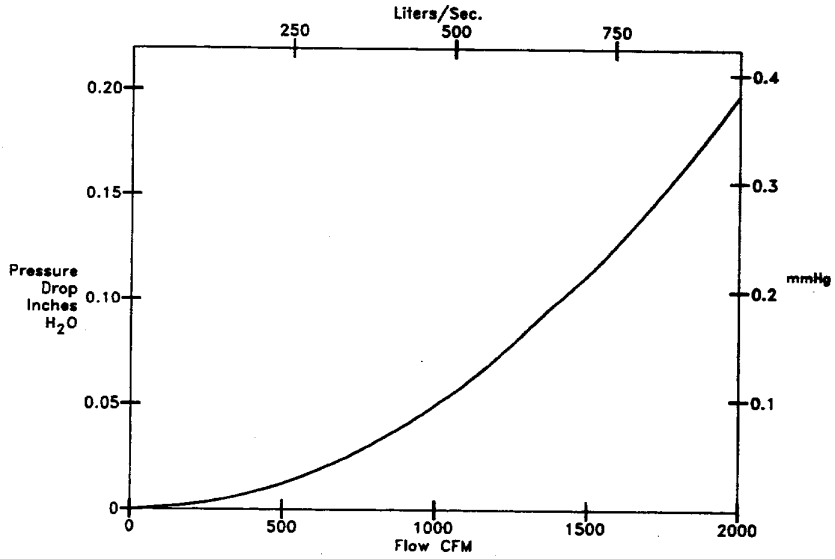


Figure 11: Pressure Drop through the ACCUBALANCE

If you wish to make back pressure corrections, you must first determine the back pressure correction factor, C_b. The back pressure correction factor, C_b, can be determined as follows:

$$C_b = \frac{V_o}{V} \qquad (1)$$

where V and V_o are the average air velocities in the duct ahead of the diffuser with and without the capture hood in place, respectively. With the known correction factor, the back-pressure corrected flow can be determined using Equation (2):

Back-pressure corrected flow = Displayed flow x C_b (2)

Appendix B

Specifications

Flow Range	30-2,000 CFM (15.0-1,000 l/s, 50-3,500 m^3/hr, 0.84-55.0 m^3/min)
Accuracy	±5% reading ±5 CFM (±5% reading ±2.4 l/s, ±5% reading ±8.5 m^3/hr, ±5% reading ±0.15 m^3/min)
Operating Temperature Range	32-140°F (0-60°C)
Instrument Operating Conditions	Altitude up to 13,000 ft (4000 meters) Relative humidity up to 80% RH, non-condensing Pollution degree 1 in accordance with IEC 664
Weight (using 2 ft × 2 ft in Hood)	7 lb 6 oz (3.4 kg)
Power	4 C-size batteries (4 alkaline batteries provided)
Battery Life	At least 40 hrs of continuous use
Carrying Case	26 in × 26 in × 7 in (660 mm × 660 mm × 180 mm)
Hood Sizes Available	
Standard:	2 ft × 2 ft; (610 mm × 610 mm)
Optional:	2 ft × 4 ft; (610 mm × 1220 mm) 1 ft × 4 ft; (305 mm × 1220 mm) 1 ft × 5 ft; (305 mm × 1525 mm) 3 ft × 3 ft; (915 mm × 915 mm)

RS-232C Output	ASCII Character codes 1200 Baud No parity 8 data bits 1 stop bit No handshaking

These specifications are subject to change without notice.



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