

Air Balancing Kit 2

Operating Manual



Illustration shows Air Balancing Kit 2 with optional extras

Contents

Introduction	3
Standard Accessories in the Air Balancing Kit 2	3
Limitations of Use	4
Micromanometer	5
Keypad Controls	5
Mode of Operation	6
Display	7
Pressure Connections.....	8
Velocity Instruments.....	9
User Menu.....	10
Option Menu	16
Downloading Data	20
Base Unit with Canvas and Frame	21
2 ft x 2 ft (600 mm x 600 mm) Frame	21
Setting Up	21
Taking Measurements.....	21
Taking Low Volume Measurements.....	22
Hood Settings in the Option Menu	23
Assembly of the Optional Frames	24
Back Pressure	26
Specifications	27
Optional Extras	28
Maintenance and Calibration	28
Appendix.....	29
Conversion Tables.....	29
Air Velocity Calculations.....	29
Duct Transverse Points.....	30

Introduction

Standard Accessories in the Air Balancing Kit 2



TT550 (V) Series Micromanometer

dpm ANE™

600 mm x 600 mm Canvas

600 mm x 600 mm Frame

Base Unit

Set of Poles

Low Volume Adaptor Plate

Airflow Straighteners

Tubing and Adaptors

Neck Sling

Wheeled Carrying Case

Calibration Certificate

Quick Guide

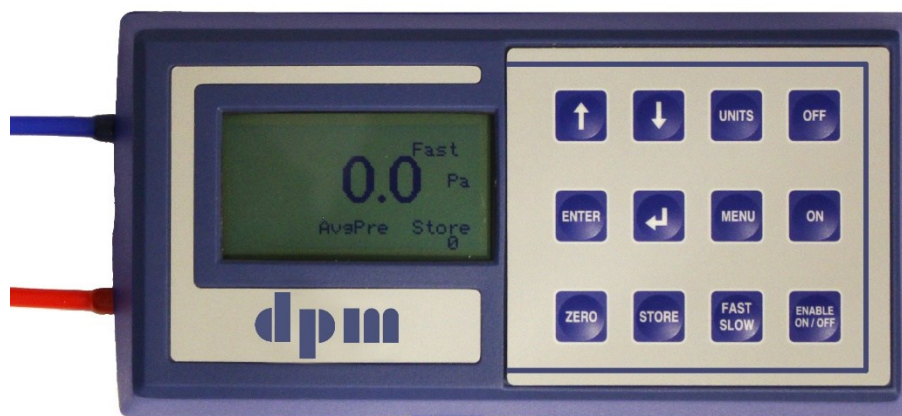
Operating Manual on memory stick



Limitations of Use

- Micromanometer:** TT Series instruments are intended for measurement of low differential air pressure in and around commercial and industrial air handling systems, in conjunction with Pitot Static Tubes, dpm Ane™, dpm Hood.
The instruments are not suitable for liquid pressure measurement, and must not be used with corrosive, toxic or otherwise hazardous gases.
The instruments are not classified “Flameproof” or “Intrinsically Safe” and consequently must not be used where an explosion hazard may exist and are not authorised for Life Support applications.
During normal operation small quantities of air (typically less than 0.1ml/min) may pass into or out of the system under test: it is the user’s responsibility to consider the consequences of such leakage before determining the suitability of the instrument for any particular purpose.
- Canvas:** Owing to size and shape, take care when carrying the assembled unit from place to place.
Avoid people and nearby equipment.
Avoid sharp objects that may tear the canvas.
Take care when fitting different sized canvases especially at the bellmouth due to sharp edges. Also, there are stainless steel pins protruding. These pins are there to give support to the fibreglass poles.
- Storage:** If the instrument is to be stored for a long period of time, or is to be transported by air, the battery must be removed.
If the micromanometer has been stored in temperatures outside of its operational limits, it will need more time to stabilise before accurate readings can be attained.
Under low humidity conditions, static electric charges may be encountered.
- Maintenance:** The bellmouth sensing grid must not be disassembled. The retaining structure is specifically designed to accommodate loading due to normal operation.
- Guarantee:** There is a 12-month guarantee on all manufactured parts.
The guarantee becomes null and void if the instrument’s parts have been tampered with, misused, abused or used outside the parameters set out in the manual.
Avoid subjecting the bellmouth sensing grid to excessive loading during use or assembly. A damaged bellmouth sensing grid e.g. any hair line cracks, will seriously affect the sensitivity and therefore must be replaced.
The manufacturer will determine if the instrument is repairable or requires replacement; charges may apply.

Micromanometer



Keypad Controls

ENABLE	Protects against accidental switching 'on' and 'off' of the instruments power source.
ON	Used in conjunction with ENABLE to switch on the instrument.
OFF	Used in conjunction with ENABLE to switch off the instrument.
FAST SLOW	Averages out the response to applied pressure changes.
UNITS	Changes the unit of measurement.
STORE	Stores readings manually.
MENU	Used to access the Option Menu from operation mode. See Page 16.
↑ and ↓	Operates the backlight. Select an appropriate function during menu operation. Set digits and values in menu operation. Toggle between supply and exhaust in hood mode.
ZERO	Overrides the time period of the auto zero system.
←	Backspace.
ENTER	Accepts commands during menu operation. Used in conjunction with ENABLE and ON to access the User Menu. See Page 10.

Mode of Operation

- On / Off:** Press and hold ENABLE then press ON or OFF as appropriate.
- Auto Zero:** The cycle will begin as soon as the instrument is switched on. This is factory set at a 30 second interval upon switch on and thereafter at 60 second intervals.
To change this timing see Page 11.
In hood mode, the instrument will auto zero every 10 seconds. This is factory set and cannot be changed.
The instrument contains a miniature solenoid valve, which isolates the pressure sensors during auto zero. The valve emits two clearly audible clicks which signal the start and end of the auto zero process.
- Battery Low:** The battery condition is monitored every time the instrument auto zeroes.
When the 'battery low' warning appears, the battery must be replaced immediately, otherwise the readings obtained will be unreliable.
If at any time the readings seem suspect, check the condition of the battery by zeroing the instrument manually using ZERO. If in doubt replace the battery.
- Units:** The unit of measurement is shown on the right hand side of the display.
Being an auto ranging instrument, the correct resolution and the decimal point will be displayed according to the pressure being applied.
The units are arranged in loop formation as follows: Kpa → mm H₂O → in H₂O → mbar → m/sec → ft/min → L/sec → m³/hr → cfm → Kpa.
Model dependent, some units may not be available.
- FAST SLOW:** Some pressurised circuits exhibit pressure and velocity fluctuations, which can be disconcerting. If unacceptable fluctuations occur, press FAST SLOW and verify that the slow indication is displayed on the screen.
Time constant: Slow1 = 5 sec Slow2 = 10 sec Slow3 = 15 sec Slow4 = 20 sec
- Store:** The number of readings stored on the instrument is displayed on the screen.
To store data manually press STORE on the instrument or press the red button on the base unit, ensuring the jack plug is connected to the instrument, the reading on the display will be logged and the counter will increase by one. During data logging the counter will increase every time the instrument records a value. A maximum of 2500 readings can be stored. For information on data logging see Page 19.
- Audible Feedback:** While the instrument is on, audible feedback can be heard every time a key is pressed.
- + (Signal In) & - (Reference)** Pressure ports. The instrument responds to positive, negative and differential pressure.
- RS 232 Port:** Located between the two ports. This is to transfer data of pressures and differential pressures, on a periodic basis, to the PC using the Hyper Terminal software (or equivalent). This period is factory set to 5 seconds. To change the RS 232 Results Period see Page 12. For downloading stored data see Pages 19 and 20.

Display

The TT550 (V) series Micromanometer has an LCD display to show the settings being used and the measurements being taken.

PT: 1.000	Area: 1
Auto Zero . . .	Slow4
3.19 m/s	
AvgVol	AvgVel
355	5.02
Store	5

Each screen element is explained below:

PT: 1.000 Pitot Tube Factor (dpm AneTM Factor or Hood Factor).

Area: 1 Area Setting.
Select the duct shape and input the duct dimensions in mm or ins.
See Page 13.

Auto Zero . . . Whenever the auto zero sequence is initiated manually or at preset 'Auto Zero . . .' will be displayed until the cycle is complete.

Slow4 Mode of the instrument.
Press the FAST SLOW key to change the mode.

3.19 m/s Unit of measurement.
Press UNITS to toggle between units of measurement.
Being an auto ranging instrument, the resolution and decimal points will change.

AvgVol Average volume in l/s (cfm).
355 The average volume is a function of average velocity multiplied by area.

AvgVel Average velocity of the readings stored.
5.02 In the hood mode it shows AvgVol

Store Number of readings stored.
5 Up to 2500 readings can be stored.

Pressure Connections

Gauge / Duct Static Measurement:	Connect to + (Signal In). Leave – (Reference) open to atmosphere. Readings may be positive or negative, depending on whether the system under test is above or below atmosphere pressure.
Orifice Plates:	Connect upstream tapping to + (Signal In) and downstream tapping to - (Reference). Pressure readings should always be positive.
Flow Grids:	Connect +ve tapping to + (Signal In) and -ve tapping to - (Reference). Pressure readings should always be positive.
Inlet Cones:	Connect tapping to + (Signal In) using 'T' pieces to join the annular tapping together. Leave - (Reference) open to atmosphere making sure that the open port is shielded against significant air movement from the ingoing airstream. Pressure readings should always be negative.
Total Head Probe:	Connect to + (Signal In). Leave - (Reference) open. Readings should always be positive
dpm Ane™:	Input Pitot Tube Factor 0.843. Connect red tubing to + (Signal In) and blue tubing to - (Reference). Use UNITS key to toggle between m/sec and ft/min depending upon model. Readings should always be positive.
dpm-i Pitot Tube:	Input the Pitot Tube Factor 0.838. Connect red tubing to + (Signal In) and blue tubing to - (Reference). Use UNITS key to toggle between m/sec and ft/min depending upon model. Readings should always be positive.
Ellipsoidal Pitot Tube:	Pitot Tube Factor 1.000. Connect red tubing to + (Signal In) and blue tubing to - (Reference). Use UNITS key to toggle between m/sec and ft/min depending upon model. Readings should always be positive.
Mini Hood Kit:	Volume Box Factor 30.6. Connect red tubing to + (Signal In) and blue tubing to - (Reference). Use UNITS key to toggle between l/sec and m ³ /hr depending upon model. Readings should always be positive.

Velocity Instruments

dpm Ane™:



Input the Pitot Tube Factor 0.843.

Connect the red tubing to + (Signal In) and the blue tubing to - (Reference). The dpm Ane™ head should be placed into the air stream in the direction indicated by the arrows. Readings should always be positive.

If negative readings are obtained, there may be a leak or blockage in one of the pressure tubes; the tubes may be connected the wrong way round, or the measurements may be from an extract grille.

dpm-i Pitot Tube:

Input the Pitot Tube Factor 0.838.

Connect total pressure tapping to + (Signal In) and static pressure tapping to - (Reference). The larger hole located at the front of the dpm-i Pitot Tube must face directly into the oncoming air stream, as this senses the Total Pressure.

Readings should always be positive.

If a negative reading is obtained there may be a leak or blockage in one of the pressure tubes or the tubes may be connected the wrong way round.

Ellipsoidal Pitot Tube: Connect total pressure tapping to + (Signal In) and static pressure tapping to - (Reference). The hole at the tip of the Pitot Static Tube must face directly into the oncoming air stream, as this senses the Total Pressure.

Readings should always be positive.

If a negative reading is obtained, there may be a leak or blockage in one of the pressure tubes or the tubes may be connected the wrong way round.

Most Pitot Static Tubes will give satisfactory results, but the NPL modified ellipsoidal pattern is particularly recommended.

The velocity range is calibrated at 'standard air' 1000 mbar / 16°C, for use with Total Head Probes and Pitot Static Tubes having a calibration factor unity. For non-standard air-conditions the barometric pressure and temperature can be entered, see the User Menu to change the default values, Page 15, or see the Option Menu to change the values temporarily, Page 19.

Air Velocity Calculations using S.I Scales:

$$\text{For non-standard air conditions: } V = 1.291 \times PT \sqrt{\frac{1013.25}{B} \times \frac{T}{289} \times P_v}$$

V = Velocity in m/sec

PT = Pitot Tube Factor (for Ellipsoidal type 1.000)

B = Barometric pressure in mbar

T = Absolute temperature in °K (= t in °C + 273 where t = airstream temperature)

Pv = Velocity pressure in Pa

Air Velocity Calculations using Imperial Scales:

$$\text{For non-standard air conditions: } V = 4006 \times PT \sqrt{\frac{30}{B} \times \frac{T}{521} \times P_v}$$

V = Velocity in ft/min

PT = Pitot Tube Factor (for Ellipsoidal type 1.000)

B = Barometric pressure in inHg

T = Absolute temperature in °R (= t in °F + 460 where t = airstream temperature)

Pv = Velocity pressure in wg (H₂O)

User Menu

The User Menu is used to input user values and change default settings.

To access the User Menu, switch on the instrument while holding down the ENTER key until the menu appears.

Page 11

- Set Clock: To set the clock to local time.
- Auto Zero Time: Factory set at 60 seconds, (for which the instrument specifications are based).
Changing the default setting will override this.
Inputting 0 seconds will switch off the auto zero function.
- Note: **When the instrument is in l/sec, m³/hr or cfm the auto zero time is factory set at 10 seconds. This cannot be changed.**
- Switch Off Period: To save battery, providing that no keys are pressed, the instrument will switch off after 10 minutes. This can be overridden by changing the default setting.

Page 12

- RS232 Result Period: To print raw data as measurements are being made to a PC via the Hyper Terminal (or equivalent) software.
- Back Light Period: To adjust the back light time. Use ▲ and ▼ to switch on the back light.

Page 13

- Area Settings: Select the duct shape and input dimensions in mm or ins.
Store up to 4 different area settings
- Pitot Tube Factor: Up to three different Pitot Tube Factors can be stored.
PT 1: 1.000 PT 2: 1.000 dpm A: 0.843

Page 14

- Vol / Hood Select: Select either Volume Box or Hood.
- Volume Box: Up to 4 different values can be stored: e.g. vav, iris dampers and orifice plates.
To obtain the correct factor, use the manufacturer's data sheet. If the volume readings for K factors is shown in l/sec or cfm, it is important to convert that K value to m³/hr and input this value in to the instrument in order to obtain the correct readings.
The dpm ANE™ Factor is 30.6.
- Hood Factor: Up to 4 Hood Factors can be stored.
Hood Supply: 310.0 Hood Exhaust: 305.0 Low Vol Sup: 60.0 Low Vol Exh: 70.0

Page 15

- Temp / Pressure: To change air stream temperature and barometric pressure.
Air stream temperature set at 16 °C and Barometric pressure set at 1000 mbar.
- Select Date Format: Set the date format to European or USA, the temperature units to °C or °F and the barometric pressure units to mb or inHg.
- Sensitivity: Select the decimal places for Pascals and velocity readings.

dpm ANE™: It is recommended not to change this setting as this will give rise to false readings.
Hood settings have been derived with a four way diffuser; these can be changed by the user when carrying out volume readings via the Option Menu. It is recommended not to change these settings in the User Menu as this will give rise to false readings.

User Menu

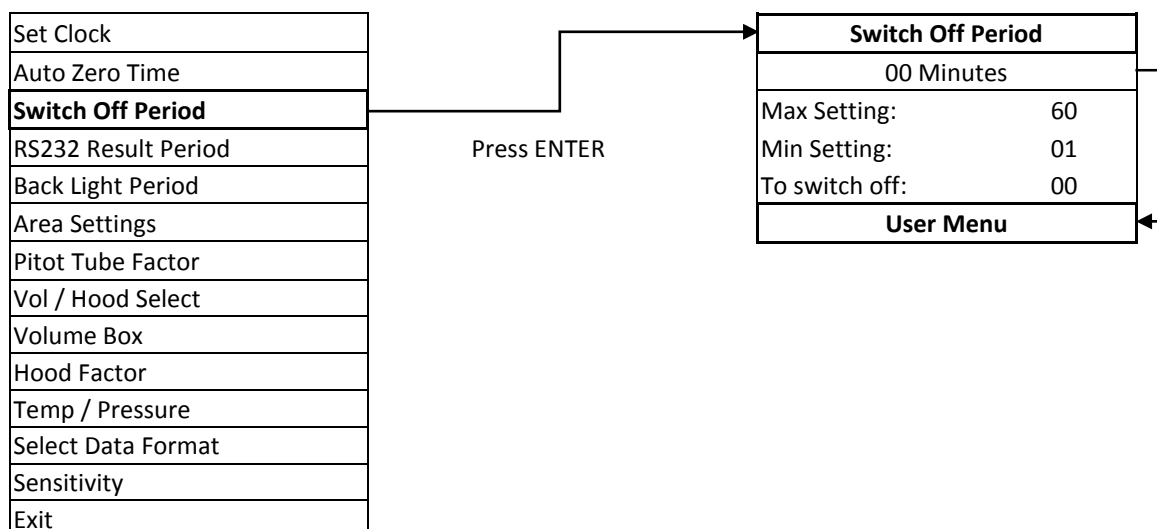
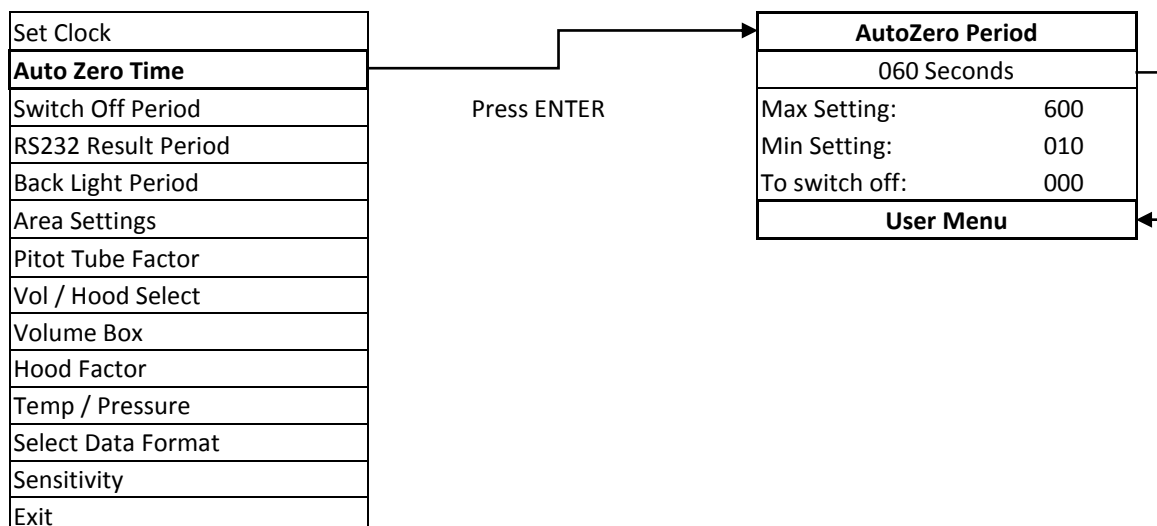
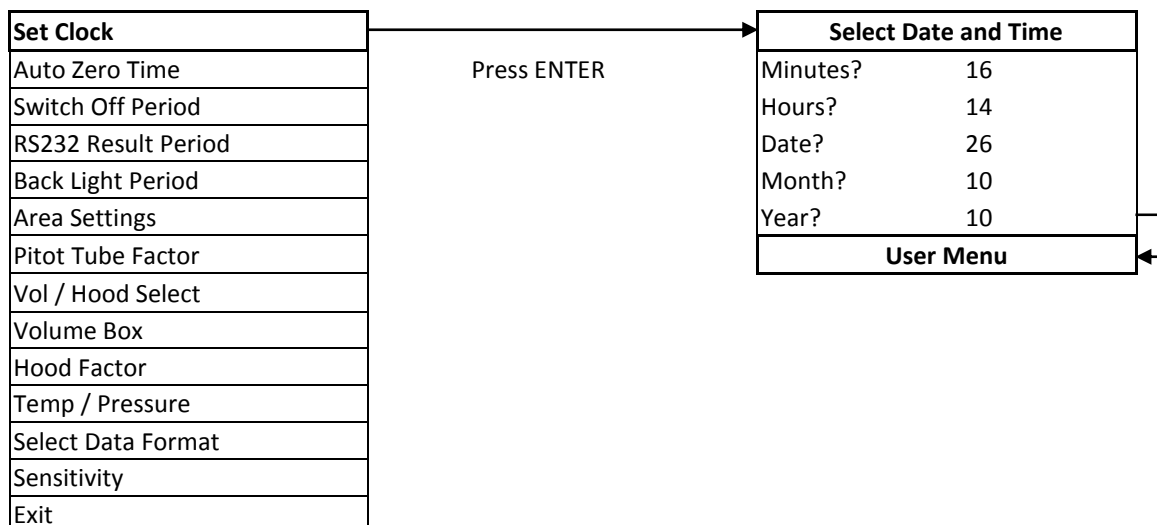
To access the User Menu, switch on the instrument while holding down the ENTER key until the menu appears.

Select from the list:

Use ▲ and ▼ to scroll. Press ENTER to select.

Entering a value:

Use ▲ and ▼ to set each digit or value then press ENTER.

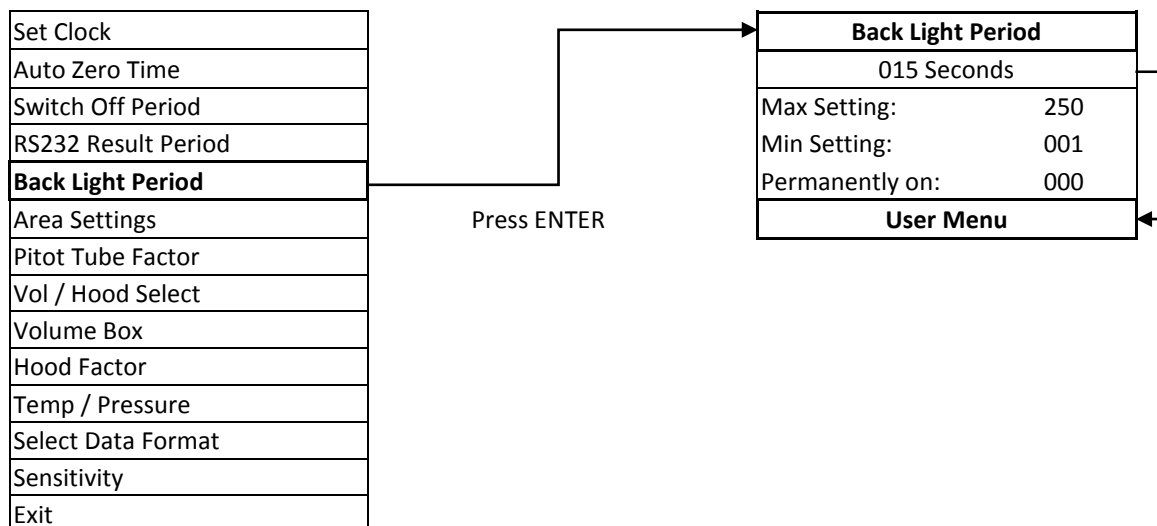
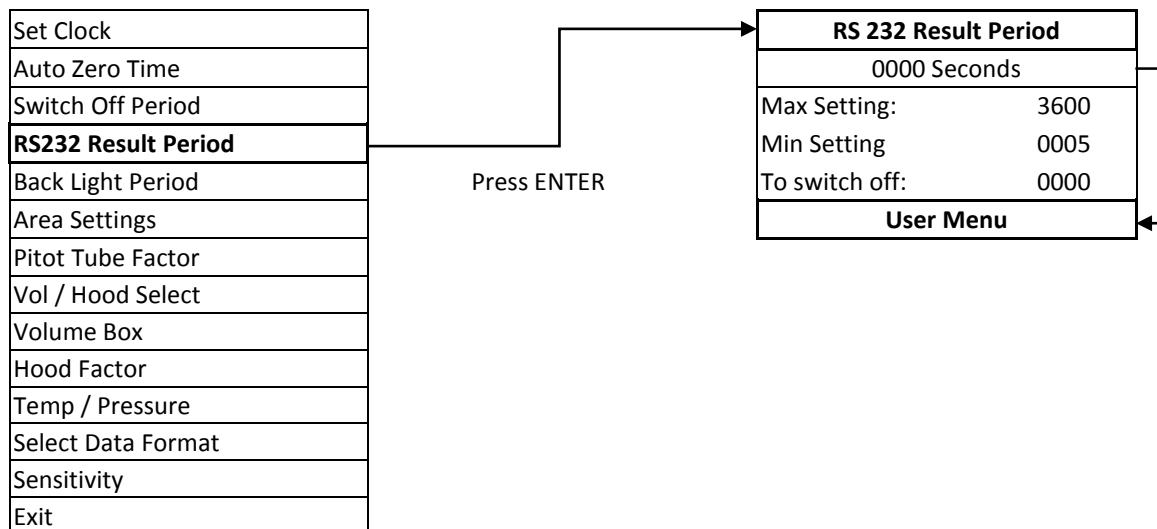


User Menu

To access the User Menu, switch on the instrument while holding down the ENTER key until the menu appears.

Select from the list: Use ▲ and ▼ to scroll. Press ENTER to select.

Entering a value: Use ▲ and ▼ to set each digit or value then press ENTER.

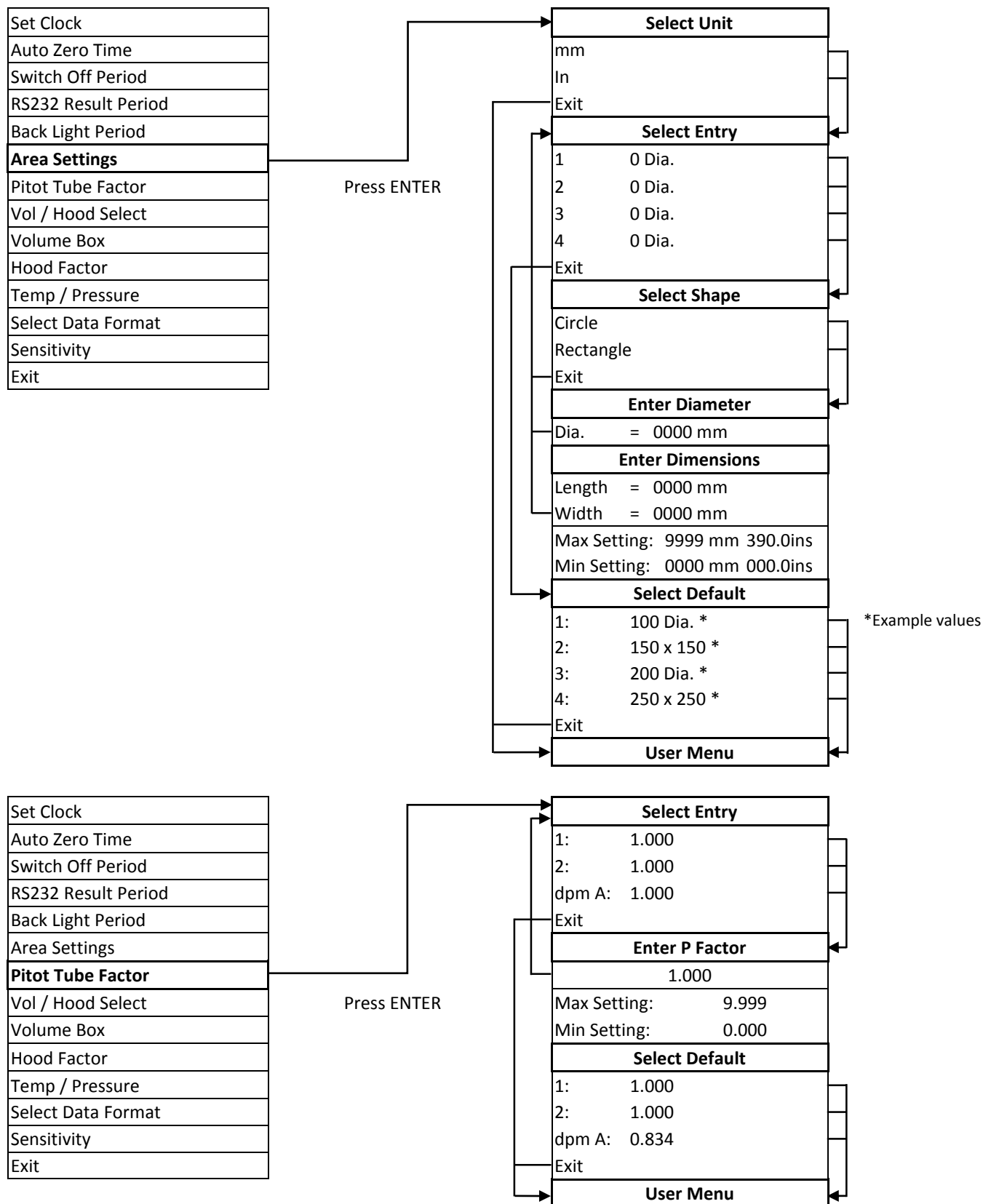


User Menu

To access the User Menu, switch on the instrument while holding down the ENTER key until the menu appears

Select from the list: Use ▲ and ▼ to scroll. Press ENTER to select.

Entering a value: Use ▲ and ▼ to set each digit or value then press ENTER.



User Menu

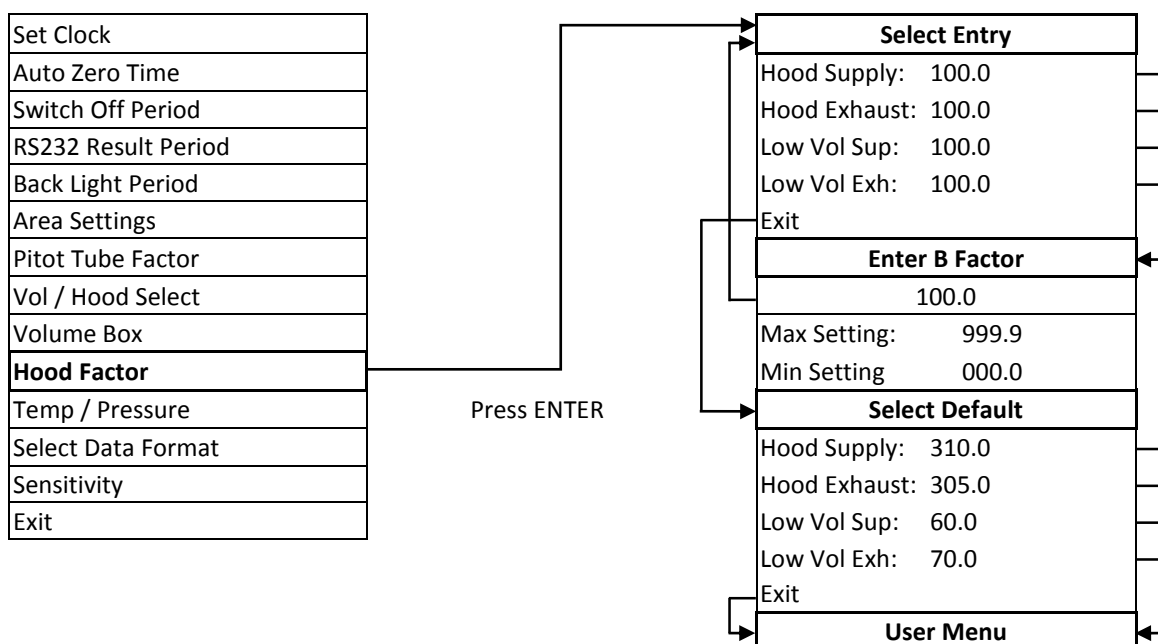
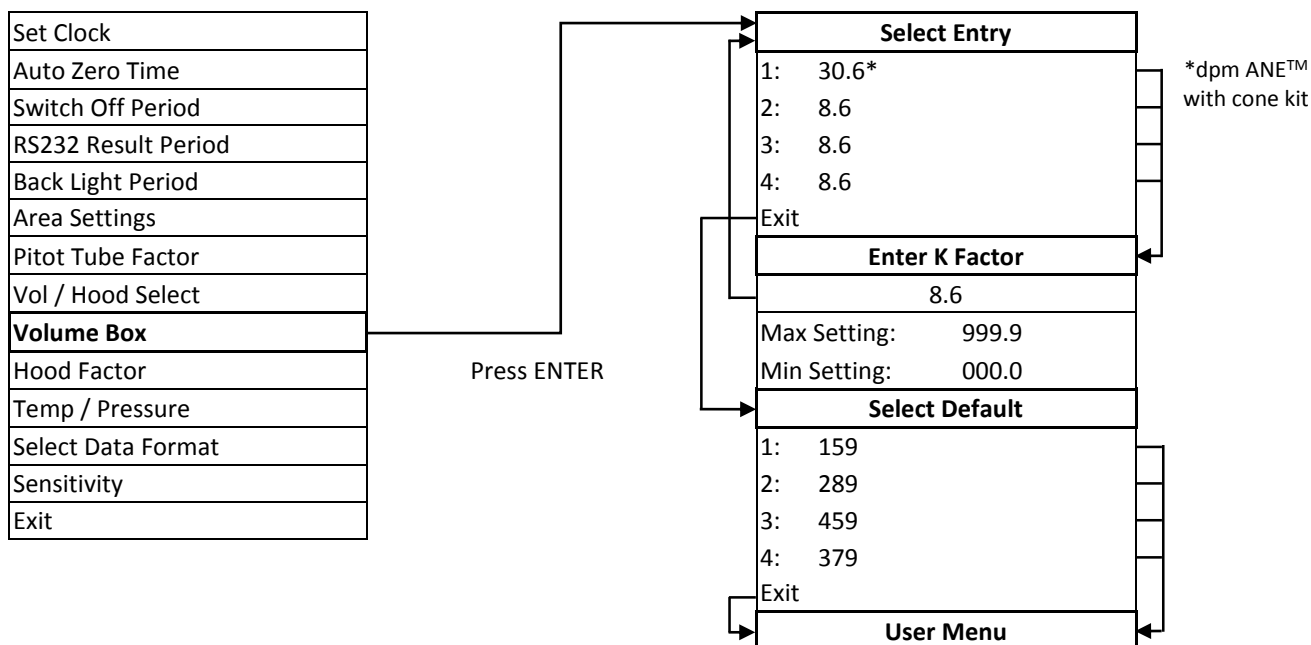
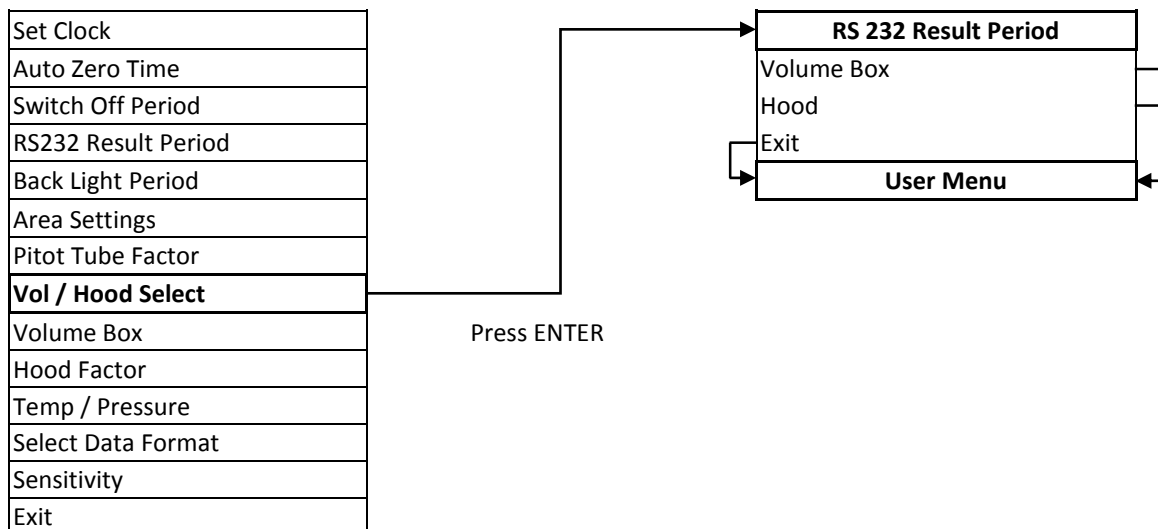
To access the User Menu, switch on the instrument while holding down the ENTER key until the menu appears.

Select from the list:

Use ▲ and ▼ to scroll. Press ENTER to select.

Entering a value:

Use ▲ and ▼ to set each digit or value then press ENTER.



User Menu

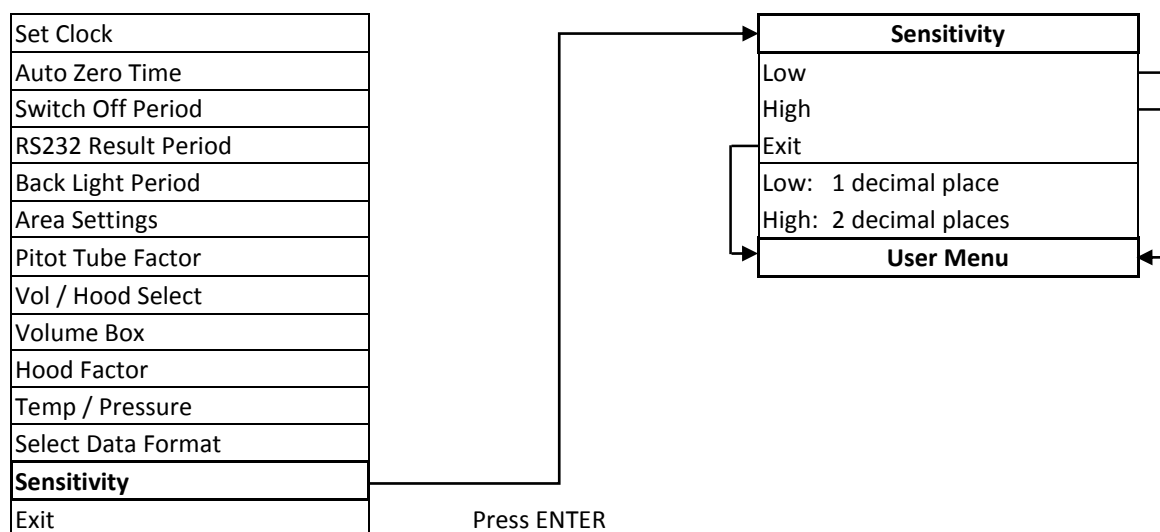
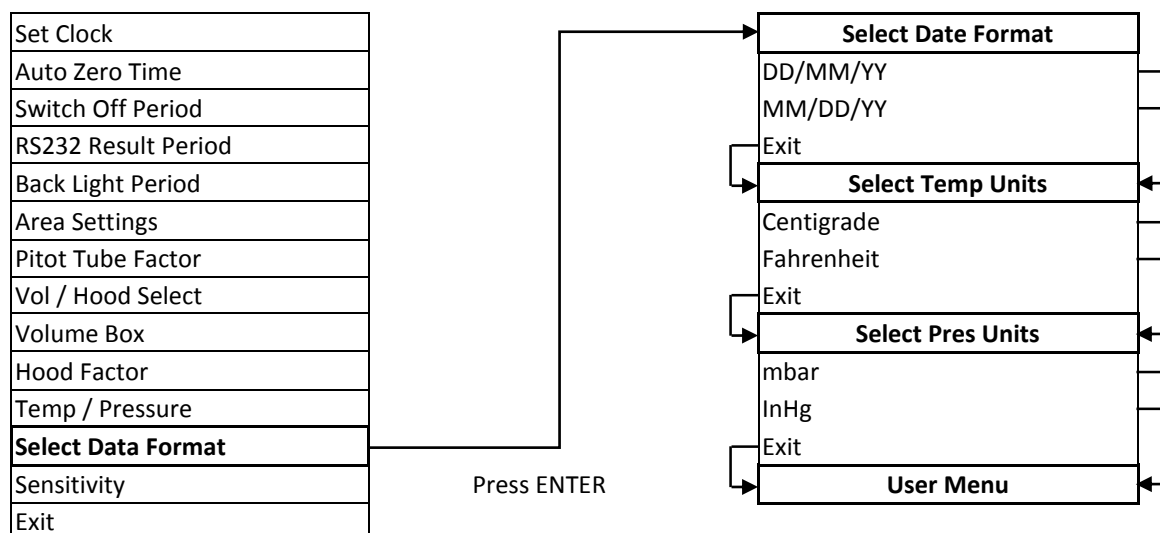
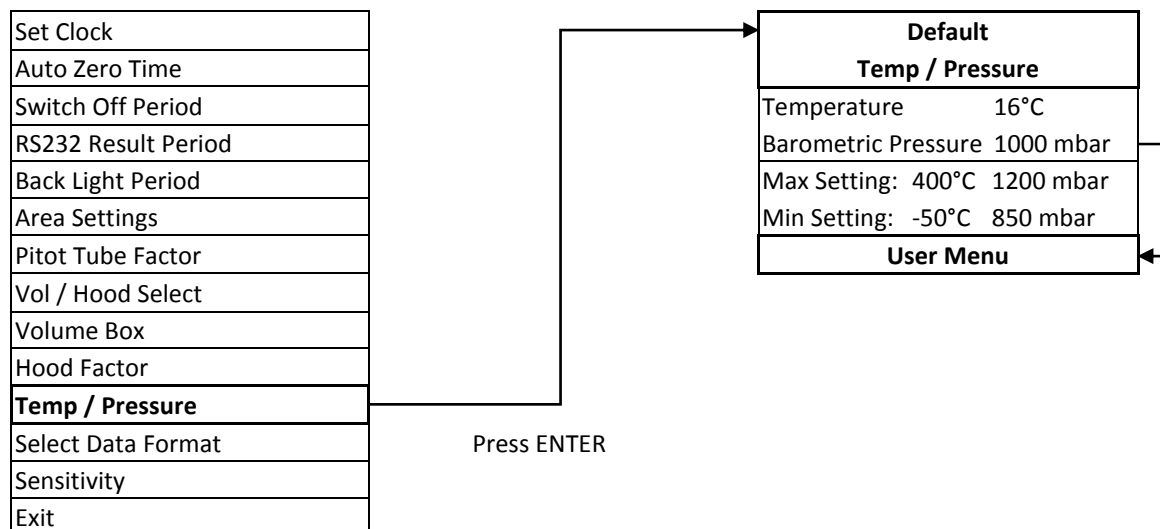
To access the User Menu, switch on the instrument while holding down the ENTER key until the menu appears.

Select from the list:

Use ▲ and ▼ to scroll. Press ENTER to select.

Entering a value:

Use ▲ and ▼ to set each digit or value then press ENTER.



Option Menu

The Option Menu is used to temporarily change default settings. Any settings changed in the Option Menu will revert to the default settings as soon as the instrument is switched off.

To access the Option Menu, press MENU when the instrument is in operation mode.

Page 16

Review Results: View stored data in the form of time, measured value and unit of measurement. Providing the stored readings are in the same unit, the average value will be shown at the bottom of the screen as the cursor moves down.

Page 17

Del Last Result: Deletes the last stored value.
Clear Memory: Deletes all stored data.
Set Area: Select an area setting from the list of 4 values.
Select Pitot Factor: Select a Pitot Tube Factor from the list of 3 values.

Page 18

Vol / Hood Select: Select either Volume Box or Hood.
Set Vol Box Factor: Select a Volume Box Factor from the list of 4 values.
Set Hood Factor: Up to 4 different hood factors can be altered from the default settings.

Default values **Hood Supply: 310.0 Hood Exhaust: 305.0 Low Vol Sup: 60.0 Low Vol Exh: 70.0**

To adjust the hood factor for different types of diffuser and different sized Hoods, it is important to take Pitot Traverse measurements prior to taking volume measurements with the dpm Hood; the correction factor can then be applied to volume measurements to match the Pitot Traverse.

Page 19

Set Temp/ Pressure: Change the airstream temperature and barometric pressure.
Start Recording: This feature is used for data logging. Up to 2500 readings can be stored.
PC Connection: To download stored data to a PC.

Readings highlighted in bold have be derived with a four way diffuser, this can be changed by the user when carrying out volume readings via the Option Menu.

Option Menu

Select from the list: Use ▲ and ▼ to scroll. Press ENTER to select.
Entering a value: Use ▲ and ▼ to set each digit or value then press ENTER.

Review Results		
Del Last Result		
Clear Memory		
Set Area		
Select Pitot Factor		
Vol / Hood Select		
Set Vol Box Factor		
Set Hood Factor		
Set Temp / Pressure		
Start Recording		
PC Connection		
Exit		

Press ENTER

Use ▲ and ▼ to view more results

14:57:02	40.0	Pa
14:57:13	79.9	Pa
14:57:27	160	Pa
14:57:53	400	Pa
14:58:04	800	Pa
14:58:17	1.60	Kpa
14:58:30	3.00	Kpa
Avg (1)	40.0	Pa

To return to Option Menu
press ENTER

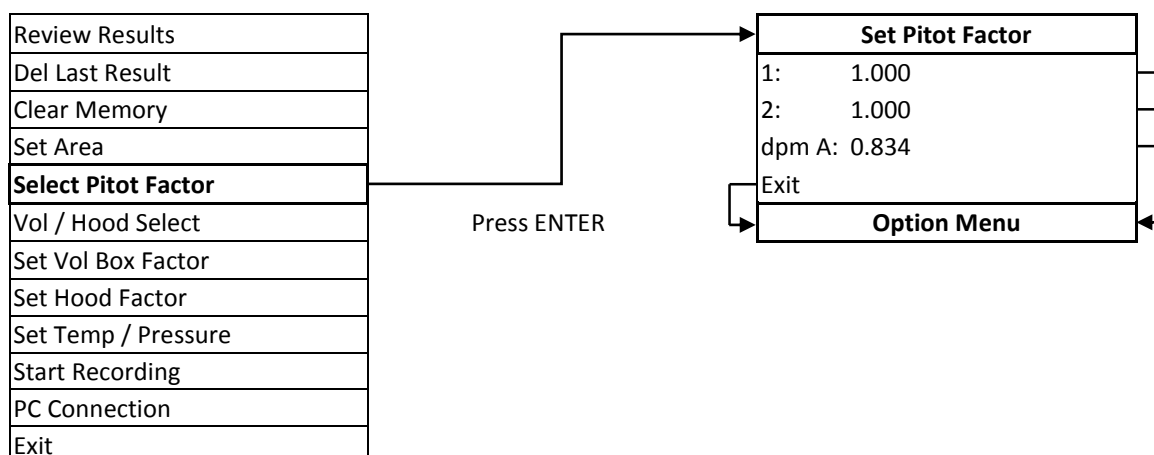
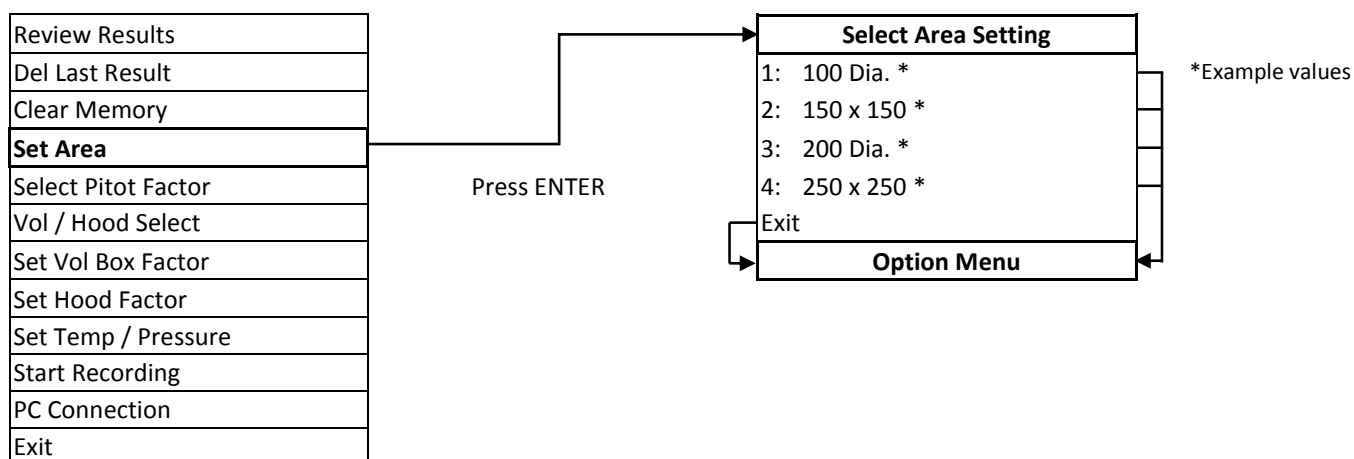
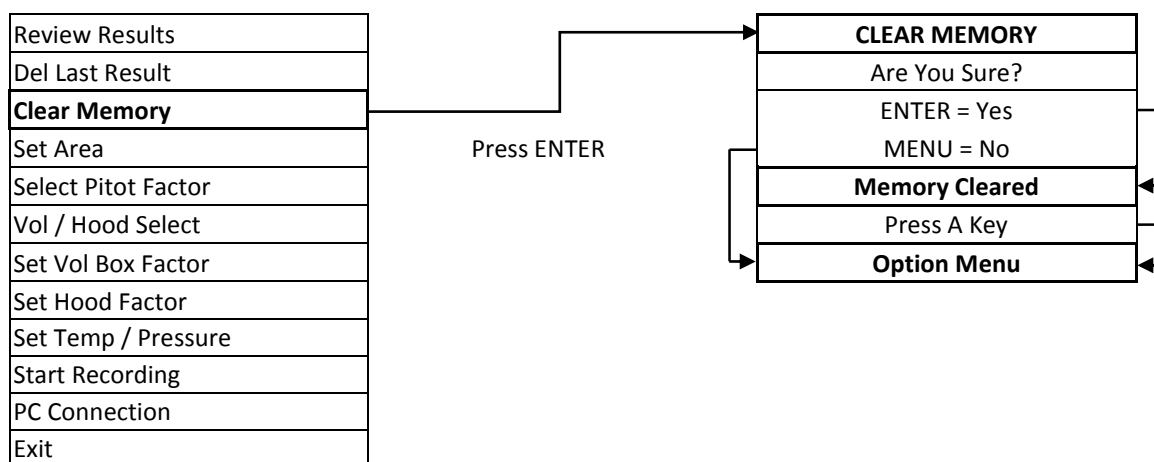
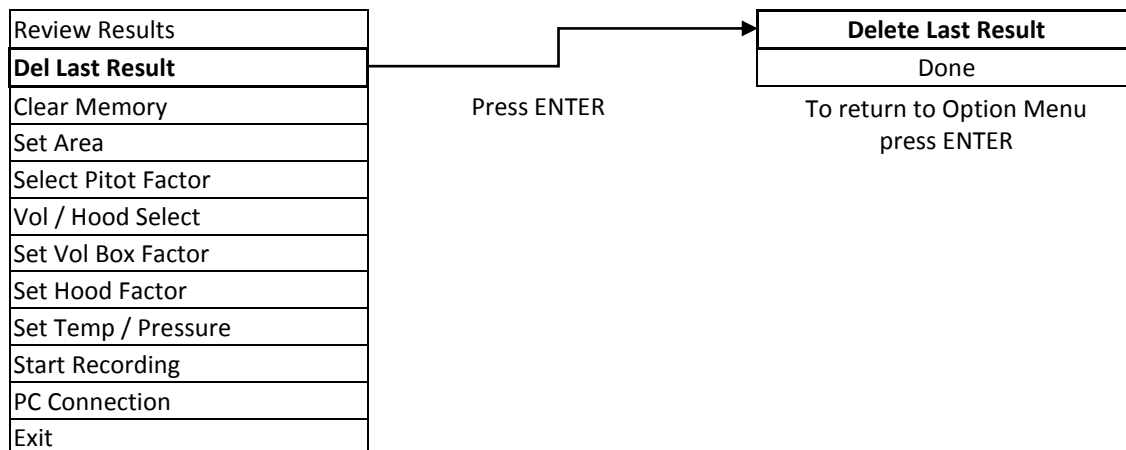
Option Menu

Select from the list:

Use **↑** and **↓** to scroll. Press ENTER to select.

Entering a value:

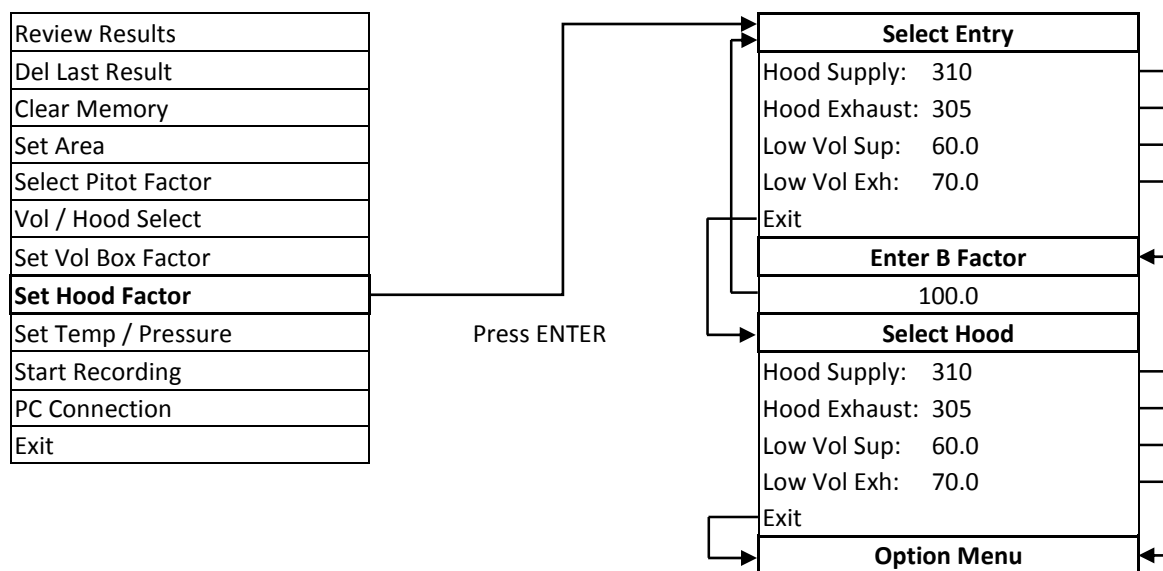
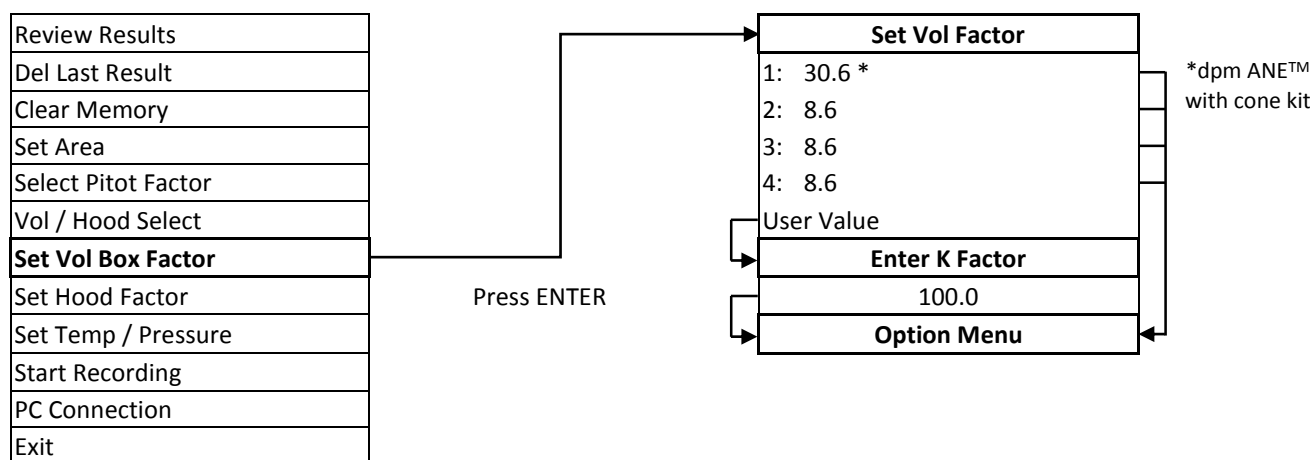
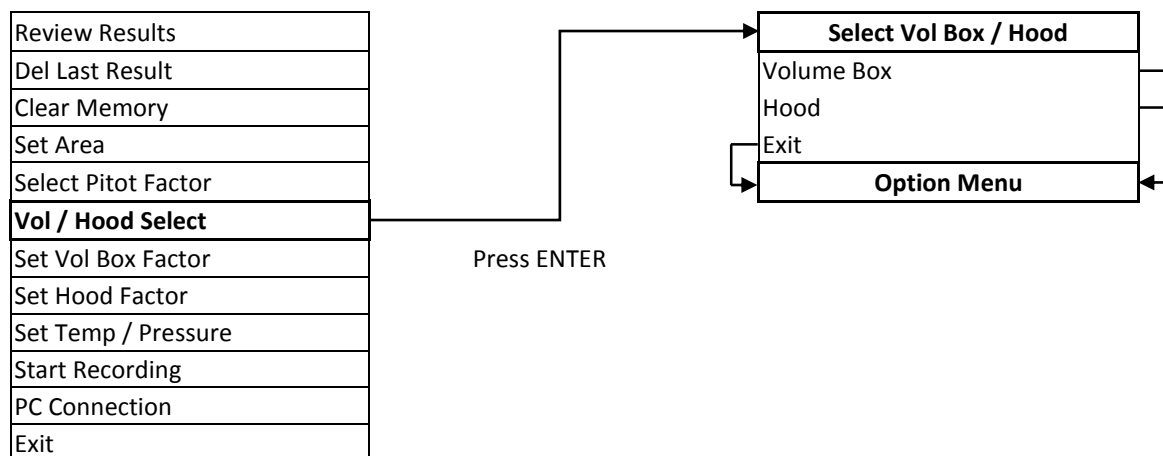
Use **↑** and **↓** to set each digit or value then press ENTER.



Option Menu

Select from the list: Use $\uparrow$ and $\downarrow$ to scroll. Press ENTER to select.

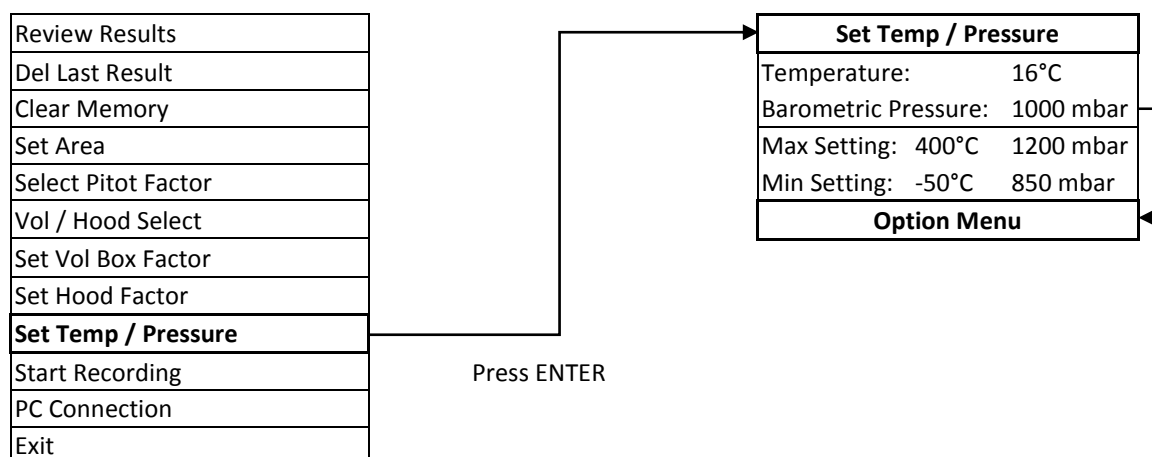
Entering a value: Use $\uparrow$ and $\downarrow$ to set each digit or value then press ENTER.



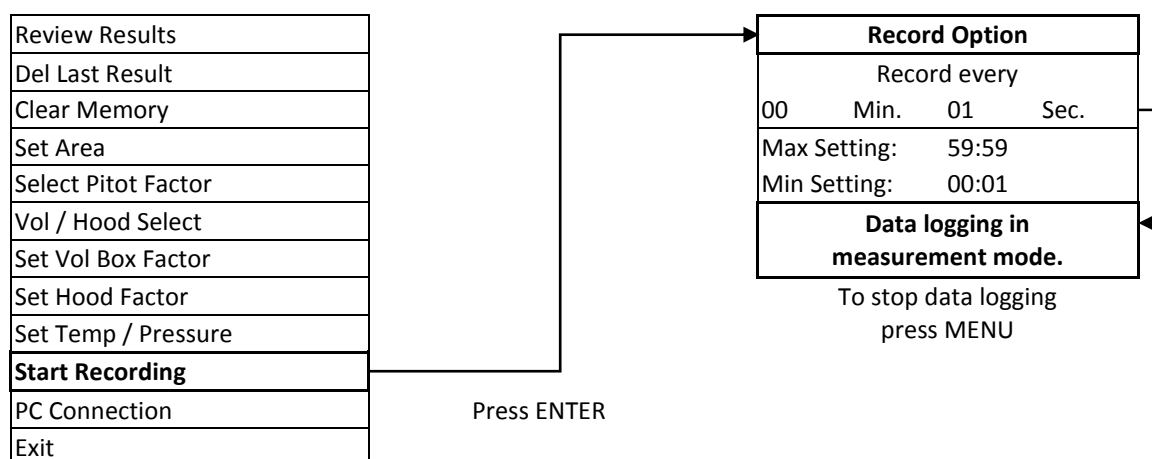
Option Menu

Select from the list: Use ▲ and ▼ to scroll. Press ENTER to select.

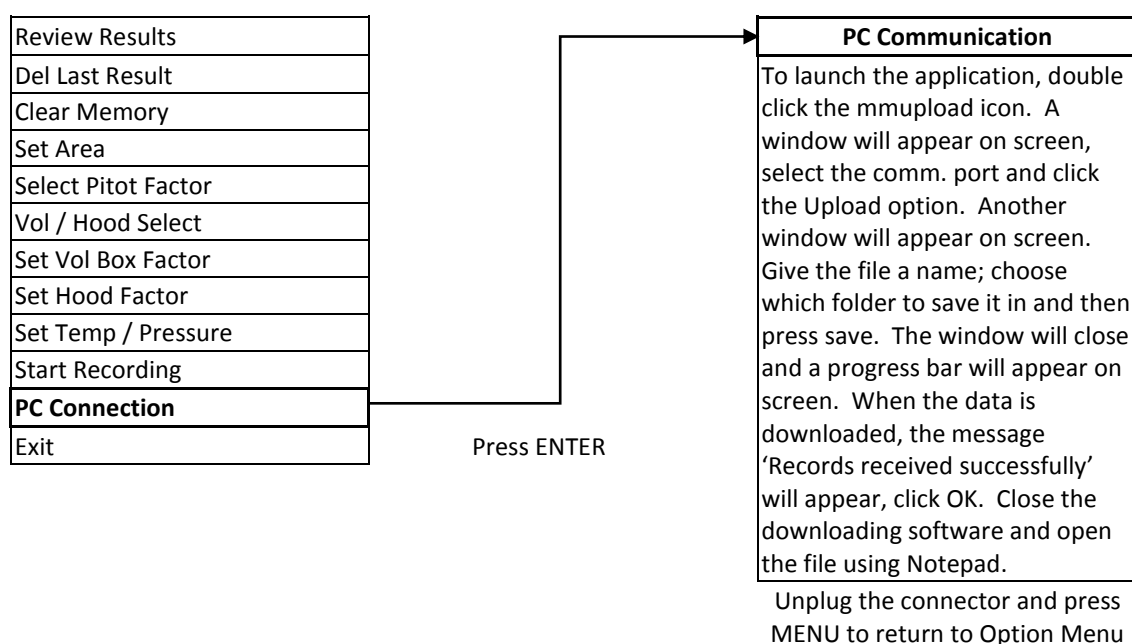
Entering a value: Use ▲ and ▼ to set each digit or value then press ENTER.



Before data logging, select the correct unit in measurement mode.



Software must be installed. Ensure that the cable is connected to the PC via the D-type connector.
Connect the plug to the RS 232 socket.

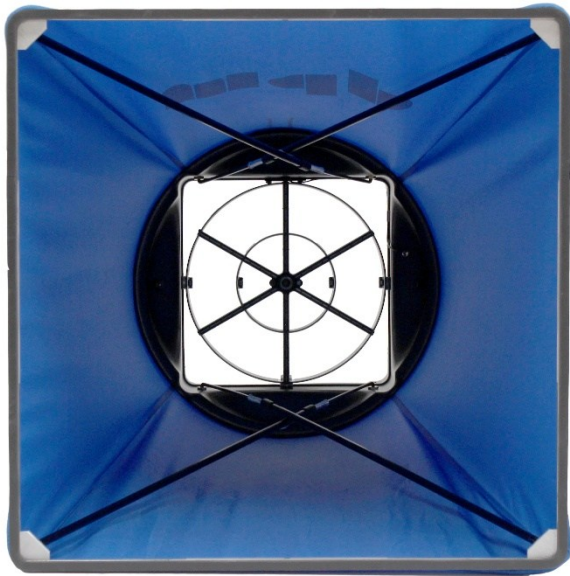


Downloading Data

Important: Only use a genuine cable and software from DP Measurement.
If any other accessories or the incorrect downloading software are used then the guarantee on the instrument and the accessories becomes null and void.
All charges apply.

Base Unit with Canvas and Frame

2 ft x 2 ft (600 mm x 600 mm) Frame



To assemble lift the canvas by the frame at the top so that it forms a cone shape.

Take a pole and place the hollow end over one of the arms inside the base unit and slide the other end under the opposite corner of the frame as shown, ensuring that the canvas does not become caught. Repeat for each of the other poles.

The poles must not cross over the manifold.

Setting Up

Take the Micromanometer and connect the red tubing to the + (Signal In) pressure port and blue tubing to the – (Reference) pressure port.

Switch on the instrument and select the units of measurement, l/sec, m³/hr or cfm (model dependant).

When in the hood mode the instrument will be auto zeroing every 10 seconds, this cannot be changed. To obtain steady readings select Slow1.

The Hood is calibrated with a four way diffuser and the hood supply and exhaust factors have been calculated to obtain the optimum accuracy.

Taking Measurements

- 1: Ensure that the instrument is in the correct measurement mode and that the correct Hood factor is displayed at the top of the screen. Readings should always be positive.
If in doubt have the Micromanometer in pressure mode to show if the grill is in supply or exhaust, then revert back to the hood mode.
- 2: In the case of fluctuating readings, FAST SLOW can be used to dampen down the readings.
- 3: To change from supply to exhaust, press ▲ or ▼.

Care must be taken when using the ▲ or ▼ key to operate the back light, as this will cause the instrument to toggle between supply and exhaust.

For different diffusers it is important to take Pitot Traverse measurements prior to taking volume measurements with the dpm Air Balancing Kit; the correction factor can then be applied to volume measurements to match the Pitot Traverse. To apply the correction factors, see Page 23.

Taking Low Volume Measurements



The dpm Hood can be used with the Low Volume Adaptor Plate according to the volume measurements being taken:

The Low Volume Adaptor Plate (as shown) is suitable for low flow measurements, starting from 5 l/sec (18 m³/hr, 11 cfm) to 25 l/sec (90 m³/hr, 53 cfm).

The Low Volume Adaptor Plate is placed on top of the sensor grid beneath the brass fittings.

To remove: gently pull until the Low Volume Adaptor Plate slides out of place.

To replace: slot the Low Volume Adaptor Plate underneath the brass fittings on one side of the sensing grid and push gently until it slots beneath the second pair of brass fittings.

Note: It is recommended that the Low Volume Adaptor Plate is used to take low volume readings only.

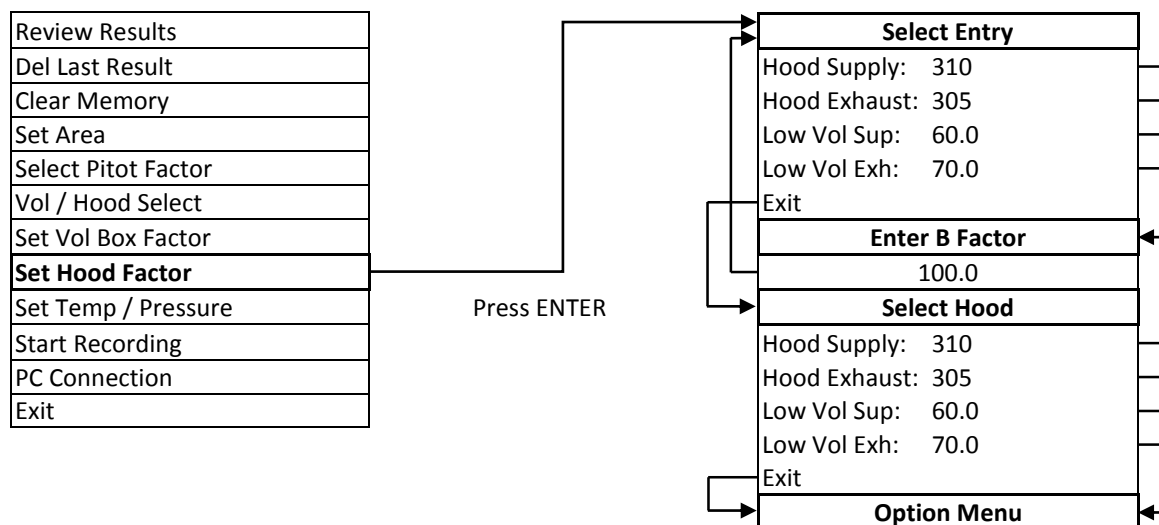
It is also important to change the settings of the Micromanometer to low volume supply or low volume exhaust. As follows:

1. Press **MENU** to display the Option Menu.
2. Scroll down to **Set Hood Factor** and press **ENTER**.
3. Scroll down to **Exit** and press **ENTER**
4. Scroll down to **Low Vol Sup** or **Low Vol Exh** and then press **ENTER**
5. This will return you to the Option menu, scroll down to **Exit** and press **ENTER**

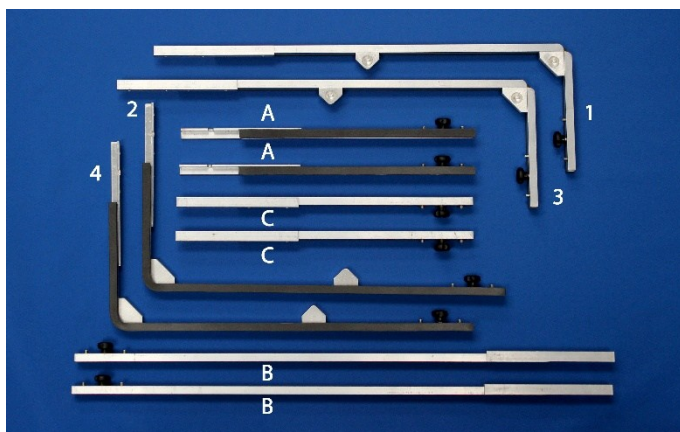
When correctly set Low Vol Sup or Low Vol Exh will appear on the LCD screen. Use the **▲** or **▼** key to toggle between supply and exhaust.

Hood Settings in the Option Menu

Select from the list: Use ▲ and ▼ to scroll. Press ENTER to select.
 Entering a value: Use ▲ and ▼ to set each digit or value then press ENTER.



Assembly of the Optional Frames

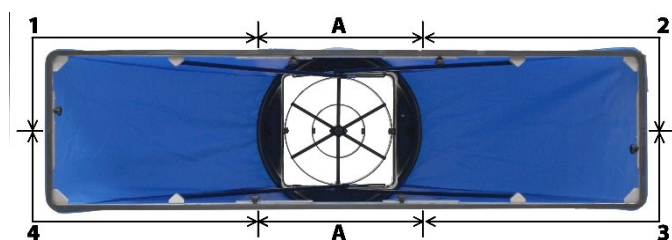


All frames are fitted together as shown in the illustrations.

Pieces 1, 2, 3 and 4 are corner frames, which are common to all the different Hood sizes. Pieces A, B and C are extensions, which are used to extend the frame size.

Note: Always fit the canvas from the instrument side to prevent the risk of the instrument being dislodged from the casing/bellmouth.

1 ft x 4 ft (300 mm x 1200 mm) Canvas

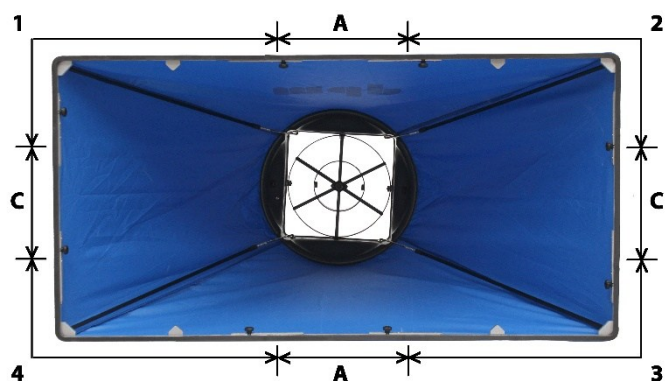


Frame 1 + 2 + 3 + 4 + A + A

To assemble please see the illustration.

Fit the larger end of the hood to the frame ensuring that the seams are in line with the corners. Then fit the smaller end to the base ensuring that the canvas is not caught. The poles can be fitted so that they cross over and connect to the inner sockets, as shown, or run parallel to the side seams connected to the outer sockets.

2 ft x 4 ft (600 mm x 1200 mm) Canvas

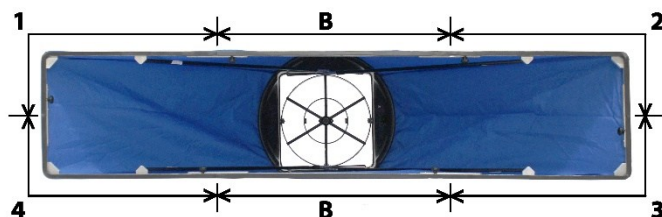


Frame 1 + 2 + 3 + 4 + A + A + C + C

To assemble please see the illustration.

Fit the larger end of the hood to the frame ensuring that the seams are in line with the corners. Then fit the smaller end to the base ensuring that the canvas is not caught. Fit the poles so that they run parallel to the side seams as shown.

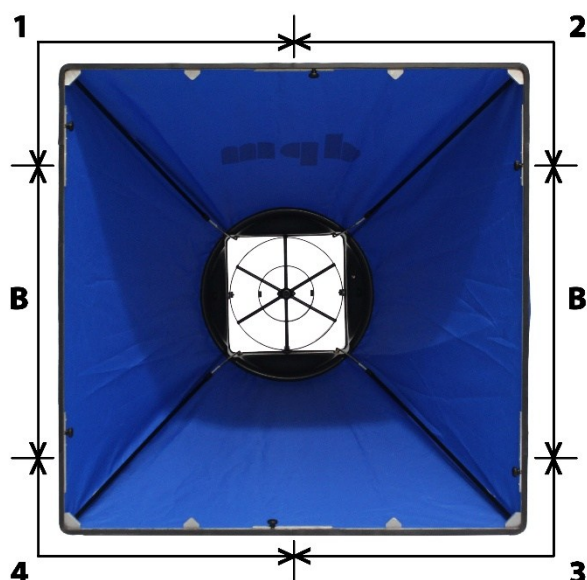
1 ft x 5 ft (300 mm x 1500 mm) Canvas



Frame 1 + 2 + 3 + 4 + B + B

To assemble please see the illustration. Fit the larger end of the hood to the frame ensuring that the seams are in line with the corners. Then fit the smaller end to the base ensuring that the canvas is not caught. Fit the poles so that they cross over and connect to the inner sockets as shown.

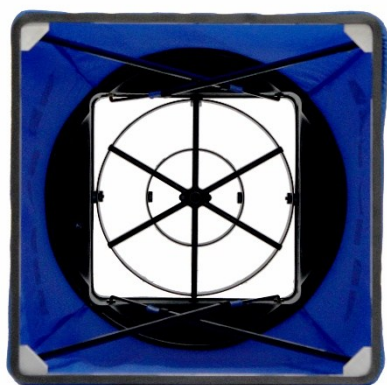
3 ft x 3 ft (900 mm x 900 mm)



Frame 1 + 2 + 3 + 4 + B + B

To assemble please see the illustration. Fit the larger end of the hood to the frame ensuring that the seams are in line with the corners. Then fit the smaller end to the base ensuring that the canvas is not caught. Fit the poles so that they run parallel to the side seams as shown.

1.3 ft x 1.3 ft (400 mm x 400 mm) Frame



Tall Canvas

Fit the poles so that they run cross over as shown.



Short Canvas

Fit the 25 cm poles so that they run parallel to the side seams as shown.

Back Pressure

The dpm 2 ft x 2 ft (600 mm x 600 mm) hood has been tested in the laboratory and in field conditions to determine the back pressure added to the system.

For volumes below 200 l/sec (720 m³/hr 424 cfm), the dpm Hood does not introduce any back pressure.

To compensate for volumes above 200 l/sec (720 m³/hr 424 cfm), an increase of 12%* has to be applied to the hood factor (from 310 to 346).

*These results were obtained using a top-entry four way diffuser.

Specifications

550 Models Range / Resolution in High Sensitivity Setting

SV	CV	DV	Pressure			
●	●	●	Pa	± 0.06 to 99.99	± 100.0 to 999.9	± 1000 to 5000
	●	●	mm H ₂ O	± 0.004 to 9.999	± 10.00 to 99.99	± 100.0 to 510.0
	●	●	in H ₂ O	± 0.000 to 9.999	± 10.00 to 20.00	
	●	●	mbar	± 0.000 to 9.999	± 10.00 to 50.00	
			Velocity	Ellipsoidal	dpm-i	dpm-Ane™
●	●		m/sec	2.00 to 90.0	0.27 to 30.0	0.27 to 50.0
		●	ft/min	394 to 17730	53 to 5905	53 to 9843
			Volume (dpm Hood)	Low volume adaptor plate		
●	●		l/sec	Supply / Exhaust	5 to 25	25 to 1000
●	●		m ³ /hr	Supply / Exhaust	18 to 90	90 to 3600
		●	cfm	Supply / Exhaust	11 to 53	53 to 2119

Accuracy:

Pressure 20°C:

Readings < 100 counts ± 2 counts.

Readings > 100 counts ± 1% of reading ± 1 count

Velocity with Ellipsoidal type 16°C, 1000 mbar:

Readings < 100 counts ± 2 counts.

Readings > 100 counts ± 1% of reading ± 1 count

Velocity with dpm-i type 16°C, 1000 mbar:

± 3% of reading or

± 0.05 m/sec (10 ft/min) ± 1 count

Whichever is the greater.

Velocity with dpm-Ane™ 16°C, 1000 mbar:

Up to 8 m/sec (1575 ft/min)

± 1% of reading ± 0.03 m/sec.

From 8 to 50 m/sec (1575 to 9843 ft/min)

± 1 m/sec (197 ft/min)

Volume with dpm Hood 16°C, 1000 mbar:

With Adaptor Plate and using appropriate settings:

Flow < 25 l/sec (90 m³/hr, 53 cfm)

± 3% of reading ± 2 l/sec (7 m³/hr, 4 cfm)

Without Adaptor Plate and using appropriate settings:

Flow > 25 l/sec (90 m³/hr, 53 cfm)

± 3% of reading ± 4 l/sec (14 m³/hr, 9 cfm)

Volume with dpm Mini Hood Kit 16°C, 1000 mbar:

Using appropriate settings:

Flow < 12 l/sec (44 m³/hr, 25 cfm)

± 3% of reading ± 2 l/sec (7 m³/hr, 4 cfm)

General Specifications:

Recommended Operational Limits:

0° to 50°C (32° to 123°F)

Span Stability versus Temperature:

0.1% of range in use per °C (per 2°F)

Zero Drift:

Negligible due to auto zero system, when auto zero set at 60 sec intervals (2 minute warm up).

Zero System Accuracy:

± 0.05 Pascal typical

Orientation Effect:

(any 45° change) 0.1 Pascal typical

Output Socket:

RS 232 (baud rate 9600)

Data Logging:

Up to 2500 any units.

Software:

Download data to PC in very basic form.

Power Source:

Dry cell (MN1604, PP3) or Rechargeable.

System Air Leak:

0.1 ml/minute at 5Kpa (typical)

Safe Line / Differential Pressure:

15KPa

Storage Temperature Limits:

-5° to +50°C

Weight:

3.8 kg with Micromanometer and handles.

Dimensions (fully assembled):

970 x 610 x 610 mm.

Optional Extras

Canvases:

1 ft x 4 ft – 300 mm x 1200 mm
1 ft x 5 ft – 300 mm x 1500 mm
2 ft x 4 ft – 600 mm x 1200 mm
3 ft x 3 ft – 900 mm x 900 mm
1.3 ft x 1.3 ft – 400 mm x 400 mm tall
1.3 ft x 1.3 ft – 400 mm x 400 mm short

Rubber Boot

Pitot Tubes Ellipsoidal / dpm-i Straight

Mini Hood Kit

Frame Kit for Canvases

Frame - 1.3 ft x 1.3 ft – 400 mm x 400 mm

Downloading Software and Connecting Cable

Canvases are also available without the transparent panel

Maintenance and Calibration

Maintenance:

There are no user serviceable parts in the TT Series Micromanometers or the dpm Hood.

With the exception of dry cell batteries there are no consumable parts.

If the instrument is damaged or requires servicing, it should be returned to the Buckingham factory in England.

To keep the dpm Hood in the best condition, clean using a non-abrasive cleaner and keep dry. If any water gets into the dpm Hood it should be removed using an absorbent, lint-free cloth or paper.

All canvases should be rolled not folded.

If the canvas becomes worn or damaged it should be replaced immediately as this will seriously affect the accuracy of the readings.

Calibration:

All TT Series instruments and dpm Hoods are calibrated against equipment traceable to UK National Standards. It is recommended to have the instrument calibrated and checked at least annually.



In the interest of continuous product development and improvement DP Measurement reserve the right to amend specifications and to discontinue models, features and colours of the TT Series Micromanometers and dpm Hood at any time without prior notice.



DP Measurement

Unit 11, Top Angel, Buckingham Industrial Park

Buckingham, England. MK18 1TH

Tel / Fax: +44 (0)1280 817122

www.ttseries.com email: dpm@ttseries.com

Appendix

Conversion Tables

Pressure:

	Pa	mbar	mm H ₂ O	in H ₂ O	mm Hg	in Hg	PSI
Pa	1	100.0	9.806	249.1	133.3	3385	6892
mbar	0.010	1	0.098	2.491	1.333	33.85	68.92
mm H ₂ O	0.102	10.20	1	25.40	13.60	345.42	702.8
in H ₂ O	0.004	0.402	0.039	1	0.535	13.51	27.67
mm Hg	7.501×10^{-3}	0.750	0.074	1.868	1	25.64	51.70
in Hg	2.953×10^{-4}	0.029	2.895×10^{-3}	0.074	0.039	1	2.305
PSI	1.451×10^{-4}	0.014	1.423×10^{-3}	0.036	0.019	0.4338	1

Volume:

	m ³ /sec	m ³ /hr	l/sec	cfm
m ³ /sec	1	0.0002	0.001	0.0004
m ³ /hr	3600	1	3.6	1.699
l/sec	999.97	0.2777	1	0.4719
cfm	2118.88	0.5885	2.1189	1

Velocity:

	m/sec	ft/min
m/sec	1	0.005
ft/min	196.85	1

Air Velocity Calculations

Air Velocity Calculations using S.I Scales:

For non-standard air conditions:
$$V = 1.291 \times PT \sqrt{\frac{1013.25}{B} \times \frac{T}{289} \times P_v}$$

V = Velocity in m/sec

PT = Pitot Tube Factor (for Ellipsoidal type 1.000)

B = Barometric pressure in mbar

T = Absolute temperature in °K (= t in °C + 273 where t = airstream temperature)

P_v = Velocity pressure in Pa

Air Velocity Calculations using Imperial Scales:

For non-standard air conditions:
$$V = 4006 \times PT \sqrt{\frac{30}{B} \times \frac{T}{521} \times P_v}$$

V = Velocity in ft/min

PT = Pitot Tube Factor (for Ellipsoidal type 1.000)

B = Barometric pressure in inHg

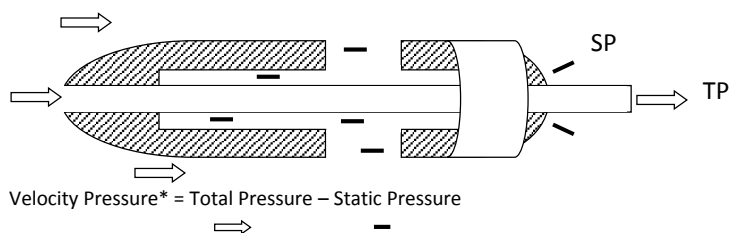
T = Absolute temperature in °R (= t in °F + 460 where t = airstream temperature)

P_v = Velocity pressure in wg (H₂O)

Duct Transverse Points

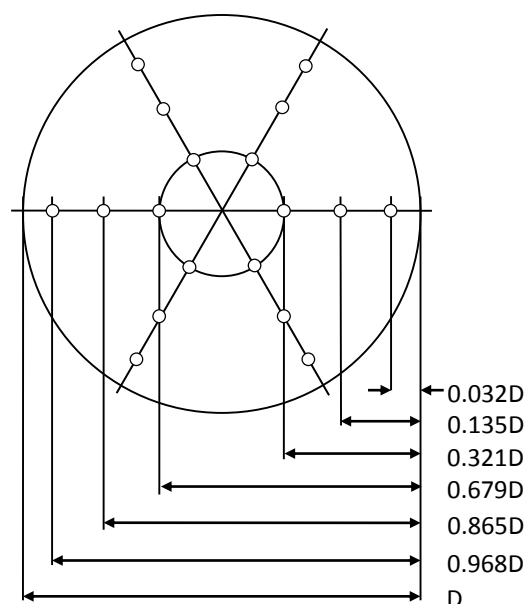
Principle of Operation:

Pitot Head



*Calculated by the Micromanometer

Log Linear Rule for Traverse Points on 3 Diameters in a Circular Duct:



The nose of the Pitot Tube should face directly into the airstream thus the Total Pressure flows down the inner tube which is connected to the + (Signal In) port.

The static holes are positioned around the side of the Pitot Tube and lead into an outer tube. This is connected to the black tubing which in turn is connected to the - (Reference) port.

Ideally traverse points should be at least six duct diameters away from any bend or obstruction in the system. The Pitot Tube should be inserted at right angles to the walls of the ducts and measurements are taken in the positions shown in the diagrams (left). The directional pointer can be used to ensure that the Pitot Tube head is parallel to the duct walls.

Alternative Measuring Points and Traverse Lines Relative to Side Lengths for Regular Ducts:

