

# Fumehood Performance Test Report

## 6' Protector ECHO ASHRAE 110 MODIFIED TEST

Prepared For

**Labconco Corporation**

Prepared By

*AccuTec*  
Services, Inc.  
[www.atsiusa.com](http://www.atsiusa.com)

Report Date: 02-12-2015

Project No.: 142327

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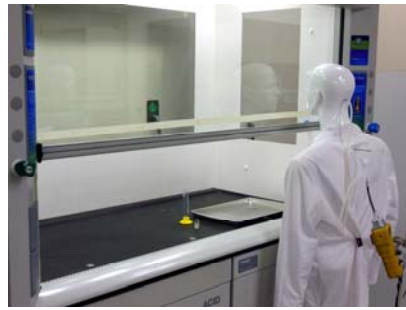


## **1.0 Introduction**

- 1.1** This report documents the work performed by AccuTec Services, Inc. for the Labconco Corporation, at the Labconco Manufacturing Plant located in Kansas City, MO.
- 1.2** The scope of the project is to test the as manufactured performance of the 6' Protector ECHO Labconco Laboratory Fume Hood. The Protector ECHO series fume hoods are ductless bench top fume hood equipped with chemical filters.
- 1.3** The fume hood was tested in accordance with a modified ASHRAE 110 fume hood testing protocol; to establish an "As Manufactured" rating for the equipment.
  - 1.3.1** The AHSRAE 110 protocol was modified by replacing the tracer gas SF6 with Isopropyl Alcohol (IPA).
  - 1.3.2** 20 mL of IPA is exposed and evaporated in a 12.25" x 17.25" x 0.50" tray for each tracer gas test listed below, unless otherwise noted.
    - 1.3.2.1** Breathing zone left, center, right
    - 1.3.2.2** Sash Movement Effect
    - 1.3.2.3** Perimeter Scan (30mL IPA)
  - 1.3.3** A mannequin, with a breathing zone 3" from the sash, is used to simulate lab personnel working in the hood.
  - 1.3.4** Velocity measurements are taken in the center of no greater than 1ft<sup>2</sup> areas in the opening plane of the fume hood.
  - 1.3.5** Large and small scale visible smoke pattern testing.

## **2.0 Summary**

- 2.1** All test methods were performed in accordance with the guidelines established by the ANSI/ASHRAE 110-1995 Method of Testing Performance of Laboratory Fume Hoods. The ASHRAE test was modified by replacing the standard tracer gas (SF6) with isopropyl alcohol in order to properly challenge the overall containment capability of the chemically filtered stand alone fume hood.
- 2.2** The Fume Hood airflow was balanced to within the design intake face velocity range and tested at 66 FPM.
- 2.3** Large and small scale smoke sources were used in the work area as well as around the front sash opening to confirm acceptable visible containment and airflow patterns.

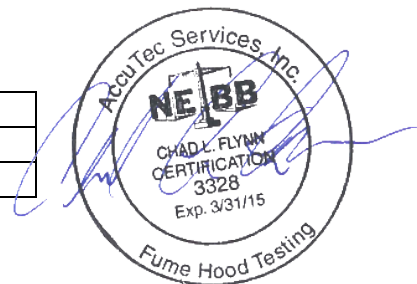


- 2.2.1 Airflow velocity data is located in Section 2 of this report.
- 2.2.2 Airflow visualization data is located in section 3 of this report
- 2.2.3 Trace gas test data is located in section 4 of this report.
- 2.2.4 Certificates of calibration are located in section 5 of this report

### 3.0 Fume Hood Ratings

- 3.1 The 6' Protector ECHO ductless fume hood passed the acceptance criteria of no greater than AM-0.05 as listed in the specifications. The actual rating is shown in the table below.

IPA NIH Fume Hood Test	
Fume Hood SN	140997697B
Rating	AM-0.000



### 4.0 Abbreviations

- 4.1 The following abbreviations may have been used throughout this report and are represented here for reference.

SME	Sash Movement Effect	AM	As Manufactured
FPM	Feet per minute	Sec.	Seconds
Cal.	Calibration	L/m	Liters per minute
ppm.	Parts Per Million	No.	Number

## **5.0 Standards Utilized**

- 5.1** The following calibrated field equipment was used in the execution of this work. Current certificates of calibration are provided in Section 5 of this report.

<b>Device</b>	<b>Model</b>	<b>Serial No.</b>
TSI Anemometer	966	P07460054
BIOS Flow Meter	Definer 220	119896
MiniRAE	2000	110-014350

## **6.0 References**

- 5.1** ANSI/ASHRAE 110-1995 "Method of Testing Performance of Laboratory Fume Hoods"
- 5.2** Testing Protocol for ERLAB Ductless Fume Hood, Prepared by Exposure Control Technologies, Inc.



## Airflow Velocity Test Report

Project: Labconco  
 Location: Labconco Test Lab  
 Manufacturer: Labconco  
 Unit ID: 182610002

Model: Protector ECHO  
 Serial No.: 140997697B  
 Type: Ductless Fume Hood

Position of Sash (Percent Open)			<b>100%</b>
Average Airflow Face Velocity (fpm)			66
Highest Airflow Face Velocity (fpm)			74
Lowest Airflow Face Velocity (fpm)			58

<u>16"</u>	Actual Sash Height	Narrative: _____ _____ _____ _____ _____ _____
<u>62.25"</u>	Actual Sash Width	
<u>16"</u>	Design Sash Height	
<u>62.25"</u>	Design Sash Width	
<u>Vertical</u>	Sash Configuration	
<u>60 fpm</u>	Design Airflow Face Velocity	

Acceptance Criteria:   X   Has Been Met        Has Not Been Met

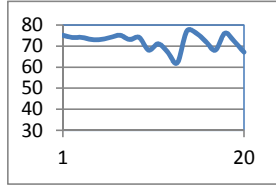
Notes: Modified AHRAE 110 Test (Isopropyl alcohol)  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Standards Utilized: 9565P1148030 Cal. Due Date: 12-Aug-15

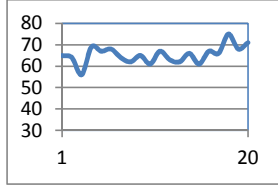
Technician: CLF Test Date: 19-Jan-15



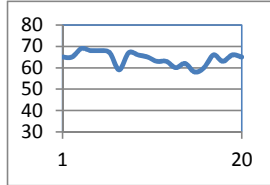
## Airflow Velocity Test Report



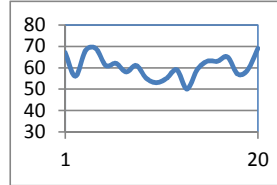
Max Velocity:	77 fpm
Min Velocity:	62 fpm
Avg Velocity:	72 fpm



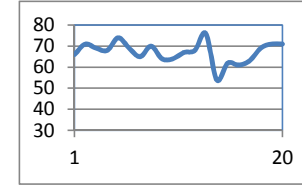
Max Velocity:	75 fpm
Min Velocity:	56 fpm
Avg Velocity:	65 fpm



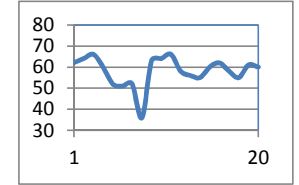
Max Velocity:	69 fpm
Min Velocity:	58 fpm
Avg Velocity:	64 fpm



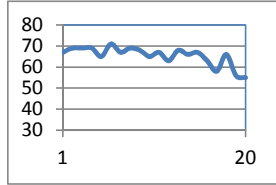
Max Velocity:	69 fpm
Min Velocity:	50 fpm
Avg Velocity:	60 fpm



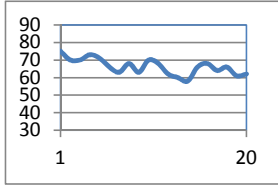
Max Velocity:	76 fpm
Min Velocity:	54 fpm
Avg Velocity:	67 fpm



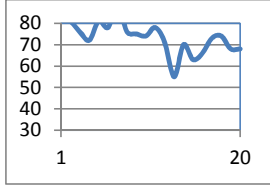
Max Velocity:	66 fpm
Min Velocity:	36 fpm
Avg Velocity:	58 fpm



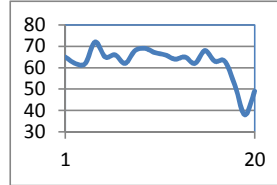
Max Velocity:	71 fpm
Min Velocity:	55 fpm
Avg Velocity:	65 fpm



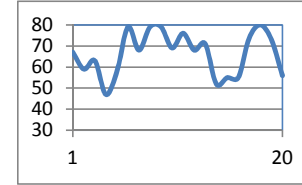
Max Velocity:	75 fpm
Min Velocity:	58 fpm
Avg Velocity:	66 fpm



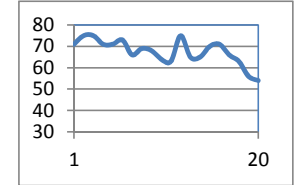
Max Velocity:	89 fpm
Min Velocity:	55 fpm
Avg Velocity:	74 fpm



Max Velocity:	72 fpm
Min Velocity:	38 fpm
Avg Velocity:	62.4 fpm



Max Velocity:	80 fpm
Min Velocity:	47 fpm
Avg Velocity:	66 fpm



Max Velocity:	75 fpm
Min Velocity:	54 fpm
Avg Velocity:	68 fpm

Total:

Avg Velocity:	66 fpm
Max Velocity:	74 fpm
Min Velocity:	58 fpm





Model:	Protector ECHO
Serial No.:	140997697B
Type:	Ductless Fume Hood

16"	Sash Height	Narrative:
62.25"	Sash Width	
Vertical	Sash Configuration	
Smoke Pen	Challenge Medium	

Sash Closed Perimeter/Interior Test:	X	Pass	Fail
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Notes: Modified AHRAE 110 Test (Isopropyl alcohol)

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Model:	Protector ECHO
Serial No.:	140997697B
Type:	Ductless Fume Hood

16"	Sash Height	Narrative:	
62.25"	Sash Width		
Vertical	Sash Configuration		
Glycol Fogger	Challenge Medium		

Sash Closed Perimeter/Interior Test:   X   Pass        Fail

Notes: **Modified AHRAE 110 Test (Isopropyl alcohol)**

Page 1



## Tracer Gas Containment Report

Project: Labconco  
Location: Labconco Test Lab  
Manufacturer: Labconco  
Unit ID: 182610002

Model: Protector ECHO  
Serial No.: 140997697B  
Type: Ductless Fume Hood

	<b>Left</b>	<b>Center</b>	<b>Right</b>
Average Concentration:	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>
Peak Concentration:	<u>0.000</u>	<u>0.000</u>	<u>0.000</u>

Static Mode Performance Rating: AM- 0.000

<u>16"</u>	Sash Height	Narrative:	<u></u>
<u>62.25"</u>	Sash Width		<u></u>
<u>Vertical</u>	Sash Configuration		<u></u>
<u>20 mL IPA</u>	Tracer Gas Release Rate		<u></u>
			<u></u>
			<u></u>
			<u></u>
			<u></u>

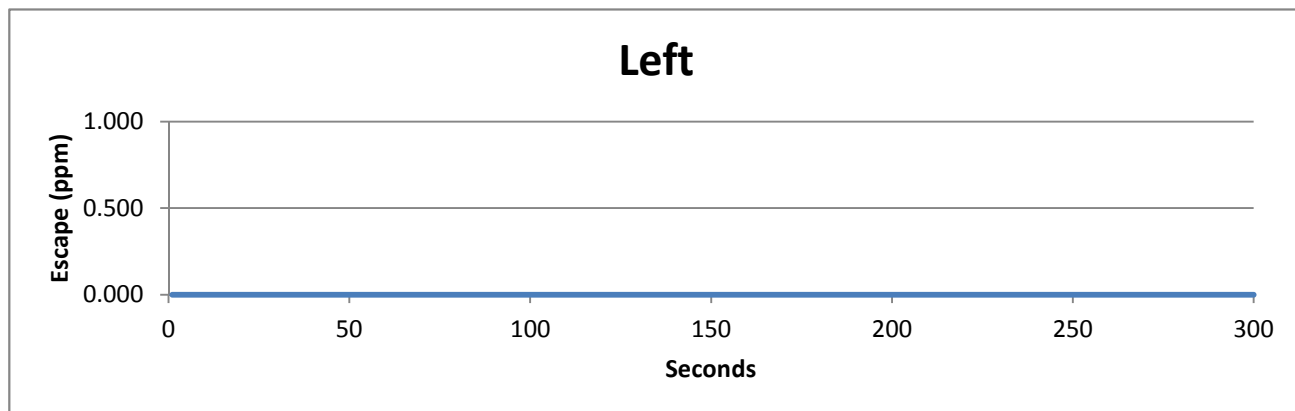
Acceptance Criteria:   X   Has Been Met        Has Not Been Met

Notes: Modified AHRAE 110 Test (Isopropyl alcohol)

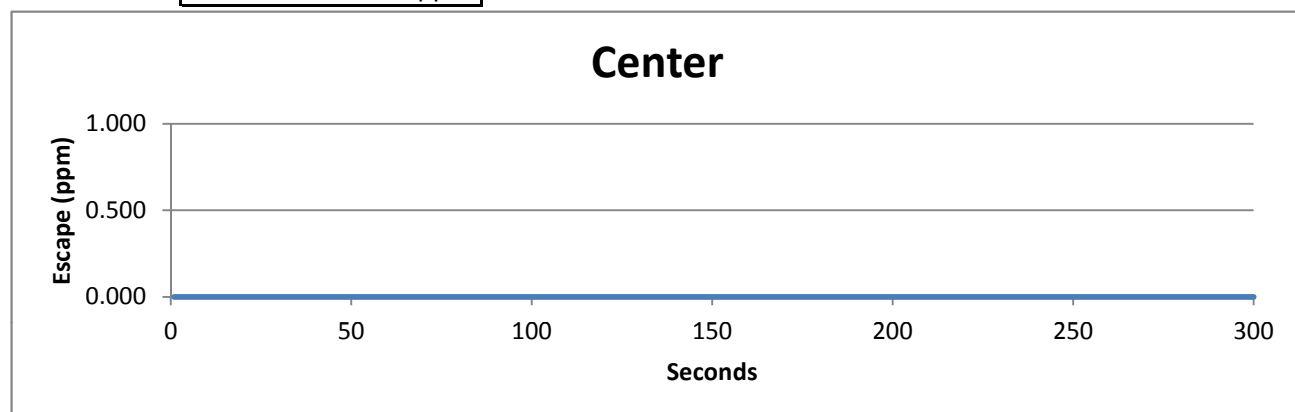
Standards Utilized: miniRAE 2000 Cal. Due Date: JAN 2016

Technician: CLF Test Date: 19-Jan-15

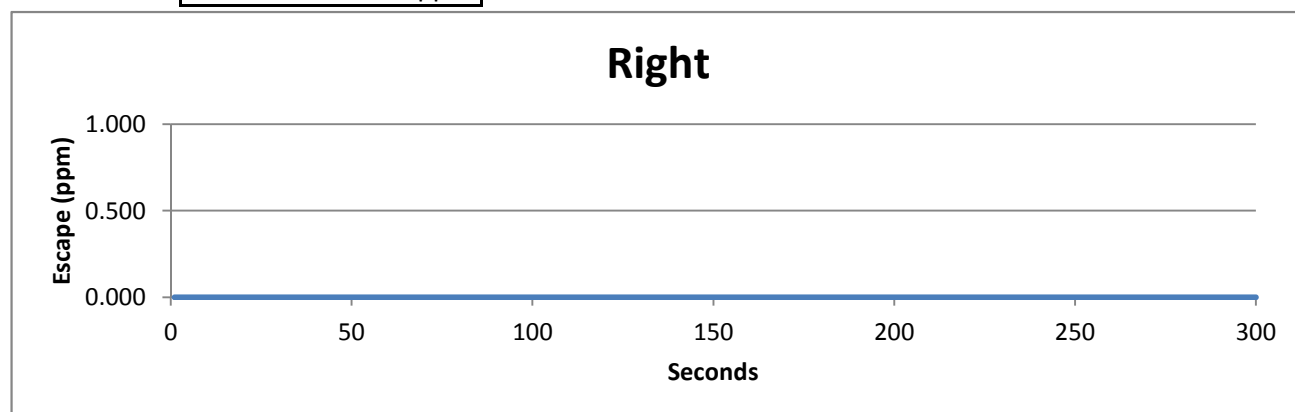
## Tracer Gas Containment Test Report



Average:	0.000	ppm
Peak:	0.000	ppm



Average:	0.000	ppm
Peak:	0.000	ppm



Average:	0.000	ppm
Peak:	0.000	ppm

## Tracer Gas Containment Report

### Sash Movement Effect

Project: Labconco  
Location: Labconco Test Lab  
Manufacturer: Labconco  
Unit ID: 182610002

Model: Protector ECHO  
Serial No.: 140997697B  
Type: Ductless Fume Hood

Tracer Gas Concentration (ppm)				
Time Span	Data Set No.	Cycle 1 Open	Cycle 2 Open	Cycle 3 Open
0-45 Secs	1	0.000	0.000	0.000
1-46 Secs	2	0.000	0.000	0.000
2-47 Secs	3	0.000	0.000	0.000
3-48 Secs	4	0.000	0.000	0.000
4-49 Secs	5	0.000	0.000	0.000
5-50 Secs	6	0.000	0.000	0.000
6-51 Secs	7	0.000	0.000	0.000
7-52 Secs	8	0.000	0.000	0.000
8-53 Secs	9	0.000	0.000	0.000
9-54 Secs	10	0.000	0.000	0.000
10-55 Secs	11	0.000	0.000	0.000
11-56 Secs	12	0.000	0.000	0.000
12-57 Secs	13	0.000	0.000	0.000
13-58 Secs	14	0.000	0.000	0.000
14-59 Secs	15	0.000	0.000	0.000
15-60 Secs	16	0.000	0.000	0.000
Total		0.000	0.000	0.000
Average		0.000	0.000	0.000
<b>SME-AM</b>		<b>0.000</b>		

16" Sash Height  
62.25" Sash Width  
Vertical Sash Configuration  
20 mL IPA Tracer Gas Release Rate

Notes: Modified ASHRAE 110 (Isopropyl Alcohol)

Acceptance Criteria:   X   Has Been Met        Has Not Been Met

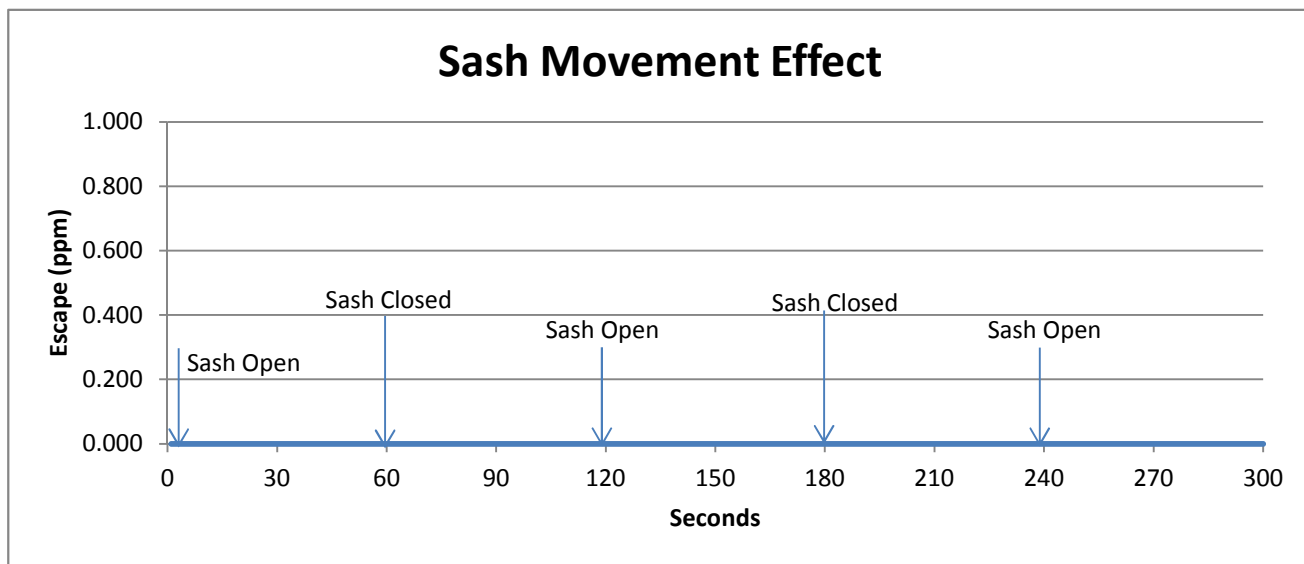
Standards Utilized: miniRAE 2000 Cal. Due Date: JAN 2016

Technician: CLF Test Date: 19-Jan-15



## Tracer Gas Containment Report

### Sash Movement Effect



Narrative:

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Notes: Modified ASHRAE 110 Protocol (IPA).

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## Tracer Gas Containment Report Perimeter Scan

Project: Labconco  
Location: Labconco Test Lab  
Manufacturer: Labconco  
Unit ID: 182610002

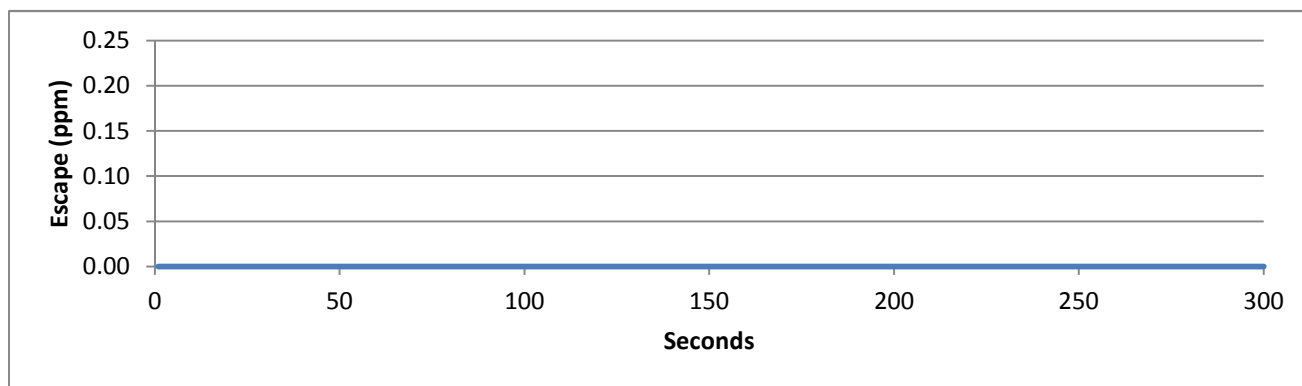
Model: Protector ECHO  
Serial No.: 140997697B  
Type: Ductless Fume Hood

### Location and Concentration of Leakage:

Indicate location of leaks and concentration below

<u>28"</u>	Sash Height	Notes: <u>Modified ASHRAE 110 (IPA)</u>
<u>62.25"</u>	Sash Width	
<u>Vertical</u>	Sash Configuration	
<u>30 mL IPA</u>	Tracer Gas Release Rate	

### Perimeter Scan Graph



Acceptance Criteria:   X   Has Been Met        Has Not Been Met

Standards Utilized: miniRAE 2000 Cal. Due Date: JAN 2016

Technician: CLF Test Date: 25-Jul-12





## Calibration Certificate

**Certificate No.** 5052989      **Sold to:** AccuTec Services Inc. - Lee's Summit  
**Product** Definer 220 Medium Flow      320 NW Capital Drive  
**Serial No.** 119896      Lee's Summit, MO 64086  
**Cal. Date** 12-Jan-2015      USA

All calibrations are performed at Mesa Laboratories, Inc., 10 Park Place, Butler, NJ, 07405, an ISO 17025:2005 accredited laboratory through NVLAP of NIST. This report shall not be reproduced except in full without the written approval of the laboratory. Results only relate to the items calibrated. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

### As Received Calibration Data

**Technician** Lilianna Malinowska      **Lab. Pressure** 759 mmHg  
**Lab. Temperature** 22.5 °C

Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Received
103.19 sccm	100.765 sccm	2.41 %	1.00%	Out of Tolerance
1023.4 sccm	1000.5 sccm	2.29 %	1.00%	Out of Tolerance
5119.6 sccm	5001.35 sccm	2.36 %	1.00%	Out of Tolerance
17.4 °C	22.5 °C	-5.1 °C	±0.8°C	Out of Tolerance
758 mmHg	759 mmHg	-1.0 mmHg	±3.5mmHg	In Tolerance

### Mesa Laboratoires Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML-800-24	117991	22-Apr-2014	22-Apr-2015
Precision Thermometer	305460	9-Sep-2014	9-Sep-2015
Precision Barometer	2981392	24-Jun-2014	24-Jun-2015

Mesa Laboratories Inc. 10 Park Place Butler, NJ 07405 USA  
(973) 492-8400 FAX (973) 492-8270 [www.mesalabs.com](http://www.mesalabs.com) Symbol "MLAB" on the NASDAQ



## As Shipped Calibration Data

Certificate No. 5052989

Technician Lilianna Malinowska

Lab. Pressure 759 mmHg

Lab. Temperature 22.6 °C

Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Shipped
102.19 sccm	101.755 sccm	0.43 %	1.00%	In Tolerance
1004.5 sccm	1000.7 sccm	0.38 %	1.00%	In Tolerance
5028.4 sccm	5001.45 sccm	0.54 %	1.00%	In Tolerance
22.6 °C	22.6 °C	-	±0.8°C	In Tolerance
759 mmHg	759 mmHg	-	±3.5mmHg	In Tolerance

## Mesa Laboratories Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML-800-24	100439	8-May-2014	8-May-2015
Precision Thermometer	305460	9-Sep-2014	9-Sep-2015
Precision Barometer	2981392	24-Jun-2014	24-Jun-2015

## Calibration Notes

The expanded uncertainty of flow, temperature, and pressure measurements all have a coverage factor of  $k = 2$  for a confidence interval of approximately 95%.

Flow testing is in accordance with our test number PR18-13 with an expanded uncertainty of 0.18% using high-purity nitrogen or filtered laboratory air. Flow readings in sccm are performed at STP of 21.1°C and 760 mmHg.

Pressure testing is in accordance with our test number PR18-11 with an expanded uncertainty of 0.16 mmHg.

Temperature testing is in accordance with our test number PR18-12 with an expanded uncertainty of 0.04 °C.

Traceability to the International System of Units (SI) is verified by accreditation to ISO/IEC 17025 by NVLAP under NVLAP Code 200661-0.

## Technician Notes:

David W. Wilson, Chief Metrologist



# CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA  
Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 <http://www.tsi.com>

ENVIRONMENT CONDITION			MODEL	9555-P
TEMPERATURE	73.2 (22.9)	°F (°C)	SERIAL NUMBER	9555P0746017
RELATIVE HUMIDITY	24	%RH		
BAROMETRIC PRESSURE	28.71 (972.2)	inHg (hPa)		

☒ AS LEFT  
☐ AS FOUND

☒ IN TOLERANCE  
☐ OUT OF TOLERANCE

## - CALIBRATION VERIFICATION RESULTS -

THERMO COUPLE				SYSTEM PRESSURE01-02				Unit: °F (°C)
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	73.1 (22.8)	73.1 (22.8)	71.1~75.1 (21.7~23.9)					

DIFFERENTIAL PRESSURE				SYSTEM PRESSURE01-02				Unit: inH <sub>2</sub> O (Pa)
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	-3.715 (-925.0)	-3.734 (-929.8)	-3.756~-3.674 (-935.2~-914.8)	3	8.005 (1993.2)	8.011 (1994.7)	7.921~8.089 (1972.3~2014.2)	
2	1.910 (475.6)	1.902 (473.6)	1.887~1.933 (469.9~481.3)	4	13.991 (3483.8)	14.010 (3488.5)	13.847~14.135 (3447.9~3519.6)	

BAROMETRIC PRESSURE				SYSTEM PRESSURE01-02				Unit: inHg (hPa)
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	19.65 (665.4)	19.65 (665.4)	19.26~20.04 (652.2~678.6)	3	34.37 (1163.9)	34.38 (1164.2)	33.68~35.06 (1140.5~1187.3)	
2	28.79 (974.9)	28.79 (974.9)	28.21~29.37 (955.3~994.6)					

TSI does hereby certify that the above described instrument conforms to the original manufacturer's specification (not applicable to As Found data) and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST) or has been verified with respect to instrumentation whose accuracy is traceable to NIST, or is derived from accepted values of physical constants. TSI's calibration system is registered to ISO-9001:2008.

Measurement Variable	System ID	Last Cal.	Cal. Due	Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E004626	10-30-14	10-30-15	Pressure	E005254	10-20-14	10-20-15
Pressure	E003982	09-10-14	03-10-15	DC Voltage	E003493	01-06-15	01-06-16

CALIBRATED

January 26, 2015

DATE

Doc. ID: CERT\_GEN\_WCC



# CERTIFICATE OF CALIBRATION AND TESTING

TSI Incorporated, 500 Cardigan Road, Shoreview, MN 55126 USA  
Tel: 1-800-874-2811 1-651-490-2811 Fax: 1-651-490-3824 <http://www.tsi.com>

ENVIRONMENT CONDITION			MODEL	9555-P
TEMPERATURE	73.2 (22.9)	°F (°C)	SERIAL NUMBER	9555P0746017
RELATIVE HUMIDITY	24	%RH		
BAROMETRIC PRESSURE	28.71 (972.2)	inHg (hPa)		

☒ AS LEFT  
☐ AS FOUND

☒ IN TOLERANCE  
☐ OUT OF TOLERANCE

## - CALIBRATION VERIFICATION RESULTS -

THERMO COUPLE				SYSTEM PRESSURE01-02				Unit: °F (°C)
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	73.1 (22.8)	73.1 (22.8)	71.1~75.1 (21.7~23.9)					

DIFFERENTIAL PRESSURE				SYSTEM PRESSURE01-02				Unit: inH <sub>2</sub> O (Pa)
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	-3.715 (-925.0)	-3.734 (-929.8)	-3.756~-3.674 (-935.2~-914.8)	3	8.005 (1993.2)	8.011 (1994.7)	7.921~8.089 (1972.3~2014.2)	
2	1.910 (475.6)	1.902 (473.6)	1.887~1.933 (469.9~481.3)	4	13.991 (3483.8)	14.010 (3488.5)	13.847~14.135 (3447.9~3519.6)	

BAROMETRIC PRESSURE				SYSTEM PRESSURE01-02				Unit: inHg (hPa)
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE	
1	19.65 (665.4)	19.65 (665.4)	19.26~20.04 (652.2~678.6)	3	34.37 (1163.9)	34.38 (1164.2)	33.68~35.06 (1140.5~1187.3)	
2	28.79 (974.9)	28.79 (974.9)	28.21~29.37 (955.3~994.6)					

TSI does hereby certify that the above described instrument conforms to the original manufacturer's specification (not applicable to As Found data) and has been calibrated using standards whose accuracies are traceable to the United States National Institute of Standards and Technology (NIST) or has been verified with respect to instrumentation whose accuracy is traceable to NIST, or is derived from accepted values of physical constants. TSI's calibration system is registered to ISO-9001:2008.

Measurement Variable	System ID	Last Cal.	Cal. Due	Measurement Variable	System ID	Last Cal.	Cal. Due
Temperature	E004626	10-30-14	10-30-15	Pressure	E005254	10-20-14	10-20-15
Pressure	E003982	09-10-14	03-10-15	DC Voltage	E003493	01-06-15	01-06-16

CALIBRATED

January 26, 2015

DATE

Doc. ID: CERT\_GEN\_WCC

# Certificate of Calibration

The following instrument

Model PGM-7600, MiniRAE 2000

Serial No. 110-014350

has been calibrated using gases that are traceable to N.I.S.T. standards.

Sensor	Test Gas Concentration	Gas Lot #	Reading
PID	Isobutylene 100 ppm ( $\pm 2\%$ )	95335	100
PID	Isobutylene 2000 ppm ( $\pm 2\%$ )	1406321	Pass
PID	Isobutylene 5000 ppm ( $\pm 2\%$ )	1612599	Pass

After calibration, the instrument was re-checked with the calibration gases and given the results shown on the table.

Calibration date: 1-15-2015

Calibrated by: Louie Le

**RAE Systems, Inc.**

