Fumehood Performance Test Report

6ft Protector XStream
Adverse Conditions Testing, 40 FPM

Prepared For

Labconco Corporation

Prepared By

AccuTec
Services, Inc.
www.atsiusa.com

Report Date: 09-13-2012

Project No.: 121747

AccuTec
Services, Inc.

Table of Contents

1.0 Introduction

1.1 This report documents the work performed by AccuTec Services, Inc. and the test results for Labconco Corporation located in Kansas City, MO.

1.2 The scope of the project is to test the performance of Labconco Protector XStream Laboratory Fume Hoods in accordance with National Institute of Health (NIH) ASHRAE 110 with modifications as detailed below; to establish an “As Manufactured” rating for the equipment.

2.0 Summary

2.1 All test methods were performed in accordance with the guidelines established by the "On Site Testing Constant Volume Fume Hoods", 1999 Edition published by the National Institutes of Health, with variations noted in 2.2 – 2.4.

2.2 The Fume Hood was balanced to the design inlet velocity value; then tested to establish an “As Manufactured” performance rating and a velocity profile at 40 fpm. Test Data is included in Section 2 of this report.

2.3 The Fume Hood was tested with a 50 fpm Cross Draft to test adverse conditions.

2.4 The Fume Hood was tested at 50 fpm face velocity at chest height, to test concentrations of tracer gas directly across from the ejector.

3.0 Fume Hood Ratings

The XStream hood passed the acceptance criteria of 6.0AM-0.05 as listed in the specifications; individual ratings are listed in the table below.

40 FPM NIH Modified	
Fume Hood ID	Protector XStream
Rating	6.0AM-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 3 of this report.

Device	Model	Serial No.
TSI Anemometer	966	P07460054
Uson Leak Meter	Q200	2000513
BIOS Flow Meter	Definer 220	119896

AccuTec Services, Inc.
www.atsiusa.com

Airflow Velocity Test Report

Project:	Labconco	Model:	Protector XStream 2012
Location:	Manufacturer	Serial No.:	--
Manufacturer:	Labconco	Type:	Laboratory Fume Hood
Unit ID:	--		

Position of Sash (Percent Open)			**100%**
Average Airflow Face Velocity (fpm)			41
Highest Airflow Face Velocity (fpm)			56
Lowest Airflow Face Velocity (fpm)			27

28"	Actual Sash Height	Notes: 460 CFM at 0.07 In. W.C.
62.25"	Actual Sash Width	
28"	Design Sash Height	
62.25"	Design Sash Width	
Vertical	Sash Configuration	
40 fpm	Design Airflow Face Velocity	

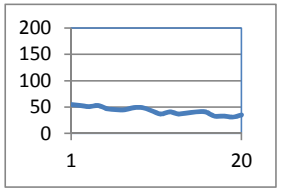
Acceptance Criteria: __X__ Has Been Met _____ Has Not Been Met

Standards Utilized: P07460054 Cal. Due Date: 13-Aug-13

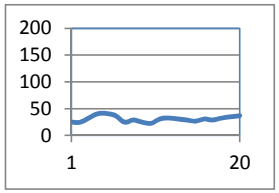
Technician: CLF Test Date: 25-Jul-12

AccuTec Services, Inc.
www.atsiusa.com

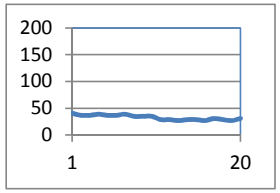
Airflow Velocity Test Report (Data)



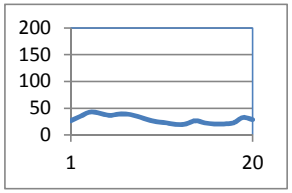
Max Velocity:	55 fpm
Min Velocity:	31 fpm
Avg Velocity:	43 fpm



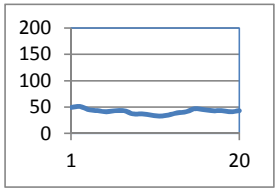
Max Velocity:	41 fpm
Min Velocity:	23 fpm
Avg Velocity:	31 fpm



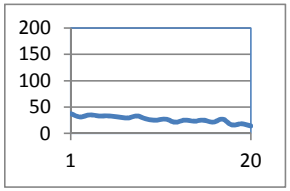
Max Velocity:	41 fpm
Min Velocity:	27 fpm
Avg Velocity:	33 fpm



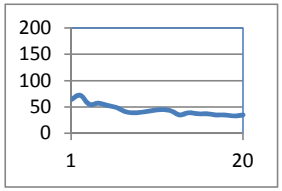
Max Velocity:	43 fpm
Min Velocity:	20 fpm
Avg Velocity:	30 fpm



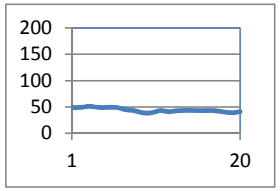
Max Velocity:	51 fpm
Min Velocity:	33 fpm
Avg Velocity:	42 fpm



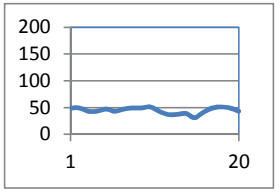
Max Velocity:	37 fpm
Min Velocity:	14 fpm
Avg Velocity:	27 fpm



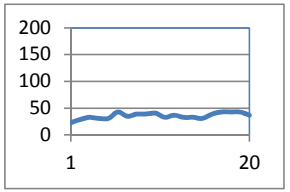
Max Velocity:	72 fpm
Min Velocity:	33 fpm
Avg Velocity:	44 fpm



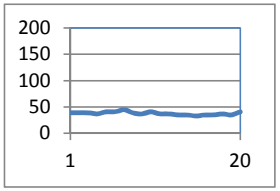
Max Velocity:	51 fpm
Min Velocity:	39 fpm
Avg Velocity:	44 fpm



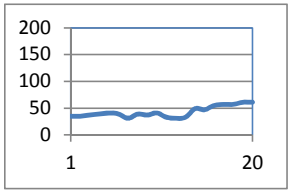
Max Velocity:	51 fpm
Min Velocity:	31 fpm
Avg Velocity:	45 fpm



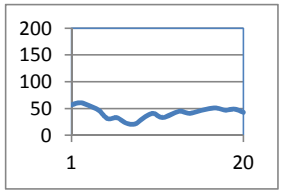
Max Velocity:	43 fpm
Min Velocity:	23 fpm
Avg Velocity:	36 fpm



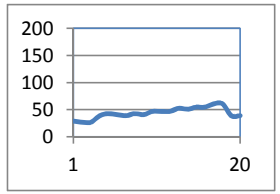
Max Velocity:	45 fpm
Min Velocity:	33 fpm
Avg Velocity:	38 fpm



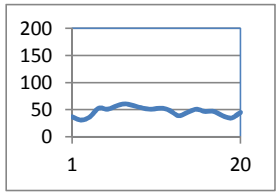
Max Velocity:	61 fpm
Min Velocity:	31 fpm
Avg Velocity:	43 fpm



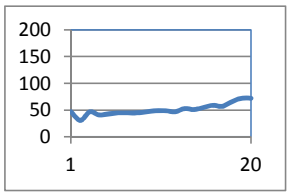
Max Velocity:	61 fpm
Min Velocity:	21 fpm
Avg Velocity:	42 fpm



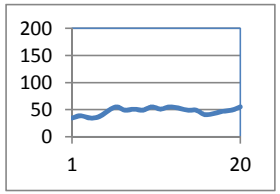
Max Velocity:	61 fpm
Min Velocity:	27 fpm
Avg Velocity:	44 fpm



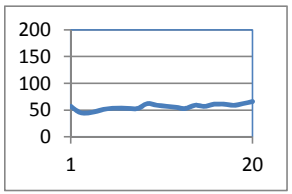
Max Velocity:	61 fpm
Min Velocity:	31 fpm
Avg Velocity:	47 fpm



Max Velocity:	72 fpm
Min Velocity:	31 fpm
Avg Velocity:	51 fpm



Max Velocity:	55 fpm
Min Velocity:	35 fpm
Avg Velocity:	47 fpm



Max Velocity:	66 fpm
Min Velocity:	45 fpm
Avg Velocity:	56 fpm

Total:

Avg Velocity:	41 fpm
Max Velocity:	56 fpm
Min Velocity:	27 fpm

AccuTec Services, Inc.
www.atsiusa.com

Airflow Visualization Test Report (Local)

Project:	Labconco	Model:	Protector XStream 2012
Location:	Manufacturer	Serial No.:	--
Manufacturer:	Labconco	Type:	Laboratory Fume Hood
Unit ID:	--		

Challenge: X Local ___ Large Volume

28"	Sash Height
62.25"	Sash Width
Vertical	Sash Configuration
Smoke Pen	Challenge Medium

Narrative: Tested to NIH Protocol with simulated apparatus, consisting of two 3.8 L round paint cans, one 300 mm by 300 mm card-board box, and three 150 mm by 150 mm by 300 mm card-board boxes. These items are positioned randomly between 150 mm and 250 mm behind the sash and supported off the work surface by 50 mm by 50 mm blocks.

Airfoil Test:	X Pass	___ Fail
Sash Perimeter Test:	X Pass	___ Fail
Sash Bottom Test:	X Pass	___ Fail
Work Surface Test:	X Pass	___ Fail
Hood Cavity Test:	X Pass	___ Fail
Sash Closed Perimeter/Interior Test:	X Pass	___ Fail

Acceptance Criteria: X Has Been Met ___ Has Not Been Met

Notes: Tested to NIH protocol modification: 40 FPM average face velocity.

Technician: CLF Test Date: 25-Jul-12

AccuTec Services, Inc.
www.atsiusa.com

Airflow Visualization Test Report (Large Volume)

Project:	Labconco	Model:	Protector XStream 2012
Location:	Manufacturer	Serial No.:	--
Manufacturer:	Labconco	Type:	Laboratory Fume Hood
Unit ID:	--		

Challenge: ____ Local __X__ Large Volume

28"	Sash Height
62.25"	Sash Width
Vertical	Sash Configuration
Glycol Fogger	Challenge Medium

Narrative: Tested to NIH Protocol with simulated apparatus, consisting of two 3.8 L round paint cans, one 300 mm by 300 mm card-board box, and three 150 mm by 150 mm by 300 mm card-board boxes. These items are positioned randomly between 150 mm and 250 mm behind the sash and supported off the work surface by 50 mm by 50 mm blocks.

Airfoil Test:	__X__ Pass	_____ Fail
Sash Perimeter Test:	__X__ Pass	_____ Fail
Sash Bottom Test:	__X__ Pass	_____ Fail
Work Surface Test:	__X__ Pass	_____ Fail
Hood Cavity Test:	__X__ Pass	_____ Fail
Sash Closed Perimeter/Interior Test:	__X__ Pass	_____ Fail
Acceptance Criteria:	__X__ Has Been Met	_____ Has Not Been Met

Notes: Tested to NIH protocol modification: 40 FPM average face velocity.

Technician: CLF Test Date: 25-Jul-12

AccuTec Services, Inc.
www.atsiusa.com

Tracer Gas Containment Test Report
NIH Protocol at 40 FPM

Project:	Labconco	Model:	Protector XStream 2012
Location:	Manufacturer	Serial No.:	--
Manufacturer:	Labconco	Type:	Laboratory Fume Hood
Unit ID:	--		

	Right	Center	Left	Rapid Walk-by
Average Concentration:	0.000	0.000	0.000	0.000
Peak Concentration:	0.000	0.000	0.000	0.000

Static Mode Performance Rating: AM- 0.000

28"	Sash Height
62.25"	Sash Width
Vertical	Sash Configuration
6 L/m	Tracer Gas Release Rate

Notes: Tested to NIH protocol with simulated apparatus, consisting of two 3.8 L round paint cans, one 300 mm by 300 mm by 300 mm cardboard box, and three 150 mm, by 150 mm by 300 mm carboard boxes. These items are positioned randomly between 150 mm to 250 mm behind the sash and supported off the work surface by 50 mm by 50 mm blocks.

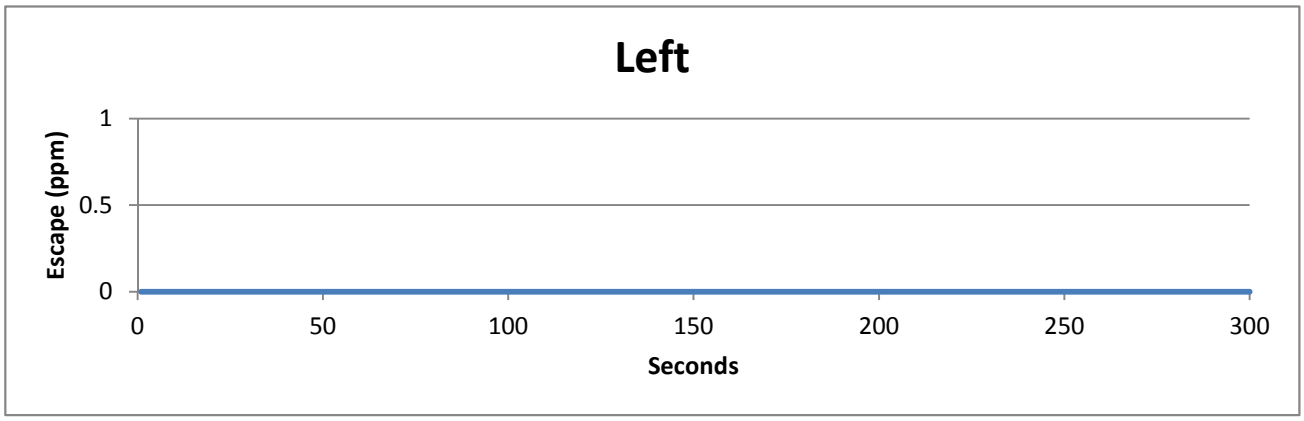
Acceptance Criteria: __X__ Has Been Met ____ Has Not Been Met

Notes: Following right, center, and left tracer gas testing, a 5 minute rapid walk by test is conducted. Rapid walk by test has the manikin and ejector in the center position. Tracer gas levels are recorded while three rapid walk-by tests are conducted, at 300 mm behind the manikin, spaced 30 seconds apart.

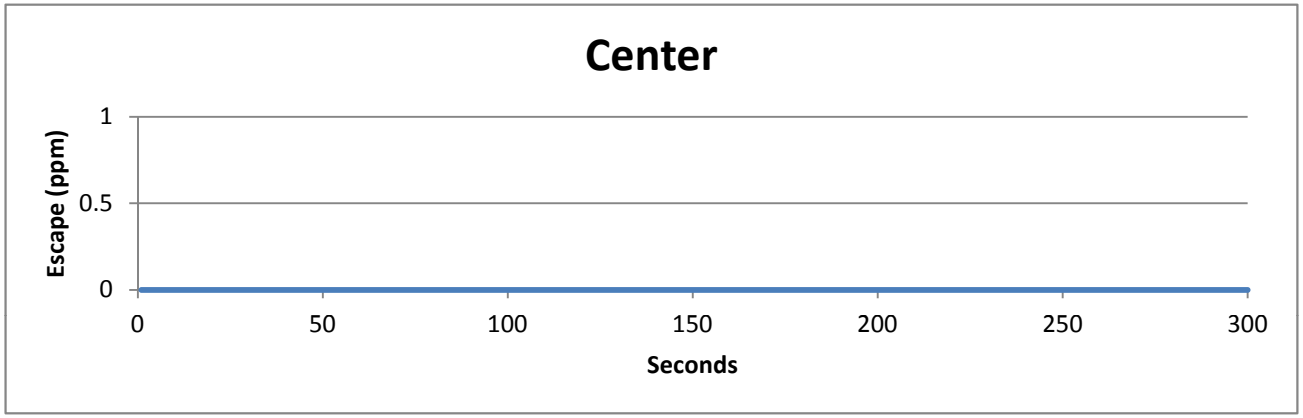
Standards Utilized:	2000513	Cal. Due Date:	05-Jan-13
Technician:	CLF	Test Date:	25-Jul-12

AccuTec Services, Inc.
www.atsiusa.com

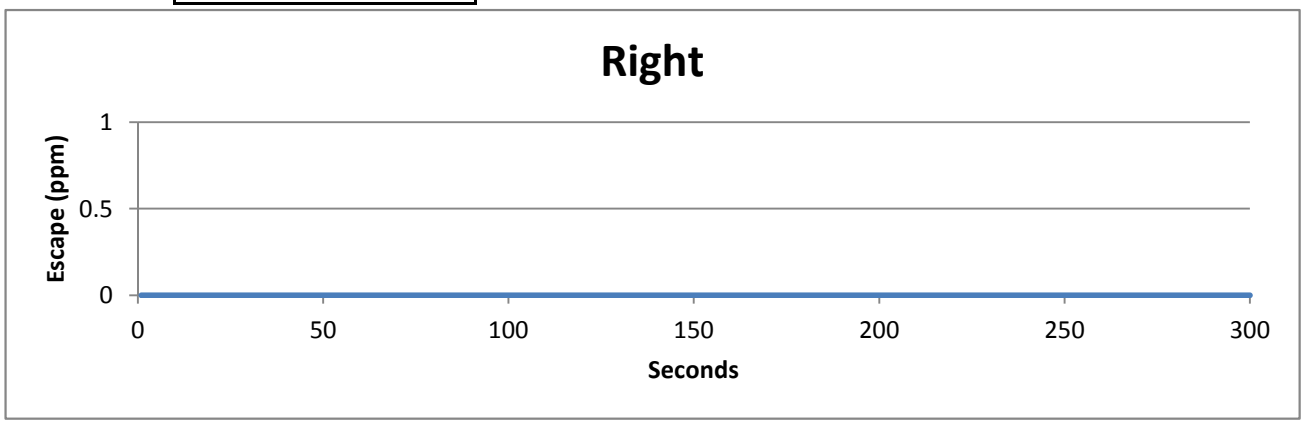
Tracer Gas Containment Test Report
NIH Protocol at 40 FPM (Data)



Average:	0.000	ppm
Peak:	0.000	ppm



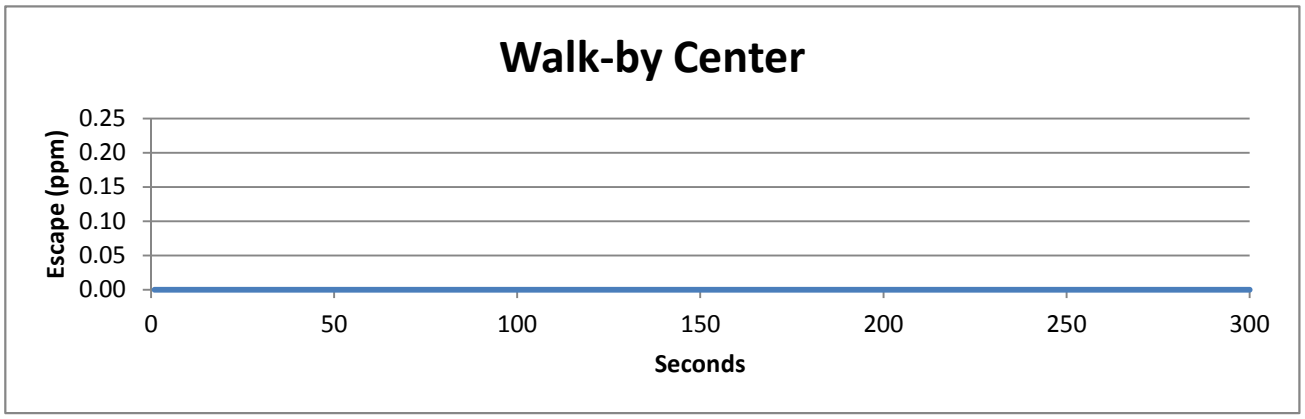
Average:	0.000	ppm
Peak:	0.000	ppm



Average:	0.000	ppm
Peak:	0.000	ppm

AccuTec Services, Inc.
www.atsiusa.com

Tracer Gas Containment Test Report
NIH Protocol at 40 FPM (Data)



Average:	0.000	ppm
Peak:	0.000	ppm

AccuTec Services, Inc.
www.atsiusa.com

Tracer Gas Containment (Perimeter) Report

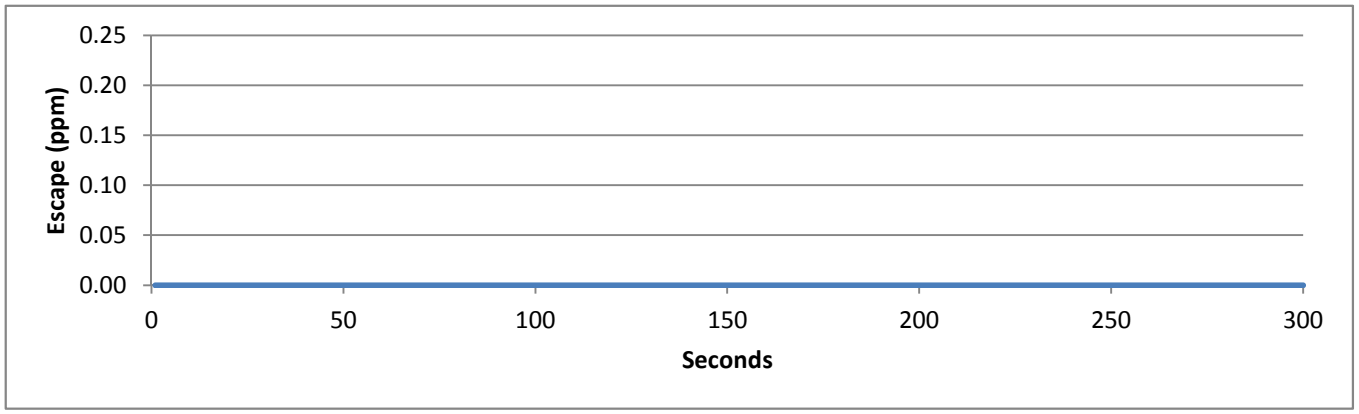
Project:	Labconco	Model:	Protector XStream 2012
Location:	Manufacturer	Serial No.:	--
Manufacturer:	Labconco	Type:	Laboratory Fume Hood
Unit ID:	--		

Location and Concentration of Leakage:

Indicate location of leaks and concentration below

28"	Sash Height	Notes: Tested to NIH protocol modification: 40 FPM average
62.25"	Sash Width	face velocity.
Vertical	Sash Configuration	
6 L/m	Tracer Gas Release Rate	

Perimeter leakage over time



Acceptance Criteria: __X__ Has Been Met _____ Has Not Been Met

Standards Utilized: 2000513 Cal. Due Date: 05-Jan-13

Technician: CLF Test Date: 25-Jul-12

AccuTec Services, Inc.
www.atsiusa.com

Tracer Gas Containment Test Report
NIH Protocol at 40 FPM Face Velocity
with 50 fpm Cross Draft

Project:	Labconco	Model:	Protector XStream 2012
Location:	Manufacturer	Serial No.:	--
Manufacturer:	Labconco	Type:	Laboratory Fume Hood
Unit ID:	--		

	Right	Center	Left
Average Concentration:	N/A	0.001	N/A
Peak Concentration:	N/A	0.054	N/A

Static Mode Performance Rating: AM- 0.001

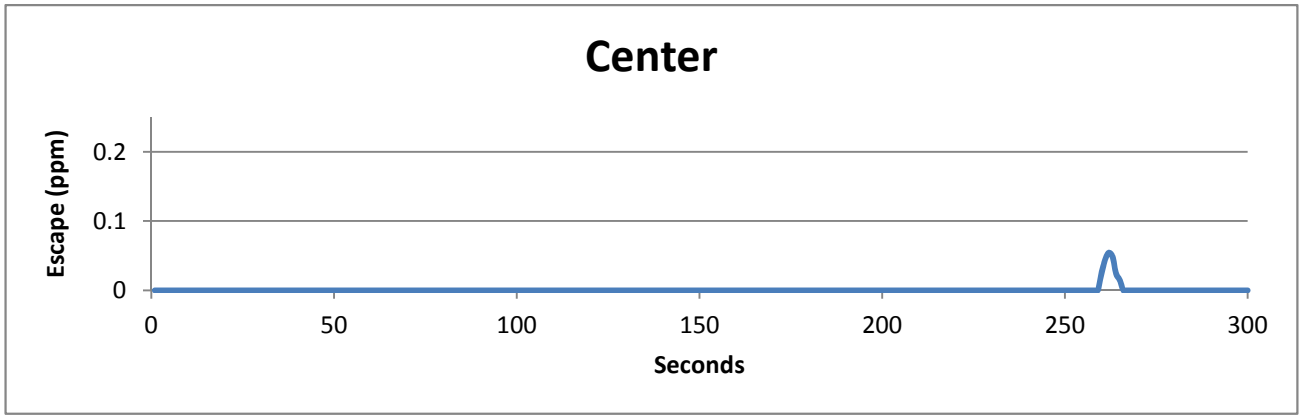
28"	Sash Height	Notes: Tested to NIH protocol with 50 FPM generated
62.25"	Sash Width	cross draft at 40 FPM face velocity.
Vertical	Sash Configuration	
6 L/m	Tracer Gas Release Rate	

Acceptance Criteria: __X__ Has Been Met ____ Has Not Been Met

Standards Utilized:	2000513	Cal. Due Date:	05-Jan-13
Technician:	CLF	Test Date:	25-Jul-12

AccuTec Services, Inc.
www.atsiusa.com

Tracer Gas Containment Test Report
NIH Protocol at 40 FPM Face Velocity
with 50 fpm Cross Draft (Data)



Average:	0.001	ppm
Peak:	0.054	ppm

AccuTec Services, Inc.
www.atsiusa.com

Tracer Gas Containment Test Report
NIH Protocol
50 FPM Face Velocity, Chest Detector

Project:	Labconco	Model:	Protector XStream 2012
Location:	Manufacturer	Serial No.:	--
Manufacturer:	Labconco	Type:	Laboratory Fume Hood
Unit ID:	--		

	Right	Center	Left
Average Concentration:	0.000	0.000	0.000
Peak Concentration:	0.000	0.000	0.000

Static Mode Performance Rating: AM- 0.000

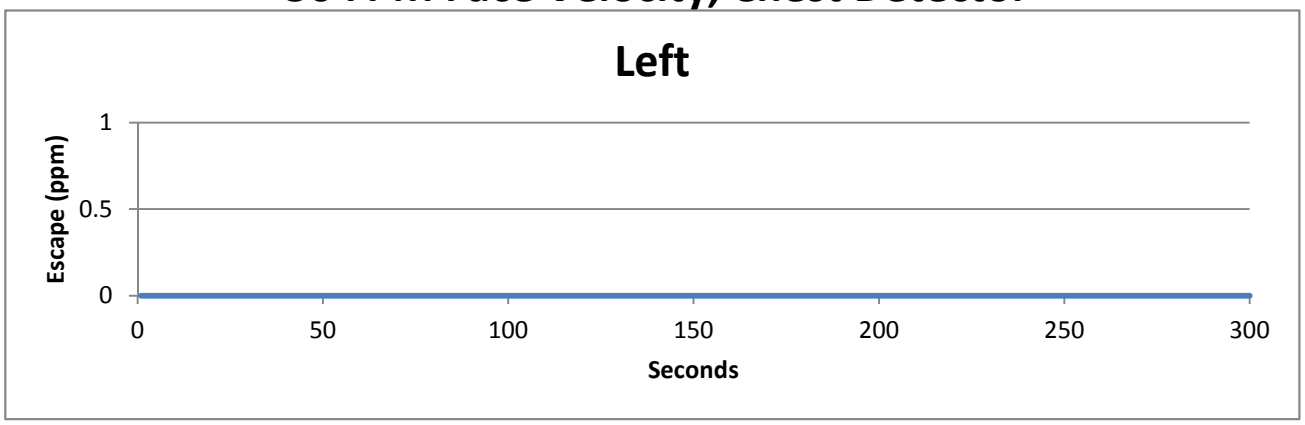
28"	Sash Height	Notes: 575 CFM at 0.10 In. W.C.
62.25"	Sash Width	Tested to NIH protocol with modifications: 50 FPM
Vertical	Sash Configuration	average face velocity. SF6 detector is the exact height of
6 L/m	Tracer Gas Release Rate	ejector, located in the chest of the manikin, 3" from the
		plane of the sash.

Acceptance Criteria: __X__ Has Been Met ____ Has Not Been Met

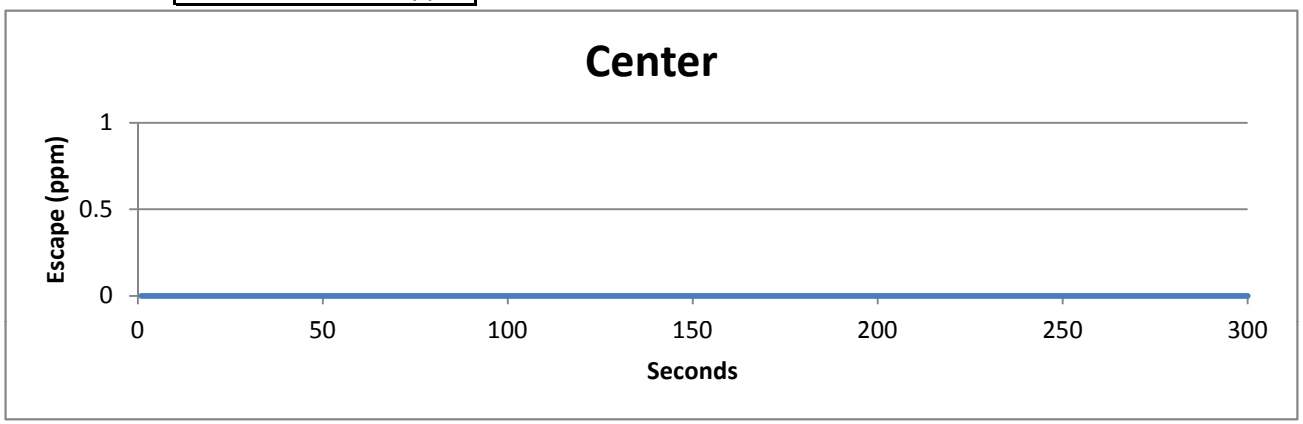
Standards Utilized:	2000513	Cal. Due Date:	05-Jan-13
Technician:	CLF	Test Date:	25-Jul-12

AccuTec Services, Inc.
www.atsiusa.com

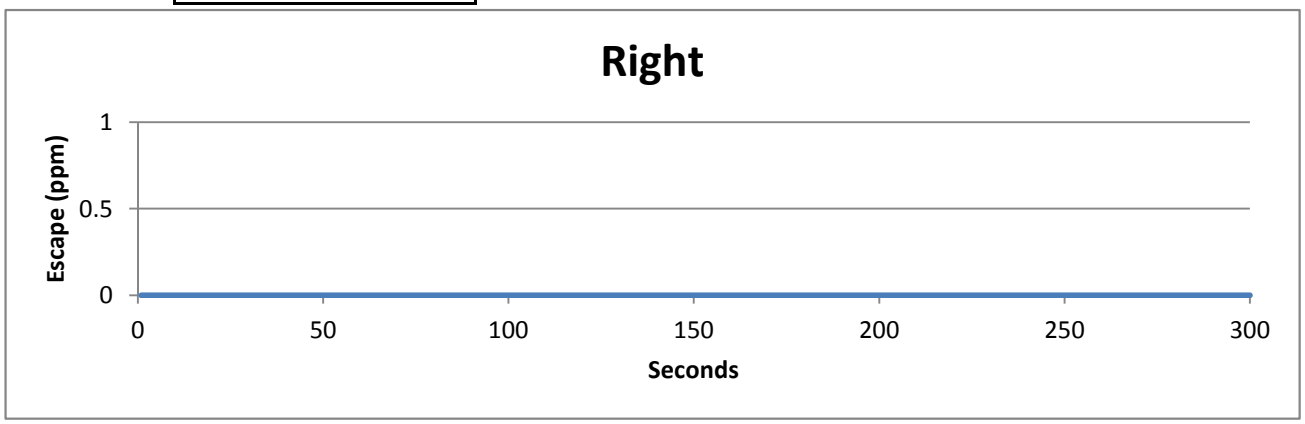
Tracer Gas Containment Test Report
NIH Protocol
50 FPM Face Velocity, Chest Detector



Average:	0.000	ppm
Peak:	0.000	ppm



Average:	0.000	ppm
Peak:	0.000	ppm



Average:	0.000	ppm
Peak:	0.000	ppm

NVLAP Lab Code 200661

Bios
Driving a Higher Standard in Flow Measurement℠

Calibration Certificate

Certificate No.	5010780	**Sold to:**	AccuTec Services Inc. - Lee's Summit
Product	Definer 220 Medium Flow		31211 East Colbern Road
Serial No.	119896		Grain Valley, MO 64029
Cal. Date	12/19/2011		USA

All calibrations are performed in accordance with ISO 17025 at Bios International Corporation, 10 Park Place, Butler, NJ, 07405, 800-663-4977, an ISO 17025:2005 – accredited laboratory through NVLAP. 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.

All units tested in accordance with Bios International Corporation test number PR18-13 using high-purity bottled nitrogen or dry filtered laboratory air.

As Received Calibration Data

Technician Sonia Otero

Lab. Pressure 766 mmHg
Lab. Temperature 22.4 °C

Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Received
100.65 sccm	100.875 sccm	-0.22%	1.00%	In Tolerance
1003.9 sccm	1005.95 sccm	-0.2%	1.00%	In Tolerance
5016.8 sccm	5007.95 sccm	0.18%	1.00%	In Tolerance
22.8 °C	22.4 °C	0.4°C	±0.8°C	In Tolerance
765 mmHg	766 mmHg	-1 mmHg	±3.5mmHg	In Tolerance

Bios International Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML-800-24	117991	3/29/2011	3/28/2012
Precision Thermometer	305460	8/15/2011	8/14/2012
Precision Barometer	2981392	5/27/2011	5/26/2012

Bios

Driving a Higher Standard in Flow Measurement℠

As Shipped Calibration Data

Certificate No. 5010780
Technician Sonia Otero

Lab. Pressure 754 mmHg
Lab. Temperature 22.4 °C

Instrument Reading	Lab Standard Reading	Deviation	Allowable Deviation	As Shipped
100.59 sccm	100.125 sccm	0.46%	1.00%	In Tolerance
1005.3 sccm	1001.65 sccm	0.36%	1.00%	In Tolerance
5032.4 sccm	5006.9 sccm	0.51%	1.00%	In Tolerance
22.3 °C	22.3 °C	-	±0.8°C	In Tolerance
754 mmHg	754 mmHg	-	±3.5mmHg	In Tolerance

Bios International Standards Used

Description	Standard Serial Number	Calibration Date	Calibration Due Date
ML-800-24	100439	4/21/2011	4/20/2012
Precision Thermometer	305460	8/15/2011	8/14/2012
Precision Barometer	2981392	5/27/2011	5/26/2012

Calibration Notes

Bios is an ISO 17025-accredited metrology laboratory. Each Bios primary gas flow standard is dynamically verified by comparing it to one of our laboratory standards, which is a Proven DryCal® Technology volumetric piston prover of much higher accuracy but of similar operating principles. For this purpose, a flow generator of ±0.03% stability is used. Our laboratory standards are qualified by direct measurement of their dimensions (diameter, length and time) using NIST-traceable precision gauges and instruments, such as depth micrometers and laser micrometers. NIST numbers for these gauges and instruments are available upon request. Rigorous analyses of our laboratory standards' uncertainties have been performed, in accordance with The Guide to the Expression of Uncertainty in Measurement (the GUM), assuring their traceable accuracy. Flow readings in sccm performed at STP of 21.1°C and 760 mmHg.

Technician Notes:

Harvey Padden, President and Chief Metrologist

TSI P/N 2300157

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		
TEMPERATURE	69.6 (20.9)	°F (°C)
RELATIVE HUMIDITY	49	%RH
BAROMETRIC PRESSURE	28.95 (980.4)	inHg (hPa)

MODEL	966
SERIAL NUMBER	P07460054

☒ AS LEFT ☒ IN TOLERANCE
☐ AS FOUND ☐ OUT OF TOLERANCE

– CALIBRATION VERIFICATION RESULTS –

HUMIDITY VERIFICATION			SYSTEM H-102			*Unit: %RH*
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	10.0	12.7	7.0~13.0	4	70.0	70.2	67.0~73.0
2	30.0	31.6	27.0~33.0	5	90.0	89.2	87.0~93.0
3	50.0	51.0	47.0~53.0				

TEMPERATURE VERIFICATION			SYSTEM T-101			*Unit: °F (°C)*
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	32.0 (0.0)	32.0 (0.0)	31.5~32.5 (−0.3~0.3)	2	140.0 (60.0)	140.0 (60.0)	139.5~140.5 (59.7~60.3)

VELOCITY VERIFICATION			SYSTEM V-111			*Unit: ft/min (m/s)*
#	STANDARD	MEASURED	ALLOWABLE RANGE	#	STANDARD	MEASURED	ALLOWABLE RANGE
1	0 (0.00)	0 (0.00)	−3~3 (−0.02~0.02)	7	644 (3.27)	647 (3.29)	625~664 (3.17~3.37)
2	35 (0.18)	36 (0.18)	32~38 (0.16~0.20)	8	999 (5.08)	1001 (5.09)	969~1029 (4.92~5.23)
3	65 (0.33)	65 (0.33)	62~68 (0.32~0.35)	9	1477 (7.50)	1493 (7.58)	1432~1521 (7.28~7.73)
4	100 (0.51)	100 (0.51)	97~103 (0.49~0.53)	10	2493 (12.66)	2500 (12.70)	2418~2568 (12.28~13.04)
5	161 (0.82)	161 (0.82)	156~165 (0.79~0.84)	11	4511 (22.92)	4504 (22.88)	4376~4647 (22.23~23.61)
6	325 (1.65)	321 (1.63)	315~335 (1.60~1.70)	12	7985 (40.56)	8028 (40.78)	7746~8225 (39.35~41.78)

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 and meets the requirements of ISO 10012:2003.

Measurement Variable	System ID	Last Cal.	Cal. Due
Barometric Pressure	E001992	04-06-12	04-06-13
Temperature	E004398	06-05-12	12-05-12
Pressure	E001058	01-18-12	01-18-13
Temperature	E003986	04-17-12	10-17-12
Humidity	E003539	02-28-12	08-28-12

Measurement Variable	System ID	Last Cal.	Cal. Due
DC Voltage	E004018	07-12-12	07-12-13
Pressure	E004041	03-30-12	09-30-12
Velocity	E003327	09-19-07	09-19-12
Temperature	E003987	04-17-12	10-17-12

Callmeier
CALIBRATED

August 14, 2012
DATE

DOC ID: CERT_GEN_WCC

Uson Ltd.
Western Way
Bury St. Edmunds
Suffolk, IP33 3SP, United Kingdom
tel +44 (0)1284 760606 fax +44 (0)1284 763049
www.uson.com

MODEL 200
CERTIFICATE OF CALIBRATION

Certificate Number: 200-9392	Customer Order No:
Customer: Labconco Corporation	Service report No 55458
Model Number: Q200	Serial Number : 2000513

CALIBRATION PROCEDURE

- The instrument was switched on for a period of 30 minutes prior to calibration.
- The instrument was calibrated at the CALIBRATION point to give a correct display.
- The calibration was carried out using the following devices that are traceable to national standards.

1. DEVICES USED

Temperature Indicator **Ai 0759**	**Ambient temperature during calibration** 22.8 °C

2. CALIBRATION POINT & SINTER TYPE FITTED AT CALIBRATION

Cal @ 1x10-6 ml/s H☒	**Cal @ 1x10-6 ml/s M☐**	**Cal @ 1x10-5 ml/s L☐**

3. SF_6 STANDARD LEAK SERIAL NUMBERS & RESULTS

SF_6 Applied Sample ml/s (ppm)	**Standard Leak (Serial Number)**	**Pre Adjustment Value* (ppm)**	**Post Adjustment Value* (ppm)**
0.01± 0.01	**1.0×10^{-8} (26312)**	**0.00**	**0.01 ppm**
0.10± 0.01	**1.0×10^{-7} (28185)**	**0.05**	**0.10 ppm**
1.00± 0.1	**1.0×10^{-6} (27459)**	**0.44**	**1.00 ppm**
10.0± 1.0	**1.0×10^{-5} (29655)**	**4.56**	**10.18 ppm**

Terms used, H, M, L Sinter type, ml/s milli-litres per second, Std standard, N/A - Not Applicable, SF_6 - Sulphur Hexafluoride, PPM - part per million.

* Indication relative to atmospheric concentration

4. APPROVAL

Pre-adjustment Calibration	Passed		Failed	x	Refer to service report for
Post-adjustment Calibration	Passed	x	Failed		failure information.

Calibrated by N.P.Elbourne	Date of Calibration
N P Elbourne	5th January 2012

Us337 v4