Certification Test Report

[Non CBI]

United States Stove Company

Freestanding Pellet Stove

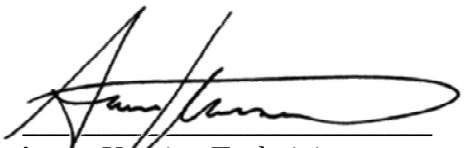
Model: 5660E

Prepared for:	United States Stove Company 227 Industrial Park Road P.O. Box 151 South Pittsburg, TN 37380
Prepared by:	OMNI-Test Laboratories, Inc. 13327 NE Airport Way Portland, OR 97230 (503) 643-3788
Test Period:	August 6, 2015
Report Date:	September 2015
Report Number:	0215PS032E

AUTHORIZED SIGNATORIES

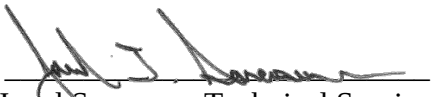
This report has been reviewed and approved by the following authorized signatories:

Technician:



Aaron Kravitz, Technician
OMNI-Test Laboratories, Inc.

QA Review:



Jared Sorenson, Technical Services Director
OMNI-Test Laboratories, Inc.

Evaluation Decision:

Ken Morgan, Testing Manager
OMNI-Test Laboratories, Inc.

October 8, 2015
Issue Date

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Section 1

Sampling Procedures and Test Results

INTRODUCTION

United States Stove Company retained OMNI-Test Laboratories, Inc. (*OMNI*) to perform U.S. Environmental Protection Agency (EPA) certification testing on the 5660E. The 5660E is a freestanding, pellet-fired room heater.

The testing was performed at *OMNI*'s testing facility in Portland, Oregon. The altitude of the laboratory is 30 feet above sea level. The unit was received in good condition and logged in at the *OMNI*'s testing facility on July 31, 2015. It was assigned and labeled with *OMNI* ID #2128. *OMNI* representative Aaron Kravitz conducted the certification testing and completed all testing by August 6, 2015.

This report is organized in accordance with the EPA-recommended outline and is summarized in the Table of Contents immediately preceding this section. The results in this report are limited to the item(s) submitted.

SAMPLING PROCEDURE

The 5660E was tested in accordance with the U.S. EPA 40 CFR Part 60, Subpart AAA – Standards of Performance for New Residential Wood Heaters using ASTM E2515 and ASTM E2779. The fuel used for certification testing was Lignetics hardwood pellet fuel; this fuel was graded as Premium by the Pellet Fuels Institute and was produced at registered mill # 03304. Particulate emissions were measured using dual sampling trains consisting of two sets of filters (front and back). The results of the integrated test run indicate an average particulate emission rate of 1.92 g/hr. The 5660E results are within the emission limit of 4.5 g/hr for affected facilities manufactured on or after May 15, 2015, or sold at retail after December 31, 2015.

The model 5660E was tested for thermal efficiency and carbon monoxide (CO) emissions in accordance with CSA B415.1-10. The heater has a demonstrated an average thermal efficiency of 62.1%. The calculated CO emission rate was below detection limits of 0.01% by volume.

SUMMARY OF RESULTS

The average particulate emission rate over the complete, integrated test run was measured to be 1.92 g/hr.

The average particulate emission factor for the complete, integrated test run was measured to be 1.65 g/dry kg of fuel.

The average thermal efficiency for the complete, integrated test run was measured to be 62.1%.

The particulate emission rate calculated from the one-hour filter was 2.08 g/hr.

The proportionality results and sample train agreement for the test run was acceptable. Quality check results for each test run are presented in Section 3 of this report.

SUMMARY TABLES

Table 1.1 – Particulate Emissions

	One-Hour Filter	Integrated Total
Emission Rate (g/hr)	2.08	1.92
Emission Factor (g/dry kg)	1.05	1.65

Table 1.2 – Efficiency and CO

	Burn Rate Segment			Integrated
	Maximum	**Medium**	**Minimum**	**Total**
Time (minutes)	62	120	180	362
Burn Rate (dry kg/hr)	2.01	1.10	0.91	1.16
Heat Output Rate (BTU/hr)	24361	13862	11155	14371
Efficiency (%, HHV)	60.9	63.1	61.6	62.1
CO Emission Rate (g/hr)	Below Detection Limit	Below Detection Limit	Below Detection Limit	Below Detection Limit

Table 1.3 – Test Facility Conditions

	Initial	Middle	Final
Room Temperature (°F)	75	80	83
Barometric Pressure (in Hg)	30.06	30.08	30.10
Air Velocity (ft/min)	< 50	< 50	< 50
Induced Draft (in H2O)	0	0	0

Table 1.4 – Fuel Measurement Summary

Segment	**Time** (min)	**Burn Rate** (dry kg/hr)	**Consumed Fuel Weight** (lbs)	**Fuel Moisture Content** (dry basis - %)
Pretest	76	1.88	5.5	5.05
Maximum	62	2.01	4.8	5.05
Medium	120	1.10	5.1	5.05
Minimum	180	0.91	6.3	5.05
Integrated Total	362	1.16	16.2	5.05

Table 1.5 – Dilution Tunnel and Flue Gas Measurements

Segment	**Average Flue Draft** (in H_2O)	**Average Dilution Tunnel Gas Measurements**		
		Velocity (ft/sec)	**Flow Rate** (dscf/min)	**Temperature** (°F)
Integrated Total	-0.042	13.63	144.5	117.3

Table 1.6 – Heater Configuration

Segment	Heat Rate Setting	Damper Setting
Pretest	HR 5	Fully Open
Maximum	HR 5	Fully Open
Medium	HR 2	3/8” from Closed
Minimum	HR 1	1/4” from Closed

Section 2

Photographs
Appliance Description
Drawings

United States Stove Company
5660E

PHOTOGRAPHS

	
5660E Front	**5660E Back**

	
5660E Left	**5660E Right**

APPLIANCE DESCRIPTION

Appliance Manufacturer: United States Stove Company
Pellet Stove Model: 5660E
Type: Freestanding, air-circulating type, pellet-fired room heater.

The 5660E's principle elements include a fuel hopper, steel firebox chamber, steel burn pot, and electrical fuel feed, combustion air, and convection air supply systems.

Air is forced by the combustion air blower through small holes in the bottom and sides of the burn pot and combustion products are routed out of the firebox chamber through a three-inch diameter flue outlet located on the rear of the unit.

Fuel is supplied from the hopper to the burn pot via an auger which lifts pellets from the bottom of the hopper. Pellets at the top of the auger screw then fall down a tube which terminates in the firebox wall just above the burn pot. Fuel supply rate is varied by cycling the auger motor as needed.

Ashes fall through the burn pot into a removable ash drawer located at the bottom of the unit. The drawer is accessed through the front firebox door, which also features a 5mm thick glass windows (10" x 15.75" front and 10" x 4.5" sides) sealed by ¾" diameter fiberglass rope gasket.

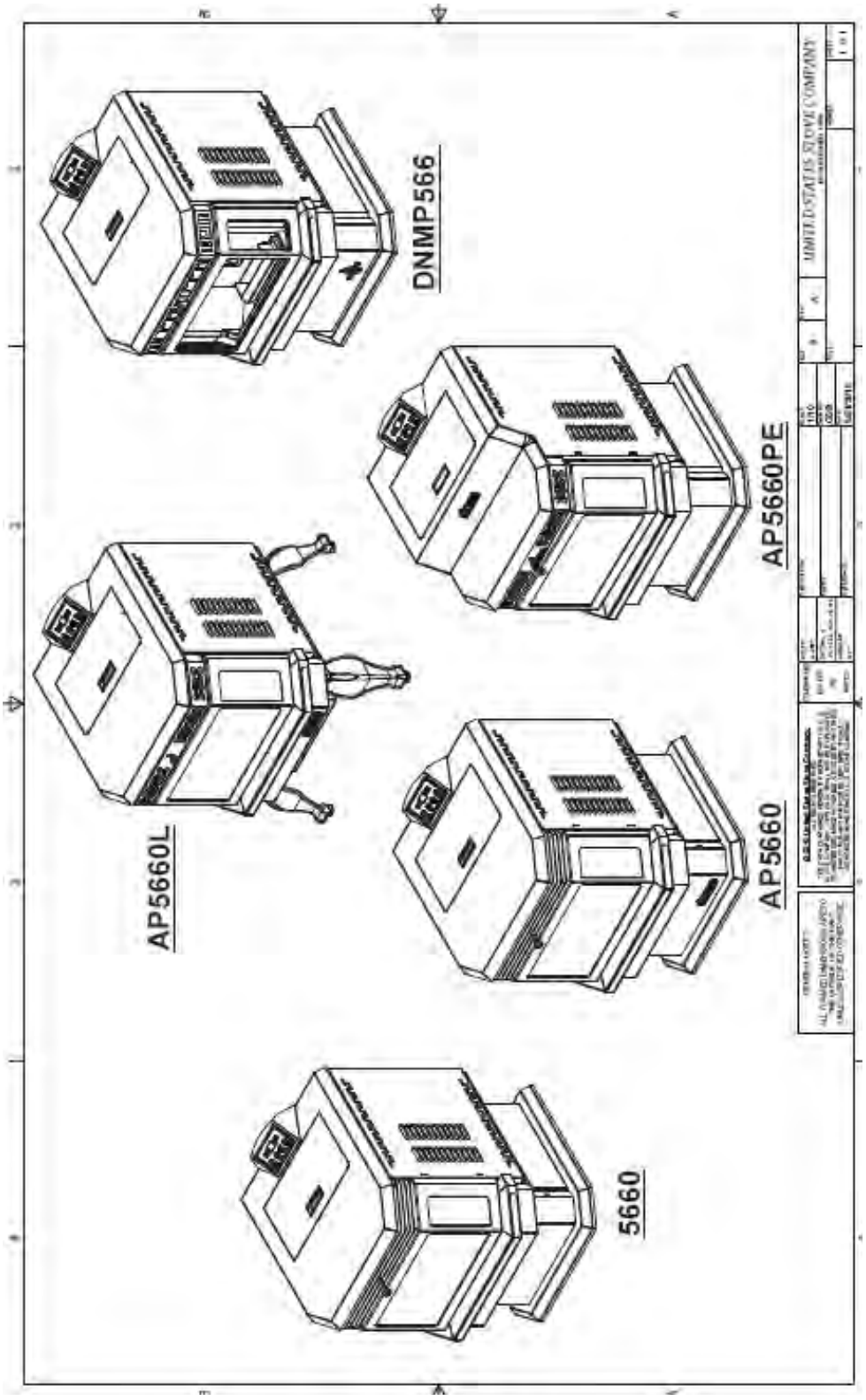
The electrical systems are regulated by a user-operated control board. On this board users can select manual mode, which has five heat output settings. The unit can also be controlled by an external thermostat system. Additionally, an adjustable manual air damper varies the size of the combustion air inlet.

MODEL VARIANTS

There are a total of 5 variants of the model 5660E. All of these models are built upon the identical firebox and functionally identical. The models along with a description of their differences are as follows:

DESIGNATION	VARIATION
5660E	Original model as described in this report
AP5660	Same as 5660E but with different logo/branding
AP5660L	Same as 5660E but with legs instead of pedestal, a different decorative vent pattern and different logo/branding
DNMP566	Same as 5660E but with a different decorative vent pattern and different logo/branding
AP5660PE	Same as 5660E but with extended pellet fuel hopper capacity, a different decorative vent pattern and different logo/branding

Line-art Illustrations of these variant models..



Engineering Drawings (K List)
[Redacted]

Section 3

Quality Assurance/Quality Control

QUALITY ASSURANCE/QUALITY CONTROL

OMNI follows the guidelines of ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories," and the quality assurance/quality control (QA/QC) procedures found in *OMNI*'s Quality Assurance Manual.

OMNI's scope of accreditation includes, but is not limited to, the following:

- ANSI (American National Standards Institute) for certification of product to safety standards.
- To perform product safety testing by the International Accreditation Service, Inc. (formerly ICBO ES) under accreditation as a testing laboratory designated TL-130.
- To perform product safety testing as a "Certification Organization" by the Standards Council of Canada (SCC).
- Serving as a testing laboratory for the certification of wood heaters by the U.S. Environmental Protection Agency.

This report is issued within the scope of *OMNI*'s accreditation. Accreditation certificates are available upon request.

The manufacturing facilities and quality control system for the production of the 5660E at United States Stove Company were evaluated to determine if sufficient to maintain conformance with OMNI's requirements for product certification. OMNI has concluded that the manufacturing facilities, processes, and quality control system are adequate to produce the appliance congruous with the standards and model codes to which it was evaluated.

Sample Analysis

Analysis Worksheets
Moisture Content Worksheet
Fuel Certification Label
Tared Filter, Probe, and O-Ring Data

Pellet Heater Lab Data - ASTM E2779 / ASTM E2515

Manufacturer:	US Stove	Equipment Numbers:	23, 131, 343
Model:	5660		
Tracking No.:	2128		
Project No.:	0215PS032E		
Run #:	1		
Date:	8/6/15		

TRAIN 1 (First Hour emissions)

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	B889	117.3	115.5	1.8
B. Rear filter catch	Filter	B890	113.2	113.3	-0.1
C. Probe catch*	Probe	62	123013.5	123013.5	0.0
D. Filter seals catch*	Seals	R340	3368.3	3368.1	0.2

Sub-Total Total Particulate, mg: 1.9

TRAIN 1 (Remainder of Test)

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	B891	126.1	117.5	8.6
B. Rear filter catch	Filter	B892	114.8	114.9	-0.1
C. Probe catch*	Probe	4	114867.9	114867.8	0.1
D. Filter seals catch*	Seals	R341	3371.6	3371.4	0.2

Sub-Total Total Particulate, mg: 8.8

Train 1 Aggregate Total Particulate, mg: **10.7**

TRAIN 2

Sample Component	Reagent	Filter, Probe or Dish #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch	Filter	B893	121.0	113.9	7.1
B. Rear filter catch	Filter	B894	118.7	118.5	0.2
C. Probe catch*	Probe	6	115357.5	115357.3	0.2
D. Filter seals catch*	Seals	R342	3416.3	3414.5	1.8

Total Particulate, mg: 9.3

AMBIENT

Sample Component	Reagent	Filter # or Probe #	Weights		
			Final, mg	Tare, mg	Particulate, mg
A. Front filter catch*	Filter	N/A			0.0

Total Particulate, mg: 0.0

*Particulate catch that results in a negative number, is assumed to be zero for probes and seals, negative numbers for filters are assumed to be part of the seal weight

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Probe catch	Final (mg) - Tare (mg) = Particulate, mg

OMNI-Test Laboratories, Inc. **ASTM E2779 Pellet Heater Run Sheets**

Client: **US Stove** Project Number: **0215PS032E** Run Number: 1

Model: **5660** Tracking Number: **2128** Date: 8/6/15

Test Crew: **A. Kravitz**

OMNI Equipment ID numbers: 23, 131, 343

ASTM E2515 Lab Sheet

Assembled By: A. Kravitz

Date/Time in Dessicator: 8/6/15 16:15

	Weighing #1	Weighing #2	Weighing #3	Weighing #4	Weighing #5
Date:	8/7/15	8/11/15	8/12/15		
Time:	1630	1330	1300		
R/H %:	11.6	12.1	16.4		
Temp:	78.0	77.6	76.8		
Audit:	500.1	500.2	500.1		
Initials:	A	A	A		

Train	Element	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A (First Hour)	Front Filter	B884	115.5	117.5	117.3	-		
	Rear Filter	B890	113.3	113.2	113.2	-		
	Probe	62	123013.5	123014.0	123013.6	123013.5		
	O-Ring Set	R340	3368.1	3370.3	3368.3	3368.3		
A (Remainder)	Front Filter	B891	117.5	126.1	126.1	-		
	Rear Filter	B892	114.9	114.8	114.8	-		
	Probe	4	114867.8	114868.3	114867.9	114867.9		
	O-Ring Set	R341	3371.4	3373.3	3371.6	3371.6		
B	Front Filter	B893	113.9	120.9	121.0	-		
	Rear Filter	B894	118.5	118.7	118.7	-		
	Probe	6	115357.3	115357.5	115357.5	-		
	O-Ring Set	R342	3414.5	3416.6	3416.3	3416.3		
BG	Filter	~~B895~~	~~115.5~~ A					

Technician Signature: _____ Date: 8/12/15

Moisture Content Worksheet

Client: Harman Home Heating / Hearth and Home Technologies
Model: Advance
Project #: 0135PS034E Tracking #: 2066
Sample description: Lignetics Premium Quality Wood Pellet Fuel

Weight record:

Prior to Oven-Drying

Balance ID #: OMNI - 00128 Audit ID #: OMNI-00283B

Date/Time in: 5/1/15 13:30 Audit weight: 199.9 g

Container: ID#: 247 Tare weight: 94.1 g

Total weight: 235.6 g

Material weight (total weight - container tare weight): 141.5 g

Post Oven-Drying

Balance ID #: OMNI - 00128

Date/Time out: 5/6/15 15:00 Audit ID #: OMNI-00283B

Total weight: 228.8 g Audit weight (if necessary): 199.9 g

Material weight (total weight - container tare weight): 134.7 g

Calculations:

Dry basis (%) = $\frac{\text{Initial - Final}}{\text{Final}} \times 100 = \frac{141.5\text{ g} - 134.7\text{ g}}{134.7\text{ g}} \times 100\% = 5.05\ \%$

Wet basis (%) = $\frac{\text{Initial - Final}}{\text{Initial}} \times 100 = \frac{141.5\text{ g} - 134.7\text{ g}}{141.5\text{ g}} \times 100\% = 4.81\ \%$

Method: ASTM D4442-92 Method A—Oven-Drying Method

Technician signature: _____ Date: 5/7/15

Reviewed by: _____ Date: 5/7/15

Pellet Fuels Institute

PFI GRADED FUEL

PFI Densified Fuel Grade: Premium
Mill Registration # 03304

Grade Requirements:

Bulk Density:	40–46 lbs/ft³
Diameter:	.230–.285 in/5.84–7.25 mm
Durability:	≥96.5
Fines:	≤0.50%
Ash Content (as received):	≤1%
Length:	≤1% >1.5 in.
Moisture:	≤8.0%
Chlorides:	≤300 ppm

Manufacturers Guaranteed Analysis:

Type of Material:	Hardwood
Additives:	None
Minimum Higher Heating Value (as received):	8000 BTU/lb.

Other Manufacturers Guarantees:

© For more information, please visit the PFI website at www.pelletheat.org.

CERTIFICATE OF MEMBERSHIP

Be it known to all parties that:

LIGNETICS OF WEST VIRGINIA
LINN, WV

Facility #: 03304

Is certified to produce Premium grade fuel and is in good standing with Conway & Robison, LLC's Quality Assurance Program for Densified Fuel Manufacturers which has been approved by the American Lumber Standard Committee (ALSC) Board of Review and is in compliance with the Pellet Fuel Institute's (PFI) Standard Specifications for Residential/Commercial Densified Fuel and the PFI Residential/Commercial Densified Fuel QA/QC Handbook.

Jason Robison

10/3/2013

Jason Robison DATE

CONWAY & ROBISON, LLC
P O Box 1508 SHARPSBURG, GA 30277
(678) 642-4036 P (770) 234-5837 F www.cr-inspect.com

FILTER TARES

Date Placed in Desiccator: 6/30/15 Technician: A. Kravitz Balance ID # 23

Thermo/Hygro meter ID #: 343 Audit Weight ID # (3) (Balance audit mfr. Std.: 500 ± 0.72)

Filter Size/ID# 102 47 110 55	Date: 7/8/15 Time: 1030 RH%: 12.0 T (F): 76.2 Initials: A	Date: 7/9/15 Time: 1100 RH%: 14.1 T (F): 76.4 Initials: C	Date: Time: RH%: T (F): Initials:	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
B882	118.4	118.3			[redacted]			
B883	115.4	115.3						
B884	112.9	113.0						
B885	118.1	118.2						
B886	115.5	115.5						
B887	113.5	113.6						
B888	117.8	117.9						
B889	115.6	115.5			US Stove	5660	0215 PS032E	1
B890	113.3	113.3						
B891	117.5	117.5						
B892	114.8	114.9						
B893	113.8	113.9						
B894	118.5	118.5						
B895	115.0	115.5						

Final Technician signature: [signature] Date: 7/9/15

PROBE TARES

Date Placed in Desiccator: 7/2/15 Technician: A. Kravitz Balance ID # 23

Thermo/Hygro meter ID #: 343 Audit Weight ID # 131 (Balance audit mfr. Std.: 500 ± 0.72)

Probe Size/ID# (47)	Date: 7/7/15 Time: 1045 RH%: 16.6 T (F): 76.2 Initials: [illegible]	Date: 7/8/15 Time: 1030 RH%: 15.2 T (F): 76.2 Initials: [illegible]	Date: 7/9/15 Time: 1100 RH%: 8.4 T (F): 74.9 Initials: [illegible]	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
OES 3	114768.4	114768.5	-		[redacted]			
4	114865.0	114865.0	-					
OES 5	113551.1	113551.0	-					
6	115354.2	115354.4	-					
OES 6	113697.2	113697.3	-					
14	114544.3	114544.1	-					
15	114347.8	114347.6	-					
24	114127.9	114127.8	-					
28	114758.0	114758.1	-					
31	114370.0	114369.6	114369.4					
32	114741.5	114741.4	-					
54	122836.8	122836.6	-					
56	123072.0	123072.0	-					
62	123013.4	123013.5	-		VSStove	5660	0215PS032E	1

Final Technician signature: [signature] Date: 7/9/15

PROBE TARES

Date Placed in Desiccator: 7/29/15 Technician: A. Kravitz Balance ID # 23

Thermo/Hygro meter ID #: 343 Audit Weight ID # 131 (Balance audit mfr. Std.: 500 ± 0.72)

Probe Size/ID# (47)	Date: 8/3/15 Time: 0905 RH%: 9.2 T (F): 77 Initials: D.O.	Date: 8/4/15 Time: 0815 RH%: 9.7 T (F): 77 Initials: AR	Date: 8/5/15 Time: 1000 RH%: 11.7 T (F): 78.1 Initials: A	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
4	114.8679	114.8678	-	58	US Stove	5660	0215PS032E	1
OES 5	113.5527	113.5531	113552.8		[redacted]			
6	115.3572	115.3573	-		US Stove	5660	0215PS032E	1
OES 6	113.7002	113.7001	-		[redacted]			
14	114.5471	114.5470	-					
15	114.3485	114.3485	-					
24	114.1293	114.1293	-					
28	114.7597	114.7596	-					
30	114.3341	114.3341	-					
31	114.3708	114.3709	-					
32	114.7419	114.7418	-					
36	114.8867	114.8869	-					
54	122.8359	122.8358	-					
56	123.0716	123.0717	-					

Final Technician signature: [signature] Date: 8/5/15

O-RING TARES

Date Placed in Desiccator: 6/26/15 Technician: A. Krawitz Balance ID # 23

Thermo/Hygro meter ID #: 343 Audit Weight ID # 131 (Balance audit mfr. Std.: 500 ± 0.72)

O-Ring Size/ID# 47	Date: 6/26/15 Time: 1130 RH%: 7.7 T (F): 74.6 Initials: A	Date: 7/1/15 Time: 1010 RH%: 15.8 T (F): 74.1 Initials: A	Date: 7/7/15 Time: 1030 RH%: 12.7 T (F): 75.9 Initials: A	Date: Time: RH%: T (F): Initials:	Manufacturer	Appliance	Project No.	Run No.
R337	4154.5	4154.2	4154.0		[redacted]			
R338	3433.5	3433.1	3432.9					
R339	3435.9	3435.6	3435.4					
R340	3368.6	3368.3	3368.1		US Stove	5660	6215PS032E	1
R341	3371.4	3371.4	-		"	"	"	"
R342	3415.0	3414.7	3414.5					
R343	3343.6	3343.4	-					
R344	4135.1	4134.8	4134.6					
R345	3350.3	3350.1	-					
R346	3347.2	3346.9	3346.7					
R347	3312.7	3312.6	-					
R348	3372.9	3372.8	-					
R349	3246.1	3245.8	3245.9					
R350	3376.0	3376.0	-					

Final Technician signature: [signature] Date: 7/7/15

Calibrations

EPA Method 28R, ASTM E2515, ASTM E2779

ID #	Lab Name/Purpose	Log Name	Attachment Type
1	Calibrator Dry Gas Meter	Rockwell Int'l Standard Test Meter	Calibration Certificate
23	Scale-Analytical Balance	Mettler Analytical Balance	Calibration Certificate
128	Scale	Acculab V1200	Calibration Log
131	500 mg Weight	Ohaus Weight Standard, 500 mg	Calibration Certificate
132	10 lb Weight	Weight Standard, 10 lb.	Calibration Certificate
185	Platform Scale	Weigh-Tronix Platform Scale	See Test Run Notes
209	Barometer	Barometer – Princo	Manual Cover
283B	Calibration Weights	Troemner Metric Weight Standards	Calibration Certificate
335	Sample Box / Dry Gas Meter	Apex Automated Emissions Sampling Box	Calibration Log
336	Sample Box / Dry Gas Meter	Apex Automated Emissions Sampling Box	Calibration Log
343	Thermohygrometer	Omega Digital Thermohygrometer	Calibration Log
410	Microtector	Dwyer Microtector	Manual, Photograph
420	Gas Analyzer	ZRE Combustion Gas Analyzer	Manual, See Test Run Notes
559	Vaneometer	Dwyer Vaneometer	Manual

DICK MUNNS COMPANY
LIQUID & GAS FLOW CALIBRATION

ISO 17025 ACCREDITED
CL-122

CERTIFICATE OF CALIBRATION

CUSTOMER:	**OMNI TEST LABS INC.** PORTLAND OR	**CALIBRATION DATE:**	10/23/14
PO NUMBER:	OTL-14-049	**CALIBRATION DUE:**	10/23/15
INST. MANUFACTURER:	ROCKWELL	**PROCEDURE:**	NAVAIR 17-20MG-02
INST. DESCRIPTION:	P.D. METER	**CALIBRATION FLUID:**	AIR @ 14.7 PSIA 70 F
MODEL NUMBER:	S-275	**STANDARD(S) USED:**	A4, A24, A321 DUE 02-2015
SERIAL NUMBER:	684390L	**NIST TRACE #' S:**	1329407628, 1361269184, 1390386562
RATED UNCERTAINTY:	+/- .5 % RD.	**AMBIENT CONDITIONS:**	760 mm HGA 51 % RH 72 F
UNCERTAINTY GIVEN:	FLOW measurement uncertainty: +/- .101 % RD. K=2	**CERTIFICATE FILE #:**	426663.14

NOTES: AS RECEIVED/AS LEFT WITHIN SPECS. REFERENCE CONDITIONS ARE: 760 mm HGA 70 F **OMNI-00001**

TEST POINT NUMBER	UUT INDICATED SCFM	DM.STD. ACTUAL SCFM	CORRECTION FACTOR	K FACTOR
1	0.2603	0.26	0.99888	60.067
2	0.5106	0.51	0.99877	60.074
3	1.0213	1.02	0.99868	60.079
4	1.4921	1.49	0.99858	60.085
5	2.0231	2.02	0.99845	60.093
6	2.4946	2.49	0.99817	60.110
7	3.0253	3.02	0.99823	60.106
8	3.4866	3.48	0.99812	60.113
		AVERAGE (Y)=	0.99848542	

All instruments used in the performance of the shown calibration have traceability to the National Institute of Standards and Technology (NIST). The uncertainty ratio between the calibration standards (DM.STD.) used and the unit under test (UUT) is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the shown procedure number, in accordance with ISO 10012:2003, ISO 17025:2005, ANSI/NCSL-Z-540.3, and/or MIL-STD-45662A. Test methods: API2530-92 & ASME MFC-3M-1989.

Dick Munns Company • 10572 Calle Lee #130 • Los Alamitos, CA 90720
Phone (714) 827-1215 • Fax (714) 827-0823

Date: 10/23/2014

Approved By:

Calibration Technician:

Page 1 of 1

Certificate of Calibration

Certificate Number: **598198**

JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

OnSite

PO: OTL-15-020
Order Date: 07/23/2015
Authorized By: N/A

ACCREDITED
0723.01
Calibration

Property #: OMNI-00023
User: N/A
Department: N/A
Make: Mettler
Model: AE200
Serial #: E17657
Description: Scale, 205g
Procedure: DCN 500818/500887
Accuracy: ±0.0004g ±1 LSD

Calibrated on: 07/23/2015
*Recommended Due: 01/23/2016
Environment: 20 °C 40 % RH
* As Received: Out of Tolerance
* As Returned: Within Tolerance
Action Taken: Adjusted
Technician: 111

Remarks: * Many factors may cause the unit to drift out of calibration before the recommended due date. Any reported error is the absolute value between the reference and the unit. Uncertainties include the effects of the unit.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
723A	Rice Lake	1mg-200g (Class O)	Mass Set	10/31/2015	569749

Measurement Data

Parameter / Measurement Description	Range Unit	Reference	Min	Max	[k]Error	UUT	Uncertainty
Before							Accredited = ✓
Force							
	g	0.00100	0.0005	0.0015	0.0000	0.0010 g	5.7E-04 ✓
	g	0.01000	0.0095	0.0105	0.0000	0.0100 g	5.7E-04 ✓
	g	0.10000	0.0995	0.1005	0.0000	0.1000 g	5.7E-04 ✓
	g	0.50000	0.4995	0.5005	0.0000	0.5000 g	5.7E-04 ✓
	g	1.00000	0.9995	1.0005	0.0000	1.0000 g	5.7E-04 ✓
	g	40.00000	39.9995	40.0005	0.0004	40.0004 g	5.7E-04 ✓
	g	80.00000	79.9995	80.0005	0.0006	80.0006 g	5.7E-04 ✓
	g	120.00000	119.9995	120.0005	0.0009	120.0009 g	5.7E-04 ✓
	g	160.00000	159.9995	160.0005	0.0011	160.0011 g	5.8E-04 ✓
	g	200.00000	199.9995	200.0005	0.0015	200.0015 g	5.7E-04 ✓
After		Reference	Min	Max	[k]Error		Accredited = ✓
	g	0.00100	0.0005	0.0015	0.0002	0.0008 g	5.7E-04 ✓
	g	0.01000	0.0095	0.0105	0.0002	0.0098 g	5.7E-04 ✓
	g	0.10000	0.0995	0.1005	0.0002	0.0998 g	5.7E-04 ✓
	g	0.50000	0.4995	0.5005	0.0001	0.4999 g	5.7E-04 ✓
	g	1.00000	0.9995	1.0005	0.0001	0.9999 g	5.7E-04 ✓
	g	40.00000	39.9995	40.0005	0.0000	40.0000 g	5.7E-04 ✓
	g	80.00000	79.9995	80.0005	0.0000	80.0000 g	5.7E-04 ✓
	g	120.00000	119.9995	120.0005	0.0001	120.0001 g	5.7E-04 ✓
	g	160.00000	159.9995	160.0005	0.0000	160.0000 g	5.8E-04 ✓
	g	200.00000	199.9995	200.0005	0.0000	200.0000 g	5.7E-04 ✓

ANALYTICAL BALANCE CALIBRATION DATA SHEET

Balance to be calibrated: Acculab V-1200 Electronic Field Balance

ID Number: OMNI-00128

ID Number of Standard Calibration Weights: OMNI-00283 A + B

Date: 2/3/2015 By: J. Clark

Standard Weight (A) (grams)	Weight Verified (B) (grams)	Difference (A - B)
1000.0	999.9	+0.1
500.0	500.0	0.0
200.0	199.9	0.1
100.0	99.9	0.1
50.0	49.9	0.1
20.0	19.9	0.1

This calibration is traceable to NIST using calibrated standard weights.

Technician signature: _____ Date: 2/3/2015

Certificate of Calibration

Certificate Number: **547339**

JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

ACCREDITED
0723.01
Calibration

PO: OTL-13-035
Order Date: 11/19/2013
Authorized By: N/A

Property #: OMNI-00131
User: N/A
Department: N/A
Make: Ohaus
Model: 500mg
Serial #: 27503
Description: Mass
Procedure: DCN 500901
Accuracy: CLASS F (±0.72mg)

Calibrated on: 12/02/2013
*Recommended Due: 12/02/2018
Environment: 20 °C 34 % RH
As Received: Within Tolerance
As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 34

Remarks: * Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired

Refer to attachment for measurement results.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
432A	Sartorius	C-44	Microbalance 5.1g	03/11/2014	517747
723A	Rice Lake	1mg-200g (Class O)	Mass Set	09/05/2014	540048

JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (NMI's), or by using natural physical constants, intrinsic standards or ratio calibration techniques. The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2005, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless otherwise stated, a test accuracy ratio (TAR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without prior written consent of JJ Calibrations, Inc.
JJ Calibrations, Inc. quality system has been assessed and accredited to ISO/IEC 17025:2005.

Reviewer

3 Issued 12/06/2013 Rev # 14

Inspector

SCALE WEIGHT CALIBRATION DATA SHEET

Weight to be calibrated: 10 lb

ID Number: 132

Standard Calibration Weight: 10 lb

ID Number: 255

Scale Used: MTW-150K

ID Number: 353

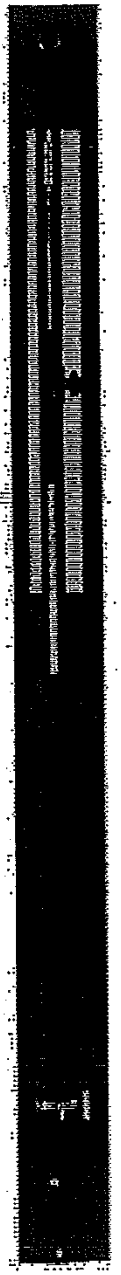
Date: 2/19/13 By: A. Kravitz

Standard Weight (A) (Lb.)	Weight Verified (B) (Lb.)	Difference (A - B)	% Error
10.0	10.0	0.0	Ø

*Acceptable tolerance is 1%.

This calibration is traceable to NIST using calibrated standard weights.

Technician signature: Date: 2/19/13



452
National
Weather
Service
Type

Instruction Booklet

for use with

PRINCO

Fortin type mercurial

Barometers

469
NOVA
Economy
Model

Manufactured by

PRINCO INSTRUMENTS, INC.
1020 Industrial Blvd.
Southampton, Pa. 18966-4095
U.S.A.

Phone: 215 355-1500
Fax: 215 355-7766

Certificate of Calibration

Certificate Number: 466281

JJ Calibrations, Inc.
7007 SE Lake Rd
Portland, OR 97267-2105
Phone 503.786.3005
FAX 503.786.2994

U723.01

Omni-Test Laboratories
13327 NE Airport Way
Portland, OR 97230

PO: OTL-10-085
Order Date: 12/20/2010
Authorized By: N/A

Property #: OMNI-00283B
User: N/A
Department: N/A
Make: Troemner Inc
Model: 200g-2Kg
Serial #: 47883
Description: Mass Set, 5 pc
Procedure: DCN 500901
Accuracy: Class 4

Calibrated on: 12/21/2010
*Recommended Due: 12/21/2015
Environment: 18 °C 40 % RH
As Received: Within Tolerance
As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 92

Remarks: * Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
383A	Setra	2000C	Scale, Digital 2 Kgm	03/25/2011	448104
479A	Sartorius	MC210S	Scale 210g	11/08/2011	461792
432A	Sartorius	C-44	Microbalance 5.1g	11/08/2011	461791
503A	Rice Lake	1mg-200g (Class O)	Mass Set	11/08/2011	460936
515A	Sartorius	LA1200S	Balance, Electronic 1200g	12/13/2011	465509

Measurement Data

Parameter / Measurement Description	Range	Unit	Reference	UUT	Variance	Min	Max	Uncertainty	Accredited = ✓
Before/After									
Mass									
		g	200.00000	200.0031	-0.00314	199.99600	200.00400	0.0003	✓
Dot		g	200.00000	200.0038	-0.00377	199.99600	200.00400	0.0003	✓
		g	500.00000	500.0056	-0.00555	499.98999	500.01001	0.0027	✓
		g	1000.0000	1000.017	-0.0172	999.9800	1000.0200	0.0029	✓
		g	2000.0000	2000.028	-0.0283	1999.9600	2000.0400	0.036	✓

JJ Calibrations, Inc. certifies that this instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual with the stated procedure using standards that are traceable to the National Institute of Standards and Technology (NIST), or other National Measurement Institutes (NMI's), or by using natural physical constants, intrinsic standards or ratio calibration techniques. The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2005, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless otherwise stated, a test accuracy ratio (TAR) of 4:1, if achievable, is maintained. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without prior written consent of JJ Calibrations, Inc.
JJ Calibrations, Inc. quality system has been assessed and accredited to ISO/IEC 17025:2005.

Carolyn S Johansen
Reviewer

5 Issued 12/22/2010 Rev # 14

Inspector

Thermal Metering System Calibration
Y Factor

Manufacturer:	Apex Instruments
Model:	XC-60EP
Serial Number:	606001
OMNI Tracking No.:	OMNI-00335
Calibrated Orifice:	☐ Yes

Average Gas Meter y Factor	Orifice Meter dH@
1.001	N/A

Calibration Date:	06/04/15	
Calibrated by:	A. Kravitz	
Calibration Frequency:	6 Months	
Next Calibration Due:	~~1/4/2016~~ tc 12/4/15	
Instrument Range:	1.000	cfm
Standard Temp.:	68	oF
Standard Press.:	29.92	"Hg
Barometric Press., Pb:	30.12	"Hg
Signature/Date:	6/4/15	

Previous Calibration Comparision

Date	12/3/2014	Acceptable Deviation (5%)	Deviation
y Factor	1.004483232	0.050224162	0.004
Acceptance	Acceptable		

Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.004
Acceptable dH@ Deviation	N/A
Maximum dH@ Deviation	N/A
Acceptance	Acceptable

Reference Standard *			
Standard Calibrator	Model	Standard Test Meter	
	S/N	OMNI-00001	
	Calib. Date	23-Oct-14	
	Calib. Value	0.9985	y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Reference Meter Pressure ("H2O), Pr	0.00	0.00	0.00
DGM Pressure ("H2O), Pd	2.32	1.15	0.70
Initial Reference Meter	927.984	939.742	945.271
Final Reference Meter	939.742	945.271	950.981
Initial DGM	0	0	0
Final DGM	11.794	5.619	5.835
Temp. Ref. Meter (°F), Tr	70.0	72.0	72.0
Temperature DGM (°F), Td	78.0	83.0	84.0
Time (min)			
Net Volume Ref. Meter, Vr	11.758	5.529	5.710
Net Volume DGM, Vd	11.794	5.619	5.835
Gas Meter y Factor =	1.005	1.000	0.997
Gas Meter y Factor Deviation (from avg.)	0.004	0.001	0.003
Orifice dH@	N/A	N/A	N/A
Orifice dH@ Deviation (from avg.)	N/A	N/A	N/A

where:

1. Deviation = |Average value for all runs - current run value|
** 2. y = [Vr x (y factor (ref)) x (Pb + (Pr/ 13.6)) x (Td + 460)]/ [Vd x (Pb + (Pd / 13.6)) x (Tr + 460)]
** 3. dH@ = 0.0317 x Pd / (Pb (Td + 460)) x [(Tr + 460) x time) / Vr]^2

* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272, or NIST traceable laboratory

** Equations come from EPA Method 5

The uncertainty of measurement is ±0.14 ft^3/min. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET
0-0.25" Digital Pressure Gauge

This form is to be used only in conjunction with Standard Procedure C-SPC.

Range: 0-0.25" WC ID Number: 335

Calibration Instrument: Digital Manometer ID Number: OMNI- 396

Date: 6/4/15 By: A. Kravitz

Range of Calibration Point ("WC)	Digital Manometer (A) ("WC)	Pressure Gauge (B) ("WC)	Difference (A - B)	% Error of Full Span*
0.00 - 0.05	0.016	0.013	0.003	1.2 %
0.05 - 0.10	0.068	0.065	0.003	1.2 %
0.10 - 0.15	0.135	0.129	0.006	2.4 %
0.15 - 0.20	~~0.196~~ 0.184	0.176	0.008	3.2 %
0.20 - 0.25	0.220	0.213	0.007	2.8 %

*Acceptable tolerance is 4%.

The uncertainty of measurement is ±0.01" WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Technician signature: _____ Date: 6/4/15

Reviewed by: _____ Date: 6/5/15

Emissions Sampling System Thermocouple Calibration Check

Calibration based on NIST Monograph 175 per ASTM E2515-11
All thermocouples are type "K"

Date: 6/4/15 Sampling System ID Numbers: 335/336

Performed By: A. Kravitz Calibration Instrument ID Number: 373

Reference Temperature (F)	Thermocouple Location				
	Ambient	Filter 1	Filter 2	Meter 1	Meter 2
0	1	1	1	1	1
30	31	31	30	31	31
60	61	61	60	61	61
90	91	91	91	91	91
120	121	121	121	121	121

Reference Temperature (F)	Thermocouple Location
	Dilution Tunnel
0	0
60	60
120	120
180	180
240	240

Reference Temperature (F)	Thermocouple Location						
	FB Top	FB Bottom	FB Back	FB Left	FB Right	Catalyst	Stack
0	0	0	0	0	0	10 1	0
200	200	200	200	200	200	~~206~~ 201	200
400	400	400	400	400	400	401	400
600	600	600	600	600	600	601	600
800	800	806	800	800	800	801	800

Note: This new form will be controlled by next calibration.

Technician Signature: _____ Date: 6/4/15

Thermal Metering System Calibration
Y Factor

Manufacturer:	Apex Instruments
Model:	XC-60EP
Serial Number:	606002
OMNI Tracking No.:	OMNI-00336
Calibrated Orifice:	☐ Yes

Average Gas Meter y Factor	Orifice Meter dH@
1.003	N/A

Calibration Date:	06/04/15	
Calibrated by:	A. Kravitz	
Calibration Frequency:	6 Months	
Next Calibration Due:	~~1/4/2016~~ 12/4/15	
Instrument Range:	1.000	cfm
Standard Temp.:	68	oF
Standard Press.:	29.92	"Hg
Barometric Press., Pb:	30.13	"Hg
Signature/Date:		4/4/15

Previous Calibration Comparision

Date	12/3/2014	Acceptable Deviation (5%)	Deviation
y Factor	1.007	0.05035	0.004
Acceptance	Acceptable		

Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.003
Acceptable dH@ Deviation	N/A
Maximum dH@ Deviation	N/A
Acceptance	Acceptable

Reference Standard *			
Standard Calibrator	Model	Standard Test Meter	
	S/N	OMNI-00001	
	Calib. Date	23-Oct-14	
	Calib. Value	0.9985	y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Reference Meter Pressure ("H2O), Pr	0.00	0.00	0.00
DGM Pressure ("H2O), Pd	0.60	1.20	2.01
Initial Reference Meter	950.981	956.241	964.189
Final Reference Meter	956.241	964.189	971.642
Initial DGM	0	0	0
Final DGM	5.281	8.036	7.536
Temp. Ref. Meter (°F), Tr	72.0	73.0	73.0
Temperature DGM (°F), Td	79.0	82.0	84.0
Time (min)			
Net Volume Ref. Meter, Vr	5.260	7.948	7.453
Net Volume DGM, Vd	5.281	8.036	7.536
Gas Meter y Factor =	1.006	1.001	1.003
Gas Meter y Factor Deviation (from avg.)	0.003	0.002	0.001
Orifice dH@	N/A	N/A	N/A
Orifice dH@ Deviation (from avg.)	N/A	N/A	N/A

where:

1. Deviation = |Average value for all runs - current run value|

** 2. y = [Vr x (y factor (ref)) x (Pb + (Pr/ 13.6)) x (Td + 460)]/ [Vd x (Pb + (Pd / 13.6)) x (Tr + 460)]

** 3. dH@ = 0.0317 x Pd / (Pb (Td + 460)) x [(Tr + 460) x time) / Vr]^2

* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272, or NIST traceable laboratory

** Equations come from EPA Method 5

The uncertainty of measurement is ±0.14 ft^3/min. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET
Digital Pressure Gauge 0-1" with Low Range

This form is to be used only in conjunction with Standard Procedure C-SPC.

OMNI ID#: 336 Date: 6/4/15 By: A. Kravitz

Full Range

Range: 0-1" WC Calibration Instrument: Digital Manometer OMNI ID# 396

Range of Calibration Point ("WC)	Digital Manometer ("WC) (A)	Pressure Gauge ("WC) (B)	Difference (A - B)	% Error of Full Span*
0.0 – 0.2	0.152	0.155	-0.003	-0.3%
0.2 – 0.4	0.454	0.449	0.005	0.5%
0.4 – 0.6	0.534	0.532	0.002	0.2%
0.6 – 0.8	0.768	0.764	0.004	0.4%
0.8 – 1.0	0.982	0.975	0.007	0.7%

*Acceptable tolerance is 4%.
The uncertainty of measurement is ±0.1" WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Low Range

Range: 0-0.10" WC Calibration Instrument: Microtector OMNI ID# 410

Range of Calibration Point ("WC)	Microtector (A) ("WC)	Pressure Gauge (B) ("WC)	Difference (A - B)	% Error of Full Span*
0.0 – 0.02	0.010	0.011	-0.001	-1%
0.02 – 0.04	0.034	0.035	-0.001	-1%
0.04 – 0.06	0.046	0.047	-0.001	-1%
0.06 – 0.08	0.068	0.069	-0.001	-1%
0.08 – 0.10	0.092	0.093	-0.001	-1%

*Acceptable tolerance is 4%.
The uncertainty of measurement is ±0.01" WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Note: This form is uncontrolled but will be standard by next calibration.

Technician signature: _____ Date: 6/4/15

Reviewed by: _____ Date: 6/5/15

OMNI Environmental, Inc.
OMNI-Test Laboratories, Inc.

VWR Temperature Hygrometer Calibration Procedure and Data Sheet

Frequency: Every Year

Step 1: Locate NIST traceable standard.

Step 2: Place unit to be calibrated, tracking No. OMNI-343, inside OMNI desiccate box on the same shelf with the NIST traceable standard.

Step 3: After a period of not less than four hours record the temperature and humidity of both units in the spaces provide below.

Step 4: If the unit to be calibrated matches the NIST standard within ± 4%, it is acceptable. If not, the unit needs to be sent to a repair company or replaced.

Verification Data:

Date: 9/22/14 Technician: A. Kravitz

Time in desiccate: 0815 Recording time: 12:15

NIST Standard Temperature: 76.6 °F NIST Standard Humidity: 19.7%

Test Unit Temperature Reading: 77.0 °F Test Unit Humidity Reading: 17.6%

Test unit OMNI- 343 is ✓ or was not ___ within acceptable limits.

Technician Signature: [signature]

Comments: Standard equipment: OMNI-291

Operating Maintenance Instructions

Negative Pressure or Vacuum Measurement

ro the gage. Connect the source of cuum or negative pressure to the right e gage connection (5) and proceed as scribed under Positive Pressure Mea- rement Section above. Remember that pressure measured in this way is gative.

Differential Pressure Measurement

fferential pressures may be measured connecting the higher (more positive) essure to the left connection (2) and lower pressure to the right connection).

Storage

rn meter circuit switch to "off" posi- n and withdraw "hook" point well ar of fluid (by turning Micrometer unter-clockwise) when gage is not in e. This will conserve the batteries and nimize build-up of oxides, etc., on the ook." Keep the unit covered and in an a free of strong solvent fumes.

Maintenance

hen the meter reading becomes reduced the pointer movement gets sluggish ith circuit on and "hook" point in id), the following should be done:

Remove the hook point (by unscrew- ing) and clean the tip lightly using fine crocus cloth. Wipe off all grit and dirt with a clean rag, reassemble and recheck meter operation.

If the meter operation continues to be sluggish, replace the size AA, 1½ volt battery. (Replace the battery at least once a year to avoid deteriora- tion of battery and damage to gage. Leakproof alkaline battery is recom- mended.)

replace the battery, remove center rew (10) located in the back of the electronic enclosure. Cover (9) will come off exposing the battery. Pull the old battery out and push a new battery into the battery holder with the positive (cen- ter) terminal to the right (to the end marked with a + on the holder).

If the fluid becomes contaminated and requires replacement; empty old fluid from gage; flush out with clear water and replace with distilled water and Dwyer A126 Fluorescein Green Color Concen- trate mixed 3/4 oz. concentrate to each quart of water. (CAUTION: Do not substitute other gage fluids as proper gage operation depends on use of the specified gage fluid to provide proper surface tension, wetting ability and electrolyte capability with unity specific gravity.)

If the gage bore is very dirty, a mild soap solution may be used to aid in cleaning prior to flushing with clear water. (CAUTION; Do not clean with liquid soaps, special solvents, degreasers, aro- matic hydro-carbons, etc. Such cleaners and solvents frequently contain chlorine, fluorine, acetone and related compounds which will permanently damage the gage, and prevent proper operation.)

If meter becomes inoperative and cannot be made to operate properly by cleaning "hook" tip or replacing battery, return the entire gage to Dwyer Instruments, Inc., for service.

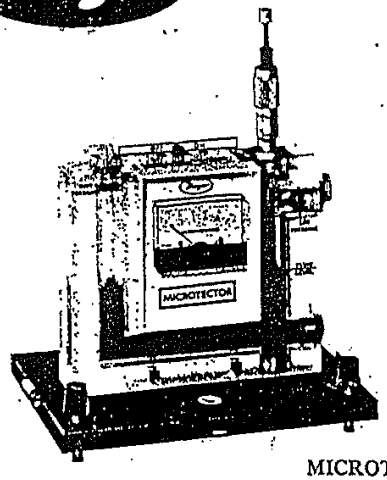
"Microtector" ®
A Product From
Dwyer Instruments, Inc.
"The Low Pressure People"

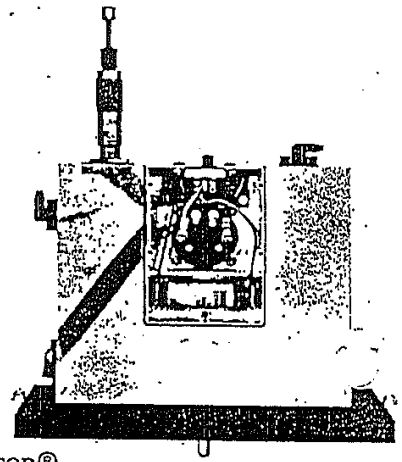
38-440190-00

DWYER INSTRUMENTS, INC.
P.O. Box 373 Michigan City, Indiana 46360 U.S.A.
Phone: Area 219/872-9141
Direct Chicago Line: Area 312/733-7883

MICROTECTOR®

Operating and Maintenance Instructions





MICROTECTOR®
Specifications and Features*

Time Proven Hook Gage Manometer Combined with Modern Electronics For Easier, Faster, more Accurate Precision Pressure Measurements.

~~Accurate and Repeatable to .0002 inches water column~~ (.000009 P.S.I.).

Pressure Range 0-2" w.c. Positive, Negative or Differential Pressures.

Non Toxic and Inexpensive Gage Fluid Consists of Distilled Water Mixed with a Small Amount of Dwyer Color and Wetting Agent Concentrate.

Convenient, Portable, Light Weight, and Self-Contained, the Unit Requires No External Power Connections and is Operated by a 1½ Volt Penlight Cell.

A.C. Detector Current Eliminates Hook Plating, Fouling and Erosion.

Micrometer Complies with Federal Specification GGG-C-105A and is Traceable to a Master at the National Bureau of Standards.

Three Point Mounting with Dual Leveling Adjustment and Circular Level Assure Rapid Set Up.

Durablock® Precision Machined Acrylic Plastic Gage Body.

Sensitive 0-50 Microamp D.C. Meter Acts as Detector and Also Indicates Battery and Hook Probe Condition.

Heavy One Half Inch Thick Steel Base Plate Provides Steady Mounting.

Top Quality Glass Epoxy Circuit Board and Solid State-Integrated Circuit Electronics.

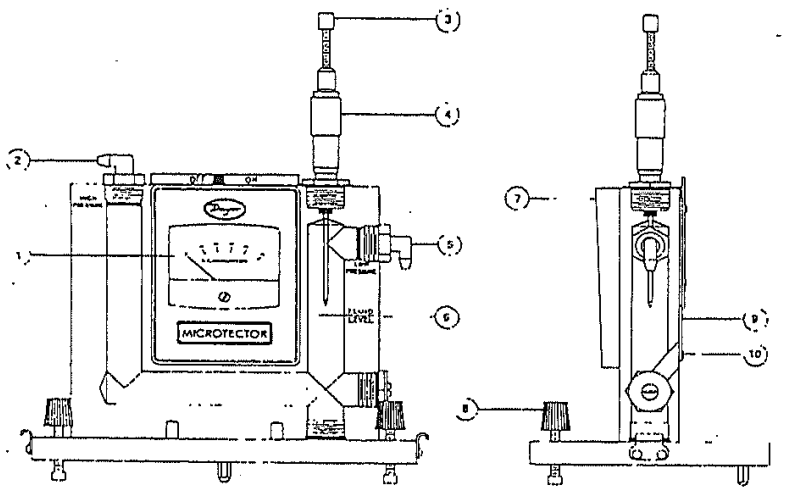
Electronic Enclosure of Tough Molded Styrene Acrylonitrile Provides Maximum Protection to Components Yet Allows Easy Access to Battery Compartment.

Rugged Sheet Steel Cover and Carrying Case Protects the Entire Unit When Not in Use.

Accessories Included are (2) 3 Foot Lengths Tygon Tubing, (2) 1/8" Pipe Thread Adapters and 3/4 oz. bottle of Fluorscein Green Color Concentrate with Wetting Agent.

**Patent Applied For*

DWYER INSTRUMENTS, INC. Telephone 219/872-9141, or



MICROTECTOR® GAGE

Precision Pressure Measurement

The Dwyer Microtector® combines the time proven principles of the Hook Gage type manometer and modern solid state integrated circuit electronics. It provides an inexpensive means of achieving accuracy and repeatability within ± .00025 inches water column throughout its 0 to 2 inches w.c. range. It is truly a new standard in precision pressure measuring devices.

Principles of Operation

A pressure to be measured is applied to the manometer fluid which is displaced in each leg of the manometer by an amount equal to ½ the applied pressure. A micrometer mounted point is then lowered until contacts the manometer gage fluid. The instant of contact is detected by completion of a low power A.C. circuit. Current for this circuit is supplied by a 1½ volt penlight cell feeding two semiconductor amplifiers which act as a free-running multivibrator operating at a frequency of approximately two kilohertz. Completion of the A.C. circuit activates a bridge rectifier which provides the signal for indication on a sensitive (0 to 50 microamps) D.C. microammeter.

On indication of contact the operator stops lowering the point and reads the micrometer which indicates one half the applied pressure. By interpolating eight divisions, (each being .000125" w.c.) between .001 micrometer graduations, a total accuracy of .00025 can easily be achieved. The micrometer complies with Federal Specification GGG-C-105A and is traceable to a master at the National Bureau of Standards.

Locating and Opening

Stand the Microtector® and case on a firm flat level surface. Remove the cover by releasing the latches and lifting straight up. If it is necessary to move the gage without case, handle only the base plate or clear acrylic block. (CAUTION: Do not handle gage by grasping meter-electronic package housing Item 7 on drawing.)

Fluid Level

Level the gage by adjusting the two front leveling screws (Item 8 on drawing) until the bubble in the spirit level is centered in the small circle. After leveling the gage, open both rapid shut off valve tube connectors (2 and 5). Back off the Micrometer (4), if necessary, to make sure that the point is not immersed in the gage fluid. The fluid level in the gage should now coincide with the mark on the right hand bore plus or minus approximately 1/32 inch (6). If the level of fluid is too high, fluid can be removed with an eye dropper pipette or carefully poured out of the right connection (5). If the level is too low, remove the top left rapid shut off valve tube connector (2), and add distilled water pre-mixed with the proper amount of Dwyer green concentrate. (See maintenance instruction for proportions.) After correcting the fluid level, reinstall the rapid shut off connectors and with them in the open position, relevel the Microtector.® The gage is now ready to be zeroed.

Zeroing

Turn the Micrometer barrel (4) until its lower end just coincides with the zero mark on the internal vertical scale *and* the zero on the barrel scale coincides with the vertical line on the internal scale. Note that the internal scale is graduated every .025" from 0 to 1.00 inch and the barrel scale is graduated in one thousandths from 0 to .025." Turn the meter circuit switch at the top of gage to the "on" position. While holding the barrel at the zero position (and with the gage level), raise or lower the point by turning the top knurled knob (3) until the point is above, but near the fluid.

Check to be sure that the meter (1) registers zero. Watch the meter, hold the barrel (4) and lower the point slowly by turning the top knurled knob (3). As the knob is turned, the point will contact the fluid and the meter pointer will move from zero to some upscale position. After making contact, turn the point out of the fluid by turning the Micrometer barrel counter-clockwise to a reading of .010 or more. Again watch the meter and, this time, lower the point by turning the Micrometer barrel. The point position where the meter pointer begins to move up scale is the zero position. This position should correspond to zero reading on the Micrometer. Adjust the point in relation to the Micrometer barrel by turning the top knob while holding the barrel steady. Repeat lowering the point, watching the meter for contact, and adjusting the point until the zero position and zero reading exactly coincide. The gage is now zeroed and should not be moved.

An alternate method of zeroing and reading can be used wherein, instead of zeroing the gage completely, a zero correction reading is taken and recorded then subtracted from the final read. Comparable results can be obtained with either method.

Positive Pressure Measurement

With the fluid at its proper level, a pressure of 2.0" water column maximum can be measured. Positive pressure should be applied to the top left connection (2) with the Micrometer zeroed as described above. This will permit simple direct reading to be taken.

After an unknown pressure has been applied at the top left connection, the fluid level will drop in the left bore and rise over the point in the right bore. Note the indicating meter point has moved upscale because the point is immersed in the fluid. Turn the Micrometer counter-clockwise until the point leaves the fluid as indicated by the meter pointer dropping to zero on scale. Then slowly turn the Micrometer down until its point just touches the fluid surface causing movement of the meter pointer. Withdraw the point and repeat several times noting each time the Micrometer reading where the meter pointer movement begins. The average of these readings multiplied by two is the pressure applied to the gage. (Avg. reading x 2 = pressure applied in inches w.c. The degree of uncertainty for the operator and instrument is indicated by the difference in these readings.)

When the readings are complete the pressure should be removed and the zero-setting of the Microtector® rechecked. Any change in the zero position will indicate inaccurate readings. Should this happen the zero-set and pressure measurement procedure should be repeated.

BULLETIN NO. H-11

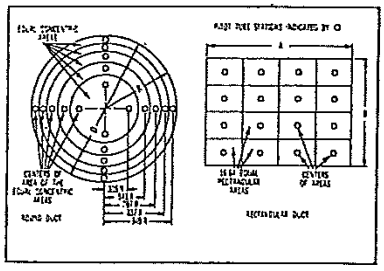
AIR VELOCITIES WITH THE DWYER PITOT TUBE

AIR VELOCITY

The total pressure of an air stream flowing in a duct is the sum of the static or bursting pressure exerted upon the sidewalls of the duct and the impact or velocity pressure of the moving air. Through the use of a pitot tube connected differentially to a manometer, the velocity pressure alone is indicated and the corresponding air velocity determined.

For accuracy of plus or minus 2%, as in laboratory applications, extreme care is required and the following precautions should be observed:

1. Duct diameter 4" or greater.
2. Make an accurate traverse per sketch at right, calculate the velocities and average the readings.
3. Provide smooth, straight duct sections a minimum of 8½ diameters in length upstream and 1½ diameters downstream from the pitot tube.
4. Provide an egg crate type straightener upstream from the pitot tube.



In making an air velocity check select a location as suggested above, connect tubing leads from both pitot tube connections to the manometer and insert in the duct with the tip directed into the air stream. If the manometer shows a minus indication reverse the tubes. With a direct reading manometer, air velocities will now be shown in feet per minute. In other types, the manometer will read velocity pressure in inches of water and the corresponding velocity will be found from the curves in this bulletin. If circumstances do not permit an accurate traverse, center the pitot tube in the duct, determine the center velocity and multiply by a factor of .9 for the approximate average velocity. Field tests run in this manner should be accurate within plus or minus 5%.

The velocity indicated is for dry air at 70°F., 29.9" Barometric Pressure and a resulting density of .075#/cu. ft. For air at a temperature other than 70°F. refer to the curves in this bulletin. For other variations from these conditions, corrections may be based upon the following data:

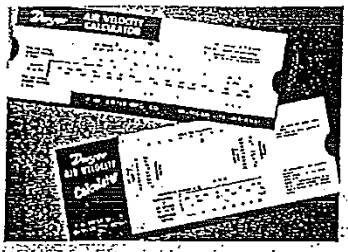
$$\text{Air Velocity} = 1096.2 \sqrt{\frac{Pv}{D}}$$

where Pv = velocity pressure in inches of water
D = Air density in #/cu. ft.

$$\text{Air Density} = 1.325 \times \frac{P_B}{T}$$

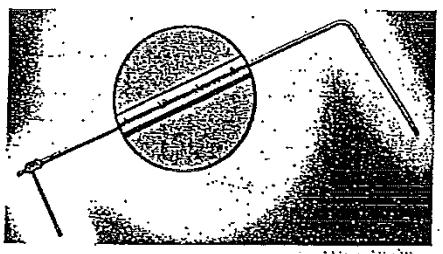
where P_B = Barometric Pressure in inches of mercury
T = Absolute Temperature (indicated temperature °F plus 460)

Flow in cu. ft. per min. = Duct area in square feet x air velocity in ft. per min.



AIR VELOCITY CALCULATOR

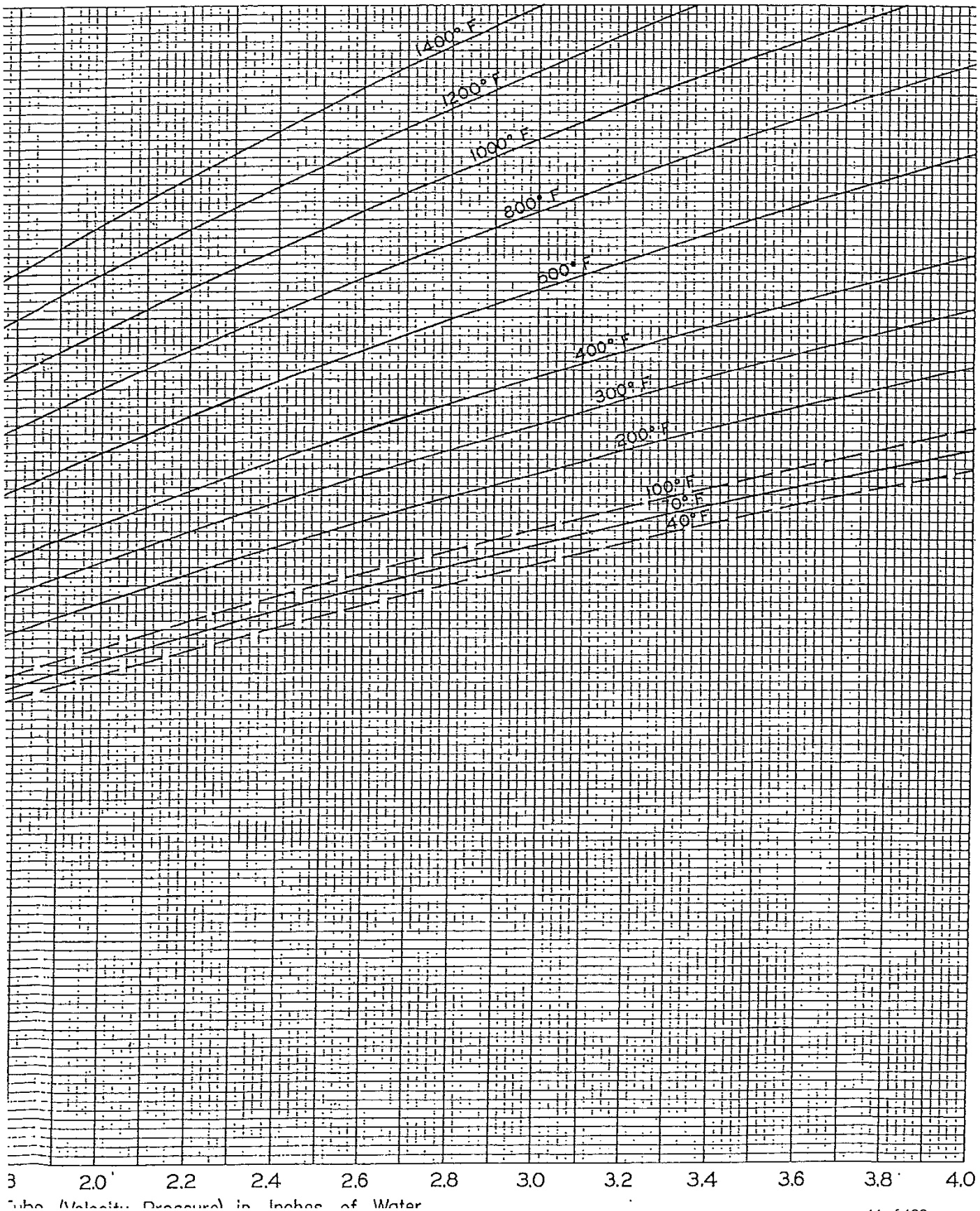
Computes velocity based on air density corrected for conditions of temperature and pressure. Eliminates tedious calculations. Ranges from .01 to 10" water corresponding to 400 to 20,000 FPM. Furnished with each pitot tube.



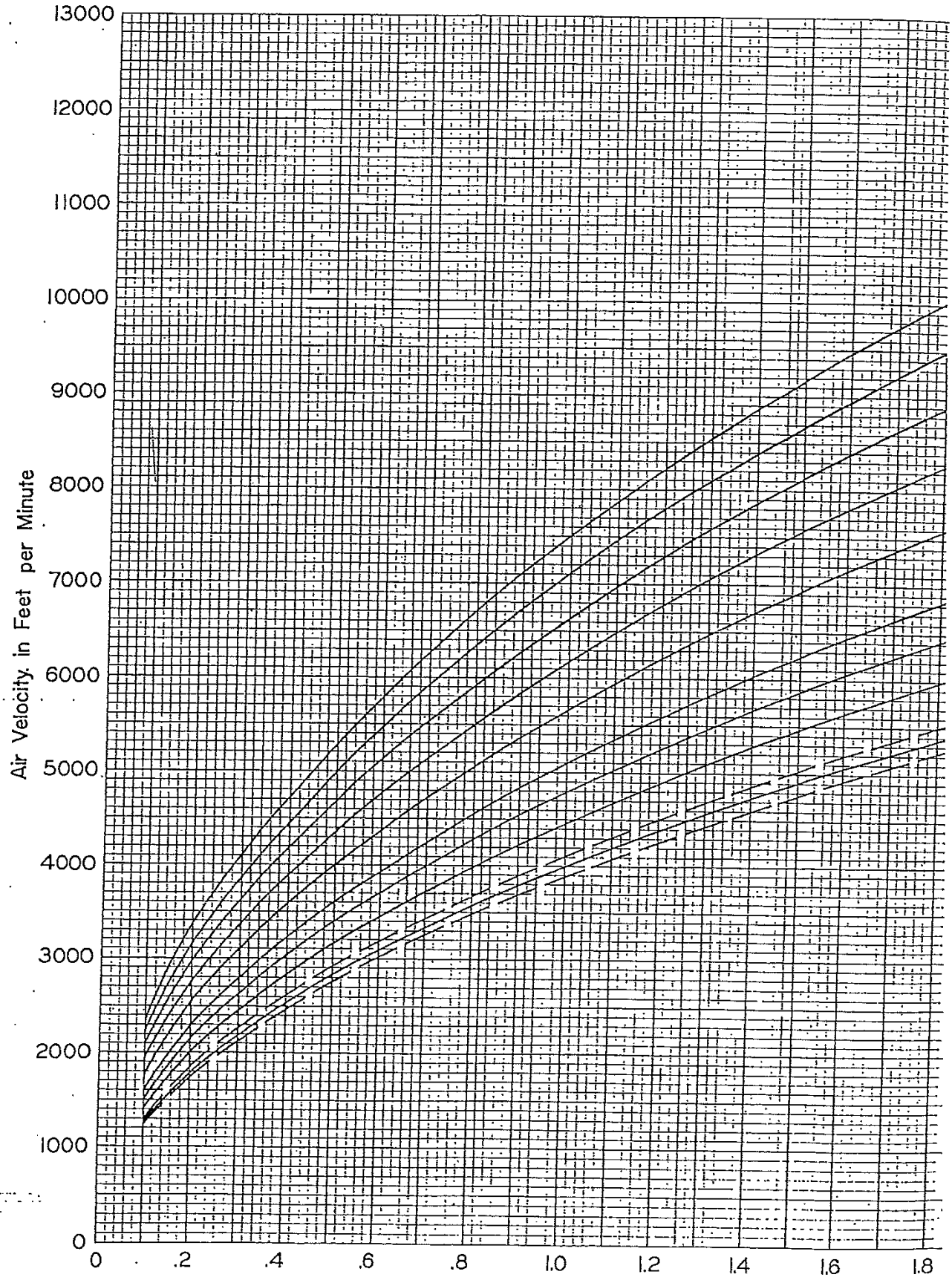
STAINLESS STEEL PITOT TUBES

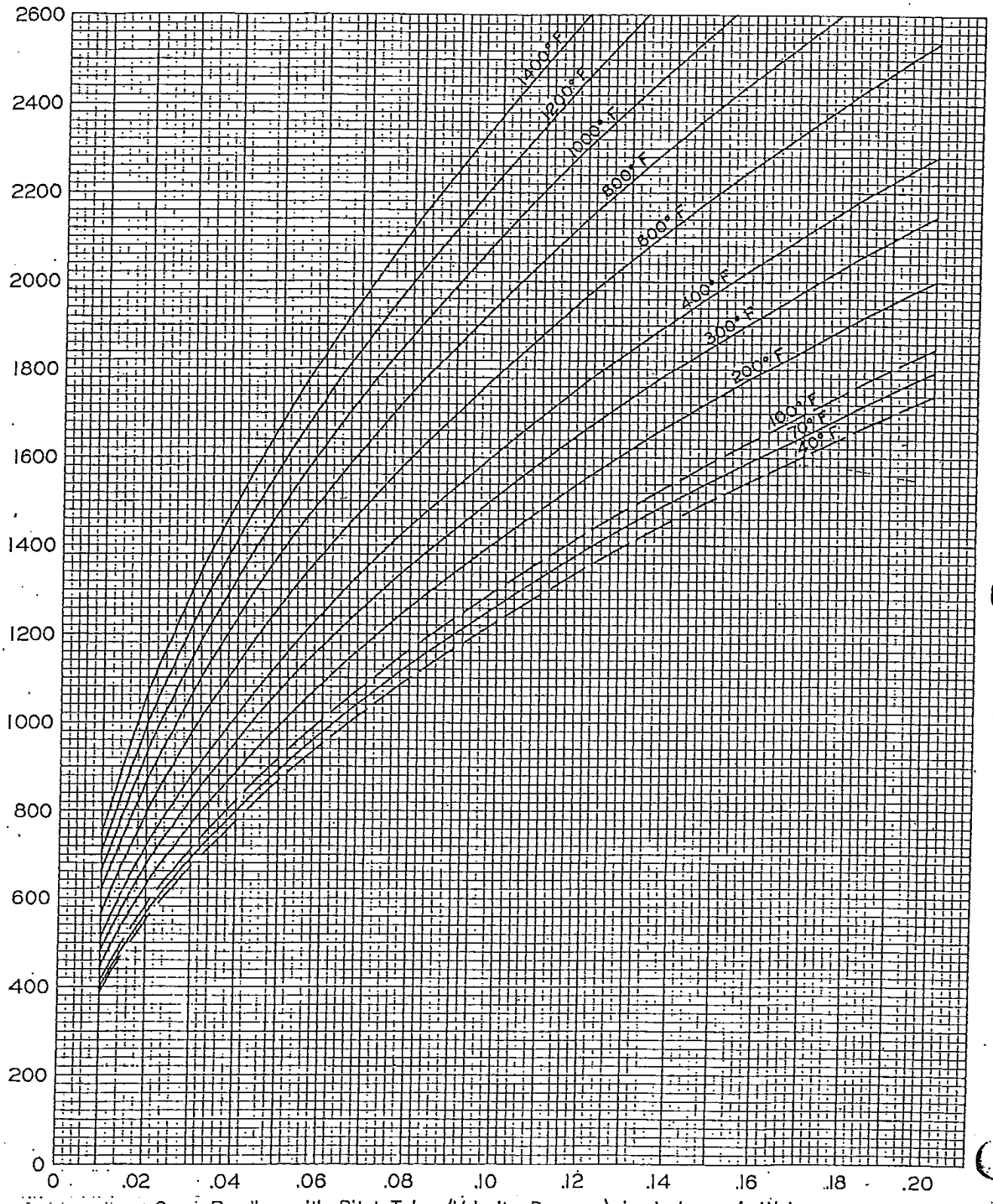
Test-confirmed unity coefficient and lifetime construction of No. 304 stainless steel. Inch graduations show depth of insertion for traversing. Complies with AMCA and ASHRAE specifications. Sizes 12" to 60" long. Hand or fixed mounting types.

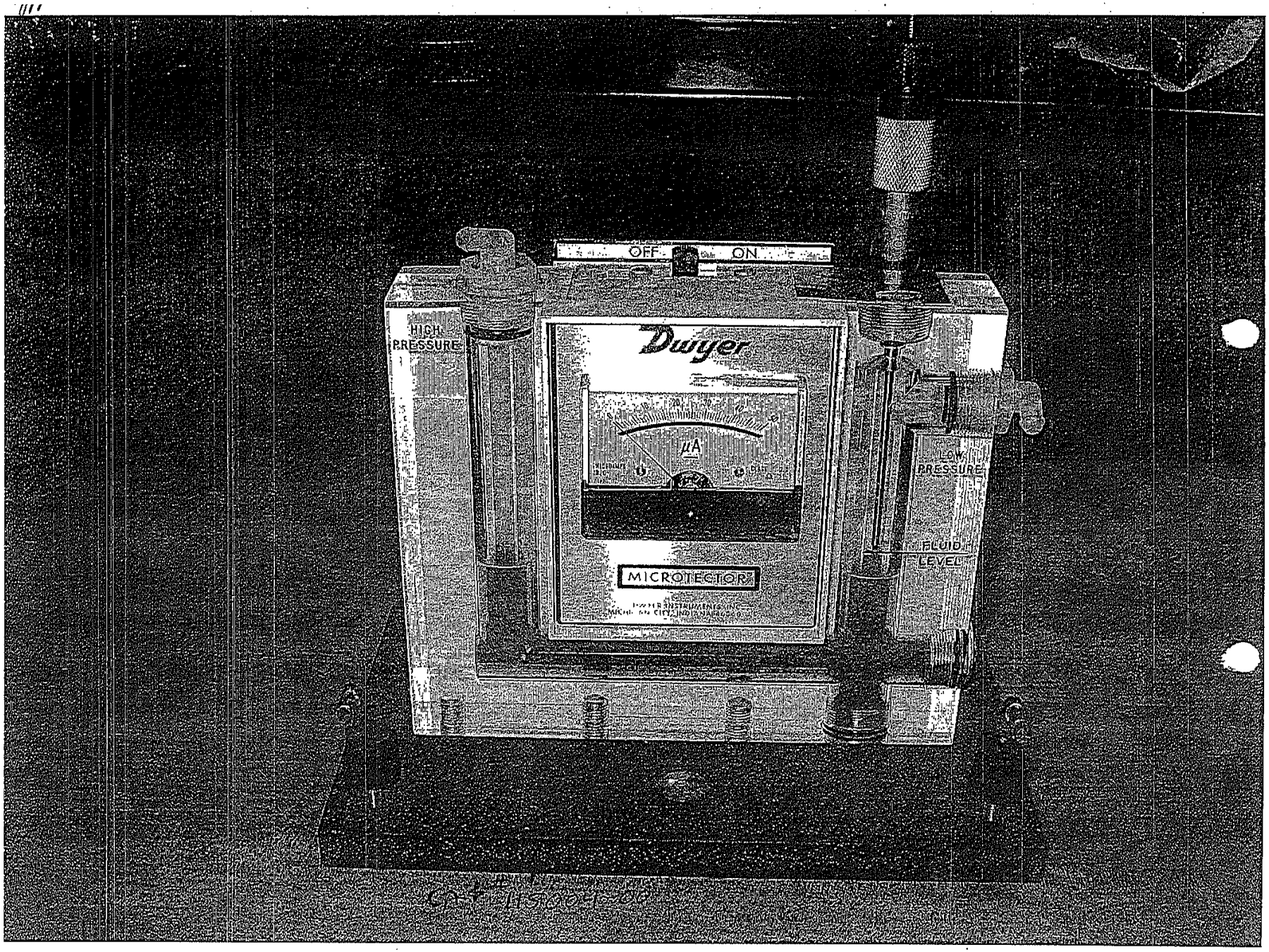
LITHOGRAPHED IN U.S.A. 3/84



Tube (Velocity Pressure) in Inches of Water


Air Velocity, in Feet per Minute
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
0
.2
.4
.6
.8
1.0
1.2
1.4
1.6
1.8

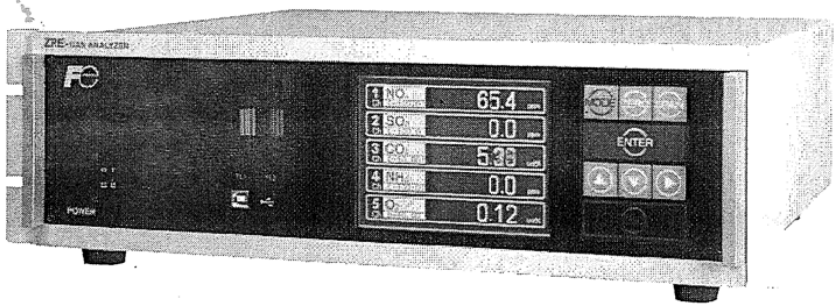

2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1400°F
1200°F
1000°F
800°F
600°F
400°F
300°F
200°F
100°F
70°F
40°F
0
.02
.04
.06
.08
.10
.12
.14
.16
.18
.20
Gage Reading with Pitot Tube (Velocity Pressure) in Inches of Water


OFF
ON
HIGH PRESSURE
Dwyer
μA
LOW PRESSURE
FLUID LEVEL
MICROTECTOR

Instruction Manual

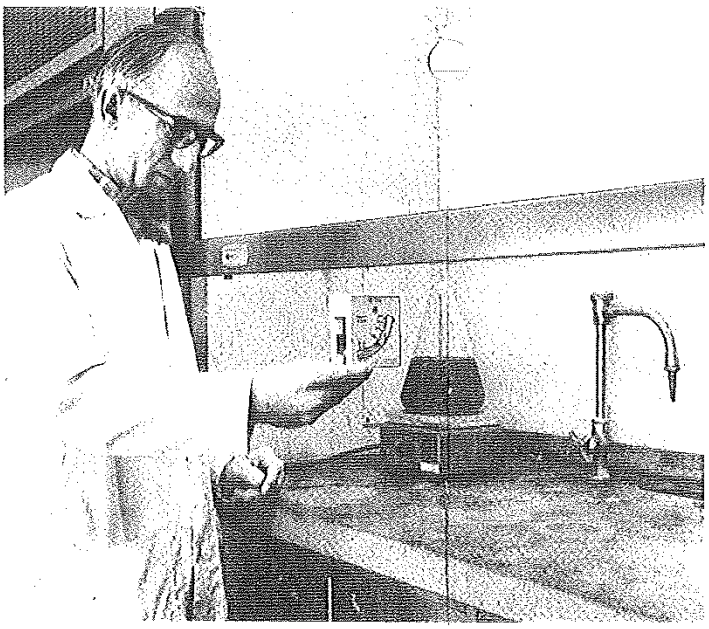
NDIR TYPE INFRARED GAS ANALYZER

TYPE: ZRE



Fuji Electric Systems Co., Ltd.

INZ-TN1ZREc-E

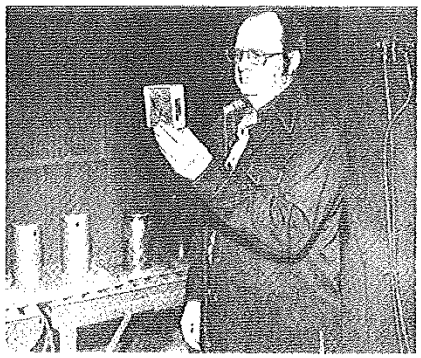


Bulletin H-14

INSTRUCTIONS for No. 480 VANEOMETER™ AIR VELOCITY METER

Use a Vaneometer to measure velocity of air flow into laboratory fume hoods and...

...at paint spray booths to determine when to change filters. Or wherever needed to meet OSHA standards of ventilation for smoke, dust or fume removal.



Use this sensitive new Dwyer Vaneometer™ to measure low air velocities–at low cost.

THE PROBLEM: How can you insure that OSHA, EPA and other safety ventilation requirements are met—at paint spray booths and at fume, smoke and dust exhaust hoods—in the plant, laboratory or restaurant? To do this, you need to measure low air velocities—from 25 to 400 feet per minute.+

Until now, instruments for this purpose have been complex and costly—from four to ten times the modest price of this unit.

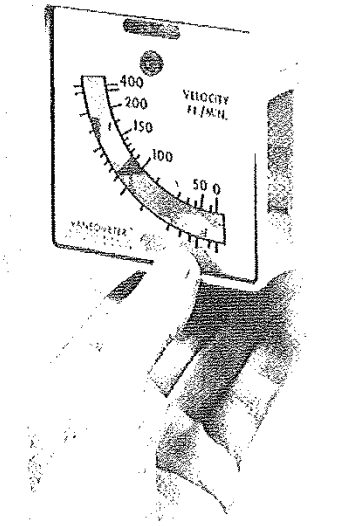
SOLUTION: The new Dwyer Vaneometer™. It's pocket-size and light in weight—only four ounces. So it's handy to carry from one work station to another to make spot checks of air flow.* And it's easy to use—for untrained personnel. Just hold meter parallel to air flow—the pendulum vane/pointer indicates air velocity in feet per minute on a large, easy-to-read scale.

It can be hand held—or permanently mounted if continuous monitoring of face velocity is desired. A versatile steel mounting bracket and operating instructions are included. It's sensitive and accurate to ±10% of full scale. The Vaneometer has a bubble level and scale visible on both sides.

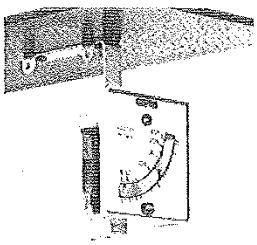
With housing of tough ABS plastic, it is durable and easy to clean with soap and water. The polyester vane can be cleaned with lacquer thinner. A spare vane is provided.

The Vaneometer is a tested, practical instrument for daily use—sensibly designed by Dwyer—"The Low Pressure People". Try one—and judge for yourself.

*For horizontal air flows only at this time. +Metric scales are available. Range: 0 to 2.0 meters per second.

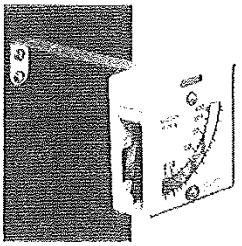


The Vaneometer's large scales are easy to read. Both sides have factory calibrated scales. Recessed bubble level at top helps insure accurate readings.



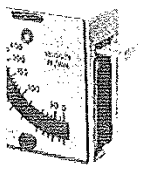
A versatile steel mounting bracket is included.

Left—Shows overhead mounting of Vaneometer for continuous monitoring.



The same bracket permits wall mounting. Bolts, nuts and screws are included.

How to Operate Meter



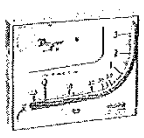
To install vane, pull vane holder from end of Vaneometer. Carefully remove vane from plastic bag and cardboard envelope. (Two vanes are enclosed, one is a spare.) Hang the vane by the wire in the two slots provided in the vane holder, then re-install the vane holder in the meter. Either side of vane may face the air flow. The meter is now ready to take readings. It is precalibrated. If vane becomes damaged, it is easily replaced with spare vane.

The Vaneometer is accurate to ±5% of full scale from bottom of scale to 100 FPM and ±10% from 100 FPM to top of scale.

For permanent mounting with bracket, Vaneometer should be located at least 6 inches from wall or side of duct. For accurate readings be sure to keep meter level at all times.

To determine face velocity, take the average of six readings. Readings should be taken at the center of six equal sections, three across top and three across the bottom.

When conditions are such that the Vaneometer cannot be permanently mounted, it may be more practical to install a Dwyer Mark II differential pressure manometer and calibrate it to indicate a dirty filter condition. To calibrate a Dwyer Mark II No. 25 Manometer with the Vaneometer, first follow Mark II installation instructions, (Bulletin D-58 included with the gage). Install new filters, start spray booth fan, note and record manometer reading and face velocity. Block-off filter media until face velocity reaches 100 feet per minute or conforms to OSHA, EPA or governing agency. Record and mark this point on the manometer, then replace filters at this point.



For replacement Vanes, order Part No. A390, package of two.

MARK II MANOMETER

DWYER INSTRUMENTS, INC., P.O. BOX 373, MICHIGAN CITY, INDIANA 46360, U.S.A., Phone: 219/879-8000

FR 69-440330-01

Example Calculations

Equations and Sample Calculations – ASTM E2779 & E2515

Manufacturer:	US Stove
Model:	5660
Run:	1
Category:	[Integrated]

Equations used to calculate the parameters listed below are described in this appendix. Sample calculations are provided for each equation. The raw data and printout results from a sample run are also provided for comparison to the sample calculations.

M_{Bdb} – Weight of test fuel burned during test run, dry basis, kg

M_{BSidb} – Weight of test fuel burned during test run segment *i* , dry basis, kg

BR – Average dry burn rate over full integrated test run, kg/hr

BR_{Si} – Average dry burn rate over test run segment *i* , kg/hr

V_s – Average gas velocity Dry burn rate, kg/hr

Q_{sd} – Average gas flow ra Total particulate matter collected, mg

$V_{m(std)}$ – Volume of Gas S Volume of gas sampled corrected to standard conditions, dscf

m_n – Total Particulate Ma Average dilution tunnel gas velocity, ft/sec

C_s - Concentration of part Particulate concentration, g/dscf

E_T – Total Particulate Em Dilution tunnel gas flow rate, dscf/min

PR - Proportional Rate Va Particulate emission rate, lbs/hr

PM_R – Average particulat Total particulate emissions, grams

PM_F – Average particulat Average fuel load moisture content, %

M_{Bdb} – Weight of test fuel burned during test run, dry basis, kg
ASTM E2779 equation (1)

$$M_{Bdb} = (M_{Swb} - M_{Ewb})(100/(100 + FM))$$

Where,

FM = average fuel moisture of test fuel, % dry basis
M_{Swb} = weight of test fuel in hopper at start of test run, wet basis, kg
M_{Ewb} = weight of test fuel in hopper at end of test run, wet basis, kg

Sample Calculation:

5.1 %
M_{Swb} = 29.1 lbs
M_{Ewb} = 12.9 lbs
0.4536 = Converstion factor from lbs to kg

M_{Bdb} = [(29.1 x 0.4536) - (12.9 x 0.4536)] (100/(100 + 5.05)

M_{Bdb} = **7** kg

M_{BSidb} – Weight of test fuel burned during test run segment *i* , dry basis, kg
ASTM E2779 equation (2)

$$M_{BSidb} = (MS_{Siwb} - M_{ESiwb})(100/(100 + FM))$$

Where,

M_{SSiwb} = weight of test fuel in hopper at start of test run segment *i* , wet basis, kg

M_{ESiwb} = weight of test fuel in hopper at end of test run segment *i* , wet basis, kg

Sample Calculation (from medium burn rate segment):

FM = 5.1 %

M_{SSiwb} = 24.3 lbs

M_{ESiwb} = 19.2 lbs

0.4536 = Converstion factor from lbs to kg

M_{BSidb} = [(24.3 x 0.4536) - (19.2 x 0.4536)] (100/(100 + 5)

M_{BSidb} = **2.2** kg

BR – Average dry burn rate over full integrated test run, kg/hr
ASTM E2779 equation (3)

$$BR = \frac{60\ M_{Bdb}}{\theta}$$

Where,

θ = Total length of full intergrated test run, min

Sample Calculation:

M_{Bdb} = 7.00 kg

θ = 362 min

$$BR = \frac{60 \times 7}{362}$$

BR = **1.16** kg/hr

BR_{Si} – Average dry burn rate over test run segment *i* , kg/hr
ASTM E2779 equation (4)

$$BR_{Si} = \frac{60\ M_{BSidb}}{\theta_{Si}}$$

Where,

θ_{Si} = Total length of test run segment *i* , min

Sample Calculation (from medium burn rate segment):

M_{BSidb} = 2.20 kg

θ = 120 min

$$BR = \frac{60 \times 2.2}{120}$$

BR = **1.10** kg/hr

V_s – Average gas velocity in the dilution tunnel, ft/sec
ASTM E2515 equations (9)

$$V_s = F_p \times K_p \times C_P \times \left(\sqrt{\Delta P}\right)_{avg} \times \sqrt{\frac{T_s}{P_s \times M_s}}$$

Where:

F_p = Adjustment factor for center of tunnel pitot tube placement, $Fp = \frac{V_{strav}}{V_{scent}}$, ASTM E2515 Equation (1)

v_{scent} = Dilution tunnel velocity calculated after the multi-point pitot traverse at the center, ft/sec

v_{strav} = Dilution tunnel velocity calculated after the multi-point pitot traverse, ft/sec

k_p = Pitot tube constant, 85.49

C_p = Pitot tube coefficient: 0.99, unitless

ΔP* = Velocity pressure in the dilution tunnel, in H_2O

T_s = Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)

P_s = Absolute average gas static pressure in diltuion tunnel, = $P_{bar} + P_g$, in Hg

P_{bar} = Barometric pressure at test site, in. Hg

P_g = Static pressure of tunnel, in. H_20; (in Hg = in H_20/13.6)

M_s = **The dilution tunnel wet molecular weight; M_s = 28.78 assuming a dry weight of 29 lb/lb-mole

Sample calculation:

$$Fp = \frac{14.23}{16.03} = 0.888$$

$$V_s = 0.888 \times 85.49 \times 0.99 \times 0.222 \times \left(\frac{117.3 + 460}{\left(30.08 + \frac{-0.44}{13.6}\right) \times 28.78} \right)^{1/2}$$

V_s = **13.63** ft/s

*The ASTM test standard mistakenly has the square root of the average delta p instead of the average of the square root of delta p. The current EPA Method 2 is also incorrect. This was verified by Mike Toney at EPA.

**The ASTM test standard mistakenly identifies Ms as the dry molecular weight. It should be the wet molecular weight as indicated in EPA Method 2.

Q_{sd} – Average gas flow rate in dilution tunnel, dscf/hr
ASTM E2515 equation (3)

$$Q_{sd} = 3600 \times (1 - B_{ws}) \times v_s \times A \times \frac{T_{std}}{T_s} \times \frac{P_s}{P_{std}}$$

Where:

3600	=	Conversion from seconds to hours (ASTM method uses 60 to convert in minutes)
B_{ws}	=	Water vapor in gas stream, proportion by volume; assume 2%
A	=	Cross sectional area of dilution tunnel, ft^2
T_{std}	=	Standard absolute temperature, 528 °R
P_s	=	Absolute average gas static pressure in diltuion tunnel, = P_{bar} + P_g , in Hg
T_s	=	Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)
P_{std}	=	Standard absolute pressure, 29.92 in Hg

Sample calculation:

$$Q_{sd} = 3600 \times (1 - 0.02) \times 13.63 \times 0.196 \times \frac{528}{\#\#\#\# + 460} \times \frac{30.1 + \frac{-0.44}{13.6}}{29.92}$$

Q_{sd} = **8672.5** dscf/hr

$V_{m(std)}$ – Volume of Gas Sampled Corrected to Dry Standard Conditions, dscf
ASTM E2515 equation (6)

$$V_{m(std)} = K_1 \times V_m \times Y \times \frac{P_{bar} + \left(\frac{\Delta H}{13.6}\right)}{T_m}$$

Where:

K_1	=	17.64 °R/in. Hg
V_m	=	Volume of gas sample measured at the dry gas meter, dcf
Y	=	Dry gas meter calibration factor, dimensionless
P_{bar}	=	Barometric pressure at the testing site, in. Hg
ΔH	=	Average pressure differential across the orifice meter, in. H_2O
T_m	=	Absolute average dry gas meter temperature, °R

Sample Calculation:

Using equation for Train 1:

$$V_{m(std)} = 17.64 \times 47.113 \times 1.001 \times \frac{\left(30.08 + \frac{0.83}{13.6}\right)}{(91.1 + 460)}$$

$V_{m(std)}$ = **45.496** dscf

Using equation for Train 2:

$$V_{m(std)} = 17.64 \times 46.372 \times 1.003 \times \frac{\left(30.08 + \frac{0.65}{13.6}\right)}{(90.7 + 460)}$$

$V_{m(std)}$ = **44.889** dscf

Using equation for ambient train:

$$V_{m(std)} = 17.64 \times 0.00 \times 0 \times \frac{\left(\underline{30.08} + \frac{0.00}{13.6}\right)}{(80.2 + 460)}$$

$V_{m(std)}$ = **0.000** dscf

m_n – Total Particulate Matter Collected, mg
ASTM E2515 Equation (12)

$$m_n = m_p + m_f + m_g$$

Where:

m_p = mass of particulate matter from probe, mg

m_f = mass of particulate matter from filters, mg

m_g = mass of particulate matter from filter seals, mg

Sample Calculation:

Using equation for Train 1 (first hour):

m_n = 0.0 + 1.7 + 0.2

m_n = 1.9 mg

Using equation for Train 1 (remainder):

m_n = 0.1 + 8.5 + 0.2

m_n = 8.8 mg

Train 1 Aggregate = **10.7** mg

Using equation for Train 2:

m_n = 0.2 + 7.3 + 1.8

m_n = **9.3** mg

C_s - Concentration of particulate matter in tunnel gas, dry basis, corrected to standard conditions, g/dsc
ASTM E2515 equation (13)

$$C_s = K_2 \times \frac{m_n}{V_{m(std)}}$$

Where:

K_2	=	Constant, 0.001 g/mg
m_n	=	Total mass of particulate matter collected in the sampling train, mg
$V_{m(std)}$	=	Volume of gas sampled corrected to dry standard conditions, dscf

Sample calculation:

For Train 1:

$$C_s = 0.001 \times \frac{10.7}{45.50}$$

C_s = **0.00024** g/dscf

For Train 2

$$C_s = 0.001 \times \frac{9.3}{44.89}$$

C_s = **0.00021** g/dscf

For Ambient Train

$$C_r = 0.001 \times \frac{0.0}{0.00}$$

C_r = **0.000000** g/dscf

E_T – Total Particulate Emissions, g
ASTM E2515 equation (15)

$$E_T = (C_s - C_r) \times Q_{std} \times \theta$$

Where:

C_s	=	Concentration of particulate matter in tunnel gas, g/dscf
C_r	=	Concentration particulate matter room air, g/dscf
Q_{std}	=	Average dilution tunnel gas flow rate, dscf/hr
θ	=	Total time of test run, minutes

Sample calculation:

For Train 1

E_T = (0.000235 - 0.000000) x 8672.5 x 362 /60

E_T = 12.31 g

For Train 2

E_T = (0.000207 - 0.000000) x 8672.5 x 362 /60

E_T = 10.84 g

Average

E = 11.57 g

Total emission values shall not differ by more than 7.5% from the total average emissions

7.5% of the average =	0.87
Train 1 difference =	0.73
Train 2 difference =	0.73

PR - Proportional Rate Variation
ASTM E2515 equation (16)

$$PR = \left[\frac{\theta \times V_{mi} \times V_s \times T_m \times T_{si}}{\theta_i \times V_m \times V_{si} \times T_{mi} \times T_s} \right] \times 100$$

Where:

θ = Total sampling time, min

θ_i = Length of recording interval, min

V_{mi} = Volume of gas sample measured by the dry gas meter during the “ith” time interval, dcf

V_m = Volume of gas sample as measured by dry gas meter, dcf

V_{si} = Average gas velocity in the dilution tunnel during the "ith" time interval, ft/sec

V_s = Average gas velocity in the dilution tunnel, ft/sec

T_{mi} = Absolute average dry gas meter temperature during the "ith" time interval, ^oR

T_m = Absolute average dry gas meter temperature, ^oR

T_{si} = Absolute average gas temperature in the dilution tunnel during the "ith" time interval, ^oR

T_s = Absolute average gas temperature in the dilution tunnel, ^oR

Sample calculation (for the first 1 minute interval of Train 1):

$$PR = \left(\frac{362 \times 0.11 \times 13.63 \times (136.0 + 460) \times (91.1 + 460)}{1 \times 47.11 \times 13.95 \times (117.3 + 460) \times (78.0 + 460)} \right) \times 100$$

PR = 87 %

PM_R – Average particulate emissions for full integrated test run, g/hr
ASTM E2779 equation (5)

$$PM_R = 60 (E_T/\theta)$$

Where,

E_T = Tota particulate emissions, grams

θ = Total length of full intergrated test run, min

Sample Calculation:

E_T (Dual train average) = 11.57 g

θ = 362 min

$PM_R = 60$ x (11.57 / 362)

PM_R = **1.92** g/hr

PM_F – Average particulate emission factor for full integrated test run, g/dry kg of fuel burned
ASTM E2779 equation (6)

$$PM_F = E_T/M_{Bdb}$$

Where,

E_T = Tota particulate emissions, grams

M_{Bdb} = Weight of test fuel burned during test run, dry basis, kg

Sample Calculation:

E_T (Dual train average) = 11.57 g

M_{Bdb} = 7.00 kg

PM_F = 11.57 / 7.00)

PM_F = **1.65** g/kg

Section 4

Label

LABELING VENDOR NOTES:

MATERIAL: 0.012 THK. ALUMINUM / 3M 9672 ADEHESIVE BACKED.

FINISH: BLACK BACKGROUND, ALUMINUM TO SHOW THRU (ALL TEXT AND ILLUSTRATIONS) UNLESS NOTED OTHERWISE.

TEXT: ALL TEXT TO BE 0.06 MIN. HIGH UNLESS OTHERWISE SPECIFIED

SOURCE:

ROEMER INDUSTRIES
P.O. Box 217
1555 Masury Rd.
Masury, OH 44438
Contact: Vicki Cornell (vicki@RoemerInd.com)
Phone: (330)-448-2000

METALLICS INC.
P.O. Box 99
W7274 County Hwy. Z
Onalaska, WI 54650-0099
Contact: Gail Hayek (cservice@metallics.net)
Phone: (608) 781-5200

HEATER MANUFACTURER INSTRUCTIONS:

ALL PLATES ARE TO BE STAMPED BY THE HEATER MFG. WITH A FACTORY IDENTIFIER NUMBER ISSUED BY USSC. (i.e. 00000-XX)

WHEN LABEL IS APPLIED TO THE HEATER, IT IS TO BE FIRMLY PRESSED OVER THE ENTIRE SURFACE TO ENSURE IT PROPERLY ADHERES TO THE MATING SURFACE OF THE HEATER.

REVISION HISTORY

REV	DESCRIPTION	DATE	BY
A	INITIAL RELEASE	3/24/2011	REC
B	ADDED REQUIRED INFO PER OMNI	8/11/2011	CDB
C	CHANGED TO INTERTEK	1/15/2015	SEH
D	REVISED PER 2015 EPA RULING	4/14/2015	SEH
E	ADDED OMNI AND WORDING FOR OMNI	8/28/15	SEH

1 INCH SQ. BORDER, LOGS AND FLAMES ARE TO BE RED

0.25 TEXT HIEGHT

0.125 TEXT HEIGHT

CAUTION HOT WHILE IN OPERATION-DO NOT TOUCH. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS. SEE NAMEPLATE AND INSTRUCTIONS. OPERATE THIS UNIT ONLY WITH THE FUEL HOPPER LID CLOSED. FAILURE TO DO SO MAY RESULT IN EMISSION OF PRODUCTS OF COMBUSTION FROM THE HOPPER UNDER CERTAIN CONDITIONS. MAINTAIN HOPPER SEAL IN GOOD CONDITION. DO NOT OVERFILL HOPPER.

PREVENT HOUSE FIRES - INSTALL AND USE ONLY IN ACCORDANCE WITH THE INSTALLATION AND OPERATING INSTRUCTIONS. CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION IN YOUR AREA. DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE. SEE LOCAL BUILDING CODE AND MANUFACTURER'S INSTRUCTIONS FOR PRECAUTIONS REQUIRED FOR PASSING THROUGH A COMBUSTIBLE WALL OR CEILING. INSPECT AND CLEAN EXHAUST VENT SYSTEM FREQUENTLY IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. KEEP VIEWING AND ASH REMOVAL DOORS TIGHTLY CLOSED DURING OPERATION. DO NOT OBSTRUCT THE COMBUSTION AIR INLET.
.EXHAUST VENT REQUIRED FOR RESIDENTIAL INSTALLATION OR MOBILE HOME INSTALLATION IS A LISTED TYPE "L" or "PL" VENTING - 3"/76 MM OR 4"/102 MM DIAMETER. PROVIDE A SOURCE OF COMBUSTION (FRESH) AIR INTO THE ROOM WHERE THE APPLIANCE IS INSTALLED.
.WARNING FOR MOBILE HOMES: DO NOT INSTALL APPLIANCE IN A SLEEPING ROOM. AN OUTSIDE COMBUSTION AIR INLET MUST BE PROVIDED. THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, CEILING AND WALLS MUST BE MAINTAINED.

0.125 TEXT HEIGHT

CAUTION: RISK OF EXCESSIVE TEMPERATURES. REPLACE GLASS ONLY WITH 5MM CERAMIC GLASS. DO NOT INSTALL IN A SLEEPING ROOM.

DANGER: RISK OF ELECTRICAL SHOCK. DISCONNECT POWER BEFORE SERVICING UNIT. ROUTE SUPPLY CORD AWAY FROM UNIT.

THIS WOOD HEATER NEEDS PERIODIC INSPECTION AND REPAIR. FOR PROPER OPERATION, CONSULT THE OWNER'S MANUAL FOR FURTHER INFORMATION. IT IS AGAINST FEDERAL REGULATIONS TO OPERATE THIS WOOD HEATER IN A MANNER INCONSISTENT WITH THE OPERATING INSTRUCTIONS IN THE OWNER'S MANUAL.

TO START, PRESS AUGER OR ON/OFF BUTTON. TO SHUTDOWN, PRESS ON/OFF BUTTON. FOR FURTHER INSTRUCTION REFER TO OWNER'S MANUAL.

ROOM HEATER, PELLET FUEL-BURNING TYPE. ALSO FOR USE IN MOBILE HOME. THE APPLIANCE HAS BEEN TESTED AND LISTED FOR USE IN MANUFACTURED HOMES IN ACCORDANCE WITH OAR-814-23-9000 THROUGH 814-23-909. FOR USE ONLY WITH PELLETIZED WOOD, THE USE OF OTHER FUELS WILL VOID WARRANTY.
.APPAREIL DE CHAUFFAGE INSÉRÉ DE COMBUSTIBLE SOLIDE/DE TYPE DE BOULETTES. ACCEPTÉ DANS. L'INSTALLATION DANS LES MAISONS MOBILES. CET APPAREIL A ÉTÉ TESTÉ ET ENREGISTRÉ POUR L'USAGE. DANS LES MAISONS MOBILES EN ACCORD AVEC OAR 814-23-9000 JUSQU' À 814-23-909. POUR UTILISATION AVEC DES GRANULÉS UNIQUEMENT ! L'UTILISATION D'AUTRES COMBUSTIBLES ANNULERA LA GARANTIE

Control Number:
108 Garner Road, Bridgeport, AL - 4002719
885 McKinley St. Eugene, OR - 4003824
No. 221 Huyuan Road Junhua, Zhejiang - 4003328

MODEL / MODÈLE : 5660
Conforms to: ASTM Std. E1509 / Certified to: ULC Std. S627 AND (UM) 84-HUD

SERIAL NUMBER / NUMÉRO DU SÉRIE

SEE DETAIL

INPUT RATING: 43,900 BTU/HR - ELECTRICAL RATING: 120V, 60Hz, 3A

DATE OF MANUFACTURE / DATE DE FABRICATION

Intertek

Tested & Listed by O-T-L US Portland Oregon USA
OMNI-Test Laboratories, Inc.
Report No.
0215PS032E

ENVIRONMENTAL PROTECTION AGENCY
Certified to comply with 2015 particulate emission standards.
Not for sale after May 15, 2020. Tested to / Testé à la norme:
ASTM E2779 / EPA Method 28R at 1.92g/hr

ATTENTION CHAUD PENDANT LE FONCTIONNEMENT-NE PAS TOUCHER -MAINTENIR LES ENFANTS ET LES VÊTEMENTS ÉLOIGNÉS. TOUT CONTACT PEUT ENTRAÎNER DES BRÛLURES. CONSULTER LA PLAQUE SIGNALÉTIQUE ET LES INSTRUCTIONS. MAINTENIR LE MOBILIER ET LES AUTRES MATIÈRES COMBUSTIBLES À BONNE DISTANCE DE L'APPAREIL. FAIRE FONCTIONNER CETTE UNITÉ UNIQUEMENT AVEC LE COUVERCLE DE TRÉMIE DU COMBUSTIBLE FERMÉ. NE PAS LE FAIRE PEUT ENTRAÎNER DES ÉMISSIONS DE PRODUITS DE LA TRÉMIE DANS CERTAINES CONDITIONS. MAINTENIR LE JOINT DE TRÉMIE EN BON ÉTAT. NE PAS SURCHARGER LA TRÉMIE.

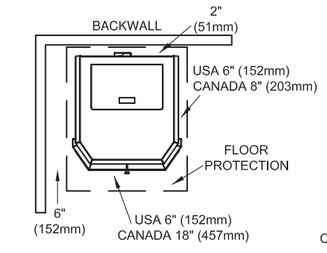
ÉVITER LES INCENDIES - INSTALLER ET UTILISER CONFORMÉMENT AUX INSTRUCTIONS D'INSTALLATION ET D'UTILISATION UNIQUEMENT. CONTACTER LES FONCTIONNAIRES DE CONSTRUCTION OU DES SERVICES D'INCENDIE LOCAUX CONCERNANT LES LIMITATIONS ET L'INSPECTION DE L'INSTALLATION DANS VOTRE MAISON. NE PAS CONNECTER CETTE UNITÉ À UN CARNEAU DE CHEMINÉE UTILISÉ POUR UN AUTRE APPAREIL. CONSULTER LE CODE LOCAL DE CONSTRUCTION ET LES INSTRUCTIONS DU FABRICANT POUR LES PRÉCAUTIONS REQUISES POUR PASSER À TRAVERS UN MUR OU UN PLAFOND COMBUSTIBLE. INSPECTER ET NETTOYER FRÉQUEMMENT LE SYSTÈME DE VENTILATION D'ÉVACUATION CONFORMÉMENT AUX INSTRUCTIONS MAINTENIR LES PORTES D'INSPECTION ET DE RETRAIT DES CENDRES BIEN FERMÉES PENDANT LE FONCTIONNEMENT. N'OBSTRUEZ PAS L'ADMISSION D'AIR DE COMBUSTION..
LA VENTILATION D'ÉVACUATION OBLIGATOIRE POUR UNE INSTALLATION RÉSIDENTIELLE OU DANS MAISON MOBILE EST LISTÉE A VENTILATION TYPE "L" ou "PL" DIAMÈTRE 3"/76 MM OU 4"/102 MM, FOURNISSEZ UNE SOURCE D'AIR (FRAIS) DE COMBUSTION DANS LA SALLE OÙ L'APPAREIL EST INSTALLÉ.
.AVIS POUR LES MAISONS MOBILES: NE PAS INSTALLE DANS UNE CHAMBRE À COUCHER. UN TUYAU EXTÉRIEUR DE COMBUSTION D'AIR DOIT ÊTRE INSTALLÉ ET NE DOIT PAS ÊTRE OBSTRUÉ LORSQUE L'APPAREIL EST EN USAGE. LA STRUCTURE INTÉGRALE DU PLANCHER, DU PLAFOND ET DES MURS DE LA MAISON MOBILE DOIT ÊTRE MAINTENUE INTACTE.

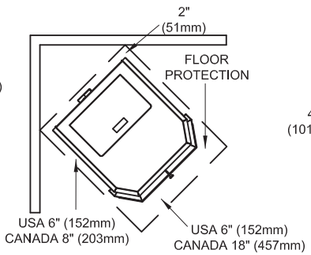
ATTENTION : RISQUE DE TEMPÉRATURES EXCESSIVES. REMPLACER LE VERRE UNIQUEMENT PAR DU VERRE CÉRAMIQUE DE 5MM. NE PAS INSTALLER DANS UNE CHAMBRE À COUCHER. FAITES PASSER LE CORDON D'ALIMENTATION À DISTANCE DE L'UNITÉ.

DANGER : RISQUE DE CHOC ÉLECTRIQUE. DÉCONNECTEZ L'ALIMENTATION AVANT DE RÉALISER L'ENTRETIEN DE L'UNITÉ.

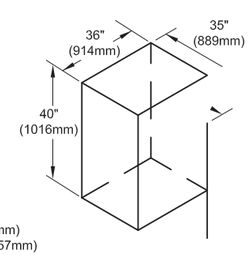
CE POÊLE À BOIS DOIT INSPECTION ET LA RÉPARATION PÉRIODIQUE. POUR UN FONCTIONNEMENT CORRECT, CONSULTEZ LE MANUEL DU PROPRIÉTAIRE POUR PLUS D'INFORMATIONS. CE EST CONTRE LES RÈGLEMENTS FÉDÉRAUX POUR FAIRE FONCTIONNER CE POÊLE À BOIS D'UNE MANIÈRE INCOMPATIBLE AVEC LES INSTRUCTIONS D'UTILISATION DANS LE MANUEL DU PROPRIÉTAIRE.
.POUR DÉMARRER, APPUYEZ SUR LA TARIÉRE OU LE BOUTON ON/OFF. POUR ARRÊTER, APPUYEZ SUR LE BOUTON ON/OFF.

MINIMUM CLEARANCES TO COMBUSTIBLES / ESPACES LIBRES MINIMUM DES MATÉRLAUX COMBUSTIBLES
NON-COMBUSTIBLE FLOOR PROTECTOR REQUIRED / UN PROTECTEUR DE SOL NON-COMBUSTIBLE REQUIS- 1in(25MM) THICK / ÉPAIS





MINIMUM ALCOVE INSTALLATION
MINIMUM INSTALLATION EN ALCÔVE



DO NOT REMOVE OR COVER THIS LABEL / NE PAS RETIRER OU COUVRIR CETTE ÉTIQUETTE

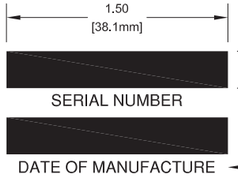
MANUFACTURED FOR / FABRIQUÉ POUR: U.S. Stove Company • 227 Industrial Park Road South Pittsburg, TN 37380 • Ph. #: 1-800-750-2723 • www.usstove.com

851902E

6.37 [161.9mm]

12.00 [304.7mm]

SERIAL & DATE BOX DETAIL



TOLERANCES EXCEPT AS NOTED
HOLES ± .005"
DECIMAL .XX = 0.03 XXX = 0.010
ANGULAR ± 2°

DESCRIPTION: SEE NOTE
FINISH:
REFERENCE: 5660
SCALE: 1:1
DWN BY: REC
DATE: 3/24/2011
SIZE: B
REV: E

UNITED STATES STOVE COMPANY
ESTABLISHED 1869

TITLE: PLATE, CERTIFICATION
NUMBER: 851902
SHEET: 1 OF 1

Section 5

Owner's Manual

Installation and Operating Manual
Model 5660

Certified for installations in the USA and Canada.

U.S. Environmental Protection Agency
Certified to comply with 2015 particulate emissions standards.

OWNER'S MANUAL

This unit is not intended to be used as a primary source of heat.

△ **PLEASE READ THIS ENTIRE MANUAL BEFORE INSTALLATION AND USE OF THIS APPLIANCE. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH.**

△ **CONTACT YOUR LOCAL BUILDING OR FIRE OFFICIALS ABOUT OBTAINING PERMITS, RESTRICTIONS AND INSTALLATION INSPECTION REQUIREMENTS IN YOUR AREA.**

△ **SAVE THESE INSTRUCTIONS.**

△ **IF YOUR HEATER IS NOT PROPERLY INSTALLED, A HOUSE FI RE MAY RESULT. FOR EVERYONE'S SAFETY, FOLLOW ALL INSTALLATION AND OPERATING DIRECTIONS. NEVER USE MAKESHIFT COMPROMISES DURING THE INSTALLATION OF THIS APPLIANCE. CONTACT YOUR LOCAL BUILDING OR FI RE OFFI CIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION REQUIREMENTS IN YOUR AREA. THESE PELLET STOVE ROOM HEATERS HAVE BEEN DESIGNED FOR USE IN THE US AND CANADA AND ARE SUITABLE FOR MOBILE HOMES.**

U.S. Stove Company
227 Industrial Park Road, South Pittsburg, TN 37380
FOR TECHNICAL ASSISTANCE: Phone 1-800-750-2723 www.usstove.com

French version is available for download from the United States Stove Company website: http://www.usstove.com/
La version française est disponible pour téléchargement à partir du site United States Stove Company: http://www.usstove.com/

Safety Precautions

△ IMPORTANT: Read this entire manual before installing and operating this product. Failure to do so may result in property damage, bodily injury, or even death. Proper installation of this stove is crucial for safe and efficient operation.

△ Install vent at clearances specified by the vent manufacturer.

△ Do not connect the pellet vent to a vent serving any other appliance or stove.

△ Do not install a flue damper in the exhaust venting system of this unit.

△ Use of outside air is not required for this unit.

△ Contact your local building officials to obtain a permit and information on any additional installation restrictions or inspection requirements in your area.

△ Do not throw this manual away. This manual has important operating and maintenance instructions that you will need at a later time. Always follow the instructions in this manual.

△ This appliance is designed for the use of pelletized fuel that meet or exceed the standard set by the Pellet Fuel Institute(PFI), The use of other fuels will void warranty.

△ Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this stove. Keep all such liquids well away from the stove while it is in use.

△ A working smoke detector must be installed in the same room as this product.

△ Install a smoke detector on each floor of your home; incase of accidental fire from any cause it can provide time for escape.

△ The smoke detector must be installed at least 15 feet (4,57 M) from the appliance in order to prevent undue triggering of the detector when reloading.

△ Do not unplug the stove if you suspect a malfunction. Turn the ON/OFF SWITCH to "OFF' and contact your dealer.

△ Your stove requires periodic maintenance and cleaning (see "MAINTENANCE "). Failure to maintain your stove may lead to improper and/or unsafe operation.

△ Disconnect the power cord before performing any maintenance! NOTE: Turning the ON/OFF Switch to "OFF" does not disconnect all power to the electrical components of the stove.

△ Never try to repair or replace any part of the stove unless instructions for doing so are given in this manual. All other work should be done by a trained technician.

△ Do not operate your stove with the viewing door open. The auger will not feed pellets under these circumstances and a safety concern may arise from sparks or fumes entering the room.

△ Allow the stove to cool before performing any maintenance or cleaning. Ashes must be disposed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a non-combustible surface or on the ground, well away from all combustible materials, pending final disposal.

△ The exhaust system should be checked monthly during the burning season for any build-up of soot or creosote.

△ Do not touch the hot surfaces of the stove. Educate all children on the dangers of a high-temperature stove. Young children should be supervised when they are in the same room as the stove.

△ The hopper and stove top will be hot during operation; therefore, you should always use some type of hand protection when refueling your stove.

△ A power surge protector is required. This unit must be plugged into a 110 - 120V, 60 Hz grounded electrical outlet. Do not use an adapter plug or sever the grounding plug. Do not route the electrical cord underneath, in front of, or over the heater. Do not route the cord in foot traffic areas or pinch the cord under furniture.

△ The heater will not operate during a power outage. If a power outage does occur, check the heater for smoke spillage and open a window if any smoke spills into the room.

△ The feed door must be closed and sealed during operation.

△ Never block free airflow through the open vents of the unit.

△ Keep foreign objects out of the hopper.

△ The moving parts of this stove are propelled by high torque electric motors. Keep all body parts away from the auger while the stove is plugged into an electrical outlet. These moving parts may begin to move at any time while the stove is plugged in.

△ Do not place clothing or other flammable items on or near this stove.

△ When installed in a mobile home, the stove must be grounded directly to the steel chassis and bolted to the floor. WARNING—THIS UNIT MUST NOT BE INSTALLED IN THE BEDROOM (per HUD requirements). CAUTION—THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, AND CEILING/ROOF MUST BE MAINTAINED.

△ This appliance is not intended for commercial use.

△ CAUTION: Burning fuel creates carbon monoxide and can be hazardous to your health if not properly vented.

* This appliance is a freestanding heater. It is not intended to be attached to any type of ducting. It is not a furnace.

CUT HERE

WARRANTY INFORMATION CARD

Name_____ Telephone #: (_____)_____

City_____ State_____ Zip_____

Email Address _____

Model # of Unit_____ Serial #_____

Fuel Type: ❑Wood ❑Coal ❑Pellet ❑Gas ❑Other _____

Place of Purchase (Retailer)_____

City_____ State_____ Zip_____

If internet purchase, please list website address_____

Date of Purchase _____

Reason for Purchase: ❑Alternative Heat ❑Main Heat Source

❑Decoration ❑Cost ❑Other _____

What was the determining factor for purchasing your new USSC appliance?_____

_____

I have read the owner's manual that accompanies this unit and fully understand the:
Installation ❑ Operation ❑ and Maintenance ❑ of my new USSC appliance.

Print Name	Signature	Date

Please attach a copy of your purchase receipt.

Warranty not valid without a Proof of Purchase.

Warranty information must be received within 30 days of original purchase.

Detach this page from this manual, fold in half with this page to the inside and tape together. Apply a stamp and mail to the address provided. You may use an envelope if you choose.

You may register online by going to www.usstove.com

All information submitted will be kept strictly confidential. Information provided will not be sold for advertising purposes.
Contact information will be used solely for the purpose of product notifications.

CUT HERE

CUT HERE

Fold Here

Fold Here

PLACE
STAMP
HERE

United States Stove Company
P.O. Box 151
South Pittsburg, TN 37380

CUT HERE

HEATING SPECIFICATIONS

Fuel Burn Rate* (lowest setting)	5.1 lbs./hr.
Burn Time (lowest setting)	32hrs. (approximate)
Hopper Capacity	55 lbs.

* Pellet size may effect the actual rate of fuel feed and burn times. Fuel feed rates may vary by as much as 20%. Use PFI listed fuel for best results.

DIMENSIONS

Height	30.50 in. (774.6 mm)
Width	24.25 in. (615.9 mm)
Depth	26.19 in. (665.2 mm)
Weight	270 lbs.

ELECTRICAL SPECIFICATIONS

Electrical Rating	115-120 volts, 60 HZ, 3.0 Amps
Watts (operational)	180W
Watts (igniter running)	346W

Listed By O-T-L US Portland Oregon USA
OMNI-Test Laboratories, Inc.
Report No. 0215PS032E

This manual describes the installation and operation of the United States Stove Company Model 5660 pellet stove. This heater meets the 2015 U.S. Environmental Protection Agency's crib wood emission limits for woodheaters sold after May 15, 2015. Under specific EPA test conditions burning Douglas Fir dimensional lumber this heater has been shown to deliver heat at a rate of 11,370 to 34,260 Btu/hr. This heater achieved a particulate emissions rate of 1.92 g/hr when tested to method ASTM E 2779 / EPA Method 28R.

FUEL CONSIDERATIONS

Your pellet stove is designed and tested with premium grade pellets that comply with Pellet Fuels Institute(PFI) standards. You can only burn premium grade pellets in this pellet heater. (Minimum of 40 lbs density per cubic ft, 1/4" to 5/16" diameter, length no greater than 1.5", not less than 8,200 BTU/lb, moisture under 8% by weight, ash under 1% by weight, and salt under 300 parts per million). Pellets that are soft, contain excessive amounts of loose sawdust, have been, or are wet, will result in reduced performance and may cause damage to your heater. Store your pellets in a dry place. DO NOT store the fuel within the installation clearances of the unit or within the space required for refueling and ash removal. Doing so could result in a house fire.
Do not overfire or use volatile fuels or combustibles, doing so may cause a personal and property damage hazards.

SAFETY AND EPA COMPLIANCE

Your pellet stove has been approved for installation in the USA and Canada. It may also be installed in a manufactured or mobile home. Your stove conforms to ASTM E 1509, 2012, and Certified to ULC S627, 2000, and(UM) 84-HUD by INTERTEK Testing Services in Fairview, Oregon USA.

INSTALLATION OPTIONS

△ **READ THIS ENTIRE MANUAL BEFORE YOU INSTALL AND USE YOUR PELLET STOVE. FAILURE TO FOLLOW INSTRUCTIONS MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH!**

(See specific installation details for clearances and other installation requirements)

A **Freestanding Unit**—supported by pedestal/legs and placed on a non-combustible floor surface in compliance with clearance requirements for a freestanding stove installation.

An **Alcove Unit**—supported by pedestal/legs and placed on a non-combustible floor surface in compliance with clearance requirements for an alcove installation.

Your pellet stove may be installed to code in either a **conventional** or **mobile home** (see SPECIAL MOBILE HOME REQUIREMENTS). The installation must comply with the Manufactured Home and Safety Standard (HUD), CFR3280, Part 24.

It is recommended that only a authorized technician install your pellet stove, preferably an NFI certified specialist.

DO NOT CONNECT THIS UNIT TO ANY AIR DISTRIBUTION DUCT OR SYSTEM.

The use of other components other than stated herein could cause bodily harm, heater damage, and void your warranty.

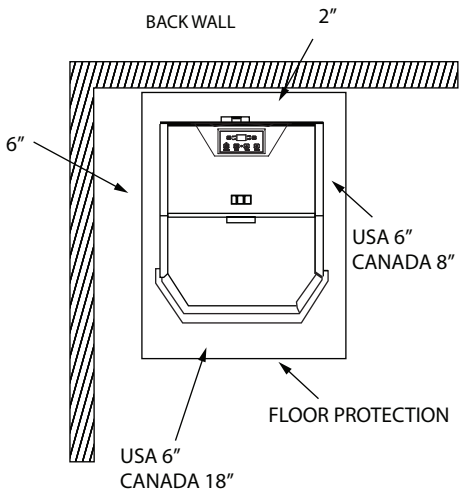
IMPROPER INSTALLATION: The manufacturer will not be held responsible for damage caused by the malfunction of a stove due to improper venting or installation. Call (800) 750-2723 and/or consult a professional installer if you have any questions.

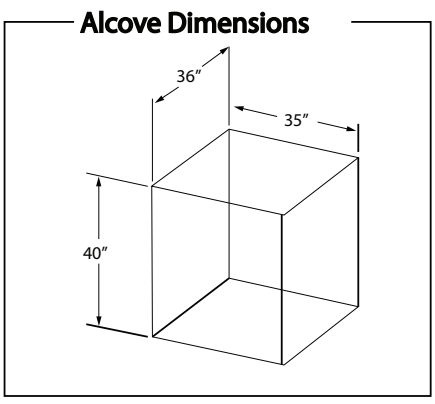
CLEARANCES

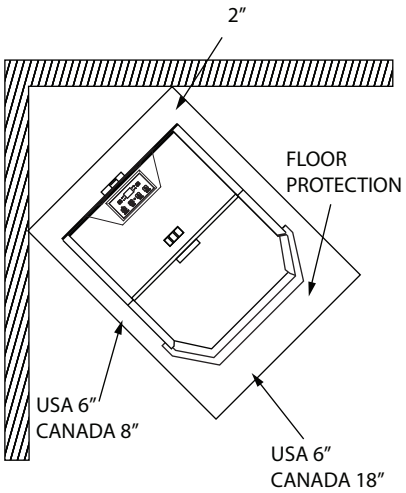
Your pellet stove has been tested and listed for installation in residential, mobile home, and alcove applications in accordance with the clearances given. For safety reasons, please adhere to the installation clearances and restrictions. Any reduction in clearance to combustibles may only be done by means approved by a regulatory authority.

INSTALL ALL VENTS AT CLEARANCES SPECIFIED BY THE VENT MANUFACTURER

When your Pellet Stove Room Heater is being installed on a combustible floor it is mandatory that a 1/2” (13mm) thick non-combustible hearth pad be installed under the heater. The non-combustible hearth pad must extend at least 6” beyond the fuel loading and ash removal openings and at least the depth of the heater plus 6 inches (152mm) out in front of the heater. The floor protector must extend 2” (51mm) beyond each side of the exhaust vent. This applies to both freestanding heaters and insert heaters.







FLOOR PROTECTION

This heater must have a non-combustible floor protector (ember protection) installed beneath it if the floor is of combustible material. If a floor pad is used, it should be UL listed or equal. The floor pad or non-combustible surface should be large enough to cover at least the area under the product and 6 in. (152 mm) beyond the front and beyond each side of the fuel loading and ash removal openings. Your heater will need a minimum 31" x 38" floor protector. Floor protection must extend under and 2 in. (50.8mm) to each side of the chimney tee for an interior vertical installation (see FIGURE 2). Canadian Installations require a minimum of 450 mm [17.7"] beyond the front of the unit and 200mm [7.8"] beyond each side of the unit. A Floor Protector of ¼ inch thick is recommended for this installation.

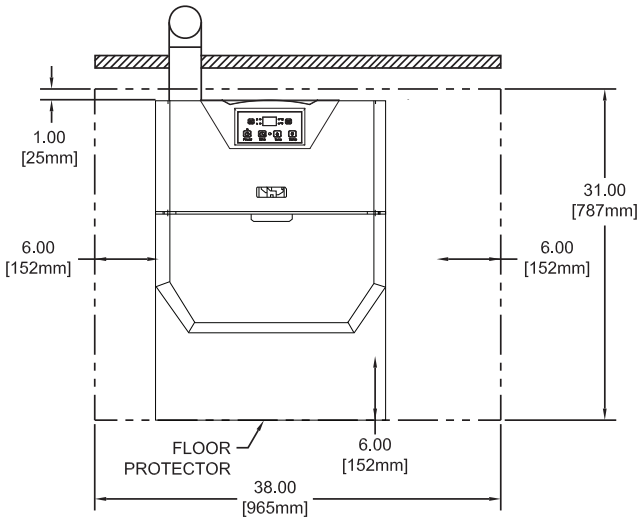


FIGURE 1

THROUGH THE WALL INSTALLATION

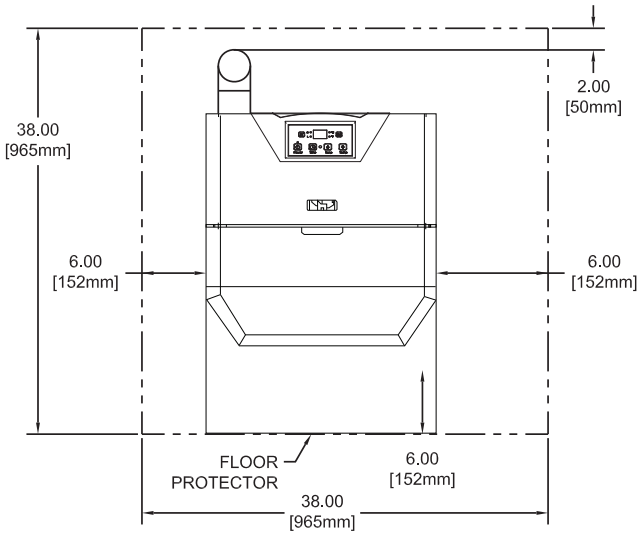


FIGURE 2

INTERIOR VERTICAL INSTALLATION

Installation

VENTING REQUIREMENTS

△ **Install vent at clearances specified by the vent manufacturer.**

△ **Do not connect the pellet vent to a vent serving any other appliance or stove.**

△ **Do not install a flue damper in the exhaust venting system of this unit.**

The following installation guidelines must be followed to ensure conformity with both the safety listing of this stove and to local building codes. Do not use makeshift methods or compromise in the installation.

IMPORTANT! This unit is equipped with a negative draft system that pulls air through the burn pot and pushes the exhaust out of the dwelling. If this unit is connected to a flue system other than the way explained in this manual, it will not function properly.

MAXIMUM VENTING DISTANCE

Installation MUST include at least 3-feet of vertical pipe outside the home. This will create some natural draft to reduce the possibility of smoke or odor during appliance shutdown and keep exhaust from causing a nuisance or hazard by exposing people or shrubs to high temperatures. The maximum recommend vertical venting height is 12-feet for 3-inch type “PL” vent. Total length of horizontal vent must not exceed 4-feet. This could cause back pressure. Use no more than 180 degrees of elbows (two 90-degree elbows, or two 45-degree and one 90-degree elbow, etc.) to maintain adequate draft.

IMPORTANCE OF PROPER DRAFT

Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too much draft may cause excessive temperatures in the appliance. Inadequate draft may cause backpuffing into the room and ‘plugging’ of the chimney. Inadequate draft will cause the appliance to leak smoke into the room through appliance and chimney connector joints. An uncontrollable burn or excessive temperature indicates excessive draft. Take into account the chimney’s location to insure it is not too close to neighbors or in a valley which may cause unhealthy or nuisance conditions.

PELLET VENT TYPE

A UL listed 3-inch or 4-inch type “PL” pellet vent exhaust system must be used for installation and attached to the pipe connector provided on the back of the stove (use a 3-inch to 4-inch adapter for 4-inch pipe). Connection at back of stove must be sealed using Hi-Temp RTV. Use 4-inch vent if the vent height is over 12-feet or if the installation is over 2,500 feet above sea level.

We recommend the use of Simpson Dura-Vent® or Metal-Fab® pipe (if you use other pipe, consult your local building codes and/or building inspectors). Do not use Type-B Gas Vent pipe or galvanized pipe with this unit. The pellet vent pipe is designed to disassemble for cleaning and should be checked several times during the burning season. Pellet vent pipe is not furnished with the unit and must be purchased separately.

PELLET VENT INSTALLATION

The installation must include a clean-out tee to enable collection of fly ash and to permit periodic cleaning of the exhaust system. 90-degree elbows accumulate fly ash and soot thereby reducing exhaust flow and performance of the stove. Each elbow or tee reduces draft potential by 30% to 50%.

All joints in the vent system must be fastened by at least 3 screws, and all joints must be sealed with Hi-Temp RTV silicone sealant to be airtight. The area where the vent pipe penetrates to the exterior of the home must be sealed with silicone or other means to maintain the vapor barrier between the exterior and the interior of the home.

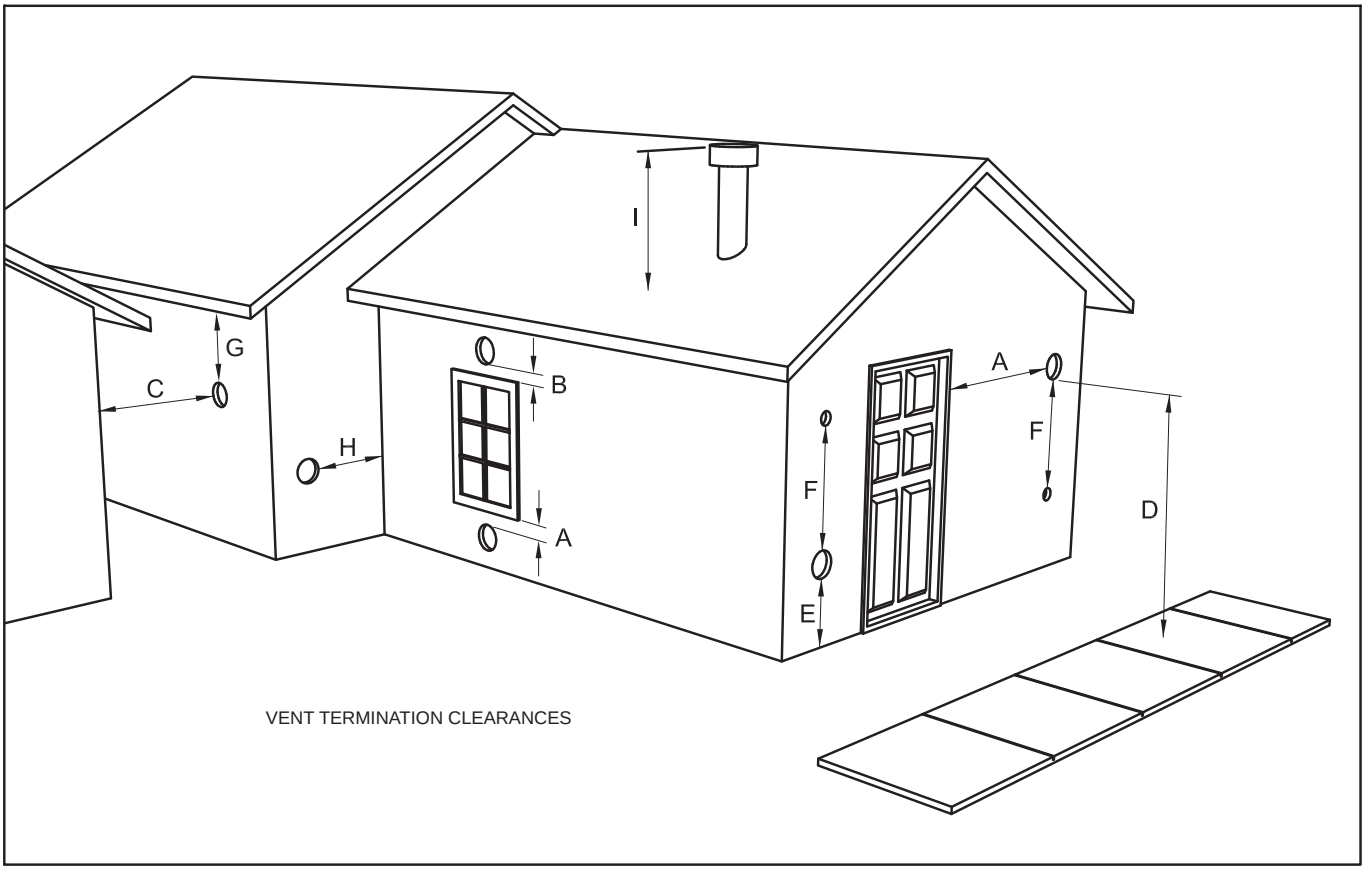
Vent surfaces can get hot enough to cause burns if touched by children. Noncombustible shielding or guards may be required.

PELLET VENT TERMINATION

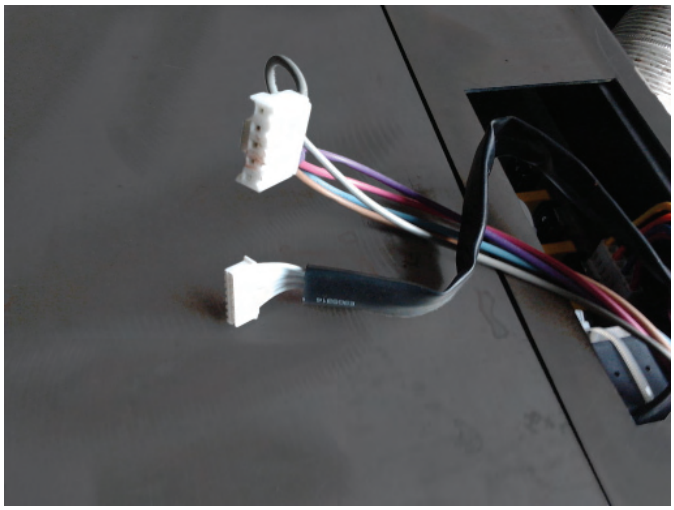
Do not terminate the vent in an enclosed or semi-enclosed area, such as; carport, garage, attic, crawl space, under a sundeck or porch, narrow walkway, or any other location that can build up a concentration of fumes. Termination in one of these areas can also lead to unpredictable pressure situations with the appliance, and could result in improper performance and/or malfunction The termination must exhaust above the outside air inlet elevation. The termination must not be located where it will become plugged by snow or other materials. Do not terminate the venting into an existing steel or masonry chimney.

VENT TERMINATION CLEARANCES

A) Minimum 4-foot (1.22m) clearance below or beside any door or window that opens.
B) Minimum 1-foot (0.3m) clearance above any door or window that opens.
C) Minimum 3-foot (0.91m) clearance from any adjacent building.
D) Minimum 7-foot (2.13m) clearance from any grade when adjacent to public walkways.
E) Minimum 2-foot (0.61m) clearance above any grass, plants, or other combustible materials.
F) Minimum 3-foot (0.91m) clearance from an forced air intake of any appliance.
G) Minimum 2-foot (0.61m) clearance below eves or overhang.
H) Minimum 1-foot (0.3m) clearance horizontally from combustible wall.
I) Must be a minimum of 3 foot (0.091m) above the roof and 2 foot (0.61m) above the highest point or the roof within 10 feet (3.05m).



VENT TERMINATION CLEARANCES

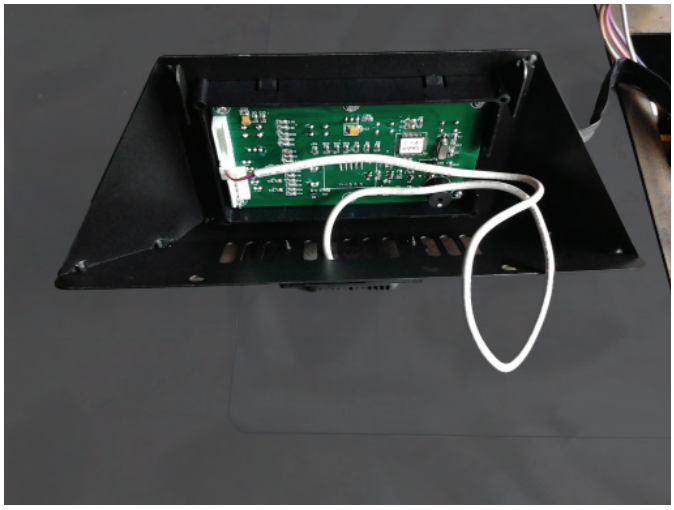


STEP 1

Pull the factory installed wires out of the top of the stove. There will be two wire harnesses, ash shown.

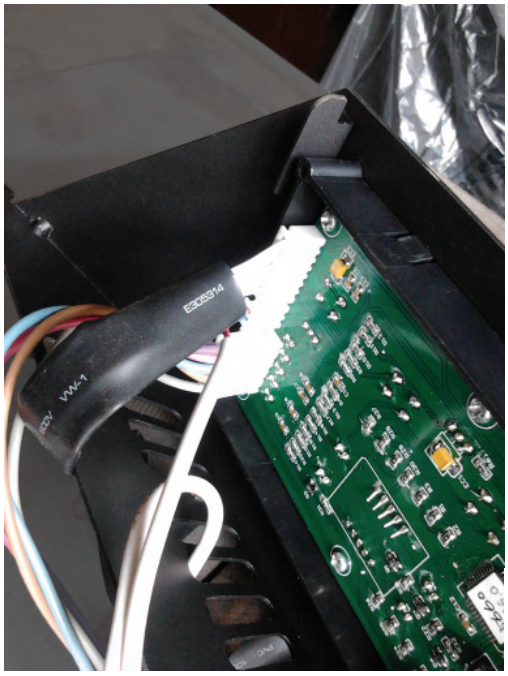
STEP 2

Unpack the top mount controls and ensure that the wiring harness shown is attached securely.



STEP 3

Connect the factory installed wiring harnesses to the control panel as shown.



STEP 4

Attach the control panel to the top of the stove, as shown.

STEP 5

Secure with two sheet metal screws.

Installation

You have already made the important decision of choosing your U.S. Stove Pellet Burning Room Heater; now your next step is to determine where to install your new pellet stove heater. To get the most efficient use of re-circulated heat, you should consider a room that is centrally located within your home. Choose a room that is large and open.
It is Extremely Important to maintain proper clearances from any combustible surfaces or materials in the room where your heater will be located. You can find proper clearance measurements on page 12 of this manual and on the rating label of your pellet stove.
The pellet stove can be vented through an exterior wall or into an existing masonry or metal chimney. The chimney must be lined if it is over 6" (150mm) in diameter or if it has a cross-sectional area of over 28 square inches (711mm2). Venting can pass through the ceiling and roof if approved pipe is used. Where passage through a wall, or partition of combustible construction is desired, the installation must conform to CAN/CSA-B365.

DO NOT OBTAIN COMBUSTION AIR FROM THE ATTIC, GARAGE OR ANY OTHER UNVENTILATED AREA. YOU MAY OBTAIN COMBUSTION AIR FROM A VENTILATED CRAWL SPACE.

DO NOT INSTALL A FLUE DAMPER IN THE EXHAUST VENTING SYSTEM OF THIS UNIT.

DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER HEATER, FURNACE OR APPLIANCE.

INSTALL VENT AT CLEARANCES SPECIFIED BY THE VENT MANUFACTURER.

ONLY USE APPROVED MATERIAL FOR INSTALLATION, FAILURE TO DO SO MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY, OR EVEN DEATH.

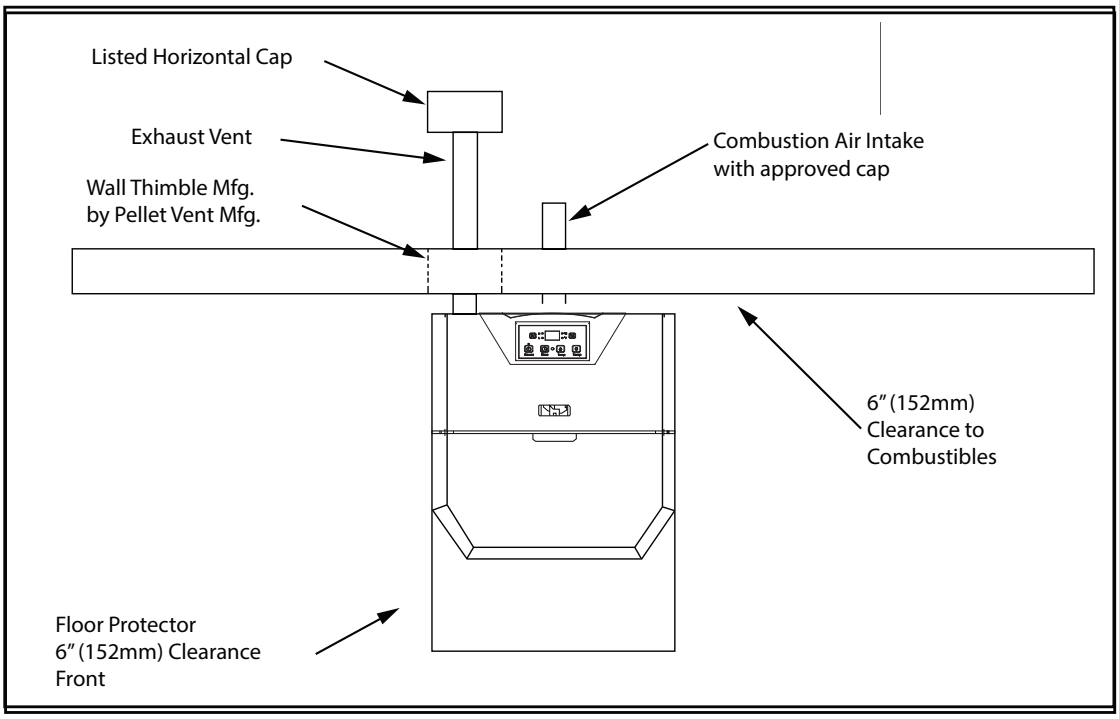
This appliance is certified for use with listed 3 inch or 4 inch "PL" or "L" pellet venting products as well as Selkirk's Direct-Temp Vent system for pellet burning appliances. The use of other components other than stated herein could cause bodily harm, heater damage, and void your warranty.

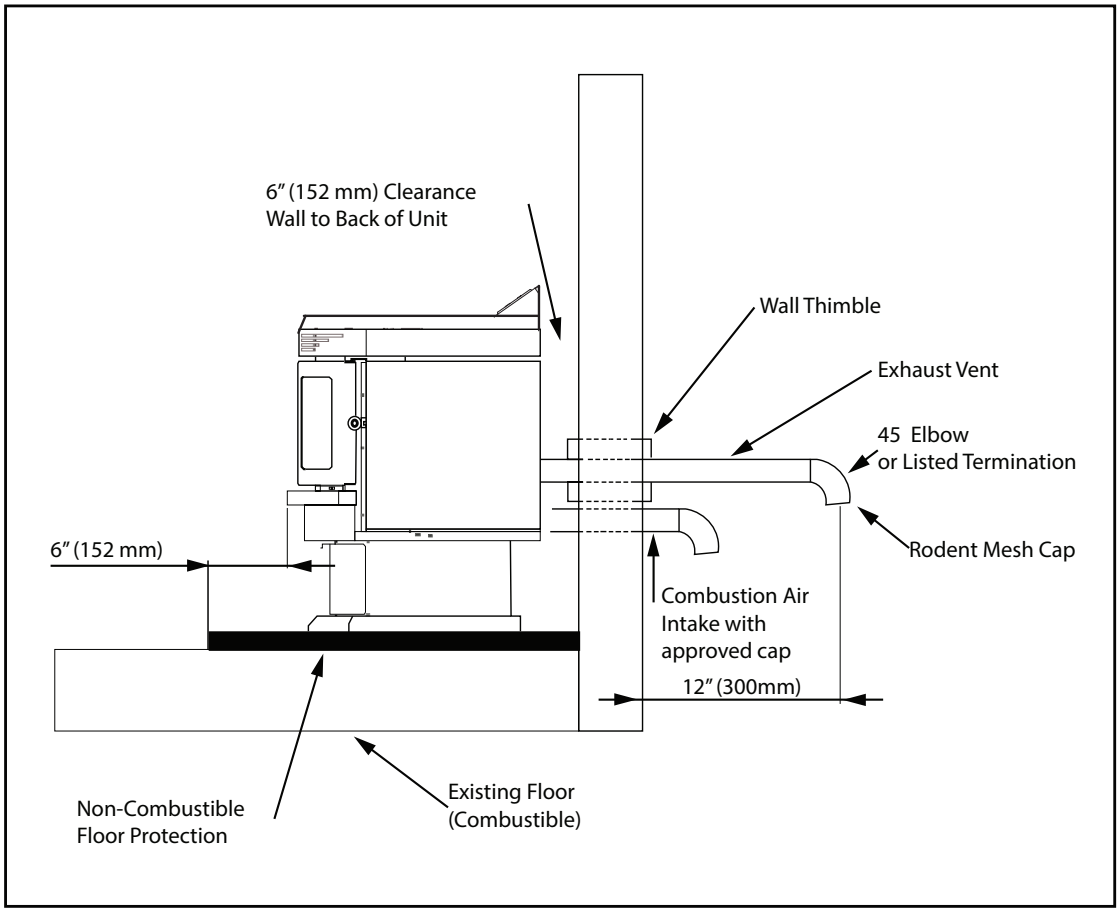
HORIZONTAL EXHAUST VENT INSTALLATION

1. Locate your pellet stove in a location which meets the requirements of this manual, but in an area where it does not interfere with the house framing, wiring, etc.
2. Install a non-combustible hearth pad underneath the pellet stove. This pad should extend at least 6" (152mm) in front of the unit.
3. Place the pellet stove approximately 15" (381mm) away from the interior wall.
4. Locate the center of the exhaust pipe of your unit. This point should then be extended to the interior wall of your house. Once you have located the center point, on the interior wall, cut a 7" (175mm) diameter hole through the wall.
5. The next step is to install the wall thimble, refer to the instructions which come with the wall thimble for this step.
6. Install the appropriate length of exhaust vent pipe into the wall thimble. See steps 11 and 12 when determining the correct length of exhaust vent to use.
7. **Outside Fresh Air is Mandatory when installing this pellet stove room heater in airtight homes and mobile homes.** Be sure that the outside air vent has an approved cap on it to prevent rodents from entering. Be sure to install in location that won't become blocked with snow, etc.
8. The air intake pipe is equipped with a butterfly valve that is preset to maximum air intake. For optimum operating efficiency you may calibrate the butterfly valve to provide less intake air. **Caution: Too much restriction on the intake air will cause dirtier burn, therefore, will require more frequent cleaning.**

9. Connect the exhaust vent pipe to the exhaust outlet of your pellet stove.
10. Secure all vent joint connections with 3 screws. Seal the exhaust vent joint connections with high temperature silicone sealant.
11. Push the unit straight back to the interior wall, being sure to maintain the minimum clearances to combustibles 6" (152mm) to the back of the unit. Seal the annular space of the wall thimble and around the vent pipe with high temperature silicone sealant.
12. The exhaust vent pipe must extend at least 12" (300mm) out past the exterior wall. Seal the annular space of the wall thimble and around the vent pipe with high temperature silicone sealant.
13. Install an approved horizontal termination cap or if necessary install a 90° elbow and appropriate length of vertical venting. An approved vertical vent cap is recommended.

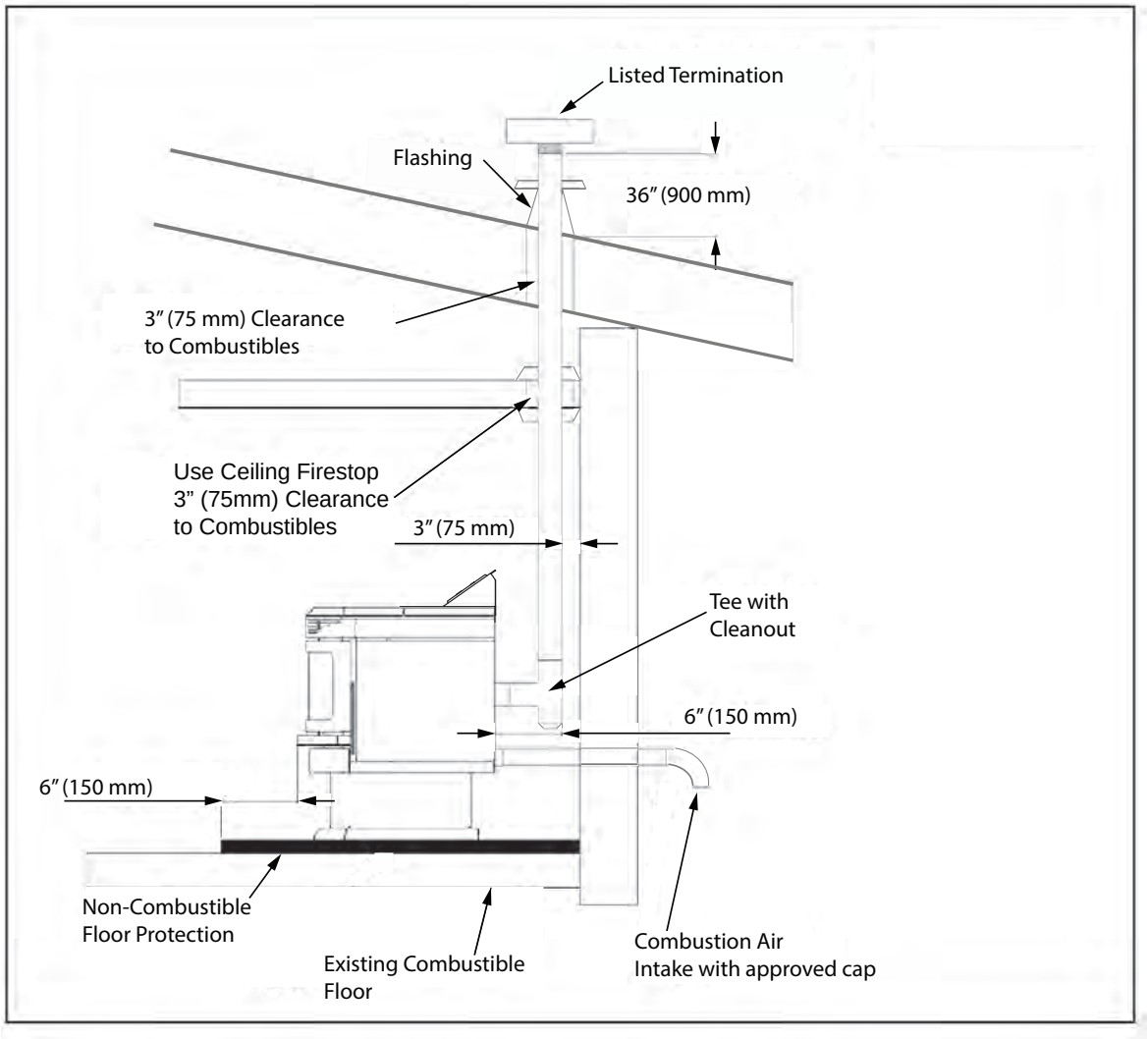
HORIZONTAL EXHAUST VENT INSTALLATION





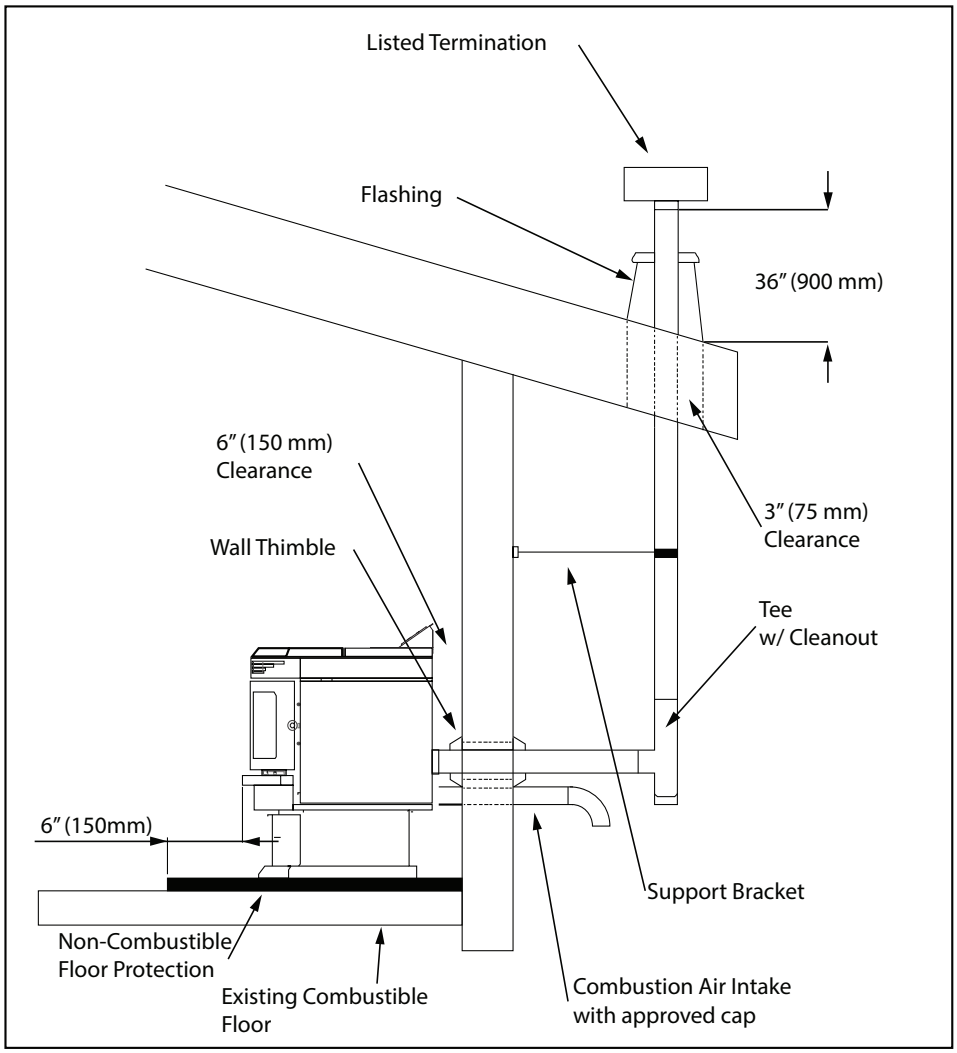
FREESTANDING INTERIOR VERTICAL INSTALLATION

1. Locate your Pellet Stove Room Heater in a location which meets the requirements of this manual, but in an area where it does not interfere with the house framing, wiring, etc.
2. Install a non-combustible hearth pad underneath the pellet stove. This pad should extend at least 6” (152mm) in front of the unit.
3. Place your Pellet Stove Room Heater on the hearth pad and locate the unit in a manner that will leave the exhaust vent with a minimum of 3” (75mm) clearance to any combustible wall.
4. When installing the air intake, locate the center of the combustion air intake pipe at the back of your unit. Line up the center with the same spot on your exterior wall and cut a 2-1/2” (64mm) diameter hole through the wall.
5. Install the combustion air intake pipe.
6. Secure all vent joint connections with 3 screws. Seal the exhaust vent joint connections with high temperature silicone sealant.
7. Install a tee, with a cleanout, on the exhaust pipe found at the rear of your unit.
8. Install approved vent upward through the ceiling. When you pass through the combustible framing ensure that the appropriate ceiling fire stop is used. You must maintain a minimum 3” (75mm) clearance to combustibles and keep any insulation away from the exhaust vent.
9. Extend the exhaust vent through the roof flashing and ensure that the vertical cap is approximately 36” (900mm) above the roof.



FREESTANDING EXTERIOR VERTICAL INSTALLATION

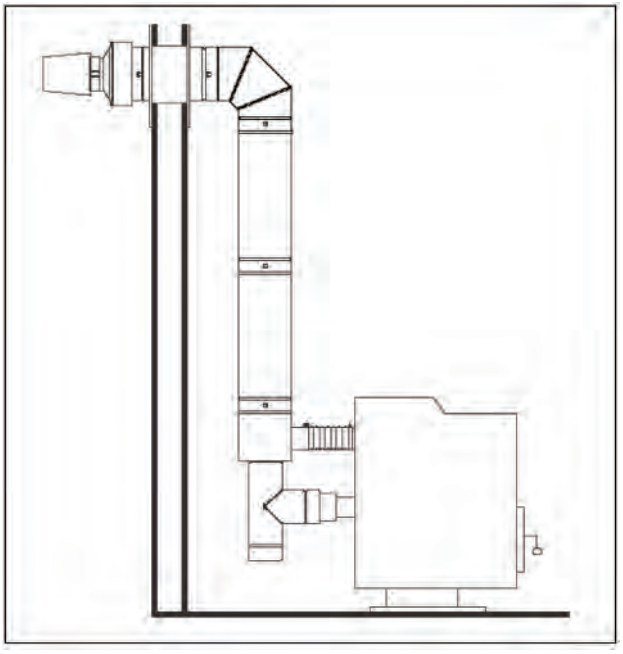
1. Locate your Pellet Stove Room Heater in a location which meets the requirements of this manual, but in an area where it does not interfere with the house framing, wiring, etc.
2. Install a non-combustible hearth pad underneath the pellet stove. This pad should extend at least 6" (152mm) in front of the unit.
3. Place your Pellet Stove Room Heater on the hearth pad and locate the unit in a manner that will leave the exhaust vent with a minimum of 3" (75mm) clearance to any combustible wall.
4. If installing the optional air intake, locate the center of the combustion air intake pipe at the back of your unit. Line up the center with the same spot on your exterior wall and cut a 2-1/2" (64mm) diameter hole through the wall.
5. Secure all vent joint connections with 3 screws. Seal the exhaust vent joint connections with high temperature silicone sealant.
6. Locate the center of the exhaust pipe, at the back of the unit. Line up the center with the same spot on the exterior wall a cut a 7" (178mm) diameter hole through the wall.
7. Install the wall thimble; (refer to the instructions which come with the wall thimble).
8. Install an approved exhaust vent through the wall; be sure to make sure that 3" (75mm) clearances to combustibles are maintained.
9. Secure all vent joint connections with 3 screws. Seal the exhaust vent joint connections with high temperature silicone sealant.
10. Install a Tee with a cleanout on the end of the exhaust pipe and then install approved venting upward from there. Be sure to install support brackets every 5' (1525cm) to keep the venting straight and secure.
11. Extend the exhaust vent through the roof flashing and ensure that the vertical cap is approximately 36" (900mm) above the roof.



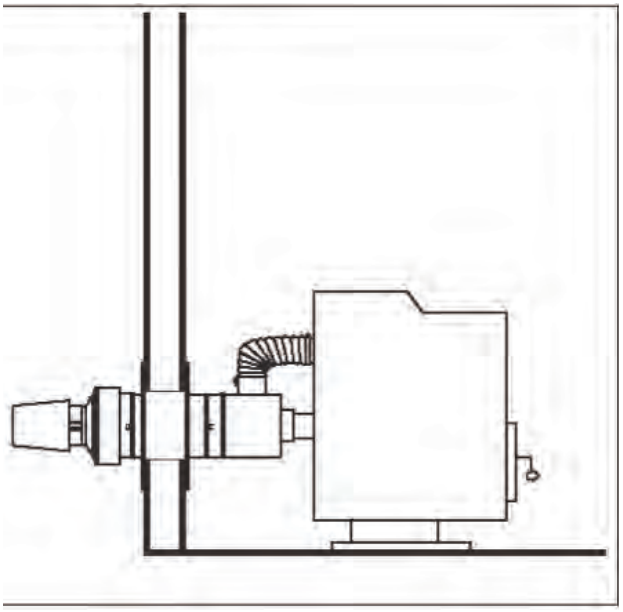
SELKIRK DIRECT-TEMP VENT SYSTEM FOR PELLET STOVE HEATERS

Images courtesy of Selkirk

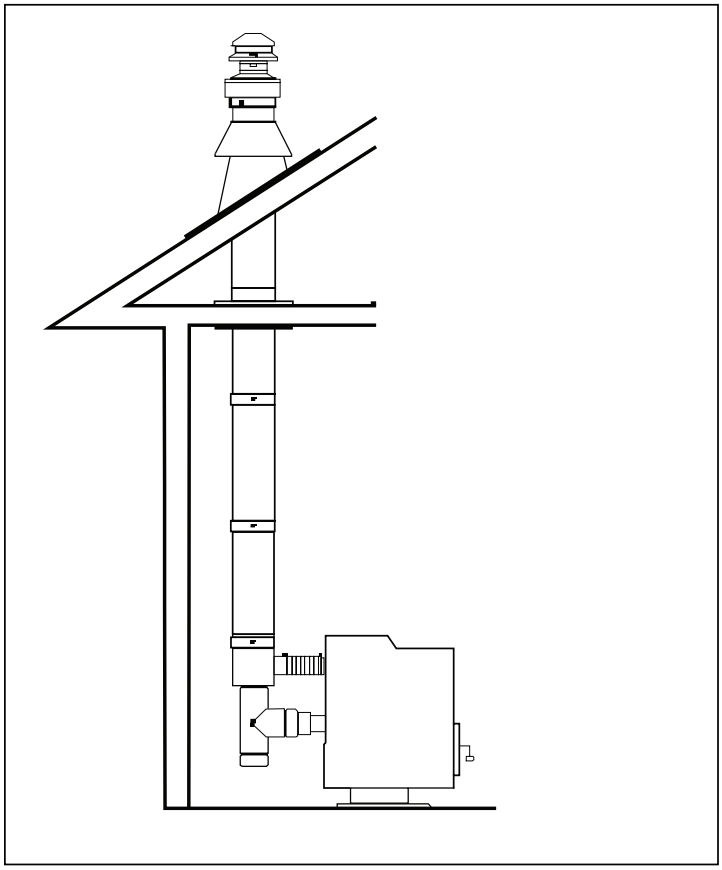
UP AND OUT HORIZONTAL TERMINATION KIT



STRAIGHT OUT HORIZONTAL TERMINATION KIT



STRAIGHT OUT HORIZONTAL TERMINATION KIT



Mobile Home Installation

Mobile home installation should be done in accordance with the Manufactured Home and Safety Standard (HUD), CFR 3280, Part 24. Canadian installations require that the heater must be connected to a 3 or 4 inch, factory-built chimney conforming to CAN/ULC-S629. See the installation illustrations in this manual for minimum height above the roof. U.S. Stove suggests the use of Selkirk's Pellet Venting Products. Refer to their installation instructions for proper installation of the exhaust and combustion air intake. The chimney installation must allow for removal in case of mobile home transportation, especially outside connections. You may contact your local building authority or person having jurisdiction on height restrictions.

In order for this unit to be installed in a mobile home the following criteria must be met:

- The unit must be secured to the floor using lag bolts in the holes provided in the pedestal base.
- Ensure that the unit is permanently electrically grounded to the chassis of your home with 18 gauge copper wire.
- All exhaust systems must have a spark arrestor.

IT IS MANDATORY TO TAKE THE COMBUSTION AIR FROM THE OUTSIDE WHEN INSTALLING THIS UNIT IN AIR TIGHT OR MANUFACTURED/MOBILE HOMES.

CAUTION: THE STRUCTURAL INTEGRITY OF THE MANUFACTURED HOME FLOOR, WALL, AND CEILING/ROOF MUST BE MAINTAINED. MAKE SURE TO MAINTAIN AN EFFECTIVE VAPOR BARRIER BY SEALING WITH SILICONE WHERE THE CHIMNEY OR OTHER COMPONENTS PENETRATE TO THE EXTERIOR OF THE STRUCTURE. REFER TO AND FOLLOW THE CHIMNEY MANUFACTURER'S INSTALLATION INSTRUCTIONS.

WARNING: DO NOT INSTALL IN SLEEPING ROOM.

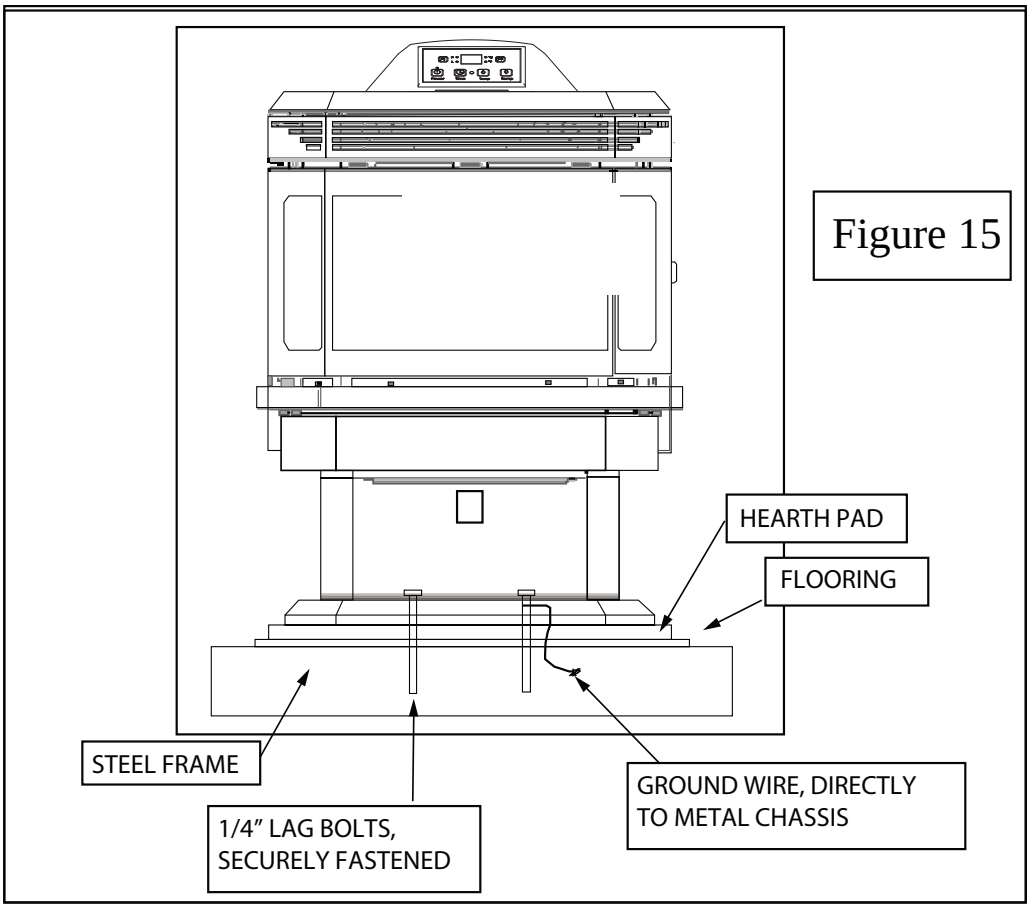
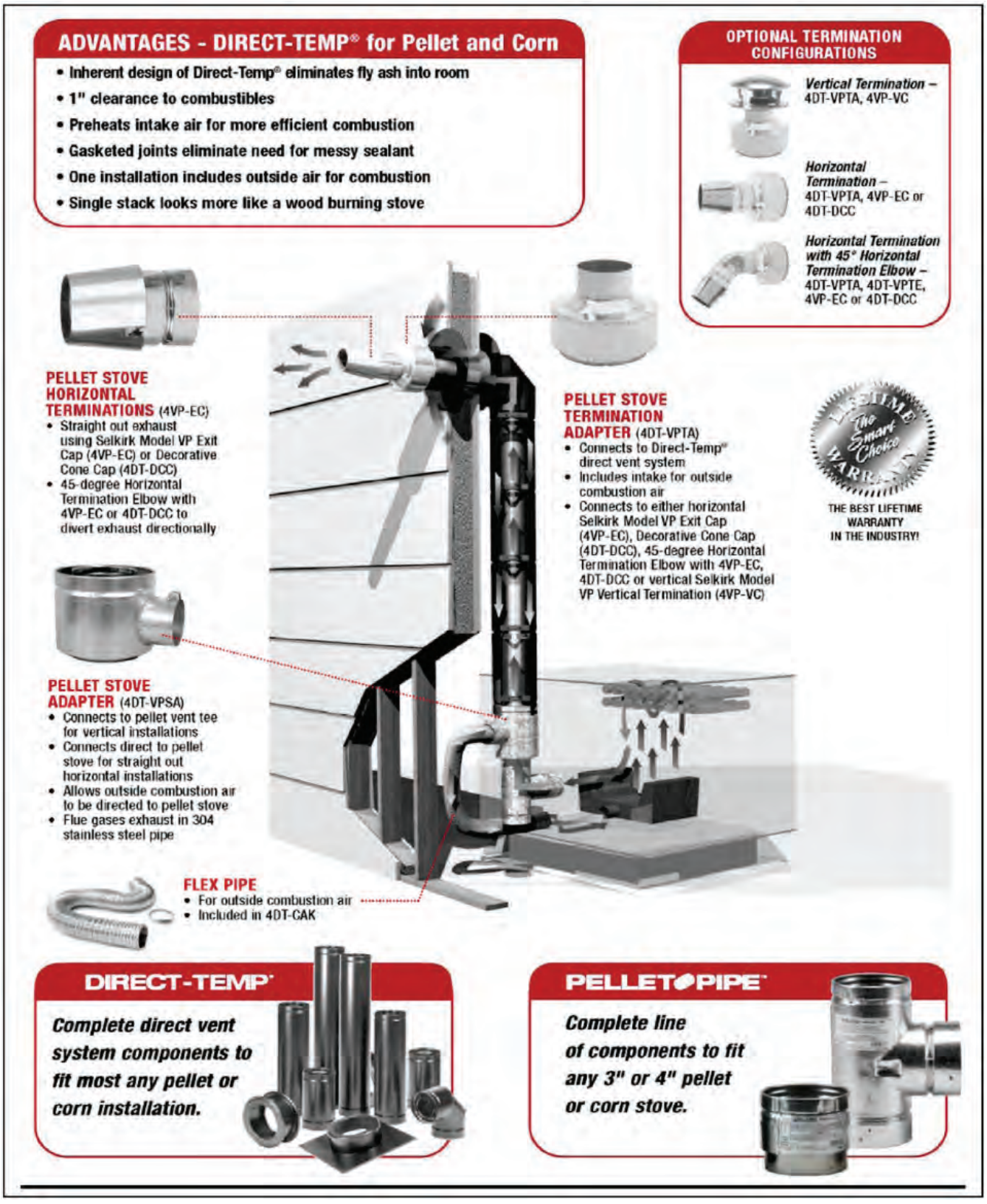


Figure 15

NOTE: Only the freestanding model is approved for installation into a mobile home.

SELKIRK DIRECT-TEMP VENT SYSTEM FOR PELLET STOVE HEATERS

Images courtesy of Selkirk



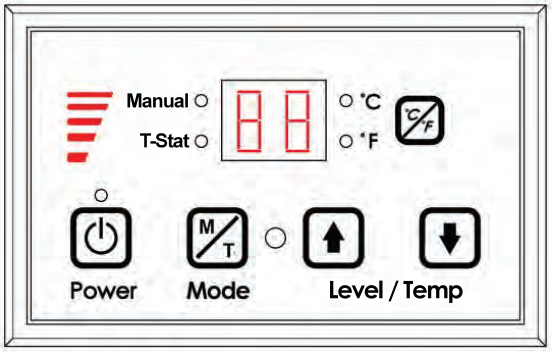
Control Panel

PANEL CONTROLS

The blowers and automatic fuel supply are controlled from a panel on the top of the stove. The control panel functions are a follows.

A. ON/OFF SWITCH ("POWER" BUTTON)

- When pushed, the stove will automatically ignite. No other fire starter is necessary. The igniter will stay on for at least 10 and up to 12 minutes, depending on when Proof of Fire is reached. The fire should start in approximately 5 minutes.
- The red light located above the "POWER" button will turn green when pressed and remain green until the stove is turned off.
- After pushing "POWER", the auger motor is on for 3.5 minutes, off for 1 minute. During the remainder of the start-up period, the auger motor operates on the heat range "1" setting.
- During start up the heat level advance (Up and Down keys) will change the heat range indicator level accordingly, but there is no change in the stoves operating conditions until start-up is completed.
- During start-up ignition must occur within 12 minutes or the stove will error out and show E4.
- During the start-up phase, the Mode key does not function.



B. LEVEL / TEMP ARROW BUTTONS

- These buttons when pushed will set the pellet feed rate, hence the heat output or heat range of your stove.
- The levels of heat output will incrementally change on the bar graph starting from heat range "1" to heat range "5".

C. °C / °F Button

- The °C / °F button changes the two digit display from degrees Celsius to degrees Fahrenheit.

D. MODE (M/T) BUTTON

- The Mode of the stove can be switched between manual and controlled with a Thermostat. Separate LEDs to the left of the two digit display indicate the mode of operation – Manual or T-Stat. The stove has to be in normal operation to be switched from Manual to T-Stat mode.
- Manual mode operates according to the 5 set levels of feed on the bar graph from heat range "1" to heat range "5".
- T-Stat mode works as follows:
- The stove has a built in Thermostat into the controls of the appliance. The temperature sensor for the T-Stat is located on the back of the stove behind the display board.
- Once the stove has gone into run mode the stove can be switch into T-Stat mode.
- The Up and Down Level / Temp Arrow buttons are used to change the desired set-point temperature. Once the desired temperature is reached the two digit display will flash for four seconds and reset to the actual room temperature.
- Once the stove reaches within 3°F of the desired temperature set point, it returns to the heat range that the stove was set on before it was switched to T-Stat mode (if the stove was running on heat range "5" when switched to T-stat mode when it gets within 3°F of the set point it will return to heat range "5").
- Once the stove reaches the desired set-point, the stove will drop to heat range "1".
- When room temperature drops below desired set-point the stove will ramp back up until it reaches the desired temperature.

Operation

△ **DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE - Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or "freshen up" a fire in this stove. Keep all such liquids well away from the stove while it is in use.**

△ **HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.**

This heater is designed to burn only PFI Premium grade pellets. This appliance can also burn pellets rated as standard after May 16, 2015
DO NOT BURN:

1. Garbage;
2. Lawn clippings or yard waste;
3. Materials containing rubber, including tires;
4. Materials containing plastic;
5. Waste petroleum products, paints or paint thinners, or asphalt products;
6. Materials containing asbestos;
7. Construction or demolition debris;
8. Railroad ties or pressure-treated wood;
9. Manure or animal remains;
10. Salt water driftwood or other previously salt water saturated materials;
11. Unseasoned wood; or
12. Paper products, cardboard, plywood, or particle-board. The prohibition against burning these materials does not prohibit the use of fire starters made from paper, cardboard, saw dust, wax and similar substances for the purpose of starting a fire in an affected wood heater.

Burning these materials may result in release of toxic fumes or render the heater ineffective and cause smoke.

PROPER FUEL

THIS STOVE IS APPROVED FOR BURNING PELLETIZED WOOD FUEL ONLY ! Factory-approved pellets are those 1/4" or 5/16" in diameter and not over 1" long. Longer or thicker pellets sometimes bridge the auger flights, which prevents proper pellet feed. Burning wood in forms other than pellets is not permitted. It will violate the building codes for which the stove has been approved and will void all warranties. The design incorporates automatic feed of the pellet fuel into the fire at a carefully prescribed rate. Any additional fuel introduced by hand will not increase heat output but may seriously impair the stoves performance by generating considerable smoke. Do not burn wet pellets. The stove's performance depends heavily on the quality of your pellet fuel. Avoid pellet brands that display these characteristics:

1. Excess Fines – "Fines" is a term describing crushed pellets or loose material that looks like sawdust or sand. Pellets can be screened before being placed in hopper to remove most fines.
2. Binders – Some pellets are produced with materials to hold the together, or "bind" them.
3. High ash content – Poor quality pellets will often create smoke and dirty glass. They will create a need for more frequent maintenance. You will have to empty the burn pot plus vacuum the entire system more often. Poor quality pellets could damage the auger. We cannot accept responsibility for damage due to poor quality pellet.

PRE-START-UP CHECK

Remove burn pot, making sure it is clean and none of the air holes are plugged. Clean the firebox, and then reinstall burn pot. Clean door glass if necessary (a dry cloth or paper towel is usually sufficient). Never use abrasive cleaners on the glass or door. Check fuel in the hopper, and refill if necessary.

BUILDING A FIRE

Never use a grate or other means of supporting the fuel. Use only the burn pot supplied with this heater.
Hopper lid must be closed in order for the unit to feed pellets.
During the start-up period:

1. Make sure burn pot is free of pellets.
2. DO NOT open the viewing door.
3. DO NOT open the damper, the damper needs to be closed during start up.
4. DO NOT add pellets to the burn pot by hand.

NOTE: During the first few fires, your stove will emit an odor as the high temperature paint cures or becomes seasoned to the metal. Maintaining smaller fires will minimize this. Avoid placing items on stove top during this period because paint could be affected.

Operation

THE HOTROD AUTOMATIC FIRESTARTER

1. Fill hopper and clean burn pot.
2. Press “On/Off” button. Make sure green light comes on.
3. The damper should be completely closed or open no more than ¼ of the way during start-up. This will vary depending on your installation and elevation. Once fire is established adjust for desired flame increasing the amount the damper is open as the heat setting is increased. (See “DAMPER CONTROL”)
4. Adjust feed rate to desired setting by pressing “Heat Level Advance” button.

If fire doesn’t start in 12 minutes, press “On/Off”, wait a few minutes, clear the burn pot, and start procedure again.

DAMPER CONTROL

The damper control lever is located on the back of the stove on the lower left side. The dampener adjusts the combustion air. This control is necessary due to the varied burn characteristics of individual installations, different pellet brands and pellet feed rates. It allows you to improve the efficiency of your stove. Providing correct combustion air will reduce the frequency of cleaning your glass door and prevent the rapid buildup of creosote inside your stove and chimney.
You should adjust the damper based on the fire’s appearance. A low, reddish, dirty fire can be improved by turning the dampener slightly to the right. A “blow torch” fire can be improved by turning the dampener to the left a little bit.
As a general rule, on lower feed rate settings, the damper should be farther to the left closing it off. On higher feed rates, the damper should be open more by having it set more towards the right. Through trial and error, you will find the best setting. Consult your dealer if you need help.
NOTE: On heat range “1”, damper should be either completely closed or open no more than a ¼ of the way. If damper is open to far, it can cause the fire to go out.

OPENING DOOR

If the door is opened while the stove is in operation it must be closed within 30 seconds or the stove will shut down. If the stove shuts down push the “On/Off” button to re-start your stove. The stove will have to fully shut down and turn off before you will be able to restart the stove.

ROOM AIR FAN

When starting your stove the Room Air Fan will not come on until the stove’s heat exchanger warms up. This usually takes about 10 minutes from start-up.

IF STOVE RUNS OUT OF PELLETS

The fire goes out and the auger motor and blowers will run until the stove cools. This will take 30 minutes or longer depending on the heat remaining in the appliance. After the stove components stop running all lights on the display will go out and the two digit display will begin flashing “E3”

REFUELING

- The hopper and stove top will be hot during operation; therefore, you should always use some type of hand protection when refueling your stove.
- Never place your hand near the auger while the stove is in operation.

We recommend that you not let the hopper drop below ¼ full.

KEEP HOPPER LID CLOSED AT ALL TIMES EXCEPT WHEN REFILLING.

DO NOT OVERFILL HOPPER.

SHUTDOWN PROCEDURE

Turning your stove off is a matter of pressing the “POWER” button on the display board. The green light will turn back to red when the “POWER” button is pushed. The auger motor will stop, and the blowers will continue to operate until the internal firebox temperatures have fallen to a preset level.

WARNING: Never shut down this unit by unplugging it from the power source.

1. Your stove is equipped with a high temperature thermodisc. This unit has a manual reset thermodisc. This safety switch has two functions.
    A. To recognize an overheat situation in the stove and shut down the fuel feed or auger system.
    B. In case of a malfunctioning convection blower, the high-temperature thermodisc will automatically shut down the auger, preventing the stove from overheating.

NOTE: On some units, once tripped, like a circuit breaker, the reset button will have to be pushed before restarting your stove. On other units the thermodisc has no reset button and will reset itself once the stove has cooled. The manufacturer recommends that you call your dealer if this occurs as this may indicate a more serious problem. A service call may be required.

2. If the combustion blower fails, an air pressure switch will automatically shut down the auger.

NOTE: Opening the stove door for more than 30 seconds during operation will cause enough pressure change to activate the air switch, shutting the fuel feed off. The stove will shut down and show “E2” on the two digit display. The stove has to fully shut down before restarting.

TAMPER WARNING

This wood heater has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual.

VISIBLE SMOKE

The amount of visible smoke being produced can be an effective method of determining how efficiently the combustion process is taking place at the given settings. Visible smoke consist of unburned fuel and moisture leaving your stove. Learn to adjust the air settings of your specific unit to produce the smallest amount of visible smoke. Wood that has not been seasoned properly and has a high wood moisture content will produce excess visible smoke and burn poorly.

Maintenance

△ **Failure to clean and maintain this unit as indicated can result in poor performance and safety hazards.**

△ **Unplug your stove’s electrical cord prior to removing the back panel or opening the exhaust system for any inspection, cleaning, or maintenance work.**

△ **Never perform any inspections, cleaning, or maintenance on a hot stove.**

△ **Do not operate stove with broken glass, leakage of flue gas may result.**

△ **Attempts to achieve heat output rates that exceed heater design specifications can result in permanent damage to the heater.**

EXHAUST SYSTEM

Creosote Formation – When any wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue or a newly started fire or from a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited, this creosote makes an extremely hot fire, which may damage the chimney or even destroy the house. Despite their high efficiency, pellet stoves can accumulate creosote under certain conditions.
Fly Ash – This accumulates in the horizontal portion of an exhaust run. Though non-combustible, it may impede the normal exhaust flow. It should therefore be periodically removed.
Inspection and Removal – The chimney connector and chimney should be inspected by a qualified person annually or per ton of pellets to determine if a creosote or fly ash build-up has occurred. If creosote has accumulated, it should be removed to reduce the risk of a chimney fire. Inspect the system at the stove connection and at the chimney top. Cooler surfaces tend to build creosote deposits quicker, so it is important to check the chimney from the top as well as from the bottom. The creosote should be removed with a brush specifically designed for the type of chimney in use. A qualified chimney sweep can perform this service. It is also recommended that before each heating season the entire system be professionally inspected, cleaned and, if necessary, repaired. To clean the chimney, disconnect the vent from the stove.

INTERIOR CHAMBERS

- Burn Pot: Periodically remove and clean the burn pot and the area inside the burn pot housing. In particular, it is advisable to clean out the holes in the burn pot to remove any build up that may prevent air from moving through the burn pot freely.
- Heat Exchanger: There is a clean out plate on both sides of the heat exchanger that need to be removed to clean fly ash out of the heat exchanger. The cleanouts are located inside the cabinet doors, on the lower front corners of the heat exchanger.

If a vacuum is used to clean your stove, we suggest using a vacuum designed for ash removal. Some regular vacuum

cleaner (i.e. shop vacs) may leak ash into the room.
DO NOT VACUUM HOT ASH

CHECK AND CLEAN THE HOPPER

Check the hopper periodically to determine if there is any sawdust (fines) that is building up in the feed system or pellets that are sticking to the hopper surface. Clean as needed.

DOOR AND GLASS GASKETS

Inspect the main door and glass window gaskets periodically. The main door may need to be removed to have frayed, broken, or compacted gaskets replaced by your authorized dealer. This unit's door uses a 3/4" diameter rope gasket.

BLOWER MOTORS

Clean the air holes on the motors of both the exhaust and distribution blowers annually. Remove the exhaust blower from the exhaust duct and clean out the internal fan blades as part of your fall start-up.

PAINTED SURFACES

Painted surfaces may be wiped down with a damp cloth. If scratches appear, or you wish to renew your paint, contact your authorized dealer to obtain a can of suitable high-temperature paint.

GLASS - CLEANING, REMOVAL AND REPLACEMENT OF BROKEN DOOR GLASS

Cleaning - We recommend using a high quality glass cleaner. Should a buildup of creosote or carbon accumulate, you may wish to use 000 steel wool and water to clean the glass. DO NOT use abrasive cleaners. DO NOT perform the cleaning while the glass is HOT. ,
In the event you need to replace the glass, Do not attempt to operate the unit with broken glass. Replacement glass may be purchased from your U.S. Stove Pellet Burning Room Heater Dealer. If glass is broken, follow these removal procedures:
Replacement glass must be 0.197" thick tempered ceramic glass with a working service temperature of 1400 deg. F.
Center Glass size: 10" x 10.67" Side glass size: 4" x 10.67"

1. Once the heater has cooled, remove the door from the heater.
2. Remove the rope gasket from the door followed by the eight(8) nuts holding the glass retainer in place.
3. While wearing gloves, carefully remove any loose pieces of glass from the door frame.
4. Replace the glass and gasket, making sure the gasket runs the full perimeter of the glass edge.
5. Re-install the retainer and eight nuts and rope gasket using high temperature silicone to adhere the gasket to the door.
6. Never use substitute materials for the glass.

DO NOT abuse the door glass by striking, slamming or similar trauma. Do not operate the stove with the glass removed, cracked or broken.

FALL START UP

Prior to starting the first fire of the heating season, check the outside area around the exhaust and air intake systems for obstructions. Clean and remove any fly ash from the exhaust venting system. Clean any screens on the exhaust system and on the outside air intake pipe. Turn all of the controls on and make sure that they are working properly. This is also a good time to give the entire stove a good cleaning throughout.

SPRING SHUTDOWN

After the last burn in the spring, remove any remaining pellets from the hopper and the auger feed system. Scoop out the pellets and then run the auger until the hopper is empty and pellets stop flowing (this can be done by pressing the "ON" button with the viewing door open). Vacuum out the hopper. Thoroughly clean the burn pot, and firebox. It may be desirable to spray the inside of the cleaned hopper with an aerosol silicone spray if your stove is in a high humidity area. The exhaust system should be thoroughly cleaned.

SPRING SHUTDOWN

After the last burn in the spring, remove any remaining pellets from the hopper and the auger feed system. Scoop out the pellets and then run the auger until the hopper is empty and pellets stop flowing (this can be done by pressing the "ON" button with the viewing door open). Vacuum out the hopper. Thoroughly clean the burn pot, and firebox. It may be desirable to spray the inside of the cleaned hopper with an aerosol silicone spray if your stove is in a high humidity area. The exhaust system should be thoroughly cleaned.

Maintenance

MAINTENANCE SCHEDULE

Use the following as a guide under average use conditions.
Gaskets around door and door glass should be inspected and repaired or replaced when necessary.

	Daily	Weekly	Monthly or as needed
Burn Pot	Stirred	Empty	
Combustion Chamber		Brushed	
Ashes		Check	Empty
Interior Chambers			Vacuumed
Combustion Blower Blades			Vacuumed / Brushed
Convection Blower Impeller			Vacuumed / Brushed
Vent System			Cleaned
Gaskets			Inspected
Glass			Wiped/Cleaned
Hopper (end of season)			Emptied and vacuumed
Heat Exchanger Tubes			Bi-Weekly

ASH REMOVAL - FREESTANDING UNIT

Remove the ashes periodically to avoid unnecessary ash build up. Ash removal is as follows:

1. Let fire burn out and allow unit cool to room temperature.
2. Clean the heat exchanger tubes (see Heat Exchanger Cleaning section) – Make sure Pellet Stove is at room temperature before touching .
3. Open the ash pan door, remove the burn pot and empty into metal container.
4. Vacuum to remove ashes from the firebox.
   BE SURE THAT ASHES ARE COOL TO THE TOUCH BEFORE VACUUMING. Some vacuum cleaners may leak ash into the room. Your vacuum cleaner should have a special filter or bag to eliminate leakage.
5. Remove ash pan and dispose of ashes into metal container.
6. Reinstall ash pan.
7. Reinstall burn pot.

ATTENTION:

This wood heater needs periodic inspection and repair for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with operating instructions in this manual.

Maintenance

ASH REMOVAL - INSERT UNIT

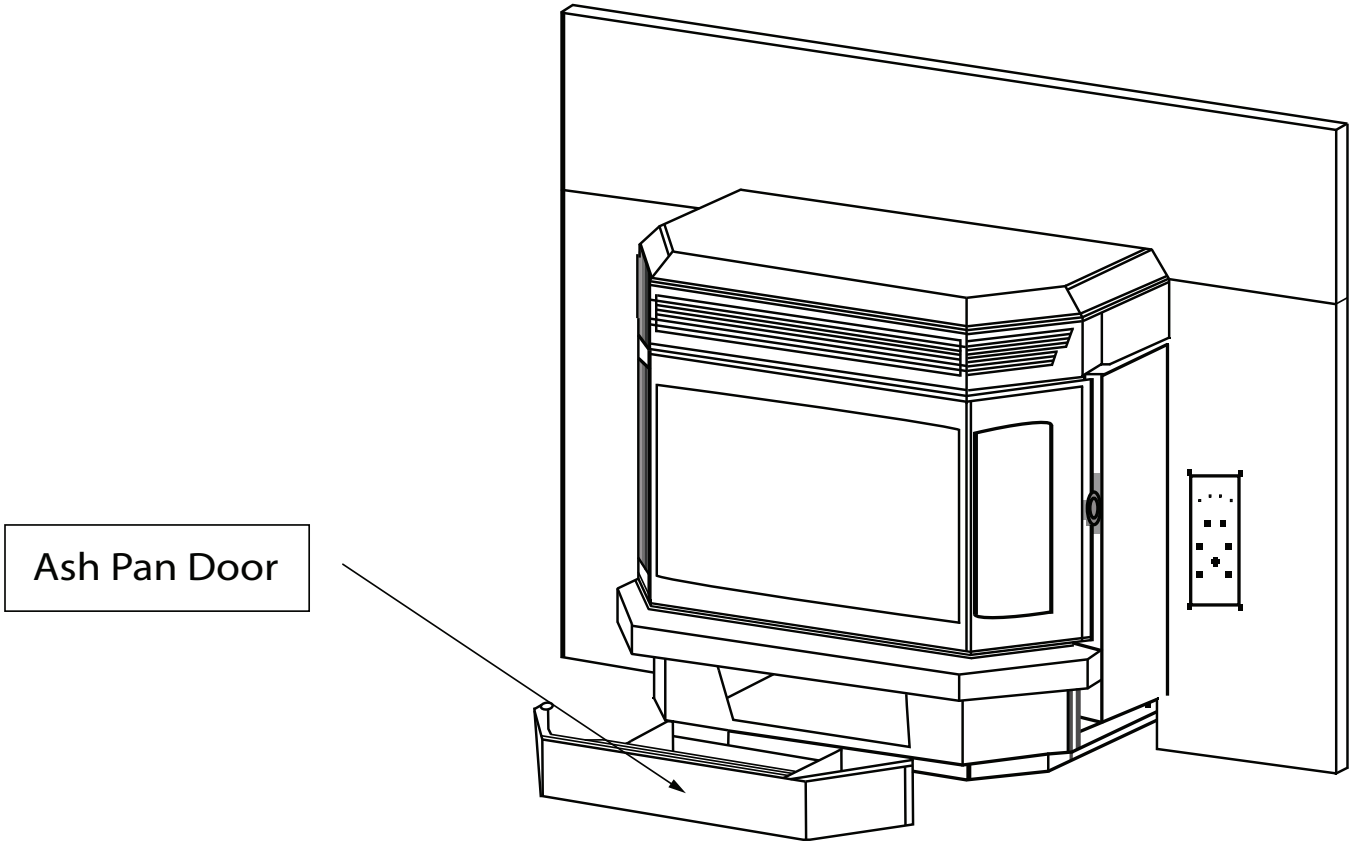
1. Allow Heater to cool to room temperature
2. Lift the ash pan door up and pull out
3. Follow directions for freestanding unit above on this page.

DISPOSAL OF ASHES

Ashes should be placed in a steel metal container with a tight fitting lid. The closed container of ashes should be placed on a non-combustible floor or on the ground well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have been thoroughly cooled. Do not place other waste in the same container.

SMOKE AND CO MONITORS

Burning wood naturally produces smoke and carbon monoxide(CO) emissions. CO is a poisonous gas when exposed to elevated concentrations for extended periods of time. While the modern combustion systems in heaters drastically reduce the amount of CO emitted out the chimney, exposure to the gases in closed or confined areas can be dangerous. Make sure your stove gaskets and chimney joints are in good working order and sealing properly to ensure unintended exposure. It is recommended that you use both smoke and CO monitors in areas having the potential to generate CO.

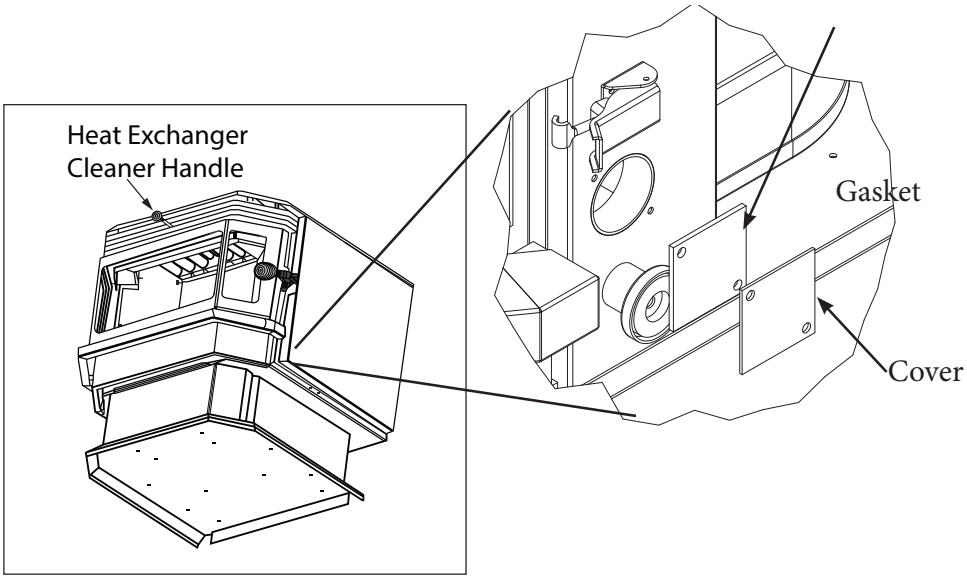


Maintenance

CLEANING

Heat Exchanger Tubes – Your Pellet Stove Room Heater is designed with a built in heat exchanger tube cleaner. This should be used every 2 or 3 days to remove ash build up on the heat exchanger tubes, which can reduce heat transfer. The handle, for the heat exchanger tube cleaner, is located in front of the vent tubes on front side of heater. Slide the rod front to back several times to clean the tubes then follow the instructions for ash removal.

Periodically remove the clean outs on either side of the heat exchanger. Clean out the ash, then follow the instructions for ash removal. Check the gasket before replacing the clean out cover. If gasket is damaged new gasket can be ordered. Alternatively, high temperature silicone can be used to ensure a proper seal between the clean out cover and the stove body.



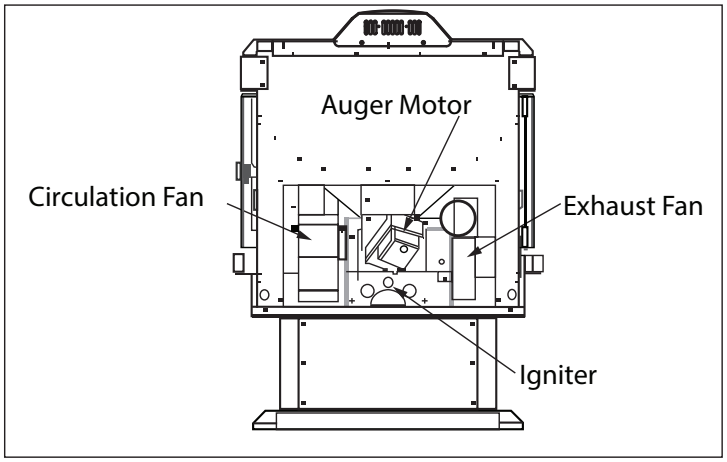
WARNING: DO NOT ATTEMPT TO OPERATE THE HEAT EXCHANGE TUBE CLEANER WHILE THE PELLET STOVE IS IN OPERATION OR COOLING DOWN; WAIT UNTIL PELLET STOVE HAS COOLED COMPLETELY BEFORE PERFORMING THIS PROCEDURE.

FANS – DANGER: RISK OF ELECTRIC SHOCK. DISCONNECT POWER BEFORE SERVICING UNIT

Over time ash or dust may accumulate on the blades of the circulation & exhaust fans. The fans should be inspected, periodically, and if any accumulation is present vacuumed clean as the ash or dust can impede the fans performance. It is also possible that creosote may accumulate in the exhaust fan therefore, this must be brushed clean.

The exhaust fan can be found behind the left side panel (facing the front of the heater), the circulation fan can be found behind the right side panel. To access the igniter, remove the air inlet tube and cover (2 screws). The auger motor is located in the center rear of the unit.

Note: When cleaning, take care not to damage the fan blades.



Trouble Shooting Guide

When your stove acts out of the ordinary, the first reaction is to call for help. This guide may save time and money by enabling you to solve simple problems yourself. Problems encountered are often the result of only five factors: 1) poor fuel; 2) poor operation or maintenance; 3) poor installation; 4) component failure; 5) factory defect. You can usually solve those problems related to 1 and 2. Your dealer can solve problems relating to 3, 4 and 5.

For the sake of troubleshooting and using this guide to assist, you should look at your heat level setting to see which light is flashing.

△ **Disconnect the power cord before performing any maintenance! NOTE: Turning the ON/OFF Switch to "OFF" does not disconnect all power to the electrical components of the stove.**

△ **Never try to repair or replace any part of the stove unless instructions for doing so are given in this manual. All other work should be done by a trained technician.**

Display is Flashing "E1"	
Possible Causes	**Possible Remedies: (Unplug stove first when possible)**
1. The convection blower is overheating and tripping the internal temperature shutoff.	Clean any dust off of the windings and fan blade. If oiling the blower does not help, the blower may be bad.
2. The stove is being left on the highest setting for extended periods of time.	If operating the heater on the highest heat setting, the room temperature could increase enough and lead to potential overheating situations. If this happens try operating at a lower heat setting.
3. Fuel other than wood pellets is being burned in the stove.	This pellet stove is designed and tested to use wood pellets. Check for signs of fuel other than wood pellets. No other types of fuel have been approved for this pellet stove. If there are signs of other types of fuel being used, stop using them immediately.
4. Power surge or brown out situation.	A power surge, spike, or voltage drop could cause the high limit switch to trip. Check to see if a surge protector is being used on the stove. If not, recommend one to the customer.
5. High Limit Switch is malfunctioning.	If the other items check out OK, replace the high limit switch.

Trouble Shooting Guide

Display is Flashing "E2"	
Possible Causes	**Possible Remedies: (Unplug stove first when possible)**
1. Airflow switch hose or stove attachment pipes for hose are blocked.	Unhook air hose from the air switch and blow through it. If air flows freely, the hose and tube are fine. If air will not flow throw the hose, use a wire coat hanger to clear the blockage.
2. The air inlet, burnpot, interior combustion air chambers, combustion blower, or exhaust pipe are blocked with ash or foreign material.	Follow all cleaning procedures in the maintenance section of the owner's manual.
3. The firebox is not properly sealed.	Make sure the door is closed and that the gasket is in good shape.
4. Vent pipe is incorrectly installed.	Check to make sure vent pipe installation meets criteria in owner's manual.
5. The airflow switch wire connections are bad.	Check the connectors that attach the gray wires to the air switch.
6. Combustion blower failure.	With the stove on, check to see if the combustion blower is running. If it is not, you will need to check for power going to the combustion blower. It should be a full current. If there is power, the blower is bad. If there is not, see #8.
7. Control board not sending power to combustion blower.	If there is no current going to the combustion blower, check all wire connections. If all wires are properly connected, you have a bad control board.
8. Control board not sending power to air switch.	There should be a 5-volt current (approximately) going to the air switch after the stove has been on for 30 seconds.
9. Air switch has failed.	To test the air switch, you will need to disconnect the air hose from the body of the stove. With the other end still attached to the air switch, very gently suck on the loose end of the hose (you may want to remove the hose entirely off the stove and the air switch first and make sure it is clear). If you hear a click, the air switch is working. BE CAREFUL TOO MUCH VACUUM CAN DAMAGE THE AIR SWITCH.

Trouble Shooting Guide

Display is Flashing "E3"	
Possible Causes	**Possible Remedies: (Unplug stove first when possible)**
1. The hopper is out of pellets	Refill the hopper.
2. The air dampener is too far open for a low feed setting	If on the low setting, you may need to close the dampener all the way.
3. The burnpot holes are blocked.	Remove the burnpot and thoroughly clean it.
4. The air inlet, the interior chambers, or exhaust system has a partial blockage.	Follow all cleaning procedures in the maintenance section of the owner's manual
5. The hopper safety switch has failed or hopper is open.	When operating the unit, be sure the hopper lid is closed so that the hopper safety switch will activate. Check the wires leading from the hopper safety switch to the control panel and auger motor for secure connections. Use a continuity tester to test the hopper safety switch; replace if necessary.
6. The auger shaft is jammed.	"Start by emptying the hopper. Then remove the auger motor by removing the auger pin, then remove the two bolts that hold the auger bracket to the auger tube. The auger bracket will now be able to be removed form the auger tube. Remove the two bolts on the side of the auger tube to remove the lower bearing of the auger. Pull the auger out of the tube to free the jam.
7. The auger motor has failed.	Remove the auger motor from the auger shaft and try to run the unit. If the motor will turn the shaft is jammed on something. If the motor will not turn, the motor is bad.
8. The Proof of Fire (POF) thermodisc has malfunctioned.	Temporarily bypass the POF thermodisc by disconnecting the two wires and connecting them with a short piece of wire. Then plug the stove back up. If the stove comes on and works, you need to replace the POF thermodisc. This is for testing only. DO NOT LEAVE THE THERMODISC BYPASSED. Your blowers will never shut off and if the fire went out the auger will continue to feed pellets until the hopper is empty if you leave the POF thermodisc bypassed.
9. The control board is not sending power to the POF thermodisc or other auger system components.	There should be a 5-volt (approximately) current going to the POF thermodisc after the stove has been on for 10 minutes.

Display is Flashing "E4"	
Possible Causes	**Possible Remedies: (Unplug stove first when possible)**
1. The air inlet, burnpot, interior combustion air chambers, combustion blower, or exhaust pipe are blocked with ash or foreign material.	Follow all cleaning procedures in the maintenance section of the owner's manual.
2. The Proof of Fire (POF) thermodisc has came unplugged	Check the (POF) thermodisc to see if the wires are connected properly.
3. The Proof of Fire (POF) thermodisc has malfunctioned.	Temporarily bypass the POF thermodisc by disconnecting the two wires and connecting them with a short piece of wire. Then plug the stove back up. If the stove comes on and works, you need to replace the POF thermodisc. This is for testing only. DO NOT LEAVE THE THERMODISC BYPASSED. Your blowers will never shut off and if the fire went out the auger will continue to feed pellets until the hopper is empty if you leave the POF thermodisc bypassed.

4. The hopper is out of Pellets.	Refill the hopper.
5. The hopper safety switch has failed or hopper is open.	When operating the unit, be sure the hopper lid is closed so that the hopper safety switch will activate. Check the wires leading from the hopper safety switch to the control panel and auger motor for secure connections. Use a continuity tester to test the hopper safety switch; replace if necessary.
6. The auger shaft is jammed.	Start by emptying the hopper. Then remove the auger motor by removing the auger pin. Remove the auger shaft inspection plate in the hopper so that you can see the auger shaft. Gently lift the auger shaft straight up so that the end of the auger shaft comes up out of the bottom auger bushing. Next, remove the two nuts that hold the top auger biscuit in. Then rotate the bottom end of the auger shaft up towards you until you can lift the shaft out of the stove. After you have removed the shaft, inspect it for bent flights, burrs, or broken welds. Remove any foreign material that might have caused the jam. Also, check the auger tube for signs of damage such as burrs, rough spots, or grooves cut into the metal that could have caused a jam.
7. The auger motor has failed.	Remove the auger motor from the auger shaft and try to run the unit. If the motor will turn the shaft is jammed on something. If the motor will not turn, the motor is bad.

Display is Flashing “E5”	
Possible Causes	**Possible Remedies: (Unplug stove first when possible)**
1. The stove automatically flashes "E5" when turned on	The T-stat sensor has come unplugged form the control board. Check to see if the sensor is unplugged. If the sensor is not unplugged then the sensor is damaged or has a short. If the sensor is damaged or has a short it will need to be replaced.

STOVE FEEDS PELLETS, BUT WILL NOT IGNITE	
Possible Causes:	**Possible Remedies: (Unplug stove first when possible)**
1. Air damper open too far for ignition.	Push the air damper in closer to the side of the stove for startup. In some situations it may be necessary to have the damper completely closed for ignition to take place. After there is a flame, the damper can then be adjusted for the desired feed setting.
2. Blockage in igniter tube or inlet for igniter tube.	Find the igniter housing on the backside of the firewall. The air intake hole is a small hole located on bottom side of the housing. Make sure it is clear. Also, look from the front of the stove to make sure there is not any debris around the igniter element inside of the igniter housing.
3. The burnpot is not pushed completely to the rear of the firebox.	Make sure that the air intake collar on the burnpot is touching the rear wall of the firebox.
4. Bad igniter element.	Put power directly to the igniter element. Watch the tip of the igniter from the front of the stove. After about 2 minutes the tip should glow. If it does not, the element is bad.
5. The control board is not sending power to the igniter.	Check the voltage going to the igniter during startup. It should be a full current. If the voltage is lower than full current, check the wiring. If the wiring checks out good, the board is bad.

Trouble Shooting Guide

SMOKE SMELL COMING BACK INTO THE HOME	
Possible Causes:	**Possible Remedies: (Unplug stove first when possible)**
1. There is a leak in the vent pipe system.	Inspect all vent pipe connections. Make sure they are sealed with RTV silicone that has a temperature rating on 500 degree F or higher. Also, seal joints with UL-181-AP foil tape. Also, make sure the square to round adapter piece on the combustion blower has been properly sealed with the same RTV.
2. The gasket on the combustion blower has gone bad.	Inspect both gaskets on the combustion blower to make sure they are in good shape.
Because it is a wood-burning device, your pellet heater may emit a faint wood-burning odor. If this increases beyond normal, or if you notice an unusual soot build-up on walls or furniture, check your exhaust system carefully for leaks. All joints should be properly sealed. Also clean your stove, following instructions in “MAINTENANCE”. If problem persists, contact your dealer.	

CONVECTION BLOWER SHUTS OFF AND COMES BACK ON	
Possible Causes:	**Possible Remedies: (Unplug stove first when possible)**
1. The convection blower is overheating and tripping the internal temperature shutoff.	Clean any dust off of the windings and fan blades. If cleaning the blower does not help, the blower may be bad.
2. Circuit board malfunction.	Test the current going to the convection blower. If there is power being sent to the blower when it is shut off, then the control board is fine. If there is NOT power being sent to the blower when it shuts off during operation, then you have a bad control board.

STOVE WILL NOT FEED PELLETS, BUT FUEL FEED LIGHT COMES ON AS DESIGNED	
Possible Causes:	**Possible Remedies: (Unplug stove first when possible)**
1. High limit switch has tripped or is defective.	Wait for the stove to cool for about 30 - 45 minutes. Locate the High Limit thermodisc and press the reset button on the back of it. If the heater will not restart, check the thermodisc to see if it’s bad. To test if the thermodisc is bad, you can bypass it as described previously for the POF thermodisc.
2. Bad Auger Motor.	Remove the auger motor from the auger shaft and try to run the unit. If the motor will turn the shaft is jammed on something. If the motor will not turn, the motor is bad.
3. Auger Jam.	Start by emptying the hopper. Then remove the auger motor by removing the auger pin. Remove the auger shaft inspection plate in the hopper so that you can see the auger shaft. Gently lift the auger shaft straight up so that the end of the auger shaft comes up out of the bottom auger bushing. Next, remove the two nuts that hold the top auger biscuit in. Then rotate the bottom end of the auger shaft up towards you until you can lift the shaft out of the stove. After you have removed the shaft, inspect it for bent flights, burrs, or broken welds. Remove any foreign material that might have caused the jam. Also, check the auger tube for signs of damage such as burrs, rough spots, or grooves cut into the metal that could have caused a jam.
4. Loose wire or connector.	Check all wires and connectors that connector to the auger motor, high limit switch, and the Molex connector.
5. Bad control board.	If the fuse is good, the wires and connectors check out good, and the high limit switch did not trip, test for power going to the auger motor. If there is not a full current going to the auger motor when the fuel feed light is on, you have a bad control board.

Trouble Shooting Guide

HIGH LIMIT SWITCH KEEPS TRIPPING	
Possible Causes:	**Possible Remedies: (Unplug stove first when possible)**
1. The convection blower is overheating and tripping the internal temperature shutoff.	Clean any dust off of the windings and fan blades. If oiling the blower does not help, the blower may be bad.
2. The stove is being left on the highest setting for extended periods of time.	If operating the heater on the highest heat setting, the room temperature could increase enough and lead to potential overheating situations. If this happens, try operating at a lower heat setting.
3. Fuel other than wood pellets is being burned in the stove.	This pellet stove is designed and tested to use wood pellets. Check for signs of fuel other than wood pellets. No other types of fuel have been approved for this pellet stove. If there are signs of other types of fuel being used, stop using them immediately.
4. Power surge or brown out situation.	A power surge, spike, or voltage drop could cause the high limit switch to trip. Check to see if a surge protector is being used on the stove. If not, recommend one to the consumer.
5. High limit switch is malfunctioning.	If the other items check out OK, replace the high limit switch.

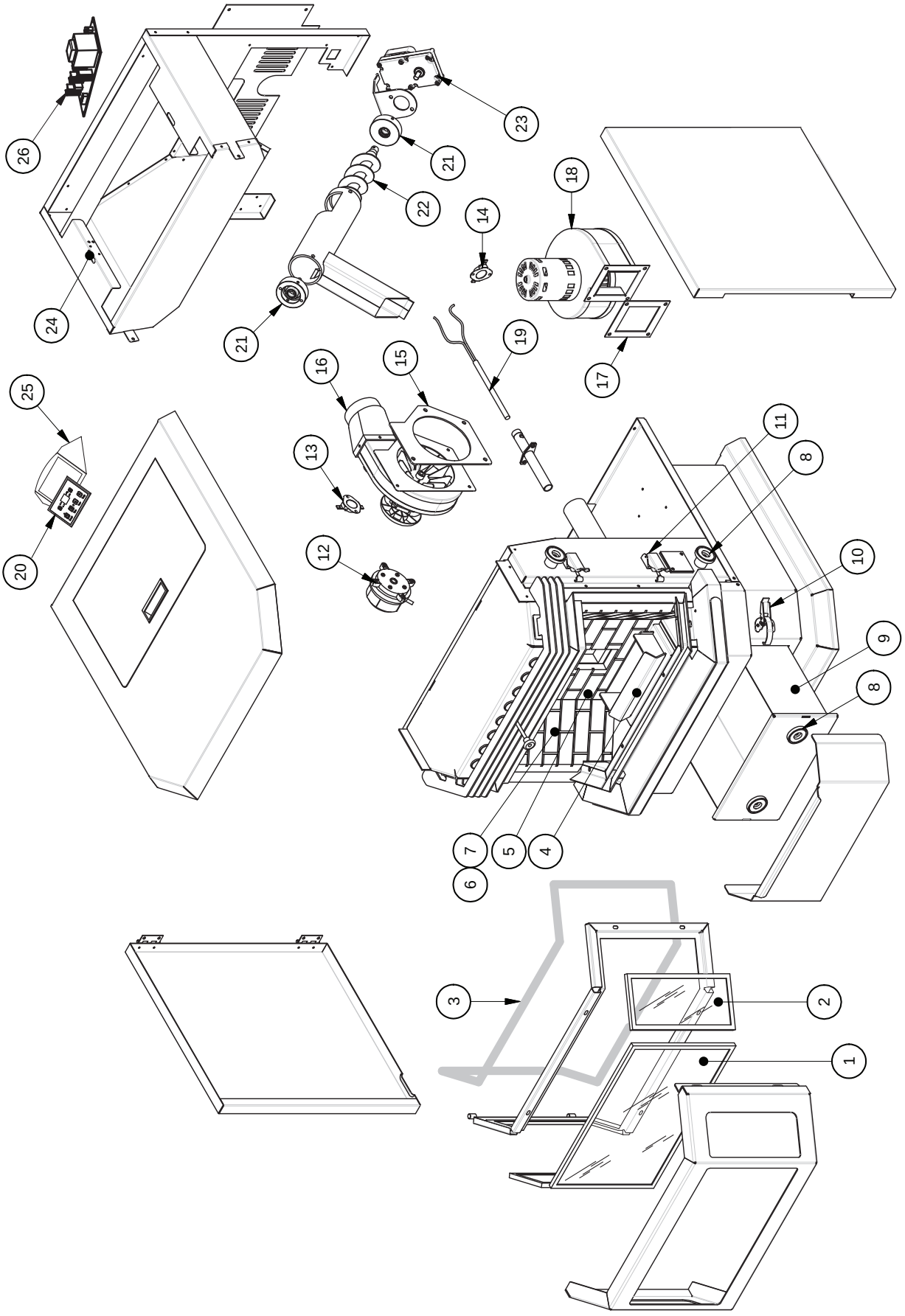
• GLASS “SOOT’S” UP AT A VERY FAST RATE • FLAME IS LAZY, DARK, AND HAS BLACK TIPS • AFTER STOVE HAS BEEN ON FOR A WHILE, THE BURNPOT OVERFILLS	
Possible Causes:	**Possible Remedies: (Unplug stove first when possible)**
1. Stove or vent pipe is dirty, which restricts airflow through the burnpot.	Follow all cleaning procedure in the maintenance section of the owner’s manual.
2. Vent pipe installed improperly.	Check to make sure the vent pipe has been installed according to the criteria in the owner’s manual.
3. Air damper is set too far in (closed) for a higher setting.	Pull the damper knob farther out away from the side of the stove and try to burn the unit again.
4. Burnpot holes are blocked.	Remove the burnpot and thoroughly clean it.
5. Air damper is broken.	Visually inspect the damper assembly. Make sure the damper plate is attached to the damper rod. When the damper rod is moved the plate should move with it.
6. Blockage in air intake pipe.	Visually inspect the air intake pipe that leads into the burnpot for foreign material.
7. Combustion blower is not spinning fast enough.	Test the RPM on the blower after the blades have been cleaned. The RPM should be approximately 3000 RPM.
8. Bad Pellets. (Applies to GLASS “SOOT’S” UP AT A VERY FAST RATE Only)	The brand of pellets or the batch of pellets that are being used may be of poor quality. If possible, try a different brand of pellets. You might also want to try a brand that is made from a different type of wood (softwood vs. hardwood). Different woods have different characteristics when being burned.

Parts List

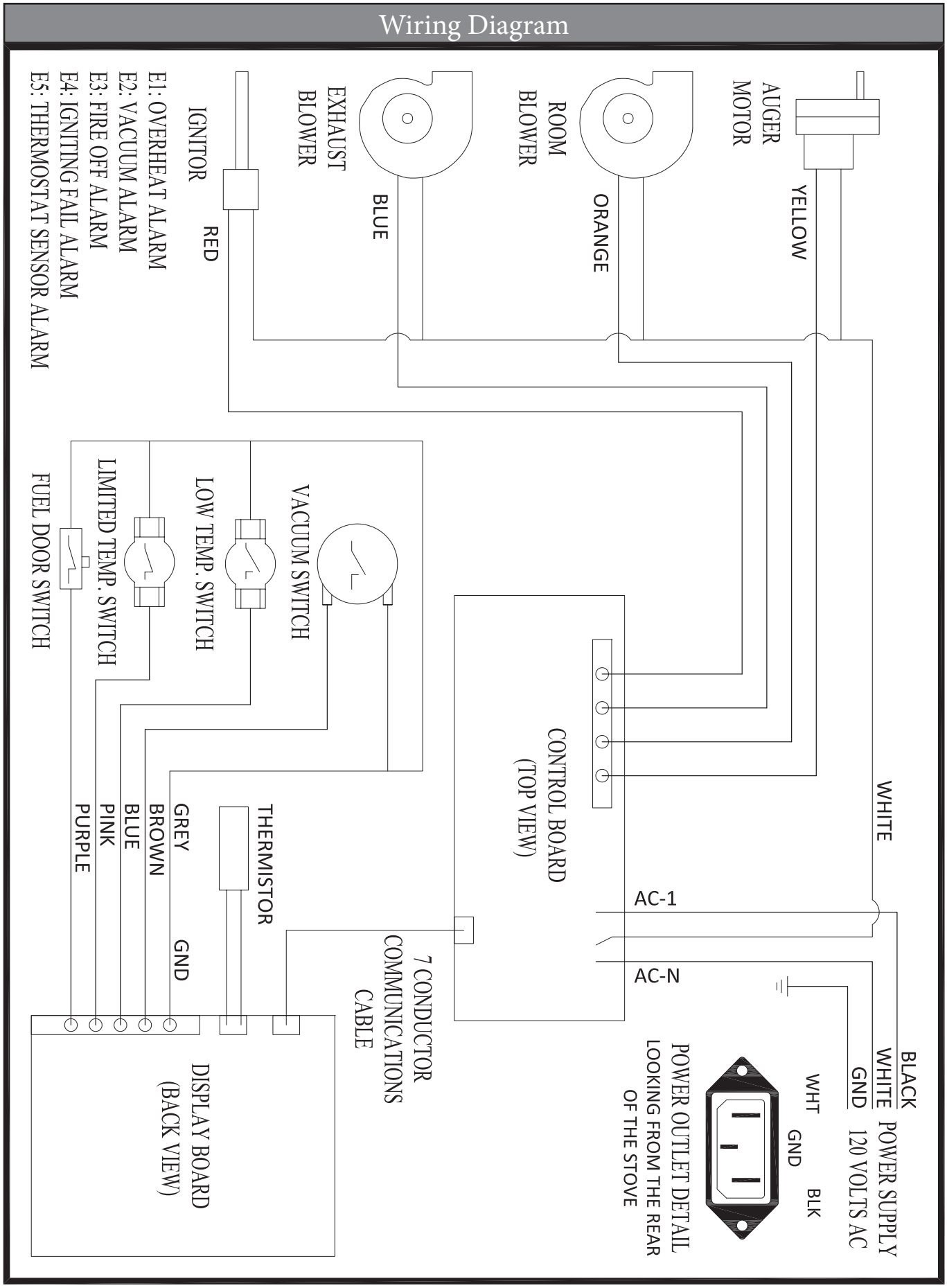
Key	Part No.	Description	Qty.
1	88161	Glass w/Gasket, Center	1
2	88162	Glass w/Gasket, Side	2
3	88082	Gasket, Door	6 ft
4	891994	Burn Pot	1
5	88163	Brick Panel - Center	1
6	88164	Brick Panel - Left	1
7	88165	Brick Panel - Right	1
8	891995	Magnet	4
9	891996	Ash Pan	1
10	891997	Latch, Ash Pan	2
11	891540	Latch, Door	4
12	80549	Pressure Switch	1
13	80599	Switch, Low-Temp	1
14	80601	Switch, Hi-Temp (w/Reset Button)	1
15	88166	Gasket, Exhaust Blower	1
16	80602	Blower, Exhaust	1
17	88167	Gasket, Convection Blower	1
18	80622	Blower, Convection	1
19	80604	Igniter	1
20	80676	PCB, Circuit Board	1
21	891998	Bushing	2
22	891999	Auger	1
23	80606	Motor, Auger	1
24	80491	Micro Switch	1
25	892199	Housing, PCBA Controller	1
26	80631	PCBA Board	1

IN ORDER TO MAINTAIN WARRANTY, COMPONENTS MUST BE REPLACED USING ORIGINAL MANUFACTURERS PARTS PURCHASED THROUGH YOUR DEALER OR DIRECTLY FROM THE APPLIANCE MANUFACTURER.
USE OF THIRD PARTY COMPONENTS WILL VOID THE WARRANTY.

Parts Diagram



Wiring Diagram



Limited Warranty

The operation of this wood heater in a manner inconsistent with the owner's manual will void your warranty and is also against federal regulations.

United States Stove Company warrants to the original purchaser its products against premature failure of any component due to workmanship, quality, or materials as follows:

TIME PERIOD:

Firebox	Three Years
Flue Collar - if equipped	Three Years
All Doors	Three Years
Firebox Baffle	One Year
Door Gaskets	One Year
All Electrical Components (Including Blower) - if equipped	One Year
Cabinet and Trim	One Year

CLAIM PROCEDURE

Any defects should be reported to United States Stove Company or its dealer and/or distributor giving descriptions and pertinent data, including proof or purchase which will be returned upon request.
Providing the heater has been installed and used in accordance with the Owners Manual supplied with the heater, United States Stove Company will either:

1) Replace the defective part free of charge
2) Replace the heater free of charge
3) Where the defect is of a cosmetic (non-functional) nature, United States Stove Company will bear reasonable expense to refurbish the heater, including such items as welding, painting, and incidental labor. A "Reasonable" is de□ned by terms of this warranty as $30.00/hour with full refund for any purchase of parts.

NOT COVERED

Speci□cally not covered under terms of this limited warranty or any other warranty are problems relating to smoking or creosote. Smoking is attributable to inadequate draft due to the design or installation of the □ue system or installation of the heater itself. Creosote formation is largely attributable to improper operation of the unit and/or draft as mentioned above. Also, not covered are:

1) Removal and re-installation cost.
2) Service calls to diagnose trouble (unless authorized in writing by the manufacturer, distributor, or dealer).
3) Painted surfaces, brass or brass-colored surfaces.
4) Damage or defect caused by improper installation, accidents, misuse, abuse (including over□ring) or alteration.
5) Transportation or shipping costs.

LIMITATIONS AND EXCLUSIONS

1) United States Stove Company shall not be liable for incidental, consequential, special, or contingent damages anyone might suffer as a result of their breach of this written warranty or any implied warranty.
2) Should the heater be replaced by United States Stove Company "free of charge", all further warranty obligations are thereby met.
3) Parts and/or service replacements made under the terms of this warranty are warranted only for the remaining period of the original heater warranty.
4) Without speci□c written exclusionary waivers, no one has authority to add to or vary this limited warranty, or to create for United States Stove Company any further obligation of liability in connection with this heater or any other applicable accessory. Any further warranty implication applicable to this heater or any applicable accessory is limited in duration to the same time period as the original statement in the above schedule.

YOUR DUTIES

1) This heater, including all applicable accessories, must be installed and operated in accordance with local authorities having jurisdiction and the instructions furnished with the Owners Manual.
2) You should keep as permanent record your proof of purchase (or canceled check or invoice).

PROBLEM/RESOLUTION

1) As purchaser, you must □rst contact the dealer and/or distributor from whom you purchased your heater.
2) If within a reasonable period of time you do not receive satisfactory service from the distributor and/or dealer, write or call United States Stove Company, Customer Service Department, including complete details of the problem and/or problems you are experiencing, details of your installation, your proof of purchase, and the heater serial number or test agency code number.

WARRANTOR

The warrantor of record is United States Stove Company, PO Box 151, 227 Industrial Drive, South Pittsburg, Tennessee 37380. Phone number 800-750-2723.

NOTE

This warranty gives you speci□c legal rights; and, you may also have other rights which vary from state to state.

IMPORTANT

Keep this warranty card for future reference.

We congratulate you on your selection of United States Stove Company and its products. As the oldest solid fuel manufacturer in the United States (since 1869), the United States Stove Company is very proud of its products, service, employees, and satis□ed customers. As President of United States Stove Company, I would like to hear from you if you are not satis□ed with the manner in which you have been handled by our distributor, dealer, representative, customer service department, parts department, or sales department. Please write me at the above address.

Sincerely

Richard Rogers, President

85989 I

How to Order Repair Parts

THIS MANUAL WILL HELP YOU OBTAIN EFFICIENT, DEPENDABLE SERVICE FROM YOUR PELLET STOVE, AND ENABLE YOU TO ORDER REPAIR PARTS CORRECTLY.

KEEP THIS MANUAL IN A SAFE PLACE FOR FUTURE REFERENCE.

WHEN WRITING, ALWAYS GIVE THE FULL MODEL NUMBER WHICH IS ON THE NAMEPLATE ATTACHED TO THE HEATER.

WHEN ORDERING REPAIR PARTS, ALWAYS GIVE THE FOLLOWING INFORMATION AS SHOWN IN THIS LIST:

1. THE PART NUMBER
2. THE PART DESCRIPTION
3. THE MODEL NUMBER: _____
4. THE SERIAL NUMBER: _____

227 Industrial Park Road, South Pittsburg, TN 37380
www.usstove.com
1-800-750-2723

Section 6

Test Data by Run

Run 1

Pellet Heater Test Results - ASTM E2779 / ASTM E2515

Manufacturer: US Stove
Model: 5660
Project No.: 0215PS032E
Tracking No.: 2128
Run: 1
Test Date: 08/06/15

Burn Rate (Composite)	**1.16 kg/hr dry**
Average Tunnel Temperature	117 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	13.63 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8672.5 dscf/hour
Average Delta p	0.049 inches H20
Average Delta H	0.83 inches H20
Total Time of Test	362 minutes

Burn Rate (High)	**2.01** kg/hr dry
Burn Rate (Med)	**1.10** kg/hr dry 54.9% of High
Burn Rate (Low)	**0.91** kg/hr dry 45.2% of High

	AMBIENT	SAMPLE TRAIN 1	SAMPLE TRAIN 2	FIRST HOUR FILTER (TRAIN 1)
Total Sample Volume - Vm	0.000 cubic feet	47.113 cubic feet	46.372 cubic feet	8.076 cubic feet
Average Gas Meter Temperature	80 degrees Fahrenheit	91 degrees Fahrenheit	91 degrees Fahrenheit	82 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	0.000 dscf	45.496 dscf	44.889 dscf	7.926 dscf
Total Particulates - m_n	0 mg	10.7 mg	9.3 mg	1.9 mg
Particulate Concentration (dry-standard) - C_r/C_s	0.000000 grams/dscf	0.00024 grams/dscf	0.00021 grams/dscf	0.00024 grams/dscf
Total Particulate Emissions - E_T	0.00 grams	12.31 grams	10.84 grams	2.08 grams
Particulate Emission Rate	0.00 grams/hour	2.04 grams/hour	1.80 grams/hour	2.08 grams/hour
Emissisons Factor		1.76 g/kg	1.55 g/kg	1.05 g/kg
Difference from Average Total Particulate Emissions		0.73 grams	0.73 grams	

Dual Train Comparison Results Are Acceptable

FINAL AVERAGE RESULTS

Integrated Test Run	
Total Particulate Emissions - E_T	11.57 grams
Particulate Emission Rate	**1.92 grams/hour**
Emissisons Factor	1.65 grams/kg
First Hour Emissions	
Total Particulate Emissions - E_T	2.08 grams
Particulate Emission Rate	2.08 grams/hour
Emissisons Factor	1.05 grams/kg

Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: US Stove
Model: 5660
Tracking No.: 2128
Project No.: 0215PS032E
Test Date: 06-Aug-15
Beginning Clock Time: 09:59

High Burn End Time: 62
Medium Burn End Time: 182
Total Sampling Time: 362 min
Recording Interval: 1 min
Background Sample Volume: 0 cubic feet

PM Control Modules: 335/336
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.78 lb/lb-mole
Dilution Tunnel H2O: 2.00 percent
Dilution Tunnel Static: -0.440 "H2O
Tunnel Area: 0.19635 ft2
Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.63 ft/sec.
Intial Tunnel Flow: 143.8 scfm
Average Tunnel Flow: 144.5 scfm
Post-Test Leak Check (1): 0.002 cfm @ -2 in. Hg
Post-Test Leak Check (2): 0.001 cfm @ -2 in. Hg
Fuel Moisture: 5.1 Dry Basis %

Meter Box Y Factor: 1.001 (1) 1.003 (2) N/A (Amb)

Barometric Pressure: Begin 30.06, Middle 30.08, End 30.1, Average 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 132, 185, 209, 335, 336, 410, 420, 559

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center	
Initial dP	0.037	0.047	0.045	0.032	0.033	0.049	0.050	0.028	0.052	"H2O
Temp:	136	136	136	136	136	136	136	136	136	°F

V_{strav} 14.23 ft/sec V_{scent} 16.03 ft/sec F_p 0.888

	Particulate Sampling Data														Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data		
Elapsed Time (min)	Gas Meter 1 (ft^3)	Gas Meter 2 (ft^3)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H_2O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H_2O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H_2O)	CO_2 (%)	CO (%)
0	0.000	0.000			0.03	78	0.12	0.44	78	0.9	136	0.052			29.1		426	76	76	75	-0.040	4.6	0
1	0.110	0.121	0.11	0.12	0.91	78	1.58	0.72	78	0.9	136	0.050	87	98	29.1	0	430	77	77	75	-0.042	3.6	0
2	0.244	0.254	0.13	0.13	0.92	78	1.59	0.73	78	0.9	136	0.051	105	106	29.0	-0.1	430	78	78	75	-0.043	4.1	0
3	0.380	0.387	0.14	0.13	0.92	78	1.59	0.73	78	0.9	136	0.049	109	108	28.9	-0.1	430	78	78	75	-0.041	4.1	0
4	0.514	0.520	0.13	0.13	0.92	78	1.59	0.73	78	0.9	136	0.048	109	109	28.8	-0.1	434	79	78	75	-0.043	4	0
5	0.648	0.654	0.13	0.13	0.92	78	1.6	0.72	78	0.9	136	0.049	107	109	28.8	0	425	79	79	75	-0.042	3.4	0
6	0.784	0.787	0.14	0.13	0.92	78	1.59	0.73	78	0.9	136	0.049	109	108	28.7	-0.1	428	79	79	76	-0.044	3.5	0
7	0.918	0.920	0.13	0.13	0.92	78	1.6	0.73	78	0.9	136	0.049	107	108	28.7	0	427	80	79	75	-0.044	3.7	0
8	1.053	1.053	0.14	0.13	0.92	78	1.59	0.73	78	1	136	0.050	107	107	28.6	-0.1	424	80	79	75	-0.043	4.4	0
9	1.188	1.187	0.14	0.13	0.92	78	1.6	0.73	79	1	136	0.051	106	107	28.5	-0.1	428	80	80	75	-0.043	4.8	0
10	1.323	1.320	0.14	0.13	0.91	79	1.6	0.73	79	0.9	137	0.048	109	109	28.5	0	428	81	80	75	-0.042	4.7	0
11	1.457	1.454	0.13	0.13	0.92	79	1.59	0.73	79	0.9	137	0.051	105	107	28.4	-0.1	436	81	80	76	-0.043	5	0
12	1.593	1.587	0.14	0.13	0.92	79	1.59	0.73	79	1	137	0.049	109	108	28.3	-0.1	434	81	80	76	-0.043	4.2	0
13	1.727	1.720	0.13	0.13	0.91	79	1.59	0.73	79	1	138	0.048	109	109	28.2	-0.1	442	81	81	75	-0.043	4.9	0
14	1.862	1.854	0.14	0.13	0.92	79	1.59	0.72	79	1	138	0.051	106	107	28.1	-0.1	442	82	81	76	-0.044	3.6	0
15	1.997	1.987	0.14	0.13	0.92	79	1.59	0.73	80	1	138	0.051	106	106	28.0	-0.1	444	82	81	76	-0.043	4.4	0
16	2.131	2.120	0.13	0.13	0.91	80	1.59	0.72	80	1	138	0.050	106	107	28.0	0	435	82	81	76	-0.044	3.3	0
17	2.266	2.253	0.14	0.13	0.91	80	1.59	0.73	80	1	137	0.049	108	108	27.9	-0.1	435	82	81	76	-0.045	3.5	0
18	2.401	2.387	0.14	0.13	0.91	80	1.59	0.72	80	1	138	0.050	107	108	27.8	-0.1	446	82	81	76	-0.045	5.7	0
19	2.535	2.519	0.13	0.13	0.91	80	1.59	0.72	80	1	138	0.049	107	107	27.8	0	445	83	82	76	-0.045	4.9	0
20	2.670	2.653	0.14	0.13	0.91	80	1.58	0.73	81	1	138	0.048	109	110	27.7	-0.1	438	83	82	76	-0.042	4.8	0
21	2.805	2.786	0.14	0.13	0.92	81	1.59	0.72	81	1	138	0.050	107	107	27.6	-0.1	439	83	82	76	-0.043	4.4	0
22	2.940	2.919	0.14	0.13	0.91	81	1.59	0.73	81	1	138	0.050	107	107	27.5	-0.1	436	83	82	76	-0.042	4.8	0
23	3.074	3.053	0.13	0.13	0.91	81	1.59	0.72	81	1	138	0.050	106	108	27.5	0	441	83	82	76	-0.044	4.3	0
24	3.209	3.186	0.14	0.13	0.91	81	1.6	0.73	81	1	138	0.049	108	108	27.4	-0.1	435	83	82	76	-0.044	3.5	0
25	3.344	3.320	0.14	0.13	0.90	82	1.6	0.72	82	1	138	0.051	106	106	27.3	-0.1	440	84	83	76	-0.044	4.2	0
26	3.478	3.452	0.13	0.13	0.91	82	1.59	0.73	82	1	138	0.050	106	106	27.3	0	441	84	83	76	-0.044	4.4	0
27	3.613	3.587	0.14	0.14	0.91	82	1.6	0.72	82	1	137	0.051	105	107	27.2	-0.1	435	84	83	76	-0.044	3.6	0
28	3.748	3.719	0.14	0.13	0.91	82	1.59	0.72	82	1	137	0.050	106	106	27.1	-0.1	432	84	83	76	-0.044	4.1	0
29	3.883	3.853	0.14	0.13	0.91	82	1.59	0.72	82	1	137	0.051	105	106	27.0	-0.1	435	84	83	76	-0.044	4.5	0
30	4.018	3.986	0.14	0.13	0.91	83	1.6	0.72	83	1	138	0.051	105	105	27.0	0	438	84	83	76	-0.044	4.9	0
31	4.153	4.119	0.14	0.13	0.91	83	1.59	0.73	83	1	138	0.049	107	107	26.9	-0.1	441	84	83	76	-0.043	5.4	0
32	4.288	4.253	0.14	0.13	0.91	83	1.59	0.72	83	1	138	0.049	107	108	26.8	-0.1	444	84	83	76	-0.044	4.8	0
33	4.422	4.386	0.13	0.13	0.91	83	1.59	0.73	83	1	139	0.049	107	108	26.7	-0.1	445	84	83	76	-0.043	5	0
34	4.558	4.520	0.14	0.13	0.91	83	1.6	0.72	83	1	139	0.050	107	107	26.6	-0.1	449	84	83	77	-0.044	4.3	0
35	4.693	4.653	0.14	0.13	0.91	84	1.6	0.72	84	1	139	0.050	106	106	26.5	-0.1	450	85	83	76	-0.045	4.1	0
36	4.827	4.787	0.13	0.13	0.92	84	1.6	0.72	84	1	139	0.050	105	107	26.4	-0.1	454	85	83	76	-0.045	4.5	0

Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: US Stove
Model: 5660
Tracking No.: 2128
Project No.: 0215PS032E
Test Date: 06-Aug-15
Beginning Clock Time: 09:59

High Burn End Time: 62
Medium Burn End Time: 182
Total Sampling Time: 362 min
Recording Interval: 1 min
Background Sample Volume: 0 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) N/A (Amb)

Barometric Pressure: Begin 30.06 Middle 30.08 End 30.1 Average 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 132, 185, 209, 335, 336, 410, 420, 559

PM Control Modules: 335/336
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.78 lb/lb-mole
Dilution Tunnel H2O: 2.00 percent
Dilution Tunnel Static: -0.440 "H2O
Tunnel Area: 0.19635 ft2
Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.63 ft/sec.
Intial Tunnel Flow: 143.8 scfm
Average Tunnel Flow: 144.5 scfm
Post-Test Leak Check (1): 0.002 cfm @ -2 in. Hg
Post-Test Leak Check (2): 0.001 cfm @ -2 in. Hg
Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center	
Initial dP	0.037	0.047	0.045	0.032	0.033	0.049	0.050	0.028	0.052	"H2O
Temp:	136	136	136	136	136	136	136	136	136	°F

V_{strav} 14.23 ft/sec V_{scent} 16.03 ft/sec F_p 0.888

	Particulate Sampling Data														Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data		
Elapsed Time (min)	Gas Meter 1 (ft^3)	Gas Meter 2 (ft^3)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H_2O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H_2O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H_2O)	CO_2 (%)	CO (%)
37	4.963	4.920	0.14	0.13	0.91	84	1.6	0.72	84	1	140	0.050	107	106	26.3	-0.1	455	85	83	77	-0.046	4.5	0
38	5.098	5.053	0.14	0.13	0.91	84	1.6	0.72	84	1	139	0.050	106	106	26.3	0	447	85	83	76	-0.045	3.6	0
39	5.233	5.187	0.14	0.13	0.91	84	1.6	0.72	84	1	139	0.051	105	106	26.2	-0.1	449	85	84	77	-0.045	5.1	0
40	5.369	5.321	0.14	0.13	0.92	84	1.59	0.73	85	1	139	0.049	108	108	26.1	-0.1	443	85	84	76	-0.042	4.6	0
41	5.504	5.455	0.14	0.13	0.91	85	1.6	0.72	85	1	139	0.050	106	107	26.1	0	447	85	84	76	-0.044	4.9	0
42	5.638	5.588	0.13	0.13	0.91	85	1.6	0.72	85	1	140	0.048	108	108	26.0	-0.1	453	85	84	76	-0.044	5.7	0
43	5.774	5.722	0.14	0.13	0.92	85	1.59	0.72	85	1	140	0.051	106	106	25.9	-0.1	449	85	84	76	-0.043	5.1	0
44	5.910	5.855	0.14	0.13	0.91	85	1.6	0.72	85	1	140	0.049	108	107	25.8	-0.1	445	85	84	76	-0.043	4.1	0
45	6.045	5.988	0.14	0.13	0.91	85	1.6	0.72	85	1	139	0.051	105	105	25.7	-0.1	441	85	84	77	-0.045	3.8	0
46	6.180	6.123	0.14	0.14	0.91	85	1.61	0.72	85	1	140	0.050	106	108	25.7	0	451	85	84	77	-0.046	4.3	0
47	6.316	6.256	0.14	0.13	0.90	85	1.6	0.73	86	1	140	0.050	107	106	25.6	-0.1	453	85	84	76	-0.045	4.7	0
48	6.451	6.390	0.14	0.13	0.90	86	1.61	0.72	86	1	140	0.050	106	107	25.5	-0.1	452	85	84	76	-0.046	4.2	0
49	6.586	6.523	0.14	0.13	0.91	86	1.6	0.72	86	1	140	0.051	105	105	25.4	-0.1	446	85	84	77	-0.044	4	0
50	6.722	6.657	0.14	0.13	0.90	86	1.61	0.72	86	1	140	0.048	109	109	25.4	0	450	85	84	77	-0.046	4.7	0
51	6.857	6.790	0.14	0.13	0.90	86	1.6	0.72	86	1	140	0.048	108	108	25.3	-0.1	445	85	84	77	-0.045	4.6	0
52	6.992	6.923	0.14	0.13	0.91	86	1.6	0.72	86	1	140	0.048	108	108	25.2	-0.1	450	85	84	77	-0.046	5.3	0
53	7.127	7.057	0.14	0.13	0.91	86	1.6	0.72	86	1	140	0.049	107	108	25.1	-0.1	455	85	84	77	-0.044	5.6	0
54	7.263	7.190	0.14	0.13	0.91	86	1.6	0.72	86	1	141	0.050	107	106	25.0	-0.1	453	86	84	77	-0.044	5.1	0
55	7.398	7.324	0.14	0.13	0.91	87	1.6	0.72	87	1	140	0.051	105	106	24.9	-0.1	450	86	84	77	-0.044	4.4	0
56	7.533	7.457	0.14	0.13	0.91	87	1.6	0.72	87	1	140	0.049	107	107	24.8	-0.1	450	86	84	77	-0.043	4.5	0
57	7.670	7.592	0.14	0.14	0.91	87	1.61	0.72	87	1	141	0.050	107	107	24.7	-0.1	451	86	84	77	-0.047	3.9	0
58	7.805	7.724	0.14	0.13	0.90	87	1.6	0.72	87	1	141	0.050	106	105	24.7	0	460	86	84	77	-0.046	5.1	0
59	7.940	7.858	0.14	0.13	0.91	87	1.6	0.72	87	1	141	0.049	107	108	24.6	-0.1	457	86	84	77	-0.046	4.3	0
60	8.076	7.992	0.14	0.13	0.91	87	1.61	0.72	87	1	141	0.050	107	107	24.5	-0.1	453	86	85	77	-0.046	4.5	0
61	8.211	8.125	0.14	0.13	0.89	87	1.63	0.72	87	1	140	0.050	106	106	24.4	-0.1	449	79	84	77	-0.046	4.3	0
62	8.345	8.259	0.13	0.13	0.89	87	1.63	0.72	87	1	132	0.052	102	104	24.3	-0.1	426	79	84	77	-0.047	4.8	0
63	8.479	8.392	0.13	0.13	0.89	88	1.64	0.72	87	1	125	0.051	102	103	24.3	0	404	80	84	78	-0.047	3.4	0
64	8.614	8.527	0.14	0.14	0.89	88	1.64	0.72	88	1	121	0.051	103	104	24.3	0	389	80	84	78	-0.045	3.7	0
65	8.748	8.659	0.13	0.13	0.89	88	1.63	0.72	88	1	119	0.052	101	101	24.2	-0.1	386	80	84	78	-0.046	4.7	0
66	8.882	8.793	0.13	0.13	0.89	88	1.64	0.72	88	1	117	0.051	102	103	24.2	0	373	80	84	77	-0.044	2.5	0
67	9.017	8.926	0.14	0.13	0.89	88	1.64	0.71	88	1	116	0.051	102	102	24.2	0	374	80	84	78	-0.045	4.9	0
68	9.151	9.059	0.13	0.13	0.88	88	1.65	0.71	88	1	115	0.051	102	102	24.1	-0.1	368	81	84	78	-0.046	3	0
69	9.285	9.192	0.13	0.13	0.89	88	1.65	0.71	88	1	115	0.051	102	102	24.1	0	369	81	84	78	-0.045	5	0
70	9.420	9.325	0.14	0.13	0.88	88	1.64	0.71	88	1	115	0.051	102	102	24.1	0	372	81	84	78	-0.046	4.4	0
71	9.553	9.458	0.13	0.13	0.89	88	1.65	0.71	88	1	114	0.051	101	102	24.0	-0.1	365	81	84	78	-0.044	3.5	0
72	9.688	9.590	0.14	0.13	0.89	88	1.65	0.71	88	1	114	0.051	102	101	24.0	0	371	81	83	78	-0.046	4.4	0
73	9.821	9.723	0.13	0.13	0.88	88	1.65	0.71	88	1	113	0.053	99	100	24.0	0	365	81	83	78	-0.045	3.6	0

Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: US Stove
Model: 5660
Tracking No.: 2128
Project No.: 0215PS032E
Test Date: 06-Aug-15
Beginning Clock Time: 09:59

High Burn End Time: 62
Medium Burn End Time: 182
Total Sampling Time: 362 min
Recording Interval: 1 min
Background Sample Volume: 0 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) N/A (Amb)

Barometric Pressure: Begin 30.06 Middle 30.08 End 30.1 Average 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 132, 185, 209, 335, 336, 410, 420, 559

PM Control Modules: 335/336
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.78 lb/lb-mole
Dilution Tunnel H2O: 2.00 percent
Dilution Tunnel Static: -0.440 "H2O
Tunnel Area: 0.19635 ft2
Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.63 ft/sec.
Intial Tunnel Flow: 143.8 scfm
Average Tunnel Flow: 144.5 scfm
Post-Test Leak Check (1): 0.002 cfm @ -2 in. Hg
Post-Test Leak Check (2): 0.001 cfm @ -2 in. Hg
Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center	
Initial dP	0.037	0.047	0.045	0.032	0.033	0.049	0.050	0.028	0.052	"H2O
Temp:	136	136	136	136	136	136	136	136	136	°F

V_{strav} 14.23 ft/sec V_{scent} 16.03 ft/sec F_p 0.888

	Particulate Sampling Data														Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data		
Elapsed Time (min)	Gas Meter 1 (ft^3)	Gas Meter 2 (ft^3)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H_2O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H_2O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H_2O)	CO_2 (%)	CO (%)
74	9.955	9.854	0.13	0.13	0.88	88	1.66	0.71	88	1	113	0.052	100	100	24.0	0	367	81	83	78	-0.045	3.8	0
75	10.090	9.987	0.14	0.13	0.87	89	1.65	0.70	88	1	113	0.049	104	104	23.9	-0.1	361	81	83	78	-0.043	3.1	0
76	10.223	10.119	0.13	0.13	0.88	89	1.66	0.70	89	1	113	0.051	100	101	23.9	0	365	81	83	78	-0.045	3.5	0
77	10.356	10.252	0.13	0.13	0.88	89	1.66	0.70	89	1	113	0.051	100	102	23.8	-0.1	367	81	83	78	-0.045	3.6	0
78	10.491	10.383	0.14	0.13	0.88	89	1.66	0.70	89	1	113	0.051	102	100	23.8	0	365	81	83	77	-0.044	4.9	0
79	10.624	10.516	0.13	0.13	0.88	89	1.66	0.70	89	1	112	0.051	100	102	23.7	-0.1	364	81	83	78	-0.044	2.9	0
80	10.758	10.647	0.13	0.13	0.88	89	1.66	0.70	89	1	112	0.050	102	101	23.7	0	363	81	82	77	-0.044	4.5	0
81	10.892	10.779	0.13	0.13	0.88	89	1.67	0.70	89	1	113	0.051	101	101	23.7	0	361	81	82	77	-0.045	2.9	0
82	11.024	10.910	0.13	0.13	0.88	89	1.67	0.70	89	1	113	0.050	101	101	23.6	-0.1	363	81	82	77	-0.044	4.1	0
83	11.159	11.043	0.14	0.13	0.87	89	1.68	0.70	89	1	114	0.050	103	103	23.5	-0.1	370	81	82	78	-0.045	3.8	0
84	11.292	11.173	0.13	0.13	0.88	89	1.67	0.69	89	1	113	0.051	100	100	23.5	0	364	82	82	77	-0.043	3.5	0
85	11.425	11.305	0.13	0.13	0.87	89	1.68	0.69	89	1	113	0.051	100	101	23.5	0	363	82	82	78	-0.044	3.3	0
86	11.559	11.436	0.13	0.13	0.88	89	1.68	0.69	89	1	113	0.050	102	101	23.4	-0.1	359	82	82	78	-0.043	3	0
87	11.692	11.567	0.13	0.13	0.87	89	1.68	0.69	89	1	113	0.052	100	99	23.4	0	360	82	82	78	-0.043	3.9	0
88	11.825	11.698	0.13	0.13	0.87	89	1.68	0.69	89	1.1	113	0.052	100	99	23.4	0	358	82	82	77	-0.044	2.9	0
89	11.958	11.829	0.13	0.13	0.87	89	1.68	0.68	89	1	113	0.049	103	102	23.3	-0.1	357	82	82	78	-0.043	4.3	0
90	12.090	11.960	0.13	0.13	0.87	89	1.68	0.69	89	1.1	113	0.051	100	100	23.3	0	356	82	82	78	-0.044	2.8	0
91	12.224	12.090	0.13	0.13	0.87	89	1.68	0.68	89	1	112	0.050	102	101	23.3	0	355	82	82	78	-0.043	4	0
92	12.356	12.221	0.13	0.13	0.86	89	1.69	0.68	89	1.1	113	0.051	100	100	23.2	-0.1	358	82	82	78	-0.044	2.7	0
93	12.489	12.351	0.13	0.13	0.87	90	1.68	0.68	89	1.1	113	0.049	102	102	23.1	-0.1	356	82	82	78	-0.043	4.3	0
94	12.622	12.482	0.13	0.13	0.86	90	1.69	0.68	89	1.1	113	0.051	100	100	23.1	0	362	82	82	79	-0.044	4	0
95	12.754	12.612	0.13	0.13	0.86	90	1.69	0.68	89	1.1	113	0.050	101	101	23.1	0	358	82	82	78	-0.043	3.9	0
96	12.887	12.742	0.13	0.13	0.86	90	1.69	0.67	89	1.1	113	0.050	101	101	23.0	-0.1	362	82	82	78	-0.044	3.7	0
97	13.018	12.871	0.13	0.13	0.86	90	1.7	0.68	89	1.1	113	0.048	102	102	23.0	0	358	82	82	79	-0.043	3.1	0
98	13.152	13.001	0.13	0.13	0.86	90	1.7	0.68	89	1.1	113	0.051	101	100	22.9	-0.1	359	82	82	79	-0.043	3.7	0
99	13.283	13.132	0.13	0.13	0.86	90	1.71	0.67	89	1.1	113	0.049	101	102	22.9	0	356	82	82	79	-0.043	3.1	0
100	13.415	13.260	0.13	0.13	0.86	90	1.7	0.67	89	1.1	113	0.050	101	99	22.8	-0.1	355	82	82	79	-0.042	4.1	0
101	13.547	13.390	0.13	0.13	0.85	90	1.71	0.67	89	1.1	113	0.050	101	101	22.8	0	355	83	82	79	-0.044	3	0
102	13.679	13.519	0.13	0.13	0.86	90	1.7	0.67	89	1.1	113	0.051	100	99	22.7	-0.1	354	83	82	79	-0.043	4	0
103	13.811	13.648	0.13	0.13	0.84	90	1.71	0.67	90	1.1	113	0.052	99	98	22.7	0	355	83	82	79	-0.043	3.3	0
104	13.942	13.778	0.13	0.13	0.85	90	1.72	0.66	90	1.1	113	0.049	101	102	22.7	0	358	83	82	79	-0.043	4.6	0
105	14.074	13.905	0.13	0.13	0.85	90	1.72	0.66	90	1.1	113	0.051	100	97	22.6	-0.1	361	83	82	79	-0.045	3.4	0
106	14.205	14.034	0.13	0.13	0.85	90	1.72	0.66	90	1.1	114	0.049	101	101	22.6	0	360	83	82	79	-0.043	3.9	0
107	14.337	14.163	0.13	0.13	0.85	90	1.73	0.66	90	1.1	114	0.048	103	102	22.5	-0.1	361	83	82	79	-0.043	3.8	0
108	14.467	14.291	0.13	0.13	0.84	90	1.72	0.66	90	1.1	114	0.050	99	99	22.4	-0.1	363	83	82	79	-0.045	3.5	0
109	14.599	14.419	0.13	0.13	0.85	90	1.72	0.65	90	1.1	114	0.051	100	98	22.4	0	364	83	82	79	-0.043	4.6	0
110	14.729	14.547	0.13	0.13	0.84	90	1.73	0.66	90	1.1	114	0.051	98	98	22.4	0	362	83	82	79	-0.045	2.7	0

Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: US Stove
Model: 5660
Tracking No.: 2128
Project No.: 0215PS032E
Test Date: 06-Aug-15
Beginning Clock Time: 09:59

High Burn End Time: 62
Medium Burn End Time: 182
Total Sampling Time: 362 min
Recording Interval: 1 min
Background Sample Volume: 0 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) N/A (Amb)

Barometric Pressure: Begin 30.06 Middle 30.08 End 30.1 Average 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 132, 185, 209, 335, 336, 410, 420, 559

PM Control Modules: 335/336
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.78 lb/lb-mole
Dilution Tunnel H2O: 2.00 percent
Dilution Tunnel Static: -0.440 "H2O
Tunnel Area: 0.19635 ft2
Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.63 ft/sec.
Intial Tunnel Flow: 143.8 scfm
Average Tunnel Flow: 144.5 scfm
Post-Test Leak Check (1): 0.002 cfm @ -2 in. Hg
Post-Test Leak Check (2): 0.001 cfm @ -2 in. Hg
Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center	
Initial dP	0.037	0.047	0.045	0.032	0.033	0.049	0.050	0.028	0.052	"H2O
Temp:	136	136	136	136	136	136	136	136	136	°F

V_{strav} 14.23 ft/sec V_{scent} 16.03 ft/sec F_p 0.888

	Particulate Sampling Data														Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data		
Elapsed Time (min)	Gas Meter 1 (ft^3)	Gas Meter 2 (ft^3)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H_2O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H_2O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H_2O)	CO_2 (%)	CO (%)
111	14.861	14.674	0.13	0.13	0.84	90	1.74	0.65	90	1.1	114	0.051	100	97	22.3	-0.1	367	83	82	79	-0.044	4.8	0
112	14.991	14.802	0.13	0.13	0.83	90	1.74	0.65	90	1.1	115	0.050	99	99	22.3	0	369	83	82	78	-0.046	3.5	0
113	15.122	14.930	0.13	0.13	0.83	90	1.74	0.65	90	1.1	114	0.049	101	100	22.2	-0.1	363	83	83	78	-0.042	4.5	0
114	15.252	15.057	0.13	0.13	0.83	90	1.74	0.65	90	1.1	114	0.049	100	99	22.2	0	363	83	83	79	-0.045	2.6	0
115	15.383	15.184	0.13	0.13	0.84	91	1.74	0.65	90	1.1	114	0.049	101	99	22.1	-0.1	361	83	83	79	-0.044	4.3	0
116	15.513	15.311	0.13	0.13	0.83	91	1.75	0.65	90	1.1	114	0.051	98	97	22.1	0	367	83	83	79	-0.045	3.8	0
117	15.644	15.437	0.13	0.13	0.83	91	1.75	0.64	90	1.1	114	0.048	102	100	22.1	0	361	83	83	78	-0.044	3.5	0
118	15.773	15.564	0.13	0.13	0.83	91	1.75	0.64	90	1.1	114	0.047	101	101	22.0	-0.1	364	83	83	79	-0.044	4	0
119	15.904	15.691	0.13	0.13	0.83	91	1.75	0.64	90	1.1	114	0.051	99	97	22.0	0	359	83	83	79	-0.043	3	0
120	16.033	15.818	0.13	0.13	0.83	91	1.76	0.64	90	1.1	114	0.048	100	100	21.9	-0.1	361	83	83	79	-0.044	3.7	0
121	16.163	15.943	0.13	0.13	0.83	91	1.76	0.64	90	1.1	114	0.050	99	97	21.9	0	352	83	83	79	-0.044	2.7	0
122	16.292	16.070	0.13	0.13	0.83	91	1.77	0.64	90	1.2	114	0.048	100	100	21.8	-0.1	365	83	83	79	-0.044	5.1	0
123	16.423	16.196	0.13	0.13	0.82	91	1.78	0.64	90	1.1	114	0.049	101	98	21.8	0	363	83	83	79	-0.045	3.2	0
124	16.551	16.322	0.13	0.13	0.82	91	1.77	0.63	90	1.2	114	0.048	99	100	21.8	0	365	83	83	80	-0.043	5	0
125	16.682	16.447	0.13	0.13	0.82	91	1.77	0.64	90	1.2	115	0.047	103	100	21.7	-0.1	365	83	83	80	-0.045	3.3	0
126	16.810	16.573	0.13	0.13	0.82	91	1.77	0.64	90	1.2	115	0.049	98	99	21.7	0	362	83	83	80	-0.043	4.1	0
127	16.940	16.699	0.13	0.13	0.82	91	1.78	0.63	90	1.2	114	0.050	99	97	21.6	-0.1	361	83	83	79	-0.044	3.3	0
128	17.070	16.824	0.13	0.13	0.82	91	1.78	0.63	90	1.2	114	0.050	99	97	21.6	0	358	83	83	80	-0.043	3.6	0
129	17.198	16.949	0.13	0.13	0.82	91	1.79	0.63	90	1.2	114	0.050	97	97	21.5	-0.1	364	83	83	80	-0.044	4.1	0
130	17.328	17.074	0.13	0.13	0.82	91	1.79	0.62	90	1.2	114	0.049	100	98	21.5	0	357	83	83	80	-0.042	3	0
131	17.456	17.199	0.13	0.13	0.82	91	1.79	0.63	90	1.2	114	0.050	97	97	21.5	0	358	83	83	80	-0.043	3.7	0
132	17.585	17.324	0.13	0.13	0.81	91	1.79	0.62	91	1.2	114	0.051	97	96	21.4	-0.1	355	84	83	79	-0.044	2.8	0
133	17.713	17.449	0.13	0.13	0.81	91	1.8	0.62	91	1.2	114	0.049	98	98	21.4	0	363	84	83	79	-0.044	5	0
134	17.842	17.573	0.13	0.12	0.80	91	1.8	0.62	91	1.2	114	0.050	98	96	21.3	-0.1	362	84	83	79	-0.045	3.2	0
135	17.971	17.697	0.13	0.12	0.81	91	1.8	0.62	91	1.2	114	0.051	97	95	21.3	0	360	84	83	80	-0.043	4.2	0
136	18.098	17.821	0.13	0.12	0.81	91	1.8	0.62	91	1.2	115	0.048	99	98	21.2	-0.1	360	84	83	79	-0.043	2.7	0
137	18.227	17.946	0.13	0.13	0.81	91	1.8	0.62	91	1.2	114	0.051	97	96	21.2	0	355	84	83	80	-0.042	3.5	0
138	18.355	18.070	0.13	0.12	0.80	91	1.8	0.61	91	1.2	114	0.049	98	97	21.2	0	359	84	83	80	-0.044	3.5	0
139	18.483	18.193	0.13	0.12	0.80	91	1.81	0.62	91	1.2	114	0.051	96	94	21.1	-0.1	359	84	83	80	-0.043	3.7	0
140	18.612	18.317	0.13	0.12	0.81	91	1.81	0.61	91	1.2	115	0.048	100	98	21.1	0	361	84	83	80	-0.043	3.5	0
141	18.738	18.440	0.13	0.12	0.80	91	1.82	0.61	91	1.2	114	0.048	98	97	21.0	-0.1	354	84	83	79	-0.042	2.9	0
142	18.867	18.564	0.13	0.12	0.79	92	1.82	0.61	91	1.2	114	0.048	100	98	21.0	0	358	84	83	80	-0.043	3.8	0
143	18.994	18.687	0.13	0.12	0.80	92	1.82	0.61	91	1.2	114	0.049	97	96	21.0	0	350	84	83	80	-0.042	2.8	0
144	19.122	18.810	0.13	0.12	0.80	92	1.82	0.61	91	1.2	114	0.049	98	96	20.9	-0.1	357	84	83	80	-0.043	4.2	0
145	19.250	18.934	0.13	0.12	0.80	92	1.83	0.60	91	1.2	114	0.050	97	96	20.9	0	358	84	83	79	-0.044	3.3	0
146	19.376	19.056	0.13	0.12	0.80	92	1.82	0.61	91	1.2	114	0.049	97	95	20.8	-0.1	358	84	83	80	-0.043	4.2	0
147	19.504	19.179	0.13	0.12	0.79	92	1.82	0.60	91	1.2	115	0.048	99	97	20.7	-0.1	362	84	83	79	-0.043	3.8	0

Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: US Stove
Model: 5660
Tracking No.: 2128
Project No.: 0215PS032E
Test Date: 06-Aug-15
Beginning Clock Time: 09:59

High Burn End Time: 62
Medium Burn End Time: 182
Total Sampling Time: 362 min
Recording Interval: 1 min
Background Sample Volume: 0 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) N/A (Amb)

Barometric Pressure: Begin 30.06 Middle 30.08 End 30.1 Average 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 132, 185, 209, 335, 336, 410, 420, 559

PM Control Modules: 335/336
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.78 lb/lb-mole
Dilution Tunnel H2O: 2.00 percent
Dilution Tunnel Static: -0.440 "H2O
Tunnel Area: 0.19635 ft2
Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.63 ft/sec.
Intial Tunnel Flow: 143.8 scfm
Average Tunnel Flow: 144.5 scfm
Post-Test Leak Check (1): 0.002 cfm @ -2 in. Hg
Post-Test Leak Check (2): 0.001 cfm @ -2 in. Hg
Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center	
Initial dP	0.037	0.047	0.045	0.032	0.033	0.049	0.050	0.028	0.052	"H2O
Temp:	136	136	136	136	136	136	136	136	136	°F

V_{strav} 14.23 ft/sec V_{scent} 16.03 ft/sec F_p 0.888

	Particulate Sampling Data														Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data		
Elapsed Time (min)	Gas Meter 1 (ft^3)	Gas Meter 2 (ft^3)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H_2O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H_2O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H_2O)	CO_2 (%)	CO (%)
148	19.632	19.301	0.13	0.12	0.79	92	1.83	0.60	91	1.2	114	0.048	99	96	20.8	0.1	356	84	83	79	-0.044	3.1	0
149	19.758	19.424	0.13	0.12	0.79	92	1.84	0.60	91	1.2	115	0.049	97	96	20.7	-0.1	362	84	83	80	-0.044	4.2	0
150	19.886	19.546	0.13	0.12	0.79	92	1.84	0.60	91	1.2	115	0.048	99	96	20.6	-0.1	363	84	83	80	-0.044	4.1	0
151	20.013	19.669	0.13	0.12	0.79	92	1.84	0.60	91	1.2	115	0.051	96	94	20.6	0	365	84	83	80	-0.044	4.1	0
152	20.139	19.791	0.13	0.12	0.79	92	1.84	0.59	91	1.2	115	0.051	95	93	20.5	-0.1	365	84	83	79	-0.045	3.6	0
153	20.266	19.913	0.13	0.12	0.78	92	1.84	0.60	91	1.2	115	0.049	98	95	20.5	0	367	84	83	79	-0.043	4.8	0
154	20.393	20.035	0.13	0.12	0.78	92	1.85	0.59	91	1.2	115	0.050	97	94	20.4	-0.1	363	84	83	79	-0.045	2.5	0
155	20.518	20.157	0.13	0.12	0.79	92	1.85	0.59	91	1.2	115	0.049	96	95	20.4	0	366	84	83	80	-0.044	4.8	0
156	20.646	20.278	0.13	0.12	0.78	92	1.85	0.59	91	1.2	115	0.048	99	95	20.4	0	365	84	83	80	-0.044	3	0
157	20.772	20.399	0.13	0.12	0.78	92	1.85	0.59	91	1.2	115	0.047	99	96	20.3	-0.1	363	84	83	79	-0.043	3.8	0
158	20.897	20.521	0.13	0.12	0.78	92	1.86	0.59	91	1.2	116	0.051	94	93	20.3	0	365	84	83	79	-0.045	3.8	0
159	21.024	20.642	0.13	0.12	0.77	92	1.86	0.59	91	1.2	115	0.048	99	95	20.2	-0.1	364	84	83	79	-0.044	3.7	0
160	21.151	20.762	0.13	0.12	0.78	92	1.86	0.59	91	1.3	116	0.049	98	94	20.2	0	366	84	83	80	-0.045	3.5	0
161	21.276	20.883	0.13	0.12	0.78	92	1.86	0.59	91	1.3	115	0.049	96	94	20.1	-0.1	361	84	83	80	-0.043	3.2	0
162	21.402	21.004	0.13	0.12	0.78	92	1.87	0.59	91	1.3	115	0.050	96	94	20.1	0	362	84	83	80	-0.044	3.5	0
163	21.528	21.124	0.13	0.12	0.78	92	1.87	0.58	91	1.3	115	0.048	98	95	20.1	0	358	84	83	80	-0.043	3	0
164	21.653	21.245	0.13	0.12	0.77	92	1.87	0.58	91	1.3	115	0.050	95	94	20.0	-0.1	360	84	83	81	-0.043	4.2	0
165	21.779	21.366	0.13	0.12	0.77	92	1.88	0.58	91	1.3	115	0.049	97	94	20.0	0	355	84	83	81	-0.044	2.7	0
166	21.905	21.486	0.13	0.12	0.77	92	1.87	0.58	91	1.3	115	0.048	98	95	20.0	0	359	84	83	81	-0.043	4	0
167	22.030	21.606	0.13	0.12	0.76	92	1.88	0.58	92	1.3	115	0.048	97	95	19.9	-0.1	357	84	83	81	-0.044	3	0
168	22.155	21.727	0.13	0.12	0.77	92	1.88	0.58	92	1.3	115	0.048	97	95	19.8	-0.1	358	84	83	80	-0.042	4	0
169	22.280	21.846	0.13	0.12	0.77	92	1.88	0.57	92	1.3	115	0.049	96	93	19.8	0	361	84	83	80	-0.045	3.1	0
170	22.406	21.966	0.13	0.12	0.77	92	1.88	0.57	92	1.3	115	0.050	96	93	19.8	0	355	84	83	81	-0.043	3.7	0
171	22.530	22.086	0.12	0.12	0.77	92	1.89	0.57	92	1.3	115	0.050	94	93	19.7	-0.1	361	84	83	81	-0.046	3.3	0
172	22.655	22.206	0.13	0.12	0.76	92	1.89	0.57	92	1.3	115	0.049	96	94	19.7	0	361	84	83	81	-0.044	4.4	0
173	22.780	22.325	0.13	0.12	0.77	92	1.9	0.57	92	1.3	115	0.048	97	94	19.6	-0.1	363	84	83	81	-0.044	4.2	0
174	22.905	22.444	0.13	0.12	0.76	92	1.89	0.57	92	1.3	115	0.050	95	92	19.6	0	364	84	83	81	-0.044	3.9	0
175	23.029	22.563	0.12	0.12	0.76	92	1.9	0.57	92	1.3	116	0.050	94	92	19.5	-0.1	368	84	83	81	-0.045	4.9	0
176	23.153	22.683	0.12	0.12	0.76	92	1.9	0.57	92	1.3	116	0.049	95	94	19.5	0	365	84	83	81	-0.044	3.5	0
177	23.278	22.802	0.13	0.12	0.75	92	1.91	0.57	92	1.3	116	0.049	96	93	19.4	-0.1	367	84	84	81	-0.044	4.2	0
178	23.403	22.921	0.13	0.12	0.76	92	1.91	0.57	92	1.3	116	0.049	96	93	19.4	0	364	84	84	80	-0.044	3.4	0
179	23.527	23.039	0.12	0.12	0.76	92	1.9	0.57	92	1.3	116	0.048	96	93	19.4	0	366	84	84	81	-0.044	4.2	0
180	23.650	23.158	0.12	0.12	0.76	92	1.91	0.57	92	1.3	116	0.052	92	90	19.3	-0.1	368	85	84	80	-0.044	4.1	0
181	23.775	23.277	0.13	0.12	0.75	92	1.91	0.57	92	1.3	116	0.049	96	93	19.3	0	363	85	84	81	-0.042	3.6	0
182	23.899	23.396	0.12	0.12	0.75	93	1.92	0.56	92	1.3	116	0.049	95	93	19.2	-0.1	367	85	84	81	-0.045	3.2	0
183	24.023	23.514	0.12	0.12	0.75	93	1.91	0.56	92	1.3	115	0.049	95	92	19.2	0	361	85	84	81	-0.043	4.3	0
184	24.146	23.633	0.12	0.12	0.75	93	1.91	0.56	92	1.3	114	0.047	96	95	19.1	-0.1	358	85	84	80	-0.045	3.2	0

Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: US Stove
Model: 5660
Tracking No.: 2128
Project No.: 0215PS032E
Test Date: 06-Aug-15
Beginning Clock Time: 09:59

High Burn End Time: 62
Medium Burn End Time: 182
Total Sampling Time: 362 min
Recording Interval: 1 min
Background Sample Volume: 0 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) N/A (Amb)

Barometric Pressure: Begin 30.06 Middle 30.08 End 30.1 Average 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 132, 185, 209, 335, 336, 410, 420, 559

PM Control Modules: 335/336
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.78 lb/lb-mole
Dilution Tunnel H2O: 2.00 percent
Dilution Tunnel Static: -0.440 "H2O
Tunnel Area: 0.19635 ft2
Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.63 ft/sec.
Intial Tunnel Flow: 143.8 scfm
Average Tunnel Flow: 144.5 scfm
Post-Test Leak Check (1): 0.002 cfm @ -2 in. Hg
Post-Test Leak Check (2): 0.001 cfm @ -2 in. Hg
Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center	
Initial dP	0.037	0.047	0.045	0.032	0.033	0.049	0.050	0.028	0.052	"H2O
Temp:	136	136	136	136	136	136	136	136	136	°F

V_{strav} 14.23 ft/sec V_{scent} 16.03 ft/sec F_p 0.888

	Particulate Sampling Data														Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data		
Elapsed Time (min)	Gas Meter 1 (ft^3)	Gas Meter 2 (ft^3)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H_2O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H_2O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H_2O)	CO_2 (%)	CO (%)
185	24.270	23.750	0.12	0.12	0.75	93	1.92	0.56	92	1.3	113	0.050	94	90	19.1	0	352	85	84	81	-0.042	3.6	0
186	24.394	23.868	0.12	0.12	0.75	93	1.92	0.56	92	1.3	113	0.049	95	92	19.1	0	352	85	84	81	-0.044	3.2	0
187	24.518	23.986	0.12	0.12	0.75	93	1.92	0.55	92	1.3	113	0.048	96	93	19.0	-0.1	351	85	84	81	-0.042	3.7	0
188	24.641	24.104	0.12	0.12	0.75	93	1.92	0.56	92	1.3	113	0.050	93	91	19.0	0	346	85	84	81	-0.043	2.5	0
189	24.764	24.222	0.12	0.12	0.75	93	1.92	0.56	92	1.3	113	0.048	95	93	19.0	0	351	85	84	80	-0.043	4	0
190	24.888	24.339	0.12	0.12	0.74	93	1.92	0.55	92	1.3	113	0.047	97	93	18.9	-0.1	347	85	84	81	-0.043	2.9	0
191	25.011	24.457	0.12	0.12	0.74	93	1.93	0.55	92	1.3	113	0.049	94	92	18.9	0	348	85	84	81	-0.043	3.2	0
192	25.135	24.574	0.12	0.12	0.74	93	1.93	0.55	92	1.3	112	0.049	95	91	18.9	0	340	85	84	81	-0.041	2.7	0
193	25.258	24.692	0.12	0.12	0.74	93	1.93	0.55	92	1.3	112	0.048	95	93	18.8	-0.1	337	85	84	81	-0.043	2.3	0
194	25.380	24.810	0.12	0.12	0.74	93	1.93	0.55	92	1.3	112	0.047	95	94	18.8	0	339	85	84	81	-0.041	4.3	0
195	25.503	24.927	0.12	0.12	0.74	93	1.93	0.55	92	1.3	111	0.049	94	91	18.8	0	335	85	84	81	-0.042	2.5	0
196	25.627	25.044	0.12	0.12	0.74	93	1.94	0.55	92	1.3	112	0.050	94	90	18.7	-0.1	342	85	84	81	-0.042	4	0
197	25.750	25.161	0.12	0.12	0.74	93	1.94	0.55	92	1.3	112	0.048	95	92	18.7	0	337	85	84	81	-0.041	3	0
198	25.873	25.278	0.12	0.12	0.74	93	1.94	0.55	92	1.3	112	0.048	95	92	18.6	-0.1	340	85	84	81	-0.042	3.1	0
199	25.995	25.394	0.12	0.12	0.74	93	1.94	0.54	92	1.3	112	0.047	95	92	18.6	0	336	85	84	81	-0.042	2.7	0
200	26.118	25.511	0.12	0.12	0.73	93	1.94	0.55	92	1.3	112	0.048	95	92	18.6	0	341	85	84	81	-0.043	3.8	0
201	26.240	25.628	0.12	0.12	0.74	93	1.94	0.55	92	1.3	112	0.048	94	92	18.5	-0.1	338	85	84	82	-0.040	3.6	0
202	26.363	25.745	0.12	0.12	0.73	93	1.95	0.55	92	1.3	112	0.049	94	91	18.5	0	337	85	84	82	-0.043	2.6	0
203	26.486	25.862	0.12	0.12	0.73	93	1.94	0.54	92	1.3	112	0.050	93	90	18.5	0	339	85	84	82	-0.040	4.3	0
204	26.608	25.978	0.12	0.12	0.73	93	1.95	0.55	92	1.3	112	0.049	93	90	18.4	-0.1	334	85	84	81	-0.042	2.3	0
205	26.730	26.094	0.12	0.12	0.74	93	1.95	0.54	92	1.3	112	0.049	93	90	18.4	0	337	85	84	82	-0.041	3.7	0
206	26.852	26.211	0.12	0.12	0.73	93	1.94	0.54	92	1.3	112	0.048	94	92	18.4	0	331	85	84	81	-0.040	2.8	0
207	26.974	26.327	0.12	0.12	0.73	93	1.96	0.54	92	1.3	112	0.050	92	89	18.3	-0.1	335	85	84	81	-0.041	3.3	0
208	27.097	26.443	0.12	0.12	0.73	93	1.96	0.54	92	1.4	111	0.050	93	89	18.3	0	330	85	84	81	-0.039	2.9	0
209	27.219	26.560	0.12	0.12	0.72	93	1.96	0.54	93	1.4	111	0.049	93	91	18.2	-0.1	333	85	84	81	-0.042	2.6	0
210	27.342	26.676	0.12	0.12	0.73	93	1.95	0.54	93	1.4	111	0.049	94	90	18.2	0	333	85	84	81	-0.040	3.9	0
211	27.464	26.792	0.12	0.12	0.73	93	1.96	0.54	93	1.4	111	0.048	94	91	18.2	0	332	85	84	81	-0.041	2.5	0
212	27.585	26.908	0.12	0.12	0.73	93	1.96	0.54	93	1.4	111	0.050	91	89	18.1	-0.1	331	85	84	82	-0.039	4	0
213	27.707	27.024	0.12	0.12	0.73	93	1.96	0.54	93	1.4	111	0.048	94	91	18.1	0	328	85	84	81	-0.040	2.5	0
214	27.829	27.139	0.12	0.11	0.73	93	1.97	0.54	93	1.4	112	0.051	91	87	18.1	0	335	85	84	81	-0.042	3.3	0
215	27.951	27.256	0.12	0.12	0.73	93	1.97	0.54	93	1.4	112	0.049	93	91	18.0	-0.1	335	85	84	82	-0.040	4.1	0
216	28.073	27.372	0.12	0.12	0.72	93	1.97	0.54	93	1.4	112	0.048	94	91	18.0	0	336	85	84	81	-0.042	2.8	0
217	28.195	27.487	0.12	0.11	0.72	93	1.97	0.53	93	1.4	112	0.049	93	89	18.0	0	336	85	84	81	-0.040	3.9	0
218	28.317	27.603	0.12	0.12	0.72	93	1.97	0.53	93	1.4	112	0.049	93	90	17.9	-0.1	333	85	84	81	-0.040	2.9	0
219	28.439	27.718	0.12	0.11	0.73	93	1.97	0.54	93	1.4	112	0.048	94	90	17.9	0	334	85	84	81	-0.041	3.3	0
220	28.559	27.833	0.12	0.11	0.72	93	1.97	0.54	93	1.4	111	0.050	91	88	17.9	0	329	85	84	82	-0.040	2.6	0
221	28.681	27.950	0.12	0.12	0.73	93	1.97	0.53	93	1.4	112	0.048	94	92	17.8	-0.1	333	85	84	82	-0.040	3.4	0

Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: US Stove
Model: 5660
Tracking No.: 2128
Project No.: 0215PS032E
Test Date: 06-Aug-15
Beginning Clock Time: 09:59

High Burn End Time: 62
Medium Burn End Time: 182
Total Sampling Time: 362 min
Recording Interval: 1 min
Background Sample Volume: 0 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) N/A (Amb)

Barometric Pressure: Begin 30.06 Middle 30.08 End 30.1 Average 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 132, 185, 209, 335, 336, 410, 420, 559

PM Control Modules: 335/336
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.78 lb/lb-mole
Dilution Tunnel H2O: 2.00 percent
Dilution Tunnel Static: -0.440 "H2O
Tunnel Area: 0.19635 ft2
Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.63 ft/sec.
Intial Tunnel Flow: 143.8 scfm
Average Tunnel Flow: 144.5 scfm
Post-Test Leak Check (1): 0.002 cfm @ -2 in. Hg
Post-Test Leak Check (2): 0.001 cfm @ -2 in. Hg
Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center	
Initial dP	0.037	0.047	0.045	0.032	0.033	0.049	0.050	0.028	0.052	"H2O
Temp:	136	136	136	136	136	136	136	136	136	°F

V_{strav} 14.23 ft/sec V_{scent} 16.03 ft/sec F_p 0.888

	Particulate Sampling Data														Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data		
Elapsed Time (min)	Gas Meter 1 (ft^3)	Gas Meter 2 (ft^3)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H_2O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H_2O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H_2O)	CO_2 (%)	CO (%)
222	28.802	28.065	0.12	0.12	0.72	93	1.97	0.54	93	1.4	111	0.048	93	90	17.8	0	328	85	84	82	-0.039	2.7	0
223	28.924	28.180	0.12	0.11	0.72	93	1.97	0.53	93	1.4	111	0.050	92	88	17.8	0	331	85	84	82	-0.042	3.2	0
224	29.046	28.295	0.12	0.12	0.72	93	1.97	0.53	93	1.4	111	0.049	93	89	17.7	-0.1	334	85	84	82	-0.040	3.9	0
225	29.168	28.410	0.12	0.11	0.72	93	1.97	0.53	93	1.4	111	0.049	93	89	17.7	0	328	85	84	82	-0.040	2.6	0
226	29.289	28.526	0.12	0.12	0.72	93	1.98	0.53	93	1.4	111	0.047	94	92	17.7	0	333	85	84	81	-0.041	3.6	0
227	29.410	28.641	0.12	0.11	0.71	94	1.98	0.53	93	1.4	111	0.050	91	88	17.6	-0.1	329	85	84	81	-0.041	2.4	0
228	29.531	28.755	0.12	0.11	0.72	94	1.98	0.53	93	1.4	111	0.050	91	87	17.6	0	336	85	84	81	-0.041	4	0
229	29.652	28.870	0.12	0.12	0.72	94	1.98	0.53	93	1.4	111	0.048	93	90	17.5	-0.1	329	85	84	81	-0.040	3.3	0
230	29.773	28.985	0.12	0.11	0.72	94	1.98	0.53	93	1.4	111	0.050	91	88	17.5	0	333	85	84	82	-0.042	3	0
231	29.893	29.100	0.12	0.12	0.72	94	1.98	0.52	93	1.4	111	0.048	92	90	17.5	0	328	85	84	82	-0.038	3.7	0
232	30.015	29.214	0.12	0.11	0.71	94	1.99	0.53	93	1.4	111	0.049	93	88	17.4	-0.1	328	85	84	82	-0.042	2.1	0
233	30.136	29.328	0.12	0.11	0.71	94	1.99	0.53	93	1.4	111	0.051	90	87	17.4	0	328	85	84	82	-0.040	3.6	0
234	30.256	29.443	0.12	0.12	0.71	94	1.99	0.53	93	1.4	111	0.050	91	88	17.4	0	325	85	84	82	-0.040	2.4	0
235	30.378	29.558	0.12	0.11	0.71	94	1.98	0.53	93	1.4	111	0.048	94	90	17.3	-0.1	327	85	84	82	-0.040	3.1	0
236	30.498	29.672	0.12	0.11	0.71	94	1.99	0.53	93	1.4	111	0.050	91	87	17.3	0	325	85	84	82	-0.037	3.2	0
237	30.619	29.786	0.12	0.11	0.71	94	1.99	0.53	93	1.4	111	0.049	92	88	17.3	0	324	85	84	81	-0.040	2.3	0
238	30.740	29.900	0.12	0.11	0.70	94	1.99	0.52	93	1.4	111	0.049	92	88	17.2	-0.1	325	85	84	82	-0.040	3.1	0
239	30.860	30.015	0.12	0.12	0.71	94	1.99	0.52	93	1.4	111	0.049	91	89	17.2	0	325	85	84	81	-0.040	2.7	0
240	30.980	30.123	0.12	0.11	0.71	94	2	0.52	93	1.4	111	0.050	91	83	17.1	-0.1	329	85	84	82	-0.041	3.6	0
241	31.101	30.237	0.12	0.11	0.71	94	1.99	0.52	93	1.4	110	0.048	93	89	17.1	0	323	85	84	82	-0.039	2.5	0
242	31.221	30.361	0.12	0.12	0.71	94	1.99	0.90	93	2.1	111	0.050	91	95	17.1	0	323	85	85	82	-0.040	2.7	0
243	31.342	30.511	0.12	0.15	0.71	94	1.99	0.90	93	2.1	111	0.048	93	118	17.0	-0.1	324	85	85	82	-0.039	2.9	0
244	31.468	30.655	0.13	0.14	0.91	94	2.36	0.78	93	1.9	111	0.049	96	112	17.0	0	324	85	85	82	-0.040	2.6	0
245	31.605	30.786	0.14	0.13	0.91	94	2.37	0.70	93	1.8	111	0.050	103	101	17.0	0	326	85	85	82	-0.040	3.2	0
246	31.742	30.918	0.14	0.13	0.91	94	2.37	0.70	93	1.8	111	0.048	106	103	17.0	0	321	85	85	82	-0.037	2.9	0
247	31.880	31.051	0.14	0.13	0.92	94	2.37	0.70	93	1.8	111	0.048	106	104	16.9	-0.1	320	86	85	82	-0.041	2.4	0
248	32.017	31.183	0.14	0.13	0.91	94	2.37	0.70	93	1.8	111	0.049	104	102	16.9	0	321	86	85	82	-0.039	3.5	0
249	32.153	31.316	0.14	0.13	0.91	94	2.37	0.70	93	1.8	111	0.052	101	100	16.9	0	322	86	85	82	-0.039	2.6	0
250	32.290	31.448	0.14	0.13	0.92	94	2.37	0.70	94	1.8	111	0.048	106	103	16.8	-0.1	324	86	85	82	-0.038	3.9	0
251	32.427	31.581	0.14	0.13	0.91	94	2.38	0.70	94	1.8	111	0.048	106	104	16.8	0	321	86	85	82	-0.041	1.8	0
252	32.564	31.713	0.14	0.13	0.91	94	2.38	0.70	94	1.8	111	0.049	104	102	16.7	-0.1	329	86	85	82	-0.040	4.4	0
253	32.700	31.846	0.14	0.13	0.90	94	2.38	0.70	94	1.8	112	0.047	106	105	16.7	0	327	86	85	82	-0.039	3.2	0
254	32.837	31.977	0.14	0.13	0.91	94	2.38	0.70	94	1.8	112	0.049	105	101	16.7	0	328	86	85	82	-0.040	2.6	0
255	32.974	32.110	0.14	0.13	0.91	94	2.37	0.70	94	1.8	111	0.049	104	103	16.7	0	323	86	85	82	-0.037	3	0
256	33.111	32.241	0.14	0.13	0.91	94	2.39	0.70	94	1.8	111	0.049	104	101	16.6	-0.1	321	86	85	82	-0.040	2	0
257	33.247	32.374	0.14	0.13	0.90	94	2.38	0.70	94	1.8	111	0.048	105	104	16.5	-0.1	327	86	85	82	-0.039	3.9	0
258	33.383	32.505	0.14	0.13	0.90	94	2.38	0.70	94	1.8	111	0.051	102	99	16.5	0	322	86	85	82	-0.039	2.5	0

Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: US Stove
Model: 5660
Tracking No.: 2128
Project No.: 0215PS032E
Test Date: 06-Aug-15
Beginning Clock Time: 09:59

High Burn End Time: 62
Medium Burn End Time: 182
Total Sampling Time: 362 min
Recording Interval: 1 min
Background Sample Volume: 0 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) N/A (Amb)

Barometric Pressure: Begin 30.06 Middle 30.08 End 30.1 Average 30.08 "Hg

OMNI Equipment Numbers: 23, 131, 132, 185, 209, 335, 336, 410, 420, 559

PM Control Modules: 335/336
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.78 lb/lb-mole
Dilution Tunnel H2O: 2.00 percent
Dilution Tunnel Static: -0.440 "H2O
Tunnel Area: 0.19635 ft2
Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.63 ft/sec.
Intial Tunnel Flow: 143.8 scfm
Average Tunnel Flow: 144.5 scfm
Post-Test Leak Check (1): 0.002 cfm @ -2 in. Hg
Post-Test Leak Check (2): 0.001 cfm @ -2 in. Hg
Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center	
Initial dP	0.037	0.047	0.045	0.032	0.033	0.049	0.050	0.028	0.052	"H2O
Temp:	136	136	136	136	136	136	136	136	136	°F

V_{strav} 14.23 ft/sec V_{scent} 16.03 ft/sec F_p 0.888

	Particulate Sampling Data														Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data		
Elapsed Time (min)	Gas Meter 1 (ft^3)	Gas Meter 2 (ft^3)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H_2O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H_2O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H_2O)	CO_2 (%)	CO (%)
259	33.520	32.638	0.14	0.13	0.90	94	2.38	0.69	94	1.8	112	0.048	106	104	16.5	0	326	86	85	82	-0.041	3.5	0
260	33.657	32.769	0.14	0.13	0.90	94	2.38	0.69	94	1.8	111	0.047	107	104	16.5	0	321	86	85	82	-0.038	2.8	0
261	33.792	32.901	0.14	0.13	0.90	94	2.39	0.69	94	1.8	112	0.048	104	103	16.4	-0.1	324	86	85	82	-0.041	2.9	0
262	33.928	33.028	0.14	0.13	0.90	95	2.39	0.70	94	1.8	111	0.049	104	98	16.4	0	322	86	85	82	-0.037	3.5	0
263	34.065	33.156	0.14	0.13	0.90	95	2.39	0.69	94	1.8	111	0.049	104	99	16.4	0	322	86	85	82	-0.041	2.3	0
264	34.202	33.287	0.14	0.13	0.90	95	2.39	0.69	94	1.8	111	0.051	102	99	16.3	-0.1	326	86	85	82	-0.040	3.8	0
265	34.337	33.419	0.14	0.13	0.90	95	2.39	0.69	94	1.8	112	0.049	103	102	16.3	0	324	86	85	82	-0.039	3	0
266	34.473	33.540	0.14	0.12	0.90	95	2.39	0.69	94	1.8	112	0.048	105	95	16.2	-0.1	324	86	85	82	-0.038	3.2	0
267	34.610	33.663	0.14	0.12	0.89	95	2.4	0.69	94	1.8	111	0.048	105	96	16.2	0	318	86	85	82	-0.037	2.5	0
268	34.746	33.785	0.14	0.12	0.89	95	2.4	0.69	94	1.8	111	0.050	102	93	16.2	0	325	86	85	83	-0.041	2.6	0
269	34.881	33.916	0.13	0.13	0.89	95	2.4	0.69	94	1.8	112	0.048	104	103	16.1	-0.1	327	86	86	83	-0.041	3.7	0
270	35.017	34.047	0.14	0.13	0.89	95	2.4	0.69	94	1.8	112	0.051	102	99	16.1	0	329	87	85	82	-0.042	2.9	0
271	35.154	34.178	0.14	0.13	0.89	95	2.4	0.68	94	1.8	111	0.050	103	100	16.1	0	327	87	85	82	-0.039	3.5	0
272	35.289	34.308	0.13	0.13	0.89	95	2.4	0.69	94	1.8	111	0.050	102	100	16.0	-0.1	324	87	86	82	-0.039	2.6	0
273	35.424	34.435	0.13	0.13	0.90	95	2.4	0.68	94	1.8	111	0.050	102	97	16.0	0	328	87	86	82	-0.040	3.7	0
274	35.561	34.539	0.14	0.10	0.90	95	2.41	0.69	94	1.8	111	0.047	106	82	16.0	0	322	87	86	83	-0.037	2.5	0
275	35.697	34.669	0.14	0.13	0.89	95	2.41	0.68	94	1.8	111	0.047	106	103	15.9	-0.1	325	87	86	83	-0.040	2.8	0
276	35.832	34.793	0.13	0.12	0.89	95	2.4	0.69	94	1.8	111	0.048	104	97	15.9	0	318	87	86	83	-0.037	2.8	0
277	35.968	34.903	0.14	0.11	0.90	95	2.41	0.69	94	1.8	111	0.050	102	84	15.8	-0.1	320	87	86	83	-0.041	2.2	0
278	36.104	35.032	0.14	0.13	0.90	95	2.41	0.68	94	1.8	111	0.050	102	99	15.8	0	321	87	86	82	-0.039	3.5	0
279	36.237	35.167	0.13	0.13	0.86	95	2.34	0.68	94	1.8	111	0.048	102	106	15.8	0	317	87	86	82	-0.038	2.6	0
280	36.369	35.302	0.13	0.13	0.85	95	2.34	0.68	94	1.8	111	0.048	102	106	15.8	0	323	87	86	83	-0.039	3.6	0
281	36.503	35.437	0.13	0.13	0.85	95	2.34	0.68	94	1.8	112	0.049	102	105	15.7	-0.1	324	87	86	83	-0.040	2.8	0
282	36.635	35.572	0.13	0.13	0.85	95	2.35	0.68	94	1.8	112	0.048	102	106	15.7	0	326	87	86	82	-0.039	3.5	0
283	36.768	35.707	0.13	0.13	0.84	95	2.35	0.68	94	1.8	112	0.048	102	106	15.7	0	324	87	86	82	-0.038	3.1	0
284	36.900	35.842	0.13	0.13	0.85	95	2.36	0.67	94	1.8	112	0.051	99	103	15.6	-0.1	323	87	86	82	-0.040	2.5	0
285	37.032	35.977	0.13	0.13	0.85	95	2.35	0.68	94	1.8	112	0.050	100	104	15.6	0	322	87	86	82	-0.038	3.4	0
286	37.165	36.112	0.13	0.13	0.85	95	2.35	0.68	94	1.8	112	0.047	103	107	15.6	0	322	87	86	83	-0.039	2.7	0
287	37.297	36.247	0.13	0.13	0.85	95	2.36	0.68	94	1.8	112	0.047	103	107	15.5	-0.1	323	87	86	83	-0.038	3.3	0
288	37.430	36.382	0.13	0.13	0.85	95	2.35	0.68	94	1.8	112	0.048	102	106	15.5	0	317	87	86	83	-0.037	2.5	0
289	37.561	36.517	0.13	0.13	0.85	95	2.36	0.68	94	1.8	112	0.049	100	105	15.5	0	319	87	86	83	-0.039	2.5	0
290	37.695	36.652	0.13	0.13	0.85	95	2.35	0.68	94	1.8	112	0.048	103	106	15.4	-0.1	320	87	86	83	-0.037	3.3	0
291	37.826	36.787	0.13	0.13	0.84	95	2.35	0.67	94	1.8	111	0.050	99	103	15.4	0	318	87	86	83	-0.038	2.7	0
292	37.958	36.922	0.13	0.13	0.85	95	2.36	0.68	94	1.8	112	0.050	100	104	15.4	0	321	87	86	82	-0.039	3.2	0
293	38.091	37.057	0.13	0.13	0.84	95	2.36	0.67	94	1.8	112	0.048	102	106	15.3	-0.1	323	87	86	83	-0.041	3	0
294	38.222	37.192	0.13	0.13	0.85	95	2.37	0.68	94	1.8	112	0.048	101	106	15.3	0	330	87	86	83	-0.041	4.2	0
295	38.355	37.327	0.13	0.13	0.85	95	2.37	0.67	94	1.8	112	0.049	101	105	15.2	-0.1	327	87	86	82	-0.038	3.6	0

Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: US Stove
Model: 5660
Tracking No.: 2128
Project No.: 0215PS032E
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Beginning Clock Time: 09:59

High Burn End Time: 62
Medium Burn End Time: 182
Total Sampling Time: 362 min
Recording Interval: 1 min
Background Sample Volume: 0 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) N/A (Amb)

Barometric Pressure:

Begin	Middle	End	Average
30.06	30.08	30.1	30.08 "Hg

OMNI Equipment Numbers: 23, 131, 132, 185, 209, 335, 336, 410, 420, 559

PM Control Modules: 335/336
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.78 lb/lb-mole
Dilution Tunnel H2O: 2.00 percent
Dilution Tunnel Static: -0.440 "H2O
Tunnel Area: 0.19635 ft2
Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.63 ft/sec.
Intial Tunnel Flow: 143.8 scfm
Average Tunnel Flow: 144.5 scfm
Post-Test Leak Check (1): 0.002 cfm @ -2 in. Hg
Post-Test Leak Check (2): 0.001 cfm @ -2 in. Hg
Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center	
Initial dP	0.037	0.047	0.045	0.032	0.033	0.049	0.050	0.028	0.052	"H2O
Temp:	136	136	136	136	136	136	136	136	136	°F

V_{strav} 14.23 ft/sec V_{scent} 16.03 ft/sec F_p 0.888

	Particulate Sampling Data														Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data		
Elapsed Time (min)	Gas Meter 1 (ft^3)	Gas Meter 2 (ft^3)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H_2O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H_2O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H_2O)	CO_2 (%)	CO (%)
296	38.486	37.462	0.13	0.13	0.85	95	2.36	0.67	94	1.8	112	0.049	100	105	15.2	0	324	87	86	83	-0.038	2.7	0
297	38.619	37.597	0.13	0.13	0.84	95	2.37	0.67	94	1.8	112	0.049	101	105	15.2	0	322	86	86	83	-0.040	2.6	0
298	38.751	37.732	0.13	0.13	0.84	95	2.36	0.67	94	1.8	112	0.049	101	105	15.1	-0.1	320	86	86	83	-0.040	2.5	0
299	38.883	37.867	0.13	0.13	0.85	95	2.36	0.67	94	1.8	112	0.049	101	105	15.1	0	325	86	86	83	-0.039	3.7	0
300	39.014	38.002	0.13	0.13	0.84	95	2.36	0.67	94	1.8	112	0.049	100	105	15.1	0	322	87	86	82	-0.038	2.8	0
301	39.146	38.137	0.13	0.13	0.84	95	2.37	0.67	95	1.8	112	0.050	100	103	15.0	-0.1	324	87	86	82	-0.040	2.9	0
302	39.278	38.272	0.13	0.13	0.84	95	2.37	0.67	95	1.8	112	0.049	101	104	15.0	0	323	87	86	83	-0.038	3	0
303	39.410	38.407	0.13	0.13	0.84	95	2.37	0.67	95	1.8	112	0.048	102	105	15.0	0	324	87	86	83	-0.041	2.5	0
304	39.542	38.542	0.13	0.13	0.84	95	2.38	0.67	95	1.8	112	0.049	101	104	14.9	-0.1	328	87	86	83	-0.040	3.6	0
305	39.673	38.677	0.13	0.13	0.84	95	2.37	0.67	95	1.9	112	0.051	98	102	14.9	0	328	86	86	83	-0.040	2.9	0
306	39.805	38.812	0.13	0.13	0.84	95	2.38	0.67	95	1.8	112	0.048	102	105	14.8	-0.1	327	87	86	83	-0.040	3.6	0
307	39.936	38.947	0.13	0.13	0.84	95	2.38	0.67	95	1.8	112	0.049	100	104	14.8	0	323	87	86	82	-0.040	2.5	0
308	40.068	39.082	0.13	0.13	0.84	95	2.38	0.67	95	1.9	112	0.049	101	104	14.8	0	321	87	86	83	-0.039	2.8	0
309	40.199	39.217	0.13	0.13	0.84	95	2.38	0.67	95	1.9	112	0.049	100	104	14.7	-0.1	322	86	86	83	-0.039	3.2	0
310	40.331	39.352	0.13	0.13	0.84	95	2.38	0.67	95	1.8	112	0.050	100	103	14.7	0	322	87	86	83	-0.041	2.9	0
311	40.462	39.487	0.13	0.13	0.84	95	2.38	0.66	95	1.9	112	0.047	102	107	14.7	0	327	87	86	83	-0.040	3.8	0
312	40.593	39.622	0.13	0.13	0.84	95	2.38	0.67	95	1.9	112	0.048	101	105	14.6	-0.1	323	87	86	83	-0.039	2.7	0
313	40.725	39.757	0.13	0.13	0.83	95	2.38	0.67	95	1.9	113	0.048	102	106	14.6	0	326	87	86	83	-0.038	3.6	0
314	40.855	39.892	0.13	0.13	0.84	95	2.39	0.66	95	1.9	112	0.049	99	104	14.6	0	324	86	86	83	-0.038	2.7	0
315	40.988	40.027	0.13	0.13	0.83	95	2.39	0.66	95	1.9	112	0.050	100	103	14.5	-0.1	324	87	86	83	-0.039	3.2	0
316	41.118	40.162	0.13	0.13	0.83	95	2.39	0.66	95	1.9	113	0.049	99	104	14.5	0	324	87	86	83	-0.040	2.8	0
317	41.250	40.297	0.13	0.13	0.83	95	2.39	0.66	95	1.9	113	0.048	102	106	14.5	0	327	87	86	83	-0.040	3.3	0
318	41.380	40.432	0.13	0.13	0.84	95	2.38	0.66	95	1.9	113	0.050	98	103	14.4	-0.1	328	87	86	83	-0.038	3.8	0
319	41.512	40.567	0.13	0.13	0.83	95	2.39	0.66	95	1.9	113	0.048	102	106	14.4	0	326	87	86	83	-0.039	2.9	0
320	41.642	40.702	0.13	0.13	0.83	95	2.39	0.66	95	1.9	113	0.047	101	107	14.4	0	321	87	86	83	-0.038	2.6	0
321	41.774	40.837	0.13	0.13	0.83	95	2.4	0.66	95	1.9	112	0.050	100	103	14.3	-0.1	319	87	86	83	-0.038	2.5	0
322	41.904	40.972	0.13	0.13	0.83	95	2.39	0.66	95	1.9	112	0.050	98	103	14.3	0	325	87	86	83	-0.040	3.5	0
323	42.036	41.107	0.13	0.13	0.83	95	2.39	0.66	95	1.9	112	0.047	103	107	14.3	0	323	87	86	83	-0.039	3.2	0
324	42.166	41.242	0.13	0.13	0.83	95	2.4	0.66	95	1.9	113	0.048	100	106	14.2	-0.1	326	87	86	83	-0.039	3.4	0
325	42.298	41.377	0.13	0.13	0.83	96	2.4	0.66	95	1.9	112	0.048	101	105	14.2	0	322	87	86	83	-0.037	2.8	0
326	42.428	41.512	0.13	0.13	0.83	96	2.4	0.66	95	1.9	112	0.048	100	105	14.2	0	320	87	86	83	-0.038	2.4	0
327	42.559	41.647	0.13	0.13	0.82	96	2.4	0.66	95	1.9	112	0.050	99	103	14.1	-0.1	323	87	86	83	-0.038	3.2	0
328	42.689	41.782	0.13	0.13	0.83	96	2.4	0.66	95	1.9	112	0.047	101	107	14.1	0	320	87	86	83	-0.038	2.5	0
329	42.821	41.917	0.13	0.13	0.83	96	2.41	0.65	95	1.9	113	0.049	100	104	14.0	-0.1	325	87	86	83	-0.039	2.9	0
330	42.951	42.052	0.13	0.13	0.83	96	2.4	0.66	95	1.9	113	0.048	100	106	14.0	0	325	87	86	83	-0.038	3.4	0
331	43.082	42.187	0.13	0.13	0.82	96	2.41	0.66	95	1.9	113	0.048	101	106	14.0	0	322	87	86	83	-0.039	2.7	0
332	43.212	42.322	0.13	0.13	0.82	96	2.41	0.65	95	1.9	113	0.049	99	104	13.9	-0.1	323	87	86	83	-0.038	2.9	0

Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: US Stove
Model: 5660
Tracking No.: 2128
Project No.: 0215PS032E
Test Date: 06-Aug-15
Beginning Clock Time: 09:59

High Burn End Time: 62
Medium Burn End Time: 182
Total Sampling Time: 362 min
Recording Interval: 1 min
Background Sample Volume: 0 cubic feet

Meter Box Y Factor: 1.001 (1) 1.003 (2) N/A (Amb)

Barometric Pressure:

Begin	Middle	End	Average
30.06	30.08	30.1	30.08 "Hg

OMNI Equipment Numbers: 23, 131, 132, 185, 209, 335, 336, 410, 420, 559

PM Control Modules: 335/336
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.78 lb/lb-mole
Dilution Tunnel H2O: 2.00 percent
Dilution Tunnel Static: -0.440 "H2O
Tunnel Area: 0.19635 ft2
Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.63 ft/sec.
Intial Tunnel Flow: 143.8 scfm
Average Tunnel Flow: 144.5 scfm
Post-Test Leak Check (1): 0.002 cfm @ -2 in. Hg
Post-Test Leak Check (2): 0.001 cfm @ -2 in. Hg
Fuel Moisture: 5.1 Dry Basis %

Velocity Traverse Data

	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center	
Initial dP	0.037	0.047	0.045	0.032	0.033	0.049	0.050	0.028	0.052	"H2O
Temp:	136	136	136	136	136	136	136	136	136	°F

V_{strav} 14.23 ft/sec V_{scent} 16.03 ft/sec F_p 0.888

	Particulate Sampling Data														Fuel Weight (lb)		Temperature Data (°F)				Stack Gas Data		
Elapsed Time (min)	Gas Meter 1 (ft^3)	Gas Meter 2 (ft^3)	Sample Rate 1 (cfm)	Sample Rate 2 (cfm)	Orifice dH 1 ("H_2O)	Meter Temp 1 (°F)	Meter Vacuum 1 ("Hg)	Orifice dH 2 ("H_2O)	Meter Temp 2 (°F)	Meter Vacuum 2 ("Hg)	Dilution Tunnel (°F)	Dilution Tunnel Center dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Filter 2	Ambient	Draft ("H_2O)	CO_2 (%)	CO (%)
333	43.343	42.457	0.13	0.13	0.83	96	2.41	0.65	95	1.9	113	0.048	101	106	13.9	0	321	87	86	83	-0.040	2.4	0
334	43.473	42.592	0.13	0.13	0.83	96	2.41	0.66	95	1.9	113	0.048	100	106	13.9	0	322	87	86	83	-0.039	3.4	0
335	43.604	42.727	0.13	0.13	0.82	96	2.41	0.65	95	1.9	112	0.050	99	103	13.9	0	322	87	86	83	-0.039	2.8	0
336	43.734	42.862	0.13	0.13	0.82	96	2.41	0.65	95	1.9	113	0.048	100	106	13.8	-0.1	324	87	86	83	-0.039	2.9	0
337	43.865	42.997	0.13	0.13	0.82	96	2.41	0.65	95	1.9	112	0.049	100	104	13.8	0	318	87	86	83	-0.036	2.6	0
338	43.995	43.132	0.13	0.13	0.82	96	2.41	0.65	95	1.9	112	0.050	98	103	13.8	0	318	87	86	83	-0.039	2.6	0
339	44.126	43.267	0.13	0.13	0.82	96	2.42	0.65	95	1.9	112	0.048	101	105	13.7	-0.1	321	87	86	83	-0.038	3.1	0
340	44.255	43.402	0.13	0.13	0.82	96	2.42	0.66	95	1.9	112	0.050	97	103	13.7	0	320	87	86	84	-0.038	3	0
341	44.386	43.537	0.13	0.13	0.82	96	2.42	0.65	95	1.9	112	0.048	101	105	13.7	0	320	87	86	83	-0.037	2.8	0
342	44.516	43.672	0.13	0.13	0.82	96	2.42	0.65	95	1.9	112	0.050	98	103	13.6	-0.1	313	87	86	83	-0.036	2	0
343	44.647	43.807	0.13	0.13	0.82	96	2.42	0.65	95	1.9	112	0.048	101	105	13.6	0	318	87	86	83	-0.040	3.1	0
344	44.776	43.942	0.13	0.13	0.82	96	2.42	0.64	95	1.9	112	0.049	98	104	13.5	-0.1	321	87	86	83	-0.038	3.2	0
345	44.907	44.077	0.13	0.13	0.82	96	2.42	0.65	95	1.9	112	0.048	101	105	13.5	0	320	87	86	83	-0.038	2.7	0
346	45.036	44.212	0.13	0.13	0.82	96	2.42	0.65	95	1.9	112	0.048	99	105	13.5	0	323	87	86	83	-0.038	3.6	0
347	45.167	44.347	0.13	0.13	0.82	96	2.42	0.64	95	1.9	112	0.049	100	104	13.4	-0.1	322	87	86	83	-0.040	2.7	0
348	45.296	44.482	0.13	0.13	0.82	96	2.42	0.65	95	1.9	112	0.049	98	104	13.4	0	325	87	86	83	-0.039	3.6	0
349	45.427	44.617	0.13	0.13	0.81	96	2.42	0.65	95	1.9	112	0.050	99	103	13.4	0	317	87	86	83	-0.036	2.5	0
350	45.556	44.752	0.13	0.13	0.82	96	2.42	0.65	95	1.9	112	0.049	98	104	13.3	-0.1	319	87	86	83	-0.039	2.6	0
351	45.686	44.887	0.13	0.13	0.81	96	2.42	0.65	95	1.9	112	0.051	97	102	13.3	0	321	87	86	83	-0.040	2.9	0
352	45.815	45.022	0.13	0.13	0.82	96	2.43	0.65	95	1.9	113	0.048	99	106	13.3	0	325	87	86	83	-0.041	3.1	0
353	45.946	45.157	0.13	0.13	0.81	96	2.42	0.64	95	1.9	113	0.050	99	103	13.2	-0.1	326	87	86	83	-0.040	3.5	0
354	46.075	45.292	0.13	0.13	0.82	96	2.42	0.64	95	1.9	112	0.047	100	107	13.2	0	322	87	86	83	-0.040	2.6	0
355	46.205	45.427	0.13	0.13	0.82	96	2.43	0.64	95	1.9	113	0.051	97	102	13.2	0	322	87	86	83	-0.037	3.3	0
356	46.335	45.562	0.13	0.13	0.82	96	2.43	0.64	95	1.9	112	0.050	98	103	13.1	-0.1	320	87	86	83	-0.038	2.7	0
357	46.465	45.697	0.13	0.13	0.81	96	2.43	0.64	95	1.9	113	0.047	101	107	13.1	0	322	87	86	83	-0.039	2.9	0
358	46.595	45.832	0.13	0.13	0.82	96	2.43	0.64	95	1.9	112	0.048	100	105	13.1	0	321	87	86	83	-0.038	2.8	0
359	46.724	45.967	0.13	0.13	0.81	96	2.43	0.65	95	1.9	112	0.049	98	104	13.0	-0.1	321	87	86	84	-0.040	2.5	0
360	46.854	46.102	0.13	0.13	0.81	96	2.44	0.64	95	1.9	113	0.049	99	104	13.0	0	322	87	86	83	-0.038	3.3	0
361	46.983	46.237	0.13	0.13	0.81	96	2.44	0.64	95	1.9	113	0.050	97	103	13.0	0	323	87	86	83	-0.040	2.5	0
362	47.113	46.372	0.13	0.13	0.81	96	2.44	0.64	95	1.9	113	0.049	99	104	12.9	-0.1	324	87	86	84	-0.039	3.9	0
Avg/Tot	47.113	46.372	0.13	0.13	0.83	91		0.65	91		117	0.049	100	100				85	84	80	-0.042			

OMNI-Test Laboratories, Inc.

Manufacturer:	US Stove	**Technicians:**	A. Kravitz
Model:	5660		
Date:	08/06/15		
Run:	1		
Control #:	2128		
Test Duration:	362		
Output Category:	All		

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	62.1%	66.5%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	62%	66.8%

Output Rate (kJ/h)	14,037	13,316	**(Btu/h)**
Burn Rate (kg/h)	1.16	2.56	**(lb/h)**
Input (kJ/h)	22,604	21,443	**(Btu/h)**

Test Load Weight (dry kg)	7.00	15.42	**dry lb**
MC wet (%)	4.81		
MC dry (%)	5.05		
Particulate (g)	0		
CO (g)	0		
Test Duration (h)	6.03		

Emissions	Particulate	CO
g/MJ Output	0.00	0.00
g/kg Dry Fuel	0.00	0.00
g/h	0.00	0.00
lb/MM Btu Output	0.00	0.00

Air/Fuel Ratio (A/F)	28.38

VERSION: **2.3** **3/23/2010**

OMNI-Test Laboratories, Inc.

Manufacturer:	US Stove	**Technicians:**	A. Kravitz
Model:	5660		
Date:	08/06/15		
Run:	1		
Control #:	2128		
Test Duration:	62		
Output Category:	High		

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	60.9%	65.1%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	61%	65.5%

Output Rate (kJ/h)	23,797	22,574	**(Btu/h)**
Burn Rate (kg/h)	2.01	4.42	**(lb/h)**
Input (kJ/h)	39,105	37,096	**(Btu/h)**

Test Load Weight (dry kg)	2.07	4.57	**dry lb**
MC wet (%)	4.81		
MC dry (%)	5.05		
Particulate (g)	0		
CO (g)	0		
Test Duration (h)	1.03		

Emissions	Particulate	CO
g/MJ Output	0.00	0.00
g/kg Dry Fuel	0.00	0.00
g/h	0.00	0.00
lb/MM Btu Output	0.00	0.00

Air/Fuel Ratio (A/F)	23.31

VERSION: **2.3** **3/23/2010**

OMNI-Test Laboratories, Inc.

Manufacturer:	US Stove	**Technicians:**	A. Kravitz
Model:	5660		
Date:	08/06/15		
Run:	1		
Control #:	2128		
Test Duration:	120		
Output Category:	Med		

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	63.1%	67.5%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	63%	67.9%

Output Rate (kJ/h)	13,544	12,848	**(Btu/h)**
Burn Rate (kg/h)	1.10	2.43	**(lb/h)**
Input (kJ/h)	21,467	20,364	**(Btu/h)**

Test Load Weight (dry kg)	2.20	4.85	**dry lb**
MC wet (%)	4.81		
MC dry (%)	5.05		
Particulate (g)	0		
CO (g)	0		
Test Duration (h)	2.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.00	0.00
g/kg Dry Fuel	0.00	0.00
g/h	0.00	0.00
lb/MM Btu Output	0.00	0.00

Air/Fuel Ratio (A/F)	27.11

VERSION: **2.3** **3/23/2010**

OMNI-Test Laboratories, Inc.

Manufacturer:	US Stove	**Technicians:**	A. Kravitz
Model:	5660		
Date:	08/06/15		
Run:	1		
Control #:	2128		
Test Duration:	180		
Output Category:	Low		

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	61.6%	66.0%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	62%	66.3%

Output Rate (kJ/h)	10,893	10,334	**(Btu/h)**
Burn Rate (kg/h)	0.91	2.00	**(lb/h)**
Input (kJ/h)	17,679	16,770	**(Btu/h)**

Test Load Weight (dry kg)	2.72	6.00	**dry lb**
MC wet (%)	4.81		
MC dry (%)	5.05		
Particulate (g)	0		
CO (g)	0		
Test Duration (h)	3.00		

Emissions	Particulate	CO
g/MJ Output	0.00	0.00
g/kg Dry Fuel	0.00	0.00
g/h	0.00	0.00
lb/MM Btu Output	0.00	0.00

Air/Fuel Ratio (A/F)	31.73

VERSION: **2.3** **3/23/2010**

OMNI-Test Laboratories, Inc. **ASTM E2779 Pellet Heater Run Sheets**

Client: **US Stove** Project Number: **0215PS032E** Run Number: 1

Model: **5660** Tracking Number: **2128** Date: 8/6/15

Test Crew: **A. Kravitz**

OMNI Equipment ID numbers: 335, 336, 185

Pellet Heater Run Notes

Air Control Settings

High Burn Rate Target: Maximum

Settings: HR = 5

Damper = Fully Open

Medium Burn Rate Target: ~50%

Settings: HR = 2

Damper = 3/8" from closed

Low Burn Rate Target: Minimum

Settings: HR = 1

Damper = 1/4" from closed

Additional Settings Notes:

High burn: 0-62 min

Med burn: 62-182 min

Low burn: 182-362 min

Preburn Notes

Time	Notes
	None

Test Notes

Time	Notes
	None

Pellet Moisture Content: 5.05%

Technician Signature: _____ Date: 8/6/15

OMNI-Test Laboratories, Inc. **ASTM E2779 Pellet Heater Run Sheets**

Client: **US Stove** Project Number: **0215PS032E** Run Number: 1

Model: **5660** Tracking Number: **2128** Date: 8/6/15

Test Crew: **A. Kravitz**

OMNI Equipment ID numbers: 335, 336, 185, 209, 132, 410, 420, 589

Pellet Heater Supplemental Data

Start Time: 09:59 Booth #: E1

Stop Time: 16:01

Stack Gas Leak Check:

Initial: 0 Final: 0

Sample Train Leak Check:

A: 0.002 @ -15 "Hg

B: 0.001 @ -15 "Hg

Calibrations: Span Gas CO_2: 16.78 CO: 4.244

	Pre Test		Post Test	
	Zero	Span	Zero	Span
Time	09:48	09:49	16:03	16:06
CO_2	0.00	16.96	0.18	16.81
CO	0.000	4.247	-0.058	4.271

Air Velocity (ft/min): Initial: 650 Final: 650

Scale Audit (lbs): Initial: 10.0 Final: 10.0

Pitot Tube Leak Test: Initial: 0 Final: 0

Stack Diameter (in): 3

Induced Draft: 0

% Smoke Capture: 100

Flue Pipe Cleaned Prior to First Test in Series:

Date: 7/31/15 Initials: [signature]

	Initial	Middle	Ending
P_b (in/Hg)	30.06	30.08	30.10
Ambient (°F)	75	80	84

Background Filter Volume: NA

Tunnel Traverse

Microtector Reading	dP (in H_2O)	T(°F)
NA	0.037	136
	0.047	
	0.045	
	0.032	
	0.033	
	0.049	
	0.050	
	0.028	
Center:		
NA	0.052	136
Static:		
NA	-0.44	136

Technician Signature: [signature] Date: 8/6/15