



# OMNI-Test Laboratories, Inc.

EPA Standard of Performance for New Residential Wood Heaters

## Certification Test Report

### Non-Confidential Business Information (Non-CBI)

**Manufacturer:** Hearth & Home Technologies, Inc.  
**Heater Type:** Pellet-Fired, Freestanding  
**Model:** P61-C

**Prepared for:** Hearth & Home Technologies, Inc.  
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Halifax, PA 17032  
USA

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**Test Period:** December 10, 2018

**Report Date:** January 22, 2019  
**Report Revision Date:** February 27, 2024

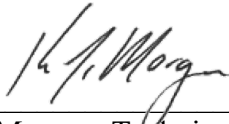
**Report Number:** 0135PS022E

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## **AUTHORIZED SIGNATORIES**

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

**Evaluator:**



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Ken Morgan, Technical Services Director  
OMNI-Test Laboratories, Inc

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# **Section 1**

## **Appliance, Testing, & Results**

- 1.1 - Summary Tables
- 1.2 - Procedures and Results Summary
- 1.3 - Appliance Description

## 1.1 - Summary Tables

**Table 1 – Particulate Emissions**

	Integrated Total	One-Hour Filter
<b>Emission Rate</b> (g/hr) Uncorrected <sup>1</sup>	1.48	3.68
<b>Emission Rate</b> (g/hr) Corrected <sup>2</sup>	1.65	3.68
<b>Emission Factor</b> (g/dry kg)	0.95	1.16

<sup>1</sup>Uncorrected refers to gravimetric analysis that takes negative filter weights as a negative value in cases where filter residue was transferred to (stuck to) O-ring gaskets to account for the mass transfer.

<sup>2</sup>Corrected refers to gravimetric analysis where negative filter weights are taken as zero, thus reporting a higher value by overreporting of transferred filter material. The uncorrected values were added to this report in response to a request by the US EPA.

**Table 2 – Efficiency and CO**

	Integrated Total	Burn Rate Segment		
		Maximum	Medium	Minimum
<b>Time</b> (minutes)	362	61	121	180
<b>Burn Rate</b> (dry kg/hr)	1.562	3.259	1.323	1.148
<b>Heat Input Rate</b> (BTU/hr, HHV)	29,108	60,734	24,653	21,384
<b>Heat Output Rate</b> (BTU/hr, HHV)	23,080	46,831	19,804	17,085
<b>Efficiency</b> (%, HHV)	79.3%	77.1%	80.3%	79.9%
<b>Efficiency</b> (%, LHV)	85.0%	82.6%	86.1%	85.6%
<b>CO Emission Rate</b> (g/min)	0.18	0.68	0.07	0.09

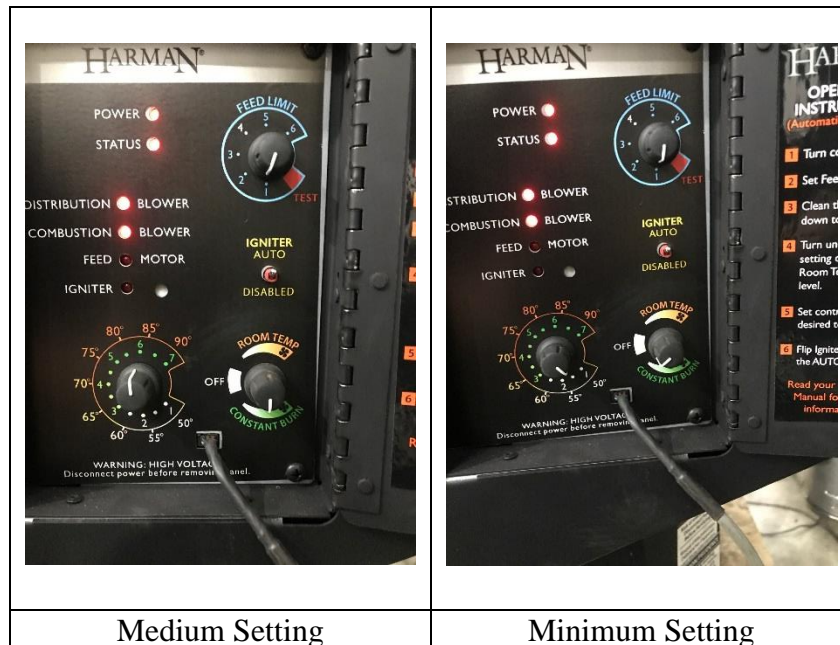
## 1.1 - Summary Tables

**Table 3 – Test Facility Conditions**

	Initial	Middle	Final
Room Temperature (°F)	74	78	76
Barometric Pressure (in Hg)	30.33	30.32	30.31
Air Velocity (ft/min)	<50	<50	<50
Induced Draft (in H2O)	Φ	Φ	Φ

**Table 4 – Heater Configuration**

	Pretest	Burn Rate Segment		
		Maximum	Medium	Minimum
Temp Dial	Max (fixed)	Max (fixed)	6/448°F	Min (Fixed)
Feed Adj. Dial	52.5 sec	52.5 sec	20 sec	17.5 sec
Mode Dial	Max	Max	180° Down	Min



## 1.2 - Procedures and Results Summary

### TESTING PROCEDURE

The P61-C 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 Energex brand densified wood pellet fuel; this fuel was graded as Premium by the Pellet Fuels Institute and was produced at registered mill # 16012. Particulate emissions were measured using dual sampling trains consisting of two sets of filters (front and back).

A single test run was performed. The unit was installed in accordance with the manufacturer's instructions. Testing was done at OMNI Test Laboratories in Portland OR. The dilution tunnel that was used can be found in Section 2 of this report.

The manufacturer's instructions specified leaving the fan on the maximum dial setting (fixed stop) throughout the run, and operating the pre-burn and high burn segments at maximum heat dial setting (fixed stop), the medium burn segment at heat dial setting 6 of 7 (see photo in table 4), and the low burn segment at the minimum heat dial setting (fixed stop). These settings were used for the test run, as specified. No home user could achieve a lower burn rate than that tested via manipulation of any of these settings.

### RESULTS SUMMARY

Proportionality results of the integrated test run, in addition to all other validity criteria, were within specified limits. All burn rate categories were achieved. Negative filter weight was found on Train A and Train B. This is caused by filter material transferring to the Oring gasket. Transfer weight can be seen as a positive weight on the O-rings, negative filter is added back into the calculation to prevent transfer weight as being counted as emissions. No additional sampling anomalies occurred, therefore, this test run is considered valid and appropriate.

The results of the integrated test run indicate an average particulate emission rate of 1.48 g/hr. The P61-C results are within the emission limit of 2.0 g/hr for affected appliances manufactured on or after May 15, 2020 or sold at retail after December 31, 2020.

The model P61-C 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 79.3%. The calculated CO emission rate was 0.18 g/min.

Upon completion of emissions certification testing, the sample unit was sealed and will be stored by the manufacturer in accordance with the requirements of the CFR.

### 1.3 - Appliance Description

**Appliance Manufacturer:** Hearth & Home Technologies, Inc.

**Pellet Stove Model:** P61-C

**Type:** Freestanding, air-circulating type, pellet-fired room heater.

The P61-C's principle elements include a fuel hopper, s firebox chamber, stainless steel burn pot, and electrical fuel feed, combustion air, and convection air supply systems. The frame of the unit is constructed of mild steel.

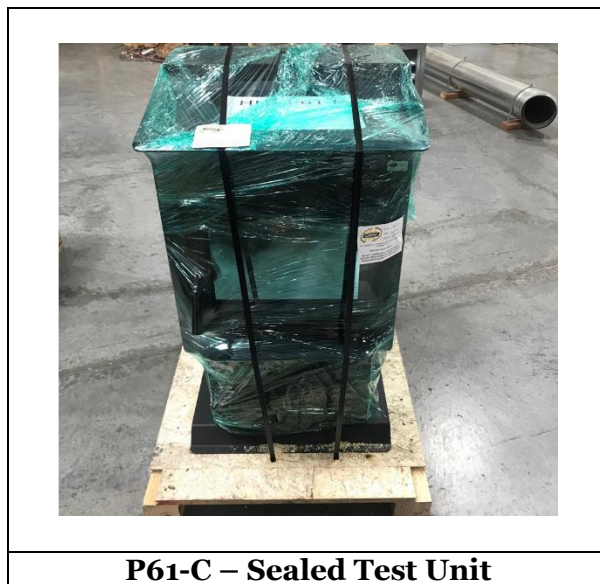
Combustion products are routed out of the firebox chamber via a baffle-type heat exchanger through a 3-inch diameter flue outlet located on the rear of the unit. The firebox features a three 9" x 4 1/2" firebricks mounted above and behind the firepot.

Fuel is supplied from the hopper to the burn pot via a short screw-type auger, mounted horizontally. 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 a mild steel door, distinct from the cast aluminum front firebox door, which also features a 13 1/4" x 9 1/2" glass panel.

The electrical systems are regulated by several user-operated dials. The user may manually select a heat setting from 1 to 7 (demarcations in °F are also shown). This knob allows users to achieve the maximum and minimum burn rates at its fixed stops – lower or higher burn rates are not possible. The unit can also be controlled by an internal or external thermostat system. Knobs to tune the stove's burn characteristics are also provided.

More detailed information is shown in the manufacturer's design drawings, Appendix C of this report. This information is considered confidential business information (CBI) by the manufacturer and is not included in the non-CBI version of this report.





# Appliance Photographs

P61-C

Test Date: 8/31/2018



**P61-C Front**



**P61-C Back**



**P61-C Left**



**P61-C Right**

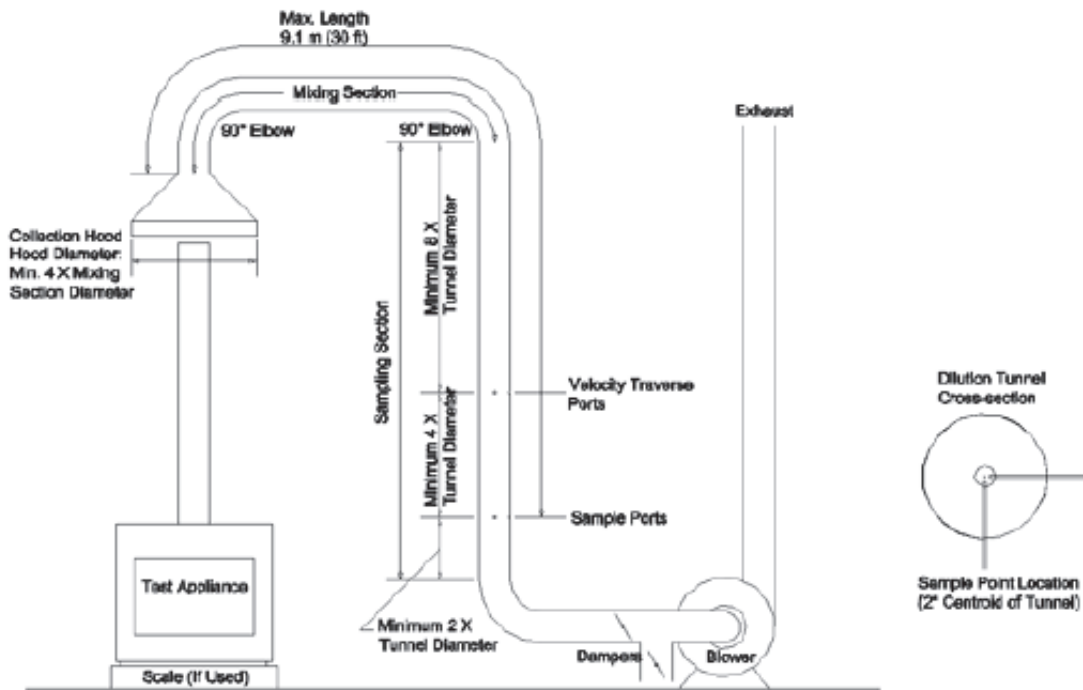
# **Section 2**

## **Test Data**




2.1 Test Data by Run

2.2 Sample Analysis & Tares

## Example of ASTM E2515-11 Dilution Tunnel



Prior to testing, sample point and travers point locations are verified to ensure placement is within specifications. Collection hood, tunnel diameter, and mixing section length are also verified to be within specifications.

<b>Information</b>	<b>Tunnel 1</b>	<b>Tunnel 2</b>	<b>Tunnel 3</b>
Name of Tunnel	6" Dilution Tunnel	6" Dilution Tunnel	12" Dilution Tunnel
Location of Tunnel	OMNI Test Lab, Emissions Booth 1	OMNI Test Lab, Emissions Booth 2	OMNI Test Lab, Emissions Booth 3
Presence of Mixing Baffles (EPA 5G)	Two steel semicircles on opposite sides of the duct midway between the T connector and elbow upstream of sampling section (available but not used)	Two steel semicircles on opposite sides of the duct midway between the T connector and elbow upstream of sampling section (available but not used)	There are no mixing baffles
Presence of mixing section (ASTM E2515)	5' mixing section of dilution tunnel	5' mixing section of dilution tunnel	5' mixing section of dilution tunnel
Description of Tunnel Turns	Steel T connector and 90° elbow are used for connecting mixing section, the sampling section. The elbow before the sampling section begins is of the same 6" diameter as the sampling section straight ducting	Steel T connector and 90° elbow are used for connecting mixing section, the sampling section. The elbow before the sampling section begins is of the same 6" diameter as the sampling section straight ducting	Steel T connector and 90° elbow are used for connecting mixing section, the sampling section. The elbow before the sampling section begins is of the same 12" diameter as the sampling section straight ducting
Diameter of Horizontal Flue Section	6"	6"	12"
Diameter of Sampling Section	6"	6"	12"
Photograph of Tunnel Apparatus			

## **2.1 - Test Data by Run**

### Run 1 Notes & Results

## Pellet Heater Conditioning Data - ASTM E2779

Manufacturer: HHT Halifax  
 Model: P61-C  
 Tracking No.: 2331  
 Project No.: 0135PS022E  
 Test Date: 11/15 - 11/29/2018  
 Operation Category: Medium

Elapsed Time (hours)	Fuel Reading (lbs)	Stack (°F)
0	40.6	413.6
1	32.7	429.9
2	28.7	249.4
3	25.7	251.9
4	23.0	252.2
5	20.3	246.8
6	17.6	256.5
7	41.2	406.4
8	33.5	425.4
9	29.6	249.5
10	26.5	249.8
11	23.7	251.0
12	21.1	246.8
13	18.3	244.9
14	45.1	151.1
15	38.5	419.6
16	30.8	336.9
17	27.4	254.0
18	24.5	252.3
19	21.7	249.8
20	18.9	251.4
21	45.5	82.7
22	39.4	421.1
23	31.5	429.3
24	26.7	243.6
25	23.4	245.7
26	20.4	238.9
27	17.4	251.4
28	14.7	254.2
29	41.5	405.9
30	33.9	430.4

## Pellet Heater Conditioning Data - ASTM E2779

Manufacturer: HHT Halifax  
 Model: P61-C  
 Tracking No.: 2331  
 Project No.: 0135PS022E  
 Test Date: 11/15 - 11/29/2018  
 Operation Category: Medium

Elapsed Time (hours)	Fuel Reading (lbs)	Stack (°F)
31	27.9	290.4
32	24.5	263.0
33	21.3	257.1
34	18.7	257.3
35	16.1	256.4
36	12.7	405.0
37	40.6	418.2
38	33.0	436.9
39	27.5	254.9
40	24.2	259.0
41	21.2	250.1
42	18.2	254.8
43	15.4	254.9
44	43.9	337.2
45	36.8	431.5
46	29.8	327.8
47	26.1	252.0
48	23.0	260.2
49	20.1	250.5
50	17.4	243.6

P61-C Burn Settings for 12-10-2018

Preset:

One 40 pound bag of Energex Pellets (Do not open hopper during test)  
Connect DDM  
Set Mode knob to OFF before plugging in stove.  
Power supply: Make sure Range Switch is 120V 60Hz. Set to 114V then slowly increase until supply just changes to 115V.  
Plug in stove to power supply.  
Draft adjust -33V (already set)

High: (Setting when ready to start preburn)

Feed Adjuster: #5.04 or 52.5 seconds  
Temperature knob: Max CW #7, 480F setpoint  
Mode knob: Constant Burn max CCW (start pre-burn time now)

Medium<50%:

Feed Adjuster: 20 seconds or #1.33  
Temperature knob: 448F setpoint or #6.01  
Mode knob: 38mode (screen e), pointer center down


Low:

Feed Adjuster: 17.5 seconds  
Temperature knob: Max CCW #1 285F setpoint  
Mode knob: L(Low) (Left of center down, pointing at "C" of Constant Burn)



## ASTM E2779 / ASTM E2515 Emissions Results

Manufacturer: HHT Halifax  
 Model: P61-C  
 Project No.: 0135PS022E  
 Tracking No.: 2331  
 Run: 1  
 Test Date: 12/10/18

Technician Signature: 

Integrated Test Run	
Particulate Emission Rate	<b>1.48 g/hr</b>
Total Particulate Emissions - $E_T$	8.95 g
Emissions Factor	0.95 g/kg
CSA B415 Efficiency	<b>79.3% HHV</b>


First Hour Emissions	
Particulate Emission Rate	3.68 g/hr
Total Particulate Emissions - $E_T$	3.68 g
Emissions Factor	1.16 g/kg

Burn Rate (Composite)	<b>1.56 kg/hr dry</b>
Burn Rate (High)	3.26 kg/hr dry
Burn Rate (Medium)	1.32 kg/hr dry
Burn Rate (Low)	1.15 kg/hr dry
Average Tunnel Temperature	87 degrees F
Avg. Velocity in Dilution Tunnel - $v_s$	13.70 ft/second
Avg. Flow Rate in Dilution Tunnel - $Q_{sd}$	9280.3 dscf/hour
Average $\Delta p$	0.055 inches H2O
Average $\Delta H$	1.36 inches H2O
Total Time of Test	362 minutes

40.6% Of High  
 35.2% Of High

## ASTM E2779 / ASTM E2515 Emissions Results

Manufacturer: HHT Halifax  
 Model: P61-C  
 Project No.: 0135PS022E  
 Tracking No.: 2331  
 Run: 1  
 Test Date: 12/10/18

Technician Signature: 

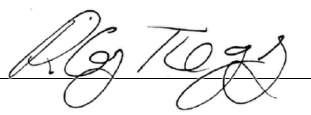
	1 <sup>st</sup> Hour	Sample Train 1	Sample Train 2	Sample	Unit
Total Sample Volume - $V_m$	9.621	58.499	58.500	N/A	ft <sup>3</sup>
Average Gas Meter Temperature	77.38	79.70	80.79		°F
Sample Volume (Std. Conditions) - $V_{mstd}$	9.578	57.989	57.137		dsf <sup>3</sup>
Total Particulates - $m_n$	3.8	9.2	9.2		mg
Particulate Concentration - $C_r/C_s$	3.967E-04	1.59E-04	1.61E-04		g/dsf <sup>3</sup>
Total Particulate Emissions - $E_T$	3.68	8.88	9.02		g
Particulate Emission Rate	3.68	1.47	1.49		g/hr
Emissions Factor	1.16	0.94	0.96		g/kg
Delta from Avg. Particulate Emissions		0.07	0.07		g

Quality Checks			
Filter Temps < 90 °F	OK	Ambient Temp (55-90°F)	OK
Filter Face Velocity	OK	Negative Probe Weight	OK
Leakage Rate	OK	Pro-Rate Variation	OK
Medium Burn Rate < 50%	OK	Dual Train Comparison	OK

# ASTM E2779 / ASTM E2515 Emissions Results

Corrected

Manufacturer: HHT Halifax  
 Model: P61-C  
 Project No.: 0135PS022E  
 Tracking No.: 2331  
 Run: 1  
 Test Date: 12/10/18

Technician Signature: 

Integrated Test Run	
Particulate Emission Rate	1.65 g/hr
Total Particulate Emissions - E <sub>T</sub>	9.97 g
Emissions Factor	1.06 g/kg
CSA B415 Efficiency	79.3% HHV

First Hour Emissions	
Particulate Emission Rate	3.68 g/hr
Total Particulate Emissions - E <sub>T</sub>	3.68 g
Emissions Factor	1.16 g/kg

Burn Rate (Composite)	1.56 kg/hr dry	
Burn Rate (High)	3.26 kg/hr dry	
Burn Rate (Medium)	1.32 kg/hr dry	40.6% Of High
Burn Rate (Low)	1.15 kg/hr dry	35.2% Of High
Average Tunnel Temperature	87 degrees F	
Avg.Velocity in Dilution Tunnel - v <sub>s</sub>	13.70 ft/second	
Avg.Flow Rate in Dilution Tunnel - Q <sub>sd</sub>	9280.3 dscf/hour	
Average Δp	0.055 inches H2O	
Average ΔH	1.36 inches H2O	
Total Time of Test	362 minutes	

## ASTM E2779 / ASTM E2515 Emissions Results

Manufacturer: HHT Halifax  
 Model: P61-C  
 Project No.: 0135PS022E  
 Tracking No.: 2331  
 Run: 1  
 Test Date: 12/10/18

Technician Signature: \_\_\_\_\_

	1 <sup>st</sup> Hour	Sample Train 1	Sample Train 2	Sample	Unit
Total Sample Volume - $V_m$	9.621	58.499	58.500	N/A	ft <sup>3</sup>
Average Gas Meter Temperature	77.38	79.70	80.79		°F
Sample Volume (Std. Conditions) - $V_{mstd}$	9.578	57.989	57.137		dsf <sup>3</sup>
Total Particulates - $m_n$	3.8	10.7	9.8		mg
Particulate Concentration - $C_r/C_s$	3.967E-04	1.85E-04	1.72E-04		g/dsf <sup>3</sup>
Total Particulate Emissions - $E_T$	3.68	10.33	9.60		g
Particulate Emission Rate	3.68	1.71	1.59		g/hr
Emissions Factor	1.16	1.10	1.02		g/kg
Delta from Avg. Particulate Emissions		0.36	0.36		g

### Quality Checks

Filter Temps < 90 °F	OK	Ambient Temp (55-90°F)	OK
Filter Face Velocity	OK	Negative Probe Weight	OK
Leakage Rate	OK	Pro-Rate Variation	OK
Medium Burn Rate < 50%	OK	Dual Train Comparison	OK
Train Precision 7.5%	1.638	Train Precision 0.5g/kg	0.08

### CSA B415.1 Results - Overall & By Category

Manufacturer: HHT Halifax  
 Model: P61-C  
 Date: 10-Dec-18

Run: 1  
 Control #: 0135PS022E  
 Test Duration: 362

Test Results in Accordance with CSA B415.1-09 - Overall			
	HHV Basis	LHV Basis	
Overall Efficiency	79.3%	85.0%	
Combustion Efficiency	99.5%	99.5%	
Heat Transfer Efficiency	80%	85.4%	
Output Rate (kJ/h)	24,330	23,080	(Btu/h)
Burn Rate (kg/h)	1.56	3.44	(lb/h)
Input (kJ/h)	30,685	29,108	(Btu/h)
Test Load Weight (dry kg)	9.42	20.77	dry lb
MC wet (%)	5.15		
MC dry (%)	5.43		
Particulate (g )	8.95		
CO (g)	67		
Test Duration (h)	6.03		
Emissions	Particulate	CO	
g/MJ Output	0.06	0.46	
g/kg Dry Fuel	0.95	7.10	
g/h	1.48	11.09	
lb/MM Btu Output	0.14	1.06	
Air/Fuel Ratio (A/F)	20.07		

Test Results in Accordance with CSA B415.1-09 - Maximum			
	HHV Basis	LHV Basis	
Overall Efficiency	77.1%	82.6%	
Combustion Efficiency	99.4%	99.4%	
Heat Transfer Efficiency	78%	83.1%	
Output Rate (kJ/h)	49,369	46,831	(Btu/h)
Burn Rate (kg/h)	3.26	7.18	(lb/h)
Input (kJ/h)	64,024	60,734	(Btu/h)
Test Load Weight (dry kg)	3.31	7.30	dry lb
MC wet (%)	5.15		
MC dry (%)	5.43		
Particulate (g )	3.80		
CO (g)	42		
Test Duration (h)	1.02		
Emissions	Particulate	CO	
g/MJ Output	0.08	0.83	
g/kg Dry Fuel	1.15	12.59	
g/h	3.74	41.04	
lb/MM Btu Output	0.18	1.93	
Air/Fuel Ratio (A/F)	13.08		

Test Results in Accordance with CSA B415.1-09 - Medium			
	HHV Basis	LHV Basis	
Overall Efficiency	80.3%	86.1%	
Combustion Efficiency	99.5%	99.5%	
Heat Transfer Efficiency	80.7%	86.5%	
Output Rate (kJ/h)	20,877	19,804	(Btu/h)
Burn Rate (kg/h)	1.32	2.92	(lb/h)
Input (kJ/h)	25,989	24,653	(Btu/h)
Test Load Weight (dry kg)	2.67	5.88	dry lb
MC wet (%)	5.15		
MC dry (%)	5.43		
Particulate (g )	-		
CO (g)	9		
Test Duration (h)	2.02		
Emissions	Particulate	CO	
g/MJ Output	-	0.21	
g/kg Dry Fuel	-	3.31	
g/h	-	4.38	
lb/MM Btu Output	-	0.49	
Air/Fuel Ratio (A/F)	20.65		

Test Results in Accordance with CSA B415.1-09 - Minimum			
	HHV Basis	LHV Basis	
Overall Efficiency	79.9%	85.6%	
Combustion Efficiency	99.5%	99.5%	
Heat Transfer Efficiency	80.3%	86.0%	
Output Rate (kJ/h)	18,011	17,085	(Btu/h)
Burn Rate (kg/h)	1.15	2.53	(lb/h)
Input (kJ/h)	22,543	21,384	(Btu/h)
Test Load Weight (dry kg)	3.44	7.59	dry lb
MC wet (%)	5.15		
MC dry (%)	5.43		
Particulate (g )	-		
CO (g)	17		
Test Duration (h)	3.00		
Emissions	Particulate	CO	
g/MJ Output	-	0.32	
g/kg Dry Fuel	-	4.96	
g/h	-	5.69	
lb/MM Btu Output	-	0.73	
Air/Fuel Ratio (A/F)	23.95		

VERSION: 2-2 42/14/2009

Modified to fit this Format

## Pellet Heater Preburn Data - ASTM E2779

Manufacturer: HHT Halifax  
 Model: P61-C  
 Tracking No.: 2331  
 Project No.: 0135PS022E  
 Test Date: 10-Dec-18

PB Length: 66 min  
 Recording Interval: 1 min

Averages:	346	70	-0.03	8.39	0.05
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Elapsed Time (min)	Scale Reading	Weight Change	Stack (F)	Ambient (F)	Draft ("H2O)	CO2 (%)	CO (%)
0	7.3	-	185	68	-0.01	N/A	N/A
1	7.3	0	178	68	-0.02	N/A	N/A
2	7.3	0	167	68	-0.02	N/A	N/A
3	7.2	-0.1	165	68	-0.02	N/A	N/A
4	7.2	0	165	68	-0.02	5.07	0.04
5	7.1	-0.1	166	68	-0.02	5.37	0.03
6	7.0	-0.1	167	68	-0.02	5.54	0.03
7	7.0	0	170	68	-0.02	6.13	0.03
8	6.9	-0.1	173	68	-0.02	6.35	0.03
9	6.8	-0.1	175	68	-0.02	6.70	0.03
10	6.8	0	177	68	-0.02	7.25	0.04
11	6.7	-0.1	183	68	-0.02	7.65	0.06
12	6.6	-0.1	218	68	-0.02	7.53	0.07
13	6.5	-0.1	250	68	-0.02	7.38	0.08
14	6.4	-0.1	271	69	-0.03	7.32	0.07
15	6.4	0	288	68	-0.03	7.50	0.08
16	6.3	-0.1	298	69	-0.03	7.78	0.08
17	6.2	-0.1	307	69	-0.03	7.63	0.06
18	6.1	-0.1	316	69	-0.03	6.99	0.04
19	6.0	-0.1	323	69	-0.03	6.46	0.03
20	5.9	-0.1	333	69	-0.03	6.04	0.03
21	5.8	-0.1	342	69	-0.03	5.82	0.02
22	5.6	-0.2	349	69	-0.03	5.94	0.02
23	5.5	-0.1	360	69	-0.04	6.19	0.02
24	5.4	-0.1	366	69	-0.04	7.01	0.02
25	5.3	-0.1	368	69	-0.04	7.83	0.01
26	5.1	-0.2	374	70	-0.04	8.10	0.01
27	5.0	-0.1	378	69	-0.04	8.75	0.03
28	4.9	-0.1	380	70	-0.04	8.92	0.03
29	4.8	-0.1	383	70	-0.04	8.46	0.02

## Pellet Heater Preburn Data - ASTM E2779

Manufacturer: HHT Halifax  
 Model: P61-C  
 Tracking No.: 2331  
 Project No.: 0135PS022E  
 Test Date: 10-Dec-18

PB Length: 66 min  
 Recording Interval: 1 min

Averages:	346	70	-0.03	8.39	0.05
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30	4.6	-0.2	390	70	-0.04	8.80	0.02
31	4.5	-0.1	392	70	-0.04	8.61	0.02
32	4.4	-0.1	393	70	-0.04	8.70	0.03
33	4.2	-0.2	394	70	-0.04	9.69	0.06
34	4.1	-0.1	397	70	-0.04	9.50	0.04
35	4.0	-0.1	399	71	-0.04	8.97	0.02
36	3.9	-0.1	401	71	-0.04	8.77	0.01
37	3.7	-0.2	402	71	-0.04	8.92	0.02
38	3.6	-0.1	406	70	-0.04	9.72	0.12
39	3.5	-0.1	408	72	-0.04	9.55	0.05
40	3.3	-0.2	410	71	-0.04	9.49	0.04
41	3.2	-0.1	412	71	-0.04	9.97	0.07
42	3.1	-0.1	412	71	-0.04	10.12	0.10
43	2.9	-0.2	411	72	-0.04	10.04	0.10
44	2.8	-0.1	410	71	-0.04	9.90	0.10
45	2.7	-0.1	412	72	-0.04	9.18	0.04
46	2.6	-0.1	411	71	-0.04	8.72	0.02
47	2.4	-0.2	414	72	-0.04	8.86	0.02
48	2.3	-0.1	416	72	-0.04	9.17	0.02
49	2.2	-0.1	417	72	-0.04	9.04	0.01
50	2.0	-0.2	417	71	-0.04	9.58	0.08
51	1.9	-0.1	418	71	-0.04	10.03	0.17
52	1.8	-0.1	417	72	-0.04	9.57	0.08
53	1.7	-0.1	417	72	-0.04	9.68	0.04
54	1.6	-0.1	415	71	-0.04	9.59	0.03
55	1.4	-0.2	415	72	-0.04	9.14	0.02
56	1.3	-0.1	418	72	-0.04	8.68	0.01
57	1.2	-0.1	419	73	-0.04	8.70	0.01
58	1.0	-0.2	421	72	-0.04	9.10	0.01
59	0.9	-0.1	420	72	-0.04	9.70	0.05
60	0.8	-0.1	419	72	-0.04	10.23	0.15
61	0.7	-0.1	419	72	-0.04	10.14	0.25

## Pellet Heater Preburn Data - ASTM E2779

Manufacturer: HHT Halifax  
 Model: P61-C  
 Tracking No.: 2331  
 Project No.: 0135PS022E  
 Test Date: 10-Dec-18

PB Length: 66 min  
 Recording Interval: 1 min

Averages: 

346	70	-0.03	8.39	0.05
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62	0.5	-0.2	419	71	-0.04	9.45	0.10
63	0.4	-0.1	419	72	-0.04	9.13	0.05
64	0.3	-0.1	421	73	-0.04	9.31	0.07
65	0.1	-0.2	421	73	-0.04	9.42	0.04
66	0.0	-0.1	420	73	-0.04	9.54	0.05



### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: HHT Halifax High Burn End Time: 61  
 Model: P61-C Medium Burn End Time: 182  
 Tracking No.: 2331 Total Sampling Time: 362 min  
 Project No.: 0135PS022E Recording Interval: 1 min  
 Test Date: 10-Dec-18  
 Beginning Clock Time: 09:20 Background Sample Volume: 0 cubic feet

Meter Box Y Factor: 0.997 (1) 0.985 (2) 0 (Amb)

Barometric Pressure: Begin Middle End Average  
30.33 30.32 30.31 30.32 "Hg

PM Control Modules: 371/372

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: -0.200 "H<sub>2</sub>O  
 Tunnel Area: 0.1963 ft<sup>2</sup>  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.70 ft/sec.  
 Initial Tunnel Flow: 149.7 scfm  
 Average Tunnel Flow: 154.7 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ -10 in. Hg  
 Post-Test Leak Check (2): 0.001 cfm @ -16 in. Hg  
 Fuel Moisture (%): 5.430 Dry Basis 5.150 Wet Basis

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.034	0.048	0.048	0.036	0.028	0.044	0.050	0.040	0.054
Temp:	108	108	108	108	108	108	108	108	108
	V <sub>strav</sub> 13.77 ft/sec			V <sub>scent</sub> 15.87 ft/sec			F <sub>p</sub> 0.868		

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)						Stack Gas Data				
	Meter 1 (ft <sup>3</sup> )	Meter 2 (ft <sup>3</sup> )	Rate 1 (cfm)	Rate 2 (cfm)	dH 1 ("H <sub>2</sub> O)	Meter 1 T (°F)	Meter Vac 1 ("Hg)	dH 2 ("H <sub>2</sub> O)	Meter 2 T (°F)	Meter Vac 2 ("Hg)	Dilution Tunnel (°F)	Tunnel dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Dryer 1	Filter 2	Dryer 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
0	0.000	0.000			0.01	73	-0.07	0.46	76	0.90	108	0.055			21.9		420	68	75	68	75	73	-0.040	9.77	0.073
1	0.156	0.154	0.16	0.15	1.38	73	2.01	1.13	76	1.10	108	0.055	100	98	21.7	-0.2	421	69	77	70	75	73	-0.039	9.86	0.110
2	0.316	0.318	0.16	0.16	1.38	73	2.01	1.12	76	1.10	108	0.055	103	105	21.6	-0.1	421	69	77	71	75	72	-0.040	9.47	0.100
3	0.477	0.481	0.16	0.16	1.38	73	2.01	1.12	76	1.10	107	0.055	103	104	21.5	-0.1	421	70	77	72	73	73	-0.041	9.99	0.310
4	0.637	0.644	0.16	0.16	1.37	73	2.00	1.12	76	1.10	107	0.054	103	105	21.4	-0.1	419	70	77	72	71	72	-0.041	9.31	0.100
5	0.798	0.806	0.16	0.16	1.37	73	2.00	1.12	76	1.10	107	0.055	103	103	21.3	-0.1	420	71	76	73	69	73	-0.040	9.39	0.100
6	0.958	0.969	0.16	0.16	1.37	74	2.00	1.12	76	1.10	107	0.055	102	104	21.1	-0.2	419	71	76	73	69	72	-0.040	9.18	0.051
7	1.118	1.132	0.16	0.16	1.37	74	2.00	1.11	76	1.10	107	0.055	102	104	21.0	-0.1	421	71	76	73	68	73	-0.039	8.91	0.032
8	1.278	1.295	0.16	0.16	1.37	74	1.99	1.12	76	1.10	107	0.054	103	105	20.9	-0.1	420	71	76	74	68	73	-0.040	9.10	0.048
9	1.439	1.457	0.16	0.16	1.37	74	1.99	1.11	77	1.10	107	0.054	104	104	20.7	-0.2	420	72	76	74	67	73	-0.041	9.51	0.130
10	1.599	1.619	0.16	0.16	1.37	74	1.99	1.11	77	1.10	107	0.053	104	105	20.6	-0.1	421	72	76	74	67	72	-0.041	10.02	0.230
11	1.759	1.781	0.16	0.16	1.36	74	2.00	1.10	77	1.10	107	0.054	103	104	20.5	-0.1	422	72	76	75	67	73	-0.041	9.46	0.095
12	1.919	1.943	0.16	0.16	1.37	74	1.99	1.11	77	1.10	107	0.055	102	103	20.3	-0.2	421	73	76	75	67	72	-0.041	9.92	0.170
13	2.079	2.105	0.16	0.16	1.36	75	2.00	1.10	77	1.10	107	0.054	103	104	20.2	-0.1	423	73	76	75	67	72	-0.041	9.95	0.160
14	2.239	2.267	0.16	0.16	1.36	75	1.99	1.10	77	1.10	107	0.055	102	103	20.1	-0.1	422	73	76	75	67	72	-0.040	9.46	0.064
15	2.399	2.429	0.16	0.16	1.36	75	1.99	1.10	78	1.10	107	0.054	103	104	19.9	-0.2	423	73	76	76	67	72	-0.041	9.75	0.120
16	2.559	2.591	0.16	0.16	1.37	75	1.99	1.10	78	1.10	107	0.054	103	104	19.8	-0.1	420	73	76	76	67	72	-0.040	9.74	0.100
17	2.720	2.753	0.16	0.16	1.36	75	2.00	1.10	78	1.10	108	0.055	103	103	19.7	-0.1	422	74	76	76	67	72	-0.040	9.75	0.200
18	2.880	2.915	0.16	0.16	1.37	75	1.98	1.10	78	1.10	107	0.055	102	103	19.6	-0.1	422	74	76	76	67	73	-0.041	9.03	0.072
19	3.040	3.077	0.16	0.16	1.36	76	2.00	1.10	78	1.10	107	0.054	103	104	19.5	-0.1	421	74	76	77	68	72	-0.041	9.05	0.042
20	3.200	3.239	0.16	0.16	1.36	76	1.99	1.10	79	1.10	107	0.055	102	103	19.3	-0.2	419	74	76	77	68	72	-0.039	9.77	0.200
21	3.360	3.401	0.16	0.16	1.35	76	1.99	1.09	79	1.10	107	0.054	103	104	19.2	-0.1	417	74	76	77	68	73	-0.040	9.21	0.086
22	3.520	3.562	0.16	0.16	1.35	76	1.99	1.10	79	1.10	107	0.056	101	101	19.1	-0.1	417	74	77	77	68	73	-0.040	9.11	0.054
23	3.679	3.724	0.16	0.16	1.35	76	1.99	1.10	79	1.10	107	0.054	102	104	19.0	-0.1	418	74	77	77	68	72	-0.038	8.09	0.016
24	3.839	3.887	0.16	0.16	1.35	77	2.00	1.10	79	1.10	107	0.054	103	104	18.9	-0.1	419	74	77	78	69	72	-0.041	8.41	0.013
25	4.000	4.049	0.16	0.16	1.36	77	1.99	1.10	79	1.10	107	0.055	102	103	18.7	-0.2	419	75	77	78	69	72	-0.039	9.18	0.041
26	4.160	4.211	0.16	0.16	1.36	77	2.00	1.09	80	1.10	107	0.054	103	104	18.6	-0.1	416	75	77	78	69	72	-0.040	9.41	0.058
27	4.320	4.372	0.16	0.16	1.36	77	1.99	1.10	80	1.10	107	0.056	101	101	18.5	-0.1	417	75	77	78	69	72	-0.040	8.98	0.024
28	4.480	4.534	0.16	0.16	1.36	77	1.99	1.09	80	1.10	107	0.054	103	104	18.4	-0.1	420	75	77	78	69	72	-0.041	8.52	0.015
29	4.640	4.697	0.16	0.16	1.36	78	2.00	1.10	80	1.10	107	0.055	102	103	18.2	-0.2	419	75	78	78	70	72	-0.039	8.77	0.027
30	4.801	4.858	0.16	0.16	1.36	78	2.00	1.10	80	1.10	107	0.054	103	103	18.1	-0.1	420	75	78	78	70	72	-0.040	9.72	0.110
31	4.961	5.020	0.16	0.16	1.37	78	2.00	1.10	80	1.10	107	0.055	102	103	18.0	-0.1	421	75	78	78	70	72	-0.041	9.31	0.054
32	5.121	5.182	0.16	0.16	1.36	78	2.00	1.09	81	1.10	107	0.054	103	103	17.9	-0.1	421	75	78	78	70	72	-0.042	9.35	0.110
33	5.282	5.345	0.16	0.16	1.36	78	2.00	1.09	81	1.10	107	0.055	102	103	17.7	-0.2	420	75	78	78	70	72	-0.040	9.88	0.140
34	5.443	5.507	0.16	0.16	1.35	78	2.00	1.09	81	1.20	107	0.054	103	103	17.6	-0.1	420	75	79	78	71	72	-0.040	9.51	0.098
35	5.604	5.669	0.16	0.16	1.35	79	2.01	1.09	81	1.20	107	0.055	102	103	17.5	-0.1	422	75	79	78	71	73	-0.040	8.92	0.036
36	5.764	5.831	0.16	0.16	1.36	79	2.01	1.09	81	1.20	107	0.054	102	103	17.4	-0.1	422	75	79	78	71	73	-0.040	9.35	0.083
37	5.924	5.994	0.16	0.16	1.35	79	2.00	1.10	81	1.20	107	0.055	101	103	17.2	-0.2	423	75	79	78	71	72	-0.040	9.67	0.150
38	6.085	6.155	0.16	0.16	1.36	79	2.01	1.09	81	1.20	107	0.054	103	103	17.1	-0.1	422	75	79	78	72	72	-0.040	9.53	0.090
39	6.245	6.317	0.16	0.16	1.35	79	2.01	1.09	81	1.20	107	0.055	101	103	17.0	-0.1	423	75	79	78	72	72	-0.041	9.78	0.180
40	6.406	6.479	0.16	0.16	1.35	79	2.01	1.09	82	1.20	107	0.055	102	102	16.9	-0.1	423	76	80	78	72	72	-0.040	9.30	0.089
41	6.566	6.642	0.16	0.16	1.35	79	2.01	1.09	82	1.20	107	0.055	101	103	16.7	-0.2	422	76	80	78	72	72	-0.041	9.46	0.056
42	6.727	6.804	0.16	0.16	1.36	79	2.00	1.09	82	1.20	107	0.055	102	102	16.6	-0.1	421	76	80	78	72	72	-0.040	9.42	0.062
43	6.887	6.966	0.16	0.16	1.35	80	2.01	1.09	82	1.20	107	0.054	102	103	16.5	-0.1	421	76	80	79	72	72	-0.041	9.05	0.034
44	7.048	7.128	0.16	0.16	1.35	80	2.01	1.09	82	1.20	107	0.054	103	103	16.4	-0.1	418	76	80	79	73	72	-0.040	8.82	0.029
45	7.208	7.290	0.16	0.16	1.35	80	2.01	1.09	82	1.20	107	0.055	101	102	16.3	-0.1	416	76	80	79	73	73	-0.039	8.70	0.018
46	7.369	7.453	0.16	0.16	1.35	80	2.01	1.08	82	1.20	107	0.054	103	104	16.2	-0.1	417	76	81	79	73	73	-0.040	8.16	0.011
47	7.530	7.614	0.16	0.16	1.34	80	2.01	1.08	82	1.20	107	0.053	104	104	16.1	-0.1	415	76	81	79	73	72	-0.039	7.70	0.009
48	7.690																								

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: HHT Halifax High Burn End Time: 61  
 Model: P61-C Medium Burn End Time: 182  
 Tracking No.: 2331 Total Sampling Time: 362 min  
 Project No.: 0135PS022E Recording Interval: 1 min  
 Test Date: 10-Dec-18  
 Beginning Clock Time: 09:20 Background Sample Volume: 0 cubic feet

Meter Box Y Factor: 0.997 (1) 0.985 (2) 0 (Amb)

Barometric Pressure: 

Begin	Middle	End	Average
<u>30.33</u>	<u>30.32</u>	<u>30.31</u>	<u>30.32</u>

<sup>°Hg</sup>

PM Control Modules: 371/372

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: -0.200 <sup>°H<sub>2</sub>O</sup>  
 Tunnel Area: 0.1963 ft<sup>2</sup>  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.70 ft/sec.  
 Initial Tunnel Flow: 149.7 scfm  
 Average Tunnel Flow: 154.7 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ -10 in. Hg  
 Post-Test Leak Check (2): 0.001 cfm @ -16 in. Hg  
 Fuel Moisture (%): 5.430 Dry Basis 5.150 Wet Basis

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	<u>0.034</u>	<u>0.048</u>	<u>0.048</u>	<u>0.036</u>	<u>0.028</u>	<u>0.044</u>	<u>0.050</u>	<u>0.040</u>	<u>0.054</u>
Temp:	<u>108</u>	<u>108</u>	<u>108</u>	<u>108</u>	<u>108</u>	<u>108</u>	<u>108</u>	<u>108</u>	<u>108</u>
	V <sub>strav</sub> <u>13.77</u> ft/sec			V <sub>scent</sub> <u>15.87</u> ft/sec			F <sub>p</sub> <u>0.868</u>		

Elapsed Time (min)	Particulate Sampling Data											Fuel Weight (lb)				Temperature Data (°F)						Stack Gas Data			
	Meter 1 (ft <sup>3</sup> )	Meter 2 (ft <sup>3</sup> )	Rate 1 (cfm)	Rate 2 (cfm)	dH 1 (°H <sub>2</sub> O)	Meter 1 T (°F)	Meter Vac 1 (°Hg)	dH 2 (°H <sub>2</sub> O)	Meter 2 T (°F)	Meter Vac 2 (°Hg)	Dilution Tunnel (°F)	Tunnel dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Dryer 1	Filter 2	Dryer 2	Ambient	Draft (°H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
50	8.011	8.101	0.16	0.16	1.35	80	2.01	1.09	83	1.20	107	0.054	102	103	15.7	-0.1	416	76	81	78	74	72	-0.041	8.69	0.063
51	8.172	8.263	0.16	0.16	1.35	80	2.02	1.09	83	1.20	107	0.055	102	102	15.6	-0.1	418	76	81	78	74	72	-0.041	9.19	0.110
52	8.333	8.425	0.16	0.16	1.36	81	2.02	1.09	83	1.20	107	0.055	102	102	15.4	-0.2	421	76	81	78	74	73	-0.042	8.59	0.047
53	8.493	8.587	0.16	0.16	1.36	81	2.02	1.09	83	1.20	107	0.055	101	102	15.3	-0.1	422	76	81	78	74	74	-0.041	9.53	0.240
54	8.654	8.750	0.16	0.16	1.36	81	2.01	1.09	83	1.20	106	0.053	103	105	15.2	-0.1	422	76	81	78	74	73	-0.042	9.86	0.260
55	8.815	8.911	0.16	0.16	1.36	81	2.02	1.09	83	1.20	106	0.054	103	102	15.1	-0.1	421	76	81	78	74	74	-0.042	9.90	0.410
56	8.976	9.073	0.16	0.16	1.36	81	2.02	1.09	83	1.20	108	0.054	103	103	14.9	-0.2	423	76	81	78	74	72	-0.043	9.46	0.190
57	9.137	9.235	0.16	0.16	1.36	81	2.03	1.09	83	1.20	109	0.053	104	104	14.8	-0.1	422	76	81	78	75	73	-0.041	9.13	0.069
58	9.298	9.398	0.16	0.16	1.36	81	2.02	1.09	83	1.20	108	0.055	102	103	14.7	-0.1	422	76	81	78	75	72	-0.041	9.80	0.450
59	9.459	9.560	0.16	0.16	1.36	81	2.02	1.08	83	1.20	108	0.054	103	103	14.6	-0.1	419	76	81	78	75	72	-0.042	9.36	0.250
60	9.621	9.722	0.16	0.16	1.35	81	2.03	1.09	83	1.20	108	0.054	103	103	14.5	-0.1	419	76	81	78	75	73	-0.042	9.00	0.070
61	9.784	9.884	0.16	0.16	1.36	81	2.01	1.09	83	1.20	108	0.053	105	104	14.2	-0.3	419	75	81	78	75	71	-0.040	8.85	0.079
62	9.945	10.047	0.16	0.16	1.37	81	2.01	1.09	83	1.20	108	0.054	103	104	14.2	0.0	420	76	81	78	75	72	-0.041	8.96	0.057
63	10.107	10.209	0.16	0.16	1.37	81	2.01	1.09	83	1.20	108	0.054	103	103	14.1	-0.1	416	76	81	78	75	71	-0.042	9.07	0.066
64	10.268	10.371	0.16	0.16	1.37	81	1.99	1.09	83	1.20	106	0.054	103	103	14.0	-0.1	398	76	81	78	75	71	-0.045	9.48	0.170
65	10.430	10.533	0.16	0.16	1.37	81	2.00	1.09	83	1.20	100	0.055	102	101	14.0	0.0	362	75	81	77	75	71	-0.044	9.07	0.104
66	10.592	10.696	0.16	0.16	1.37	81	1.99	1.09	83	1.20	96	0.057	100	100	13.9	-0.1	344	75	81	77	75	72	-0.043	6.81	0.015
67	10.754	10.859	0.16	0.16	1.37	81	2.00	1.09	83	1.20	94	0.054	102	103	13.8	-0.1	331	75	81	77	75	71	-0.041	5.45	0.005
68	10.916	11.020	0.16	0.16	1.37	81	1.99	1.09	83	1.20	92	0.057	99	98	13.8	0.0	320	75	81	77	75	72	-0.040	5.79	0.006
69	11.077	11.183	0.16	0.16	1.37	81	2.00	1.09	83	1.20	91	0.057	98	100	13.7	-0.1	312	75	81	77	75	72	-0.039	6.14	0.004
70	11.239	11.346	0.16	0.16	1.37	81	2.00	1.09	83	1.20	89	0.055	101	101	13.7	0.0	303	74	80	76	75	71	-0.039	6.34	0.004
71	11.402	11.509	0.16	0.16	1.37	81	2.00	1.08	83	1.20	88	0.054	102	102	13.6	-0.1	297	74	80	76	76	70	-0.038	6.07	0.002
72	11.564	11.671	0.16	0.16	1.37	81	1.99	1.09	83	1.20	88	0.057	99	99	13.6	0.0	292	74	79	76	76	70	-0.037	6.11	0.004
73	11.726	11.833	0.16	0.16	1.37	81	1.99	1.09	83	1.20	87	0.056	100	99	13.5	-0.1	288	74	79	75	76	70	-0.036	5.69	0.003
74	11.888	11.996	0.16	0.16	1.37	81	2.00	1.09	83	1.20	86	0.056	99	100	13.4	-0.1	284	73	79	75	76	72	-0.036	5.68	0.003
75	12.050	12.159	0.16	0.16	1.37	81	2.00	1.09	83	1.20	86	0.056	99	100	13.4	0.0	279	73	78	75	75	71	-0.035	6.19	0.005
76	12.212	12.321	0.16	0.16	1.37	81	2.00	1.09	83	1.20	85	0.057	99	98	13.3	-0.1	275	73	78	75	75	71	-0.034	5.95	0.004
77	12.374	12.483	0.16	0.16	1.38	81	2.00	1.09	83	1.20	85	0.056	99	99	13.3	0.0	272	73	77	74	75	71	-0.034	5.74	0.004
78	12.537	12.646	0.16	0.16	1.38	81	1.99	1.09	83	1.20	84	0.056	100	100	13.2	-0.1	268	72	77	74	75	70	-0.034	5.79	0.007
79	12.699	12.808	0.16	0.16	1.37	81	2.00	1.09	83	1.20	84	0.056	99	99	13.2	0.0	266	72	77	74	75	71	-0.033	5.55	0.005
80	12.861	12.972	0.16	0.16	1.37	81	1.99	1.09	83	1.20	84	0.056	99	100	13.1	-0.1	263	72	76	74	75	71	-0.033	5.34	0.007
81	13.024	13.134	0.16	0.16	1.37	81	2.00	1.08	83	1.20	83	0.054	102	101	13.1	0.0	261	72	76	73	75	71	-0.034	5.83	0.008
82	13.186	13.296	0.16	0.16	1.37	81	2.00	1.09	83	1.20	83	0.056	99	99	13.0	-0.1	259	72	76	73	75	70	-0.033	5.76	0.011
83	13.348	13.459	0.16	0.16	1.37	81	1.99	1.09	82	1.20	82	0.056	99	100	13.0	0.0	258	71	76	73	75	69	-0.033	5.60	0.006
84	13.511	13.622	0.16	0.16	1.37	81	1.99	1.09	82	1.20	82	0.056	100	100	12.9	-0.1	256	71	75	73	75	70	-0.032	5.41	0.008
85	13.673	13.785	0.16	0.16	1.37	80	1.99	1.09	82	1.20	82	0.055	100	101	12.9	0.0	255	71	75	72	75	71	-0.032	5.60	0.008
86	13.836	13.947	0.16	0.16	1.37	80	2.00	1.09	82	1.20	82	0.055	101	100	12.8	-0.1	255	71	75	72	75	70	-0.031	5.80	0.011
87	13.998	14.109	0.16	0.16	1.37	80	1.99	1.09	82	1.20	82	0.056	99	99	12.7	-0.1	254	71	75	72	75	70	-0.031	6.01	0.008
88	14.161	14.272	0.16	0.16	1.37	80	1.99	1.09	82	1.20	83	0.055	101	101	12.7	0.0	254	71	75	72	75	70	-0.031	6.15	0.008
89	14.323	14.435	0.16	0.16	1.37	80	2.00	1.09	82	1.20	83	0.056	99	100	12.6	-0.1	253	71	74	72	75	70	-0.031	6.36	0.011
90	14.485	14.598	0.16	0.16	1.38	80	1.99	1.08	82	1.20	83	0.056	99	100	12.6	0.0	251	71	74	72	75	69	-0.031	6.50	0.012
91	14.648	14.760	0.16	0.16	1.38	80	2.00	1.09	82	1.20	83	0.057	99	98	12.5	-0.1	249	71	74	72	75	69	-0.030	6.30	0.009
92	14.810	14.922	0.16	0.16	1.37	80	2.00	1.08	82	1.20	82	0.055	100	100	12.5	0.0	248	71	74	72	74	70	-0.030	5.72	0.008
93	14.972	15.085	0.16	0.16	1.37	80	2.00	1.09	82	1.20	82	0.054	101	102	12.4	-0.1	246	71	74	72	74	70	-0.030	5.34	0.008
94	15.135	15.248	0.16	0.16	1.37	80	2.00	1.09	82	1.20	82	0.057	99	99	12.4	0.0	245	71	74	72	74	70	-0.029	5.43	0.012
95	15.297	15.410	0.16	0.16	1.38	80	2.00	1.08	82	1.20	82	0.055	100	100	12.3	-0.1	244	70	73	72	74	70	-0.030	5.30	0.017
96	15.459	15.572	0.16	0.16	1.37	80	2.00	1.08	82	1.20	82	0.056	99	99	12.3	0.0	243	71	73	72	74	69	-0.029	5.36	0.021
97	15.621	15.735																							

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: HHT Halifax High Burn End Time: 61  
 Model: P61-C Medium Burn End Time: 182  
 Tracking No.: 2331 Total Sampling Time: 362 min  
 Project No.: 0135PS022E Recording Interval: 1 min  
 Test Date: 10-Dec-18  
 Beginning Clock Time: 09:20 Background Sample Volume: 0 cubic feet

Meter Box Y Factor: 0.997 (1) 0.985 (2) 0 (Amb)

Barometric Pressure: Begin Middle End Average  
30.33 30.32 30.31 30.32 Hg

PM Control Modules: 371/372  
 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: -0.200 H<sub>2</sub>O  
 Tunnel Area: 0.1963 ft<sup>2</sup>  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.70 ft/sec.  
 Initial Tunnel Flow: 149.7 scfm  
 Average Tunnel Flow: 154.7 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ -10 in. Hg  
 Post-Test Leak Check (2): 0.001 cfm @ -16 in. Hg  
 Fuel Moisture (%): 5.430 Dry Basis 5.150 Wet Basis

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.034	0.048	0.048	0.036	0.028	0.044	0.050	0.040	0.054
Temp:	108	108	108	108	108	108	108	108	108
	V <sub>strav</sub> 13.77 ft/sec			V <sub>scent</sub> 15.87 ft/sec			F <sub>p</sub> 0.868		

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)		Temperature Data (°F)						Stack Gas Data				
	Meter 1 (ft <sup>3</sup> )	Meter 2 (ft <sup>3</sup> )	Rate 1 (cfm)	Rate 2 (cfm)	dH 1 (H <sub>2</sub> O)	Meter 1 T (°F)	Meter Vac 1 (Hg)	dH 2 (H <sub>2</sub> O)	Meter 2 T (°F)	Meter Vac 2 (Hg)	Dilution Tunnel (°F)	Tunnel dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Dryer 1	Filter 2	Dryer 2	Ambient	Draft (H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
100	16.107	16.222	0.16	0.16	1.38	80	1.99	1.08	81	1.20	82	0.055	100	100	12.1	0.0	242	70	73	71	74	70	-0.028	5.78	0.015
101	16.269	16.385	0.16	0.16	1.38	80	2.00	1.08	81	1.20	83	0.056	99	100	12.0	-0.1	242	70	73	72	74	70	-0.029	5.55	0.025
102	16.431	16.547	0.16	0.16	1.37	80	2.00	1.08	81	1.20	82	0.055	100	100	12.0	0.0	241	70	73	71	74	70	-0.029	5.60	0.016
103	16.593	16.710	0.16	0.16	1.37	80	2.00	1.09	81	1.20	82	0.055	100	101	11.9	-0.1	240	71	73	71	74	69	-0.028	5.80	0.023
104	16.756	16.872	0.16	0.16	1.37	80	1.99	1.08	81	1.20	82	0.055	101	100	11.9	0.0	240	70	73	71	74	69	-0.028	5.34	0.018
105	16.918	17.034	0.16	0.16	1.37	80	1.99	1.08	81	1.20	83	0.055	100	100	11.8	-0.1	239	70	73	71	74	69	-0.028	5.26	0.010
106	17.080	17.196	0.16	0.16	1.37	80	2.00	1.09	81	1.20	83	0.055	100	100	11.8	0.0	239	70	73	71	74	69	-0.029	5.45	0.014
107	17.242	17.359	0.16	0.16	1.37	80	2.00	1.08	81	1.20	82	0.057	98	99	11.7	-0.1	239	70	73	71	73	69	-0.030	5.52	0.013
108	17.404	17.521	0.16	0.16	1.38	80	2.00	1.08	81	1.20	82	0.056	99	99	11.7	0.0	240	70	72	71	73	69	-0.029	5.67	0.008
109	17.566	17.683	0.16	0.16	1.38	80	2.00	1.08	81	1.20	82	0.056	99	99	11.6	-0.1	239	70	72	71	73	69	-0.028	5.68	0.011
110	17.728	17.845	0.16	0.16	1.38	80	2.00	1.08	81	1.20	83	0.055	100	100	11.6	0.0	239	70	72	71	73	70	-0.028	5.92	0.010
111	17.890	18.009	0.16	0.16	1.37	80	1.99	1.08	81	1.20	83	0.055	100	102	11.5	-0.1	239	70	72	71	73	69	-0.029	5.61	0.009
112	18.052	18.171	0.16	0.16	1.38	80	2.00	1.08	81	1.20	83	0.055	100	100	11.5	0.0	239	70	72	71	73	69	-0.029	5.49	0.008
113	18.215	18.332	0.16	0.16	1.38	80	2.00	1.08	81	1.20	83	0.057	99	98	11.4	-0.1	239	70	72	71	73	69	-0.028	5.92	0.009
114	18.377	18.495	0.16	0.16	1.38	80	2.00	1.09	81	1.20	83	0.055	100	101	11.4	0.0	239	70	72	71	73	69	-0.028	6.00	0.013
115	18.539	18.657	0.16	0.16	1.36	80	2.00	1.08	81	1.20	83	0.055	100	100	11.3	-0.1	238	70	72	71	73	69	-0.028	5.76	0.012
116	18.701	18.820	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.056	99	100	11.6	0.3	239	70	72	71	73	70	-0.029	5.70	0.016
117	18.863	18.981	0.16	0.16	1.37	80	2.00	1.09	81	1.20	83	0.055	100	100	11.2	-0.4	242	70	72	71	73	70	-0.029	5.82	0.023
118	19.025	19.143	0.16	0.16	1.37	80	2.01	1.08	81	1.20	83	0.055	100	100	11.2	0.0	243	70	72	72	73	69	-0.029	5.65	0.013
119	19.187	19.306	0.16	0.16	1.37	80	1.99	1.09	81	1.20	83	0.056	99	100	11.1	-0.1	243	70	72	71	73	69	-0.029	5.87	0.014
120	19.349	19.468	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.055	100	100	11.1	0.0	242	70	72	72	73	69	-0.028	6.18	0.014
121	19.511	19.630	0.16	0.16	1.36	80	2.00	1.08	81	1.20	83	0.055	100	100	11.0	-0.1	242	70	72	72	73	70	-0.029	6.00	0.015
122	19.673	19.792	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.057	99	99	11.0	0.0	241	70	72	71	73	70	-0.029	5.87	0.012
123	19.835	19.954	0.16	0.16	1.36	80	1.99	1.08	81	1.20	83	0.057	99	99	10.9	-0.1	242	70	72	71	73	70	-0.030	5.75	0.011
124	19.998	20.117	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.056	100	100	10.9	0.0	241	70	72	71	73	69	-0.029	5.71	0.009
125	20.160	20.279	0.16	0.16	1.36	80	2.01	1.08	81	1.20	83	0.055	100	100	10.8	-0.1	241	70	72	72	73	69	-0.029	5.79	0.010
126	20.322	20.440	0.16	0.16	1.36	80	2.00	1.08	81	1.20	83	0.056	99	99	10.8	0.0	241	70	72	72	73	69	-0.028	5.77	0.010
127	20.484	20.602	0.16	0.16	1.36	80	2.00	1.08	81	1.20	83	0.056	99	99	10.7	-0.1	241	70	72	72	73	70	-0.029	5.74	0.009
128	20.646	20.766	0.16	0.16	1.36	80	2.00	1.08	81	1.20	83	0.055	100	102	10.7	0.0	241	70	72	72	73	70	-0.029	5.78	0.006
129	20.808	20.927	0.16	0.16	1.37	80	1.99	1.07	81	1.20	83	0.056	99	99	10.6	-0.1	241	70	72	71	73	70	-0.028	5.55	0.006
130	20.970	21.089	0.16	0.16	1.36	80	2.00	1.08	81	1.20	83	0.056	99	99	10.6	0.0	241	70	72	71	73	70	-0.028	5.72	0.008
131	21.132	21.251	0.16	0.16	1.36	80	2.00	1.08	81	1.20	83	0.055	100	100	10.5	-0.1	241	70	72	71	72	69	-0.029	5.74	0.010
132	21.294	21.414	0.16	0.16	1.37	80	1.99	1.08	81	1.20	83	0.055	100	101	10.5	0.0	241	70	72	71	72	70	-0.029	5.85	0.011
133	21.456	21.576	0.16	0.16	1.37	80	2.00	1.07	81	1.20	83	0.055	100	100	10.5	0.0	241	70	71	71	72	70	-0.029	5.73	0.010
134	21.618	21.737	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.055	100	100	10.4	-0.1	241	71	71	72	72	70	-0.029	5.74	0.006
135	21.780	21.899	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.055	100	100	10.4	0.0	241	71	71	72	72	70	-0.029	5.62	0.005
136	21.942	22.062	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.057	99	99	10.3	-0.1	240	71	71	72	72	70	-0.029	5.78	0.007
137	22.104	22.224	0.16	0.16	1.37	80	2.00	1.07	81	1.20	83	0.055	100	100	10.3	0.0	240	71	71	72	72	70	-0.028	5.68	0.011
138	22.266	22.385	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.056	99	99	10.2	-0.1	240	71	71	72	72	70	-0.029	5.45	0.048
139	22.428	22.547	0.16	0.16	1.36	80	2.01	1.08	81	1.20	83	0.056	99	99	10.1	-0.1	240	71	71	72	72	70	-0.029	5.74	0.030
140	22.590	22.709	0.16	0.16	1.37	80	2.01	1.08	81	1.20	83	0.056	99	99	10.1	0.0	240	71	71	72	72	69	-0.029	5.93	0.017
141	22.752	22.871	0.16	0.16	1.37	80	2.01	1.07	81	1.20	83	0.056	99	99	10.1	0.0	240	71	71	72	72	70	-0.029	6.16	0.015
142	22.914	23.033	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.057	99	99	10.0	-0.1	240	71	71	72	72	69	-0.029	5.84	0.013
143	23.076	23.195	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.056	99	99	10.0	0.0	240	71	71	72	72	69	-0.029	5.73	0.011
144	23.238	23.357	0.16	0.16	1.36	80	2.00	1.07	81	1.20	83	0.055	100	100	9.9	-0.1	239	71	71	72	72	69	-0.029	5.76	0.011
145	23.400	23.519	0.16	0.16	1.37	80	2.00	1.07	81	1.20	83	0.056	99	99	9.9	0.0	239	71	71	72	72	70	-0.029	5.79	0.018
146	23.561	23.680	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.055	100	100	9.8	-0.1	238	71	71	72	72	70	-0.029	5.69	0.018
147	23.723	23.842	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.057	99	99	9.8	0.0	238	71							

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: <b>1</b>	Manufacturer: <b>HHT Halifax</b>	High Burn End Time: <b>61</b>
Model: <b>P61-C</b>	Tracking No.: <b>2331</b>	Medium Burn End Time: <b>182</b>
Project No.: <b>0135PS022E</b>	Test Date: <b>10-Dec-18</b>	Total Sampling Time: <b>362</b> min
Beginning Clock Time: <b>09:20</b>	Recording Interval: <b>1</b> min	Background Sample Volume: <b>0</b> cubic feet
Meter Box Y Factor: <b>0.997</b> (1) <b>0.985</b> (2) <b>0</b> (Amb)		
Barometric Pressure: <b>30.33</b> <b>30.32</b> <b>30.31</b> <b>30.32</b> "Hg		

PM Control Modules: <b>371/372</b>	Dilution Tunnel MW(dry): <b>29.00</b> lb/lb-mole	Avg. Tunnel Velocity: <b>13.70</b> ft/sec.
	Dilution Tunnel MW(wet): <b>28.78</b> lb/lb-mole	Initial Tunnel Flow: <b>149.7</b> scfm
	Dilution Tunnel H2O: <b>2.00</b> percent	Average Tunnel Flow: <b>154.7</b> scfm
	Dilution Tunnel Static: <b>-0.200</b> "H <sub>2</sub> O	Post-Test Leak Check (1): <b>0.000</b> cfm @ <b>-10</b> in. Hg
	Tunnel Area: <b>0.1963</b> ft <sup>2</sup>	Post-Test Leak Check (2): <b>0.001</b> cfm @ <b>-16</b> in. Hg
Pitot Tube Cp: <b>0.99</b>		Fuel Moisture (%): <b>5.430</b> Dry Basis <b>5.150</b> Wet Basis

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.034	0.048	0.048	0.036	0.028	0.044	0.050	0.040	0.054
Temp:	108	108	108	108	108	108	108	108	108
V <sub>strav</sub>	13.77			ft/sec			V <sub>scent</sub>	15.87	
	ft/sec			F <sub>p</sub>			0.868		

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)						Stack Gas Data		
	Meter 1 (ft <sup>2</sup> )	Meter 2 (ft <sup>2</sup> )	Rate 1 (cfm)	Rate 2 (cfm)	dH 1 ("H <sub>2</sub> O)	Meter 1 T (°F)	Meter Vac 1 ("Hg)	dH 2 ("H <sub>2</sub> O)	Meter 2 T (°F)	Meter Vac 2 ("Hg)	Dilution Tunnel (°F)	Tunnel dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Dryer 1	Filter 2	Dryer 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
150	24.209	24.328	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.054	101	101	9.6	-0.1	238	71	71	72	72	70	-0.028	5.47	0.009
151	24.371	24.489	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.056	99	99	9.6	0.0	238	71	71	72	72	70	-0.029	5.67	0.018
152	24.532	24.652	0.16	0.16	1.36	80	2.01	1.07	81	1.20	83	0.056	99	100	9.5	-0.1	239	71	71	72	72	70	-0.028	5.91	0.014
153	24.694	24.814	0.16	0.16	1.37	80	2.00	1.07	81	1.20	83	0.055	100	100	9.5	0.0	239	71	71	72	72	70	-0.028	6.06	0.017
154	24.856	24.975	0.16	0.16	1.37	80	2.01	1.08	81	1.20	83	0.055	100	100	9.4	-0.1	240	71	71	72	72	70	-0.029	6.23	0.020
155	25.018	25.137	0.16	0.16	1.37	80	2.00	1.07	81	1.20	83	0.054	101	101	9.4	0.0	241	71	71	72	72	70	-0.028	6.25	0.030
156	25.180	25.299	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.057	99	99	9.3	-0.1	240	71	71	72	72	70	-0.029	6.37	0.023
157	25.342	25.461	0.16	0.16	1.37	80	2.01	1.07	81	1.20	83	0.055	100	100	9.2	-0.1	241	71	71	72	72	70	-0.032	6.38	0.032
158	25.504	25.622	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.056	99	99	9.2	0.0	242	71	71	72	72	70	-0.032	6.24	0.037
159	25.666	25.784	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.055	100	100	9.1	-0.1	241	71	71	72	72	69	-0.031	6.50	0.071
160	25.828	25.947	0.16	0.16	1.37	80	2.01	1.08	81	1.20	83	0.055	100	101	9.1	0.0	241	71	71	72	72	69	-0.032	6.29	0.033
161	25.990	26.108	0.16	0.16	1.37	80	2.00	1.07	81	1.20	83	0.056	99	99	9.1	0.0	241	71	71	72	72	70	-0.031	5.56	0.013
162	26.152	26.270	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.055	100	100	9.0	-0.1	240	71	71	72	72	70	-0.031	5.73	0.020
163	26.313	26.432	0.16	0.16	1.37	80	2.01	1.08	81	1.20	83	0.056	99	99	9.0	0.0	240	71	71	72	72	70	-0.031	5.48	0.025
164	26.475	26.594	0.16	0.16	1.37	80	2.01	1.08	81	1.20	83	0.057	99	99	8.9	-0.1	240	71	71	72	72	70	-0.031	5.43	0.018
165	26.637	26.756	0.16	0.16	1.37	80	2.01	1.08	81	1.20	83	0.055	100	100	8.9	0.0	240	71	71	72	72	70	-0.031	5.54	0.008
166	26.799	26.917	0.16	0.16	1.37	80	2.01	1.07	81	1.20	83	0.055	100	100	8.8	-0.1	239	71	71	72	72	70	-0.031	5.62	0.013
167	26.961	27.079	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.056	99	99	8.8	0.0	240	71	71	72	72	70	-0.032	5.80	0.022
168	27.123	27.242	0.16	0.16	1.37	80	2.00	1.07	81	1.20	83	0.054	101	102	8.7	-0.1	239	71	71	72	72	70	-0.031	5.75	0.024
169	27.284	27.403	0.16	0.16	1.36	80	2.00	1.07	81	1.20	83	0.056	99	99	8.7	0.0	239	71	71	72	72	70	-0.031	5.75	0.050
170	27.446	27.565	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.055	100	100	8.6	-0.1	238	71	71	72	72	70	-0.031	5.52	0.017
171	27.608	27.726	0.16	0.16	1.37	80	2.00	1.07	81	1.20	83	0.055	100	100	8.6	0.0	239	71	71	72	72	70	-0.031	5.98	0.022
172	27.770	27.889	0.16	0.16	1.36	80	2.00	1.07	81	1.20	83	0.055	100	101	8.5	-0.1	239	71	71	72	72	70	-0.031	5.76	0.024
173	27.932	28.051	0.16	0.16	1.36	80	2.00	1.07	81	1.20	83	0.056	99	99	8.5	0.0	239	71	71	72	72	70	-0.031	5.79	0.028
174	28.094	28.212	0.16	0.16	1.37	80	2.01	1.07	81	1.20	83	0.055	100	100	8.4	-0.1	238	71	71	72	72	70	-0.031	5.81	0.019
175	28.256	28.373	0.16	0.16	1.37	80	2.00	1.07	81	1.20	83	0.056	99	99	8.4	0.0	238	71	71	72	72	71	-0.030	5.68	0.016
176	28.418	28.536	0.16	0.16	1.37	80	2.01	1.07	81	1.20	83	0.056	99	100	8.3	-0.1	238	71	71	72	72	70	-0.031	5.80	0.036
177	28.579	28.697	0.16	0.16	1.35	80	2.01	1.07	81	1.20	83	0.056	99	99	8.3	0.0	239	71	71	72	72	70	-0.032	5.69	0.019
178	28.741	28.859	0.16	0.16	1.37	80	2.00	1.08	81	1.20	83	0.055	100	100	8.2	-0.1	239	71	71	72	72	70	-0.031	5.69	0.019
179	28.903	29.021	0.16	0.16	1.36	80	2.00	1.07	81	1.20	83	0.055	100	100	8.2	0.0	238	71	71	72	72	70	-0.031	5.60	0.013
180	29.065	29.183	0.16	0.16	1.36	80	2.01	1.08	81	1.20	83	0.055	100	100	8.1	-0.1	238	71	71	72	72	70	-0.031	5.54	0.007
181	29.227	29.344	0.16	0.16	1.36	80	2.00	1.07	81	1.20	83	0.057	99	98	8.1	0.0	238	71	71	72	72	70	-0.031	5.60	0.008
182	29.389	29.506	0.16	0.16	1.37	81	2.01	1.07	81	1.20	83	0.055	100	100	8.0	-0.1	239	71	71	72	72	71	-0.031	5.85	0.014
183	29.550	29.667	0.16	0.16	1.37	80	2.00	1.07	81	1.20	83	0.056	99	99	8.0	0.0	239	71	71	72	72	70	-0.031	6.05	0.025
184	29.712	29.830	0.16	0.16	1.36	81	2.01	1.07	81	1.20	83	0.056	99	100	7.9	-0.1	240	71	71	72	72	70	-0.031	5.84	0.026
185	29.874	29.991	0.16	0.16	1.36	81	2.01	1.07	81	1.20	83	0.055	100	100	7.9	0.0	241	71	71	72	72	71	-0.030	5.90	0.024
186	30.036	30.152	0.16	0.16	1.37	81	2.00	1.08	81	1.20	83	0.057	98	98	7.8	-0.1	241	71	71	72	72	70	-0.032	6.13	0.083
187	30.198	30.314	0.16	0.16	1.36	81	2.01	1.07	81	1.20	83	0.055	100	100	7.8	0.0	242	71	70	72	72	70	-0.031	5.90	0.087
188	30.360	30.477	0.16	0.16	1.36	81	2.01	1.07	81	1.20	83	0.056	99	100	7.7	-0.1	242	71	70	72	72	70	-0.032	5.65	0.100
189	30.521	30.638	0.16	0.16	1.36	81	2.00	1.07	81	1.20	83	0.055	99	100	7.7	0.0	242	71	70	72	72	70	-0.032	5.45	0.076
190	30.683	30.799	0.16	0.16	1.36	81	2.01	1.08	81	1.20	83	0.056	99	99	7.6	-0.1	243	71	70	72	72	70	-0.031	5.45	0.033
191	30.845	30.961	0.16	0.16	1.36	81	2.01	1.07	81	1.20	84	0.055	100	100	7.6	0.0	243	71	70	72	72	70	-0.032	5.25	0.044
192	31.007	31.123	0.16	0.16	1.36	81	2.01	1.07	81	1.20	84	0.056	99	100	7.5	-0.1	243	71	70	72	72	70	-0.031	5.32	0.029
193	31.169	31.284	0.16	0.16	1.36	81	2.00	1.07	81	1.20	84	0.056	99	99	7.5	0.0	242	71	70	72	72	70	-0.032	4.92	0.037
194	31.331	31.446	0.16	0.16	1.36	81	2.01	1.07	81	1.20	84	0.056	99	100	7.5	0.0	242	71	70	72	72	70	-0.031	4.64	0.023
195	31.493	31.608	0.16	0.16	1.35	81	2.01	1.07	81	1.20	84	0.055	100	100	7.4	-0.1	242	71	70	72	72	70	-0.032	4.62	0.007
196	31.655	31.770	0.16	0.16	1.36	81	2.00	1.07	81	1.20	84	0.057	98	99	7.4	0.0	241	71	70	72	72	70	-0.032		

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: <b>1</b>	Manufacturer: <b>HHT Halifax</b>	High Burn End Time: <b>61</b>
Model: <b>P61-C</b>	Tracking No.: <b>2331</b>	Medium Burn End Time: <b>182</b>
Project No.: <b>0135PS022E</b>	Test Date: <b>10-Dec-18</b>	Total Sampling Time: <b>362</b> min
Beginning Clock Time: <b>09:20</b>	Recording Interval: <b>1</b> min	Background Sample Volume: <b>0</b> cubic feet
Meter Box Y Factor: <b>0.997</b> (1) <b>0.985</b> (2) <b>0</b> (Amb)	Barometric Pressure: <b>Begin</b> <b>Middle</b> <b>End</b> <b>Average</b>	
	<b>30.33</b> <b>30.32</b> <b>30.31</b> <b>30.32</b> "Hg	

PM Control Modules: <b>371/372</b>	Dilution Tunnel MW(dry): <b>29.00</b> lb/lb-mole	Avg. Tunnel Velocity: <b>13.70</b> ft/sec.
	Dilution Tunnel MW(wet): <b>28.78</b> lb/lb-mole	Initial Tunnel Flow: <b>149.7</b> scfm
	Dilution Tunnel H2O: <b>2.00</b> percent	Average Tunnel Flow: <b>154.7</b> scfm
	Dilution Tunnel Static: <b>-0.200</b> "H <sub>2</sub> O	Post-Test Leak Check (1): <b>0.000</b> cfm @ <b>-10</b> in. Hg
	Tunnel Area: <b>0.1963</b> ft <sup>2</sup>	Post-Test Leak Check (2): <b>0.001</b> cfm @ <b>-16</b> in. Hg
Pitot Tube Cp: <b>0.99</b>		Fuel Moisture (%): <b>5.430</b> Dry Basis <b>5.150</b> Wet Basis

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.034	0.048	0.048	0.036	0.028	0.044	0.050	0.040	0.054
Temp:	108	108	108	108	108	108	108	108	108
V <sub>strav</sub>	13.77			ft/sec			V <sub>scent</sub>	15.87	
	ft/sec			F <sub>p</sub>			0.868		

Elapsed Time (min)	Particulate Sampling Data										Fuel Weight (lb)				Temperature Data (°F)						Stack Gas Data				
	Meter 1 (ft <sup>2</sup> )	Meter 2 (ft <sup>2</sup> )	Rate 1 (cfm)	Rate 2 (cfm)	dH 1 ("H <sub>2</sub> O)	Meter 1 T (°F)	Meter Vac 1 ("Hg)	dH 2 ("H <sub>2</sub> O)	Meter 2 T (°F)	Meter Vac 2 ("Hg)	Dilution Tunnel (°F)	Tunnel dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Dryer 1	Filter 2	Dryer 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
200	32.303	32.416	0.16	0.16	1.35	81	2.01	1.07	81	1.20	83	0.055	100	100	7.3	0.0	237	71	70	72	72	70	-0.031	4.02	0.019
201	32.464	32.577	0.16	0.16	1.36	81	2.00	1.07	81	1.20	83	0.054	100	101	7.2	-0.1	236	71	70	72	72	70	-0.030	4.09	0.010
202	32.626	32.739	0.16	0.16	1.36	81	2.01	1.07	81	1.20	83	0.054	101	101	7.2	0.0	235	71	70	72	72	70	-0.031	4.00	0.007
203	32.788	32.901	0.16	0.16	1.37	81	2.01	1.07	81	1.20	83	0.056	99	99	7.1	-0.1	234	71	70	72	72	70	-0.030	4.05	0.007
204	32.950	33.063	0.16	0.16	1.36	81	2.01	1.06	81	1.20	83	0.055	100	100	7.1	0.0	233	71	70	72	72	70	-0.030	4.03	0.006
205	33.112	33.224	0.16	0.16	1.36	81	2.02	1.07	81	1.30	83	0.055	100	100	7.1	0.0	233	71	70	72	72	70	-0.030	4.47	0.006
206	33.273	33.385	0.16	0.16	1.36	81	2.00	1.07	81	1.20	83	0.055	99	100	7.0	-0.1	232	71	70	72	72	70	-0.030	4.52	0.006
207	33.435	33.548	0.16	0.16	1.36	81	2.02	1.07	81	1.20	83	0.056	99	100	7.0	0.0	231	71	70	72	72	70	-0.030	4.58	0.006
208	33.597	33.709	0.16	0.16	1.36	81	2.02	1.06	81	1.20	83	0.055	100	100	6.9	-0.1	230	71	70	72	72	70	-0.030	4.61	0.006
209	33.759	33.870	0.16	0.16	1.37	81	2.01	1.07	81	1.20	83	0.055	100	100	6.9	0.0	230	71	70	72	72	70	-0.030	4.64	0.004
210	33.923	34.034	0.16	0.16	1.37	81	2.01	1.07	81	1.20	83	0.057	100	100	6.8	-0.1	231	71	70	72	72	70	-0.030	4.86	0.006
211	34.085	34.196	0.16	0.16	1.36	81	2.02	1.07	81	1.30	83	0.055	100	100	6.8	0.0	232	71	70	72	72	70	-0.030	5.07	0.005
212	34.247	34.358	0.16	0.16	1.36	81	2.01	1.06	81	1.30	83	0.056	99	99	6.8	0.0	231	71	70	72	72	70	-0.029	5.47	0.008
213	34.409	34.519	0.16	0.16	1.37	81	2.01	1.07	81	1.20	83	0.055	100	100	6.7	-0.1	232	71	70	72	72	70	-0.030	5.44	0.011
214	34.570	34.680	0.16	0.16	1.37	81	2.01	1.07	81	1.30	83	0.055	99	100	6.6	-0.1	233	71	70	72	72	70	-0.029	5.41	0.016
215	34.732	34.842	0.16	0.16	1.37	81	2.02	1.07	81	1.30	83	0.055	100	100	6.6	0.0	234	71	70	72	72	70	-0.031	5.77	0.025
216	34.896	35.006	0.16	0.16	1.36	81	2.02	1.07	81	1.30	83	0.055	101	102	6.5	-0.1	236	71	70	72	72	70	-0.030	6.02	0.023
217	35.058	35.167	0.16	0.16	1.36	81	2.02	1.07	81	1.30	83	0.055	100	100	6.5	0.0	237	71	70	72	71	70	-0.030	6.31	0.017
218	35.219	35.328	0.16	0.16	1.36	81	2.02	1.07	81	1.20	83	0.056	99	99	6.4	-0.1	239	71	70	72	72	70	-0.031	6.56	0.028
219	35.381	35.490	0.16	0.16	1.36	81	2.01	1.07	81	1.30	83	0.055	100	100	6.4	0.0	240	71	70	72	71	70	-0.031	6.59	0.036
220	35.543	35.651	0.16	0.16	1.36	81	2.01	1.06	81	1.30	83	0.056	99	99	6.3	-0.1	242	71	70	72	71	70	-0.032	6.65	0.059
221	35.705	35.812	0.16	0.16	1.36	81	2.02	1.07	81	1.30	84	0.056	99	99	6.3	0.0	243	71	70	72	71	70	-0.031	6.60	0.085
222	35.866	35.974	0.16	0.16	1.36	81	2.01	1.07	81	1.30	84	0.056	99	100	6.2	-0.1	244	71	70	72	72	70	-0.032	6.24	0.100
223	36.028	36.136	0.16	0.16	1.36	81	2.01	1.06	81	1.30	84	0.054	101	101	6.2	0.0	245	71	70	72	71	70	-0.032	5.83	0.150
224	36.190	36.296	0.16	0.16	1.36	81	2.01	1.06	81	1.30	84	0.055	100	99	6.1	-0.1	245	71	70	72	71	70	-0.032	5.74	0.110
225	36.352	36.458	0.16	0.16	1.35	81	2.01	1.07	81	1.30	84	0.055	100	100	6.1	0.0	245	71	70	72	71	70	-0.032	5.18	0.044
226	36.514	36.619	0.16	0.16	1.36	81	2.01	1.07	81	1.30	84	0.055	100	100	6.1	0.0	244	71	70	72	71	71	-0.032	4.68	0.069
227	36.675	36.781	0.16	0.16	1.37	81	2.01	1.06	81	1.30	84	0.055	100	100	6.0	-0.1	242	71	70	72	71	70	-0.032	4.55	0.022
228	36.837	36.942	0.16	0.16	1.36	81	2.02	1.07	81	1.30	84	0.055	100	100	6.0	0.0	240	71	70	72	71	70	-0.031	3.96	0.009
229	36.999	37.103	0.16	0.16	1.36	81	2.01	1.07	81	1.30	84	0.055	100	100	6.0	0.0	238	71	70	72	71	70	-0.031	3.45	0.012
230	37.161	37.265	0.16	0.16	1.36	81	2.01	1.06	81	1.30	84	0.057	98	99	5.9	-0.1	237	71	70	72	71	70	-0.031	3.26	0.011
231	37.322	37.426	0.16	0.16	1.37	81	2.01	1.06	81	1.30	84	0.054	100	101	5.9	0.0	235	71	70	72	71	70	-0.031	3.43	0.017
232	37.484	37.587	0.16	0.16	1.36	81	2.01	1.07	81	1.30	84	0.055	100	100	5.9	0.0	234	71	70	72	71	70	-0.031	3.40	0.015
233	37.646	37.748	0.16	0.16	1.36	81	2.01	1.07	81	1.30	84	0.055	100	100	5.8	-0.1	233	71	70	72	71	70	-0.030	3.17	0.018
234	37.808	37.910	0.16	0.16	1.36	81	2.01	1.07	81	1.30	84	0.055	100	100	5.8	0.0	233	71	70	72	71	70	-0.030	3.98	0.005
235	37.969	38.071	0.16	0.16	1.37	81	2.01	1.07	81	1.30	83	0.055	99	100	5.8	0.0	232	71	70	72	71	70	-0.030	4.26	0.006
236	38.131	38.232	0.16	0.16	1.36	81	2.02	1.07	81	1.30	83	0.055	100	100	5.7	-0.1	232	71	70	72	71	70	-0.030	4.35	0.006
237	38.293	38.394	0.16	0.16	1.36	81	2.02	1.07	81	1.30	83	0.056	99	99	5.7	0.0	231	71	70	72	71	70	-0.030	4.18	0.007
238	38.454	38.555	0.16	0.16	1.37	81	2.02	1.07	81	1.30	84	0.055	100	100	5.6	-0.1	231	71	70	72	71	70	-0.030	4.50	0.004
239	38.616	38.716	0.16	0.16	1.36	81	2.02	1.07	81	1.30	83	0.055	100	100	5.6	0.0	231	71	70	72	71	70	-0.029	4.96	0.006
240	38.778	38.877	0.16	0.16	1.36	81	2.02	1.06	81	1.30	84	0.055	100	100	5.6	0.0	232	71	70	72	71	70	-0.030	4.99	0.006
241	38.940	39.039	0.16	0.16	1.36	81	2.02	1.07	81	1.30	83	0.055	100	100	5.5	-0.1	231	71	70	72	71	70	-0.030	4.99	0.003
242	39.101	39.200	0.16	0.16	1.36	81	2.01	1.06	81	1.30	83	0.055	99	100	5.5	0.0	232	71	70	72	71	70	-0.030	5.45	0.004
243	39.263	39.361	0.16	0.16	1.37	81	2.02	1.07	81	1.30	83	0.054	101	101	5.4	-0.1	233	71	70	72	71	70	-0.030	5.58	0.007
244	39.425	39.522	0.16	0.16	1.37	81	2.01	1.07	81	1.30	83	0.054	101	101	5.3	-0.1	234	71	70	72	71	70	-0.030	5.64	0.021
245	39.587	39.684	0.16	0.16	1.36	81	2.02	1.06	81	1.30	83	0.055	100	100	5.3	0.0	236	71	70	72	71	70	-0.030	5.71	0.016
246	39.748	39.844	0.16	0.16	1.36	81	2.02	1.07	81	1.30	84	0.055	100	99	5.2	-0.1	238								

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: <b>1</b>	Manufacturer: <b>HHT Halifax</b>	High Burn End Time: <b>61</b>
Model: <b>P61-C</b>	Tracking No.: <b>2331</b>	Medium Burn End Time: <b>182</b>
Project No.: <b>0135PS022E</b>	Test Date: <b>10-Dec-18</b>	Total Sampling Time: <b>362</b> min
Beginning Clock Time: <b>09:20</b>	Recording Interval: <b>1</b> min	Background Sample Volume: <b>0</b> cubic feet
Meter Box Y Factor: <b>0.997</b> (1) <b>0.985</b> (2) <b>0</b> (Amb)		
Barometric Pressure: <b>Begin Middle End Average</b>		
<b>30.33 30.32 30.31 30.32</b> "Hg		

PM Control Modules: <b>371/372</b>	Dilution Tunnel MW(dry): <b>29.00</b> lb/lb-mole	Avg. Tunnel Velocity: <b>13.70</b> ft/sec.
Dilution Tunnel MW(wet): <b>28.78</b> lb/lb-mole	Dilution Tunnel H2O: <b>2.00</b> percent	Initial Tunnel Flow: <b>149.7</b> scfm
Dilution Tunnel Static: <b>-0.200</b> "H <sub>2</sub> O	Tunnel Area: <b>0.1963</b> ft <sup>2</sup>	Average Tunnel Flow: <b>154.7</b> scfm
Pitot Tube Cp: <b>0.99</b>	Post-Test Leak Check (1): <b>0.000</b> cfm @ <b>-10</b> in. Hg	Post-Test Leak Check (2): <b>0.001</b> cfm @ <b>-16</b> in. Hg
	Fuel Moisture (%): <b>5.430</b> Dry Basis <b>5.150</b> Wet Basis	

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.034	0.048	0.048	0.036	0.028	0.044	0.050	0.040	0.054
Temp:	108	108	108	108	108	108	108	108	108
V <sub>strav</sub>	13.77			ft/sec			V <sub>scent</sub>	15.87	
F <sub>p</sub>	0.868								

Elapsed Time (min)	Particulate Sampling Data												Fuel Weight (lb)				Temperature Data (°F)						Stack Gas Data		
	Meter 1 (ft <sup>3</sup> )	Meter 2 (ft <sup>3</sup> )	Rate 1 (cfm)	Rate 2 (cfm)	dH 1 ("H <sub>2</sub> O)	Meter 1 T (°F)	Meter Vac 1 ("Hg)	dH 2 ("H <sub>2</sub> O)	Meter 2 T (°F)	Meter Vac 2 ("Hg)	Dilution Tunnel (°F)	Tunnel dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Dryer 1	Filter 2	Dryer 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
250	40.395	40.489	0.16	0.16	1.36	81	2.02	1.06	82	1.30	84	0.055	100	100	5.0	-0.1	241	71	70	72	71	70	-0.031	5.88	0.028
251	40.557	40.650	0.16	0.16	1.35	81	2.02	1.06	82	1.30	84	0.055	100	100	5.0	0.0	242	71	70	72	71	70	-0.031	5.77	0.026
252	40.719	40.812	0.16	0.16	1.35	81	2.02	1.06	82	1.30	84	0.056	99	99	4.9	-0.1	243	71	70	72	71	70	-0.032	5.68	0.020
253	40.880	40.972	0.16	0.16	1.36	81	2.02	1.07	82	1.30	84	0.055	100	99	4.9	0.0	243	71	70	72	71	71	-0.031	5.41	0.011
254	41.042	41.133	0.16	0.16	1.36	81	2.02	1.06	82	1.30	84	0.054	101	101	4.9	0.0	242	71	70	72	71	71	-0.031	5.45	0.017
255	41.204	41.295	0.16	0.16	1.36	81	2.02	1.07	82	1.30	84	0.056	99	99	4.8	-0.1	243	71	70	72	71	70	-0.032	5.16	0.013
256	41.365	41.456	0.16	0.16	1.36	81	2.02	1.06	82	1.30	85	0.056	99	99	4.8	0.0	243	71	70	72	71	71	-0.031	5.06	0.017
257	41.527	41.617	0.16	0.16	1.36	81	2.02	1.06	82	1.30	85	0.055	100	100	4.7	-0.1	242	71	70	72	71	70	-0.031	4.97	0.020
258	41.689	41.777	0.16	0.16	1.36	81	2.02	1.06	82	1.30	84	0.055	100	99	4.7	0.0	242	71	70	72	71	70	-0.032	5.23	0.073
259	41.850	41.939	0.16	0.16	1.36	81	2.02	1.06	82	1.30	84	0.055	100	100	4.6	-0.1	241	71	70	72	72	70	-0.031	4.95	0.091
260	42.012	42.099	0.16	0.16	1.36	81	2.02	1.06	82	1.30	84	0.055	100	99	4.6	0.0	240	71	70	73	72	70	-0.031	4.62	0.062
261	42.174	42.261	0.16	0.16	1.35	81	2.01	1.06	82	1.30	84	0.056	99	99	4.6	0.0	239	71	70	72	71	70	-0.031	4.33	0.059
262	42.335	42.422	0.16	0.16	1.36	81	2.02	1.06	82	1.30	84	0.055	100	100	4.5	-0.1	239	71	70	72	71	70	-0.031	4.24	0.049
263	42.497	42.583	0.16	0.16	1.36	81	2.02	1.06	82	1.30	84	0.055	100	100	4.5	0.0	238	71	70	72	71	71	-0.031	4.10	0.061
264	42.659	42.744	0.16	0.16	1.36	81	2.02	1.06	82	1.30	84	0.055	100	100	4.5	0.0	236	71	70	72	71	71	-0.031	4.32	0.062
265	42.821	42.905	0.16	0.16	1.36	81	2.02	1.06	82	1.30	84	0.055	100	100	4.4	-0.1	236	71	70	73	71	70	-0.030	4.21	0.040
266	42.982	43.067	0.16	0.16	1.35	81	2.02	1.06	82	1.30	84	0.055	100	100	4.4	0.0	236	71	70	73	71	71	-0.030	4.06	0.050
267	43.144	43.227	0.16	0.16	1.36	81	2.03	1.06	82	1.30	84	0.056	99	98	4.3	-0.1	235	71	70	72	71	71	-0.030	4.46	0.020
268	43.306	43.388	0.16	0.16	1.36	81	2.03	1.07	82	1.30	84	0.057	98	98	4.3	0.0	235	71	70	72	71	70	-0.031	4.61	0.006
269	43.467	43.549	0.16	0.16	1.36	81	2.02	1.06	82	1.30	83	0.056	99	99	4.3	0.0	234	71	70	72	71	70	-0.030	4.62	0.010
270	43.629	43.710	0.16	0.16	1.36	81	2.03	1.06	82	1.30	83	0.057	98	98	4.2	-0.1	234	71	70	72	71	70	-0.031	4.61	0.006
271	43.790	43.871	0.16	0.16	1.35	81	2.03	1.06	82	1.30	83	0.056	99	99	4.2	0.0	234	71	70	72	71	70	-0.031	5.01	0.004
272	43.952	44.031	0.16	0.16	1.35	81	2.02	1.06	82	1.30	82	0.056	99	98	4.1	-0.1	233	71	70	72	71	70	-0.031	4.94	0.004
273	44.114	44.193	0.16	0.16	1.36	81	2.02	1.06	82	1.30	82	0.055	100	100	4.1	0.0	233	71	70	72	71	71	-0.031	5.12	0.012
274	44.275	44.353	0.16	0.16	1.36	81	2.03	1.06	82	1.30	82	0.056	99	98	4.0	-0.1	233	71	70	72	71	70	-0.031	5.18	0.017
275	44.437	44.514	0.16	0.16	1.36	81	2.02	1.06	82	1.30	82	0.055	100	99	4.0	0.0	234	71	70	72	71	70	-0.031	5.03	0.011
276	44.599	44.676	0.16	0.16	1.36	81	2.03	1.06	82	1.30	81	0.056	99	99	3.9	-0.1	234	71	70	72	71	70	-0.031	5.06	0.004
277	44.760	44.837	0.16	0.16	1.36	81	2.02	1.06	82	1.30	81	0.055	99	99	3.9	0.0	234	71	70	72	71	70	-0.031	4.99	0.007
278	44.922	44.997	0.16	0.16	1.36	81	2.02	1.06	82	1.30	81	0.056	99	98	3.8	-0.1	235	71	70	72	71	70	-0.031	5.23	0.005
279	45.084	45.158	0.16	0.16	1.36	81	2.02	1.07	82	1.30	81	0.055	100	99	3.8	0.0	234	71	70	72	71	70	-0.031	5.41	0.004
280	45.246	45.320	0.16	0.16	1.36	81	2.03	1.06	82	1.30	81	0.057	98	98	3.7	-0.1	234	71	70	72	71	70	-0.032	5.53	0.002
281	45.407	45.480	0.16	0.16	1.36	81	2.02	1.06	81	1.30	81	0.054	100	100	3.7	0.0	234	71	70	72	71	70	-0.031	5.57	0.004
282	45.569	45.641	0.16	0.16	1.36	81	2.02	1.06	81	1.30	81	0.055	100	100	3.6	-0.1	234	71	70	72	71	70	-0.032	5.29	0.004
283	45.731	45.803	0.16	0.16	1.35	81	2.02	1.06	81	1.30	81	0.056	99	99	3.6	0.0	235	71	70	72	71	70	-0.032	5.23	0.006
284	45.893	45.963	0.16	0.16	1.36	81	2.02	1.05	81	1.30	81	0.056	99	98	3.5	-0.1	235	71	70	72	71	69	-0.030	5.56	0.007
285	46.055	46.124	0.16	0.16	1.36	81	2.02	1.06	81	1.30	81	0.057	98	98	3.5	0.0	234	70	70	72	71	69	-0.032	5.73	0.011
286	46.216	46.285	0.16	0.16	1.36	81	2.02	1.06	81	1.30	80	0.057	97	98	3.5	0.0	234	70	70	72	71	69	-0.032	5.52	0.010
287	46.378	46.447	0.16	0.16	1.35	81	2.02	1.06	81	1.30	80	0.056	99	99	3.4	-0.1	234	70	70	71	71	69	-0.032	5.37	0.020
288	46.540	46.607	0.16	0.16	1.35	81	2.02	1.06	81	1.30	80	0.055	100	99	3.4	0.0	234	70	70	71	71	69	-0.031	5.27	0.017
289	46.702	46.768	0.16	0.16	1.36	81	2.03	1.06	81	1.30	80	0.056	99	99	3.3	-0.1	235	70	70	71	71	69	-0.032	5.20	0.007
290	46.864	46.929	0.16	0.16	1.36	81	2.02	1.05	81	1.30	80	0.057	98	98	3.3	0.0	236	70	70	71	71	69	-0.032	5.41	0.010
291	47.026	47.090	0.16	0.16	1.36	81	2.03	1.06	81	1.30	80	0.055	100	99	3.2	-0.1	237	70	70	71	71	69	-0.032	5.67	0.012
292	47.187	47.251	0.16	0.16	1.36	81	2.03	1.06	81	1.30	80	0.056	98	99	3.2	0.0	238	70	70	71	71	69	-0.032	5.74	0.016
293	47.349	47.412	0.16	0.16	1.35	81	2.02	1.06	81	1.30	80	0.056	99	99	3.1	-0.1	238	70	70	71	71	69	-0.032	5.86	0.045
294	47.511	47.573	0.16	0.16	1.36	81	2.03	1.06	81	1.30	80	0.056	99	99	3.1	0.0	239	70	70	71	71	69	-0.033	5.73	0.044
295	47.673	47.733	0.16	0.16	1.36	80	2.02	1.06	81	1.30	80	0.056	99	98	3.0	-0.1	239	70	70	71	71	69	-0.033	5.32	0.036
296	47.834	47.894	0.16	0.16	1.36	80	2.02	1.06	81	1.30	80	0.056	99	99	3.0	0.0	240	69	70	71	71	69	-0.032	5.27	0.049
297	47.996	48.05																							

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: HHT Halifax High Burn End Time: 61  
 Model: P61-C Medium Burn End Time: 182  
 Tracking No.: 2331 Total Sampling Time: 362 min  
 Project No.: 0135PS022E Recording Interval: 1 min  
 Test Date: 10-Dec-18  
 Beginning Clock Time: 09:20 Background Sample Volume: 0 cubic feet

Meter Box Y Factor: 0.997 (1) 0.985 (2) 0 (Amb)

Barometric Pressure: Begin Middle End Average  
30.33 30.32 30.31 30.32 "Hg

PM Control Modules: 371/372  
 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: -0.200 "H<sub>2</sub>O  
 Tunnel Area: 0.1963 ft<sup>2</sup>  
 Pitot Tube Cp: 0.99

Avg. Tunnel Velocity: 13.70 ft/sec.  
 Initial Tunnel Flow: 149.7 scfm  
 Average Tunnel Flow: 154.7 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ -10 in. Hg  
 Post-Test Leak Check (2): 0.001 cfm @ -16 in. Hg  
 Fuel Moisture (%): 5.430 Dry Basis 5.150 Wet Basis

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.034	0.048	0.048	0.036	0.028	0.044	0.050	0.040	0.054
Temp:	108	108	108	108	108	108	108	108	108
	V <sub>strav</sub> 13.77 ft/sec			V <sub>scent</sub> 15.87 ft/sec			F <sub>p</sub> 0.868		

Elapsed Time (min)	Particulate Sampling Data										Fuel Weight (lb)				Temperature Data (°F)						Stack Gas Data				
	Meter 1 (ft <sup>3</sup> )	Meter 2 (ft <sup>3</sup> )	Rate 1 (cfm)	Rate 2 (cfm)	dH 1 ("H <sub>2</sub> O)	Meter 1 T (°F)	Meter Vac 1 ("Hg)	dH 2 ("H <sub>2</sub> O)	Meter 2 T (°F)	Meter Vac 2 ("Hg)	Dilution Tunnel (°F)	Tunnel dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Dryer 1	Filter 2	Dryer 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
300	48.481	48.538	0.16	0.16	1.36	80	2.02	1.06	81	1.30	80	0.056	99	99	2.8	-0.1	240	69	70	71	71	69	-0.033	4.99	0.049
301	48.643	48.699	0.16	0.16	1.36	80	2.02	1.06	81	1.30	80	0.057	98	98	2.8	0.0	240	69	70	71	71	70	-0.033	5.01	0.025
302	48.805	48.859	0.16	0.16	1.36	80	2.03	1.06	81	1.30	80	0.057	98	97	2.7	-0.1	239	69	70	71	71	69	-0.032	4.67	0.011
303	48.967	49.020	0.16	0.16	1.36	80	2.02	1.06	81	1.30	80	0.057	98	98	2.7	0.0	239	69	70	70	71	69	-0.033	4.66	0.013
304	49.128	49.182	0.16	0.16	1.36	80	2.02	1.06	81	1.30	80	0.056	99	99	2.6	-0.1	238	69	70	70	71	68	-0.032	4.33	0.013
305	49.290	49.342	0.16	0.16	1.36	80	2.03	1.06	81	1.30	80	0.057	98	97	2.6	0.0	238	69	70	70	71	69	-0.032	4.49	0.009
306	49.452	49.503	0.16	0.16	1.36	80	2.02	1.06	81	1.30	80	0.056	99	99	2.6	0.0	237	69	70	70	71	68	-0.032	4.46	0.018
307	49.614	49.664	0.16	0.16	1.36	80	2.02	1.06	80	1.30	80	0.057	98	98	2.5	-0.1	237	69	70	70	71	68	-0.033	4.66	0.023
308	49.776	49.825	0.16	0.16	1.37	80	2.02	1.05	80	1.30	79	0.056	99	99	2.5	0.0	236	69	70	70	71	68	-0.033	4.66	0.021
309	49.937	49.985	0.16	0.16	1.36	80	2.02	1.06	80	1.30	80	0.057	98	97	2.4	-0.1	236	68	70	70	71	68	-0.032	4.59	0.018
310	50.099	50.146	0.16	0.16	1.36	80	2.03	1.06	80	1.30	79	0.057	98	98	2.4	0.0	236	68	70	70	71	68	-0.032	4.56	0.020
311	50.261	50.308	0.16	0.16	1.37	80	2.03	1.06	80	1.30	79	0.055	100	100	2.4	0.0	235	68	70	70	71	68	-0.032	4.68	0.007
312	50.423	50.468	0.16	0.16	1.37	79	2.03	1.06	80	1.30	79	0.057	98	97	2.3	-0.1	235	68	70	70	71	68	-0.032	4.84	0.006
313	50.584	50.629	0.16	0.16	1.36	79	2.03	1.06	80	1.30	79	0.056	99	99	2.3	0.0	235	68	69	70	71	68	-0.032	4.59	0.009
314	50.746	50.790	0.16	0.16	1.36	79	2.03	1.06	80	1.30	79	0.057	98	98	2.2	-0.1	234	68	69	70	71	68	-0.032	4.66	0.011
315	50.908	50.951	0.16	0.16	1.36	79	2.02	1.06	80	1.30	79	0.056	99	99	2.2	0.0	234	68	69	70	71	68	-0.032	4.56	0.010
316	51.070	51.111	0.16	0.16	1.37	79	2.02	1.06	80	1.30	79	0.056	99	98	2.2	0.0	234	68	69	70	71	68	-0.032	4.73	0.010
317	51.231	51.272	0.16	0.16	1.36	79	2.03	1.06	80	1.30	79	0.057	98	98	2.1	-0.1	234	68	69	70	71	68	-0.032	4.79	0.009
318	51.393	51.433	0.16	0.16	1.36	79	2.03	1.06	80	1.30	79	0.058	97	97	2.1	0.0	233	68	69	70	70	68	-0.033	4.90	0.003
319	51.555	51.593	0.16	0.16	1.36	79	2.03	1.06	80	1.30	79	0.057	98	97	2.0	-0.1	233	68	69	70	70	68	-0.033	4.93	0.004
320	51.716	51.754	0.16	0.16	1.36	79	2.03	1.06	80	1.30	79	0.056	99	99	2.0	0.0	233	68	69	69	70	68	-0.032	5.13	0.003
321	51.878	51.916	0.16	0.16	1.36	79	2.02	1.05	80	1.30	79	0.056	99	99	1.9	-0.1	233	68	69	69	70	68	-0.032	4.93	0.003
322	52.040	52.075	0.16	0.16	1.37	79	2.03	1.06	80	1.30	79	0.056	99	97	1.9	0.0	233	68	69	69	70	68	-0.032	5.17	0.007
323	52.202	52.236	0.16	0.16	1.36	79	2.02	1.06	80	1.30	79	0.056	99	99	1.8	-0.1	232	68	69	69	70	68	-0.032	5.19	0.010
324	52.363	52.398	0.16	0.16	1.36	79	2.02	1.06	80	1.30	78	0.056	99	99	1.8	0.0	233	68	69	69	70	68	-0.032	5.22	0.005
325	52.525	52.558	0.16	0.16	1.36	79	2.03	1.05	80	1.30	78	0.056	99	98	1.7	-0.1	233	68	69	69	70	68	-0.032	5.17	0.006
326	52.687	52.718	0.16	0.16	1.36	79	2.02	1.06	80	1.30	78	0.056	99	98	1.7	0.0	233	68	69	69	70	68	-0.033	5.34	0.004
327	52.848	52.879	0.16	0.16	1.37	79	2.03	1.06	80	1.30	78	0.056	99	99	1.7	0.0	233	68	69	69	70	68	-0.032	5.30	0.004
328	53.010	53.041	0.16	0.16	1.36	79	2.03	1.06	79	1.30	78	0.056	99	99	1.6	-0.1	233	68	69	69	70	68	-0.032	5.22	0.005
329	53.171	53.200	0.16	0.16	1.36	79	2.02	1.06	79	1.30	78	0.055	99	98	1.6	0.0	234	68	69	69	70	68	-0.033	5.33	0.009
330	53.333	53.361	0.16	0.16	1.36	79	2.03	1.06	79	1.30	78	0.056	99	99	1.5	-0.1	233	68	69	69	70	67	-0.032	5.68	0.018
331	53.495	53.523	0.16	0.16	1.36	79	2.02	1.06	79	1.30	78	0.057	98	98	1.5	0.0	233	68	69	69	70	67	-0.033	5.75	0.022
332	53.656	53.682	0.16	0.16	1.35	78	2.03	1.06	79	1.30	78	0.057	98	97	1.4	-0.1	234	67	69	69	70	67	-0.032	5.60	0.019
333	53.817	53.843	0.16	0.16	1.37	78	2.03	1.06	79	1.30	78	0.057	98	98	1.4	0.0	234	67	69	69	70	68	-0.032	5.64	0.060
334	53.979	54.004	0.16	0.16	1.37	78	2.03	1.06	79	1.30	78	0.057	98	98	1.3	-0.1	234	67	69	69	70	67	-0.032	5.43	0.028
335	54.140	54.165	0.16	0.16	1.36	78	2.03	1.05	79	1.30	78	0.055	100	100	1.3	0.0	233	67	69	69	70	67	-0.032	5.19	0.036
336	54.302	54.325	0.16	0.16	1.37	78	2.02	1.06	79	1.30	78	0.055	100	99	1.2	-0.1	233	67	69	69	70	68	-0.032	5.21	0.046
337	54.464	54.486	0.16	0.16	1.36	78	2.02	1.06	79	1.30	78	0.056	99	99	1.2	0.0	233	67	69	69	70	67	-0.033	5.30	0.023
338	54.625	54.647	0.16	0.16	1.35	78	2.03	1.06	79	1.30	78	0.056	99	99	1.1	-0.1	233	67	69	69	70	67	-0.032	5.50	0.018
339	54.786	54.807	0.16	0.16	1.36	78	2.03	1.06	79	1.30	78	0.057	98	97	1.1	0.0	234	67	69	69	70	67	-0.033	5.53	0.014
340	54.948	54.967	0.16	0.16	1.36	78	2.02	1.06	79	1.30	78	0.055	100	99	1.0	-0.1	234	67	69	69	70	67	-0.032	5.48	0.012
341	55.109	55.129	0.16	0.16	1.36	78	2.03	1.06	79	1.30	78	0.057	98	98	1.0	0.0	234	67	69	69	70	67	-0.032	5.39	0.020
342	55.271	55.289	0.16	0.16	1.37	78	2.03	1.06	79	1.30	78	0.057	98	97	0.9	-0.1	235	67	69	69	70	67	-0.032	5.44	0.049
343	55.432	55.449	0.16	0.16	1.36	78	2.03	1.06	79	1.30	78	0.057	98	97	0.9	0.0	235	67	69	69	70	67	-0.033	5.58	0.026
344	55.594	55.611	0.16	0.16	1.36	78	2.03	1.06	79	1.30	78	0.056	99	99	0.9	0.0	235	67	69	69	69	67	-0.032	5.37	0.024
345	55.755	55.771	0.16	0.16	1.36	78	2.04	1.06	79	1.30	78	0.057	98	97	0.8	-0.1	235	67	68	69	69	67	-0.033	5.17	0.025
346	55.917	55.931	0.16	0.16	1.36	78	2.03	1.06	79	1.30	78	0.057	98	97	0.8	0.0	235	67	68	69	69	67	-0.032	5.06	0.022
347	56.078	56.092	0.16	0.16	1.37	78	2.03	1.06	79	1.30	78	0.056	99	99	0.7	-0.1	234	67	68	69	69	67	-0.032	5.22	0.010
348	56.240	56.253																							

### Pellet Heater Test Data - ASTM E2779 / ASTM E2515

Run: 1

Manufacturer: HHT Halifax High Burn End Time: 61  
 Model: P61-C Medium Burn End Time: 182  
 Tracking No.: 2331 Total Sampling Time: 362 min  
 Project No.: 0135PS022E Recording Interval: 1 min  
 Test Date: 10-Dec-18  
 Beginning Clock Time: 09:20 Background Sample Volume: 0 cubic feet  
 Meter Box Y Factor: 0.997 (1) 0.985 (2) 0 (Amb)  
 Barometric Pressure: Begin Middle End Average  
30.33 30.32 30.31 30.32 "Hg

PM Control Modules: 371/372  
 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: -0.200 "H<sub>2</sub>O  
 Tunnel Area: 0.1963 ft<sup>2</sup>  
 Pitot Tube Cp: 0.99  
 Avg. Tunnel Velocity: 13.70 ft/sec.  
 Initial Tunnel Flow: 149.7 scfm  
 Average Tunnel Flow: 154.7 scfm  
 Post-Test Leak Check (1): 0.000 cfm @ -10 in. Hg  
 Post-Test Leak Check (2): 0.001 cfm @ -16 in. Hg  
 Fuel Moisture (%): 5.430 Dry Basis 5.150 Wet Basis

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	Center
Initial dP	0.034	0.048	0.048	0.036	0.028	0.044	0.050	0.040	0.054
Temp:	108	108	108	108	108	108	108	108	108
	V <sub>strav</sub> 13.77 ft/sec			V <sub>scent</sub> 15.87 ft/sec			F <sub>p</sub> 0.868		

Elapsed Time (min)	Particulate Sampling Data											Fuel Weight (lb)		Temperature Data (°F)							Stack Gas Data				
	Meter 1 (ft <sup>3</sup> )	Meter 2 (ft <sup>3</sup> )	Rate 1 (cfm)	Rate 2 (cfm)	dH 1 ("H <sub>2</sub> O)	Meter 1 T (°F)	Meter Vac 1 ("Hg)	dH 2 ("H <sub>2</sub> O)	Meter 2 T (°F)	Meter Vac 2 ("Hg)	Dilution Tunnel (°F)	Tunnel dP	Pro. Rate 1	Pro. Rate 2	Scale Reading	Weight Change	Stack	Filter 1	Dryer 1	Filter 2	Dryer 2	Ambient	Draft ("H <sub>2</sub> O)	CO <sub>2</sub> (%)	CO (%)
350	56.563	56.573	0.16	0.16	1.36	78	2.03	1.06	79	1.30	78	0.058	98	96	0.6	0.0	234	67	68	69	69	67	-0.033	5.34	0.011
351	56.724	56.735	0.16	0.16	1.36	78	2.03	1.06	79	1.30	78	0.056	99	99	0.5	-0.1	234	67	68	69	69	67	-0.032	5.23	0.023
352	56.885	56.895	0.16	0.16	1.37	78	2.04	1.06	79	1.30	78	0.056	99	98	0.5	0.0	234	67	68	69	69	67	-0.032	5.17	0.011
353	57.047	57.055	0.16	0.16	1.37	78	2.03	1.06	79	1.30	78	0.057	98	97	0.4	-0.1	234	67	68	69	69	67	-0.032	5.37	0.005
354	57.208	57.217	0.16	0.16	1.37	78	2.03	1.06	79	1.30	78	0.057	98	98	0.4	0.0	234	67	68	69	69	67	-0.033	5.18	0.005
355	57.370	57.376	0.16	0.16	1.37	78	2.04	1.05	79	1.30	78	0.056	99	97	0.4	0.0	234	67	68	69	69	67	-0.032	5.21	0.007
356	57.531	57.537	0.16	0.16	1.36	78	2.03	1.06	78	1.30	78	0.056	99	99	0.3	-0.1	234	67	68	68	69	67	-0.033	5.27	0.017
357	57.693	57.698	0.16	0.16	1.37	78	2.03	1.05	78	1.30	78	0.055	100	100	0.3	0.0	234	67	68	68	69	67	-0.032	5.31	0.012
358	57.854	57.858	0.16	0.16	1.36	78	2.03	1.05	78	1.30	78	0.057	98	97	0.2	-0.1	233	67	68	68	69	67	-0.033	5.12	0.007
359	58.015	58.018	0.16	0.16	1.36	77	2.03	1.06	78	1.30	78	0.056	99	98	0.2	0.0	234	67	68	68	69	66	-0.032	4.98	0.007
360	58.176	58.179	0.16	0.16	1.36	78	2.03	1.06	78	1.30	78	0.056	99	99	0.1	-0.1	234	67	68	68	69	67	-0.032	5.01	0.009
361	58.338	58.340	0.16	0.16	1.36	77	2.02	1.06	78	1.30	78	0.057	99	98	0.1	0.0	234	67	68	68	69	67	-0.033	5.06	0.005
362	58.499	58.500	0.16	0.16	1.36	77	2.03	1.06	78	1.30	78	0.057	98	97	0.0	-0.1	234	67	68	68	69	67	-0.032	5.36	0.005
Avg/Tot	58.499	58.500	0.16	0.16	1.36	80	2.00	1.07	81	1.23	87	0.06	100	100			273	71	72	72	72	70	-0.033	6.07	0.035



**Pellet Heater Certification Run Sheets**

Client: HHT Halifax Project Number: 0135PS022E Run Number: 1  
 Model: PG1-C Tracking Number: 2331 Date: 12/10/2018  
 Test Crew: A. Kravitz  
 OMNI Equipment ID numbers: 132, 185, 335, 336, 283A, 410, 559, 592, 635, 650

**ASTM E2779 Run Notes**

**Air Control Settings**

High Burn Rate Target: 100%  
 Settings: Temp knob: Max (fixed stop)  
Feed Adj: 52.5 sec  
Mode: Constant Max (fixed stop)

Medium Burn Rate Target: <50%  
 Settings: Temp: 478F  
Feed: 20 sec  
Mode: 90° down

Low Burn Rate Target: Minimum  
 Settings: Temp: Min (Fixed stop)  
Feed: 17.5 sec  
Mode: Constant Min

Additional Settings Notes:  
 BR controlled by temp knob only, fixed stops min+max


Pellet Moisture Content: 5.15% UB  
 Pellet Specifications: Energex Premium  
 Pellet Analysis Notes: TPT rpt. # W218-0922-01

**Preburn Notes**

Time	Notes
	<u>None</u>

**Test Notes**

Time	Notes
<u>60:00</u> <u>61:00</u> <u>182:00</u>	<u>Changed filter A</u> <u>Changed to med</u> <u>Changed to low</u>

Technician Signature:  Date: 12/10/18

**Pellet Heater Certification Run Sheets**

Client: **HHT Halifax** Project Number: **0135PS022E** Run Number: **1**  
 Model: **PCI-C** Tracking Number: **2331** Date: **12/10/2018**  
 Test Crew: **A. Kravitz**  
 OMNI Equipment ID numbers: **132, 185, 335, 336, 283A, 410, 559, 592, 635, 650**

**ASTM E2515 Sampling Information**

Test Location: **OMNI E1** Clock Time @ ET=0: **9:20**  
 Span Gas Concentrations: **CO<sub>2</sub>(%): 17.06** **CO(%): 4.240** **CO(ppm): 901**

Test Run Validation Checks	Pre Test	Post Test
Zero Stack Gas Leakage	✓	✓
Zero Pitot Line Leakage	✓	✓
Zero Induced Draft	✓	
100% Smoke Capture	✓	

Test Run Validation Measurements	Pre Test		Post Test	
Scale Audit (lbs)	10.0		10.0	
CO <sub>2</sub> % (Zero/Span)	0.00	17.06	0.01	17.02
CO % (Zero/Span)	0.000	4.240	0.000	4.287
CO ppm (Zero/Span)	0	901	0	899
Sample A Leakage (cfm @ "Hg)	∅		∅	@ -10
Sample B Leakage (cfm @ "Hg)	∅		∅	@ -14
Room Air Velocity (ft/min)	50		50	
Barometric Pressure ("Hg)	30.37		30.31	
Relative Humidity (%)	31%		31%	
Tunnel Static ("H <sub>2</sub> O)	-0.20		-0.200	

**Last Cleaning Dates**

Flue Pipe	12/7/2017
Dilution Tunnel	12/7/2018
Sample Dryers	10/26/2018

**Dilution Tunnel Traverse**

Traverse Point	1	2	3	4	5	6	7	8	Center
Δp ("H <sub>2</sub> O)	0.074	0.048	0.048	0.036	0.028	0.044	0.050	0.040	0.054
T (°F)	108	→							

Technician Signature: \_\_\_\_\_



Date: 12/10/18

## **2.2 - Sample Analysis & Tares**

Analysis Worksheets  
Tared Filter, Probe, and O-Ring Data  
Pellet Fuel Label  
Pellet Fuel Analysis Report

### Pellet Heater Certification Run Sheets

Client: **HHT Halifax** Project Number: **0135PS022E** Run Number: **1**  
 Model: **P61-C** Tracking Number: **2331** Date: **12/10/2018**  
 Test Crew: **A. Kravitz**  
 OMNI Equipment ID numbers: **132, 185, 335, 336, 283A, 410, 559, 592, 635, 650**

#### ASTM E2515 Lab Sheet

Assembled By:

*A. Kravitz*

Date/Time in Desiccator:

*12/10/18*

Weighing #1	Weighing #2	Weighing #3	Weighing #4
Date: <i>12/13/18</i>	Date: <i>12/13/18</i>	Date:	Date:
Time: <i>0945</i>	Time: <i>0900</i>	Time:	Time:
R/H %: <i>9.3</i>	R/H %: <i>12.1</i>	R/H %:	R/H %:
Temp (F): <i>65.6</i>	Temp (F): <i>66.3</i>	Temp (F):	Temp (F):
Audit 1: <i>199.9</i>	Audit 1: <i>200.0</i>	Audit 1:	Audit 1:
Audit 2: <i>2000.0</i>	Audit 2: <i>2000.1</i>	Audit 2:	Audit 2:
Audit 3: <i>99997.9</i>	Audit 3: <i>99998.0</i>	Audit 3:	Audit 3:
Initials: <i>A</i>	Initials: <i>A</i>	Initials:	Initials:

Train	Item	ID #	Tare (mg)	Weight (mg)	Weight (mg)	Weight (mg)	Weight (mg)
A	Front Filter (60 min)	<i>D618</i>	<i>120.5</i>	<i>124.3</i>	<i>124.3</i>		
A	Front Filter (Remainder)	<i>D619</i>	<i>121.6</i>	<i>127.0</i>	<i>127.0</i>		
A	Rear Filter	<i>D620</i>	<i>121.5</i>	<i>120.0</i>	<i>120.0</i>		
A	Probe	<i>28</i>	<i>114750.2</i>	<i>114750.2</i>	<i>114750.2</i>		
A	O-Ring Set	<i>R691</i>	<i>4095.3</i>	<i>4096.8</i>	<i>4096.8</i>		
B	Front Filter	<i>D621</i>	<i>122.4</i>	<i>131.7</i>	<i>131.6</i>		
B	Rear Filter	<i>D622</i>	<i>121.6</i>	<i>121.1</i>	<i>121.0</i>		
B	Probe	<i>29</i>	<i>114278.0</i>	<i>114277.8</i>	<i>114277.9</i>		
B	O-Ring Set	<i>R692</i>	<i>3306.7</i>	<i>3307.2</i>	<i>3307.3</i>		
BG	Filter						

Technician Signature: \_\_\_\_\_

*A. Kravitz*

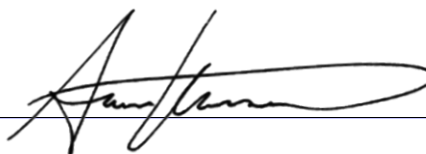
Date: *12/13/18*

## Pellet Heater Lab Data - ASTM E2779 / ASTM E2515

Manufacturer: HHT Halifax  
 Model: P61-C  
 Tracking No.: 2331  
 Project No.: 0135PS022E  
 Run #: 1  
 Date: 10-Dec-18

Equipment Numbers: 131, 592, 637

Technician Signature: \_\_\_\_\_



### TRAIN 1 (First Hour emissions)

Sample Component	Reagent	Filter, Probe or Seal #	Mass Readings		
			Tare, mg	Final, mg	Particulate, mg
A. Front filter catch	Filter	D618	120.5	124.3	3.8
B. Rear filter catch	Filter				0.0
C. Probe catch*	Probe				0.0
D. Filter seals catch*	Seals				0.0
1 <sup>st</sup> hour Sub-Total, mg:					3.8

### TRAIN 1 (Remainder of Test)

Sample Component	Reagent	Filter, Probe or Seal #	Mass Readings		
			Tare, mg	Final, mg	Particulate, mg
A. Front filter catch	Filter	D619	121.6	127.0	5.4
B. Rear filter catch	Filter	D620	121.5	120.0	-1.5
C. Probe catch*	Probe	28	114750.2	114750.2	0.0
D. Filter seals catch*	Seals	R691	4095.3	4096.8	1.5
Remainder Sub-Total, mg:					5.4
Train 1 Aggregate, mg:					9.2

### TRAIN 2

Sample Component	Reagent	Filter, Probe or Seal #	Mass Readings		
			Tare, mg	Final, mg	Particulate, mg
A. Front filter catch	Filter	D621	122.4	131.6	9.2
B. Rear filter catch	Filter	D622	121.6	121.0	-0.6
C. Probe catch*	Probe	29	114278.0	114277.9	0.0
D. Filter seals catch*	Seals	R692	3306.7	3307.3	0.6
Train 2 Aggregate, mg:					9.2

### AMBIENT

Sample Component	Reagent	Filter, Probe or Seal #	Mass Readings		
			Tare, mg	Final, mg	Particulate, mg
A. Front filter catch*	Filter				0.0
Ambient Aggregate, 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 included in O-ring seal weights.

Tare Sheet: (check one)

Probes \_\_\_\_\_

47mm Filters

100mm Filters \_\_\_\_\_

O-Ring Pair \_\_\_\_\_

Prepared By: B. Davis

Balance ID #: Omni-00637

Thermohygrometer ID #: Omni-00592 Audit Weight ID #/Mass: Omni-00283A / 200 mg

Placed in Dessicator:	Date: <u>11/15/18</u>	Date: <u>11/16/18</u>	Date: _____	Date: _____	Date Used	Project Number	Run No.
	Time: <u>1410</u>	Time: <u>0923</u>	Time: _____	Time: _____			
Date: <u>11/14/18</u>	RH %: <u>20.6</u>	RH %: <u>19.4</u>	RH %: _____	RH %: _____	Date Used	Project Number	Run No.
Time: <u>0800</u>	T (°F): <u>68.4</u>	T (°F): <u>65.3</u>	T (°F): _____	T (°F): _____			
ID #	Audit: <u>200.1</u>	Audit: <u>200.0</u>	Audit: _____	Audit: _____			
D613	121.1	121.2	-				
D614	121.1	121.3	-				
D615	120.8	120.8	-				
D616	120.9	121.0	-				
D617	120.9	120.9	-				
D618	120.5	120.5	-		12/16/18	0135PS022E	1
D619	121.4	121.6	-				
D620	121.3	121.5	-				
D621	122.2	122.4	-				
D622	121.5	121.6	-				
D623	121.4	121.4	-				
D624	121.2	121.3	-				
D625	121.3	121.5	-				
D626	121.4	121.3	-				
D627	122.2	122.2	-				
D628	121.5	121.5	-				
D629	120.4	120.4	-				
D630	121.1	121.1	-				
D631	121.4	121.3	-				
D632	120.7	120.5	-				
Initials: <u>BA</u>	Initials: <u>BA</u>	Initials: _____	Initials: _____				

Final Technician Signature: B. Davis

Date: 11/16/18

Evaluator signature: K. J. Moya



Tare Sheet: (check one)

Probes

47mm Filters

100mm Filters

O-Ring Pair

Prepared By: MLindenberg

Balance ID #: Omni-00637

Thermohygrometer ID #: Omni-00592

Audit Weight ID #/Mass: Omni-00283A / 5g

Placed in Dessicator:	Date: <u>11/6/18</u>	Date: <u>11/7/18</u>	Date: _____	Date: _____	Date Used	Project Number	Run No.
	Time: <u>0942</u>	Time: <u>0933</u>	Time: _____	Time: _____			
Date: <u>10/11/2018</u>	RH %: <u>14.4</u>	RH %: <u>17.6</u>	RH %: _____	RH %: _____			
Time: <u>4:30</u>	T (°F): <u>71.9</u>	T (°F): <u>71.8</u>	T (°F): _____	T (°F): _____			
ID #	Audit: <u>5000.0</u>	Audit: <u>4999.9</u>	Audit: _____	Audit: _____			
<u>R 691</u>	<u>4095.4</u>	<u>4095.3</u>	<u>-</u>		<u>12/10/18</u>	<u>0135 P50 22E</u>	<u>1</u>
<u>R 692</u>	<u>3306.6</u>	<u>3306.7</u>	<u>-</u>		<u>↓</u>	<u>↓</u>	<u>↓</u>
Initials: <u>BR</u>	Initials: <u>BR</u>	Initials: _____	Initials: _____				

Final Technician Signature: [Signature]

Date: 11/15/18

Evaluator signature: [Signature]





Twin Ports Testing, Inc.  
 1301 North 3rd Street  
 Superior, WI 54880  
 p: 715-392-7114  
 p: 800-373-2562  
 f: 715-392-7163  
 www.twinportstesting.com

**Report No:** USR:W218-0922-01  
**Issue No:** 1

# Analytical Test Report

**Client:** Hearth & Home Technologies  
 352 Mountain House Rd.  
 Halifax, PA 17032  
**Attention:** Corie Podschelnech  
**PO No:**

Signed: *Katy Jahr*  
 Katy Jahr  
 Chemistry Lab Supervisor  
 Date of Issue: 10/2/2018  
THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

**Sample Details**  
**Sample Log No:** W218-0922-01      **Sample Date:**  
**Sample Designation:** Energex 40 Lb Pellet Bag      **Sample Time:**  
**Sample Recognized As:** Wood Pellets      **Arrival Date:** 9/27/2018

## Test Results

	METHOD	UNITS	MOISTURE FREE	AS RECEIVED
Moisture Total	ASTM E871	wt. %		5.15
Ash	ASTM D1102	wt. %	0.39	0.37
Volatile Matter	ASTM D3175	wt. %	81.58	77.37
Fixed Carbon by Difference	ASTM D3172	wt. %	18.03	17.10
Sulfur	ASTM D4239	wt. %	0.010	0.010
SO <sub>2</sub>	Calculated	lb/mmbtu		0.024
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	18.32	17.25
Net Cal. Value at Const. Pressure	ISO 1928	J/g	18319	17249
Gross Cal. Value at Const. Vol.	ASTM E711	J/g	19643	18631
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8445	8010

Carbon	ASTM D5373	wt. %	49.45	46.90
Hydrogen*	ASTM D5373	wt. %	6.08	5.77
Nitrogen	ASTM D5373	wt. %	< 0.20	< 0.19
Oxygen*	ASTM D3176	wt. %	> 43.87	> 41.61

\*Note: As received values do not include hydrogen and oxygen in the total moisture.

Chlorine	ASTM D6721	mg/kg	48	46
Fluorine	ASTM D3761	mg/kg		
Mercury	ASTM D6722	mg/kg		

Bulk Density	ASTM E873	lbs/ft <sup>3</sup>		45.63
Fines (Less than 1/8")	TPT CH-P-06	wt. %		0.16
Durability Index	Kansas State	PDI		98.8
Sample Above 1.50"	TPT CH-P-06	wt. %		0.0
Maximum Length (Single Pellet)	TPT CH-P-06	inch		1.233
Diameter, Range	TPT CH-P-05	inch	0.259 to	0.262
Diameter, Average	TPT CH-P-05	inch		0.261
Stated Bag Weight	TPT CH-P-01	lbs		40.0
Actual Bag Weight	TPT CH-P-01	lbs		40.3

**Comments**



PFI Densified Fuel Grade: Premium  
Mill Registration # 16012

**Grade Requirements:**

Bulk Density:	40-48 lbs/ft <sup>3</sup>
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:	<1% Vegetable Based Oil
Minimum Higher Heating Value (as received):	7900 BTU/lb

Other Manufacturers Guarantees:



For more information, please visit the PFI website at [www.pelletheat.org](http://www.pelletheat.org).

# **Section 3**

## **Laboratory Quality Assurance**

- 3.1 - Quality Assurance/Quality Control
- 3.2 - Calibration Data
- 3.3 - Example Calculations

### **3.1 - 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 P61-C at Hearth & Home Technologies, Inc. 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.

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### 3.2 - Calibration Data

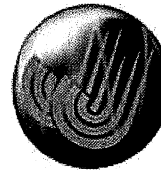
Equipment for ASTM E2515, ASTM E2779, & EPA Method 28R

ID #	Lab Name/Purpose	Log Name	Attachment Type
131	Audit Weight	500mg Weight	Calibration Certificate
132	10 lb Weight	Weight Standard, 10 lb.	Calibration Log
185	1000lb Scale	Weight Indicator, Model WI-127	Calibration Certificate
283A	Audit Weight Set	Troemer weight set	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
410	Microtector	Dwyer Microtector	Calibration Certificate
559	Vaneometer	Dwyer Vaneometer	Equipment Record
592	Thermohygrometer	Omega Digital Thermohygrometer	Calibration Log
594	Combustion Gas Analyzer	CAI Gas Analyzer	See Run Sheet
637	Milligram Balance	Analytical Balance - Mettler - Toledo	Calibration Certificate
* 650	Barometer/Hygrometer	Digital Barometer	Calibration Certificate

\*Barometer was outside the bi-annual (6 month) calibration interval. The subsequent calibration has been provided showing that the device was received by the calibration laboratory within tolerance.

# Certificate of Calibration

Certificate Number: **698278**



**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

PO: **190231**  
 Order Date: **04/04/2019**  
 Authorized By: **N/A**



Calibrated on: **04/18/2019**  
 \*Recommended Due: **04/18/2020**  
 Environment: **22 °C 53 % RH**  
 \* As Received: **Within Tolerance**  
 \* As Returned: **Within Tolerance**  
 Action Taken: **Calibrated**  
 Technician: **146**

Property #: **OMNI-00650**  
 User: **N/A**  
 Department: **N/A**  
 Make: **Control Company**  
 Model: **6530**  
 Serial #: **181062211**  
 Description: **Thermohygrometer / Barometer**  
 Procedure: **403406**  
 Accuracy: **±3%RH, ±.4 °C (0.8 °F), ±4mbar (0.12inHg)**

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
847A	Fluke	RPM4	Reference Pressure Monitor	11/21/2019	688957
644A	Thunder Scientific	1200	Two Pressure Humidity Generator	07/30/2019	674006

Parameter	Measurement Description	Range Unit	Measurement Data				UUT	Uncertainty
			Reference	Min	Max	*Error		
<b>Before/After Humidity</b>							Accredited = ✓	
		%	13.0	10	16	1	14 % 5.8E-01 ✓	
		%	50.0	47	53	2	48 % 5.8E-01 ✓	
	%	80.0	77	83	3	77 % 5.8E-01 ✓		
<b>Temperature</b>		°C	20.00	19.6	20.4	0.4	19.6 °C 8.1E-02 ✓	
		°C	35.00	34.6	35.4	0.4	34.6 °C 8.1E-02 ✓	
		°C	50.00	49.6	50.4	0.2	49.8 °C 8.1E-02 ✓	
<b>Barometer</b>		29 inHg	29.6210	29.501	29.741	0.009	29.630 inHg 8.1E-02 ✓	

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.

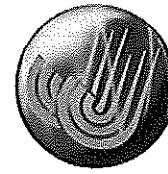
  
 Reviewer

3 Issued 04/19/2019 Rev # 15

  
 Inspector

# 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

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 ( $\pm 0.72\text{mg}$ )**

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


<u>Std ID</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Nomenclature</u>	<u>Due Date</u>	<u>Trace ID</u>
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 (NMIs), 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 pounds

ID Number: OMNI-00132

Standard Calibration Weight: 10 pounds

ID Number: OMNI-00255

Scale Used: MTW-150K

ID Number: OMNI-00353

Date: 2/23/2018

By: B. Davis

Standard Weight (A) (Lb.)	Weight Verified (B) (Lb.)	Difference (A - B)	% Error
10.0	10.0	0.0	0

\*Acceptable tolerance is 1%.

*This calibration is traceable to NIST using calibrated standard weights.*

Technician signature:  Date: 2/23/18





# QUALITY CONTROL SERVICES

LABORATORY EQUIPMENT • SALES • SERVICE • CALIBRATION • REPAIRS  
2340 SE 11<sup>TH</sup> Ave. Portland, Oregon 97214 • Box 14831 Portland, Oregon 97293  
(503) 236-2712 • FAX (503) 235-2535 • www.qc-services.com



OMNI-Test Laboratories, Inc.  
13327 NE Airport Way  
Portland, OR 97230

Report Number: OMNE0321676181002

## A2LA ACCREDITED CERTIFICATE OF CALIBRATION WITH DATA

### INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Weigh-Tronix	WI-127 1000x0.1lb	21676	185	Lab
Units	Readability	SOP	Cal Date	Last Cal Date	Cal Due Date
lbs	0.1	QC033	10/2/18	10/4/17	10/2019

### FUNCTIONAL CHECKS

SHIFT TEST		LINEARITY		REPEATABILITY		ENVIRONMENTAL CONDITIONS		
Test Wt:	Tol:	Test Wt:	Tol:	Test Wt:	Tol:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
500	0.5	HB44	HB44	200	0.2	Good	Fair	Poor
As-Found:		As-Found:		As-Found:		Temperature: 20.2°C		
Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>			
As-Left:		As-Left:		As-Left:				
Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>			

### CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
1000	999.8	999.8	0.12
700	699.8	699.8	0.12
500	499.9	499.9	0.08
200	200.0	200.0	0.08
100	100.0	100.0	0.05
50	50.0	50.0	0.05

### CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Avoirdupois Cast W	Rice Lake	25 and 50lb	PWO990-CA	11/24/17	11/2019	20172265

Permanent Information Concerning this Equipment:

Comments/Information Concerning this Calibration

10/2/2018 - Relative Humidity = 61.0 %

Report prepared/reviewed by:

Date:

10-2-18

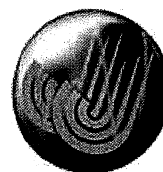
Technician: D. Oudeans

Signature:

THIS CERTIFICATE SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE APPROVAL OF QUALITY CONTROL SERVICES, INC.

The uncertainty is calculated according to the ISO Guide to the Expression of Uncertainty in Measurement and includes the uncertainty of standards used combined with the observed standard deviation of the unit under test. The uncertainty is expanded with a k factor of 2 for an approximate 95% level of confidence. Instruments listed above were calibrated using standards traceable to the National Institute of Standards and Technology (NIST). Calibration data reflect results at the time and location of calibration. Calibration data should be reviewed to insure that the instrument is performing to its required accuracy.

# Certificate of Calibration



**JJ Calibrations, Inc.**

7007 SE Lake Rd  
Portland, OR 97267-2105  
Phone 503.786.3005  
FAX 503.786.2994

Certificate Number: **685888**

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

PO: **180188**  
Order Date: **10/09/2018**  
Authorized By: **N/A**



Calibrated on: **10/26/2018**  
\*Recommended Due: **10/26/2023**  
Environment: **20 °C 57 % RH**  
\* As Received: **Within Tolerance**  
\* As Returned: **Within Tolerance**  
Action Taken: **Calibrated**  
Technician: **139**

Property #: **OMNI-00283A**  
User: **N/A**  
Department: **N/A**  
Make: **Troemner Inc**  
Model: **1mg-100g (Class F)**  
Serial #: **47883**  
Description: **Mass Set, 21pc**  
Procedure: **DCN 500901**  
Accuracy: **Class F**

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.

**This set meets Class F specifications.**  
**Received and returned eight (8) masses in a black case secured by a rubber band.**

### Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
723A	Rice Lake	1mg-200g (Class 0)	Mass Set,	03/23/2019	668240
800A	Sartorius	MSA225W100DI	Analytical Balance	12/11/2018	663857

### Measurement Data

Parameter	Measurement Description	Range Unit	Reference	Min	Max	*Error	UUT	Uncertainty
<b>Before/After</b>								Accredited = ✓
<b>Mass</b>								
Dot	200 mg	200.00030	199.4603	200.5403	0.0500	200.0503 mg	6.2E-01	✓
	1 g	1.0000880	0.9991088	1.0009088	0.0000000	1.000088 g	1E-03	✓
	2 g	2.00001470	1.9989147	2.0011147	0.0003250	2.0003397 g	1.3E-03	✓
	5 g	5.00000840	4.9985084	5.0015084	0.0000400	4.9999684 g	1.7E-03	✓
	10 g	10.0000100	9.998010	10.002010	0.000245	9.999765 g	2.3E-03	✓
Dot	20 g	20.0000140	19.996014	20.004014	0.000990	20.001004 g	4.6E-03	✓
	50 g	49.9999660	49.989966	50.009966	0.000595	49.999371 g	1.1E-02	✓
	100 g	100.000000	99.98000	100.02000	0.00194	99.99806 g	2.3E-02	✓

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/NCCL 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 10/29/2018 Rev # 15

  
Inspector

# Thermal Metering System Calibration Y Factor

Manufacturer: APEX  
 Model: XC-60-EP  
 Serial Number: 606001  
 OMNI Tracking No.: OMNI-00335  
 Calibrated Orifice:           

Previous Calibration Comparison			
Date	1/17/2018	Acceptable Deviation (5%)	Deviation
y Factor	0.977	0.04885	0.009
Acceptance	Acceptable		

<b>Average Gas Meter y Factor</b> <b>0.986</b>
---

<b>Orifice Meter dH@</b> <b>N/A</b>
--

Calibration Date: 07/17/18  
 Calibrated by: B. Davis  
 Calibration Frequency: Six months  
 Next Calibration Due: 1/17/2019  
 Instrument Range: 1.000 cfm  
 Standard Temp.: 68 oF  
 Standard Press.: 29.92 "Hg  
 Barometric Press., Pb: 30.12 "Hg  
 Signature/Date: *B. Davis* 7/18/2018

Current Calibration	
Acceptable y Deviation	0.020
Maximum y Deviation	0.008
Acceptable dH@ Deviation	N/A
Maximum dH@ Deviation	N/A
Acceptance	Acceptable

Reference Standard *		
Standard	Model	Standard Test Meter
Calibrator	S/N	OMNI-00001
	Calib. Date	30-Oct-17
	Calib. Value	0.9977 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	2.00	1.38	1.00
Initial Reference Meter	609.1	615.5	620.8
Final Reference Meter	615.4	620.7	626.7
Initial DGM	0	0	0
Final DGM	6.292	5.245	5.995
Temp. Ref. Meter (°F), Tr	92.0	93.0	91.0
Temperature DGM (°F), Td	92.0	93.0	91.0
Time (min)			
Net Volume Ref. Meter, Vr	6.300	5.200	5.900
Net Volume DGM, Vd	6.292	5.245	5.995
<b>Gas Meter y Factor =</b>	<b>0.994</b>	<b>0.986</b>	<b>0.979</b>
<b>Gas Meter y Factor Deviation (from avg.)</b>	0.008	0.001	0.007
<b>Orifice dH@</b>	N/A	N/A	N/A
<b>Orifice dH@ Deviation (from avg.)</b>	N/A	N/A	N/A

where:

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

\* 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<sup>3</sup>/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

Instrument to be calibrated: Pressure Transducer

Maximum Range: 0-2" WC ID Number: OMNI-00335

Calibration Instrument: Digital Manometer ID Number: OMNI-00395

Date: 7/18/2018 By: B. Davis

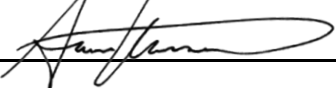
**This form is to be used only in conjunction with Standard Procedure C-SPC.**

Range of Calibration Point ("WC)	Digital Manometer Input ("WC)	Pressure Gauge Response ("WC)	Difference (Input - Response)	% Error of Full Span*
0-20% Max. Range 0 - 0.4	0.183	0.183	0.0	0.0
20-40% Max. Range 0.4 - 0.8	0.705	0.704	0.001	0.05
40-60% Max. Range 0.8 - 1.2	1.019	1.016	0.003	0.15
60-80% Max. Range 1.2 - 1.6	1.394	1.391	0.003	0.15
80-100% Max. Range 1.6 - 2.0	1.980	1.978	0.002	0.10

\*Acceptable tolerance is 4%.

The uncertainty of measurement is  $\pm 0.4$ " WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Technician signature:  Date: 7/18/18

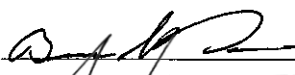

Reviewed by:  Date: 7/20/18

Temperature Calibration EPA Method 28R, ASTM 2515								
BOOTH:		TEMPERATURE MONITOR TYPE:				EQUIPMENT NUMBER:		
Mobile		National Instruments Logger				00335, 00336		
REFERENCE METER EQUIPMENT NUMBER: 00373				Calibration Due Date: 8/02/17				
CALIBRATION PERFORMED BY:			DATE:		AMBIENT TEMPERATURE:		BAROMETRIC PRESSURE:	
B. Davis			7/17/18		76		30.12	
Input Temperature (F)	Ambient	Meter A					Tunnel	FB Interior
			Meter B	Filter A	Filter B			
0	0	1	1	1	1	0	0	
100	100	101	101	100	100	100	100	
300	300	300	300	300	300	300	300	
500	500	501	500	500	500	500	500	
700	700	700	700	700	700	700	700	
1000	1000	1001	1000	1000	1000	1000	1000	

Input (F)	FB Top	FB Bottom	FB Back	FB Left	FB Right	Imp A	Imp B	Cat	Stack
0	0	0	0	0	0	1	1	1	0
100	100	100	100	100	100	101	101	101	100
300	300	300	300	300	300	300	300	300	300
500	500	500	500	500	500	500	500	500	500
700	700	700	700	700	700	700	700	700	700
1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

1500  
2000

1500  
2000

Technician signature:  Date: 7/17/18  
 Reviewed By:  Date: 7/20/18

# Thermal Metering System Calibration Y Factor

Manufacturer: APEX  
 Model: XC-60-EP  
 Serial Number: 606002  
 OMNI Tracking No.: OMNI-00336  
 Calibrated Orifice:           

<b>Average Gas Meter y Factor</b>
<b>0.985</b>

<b>Orifice Meter dH@</b>
<b>N/A</b>

Calibration Date: 07/17/18  
 Calibrated by: B. Davis  
 Calibration Frequency: Six months  
 Next Calibration Due: 1/17/2019  
 Instrument Range: 1.000 cfm  
 Standard Temp.: 68 oF  
 Standard Press.: 29.92 "Hg  
 Barometric Press., Pb: 30.12 "Hg  
 Signature/Date: *B. Davis* 1/17/2018

### Previous Calibration Comparison

Date	<u>1/17/2018</u>	Acceptable Deviation (5%)	Deviation
y Factor	<u>0.979</u>	0.04895	0.006
Acceptance	<b>Acceptable</b>		

### Current Calibration

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

### Reference Standard \*

Standard	Model	Standard Test Meter
Calibrator	S/N	<u>OMNI-00001</u>
	Calib. Date	<u>30-Oct-17</u>
	Calib. Value	<u>0.9977</u> y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Reference Meter Pressure ("H2O), Pr	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>
DGM Pressure ("H2O), Pd	<u>1.91</u>	<u>1.20</u>	<u>0.80</u>
Initial Reference Meter	<u>572.4</u>	<u>577.5</u>	<u>582.9</u>
Final Reference Meter	<u>577.4</u>	<u>582.604</u>	<u>588.1</u>
Initial DGM	<u>0</u>	<u>0</u>	<u>0</u>
Final DGM	<u>5.061</u>	<u>5.245</u>	<u>5.34</u>
Temp. Ref. Meter (°F), Tr	<u>86.0</u>	<u>86.0</u>	<u>78.0</u>
Temperature DGM (°F), Td	<u>90.0</u>	<u>95.0</u>	<u>86.0</u>
Time (min)	<u>23.5</u>	<u>30.0</u>	<u>37.8</u>
Net Volume Ref. Meter, Vr	5.000	5.104	5.200
Net Volume DGM, Vd	5.061	5.245	5.34
<b>Gas Meter y Factor =</b>	<b>0.988</b>	<b>0.984</b>	<b>0.984</b>
<b>Gas Meter y Factor Deviation (from avg.)</b>	0.003	0.001	0.001
<b>Orifice dH@</b>	N/A	N/A	N/A
<b>Orifice dH@ Deviation (from avg.)</b>	N/A	N/A	N/A

where:

1. Deviation = |Average value for all runs - current run value|
- \*\* 2.  $y = [V_r \times (y \text{ factor (ref)}) \times (P_b + (P_r / 13.6)) \times (T_d + 460)] / [V_d \times (P_b + (P_d / 13.6)) \times (T_r + 460)]$
- \*\* 3.  $dH@ = 0.0317 \times P_d / (P_b (T_d + 460)) \times [(T_r + 460) \times \text{time}] / V_r]^2$

\* 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  $\pm 0.14 \text{ ft}^3/\text{min}$ . This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

## DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET

Instrument to be calibrated: Pressure Transducer

Maximum Range: 0-2" WC ID Number: OMNI-00336

Calibration Instrument: Digital Manometer ID Number: OMNI-00395

Date: 7/18/18 By: B. Davis

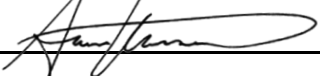
**This form is to be used only in conjunction with Standard Procedure C-SPC.**

Range of Calibration Point ("WC)	Digital Manometer Input ("WC)	Pressure Gauge Response ("WC)	Difference (Input - Response)	% Error of Full Span*
0-20% Max. Range 0 - 0.4	0.045	0.041	0.003	0.20
20-40% Max. Range 0.4 - 0.8	0.446	0.447	0.001	0.05
40-60% Max. Range 0.8 - 1.2	0.900	0.901	0.001	0.05
60-80% Max. Range 1.2 - 1.6	1.589	1.592	0.003	0.20
80-100% Max. Range 1.6 - 2.0	1.902	1.908	0.006	0.30

\*Acceptable tolerance is 4%.

The uncertainty of measurement is  $\pm 0.4$ " WC. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Technician signature:  Date: 7/18/18


Reviewed by:  Date: 7/20/18

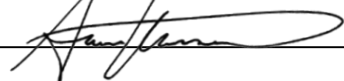
Temperature Calibration EPA Method 28R, ASTM 2515								
BOOTH:		TEMPERATURE MONITOR TYPE:				EQUIPMENT NUMBER:		
Mobile		National Instruments Logger				00335, 00336		
REFERENCE METER EQUIPMENT NUMBER: 00373				Calibration Due Date: 8/02/17				
CALIBRATION PERFORMED BY:			DATE:		AMBIENT TEMPERATURE:		BAROMETRIC PRESSURE:	
B. Davis			7/17/18		76		30.12	
Input Temperature (F)	Ambient	Meter A					Tunnel	FB Interior
			Meter B	Filter A	Filter B			
0	0	1	1	1	1	0	0	
100	100	101	101	100	100	100	100	
300	300	300	300	300	300	300	300	
500	500	501	500	500	500	500	500	
700	700	700	700	700	700	700	700	
1000	1000	1001	1000	1000	1000	1000	1000	

Input (F)	FB Top	FB Bottom	FB Back	FB Left	FB Right	Imp A	Imp B	Cat	Stack
0	0	0	0	0	0	1	1	1	0
100	100	100	100	100	100	101	101	101	100
300	300	300	300	300	300	300	300	300	300
500	500	500	500	500	500	500	500	500	500
700	700	700	700	700	700	700	700	700	700
1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

1500  
2000

1500  
2000

Technician signature:  Date: 7/17/18

Reviewed By:  Date: 7/20/18





## VWR Temperature Hygrometer Calibration Procedure and Data Sheet

Frequency: Every Two Years

Step 1: Locate NIST traceable standard.

Step 2: Place unit to be calibrated, tracking No. OMNI-00592, 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  $\pm 4\%$ , it is acceptable. If not, the unit needs to be sent to a repair company or replaced.

### Verification Data:

Date: 1/8/2018 Technician: B Davis

Time in desiccate: 0910 Recording time: 1335

NIST Standard Temperature: 28.3 °F NIST Standard Humidity: 74.5

Test Unit Temperature Reading: 25.4 °F Test Unit Humidity Reading: 74.3

Test unit OMNI- 00592 is X or was not      within acceptable limits.

Technician Signature: B Davis

Comments: Full scale of OMNI-00592 is 90% RH, with a difference of 2.9 this gives a error percentage of 3.22%. This value is within the allowable 4%.

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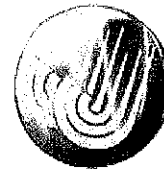
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# Certificate of Calibration

Certificate Number: **681844**



**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: **180176**  
 Order Date: **08/07/2018**  
 Authorized By: **N/A**



Calibrated on: **08/07/2018**  
 \*Recommended Due: **02/07/2019**  
 Environment: **22 °C 38 % RH**  
 \* As Received: **Out of Tolerance**  
 \* As Returned: **Within Tolerance**  
 Action Taken: **Adjusted**  
 Technician: **III**

Property #: **OMNI-00637**  
 User: **N/A**  
 Department: **N/A**  
 Make: **Mettler Toledo**  
 Model: **MS104TS/00**  
 Serial #: **B729400181**  
 Description: **Analytical Scale, 120g**  
 Procedure: **DCN 500887**  
 Accuracy: **±0.0005g**

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.

Balance went into over range at max capacity. Adjusted balance to bring all points back into tolerance.

### Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
256A	Rice Lake	W0133K	Mass Set,	05/30/2019	660578

### Parameter

### Measurement Data

Measurement Description	Range Unit	Reference	Min	Max	*Error	UUT	Uncertainty
<b>Before</b>							Accredited = ✓
<b>Force</b>							
	g	10.00000	9.9995	10.0005	0.0004	10.0004 g	5.7E-04 ✓
	g	30.00000	29.9995	30.0005	0.0004	30.0004 g	5.7E-04 ✓
	g	60.00000	59.9995	60.0005	0.0004	60.0004 g	5.7E-04 ✓
	g	90.00000	89.9995	90.0005	0.0005	90.0005 g	5.7E-04 ✓
	g	120.00000	119.9995	120.0005	120.0000	0.0000 g	5.7E-04 ✓
<b>After</b>							Accredited = ✓
	g	10.00000	9.9995	10.0005	0.0000	10.0000 g	5.7E-04 ✓
	g	30.00000	29.9995	30.0005	0.0001	29.9999 g	5.7E-04 ✓
	g	60.00000	59.9995	60.0005	0.0001	60.0001 g	5.7E-04 ✓
	g	90.00000	89.9995	90.0005	0.0002	89.9998 g	5.7E-04 ✓
	g	120.00000	119.9995	120.0005	0.0002	119.9998 g	5.7E-04 ✓

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/NCCL 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 08/09/2018 Rev # 15

\_\_\_\_\_  
 Inspector



Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001



Cert. No.: 6530-9263396

Traceable® Certificate of Calibration for Digital Barometer

Manufactured for and distributed by : Control Company "Drawer 58307,Houston,TX,77258,USA"

Instrument Identification:

Model: 6530,

S/N: 181062211

Manufacturer: Control Company

Standards/Equipment:

Table with 4 columns: Description, Serial Number, Due Date, NIST Traceable Reference. Rows include Digital Barometer, Digital Thermometer, Chilled Mirror Hygrometer, and Climate Chamber.

Certificate Information:

Technician: 57

Procedure: CAL-31

Cal Date: 26 Feb 2018

Cal Due Date: 26 Feb 2020

Test Conditions: 54.9%RH 22.83°C 1023mBar

Calibration Data: (New Instrument)

Table with 11 columns: Unit(s), Nominal, As Found, In Tol, Nominal, As Left, In Tol, Min, Max, ±U, TUR. Rows show calibration data for %RH, °C, and mb/hPa.

This certificate indicates Traceability to standards provided by (NIST) National Institute of Standards and Technology and/or a National Standards Laboratory.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement : (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ± U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min=As Left Nominal(Rounded) - Tolerance; Max= As Left Nominal(Rounded) + Tolerance;

Nicol Rodriguez signature

Nicol Rodriguez, Quality Manager

Aaron Judice signature

Aaron Judice, Technical Manager

Maintaining Accuracy:

In our opinion once calibrated your Digital Barometer should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Digital Barometer change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598 Phone 281 482-1714 Fax 281 482-9448 sales@control3.com www.control3.com

Control Company is an ISO/IEC 17025:2005 Calibration Laboratory Accredited by (A2LA) American Association for Laboratory Accreditation, Certificate No. 1750.01. Control Company is ISO 9001:2008 Quality Certified by DNV GL, Certificate No. CERT-01805-2006-AQ-HOU-RvA. International Laboratory Accreditation Cooperation (ILAC) - Multilateral Recognition Arrangement (MRA).

### **3.3 - Example Calculations**

## Equations and Sample Calculations - ASTM E2779 & E2515

Manufacturer:	HHT Halifax
Model:	P61-C
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 in the dilution tunnel, ft/sec

$Q_{sd}$  - Average gas flow rate in dilution tunnel, dscf/hr

$V_{m(std)}$  - Volume of Gas Sampled Corrected to Dry Standard Conditions, dscf

$m_n$  - Total Particulate Matter Collected, mg

$C_s$  - Concentration of particulate matter in tunnel gas, dry basis, corrected to standard conditions, g/dscf

$E_T$  - Total Particulate Emissions, g

PR - Proportional Rate Variation

$PM_R$  - Average particulate emissions for full integrated test run, g/hr

$PM_F$  - Average particulate emission factor for full integrated test run, g/dry kg of fuel burned

## Equations and Sample Calculations - ASTM E2779 & E2515

$M_{Bdb}$  - 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:

5.15 %

$$M_{Swb} = 21.9 \text{ lbs}$$

$$M_{Ewb} = 0.0 \text{ lbs}$$

0.4536 = Conversion factor from lbs to kg

$$M_{Bdb} = [(21.9 \times 0.4536) - (0.0 \times 0.4536)] (100/(100 + 5.15))$$

$$M_{Bdb} = 9.45 \text{ kg}$$

## Equations and Sample Calculations - ASTM E2779 & E2515

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

ASTM E2779 equation (2)

$$M_{BSidb} = (M_{S_{Siwb}} - M_{E_{Siwb}})(100 / (100 + FM))$$

Where,

$M_{S_{Siwb}}$  = weight of test fuel in hopper at start of test run segment  $i$ , wet basis, kg

$M_{E_{Siwb}}$  = weight of test fuel in hopper at end of test run segment  $i$ , wet basis, kg

Sample Calculation (from medium burn rate segment):

$$FM = 5.15 \%$$

$$M_{S_{Siwb}} = 14.2 \text{ lbs}$$

$$M_{E_{Siwb}} = 8.0 \text{ lbs}$$

0.4536 = Conversion factor from lbs to kg

$$M_{BSidb} = [(14.2 \times 0.4536) - (8.0 \times 0.4536)] (100 / (100 + 5))$$

$$M_{BSidb} = 2.7 \text{ kg}$$



## Equations and Sample Calculations - ASTM E2779 & E2515

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

ASTM E2779 equation (3)

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

Where,

$\theta$  = Total length of full intergrated test run, min

Sample Calculation:

$$M_{Bdb} = 9.45 \quad \text{kg}$$

$$\theta = 362 \quad \text{min}$$

$$BR = \frac{60 \times 9.45}{362}$$

$$BR = 1.57 \quad \text{kg/hr}$$

## Equations and Sample Calculations - ASTM E2779 & E2515

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

ASTM E2779 equation (4)

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

Where,

$$\theta_{Si} = \text{Total length of test run segment } i, \text{ min}$$

Sample Calculation (from medium burn rate segment):

$$M_{BSidb} = 2.67 \text{ kg}$$

$$\theta = 121 \text{ min}$$

$$BR = \frac{60 \times 2.67}{121}$$

$$BR = 1.33 \text{ kg/hr}$$

## Equations and Sample Calculations - ASTM E2779 & E2515

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

ASTM E2515 equations (9)

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

Where:

- $F_p$  = djustment factor for center of tunnel pitot tube placement,  $F_p = \frac{V_{strav}}{V_{scent}}$ , 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
- $\Delta P^*$  = Velocity pressure in the dilution tunnel, in H<sub>2</sub>O
- $T_s$  = Absolute average gas temperature in the dilution tunnel, °R; (°R = °F + 460)
- $P_s$  = Absolute average gas static pressure in diluion tunnel, =  $P_{bar} + P_g$ , in Hg
- $P_{bar}$  = Barometric pressure at test site, in. Hg
- $P_g$  = Static pressure of tunnel, in. H<sub>2</sub>O; (in Hg = in H<sub>2</sub>O/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:

$$F_p = \frac{13.77}{15.87} = 0.868$$

$$V_s = 0.868 \times 85.49 \times 0.99 \times 0.236 \times \left( \left( \frac{86.7 + 460}{30.32 + \frac{-0.20}{13.6}} \right) \times 28.78 \right)^{1/2}$$

$$V_s = 13.70 \text{ ft/s}$$

\*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  $M_s$  as the dry molecular weight. It should be the wet molecular weight as indicated in EPA Method 2.

## Equations and Sample Calculations - ASTM E2779 & E2515

$Q_{sd}$  - 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 <sup>2</sup>
$T_{std}$	=	Standard absolute temperature, 528 °R
$P_s$	=	Absolute average gas static pressure in dilution 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:

$$Q_{sd} = 3600 \times (1 - 0.02) \times 13.70 \times 0.1963 \times \frac{528}{86.7 + 460} \times \frac{30.32 + \frac{-0.20}{13.6}}{29.92}$$

$$Q_{sd} = 9280.3 \text{ dscf/hr}$$

## Equations and Sample Calculations - ASTM E2779 & E2515

$V_{m(std)}$  - 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
- $\Delta H$  = Average pressure differential across the orifice meter, in. H<sub>2</sub>O
- $T_m$  = Absolute average dry gas meter temperature, °R

Sample Calculation:

Using equation for Train 1:

$$V_{m(std)} = 17.64 \times 58.499 \times 0.997 \times \frac{\left( 30.32 + \frac{1.36}{13.6} \right)}{\left( 79.7 + 460 \right)}$$

$$V_{m(std)} = \mathbf{57.989} \text{ dscf}$$

Using equation for Train 2:

$$V_{m(std)} = 17.64 \times 58.500 \times 0.985 \times \frac{\left( 30.32 + \frac{1.07}{13.6} \right)}{\left( 80.8 + 460 \right)}$$

$$V_{m(std)} = \mathbf{57.137} \text{ dscf}$$

Using equation for ambient train:

$$V_{m(std)} = 17.64 \times 0.00 \times 0 \times \frac{\left( 30.32 + \frac{0.00}{13.6} \right)}{\left( 69.9 + 460 \right)}$$

$$V_{m(std)} = \mathbf{0.000} \text{ dscf}$$

## Equations and Sample Calculations - ASTM E2779 & E2515

$m_n$  - 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):

$$m_n = 0.0 + 3.8 + 0.0$$

$$m_n = 3.8 \text{ mg}$$

Using equation for Train 1 (remainder):

$$m_n = 0.0 + 3.9 + 1.5$$

$$m_n = 5.4 \text{ mg}$$

Train 1 Aggregate = **9.2 mg**

Using equation for Train 2:

$$m_n = 0.0 + 8.6 + 0.6$$

$$m_n = \mathbf{9.2 \text{ mg}}$$

## Equations and Sample Calculations - ASTM E2779 & E2515

$C_s$  - Concentration of particulate matter in tunnel gas, dry basis, corrected to standard conditions, g/dscf

ASTM E2515 equation (13)

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

Where:

$K_2$  = Constant, 0.001 g/mg

$m_n$  = Total mass of particulate matter collected in the sampling train, mg

$V_{m(\text{std})}$  = Volume of gas sampled corrected to dry standard conditions, dscf

Sample calculation:

For Train 1:

$$C_s = 0.001 \times \frac{9.2}{57.99}$$

$$C_s = 1.59\text{E-}04 \text{ g/dscf}$$

For Train 2

$$C_s = 0.001 \times \frac{9.2}{57.14}$$

$$C_s = 1.61\text{E-}04 \text{ g/dscf}$$

For Ambient Train

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

$$C_r = 0.000000 \text{ g/dscf}$$

## Equations and Sample Calculations - ASTM E2779 & E2515

$E_T$  - 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
- $\theta$  = Total time of test run, minutes

Sample calculation:

For Train 1

$$E_T = ( \underline{0.000159} - 0.000000 ) \times \underline{9280.3} \times \underline{362} / 60$$
$$E_T = \underline{8.88} \text{ g}$$

For Train 2

$$E_T = ( \underline{0.000161} - 0.000000 ) \times \underline{9280.3} \times \underline{362} / 60$$
$$E_T = \underline{9.02} \text{ g}$$

Average

$$E = \underline{8.95} \text{ g}$$

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

$$7.5\% \text{ of the average} = \underline{0.67}$$

$$\text{Train 1 difference} = \underline{0.07}$$

$$\text{Train 2 difference} = \underline{0.07}$$



## Equations and Sample Calculations - ASTM E2779 & E2515

### 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:

- $\theta$  = Total sampling time, min
- $\theta_i$  = 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, °R
- $T_m$  = Absolute average dry gas meter temperature, °R
- $T_{si}$  = Absolute average gas temperature in the dilution tunnel during the "ith" time interval, °R
- $T_s$  = Absolute average gas temperature in the dilution tunnel, °R

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

$$PR = \left( \frac{362 \times 0.156 \times 13.70 \times (108.0 + 460) \times (79.7 + 460)}{1 \times 58.499 \times 13.90 \times (86.7 + 460) \times (73.0 + 460)} \right) \times 100$$

$$PR = \underline{100} \%$$

## Equations and Sample Calculations - ASTM E2779 & E2515

$PM_R$  - Average particulate emissions for full integrated test run, g/hr

ASTM E2779 equation (5)

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

Where,

$E_T$  = Total particulate emissions, grams

$\theta$  = Total length of full integrated test run, min

Sample Calculation:

$$E_T \text{ (Dual train average)} = 8.95 \text{ g}$$

$$\theta = 362 \text{ min}$$

$$PM_R = 60 \times ( 8.95 / 362 )$$

$$PM_R = 1.48 \text{ g/hr}$$

## Equations and Sample Calculations - ASTM E2779 & E2515

$PM_F$  - 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,

$E_T$  = Total particulate emissions, grams

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

Sample Calculation:

$$E_T \text{ (Dual train average)} = 8.95 \text{ g}$$

$$M_{Bdb} = 9.45 \text{ kg}$$

$$PM_F = 8.95 / 9.45 )$$

$$PM_F = 0.95 \text{ g/kg}$$

# **Appendix A – Labeling & Owner’s Manual**



Report # / Rapport #0135PS022E  
 Tested to / Testé à: ASTM E 1509-04, ULC-S627-00,  
 ASTM E 2515-11, ASTM E 2779-10

Serial No. **HF**  
 N° de série:

BARCODE LABEL

**MODEL / MODÈLE: "P61-C"**

Room Heater Pellet Fuel-Burning Type  
 SUITABLE FOR MOBILE-HOME INSTALLATION  
 This pellet burning appliance has been tested and listed for use in  
 Manufactured Homes in accordance with OAR 814-23-900 through 814-23-909



Made in U.S.A. of US and imported parts. / Fabriqué  
 aux États-Unis-d'Amérique par des pièces d'origine  
 américaine et pièces importées.

Room Heater, Pellet Fuel-Burning Type, Also For Use In Mobile Homes. (UM) 84-HUD  
**"PREVENT HOUSE FIRES"** Install and use only in accordance with manufactures  
 installation and operation instructions.

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.

Contact local building or fire officials about restrictions and installation inspection in  
 your area.

**WARNING: FOR MANUFACTURED HOMES:** Do not install appliance in a sleeping  
 room. An outside combustion air inlet must be provided. The structural integrity of the  
 manufactured home floor, ceiling and walls must be maintained.

Refer to manufacturer's instructions and local codes for precautions required for  
 passing chimney through a combustible wall or ceiling. Inspect and clean exhaust  
 venting system frequently in accordance with manufacturer's instructions.

Use a 3" or 4" diameter type "L" or "PL" venting system.

Do not connect this unit to a chimney flue servicing another appliance.

Do not obstruct the space beneath the heater.

**FOR USE WITH PELLETIZED WOOD FUEL ONLY.**

Input Rating Max: 7.1 lb. fuel/hr

EPA Certified Emissions: 1.5 g/hr

U.S. Electrical Rating: 115 VAC, 60 Hz, Start 4.2 AMPS, Run 2.8 AMPS

Fuel Type: Wood Pellet.

**Route power cord away from unit.**

**OPERATE ONLY WITH DOORS CLOSED**

**DANGER:** Risk of Electrical Shock. Disconnect Power Before Servicing Unit.

For Further Instruction, Refer To Installation and Owner's Manual.

Replace glass only with 5mm mirrored ceramic available from your dealer.

**DO NOT REMOVE THIS LABEL / NE PAS ENLEVER CETTE ÉTIQUETTE**

**MINIMUM CLEARANCES TO COMBUSTIBLES/ DISTANCES DE  
 SECURITE PAR RAPPORT AUX MATERIAUX COMBUSTIBLES:**

	Without Side Shields	With Side Shields
	Sans Écrans Latéraux	Avec Écrans Latéraux
Back Wall / Entre Mur Arrière	2' / 51mm	2' / 51mm
Side Wall / Entre Paroi Latér	18" / 457mm	12" / 305mm

**CORNER INSTALLATION / EN ANGLE**

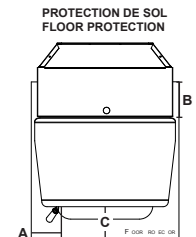
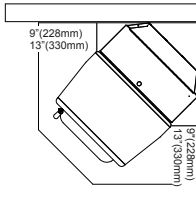
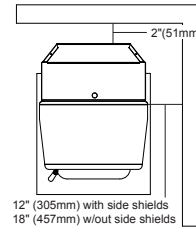
Walls to Appliance / Entre Murs et appareil	13" / 330mm	9" / 228mm
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**FLOOR PROTECTION / Protection Du Plancher**

	USA	Canada
Sides/Côtés (A)	6"	152mm
Back/Arrière (B)	6"	152mm
Front/Avant (C)	6"	152mm

Floor Protection Must Be a Non-Combustible Material. Must Also be  
 Place Under Any Horizontal Flue Connector, Extending 2" or 51mm  
 Beyond the Pipe Measurement.

Pour protéger le plancher, il faut sous le péole un matériau. Qui doit  
 aussi être placé sous les parties horizontales du tuyau de raccord à la  
 cheminée et s'étendre à 51mm ø 2 po. au-delà de la mesure du tuyau.



Chauffe-chambre, Pellet à combustibles Type, également pour les maisons mobiles. (UM) 84-HUD  
**"EMPECHER MAISON INCENDIES"** Installer et utiliser uniquement en conformité avec les instructions  
 du fabricant d'installation et d'exploitation.

Ce poêle à bois doit inspection périodique et la réparation 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.  
 Contactez le service des incendies à propos des restrictions et l'inspection d'installation dans votre région.

**AVERTISSEMENT: POUR MAISONS PRÉFABRIQUÉES:** Ne pas installer l'appareil dans une chambre à  
 coucher. Une entrée d'air de combustion à l'extérieur doit être fournie. L'intégrité structurale de la maison  
 étage, plafond et murs fabriqués doit être maintenue.

Reportez-vous aux instructions du fabricant et les codes locaux pour les précautions nécessaires pour  
 faire passer la cheminée à travers un mur ou un plafond combustible. Inspectez et nettoyez système  
 d'évacuation souvent en conformité avec les instructions du fabricant.

Utilisez un "ou 4" Type de diamètre «L» 3 ou le système de ventilation "PL".

Ne pas connecter cet appareil à un conduit de cheminée desservant un autre appareil.

Ne pas obstruer l'espace sous le chauffe-eau.

**À UTILISER AVEC LA GRANULE DE BOIS SEULEMENT..**

Entrée Max Note: £ 7,1 carburant / h

Émissions certifiées EPA: 1,5 g / h

US Note électrique: 115 VAC, 60 Hz, Start 4,2 AMPS, Run 2,8 AMPS

Type de carburant: granulés de bois.

**Route cordon électrique de l'appareil.**

**Fonctionner uniquement avec les portes fermées**

**DANGER:** Risque de choc électrique. Débranchez l'alimentation avant l'Unité des services.

Pour de plus amples instructions, reportez-vous à l'installation et le manuel du propriétaire.

Remplacer le verre seulement avec 5mm miroir en céramique disponibles chez votre revendeur.

**Ne ENLEVEZ PAS CETTE ÉTIQUETTE / NE PAS CETTE ÉTIQUETTE enlever**

US ENVIRONMENTAL PROTECTION AGENCY  
 Certified to comply with 2020 particulate emission standards.  
 Certifié conforme aux normes 2020 d'émission de particules.

Date of Manufacture / Date de fabrication:



Manufactured by / Fabriqué par: Hearth and Home Technologies 352 Mountain House Road, Halifax PA 17032

P.N. 8390-061\_R1

LABEL TICKET			
<b>ECO:</b>	89505	<b>LABEL SIZE:</b>	4.375" H x 10.75" W
<b>PART # / REV:</b>	8390-061_R1	<b>ADHESIVE:</b>	3M 486 Adhesive
<b>ORIGINATOR:</b>	Spidlet	<b>MATERIAL:</b>	24 Gauge Aluminum
<b>DATE:</b>	12/19/18	<b>INK:</b>	Black Background
 352 Mountain House Road Halifax, PA 17032		Corners .062 Barcode label must have the serial number on it. The barcode label must be able to read Code 39 Full ASCII.	

# Installation Manual

## Installation and Appliance Setup

**INSTALLER:** Leave this manual with party responsible for use and operation.

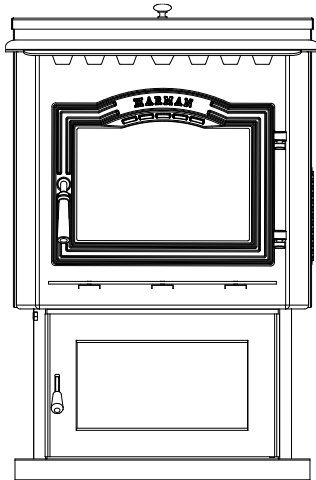
**OWNER:** Retain this manual for future reference.

**NOTICE: SAVE THESE INSTRUCTIONS**

# HARMAN®

**BUILT TO A STANDARD, NOT A PRICE**

**Model(s):**  
**P43-C, P61-C & P68-C**  
**Freestanding Pellet Stove**



### **WARNING**



Please read this entire manual before installation and use of this pellet fuel-burning room heater.

Failure to follow these instructions could result in property damage, bodily injury or even death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Do not overfire - If any external part starts to glow, you are overfiring. Reduce feed rate. Overfiring will void your warranty.
- Comply with all minimum clearances to combustibles as specified. Failure to comply may cause house fire.

### **WARNING**



#### **HOT SURFACES!**

Glass and other surfaces are hot during operation AND cool down.

**Hot glass will cause burns.**

- Do not touch glass until it is cooled
  - NEVER allow children to touch glass
  - Keep children away
  - CAREFULLY SUPERVISE children in same room as stove.
  - Alert children and adults to hazards of high temperatures.
- High temperatures may ignite clothing or other flammable materials.**
- Keep clothing, furniture, draperies and other flammable materials away.

### **CAUTION**

Check building codes prior to installation.

- Installation **MUST** comply with local, regional, state and national codes and regulations.
- Contact local building or fire officials about restrictions and installation inspection requirements in your area.

### **NOTE**

To obtain a French translation of this manual, please contact your dealer or visit [www.harmanstoves.com](http://www.harmanstoves.com)

Pour obtenir une traduction française de ce manuel, s'il vous plaît contacter votre revendeur ou visitez [www.harmanstoves.com](http://www.harmanstoves.com)

## ▲ Safety Alert Key:

- **DANGER!** Indicates a hazardous situation which, if not avoided will result in death or serious injury.
- **WARNING!** Indicates a hazardous situation which, if not avoided could result in death or serious injury.
- **CAUTION!** Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE:** Indicates practices which may cause damage to the stove or to property.

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→ = Contains updated information

# Installation Standard Work Checklist

## ATTENTION INSTALLER: Follow this Standard Work Checklist

This standard work checklist is to be used by the installer in conjunction with, not instead of, the instructions contained in this installation manual.

Customer: \_\_\_\_\_  
 Lot/Address: \_\_\_\_\_  
 \_\_\_\_\_  
 Model: \_\_\_\_\_

Date Installed: \_\_\_\_\_  
 Location of Stove: \_\_\_\_\_  
 Installer: \_\_\_\_\_  
 Dealer/Distributor Ph #: \_\_\_\_\_  
 Serial Number: \_\_\_\_\_

 **WARNING! Risk of Fire or Explosion! Failure to install appliance to these instructions can lead to a fire or explosion.**

### Appliance Install Section 3

Required non-combustible floor protection	<input type="checkbox"/>	IF NO, WHY? _____
Verified clearances to combustible.	<input type="checkbox"/>	_____
Unit is Leveled and secured.	<input type="checkbox"/>	_____

### Venting/Chimney Section 4

Venting Configuration complies to vent diagrams.	<input type="checkbox"/>	IF NO, WHY? _____
Venting installed, sealed and secured in place with proper clearances.	<input type="checkbox"/>	_____
Exterior wall/roof flashing installed and sealed	<input type="checkbox"/>	_____
Terminations installed and sealed.	<input type="checkbox"/>	_____

### Electrical Section 1

120 VAC unswitched power provided to the appliance.	<input type="checkbox"/>	IF NO, WHY? _____
Check outlet with multi-meter for proper voltage. (115-120 VAC)	<input type="checkbox"/>	_____
Record voltage reading: _____		

### Appliance Setup Section 5

All packaging and protective materials are removed	<input type="checkbox"/>	IF NO, WHY? _____
Accessories installed properly	<input type="checkbox"/>	_____
Manual bag and all it's contents are removed from inside the appliance and given to party responsible for use and operation	<input type="checkbox"/>	_____
Started appliance and verified that all motors and blowers operate as they should.	<input type="checkbox"/>	_____
Checked draft using a Manometer. Record readings: _____	<input type="checkbox"/>	_____
During operation, verify that the hopper lid switch (If applicable) and pressure switch are working properly by briefly opening the hopper lid and main door and verifying that the feed motor is interrupted.	<input type="checkbox"/>	_____

Hearth and Home Technologies recommends the following:  
 Photographing the installation and copying this checklist for your file.  
 This checklist remain visible at all times on the appliance until the installation is complete.

Comments: Further description of the issues, who is responsible (Installer/Builder/Other Trades, etc.) and corrective action needed \_\_\_\_\_

Comments communicated to party responsible \_\_\_\_\_ by \_\_\_\_\_ on \_\_\_\_\_  
 (Builder / Gen Contractor) (Installer) (Date)



# 1 Product Specific and Important Safety Information

## A. Appliance Certification

<b>MODEL:</b>	P43-C Pellet Stove
<b>LABORATORY:</b>	OMNI Test Laboratories, Inc
<b>REPORT NO.</b>	0135PS023E / 0135PS023S
<b>TYPE:</b>	Pellet Fueled/Supplementary For Residential Use
<b>STANDARD(s):</b>	ASTM E 1509-04, ULC-S627-00, ASTM E 2515-11, ASTM E 2779-10

<b>MODEL:</b>	P61-C Pellet Stove
<b>LABORATORY:</b>	OMNI Test Laboratories, Inc
<b>REPORT NO.</b>	0135PS022E / 0135PS022S
<b>TYPE:</b>	Pellet Fueled/Supplementary For Residential Use
<b>STANDARD(s):</b>	ASTM E 1509-04, ULC-S627-00, ASTM E 2515-11, ASTM E 2779-10

<b>MODEL:</b>	P68-C Pellet Stove
<b>LABORATORY:</b>	OMNI Test Laboratories, Inc
<b>REPORT NO.</b>	0135PS013E / 0135PS013S
<b>TYPE:</b>	Pellet Fueled/Supplementary For Residential Use
<b>STANDARD(s):</b>	ASTM E 1509-04, ULC-S627-00, ASTM E 2515-11, ASTM E 2779-10

**NOTE:** This installation must conform with local codes. In the absence of local codes you must comply with the **ASTM E1509-2004, ULC-S627-00, ULC/ORD-C-1482-M1990, (UM) 84-HUD**

The P43-C, P61-C and P68-C is Certified to comply with 2020 particulate emission standards.



## B. Glass Specifications

This appliance is equipped with 5mm mirrored ceramic glass. Replace glass only with 5mm ceramic glass. Please contact your dealer for replacement glass.

## C. Mobile Home Approved

This appliance is approved for mobile home installations when not installed in a sleeping room and when an outside combustion air inlet is provided.

The structural integrity of the mobile home floor, ceiling, and walls must be maintained. The appliance must be properly grounded to the frame of the mobile home and use only listed pellet vent, Class "PL" connector pipe.

A Harman® Outside Air Kit must be installed in a mobile home installation.



### WARNING

**THE STRUCTURAL INTEGRITY OF THE MANUFACTURED HOME FLOOR, WALL, AND CEILING/ROOF MUST BE MAINTAINED.**

**DO NOT INSTALL IN SLEEPING ROOM.**

## D. California Safety Information



### WARNING

This product and the fuels used to operate this product (wood), and the products of combustion of such fuels, can expose you to chemicals including carbon black, which is known to the State of California to cause cancer, and carbon monoxide, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to: [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

## E. BTU & Efficiency Specifications

### → P43-C Freestanding Pellet Stove:

<b>EPA Certification Number:</b>	165-18
<b>EPA Certified Emissions:</b>	1.82 g/hr
<b>*LHV Tested Efficiency:</b>	82.7%
<b>**HHV Tested Efficiency:</b>	76.7%
<b>***EPA BTU Output:</b>	18,780 - 33,250
<b>****BTU Input:</b>	23,900 - 45,200
<b>Vent Size:</b>	3 Inch
<b>Hopper Capacity:</b>	50 lbs
<b>Fuel</b>	Wood Pellet

### P61-C Freestanding Pellet Stove:

<b>EPA Certification Number:</b>	177-19
<b>EPA Certified Emissions:</b>	1.5 g/hr
<b>*LHV Tested Efficiency:</b>	85%
<b>**HHV Tested Efficiency:</b>	79%
<b>***EPA BTU Output:</b>	17,100 - 46,800
<b>****BTU Input:</b>	21,400 - 60,700
<b>Vent Size:</b>	3 Inch
<b>Hopper Capacity:</b>	72 lbs
<b>Fuel</b>	Wood Pellet

### P68-C Freestanding Pellet Stove:

<b>EPA Certification Number:</b>	178-19
<b>EPA Certified Emissions:</b>	1.4 g/hr
<b>*LHV Tested Efficiency:</b>	85%
<b>**HHV Tested Efficiency:</b>	79.5%
<b>***EPA BTU Output:</b>	15,900 - 53,100
<b>****BTU Input:</b>	20,200 - 67,600
<b>Vent Size:</b>	3 Inch
<b>Hopper Capacity:</b>	76 lbs
<b>Fuel</b>	Wood Pellet

\* Weighted average LHV efficiency using data collected during EPA emissions test.

\*\*Weighted average HHV efficiency using data collected during EPA emissions test.

\*\*\*A range of BTU outputs based on EPA Default Efficiency and the burn rates from the low and high EPA tests.

\*\*\*\*Based on the maximum feed rate per hour multiplied by approximately 8,600 BTU's which is the average BTU's from a pound of pellets.

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.

## F. Non-Combustible Materials Specification

Material which will not ignite and burn. Such materials are those consisting entirely of steel, iron, brick, tile, concrete, slate, glass or plasters, or any combination thereof.

Materials that are reported as passing **ASTM E 136, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C** and **UL763** shall be considered non-combustible materials.

## G. Combustible Materials Specification

Materials made of or surfaced with wood, compressed paper, plant fibers, plastics, or other material that can ignite and burn, whether flame proofed or not, or plastered or unplastered shall be considered combustible materials.

## H. Electrical Codes

120 VAC, 60 Hz, Start 4.2 Amps, Run 2.8 Amps

**NOTE: Some generator or battery back-up systems may not be compatible with the micro-processor electronics on this appliance. Please consult the power supply manufacturer for compatible systems.**

**WARNING! Risk of Fire!** Hearth & Home Technologies disclaims any responsibility for, and the warranty and agency listing will be voided by the below actions.

### DO NOT:

- Install or operate damaged appliance
- Modify appliance
- Install other than as instructed by Hearth & Home Technologies
- Operate the appliance without fully assembling all components
- Overfire
- Install any component not approved by Hearth & Home Technologies
- Install parts or components not Listed or approved.
- Disable safety switches

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage.

For assistance or additional information, consult a qualified installer, service agency or your dealer.

**NOTE:** Hearth & Home Technologies, manufacturer of this appliance, reserves the right to alter its products, their specifications and/or price without notice.

Harman® is a registered trademark of Hearth & Home Technologies.

# 2 Getting Started

## A. Design and Installation Considerations

### 1. Appliance Location

**NOTICE:** Check building codes prior to installation.

- Installation MUST comply with local, regional, state and national codes and regulations.
- Consult insurance carrier, local building inspector, fire officials or authorities having jurisdiction over restrictions, installation inspection and permits.

It is a good idea to plan your installation on paper, using exact measurements for clearances and floor protection, before actually beginning the installation

Consideration must be given to:

- Safety, convenience, traffic flow
- Placement of the chimney and chimney connector.
- If you are not using an existing chimney, place the appliance where there will be a clear passage for a factory-built listed chimney through the ceiling and roof.
- Installing an optional outside air kit would affect the location of the vent termination.

Since pellet exhaust can contain ash, soot or sparks, you must consider the location of:

- Windows
- Air Intakes
- Air Conditioner
- Overhang, soffits, porch roofs, adjacent walls
- Landscaping, vegetation

When locating vent and venting termination, vent above roof line when possible.

**Warning! Risk of Fire** Damaged parts could impair safe operation. Do NOT install damaged, incomplete or substitute components.

**NOTICE:** Locating the appliance in a location of considerable air movement can cause intermittent smoke spillage from appliance. Do not locate appliance near:

- Frequently open doors
- Central heat outlets or returns

Installation and service of this appliance should be performed by qualified personnel. Hearth & Home Technologies recommends HHT Factory Trained or NFI certified professionals.

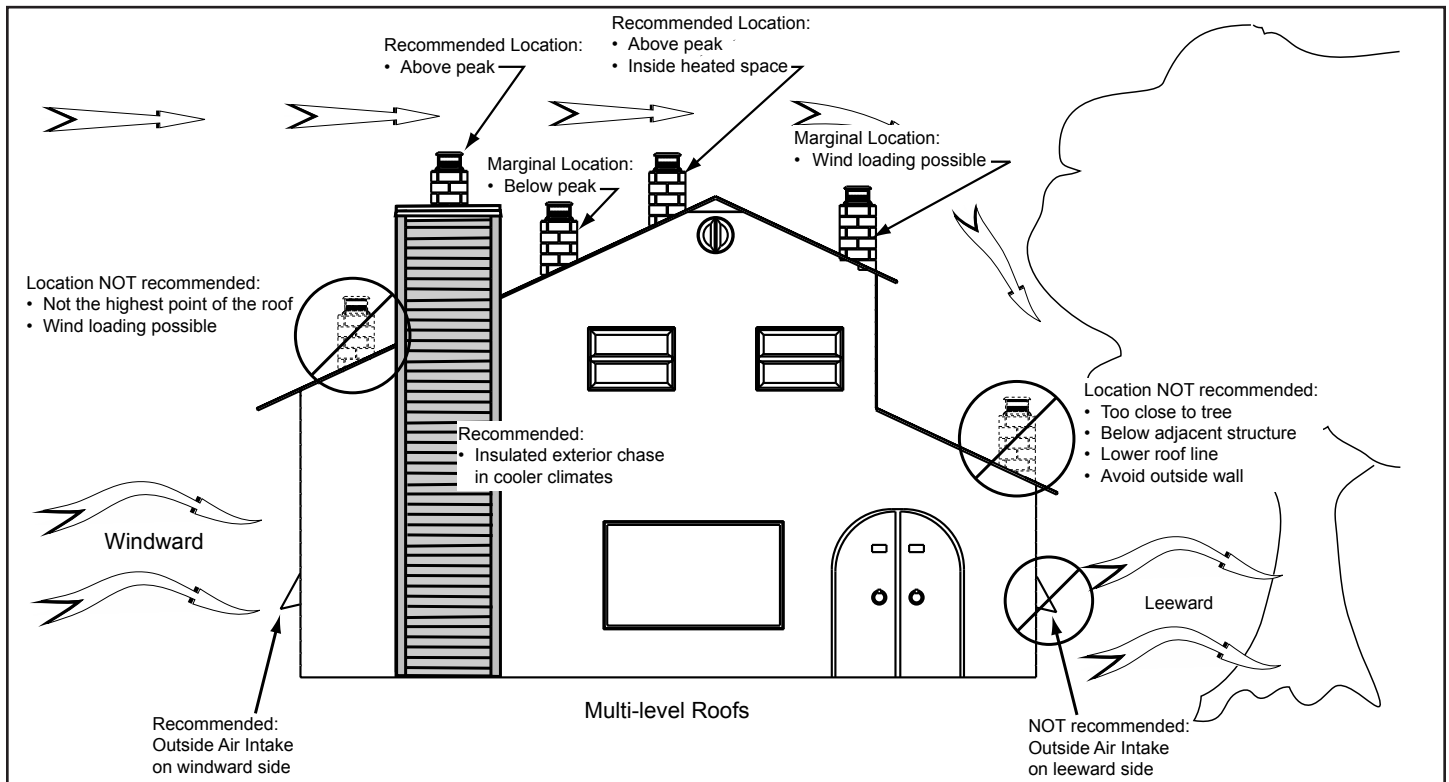


Figure 2.1

## B. Tools And Supplies Needed

Tools and building supplies normally required for installation, unless installing into an existing masonry fireplace:

Reciprocating Saw	Gloves
Hammer	Safety Glasses
Phillips Screwdriver	Electric Drill & Bits
Tape Measure	
Level	<u>May also need:</u>
Non-Combustible Sealant Material	Vent Support Straps
	Venting Paint

## C. Inspect Appliance and Components

- Carefully remove the appliance and components from the packaging.
- The vent system components and decorative doors and fronts may be shipped in separate packages.
- Report to your dealer any parts damaged in shipment, particularly the condition of the glass.
- **Read all of the instructions before starting the installation. Follow these instructions carefully during the installation to ensure maximum safety and benefit.**



### WARNING

**RISK OF FIRE OR EXPLOSION! Damaged parts could impair safe operation. DO NOT install damaged, incomplete or substitute components. Keep appliance dry.**

Hearth & Home Technologies disclaims any responsibility for, and the warranty will be voided by the following actions:

- Installation and use of any damaged appliance or vent system component.
- Modification of the appliance or vent system.
- Installation other than as instructed by Hearth & Home Technologies.
- Installation and/or use of any component part not approved by Hearth & Home Technologies.

**Any such action may cause a fire hazard.**



### WARNING

**Risk of Fire, Explosion or Electric Shock! DO NOT use this appliance if any part has been under water. Call a qualified service technician to inspect the appliance and to replace any part of the control system which has been under water.**

### INSTALL EXHAUST VENT AT CLEARANCES SPECIFIED BY THE MANUFACTURER.

Most pellet vent pipe requires a minimum of 1" of clearance to combustible materials although some can be installed at 1" clearance.

Follow these instructions along with all local codes regarding installation of this appliance.

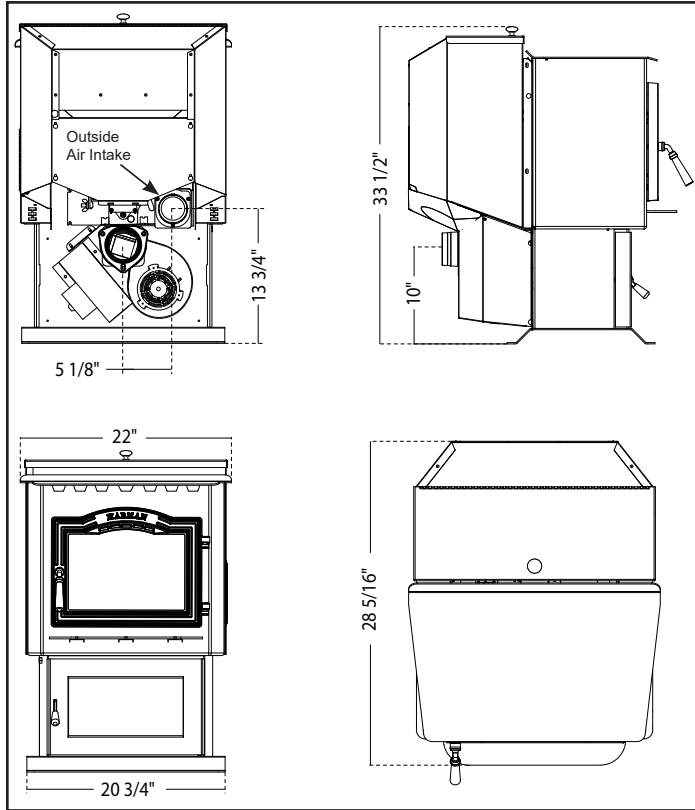
Do **NOT** use makeshift compromises when installing this appliance, serious consequences may result.

# 3 Clearances

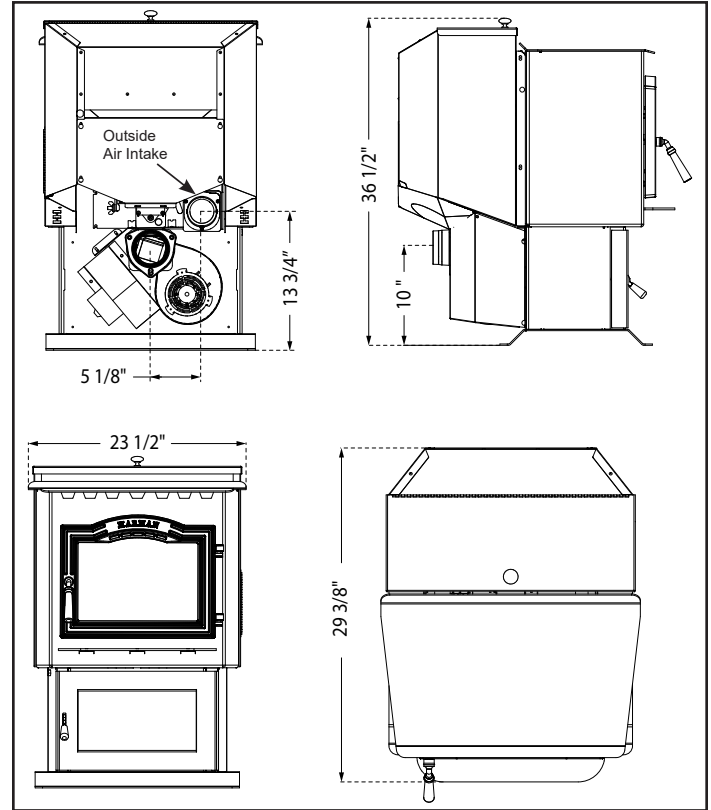
## A. Appliance Dimension Diagram

Dimensions are actual appliance dimensions. Use for reference only.

### P43-C Freestanding Pellet Stove



### P61-C Freestanding Pellet Stove



### P68-C Freestanding Pellet Stove

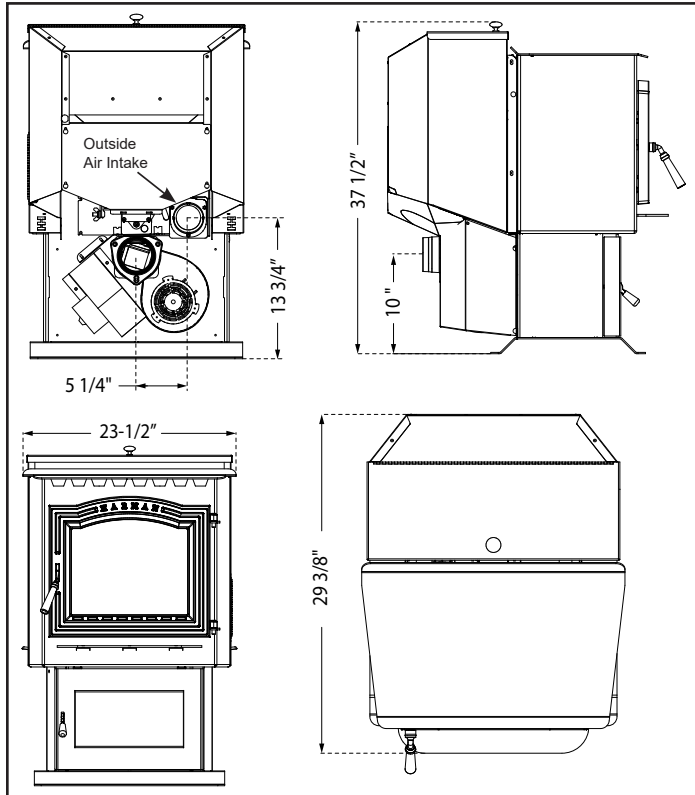


Figure 3.1

## B. Clearances to Combustibles

When selecting a location for the appliance it is important to consider the required clearances to walls, Figure 3.2.

**⚠ WARNING**

**RISK OF FIRE OR BURNS! Provide adequate clearance around air openings and for service access. Due to high temperatures, the appliance should be located out of traffic and away from furniture and draperies.**

**⚠ CAUTION**

**THIS APPLIANCE MUST BE VENTED TO THE OUTSIDE.**

**NOTICE:** Illustrations reflect typical installations and are FOR DESIGN PURPOSES ONLY. Actual installation may vary due to individual design preference.

Place the stove away from combustible walls at least as far as shown in Figure 3.2. Please note the difference in side wall clearance with and without side shields.

Note that the clearances shown are minimum for safety but do not leave much room for access when cleaning or servicing. Please take this into account when placing the stove.

Due to high temperatures, the stove should be placed out of traffic and away from furniture and draperies.

Children and adults should be alerted to the hazards of high surface temperatures and should stay away to avoid burns to skin and/or clothing.

Young children should be carefully supervised when they are in the same room as the stove.

Clothing and other flammable materials should not be placed on or near this unit.

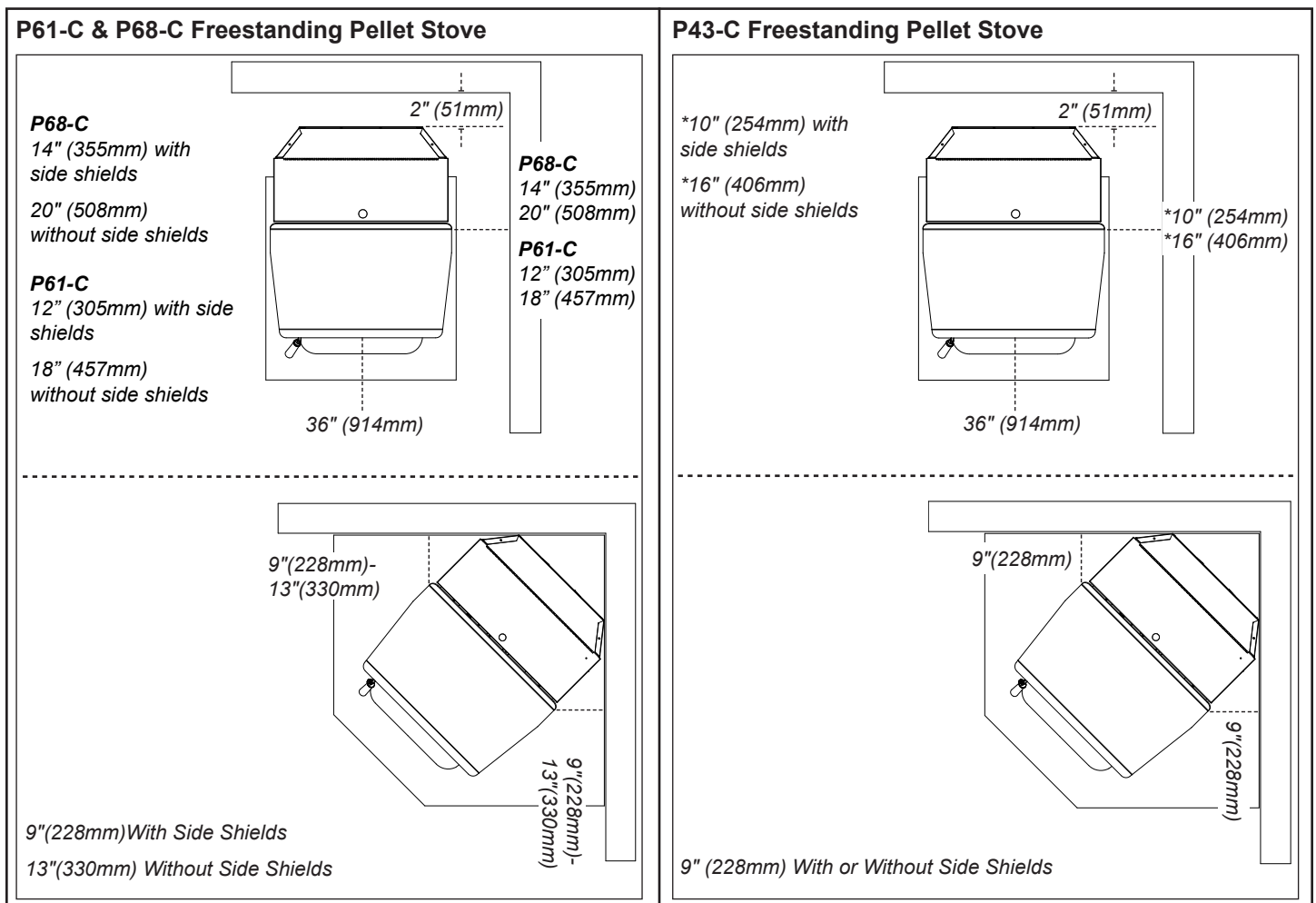


Figure 3.2

## C. Floor Protection



### CAUTION

Hearth and Home Technologies does not recommend adhesive based vinyl flooring due to thermal expansion. Floating-style flooring (LVP - luxury vinyl plank or LVT – luxury vinyl tile) can be used, but it will reach temperatures up to 110 °F in a room with ambient temperature of 70 °F. Consult flooring specifications to ensure compatibility.

HHT recommends wood stoves and inserts have 29 inches of alternative flooring in front of the stove before using LVP/LVT regardless if they sit flush on the floor or are elevated on a raised hearth.

For all other flooring, continue to follow clearance to combustible requirements in the installation manual.

**NOTICE:** Clearances that do not meet the minimum guidelines could result in damage or buckling to the vinyl flooring and is done at the installer's risk.

#### Parallel Installation:

Place the stove on a noncombustible type floor or floor protector that extends a minimum of 6 inches (152mm) to the front of the load door opening, 6 inches (152mm) to the sides of the door opening, and 6 inches to the rear.

The P-Series does not require R value floor protection.

The minimum floor protector material is 20 gauge sheet metal. Other floor protector materials that can be used include Type I hearth pads, ceramic tile, stone, brick, etc. Figure 3.3

\*Floor protection dimensions for the front and sides are measured from the appliance door opening and the rear is measured by the pedestal base rear edge.

**P43-C** - Minimum size rectangular floor protection is 25-7/16" Wide by 26-3/4" Deep (646mm X 680mm).

**P61-C** - Minimum size rectangular floor protection is 25-1/8" Wide by 27-3/4" Deep (638mm X 705mm).

**P68-C** - Minimum size rectangular floor protection is 25-3/16" Wide by 27-3/4" Deep (640mm X 705mm).

#### Venting:

**US** - Follow PL vent manufacturers recommendations when configuring vent pipe installation.

**Canada** - Must extend 2" (51mm) beyond each side of any horizontal flue pipe.

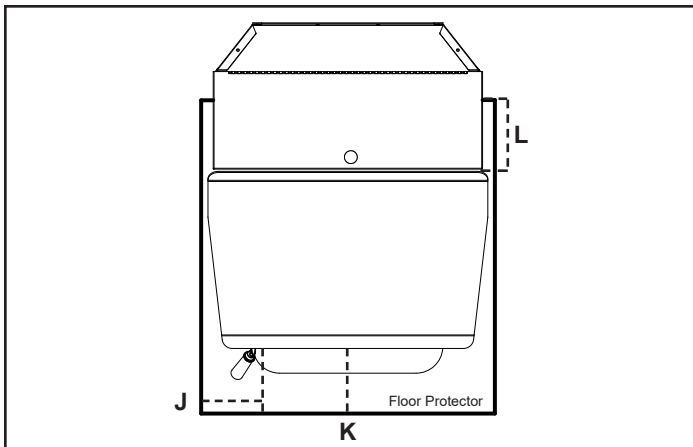


Figure 3.3

Floor Protection Requirements		US	Canada
J	Sides	6"	152mm
K	Front	6"	152mm
L	Rear	6"	152mm

#### Corner Installation:

Minimum size floor protection for a corner installation hearth pad is:

**P43-C** - Minimum size floor protection is 25-7/16" Wide by 26-3/4" Deep (646mm X 680mm).

**P61-C** - Minimum size floor protection is 25-1/8" Wide by 27-3/4" Deep (638mm X 705mm).

**P68-C** - Minimum size floor protection is 25-3/16" Wide by 27-3/4" Deep (640mm X 705mm).

**Note:** Floor protector **WILL NOT** touch the wall using minimum clearances.

If corner floor protection is desired to touch the wall, the floor protection will need to be at least 40" x 40" (1016mm x 1016mm). **Note:** This will allow the floor protection to touch the wall as shown. Figure 3.4.

Alternate floor protector dimension may be used as long as they satisfy the measurement requirements shown below.

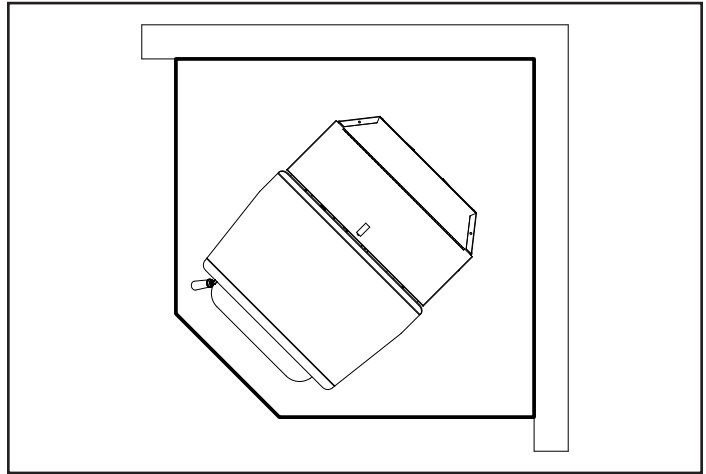


Figure 3.4

## D. Mobile Home Installation

When installing this unit in a mobile home, several requirements must be followed:

1. The unit must be bolted to the floor. This can be done using an appropriate fastener for the application.
2. The unit must also be connected to outside air. See "Termination Location and Vent Information" Section D.
3. Floor protection and clearances must be followed as shown.
4. The appliance must be properly grounded to the frame of the mobile home using a minimum of 8 AWG copper solid or stranded, insulated or bare wire or equivalent.

# 4 Termination Location and Vent Information

## A. Vent Termination Minimum Clearances

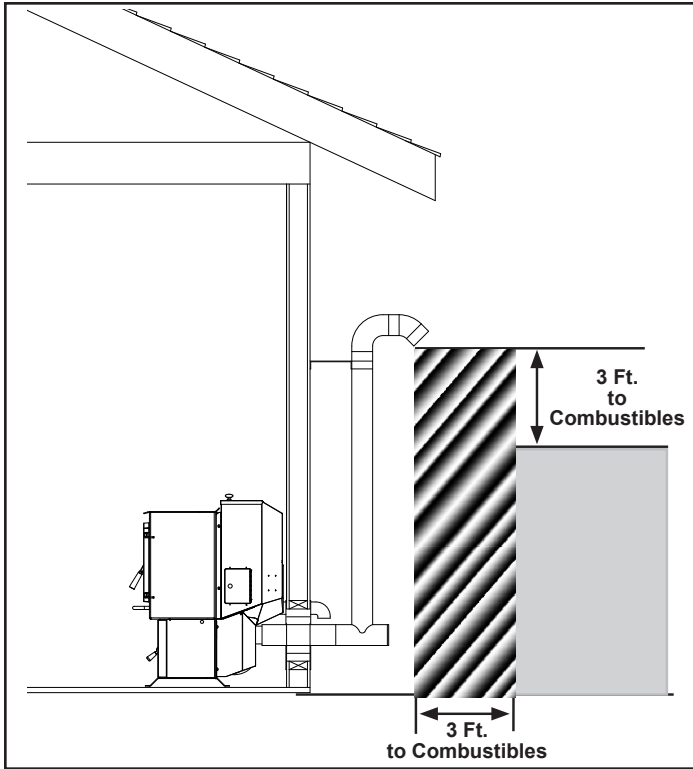


Figure 4.1

**Note:** Follow venting manufacturer's recommendations for sealing pipe joints.

### #1 Preferred method (Figure 4.1)

This method provides excellent venting for normal operation and allows the stove to be installed closest to the wall. Two inches from the wall is safe; however, four inches allows better access to remove the rear panel. The vertical portion of the vent should be three to five feet high. This vertical section will help provide natural draft in the event of a power failure.

**Do not place joints within wall pass-through.**

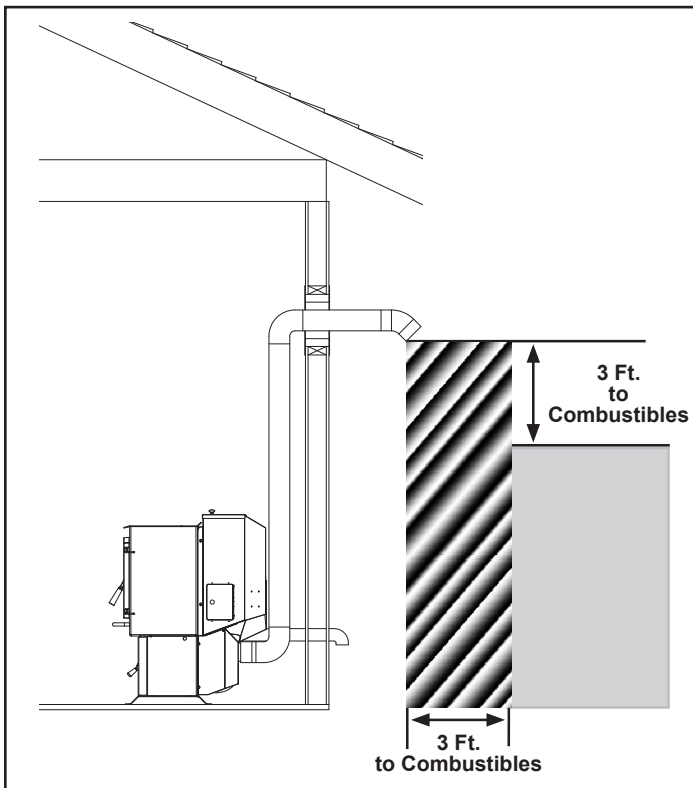



Figure 4.2

### #2 Preferred method (Figure 4.2)

This method also provides excellent venting for normal operation but requires the stove to be installed farther from the wall. The vertical portion of the vent should be three to five feet high and at least 1" from a combustible wall. This vertical section will provide natural draft in the event of a power failure.

If the stove is installed below grade be sure the vent termination is at least 12" above grade. The outlet must also be 1 foot from the house/building.

**Do not place joints within wall pass-through.**

 <b>CAUTION</b>
<b>Keep combustible materials (such as grass, leaves, etc.) at least 3 feet away from the flue outlet on the outside of the building.</b>



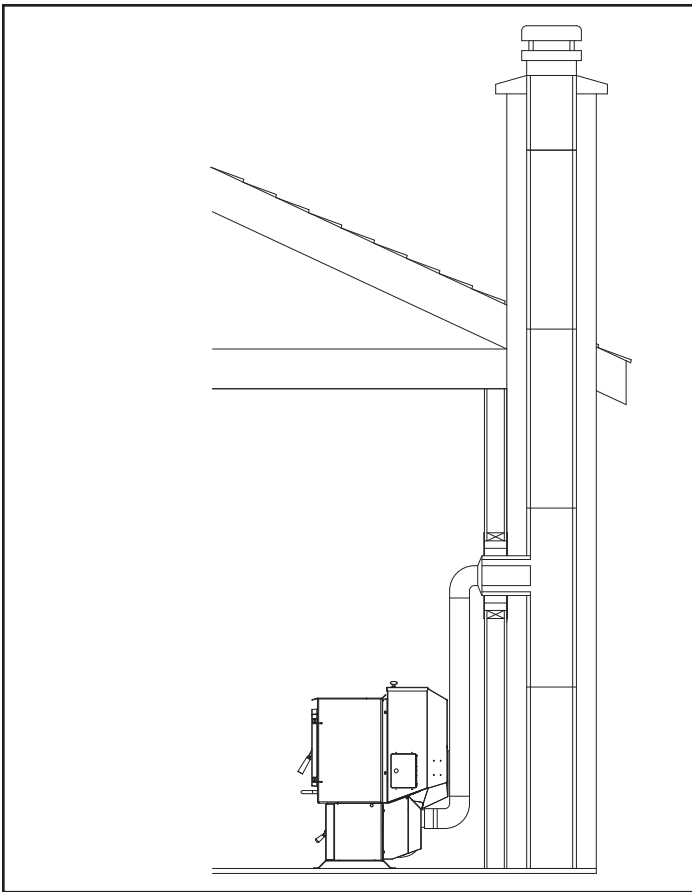


Figure 4.3

### #3 Installing into an existing chimney (Figure 4.3)

This method provides excellent venting for normal operation. This method also provides natural draft in the event of a power failure. If the chimney condition is questionable\* you may want to install a liner as in method #7.

In some places in the US and Canada it is required that the vent pipe extend all the way to the top of the chimney.

\*The chimney should be inspected and cleaned before installing your stove. If you discover that the chimney does not have a clay tile liner or has cracks or flaking of the tile liner you will need to install a stainless steel liner within the chimney. In most cases the inside diameter of this liner should be 4". Either flexible or rigid liner may be used for this purpose. Refer to Method 6 & 7.

Be sure to design the venting so that it can be easily cleaned.

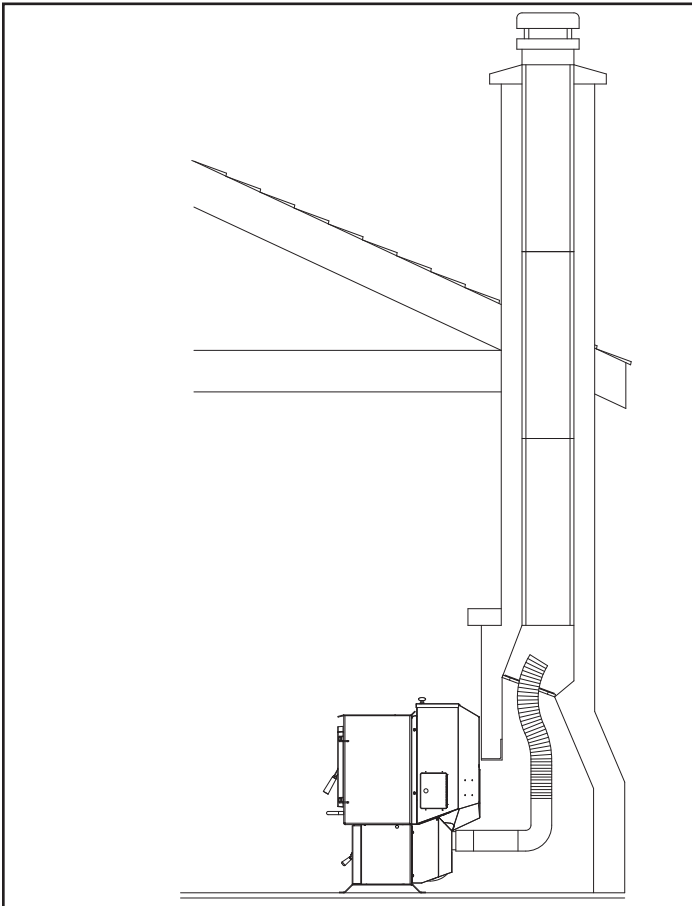


Figure 4.4

### #4 Installing into an existing fireplace chimney (Figure 4.4)

This method provides excellent venting for normal operation. This method also provides natural draft in the event of a power failure. If the chimney condition is questionable\* you may want to install a liner as in method #6.

In some places in the US and Canada it is required that the vent pipe extend all the way to the top of the chimney.

\*The chimney should be inspected and cleaned before installing your stove. If you discover that the chimney does not have a clay tile liner or has cracks or flaking of the tile liner you will need to install a stainless steel liner within the chimney. In most cases the inside diameter of this liner should be 4". Either flexible or rigid liner may be used for this purpose. Refer to Method 5 & 6.

The chimney should be sealed at the damper using a steel plate. Kaowool, mineral wool or an equivalent non-combustible insulation is recommended to be installed on top of the sealing plate to reduce the possibility of condensation. The connector pipe should extend through the smoke chamber to the base or into the first flue tile.

Be sure to design the venting so that it can be easily cleaned.

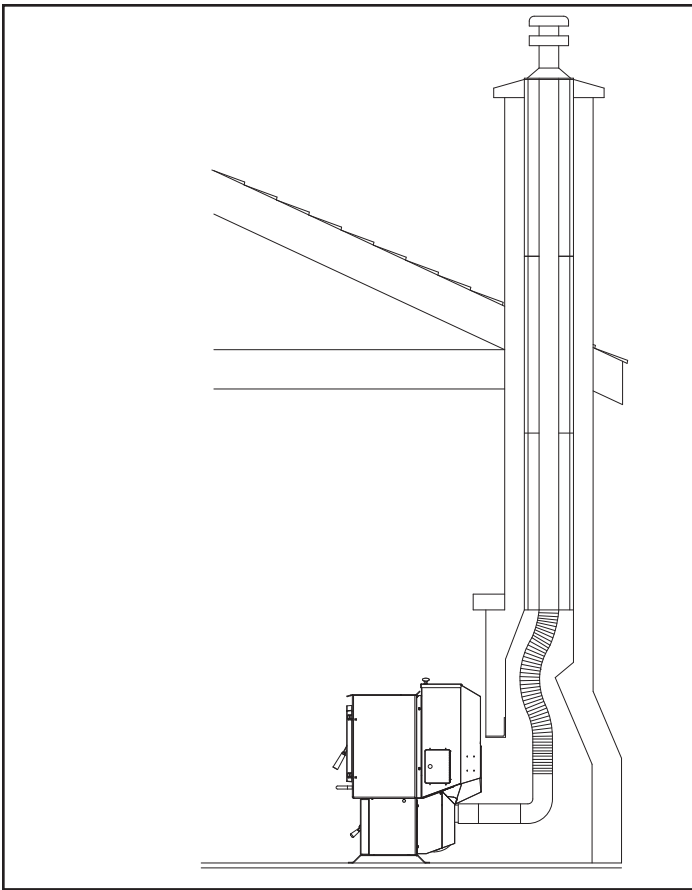


Figure 4.5

**#5 Installing into an existing fireplace chimney (Figure 4.5) w/Full Liner**

This method provides excellent venting for normal operation. This method also provides natural draft in the event of a power failure.

In some places in the US and Canada it is required that the vent pipe extend all the way to the top of the chimney. The pipe or liner inside the chimney should be 4" diameter.

In this method a cap should also be installed on the chimney to keep out rain. Be sure to use approved pellet vent pipe fittings. Pipe size should be increased to 4" using this method.

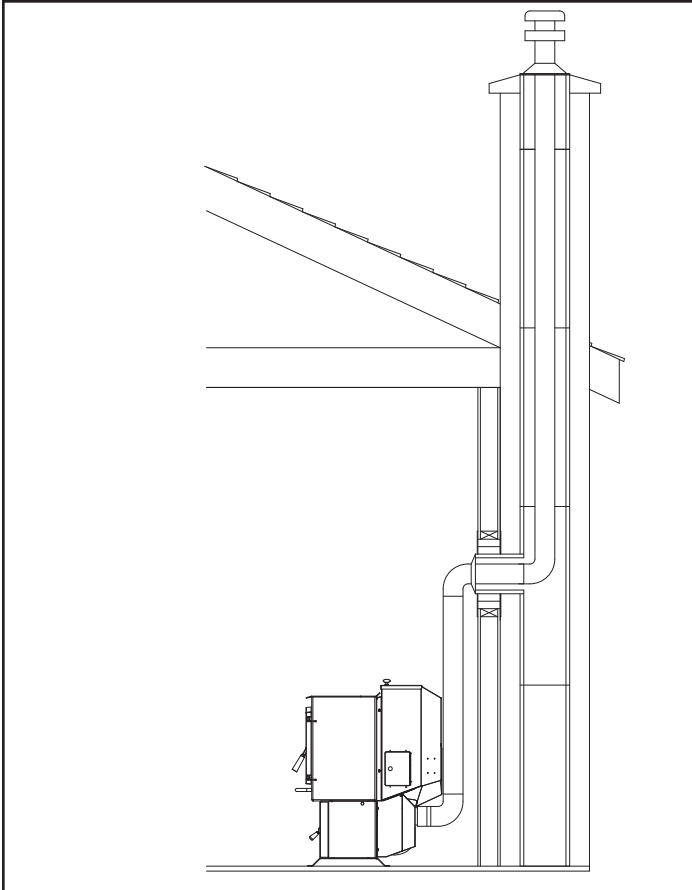


Figure 4.6

**#6 Installing into an existing chimney (Figure 4.6) w/Full liner**

This method provides excellent venting for normal operation. This method also provides natural draft in the event of a power failure.

In some places in the US and Canada it is required that the vent pipe extend all the way to the top of the chimney. The pipe or liner inside the chimney should be 4" diameter.

In this method a cap should also be installed on the chimney to keep out rain.

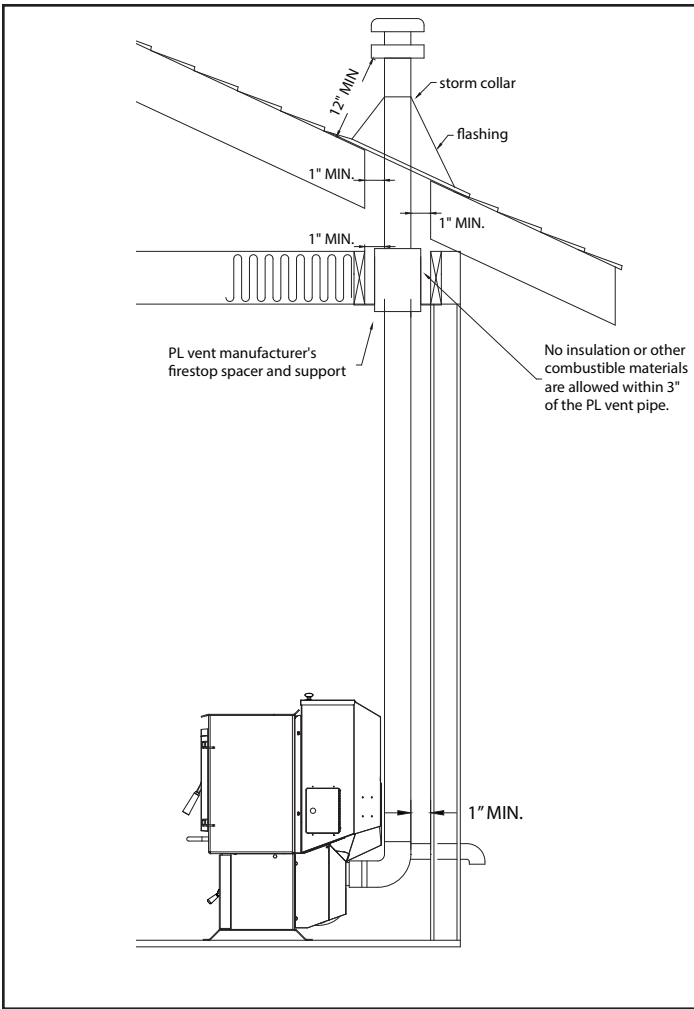


Figure 4.7

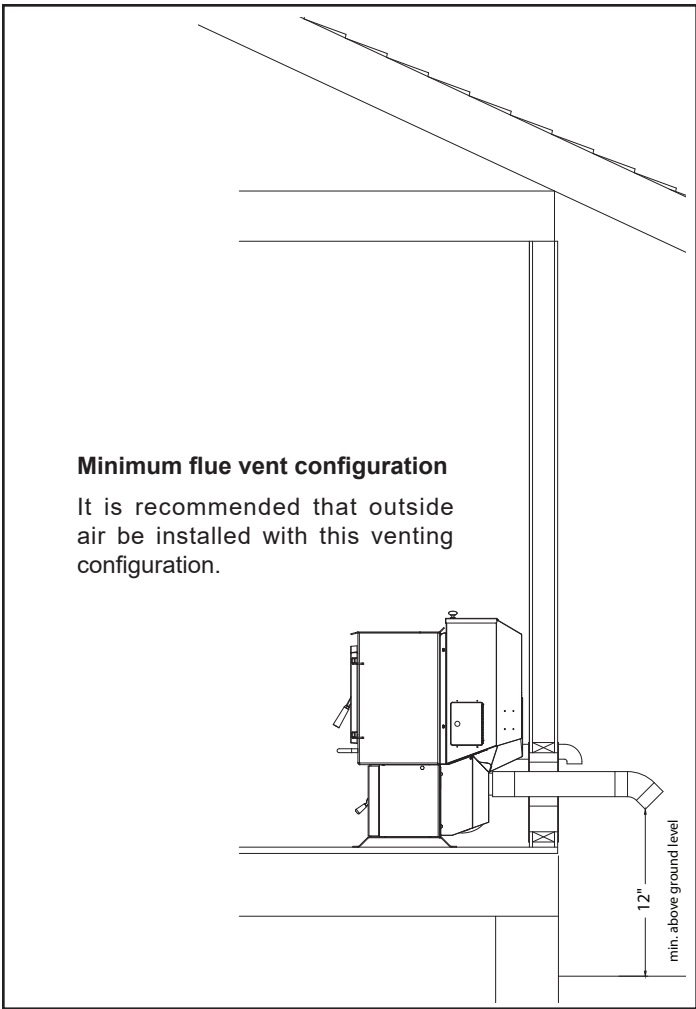


Figure 4.8

**#7 Installing through the ceiling**

Through the ceiling vent, follow PL vent manufacturers recommendations when using wall and ceiling pass through.

**Do not place joints within wall pass-through.**

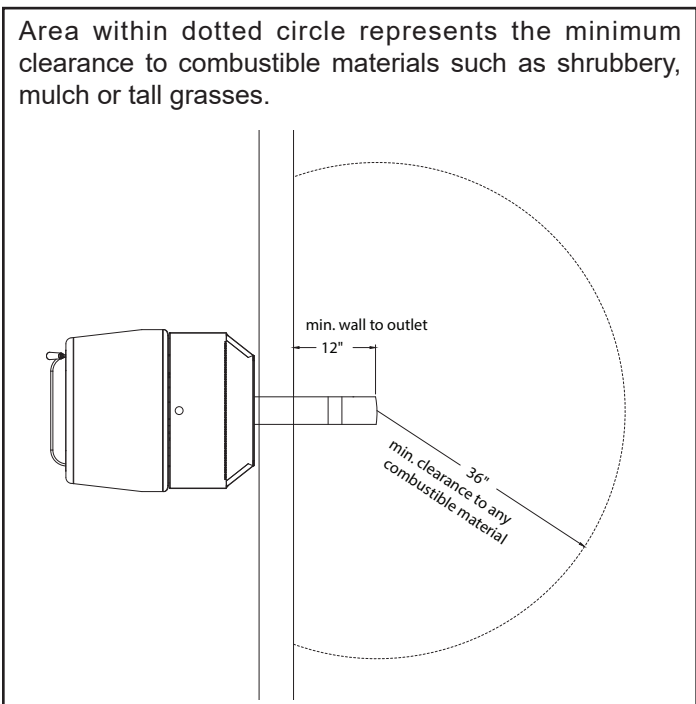


Figure 4.9

## B. Chimney Diagram

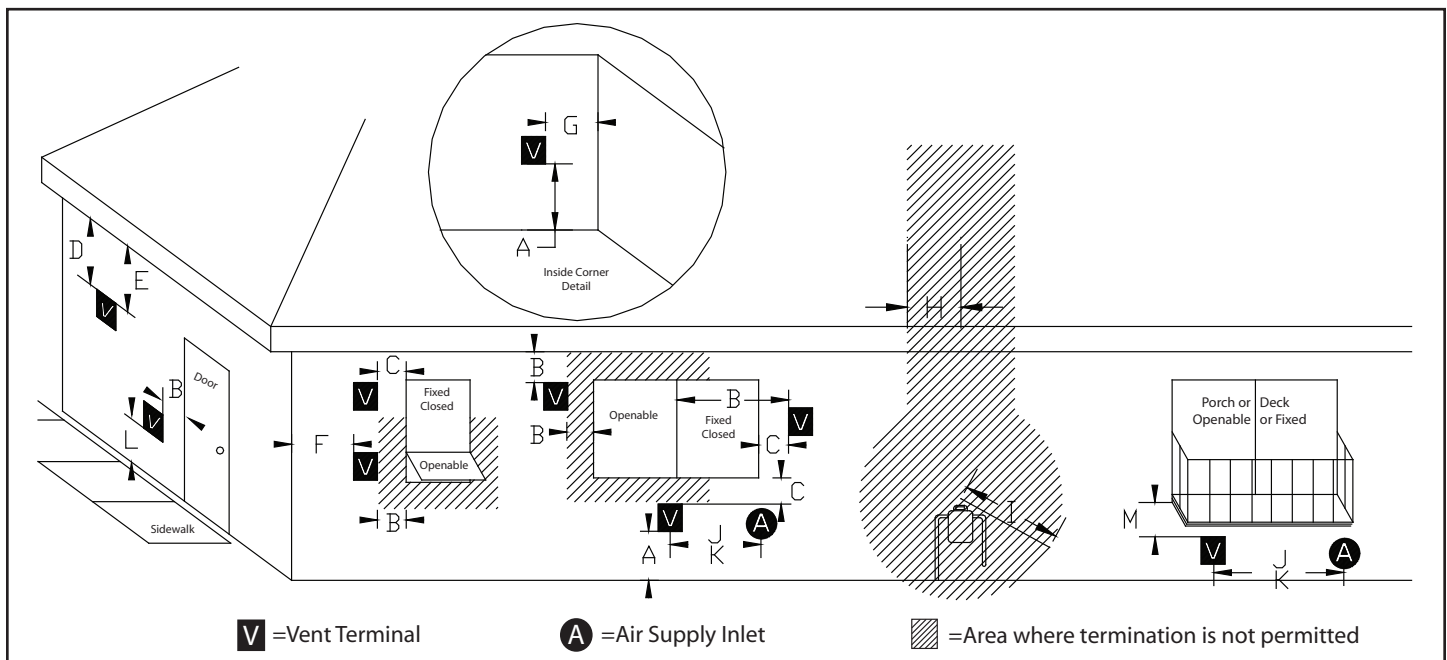


Figure 4.10

### Requirements for Terminating the Venting

- Venting terminals must not be recessed into a wall or siding.
- Only PL vent pipe wall pass-through and fire stops should be used when venting through combustible materials.
- Always take into consideration the effect the prevailing wind direction or other wind currents will cause with flyash and /or smoke when placing the termination.

### In addition, the following must be observed:

- The clearance above grade must be a minimum of 12".
- The clearance to a window or door that may be opened must be a minimum of 48" to the side and 48" below the window/door, and 12" above the window/door. (**with outside air installed, 12" to side and below**)
- A 12" clearance to a permanently closed window is recommended to prevent condensation on the window.
- The vertical clearance to a ventilated soffit located above the terminal within a horizontal distance of 2 feet (60 cm) from the center-line of the terminal must be a minimum of 18".
- The clearance to an unventilated soffit must be a minimum of 12".
- The clearance to an outside corner is 11" from center of pipe.
- The clearance to an inside corner is 12".
- A vent must not be installed within 3 feet (90 cm) above a gas meter/regulator assembly when measured from the horizontal center-line of the regulator.

- The clearance to service regulator vent outlet must be a minimum of 6 feet.
- The clearance to a non-mechanical air supply inlet to the building or the combustion air inlet to any other appliance must be a minimum of 48".
- The clearance to a mechanical air supply inlet must be a minimum of 10 feet. (**with outside air installed, 6 feet**)
- The clearance above a paved sidewalk or a paved driveway located on public property must be a minimum of 7 feet.
- The clearance under a veranda, porch, deck or balcony must be a minimum of 12 inches. (**B. also**)

**Note: The clearance to vegetation and other exterior combustibles such as mulch is 36" as measured from the center of the outlet or cap. This 36" radius continues to grade.**

Certain Canadian and or Local codes or regulations may require different clearances.

A vent shall not terminate directly above a side-walk or paved driveway which is located between two single family dwellings and serves both dwellings.

Only permitted if veranda, porch, deck, or balcony is fully open on a minimum of 2 sides beneath the floor.

**See NFPA 211 for more installation clearance reductions when using outside air. Where passage through a wall, or partition of combustible construction is desired, the installation shall conform to CAN/CSA-B365. (if in Canada)**

## C. Venting & Use of Elbows

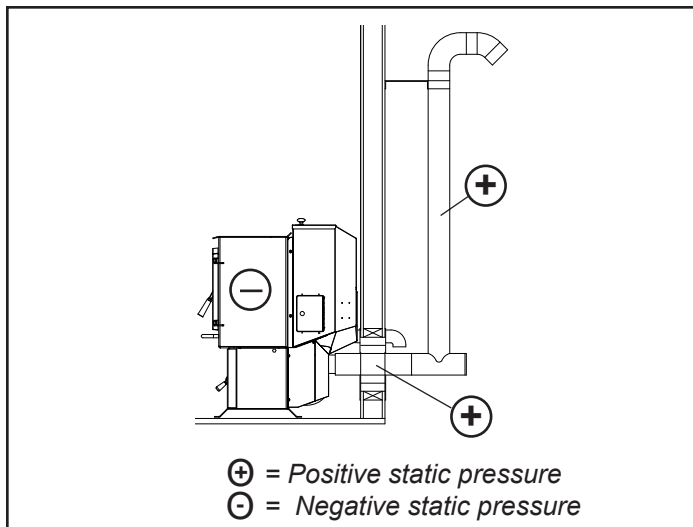


Figure 4.11

Harman pellet stoves depend on a combustion fan to pull air through the unit for combustion. The venting system restricts the ability of the combustion fan to move the required amount of air through the unit. A system with too much resistance will result in incomplete combustion, more frequent required cleaning and poor unit performance. It is always best to choose a location for the appliance that will result in a venting system with the shortest equivalent vent length (EVL).

It is best to have your venting system designed by a Harman authorized dealer before you finalize your purchase of an appliance.

**Equivalent Vent Length:** *The equivalent vent length for common pellet vent components are:*

- 90° Elbows or Tee: 5 EVL Units
- 45° elbow: 3 EVL Units
- Vertical Pipe or Liner: ½ EVL Unit
- Horizontal Pipe or liner: 1 EVL Unit

**The total allowable equivalent vent length is:**

- 20 EVL for 3" pellet vent pipe or liner
- 30 EVL for 4" pellet vent pipe or liner

Due to the potential for fly ash accumulation in horizontal venting sections, the maximum permissible horizontal venting length is:

- 4 ft. for 3" & 4" pellet vent pipe.

### Example: First Floor Installation

A unit is to be installed using 3" Pellet Pipe with 3 feet of horizontal pipe, a Tee, 10 feet of vertical pipe, a 90° elbow and a termination cap.

***The equivalent vent length is:***

3 ft. of Horizontal Pipe (1 x 3 EVL)	= 3 EVL
90° Elbow or Tee (1 x EVL)	= 5 EVL
10 ft. of Vertical Pipe (10 x .5 EVL)	= 5 EVL
90° Elbow or Tee (1 x EVL)	= 5 EVL
<u>Termination Cap</u>	<u>= 0 EVL</u>
<b>Equivalent Vent Length</b>	<b>= 18 EVL</b>

In the example system detailed above, the EVL was 138 which is less than the maximum of 20 EVL for 3" pellet vent pipe, thus this is a satisfactory venting configuration.

### Example: Connection to Masonry Chimney

A unit is to be installed using 3" Pellet Pipe with 2 feet of horizontal pipe, a Tee, 4 feet of vertical pipe, an elbow, a Tee, 21 feet of vertical liner, and a termination cap.

***The equivalent vent length is:***

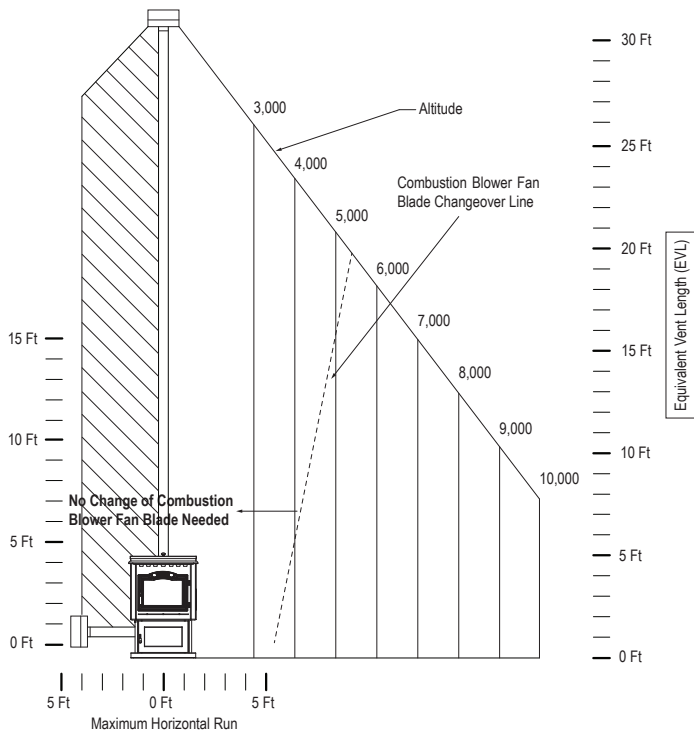
2 ft. of Horizontal Pipe (1 x 2 EVL)	= 2 EVL
90° Tee (1 x 5 EVL)	= 5 EVL
4 ft. of Vertical Pipe (4 x .5 EVL)	= 2 EVL
90° Elbow (1 x 5 EVL)	= 5 EVL
90° Tee (1 x 5 EVL)	= 5 EVL
21 ft. of Vertical Liner (21 x .5 EVL)	= 10.5 EVL
<u>Termination Cap</u>	<u>= 0 EVL</u>
<b>Equivalent Vent Length</b>	<b>= 29.5 EVL</b>

In the example system detailed above, the EVL was 29.5 which exceeds the maximum of 20 ft. for 3" pellet vent pipe, thus 3" vent pipe should not be used in this installation. However, since 4" pipe can support an EVL up to 30, the use of 4" pipe would create a satisfactory installation.

## C. Venting & Use of Elbows *continued*

**Note:** When the amount of vertical pellet vent pipe in the system exceeds 15 feet, 4" pellet vent pipe should be used.

**Note:** Equivalent Venting Length decreases as altitude increases.



### Example:

A unit with an EVL of 13, is to be installed at an altitude of 3,000 feet above sea level.

From the chart to the left, at 3,000 feet of altitude, the maximum permissible equivalent venting length is 26 feet. Therefore this would be an acceptable installation with no need to change the combustion blower fan.

However, if the same unit (EVL 13) was to be installed an altitude of 9,000 feet above sea level, the installation would no longer be acceptable and the equivalent vent length of the pipe would have to be reduced for proper unit operation.

- Long runs of flex or PL vent pipe installed directly vertical from the flue stub may require more frequent cleaning due to fly ash falling off inside and collecting directly above the combustion blower outlet.
- 4" stainless steel flex vent piping is only allowed for use in masonry fireplaces and chimneys or factory built wood-burning fireplaces with Class A metal chimneys.
- All pellet vent pipe must be secured together either by means provided by pipe manufacturer or by 3 screws at each joint.
- Use only the specified venting components. Use of any other components will void the product warranty and may pose a hazard.
- Do Not Install a Flue Damper In The Exhaust Venting System of This Appliance.
- DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.
- **NOTE:** Simpson DuraVent PelletVent Pro Harman® Adapter Part #3PVP-ADHB and PelletVent Pro Harman® Adapter Inserter Part #3PVPX4ADHB are highly recommended to be installed on the starter collar to insure a proper pipe connection to the unit.
- **INSTALL VENT AT CLEARANCES SPECIFIED BY THE VENT MANUFACTURER**
- Use silicone to create an effective vapor barrier at the location where the chimney or outside air ducting passes through to the exterior of the structure

## D. Outside Air

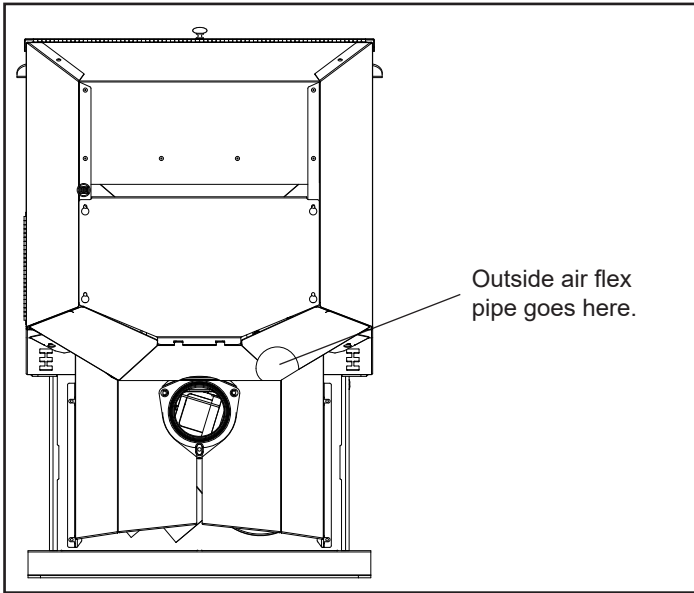


Figure 4.12

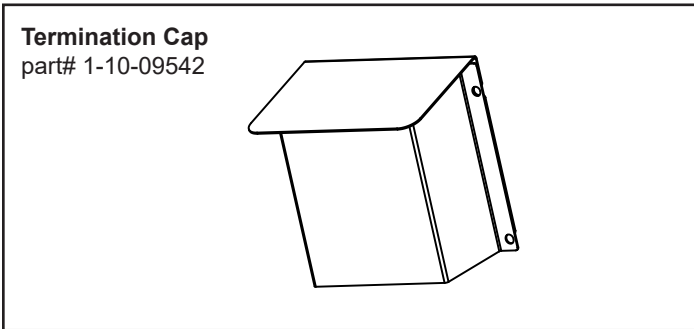


Figure 4.13

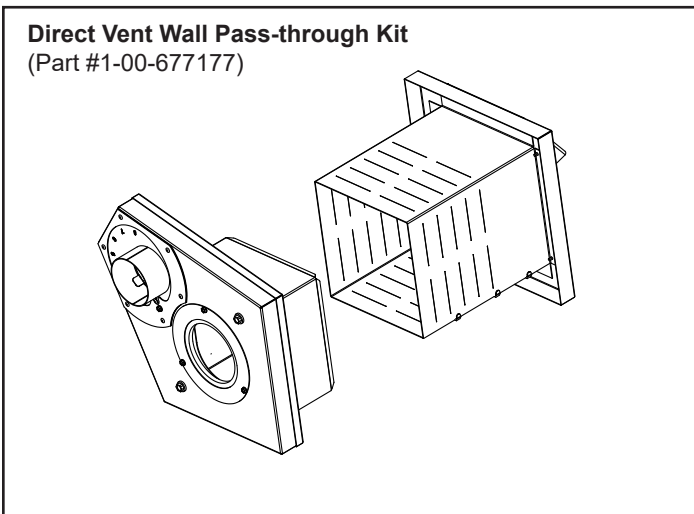


Figure 4.14

### Outside Air:

**Hearth & Home Technologies recommend attaching outside air in all installations, especially lower level and main floor locations.**

Per national building codes, consideration must be given to combustion air supply to all combustion appliances. Failure to supply adequate combustion air for all appliance demands, may lead to back-drafting of those and other appliances.

When the appliance is side-wall vented: The air intake is best located on the same exterior wall as the exhaust vent outlet and located lower on the wall than the exhaust vent outlet.

When the appliance is roof vented: The air intake is best located on the exterior wall oriented towards the prevailing wind direction during the heating season.

The outside air connection will supply the demands of the pellet appliance, but consideration must be given to the total house demand. House demand may consume some air needed for the stove, especially during a power failure. It may be necessary to add additional ventilation to the space in which the pellet appliance is located. Consult with your local HVAC professional to determine the ventilation demands for your house.

To install outside air use 3". non-combustible flex pipe Figure 4.13. There is a break-away hole on the rear panel of the P-Series stove which must be removed before connecting the flex pipe. Figure 4.12. The pipe should be run outside and terminate to the side or below the vent pipe outlet so the flue outlet is more than 12" from the inlet cover. The Termination Cap should be used to keep birds, rodents, etc. out of the pipe Figure 4.13.


You may choose to use the optional Direct Vent Wall Pass-through Kit which incorporates the venting pass-through and outside air inlet into one component. Figure 4.14.

**Use silicone to create an effective vapor barrier at the location where the chimney or outside air ducting passes through to the exterior of the structure.**

## E. Locating Your Appliance & Chimney

Location of the appliance and chimney will affect performance.

- Install through the warm airspace enclosed by the building envelope. This helps to produce more draft, especially during lighting and die-down of the fire.
- Penetrate the highest part of the roof. This minimizes the effects of wind loading.
- Locate termination cap away from trees, adjacent structures, uneven roof lines and other obstructions.
- Minimize the use of chimney offsets.
- Consider the appliance location relative to floor and ceiling and attic joists.

 <b>CAUTION</b>
<ul style="list-style-type: none"> <li>• DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVICING ANOTHER APPLIANCE.</li> <li>• DO NOT CONNECT TO ANY AIR DISTRIBUTION DUCT OR SYSTEM.</li> </ul>
<p>May allow flue gases to enter the house</p>

## F. Draft

Draft is the pressure difference needed to vent appliances successfully. When an appliance is drafting successfully, all combustion by products are exiting the home through the chimney.

Considerations for successful draft include:

- Preventing negative pressure
- Location of appliance and chimney

To measure the draft or negative pressure on your appliance use a manahelic or a digital pressure gauge capable of reading 0 - 1 inches of water column (W.C.).


The appliance should be running on high for at least 15 minutes for the test.

With the stove running on high you should have a negative pressure equal to or greater than the number given in the chart below. If you have a lower reading than you find on the chart, your appliance does not have adequate draft to burn the fuel properly.

<b>Minimum Vacuum Requirements:</b>	<b>.35 - .55</b>
-------------------------------------	------------------

Prior to installing the flue pipe, connect a draft meter. (The draft meter must have a minimum range of 0 - .5") Record the first reading. Connect flue pipe to stove and be sure all doors and windows in the home are closed. Record the second draft reading \_\_\_\_\_. If the second reading is more than .05" lower than the first reading, check for possible restrictions or the need for outside air. For more information on the draft test procedure, refer to Page 21

## G. Negative Pressure

 <b>WARNING</b>
<p><b>Risk of Asphyxiation!</b> Negative pressure can cause spillage of combustion fumes and soot.</p>

Negative pressure results from the imbalance of air available for the appliance to operate properly. It can be strongest in lower levels of the house.

Causes include:

- Exhaust fans (kitchen, bath, etc.)
- Range hoods
- Combustion air requirements for furnaces, water heaters and other combustion appliances
- Clothes dryers
- Location of return-air vents to furnace or air conditioning
- Imbalances of the HVAC air handling system
- Upper level air leaks such as:
  - Recessed lighting
  - Attic hatch
  - Duct leaks

To minimize the effects of negative air pressure:

- Install the outside air kit with the intake facing prevailing winds during the heating season
- Ensure adequate outdoor air for all combustion appliances and exhaust equipment
- Ensure furnace and air conditioning return vents are not located in the immediate vicinity of the appliance
- Avoid installing the appliance near doors, walkways or small isolated spaces
- Recessed lighting should be a "sealed can" design
- Attic hatches weather stripped or sealed
- Attic mounted duct work and air handler joints and seams taped or sealed

**NOTICE:** *Hearth & Home Technologies assumes no responsibility for the improper performance of the chimney system caused by:*

- *Inadequate draft due to environmental conditions*
- *Downdrafts*
- *Tight sealing construction of the structure*
- *Mechanical exhausting devices*



## H. Avoiding Smoke and Odors

### Negative Pressure, Shut-down, and Power Failure:

To reduce the probability of back-drafting or burn-back in the pellet burning appliance during power failure or shut-down conditions, the stove must be able to draft naturally without exhaust blower operation. Negative pressure in the house will resist this natural draft if not accounted for in the pellet appliance installation.

Heat rises in the house and leaks out at upper levels. This air must be replaced with cold air from outdoors, which flows into lower levels of the house. Vents and chimneys into basements and lower levels of the house can become the conduit for air supply, and reverse under these conditions.

### Outside Air

An outside air kit is recommended in all installations. The Outside Air Kit must be ordered separately.

Per national building codes, consideration must be given to combustion air supply to all combustion appliances. Failure to supply adequate combustion air for all appliance demands may lead to back drafting of those and other appliances.

When the appliance is roof vented (strongly recommended):

The air intake is best located on the exterior wall oriented towards the prevailing wind direction during the heating season.

When the appliance is side-wall vented:

The air intake is best located on the same exterior wall as the exhaust vent outlet and located lower on the wall than the exhaust vent outlet.

The outside air supply kit can supply most of the demands of the pellet appliance, but consideration must be given to the total house demand.

House demand may consume the air needed for the appliance. It may be necessary to add additional ventilation to the space in which the pellet appliance is located.

Consult with your local HVAC professional to determine the ventilation demands for your house.

### Vent Pipe

Be sure to use approved pellet vent pipe wall and ceiling pass-through fittings to go through combustible walls and ceilings. Be sure to use a starting collar to attach the venting system to the stove. The starting collar must be secured to the flue stub with at least three screws, and sealed with high temp silicone caulking.

4" stainless steel flex vent piping is only allowed for use in masonry fireplaces and chimneys or factory built wood burning fireplaces with class A metal chimneys.

Pellet venting pipe (also known as Type L vent) is constructed of two layers with air space between the layers. This air space acts as an insulator and reduces the outside surface temperature to allow a clearance to combustibles of only 1 inch. The sections of pipe lock together to form an air tight seal in most cases. Follow venting manufacturer's recommendations for sealing pipe joints.

Where passing through an exterior wall or roof, be sure to use the appropriate pass-through device providing an adequate vapor barrier. Venting manufacturers generally provide these pass-through devices.

### Vent Configurations:

To reduce probability of reverse drafting during shut-down conditions, Hearth & Home Technologies strongly recommends:

- Installing the pellet vent with a minimum vertical run of five feet, preferably terminating above the roof line.
- Installing the outside air intake at least four feet below the vent termination.

To prevent soot damage to exterior walls of the house and to prevent re-entry of soot or ash into the house:

- Maintain specified clearances to windows, doors, and air inlets, including air conditioners.
- Vents should not be placed below ventilated soffits. Run the vent above the roof.
- Avoid venting into alcove locations.
- Vents should not terminate under overhangs, decks or onto covered porches.
- Maintain minimum clearance of 12 inches from the vent termination to the exterior wall. If you see deposits developing on the wall, you may need to extend this distance to accommodate your installation conditions.

**Hearth & Home Technologies assumes no responsibility for, nor does the warranty extend to, smoke damage caused by reverse drafting of pellet appliances under shut-down or power failure conditions.**

## I. Fire Safety

To provide reasonable fire safety, the following should be given serious consideration:

- Install at least one smoke detector and CO detector on each floor of your home.
- Locate smoke detector away from the heating appliance and close to the sleeping areas.
- Follow the smoke detector manufacturer's placement and installation instructions and maintain regularly.
- Conveniently locate a Class A fire extinguisher to contend with small fires.
- In the event of a hopper fire:
  - Evacuate the house immediately.
  - Notify fire department.

### WARNING



**Fire Risk.**  
Hearth & Home Technologies disclaims any responsibility for, and the warranty will be voided by the following actions:

- Installation and use of any damaged appliance.
- Modification of the appliance.
- Installation other than as instructed by Hearth & Home Technologies.
- Installation and/or use of any component part not approved by Hearth & Home Technologies.
- Operating appliance without fully assembling all components.
- Do NOT Overfire.

**Or any such action that may cause a fire hazard.**

### 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.**

## J. Inspect Appliance & Components

- Remove appliance and components from packaging and inspect for damage.
- Report to your dealer any parts damaged in shipment.
- **Read all the instructions before starting the installation. Follow these instructions carefully during the installation to ensure maximum safety and benefit.**

### WARNING



Inspect appliance and components for damage. Damaged parts may impair safe operation.

- Do NOT install damaged components.
- Do NOT install incomplete components.
- Do NOT install substitute components.

Report damaged parts to dealer.

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.

# 5 Appliance Set-Up

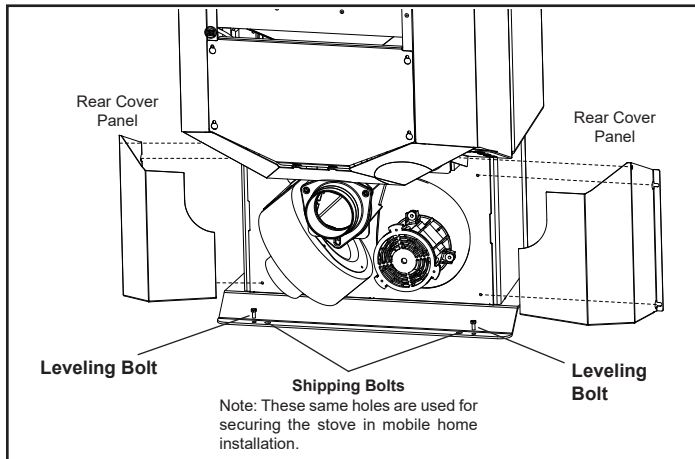


Figure 5.1

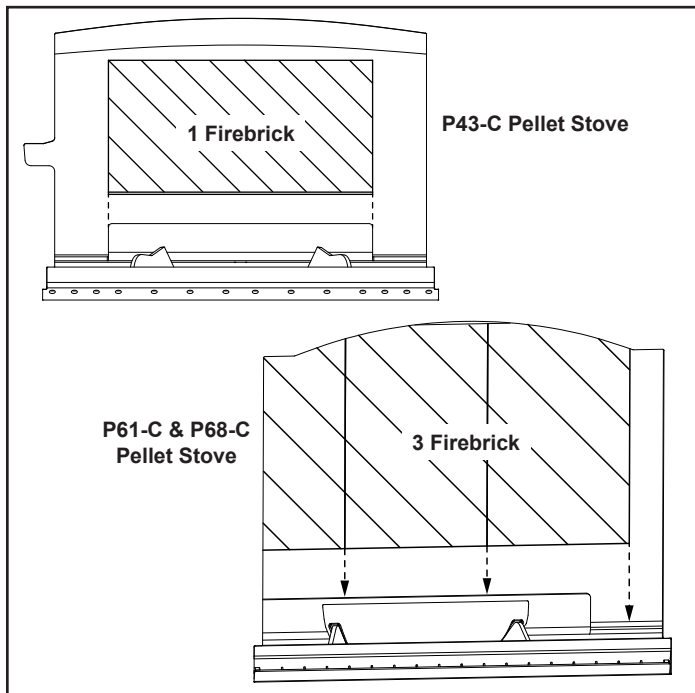


Figure 5.2

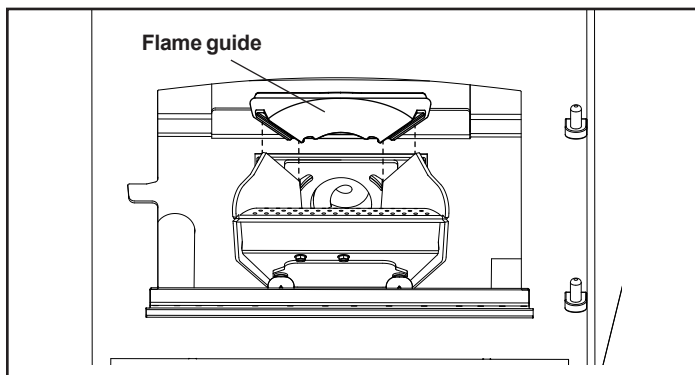


Figure 5.3

## A. Unpacking

The P-Series is bolted (1/4 x 1" hex head bolts) to the skid to prevent movement during shipping.

To free the stove from the skid you must remove the hold-down bolts in the rear of the pedestal base using a 7/16" socket or wrench. Figure 5.1.

## B. Removing Rear Cover Panels

The rear cover panels are secured to the stove with three screws each. Two of the screws need only be loosened, not removed, to remove the panels. It is recommended that the rear covers are installed using a 5/16" socket, wrench or nut driver after the unit is in place and the vent pipe is installed, to prevent contact with hot or moving parts.

If needed, install the (2) 5/16-18 X 3/4" leveling bolts located in the hardware kit. Figure 5.1.

## C. Firebrick

The P43-C Pellet Stove has a single (1) firebrick that gets installed horizontally on the angle bracket above the burnpot. The P61-C and P68-C have three (3) firebrick that get installed vertically on the angle bracket. Figure 5.2.

## D. Flame Guide

Install the cast iron flame guide on top of the burn pot. Make sure that the flame guide is fully seated on the vertical sides of the burn pot and that the back of the guide rests against the body of the stove. Figure 5.3.

## E. Room Sensor Installation

The room sensor is a small temperature sensor on the end of a 60" wire. This sensor is installed much like a standard wall thermostat. There is a remote room sensor port on the rear of the unit for easy external connection. Use standard 18-2 thermostat wire to extend the sensor to the desired location (50' maximum). The room sensor should be installed in the location where you want to control the temperature.

**NOTE:** Distances of more than 25 feet from the unit or in another room are not recommended. The room sensor is essential for the P-Series excellent efficiency.

**NOTE:** It is recommended that the room sensor be installed, even if only installed on the rear of the unit as a return air sensor.

## F. Low Draft Voltage Adjustment

These units are pre-tested at the factory with exactly 120 VAC, 60 Hz. They are checked and adjusted for firebox tightness, gasket leakage, motor operation and igniter operation. The P-Series is then factory set at a mid-point adjustment and in most cases will not need any adjustments.

**NOTE: The factory low draft setting may not be correct for the unit's permanent installation conditions.**

The control board on the P-Series is equipped with a low draft adjustment port located on the control face just to the right of the igniter light. Figure 5.4. This voltage adjustment is provided to allow the unit to be adjusted for the household voltage where the unit is going to be in permanent operation.

**NOTE: The line voltage varies from area to area and often home to home.**

The low draft voltage should be adjusted to achieve the most efficient burn on low burn or "maintenance". This voltage adjustment allows the installer to change the low voltage set point approximately 10 volts. This adjustment should be done by the installer during set up because a draft meter reading is **required** to insure proper set up.

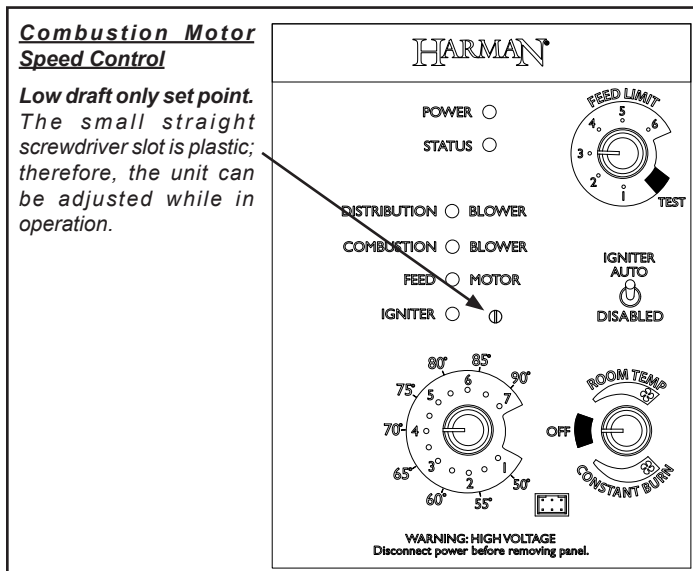


Figure 5.4

If the unit is not adjusted properly, it does not cause a safety concern. If the unit is adjusted too high, only efficiency is lost. If the unit is adjusted too low, the low draft pressure switch will not allow the feed motor or the igniter to operate.

A simple draft test should be performed after completing the flue pipe installation. To record the results for future reference:

1. Plug unit into a 120 VAC, 60 HZ outlet.
2. Close the hopper lid, front view door, and the ash pan door. Neither pellets or a fire are required for this test.
3. With the mode selector in the "OFF" position, turn the feed adjuster to "TEST".
4. Record the high draft \_\_\_\_\_ in W.C. (Normal is -.50 to -.60) The control will be on the High Draft for a total of 2 minutes.
5. After 1 minute, the combustion motor will go down to low draft and the distribution blower will go on high. Allow approximately 15 seconds to pass for the combustion motor to slow before checking the low draft.
6. If the low draft is between -.35 and -.45, record the reading \_\_\_\_\_ in W.C. If the reading is higher, slowly turn the set screw counter-clockwise until the draft lowers. If the reading is lower, very slowly turn the set screw clockwise until the draft increases.

**NOTE: In some cases, the draft may not go as low as -.35 to -.45 even with the set screw completely counter-clockwise. Ideally, you should just set it as low as possible.**

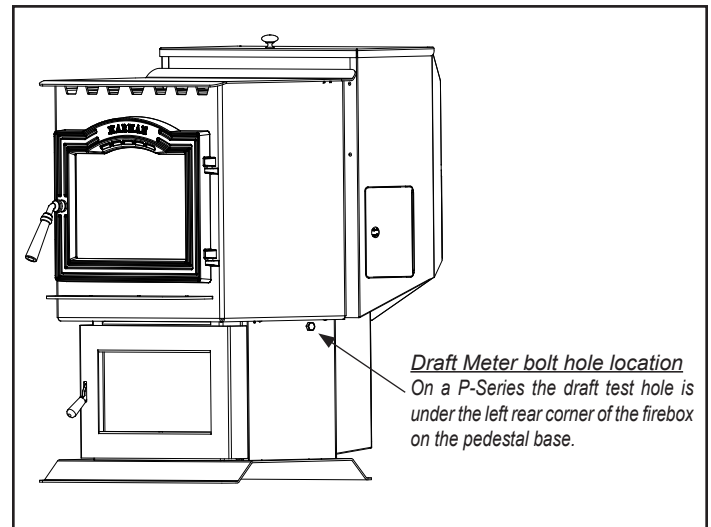


Figure 5.5

Connect the power cord to a 120 VAC, 60 Hz grounded receptacle. (A surge protector is recommended to protect the circuit board.) Also be sure that the polarity of the outlet that the stove is plugged into is correct.

# 6 Reference Material

## A. Safety Reminders

When installing and operating your Harman® P-Series, respect basic safety standards. Read these instructions carefully before you attempt to install or operate the P-Series. Failure to do so may result in damage to property or personal injury and may void the product warranty.

Consult with your local building code agency and insurance representative before you begin your installation to ensure compliance with local codes, including the need for permits and follow-up inspections.

 <b>CAUTION</b>
<b>This appliance must be vented to the outside.</b>


Due to high temperatures, this stove should be placed out of traffic and away from furniture and draperies.

Children and adults should be alerted to the hazards of high surface temperatures and should stay away to avoid burn to skin and/or clothing.

Young children should be carefully supervised when they are in the same room as the stove.

Clothing and other flammable materials should not be placed on or near this stove.

Installation and repair of this stove should be done by a qualified service person. The appliance should be inspected before use and at least annually by a qualified service person. More frequent cleaning may be required. It is imperative that control compartments, burners, and circulating air passageways of this stove be kept clean.


 <b>CAUTION</b>
<b>WHEN THIS ROOM HEATER IS NOT PROPERLY INSTALLED, A HOUSE FIRE MAY RESULT. TO REDUCE THE RISK OF FIRE, FOLLOW THE INSTALLATION INSTRUCTIONS. CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION REQUIREMENTS IN YOUR AREA.</b>


 <b>CAUTION</b>
<b>THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, AND CEILING/ROOF MUST BE MAINTAINED.</b>

 <b>CAUTION</b>
<b>THE STOVE IS HOT WHILE IN OPERATION. KEEP CHILDREN, CLOTHING AND FURNITURE AWAY. CONTACT MAY CAUSE SKIN BURNS.</b>

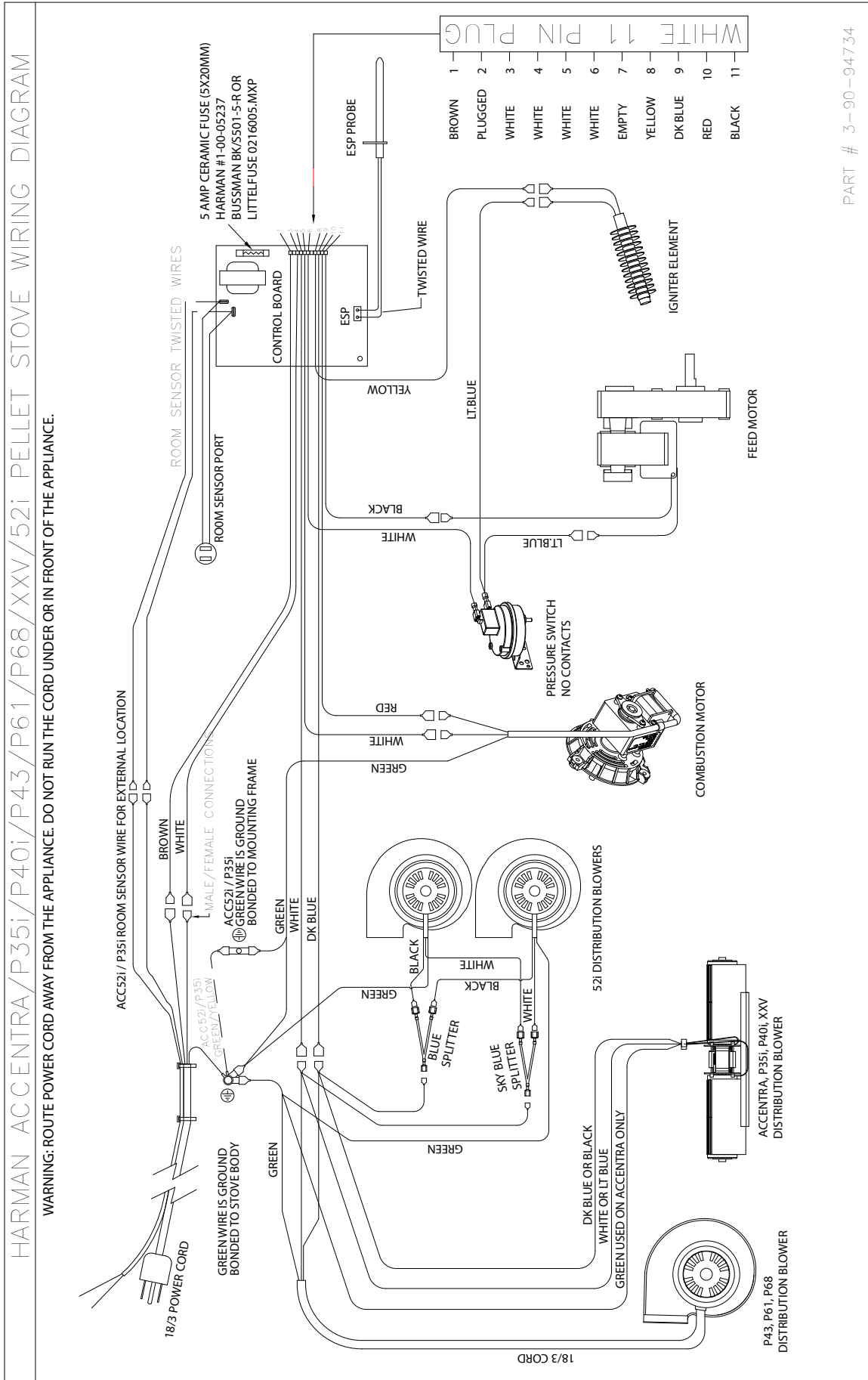
 <b>WARNING</b>
<b>MOBILE/MANUFACTURED HOME GUIDELINES DO NOT ALLOW INSTALLATION IN A SLEEPING ROOM.</b>

 <b>WARNING</b>
<b>KEEP COMBUSTIBLE MATERIALS SUCH AS GRASS, LEAVES, ETC. AT LEAST 3 FEET AWAY FROM THE POINT DIRECTLY UNDER THE VENT TERMINATION.</b>

 <b>WARNING</b>
<b>USE OF IMPROPER FUELS, FIRESTARTERS OR ALTERING THE STOVE FOR HIGHER HEAT OUTPUT MAY CAUSE DAMAGE TO THE STOVE AND COULD RESULT IN A HOUSE FIRE. USE ONLY APPROVED FUELS AND OPERATION GUIDELINES</b>

 <b>WARNING</b>
<b>BURNING COLORED PAPER, CARDBOARD, SOLVENTS, TRASH AND GARBAGE OR ALTERING THE STOVE FOR HIGHER HEAT OUTPUT MAY CAUSE DAMAGE TO THE STOVE AND COULD RESULT IN A HOUSE FIRE. USE ONLY APPROVED FUELS AND FOLLOW ONLY THESE OPERATION GUIDELINES.</b>

# B. Wiring Diagram



# HARMAN®

352 Mountain House Road, Halifax, PA 17032  
[www.harmanstoves.com](http://www.harmanstoves.com)

Please contact your Harman® dealer with any questions or concerns.  
For the location of your nearest Harman® dealer,  
please visit [www.harmanstoves.com](http://www.harmanstoves.com).

*Printed in U.S.A*

# Owner's Manual

## Care and Operation

**INSTALLER:** Leave this manual with party responsible for use and operation.

**OWNER:** Retain this manual for future reference.

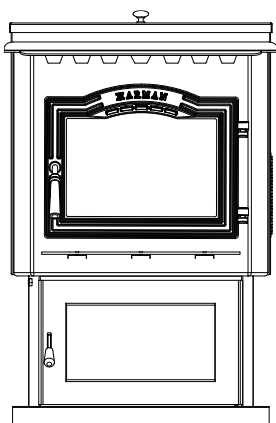
Contact your local dealer with questions on installation, operation or service.

**NOTICE: SAVE THESE INSTRUCTIONS**

# HARMAN®

**BUILT TO A STANDARD, NOT A PRICE**

**Model(s):**  
**P43-C, P61-C & P68-C**  
**Freestanding Pellet Stove**



### CAUTION

Check building codes prior to installation.

- Installation **MUST** comply with local, regional, state and national codes and regulations.
- Contact local building or fire officials about restrictions and installation inspection requirements in your area.

### NOTE

To obtain a French translation of this manual, please contact your dealer or visit [www.harmanstoves.com](http://www.harmanstoves.com)

Pour obtenir une traduction française de ce manuel, s'il vous plaît contacter votre revendeur ou visitez [www.harmanstoves.com](http://www.harmanstoves.com)



### WARNING



Please read this entire manual before installation and use of this pellet fuel-burning room heater.

Failure to follow these instructions could result in property damage, bodily injury or even death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- Do not overfire - If any external part starts to glow, you are overfiring. Reduce feed rate. Overfiring will void your warranty.
- Comply with all minimum clearances to combustibles as specified. Failure to comply may cause house fire.



### WARNING



### HOT SURFACES!

Glass and other surfaces are hot during operation AND cool down.

**Hot glass will cause burns.**

- Do not touch glass until it is cooled
- NEVER allow children to touch glass
- Keep children away
- CAREFULLY SUPERVISE children in same room as stove.
- Alert children and adults to hazards of high temperatures.  
**High temperatures may ignite clothing or other flammable materials.**
- Keep clothing, furniture, draperies and other flammable materials away.





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## ▲ Safety Alert Key:

- **DANGER!** Indicates a hazardous situation which, if not avoided will result in death or serious injury.
- **WARNING!** Indicates a hazardous situation which, if not avoided could result in death or serious injury.
- **CAUTION!** Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
- **NOTICE:** Used to address practices not related to personal injury.

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→ = Contains updated information

## 2 Product Specific and Important Safety Information

### A. Appliance Certification

<b>MODEL:</b>	P43-C Pellet Stove
<b>LABORATORY:</b>	OMNI Test Laboratories, Inc
<b>REPORT NO.</b>	0135PS023E / 0135PS023S
<b>TYPE:</b>	Pellet Fueled/Supplementary For Residential Use
<b>STANDARD(s):</b>	ASTM E 1509-04, ULC-S627-00, ASTM E 2515-11, ASTM E 2779-10

<b>MODEL:</b>	P61-C Pellet Stove
<b>LABORATORY:</b>	OMNI Test Laboratories, Inc
<b>REPORT NO.</b>	0135PS022E / 0135PS022S
<b>TYPE:</b>	Pellet Fueled/Supplementary For Residential Use
<b>STANDARD(s):</b>	ASTM E 1509-04, ULC-S627-00, ASTM E 2515-11, ASTM E 2779-10

<b>MODEL:</b>	P68-C Pellet Stove
<b>LABORATORY:</b>	OMNI Test Laboratories, Inc
<b>REPORT NO.</b>	0135PS013E / 0135PS013S
<b>TYPE:</b>	Pellet Fueled/Supplementary For Residential Use
<b>STANDARD(s):</b>	ASTM E 1509-04, ULC-S627-00, ASTM E 2515-11, ASTM E 2779-10

**NOTE:** This installation must conform with local codes. In the absence of local codes you must comply with the **ASTM E1509-2004, ULC-S627-00, ULC/ORD-C-1482-M1990, (UM) 84-HUD**

The P43-C, P61-C and P68-C is Certified to comply with 2020 particulate emission standards.



### B. Mobile Home Approved

This appliance is approved for mobile home installations when not installed in a sleeping room and when an outside combustion air inlet is provided.

The structural integrity of the mobile home floor, ceiling, and walls must be maintained. The appliance must be properly grounded to the frame of the mobile home and use only listed pellet vent, Class "PL" connector pipe.

A Harman® Outside Air Kit must be installed in a mobile home installation.

 <b>WARNING</b>
<b>THE STRUCTURAL INTEGRITY OF THE MANUFACTURED HOME FLOOR, WALL, AND CEILING/ROOF MUST BE MAINTAINED.</b>
<b>DO NOT INSTALL IN SLEEPING ROOM.</b>

### C. Glass Specifications


This appliance is equipped with 5mm mirrored ceramic glass. Replace glass only with 5mm ceramic glass. Please contact your dealer for replacement glass.

### D. Electrical Rating

120 VAC, 60 Hz, Start 4.2 Amps, Run 2.8 Amps

**NOTE: Some generator or battery back-up systems may not be compatible with the micro-processor electronics on this appliance. Please consult the power supply manufacturer for compatible systems.**

### E. California

 <b>WARNING</b>
<p>This product and the fuels used to operate this product (wood), and the products of combustion of such fuels, can expose you to chemicals including carbon black, which is known to the State of California to cause cancer, and carbon monoxide, which is know to the State of California to cause birth defects or other reproductive harm. For more information go to: <a href="http://www.P65Warnings.ca.gov">www.P65Warnings.ca.gov</a></p>

## F. BTU & Efficiency Specifications

### → P43-C Freestanding Pellet Stove:

<b>EPA Certification Number:</b>	165-18
<b>EPA Certified Emissions:</b>	1.82 g/hr
<b>*LHV Tested Efficiency:</b>	82.7%
<b>**HHV Tested Efficiency:</b>	76.7%
<b>***EPA BTU Output:</b>	18,780 - 33,250
<b>****BTU Input:</b>	23,900 - 45,200
<b>Vent Size:</b>	3 Inch
<b>Hopper Capacity:</b>	50 lbs
<b>Fuel</b>	Wood Pellet

### P61-C Freestanding Pellet Stove:

<b>EPA Certification Number:</b>	177-19
<b>EPA Certified Emissions:</b>	1.5 g/hr
<b>*LHV Tested Efficiency:</b>	85%
<b>**HHV Tested Efficiency:</b>	79%
<b>***EPA BTU Output:</b>	17,100 - 46,800
<b>****BTU Input:</b>	21,400 - 60,700
<b>Vent Size:</b>	3 Inch
<b>Hopper Capacity:</b>	72 lbs
<b>Fuel</b>	Wood Pellet

### P68-C Freestanding Pellet Stove:

<b>EPA Certification Number:</b>	178-19
<b>EPA Certified Emissions:</b>	1.4 g/hr
<b>*LHV Tested Efficiency:</b>	85%
<b>**HHV Tested Efficiency:</b>	79.5%
<b>***EPA BTU Output:</b>	15,900 - 53,100
<b>****BTU Input:</b>	20,200 - 67,600
<b>Vent Size:</b>	3 Inch
<b>Hopper Capacity:</b>	76 lbs
<b>Fuel</b>	Wood Pellet

\* Weighted average LHV efficiency using data collected during EPA emissions test.

\*\*Weighted average HHV efficiency using data collected during EPA emissions test.

\*\*\*A range of BTU outputs based on EPA Default Efficiency and the burn rates from the low and high EPA tests.

\*\*\*\*Based on the maximum feed rate per hour multiplied by approximately 8,600 BTU's which is the average BTU's from a pound of pellets.

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.

BTU output will vary, depending on the brand of fuel you use in your appliance. Consult your Harman® dealer for best results.

**WARNING! Risk of Fire!** Hearth & Home Technologies disclaims any responsibility for, and the warranty and agency listing will be voided by the below actions.

#### DO NOT:

- Install or operate damaged appliance
- Modify appliance
- Install other than as instructed by Hearth & Home Technologies
- Operate the appliance without fully assembling all components
- Overfire
- Install any component not approved by Hearth & Home Technologies
- Install parts or components not Listed or approved.
- Disable safety switches

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage.

For assistance or additional information, consult a qualified installer, service agency or your dealer.



**NOTE:** Hearth & Home Technologies, manufacturer of this appliance, reserves the right to alter its products, their specifications and/or price without notice.

Harman® is a registered trademark of Hearth & Home Technologies.

# 3 General Information

## A. Appliance Safety

**WARNING! DO NOT operate stove before reading and understanding operating instructions. Failure to operate stove according to operating instructions could cause fire or injury.**

 <b>WARNING</b>	
	<b>HOT SURFACES!</b> Glass and other surfaces are hot during operation AND cool down.
	<b>Hot glass will cause burns.</b> <ul style="list-style-type: none"><li>• <b>DO NOT</b> touch glass until it is cooled</li><li>• <b>NEVER</b> allow children to touch glass</li><li>• Keep children away</li></ul>
<ul style="list-style-type: none"><li>• <b>CAREFULLY SUPERVISE</b> children in same room as stove.</li><li>• Alert children and adults to hazards of high temperatures.</li></ul>	
<b>High temperatures may ignite clothing or other flammable materials.</b>	
<ul style="list-style-type: none"><li>• Keep clothing, furniture, draperies and other flammable materials away.</li></ul>	

If you expect that small children or vulnerable adults may come into contact with this appliance, the following precautions are recommended:


- Install a physical barrier such as:
  - A decorative fire screen.
  - Adjustable safety gate.
- Install a switch lock or a wall/remote control with child protection lockout feature.
- Keep remote controls out of reach of children.
- Never leave children alone near a hot stove, whether operating or cooling down.
- Teach children to **NEVER** touch the stove.
- Consider not using the stove when children will be present.
- Use only specified components as replacement parts. Other components may not allow your stove to operate as it was intended.

Contact your dealer for more information, or visit: [www.hpba.org/safety-information](http://www.hpba.org/safety-information).

To prevent unintended operation when not using your stove for an extended period of time (summer months, vacations, trips, etc):

- Unplug stove from receptacle.

Connect the power cord to a 120 VAC, 60 Hz grounded receptacle. (A surge protector is recommended to protect the circuit board.) Be sure the polarity of the outlet the stove is plugged into is correct.

 <b>WARNING</b>	
<b>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.</b>	

## B. Clear Space

**WARNING! RISK OF FIRE!** Do NOT place combustible objects in front or to the sides of the appliance. High temperatures may ignite clothing, furniture or draperies.

**Mantel:** Avoid placing candles and other heat-sensitive objects on mantel or hearth. Heat may damage these objects.

**NOTICE:** Clearances may only be reduced by means approved by the regulatory authority having jurisdiction.

**WARNING! RISK OF FIRE!** Keep combustible materials, gasoline and other flammable vapors and liquids clear of appliance.

- Do **NOT** store flammable materials in the appliance's vicinity.
- Do **NOT** use gasoline, lantern fuel, kerosene, charcoal lighter fluid or similar liquids to start or "freshen up" a fire in this heater.

Keep all such liquids well away from the heater while it is in use as combustible materials may ignite.

## C. Control Explanation

### Power Light

Indicates power to the control.

### Status Light

Will be lit in either stove or room temp mode when pointer is not within off position band except after normal shut down. Blinks to indicate errors listed below.

Indicates power to distribution blower.

Indicates power to combustion blower

Indicates power to the feed motor.

Indicates igniter is on.

### Feed limit

Sets the maximum feed rate

### Test

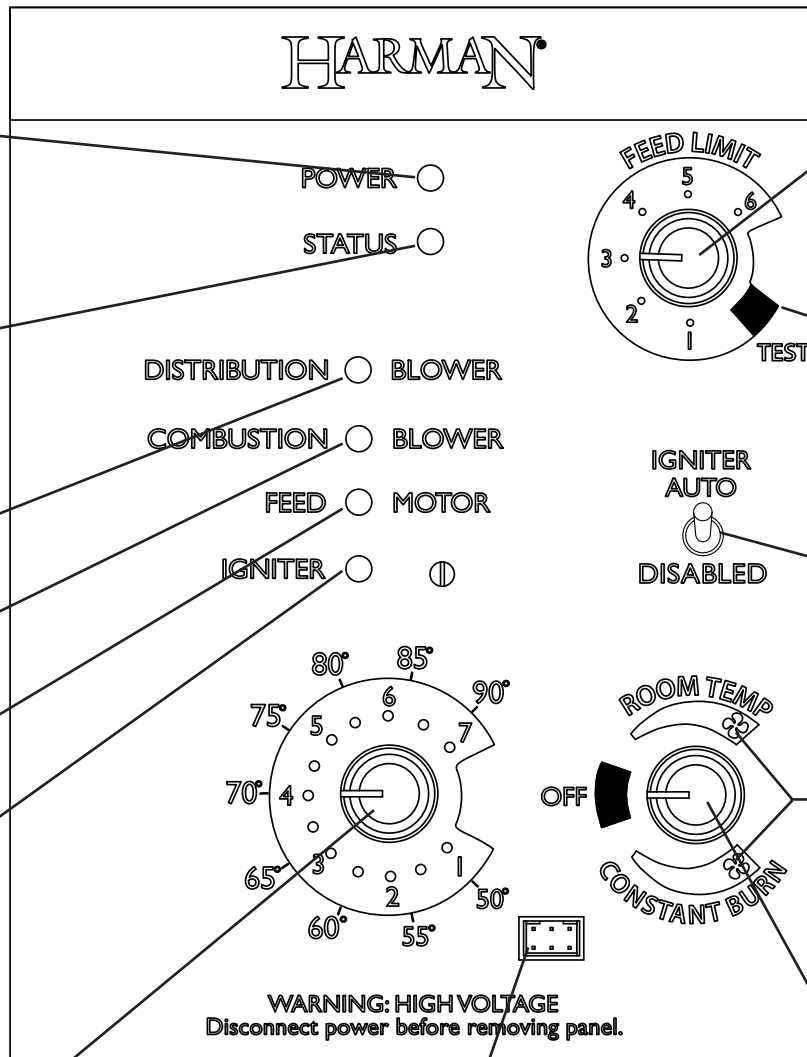
Runs all motors at full speed for one minute to check operation. Afterwards the control will simulate a minimum burn with the combustion blower remaining on low.

### Igniter switch

Set to appropriate Start-Up mode.

Distribution Blower speed adjustment range.

L = low  
H = high



### Temp dial

Allows you to adjust the room temperature setting, in Room Temp Mode, using the outer scale marked in degrees Fahrenheit. It also allows you to adjust the constant burn setting, while in Constant burn Mode, using the inner scale marked from 1 to 7.

### Dealer Diagnostic Port

For dealer maintenance only. Requires special DDM monitor supplied to Harman® Dealers exclusively.

### Mode Selector

Allows you to choose between Room Temp Mode, Constant burn Mode, or OFF. Also allows you to vary the distribution blower speed by turning the knob to the high or low side of each mode.

## D. Fuel Specifications

### Fuel and Fuel Storage

Pellet fuel quality can fluctuate from manufacturer to manufacturer, and even from bag to bag.

Hearth & Home Technologies recommends using only fuel that is certified by the Pellet Fuels Institute (PFI).

#### Fuel Material

- Made from sawdust and/or other wood by-products
- Source material typically determines ash content

#### Higher Ash Content Material

- Hardwoods with high mineral content
- Bark and leaves as source material
- “Standard” grade pellets

#### Lower Ash Content Material

- Softwood; pine, fir, etc.
- Materials with lower mineral content
- “Premium” grade pellets

#### **CAUTION! Do not burn fuel that contains an additive.**

- May cause hopper fire
- Damage to product may result

Read the list of ingredients on the packaging.

#### Clinkers

Minerals and other non-combustible materials, like sand, will turn into a hard glass-like substance when heated.

Trees from different areas will vary in mineral content. For this reason, some fuels will produce more clinkers than others.

#### Moisture

Always burn dry fuel. Burning fuel with high moisture content takes energy to dry and tends to cool the appliance thus, robbing heat from your home. Damp pellet fuel could turn back into sawdust which does not flow properly through the feed system.

#### Size

- Pellets are either 1/4 inch or 5/16 inch (6-8mm) in diameter
- Length should be no more than 1-1/2 inches (38mm)
- Pellet length can vary from lot to lot from the same manufacturer.

#### Performance

- Higher ash content requires more frequent maintenance.
- “Premium” grade pellets will produce the highest heat output.
- Burning pellets longer than 1-1/2 inches (38mm) can cause inconsistent feeding and/or ignition.

We recommend that you buy fuel in multi-ton lots whenever possible. However, we do recommend trying different brands prior to purchasing multi-ton lots, to ensure your satisfaction.

**CAUTION!** *Tested and approved for use with wood pellets ONLY. Burning of any other fuel will void your warranty.*

#### Storage

- Wood pellets should be left in their original sealed bag until ready to use, to prevent moisture.
- Do not store fuel within the specified clearance areas, or in a location that will interfere with routine cleaning and maintenance procedures.



### CAUTION

Tested and approved for use with wood pellets ONLY.  
Burning of any other fuel will void your warranty.

### NOTICE

Hearth & Home Technologies is not responsible for stove performance or extra maintenance required as a result of using fuel with higher ash or mineral content.

## E. General Operating Information

### 1. Room Sensor Calls For Heat

The appliance is like most modern furnaces; when the room sensor calls for heat, your appliance will automatically light and deliver heat.

When the room is up to temperature and the room sensor is satisfied, the appliance will shut down.

### 2. Heat Output Controls

The appliance will turn on and off as the room sensor demands. When the room sensor calls for heat, the appliance will always start up on High. After burning approximately 7-10 minutes, the appliance will then burn at the rate at which it was originally set. If the appliance is set at one of the lower settings, it will run quieter but take longer to heat up an area than if it were set at a higher burn rate.

Regardless of the burn rate, when the area is warm enough to satisfy the room sensor, the appliance will shut off.

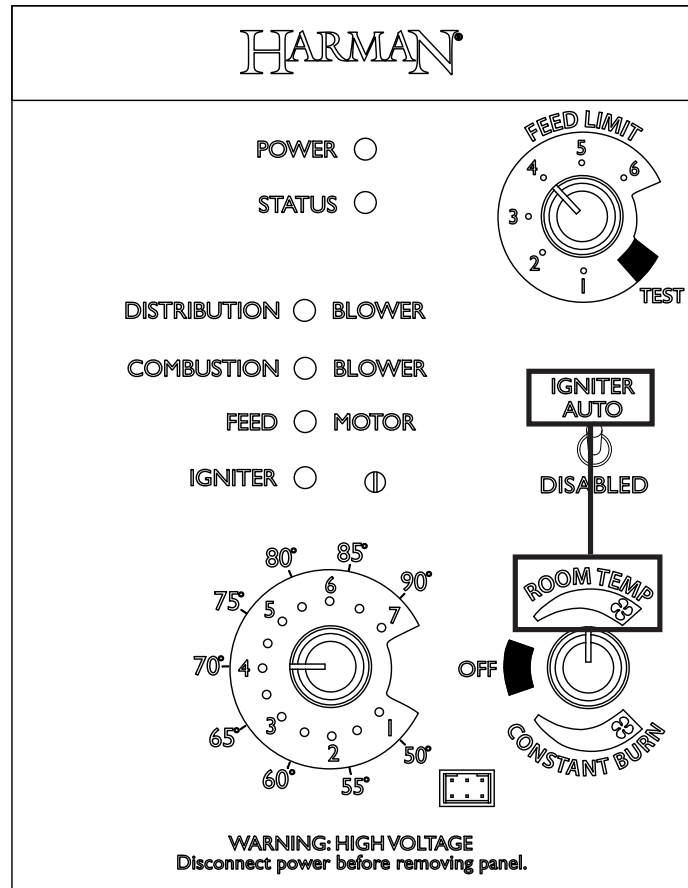


Figure 3.1

## WARNING



### Fire Hazard

Keep combustible materials, gasoline and other flammable vapors and liquids clear of appliance.

- Do **NOT** store flammable materials in the appliance's vicinity.
- **NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR "FRESHEN UP" A FIRE IN THIS HEATER. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE HEATER WHILE IT IS IN USE.**
- **DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA OR ENGINE OIL.**
- **DO NOT USE CHEMICALS OF FLUIDS TO START THE FIRE.**
- Combustible materials may ignite.



# 4 Operating Instructions

## A. Starting Your First Fire

1. A room sensor is required for proper operation of this appliance in "Room Temp" mode. At this time, fill the hopper with pellets, insure the control is set to "OFF". Figure 4.1. Plug the power cord into a properly grounded, nearby outlet.
2. Once power is present, the unit will run through a quick diagnostics test to insure the control is operating properly. This is normal.
3. For your first fire it may be necessary to purge the auger system by putting the feed limit knob to "Test" prior to starting the unit. Figure 4.2. This insures that plenty of fuel enters the burn pot for proper ignition.
4. Flip toggle switch to desired mode "Auto or Disabled". Figure 4.3. Set feed limit knob to desired setting and turn mode dial to "Room Temp" or "Constant burn" Figure 4.4. **Note:** Feed rate of #4 is a good starting point. Adjustments may need to be made depending on fuel quality and/or heat output desired.
5. The fuel feed system and the igniter should now be on.
6. Once the appliance has ignited, let it burn for approximately 7-10 minutes. After this time, the igniter light should turn off and the unit should begin to operate per the settings at the control.

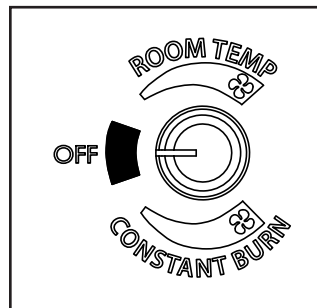


Figure 4.1

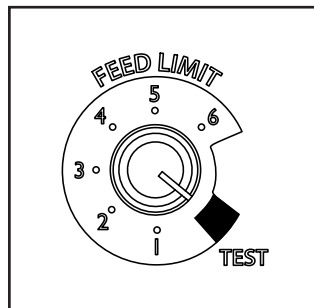


Figure 4.2

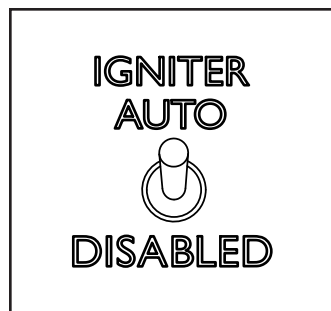


Figure 4.3

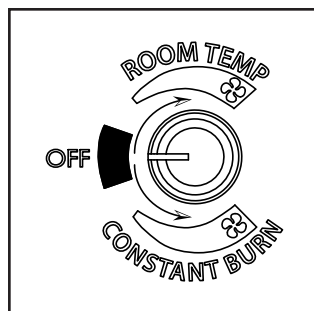


Figure 4.4


## B. Fire Characteristics

A properly adjusted fire has a medium active flame pattern that extends out of the burn pot approximately 6 inches (152mm).

## C. Feed Limit Instructions

The Feed Limit control is factory set at #4, and should be adequate for most fuels.

However, if the flame height is too high or too low, you will need to adjust the Feed Limit. Wait until the appliance has been burning for 15 minutes before making your adjustments and allow 15 minutes for feed adjustment to take effect.

 <b>CAUTION</b>
Odors and vapors released during initial operation. <ul style="list-style-type: none"><li>• Curing of high temperature paint.</li><li>• Open windows for air circulation.</li></ul> Odors may be irritating to sensitive individuals.

## D. Ignition Cycles

1. At the beginning of each ignition cycle, it is normal to see some smoke in the firebox. The smoke will stop once the fire starts.
2. The distribution blower will automatically turn on after your appliance has reached the set temperature.

This blower transfers heat from your appliance into the room, and will continue to run in "constant burn" mode at the set speed you have the control knob at. In "room temp" mode however, the blower will turn on and off in accordance to what temperature the room sensor is reading. When the room sensor is satisfied the blower will shut down until the room sensor sees a demand for heat.

3. Occasionally the appliance may run out of fuel and shut itself down. When this happens, the unit will need to be turned to the off position and restarted.

If needed, follow the instructions in Section A "Starting Your First Fire".



## WARNING



### Fire Risk

Do NOT operate appliance:

- With appliance door open.
- Burnpot floor open.
- Cleaning slide plates open.

### Do NOT store fuel:

- Closer than required clearances to combustibles to appliance
- Within space required for loading or ash removal.

## E. Automatic Ignition

Adjust Feed Limit. If this is your first fire or you are trying different pellets, set the feed limit to #4, Figure 4.5 This is a conservative number and will probably need to be increased. After you know a Feed Limit setting that works well, use that setting. Remember, if your feed rate is too high you may waste fuel.

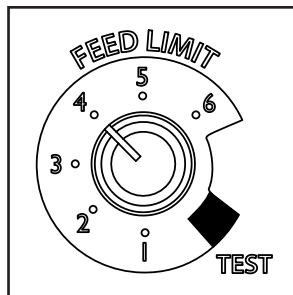


Figure 4.5

Setting the feed limit # for maximum burn: With the unit burning in "AUTO", turn to "Constant Burn" and put the fan on "H". Set the Temperature Dial to #7. Allow the unit to burn for about 30 minutes and check ash on front of burn pot. Figure 4.6. If the ash line is larger than 1", turn the feed limit from #4 to #5. Allow another 30 minutes of burn time and check again. If, at #6 setting, a 1" or less ash bed is not obtainable, it is not a problem. The 1" ash bed is only at maximum burn rate and during normal operation, the ash bed will be larger.

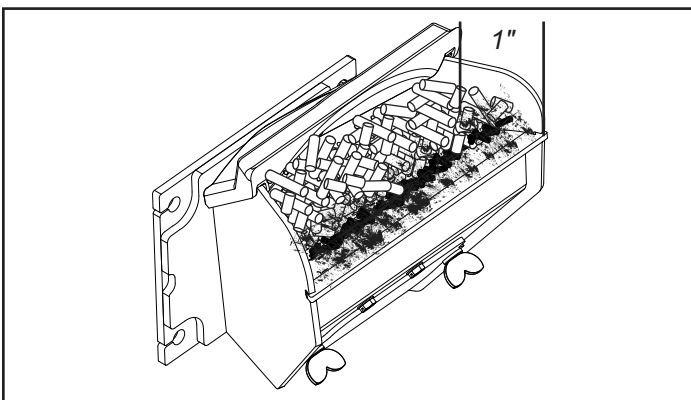


Figure 4.6

**Note:** The firebox low pressure switch will not allow the auger motor or the igniter element to operate if the view door is open.

### Igniter Switch to "AUTO" (up position)

Make sure the unit is plugged into a properly grounded, 120 VAC, 60 Hz electrical source. The power light should be the only light lit.

**Note:** Be sure there is no fuel or other combustibles in the ash pan prior to lighting.

1. Turn Mode Selector to "OFF".
2. Fill hopper with pellets.
3. Clean burn pot with scraper, if necessary.
4. If starting after an empty hopper, turn Feed Limit to "TEST" (for one 60 second cycle). This will flow pellets into the auger tube and also allow you to check the motors for operation.

**NOTE:** The auger motor will not operate with the view door open.

5. Turn Feed Limit to #4.
6. Flip the Igniter Switch up into the "AUTO" position.
7. Turn the Temperature Dial to the desired room temperature.
8. Turn Mode Selector to Room Temperature or Constant Burn mode.
9. Fill hopper with pellets and remove ashes as required. Keep the hopper lid and firebox doors closed while in operation. Maintain door seals in good condition. Failure to do so will affect operation of the appliance and may permit escape of smoke or gases into the living space causing smoke detectors to sound.



## WARNING

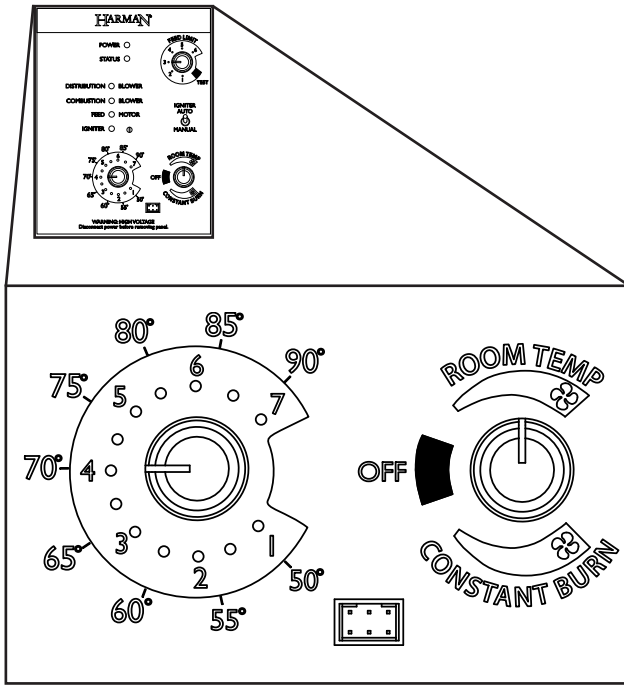
**BURNING GARBAGE, USE OF IMPROPER FUELS, FIRESTARTERS OR ALTERING THE STOVE FOR HIGHER HEAT OUTPUT MAY CAUSE DAMAGE TO THE STOVE AND COULD RESULT IN A HOUSE FIRE. USE ONLY APPROVED FUELS AND FOLLOW ONLY THESE OPERATION GUIDELINES.**



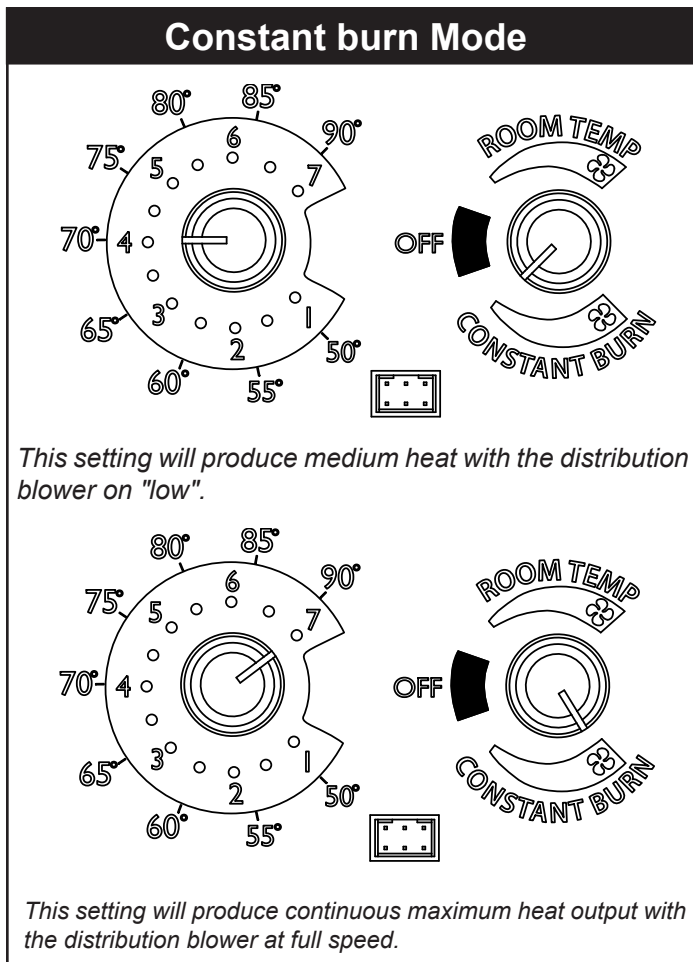
## WARNING

**NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR 'FRESHEN UP' A FIRE IN THIS HEATER. KEEP ALL SUCH LIQUIDS WELL AWAY FROM THE HEATER, WHILE IN USE.**

## E. Automatic Ignition (Continued)



**Room Temperature Mode:** This setting will produce a room temperature of 70 degrees with the distribution blower at medium speed.



This setting will produce medium heat with the distribution blower on "low".

This setting will produce continuous maximum heat output with the distribution blower at full speed.

The P-Series Pellet Stove is more than just automatic ignition, it is also automatic temperature control. The automatic system will allow the fire size to be adjusted to match the heating needs and even put the fire out if necessary. If heat is needed after the fire is out, the P-Series Pellet Stove will automatically re-ignite and adjust the fire size to match the heating need. The totally automatic room sensor mode is recommended because of its efficiency. The unit can be switched between "AUTO" and "DISABLED" at any time during operation.

### Igniter switch to "AUTO"

#### **Room Temperature Mode**

In "Room Temp Mode" heat output is controlled automatically by the Room Sensing Probe. When the Room Sensing Probe calls for heat, the stove will increase output. When the Room Sensing Probe is getting close to the set temperature, the stove will begin to level off output and keep the fire burning at just the right temperature to maintain that setting.

High output is determined by the Feed Limit setting. This setting, generally on #4, can be increased if higher burn rates are necessary (Figure 4.6). The unit's maximum burn rate should not create less than 1" of ash on the burn pot front edge (Figure 4.7). Overfeeding is not a safety concern, but fuel may be wasted if unburned pellets fall into the ash pan.

In "Room Temp Mode" a constant fuel consumption rate is sacrificed for exact room temperature. Therefore, as it gets colder more pellets will be burned automatically.

The distribution blower speed will vary according to the position of the mode selector pointer, and fire size.

### Igniter switch to "AUTO"

#### **Constant Burn Mode**

This allows for automatic ignition upon start-up only. The unit can then be set at any desired setting. The heat output and fuel consumption will remain constant regardless of room temperature. The unit's maximum feed rate should not create less than 1" of ash on the burn pot front edge. Figure 4.7.

The unit's low burn or maintenance setting is as low as it will go. It will not go out unless it runs out of fuel or is turned off.

### Shut-Down Procedure

To kill the fire or stop burning the stove, turn the Mode Selector to "OFF". This will cause the fire to diminish and burn out. When the fire burns out and the stove cools down everything will stop.

If you pull the plug to shut down the stove, all motors will stop. This may cause incomplete combustion and smoke in the firebox. If the load door is opened, the smoke may escape.

The best way to shut down the stove is simply let it run out of pellets, then the stove will shut down automatically.



# 5 Maintenance & Service

When properly maintained, your stove will give you many years of trouble-free service. **Contact your dealer** to answer questions regarding proper operation, trouble-shooting and service for your appliance. Visit [www.harmanstoves.com](http://www.harmanstoves.com) to find a dealer. We recommend annual service by a qualified service technician.

**Note:** Do not use a household vacuum to clean the stove. We recommend that you use a shop vacuum that is equipped with a fine dust filter called a HEPA filter or a vacuum specially made for fly ash and soot. **USING A VACUUM WHICH IS NOT EQUIPPED WITH A FINE DUST FILTER WILL BLOW FLY ASH AND SOOT OUT INTO THE ROOM.**

**NOTE:** THE STOVE MUST BE COMPLETELY OUT BEFORE YOU VACUUM THE STOVE. LIVE PELLET EMBERS, IF SUCKED INTO THE VACUUM, WILL LIGHT THE VACUUM ON FIRE AND MAY ULTIMATELY CAUSE A HOUSE FIRE.

## A. Proper Shutdown Procedure

 <b>CAUTION</b>	
	<b>Shock and Smoke Hazard</b>
	• Turn unit to the off position, let appliance completely cool and combustion blower must be off. Now you can unplug appliance before servicing.
	• Smoke spillage into room can occur if appliance is not cool before unplugging.
	• Risk of shock if appliance not unplugged before servicing appliance.

Follow the detailed instructions found in this section for each step listed in the chart below.

## B. General Maintenance

### Types of Fuel

The type of fuel you are burning will dictate how often you have to clean your burnpot.

If the fuel you are burning has a high dirt or ash content, it may be necessary to clean the burnpot more than once a day.

Dirty fuel will cause clinkers to form in the burnpot. A clinker is formed when dirt, ash or a non-burnable substance is heated to 2000°F (1093°C) and becomes glass-like.

## C. Quick Reference Maintenance Chart

Frequency	Cleaning Procedure	Safety Measures	Tips
Daily	Scrape Burn pot	Wear flame resistant gloves <sup>3</sup>	Vigorous, strong scraping specifically near neck of burn pot. Scrape every time you add pellets or at least every 3 bags of fuel. <sup>2</sup>
Weekly	Empty Ash Pan	Wear protective gloves. <sup>1</sup> Put ashes into a steel non-combustible container with tight fitting lid outside.	Unit does not need to be turned off. Reduce to low burn during removal.
	Clean the Glass	Stove must be turned off and cold.	
Monthly	Scrape & Vacuum Heat Exchanger	Stove must be turned off and cold.	Use provided scraper. Scrape back and sides of firebox.
	Brush & vacuum the distribution fan	Stove must be turned off, cold and unplugged from power supply.	Use provided paint brush. This should be done approximately every 25 bags. <sup>2</sup>
	Inspect Hopper lid gasket for damage		Replace gasketing if frays, tears or other visible damage to gasket. This should be done approximately every 50 bags. <sup>2</sup>
	Clean Igniter	Stove must be turned off, cold and unplugged from power supply. Wear protective gloves. <sup>1</sup> Put ashes into a steel non-combustible container with tight fitting lid outside.	Use provided paint brush. Vacuum loose ash from around igniter and inside burn pot.
<b>Stove MUST be turned off, cold and unplugged from power supply for Yearly Cleaning.</b>			
Yearly <sup>4</sup>	Brush & vacuum the combustion fan and venting/exhaust path	Wear protective gloves. <sup>1</sup> Put ashes into a steel non-combustible container with tight fitting lid outside.	Use provided paint brush to brush fan blades. *Use flue brush to clean venting being careful not to damage the ESP. <sup>2</sup>
	Inspect door gasket		Replace gasketing if frays, tears or other visible damage to gasket.
	Brush & vacuum venting system	Wear protective gloves. <sup>1</sup> Put ashes into a steel non-combustible container with tight fitting lid outside.	

\* A flue brush of appropriate size and length may need to be purchased for proper maintenance.

1. Protective gloves will help prevent skin abrasion while working on steel surfaces.
2. Frequency of cleaning depends largely on fuel type. Lower quality pellets require most frequent cleaning.
3. Flame resistant gloves will help protect your skin from potential contact with heat or flames.
4. Yearly cleaning is also known as a Total Clean. This requires completing all the Daily, Weekly, Monthly and Yearly maintenance mentioned. This should be done before you begin burning the unit each heating season.

## D. Glass Maintenance

The glass used in your stove is manufactured to exact standards to withstand the high heat of the fire, but like all glass, it must be treated with common sense and care. Never slam the door shut or strike the glass with a heavy object. If the glass is broken or damaged, do not operate the stove until it has been replaced.

### Glass - Replacement

If the stove's glass is cracked or broken, you must replace it before operating your stove. Remove pieces carefully. Replace glass only with Harman® replacement glass; **do not use substitutes**.

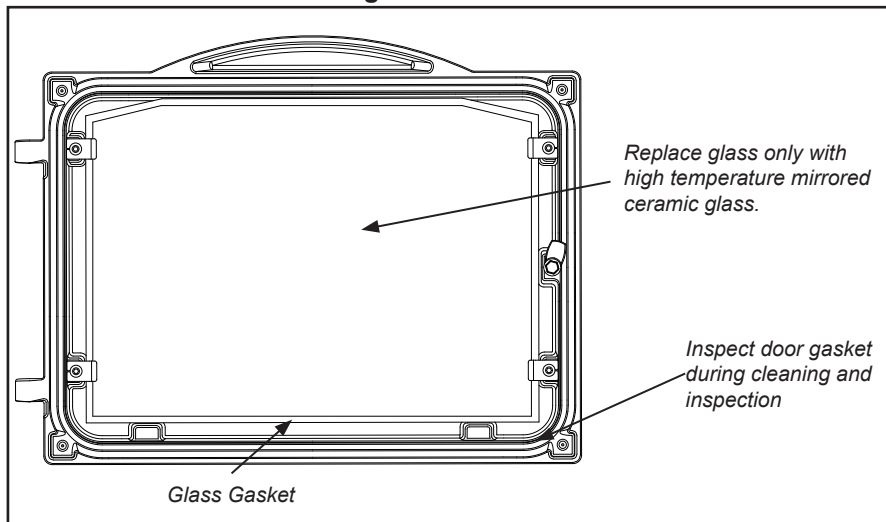
Carefully remove damaged glass, gasket material, and hold down clips (set aside).

Install the self adhesive 1/4" gasket material around the front face of the glass. Set the glass panel and gasket gently onto the door. Install the hold down clips and tighten with bolts.

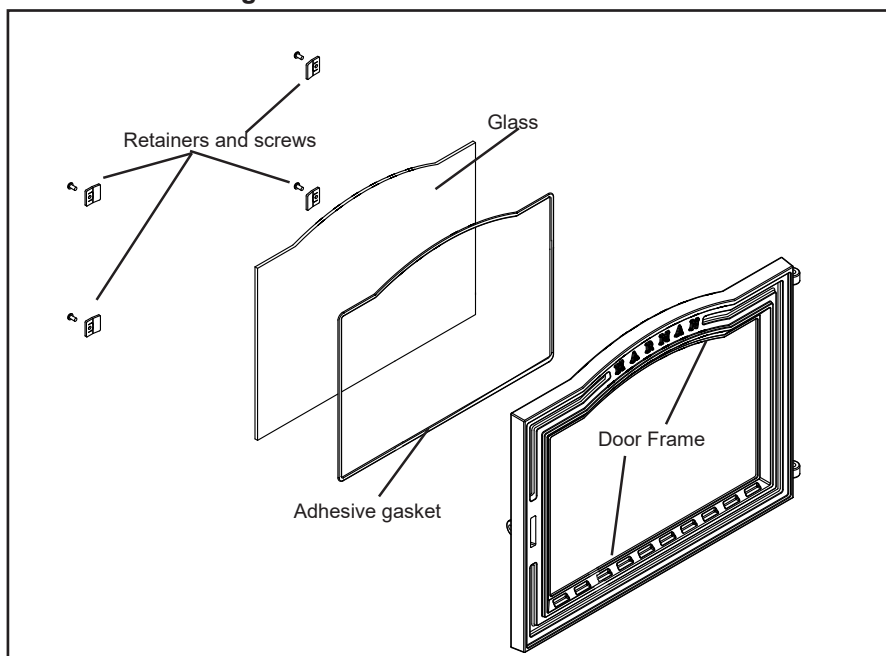
### Glass - Cleaning

Sometimes it will be necessary to clean accumulated ash from the glass surface; allowing this ash to remain on the glass for long periods can result in "etching" due to the acidity of the ash. Never clean the glass while it is hot, and **do not** use abrasive substances. Wash the surface with cool water, and rinse thoroughly. You may wish to use a non-abrasive cleaner specifically designed for use on stove glass. In any case, dry thoroughly before relighting your stove.

#### P43-C & P61-C Freestanding Pellet Stove



#### P68-C Freestanding Pellet Stove



## E. Burnpot Maintenance

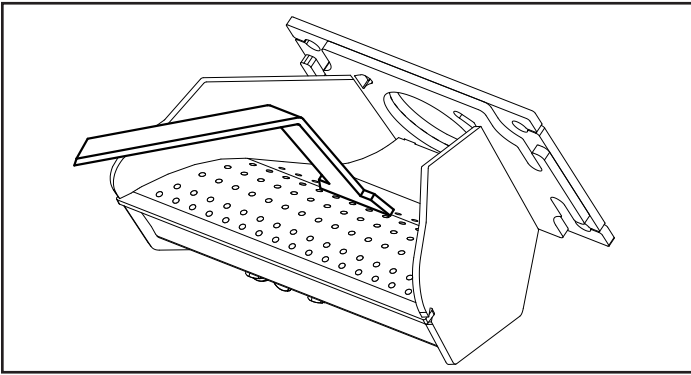


Figure 5.1

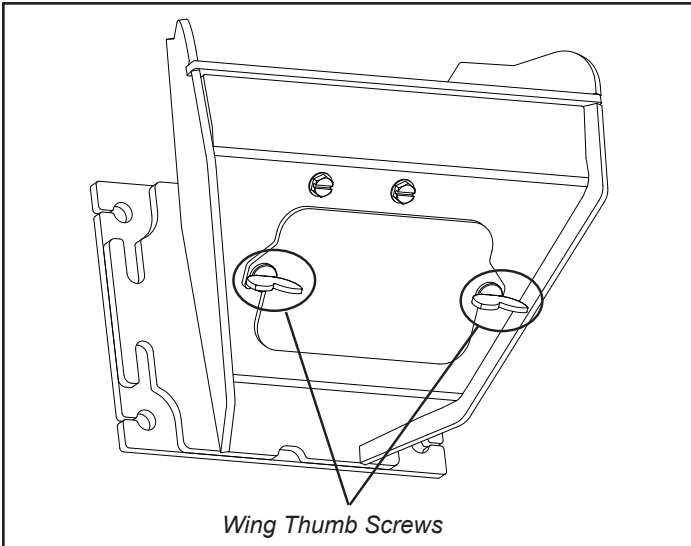


Figure 5.2

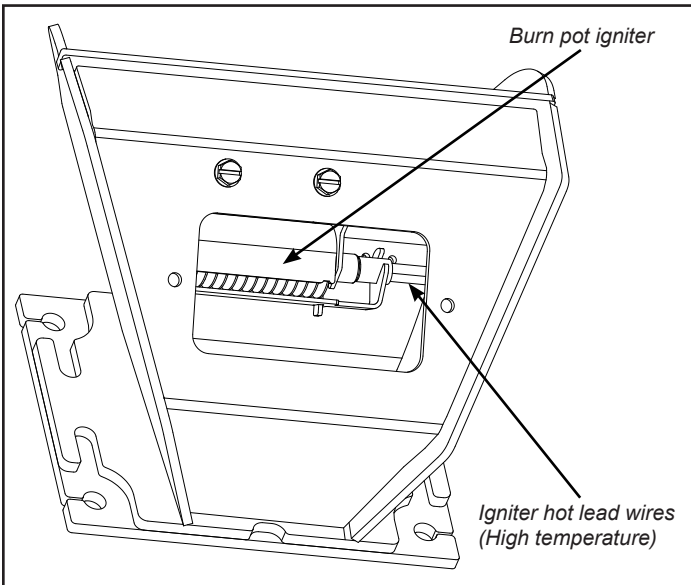


Figure 5.3 - View from below through the ash pan opening.

Whenever adding fuel, take the opportunity to clean the burn pot. **(Weekly at minimum)**

- Scrape the top holed surface and sides of the burn pot down to auger tube Figure 5.1. It is not necessary to completely remove all material from the burn pot. The excess will be pushed out during the next use.
- With the fire out and burn pot cold, use the supplied allen wrench to remove any build-up that may have accumulated in the holes of the burn pot grate. Simply push the allen wrench down through each hole ensuring it is clear of any build-up paying attention not to damage the igniter element in the process.

**Monthly, or after each ton of fuel burned:**

- Loosen the (2) wing thumb screws on the lower front angle of the burn pot. Figure 5.2
- Lift off the clean-out cover to open the bottom clean-out chamber. Figure 5.3

**⚠ DANGER**

**Disconnect the power to the unit before removing cover.**

- Clean ash buildup from inside the chamber while cover is off. Use the scraper to tap on the top front edge of the burn pot. This will help knock pieces of ash, loosened by the scraping process, down through the holes. It also helps knock scale off of the igniter element.

### Figure 5.3

The igniter is made to be removable for service by insulated male/female wire connectors. These connections between the hot leads (the wires inside the burn pot) and the cold leads (the wires from the control board) are always pulled to the inside rear of the feeder body. **(Not coiled inside the burn pot.)**

It is very important that these connections are to the inside rear of the feeder body. Also, the extra wire of the igniter wire service loop must be pulled out through the rear of the feeder and tied up so that it will not be damaged by any moving parts.

**Note:** The hot lead/cold lead connection must always be pulled to the rear of the feeder body before operation.

**⚠ WARNING**

**Use caution when cleaning burn pot clean-out chamber. Do not damage the high temperature igniter wires.**

## F. Combustion Blower Chamber

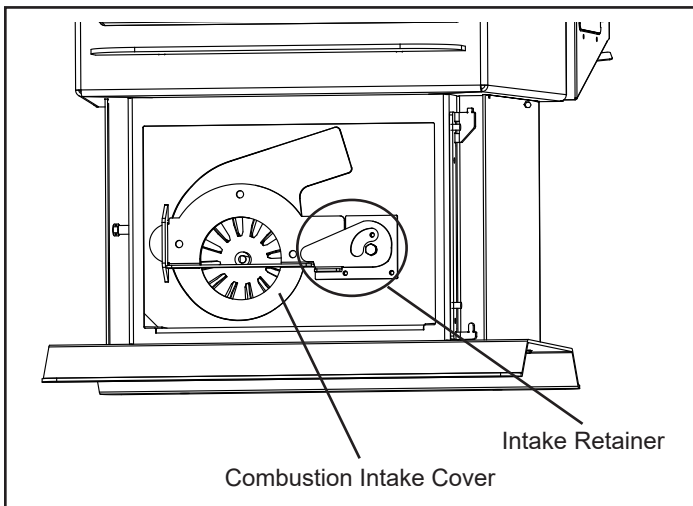


Figure 5.4

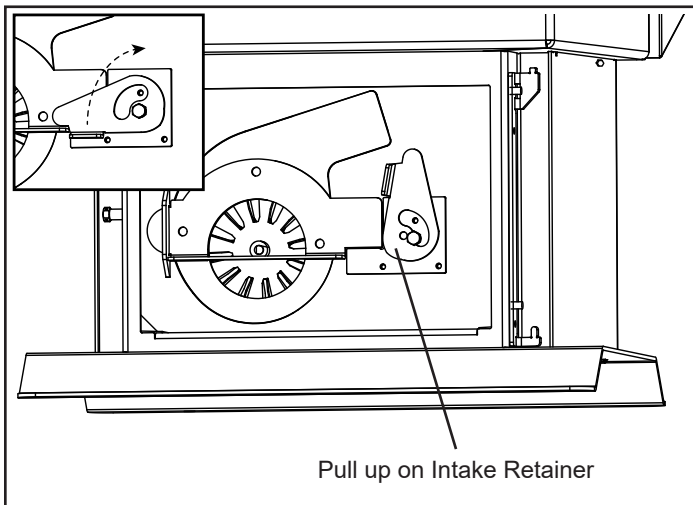


Figure 5.5

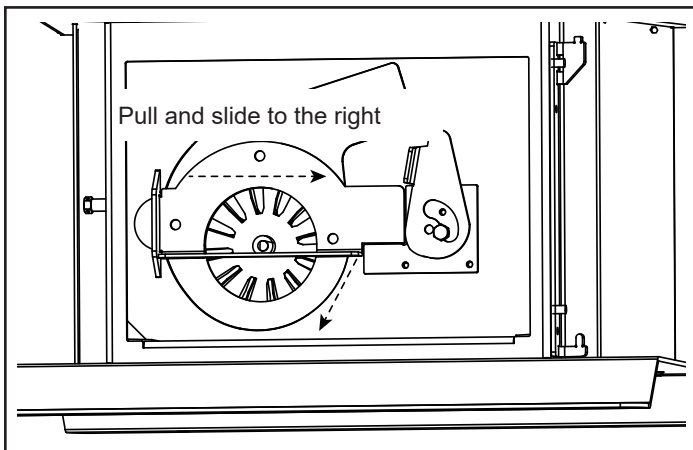


Figure 5.6

## Monthly Cleaning- continued:

There is a combustion intake cover located behind the ash pan that must be removed to properly clean the combustion blower fan blade. Figure 5.4. In order to remove the combustion intake cover you must pull up on the intake retainer. Figure 5.5. This will allow the combustion intake cover to be removed. To remove the combustion intake cover pull towards the front of the unit while sliding to the right. Figure 5.6.

Now that the combustion intake cover is removed you can remove any flyash or debris that has collected around combustion blower fan blade and areas around it.

The exhaust passage may need cleaned as well. Keep in mind the ESP Sensor is located just inside the exhaust passage Figure 5.7. Be sure not to damage the ESP Sensor while cleaning this area.

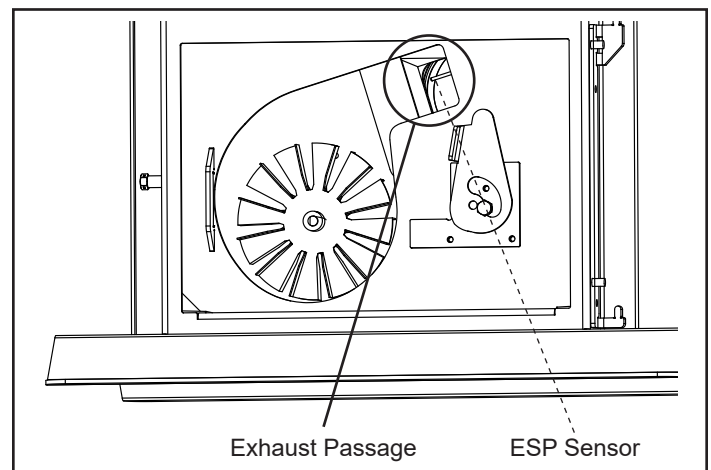


Figure 5.7



## G. Pellet Feeder Chamber

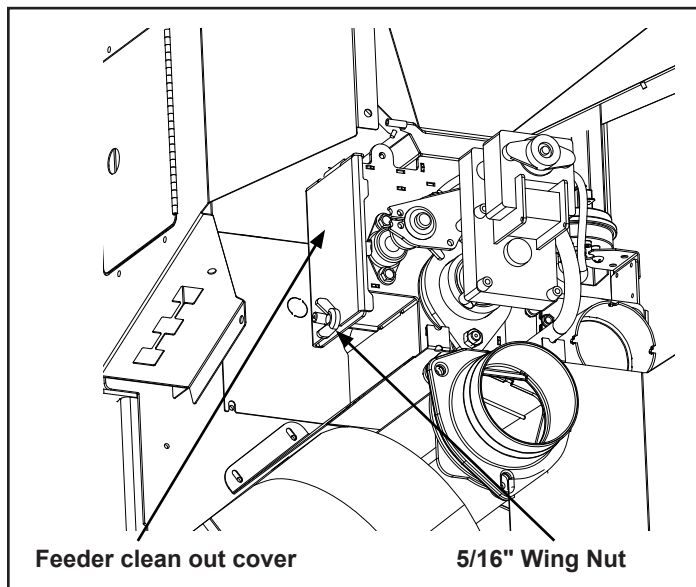


Figure 5.8

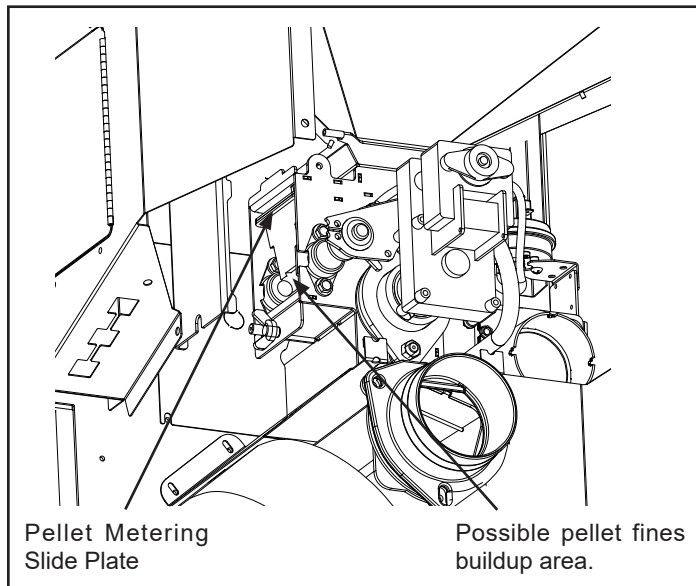


Figure 5.9

## Feeder Chamber

This chamber may get a buildup of fines from the feeder mechanism movement. This area should be checked and cleaned at least once a year.

### To remove the feeder cover:

- Loosen the 5/16" wing nut. Figure 5.8.
- Lift up and slide the cover off of the threaded stud.
- Inspect and clean the inner chamber if necessary Figure 5.9.
- Reinstall the cover making certain it is seated properly on the feeder body and tighten as tightly as you can by hand.

**NOTE:** Views are shown with the rear motor covers removed.

# 6 Troubleshooting and Frequently Asked Questions

## A. Error Code Description

### Status light error messages:

**2 Blinks:** Indicates an open feed circuit, typically from pressure switch or hopper switch. Blink status automatically clears when feed circuit is complete. Does not blink if door/hopper is opened when stove is off.

**3 Blinks:** Indicates that the ESP (Exhaust Sensing Probe) has failed, has a broken connection, or has gone out of range too many times. This requires a manual reset\*.

**4 Blinks:** Can occur only in Room Temp Mode and indicates Room Sensing Probe failed or not installed. If a Room Sensing Probe is then installed, the status light will automatically reset.

**NOTE:** Unit will not start in "AUTO" with this status error.

**5 Blinks (In Igniter Auto. Mode Only):** Indicates that the unit has failed to light within the 36 minute start cycle. To reset - Turn Mode Selector to "OFF", then turn to either mode again.)

**6 Blinks :** Indicates that the control has calculated poor or incomplete combustion occurring for more than 25 minutes.

A six blink status may be set if the stove is allowed to run out of pellets. To reset, turn mode selector to "OFF" then back on to the desired mode. If the unit was not out of pellets, see Troubleshooting section for more details.

\* **Manual reset-** disconnect power cord for a few seconds and reconnect. If error still occurs call your Dealer.

## B. Frequently Asked Questions

ISSUES	SOLUTIONS
1. Metallic noise.	1. Noise is caused by metal expanding and contracting as it heats up and cools down, similar to the sound produced by a furnace or heating duct. This noise does not affect the operation or longevity of your appliance.
2. White ash buildup on glass.	2. This is normal. Clean the glass using any non-abrasive glass cleaner.
3. Glass has buildup of black soot	3. Excessive build-up of ash. See solution #4. The lower burn settings will produce more ash, the higher burn settings produce less. The more it burns on low the more frequent cleaning of the glass is required.
4. Glass has turned dirty.	4. Excessive build up of ash. The lower burn settings will produce more ash, the higher burn settings produce less. The more it burns on low the more frequent cleaning of the glass is required.
5. Fire has tall flames with black tails and is lazy.	5. The feed rate needs to be reduced or the burnpot needs cleaning. Heat exchanger or exhaust blower needs cleaning.
6. Smoky start-up or puffs of smoke from the airwash.	6. Either the burnpot is dirty or there is too much fuel at start-up and not enough air.
7. Large flame at start-up.	7. This is normal. Flame will settle down once the fire is established.

Contact your dealer for additional information regarding operation and troubleshooting. Visit [www.harmanstoves.com](http://www.harmanstoves.com) to find dealer.

## C. Troubleshooting

With proper installation, operation, and maintenance your appliance will provide years of trouble-free service. If you do experience a problem, this troubleshooting guide will assist a qualified service person in the diagnosis of a problem and the corrective action to be taken. This troubleshooting guide can only be used by a qualified service technician.

### STOVE DOES NOT FEED

1. No fuel in hopper.
2. Firebox draft may be too low for sensing switch in feeder circuit to operate. **Check for closed doors**, loose or missing gasket on doors or hopper lid.
3. Feed motor will not run until the ESP control senses a certain temperature. Maybe you did not put enough fuel or starting gel in the burn pot before manually lighting the fire.
4. Restriction in the hopper or feeder. Remove all fuel and examine. Clear the obstruction.
5. Feed motor has failed.

### PARTIALLY BURNED PELLETS

1. Feed rate too high.
2. Poor air to fuel mixture. (Check burn pot clean-out cover and air intake).
3. Burn pot or heat exchanger tubes may need to be cleaned.
4. Combination of all the above.
5. #6 status blink: A 6 blink control board status indication is caused by poor or incomplete combustion. The circuit board has the ability to track the combustion through feed settings and ESP temperatures. When the control board has calculated poor or incomplete combustion, it will shut down the unit as a safety feature. (Poor or incomplete combustion is a contributor of creosote which may cause a chimney fire)

### A 6 blink status may be caused by several things:

1. Blocked or partially blocked flue.
2. Blocked or partially blocked inlet air.
  - a. Backdraft damper on the inlet pipe may be stuck closed.
  - b. If outside air is installed, the inlet cover may be blocked.
3. The air chamber under the burnpot may be filled with fines and small bits of ash.
4. The holes in the burnpot may be getting filled with ash or carbon buildup.
5. Combustion blower fan blades may need cleaned.
6. Fuel restrictions as noted above.

### SMOKE SMELL

Follow venting manufacturer's recommendations for sealing pipe joints. The exhaust vent is the only part of the system that is under positive pressure.

### FIRE HAS GONE OUT- Check for status light.

1. No fuel in hopper.
2. Draft is too low, blocked flue.
3. Something is restricting fuel flow.
4. Hopper lid not closed properly.
5. Feed motor or combustion blower has failed.

### SMOKE IS VISIBLE COMING OUT OF VENT

1. Air-fuel ratio is too rich.
  - a. Feed rate too high.
  - b. Draft too low caused by a gasket leak.

### LOW HEAT OUTPUT

1. Feed rate too low
2. Draft too low because of gasket leak.
3. Poor quality or damp pellets
4. Combination of 1 and 2.

### HELPFUL HINTS

#### 1. Cleaning Burn Pot

Whenever your stove is not burning, take the opportunity to scrape the burn pot to remove carbon buildup. A vacuum cleaner is handy to remove the residue. Be sure the stove is cold if you use a vacuum.

Carbon buildup can be scraped loose with the fire burning using the special tool provided with your stove. Scrape the floor and sides of the burn pot. The carbon will be pushed out by the incoming fuel. Always wear gloves to do this.

#### 2. Removing Ashes

Turn the Temp Dial to number 1 approximately 30 minutes before removing ashes. This will result in a cooler stove and ash pan.

Maximum Feed Limit settings are not needed in most cases. Operating in the normal range (#4) is recommended when maximum heat output is not required. The ESP probe prevents the stove from being over-fired.

Keep the stove free of dust and dirt.

#### Fuel

The P-Series Pellet Stove is approved for burning any grade of pelletized bio-mass fuel.

It should be noted, however, that higher ash content will require more frequent ash removal, scraping of the burn pot, and may provide less BTU's per pound.

The moisture content of pellets must not exceed 8%. Higher moisture will rob BTU's and may not burn properly.

Fuel should **not** be stored within the stove installation clearances or within the space required for cleaning and ash removal.

# 7 Reference Material

## A. Safety Reminders

When operating your Harman® P-Series Pellet Stove, respect basic safety standards. Read these instructions carefully before you attempt to operate the P-Series Pellet Stove. Failure to do so may result in damage to property or personal injury and may void the product warranty.

**CAUTION: This appliance must be vented to the outside.**

Due to high temperatures, this stove should be placed out of traffic and away from furniture and draperies.

Children and adults should be alerted to the hazards of high surface temperatures and should stay away to avoid burn to skin and/or clothing.

Young children should be carefully supervised when they are in the same room as the stove.

Clothing and other flammable materials should not be placed on or near this stove.

Installation and repair of this stove should be done by a qualified service person. The appliance should be inspected before use and at least annually by a qualified service person. More frequent cleaning will be required. It is imperative that control compartments and circulating air passageways of this stove be kept clean.

**Disposal of ashes:** Ashes should be placed in a 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 thoroughly cooled.

**Soot and fly ash:** Formation and need for removal. The products of combustion contain small particles of fly ash. The fly ash will collect in the exhaust venting system and will restrict the flow of the flue gases. Pellet fuels have different ash contents depending on what type of wood has been used to make the pellets. **We recommend to clean the system after approximately 1 ton of pellets have been burned and judge from that how often the stove should be cleaned, remember if you change pellets it may change how often you have to clean your stove.**

With any hearth appliance, installation of smoke detectors/ Carbon Monoxide detectors is recommended on every level of the home.

When burning wood slowly, the potential exists for creosote to form. The venting system should be inspected periodically throughout the heating season to determine if a creosote buildup has occurred. If a significant layer of creosote has accumulated (3mm or more), it should be removed to reduce the risk of a chimney fire. If a fire occurs, call the fire department, shut down the stove, and evacuate the residence. Before using the appliance, have the venting system thoroughly inspected and replace any damaged components.



### WARNING

**MOBILE/MANUFACTURED HOME GUIDELINES DO NOT ALLOW INSTALLATION IN A SLEEPING ROOM.**



### CAUTION

**THE STRUCTURAL INTEGRITY OF THE MOBILE HOME FLOOR, WALL, AND CEILING/ROOF MUST BE MAINTAINED.**



### CAUTION

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



### WARNING

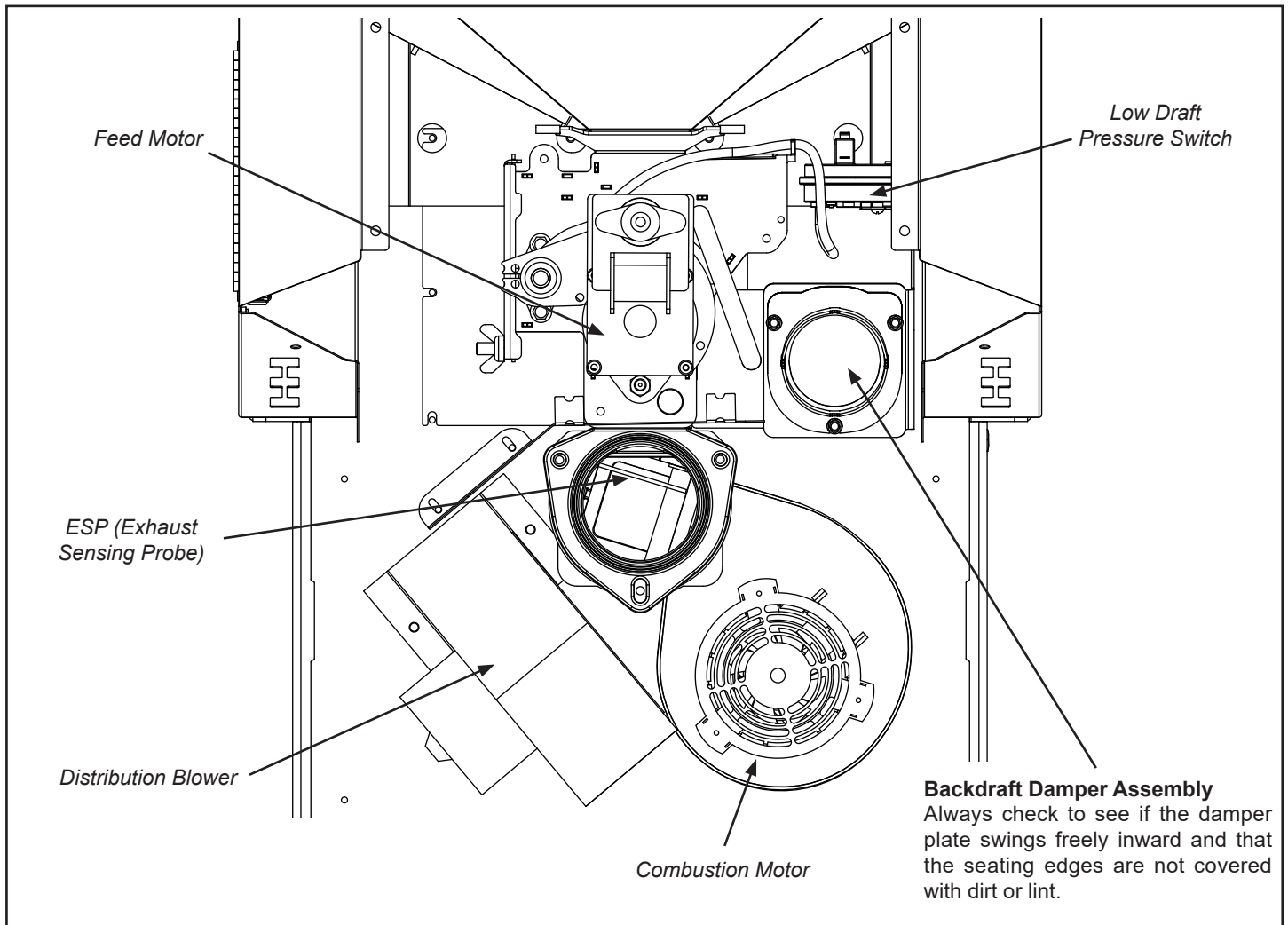
**KEEP COMBUSTIBLE MATERIALS SUCH AS GRASS, LEAVES, ETC. AT LEAST 3 FEET AWAY FROM THE POINT DIRECTLY UNDER THE VENT TERMINATION.**



### WARNING

**USE OF IMPROPER FUELS, FIRESTARTERS OR ALTERING THE STOVE FOR HIGHER HEAT OUTPUT MAY CAUSE DAMAGE TO THE STOVE AND COULD RESULT IN A HOUSE FIRE. USE ONLY APPROVED FUELS AND OPERATION GUIDELINES**

## B. Motor and Component Location



### **P-Series Pellet Stove Safety Devices**

The **Control Board/ESP** combination is responsible for all high limit safety control. There are 2 high limits, one normal operation high limit and one backup high limit. The control has an automatic diagnostic circuit that continuously monitors the ESP and Room Sensor for faults. If a fault should occur, the control sends a status alert and at the same time the unit goes down to minimum feed/minimum burn as a safety condition.

The **Low Draft Pressure Switch** is a differential pressure switch that monitors the negative pressure (Draft) in the firebox. If the draft becomes too low for proper combustion, the switch opens, cutting power to the feed motor and the igniter circuits. This switch is connected into the AC (high voltage) wiring.

## C. Loss of Power

Harman pellet burning appliances rely on a combustion blower to remove exhaust from the firebox. A power failure will cause the combustion blower to stop running, which may lead to exhaust see page into the room. Vertical rise in the venting system can help create natural draft, which may reduce the likelihood of exhaust leakage into the home.

Installation of a low-cost uninterruptible power supply (UPS) or battery backup system can help ensure the units shuts down without any minor smoke leakage into the home. Harman recommends the installation of one of these two systems for areas prone to power outages.

**There is one Harman® approved UPS option for your appliance:**

**Uninterruptible Power Supply UPS** battery back-ups are available online or at computer and office equipment stores. Your Harman® appliance with Rev E or later software available beginning in November 2010 may be plugged directly into a Harman® approved UPS:

- **TrippLite model INTERNET750U** is tested and approved. Other brands or models may not be compatible.

When power is lost, a fully charged UPS will power a safe, combustion blower only shut-down. Your appliance will pulse the blower every few seconds to clear exhaust until the fire is out. **NOTE: The UPS provides safe shut-down only. It is not intended for continued operation.**

- A Inverter/Charger connects to a 12 volt deep cycle battery that will run your appliance for up to eight (8) hours. It includes a trickle charge feature that keeps your battery charged when power is available. **NOTE:** If the power is out for longer than battery life, smoke leakage may still occur unless your stove has been safely shut down.

**For an approved Inverter/Charger refer to [www.harmanstoves.com](http://www.harmanstoves.com).**

Your appliance will recognize when power is restored. What happens depends on ESP temperature and whether it is equipped with automatic ignition:

- In **“Automatic” Mode**, units equipped with automatic ignition will respond to the set point and ESP temperature and resume normal operation.
- In **“Idle” Mode**, or for units without automatic ignition:
  - If the ESP is cool, the appliance will remain shut down.
  - If the fire is out and the ESP is still warm, the feeder may restart. Since the fire is out, the ESP temperature will not rise. The unit will then shut-down, and may flash a six-blink status error. (See ESP error codes)
  - If the fire is still burning, it will resume normal operation.

Contact your dealer if you have questions about UPS compatibility with your appliance.

**IMPORTANT!** : UPS or Battery Backup cannot prevent smoke leakage from an improperly maintained unit. Keep the venting system clean and free from obstructions and maintain all gaskets to keep an airtight seal.

### WARNING

**Use only Harman® approved battery back-up devices. Other products may not operate properly, can create unsafe conditions or damage your appliance.**

### CAUTION

**Always keep appliance doors and hopper lid closed and latched during operation and during power failures to minimize risk of smoke or burn-back.**

## D. Emergency Manual Ignition

Harman® pellet stoves and inserts should be lit using the automatic ignition system. This is the safest and most reliable way for igniting the unit. In the event the automatic igniter is not functioning, the steps below may be followed to manually light the stove or insert in the “Constant Burn” mode. Manual lighting is for emergency purposes only, and the igniter should be repaired or replaced as soon as practical.

### WARNING

Only use firestarter commercially marketed for pellet stoves and inserts, including wax coated wood chips, pellet starter gel and pellet igniter blocks. Use of any other type of firestarter is prohibited.

To avoid serious injury or death read and follow manufacturer’s warning and instructions for use of firestarter. Use of firestarter is only permitted when performing a cold start.

Never attempt to manually light a stove or insert that has been operated recently and is not at room temperature. If automatic ignition was attempted, be sure to give the stove or insert at least 30 minutes or longer to cool to room temperature.

Be sure that the stove or insert is in the “Igniter - Disabled” mode of operation.

Once all the precautions have been taken, follow these steps:

1. Turn the Mode Selector to “OFF”.
2. Fill burn pot with pellets, only half way. (Do Not Over Fill).
3. Add firestarter to pellets following manufacturer’s instructions.
4. Light pellet gel with a match, and close the door, turn Mode Selector to Constant Burn. Operation will begin when the fire reaches the proper temperature.

E. Service Parts

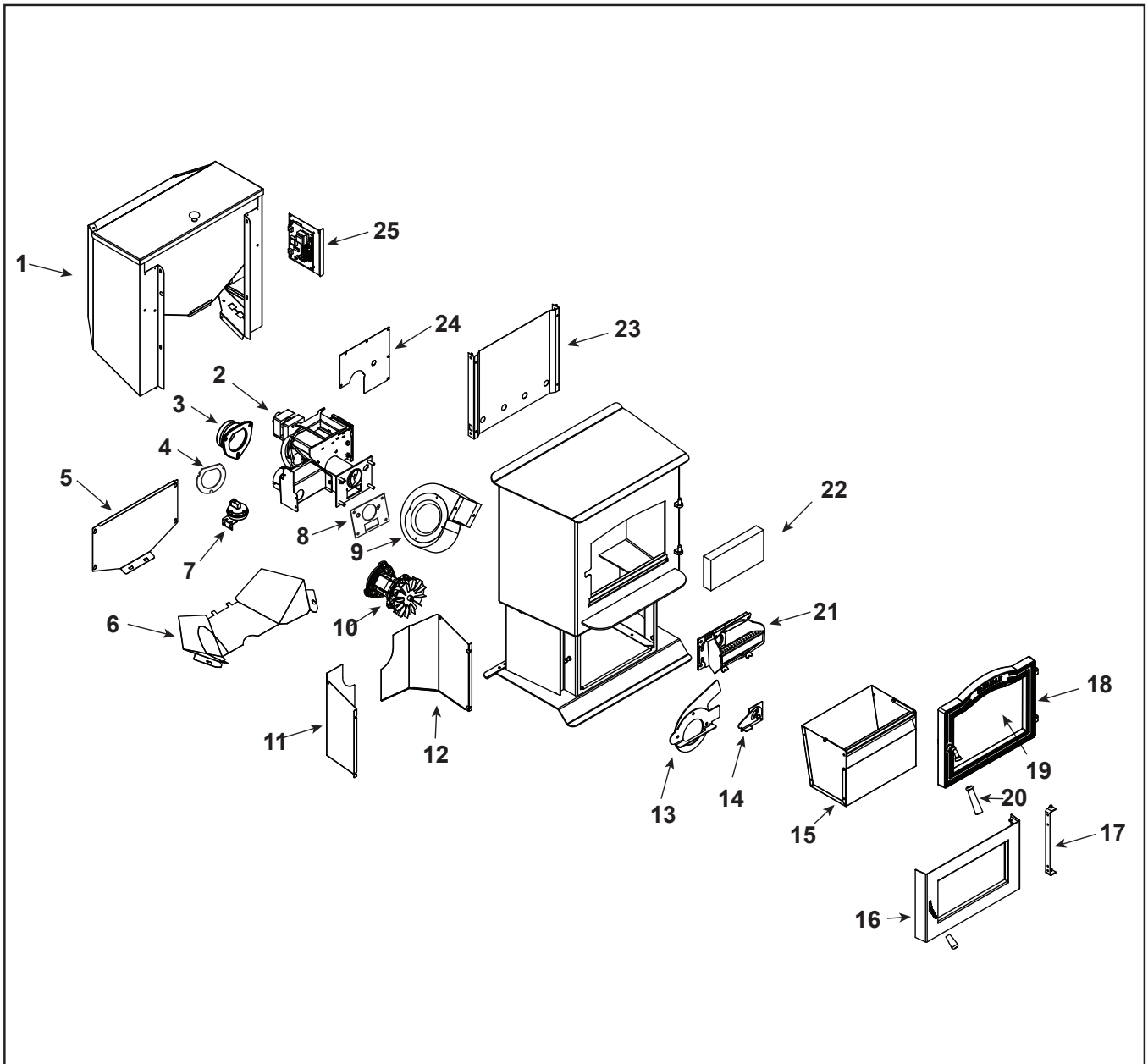


Service Parts

Steel Pellet Stove  
1-90-04400-1 (Black)

P43-C Pellet

Beginning Manufacturing Date: March 2019  
Ending Manufacturing Date: Active



IMPORTANT: THIS IS DATED INFORMATION. Parts must be ordered from a dealer or distributor. **Hearth and Home Technologies does not sell directly to consumers.** Provide model number and serial number when requesting service parts from your dealer or distributor.

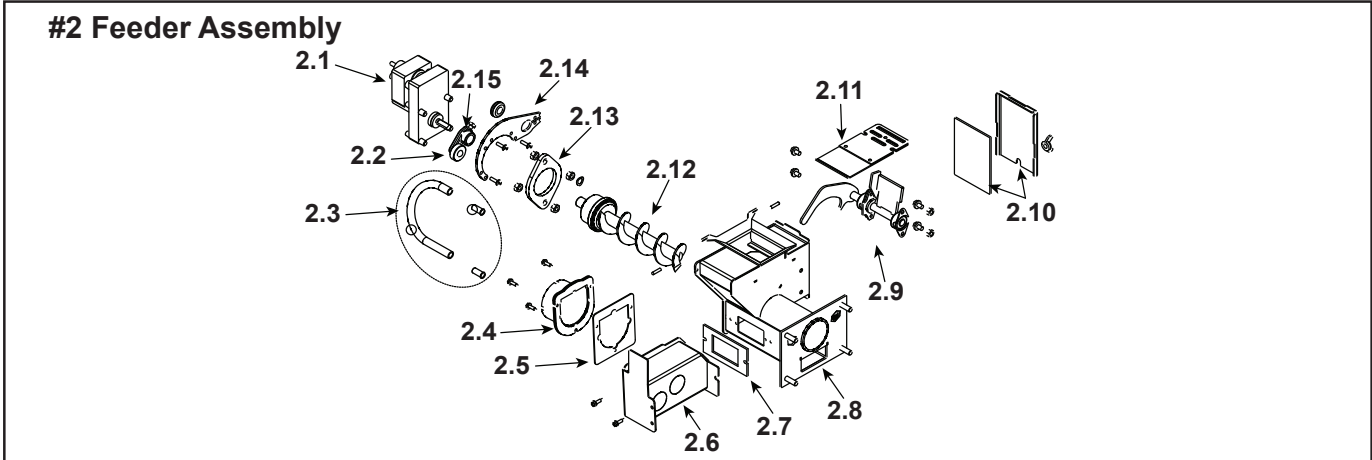


Stocked at Depot

ITEM	Description	COMMENTS	PART NUMBER	
1	Hopper Assembly		1-10-04300	Y
	Hopper Knob		1-00-02000-1	
	Hopper Latch Assembly	Pre HF2372946	1-00-773901	
		Post HF2372946	SRV8000-050	
	Hopper Lid w/Hinge, Knob		1-10-773900	

Additional service parts on following page.

11/23



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**Stocked at Depot**

ITEM	Description	COMMENTS	PART NUMBER	
2	Feeder Assembly		1-10-09535A	
2.1	Pellet Feeder Gear Motor, 4RPM		3-20-60906	Y
2.2	UL Feeder Cam Bearing		3-31-3014	Y
2.3	Feeder Crossover Kit		1-00-67900	Y
	9MM Silicone Tube	5 Ft	1-00-511427	Y
2.4	Pellet Air Intake Assembly		1-10-06810A	
2.5	Gasket Feeder Air Intake	Pkg of 6	3-44-72224-6	Y
2.6	UL Feeder Air Intake		1-10-72222	
2.7	Gasket Ultra Air Intake	Pkg of 10	3-44-677160-10	Y
2.8	Ultra Feeder Weldment		1-10-724132	Y
2.9	UL Feeder Pusher Arm		1-10-677187W	Y
2.10	Gasket, UL Feeder		1-00-677122	Y
2.11	Slide Plate Assembly		1-10-677121A	Y
2.12	UL Feeder Auger Assembly		3-50-00565	Y
2.13	Bearing Flange w/Hardware		1-00-04035	Y
2.14	UL Feeder Gear Motor Bracket w/Grommet		1-00-247406	Y
2.15	UL Feeder Cam Block		3-00-677154	Y
	Hopper Switch Feeder Fitting	Pkg of 2	1-00-142818	Y
	Motor Bracket Grommet	Pkg of 12	3-31-2761-12	
	Pillow Block	Pkg of 4	3-31-3614087-4	Y
	Silicone Tubing, 1/8"	5 Ft	1-00-5113574	Y
3	Flue Tail Pipe		3-00-247237	Y
4	Gasket Set, Burn Pot & Tailpipe	Pkg of 5 Sets	1-00-07381	Y
5	Auger Motor Cover		2-00-773843P	Y
6	Auger Motor Shield		2-00-773815P	Y
7	Differential Switch		3-20-6866	Y
8	Gasket Set, Burn Pot & Tailpipe	Pkg of 5 Sets	1-00-07381	Y

Additional service parts on following page.



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**Stocked at Depot**

ITEM	Description	COMMENTS	PART NUMBER	
9	Distribution Blower		3-21-33647	Y
10	Combustion Blower	Fan blades not included	3-21-08639	Y
	Combustion Blower Mounting Screws (Pkg of 100)	Commonly required for Combustion Blower replacement	1-00-53483208	
	Fan Blade, 5" Double Paddle (Combustion Blower)		3-20-502221	Y
11	Rear Cover Left		2-00-773828-1P	Y
12	Rear Cover Right		2-00-773828-2P	Y
13	Comb Intake Weldment		1-10-08516S	Y
14	Retainer Assembly		1-10-08533S	Y
15	Ash Pan		1-10-7738108A	Y
16	Ash Door Assembly		1-10-773904A	
	Wood Handle		1600663	
17	Bolt on Hinge		2-00-06968B	
18	Cast Door Frame		4-00-06800P	
	Cast Door w/Glass		1-10-06800M	
	Pin, Slick (Pkg of 2)	Post #HF2371860	1-00-110	
19	Glass Panel w/Gasket		1-00-950133647	Y
20	Door Handle Assembly		1-00-453001	Y
	<b>Contains: Handle, 6 mm Washer, SHCS, handle, Elbow, Paw (Cast), SSS, Bhcs.</b>			
	Wooden Handle w/Hardware, Load Door		1-00-00247	Y
	Wave Washer	Pkg of 10	SRV3-31-453013	
21	Burn Pot Weldment		1-10-00675	Y
	Flame Guide		3-00-03000	Y
	Clean Out Cover	2 Sets	1-00-06623	Y
	Thumb Screw	Pkg of 10	3-31-782108-10	Y
22	Fire Brick 4-1/2 x 9 x 1-1/4"	Pkg of 7	1-00-900450125	Y
	Firebrick, Full Skid	414 Pcs	3-40-900450-414	
23	Hopper Heat Shield		2-00-773854B	
24	Feeder Cover		2-00-773826L	
25	Circuit Board w/Knobs & Shafts		1-00-05886	Y
	Control Board Label		3-90-07766	
	Circuit Board Plate, Studded w/label		1-10-08327	
	Knob, Control Board/D-Shaft	25 Sets	1-00-015605	Y
	Arrow Burn Pot Scraper	Pkg of 10	2-00-773850-10	
	Cradle Assembly			
	Igniter Holder, Cradle, & Flat Bottom		1-00-777907	Y
	Diagnostic Display Module		3-20-05401	Y
	DDM Replacement Cable		1-00-05402	

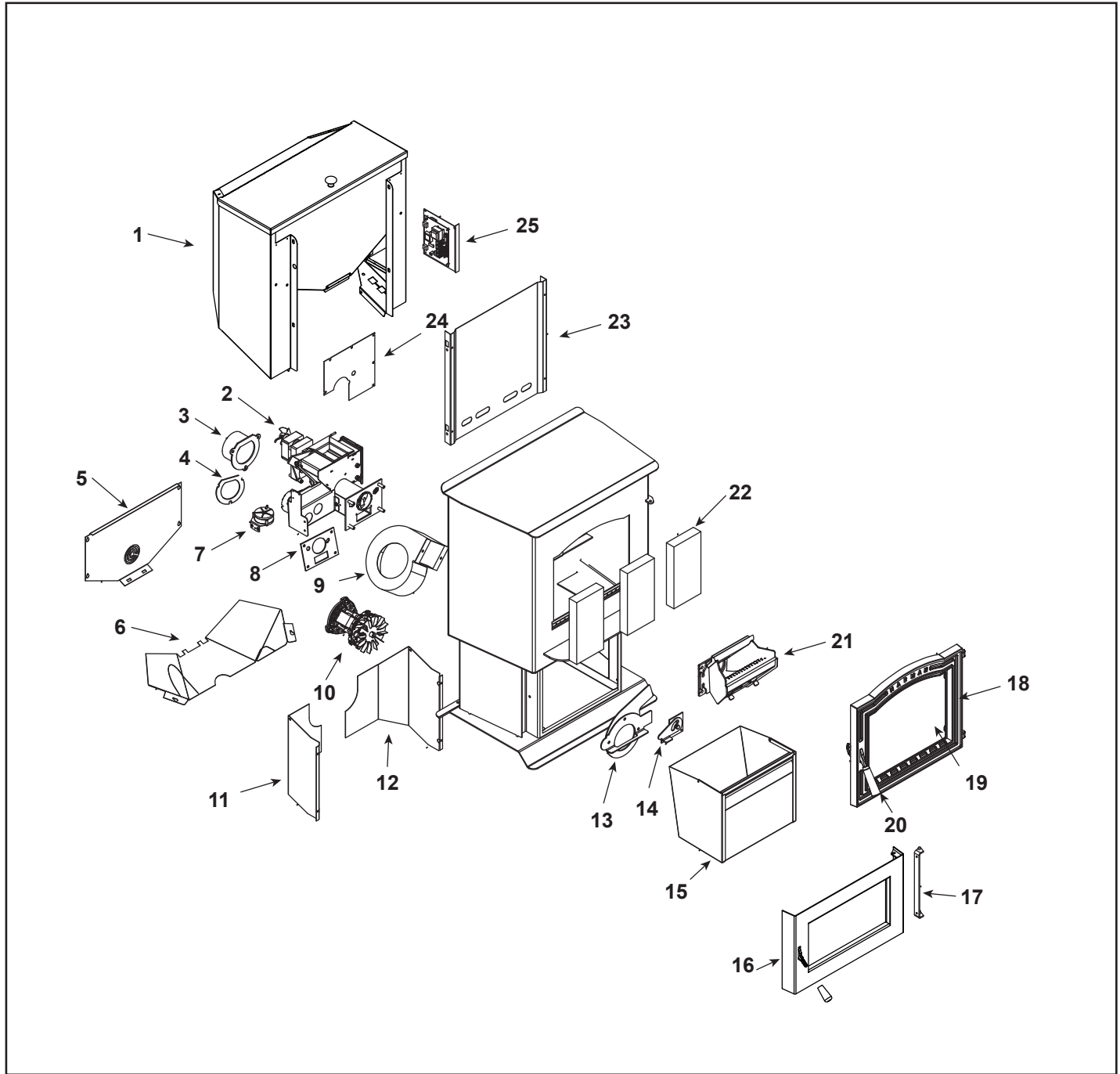
Additional service parts on following page.

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**Stocked  
at Depot**

ITEM	Description	COMMENTS	PART NUMBER	Stocked at Depot
	Door Hinge w/pin, Cast	Pre #HF2371860	3-00-773813	
	Draft Meter Assembly		1-00-00637	Y
	Draft Meter Bolt and Tube		1-00-04004	
	Fuse, 5 Amp Ceramic	Pkg of 5	1-00-05237	Y
	Gasket, 1/4" Rope Black W/PSA (Glass)	15 Ft	1-00-2312	Y
	Gasket, 3/8" Rope White LD (Ash or Load Door)	15 Ft	1-00-1203589	Y
	Gasket Set, Burn Pot & Tailpipe	Pkg of 5 Sets	1-00-07381	Y
	Gasket, Hopper Lid		1-00-00248	Y
	Gasket, Hopper Throat		3-44-677185	Y
	Gasket, Burn Pot		3-44-237639	Y
	Glass Clip	Pkg of 4	1-00-249140	Y
	Igniter		3-20-677200	Y
		Pkg of 10	1-00-677200	Y
	Label, Caution & Danger	10 ea	1-00-200408541	
	Manual Pack		SRV1-00-00680	
	Outside Air Termination Cap		1-10-09542	
	Power Cord		3-20-39685	Y
	Room Sensor		3-20-00906	Y
	Tinnerman 10-24	Pkg of 25	SRV3-31-00177	
	Thermister Probe (ESP Probe)		3-20-00844	Y
	Thermostat Extension		3-20-00607	Y
	Touch up Paint, Black		3-42-19905	
	Wiring Harness		3-20-08727	Y
	LeafDoor Trim	Brushed Stainless	3-43-06802-7	
		<b>No longer available</b>	3-43-06802-8	
	Modern Door trim	Brushed Stainless	3-43-06839-7	
	Ash Lip Trim	Brushed Stainless	3-43-08400-7	
		Bright Nickel	3-43-08400-8	
	Tile Frame	Brushed Stainless	3-43-06729-7	
		<b>No longer available</b>	3-43-06729-8	
	Spring Clips (Required for installation of Tile Frame)	Pkg of 20	3-31-232547-20	



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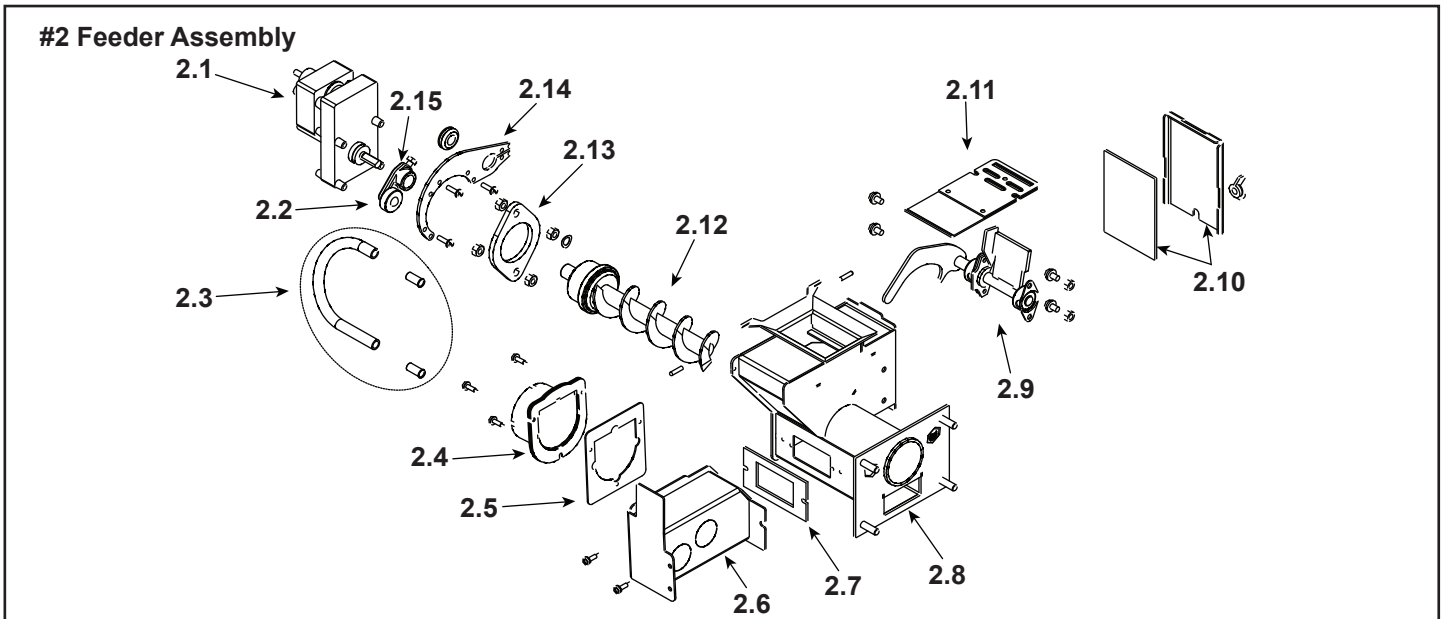


**Stocked at Depot**

ITEM	Description	COMMENTS	PART NUMBER	
1	Hopper Assembly		1-10-05803	Y
	Hopper Knob		1-00-02000-1	
	Hopper Latch Assembly	Pre HF2402759	1-00-773901	
		Post HF2402759	SRV8000-050	

Additional service parts on following page.

11/23



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**Stocked  
at Depot**

ITEM	Description	COMMENTS	PART NUMBER	
2	Feeder Assembly	Post 008085803	1-10-09684A	
2.1	Pellet Feeder Gear Motor, 4RPM		3-20-60906	Y
2.2	UL Feeder Cam		3-31-3014	Y
2.3	Feeder Air Crossover Kit		1-00-67900	Y
	9MM Silicone Tube	5 Ft	1-00-511427	Y
2.4	Pellet Air Intake Assembly		1-10-06810A	
2.5	Gasket Feeder Air Intake	Pkg of 6	3-44-72224-6	Y
2.6	UL Feeder Air Intake		1-10-72228	
2.7	Gasket Ultra Air Intake	Pkg of 10	3-44-677160-10	Y
2.8	Ultra Feeder Weldment		1-10-724132	Y
2.9	UL Feeder Pusher Arm		1-10-677188W	Y
2.10	Gasket, UL Feeder Cover		1-00-677122	Y
2.11	Slide Plate Assembly		1-10-677121A	Y
2.12	UL Feeder Auger Assembly		3-50-00565	Y
2.13	Pellet Feeder Bearing Retainer w/Hardware	Pkg of 2	1-00-04035	Y
2.14	UL Feeder Gear Motor Bracket w/Grommet		1-00-247406	Y
2.15	UL Feeder Cam Block		3-00-677154	Y
	Gasket, Hopper Throat		3-44-677185	Y
	Hopper Switch Feeder Fitting	Pkg of 2	1-00-142818	Y
	Motor Bracket Grommet	Pkg of 12	3-31-2761-12	
	Pillow Block	Pkg of 4	3-31-3614087-4	Y
	Silicone Tubing, 1/8"	5 Ft	1-00-5113574	Y

Additional service parts on following page.

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**Stocked  
at Depot**

ITEM	Description	COMMENTS	PART NUMBER	
3	Flue Tail Pipe		3-00-247237	Y
4	Gasket Set, Burn Pot & Tailpipe	Pkg of 5 Sets	1-00-07381	Y
5	Auger Motor Cover		2-00-06470P	Y
6	Auger Motor Shield		2-00-06467P	Y
7	Differential Switch		3-20-6866	Y
8	Gasket Set, Burn Pot & Tailpipe	Pkg of 5 Sets	1-00-07381	Y
9	Distribution Blower		3-21-33647	Y
10	Combustion Motor	Fan blades not included	3-21-08639	Y
	Combustion Blower Grommets & Spacers	Pkg of 25	1-00-960026	
	Combustion Blower Mounting Screws (Pkg of 100)	Commonly required for Combustion Blower replacement	1-00-53483208	
	Fan Blade, 5" Double Paddle (Combustion Blower)		3-20-502221	Y
11	Rear Cover Left		2-00-06468-1P	Y
12	Rear Cover Right		2-00-06468-2P	Y
13	Comb Intake Weldment		1-10-08516S	Y
14	Retainer Assembly		1-10-08533S	Y
15	Ash Pan		1-10-05800	Y
16	Ash Door Assembly		1-10-06798A	
	Wood Handle		1600663	
17	Bolt on Hinge		2-00-06968B	
18	Cast Door Frame		4-00-06800P	
	Cast Door w/Glass		1-10-06800M	
	Pin, Slick (Pkg of 2)	Post #HF2402358	1-00-110	
19	Glass Panel w/Gasket		1-00-950133647	Y
	Glass Clip w/Hardware (Pkg of 4)		1-00-249140	
20	Door Handle Assembly		1-00-453001	Y
	<b>Contains: Wooden Handle, Wave Washer, SHCS, Cast Handle, , SSS, Bhcs, Cast Pawl</b>			
	Paw Bolt	<b>No longer available</b>	4-31-06393	
	Wooden Handle w/Hardware, Load Door	2 Sets	1-00-00247	Y
	Wave Washer	Pkg of 10	SRV3-31-453013	
21	Burn Pot Weldment		1-10-05802	Y
	Flame Guide		3-00-08534	Y
	Clean Out Cover	2 Sets	1-00-06623	Y
	Thumb Screw	Pkg of 10	3-31-782108-10	Y
22	Fire Brick 4-1/2 x 9 x 1-1/4"	Pkg of 7	1-00-900450125	Y
	Fire Brick , Full Skid	414 Pcs	3-40-900450-414	
23	Hopper Heat Shield		2-00-06471B	
24	Feeder Cover		2-00-773826L	

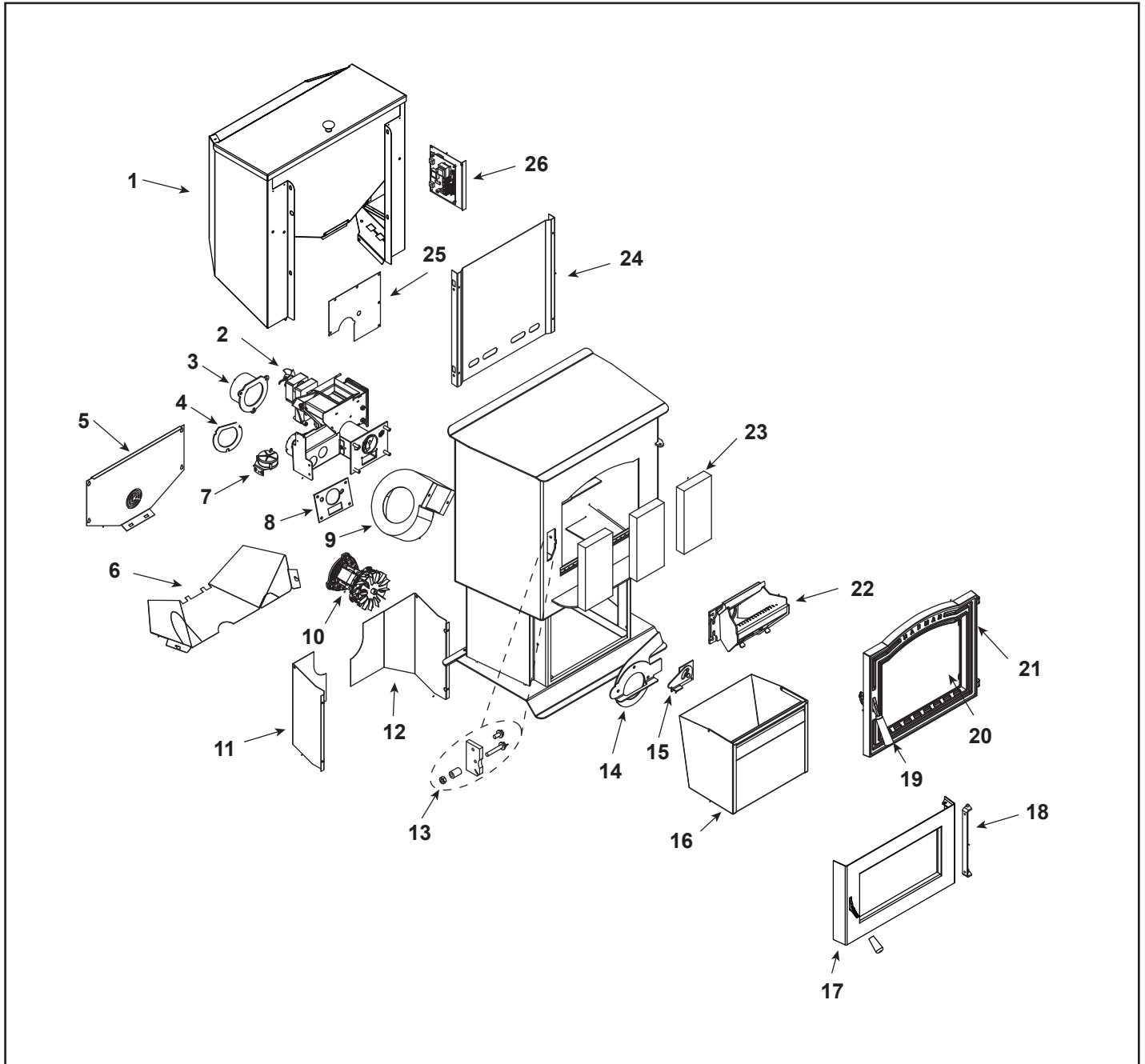
Additional service parts on following page.

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**Stocked  
at Depot**

ITEM	Description	COMMENTS	PART NUMBER	
25	Circuit Board w/Knobs & Shafts		1-00-05886	Y
	Circuit Board Plate, Studded w/label		1-10-08327	
	Control Panel Label		3-90-07766	
	Knob, Contol Board/D-Shaft	25 Sets	1-00-015605	Y
	Arrow Burn Pot Scraper	Pkg of 10	2-00-773850-10	
	Cast Weld on Door Hinge (Qty 2 req)	Pre #HF2402358	3-00-773813	
	Cradle Assembly (Igniter Holder, Cradle, & flat Bottom)		1-00-777907	Y
	Diagnostic Display Module		3-20-05401	Y
	DDM Replacement Cable		1-00-05402	
	Draft Meter Assembly		1-00-00637	Y
	Draft Meter Bolt and Tube		1-00-04004	
	Fuse, 5 Amp Ceramic	Pkg of 5	1-00-05237	Y
	Gasket, 1/4" Rope Black W/PSA (Glass)	15 Ft	1-00-2312	Y
	Gasket, 3/8" Rope White LD (Ash or Load Door)	15 Ft	1-00-1203589	Y
	Gasket Set, Burn Pot & Tailpipe	Pkg of 5 Sets	1-00-07381	Y
	Gasket, Hopper Lid		1-00-00248	Y
	Hopper Lid w/Hinge, Knob		1-10-06493	
	Igniter		3-20-677200	Y
		Pkg of 10	1-00-677200	Y
	Labels, Caution & Danger	10 ea	1-00-200408541	
	Manual Pack		SRV1-00-00680	
	Outside Air Termination Cap		1-10-09542	
	Power Cord		3-20-39685	Y
	Room Sensor		3-20-00906	Y
	Tinnerman 10-24	Pkg of 25	SRV3-31-00177	
	Thermostat Extension		3-20-00607	Y
	Thermister Probe (ESP Probe)		3-20-00844	Y
	Touch up Paint, Black, 12 oz Can		3-42-19905	
	Wiring Harness		3-20-08727	Y
	Leaf Door Trim	Brushed Stainless	3-43-06802-7	
		<b>No longer available</b>	3-43-06802-8	
	Modern Door Trim	Brushed Stainless	3-43-06839-7	
	Ash Lip Trim	Brushed Stainless	3-43-08400-7	
		Bright Nickel	3-43-08400-8	
	Tile Frame	Brushed Stainless	3-43-06729-7	
		<b>No longer available</b>	3-43-06729-8	
	Spring Clips (Required for installation of Tile Frame)	Pkg of 20	3-31-232547-20	



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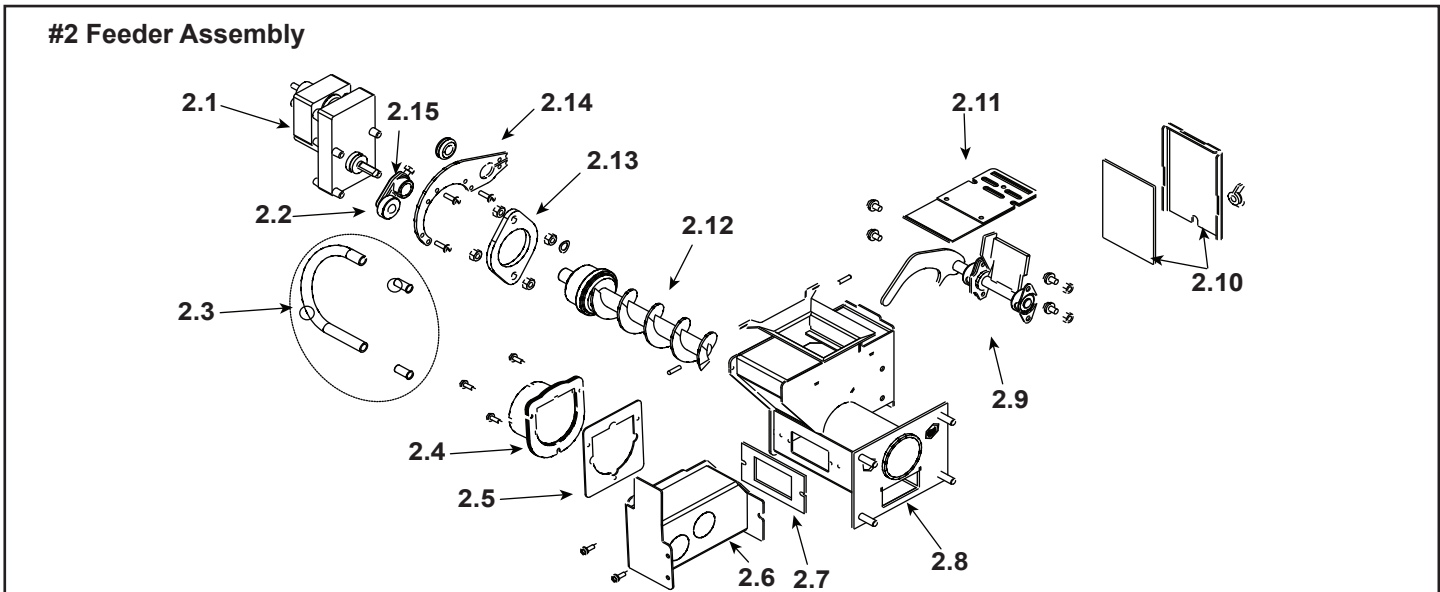


**Stocked at Depot**

ITEM	Description	COMMENTS	PART NUMBER	
1	Hopper Assembly		1-10-00688	Y
	Hopper Latch Assembly	Pre HF2424081	1-00-773901	
		Post HF2424081	SRV8000-050	
	Hopper Knob		1-00-02000-1	

Additional service parts on following page.

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**Stocked at Depot**

ITEM	Description	COMMENTS	PART NUMBER	
2	Feeder Assembly	Post 008280309	1-10-07906A	
2.1	Pellet Feeder Gear Motor, 6RPM		3-20-09302	Y
	Gear Motor Fan Blade	Pkg of 3	3-20-09302-3	Y
2.2	UL Feeder Cam		3-31-3014	Y
2.3	Feeder Air Crossover Kit		1-00-67900	Y
	9MM Silicone Tube	5 Ft	1-00-511427	Y
2.4	Pellet Air Intake Assembly		1-10-06810A	
2.5	Gasket Feeder Air Intake	Pkg of 6	3-44-72224-6	Y
2.6	UL Feeder Air Intake		1-10-72228	
2.7	Gasket Ultra Air Intake	Pkg of 10	3-44-677160-10	Y
2.8	Ultra Feeder Weldment		1-10-724132	Y
2.9	UL Feeder Pusher Arm		1-10-677187W	Y
2.10	Gasket, UL Feeder Cover		1-00-677122	Y
2.11	Slide Plate Assembly		1-10-677121A	Y
2.12	UL Feeder Auger Assembly		3-50-00565	Y
2.13	Bearing Flange w/Hardware		1-00-04035	Y
2.14	UL Feeder Gear Motor Bracket w/Grommet		1-00-247406	Y
2.15	UL Feeder Cam Block		3-00-677154	Y
	Gasket, Hopper Throat		3-44-677185	Y
	Hopper Switch Feeder Fitting	Pkg of 2	1-00-142818	Y
	Motor Bracket Grommet	Pkg of 12	3-31-2761-12	
	Pillow Block	Pkg of 4	3-31-3614087-4	Y
	Silicone Tubing, 1/8"	5 Ft	1-00-5113574	Y

Additional service parts on following page.



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**Stocked  
at Depot**

ITEM	Description	COMMENTS	PART NUMBER	
3	Flue Tail Pipe		3-00-247237	Y
4	Gasket Set, Burn Pot & Tailpipe	Pkg of 5 Sets	1-00-07381	Y
5	Auger Motor Cover		2-00-06470P	Y
6	Auger Motor Shield		2-00-06467P	Y
7	Differential Switch		3-20-6866	Y
8	Gasket Set, Burn Pot & Tailpipe	Pkg of 5 Sets	1-00-07381	Y
9	Distribution Blower		3-21-33647	Y
10	Combustion Blower	Fan blades not included	3-21-08639	Y
	Combustion Blower Grommets & Spacers	Pkg of 25	1-00-960026	
	Combustion Blower Mounting Screws (Pkg of 100)	Commonly required for Combustion Blower replacement	1-00-53483208	
	Fan Blade, 5" Double Paddle (Combustion Blower)		3-20-502221	Y
11	Rear Cover Left		2-00-06468-1P	Y
12	Rear Cover Right		2-00-06468-2P	Y
13	Door Latch Assembly Contains: Latch Adjustment, SHCS(1/4-20 X 1), Lock Nut (1/4 X 20), Jam Nut (HX Jam 1/4-20Z) Steel Bushing,		1-00-06713	Y
14	Comb Intake Weldment		1-10-08516S	Y
15	Retainer Assembly		1-10-08533S	Y
16	Ash Pan		1-10-05800	Y
17	Ash Door Assembly		1-10-06798A	
	Wood Knob		1600663	
18	Bolt on Hinge		2-00-06968B	
19	Cast Door Frame		3-00-06718P	
	Slick Pins, 1 pair		1-00-110	Y
20	Glass Panel w/Gasket		1-00-00688	Y
	Glass Clip w/Hardware	Pkg of 4	1-00-249140	Y
21	Door Handle Assembly Contains: Handle, 6 mm Washer, SHCS, handle, Dowel, Plunger, SSS, Bhcs		1-00-249119	Y
	Ball Plunger	Pkg of 3	3-31-5500-3	
	Front Door Latch		3-00-249119P	Y
	Latch Ball Spring Bracket		2-00-06714	
	Wooden Handle , Load Door	Pkg of 2	1-00-00247	Y
22	Burn Pot Weldment		1-10-06723	Y
	Flame Guide		3-00-03000	Y
	Clean Out Cover	2 Sets	1-00-06623	Y
	Thumb Screw	Pkg of 10	3-31-782108-10	Y
23	Fire Brick 4-1/2 x 9 x 1-1/4"	Pkg of 7	1-00-900450125	Y
	Fire Brick , Full Skid	414 Pcs	3-40-900450-414	

Additional service parts on following page.

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**Stocked  
at Depot**

ITEM	Description	COMMENTS	PART NUMBER	
24	Hopper Heat Shield		2-00-06715B	
25	Feeder Opening Cover		2-00-773826L	
26	Circuit Board w/Knobs & Shafts		1-00-05886	Y
	Circuit Board Plate-Studded w/label		1-10-08327	
	Control Panel Label		3-90-07766	
	Knob, Contol Board/D-Shaft	25 Sets	1-00-015605	Y
	Arrow Burn Pot Scraper	Pkg of 10	2-00-773850-10	
	Cradle Assembly			
	Igniter Holder, Cradle, & Flat Bottom		1-00-777907	Y
	Diagnostic Display Module		3-20-05401	Y
	DDM Replacement Cable		1-00-05402	
	Draft Meter Assembly		1-00-00637	Y
	Draft Meter Bolt and Tube		1-00-04004	
	Fuse, 5 Amp Ceramic	Pkg of 5	1-00-05237	Y
	Gasket, 1/4" Rope Black W/PSA (Glass)	15 Ft	1-00-2312	Y
	Gasket, 3/8" Rope White LD (Ash or Load Door)	15 Ft	1-00-1203589	Y
	Gasket Set, Burn Pot & Tailpipe	Pkg of 5 Sets	1-00-07381	Y
	Gasket, Burn Pot		3-44-237639	Y
	Gasket, Hopper Lid		1-00-00248	Y
	Hopper Lid w/Hinge, Knob		1-10-06493	
	Igniter		3-20-677200	Y
		Pkg of 10	1-00-677200	Y
	Labels, Caution & Danger	10 ea	1-00-200408541	
	Load Door Hinge		2-00-06707L	
	Manual Pack		SRV1-00-00680	
	Outside Air Termination Cap		1-10-09542	
	Room Sensor		3-20-00906	Y
	Power Cord		3-20-39685	Y
	Tinnerman 10-24	Pkg of 25	SRV3-31-00177	
	Thermister Probe (ESP Probe)		3-20-00844	Y
	Thermostat Extension		3-20-00607	Y
	Touch up Paint, Black, 12 oz Can		3-42-19905	
	Wiring Harness		3-20-08727	Y

Additional service parts on following page.



## G. Warranty Policy

### Hearth & Home Technologies LLC LIMITED LIFETIME WARRANTY

Hearth & Home Technologies LLC (“HHT”) extends the following warranty for HHT gas, wood, pellet and electric hearth appliances (each a “Product” and collectively, the “Product(s)”) and certain component parts set forth in the table below (“Component Part(s)”) that are purchased from a HHT authorized dealer or distributor.

#### **WARRANTY COVERAGE:**

HHT warrants that the Products and their Component Parts will be free from defects in materials and workmanship for the applicable period of Warranty coverage set forth in the table below (“Warranty Period”). If a Product or Component Parts are found to be defective in materials or workmanship during the applicable Warranty Period, HHT will, at its option, repair the applicable Component Part(s), replace the applicable Component Part(s), or refund the purchase price of the applicable Product(s). The maximum amount recoverable under this Warranty is limited to the purchase price of the Product. This Warranty is transferable from the original purchaser to subsequent owners, but the Warranty Period will not be extended in duration or expanded in coverage for any such transfer. This Warranty is subject to conditions, exclusions, and limitations as described below.

#### **WARRANTY PERIOD:**

Warranty coverage begins at the date of installation. In the case of new home constructions, Warranty coverage begins on the date of first occupancy of the dwelling or six months after the sale of the Product(s) by an independent, authorized HHT dealer or distributor, whichever occurs earlier. However, the Warranty coverage shall commence no later than 24 months following the date of Product shipment from HHT, regardless of the installation or occupancy date.

The term “Lifetime” in the table below is defined as: 20 years from the beginning date of warranty coverage for gas appliances, 10 years from the beginning date of warranty coverage for wood and pellet appliances, and 5 years from the beginning of warranty coverage for standalone gas log sets. These time periods reflect the minimum expected useful lives of the designated Component Parts under normal operating conditions.

Warranty Period		HHT Manufactured Appliances and Venting					
Component Parts	Labor	Gas	Pellet	Wood	Electric	Venting	Component Parts Covered by this Warranty
1 Year		X	X	X		X	All parts including handles, external enameled components and other material except as covered by Warranty Conditions, Warranty Exclusions, and Warranty Limitations listed
2 Years					X		All parts except as covered by Warranty Conditions, Warranty Exclusions, and Warranty Limitations listed
2 years			X	X			Igniters, Auger Motors, Electronic Components, and Glass
		X					Electrical components limited to modules, remotes/wall switches, valves, pilots, blowers, junction boxes, wire harnesses, transformers and lights (excluding light bulbs)
		X		X			Molded Refractory Panels, Glass Liners
3 years			X				Firepots, burnpots, mechanical feeders/auger assemblies
5 years		X					Burners and logs for standalone gas log sets (Vented and Vent Free gas log sets not sold as components of the fireplace or stove)
5 years	1 year	X					Vent Free Burners and Vent Free Log components of HHT manufactured fireplaces or stoves
			X	X			Castings, Medallions and Baffles
6 years	3 years			X			Catalysts
7 years	3 years		X	X			Manifold tubes, HHT Chimney and Terminations
10 years	1 year	X					Burners, logs and refractory components of HHT manufactured fireplaces or stoves
Limited Lifetime	3 years	X	X	X			Firebox and heat exchanger, FlexBurn® System (engine, inner cover, access cover and fireback)
1 Year	None	X	X	X	X	X	All purchased replacement parts

## **WARRANTY CONDITIONS:**

- Because HHT cannot control the quality of any Products sold by unauthorized sellers, this Warranty only covers Products that are purchased through an HHT authorized dealer or distributor unless otherwise prohibited by law; a list of HHT authorized dealers is available on the HHT branded websites.
- This Warranty is only valid while the applicable Product remains at the site of original installation.
- This Warranty is only valid in the country in which the HHT authorized dealer or distributor that sold the applicable Product is authorized to sell applicable Product.
- Contact your installing distributor or dealer for Warranty service. If the installing dealer or distributor is unable to provide necessary parts, contact the nearest HHT authorized dealer or supplier. Additional service fees may apply if you are seeking Warranty service from a dealer other than the dealer from whom you originally purchased the applicable Product.
- No HHT consumer should bear cost of warranty service or costs incurred while servicing warranty claims (i.e., travel, gas, or mileage) when the service is performed within the terms of this Warranty. Check with your dealer or distributor in advance for any costs to you when arranging a warranty call. Travel and shipping charges for parts are not covered by this Warranty.

## **WARRANTY EXCLUSIONS:**

This Warranty does not cover the following:

- Changes in surface finishes as a result of normal use. As a heating appliance, some changes in color of interior and exterior surface finishes may occur. This is not a flaw and is not covered under the Warranty.
- Damage to printed, plated, or enameled surfaces caused by fingerprints, accidents, misuse, scratches, melted items or other external sources and residues left on the plated surfaces from the use of abrasive cleaners or polishes.
- Repair or replacement of parts that are subject to normal wear and tear during the Warranty Period are not covered. These parts include: paint, wood and pellet gaskets, firebricks, grates, flame guides, batteries and the discoloration of glass.
- Minor expansion, contraction, or movement of certain parts causing noise. These conditions are normal and complaints related to this noise are not covered by this Warranty.
- Damages resulting from: (1) failure to install, operate, or maintain the applicable Product in accordance with the installation instructions, operating instructions, and listing agent identification label furnished with the applicable Product; (2) failure to install the applicable Product in accordance with local building codes; (3) shipping or improper handling; (4) improper operation, abuse, misuse, continued operation with damaged, corroded or failed components, accident, or improperly/incorrectly performed repairs; (5) environmental conditions, inadequate ventilation, negative pressure, or drafting caused by tightly sealed constructions, insufficient make-up air supply, or handling devices such as exhaust fans or forced air furnaces or other such causes; (6) use of fuels other than those specified in the operation instructions; (7) installation or use of components not supplied with the applicable Product or any other components not expressly authorized and approved by HHT; (8) modification of the appliance not expressly authorized and approved by HHT in writing; and/or (9) interruptions or fluctuations of electrical power supply to the applicable Product.
- Non-HHT venting components, hearth connections or other accessories used in conjunction with the applicable Product.
- Any part of a pre-existing fireplace system in which an insert or a decorative gas applicable Product is installed.
- HHT's obligation under this Warranty does not extend to the Product's capability to heat the desired space. Information is provided to assist the consumer and the dealer in selecting the proper Product for the application. Consideration must be given to the Product location and configuration, environmental conditions, insulation and air tightness of the structure.

### **This warranty is void if:**

- The applicable Product has been over-fired, operated in atmospheres contaminated by chlorine, fluorine, or other damaging chemicals. Over-firing can be identified by, but not limited to, warped plates or tubes, deformation/warping of interior cast iron structure or components, rust colored cast iron, bubbling, cracking and discoloration of steel or enamel finishes.
- The applicable Product is subjected to prolonged periods of dampness or condensation.
- There is any damage to the applicable Product due to water or weather damage which is the result of, but not limited to, improper chimney or venting installation.

## **LIMITATIONS OF REMEDIES AND LIABILITY:**

- **EXCEPT TO THE EXTENT PROVIDED BY LAW, HHT MAKES NO EXPRESS WARRANTIES OTHER THAN THE WARRANTY SPECIFIED HEREIN. The owner's exclusive remedy and HHT's sole obligation under this Warranty or in contract, tort or otherwise, shall be limited to replacement of the Component Part(s), repair of the Component Part(s), or refund of the original purchase price of the applicable Product(s), as specified above; provided, however, that (i) if HHT is unable to provide replacement of the Component Part(s) and repair of the Component Part(s) is not commercially practicable or cannot be timely made, or (ii) the customer is willing to accept a refund of the purchase price of the applicable Product(s), HHT may discharge all such obligations by refunding the purchase price of the applicable Product. In no event will HHT be liable for any incidental or consequential damages caused by defects in the applicable Product. Some States do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This Warranty gives you specific legal rights and you may also have other rights which vary from State to State. THE DURATION OF ANY IMPLIED WARRANTY IS LIMITED TO DURATION OF THE EXPRESSED WARRANTY SPECIFIED ABOVE FOR THE APPLICABLE PRODUCT. Some States do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.**





# **Appendix B**

## **Revision History**



Date	Project No.	Tech. & Evaluator	Report Sect.	Summary of Changes
01/22/2019	0135PS022E	A Kravits A Tiegs	ALL	First Issue of Report
02/26/2024	0135PS022E (Edition 001)	R Tiegs K Morgan	Appendix D	Revision History Added to report.
			1.1	Uncorrected/Corrected Emission Values added. (pg 5)
			1.2	Updated Run Summary to address all anomalies and run validity. (pg7)
				Added statement about test sight location and dilution tunnel. (pg 7)
			2.1	Added Train Precision values to Emission Results. (pg 17-18)
			2.1	Added Corrected Emission values to report. (pg19-20)
			2	Dilution Tunnel Schematic and tunnel used added to report.(pg11-12)
			Appendix A	New Manual added. The manual was reviewed to ensure that adequate references to draft and draft-related performance was addressed in relation to the appliance type (a pellet stove in this case).
2/27/24	0135PS022E (Edition 002)	K. Morgan	Section 3.2 Pages 45 and 46	Added additional Barometer calibration data
			Appendix A Page 78	Added manufacturer's Installation Manual