Certification Test Report

Harman Home Heating

Freestanding Pellet Stove

Model: XXV

(Note: model name was changed from "XXV Touch" to "XXV" after testing was completed)

Prepared for:	Harman Home Heating 352 Mountain House Road Halifax, PA 17032
Prepared by:	OMNI-Test Laboratories, Inc. 13327 NE Airport Way Portland, OR 97230 (503) 643-3788
Test Period:	November 13-14, 2014
Report Date:	January 2015
Report Number:	0135PS033E

AUTHORIZED SIGNATORIES

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

Technician:

Jeremy Clark, Emissions Testing Specialist
OMNI-Test Laboratories, Inc.

QA Review:

Chuck Burns, Accreditation & QA Manager
OMNI-Test Laboratories, Inc.

Evaluation Decision:

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

1-23-15
Issue Date

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Section 1

Photographs/Appliance Description/Drawings

Harman Home Heating

XXV

Test Dates: November 13-14, 2014

APPLIANCE DESCRIPTION

Appliance Manufacturer: Harman Home Heating

Pellet Stove Model: XXV

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

PELLET HEATER DESCRIPTION

Materials of Construction: The firebox is constructed of mild steel with the exterior being constructed of steel and cast iron.

Air Introduction System: Air enters the firepot through holes in the firepot. Air is drawn through the pot via a combustion fan.

Combustion Control Mechanisms: Electronically controlled via user-selectable control panel.

Combustor: N/A.

Internal Baffles: N/A.

Other Features: Large capacity ash drawer.

Flue Outlet: The three-inch diameter flue outlet is located on the bottom-center of the unit.

PELLET HEATER OPERATING INSTRUCTIONS

Specific written instructions: See Section 3 of this report. All markings and instruction materials were reviewed for content prior to printing.

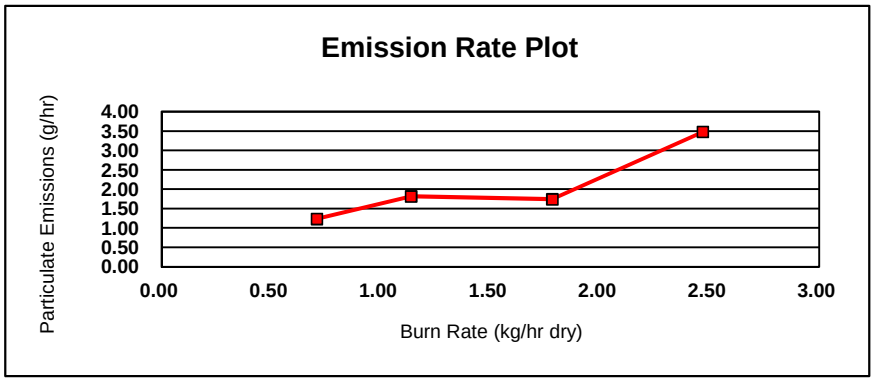
Section 4

Test Data by Run

EPA Weighted Average Emissions
EPA Method 28

Client:	Harman	Status:	Final
Stove Model:	XXV	Stove Type:	Pellet Stove
Test Dates:	11/13/14 - 11/14/14		
Project Number:	0135PS033E		
Tracking Number:	2022		

Weighted Average (g/hr)
1.76



Run #	4	
Burn Rate (dry kg/hr)	0.71	
Category	1	
Overall Efficiency (%)	78%	
Emissions (g/hr)	1.23	
Cap (g/hr)	15.00	
Weighting Factor	0.478	26.41%
Heat Output (BTU/hr)	10600	

Run #	3	
Burn Rate (dry kg/hr)	1.14	
Category	2	
Overall Efficiency (%)	78%	
Emissions (g/hr)	1.82	
Cap (g/hr)	15.00	
Weighting Factor	0.718	39.66%
Heat Output (BTU/hr)	17024	

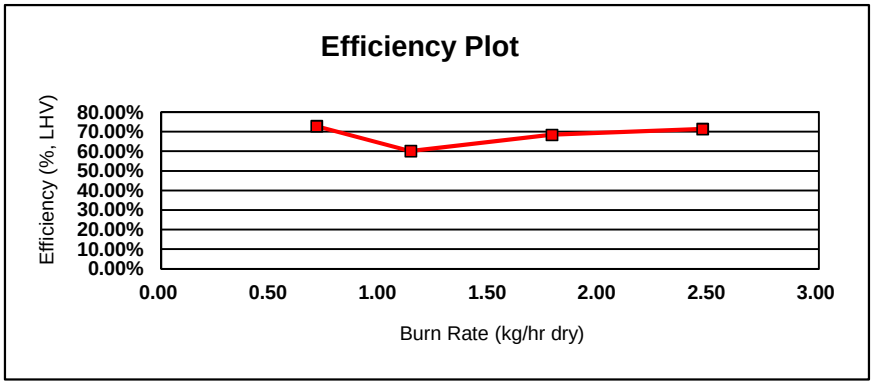
Run #	2	
Burn Rate (dry kg/hr)	1.78	
Category	3	
Overall Efficiency (%)	78%	
Emissions (g/hr)	1.74	
Cap (g/hr)	18.00	
Weighting Factor	0.482	26.63%
Heat Output (BTU/hr)	26660	

Run #	1	
Burn Rate (dry kg/hr)	2.47	
Category	4	
Overall Efficiency (%)	78%	
Emissions (g/hr)	3.48	
Cap (g/hr)	18.00	
Weighting Factor	0.132	7.30%
Heat Output (BTU/hr)	36939	

Weighted Average HHV Efficiency
CSA B415.1-10

Client:	Harman	Status:	Final
Stove Model:	XXV	Stove Type:	Pellet Stove
Test Dates:	11/13/14 - 11/14/14		
Project Number:	0135PS033E		
Tracking Number:	2022		

Weighted Average (%, HHV) 66.51%

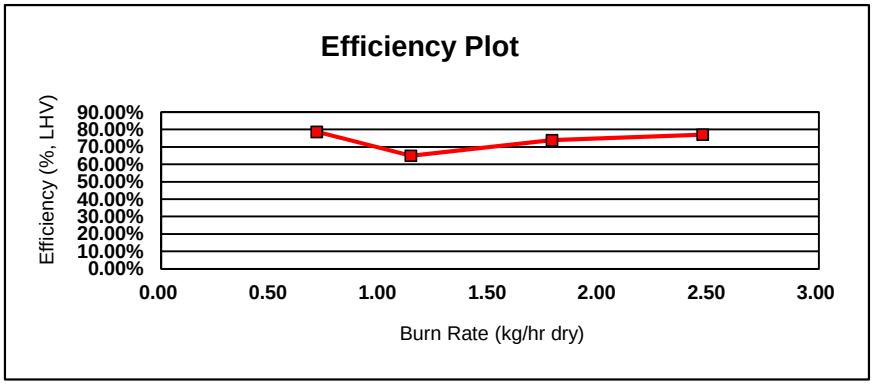


Run #	4	
Burn Rate (dry kg/hr)	0.71	
Category	1	
Efficiency (%)	72.83%	
Weighting Factor	0.478	26.41%
Run #	3	
Burn Rate (dry kg/hr)	1.14	
Category	2	
Efficiency (%)	60.13%	
Weighting Factor	0.718	39.66%
Run #	2	
Burn Rate (dry kg/hr)	1.78	
Category	3	
Efficiency (%)	68.41%	
Weighting Factor	0.482	26.63%
Run #	1	
Burn Rate (dry kg/hr)	2.47	
Category	4	
Efficiency (%)	71.37%	
Weighting Factor	0.132	7.30%

Weighted Average LHV Efficiency
CSA B415.1-10

Client:	Harman	Status:	Final
Stove Model:	XXV	Stove Type:	Pellet Stove
Test Dates:	11/13/14 - 11/14/14		
Project Number:	0135PS033E		
Tracking Number:	2022		

Weighted Average (%, LHV) 71.88%



Run #	4	
Burn Rate (dry kg/hr)	0.71	
Category	1	
Efficiency (%)	78.72%	
Weighting Factor	0.478	26.41%
Run #	3	
Burn Rate (dry kg/hr)	1.14	
Category	2	
Efficiency (%)	64.99%	
Weighting Factor	0.718	39.66%
Run #	2	
Burn Rate (dry kg/hr)	1.78	
Category	3	
Efficiency (%)	73.94%	
Weighting Factor	0.482	26.63%
Run #	1	
Burn Rate (dry kg/hr)	2.47	
Category	4	
Efficiency (%)	77.13%	
Weighting Factor	0.132	7.30%

Run 1

Wood Heater Test Data - EPA Method 5G

Manufacturer: Harman
Model: XXV Touch
Project No.: 0135PS033E
Tracking No.: 2022
Run: 1
Test Date: 11/13/14

Burn Rate	**2.47 kg/hr dry**
Average Tunnel Temperature	92 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	12.1 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	7878.8 dscf/hour
Average Delta p	0.032 inches H20
Average Delta H	1.42 inches H20
Total Time of Test	120 minutes

	AVERAGE	SAMPLE TRAIN 1	SAMPLE TRAIN 2
Total Sample Volume - Vm	15.48 cubic feet	15.32 cubic feet	15.63 cubic feet
Average Gas Meter Temperature	75 degrees Fahrenheit	76 degrees Fahrenheit	74 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	15.7 dscf	15.6 dscf	15.8 dscf
Total Particulates - mn		4.2 mg	4.5 mg
Particulate Concentration (dry-standard)	0.00028 grams/dscf	0.00027 grams/dscf	0.00028 grams/dscf
Particulate Emission Rate	2.18 grams/hour	2.13 grams/hour	2.24 grams/hour
Adjusted Emissions	**3.48 grams/hour**	3.40 grams/hour	3.56 grams/hour
Difference from Average		0.08 grams/hour	0.08 grams/hour
7.5% of the average emission rate	0.26		
Weighted Average Emission Rate Limit	4.10 grams/hour		
7.5% of the weighted average emission rate limit	0.31		

Results Are Acceptable

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Run: 1

Manufacturer: Harman
Model: XXV Touch
Tracking No.: 2022
Project No.: 0135PS033E
Test Date: 13-Nov-14
Beginning Clock Time: 17:11
Recording Interval: 10 min.
Total Sampling Time: 120 min.

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
Initial dP	0.028	0.034	0.034	0.034	0.024	0.036	0.034	0.030	"H2O
Initial Temp.	95	95	95	95	94	94	94	94	oF

OMNI Equipment Numbers: OMNI-00001, OMNI-00023, OMNI-00128, OMNI-00131, OMNI-00132, OMNI-00185, OMNI-00209, OMNI-283B, OMNI-00296-T57, OMNI-00335, OMNI-00336, OMNI-00343, OMNI-00410, OMNI-00417, OMNI-00439

PM Control Module: 371/372
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.56 lb/lb-mole
Dilution Tunnel H2O: 4.00 percent
Dilution Tunnel Static: -0.365 "H2O
Pitot Tube Cp: 0.99
Meter Box Y Factor: 1.024 (1) 1.017 (2)
Barometric Pressure: Begin 30.06, Middle 30.05, End 30.03, Average 30.05 "Hg

Tunnel Velocity: 12.10 ft/sec.
Intial Tunnel Flow: 130.8 scfm
Average Tunnel Flow: 131.3 scfm
Tunnel Area: 0.1963 ft2
Post-Test Leak Check (1): 0.000@-5 cfm@"Hg
Post-Test Leak Check (2): 0.000@-3 cfm@"Hg
Fuel Moisture (dry basis %): 5.63
Total Particulate (1): 4.2
Total Particulate (2): 4.5

Elapsed Time	Particulate Sampling Data														Fuel Weight, lb		Wood Heater Temperature Data, oF											Stack
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Meter oF (1)	Meter oF (2)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%) (1)	Pro. Rate (10%) (2)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Exit	Average Surface	Stack	Filter (1)	Filter (2)	Impinger exit (1)	Impinger exit (2)	Ambient	Draft In. H2O
0	0.000	0.000			0.70	0.70	68	68	1.53	1.6	95	0.032			11.5		890	513	1170	586	662	N/A	764.2	440	68	68	N/A	N/A	67	-0.052
10	1.299	1.324	0.13	0.13	1.57	1.36	70	69	0.36	0.7	89	0.032	103	103	10.5	-1	926	513	1184	594	672		777.8	444	71	72			67	-0.053
20	2.609	2.657	0.13	0.13	1.57	1.33	73	71	0.35	0.7	90	0.032	104	104	10.4	-0.1	944	514	1403	598	675		826.8	447	72	74			67	-0.053
30	3.916	3.984	0.13	0.13	1.55	1.32	75	73	0.32	0.7	90	0.032	103	103	8.6	-1.8	915	514	1282	594	669		794.8	451	73	75			68	-0.052
40	5.215	5.304	0.13	0.13	1.53	1.30	77	75	0.3	0.7	91	0.032	102	102	7.7	-0.9	932	515	1337	592	690		813.2	453	73	75			68	-0.052
50	6.508	6.620	0.13	0.13	1.52	1.29	78	76	0.29	0.6	90	0.032	102	101	6.7	-1	907	510	1312	597	680		801.2	448	73	75			68	-0.053
60	7.791	7.927	0.13	0.13	1.49	1.27	79	77	0.27	0.6	91	0.032	101	101	5.8	-0.9	934	516	1428	595	685		831.6	451	74	75			68	-0.052
70	9.066	9.228	0.13	0.13	1.47	1.26	79	77	0.25	0.6	90	0.032	100	100	4.8	-1	908	509	1409	583	699		821.6	451	73	75			68	-0.052
80	10.337	10.524	0.13	0.13	1.44	1.25	79	77	0.22	0.6	89	0.032	100	100	3.9	-0.9	928	516	1476	605	703		845.6	454	73	74			67	-0.052
90	11.599	11.812	0.13	0.13	1.44	1.23	79	77	0.2	0.6	88	0.032	99	99	2.9	-1	938	514	1613	592	698		871.0	453	72	74			65	-0.053
100	12.850	13.092	0.13	0.13	1.40	1.22	78	76	0.17	0.5	88	0.032	98	98	2.0	-0.9	923	511	1420	589	716		831.8	450	72	73			65	-0.052
110	14.091	14.365	0.12	0.13	1.40	1.21	78	76	0.16	0.5	103	0.032	99	99	1.0	-1	905	506	1505	581	689		837.2	445	71	73			65	-0.053
120	15.322	15.630	0.12	0.13	1.37	1.20	78	76	0.13	0.5	102	0.032	98	98	0.0	-1	930	510	1400	592	715		829.4	451	71	72			65	-0.053
Avg/Total	15.322	15.630	0.13	0.13	1.42	1.23	76.23	74.46			92.0	0.032	100.62	100.65									65.2		72.00	73.46	#DIV/0!	#DIV/0!		-0.052

OMNI-Test Laboratories, Inc.

Manufacturer:	Harman	**Technicians:**	J. Clark
Model:	XXV		
Date:	11/13/14		
Run:	1		
Control #:	2022		
Test Duration:	120		
Output Category:	Category 4		

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	71.4%	77.1%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	72%	77.5%

Output Rate (kJ/h)	34,916	33,122	**(Btu/h)**
Burn Rate (kg/h)	2.47	5.44	**(lb/h)**
Input (kJ/h)	48,926	46,412	**(Btu/h)**

Test Load Weight (dry kg)	4.94	10.89	**dry lb**
MC wet (%)	5.332814325		
MC dry (%)	5.63		
Particulate (g)	0		
CO (g)	37		
Test Duration (h)	2.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.00	0.53
g/kg Dry Fuel	0.00	7.50
g/h	0.00	18.52
lb/MM Btu Output	0.00	1.23

Air/Fuel Ratio (A/F)	14.26

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

VERSION: 2.3 3/23/2010

Manufacturer: Harman
Model: XXV
Date: 11/13/2014
Run: 1
Control #: 2022
Test Duration: 120
Output Category: Category 4

Appliance Type: Pellet (Cat, Non-Cat, Pellet)

Temp. Units F (F or C)
Weight Units lb (kg or lb)

Default Fuel Values

	D. Fir	Oak
HHV (kJ/kg)	19,810	19,887
%C	48.73	50
%H	6.87	6.6
%O	43.9	42.9
%Ash	0.5	0.5

Wood Moisture (% wet): 5.33
Load Weight (lb wet): 11.50
Burn Rate (dry kg/h): 2.47
Total Particulate Emissions: g

Fuel Data

	D. Fir	
HHV	19810	kJ/kg
%C	48.73	
%H	6.87	
%O	43.9	
%Ash	0.5	

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurence and the next reading showing a decrease in weight.

Averages		**0.05**	**7.71**	**#DIV/0!**	**449.08**	**66.77**
					Temp. (ºF)	
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas Composition (%) CO**	**CO_2**	**O_2**	**Flue Gas**	**Room Temp**
0	11.50	0.03	7.53		440.0	67.0
10	10.50	0.03	6.95		444.0	67.0
20	10.40	0.03	7.61		447.0	67.0
30	8.60	0.04	7.54		451.0	68.0
40	7.70	0.06	7.84		453.0	68.0
50	6.70	0.11	8.38		448.0	68.0
60	5.80	0.05	7.66		451.0	68.0
70	4.80	0.05	7.89		451.0	68.0
80	3.90	0.03	7.51		454.0	67.0
90	2.90	0.03	8.02		453.0	65.0
100	2.00	0.05	7.85		450.0	65.0
110	1.00	0.05	7.46		445.0	65.0
120	0.00	0.08	7.96		451.0	65.0

Method 28 Preburn Data

Run Data

Client:	Harman	Test Run:	1
Model:	XXV	Date:	11/13/2014
Project Number:	0135PS033E	Test Crew:	J. Clark, A. Kravitz
Tracking Number:	2022	Equipment:	185, 335, 336
	Coal Bed Range (lb): N/A (pellet)		

Logged Data

			Temperatures (F)								
Elapsed Time (min)	Scale (lb)	Stack Draft (in H2O)	Stack	Ambient	FB Top	FB Bottom	FB Back	FB Left	FB Right	Cat. In	Cat. Out
0	31.4	-0.015	343	64	74	380	1822	3218	488	N/A	N/A
10	30.5	-0.016	402	65	819	458	1870	3218	602		
20	29.5	-0.015	424	66	865	493	1140	565	636		
30	28.6	-0.016	437	66	909	510	1503	591	655		
40	51.2	-0.016	409	66	726	483	498	485	540		
50	50.4	-0.016	432	66	873	504	1048	586	651		
60	49.4	-0.016	440	67	894	513	1057	590	671		
	Averages:	-0.016	412.43	65.71	737.14	477.29	1276.86	1321.86	606.14		

OMNI-Test Laboratories, Inc.

Method 28 Run Sheets

Client: **Harman** Project Number: **0135PS033E** Run Number: 1

Model: **XXV** Tracking Number: **2022** Date: 11/13/14

Test Crew: **A. Kravitz, J. Clark**

OMNI Equipment ID numbers: 23, 131, 132, 209, 288, 343, 371, 372, 410, 420, 559

Pellet Run Notes

Preburn Settings

Target Output (Category): IV

Target Output (dry kg/hr): Max

Preburn Notes

TIME	NOTES
20:00	fired FB TC's
34:00	+23.4 lb

Test Settings

Target Output (Category): IV

Target Output (dry kg/hr): Max

Test Notes

TIME	NOTES
	Test started @ gas logger ET = 13:00 Test settings Temp = 7.00 Feed = 6.00 Mode = Stoker High Draft = -.00 V

Technician Signature: _____ Date: 11/13/14

OMNI-Test Laboratories, Inc.

Method 28 Run Sheets

Client: **Harman** Project Number: **0135PS033E** Run Number: 1
Model: **XXV** Tracking Number: **2022** Date: 11/13/14
Test Crew: **A. Kravitz, J. Clark**
OMNI Equipment ID numbers: 23, 131, 132, 209, 288, 343, 371, 372, 410, 420, 559

Pellet Supplemental Data

Start Time: 5:11 Booth #: E2
Stop Time: 7:11

Stack Gas Leak Check:
Initial: 6 Final: Ø

Sample Train Leak Check:
A: 0.004 @ -5 "Hg
B: 0.000 @ -3 "Hg

Calibrations: Span Gas CO_2: 16.90 O_2: N/A CO: 4.295
Mid Gas CO_2: 9.87 O_2: N/A CO: 2.493

	Pre Test			Post Test		
	Zero	Span	Mid	Zero	Span	Mid
Time	16:46	16:49	16:50	22:32	22:31	22:29
O_2	N/A	N/A	N/A	N/A	N/A	N/A
CO_2	0.00	16.80	10.18	0.28	17.04	10.38
CO	0.000	4.296	2.504	0.023	4.290	2.477

Air Velocity (ft/min): Initial: <50 Final: <50
Scale Audit (lbs): Initial: 10.0 Final: 10.0
Pitot Tube Leak Test: Initial: Ø Final: Ø
Stack Diameter (in): 3
Induced Draft: 0
% Smoke Capture: 100
Flue Pipe Cleaned Prior to First Test in Series:
Date: 11/13/14 Initials: AK

	Initial	Middle	Ending
P_b (in/Hg)	30.06	30.05	30.03
Ambient (°F)	67	68	65

Tunnel Traverse	
dP (in H_2O)	T(°F)
0.028	95
0.034	↓
0.034	↓
0.034	↓
0.024	94
0.031	↓
0.034	↓
0.030	↓
N/A	N/A
↓	↓
↓	↓
↓	↓
Static P:	-0.365

Technician Signature: _____ Date: 11/13/14

Run 2

Wood Heater Test Data - EPA Method 5G

Manufacturer: Harman
Model: XXV Touch
Project No.: 0135PS033E
Tracking No.: 2022
Run: 2
Test Date: 11/13/14

Burn Rate	**1.78 kg/hr dry**
Average Tunnel Temperature	80 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	12.3 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8182.1 dscf/hour
Average Delta p	0.034 inches H20
Average Delta H	1.44 inches H20
Total Time of Test	120 minutes

	AVERAGE	SAMPLE TRAIN 1	SAMPLE TRAIN 2
Total Sample Volume - Vm	15.75 cubic feet	15.39 cubic feet	16.10 cubic feet
Average Gas Meter Temperature	76 degrees Fahrenheit	77 degrees Fahrenheit	75 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	16.0 dscf	15.6 dscf	16.3 dscf
Total Particulates - mn		1.8 mg	1.9 mg
Particulate Concentration (dry-standard)	0.00012 grams/dscf	0.00012 grams/dscf	0.00012 grams/dscf
Particulate Emission Rate	0.95 grams/hour	0.94 grams/hour	0.95 grams/hour
Adjusted Emissions	**1.74 grams/hour**	1.73 grams/hour	1.75 grams/hour
Difference from Average		0.01 grams/hour	0.01 grams/hour
7.5% of the average emission rate	0.13		
Weighted Average Emission Rate Limit	4.10 grams/hour		
7.5% of the weighted average emission rate limit	0.31		

Results Are Acceptable

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Run: 2

Manufacturer: Harman
Model: XXV Touch
Tracking No.: 2022
Project No.: 0135PS033E
Test Date: 13-Nov-14
Beginning Clock Time: 20:19
Recording Interval: 10 min.
Total Sampling Time: 120 min.

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
Initial dP	0.030	0.036	0.038	0.032	0.030	0.036	0.036	0.030	"H2O
Initial Temp.	83	83	83	83	81	81	81	81	oF

OMNI Equipment Numbers: OMNI-00001, OMNI-00023, OMNI-00128, OMNI-00131, OMNI-00132, OMNI-00185, OMNI-00209, OMNI-283B, OMNI-00296-T57, OMNI-00335, OMNI-00336, OMNI-00343, OMNI-00410, OMNI-00417, OMNI-00439

PM Control Module: N/A
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.56 lb/lb-mole
Dilution Tunnel H2O: 4.00 percent
Dilution Tunnel Static: -0.375 "H2O
Pitot Tube Cp: 0.99
Meter Box Y Factor: 1.024 (1) 1.017 (2)
Barometric Pressure: Begin 30.04, Middle 30.04, End 30.05, Average 30.04 "Hg

Tunnel Velocity: 12.29 ft/sec.
Intial Tunnel Flow: 135.9 scfm
Average Tunnel Flow: 136.4 scfm
Tunnel Area: 0.1963 ft2
Post-Test Leak Check (1): 0.000@-5 cfm@"Hg
Post-Test Leak Check (2): 0.000@-3 cfm@"Hg
Fuel Moisture (dry basis %): 5.63
Total Particulate (1): 1.8
Total Particulate (2): 1.9

Elapsed Time	Particulate Sampling Data														Fuel Weight, lb		Wood Heater Temperature Data, oF												Stack
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Meter oF (1)	Meter oF (2)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%) (1)	Pro. Rate (10%) (2)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Exit	Average Surface	Stack	Filter (1)	Filter (2)	Impinger exit (1)	Impinger exit (2)	Ambient	Draft In. H2O
0	0.000	0.000			0.70	0.70	72	71	0.38	0.7	82	0.034			8.3		707	412	541	471	534	N/A	533.0	375	72	73	N/A	N/A	67	-0.043
10	1.276	1.340	0.13	0.13	1.52	1.38	73	71	0.39	0.5	81	0.034	101	101	7.6	-0.7	718	409	545	456	530		531.6	376	72	74			67	-0.044
20	2.560	2.684	0.13	0.13	1.51	1.35	75	73	0.39	0.4	81	0.034	101	101	6.9	-0.7	724	413	540	456	533		533.2	379	72	74			67	-0.044
30	3.842	4.024	0.13	0.13	1.50	1.35	76	74	0.39	0.4	80	0.034	101	101	6.2	-0.7	739	417	602	477	543		555.6	381	73	74			67	-0.044
40	5.122	5.364	0.13	0.13	1.50	1.35	78	75	0.39	0.4	82	0.034	101	101	5.5	-0.7	746	421	596	474	559		559.2	384	73	75			67	-0.044
50	6.405	6.704	0.13	0.13	1.50	1.34	79	76	0.39	0.5	82	0.034	101	101	4.8	-0.7	735	417	639	470	562		564.6	375	73	75			67	-0.045
60	7.688	8.045	0.13	0.13	1.50	1.33	79	76	0.38	0.5	80	0.034	100	100	4.1	-0.7	717	410	528	443	543		528.2	373	72	74			67	-0.044
70	8.972	9.388	0.13	0.13	1.49	1.34	79	76	0.39	0.5	79	0.034	100	100	3.4	-0.7	723	407	592	463	559		548.8	371	72	73			66	-0.044
80	10.256	10.732	0.13	0.13	1.49	1.35	79	76	0.38	0.5	79	0.034	100	101	2.7	-0.7	724	408	614	479	549		554.8	375	71	73			65	-0.043
90	11.541	12.075	0.13	0.13	1.49	1.34	79	76	0.38	0.5	79	0.034	101	100	2.1	-0.6	733	411	614	473	544		555.0	379	71	72			65	-0.044
100	12.825	13.417	0.13	0.13	1.50	1.34	78	75	0.39	0.5	78	0.034	101	101	1.3	-0.8	698	410	664	471	539		556.4	380	70	72			64	-0.046
110	14.109	14.759	0.13	0.13	1.49	1.34	78	75	0.37	0.5	78	0.034	101	101	0.7	-0.6	715	412	631	454	554		553.2	382	70	72			63	-0.045
120	15.392	16.101	0.13	0.13	1.50	1.35	78	75	0.38	0.5	78	0.034	100	101	0.0	-0.7	720	409	600	443	551		544.6	372	69	72			64	-0.045
Avg/Total	15.392	16.101	0.13	0.13	1.44	1.30	77.15	74.54			79.9	0.034	100.67	100.70									11.6		71.54	73.31	#DIV/0!	#DIV/0!		-0.044

OMNI-Test Laboratories, Inc.

Manufacturer:	Harman	**Technicians:**	J. Clark
Model:	XXV		
Date:	11/13/14		
Run:	2		
Control #:	2022		
Test Duration:	120		
Output Category:	Category 3		

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	68.4%	73.9%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	69%	74.3%

Output Rate (kJ/h)	24,156	22,915	**(Btu/h)**
Burn Rate (kg/h)	1.78	3.93	**(lb/h)**
Input (kJ/h)	35,312	33,497	**(Btu/h)**

Test Load Weight (dry kg)	3.57	7.86	**dry lb**
MC wet (%)	5.332814325		
MC dry (%)	5.63		
Particulate (g)	0		
CO (g)	10		
Test Duration (h)	2.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.00	0.22
g/kg Dry Fuel	0.00	2.92
g/h	0.00	5.21
lb/MM Btu Output	0.00	0.50

Air/Fuel Ratio (A/F)	20.05

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

VERSION: 2.3 3/23/2010

Manufacturer: Harman
Model: XXV
Date: 11/13/2014
Run: 2
Control #: 2022
Test Duration: 120
Output Category: Category 3

Appliance Type: Pellet (Cat, Non-Cat, Pellet)

Temp. Units F (F or C)
Weight Units lb (kg or lb)

Wood Moisture (% wet): 5.33
Load Weight (lb wet): 8.30
Burn Rate (dry kg/h): 1.78
Total Particulate Emissions: g

Fuel Data

	D. Fir	
HHV	19810	kJ/kg
%C	48.73	
%H	6.87	
%O	43.9	
%Ash	0.5	

Default Fuel Values

	D. Fir	Oak
HHV (kJ/kg)	19,810	19,887
%C	48.73	50
%H	6.87	6.6
%O	43.9	42.9
%Ash	0.5	0.5

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurence and the next reading showing a decrease in weight.

Averages	**0.01**	**5.28**	**#DIV/0!**	**377.08**	**65.85**	
				Temp. (ºF)		
Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Flue Gas	Room Temp
0	8.30	0.02	5.12		375.0	67.0
10	7.60	0.02	4.85		376.0	67.0
20	6.90	0.01	5.43		379.0	67.0
30	6.20	0.02	5.55		381.0	67.0
40	5.50	0.02	5.32		384.0	67.0
50	4.80	0.01	5.37		375.0	67.0
60	4.10	0.01	5.12		373.0	67.0
70	3.40	0.01	5.73		371.0	66.0
80	2.70	0.01	5.31		375.0	65.0
90	2.10	0.01	5.29		379.0	65.0
100	1.30	0.01	5.13		380.0	64.0
110	0.70	0.01	5.14		382.0	63.0
120	0.00	0.01	5.24		372.0	64.0

Method 28 Preburn Data

Run Data

Client:	Harman	Test Run:	2
Model:	XXV	Date:	11/13/2014
Project Number:	0135PS033E	Test Crew:	J. Clark, A. Kravitz
Tracking Number:	2022	Equipment:	185, 335, 336
	Coal Bed Range (lb): N/A (pellet)		

Logged Data

			Temperatures (F)								
Elapsed Time (min)	Scale (lb)	Stack Draft (in H2O)	Stack	Ambient	FB Top	FB Bottom	FB Back	FB Left	FB Right	Cat. In	Cat. Out
0	35.6	-0.004	425	65	836	483	832	513	630	N/A	N/A
10	34.9	-0.004	400	65	772	443	900	482	591		
20	34.1	-0.004	392	65	764	434	887	502	592		
30	33.4	-0.004	385	66	739	424	788	477	551		
40	32.8	-0.004	375	66	723	417	767	463	545		
50	32.1	-0.004	376	67	715	413	695	465	536		
60	31.3	-0.004	374	67	706	412	520	466	535		
	Averages:	-0.004	389.57	65.86	750.71	432.29	769.86	481.14	568.57		

OMNI-Test Laboratories, Inc.

Method 28 Run Sheets

Client: **Harman** Project Number: **0135PS033E** Run Number: 2

Model: **XXV** Tracking Number: **2022** Date: 11/13/14

Test Crew: **A. Kravitz, J. Clark**

OMNI Equipment ID numbers: 23, 131, 132, 209, 288, 343, 371, 372, 410, 420, 559

Pellet Run Notes

Preburn Settings

Target Output (Category): III

Target Output (dry kg/hr): 1.25 - 1.90

Preburn Notes

TIME	NOTES
	N/A

Test Settings

Target Output (Category): III

Target Output (dry kg/hr): 1.25 - 1.90

Test Notes

TIME	NOTES
	Test started at gas data file ET 201 minutes. Test Settings: Temp = 5.89 Feed = 3.89 Mode = Stove High Draft = - 00 v

Technician Signature: _____ Date: 11/13/14

OMNI-Test Laboratories, Inc.

Method 28 Run Sheets

Client: Harman | Project Number: 0135PS033E | Run Number: 2
Model: XXV | Tracking Number: 2022 | Date: 11/13/14
Test Crew: A. Kravitz, J. Clark
OMNI Equipment ID numbers: 23, 131, 132, 209, 288, 343, 371, 372, 410, 420, 559

Pellet Supplemental Data

Start Time: 20:19 | Booth #: E2
Stop Time: 22:19

Stack Gas Leak Check:
Initial: Ø Final: Ø

Sample Train Leak Check:
A: 0.000 @ -5 "Hg
B: 0.000 @ -3 "Hg

Calibrations: Span Gas CO_2: 16.90 O_2: N/A CO: 4.295
Mid Gas CO_2: 9.87 O_2: N/A CO: 2.493

	Pre Test			Post Test		
Time	Zero	Span	Mid	Zero	Span	Mid
	16:48	16:49	16:50	22:32	22:31	22:29
O_2	N/A	N/A	N/A	N/A	N/A	N/A
CO_2	0.00	16.80	10.18	0.28	17.04	10.38
CO	0.000	4.296	2.504	0.023	4.290	2.477

Air Velocity (ft/min): Initial: <50 Final: <50
Scale Audit (lbs): Initial: 10.0 Final: 10.0
Pitot Tube Leak Test: Initial: Ø Final: Ø
Stack Diameter (in): 3
Induced Draft: 0
% Smoke Capture: 100
Flue Pipe Cleaned Prior to First Test in Series:
Date: 11/13/14 Initials: JC

	Initial	Middle	Ending
P_b (in/Hg)	30.04	30.04	30.05
Ambient (°F)	67	67	63

Tunnel Traverse	
dP (in H_2O)	T(°F)
0.030	83
0.036	↓
0.038	↓
0.032	↓
0.030	81
036	↓
0.036	↓
0.030	↓
N/A	N/A
↓	↓
↓	↓
↓	↓
Static P:	-0.375

Technician Signature: [signature] Date: 11/13/14

Run 3

Wood Heater Test Data - EPA Method 5G

Manufacturer: Harman
Model: XXV Touch
Project No.: 0135PS033E
Tracking No.: 2022
Run: 3
Test Date: 11/13/14

Burn Rate	**1.14 kg/hr dry**
Average Tunnel Temperature	77 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	12.3 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8236.2 dscf/hour
Average Delta p	0.034 inches H20
Average Delta H	1.45 inches H20
Total Time of Test	120 minutes

	AVERAGE	SAMPLE TRAIN 1	SAMPLE TRAIN 2
Total Sample Volume - Vm	15.81 cubic feet	15.46 cubic feet	16.15 cubic feet
Average Gas Meter Temperature	74 degrees Fahrenheit	76 degrees Fahrenheit	73 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	16.1 dscf	15.7 dscf	16.4 dscf
Total Particulates - mn		1.8 mg	2.1 mg
Particulate Concentration (dry-standard)	0.00012 grams/dscf	0.00011 grams/dscf	0.00013 grams/dscf
Particulate Emission Rate	1.00 grams/hour	0.94 grams/hour	1.05 grams/hour
Adjusted Emissions	**1.82 grams/hour**	1.73 grams/hour	1.90 grams/hour
Difference from Average		0.09 grams/hour	0.09 grams/hour
7.5% of the average emission rate	0.14		
Weighted Average Emission Rate Limit	4.10 grams/hour		
7.5% of the weighted average emission rate limit	0.31		

Results Are Acceptable

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Run: 3

Manufacturer: Harman
Model: XXV Touch
Tracking No.: 2022
Project No.: 0135PS033E
Test Date: 13-Nov-14
Beginning Clock Time: 23:28
Recording Interval: 10 min.
Total Sampling Time: 120 min.

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
Initial dP	0.032	0.036	0.038	0.030	0.030	0.034	0.036	0.034	"H2O
Initial Temp.	74	74	74	74	74	74	74	74	oF

OMNI Equipment Numbers: OMNI-00001, OMNI-00023, OMNI-00128, OMNI-00131, OMNI-00132, OMNI-00185, OMNI-00209, OMNI-283B, OMNI-00296-T57, OMNI-00335, OMNI-00336, OMNI-00343, OMNI-00410, OMNI-00417, OMNI-00439

PM Control Module: N/A
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.56 lb/lb-mole
Dilution Tunnel H2O: 4.00 percent
Dilution Tunnel Static: -0.371 "H2O
Pitot Tube Cp: 0.99
Meter Box Y Factor: 1.024 (1) 1.017 (2)
Barometric Pressure: Begin 30.05, Middle 30.07, End 30.10, Average 30.07 "Hg

Tunnel Velocity: 12.30 ft/sec.
Intial Tunnel Flow: 137.6 scfm
Average Tunnel Flow: 137.3 scfm
Tunnel Area: 0.1963 ft2
Post-Test Leak Check (1): 0.000@-5 cfm@"Hg
Post-Test Leak Check (2): 0.000@-3 cfm@"Hg
Fuel Moisture (dry basis %): 5.63
Total Particulate (1): 1.8
Total Particulate (2): 2.1

Elapsed Time	Particulate Sampling Data														Fuel Weight, lb		Wood Heater Temperature Data, oF												Stack
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Meter oF (1)	Meter oF (2)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%) (1)	Pro. Rate (10%) (2)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Exit	Average Surface	Stack	Filter (1)	Filter (2)	Impinger exit (1)	Impinger exit (2)	Ambient	Draft In. H2O
0	0.000	0.000			0.70	0.70	70	69	0.41	0.5	74	0.034			5.3		478	300	472	328	393	N/A	394.2	286	65	65	N/A	N/A	63	-0.027
10	1.289	1.352	0.13	0.14	1.54	1.38	70	69	0.41	0.6	77	0.034	102	102	4.8	-0.5	480	300	523	323	376		400.4	288	67	68			63	-0.027
20	2.580	2.702	0.13	0.14	1.52	1.37	72	70	0.41	0.6	76	0.034	101	102	4.4	-0.4	476	299	491	329	367		392.4	287	68	69			64	-0.029
30	3.869	4.047	0.13	0.13	1.50	1.36	74	71	0.41	0.6	77	0.034	101	101	4.0	-0.4	476	298	466	335	373		389.6	289	69	70			64	-0.027
40	5.159	5.392	0.13	0.13	1.51	1.35	75	73	0.41	0.6	78	0.034	101	101	3.5	-0.5	498	302	432	337	393		392.4	293	69	70			64	-0.027
50	6.446	6.738	0.13	0.13	1.52	1.36	76	73	0.4	0.6	78	0.034	101	101	3.1	-0.4	502	305	445	332	388		394.4	295	70	71			64	-0.029
60	7.735	8.084	0.13	0.13	1.51	1.36	77	74	0.4	0.6	77	0.034	100	101	2.6	-0.5	492	299	467	328	386		394.4	290	70	71			65	-0.031
70	9.024	9.431	0.13	0.13	1.50	1.35	77	75	0.41	0.6	77	0.034	100	100	2.2	-0.4	481	300	434	321	377		382.6	289	70	71			65	-0.031
80	10.313	10.777	0.13	0.13	1.51	1.35	78	75	0.4	0.6	78	0.034	100	100	1.7	-0.5	485	302	426	326	377		383.2	291	70	71			65	-0.030
90	11.601	12.123	0.13	0.13	1.51	1.35	78	75	0.4	0.6	78	0.034	100	100	1.3	-0.4	477	295	455	316	368		382.2	286	70	72			65	-0.029
100	12.890	13.467	0.13	0.13	1.50	1.35	78	76	0.4	0.6	78	0.034	100	100	0.9	-0.4	491	297	454	329	388		391.8	290	71	72			65	-0.030
110	14.177	14.811	0.13	0.13	1.51	1.34	79	76	0.39	0.6	80	0.034	100	100	0.4	-0.5	485	302	433	321	370		382.2	291	71	72			65	-0.030
120	15.465	16.153	0.13	0.13	1.50	1.34	79	76	0.4	0.6	78	0.034	100	100	0.0	-0.4	479	298	406	327	370		376.0	292	71	72			65	-0.030
Avg/Total	15.465	16.153	0.13	0.13	1.45	1.30	75.62	73.23			77.4	0.034	100.71	100.73									18.2		69.31	70.31	#DIV/0!	#DIV/0!		-0.029

OMNI-Test Laboratories, Inc.

Manufacturer:	Harman	**Technicians:**	J. Clark
Model:	XXV		
Date:	11/13/14		
Run:	3		
Control #:	2022		
Test Duration:	120		
Output Category:	Category 2		

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	60.1%	65.0%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	60%	65.3%

Output Rate (kJ/h)	13,558	12,861	**(Btu/h)**
Burn Rate (kg/h)	1.14	2.51	**(lb/h)**
Input (kJ/h)	22,549	21,390	**(Btu/h)**

Test Load Weight (dry kg)	2.28	5.02	**dry lb**
MC wet (%)	5.332814325		
MC dry (%)	5.63		
Particulate (g)	0		
CO (g)	17		
Test Duration (h)	2.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.00	0.62
g/kg Dry Fuel	0.00	7.38
g/h	0.00	8.40
lb/MM Btu Output	0.00	1.44

Air/Fuel Ratio (A/F)	35.39

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

VERSION: 2.3 3/23/2010

Manufacturer: Harman
Model: XXV
Date: 11/13/2014
Run: 3
Control #: 2022
Test Duration: 120
Output Category: Category 2

Appliance Type: Pellet (Cat, Non-Cat, Pellet)

Temp. Units F (F or C)
Weight Units lb (kg or lb)

Wood Moisture (% wet): 5.33
Load Weight (lb wet): 5.30
Burn Rate (dry kg/h): 1.14
Total Particulate Emissions: g

Fuel Data

	D. Fir	
HHV	19810	kJ/kg
%C	48.73	
%H	6.87	
%O	43.9	
%Ash	0.5	

Default Fuel Values

	D. Fir	Oak
HHV (kJ/kg)	19,810	19,887
%C	48.73	50
%H	6.87	6.6
%O	43.9	42.9
%Ash	0.5	0.5

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurence and the next reading showing a decrease in weight.

Averages		**0.02**	**2.64**	**#DIV/0!**	**289.77**	**64.38**
					Temp. (ºF)	
Elapsed Time (min)	**Fuel Weight Remaining (lb)**	**Flue Gas Composition (%) CO**	**CO_2**	**O_2**	**Flue Gas**	**Room Temp**
0	5.30	0.01	2.33		286.0	63.0
10	4.80	0.02	2.69		288.0	63.0
20	4.40	0.03	2.52		287.0	64.0
30	4.00	0.03	2.74		289.0	64.0
40	3.50	0.02	2.80		293.0	64.0
50	3.10	0.01	2.95		295.0	64.0
60	2.60	0.02	2.65		290.0	65.0
70	2.20	0.02	2.41		289.0	65.0
80	1.70	0.01	2.90		291.0	65.0
90	1.30	0.01	2.38		286.0	65.0
100	0.90	0.01	2.57		290.0	65.0
110	0.40	0.01	2.70		291.0	65.0
120	0.00	0.00	2.62		292.0	65.0

Method 28 Preburn Data

Run Data

Client:	Harman	Test Run:	3
Model:	XXV	Date:	11/13/2014
Project Number:	0135PS033E	Test Crew:	J. Clark, A. Kravitz
Tracking Number:	2022	Equipment:	185, 335, 336
	Coal Bed Range (lb): N/A (pellet)		

Logged Data

			Temperatures (F)								
Elapsed Time (min)	Scale (lb)	Stack Draft (in H2O)	Stack	Ambient	FB Top	FB Bottom	FB Back	FB Left	FB Right	Cat. In	Cat. Out
0	22.5	-0.004	367	63	663	404	535	430	508	N/A	N/A
10	22	-0.004	322	63	547	349	440	357	424		
20	21.6	-0.004	312	63	529	333	408	354	411		
30	21.2	-0.004	297	62	491	314	376	335	392		
40	20.7	-0.004	294	62	486	308	383	326	392		
50	20.3	-0.004	289	62	473	303	476	316	379		
60	19.9	-0.004	285	63	471	300	449	325	390		
	Averages:	-0.004	309.43	62.57	522.86	330.14	438.14	349.00	413.71		

OMNI-Test Laboratories, Inc.

Method 28 Run Sheets

Client: **Harman** Project Number: **0135PS033E** Run Number: 3

Model: **XXV** Tracking Number: **2022** Date: 11/13/14

Test Crew: **A. Kravitz, J. Clark**

OMNI Equipment ID numbers: 23, 131, 132, 209, 288, 343, 371, 372, 410, 420, 559

Pellet Run Notes

Preburn Settings

Target Output (Category): II

Target Output (dry kg/hr): 0.80 - 1.25

Preburn Notes

TIME	NOTES
	N/A

Test Settings

Target Output (Category): II

Target Output (dry kg/hr): 0.80 - 1.25

Test Notes

TIME	NOTES
	Test started at gas data file ET 389 minutes. Test Settings: Temp = 2.99 Feed = 2.17 Mode = Stove High Draft = -.00 v

Technician Signature: _____ Date: 11/13/14

OMNI-Test Laboratories, Inc.

Method 28 Run Sheets

Client: **Harman** Project Number: **0135PS033E** Run Number: 3
Model: **XXV** Tracking Number: **2022** Date: 11/13/14
Test Crew: **A. Kravitz, J. Clark**
OMNI Equipment ID numbers: 23, 131, 132, 209, 288, 343, 371, 372, 410, 420, 559

Pellet Supplemental Data

Start Time: 23:28 11/13/14
Stop Time: 01:28 11/14/14

Booth #: E2

Stack Gas Leak Check:
Initial: Ø Final: Ø

Sample Train Leak Check:
A: 0.000 @ -5 "Hg
B: 0.000 @ -3 "Hg

Calibrations: Span Gas CO_2: 16.90 O_2: N/A CO: 4.295
Mid Gas CO_2: 9.87 O_2: N/A CO: 2.493

	Pre Test			Post Test		
	Zero	Span	Mid	Zero	Span	Mid
Time	20:33	20:35	20:36	01:37	01:36	01:34
O_2	N/A	N/A	N/A	N/A	N/A	N/A
CO_2	0.00	16.80	10.03	-0.01	16.73	9.89
CO	0.000	4.295	2.500	0.004	4.275	2.461

Air Velocity (ft/min): Initial: <50 Final: <50
Scale Audit (lbs): Initial: 10.0 Final: 10.0
Pitot Tube Leak Test: Initial: Ø Final: Ø
Stack Diameter (in): 3
Induced Draft: 0
% Smoke Capture: 100
Flue Pipe Cleaned Prior to First Test in Series:
Date: 11/13/14 Initials: AK

Tunnel Traverse	
dP (in H_2O)	T(°F)
0.032	74
0.036	↓
0.038	
0.030	
0.030	
0.034	
0.036	
0.034	
N/A	N/A
↓	↓
Static P:	-0.371

	Initial	Middle	Ending
P_b (in/Hg)	30.05	30.07	30.10
Ambient (°F)	63	65	65

Technician Signature: [signature] Date: 11/14/14

Run 4

Wood Heater Test Data - EPA Method 5G

Manufacturer: Harman
Model: XXV Touch
Project No.: 0135PS033E
Tracking No.: 2022
Run: 4
Test Date: 11/14/14

Burn Rate	**0.71 kg/hr dry**
Average Tunnel Temperature	71 degrees Fahrenheit
Average Gas Velocity in Dilution Tunnel - vs	12.3 feet/second
Average Gas Flow Rate in Dilution Tunnel - Qsd	8389.2 dscf/hour
Average Delta p	0.035 inches H20
Average Delta H	1.46 inches H20
Total Time of Test	120 minutes

	AVERAGE	SAMPLE TRAIN 1	SAMPLE TRAIN 2
Total Sample Volume - Vm	15.81 cubic feet	15.49 cubic feet	16.12 cubic feet
Average Gas Meter Temperature	74 degrees Fahrenheit	75 degrees Fahrenheit	73 degrees Fahrenheit
Total Sample Volume (Standard Conditions) - Vmstd	16.1 dscf	15.8 dscf	16.4 dscf
Total Particulates - mn		1.3 mg	1.1 mg
Particulate Concentration (dry-standard)	0.00007 grams/dscf	0.00008 grams/dscf	0.00007 grams/dscf
Particulate Emission Rate	0.63 grams/hour	0.69 grams/hour	0.56 grams/hour
Adjusted Emissions	**1.23 grams/hour**	1.34 grams/hour	1.13 grams/hour
Difference from Average		0.10 grams/hour	0.10 grams/hour
7.5% of the average emission rate	0.09		
Weighted Average Emission Rate Limit	4.10 grams/hour		
7.5% of the weighted average emission rate limit	0.31		

Results Are Acceptable

OMNI-Test Laboratories, Inc.

Wood Heater Test Data - EPA Method 5G

Run: 4

Manufacturer: Harman
Model: XXV Touch
Tracking No.: 2022
Project No.: 0135PS033E
Test Date: 14-Nov-14
Beginning Clock Time: 09:55
Recording Interval: 10 min.
Total Sampling Time: 120 min.

Velocity Traverse Data									
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8	
Initial dP	0.030	0.038	0.040	0.032	0.040	0.028	0.036	0.032	"H2O
Initial Temp.	73	73	73	73	74	74	74	74	oF

OMNI Equipment Numbers: OMNI-00001, OMNI-00023, OMNI-00128, OMNI-00131, OMNI-00132, OMNI-00185, OMNI-00209, OMNI-283B, OMNI-00296-T57, OMNI-00335, OMNI-00336, OMNI-00343, OMNI-00410, OMNI-00417, OMNI-00439

PM Control Module: N/A
Dilution Tunnel MW(dry): 29.00 lb/lb-mole
Dilution Tunnel MW(wet): 28.56 lb/lb-mole
Dilution Tunnel H2O: 4.00 percent
Dilution Tunnel Static: -0.360 "H2O
Pitot Tube Cp: 0.99
Meter Box Y Factor: 1.024 (1) 1.017 (2)
Barometric Pressure: Begin 30.15, Middle 30.15, End 30.16, Average 30.15 "Hg

Tunnel Velocity: 12.35 ft/sec.
Intial Tunnel Flow: 139.2 scfm
Average Tunnel Flow: 139.8 scfm
Tunnel Area: 0.1963 ft2
Post-Test Leak Check (1): 0.001@-5 cfm@"Hg
Post-Test Leak Check (2): 0.000@-3 cfm@"Hg
Fuel Moisture (dry basis %): 5.63
Total Particulate (1): 1.3
Total Particulate (2): 1.1

Elapsed Time	Particulate Sampling Data														Fuel Weight, lb		Wood Heater Temperature Data, oF												Stack
	Gas Meter Cubic Feet (1)	Gas Meter Cubic Feet (2)	Sample Rate, cfm (1)	Sample Rate, cfm (2)	Orifice dH (1)	Orifice dH (2)	Meter oF (1)	Meter oF (2)	Meter Vac. In. Hg. (1)	Meter Vac. In. Hg. (2)	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%) (1)	Pro. Rate (10%) (2)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Catalyst Exit	Average Surface	Stack	Filter (1)	Filter (2)	Impinger exit (1)	Impinger exit (2)	Ambient	Draft In. H2O
0	0.000	0.000			0.70	0.70	68	69	1.29	1.3	74	0.035			3.3		496	236	569	295	309	N/A	381.0	217	68	67	N/A	N/A	66	-0.021
10	1.281	1.337	0.13	0.13	1.54	1.37	70	69	0.41	0.6	72	0.035	101	101	3.1	-0.2	468	241	546	277	293		365.0	215	68	68			66	-0.021
20	2.571	2.679	0.13	0.13	1.53	1.36	72	71	0.4	0.6	71	0.035	101	101	2.8	-0.3	461	236	546	270	289		360.4	210	67	68			65	-0.021
30	3.860	4.020	0.13	0.13	1.53	1.35	74	73	0.41	0.6	71	0.035	101	101	2.5	-0.3	477	242	569	276	299		372.6	216	67	67			65	-0.020
40	5.151	5.361	0.13	0.13	1.53	1.35	75	73	0.4	0.6	71	0.035	101	101	2.2	-0.3	469	241	580	276	301		373.4	213	67	67			65	-0.021
50	6.443	6.705	0.13	0.13	1.53	1.36	76	74	0.41	0.6	71	0.035	101	101	2.0	-0.2	483	239	577	281	298		375.6	212	66	67			64	-0.021
60	7.736	8.049	0.13	0.13	1.52	1.36	76	74	0.4	0.6	70	0.035	101	101	1.6	-0.4	464	242	529	280	297		362.4	214	66	67			64	-0.017
70	9.029	9.394	0.13	0.13	1.53	1.36	77	75	0.4	0.6	70	0.035	100	100	1.4	-0.2	457	243	533	282	302		363.4	216	66	67			64	-0.019
80	10.323	10.740	0.13	0.13	1.52	1.35	77	75	0.4	0.6	71	0.035	101	101	1.1	-0.3	447	242	517	279	297		356.4	216	66	67			64	-0.019
90	11.616	12.085	0.13	0.13	1.53	1.35	77	75	0.4	0.6	70	0.035	100	100	0.8	-0.3	463	241	557	277	300		367.6	214	66	67			64	-0.019
100	12.908	13.431	0.13	0.13	1.52	1.35	77	75	0.4	0.6	70	0.035	100	101	0.5	-0.3	446	242	511	271	301		354.2	213	66	66			64	-0.018
110	14.201	14.777	0.13	0.13	1.52	1.34	77	75	0.39	0.6	71	0.035	101	101	0.3	-0.2	462	246	543	274	308		366.6	218	66	66			64	-0.018
120	15.493	16.121	0.13	0.13	1.51	1.35	77	75	0.4	0.6	70	0.035	100	100	0.0	-0.3	461	248	559	278	315		372.2	220	66	66			64	-0.019
Avg/Total	15.493	16.121	0.13	0.13	1.46	1.30	74.85	73.31			70.9	0.035	100.64	100.68									8.8		66.54	66.92	#DIV/0!	#DIV/0!		-0.020

OMNI-Test Laboratories, Inc.

Manufacturer:	Harman	**Technicians:**	J. Clark
Model:	XXV		
Date:	11/14/14		
Run:	4		
Control #:	2022		
Test Duration:	120		
Output Category:	Category 1		

Test Results in Accordance with CSA B415.1-09

	HHV Basis	LHV Basis
Overall Efficiency	72.8%	78.7%
Combustion Efficiency	99.5%	99.5%
Heat Transfer Efficiency	73%	79.1%

Output Rate (kJ/h)	10,225	9,700	**(Btu/h)**
Burn Rate (kg/h)	0.71	1.56	**(lb/h)**
Input (kJ/h)	14,040	13,318	**(Btu/h)**

Test Load Weight (dry kg)	1.42	3.12	**dry lb**
MC wet (%)	5.332814325		
MC dry (%)	5.63		
Particulate (g)	0		
CO (g)	10		
Test Duration (h)	2.00		

Emissions	**Particulate**	**CO**
g/MJ Output	0.00	0.50
g/kg Dry Fuel	0.00	7.18
g/h	0.00	5.09
lb/MM Btu Output	0.00	1.16

Air/Fuel Ratio (A/F)	30.89

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

VERSION: 2.3 3/23/2010

Manufacturer: Harman
Model: XXV
Date: 11/14/2014
Run: 4
Control #: 2022
Test Duration: 120
Output Category: Category 1

Appliance Type: Pellet (Cat, Non-Cat, Pellet)

Temp. Units F (F or C)
Weight Units lb (kg or lb)

Default Fuel Values

	D. Fir	Oak
HHV (kJ/kg)	19,810	19,887
%C	48.73	50
%H	6.87	6.6
%O	43.9	42.9
%Ash	0.5	0.5

Wood Moisture (% wet): 5.33
Load Weight (lb wet): 3.30
Burn Rate (dry kg/h): 0.71
Total Particulate Emissions: g

Fuel Data

	D. Fir	
HHV	19810	kJ/kg
%C	48.73	
%H	6.87	
%O	43.9	
%Ash	0.5	

Note 1: For other fuels, use the heating value and fuel composition determined by analysis of fuel sample in accordance with Clause 9.2.

Note 2: In cases where the "Fuel Weight Remaining" is the same for three or more readings in a row, a "divide by zero error" will occur in the calculation sheet. In such cases, adjust the weight values by interpolation between the first occurence and the next reading showing a decrease in weight.

Averages	**0.02**	**3.13**	**#DIV/0!**	**214.92**	**64.54**	
				Temp. (ºF)		
Elapsed Time (min)	Fuel Weight Remaining (lb)	Flue Gas Composition (%) CO	CO_2	O_2	Flue Gas	Room Temp
0	3.30	0.03	3.63		217.0	66.0
10	3.10	0.02	2.78		215.0	66.0
20	2.80	0.02	2.97		210.0	65.0
30	2.50	0.01	3.09		216.0	65.0
40	2.20	0.02	3.25		213.0	65.0
50	2.00	0.02	3.21		212.0	64.0
60	1.60	0.02	2.84		214.0	64.0
70	1.40	0.02	2.98		216.0	64.0
80	1.10	0.02	3.00		216.0	64.0
90	0.80	0.01	3.40		214.0	64.0
100	0.50	0.02	2.86		213.0	64.0
110	0.30	0.02	3.18		218.0	64.0
120	0.00	0.02	3.55		220.0	64.0

Method 28 Preburn Data

Run Data

Client:	Harman	Test Run:	4
Model:	XXV	Date:	11/14/2014
Project Number:	0135PS033E	Test Crew:	J. Clark, A. Kravitz
Tracking Number:	2022	Equipment:	185, 335, 336
	Coal Bed Range (lb): N/A (pellet)		

Logged Data

			Temperatures (F)								
Elapsed Time (min)	Scale (lb)	Stack Draft (in H2O)	Stack	Ambient	FB Top	FB Bottom	FB Back	FB Left	FB Right	Cat. In	Cat. Out
0	14	-0.004	211	65	412	184	426	244	258	N/A	N/A
10	13.8	-0.004	195	65	321	195	375	204	231		
20	13.6	-0.004	195	66	306	192	343	189	216		
30	13.5	-0.005	168	66	322	183	350	193	211		
40	13.2	-0.005	189	66	427	202	487	244	259		
50	12.9	-0.005	204	66	471	221	542	268	288		
60	12.6	-0.005	216	66	493	236	566	290	309		
	Averages:	-0.005	196.86	65.71	393.14	201.86	441.29	233.14	253.14		

OMNI-Test Laboratories, Inc.

Method 28 Run Sheets

Client: **Harman** Project Number: **0135PS033E** Run Number: 4

Model: **XXV** Tracking Number: **2022** Date: 11/14/14

Test Crew: **A. Kravitz, J. Clark**

OMNI Equipment ID numbers: 23, 131, 132, 209, 288, 343, 371, 372, 410, 420, 559

Pellet Run Notes

Preburn Settings

Target Output (Category): I

Target Output (dry kg/hr): < 0.80

Preburn Notes

TIME	NOTES
	None

Test Settings

Target Output (Category): I

Target Output (dry kg/hr): <0.80

Test Notes

TIME	NOTES
	Began test @ Gas logger ET = 33:00 Test settings Temp: 1.00 Feed: 17.5 sec (0.85) Mode: Stove high Draft: -41 V

Technician Signature: [signature]

Date: 11/14/14

OMNI-Test Laboratories, Inc.

Method 28 Run Sheets

Client: Harman | Project Number: 0135PS033E | Run Number: 4
Model: XXV | Tracking Number: 2022 | Date: 11/14/14
Test Crew: A. Kravitz, J. Clark
OMNI Equipment ID numbers: 23, 131, 132, 209, 288, 343, 371, 372, 410, 420, 559

Pellet Supplemental Data

Start Time: 9:55 | Booth #: E2
Stop Time: 11:55

Stack Gas Leak Check:
Initial: 0 Final: 0

Sample Train Leak Check:
A: 0.001 @ 5 "Hg
B: 0.000 @ 3 "Hg

Calibrations: Span Gas CO_2: 16.90 O_2: N/A CO: 4.295
Mid Gas CO_2: 9.87 O_2: N/A CO: 2.493

	Pre Test			Post Test		
Time	Zero	Span	Mid	Zero	Span	Mid
	09:18	09:20	09:21	12:00	11:59	11:58
O_2	N/A	N/A	N/A	N/A	N/A	N/A
CO_2	0.00	16.80	10.16	0.15	16.94	10.26
CO	0.000	4.246	2.500	0.018	4.252	2.461

Air Velocity (ft/min): Initial: 650 Final: 650
Scale Audit (lbs): Initial: 10.0 Final: 10.0
Pitot Tube Leak Test: Initial: 0 Final: 0
Stack Diameter (in): 3
Induced Draft: 0
% Smoke Capture: 100
Flue Pipe Cleaned Prior to First Test in Series:
Date: 11/13/14 Initials:

	Initial	Middle	Ending
P_b (in/Hg)	30.15	30.15	30.16
Ambient (°F)	66	65	64

Tunnel Traverse	
dP (in H_2O)	T(°F)
0.030	73
0.038	↓
0.040	↓
0.032	↓
0.028	74
0.040	↓
0.036	↓
0.032	↓
N/A	N/A
↓	↓
↓	↓
↓	↓
Static P:	-.31

Technician Signature: _____ Date: 11/14/14

Section 5

Sampling Procedures and Test Results

INTRODUCTION

Harman Home Heating retained OMNI-Test Laboratories, Inc. (*OMNI*) to perform U.S. Environmental Protection Agency (EPA) certification testing on the XXV. The XXV is a freestanding, pellet-fired room heater.

The testing was performed at *OMNI*'s testing facility in Portland, Oregon. The altitude of the laboratory is 30 feet above sea level. The unit was received in good condition and logged in at the *OMNI*'s testing facility on November 10, 2014. It was assigned and labeled with *OMNI* ID #2022. *OMNI* representatives Jeremy Clark and Aaron Kravitz conducted the certification testing and completed all testing by November 14, 2014. A testing contract, including provisions for Random Compliance Audit (RCA) testing, has been signed by Matthew Troutman of Harman Home Heating and is on file at *OMNI*.

The XXV was tested in accordance with the U.S. EPA 40 CFR Part 60, Subpart AAA – Standard of Performance for Residential Wood Heaters (Appendix A, Methods 28 and 5G). Particulate emissions were measured using a Method 5G3 sampling train consisting of two sets of filters (front and back). The weighted average emissions of the four test runs indicate a particulate emission rate of 1.76 g/hr. Test runs were conducted in each of four burn rate categories (<0.80 kg/hr; 0.80-1.25 kg/hr; 1.25-1.90 kg/hr; and maximum). Emissions for each of the individual test runs did not exceed the cap. The XXV results are within the emission limit of 7.5 g/hr for non-catalytic affected facilities manufactured on or after July 1, 1990, or sold at retail on or after July 1, 1992.

Overall efficiency was tested in accordance with CSA standard B415.1-10, Performance Testing of Solid-Fuel-Burning Heating Appliances. The four test runs conducted indicate a weighted average Higher Heating Value efficiency of 66.51% and Lower Heating Value efficiency of 71.88%.

There were no invalid runs nor was there any deviation from test methods during this test series.

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

Table 1.1 – Particulate Emissions and Efficiency

Run	Burn Rate (kg/hr dry)	Method 5G Emissions (g/hr)	CSA B415 Efficiency (%, HHV)	CSA B415 Efficiency (%, LHV)
1	2.47	3.48	71.37	77.13
2	1.78	1.74	68.41	73.94
3	1.14	1.82	60.13	64.99
4	0.71	1.23	72.83	78.72
Weighted Average		1.76	66.51	71.88

Table 1.2 – Test Facility Conditions

	Room Temperature (°F)		Barometric Pressure (Hg)		Air Velocity (ft/min)	
Run	Before	After	Before	After	Before	After
1	67	65	30.06	30.03	<50	<50
2	67	64	30.04	30.05	<50	<50
3	63	65	30.05	30.10	<50	<50
4	66	64	30.15	30.16	<50	<50

Table 1.3.1 – Fuel Measurement Summary – PRETEST

Run	Beginning Fuel Weight (lbs)	Ending Fuel Weight (lbs)
1	31.4	49.4
2	35.6	31.3
3	22.5	19.9
4	14.0	12.6

Table 1.3.2 – Fuel Measurement Summary – TEST

Run	Consumed Fuel Weight (lbs)	Fuel Moisture Content (Dry basis - %)
1	11.5	5.63
2	8.3	5.63
3	5.3	5.63
4	3.3	5.63

Table 1.4 – Dilution Tunnel Gas Measurements and Sampling Data Summary

Run	Length of Test (min)	Average Dilution Tunnel Gas Measurements		
		Velocity (ft/sec)	Flow Rate (dscf/min)	Temperature (°F)
1	120	12.10	131.3	92.0
2	120	12.29	136.4	79.9
3	120	12.30	137.3	77.4
4	120	12.35	139.8	70.9

Table 1.5 - Heater Operation Data (Average Temperature Data)

Run	Beginning Surface Temperature Average[a]	Ending Surface Temperature Average[a]	Surface Delta T[b]
1	764.2	829.4	65.2
2	533.0	544.6	11.6
3	394.2	376.0	18.2
4	381.0	372.2	8.8
a. All temperatures are in °F.			
b. Represents the difference between beginning and ending average surface temperature.			

Table 1.6 – Pretest Configuration

Run	Stove Temperature Control	Feed Adjuster	Temperature Control	Low Draft	Time (min)
1	7.00	6.00	Stove High	-00V	60
2	5.89	3.89	Stove High	-00V	60
3	2.99	2.17	Stove High	-00V	60
4	1.00	0.85	Stove High	-41V	60

Table 1.7 – Test Configuration

Run	Stove Temperature Control	Feed Adjuster	Temperature Control	Low Draft	Time (min)
1	7.00	6.00	Stove High	-00V	120
2	5.89	3.89	Stove High	-00V	120
3	2.99	2.17	Stove High	-00V	120
4	1.00	0.85	Stove High	-41V	120

Table 1.8 – Run Data

Run	Average Dry Burn Rate (kg/hr)	Initial (Induced) Draft (in H_2O)	Average Draft (in H_2O)	Run Time (min)
1	2.47	0	-0.052	120
2	1.78	0	-0.044	120
3	1.14	0	-0.029	120
4	0.71	0	-0.020	120

TEST RESULTS AND DISCUSSION

A total of four test runs were conducted in the following categories: one in the <0.80 kg/hr dry category, one in the 0.80 to 1.25 kg/hr dry category, one in the 1.25 to 1.90 kg/hr dry category, and one at maximum.

The weighted particulate emission rate was measured to be 1.76 g/hr.

The weighted average Higher Heating Value efficiency was measured to be 66.51%.

The weighted average Lower Heating Value efficiency was measured to be 71.88%.

The proportionality results for all four test runs were acceptable. Quality check results for each test run are presented in Section 2 of this report.