# Certification Test Report

## Harman Home Heating
### Freestanding Pellet Stove
**Model:** P68

| | |
|---|---|
| **Prepared for:** | Harman Home Heating<br>352 Mountain House Road<br>Halifax, PA 17032 |
| **Prepared by:** | OMNI-Test Laboratories, Inc.<br>13327 NE Airport Way<br>Portland, OR 97230<br>(503) 643-3788 |
| **Test Period:** | July 15-17, 2014 |
| **Report Date:** | August 2014 |
| **Report Number:** | 0135PS013E.AD03 |

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## AUTHORIZED SIGNATORIES

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

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# Section 1

## Photographs/Appliance Description/Drawings

# Harman Home Heating

P68

**Test Dates:** July 15-17, 2014

## APPLIANCE DESCRIPTION

**Appliance Manufacturer:** Harman Home Heating

**Pellet Stove Model:** P68

**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 entirely of steel.

**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 3-inch diameter flue outlet is located in the bottom/rear 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.

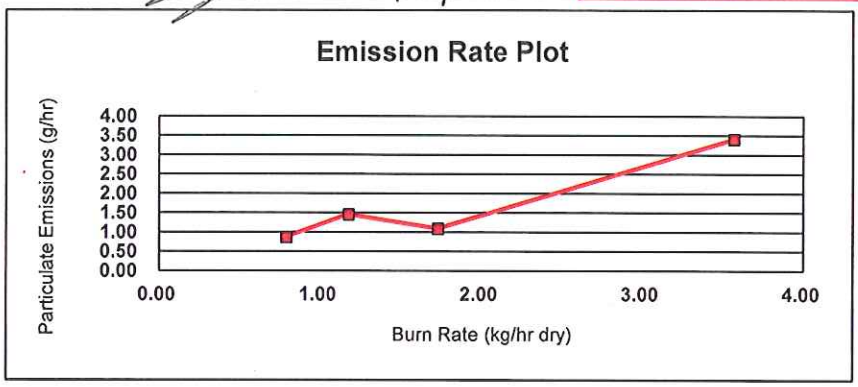
# Section 4

## Test Data by Run

# EPA Weighted Average Emissions
# EPA Method 28

| | | | |
|---|---|---|---|
| Client: | Harman | Status: | Final |
| Stove Model: | P68 | Stove Type: | Pellet Stove |
| Test Dates: | July 15-17, 2014 | | |
| Project Number: | 0135PS013E.AD03 | | |
| Tracking Number: | 1980 | | |
| Signature/Date: | 7/22/14 | | |

**Weighted Average (g/hr)**
**1.3**




| | | |
|---|---|---|
| Run # | 1 | |
| Burn Rate (dry kg/hr) | 0.79 | |
| Category | 1 | |
| Overall Efficiency (%) | 78% | |
| Emissions (g/hr) | 0.87 | |
| Cap (g/hr) | 15.00 | |
| Weighting Factor | 0.514 | 28.91% |
| Heat Output (BTU/hr) | 11846 | |

| | | |
|---|---|---|
| Run # | 2 | |
| Burn Rate (dry kg/hr) | 1.18 | |
| Category | 2 | |
| Overall Efficiency (%) | 78% | |
| Emissions (g/hr) | 1.45 | |
| Cap (g/hr) | 15.00 | |
| Weighting Factor | 0.637 | 35.84% |
| Heat Output (BTU/hr) | 17609 | |

| | | |
|---|---|---|
| Run # | 3 | |
| Burn Rate (dry kg/hr) | 1.73 | |
| Category | 3 | |
| Overall Efficiency (%) | 78% | |
| Emissions (g/hr) | 1.09 | |
| Cap (g/hr) | 18.00 | |
| Weighting Factor | 0.477 | 26.83% |
| Heat Output (BTU/hr) | 25933 | |

| | | |
|---|---|---|
| Run # | 4 | |
| Burn Rate (dry kg/hr) | 3.57 | |
| Category | 4 | |
| Overall Efficiency (%) | 78% | |
| Emissions (g/hr) | 3.41 | |
| Cap (g/hr) | 18.00 | |
| Weighting Factor | 0.150 | 8.43% |
| Heat Output (BTU/hr) | 53467 | |

# Run 1

# Wood Heater Test Data - EPA Method 5G

Manufacturer: Harman
Model: P68
Project No.: 0135PS013E.AD03
Tracking No.: 1980
Run: 1
Test Date: 07/15/14

| | |
|---|---|
| Burn Rate | **0.79 kg/hr dry** |
| Average Tunnel Temperature | 88 degrees Fahrenheit |
| Average Gas Velocity in Dilution Tunnel - vs | 13.0 feet/second |
| Average Gas Flow Rate in Dilution Tunnel - Qsd | 8548.6 dscf/hour |
| Average Delta p | 0.037 inches H20 |
| Average Delta H | 1.47 inches H20 |
| Total Time of Test | 120 minutes |

| | AVERAGE | SAMPLE TRAIN 1 | SAMPLE TRAIN 2 |
|---|---|---|---|
| Total Sample Volume - Vm | 15.98 cubic feet | 15.96 cubic feet | 15.99 cubic feet |
| Average Gas Meter Temperature | 86 degrees Fahrenheit | 87 degrees Fahrenheit | 85 degrees Fahrenheit |
| Total Sample Volume (Standard Conditions) - Vmstd | 15.6 dscf | 15.6 dscf | 15.6 dscf |
| Total Particulates - mn | | 0.7 mg | 0.8 mg |
| Particulate Concentration (dry-standard) | 0.00005 grams/dscf | 0.00004 grams/dscf | 0.00005 grams/dscf |
| Particulate Emission Rate | 0.41 grams/hour | 0.38 grams/hour | 0.44 grams/hour |
| Adjusted Emissions | **0.87 grams/hour** | 0.82 grams/hour | 0.92 grams/hour |
| Difference from Average | | 0.05 grams/hour | 0.05 grams/hour |
| 7.5% of the average emission rate | 0.07 | | |
| 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: P68
Tracking No.: 1980
Project No.: 0135PS013E.AD03
Test Date: 15-Jul-14
Beginning Clock Time: 11:17
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 | 0.040 | 0.038 | 0.038 | 0.036 | 0.040 | 0.040 | 0.034 | "H2O |
| Initial Temp. | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | oF |

OMNI Equipment Numbers: OMNI-00001, OMNI-00023, OMNI-00128, OMNI-00131, OMNI-00132, OMNI-00209, OMNI-283B, OMNI-00288, OMNI-00296-T40, OMNI-00343, OMNI-00371, OMNI-00372, OMNI-00410, OMNI-00417

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: -0.325 "H2O
Pitot Tube Cp: 0.99
Meter Box Y Factor: 1.002 (1) 0.999 (2)
Barometric Pressure: Begin 30.14, Middle 30.13, End 30.09, Average 30.12 "Hg

Signature/Date: 7/15/14

Tunnel Velocity: 13.00 ft/sec.
Intial Tunnel Flow: 142.7 scfm
Average Tunnel Flow: 142.5 scfm
Tunnel Area: 0.1963 ft2
Post-Test Leak Check (1): 0.000@-8 cfm@"Hg
Post-Test Leak Check (2): 0.000@-5 cfm@"Hg
Fuel Moisture (dry basis %): 5.98
Total Particulate (1): 0.7
Total Particulate (2): 0.8

| 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 | | | 0.34 | 0.40 | 78 | 78 | 1.2 | 0.8 | 85 | 0.037 | | | 3.7 | | 160 | 152 | 98 | 318 | 307 | N/A | 207.0 | 177 | 76 | 76 | N/A | N/A | 77 | -0.039 |
| 10 | 1.315 | 1.323 | 0.13 | 0.13 | 1.56 | 1.34 | 80 | 79 | 0.38 | 0.6 | 86 | 0.037 | 101 | 101 | 3.4 | -0.3 | 159 | 154 | 99 | 312 | 304 | | 205.6 | 180 | 77 | 77 | | | 77 | -0.039 |
| 20 | 2.634 | 2.654 | 0.13 | 0.13 | 1.57 | 1.33 | 82 | 81 | 0.34 | 0.6 | 86 | 0.037 | 101 | 101 | 3.1 | -0.3 | 163 | 156 | 99 | 322 | 314 | | 210.8 | 180 | 78 | 78 | | | 78 | -0.025 |
| 30 | 3.955 | 3.983 | 0.13 | 0.13 | 1.57 | 1.33 | 85 | 83 | 0.34 | 0.6 | 87 | 0.037 | 100 | 101 | 2.8 | -0.3 | 165 | 158 | 100 | 322 | 315 | | 212.0 | 182 | 78 | 78 | | | 78 | -0.025 |
| 40 | 5.281 | 5.313 | 0.13 | 0.13 | 1.57 | 1.32 | 86 | 84 | 0.35 | 0.6 | 87 | 0.037 | 101 | 101 | 2.5 | -0.3 | 164 | 159 | 100 | 315 | 308 | | 209.2 | 180 | 79 | 79 | | | 78 | -0.024 |
| 50 | 6.613 | 6.646 | 0.13 | 0.13 | 1.55 | 1.32 | 88 | 85 | 0.35 | 0.6 | 87 | 0.037 | 101 | 101 | 2.2 | -0.3 | 160 | 159 | 101 | 313 | 302 | | 207.0 | 179 | 79 | 79 | | | 79 | -0.024 |
| 60 | 7.946 | 7.978 | 0.13 | 0.13 | 1.57 | 1.32 | 89 | 86 | 0.35 | 0.6 | 88 | 0.037 | 101 | 101 | 1.8 | -0.4 | 163 | 160 | 101 | 318 | 308 | | 210.0 | 182 | 79 | 79 | | | 79 | -0.024 |
| 70 | 9.282 | 9.312 | 0.13 | 0.13 | 1.57 | 1.32 | 89 | 87 | 0.35 | 0.5 | 88 | 0.037 | 101 | 101 | 1.5 | -0.3 | 162 | 160 | 101 | 314 | 308 | | 209.0 | 181 | 80 | 80 | | | 79 | -0.025 |
| 80 | 10.618 | 10.647 | 0.13 | 0.13 | 1.57 | 1.32 | 90 | 87 | 0.34 | 0.5 | 88 | 0.037 | 101 | 101 | 1.3 | -0.2 | 162 | 160 | 102 | 319 | 308 | | 210.2 | 182 | 80 | 80 | | | 79 | -0.024 |
| 90 | 11.954 | 11.982 | 0.13 | 0.13 | 1.57 | 1.32 | 90 | 88 | 0.34 | 0.5 | 89 | 0.037 | 101 | 101 | 1.0 | -0.3 | 161 | 160 | 102 | 319 | 309 | | 210.2 | 184 | 80 | 80 | | | 79 | -0.024 |
| 100 | 13.291 | 13.318 | 0.13 | 0.13 | 1.57 | 1.32 | 91 | 88 | 0.35 | 0.5 | 90 | 0.037 | 101 | 101 | 0.6 | -0.4 | 163 | 161 | 102 | 325 | 314 | | 213.0 | 185 | 80 | 81 | | | 80 | -0.024 |
| 110 | 14.628 | 14.653 | 0.13 | 0.13 | 1.57 | 1.31 | 91 | 89 | 0.35 | 0.3 | 90 | 0.037 | 101 | 100 | 0.3 | -0.3 | 164 | 162 | 103 | 322 | 313 | | 212.8 | 185 | 81 | 81 | | | 80 | -0.024 |
| 120 | 15.965 | 15.988 | 0.13 | 0.13 | 1.56 | 1.32 | 91 | 89 | 0.35 | 0.3 | 90 | 0.037 | 101 | 100 | 0.0 | -0.3 | 163 | 162 | 103 | 323 | 317 | | 213.6 | 185 | 81 | 81 | | | 80 | -0.025 |
| Avg/Total | 15.965 | 15.988 | 0.13 | 0.13 | 1.47 | 1.25 | 86.92 | 84.92 | | | 87.77 | 0.037 | 100.65 | 100.68 | | | | | | | | | 7 | | 79.08 | 79.15 | #DIV/0! | #DIV/0! | | -0.027 |

# Run Notes

Client: Harman
Model: P68
Project #: 0135PS013E.AD03
Tracking #: 1980
Run #: 1 Date: 7/14/2014 dc 7/15/2014
Test Crew: J. Clark
OMNI Equipment ID #(s): 1,23,128,131,132,209,283B,288,296-T56,343,371,372,410,417,438

## PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCABLE)

PRIMARY:

Stove Setting: Constant H
Feed Rate : 0.28
Temperature : 1.00
Low Draft : ~36 V

SECONDARY: Auto

TERTIARY:

FAN:

## PREBURN SETTINGS AND ACTIVITIES

| TIME | AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY | FAN SETTING CHANGE | ADD FUEL + WT. | ADD FUEL - WT. | RAKE COAL | COMMENT |
|---|---|---|---|---|---|---|
| | N/A | | | | | |

## TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)

N/A

Okanagan "100% Natural Softwood" pellets

START UP PROCEDURES

BYPASS: N/A
FUEL LOADING: Auto
DOOR: N/A
PRIMARY AIR: Auto

OTHER: N/A

DESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)
PRIMARY:

Same as above

SECONDARY: Auto

TERTIARY:

FAN:

Technician signature: _____ Date: 7/14/14 dc 7/15/14

OMNI-Test Laboratories, Inc.
Portland, OR

# Supplemental Data EPA 5G/5H

Client: Harman

Model: P68 Project #: 0135PS013E.AD03 Tracking #: 1980

Date: ~~7/14/14~~ 7/15/14 Run #: 1 Booth: E2

Test Crew: J. Clark Start Time: 11:17 Stop Time: 13:17

OMNI Equipment #(s): 1, 23, 128, 131, 132, 209, 283B, 288, 296-T56, 343, 371, 372, 410, 417, 438

Stack Gas Leak Check:
Initial: Ø
Final: Ø

Dilution Tunnel Gas Leak Check (5H only):
Initial: N/A
Final: N/A

Calibrations: Span Gas $CO_2$: 16.83 $O_2$: 20.95 CO: 4.183 $CO_2$ (DT): N/A
Mid Gas $CO_2$: 9.87 $O_2$: 10.47 CO: 2.493 $CO_2$ (DT): N/A

| | Pre Test | | | Post Test | | |
|---|---|---|---|---|---|---|
| Time | Zero | Span | Mid | Zero | Span | Mid |
| | 10:22 | 10:25 | 10:29 | 13:27 | 13:29 | 13:30 |
| $O_2$ | 0.00 | 20.95 | 10.70 | 0.08 | 20.92 | 10.74 |
| $CO_2$ | 0.00 | 16.83 | 9.96 | 0.06 | 16.89 | 9.97 |
| CO | 0.000 | 4.183 | 2.420 | 0.001 | 4.185 | 2.409 |
| $CO_2$ (DT) | N/A | | | | | |

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 (inches): 6"

Induced Draft: Ø

% Smoke Capture: 100%

Flue Pipe Cleaned Prior to First Test in Series:

Date: 7/11/14 Initials: SC

| Tunnel Traverse | |
|---|---|
| dP (in $H_2O$) | T(°F) |
| .030 | 85 |
| .040 | 85 |
| .038 | 85 |
| .038 | 85 |
| .036 | 85 |
| .040 | 85 |
| .040 | 85 |
| .034 | 85 |
| N/A | N/A |
| ↓ | ↓ |
| Static P: | -0.325 |

| | Initial | Middle | Ending |
|---|---|---|---|
| $P_b$ (in/Hg) | 30.14 | 30.13 | 30.09 |
| Ambient (°F) | 77 | 79 | 81 |

Technician signature:

Date: ~~7/14/14~~ 7/15/14

# Run 2

OMNI-Test Laboratories, Inc.

# Wood Heater Test Data - EPA Method 5G

Manufacturer: Harman
Model: P68
Project No.: 0135PS013E.AD03
Tracking No.: 1980
Run: 2
Test Date: 07/15/14

| | |
|---|---|
| Burn Rate | **1.18 kg/hr dry** |
| Average Tunnel Temperature | 113 degrees Fahrenheit |
| Average Gas Velocity in Dilution Tunnel - vs | 13.4 feet/second |
| Average Gas Flow Rate in Dilution Tunnel - Qsd | 8437.2 dscf/hour |
| Average Delta p | 0.038 inches H20 |
| Average Delta H | 1.54 inches H20 |
| Total Time of Test | 120 minutes |

| | AVERAGE | SAMPLE TRAIN 1 | SAMPLE TRAIN 2 |
|---|---|---|---|
| Total Sample Volume - Vm | 16.06 cubic feet | 16.01 cubic feet | 16.10 cubic feet |
| Average Gas Meter Temperature | 92 degrees Fahrenheit | 93 degrees Fahrenheit | 91 degrees Fahrenheit |
| Total Sample Volume (Standard Conditions) - Vmstd | 15.5 dscf | 15.4 dscf | 15.6 dscf |
| Total Particulates - mn | | 1.2 mg | 1.6 mg |
| Particulate Concentration (dry-standard) | 0.00009 grams/dscf | 0.00008 grams/dscf | 0.00010 grams/dscf |
| Particulate Emission Rate | 0.76 grams/hour | 0.66 grams/hour | 0.87 grams/hour |
| Adjusted Emissions | **1.45 grams/hour** | 1.28 grams/hour | 1.62 grams/hour |
| Difference from Average | | 0.17 grams/hour | 0.17 grams/hour |
| 7.5% of the average emission rate | 0.11 | | |
| 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: P68
Tracking No.: 1980
Project No.: 0135PS013E.AD03
Test Date: 15-Jul-14
Beginning Clock Time: 14:23
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 | 0.036 | 0.038 | 0.040 | 0.038 | 0.034 | 0.042 | 0.038 | 0.036 | "H2O |
| Initial Temp. | 110 | 110 | 110 | 110 | 110 | 111 | 111 | 111 | oF |

OMNI Equipment Numbers: OMNI-00001, OMNI-00023, OMNI-00128, OMNI-00131, OMNI-00132, OMNI-00209, OMNI-283B, OMNI-00288, OMNI-00296-T40, OMNI-00343, OMNI-00371, OMNI-00372, OMNI-00410, OMNI-00417

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: -0.330 "H2O
Pitot Tube Cp: 0.99
Meter Box Y Factor: 1.002 (1) 0.999 (2)

| Barometric Pressure: | Begin | Middle | End | Average |
|---|---|---|---|---|
| | 30.09 | 30.06 | 30.04 | 30.06 "Hg |

Signature/Date: 7/14/14

Tunnel Velocity: 13.43 ft/sec.
Intial Tunnel Flow: 140.8 scfm
Average Tunnel Flow: 140.6 scfm
Tunnel Area: 0.1963 ft2
Post-Test Leak Check (1): 0.000@-8 cfm@"Hg
Post-Test Leak Check (2): 0.000@-5 cfm@"Hg
Fuel Moisture (dry basis %): 5.98
Total Particulate (1): 1.2
Total Particulate (2): 1.6

| 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 | | | 1.44 | 1.14 | 87 | 86 | 0.33 | 0.3 | 110 | 0.038 | | | 5.5 | | 180 | 195 | 105 | 347 | 348 | N/A | 235.0 | 271 | 80 | 80 | N/A | N/A | 82 | 0.000 |
| 10 | 1.330 | 1.340 | 0.13 | 0.13 | 1.57 | 1.33 | 88 | 86 | 0.33 | 0.3 | 112 | 0.038 | 101 | 101 | 5.0 | -0.5 | 182 | 198 | 105 | 357 | 357 | | 239.8 | 277 | 84 | 84 | | | 82 | -0.002 |
| 20 | 2.661 | 2.684 | 0.13 | 0.13 | 1.55 | 1.32 | 90 | 88 | 0.34 | 0.3 | 112 | 0.038 | 101 | 101 | 4.6 | -0.4 | 183 | 200 | 108 | 347 | 349 | | 237.4 | 271 | 85 | 85 | | | 83 | 0.000 |
| 30 | 3.992 | 4.024 | 0.13 | 0.13 | 1.55 | 1.33 | 91 | 89 | 0.35 | 0.3 | 112 | 0.038 | 101 | 101 | 4.1 | -0.5 | 181 | 199 | 110 | 345 | 342 | | 235.4 | 269 | 86 | 86 | | | 83 | 0.001 |
| 40 | 5.325 | 5.365 | 0.13 | 0.13 | 1.56 | 1.32 | 93 | 90 | 0.34 | 0.3 | 112 | 0.038 | 101 | 101 | 3.7 | -0.4 | 182 | 198 | 111 | 343 | 344 | | 235.6 | 270 | 87 | 87 | | | 83 | 0.000 |
| 50 | 6.658 | 6.706 | 0.13 | 0.13 | 1.56 | 1.32 | 94 | 91 | 0.34 | 0.3 | 112 | 0.038 | 100 | 101 | 3.2 | -0.5 | 182 | 199 | 112 | 346 | 338 | | 235.4 | 269 | 87 | 87 | | | 83 | 0.001 |
| 60 | 7.994 | 8.048 | 0.13 | 0.13 | 1.56 | 1.32 | 94 | 92 | 0.33 | 0.3 | 112 | 0.038 | 101 | 101 | 2.8 | -0.4 | 181 | 197 | 112 | 348 | 345 | | 236.6 | 272 | 88 | 88 | | | 83 | 0.000 |
| 70 | 9.329 | 9.390 | 0.13 | 0.13 | 1.54 | 1.32 | 95 | 92 | 0.33 | 0.3 | 113 | 0.038 | 101 | 101 | 2.3 | -0.5 | 184 | 199 | 112 | 352 | 355 | | 240.4 | 275 | 88 | 88 | | | 83 | 0.000 |
| 80 | 10.664 | 10.732 | 0.13 | 0.13 | 1.55 | 1.32 | 95 | 93 | 0.33 | 0.3 | 113 | 0.038 | 101 | 100 | 1.8 | -0.5 | 182 | 200 | 113 | 345 | 346 | | 237.2 | 271 | 88 | 88 | | | 84 | 0.001 |
| 90 | 12.000 | 12.075 | 0.13 | 0.13 | 1.54 | 1.32 | 96 | 93 | 0.34 | 0.3 | 114 | 0.038 | 101 | 101 | 1.4 | -0.4 | 183 | 202 | 114 | 346 | 351 | | 239.2 | 272 | 88 | 88 | | | 84 | 0.002 |
| 100 | 13.335 | 13.417 | 0.13 | 0.13 | 1.55 | 1.32 | 96 | 93 | 0.34 | 0.3 | 114 | 0.038 | 100 | 100 | 0.9 | -0.5 | 185 | 202 | 114 | 347 | 352 | | 240.0 | 274 | 87 | 88 | | | 84 | 0.002 |
| 110 | 14.673 | 14.761 | 0.13 | 0.13 | 1.55 | 1.32 | 96 | 94 | 0.35 | 0.3 | 114 | 0.038 | 101 | 100 | 0.5 | -0.4 | 182 | 203 | 115 | 338 | 347 | | 237.0 | 271 | 86 | 87 | | | 84 | 0.002 |
| 120 | 16.009 | 16.104 | 0.13 | 0.13 | 1.55 | 1.31 | 97 | 94 | 0.34 | 0.3 | 114 | 0.038 | 100 | 100 | 0.0 | -0.5 | 181 | 202 | 115 | 343 | 348 | | 237.8 | 273 | 85 | 87 | | | 84 | 0.001 |
| Avg/Total | 16.009 | 16.104 | 0.13 | 0.13 | 1.54 | 1.31 | 93.23 | 90.85 | | | 112.64 | 0.038 | 100.69 | 100.71 | | | | | | | | | 3 | | 86.08 | 86.38 | #DIV/0! | #DIV/0! | | 0.001 |

# Run Notes

Client: Harman
Model: P68
Project #: 0135PS013E.AD03
Tracking #: 1980
Run #: 2 Date: 7/14*/15/2014
Test Crew: J. Clark
OMNI Equipment ID #(s): 1,23,128,131,132,209,283B,288,296-T56,343,371,372,410,417,438

## PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCABLE)

PRIMARY:

Stove Setting: Constant H
Feed Rate: 0.70
Temperature: 2.54
Low Draft Adjustment: -00V

SECONDARY: Auto

TERTIARY:

FAN:

## PREBURN SETTINGS AND ACTIVITIES

| TIME | AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY | FAN SETTING CHANGE | ADD FUEL + WT. | ADD FUEL - WT. | RAKE COAL | COMMENT |
|---|---|---|---|---|---|---|
| | N/A | | | | | |

## TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)

N/A
pellet

START UP PROCEDURES

BYPASS: N/A
FUEL LOADING: Auto
DOOR: N/A
PRIMARY AIR: Auto

OTHER: N/A

DESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)
PRIMARY:

Same as above

SECONDARY: Auto

TERTIARY:

FAN:

Technician signature: _____ Date: 7/14/14 & 7/15/14

*OMNI-Test Laboratories, Inc.*
*Portland, OR*

# Supplemental Data EPA 5G/5H

Client: Harman

Model: P68 15 Project #: 0135PS013E.AD03 Tracking #: 1980

Date: 7/14/2014 Run #: 2 Booth: E2

Test Crew: A. Clark Start Time: 14:23 Stop Time: 16:23

OMNI Equipment #(s): 123, 128, 131, 132, 209, 283B, 288, 296-T56, 343, 371, 372, 410, 417, 438

Stack Gas Leak Check:
Initial: Ø
Final: Ø

Dilution Tunnel Gas Leak Check (5H only):
Initial: N/A
Final: N/A

Calibrations: Span Gas $CO_2$: 16.83 $O_2$: 20.95 CO: 4.183 $CO_2$ (DT): N/A
Mid Gas $CO_2$: 9.87 $O_2$: 10.47 CO: 2.493 $CO_2$ (DT): N/A

| | Pre Test | | | Post Test | | |
|---|---|---|---|---|---|---|
| Time | Zero | Span | Mid | Zero | Span | Mid |
| | 13:35 | 13:37 | 13:39 | 4:35 | 4:30 | 4:32 |
| $O_2$ | 0.00 | 20.95 | 10.70 | 0.09 | 20.84 | 10.80 |
| $CO_2$ | 0.00 | 16.83 | 9.89 | 0.00 | 16.79 | 9.82 |
| CO | 0.000 | 4.183 | 2.452 | 0.000 | 4.191 | 2.467 |
| $CO_2$ (DT) | N/A | | | | | |

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 (inches): 6"

Induced Draft: Ø

% Smoke Capture: 100 %

Flue Pipe Cleaned Prior to First Test in Series:

Date: 7/11/14 Initials: JC

| | Initial | Middle | Ending |
|---|---|---|---|
| $P_b$ (in/Hg) | 30.09 | 30.06 | 30.04 |
| Ambient (°F) | 82 | 83 | 84 |

| Tunnel Traverse | |
|---|---|
| dP (in $H_2O$) | T(°F) |
| .036 | 110 |
| .038 | 110 |
| .040 | 110 |
| .038 | 110 |
| .034 | 110 |
| .042 | 111 |
| .038 | 111 |
| .036 | 111 |
| N/A | N/A |
| ↓ | ↓ |
| Static P: | -0.330 |

Technician signature:

Date: 7/15/14

# Run 3

# Wood Heater Test Data - EPA Method 5G

Manufacturer: Harman
Model: P68
Project No.: 0135PS013E.AD03
Tracking No.: 1980
Run: 3
Test Date: 07/16/14

| | |
|---|---|
| Burn Rate | **1.73 kg/hr dry** |
| Average Tunnel Temperature | 112 degrees Fahrenheit |
| Average Gas Velocity in Dilution Tunnel - vs | 13.2 feet/second |
| Average Gas Flow Rate in Dilution Tunnel - Qsd | 8274.8 dscf/hour |
| Average Delta p | 0.036 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 | 16.55 cubic feet | 15.82 cubic feet | 17.28 cubic feet |
| Average Gas Meter Temperature | 85 degrees Fahrenheit | 86 degrees Fahrenheit | 83 degrees Fahrenheit |
| Total Sample Volume (Standard Conditions) - Vmstd | 16.2 dscf | 15.5 dscf | 16.9 dscf |
| Total Particulates - mn | | 1 mg | 1.1 mg |
| Particulate Concentration (dry-standard) | 0.00006 grams/dscf | 0.00006 grams/dscf | 0.00006 grams/dscf |
| Particulate Emission Rate | 0.54 grams/hour | 0.54 grams/hour | 0.54 grams/hour |
| Adjusted Emissions | **1.09 grams/hour** | 1.08 grams/hour | 1.09 grams/hour |
| Difference from Average | | 0.00 grams/hour | 0.00 grams/hour |
| 7.5% of the average emission rate | 0.08 | | |
| 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: P68
Tracking No.: 1980
Project No.: 0135PS013E.AD03
Test Date: 16-Jul-14
Beginning Clock Time: 08:41
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 | 0.040 | 0.040 | 0.038 | 0.028 | 0.042 | 0.040 | 0.034 | "H2O |
| Initial Temp. | 111 | 111 | 111 | 111 | 111 | 111 | 111 | 111 | oF |

OMNI Equipment Numbers: OMNI-00001, OMNI-00023, OMNI-00128, OMNI-00131, OMNI-00132, OMNI-00209, OMNI-283B, OMNI-00288, OMNI-00296-T40, OMNI-00343, OMNI-00371, OMNI-00372, OMNI-00410, OMNI-00417

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: -0.330 "H2O
Pitot Tube Cp: 0.99
Meter Box Y Factor: 1.002 (1) 0.999 (2)
Barometric Pressure: Begin 30.10, Middle 30.08, End 30.06, Average 30.08 "Hg

Signature/Date: 7/22/14

Tunnel Velocity: 13.15 ft/sec.
Intial Tunnel Flow: 137.7 scfm
Average Tunnel Flow: 137.9 scfm
Tunnel Area: 0.1963 ft2
Post-Test Leak Check (1): 0.000@-6.5 cfm@"Hg
Post-Test Leak Check (2): 0.000@-5.5 cfm@"Hg
Fuel Moisture (dry basis %): 5.98
Total Particulate (1): 1.0
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 | | | 0.25 | 0.15 | 77 | 76 | 0.33 | 0.4 | 111 | 0.036 | | | 8.1 | | 239 | 243 | 112 | 450 | 454 | N/A | 299.6 | 327 | 75 | 75 | N/A | N/A | 77 | -0.011 |
| 10 | 1.304 | 1.418 | 0.13 | 0.14 | 1.56 | 1.54 | 79 | 77 | 0.32 | 0.3 | 112 | 0.036 | 101 | 100 | 7.4 | -0.7 | 246 | 247 | 114 | 458 | 459 | | 304.8 | 329 | 79 | 79 | | | 77 | -0.010 |
| 20 | 2.614 | 2.845 | 0.13 | 0.14 | 1.55 | 1.51 | 82 | 80 | 0.32 | 0.3 | 111 | 0.036 | 101 | 100 | 6.8 | -0.6 | 240 | 248 | 116 | 438 | 435 | | 295.4 | 322 | 80 | 80 | | | 77 | -0.010 |
| 30 | 3.926 | 4.271 | 0.13 | 0.14 | 1.54 | 1.51 | 84 | 81 | 0.32 | 0.3 | 112 | 0.036 | 101 | 100 | 6.0 | -0.8 | 244 | 248 | 116 | 454 | 450 | | 302.4 | 327 | 81 | 81 | | | 77 | -0.011 |
| 40 | 5.240 | 5.701 | 0.13 | 0.14 | 1.55 | 1.52 | 86 | 83 | 0.32 | 0.3 | 112 | 0.036 | 100 | 100 | 5.4 | -0.6 | 247 | 252 | 116 | 471 | 459 | | 309.0 | 333 | 81 | 82 | | | 78 | -0.012 |
| 50 | 6.556 | 7.139 | 0.13 | 0.14 | 1.54 | 1.54 | 87 | 84 | 0.33 | 0.3 | 112 | 0.036 | 100 | 100 | 4.7 | -0.7 | 241 | 253 | 117 | 443 | 446 | | 300.0 | 325 | 82 | 83 | | | 78 | -0.011 |
| 60 | 7.874 | 8.582 | 0.13 | 0.14 | 1.55 | 1.54 | 88 | 85 | 0.33 | 0.3 | 112 | 0.036 | 100 | 101 | 4.0 | -0.7 | 244 | 254 | 117 | 454 | 453 | | 304.4 | 329 | 82 | 83 | | | 78 | -0.012 |
| 70 | 9.194 | 10.029 | 0.13 | 0.14 | 1.55 | 1.54 | 89 | 85 | 0.33 | 0.3 | 112 | 0.036 | 100 | 101 | 3.3 | -0.7 | 245 | 256 | 117 | 457 | 453 | | 305.6 | 330 | 83 | 83 | | | 78 | -0.011 |
| 80 | 10.519 | 11.478 | 0.13 | 0.14 | 1.55 | 1.54 | 89 | 86 | 0.32 | 0.3 | 112 | 0.036 | 101 | 101 | 2.6 | -0.7 | 245 | 257 | 119 | 443 | 452 | | 303.2 | 325 | 83 | 83 | | | 78 | -0.010 |
| 90 | 11.846 | 12.928 | 0.13 | 0.15 | 1.55 | 1.55 | 90 | 86 | 0.33 | 0.3 | 113 | 0.036 | 101 | 101 | 1.9 | -0.7 | 243 | 254 | 118 | 457 | 457 | | 305.8 | 330 | 83 | 83 | | | 79 | -0.011 |
| 100 | 13.172 | 14.380 | 0.13 | 0.15 | 1.55 | 1.55 | 90 | 86 | 0.33 | 0.3 | 112 | 0.036 | 101 | 101 | 1.3 | -0.6 | 237 | 251 | 117 | 449 | 445 | | 299.8 | 327 | 82 | 83 | | | 79 | -0.011 |
| 110 | 14.499 | 15.833 | 0.13 | 0.15 | 1.55 | 1.55 | 90 | 86 | 0.32 | 0.2 | 112 | 0.036 | 101 | 101 | 0.6 | -0.7 | 234 | 248 | 117 | 451 | 438 | | 297.6 | 325 | 82 | 83 | | | 80 | -0.011 |
| 120 | 15.825 | 17.285 | 0.13 | 0.15 | 1.55 | 1.55 | 90 | 86 | 0.32 | 0.2 | 113 | 0.036 | 101 | 101 | 0.0 | -0.6 | 234 | 247 | 118 | 455 | 440 | | 298.8 | 325 | 83 | 83 | | | 79 | -0.010 |
| Avg/Total | 15.825 | 17.285 | 0.13 | 0.14 | 1.45 | 1.43 | 86.23 | 83.15 | | | 112.00 | 0.036 | 100.63 | 100.66 | | | | | | | | | 1 | | 81.23 | 81.62 | #DIV/0! | #DIV/0! | | -0.011 |

# Run Notes

Client: Harman
Model: P68
Project #: 0135PS013E.AD03
Tracking #: 1980
Run #: 3 Date: 7/16/2014
Test Crew: J. Clark
OMNI Equipment ID #(s): 1, 23, 128, 131, 132, 209, 283B, 288, 296-T56, 343, 371, 372, 410, 417, 438

## PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCABLE)

PRIMARY:

Stove Setting: Constant H
Feed Rate : 1.61
Temperature : 4.77
Draft Adj. : -.00 V

SECONDARY: Auto

TERTIARY:

FAN:

## PREBURN SETTINGS AND ACTIVITIES

| TIME | AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY | FAN SETTING CHANGE | ADD FUEL + WT. | ADD FUEL - WT. | RAKE COAL | COMMENT |
|---|---|---|---|---|---|---|
| | N/A | | | | | |

## TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)

N/A
pellets

START UP PROCEDURES

BYPASS: N/A
FUEL LOADING: Auto
DOOR: N/A
PRIMARY AIR: Auto

OTHER: N/A

DESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)
PRIMARY:

Same as above

SECONDARY: Auto

TERTIARY:

FAN:

Technician signature: _____ Date: 7/16/14

OMNI-Test Laboratories, Inc.
Portland, OR

# Supplemental Data EPA 5G/5H

Client: Harman

Model: P68 Project #: 0135PS013E.AD03 Tracking #: 1980

Date: 7/16/2014 Run #: 3 Booth: E2

Test Crew: J. Clark Start Time: 8:41 Stop Time: 10:41

OMNI Equipment #(s): 1,23,128,131,132,209,283B,288,296-T56,343,371,372,410,417,438

Stack Gas Leak Check:

Initial: Ø

Final: N/A - gas train filled w/ H2O

Dilution Tunnel Gas Leak Check (5H only):

Initial: N/A

Final: N/A

Calibrations: Span Gas $CO_2$: 16.83 $O_2$: 20.95 CO: 4.183 $CO_2$ (DT): N/A

Mid Gas $CO_2$: 9.87 $O_2$: 10.47 CO: 2.493 $CO_2$ (DT): N/A

| | Pre Test | | | Post Test | | |
|---|---|---|---|---|---|---|
| Time | Zero | Span | Mid | Zero | Span | Mid |
| | 7:47 | 7:48 | 7:49 | | | |
| $O_2$ | 0.00 | 20.95 | 10.69 ~~9.88~~ dc | | | |
| $CO_2$ | 0.00 | 16.83 | 9.88 | | | |
| CO | 0.000 | 4.183 | 2.499 | | | |
| $CO_2$ (DT) | N/A | | | | | |

dc

Gas train equipment failure

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 (inches): 6"

Induced Draft: Ø

% Smoke Capture: 100%

Flue Pipe Cleaned Prior to First Test in Series:

Date: 7/11/14 Initials: dc

| Tunnel Traverse | |
|---|---|
| dP (in $H_2O$) | T(°F) |
| .028 | 111 |
| .040 | 111 |
| .040 | 111 |
| .038 | 111 |
| .028 | 111 |
| .042 | 111 |
| .040 | 111 |
| .034 | 111 |
| N/A | N/A |
| | |
| | |
| | |
| Static P: | -0.33 |

| | Initial | Middle | Ending |
|---|---|---|---|
| $P_b$ (in/Hg) | 30.10 | 30.08 | 30.06 |
| Ambient (°F) | 77 | 78 | 79 |

Technician signature:

Date: 7/16/2014

# Run 4

OMNI-Test Laboratories, Inc.

# Wood Heater Test Data - EPA Method 5G

Manufacturer: Harman
Model: P68
Project No.: 0135PS013E.AD03
Tracking No.: 1980
Run: 4
Test Date: 07/17/14

| | |
|---|---|
| Burn Rate | **3.57 kg/hr dry** |
| Average Tunnel Temperature | 123 degrees Fahrenheit |
| Average Gas Velocity in Dilution Tunnel - vs | 13.5 feet/second |
| Average Gas Flow Rate in Dilution Tunnel - Qsd | 8374.6 dscf/hour |
| Average Delta p | 0.038 inches H20 |
| Average Delta H | 1.49 inches H20 |
| Total Time of Test | 120 minutes |

| | AVERAGE | SAMPLE TRAIN 1 | SAMPLE TRAIN 2 |
|---|---|---|---|
| Total Sample Volume - Vm | 15.65 cubic feet | 15.70 cubic feet | 15.60 cubic feet |
| Average Gas Meter Temperature | 85 degrees Fahrenheit | 86 degrees Fahrenheit | 83 degrees Fahrenheit |
| Total Sample Volume (Standard Conditions) - Vmstd | 15.3 dscf | 15.4 dscf | 15.3 dscf |
| Total Particulates - mn | | 3.7 mg | 4.1 mg |
| Particulate Concentration (dry-standard) | 0.00025 grams/dscf | 0.00024 grams/dscf | 0.00027 grams/dscf |
| Particulate Emission Rate | 2.13 grams/hour | 2.02 grams/hour | 2.24 grams/hour |
| Adjusted Emissions | **3.41 grams/hour** | 3.26 grams/hour | 3.56 grams/hour |
| Difference from Average | | 0.15 grams/hour | 0.15 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: 4**

Manufacturer: Harman
Model: P68
Tracking No.: 1980
Project No.: 0135PS013E.AD03
Test Date: 17-Jul-14
Beginning Clock Time: 08:59
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 | 0.038 | 0.040 | 0.038 | 0.038 | 0.044 | 0.040 | 0.036 | "H2O |
| Initial Temp. | 121 | 121 | 121 | 121 | 120 | 120 | 120 | 121 | oF |

OMNI Equipment Numbers: OMNI-00001, OMNI-00023, OMNI-00128, OMNI-00131, OMNI-00132, OMNI-00209, OMNI-283B, OMNI-00288, OMNI-00296-T40, OMNI-00343, OMNI-00371, OMNI-00372, OMNI-00410, OMNI-00417

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: -0.356 "H2O
Pitot Tube Cp: 0.99
Meter Box Y Factor: 1.002 (1) 0.999 (2)

| Barometric Pressure: | Begin | Middle | End | Average |
|---|---|---|---|---|
| | 30.15 | 30.14 | 30.14 | 30.14 "Hg |

Signature/Date: 7/22/14

Tunnel Velocity: 13.54 ft/sec.
Intial Tunnel Flow: 139.6 scfm
Average Tunnel Flow: 139.6 scfm
Tunnel Area: 0.1963 ft2
Post-Test Leak Check (1): 0.000@-7 cfm@"Hg
Post-Test Leak Check (2): 0.000@-5 cfm@"Hg
Fuel Moisture (dry basis %): 5.98
Total Particulate (1): 3.7
Total Particulate (2): 4.1

| 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 | | | 1.17 | 0.95 | 77 | 75 | 0.37 | 0.4 | 121 | 0.038 | | | 16.7 | | 461 | 391 | 148 | 775 | 775 | N/A | 510.0 | 441 | 75 | 75 | N/A | N/A | 79 | -0.044 |
| 10 | 1.316 | 1.323 | 0.13 | 0.13 | 1.57 | 1.32 | 79 | 77 | 0.33 | 0.4 | 121 | 0.038 | 103 | 104 | 15.3 | -1.4 | 461 | 394 | 150 | 781 | 774 | | 512.0 | 443 | 78 | 79 | | | 77 | -0.036 |
| 20 | 2.633 | 2.632 | 0.13 | 0.13 | 1.56 | 1.30 | 82 | 79 | 0.33 | 0.4 | 121 | 0.038 | 102 | 102 | 13.9 | -1.4 | 456 | 395 | 150 | 778 | 773 | | 510.4 | 443 | 80 | 80 | | | 78 | -0.035 |
| 30 | 3.950 | 3.938 | 0.13 | 0.13 | 1.54 | 1.29 | 84 | 81 | 0.32 | 0.3 | 121 | 0.038 | 102 | 101 | 12.5 | -1.4 | 457 | 397 | 151 | 778 | 772 | | 511.0 | 444 | 81 | 81 | | | 78 | -0.035 |
| 40 | 5.265 | 5.242 | 0.13 | 0.13 | 1.54 | 1.28 | 86 | 83 | 0.31 | 0.3 | 122 | 0.038 | 101 | 101 | 11.1 | -1.4 | 460 | 399 | 151 | 788 | 774 | | 514.4 | 446 | 81 | 82 | | | 78 | -0.035 |
| 50 | 6.580 | 6.545 | 0.13 | 0.13 | 1.54 | 1.28 | 87 | 84 | 0.3 | 0.3 | 122 | 0.038 | 101 | 101 | 9.7 | -1.4 | 457 | 398 | 152 | 791 | 772 | | 514.0 | 447 | 82 | 83 | | | 79 | -0.034 |
| 60 | 7.893 | 7.847 | 0.13 | 0.13 | 1.53 | 1.27 | 88 | 85 | 0.29 | 0.3 | 123 | 0.038 | 101 | 101 | 8.3 | -1.4 | 452 | 399 | 153 | 787 | 765 | | 511.2 | 446 | 82 | 83 | | | 80 | -0.034 |
| 70 | 9.204 | 9.147 | 0.13 | 0.13 | 1.52 | 1.26 | 89 | 85 | 0.28 | 0.3 | 123 | 0.038 | 101 | 100 | 6.9 | -1.4 | 452 | 397 | 153 | 775 | 765 | | 508.4 | 444 | 83 | 83 | | | 80 | -0.035 |
| 80 | 10.512 | 10.446 | 0.13 | 0.13 | 1.51 | 1.26 | 89 | 86 | 0.28 | 0.3 | 124 | 0.038 | 100 | 100 | 5.6 | -1.3 | 453 | 398 | 153 | 784 | 767 | | 511.0 | 447 | 83 | 84 | | | 80 | -0.035 |
| 90 | 11.816 | 11.741 | 0.13 | 0.13 | 1.50 | 1.25 | 90 | 86 | 0.26 | 0.3 | 124 | 0.038 | 100 | 100 | 4.2 | -1.4 | 454 | 398 | 154 | 791 | 771 | | 513.6 | 448 | 83 | 84 | | | 81 | -0.036 |
| 100 | 13.115 | 13.032 | 0.13 | 0.13 | 1.49 | 1.24 | 90 | 87 | 0.26 | 0.3 | 124 | 0.038 | 100 | 99 | 2.8 | -1.4 | 456 | 399 | 154 | 776 | 759 | | 508.8 | 446 | 83 | 84 | | | 81 | -0.035 |
| 110 | 14.409 | 14.319 | 0.13 | 0.13 | 1.46 | 1.24 | 91 | 87 | 0.24 | 0.3 | 125 | 0.038 | 99 | 99 | 1.4 | -1.4 | 447 | 398 | 154 | 773 | 748 | | 504.0 | 444 | 84 | 84 | | | 81 | -0.036 |
| 120 | 15.696 | 15.602 | 0.13 | 0.13 | 1.46 | 1.22 | 91 | 87 | 0.22 | 0.2 | 125 | 0.038 | 99 | 99 | 0.0 | -1.4 | 452 | 398 | 154 | 780 | 766 | | 510.0 | 446 | 84 | 85 | | | 81 | -0.034 |
| Avg/Total | 15.696 | 15.602 | 0.13 | 0.13 | 1.49 | 1.24 | 86.38 | 83.23 | | | 122.74 | 0.038 | 100.65 | 100.66 | | | | | | | | | 0 | | 81.46 | 82.08 | #DIV/0! | #DIV/0! | | -0.036 |

# Run Notes

Client: Harman
Model: P68
Project #: 0135PS013E.AD03
Tracking #: 1980
Run #: 4 Date: 7/17/2014
Test Crew: J. Clark
OMNI Equipment ID #(s): 1,23,128,131,132,209,283B,288,296-T56,343,371,372,410,417,438

## PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCABLE)

PRIMARY:

Stove Setting: Constant #
Feed Rate: 4.42
Temperature: 7.00
Low Draft Adj: -00 V
Category IV

SECONDARY: Auto

TERTIARY:

FAN:

## PREBURN SETTINGS AND ACTIVITIES

| TIME | AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY | FAN SETTING CHANGE | ADD FUEL + WT. | ADD FUEL - WT. | RAKE COAL | COMMENT |
|---|---|---|---|---|---|---|
| | N/A | | | | | |

## TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)

N/A
pellets

START UP PROCEDURES

BYPASS: N/A
FUEL LOADING: Auto
DOOR: N/A
PRIMARY AIR: Auto

OTHER: N/A

DESCRIBE OR SKETCH TEST SETTINGS BELOW:
(SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)
PRIMARY:

Same as above

SECONDARY: Auto

TERTIARY:

FAN:

Technician signature: _____ Date: 7/17/14

OMNI-Test Laboratories, Inc.
Portland, OR

# Supplemental Data EPA 5G/5H

Client: Harman

Model: P68 Project #: 0135PS013E.AD03 Tracking #: 1980

Date: 7/17/2014 Run #: 4 Booth: E2

Test Crew: J. Clark Start Time: 8:59 Stop Time: 10:59

OMNI Equipment #(s): 123, 128, 131, 132, 209, 283B, 288, 296-T56, 343, 371, 372, 410, 417, 438

Stack Gas Leak Check:
Initial: 0
Final: 0

Dilution Tunnel Gas Leak Check (5H only):
Initial: N/A
Final: N/A

Calibrations: Span Gas $CO_2$: 16.83 $O_2$: 20.95 CO: 4.183 $CO_2$ (DT): N/A
Mid Gas $CO_2$: 9.87 $O_2$: 10.47 CO: 2.493 $CO_2$ (DT): N/A

| | Pre Test | | | Post Test | | |
|---|---|---|---|---|---|---|
| Time | Zero | Span | Mid | Zero | Span | Mid |
| | 8:00 | 8:02 | 8:04 | 11:00 | 11:03 | 11:06 |
| $O_2$ | N/A | | | | | |
| $CO_2$ | 0.00 | 16.83 | 9.86 | 0.02 | 16.87 | 9.89 |
| CO | 0.000 | 4.183 | 2.483 | -0.001 | 4.175 | 2.481 |
| $CO_2$ (DT) | N/A | | | | | |

Air Velocity (ft/min): Initial: <50 Final: <50

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

Pitot Tube Leak Test: Initial: 0 Final: 0

Stack Diameter (inches): 6"

Induced Draft: 0

% Smoke Capture: 100 %

Flue Pipe Cleaned Prior to First Test in Series:
Date: 7/11/14 Initials: JC

| Tunnel Traverse | |
|---|---|
| dP (in $H_2O$) | T(°F) |
| .028 | 121 |
| .038 | 121 |
| .040 | 121 |
| .038 | 121 |
| .038 | 120 |
| .044 | 120 |
| .040 | 120 |
| .036 | 121 |
| N/A | N/A |
| ↓ | ↓ |
| Static P: | -0.356 |

| | Initial | Middle | Ending |
|---|---|---|---|
| $P_b$ (in/Hg) | 30.15 | 30.14 | 30.14 |
| Ambient (°F) | 79 | 79 | 82 |

Technician signature: [signature]

Date: 7/17/14

# 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 P68. The P68 is a freestanding, pellet-fired room heater.

The testing was performed at *OMNI*'s testing facility in Portland, Oregon. The altitude of the laboratory is 30 feet above sea level. The unit was received in good condition and logged in at the *OMNI*'s testing facility on July 14, 2014. It was assigned and labeled with *OMNI* ID #1980. *OMNI* representative Jeremy Clark conducted the certification testing and completed all testing by July 17, 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 P68 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 5G sampling train consisting of two filters (front and back). The weighted average emissions of the four test runs indicate a particulate emission rate of 1.3 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). There were no deviations from any of the test methods used. Emissions for each of the individual test runs did not exceed the cap. The P68 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.

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

| Run | Burn Rate (kg/hr dry) | Method 5G Emissions (g/hr) |
|---|---|---|
| 1 | 0.79 | 0.87 |
| 2 | 1.18 | 1.45 |
| 3 | 1.73 | 1.09 |
| 4 | 3.57 | 3.41 |
| Weighted particulate emission average of four test runs: 1.3 g/hr | | |

## Table 1.2 – Test Facility Conditions

| Run | Room Temperature (°F) | | Barometric Pressure (Hg) | | Air Velocity (ft/min) | |
|---|---|---|---|---|---|---|
| | Before | After | Before | After | Before | After |
| 1 | 77 | 80 | 30.14 | 30.09 | <50 | <50 |
| 2 | 82 | 84 | 30.09 | 30.04 | <50 | <50 |
| 3 | 77 | 79 | 30.10 | 30.06 | <50 | <50 |
| 4 | 79 | 81 | 30.15 | 30.14 | <50 | <50 |

**Table 1.3.1 – Fuel Measurement Summary – PRETEST**

| Run | Beginning Fuel Weight (lbs) | Ending Fuel Weight (lbs) |
|---|---|---|
| 1 | 21.2 | 19.3 |
| 2 | 15.5 | 12.9 |
| 3 | 26.0 | 21.7 |
| 4 | 45.7 | 35.7 |

**Table 1.3.2 – Fuel Measurement Summary – TEST**

| Run | Net Fuel Weight (lbs) | Fuel Moisture Content (Dry basis - %) |
|---|---|---|
| 1 | 3.7 | 5.98 |
| 2 | 5.5 | 5.98 |
| 3 | 8.1 | 5.98 |
| 4 | 16.7 | 5.98 |

**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 | 13.00 | 142.5 | 88 |
| 2 | 120 | 13.43 | 140.6 | 113 |
| 3 | 120 | 13.15 | 137.9 | 112 |
| 4 | 120 | 13.54 | 139.6 | 123 |

**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 | 207.0 | 213.6 | 6.6 |
| 2 | 235.0 | 237.8 | 2.8 |
| 3 | 299.6 | 298.8 | 0.8 |
| 4 | 510.0 | 510.0 | 0.0 |
| 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 Adjustment | Time (min) |
|---|---|---|---|---|---|
| 1 | Constant H | 0.28 | 1.00 | -36 V | 60 |
| 2 | Constant H | 0.70 | 2.54 | -00 V | 60 |
| 3 | Constant H | 1.61 | 4.77 | -00 V | 60 |
| 4 | Constant H | 4.42 | 7.00 | -00 V | 60 |

## Table 1.7 – Test Configuration

| Run | Stove Temperature Control | Feed Adjuster | Temperature Control | Low Draft Adjustment | Time (min) |
|---|---|---|---|---|---|
| 1 | Constant H | 0.28 | 1.00 | -36 V | 120 |
| 2 | Constant H | 0.70 | 2.54 | -00 V | 120 |
| 3 | Constant H | 1.61 | 4.77 | -00 V | 120 |
| 4 | Constant H | 4.42 | 7.00 | -00 V | 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 | 0.79 | 0 | -0.027 | 120 |
| 2 | 1.18 | 0 | 0.001 | 120 |
| 3 | 1.73 | 0 | -0.011 | 120 |
| 4 | 3.57 | 0 | -0.036 | 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 1.3 g/hr.

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.