



**ATTN: Engineering Department**

**LEED Fabrication, Inc.**

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Brighton, CO 80603

**Phone:** (303) 659-6801

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### **Summary:**

Leed Fabrication, Inc. contracted Air Hygiene Inc. to conduct performance testing on Emission Combustion Device on Flare Unit, EC36-2S. The unit was tested on August 26th through August 27th at the Loveland Facility in Loveland, Colorado. The flare unit was re-tested to satisfy the specifications as described in United States Code of Federal Regulations Title 40, Part 60, Subpart OOOO (40 CFR 60, Subpart OOOO).

### **Testing Methods:**

The production flare model was tested according to EPA source emissions test method

- o Method 1 – Sample and Velocity Traverse for Stationary Sources
- o Method 2 – Determination of Stack Gas Velocity and Volumetric Flow Rate
- o Method 2A – Direct Measurement of Gas Volume Through Pipes and Small Ducts
- o Method 3C – Determination of Carbon Dioxide, Methane, Nitrogen and Oxygen from stationary Sources
- o Method 4 – Determination of Moisture Content in Stack Gas
- o Method 10 – Determination of Carbon Monoxide Emission from Stationary Sources
- o Method 22 – Visual Determination of Fugitive Emissions from Material Sources and Smoke Emission from Flares
- o Method 25A – Determination of Total Gaseous Organic Concentration Using Flame Ionization Analyzer
- o ASTM D1945-03 – Standard Test Method for Analysis of Natural Gas by Gas Chromatography
- o ASTM D3588-98 – Standard Practice for Calculating Heat Value, Compressibility Factor, and Relative Density of Gaseous Fuels

### **Requirement Specification:**

In accordance to 40 CFR 60 Subpart OOOO, §60.5413(d)(12)(i) through (vi), this report contains the following information.

- o A full schematic and dimensions of the flare unit are presented in page 3
- o The maximum net Heat Input Rating of the EC36-2S is 2.47MMBtu/hr
- o The inlet gas fuel range for 0% (min. rate) and 100% (max. rate) are 2.90MSCFD, and 24.14MSCFD, respectively
- o Air/Stream injection/assist is not applicable for EC36-2S
- o The test parameter ranges below, as applicable to this unit
  - Fuel gas delivery pressure and temperature – See Air Hygiene report Appendix B
  - Fuel gas moisture range – >5ppm
  - Purge gas usage range – Not applicable



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- Condensate liquid fuel separation range – No liquid in the gas
  - Combustion temperature range – See Air Hygiene report Appendix B
  - Excess combustion air range – See Table 2.1 - 2.4
  - Flame arrestor – See blue print of the production flare unit on page 3
  - Burner manifold pressure – 0.17psi min and 1.12psi max
  - Pilot flame indicator – See blue print of the production flare unit on page 3
  - Pilot flame fuel usage – Not Applicable
  - Tip velocity range – Not Applicable
  - Momentum flux ratio – Not Applicable
  - Exit temperature range – See Air Hygiene report Appendix B
  - Weather condition - See Air Hygiene report Appendix B

**Specified Testing Conclusion for Model EC36-2S:**

- o The device was tested with no visible emission
- o The device was tested with less than 10 ppmvw average as propane corrected to 3 percent carbon dioxide
- o The device was tested with less than 10 ppmvd average as carbon monoxide corrected to 3 percent carbon dioxide
- o The device was tested with higher than 150 percent excess air
- o The device was tested with higher than 95 percent destruction efficiency for VOC









AIR HYGIENE, INC.

# *Testing Solutions for a Better World*

STACK EMISSIONS STUDY  
EPA 40 CFR PART 60 SUBPART 0000  
FOR THE  
COMBUSTION FLARE EC36-2S MODEL  
PREPARED FOR  
LEED FABRICATION SERVICES INC.  
AT THE  
LOVELAND FACILITY  
LOVELAND, COLORADO  
SEPTEMBER 1-3, 2015



**Corporate Headquarters**

1600 W Tacoma Street  
Broken Arrow, OK 74012



AIR HYGIENE, INC.

(918) 307-8865 or (888) 461-8778  
[www.airhygiene.com](http://www.airhygiene.com)

**Remote Testing Offices**

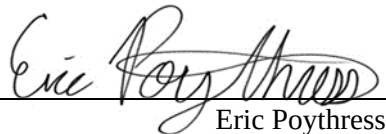
Las Vegas, NV 89156  
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**STACK EMISSIONS STUDY  
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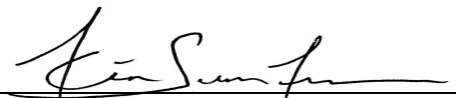
Prepared and Reviewed by:



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Test Manager



Min Sum Lee, QSTI,  
Project Manager



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**Stack Emissions Study  
Combustion Flare EC36-2S Model  
Leed Fabrication Services Inc.  
Loveland Facility  
Loveland, Colorado  
September 1-3, 2015**

## **1.0 INTRODUCTION**

Air Hygiene International, Inc. (Air Hygiene) has completed the emissions testing study for carbon monoxide (CO), total hydrocarbons (THC), flow, visual emission (VE), moisture (H<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>), and oxygen (O<sub>2</sub>) from the exhaust of the Combustion Flare EC36-2S Model for Leed Fabrication Services Inc. at the Loveland Facility near Loveland, Colorado. This report details the background, results, process description, and the sampling/analysis methodology of the stack sampling survey conducted on September 1-3, 2015.

## **1.1 TEST PURPOSE AND OBJECTIVES**

The purpose of the test was to conduct compliance emission test to document levels of selected pollutants at four ramp-up ramp-down test loads (0-30-0%, 30-70-30%, 70-100-70%, and 90-100%). The information will be used to confirm compliance with United States Code of Federal Regulations (CFR), Title 40 (40 CFR), Part 60 (40 CFR 60), Subpart OOOO. The specific objective was to determine the emission concentration of CO, THC, flow, visual emission, H<sub>2</sub>O, CO<sub>2</sub>, and O<sub>2</sub> from the exhaust of Leed Fabrication Services Inc.'s Combustion Flare EC36-2S Model.

## **1.2 SUMMARY OF TEST PROGRAM**

The following list details pertinent information related to this specific project:

- 1.2.1 Participating Organizations
  - Environment Protection Agency (EPA)
  - Leed Fabrication Services Inc.
  - Air Hygiene
- 1.2.2 Industry
  - Oil and Natural Gas Storage Transport and Processing
- 1.2.3 Air Permit and Federal Requirements
  - 40 CFR 60, Subpart OOOO
- 1.2.4 Plant Location
  - Loveland Facility near Loveland, Colorado
  - 5100 Boyd Lake Ave, Loveland, Colorado 80538
- 1.2.5 Equipment Tested
  - Combustion Flare EC36-2S Model
- 1.2.6 Emission Points
  - For all gases, three sample points in the exhaust duct from the Combustion Flare EC36-2S Model, determined according 40 CFR 60 Subpart OOOO
  - For all moisture, flow and fixed gas testing, 20 sampling points in the exhaust duct from the Combustion Flare EC36-2S Model
  - For visual emission, one sample visual observation point from the exit of the exhaust duct to the atmosphere from the Combustion Flare EC36-2S Model

- 1.2.7 Pollutants Measured
  - CO
  - THC
  - Flow
  - Visual Emission
  - H<sub>2</sub>O
  - CO<sub>2</sub>
  - O<sub>2</sub>
- 1.2.8 Dates of Emission Test
  - September 1-3, 2015

### 1.3 KEY PERSONNEL

|                                 |                 |              |
|---------------------------------|-----------------|--------------|
| Leed Fabrication Services Inc.: | Braden Costello | 303-999-1226 |
| Leed Fabrication Services Inc.  | Tony Sanelli    | 303-659-6801 |
| Air Hygiene                     | Min Sum Lee     | 918-307-8865 |
| Air Hygiene:                    | Tim Page        | 918-307-8865 |
| Air Hygiene:                    | Colby Gniech    | 918-307-8865 |

### 2.0 SUMMARY OF TEST RESULTS

Results from the sampling conducted on Leed Fabrication Services Inc.'s Combustion Flare EC36-2S Model located at the Loveland Facility on September 1-3, 2015 are summarized in the following table and relate only to the items tested.

**TABLE 2.1**  
**EC36-2S 0-30-0 LOAD DATA SUMMARY**

| Parameter                                       | 0-30-0 Load, Run -<br>EC36-2S R1 | 0-30-0 Load, Run -<br>EC36-2S R2 | 0-30-0 Load, Run -<br>EC36-2S R3 | Average  |
|-------------------------------------------------|----------------------------------|----------------------------------|----------------------------------|----------|
| Date (mm/dd/yy)                                 | 09/01/15                         | 09/01/15                         | 09/01/15                         | --       |
| Start Time (hh:mm:ss)                           | 14:36:29                         | 15:57:29                         | 17:20:29                         | --       |
| End Time (hh:mm:ss)                             | 15:46:29                         | 17:07:26                         | 18:30:29                         | --       |
| Run Duration (min / run)                        | 70                               | 70                               | 70                               | 70       |
| Bar. Pressure (in. Hg)                          | 24.95                            | 24.93                            | 24.94                            | 24.94    |
| Amb. Temp. (°F)                                 | 90                               | 90                               | 90                               | 90       |
| Rel. Humidity (%)                               | 16                               | 17                               | 11                               | 15       |
| Spec. Humidity (lb water / lb air)              | 0.005728                         | 0.006094                         | 0.003928                         | 0.005250 |
| Wind Speed (mph)                                | 4.0                              | 6.0                              | 8.0                              | 6.0      |
| Wind Direction (--)                             | NW                               | NNW                              | NW                               | --       |
| Inlet Gas Canister Pressure Start (inHg)        | -25.11                           | -17.02                           | -11.84                           | --       |
| Inlet Gas Canister Pressure Stop (inHg)         | -17.02                           | -11.84                           | -1.11                            | --       |
| Stack Flow (M2) (dscfh)                         | 40,752                           | 43,796                           | 39,307                           | 41,285   |
| Stack Moisture (Method 4)                       | 2.7                              | 2.5                              | 2.8                              | 2.6      |
| Gross Fuel Heating Value (Btu/ft <sup>3</sup> ) | 2,545.3                          | 2,545.3                          | 2,545.3                          | 2,545.30 |
| Average Inlet Fuel Flowrate (SCFH)              | 280.2                            | 277.7                            | 276.8                            | 278.23   |
| Average Inlet Mass Fuel Flowrate (lb/hr)        | 32.5                             | 32.2                             | 32.2                             | 32.32    |
| % Excess Air                                    | 1,053.7                          | 1,217.7                          | 1,306.9                          | 1,192.77 |
| CO <sub>2</sub> (%) - Modified method 3C        | 2.21                             | 2.12                             | 2.06                             | 2.13     |
| O <sub>2</sub> (%) - Modified Method 3C         | 19.00                            | 19.20                            | 19.30                            | 19.17    |
| N <sub>2</sub> (%) - Modified Method 3C         | 78.80                            | 78.70                            | 78.70                            | 78.73    |
| Visual Emission (mm:ss)                         | 0:00                             | 0:00                             | 0:00                             | 0.00     |
| CO (ppmvd)                                      | 4.13                             | 3.60                             | 3.59                             | 3.77     |
| CO (ppm@3%CO <sub>2</sub> )                     | 5.60                             | 5.10                             | 5.22                             | 5.31     |
| THC (ppmww)                                     | 1.07                             | 0.71                             | 0.60                             | 0.79     |
| THC (ppm@3%CO <sub>2</sub> )                    | 1.45                             | 1.01                             | 0.88                             | 1.11     |
| THC (lb/hr)                                     | 0.01                             | 0.00                             | 0.00                             | 0.00     |
| VOC Destruction Efficiency (%)                  | 99.983                           | 99.990                           | 99.988                           | 99.987   |

**TABLE 2.2**  
**EC36-2S 30-70-30 LOAD DATA SUMMARY**

| Parameter                                       | 30-70-30 Load,<br>Run - EC36-2S R4 | 30-70-30 Load,<br>Run - EC36-2S R5 | 30-70-30 Load,<br>Run - EC36-2S R6 | Average  |
|-------------------------------------------------|------------------------------------|------------------------------------|------------------------------------|----------|
| Date (mm/dd/yy)                                 | 09/02/15                           | 09/02/15                           | 09/02/15                           | --       |
| Start Time (hh:mm:ss)                           | 13:25:02                           | 14:48:02                           | 16:26:02                           | --       |
| End Time (hh:mm:ss)                             | 14:35:02                           | 15:58:02                           | 17:36:02                           | --       |
| Run Duration (min / run)                        | 71                                 | 70                                 | 71                                 | 71       |
| Bar. Pressure (in. Hg)                          | 24.94                              | 24.93                              | 24.90                              | 24.92    |
| Amb. Temp. (°F)                                 | 91                                 | 91                                 | 93                                 | 92       |
| Rel. Humidity (%)                               | 16                                 | 12                                 | 12                                 | 13       |
| Spec. Humidity (lb water / lb air)              | 0.005914                           | 0.004427                           | 0.004719                           | 0.005020 |
| Wind Speed (mph)                                | 4.0                                | 7.0                                | 4.0                                | 5.0      |
| Wind Direction (--)                             | NE                                 | N                                  | NNE                                | --       |
| Inlet Gas Canister Pressure Start (inHg)        | -25.10                             | -17.83                             | -10.05                             | --       |
| Inlet Gas Canister Pressure Stop (inHg)         | -17.83                             | -10.05                             | -0.20                              | --       |
| Stack Flow (M2) (dscfh)                         | 39,207                             | 40,876                             | 38,278                             | 39,454   |
| Stack Moisture (Method 4)                       | 3.2                                | 3.5                                | 3.5                                | 3.4      |
| Gross Fuel Heating Value (Btu/ft <sup>3</sup> ) | 2,553.5                            | 2,553.5                            | 2,553.5                            | 2,553.50 |
| Average Inlet Fuel Flowrate (SCFH)              | 505.4                              | 524.4                              | 520.4                              | 516.70   |
| Average Inlet Mass Fuel Flowrate (lb/hr)        | 58.4                               | 60.9                               | 55.3                               | 58.21    |
| % Excess Air                                    | 495.9                              | 630.3                              | 580.0                              | 568.73   |
| CO <sub>2</sub> (%) - Modified method 3C        | 3.39                               | 3.01                               | 3.15                               | 3.18     |
| O <sub>2</sub> (%) - Modified Method 3C         | 17.40                              | 18.00                              | 17.80                              | 17.73    |
| N <sub>2</sub> (%) - Modified Method 3C         | 79.20                              | 79.00                              | 79.10                              | 79.10    |
| Visual Emission (mm:ss)                         | 0:00                               | 0:00                               | 0:00                               | 0:00     |
| CO (ppmvd)                                      | 3.63                               | 3.51                               | 3.27                               | 3.47     |
| CO (ppm@3%CO <sub>2</sub> )                     | 3.21                               | 3.50                               | 3.11                               | 3.28     |
| THC (ppmww)                                     | 0.56                               | 0.26                               | 0.49                               | 0.43     |
| THC (ppm@3%CO <sub>2</sub> )                    | 0.49                               | 0.25                               | 0.46                               | 0.40     |
| THC (lb/hr)                                     | 0.00                               | 0.00                               | 0.00                               | 0.00     |
| VOC Destruction Efficiency (%)                  | 99.996                             | 99.998                             | 99.996                             | 99.997   |



**TABLE 2.3**  
**EC36-2S 70-100-70 LOAD DATA SUMMARY**

| Parameter                                       | 70-100-70 Load,<br>Run - EC36-2S R7 | 70-100-70 Load,<br>Run - EC36-2S R8 | 70-100-70 Load,<br>Run - EC36-2S R9 | Average  |
|-------------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|----------|
| Date (mm/dd/yy)                                 | 09/02/15                            | 09/02/15                            | 09/02/15                            | --       |
| Start Time (hh:mm:ss)                           | 8:28:02                             | 9:50:02                             | 11:10:02                            | --       |
| End Time (hh:mm:ss)                             | 9:38:02                             | 11:00:02                            | 12:20:02                            | --       |
| Run Duration (min / run)                        | 71                                  | 71                                  | 71                                  | 71       |
| Bar. Pressure (in. Hg)                          | 25.00                               | 25.00                               | 24.99                               | 25.00    |
| Amb. Temp. (°F)                                 | 63                                  | 83                                  | 87                                  | 78       |
| Rel. Humidity (%)                               | 57                                  | 34                                  | 22                                  | 38       |
| Spec. Humidity (lb water / lb air)              | 0.008341                            | 0.009784                            | 0.007169                            | 0.008431 |
| Wind Speed (mph)                                | 3.0                                 | 4.0                                 | 2.0                                 | 3.0      |
| Wind Direction (--)                             | S                                   | S                                   | S                                   | --       |
| Inlet Gas Canister Pressure Start (inHg)        | -25.20                              | -18.05                              | -10.11                              | -17.79   |
| Inlet Gas Canister Pressure Stop (inHg)         | -18.05                              | -10.11                              | -0.10                               | -9.42    |
| Stack Flow (M2) (dscfh)                         | 54,008                              | 54,888                              | 54,081                              | 54,326   |
| Stack Moisture (Method 4)                       | 5.6                                 | 4.9                                 | 5.0                                 | 5.2      |
| Gross Fuel Heating Value (Btu/ft <sup>3</sup> ) | 2,550.1                             | 2,550.1                             | 2,550.1                             | 2,550.10 |
| Average Inlet Fuel Flowrate (SCFH)              | 975.1                               | 953.7                               | 951.4                               | 960.07   |
| Average Inlet Mass Fuel Flowrate (lb/hr)        | 113.3                               | 110.8                               | 110.5                               | 111.51   |
| % Excess Air                                    | 219.7                               | 229.7                               | 219.3                               | 222.90   |
| CO <sub>2</sub> (%) - Modified method 3C        | 5.58                                | 5.38                                | 5.53                                | 5.50     |
| O <sub>2</sub> (%) - Modified Method 3C         | 14.50                               | 14.70                               | 14.50                               | 14.57    |
| N <sub>2</sub> (%) - Modified Method 3C         | 79.90                               | 79.90                               | 80.00                               | 79.93    |
| Visual Emission (mm:ss)                         | 0:00                                | 0:00                                | 0:00                                | 0:00     |
| CO (ppmvd)                                      | 0.40                                | 0.48                                | 0.42                                | 0.43     |
| CO (ppm@3%CO <sub>2</sub> )                     | 0.21                                | 0.27                                | 0.23                                | 0.24     |
| THC (ppmww)                                     | 0.07                                | 0.17                                | 0.08                                | 0.11     |
| THC (ppm@3%CO <sub>2</sub> )                    | 0.04                                | 0.10                                | 0.04                                | 0.06     |
| THC (lb/hr)                                     | 0.00                                | 0.00                                | 0.00                                | 0.00     |
| VOC Destruction Efficiency (%)                  | 99.999                              | 99.999                              | 99.999                              | 99.999   |

**TABLE 2.4**  
**EC36-2S 90-100 LOAD DATA SUMMARY**

| Parameter                                       | 90-100 Load, Run -<br>EC36-2S R10 | 90-100 Load, Run -<br>EC36-2S R11 | 90-100 Load, Run -<br>EC36-2S R12 | Average  |
|-------------------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|----------|
| Date (mm/dd/yy)                                 | 09/03/15                          | 09/03/15                          | 09/03/15                          | --       |
| Start Time (hh:mm:ss)                           | 8:19:07                           | 9:41:07                           | 11:02:07                          | --       |
| End Time (hh:mm:ss)                             | 9:29:07                           | 10:51:07                          | 12:12:07                          | --       |
| Run Duration (min / run)                        | 71                                | 71                                | 71                                | 71       |
| Bar. Pressure (in. Hg)                          | 24.94                             | 24.94                             | 24.93                             | 24.94    |
| Amb. Temp. (°F)                                 | 69                                | 75                                | 79                                | 74       |
| Rel. Humidity (%)                               | 54                                | 45                                | 33                                | 44       |
| Spec. Humidity (lb water / lb air)              | 0.009777                          | 0.009985                          | 0.008341                          | 0.009368 |
| Wind Speed (mph)                                | 10.0                              | 2.0                               | 2.0                               | 4.7      |
| Wind Direction (--)                             | NE                                | N                                 | S                                 | --       |
| Inlet Gas Canister Pressure Start (inHg)        | -25.18                            | -17.33                            | -9.26                             | --       |
| Inlet Gas Canister Pressure Stop (inHg)         | -17.33                            | -9.26                             | -0.98                             | --       |
| Stack Flow (M2) (dscfh)                         | 59,758                            | 61,265                            | 57,358                            | 59,460   |
| Stack Moisture (Method 4)                       | 4.1                               | 4.7                               | 5.1                               | 4.7      |
| Gross Fuel Heating Value (Btu/ft <sup>3</sup> ) | 2,549.9                           | 2,549.9                           | 2,549.9                           | 2,549.90 |
| Average Inlet Fuel Flowrate (SCFH)              | 994.0                             | 1,040.0                           | 1,048.4                           | 1,027.48 |
| Average Inlet Mass Fuel Flowrate (lb/hr)        | 115.4                             | 120.1                             | 121.8                             | 119.10   |
| % Excess Air                                    | 303.0                             | 266.5                             | 280.0                             | 283.17   |
| CO <sub>2</sub> (%) - Modified method 3C        | 4.60                              | 4.95                              | 4.82                              | 4.79     |
| O <sub>2</sub> (%) - Modified Method 3C         | 15.80                             | 15.30                             | 15.50                             | 15.53    |
| N <sub>2</sub> (%) - Modified Method 3C         | 79.60                             | 79.70                             | 79.70                             | 79.67    |
| Visual Emission (mm:ss)                         | 0:00                              | 0:00                              | 0:00                              | 0:00     |
| CO (ppmvd)                                      | 1.55                              | 1.32                              | 0.71                              | 1.19     |
| CO (ppm@3%CO <sub>2</sub> )                     | 1.01                              | 0.80                              | 0.44                              | 0.75     |
| THC (ppmww)                                     | 0.36                              | 0.20                              | 0.10                              | 0.22     |
| THC (ppm@3%CO <sub>2</sub> )                    | 0.24                              | 0.12                              | 0.06                              | 0.14     |
| THC (lb/hr)                                     | 0.00                              | 0.00                              | 0.00                              | 0.00     |
| VOC Destruction Efficiency (%)                  | 99.998                            | 99.999                            | 99.999                            | 99.999   |

All testing was conducted according to the requirement of 40 CFR 60.5413 and 40 CFR 60.5412.

### 3.0 SOURCE OPERATION

#### 3.1 PROCESS DESCRIPTION

Leed Fabrication Services Inc. (Leed) owns and operates the Loveland Facility located at 5100 Boyd Lake Ave in Loveland, Colorado. Leed designs and manufactures a wide range of well head production equipment, emission control devices, miscellaneous pressure vessels, and provides field services and technical support for these and other oil field requirements.

#### 3.2 SAMPLING LOCATION

The sample ports were located approximately 23 feet above grade level on the exhaust system. The stack had a 30 inches inner diameter and was equipped with two, 3 inch ports oriented at 90 degrees. The ports were greater than 4 duct diameters downstream from the highest peak flame and 1.00 duct diameters upstream from the stack exit to the atmosphere. THC and CO samples for gaseous emissions were continuously drawn from the exhaust system at one sample port with three sampling points located at 16.7 percent, 50 percent, and 83.3 percent of the stack diameter. All visual emission observation was made by viewing the point where the exhaust system exited to the atmosphere at the top of the exhaust stack. All fuel sampling was continuously drawn from the fuel supply system with silonite-coated stainless steel evacuated canister from a tap located at greater than 8 pipe diameter, 24 inches upstream of the fuel monitoring system. All flow, fixed gases and moisture sampling was continuously drawn from the exhaust system at two ports with 24 points across the stack according to Method 1.

### 4.0 SAMPLING AND ANALYTICAL PROCEDURES

#### 4.1 TEST METHODS

The emission test on the Combustion Flare EC36-2S Model at the Loveland Facility was performed following United States Environmental Protection Agency (EPA) methods described by the Code of Federal Regulations (CFR). Table 4.1 outlines the specific methods performed on September 1-3, 2015.

**TABLE 4.1**  
**SUMMARY OF SAMPLING METHODS**

| <b>Pollutant or Parameter</b>              | <b>Sampling Method</b> | <b>Analysis Method</b>          |
|--------------------------------------------|------------------------|---------------------------------|
| Sample Point Location                      | EPA Method 1           | Equal Area Method               |
| Stack Flow Rate                            | EPA Method 2           | S-Type Pitot Tube               |
| Fuel Flow Rate                             | EPA Method 2a          | Volume Displacement             |
| CO <sub>2</sub> , O <sub>2</sub> , Methane | EPA Method 3C          | Gas Chromatograph-TCD           |
| Stack Moisture Content                     | EPA Method 4           | Gravimetric Analysis            |
| Carbon Monoxide                            | EPA Method 10          | Nondispersive Infrared Analyzer |
| Visual Emission                            | EPA Method 22          | Visual Observation              |

| Pollutant or Parameter | Sampling Method                   | Analysis Method           |
|------------------------|-----------------------------------|---------------------------|
| Total Hydrocarbons     | EPA Method 25a                    | Flame Ionization Detector |
| Fuel Content Analysis  | ASTM D 1945-03,<br>ASTM D 3588-98 | Gas Chromatograph         |

## 4.2 INSTRUMENT CONFIGURATION AND OPERATIONS FOR GAS ANALYSIS

The sampling and analysis procedures used during these tests conform with the methods outlined in the Code of Federal Regulations (CFR), Title 40, Part 60, Appendix A, Methods 1, 2, 2a, 3c 4, 10, 22, 25a, ASTM D1945-03, and ASTM D3588-98 .

Figure 4.1 depicts the sample system used for the CO, THC, CO<sub>2</sub>, and O<sub>2</sub> tests. A heated stainless steel probe was inserted into the sample port of the stack to extract gas samples from the emission stream at three points located at 16.7, 50, and 83.3 percent across the stack diameter. The gas sample was continuously pulled through the probe and a portion of the sample was transported, via heat-traced Teflon® tubing to a stainless steel minimum-contact condenser designed to dry the sample. Transportation of the sample, through Teflon® tubing, continued into the sample manifold within the mobile laboratory via a stainless steel/Teflon® diaphragm pump. From the manifold, the sample was partitioned to the CO analyzers through rotameters that controlled the flow rate of the sample. Exhaust samples were also routed to the THC analyzer prior to gas conditioning.

Figure 4.1 shows that the sample system was also equipped with a separate path through which a calibration gas could be delivered to the probe and back through the entire sampling system. This allowed for convenient performance of system bias checks as required by the testing methods.

All instruments were housed in an air-conditioned, trailer-mounted mobile laboratory. Gaseous calibration standards were provided in aluminum cylinders with the concentrations certified by the vendor. EPA Protocol No. 1 was used to determine the cylinder concentrations where applicable (i.e. CO calibration gases).

Table 4.2 provides a description of the analyzers used for the instrument portion of the tests. All data from the continuous monitoring instruments were recorded on a Logic Beach Portable Data Logging System Hyperlogger which retrieves calibrated electronic data from each instrument every one second and reports an average of the collected data every 30 seconds. Data records can be found in Appendix A and B of this report.

Figure 4.2 represents the sample system used for moisture and flow testing. An inconel probe with an inconel 3/8 inches tubing, pitots tube and thermocouple were inserted into the sample ports of the stack to extract gas measurements from the emission stream through a glass impinger train. Flow rates were monitored with oil filled manometers and total sample volumes were measured with a dry gas meter. Tedlar bags were collected at the exit of this train.

Three test runs for each of the firing rate at 0-30-0 percent, 30-70-30 percent, 70-100-70 percent, and 90-100 percent (ramp up, ramp down) of approximately 61 minutes each were conducted on the Combustion Flare EC36-2S Model for CO, THC, CO<sub>2</sub>, and O<sub>2</sub>.

Figure 4.3 represents the inlet sampling system in accordance with Method 2A, 40 CFR part 60 to measure inlet gas flow rate, pressure and temperature. Fuel sample was collected at greater than 24 inches upstream from gas flow meter.

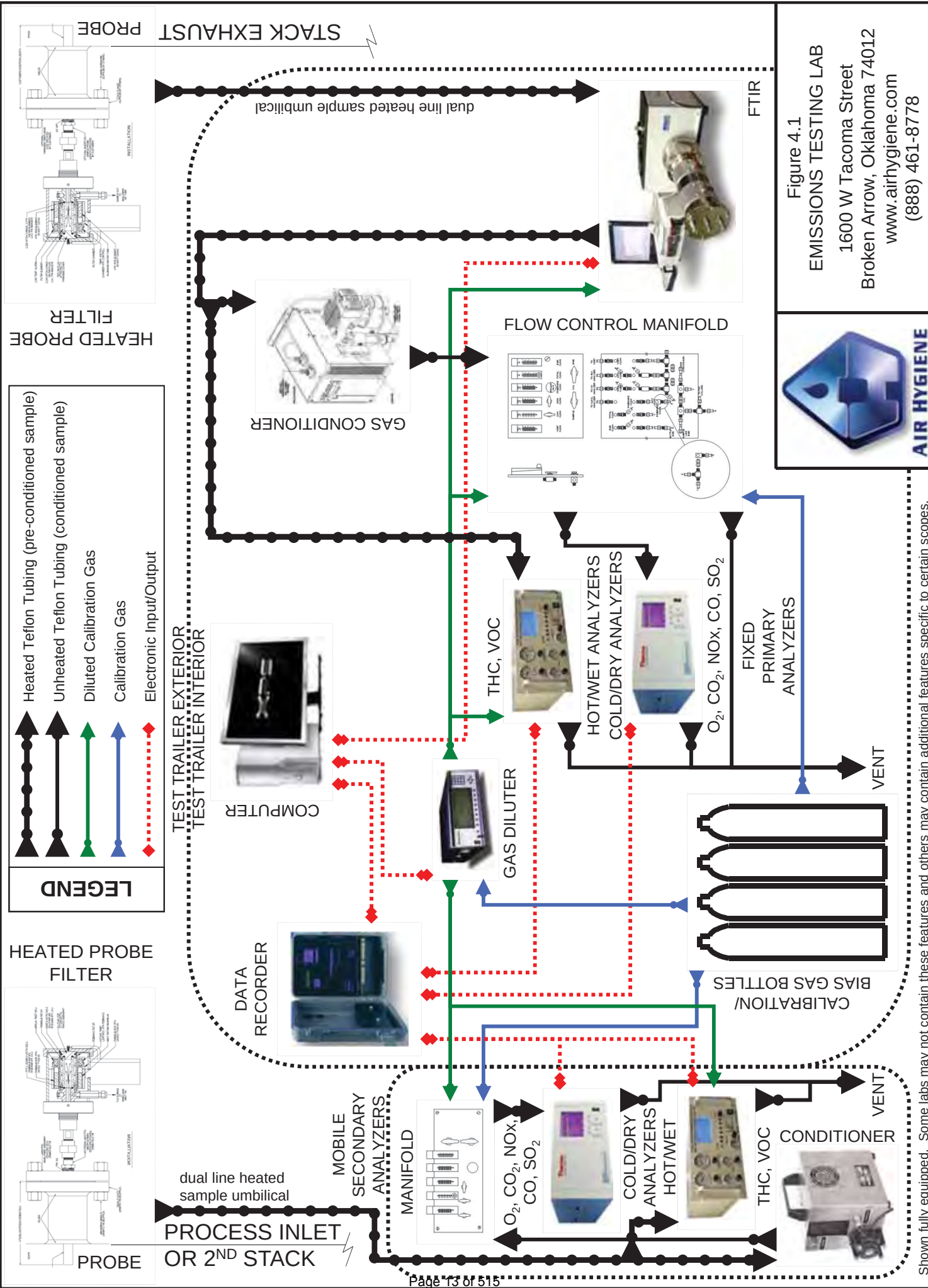
The stack gas analysis for O<sub>2</sub> and CO<sub>2</sub> concentrations was performed in accordance with procedures set forth in EPA Method 3C. The sample were collected in a tedlar bag and analyzed by GC-TCD at an offsite laboratory.

CO emission concentrations were quantified in accordance with procedures set forth in EPA Method 10. A continuous nondispersive infrared (NDIR) analyzer was used for this purpose.

THC emission concentrations were quantified in accordance with procedures set forth in EPA Method 25a. A continuous flame ionization (FID) analyzer was used for this purpose.

**TABLE 4.2**  
**ANALYTICAL INSTRUMENTATION**

| Parameter | Manufacturer and Model | Range                            | Sensitivity | Detection Principle                                                                       |
|-----------|------------------------|----------------------------------|-------------|-------------------------------------------------------------------------------------------|
| CO        | Thermo 48C             | User may select up to 10,000 ppm | 0.1 ppm     | Infrared absorption, gas filter correlation detector, microprocessor based linearization. |
| THC       | Thermo 51C             | User may select up to 10,000 ppm | 0.1 ppm     | Flame Ionization Detector                                                                 |



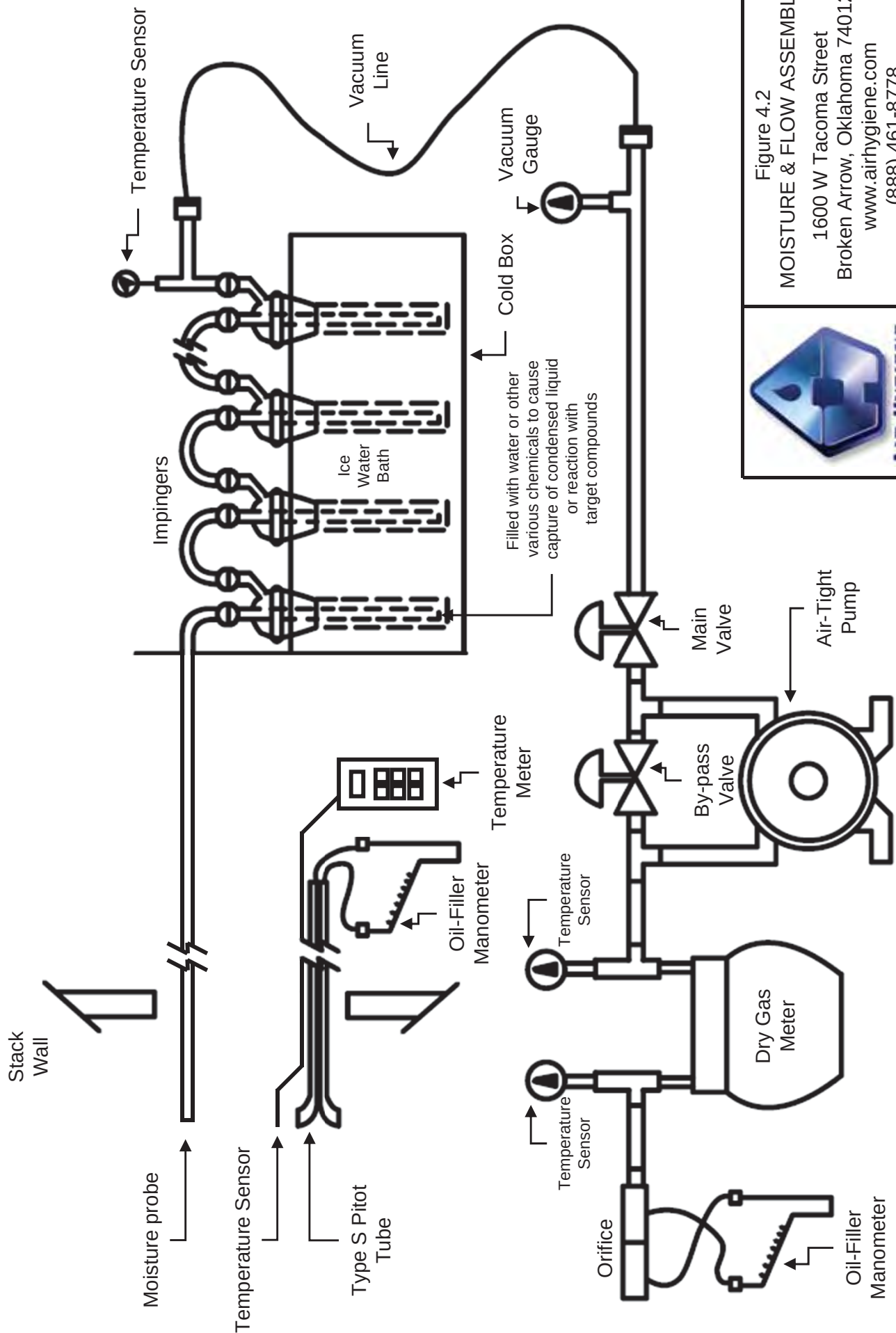


Figure 4.2  
 MOISTURE & FLOW ASSEMBLY  
 1600 W Tacoma Street  
 Broken Arrow, Oklahoma 74012  
 www.airhygiene.com  
 (888) 461-8778

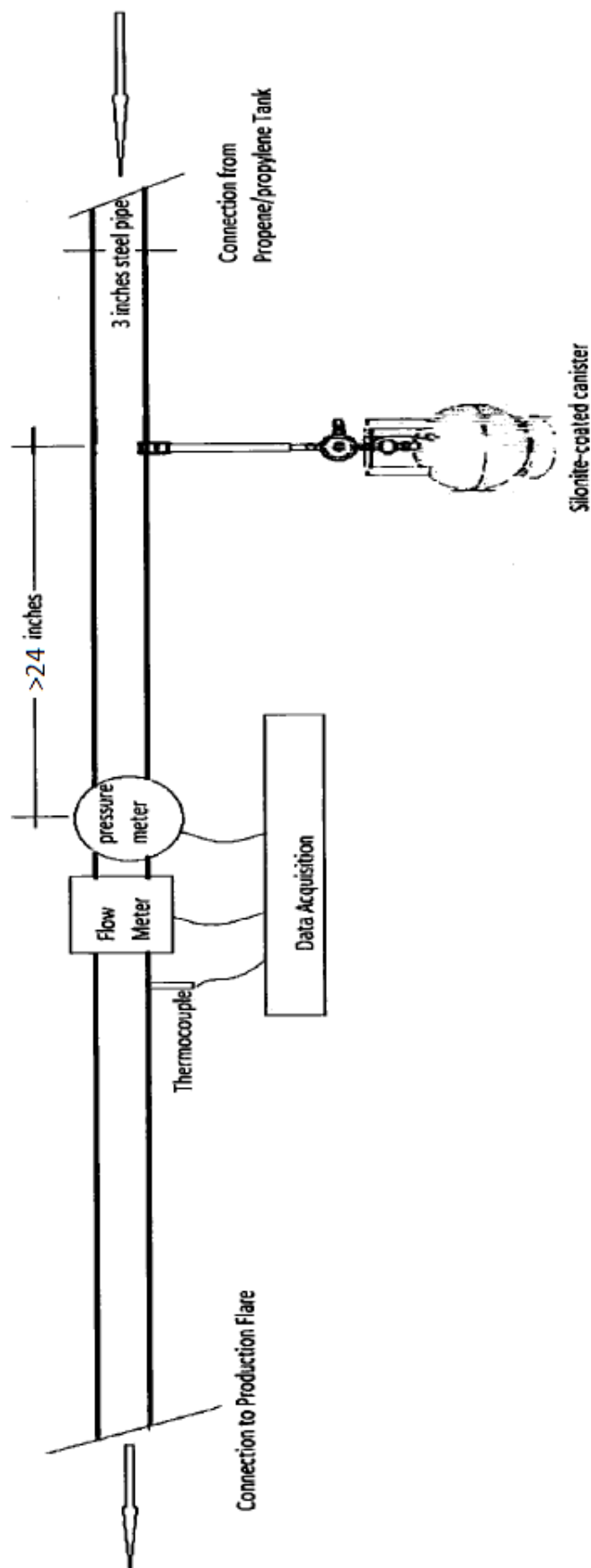


Figure 4.3

#### FUEL SAMPLING SETUP

1600 W Tacoma Street  
Broken Arrow, Oklahoma 74012

[www.airhygiene.com](http://www.airhygiene.com)  
(888) 461-8778



**AIR HYGIENE**



**APPENDIX A**

**TEST RESULTS AND CALCULATIONS**

**TABLE A.1:  
EMISSIONS TESTING SCHEDULE**

| Unit    | Load      | Test Type              | Run          | Date     | Start    | Stop     | Time Sync |
|---------|-----------|------------------------|--------------|----------|----------|----------|-----------|
| EC36-2S | 0-30-0    | CO,THC & Fuel Sampling | EC36-2S R1   | 09/01/15 | 14:36:29 | 15:46:29 | MDT       |
| EC36-2S | 0-30-0    | CO,THC & Fuel Sampling | EC36-2S R2   | 09/01/15 | 15:57:29 | 17:07:26 | MDT       |
| EC36-2S | 0-30-0    | CO,THC & Fuel Sampling | EC36-2S R3   | 09/01/15 | 17:20:29 | 18:30:29 | MDT       |
| EC36-2S | 70-100-70 | CO,THC & Fuel Sampling | EC36-2S R7   | 09/02/15 | 8:28:02  | 9:38:02  | MDT       |
| EC36-2S | 70-100-70 | CO,THC & Fuel Sampling | EC36-2S R8   | 09/02/15 | 9:50:02  | 11:00:02 | MDT       |
| EC36-2S | 70-100-70 | CO,THC & Fuel Sampling | EC36-2S R9   | 09/02/15 | 11:10:02 | 12:20:02 | MDT       |
| EC36-2S | 30-70-30  | CO,THC & Fuel Sampling | EC36-2S R4   | 09/02/15 | 13:25:02 | 14:35:02 | MDT       |
| EC36-2S | 30-70-30  | CO,THC & Fuel Sampling | EC36-2S R5   | 09/02/15 | 14:48:02 | 15:58:02 | MDT       |
| EC36-2S | 30-70-30  | CO,THC & Fuel Sampling | EC36-2S R6   | 09/02/15 | 16:26:02 | 17:36:02 | MDT       |
| EC36-2S | 90-100    | CO,THC & Fuel Sampling | EC36-2S R10  | 09/03/15 | 8:19:07  | 9:29:07  | MDT       |
| EC36-2S | 90-100    | CO,THC & Fuel Sampling | EC36-2S R11  | 09/03/15 | 9:41:07  | 10:51:07 | MDT       |
| EC36-2S | 90-100    | CO,THC & Fuel Sampling | EC36-2S R12  | 09/03/15 | 11:02:07 | 12:12:07 | MDT       |
| EC36-2S | 0-30-0    | Fixed Gas & Moisture   | 0-30-0%-1    | 09/01/15 | 14:36    | 15:46    | MDT       |
| EC36-2S | 0-30-0    | Fixed Gas & Moisture   | 0-30-0%-2    | 09/01/15 | 15:57    | 17:07    | MDT       |
| EC36-2S | 0-30-0    | Fixed Gas & Moisture   | 0-30-0%-3    | 09/01/15 | 17:20    | 18:30    | MDT       |
| EC36-2S | 70-100-70 | Fixed Gas & Moisture   | 70-100-70%-1 | 09/02/15 | 8:28     | 9:38     | MDT       |
| EC36-2S | 70-100-70 | Fixed Gas & Moisture   | 70-100-70%-2 | 09/02/15 | 9:50     | 11:00    | MDT       |
| EC36-2S | 70-100-70 | Fixed Gas & Moisture   | 70-100-70%-3 | 09/02/15 | 11:10    | 12:20    | MDT       |
| EC36-2S | 30-70-30  | Fixed Gas & Moisture   | 30-70-30%-1  | 09/02/15 | 13:25    | 14:35    | MDT       |
| EC36-2S | 30-70-30  | Fixed Gas & Moisture   | 30-70-30%-2  | 09/02/15 | 14:48    | 15:58    | MDT       |
| EC36-2S | 30-70-30  | Fixed Gas & Moisture   | 30-70-30%-3  | 09/02/15 | 16:26    | 17:36    | MDT       |
| EC36-2S | 90-100    | Fixed Gas & Moisture   | 90-100%-1    | 09/03/15 | 8:19     | 9:28     | MDT       |
| EC36-2S | 90-100    | Fixed Gas & Moisture   | 90-100%-2    | 09/03/15 | 9:41     | 10:51    | MDT       |
| EC36-2S | 90-100    | Fixed Gas & Moisture   | 90-100%-3    | 09/03/15 | 11:02    | 12:12    | MDT       |

## EXAMPLE CALCULATIONS (INFORMATION)

### Specific Humidity (RH<sub>sp</sub>)

Note: RH<sub>sp</sub> (gr/lb) calculated using temperature, relative humidity, and barometric pressure with psychrometric chart, psychrometric calculator, or built in psychrometric algorithm.

$$RH_{sp} (lb/lb) = \left[ \left( \frac{gr}{lb} \right) \times \frac{lb}{7000 gr} \right] \quad RH_{sp} = \frac{40.10 \text{ gr}}{lb} \times \frac{1 lb}{7000 gr} = 0.005728 \frac{lb \text{ H}_2\text{O}}{lb \text{ Air}}$$

## EXAMPLE CALCULATIONS (CALIBRATION)

### Calibration Error and Estimated Point, RM 25A, THC Analyzer

RM 25A, (12-17-09), 8.4 Calibration Error Test. Immediately prior to the test series (within 2 hours of the start of the test), introduce zero gas and high-level calibration gas at the calibration valve assembly. Adjust the analyzer output to the appropriate levels, if necessary. Calculate the predicted response for the low-level and mid-level gases based on a linear response line between the zero and high-level response. Then introduce low-level and mid-level calibration gases successively to the measurement system. ... These differences must be less than 5 percent of the respective calibration gas value. (calc for THC analyzer mid gas, if applicable)

$$E_p = \frac{C_{Dir(H)} - C_{Dir(Z)}}{C_{V(H)} - C_{V(Z)}} \times C_{Dir(M)} + C_{Dir(Z)} \quad \text{Eq. of a line } y=mx+b \quad E_p = \frac{8.01 \text{ ppm} - 0.06 \text{ ppm}}{7.98 \text{ ppm} - 0.00 \text{ ppm}} \times 5.02 \text{ ppm} + 0.06 = 5.06 \text{ ppm}$$

$$ACE = \left( \frac{C_{Dir} - C_V}{CS} \right) \times 100 \quad \text{Eq. 7E-1} \quad ACE_{THC} = \frac{5.01 \text{ ppm} - 5.06 \text{ ppm}}{5.02 \text{ ppm}} \times 100 = -1.02 \%$$

## EXAMPLE CALCULATIONS (BIAS, DRIFT, AND CORRECTED RAW AVERAGE)

### System Bias

RM 7E, (12-17-09), 12.3 System Bias. For non-dilution systems, use Equation 7E-2 to calculate the system bias separately for the low-level and upscale calibration gases. (calc for THC analyzer upscale gas, Run 1 initial bias, if applicable)

$$SB = \left( \frac{C_S - C_{Dir}}{CS} \right) \times 100 \quad \text{Eq. 7E-2} \quad SB = \frac{3.08 \text{ ppm} - 3.04 \text{ ppm}}{10.00 \text{ ppm}} \times 100 = 0.40 \%$$

### Drift Assessment

RM 7E, (12-17-09), 12.5 Drift Assessment. Use Equation 7E-4 to separately calculate the low-level and upscale drift over each test run. (calc for THC analyzer upscale drift, Run 1, if applicable)

$$D = |SB_{final} - SB_i| \quad \text{Eq. 7E-4} \quad D = | -0.10 \% - 0.40 \% | = 0.50 \%$$

### Alternative Drift and Bias

RM 7E, (12-17-09), 13.2 / 13.3 System Bias and Drift. Alternatively, the results are acceptable if  $|C_S - C_{dir}|$  is  $\leq 0.5$  ppmv or if  $|C_S - C_V|$  is  $\leq 0.5$  ppmv (as applicable). (calc for THC analyzer initial upscale, Run 1, if applicable)

$$SB / D_{Alt} = |C_S - C_{Dir}| \quad \text{Eq. Section 13.2 and 13.3} \quad SB / D_{Alt} = | 3.08 \text{ ppm} - 3.04 \text{ ppm} | = 0.04 \text{ ppm}$$

### Bias Adjusted Average

RM 7E, (12-17-09), 12.6 Effluent Gas Concentration. For each test run, calculate C<sub>avg</sub>, the arithmetic average of all valid THC concentration values (e.g., 1-minute averages). Then adjust the value of C<sub>avg</sub> for bias, using Equation 7E-5b. (calc for THC analyzer, Run 1, if applicable)

$$C_{Gas} = (C_{Avg} - C_O) \times \left( \frac{C_{MA}}{C_M - C_O} \right) \quad \text{Eq. 7E-5b} \quad C_{Gas} = \left( 1.08 \text{ ppm} - 0.01 \text{ ppm} \right) \times \left( \frac{3.02 \text{ ppm}}{3.06 \text{ ppm} - 0.01 \text{ ppm}} \right) = 1.07 \text{ ppm}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

#### EXAMPLE CALCULATIONS (RUNS)

##### Diluent-Corrected Pollutant Concentration, CO<sub>2</sub> Based

Calculate the CO<sub>2</sub> corrected pollutant concentration, as follows: (calc for THC gas, Run 1, if applicable)

Uinsg Method 3C fixed gas analysis

$$C_{adj} = 1.10 \text{ ppm} \times \left( \frac{3.00 \%}{2.10 \%} \right) = 1.56 \text{ ppm@3\%CO}_2$$

#### EXAMPLE CALCULATIONS (RUNS)

##### Emissions Rate (lb/hr)

Calculation for pound per hour emission rate. Calculate, as follows: (calc for THC gas Run 1, if applicable)

$$E_{lb/hr} = \frac{C_{Gas}}{10^6} \times \frac{Q_S \times MW}{G} \quad E_{lb/hr} = \frac{1.10 \text{ ppm}}{10^6 \text{ ppm/part}} \times \frac{43,796 \text{ SCFH} \times 44.00 \text{ lb/lb-mol}}{385.23 \text{ SCF/lb-mol}} = \frac{0.005 \text{ lb}}{\text{hr}}$$

##### VOC Destruction Efficiency

Calculation for VOC destruction Efficiency. Calculate, as follows: (calc for run 1, if applicable)

$$DE\% = \frac{32.545 - 0.005 \text{ lb/hr}}{32.545 \text{ lb/hr}} \times 100 = 99.983 \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

### EXAMPLE CALCULATIONS (Reference Method 1 - Circular Stack)

#### Diameter of Stack (in.)

$$D(\text{in.}) = L_{fw} - L_{rw}$$

$$D(\text{in.}) = 34.50 \text{ in.} - 5.00 \text{ in.} = 29.50 \text{ in.}$$

#### Stack Diameters Downstream

$$B_D(\text{dia.}) = \frac{B}{D}$$

$$B_D(\text{dia.}) = \frac{144.00 \text{ in.}}{29.50 \text{ in.}} = 4.88 \text{ diameters}$$

#### Area of Stack (ft<sup>2</sup>)

$$A_s(\text{ft}^2) = \pi \times \left( \frac{D}{2 \times 12} \right)^2$$

$$A_s(\text{ft}^2) = 3.14 \times \left( \frac{29.50 \text{ in.}}{2 \times 12 \text{ in./ft}} \right)^2 = 4.75 \text{ ft}^2$$

#### Stack Diameters Upstream

$$A_D(\text{dia.}) = \frac{A}{D}$$

$$A_D(\text{dia.}) = \frac{36.00 \text{ in.}}{29.50 \text{ in.}} = 1.22 \text{ diameters}$$

### EXAMPLE CALCULATIONS (Reference Method 3C) [Values from Run 1 test]

#### Carbon Monoxide Concentration (%)

$$\%CO = \frac{\text{ppmCO}}{10,000}$$

$$\%CO(\%) = \frac{0.00 \text{ ppm}}{10,000 \text{ ppm/\%}} = 0.0000 \%$$

#### Nitrogen Concentration (%)

$$\%N_2 = 100 - \%CO_2 - \%O_2 - \%CO$$

$$\%N_2(\%) = 100 - 2.21 \% - 19.00 \% - 0.00 / 10,000 \% = 78.79 \%$$

#### Stack Dry Molecular Weight (lb/lb-mole)

$$M_d(\text{lb} / \text{lb} - \text{mol}) = \sum \left( \frac{MW_{comp}}{100} \times \%component \right)$$

$$M_d(\text{lb/lb-mol}) = \left( \frac{44 \text{ lb/lb-mol}}{100} \times 2.21 \% \right) +$$

$$\left( \frac{32 \text{ lb/lb-mol}}{100} \times 19.00 \% \right) + \left( \frac{28 \text{ lb/lb-mol}}{100} \times \left[ \frac{0.00}{10,000} + 78.80 \right] \right) = \frac{29.12 \text{ lb}}{\text{lb-mol}}$$

#### Stack Wet Molecular Weight (lb/lb-mole)

$$M_s(\text{lb} / \text{lb} - \text{mol}) = \left[ M_d \times \left( 1 - \frac{B_{ws}}{100} \right) \right] + \left[ MW_{H_2O} \times \frac{B_{ws}}{100} \right]$$

$$M_s(\text{lb/lb-mol}) = \left\{ \frac{29.12 \text{ lb}}{\text{lb-mol}} \times \left( 1 - \frac{2.69 \%}{100} \right) \right\} + \left\{ \frac{18 \text{ lb}}{\text{lb-mol}} \times \frac{2.69 \%}{100} \right\} = \frac{28.82 \text{ lb}}{\text{lb-mol}}$$

#### Average Excess Air (%)

$$\%EA_{avg}(\%) = \frac{100 \times \left[ (\%O_2)_{avg} - (0.5 \times (\%CO)_{avg}) \right]}{\left[ (0.264 \times (N_2)_{avg}) - \left[ (\%O_2)_{avg} - (0.5 \times (\%CO)_{avg}) \right] \right]}$$

$$(\%EA)_{AVG} = \frac{100 \times \{ 19.00 \% - (0.5 \times 0.000 \%) \}}{(0.264 \times 78.80 \%) - \{ 19.00 \% - (0.5 \times 0.000 \%) \}} = 1,053.68 \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

**EXAMPLE CALCULATIONS (Reference Method 2) [Values from Run 1 test]**

**Absolute Stack Pressure (in. Hg)**

$$P_s (\text{in. Hg}) = P_b + \frac{P_{\text{static}}}{13.6}$$

$$P_s (\text{in. Hg}) = 24.95 \text{ in. Hg} + \frac{0.00 \text{ in. H}_2\text{O}}{13.6 \text{ in. H}_2\text{O/in. Hg}} = 24.95 \text{ in. Hg}$$

**Average Stack Gas Velocity (ft/sec)**

$$v_s (\text{ft/sec}) = K_p \times C_p \times (\sqrt{\Delta p})_{\text{avg}} \times \sqrt{\frac{(t_s)_{\text{avg}} + T_u}{P_s \times M_s}}$$

$v_{sl}$  (ft/sec) =

$$\left( \frac{85.49 \text{ ft (lb/lb-mol)(in. Hg)}}{\text{sec (}^\circ\text{R)(in. H}_2\text{O)}} \right)^{1/2} \times 0.82 \times 0.07 \text{ in. H}_2\text{O}^{1/2} \times \sqrt{\frac{720.67 + 460^\circ\text{R}}{24.95 \text{ in. Hg} \times 28.82 \text{ lb/lb-mol}}} = \frac{6.5 \text{ ft}}{\text{sec}}$$

**Average Stack Dry Standard Flow Rate (dscfh)**

$$Q_{sd} (\text{dscfh}) = \frac{60 \times 60 \times \left( 1 - \frac{B_{ws}}{100} \right) \times v_s \times A_s \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sd} (\text{dscf/hr}) = \frac{3600 \text{ sec}}{\text{hr}} \times \left( 1 - \frac{2.69 \%}{100} \right) \times \frac{6.57 \text{ ft}}{\text{sec}} \times 4.75 \text{ ft}^2 \times \frac{68.00 + 460^\circ\text{R}}{720.67 + 460^\circ\text{R}} \times \frac{24.95 \text{ in. Hg}}{29.92 \text{ in. Hg}} = \frac{40,752.34 \text{ dscf}}{\text{hr}}$$

**Average Stack Wet Flow Rate (acfm)**

$$Q_{aw} (\text{acfm}) = 60 \times v_s \times A_s$$

$$Q_{aw} (\text{acf/min}) = \frac{60 \text{ sec}}{\text{min}} \times \frac{6.57 \text{ ft}}{\text{sec}} \times 4.75 \text{ ft}^2 = \frac{1,871.61 \text{ acf}}{\text{min}}$$

**Average Stack Wet Standard Flow Rate (ascfh)**

$$Q_{sw} (\text{ascfh}) = \frac{60 \times Q_{aw} \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sw} (\text{ascf/hr}) = \frac{60 \text{ min}}{\text{hr}} \times \frac{1,871.61 \text{ acf}}{\text{min}} \times \frac{68.00 + 460^\circ\text{R}}{720.67 + 460^\circ\text{R}} \times \frac{24.95 \text{ in. Hg}}{29.92 \text{ in. Hg}} = \frac{41,877.59 \text{ ascf}}{\text{hr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

**EXAMPLE CALCULATIONS (Reference Method 4) [Values from Run 1 test]**

**Water Volume Weighed (scf)**

$$V_{ws(g)(std)}(scf) = W_t \times K_5$$

$$V_{ws(g)(std)} = 24.90 \text{ g} \times 0.04715 \text{ ft}^3/\text{g} = 1.170 \text{ scf}$$

**Standard Meter Volume (dscf)**

$$V_{m(std)}(dscf) = \frac{K_1 \times Y \times V_m \times \left( P_b + \frac{\Delta H_{avg}}{13.6} \right)}{(t_m)_{avg} + T_u}$$

$$V_{m(std)} = \frac{17.65 \text{ }^{\circ}\text{R}}{\text{in. Hg}} \times 0.98 \times 53.48 \text{ dcf} \times \left( 24.95 \text{ in. Hg} + \frac{1.70 \text{ in. H}_2\text{O}}{13.6 \text{ in. H}_2\text{O} / \text{in. Hg}} \right) = 42.52 \text{ dscf}$$

$$85.44 \text{ }^{\circ}\text{F} + 460 \text{ }^{\circ}\text{R}$$

**Calculated Moisture Content (%)**

$$B_{ws(calc)}(\%) = 100 \times \frac{V_{ws(g)(std)}}{V_{ws(g)(std)} + V_{m(std)}}$$

$$B_{ws(calc)} = 100 \times \frac{1.17 \text{ dscf}}{1.17 \text{ dscf} + 42.52 \text{ dscf}} = 2.69 \%$$

**Saturated Moisture Content (%)**

$$B_{ws(svp)}(\%) = 100 \times \frac{10^{\frac{6.691 - \frac{3144}{t_s(avg) + 390.86}}}{P_b + \frac{P_{static}}{13.6}}} \leq 100$$

$$B_{ws(svp)} = 100 \times \frac{10^{\left( 6.691 - \frac{3144}{720.67 \text{ }^{\circ}\text{F} + 390.86} \right)}}{24.95 \text{ in. Hg} + \frac{0.00 \text{ in. H}_2\text{O}}{13.6 \text{ in. H}_2\text{O} / \text{in. Hg}}} \leq 100 = 100.00 \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

# Calculations, Formulas, and Constants

The following information supports the spreadsheets for this testing project.

## Given Data:

Ideal Gas Conversion Factor = 385.23 SCF/lb-mol at 68 deg F & 14.696 psia

Fuel Heating Value is based upon Air Hygiene's fuel gas calculation sheet. All calculations are based upon a correction to 68 deg F & 14.696 psia

High Heating Values (HHV) are used for the Fuel Heating Value, F-Factor, and Fuel Flow Data per EPA requirements.

### ASTM D 3588

|                                                    |       |
|----------------------------------------------------|-------|
| Molecular Weight of NOx (lb/lb-mole) =             | 46.01 |
| Molecular Weight of CO (lb/lb-mole) =              | 28.00 |
| Molecular Weight of SO <sub>2</sub> (lb/lb-mole) = | 64.00 |
| Molecular Weight of THC (propane) (lb/lb-mole) =   | 44.00 |
| Molecular Weight of VOC (methane) (lb/lb-mole) =   | 16.00 |
| Molecular Weight of NH <sub>3</sub> (lb/lb-mole) = | 17.03 |
| Molecular Weight of HCHO (lb/lb-mole) =            | 30.03 |

### 40CFR60, App. A., RM 19, Table 19-1

|                                           |                 |
|-------------------------------------------|-----------------|
| Conversion Constant for NOx =             | 0.0000001194351 |
| Conversion Constant for CO =              | 0.0000000726839 |
| Conversion Constant for SO <sub>2</sub> = | 0.0000001661345 |
| Conversion Constant for THC =             | 0.0000001142175 |
| Conversion Constant for VOC (methane) =   | 0.0000000415336 |
| Conversion Constant for NH <sub>3</sub> = | 0.0000000442074 |
| Conversion Constant for HCHO =            | 0.0000000779534 |

NOTE: units are lb/ppm\*ft<sup>3</sup>

## Formulas:

1. Corrected Raw Average (C<sub>Gas</sub>), 40CFR60, App. A, RM 7E, Eq. 7E-5 (08/15/06)

$$C_{Gas} = (C_{Avg} - C_o) \times \left( \frac{C_{MA}}{C_M - C_o} \right)$$

2. Correction to % O<sub>2</sub>, 40CFR60, App. A, RM 20, Eq. 20-5 (11/26/02)

$$C_{adj} = C_{Gas(Target)} \times \left( \frac{20.9\% - AdjFactor}{20.9\% - C_{Gas(O_2)}} \right)$$

3. Correction to % O<sub>2</sub> and ISO Conditions

$$C_{ISO} = C_{Adj} \times \sqrt{\frac{P_r}{P_o}} \times e^{(19 \times (H_o - 0.00633))} \times \left( \frac{288}{T_a} \right)^{1.53}$$

4. Method 19 stack exhaust flow (scfh)

$$Q_s = \left( \frac{FFactor \times Q_f \times HHV}{1,000,000} \right) \times \left( \frac{20.9\%}{20.9\% - C_{Gas(O_2)}} \right)$$

5. Emission Rate in lb/hr

$$E_{lb/hr} = \frac{C_{Gas}}{10^6} \times \frac{Q_s \times MW}{G}$$

6. Emission Rate in tons per year

$$E_{ton/yr} = \frac{E_{lb/hr} \times hr_{year}}{2000}$$

7. Emission Concentration in lb/MMBtu (O<sub>2</sub> based)

$$E_{lb/MMBtu} = \frac{C_{Gas} \times F_d Factor \times Conv_c \times 20.9\%}{20.9\% - C_{Gas(O_2)}}$$

8. Emission Concentration in g/hp\*hr

$$E_{g/hp \cdot hr} = \frac{E_{lb/hr} \times 453.6}{mw \times 1314.022} \text{ or } \frac{E_{lb/hr} \times 453.6}{hp}$$



**RM 7E, (08-15-06), 12.1 Nomenclature. The terms used in the equations are defined as follows:**

ACE = Analyzer calibration error, percent of calibration span.  
B<sub>WS</sub> = Moisture content of sample gas as measured by Method 4 or other approved method, percent/100.  
C<sub>avg</sub> = Average unadjusted gas concentration indicated by data recorder for the test run.  
C<sub>D</sub> = Pollutant concentration adjusted to dry conditions.  
C<sub>dir</sub> = Measured concentration of a calibration gas (low, mid, or high) when introduced in direct calibration mode.  
C<sub>Gas</sub> = Average effluent gas concentration adjusted for bias.  
C<sub>M</sub> = Average of initial and final system calibration bias (or 2-point system calibration error) check responses for the upscale calibration gas.  
C<sub>MA</sub> = Actual concentration of the upscale calibration gas, ppmv.  
C<sub>O</sub> = Average of the initial and final system calibration bias (or 2-point system calibration error) check responses from the low-level (or zero) calibration gas.  
C<sub>S</sub> = Measured concentration of a calibration gas (low, mid, or high) when introduced in system calibration mode.  
C<sub>SS</sub> = Concentration of NO<sub>x</sub> measured in the spiked sample.  
C<sub>Spike</sub> = Concentration of NO<sub>x</sub> in the undiluted spike gas.  
C<sub>calc</sub> = Calculated concentration of NO<sub>x</sub> in the spike gas diluted in the sample.  
C<sub>V</sub> = Manufacturer certified concentration of a calibration gas (low, mid, or high).  
C<sub>W</sub> = Pollutant concentration measured under moist sample conditions, wet basis.  
CS = Calibration span.  
D = Drift assessment, percent of calibration span.  
E<sub>p</sub> = The predicted response for the low-level and mid-level gases based on a linear response line between the zero and high-level response.  
Eff<sub>NO<sub>2</sub></sub> = NO<sub>2</sub> to NO converter efficiency, percent.  
H = High calibration gas, designator.  
L = Low calibration gas, designator.  
M = Mid calibration gas, designator.  
NO<sub>Final</sub> = The average NO concentration observed with the analyzer in the NO mode during the converter efficiency test in Section 16.2.2.  
NO<sub>x</sub>Corr = The NO<sub>x</sub> concentration corrected for the converter efficiency.  
NO<sub>x</sub>Final = The final NO<sub>x</sub> concentration observed during the converter efficiency test in Section 16.2.2.  
NO<sub>x</sub>Peak = The highest NO<sub>x</sub> concentration observed during the converter efficiency test in Section 16.2.2.  
Q<sub>Spike</sub> = Flow rate of spike gas introduced in system calibration mode, L/min.  
Q<sub>Total</sub> = Total sample flow rate during the spike test, L/min.  
R = Spike recovery, percent.  
SB = System bias, percent of calibration span.  
SB<sub>i</sub> = Pre-run system bias, percent of calibration span.  
SB<sub>f</sub> = Post-run system bias, percent of calibration span.  
SB / D<sub>Alt</sub> = Alternative absolute difference criteria to pass bias and/or drift checks.  
SCE = System calibration error, percent of calibration span.  
SCE<sub>i</sub> = Pre-run system calibration error, percent of calibration span.  
SCE<sub>final</sub> = Post-run system calibration error, percent of calibration span.  
Z = Zero calibration gas, designator.

**40CFR60.355(b)(1), (09-20-06), Nomenclature. The terms used in the equations are defined as follows:**

P<sub>i</sub> = reference combustor inlet absolute pressure at 101.3 kilopascals ambient pressure, mm Hg  
P<sub>o</sub> = observed combustor inlet absolute pressure at test, mm Hg  
H<sub>a</sub> = observed humidity of ambient air, g H<sub>2</sub>O/g air  
e = transcendental constant, 2.718  
T<sub>a</sub> = ambient temperature, K

**RM 19, (07-29-06), 12.1 Nomenclature. The terms used in the equations are defined as follows:**

AdjFactor = Percent oxygen or carbon dioxide adjustment applied to a target pollutant  
 $B_{wa}$  = Moisture fraction of ambient air, percent.  
 Btu = British thermal unit  
 $\%C$  = Concentration of carbon from an ultimate analysis of fuel, weight percent.  
 $\%CO_{2d}, \%CO_{2w}$  = Concentration of carbon dioxide on a dry and wet basis, respectively, percent.  
 CIP / CDP = Combustor inlet pressure / compressor discharge pressure (mm Hg); note, some manufactures reference as PCD.  
 $E$  = Pollutant emission rate, ng/J (lb/million Btu).  
 $E_a$  = Average pollutant rate for the specified performance test period, ng/J (lb/million Btu).  
 $E_{ao}, E_{ai}$  = Average pollutant rate of the control device, outlet and inlet, respectively, for the performance test period, ng/J (lb/million Btu).  
 $E_{gi}$  = Pollutant rate from the steam generating unit, ng/J (lb/million Btu).  
 $E_{go}$  = Pollutant emission rate from the steam generating unit, ng/J (lb/million Btu).  
 $E_{ci}$  = Pollutant rate in combined effluent, ng/J (lb/million Btu).  
 $E_{co}$  = Pollutant emission rate in combined effluent, ng/J (lb/million Btu).  
 $E_d$  = Average pollutant rate for each sampling period (e.g., 24-hr Method 6B sample or 24-hr fuel sample) or for each fuel lot (e.g., amount of fuel bunkered), ng/J (lb/million Btu).  
 $E_{di}$  = Average inlet  $SO_2$  rate for each sampling period d, ng/J (lb/million Btu).  
 $E_g$  = Pollutant rate from gas turbine, ng/J (lb/million Btu).  
 $E_{ga}$  = Daily geometric average pollutant rate, ng/J (lbs/million Btu) or ppm corrected to 7 percent  $O_2$ .  
 $E_{go}, E_{gi}$  = Matched pair hourly arithmetic average pollutant rate, outlet and inlet, respectively, ng/J (lb/million Btu) or ppm corrected to 7 percent  $O_2$ .  
 $E_h$  = Hourly average pollutant, ng/J (lb/million Btu).  
 $E_{hj}$  = Hourly arithmetic average pollutant rate for hour "j," ng/J (lb/million Btu) or ppm corrected to 7 percent  $O_2$ .  
 EXP = Natural logarithmic base (2.718) raised to the value enclosed by brackets.  
 Fc = Ratio of the volume of carbon dioxide produced to the gross calorific value of the fuel from Method 19  
 $F_d, F_w, F_c$  = Volumes of combustion components per unit of heat content, scm/J (scf/million Btu).  
 $ft^3$  = cubic feet  
 G = ideal gas conversion factor  
 (385.23 SCF/lb-mol at 68 deg F & 14.696 psia)  
 GCM = gross Btu per SCF (constant, compound based)  
 GCV = Gross calorific value of the fuel consistent with the ultimate analysis, kJ/kg (Btu/lb).  
 $GCV_p, GCV_r$  = Gross calorific value for the product and raw fuel lots, respectively, dry basis, kJ/kg (Btu/lb).  
 $\%H$  = Concentration of hydrogen from an ultimate analysis of fuel, weight percent.  
 $H_b$  = Heat input rate to the steam generating unit from fuels fired in the steam generating unit, J/hr (million Btu/hr).  
 $H_g$  = Heat input rate to gas turbine from all fuels fired in the gas turbine, J/hr (million Btu/hr).  
 $\%H_2O$  = Concentration of water from an ultimate analysis of fuel, weight percent.  
 $H_t$  = Total numbers of hours in the performance test period (e.g., 720 hours for 30-day performance test period).  
 K = volume of combustion component per pound of component (constant)  
 K = Conversion factor,  $10^{-5}$  (kJ/J)/(%) [ $10^6$  Btu/million Btu].  
 $K_c = (9.57 \text{ scm/kg})/\% [(1.53 \text{ scf/lb})/\%]$ .  
 $K_{cc} = (2.0 \text{ scm/kg})/\% [(0.321 \text{ scf/lb})/\%]$ .  
 $K_{ni} = (22.7 \text{ scm/kg})/\% [(3.64 \text{ scf/lb})/\%]$ .  
 $K_{nw} = (34.74 \text{ scm/kg})/\% [(5.57 \text{ scf/lb})/\%]$ .  
 $K_n = (0.86 \text{ scm/kg})/\% [(0.14 \text{ scf/lb})/\%]$ .  
 $K_o = (2.85 \text{ scm/kg})/\% [(0.46 \text{ scf/lb})/\%]$ .  
 $K_s = (3.54 \text{ scm/kg})/\% [(0.57 \text{ scf/lb})/\%]$ .  
 $K_{sulfur} = 2 \times 10^4 \text{ Btu/mt}\% \text{-MMBtu}$   
 $K_w = (1.30 \text{ scm/kg})/\% [(0.21 \text{ scf/lb})/\%]$ .  
 lb = pound  
 ln = Natural log of indicated value.  
 $L_p, L_r$  = Weight of the product and raw fuel lots, respectively, metric ton (ton).  
 $\%N$  = Concentration of nitrogen from an ultimate analysis of fuel, weight percent.  
 $M_{\%}$  = mole percent  
 mol = mole  
 MW = molecular weight (lb/lb-mol)  
 $MW_{AIR}$  = molecular weight of air ( 28.9625 lb/lb-mole)<sup>-1</sup>  
 NCM = net Btu per SCF (constant based on compound)  
 $\%O$  = Concentration of oxygen from an ultimate analysis of fuel, weight percent.  
 $\%O_{2d}, \%O_{2w}$  = Concentration of oxygen on a dry and wet basis, respectively, percent.  
 $P_B$  = barometric pressure, in Hg  
 $P_s$  = Potential  $SO_2$  emissions, percent.  
 $\%S$  = Sulfur content of as-fired fuel lot, dry basis, weight percent.  
 $S_a$  = Standard deviation of the hourly average pollutant rates for each performance test period, ng/J (lb/million Btu).  
 $\%S_f$  = Concentration of sulfur from an ultimate analysis of fuel, weight percent.  
 $S(\text{wt}\%)$  = weight percent of sulfur, per lab analysis by appropriate ASTM standard  
 $S_i$  = Standard deviation of the hourly average inlet pollutant rates for each performance test period, ng/J (lb/million Btu).  
 $S_o$  = Standard deviation of the hourly average emission rates for each performance test period, ng/J (lb/million Btu).  
 $\%S_p, \%S_r$  = Sulfur content of the product and raw fuel lots respectively, dry basis, weight percent.  
 SCF = standard cubic feet  
 SH = specific humidity, pounds of water per pound of air  
 $t_{0.95}$  = Values shown in Table 19-3 for the indicated number of data points n.  
 $T_{amb}$  = ambient temperature, °F  
 W/D Factor = 1.0236 = conv. at 14.696 psia and  
 68 deg F (ref. Civil Eng. Ref. Manual, 7th Ed.)  
 $X_{CO_2}$  =  $CO_2$  Correction factor, percent.  
 $X_k$  = Fraction of total heat input from each type of fuel k.

## Nomenclature

- %CO = carbon monoxide concentration (%)
- %CO<sub>2</sub> = carbon dioxide concentration (%)
- %N<sub>2</sub> = nitrogen concentration (%)
- %O<sub>2</sub> = oxygen concentration (%)
- %O<sub>2,wet</sub> = Oxygen content of gas stream, % by volume of wet gas. (Note: The oxygen percentage used in Method 201A, Equation 3 is on a wet gas basis. That means that since oxygen is typically measured on a dry gas basis, the measured percent O<sub>2</sub> must be multiplied by the quantity (1 - B<sub>ws</sub>) to convert to the actual volume fraction. Therefore, %O<sub>2,wet</sub> = (1 - B<sub>ws</sub>) \* %O<sub>2, dry</sub>)
- (%EA)<sub>avg</sub> = average excess air (%)
- (F<sub>o</sub>)<sub>avg</sub> = average calculated fuel factor
- [(Δp)<sup>0.5</sup>]<sub>avg</sub> = Average of square roots of the velocity pressures measured during the preliminary traverse, inches W.C.
- μ = Gas viscosity, micropoise
- 12.0 = Constant calculated as 60 percent of 20.5 square inch cross-sectional area of combined cyclone head, square inches
- 17.03 = mg/milliequivalents for ammonium ion
- 22.4 = liters of ideal gas per mol of substance at 0°C and 1 atm (ref. Civil Engineering Reference Manual, 7th ed. - Michael R. Lindeburg)
- 5.02 × 10<sup>4</sup> = constant derived from the molecular weight and correcting standard temperature and pressure (ref. Bay Area Air Quality Management District, Source Test Procedure ST-1B, Ammonia Integrated Sampling, Adopted January 20, 1982, Regulation 7-303)
- A = distance upstream (in.)
- A<sub>D</sub> = stack diameters upstream (dia.)
- A<sub>n</sub> = Area of nozzle, square feet
- A<sub>s</sub> = area of stack (ft<sup>2</sup>)
- B = distance downstream (in.)
- B<sub>D</sub> = stack diameters downstream (dia.)
- b<sub>f</sub> = Average blockage factor calculated in Equation 26, dimensionless
- B<sub>wm</sub> = meter moisture content (%)
- B<sub>ws</sub> = stack moisture content (%)
- C = Cunningham correction factor for particle diameter, D<sub>p</sub>, and calculated using the actual stack gas temperature, dimensionless
- C<sub>1</sub> = -150.3162 (micropoise)
- C<sub>2</sub> = 18.0614 (micropoise/K<sup>0.5</sup>) = 13.4622 (micropoise/R<sup>0.5</sup>)
- C<sub>3</sub> = 1.19183 × 10<sup>6</sup> (micropoise/K<sup>2</sup>) = 3.86153 × 10<sup>6</sup> (micropoise/R<sup>2</sup>)
- C<sub>4</sub> = 0.591123 (micropoise)
- C<sub>5</sub> = 91.9723 (micropoise)
- C<sub>6</sub> = 4.91705 × 10<sup>-5</sup> (micropoise/K<sup>2</sup>) = 1.51761 × 10<sup>-5</sup> (micropoise/R<sup>2</sup>)
- C<sub>a</sub> = Acetone blank concentration, mg/mg
- C<sub>b</sub> = Concentration of NH<sub>3</sub> ion in the back half of train (breakthrough)
- C<sub>f</sub> = Concentration of NH<sub>3</sub> ion in the front half of train (main catch)
- C<sub>fPM10</sub> = Conc. of filterable PM<sub>10</sub>, gr/dscf
- C<sub>fPM2.5</sub> = Conc. of filterable PM<sub>2.5</sub>, gr/dscf
- C<sub>k</sub> = K Factor Constant, 849.8
- C<sub>n</sub> = nozzle diameter constant, 0.03575
- C<sub>p</sub>' = Coefficient for the pitot used in the preliminary traverse, dimensionless

## Nomenclature

- $C_p$  = Pitot coefficient for the combined cyclone pitot, dimensionless
- $C_{cpm}$  = Concentration of the condensable PM in the stack gas, dry basis, corrected to standard conditions, milligrams/dry standard cubic foot.
- $C_r$  = Re-estimated Cunningham correction factor for particle diameter equivalent to the actual cut size diameter and calculated using the actual stack gas temperature, dimensionless
- $D_{50}$  = Particle cut diameter, micrometers
- $D_{50(N+1)}$  =  $D_{50}$  value for cyclone IV calculated during the N+1 iterative step, micrometers
- $D_{50-1}$  = Re-calculated particle cut diameters based on re-estimated  $C_r$ , micrometers
- $D_{50LL}$  = Cut diameter for cyclone I corresponding to the 2.25 micrometer cut diameter for cyclone IV, micrometer
- $D_{50N}$  =  $D_{50}$  value for cyclone IV calculated during the Nth iterative step, micrometers
- $D_{50T}$  = Cyclone I cut diameter corresponding to the middle of the overlap zone shown in Method 201A, Figure 10 of Section 17, micrometers
- $D_e$  = equivalent stack diameter (in.)
- $\Delta H@$  =  $\Delta H$  @ 0.75 scfm (in. H<sub>2</sub>O)
- $\Delta H_{avg}$  = average orifice pressure (in. H<sub>2</sub>O)
- $D_n$  = Inner diameter of sampling nozzle mounted on Cyclone I, inches
- $D_{na}$  = actual nozzle diameter (in.)
- $D_p$  = Physical particle size, micrometers
- $\Delta p$  = velocity head (in. H<sub>2</sub>O)
- $\Delta p_1$  = velocity head at first current traverse point (in. H<sub>2</sub>O)
- $\Delta p'_1$  = velocity head at first preliminary traverse point (in. H<sub>2</sub>O)
- $\Delta p_{avg}$  = average pitot tube differential pressure (in. H<sub>2</sub>O)
- $\Delta p_n$  = velocity head at subsequent current traverse point (in. H<sub>2</sub>O)
- $\Delta p_{RM2}$  = method 2 velocity head (in. H<sub>2</sub>O)
- $D_s$  = diameter of stack (in.)
- $F_d$  = fuel f-factor (dscf/MMBtu)
- $f_{O_2}$  = stack gas fraction of O<sub>2</sub>, by volume, dry basis
- $I$  = Percent isokinetic sampling, dimensionless
- $K_1$  = standard volume correction, 17.65°R/in. Hg
- $K_4$  = isokinetic conversion constant, 0.0945min•in.Hg/sec•°R
- $K_5$  = water mass to std water vapor, 0.04715 ft<sup>3</sup>/g
- $K_p$  = 85.49, ((ft/sec)/(pounds/mole •°R))
- $L$  = length of stack (in.)
- $L_{fw}$  = distance to far wall of stack (in.)
- $L_{nw}$  = distance to near wall of stack (in.) [reference]
- $m_{\#x}$  = weight measurements (g)
- $M_1$  = Milligrams of PM collected on the filter, less than or equal to 2.5 micrometers
- $M_2$  = Milligrams of PM recovered from Container #2 (acetone blank corrected), greater than 10 micrometers
- $M_3$  = Milligrams of PM recovered from Container #3 (acetone blank corrected), less than or equal to 10 and greater than 2.5 micrometers
- $M_4$  = Milligrams of PM recovered from Container #4 (acetone blank corrected), less than or equal to 2.5 micrometers
- $m_a$  = Mass of residue of acetone after evaporation, mg
- $m_c$  = Mass of the NH<sub>4</sub><sup>+</sup> added to sample to form ammonium sulfate, mg

## Nomenclature

- $m_{\text{cpm}}$  = Mass of the total condensable PM, mg
- $M_d$  = Molecular weight of dry gas, pounds/pound mole
- $m_{\text{fb}}$  = Mass of total CPM in field train recovery blank, mg
- $m_{\text{fx}}$  = final weight, avg of last two measurements (g)
- mg = Milligram
- mg/L = Milligram per liter
- $m_i$  = Mass of inorganic CPM, mg
- $m_{\text{ib}}$  = Mass of inorganic CPM in field train recovery blank, mg
- $M_n$  = total particulates (mg)
- $m_o$  = Mass of organic CPM, mg
- $m_{\text{ob}}$  = Mass of organic CPM in field train blank, mg
- $m_r$  = Mass of dried sample from inorganic fraction, mg
- $m_{\text{tx}}$  = tare weight (g)
- MW = molecular weight (lb/lb-mole)
- $M_w$  = Molecular weight of wet gas, pounds/pound mole
- N = Normality of ammonium hydroxide titrant
- $N_a$  = null angle (deg.)
- $N_{\text{re}}$  = Reynolds number, dimensionless
- $N_{\text{tp}}$  = Number of iterative steps or total traverse points
- $P_b = P_{\text{bar}}$  = barometric pressure (in. Hg)
- $P_{\text{bar}}$  = barometric pressure (in. Hg)
- ppmCO = carbon monoxide concentration (ppm)
- ppmv = Parts per million by volume
- ppmw = Parts per million by weight
- $P_s$  = absolute stack pressure (in. Hg)
- $P_{\text{static}}$  = static pressure (in. H<sub>2</sub>O)
- $P_{\text{std}}$  = standard pressure, 29.92 in. Hg
- $\Theta$  = total sampling time (min)
- $Q_{\text{aw}}$  = average stack wet flow rate (ascf/min)
- $Q_l$  = Sampling rate for cyclone I to achieve specified  $D_{50}$
- $Q_m$  = estimated orifice flow rate, 0.750 acfm, else  $V_m/Q$  from previous run
- $Q_s$  = Sampling rate for cyclone I to achieve specified  $D_{50}$
- $Q_{\text{s(std)}}$  = total cyclone flow rate at standard conditions (dscf/min)
- $Q_{\text{sd}}$  = dry standard stack flow rate (dscfm)
- $Q_{\text{sST}}$  = Dry gas sampling rate through the sampling assembly, dscfm
- $Q_{\text{sw}}$  = wet standard stack flow rate (ascfm)
- $R_{\text{max}}$  = Nozzle/stack velocity ratio parameter, dimensionless
- $R_{\text{min}}$  = Nozzle/stack velocity ratio parameter, dimensionless
- $t_1$  = Sampling time at point 1, min
- $t_m$  = average gas meter temperature (°F)
- $t_m$  = average meter temperature (°F)
- $T_m$  = Meter box and orifice gas temperature, °R
- $t_n$  = Sampling time at point n, min
- $t_r$  = Total projected run time, min
- $T_s$  = Absolute stack gas temperature, °R
- $T_{\text{std}}$  = standard temperature, 68°F, 528°R

## Nomenclature

- $T_u$  = absolute temperature offset, 460°R
- $V_a$  = Volume of acetone blank, ml
- $V_{aw}$  = Volume of acetone used in sample recovery wash, ml
- $V_b$  = Volume of aliquot taken for IC analysis, ml
- $V_c$  = Quantity of water captured in impingers and silica gel, ml
- $V_f$  = final impinger volume (ml)
- $V_i$  = initial impinger volume (ml)
- $V_{ic}$  = Volume of impinger contents sample, ml
- $V_m$  = Dry gas meter volume sampled, acf
- $V_{m(std)}$  = standard meter volume (dscf)
- $V_{max}$  = Maximum gas velocity calculated from Equations 18 or 19, ft/sec
- $v_{max}$  = maximum nozzle velocity (ft/sec)
- $V_{mf}$  = final dry gas meter reading (dcf)
- $V_{mi}$  = initial dry gas meter reading (dcf)
- $v_{min}$  = Minimum gas velocity calculated from Method 201A, Equations 16 or 17, ft/sec
- $V_{ms}$  = Dry gas meter volume sampled, corrected to standard conditions, dscf
- $v_n$  = Sample gas velocity in the nozzle, ft/sec
- $v_{org}$  = organics wash volume (ml)
- $V_p$  = Volume of water added during train purge
- $v_s$  = average stack gas velocity (ft/sec)
- $v_{sl}$  = local velocity (ft/sec)
- $V_t$  = total impinger volume (ml) =  $;(V_f - V_i)$
- $V_t$  = Volume of NH<sub>4</sub>OH titrant, ml
- $V_{w(std)}$  = volume of water vapor in gas sample at standard conditions (scf)
- $v_x$  = blank volume (ml)
- $W$  = width of stack (in.)
- $W_{2,3,4}$  = Weight of PM recovered from Containers #2, #3, and #4, mg
- $W_a$  = Weight of blank residue in acetone used to recover samples, mg
- $W_f$  = final impinger weight (g)
- $W_i$  = initial impinger weight (g)
- $W_t$  = total impinger weight (g) =  $;(W_f - W_i)$
- $w_x$  = blank weight of solids (g)
- $Y$  = meter calibration factor (a.k.a gamma)
- $Z$  = Ratio between estimated cyclone IV D<sub>50</sub> values, dimensionless
- $\gamma$  = Dry gas meter gamma value, dimensionless
- $\Delta H$  = Meter box orifice pressure drop, inches W.C.
- $\Delta H@$  = Pressure drop across orifice at flow rate of 0.75 scfm at standard conditions, inches W.C.  
(Note: Specific to each orifice and meter box.)
- $\Delta p_1$  = Velocity pressure measured at point 1, inches W.C.
- $\Delta p_{avg}$  = Average velocity pressure, inches W.C.
- $\Delta p_m$  = Observed velocity pressure using S-type pitot tube in preliminary traverse, inches W.C.
- $\Delta p_{max}$  = Maximum velocity pressure, inches W.C.
- $\Delta p_{min}$  = Minimum velocity pressure, inches W.C.
- $\Delta p_n$  = Velocity pressure measured at point n during the test run, inches W.C.
- $\Delta p_s$  = Velocity pressure calculated in Method 201a, Equation 25, inches W.C.
- $\Delta p_{s1}$  = Velocity pressure adjusted for combined cyclone pitot tube, inches W.C.

## Nomenclature

- $\Delta p_{s2}$  = Velocity pressure corrected for blockage, inches W.C.
- $\theta$  = Total run time, min
- $\rho_a$  = Density of acetone, mg/ml (see label on bottle)
- $\Sigma_n$  = total number of sampling points

**APPENDIX B**

**EMISSION DATA RECORDS**



| Leed Fabrication Services Inc. |                            |
|--------------------------------|----------------------------|
| Air Permit # :                 | 40 CFR 60 Sub Part OOOO    |
| Plant Name or Location:        | Loveland Facility          |
| Date:                          | September 1, 2015          |
| Project Number:                | leed-15-brighton.co-comp#1 |
| Manufacturer & Equipment:      | EC36-2S                    |
| Test Load:                     | Multiple                   |
| Tester(s) / Test Unit(s):      | TP/MSL/CG/ZVN/210          |

|                             |                   | RUN        |            |            |            |            |            |            |            |            |             |             |             |
|-----------------------------|-------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|
|                             | UNITS             | EC36-2S R1 | EC36-2S R2 | EC36-2S R3 | EC36-2S R7 | EC36-2S R8 | EC36-2S R9 | EC36-2S R4 | EC36-2S R5 | EC36-2S R6 | EC36-2S R10 | EC36-2S R11 | EC36-2S R12 |
| Start Time                  | hh:mm:ss          | 14:36:29   | 15:57:29   | 17:20:29   | 08:28:02   | 09:50:02   | 11:10:02   | 13:25:02   | 14:48:02   | 16:26:02   | 08:19:07    | 09:41:07    | 11:02:07    |
| End Time                    | hh:mm:ss          | 15:46:29   | 17:07:26   | 18:30:29   | 09:38:02   | 11:00:02   | 12:20:02   | 14:35:02   | 15:58:02   | 17:36:02   | 09:29:07    | 10:51:07    | 12:12:07    |
| Bar. Pressure               | in. Hg            | 24.95      | 24.93      | 24.94      | 25.00      | 25.00      | 24.99      | 24.94      | 24.93      | 24.90      | 24.94       | 24.94       | 24.93       |
| Amb. Temp.                  | °F                | 90         | 90         | 90         | 63         | 83         | 87         | 91         | 91         | 93         | 69          | 75          | 79          |
| Rel. Humidity               | %                 | 16         | 17         | 11         | 57         | 34         | 22         | 16         | 12         | 12         | 54          | 45          | 33          |
| Spec. Humidity              | lb water / lb air | 0.005728   | 0.006094   | 0.003928   | 0.008341   | 0.009784   | 0.007169   | 0.005914   | 0.004427   | 0.004719   | 0.009777    | 0.009985    | 0.008341    |
| Date                        | mm/dd/yy          | 09/01/15   | 09/01/15   | 09/01/15   | 09/02/15   | 09/02/15   | 09/02/15   | 09/02/15   | 09/02/15   | 09/02/15   | 09/03/15    | 09/03/15    | 09/03/15    |
| Unit Number                 |                   | EC36-2S    | EC36-2S    | EC36-2S    | EC36-2S    | EC36-2S    | EC36-2S    | EC36-2S    | EC36-2S    | EC36-2S    | EC36-2S     | EC36-2S     | EC36-2S     |
| Load Designator             | %                 | 0-30-0     | 0-30-0     | 0-30-0     | 70-100-70  | 70-100-70  | 70-100-70  | 30-70-30   | 30-70-30   | 30-70-30   | 90-100      | 90-100      | 90-100      |
| Gross Fuel Heating Value    | Btu/ft3           | 2,545      | 2,545      | 2,545      | 2,550      | 2,550      | 2,550      | 2,554      | 2,554      | 2,554      | 2,550       | 2,550       | 2,550       |
| Stack Flow (M2)             | dscfh             | 40,752     | 43,796     | 39,307     | 54,008     | 54,888     | 54,081     | 39,207     | 40,876     | 38,278     | 59,758      | 61,265      | 57,358      |
| Stack Moisture              | Method 4          | 2.69       | 2.45       | 2.77       | 5.59       | 4.94       | 4.99       | 3.19       | 3.49       | 3.47       | 4.10        | 4.71        | 5.14        |
| Wind Speed                  | mph               | 4          | 6          | 8          | 3          | 4          | 2          | 4          | 7          | 4          | 10          | 2           | 2           |
| Wind Direction              | --                | NW         | NNW        | NW         | S          | S          | S          | NE         | N          | NNE        | NE          | N           | S           |
| CO <sub>2</sub> - Method 3C | %                 | 2.21       | 2.12       | 2.06       | 5.58       | 5.38       | 5.53       | 3.39       | 3.01       | 3.15       | 4.60        | 4.95        | 4.82        |
| O <sub>2</sub> - Method 3C  | %                 | 19.00      | 19.20      | 19.30      | 14.50      | 14.70      | 14.50      | 17.40      | 18.00      | 17.80      | 15.80       | 15.30       | 15.50       |
| N <sub>2</sub> -Method 3C   | %                 | 78.80      | 78.70      | 78.70      | 79.90      | 79.90      | 80.00      | 79.20      | 79.00      | 79.10      | 79.60       | 79.70       | 79.70       |
| Excess Air                  | %                 | 1,053.70   | 1,217.70   | 1,306.90   | 219.70     | 229.70     | 219.30     | 495.90     | 630.30     | 580.00     | 303.00      | 266.50      | 280.00      |

**METHOD 1 - ISOKINETIC TRAVERSE FOR A CIRCULAR SOURCE**

|                   |                   |                             |                            |
|-------------------|-------------------|-----------------------------|----------------------------|
| <b>Company</b>    | Leed Fabrication  | <b>Date</b>                 | 09/01/15                   |
| <b>Plant Name</b> | Loveland Facility | <b>Project #</b>            | leed-15-brighton.co-comp#1 |
| <b>Equipment</b>  | EC-36-2S          | <b># of Ports Available</b> | 2                          |
| <b>Location</b>   | Ports             | <b># of Ports Used</b>      | 2                          |

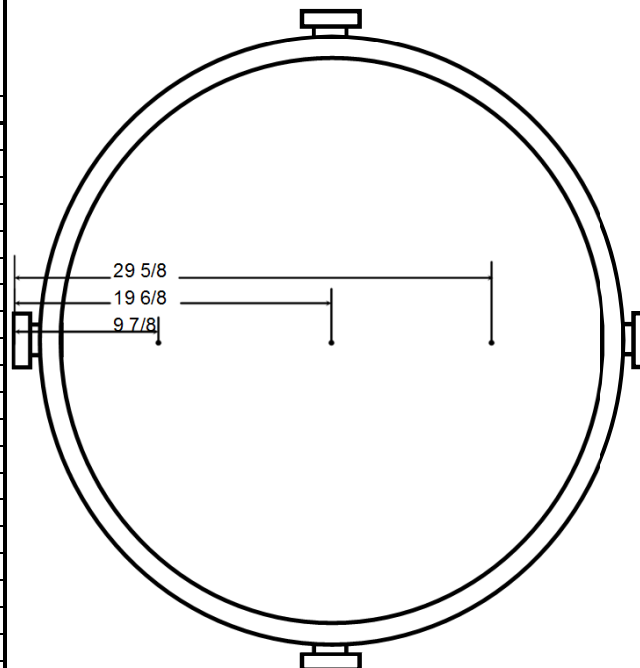
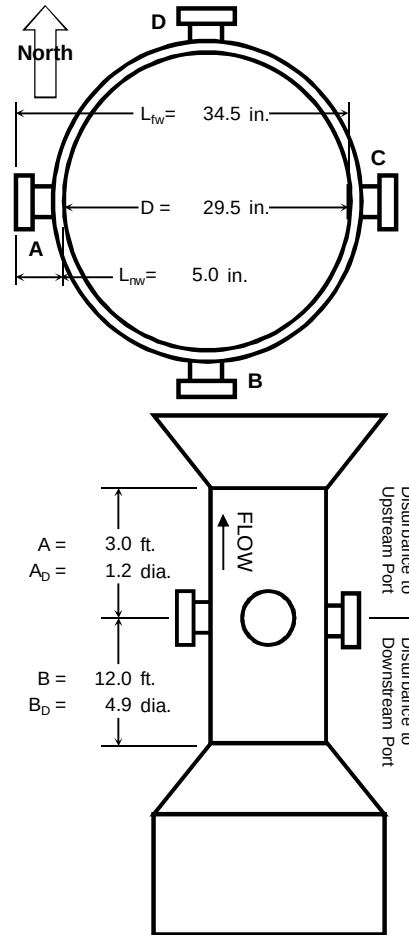
| Circular Stack or Duct Diameter |                    |       |                 |
|---------------------------------|--------------------|-------|-----------------|
| Distance to Far Wall of Stack   | (L <sub>fw</sub> ) | 34.50 | in.             |
| Distance to Near Wall of Stack  | (L <sub>nw</sub> ) | 5.00  | in.             |
| Diameter of Stack               | (D)                | 29.50 | in.             |
| Area of Stack                   | (A <sub>s</sub> )  | 4.75  | ft <sup>2</sup> |

| Distance from Disturbances to Port |                   |        |           |
|------------------------------------|-------------------|--------|-----------|
| Distance Upstream                  | (A)               | 36.00  | in.       |
| Diameters Upstream                 | (A <sub>D</sub> ) | 1.22   | diameters |
| Distance Downstream                | (B)               | 144.00 | in.       |
| Diameters Downstream               | (B <sub>D</sub> ) | 4.88   | diameters |

| Number of Traverse Points Required                                                                            |                      |                                |                      |                     |            |
|---------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------|----------------------|---------------------|------------|
| Diameters to                                                                                                  |                      | Minimum Number of <sup>1</sup> |                      | Minimum Number of   |            |
| Flow Disturbance                                                                                              |                      | Traverse Points                |                      | Traverse Points     |            |
| Down (B <sub>D</sub> )                                                                                        | Up (A <sub>B</sub> ) | Particulate                    | Velocity             | Comp Stratification |            |
| Stream                                                                                                        | Stream               | Points                         | Points               | Criteria            | Points     |
| 2.00-4.99                                                                                                     | 0.50-1.24            | 24                             | 16                   | ○ RM 7E 8.1.2       | 12 RM1 pts |
| 5.00-5.99                                                                                                     | 1.25-1.49            | 20                             | 16                   | ● ○○○○ Req.         | 3 points   |
| 6.00-6.99                                                                                                     | 1.50-1.74            | 16                             | 12                   |                     |            |
| 7.00-7.99                                                                                                     | 1.75-1.99            | 12                             | 12                   |                     |            |
| >= 8.00                                                                                                       | >=2.00               | 8 or 12 <sup>2</sup>           | 8 or 12 <sup>2</sup> | Minimum Number of   |            |
| Upstream Spec                                                                                                 |                      | 24                             | 16                   | Traverse Points     |            |
| Downstream Spec                                                                                               |                      | 24                             | 16                   | RATA Stratification |            |
| Traverse Pts Required                                                                                         |                      | 24                             | 16                   | Criteria            | Points     |
| <sup>1</sup> Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest. |                      |                                |                      | ○ Part75/60         | 12 RM1 pts |
|                                                                                                               |                      |                                |                      | ○ 75 abrv (a)       | 3 points   |
|                                                                                                               |                      |                                |                      | ○ 75 abrv (b)       | 6 points   |
|                                                                                                               |                      |                                |                      |                     |            |
| <sup>2</sup> 8 for Circular Stacks 12 to 24 inches                                                            |                      |                                |                      |                     |            |
| 12 for Circular Stacks over 24 inches                                                                         |                      |                                |                      |                     |            |

| Number of Traverse Points Used |          |   |            |
|--------------------------------|----------|---|------------|
| 2                              | Ports by | 3 | Pts / port |
| 1                              | Pts Used | 3 | Required   |

| Traverse Point Locations |                           |                           |                                     |
|--------------------------|---------------------------|---------------------------|-------------------------------------|
| Traverse Point Number    | Percent of Stack Diameter | Distance from Inside Wall | Distance Including Reference Length |
|                          | %                         | in.                       | in.                                 |
| 1                        | 16.7%                     | 4 7/8                     | 9 7/8                               |
| 2                        | 50.0%                     | 14 6/8                    | 19 6/8                              |
| 3                        | 83.3%                     | 24 5/8                    | 29 5/8                              |
| 4                        |                           |                           |                                     |
| 5                        |                           |                           |                                     |
| 6                        |                           |                           |                                     |
| 7                        |                           |                           |                                     |
| 8                        |                           |                           |                                     |
| 9                        |                           |                           |                                     |
| 10                       |                           |                           |                                     |
| 11                       |                           |                           |                                     |
| 12                       |                           |                           |                                     |
| 13                       |                           |                           |                                     |
| 14                       |                           |                           |                                     |
| 15                       |                           |                           |                                     |
| 16                       |                           |                           |                                     |
| 17                       |                           |                           |                                     |
| 18                       |                           |                           |                                     |
| 19                       |                           |                           |                                     |
| 20                       |                           |                           |                                     |
| 21                       |                           |                           |                                     |
| 22                       |                           |                           |                                     |
| 23                       |                           |                           |                                     |
| 24                       |                           |                           |                                     |



# METHOD 1 - SAMPLE AND VELOCITY TRAVERSES FOR CIRCULAR SOURCES

|                          |                            |                         |          |
|--------------------------|----------------------------|-------------------------|----------|
| <b>Plant Name</b>        | Loveland Facility          | <b>Date</b>             | 09/01/15 |
| <b>Sampling Location</b> | EC-36-2S                   | <b>Stack Type</b>       | Circular |
| <b>Operator</b>          | TP                         | <b>Ports Available</b>  | 2        |
| <b>Project #</b>         | leed-15-brighton.co-comp#1 | <b>Ports Used</b>       | 2        |
| <b>Stack Size</b>        | Large (>24 inch diameter)  | <b>Port ID (inches)</b> | 3.00     |

| Circular Stack or Duct Diameter       |                    |       |                 |
|---------------------------------------|--------------------|-------|-----------------|
| <b>Distance to Far Wall of Stack</b>  | (L <sub>fw</sub> ) | 34.50 | in              |
| <b>Distance to Near Wall of Stack</b> | (L <sub>nw</sub> ) | 5.00  | in              |
| <b>Diameter of Stack</b>              | (D)                | 29.50 | in              |
| <b>Area of Stack</b>                  | (A <sub>s</sub> )  | 4.75  | ft <sup>2</sup> |

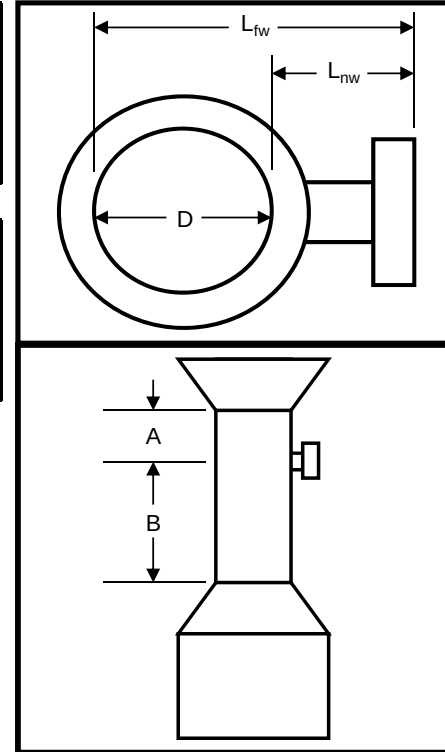
| Distance from Port to Disturbances |                   |        |           |
|------------------------------------|-------------------|--------|-----------|
| <b>Distance Upstream</b>           | (A)               | 36.00  | in        |
| <b>Diameters Upstream</b>          | (A <sub>D</sub> ) | 1.22   | diameters |
| <b>Distance Downstream</b>         | (B)               | 144.00 | in        |
| <b>Diameters Downstream</b>        | (B <sub>D</sub> ) | 4.88   | diameters |

| Number of Traverse Points Required |           |                                                |                      |
|------------------------------------|-----------|------------------------------------------------|----------------------|
| Diameters to Flow Disturbance      |           | Minimum Number of <sup>1</sup> Traverse Points |                      |
| Down Stream                        | Up Stream | Particulate Points                             | Velocity Points      |
| 2.00-4.99                          | 0.50-1.24 | 24                                             | 16                   |
| 5.00-5.99                          | 1.25-1.49 | 20                                             | 16                   |
| 6.00-6.99                          | 1.50-1.74 | 16                                             | 12                   |
| 7.00-7.99                          | 1.75-1.99 | 12                                             | 12                   |
| >= 8.00                            | >= 2.00   | 8 or 12 <sup>2</sup>                           | 8 or 12 <sup>2</sup> |
| <b>Upstream Spec</b>               |           | 24                                             | 16                   |
| <b>Downstream Spec</b>             |           | 24                                             | 16                   |
| <b>Traverse Pts Required</b>       |           | 24                                             | 16                   |

<sup>1</sup> Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest.

<sup>2</sup> 8 for Circular Stacks 12 to 24 inches  
12 for Circular Stacks over 24 inches

| Location of Traverse Points in Circular Stacks |                                                                  |      |      |      |      |      |      |      |      |
|------------------------------------------------|------------------------------------------------------------------|------|------|------|------|------|------|------|------|
| Traverse Point                                 | (Fraction of Stack Dimension from Inside Wall to Traverse Point) |      |      |      |      |      |      |      |      |
| Number                                         | 2                                                                | 4    | 6    | 8    | 10   | 12   | 14   | 16   | 18   |
| 1                                              | .146                                                             | .087 | .044 | .032 | .026 | .021 | .018 | .016 | .014 |
| 2                                              | .854                                                             | .250 | .146 | .105 | .082 | .067 | .057 | .049 | .044 |
| 3                                              |                                                                  | .750 | .296 | .194 | .146 | .118 | .099 | .085 | .075 |
| 4                                              |                                                                  | .933 | .704 | .323 | .226 | .177 | .146 | .125 | .109 |
| 5                                              |                                                                  |      | .854 | .677 | .342 | .250 | .201 | .169 | .146 |
| 6                                              |                                                                  |      | .956 | .806 | .658 | .356 | .269 | .220 | .188 |
| 7                                              |                                                                  |      |      | .895 | .774 | .644 | .366 | .283 | .236 |
| 8                                              |                                                                  |      |      | .968 | .854 | .750 | .634 | .375 | .296 |
| 9                                              |                                                                  |      |      |      | .918 | .823 | .731 | .625 | .382 |
| 10                                             |                                                                  |      |      |      | .974 | .882 | .799 | .717 | .618 |
| 11                                             |                                                                  |      |      |      |      | .933 | .854 | .780 | .704 |
| 12                                             |                                                                  |      |      |      |      | .979 | .901 | .831 | .764 |



- ☒ Method 1 Trav
- ☐ 12 Point PM Trav (M201a ONLY)
- ☐ Velocity

| Number of Traverse Points Used |                 |    |                 |
|--------------------------------|-----------------|----|-----------------|
| 2                              | <b>Ports by</b> | 12 | <b>Across</b>   |
| 24                             | <b>Pts Used</b> | 24 | <b>Required</b> |

| Traverse Point Locations |                            |                           |                                     |
|--------------------------|----------------------------|---------------------------|-------------------------------------|
| Traverse Point Number    | Fraction of Stack Diameter | Distance from Inside Wall | Distance Including Reference Length |
|                          |                            | in                        | in                                  |
| 1                        | 0.021                      | 5/8                       | 5 5/8                               |
| 2                        | 0.067                      | 2                         | 7                                   |
| 3                        | 0.118                      | 3 4/8                     | 8 4/8                               |
| 4                        | 0.177                      | 5 2/8                     | 10 2/8                              |
| 5                        | 0.250                      | 7 3/8                     | 12 3/8                              |
| 6                        | 0.356                      | 10 4/8                    | 15 4/8                              |
| 7                        | 0.644                      | 19                        | 24                                  |
| 8                        | 0.750                      | 22 1/8                    | 27 1/8                              |
| 9                        | 0.823                      | 24 2/8                    | 29 2/8                              |
| 10                       | 0.882                      | 26                        | 31                                  |
| 11                       | 0.933                      | 27 4/8                    | 32 4/8                              |
| 12                       | 0.979                      | 28 7/8                    | 33 7/8                              |

## **EMISSION DATA RECORDS**

**0-30-0% Ramp-up, Ramp-down Unit Operations Data**

**METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE**

| Source Information |                   |
|--------------------|-------------------|
| Plant Name         | Loveland Facility |
| Sampling Location  | EC-36-2S          |
| Fuel Type          | Gas, Propene      |

| Test Information          |              |                            |         |
|---------------------------|--------------|----------------------------|---------|
| Project #                 |              | leed-15-brighton.co-comp#1 |         |
| Operator                  |              | TP                         |         |
| Date for Preliminary Run  | (mm/dd/yy)   | 09/01/15                   |         |
| Standard Temperature      |              | 68                         | °F      |
| Standard Pressure         |              | 29.92                      | in Hg   |
| Required Sample Vol.      | RM4, 8.1.1.2 | 21                         | scf     |
| Run Duration              | ≤0.75 cfm    | 65                         | minutes |
| Unit Number               |              | 1                          |         |
| Base Run Number           |              | 0-30-0%                    |         |
| Number of Ports Available |              | 2                          |         |
| Number of Ports Used      |              | 2                          |         |
| Port Inside Diameter      |              | 3.00                       | in      |
| Stack Shape               |              | Circular                   |         |

| Test Equipment Information       |                    |              |              |              |                     |
|----------------------------------|--------------------|--------------|--------------|--------------|---------------------|
| Run                              |                    | 1            | 2            | 3            |                     |
| Test Date                        | (mm/dd/yy)         | 09/01/15     | 09/01/15     | 09/01/15     |                     |
| Load                             | % or w/DB          | 0-30-0       | 0-30-0       | 0-30-0       |                     |
| Meter Box Number                 | from ACS           | SAMP-CP-0007 | SAMP-CP-0007 | SAMP-CP-0007 |                     |
| Meter Calibration Factor         | (Y)                | 0.980        | 0.980        | 0.980        |                     |
| Orifice Meter Coefficient        | ( $\Delta H_{@}$ ) | 1.656        | 1.656        | 1.656        | in H <sub>2</sub> O |
| Pitot Identification             | from ACS           | 4174         | 4174         | 4174         |                     |
| Pitot Tube Coefficient           | (C <sub>p</sub> )  | 0.819        | 0.819        | 0.819        |                     |
| Probe Number                     | from ACS           | SAMP-PF-0001 | SAMP-SP-0001 | SAMP-SP-0001 |                     |
| Probe Length                     |                    | 60.0         | 60.0         | 60.0         | in                  |
| (SS, Glass .... ) Liner Material | from list          | inconel      | inconel      | inconel      |                     |
| Impinger Case Number             | from ACS           | SAMP-BC-0002 | SAMP-BC-0002 | SAMP-BC-0002 |                     |

| Testing Company Information |                                                   |
|-----------------------------|---------------------------------------------------|
| Company Name                | Air Hygiene International, Inc. (Tulsa, Oklahoma) |
| Address                     | 1600 W Tacoma Street                              |
| City, State Zip             | Broken Arrow, Oklahoma 74012                      |
| Project Manager             | Min Sum Lee                                       |
| Phone Number                | (918) 307-8865                                    |
| Fax Number                  | (918) 307-9131                                    |

**METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] - RESULTS**

|                          |                            |
|--------------------------|----------------------------|
| <b>Plant Name</b>        | Loveland Facility          |
| <b>Sampling Location</b> | EC-36-2S                   |
| <b>Project #</b>         | leed-15-brighton.co-comp#1 |

| <b>Historical Data</b>             | <b>0-30-0%-1</b> | <b>0-30-0%-2</b> | <b>0-30-0%-3</b> | <b>Average</b> | <b>Units</b>           |
|------------------------------------|------------------|------------------|------------------|----------------|------------------------|
| Run Start Time                     | 14:36            | 15:57            | 17:20            |                | hh:mm                  |
| Run Stop Time                      | 15:46            | 17:07            | 18:30            |                | hh:mm                  |
| Test Date                          | 09/01/15         | 09/01/15         | 09/01/15         |                | mm/dd/yy               |
| Meter Calibration Factor           | 0.980            | 0.980            | 0.980            |                |                        |
| Pitot Tube Coefficient             | 0.819            | 0.819            | 0.819            |                |                        |
| Initial Meter Volume               | 806.865          | 860.485          | 914.495          |                | ft <sup>3</sup>        |
| Final Meter Volume                 | 860.345          | 914.340          | 967.960          |                | ft <sup>3</sup>        |
| Total Meter Volume                 | 53.480           | 53.855           | 53.465           | 53.600         | ft <sup>3</sup>        |
| Total Sampling Time                | 65.00            | 65.00            | 65.00            | 65.00          | min                    |
| Average Meter Temperature          | 85.44            | 83.73            | 81.92            | 83.69          | °F                     |
| Average Stack Temperature          | 720.67           | 685.08           | 720.54           | 708.76         | °F                     |
| Barometric Pressure                | 24.95            | 24.93            | 24.94            | 24.94          | in Hg                  |
| Stack Static Pressure              | 0.00             | 0.00             | 0.00             | 0.00           | in H <sub>2</sub> O    |
| Absolute Stack Pressure            | 24.95            | 24.93            | 24.94            | 24.94          | in Hg                  |
| Average Orifice Pressure Drop      | 1.70             | 1.70             | 1.70             | 1.70           | in H <sub>2</sub> O    |
| Absolute Meter Pressure            | 25.07            | 25.05            | 25.06            | 25.06          | in Hg                  |
| Avg Square Root Pitot Pressure     | 0.07             | 0.08             | 0.07             | 0.07           | √(in H <sub>2</sub> O) |
| <b>Moisture Content Data</b>       | <b>0-30-0%-1</b> | <b>0-30-0%-2</b> | <b>0-30-0%-3</b> | <b>Average</b> | <b>Units</b>           |
| Impinger Water Weight Gain         | 10.90            | 10.80            | 13.30            | 11.67          | g                      |
| Silica Gel Weight Gain             | 14.00            | 12.10            | 12.50            | 12.87          | g                      |
| Total Water Volume Collected       | 24.94            | 22.94            | 25.85            | 24.58          | ml                     |
| Standard Water Vapor Volume        | 1.17             | 1.08             | 1.22             | 1.16           | scf                    |
| Standard Meter Volume              | 42.5             | 42.9             | 42.8             | 42.7           | dscf                   |
| Calculated Stack Moisture          | 2.69             | 2.45             | 2.77             | 2.64           | %                      |
| Saturated Stack Moisture           | 100.00           | 100.00           | 100.00           | 100.00         | %                      |
| Reported Stack Moisture Content    | 2.69             | 2.45             | 2.77             | 2.64           | %                      |
| <b>Method 3C Gas Analysis Data</b> | <b>0-30-0%-1</b> | <b>0-30-0%-2</b> | <b>0-30-0%-3</b> | <b>Average</b> | <b>Units</b>           |
| Carbon Dioxide Content             | 2.2              | 2.1              | 2.1              | 2.1            | %                      |
| Oxygen Content                     | 19.0             | 19.2             | 19.3             | 19.2           | %                      |
| Nitrogen Content                   | 78.8             | 78.7             | 78.7             | 78.7           | %                      |
| Stack Dry Molecular Weight         | 29.12            | 29.11            | 29.12            | 29.12          | lb/lb-mole             |
| Stack Wet Molecular Weight         | 28.82            | 28.84            | 28.81            | 28.82          | lb/lb-mole             |
| Percent Excess Air                 | 1053.7           | 1217.7           | 1306.9           | 1192.7         | %                      |
| <b>Volumetric Flow Rate Data</b>   | <b>0-30-0%-1</b> | <b>0-30-0%-2</b> | <b>0-30-0%-3</b> | <b>Average</b> | <b>Units</b>           |
| Average Stack Gas Velocity         | 6.57             | 6.84             | 6.35             | 6.59           | ft/sec                 |
| Stack Cross-Sectional Area         | 4.75             | 4.75             | 4.75             | 4.75           | ft <sup>2</sup>        |
| Actual Stack Flow Rate             | 1,872            | 1,948            | 1,807            | 1,876          | acfm                   |
| Wet Standard Stack Flow Rate       | 42               | 45               | 40               | 42             | wkscfh                 |
| Dry Standard Stack Flow Rate       | 40,752           | 43,796           | 39,307           | 41,285         | dscfh                  |

**METHOD 3C - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER**

|                          |                            |                         |          |                         |     |
|--------------------------|----------------------------|-------------------------|----------|-------------------------|-----|
| <b>Plant Name</b>        | Loveland Facility          | <b>Preliminary Date</b> | 09/01/15 |                         |     |
| <b>Sampling Location</b> | EC-36-2S                   | <b>Operator</b>         | TP       |                         |     |
| <b>Project #</b>         | leed-15-brighton.co-comp#1 | <b># of Ports Used</b>  | 2        |                         |     |
| <b>Fuel Type</b>         | Gas, Propene               | <b>Min. Fuel Factor</b> | N/A      | <b>Max. Fuel Factor</b> | N/A |

| Gas Analysis Data           |                             |                            |                       |                            |                             |                                  |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | 0-30-0%-1                   |                            | <b>Date</b>           | 09/01/15                   | <b>Run Start Time</b>       | 14:36                            | <b>Run Stop Time</b> | 15:46                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>Methane Conc.</b>  | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b>    | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCH <sub>4</sub> ) | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (F <sub>o</sub> ) <sub>avg</sub> | (%EA) <sub>avg</sub> |                             |
| hh:mm                       | %                           | %                          | ppm                   | %                          | lb/lb-mole                  |                                  | %                    |                             |
| 01:10                       | 2.2                         | 19.0                       | 0.0                   | 78.8                       | 29.12                       | 0.860                            | 1053.7               | N/A                         |

| Gas Analysis Data           |                             |                            |                       |                            |                             |                                  |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | 0-30-0%-2                   |                            | <b>Date</b>           | 09/01/15                   | <b>Run Start Time</b>       | 15:57                            | <b>Run Stop Time</b> | 17:07                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>Methane Conc.</b>  | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b>    | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCH <sub>4</sub> ) | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (F <sub>o</sub> ) <sub>avg</sub> | (%EA) <sub>avg</sub> |                             |
| hh:mm                       | %                           | %                          | ppm                   | %                          | lb/lb-mole                  |                                  | %                    |                             |
| 01:10                       | 2.1                         | 19.2                       | 0.0                   | 78.7                       | 29.11                       | 0.802                            | 1217.7               | N/A                         |

| Gas Analysis Data           |                             |                            |                       |                            |                             |                                  |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | 0-30-0%-3                   |                            | <b>Date</b>           | 09/01/15                   | <b>Run Start Time</b>       | 17:20                            | <b>Run Stop Time</b> | 18:30                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>Methane Conc.</b>  | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b>    | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCH <sub>4</sub> ) | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (F <sub>o</sub> ) <sub>avg</sub> | (%EA) <sub>avg</sub> |                             |
| hh:mm                       | %                           | %                          | ppm                   | %                          | lb/lb-mole                  |                                  | %                    |                             |
| 01:10                       | 2.1                         | 19.3                       | 0.0                   | 78.7                       | 29.12                       | 0.777                            | 1306.9               | N/A                         |

**METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES**

|                          |                            |                         |          |
|--------------------------|----------------------------|-------------------------|----------|
| <b>Plant Name</b>        | Loveland Facility          | <b>Preliminary Date</b> | 09/01/15 |
| <b>Sampling Location</b> | EC-36-2S                   | <b>Operator</b>         | TP       |
| <b>Project #</b>         | leed-15-brighton.co-comp#1 | <b>Ports Used</b>       | 2        |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | 0-30-0%-1                           |                   | <b>Date</b>       | 09/01/15                      | <b>Start Time</b>            | 14:36                  | <b>Stop Time</b>  | 15:46               |
| <b>Meter Box Number</b>      | SAMP-CP-0007                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.980             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 53.480            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 24.95             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 721               | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.00              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 85                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.70              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | H <sub>2</sub> O                    | H <sub>2</sub> O  | -                 | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 719.00            | 719.40            | 583.70                        | 858.40                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 715.00            | 714.90            | 581.30                        | 844.40                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 4.0               | 4.5               | 2.4                           | 14.0                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>f</sub> )                   | 24.90             | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 1.174                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 42.519            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 2.69              | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 2.69                   | %                 |                     |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | 0-30-0%-2                           |                   | <b>Date</b>       | 09/01/15                      | <b>Start Time</b>            | 15:57                  | <b>Stop Time</b>  | 17:07               |
| <b>Meter Box Number</b>      | SAMP-CP-0007                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.980             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 53.855            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 24.93             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 685               | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.00              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 84                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.70              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | H <sub>2</sub> O                    | H <sub>2</sub> O  | -                 | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 721.30            | 725.20            | 586.40                        | 870.50                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 719.00            | 719.40            | 583.70                        | 858.40                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 2.3               | 5.8               | 2.7                           | 12.1                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>f</sub> )                   | 22.90             | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 1.080                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 42.918            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 2.45              | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 2.45                   | %                 |                     |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | 0-30-0%-3                           |                   | <b>Date</b>       | 09/01/15                      | <b>Start Time</b>            | 17:20                  | <b>Stop Time</b>  | 18:30               |
| <b>Meter Box Number</b>      | SAMP-CP-0007                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.980             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 53.465            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 24.94             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 721               | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.00              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 82                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.70              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | H <sub>2</sub> O                    | H <sub>2</sub> O  | -                 | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 726.90            | 730.50            | 588.80                        | 883.00                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 721.30            | 725.20            | 586.40                        | 870.50                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 5.6               | 5.3               | 2.4                           | 12.5                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>f</sub> )                   | 25.80             | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 1.216                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 42.766            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 2.77              | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 2.77                   | %                 |                     |



METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | EC-36-2S                   |
| Project #         | leed-15-brighton.co-comp#1 |

|            |            |
|------------|------------|
| Date       | 09/01/15   |
| Operator   | TP         |
| Run Number | 0-30-09%-1 |

| Leak Checks |       |          |                       |                         |       |
|-------------|-------|----------|-----------------------|-------------------------|-------|
| Train       | Pre   | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| PASS        | Post  | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| < 3.0       | Pitot | Pre (+)  | 0.160                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Pre (-)  | 0.210                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (+) | 0.170                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (-) | 0.200                 | in H <sub>2</sub> O for | 15.0  |

| Nozzle Measurements |  |  |  |      |
|---------------------|--|--|--|------|
| Pre                 |  |  |  | PASS |
| Post                |  |  |  | PASS |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 14:36 | End | 15:46 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 715.0 | 714.9 | 581.3 | 844.4 |       |       |       |       |
| Post    | 719.0 | 719.4 | 583.7 | 858.4 |       |       |       |       |

| Sampling Equipment        |                    |           |
|---------------------------|--------------------|-----------|
| Meter Box Number          | SAMP-CP-0007       |           |
| Meter Cal Factor          | (Y)                | 0.980     |
| Low Flow Meter            | SAMP-MN-0001       |           |
| Average Nozzle Diameter   | (D <sub>no</sub> ) | in        |
| Suggested Nozzle Diameter | (D <sub>n</sub> )  | 0.4532 in |
| Probe Number              | SAMP-PF-0001       | in        |
| Probe Length              | 60                 | in        |
| Liner Material            | inconel            |           |
| Sample Case / Oven Number |                    |           |
| Impinger Case Number      | SAMP-BC-0002       |           |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |       |                     |
|---------------------------------------------------|-------------------------------------|-------|---------------------|
| Pitot Coefficient                                 | (C <sub>p</sub> )                   | 0.819 |                     |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 720.7 | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 85.4  |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.656 | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.07  | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 2.69  | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.12 | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.75  | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 |       |                     |

| Pressures               |                        |       |                     |
|-------------------------|------------------------|-------|---------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 24.95 | in Hg               |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.00  | in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 24.95 | in Hg               |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 25.07 | in Hg               |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Traverse Point # | Sampling Time (Θ) | Timer Time | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Snorkel Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (568°F) | Cond. Temp (≤-°F) | CPM Filter Temp (-±-°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (ΔP <sup>1/2</sup> ) | Local Stack Velocity (v <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|------------------|-------------------|------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-------------------------|------------------------|----------------------------|-------------------|-------------------------|-------------------------------------|--------------------------------------|-------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
|                  | min               | hh:mm:ss   | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                      | °F                     | °F                         | °F                | °F                      | °F                                  | °F                                   | in Hg       | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1              | 0.0               | 00:00:00   | 806.865                                 | 0.005               | 1.656                                 | 1.70                                 | 531                          | 254                     |                        | 63                         |                   |                         | 80                                  | 78                                   | 3.0         | 0.07                                | 5.82                                   | 1.826                                                |                               | 43.832                                                |
| A-2              | 2.7               | 00:02:43   | 809.135                                 | 0.005               | 1.656                                 | 1.70                                 | 606                          | 254                     |                        | 59                         |                   |                         | 82                                  | 78                                   | 3.0         | 0.07                                | 6.03                                   | 3.597                                                |                               | 43.165                                                |
| A-3              | 5.4               | 00:05:25   | 811.340                                 | 0.005               | 1.656                                 | 1.70                                 | 773                          | 254                     |                        | 58                         |                   |                         | 85                                  | 79                                   | 3.0         | 0.07                                | 6.49                                   | 5.393                                                |                               | 43.146                                                |
| A-4              | 8.1               | 00:08:07   | 813.585                                 | 0.005               | 1.656                                 | 1.70                                 | 854                          | 254                     |                        | 59                         |                   |                         | 86                                  | 79                                   | 3.0         | 0.07                                | 6.70                                   | 7.124                                                |                               | 42.743                                                |
| A-5              | 10.8              | 00:10:50   | 815.750                                 | 0.005               | 1.656                                 | 1.70                                 | 850                          | 254                     |                        | 60                         |                   |                         | 87                                  | 79                                   | 3.0         | 0.07                                | 6.69                                   | 8.921                                                |                               | 42.820                                                |
| A-6              | 13.5              | 00:13:33   | 818.000                                 | 0.005               | 1.656                                 | 1.70                                 | 834                          | 254                     |                        | 63                         |                   |                         | 90                                  | 80                                   | 3.0         | 0.07                                | 6.65                                   | 10.663                                               |                               | 42.653                                                |
| A-7              | 16.3              | 00:16:15   | 820.190                                 | 0.005               | 1.656                                 | 1.70                                 | 838                          | 254                     |                        | 63                         |                   |                         | 90                                  | 80                                   | 3.0         | 0.07                                | 6.66                                   | 12.434                                               |                               | 42.630                                                |
| A-8              | 19.0              | 00:18:58   | 822.415                                 | 0.005               | 1.656                                 | 1.70                                 | 781                          | 254                     |                        | 64                         |                   |                         | 91                                  | 81                                   | 3.0         | 0.07                                | 6.51                                   | 14.249                                               |                               | 42.746                                                |
| A-9              | 21.7              | 00:21:40   | 824.700                                 | 0.005               | 1.656                                 | 1.70                                 | 627                          | 254                     |                        | 65                         |                   |                         | 91                                  | 82                                   | 3.0         | 0.07                                | 6.09                                   | 15.963                                               |                               | 42.567                                                |
| A-10             | 24.4              | 00:24:22   | 826.860                                 | 0.005               | 1.656                                 | 1.70                                 | 777                          | 254                     |                        | 63                         |                   |                         | 91                                  | 82                                   | 3.0         | 0.07                                | 6.50                                   | 17.724                                               |                               | 42.538                                                |
| A-11             | 27.1              | 00:27:05   | 829.080                                 | 0.005               | 1.656                                 | 1.70                                 | 708                          | 254                     |                        | 61                         |                   |                         | 91                                  | 83                                   | 3.0         | 0.07                                | 6.31                                   | 19.310                                               |                               | 42.130                                                |
| A-12             | 29.8              | 00:29:47   | 831.080                                 | 0.005               | 1.656                                 | 1.70                                 | 660                          | 254                     |                        | 60                         |                   |                         | 92                                  | 83                                   | 3.0         | 0.07                                | 6.18                                   | 21.274                                               |                               | 42.548                                                |
| B-1              | 32.5              | 00:32:30   | 833.560                                 | 0.005               | 1.656                                 | 1.70                                 | 635                          | 254                     |                        | 61                         |                   |                         | 89                                  | 83                                   | 3.0         | 0.07                                | 6.11                                   | 23.085                                               |                               | 42.618                                                |
| B-2              | 35.2              | 00:35:12   | 835.840                                 | 0.005               | 1.656                                 | 1.70                                 | 614                          | 254                     |                        | 59                         |                   |                         | 91                                  | 83                                   | 3.0         | 0.07                                | 6.05                                   | 24.813                                               |                               | 42.537                                                |
| B-3              | 37.9              | 00:37:55   | 838.020                                 | 0.005               | 1.656                                 | 1.70                                 | 748                          | 254                     |                        | 59                         |                   |                         | 92                                  | 83                                   | 3.0         | 0.07                                | 6.42                                   | 26.567                                               |                               | 42.508                                                |
| B-4              | 40.6              | 00:40:37   | 840.235                                 | 0.005               | 1.656                                 | 1.70                                 | 851                          | 254                     |                        | 58                         |                   |                         | 91                                  | 83                                   | 3.0         | 0.07                                | 6.69                                   | 28.323                                               |                               | 42.485                                                |
| B-5              | 43.3              | 00:43:20   | 842.450                                 | 0.005               | 1.656                                 | 1.70                                 | 881                          | 254                     |                        | 59                         |                   |                         | 91                                  | 84                                   | 3.0         | 0.07                                | 6.76                                   | 30.007                                               |                               | 42.362                                                |
| B-6              | 46.0              | 00:46:03   | 844.575                                 | 0.010               | 1.656                                 | 1.70                                 | 871                          | 254                     |                        | 59                         |                   |                         | 90                                  | 84                                   | 3.0         | 0.10                                | 9.53                                   | 31.842                                               |                               | 42.456                                                |
| B-7              | 48.8              | 00:48:45   | 846.890                                 | 0.010               | 1.656                                 | 1.70                                 | 864                          | 254                     |                        | 59                         |                   |                         | 90                                  | 83                                   | 3.0         | 0.10                                | 9.51                                   | 33.627                                               |                               | 42.477                                                |
| B-8              | 51.5              | 00:51:28   | 849.140                                 | 0.005               | 1.656                                 | 1.70                                 | 655                          | 254                     |                        | 59                         |                   |                         | 90                                  | 83                                   | 3.0         | 0.07                                | 6.17                                   | 35.444                                               |                               | 42.533                                                |
| B-9              | 54.2              | 00:54:10   | 851.430                                 | 0.005               | 1.656                                 | 1.70                                 | 665                          | 254                     |                        | 59                         |                   |                         | 90                                  | 83                                   | 3.0         | 0.07                                | 6.20                                   | 37.166                                               |                               | 42.476                                                |
| B-10             | 56.9              | 00:56:53   | 853.600                                 | 0.005               | 1.656                                 | 1.70                                 | 572                          | 254                     |                        | 59                         |                   |                         | 90                                  | 83                                   | 3.0         | 0.07                                | 5.93                                   | 38.952                                               |                               | 42.493                                                |
| B-11             | 59.6              | 00:59:35   | 855.850                                 | 0.005               | 1.656                                 | 1.70                                 | 558                          | 254                     |                        | 59                         |                   |                         | 90                                  | 83                                   | 3.0         | 0.07                                | 5.89                                   | 40.737                                               |                               | 42.508                                                |
| B-12             | 62.3              | 01:02:18   | 858.100                                 | 0.005               | 1.656                                 | 1.70                                 | 543                          | 254                     |                        | 59                         |                   |                         | 89                                  | 83                                   | 3.0         | 0.07                                | 5.85                                   | 42.520                                               |                               | 42.520                                                |
| Last Pt          | 65.0              | 01:05:00   | 860.345                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |
| Final Val        | 65.0              | 01:05:00   | 860.345                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      | Max Vac     | 3.0                                 | Final Values                           | 42.520                                               |                               |                                                       |
| Average Values   |                   |            |                                         | 0.01                |                                       | 1.70                                 | 721                          | 254                     |                        | 60                         |                   |                         | 89                                  | 82                                   |             | 0.07                                | 6.57                                   |                                                      |                               |                                                       |
|                  |                   |            |                                         |                     |                                       |                                      |                              |                         |                        |                            |                   |                         | 85                                  |                                      |             |                                     |                                        |                                                      |                               |                                                       |

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | EC-36-2S                   |
| Project #         | leed-15-brighton.co-comp#1 |

|            |            |
|------------|------------|
| Date       | 09/01/15   |
| Operator   | TP         |
| Run Number | 0-30-09%-2 |

| Leak Checks |       |          |                       |                         |       |
|-------------|-------|----------|-----------------------|-------------------------|-------|
| Train       | Pre   | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| PASS        | Post  | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| < 3.0       | Pitot | Pre (+)  | 0.130                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Pre (-)  | 0.160                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (+) | 0.230                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (-) | 0.180                 | in H <sub>2</sub> O for | 15.0  |

| Nozzle Measurements |  |  |  |      |
|---------------------|--|--|--|------|
| Pre                 |  |  |  | PASS |
| Post                |  |  |  | PASS |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 15:57 | End | 17:07 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 719.0 | 719.4 | 583.7 | 858.4 |       |       |       |       |
| Post    | 721.3 | 725.2 | 586.4 | 870.5 |       |       |       |       |

| Sampling Equipment        |                    |           |
|---------------------------|--------------------|-----------|
| Meter Box Number          | SAMP-CP-0007       |           |
| Meter Cal Factor          | (Y)                | 0.980     |
| Low Flow Meter            | SAMP-MN-0001       |           |
| Average Nozzle Diameter   | (D <sub>no</sub> ) | in        |
| Suggested Nozzle Diameter | (D <sub>n</sub> )  | 0.4152 in |
| Probe Number              | SAMP-SP-0001       | in        |
| Probe Length              | 60                 | in        |
| Liner Material            | inconel            |           |
| Sample Case / Oven Number |                    |           |
| Impinger Case Number      | SAMP-BC-0002       |           |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |       |                     |
|---------------------------------------------------|-------------------------------------|-------|---------------------|
| Pitot Coefficient                                 | (C <sub>p</sub> )                   | 0.819 |                     |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 685.1 | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 83.7  |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.656 | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.08  | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 2.45  | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.11 | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.65  | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 |       |                     |

| Pressures               |                        |       |                     |
|-------------------------|------------------------|-------|---------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 24.93 | in Hg               |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.00  | in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 24.93 | in Hg               |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 25.05 | in Hg               |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Traverse Point # | Sampling Time (Θ) | Timer Time | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Snorkel Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (568°F) | Cond. Temp (≤-°F) | CPM Filter Temp (-±-°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (ΔP <sup>1/2</sup> ) | Local Stack Velocity (v <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|------------------|-------------------|------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-------------------------|------------------------|----------------------------|-------------------|-------------------------|-------------------------------------|--------------------------------------|-------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
|                  | min               | hh:mm:ss   | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                      | °F                     | °F                         | °F                | °F                      | °F                                  | °F                                   | in Hg       | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1              | 0.0               | 00:00:00   | 860.485                                 | 0.005               | 1.656                                 | 1.70                                 | 632                          | 254                     |                        | 59                         |                   |                         | 85                                  | 81                                   | 3.0         | 0.07                                | 6.10                                   | 2.111                                                |                               | 50.656                                                |
| A-2              | 2.7               | 00:02:43   | 863.130                                 | 0.005               | 1.656                                 | 1.70                                 | 688                          | 254                     |                        | 56                         |                   |                         | 88                                  | 81                                   | 3.0         | 0.07                                | 6.26                                   | 3.865                                                |                               | 46.384                                                |
| A-3              | 5.4               | 00:05:25   | 865.335                                 | 0.005               | 1.656                                 | 1.70                                 | 798                          | 254                     |                        | 55                         |                   |                         | 88                                  | 81                                   | 3.0         | 0.07                                | 6.55                                   | 5.620                                                |                               | 44.961                                                |
| A-4              | 8.1               | 00:08:07   | 867.540                                 | 0.005               | 1.656                                 | 1.70                                 | 803                          | 254                     |                        | 56                         |                   |                         | 87                                  | 81                                   | 3.0         | 0.07                                | 6.57                                   | 7.492                                                |                               | 44.951                                                |
| A-5              | 10.8              | 00:10:50   | 869.890                                 | 0.005               | 1.656                                 | 1.70                                 | 807                          | 254                     |                        | 57                         |                   |                         | 87                                  | 81                                   | 3.0         | 0.07                                | 6.58                                   | 9.173                                                |                               | 44.028                                                |
| A-6              | 13.5              | 00:13:33   | 872.000                                 | 0.005               | 1.656                                 | 1.70                                 | 805                          | 254                     |                        | 57                         |                   |                         | 87                                  | 81                                   | 3.0         | 0.07                                | 6.57                                   | 11.005                                               |                               | 44.018                                                |
| A-7              | 16.3              | 00:16:15   | 874.300                                 | 0.050               | 1.656                                 | 1.70                                 | 813                          | 254                     |                        | 57                         |                   |                         | 87                                  | 81                                   | 3.0         | 0.22                                | 20.84                                  | 12.689                                               |                               | 43.506                                                |
| A-8              | 19.0              | 00:18:58   | 876.415                                 | 0.005               | 1.656                                 | 1.70                                 | 593                          | 254                     |                        | 58                         |                   |                         | 87                                  | 81                                   | 3.0         | 0.07                                | 5.99                                   | 14.453                                               |                               | 43.360                                                |
| A-9              | 21.7              | 00:21:40   | 878.630                                 | 0.005               | 1.656                                 | 1.70                                 | 561                          | 254                     |                        | 58                         |                   |                         | 87                                  | 81                                   | 3.0         | 0.07                                | 5.90                                   | 16.214                                               |                               | 43.237                                                |
| A-10             | 24.4              | 00:24:22   | 880.840                                 | 0.005               | 1.656                                 | 1.70                                 | 606                          | 254                     |                        | 58                         |                   |                         | 87                                  | 81                                   | 3.0         | 0.07                                | 6.03                                   | 18.034                                               |                               | 43.281                                                |
| A-11             | 27.1              | 00:27:05   | 883.125                                 | 0.005               | 1.656                                 | 1.70                                 | 575                          | 254                     |                        | 58                         |                   |                         | 87                                  | 81                                   | 3.0         | 0.07                                | 5.94                                   | 19.806                                               |                               | 43.213                                                |
| A-12             | 29.8              | 00:29:47   | 885.350                                 | 0.005               | 1.656                                 | 1.70                                 | 545                          | 254                     |                        | 59                         |                   |                         | 87                                  | 81                                   | 3.0         | 0.07                                | 5.86                                   | 21.606                                               |                               | 43.212                                                |
| B-1              | 32.5              | 00:32:30   | 887.610                                 | 0.005               | 1.656                                 | 1.70                                 | 630                          | 254                     |                        | 59                         |                   |                         | 83                                  | 81                                   | 3.0         | 0.07                                | 6.10                                   | 23.405                                               |                               | 43.209                                                |
| B-2              | 35.2              | 00:35:12   | 889.860                                 | 0.005               | 1.656                                 | 1.70                                 | 610                          | 254                     |                        | 58                         |                   |                         | 85                                  | 81                                   | 3.0         | 0.07                                | 6.04                                   | 25.192                                               |                               | 43.187                                                |
| B-3              | 37.9              | 00:37:55   | 892.100                                 | 0.005               | 1.656                                 | 1.70                                 | 733                          | 254                     |                        | 59                         |                   |                         | 86                                  | 81                                   | 3.0         | 0.07                                | 6.38                                   | 26.954                                               |                               | 43.127                                                |
| B-4              | 40.6              | 00:40:37   | 894.310                                 | 0.005               | 1.656                                 | 1.70                                 | 801                          | 254                     |                        | 58                         |                   |                         | 86                                  | 81                                   | 3.0         | 0.07                                | 6.56                                   | 28.724                                               |                               | 43.086                                                |
| B-5              | 43.3              | 00:43:20   | 896.530                                 | 0.005               | 1.656                                 | 1.70                                 | 801                          | 254                     |                        | 58                         |                   |                         | 86                                  | 81                                   | 3.0         | 0.07                                | 6.56                                   | 30.506                                               |                               | 43.067                                                |
| B-6              | 46.0              | 00:46:03   | 898.765                                 | 0.005               | 1.656                                 | 1.70                                 | 815                          | 254                     |                        | 59                         |                   |                         | 86                                  | 81                                   | 3.0         | 0.07                                | 6.60                                   | 32.268                                               |                               | 43.024                                                |
| B-7              | 48.8              | 00:48:45   | 900.975                                 | 0.005               | 1.656                                 | 1.70                                 | 595                          | 254                     |                        | 59                         |                   |                         | 85                                  | 81                                   | 3.0         | 0.07                                | 6.00                                   | 33.964                                               |                               | 42.901                                                |
| B-8              | 51.5              | 00:51:28   | 903.100                                 | 0.005               | 1.656                                 | 1.70                                 | 570                          | 254                     |                        | 59                         |                   |                         | 86                                  | 82                                   | 3.0         | 0.07                                | 5.93                                   | 35.804                                               |                               | 42.964                                                |
| B-9              | 54.2              | 00:54:10   | 905.410                                 | 0.005               | 1.656                                 | 1.70                                 | 692                          | 254                     |                        | 60                         |                   |                         | 86                                  | 82                                   | 3.0         | 0.07                                | 6.27                                   | 37.608                                               |                               | 42.980                                                |
| B-10             | 56.9              | 00:56:53   | 907.675                                 | 0.005               | 1.656                                 | 1.70                                 | 729                          | 254                     |                        | 60                         |                   |                         | 86                                  | 82                                   | 3.0         | 0.07                                | 6.37                                   | 39.348                                               |                               | 42.925                                                |
| B-11             | 59.6              | 00:59:35   | 909.860                                 | 0.005               | 1.656                                 | 1.70                                 | 700                          | 254                     |                        | 60                         |                   |                         | 86                                  | 82                                   | 3.0         | 0.07                                | 6.29                                   | 41.124                                               |                               | 42.912                                                |
| B-12             | 62.3              | 01:02:18   | 912.090                                 | 0.005               | 1.656                                 | 1.70                                 | 540                          | 254                     |                        | 60                         |                   |                         | 86                                  | 81                                   | 3.0         | 0.07                                | 5.84                                   | 42.918                                               |                               | 42.918                                                |
| Last Pt          | 65.0              | 01:05:00   | 914.340                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |
| Final Val        | 65.0              | 01:05:00   | 914.340                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      | Max Vac     | 3.0                                 |                                        | Final Values                                         | 42.918                        |                                                       |
| Average Values   |                   |            |                                         | 0.01                |                                       | 1.70                                 | 685                          | 254                     |                        | 58                         |                   |                         | 86                                  | 81                                   |             |                                     | 0.08                                   | 6.84                                                 |                               |                                                       |
|                  |                   |            |                                         |                     |                                       |                                      |                              |                         |                        |                            |                   |                         | 84                                  |                                      |             |                                     |                                        |                                                      |                               |                                                       |

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | EC-36-2S                   |
| Project #         | leed-15-brighton.co-comp#1 |

|            |            |
|------------|------------|
| Date       | 09/01/15   |
| Operator   | TP         |
| Run Number | 0-30-09%-3 |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |       |                     |
|---------------------------------------------------|-------------------------------------|-------|---------------------|
| Pitot Coefficient                                 | (C <sub>p</sub> )                   | 0.819 |                     |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 720.5 | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 81.9  |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.656 | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.07  | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 2.77  | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.12 | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.66  | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 |       |                     |

| Leak Checks |       |          |                       |                         |       |
|-------------|-------|----------|-----------------------|-------------------------|-------|
| Train       | Pre   | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| PASS        | Post  | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| < 3.0       | Pitot | Pre (+)  | 0.160                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Pre (-)  | 0.230                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (+) | 0.145                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (-) | 0.175                 | in H <sub>2</sub> O for | 15.0  |

| Sampling Equipment        |                    |           |
|---------------------------|--------------------|-----------|
| Meter Box Number          | SAMP-CP-0007       |           |
| Meter Cal Factor          | (Y)                | 0.980     |
| Low Flow Meter            | SAMP-MN-0001       |           |
| Average Nozzle Diameter   | (D <sub>no</sub> ) | in        |
| Suggested Nozzle Diameter | (D <sub>n</sub> )  | 0.4301 in |
| Probe Number              | SAMP-SP-0001       | in        |
| Probe Length              | 60                 | in        |
| Liner Material            | inconel            |           |
| Sample Case / Oven Number |                    |           |
| Impinger Case Number      | SAMP-BC-0002       |           |

| Pressures               |                        |       |                     |
|-------------------------|------------------------|-------|---------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 24.94 | in Hg               |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.00  | in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 24.94 | in Hg               |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 25.06 | in Hg               |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 17:20 | End | 18:30 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 721.3 | 725.2 | 586.4 | 870.5 |       |       |       |       |
| Post    | 726.9 | 730.5 | 588.8 | 883.0 |       |       |       |       |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Traverse Point # | Sampling Time (Θ) | Timer Time | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Snorkel Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (568°F) | Cond. Temp (≤-°F) | CPM Filter Temp (-±-°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (ΔP <sup>1/2</sup> ) | Local Stack Velocity (v <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|------------------|-------------------|------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-------------------------|------------------------|----------------------------|-------------------|-------------------------|-------------------------------------|--------------------------------------|-------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
|                  | min               | hh:mm:ss   | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                      | °F                     | °F                         | °F                | °F                      | °F                                  | °F                                   | in Hg       | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1              | 0.0               | 00:00:00   | 914.495                                 | 0.005               | 1.656                                 | 1.70                                 | 592                          | 254                     |                        | 63                         |                   |                         | 81                                  | 80                                   | 3.0         | 0.07                                | 5.99                                   | 1.817                                                |                               | 43.596                                                |
| A-2              | 2.7               | 00:02:43   | 916.760                                 | 0.005               | 1.656                                 | 1.70                                 | 628                          | 254                     |                        | 59                         |                   |                         | 85                                  | 80                                   | 3.0         | 0.07                                | 6.10                                   | 3.590                                                |                               | 43.084                                                |
| A-3              | 5.4               | 00:05:25   | 918.980                                 | 0.005               | 1.656                                 | 1.70                                 | 735                          | 254                     |                        | 59                         |                   |                         | 85                                  | 80                                   | 3.0         | 0.07                                | 6.39                                   | 5.364                                                |                               | 42.914                                                |
| A-4              | 8.1               | 00:08:07   | 921.200                                 | 0.005               | 1.656                                 | 1.70                                 | 762                          | 254                     |                        | 59                         |                   |                         | 86                                  | 80                                   | 3.0         | 0.07                                | 6.46                                   | 7.156                                                |                               | 42.939                                                |
| A-5              | 10.8              | 00:10:50   | 923.445                                 | 0.005               | 1.656                                 | 1.70                                 | 768                          | 254                     |                        | 61                         |                   |                         | 86                                  | 80                                   | 3.0         | 0.07                                | 6.48                                   | 8.917                                                |                               | 42.800                                                |
| A-6              | 13.5              | 00:13:33   | 925.650                                 | 0.005               | 1.656                                 | 1.70                                 | 772                          | 254                     |                        | 61                         |                   |                         | 86                                  | 80                                   | 3.0         | 0.07                                | 6.49                                   | 10.697                                               |                               | 42.788                                                |
| A-7              | 16.3              | 00:16:15   | 927.880                                 | 0.005               | 1.656                                 | 1.70                                 | 786                          | 254                     |                        | 61                         |                   |                         | 86                                  | 80                                   | 3.0         | 0.07                                | 6.52                                   | 12.505                                               |                               | 42.874                                                |
| A-8              | 19.0              | 00:18:58   | 930.145                                 | 0.005               | 1.656                                 | 1.70                                 | 670                          | 254                     |                        | 62                         |                   |                         | 86                                  | 80                                   | 3.0         | 0.07                                | 6.21                                   | 14.265                                               |                               | 42.796                                                |
| A-9              | 21.7              | 00:21:40   | 932.350                                 | 0.005               | 1.656                                 | 1.70                                 | 732                          | 254                     |                        | 62                         |                   |                         | 85                                  | 80                                   | 3.0         | 0.07                                | 6.38                                   | 15.955                                               |                               | 42.547                                                |
| A-10             | 24.4              | 00:24:22   | 934.465                                 | 0.005               | 1.656                                 | 1.70                                 | 796                          | 254                     |                        | 63                         |                   |                         | 85                                  | 80                                   | 3.0         | 0.07                                | 6.55                                   | 17.837                                               |                               | 42.809                                                |
| A-11             | 27.1              | 00:27:05   | 936.820                                 | 0.005               | 1.656                                 | 1.70                                 | 783                          | 254                     |                        | 63                         |                   |                         | 85                                  | 80                                   | 3.0         | 0.07                                | 6.51                                   | 19.599                                               |                               | 42.761                                                |
| A-12             | 29.8              | 00:29:47   | 939.025                                 | 0.005               | 1.656                                 | 1.70                                 | 752                          | 254                     |                        | 63                         |                   |                         | 85                                  | 80                                   | 3.0         | 0.07                                | 6.43                                   | 21.401                                               |                               | 42.801                                                |
| B-1              | 32.5              | 00:32:30   | 941.280                                 | 0.005               | 1.656                                 | 1.70                                 | 690                          | 254                     |                        | 63                         |                   |                         | 83                                  | 80                                   | 3.0         | 0.07                                | 6.27                                   | 23.218                                               |                               | 42.864                                                |
| B-2              | 35.2              | 00:35:12   | 943.550                                 | 0.005               | 1.656                                 | 1.70                                 | 604                          | 254                     |                        | 64                         |                   |                         | 84                                  | 79                                   | 3.0         | 0.07                                | 6.03                                   | 25.003                                               |                               | 42.862                                                |
| B-3              | 37.9              | 00:37:55   | 945.780                                 | 0.005               | 1.656                                 | 1.70                                 | 688                          | 254                     |                        | 64                         |                   |                         | 84                                  | 79                                   | 3.0         | 0.07                                | 6.26                                   | 26.776                                               |                               | 42.842                                                |
| B-4              | 40.6              | 00:40:37   | 947.995                                 | 0.005               | 1.656                                 | 1.70                                 | 791                          | 254                     |                        | 65                         |                   |                         | 84                                  | 79                                   | 3.0         | 0.07                                | 6.54                                   | 28.557                                               |                               | 42.836                                                |
| B-5              | 43.3              | 00:43:20   | 950.220                                 | 0.005               | 1.656                                 | 1.70                                 | 821                          | 254                     |                        | 65                         |                   |                         | 84                                  | 79                                   | 3.0         | 0.07                                | 6.61                                   | 30.338                                               |                               | 42.831                                                |
| B-6              | 46.0              | 00:46:03   | 952.445                                 | 0.005               | 1.656                                 | 1.70                                 | 832                          | 254                     |                        | 66                         |                   |                         | 84                                  | 79                                   | 3.0         | 0.07                                | 6.64                                   | 32.096                                               |                               | 42.794                                                |
| B-7              | 48.8              | 00:48:45   | 954.640                                 | 0.005               | 1.656                                 | 1.70                                 | 833                          | 254                     |                        | 65                         |                   |                         | 84                                  | 79                                   | 3.0         | 0.07                                | 6.64                                   | 33.877                                               |                               | 42.792                                                |
| B-8              | 51.5              | 00:51:28   | 956.865                                 | 0.005               | 1.656                                 | 1.70                                 | 674                          | 254                     |                        | 64                         |                   |                         | 84                                  | 78                                   | 3.0         | 0.07                                | 6.22                                   | 35.659                                               |                               | 42.791                                                |
| B-9              | 54.2              | 00:54:10   | 959.090                                 | 0.005               | 1.656                                 | 1.70                                 | 662                          | 254                     |                        | 63                         |                   |                         | 84                                  | 78                                   | 3.0         | 0.07                                | 6.19                                   | 37.430                                               |                               | 42.777                                                |
| B-10             | 56.9              | 00:56:53   | 961.300                                 | 0.005               | 1.656                                 | 1.70                                 | 680                          | 254                     |                        | 62                         |                   |                         | 84                                  | 78                                   | 3.0         | 0.07                                | 6.24                                   | 39.165                                               |                               | 42.725                                                |
| B-11             | 59.6              | 00:59:35   | 963.465                                 | 0.005               | 1.656                                 | 1.70                                 | 642                          | 254                     |                        | 62                         |                   |                         | 84                                  | 78                                   | 3.0         | 0.07                                | 6.13                                   | 40.984                                               |                               | 42.766                                                |
| B-12             | 62.3              | 01:02:18   | 965.735                                 | 0.005               | 1.656                                 | 1.70                                 | 600                          | 254                     |                        | 62                         |                   |                         | 84                                  | 78                                   | 3.0         | 0.07                                | 6.02                                   | 42.767                                               |                               | 42.767                                                |
| Last Pt          | 65.0              | 01:05:00   | 967.960                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |
| Final Val        | 65.0              | 01:05:00   | 967.960                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      | Max Vac     | 3.0                                 | Final Values                           | 42.767                                               |                               |                                                       |
| Average Values   |                   |            |                                         | 0.01                |                                       | 1.70                                 | 721                          | 254                     |                        | 63                         |                   |                         | 85                                  | 79                                   |             | 0.07                                | 6.35                                   |                                                      |                               |                                                       |
|                  |                   |            |                                         |                     |                                       |                                      |                              |                         |                        |                            |                   |                         | 82                                  |                                      |             |                                     |                                        |                                                      |                               |                                                       |

**Leed Fabrication Services Inc.**  
**September 1, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 2.7    | %    |
| Stack Exhaust Flow (M2) | 43,796 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.95    | in. Hg                       |
| Relative Humidity   | 16       | %                            |
| Ambient Temperature | 90       | °F                           |
| Specific Humidity   | 0.005728 | lb H <sub>2</sub> O / lb air |

0-30-0 Load, Run - EC36-2S R1

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| A1 | 09/01/15 14:36:29                | 19800                     | 19.32                 | 4.67          | 1.52           | 1.09                   | 0.23                 | 112.10           | 136.00            |
|    | 09/01/15 14:36:59                | 19830                     | 19.33                 | 5.26          | 1.46           | 1.09                   | 0.23                 | 112.10           | 136.00            |
|    | 09/01/15 14:37:29                | 19860                     | 19.28                 | 5.01          | 1.28           | 1.11                   | 0.23                 | 112.30           | 136.00            |
|    | 09/01/15 14:37:59                | 19890                     | 19.23                 | 5.03          | 1.33           | 1.15                   | 0.23                 | 112.30           | 136.00            |
|    | 09/01/15 14:38:29                | 19920                     | 19.24                 | 5.01          | 1.45           | 1.14                   | 0.23                 | 112.50           | 120.00            |
|    | 09/01/15 14:38:59                | 19950                     | 19.25                 | 5.01          | 1.38           | 1.14                   | 0.23                 | 112.50           | 120.00            |
|    | 09/01/15 14:39:29                | 19980                     | 19.21                 | 5.03          | 1.18           | 1.16                   | 0.23                 | 112.60           | 151.00            |
|    | 09/01/15 14:39:59                | 20010                     | 19.09                 | 5.07          | 1.17           | 1.23                   | 0.23                 | 112.60           | 151.00            |
|    | 09/01/15 14:40:29                | 20040                     | 17.83                 | 4.58          | 1.27           | 2.24                   | 0.65                 | 112.80           | 325.00            |
|    | 09/01/15 14:40:59                | 20070                     | 17.81                 | 4.14          | 1.30           | 2.29                   | 0.65                 | 112.80           | 325.00            |
|    | 09/01/15 14:41:29                | 20100                     | 17.78                 | 4.19          | 1.11           | 2.33                   | 0.66                 | 112.80           | 325.00            |
|    | 09/01/15 14:41:59                | 20130                     | 17.89                 | 4.12          | 1.09           | 2.23                   | 0.66                 | 112.80           | 325.00            |
|    | 09/01/15 14:42:29                | 20160                     | 17.89                 | 4.09          | 1.15           | 2.23                   | 0.67                 | 112.90           | 325.00            |
|    | 09/01/15 14:42:59                | 20190                     | 17.83                 | 4.12          | 1.22           | 2.28                   | 0.67                 | 112.90           | 325.00            |
|    | 09/01/15 14:43:29                | 20220                     | 17.73                 | 3.95          | 1.08           | 2.35                   | 0.66                 | 112.90           | 325.00            |
|    | 09/01/15 14:43:59                | 20250                     | 17.82                 | 3.98          | 1.05           | 2.28                   | 0.66                 | 112.90           | 325.00            |
|    | 09/01/15 14:44:29                | 20280                     | 17.70                 | 4.02          | 0.98           | 2.37                   | 0.68                 | 113.00           | 326.00            |
|    | 09/01/15 14:44:59                | 20310                     | 17.64                 | 3.97          | 1.09           | 2.43                   | 0.68                 | 113.00           | 326.00            |
|    | 09/01/15 14:45:29                | 20340                     | 17.52                 | 3.96          | 0.96           | 2.50                   | 0.67                 | 113.00           | 341.00            |
|    | 09/01/15 14:45:59                | 20370                     | 17.62                 | 3.94          | 0.94           | 2.42                   | 0.67                 | 113.00           | 341.00            |
|    | 09/01/15 14:46:29                | 20400                     | 17.65                 | 3.96          | 1.00           | 2.41                   | 0.68                 | 113.10           | 341.00            |
|    | 09/01/15 14:46:59                | 20430                     | 17.54                 | 3.97          | 1.02           | 2.48                   | 0.68                 | 113.10           | 341.00            |
|    | 09/01/15 14:47:29                | 20460                     | 17.65                 | 3.79          | 1.02           | 2.41                   | 0.68                 | 113.10           | 310.00            |
|    | 09/01/15 14:47:59                | 20490                     | 17.81                 | 3.86          | 1.05           | 2.28                   | 0.68                 | 113.10           | 310.00            |
|    | 09/01/15 14:48:29                | 20520                     | 17.87                 | 4.08          | 1.07           | 2.22                   | 0.68                 | 113.10           | 310.00            |
|    | 09/01/15 14:48:59                | 20550                     | 17.76                 | 3.96          | 1.07           | 2.32                   | 0.68                 | 113.10           | 310.00            |
|    | 09/01/15 14:49:29                | 20580                     | 17.84                 | 3.82          | 1.03           | 2.27                   | 0.69                 | 113.10           | 326.00            |
|    | 09/01/15 14:49:59                | 20610                     | 17.92                 | 3.91          | 1.04           | 2.20                   | 0.69                 | 113.10           | 326.00            |
|    | 09/01/15 14:50:29                | 20640                     | 17.96                 | 3.99          | 1.05           | 2.17                   | 0.70                 | 113.10           | 341.00            |
|    | 09/01/15 14:50:59                | 20670                     | 17.96                 | 3.86          | 1.20           | 2.17                   | 0.70                 | 113.10           | 341.00            |
|    | 09/01/15 14:51:29                | 20700                     | 17.91                 | 3.86          | 1.08           | 2.19                   | 0.71                 | 113.20           | 310.00            |
|    | 09/01/15 14:51:59                | 20730                     | 17.94                 | 3.83          | 1.03           | 2.18                   | 0.71                 | 113.20           | 310.00            |
|    | 09/01/15 14:52:29                | 20760                     | 17.89                 | 3.94          | 1.05           | 2.21                   | 0.71                 | 113.20           | 310.00            |
|    | 09/01/15 14:52:59                | 20790                     | 17.88                 | 3.97          | 1.19           | 2.21                   | 0.71                 | 113.20           | 310.00            |
|    | 09/01/15 14:53:29                | 20820                     | 17.87                 | 4.15          | 1.15           | 2.22                   | 0.72                 | 113.30           | 326.00            |
|    | 09/01/15 14:53:59                | 20850                     | 17.93                 | 4.32          | 1.05           | 2.19                   | 0.72                 | 113.30           | 326.00            |
|    | 09/01/15 14:54:29                | 20880                     | 17.89                 | 4.21          | 1.12           | 2.21                   | 0.72                 | 113.30           | 342.00            |
|    | 09/01/15 14:54:59                | 20910                     | 17.90                 | 4.10          | 1.32           | 2.22                   | 0.72                 | 113.30           | 342.00            |
|    | 09/01/15 14:55:29                | 20940                     | 17.94                 | 4.21          | 1.43           | 2.19                   | 0.73                 | 113.40           | 326.00            |
|    | 09/01/15 14:55:59                | 20970                     | 17.81                 | 4.17          | 1.05           | 2.28                   | 0.73                 | 113.40           | 326.00            |
|    | 09/01/15 14:56:29                | 21000                     | 18.40                 | 3.88          | 1.16           | 1.89                   | 0.38                 | 113.40           | 214.00            |
| A2 | 09/01/15 14:56:59                | 21030                     | 19.39                 | 4.54          | 1.34           | 1.02                   | 0.38                 | 113.40           | 214.00            |
|    | 09/01/15 14:57:29                | 21060                     | 19.16                 | 4.85          | 1.45           | 1.18                   | 0.18                 | 113.60           | 150.00            |
|    | 09/01/15 14:57:59                | 21090                     | 19.25                 | 4.54          | 1.54           | 1.14                   | 0.18                 | 113.60           | 150.00            |
|    | 09/01/15 14:58:29                | 21120                     | 19.30                 | 4.39          | 1.40           | 1.10                   | 0.19                 | 113.70           | 180.00            |
|    | 09/01/15 14:58:59                | 21150                     | 19.23                 | 4.21          | 1.38           | 1.14                   | 0.19                 | 113.70           | 180.00            |
|    | 09/01/15 14:59:29                | 21180                     | 19.16                 | 4.25          | 1.43           | 1.18                   | 0.29                 | 113.80           | 211.00            |
|    | 09/01/15 14:59:59                | 21210                     | 18.62                 | 4.30          | 1.20           | 1.56                   | 0.29                 | 113.80           | 211.00            |
|    | 09/01/15 15:00:29                | 21240                     | 17.57                 | 4.05          | 0.99           | 2.46                   | 0.69                 | 113.80           | 341.00            |
|    | 09/01/15 15:00:59                | 21270                     | 17.61                 | 3.88          | 0.96           | 2.44                   | 0.69                 | 113.80           | 341.00            |
|    | 09/01/15 15:01:29                | 21300                     | 17.67                 | 3.93          | 1.09           | 2.38                   | 0.70                 | 113.80           | 310.00            |
|    | 09/01/15 15:01:59                | 21330                     | 17.51                 | 3.73          | 1.02           | 2.48                   | 0.70                 | 113.80           | 310.00            |
|    | 09/01/15 15:02:29                | 21360                     | 17.29                 | 3.64          | 0.93           | 2.66                   | 0.69                 | 113.70           | 325.00            |
|    | 09/01/15 15:02:59                | 21390                     | 17.49                 | 3.78          | 0.91           | 2.52                   | 0.69                 | 113.70           | 325.00            |
|    | 09/01/15 15:03:29                | 21420                     | 17.59                 | 3.92          | 0.94           | 2.46                   | 0.67                 | 113.60           | 325.00            |
|    | 09/01/15 15:03:59                | 21450                     | 17.69                 | 3.89          | 1.11           | 2.37                   | 0.67                 | 113.60           | 325.00            |
|    | 09/01/15 15:04:29                | 21480                     | 17.79                 | 3.87          | 1.09           | 2.30                   | 0.69                 | 113.40           | 325.00            |
|    | 09/01/15 15:04:59                | 21510                     | 17.63                 | 3.86          | 1.04           | 2.42                   | 0.69                 | 113.40           | 325.00            |
|    | 09/01/15 15:05:29                | 21540                     | 17.73                 | 4.08          | 0.95           | 2.36                   | 0.68                 | 113.20           | 325.00            |
|    | 09/01/15 15:05:59                | 21570                     | 17.67                 | 3.95          | 0.98           | 2.38                   | 0.68                 | 113.20           | 325.00            |

**Leed Fabrication Services Inc.**  
**September 1, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 2.7    | %    |
| Stack Exhaust Flow (M2) | 43,796 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.95    | in. Hg                       |
| Relative Humidity   | 16       | %                            |
| Ambient Temperature | 90       | °F                           |
| Specific Humidity   | 0.005728 | lb H <sub>2</sub> O / lb air |

0-30-0 Load, Run - EC36-2S R1

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
|    | 09/01/15 15:06:29                | 21600                     | 17.73                 | 3.84          | 1.08           | 2.35                   | 0.68                 | 113.10           | 326.00            |
|    | 09/01/15 15:06:59                | 21630                     | 17.82                 | 3.81          | 1.02           | 2.27                   | 0.68                 | 113.10           | 326.00            |
|    | 09/01/15 15:07:29                | 21660                     | 17.68                 | 3.75          | 0.91           | 2.38                   | 0.68                 | 113.00           | 326.00            |
|    | 09/01/15 15:07:59                | 21690                     | 17.83                 | 3.87          | 1.02           | 2.27                   | 0.68                 | 113.00           | 326.00            |
|    | 09/01/15 15:08:29                | 21720                     | 17.78                 | 3.86          | 1.05           | 2.32                   | 0.68                 | 112.80           | 326.00            |
|    | 09/01/15 15:08:59                | 21750                     | 17.77                 | 3.85          | 0.97           | 2.32                   | 0.68                 | 112.80           | 326.00            |
|    | 09/01/15 15:09:29                | 21780                     | 17.80                 | 3.85          | 0.94           | 2.31                   | 0.68                 | 112.70           | 326.00            |
|    | 09/01/15 15:09:59                | 21810                     | 17.86                 | 3.83          | 1.05           | 2.25                   | 0.68                 | 112.70           | 326.00            |
|    | 09/01/15 15:10:29                | 21840                     | 17.95                 | 3.83          | 1.11           | 2.19                   | 0.69                 | 112.70           | 326.00            |
|    | 09/01/15 15:10:59                | 21870                     | 17.86                 | 3.68          | 0.97           | 2.24                   | 0.69                 | 112.70           | 326.00            |
|    | 09/01/15 15:11:29                | 21900                     | 17.77                 | 3.61          | 0.87           | 2.30                   | 0.69                 | 112.60           | 326.00            |
|    | 09/01/15 15:11:59                | 21930                     | 17.43                 | 3.41          | 0.84           | 2.55                   | 0.69                 | 112.60           | 326.00            |
|    | 09/01/15 15:12:29                | 21960                     | 18.33                 | 3.29          | 1.13           | 1.94                   | 0.30                 | 112.60           | 166.00            |
|    | 09/01/15 15:12:59                | 21990                     | 19.40                 | 3.68          | 1.33           | 1.05                   | 0.30                 | 112.60           | 166.00            |
|    | 09/01/15 15:13:29                | 22020                     | 19.33                 | 4.17          | 1.21           | 1.10                   | 0.22                 | 112.70           | 135.00            |
|    | 09/01/15 15:13:59                | 22050                     | 19.32                 | 4.22          | 1.30           | 1.10                   | 0.22                 | 112.70           | 135.00            |
|    | 09/01/15 15:14:29                | 22080                     | 19.30                 | 4.47          | 1.44           | 1.11                   | 0.23                 | 112.80           | 135.00            |
|    | 09/01/15 15:14:59                | 22110                     | 19.34                 | 4.55          | 1.39           | 1.09                   | 0.23                 | 112.80           | 135.00            |
|    | 09/01/15 15:15:29                | 22140                     | 18.76                 | 4.36          | 1.13           | 1.47                   | 0.57                 | 112.80           | 293.00            |
|    | 09/01/15 15:15:59                | 22170                     | 17.52                 | 3.99          | 0.95           | 2.49                   | 0.57                 | 112.80           | 293.00            |
|    | 09/01/15 15:16:29                | 22200                     | 17.52                 | 3.63          | 0.97           | 2.52                   | 0.70                 | 112.80           | 342.00            |
| A3 | 09/01/15 15:16:59                | 22230                     | 17.58                 | 3.79          | 0.93           | 2.46                   | 0.70                 | 112.80           | 342.00            |
|    | 09/01/15 15:17:29                | 22260                     | 17.67                 | 3.88          | 0.92           | 2.40                   | 0.70                 | 112.70           | 342.00            |
|    | 09/01/15 15:17:59                | 22290                     | 17.50                 | 3.74          | 0.91           | 2.52                   | 0.70                 | 112.70           | 342.00            |
|    | 09/01/15 15:18:29                | 22320                     | 17.46                 | 3.68          | 0.96           | 2.55                   | 0.72                 | 112.50           | 342.00            |
|    | 09/01/15 15:18:59                | 22350                     | 17.54                 | 3.68          | 0.91           | 2.50                   | 0.72                 | 112.50           | 342.00            |
|    | 09/01/15 15:19:29                | 22380                     | 17.54                 | 3.73          | 0.85           | 2.50                   | 0.71                 | 112.20           | 342.00            |
|    | 09/01/15 15:19:59                | 22410                     | 17.48                 | 3.77          | 0.92           | 2.54                   | 0.71                 | 112.20           | 342.00            |
|    | 09/01/15 15:20:29                | 22440                     | 17.31                 | 3.77          | 0.88           | 2.66                   | 0.71                 | 111.90           | 342.00            |
|    | 09/01/15 15:20:59                | 22470                     | 17.29                 | 3.65          | 0.80           | 2.66                   | 0.71                 | 111.90           | 342.00            |
|    | 09/01/15 15:21:29                | 22500                     | 17.15                 | 3.56          | 0.73           | 2.77                   | 0.70                 | 111.70           | 327.00            |
|    | 09/01/15 15:21:59                | 22530                     | 17.06                 | 3.42          | 0.80           | 2.82                   | 0.70                 | 111.70           | 327.00            |
|    | 09/01/15 15:22:29                | 22560                     | 17.27                 | 3.27          | 0.85           | 2.68                   | 0.69                 | 111.40           | 342.00            |
|    | 09/01/15 15:22:59                | 22590                     | 17.42                 | 3.46          | 0.87           | 2.58                   | 0.69                 | 111.40           | 342.00            |
|    | 09/01/15 15:23:29                | 22620                     | 17.23                 | 3.52          | 0.77           | 2.71                   | 0.69                 | 111.10           | 327.00            |
|    | 09/01/15 15:23:59                | 22650                     | 17.20                 | 3.30          | 0.89           | 2.72                   | 0.69                 | 111.10           | 327.00            |
|    | 09/01/15 15:24:29                | 22680                     | 17.33                 | 3.48          | 0.94           | 2.64                   | 0.69                 | 110.80           | 327.00            |
|    | 09/01/15 15:24:59                | 22710                     | 17.29                 | 3.55          | 0.87           | 2.66                   | 0.69                 | 110.80           | 327.00            |
|    | 09/01/15 15:25:29                | 22740                     | 17.38                 | 3.72          | 0.94           | 2.59                   | 0.69                 | 110.50           | 343.00            |
|    | 09/01/15 15:25:59                | 22770                     | 17.31                 | 3.86          | 0.89           | 2.65                   | 0.69                 | 110.50           | 343.00            |
|    | 09/01/15 15:26:29                | 22800                     | 17.35                 | 3.56          | 0.90           | 2.63                   | 0.69                 | 110.20           | 343.00            |
|    | 09/01/15 15:26:59                | 22830                     | 17.34                 | 3.71          | 0.87           | 2.64                   | 0.69                 | 110.20           | 343.00            |
|    | 09/01/15 15:27:29                | 22860                     | 17.42                 | 3.76          | 0.88           | 2.58                   | 0.70                 | 109.90           | 328.00            |
|    | 09/01/15 15:27:59                | 22890                     | 17.37                 | 3.52          | 0.97           | 2.61                   | 0.70                 | 109.90           | 328.00            |
|    | 09/01/15 15:28:29                | 22920                     | 17.64                 | 3.54          | 1.01           | 2.43                   | 0.42                 | 109.70           | 216.00            |
|    | 09/01/15 15:28:59                | 22950                     | 19.08                 | 3.86          | 1.25           | 1.32                   | 0.42                 | 109.70           | 216.00            |
|    | 09/01/15 15:29:29                | 22980                     | 19.26                 | 4.70          | 1.17           | 1.13                   | 0.20                 | 109.60           | 121.00            |
|    | 09/01/15 15:29:59                | 23010                     | 19.22                 | 4.83          | 1.23           | 1.14                   | 0.20                 | 109.60           | 121.00            |
|    | 09/01/15 15:30:29                | 23040                     | 19.29                 | 4.94          | 1.31           | 1.10                   | 0.20                 | 109.60           | 136.00            |
|    | 09/01/15 15:30:59                | 23070                     | 19.30                 | 4.99          | 1.32           | 1.10                   | 0.20                 | 109.60           | 136.00            |
|    | 09/01/15 15:31:29                | 23100                     | 19.31                 | 5.05          | 1.38           | 1.10                   | 0.19                 | 109.50           | 136.00            |
|    | 09/01/15 15:31:59                | 23130                     | 19.31                 | 5.18          | 1.45           | 1.10                   | 0.19                 | 109.50           | 136.00            |
|    | 09/01/15 15:32:29                | 23160                     | 17.98                 | 4.89          | 1.17           | 2.09                   | 0.60                 | 109.30           | 310.00            |
|    | 09/01/15 15:32:59                | 23190                     | 17.68                 | 4.34          | 1.05           | 2.39                   | 0.60                 | 109.30           | 310.00            |
|    | 09/01/15 15:33:29                | 23220                     | 17.59                 | 4.18          | 1.01           | 2.44                   | 0.59                 | 108.90           | 311.00            |
|    | 09/01/15 15:33:59                | 23250                     | 17.61                 | 4.00          | 1.00           | 2.44                   | 0.59                 | 108.90           | 311.00            |
|    | 09/01/15 15:34:29                | 23280                     | 17.62                 | 3.94          | 0.94           | 2.42                   | 0.58                 | 108.60           | 310.00            |
|    | 09/01/15 15:34:59                | 23310                     | 17.64                 | 3.99          | 1.08           | 2.42                   | 0.58                 | 108.60           | 310.00            |
|    | 09/01/15 15:35:29                | 23340                     | 17.65                 | 4.01          | 1.00           | 2.41                   | 0.58                 | 108.20           | 295.00            |
|    | 09/01/15 15:35:59                | 23370                     | 17.66                 | 3.82          | 0.94           | 2.40                   | 0.58                 | 108.20           | 295.00            |

**Leed Fabrication Services Inc.**  
**September 1, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 2.7    | %    |
| Stack Exhaust Flow (M2) | 43,796 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.95    | in. Hg                       |
| Relative Humidity   | 16       | %                            |
| Ambient Temperature | 90       | °F                           |
| Specific Humidity   | 0.005728 | lb H <sub>2</sub> O / lb air |

0-30-0 Load, Run - EC36-2S R1

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| 09/01/15 15:36:29                | 23400                     | 17.63                 | 3.82          | 0.96           | 2.42                   | 0.59                 | 107.80           | 327.00            |
| 09/01/15 15:36:59                | 23430                     | 17.63                 | 3.92          | 1.14           | 2.42                   | 0.59                 | 107.80           | 327.00            |
| 09/01/15 15:37:29                | 23460                     | 17.63                 | 4.08          | 1.00           | 2.41                   | 0.58                 | 107.50           | 327.00            |
| 09/01/15 15:37:59                | 23490                     | 17.60                 | 3.97          | 1.06           | 2.43                   | 0.58                 | 107.50           | 327.00            |
| 09/01/15 15:38:29                | 23520                     | 17.60                 | 3.90          | 1.04           | 2.43                   | 0.58                 | 107.10           | 296.00            |
| 09/01/15 15:38:59                | 23550                     | 17.62                 | 3.76          | 0.96           | 2.42                   | 0.58                 | 107.10           | 296.00            |
| 09/01/15 15:39:29                | 23580                     | 17.57                 | 3.81          | 0.90           | 2.44                   | 0.58                 | 106.40           | 312.00            |
| 09/01/15 15:39:59                | 23610                     | 17.60                 | 3.78          | 0.98           | 2.43                   | 0.58                 | 106.40           | 312.00            |
| 09/01/15 15:40:29                | 23640                     | 17.60                 | 3.83          | 0.95           | 2.42                   | 0.58                 | 106.10           | 312.00            |
| 09/01/15 15:40:59                | 23670                     | 17.55                 | 3.74          | 0.95           | 2.47                   | 0.58                 | 106.10           | 312.00            |
| 09/01/15 15:41:29                | 23700                     | 17.55                 | 3.95          | 0.92           | 2.48                   | 0.60                 | 105.70           | 312.00            |
| 09/01/15 15:41:59                | 23730                     | 17.63                 | 3.77          | 0.97           | 2.40                   | 0.60                 | 105.70           | 312.00            |
| 09/01/15 15:42:29                | 23760                     | 17.52                 | 3.43          | 0.92           | 2.49                   | 0.59                 | 105.30           | 312.00            |
| 09/01/15 15:42:59                | 23790                     | 17.55                 | 3.51          | 0.89           | 2.48                   | 0.59                 | 105.30           | 312.00            |
| 09/01/15 15:43:29                | 23820                     | 17.59                 | 3.71          | 0.91           | 2.44                   | 0.22                 | 105.00           | 152.00            |
| 09/01/15 15:43:59                | 23850                     | 17.61                 | 3.86          | 0.98           | 2.43                   | 0.22                 | 105.00           | 152.00            |
| 09/01/15 15:44:29                | 23880                     | 18.56                 | 3.90          | 1.39           | 1.74                   | 0.21                 | 104.90           | 152.00            |
| 09/01/15 15:44:59                | 23910                     | 19.19                 | 4.59          | 1.37           | 1.16                   | 0.21                 | 104.90           | 152.00            |
| 09/01/15 15:45:29                | 23940                     | 19.16                 | 4.73          | 1.21           | 1.17                   | 0.20                 | 104.90           | 152.00            |
| 09/01/15 15:45:59                | 23970                     | 19.22                 | 4.72          | 1.34           | 1.14                   | 0.20                 | 104.90           | 152.00            |
| 09/01/15 15:46:29                | 24000                     | 19.21                 | 4.74          | 1.46           | 1.15                   | 0.21                 | 104.90           | 152.00            |
| <b>RAW AVERAGE</b>               |                           | <b>18.01</b>          | <b>4.04</b>   | <b>1.08</b>    | <b>2.11</b>            | <b>0.55</b>          | <b>111.30</b>    | <b>280.21</b>     |

| Bias                   | Serial Number:  | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Press. Trans<br>(in. H <sub>2</sub> O) | Temp. Trans.<br>(°F) | F-Flow Trans.<br>(SCFH) |
|------------------------|-----------------|-----------------------|---------------|----------------|------------------------|----------------------------------------|----------------------|-------------------------|
|                        | INSTO2-0011     | INST-CO-0022          | INST-TH-0002  | INST-C2-0013   | 1434717                | 1434717                                | 1434717              |                         |
|                        | Initial Zero    | 0.04                  | -0.04         | -0.04          | 0.06                   |                                        |                      |                         |
|                        | Final Zero      | 0.03                  | -0.10         | 0.05           | 0.01                   |                                        |                      |                         |
|                        | Avg. Zero       | 0.04                  | -0.07         | 0.01           | 0.04                   |                                        |                      |                         |
|                        | Initial UpScale | 11.94                 | 9.32          | 3.08           | 9.00                   |                                        |                      |                         |
|                        | Final UpScale   | 11.91                 | 9.41          | 3.03           | 9.04                   |                                        |                      |                         |
|                        | Avg. UpScale    | 11.93                 | 9.37          | 3.06           | 9.02                   |                                        |                      |                         |
| <b>Upscale Cal Gas</b> |                 | 11.91                 | 9.48          | 3.02           | 9.09                   |                                        |                      |                         |

| EMISSIONS DATA                          | O <sub>2</sub> | CO   | THC  | CO <sub>2</sub> |
|-----------------------------------------|----------------|------|------|-----------------|
| Corrected Raw Average (ppm/% dry basis) | 18.01          | 4.13 | 1.10 | 2.10            |
| Corrected Raw Average (ppm/% wet basis) | 17.52          | 4.02 | 1.07 | 2.05            |
| Emission Rate (lb/hr)                   | N/A            | 0.01 | 0.01 | N/A             |

**Leed Fabrication Services Inc.**  
**September 1, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 2.5    | %    |
| Stack Exhaust Flow (M2) | 39,307 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.93    | in. Hg                       |
| Relative Humidity   | 17       | %                            |
| Ambient Temperature | 90       | °F                           |
| Specific Humidity   | 0.006094 | lb H <sub>2</sub> O / lb air |

0-30-0 Load, Run - EC36-2S R2

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| A1 | 09/01/15 15:57:29                | 24660                     | 19.34                 | 3.84          | 1.19           | 1.07                   | 0.23                 | 101.70           | 153.00            |
|    | 09/01/15 15:57:59                | 24690                     | 19.33                 | 3.96          | 1.12           | 1.08                   | 0.23                 | 101.70           | 153.00            |
|    | 09/01/15 15:58:29                | 24720                     | 19.35                 | 4.04          | 1.19           | 1.07                   | 0.22                 | 101.70           | 153.00            |
|    | 09/01/15 15:58:59                | 24750                     | 19.33                 | 4.08          | 1.38           | 1.08                   | 0.22                 | 101.70           | 153.00            |
|    | 09/01/15 15:59:29                | 24780                     | 19.34                 | 4.15          | 1.26           | 1.07                   | 0.22                 | 101.80           | 169.00            |
|    | 09/01/15 15:59:59                | 24810                     | 19.08                 | 4.17          | 1.08           | 1.23                   | 0.22                 | 101.80           | 169.00            |
|    | 09/01/15 16:00:29                | 24840                     | 18.01                 | 3.99          | 0.87           | 2.11                   | 0.21                 | 101.70           | 153.00            |
|    | 09/01/15 16:00:59                | 24870                     | 17.93                 | 3.63          | 0.98           | 2.19                   | 0.21                 | 101.70           | 153.00            |
|    | 09/01/15 16:01:29                | 24900                     | 17.93                 | 3.55          | 0.96           | 2.18                   | 0.58                 | 101.60           | 299.00            |
|    | 09/01/15 16:01:59                | 24930                     | 17.73                 | 3.54          | 0.83           | 2.34                   | 0.58                 | 101.60           | 299.00            |
|    | 09/01/15 16:02:29                | 24960                     | 17.87                 | 3.51          | 0.85           | 2.25                   | 0.59                 | 101.30           | 315.00            |
|    | 09/01/15 16:02:59                | 24990                     | 17.84                 | 3.43          | 0.91           | 2.26                   | 0.59                 | 101.30           | 315.00            |
|    | 09/01/15 16:03:29                | 25020                     | 17.91                 | 3.38          | 0.93           | 2.23                   | 0.58                 | 100.90           | 330.00            |
|    | 09/01/15 16:03:59                | 25050                     | 17.84                 | 3.32          | 0.83           | 2.26                   | 0.58                 | 100.90           | 330.00            |
|    | 09/01/15 16:04:29                | 25080                     | 17.88                 | 3.34          | 0.82           | 2.25                   | 0.59                 | 100.70           | 315.00            |
|    | 09/01/15 16:04:59                | 25110                     | 18.02                 | 3.38          | 0.92           | 2.13                   | 0.59                 | 100.70           | 315.00            |
|    | 09/01/15 16:05:29                | 25140                     | 17.95                 | 3.46          | 0.82           | 2.20                   | 0.57                 | 100.30           | 299.00            |
|    | 09/01/15 16:05:59                | 25170                     | 17.93                 | 3.37          | 0.78           | 2.19                   | 0.57                 | 100.30           | 299.00            |
|    | 09/01/15 16:06:29                | 25200                     | 17.99                 | 3.40          | 0.88           | 2.16                   | 0.58                 | 100.00           | 315.00            |
|    | 09/01/15 16:06:59                | 25230                     | 17.98                 | 3.41          | 0.94           | 2.17                   | 0.58                 | 100.00           | 315.00            |
|    | 09/01/15 16:07:29                | 25260                     | 17.99                 | 3.38          | 0.87           | 2.16                   | 0.59                 | 99.70            | 316.00            |
|    | 09/01/15 16:07:59                | 25290                     | 18.03                 | 3.39          | 0.79           | 2.12                   | 0.59                 | 99.70            | 316.00            |
|    | 09/01/15 16:08:29                | 25320                     | 18.01                 | 3.38          | 0.86           | 2.13                   | 0.57                 | 99.40            | 300.00            |
|    | 09/01/15 16:08:59                | 25350                     | 17.97                 | 3.36          | 0.92           | 2.17                   | 0.57                 | 99.40            | 300.00            |
|    | 09/01/15 16:09:29                | 25380                     | 17.97                 | 3.29          | 0.84           | 2.17                   | 0.58                 | 99.10            | 316.00            |
|    | 09/01/15 16:09:59                | 25410                     | 17.96                 | 3.29          | 0.76           | 2.17                   | 0.58                 | 99.10            | 316.00            |
|    | 09/01/15 16:10:29                | 25440                     | 18.06                 | 3.31          | 0.81           | 2.11                   | 0.58                 | 98.80            | 316.00            |
|    | 09/01/15 16:10:59                | 25470                     | 18.01                 | 3.31          | 0.90           | 2.13                   | 0.58                 | 98.80            | 316.00            |
|    | 09/01/15 16:11:29                | 25500                     | 18.03                 | 3.32          | 0.83           | 2.12                   | 0.59                 | 98.50            | 300.00            |
|    | 09/01/15 16:11:59                | 25530                     | 17.99                 | 3.27          | 0.78           | 2.16                   | 0.59                 | 98.50            | 300.00            |
|    | 09/01/15 16:12:29                | 25560                     | 17.89                 | 3.26          | 0.73           | 2.21                   | 0.58                 | 98.20            | 316.00            |
|    | 09/01/15 16:12:59                | 25590                     | 17.77                 | 3.29          | 0.77           | 2.33                   | 0.58                 | 98.20            | 316.00            |
|    | 09/01/15 16:13:29                | 25620                     | 17.96                 | 3.27          | 0.76           | 2.17                   | 0.59                 | 98.00            | 317.00            |
|    | 09/01/15 16:13:59                | 25650                     | 17.84                 | 3.32          | 0.73           | 2.25                   | 0.59                 | 98.00            | 317.00            |
|    | 09/01/15 16:14:29                | 25680                     | 17.91                 | 3.23          | 0.85           | 2.21                   | 0.57                 | 97.70            | 301.00            |
|    | 09/01/15 16:14:59                | 25710                     | 17.96                 | 3.25          | 0.83           | 2.18                   | 0.57                 | 97.70            | 301.00            |
|    | 09/01/15 16:15:29                | 25740                     | 17.92                 | 3.26          | 0.75           | 2.21                   | 0.59                 | 97.40            | 317.00            |
|    | 09/01/15 16:15:59                | 25770                     | 19.21                 | 3.38          | 0.98           | 1.26                   | 0.59                 | 97.40            | 317.00            |
|    | 09/01/15 16:16:29                | 25800                     | 19.46                 | 4.34          | 1.02           | 1.01                   | 0.39                 | 97.10            | 236.00            |
|    | 09/01/15 16:16:59                | 25830                     | 19.37                 | 4.66          | 0.93           | 1.07                   | 0.39                 | 97.10            | 236.00            |
|    | 09/01/15 16:17:29                | 25860                     | 19.47                 | 4.69          | 0.97           | 1.01                   | 0.19                 | 97.10            | 154.00            |
| A2 | 09/01/15 16:17:59                | 25890                     | 19.42                 | 4.68          | 0.98           | 1.04                   | 0.19                 | 97.10            | 154.00            |
|    | 09/01/15 16:18:29                | 25920                     | 19.40                 | 4.67          | 1.02           | 1.05                   | 0.17                 | 97.00            | 123.00            |
|    | 09/01/15 16:18:59                | 25950                     | 19.16                 | 4.87          | 0.90           | 1.18                   | 0.17                 | 97.00            | 123.00            |
|    | 09/01/15 16:19:29                | 25980                     | 17.64                 | 4.29          | 0.67           | 2.39                   | 0.17                 | 97.10            | 123.00            |
|    | 09/01/15 16:19:59                | 26010                     | 17.67                 | 3.49          | 0.75           | 2.39                   | 0.17                 | 97.10            | 123.00            |
|    | 09/01/15 16:20:29                | 26040                     | 17.70                 | 3.35          | 0.72           | 2.38                   | 0.64                 | 96.90            | 318.00            |
|    | 09/01/15 16:20:59                | 26070                     | 17.71                 | 3.34          | 0.68           | 2.36                   | 0.64                 | 96.90            | 318.00            |
|    | 09/01/15 16:21:29                | 26100                     | 17.74                 | 3.30          | 0.68           | 2.34                   | 0.65                 | 96.50            | 350.00            |
|    | 09/01/15 16:21:59                | 26130                     | 17.67                 | 3.28          | 0.75           | 2.39                   | 0.65                 | 96.50            | 350.00            |
|    | 09/01/15 16:22:29                | 26160                     | 17.75                 | 3.24          | 0.76           | 2.33                   | 0.65                 | 96.10            | 335.00            |
|    | 09/01/15 16:22:59                | 26190                     | 17.80                 | 3.24          | 0.71           | 2.30                   | 0.65                 | 96.10            | 335.00            |
|    | 09/01/15 16:23:29                | 26220                     | 17.79                 | 3.25          | 0.71           | 2.30                   | 0.68                 | 95.70            | 336.00            |
|    | 09/01/15 16:23:59                | 26250                     | 17.88                 | 3.24          | 0.76           | 2.23                   | 0.68                 | 95.70            | 336.00            |
|    | 09/01/15 16:24:29                | 26280                     | 17.83                 | 3.18          | 0.70           | 2.27                   | 0.67                 | 95.40            | 336.00            |
|    | 09/01/15 16:24:59                | 26310                     | 17.84                 | 3.19          | 0.66           | 2.26                   | 0.67                 | 95.40            | 336.00            |
|    | 09/01/15 16:25:29                | 26340                     | 17.92                 | 3.21          | 0.77           | 2.20                   | 0.68                 | 95.10            | 320.00            |
|    | 09/01/15 16:25:59                | 26370                     | 17.86                 | 3.29          | 0.72           | 2.24                   | 0.68                 | 95.10            | 320.00            |
|    | 09/01/15 16:26:29                | 26400                     | 17.79                 | 3.24          | 0.67           | 2.30                   | 0.68                 | 94.80            | 336.00            |
|    | 09/01/15 16:26:59                | 26430                     | 17.90                 | 3.20          | 0.67           | 2.21                   | 0.68                 | 94.80            | 336.00            |

**Leed Fabrication Services Inc.**  
**September 1, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 2.5    | %    |
| Stack Exhaust Flow (M2) | 39,307 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.93    | in. Hg                       |
| Relative Humidity   | 17       | %                            |
| Ambient Temperature | 90       | °F                           |
| Specific Humidity   | 0.006094 | lb H <sub>2</sub> O / lb air |

0-30-0 Load, Run - EC36-2S R2

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmwv) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
|    | 09/01/15 16:27:29                | 26460                     | 17.82                 | 3.24          | 0.73           | 2.27                   | 0.68                 | 94.50            | 320.00            |
|    | 09/01/15 16:27:59                | 26490                     | 17.82                 | 3.25          | 0.67           | 2.27                   | 0.68                 | 94.50            | 320.00            |
|    | 09/01/15 16:28:29                | 26520                     | 17.78                 | 3.20          | 0.68           | 2.30                   | 0.68                 | 94.20            | 321.00            |
|    | 09/01/15 16:28:59                | 26550                     | 17.73                 | 3.19          | 0.71           | 2.33                   | 0.68                 | 94.20            | 321.00            |
|    | 09/01/15 16:29:29                | 26580                     | 17.75                 | 3.19          | 0.67           | 2.33                   | 0.66                 | 93.90            | 352.00            |
|    | 09/01/15 16:29:59                | 26610                     | 17.86                 | 3.25          | 0.65           | 2.25                   | 0.66                 | 93.90            | 352.00            |
|    | 09/01/15 16:30:29                | 26640                     | 17.89                 | 3.23          | 0.72           | 2.21                   | 0.65                 | 93.60            | 320.00            |
|    | 09/01/15 16:30:59                | 26670                     | 17.91                 | 3.22          | 0.73           | 2.21                   | 0.65                 | 93.60            | 320.00            |
|    | 09/01/15 16:31:29                | 26700                     | 17.80                 | 3.17          | 0.64           | 2.30                   | 0.68                 | 93.30            | 353.00            |
|    | 09/01/15 16:31:59                | 26730                     | 17.77                 | 3.12          | 0.65           | 2.32                   | 0.68                 | 93.30            | 353.00            |
|    | 09/01/15 16:32:29                | 26760                     | 17.83                 | 3.10          | 0.69           | 2.27                   | 0.68                 | 93.00            | 337.00            |
|    | 09/01/15 16:32:59                | 26790                     | 17.69                 | 3.12          | 0.61           | 2.37                   | 0.68                 | 93.00            | 337.00            |
|    | 09/01/15 16:33:29                | 26820                     | 17.83                 | 3.35          | 0.67           | 2.28                   | 0.68                 | 92.80            | 338.00            |
|    | 09/01/15 16:33:59                | 26850                     | 19.05                 | 4.06          | 0.88           | 1.32                   | 0.68                 | 92.80            | 338.00            |
|    | 09/01/15 16:34:29                | 26880                     | 19.26                 | 3.88          | 0.95           | 1.12                   | 0.47                 | 92.50            | 239.00            |
|    | 09/01/15 16:34:59                | 26910                     | 19.25                 | 4.05          | 0.93           | 1.13                   | 0.47                 | 92.50            | 239.00            |
|    | 09/01/15 16:35:29                | 26940                     | 19.20                 | 4.18          | 0.88           | 1.15                   | 0.24                 | 92.40            | 156.00            |
|    | 09/01/15 16:35:59                | 26970                     | 19.20                 | 4.15          | 0.85           | 1.16                   | 0.24                 | 92.40            | 156.00            |
|    | 09/01/15 16:36:29                | 27000                     | 19.24                 | 4.13          | 0.89           | 1.13                   | 0.23                 | 92.40            | 156.00            |
|    | 09/01/15 16:36:59                | 27030                     | 19.23                 | 4.16          | 0.88           | 1.14                   | 0.23                 | 92.40            | 156.00            |
|    | 09/01/15 16:37:29                | 27060                     | 18.63                 | 4.13          | 0.72           | 1.57                   | 0.20                 | 92.40            | 156.00            |
| A3 | 09/01/15 16:37:59                | 27090                     | 17.71                 | 3.74          | 0.63           | 2.36                   | 0.20                 | 92.40            | 156.00            |
|    | 09/01/15 16:38:29                | 27120                     | 17.71                 | 3.35          | 0.68           | 2.35                   | 0.56                 | 92.20            | 303.00            |
|    | 09/01/15 16:38:59                | 27150                     | 17.74                 | 3.32          | 0.70           | 2.36                   | 0.56                 | 92.20            | 303.00            |
|    | 09/01/15 16:39:29                | 27180                     | 17.78                 | 3.35          | 0.61           | 2.30                   | 0.68                 | 92.00            | 338.00            |
|    | 09/01/15 16:39:59                | 27210                     | 17.51                 | 3.33          | 0.53           | 2.50                   | 0.68                 | 92.00            | 338.00            |
|    | 09/01/15 16:40:29                | 27240                     | 17.53                 | 3.49          | 0.60           | 2.51                   | 0.68                 | 91.60            | 322.00            |
|    | 09/01/15 16:40:59                | 27270                     | 17.83                 | 3.47          | 0.65           | 2.28                   | 0.68                 | 91.60            | 322.00            |
|    | 09/01/15 16:41:29                | 27300                     | 17.96                 | 3.21          | 0.63           | 2.17                   | 0.68                 | 91.30            | 322.00            |
|    | 09/01/15 16:41:59                | 27330                     | 17.83                 | 3.24          | 0.59           | 2.27                   | 0.68                 | 91.30            | 322.00            |
|    | 09/01/15 16:42:29                | 27360                     | 17.92                 | 3.18          | 0.64           | 2.21                   | 0.67                 | 91.00            | 339.00            |
|    | 09/01/15 16:42:59                | 27390                     | 17.86                 | 3.18          | 0.70           | 2.24                   | 0.67                 | 91.00            | 339.00            |
|    | 09/01/15 16:43:29                | 27420                     | 17.89                 | 3.18          | 0.66           | 2.23                   | 0.67                 | 90.60            | 355.00            |
|    | 09/01/15 16:43:59                | 27450                     | 17.74                 | 3.16          | 0.58           | 2.33                   | 0.67                 | 90.60            | 355.00            |
|    | 09/01/15 16:44:29                | 27480                     | 17.83                 | 3.12          | 0.57           | 2.27                   | 0.65                 | 90.30            | 354.00            |
|    | 09/01/15 16:44:59                | 27510                     | 17.78                 | 3.04          | 0.60           | 2.32                   | 0.65                 | 90.30            | 354.00            |
|    | 09/01/15 16:45:29                | 27540                     | 17.67                 | 3.10          | 0.61           | 2.38                   | 0.68                 | 90.00            | 339.00            |
|    | 09/01/15 16:45:59                | 27570                     | 17.71                 | 3.21          | 0.56           | 2.37                   | 0.68                 | 90.00            | 339.00            |
|    | 09/01/15 16:46:29                | 27600                     | 17.90                 | 3.12          | 0.61           | 2.24                   | 0.67                 | 89.70            | 355.00            |
|    | 09/01/15 16:46:59                | 27630                     | 19.20                 | 3.35          | 0.87           | 1.21                   | 0.67                 | 89.70            | 355.00            |
|    | 09/01/15 16:47:29                | 27660                     | 19.26                 | 4.07          | 0.87           | 1.14                   | 0.45                 | 89.50            | 240.00            |
|    | 09/01/15 16:47:59                | 27690                     | 19.34                 | 4.10          | 0.82           | 1.07                   | 0.45                 | 89.50            | 240.00            |
|    | 09/01/15 16:48:29                | 27720                     | 19.25                 | 4.15          | 0.81           | 1.13                   | 0.21                 | 89.40            | 141.00            |
|    | 09/01/15 16:48:59                | 27750                     | 19.30                 | 4.35          | 0.85           | 1.11                   | 0.21                 | 89.40            | 141.00            |
|    | 09/01/15 16:49:29                | 27780                     | 19.28                 | 4.34          | 0.92           | 1.13                   | 0.21                 | 89.40            | 157.00            |
|    | 09/01/15 16:49:59                | 27810                     | 19.31                 | 4.33          | 0.86           | 1.12                   | 0.21                 | 89.40            | 157.00            |
|    | 09/01/15 16:50:29                | 27840                     | 19.29                 | 4.19          | 0.80           | 1.12                   | 0.19                 | 89.40            | 141.00            |
|    | 09/01/15 16:50:59                | 27870                     | 19.29                 | 4.27          | 0.81           | 1.11                   | 0.19                 | 89.40            | 141.00            |
|    | 09/01/15 16:51:29                | 27900                     | 19.29                 | 4.43          | 0.84           | 1.11                   | 0.19                 | 89.30            | 156.00            |
|    | 09/01/15 16:51:59                | 27930                     | 19.24                 | 4.48          | 0.99           | 1.14                   | 0.19                 | 89.30            | 156.00            |
|    | 09/01/15 16:52:29                | 27960                     | 18.85                 | 4.58          | 0.80           | 1.40                   | 0.16                 | 89.30            | 156.00            |
|    | 09/01/15 16:52:59                | 27990                     | 17.87                 | 4.16          | 0.62           | 2.25                   | 0.16                 | 89.30            | 156.00            |
|    | 09/01/15 16:53:29                | 28020                     | 17.80                 | 3.72          | 0.58           | 2.30                   | 0.40                 | 89.20            | 255.00            |
|    | 09/01/15 16:53:59                | 28050                     | 17.87                 | 3.63          | 0.64           | 2.26                   | 0.40                 | 89.20            | 255.00            |
|    | 09/01/15 16:54:29                | 28080                     | 17.88                 | 3.57          | 0.65           | 2.25                   | 0.60                 | 88.90            | 322.00            |
|    | 09/01/15 16:54:59                | 28110                     | 17.88                 | 3.62          | 0.61           | 2.25                   | 0.60                 | 88.90            | 322.00            |
|    | 09/01/15 16:55:29                | 28140                     | 17.96                 | 3.54          | 0.60           | 2.19                   | 0.60                 | 88.70            | 322.00            |
|    | 09/01/15 16:55:59                | 28170                     | 17.78                 | 3.46          | 0.61           | 2.31                   | 0.60                 | 88.70            | 322.00            |
|    | 09/01/15 16:56:29                | 28200                     | 17.95                 | 3.51          | 0.61           | 2.18                   | 0.61                 | 88.50            | 306.00            |
|    | 09/01/15 16:56:59                | 28230                     | 17.88                 | 3.34          | 0.56           | 2.27                   | 0.61                 | 88.50            | 306.00            |



**Leed Fabrication Services Inc.**  
**September 1, 2015**  
**EC36-2S**  
**Loveland Facility**

### Unit Data

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 2.5    | %    |
| Stack Exhaust Flow (M2) | 39,307 | SCFH |

## Weather Data

| Weather Data        |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.93    | in. Hg                       |
| Relative Humidity   | 17       | %                            |
| Ambient Temperature | 90       | ° F                          |
| Specific Humidity   | 0.006094 | lb H <sub>2</sub> O / lb air |

0-30-0 Load, Run - EC36-2S R2

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmwv) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| 09/01/15 16:57:29                | 28260                     | 17.79                 | 3.24          | 0.51           | 2.31                   | 0.60                 | 87.80            | 307.00            |
| 09/01/15 16:57:59                | 28290                     | 18.31                 | 3.09          | 0.60           | 1.92                   | 0.60                 | 87.80            | 307.00            |
| 09/01/15 16:58:29                | 28320                     | 17.95                 | 2.91          | 0.64           | 2.18                   | 0.59                 | 88.20            | 306.00            |
| 09/01/15 16:58:59                | 28350                     | 17.97                 | 3.09          | 0.60           | 2.18                   | 0.59                 | 88.20            | 306.00            |
| 09/01/15 16:59:29                | 28380                     | 18.10                 | 3.03          | 0.56           | 2.09                   | 0.58                 | 88.00            | 322.00            |
| 09/01/15 16:59:59                | 28410                     | 17.98                 | 3.06          | 0.57           | 2.17                   | 0.58                 | 88.00            | 322.00            |
| 09/01/15 17:00:29                | 28440                     | 17.84                 | 3.13          | 0.62           | 2.28                   | 0.58                 | 87.90            | 322.00            |
| 09/01/15 17:00:59                | 28470                     | 18.04                 | 3.19          | 0.60           | 2.13                   | 0.58                 | 87.90            | 322.00            |
| 09/01/15 17:01:29                | 28500                     | 17.85                 | 3.08          | 0.54           | 2.26                   | 0.58                 | 87.80            | 306.00            |
| 09/01/15 17:01:59                | 28530                     | 17.70                 | 3.22          | 0.52           | 2.39                   | 0.58                 | 87.80            | 306.00            |
| 09/01/15 17:02:29                | 28560                     | 17.64                 | 3.39          | 0.55           | 2.42                   | 0.58                 | 87.80            | 322.00            |
| 09/01/15 17:02:59                | 28590                     | 17.77                 | 3.40          | 0.60           | 2.34                   | 0.58                 | 87.80            | 322.00            |
| 09/01/15 17:03:29                | 28620                     | 17.81                 | 3.32          | 0.55           | 2.30                   | 0.57                 | 87.80            | 322.00            |
| 09/01/15 17:03:59                | 28650                     | 17.78                 | 3.38          | 0.52           | 2.31                   | 0.57                 | 87.80            | 322.00            |
| 09/01/15 17:04:29                | 28680                     | 17.83                 | 3.34          | 0.58           | 2.28                   | 0.58                 | 87.90            | 306.00            |
| 09/01/15 17:04:59                | 28710                     | 17.87                 | 3.35          | 0.64           | 2.25                   | 0.58                 | 87.90            | 306.00            |
| 09/01/15 17:05:29                | 28740                     | 17.85                 | 3.26          | 0.61           | 2.27                   | 0.49                 | 88.00            | 272.00            |
| 09/01/15 17:05:59                | 28770                     | 18.50                 | 3.26          | 0.69           | 1.80                   | 0.49                 | 88.00            | 272.00            |
| 09/01/15 17:06:29                | 28800                     | 19.14                 | 3.87          | 0.78           | 1.21                   | 0.24                 | 88.10            | 173.00            |
| 09/01/15 17:06:59                | 28830                     | 19.16                 | 4.40          | 0.80           | 1.20                   | 0.24                 | 88.10            | 173.00            |
| 09/01/15 17:07:29                | 28860                     | 19.14                 | 4.41          | 0.78           | 1.21                   | 0.23                 | 88.30            | 157.00            |

**RAW AVERAGE**

|                 | O <sub>2</sub> | CO           | THC          | CO <sub>2</sub> | Press. Trans           | Temp. Trans. | F-Flow Trans. |
|-----------------|----------------|--------------|--------------|-----------------|------------------------|--------------|---------------|
| Serial Number:  | INSTO2-0011    | INST-CO-0022 | INST-TH-0002 | INST-C2-0013    | 1434717                | 1434717      | 1434717       |
|                 |                |              |              |                 | (in. H <sub>2</sub> O) | (°F)         | (SCFH)        |
| Initial Zero    | 0.03           | -0.10        | 0.05         | 0.01            |                        |              |               |
| Final Zero      | 0.05           | 0.02         | 0.02         | 0.03            |                        |              |               |
| Avg. Zero       | 0.04           | -0.04        | 0.04         | 0.02            |                        |              |               |
| Initial UpScale | 11.91          | 9.41         | 3.03         | 9.04            |                        |              |               |
| Final UpScale   | 11.92          | 9.39         | 3.03         | 9.03            |                        |              |               |
| Avg. UpScale    | 11.92          | 9.40         | 3.03         | 9.04            |                        |              |               |
|                 | 11.91          | 9.48         | 3.02         | 9.09            |                        |              |               |

| EMISSIONS DATA                          | O <sub>2</sub> | CO   | THC  | CO <sub>2</sub> |
|-----------------------------------------|----------------|------|------|-----------------|
| Corrected Raw Average (ppm/% dry basis) | 18.23          | 3.60 | 0.73 | 1.97            |
| Corrected Raw Average (ppm/% wet basis) | 17.78          | 3.52 | 0.71 | 1.92            |
| Emission Rate (lb/hr)                   | N/A            | 0.01 | 0.00 | N/A             |

**Leed Fabrication Services Inc.**  
**September 1, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 2.8    | %    |
| Stack Exhaust Flow (M2) | 54,008 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.94    | in. Hg                       |
| Relative Humidity   | 11       | %                            |
| Ambient Temperature | 90       | °F                           |
| Specific Humidity   | 0.003928 | lb H <sub>2</sub> O / lb air |

0-30-0 Load, Run - EC36-2S R3

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| A1 | 09/01/15 17:20:29                | 29640                     | 19.36                 | 4.41          | 0.81           | 1.09                   | 0.22                 | 88.80            | 141.00            |
|    | 09/01/15 17:20:59                | 29670                     | 19.33                 | 4.54          | 0.87           | 1.10                   | 0.22                 | 88.80            | 141.00            |
|    | 09/01/15 17:21:29                | 29700                     | 19.34                 | 4.61          | 0.89           | 1.10                   | 0.22                 | 88.90            | 126.00            |
|    | 09/01/15 17:21:59                | 29730                     | 19.39                 | 4.51          | 0.84           | 1.08                   | 0.22                 | 88.90            | 126.00            |
|    | 09/01/15 17:22:29                | 29760                     | 19.36                 | 4.51          | 0.81           | 1.09                   | 0.21                 | 89.00            | 157.00            |
|    | 09/01/15 17:22:59                | 29790                     | 19.29                 | 4.55          | 0.90           | 1.13                   | 0.21                 | 89.00            | 157.00            |
|    | 09/01/15 17:23:29                | 29820                     | 19.26                 | 4.59          | 0.89           | 1.14                   | 0.40                 | 89.10            | 224.00            |
|    | 09/01/15 17:23:59                | 29850                     | 18.16                 | 4.49          | 0.61           | 1.98                   | 0.40                 | 89.10            | 224.00            |
|    | 09/01/15 17:24:29                | 29880                     | 17.98                 | 3.80          | 0.64           | 2.18                   | 0.57                 | 89.10            | 353.00            |
|    | 09/01/15 17:24:59                | 29910                     | 18.01                 | 3.65          | 0.66           | 2.15                   | 0.57                 | 89.10            | 353.00            |
|    | 09/01/15 17:25:29                | 29940                     | 17.99                 | 3.63          | 0.62           | 2.16                   | 0.57                 | 89.10            | 321.00            |
|    | 09/01/15 17:25:59                | 29970                     | 18.01                 | 3.61          | 0.62           | 2.16                   | 0.57                 | 89.10            | 321.00            |
|    | 09/01/15 17:26:29                | 30000                     | 17.89                 | 3.53          | 0.60           | 2.23                   | 0.54                 | 89.00            | 321.00            |
|    | 09/01/15 17:26:59                | 30030                     | 17.91                 | 3.54          | 0.63           | 2.24                   | 0.54                 | 89.00            | 321.00            |
|    | 09/01/15 17:27:29                | 30060                     | 18.00                 | 3.58          | 0.66           | 2.16                   | 0.56                 | 89.00            | 321.00            |
|    | 09/01/15 17:27:59                | 30090                     | 17.91                 | 3.56          | 0.58           | 2.22                   | 0.56                 | 89.00            | 321.00            |
|    | 09/01/15 17:28:29                | 30120                     | 18.02                 | 3.64          | 0.62           | 2.14                   | 0.55                 | 88.90            | 321.00            |
|    | 09/01/15 17:28:59                | 30150                     | 18.07                 | 3.50          | 0.62           | 2.12                   | 0.55                 | 88.90            | 321.00            |
|    | 09/01/15 17:29:29                | 30180                     | 18.08                 | 3.37          | 0.63           | 2.10                   | 0.56                 | 88.90            | 305.00            |
|    | 09/01/15 17:29:59                | 30210                     | 18.04                 | 3.43          | 0.61           | 2.13                   | 0.56                 | 88.90            | 305.00            |
|    | 09/01/15 17:30:29                | 30240                     | 18.00                 | 3.50          | 0.64           | 2.16                   | 0.55                 | 88.90            | 305.00            |
|    | 09/01/15 17:30:59                | 30270                     | 18.03                 | 3.33          | 0.68           | 2.15                   | 0.55                 | 88.90            | 305.00            |
|    | 09/01/15 17:31:29                | 30300                     | 18.02                 | 3.37          | 0.66           | 2.15                   | 0.55                 | 88.80            | 321.00            |
|    | 09/01/15 17:31:59                | 30330                     | 18.09                 | 3.32          | 0.64           | 2.09                   | 0.55                 | 88.80            | 321.00            |
|    | 09/01/15 17:32:29                | 30360                     | 18.07                 | 3.26          | 0.61           | 2.10                   | 0.54                 | 88.80            | 321.00            |
|    | 09/01/15 17:32:59                | 30390                     | 18.11                 | 3.26          | 0.67           | 2.10                   | 0.54                 | 88.80            | 321.00            |
|    | 09/01/15 17:33:29                | 30420                     | 18.08                 | 3.24          | 0.71           | 2.12                   | 0.54                 | 88.80            | 305.00            |
|    | 09/01/15 17:33:59                | 30450                     | 18.09                 | 3.29          | 0.65           | 2.12                   | 0.54                 | 88.80            | 305.00            |
|    | 09/01/15 17:34:29                | 30480                     | 18.11                 | 3.30          | 0.67           | 2.11                   | 0.55                 | 88.70            | 289.00            |
|    | 09/01/15 17:34:59                | 30510                     | 18.14                 | 3.28          | 0.68           | 2.07                   | 0.55                 | 88.70            | 289.00            |
|    | 09/01/15 17:35:29                | 30540                     | 18.03                 | 3.25          | 0.66           | 2.17                   | 0.57                 | 88.80            | 289.00            |
|    | 09/01/15 17:35:59                | 30570                     | 18.02                 | 3.21          | 0.63           | 2.17                   | 0.57                 | 88.80            | 289.00            |
|    | 09/01/15 17:36:29                | 30600                     | 18.08                 | 3.20          | 0.62           | 2.12                   | 0.56                 | 88.80            | 321.00            |
|    | 09/01/15 17:36:59                | 30630                     | 18.02                 | 3.19          | 0.64           | 2.17                   | 0.56                 | 88.80            | 321.00            |
|    | 09/01/15 17:37:29                | 30660                     | 18.10                 | 3.20          | 0.67           | 2.12                   | 0.57                 | 88.80            | 321.00            |
|    | 09/01/15 17:37:59                | 30690                     | 18.01                 | 3.22          | 0.59           | 2.17                   | 0.57                 | 88.80            | 321.00            |
|    | 09/01/15 17:38:29                | 30720                     | 18.44                 | 3.26          | 0.71           | 1.89                   | 0.35                 | 88.90            | 191.00            |
|    | 09/01/15 17:38:59                | 30750                     | 19.32                 | 3.62          | 0.90           | 1.15                   | 0.35                 | 88.90            | 191.00            |
|    | 09/01/15 17:39:29                | 30780                     | 19.25                 | 4.11          | 0.88           | 1.19                   | 0.23                 | 89.00            | 157.00            |
|    | 09/01/15 17:39:59                | 30810                     | 19.21                 | 4.14          | 0.81           | 1.20                   | 0.23                 | 89.00            | 157.00            |
|    | 09/01/15 17:40:29                | 30840                     | 19.28                 | 4.15          | 0.83           | 1.17                   | 0.22                 | 89.10            | 157.00            |
| A2 | 09/01/15 17:40:59                | 30870                     | 19.27                 | 4.14          | 0.84           | 1.18                   | 0.22                 | 89.10            | 157.00            |
|    | 09/01/15 17:41:29                | 30900                     | 18.87                 | 4.20          | 0.79           | 1.42                   | 0.42                 | 89.20            | 239.00            |
|    | 09/01/15 17:41:59                | 30930                     | 17.93                 | 3.93          | 0.65           | 2.25                   | 0.42                 | 89.20            | 239.00            |
|    | 09/01/15 17:42:29                | 30960                     | 17.82                 | 3.46          | 0.62           | 2.33                   | 0.59                 | 89.20            | 322.00            |
|    | 09/01/15 17:42:59                | 30990                     | 17.85                 | 3.37          | 0.59           | 2.32                   | 0.59                 | 89.20            | 322.00            |
|    | 09/01/15 17:43:29                | 31020                     | 18.00                 | 3.23          | 0.68           | 2.20                   | 0.58                 | 89.00            | 322.00            |
|    | 09/01/15 17:43:59                | 31050                     | 17.84                 | 3.05          | 0.63           | 2.32                   | 0.58                 | 89.00            | 322.00            |
|    | 09/01/15 17:44:29                | 31080                     | 17.88                 | 3.17          | 0.60           | 2.31                   | 0.59                 | 88.90            | 306.00            |
|    | 09/01/15 17:44:59                | 31110                     | 17.83                 | 3.06          | 0.58           | 2.31                   | 0.59                 | 88.90            | 306.00            |
|    | 09/01/15 17:45:29                | 31140                     | 17.91                 | 3.12          | 0.65           | 2.29                   | 0.71                 | 88.80            | 341.00            |
|    | 09/01/15 17:45:59                | 31170                     | 17.97                 | 3.01          | 0.61           | 2.22                   | 0.71                 | 88.80            | 341.00            |
|    | 09/01/15 17:46:29                | 31200                     | 17.89                 | 3.00          | 0.57           | 2.31                   | 0.58                 | 88.70            | 306.00            |
|    | 09/01/15 17:46:59                | 31230                     | 17.89                 | 3.07          | 0.62           | 2.29                   | 0.58                 | 88.70            | 306.00            |
|    | 09/01/15 17:47:29                | 31260                     | 17.93                 | 3.07          | 0.71           | 2.27                   | 0.58                 | 88.60            | 322.00            |
|    | 09/01/15 17:47:59                | 31290                     | 17.83                 | 3.12          | 0.70           | 2.34                   | 0.58                 | 88.60            | 322.00            |
|    | 09/01/15 17:48:29                | 31320                     | 17.84                 | 3.09          | 0.63           | 2.32                   | 0.58                 | 88.50            | 322.00            |
|    | 09/01/15 17:48:59                | 31350                     | 17.90                 | 3.11          | 0.66           | 2.29                   | 0.58                 | 88.50            | 322.00            |
|    | 09/01/15 17:49:29                | 31380                     | 17.76                 | 3.01          | 0.69           | 2.39                   | 0.58                 | 88.50            | 306.00            |
|    | 09/01/15 17:49:59                | 31410                     | 17.92                 | 3.10          | 0.65           | 2.27                   | 0.58                 | 88.50            | 306.00            |

**Leed Fabrication Services Inc.**  
**September 1, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 2.8    | %    |
| Stack Exhaust Flow (M2) | 54,008 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.94    | in. Hg                       |
| Relative Humidity   | 11       | %                            |
| Ambient Temperature | 90       | °F                           |
| Specific Humidity   | 0.003928 | lb H <sub>2</sub> O / lb air |

0-30-0 Load, Run - EC36-2S R3

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
|    | 09/01/15 17:50:29                | 31440                     | 17.96                 | 3.02          | 0.65           | 2.24                   | 0.59                 | 88.40            | 322.00            |
|    | 09/01/15 17:50:59                | 31470                     | 17.86                 | 3.05          | 0.59           | 2.31                   | 0.59                 | 88.40            | 322.00            |
|    | 09/01/15 17:51:29                | 31500                     | 17.75                 | 3.08          | 0.60           | 2.41                   | 0.58                 | 88.40            | 322.00            |
|    | 09/01/15 17:51:59                | 31530                     | 17.73                 | 3.12          | 0.61           | 2.41                   | 0.58                 | 88.40            | 322.00            |
|    | 09/01/15 17:52:29                | 31560                     | 17.87                 | 3.11          | 0.61           | 2.31                   | 0.58                 | 88.40            | 322.00            |
|    | 09/01/15 17:52:59                | 31590                     | 17.88                 | 3.06          | 0.56           | 2.29                   | 0.58                 | 88.40            | 322.00            |
|    | 09/01/15 17:53:29                | 31620                     | 17.84                 | 2.97          | 0.59           | 2.33                   | 0.58                 | 88.40            | 322.00            |
|    | 09/01/15 17:53:59                | 31650                     | 17.85                 | 3.05          | 0.62           | 2.34                   | 0.58                 | 88.40            | 322.00            |
|    | 09/01/15 17:54:29                | 31680                     | 17.82                 | 3.04          | 0.59           | 2.33                   | 0.58                 | 88.40            | 322.00            |
|    | 09/01/15 17:54:59                | 31710                     | 17.66                 | 3.06          | 0.50           | 2.46                   | 0.58                 | 88.40            | 322.00            |
|    | 09/01/15 17:55:29                | 31740                     | 17.68                 | 3.18          | 0.58           | 2.46                   | 0.48                 | 88.30            | 256.00            |
|    | 09/01/15 17:55:59                | 31770                     | 18.38                 | 3.18          | 0.74           | 1.92                   | 0.48                 | 88.30            | 256.00            |
|    | 09/01/15 17:56:29                | 31800                     | 19.23                 | 3.59          | 0.84           | 1.25                   | 0.22                 | 88.30            | 126.00            |
|    | 09/01/15 17:56:59                | 31830                     | 19.28                 | 4.16          | 0.81           | 1.18                   | 0.22                 | 88.30            | 126.00            |
|    | 09/01/15 17:57:29                | 31860                     | 19.31                 | 4.34          | 0.89           | 1.16                   | 0.21                 | 88.40            | 141.00            |
|    | 09/01/15 17:57:59                | 31890                     | 19.34                 | 4.31          | 0.95           | 1.13                   | 0.21                 | 88.40            | 141.00            |
|    | 09/01/15 17:58:29                | 31920                     | 19.33                 | 4.27          | 0.87           | 1.15                   | 0.21                 | 88.50            | 141.00            |
|    | 09/01/15 17:58:59                | 31950                     | 19.28                 | 4.34          | 0.88           | 1.18                   | 0.21                 | 88.50            | 141.00            |
|    | 09/01/15 17:59:29                | 31980                     | 19.32                 | 4.42          | 0.85           | 1.15                   | 0.20                 | 88.50            | 157.00            |
|    | 09/01/15 17:59:59                | 32010                     | 19.11                 | 4.33          | 0.79           | 1.26                   | 0.20                 | 88.50            | 157.00            |
| A3 | 09/01/15 18:00:29                | 32040                     | 17.69                 | 3.92          | 0.54           | 2.41                   | 0.69                 | 88.60            | 340.00            |
|    | 09/01/15 18:00:59                | 32070                     | 17.56                 | 3.40          | 0.57           | 2.54                   | 0.69                 | 88.60            | 340.00            |
|    | 09/01/15 18:01:29                | 32100                     | 17.64                 | 3.29          | 0.62           | 2.49                   | 0.69                 | 88.50            | 357.00            |
|    | 09/01/15 18:01:59                | 32130                     | 17.69                 | 3.21          | 0.58           | 2.43                   | 0.69                 | 88.50            | 357.00            |
|    | 09/01/15 18:02:29                | 32160                     | 17.63                 | 3.19          | 0.51           | 2.48                   | 0.69                 | 88.50            | 340.00            |
|    | 09/01/15 18:02:59                | 32190                     | 17.62                 | 3.16          | 0.57           | 2.49                   | 0.69                 | 88.50            | 340.00            |
|    | 09/01/15 18:03:29                | 32220                     | 17.55                 | 3.10          | 0.60           | 2.53                   | 0.63                 | 88.50            | 323.00            |
|    | 09/01/15 18:03:59                | 32250                     | 17.38                 | 3.16          | 0.59           | 2.66                   | 0.63                 | 88.50            | 323.00            |
|    | 09/01/15 18:04:29                | 32280                     | 17.37                 | 3.18          | 0.48           | 2.67                   | 0.68                 | 88.40            | 340.00            |
|    | 09/01/15 18:04:59                | 32310                     | 17.45                 | 3.10          | 0.53           | 2.62                   | 0.68                 | 88.40            | 340.00            |
|    | 09/01/15 18:05:29                | 32340                     | 17.54                 | 3.11          | 0.58           | 2.56                   | 0.68                 | 88.40            | 340.00            |
|    | 09/01/15 18:05:59                | 32370                     | 17.46                 | 3.11          | 0.55           | 2.60                   | 0.68                 | 88.40            | 340.00            |
|    | 09/01/15 18:06:29                | 32400                     | 17.39                 | 3.02          | 0.49           | 2.65                   | 0.66                 | 88.30            | 340.00            |
|    | 09/01/15 18:06:59                | 32430                     | 17.41                 | 3.07          | 0.56           | 2.65                   | 0.66                 | 88.30            | 340.00            |
|    | 09/01/15 18:07:29                | 32460                     | 17.44                 | 3.10          | 0.63           | 2.62                   | 0.64                 | 88.30            | 340.00            |
|    | 09/01/15 18:07:59                | 32490                     | 17.42                 | 3.10          | 0.55           | 2.62                   | 0.64                 | 88.30            | 340.00            |
|    | 09/01/15 18:08:29                | 32520                     | 17.50                 | 3.05          | 0.55           | 2.59                   | 0.65                 | 88.10            | 324.00            |
|    | 09/01/15 18:08:59                | 32550                     | 17.44                 | 3.04          | 0.49           | 2.61                   | 0.65                 | 88.10            | 324.00            |
|    | 09/01/15 18:09:29                | 32580                     | 17.40                 | 3.01          | 0.56           | 2.65                   | 0.64                 | 88.10            | 323.00            |
|    | 09/01/15 18:09:59                | 32610                     | 17.47                 | 3.05          | 0.58           | 2.59                   | 0.64                 | 88.10            | 323.00            |
|    | 09/01/15 18:10:29                | 32640                     | 17.42                 | 3.02          | 0.59           | 2.63                   | 0.64                 | 87.90            | 340.00            |
|    | 09/01/15 18:10:59                | 32670                     | 17.39                 | 2.96          | 0.51           | 2.65                   | 0.64                 | 87.90            | 340.00            |
|    | 09/01/15 18:11:29                | 32700                     | 17.42                 | 3.01          | 0.51           | 2.64                   | 0.64                 | 87.90            | 324.00            |
|    | 09/01/15 18:11:59                | 32730                     | 17.51                 | 3.01          | 0.54           | 2.57                   | 0.64                 | 87.90            | 324.00            |
|    | 09/01/15 18:12:29                | 32760                     | 18.29                 | 3.13          | 0.71           | 2.01                   | 0.27                 | 87.80            | 158.00            |
|    | 09/01/15 18:12:59                | 32790                     | 19.15                 | 4.09          | 0.83           | 1.25                   | 0.27                 | 87.80            | 158.00            |
|    | 09/01/15 18:13:29                | 32820                     | 19.14                 | 4.53          | 0.86           | 1.26                   | 0.23                 | 87.70            | 157.00            |
|    | 09/01/15 18:13:59                | 32850                     | 19.13                 | 4.56          | 0.87           | 1.27                   | 0.23                 | 87.70            | 157.00            |
|    | 09/01/15 18:14:29                | 32880                     | 19.14                 | 4.73          | 0.87           | 1.26                   | 0.21                 | 87.70            | 157.00            |
|    | 09/01/15 18:14:59                | 32910                     | 19.12                 | 4.66          | 0.80           | 1.27                   | 0.21                 | 87.70            | 157.00            |
|    | 09/01/15 18:15:29                | 32940                     | 19.08                 | 4.76          | 0.82           | 1.30                   | 0.21                 | 87.70            | 157.00            |
|    | 09/01/15 18:15:59                | 32970                     | 19.15                 | 4.83          | 0.83           | 1.26                   | 0.21                 | 87.70            | 157.00            |
|    | 09/01/15 18:16:29                | 33000                     | 17.87                 | 4.44          | 0.60           | 2.24                   | 0.66                 | 87.70            | 324.00            |
|    | 09/01/15 18:16:59                | 33030                     | 17.64                 | 3.48          | 0.60           | 2.48                   | 0.66                 | 87.70            | 324.00            |
|    | 09/01/15 18:17:29                | 33060                     | 17.55                 | 3.28          | 0.54           | 2.54                   | 0.65                 | 87.50            | 324.00            |
|    | 09/01/15 18:17:59                | 33090                     | 17.60                 | 3.23          | 0.58           | 2.52                   | 0.65                 | 87.50            | 324.00            |
|    | 09/01/15 18:18:29                | 33120                     | 17.52                 | 3.20          | 0.57           | 2.57                   | 0.65                 | 87.30            | 324.00            |
|    | 09/01/15 18:18:59                | 33150                     | 17.57                 | 3.17          | 0.55           | 2.53                   | 0.65                 | 87.30            | 324.00            |
|    | 09/01/15 18:19:29                | 33180                     | 17.60                 | 3.11          | 0.53           | 2.51                   | 0.64                 | 87.20            | 324.00            |
|    | 09/01/15 18:19:59                | 33210                     | 17.58                 | 3.14          | 0.59           | 2.51                   | 0.64                 | 87.20            | 324.00            |

**Leed Fabrication Services Inc.**  
**September 1, 2015**  
**EC36-2S**  
**Loveland Facility**

### Unit Data

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 2.8    | %    |
| Stack Exhaust Flow (M2) | 54,008 | SCFH |

## Weather Data

| Weather Data        |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.94    | in. Hg                       |
| Relative Humidity   | 11       | %                            |
| Ambient Temperature | 90       | ° F                          |
| Specific Humidity   | 0.003928 | lb H <sub>2</sub> O / lb air |

0-30-0 Load, Run - EC36-2S R3

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmwv) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| 09/01/15 18:20:29                | 33240                     | 17.50                 | 3.10          | 0.57           | 2.57                   | 0.62                 | 87.10            | 324.00            |
| 09/01/15 18:20:59                | 33270                     | 17.53                 | 3.16          | 0.54           | 2.55                   | 0.62                 | 87.10            | 324.00            |
| 09/01/15 18:21:29                | 33300                     | 17.59                 | 3.15          | 0.55           | 2.51                   | 0.61                 | 86.90            | 323.00            |
| 09/01/15 18:21:59                | 33330                     | 17.59                 | 3.15          | 0.58           | 2.50                   | 0.61                 | 86.90            | 323.00            |
| 09/01/15 18:22:29                | 33360                     | 17.57                 | 3.12          | 0.59           | 2.53                   | 0.61                 | 86.80            | 307.00            |
| 09/01/15 18:22:59                | 33390                     | 17.62                 | 3.10          | 0.55           | 2.49                   | 0.61                 | 86.80            | 307.00            |
| 09/01/15 18:23:29                | 33420                     | 17.54                 | 3.13          | 0.53           | 2.56                   | 0.61                 | 86.50            | 340.00            |
| 09/01/15 18:23:59                | 33450                     | 17.65                 | 3.12          | 0.56           | 2.48                   | 0.61                 | 86.50            | 340.00            |
| 09/01/15 18:24:29                | 33480                     | 17.57                 | 3.10          | 0.59           | 2.53                   | 0.61                 | 86.40            | 324.00            |
| 09/01/15 18:24:59                | 33510                     | 17.65                 | 3.07          | 0.55           | 2.48                   | 0.61                 | 86.40            | 324.00            |
| 09/01/15 18:25:29                | 33540                     | 17.64                 | 3.12          | 0.58           | 2.48                   | 0.63                 | 86.20            | 341.00            |
| 09/01/15 18:25:59                | 33570                     | 17.67                 | 3.11          | 0.58           | 2.45                   | 0.63                 | 86.20            | 341.00            |
| 09/01/15 18:26:29                | 33600                     | 17.61                 | 3.06          | 0.55           | 2.49                   | 0.45                 | 86.20            | 225.00            |
| 09/01/15 18:26:59                | 33630                     | 17.55                 | 3.08          | 0.54           | 2.55                   | 0.45                 | 86.20            | 225.00            |
| 09/01/15 18:27:29                | 33660                     | 17.98                 | 3.13          | 0.62           | 2.27                   | 0.25                 | 86.10            | 190.00            |
| 09/01/15 18:27:59                | 33690                     | 18.97                 | 3.69          | 0.85           | 1.41                   | 0.25                 | 86.10            | 190.00            |
| 09/01/15 18:28:29                | 33720                     | 19.00                 | 4.39          | 0.83           | 1.38                   | 0.24                 | 86.20            | 158.00            |
| 09/01/15 18:28:59                | 33750                     | 18.98                 | 4.52          | 0.75           | 1.39                   | 0.24                 | 86.20            | 158.00            |
| 09/01/15 18:29:29                | 33780                     | 18.99                 | 4.48          | 0.79           | 1.37                   | 0.24                 | 86.20            | 158.00            |
| 09/01/15 18:29:59                | 33810                     | 19.00                 | 4.55          | 0.80           | 1.37                   | 0.24                 | 86.20            | 158.00            |
| 09/01/15 18:30:29                | 33840                     | 19.04                 | 4.54          | 0.83           | 1.34                   | 0.23                 | 86.20            | 174.00            |

### RAW AVERAGE

18.13

3.51

0.60

## 2.08

0.50

88.20

276.84

|                 | O <sub>2</sub> | CO           | THC          | CO <sub>2</sub> | Press. Trans           | Temp. Trans. | F-Flow Trans. |
|-----------------|----------------|--------------|--------------|-----------------|------------------------|--------------|---------------|
| Serial Number:  | INSTO2-0011    | INST-CO-0022 | INST-TH-0002 | INST-C2-0013    | 1434717                | 1434717      | 1434717       |
|                 | (%)            | (ppmvvd)     | (ppmvw)      | (%)             | (in. H <sub>2</sub> O) | (°F)         | (SCFH)        |
| Initial Zero    | 0.05           | 0.02         | 0.02         | 0.03            |                        |              |               |
| Final Zero      | 0.04           | -0.07        | 0.08         | 0.04            |                        |              |               |
| Avg. Zero       | 0.05           | -0.03        | 0.05         | 0.04            |                        |              |               |
| Initial UpScale | 11.92          | 9.39         | 3.03         | 9.03            |                        |              |               |
| Final UpScale   | 11.98          | 9.22         | 3.00         | 9.13            |                        |              |               |
| Avg. UpScale    | 11.95          | 9.31         | 3.02         | 9.08            |                        |              |               |

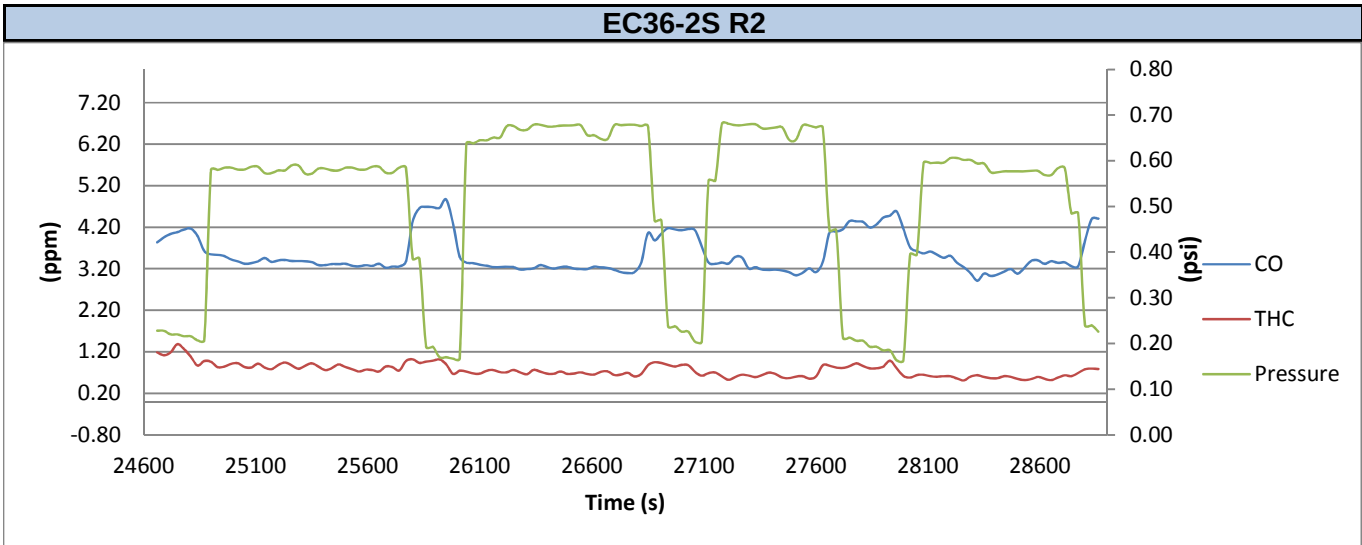
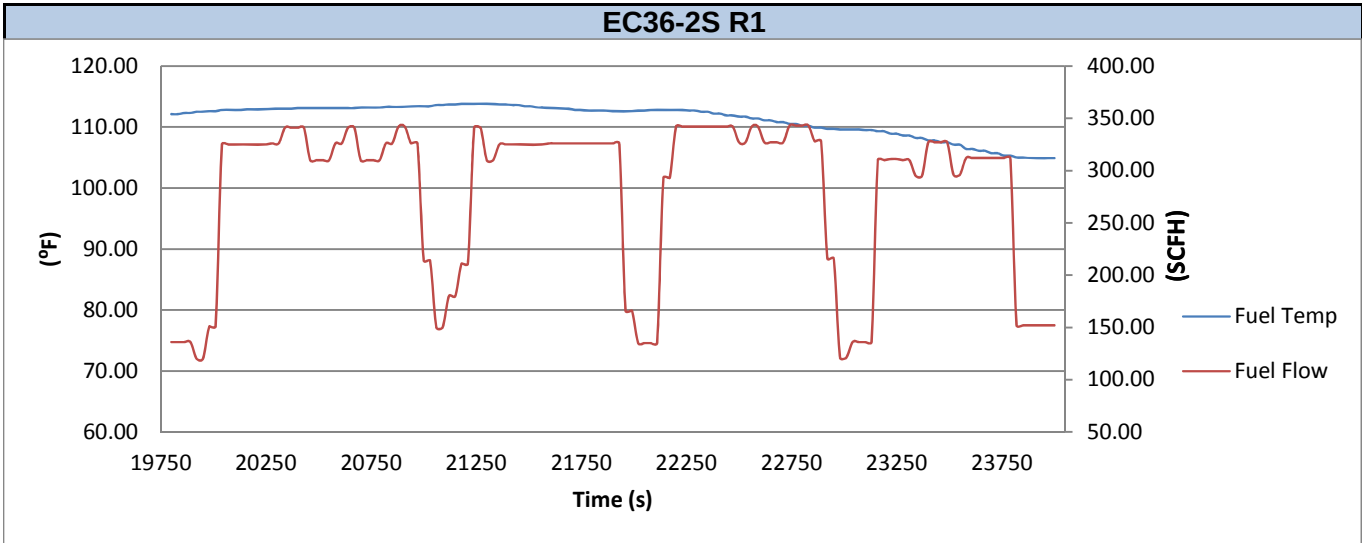
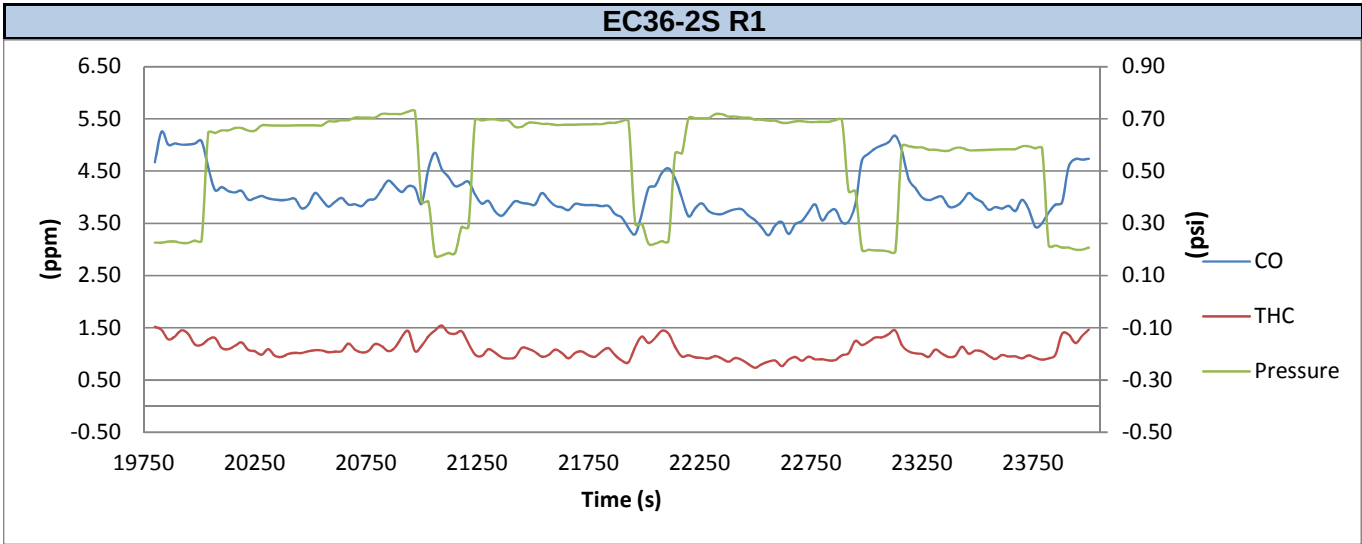
## Upscale Cal Gas

11.91

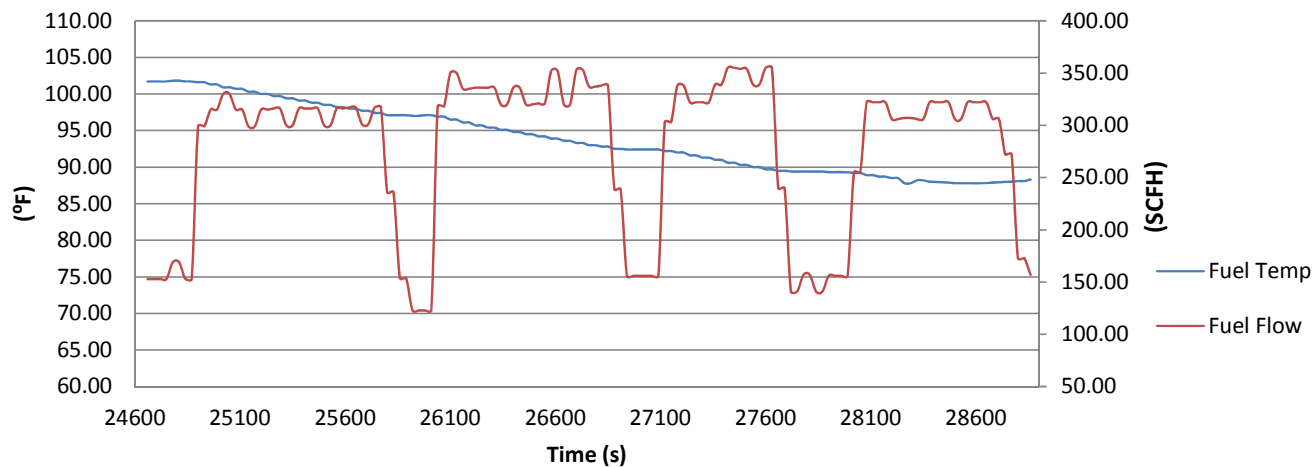
9.48

3.02

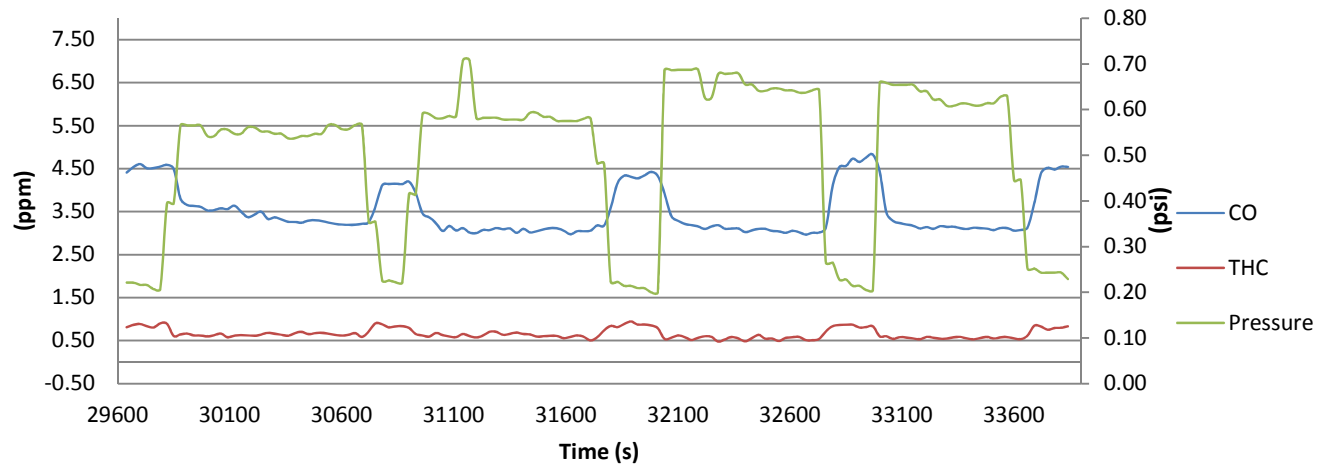
| EMISSIONS DATA                          | O <sub>2</sub> | CO   | THC  | CO2  |
|-----------------------------------------|----------------|------|------|------|
| Corrected Raw Average (ppm/% dry basis) | 18.09          | 3.59 | 0.62 | 2.06 |
| Corrected Raw Average (ppm/% wet basis) | 17.59          | 3.49 | 0.60 | 2.00 |
| Emission Rate (lb/hr)                   | N/A            | 0.01 | 0.00 | N/A  |



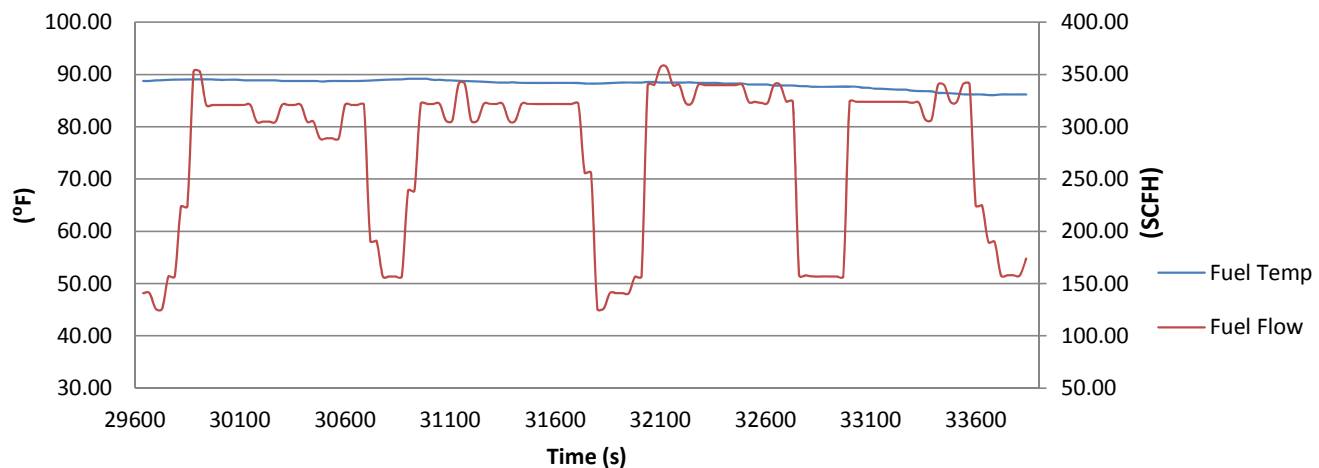
### EC36-2S R2



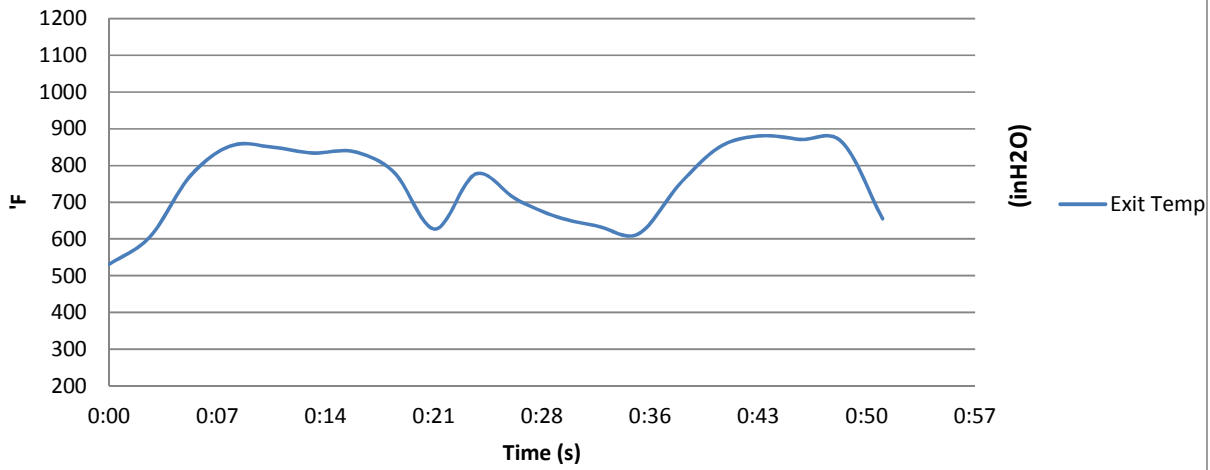
### EC36-2S R3



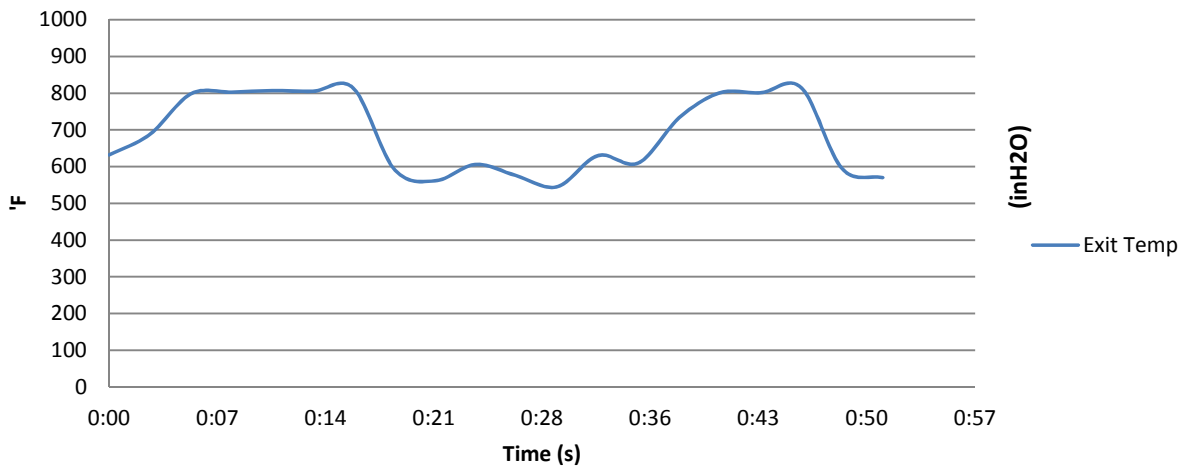
### EC36-2S R3



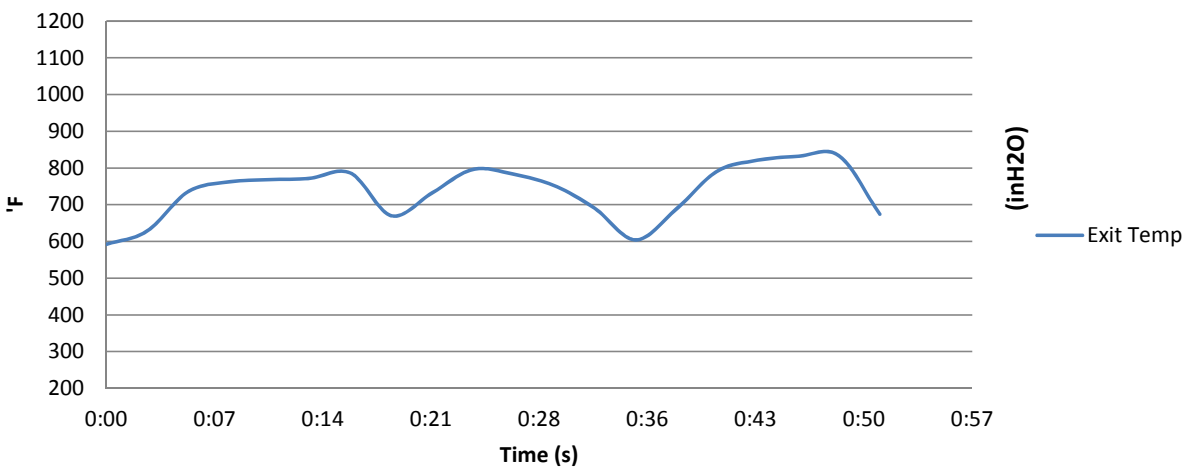
EC36 R1



EC36 R2



EC36 R3



## **EMISSION DATA RECORDS**

**30-70-30% Ramp-up, Ramp-down Unit Operations Data**



**METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE**

| Source Information |                   |
|--------------------|-------------------|
| Plant Name         | Loveland Facility |
| Sampling Location  | EC-36-2S          |
| Fuel Type          | Gas, Propene      |

| Test Information          |              |                            |         |
|---------------------------|--------------|----------------------------|---------|
| Project #                 |              | leed-15-brighton.co-comp#1 |         |
| Operator                  |              | TP                         |         |
| Date for Preliminary Run  | (mm/dd/yy)   | 09/02/15                   |         |
| Standard Temperature      |              | 68                         | °F      |
| Standard Pressure         |              | 29.92                      | in Hg   |
| Required Sample Vol.      | RM4, 8.1.1.2 | 21                         | scf     |
| Run Duration              | ≤0.75 cfm    | 65                         | minutes |
| Unit Number               |              | 1                          |         |
| Base Run Number           |              | 30-70-30%                  |         |
| Number of Ports Available |              | 2                          |         |
| Number of Ports Used      |              | 2                          |         |
| Port Inside Diameter      |              | 3.00                       | in      |
| Stack Shape               |              | Circular                   |         |

| Test Equipment Information       |                    |              |              |              |                     |
|----------------------------------|--------------------|--------------|--------------|--------------|---------------------|
| Run                              |                    | 1            | 2            | 3            |                     |
| Test Date                        | (mm/dd/yy)         | 09/02/15     | 09/02/15     | 09/02/15     |                     |
| Load                             | % or w/DB          | 30-70-30     | 30-70-30     | 30-70-30     |                     |
| Meter Box Number                 | from ACS           | SAMP-CP-0007 | SAMP-CP-0007 | SAMP-CP-0007 |                     |
| Meter Calibration Factor         | (Y)                | 0.980        | 0.980        | 0.980        |                     |
| Orifice Meter Coefficient        | ( $\Delta H_{@}$ ) | 1.656        | 1.656        | 1.656        | in H <sub>2</sub> O |
| Pitot Identification             | from ACS           | 4174         | 4174         | 4174         |                     |
| Pitot Tube Coefficient           | (C <sub>p</sub> )  | 0.819        | 0.819        | 0.819        |                     |
| Probe Number                     | from ACS           | SAMP-PF-0001 | SAMP-SP-0001 | SAMP-SP-0001 |                     |
| Probe Length                     |                    | 60.0         | 60.0         | 60.0         | in                  |
| (SS, Glass .... ) Liner Material | from list          | inconel      | inconel      | inconel      |                     |
| Impinger Case Number             | from ACS           | SAMP-BC-0002 | SAMP-BC-0002 | SAMP-BC-0002 |                     |

| Testing Company Information |                                                   |
|-----------------------------|---------------------------------------------------|
| Company Name                | Air Hygiene International, Inc. (Tulsa, Oklahoma) |
| Address                     | 1600 W Tacoma Street                              |
| City, State Zip             | Broken Arrow, Oklahoma 74012                      |
| Project Manager             | Min Sum Lee                                       |
| Phone Number                | (918) 307-8865                                    |
| Fax Number                  | (918) 307-9131                                    |

**METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] - RESULTS**

|                          |                            |
|--------------------------|----------------------------|
| <b>Plant Name</b>        | Loveland Facility          |
| <b>Sampling Location</b> | EC-36-2S                   |
| <b>Project #</b>         | leed-15-brighton.co-comp#1 |

| <b>Historical Data</b>             | <b>30-70-30%-4</b> | <b>30-70-30%-5</b> | <b>30-70-30%-6</b> | <b>Average</b> | <b>Units</b>           |
|------------------------------------|--------------------|--------------------|--------------------|----------------|------------------------|
| Run Start Time                     | 13:25              | 14:48              | 16:26              |                | hh:mm                  |
| Run Stop Time                      | 14:35              | 15:58              | 17:36              |                | hh:mm                  |
| Test Date                          | 09/02/15           | 09/02/15           | 09/02/15           |                | mm/dd/yy               |
| Meter Calibration Factor           | 0.980              | 0.980              | 0.980              |                |                        |
| Pitot Tube Coefficient             | 0.819              | 0.819              | 0.819              |                |                        |
| Initial Meter Volume               | 128.725            | 182.000            | 235.305            |                | ft <sup>3</sup>        |
| Final Meter Volume                 | 181.825            | 235.120            | 288.760            |                | ft <sup>3</sup>        |
| Total Meter Volume                 | 53.100             | 53.120             | 53.455             | 53.225         | ft <sup>3</sup>        |
| Total Sampling Time                | 65.00              | 65.00              | 65.00              | 65.00          | min                    |
| Average Meter Temperature          | 87.83              | 83.98              | 87.06              | 86.29          | °F                     |
| Average Stack Temperature          | 1052.38            | 1110.17            | 1073.38            | 1078.64        | °F                     |
| Barometric Pressure                | 24.94              | 24.93              | 24.90              | 24.92          | in Hg                  |
| Stack Static Pressure              | 0.00               | 0.00               | 0.00               | 0.00           | in H <sub>2</sub> O    |
| Absolute Stack Pressure            | 24.94              | 24.93              | 24.90              | 24.92          | in Hg                  |
| Average Orifice Pressure Drop      | 1.70               | 1.70               | 1.70               | 1.70           | in H <sub>2</sub> O    |
| Absolute Meter Pressure            | 25.06              | 25.05              | 25.02              | 25.05          | in Hg                  |
| Avg Square Root Pitot Pressure     | 0.08               | 0.09               | 0.08               | 0.08           | √(in H <sub>2</sub> O) |
| <b>Moisture Content Data</b>       | <b>30-70-30%-4</b> | <b>30-70-30%-5</b> | <b>30-70-30%-6</b> | <b>Average</b> | <b>Units</b>           |
| Impinger Water Weight Gain         | 18.00              | 19.90              | 19.10              | 19.00          | g                      |
| Silica Gel Weight Gain             | 11.40              | 12.60              | 13.10              | 12.37          | g                      |
| Total Water Volume Collected       | 29.45              | 32.56              | 32.26              | 31.42          | ml                     |
| Standard Water Vapor Volume        | 1.39               | 1.53               | 1.52               | 1.48           | scf                    |
| Standard Meter Volume              | 42.0               | 42.3               | 42.3               | 42.2           | dscf                   |
| Calculated Stack Moisture          | 3.19               | 3.49               | 3.47               | 3.38           | %                      |
| Saturated Stack Moisture           | 100.00             | 100.00             | 100.00             | 100.00         | %                      |
| Reported Stack Moisture Content    | 3.19               | 3.49               | 3.47               | 3.38           | %                      |
| <b>Method 3C Gas Analysis Data</b> | <b>30-70-30%-4</b> | <b>30-70-30%-5</b> | <b>30-70-30%-6</b> | <b>Average</b> | <b>Units</b>           |
| Carbon Dioxide Content             | 3.4                | 3.0                | 3.2                | 3.2            | %                      |
| Oxygen Content                     | 17.4               | 18.0               | 17.8               | 17.7           | %                      |
| Nitrogen Content                   | 79.2               | 79.0               | 79.1               | 79.1           | %                      |
| Stack Dry Molecular Weight         | 29.24              | 29.20              | 29.22              | 29.22          | lb/lb-mole             |
| Stack Wet Molecular Weight         | 28.88              | 28.81              | 28.83              | 28.84          | lb/lb-mole             |
| Percent Excess Air                 | 495.9              | 630.3              | 580.0              | 568.7          | %                      |
| <b>Volumetric Flow Rate Data</b>   | <b>30-70-30%-4</b> | <b>30-70-30%-5</b> | <b>30-70-30%-6</b> | <b>Average</b> | <b>Units</b>           |
| Average Stack Gas Velocity         | 8.14               | 8.85               | 8.10               | 8.36           | ft/sec                 |
| Stack Cross-Sectional Area         | 4.75               | 4.75               | 4.75               | 4.75           | ft <sup>2</sup>        |
| Actual Stack Flow Rate             | 2,320              | 2,520              | 2,306              | 2,382          | acfm                   |
| Wet Standard Stack Flow Rate       | 41                 | 42                 | 40                 | 41             | wkscfh                 |
| Dry Standard Stack Flow Rate       | 39,207             | 40,876             | 38,278             | 39,454         | dscfh                  |

**METHOD 3C - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER**

|                          |                            |                         |          |                         |     |
|--------------------------|----------------------------|-------------------------|----------|-------------------------|-----|
| <b>Plant Name</b>        | Loveland Facility          | <b>Preliminary Date</b> | 09/02/15 |                         |     |
| <b>Sampling Location</b> | EC-36-2S                   | <b>Operator</b>         | TP       |                         |     |
| <b>Project #</b>         | leed-15-brighton.co-comp#1 | <b># of Ports Used</b>  | 2        |                         |     |
| <b>Fuel Type</b>         | Gas, Propene               | <b>Min. Fuel Factor</b> | N/A      | <b>Max. Fuel Factor</b> | N/A |

| Gas Analysis Data           |                             |                            |                       |                            |                             |                                  |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | 30-70-30%-4                 |                            | <b>Date</b>           | 09/02/15                   | <b>Run Start Time</b>       | 13:25                            | <b>Run Stop Time</b> | 14:35                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>Methane Conc.</b>  | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b>    | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCH <sub>4</sub> ) | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (F <sub>o</sub> ) <sub>avg</sub> | (%EA) <sub>avg</sub> |                             |
| hh:mm                       | %                           | %                          | ppm                   | %                          | lb/lb-mole                  |                                  | %                    |                             |
| 01:10                       | 3.4                         | 17.4                       | 0.0                   | 79.2                       | 29.24                       | 1.032                            | 495.9                | N/A                         |

| Gas Analysis Data           |                             |                            |                       |                            |                             |                                  |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | 30-70-30%-5                 |                            | <b>Date</b>           | 09/02/15                   | <b>Run Start Time</b>       | 14:48                            | <b>Run Stop Time</b> | 15:58                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>Methane Conc.</b>  | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b>    | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCH <sub>4</sub> ) | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (F <sub>o</sub> ) <sub>avg</sub> | (%EA) <sub>avg</sub> |                             |
| hh:mm                       | %                           | %                          | ppm                   | %                          | lb/lb-mole                  |                                  | %                    |                             |
| 01:10                       | 3.0                         | 18.0                       | 0.0                   | 79.0                       | 29.20                       | 0.963                            | 630.3                | N/A                         |

| Gas Analysis Data           |                             |                            |                       |                            |                             |                                  |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | 30-70-30%-6                 |                            | <b>Date</b>           | 09/02/15                   | <b>Run Start Time</b>       | 16:26                            | <b>Run Stop Time</b> | 17:36                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>Methane Conc.</b>  | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b>    | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCH <sub>4</sub> ) | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (F <sub>o</sub> ) <sub>avg</sub> | (%EA) <sub>avg</sub> |                             |
| hh:mm                       | %                           | %                          | ppm                   | %                          | lb/lb-mole                  |                                  | %                    |                             |
| 01:10                       | 3.2                         | 17.8                       | 0.0                   | 79.1                       | 29.22                       | 0.984                            | 580.0                | N/A                         |

**METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES**

|                          |                            |                         |          |
|--------------------------|----------------------------|-------------------------|----------|
| <b>Plant Name</b>        | Loveland Facility          | <b>Preliminary Date</b> | 09/02/15 |
| <b>Sampling Location</b> | EC-36-2S                   | <b>Operator</b>         | TP       |
| <b>Project #</b>         | leed-15-brighton.co-comp#1 | <b>Ports Used</b>       | 2        |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | 30-70-30%-4                         |                   | <b>Date</b>       | 09/02/15                      | <b>Start Time</b>            | 13:25                  | <b>Stop Time</b>  | 14:35               |
| <b>Meter Box Number</b>      | SAMP-CP-0007                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.980             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 53.100            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 24.94             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 1052              | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.00              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 88                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.70              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | H <sub>2</sub> O                    | H <sub>2</sub> O  | -                 | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 707.70            | 691.40            | 601.70                        | 887.00                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 700.40            | 684.70            | 597.70                        | 875.60                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 7.3               | 6.7               | 4.0                           | 11.4                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>f</sub> )                   | 29.40             | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 1.386                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 42.016            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 3.19              | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 3.19                   | %                 |                     |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | 30-70-30%-5                         |                   | <b>Date</b>       | 09/02/15                      | <b>Start Time</b>            | 14:48                  | <b>Stop Time</b>  | 15:58               |
| <b>Meter Box Number</b>      | SAMP-CP-0007                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.980             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 53.120            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 24.93             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 1110              | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.00              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 84                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.70              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | H <sub>2</sub> O                    | H <sub>2</sub> O  | -                 | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 718.60            | 697.60            | 604.50                        | 873.80                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 707.70            | 691.40            | 601.70                        | 861.20                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 10.9              | 6.2               | 2.8                           | 12.6                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>f</sub> )                   | 32.50             | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 1.532                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 42.312            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 3.49              | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 3.49                   | %                 |                     |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | 30-70-30%-6                         |                   | <b>Date</b>       | 09/02/15                      | <b>Start Time</b>            | 16:26                  | <b>Stop Time</b>  | 17:36               |
| <b>Meter Box Number</b>      | SAMP-CP-0007                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.980             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 53.455            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 24.90             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 1073              | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.00              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 87                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.70              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | H <sub>2</sub> O                    | H <sub>2</sub> O  | -                 | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 727.50            | 704.40            | 607.90                        | 886.90                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 718.60            | 697.60            | 604.50                        | 873.80                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 8.9               | 6.8               | 3.4                           | 13.1                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>f</sub> )                   | 32.20             | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 1.518                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 42.289            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 3.47              | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 3.47                   | %                 |                     |

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |  |                            |  |  |  |
|-------------------|--|----------------------------|--|--|--|
| Plant Name        |  | Loveland Facility          |  |  |  |
| Sampling Location |  | EC-36-2S                   |  |  |  |
| Project #         |  | leed-15-brighton.co-comp#1 |  |  |  |

|            |  |             |  |
|------------|--|-------------|--|
| Date       |  | 09/02/15    |  |
| Operator   |  | TP          |  |
| Run Number |  | 30-70-30%-4 |  |

|             |          |       |                         |      |       |
|-------------|----------|-------|-------------------------|------|-------|
| Leak Checks |          |       |                         |      |       |
| Train       | Pre      | 0.000 | ft <sup>3</sup> /min@   | 15.0 | in Hg |
| PASS        | Post     | 0.000 | ft <sup>3</sup> /min@   | 15.0 | in Hg |
| Pitot       | Pre (+)  | 0.175 | in H <sub>2</sub> O for | 15.0 | sec   |
|             | Pre (-)  | 0.145 | in H <sub>2</sub> O for | 15.0 | sec   |
|             | Post (+) | 0.100 | in H <sub>2</sub> O for | 15.0 | sec   |
|             | Post (-) | 0.125 | in H <sub>2</sub> O for | 15.0 | sec   |

|                           |  |                    |  |           |  |
|---------------------------|--|--------------------|--|-----------|--|
| Sampling Equipment        |  |                    |  |           |  |
| Meter Box Number          |  | SAMP-CP-0007       |  |           |  |
| Meter Cal Factor          |  | (Y) 0.980          |  |           |  |
| Low Flow Meter            |  | SAMP-MN-0001       |  |           |  |
| Average Nozzle Diameter   |  | (D <sub>no</sub> ) |  | in        |  |
| Suggested Nozzle Diameter |  | (D <sub>n</sub> )  |  | 0.4703 in |  |
| Probe Number              |  | SAMP-PF-0001       |  |           |  |
| Probe Length              |  | 60                 |  | in        |  |
| Liner Material            |  | inconel            |  |           |  |
| Sample Case / Oven Number |  |                    |  |           |  |
| Impinger Case Number      |  | SAMP-BC-0002       |  |           |  |

|                                                   |  |                                     |        |                     |  |
|---------------------------------------------------|--|-------------------------------------|--------|---------------------|--|
| Ideal Nozzle Diameter and IsoKinetic Factor Setup |  |                                     |        |                     |  |
| Pitot Coefficient                                 |  | (C <sub>p</sub> )                   | 0.819  |                     |  |
| Average Stack Temp                                |  | (t <sub>s</sub> )                   | 1052.4 | °F                  |  |
| Average Meter Temp                                |  | (t <sub>m</sub> )                   | 87.8   |                     |  |
| Orifice Meter Coefficient                         |  | (ΔH@)                               | 1.656  | in H <sub>2</sub> O |  |
| Square Root ΔP                                    |  | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.08   | in H <sub>2</sub> O |  |
| Stack Moisture Content                            |  | (B <sub>wt</sub> )                  | 3.19   | %                   |  |
| Stack Dry Molecular Weight                        |  | (M <sub>d</sub> )                   | 29.24  | lb/lb-mole          |  |
| Estimated Orifice Flow Rate                       |  | (Q <sub>m</sub> )                   | 0.75   | acfm                |  |
| ΔP to ΔH Isokinetic Factor                        |  | (K)                                 |        |                     |  |

|                         |  |                        |       |                     |  |
|-------------------------|--|------------------------|-------|---------------------|--|
| Pressures               |  |                        |       |                     |  |
| Barometric Pressure     |  | (P <sub>b</sub> )      | 24.94 | in Hg               |  |
| Stack Static Pressure   |  | (P <sub>static</sub> ) | 0.00  | in H <sub>2</sub> O |  |
| Absolute Stack Pressure |  | (P <sub>a</sub> )      | 24.94 | in Hg               |  |
| Absolute Meter Pressure |  | (P <sub>m</sub> )      | 25.06 | in Hg               |  |

|          |       |     |       |
|----------|-------|-----|-------|
| Run Time |       |     |       |
| Start    | 13:25 | End | 14:35 |

|         |       |       |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
| Pre     | 700.4 | 684.7 | 597.7 | 875.6 |       |       |       |       |
| Post    | 707.7 | 691.4 | 601.7 | 887.0 |       |       |       |       |

|              |  |  |  |  |  |    |
|--------------|--|--|--|--|--|----|
| Wash Volumes |  |  |  |  |  | ml |
|              |  |  |  |  |  | ml |

| Traverse Point # | Sampling Time (Θ) | Timer Time | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Snorkel Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (568°F) | Cond. Temp (≤-°F) | CPM Filter Temp (-±-°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (ΔP <sup>1/2</sup> ) | Local Stack Velocity (v <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|------------------|-------------------|------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-------------------------|------------------------|----------------------------|-------------------|-------------------------|-------------------------------------|--------------------------------------|-------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
|                  | min               | hh:mm:ss   | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                      | °F                     | °F                         | °F                | °F                      | °F                                  | °F                                   | in Hg       | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1              | 0.0               | 00:00:00   | 128.725                                 | 0.005               | 1.656                                 | 1.70                                 | 1019                         | 254                     |                        | 68                         |                   |                         | 80                                  | 75                                   | 3.0         | 0.07                                | 7.10                                   | 1.823                                                |                               | 43.743                                                |
| A-2              | 2.7               | 00:02:43   | 130.985                                 | 0.005               | 1.656                                 | 1.70                                 | 998                          | 254                     |                        | 62                         |                   |                         | 88                                  | 75                                   | 3.0         | 0.07                                | 7.05                                   | 3.632                                                |                               | 43.581                                                |
| A-3              | 5.4               | 00:05:25   | 133.245                                 | 0.005               | 1.656                                 | 1.70                                 | 1163                         | 254                     |                        | 60                         |                   |                         | 90                                  | 77                                   | 3.0         | 0.07                                | 7.44                                   | 5.351                                                |                               | 42.804                                                |
| A-4              | 8.1               | 00:08:07   | 135.400                                 | 0.005               | 1.656                                 | 1.70                                 | 1200                         | 254                     |                        | 60                         |                   |                         | 90                                  | 77                                   | 3.0         | 0.07                                | 7.52                                   | 7.073                                                |                               | 42.440                                                |
| A-5              | 10.8              | 00:10:50   | 137.560                                 | 0.010               | 1.656                                 | 1.70                                 | 1214                         | 254                     |                        | 60                         |                   |                         | 90                                  | 78                                   | 3.0         | 0.10                                | 10.68                                  | 8.842                                                |                               | 42.443                                                |
| A-6              | 13.5              | 00:13:33   | 139.780                                 | 0.010               | 1.656                                 | 1.70                                 | 1209                         | 254                     |                        | 60                         |                   |                         | 91                                  | 78                                   | 3.0         | 0.10                                | 10.66                                  | 10.570                                               |                               | 42.279                                                |
| A-7              | 16.3              | 00:16:15   | 141.950                                 | 0.005               | 1.656                                 | 1.70                                 | 1225                         | 254                     |                        | 60                         |                   |                         | 92                                  | 79                                   | 3.0         | 0.07                                | 7.58                                   | 12.326                                               |                               | 42.260                                                |
| A-8              | 19.0              | 00:18:58   | 144.160                                 | 0.005               | 1.656                                 | 1.70                                 | 941                          | 254                     |                        | 60                         |                   |                         | 94                                  | 81                                   | 3.0         | 0.07                                | 6.91                                   | 14.068                                               |                               | 42.203                                                |
| A-9              | 21.7              | 00:21:40   | 146.360                                 | 0.005               | 1.656                                 | 1.70                                 | 904                          | 254                     |                        | 60                         |                   |                         | 94                                  | 81                                   | 3.0         | 0.07                                | 6.82                                   | 15.802                                               |                               | 42.138                                                |
| A-10             | 24.4              | 00:24:22   | 148.550                                 | 0.010               | 1.656                                 | 1.70                                 | 900                          | 254                     |                        | 60                         |                   |                         | 94                                  | 82                                   | 3.0         | 0.10                                | 9.63                                   | 17.542                                               |                               | 42.101                                                |
| A-11             | 27.1              | 00:27:05   | 150.750                                 | 0.015               | 1.656                                 | 1.70                                 | 984                          | 254                     |                        | 60                         |                   |                         | 94                                  | 83                                   | 3.0         | 0.12                                | 12.15                                  | 19.281                                               |                               | 42.067                                                |
| A-12             | 29.8              | 00:29:47   | 152.950                                 | 0.010               | 1.656                                 | 1.70                                 | 975                          | 254                     |                        | 60                         |                   |                         | 94                                  | 84                                   | 3.0         | 0.10                                | 9.89                                   | 21.049                                               |                               | 42.098                                                |
| B-1              | 32.5              | 00:32:30   | 155.190                                 | 0.005               | 1.656                                 | 1.70                                 | 896                          | 254                     |                        | 62                         |                   |                         | 91                                  | 84                                   | 3.0         | 0.07                                | 6.80                                   | 23.143                                               |                               | 42.726                                                |
| B-2              | 35.2              | 00:35:12   | 157.835                                 | 0.005               | 1.656                                 | 1.70                                 | 907                          | 254                     |                        | 60                         |                   |                         | 94                                  | 85                                   | 3.0         | 0.07                                | 6.82                                   | 24.520                                               |                               | 42.034                                                |
| B-3              | 37.9              | 00:37:55   | 159.580                                 | 0.005               | 1.656                                 | 1.70                                 | 1094                         | 254                     |                        | 59                         |                   |                         | 95                                  | 85                                   | 3.0         | 0.07                                | 7.28                                   | 26.238                                               |                               | 41.981                                                |
| B-4              | 40.6              | 00:40:37   | 161.760                                 | 0.005               | 1.656                                 | 1.70                                 | 1175                         | 254                     |                        | 60                         |                   |                         | 96                                  | 86                                   | 3.0         | 0.07                                | 7.46                                   | 27.988                                               |                               | 41.983                                                |
| B-5              | 43.3              | 00:43:20   | 163.985                                 | 0.010               | 1.656                                 | 1.70                                 | 1197                         | 254                     |                        | 60                         |                   |                         | 97                                  | 86                                   | 3.0         | 0.10                                | 10.63                                  | 29.729                                               |                               | 41.971                                                |
| B-6              | 46.0              | 00:46:03   | 166.200                                 | 0.010               | 1.656                                 | 1.70                                 | 1204                         | 254                     |                        | 61                         |                   |                         | 96                                  | 86                                   | 3.0         | 0.10                                | 10.65                                  | 31.382                                               |                               | 41.842                                                |
| B-7              | 48.8              | 00:48:45   | 168.300                                 | 0.005               | 1.656                                 | 1.70                                 | 1096                         | 254                     |                        | 61                         |                   |                         | 96                                  | 87                                   | 3.0         | 0.07                                | 7.28                                   | 33.217                                               |                               | 41.958                                                |
| B-8              | 51.5              | 00:51:28   | 170.635                                 | 0.005               | 1.656                                 | 1.70                                 | 891                          | 254                     |                        | 61                         |                   |                         | 96                                  | 87                                   | 3.0         | 0.07                                | 6.78                                   | 34.970                                               |                               | 41.964                                                |
| B-9              | 54.2              | 00:54:10   | 172.865                                 | 0.005               | 1.656                                 | 1.70                                 | 1037                         | 254                     |                        | 61                         |                   |                         | 96                                  | 87                                   | 3.0         | 0.07                                | 7.14                                   | 36.711                                               |                               | 41.955                                                |
| B-10             | 56.9              | 00:56:53   | 175.080                                 | 0.005               | 1.656                                 | 1.70                                 | 1038                         | 254                     |                        | 61                         |                   |                         | 95                                  | 87                                   | 3.0         | 0.07                                | 7.14                                   | 38.473                                               |                               | 41.970                                                |
| B-11             | 59.6              | 00:59:35   | 177.320                                 | 0.005               | 1.656                                 | 1.70                                 | 1001                         | 254                     |                        | 61                         |                   |                         | 95                                  | 87                                   | 3.0         | 0.07                                | 7.06                                   | 40.243                                               |                               | 41.993                                                |
| B-12             | 62.3              | 01:02:18   | 179.570                                 | 0.005               | 1.656                                 | 1.70                                 | 989                          | 254                     |                        | 61                         |                   |                         | 94                                  | 87                                   | 3.0         | 0.07                                | 7.03                                   | 42.019                                               |                               | 42.019                                                |
| Last Pt          | 65.0              | 01:05:00   | 181.825                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |
| Final Val        | 65.0              | 01:05:00   | 181.825                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      | Max Vac     | 3.0                                 | Final Values                           | 42.019                                               |                               |                                                       |
| Average Values   |                   |            |                                         | 0.01                |                                       | 1.70                                 | 1052                         | 254                     |                        | 61                         |                   |                         | 93                                  | 83                                   |             | 0.08                                | 8.14                                   |                                                      |                               |                                                       |
|                  |                   |            |                                         |                     |                                       |                                      |                              |                         |                        |                            |                   |                         | 88                                  |                                      |             |                                     |                                        |                                                      |                               |                                                       |

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | EC-36-2S                   |
| Project #         | leed-15-brighton.co-comp#1 |

|            |             |
|------------|-------------|
| Date       | 09/02/15    |
| Operator   | TP          |
| Run Number | 30-70-30%-5 |

| Leak Checks |       |          |                       |                         |       |
|-------------|-------|----------|-----------------------|-------------------------|-------|
| Train       | Pre   | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| PASS        | Post  | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| < 3.0       | Pitot | Pre (+)  | 0.165                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Pre (-)  | 0.100                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (+) | 0.200                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (-) | 0.180                 | in H <sub>2</sub> O for | 15.0  |

| Nozzle Measurements |  |  |  |      |
|---------------------|--|--|--|------|
| Pre                 |  |  |  | PASS |
| Post                |  |  |  | PASS |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 14:48 | End | 15:58 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 707.7 | 691.4 | 601.7 | 861.2 |       |       |       |       |
| Post    | 718.6 | 697.6 | 604.5 | 873.8 |       |       |       |       |

| Sampling Equipment        |                    |           |
|---------------------------|--------------------|-----------|
| Meter Box Number          | SAMP-CP-0007       |           |
| Meter Cal Factor          | (Y)                | 0.980     |
| Low Flow Meter            | SAMP-MN-0001       |           |
| Average Nozzle Diameter   | (D <sub>no</sub> ) | in        |
| Suggested Nozzle Diameter | (D <sub>n</sub> )  | 0.4355 in |
| Probe Number              | SAMP-SP-0001       | in        |
| Probe Length              | 60                 | in        |
| Liner Material            | inconel            |           |
| Sample Case / Oven Number |                    |           |
| Impinger Case Number      | SAMP-BC-0002       |           |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Pitot Coefficient                                 | (C <sub>p</sub> )                   | 0.819  |                     |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 1110.2 | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 84.0   |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.656  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.09   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 3.49   | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.20  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.65   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 |        |                     |

| Pressures               |                        |       |                     |
|-------------------------|------------------------|-------|---------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 24.93 | in Hg               |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.00  | in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 24.93 | in Hg               |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 25.05 | in Hg               |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Traverse Point # | Sampling Time (Θ) | Timer Time | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Snorkel Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (568°F) | Cond. Temp (≤-°F) | CPM Filter Temp (-±-°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (ΔP <sup>1/2</sup> ) | Local Stack Velocity (v <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|------------------|-------------------|------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-------------------------|------------------------|----------------------------|-------------------|-------------------------|-------------------------------------|--------------------------------------|-------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
|                  | min               | hh:mm:ss   | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                      | °F                     | °F                         | °F                | °F                      | °F                                  | °F                                   | in Hg       | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1              | 0.0               | 00:00:00   | 182.000                                 | 0.005               | 1.656                                 | 1.70                                 | 997                          | 254                     |                        | 71                         |                   |                         | 86                                  | 85                                   | 3.0         | 0.07                                | 7.05                                   | 1.779                                                |                               | 42.703                                                |
| A-2              | 2.7               | 00:02:43   | 184.240                                 | 0.005               | 1.656                                 | 1.70                                 | 943                          | 254                     |                        | 68                         |                   |                         | 89                                  | 85                                   | 3.0         | 0.07                                | 6.92                                   | 3.510                                                |                               | 42.122                                                |
| A-3              | 5.4               | 00:05:25   | 186.425                                 | 0.005               | 1.656                                 | 1.70                                 | 1166                         | 254                     |                        | 65                         |                   |                         | 90                                  | 85                                   | 3.0         | 0.07                                | 7.45                                   | 5.267                                                |                               | 42.137                                                |
| A-4              | 8.1               | 00:08:07   | 188.645                                 | 0.010               | 1.656                                 | 1.70                                 | 1211                         | 254                     |                        | 61                         |                   |                         | 90                                  | 85                                   | 3.0         | 0.10                                | 10.68                                  | 6.988                                                |                               | 41.931                                                |
| A-5              | 10.8              | 00:10:50   | 190.820                                 | 0.010               | 1.656                                 | 1.70                                 | 1237                         | 254                     |                        | 60                         |                   |                         | 89                                  | 84                                   | 3.0         | 0.10                                | 10.77                                  | 8.741                                                |                               | 41.955                                                |
| A-6              | 13.5              | 00:13:33   | 193.030                                 | 0.010               | 1.656                                 | 1.70                                 | 1227                         | 254                     |                        | 60                         |                   |                         | 88                                  | 84                                   | 3.0         | 0.10                                | 10.74                                  | 10.487                                               |                               | 41.946                                                |
| A-7              | 16.3              | 00:16:15   | 195.230                                 | 0.010               | 1.656                                 | 1.70                                 | 1218                         | 254                     |                        | 59                         |                   |                         | 88                                  | 83                                   | 3.0         | 0.10                                | 10.71                                  | 12.246                                               |                               | 41.986                                                |
| A-8              | 19.0              | 00:18:58   | 197.445                                 | 0.005               | 1.656                                 | 1.70                                 | 996                          | 254                     |                        | 58                         |                   |                         | 88                                  | 83                                   | 3.0         | 0.07                                | 7.05                                   | 13.998                                               |                               | 41.993                                                |
| A-9              | 21.7              | 00:21:40   | 199.650                                 | 0.005               | 1.656                                 | 1.70                                 | 1115                         | 254                     |                        | 58                         |                   |                         | 88                                  | 82                                   | 3.0         | 0.07                                | 7.33                                   | 15.747                                               |                               | 41.991                                                |
| A-10             | 24.4              | 00:24:22   | 201.850                                 | 0.005               | 1.656                                 | 1.70                                 | 1099                         | 254                     |                        | 57                         |                   |                         | 88                                  | 82                                   | 3.0         | 0.07                                | 7.30                                   | 17.535                                               |                               | 42.085                                                |
| A-11             | 27.1              | 00:27:05   | 204.100                                 | 0.005               | 1.656                                 | 1.70                                 | 1078                         | 254                     |                        | 57                         |                   |                         | 87                                  | 82                                   | 3.0         | 0.07                                | 7.25                                   | 19.238                                               |                               | 41.975                                                |
| A-12             | 29.8              | 00:29:47   | 206.240                                 | 0.005               | 1.656                                 | 1.70                                 | 1057                         | 254                     |                        | 57                         |                   |                         | 86                                  | 81                                   | 3.0         | 0.07                                | 7.20                                   | 21.124                                               |                               | 42.248                                                |
| B-1              | 32.5              | 00:32:30   | 208.605                                 | 0.005               | 1.656                                 | 1.70                                 | 912                          | 254                     |                        | 59                         |                   |                         | 81                                  | 80                                   | 3.0         | 0.07                                | 6.85                                   | 22.932                                               |                               | 42.336                                                |
| B-2              | 35.2              | 00:35:12   | 210.860                                 | 0.005               | 1.656                                 | 1.70                                 | 924                          | 254                     |                        | 56                         |                   |                         | 85                                  | 80                                   | 3.0         | 0.07                                | 6.88                                   | 24.713                                               |                               | 42.365                                                |
| B-3              | 37.9              | 00:37:55   | 213.090                                 | 0.005               | 1.656                                 | 1.70                                 | 1070                         | 254                     |                        | 56                         |                   |                         | 85                                  | 79                                   | 3.0         | 0.07                                | 7.23                                   | 26.472                                               |                               | 42.355                                                |
| B-4              | 40.6              | 00:40:37   | 215.290                                 | 0.010               | 1.656                                 | 1.70                                 | 1188                         | 254                     |                        | 56                         |                   |                         | 85                                  | 79                                   | 3.0         | 0.10                                | 10.61                                  | 28.238                                               |                               | 42.358                                                |
| B-5              | 43.3              | 00:43:20   | 217.500                                 | 0.010               | 1.656                                 | 1.70                                 | 1203                         | 254                     |                        | 56                         |                   |                         | 85                                  | 79                                   | 3.0         | 0.10                                | 10.66                                  | 29.949                                               |                               | 42.281                                                |
| B-6              | 46.0              | 00:46:03   | 219.640                                 | 0.010               | 1.656                                 | 1.70                                 | 1221                         | 254                     |                        | 56                         |                   |                         | 86                                  | 78                                   | 3.0         | 0.10                                | 10.72                                  | 31.748                                               |                               | 42.331                                                |
| B-7              | 48.8              | 00:48:45   | 221.890                                 | 0.010               | 1.656                                 | 1.70                                 | 1213                         | 254                     |                        | 56                         |                   |                         | 86                                  | 78                                   | 3.0         | 0.10                                | 10.69                                  | 33.503                                               |                               | 42.319                                                |
| B-8              | 51.5              | 00:51:28   | 224.085                                 | 0.005               | 1.656                                 | 1.70                                 | 1028                         | 254                     |                        | 56                         |                   |                         | 87                                  | 78                                   | 3.0         | 0.07                                | 7.13                                   | 35.264                                               |                               | 42.317                                                |
| B-9              | 54.2              | 00:54:10   | 226.290                                 | 0.010               | 1.656                                 | 1.70                                 | 1141                         | 254                     |                        | 57                         |                   |                         | 87                                  | 78                                   | 3.0         | 0.10                                | 10.46                                  | 37.141                                               |                               | 42.447                                                |
| B-10             | 56.9              | 00:56:53   | 228.640                                 | 0.015               | 1.656                                 | 1.70                                 | 1185                         | 254                     |                        | 57                         |                   |                         | 88                                  | 78                                   | 3.0         | 0.12                                | 12.98                                  | 38.773                                               |                               | 42.298                                                |
| B-11             | 59.6              | 00:59:35   | 230.685                                 | 0.010               | 1.656                                 | 1.70                                 | 1119                         | 254                     |                        | 57                         |                   |                         | 87                                  | 78                                   | 3.0         | 0.10                                | 10.39                                  | 40.534                                               |                               | 42.296                                                |
| B-12             | 62.3              | 01:02:18   | 232.890                                 | 0.005               | 1.656                                 | 1.70                                 | 1096                         | 254                     |                        | 57                         |                   |                         | 88                                  | 78                                   | 3.0         | 0.07                                | 7.29                                   | 42.314                                               |                               | 42.314                                                |
| Last Pt          | 65.0              | 01:05:00   | 235.120                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |
| Final Val        | 65.0              | 01:05:00   | 235.120                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      | Max Vac     | 3.0                                 | Final Values                           | 42.314                                               |                               |                                                       |
| Average Values   |                   |            |                                         | 0.01                |                                       | 1.70                                 | 1110                         | 254                     |                        | 59                         |                   |                         | 87                                  | 81                                   |             | 0.09                                | 8.85                                   |                                                      |                               |                                                       |
|                  |                   |            |                                         |                     |                                       |                                      |                              |                         |                        |                            |                   |                         | 84                                  |                                      |             |                                     |                                        |                                                      |                               |                                                       |

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | EC-36-2S                   |
| Project #         | leed-15-brighton.co-comp#1 |

|            |             |
|------------|-------------|
| Date       | 09/02/15    |
| Operator   | TP          |
| Run Number | 30-70-30%-6 |

| Leak Checks |       |          |                       |                         |       |
|-------------|-------|----------|-----------------------|-------------------------|-------|
| Train       | Pre   | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| PASS        | Post  | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| < 3.0       | Pitot | Pre (+)  | 0.100                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Pre (-)  | 0.165                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (+) | 0.125                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (-) | 0.200                 | in H <sub>2</sub> O for | 15.0  |

| Nozzle Measurements |  |  |  |      |
|---------------------|--|--|--|------|
| Pre                 |  |  |  | PASS |
| Post                |  |  |  | PASS |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 16:26 | End | 17:36 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 718.6 | 697.6 | 604.5 | 873.8 |       |       |       |       |
| Post    | 727.5 | 704.4 | 607.9 | 886.9 |       |       |       |       |

| Sampling Equipment        |                    |           |
|---------------------------|--------------------|-----------|
| Meter Box Number          | SAMP-CP-0007       |           |
| Meter Cal Factor          | (Y)                | 0.980     |
| Low Flow Meter            | SAMP-MN-0001       |           |
| Average Nozzle Diameter   | (D <sub>no</sub> ) | in        |
| Suggested Nozzle Diameter | (D <sub>n</sub> )  | 0.4413 in |
| Probe Number              | SAMP-SP-0001       | in        |
| Probe Length              | 60                 | in        |
| Liner Material            | inconel            |           |
| Sample Case / Oven Number |                    |           |
| Impinger Case Number      | SAMP-BC-0002       |           |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Pitot Coefficient                                 | (C <sub>p</sub> )                   | 0.819  |                     |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 1073.4 | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 87.1   |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.656  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.08   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 3.47   | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.22  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.65   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 |        |                     |

| Pressures               |                        |       |                     |
|-------------------------|------------------------|-------|---------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 24.90 | in Hg               |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.00  | in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 24.90 | in Hg               |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 25.02 | in Hg               |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Traverse Point # | Sampling Time (Θ) | Timer Time | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Snorkel Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (568°F) | Cond. Temp (≤-°F) | CPM Filter Temp (-±-°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (ΔP <sup>1/2</sup> ) | Local Stack Velocity (v <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|------------------|-------------------|------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-------------------------|------------------------|----------------------------|-------------------|-------------------------|-------------------------------------|--------------------------------------|-------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
|                  | min               | hh:mm:ss   | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                      | °F                     | °F                         | °F                | °F                      | °F                                  | °F                                   | in Hg       | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1              | 0.0               | 00:00:00   | 235.305                                 | 0.005               | 1.656                                 | 1.70                                 | 880                          | 254                     |                        | 59                         |                   |                         | 84                                  | 78                                   | 3.0         | 0.07                                | 6.77                                   | 1.804                                                |                               | 43.295                                                |
| A-2              | 2.7               | 00:02:43   | 237.560                                 | 0.005               | 1.656                                 | 1.70                                 | 1116                         | 254                     |                        | 53                         |                   |                         | 88                                  | 79                                   | 3.0         | 0.07                                | 7.34                                   | 3.516                                                |                               | 42.192                                                |
| A-3              | 5.4               | 00:05:25   | 239.710                                 | 0.005               | 1.656                                 | 1.70                                 | 1130                         | 254                     |                        | 53                         |                   |                         | 90                                  | 79                                   | 3.0         | 0.07                                | 7.37                                   | 5.245                                                |                               | 41.958                                                |
| A-4              | 8.1               | 00:08:07   | 241.885                                 | 0.010               | 1.656                                 | 1.70                                 | 1162                         | 254                     |                        | 53                         |                   |                         | 91                                  | 79                                   | 3.0         | 0.10                                | 10.53                                  | 6.996                                                |                               | 41.974                                                |
| A-5              | 10.8              | 00:10:50   | 244.090                                 | 0.010               | 1.656                                 | 1.70                                 | 1183                         | 254                     |                        | 54                         |                   |                         | 92                                  | 80                                   | 3.0         | 0.10                                | 10.60                                  | 8.747                                                |                               | 41.988                                                |
| A-6              | 13.5              | 00:13:33   | 246.300                                 | 0.005               | 1.656                                 | 1.70                                 | 1194                         | 254                     |                        | 56                         |                   |                         | 92                                  | 80                                   | 3.0         | 0.07                                | 7.52                                   | 10.468                                               |                               | 41.870                                                |
| A-7              | 16.3              | 00:16:15   | 248.470                                 | 0.010               | 1.656                                 | 1.70                                 | 1185                         | 254                     |                        | 56                         |                   |                         | 93                                  | 81                                   | 3.0         | 0.10                                | 10.60                                  | 12.208                                               |                               | 41.857                                                |
| A-8              | 19.0              | 00:18:58   | 250.670                                 | 0.005               | 1.656                                 | 1.70                                 | 988                          | 254                     |                        | 57                         |                   |                         | 94                                  | 81                                   | 3.0         | 0.07                                | 7.04                                   | 13.939                                               |                               | 41.818                                                |
| A-9              | 21.7              | 00:21:40   | 252.860                                 | 0.010               | 1.656                                 | 1.70                                 | 1107                         | 254                     |                        | 57                         |                   |                         | 94                                  | 82                                   | 3.0         | 0.10                                | 10.35                                  | 15.649                                               |                               | 41.731                                                |
| A-10             | 24.4              | 00:24:22   | 255.025                                 | 0.015               | 1.656                                 | 1.70                                 | 1171                         | 254                     |                        | 58                         |                   |                         | 94                                  | 83                                   | 3.0         | 0.12                                | 12.93                                  | 17.405                                               |                               | 41.771                                                |
| A-11             | 27.1              | 00:27:05   | 257.250                                 | 0.010               | 1.656                                 | 1.70                                 | 995                          | 254                     |                        | 58                         |                   |                         | 94                                  | 83                                   | 3.0         | 0.10                                | 9.97                                   | 19.164                                               |                               | 41.813                                                |
| A-12             | 29.8              | 00:29:47   | 259.480                                 | 0.005               | 1.656                                 | 1.70                                 | 980                          | 254                     |                        | 58                         |                   |                         | 93                                  | 84                                   | 3.0         | 0.07                                | 7.02                                   | 20.963                                               |                               | 41.927                                                |
| B-1              | 32.5              | 00:32:30   | 261.760                                 | 0.005               | 1.656                                 | 1.70                                 | 947                          | 254                     |                        | 60                         |                   |                         | 90                                  | 84                                   | 3.0         | 0.07                                | 6.93                                   | 22.724                                               |                               | 41.951                                                |
| B-2              | 35.2              | 00:35:12   | 263.985                                 | 0.005               | 1.656                                 | 1.70                                 | 956                          | 254                     |                        | 59                         |                   |                         | 92                                  | 84                                   | 3.0         | 0.07                                | 6.96                                   | 24.473                                               |                               | 41.954                                                |
| B-3              | 37.9              | 00:37:55   | 266.200                                 | 0.005               | 1.656                                 | 1.70                                 | 1162                         | 254                     |                        | 59                         |                   |                         | 92                                  | 85                                   | 3.0         | 0.07                                | 7.45                                   | 26.185                                               |                               | 41.896                                                |
| B-4              | 40.6              | 00:40:37   | 268.370                                 | 0.005               | 1.656                                 | 1.70                                 | 1217                         | 254                     |                        | 60                         |                   |                         | 92                                  | 85                                   | 3.0         | 0.07                                | 7.57                                   | 27.921                                               |                               | 41.882                                                |
| B-5              | 43.3              | 00:43:20   | 270.570                                 | 0.005               | 1.656                                 | 1.70                                 | 1218                         | 254                     |                        | 60                         |                   |                         | 92                                  | 85                                   | 3.0         | 0.07                                | 7.57                                   | 29.677                                               |                               | 41.896                                                |
| B-6              | 46.0              | 00:46:03   | 272.795                                 | 0.005               | 1.656                                 | 1.70                                 | 1223                         | 254                     |                        | 60                         |                   |                         | 92                                  | 85                                   | 3.0         | 0.07                                | 7.58                                   | 31.409                                               |                               | 41.878                                                |
| B-7              | 48.8              | 00:48:45   | 274.990                                 | 0.005               | 1.656                                 | 1.70                                 | 1078                         | 254                     |                        | 61                         |                   |                         | 92                                  | 85                                   | 3.0         | 0.07                                | 7.25                                   | 33.176                                               |                               | 41.907                                                |
| B-8              | 51.5              | 00:51:28   | 277.230                                 | 0.005               | 1.656                                 | 1.70                                 | 915                          | 254                     |                        | 61                         |                   |                         | 91                                  | 85                                   | 3.0         | 0.07                                | 6.86                                   | 34.929                                               |                               | 41.915                                                |
| B-9              | 54.2              | 00:54:10   | 279.450                                 | 0.005               | 1.656                                 | 1.70                                 | 1066                         | 254                     |                        | 62                         |                   |                         | 91                                  | 85                                   | 3.0         | 0.07                                | 7.22                                   | 36.686                                               |                               | 41.927                                                |
| B-10             | 56.9              | 00:56:53   | 281.675                                 | 0.005               | 1.656                                 | 1.70                                 | 1035                         | 254                     |                        | 62                         |                   |                         | 90                                  | 85                                   | 3.0         | 0.07                                | 7.15                                   | 38.485                                               |                               | 41.983                                                |
| B-11             | 59.6              | 00:59:35   | 283.950                                 | 0.005               | 1.656                                 | 1.70                                 | 939                          | 254                     |                        | 62                         |                   |                         | 90                                  | 85                                   | 3.0         | 0.07                                | 6.92                                   | 40.323                                               |                               | 42.076                                                |
| B-12             | 62.3              | 01:02:18   | 286.275                                 | 0.005               | 1.656                                 | 1.70                                 | 914                          | 254                     |                        | 62                         |                   |                         | 90                                  | 84                                   | 3.0         | 0.07                                | 6.85                                   | 42.289                                               |                               | 42.289                                                |
| Last Pt          | 65.0              | 01:05:00   | 288.760                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |
| Final Val        | 65.0              | 01:05:00   | 288.760                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      | Max Vac     | 3.0                                 | Final Values                           | 42.289                                               |                               |                                                       |
| Average Values   |                   |            |                                         | 0.01                |                                       | 1.70                                 | 1073                         | 254                     |                        | 58                         |                   |                         | 91                                  | 83                                   |             | 0.08                                | 8.10                                   |                                                      |                               |                                                       |
|                  |                   |            |                                         |                     |                                       |                                      |                              |                         |                        |                            |                   |                         | 87                                  |                                      |             |                                     |                                        |                                                      |                               |                                                       |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 3.2    | %    |
| Stack Exhaust Flow (M2) | 39,207 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.94    | in. Hg                       |
| Relative Humidity   | 16       | %                            |
| Ambient Temperature | 91       | °F                           |
| Specific Humidity   | 0.005914 | lb H <sub>2</sub> O / lb air |

30-70-30 Load, Run - EC36-2S R4

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| A1 | 09/02/15 13:25:02                | 25110                     | 18.23                 | 6.49          | 1.02           | 1.95                   | 0.39                 | 109.10           | 306.00            |
|    | 09/02/15 13:25:32                | 25140                     | 18.29                 | 6.63          | 0.99           | 1.92                   | 0.39                 | 109.10           | 306.00            |
|    | 09/02/15 13:26:02                | 25170                     | 18.21                 | 6.31          | 0.91           | 1.97                   | 0.38                 | 109.40           | 306.00            |
|    | 09/02/15 13:26:32                | 25200                     | 18.25                 | 6.54          | 0.91           | 1.97                   | 0.38                 | 109.40           | 306.00            |
|    | 09/02/15 13:27:02                | 25230                     | 18.24                 | 6.47          | 0.99           | 1.96                   | 0.74                 | 109.60           | 458.00            |
|    | 09/02/15 13:27:32                | 25260                     | 18.16                 | 6.57          | 0.94           | 2.03                   | 0.74                 | 109.60           | 458.00            |
|    | 09/02/15 13:28:02                | 25290                     | 16.73                 | 6.36          | 0.56           | 2.98                   | 1.16                 | 109.50           | 612.00            |
|    | 09/02/15 13:28:32                | 25320                     | 16.13                 | 4.45          | 0.47           | 3.46                   | 1.16                 | 109.50           | 612.00            |
|    | 09/02/15 13:29:02                | 25350                     | 16.32                 | 3.67          | 0.57           | 3.32                   | 1.18                 | 109.30           | 597.00            |
|    | 09/02/15 13:29:32                | 25380                     | 16.23                 | 3.54          | 0.52           | 3.39                   | 1.18                 | 109.30           | 597.00            |
|    | 09/02/15 13:30:02                | 25410                     | 16.34                 | 3.45          | 0.47           | 3.31                   | 1.19                 | 109.20           | 613.00            |
|    | 09/02/15 13:30:32                | 25440                     | 16.35                 | 3.37          | 0.50           | 3.31                   | 1.19                 | 109.20           | 613.00            |
|    | 09/02/15 13:31:02                | 25470                     | 16.26                 | 3.39          | 0.57           | 3.35                   | 1.21                 | 109.20           | 614.00            |
|    | 09/02/15 13:31:32                | 25500                     | 16.36                 | 3.99          | 0.49           | 3.30                   | 1.21                 | 109.20           | 614.00            |
|    | 09/02/15 13:32:02                | 25530                     | 16.08                 | 3.71          | 0.40           | 3.50                   | 1.21                 | 109.10           | 582.00            |
|    | 09/02/15 13:32:32                | 25560                     | 16.29                 | 3.38          | 0.52           | 3.35                   | 1.21                 | 109.10           | 582.00            |
|    | 09/02/15 13:33:02                | 25590                     | 16.13                 | 3.76          | 0.63           | 3.45                   | 1.22                 | 109.10           | 614.00            |
|    | 09/02/15 13:33:32                | 25620                     | 16.21                 | 3.35          | 0.62           | 3.42                   | 1.22                 | 109.10           | 614.00            |
|    | 09/02/15 13:34:02                | 25650                     | 16.09                 | 2.91          | 0.47           | 3.49                   | 1.20                 | 109.00           | 582.00            |
|    | 09/02/15 13:34:32                | 25680                     | 16.27                 | 2.86          | 0.45           | 3.38                   | 1.20                 | 109.00           | 582.00            |
|    | 09/02/15 13:35:02                | 25710                     | 16.23                 | 3.34          | 0.43           | 3.37                   | 1.21                 | 109.00           | 582.00            |
|    | 09/02/15 13:35:32                | 25740                     | 16.24                 | 3.11          | 0.50           | 3.36                   | 1.21                 | 109.00           | 582.00            |
|    | 09/02/15 13:36:02                | 25770                     | 16.29                 | 3.23          | 0.50           | 3.35                   | 1.21                 | 109.00           | 582.00            |
|    | 09/02/15 13:36:32                | 25800                     | 16.28                 | 3.46          | 0.42           | 3.34                   | 1.21                 | 109.00           | 582.00            |
|    | 09/02/15 13:37:02                | 25830                     | 16.20                 | 3.01          | 0.39           | 3.41                   | 1.21                 | 109.00           | 598.00            |
|    | 09/02/15 13:37:32                | 25860                     | 16.25                 | 2.64          | 0.49           | 3.38                   | 1.21                 | 109.00           | 598.00            |
|    | 09/02/15 13:38:02                | 25890                     | 16.25                 | 2.74          | 0.51           | 3.36                   | 1.21                 | 109.00           | 598.00            |
|    | 09/02/15 13:38:32                | 25920                     | 16.41                 | 3.07          | 0.45           | 3.26                   | 1.21                 | 109.00           | 598.00            |
|    | 09/02/15 13:39:02                | 25950                     | 16.48                 | 3.52          | 0.45           | 3.22                   | 1.22                 | 109.10           | 582.00            |
|    | 09/02/15 13:39:32                | 25980                     | 16.39                 | 3.41          | 0.52           | 3.27                   | 1.22                 | 109.10           | 582.00            |
|    | 09/02/15 13:40:02                | 26010                     | 16.42                 | 3.16          | 0.52           | 3.25                   | 1.21                 | 109.10           | 598.00            |
|    | 09/02/15 13:40:32                | 26040                     | 16.38                 | 3.23          | 0.43           | 3.29                   | 1.21                 | 109.10           | 598.00            |
|    | 09/02/15 13:41:02                | 26070                     | 16.56                 | 3.07          | 0.45           | 3.17                   | 1.21                 | 109.20           | 582.00            |
|    | 09/02/15 13:41:32                | 26100                     | 16.44                 | 3.17          | 0.49           | 3.24                   | 1.21                 | 109.20           | 582.00            |
|    | 09/02/15 13:42:02                | 26130                     | 16.48                 | 2.98          | 0.51           | 3.22                   | 1.00                 | 109.30           | 527.00            |
|    | 09/02/15 13:42:32                | 26160                     | 16.41                 | 3.09          | 0.44           | 3.27                   | 1.00                 | 109.30           | 527.00            |
|    | 09/02/15 13:43:02                | 26190                     | 17.29                 | 3.26          | 0.69           | 2.71                   | 0.37                 | 109.40           | 290.00            |
|    | 09/02/15 13:43:32                | 26220                     | 18.48                 | 4.79          | 1.00           | 1.75                   | 0.37                 | 109.40           | 290.00            |
|    | 09/02/15 13:44:02                | 26250                     | 18.48                 | 5.95          | 1.00           | 1.77                   | 0.38                 | 109.80           | 290.00            |
|    | 09/02/15 13:44:32                | 26280                     | 18.60                 | 5.98          | 0.95           | 1.68                   | 0.38                 | 109.80           | 290.00            |
| A2 | 09/02/15 13:45:02                | 26310                     | 18.62                 | 5.68          | 1.00           | 1.63                   | 0.37                 | 110.10           | 275.00            |
|    | 09/02/15 13:45:32                | 26340                     | 18.59                 | 5.67          | 1.15           | 1.66                   | 0.37                 | 110.10           | 275.00            |
|    | 09/02/15 13:46:02                | 26370                     | 18.56                 | 5.67          | 1.17           | 1.69                   | 0.38                 | 110.40           | 305.00            |
|    | 09/02/15 13:46:32                | 26400                     | 18.51                 | 5.86          | 1.10           | 1.73                   | 0.38                 | 110.40           | 305.00            |
|    | 09/02/15 13:47:02                | 26430                     | 18.42                 | 5.92          | 1.10           | 1.79                   | 0.36                 | 110.70           | 274.00            |
|    | 09/02/15 13:47:32                | 26460                     | 18.32                 | 6.14          | 1.05           | 1.87                   | 0.36                 | 110.70           | 274.00            |
|    | 09/02/15 13:48:02                | 26490                     | 18.04                 | 6.39          | 1.10           | 2.11                   | 0.37                 | 110.90           | 290.00            |
|    | 09/02/15 13:48:32                | 26520                     | 18.01                 | 6.93          | 1.04           | 2.13                   | 0.37                 | 110.90           | 290.00            |
|    | 09/02/15 13:49:02                | 26550                     | 18.04                 | 7.00          | 1.00           | 2.12                   | 0.74                 | 111.10           | 441.00            |
|    | 09/02/15 13:49:32                | 26580                     | 17.52                 | 7.01          | 0.94           | 2.38                   | 0.74                 | 111.10           | 441.00            |
|    | 09/02/15 13:50:02                | 26610                     | 15.30                 | 5.54          | 0.50           | 4.06                   | 1.13                 | 111.10           | 609.00            |
|    | 09/02/15 13:50:32                | 26640                     | 15.38                 | 3.51          | 0.46           | 4.01                   | 1.13                 | 111.10           | 609.00            |
|    | 09/02/15 13:51:02                | 26670                     | 15.46                 | 3.39          | 0.45           | 3.93                   | 1.16                 | 111.10           | 594.00            |
|    | 09/02/15 13:51:32                | 26700                     | 15.45                 | 3.18          | 0.54           | 3.96                   | 1.16                 | 111.10           | 594.00            |
|    | 09/02/15 13:52:02                | 26730                     | 15.44                 | 3.03          | 0.58           | 3.95                   | 1.17                 | 111.00           | 594.00            |
|    | 09/02/15 13:52:32                | 26760                     | 15.58                 | 2.87          | 0.49           | 3.84                   | 1.17                 | 111.00           | 594.00            |
|    | 09/02/15 13:53:02                | 26790                     | 15.51                 | 2.89          | 0.45           | 3.90                   | 1.18                 | 111.00           | 595.00            |
|    | 09/02/15 13:53:32                | 26820                     | 15.43                 | 2.84          | 0.50           | 3.96                   | 1.18                 | 111.00           | 595.00            |
|    | 09/02/15 13:54:02                | 26850                     | 15.45                 | 2.76          | 0.55           | 3.94                   | 1.20                 | 110.90           | 612.00            |
|    | 09/02/15 13:54:32                | 26880                     | 15.43                 | 2.91          | 0.47           | 3.95                   | 1.20                 | 110.90           | 612.00            |



**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 3.2    | %    |
| Stack Exhaust Flow (M2) | 39,207 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.94    | in. Hg                       |
| Relative Humidity   | 16       | %                            |
| Ambient Temperature | 91       | °F                           |
| Specific Humidity   | 0.005914 | lb H <sub>2</sub> O / lb air |

30-70-30 Load, Run - EC36-2S R4

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
|    | 09/02/15 13:55:02                | 26910                     | 15.22                 | 2.64          | 0.38           | 4.10                   | 1.21                 | 110.90           | 596.00            |
|    | 09/02/15 13:55:32                | 26940                     | 15.53                 | 2.45          | 0.48           | 3.89                   | 1.21                 | 110.90           | 596.00            |
|    | 09/02/15 13:56:02                | 26970                     | 15.51                 | 2.46          | 0.55           | 3.90                   | 1.21                 | 110.80           | 596.00            |
|    | 09/02/15 13:56:32                | 27000                     | 15.50                 | 2.55          | 0.49           | 3.91                   | 1.21                 | 110.80           | 596.00            |
|    | 09/02/15 13:57:02                | 27030                     | 15.42                 | 3.07          | 0.47           | 3.97                   | 1.21                 | 110.80           | 580.00            |
|    | 09/02/15 13:57:32                | 27060                     | 15.46                 | 2.91          | 0.55           | 3.94                   | 1.21                 | 110.80           | 580.00            |
|    | 09/02/15 13:58:02                | 27090                     | 15.55                 | 2.42          | 0.65           | 3.87                   | 1.21                 | 110.80           | 580.00            |
|    | 09/02/15 13:58:32                | 27120                     | 15.37                 | 2.36          | 0.52           | 3.99                   | 1.21                 | 110.80           | 580.00            |
|    | 09/02/15 13:59:02                | 27150                     | 15.47                 | 2.39          | 0.44           | 3.93                   | 0.86                 | 110.90           | 475.00            |
|    | 09/02/15 13:59:32                | 27180                     | 15.30                 | 2.34          | 0.48           | 4.04                   | 0.86                 | 110.90           | 475.00            |
|    | 09/02/15 14:00:02                | 27210                     | 17.12                 | 2.89          | 0.86           | 2.85                   | 0.44                 | 111.10           | 337.00            |
|    | 09/02/15 14:00:32                | 27240                     | 17.67                 | 5.07          | 0.87           | 2.39                   | 0.44                 | 111.10           | 337.00            |
|    | 09/02/15 14:01:02                | 27270                     | 17.75                 | 5.67          | 0.87           | 2.32                   | 0.44                 | 111.50           | 337.00            |
|    | 09/02/15 14:01:32                | 27300                     | 17.72                 | 5.73          | 0.98           | 2.35                   | 0.44                 | 111.50           | 337.00            |
|    | 09/02/15 14:02:02                | 27330                     | 17.75                 | 5.80          | 1.01           | 2.33                   | 0.44                 | 111.80           | 336.00            |
|    | 09/02/15 14:02:32                | 27360                     | 17.73                 | 5.86          | 0.91           | 2.35                   | 0.44                 | 111.80           | 336.00            |
|    | 09/02/15 14:03:02                | 27390                     | 17.68                 | 5.93          | 0.87           | 2.37                   | 0.64                 | 112.10           | 419.00            |
|    | 09/02/15 14:03:32                | 27420                     | 17.76                 | 6.02          | 0.98           | 2.31                   | 0.64                 | 112.10           | 419.00            |
|    | 09/02/15 14:04:02                | 27450                     | 16.66                 | 6.03          | 0.73           | 3.01                   | 1.15                 | 112.10           | 576.00            |
|    | 09/02/15 14:04:32                | 27480                     | 15.18                 | 4.04          | 0.43           | 4.11                   | 1.15                 | 112.10           | 576.00            |
|    | 09/02/15 14:05:02                | 27510                     | 15.07                 | 2.62          | 0.48           | 4.22                   | 1.16                 | 112.10           | 593.00            |
| A3 | 09/02/15 14:05:32                | 27540                     | 15.17                 | 2.50          | 0.54           | 4.15                   | 1.16                 | 112.10           | 593.00            |
|    | 09/02/15 14:06:02                | 27570                     | 15.36                 | 2.56          | 0.50           | 4.02                   | 1.18                 | 112.00           | 594.00            |
|    | 09/02/15 14:06:32                | 27600                     | 15.41                 | 2.55          | 0.41           | 3.98                   | 1.18                 | 112.00           | 594.00            |
|    | 09/02/15 14:07:02                | 27630                     | 15.34                 | 2.39          | 0.44           | 4.03                   | 1.19                 | 111.90           | 610.00            |
|    | 09/02/15 14:07:32                | 27660                     | 15.28                 | 2.37          | 0.55           | 4.04                   | 1.19                 | 111.90           | 610.00            |
|    | 09/02/15 14:08:02                | 27690                     | 14.91                 | 2.21          | 0.53           | 4.32                   | 1.21                 | 111.90           | 595.00            |
|    | 09/02/15 14:08:32                | 27720                     | 14.59                 | 1.99          | 0.43           | 4.51                   | 1.21                 | 111.90           | 595.00            |
|    | 09/02/15 14:09:02                | 27750                     | 14.71                 | 1.91          | 0.41           | 4.45                   | 1.21                 | 111.90           | 579.00            |
|    | 09/02/15 14:09:32                | 27780                     | 14.92                 | 1.82          | 0.52           | 4.32                   | 1.21                 | 111.90           | 579.00            |
|    | 09/02/15 14:10:02                | 27810                     | 14.89                 | 1.90          | 0.49           | 4.32                   | 1.20                 | 112.00           | 579.00            |
|    | 09/02/15 14:10:32                | 27840                     | 14.76                 | 2.03          | 0.44           | 4.40                   | 1.20                 | 112.00           | 579.00            |
|    | 09/02/15 14:11:02                | 27870                     | 14.85                 | 1.81          | 0.48           | 4.37                   | 1.21                 | 111.90           | 595.00            |
|    | 09/02/15 14:11:32                | 27900                     | 14.99                 | 1.81          | 0.58           | 4.26                   | 1.21                 | 111.90           | 595.00            |
|    | 09/02/15 14:12:02                | 27930                     | 14.84                 | 1.81          | 0.50           | 4.37                   | 1.21                 | 111.80           | 595.00            |
|    | 09/02/15 14:12:32                | 27960                     | 14.70                 | 1.70          | 0.42           | 4.44                   | 1.21                 | 111.80           | 595.00            |
|    | 09/02/15 14:13:02                | 27990                     | 14.80                 | 1.68          | 0.43           | 4.39                   | 1.20                 | 111.60           | 595.00            |
|    | 09/02/15 14:13:32                | 28020                     | 14.78                 | 1.77          | 0.55           | 4.40                   | 1.20                 | 111.60           | 595.00            |
|    | 09/02/15 14:14:02                | 28050                     | 14.78                 | 1.74          | 0.52           | 4.40                   | 1.21                 | 111.40           | 579.00            |
|    | 09/02/15 14:14:32                | 28080                     | 14.98                 | 1.65          | 0.44           | 4.25                   | 1.21                 | 111.40           | 579.00            |
|    | 09/02/15 14:15:02                | 28110                     | 15.02                 | 1.70          | 0.47           | 4.27                   | 0.43                 | 111.30           | 337.00            |
|    | 09/02/15 14:15:32                | 28140                     | 16.85                 | 2.59          | 0.85           | 3.01                   | 0.43                 | 111.30           | 337.00            |
|    | 09/02/15 14:16:02                | 28170                     | 17.60                 | 5.17          | 0.95           | 2.43                   | 0.42                 | 111.40           | 306.00            |
|    | 09/02/15 14:16:32                | 28200                     | 17.65                 | 6.05          | 0.88           | 2.42                   | 0.42                 | 111.40           | 306.00            |
|    | 09/02/15 14:17:02                | 28230                     | 17.70                 | 5.99          | 0.87           | 2.35                   | 0.41                 | 111.50           | 305.00            |
|    | 09/02/15 14:17:32                | 28260                     | 17.72                 | 6.12          | 0.93           | 2.35                   | 0.41                 | 111.50           | 305.00            |
|    | 09/02/15 14:18:02                | 28290                     | 17.78                 | 6.12          | 1.01           | 2.30                   | 0.42                 | 111.50           | 321.00            |
|    | 09/02/15 14:18:32                | 28320                     | 17.67                 | 6.00          | 0.95           | 2.38                   | 0.42                 | 111.50           | 321.00            |
|    | 09/02/15 14:19:02                | 28350                     | 17.65                 | 6.33          | 0.85           | 2.39                   | 0.42                 | 111.50           | 321.00            |
|    | 09/02/15 14:19:32                | 28380                     | 17.70                 | 6.51          | 0.92           | 2.37                   | 0.42                 | 111.50           | 321.00            |
|    | 09/02/15 14:20:02                | 28410                     | 17.26                 | 6.31          | 0.90           | 2.58                   | 1.15                 | 111.10           | 593.00            |
|    | 09/02/15 14:20:32                | 28440                     | 15.09                 | 4.45          | 0.59           | 4.17                   | 1.15                 | 111.10           | 593.00            |
|    | 09/02/15 14:21:02                | 28470                     | 15.14                 | 2.61          | 0.51           | 4.16                   | 1.15                 | 110.60           | 578.00            |
|    | 09/02/15 14:21:32                | 28500                     | 15.29                 | 2.30          | 0.51           | 4.04                   | 1.15                 | 110.60           | 578.00            |
|    | 09/02/15 14:22:02                | 28530                     | 14.66                 | 2.35          | 0.54           | 4.48                   | 1.15                 | 110.00           | 595.00            |
|    | 09/02/15 14:22:32                | 28560                     | 14.99                 | 2.13          | 0.57           | 4.30                   | 1.15                 | 110.00           | 595.00            |
|    | 09/02/15 14:23:02                | 28590                     | 14.97                 | 1.92          | 0.46           | 4.25                   | 1.16                 | 109.50           | 579.00            |
|    | 09/02/15 14:23:32                | 28620                     | 14.84                 | 1.96          | 0.47           | 4.37                   | 1.16                 | 109.50           | 579.00            |
|    | 09/02/15 14:24:02                | 28650                     | 14.76                 | 2.02          | 0.53           | 4.40                   | 1.16                 | 109.00           | 580.00            |
|    | 09/02/15 14:24:32                | 28680                     | 15.05                 | 1.91          | 0.53           | 4.23                   | 1.16                 | 109.00           | 580.00            |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 3.2    | %    |
| Stack Exhaust Flow (M2) | 39,207 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.94    | in. Hg                       |
| Relative Humidity   | 16       | %                            |
| Ambient Temperature | 91       | °F                           |
| Specific Humidity   | 0.005914 | lb H <sub>2</sub> O / lb air |

30-70-30 Load, Run - EC36-2S R4

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| 09/02/15 14:25:02                | 28710                     | 14.79                 | 2.08          | 0.45           | 4.38                   | 1.16                 | 108.50           | 597.00            |
| 09/02/15 14:25:32                | 28740                     | 14.96                 | 2.00          | 0.50           | 4.31                   | 1.16                 | 108.50           | 597.00            |
| 09/02/15 14:26:02                | 28770                     | 15.18                 | 1.66          | 0.61           | 4.12                   | 1.16                 | 108.00           | 581.00            |
| 09/02/15 14:26:32                | 28800                     | 14.82                 | 1.50          | 0.51           | 4.37                   | 1.16                 | 108.00           | 581.00            |
| 09/02/15 14:27:02                | 28830                     | 14.95                 | 1.71          | 0.47           | 4.30                   | 1.15                 | 107.50           | 581.00            |
| 09/02/15 14:27:32                | 28860                     | 15.55                 | 1.74          | 0.51           | 3.86                   | 1.15                 | 107.50           | 581.00            |
| 09/02/15 14:28:02                | 28890                     | 15.19                 | 1.59          | 0.59           | 4.10                   | 1.15                 | 106.60           | 582.00            |
| 09/02/15 14:28:32                | 28920                     | 14.78                 | 1.80          | 0.57           | 4.38                   | 1.15                 | 106.60           | 582.00            |
| 09/02/15 14:29:02                | 28950                     | 14.50                 | 1.78          | 0.46           | 4.58                   | 1.14                 | 106.00           | 566.00            |
| 09/02/15 14:29:32                | 28980                     | 14.65                 | 1.74          | 0.37           | 4.51                   | 1.14                 | 106.00           | 566.00            |
| 09/02/15 14:30:02                | 29010                     | 14.58                 | 1.80          | 0.40           | 4.52                   | 1.14                 | 105.50           | 583.00            |
| 09/02/15 14:30:32                | 29040                     | 14.48                 | 1.74          | 0.43           | 4.60                   | 1.14                 | 105.50           | 583.00            |
| 09/02/15 14:31:02                | 29070                     | 14.58                 | 1.79          | 0.38           | 4.54                   | 0.81                 | 105.10           | 478.00            |
| 09/02/15 14:31:32                | 29100                     | 14.37                 | 1.86          | 0.39           | 4.67                   | 0.81                 | 105.10           | 478.00            |
| 09/02/15 14:32:02                | 29130                     | 14.47                 | 1.75          | 0.48           | 4.61                   | 0.40                 | 104.90           | 355.00            |
| 09/02/15 14:32:32                | 29160                     | 14.51                 | 1.68          | 0.43           | 4.59                   | 0.40                 | 104.90           | 355.00            |
| 09/02/15 14:33:02                | 29190                     | 16.63                 | 2.69          | 0.64           | 3.17                   | 0.41                 | 104.90           | 371.00            |
| 09/02/15 14:33:32                | 29220                     | 16.96                 | 5.86          | 0.68           | 2.86                   | 0.41                 | 104.90           | 371.00            |
| 09/02/15 14:34:02                | 29250                     | 16.93                 | 6.04          | 0.77           | 2.89                   | 0.41                 | 104.80           | 340.00            |
| 09/02/15 14:34:32                | 29280                     | 16.94                 | 6.13          | 0.73           | 2.90                   | 0.41                 | 104.80           | 340.00            |
| 09/02/15 14:35:02                | 29310                     | 17.09                 | 6.19          | 0.70           | 2.78                   | 0.77                 | 104.60           | 462.00            |
| <b>RAW AVERAGE</b>               |                           | <b>16.18</b>          | <b>3.63</b>   | <b>0.63</b>    | <b>3.42</b>            | <b>0.94</b>          | <b>109.87</b>    | <b>505.36</b>     |

| Bias                   | Serial Number:  | O <sub>2</sub> | CO           | THC          | CO <sub>2</sub> | Press. Trans           | Temp. Trans. | F-Flow Trans. |
|------------------------|-----------------|----------------|--------------|--------------|-----------------|------------------------|--------------|---------------|
|                        |                 | (%)            | (ppmvd)      | (ppmvw)      | (%)             | (in. H <sub>2</sub> O) | (°F)         | (SCFH)        |
|                        | INSTO2-0011     | INST-CO-0022   | INST-TH-0002 | INST-C2-0013 | 1434717         | 1434717                | 1434717      |               |
|                        | Initial Zero    | -0.01          | -0.04        | 0.00         | 0.03            |                        |              |               |
|                        | Final Zero      | 0.01           | 0.21         | 0.12         | 0.01            |                        |              |               |
|                        | Avg. Zero       | 0.00           | 0.09         | 0.06         | 0.02            |                        |              |               |
|                        | Initial UpScale | 11.91          | 9.29         | 3.02         | 9.04            |                        |              |               |
|                        | Final UpScale   | 11.89          | 9.38         | 3.03         | 9.02            |                        |              |               |
|                        | Avg. UpScale    | 11.90          | 9.34         | 3.03         | 9.03            |                        |              |               |
| <b>Upscale Cal Gas</b> |                 | 11.91          | 9.48         | 3.02         | 9.09            |                        |              |               |

| EMISSIONS DATA                          | O <sub>2</sub> | CO   | THC  | CO <sub>2</sub> |
|-----------------------------------------|----------------|------|------|-----------------|
| Corrected Raw Average (ppm/% dry basis) | 16.19          | 3.63 | 0.58 | 3.43            |
| Corrected Raw Average (ppm/% wet basis) | 15.68          | 3.51 | 0.56 | 3.32            |
| Emission Rate (lb/hr)                   | N/A            | 0.01 | 0.00 | N/A             |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 3.5    | %    |
| Stack Exhaust Flow (M2) | 40,876 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.93    | in. Hg                       |
| Relative Humidity   | 12       | %                            |
| Ambient Temperature | 91       | °F                           |
| Specific Humidity   | 0.004427 | lb H <sub>2</sub> O / lb air |

30-70-30 Load, Run - EC36-2S R5

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmwv) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| A1 | 09/02/15 14:48:02                | 30090                     | 18.21                 | 5.06          | 0.96           | 1.94                   | 0.39                 | 100.10           | 342.00            |
|    | 09/02/15 14:48:32                | 30120                     | 18.09                 | 5.30          | 0.99           | 2.04                   | 0.39                 | 100.10           | 342.00            |
|    | 09/02/15 14:49:02                | 30150                     | 17.96                 | 5.48          | 0.92           | 2.14                   | 0.39                 | 100.30           | 342.00            |
|    | 09/02/15 14:49:32                | 30180                     | 17.96                 | 5.92          | 0.84           | 2.15                   | 0.39                 | 100.30           | 342.00            |
|    | 09/02/15 14:50:02                | 30210                     | 18.01                 | 5.90          | 0.82           | 2.12                   | 0.39                 | 100.40           | 326.00            |
|    | 09/02/15 14:50:32                | 30240                     | 18.06                 | 5.62          | 0.91           | 2.08                   | 0.39                 | 100.40           | 326.00            |
|    | 09/02/15 14:51:02                | 30270                     | 18.12                 | 5.68          | 0.88           | 2.02                   | 0.38                 | 100.50           | 342.00            |
|    | 09/02/15 14:51:32                | 30300                     | 17.20                 | 5.26          | 0.52           | 2.61                   | 0.38                 | 100.50           | 342.00            |
|    | 09/02/15 14:52:02                | 30330                     | 16.32                 | 3.64          | 0.39           | 3.30                   | 1.11                 | 100.50           | 603.00            |
|    | 09/02/15 14:52:32                | 30360                     | 16.34                 | 3.01          | 0.44           | 3.28                   | 1.11                 | 100.50           | 603.00            |
|    | 09/02/15 14:53:02                | 30390                     | 16.50                 | 2.78          | 0.42           | 3.18                   | 1.14                 | 100.10           | 605.00            |
|    | 09/02/15 14:53:32                | 30420                     | 16.53                 | 2.82          | 0.34           | 3.17                   | 1.14                 | 100.10           | 605.00            |
|    | 09/02/15 14:54:02                | 30450                     | 16.50                 | 3.04          | 0.34           | 3.17                   | 1.13                 | 99.70            | 589.00            |
|    | 09/02/15 14:54:32                | 30480                     | 16.40                 | 3.02          | 0.43           | 3.24                   | 1.13                 | 99.70            | 589.00            |
|    | 09/02/15 14:55:02                | 30510                     | 16.49                 | 3.02          | 0.36           | 3.20                   | 1.15                 | 99.30            | 590.00            |
|    | 09/02/15 14:55:32                | 30540                     | 16.39                 | 2.96          | 0.29           | 3.26                   | 1.15                 | 99.30            | 590.00            |
|    | 09/02/15 14:56:02                | 30570                     | 16.40                 | 3.14          | 0.31           | 3.22                   | 1.13                 | 98.90            | 590.00            |
|    | 09/02/15 14:56:32                | 30600                     | 16.39                 | 3.21          | 0.34           | 3.25                   | 1.13                 | 98.90            | 590.00            |
|    | 09/02/15 14:57:02                | 30630                     | 16.46                 | 3.11          | 0.32           | 3.21                   | 1.14                 | 98.70            | 574.00            |
|    | 09/02/15 14:57:32                | 30660                     | 16.60                 | 3.32          | 0.33           | 3.11                   | 1.14                 | 98.70            | 574.00            |
|    | 09/02/15 14:58:02                | 30690                     | 16.38                 | 3.17          | 0.36           | 3.24                   | 1.14                 | 98.40            | 590.00            |
|    | 09/02/15 14:58:32                | 30720                     | 16.10                 | 2.74          | 0.28           | 3.48                   | 1.14                 | 98.40            | 590.00            |
|    | 09/02/15 14:59:02                | 30750                     | 16.51                 | 2.61          | 0.29           | 3.18                   | 1.14                 | 98.10            | 607.00            |
|    | 09/02/15 14:59:32                | 30780                     | 16.62                 | 3.01          | 0.38           | 3.11                   | 1.14                 | 98.10            | 607.00            |
|    | 09/02/15 15:00:02                | 30810                     | 16.72                 | 2.55          | 0.37           | 3.04                   | 1.15                 | 97.90            | 608.00            |
|    | 09/02/15 15:00:32                | 30840                     | 16.65                 | 2.64          | 0.26           | 3.07                   | 1.15                 | 97.90            | 608.00            |
|    | 09/02/15 15:01:02                | 30870                     | 16.55                 | 2.64          | 0.22           | 3.15                   | 1.14                 | 97.60            | 591.00            |
|    | 09/02/15 15:01:32                | 30900                     | 16.73                 | 2.64          | 0.30           | 3.03                   | 1.14                 | 97.60            | 591.00            |
|    | 09/02/15 15:02:02                | 30930                     | 16.71                 | 2.81          | 0.30           | 3.05                   | 1.14                 | 97.40            | 591.00            |
|    | 09/02/15 15:02:32                | 30960                     | 16.82                 | 2.72          | 0.27           | 2.97                   | 1.14                 | 97.40            | 591.00            |
|    | 09/02/15 15:03:02                | 30990                     | 16.67                 | 2.76          | 0.25           | 3.07                   | 1.14                 | 97.10            | 608.00            |
|    | 09/02/15 15:03:32                | 31020                     | 16.80                 | 2.78          | 0.32           | 2.98                   | 1.14                 | 97.10            | 608.00            |
|    | 09/02/15 15:04:02                | 31050                     | 16.79                 | 2.70          | 0.36           | 2.99                   | 1.14                 | 96.90            | 592.00            |
|    | 09/02/15 15:04:32                | 31080                     | 16.77                 | 2.66          | 0.30           | 3.01                   | 1.14                 | 96.90            | 592.00            |
|    | 09/02/15 15:05:02                | 31110                     | 16.88                 | 2.63          | 0.26           | 2.95                   | 1.13                 | 96.60            | 576.00            |
|    | 09/02/15 15:05:32                | 31140                     | 17.73                 | 3.42          | 0.56           | 2.36                   | 1.13                 | 96.60            | 576.00            |
|    | 09/02/15 15:06:02                | 31170                     | 18.21                 | 4.69          | 0.71           | 1.96                   | 0.59                 | 96.50            | 381.00            |
|    | 09/02/15 15:06:32                | 31200                     | 18.13                 | 4.84          | 0.79           | 2.01                   | 0.59                 | 96.50            | 381.00            |
|    | 09/02/15 15:07:02                | 31230                     | 18.11                 | 5.40          | 0.69           | 2.04                   | 0.51                 | 96.70            | 379.00            |
|    | 09/02/15 15:07:32                | 31260                     | 18.08                 | 4.99          | 0.70           | 2.04                   | 0.51                 | 96.70            | 379.00            |
|    | 09/02/15 15:08:02                | 31290                     | 18.09                 | 5.12          | 0.82           | 2.04                   | 0.51                 | 97.00            | 347.00            |
| A2 | 09/02/15 15:08:32                | 31320                     | 18.06                 | 5.08          | 0.68           | 2.08                   | 0.51                 | 97.00            | 347.00            |
|    | 09/02/15 15:09:02                | 31350                     | 16.98                 | 4.83          | 0.33           | 2.76                   | 0.82                 | 97.20            | 469.00            |
|    | 09/02/15 15:09:32                | 31380                     | 15.56                 | 3.57          | 0.17           | 3.83                   | 0.82                 | 97.20            | 469.00            |
|    | 09/02/15 15:10:02                | 31410                     | 15.44                 | 2.97          | 0.27           | 3.94                   | 1.13                 | 97.30            | 591.00            |
|    | 09/02/15 15:10:32                | 31440                     | 15.41                 | 3.54          | 0.31           | 3.96                   | 1.13                 | 97.30            | 591.00            |
|    | 09/02/15 15:11:02                | 31470                     | 15.24                 | 3.54          | 0.20           | 4.07                   | 1.12                 | 97.30            | 575.00            |
|    | 09/02/15 15:11:32                | 31500                     | 15.31                 | 2.43          | 0.11           | 4.03                   | 1.12                 | 97.30            | 575.00            |
|    | 09/02/15 15:12:02                | 31530                     | 15.25                 | 2.34          | 0.12           | 4.08                   | 1.11                 | 97.30            | 591.00            |
|    | 09/02/15 15:12:32                | 31560                     | 15.30                 | 2.16          | 0.18           | 4.04                   | 1.11                 | 97.30            | 591.00            |
|    | 09/02/15 15:13:02                | 31590                     | 15.35                 | 2.11          | 0.19           | 4.01                   | 1.11                 | 97.40            | 590.00            |
|    | 09/02/15 15:13:32                | 31620                     | 15.42                 | 2.24          | 0.13           | 3.96                   | 1.11                 | 97.40            | 590.00            |
|    | 09/02/15 15:14:02                | 31650                     | 15.48                 | 2.33          | 0.15           | 3.91                   | 1.11                 | 97.30            | 591.00            |
|    | 09/02/15 15:14:32                | 31680                     | 15.48                 | 2.37          | 0.23           | 3.91                   | 1.11                 | 97.30            | 591.00            |
|    | 09/02/15 15:15:02                | 31710                     | 15.49                 | 2.38          | 0.24           | 3.90                   | 1.11                 | 97.30            | 574.00            |
|    | 09/02/15 15:15:32                | 31740                     | 15.50                 | 2.28          | 0.16           | 3.90                   | 1.11                 | 97.30            | 574.00            |
|    | 09/02/15 15:16:02                | 31770                     | 15.62                 | 2.24          | 0.12           | 3.80                   | 1.11                 | 97.20            | 591.00            |
|    | 09/02/15 15:16:32                | 31800                     | 15.47                 | 2.25          | 0.14           | 3.90                   | 1.11                 | 97.20            | 591.00            |
|    | 09/02/15 15:17:02                | 31830                     | 15.49                 | 2.88          | 0.15           | 3.90                   | 1.11                 | 97.00            | 591.00            |
|    | 09/02/15 15:17:32                | 31860                     | 15.48                 | 2.60          | 0.13           | 3.90                   | 1.11                 | 97.00            | 591.00            |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 3.5    | %    |
| Stack Exhaust Flow (M2) | 40,876 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.93    | in. Hg                       |
| Relative Humidity   | 12       | %                            |
| Ambient Temperature | 91       | °F                           |
| Specific Humidity   | 0.004427 | lb H <sub>2</sub> O / lb air |

30-70-30 Load, Run - EC36-2S R5

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
|    | 09/02/15 15:18:02                | 31890                     | 15.48                 | 2.63          | 0.11           | 3.91                   | 1.11                 | 96.90            | 591.00            |
|    | 09/02/15 15:18:32                | 31920                     | 15.48                 | 2.75          | 0.17           | 3.92                   | 1.11                 | 96.90            | 591.00            |
|    | 09/02/15 15:19:02                | 31950                     | 15.50                 | 2.62          | 0.22           | 3.88                   | 1.12                 | 96.70            | 575.00            |
|    | 09/02/15 15:19:32                | 31980                     | 15.59                 | 2.33          | 0.16           | 3.84                   | 1.12                 | 96.70            | 575.00            |
|    | 09/02/15 15:20:02                | 32010                     | 15.63                 | 2.21          | 0.10           | 3.77                   | 1.11                 | 96.50            | 591.00            |
|    | 09/02/15 15:20:32                | 32040                     | 15.58                 | 2.12          | 0.13           | 3.83                   | 1.11                 | 96.50            | 591.00            |
|    | 09/02/15 15:21:02                | 32070                     | 15.52                 | 2.25          | 0.21           | 3.86                   | 1.13                 | 96.30            | 592.00            |
|    | 09/02/15 15:21:32                | 32100                     | 15.46                 | 2.28          | 0.15           | 3.91                   | 1.13                 | 96.30            | 592.00            |
|    | 09/02/15 15:22:02                | 32130                     | 15.45                 | 2.23          | 0.14           | 3.92                   | 1.11                 | 96.10            | 592.00            |
|    | 09/02/15 15:22:32                | 32160                     | 16.42                 | 2.47          | 0.33           | 3.28                   | 1.11                 | 96.10            | 592.00            |
|    | 09/02/15 15:23:02                | 32190                     | 17.44                 | 4.44          | 0.57           | 2.54                   | 0.64                 | 96.00            | 399.00            |
|    | 09/02/15 15:23:32                | 32220                     | 17.75                 | 5.69          | 0.65           | 2.32                   | 0.64                 | 96.00            | 399.00            |
|    | 09/02/15 15:24:02                | 32250                     | 18.11                 | 5.46          | 0.68           | 2.02                   | 0.51                 | 96.10            | 363.00            |
|    | 09/02/15 15:24:32                | 32280                     | 17.99                 | 5.20          | 0.58           | 2.11                   | 0.51                 | 96.10            | 363.00            |
|    | 09/02/15 15:25:02                | 32310                     | 17.91                 | 5.18          | 0.61           | 2.18                   | 0.50                 | 96.30            | 347.00            |
|    | 09/02/15 15:25:32                | 32340                     | 17.99                 | 5.39          | 0.59           | 2.12                   | 0.50                 | 96.30            | 347.00            |
|    | 09/02/15 15:26:02                | 32370                     | 17.92                 | 5.26          | 0.55           | 2.16                   | 0.51                 | 96.40            | 347.00            |
|    | 09/02/15 15:26:32                | 32400                     | 17.65                 | 5.48          | 0.57           | 2.31                   | 0.51                 | 96.40            | 347.00            |
|    | 09/02/15 15:27:02                | 32430                     | 16.51                 | 4.65          | 0.39           | 3.16                   | 0.82                 | 96.50            | 470.00            |
|    | 09/02/15 15:27:32                | 32460                     | 16.39                 | 3.25          | 0.31           | 3.24                   | 0.82                 | 96.50            | 470.00            |
|    | 09/02/15 15:28:02                | 32490                     | 16.38                 | 3.43          | 0.20           | 3.24                   | 1.15                 | 96.20            | 593.00            |
| A3 | 09/02/15 15:28:32                | 32520                     | 16.43                 | 4.10          | 0.17           | 3.21                   | 1.15                 | 96.20            | 593.00            |
|    | 09/02/15 15:29:02                | 32550                     | 16.44                 | 5.05          | 0.22           | 3.21                   | 1.15                 | 96.00            | 594.00            |
|    | 09/02/15 15:29:32                | 32580                     | 16.47                 | 5.53          | 0.21           | 3.20                   | 1.15                 | 96.00            | 594.00            |
|    | 09/02/15 15:30:02                | 32610                     | 16.44                 | 5.46          | 0.17           | 3.21                   | 1.15                 | 95.70            | 594.00            |
|    | 09/02/15 15:30:32                | 32640                     | 16.29                 | 5.02          | 0.12           | 3.30                   | 1.15                 | 95.70            | 594.00            |
|    | 09/02/15 15:31:02                | 32670                     | 16.31                 | 4.30          | 0.18           | 3.30                   | 1.14                 | 95.40            | 594.00            |
|    | 09/02/15 15:31:32                | 32700                     | 16.25                 | 3.60          | 0.21           | 3.33                   | 1.14                 | 95.40            | 594.00            |
|    | 09/02/15 15:32:02                | 32730                     | 16.43                 | 3.39          | 0.18           | 3.22                   | 1.14                 | 95.20            | 594.00            |
|    | 09/02/15 15:32:32                | 32760                     | 16.39                 | 3.11          | 0.15           | 3.25                   | 1.14                 | 95.20            | 594.00            |
|    | 09/02/15 15:33:02                | 32790                     | 16.32                 | 3.36          | 0.15           | 3.28                   | 1.14                 | 95.10            | 594.00            |
|    | 09/02/15 15:33:32                | 32820                     | 16.41                 | 3.26          | 0.19           | 3.23                   | 1.14                 | 95.10            | 594.00            |
|    | 09/02/15 15:34:02                | 32850                     | 16.39                 | 2.88          | 0.15           | 3.24                   | 1.11                 | 95.00            | 577.00            |
|    | 09/02/15 15:34:32                | 32880                     | 16.26                 | 2.92          | 0.10           | 3.31                   | 1.11                 | 95.00            | 577.00            |
|    | 09/02/15 15:35:02                | 32910                     | 16.30                 | 3.36          | 0.18           | 3.30                   | 1.12                 | 94.90            | 594.00            |
|    | 09/02/15 15:35:32                | 32940                     | 16.27                 | 3.09          | 0.22           | 3.33                   | 1.12                 | 94.90            | 594.00            |
|    | 09/02/15 15:36:02                | 32970                     | 16.41                 | 2.53          | 0.19           | 3.23                   | 1.13                 | 94.80            | 594.00            |
|    | 09/02/15 15:36:32                | 33000                     | 16.42                 | 2.67          | 0.15           | 3.23                   | 1.13                 | 94.80            | 594.00            |
|    | 09/02/15 15:37:02                | 33030                     | 16.57                 | 2.70          | 0.15           | 3.11                   | 1.11                 | 94.70            | 577.00            |
|    | 09/02/15 15:37:32                | 33060                     | 16.52                 | 2.69          | 0.23           | 3.15                   | 1.11                 | 94.70            | 577.00            |
|    | 09/02/15 15:38:02                | 33090                     | 16.35                 | 2.81          | 0.21           | 3.26                   | 1.11                 | 94.60            | 577.00            |
|    | 09/02/15 15:38:32                | 33120                     | 16.43                 | 3.15          | 0.16           | 3.22                   | 1.11                 | 94.60            | 577.00            |
|    | 09/02/15 15:39:02                | 33150                     | 15.74                 | 3.29          | 0.13           | 3.68                   | 1.12                 | 94.50            | 577.00            |
|    | 09/02/15 15:39:32                | 33180                     | 16.57                 | 3.19          | 0.36           | 3.17                   | 1.12                 | 94.50            | 577.00            |
|    | 09/02/15 15:40:02                | 33210                     | 17.58                 | 4.56          | 0.50           | 2.44                   | 0.61                 | 94.50            | 399.00            |
|    | 09/02/15 15:40:32                | 33240                     | 17.62                 | 5.56          | 0.49           | 2.40                   | 0.61                 | 94.50            | 399.00            |
|    | 09/02/15 15:41:02                | 33270                     | 17.61                 | 5.65          | 0.57           | 2.40                   | 0.47                 | 94.70            | 348.00            |
|    | 09/02/15 15:41:32                | 33300                     | 17.58                 | 5.72          | 0.57           | 2.43                   | 0.47                 | 94.70            | 348.00            |
|    | 09/02/15 15:42:02                | 33330                     | 17.53                 | 5.91          | 0.51           | 2.45                   | 0.46                 | 95.00            | 347.00            |
|    | 09/02/15 15:42:32                | 33360                     | 17.54                 | 5.97          | 0.53           | 2.45                   | 0.46                 | 95.00            | 347.00            |
|    | 09/02/15 15:43:02                | 33390                     | 17.27                 | 6.02          | 0.53           | 2.56                   | 0.47                 | 95.10            | 331.00            |
|    | 09/02/15 15:43:32                | 33420                     | 15.29                 | 4.90          | 0.22           | 4.02                   | 0.47                 | 95.10            | 331.00            |
|    | 09/02/15 15:44:02                | 33450                     | 15.25                 | 2.92          | 0.14           | 4.06                   | 1.14                 | 95.10            | 594.00            |
|    | 09/02/15 15:44:32                | 33480                     | 15.28                 | 2.63          | 0.15           | 4.03                   | 1.14                 | 95.10            | 594.00            |
|    | 09/02/15 15:45:02                | 33510                     | 15.25                 | 2.63          | 0.22           | 4.07                   | 1.11                 | 94.80            | 593.00            |
|    | 09/02/15 15:45:32                | 33540                     | 15.11                 | 2.50          | 0.19           | 4.15                   | 1.11                 | 94.80            | 593.00            |
|    | 09/02/15 15:46:02                | 33570                     | 15.23                 | 2.36          | 0.15           | 4.07                   | 1.11                 | 94.50            | 593.00            |
|    | 09/02/15 15:46:32                | 33600                     | 15.12                 | 2.30          | 0.11           | 4.16                   | 1.11                 | 94.50            | 593.00            |
|    | 09/02/15 15:47:02                | 33630                     | 15.23                 | 2.26          | 0.23           | 4.07                   | 1.10                 | 94.30            | 577.00            |
|    | 09/02/15 15:47:32                | 33660                     | 15.21                 | 2.30          | 0.21           | 4.09                   | 1.10                 | 94.30            | 577.00            |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 3.5    | %    |
| Stack Exhaust Flow (M2) | 40,876 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.93    | in. Hg                       |
| Relative Humidity   | 12       | %                            |
| Ambient Temperature | 91       | °F                           |
| Specific Humidity   | 0.004427 | lb H <sub>2</sub> O / lb air |

30-70-30 Load, Run - EC36-2S R5

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| 09/02/15 15:48:02                | 33690                     | 15.33                 | 2.29          | 0.14           | 3.99                   | 1.11                 | 94.10            | 594.00            |
| 09/02/15 15:48:32                | 33720                     | 15.32                 | 2.30          | 0.18           | 4.02                   | 1.11                 | 94.10            | 594.00            |
| 09/02/15 15:49:02                | 33750                     | 15.39                 | 2.33          | 0.25           | 3.96                   | 1.10                 | 93.90            | 594.00            |
| 09/02/15 15:49:32                | 33780                     | 15.24                 | 2.26          | 0.34           | 4.07                   | 1.10                 | 93.90            | 594.00            |
| 09/02/15 15:50:02                | 33810                     | 15.26                 | 2.38          | 0.26           | 4.05                   | 1.13                 | 93.80            | 595.00            |
| 09/02/15 15:50:32                | 33840                     | 15.10                 | 2.47          | 0.16           | 4.15                   | 1.13                 | 93.80            | 595.00            |
| 09/02/15 15:51:02                | 33870                     | 15.08                 | 2.36          | 0.14           | 4.18                   | 1.11                 | 93.50            | 578.00            |
| 09/02/15 15:51:32                | 33900                     | 15.20                 | 2.33          | 0.18           | 4.09                   | 1.11                 | 93.50            | 578.00            |
| 09/02/15 15:52:02                | 33930                     | 15.15                 | 2.17          | 0.27           | 4.13                   | 1.11                 | 93.30            | 595.00            |
| 09/02/15 15:52:32                | 33960                     | 15.20                 | 2.13          | 0.24           | 4.10                   | 1.11                 | 93.30            | 595.00            |
| 09/02/15 15:53:02                | 33990                     | 15.21                 | 2.18          | 0.17           | 4.08                   | 1.11                 | 93.20            | 578.00            |
| 09/02/15 15:53:32                | 34020                     | 15.00                 | 2.14          | 0.15           | 4.23                   | 1.11                 | 93.20            | 578.00            |
| 09/02/15 15:54:02                | 34050                     | 15.19                 | 2.05          | 0.23           | 4.10                   | 1.12                 | 93.10            | 595.00            |
| 09/02/15 15:54:32                | 34080                     | 15.19                 | 2.19          | 0.27           | 4.09                   | 1.12                 | 93.10            | 595.00            |
| 09/02/15 15:55:02                | 34110                     | 15.31                 | 2.32          | 0.30           | 4.05                   | 0.50                 | 93.10            | 349.00            |
| 09/02/15 15:55:32                | 34140                     | 17.10                 | 3.55          | 0.60           | 2.80                   | 0.50                 | 93.10            | 349.00            |
| 09/02/15 15:56:02                | 34170                     | 17.55                 | 5.85          | 0.57           | 2.46                   | 0.47                 | 93.30            | 348.00            |
| 09/02/15 15:56:32                | 34200                     | 17.52                 | 6.00          | 0.63           | 2.48                   | 0.47                 | 93.30            | 348.00            |
| 09/02/15 15:57:02                | 34230                     | 17.49                 | 6.01          | 0.62           | 2.49                   | 0.47                 | 93.60            | 332.00            |
| 09/02/15 15:57:32                | 34260                     | 17.46                 | 6.12          | 0.58           | 2.52                   | 0.47                 | 93.60            | 332.00            |
| 09/02/15 15:58:02                | 34290                     | 17.47                 | 6.19          | 0.63           | 2.51                   | 0.47                 | 93.70            | 332.00            |
| <b>RAW AVERAGE</b>               |                           | <b>16.41</b>          | <b>3.51</b>   | <b>0.34</b>    | <b>3.24</b>            | <b>0.95</b>          | <b>96.31</b>     | <b>524.37</b>     |

| Bias                   | Serial Number:  | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Press. Trans<br>(in. H <sub>2</sub> O) | Temp. Trans.<br>(°F) | F-Flow Trans.<br>(SCFH) |
|------------------------|-----------------|-----------------------|---------------|----------------|------------------------|----------------------------------------|----------------------|-------------------------|
|                        | INSTO2-0011     | INST-CO-0022          | INST-TH-0002  | INST-C2-0013   | 1434717                | 1434717                                | 1434717              |                         |
|                        | Initial Zero    | 0.01                  | 0.21          | 0.12           | 0.01                   |                                        |                      |                         |
|                        | Final Zero      | -0.02                 | -0.14         | 0.04           | 0.04                   |                                        |                      |                         |
|                        | Avg. Zero       | -0.01                 | 0.04          | 0.08           | 0.03                   |                                        |                      |                         |
|                        | Initial UpScale | 11.89                 | 9.38          | 3.03           | 9.02                   |                                        |                      |                         |
|                        | Final UpScale   | 11.87                 | 9.47          | 2.97           | 9.03                   |                                        |                      |                         |
|                        | Avg. UpScale    | 11.88                 | 9.43          | 3.00           | 9.03                   |                                        |                      |                         |
| <b>Upscale Cal Gas</b> |                 | 11.91                 | 9.48          | 3.02           | 9.09                   |                                        |                      |                         |

| EMISSIONS DATA                          | O <sub>2</sub> | CO   | THC  | CO <sub>2</sub> |
|-----------------------------------------|----------------|------|------|-----------------|
| Corrected Raw Average (ppm/% dry basis) | 16.45          | 3.51 | 0.27 | 3.25            |
| Corrected Raw Average (ppm/% wet basis) | 15.87          | 3.39 | 0.26 | 3.14            |
| Emission Rate (lb/hr)                   | N/A            | 0.01 | 0.00 | N/A             |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 3.5    | %    |
| Stack Exhaust Flow (M2) | 38,278 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.90    | in. Hg                       |
| Relative Humidity   | 12       | %                            |
| Ambient Temperature | 93       | °F                           |
| Specific Humidity   | 0.004719 | lb H <sub>2</sub> O / lb air |

30-70-30 Load, Run - EC36-2S R6

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmwv) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| A1 | 09/02/15 16:26:02                | 35970                     | 18.13                 | 5.81          | 0.72           | 2.01                   | 0.43                 | 95.00            | 315.00            |
|    | 09/02/15 16:26:32                | 36000                     | 18.08                 | 5.80          | 0.68           | 2.05                   | 0.43                 | 95.00            | 315.00            |
|    | 09/02/15 16:27:02                | 36030                     | 18.13                 | 5.70          | 0.67           | 2.01                   | 0.43                 | 95.40            | 346.00            |
|    | 09/02/15 16:27:32                | 36060                     | 18.07                 | 5.77          | 0.80           | 2.06                   | 0.43                 | 95.40            | 346.00            |
|    | 09/02/15 16:28:02                | 36090                     | 18.09                 | 6.17          | 0.73           | 2.04                   | 0.44                 | 95.70            | 346.00            |
|    | 09/02/15 16:28:32                | 36120                     | 18.03                 | 6.05          | 0.75           | 2.09                   | 0.44                 | 95.70            | 346.00            |
|    | 09/02/15 16:29:02                | 36150                     | 16.73                 | 6.11          | 0.49           | 2.94                   | 0.79                 | 96.10            | 453.00            |
|    | 09/02/15 16:29:32                | 36180                     | 16.23                 | 4.93          | 0.44           | 3.35                   | 0.79                 | 96.10            | 453.00            |
|    | 09/02/15 16:30:02                | 36210                     | 16.27                 | 4.55          | 0.33           | 3.32                   | 1.14                 | 96.40            | 593.00            |
|    | 09/02/15 16:30:32                | 36240                     | 16.18                 | 3.79          | 0.26           | 3.38                   | 1.14                 | 96.40            | 593.00            |
|    | 09/02/15 16:31:02                | 36270                     | 16.30                 | 3.69          | 0.35           | 3.31                   | 1.14                 | 96.60            | 625.00            |
|    | 09/02/15 16:31:32                | 36300                     | 16.36                 | 3.46          | 0.39           | 3.26                   | 1.14                 | 96.60            | 625.00            |
|    | 09/02/15 16:32:02                | 36330                     | 16.38                 | 3.32          | 0.34           | 3.25                   | 1.12                 | 96.70            | 591.00            |
|    | 09/02/15 16:32:32                | 36360                     | 16.50                 | 3.10          | 0.31           | 3.17                   | 1.12                 | 96.70            | 591.00            |
|    | 09/02/15 16:33:02                | 36390                     | 16.42                 | 2.98          | 0.30           | 3.21                   | 1.12                 | 96.90            | 608.00            |
|    | 09/02/15 16:33:32                | 36420                     | 16.60                 | 2.94          | 0.41           | 3.10                   | 1.12                 | 96.90            | 608.00            |
|    | 09/02/15 16:34:02                | 36450                     | 16.63                 | 2.94          | 0.38           | 3.09                   | 1.12                 | 97.10            | 591.00            |
|    | 09/02/15 16:34:32                | 36480                     | 16.51                 | 3.08          | 0.33           | 3.16                   | 1.12                 | 97.10            | 591.00            |
|    | 09/02/15 16:35:02                | 36510                     | 16.57                 | 3.35          | 0.32           | 3.12                   | 1.13                 | 97.30            | 591.00            |
|    | 09/02/15 16:35:32                | 36540                     | 16.37                 | 3.59          | 0.40           | 3.26                   | 1.13                 | 97.30            | 591.00            |
|    | 09/02/15 16:36:02                | 36570                     | 16.53                 | 3.54          | 0.38           | 3.15                   | 1.11                 | 97.50            | 607.00            |
|    | 09/02/15 16:36:32                | 36600                     | 16.47                 | 3.45          | 0.31           | 3.19                   | 1.11                 | 97.50            | 607.00            |
|    | 09/02/15 16:37:02                | 36630                     | 16.48                 | 3.64          | 0.34           | 3.19                   | 1.10                 | 97.80            | 590.00            |
|    | 09/02/15 16:37:32                | 36660                     | 16.38                 | 3.47          | 0.38           | 3.26                   | 1.10                 | 97.80            | 590.00            |
|    | 09/02/15 16:38:02                | 36690                     | 16.51                 | 3.57          | 0.36           | 3.16                   | 1.10                 | 97.90            | 589.00            |
|    | 09/02/15 16:38:32                | 36720                     | 16.60                 | 3.86          | 0.32           | 3.10                   | 1.10                 | 97.90            | 589.00            |
|    | 09/02/15 16:39:02                | 36750                     | 16.48                 | 3.40          | 0.36           | 3.18                   | 1.10                 | 98.20            | 589.00            |
|    | 09/02/15 16:39:32                | 36780                     | 16.41                 | 3.05          | 0.44           | 3.22                   | 1.10                 | 98.20            | 589.00            |
|    | 09/02/15 16:40:02                | 36810                     | 16.57                 | 3.57          | 0.38           | 3.14                   | 1.12                 | 98.40            | 606.00            |
|    | 09/02/15 16:40:32                | 36840                     | 16.65                 | 3.32          | 0.37           | 3.07                   | 1.12                 | 98.40            | 606.00            |
|    | 09/02/15 16:41:02                | 36870                     | 16.65                 | 3.01          | 0.45           | 3.05                   | 1.12                 | 98.60            | 590.00            |
|    | 09/02/15 16:41:32                | 36900                     | 16.43                 | 2.87          | 0.38           | 3.20                   | 1.12                 | 98.60            | 590.00            |
|    | 09/02/15 16:42:02                | 36930                     | 16.35                 | 2.82          | 0.34           | 3.26                   | 1.11                 | 98.80            | 573.00            |
|    | 09/02/15 16:42:32                | 36960                     | 16.38                 | 2.87          | 0.42           | 3.23                   | 1.11                 | 98.80            | 573.00            |
|    | 09/02/15 16:43:02                | 36990                     | 16.78                 | 2.95          | 0.62           | 3.03                   | 1.07                 | 98.90            | 555.00            |
|    | 09/02/15 16:43:32                | 37020                     | 18.17                 | 3.96          | 0.81           | 1.98                   | 1.07                 | 98.90            | 555.00            |
|    | 09/02/15 16:44:02                | 37050                     | 18.19                 | 5.12          | 0.70           | 1.93                   | 0.46                 | 99.20            | 313.00            |
|    | 09/02/15 16:44:32                | 37080                     | 18.11                 | 5.35          | 0.71           | 2.01                   | 0.46                 | 99.20            | 313.00            |
|    | 09/02/15 16:45:02                | 37110                     | 18.15                 | 5.33          | 0.85           | 1.99                   | 0.45                 | 99.60            | 344.00            |
|    | 09/02/15 16:45:32                | 37140                     | 18.12                 | 5.37          | 0.92           | 1.99                   | 0.45                 | 99.60            | 344.00            |
| A2 | 09/02/15 16:46:02                | 37170                     | 18.05                 | 5.53          | 0.82           | 2.05                   | 0.45                 | 100.00           | 344.00            |
|    | 09/02/15 16:46:32                | 37200                     | 18.04                 | 5.70          | 0.70           | 2.07                   | 0.45                 | 100.00           | 344.00            |
|    | 09/02/15 16:47:02                | 37230                     | 17.02                 | 5.50          | 0.57           | 2.71                   | 0.72                 | 100.30           | 431.00            |
|    | 09/02/15 16:47:32                | 37260                     | 15.69                 | 3.92          | 0.49           | 3.72                   | 0.72                 | 100.30           | 431.00            |
|    | 09/02/15 16:48:02                | 37290                     | 15.66                 | 3.29          | 0.39           | 3.76                   | 1.15                 | 100.60           | 589.00            |
|    | 09/02/15 16:48:32                | 37320                     | 15.74                 | 3.67          | 0.35           | 3.70                   | 1.15                 | 100.60           | 589.00            |
|    | 09/02/15 16:49:02                | 37350                     | 15.67                 | 3.49          | 0.43           | 3.74                   | 1.16                 | 100.70           | 589.00            |
|    | 09/02/15 16:49:32                | 37380                     | 15.64                 | 2.80          | 0.50           | 3.76                   | 1.16                 | 100.70           | 589.00            |
|    | 09/02/15 16:50:02                | 37410                     | 15.68                 | 2.56          | 0.42           | 3.74                   | 1.16                 | 100.90           | 621.00            |
|    | 09/02/15 16:50:32                | 37440                     | 15.67                 | 2.40          | 0.36           | 3.74                   | 1.16                 | 100.90           | 621.00            |
|    | 09/02/15 16:51:02                | 37470                     | 15.70                 | 2.39          | 0.41           | 3.72                   | 1.16                 | 101.00           | 588.00            |
|    | 09/02/15 16:51:32                | 37500                     | 15.49                 | 2.38          | 0.61           | 3.88                   | 1.16                 | 101.00           | 588.00            |
|    | 09/02/15 16:52:02                | 37530                     | 15.58                 | 2.44          | 0.66           | 3.82                   | 1.16                 | 101.10           | 604.00            |
|    | 09/02/15 16:52:32                | 37560                     | 15.74                 | 2.43          | 0.51           | 3.70                   | 1.16                 | 101.10           | 604.00            |
|    | 09/02/15 16:53:02                | 37590                     | 15.56                 | 2.33          | 0.37           | 3.81                   | 1.17                 | 101.20           | 589.00            |
|    | 09/02/15 16:53:32                | 37620                     | 15.68                 | 2.29          | 0.38           | 3.74                   | 1.17                 | 101.20           | 589.00            |
|    | 09/02/15 16:54:02                | 37650                     | 15.69                 | 2.31          | 0.51           | 3.74                   | 1.17                 | 101.30           | 588.00            |
|    | 09/02/15 16:54:32                | 37680                     | 15.65                 | 2.21          | 0.53           | 3.76                   | 1.17                 | 101.30           | 588.00            |
|    | 09/02/15 16:55:02                | 37710                     | 15.65                 | 2.18          | 0.44           | 3.76                   | 1.17                 | 101.30           | 588.00            |
|    | 09/02/15 16:55:32                | 37740                     | 15.69                 | 2.17          | 0.34           | 3.73                   | 1.17                 | 101.30           | 588.00            |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 3.5    | %    |
| Stack Exhaust Flow (M2) | 38,278 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.90    | in. Hg                       |
| Relative Humidity   | 12       | %                            |
| Ambient Temperature | 93       | °F                           |
| Specific Humidity   | 0.004719 | lb H <sub>2</sub> O / lb air |

30-70-30 Load, Run - EC36-2S R6

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
|    | 09/02/15 16:56:02                | 37770                     | 15.74                 | 2.18          | 0.42           | 3.68                   | 1.17                 | 101.50           | 588.00            |
|    | 09/02/15 16:56:32                | 37800                     | 15.72                 | 2.19          | 0.56           | 3.72                   | 1.17                 | 101.50           | 588.00            |
|    | 09/02/15 16:57:02                | 37830                     | 15.65                 | 2.16          | 0.51           | 3.75                   | 1.17                 | 101.50           | 588.00            |
|    | 09/02/15 16:57:32                | 37860                     | 15.66                 | 2.18          | 0.40           | 3.75                   | 1.17                 | 101.50           | 588.00            |
|    | 09/02/15 16:58:02                | 37890                     | 15.74                 | 2.27          | 0.42           | 3.69                   | 1.16                 | 101.60           | 588.00            |
|    | 09/02/15 16:58:32                | 37920                     | 15.50                 | 2.19          | 0.53           | 3.87                   | 1.16                 | 101.60           | 588.00            |
|    | 09/02/15 16:59:02                | 37950                     | 15.59                 | 2.20          | 0.46           | 3.81                   | 1.16                 | 101.60           | 588.00            |
|    | 09/02/15 16:59:32                | 37980                     | 15.55                 | 2.27          | 0.37           | 3.83                   | 1.16                 | 101.60           | 588.00            |
|    | 09/02/15 17:00:02                | 38010                     | 15.65                 | 2.21          | 0.44           | 3.75                   | 1.16                 | 101.70           | 588.00            |
|    | 09/02/15 17:00:32                | 38040                     | 15.58                 | 2.10          | 0.55           | 3.81                   | 1.16                 | 101.70           | 588.00            |
|    | 09/02/15 17:01:02                | 38070                     | 16.90                 | 2.38          | 0.75           | 2.98                   | 0.85                 | 101.70           | 482.00            |
|    | 09/02/15 17:01:32                | 38100                     | 17.71                 | 4.56          | 0.80           | 2.32                   | 0.85                 | 101.70           | 482.00            |
|    | 09/02/15 17:02:02                | 38130                     | 17.39                 | 5.69          | 0.73           | 2.55                   | 0.49                 | 101.80           | 344.00            |
|    | 09/02/15 17:02:32                | 38160                     | 17.33                 | 5.93          | 0.81           | 2.61                   | 0.49                 | 101.80           | 344.00            |
|    | 09/02/15 17:03:02                | 38190                     | 17.43                 | 5.88          | 0.74           | 2.53                   | 0.48                 | 102.00           | 343.00            |
|    | 09/02/15 17:03:32                | 38220                     | 17.40                 | 5.65          | 0.68           | 2.56                   | 0.48                 | 102.00           | 343.00            |
|    | 09/02/15 17:04:02                | 38250                     | 17.50                 | 5.70          | 0.81           | 2.48                   | 0.48                 | 102.10           | 343.00            |
|    | 09/02/15 17:04:32                | 38280                     | 16.06                 | 5.69          | 0.71           | 3.41                   | 0.48                 | 102.10           | 343.00            |
|    | 09/02/15 17:05:02                | 38310                     | 15.30                 | 3.36          | 0.52           | 4.02                   | 1.14                 | 102.20           | 586.00            |
|    | 09/02/15 17:05:32                | 38340                     | 15.29                 | 2.62          | 0.38           | 4.03                   | 1.14                 | 102.20           | 586.00            |
|    | 09/02/15 17:06:02                | 38370                     | 15.51                 | 3.01          | 0.40           | 3.87                   | 1.15                 | 102.10           | 587.00            |
| A3 | 09/02/15 17:06:32                | 38400                     | 15.43                 | 3.20          | 0.51           | 3.92                   | 1.15                 | 102.10           | 587.00            |
|    | 09/02/15 17:07:02                | 38430                     | 15.42                 | 2.73          | 0.66           | 3.93                   | 1.14                 | 102.00           | 587.00            |
|    | 09/02/15 17:07:32                | 38460                     | 15.33                 | 2.38          | 0.54           | 3.99                   | 1.14                 | 102.00           | 587.00            |
|    | 09/02/15 17:08:02                | 38490                     | 15.32                 | 2.38          | 0.41           | 4.00                   | 1.14                 | 101.90           | 587.00            |
|    | 09/02/15 17:08:32                | 38520                     | 15.50                 | 2.30          | 0.44           | 3.93                   | 1.14                 | 101.90           | 587.00            |
|    | 09/02/15 17:09:02                | 38550                     | 15.98                 | 1.64          | 0.63           | 3.48                   | 1.15                 | 101.70           | 587.00            |
|    | 09/02/15 17:09:32                | 38580                     | 15.55                 | 1.26          | 0.57           | 3.83                   | 1.15                 | 101.70           | 587.00            |
|    | 09/02/15 17:10:02                | 38610                     | 15.81                 | 1.14          | 0.45           | 3.60                   | 1.14                 | 101.60           | 587.00            |
|    | 09/02/15 17:10:32                | 38640                     | 16.11                 | 1.09          | 0.50           | 3.46                   | 1.14                 | 101.60           | 587.00            |
|    | 09/02/15 17:11:02                | 38670                     | 15.65                 | 1.19          | 0.53           | 3.69                   | 1.14                 | 101.30           | 587.00            |
|    | 09/02/15 17:11:32                | 38700                     | 15.18                 | 1.39          | 0.58           | 4.09                   | 1.14                 | 101.30           | 587.00            |
|    | 09/02/15 17:12:02                | 38730                     | 15.35                 | 1.39          | 0.52           | 3.98                   | 1.14                 | 100.90           | 604.00            |
|    | 09/02/15 17:12:32                | 38760                     | 15.16                 | 1.33          | 0.40           | 4.07                   | 1.14                 | 100.90           | 604.00            |
|    | 09/02/15 17:13:02                | 38790                     | 15.03                 | 1.35          | 0.42           | 4.22                   | 1.13                 | 100.60           | 588.00            |
|    | 09/02/15 17:13:32                | 38820                     | 15.45                 | 1.36          | 0.56           | 3.90                   | 1.13                 | 100.60           | 588.00            |
|    | 09/02/15 17:14:02                | 38850                     | 15.35                 | 1.38          | 0.46           | 3.96                   | 1.12                 | 100.20           | 604.00            |
|    | 09/02/15 17:14:32                | 38880                     | 15.19                 | 1.33          | 0.38           | 4.09                   | 1.12                 | 100.20           | 604.00            |
|    | 09/02/15 17:15:02                | 38910                     | 15.70                 | 1.38          | 0.47           | 3.75                   | 1.12                 | 99.70            | 588.00            |
|    | 09/02/15 17:15:32                | 38940                     | 15.48                 | 1.27          | 0.54           | 3.84                   | 1.12                 | 99.70            | 588.00            |
|    | 09/02/15 17:16:02                | 38970                     | 15.55                 | 1.20          | 0.50           | 3.84                   | 1.11                 | 99.40            | 605.00            |
|    | 09/02/15 17:16:32                | 39000                     | 16.42                 | 1.54          | 0.50           | 3.27                   | 1.11                 | 99.40            | 605.00            |
|    | 09/02/15 17:17:02                | 39030                     | 17.15                 | 3.47          | 0.63           | 2.75                   | 0.60                 | 99.00            | 396.00            |
|    | 09/02/15 17:17:32                | 39060                     | 17.53                 | 5.15          | 0.79           | 2.44                   | 0.60                 | 99.00            | 396.00            |
|    | 09/02/15 17:18:02                | 39090                     | 17.61                 | 5.69          | 0.72           | 2.38                   | 0.44                 | 98.90            | 313.00            |
|    | 09/02/15 17:18:32                | 39120                     | 17.58                 | 5.71          | 0.73           | 2.41                   | 0.44                 | 98.90            | 313.00            |
|    | 09/02/15 17:19:02                | 39150                     | 17.55                 | 5.93          | 0.80           | 2.43                   | 0.44                 | 98.80            | 313.00            |
|    | 09/02/15 17:19:32                | 39180                     | 17.53                 | 6.07          | 0.90           | 2.43                   | 0.44                 | 98.80            | 313.00            |
|    | 09/02/15 17:20:02                | 39210                     | 17.58                 | 6.16          | 0.83           | 2.43                   | 0.44                 | 98.70            | 313.00            |
|    | 09/02/15 17:20:32                | 39240                     | 17.55                 | 6.03          | 0.69           | 2.37                   | 0.44                 | 98.70            | 313.00            |
|    | 09/02/15 17:21:02                | 39270                     | 15.64                 | 4.68          | 0.43           | 3.72                   | 0.78                 | 98.50            | 451.00            |
|    | 09/02/15 17:21:32                | 39300                     | 15.32                 | 2.24          | 0.50           | 3.99                   | 0.78                 | 98.50            | 451.00            |
|    | 09/02/15 17:22:02                | 39330                     | 15.33                 | 1.92          | 0.47           | 3.98                   | 1.11                 | 97.90            | 606.00            |
|    | 09/02/15 17:22:32                | 39360                     | 15.63                 | 1.79          | 0.41           | 3.76                   | 1.11                 | 97.90            | 606.00            |
|    | 09/02/15 17:23:02                | 39390                     | 15.48                 | 1.67          | 0.42           | 3.88                   | 1.09                 | 97.20            | 574.00            |
|    | 09/02/15 17:23:32                | 39420                     | 15.34                 | 1.73          | 0.52           | 3.98                   | 1.09                 | 97.20            | 574.00            |
|    | 09/02/15 17:24:02                | 39450                     | 15.68                 | 1.66          | 0.55           | 3.75                   | 1.09                 | 96.60            | 590.00            |
|    | 09/02/15 17:24:32                | 39480                     | 15.54                 | 1.56          | 0.44           | 3.82                   | 1.09                 | 96.60            | 590.00            |
|    | 09/02/15 17:25:02                | 39510                     | 15.56                 | 1.55          | 0.41           | 3.81                   | 1.09                 | 95.90            | 575.00            |
|    | 09/02/15 17:25:32                | 39540                     | 15.83                 | 1.50          | 0.47           | 3.61                   | 1.09                 | 95.90            | 575.00            |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 3.5    | %    |
| Stack Exhaust Flow (M2) | 38,278 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.90    | in. Hg                       |
| Relative Humidity   | 12       | %                            |
| Ambient Temperature | 93       | °F                           |
| Specific Humidity   | 0.004719 | lb H <sub>2</sub> O / lb air |

30-70-30 Load, Run - EC36-2S R6

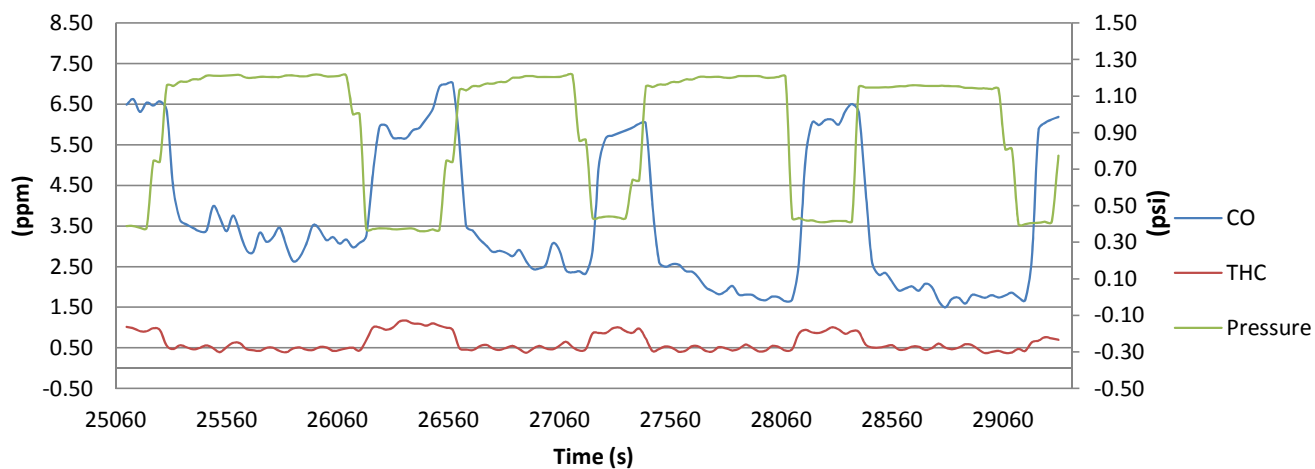
| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| 09/02/15 17:26:02                | 39570                     | 15.65                 | 1.43          | 0.54           | 3.75                   | 1.10                 | 95.40            | 576.00            |
| 09/02/15 17:26:32                | 39600                     | 15.88                 | 1.45          | 0.49           | 3.62                   | 1.10                 | 95.40            | 576.00            |
| 09/02/15 17:27:02                | 39630                     | 16.25                 | 1.31          | 0.48           | 3.30                   | 1.10                 | 94.90            | 593.00            |
| 09/02/15 17:27:32                | 39660                     | 16.27                 | 1.20          | 0.56           | 3.29                   | 1.10                 | 94.90            | 593.00            |
| 09/02/15 17:28:02                | 39690                     | 15.97                 | 1.26          | 0.53           | 3.49                   | 1.09                 | 94.40            | 576.00            |
| 09/02/15 17:28:32                | 39720                     | 15.63                 | 1.38          | 0.42           | 3.76                   | 1.09                 | 94.40            | 576.00            |
| 09/02/15 17:29:02                | 39750                     | 15.59                 | 1.43          | 0.38           | 3.77                   | 1.12                 | 93.40            | 595.00            |
| 09/02/15 17:29:32                | 39780                     | 15.38                 | 1.43          | 0.41           | 3.96                   | 1.12                 | 93.40            | 595.00            |
| 09/02/15 17:30:02                | 39810                     | 15.63                 | 1.46          | 0.55           | 3.73                   | 1.11                 | 93.00            | 579.00            |
| 09/02/15 17:30:32                | 39840                     | 15.44                 | 1.45          | 0.49           | 3.90                   | 1.11                 | 93.00            | 579.00            |
| 09/02/15 17:31:02                | 39870                     | 15.44                 | 1.37          | 0.39           | 3.89                   | 1.11                 | 92.60            | 596.00            |
| 09/02/15 17:31:32                | 39900                     | 15.42                 | 1.45          | 0.33           | 3.89                   | 1.11                 | 92.60            | 596.00            |
| 09/02/15 17:32:02                | 39930                     | 15.14                 | 1.47          | 0.39           | 4.13                   | 0.48                 | 92.40            | 349.00            |
| 09/02/15 17:32:32                | 39960                     | 16.70                 | 1.74          | 0.70           | 3.10                   | 0.48                 | 92.40            | 349.00            |
| 09/02/15 17:33:02                | 39990                     | 17.71                 | 4.19          | 0.76           | 2.30                   | 0.46                 | 92.50            | 349.00            |
| 09/02/15 17:33:32                | 40020                     | 17.52                 | 5.31          | 0.65           | 2.44                   | 0.46                 | 92.50            | 349.00            |
| 09/02/15 17:34:02                | 40050                     | 17.37                 | 5.67          | 0.58           | 2.56                   | 0.46                 | 92.60            | 333.00            |
| 09/02/15 17:34:32                | 40080                     | 17.46                 | 5.94          | 0.66           | 2.49                   | 0.46                 | 92.60            | 333.00            |
| 09/02/15 17:35:02                | 40110                     | 17.62                 | 5.74          | 0.78           | 2.39                   | 0.45                 | 92.70            | 348.00            |
| 09/02/15 17:35:32                | 40140                     | 17.73                 | 5.68          | 0.79           | 2.31                   | 0.45                 | 92.70            | 348.00            |
| 09/02/15 17:36:02                | 40170                     | 17.72                 | 5.51          | 0.70           | 2.30                   | 0.45                 | 92.60            | 333.00            |
| <b>RAW AVERAGE</b>               |                           | <b>16.32</b>          | <b>3.21</b>   | <b>0.52</b>    | <b>3.29</b>            | <b>0.94</b>          | <b>98.54</b>     | <b>520.38</b>     |

| Bias                   | Serial Number:  | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Press. Trans<br>(in. H <sub>2</sub> O) | Temp. Trans.<br>(°F) | F-Flow Trans.<br>(SCFH) |
|------------------------|-----------------|-----------------------|---------------|----------------|------------------------|----------------------------------------|----------------------|-------------------------|
|                        | INSTO2-0011     | INST-CO-0022          | INST-TH-0002  | INST-C2-0013   | 1434717                | 1434717                                | 1434717              |                         |
|                        | Initial Zero    | -0.02                 | -0.14         | 0.04           | 0.04                   |                                        |                      |                         |
|                        | Final Zero      | -0.02                 | 0.08          | 0.00           | 0.05                   |                                        |                      |                         |
|                        | Avg. Zero       | -0.02                 | -0.03         | 0.02           | 0.05                   |                                        |                      |                         |
|                        | Initial UpScale | 11.89                 | 9.38          | 3.03           | 9.02                   |                                        |                      |                         |
|                        | Final UpScale   | 11.85                 | 9.37          | 3.04           | 9.01                   |                                        |                      |                         |
|                        | Avg. UpScale    | 11.87                 | 9.38          | 3.04           | 9.02                   |                                        |                      |                         |
| <b>Upscale Cal Gas</b> |                 | 11.91                 | 9.48          | 3.02           | 9.09                   |                                        |                      |                         |

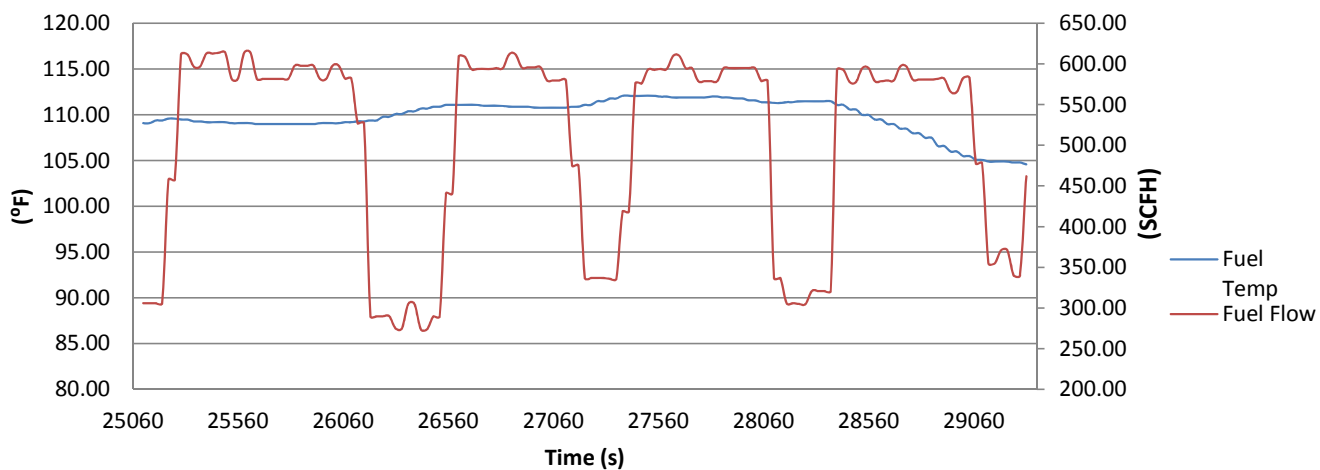
| EMISSIONS DATA                          | O <sub>2</sub> | CO   | THC  | CO <sub>2</sub> |
|-----------------------------------------|----------------|------|------|-----------------|
| Corrected Raw Average (ppm/% dry basis) | 16.37          | 3.27 | 0.51 | 3.28            |
| Corrected Raw Average (ppm/% wet basis) | 15.80          | 3.15 | 0.49 | 3.17            |
| Emission Rate (lb/hr)                   | N/A            | 0.01 | 0.00 | N/A             |



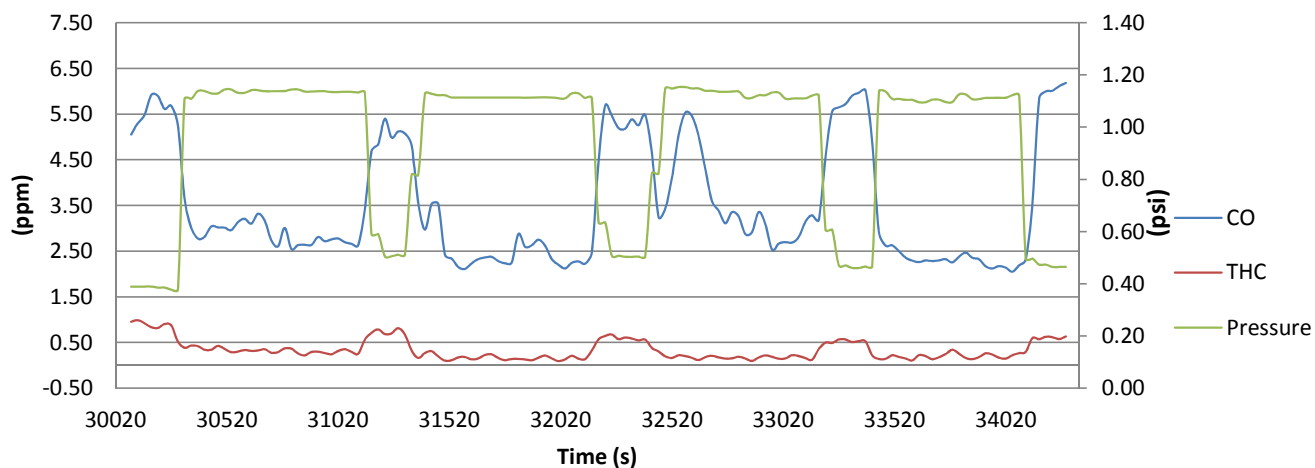
### EC36-2S R4



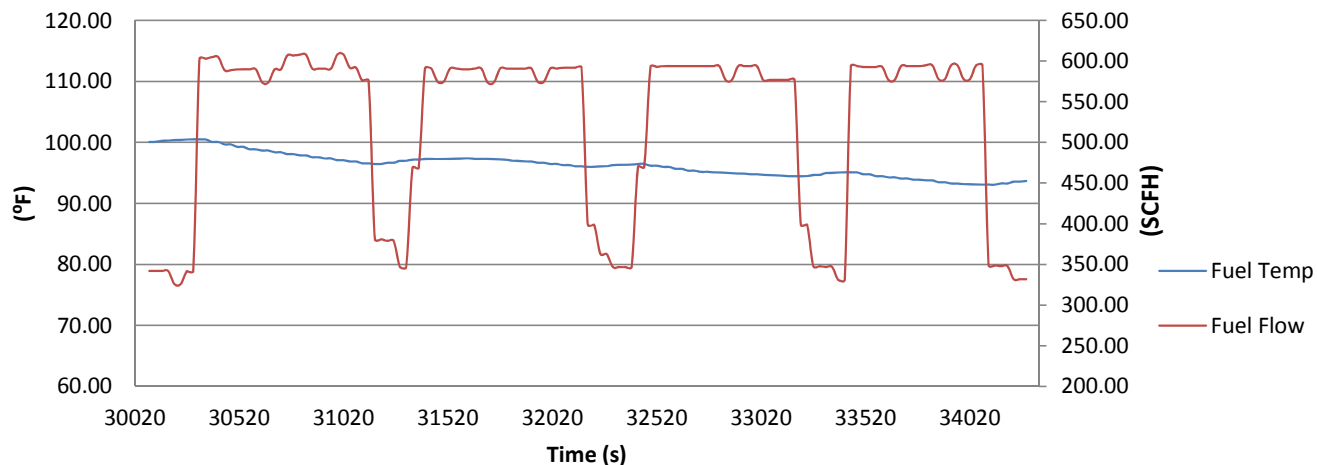
### EC36-2S R4



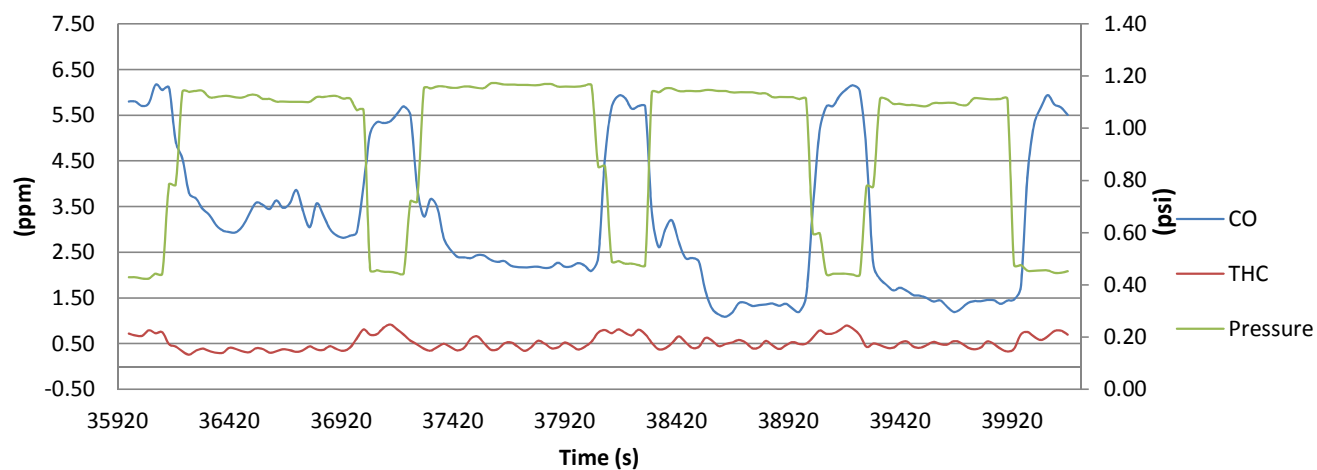
### EC36-2S R5



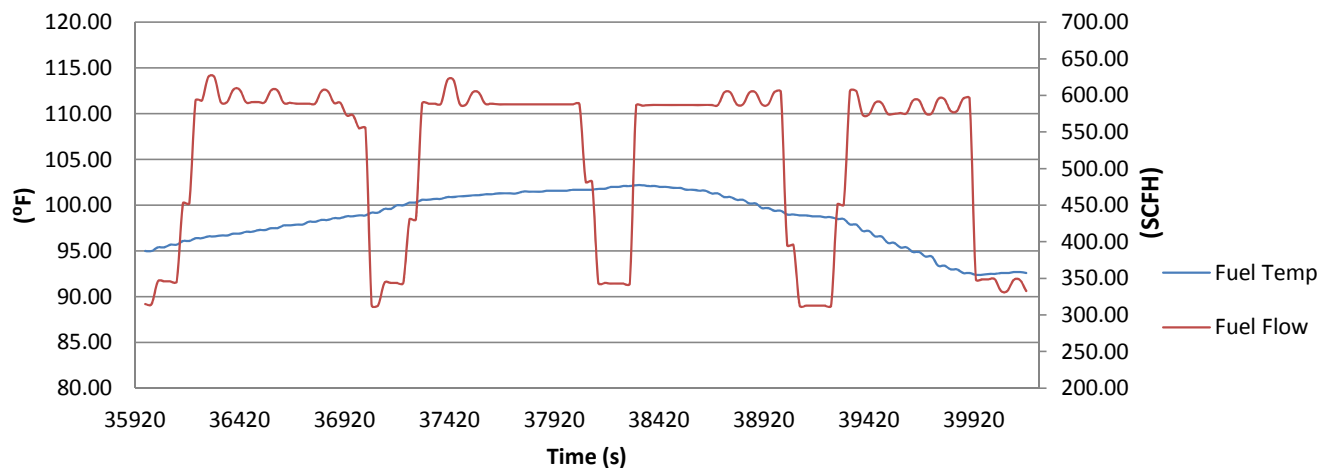
EC36-2S R5



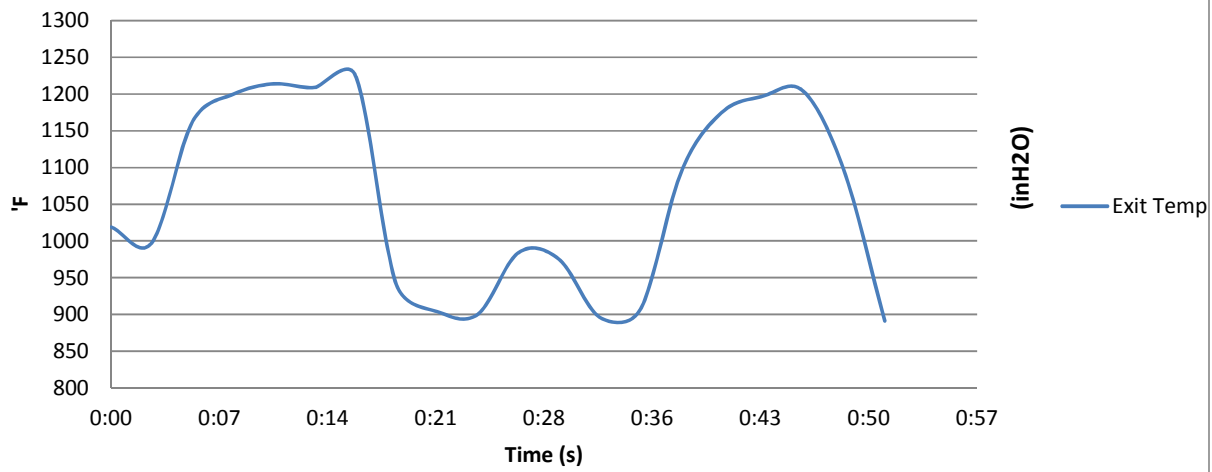
EC36-2S R6



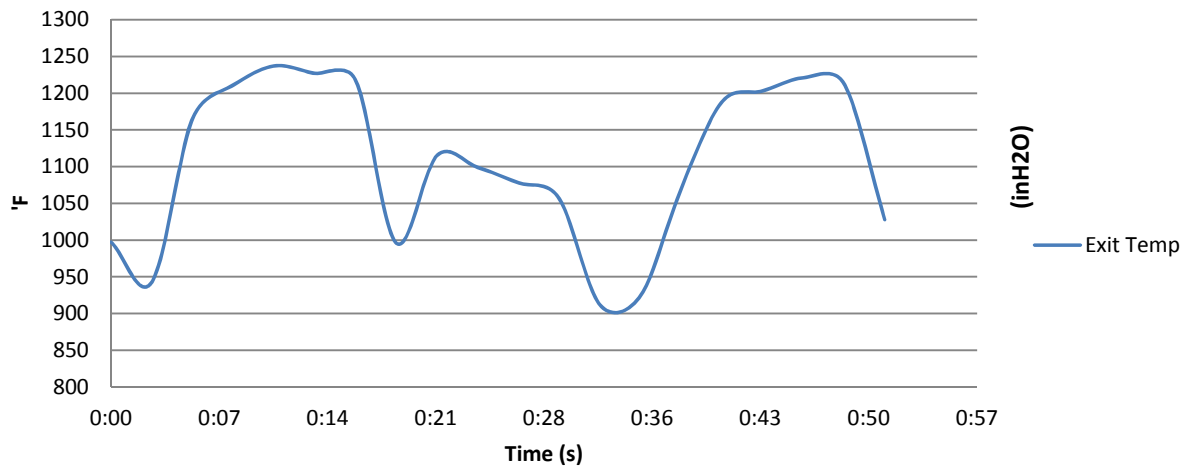
EC36-2S R6



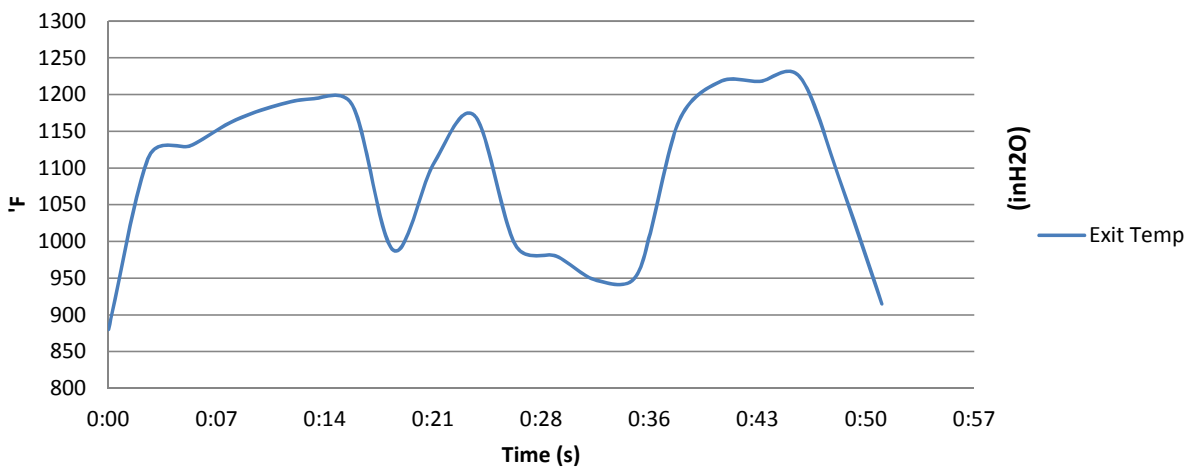
EC36 R4



EC36 R5



EC36 R6



## **EMISSION DATA RECORDS**

**70-100-70% Ramp-up, Ramp-down Unit Operations Data**

**METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE**

| Source Information |                   |
|--------------------|-------------------|
| Plant Name         | Loveland Facility |
| Sampling Location  | EC-36-2S          |
| Fuel Type          | Gas, Propene      |

| Test Information          |              |                            |         |
|---------------------------|--------------|----------------------------|---------|
| Project #                 |              | leed-15-brighton.co-comp#1 |         |
| Operator                  |              | TP                         |         |
| Date for Preliminary Run  | (mm/dd/yy)   | 09/01/15                   |         |
| Standard Temperature      |              | 68                         | °F      |
| Standard Pressure         |              | 29.92                      | in Hg   |
| Required Sample Vol.      | RM4, 8.1.1.2 | 21                         | scf     |
| Run Duration              | ≤0.75 cfm    | 65                         | minutes |
| Unit Number               |              | 1                          |         |
| Base Run Number           |              | 70-100-70%                 |         |
| Number of Ports Available |              | 2                          |         |
| Number of Ports Used      |              | 2                          |         |
| Port Inside Diameter      |              | 3.00                       | in      |
| Stack Shape               |              | Circular                   |         |

| Test Equipment Information       |                    |              |              |              |                     |
|----------------------------------|--------------------|--------------|--------------|--------------|---------------------|
| Run                              |                    | 1            | 2            | 3            |                     |
| Test Date                        | (mm/dd/yy)         | 09/02/15     | 09/02/15     | 09/02/15     |                     |
| Load                             | % or w/DB          | 70-100-70    | 70-100-70    | 70-100-70    |                     |
| Meter Box Number                 | from ACS           | SAMP-CP-0007 | SAMP-CP-0007 | SAMP-CP-0007 |                     |
| Meter Calibration Factor         | (Y)                | 0.980        | 0.980        | 0.980        |                     |
| Orifice Meter Coefficient        | ( $\Delta H_{@}$ ) | 1.656        | 1.656        | 1.656        | in H <sub>2</sub> O |
| Pitot Identification             | from ACS           | 4174         | 4174         | 4174         |                     |
| Pitot Tube Coefficient           | (C <sub>p</sub> )  | 0.819        | 0.819        | 0.819        |                     |
| Probe Number                     | from ACS           | SAMP-PF-0001 | SAMP-SP-0001 | SAMP-SP-0001 |                     |
| Probe Length                     |                    | 60.0         | 60.0         | 60.0         | in                  |
| (SS, Glass .... ) Liner Material | from list          | inconel      | inconel      | inconel      |                     |
| Impinger Case Number             | from ACS           | SAMP-BC-0002 | SAMP-BC-0002 | SAMP-BC-0002 |                     |

| Testing Company Information |                                                   |
|-----------------------------|---------------------------------------------------|
| Company Name                | Air Hygiene International, Inc. (Tulsa, Oklahoma) |
| Address                     | 1600 W Tacoma Street                              |
| City, State Zip             | Broken Arrow, Oklahoma 74012                      |
| Project Manager             | Min Sum Lee                                       |
| Phone Number                | (918) 307-8865                                    |
| Fax Number                  | (918) 307-9131                                    |

**METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] - RESULTS**

|                          |                            |
|--------------------------|----------------------------|
| <b>Plant Name</b>        | Loveland Facility          |
| <b>Sampling Location</b> | EC-36-2S                   |
| <b>Project #</b>         | leed-15-brighton.co-comp#1 |

| <b>Historical Data</b>             | <b>70-100-70%-1</b> | <b>70-100-70%-2</b> | <b>70-100-70%-3</b> | <b>Average</b> | <b>Units</b>           |
|------------------------------------|---------------------|---------------------|---------------------|----------------|------------------------|
| Run Start Time                     | 08:28               | 09:50               | 11:10               |                | hh:mm                  |
| Run Stop Time                      | 09:38               | 11:00               | 12:20               |                | hh:mm                  |
| Test Date                          | 09/02/15            | 09/02/15            | 09/02/15            |                | mm/dd/yy               |
| Meter Calibration Factor           | 0.980               | 0.980               | 0.980               |                |                        |
| Pitot Tube Coefficient             | 0.819               | 0.819               | 0.819               |                |                        |
| Initial Meter Volume               | 968.380             | 21.325              | 75.175              |                | ft <sup>3</sup>        |
| Final Meter Volume                 | 1021.165            | 75.020              | 128.500             |                | ft <sup>3</sup>        |
| Total Meter Volume                 | 52.785              | 53.695              | 53.325              | 53.268         | ft <sup>3</sup>        |
| Total Sampling Time                | 65.00               | 65.00               | 65.00               | 65.00          | min                    |
| Average Meter Temperature          | 74.96               | 80.98               | 82.38               | 79.44          | °F                     |
| Average Stack Temperature          | 1503.17             | 1381.08             | 1376.17             | 1420.14        | °F                     |
| Barometric Pressure                | 25.00               | 25.00               | 24.99               | 25.00          | in Hg                  |
| Stack Static Pressure              | 0.00                | 0.00                | 0.00                | 0.00           | in H <sub>2</sub> O    |
| Absolute Stack Pressure            | 25.00               | 25.00               | 24.99               | 25.00          | in Hg                  |
| Average Orifice Pressure Drop      | 1.70                | 1.70                | 1.70                | 1.70           | in H <sub>2</sub> O    |
| Absolute Meter Pressure            | 25.12               | 25.12               | 25.11               | 25.12          | in Hg                  |
| Avg Square Root Pitot Pressure     | 0.13                | 0.13                | 0.12                | 0.13           | √(in H <sub>2</sub> O) |
| <b>Moisture Content Data</b>       | <b>70-100-70%-1</b> | <b>70-100-70%-2</b> | <b>70-100-70%-3</b> | <b>Average</b> | <b>Units</b>           |
| Impinger Water Weight Gain         | 43.80               | 34.30               | 34.30               | 37.47          | g                      |
| Silica Gel Weight Gain             | 10.00               | 13.20               | 13.30               | 12.17          | g                      |
| Total Water Volume Collected       | 53.90               | 47.59               | 47.69               | 49.72          | ml                     |
| Standard Water Vapor Volume        | 2.54                | 2.24                | 2.24                | 2.34           | scf                    |
| Standard Meter Volume              | 42.9                | 43.1                | 42.7                | 42.9           | dscf                   |
| Calculated Stack Moisture          | 5.59                | 4.94                | 4.99                | 5.17           | %                      |
| Saturated Stack Moisture           | 100.00              | 100.00              | 100.00              | 100.00         | %                      |
| Reported Stack Moisture Content    | 5.59                | 4.94                | 4.99                | 5.17           | %                      |
| <b>Method 3C Gas Analysis Data</b> | <b>70-100-70%-1</b> | <b>70-100-70%-2</b> | <b>70-100-70%-3</b> | <b>Average</b> | <b>Units</b>           |
| Carbon Dioxide Content             | 5.6                 | 5.4                 | 5.5                 | 5.5            | %                      |
| Oxygen Content                     | 14.5                | 14.7                | 14.5                | 14.6           | %                      |
| Nitrogen Content                   | 79.9                | 79.9                | 80.0                | 79.9           | %                      |
| Stack Dry Molecular Weight         | 29.47               | 29.45               | 29.46               | 29.46          | lb/lb-mole             |
| Stack Wet Molecular Weight         | 28.83               | 28.88               | 28.89               | 28.87          | lb/lb-mole             |
| Percent Excess Air                 | 219.7               | 229.7               | 219.3               | 222.9          | %                      |
| <b>Volumetric Flow Rate Data</b>   | <b>70-100-70%-1</b> | <b>70-100-70%-2</b> | <b>70-100-70%-3</b> | <b>Average</b> | <b>Units</b>           |
| Average Stack Gas Velocity         | 14.90               | 14.10               | 13.68               | 14.23          | ft/sec                 |
| Stack Cross-Sectional Area         | 4.75                | 4.75                | 4.75                | 4.75           | ft <sup>2</sup>        |
| Actual Stack Flow Rate             | 4,242               | 4,016               | 3,897               | 4,052          | acfm                   |
| Wet Standard Stack Flow Rate       | 57                  | 58                  | 56                  | 57             | wkscfh                 |
| Dry Standard Stack Flow Rate       | 54,008              | 54,888              | 53,348              | 54,081         | dscfh                  |

**METHOD 3C - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER**

|                          |                            |                         |          |                         |     |
|--------------------------|----------------------------|-------------------------|----------|-------------------------|-----|
| <b>Plant Name</b>        | Loveland Facility          | <b>Preliminary Date</b> | 09/01/15 |                         |     |
| <b>Sampling Location</b> | EC-36-2S                   | <b>Operator</b>         | TP       |                         |     |
| <b>Project #</b>         | leed-15-brighton.co-comp#1 | <b># of Ports Used</b>  | 2        |                         |     |
| <b>Fuel Type</b>         | Gas, Propene               | <b>Min. Fuel Factor</b> | N/A      | <b>Max. Fuel Factor</b> | N/A |

| Gas Analysis Data           |                             |                            |                       |                            |                             |                                  |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | 70-100-70%-1                |                            | <b>Date</b>           | 09/02/15                   | <b>Run Start Time</b>       | 08:28                            | <b>Run Stop Time</b> | 09:38                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>Methane Conc.</b>  | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b>    | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCH <sub>4</sub> ) | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (F <sub>o</sub> ) <sub>avg</sub> | (%EA) <sub>avg</sub> |                             |
| hh:mm                       | %                           | %                          | ppm                   | %                          | lb/lb-mole                  |                                  | %                    |                             |
| 01:10                       | 5.6                         | 14.5                       | 0.0                   | 79.9                       | 29.47                       | 1.147                            | 219.7                | N/A                         |

| Gas Analysis Data           |                             |                            |                       |                            |                             |                                  |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | 70-100-70%-2                |                            | <b>Date</b>           | 09/02/15                   | <b>Run Start Time</b>       | 09:50                            | <b>Run Stop Time</b> | 11:00                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>Methane Conc.</b>  | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b>    | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCH <sub>4</sub> ) | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (F <sub>o</sub> ) <sub>avg</sub> | (%EA) <sub>avg</sub> |                             |
| hh:mm                       | %                           | %                          | ppm                   | %                          | lb/lb-mole                  |                                  | %                    |                             |
| 01:10                       | 5.4                         | 14.7                       | 0.0                   | 79.9                       | 29.45                       | 1.152                            | 229.7                | N/A                         |

| Gas Analysis Data           |                             |                            |                       |                            |                             |                                  |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | 70-100-70%-3                |                            | <b>Date</b>           | 09/02/15                   | <b>Run Start Time</b>       | 11:10                            | <b>Run Stop Time</b> | 12:20                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>Methane Conc.</b>  | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b>    | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCH <sub>4</sub> ) | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (F <sub>o</sub> ) <sub>avg</sub> | (%EA) <sub>avg</sub> |                             |
| hh:mm                       | %                           | %                          | ppm                   | %                          | lb/lb-mole                  |                                  | %                    |                             |
| 01:10                       | 5.5                         | 14.5                       | 0.0                   | 80.0                       | 29.46                       | 1.157                            | 219.3                | N/A                         |

**METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES**

|                          |                            |                         |          |
|--------------------------|----------------------------|-------------------------|----------|
| <b>Plant Name</b>        | Loveland Facility          | <b>Preliminary Date</b> | 09/01/15 |
| <b>Sampling Location</b> | EC-36-2S                   | <b>Operator</b>         | TP       |
| <b>Project #</b>         | leed-15-brighton.co-comp#1 | <b>Ports Used</b>       | 2        |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | 70-100-70%-1                        |                   | <b>Date</b>       | 09/02/15                      | <b>Start Time</b>            | 08:28                  | <b>Stop Time</b>  | 09:38               |
| <b>Meter Box Number</b>      | SAMP-CP-0007                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.980             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 52.785            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 25.00             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 1503              | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.00              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 75                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.70              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | H <sub>2</sub> O                    | H <sub>2</sub> O  | -                 | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 755.70            | 742.50            | 591.80                        | 893.00                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 726.90            | 730.50            | 588.80                        | 883.00                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 28.8              | 12.0              | 3.0                           | 10.0                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>f</sub> )                   | 53.80             | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 2.537                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 42.874            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 5.59              | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 5.59                   | %                 |                     |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | 70-100-70%-2                        |                   | <b>Date</b>       | 09/02/15                      | <b>Start Time</b>            | 09:50                  | <b>Stop Time</b>  | 11:00               |
| <b>Meter Box Number</b>      | SAMP-CP-0007                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.980             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 53.695            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 25.00             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 1381              | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.00              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 81                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.70              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | H <sub>2</sub> O                    | H <sub>2</sub> O  | -                 | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 776.70            | 752.70            | 594.90                        | 869.60                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 755.70            | 742.50            | 591.80                        | 856.40                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 21.0              | 10.2              | 3.1                           | 13.2                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>f</sub> )                   | 47.50             | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 2.240                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 43.128            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 4.94              | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 4.94                   | %                 |                     |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | 70-100-70%-3                        |                   | <b>Date</b>       | 09/02/15                      | <b>Start Time</b>            | 11:10                  | <b>Stop Time</b>  | 12:20               |
| <b>Meter Box Number</b>      | SAMP-CP-0007                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.980             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 53.325            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 24.99             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 1376              | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.00              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 82                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.70              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | H <sub>2</sub> O                    | H <sub>2</sub> O  | -                 | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 798.60            | 762.00            | 598.00                        | 882.90                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 776.70            | 752.70            | 594.90                        | 869.60                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 21.9              | 9.3               | 3.1                           | 13.3                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>f</sub> )                   | 47.60             | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 2.244                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 42.703            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 4.99              | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 4.99                   | %                 |                     |



METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | EC-36-2S                   |
| Project #         | leed-15-brighton.co-comp#1 |

|            |              |
|------------|--------------|
| Date       | 09/02/15     |
| Operator   | TP           |
| Run Number | 70-100-70%-1 |

| Leak Checks |       |          |                       |                         |       |
|-------------|-------|----------|-----------------------|-------------------------|-------|
| Train       | Pre   | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| PASS        | Post  | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| < 3.0       | Pitot | Pre (+)  | 0.090                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Pre (-)  | 0.095                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (+) | 0.150                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (-) | 0.175                 | in H <sub>2</sub> O for | 15.0  |

| Nozzle Measurements |  |  |  |      |
|---------------------|--|--|--|------|
| Pre                 |  |  |  | PASS |
| Post                |  |  |  | PASS |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 08:28 | End | 09:38 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 726.9 | 730.5 | 588.8 | 883.0 |       |       |       |       |
| Post    | 755.7 | 742.5 | 591.8 | 893.0 |       |       |       |       |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Pitot Coefficient                                 | (C <sub>p</sub> )                   | 0.819  |                     |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 1503.2 | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 75.0   |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.656  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.13   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 5.59   | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.47  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.75   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 |        |                     |

| Pressures               |                        |       |                     |
|-------------------------|------------------------|-------|---------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 25.00 | in Hg               |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.00  | in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 25.00 | in Hg               |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 25.12 | in Hg               |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Traverse Point # | Sampling Time (Θ) | Timer Time | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Snorkel Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (568°F) | Cond. Temp (≤-°F) | CPM Filter Temp (-±-°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (ΔP <sup>1/2</sup> ) | Local Stack Velocity (v <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|------------------|-------------------|------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-------------------------|------------------------|----------------------------|-------------------|-------------------------|-------------------------------------|--------------------------------------|-------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
|                  | min               | hh:mm:ss   | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                      | °F                     | °F                         | °F                | °F                      | °F                                  | °F                                   | in Hg       | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1              | 0.0               | 00:00:00   | 968.380                                 | 0.005               | 1.656                                 | 1.70                                 | 1325                         | 254                     |                        | 50                         |                   |                         | 75                                  | 65                                   | 3.5         | 0.07                                | 7.79                                   | 1.841                                                |                               | 44.173                                                |
| A-2              | 2.7               | 00:02:43   | 970.625                                 | 0.010               | 1.656                                 | 1.70                                 | 1358                         | 254                     |                        | 49                         |                   |                         | 76                                  | 65                                   | 3.5         | 0.10                                | 11.13                                  | 3.692                                                |                               | 44.300                                                |
| A-3              | 5.4               | 00:05:25   | 972.885                                 | 0.010               | 1.656                                 | 1.70                                 | 1625                         | 254                     |                        | 48                         |                   |                         | 77                                  | 66                                   | 3.5         | 0.10                                | 11.91                                  | 5.380                                                |                               | 43.039                                                |
| A-4              | 8.1               | 00:08:07   | 974.950                                 | 0.020               | 1.656                                 | 1.70                                 | 1661                         | 254                     |                        | 49                         |                   |                         | 78                                  | 67                                   | 3.5         | 0.14                                | 16.99                                  | 7.151                                                |                               | 42.903                                                |
| A-5              | 10.8              | 00:10:50   | 977.120                                 | 0.015               | 1.656                                 | 1.70                                 | 1680                         | 254                     |                        | 50                         |                   |                         | 78                                  | 67                                   | 3.5         | 0.12                                | 14.78                                  | 8.938                                                |                               | 42.900                                                |
| A-6              | 13.5              | 00:13:33   | 979.310                                 | 0.015               | 1.656                                 | 1.70                                 | 1685                         | 254                     |                        | 51                         |                   |                         | 79                                  | 68                                   | 3.5         | 0.12                                | 14.80                                  | 10.721                                               |                               | 42.885                                                |
| A-7              | 16.3              | 00:16:15   | 981.500                                 | 0.200               | 1.656                                 | 1.70                                 | 1691                         | 254                     |                        | 52                         |                   |                         | 80                                  | 69                                   | 3.5         | 0.45                                | 54.12                                  | 12.506                                               |                               | 42.876                                                |
| A-8              | 19.0              | 00:18:58   | 983.695                                 | 0.020               | 1.656                                 | 1.70                                 | 1582                         | 254                     |                        | 52                         |                   |                         | 80                                  | 70                                   | 3.5         | 0.14                                | 16.67                                  | 14.292                                               |                               | 42.877                                                |
| A-9              | 21.7              | 00:21:40   | 985.895                                 | 0.010               | 1.656                                 | 1.70                                 | 1512                         | 254                     |                        | 53                         |                   |                         | 80                                  | 71                                   | 3.5         | 0.10                                | 11.59                                  | 16.078                                               |                               | 42.873                                                |
| A-10             | 24.4              | 00:24:22   | 988.095                                 | 0.010               | 1.656                                 | 1.70                                 | 1575                         | 254                     |                        | 53                         |                   |                         | 81                                  | 71                                   | 3.5         | 0.10                                | 11.77                                  | 17.865                                               |                               | 42.876                                                |
| A-11             | 27.1              | 00:27:05   | 990.300                                 | 0.010               | 1.656                                 | 1.70                                 | 1573                         | 254                     |                        | 54                         |                   |                         | 81                                  | 73                                   | 3.5         | 0.10                                | 11.76                                  | 19.665                                               |                               | 42.906                                                |
| A-12             | 29.8              | 00:29:47   | 992.525                                 | 0.005               | 1.656                                 | 1.70                                 | 1556                         | 254                     |                        | 55                         |                   |                         | 82                                  | 74                                   | 3.5         | 0.07                                | 8.28                                   | 21.454                                               |                               | 42.909                                                |
| B-1              | 32.5              | 00:32:30   | 994.740                                 | 0.005               | 1.656                                 | 1.70                                 | 1364                         | 254                     |                        | 57                         |                   |                         | 79                                  | 75                                   | 3.5         | 0.07                                | 7.88                                   | 22.959                                               |                               | 42.386                                                |
| B-2              | 35.2              | 00:35:12   | 996.600                                 | 0.010               | 1.656                                 | 1.70                                 | 1348                         | 254                     |                        | 55                         |                   |                         | 80                                  | 75                                   | 3.5         | 0.10                                | 11.09                                  | 25.021                                               |                               | 42.893                                                |
| B-3              | 37.9              | 00:37:55   | 999.150                                 | 0.020               | 1.656                                 | 1.70                                 | 1525                         | 254                     |                        | 55                         |                   |                         | 80                                  | 75                                   | 3.5         | 0.14                                | 16.44                                  | 26.787                                               |                               | 42.859                                                |
| B-4              | 40.6              | 00:40:37   | 1001.335                                | 0.020               | 1.656                                 | 1.70                                 | 1548                         | 254                     |                        | 56                         |                   |                         | 79                                  | 75                                   | 3.5         | 0.14                                | 16.53                                  | 28.579                                               |                               | 42.869                                                |
| B-5              | 43.3              | 00:43:20   | 1003.550                                | 0.025               | 1.656                                 | 1.70                                 | 1562                         | 254                     |                        | 56                         |                   |                         | 79                                  | 75                                   | 3.5         | 0.16                                | 18.55                                  | 30.360                                               |                               | 42.861                                                |
| B-6              | 46.0              | 00:46:03   | 1005.750                                | 0.025               | 1.656                                 | 1.70                                 | 1549                         | 254                     |                        | 56                         |                   |                         | 78                                  | 74                                   | 3.5         | 0.16                                | 18.49                                  | 32.102                                               |                               | 42.803                                                |
| B-7              | 48.8              | 00:48:45   | 1007.900                                | 0.020               | 1.656                                 | 1.70                                 | 1331                         | 254                     |                        | 56                         |                   |                         | 78                                  | 74                                   | 3.5         | 0.14                                | 15.62                                  | 33.894                                               |                               | 42.813                                                |
| B-8              | 51.5              | 00:51:28   | 1010.110                                | 0.015               | 1.656                                 | 1.70                                 | 1257                         | 254                     |                        | 56                         |                   |                         | 77                                  | 73                                   | 3.5         | 0.12                                | 13.24                                  | 35.673                                               |                               | 42.807                                                |
| B-9              | 54.2              | 00:54:10   | 1012.300                                | 0.010               | 1.656                                 | 1.70                                 | 1487                         | 254                     |                        | 56                         |                   |                         | 78                                  | 73                                   | 3.5         | 0.10                                | 11.51                                  | 37.458                                               |                               | 42.809                                                |
| B-10             | 56.9              | 00:56:53   | 1014.500                                | 0.010               | 1.656                                 | 1.70                                 | 1431                         | 254                     |                        | 56                         |                   |                         | 77                                  | 73                                   | 3.5         | 0.10                                | 11.35                                  | 39.236                                               |                               | 42.803                                                |
| B-11             | 59.6              | 00:59:35   | 1016.690                                | 0.015               | 1.656                                 | 1.70                                 | 1433                         | 254                     |                        | 56                         |                   |                         | 77                                  | 72                                   | 3.5         | 0.12                                | 13.90                                  | 41.041                                               |                               | 42.826                                                |
| B-12             | 62.3              | 01:02:18   | 1018.910                                | 0.010               | 1.656                                 | 1.70                                 | 1418                         | 254                     |                        | 56                         |                   |                         | 77                                  | 72                                   | 3.5         | 0.10                                | 11.31                                  | 42.874                                               |                               | 42.874                                                |
| Last Pt          | 65.0              | 01:05:00   | 1021.165                                |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |
| Final Val        | 65.0              | 01:05:00   | 1021.165                                |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      | Max Vac     | 3.5                                 |                                        | Final Values                                         | 42.874                        |                                                       |
| Average Values   |                   |            |                                         | 0.02                |                                       | 1.70                                 | 1503                         | 254                     |                        | 54                         |                   |                         | 79                                  | 71                                   |             | 0.13                                | 14.90                                  |                                                      |                               |                                                       |
|                  |                   |            |                                         |                     |                                       |                                      |                              |                         |                        |                            |                   |                         | 75                                  |                                      |             |                                     |                                        |                                                      |                               |                                                       |

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | EC-36-2S                   |
| Project #         | leed-15-brighton.co-comp#1 |

|            |              |
|------------|--------------|
| Date       | 09/02/15     |
| Operator   | TP           |
| Run Number | 70-100-70%-2 |

| Leak Checks |       |          |                       |                         |       |
|-------------|-------|----------|-----------------------|-------------------------|-------|
| Train       | Pre   | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| PASS        | Post  | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| < 3.0       | Pitot | Pre (+)  | 0.125                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Pre (-)  | 0.145                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (+) | 0.100                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (-) | 0.115                 | in H <sub>2</sub> O for | 15.0  |

| Nozzle Measurements |  |  |  |      |
|---------------------|--|--|--|------|
| Pre                 |  |  |  | PASS |
| Post                |  |  |  | PASS |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 09:50 | End | 11:00 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 755.7 | 742.5 | 591.8 | 856.4 |       |       |       |       |
| Post    | 776.7 | 752.7 | 594.9 | 869.6 |       |       |       |       |

| Sampling Equipment        |                    |           |
|---------------------------|--------------------|-----------|
| Meter Box Number          | SAMP-CP-0007       |           |
| Meter Cal Factor          | (Y)                | 0.980     |
| Low Flow Meter            | SAMP-MN-0001       |           |
| Average Nozzle Diameter   | (D <sub>no</sub> ) | in        |
| Suggested Nozzle Diameter | (D <sub>n</sub> )  | 0.4170 in |
| Probe Number              | SAMP-SP-0001       | in        |
| Probe Length              | 60                 | in        |
| Liner Material            | inconel            |           |
| Sample Case / Oven Number |                    |           |
| Impinger Case Number      | SAMP-BC-0002       |           |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Pitot Coefficient                                 | (C <sub>p</sub> )                   | 0.819  |                     |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 1381.1 | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 81.0   |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.656  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.13   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 4.94   | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.45  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.66   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 |        |                     |

| Pressures               |                        |       |                     |
|-------------------------|------------------------|-------|---------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 25.00 | in Hg               |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.00  | in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 25.00 | in Hg               |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 25.12 | in Hg               |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Traverse Point # | Sampling Time (Θ) | Timer Time | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Snorkel Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (568°F) | Cond. Temp (≤-°F) | CPM Filter Temp (-±-°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (ΔP <sup>1/2</sup> ) | Local Stack Velocity (v <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|------------------|-------------------|------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-------------------------|------------------------|----------------------------|-------------------|-------------------------|-------------------------------------|--------------------------------------|-------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
|                  | min               | hh:mm:ss   | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                      | °F                     | °F                         | °F                | °F                      | °F                                  | °F                                   | in Hg       | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1              | 0.0               | 00:00:00   | 21.325                                  | 0.010               | 1.656                                 | 1.70                                 | 1295                         | 254                     |                        | 63                         |                   |                         | 75                                  | 71                                   | 3.5         | 0.10                                | 10.92                                  | 1.851                                                |                               | 44.413                                                |
| A-2              | 2.7               | 00:02:43   | 23.595                                  | 0.015               | 1.656                                 | 1.70                                 | 1386                         | 254                     |                        | 58                         |                   |                         | 79                                  | 71                                   | 3.5         | 0.12                                | 13.72                                  | 3.702                                                |                               | 44.428                                                |
| A-3              | 5.4               | 00:05:25   | 25.875                                  | 0.020               | 1.656                                 | 1.70                                 | 1565                         | 254                     |                        | 55                         |                   |                         | 80                                  | 71                                   | 3.5         | 0.14                                | 16.59                                  | 5.427                                                |                               | 43.413                                                |
| A-4              | 8.1               | 00:08:07   | 28.000                                  | 0.025               | 1.656                                 | 1.70                                 | 1523                         | 254                     |                        | 54                         |                   |                         | 81                                  | 72                                   | 3.5         | 0.16                                | 18.35                                  | 7.127                                                |                               | 42.764                                                |
| A-5              | 10.8              | 00:10:50   | 30.100                                  | 0.025               | 1.656                                 | 1.70                                 | 1498                         | 254                     |                        | 54                         |                   |                         | 82                                  | 72                                   | 3.5         | 0.16                                | 18.24                                  | 9.009                                                |                               | 43.242                                                |
| A-6              | 13.5              | 00:13:33   | 32.425                                  | 0.025               | 1.656                                 | 1.70                                 | 1499                         | 254                     |                        | 54                         |                   |                         | 83                                  | 73                                   | 3.5         | 0.16                                | 18.24                                  | 10.790                                               |                               | 43.158                                                |
| A-7              | 16.3              | 00:16:15   | 34.630                                  | 0.025               | 1.656                                 | 1.70                                 | 1515                         | 254                     |                        | 54                         |                   |                         | 83                                  | 73                                   | 3.5         | 0.16                                | 18.32                                  | 12.591                                               |                               | 43.168                                                |
| A-8              | 19.0              | 00:18:58   | 36.860                                  | 0.015               | 1.656                                 | 1.70                                 | 1302                         | 254                     |                        | 54                         |                   |                         | 84                                  | 74                                   | 3.5         | 0.12                                | 13.40                                  | 14.388                                               |                               | 43.165                                                |
| A-9              | 21.7              | 00:21:40   | 39.090                                  | 0.015               | 1.656                                 | 1.70                                 | 1228                         | 254                     |                        | 55                         |                   |                         | 84                                  | 75                                   | 3.5         | 0.12                                | 13.12                                  | 16.188                                               |                               | 43.169                                                |
| A-10             | 24.4              | 00:24:22   | 41.325                                  | 0.020               | 1.656                                 | 1.70                                 | 1365                         | 254                     |                        | 56                         |                   |                         | 85                                  | 76                                   | 3.5         | 0.14                                | 15.75                                  | 17.985                                               |                               | 43.164                                                |
| A-11             | 27.1              | 00:27:05   | 43.560                                  | 0.015               | 1.656                                 | 1.70                                 | 1305                         | 254                     |                        | 56                         |                   |                         | 85                                  | 77                                   | 3.5         | 0.12                                | 13.41                                  | 19.808                                               |                               | 43.218                                                |
| A-12             | 29.8              | 00:29:47   | 45.830                                  | 0.015               | 1.656                                 | 1.70                                 | 1289                         | 254                     |                        | 56                         |                   |                         | 86                                  | 77                                   | 3.5         | 0.12                                | 13.35                                  | 21.650                                               |                               | 43.300                                                |
| B-1              | 32.5              | 00:32:30   | 48.125                                  | 0.005               | 1.656                                 | 1.70                                 | 1229                         | 254                     |                        | 57                         |                   |                         | 84                                  | 78                                   | 3.5         | 0.07                                | 7.58                                   | 23.477                                               |                               | 43.342                                                |
| B-2              | 35.2              | 00:35:12   | 50.400                                  | 0.010               | 1.656                                 | 1.70                                 | 1234                         | 254                     |                        | 56                         |                   |                         | 86                                  | 78                                   | 3.5         | 0.10                                | 10.73                                  | 25.281                                               |                               | 43.339                                                |
| B-3              | 37.9              | 00:37:55   | 52.650                                  | 0.010               | 1.656                                 | 1.70                                 | 1241                         | 254                     |                        | 56                         |                   |                         | 87                                  | 78                                   | 3.5         | 0.10                                | 10.75                                  | 27.059                                               |                               | 43.294                                                |
| B-4              | 40.6              | 00:40:37   | 54.870                                  | 0.015               | 1.656                                 | 1.70                                 | 1430                         | 254                     |                        | 57                         |                   |                         | 87                                  | 79                                   | 3.5         | 0.12                                | 13.88                                  | 28.835                                               |                               | 43.253                                                |
| B-5              | 43.3              | 00:43:20   | 57.090                                  | 0.015               | 1.656                                 | 1.70                                 | 1467                         | 254                     |                        | 58                         |                   |                         | 88                                  | 80                                   | 3.5         | 0.12                                | 14.02                                  | 30.601                                               |                               | 43.201                                                |
| B-6              | 46.0              | 00:46:03   | 59.300                                  | 0.020               | 1.656                                 | 1.70                                 | 1496                         | 254                     |                        | 58                         |                   |                         | 88                                  | 80                                   | 3.5         | 0.14                                | 16.30                                  | 32.370                                               |                               | 43.160                                                |
| B-7              | 48.8              | 00:48:45   | 61.515                                  | 0.015               | 1.656                                 | 1.70                                 | 1329                         | 254                     |                        | 58                         |                   |                         | 88                                  | 81                                   | 3.5         | 0.12                                | 13.50                                  | 34.193                                               |                               | 43.192                                                |
| B-8              | 51.5              | 00:51:28   | 63.800                                  | 0.015               | 1.656                                 | 1.70                                 | 1240                         | 254                     |                        | 59                         |                   |                         | 89                                  | 81                                   | 3.5         | 0.12                                | 13.16                                  | 35.947                                               |                               | 43.137                                                |
| B-9              | 54.2              | 00:54:10   | 66.000                                  | 0.020               | 1.656                                 | 1.70                                 | 1413                         | 254                     |                        | 59                         |                   |                         | 89                                  | 81                                   | 3.5         | 0.14                                | 15.96                                  | 37.733                                               |                               | 43.124                                                |
| B-10             | 56.9              | 00:56:53   | 68.240                                  | 0.015               | 1.656                                 | 1.70                                 | 1452                         | 254                     |                        | 60                         |                   |                         | 90                                  | 82                                   | 3.5         | 0.12                                | 13.96                                  | 39.587                                               |                               | 43.186                                                |
| B-11             | 59.6              | 00:59:35   | 70.570                                  | 0.015               | 1.656                                 | 1.70                                 | 1434                         | 254                     |                        | 60                         |                   |                         | 90                                  | 82                                   | 3.5         | 0.12                                | 13.89                                  | 41.306                                               |                               | 43.102                                                |
| B-12             | 62.3              | 01:02:18   | 72.730                                  | 0.010               | 1.656                                 | 1.70                                 | 1411                         | 254                     |                        | 60                         |                   |                         | 90                                  | 82                                   | 3.5         | 0.10                                | 11.28                                  | 43.129                                               |                               | 43.129                                                |
| Last Pt          | 65.0              | 01:05:00   | 75.020                                  |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |
| Final Val        | 65.0              | 01:05:00   | 75.020                                  |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      | Max Vac     | 3.5                                 | Final Values                           | 43.129                                               |                               |                                                       |
| Average Values   |                   |            |                                         | 0.02                |                                       | 1.70                                 | 1381                         | 254                     |                        | 57                         |                   |                         | 85                                  | 77                                   |             | 0.13                                | 14.10                                  |                                                      |                               |                                                       |
|                  |                   |            |                                         |                     |                                       |                                      |                              |                         |                        |                            |                   |                         | 81                                  |                                      |             |                                     |                                        |                                                      |                               |                                                       |

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | EC-36-2S                   |
| Project #         | leed-15-brighton.co-comp#1 |

|            |              |
|------------|--------------|
| Date       | 09/02/15     |
| Operator   | TP           |
| Run Number | 70-100-70%-3 |

| Leak Checks |       |          |                       |                         |       |
|-------------|-------|----------|-----------------------|-------------------------|-------|
| Train       | Pre   | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| PASS        | Post  | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| < 3.0       | Pitot | Pre (+)  | 0.135                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Pre (-)  | 0.160                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (+) | 0.100                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (-) | 0.200                 | in H <sub>2</sub> O for | 15.0  |

| Nozzle Measurements |  |  |  |      |
|---------------------|--|--|--|------|
| Pre                 |  |  |  | PASS |
| Post                |  |  |  | PASS |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 11:10 | End | 12:20 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 776.7 | 752.7 | 594.9 | 869.6 |       |       |       |       |
| Post    | 798.6 | 762.0 | 598.0 | 882.9 |       |       |       |       |

| Sampling Equipment        |                    |           |
|---------------------------|--------------------|-----------|
| Meter Box Number          | SAMP-CP-0007       |           |
| Meter Cal Factor          | (Y)                | 0.980     |
| Low Flow Meter            | SAMP-MN-0001       |           |
| Average Nozzle Diameter   | (D <sub>no</sub> ) | in        |
| Suggested Nozzle Diameter | (D <sub>n</sub> )  | 0.4202 in |
| Probe Number              | SAMP-SP-0001       | in        |
| Probe Length              | 60                 | in        |
| Liner Material            | inconel            |           |
| Sample Case / Oven Number |                    |           |
| Impinger Case Number      | SAMP-BC-0002       |           |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Pitot Coefficient                                 | (C <sub>p</sub> )                   | 0.819  |                     |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 1376.2 | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 82.4   |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.656  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.12   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 4.99   | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.46  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.66   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 |        |                     |

| Pressures               |                        |       |                     |
|-------------------------|------------------------|-------|---------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 24.99 | in Hg               |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.00  | in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 24.99 | in Hg               |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 25.11 | in Hg               |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Traverse Point # | Sampling Time (Θ) | Timer Time | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Snorkel Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (568°F) | Cond. Temp (≤-°F) | CPM Filter Temp (-±-°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (ΔP <sup>1/2</sup> ) | Local Stack Velocity (v <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|------------------|-------------------|------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-------------------------|------------------------|----------------------------|-------------------|-------------------------|-------------------------------------|--------------------------------------|-------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
|                  | min               | hh:mm:ss   | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                      | °F                     | °F                         | °F                | °F                      | °F                                  | °F                                   | in Hg       | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1              | 0.0               | 00:00:00   | 75.175                                  | 0.050               | 1.656                                 | 1.70                                 | 1203                         | 254                     |                        | 66                         |                   |                         | 83                                  | 82                                   | 3.5         | 0.22                                | 23.77                                  | 1.817                                                |                               | 43.618                                                |
| A-2              | 2.7               | 00:02:43   | 77.445                                  | 0.010               | 1.656                                 | 1.70                                 | 1242                         | 254                     |                        | 60                         |                   |                         | 86                                  | 82                                   | 3.5         | 0.10                                | 10.76                                  | 3.634                                                |                               | 43.606                                                |
| A-3              | 5.4               | 00:05:25   | 79.720                                  | 0.010               | 1.656                                 | 1.70                                 | 1454                         | 254                     |                        | 58                         |                   |                         | 87                                  | 82                                   | 3.5         | 0.10                                | 11.41                                  | 5.453                                                |                               | 43.621                                                |
| A-4              | 8.1               | 00:08:07   | 82.000                                  | 0.015               | 1.656                                 | 1.70                                 | 1486                         | 254                     |                        | 59                         |                   |                         | 88                                  | 83                                   | 3.5         | 0.12                                | 14.08                                  | 7.276                                                |                               | 43.656                                                |
| A-5              | 10.8              | 00:10:50   | 84.290                                  | 0.015               | 1.656                                 | 1.70                                 | 1486                         | 254                     |                        | 60                         |                   |                         | 87                                  | 83                                   | 3.5         | 0.12                                | 14.08                                  | 8.977                                                |                               | 43.092                                                |
| A-6              | 13.5              | 00:13:33   | 86.425                                  | 0.015               | 1.656                                 | 1.70                                 | 1532                         | 254                     |                        | 61                         |                   |                         | 86                                  | 83                                   | 3.5         | 0.12                                | 14.25                                  | 10.617                                               |                               | 42.467                                                |
| A-7              | 16.3              | 00:16:15   | 88.480                                  | 0.020               | 1.656                                 | 1.70                                 | 1482                         | 254                     |                        | 61                         |                   |                         | 85                                  | 82                                   | 3.5         | 0.14                                | 16.25                                  | 12.339                                               |                               | 42.305                                                |
| A-8              | 19.0              | 00:18:58   | 90.635                                  | 0.015               | 1.656                                 | 1.70                                 | 1273                         | 254                     |                        | 62                         |                   |                         | 85                                  | 82                                   | 3.5         | 0.12                                | 13.29                                  | 14.181                                               |                               | 42.543                                                |
| A-9              | 21.7              | 00:21:40   | 92.940                                  | 0.015               | 1.656                                 | 1.70                                 | 1339                         | 254                     |                        | 61                         |                   |                         | 85                                  | 81                                   | 3.5         | 0.12                                | 13.54                                  | 15.949                                               |                               | 42.530                                                |
| A-10             | 24.4              | 00:24:22   | 95.150                                  | 0.015               | 1.656                                 | 1.70                                 | 1432                         | 254                     |                        | 62                         |                   |                         | 85                                  | 81                                   | 3.5         | 0.12                                | 13.89                                  | 18.060                                               |                               | 43.345                                                |
| A-11             | 27.1              | 00:27:05   | 97.790                                  | 0.010               | 1.656                                 | 1.70                                 | 1364                         | 254                     |                        | 62                         |                   |                         | 85                                  | 81                                   | 3.5         | 0.10                                | 11.13                                  | 19.540                                               |                               | 42.633                                                |
| A-12             | 29.8              | 00:29:47   | 99.640                                  | 0.010               | 1.656                                 | 1.70                                 | 1358                         | 254                     |                        | 62                         |                   |                         | 84                                  | 81                                   | 3.5         | 0.10                                | 11.12                                  | 21.334                                               |                               | 42.667                                                |
| B-1              | 32.5              | 00:32:30   | 101.880                                 | 0.015               | 1.656                                 | 1.70                                 | 1324                         | 254                     |                        | 64                         |                   |                         | 80                                  | 80                                   | 3.5         | 0.12                                | 13.49                                  | 23.200                                               |                               | 42.830                                                |
| B-2              | 35.2              | 00:35:12   | 104.200                                 | 0.015               | 1.656                                 | 1.70                                 | 1348                         | 254                     |                        | 62                         |                   |                         | 83                                  | 79                                   | 3.5         | 0.12                                | 13.58                                  | 24.926                                               |                               | 42.730                                                |
| B-3              | 37.9              | 00:37:55   | 106.350                                 | 0.020               | 1.656                                 | 1.70                                 | 1475                         | 254                     |                        | 62                         |                   |                         | 83                                  | 79                                   | 3.5         | 0.14                                | 16.22                                  | 26.692                                               |                               | 42.707                                                |
| B-4              | 40.6              | 00:40:37   | 108.550                                 | 0.025               | 1.656                                 | 1.70                                 | 1510                         | 254                     |                        | 62                         |                   |                         | 83                                  | 78                                   | 3.5         | 0.16                                | 18.30                                  | 28.488                                               |                               | 42.732                                                |
| B-5              | 43.3              | 00:43:20   | 110.785                                 | 0.025               | 1.656                                 | 1.70                                 | 1484                         | 254                     |                        | 63                         |                   |                         | 83                                  | 78                                   | 3.5         | 0.16                                | 18.17                                  | 30.268                                               |                               | 42.731                                                |
| B-6              | 46.0              | 00:46:03   | 113.000                                 | 0.020               | 1.656                                 | 1.70                                 | 1511                         | 254                     |                        | 63                         |                   |                         | 84                                  | 78                                   | 3.5         | 0.14                                | 16.37                                  | 32.030                                               |                               | 42.707                                                |
| B-7              | 48.8              | 00:48:45   | 115.195                                 | 0.015               | 1.656                                 | 1.70                                 | 1298                         | 254                     |                        | 63                         |                   |                         | 84                                  | 78                                   | 3.5         | 0.12                                | 13.39                                  | 33.785                                               |                               | 42.675                                                |
| B-8              | 51.5              | 00:51:28   | 117.380                                 | 0.010               | 1.656                                 | 1.70                                 | 1246                         | 254                     |                        | 63                         |                   |                         | 84                                  | 78                                   | 3.5         | 0.10                                | 10.77                                  | 35.575                                               |                               | 42.690                                                |
| B-9              | 54.2              | 00:54:10   | 119.610                                 | 0.010               | 1.656                                 | 1.70                                 | 1398                         | 254                     |                        | 64                         |                   |                         | 84                                  | 78                                   | 3.5         | 0.10                                | 11.24                                  | 37.345                                               |                               | 42.680                                                |
| B-10             | 56.9              | 00:56:53   | 121.815                                 | 0.010               | 1.656                                 | 1.70                                 | 1285                         | 254                     |                        | 64                         |                   |                         | 85                                  | 78                                   | 3.5         | 0.10                                | 10.89                                  | 39.130                                               |                               | 42.687                                                |
| B-11             | 59.6              | 00:59:35   | 124.040                                 | 0.010               | 1.656                                 | 1.70                                 | 1255                         | 254                     |                        | 65                         |                   |                         | 85                                  | 79                                   | 3.5         | 0.10                                | 10.80                                  | 40.933                                               |                               | 42.713                                                |
| B-12             | 62.3              | 01:02:18   | 126.290                                 | 0.005               | 1.656                                 | 1.70                                 | 1243                         | 254                     |                        | 65                         |                   |                         | 85                                  | 79                                   | 3.5         | 0.07                                | 7.61                                   | 42.704                                               |                               | 42.704                                                |
| Last Pt          | 65.0              | 01:05:00   | 128.500                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |
| Final Val        | 65.0              | 01:05:00   | 128.500                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      | Max Vac     | 3.5                                 | Final Values                           | 42.704                                               |                               |                                                       |
| Average Values   |                   |            |                                         | 0.02                |                                       | 1.70                                 | 1376                         | 254                     |                        | 62                         |                   |                         | 85                                  | 80                                   |             | 0.12                                | 13.68                                  |                                                      |                               |                                                       |
|                  |                   |            |                                         |                     |                                       |                                      |                              |                         |                        |                            |                   |                         | 82                                  |                                      |             |                                     |                                        |                                                      |                               |                                                       |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 5.6    | %    |
| Stack Exhaust Flow (M2) | 54,008 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 25.00    | in. Hg                       |
| Relative Humidity   | 57       | %                            |
| Ambient Temperature | 63       | °F                           |
| Specific Humidity   | 0.008341 | lb H <sub>2</sub> O / lb air |

70-100-70 Load, Run - EC36-2S R7

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| A1 | 09/02/15 08:28:02                | 7290                      | 14.53                 | 1.26          | 0.06           | 4.53                   | 0.62                 | 70.70            | 751.00            |
|    | 09/02/15 08:28:32                | 7320                      | 14.55                 | 1.20          | 0.06           | 4.51                   | 0.62                 | 70.70            | 751.00            |
|    | 09/02/15 08:29:02                | 7350                      | 14.43                 | 1.12          | 0.09           | 4.59                   | 0.62                 | 70.90            | 751.00            |
|    | 09/02/15 08:29:32                | 7380                      | 14.53                 | 1.12          | 0.09           | 4.52                   | 0.62                 | 70.90            | 751.00            |
|    | 09/02/15 08:30:02                | 7410                      | 14.57                 | 1.17          | 0.06           | 4.51                   | 0.62                 | 71.00            | 734.00            |
|    | 09/02/15 08:30:32                | 7440                      | 14.58                 | 1.21          | 0.07           | 4.49                   | 0.62                 | 71.00            | 734.00            |
|    | 09/02/15 08:31:02                | 7470                      | 14.51                 | 1.22          | 0.09           | 4.54                   | 0.84                 | 71.10            | 898.00            |
|    | 09/02/15 08:31:32                | 7500                      | 13.61                 | 1.09          | 0.10           | 5.06                   | 0.84                 | 71.10            | 898.00            |
|    | 09/02/15 08:32:02                | 7530                      | 12.42                 | 0.57          | 0.06           | 5.95                   | 1.03                 | 71.00            | 1,062.00          |
|    | 09/02/15 08:32:32                | 7560                      | 12.21                 | 0.42          | 0.00           | 6.08                   | 1.03                 | 71.00            | 1,062.00          |
|    | 09/02/15 08:33:02                | 7590                      | 11.99                 | 0.65          | 0.05           | 6.22                   | 0.99                 | 70.90            | 1,077.00          |
|    | 09/02/15 08:33:32                | 7620                      | 11.81                 | 0.88          | 0.07           | 6.32                   | 0.99                 | 70.90            | 1,077.00          |
|    | 09/02/15 08:34:02                | 7650                      | 11.84                 | 1.21          | 0.04           | 6.32                   | 1.00                 | 70.70            | 1,077.00          |
|    | 09/02/15 08:34:32                | 7680                      | 11.76                 | 1.40          | 0.01           | 6.36                   | 1.00                 | 70.70            | 1,077.00          |
|    | 09/02/15 08:35:02                | 7710                      | 11.70                 | 1.60          | 0.04           | 6.42                   | 1.00                 | 70.70            | 1,044.00          |
|    | 09/02/15 08:35:32                | 7740                      | 11.89                 | 1.84          | 0.10           | 6.29                   | 1.00                 | 70.70            | 1,044.00          |
|    | 09/02/15 08:36:02                | 7770                      | 11.78                 | 1.88          | 0.11           | 6.35                   | 1.02                 | 70.60            | 1,045.00          |
|    | 09/02/15 08:36:32                | 7800                      | 11.84                 | 1.96          | 0.07           | 6.31                   | 1.02                 | 70.60            | 1,045.00          |
|    | 09/02/15 08:37:02                | 7830                      | 11.80                 | 1.78          | 0.03           | 6.33                   | 1.00                 | 70.50            | 1,061.00          |
|    | 09/02/15 08:37:32                | 7860                      | 11.84                 | 1.56          | 0.02           | 6.32                   | 1.00                 | 70.50            | 1,061.00          |
|    | 09/02/15 08:38:02                | 7890                      | 12.00                 | 1.37          | 0.01           | 6.21                   | 1.00                 | 70.50            | 1,044.00          |
|    | 09/02/15 08:38:32                | 7920                      | 11.92                 | 1.24          | 0.07           | 6.27                   | 1.00                 | 70.50            | 1,044.00          |
|    | 09/02/15 08:39:02                | 7950                      | 11.91                 | 1.11          | 0.06           | 6.27                   | 1.02                 | 70.60            | 1,062.00          |
|    | 09/02/15 08:39:32                | 7980                      | 11.95                 | 0.90          | 0.01           | 6.25                   | 1.02                 | 70.60            | 1,062.00          |
|    | 09/02/15 08:40:02                | 8010                      | 11.80                 | 0.78          | 0.01           | 6.34                   | 1.00                 | 70.60            | 1,044.00          |
|    | 09/02/15 08:40:32                | 8040                      | 12.02                 | 0.74          | 0.07           | 6.20                   | 1.00                 | 70.60            | 1,044.00          |
|    | 09/02/15 08:41:02                | 8070                      | 12.04                 | 0.70          | 0.10           | 6.19                   | 1.00                 | 70.60            | 1,027.00          |
|    | 09/02/15 08:41:32                | 8100                      | 12.02                 | 0.68          | 0.03           | 6.20                   | 1.00                 | 70.60            | 1,027.00          |
|    | 09/02/15 08:42:02                | 8130                      | 11.93                 | 0.67          | 0.04           | 6.26                   | 1.00                 | 70.70            | 1,044.00          |
|    | 09/02/15 08:42:32                | 8160                      | 11.89                 | 0.62          | 0.06           | 6.28                   | 1.00                 | 70.70            | 1,044.00          |
|    | 09/02/15 08:43:02                | 8190                      | 11.91                 | 0.59          | 0.08           | 6.28                   | 1.01                 | 70.70            | 1,027.00          |
|    | 09/02/15 08:43:32                | 8220                      | 11.94                 | 0.55          | 0.13           | 6.25                   | 1.01                 | 70.70            | 1,027.00          |
|    | 09/02/15 08:44:02                | 8250                      | 11.92                 | 0.55          | 0.07           | 6.26                   | 1.02                 | 70.80            | 1,028.00          |
|    | 09/02/15 08:44:32                | 8280                      | 11.88                 | 0.50          | 0.04           | 6.28                   | 1.02                 | 70.80            | 1,028.00          |
|    | 09/02/15 08:45:02                | 8310                      | 12.02                 | 0.48          | 0.02           | 6.20                   | 1.01                 | 70.80            | 1,044.00          |
|    | 09/02/15 08:45:32                | 8340                      | 11.85                 | 0.47          | 0.03           | 6.30                   | 1.01                 | 70.80            | 1,044.00          |
|    | 09/02/15 08:46:02                | 8370                      | 11.93                 | 0.41          | 0.07           | 6.26                   | 1.02                 | 70.90            | 1,045.00          |
|    | 09/02/15 08:46:32                | 8400                      | 11.82                 | 0.42          | 0.04           | 6.32                   | 1.02                 | 70.90            | 1,045.00          |
|    | 09/02/15 08:47:02                | 8430                      | 11.83                 | 0.40          | 0.01           | 6.33                   | 0.92                 | 71.00            | 936.00            |
|    | 09/02/15 08:47:32                | 8460                      | 12.07                 | 0.37          | 0.04           | 6.19                   | 0.92                 | 71.00            | 936.00            |
|    | 09/02/15 08:48:02                | 8490                      | 13.62                 | 0.40          | 0.13           | 5.17                   | 0.71                 | 71.20            | 755.00            |
| A2 | 09/02/15 08:48:32                | 8520                      | 14.21                 | 0.52          | 0.11           | 4.74                   | 0.71                 | 71.20            | 755.00            |
|    | 09/02/15 08:49:02                | 8550                      | 14.26                 | 0.59          | 0.06           | 4.71                   | 0.70                 | 71.40            | 754.00            |
|    | 09/02/15 08:49:32                | 8580                      | 14.36                 | 0.56          | 0.09           | 4.64                   | 0.70                 | 71.40            | 754.00            |
|    | 09/02/15 08:50:02                | 8610                      | 14.36                 | 0.66          | 0.13           | 4.64                   | 0.88                 | 71.70            | 883.00            |
|    | 09/02/15 08:50:32                | 8640                      | 14.23                 | 0.61          | 0.08           | 4.73                   | 0.88                 | 71.70            | 883.00            |
|    | 09/02/15 08:51:02                | 8670                      | 12.69                 | 0.39          | 0.04           | 5.67                   | 1.07                 | 71.80            | 1,029.00          |
|    | 09/02/15 08:51:32                | 8700                      | 11.64                 | -0.03         | 0.07           | 6.45                   | 1.07                 | 71.80            | 1,029.00          |
|    | 09/02/15 08:52:02                | 8730                      | 11.48                 | -0.18         | 0.07           | 6.54                   | 1.07                 | 71.90            | 1,029.00          |
|    | 09/02/15 08:52:32                | 8760                      | 11.71                 | -0.19         | 0.04           | 6.41                   | 1.07                 | 71.90            | 1,029.00          |
|    | 09/02/15 08:53:02                | 8790                      | 12.63                 | -0.19         | 0.08           | 5.82                   | 1.05                 | 72.00            | 1,027.00          |
|    | 09/02/15 08:53:32                | 8820                      | 12.99                 | -0.15         | 0.11           | 5.51                   | 1.05                 | 72.00            | 1,027.00          |
|    | 09/02/15 08:54:02                | 8850                      | 13.04                 | -0.11         | 0.10           | 5.51                   | 1.04                 | 72.10            | 1,027.00          |
|    | 09/02/15 08:54:32                | 8880                      | 13.32                 | -0.10         | 0.06           | 5.32                   | 1.04                 | 72.10            | 1,027.00          |
|    | 09/02/15 08:55:02                | 8910                      | 13.05                 | -0.06         | 0.07           | 5.47                   | 1.03                 | 72.20            | 1,026.00          |
|    | 09/02/15 08:55:32                | 8940                      | 13.18                 | -0.09         | 0.13           | 5.42                   | 1.03                 | 72.20            | 1,026.00          |
|    | 09/02/15 08:56:02                | 8970                      | 13.13                 | -0.14         | 0.15           | 5.43                   | 1.03                 | 72.30            | 1,042.00          |
|    | 09/02/15 08:56:32                | 9000                      | 13.14                 | -0.09         | 0.10           | 5.42                   | 1.03                 | 72.30            | 1,042.00          |
|    | 09/02/15 08:57:02                | 9030                      | 12.89                 | -0.11         | 0.07           | 5.59                   | 1.01                 | 72.50            | 1,058.00          |
|    | 09/02/15 08:57:32                | 9060                      | 12.83                 | -0.15         | 0.08           | 5.65                   | 1.01                 | 72.50            | 1,058.00          |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 5.6    | %    |
| Stack Exhaust Flow (M2) | 54,008 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 25.00    | in. Hg                       |
| Relative Humidity   | 57       | %                            |
| Ambient Temperature | 63       | °F                           |
| Specific Humidity   | 0.008341 | lb H <sub>2</sub> O / lb air |

70-100-70 Load, Run - EC36-2S R7

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmwv) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
|    | 09/02/15 08:58:02                | 9090                      | 13.01                 | -0.11         | 0.08           | 5.52                   | 1.00                 | 72.60            | 1,023.00          |
|    | 09/02/15 08:58:32                | 9120                      | 12.93                 | -0.16         | 0.06           | 5.57                   | 1.00                 | 72.60            | 1,023.00          |
|    | 09/02/15 08:59:02                | 9150                      | 13.12                 | -0.14         | 0.07           | 5.42                   | 1.00                 | 72.70            | 1,022.00          |
|    | 09/02/15 08:59:32                | 9180                      | 13.24                 | -0.11         | 0.12           | 5.37                   | 1.00                 | 72.70            | 1,022.00          |
|    | 09/02/15 09:00:02                | 9210                      | 13.28                 | -0.08         | 0.12           | 5.32                   | 0.99                 | 72.80            | 1,022.00          |
|    | 09/02/15 09:00:32                | 9240                      | 13.20                 | -0.09         | 0.06           | 5.38                   | 0.99                 | 72.80            | 1,022.00          |
|    | 09/02/15 09:01:02                | 9270                      | 12.81                 | -0.14         | 0.08           | 5.64                   | 1.00                 | 72.90            | 1,022.00          |
|    | 09/02/15 09:01:32                | 9300                      | 12.84                 | -0.16         | 0.13           | 5.63                   | 1.00                 | 72.90            | 1,022.00          |
|    | 09/02/15 09:02:02                | 9330                      | 12.78                 | -0.15         | 0.08           | 5.67                   | 1.01                 | 73.00            | 1,057.00          |
|    | 09/02/15 09:02:32                | 9360                      | 12.90                 | -0.16         | 0.06           | 5.60                   | 1.01                 | 73.00            | 1,057.00          |
|    | 09/02/15 09:03:02                | 9390                      | 12.92                 | -0.14         | 0.06           | 5.57                   | 0.91                 | 73.10            | 966.00            |
|    | 09/02/15 09:03:32                | 9420                      | 13.13                 | -0.16         | 0.11           | 5.45                   | 0.91                 | 73.10            | 966.00            |
|    | 09/02/15 09:04:02                | 9450                      | 14.52                 | 0.05          | 0.10           | 4.58                   | 0.72                 | 73.30            | 769.00            |
|    | 09/02/15 09:04:32                | 9480                      | 14.97                 | 0.83          | 0.09           | 4.23                   | 0.72                 | 73.30            | 769.00            |
|    | 09/02/15 09:05:02                | 9510                      | 14.99                 | 1.33          | 0.13           | 4.20                   | 0.72                 | 73.60            | 768.00            |
|    | 09/02/15 09:05:32                | 9540                      | 14.99                 | 1.38          | 0.16           | 4.21                   | 0.72                 | 73.60            | 768.00            |
|    | 09/02/15 09:06:02                | 9570                      | 14.95                 | 1.46          | 0.13           | 4.22                   | 0.72                 | 73.90            | 768.00            |
|    | 09/02/15 09:06:32                | 9600                      | 15.14                 | 1.49          | 0.09           | 4.09                   | 0.72                 | 73.90            | 768.00            |
|    | 09/02/15 09:07:02                | 9630                      | 14.65                 | 1.67          | 0.07           | 4.35                   | 1.07                 | 74.10            | 1,042.00          |
|    | 09/02/15 09:07:32                | 9660                      | 13.03                 | 0.85          | 0.08           | 5.50                   | 1.07                 | 74.10            | 1,042.00          |
|    | 09/02/15 09:08:02                | 9690                      | 13.09                 | -0.09         | 0.15           | 5.45                   | 1.07                 | 74.10            | 1,024.00          |
| A3 | 09/02/15 09:08:32                | 9720                      | 12.83                 | -0.12         | 0.08           | 5.63                   | 1.07                 | 74.10            | 1,024.00          |
|    | 09/02/15 09:09:02                | 9750                      | 13.00                 | -0.15         | 0.05           | 5.51                   | 1.06                 | 74.20            | 1,058.00          |
|    | 09/02/15 09:09:32                | 9780                      | 12.95                 | -0.15         | 0.06           | 5.54                   | 1.06                 | 74.20            | 1,058.00          |
|    | 09/02/15 09:10:02                | 9810                      | 13.08                 | -0.16         | 0.10           | 5.47                   | 1.07                 | 74.30            | 1,041.00          |
|    | 09/02/15 09:10:32                | 9840                      | 13.13                 | -0.14         | 0.08           | 5.42                   | 1.07                 | 74.30            | 1,041.00          |
|    | 09/02/15 09:11:02                | 9870                      | 13.06                 | -0.10         | 0.05           | 5.46                   | 1.07                 | 74.30            | 1,024.00          |
|    | 09/02/15 09:11:32                | 9900                      | 13.08                 | -0.10         | 0.02           | 5.46                   | 1.07                 | 74.30            | 1,024.00          |
|    | 09/02/15 09:12:02                | 9930                      | 13.23                 | -0.11         | 0.06           | 5.35                   | 1.08                 | 74.40            | 1,059.00          |
|    | 09/02/15 09:12:32                | 9960                      | 13.05                 | -0.12         | 0.17           | 5.48                   | 1.08                 | 74.40            | 1,059.00          |
|    | 09/02/15 09:13:02                | 9990                      | 13.08                 | -0.14         | 0.13           | 5.46                   | 1.08                 | 74.50            | 1,059.00          |
|    | 09/02/15 09:13:32                | 10020                     | 12.94                 | -0.13         | 0.07           | 5.54                   | 1.08                 | 74.50            | 1,059.00          |
|    | 09/02/15 09:14:02                | 10050                     | 12.93                 | -0.18         | 0.01           | 5.57                   | 1.08                 | 74.70            | 1,024.00          |
|    | 09/02/15 09:14:32                | 10080                     | 12.89                 | -0.16         | 0.02           | 5.57                   | 1.08                 | 74.70            | 1,024.00          |
|    | 09/02/15 09:15:02                | 10110                     | 12.93                 | -0.18         | 0.06           | 5.57                   | 1.09                 | 74.80            | 1,042.00          |
|    | 09/02/15 09:15:32                | 10140                     | 13.00                 | -0.19         | 0.03           | 5.52                   | 1.09                 | 74.80            | 1,042.00          |
|    | 09/02/15 09:16:02                | 10170                     | 13.12                 | -0.17         | 0.01           | 5.44                   | 1.09                 | 74.90            | 1,041.00          |
|    | 09/02/15 09:16:32                | 10200                     | 13.30                 | -0.12         | 0.06           | 5.31                   | 1.09                 | 74.90            | 1,041.00          |
|    | 09/02/15 09:17:02                | 10230                     | 13.33                 | -0.11         | 0.10           | 5.29                   | 0.93                 | 75.10            | 929.00            |
|    | 09/02/15 09:17:32                | 10260                     | 13.40                 | -0.10         | 0.06           | 5.26                   | 0.93                 | 75.10            | 929.00            |
|    | 09/02/15 09:18:02                | 10290                     | 14.64                 | 0.04          | 0.07           | 4.50                   | 0.66                 | 75.30            | 713.00            |
|    | 09/02/15 09:18:32                | 10320                     | 15.45                 | 1.33          | 0.07           | 3.87                   | 0.66                 | 75.30            | 713.00            |
|    | 09/02/15 09:19:02                | 10350                     | 15.54                 | 2.36          | 0.16           | 3.81                   | 0.66                 | 75.60            | 729.00            |
|    | 09/02/15 09:19:32                | 10380                     | 15.50                 | 2.64          | 0.14           | 3.83                   | 0.66                 | 75.60            | 729.00            |
|    | 09/02/15 09:20:02                | 10410                     | 15.50                 | 2.57          | 0.09           | 3.85                   | 0.67                 | 76.00            | 696.00            |
|    | 09/02/15 09:20:32                | 10440                     | 15.89                 | 2.63          | 0.18           | 3.54                   | 0.67                 | 76.00            | 696.00            |
|    | 09/02/15 09:21:02                | 10470                     | 15.95                 | 2.85          | 0.22           | 3.50                   | 0.66                 | 76.20            | 728.00            |
|    | 09/02/15 09:21:32                | 10500                     | 15.82                 | 2.80          | 0.13           | 3.59                   | 0.66                 | 76.20            | 728.00            |
|    | 09/02/15 09:22:02                | 10530                     | 15.74                 | 2.71          | 0.12           | 3.63                   | 0.90                 | 76.50            | 959.00            |
|    | 09/02/15 09:22:32                | 10560                     | 14.55                 | 2.72          | 0.08           | 4.40                   | 0.90                 | 76.50            | 959.00            |
|    | 09/02/15 09:23:02                | 10590                     | 13.29                 | 1.00          | 0.06           | 5.31                   | 1.07                 | 76.60            | 1,054.00          |
|    | 09/02/15 09:23:32                | 10620                     | 13.27                 | 0.01          | 0.03           | 5.33                   | 1.07                 | 76.60            | 1,054.00          |
|    | 09/02/15 09:24:02                | 10650                     | 13.17                 | -0.05         | 0.02           | 5.40                   | 1.07                 | 76.80            | 1,054.00          |
|    | 09/02/15 09:24:32                | 10680                     | 13.37                 | -0.09         | 0.07           | 5.27                   | 1.07                 | 76.80            | 1,054.00          |
|    | 09/02/15 09:25:02                | 10710                     | 13.33                 | -0.01         | 0.06           | 5.30                   | 1.11                 | 76.90            | 1,055.00          |
|    | 09/02/15 09:25:32                | 10740                     | 13.30                 | -0.08         | 0.04           | 5.32                   | 1.11                 | 76.90            | 1,055.00          |
|    | 09/02/15 09:26:02                | 10770                     | 13.37                 | -0.09         | 0.07           | 5.26                   | 1.11                 | 77.10            | 1,055.00          |
|    | 09/02/15 09:26:32                | 10800                     | 13.26                 | -0.10         | 0.07           | 5.34                   | 1.11                 | 77.10            | 1,055.00          |
|    | 09/02/15 09:27:02                | 10830                     | 13.27                 | -0.15         | 0.03           | 5.33                   | 1.12                 | 77.20            | 1,022.00          |
|    | 09/02/15 09:27:32                | 10860                     | 13.12                 | -0.14         | 0.04           | 5.42                   | 1.12                 | 77.20            | 1,022.00          |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 5.6    | %    |
| Stack Exhaust Flow (M2) | 54,008 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 25.00    | in. Hg                       |
| Relative Humidity   | 57       | %                            |
| Ambient Temperature | 63       | °F                           |
| Specific Humidity   | 0.008341 | lb H <sub>2</sub> O / lb air |

70-100-70 Load, Run - EC36-2S R7

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| 09/02/15 09:28:02                | 10890                     | 13.28                 | -0.15         | 0.08           | 5.34                   | 1.12                 | 77.30            | 1,056.00          |
| 09/02/15 09:28:32                | 10920                     | 13.44                 | -0.13         | 0.07           | 5.22                   | 1.12                 | 77.30            | 1,056.00          |
| 09/02/15 09:29:02                | 10950                     | 13.46                 | -0.07         | 0.03           | 5.22                   | 1.12                 | 77.50            | 1,039.00          |
| 09/02/15 09:29:32                | 10980                     | 13.40                 | -0.08         | 0.07           | 5.25                   | 1.12                 | 77.50            | 1,039.00          |
| 09/02/15 09:30:02                | 11010                     | 13.43                 | -0.06         | 0.12           | 5.22                   | 1.12                 | 77.60            | 1,038.00          |
| 09/02/15 09:30:32                | 11040                     | 13.44                 | -0.06         | 0.09           | 5.23                   | 1.12                 | 77.60            | 1,038.00          |
| 09/02/15 09:31:02                | 11070                     | 13.45                 | -0.10         | 0.05           | 5.22                   | 1.13                 | 77.90            | 1,021.00          |
| 09/02/15 09:31:32                | 11100                     | 13.51                 | -0.09         | 0.08           | 5.18                   | 1.13                 | 77.90            | 1,021.00          |
| 09/02/15 09:32:02                | 11130                     | 13.38                 | -0.07         | 0.17           | 5.27                   | 1.13                 | 78.00            | 1,072.00          |
| 09/02/15 09:32:32                | 11160                     | 13.27                 | -0.12         | 0.14           | 5.35                   | 1.13                 | 78.00            | 1,072.00          |
| 09/02/15 09:33:02                | 11190                     | 13.41                 | -0.11         | 0.05           | 5.24                   | 1.13                 | 78.20            | 1,037.00          |
| 09/02/15 09:33:32                | 11220                     | 13.44                 | -0.13         | 0.03           | 5.23                   | 1.13                 | 78.20            | 1,037.00          |
| 09/02/15 09:34:02                | 11250                     | 13.34                 | -0.11         | 0.08           | 5.29                   | 1.13                 | 78.40            | 1,037.00          |
| 09/02/15 09:34:32                | 11280                     | 13.39                 | -0.16         | 0.13           | 5.26                   | 1.13                 | 78.40            | 1,037.00          |
| 09/02/15 09:35:02                | 11310                     | 13.32                 | -0.14         | 0.07           | 5.30                   | 1.13                 | 78.50            | 1,054.00          |
| 09/02/15 09:35:32                | 11340                     | 13.39                 | -0.14         | 0.05           | 5.27                   | 1.13                 | 78.50            | 1,054.00          |
| 09/02/15 09:36:02                | 11370                     | 13.46                 | -0.15         | 0.08           | 5.22                   | 1.03                 | 78.70            | 979.00            |
| 09/02/15 09:36:32                | 11400                     | 13.43                 | -0.11         | 0.12           | 5.24                   | 1.03                 | 78.70            | 979.00            |
| 09/02/15 09:37:02                | 11430                     | 13.34                 | -0.15         | 0.06           | 5.29                   | 0.72                 | 79.00            | 777.00            |
| 09/02/15 09:37:32                | 11460                     | 13.40                 | -0.15         | 0.05           | 5.26                   | 0.72                 | 79.00            | 777.00            |
| 09/02/15 09:38:02                | 11490                     | 14.15                 | -0.10         | 0.08           | 4.81                   | 0.71                 | 79.30            | 760.00            |
| <b>RAW AVERAGE</b>               |                           | <b>13.22</b>          | <b>0.47</b>   | <b>0.08</b>    | <b>5.38</b>            | <b>0.97</b>          | <b>73.71</b>     | <b>975.12</b>     |

| Bias                   | Serial Number:  |       |      |      | Press. Trans           | Temp. Trans. | F-Flow Trans. |
|------------------------|-----------------|-------|------|------|------------------------|--------------|---------------|
|                        |                 |       |      |      | 1434717                | 1434717      |               |
|                        |                 |       |      |      | (in. H <sub>2</sub> O) | (°F)         | (SCFH)        |
|                        |                 |       |      |      | 1434717                | 1434717      | 1434717       |
|                        | Initial Zero    | -0.07 | 0.07 | 0.00 | 0.03                   |              |               |
|                        | Final Zero      | -0.08 | 0.09 | 0.00 | 0.08                   |              |               |
|                        | Avg. Zero       | -0.08 | 0.08 | 0.00 | 0.06                   |              |               |
|                        | Initial UpScale | 11.89 | 9.44 | 3.04 | 9.04                   |              |               |
|                        | Final UpScale   | 11.80 | 9.39 | 3.00 | 9.09                   |              |               |
|                        | Avg. UpScale    | 11.85 | 9.42 | 3.02 | 9.07                   |              |               |
| <b>Upscale Cal Gas</b> |                 | 11.91 | 9.48 | 3.02 | 9.09                   |              |               |

| EMISSIONS DATA                          | O <sub>2</sub> | CO   | THC  | CO <sub>2</sub> |
|-----------------------------------------|----------------|------|------|-----------------|
| Corrected Raw Average (ppm/% dry basis) | 13.28          | 0.40 | 0.08 | 5.37            |
| Corrected Raw Average (ppm/% wet basis) | 12.55          | 0.37 | 0.07 | 5.07            |
| Emission Rate (lb/hr)                   | N/A            | 0.00 | 0.00 | N/A             |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 4.9    | %    |
| Stack Exhaust Flow (M2) | 54,888 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 25.00    | in. Hg                       |
| Relative Humidity   | 34       | %                            |
| Ambient Temperature | 83       | °F                           |
| Specific Humidity   | 0.009784 | lb H <sub>2</sub> O / lb air |

70-100-70 Load, Run - EC36-2S R8

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| A1 | 09/02/15 09:50:02                | 12210                     | 14.85                 | 1.45          | 0.04           | 4.32                   | 0.70                 | 81.40            | 756.00            |
|    | 09/02/15 09:50:32                | 12240                     | 14.93                 | 1.34          | 0.15           | 4.27                   | 0.70                 | 81.40            | 756.00            |
|    | 09/02/15 09:51:02                | 12270                     | 14.95                 | 1.47          | 0.17           | 4.26                   | 0.70                 | 81.60            | 756.00            |
|    | 09/02/15 09:51:32                | 12300                     | 15.05                 | 1.58          | 0.13           | 4.18                   | 0.70                 | 81.60            | 756.00            |
|    | 09/02/15 09:52:02                | 12330                     | 14.74                 | 1.45          | 0.06           | 4.41                   | 0.70                 | 81.80            | 756.00            |
|    | 09/02/15 09:52:32                | 12360                     | 14.74                 | 1.20          | 0.02           | 4.42                   | 0.70                 | 81.80            | 756.00            |
|    | 09/02/15 09:53:02                | 12390                     | 14.67                 | 1.31          | 0.10           | 4.41                   | 1.04                 | 82.00            | 1,058.00          |
|    | 09/02/15 09:53:32                | 12420                     | 12.92                 | 0.74          | 0.13           | 5.57                   | 1.04                 | 82.00            | 1,058.00          |
|    | 09/02/15 09:54:02                | 12450                     | 12.80                 | -0.10         | 0.07           | 5.67                   | 1.06                 | 82.00            | 1,043.00          |
|    | 09/02/15 09:54:32                | 12480                     | 12.72                 | -0.16         | 0.07           | 5.75                   | 1.06                 | 82.00            | 1,043.00          |
|    | 09/02/15 09:55:02                | 12510                     | 12.92                 | -0.13         | 0.13           | 5.60                   | 1.09                 | 82.00            | 1,044.00          |
|    | 09/02/15 09:55:32                | 12540                     | 12.99                 | -0.08         | 0.15           | 5.54                   | 1.09                 | 82.00            | 1,044.00          |
|    | 09/02/15 09:56:02                | 12570                     | 12.53                 | -0.10         | 0.06           | 5.86                   | 1.11                 | 82.10            | 1,046.00          |
|    | 09/02/15 09:56:32                | 12600                     | 12.70                 | -0.13         | 0.06           | 5.75                   | 1.11                 | 82.10            | 1,046.00          |
|    | 09/02/15 09:57:02                | 12630                     | 12.53                 | -0.07         | 0.10           | 5.87                   | 1.12                 | 82.10            | 1,013.00          |
|    | 09/02/15 09:57:32                | 12660                     | 12.91                 | -0.05         | 0.18           | 5.64                   | 1.12                 | 82.10            | 1,013.00          |
|    | 09/02/15 09:58:02                | 12690                     | 13.29                 | 0.00          | 0.13           | 5.33                   | 1.13                 | 82.20            | 1,046.00          |
|    | 09/02/15 09:58:32                | 12720                     | 13.08                 | 0.04          | 0.09           | 5.49                   | 1.13                 | 82.20            | 1,046.00          |
|    | 09/02/15 09:59:02                | 12750                     | 13.23                 | 0.00          | 0.07           | 5.38                   | 1.13                 | 82.30            | 1,046.00          |
|    | 09/02/15 09:59:32                | 12780                     | 13.41                 | 0.03          | 0.11           | 5.28                   | 1.13                 | 82.30            | 1,046.00          |
|    | 09/02/15 10:00:02                | 12810                     | 13.60                 | 0.03          | 0.14           | 5.17                   | 1.11                 | 82.40            | 1,045.00          |
|    | 09/02/15 10:00:32                | 12840                     | 13.49                 | 0.08          | 0.10           | 5.21                   | 1.11                 | 82.40            | 1,045.00          |
|    | 09/02/15 10:01:02                | 12870                     | 13.45                 | 0.01          | 0.09           | 5.26                   | 1.13                 | 82.50            | 1,046.00          |
|    | 09/02/15 10:01:32                | 12900                     | 13.66                 | -0.01         | 0.17           | 5.12                   | 1.13                 | 82.50            | 1,046.00          |
|    | 09/02/15 10:02:02                | 12930                     | 13.61                 | 0.05          | 0.20           | 5.14                   | 1.12                 | 82.60            | 1,045.00          |
|    | 09/02/15 10:02:32                | 12960                     | 13.57                 | 0.07          | 0.13           | 5.16                   | 1.12                 | 82.60            | 1,045.00          |
|    | 09/02/15 10:03:02                | 12990                     | 13.35                 | -0.02         | 0.08           | 5.30                   | 1.12                 | 82.80            | 1,045.00          |
|    | 09/02/15 10:03:32                | 13020                     | 13.50                 | -0.08         | 0.08           | 5.22                   | 1.12                 | 82.80            | 1,045.00          |
|    | 09/02/15 10:04:02                | 13050                     | 13.50                 | -0.01         | 0.10           | 5.21                   | 1.12                 | 82.90            | 1,045.00          |
|    | 09/02/15 10:04:32                | 13080                     | 13.58                 | 0.01          | 0.08           | 5.17                   | 1.12                 | 82.90            | 1,045.00          |
|    | 09/02/15 10:05:02                | 13110                     | 13.52                 | 0.06          | 0.10           | 5.18                   | 1.12                 | 83.10            | 1,061.00          |
|    | 09/02/15 10:05:32                | 13140                     | 13.28                 | 0.05          | 0.18           | 5.35                   | 1.12                 | 83.10            | 1,061.00          |
|    | 09/02/15 10:06:02                | 13170                     | 13.34                 | 0.00          | 0.15           | 5.31                   | 1.12                 | 83.30            | 1,044.00          |
|    | 09/02/15 10:06:32                | 13200                     | 13.27                 | 0.04          | 0.08           | 5.33                   | 1.12                 | 83.30            | 1,044.00          |
|    | 09/02/15 10:07:02                | 13230                     | 13.24                 | 0.01          | 0.11           | 5.38                   | 1.12                 | 83.40            | 1,044.00          |
|    | 09/02/15 10:07:32                | 13260                     | 13.38                 | 0.13          | 0.13           | 5.28                   | 1.12                 | 83.40            | 1,044.00          |
|    | 09/02/15 10:08:02                | 13290                     | 13.24                 | 0.17          | 0.11           | 5.36                   | 0.99                 | 83.50            | 952.00            |
|    | 09/02/15 10:08:32                | 13320                     | 13.51                 | 0.12          | 0.08           | 5.22                   | 0.99                 | 83.50            | 952.00            |
|    | 09/02/15 10:09:02                | 13350                     | 14.61                 | 0.24          | 0.15           | 4.53                   | 0.56                 | 83.80            | 665.00            |
|    | 09/02/15 10:09:32                | 13380                     | 15.87                 | 1.44          | 0.26           | 3.61                   | 0.56                 | 83.80            | 665.00            |
| A2 | 09/02/15 10:10:02                | 13410                     | 15.64                 | 3.04          | 0.19           | 3.76                   | 0.63                 | 84.10            | 716.00            |
|    | 09/02/15 10:10:32                | 13440                     | 15.65                 | 2.75          | 0.13           | 3.75                   | 0.63                 | 84.10            | 716.00            |
|    | 09/02/15 10:11:02                | 13470                     | 15.64                 | 2.69          | 0.15           | 3.74                   | 0.66                 | 84.40            | 701.00            |
|    | 09/02/15 10:11:32                | 13500                     | 15.43                 | 2.55          | 0.17           | 3.91                   | 0.66                 | 84.40            | 701.00            |
|    | 09/02/15 10:12:02                | 13530                     | 15.31                 | 2.23          | 0.12           | 4.00                   | 0.66                 | 84.70            | 717.00            |
|    | 09/02/15 10:12:32                | 13560                     | 15.48                 | 1.98          | 0.12           | 3.90                   | 0.66                 | 84.70            | 717.00            |
|    | 09/02/15 10:13:02                | 13590                     | 15.75                 | 2.48          | 0.21           | 3.62                   | 1.06                 | 84.80            | 1,037.00          |
|    | 09/02/15 10:13:32                | 13620                     | 13.76                 | 2.09          | 0.15           | 5.03                   | 1.06                 | 84.80            | 1,037.00          |
|    | 09/02/15 10:14:02                | 13650                     | 13.67                 | 0.30          | 0.11           | 5.09                   | 1.09                 | 84.80            | 1,056.00          |
|    | 09/02/15 10:14:32                | 13680                     | 13.58                 | 0.02          | 0.12           | 5.15                   | 1.09                 | 84.80            | 1,056.00          |
|    | 09/02/15 10:15:02                | 13710                     | 13.50                 | -0.04         | 0.17           | 5.21                   | 1.11                 | 84.80            | 1,041.00          |
|    | 09/02/15 10:15:32                | 13740                     | 13.57                 | -0.10         | 0.15           | 5.16                   | 1.11                 | 84.80            | 1,041.00          |
|    | 09/02/15 10:16:02                | 13770                     | 13.60                 | -0.07         | 0.07           | 5.14                   | 1.12                 | 84.80            | 1,058.00          |
|    | 09/02/15 10:16:32                | 13800                     | 13.55                 | -0.10         | 0.14           | 5.18                   | 1.12                 | 84.80            | 1,058.00          |
|    | 09/02/15 10:17:02                | 13830                     | 13.63                 | -0.14         | 0.20           | 5.13                   | 1.13                 | 84.80            | 1,041.00          |
|    | 09/02/15 10:17:32                | 13860                     | 13.65                 | -0.14         | 0.15           | 5.12                   | 1.13                 | 84.80            | 1,041.00          |
|    | 09/02/15 10:18:02                | 13890                     | 13.65                 | -0.09         | 0.13           | 5.10                   | 1.12                 | 84.80            | 1,041.00          |
|    | 09/02/15 10:18:32                | 13920                     | 13.74                 | -0.11         | 0.14           | 5.07                   | 1.12                 | 84.80            | 1,041.00          |
|    | 09/02/15 10:19:02                | 13950                     | 13.76                 | -0.01         | 0.19           | 5.05                   | 1.12                 | 84.80            | 1,041.00          |
|    | 09/02/15 10:19:32                | 13980                     | 13.86                 | 0.07          | 0.30           | 4.98                   | 1.12                 | 84.80            | 1,041.00          |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 4.9    | %    |
| Stack Exhaust Flow (M2) | 54,888 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 25.00    | in. Hg                       |
| Relative Humidity   | 34       | %                            |
| Ambient Temperature | 83       | °F                           |
| Specific Humidity   | 0.009784 | lb H <sub>2</sub> O / lb air |

70-100-70 Load, Run - EC36-2S R8

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmwv) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
|    | 09/02/15 10:20:02                | 14010                     | 13.87                 | 0.01          | 0.23           | 4.99                   | 1.12                 | 84.90            | 1,057.00          |
|    | 09/02/15 10:20:32                | 14040                     | 13.99                 | 0.05          | 0.18           | 4.90                   | 1.12                 | 84.90            | 1,057.00          |
|    | 09/02/15 10:21:02                | 14070                     | 13.97                 | 0.10          | 0.14           | 4.90                   | 1.12                 | 85.00            | 1,041.00          |
|    | 09/02/15 10:21:32                | 14100                     | 13.92                 | 0.16          | 0.15           | 4.94                   | 1.12                 | 85.00            | 1,041.00          |
|    | 09/02/15 10:22:02                | 14130                     | 13.97                 | 0.15          | 0.19           | 4.92                   | 1.12                 | 85.10            | 1,057.00          |
|    | 09/02/15 10:22:32                | 14160                     | 13.88                 | 0.19          | 0.17           | 4.97                   | 1.12                 | 85.10            | 1,057.00          |
|    | 09/02/15 10:23:02                | 14190                     | 13.96                 | 0.09          | 0.12           | 4.91                   | 1.12                 | 85.30            | 1,040.00          |
|    | 09/02/15 10:23:32                | 14220                     | 13.73                 | 0.03          | 0.14           | 5.07                   | 1.12                 | 85.30            | 1,040.00          |
|    | 09/02/15 10:24:02                | 14250                     | 13.82                 | 0.01          | 0.18           | 5.01                   | 1.12                 | 85.40            | 1,040.00          |
|    | 09/02/15 10:24:32                | 14280                     | 13.71                 | 0.01          | 0.21           | 5.09                   | 1.12                 | 85.40            | 1,040.00          |
|    | 09/02/15 10:25:02                | 14310                     | 13.90                 | -0.05         | 0.16           | 4.98                   | 0.75                 | 85.60            | 786.00            |
|    | 09/02/15 10:25:32                | 14340                     | 15.12                 | 0.26          | 0.17           | 4.18                   | 0.75                 | 85.60            | 786.00            |
|    | 09/02/15 10:26:02                | 14370                     | 15.82                 | 1.49          | 0.26           | 3.65                   | 0.68                 | 86.00            | 732.00            |
|    | 09/02/15 10:26:32                | 14400                     | 15.79                 | 2.50          | 0.26           | 3.65                   | 0.68                 | 86.00            | 732.00            |
|    | 09/02/15 10:27:02                | 14430                     | 15.75                 | 2.23          | 0.21           | 3.69                   | 0.68                 | 86.20            | 748.00            |
|    | 09/02/15 10:27:32                | 14460                     | 15.80                 | 2.29          | 0.19           | 3.64                   | 0.68                 | 86.20            | 748.00            |
|    | 09/02/15 10:28:02                | 14490                     | 15.71                 | 2.35          | 0.25           | 3.70                   | 0.67                 | 86.50            | 731.00            |
|    | 09/02/15 10:28:32                | 14520                     | 15.49                 | 2.18          | 0.23           | 3.88                   | 0.67                 | 86.50            | 731.00            |
|    | 09/02/15 10:29:02                | 14550                     | 15.76                 | 2.10          | 0.22           | 3.70                   | 0.68                 | 86.80            | 748.00            |
|    | 09/02/15 10:29:32                | 14580                     | 15.90                 | 2.93          | 0.20           | 3.57                   | 0.68                 | 86.80            | 748.00            |
|    | 09/02/15 10:30:02                | 14610                     | 15.70                 | 3.16          | 0.22           | 3.71                   | 0.86                 | 87.00            | 906.00            |
| A3 | 09/02/15 10:30:32                | 14640                     | 15.45                 | 2.56          | 0.26           | 3.85                   | 0.86                 | 87.00            | 906.00            |
|    | 09/02/15 10:31:02                | 14670                     | 13.80                 | 1.59          | 0.18           | 5.01                   | 1.08                 | 87.10            | 1,050.00          |
|    | 09/02/15 10:31:32                | 14700                     | 13.62                 | 0.15          | 0.14           | 5.15                   | 1.08                 | 87.10            | 1,050.00          |
|    | 09/02/15 10:32:02                | 14730                     | 13.77                 | -0.04         | 0.13           | 5.05                   | 1.11                 | 87.10            | 1,052.00          |
|    | 09/02/15 10:32:32                | 14760                     | 13.89                 | 0.01          | 0.17           | 4.98                   | 1.11                 | 87.10            | 1,052.00          |
|    | 09/02/15 10:33:02                | 14790                     | 14.08                 | 0.14          | 0.16           | 4.85                   | 1.11                 | 87.20            | 1,053.00          |
|    | 09/02/15 10:33:32                | 14820                     | 13.96                 | 0.12          | 0.15           | 4.91                   | 1.11                 | 87.20            | 1,053.00          |
|    | 09/02/15 10:34:02                | 14850                     | 14.23                 | -0.07         | 0.23           | 4.76                   | 1.12                 | 87.20            | 1,053.00          |
|    | 09/02/15 10:34:32                | 14880                     | 14.43                 | 0.01          | 0.23           | 4.62                   | 1.12                 | 87.20            | 1,053.00          |
|    | 09/02/15 10:35:02                | 14910                     | 14.29                 | 0.02          | 0.18           | 4.70                   | 1.11                 | 87.30            | 1,052.00          |
|    | 09/02/15 10:35:32                | 14940                     | 14.30                 | 0.00          | 0.23           | 4.71                   | 1.11                 | 87.30            | 1,052.00          |
|    | 09/02/15 10:36:02                | 14970                     | 14.42                 | -0.11         | 0.28           | 4.62                   | 1.12                 | 87.40            | 1,036.00          |
|    | 09/02/15 10:36:32                | 15000                     | 14.61                 | 0.00          | 0.22           | 4.49                   | 1.12                 | 87.40            | 1,036.00          |
|    | 09/02/15 10:37:02                | 15030                     | 14.27                 | 0.01          | 0.17           | 4.71                   | 1.11                 | 87.50            | 1,035.00          |
|    | 09/02/15 10:37:32                | 15060                     | 14.21                 | -0.11         | 0.24           | 4.76                   | 1.11                 | 87.50            | 1,035.00          |
|    | 09/02/15 10:38:02                | 15090                     | 14.58                 | -0.13         | 0.28           | 4.54                   | 1.12                 | 87.60            | 1,036.00          |
|    | 09/02/15 10:38:32                | 15120                     | 14.54                 | -0.08         | 0.23           | 4.54                   | 1.12                 | 87.60            | 1,036.00          |
|    | 09/02/15 10:39:02                | 15150                     | 14.50                 | -0.12         | 0.21           | 4.53                   | 1.12                 | 87.70            | 1,036.00          |
|    | 09/02/15 10:39:32                | 15180                     | 14.12                 | -0.12         | 0.23           | 4.82                   | 1.12                 | 87.70            | 1,036.00          |
|    | 09/02/15 10:40:02                | 15210                     | 14.35                 | -0.02         | 0.23           | 4.69                   | 1.12                 | 87.80            | 1,052.00          |
|    | 09/02/15 10:40:32                | 15240                     | 14.65                 | 0.04          | 0.22           | 4.46                   | 1.12                 | 87.80            | 1,052.00          |
|    | 09/02/15 10:41:02                | 15270                     | 14.18                 | 0.00          | 0.17           | 4.79                   | 0.70                 | 88.00            | 763.00            |
|    | 09/02/15 10:41:32                | 15300                     | 15.90                 | 0.37          | 0.34           | 3.65                   | 0.70                 | 88.00            | 763.00            |
|    | 09/02/15 10:42:02                | 15330                     | 16.69                 | 1.66          | 0.37           | 3.04                   | 0.67                 | 88.30            | 729.00            |
|    | 09/02/15 10:42:32                | 15360                     | 16.73                 | 2.33          | 0.36           | 3.04                   | 0.67                 | 88.30            | 729.00            |
|    | 09/02/15 10:43:02                | 15390                     | 16.95                 | 1.91          | 0.42           | 2.85                   | 0.66                 | 88.60            | 712.00            |
|    | 09/02/15 10:43:32                | 15420                     | 16.66                 | 2.06          | 0.45           | 3.07                   | 0.66                 | 88.60            | 712.00            |
|    | 09/02/15 10:44:02                | 15450                     | 16.30                 | 2.55          | 0.34           | 3.28                   | 0.66                 | 88.80            | 728.00            |
|    | 09/02/15 10:44:32                | 15480                     | 16.67                 | 2.37          | 0.38           | 3.09                   | 0.66                 | 88.80            | 728.00            |
|    | 09/02/15 10:45:02                | 15510                     | 16.83                 | 1.89          | 0.38           | 2.91                   | 1.06                 | 89.00            | 1,029.00          |
|    | 09/02/15 10:45:32                | 15540                     | 14.61                 | 1.68          | 0.31           | 4.41                   | 1.06                 | 89.00            | 1,029.00          |
|    | 09/02/15 10:46:02                | 15570                     | 14.30                 | 0.24          | 0.30           | 4.70                   | 1.08                 | 89.00            | 1,047.00          |
|    | 09/02/15 10:46:32                | 15600                     | 14.98                 | 0.09          | 0.33           | 4.27                   | 1.08                 | 89.00            | 1,047.00          |
|    | 09/02/15 10:47:02                | 15630                     | 15.82                 | -0.01         | 0.38           | 3.67                   | 1.11                 | 89.10            | 1,032.00          |
|    | 09/02/15 10:47:32                | 15660                     | 15.27                 | -0.06         | 0.33           | 3.97                   | 1.11                 | 89.10            | 1,032.00          |
|    | 09/02/15 10:48:02                | 15690                     | 14.56                 | -0.02         | 0.33           | 4.53                   | 1.12                 | 89.10            | 1,050.00          |
|    | 09/02/15 10:48:32                | 15720                     | 14.98                 | 0.06          | 0.38           | 4.27                   | 1.12                 | 89.10            | 1,050.00          |
|    | 09/02/15 10:49:02                | 15750                     | 15.56                 | 0.02          | 0.37           | 3.81                   | 1.12                 | 89.10            | 1,033.00          |
|    | 09/02/15 10:49:32                | 15780                     | 14.99                 | -0.07         | 0.25           | 4.19                   | 1.12                 | 89.10            | 1,033.00          |



**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 4.9    | %    |
| Stack Exhaust Flow (M2) | 54,888 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 25.00    | in. Hg                       |
| Relative Humidity   | 34       | %                            |
| Ambient Temperature | 83       | °F                           |
| Specific Humidity   | 0.009784 | lb H <sub>2</sub> O / lb air |

70-100-70 Load, Run - EC36-2S R8

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| 09/02/15 10:50:02                | 15810                     | 14.51                 | -0.13         | 0.26           | 4.55                   | 1.11                 | 89.20            | 1,032.00          |
| 09/02/15 10:50:32                | 15840                     | 14.52                 | -0.07         | 0.33           | 4.55                   | 1.11                 | 89.20            | 1,032.00          |
| 09/02/15 10:51:02                | 15870                     | 14.63                 | 0.02          | 0.29           | 4.48                   | 1.11                 | 89.20            | 1,032.00          |
| 09/02/15 10:51:32                | 15900                     | 14.42                 | 0.06          | 0.22           | 4.61                   | 1.11                 | 89.20            | 1,032.00          |
| 09/02/15 10:52:02                | 15930                     | 14.42                 | 0.06          | 0.27           | 4.60                   | 1.12                 | 89.20            | 1,032.00          |
| 09/02/15 10:52:32                | 15960                     | 14.75                 | 0.02          | 0.38           | 4.40                   | 1.12                 | 89.20            | 1,032.00          |
| 09/02/15 10:53:02                | 15990                     | 14.86                 | -0.03         | 0.35           | 4.30                   | 1.12                 | 89.30            | 1,032.00          |
| 09/02/15 10:53:32                | 16020                     | 14.75                 | -0.12         | 0.28           | 4.39                   | 1.12                 | 89.30            | 1,032.00          |
| 09/02/15 10:54:02                | 16050                     | 14.62                 | -0.13         | 0.26           | 4.51                   | 1.12                 | 89.40            | 1,032.00          |
| 09/02/15 10:54:32                | 16080                     | 14.81                 | -0.09         | 0.38           | 4.32                   | 1.12                 | 89.40            | 1,032.00          |
| 09/02/15 10:55:02                | 16110                     | 14.75                 | -0.10         | 0.36           | 4.38                   | 1.11                 | 89.30            | 1,032.00          |
| 09/02/15 10:55:32                | 16140                     | 15.23                 | -0.06         | 0.35           | 4.05                   | 1.11                 | 89.30            | 1,032.00          |
| 09/02/15 10:56:02                | 16170                     | 15.24                 | -0.01         | 0.37           | 4.04                   | 1.12                 | 89.30            | 1,032.00          |
| 09/02/15 10:56:32                | 16200                     | 15.01                 | 0.02          | 0.40           | 4.22                   | 1.12                 | 89.30            | 1,032.00          |
| 09/02/15 10:57:02                | 16230                     | 14.83                 | 0.04          | 0.42           | 4.31                   | 0.69                 | 89.40            | 745.00            |
| 09/02/15 10:57:32                | 16260                     | 14.63                 | 0.02          | 0.36           | 4.51                   | 0.69                 | 89.40            | 745.00            |
| 09/02/15 10:58:02                | 16290                     | 15.87                 | 0.00          | 0.44           | 3.59                   | 0.66                 | 89.60            | 726.00            |
| 09/02/15 10:58:32                | 16320                     | 16.69                 | 0.01          | 0.45           | 3.07                   | 0.66                 | 89.60            | 726.00            |
| 09/02/15 10:59:02                | 16350                     | 17.03                 | 0.95          | 0.47           | 2.81                   | 0.66                 | 89.80            | 710.00            |
| 09/02/15 10:59:32                | 16380                     | 16.89                 | 1.45          | 0.51           | 2.88                   | 0.66                 | 89.80            | 710.00            |
| 09/02/15 11:00:02                | 16410                     | 16.65                 | 1.71          | 0.46           | 3.06                   | 0.65                 | 90.10            | 726.00            |
| <b>RAW AVERAGE</b>               |                           | <b>14.48</b>          | <b>0.56</b>   | <b>0.21</b>    | <b>4.56</b>            | <b>0.98</b>          | <b>85.84</b>     | <b>953.72</b>     |

| Bias                   | Serial Number:  |              |              |              | Press. Trans           | Temp. Trans. | F-Flow Trans. |
|------------------------|-----------------|--------------|--------------|--------------|------------------------|--------------|---------------|
|                        | INSTO2-0011     | INST-CO-0022 | INST-TH-0002 | INST-C2-0013 | 1434717                | 1434717      | 1434717       |
|                        |                 | (%)          | (ppmvd)      | (ppmvw)      | (in. H <sub>2</sub> O) | (°F)         | (SCFH)        |
|                        | Initial Zero    | -0.08        | 0.09         | 0.00         |                        |              |               |
|                        | Final Zero      | -0.07        | 0.08         | 0.07         |                        |              |               |
|                        | Avg. Zero       | -0.08        | 0.09         | 0.04         |                        |              |               |
|                        |                 |              |              |              |                        |              |               |
|                        | Initial UpScale | 11.80        | 9.39         | 3.00         | 9.09                   |              |               |
|                        | Final UpScale   | 11.82        | 9.35         | 2.96         | 9.05                   |              |               |
|                        | Avg. UpScale    | 11.81        | 9.37         | 2.98         | 9.07                   |              |               |
| <b>Upscale Cal Gas</b> |                 | 11.91        | 9.48         | 3.02         | 9.09                   |              |               |

| EMISSIONS DATA                          | O <sub>2</sub> | CO   | THC  | CO <sub>2</sub> |
|-----------------------------------------|----------------|------|------|-----------------|
| Corrected Raw Average (ppm/% dry basis) | 14.59          | 0.48 | 0.18 | 4.54            |
| Corrected Raw Average (ppm/% wet basis) | 13.87          | 0.45 | 0.17 | 4.31            |
| Emission Rate (lb/hr)                   | N/A            | 0.00 | 0.00 | N/A             |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 5.0    | %    |
| Stack Exhaust Flow (M2) | 54,081 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.99    | in. Hg                       |
| Relative Humidity   | 22       | %                            |
| Ambient Temperature | 87       | °F                           |
| Specific Humidity   | 0.007169 | lb H <sub>2</sub> O / lb air |

70-100-70 Load, Run - EC36-2S R9

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| A1 | 09/02/15 11:10:02                | 17010                     | 15.45                 | 2.10          | 0.40           | 3.97                   | 0.65                 | 91.60            | 708.00            |
|    | 09/02/15 11:10:32                | 17040                     | 15.55                 | 2.23          | 0.29           | 3.89                   | 0.65                 | 91.60            | 708.00            |
|    | 09/02/15 11:11:02                | 17070                     | 15.54                 | 2.51          | 0.20           | 3.89                   | 0.65                 | 91.70            | 707.00            |
|    | 09/02/15 11:11:32                | 17100                     | 15.58                 | 2.60          | 0.21           | 3.87                   | 0.65                 | 91.70            | 707.00            |
|    | 09/02/15 11:12:02                | 17130                     | 15.67                 | 2.98          | 0.28           | 3.81                   | 0.64                 | 91.90            | 707.00            |
|    | 09/02/15 11:12:32                | 17160                     | 15.67                 | 3.21          | 0.26           | 3.80                   | 0.64                 | 91.90            | 707.00            |
|    | 09/02/15 11:13:02                | 17190                     | 15.49                 | 3.23          | 0.19           | 3.92                   | 1.05                 | 91.90            | 1,056.00          |
|    | 09/02/15 11:13:32                | 17220                     | 13.77                 | 2.27          | 0.13           | 5.02                   | 1.05                 | 91.90            | 1,056.00          |
|    | 09/02/15 11:14:02                | 17250                     | 13.41                 | 0.43          | 0.17           | 5.32                   | 1.08                 | 91.70            | 1,042.00          |
|    | 09/02/15 11:14:32                | 17280                     | 13.57                 | 0.13          | 0.22           | 5.22                   | 1.08                 | 91.70            | 1,042.00          |
|    | 09/02/15 11:15:02                | 17310                     | 13.39                 | 0.05          | 0.16           | 5.33                   | 1.10                 | 91.70            | 1,043.00          |
|    | 09/02/15 11:15:32                | 17340                     | 13.09                 | -0.10         | 0.15           | 5.53                   | 1.10                 | 91.70            | 1,043.00          |
|    | 09/02/15 11:16:02                | 17370                     | 13.39                 | -0.16         | 0.21           | 5.36                   | 1.11                 | 91.60            | 1,044.00          |
|    | 09/02/15 11:16:32                | 17400                     | 13.48                 | -0.15         | 0.22           | 5.29                   | 1.11                 | 91.60            | 1,044.00          |
|    | 09/02/15 11:17:02                | 17430                     | 13.28                 | -0.17         | 0.17           | 5.42                   | 1.12                 | 91.60            | 1,028.00          |
|    | 09/02/15 11:17:32                | 17460                     | 13.31                 | -0.23         | 0.15           | 5.42                   | 1.12                 | 91.60            | 1,028.00          |
|    | 09/02/15 11:18:02                | 17490                     | 13.34                 | -0.20         | 0.17           | 5.39                   | 1.11                 | 91.60            | 1,061.00          |
|    | 09/02/15 11:18:32                | 17520                     | 13.53                 | -0.13         | 0.19           | 5.27                   | 1.11                 | 91.60            | 1,061.00          |
|    | 09/02/15 11:19:02                | 17550                     | 13.34                 | -0.13         | 0.14           | 5.37                   | 1.12                 | 91.70            | 1,061.00          |
|    | 09/02/15 11:19:32                | 17580                     | 13.24                 | -0.15         | 0.15           | 5.46                   | 1.12                 | 91.70            | 1,061.00          |
|    | 09/02/15 11:20:02                | 17610                     | 13.33                 | -0.12         | 0.21           | 5.41                   | 1.12                 | 91.70            | 1,045.00          |
|    | 09/02/15 11:20:32                | 17640                     | 13.50                 | -0.10         | 0.19           | 5.28                   | 1.12                 | 91.70            | 1,045.00          |
|    | 09/02/15 11:21:02                | 17670                     | 13.49                 | -0.08         | 0.14           | 5.28                   | 1.12                 | 91.70            | 1,044.00          |
|    | 09/02/15 11:21:32                | 17700                     | 13.67                 | -0.07         | 0.15           | 5.16                   | 1.12                 | 91.70            | 1,044.00          |
|    | 09/02/15 11:22:02                | 17730                     | 13.52                 | -0.05         | 0.24           | 5.23                   | 1.12                 | 91.80            | 1,028.00          |
|    | 09/02/15 11:22:32                | 17760                     | 13.24                 | -0.13         | 0.29           | 5.43                   | 1.12                 | 91.80            | 1,028.00          |
|    | 09/02/15 11:23:02                | 17790                     | 13.47                 | -0.16         | 0.22           | 5.28                   | 1.12                 | 91.80            | 1,028.00          |
|    | 09/02/15 11:23:32                | 17820                     | 13.39                 | -0.13         | 0.14           | 5.32                   | 1.12                 | 91.80            | 1,028.00          |
|    | 09/02/15 11:24:02                | 17850                     | 13.43                 | -0.13         | 0.12           | 5.31                   | 1.12                 | 91.90            | 1,044.00          |
|    | 09/02/15 11:24:32                | 17880                     | 13.15                 | -0.08         | 0.16           | 5.46                   | 1.12                 | 91.90            | 1,044.00          |
|    | 09/02/15 11:25:02                | 17910                     | 12.82                 | -0.16         | 0.21           | 5.73                   | 1.12                 | 91.90            | 1,027.00          |
|    | 09/02/15 11:25:32                | 17940                     | 13.17                 | -0.11         | 0.17           | 5.50                   | 1.12                 | 91.90            | 1,027.00          |
|    | 09/02/15 11:26:02                | 17970                     | 13.50                 | -0.07         | 0.07           | 5.26                   | 1.12                 | 91.90            | 1,044.00          |
|    | 09/02/15 11:26:32                | 18000                     | 13.50                 | 0.00          | 0.12           | 5.26                   | 1.12                 | 91.90            | 1,044.00          |
|    | 09/02/15 11:27:02                | 18030                     | 13.54                 | 0.00          | 0.20           | 5.22                   | 0.77                 | 92.00            | 810.00            |
|    | 09/02/15 11:27:32                | 18060                     | 13.97                 | -0.09         | 0.17           | 5.01                   | 0.77                 | 92.00            | 810.00            |
|    | 09/02/15 11:28:02                | 18090                     | 15.54                 | 0.54          | 0.15           | 3.92                   | 0.67                 | 92.30            | 724.00            |
|    | 09/02/15 11:28:32                | 18120                     | 15.55                 | 1.68          | 0.15           | 3.91                   | 0.67                 | 92.30            | 724.00            |
|    | 09/02/15 11:29:02                | 18150                     | 15.53                 | 1.84          | 0.21           | 3.91                   | 0.66                 | 92.50            | 739.00            |
|    | 09/02/15 11:29:32                | 18180                     | 15.70                 | 2.05          | 0.21           | 3.79                   | 0.66                 | 92.50            | 739.00            |
| A2 | 09/02/15 11:30:02                | 18210                     | 15.60                 | 2.37          | 0.17           | 3.86                   | 0.66                 | 92.70            | 739.00            |
|    | 09/02/15 11:30:32                | 18240                     | 15.60                 | 2.34          | 0.15           | 3.85                   | 0.66                 | 92.70            | 739.00            |
|    | 09/02/15 11:31:02                | 18270                     | 15.52                 | 1.98          | 0.15           | 3.91                   | 0.87                 | 92.90            | 881.00            |
|    | 09/02/15 11:31:32                | 18300                     | 15.35                 | 1.80          | 0.17           | 4.02                   | 0.87                 | 92.90            | 881.00            |
|    | 09/02/15 11:32:02                | 18330                     | 13.71                 | 1.22          | 0.08           | 5.09                   | 1.06                 | 92.90            | 1,021.00          |
|    | 09/02/15 11:32:32                | 18360                     | 13.70                 | -0.09         | 0.07           | 5.13                   | 1.06                 | 92.90            | 1,021.00          |
|    | 09/02/15 11:33:02                | 18390                     | 13.46                 | -0.26         | 0.10           | 5.31                   | 1.07                 | 92.90            | 1,022.00          |
|    | 09/02/15 11:33:32                | 18420                     | 13.67                 | -0.25         | 0.15           | 5.15                   | 1.07                 | 92.90            | 1,022.00          |
|    | 09/02/15 11:34:02                | 18450                     | 13.37                 | -0.23         | 0.10           | 5.35                   | 1.08                 | 92.90            | 1,023.00          |
|    | 09/02/15 11:34:32                | 18480                     | 13.71                 | -0.30         | 0.06           | 5.14                   | 1.08                 | 92.90            | 1,023.00          |
|    | 09/02/15 11:35:02                | 18510                     | 13.77                 | -0.24         | 0.09           | 5.10                   | 1.11                 | 93.00            | 1,042.00          |
|    | 09/02/15 11:35:32                | 18540                     | 13.84                 | -0.16         | 0.15           | 5.05                   | 1.11                 | 93.00            | 1,042.00          |
|    | 09/02/15 11:36:02                | 18570                     | 13.93                 | -0.19         | 0.15           | 5.00                   | 1.11                 | 93.00            | 1,058.00          |
|    | 09/02/15 11:36:32                | 18600                     | 13.79                 | -0.08         | 0.09           | 5.07                   | 1.11                 | 93.00            | 1,058.00          |
|    | 09/02/15 11:37:02                | 18630                     | 13.59                 | -0.17         | 0.09           | 5.21                   | 1.12                 | 93.10            | 1,042.00          |
|    | 09/02/15 11:37:32                | 18660                     | 13.64                 | -0.29         | 0.20           | 5.18                   | 1.12                 | 93.10            | 1,042.00          |
|    | 09/02/15 11:38:02                | 18690                     | 13.74                 | -0.28         | 0.15           | 5.12                   | 1.13                 | 93.10            | 1,059.00          |
|    | 09/02/15 11:38:32                | 18720                     | 13.76                 | -0.22         | 0.08           | 5.11                   | 1.13                 | 93.10            | 1,059.00          |
|    | 09/02/15 11:39:02                | 18750                     | 13.53                 | -0.18         | 0.02           | 5.24                   | 1.12                 | 93.20            | 1,025.00          |
|    | 09/02/15 11:39:32                | 18780                     | 13.72                 | -0.32         | 0.06           | 5.13                   | 1.12                 | 93.20            | 1,025.00          |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 5.0    | %    |
| Stack Exhaust Flow (M2) | 54,081 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.99    | in. Hg                       |
| Relative Humidity   | 22       | %                            |
| Ambient Temperature | 87       | °F                           |
| Specific Humidity   | 0.007169 | lb H <sub>2</sub> O / lb air |

70-100-70 Load, Run - EC36-2S R9

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
|    | 09/02/15 11:40:02                | 18810                     | 13.94                 | -0.24         | 0.17           | 5.00                   | 1.12                 | 93.30            | 1,041.00          |
|    | 09/02/15 11:40:32                | 18840                     | 13.96                 | -0.15         | 0.17           | 4.99                   | 1.12                 | 93.30            | 1,041.00          |
|    | 09/02/15 11:41:02                | 18870                     | 13.71                 | -0.18         | 0.07           | 5.11                   | 1.11                 | 93.30            | 1,041.00          |
|    | 09/02/15 11:41:32                | 18900                     | 13.87                 | -0.26         | 0.07           | 5.04                   | 1.11                 | 93.30            | 1,041.00          |
|    | 09/02/15 11:42:02                | 18930                     | 13.90                 | -0.15         | 0.16           | 5.02                   | 1.11                 | 93.50            | 1,024.00          |
|    | 09/02/15 11:42:32                | 18960                     | 13.93                 | -0.15         | 0.16           | 4.99                   | 1.11                 | 93.50            | 1,024.00          |
|    | 09/02/15 11:43:02                | 18990                     | 13.79                 | -0.14         | 0.10           | 5.08                   | 1.11                 | 93.50            | 1,024.00          |
|    | 09/02/15 11:43:32                | 19020                     | 13.59                 | -0.23         | 0.06           | 5.20                   | 1.11                 | 93.50            | 1,024.00          |
|    | 09/02/15 11:44:02                | 19050                     | 13.59                 | -0.32         | 0.10           | 5.21                   | 1.03                 | 93.60            | 986.00            |
|    | 09/02/15 11:44:32                | 19080                     | 13.81                 | -0.31         | 0.07           | 5.07                   | 1.03                 | 93.60            | 986.00            |
|    | 09/02/15 11:45:02                | 19110                     | 14.20                 | -0.22         | 0.05           | 4.85                   | 0.70                 | 93.80            | 772.00            |
|    | 09/02/15 11:45:32                | 19140                     | 15.43                 | 0.23          | 0.11           | 4.00                   | 0.70                 | 93.80            | 772.00            |
|    | 09/02/15 11:46:02                | 19170                     | 15.75                 | 1.62          | 0.11           | 3.75                   | 0.66                 | 94.00            | 721.00            |
|    | 09/02/15 11:46:32                | 19200                     | 15.76                 | 2.19          | 0.08           | 3.74                   | 0.66                 | 94.00            | 721.00            |
|    | 09/02/15 11:47:02                | 19230                     | 15.86                 | 2.51          | 0.15           | 3.66                   | 0.66                 | 94.30            | 753.00            |
|    | 09/02/15 11:47:32                | 19260                     | 15.56                 | 2.50          | 0.19           | 3.87                   | 0.66                 | 94.30            | 753.00            |
|    | 09/02/15 11:48:02                | 19290                     | 15.54                 | 1.93          | 0.14           | 3.90                   | 0.86                 | 94.60            | 909.00            |
|    | 09/02/15 11:48:32                | 19320                     | 14.94                 | 2.04          | 0.07           | 4.24                   | 0.86                 | 94.60            | 909.00            |
|    | 09/02/15 11:49:02                | 19350                     | 13.50                 | 0.84          | 0.02           | 5.26                   | 1.04                 | 94.60            | 1,034.00          |
|    | 09/02/15 11:49:32                | 19380                     | 13.51                 | -0.23         | 0.10           | 5.26                   | 1.04                 | 94.60            | 1,034.00          |
|    | 09/02/15 11:50:02                | 19410                     | 13.47                 | -0.19         | 0.08           | 5.29                   | 1.06                 | 94.60            | 1,052.00          |
| A3 | 09/02/15 11:50:32                | 19440                     | 13.52                 | -0.22         | 0.03           | 5.26                   | 1.06                 | 94.60            | 1,052.00          |
|    | 09/02/15 11:51:02                | 19470                     | 13.67                 | -0.28         | 0.01           | 5.17                   | 1.08                 | 94.60            | 1,020.00          |
|    | 09/02/15 11:51:32                | 19500                     | 13.55                 | -0.23         | 0.06           | 5.23                   | 1.08                 | 94.60            | 1,020.00          |
|    | 09/02/15 11:52:02                | 19530                     | 13.74                 | -0.23         | 0.08           | 5.11                   | 1.10                 | 94.60            | 1,038.00          |
|    | 09/02/15 11:52:32                | 19560                     | 13.66                 | -0.22         | 0.03           | 5.15                   | 1.10                 | 94.60            | 1,038.00          |
|    | 09/02/15 11:53:02                | 19590                     | 13.18                 | -0.24         | 0.03           | 5.47                   | 1.11                 | 94.60            | 1,039.00          |
|    | 09/02/15 11:53:32                | 19620                     | 13.53                 | -0.31         | 0.10           | 5.26                   | 1.11                 | 94.60            | 1,039.00          |
|    | 09/02/15 11:54:02                | 19650                     | 13.57                 | -0.26         | 0.08           | 5.21                   | 1.12                 | 94.70            | 1,039.00          |
|    | 09/02/15 11:54:32                | 19680                     | 13.66                 | -0.32         | 0.03           | 5.17                   | 1.12                 | 94.70            | 1,039.00          |
|    | 09/02/15 11:55:02                | 19710                     | 13.72                 | -0.19         | 0.06           | 5.12                   | 1.12                 | 94.70            | 1,039.00          |
|    | 09/02/15 11:55:32                | 19740                     | 13.60                 | -0.23         | 0.06           | 5.20                   | 1.12                 | 94.70            | 1,039.00          |
|    | 09/02/15 11:56:02                | 19770                     | 13.61                 | -0.29         | 0.04           | 5.19                   | 1.12                 | 94.80            | 1,039.00          |
|    | 09/02/15 11:56:32                | 19800                     | 13.55                 | -0.29         | 0.07           | 5.24                   | 1.12                 | 94.80            | 1,039.00          |
|    | 09/02/15 11:57:02                | 19830                     | 13.50                 | -0.29         | 0.07           | 5.26                   | 1.12                 | 94.90            | 1,022.00          |
|    | 09/02/15 11:57:32                | 19860                     | 13.82                 | -0.29         | 0.03           | 5.07                   | 1.12                 | 94.90            | 1,022.00          |
|    | 09/02/15 11:58:02                | 19890                     | 13.63                 | -0.21         | 0.03           | 5.16                   | 1.12                 | 94.90            | 1,022.00          |
|    | 09/02/15 11:58:32                | 19920                     | 13.45                 | -0.24         | 0.11           | 5.30                   | 1.12                 | 94.90            | 1,022.00          |
|    | 09/02/15 11:59:02                | 19950                     | 13.73                 | -0.32         | 0.10           | 5.12                   | 1.11                 | 94.90            | 1,038.00          |
|    | 09/02/15 11:59:32                | 19980                     | 13.73                 | -0.24         | 0.03           | 5.12                   | 1.11                 | 94.90            | 1,038.00          |
|    | 09/02/15 12:00:02                | 20010                     | 13.75                 | -0.14         | 0.03           | 5.08                   | 1.12                 | 95.00            | 1,054.00          |
|    | 09/02/15 12:00:32                | 20040                     | 13.63                 | -0.25         | 0.11           | 5.18                   | 1.12                 | 95.00            | 1,054.00          |
|    | 09/02/15 12:01:02                | 20070                     | 13.99                 | -0.27         | 0.15           | 4.99                   | 0.64                 | 95.20            | 702.00            |
|    | 09/02/15 12:01:32                | 20100                     | 16.03                 | 0.41          | 0.13           | 3.56                   | 0.64                 | 95.20            | 702.00            |
|    | 09/02/15 12:02:02                | 20130                     | 16.23                 | 2.16          | 0.08           | 3.39                   | 0.63                 | 95.60            | 702.00            |
|    | 09/02/15 12:02:32                | 20160                     | 16.37                 | 2.57          | 0.15           | 3.29                   | 0.63                 | 95.60            | 702.00            |
|    | 09/02/15 12:03:02                | 20190                     | 16.12                 | 2.80          | 0.17           | 3.46                   | 0.63                 | 95.90            | 701.00            |
|    | 09/02/15 12:03:32                | 20220                     | 16.17                 | 2.27          | 0.17           | 3.44                   | 0.63                 | 95.90            | 701.00            |
|    | 09/02/15 12:04:02                | 20250                     | 16.22                 | 2.45          | 0.12           | 3.40                   | 0.63                 | 96.10            | 685.00            |
|    | 09/02/15 12:04:32                | 20280                     | 16.27                 | 2.56          | 0.15           | 3.35                   | 0.63                 | 96.10            | 685.00            |
|    | 09/02/15 12:05:02                | 20310                     | 15.91                 | 2.71          | 0.14           | 3.53                   | 1.06                 | 96.30            | 1,015.00          |
|    | 09/02/15 12:05:32                | 20340                     | 14.10                 | 1.62          | 0.06           | 4.88                   | 1.06                 | 96.30            | 1,015.00          |
|    | 09/02/15 12:06:02                | 20370                     | 13.90                 | -0.03         | 0.03           | 5.01                   | 1.08                 | 96.20            | 1,017.00          |
|    | 09/02/15 12:06:32                | 20400                     | 13.83                 | -0.18         | 0.10           | 5.04                   | 1.08                 | 96.20            | 1,017.00          |
|    | 09/02/15 12:07:02                | 20430                     | 13.91                 | -0.21         | 0.14           | 5.01                   | 1.08                 | 96.10            | 1,034.00          |
|    | 09/02/15 12:07:32                | 20460                     | 14.13                 | -0.12         | 0.07           | 4.84                   | 1.08                 | 96.10            | 1,034.00          |
|    | 09/02/15 12:08:02                | 20490                     | 14.06                 | -0.09         | 0.04           | 4.91                   | 1.11                 | 96.10            | 1,019.00          |
|    | 09/02/15 12:08:32                | 20520                     | 14.08                 | -0.15         | 0.06           | 4.89                   | 1.11                 | 96.10            | 1,019.00          |
|    | 09/02/15 12:09:02                | 20550                     | 14.12                 | -0.19         | 0.10           | 4.86                   | 1.12                 | 96.10            | 1,036.00          |
|    | 09/02/15 12:09:32                | 20580                     | 14.04                 | -0.18         | 0.05           | 4.92                   | 1.12                 | 96.10            | 1,036.00          |

**Leed Fabrication Services Inc.**  
**September 2, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 5.0    | %    |
| Stack Exhaust Flow (M2) | 54,081 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.99    | in. Hg                       |
| Relative Humidity   | 22       | %                            |
| Ambient Temperature | 87       | °F                           |
| Specific Humidity   | 0.007169 | lb H <sub>2</sub> O / lb air |

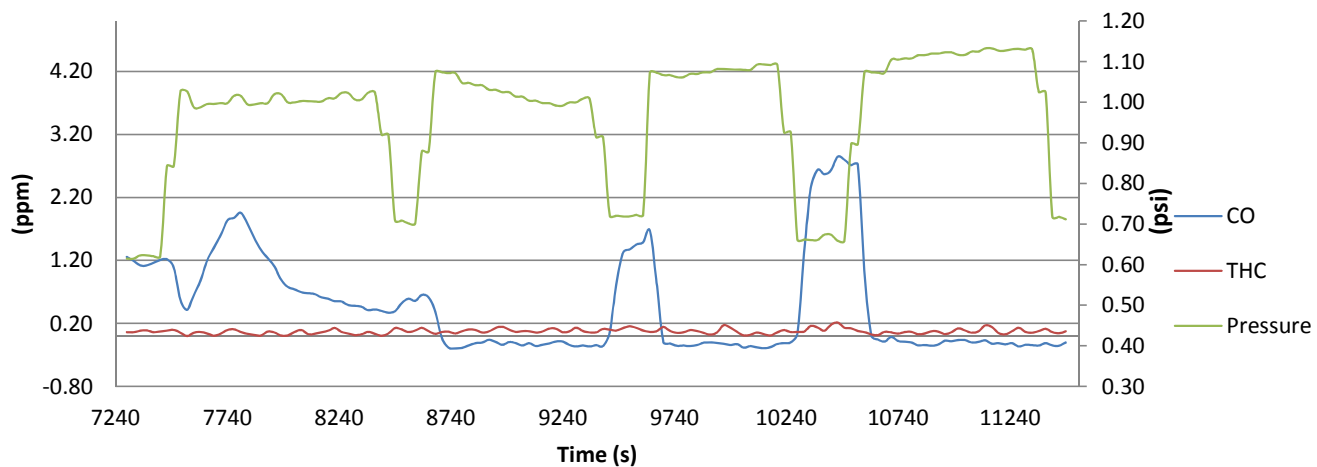
70-100-70 Load, Run - EC36-2S R9

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| 09/02/15 12:10:02                | 20610                     | 14.09                 | -0.19         | 0.02           | 4.88                   | 1.11                 | 96.10            | 1,019.00          |
| 09/02/15 12:10:32                | 20640                     | 14.11                 | -0.20         | 0.04           | 4.87                   | 1.11                 | 96.10            | 1,019.00          |
| 09/02/15 12:11:02                | 20670                     | 14.16                 | -0.15         | 0.14           | 4.84                   | 1.12                 | 96.20            | 1,052.00          |
| 09/02/15 12:11:32                | 20700                     | 14.16                 | -0.11         | 0.09           | 4.84                   | 1.12                 | 96.20            | 1,052.00          |
| 09/02/15 12:12:02                | 20730                     | 14.23                 | -0.13         | 0.05           | 4.79                   | 1.11                 | 96.30            | 1,051.00          |
| 09/02/15 12:12:32                | 20760                     | 14.20                 | -0.08         | 0.02           | 4.80                   | 1.11                 | 96.30            | 1,051.00          |
| 09/02/15 12:13:02                | 20790                     | 14.03                 | -0.15         | 0.11           | 4.93                   | 1.11                 | 96.50            | 1,018.00          |
| 09/02/15 12:13:32                | 20820                     | 14.49                 | -0.26         | 0.13           | 4.63                   | 1.11                 | 96.50            | 1,018.00          |
| 09/02/15 12:14:02                | 20850                     | 14.11                 | -0.26         | 0.05           | 4.83                   | 1.11                 | 96.50            | 1,051.00          |
| 09/02/15 12:14:32                | 20880                     | 13.95                 | -0.27         | 0.03           | 4.97                   | 1.11                 | 96.50            | 1,051.00          |
| 09/02/15 12:15:02                | 20910                     | 14.08                 | -0.19         | 0.10           | 4.91                   | 1.11                 | 96.60            | 1,018.00          |
| 09/02/15 12:15:32                | 20940                     | 14.54                 | -0.15         | 0.09           | 4.60                   | 1.11                 | 96.60            | 1,018.00          |
| 09/02/15 12:16:02                | 20970                     | 14.17                 | -0.16         | 0.07           | 4.83                   | 0.92                 | 96.60            | 910.00            |
| 09/02/15 12:16:32                | 21000                     | 14.34                 | -0.21         | 0.09           | 4.69                   | 0.92                 | 96.60            | 910.00            |
| 09/02/15 12:17:02                | 21030                     | 13.91                 | -0.20         | 0.06           | 5.00                   | 0.64                 | 96.90            | 716.00            |
| 09/02/15 12:17:32                | 21060                     | 14.23                 | -0.24         | 0.04           | 4.83                   | 0.64                 | 96.90            | 716.00            |
| 09/02/15 12:18:02                | 21090                     | 15.35                 | 0.05          | 0.12           | 4.05                   | 0.64                 | 97.20            | 668.00            |
| 09/02/15 12:18:32                | 21120                     | 15.77                 | 1.50          | 0.16           | 3.73                   | 0.64                 | 97.20            | 668.00            |
| 09/02/15 12:19:02                | 21150                     | 15.58                 | 2.28          | 0.09           | 3.88                   | 0.64                 | 97.50            | 699.00            |
| 09/02/15 12:19:32                | 21180                     | 15.73                 | 2.32          | 0.07           | 3.76                   | 0.64                 | 97.50            | 699.00            |
| 09/02/15 12:20:02                | 21210                     | 15.83                 | 2.81          | 0.14           | 3.68                   | 0.64                 | 97.70            | 699.00            |
| <b>RAW AVERAGE</b>               |                           | <b>14.21</b>          | <b>0.44</b>   | <b>0.12</b>    | <b>4.79</b>            | <b>0.98</b>          | <b>93.98</b>     | <b>951.37</b>     |

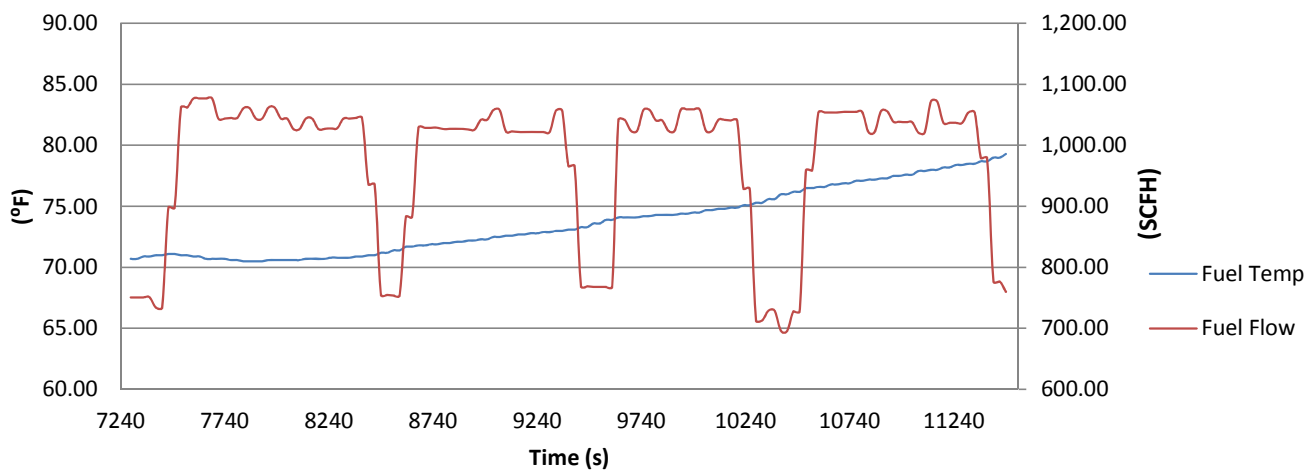
| Bias | Serial Number:  | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Press. Trans<br>(in. H <sub>2</sub> O) | Temp. Trans.<br>(°F) | F-Flow Trans.<br>(SCFH) |
|------|-----------------|-----------------------|---------------|----------------|------------------------|----------------------------------------|----------------------|-------------------------|
|      | INSTO2-0011     | INST-CO-0022          | INST-TH-0002  | INST-C2-0013   | 1434717                | 1434717                                | 1434717              |                         |
|      | Initial Zero    | -0.07                 | 0.08          | 0.07           | 0.04                   |                                        |                      |                         |
|      | Final Zero      | -0.01                 | -0.04         | 0.00           | 0.03                   |                                        |                      |                         |
|      | Avg. Zero       | -0.04                 | 0.02          | 0.04           | 0.04                   |                                        |                      |                         |
|      | Initial UpScale | 11.82                 | 9.35          | 2.96           | 9.05                   |                                        |                      |                         |
|      | Final UpScale   | 11.91                 | 9.29          | 3.02           | 9.04                   |                                        |                      |                         |
|      | Avg. UpScale    | 11.87                 | 9.32          | 2.99           | 9.05                   |                                        |                      |                         |
|      | Upscale Cal Gas | 11.91                 | 9.48          | 3.02           | 9.09                   |                                        |                      |                         |

| EMISSIONS DATA                          | O <sub>2</sub> | CO   | THC  | CO <sub>2</sub> |
|-----------------------------------------|----------------|------|------|-----------------|
| Corrected Raw Average (ppm/% dry basis) | 14.25          | 0.42 | 0.09 | 4.80            |
| Corrected Raw Average (ppm/% wet basis) | 13.54          | 0.40 | 0.08 | 4.56            |
| Emission Rate (lb/hr)                   | N/A            | 0.00 | 0.00 | N/A             |

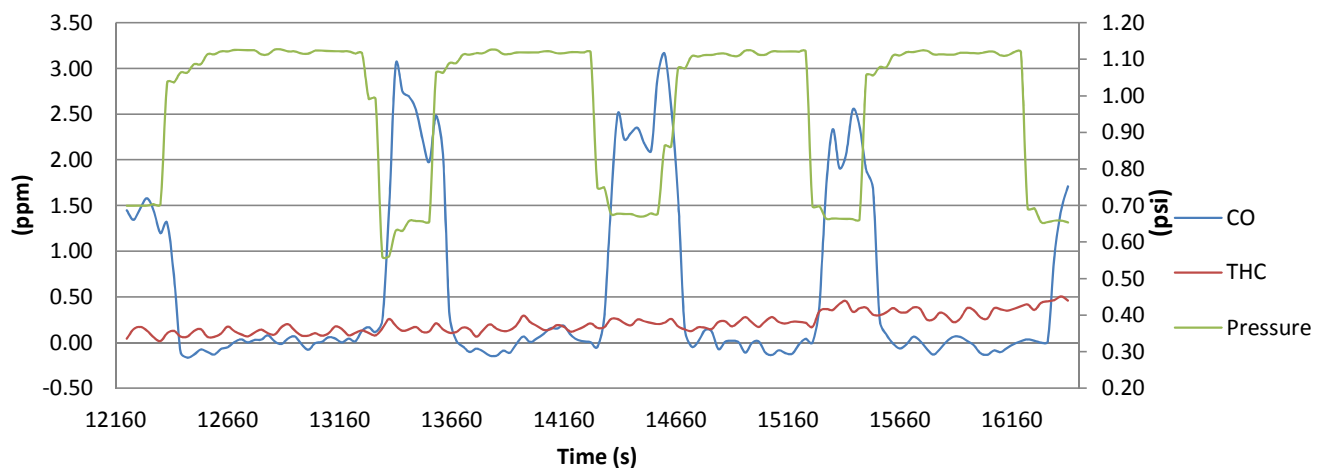
### EC36-2S R7



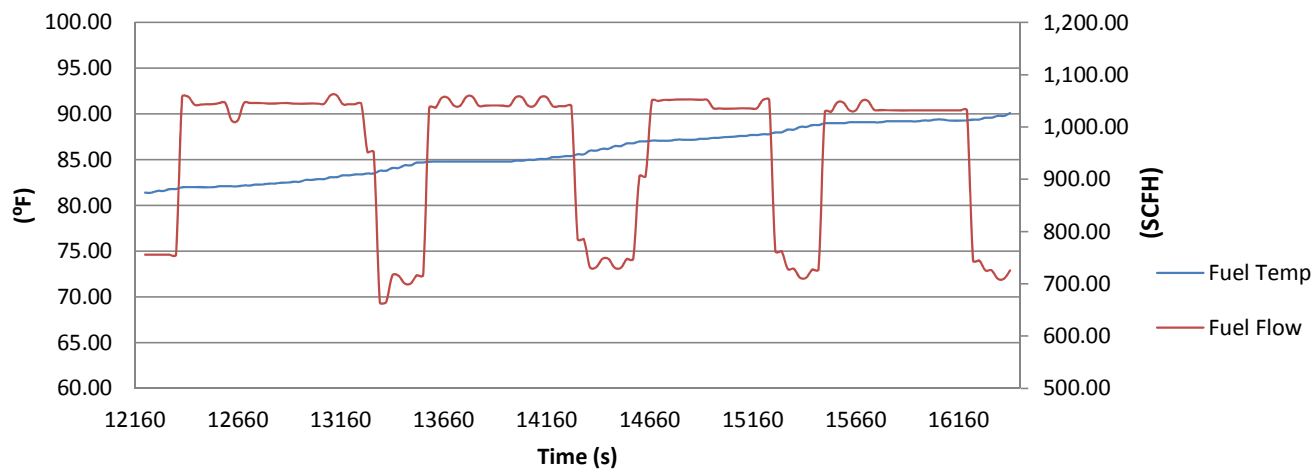
### EC36-2S R7



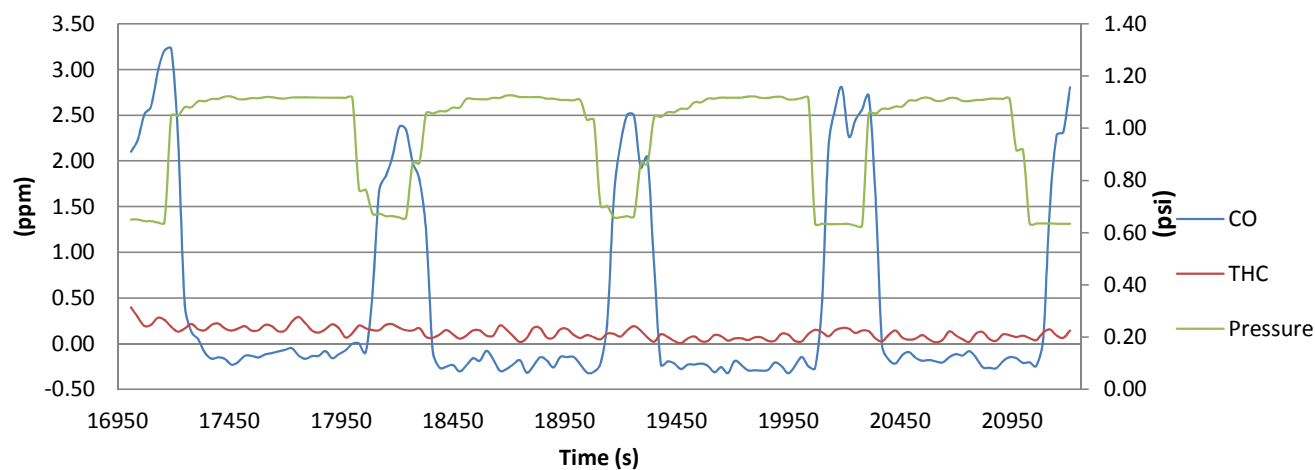
### EC36-2S R8



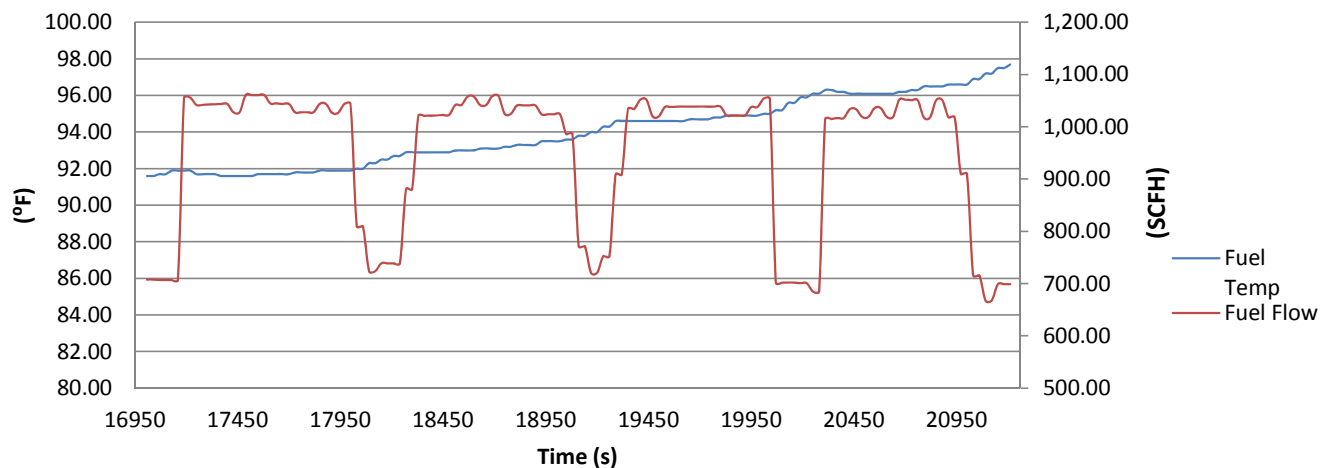
EC36-2S R8



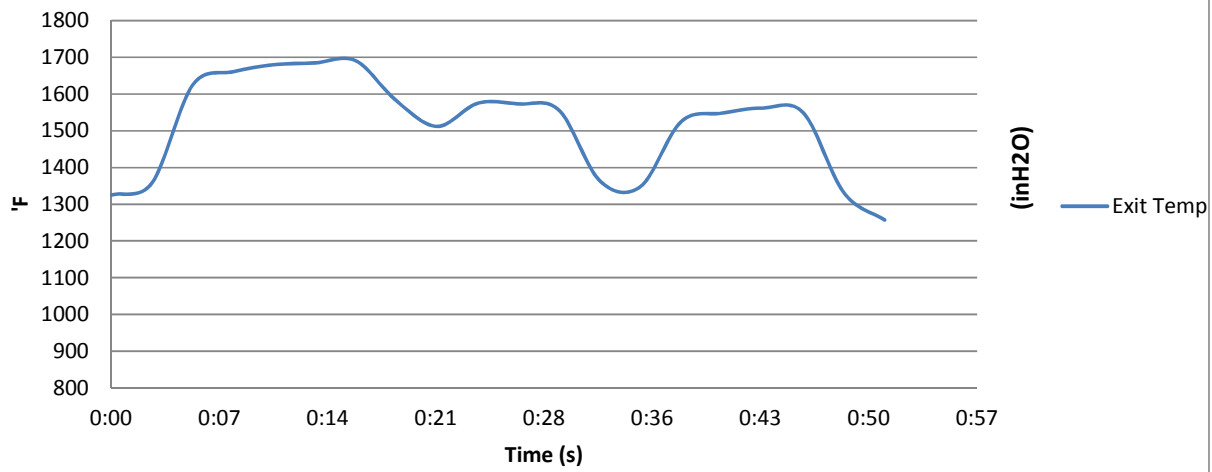
EC36-2S R9



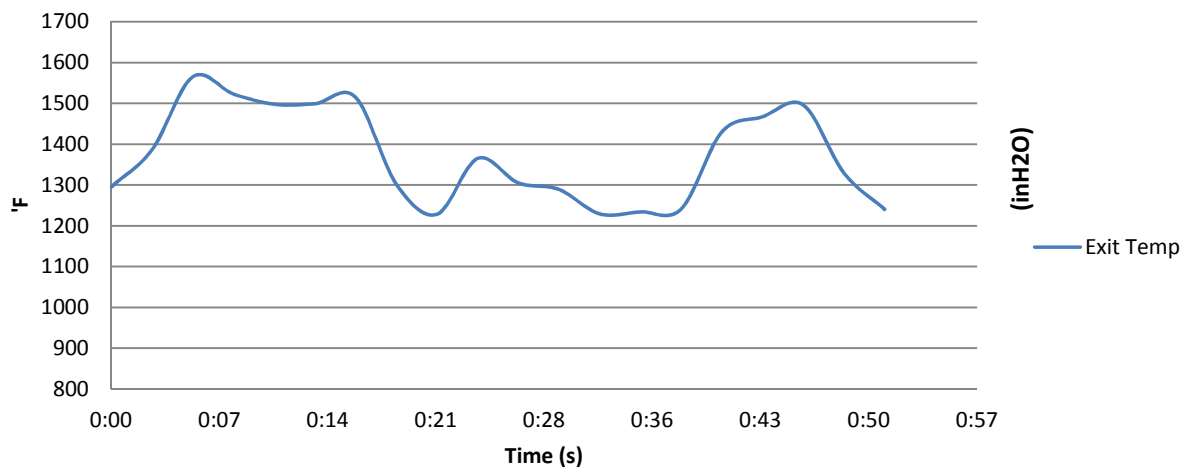
EC36-2S R9



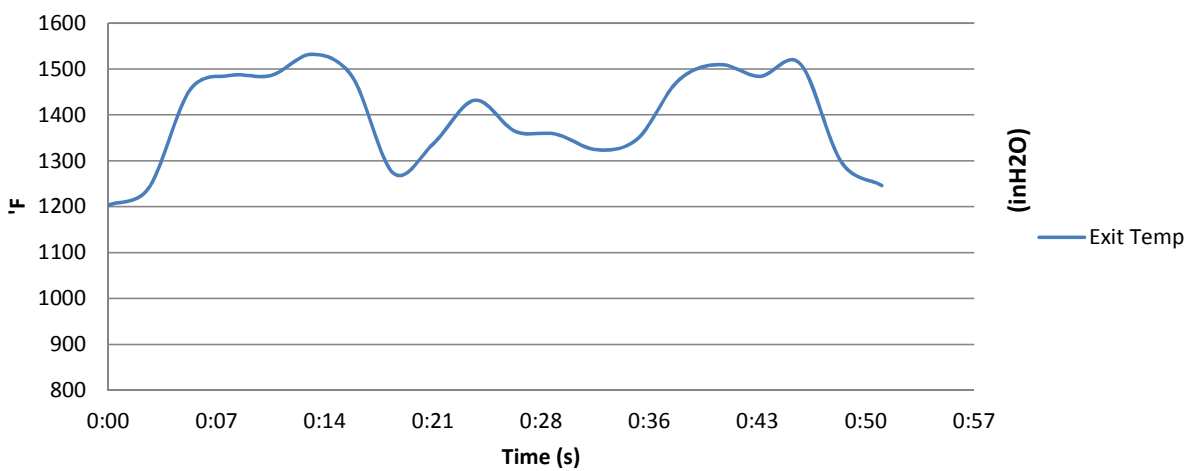
EC36 R7



EC36 R8



EC36 R9



## **EMISSION DATA RECORDS**

### **90-100% Fixed Rate Unit Operations Data**



**METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE**

| Source Information |                   |
|--------------------|-------------------|
| Plant Name         | Loveland Facility |
| Sampling Location  | EC-36-2S          |
| Fuel Type          | Gas, Propene      |

| Test Information          |              |                            |         |
|---------------------------|--------------|----------------------------|---------|
| Project #                 |              | leed-15-brighton.co-comp#1 |         |
| Operator                  |              | TP                         |         |
| Date for Preliminary Run  | (mm/dd/yy)   | 09/03/15                   |         |
| Standard Temperature      |              | 68                         | °F      |
| Standard Pressure         |              | 29.92                      | in Hg   |
| Required Sample Vol.      | RM4, 8.1.1.2 | 21                         | scf     |
| Run Duration              | ≤0.75 cfm    | 65                         | minutes |
| Unit Number               |              | 1                          |         |
| Base Run Number           |              | 90-100                     |         |
| Number of Ports Available |              | 2                          |         |
| Number of Ports Used      |              | 2                          |         |
| Port Inside Diameter      |              | 3.00                       | in      |
| Stack Shape               |              | Circular                   |         |

| Test Equipment Information       |                    |              |              |              |                     |
|----------------------------------|--------------------|--------------|--------------|--------------|---------------------|
| Run                              |                    | 1            | 2            | 3            |                     |
| Test Date                        | (mm/dd/yy)         | 09/03/15     | 09/03/15     | 09/03/15     |                     |
| Load                             | % or w/DB          | 90-100       | 90-100       | 90-100       |                     |
| Meter Box Number                 | from ACS           | SAMP-CP-0007 | SAMP-CP-0007 | SAMP-CP-0007 |                     |
| Meter Calibration Factor         | (Y)                | 0.980        | 0.980        | 0.980        |                     |
| Orifice Meter Coefficient        | ( $\Delta H_{@}$ ) | 1.656        | 1.656        | 1.656        | in H <sub>2</sub> O |
| Pitot Identification             | from ACS           | 4174         | 4174         | 4174         |                     |
| Pitot Tube Coefficient           | (C <sub>p</sub> )  | 0.819        | 0.819        | 0.819        |                     |
| Probe Number                     | from ACS           | SAMP-PF-0001 | SAMP-SP-0001 | SAMP-SP-0001 |                     |
| Probe Length                     |                    | 60.0         | 60.0         | 60.0         | in                  |
| (SS, Glass .... ) Liner Material | from list          | inconel      | inconel      | inconel      |                     |
| Impinger Case Number             | from ACS           | SAMP-BC-0002 | SAMP-BC-0002 | SAMP-BC-0002 |                     |

| Testing Company Information |                                                   |
|-----------------------------|---------------------------------------------------|
| Company Name                | Air Hygiene International, Inc. (Tulsa, Oklahoma) |
| Address                     | 1600 W Tacoma Street                              |
| City, State Zip             | Broken Arrow, Oklahoma 74012                      |
| Project Manager             | Min Sum Lee                                       |
| Phone Number                | (918) 307-8865                                    |
| Fax Number                  | (918) 307-9131                                    |

**METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] - RESULTS**

|                          |                            |
|--------------------------|----------------------------|
| <b>Plant Name</b>        | Loveland Facility          |
| <b>Sampling Location</b> | EC-36-2S                   |
| <b>Project #</b>         | leed-15-brighton.co-comp#1 |

| <b>Historical Data</b>             | <b>90-100-1</b> | <b>90-100-2</b> | <b>90-100-3</b> | <b>Average</b> | <b>Units</b>           |
|------------------------------------|-----------------|-----------------|-----------------|----------------|------------------------|
| Run Start Time                     | 08:19           | 09:41           | 11:02           |                | hh:mm                  |
| Run Stop Time                      | 09:29           | 10:51           | 12:12           |                | hh:mm                  |
| Test Date                          | 09/03/15        | 09/03/15        | 09/03/15        |                | mm/dd/yy               |
| Meter Calibration Factor           | 0.980           | 0.980           | 0.980           |                |                        |
| Pitot Tube Coefficient             | 0.819           | 0.819           | 0.819           |                |                        |
| Initial Meter Volume               | 288.930         | 342.820         | 396.270         |                | ft <sup>3</sup>        |
| Final Meter Volume                 | 342.650         | 395.845         | 449.625         |                | ft <sup>3</sup>        |
| Total Meter Volume                 | 53.720          | 53.025          | 53.355          | 53.367         | ft <sup>3</sup>        |
| Total Sampling Time                | 65.00           | 65.00           | 65.00           | 65.00          | min                    |
| Average Meter Temperature          | 73.29           | 78.31           | 79.35           | 76.99          | °F                     |
| Average Stack Temperature          | 1263.25         | 1303.42         | 1335.21         | 1300.63        | °F                     |
| Barometric Pressure                | 24.94           | 24.94           | 24.93           | 24.94          | in Hg                  |
| Stack Static Pressure              | 0.00            | 0.00            | 0.00            | 0.00           | in H <sub>2</sub> O    |
| Absolute Stack Pressure            | 24.94           | 24.94           | 24.93           | 24.94          | in Hg                  |
| Average Orifice Pressure Drop      | 1.70            | 1.70            | 1.70            | 1.70           | in H <sub>2</sub> O    |
| Absolute Meter Pressure            | 25.06           | 25.06           | 25.05           | 25.06          | in Hg                  |
| Avg Square Root Pitot Pressure     | 0.13            | 0.14            | 0.13            | 0.13           | √(in H <sub>2</sub> O) |
| <b>Moisture Content Data</b>       | <b>90-100-1</b> | <b>90-100-2</b> | <b>90-100-3</b> | <b>Average</b> | <b>Units</b>           |
| Impinger Water Weight Gain         | 27.70           | 33.50           | 34.40           | 31.87          | g                      |
| Silica Gel Weight Gain             | 11.90           | 11.30           | 14.90           | 12.70          | g                      |
| Total Water Volume Collected       | 39.67           | 44.88           | 49.39           | 44.65          | ml                     |
| Standard Water Vapor Volume        | 1.87            | 2.11            | 2.32            | 2.10           | scf                    |
| Standard Meter Volume              | 43.7            | 42.7            | 42.9            | 43.1           | dscf                   |
| Calculated Stack Moisture          | 4.10            | 4.71            | 5.14            | 4.65           | %                      |
| Saturated Stack Moisture           | 100.00          | 100.00          | 100.00          | 100.00         | %                      |
| Reported Stack Moisture Content    | 4.10            | 4.71            | 5.14            | 4.65           | %                      |
| <b>Method 3C Gas Analysis Data</b> | <b>90-100-1</b> | <b>90-100-2</b> | <b>90-100-3</b> | <b>Average</b> | <b>Units</b>           |
| Carbon Dioxide Content             | 4.6             | 5.0             | 4.8             | 4.8            | %                      |
| Oxygen Content                     | 15.8            | 15.3            | 15.5            | 15.5           | %                      |
| Nitrogen Content                   | 79.6            | 79.7            | 79.7            | 79.7           | %                      |
| Stack Dry Molecular Weight         | 29.37           | 29.39           | 29.39           | 29.38          | lb/lb-mole             |
| Stack Wet Molecular Weight         | 28.90           | 28.85           | 28.81           | 28.85          | lb/lb-mole             |
| Percent Excess Air                 | 303.0           | 266.5           | 280.0           | 283.2          | %                      |
| <b>Volumetric Flow Rate Data</b>   | <b>90-100-1</b> | <b>90-100-2</b> | <b>90-100-3</b> | <b>Average</b> | <b>Units</b>           |
| Average Stack Gas Velocity         | 14.28           | 15.08           | 14.44           | 14.60          | ft/sec                 |
| Stack Cross-Sectional Area         | 4.75            | 4.75            | 4.75            | 4.75           | ft <sup>2</sup>        |
| Actual Stack Flow Rate             | 4,066           | 4,294           | 4,112           | 4,157          | acfm                   |
| Wet Standard Stack Flow Rate       | 62              | 64              | 60              | 62             | wkscfh                 |
| Dry Standard Stack Flow Rate       | 59,758          | 61,265          | 57,358          | 59,460         | dscfh                  |

**METHOD 3C - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER**

|                          |                            |                         |          |                         |     |
|--------------------------|----------------------------|-------------------------|----------|-------------------------|-----|
| <b>Plant Name</b>        | Loveland Facility          | <b>Preliminary Date</b> | 09/03/15 |                         |     |
| <b>Sampling Location</b> | EC-36-2S                   | <b>Operator</b>         | TP       |                         |     |
| <b>Project #</b>         | leed-15-brighton.co-comp#1 | <b># of Ports Used</b>  | 2        |                         |     |
| <b>Fuel Type</b>         | Gas, Propene               | <b>Min. Fuel Factor</b> | N/A      | <b>Max. Fuel Factor</b> | N/A |

| Gas Analysis Data           |                             |                            |                       |                            |                             |                                  |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | 90-100-1                    |                            | <b>Date</b>           | 09/03/15                   | <b>Run Start Time</b>       | 08:19                            | <b>Run Stop Time</b> | 09:29                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>Methane Conc.</b>  | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b>    | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCH <sub>4</sub> ) | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (F <sub>o</sub> ) <sub>avg</sub> | (%EA) <sub>avg</sub> |                             |
| hh:mm                       | %                           | %                          | ppm                   | %                          | lb/lb-mole                  |                                  | %                    |                             |
| 01:10                       | 4.6                         | 15.8                       | 0.0                   | 79.6                       | 29.37                       | 1.109                            | 303.0                | N/A                         |

| Gas Analysis Data           |                             |                            |                       |                            |                             |                                  |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | 90-100-2                    |                            | <b>Date</b>           | 09/03/15                   | <b>Run Start Time</b>       | 09:41                            | <b>Run Stop Time</b> | 10:51                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>Methane Conc.</b>  | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b>    | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCH <sub>4</sub> ) | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (F <sub>o</sub> ) <sub>avg</sub> | (%EA) <sub>avg</sub> |                             |
| hh:mm                       | %                           | %                          | ppm                   | %                          | lb/lb-mole                  |                                  | %                    |                             |
| 01:10                       | 5.0                         | 15.3                       | 0.0                   | 79.7                       | 29.39                       | 1.131                            | 266.5                | N/A                         |

| Gas Analysis Data           |                             |                            |                       |                            |                             |                                  |                      |                             |
|-----------------------------|-----------------------------|----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------------|----------------------|-----------------------------|
| <b>Run Number</b>           | 90-100-3                    |                            | <b>Date</b>           | 09/03/15                   | <b>Run Start Time</b>       | 11:02                            | <b>Run Stop Time</b> | 12:12                       |
| <b>Sample Analysis Time</b> | <b>CO<sub>2</sub> Conc.</b> | <b>O<sub>2</sub> Conc.</b> | <b>Methane Conc.</b>  | <b>N<sub>2</sub> Conc.</b> | <b>Dry Molecular Weight</b> | <b>Calculated Fuel Factor</b>    | <b>Excess Air</b>    | <b>Fuel Factor in Range</b> |
|                             | (%CO <sub>2</sub> )         | (%O <sub>2</sub> )         | (ppmCH <sub>4</sub> ) | (%N <sub>2</sub> )         | (M <sub>d</sub> )           | (F <sub>o</sub> ) <sub>avg</sub> | (%EA) <sub>avg</sub> |                             |
| hh:mm                       | %                           | %                          | ppm                   | %                          | lb/lb-mole                  |                                  | %                    |                             |
| 01:10                       | 4.8                         | 15.5                       | 0.0                   | 79.7                       | 29.39                       | 1.120                            | 280.0                | N/A                         |

**METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES**

|                          |                            |                         |          |
|--------------------------|----------------------------|-------------------------|----------|
| <b>Plant Name</b>        | Loveland Facility          | <b>Preliminary Date</b> | 09/03/15 |
| <b>Sampling Location</b> | EC-36-2S                   | <b>Operator</b>         | TP       |
| <b>Project #</b>         | leed-15-brighton.co-comp#1 | <b>Ports Used</b>       | 2        |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | 90-100-1                            |                   | <b>Date</b>       | 09/03/15                      | <b>Start Time</b>            | 08:19                  | <b>Stop Time</b>  | 09:29               |
| <b>Meter Box Number</b>      | SAMP-CP-0007                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.980             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 53.720            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 24.94             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 1263              | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.00              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 73                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.70              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | H <sub>2</sub> O                    | H <sub>2</sub> O  | -                 | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 745.60            | 711.30            | 610.60                        | 898.80                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 727.50            | 704.40            | 607.90                        | 886.90                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 18.1              | 6.9               | 2.7                           | 11.9                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>f</sub> )                   | 39.60             | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 1.867                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 43.665            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 4.10              | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 4.10                   | %                 |                     |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | 90-100-2                            |                   | <b>Date</b>       | 09/03/15                      | <b>Start Time</b>            | 09:41                  | <b>Stop Time</b>  | 10:51               |
| <b>Meter Box Number</b>      | SAMP-CP-0007                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.980             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 53.025            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 24.94             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 1303              | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.00              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 78                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.70              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | H <sub>2</sub> O                    | H <sub>2</sub> O  | -                 | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 769.00            | 718.70            | 613.30                        | 910.10                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 745.60            | 711.30            | 610.60                        | 898.80                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 23.4              | 7.4               | 2.7                           | 11.3                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>f</sub> )                   | 44.80             | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 2.112                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 42.698            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 4.71              | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 4.71                   | %                 |                     |

| Moisture Content Data        |                                     |                   |                   |                               |                              |                        |                   |                     |
|------------------------------|-------------------------------------|-------------------|-------------------|-------------------------------|------------------------------|------------------------|-------------------|---------------------|
| <b>Run Number</b>            | 90-100-3                            |                   | <b>Date</b>       | 09/03/15                      | <b>Start Time</b>            | 11:02                  | <b>Stop Time</b>  | 12:12               |
| <b>Meter Box Number</b>      | SAMP-CP-0007                        |                   |                   |                               | <b>Meter Cal Factor</b>      | (Y)                    | 0.980             |                     |
| <b>Total Meter Volume</b>    | (V <sub>m</sub> )                   | 53.355            | dcf               |                               | <b>Barometric Pressure</b>   | (P <sub>b</sub> )      | 24.93             | in Hg               |
| <b>Average Stack Temp</b>    | (t <sub>s</sub> ) <sub>avg</sub>    | 1335              | °F                |                               | <b>Stack Static Pressure</b> | (P <sub>static</sub> ) | 0.00              | in H <sub>2</sub> O |
| <b>Average Meter Temp</b>    | (t <sub>m</sub> ) <sub>avg</sub>    | 79                | °F                |                               | <b>Avg Orifice Pressure</b>  | (ΔH) <sub>avg</sub>    | 1.70              | in H <sub>2</sub> O |
|                              | <b>Impinger 1</b>                   | <b>Impinger 2</b> | <b>Impinger 3</b> | <b>Impinger 4</b>             | <b>Impinger 5</b>            | <b>Impinger 6</b>      | <b>Impinger 7</b> | <b>Impinger 8</b>   |
|                              | (g)                                 | (g)               | (g)               | (g)                           |                              |                        |                   |                     |
| <b>Contents</b>              | H <sub>2</sub> O                    | H <sub>2</sub> O  | -                 | Sil Gel                       |                              |                        |                   |                     |
| <b>Final Value</b>           | (V <sub>f</sub> ),(W <sub>f</sub> ) | 793.70            | 726.10            | 615.60                        | 863.90                       |                        |                   |                     |
| <b>Initial Value</b>         | (V <sub>i</sub> ),(W <sub>i</sub> ) | 769.00            | 718.70            | 613.30                        | 849.00                       |                        |                   |                     |
| <b>Net Value</b>             | (V <sub>n</sub> ),(W <sub>n</sub> ) | 24.7              | 7.4               | 2.3                           | 14.9                         |                        |                   |                     |
| Results                      |                                     |                   |                   |                               |                              |                        |                   |                     |
| <b>Total Weight</b>          | (W <sub>f</sub> )                   | 49.30             | g                 | <b>Water Vol Weighed</b>      | (V <sub>wsg(std)</sub> )     | 2.324                  | scf               |                     |
| <b>Std Meter Volume</b>      | (V <sub>m(std)</sub> )              | 42.864            | dscf              | <b>Sat. Moisture Content</b>  | (B <sub>ws(svp)</sub> )      | 100.00                 | %                 |                     |
| <b>Calc Moisture Content</b> | (B <sub>ws(calc)</sub> )            | 5.14              | %                 | <b>Final Moisture Content</b> | (B <sub>ws</sub> )           | 5.14                   | %                 |                     |

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | EC-36-2S                   |
| Project #         | leed-15-brighton.co-comp#1 |

|            |          |
|------------|----------|
| Date       | 09/03/15 |
| Operator   | TP       |
| Run Number | 90-100-1 |

| Leak Checks |       |          |                       |                         |       |
|-------------|-------|----------|-----------------------|-------------------------|-------|
| Train       | Pre   | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| PASS        | Post  | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| < 3.0       | Pitot | Pre (+)  | 0.220                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Pre (-)  | 0.060                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (+) | 0.130                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (-) | 0.100                 | in H <sub>2</sub> O for | 15.0  |

| Nozzle Measurements |  |  |  |      |
|---------------------|--|--|--|------|
| Pre                 |  |  |  | PASS |
| Post                |  |  |  | PASS |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 08:19 | End | 09:29 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 727.5 | 704.4 | 607.9 | 886.9 |       |       |       |       |
| Post    | 745.6 | 711.3 | 610.6 | 898.8 |       |       |       |       |

| Sampling Equipment        |                    |           |
|---------------------------|--------------------|-----------|
| Meter Box Number          | SAMP-CP-0007       |           |
| Meter Cal Factor          | (Y)                | 0.980     |
| Low Flow Meter            | SAMP-MN-0001       |           |
| Average Nozzle Diameter   | (D <sub>no</sub> ) | in        |
| Suggested Nozzle Diameter | (D <sub>n</sub> )  | 0.4353 in |
| Probe Number              | SAMP-PF-0001       | in        |
| Probe Length              | 60                 | in        |
| Liner Material            | inconel            |           |
| Sample Case / Oven Number |                    |           |
| Impinger Case Number      | SAMP-BC-0002       |           |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Pitot Coefficient                                 | (C <sub>p</sub> )                   | 0.819  |                     |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 1263.3 | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 73.3   |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.656  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.13   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 4.10   | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.37  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.75   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 |        |                     |

| Pressures               |                        |       |                     |
|-------------------------|------------------------|-------|---------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 24.94 | in Hg               |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.00  | in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 24.94 | in Hg               |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 25.06 | in Hg               |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Traverse Point # | Sampling Time (Θ) | Timer Time | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Snorkel Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (568°F) | Cond. Temp (≤-°F) | CPM Filter Temp (-±-°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (ΔP <sup>1/2</sup> ) | Local Stack Velocity (v <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>std</sub> |
|------------------|-------------------|------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-------------------------|------------------------|----------------------------|-------------------|-------------------------|-------------------------------------|--------------------------------------|-------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
|                  | min               | hh:mm:ss   | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                      | °F                     | °F                         | °F                | °F                      | °F                                  | °F                                   | in Hg       | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1              | 0.0               | 00:00:00   | 288.930                                 | 0.005               | 1.656                                 | 1.70                                 | 1223                         | 254                     |                        | 54                         |                   |                         | 69                                  | 67                                   | 3.5         | 0.07                                | 7.57                                   | 1.946                                                |                               | 46.697                                                |
| A-2              | 2.7               | 00:02:43   | 291.300                                 | 0.010               | 1.656                                 | 1.70                                 | 1229                         | 254                     |                        | 49                         |                   |                         | 70                                  | 67                                   | 3.5         | 0.10                                | 10.72                                  | 3.857                                                |                               | 46.282                                                |
| A-3              | 5.4               | 00:05:25   | 293.630                                 | 0.015               | 1.656                                 | 1.70                                 | 1226                         | 254                     |                        | 49                         |                   |                         | 72                                  | 67                                   | 3.5         | 0.12                                | 13.12                                  | 5.756                                                |                               | 46.049                                                |
| A-4              | 8.1               | 00:08:07   | 295.950                                 | 0.020               | 1.656                                 | 1.70                                 | 1242                         | 254                     |                        | 51                         |                   |                         | 74                                  | 67                                   | 3.5         | 0.14                                | 15.22                                  | 7.676                                                |                               | 46.058                                                |
| A-5              | 10.8              | 00:10:50   | 298.300                                 | 0.025               | 1.656                                 | 1.70                                 | 1280                         | 254                     |                        | 52                         |                   |                         | 75                                  | 68                                   | 3.5         | 0.16                                | 17.21                                  | 9.401                                                |                               | 45.126                                                |
| A-6              | 13.5              | 00:13:33   | 300.415                                 | 0.025               | 1.656                                 | 1.70                                 | 1307                         | 254                     |                        | 54                         |                   |                         | 76                                  | 69                                   | 3.5         | 0.16                                | 17.34                                  | 11.196                                               |                               | 44.785                                                |
| A-7              | 16.3              | 00:16:15   | 302.620                                 | 0.025               | 1.656                                 | 1.70                                 | 1307                         | 254                     |                        | 55                         |                   |                         | 78                                  | 69                                   | 3.5         | 0.16                                | 17.34                                  | 13.008                                               |                               | 44.599                                                |
| A-8              | 19.0              | 00:18:58   | 304.850                                 | 0.020               | 1.656                                 | 1.70                                 | 1287                         | 254                     |                        | 55                         |                   |                         | 78                                  | 70                                   | 3.5         | 0.14                                | 15.42                                  | 14.810                                               |                               | 44.431                                                |
| A-9              | 21.7              | 00:21:40   | 307.070                                 | 0.015               | 1.656                                 | 1.70                                 | 1261                         | 254                     |                        | 56                         |                   |                         | 79                                  | 71                                   | 3.5         | 0.12                                | 13.26                                  | 16.601                                               |                               | 44.269                                                |
| A-10             | 24.4              | 00:24:22   | 309.280                                 | 0.015               | 1.656                                 | 1.70                                 | 1231                         | 254                     |                        | 57                         |                   |                         | 79                                  | 72                                   | 3.5         | 0.12                                | 13.14                                  | 18.398                                               |                               | 44.155                                                |
| A-11             | 27.1              | 00:27:05   | 311.500                                 | 0.010               | 1.656                                 | 1.70                                 | 1217                         | 254                     |                        | 57                         |                   |                         | 79                                  | 73                                   | 3.5         | 0.10                                | 10.68                                  | 20.185                                               |                               | 44.040                                                |
| A-12             | 29.8              | 00:29:47   | 313.710                                 | 0.005               | 1.656                                 | 1.70                                 | 1196                         | 254                     |                        | 58                         |                   |                         | 78                                  | 74                                   | 3.5         | 0.07                                | 7.51                                   | 22.005                                               |                               | 44.010                                                |
| B-1              | 32.5              | 00:32:30   | 315.960                                 | 0.015               | 1.656                                 | 1.70                                 | 1286                         | 254                     |                        | 58                         |                   |                         | 75                                  | 73                                   | 3.5         | 0.12                                | 13.35                                  | 23.823                                               |                               | 43.981                                                |
| B-2              | 35.2              | 00:35:12   | 318.200                                 | 0.020               | 1.656                                 | 1.70                                 | 1307                         | 254                     |                        | 57                         |                   |                         | 77                                  | 73                                   | 3.5         | 0.14                                | 15.51                                  | 25.606                                               |                               | 43.895                                                |
| B-3              | 37.9              | 00:37:55   | 320.400                                 | 0.025               | 1.656                                 | 1.70                                 | 1317                         | 254                     |                        | 57                         |                   |                         | 77                                  | 72                                   | 3.5         | 0.16                                | 17.39                                  | 27.374                                               |                               | 43.798                                                |
| B-4              | 40.6              | 00:40:37   | 322.580                                 | 0.030               | 1.656                                 | 1.70                                 | 1322                         | 254                     |                        | 59                         |                   |                         | 77                                  | 72                                   | 3.5         | 0.17                                | 19.08                                  | 29.174                                               |                               | 43.761                                                |
| B-5              | 43.3              | 00:43:20   | 324.800                                 | 0.030               | 1.656                                 | 1.70                                 | 1321                         | 254                     |                        | 58                         |                   |                         | 77                                  | 71                                   | 3.5         | 0.17                                | 19.07                                  | 30.960                                               |                               | 43.708                                                |
| B-6              | 46.0              | 00:46:03   | 327.000                                 | 0.035               | 1.656                                 | 1.70                                 | 1314                         | 254                     |                        | 58                         |                   |                         | 77                                  | 71                                   | 3.5         | 0.19                                | 20.56                                  | 32.782                                               |                               | 43.710                                                |
| B-7              | 48.8              | 00:48:45   | 329.245                                 | 0.025               | 1.656                                 | 1.70                                 | 1298                         | 254                     |                        | 58                         |                   |                         | 77                                  | 71                                   | 3.5         | 0.16                                | 17.30                                  | 34.560                                               |                               | 43.655                                                |
| B-8              | 51.5              | 00:51:28   | 331.435                                 | 0.020               | 1.656                                 | 1.70                                 | 1268                         | 254                     |                        | 58                         |                   |                         | 77                                  | 70                                   | 3.5         | 0.14                                | 15.34                                  | 36.360                                               |                               | 43.632                                                |
| B-9              | 54.2              | 00:54:10   | 333.650                                 | 0.020               | 1.656                                 | 1.70                                 | 1248                         | 254                     |                        | 58                         |                   |                         | 77                                  | 70                                   | 3.5         | 0.14                                | 15.25                                  | 38.188                                               |                               | 43.643                                                |
| B-10             | 56.9              | 00:56:53   | 335.900                                 | 0.015               | 1.656                                 | 1.70                                 | 1230                         | 254                     |                        | 58                         |                   |                         | 78                                  | 70                                   | 3.5         | 0.12                                | 13.14                                  | 39.998                                               |                               | 43.634                                                |
| B-11             | 59.6              | 00:59:35   | 338.130                                 | 0.010               | 1.656                                 | 1.70                                 | 1214                         | 254                     |                        | 58                         |                   |                         | 77                                  | 70                                   | 3.5         | 0.10                                | 10.68                                  | 41.822                                               |                               | 43.641                                                |
| B-12             | 62.3              | 01:02:18   | 340.375                                 | 0.005               | 1.656                                 | 1.70                                 | 1187                         | 254                     |                        | 58                         |                   |                         | 78                                  | 70                                   | 3.5         | 0.07                                | 7.49                                   | 43.669                                               |                               | 43.669                                                |
| Last Pt          | 65.0              | 01:05:00   | 342.650                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |
| Final Val        | 65.0              | 01:05:00   | 342.650                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      | Max Vac     | 3.5                                 | Final Values                           | 43.669                                               |                               |                                                       |
| Average Values   |                   |            |                                         | 0.02                |                                       | 1.70                                 | 1263                         | 254                     |                        | 56                         |                   |                         | 76                                  | 70                                   |             | 0.13                                | 14.28                                  |                                                      |                               |                                                       |
|                  |                   |            |                                         |                     |                                       |                                      |                              |                         |                        |                            |                   |                         | 73                                  |                                      |             |                                     |                                        |                                                      |                               |                                                       |

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | EC-36-2S                   |
| Project #         | leed-15-brighton.co-comp#1 |

|            |          |
|------------|----------|
| Date       | 09/03/15 |
| Operator   | TP       |
| Run Number | 90-100-2 |

| Leak Checks |       |          |                       |                         |       |
|-------------|-------|----------|-----------------------|-------------------------|-------|
| Train       | Pre   | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| PASS        | Post  | 0.000    | ft <sup>3</sup> /min@ | 15.0                    | in Hg |
| < 3.0       | Pitot | Pre (+)  | 0.175                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Pre (-)  | 0.140                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (+) | 0.100                 | in H <sub>2</sub> O for | 15.0  |
|             |       | Post (-) | 0.180                 | in H <sub>2</sub> O for | 15.0  |

| Nozzle Measurements |  |  |  |      |
|---------------------|--|--|--|------|
| Pre                 |  |  |  | PASS |
| Post                |  |  |  | PASS |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 09:41 | End | 10:51 |

| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Pre     | 745.6 | 711.3 | 610.6 | 898.8 |       |       |       |       |
| Post    | 769.0 | 718.7 | 613.3 | 910.1 |       |       |       |       |

| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Pitot Coefficient                                 | (C <sub>p</sub> )                   | 0.819  |                     |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 1303.4 | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 78.3   |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.656  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.14   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>ws</sub> )                  | 4.71   | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.39  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.67   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 |        |                     |

| Pressures               |                        |       |                     |
|-------------------------|------------------------|-------|---------------------|
| Barometric Pressure     | (P <sub>b</sub> )      | 24.94 | in Hg               |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.00  | in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 24.94 | in Hg               |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 25.06 | in Hg               |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

| Traverse Point # | Sampling Time (Θ) | Timer Time | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Desired Orifice ΔH (ΔH <sub>d</sub> ) | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Snorkel Temp (248±25°F) | Filter Temp (248±25°F) | Impinger Exit Temp (568°F) | Cond. Temp (≤-°F) | CPM Filter Temp (-±-°F) | Meter Inlet Temp (t <sub>mi</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum | Square Root ΔP (ΔP <sup>1/2</sup> ) | Local Stack Velocity (v <sub>s</sub> ) | Cumul. Meter Volume (V <sub>m</sub> ) <sub>Std</sub> | Cumul. Percent IsoKinetic (I) | Est-Run Meter Volume (V <sub>m</sub> ) <sub>Std</sub> |
|------------------|-------------------|------------|-----------------------------------------|---------------------|---------------------------------------|--------------------------------------|------------------------------|-------------------------|------------------------|----------------------------|-------------------|-------------------------|-------------------------------------|--------------------------------------|-------------|-------------------------------------|----------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------------------------------|
|                  | min               | hh:mm:ss   | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                   | in H <sub>2</sub> O                  | °F                           | °F                      | °F                     | °F                         | °F                | °F                      | °F                                  | °F                                   | in Hg       | √(in H <sub>2</sub> O)              | ft/sec                                 | dscf                                                 | %                             | dscf                                                  |
| A-1              | 0.0               | 00:00:00   | 342.820                                 | 0.015               | 1.656                                 | 1.70                                 | 1223                         | 254                     |                        | 57                         |                   |                         | 74                                  | 70                                   | 3.5         | 0.12                                | 13.12                                  | 1.874                                                |                               | 44.977                                                |
| A-2              | 2.7               | 00:02:43   | 345.120                                 | 0.015               | 1.656                                 | 1.70                                 | 1236                         | 254                     |                        | 55                         |                   |                         | 79                                  | 70                                   | 3.5         | 0.12                                | 13.17                                  | 3.650                                                |                               | 43.802                                                |
| A-3              | 5.4               | 00:05:25   | 347.310                                 | 0.020               | 1.656                                 | 1.70                                 | 1237                         | 254                     |                        | 55                         |                   |                         | 80                                  | 71                                   | 3.5         | 0.14                                | 15.21                                  | 5.399                                                |                               | 43.189                                                |
| A-4              | 8.1               | 00:08:07   | 349.470                                 | 0.025               | 1.656                                 | 1.70                                 | 1300                         | 254                     |                        | 56                         |                   |                         | 80                                  | 71                                   | 3.5         | 0.16                                | 17.32                                  | 7.220                                                |                               | 43.320                                                |
| A-5              | 10.8              | 00:10:50   | 351.720                                 | 0.030               | 1.656                                 | 1.70                                 | 1359                         | 254                     |                        | 57                         |                   |                         | 80                                  | 71                                   | 3.5         | 0.17                                | 19.29                                  | 8.968                                                |                               | 43.048                                                |
| A-6              | 13.5              | 00:13:33   | 353.880                                 | 0.030               | 1.656                                 | 1.70                                 | 1400                         | 254                     |                        | 58                         |                   |                         | 81                                  | 71                                   | 3.5         | 0.17                                | 19.51                                  | 10.780                                               |                               | 43.120                                                |
| A-7              | 16.3              | 00:16:15   | 356.120                                 | 0.030               | 1.656                                 | 1.70                                 | 1383                         | 254                     |                        | 58                         |                   |                         | 81                                  | 72                                   | 3.5         | 0.17                                | 19.42                                  | 12.509                                               |                               | 42.888                                                |
| A-8              | 19.0              | 00:18:58   | 358.260                                 | 0.025               | 1.656                                 | 1.70                                 | 1347                         | 254                     |                        | 59                         |                   |                         | 82                                  | 72                                   | 3.5         | 0.16                                | 17.55                                  | 14.269                                               |                               | 42.806                                                |
| A-9              | 21.7              | 00:21:40   | 360.440                                 | 0.020               | 1.656                                 | 1.70                                 | 1320                         | 254                     |                        | 57                         |                   |                         | 83                                  | 73                                   | 3.5         | 0.14                                | 15.58                                  | 16.098                                               |                               | 42.927                                                |
| A-10             | 24.4              | 00:24:22   | 362.710                                 | 0.015               | 1.656                                 | 1.70                                 | 1300                         | 254                     |                        | 57                         |                   |                         | 83                                  | 73                                   | 3.5         | 0.12                                | 13.42                                  | 17.862                                               |                               | 42.869                                                |
| A-11             | 27.1              | 00:27:05   | 364.900                                 | 0.010               | 1.656                                 | 1.70                                 | 1265                         | 254                     |                        | 57                         |                   |                         | 84                                  | 74                                   | 3.5         | 0.10                                | 10.85                                  | 19.632                                               |                               | 42.833                                                |
| A-12             | 29.8              | 00:29:47   | 367.100                                 | 0.010               | 1.656                                 | 1.70                                 | 1130                         | 254                     |                        | 57                         |                   |                         | 85                                  | 75                                   | 3.5         | 0.10                                | 10.41                                  | 21.438                                               |                               | 42.875                                                |
| B-1              | 32.5              | 00:32:30   | 369.350                                 | 0.010               | 1.656                                 | 1.70                                 | 1315                         | 254                     |                        | 57                         |                   |                         | 83                                  | 76                                   | 3.5         | 0.10                                | 11.00                                  | 23.246                                               |                               | 42.915                                                |
| B-2              | 35.2              | 00:35:12   | 371.600                                 | 0.015               | 1.656                                 | 1.70                                 | 1326                         | 254                     |                        | 57                         |                   |                         | 85                                  | 76                                   | 3.5         | 0.12                                | 13.52                                  | 24.930                                               |                               | 42.737                                                |
| B-3              | 37.9              | 00:37:55   | 373.700                                 | 0.020               | 1.656                                 | 1.70                                 | 1341                         | 254                     |                        | 57                         |                   |                         | 85                                  | 76                                   | 3.5         | 0.14                                | 15.67                                  | 26.714                                               |                               | 42.743                                                |
| B-4              | 40.6              | 00:40:37   | 375.925                                 | 0.025               | 1.656                                 | 1.70                                 | 1348                         | 254                     |                        | 57                         |                   |                         | 85                                  | 77                                   | 3.5         | 0.16                                | 17.56                                  | 28.497                                               |                               | 42.745                                                |
| B-5              | 43.3              | 00:43:20   | 378.150                                 | 0.025               | 1.656                                 | 1.70                                 | 1345                         | 254                     |                        | 57                         |                   |                         | 84                                  | 77                                   | 3.5         | 0.16                                | 17.54                                  | 30.293                                               |                               | 42.767                                                |
| B-6              | 46.0              | 00:46:03   | 380.390                                 | 0.025               | 1.656                                 | 1.70                                 | 1347                         | 254                     |                        | 57                         |                   |                         | 84                                  | 77                                   | 3.5         | 0.16                                | 17.55                                  | 32.050                                               |                               | 42.733                                                |
| B-7              | 48.8              | 00:48:45   | 382.580                                 | 0.030               | 1.656                                 | 1.70                                 | 1356                         | 254                     |                        | 58                         |                   |                         | 84                                  | 77                                   | 3.5         | 0.17                                | 19.27                                  | 33.822                                               |                               | 42.723                                                |
| B-8              | 51.5              | 00:51:28   | 384.790                                 | 0.025               | 1.656                                 | 1.70                                 | 1346                         | 254                     |                        | 58                         |                   |                         | 83                                  | 77                                   | 3.5         | 0.16                                | 17.55                                  | 35.608                                               |                               | 42.730                                                |
| B-9              | 54.2              | 00:54:10   | 387.015                                 | 0.020               | 1.656                                 | 1.70                                 | 1322                         | 254                     |                        | 58                         |                   |                         | 83                                  | 77                                   | 3.5         | 0.14                                | 15.59                                  | 37.362                                               |                               | 42.700                                                |
| B-10             | 56.9              | 00:56:53   | 389.200                                 | 0.015               | 1.656                                 | 1.70                                 | 1306                         | 254                     |                        | 58                         |                   |                         | 83                                  | 77                                   | 3.5         | 0.12                                | 13.44                                  | 39.144                                               |                               | 42.703                                                |
| B-11             | 59.6              | 00:59:35   | 391.420                                 | 0.010               | 1.656                                 | 1.70                                 | 1265                         | 254                     |                        | 58                         |                   |                         | 83                                  | 76                                   | 3.5         | 0.10                                | 10.85                                  | 40.936                                               |                               | 42.716                                                |
| B-12             | 62.3              | 01:02:18   | 393.650                                 | 0.005               | 1.656                                 | 1.70                                 | 1165                         | 254                     |                        | 58                         |                   |                         | 83                                  | 76                                   | 3.5         | 0.07                                | 7.44                                   | 42.700                                               |                               | 42.700                                                |
| Last Pt          | 65.0              | 01:05:00   | 395.845                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      |             |                                     |                                        |                                                      |                               |                                                       |
| Final Val        | 65.0              | 01:05:00   | 395.845                                 |                     |                                       |                                      |                              |                         |                        |                            |                   |                         |                                     |                                      | Max Vac     | 3.5                                 | Final Values                           | 42.700                                               |                               |                                                       |
| Average Values   |                   |            |                                         | 0.02                |                                       | 1.70                                 | 1303                         | 254                     |                        | 57                         |                   |                         | 82                                  | 74                                   |             | 0.14                                | 15.08                                  |                                                      |                               |                                                       |
|                  |                   |            |                                         |                     |                                       |                                      |                              |                         |                        |                            |                   |                         | 78                                  |                                      |             |                                     |                                        |                                                      |                               |                                                       |

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |  |                            |  |  |  |
|-------------------|--|----------------------------|--|--|--|
| Plant Name        |  | Loveland Facility          |  |  |  |
| Sampling Location |  | EC-36-2S                   |  |  |  |
| Project #         |  | leed-15-brighton.co-comp#1 |  |  |  |

|             |          |       |                         |      |       |
|-------------|----------|-------|-------------------------|------|-------|
| Leak Checks |          |       |                         |      |       |
| Train       | Pre      | 0.000 | ft <sup>3</sup> /min@   | 15.0 | in Hg |
| PASS        | Post     | 0.000 | ft <sup>3</sup> /min@   | 15.0 | in Hg |
| Pitot       | Pre (+)  | 0.200 | in H <sub>2</sub> O for | 15.0 | sec   |
| < 3.0       | Pre (-)  | 0.130 | in H <sub>2</sub> O for | 15.0 | sec   |
|             | Post (+) | 0.165 | in H <sub>2</sub> O for | 15.0 | sec   |
|             | Post (-) | 0.100 | in H <sub>2</sub> O for | 15.0 | sec   |

|                     |  |  |      |
|---------------------|--|--|------|
| Nozzle Measurements |  |  |      |
| Pre                 |  |  | PASS |
| Post                |  |  | PASS |

|          |       |     |       |
|----------|-------|-----|-------|
| Run Time |       |     |       |
| Start    | 11:02 | End | 12:12 |

|         |       |       |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|
| Weights | Imp 1 | Imp 2 | Imp 3 | Imp 4 | Imp 5 | Imp 6 | Imp 7 | Imp 8 |
| Pre     | 769.0 | 718.7 | 613.3 | 849.0 |       |       |       |       |
| Post    | 793.7 | 726.1 | 615.6 | 863.9 |       |       |       |       |

|            |  |          |  |
|------------|--|----------|--|
| Date       |  | 09/03/15 |  |
| Operator   |  | TP       |  |
| Run Number |  | 90-100-3 |  |

|                           |                    |        |    |
|---------------------------|--------------------|--------|----|
| Sampling Equipment        |                    |        |    |
| Meter Box Number          | SAMP-CP-0007       |        |    |
| Meter Cal Factor          | (Y)                | 0.980  |    |
| Low Flow Meter            | SAMP-MN-0001       |        |    |
| Average Nozzle Diameter   | (D <sub>no</sub> ) |        | in |
| Suggested Nozzle Diameter | (D <sub>ni</sub> ) | 0.4102 | in |
| Probe Number              | SAMP-SP-0001       |        | in |
| Probe Length              | 60                 |        |    |
| Liner Material            | inconel            |        |    |
| Sample Case / Oven Number |                    |        |    |
| Impinger Case Number      | SAMP-BC-0002       |        |    |

|                                                   |                                     |        |                     |
|---------------------------------------------------|-------------------------------------|--------|---------------------|
| Ideal Nozzle Diameter and IsoKinetic Factor Setup |                                     |        |                     |
| Pitot Coefficient                                 | (C <sub>p</sub> )                   | 0.819  |                     |
| Average Stack Temp                                | (t <sub>s</sub> )                   | 1335.2 | °F                  |
| Average Meter Temp                                | (t <sub>m</sub> )                   | 79.4   |                     |
| Orifice Meter Coefficient                         | (ΔH@)                               | 1.656  | in H <sub>2</sub> O |
| Square Root ΔP                                    | (ΔP <sup>1/2</sup> <sub>avg</sub> ) | 0.13   | in H <sub>2</sub> O |
| Stack Moisture Content                            | (B <sub>wet</sub> )                 | 5.14   | %                   |
| Stack Dry Molecular Weight                        | (M <sub>d</sub> )                   | 29.39  | lb/lb-mole          |
| Estimated Orifice Flow Rate                       | (Q <sub>m</sub> )                   | 0.66   | acfm                |
| ΔP to ΔH Isokinetic Factor                        | (K)                                 |        |                     |

|                         |                        |       |                     |
|-------------------------|------------------------|-------|---------------------|
| Pressures               |                        |       |                     |
| Barometric Pressure     | (P <sub>b</sub> )      | 24.93 | in Hg               |
| Stack Static Pressure   | (P <sub>static</sub> ) | 0.00  | in H <sub>2</sub> O |
| Absolute Stack Pressure | (P <sub>a</sub> )      | 24.93 | in Hg               |
| Absolute Meter Pressure | (P <sub>m</sub> )      | 25.05 | in Hg               |

|              |  |  |  |  |    |
|--------------|--|--|--|--|----|
| Wash Volumes |  |  |  |  | ml |
|              |  |  |  |  | ml |

**Leed Fabrication Services Inc.**  
**September 3, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 4.1    | %    |
| Stack Exhaust Flow (M2) | 59,758 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.94    | in. Hg                       |
| Relative Humidity   | 54       | %                            |
| Ambient Temperature | 69       | °F                           |
| Specific Humidity   | 0.009777 | lb H <sub>2</sub> O / lb air |

90-100 Load, Run - EC36-2S R10

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| A1 | 09/03/15 08:19:07                | 4590                      | 14.73                 | 2.26          | 0.79           | 4.43                   | 0.91                 | 65.40            | 997.00            |
|    | 09/03/15 08:19:37                | 4620                      | 14.74                 | 2.14          | 0.73           | 4.43                   | 0.91                 | 65.40            | 997.00            |
|    | 09/03/15 08:20:07                | 4650                      | 14.76                 | 2.04          | 0.71           | 4.41                   | 0.91                 | 65.30            | 980.00            |
|    | 09/03/15 08:20:37                | 4680                      | 14.75                 | 1.99          | 0.71           | 4.43                   | 0.91                 | 65.30            | 980.00            |
|    | 09/03/15 08:21:07                | 4710                      | 14.75                 | 1.84          | 0.74           | 4.45                   | 0.92                 | 65.20            | 998.00            |
|    | 09/03/15 08:21:37                | 4740                      | 14.86                 | 1.87          | 0.70           | 4.36                   | 0.92                 | 65.20            | 998.00            |
|    | 09/03/15 08:22:07                | 4770                      | 14.88                 | 2.03          | 0.66           | 4.33                   | 0.93                 | 65.10            | 981.00            |
|    | 09/03/15 08:22:37                | 4800                      | 14.94                 | 2.27          | 0.69           | 4.29                   | 0.93                 | 65.10            | 981.00            |
|    | 09/03/15 08:23:07                | 4830                      | 14.92                 | 2.32          | 0.76           | 4.31                   | 0.93                 | 65.00            | 964.00            |
|    | 09/03/15 08:23:37                | 4860                      | 14.92                 | 2.33          | 0.71           | 4.31                   | 0.93                 | 65.00            | 964.00            |
|    | 09/03/15 08:24:07                | 4890                      | 14.90                 | 2.26          | 0.62           | 4.32                   | 0.93                 | 65.00            | 964.00            |
|    | 09/03/15 08:24:37                | 4920                      | 14.82                 | 2.12          | 0.64           | 4.38                   | 0.93                 | 65.00            | 964.00            |
|    | 09/03/15 08:25:07                | 4950                      | 14.87                 | 2.01          | 0.68           | 4.35                   | 0.93                 | 64.90            | 964.00            |
|    | 09/03/15 08:25:37                | 4980                      | 14.93                 | 2.08          | 0.69           | 4.31                   | 0.93                 | 64.90            | 964.00            |
|    | 09/03/15 08:26:07                | 5010                      | 14.92                 | 2.27          | 0.68           | 4.30                   | 0.91                 | 64.90            | 946.00            |
|    | 09/03/15 08:26:37                | 5040                      | 14.91                 | 2.30          | 0.66           | 4.31                   | 0.91                 | 64.90            | 946.00            |
|    | 09/03/15 08:27:07                | 5070                      | 14.91                 | 2.24          | 0.57           | 4.31                   | 0.93                 | 64.90            | 964.00            |
|    | 09/03/15 08:27:37                | 5100                      | 14.87                 | 2.14          | 0.60           | 4.34                   | 0.93                 | 64.90            | 964.00            |
|    | 09/03/15 08:28:37                | 5160                      | 14.52                 | 1.69          | 0.61           | 4.57                   | 0.98                 | 64.90            | 985.00            |
|    | 09/03/15 08:29:07                | 5190                      | 14.52                 | 1.48          | 0.52           | 4.59                   | 1.05                 | 64.90            | 1,006.00          |
|    | 09/03/15 08:29:37                | 5220                      | 14.57                 | 1.46          | 0.54           | 4.55                   | 1.05                 | 64.90            | 1,006.00          |
|    | 09/03/15 08:30:07                | 5250                      | 14.53                 | 1.49          | 0.59           | 4.58                   | 1.02                 | 65.00            | 1,022.00          |
|    | 09/03/15 08:30:37                | 5280                      | 14.52                 | 1.46          | 0.56           | 4.59                   | 1.02                 | 65.00            | 1,022.00          |
|    | 09/03/15 08:31:07                | 5310                      | 14.56                 | 1.45          | 0.49           | 4.56                   | 1.03                 | 65.00            | 1,005.00          |
|    | 09/03/15 08:31:37                | 5340                      | 14.53                 | 1.45          | 0.53           | 4.57                   | 1.03                 | 65.00            | 1,005.00          |
|    | 09/03/15 08:32:07                | 5370                      | 14.46                 | 1.42          | 0.56           | 4.62                   | 1.03                 | 65.10            | 1,005.00          |
|    | 09/03/15 08:32:37                | 5400                      | 14.48                 | 1.31          | 0.49           | 4.62                   | 1.03                 | 65.10            | 1,005.00          |
|    | 09/03/15 08:33:07                | 5430                      | 14.54                 | 1.28          | 0.52           | 4.59                   | 1.03                 | 65.20            | 1,005.00          |
|    | 09/03/15 08:33:37                | 5460                      | 14.60                 | 1.26          | 0.54           | 4.54                   | 1.03                 | 65.20            | 1,005.00          |
|    | 09/03/15 08:34:07                | 5490                      | 14.63                 | 1.36          | 0.60           | 4.51                   | 1.04                 | 65.20            | 1,005.00          |
|    | 09/03/15 08:34:37                | 5520                      | 14.54                 | 1.42          | 0.56           | 4.57                   | 1.04                 | 65.20            | 1,005.00          |
|    | 09/03/15 08:35:07                | 5550                      | 14.53                 | 1.36          | 0.44           | 4.57                   | 1.02                 | 65.30            | 1,004.00          |
|    | 09/03/15 08:35:37                | 5580                      | 14.50                 | 1.32          | 0.50           | 4.60                   | 1.02                 | 65.30            | 1,004.00          |
|    | 09/03/15 08:36:07                | 5610                      | 14.44                 | 1.19          | 0.56           | 4.63                   | 1.03                 | 65.40            | 1,004.00          |
|    | 09/03/15 08:36:37                | 5640                      | 14.44                 | 1.11          | 0.57           | 4.65                   | 1.03                 | 65.40            | 1,004.00          |
|    | 09/03/15 08:37:07                | 5670                      | 14.40                 | 1.15          | 0.51           | 4.66                   | 1.02                 | 65.50            | 1,003.00          |
|    | 09/03/15 08:37:37                | 5700                      | 14.49                 | 1.12          | 0.47           | 4.62                   | 1.02                 | 65.50            | 1,003.00          |
|    | 09/03/15 08:38:07                | 5730                      | 14.50                 | 1.17          | 0.52           | 4.59                   | 1.01                 | 65.60            | 1,002.00          |
|    | 09/03/15 08:38:37                | 5760                      | 14.58                 | 1.18          | 0.55           | 4.55                   | 1.01                 | 65.60            | 1,002.00          |
|    | 09/03/15 08:39:07                | 5790                      | 14.54                 | 1.24          | 0.56           | 4.56                   | 1.02                 | 65.70            | 1,003.00          |
|    | 09/03/15 08:39:37                | 5820                      | 14.59                 | 1.17          | 0.46           | 4.55                   | 1.02                 | 65.70            | 1,003.00          |
| A2 | 09/03/15 08:40:07                | 5850                      | 14.59                 | 1.27          | 0.48           | 4.53                   | 1.03                 | 65.80            | 1,003.00          |
|    | 09/03/15 08:40:37                | 5880                      | 14.59                 | 1.23          | 0.46           | 4.54                   | 1.03                 | 65.80            | 1,003.00          |
|    | 09/03/15 08:41:07                | 5910                      | 14.64                 | 1.28          | 0.52           | 4.50                   | 1.02                 | 65.90            | 1,003.00          |
|    | 09/03/15 08:41:37                | 5940                      | 14.63                 | 1.33          | 0.51           | 4.51                   | 1.02                 | 65.90            | 1,003.00          |
|    | 09/03/15 08:42:07                | 5970                      | 14.63                 | 1.30          | 0.44           | 4.51                   | 1.03                 | 66.00            | 1,003.00          |
|    | 09/03/15 08:42:37                | 6000                      | 14.60                 | 1.29          | 0.49           | 4.53                   | 1.03                 | 66.00            | 1,003.00          |
|    | 09/03/15 08:43:07                | 6030                      | 14.60                 | 1.19          | 0.49           | 4.55                   | 1.02                 | 66.10            | 1,002.00          |
|    | 09/03/15 08:43:37                | 6060                      | 14.67                 | 1.20          | 0.41           | 4.49                   | 1.02                 | 66.10            | 1,002.00          |
|    | 09/03/15 08:44:07                | 6090                      | 14.58                 | 1.30          | 0.41           | 4.55                   | 1.02                 | 66.20            | 1,002.00          |
|    | 09/03/15 08:44:37                | 6120                      | 14.64                 | 1.33          | 0.44           | 4.51                   | 1.02                 | 66.20            | 1,002.00          |
|    | 09/03/15 08:45:07                | 6150                      | 14.61                 | 1.37          | 0.47           | 4.52                   | 1.02                 | 66.30            | 1,002.00          |
|    | 09/03/15 08:45:37                | 6180                      | 14.57                 | 1.31          | 0.33           | 4.54                   | 1.02                 | 66.30            | 1,002.00          |



**Leed Fabrication Services Inc.**  
**September 3, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 4.1    | %    |
| Stack Exhaust Flow (M2) | 59,758 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.94    | in. Hg                       |
| Relative Humidity   | 54       | %                            |
| Ambient Temperature | 69       | °F                           |
| Specific Humidity   | 0.009777 | lb H <sub>2</sub> O / lb air |

90-100 Load, Run - EC36-2S R10

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
|    | 09/03/15 08:46:07                | 6210                      | 14.65                 | 1.23          | 0.36           | 4.50                   | 1.02                 | 66.30            | 1,002.00          |
|    | 09/03/15 08:46:37                | 6240                      | 14.60                 | 1.30          | 0.41           | 4.53                   | 1.02                 | 66.30            | 1,002.00          |
|    | 09/03/15 08:47:07                | 6270                      | 14.60                 | 1.20          | 0.39           | 4.54                   | 1.02                 | 66.30            | 1,002.00          |
|    | 09/03/15 08:47:37                | 6300                      | 14.62                 | 1.36          | 0.34           | 4.52                   | 1.02                 | 66.30            | 1,002.00          |
|    | 09/03/15 08:48:07                | 6330                      | 14.67                 | 1.30          | 0.37           | 4.48                   | 1.02                 | 66.40            | 1,002.00          |
|    | 09/03/15 08:48:37                | 6360                      | 14.56                 | 1.38          | 0.42           | 4.56                   | 1.02                 | 66.40            | 1,002.00          |
|    | 09/03/15 08:49:07                | 6390                      | 14.58                 | 1.29          | 0.44           | 4.54                   | 1.02                 | 66.30            | 1,002.00          |
|    | 09/03/15 08:49:37                | 6420                      | 14.60                 | 1.40          | 0.39           | 4.54                   | 1.02                 | 66.30            | 1,002.00          |
|    | 09/03/15 08:50:07                | 6450                      | 14.63                 | 1.31          | 0.32           | 4.51                   | 1.01                 | 66.30            | 1,001.00          |
|    | 09/03/15 08:50:37                | 6480                      | 14.64                 | 1.23          | 0.34           | 4.51                   | 1.01                 | 66.30            | 1,001.00          |
|    | 09/03/15 08:51:07                | 6510                      | 14.68                 | 1.19          | 0.34           | 4.49                   | 1.01                 | 66.30            | 984.00            |
|    | 09/03/15 08:51:37                | 6540                      | 14.64                 | 1.35          | 0.35           | 4.51                   | 1.01                 | 66.30            | 984.00            |
|    | 09/03/15 08:52:07                | 6570                      | 14.67                 | 1.30          | 0.29           | 4.49                   | 1.01                 | 66.30            | 1,001.00          |
|    | 09/03/15 08:52:37                | 6600                      | 14.65                 | 1.20          | 0.33           | 4.51                   | 1.01                 | 66.30            | 1,001.00          |
|    | 09/03/15 08:53:07                | 6630                      | 14.68                 | 1.24          | 0.33           | 4.48                   | 1.03                 | 66.10            | 1,020.00          |
|    | 09/03/15 08:53:37                | 6660                      | 14.57                 | 1.29          | 0.35           | 4.56                   | 1.03                 | 66.10            | 1,020.00          |
|    | 09/03/15 08:54:07                | 6690                      | 14.63                 | 1.29          | 0.27           | 4.53                   | 1.01                 | 66.20            | 1,001.00          |
|    | 09/03/15 08:54:37                | 6720                      | 14.64                 | 1.16          | 0.29           | 4.52                   | 1.01                 | 66.20            | 1,001.00          |
|    | 09/03/15 08:55:07                | 6750                      | 14.67                 | 1.14          | 0.33           | 4.50                   | 1.02                 | 66.20            | 1,002.00          |
|    | 09/03/15 08:55:37                | 6780                      | 14.65                 | 1.24          | 0.33           | 4.50                   | 1.02                 | 66.20            | 1,002.00          |
|    | 09/03/15 08:56:07                | 6810                      | 14.61                 | 1.28          | 0.26           | 4.53                   | 1.03                 | 66.20            | 1,002.00          |
|    | 09/03/15 08:56:37                | 6840                      | 14.68                 | 1.29          | 0.28           | 4.49                   | 1.03                 | 66.20            | 1,002.00          |
|    | 09/03/15 08:57:07                | 6870                      | 14.65                 | 1.27          | 0.32           | 4.50                   | 1.01                 | 66.20            | 1,001.00          |
|    | 09/03/15 08:57:37                | 6900                      | 14.61                 | 1.26          | 0.30           | 4.52                   | 1.01                 | 66.20            | 1,001.00          |
|    | 09/03/15 08:58:07                | 6930                      | 14.66                 | 1.17          | 0.23           | 4.50                   | 1.01                 | 66.10            | 1,001.00          |
|    | 09/03/15 08:58:37                | 6960                      | 14.62                 | 1.34          | 0.24           | 4.52                   | 1.01                 | 66.10            | 1,001.00          |
|    | 09/03/15 08:59:07                | 6990                      | 14.62                 | 1.52          | 0.28           | 4.54                   | 1.02                 | 66.10            | 967.00            |
|    | 09/03/15 08:59:37                | 7020                      | 14.62                 | 1.46          | 0.29           | 4.54                   | 1.02                 | 66.10            | 967.00            |
| A3 | 09/03/15 09:00:07                | 7050                      | 14.61                 | 1.42          | 0.23           | 4.54                   | 1.01                 | 66.00            | 1,002.00          |
|    | 09/03/15 09:00:37                | 7080                      | 14.62                 | 1.41          | 0.24           | 4.53                   | 1.01                 | 66.00            | 1,002.00          |
|    | 09/03/15 09:01:07                | 7110                      | 14.56                 | 1.37          | 0.26           | 4.57                   | 1.01                 | 66.00            | 1,002.00          |
|    | 09/03/15 09:01:37                | 7140                      | 14.60                 | 1.40          | 0.29           | 4.55                   | 1.01                 | 66.00            | 1,002.00          |
|    | 09/03/15 09:02:07                | 7170                      | 14.66                 | 1.45          | 0.22           | 4.50                   | 1.02                 | 65.90            | 1,020.00          |
|    | 09/03/15 09:02:37                | 7200                      | 14.66                 | 1.67          | 0.24           | 4.49                   | 1.02                 | 65.90            | 1,020.00          |
|    | 09/03/15 09:03:07                | 7230                      | 14.65                 | 1.54          | 0.28           | 4.52                   | 1.02                 | 65.90            | 1,003.00          |
|    | 09/03/15 09:03:37                | 7260                      | 14.67                 | 1.51          | 0.33           | 4.50                   | 1.02                 | 65.90            | 1,003.00          |
|    | 09/03/15 09:04:07                | 7290                      | 14.66                 | 1.60          | 0.29           | 4.50                   | 1.02                 | 65.80            | 1,003.00          |
|    | 09/03/15 09:04:37                | 7320                      | 14.71                 | 1.54          | 0.20           | 4.47                   | 1.02                 | 65.80            | 1,003.00          |
|    | 09/03/15 09:05:07                | 7350                      | 14.71                 | 1.61          | 0.27           | 4.47                   | 1.01                 | 65.80            | 985.00            |
|    | 09/03/15 09:05:37                | 7380                      | 14.71                 | 1.62          | 0.29           | 4.46                   | 1.01                 | 65.80            | 985.00            |
|    | 09/03/15 09:06:07                | 7410                      | 14.75                 | 1.72          | 0.25           | 4.44                   | 1.01                 | 65.70            | 985.00            |
|    | 09/03/15 09:06:37                | 7440                      | 14.69                 | 1.74          | 0.21           | 4.48                   | 1.01                 | 65.70            | 985.00            |
|    | 09/03/15 09:07:07                | 7470                      | 14.75                 | 1.83          | 0.25           | 4.43                   | 1.01                 | 65.70            | 1,002.00          |
|    | 09/03/15 09:07:37                | 7500                      | 14.72                 | 1.83          | 0.25           | 4.45                   | 1.01                 | 65.70            | 1,002.00          |
|    | 09/03/15 09:08:07                | 7530                      | 14.75                 | 1.62          | 0.21           | 4.44                   | 1.02                 | 65.60            | 986.00            |
|    | 09/03/15 09:08:37                | 7560                      | 14.71                 | 1.25          | 0.28           | 4.47                   | 1.02                 | 65.60            | 986.00            |
|    | 09/03/15 09:09:07                | 7590                      | 14.72                 | 1.17          | 0.31           | 4.45                   | 1.01                 | 65.50            | 1,003.00          |
|    | 09/03/15 09:09:37                | 7620                      | 14.72                 | 1.18          | 0.28           | 4.47                   | 1.01                 | 65.50            | 1,003.00          |
|    | 09/03/15 09:10:07                | 7650                      | 14.73                 | 1.20          | 0.21           | 4.44                   | 1.05                 | 65.50            | 988.00            |
|    | 09/03/15 09:10:37                | 7680                      | 14.67                 | 1.13          | 0.23           | 4.48                   | 1.05                 | 65.50            | 988.00            |
|    | 09/03/15 09:21:07                | 8310                      | 15.41                 | 1.78          | 0.26           | 3.97                   | 1.02                 | 65.50            | 968.00            |
|    | 09/03/15 09:21:37                | 8340                      | 15.30                 | 1.78          | 0.24           | 4.03                   | 1.02                 | 65.50            | 968.00            |
|    | 09/03/15 09:22:07                | 8370                      | 15.14                 | 1.51          | 0.18           | 4.16                   | 1.03                 | 65.50            | 1,004.00          |

**Leed Fabrication Services Inc.**  
**September 3, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 4.1    | %    |
| Stack Exhaust Flow (M2) | 59,758 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.94    | in. Hg                       |
| Relative Humidity   | 54       | %                            |
| Ambient Temperature | 69       | °F                           |
| Specific Humidity   | 0.009777 | lb H <sub>2</sub> O / lb air |

90-100 Load, Run - EC36-2S R10

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| 09/03/15 09:22:37                | 8400                      | 15.21                 | 1.30          | 0.21           | 4.11                   | 1.03                 | 65.50            | 1,004.00          |
| 09/03/15 09:23:07                | 8430                      | 15.24                 | 1.44          | 0.29           | 4.10                   | 1.02                 | 65.50            | 986.00            |
| 09/03/15 09:23:37                | 8460                      | 15.41                 | 1.53          | 0.25           | 3.98                   | 1.02                 | 65.50            | 986.00            |
| 09/03/15 09:24:07                | 8490                      | 15.38                 | 1.66          | 0.17           | 3.98                   | 1.01                 | 65.60            | 968.00            |
| 09/03/15 09:24:37                | 8520                      | 15.32                 | 1.63          | 0.20           | 4.02                   | 1.01                 | 65.60            | 968.00            |
| 09/03/15 09:25:07                | 8550                      | 15.30                 | 1.51          | 0.22           | 4.05                   | 1.02                 | 65.60            | 1,003.00          |
| 09/03/15 09:25:37                | 8580                      | 15.44                 | 1.54          | 0.27           | 3.94                   | 1.02                 | 65.60            | 1,003.00          |
| 09/03/15 09:26:07                | 8610                      | 15.41                 | 1.77          | 0.24           | 3.95                   | 1.01                 | 65.60            | 985.00            |
| 09/03/15 09:26:37                | 8640                      | 15.45                 | 1.60          | 0.21           | 3.95                   | 1.01                 | 65.60            | 985.00            |
| 09/03/15 09:27:07                | 8670                      | 15.48                 | 1.76          | 0.23           | 3.91                   | 1.02                 | 65.70            | 986.00            |
| 09/03/15 09:27:37                | 8700                      | 15.37                 | 1.74          | 0.27           | 3.99                   | 1.02                 | 65.70            | 986.00            |
| 09/03/15 09:28:07                | 8730                      | 15.44                 | 1.60          | 0.24           | 3.95                   | 1.04                 | 65.60            | 987.00            |
| 09/03/15 09:28:37                | 8760                      | 15.47                 | 1.82          | 0.20           | 3.91                   | 1.04                 | 65.60            | 987.00            |
| 09/03/15 09:29:07                | 8790                      | 15.50                 | 1.85          | 0.21           | 3.88                   | 1.02                 | 65.70            | 986.00            |
| <b>RAW AVERAGE</b>               |                           | <b>14.81</b>          | <b>1.54</b>   | <b>0.39</b>    | <b>4.39</b>            | <b>1.01</b>          | <b>65.63</b>     | <b>994.01</b>     |

| Bias                   | Serial Number:  | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Press. Trans<br>(in. H <sub>2</sub> O) | Temp. Trans.<br>(°F) | F-Flow Trans.<br>(SCFH) |
|------------------------|-----------------|-----------------------|---------------|----------------|------------------------|----------------------------------------|----------------------|-------------------------|
|                        | INSTO2-0011     |                       | INST-CO-0022  | INST-TH-0002   | INST-C2-0013           | 1434717                                | 1434717              | 1434717                 |
|                        | Initial Zero    | 0.04                  | 0.10          | 0.00           | 0.04                   |                                        |                      |                         |
|                        | Final Zero      | -0.02                 | -0.09         | 0.02           | 0.04                   |                                        |                      |                         |
|                        | Avg. Zero       | 0.01                  | 0.01          | 0.01           | 0.04                   |                                        |                      |                         |
|                        | Initial UpScale | 11.95                 | 9.43          | 3.03           | 9.05                   |                                        |                      |                         |
|                        | Final UpScale   | 11.84                 | 9.39          | 3.01           | 9.04                   |                                        |                      |                         |
|                        | Avg. UpScale    | 11.90                 | 9.41          | 3.02           | 9.05                   |                                        |                      |                         |
| <b>Upscale Cal Gas</b> |                 | 11.91                 | 9.48          | 3.02           | 9.09                   |                                        |                      |                         |

| EMISSIONS DATA                          | O <sub>2</sub> | CO   | THC  | CO <sub>2</sub> |
|-----------------------------------------|----------------|------|------|-----------------|
| Corrected Raw Average (ppm/% dry basis) | 14.83          | 1.55 | 0.38 | 4.39            |
| Corrected Raw Average (ppm/% wet basis) | 14.22          | 1.48 | 0.36 | 4.21            |
| Emission Rate (lb/hr)                   | N/A            | 0.01 | 0.00 | N/A             |

**Leed Fabrication Services Inc.**  
**September 3, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 4.7    | %    |
| Stack Exhaust Flow (M2) | 61,265 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.94    | in. Hg                       |
| Relative Humidity   | 45       | %                            |
| Ambient Temperature | 75       | °F                           |
| Specific Humidity   | 0.009985 | lb H <sub>2</sub> O / lb air |

90-100 Load, Run - EC36-2S R11

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| A1 | 09/03/15 09:41:07                | 9510                      | 15.39                 | 2.24          | 0.19           | 3.98                   | 0.95                 | 67.20            | 875.00            |
|    | 09/03/15 09:41:37                | 9540                      | 15.38                 | 2.16          | 0.22           | 3.99                   | 0.95                 | 67.20            | 875.00            |
|    | 09/03/15 09:42:07                | 9570                      | 15.39                 | 2.09          | 0.29           | 3.98                   | 0.94                 | 67.40            | 892.00            |
|    | 09/03/15 09:42:37                | 9600                      | 15.35                 | 2.08          | 0.23           | 4.02                   | 0.94                 | 67.40            | 892.00            |
|    | 09/03/15 09:43:07                | 9630                      | 15.39                 | 2.03          | 0.15           | 3.99                   | 0.94                 | 67.60            | 891.00            |
|    | 09/03/15 09:43:37                | 9660                      | 15.35                 | 2.12          | 0.17           | 4.02                   | 0.94                 | 67.60            | 891.00            |
|    | 09/03/15 09:44:07                | 9690                      | 15.30                 | 2.13          | 0.22           | 4.05                   | 0.93                 | 67.80            | 873.00            |
|    | 09/03/15 09:44:37                | 9720                      | 15.33                 | 2.03          | 0.22           | 4.03                   | 0.93                 | 67.80            | 873.00            |
|    | 09/03/15 09:45:07                | 9750                      | 15.35                 | 2.05          | 0.17           | 4.01                   | 0.94                 | 68.00            | 907.00            |
|    | 09/03/15 09:45:37                | 9780                      | 15.33                 | 2.11          | 0.19           | 4.03                   | 0.94                 | 68.00            | 907.00            |
|    | 09/03/15 09:46:07                | 9810                      | 15.24                 | 2.21          | 0.20           | 4.09                   | 0.93                 | 68.20            | 873.00            |
|    | 09/03/15 09:46:37                | 9840                      | 15.31                 | 2.07          | 0.25           | 4.05                   | 0.93                 | 68.20            | 873.00            |
|    | 09/03/15 09:47:07                | 9870                      | 15.30                 | 2.08          | 0.23           | 4.04                   | 0.93                 | 68.40            | 872.00            |
|    | 09/03/15 09:47:37                | 9900                      | 15.23                 | 2.11          | 0.17           | 4.09                   | 0.93                 | 68.40            | 872.00            |
|    | 09/03/15 09:48:07                | 9930                      | 15.34                 | 1.99          | 0.21           | 4.03                   | 0.92                 | 68.60            | 854.00            |
|    | 09/03/15 09:49:07                | 9990                      | 14.76                 | 1.84          | 0.19           | 4.41                   | 0.97                 | 68.70            | 891.00            |
|    | 09/03/15 09:49:37                | 10020                     | 14.53                 | 1.15          | 0.15           | 4.59                   | 0.97                 | 68.70            | 891.00            |
|    | 09/03/15 09:50:07                | 10050                     | 14.47                 | 0.98          | 0.15           | 4.61                   | 1.07                 | 68.80            | 1,018.00          |
|    | 09/03/15 09:50:37                | 10080                     | 14.42                 | 0.87          | 0.18           | 4.67                   | 1.07                 | 68.80            | 1,018.00          |
|    | 09/03/15 09:51:07                | 10110                     | 14.36                 | 0.85          | 0.15           | 4.71                   | 1.07                 | 68.80            | 1,000.00          |
|    | 09/03/15 09:51:37                | 10140                     | 14.44                 | 0.88          | 0.17           | 4.64                   | 1.07                 | 68.80            | 1,000.00          |
|    | 09/03/15 09:52:07                | 10170                     | 14.27                 | 0.82          | 0.19           | 4.77                   | 1.07                 | 68.90            | 1,000.00          |
|    | 09/03/15 09:52:37                | 10200                     | 14.06                 | 0.77          | 0.17           | 4.90                   | 1.07                 | 68.90            | 1,000.00          |
|    | 09/03/15 09:53:07                | 10230                     | 13.94                 | 0.62          | 0.14           | 4.98                   | 1.06                 | 68.90            | 1,068.00          |
|    | 09/03/15 09:53:37                | 10260                     | 13.88                 | 0.56          | 0.16           | 5.03                   | 1.06                 | 68.90            | 1,068.00          |
|    | 09/03/15 09:54:07                | 10290                     | 13.94                 | 0.47          | 0.18           | 4.98                   | 1.06                 | 68.90            | 1,069.00          |
|    | 09/03/15 09:54:37                | 10320                     | 13.81                 | 0.44          | 0.14           | 5.08                   | 1.06                 | 68.90            | 1,069.00          |
|    | 09/03/15 09:55:07                | 10350                     | 13.90                 | 0.39          | 0.14           | 5.01                   | 1.05                 | 68.90            | 1,068.00          |
|    | 09/03/15 09:55:37                | 10380                     | 14.08                 | 0.41          | 0.19           | 4.90                   | 1.05                 | 68.90            | 1,068.00          |
|    | 09/03/15 09:56:07                | 10410                     | 14.02                 | 0.53          | 0.22           | 4.93                   | 1.05                 | 68.80            | 1,050.00          |
|    | 09/03/15 09:56:37                | 10440                     | 13.90                 | 0.51          | 0.20           | 5.00                   | 1.05                 | 68.80            | 1,050.00          |
|    | 09/03/15 09:57:07                | 10470                     | 14.00                 | 0.45          | 0.16           | 4.95                   | 1.04                 | 68.90            | 1,067.00          |
|    | 09/03/15 09:57:37                | 10500                     | 13.92                 | 0.51          | 0.17           | 4.99                   | 1.04                 | 68.90            | 1,067.00          |
|    | 09/03/15 09:58:07                | 10530                     | 14.05                 | 0.50          | 0.21           | 4.91                   | 1.04                 | 68.80            | 1,067.00          |
|    | 09/03/15 09:58:37                | 10560                     | 13.98                 | 0.52          | 0.21           | 4.95                   | 1.04                 | 68.80            | 1,067.00          |
|    | 09/03/15 09:59:07                | 10590                     | 14.00                 | 0.50          | 0.17           | 4.94                   | 1.04                 | 68.90            | 1,067.00          |
|    | 09/03/15 09:59:37                | 10620                     | 13.98                 | 0.50          | 0.17           | 4.96                   | 1.04                 | 68.90            | 1,067.00          |
|    | 09/03/15 10:00:07                | 10650                     | 14.01                 | 0.53          | 0.21           | 4.93                   | 1.04                 | 68.90            | 1,050.00          |
|    | 09/03/15 10:00:37                | 10680                     | 14.05                 | 0.50          | 0.21           | 4.90                   | 1.04                 | 68.90            | 1,050.00          |
|    | 09/03/15 10:01:07                | 10710                     | 14.02                 | 0.55          | 0.18           | 4.93                   | 1.04                 | 69.00            | 1,067.00          |
|    | 09/03/15 10:01:37                | 10740                     | 14.07                 | 0.55          | 0.17           | 4.89                   | 1.04                 | 69.00            | 1,067.00          |
| A2 | 09/03/15 10:02:07                | 10770                     | 14.01                 | 0.55          | 0.23           | 4.94                   | 1.04                 | 68.90            | 1,067.00          |
|    | 09/03/15 10:02:37                | 10800                     | 14.02                 | 0.57          | 0.22           | 4.93                   | 1.04                 | 68.90            | 1,067.00          |
|    | 09/03/15 10:03:07                | 10830                     | 14.00                 | 0.54          | 0.18           | 4.95                   | 1.04                 | 69.00            | 1,067.00          |
|    | 09/03/15 10:03:37                | 10860                     | 14.09                 | 0.52          | 0.21           | 4.89                   | 1.04                 | 69.00            | 1,067.00          |
|    | 09/03/15 10:04:07                | 10890                     | 14.55                 | 0.69          | 0.28           | 4.60                   | 1.04                 | 69.00            | 1,067.00          |
|    | 09/03/15 10:04:37                | 10920                     | 14.71                 | 1.00          | 0.28           | 4.46                   | 1.04                 | 69.00            | 1,067.00          |
|    | 09/03/15 10:05:07                | 10950                     | 14.63                 | 1.17          | 0.22           | 4.53                   | 1.04                 | 69.00            | 1,050.00          |
|    | 09/03/15 10:05:37                | 10980                     | 14.76                 | 1.07          | 0.20           | 4.43                   | 1.04                 | 69.00            | 1,050.00          |
|    | 09/03/15 10:06:07                | 11010                     | 14.72                 | 1.06          | 0.22           | 4.47                   | 1.04                 | 69.10            | 1,067.00          |
|    | 09/03/15 10:06:37                | 11040                     | 14.81                 | 1.15          | 0.28           | 4.40                   | 1.04                 | 69.10            | 1,067.00          |
|    | 09/03/15 10:07:07                | 11070                     | 14.72                 | 1.48          | 0.24           | 4.46                   | 1.06                 | 69.00            | 1,068.00          |
|    | 09/03/15 10:07:37                | 11100                     | 14.70                 | 1.21          | 0.21           | 4.49                   | 1.06                 | 69.00            | 1,068.00          |

**Leed Fabrication Services Inc.**  
**September 3, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 4.7    | %    |
| Stack Exhaust Flow (M2) | 61,265 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.94    | in. Hg                       |
| Relative Humidity   | 45       | %                            |
| Ambient Temperature | 75       | °F                           |
| Specific Humidity   | 0.009985 | lb H <sub>2</sub> O / lb air |

90-100 Load, Run - EC36-2S R11

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
|    | 09/03/15 10:08:07                | 11130                     | 14.70                 | 1.10          | 0.23           | 4.48                   | 1.04                 | 69.10            | 1,067.00          |
|    | 09/03/15 10:08:37                | 11160                     | 14.80                 | 1.18          | 0.28           | 4.41                   | 1.04                 | 69.10            | 1,067.00          |
|    | 09/03/15 10:09:07                | 11190                     | 14.63                 | 1.38          | 0.25           | 4.51                   | 1.04                 | 69.10            | 1,066.00          |
|    | 09/03/15 10:09:37                | 11220                     | 14.65                 | 1.05          | 0.20           | 4.52                   | 1.04                 | 69.10            | 1,066.00          |
|    | 09/03/15 10:10:07                | 11250                     | 14.68                 | 1.05          | 0.24           | 4.49                   | 1.04                 | 69.10            | 1,067.00          |
|    | 09/03/15 10:10:37                | 11280                     | 14.81                 | 1.26          | 0.27           | 4.40                   | 1.04                 | 69.10            | 1,067.00          |
|    | 09/03/15 10:11:07                | 11310                     | 14.68                 | 1.45          | 0.22           | 4.49                   | 1.05                 | 69.10            | 1,067.00          |
|    | 09/03/15 10:11:37                | 11340                     | 14.66                 | 1.21          | 0.24           | 4.51                   | 1.05                 | 69.10            | 1,067.00          |
|    | 09/03/15 10:12:07                | 11370                     | 14.70                 | 1.12          | 0.28           | 4.48                   | 1.05                 | 69.10            | 1,050.00          |
|    | 09/03/15 10:12:37                | 11400                     | 14.79                 | 1.08          | 0.25           | 4.41                   | 1.05                 | 69.10            | 1,050.00          |
|    | 09/03/15 10:13:07                | 11430                     | 14.94                 | 1.29          | 0.25           | 4.31                   | 1.05                 | 69.20            | 1,067.00          |
|    | 09/03/15 10:13:37                | 11460                     | 14.85                 | 1.37          | 0.26           | 4.36                   | 1.05                 | 69.20            | 1,067.00          |
|    | 09/03/15 10:14:07                | 11490                     | 14.74                 | 1.23          | 0.30           | 4.44                   | 1.05                 | 69.20            | 1,067.00          |
|    | 09/03/15 10:14:37                | 11520                     | 14.83                 | 1.26          | 0.29           | 4.39                   | 1.05                 | 69.20            | 1,067.00          |
|    | 09/03/15 10:15:07                | 11550                     | 14.90                 | 1.18          | 0.27           | 4.34                   | 1.06                 | 69.20            | 1,068.00          |
|    | 09/03/15 10:15:37                | 11580                     | 14.82                 | 1.65          | 0.25           | 4.39                   | 1.06                 | 69.20            | 1,068.00          |
|    | 09/03/15 10:16:07                | 11610                     | 14.89                 | 1.47          | 0.29           | 4.35                   | 1.05                 | 69.20            | 1,067.00          |
|    | 09/03/15 10:16:37                | 11640                     | 14.82                 | 1.67          | 0.29           | 4.39                   | 1.05                 | 69.20            | 1,067.00          |
|    | 09/03/15 10:17:07                | 11670                     | 14.88                 | 1.47          | 0.23           | 4.35                   | 1.04                 | 69.10            | 1,067.00          |
|    | 09/03/15 10:17:37                | 11700                     | 14.88                 | 1.58          | 0.29           | 4.35                   | 1.04                 | 69.10            | 1,067.00          |
|    | 09/03/15 10:18:07                | 11730                     | 14.86                 | 1.58          | 0.35           | 4.37                   | 1.05                 | 69.20            | 1,067.00          |
|    | 09/03/15 10:18:37                | 11760                     | 14.84                 | 1.47          | 0.33           | 4.38                   | 1.05                 | 69.20            | 1,067.00          |
|    | 09/03/15 10:19:07                | 11790                     | 14.82                 | 1.27          | 0.23           | 4.39                   | 1.05                 | 69.20            | 1,067.00          |
|    | 09/03/15 10:19:37                | 11820                     | 14.87                 | 1.17          | 0.29           | 4.36                   | 1.05                 | 69.20            | 1,067.00          |
|    | 09/03/15 10:20:07                | 11850                     | 14.89                 | 1.23          | 0.33           | 4.35                   | 1.06                 | 69.10            | 1,068.00          |
|    | 09/03/15 10:20:37                | 11880                     | 14.80                 | 1.12          | 0.33           | 4.40                   | 1.06                 | 69.10            | 1,068.00          |
|    | 09/03/15 10:21:07                | 11910                     | 14.77                 | 0.95          | 0.30           | 4.43                   | 1.06                 | 69.10            | 1,068.00          |
|    | 09/03/15 10:21:37                | 11940                     | 14.81                 | 0.97          | 0.25           | 4.40                   | 1.06                 | 69.10            | 1,068.00          |
| A3 | 09/03/15 10:22:07                | 11970                     | 14.75                 | 0.93          | 0.29           | 4.45                   | 1.06                 | 69.20            | 1,068.00          |
|    | 09/03/15 10:22:37                | 12000                     | 14.85                 | 0.98          | 0.30           | 4.37                   | 1.06                 | 69.20            | 1,068.00          |
|    | 09/03/15 10:23:07                | 12030                     | 14.78                 | 1.10          | 0.25           | 4.40                   | 1.06                 | 69.20            | 1,068.00          |
|    | 09/03/15 10:23:37                | 12060                     | 14.76                 | 1.22          | 0.26           | 4.42                   | 1.06                 | 69.20            | 1,068.00          |
|    | 09/03/15 10:24:07                | 12090                     | 14.89                 | 1.30          | 0.30           | 4.35                   | 1.07                 | 69.20            | 1,069.00          |
|    | 09/03/15 10:24:37                | 12120                     | 14.87                 | 1.53          | 0.29           | 4.36                   | 1.07                 | 69.20            | 1,069.00          |
|    | 09/03/15 10:25:07                | 12150                     | 14.88                 | 1.27          | 0.25           | 4.35                   | 1.07                 | 69.20            | 1,085.00          |
|    | 09/03/15 10:25:37                | 12180                     | 14.89                 | 1.22          | 0.30           | 4.35                   | 1.07                 | 69.20            | 1,085.00          |
|    | 09/03/15 10:26:07                | 12210                     | 14.97                 | 1.40          | 0.31           | 4.29                   | 1.08                 | 69.30            | 1,069.00          |
|    | 09/03/15 10:26:37                | 12240                     | 14.88                 | 1.32          | 0.30           | 4.35                   | 1.08                 | 69.30            | 1,069.00          |
|    | 09/03/15 10:27:07                | 12270                     | 14.94                 | 1.27          | 0.25           | 4.31                   | 1.08                 | 69.30            | 1,069.00          |
|    | 09/03/15 10:27:37                | 12300                     | 14.95                 | 1.45          | 0.24           | 4.30                   | 1.08                 | 69.30            | 1,069.00          |
|    | 09/03/15 10:28:07                | 12330                     | 15.00                 | 1.35          | 0.31           | 4.26                   | 1.08                 | 69.30            | 1,069.00          |
|    | 09/03/15 10:28:37                | 12360                     | 14.97                 | 1.22          | 0.29           | 4.28                   | 1.08                 | 69.30            | 1,069.00          |
|    | 09/03/15 10:29:07                | 12390                     | 14.92                 | 1.18          | 0.22           | 4.32                   | 1.08                 | 69.40            | 1,069.00          |
|    | 09/03/15 10:29:37                | 12420                     | 15.03                 | 1.25          | 0.29           | 4.25                   | 1.08                 | 69.40            | 1,069.00          |
|    | 09/03/15 10:30:07                | 12450                     | 14.97                 | 1.63          | 0.33           | 4.28                   | 1.08                 | 69.50            | 1,069.00          |
|    | 09/03/15 10:30:37                | 12480                     | 14.91                 | 1.58          | 0.30           | 4.34                   | 1.08                 | 69.50            | 1,069.00          |
|    | 09/03/15 10:31:07                | 12510                     | 15.01                 | 1.48          | 0.25           | 4.25                   | 1.08                 | 69.50            | 1,069.00          |
|    | 09/03/15 10:31:37                | 12540                     | 14.98                 | 1.51          | 0.27           | 4.27                   | 1.08                 | 69.50            | 1,069.00          |
|    | 09/03/15 10:32:07                | 12570                     | 15.00                 | 1.55          | 0.31           | 4.27                   | 1.09                 | 69.60            | 1,069.00          |
|    | 09/03/15 10:32:37                | 12600                     | 15.07                 | 1.35          | 0.31           | 4.22                   | 1.09                 | 69.60            | 1,069.00          |
|    | 09/03/15 10:43:07                | 13230                     | 15.08                 | 1.02          | 0.21           | 4.20                   | 1.11                 | 70.50            | 1,069.00          |
|    | 09/03/15 10:43:37                | 13260                     | 15.00                 | 1.02          | 0.24           | 4.26                   | 1.11                 | 70.50            | 1,069.00          |
|    | 09/03/15 10:44:07                | 13290                     | 14.99                 | 1.00          | 0.31           | 4.26                   | 1.12                 | 70.70            | 1,051.00          |

**Leed Fabrication Services Inc.**  
**September 3, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 4.7    | %    |
| Stack Exhaust Flow (M2) | 61,265 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.94    | in. Hg                       |
| Relative Humidity   | 45       | %                            |
| Ambient Temperature | 75       | °F                           |
| Specific Humidity   | 0.009985 | lb H <sub>2</sub> O / lb air |

90-100 Load, Run - EC36-2S R11

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| 09/03/15 10:44:37                | 13320                     | 15.01                 | 1.04          | 0.31           | 4.25                   | 1.12                 | 70.70            | 1,051.00          |
| 09/03/15 10:45:07                | 13350                     | 14.85                 | 1.10          | 0.27           | 4.36                   | 1.11                 | 70.80            | 1,068.00          |
| 09/03/15 10:45:37                | 13380                     | 14.87                 | 1.12          | 0.20           | 4.35                   | 1.11                 | 70.80            | 1,068.00          |
| 09/03/15 10:46:07                | 13410                     | 14.94                 | 1.20          | 0.22           | 4.30                   | 1.11                 | 70.90            | 1,068.00          |
| 09/03/15 10:46:37                | 13440                     | 15.02                 | 1.09          | 0.27           | 4.24                   | 1.11                 | 70.90            | 1,068.00          |
| 09/03/15 10:47:07                | 13470                     | 14.98                 | 1.26          | 0.29           | 4.27                   | 1.12                 | 71.00            | 1,068.00          |
| 09/03/15 10:47:37                | 13500                     | 15.03                 | 1.40          | 0.25           | 4.24                   | 1.12                 | 71.00            | 1,068.00          |
| 09/03/15 10:48:07                | 13530                     | 15.00                 | 1.19          | 0.20           | 4.25                   | 1.11                 | 71.10            | 1,067.00          |
| 09/03/15 10:48:37                | 13560                     | 14.97                 | 1.22          | 0.25           | 4.27                   | 1.11                 | 71.10            | 1,067.00          |
| 09/03/15 10:49:07                | 13590                     | 14.87                 | 1.16          | 0.29           | 4.34                   | 1.11                 | 71.20            | 1,067.00          |
| 09/03/15 10:49:37                | 13620                     | 14.85                 | 1.10          | 0.23           | 4.36                   | 1.11                 | 71.20            | 1,067.00          |
| 09/03/15 10:50:07                | 13650                     | 14.93                 | 1.06          | 0.19           | 4.29                   | 1.10                 | 71.30            | 1,066.00          |
| 09/03/15 10:50:37                | 13680                     | 14.98                 | 1.02          | 0.26           | 4.26                   | 1.10                 | 71.30            | 1,066.00          |
| 09/03/15 10:51:07                | 13710                     | 14.90                 | 1.16          | 0.29           | 4.32                   | 1.11                 | 71.50            | 1,066.00          |
| <b>RAW AVERAGE</b>               |                           | <b>14.77</b>          | <b>1.24</b>   | <b>0.24</b>    | <b>4.42</b>            | <b>1.05</b>          | <b>69.31</b>     | <b>1,040.01</b>   |

| Bias                   | Serial Number:  | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Press. Trans<br>(in. H <sub>2</sub> O) | Temp. Trans.<br>(°F) | F-Flow Trans.<br>(SCFH) |
|------------------------|-----------------|-----------------------|---------------|----------------|------------------------|----------------------------------------|----------------------|-------------------------|
|                        | INSTO2-0011     |                       | INST-CO-0022  | INST-TH-0002   | INST-C2-0013           | 1434717                                | 1434717              | 1434717                 |
|                        | Initial Zero    | -0.02                 | -0.09         | 0.02           | 0.04                   |                                        |                      |                         |
|                        | Final Zero      | 0.01                  | -0.06         | 0.04           | 0.05                   |                                        |                      |                         |
|                        | Avg. Zero       | -0.01                 | -0.08         | 0.03           | 0.05                   |                                        |                      |                         |
|                        | Initial UpScale | 11.84                 | 9.39          | 3.01           | 9.04                   |                                        |                      |                         |
|                        | Final UpScale   | 11.85                 | 9.34          | 3.05           | 9.07                   |                                        |                      |                         |
|                        | Avg. UpScale    | 11.85                 | 9.37          | 3.03           | 9.06                   |                                        |                      |                         |
| <b>Upscale Cal Gas</b> |                 | 11.91                 | 9.48          | 3.02           | 9.09                   |                                        |                      |                         |

| EMISSIONS DATA                          | O <sub>2</sub> | CO   | THC  | CO <sub>2</sub> |
|-----------------------------------------|----------------|------|------|-----------------|
| Corrected Raw Average (ppm/% dry basis) | 14.85          | 1.32 | 0.21 | 4.41            |
| Corrected Raw Average (ppm/% wet basis) | 14.15          | 1.26 | 0.20 | 4.20            |
| Emission Rate (lb/hr)                   | N/A            | 0.01 | 0.00 | N/A             |

**Leed Fabrication Services Inc.**  
**September 3, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 5.1    | %    |
| Stack Exhaust Flow (M2) | 57,358 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.93    | in. Hg                       |
| Relative Humidity   | 33       | %                            |
| Ambient Temperature | 79       | °F                           |
| Specific Humidity   | 0.008341 | lb H <sub>2</sub> O / lb air |

90-100 Load, Run - EC36-2S R12

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmwv) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| A1 | 09/03/15 11:02:07                | 14370                     | 14.50                 | 1.15          | 0.23           | 4.61                   | 0.97                 | 73.00            | 952.00            |
|    | 09/03/15 11:02:37                | 14400                     | 14.51                 | 1.16          | 0.19           | 4.59                   | 0.97                 | 73.00            | 952.00            |
|    | 09/03/15 11:03:07                | 14430                     | 14.54                 | 1.07          | 0.17           | 4.58                   | 0.96                 | 73.20            | 951.00            |
|    | 09/03/15 11:03:37                | 14460                     | 14.68                 | 1.08          | 0.24           | 4.49                   | 0.96                 | 73.20            | 951.00            |
|    | 09/03/15 11:04:07                | 14490                     | 14.58                 | 1.18          | 0.23           | 4.54                   | 0.96                 | 73.30            | 985.00            |
|    | 09/03/15 11:04:37                | 14520                     | 14.46                 | 1.11          | 0.20           | 4.63                   | 0.96                 | 73.30            | 985.00            |
|    | 09/03/15 11:05:07                | 14550                     | 14.41                 | 1.05          | 0.21           | 4.66                   | 0.96                 | 73.40            | 968.00            |
|    | 09/03/15 11:05:37                | 14580                     | 14.54                 | 1.11          | 0.22           | 4.58                   | 0.96                 | 73.40            | 968.00            |
|    | 09/03/15 11:06:07                | 14610                     | 14.61                 | 1.18          | 0.20           | 4.52                   | 0.97                 | 73.50            | 985.00            |
|    | 09/03/15 11:06:37                | 14640                     | 14.59                 | 1.16          | 0.17           | 4.53                   | 0.97                 | 73.50            | 985.00            |
|    | 09/03/15 11:07:07                | 14670                     | 14.48                 | 1.07          | 0.21           | 4.60                   | 0.96                 | 73.60            | 950.00            |
|    | 09/03/15 11:07:37                | 14700                     | 14.50                 | 1.02          | 0.27           | 4.60                   | 0.96                 | 73.60            | 950.00            |
|    | 09/03/15 11:08:07                | 14730                     | 14.55                 | 1.03          | 0.20           | 4.56                   | 0.96                 | 73.70            | 950.00            |
|    | 09/03/15 11:08:37                | 14760                     | 14.53                 | 0.98          | 0.22           | 4.57                   | 0.96                 | 73.70            | 950.00            |
|    | 09/03/15 11:09:07                | 14790                     | 14.55                 | 0.95          | 0.20           | 4.56                   | 0.96                 | 73.70            | 950.00            |
|    | 09/03/15 11:09:37                | 14820                     | 14.40                 | 0.94          | 0.22           | 4.67                   | 0.96                 | 73.70            | 950.00            |
|    | 09/03/15 11:10:07                | 14850                     | 14.09                 | 0.77          | 0.16           | 4.86                   | 0.99                 | 73.80            | 1,020.00          |
|    | 09/03/15 11:10:37                | 14880                     | 13.97                 | 0.54          | 0.17           | 4.95                   | 0.99                 | 73.80            | 1,020.00          |
|    | 09/03/15 11:11:07                | 14910                     | 13.96                 | 0.48          | 0.25           | 4.96                   | 1.04                 | 73.80            | 1,057.00          |
|    | 09/03/15 11:11:37                | 14940                     | 13.95                 | 0.49          | 0.26           | 4.97                   | 1.04                 | 73.80            | 1,057.00          |
|    | 09/03/15 11:12:07                | 14970                     | 13.99                 | 0.53          | 0.21           | 4.94                   | 1.05                 | 73.70            | 1,075.00          |
|    | 09/03/15 11:12:37                | 15000                     | 13.99                 | 0.52          | 0.15           | 4.93                   | 1.05                 | 73.70            | 1,075.00          |
|    | 09/03/15 11:13:07                | 15030                     | 14.01                 | 0.52          | 0.14           | 4.93                   | 1.06                 | 73.70            | 1,042.00          |
|    | 09/03/15 11:13:37                | 15060                     | 13.92                 | 0.50          | 0.21           | 4.97                   | 1.06                 | 73.70            | 1,042.00          |
|    | 09/03/15 11:14:07                | 15090                     | 13.90                 | 0.50          | 0.19           | 4.99                   | 1.07                 | 73.70            | 1,060.00          |
|    | 09/03/15 11:14:37                | 15120                     | 13.93                 | 0.51          | 0.14           | 4.96                   | 1.07                 | 73.70            | 1,060.00          |
|    | 09/03/15 11:15:07                | 15150                     | 13.98                 | 0.55          | 0.20           | 4.94                   | 1.08                 | 73.60            | 1,060.00          |
|    | 09/03/15 11:15:37                | 15180                     | 14.00                 | 0.53          | 0.21           | 4.92                   | 1.08                 | 73.60            | 1,060.00          |
|    | 09/03/15 11:16:07                | 15210                     | 14.00                 | 0.53          | 0.19           | 4.92                   | 1.09                 | 73.60            | 1,061.00          |
|    | 09/03/15 11:16:37                | 15240                     | 14.00                 | 0.51          | 0.18           | 4.93                   | 1.09                 | 73.60            | 1,061.00          |
|    | 09/03/15 11:17:07                | 15270                     | 14.06                 | 0.52          | 0.22           | 4.88                   | 1.10                 | 73.50            | 1,045.00          |
|    | 09/03/15 11:17:37                | 15300                     | 14.04                 | 0.54          | 0.26           | 4.90                   | 1.10                 | 73.50            | 1,045.00          |
|    | 09/03/15 11:18:07                | 15330                     | 14.00                 | 0.53          | 0.25           | 4.92                   | 1.11                 | 73.50            | 1,062.00          |
|    | 09/03/15 11:18:37                | 15360                     | 13.99                 | 0.52          | 0.19           | 4.93                   | 1.11                 | 73.50            | 1,062.00          |
|    | 09/03/15 11:19:07                | 15390                     | 14.01                 | 0.50          | 0.15           | 4.92                   | 1.11                 | 73.40            | 1,063.00          |
|    | 09/03/15 11:19:37                | 15420                     | 14.01                 | 0.47          | 0.22           | 4.92                   | 1.11                 | 73.40            | 1,063.00          |
|    | 09/03/15 11:20:07                | 15450                     | 14.04                 | 0.50          | 0.29           | 4.90                   | 1.11                 | 73.40            | 1,114.00          |
|    | 09/03/15 11:20:37                | 15480                     | 13.94                 | 0.55          | 0.24           | 4.96                   | 1.11                 | 73.40            | 1,114.00          |
|    | 09/03/15 11:21:07                | 15510                     | 14.01                 | 0.48          | 0.21           | 4.91                   | 1.12                 | 73.30            | 1,081.00          |
|    | 09/03/15 11:21:37                | 15540                     | 14.03                 | 0.47          | 0.16           | 4.90                   | 1.12                 | 73.30            | 1,081.00          |
|    | 09/03/15 11:22:07                | 15570                     | 13.96                 | 0.44          | 0.15           | 4.95                   | 1.11                 | 73.30            | 1,063.00          |
| A2 | 09/03/15 11:22:37                | 15600                     | 14.02                 | 0.42          | 0.20           | 4.91                   | 1.11                 | 73.30            | 1,063.00          |
|    | 09/03/15 11:23:07                | 15630                     | 14.03                 | 0.44          | 0.22           | 4.90                   | 1.10                 | 73.20            | 1,063.00          |
|    | 09/03/15 11:23:37                | 15660                     | 14.00                 | 0.43          | 0.17           | 4.92                   | 1.10                 | 73.20            | 1,063.00          |
|    | 09/03/15 11:24:07                | 15690                     | 14.00                 | 0.40          | 0.17           | 4.92                   | 1.10                 | 73.20            | 1,046.00          |
|    | 09/03/15 11:24:37                | 15720                     | 13.99                 | 0.38          | 0.18           | 4.93                   | 1.10                 | 73.20            | 1,046.00          |
|    | 09/03/15 11:25:07                | 15750                     | 14.00                 | 0.36          | 0.17           | 4.92                   | 1.11                 | 73.10            | 1,063.00          |
|    | 09/03/15 11:25:37                | 15780                     | 13.99                 | 0.37          | 0.13           | 4.92                   | 1.11                 | 73.10            | 1,063.00          |
|    | 09/03/15 11:26:07                | 15810                     | 14.00                 | 0.38          | 0.15           | 4.92                   | 1.11                 | 73.10            | 1,063.00          |
|    | 09/03/15 11:26:37                | 15840                     | 14.03                 | 0.34          | 0.19           | 4.90                   | 1.11                 | 73.10            | 1,063.00          |
|    | 09/03/15 11:27:07                | 15870                     | 14.04                 | 0.37          | 0.21           | 4.89                   | 1.11                 | 73.00            | 1,063.00          |
|    | 09/03/15 11:27:37                | 15900                     | 14.02                 | 0.36          | 0.18           | 4.91                   | 1.11                 | 73.00            | 1,063.00          |
|    | 09/03/15 11:28:07                | 15930                     | 13.96                 | 0.33          | 0.12           | 4.94                   | 1.11                 | 73.00            | 1,063.00          |
|    | 09/03/15 11:28:37                | 15960                     | 14.01                 | 0.32          | 0.18           | 4.91                   | 1.11                 | 73.00            | 1,063.00          |
|    | 09/03/15 11:29:07                | 15990                     | 14.04                 | 0.32          | 0.21           | 4.89                   | 1.11                 | 72.90            | 1,047.00          |
|    | 09/03/15 11:29:37                | 16020                     | 14.03                 | 0.37          | 0.13           | 4.89                   | 1.11                 | 72.90            | 1,047.00          |
|    | 09/03/15 11:30:07                | 16050                     | 13.96                 | 0.37          | 0.15           | 4.94                   | 1.11                 | 72.90            | 1,064.00          |
|    | 09/03/15 11:30:37                | 16080                     | 13.97                 | 0.29          | 0.19           | 4.93                   | 1.11                 | 72.90            | 1,064.00          |
|    | 09/03/15 11:31:07                | 16110                     | 13.99                 | 0.35          | 0.21           | 4.90                   | 1.12                 | 72.90            | 1,064.00          |
|    | 09/03/15 11:31:37                | 16140                     | 13.99                 | 0.30          | 0.09           | 4.92                   | 1.12                 | 72.90            | 1,064.00          |

**Leed Fabrication Services Inc.**  
**September 3, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 5.1    | %    |
| Stack Exhaust Flow (M2) | 57,358 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.93    | in. Hg                       |
| Relative Humidity   | 33       | %                            |
| Ambient Temperature | 79       | °F                           |
| Specific Humidity   | 0.008341 | lb H <sub>2</sub> O / lb air |

90-100 Load, Run - EC36-2S R12

|    | Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmwv) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
|    | 09/03/15 11:32:07                | 16170                     | 13.96                 | 0.31          | 0.17           | 4.94                   | 1.11                 | 72.90            | 1,064.00          |
|    | 09/03/15 11:32:37                | 16200                     | 13.96                 | 0.32          | 0.18           | 4.95                   | 1.11                 | 72.90            | 1,064.00          |
|    | 09/03/15 11:33:07                | 16230                     | 13.95                 | 0.29          | 0.22           | 4.94                   | 1.11                 | 72.90            | 1,046.00          |
|    | 09/03/15 11:33:37                | 16260                     | 13.95                 | 0.28          | 0.15           | 4.95                   | 1.11                 | 72.90            | 1,046.00          |
|    | 09/03/15 11:34:07                | 16290                     | 13.87                 | 0.30          | 0.16           | 5.00                   | 1.10                 | 72.90            | 1,063.00          |
|    | 09/03/15 11:34:37                | 16320                     | 13.99                 | 0.28          | 0.18           | 4.92                   | 1.10                 | 72.90            | 1,063.00          |
|    | 09/03/15 11:35:07                | 16350                     | 13.97                 | 0.36          | 0.16           | 4.94                   | 1.10                 | 72.90            | 1,063.00          |
|    | 09/03/15 11:35:37                | 16380                     | 13.82                 | 0.29          | 0.14           | 5.03                   | 1.10                 | 72.90            | 1,063.00          |
|    | 09/03/15 11:36:07                | 16410                     | 13.90                 | 0.23          | 0.17           | 4.97                   | 1.12                 | 72.90            | 1,064.00          |
|    | 09/03/15 11:36:37                | 16440                     | 13.85                 | 0.26          | 0.23           | 5.00                   | 1.12                 | 72.90            | 1,064.00          |
|    | 09/03/15 11:37:07                | 16470                     | 13.84                 | 0.23          | 0.21           | 5.02                   | 1.11                 | 73.00            | 1,064.00          |
|    | 09/03/15 11:37:37                | 16500                     | 13.87                 | 0.25          | 0.17           | 4.99                   | 1.11                 | 73.00            | 1,064.00          |
|    | 09/03/15 11:38:07                | 16530                     | 13.93                 | 0.19          | 0.17           | 4.97                   | 1.11                 | 73.00            | 1,046.00          |
|    | 09/03/15 11:38:37                | 16560                     | 14.01                 | 0.31          | 0.20           | 4.91                   | 1.11                 | 73.00            | 1,046.00          |
|    | 09/03/15 11:39:07                | 16590                     | 13.98                 | 0.47          | 0.21           | 4.92                   | 1.11                 | 73.10            | 1,064.00          |
|    | 09/03/15 11:39:37                | 16620                     | 13.94                 | 0.60          | 0.12           | 4.95                   | 1.11                 | 73.10            | 1,064.00          |
|    | 09/03/15 11:40:07                | 16650                     | 13.96                 | 0.49          | 0.19           | 4.94                   | 1.10                 | 73.20            | 1,063.00          |
|    | 09/03/15 11:40:37                | 16680                     | 14.00                 | 0.56          | 0.22           | 4.91                   | 1.10                 | 73.20            | 1,063.00          |
|    | 09/03/15 11:41:07                | 16710                     | 13.96                 | 0.76          | 0.23           | 4.93                   | 1.11                 | 73.20            | 1,063.00          |
|    | 09/03/15 11:41:37                | 16740                     | 13.97                 | 0.68          | 0.19           | 4.93                   | 1.11                 | 73.20            | 1,063.00          |
|    | 09/03/15 11:42:07                | 16770                     | 14.02                 | 0.62          | 0.21           | 4.90                   | 1.10                 | 73.30            | 1,062.00          |
| A3 | 09/03/15 11:42:37                | 16800                     | 13.84                 | 0.57          | 0.20           | 5.01                   | 1.10                 | 73.30            | 1,062.00          |
|    | 09/03/15 11:43:07                | 16830                     | 13.96                 | 0.32          | 0.19           | 4.94                   | 1.11                 | 73.30            | 1,063.00          |
|    | 09/03/15 11:43:37                | 16860                     | 13.94                 | 0.30          | 0.17           | 4.94                   | 1.11                 | 73.30            | 1,063.00          |
|    | 09/03/15 11:44:07                | 16890                     | 13.88                 | 0.30          | 0.22           | 4.99                   | 1.10                 | 73.40            | 1,045.00          |
|    | 09/03/15 11:44:37                | 16920                     | 14.40                 | 0.44          | 0.17           | 4.66                   | 1.10                 | 73.40            | 1,045.00          |
|    | 09/03/15 11:45:07                | 16950                     | 14.37                 | 0.72          | 0.15           | 4.66                   | 1.11                 | 73.50            | 1,062.00          |
|    | 09/03/15 11:45:37                | 16980                     | 14.35                 | 0.70          | 0.22           | 4.68                   | 1.11                 | 73.50            | 1,062.00          |
|    | 09/03/15 11:46:07                | 17010                     | 14.36                 | 0.70          | 0.18           | 4.66                   | 1.11                 | 73.50            | 1,062.00          |
|    | 09/03/15 11:46:37                | 17040                     | 14.33                 | 0.67          | 0.18           | 4.70                   | 1.11                 | 73.50            | 1,062.00          |
|    | 09/03/15 11:47:07                | 17070                     | 14.46                 | 0.80          | 0.22           | 4.60                   | 1.12                 | 73.60            | 1,063.00          |
|    | 09/03/15 11:47:37                | 17100                     | 14.43                 | 0.97          | 0.22           | 4.63                   | 1.12                 | 73.60            | 1,063.00          |
|    | 09/03/15 11:48:07                | 17130                     | 14.51                 | 0.92          | 0.16           | 4.57                   | 1.11                 | 73.60            | 1,062.00          |
|    | 09/03/15 11:48:37                | 17160                     | 14.52                 | 0.87          | 0.21           | 4.57                   | 1.11                 | 73.60            | 1,062.00          |
|    | 09/03/15 11:49:07                | 17190                     | 14.44                 | 0.92          | 0.27           | 4.62                   | 1.10                 | 73.70            | 1,062.00          |
|    | 09/03/15 11:49:37                | 17220                     | 14.44                 | 0.89          | 0.29           | 4.62                   | 1.10                 | 73.70            | 1,062.00          |
|    | 09/03/15 11:50:07                | 17250                     | 14.24                 | 0.81          | 0.24           | 4.75                   | 1.11                 | 73.70            | 1,045.00          |
|    | 09/03/15 11:50:37                | 17280                     | 14.40                 | 0.71          | 0.17           | 4.64                   | 1.11                 | 73.70            | 1,045.00          |
|    | 09/03/15 11:51:07                | 17310                     | 14.45                 | 1.01          | 0.21           | 4.61                   | 1.11                 | 73.70            | 1,062.00          |
|    | 09/03/15 11:51:37                | 17340                     | 14.31                 | 0.91          | 0.21           | 4.70                   | 1.11                 | 73.70            | 1,062.00          |
|    | 09/03/15 11:52:07                | 17370                     | 14.37                 | 0.83          | 0.23           | 4.66                   | 1.11                 | 73.80            | 1,062.00          |
|    | 09/03/15 11:52:37                | 17400                     | 14.48                 | 0.85          | 0.19           | 4.60                   | 1.11                 | 73.80            | 1,062.00          |
|    | 09/03/15 11:53:07                | 17430                     | 14.48                 | 1.07          | 0.23           | 4.59                   | 1.11                 | 73.80            | 1,045.00          |
|    | 09/03/15 11:53:37                | 17460                     | 14.44                 | 1.02          | 0.20           | 4.60                   | 1.11                 | 73.80            | 1,045.00          |
|    | 09/03/15 11:54:07                | 17490                     | 14.33                 | 0.72          | 0.20           | 4.70                   | 1.10                 | 73.80            | 1,061.00          |
|    | 09/03/15 11:54:37                | 17520                     | 14.33                 | 0.70          | 0.21           | 4.69                   | 1.10                 | 73.80            | 1,061.00          |
|    | 09/03/15 11:55:07                | 17550                     | 14.35                 | 0.67          | 0.22           | 4.68                   | 1.10                 | 73.90            | 1,061.00          |
|    | 09/03/15 11:55:37                | 17580                     | 14.43                 | 0.74          | 0.16           | 4.62                   | 1.10                 | 73.90            | 1,061.00          |
|    | 09/03/15 11:56:07                | 17610                     | 14.42                 | 0.82          | 0.15           | 4.64                   | 1.11                 | 73.90            | 1,062.00          |
|    | 09/03/15 11:56:37                | 17640                     | 14.57                 | 0.84          | 0.19           | 4.53                   | 1.11                 | 73.90            | 1,062.00          |
|    | 09/03/15 11:57:07                | 17670                     | 14.33                 | 0.94          | 0.21           | 4.69                   | 1.12                 | 73.90            | 1,062.00          |
|    | 09/03/15 11:57:37                | 17700                     | 14.45                 | 0.77          | 0.18           | 4.61                   | 1.12                 | 73.90            | 1,062.00          |
|    | 09/03/15 11:58:07                | 17730                     | 14.34                 | 0.75          | 0.17           | 4.68                   | 1.11                 | 73.90            | 1,062.00          |
|    | 09/03/15 11:58:37                | 17760                     | 14.30                 | 0.69          | 0.21           | 4.70                   | 1.11                 | 73.90            | 1,062.00          |
|    | 09/03/15 11:59:07                | 17790                     | 14.33                 | 0.65          | 0.23           | 4.68                   | 1.11                 | 74.00            | 1,061.00          |
|    | 09/03/15 11:59:37                | 17820                     | 14.40                 | 0.63          | 0.17           | 4.65                   | 1.11                 | 74.00            | 1,061.00          |
|    | 09/03/15 12:00:07                | 17850                     | 14.42                 | 0.75          | 0.20           | 4.63                   | 1.11                 | 74.00            | 1,061.00          |
|    | 09/03/15 12:00:37                | 17880                     | 14.32                 | 0.75          | 0.22           | 4.70                   | 1.11                 | 74.00            | 1,061.00          |
|    | 09/03/15 12:01:07                | 17910                     | 14.39                 | 0.73          | 0.26           | 4.65                   | 1.11                 | 74.00            | 1,061.00          |
|    | 09/03/15 12:01:37                | 17940                     | 14.41                 | 0.91          | 0.20           | 4.63                   | 1.11                 | 74.00            | 1,061.00          |

**Leed Fabrication Services Inc.**  
**September 3, 2015**  
**EC36-2S**  
**Loveland Facility**

**Unit Data**

|                         |        |      |
|-------------------------|--------|------|
| Meas. Stack Moisture    | 5.1    | %    |
| Stack Exhaust Flow (M2) | 57,358 | SCFH |

**Weather Data**

|                     |          |                              |
|---------------------|----------|------------------------------|
| Barometric Pressure | 24.93    | in. Hg                       |
| Relative Humidity   | 33       | %                            |
| Ambient Temperature | 79       | °F                           |
| Specific Humidity   | 0.008341 | lb H <sub>2</sub> O / lb air |

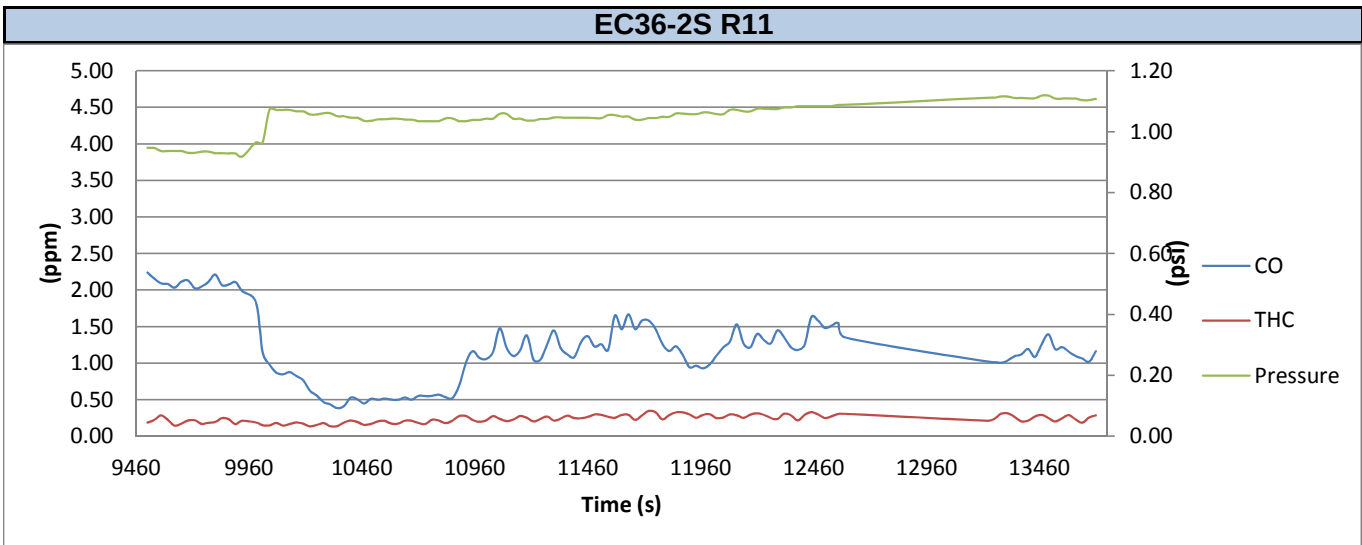
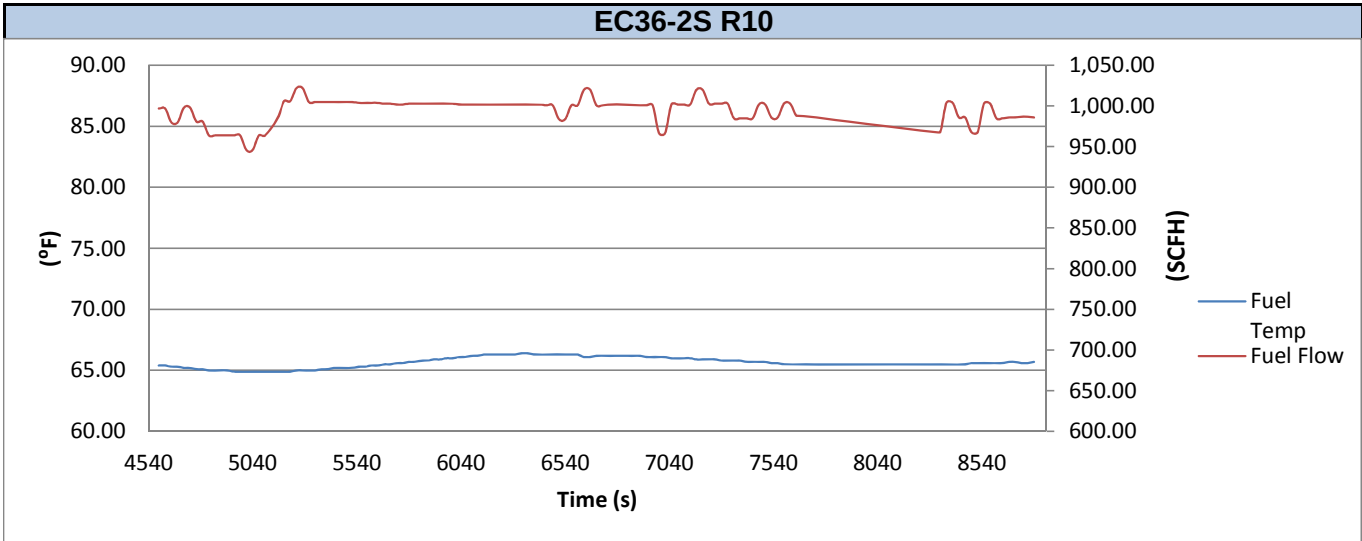
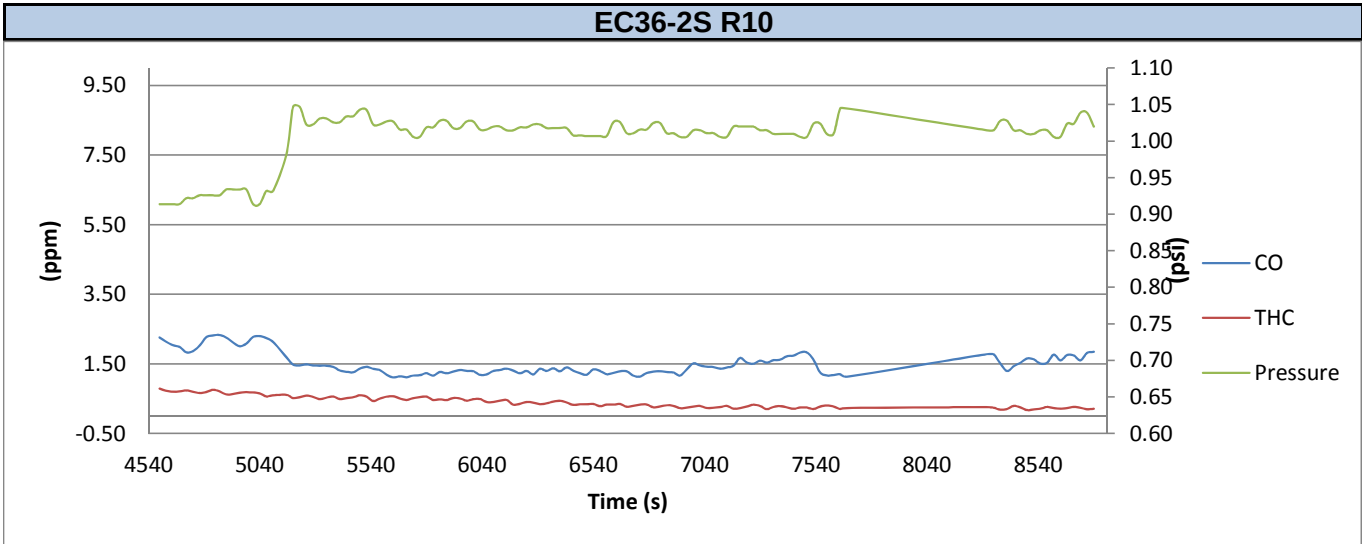
90-100 Load, Run - EC36-2S R12

| Date/Time<br>(mm/dd/yy hh:mm:ss) | Elapsed Time<br>(seconds) | O <sub>2</sub><br>(%) | CO<br>(ppmvd) | THC<br>(ppmvw) | CO <sub>2</sub><br>(%) | Fuel Pressure<br>psi | Fuel Temp.<br>°F | Fuel Flow<br>SCFH |
|----------------------------------|---------------------------|-----------------------|---------------|----------------|------------------------|----------------------|------------------|-------------------|
| 09/03/15 12:02:07                | 17970                     | 14.34                 | 0.85          | 0.21           | 4.69                   | 1.11                 | 74.10            | 1,061.00          |
| 09/03/15 12:02:37                | 18000                     | 14.37                 | 0.81          | 0.22           | 4.67                   | 1.11                 | 74.10            | 1,061.00          |
| 09/03/15 12:03:07                | 18030                     | 14.46                 | 0.94          | 0.29           | 4.59                   | 1.11                 | 74.10            | 1,044.00          |
| 09/03/15 12:03:37                | 18060                     | 14.40                 | 0.99          | 0.28           | 4.67                   | 1.11                 | 74.10            | 1,044.00          |
| 09/03/15 12:04:07                | 18090                     | 14.42                 | 0.98          | 0.21           | 4.64                   | 1.11                 | 74.10            | 1,061.00          |
| 09/03/15 12:04:37                | 18120                     | 14.54                 | 1.16          | 0.22           | 4.55                   | 1.11                 | 74.10            | 1,061.00          |
| 09/03/15 12:05:07                | 18150                     | 14.44                 | 1.20          | 0.29           | 4.61                   | 1.11                 | 74.10            | 1,061.00          |
| 09/03/15 12:05:37                | 18180                     | 14.42                 | 0.89          | 0.29           | 4.64                   | 1.11                 | 74.10            | 1,061.00          |
| 09/03/15 12:06:07                | 18210                     | 14.39                 | 0.90          | 0.23           | 4.66                   | 1.10                 | 74.10            | 1,061.00          |
| 09/03/15 12:06:37                | 18240                     | 14.52                 | 0.90          | 0.19           | 4.57                   | 1.10                 | 74.10            | 1,061.00          |
| 09/03/15 12:07:07                | 18270                     | 14.30                 | 0.81          | 0.22           | 4.72                   | 1.10                 | 74.20            | 1,060.00          |
| 09/03/15 12:07:37                | 18300                     | 14.42                 | 0.62          | 0.24           | 4.65                   | 1.10                 | 74.20            | 1,060.00          |
| 09/03/15 12:08:07                | 18330                     | 14.39                 | 0.82          | 0.19           | 4.66                   | 1.10                 | 74.20            | 1,044.00          |
| 09/03/15 12:08:37                | 18360                     | 14.32                 | 0.69          | 0.22           | 4.71                   | 1.10                 | 74.20            | 1,044.00          |
| 09/03/15 12:09:07                | 18390                     | 14.14                 | 0.68          | 0.19           | 4.81                   | 1.12                 | 74.20            | 1,062.00          |
| 09/03/15 12:09:37                | 18420                     | 14.25                 | 0.53          | 0.22           | 4.74                   | 1.12                 | 74.20            | 1,062.00          |
| 09/03/15 12:10:07                | 18450                     | 14.50                 | 0.65          | 0.16           | 4.58                   | 1.11                 | 74.20            | 1,061.00          |
| 09/03/15 12:10:37                | 18480                     | 14.55                 | 0.90          | 0.22           | 4.55                   | 1.11                 | 74.20            | 1,061.00          |
| 09/03/15 12:11:07                | 18510                     | 14.41                 | 0.92          | 0.23           | 4.63                   | 1.10                 | 74.20            | 1,061.00          |
| 09/03/15 12:11:37                | 18540                     | 14.34                 | 0.71          | 0.19           | 4.69                   | 1.10                 | 74.20            | 1,061.00          |
| 09/03/15 12:12:07                | 18570                     | 14.59                 | 0.71          | 0.22           | 4.53                   | 1.11                 | 74.30            | 1,044.00          |
| <b>RAW AVERAGE</b>               |                           | <b>14.21</b>          | <b>0.65</b>   | <b>0.20</b>    | <b>4.78</b>            | <b>1.09</b>          | <b>73.53</b>     | <b>1,048.43</b>   |

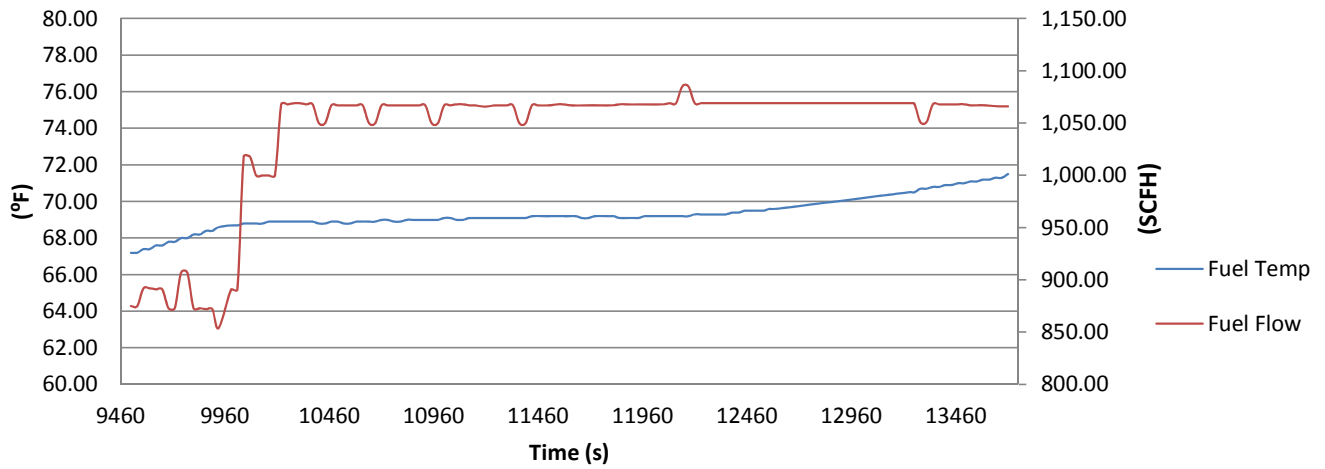
| Bias                   | Serial Number:  |         |         |                 | Press. Trans           | Temp. Trans. | F-Flow Trans. |
|------------------------|-----------------|---------|---------|-----------------|------------------------|--------------|---------------|
|                        | O <sub>2</sub>  | CO      | THC     | CO <sub>2</sub> | 1434717                | 1434717      | 1434717       |
|                        | (%)             | (ppmvd) | (ppmvw) | (%)             | (in. H <sub>2</sub> O) | (°F)         | (SCFH)        |
|                        | Initial Zero    | 0.01    | -0.06   | 0.04            | 0.05                   |              |               |
|                        | Final Zero      | 0.02    | -0.04   | 0.14            | 0.08                   |              |               |
|                        | Avg. Zero       | 0.02    | -0.05   | 0.09            | 0.07                   |              |               |
|                        | Initial UpScale | 11.85   | 9.34    | 3.05            | 9.07                   |              |               |
|                        | Final UpScale   | 11.82   | 9.30    | 3.12            | 9.11                   |              |               |
|                        | Avg. UpScale    | 11.84   | 9.32    | 3.09            | 9.09                   |              |               |
| <b>Upscale Cal Gas</b> |                 | 11.91   | 9.48    | 3.02            | 9.09                   |              |               |

| EMISSIONS DATA                          | O <sub>2</sub> | CO   | THC  | CO <sub>2</sub> |
|-----------------------------------------|----------------|------|------|-----------------|
| Corrected Raw Average (ppm/% dry basis) | 14.30          | 0.71 | 0.11 | 4.75            |
| Corrected Raw Average (ppm/% wet basis) | 13.56          | 0.68 | 0.10 | 4.50            |
| Emission Rate (lb/hr)                   | N/A            | 0.00 | 0.00 | N/A             |

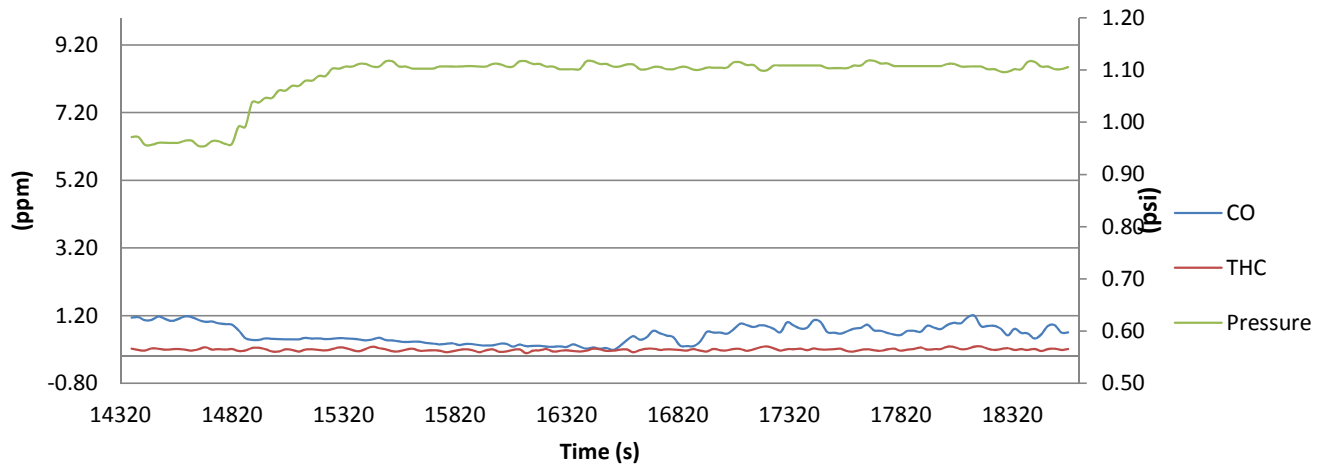




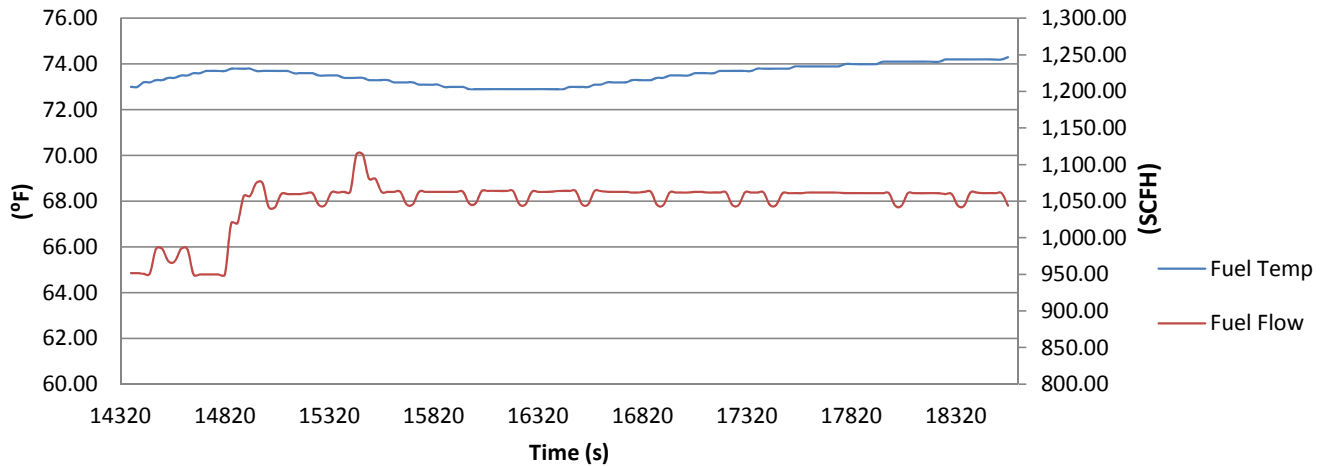
### EC36-2S R11



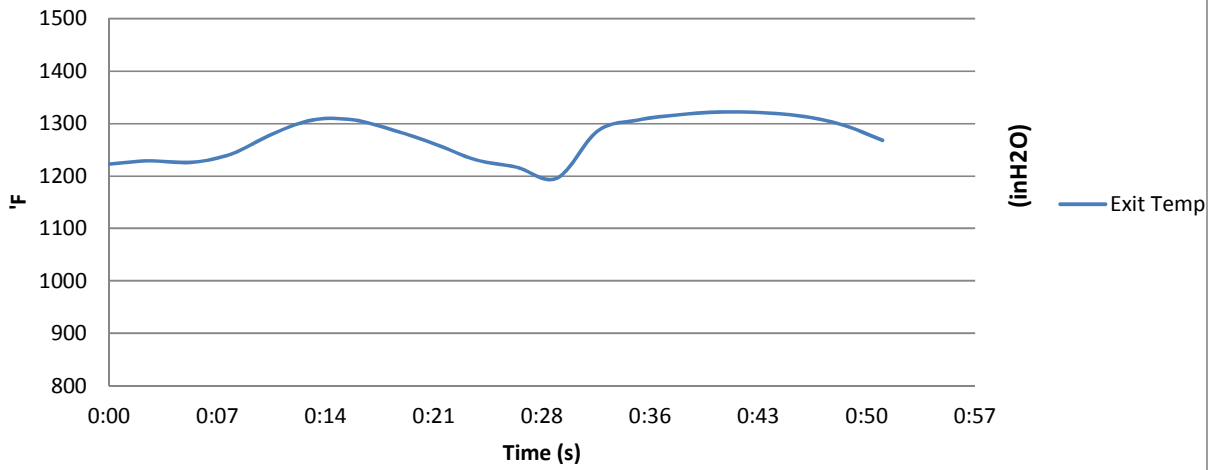
### EC36-2S R12



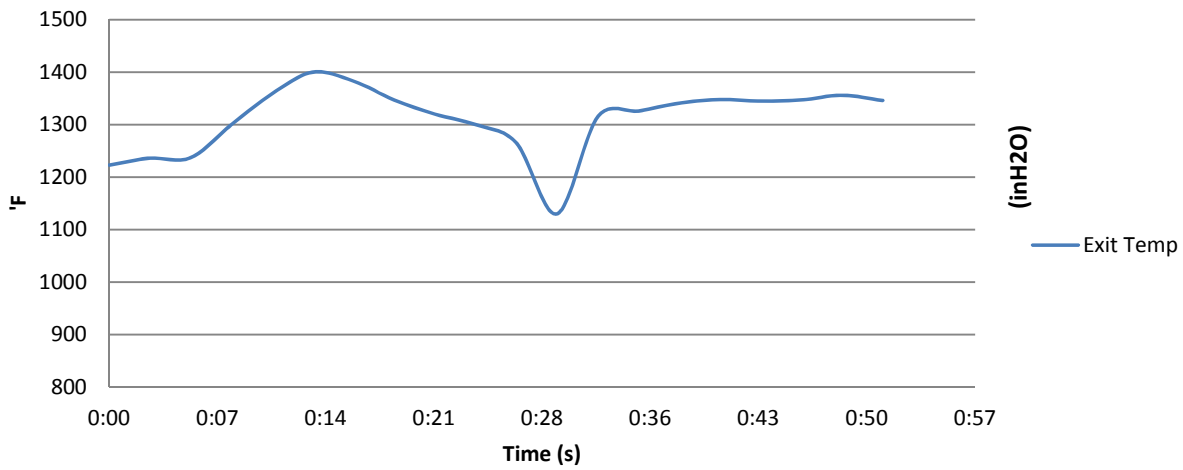
### EC36-2S R12



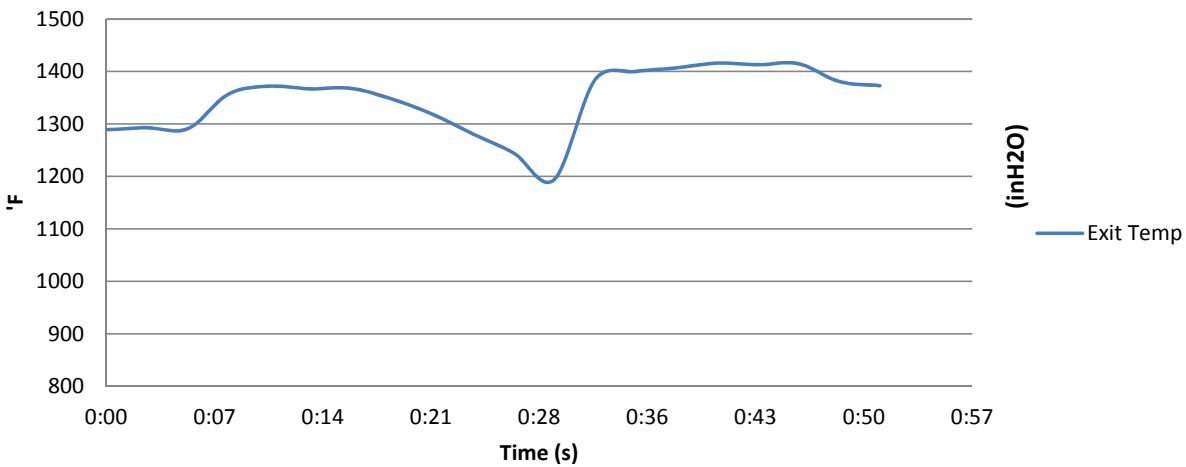
EC 36 R10



EC 36 R11



EC36 R12



**EMISSION DATA RECORDS**  
**VISUAL EMISSION DATA RECORD**

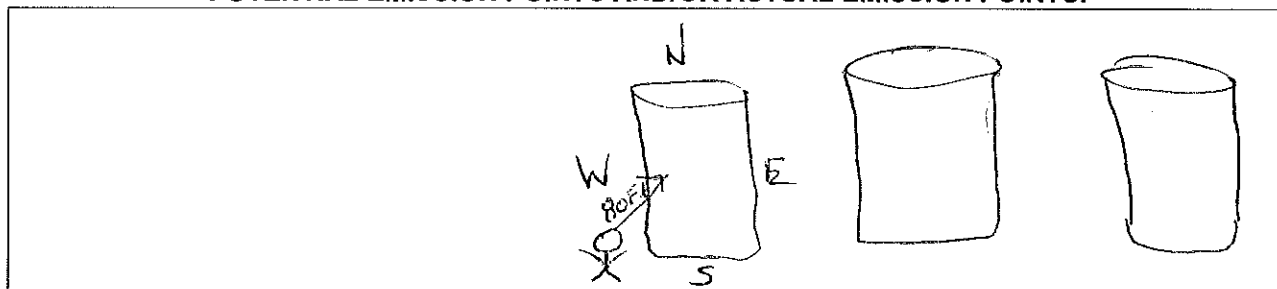
METHOD 22 R1  
FUGITIVE OR SMOKE EMISSION  
INSPECTION FORM



**AIR HYGIENE**

|                                                                                                    |                                                                                                                           |
|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| COMPANY: Leed Fabrication Service Inc.<br>LOCATION: Loveland Facility<br>COMPANY REP: Tony Sanelli | OBSERVER: Jason Dunlap <span style="margin-left: 20px;">COBY GRIFFIN</span><br>AFFILIATION: Air Hygiene<br>DATE: 9/1/2015 |
| SKY CONDITIONS: CLEAR/BLUE<br>PRECIPITATION: NONE                                                  | WIND DIRECTION: CALM NW<br>WIND SPEED: CALM 4                                                                             |
| INDUSTRY: Manufacturing                                                                            | PROCESS UNIT: <del>EC48-25</del> EC36-25                                                                                  |

SKETCH PROCESS UNIT: INDICATE OBSERVER POSITION RELATIVE TO SOURCE; INDICATE  
POTENTIAL EMISSION POINTS AND/OR ACTUAL EMISSION POINTS.



**OBSERVATIONS**

|   | CLOCK TIME | OBSERVATION PERIOD DURATION (MIN:SEC) | ACCUMULATION EMISSION TIME (MIN:SEC) | OBSERVATION LOCATION |
|---|------------|---------------------------------------|--------------------------------------|----------------------|
| ① | 14:36      | 20:00                                 | 00:00                                | S WEST               |
|   | 14:56      |                                       |                                      |                      |
| ② | 15:01      | BREAK 5:00                            | —                                    | ↓                    |
|   | 15:21      | 20:00                                 | 00:00                                |                      |
| ③ | 15:26      | BREAK 5:00                            | —                                    |                      |
|   | 15:46      | 20:00                                 | 00:00                                |                      |
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Tuesday, September 1, 2015 14:45:08

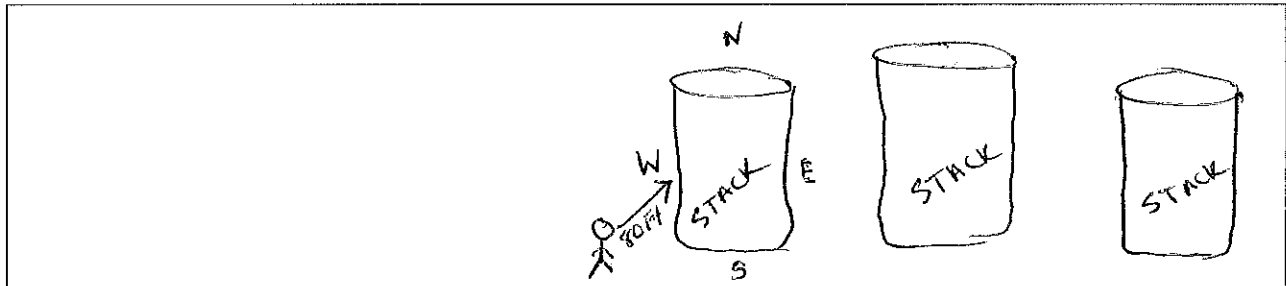
R2  
METHOD 22  
FUGITIVE OR SMOKE EMISSION  
INSPECTION FORM



**AIR HYGIENE**

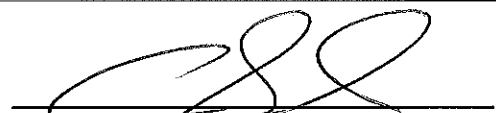
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| <b>COMPANY:</b> Leed Fabrication Service Inc.<br><b>LOCATION:</b> Loveland Facility<br><b>COMPANY REP:</b> Tony Sanelli | <b>OBSERVER:</b> Jason Dunlap<br><b>AFFILIATION:</b> Air Hygiene<br><b>DATE:</b> 9/1/2015 |
| <b>SKY CONDITIONS:</b> Cloudy<br><b>PRECIPITATION:</b>                                                                  | <b>WIND DIRECTION:</b> CALM NNW<br><b>WIND SPEED:</b> CALM 6                              |
| <b>INDUSTRY:</b> Manufacturing                                                                                          | <b>PROCESS UNIT:</b> <del>EC-18-2S</del> EC-34-2S                                         |

**SKETCH PROCESS UNIT: INDICATE OBSERVER POSITION RELATIVE TO SOURCE; INDICATE POTENTIAL EMISSION POINTS AND/OR ACTUAL EMISSION POINTS.**



**OBSERVATIONS**

|   | CLOCK TIME | OBSERVATION PERIOD DURATION (MIN:SEC) | ACCUMULATION EMISSION TIME (MIN:SEC) | OBSERVATION LOCATION |
|---|------------|---------------------------------------|--------------------------------------|----------------------|
| ① | 15:57      | 20:00                                 | 00:00                                | SWEST<br>↓           |
|   | 16:17      | BREAK 5:00                            | —                                    |                      |
| ② | 16:22      | 20:00                                 | 00:00                                |                      |
|   | 16:42      | BREAK 5:00                            | —                                    |                      |
| ③ | 16:47      | 20:00                                 | 00:00                                |                      |
|   | 17:07      |                                       |                                      |                      |
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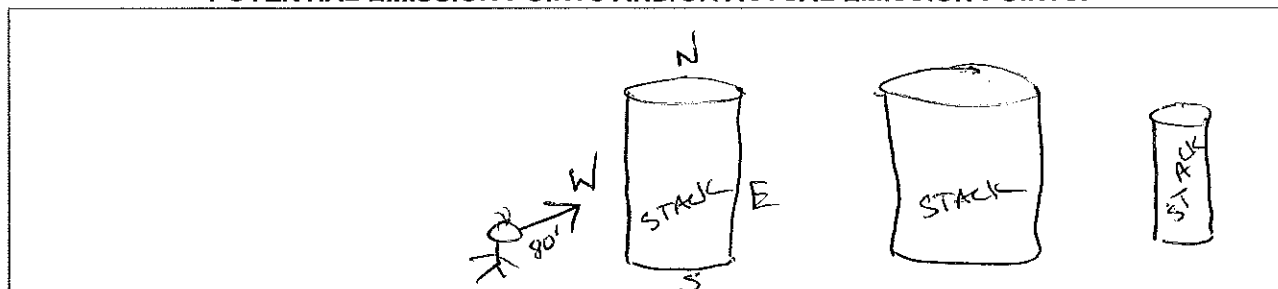
METHOD 22 R3  
FUGITIVE OR SMOKE EMISSION  
INSPECTION FORM



**AIR HYGIENE**

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| COMPANY: Leed Fabrication Service Inc.<br>LOCATION: Loveland Facility<br>COMPANY REP: Tony Sanelli                                  | OBSERVER: <del>Jasen Dunlap</del> <span style="font-family: cursive;">GIBBY GRIECH</span><br>AFFILIATION: Air Hygiene<br>DATE: 9/1/2015 |
| SKY CONDITIONS: <span style="font-family: cursive;">Cloudy</span><br>PRECIPITATION: <span style="font-family: cursive;">NONE</span> | WIND DIRECTION: <span style="font-family: cursive;">NW</span><br>WIND SPEED: <span style="font-family: cursive;">8MP</span>             |
| INDUSTRY: Manufacturing                                                                                                             | PROCESS UNIT: <del>EC40-2S</del> <span style="font-family: cursive;">EC36-2S</span>                                                     |

SKETCH PROCESS UNIT: INDICATE OBSERVER POSITION RELATIVE TO SOURCE; INDICATE  
POTENTIAL EMISSION POINTS AND/OR ACTUAL EMISSION POINTS.



**OBSERVATIONS**

|   | CLOCK TIME | OBSERVATION PERIOD DURATION (MIN:SEC) | ACCUMULATION EMISSION TIME (MIN:SEC) | OBSERVATION LOCATION |
|---|------------|---------------------------------------|--------------------------------------|----------------------|
| ① | 17:20      | 20:00                                 | 00:00                                | SWEST                |
|   | 17:40      | BREAK 5:00                            | —                                    |                      |
| ② | 17:45      | 20:00                                 | 00:00                                |                      |
|   | 18:05      | BREAK 5:00                            | —                                    |                      |
| ③ | 18:10      | 20:00                                 | 00:00                                |                      |
|   | 18:30      |                                       |                                      |                      |
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METHOD 22 R4  
FUGITIVE OR SMOKE EMISSION  
INSPECTION FORM



**AIR HYGIENE**

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| COMPANY: Leed Fabrication Service Inc.<br>LOCATION: Loveland Facility<br>COMPANY REP: Tony Sanelli | OBSERVER: <del>Jason Dunlap</del> <span style="margin-left: 20px;">Coby Gmitch</span><br>AFFILIATION: Air Hygiene<br>DATE: 9/2/2015 |
| SKY CONDITIONS: Cloudy/BW6<br>PRECIPITATION: NONE                                                  | WIND DIRECTION: CALM <span style="margin-left: 20px;">NE</span><br>WIND SPEED: CALM <span style="margin-left: 20px;">4</span>       |
| INDUSTRY: Manufacturing                                                                            | PROCESS UNIT: <del>EC-28</del> <span style="margin-left: 20px;">EC-36-25</span>                                                     |

SKETCH PROCESS UNIT: INDICATE OBSERVER POSITION RELATIVE TO SOURCE; INDICATE  
POTENTIAL EMISSION POINTS AND/OR ACTUAL EMISSION POINTS.



**OBSERVATIONS**

|   | CLOCK TIME | OBSERVATION PERIOD DURATION (MIN:SEC) | ACCUMULATION EMISSION TIME (MIN:SEC) | OBSERVATION LOCATION |
|---|------------|---------------------------------------|--------------------------------------|----------------------|
| ① | 13:25      |                                       |                                      |                      |
|   | 13:45      | 20:00                                 | 00:00                                | S WEST               |
|   |            | BREAK 5:00                            | —                                    | ↓                    |
| ② | 13:50      |                                       |                                      |                      |
|   | 14:10      | 20:00                                 | 00:00                                |                      |
|   |            | BREAK 5:00                            | —                                    |                      |
| ③ | 14:15      |                                       |                                      |                      |
|   | 14:35      | 20:00                                 | 00:00                                |                      |
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Wednesday, September 2, 2015 13:35:34

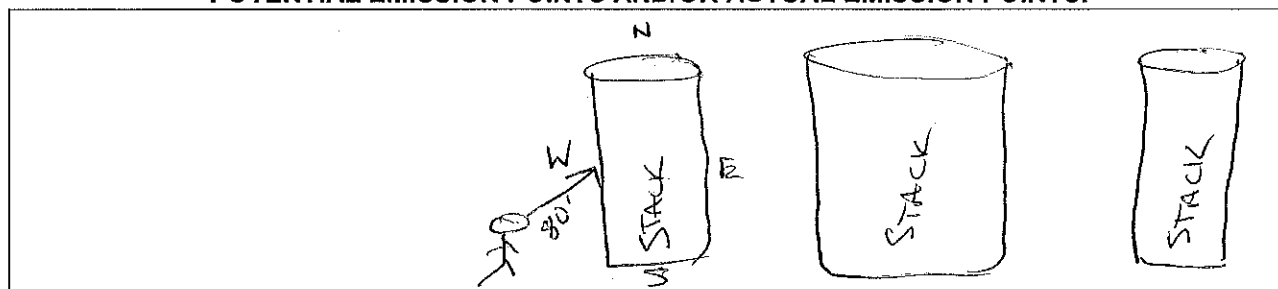
METHOD 22 R5  
FUGITIVE OR SMOKE EMISSION  
INSPECTION FORM



**AIR HYGIENE**

|                                                                                                                         |                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>COMPANY:</b> Leed Fabrication Service Inc.<br><b>LOCATION:</b> Loveland Facility<br><b>COMPANY REP:</b> Tony Sanelli | <b>OBSERVER:</b> Jason Dunlap <span style="margin-left: 20px;">GIBBY GRIEDER</span><br><b>AFFILIATION:</b> Air Hygiene<br><b>DATE:</b> 9/2/2015 |
| <b>SKY CONDITIONS:</b> Cloudy/Blue<br><b>PRECIPITATION:</b> NONE                                                        | <b>WIND DIRECTION:</b> CALM N<br><b>WIND SPEED:</b> CALM 7                                                                                      |
| <b>INDUSTRY:</b> Manufacturing                                                                                          | <b>PROCESS UNIT:</b> <del>EC40-28</del> EC36-25                                                                                                 |

**SKETCH PROCESS UNIT: INDICATE OBSERVER POSITION RELATIVE TO SOURCE; INDICATE POTENTIAL EMISSION POINTS AND/OR ACTUAL EMISSION POINTS.**



**OBSERVATIONS**

| CLOCK TIME | OBSERVATION PERIOD DURATION (MIN:SEC) | ACCUMULATION EMISSION TIME (MIN:SEC) | OBSERVATION LOCATION |
|------------|---------------------------------------|--------------------------------------|----------------------|
| ① 14:48    | 20:00                                 | 00:00                                | SWEET                |
| 15:08      | BREAK 5:00                            | —                                    |                      |
| ② 15:13    | 20:00                                 | 00:00                                |                      |
| 15:33      | BREAK 5:00                            | —                                    |                      |
| ③ 15:38    | 20:00                                 | 00:00                                |                      |
| 15:58      |                                       |                                      |                      |
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Wednesday, September 2, 2015 14:58:34

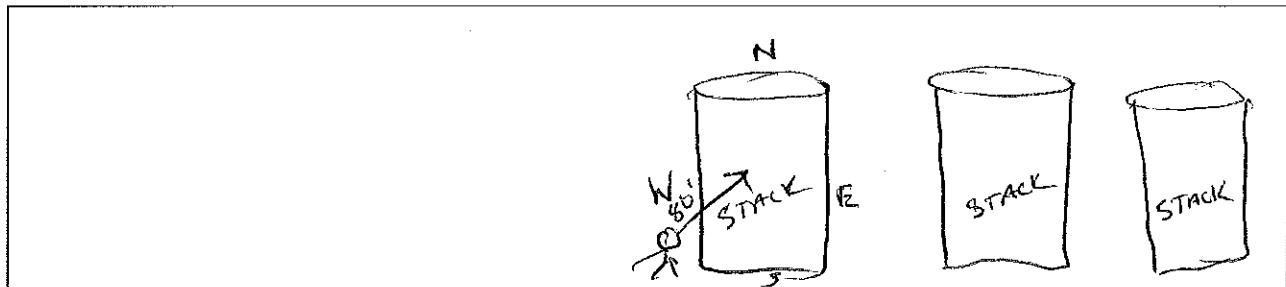
METHOD 22  
FUGITIVE OR SMOKE EMISSION  
INSPECTION FORM



**AIR HYGIENE**

|                                                                                                                         |                                                                                           |
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| <b>COMPANY:</b> Leed Fabrication Service Inc.<br><b>LOCATION:</b> Loveland Facility<br><b>COMPANY REP:</b> Tony Sanelli | <b>OBSERVER:</b> Jason Dunlap<br><b>AFFILIATION:</b> Air Hygiene<br><b>DATE:</b> 9/2/2015 |
| <b>SKY CONDITIONS:</b> Cloudy / Blue<br><b>PRECIPITATION:</b> NONE                                                      | <b>WIND DIRECTION:</b> CALM NNE<br><b>WIND SPEED:</b> CALM 4                              |
| <b>INDUSTRY:</b> Manufacturing                                                                                          | <b>PROCESS UNIT:</b> <del>EC48-2S</del> EC36-2S                                           |

**SKETCH PROCESS UNIT: INDICATE OBSERVER POSITION RELATIVE TO SOURCE; INDICATE POTENTIAL EMISSION POINTS AND/OR ACTUAL EMISSION POINTS.**



**OBSERVATIONS**

| CLOCK TIME | OBSERVATION PERIOD DURATION (MIN:SEC) | ACCUMULATION EMISSION TIME (MIN:SEC) | OBSERVATION LOCATION |
|------------|---------------------------------------|--------------------------------------|----------------------|
| 16:26      | 20:00                                 | 00:00                                | SWEST                |
| 16:46      | BREAK 5:00                            | —                                    | ↓                    |
| 16:51      | 20:00                                 | 00:00                                |                      |
| 17:11      | BREAK 5:00                            | —                                    |                      |
| 17:16      | 20:00                                 | 00:00                                |                      |
| 17:36      |                                       |                                      |                      |
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Wednesday, September 2, 2015 16:36:32



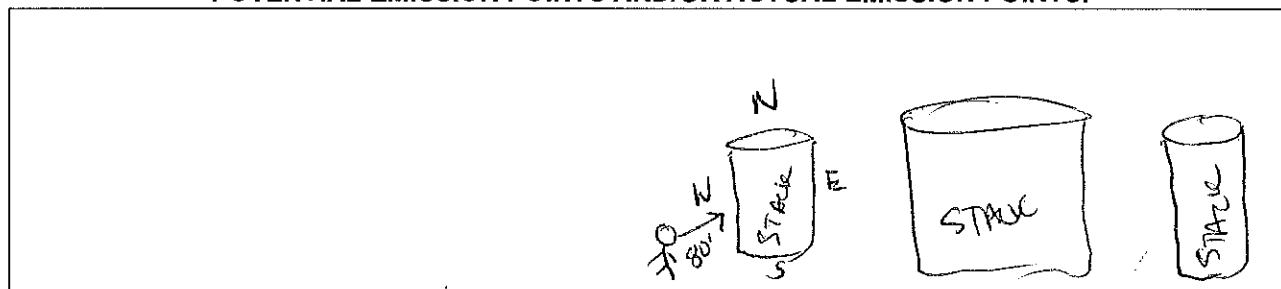
METHOD 22 R7  
FUGITIVE OR SMOKE EMISSION  
INSPECTION FORM



**AIR HYGIENE**

|                                                                                                    |                                                                                                                                      |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| COMPANY: Leed Fabrication Service Inc.<br>LOCATION: Loveland Facility<br>COMPANY REP: Tony Sanelli | OBSERVER: <del>Jason Dunlap</del> <span style="margin-left: 20px;">Colby Gniech</span><br>AFFILIATION: Air Hygiene<br>DATE: 9/2/2015 |
| SKY CONDITIONS: CLEAR/BLUE<br>PRECIPITATION: NONE                                                  | WIND DIRECTION: South<br>WIND SPEED: 3MPH                                                                                            |
| INDUSTRY: Manufacturing                                                                            | PROCESS UNIT: <del>EC48-2S</del> EC36-2S                                                                                             |

SKETCH PROCESS UNIT: INDICATE OBSERVER POSITION RELATIVE TO SOURCE; INDICATE  
POTENTIAL EMISSION POINTS AND/OR ACTUAL EMISSION POINTS.



**OBSERVATIONS**

| CLOCK TIME | OBSERVATION PERIOD DURATION (MIN:SEC) | ACCUMULATION EMISSION TIME (MIN:SEC) | OBSERVATION LOCATION |
|------------|---------------------------------------|--------------------------------------|----------------------|
| 8:28       | 20:00                                 | 00:00                                | SWEST                |
| 8:48       | BREAK 5:00                            | —                                    |                      |
| 8:53       | 20:00                                 | 00:00                                |                      |
| 9:13       | BREAK 5:00                            | —                                    |                      |
| 9:18       | 20:00                                 | 00:00                                |                      |
| 9:38       |                                       |                                      |                      |
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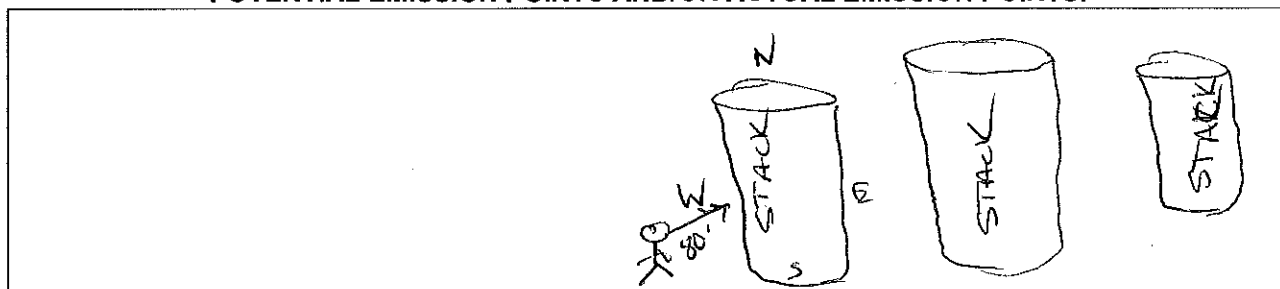
METHOD 22 R8  
FUGITIVE OR SMOKE EMISSION  
INSPECTION FORM



**AIR HYGIENE**

|                                                                                                    |                                                                                                    |
|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| COMPANY: Leed Fabrication Service Inc.<br>LOCATION: Loveland Facility<br>COMPANY REP: Tony Sanelli | OBSERVER: <del>Jason Dunlap</del> <u>Curby Gniel</u><br>AFFILIATION: Air Hygiene<br>DATE: 9/2/2015 |
| SKY CONDITIONS: <u>Clear / Blue</u><br>PRECIPITATION: <u>NONE</u>                                  | WIND DIRECTION: <u>South</u><br>WIND SPEED: <u>4 mph</u>                                           |
| INDUSTRY: Manufacturing                                                                            | PROCESS UNIT: <del>EC42-2S</del> <u>EC36-2S</u>                                                    |

SKETCH PROCESS UNIT: INDICATE OBSERVER POSITION RELATIVE TO SOURCE; INDICATE  
POTENTIAL EMISSION POINTS AND/OR ACTUAL EMISSION POINTS.



**OBSERVATIONS**

|   | CLOCK TIME | OBSERVATION PERIOD DURATION (MIN:SEC) | ACCUMULATION EMISSION TIME (MIN:SEC) | OBSERVATION LOCATION |
|---|------------|---------------------------------------|--------------------------------------|----------------------|
| ① | 9:50       | 20:00                                 | 00:00                                | SWEST                |
|   | 10:10      | BREAK 5:00                            | —                                    |                      |
| ② | 10:15      | 20:00                                 | 00:00                                |                      |
|   | 10:35      | BREAK 5:00                            | —                                    |                      |
| ③ | 10:40      | 20:00                                 | 00:00                                |                      |
|   | 11:00      |                                       |                                      |                      |
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Wednesday, September 2, 2015 10:00:23



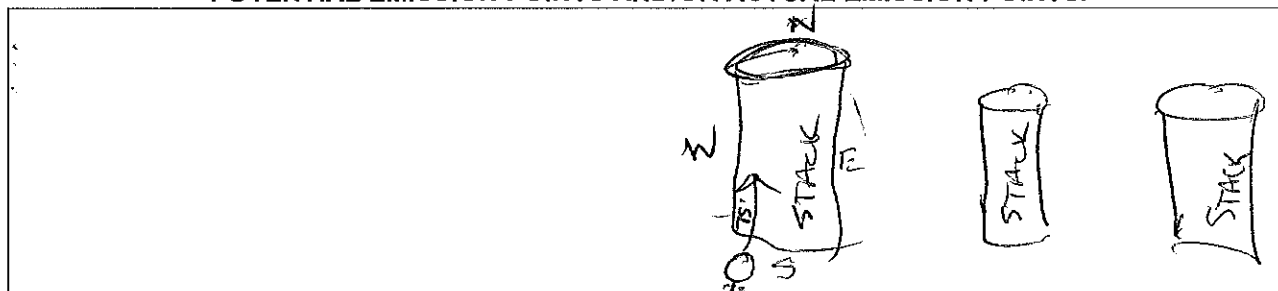
METHOD 22 R9  
FUGITIVE OR SMOKE EMISSION  
INSPECTION FORM



**AIR HYGIENE**

|                                                                                                                         |                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>COMPANY:</b> Leed Fabrication Service Inc.<br><b>LOCATION:</b> Loveland Facility<br><b>COMPANY REP:</b> Tony Sanelli | <b>OBSERVER:</b> <del>Jason Dunlap</del> COLBY GRIER<br><b>AFFILIATION:</b> Air Hygiene<br><b>DATE:</b> 9/2/2015 |
| <b>SKY CONDITIONS:</b> CLEAR/BLUE<br><b>PRECIPITATION:</b> NONE                                                         | <b>WIND DIRECTION:</b> South<br><b>WIND SPEED:</b> 2 MPH                                                         |
| <b>INDUSTRY:</b> Manufacturing                                                                                          | <b>PROCESS UNIT:</b> EC48-2S                                                                                     |

**SKETCH PROCESS UNIT: INDICATE OBSERVER POSITION RELATIVE TO SOURCE; INDICATE POTENTIAL EMISSION POINTS AND/OR ACTUAL EMISSION POINTS.**



**OBSERVATIONS**

|   | CLOCK TIME | OBSERVATION PERIOD DURATION (MIN:SEC) | ACCUMULATION EMISSION TIME (MIN:SEC) | OBSERVATION LOCATION |
|---|------------|---------------------------------------|--------------------------------------|----------------------|
| ① | 11:10      | 20:00                                 | 00:00                                | S<br>↓               |
|   | 11:30      | BREAK 5:00                            | —                                    |                      |
| ② | 11:35      | 20:00                                 | 00:00                                |                      |
|   | 11:55      | BREAK 5:00                            | —                                    |                      |
| ③ | 12:00      | 20:00                                 | 00:00                                |                      |
|   | 12:20      |                                       |                                      |                      |
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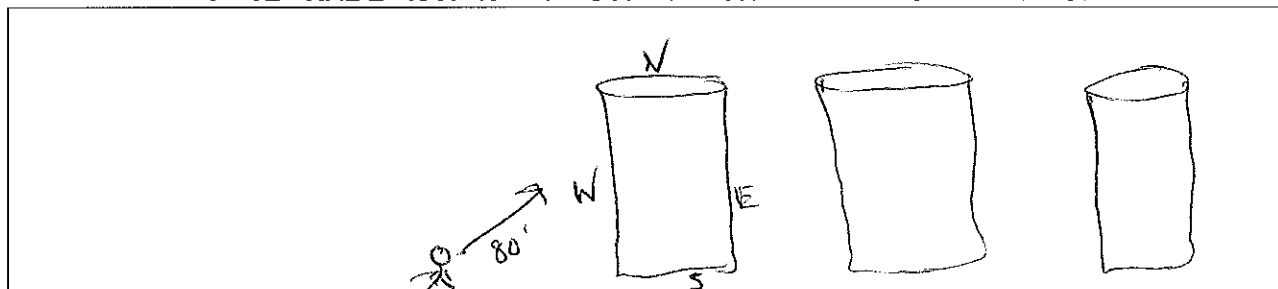
METHOD 22 R10  
FUGITIVE OR SMOKE EMISSION  
INSPECTION FORM



**AIR HYGIENE**

|                                                                                                                         |                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| <b>COMPANY:</b> Leed Fabrication Service Inc.<br><b>LOCATION:</b> Loveland Facility<br><b>COMPANY REP:</b> Tony Sanelli | <b>OBSERVER:</b> Jason Dunlap Coiby Gniel<br><b>AFFILIATION:</b> Air Hygiene<br><b>DATE:</b> 9/3/2015 |
| <b>SKY CONDITIONS:</b> Cloudy<br><b>PRECIPITATION:</b> NONE                                                             | <b>WIND DIRECTION:</b> CALM NE<br><b>WIND SPEED:</b> CALM 10                                          |
| <b>INDUSTRY:</b> Manufacturing                                                                                          | <b>PROCESS UNIT:</b> <del>EC10-28</del> EC36-28                                                       |

**SKETCH PROCESS UNIT: INDICATE OBSERVER POSITION RELATIVE TO SOURCE; INDICATE POTENTIAL EMISSION POINTS AND/OR ACTUAL EMISSION POINTS.**



**OBSERVATIONS**

|   | CLOCK TIME | OBSERVATION PERIOD DURATION (MIN:SEC) | ACCUMULATION EMISSION TIME (MIN:SEC) | OBSERVATION LOCATION |
|---|------------|---------------------------------------|--------------------------------------|----------------------|
| ① | 8:19       | 20:00                                 | 00:00                                | SOUTH                |
|   | 8:39       | BREAK 5:00                            | —                                    |                      |
| ② | 8:44       | 20:00                                 | 00:00                                |                      |
|   | 9:04       | BREAK 5:00                            | —                                    |                      |
| ③ | 9:09       | 20:00                                 | 00:00                                |                      |
|   | 9:29       |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |

SIGNATURE

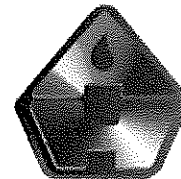




Thursday, September 3, 2015 08:29:49



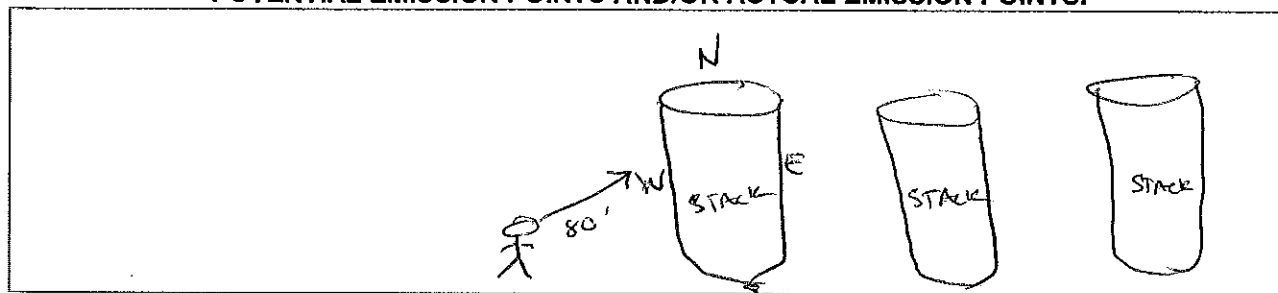
METHOD 22 *R11*  
FUGITIVE OR SMOKE EMISSION  
INSPECTION FORM



**AIR HYGIENE**

|                                                                                                                         |                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| <b>COMPANY:</b> Leed Fabrication Service Inc.<br><b>LOCATION:</b> Loveland Facility<br><b>COMPANY REP:</b> Tony Sanelli | <b>OBSERVER:</b> Colby Gniech<br><b>AFFILIATION:</b> Air Hygiene<br><b>DATE:</b> 9/3/2015 |
| <b>SKY CONDITIONS:</b> Cloudy/Grey<br><b>PRECIPITATION:</b> NONE                                                        | <b>WIND DIRECTION:</b> N<br><b>WIND SPEED:</b> 2 mph                                      |
| <b>INDUSTRY:</b> Manufacturing                                                                                          | <b>PROCESS UNIT:</b> <del>EC-48-23</del> EC 36-25                                         |

**SKETCH PROCESS UNIT: INDICATE OBSERVER POSITION RELATIVE TO SOURCE; INDICATE POTENTIAL EMISSION POINTS AND/OR ACTUAL EMISSION POINTS.**



**OBSERVATIONS**

| CLOCK<br>TIME | OBSERVATION<br>PERIOD DURATION<br>(MIN:SEC) | ACCUMULATION<br>EMISSION TIME<br>(MIN:SEC) | OBSERVATION<br>LOCATION |
|---------------|---------------------------------------------|--------------------------------------------|-------------------------|
| 9:41          | 20:00                                       | 00:00                                      | S                       |
| 10:01         | BREAK 5:00                                  | —                                          |                         |
| 10:06         | 20:00                                       | 00:00                                      |                         |
| 10:26         | BREAK 5:00                                  | —                                          |                         |
| 10:31         | 20:00                                       | 00:00                                      |                         |
| 10:51         |                                             |                                            |                         |
|               |                                             |                                            |                         |
|               |                                             |                                            |                         |
|               |                                             |                                            |                         |
|               |                                             |                                            |                         |
|               |                                             |                                            |                         |
|               |                                             |                                            |                         |

SIGNATURE



Thursday, September 3, 2015 09:51:18

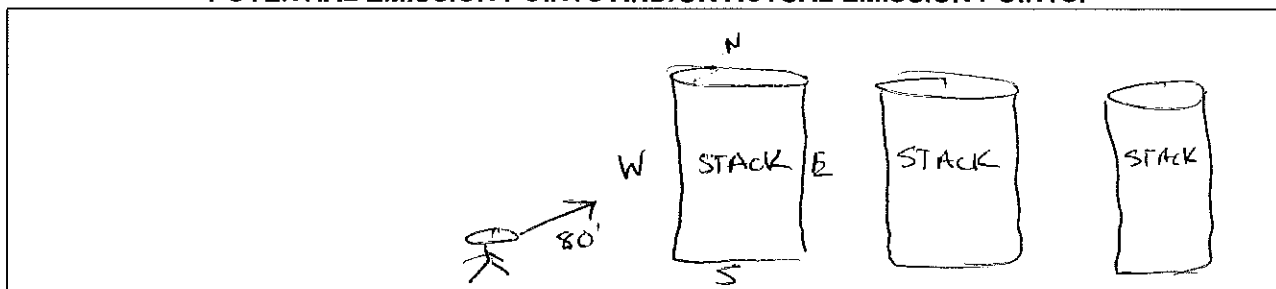
METHOD 22 R12  
FUGITIVE OR SMOKE EMISSION  
INSPECTION FORM



**AIR HYGIENE**

|                                                                                                                         |                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>COMPANY:</b> Leed Fabrication Service Inc.<br><b>LOCATION:</b> Loveland Facility<br><b>COMPANY REP:</b> Tony Sanelli | <b>OBSERVER:</b> Jason Dunlap <span style="float: right;">COBY GINIECH</span><br><b>AFFILIATION:</b> Air Hygiene<br><b>DATE:</b> 9/3/2015 |
| <b>SKY CONDITIONS:</b> Cloudy/Grey<br><b>PRECIPITATION:</b> NONE                                                        | <b>WIND DIRECTION:</b> S<br><b>WIND SPEED:</b> 2 MPH                                                                                      |
| <b>INDUSTRY:</b> Manufacturing                                                                                          | <b>PROCESS UNIT:</b> <del>EC48-25</del> EC36-25                                                                                           |

**SKETCH PROCESS UNIT: INDICATE OBSERVER POSITION RELATIVE TO SOURCE; INDICATE POTENTIAL EMISSION POINTS AND/OR ACTUAL EMISSION POINTS.**



**OBSERVATIONS**

|   | CLOCK TIME | OBSERVATION PERIOD DURATION (MIN:SEC) | ACCUMULATION EMISSION TIME (MIN:SEC) | OBSERVATION LOCATION |
|---|------------|---------------------------------------|--------------------------------------|----------------------|
| ① | 11:02      | 20:00                                 | 00:00                                | S                    |
|   | 11:22      | BREAK 5:00                            | —                                    | ↓                    |
| ② | 11:27      | 20:00                                 | 00:00                                |                      |
|   | 11:47      | BREAK 5:00                            | —                                    |                      |
| ③ | 11:52      | 20:00                                 | 00:00                                | ↓                    |
|   | 12:12      |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |
|   |            |                                       |                                      |                      |

SIGNATURE



Thursday, September 3, 2015 11:33:08

**APPENDIX C**

**CALIBRATION GAS CERTIFICATIONS**



Air Liquide America  
Specialty Gases LLC



# RATA CLASS

## Dual-Analyzed Calibration Standard

11426 FAIRMONT PKWY, LA PORTE, TX 77571

Phone: 800-248-1427

Fax: 281-474-8419

### CERTIFICATE OF ACCURACY: Interference Free Multi-Component EPA Protocol Gas

Assay Laboratory - PGVP Vendor ID: A32012

P.O. No.:

AIR LIQUIDE AMERICA SPECIALTY GASES LLC  
11426 FAIRMONT PKWY  
LA PORTE, TX 77571

Document #: 47579022-001

Customer  
AIR HYGIENE

MIKE SCOTT  
1600 WEST TACOMA ST  
BROKEN ARROW OK 74012  
US

#### ANALYTICAL INFORMATION Gas Type : NC

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: CC62432  
Cylinder Pressure\*\*\*: 2000 PSIG

Certification Date: 25Sep2012

Exp. Date: 26Sep2015  
Batch No: LAP0071800

| COMPONENT                | CERTIFIED CONCENTRATION (Moles) |         | ACCURACY** | TRACEABILITY         |
|--------------------------|---------------------------------|---------|------------|----------------------|
| NITRIC OXIDE             | 18.0                            | PPM     | +/- 1%     | Direct NIST and VSL  |
| CARBON MONOXIDE          | 18.0                            | PPM     | +/- 1%     |                      |
| NITROGEN - OXYGEN FREE   |                                 | BALANCE |            |                      |
| TOTAL OXIDES OF NITROGEN | 18.2                            | PPM     |            | Reference Value Only |

\*\*\* Do not use when cylinder pressure is below 150 psig.

\*\* Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

#### REFERENCE STANDARD

| TYPE/SRM NO. | EXPIRATION DATE | CYLINDER NUMBER | CONCENTRATION | COMPONENT       |
|--------------|-----------------|-----------------|---------------|-----------------|
| NTRM 2628    | 05Jan2016       | KAL004076       | 10.11 PPM     | NITRIC OXIDE    |
| NTRM 2635    | 01Jun2016       | AAI073320       | 25.54 PPM     | CARBON MONOXIDE |

#### INSTRUMENTATION

| INSTRUMENT/MODEL/SERIAL#     | DATE LAST CALIBRATED | ANALYTICAL PRINCIPLE |
|------------------------------|----------------------|----------------------|
| NOX ANALYZER/400-CLD/7M07001 | 27Aug2012            | CHEMI                |
| FTIR//000929060              | 31Aug2012            | FTIR                 |

#### ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

##### First Triad Analysis

##### Second Triad Analysis

##### Calibration Curve

##### NITRIC OXIDE

Date: 19Sep2012 Response Unit: VOLTS  
Z1=0.00000 R1=1.00600 T1=1.78700  
R2=1.00600 Z2=0.00000 T2=1.78800  
Z3=0.00000 T3=1.78850 R3=1.00700  
Avg. Concentration: 17.98 PPM

Date: 26Sep2012 Response Unit: VOLTS  
Z1=0.00000 R1=0.99900 T1=1.77700  
R2=1.00010 Z2=0.00000 T2=1.77400  
Z3=0.00000 T3=1.77100 R3=0.99440  
Avg. Concentration: 17.99 PPM

Concentration = A + Bx + Cx<sup>2</sup> + Dx<sup>3</sup> + Ex<sup>4</sup>  
r = 0.9999978  
Constants: A = -0.03151319  
B = 10.0474599 C =  
D = E =

##### CARBON MONOXIDE

Date: 18Sep2012 Response Unit: PPM  
Z1=-0.05045 R1=25.51696 T1=17.88547  
R2=25.58403 Z2=-0.01883 T2=17.94540  
Z3=0.01742 T3=17.99860 R3=25.62801  
Avg. Concentration: 17.92 PPM

Date: 25Sep2012 Response Unit: PPM  
Z1=-0.01312 R1=25.59315 T1=18.01561  
R2=25.60461 Z2=-0.00675 T2=18.02020  
Z3=0.00799 T3=18.08122 R3=25.62857  
Avg. Concentration: 17.99 PPM

Concentration = A + Bx + Cx<sup>2</sup> + Dx<sup>3</sup> + Ex<sup>4</sup>  
r = 9.99999E-1  
Constants: A = 0.00000E+0  
B = 9.56905E-1 C = 7.01000E-4  
D = 1.00000E-6 E = 0.00000E+0

Special Notes:

AH073 LIST ITEM AH073 ON CERTS ANG TAGS CGA 660; DEW PT. 40 DEG.F.

APPROVED BY:

DAVID KELLY

## EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

Cylinder Number:  
Product ID Number:  
Cylinder Pressure:  
COA #  
Customer PO. NO.:  
Customer:

EB0055500  
124737  
1900 PSIG  
EB0055500.20150617-0

Certification Date:  
Expiration Date:  
MFG Facility:  
Lot Number:  
Tracking Number:  
Previous Certification Dates:

07/20/2015  
07/19/2018  
RBTGS-Shreveport-LA  
EB0055500.20150617  
074328703

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G1.

Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

### Certified Concentration(s)

| Component                | Concentration | Uncertainty | Analytical Principle | Assayed On                         |
|--------------------------|---------------|-------------|----------------------|------------------------------------|
| Carbon Monoxide          | 9.48 PPM      | ±0.03 PPM   | FTIR                 | 06/22/2015                         |
| Nitric Oxide             | 8.643 PPM     | ±0.007 PPM  | Chemiluminescence    | 06/29/2015, 07/13/2015, 07/20/2015 |
| Total Oxides of Nitrogen | 8.712 PPM     |             |                      |                                    |
| Nitrogen                 | Balance       |             |                      |                                    |

Analytical Measurement Data Available Online.

### Reference Standard(s)

| Serial Number | Lot                 | Expiration | Type | Balance | Component | Concentration | Uncertainty(%) | NIST Reference |
|---------------|---------------------|------------|------|---------|-----------|---------------|----------------|----------------|
| EB0055439     | EB0055439.20140403g | 07/17/2017 | GMIS | N2      | NO        | 31.53 PPM     | 1.071          | 121001         |
| EB0055459     | EB0055459.20140403g | 06/16/2017 | GMIS | N2      | NO        | 14.79 PPM     | 1.083          | 121001         |
| EB0013666     | GC1102081256        | 07/27/2019 | GMIS | N2      | CO        | 11.8 PPM      | 1.038          | 091002         |

### Analytical Instrumentation

| Component | Analytical Principle | Make   | Model               | Serial        | MPC Date   |
|-----------|----------------------|--------|---------------------|---------------|------------|
| CO        | FTIR                 | MKS    | MKS 2031DJG2EKVS13T | 017146467     | 05/27/2015 |
| NO        | Chemiluminescence    | Thermo | T42C                | 42C-68400-360 | 06/12/2015 |
| NO        | Chemiluminescence    | Thermo | T42C                | 42C-68400-360 | 07/13/2015 |



Assay Laboratory: Red Ball TGS  
555 Craig Kennedy Way  
Shreveport, LA 71107  
800-551-8150

## EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

|                    |                      |                               |                     |
|--------------------|----------------------|-------------------------------|---------------------|
| Cylinder Number:   | EB0005166            | Certification Date:           | 03/10/2015          |
| Product ID Number: | 125612               | Expiration Date:              | 03/08/2023          |
| Cylinder Pressure: | 1900 PSIG            | MFG Facility:                 | RBTGS-Shreveport-LA |
| COA #              | EB0005166.20150305-0 | Lot Number:                   | EB0005166.20150305  |
| Customer PO. NO.:  |                      | Tracking Number:              | 5947982             |
| Customer:          |                      | Previous Certification Dates: |                     |

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G1.

Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

### Certified Concentration(s)

| Component | Concentration | Uncertainty | Analytical Principle |
|-----------|---------------|-------------|----------------------|
| Propane   | 7.97 PPM      | ±0.03 PPM   | FTIR                 |
| Air       | Balance       |             |                      |

Analytical Measurement Data Available Online.

### Reference Standard(s)

| Lot     | Expiration | Type | Balance | Component | Concentration | Uncertainty(%) | NIST Reference |
|---------|------------|------|---------|-----------|---------------|----------------|----------------|
| 84-J-18 | 09/01/2016 | SRM  | AIR     | C3H8      | 9.883 PPM     | 0.516          | 1666b          |

### Analytical Instrumentation

| Component | Analytical Principle | Make | Model               | Serial    | MPC Date             |
|-----------|----------------------|------|---------------------|-----------|----------------------|
| C3H8      | FTIR                 | MKS  | MKS 2031DJG2EKVS13T | 017146467 | 3/10/2015 1:10:30 PM |

Red Ball Technical Gas Service  
PGVP Vendor ID # G12015  
Information and Ordering  
800-551-8150  
Fax (318-425-6309)

Fred Holt  
Analyst





Air Liquide America  
Specialty Gases LLC



# RATA CLASS

Guaranteed +/- 1% Accuracy

1290 COMBERMERE STREET, TROY, MI 48083

Phone: 248-589-2950

Fax: 248-589-2134

## CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory - PGVP Vendor ID: A22014

AIR LIQUIDE AMERICA SPECIALTY GASES LLC P.O. No.: MAX  
1290 COMBERMERE STREET Document #: 54740879-001  
TROY, MI 48083

### Customer

AIR HYGIENE  
MAX CORBIN  
1600 W TACOMA  
BROKEN ARROW OK 74012  
US

### ANALYTICAL INFORMATION Gas Type : PPN,BALA

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1. EPA/600/R-12/531; May 2012. Do not use this standard if pressure is less than 100 psig.

Cylinder Number: ALM010279 Certification Date: 21Apr2014 Exp. Date: 22Apr2022  
Cylinder Pressure: 1950 PSIG Batch No: TRO0107817

| COMPONENT | CERTIFIED CONCENTRATION (Moles) | ACCURACY (ABSOLUTE / RELATIVE) |
|-----------|---------------------------------|--------------------------------|
| PROPANE   | 5.01 PPM                        | 0.03 PPM / 0.7 %               |
| AIR       | BALANCE                         |                                |

### TRACEABILITY

#### REFERENCE STANDARD

| COMPONENT | CONCENTRATION | UNCERTAINTY | CYLINDER | TYPE/SRM SAMPLE | EXP. DATE |
|-----------|---------------|-------------|----------|-----------------|-----------|
| PROPANE   | 9.6000 PPM    | 0.0600 PPM  | K012629  | 9 PPM C3H       | 24Feb2016 |

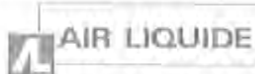
### ANALYTICAL METHOD

1st Analysis: 21Apr2014

| COMPONENT | INSTRUMENT               | ANALYTICAL/PRINCIPLE | CALIBRATED | CONCENTRATION |
|-----------|--------------------------|----------------------|------------|---------------|
| PROPANE   | HORIBA/FIA-220/G05000JAS | FLAME IONIZATION     | 17Apr2014  | 5.010 PPM     |

APPROVED BY:

ROBERT LESNIAK



Air Liquide America  
Specialty Gases LLC



# RATA CLASS

Guaranteed +/- 1% Accuracy

8832 DICE ROAD, SANTA FE SPRINGS, CA 90670-2516

Phone: 800-323-2212

Fax: 562-464-5262

## CERTIFICATE OF ACCURACY: EPA Protocol Gas

### Assay Laboratory - PGVP Vendor ID: A52014

AIR LIQUIDE AMERICA SPECIALTY GASES LLC P.O. No.: MAX  
8832 DICE ROAD Document # : 55842938-001  
SANTA FE SPRINGS, CA 90670-2516

### Customer

AIR HYGIENE  
MAX CORBIN  
1600 W TACOMA  
BROKEN ARROW OK 74012  
US

### ANALYTICAL INFORMATION Gas Type : PPN,BALA

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1. EPA/600/R-12/531; May 2012. Do not use this standard if pressure is less than 100 psig.

Cylinder Number: CC113372 Certification Date: 28Jul2014 Exp. Date: 29Jul2022  
Cylinder Pressure: 2000 PSIG Batch No: SBO0096462

| COMPONENT | CERTIFIED CONCENTRATION (Moles) | ACCURACY (ABSOLUTE / RELATIVE) |
|-----------|---------------------------------|--------------------------------|
| PROPANE   | 3.02 PPM                        | 0.04 PPM / 1.3 %               |
| AIR       | BALANCE                         |                                |

### TRACEABILITY

#### REFERENCE STANDARD

| COMPONENT | CONCENTRATION | UNCERTAINTY | CYLINDER  | TYPE/SRM SAMPLE  | EXP. DATE |
|-----------|---------------|-------------|-----------|------------------|-----------|
| PROPANE   | 2.9500 PPM    | 0.0300 PPM  | ALM023477 | NTRM 1665/112097 | 03Aug2017 |

### ANALYTICAL METHOD

1st Analysis: 28Jul2014

| COMPONENT | INSTRUMENT                   | ANALYTICAL/PRINCIPLE | CALIBRATED | CONCENTRATION |
|-----------|------------------------------|----------------------|------------|---------------|
| PROPANE   | GC-TCD/HP 5890 II/3140A38374 | GC                   | 25Jul2014  | 3.019 PPM     |

APPROVED BY: \_\_\_\_\_

JMU

## EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

Cylinder Number:  
Product ID Number:  
Cylinder Pressure:  
COA #  
Customer PO. NO.:  
Customer:

EB0060754  
124605  
1900 PSIG  
EB0060754.20141114-0

Certification Date:  
Expiration Date:  
MFG Facility:  
Lot Number:  
Tracking Number:  
Previous Certification Dates:

11/21/2014  
11/19/2022  
RBTGS-Shreveport-LA  
EB0060754.20141114  
082996536

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G1.

Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

### Certified Concentration(s)

| Component      | Concentration | Uncertainty | Analytical Principle |
|----------------|---------------|-------------|----------------------|
| Carbon Dioxide | 18.6 %        | ±0.10 %     | FTIR                 |
| Oxygen         | 20.86 %       | ±0.06 %     | MPA                  |
| Nitrogen       | Balance       |             |                      |

Analytical Measurement Data Available Online.

### Reference Standard(s)

| Lot                  | Expiration | Type | Balance | Component | Concentration | Uncertainty(%) | NIST Reference |
|----------------------|------------|------|---------|-----------|---------------|----------------|----------------|
| 80055414.20140228-1C | 10/07/2022 | GMIS | N2      | O2        | 23.8 %        | 0.505          | 071001         |
| SG-9916836           | 04/15/2016 | NTRM | N2      | CO2       | 19.98 %       | 0.0014         | 101001         |

### Analytical Instrumentation

| Component | Analytical Principle | Make   | Model               | Serial    | MPC Date               |
|-----------|----------------------|--------|---------------------|-----------|------------------------|
| O2        | MPA                  | Horiba | VA-3013             | H0000P11  | 11/10/2014 12:54:07 PM |
| CO2       | FTIR                 | MKS    | MKS 2031DJG2EKVS13T | 017146467 | 11/21/2014 10:11:30 AM |



Assay Laboratory: Red Ball TGS  
555 Craig Kennedy Way  
Shreveport, LA 71107  
800-551-8150

## EPA PROTOCOL GAS CERTIFICATE OF ANALYSIS

|                    |                      |                               |                     |
|--------------------|----------------------|-------------------------------|---------------------|
| Cylinder Number:   | EB0010811            | Certification Date:           | 07/13/2015          |
| Product ID Number: | 124606               | Expiration Date:              | 07/11/2023          |
| Cylinder Pressure: | 1900 PSIG            | MFG Facility:                 | RBTGS-Shreveport-LA |
| COA #              | EB0010811.20150708-0 | Lot Number:                   | EB0010811.20150708  |
| Customer PO. NO.:  |                      | Tracking Number:              | 013067166           |
| Customer:          |                      | Previous Certification Dates: |                     |

This calibration standard has been certified per the May 2012 EPA Traceability Protocol, Document EPA-600/R-12/531, using procedure G1.

Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

### Certified Concentration(s)

| Component      | Concentration | Uncertainty | Analytical Principle |
|----------------|---------------|-------------|----------------------|
| Carbon Dioxide | 9.09 %        | ±0.04 %     | FTIR                 |
| Oxygen         | 11.91 %       | ±0.02 %     | MPA                  |
| Nitrogen       | Balance       |             |                      |

Analytical Measurement Data Available Online.

### Reference Standard(s)

| Lot                   | Expiration | Type | Balance | Component | Concentration | Uncertainty(%) | NIST Reference |
|-----------------------|------------|------|---------|-----------|---------------|----------------|----------------|
| EB0055407.20140228Ga  | 10/07/2022 | GMIS | N2      | O2        | 19.92 %       | 0.508          | 071001         |
| EB0055414.20140228-1C | 10/07/2022 | GMIS | N2      | O2        | 23.8 %        | 0.505          | 071001         |
| GC1110110959          | 09/04/2021 | GMIS | N2      | CO2       | 21.55 %       | 0.594          | 3221755.02     |
| GC1304111020          | 09/04/2021 | GMIS | N2      | CO2       | 12.5 %        | 0.552          | 3221755.02     |

### Analytical Instrumentation

| Component | Analytical Principle | Make   | Model               | Serial    | MPC Date             |
|-----------|----------------------|--------|---------------------|-----------|----------------------|
| O2        | MPA                  | Horiba | VA-3013             | H0000P11  | 6/23/2015 8:34:06 AM |
| CO2       | FTIR                 | MKS    | MKS 2031DJG2EKVS13T | 017146467 | 7/9/2015 10:46:30 AM |

Red Ball Technical Gas Service  
PGVP Vendor ID # G12015  
Information and Ordering  
800-551-8150  
Fax (318-425-6309)



*LaMeka Dennis*

LaMeka Dennis  
Assistant Operations Manager

Version 02-B, Revised on 2015-05-27

## CERTIFICATE OF ANALYSIS (Zero Ambient Nitrogen)

Cylinder Number:  
Product ID Number:  
Cylinder Pressure:  
COA #  
Customer PO. NO.:  
Customer:

EB0070653  
121026  
1900 PSIG  
EB0070653.20150805-0

Certification Date:  
Expiration Date:  
MFG Facility:  
Lot Number:  
Tracking Number:  
Previous Certification Dates:

08/05/2015  
08/03/2023  
RBTGS-Shreveport-LA  
EB0070653.20150805  
084211280

This mixture is for laboratory use only, not for drug, household or other use.  
This mixture is certified in Mole % to be within  $\pm 2\%$  of the actual number reported with a confidence of 95%.  
This mixture was manufactured by scale; weights traceable to N.I.S.T. Certificate #622/266926-02.  
Do Not Use This Cylinder Below 100 psig (0.7 Megapascal).

Composing Material: Zero Ambient Nitrogen, Cert., Sz152

| Component                            | Specification | Concentration |
|--------------------------------------|---------------|---------------|
| Nitrogen                             | Balance       | Balance       |
| Oxygen as Impurity                   | <1.0 PPM      | <1.0 PPM      |
| Carbon Dioxide as Impurity           | <0.5 PPM      | <0.5 PPM      |
| Carbon Monoxide as Impurity          | <0.5 PPM      | <0.5 PPM      |
| Total Oxides of Nitrogen as Impurity | <0.1 PPM      | <0.1 PPM      |
| Sulfur Dioxide as Impurity           | <0.1 PPM      | <0.1 PPM      |
| Total Hydrocarbons as Impurity       | <0.1 PPM      | <0.1 PPM      |

## **APPENDIX D**

### **QUALITY ASSURANCE AND QUALITY CONTROL DATA**

## QA/QC PROGRAM

Air Hygiene ensures the quality and validity of its emission measurement and reporting procedures through a rigorous quality assurance (QA) program. The program is developed and administered by an internal QA team and encompasses five major areas:

1. QA reviews of reports, laboratory work, and field testing
2. Equipment calibration and maintenance
3. Chain-of-custody
4. Training
5. Knowledge of current test methods

Each of these areas is discussed individually below.

### QA Reviews

Air Hygiene's review procedure includes review of each source test report, along with laboratory and fieldwork, by the QA Team. The most important review is the one that takes place before a test program begins. The QA Team works closely with technical division personnel to prepare and review test protocols. Test protocol review includes selection of appropriate test procedures, evaluation of interferences or other restrictions that might preclude use of standard test procedures, and evaluation and/or development of alternate procedures.

### Equipment Calibration and Maintenance

The equipment used to conduct the emission measurements is maintained according to the manufacturer's instructions to ensure proper operation. In addition to the maintenance program, calibrations are carried out on each measurement device according to the schedule outlined by the Environmental Protection Agency. Quality control checks are also conducted in the field for each test program.

### Chain-of-Custody

Air Hygiene maintains full chain-of-custody documentation on all samples and data sheets. In addition to normal documentation of changes between field sample custodians, laboratory personnel, and field test personnel, Air Hygiene documents every individual who handles any test component in the field (e.g., probe wash, impinger loading and recovery, filter loading and recovery, etc.). Samples were stored in a locked area to which only Air Hygiene personnel have access. Field data sheets are secured at Air Hygiene's offices upon return from the field.

### Training

Personnel's training is essential to ensure quality testing. Air Hygiene has formal and informal training programs, which include:

1. Attendance at EPA-sponsored training courses
2. Enrollment in EPA correspondence courses
3. A requirement for all technicians to read and understand Air Hygiene's QA manual
4. In-house training and QA meetings on a regular basis
5. Maintenance of training records

### Knowledge of Current Test Methods

With the constant updating of standard test methods and the wide variety of emerging test procedures, it is essential that any qualified source tester keep abreast of new developments. Air Hygiene subscribes to services, which provide updates on EPA reference methods, rules, and regulations. Additionally, source test personnel regularly attend and present papers at testing and emission-related seminars and conferences. Air Hygiene personnel maintain membership in the Air and Waste Management Association and the American Industrial Hygiene Association.

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## COMBUSTION TESTING QUALITY ASSURANCE ACTIVITIES

A number of quality assurance activities were undertaken before, during, and after this testing project. This section of the report combined with the documentation in Appendix C describes each of those activities.

Each instrument's response was checked and adjusted in the field prior to the collection of data via multi-point calibration. The instrument's linearity was checked by adjusting its zero and span responses to zero nitrogen and an upscale calibration gas in the range of the expected concentrations. The instrument response was then challenged with other calibration gases of known concentration and accepted as being linear if the response of the other calibration gases agreed within plus or minus two percent of the range of predicted values.

After each test run, the analyzers were checked for zero and span drift. This allowed each test run to be bracketed by calibrations and documents the precision of the data just collected. The criterion for acceptable data is that the instrument drift is no more than three percent of the full-scale response. The quality assurance worksheets in the following pages summarize all multipoint calibration checks and zero to span checks performed during the tests. These worksheets (as prepared from the data records of Appendix A) show that no drifts in excess of three percent occurred in the zero to span checks following each test run.

The sampling systems were leak checked by demonstrating that a vacuum greater than 10 in Hg could be held for at least one minute with a decline of less than one inch of Hg. A leak test was conducted after the sample system was set up and before the system was dismantled. This test was conducted to ensure that ambient air had not diluted the sample. Any leakage detected prior to the tests would be repaired and another leak check conducted before testing commenced. No leaks were found during the pre or post-test leak checks.

The absence of leaks in the sampling system was also verified by a sampling system bias check. The sampling system's integrity was tested by comparing the responses of the analyzers to the calibration gases introduced via two paths. The first path was directly into the analyzer and the second path via the sample system at the sample probe. Any difference in the instrument responses by these two methods was attributed to sampling system bias or leakage. The criterion for acceptance is agreement within five percent of the span of the analyzer.

The control gases used to calibrate the instruments were analyzed and certified by the compressed gas vendors to plus or minus one percent accuracy for all gases. EPA Protocol No. 1 was used, where applicable to assign the concentration values traceable to the National Institute of Standards and Technology (NIST), Standard Reference Materials (SRM's). The gas calibration sheets as prepared by the vendor are contained in Appendix C.

Air Hygiene collected and reported the enclosed test data in accordance with the procedures and quality assurance activities described in this test report. Air Hygiene makes no warranty as to the suitability of the test methods. Air Hygiene also assumes no liability relating to the interpretation and use of the test data.

### INSTRUMENTAL ANALYSIS QUALITY ASSURANCE DATA

Date: September 1-3, 2015  
Company: Leed Fabrication Services Inc.  
Location: Loveland, Colorado  
Techs: MSL, TP, ZV

#### Sample System Leak Check

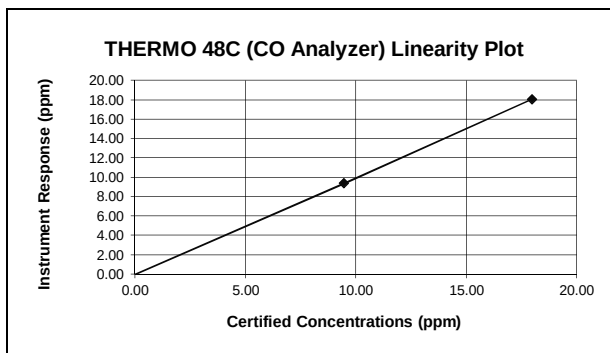
| Date                | Sample System | Leak Rate<br>(l/min) |
|---------------------|---------------|----------------------|
| September 1-3, 2015 | 1             | 0                    |



Calibration Date: September 1, 2015  
Client: Leed Fabrication Services Inc.

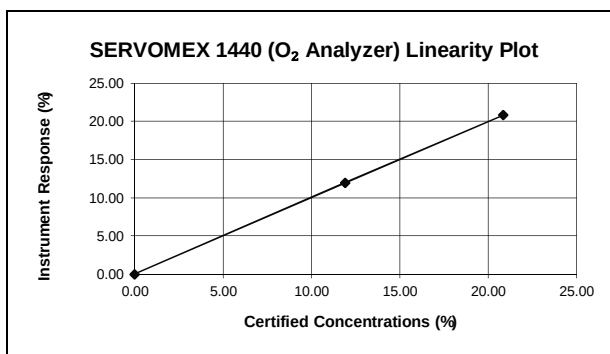
CO Span (ppm) = 18.00

| THERMO 48C (CO Analyzer)      |                           |                       |                      |                                                   |
|-------------------------------|---------------------------|-----------------------|----------------------|---------------------------------------------------|
| Certified Concentration (ppm) | Instrument Response (ppm) | Calibration Error (%) | Absolute Conc. (ppm) | Pass or Fail ( $\pm 2\%$ , $\leq 0.5\text{ppm}$ ) |
| 0.00                          | -0.03                     | -0.17                 | 0.03                 | YES (%)                                           |
| 9.48                          | 9.35                      | -0.72                 | 0.13                 | YES (%)                                           |
| 18.00                         | 18.06                     | 0.33                  | 0.06                 | YES (%)                                           |
| Linearity = 0.995             |                           |                       |                      |                                                   |



O<sub>2</sub> Span (%) = 20.86

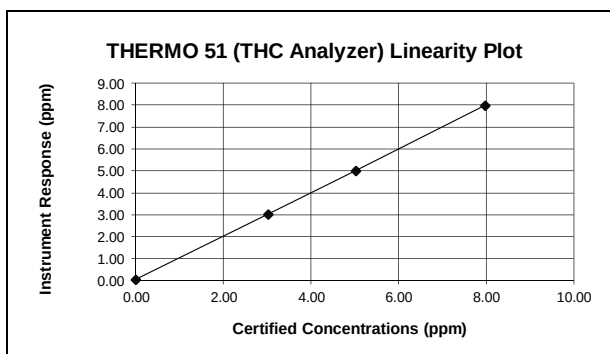
| SERVOMEX 1440 (O <sub>2</sub> Analyzer) |                         |                       |                    |                                           |
|-----------------------------------------|-------------------------|-----------------------|--------------------|-------------------------------------------|
| Certified Concentration (%)             | Instrument Response (%) | Calibration Error (%) | Absolute Conc. (%) | Pass or Fail ( $\pm 2\%$ , $\leq 0.5\%$ ) |
| 0.00                                    | 0.01                    | 0.05                  | 0.01               | YES (%)                                   |
| 11.91                                   | 11.94                   | 0.14                  | 0.03               | YES (%)                                   |
| 20.86                                   | 20.83                   | -0.14                 | 0.03               | YES (%)                                   |
| Linearity = 1.002                       |                         |                       |                    |                                           |



THC Range (ppm) = 10

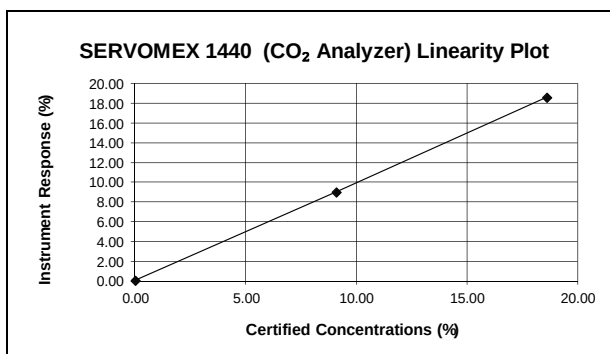
| THERMO 51 (THC Analyzer)      |                           |                       |                       |                                            |
|-------------------------------|---------------------------|-----------------------|-----------------------|--------------------------------------------|
| Certified Concentration (ppm) | Instrument Response (ppm) | Calibration Error (%) | Estimated Point (ppm) | Pass or Fail ( $\pm 2, 5\%$ ) <sup>1</sup> |
| 0.00                          | 0.06                      | 0.60                  | N/A                   | YES                                        |
| 3.02                          | 3.04                      | -0.95                 | 3.07                  | YES                                        |
| 5.02                          | 5.01                      | -1.02                 | 5.06                  | YES                                        |
| 7.98                          | 8.01                      | 0.30                  | N/A                   | YES                                        |
| Linearity = 0.997             |                           |                       |                       |                                            |

<sup>1</sup>zero/high based on 2% of span, low/mid based on 5% of concentration



CO<sub>2</sub> Span (%) = 18.60

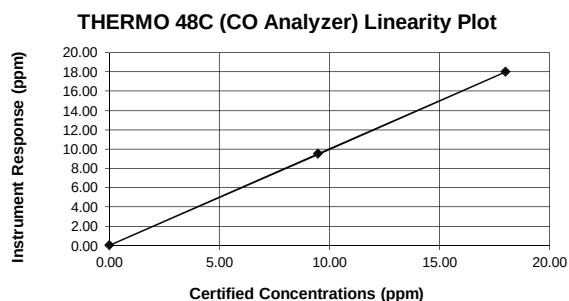
| SERVOMEX 1440 (CO <sub>2</sub> Analyzer) |                         |                       |                    |                                           |
|------------------------------------------|-------------------------|-----------------------|--------------------|-------------------------------------------|
| Certified Concentration (%)              | Instrument Response (%) | Calibration Error (%) | Absolute Conc. (%) | Pass or Fail ( $\pm 2\%$ , $\leq 0.5\%$ ) |
| 0.00                                     | 0.06                    | 0.32                  | 0.06               | YES (%)                                   |
| 9.09                                     | 9.04                    | -0.27                 | 0.05               | YES (%)                                   |
| 18.60                                    | 18.64                   | 0.22                  | 0.04               | YES (%)                                   |
| Linearity = 1.001                        |                         |                       |                    |                                           |



Calibration Date: September 2, 2015  
Client: Leed Fabrication Services Inc.

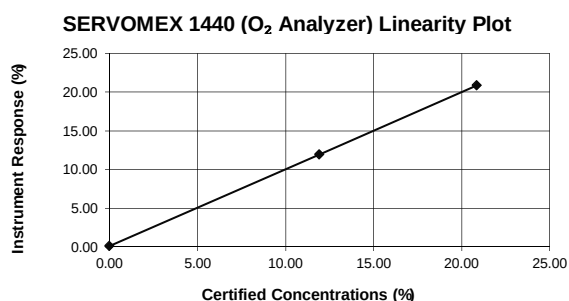
CO Span (ppm) = 18.00

| THERMO 48C (CO Analyzer)      |                           |                       |                      |                                                   |
|-------------------------------|---------------------------|-----------------------|----------------------|---------------------------------------------------|
| Certified Concentration (ppm) | Instrument Response (ppm) | Calibration Error (%) | Absolute Conc. (ppm) | Pass or Fail ( $\pm 2\%$ , $\leq 0.5\text{ppm}$ ) |
| 0.00                          | 0.02                      | 0.11                  | 0.02                 | YES (%)                                           |
| 9.48                          | 9.50                      | 0.11                  | 0.02                 | YES (%)                                           |
| 18.00                         | 18.00                     | 0.00                  | 0.00                 | YES (%)                                           |
| Linearity = 1.001             |                           |                       |                      |                                                   |



O2 Span (%) = 20.86

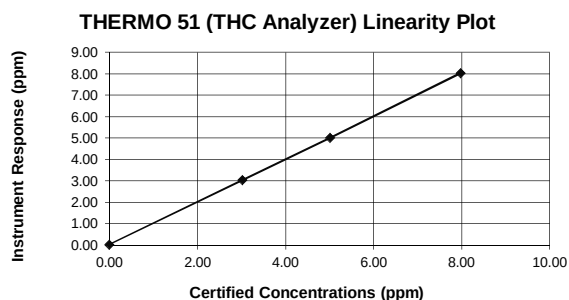
| SERVOMEX 1440 (O <sub>2</sub> Analyzer) |                         |                       |                    |                                           |
|-----------------------------------------|-------------------------|-----------------------|--------------------|-------------------------------------------|
| Certified Concentration (%)             | Instrument Response (%) | Calibration Error (%) | Absolute Conc. (%) | Pass or Fail ( $\pm 2\%$ , $\leq 0.5\%$ ) |
| 0.00                                    | 0.07                    | 0.34                  | 0.07               | YES (%)                                   |
| 11.91                                   | 11.88                   | -0.14                 | 0.03               | YES (%)                                   |
| 20.86                                   | 20.86                   | 0.00                  | 0.00               | YES (%)                                   |
| Linearity = 1.004                       |                         |                       |                    |                                           |



THC Range (ppm) = 10

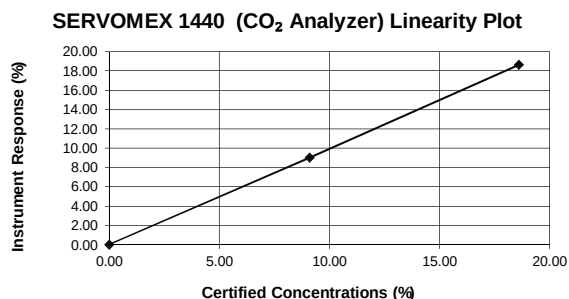
| THERMO 51 (THC Analyzer)      |                           |                       |                       |                                            |
|-------------------------------|---------------------------|-----------------------|-----------------------|--------------------------------------------|
| Certified Concentration (ppm) | Instrument Response (ppm) | Calibration Error (%) | Estimated Point (ppm) | Pass or Fail ( $\pm 2, 5\%$ ) <sup>1</sup> |
| 0.00                          | 0.03                      | 0.30                  | N/A                   | YES                                        |
| 3.02                          | 3.04                      | -0.58                 | 3.06                  | YES                                        |
| 5.01                          | 5.01                      | -0.85                 | 5.05                  | YES                                        |
| 7.97                          | 8.02                      | 0.50                  | N/A                   | YES                                        |
| Linearity = 0.993             |                           |                       |                       |                                            |

<sup>1</sup>zero/high based on 2% of span, low/mid based on 5% of concentration



CO2 Span (%) = 18.60

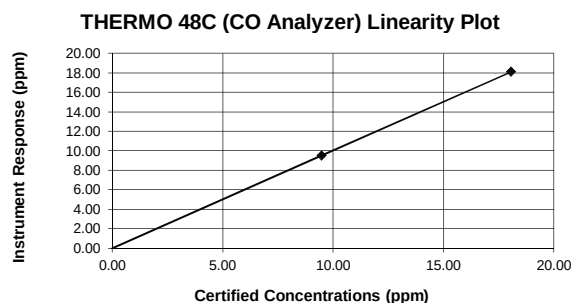
| SERVOMEX 1440 (CO <sub>2</sub> Analyzer) |                         |                       |                    |                                           |
|------------------------------------------|-------------------------|-----------------------|--------------------|-------------------------------------------|
| Certified Concentration (%)              | Instrument Response (%) | Calibration Error (%) | Absolute Conc. (%) | Pass or Fail ( $\pm 2\%$ , $\leq 0.5\%$ ) |
| 0.00                                     | 0.01                    | 0.05                  | 0.01               | YES (%)                                   |
| 9.09                                     | 9.02                    | -0.38                 | 0.07               | YES (%)                                   |
| 18.60                                    | 18.60                   | 0.00                  | 0.00               | YES (%)                                   |
| Linearity = 1.000                        |                         |                       |                    |                                           |



Calibration Date: September 3, 2015  
Client: Leed Fabrication Services Inc.

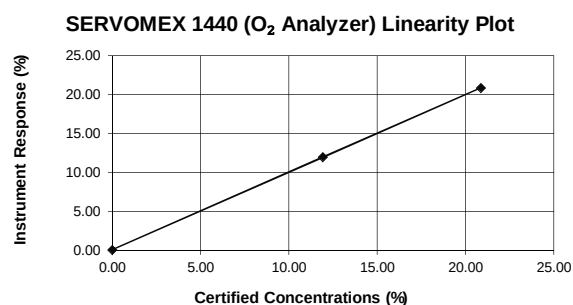
CO Span (ppm) = 18.06

| THERMO 48C (CO Analyzer)      |                           |                       |                      |                             |
|-------------------------------|---------------------------|-----------------------|----------------------|-----------------------------|
| Certified Concentration (ppm) | Instrument Response (ppm) | Calibration Error (%) | Absolute Conc. (ppm) | Pass or Fail (±2%, ≤0.5ppm) |
| 0.00                          | -0.04                     | -0.22                 | 0.04                 | YES (%)                     |
| 9.48                          | 9.49                      | 0.06                  | 0.01                 | YES (%)                     |
| 18.06                         | 18.08                     | 0.11                  | 0.02                 | YES (%)                     |
| Linearity = 0.997             |                           |                       |                      |                             |



O2 Span (%) = 20.86

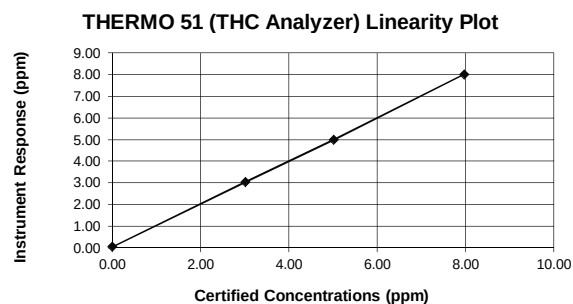
| SERVOMEX 1440 (O <sub>2</sub> Analyzer) |                         |                       |                    |                           |
|-----------------------------------------|-------------------------|-----------------------|--------------------|---------------------------|
| Certified Concentration (%)             | Instrument Response (%) | Calibration Error (%) | Absolute Conc. (%) | Pass or Fail (±2%, ≤0.5%) |
| 0.00                                    | 0.09                    | 0.43                  | 0.09               | YES (%)                   |
| 11.91                                   | 11.95                   | 0.19                  | 0.04               | YES (%)                   |
| 20.86                                   | 20.87                   | 0.05                  | 0.01               | YES (%)                   |
| Linearity = 1.004                       |                         |                       |                    |                           |



THC Range (ppm) = 10

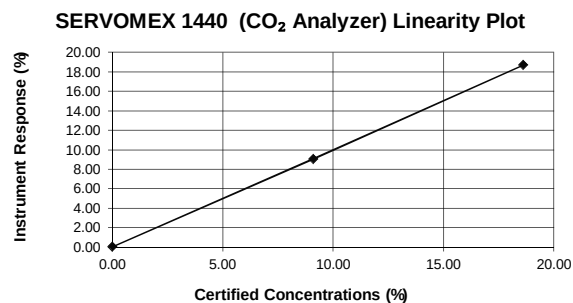
| THERMO 51 (THC Analyzer)      |                           |                       |                       |                                   |
|-------------------------------|---------------------------|-----------------------|-----------------------|-----------------------------------|
| Certified Concentration (ppm) | Instrument Response (ppm) | Calibration Error (%) | Estimated Point (ppm) | Pass or Fail (±2.5%) <sup>1</sup> |
| 0.00                          | 0.04                      | 0.40                  | N/A                   | YES                               |
| 3.02                          | 3.03                      | -0.99                 | 3.06                  | YES                               |
| 5.01                          | 4.99                      | -1.20                 | 5.05                  | YES                               |
| 7.97                          | 8.01                      | 0.40                  | N/A                   | YES                               |
| Linearity = 0.993             |                           |                       |                       |                                   |

<sup>1</sup>zero/high based on 2% of span, low/mid based on 5% of concentration



CO<sub>2</sub> Span (%) = 18.60

| SERVOMEX 1440 (CO <sub>2</sub> Analyzer) |                         |                       |                    |                           |
|------------------------------------------|-------------------------|-----------------------|--------------------|---------------------------|
| Certified Concentration (%)              | Instrument Response (%) | Calibration Error (%) | Absolute Conc. (%) | Pass or Fail (±2%, ≤0.5%) |
| 0.00                                     | 0.02                    | 0.11                  | 0.02               | YES (%)                   |
| 9.09                                     | 9.04                    | -0.27                 | 0.05               | YES (%)                   |
| 18.60                                    | 18.68                   | 0.43                  | 0.08               | YES (%)                   |
| Linearity = 0.997                        |                         |                       |                    |                           |



| DRIFT AND BIAS CHECK                     |                 |                |        |        |                 |
|------------------------------------------|-----------------|----------------|--------|--------|-----------------|
| 0-30-0 Load, Run - EC36-2S R1            |                 | O <sub>2</sub> | CO     | THC    | CO <sub>2</sub> |
| Raw Average                              |                 | 18.01          | 4.04   | 1.08   | 2.11            |
| Corrected Average                        |                 | 18.01          | 4.13   | 1.10   | 2.10            |
| Initial Zero                             |                 | 0.04           | -0.04  | -0.04  | 0.06            |
| Final Zero                               |                 | 0.03           | -0.10  | 0.05   | 0.01            |
| Avg. Zero                                |                 | 0.04           | -0.07  | 0.01   | 0.04            |
| Initial UpScale                          |                 | 11.94          | 9.32   | 3.08   | 9.00            |
| Final UpScale                            |                 | 11.91          | 9.41   | 3.03   | 9.04            |
| Avg. UpScale                             |                 | 11.93          | 9.37   | 3.06   | 9.02            |
| Sys Resp (Zero)                          |                 | 0.01           | -0.03  | 0.06   | 0.06            |
| Sys Resp (Upscale)                       |                 | 11.94          | 9.35   | 3.04   | 9.04            |
| Upscale Cal Gas                          |                 | 11.91          | 9.48   | 3.02   | 9.09            |
| Initial Zero Bias                        |                 | 0.14%          | -0.06% | -1.00% | 0.00%           |
| Final Zero Bias                          |                 | 0.10%          | -0.39% | -0.10% | -0.27%          |
| Zero Drift                               |                 | 0.05%          | 0.33%  | 0.90%  | 0.27%           |
| Initial Upscale Bias                     |                 | 0.00%          | -0.17% | 0.40%  | -0.22%          |
| Final Upscale Bias                       |                 | -0.14%         | 0.33%  | -0.10% | 0.00%           |
| Upscale Drift                            |                 | 0.14%          | 0.50%  | 0.50%  | 0.22%           |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.03           | 0.01   | --     | 0.00            |
|                                          | Final Zero      | 0.02           | 0.07   | --     | 0.05            |
|                                          | Initial Upscale | 0.00           | 0.03   | --     | 0.04            |
|                                          | Final Upscale   | 0.03           | 0.06   | --     | 0.00            |
| Calibration Span                         |                 | 20.86          | 18.00  | 10.00  | 18.60           |
| 3% of Cal. Span (drift)                  |                 | 0.63           | 0.54   | 0.30   | 0.56            |
| 5% of Cal. Span (bias)                   |                 | 1.04           | 0.90   | 0.50   | 0.93            |

| DRIFT AND BIAS CHECK                     |                 |        |        |                 |      |
|------------------------------------------|-----------------|--------|--------|-----------------|------|
| 0-30-0 Load, Run - EC36-2S R2            | O <sub>2</sub>  | CO     | THC    | CO <sub>2</sub> |      |
| Raw Average                              | 18.21           | 3.55   | 0.76   | 1.97            |      |
| Corrected Average                        | 18.23           | 3.60   | 0.73   | 1.97            |      |
| Initial Zero                             | 0.03            | -0.10  | 0.05   | 0.01            |      |
| Final Zero                               | 0.05            | 0.02   | 0.02   | 0.03            |      |
| Avg. Zero                                | 0.04            | -0.04  | 0.04   | 0.02            |      |
| Initial UpScale                          | 11.91           | 9.41   | 3.03   | 9.04            |      |
| Final UpScale                            | 11.92           | 9.39   | 3.03   | 9.03            |      |
| Avg. UpScale                             | 11.92           | 9.40   | 3.03   | 9.04            |      |
| Sys Resp (Zero)                          | 0.01            | -0.03  | 0.06   | 0.06            |      |
| Sys Resp (Upscale)                       | 11.94           | 9.35   | 3.04   | 9.04            |      |
| Upscale Cal Gas                          | 11.91           | 9.48   | 3.02   | 9.09            |      |
| Initial Zero Bias                        | 0.10%           | -0.39% | -0.10% | -0.27%          |      |
| Final Zero Bias                          | 0.19%           | 0.28%  | -0.40% | -0.16%          |      |
| Zero Drift                               | 0.10%           | 0.67%  | 0.30%  | 0.11%           |      |
| Initial Upscale Bias                     | -0.14%          | 0.33%  | -0.10% | 0.00%           |      |
| Final Upscale Bias                       | -0.10%          | 0.22%  | -0.10% | -0.05%          |      |
| Upscale Drift                            | 0.05%           | 0.11%  | 0.00%  | 0.05%           |      |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.02   | 0.07   | --              | 0.05 |
|                                          | Final Zero      | 0.04   | 0.05   | --              | 0.03 |
|                                          | Initial Upscale | 0.03   | 0.06   | --              | 0.00 |
|                                          | Final Upscale   | 0.02   | 0.04   | --              | 0.01 |
| Calibration Span                         | 20.86           | 18.00  | 10.00  | 18.60           |      |
| 3% of Cal. Span (drift)                  | 0.63            | 0.54   | 0.30   | 0.56            |      |
| 5% of Cal. Span (bias)                   | 1.04            | 0.90   | 0.50   | 0.93            |      |

| DRIFT AND BIAS CHECK                     |                 |                |        |        |                 |
|------------------------------------------|-----------------|----------------|--------|--------|-----------------|
| 0-30-0 Load, Run - EC36-2S R3            |                 | O <sub>2</sub> | CO     | THC    | CO <sub>2</sub> |
| Raw Average                              |                 | 18.13          | 3.51   | 0.66   | 2.08            |
| Corrected Average                        |                 | 18.09          | 3.59   | 0.62   | 2.06            |
| Initial Zero                             |                 | 0.05           | 0.02   | 0.02   | 0.03            |
| Final Zero                               |                 | 0.04           | -0.07  | 0.08   | 0.04            |
| Avg. Zero                                |                 | 0.05           | -0.03  | 0.05   | 0.04            |
| Initial UpScale                          |                 | 11.92          | 9.39   | 3.03   | 9.03            |
| Final UpScale                            |                 | 11.98          | 9.22   | 3.00   | 9.13            |
| Avg. UpScale                             |                 | 11.95          | 9.31   | 3.02   | 9.08            |
| Sys Resp (Zero)                          |                 | 0.01           | -0.03  | 0.06   | 0.06            |
| Sys Resp (Upscale)                       |                 | 11.94          | 9.35   | 3.04   | 9.04            |
| Upscale Cal Gas                          |                 | 11.91          | 9.48   | 3.02   | 9.09            |
| Initial Zero Bias                        |                 | 0.19%          | 0.28%  | -0.40% | -0.16%          |
| Final Zero Bias                          |                 | 0.14%          | -0.22% | 0.20%  | -0.11%          |
| Zero Drift                               |                 | 0.05%          | 0.50%  | 0.60%  | 0.05%           |
| Initial Upscale Bias                     |                 | -0.10%         | 0.22%  | -0.10% | -0.05%          |
| Final Upscale Bias                       |                 | 0.19%          | -0.72% | -0.40% | 0.48%           |
| Upscale Drift                            |                 | 0.29%          | 0.94%  | 0.30%  | 0.54%           |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.04           | 0.05   | --     | 0.03            |
|                                          | Final Zero      | 0.03           | 0.04   | --     | 0.02            |
|                                          | Initial Upscale | 0.02           | 0.04   | --     | 0.01            |
|                                          | Final Upscale   | 0.04           | 0.13   | --     | 0.09            |
| Calibration Span                         |                 | 20.86          | 18.00  | 10.00  | 18.60           |
| 3% of Cal. Span (drift)                  |                 | 0.63           | 0.54   | 0.30   | 0.56            |
| 5% of Cal. Span (bias)                   |                 | 1.04           | 0.90   | 0.50   | 0.93            |

| DRIFT AND BIAS CHECK                     |                 |        |        |                 |      |
|------------------------------------------|-----------------|--------|--------|-----------------|------|
| 70-100-70 Load, Run - EC36-2S R7         | O <sub>2</sub>  | CO     | THC    | CO <sub>2</sub> |      |
| Raw Average                              | 13.22           | 0.47   | 0.08   | 5.38            |      |
| Corrected Average                        | 13.28           | 0.40   | 0.08   | 5.37            |      |
| Initial Zero                             | -0.07           | 0.07   | 0.00   | 0.03            |      |
| Final Zero                               | -0.08           | 0.09   | 0.00   | 0.08            |      |
| Avg. Zero                                | -0.08           | 0.08   | 0.00   | 0.06            |      |
| Initial UpScale                          | 11.89           | 9.44   | 3.04   | 9.04            |      |
| Final UpScale                            | 11.80           | 9.39   | 3.00   | 9.09            |      |
| Avg. UpScale                             | 11.85           | 9.42   | 3.02   | 9.07            |      |
| Sys Resp (Zero)                          | 0.07            | 0.02   | 0.03   | 0.01            |      |
| Sys Resp (Upscale)                       | 11.88           | 9.50   | 3.04   | 9.02            |      |
| Upscale Cal Gas                          | 11.91           | 9.48   | 3.02   | 9.09            |      |
| Initial Zero Bias                        | -0.67%          | 0.28%  | -0.30% | 0.11%           |      |
| Final Zero Bias                          | -0.72%          | 0.39%  | -0.30% | 0.38%           |      |
| Zero Drift                               | 0.05%           | 0.11%  | 0.00%  | 0.27%           |      |
| Initial Upscale Bias                     | 0.05%           | -0.33% | 0.00%  | 0.11%           |      |
| Final Upscale Bias                       | -0.38%          | -0.61% | -0.40% | 0.38%           |      |
| Upscale Drift                            | 0.43%           | 0.28%  | 0.40%  | 0.27%           |      |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.14   | 0.05   | --              | 0.02 |
|                                          | Final Zero      | 0.15   | 0.07   | --              | 0.07 |
|                                          | Initial Upscale | 0.01   | 0.06   | --              | 0.02 |
|                                          | Final Upscale   | 0.08   | 0.11   | --              | 0.07 |
| Calibration Span                         | 20.86           | 18.00  | 10.00  | 18.60           |      |
| 3% of Cal. Span (drift)                  | 0.63            | 0.54   | 0.30   | 0.56            |      |
| 5% of Cal. Span (bias)                   | 1.04            | 0.90   | 0.50   | 0.93            |      |

| DRIFT AND BIAS CHECK                     |                 |        |        |                 |
|------------------------------------------|-----------------|--------|--------|-----------------|
| 70-100-70 Load, Run - EC36-2S R8         | O <sub>2</sub>  | CO     | THC    | CO <sub>2</sub> |
| Raw Average                              | 14.48           | 0.56   | 0.21   | 4.56            |
| Corrected Average                        | 14.59           | 0.48   | 0.18   | 4.54            |
| Initial Zero                             | -0.08           | 0.09   | 0.00   | 0.08            |
| Final Zero                               | -0.07           | 0.08   | 0.07   | 0.04            |
| Avg. Zero                                | -0.08           | 0.09   | 0.04   | 0.06            |
| Initial UpScale                          | 11.80           | 9.39   | 3.00   | 9.09            |
| Final UpScale                            | 11.82           | 9.35   | 2.96   | 9.05            |
| Avg. UpScale                             | 11.81           | 9.37   | 2.98   | 9.07            |
| Sys Resp (Zero)                          | 0.07            | 0.02   | 0.03   | 0.01            |
| Sys Resp (Upscale)                       | 11.88           | 9.50   | 3.04   | 9.02            |
| Upscale Cal Gas                          | 11.91           | 9.48   | 3.02   | 9.09            |
| Initial Zero Bias                        | -0.72%          | 0.39%  | -0.30% | 0.38%           |
| Final Zero Bias                          | -0.67%          | 0.33%  | 0.40%  | 0.16%           |
| Zero Drift                               | 0.05%           | 0.06%  | 0.70%  | 0.22%           |
| Initial Upscale Bias                     | -0.38%          | -0.61% | -0.40% | 0.38%           |
| Final Upscale Bias                       | -0.29%          | -0.83% | -0.80% | 0.16%           |
| Upscale Drift                            | 0.10%           | 0.22%  | 0.40%  | 0.22%           |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.15   | 0.07   | 0.07            |
|                                          | Final Zero      | 0.14   | 0.06   | 0.03            |
|                                          | Initial Upscale | 0.08   | 0.11   | 0.07            |
|                                          | Final Upscale   | 0.06   | 0.15   | 0.03            |
| Calibration Span                         | 20.86           | 18.00  | 10.00  | 18.60           |
| 3% of Cal. Span (drift)                  | 0.63            | 0.54   | 0.30   | 0.56            |
| 5% of Cal. Span (bias)                   | 1.04            | 0.90   | 0.50   | 0.93            |

| DRIFT AND BIAS CHECK                     |                 |        |        |                 |
|------------------------------------------|-----------------|--------|--------|-----------------|
| 70-100-70 Load, Run - EC36-2S R9         | O <sub>2</sub>  | CO     | THC    | CO <sub>2</sub> |
| Raw Average                              | 14.21           | 0.44   | 0.12   | 4.79            |
| Corrected Average                        | 14.25           | 0.42   | 0.09   | 4.80            |
| Initial Zero                             | -0.07           | 0.08   | 0.07   | 0.04            |
| Final Zero                               | -0.01           | -0.04  | 0.00   | 0.03            |
| Avg. Zero                                | -0.04           | 0.02   | 0.04   | 0.04            |
| Initial UpScale                          | 11.82           | 9.35   | 2.96   | 9.05            |
| Final UpScale                            | 11.91           | 9.29   | 3.02   | 9.04            |
| Avg. UpScale                             | 11.87           | 9.32   | 2.99   | 9.05            |
| Sys Resp (Zero)                          | 0.07            | 0.02   | 0.03   | 0.01            |
| Sys Resp (Upscale)                       | 11.88           | 9.50   | 3.04   | 9.02            |
| Upscale Cal Gas                          | 11.91           | 9.48   | 3.02   | 9.09            |
| Initial Zero Bias                        | -0.67%          | 0.33%  | 0.40%  | 0.16%           |
| Final Zero Bias                          | -0.38%          | -0.33% | -0.30% | 0.11%           |
| Zero Drift                               | 0.29%           | 0.67%  | 0.70%  | 0.05%           |
| Initial Upscale Bias                     | -0.29%          | -0.83% | -0.80% | 0.16%           |
| Final Upscale Bias                       | 0.14%           | -1.17% | -0.20% | 0.11%           |
| Upscale Drift                            | 0.43%           | 0.33%  | 0.60%  | 0.05%           |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.14   | 0.06   | 0.03            |
|                                          | Final Zero      | 0.08   | 0.06   | 0.02            |
|                                          | Initial Upscale | 0.06   | 0.15   | 0.03            |
|                                          | Final Upscale   | 0.03   | 0.21   | 0.02            |
| Calibration Span                         | 20.86           | 18.00  | 10.00  | 18.60           |
| 3% of Cal. Span (drift)                  | 0.63            | 0.54   | 0.30   | 0.56            |
| 5% of Cal. Span (bias)                   | 1.04            | 0.90   | 0.50   | 0.93            |

| DRIFT AND BIAS CHECK                     |                 |        |        |                 |      |
|------------------------------------------|-----------------|--------|--------|-----------------|------|
| 30-70-30 Load, Run - EC36-2S R4          | O <sub>2</sub>  | CO     | THC    | CO <sub>2</sub> |      |
| Raw Average                              | 16.18           | 3.63   | 0.63   | 3.42            |      |
| Corrected Average                        | 16.19           | 3.63   | 0.58   | 3.43            |      |
| Initial Zero                             | -0.01           | -0.04  | 0.00   | 0.03            |      |
| Final Zero                               | 0.01            | 0.21   | 0.12   | 0.01            |      |
| Avg. Zero                                | 0.00            | 0.09   | 0.06   | 0.02            |      |
| Initial UpScale                          | 11.91           | 9.29   | 3.02   | 9.04            |      |
| Final UpScale                            | 11.89           | 9.38   | 3.03   | 9.02            |      |
| Avg. UpScale                             | 11.90           | 9.34   | 3.03   | 9.03            |      |
| Sys Resp (Zero)                          | 0.07            | 0.02   | 0.03   | 0.01            |      |
| Sys Resp (Upscale)                       | 11.88           | 9.50   | 3.04   | 9.02            |      |
| Upscale Cal Gas                          | 11.91           | 9.48   | 3.02   | 9.09            |      |
| Initial Zero Bias                        | -0.38%          | -0.33% | -0.30% | 0.11%           |      |
| Final Zero Bias                          | -0.29%          | 1.06%  | 0.90%  | 0.00%           |      |
| Zero Drift                               | 0.10%           | 1.39%  | 1.20%  | 0.11%           |      |
| Initial Upscale Bias                     | 0.14%           | -1.17% | -0.20% | 0.11%           |      |
| Final Upscale Bias                       | 0.05%           | -0.67% | -0.10% | 0.00%           |      |
| Upscale Drift                            | 0.10%           | 0.50%  | 0.10%  | 0.11%           |      |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.08   | 0.06   | --              | 0.02 |
|                                          | Final Zero      | 0.06   | 0.19   | --              | 0.00 |
|                                          | Initial Upscale | 0.03   | 0.21   | --              | 0.02 |
|                                          | Final Upscale   | 0.01   | 0.12   | --              | 0.00 |
| Calibration Span                         | 20.86           | 18.00  | 10.00  | 18.60           |      |
| 3% of Cal. Span (drift)                  | 0.63            | 0.54   | 0.30   | 0.56            |      |
| 5% of Cal. Span (bias)                   | 1.04            | 0.90   | 0.50   | 0.93            |      |

| DRIFT AND BIAS CHECK                     |                 |        |        |                 |      |
|------------------------------------------|-----------------|--------|--------|-----------------|------|
| 30-70-30 Load, Run - EC36-2S R5          | O <sub>2</sub>  | CO     | THC    | CO <sub>2</sub> |      |
| Raw Average                              | 16.41           | 3.51   | 0.34   | 3.24            |      |
| Corrected Average                        | 16.45           | 3.51   | 0.27   | 3.25            |      |
| Initial Zero                             | 0.01            | 0.21   | 0.12   | 0.01            |      |
| Final Zero                               | -0.02           | -0.14  | 0.04   | 0.04            |      |
| Avg. Zero                                | -0.01           | 0.04   | 0.08   | 0.03            |      |
| Initial UpScale                          | 11.89           | 9.38   | 3.03   | 9.02            |      |
| Final UpScale                            | 11.87           | 9.47   | 2.97   | 9.03            |      |
| Avg. UpScale                             | 11.88           | 9.43   | 3.00   | 9.03            |      |
| Sys Resp (Zero)                          | 0.07            | 0.02   | 0.03   | 0.01            |      |
| Sys Resp (Upscale)                       | 11.88           | 9.50   | 3.04   | 9.02            |      |
| Upscale Cal Gas                          | 11.91           | 9.48   | 3.02   | 9.09            |      |
| Initial Zero Bias                        | -0.29%          | 1.06%  | 0.90%  | 0.00%           |      |
| Final Zero Bias                          | -0.43%          | -0.89% | 0.10%  | 0.16%           |      |
| Zero Drift                               | 0.14%           | 1.94%  | 0.80%  | 0.16%           |      |
| Initial Upscale Bias                     | 0.05%           | -0.67% | -0.10% | 0.00%           |      |
| Final Upscale Bias                       | -0.05%          | -0.17% | -0.70% | 0.05%           |      |
| Upscale Drift                            | 0.10%           | 0.50%  | 0.60%  | 0.05%           |      |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.06   | 0.19   | --              | 0.00 |
|                                          | Final Zero      | 0.09   | 0.16   | --              | 0.03 |
|                                          | Initial Upscale | 0.01   | 0.12   | --              | 0.00 |
|                                          | Final Upscale   | 0.01   | 0.03   | --              | 0.01 |
| Calibration Span                         | 20.86           | 18.00  | 10.00  | 18.60           |      |
| 3% of Cal. Span (drift)                  | 0.63            | 0.54   | 0.30   | 0.56            |      |
| 5% of Cal. Span (bias)                   | 1.04            | 0.90   | 0.50   | 0.93            |      |

| DRIFT AND BIAS CHECK                     |                 |        |        |                 |
|------------------------------------------|-----------------|--------|--------|-----------------|
| 30-70-30 Load, Run - EC36-2S R6          | O <sub>2</sub>  | CO     | THC    | CO <sub>2</sub> |
| Raw Average                              | 16.32           | 3.21   | 0.52   | 3.29            |
| Corrected Average                        | 16.37           | 3.27   | 0.51   | 3.28            |
| Initial Zero                             | -0.02           | -0.14  | 0.04   | 0.04            |
| Final Zero                               | -0.02           | 0.08   | 0.00   | 0.05            |
| Avg. Zero                                | -0.02           | -0.03  | 0.02   | 0.05            |
| Initial UpScale                          | 11.89           | 9.38   | 3.03   | 9.02            |
| Final UpScale                            | 11.85           | 9.37   | 3.04   | 9.01            |
| Avg. UpScale                             | 11.87           | 9.38   | 3.04   | 9.02            |
| Sys Resp (Zero)                          | 0.07            | 0.02   | 0.03   | 0.01            |
| Sys Resp (Upscale)                       | 11.88           | 9.50   | 3.04   | 9.02            |
| Upscale Cal Gas                          | 11.91           | 9.48   | 3.02   | 9.09            |
| Initial Zero Bias                        | -0.43%          | -0.89% | 0.10%  | 0.16%           |
| Final Zero Bias                          | -0.43%          | 0.33%  | -0.30% | 0.22%           |
| Zero Drift                               | 0.00%           | 1.22%  | 0.40%  | 0.05%           |
| Initial Upscale Bias                     | 0.05%           | -0.67% | -0.10% | 0.00%           |
| Final Upscale Bias                       | -0.14%          | -0.72% | 0.00%  | -0.05%          |
| Upscale Drift                            | 0.19%           | 0.06%  | 0.10%  | 0.05%           |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.09   | 0.16   | --              |
|                                          | Final Zero      | 0.09   | 0.06   | --              |
|                                          | Initial Upscale | 0.01   | 0.12   | --              |
|                                          | Final Upscale   | 0.03   | 0.13   | --              |
| Calibration Span                         | 20.86           | 18.00  | 10.00  | 18.60           |
| 3% of Cal. Span (drift)                  | 0.63            | 0.54   | 0.30   | 0.56            |
| 5% of Cal. Span (bias)                   | 1.04            | 0.90   | 0.50   | 0.93            |

| DRIFT AND BIAS CHECK                     |                 |        |        |                 |
|------------------------------------------|-----------------|--------|--------|-----------------|
| 90-100 Load, Run - EC36-2S R10           | O <sub>2</sub>  | CO     | THC    | CO <sub>2</sub> |
| Raw Average                              | 14.81           | 1.54   | 0.39   | 4.39            |
| Corrected Average                        | 14.83           | 1.55   | 0.38   | 4.39            |
| Initial Zero                             | 0.04            | 0.10   | 0.00   | 0.04            |
| Final Zero                               | -0.02           | -0.09  | 0.02   | 0.04            |
| Avg. Zero                                | 0.01            | 0.01   | 0.01   | 0.04            |
| Initial UpScale                          | 11.95           | 9.43   | 3.03   | 9.05            |
| Final UpScale                            | 11.84           | 9.39   | 3.01   | 9.04            |
| Avg. UpScale                             | 11.90           | 9.41   | 3.02   | 9.05            |
| Sys Resp (Zero)                          | 0.09            | -0.04  | 0.04   | 0.02            |
| Sys Resp (Upscale)                       | 11.95           | 9.49   | 3.03   | 9.04            |
| Upscale Cal Gas                          | 11.91           | 9.48   | 3.02   | 9.09            |
| Initial Zero Bias                        | -0.24%          | 0.78%  | -0.40% | 0.11%           |
| Final Zero Bias                          | -0.53%          | -0.28% | -0.20% | 0.11%           |
| Zero Drift                               | 0.29%           | 1.05%  | 0.20%  | 0.00%           |
| Initial Upscale Bias                     | 0.00%           | -0.33% | 0.00%  | 0.05%           |
| Final Upscale Bias                       | -0.53%          | -0.55% | -0.20% | 0.00%           |
| Upscale Drift                            | 0.53%           | 0.22%  | 0.20%  | 0.05%           |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.05   | 0.14   | --              |
|                                          | Final Zero      | 0.11   | 0.05   | --              |
|                                          | Initial Upscale | 0.00   | 0.06   | --              |
|                                          | Final Upscale   | 0.11   | 0.10   | --              |
| Calibration Span                         | 20.86           | 18.06  | 10.00  | 18.60           |
| 3% of Cal. Span (drift)                  | 0.63            | 0.54   | 0.30   | 0.56            |
| 5% of Cal. Span (bias)                   | 1.04            | 0.90   | 0.50   | 0.93            |



| DRIFT AND BIAS CHECK                     |                 |        |        |                 |
|------------------------------------------|-----------------|--------|--------|-----------------|
| 90-100 Load, Run - EC36-2S R11           | O <sub>2</sub>  | CO     | THC    | CO <sub>2</sub> |
| Raw Average                              | 14.77           | 1.24   | 0.24   | 4.42            |
| Corrected Average                        | 14.85           | 1.32   | 0.21   | 4.41            |
| Initial Zero                             | -0.02           | -0.09  | 0.02   | 0.04            |
| Final Zero                               | 0.01            | -0.06  | 0.04   | 0.05            |
| Avg. Zero                                | -0.01           | -0.08  | 0.03   | 0.05            |
| Initial UpScale                          | 11.84           | 9.39   | 3.01   | 9.04            |
| Final UpScale                            | 11.85           | 9.34   | 3.05   | 9.07            |
| Avg. UpScale                             | 11.85           | 9.37   | 3.03   | 9.06            |
| Sys Resp (Zero)                          | 0.09            | -0.04  | 0.04   | 0.02            |
| Sys Resp (Upscale)                       | 11.95           | 9.49   | 3.03   | 9.04            |
| Upscale Cal Gas                          | 11.91           | 9.48   | 3.02   | 9.09            |
| Initial Zero Bias                        | -0.53%          | -0.28% | -0.20% | 0.11%           |
| Final Zero Bias                          | -0.38%          | -0.11% | 0.00%  | 0.16%           |
| Zero Drift                               | 0.14%           | 0.17%  | 0.20%  | 0.05%           |
| Initial Upscale Bias                     | -0.53%          | -0.55% | -0.20% | 0.00%           |
| Final Upscale Bias                       | -0.48%          | -0.83% | 0.20%  | 0.16%           |
| Upscale Drift                            | 0.05%           | 0.28%  | 0.40%  | 0.16%           |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.11   | --     | 0.02            |
|                                          | Final Zero      | 0.08   | --     | 0.03            |
|                                          | Initial Upscale | 0.11   | --     | 0.00            |
|                                          | Final Upscale   | 0.10   | --     | 0.03            |
| Calibration Span                         | 20.86           | 18.06  | 10.00  | 18.60           |
| 3% of Cal. Span (drift)                  | 0.63            | 0.54   | 0.30   | 0.56            |
| 5% of Cal. Span (bias)                   | 1.04            | 0.90   | 0.50   | 0.93            |

| DRIFT AND BIAS CHECK                     |                 |        |       |                 |
|------------------------------------------|-----------------|--------|-------|-----------------|
| 90-100 Load, Run - EC36-2S R12           | O <sub>2</sub>  | CO     | THC   | CO <sub>2</sub> |
| Raw Average                              | 14.21           | 0.65   | 0.20  | 4.78            |
| Corrected Average                        | 14.30           | 0.71   | 0.11  | 4.75            |
| Initial Zero                             | 0.01            | -0.06  | 0.04  | 0.05            |
| Final Zero                               | 0.02            | -0.04  | 0.14  | 0.08            |
| Avg. Zero                                | 0.02            | -0.05  | 0.09  | 0.07            |
| Initial UpScale                          | 11.85           | 9.34   | 3.05  | 9.07            |
| Final UpScale                            | 11.82           | 9.30   | 3.12  | 9.11            |
| Avg. UpScale                             | 11.84           | 9.32   | 3.09  | 9.09            |
| Sys Resp (Zero)                          | 0.09            | -0.04  | 0.04  | 0.02            |
| Sys Resp (Upscale)                       | 11.95           | 9.49   | 3.03  | 9.04            |
| Upscale Cal Gas                          | 11.91           | 9.48   | 3.02  | 9.09            |
| Initial Zero Bias                        | -0.38%          | -0.11% | 0.00% | 0.16%           |
| Final Zero Bias                          | -0.34%          | 0.00%  | 1.00% | 0.32%           |
| Zero Drift                               | 0.05%           | 0.11%  | 1.00% | 0.16%           |
| Initial Upscale Bias                     | -0.48%          | -0.83% | 0.20% | 0.16%           |
| Final Upscale Bias                       | -0.62%          | -1.05% | 0.90% | 0.38%           |
| Upscale Drift                            | 0.14%           | 0.22%  | 0.70% | 0.22%           |
| Alternative<br>Specification<br>Abs Diff | Initial Zero    | 0.08   | --    | 0.03            |
|                                          | Final Zero      | 0.07   | --    | 0.06            |
|                                          | Initial Upscale | 0.10   | --    | 0.03            |
|                                          | Final Upscale   | 0.13   | --    | 0.07            |
| Calibration Span                         | 20.86           | 18.06  | 10.00 | 18.60           |
| 3% of Cal. Span (drift)                  | 0.63            | 0.54   | 0.30  | 0.56            |
| 5% of Cal. Span (bias)                   | 1.04            | 0.90   | 0.50  | 0.93            |

## S-TYPE PITOT TUBE CALIBRATION SHEET

Reference USEPA Reference Method 2 (40CFR60, App. A, Meth. 2)

|                                     |                                                 |
|-------------------------------------|-------------------------------------------------|
| PITOT SERIAL# <u>4174</u>           | CALIBRATION DATE: <u>11-Jan-13</u>              |
| PITOT TYPE: <u>S-Type</u>           | BAROMETRIC PRESSURE: <u>29.88</u> in Hg         |
| STD. PITOT TYPE: <u>Ellipsoidal</u> | STATIC PRESSURE: <u>1.4</u> in H <sub>2</sub> O |
| Cp(std): <u>0.990</u>               | BLOCKAGE %: <u>N/A</u>                          |
| PROBE SERIAL# <u>NICK</u>           | CORRECTION FACTOR: <u>1.00</u>                  |

| SIDE "A" CALIBRATION |                               |                             |       |                                           |
|----------------------|-------------------------------|-----------------------------|-------|-------------------------------------------|
| RUN NO.              | Δ Pstd<br>in H <sub>2</sub> O | Δ Ps<br>in H <sub>2</sub> O | Cp(s) | DEVIATION<br>Cp(s) - avg.Cp(s)            |
| 1                    | 0.560                         | 0.820                       | 0.818 | 0.000                                     |
| 2                    | 0.560                         | 0.820                       | 0.818 | 0.000                                     |
| 3                    | 0.560                         | 0.820                       | 0.818 | 0.000                                     |
| <b>"A" AVERAGE</b>   |                               |                             | 0.818 | 0.0000<br><small>(must be ≤ 0.01)</small> |

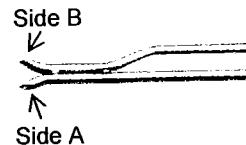
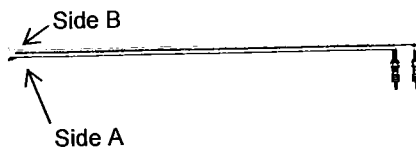
| SIDE "B" CALIBRATION |                               |                             |       |                                           |
|----------------------|-------------------------------|-----------------------------|-------|-------------------------------------------|
| RUN NO.              | Δ Pstd<br>in H <sub>2</sub> O | Δ Ps<br>in H <sub>2</sub> O | Cp(s) | DEVIATION<br>Cp(s) - avg.Cp(s)            |
| 1                    | 0.560                         | 0.815                       | 0.821 | 0.000                                     |
| 2                    | 0.560                         | 0.815                       | 0.821 | 0.000                                     |
| 3                    | 0.560                         | 0.815                       | 0.821 | 0.000                                     |
| <b>"B" AVERAGE</b>   |                               |                             | 0.821 | 0.0000<br><small>(must be ≤ 0.01)</small> |

### ACCEPTANCE CRITERIA

AVERAGE -0.0025 AVG. Cp (A) - AVG. Cp (B) must be ≤ 0.01

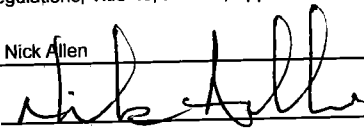
If the Average and both Deviation Averages "A" & "B" are ≤ 0.01, then the OVERALL AVERAGE below may be used.  
\* If NOT, use the "A" Average OR "B" Average.

OVERALL AVERAGE 0.8194



I certify that the above pitot tube was tested in accordance with the US EPA Method 2 standards.  
See the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Item 4.

Print Name: Nick Allen

Signature: 

Date 1.11.13

# METERING SYSTEM DRY GAS METER CALIBRATION SHEET

EPA Reference Method

Metering System Pre-Test Calibration

Air Hygiene Asset ID: samp-cp-0007

Filename: Z:\Shared\QAQC\Calibrations\PM-Equipment\IM-5 Consoles\Calibration Sheet v4.1\Current[SAMP-CP-0007 Calibration 5-14-15.xls]Original (5 point)

Make: Thermo Environmental

Date: 05/14/15

Model #: MST-C1

Barometric Pressure: 29.46 (in. Hg)

Serial #: 90704

Theoretical Critical Vacuum: 13.90 (in. Hg)

## DRY GAS METER READINGS

| $\Delta H$<br>(in. H <sub>2</sub> O) | Time<br>(min) | Volume                        |                             |                             | Initial Temperature |                |
|--------------------------------------|---------------|-------------------------------|-----------------------------|-----------------------------|---------------------|----------------|
|                                      |               | Initial<br>(ft <sup>3</sup> ) | Final<br>(ft <sup>3</sup> ) | Total<br>(ft <sup>3</sup> ) | Inlet<br>(°F)       | Outlet<br>(°F) |
| 0.25                                 | 17.00         | 892.770                       | 898.080                     | 5.310                       | 70.0                | 69.0           |
| 0.54                                 | 12.00         | 898.080                       | 903.460                     | 5.380                       | 72.0                | 69.0           |
| 1.00                                 | 10.00         | 903.460                       | 909.550                     | 6.090                       | 75.0                | 69.0           |
| 1.90                                 | 10.00         | 909.550                       | 917.630                     | 8.080                       | 76.0                | 69.0           |
| 3.40                                 | 10.00         | 917.630                       | 928.320                     | 10.690                      | 77.0                | 70.0           |

| Final Temperature |                | Orifice<br>Serial#<br>(number) | K' Orifice<br>Coefficient<br>(see above) | Actual<br>Vacuum<br>(in. Hg) | Ambient Temperature |               |                 |
|-------------------|----------------|--------------------------------|------------------------------------------|------------------------------|---------------------|---------------|-----------------|
| Inlet<br>(°F)     | Outlet<br>(°F) |                                |                                          |                              | Initial<br>(°F)     | Final<br>(°F) | Average<br>(°F) |
| 73.0              | 69.0           | 40                             | 0.2352                                   | 16.0                         | 70.1                | 70.1          | 70.1            |
| 75.0              | 69.0           | 48                             | 0.3367                                   | 16.0                         | 70.3                | 70.1          | 70.2            |
| 76.0              | 69.0           | 55                             | 0.4543                                   | 16.0                         | 70.1                | 70.3          | 70.2            |
| 78.0              | 70.0           | 63                             | 0.6061                                   | 16.0                         | 70.1                | 70.3          | 70.2            |
| 79.0              | 71.0           | 73                             | 0.8058                                   | 14.5                         | 70.1                | 70.5          | 70.3            |

## RESULTS

| DRY GAS METER                                        |                                            | ORIFICE                                               |                                             |                                                |
|------------------------------------------------------|--------------------------------------------|-------------------------------------------------------|---------------------------------------------|------------------------------------------------|
| VOLUME<br>CORRECTED<br>Vm(std)<br>(ft <sup>3</sup> ) | VOLUME<br>CORRECTED<br>Vm(std)<br>(liters) | VOLUME<br>CORRECTED<br>Vcr(std)<br>(ft <sup>3</sup> ) | VOLUME<br>CORRECTED<br>Vcr(std)<br>(liters) | VOLUME<br>NOMINAL<br>Vcr<br>(ft <sup>3</sup> ) |
| 5.207                                                | 147.47                                     | 5.116                                                 | 144.9                                       | 5.219                                          |
| 5.270                                                | 149.24                                     | 5.169                                                 | 146.4                                       | 5.274                                          |
| 5.961                                                | 168.81                                     | 5.812                                                 | 164.6                                       | 5.930                                          |
| 7.912                                                | 224.06                                     | 7.755                                                 | 219.6                                       | 7.912                                          |
| 10.487                                               | 296.98                                     | 10.309                                                | 291.9                                       | 10.519                                         |
| DRY GAS METER<br>CALIBRATION FACTOR<br>Y             |                                            | ORIFICE<br>CALIBRATION FACTOR<br>$\Delta H@$          |                                             |                                                |
| Variation<br>(number)                                | Value<br>(number)                          | Value<br>(in. H <sub>2</sub> O)                       | Value<br>(mm H <sub>2</sub> O)              | Variation<br>(in. H <sub>2</sub> O)            |
| 0.002                                                | 0.982                                      | 1.526                                                 | 38.76                                       | -0.130                                         |
| 0.001                                                | 0.981                                      | 1.609                                                 | 40.86                                       | -0.047                                         |
| -0.005                                               | 0.975                                      | 1.636                                                 | 41.56                                       | -0.020                                         |
| 0.000                                                | 0.980                                      | 1.745                                                 | 44.32                                       | 0.089                                          |
| 0.003                                                | 0.983                                      | 1.764                                                 | 44.80                                       | 0.108                                          |
| <b>AVERAGE:</b>                                      | <b>0.980</b>                               | <b>1.656</b>                                          | <b>42.06</b>                                | <b>PASSED</b>                                  |

Notes:

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/- 0.02. For Orifice Calibration Factor  $\Delta H@$ , the orifice differential pressure in inches of H<sub>2</sub>O that equates to 0.75 cfm of air at 68 °F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/- 0.2. For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above. The Critical Orifice Coefficient, K', must be entered in English units, (ft)<sup>3</sup>/(deg R)<sup>0.5</sup>/((in.Hg)\*(min)).

SIGNATURE: \_\_\_\_\_

*Craig McCarty*

DATE: 05/14/15 05/14/15

# METERING SYSTEM THERMOCOUPLE CALIBRATION SHEET

## EPA Reference Method

### Metering System Pre-Test Calibration

Air Hygiene Asset ID: samp-cp-0007

Filename: Z:\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\{SAMP-CP-0007 Calibration 5-14-15.xls}Original (5 point)

Make: Thermo Environmental

Date: 05/14/15

Model #: MST-C1

Barometric Pressure: 29.46 (in. Hg)

Serial #: 90704

Temperature (ASTM cal): 70.10 (°F)

| Thermocouple | 100 (°F) |         | 600 (°F) |         | 1200 (°F) |         |
|--------------|----------|---------|----------|---------|-----------|---------|
|              | Reading  | % Error | Reading  | % Error | Reading   | % Error |
| Stack        | 99.00    | 0.50    | 600.00   | 0.00    | 1202.00   | 0.17    |
| Probe        | 99.00    | 0.50    | 600.00   | 0.00    | 1202.00   | 0.17    |
| Filter       | 99.00    | 0.50    | 600.00   | 0.00    | 1202.00   | 0.17    |
| Dryer        | 98.00    | 1.00    | 600.00   | 0.00    | 1202.00   | 0.17    |
| Aux.         | 98.00    | 1.00    | 600.00   | 0.00    | 1202.00   | 0.17    |

Note: Calibrated against an ALTEK Thermocouple Source Series 22, direct temperature output calibrated to ASTM and IPTS standards as outlined in ALTEK Data Sheet 22.

| Thermocouple | 70.10 (°F) |       |
|--------------|------------|-------|
|              | Reading    | (±°F) |
| DGM In       | 70.0       | 0.10  |
| DGM Out      | 69.0       | 1.10  |

Note: Calibrated against ASTM Reference Thermometer.

SIGNATURE: \_\_\_\_\_

*Craig M. Carthy*

DATE: 05/14/15 05/14/15

#### Standard for Calibration of Console Thermocouple Systems

40 CFR, Part 60

Appendix A, Method 5

10.3.2 The temperature data recorded in the field shall be considered valid. If, during calibration, the absolute temperature measured with the sensor being calibrated and the reference sensor **agree within 1.5 percent**, the temperature data taken in the field shall be considered valid.

#### Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

**PROBE (STACK), HOTBOX (FILTER), AND GOOSENECK (EXIT) THERMOCOUPLE CALIBRATION SHEET**

**EPA Reference Method**

**Metering System Pre-Test Calibration**

**Air Hygiene Asset ID(s):**

**Probe:** samp-hp-0033

**Hotbox:** samp-bh-0011

**Gooseneck:** samp-ad-0032

Filename: Z:\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current[SAMP-CP-0007 Calibration 5-14-15.xls]Original (5 point)

Barometric Pressure: 29.46

| Thermo-couples | Temps |       | Signature            | Date            |          |
|----------------|-------|-------|----------------------|-----------------|----------|
|                |       | (°F)  |                      |                 |          |
| Stack          | Ref   | 70.10 | <i>Craig McCarty</i> | <i>05/14/15</i> | 05/14/15 |
|                | Read  | 69.00 |                      |                 |          |
|                | ±°F   | 1.10  |                      |                 |          |
| Filter         | Ref   | 70.10 | <i>Craig McCarty</i> | <i>05/14/15</i> | 05/14/15 |
|                | Read  | 70.00 |                      |                 |          |
|                | ±°F   | 0.10  |                      |                 |          |
| Exit           | Ref   | 70.10 | <i>Craig McCarty</i> | <i>05/14/15</i> | 05/14/15 |
|                | Read  | 69.00 |                      |                 |          |
|                | ±°F   | 1.10  |                      |                 |          |

Note: Calibrated against ASTM Reference Thermometer.

Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

# METERING SYSTEM DRY GAS METER CALIBRATION SHEET

## EPA Reference Method

### Metering System Post-Test Calibration

Air Hygiene Asset ID: samp-cp-0007

Filename: Z:\Shared\QAQC\Calibrations\PM-Equipment\IM-5 Consoles\Calibration Sheet v4.1\Current[SAMP-CP-0007 Calibration 5-14-15.xls]9-14-15 (3 point)

Make: Thermo Environmental

Date: 09/14/15

Model #: MST-C1

Barometric Pressure: 29.40 (in. Hg)

Serial #: 90704

Theoretical Critical Vacuum: 13.87 (in. Hg)

#### DRY GAS METER READINGS

| $\Delta H$<br>(in. H <sub>2</sub> O) | Time<br>(min) | Volume                        |                             |                             | Initial Temperature |                |
|--------------------------------------|---------------|-------------------------------|-----------------------------|-----------------------------|---------------------|----------------|
|                                      |               | Initial<br>(ft <sup>3</sup> ) | Final<br>(ft <sup>3</sup> ) | Total<br>(ft <sup>3</sup> ) | Inlet<br>(°F)       | Outlet<br>(°F) |
| 1.80                                 | 10.00         | 544.850                       | 552.810                     | 7.960                       | 74.0                | 67.0           |
| 1.80                                 | 10.00         | 552.810                       | 560.770                     | 7.960                       | 76.0                | 68.0           |
| 1.80                                 | 10.00         | 560.770                       | 568.760                     | 7.990                       | 77.0                | 69.0           |

| Final Temperature |                | Orifice<br>Serial#<br>(number) | K' Orifice<br>Coefficient<br>(see above) | Actual<br>Vacuum<br>(in. Hg) | Ambient Temperature |               |                 |
|-------------------|----------------|--------------------------------|------------------------------------------|------------------------------|---------------------|---------------|-----------------|
| Inlet<br>(°F)     | Outlet<br>(°F) |                                |                                          |                              | Initial<br>(°F)     | Final<br>(°F) | Average<br>(°F) |
| 76.0              | 67.0           | 63                             | 0.6061                                   | 16.0                         | 67.2                | 67.6          | 67.4            |
| 77.0              | 68.0           | 63                             | 0.6061                                   | 16.0                         | 67.6                | 68.0          | 67.8            |
| 77.0              | 69.0           | 63                             | 0.6061                                   | 16.0                         | 68.0                | 68.3          | 68.2            |

#### RESULTS

| DRY GAS METER                                        |                                            | ORIFICE                                               |                                             |                                                |
|------------------------------------------------------|--------------------------------------------|-------------------------------------------------------|---------------------------------------------|------------------------------------------------|
| VOLUME<br>CORRECTED<br>Vm(std)<br>(ft <sup>3</sup> ) | VOLUME<br>CORRECTED<br>Vm(std)<br>(liters) | VOLUME<br>CORRECTED<br>Vcr(std)<br>(ft <sup>3</sup> ) | VOLUME<br>CORRECTED<br>Vcr(std)<br>(liters) | VOLUME<br>NOMINAL<br>Vcr<br>(ft <sup>3</sup> ) |
| 7.809                                                | 221.16                                     | 7.759                                                 | 219.7                                       | 7.891                                          |
| 7.791                                                | 220.64                                     | 7.756                                                 | 219.7                                       | 7.894                                          |
| 7.809                                                | 221.16                                     | 7.754                                                 | 219.6                                       | 7.896                                          |

| DRY GAS METER<br>CALIBRATION FACTOR<br>Y |                   | ORIFICE<br>CALIBRATION FACTOR<br>$\Delta H@$ |                                |                                     |
|------------------------------------------|-------------------|----------------------------------------------|--------------------------------|-------------------------------------|
| Variation<br>(number)                    | Value<br>(number) | Value<br>(in. H <sub>2</sub> O)              | Value<br>(mm H <sub>2</sub> O) | Variation<br>(in. H <sub>2</sub> O) |
| 0.000                                    | 0.994             | 1.656                                        | 42.05                          | 0.002                               |
| 0.002                                    | 0.996             | 1.654                                        | 42.00                          | 0.000                               |
| -0.001                                   | 0.993             | 1.652                                        | 41.95                          | -0.002                              |
| <b>AVERAGE:</b>                          | <b>0.994</b>      | <b>1.654</b>                                 | <b>42.00</b>                   | <b>PASSED</b>                       |

|                   |              |              |               |            |
|-------------------|--------------|--------------|---------------|------------|
| <b>LAST 5-PT:</b> | <b>0.980</b> | <b>1.656</b> | <b>PASSED</b> | 5-PT Date: |
| <b>% DIFF:</b>    | <b>1.4%</b>  | <b>0.1%</b>  |               | 05/14/15   |

#### 40 CFR - CHAPTER I - PART 60

##### Appendix A, Method 5

##### 10.3.2 Calibration After Use

After each field use, the calibration of the metering system shall be checked by performing three calibration runs at a single, intermediate orifice setting (based on the previous field test)...Calculate the average value of the DGM calibration factor. If the value has changed by more than 5 percent, recalibrate the meter over the full range of orifice settings, as detailed in Section 10.3.1.

##### 10.3.3 Acceptable Variation in Calibration

If the DGM coefficient values obtained before and after a test series differ by more than 5 percent, the test series shall either be voided, or calculations for the test series shall be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

Notes: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is +/- 0.02. For Orifice Calibration Factor  $\Delta H@$ , the orifice differential pressure in inches of H<sub>2</sub>O that equates to 0.75 cfm of air at 68 °F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/- 0.2. For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above. The Critical Orifice Coefficient, K', must be entered in English units, (ft)<sup>3</sup>\*(deg R)<sup>0.5</sup>/((in.Hg)\*(min)).

SIGNATURE:

*Craig McCarty*

DATE: 09/14/15 09/14/15

# METERING SYSTEM THERMOCOUPLE CALIBRATION SHEET

EPA Reference Method

Metering System Post-Test Calibration

Air Hygiene Asset ID: samp-cp-0007

Filename: Z:\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current\{SAMP-CP-0007 Calibration 5-14-15.xls}9-14-15 (3 point)

Make: Thermo Environmental

Date: 09/14/15

Model #: MST-C1

Barometric Pressure: 29.40 (in. Hg)

Serial #: 90704

Temperature (ASTM cal): 66.20 (°F)

| Thermocouple | 100 (°F) |         | 600 (°F) |         | 1200 (°F) |         |
|--------------|----------|---------|----------|---------|-----------|---------|
|              | Reading  | % Error | Reading  | % Error | Reading   | % Error |
| Stack        | 100.00   | 0.00    | 601.00   | 0.17    | 1204.00   | 0.33    |
| Probe        | 100.00   | 0.00    | 601.00   | 0.17    | 1204.00   | 0.33    |
| Filter       | 100.00   | 0.00    | 601.00   | 0.17    | 1204.00   | 0.33    |
| Dryer        | 100.00   | 0.00    | 601.00   | 0.17    | 1204.00   | 0.33    |
| Aux.         | 100.00   | 0.00    | 601.00   | 0.17    | 1204.00   | 0.33    |

Note: Calibrated against an ALTEK Thermocouple Source Series 22, direct temperature output calibrated to ASTM and IPTS standards as outlined in ALTEK Data Sheet 22.

| Thermocouple | 66.20 (°F) |       |
|--------------|------------|-------|
|              | Reading    | (±°F) |
| DGM In       | 66.0       | 0.20  |
| DGM Out      | 65.0       | 1.20  |

Note: Calibrated against ASTM Reference Thermometer.

SIGNATURE: \_\_\_\_\_

*Craig M. Carthy*

DATE: 09/14/15 09/14/15

## Standard for Calibration of Console Thermocouple Systems

40 CFR, Part 60

Appendix A, Method 5

10.3.2 The temperature data recorded in the field shall be considered valid. If, during calibration, the absolute temperature measured with the sensor being calibrated and the reference sensor **agree within 1.5 percent**, the temperature data taken in the field shall be considered valid.

## Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

# PROBE (STACK), HOTBOX (FILTER), AND GOOSENECK (EXIT) THERMOCOUPLE CALIBRATION SHEET

EPA Reference Method

Metering System Post-Test Calibration

Air Hygiene Asset ID(s):

Probe: samp-hp-0033

Hotbox: samp-bh-0012

Gooseneck: samp-ad-0028

Filename: Z:\Shared\QAQC\Calibrations\PM-Equipment\M-5 Consoles\Calibration Sheet v4.1\Current[SAMP-CP-0007 Calibration 5-14-15.xls]9-14-15 (3 point)

Barometric Pressure: 29.40

| Thermo-couples |      | Temps | Signature            | Date            |          |
|----------------|------|-------|----------------------|-----------------|----------|
|                |      | (°F)  |                      |                 |          |
| Stack          | Ref  | 66.20 | <i>Craig McCarty</i> | <i>09/14/15</i> | 09/14/15 |
|                | Read | 66.00 |                      |                 |          |
|                | ±°F  | 0.20  |                      |                 |          |
| Filter         | Ref  | 66.20 | <i>Craig McCarty</i> | <i>09/14/15</i> | 09/14/15 |
|                | Read | 66.00 |                      |                 |          |
|                | ±°F  | 0.20  |                      |                 |          |
| Exit           | Ref  | 66.20 | <i>Craig McCarty</i> | <i>09/14/15</i> | 09/14/15 |
|                | Read | 66.00 |                      |                 |          |
|                | ±°F  | 0.20  |                      |                 |          |

Note: Calibrated against ASTM Reference Thermometer.

Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.





GE Oil & Gas  
Dresser Inc.  
16240 Port Northwest Drive, Suite 100  
Houston, TX 77041  
USA  
T +1 800 521 1114 +1 832 590 2303  
F +1 800 335 5224 +1 832 590 2494

#### Customer Information

Name : KOONS GAS MEASUREMENT (GAS)  
PO No. : 2539  
Badge No. : NONE

Date Printed : 05 13 2014  
Bill of Material 055223-014  
Model : 16M175  
Serial No. : 1421486  
Accessory S/N UC312082  
Sales Order No. 203937-6  
Spec. Req. Na.  
Prover Used : 1200 cu. ft.  
WME :

#### Unit Description

16M175 SERIES B3 ROOTS METER,  
COUNTER VERSION

| MIN STATIC<br>TEST PRESSURE | MIN LEAK<br>TEST PRESSURE | MAX ALLOWABLE<br>OPER PRESSURE | TC Acc at<br>(deg F) | Accuracy | Proof | % Error |
|-----------------------------|---------------------------|--------------------------------|----------------------|----------|-------|---------|
| 350 psig                    | 219 psig                  | 175 psig                       |                      |          |       |         |

This meter has been tested and successfully passed a Shell Pressure Test and Leak Test at the above conditions.

#### PROVER TEST DATA

| Test Point | Flow Rate<br>Dis Vol | % Rated<br>Capacity | Meter<br>Accuracy | ERROR<br>+/- % | Diff<br>Pressure | TC Meter<br>Accuracy | TC Meter<br>Proof % | ERROR<br>+/- % |
|------------|----------------------|---------------------|-------------------|----------------|------------------|----------------------|---------------------|----------------|
| 1          | 15700.6              | 98.1                | 100.57            | 0.57           | 1.91             |                      |                     |                |
| 2          | 1604.8               | 10.0                | 99.95             | -0.05          | 0.04             |                      |                     |                |

Above data has been determined from tests performed with air at atmospheric pressure and ambient temperature, using positive displacement bell or piston provers dimensionally traceable to the United States National Institute of Standards and Technology (NIST) and traceable to NMI- Netherlands Measurement Institute for volumetric flow rate.

TC Instrument accuracy has been determined from test performed in liquid baths at the temperatures shown above using calibrated measurement instruments whose accuracy is traceable to NIST. TC Meter Accuracy (TC Meter Proof) of both meter and instrument in conjunction is calculated using TC accuracy (TC proof) at 60 degree F.

NMI accredited laboratory no: CE-085

This meter conforms to purchaser specifications.

Test date 13-May-14 by RIOS, JOEL



## Volume Certification

### Instrument

Type: IMC/W2  
Firmware: 1.95  
Serial Number: 03/15/145927 (Manuf.) 1502035097 (Inst.)  
Meter S/N: 1515512

### Configuration

Meter Type: Series B, Imperial  
Meter Size: 2M  
Pulse Outputs: Single

### Test Conditions

Test Date: 05-04-2015 Time: 15:06  
Fixture: E-0111  
Temperature: 70.3 F.  
Line Pressure: 0.06 psi G PASS  
Battery: 5.68 Volts PASS  
Flow Rate: 2000 cfh  
Test Volume: 70.0 cu.ft. (uncorrected)  
Correction Factor: 0.96417

### Results:

**PASS**

#### VOLUME (CU.FT.)

|              | <u>Uncorrected</u> | <u>Corrected</u> |
|--------------|--------------------|------------------|
| Initial:     | 0.0000             | 0.0000           |
| Final:       | 70.0050            | 67.4578          |
| Accumulated: | 70.0050            | 67.4578          |
| Calculated:  | 70.0000            | 67.4920          |
| Error:       | 0.01 %             | -0.05 %          |

|               | <u>HF (Unc.)</u> | <u>Corrected (Prove)</u> |
|---------------|------------------|--------------------------|
| Comms Pulses: | PASS             | PASS                     |

#### PULSE OUTPUTS

|                       | <u>Uncorrected</u> | <u>Corrected</u> | <u>Fault</u> |
|-----------------------|--------------------|------------------|--------------|
| Multiplier:           | 1.0                | 1.0              | -            |
| Expected ( $\pm 1$ ): | 70                 | 67               | -            |
| Received (Ch.A):      | 70                 | 67               | -            |
| Error:                | 0                  | 0                | -            |
| Min. Width (msec):    | 124.83             | 124.83           | 499.86       |
| Result:               | PASS               | PASS             | PASS         |

This test performs a check of the configuration, volume input, and pulse outputs of the instrument. The volume input is driven at a precise flow rate for a precise number of revolutions. The test is performed at ambient temperature and pressure.

Operator: JD



Dresser Roots Meters  
and Instruments  
Dresser, Inc.  
16240 Port Northwest  
Houston, TX 77041  
Tel: 832-590-2300

## Calibration Certificate

Corrector Serial No. 03/15/145907  
Transducer Serial No. 50587-048  
PCB Serial No. 666032305

Transducer: 12bar G  
Date: 13/03/2015

### Test Equipment

Envio. Chamber: LE0061  
Druck 1: 51501570

PRT Simulator: RIG\_C  
Druck 2: 0624/98-02

### Calibration Points

Temperatures: 60.00°C, 35.00°C, 10.00°C, -15.00°C, -40.00°C  
Pressures: 0.000bar, 3.000bar, 6.000bar, 9.000bar, 12.000bar

### Pressure Checks

| Applied Pressure | Ambient @60.0°C |             | Ambient @35.0°C |             | Ambient @10.0°C |             | Ambient @-15.0°C |             | Ambient @-40.0°C |             |
|------------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|------------------|-------------|------------------|-------------|
|                  | PTZ Reading     | Deviation % | PTZ Reading     | Deviation % | PTZ Reading     | Deviation % | PTZ Reading      | Deviation % | PTZ Reading      | Deviation % |
| 0.000Bar         | 0.000           | 0.000       | 0.000           | 0.000       | 0.000           | 0.000       | 0.000            | 0.000       | 0.000            | 0.000       |
| 3.000Bar         | 2.995           | -0.042      | 2.998           | -0.020      | 3.001           | 0.005       | 3.000            | 0.002       | 3.001            | 0.007       |
| 6.000Bar         | 5.985           | -0.128      | 5.993           | -0.061      | 6.000           | 0.001       | 6.001            | 0.006       | 6.000            | 0.002       |
| 9.000Bar         | 8.973           | -0.228      | 8.987           | -0.108      | 8.993           | -0.056      | 8.996            | -0.032      | 9.001            | 0.011       |
| 12.000Bar        | 11.955          | -0.376      | 11.968          | -0.267      | 11.979          | -0.175      | 11.986           | -0.118      | 12.001           | 0.010       |

Errors are shown as %RDG at or above 20% of range, otherwise errors are displayed as %FS

### Temperature Checks

| Nominal Temperature | Ambient @60°C |          | Ambient @35°C |          | Ambient @10°C |          | Ambient @-15°C |          | Ambient @-40°C |          |
|---------------------|---------------|----------|---------------|----------|---------------|----------|----------------|----------|----------------|----------|
|                     | PTZ Reading   | Diff. °C | PTZ Reading   | Diff. °C | PTZ Reading   | Diff. °C | PTZ Reading    | Diff. °C | PTZ Reading    | Diff. °C |
| -40.0°C             | -40.01        | -0.01    | -39.99        | 0.01     | -39.97        | 0.03     | -40.02         | -0.02    | -39.99         | 0.01     |
| 10.0°C              | 10.01         | 0.01     | 10.03         | 0.03     | 10.07         | 0.07     | 9.98           | -0.02    | 10.03          | 0.03     |
| 60.0°C              | 60.01         | 0.01     | 60.06         | 0.06     | 60.06         | 0.06     | 60.01          | 0.01     | 60.05          | 0.05     |

Note 1: Accuracy limits of the Micro Series Corrector readings are better than 0.7% of reading for 20% to 100% pressure range over the full temperature range of -40.0°C to 60.0°C (-40.0°F to 140.0°F).

Note 2: All pressure Measurements used in the calibration and check procedures have certificates issued in accordance with the conditions of accreditation granted by the National Measurement Accreditation Service. NMAS has assessed the measuring capability of the laboratory issuing the certificate and its traceability to British national standards and to the units of measurement realised at the corresponding laboratory (National Physical Laboratory).

Certified By

M. Burnett

Date

3-17-15



## Volume Certification

### Instrument

Type: IMC/W2  
Firmware: 1.95  
Serial Number: 03/15/145927

### Configuration

Meter Type: Series B, Imperial  
Meter Size: 3M  
Pulse Outputs: Single

### Test Conditions

Test Date: 03-16-2015 Time: 17:24:59  
Fixture: 11  
Temperature: 73.3 °F.  
Line Pressure: 0.04 psi G PASS  
Battery: 6.04 Volts PASS  
Flow Rate: 3000 cfh  
Test Volume: 100.0 cu.ft. (uncorrected)  
Correction Factor: 0.97812

### Results:

**PASS**

#### VOLUME (CU.FT.)

|              | <u>Uncorrected</u> | <u>Corrected</u> |
|--------------|--------------------|------------------|
| Initial:     | 0.0063             | 0.0061           |
| Final:       | 100.0063           | 97.8179          |
| Accumulated: | 100.0000           | 97.8118          |
| Calculated:  | 100.0000           | 97.8119          |
| Error:       | 0.00 %             | -0.00 %          |

|               | <u>HF (Unc.)</u> | <u>Corrected (Prove)</u> |
|---------------|------------------|--------------------------|
| Comms Pulses: | PASS             | PASS                     |

#### PULSE OUTPUTS

|                    | <u>Uncorrected</u> | <u>Corrected</u> | <u>Fault</u> |
|--------------------|--------------------|------------------|--------------|
| Multiplier:        | 1.0                | 1.0              | -            |
| Expected (±1):     | 100                | 98               | -            |
| Received (Ch.A):   | 100                | 97               | -            |
| Error:             | 0                  | -1               | -            |
| Min. Width (msec): | 187.33             | 187.33           | 499.86       |
| Result:            | PASS               | PASS             | PASS         |

This test performs a check of the configuration, volume input, and pulse outputs of the instrument. The volume input is driven at a precise flow rate for a precise number of revolutions. The test is performed at ambient temperature and pressure.

Operator: DBJ

**APPENDIX E**

**FUEL ANALYSIS RECORDS**



## Olefins Final Shipping Product Purity Report

Car Number: TILX 303340

Product: Polymer Grade Propylene

Total Lbs: \_\_\_\_\_

Net Lbs: \_\_\_\_\_

|                          |                |                 |                   |
|--------------------------|----------------|-----------------|-------------------|
| Sample Date:             | 6/23/2015 2:40 | Woodland        |                   |
| Sample                   |                |                 |                   |
| Storage                  |                |                 |                   |
| Quantity                 |                | Measurement:    | Western Int'l     |
| Propylene                | 99.79          | mol %           | 99.5 min          |
| Propane                  | 0.206          | mol %           | 0.5 max           |
| Water                    | 0.01           | ppm wt.         | 5.0 max           |
| Methane                  | 1.49           | ppm mol         | 300.0 max         |
| Acetylene                | 0.00           | ppm mol         | 4.8 max           |
| Ethylene                 | 0.00           | ppm mol         | 25.0 max          |
| Ethane                   | 1.93           | ppm mol         | 450.0 max         |
| Methyl Acetylene         | 0.00           | ppm mol         | 4.0 max           |
| Propadiene               | 0.00           | ppm mol         | 4.0 max           |
| Butadiene                | 0.00           | ppm mol         | 7.8 max           |
| Carbonyl Sulfide         | 0.00           | ppb wt.         | 60.0 max          |
| Hydrogen Sulfide         | 0.08           | ppm wt.         | 0.5 max           |
| Methyl Mercaptan         | 0.01           | ppm wt.         | 0.5 max           |
| Ethyl Mercaptan          | 0.00           | ppm wt.         | 0.5 max           |
| t-Butyl Mercaptan        | 0.00           | ppm wt.         | 0.5 max           |
| <u>Total Sulphurs***</u> | <u>0.20</u>    | <u>ppm wtS.</u> | <u>0.5 max***</u> |
| Oxygenated Compounds     | 0.17           | ppm wt.         | 5.0 max           |
| Total Butenes            | 0.00           | ppm mol         | 7.5 max           |
| Oxygen                   | 2.07           | ppm wt.         | 4.0 max           |
| Carbon Monoxide          | 0.00           | ppm wt.         | 0.1 max           |
| Carbon Dioxide           | 0.10           | ppm wt.         | 1.0 max           |
| Arsine & Phosphine       | 0.00           | ppb wt.         | 20.0 max          |
| Ammonia                  | 0.00           | ppm wt.         | 1.0 max           |
| Iso Butane               | 0.00           | ppm mol         | 100.0 total C4    |
| N-Butane                 | 0.00           | ppm mol         | 100.0 total C4    |
| C5 & Heavier             | 0.00           | ppm mol         | 11.6 max          |
| Halides(as Chlorides)    | 0.00           | ppm wt.         | no spec max       |
| Hydrogen                 | 0.00           | ppm wt.         | 1.0 max           |

Analyst

NH

Ok Mark

\* Time based on 24hr Clock Mountain Standard Time

\*\*Report Based on Grab Sample Stream results on AIT5303 & AIT5405 on Shipping Date & Time

\*\*\* Total Sulfur is based on the on the following components: COS+H2S+MM+EM

IsoPropyl and Propyl Mercaptan+ Sulfides+ Di Sulfides (converted to weight sulfur)



---

2655 Park Center Dr., Suite A  
Simi Valley, CA 93065  
T: +1 805 526 7161  
F: +1 805 526 7270  
[www.alsglobal.com](http://www.alsglobal.com)

## LABORATORY REPORT

September 29, 2015

Min Lee  
Air Hygiene, Incorporated  
1600 West Tacoma Street  
Broken Arrow, OK 74012

**RE: LEED Fabrication EC48-25 / leed\_brighton.co-comp#1**

Dear Min:

Enclosed are the results of the samples submitted to our laboratory on September 9, 2015. For your reference, these analyses have been assigned our service request number P1503761.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.alsglobal.com](http://www.alsglobal.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**ALS | Environmental**

By Kelly Horiuchi at 4:09 pm, Sep 29, 2015

Kelly Horiuchi  
Laboratory Director



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Client: Air Hygiene, Incorporated  
Project: LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

Service Request No: P1503761

---

## CASE NARRATIVE

The samples were received intact under chain of custody on September 9, 2015 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

### Benzene Analysis

The samples were analyzed per ASTM D1945-03 for benzene using a gas chromatograph equipped with a flame ionization detector (FID). This procedure is described in laboratory SOP VOA-TO3C1C6. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

### BTU and CHONS Analysis

The results for BTU and CHONS were generated according to ASTM D 3588-98. The following analyses were performed and used to calculate the BTU and CHONS results. This method is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP scope of accreditation.

### C2 through C6 Hydrocarbon Analysis

The samples were analyzed according to modified EPA Method TO-3 for C2 through >C6 hydrocarbons using a gas chromatograph equipped with a flame ionization detector (FID). This method is included on the laboratory's DoD-ELAP scope of accreditation, however it is not part of the NELAP or AIHA-LAP accreditation.

### Fixed Gases Analysis

The samples were also analyzed for fixed gases (hydrogen, oxygen/argon, nitrogen, carbon monoxide, methane and carbon dioxide) according to modified EPA Method 3C (single injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This method is included on the laboratory's DoD-ELAP scope of accreditation, however it is not part of the NELAP or AIHA-LAP accreditation.





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Client: Air Hygiene, Incorporated  
Project: LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

Service Request No: P1503761

---

## CASE NARRATIVE

### Hydrogen Sulfide Analysis

The samples were also analyzed for hydrogen sulfide per modified SCAQMD Method 307-91 and ASTM D 5504-12 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). Method ASTM D 5504-12 is included on the laboratory's NELAP scope of accreditation, however it is not part of the DoD-ELAP or AIHA-LAP accreditation. Method SCAQMD 307-91 is not included on the laboratory's NELAP, DoD-ELAP, or AIHA-LAP accreditation.

---

*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.*

*Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.*



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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

| Agency                 | Web Site                                                                                                                                                                                                                        | Number                     |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| AIHA                   | <a href="http://www.aihaaccreditedlabs.org">http://www.aihaaccreditedlabs.org</a>                                                                                                                                               | 101661                     |
| Arizona DHS            | <a href="http://www.azdhs.gov/lab/license/env.htm">http://www.azdhs.gov/lab/license/env.htm</a>                                                                                                                                 | AZ0694                     |
| DoD ELAP               | <a href="http://www.pjlabs.com/search-accredited-labs">http://www.pjlabs.com/search-accredited-labs</a>                                                                                                                         | L14-2                      |
| Florida DOH (NELAP)    | <a href="http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm">http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm</a>                                                                                                   | E871020                    |
| Maine DHHS             | <a href="http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm">http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm</a>                           | 2014025                    |
| Minnesota DOH (NELAP)  | <a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>                                                                                                                           | 876241                     |
| New Jersey DEP (NELAP) | <a href="http://www.nj.gov/dep/oqa/">http://www.nj.gov/dep/oqa/</a>                                                                                                                                                             | CA009                      |
| New York DOH (NELAP)   | <a href="http://www.wadsworth.org/labcert/elap/elap.html">http://www.wadsworth.org/labcert/elap/elap.html</a>                                                                                                                   | 11221                      |
| Oregon PHD (NELAP)     | <a href="http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a> | 4068-001                   |
| Pennsylvania DEP       | <a href="http://www.depweb.state.pa.us/labs">http://www.depweb.state.pa.us/labs</a>                                                                                                                                             | 68-03307<br>(Registration) |
| Texas CEQ (NELAP)      | <a href="http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html</a>                                                                                       | T104704413-15-6            |
| Utah DOH (NELAP)       | <a href="http://www.health.utah.gov/lab/labimp/certification/index.html">http://www.health.utah.gov/lab/labimp/certification/index.html</a>                                                                                     | CA01627201<br>5-5          |
| Washington DOE         | <a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>                                                                                     | C946                       |

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at [www.alsglobal.com](http://www.alsglobal.com), or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.



Page \_\_\_\_\_ of \_\_\_\_\_

5 of 325

# ALS Environmental Sample Acceptance Check Form

Client: Air Hygiene, Incorporated

Work order: P1503761

Project: LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

Sample(s) received on: 9/9/15

Date opened: 9/9/15

by: KKELPE

**Note:** This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

|                                                                                                                  | Yes                                 | No                                  | N/A                                 |
|------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| 1 Were <b>sample containers</b> properly marked with client sample ID?                                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 2 Container(s) <b>supplied by ALS</b> ?                                                                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 3 Did <b>sample containers</b> arrive in good condition?                                                         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 4 Were <b>chain-of-custody</b> papers used and filled out?                                                       | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 5 Did <b>sample container labels</b> and/or tags agree with custody papers?                                      | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 6 Was <b>sample volume</b> received adequate for analysis?                                                       | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 7 Are samples within specified holding times?                                                                    | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| 8 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?                          | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 9 Was a <b>trip blank</b> received?                                                                              | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| 10 Were <b>custody seals</b> on outside of cooler/Box?                                                           | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?                                                                          | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?                                                                                | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?                                                                                               | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were custody seals on outside of sample container?                                                               | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Location of seal(s)? _____ Sealing Lid?                                                                          | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?                                                                                | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?                                                                                               | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 11 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information? | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Is there a client indication that the submitted samples are <b>pH</b> preserved?                                 | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were <b>VOA vials</b> checked for presence/absence of air bubbles?                                               | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?        | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 12 <b>Tubes:</b> Are the tubes capped and intact?                                                                | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Do they contain moisture?                                                                                        | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 13 <b>Badges:</b> Are the badges properly capped and intact?                                                     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Are dual bed badges separated and individually capped and intact?                                                | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

| Lab Sample ID   | Container Description | Required pH * | Received pH | Adjusted pH | VOA Headspace (Presence/Absence) | Receipt / Preservation Comments |
|-----------------|-----------------------|---------------|-------------|-------------|----------------------------------|---------------------------------|
| P1503761-001.01 | 6.0 L Silonite Can    |               |             |             |                                  |                                 |
| P1503761-002.01 | 6.0 L Silonite Can    |               |             |             |                                  |                                 |
| P1503761-003.01 | 6.0 L Silonite Can    |               |             |             |                                  |                                 |
| P1503761-004.01 | 6.0 L Silonite Can    |               |             |             |                                  |                                 |
| P1503761-005.01 | 6.0 L Silonite Can    |               |             |             |                                  |                                 |
| P1503761-006.01 | 6.0 L Silonite Can    |               |             |             |                                  |                                 |
| P1503761-007.01 | 6.0 L Silonite Can    |               |             |             |                                  |                                 |
| P1503761-008.01 | 6.0 L Silonite Can    |               |             |             |                                  |                                 |

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_  
 out of hold time for sulfur analysis \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# ALS ENVIRONMENTAL

## DETAIL SUMMARY REPORT

Client: Air Hygiene, Incorporated  
 Project ID: LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

Service Request: P1503761

Date Received: 9/9/2015  
 Time Received: 10:10

| Client Sample ID        | Lab Code     | Matrix | Date Collected | Time Collected | Container ID | Pi1 (psig) | Pf1 (psig) |                           |                             |                         |
|-------------------------|--------------|--------|----------------|----------------|--------------|------------|------------|---------------------------|-----------------------------|-------------------------|
|                         |              |        |                |                |              |            |            | TO-3 Modified - C1C6+ Can | 3C Modified - Fxd Gases Can | ASTM D5504-01 - H2S Can |
| LEED-90-100%-EC48CAN    | P1503761-001 | Air    | 8/26/2015      | 15:10          | SSC00222     | -1.80      | 5.20       | X                         | X                           | X                       |
| LEED-0-30-0%-EC48CAN    | P1503761-002 | Air    | 8/26/2015      | 20:10          | SSC00127     | -2.56      | 5.35       | X                         | X                           | X                       |
| LEED-30-70-30%-EC48CAN  | P1503761-003 | Air    | 8/27/2015      | 15:20          | SSC00194     | -2.10      | 5.24       | X                         | X                           | X                       |
| LEED-70-100-70%-EC48CAN | P1503761-004 | Air    | 8/27/2015      | 19:20          | SSC00161     | -2.47      | 5.04       | X                         | X                           | X                       |
| LEED-0-30-0%-EC36CAN    | P1503761-005 | Air    | 9/1/2015       | 18:40          | SSC00137     | -2.86      | 5.13       | X                         | X                           | X                       |
| LEED-30-70-30%-EC36CAN  | P1503761-006 | Air    | 9/2/2015       | 17:42          | SSC00099     | -2.51      | 5.39       | X                         | X                           | X                       |
| LEED-70-100-70%-EC36CAN | P1503761-007 | Air    | 9/2/2015       | 12:30          | SSC00151     | -2.34      | 5.26       | X                         | X                           | X                       |
| LEED-90-100%-EC36CAN    | P1503761-008 | Air    | 9/3/2015       | 12:19          | SSC00188     | -2.60      | 5.40       | X                         | X                           | X                       |

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated

**Client Sample ID:** LEED-0-30-0%-EC36CAN

**Client Project ID:** LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

ALS Project ID: P1503761

ALS Sample ID: P1503761-005

Test Code: ASTM D1945-03

Instrument ID: HP5890 II/GC8/FID

Analyst: Nalini Lall

Sampling Media: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00137

Date Collected: 9/1/15

Date Received: 9/9/15

Date Analyzed: 9/17/15

Volume(s) Analyzed: 0.050 ml(s)

Initial Pressure (psig): -2.86      Final Pressure (psig): 5.13

Canister Dilution Factor: 1.67

| Compound                     | Result<br>ppmV | MRL<br>ppmV | Data<br>Qualifier |
|------------------------------|----------------|-------------|-------------------|
| Methane                      | ND             | 17          |                   |
| C <sub>2</sub> as Ethane     | ND             | 17          |                   |
| C <sub>3</sub> as Propane    | 990,000        | 17          |                   |
| C <sub>4</sub> as n-Butane   | ND             | 17          |                   |
| C <sub>5</sub> as n-Pentane  | ND             | 17          |                   |
| C <sub>6</sub> as n-Hexane   | ND             | 17          |                   |
| C <sub>6</sub> + as n-Hexane | ND             | 33          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Air Hygiene, Incorporated

**Client Sample ID:** LEED-30-70-30-EC36CAN

**Client Project ID:** LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

ALS Project ID: P1503761

ALS Sample ID: P1503761-006

Test Code: ASTM D1945-03

Instrument ID: HP5890 II/GC8/FID

Analyst: Nalini Lall

Sampling Media: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00099

Date Collected: 9/2/15

Date Received: 9/9/15

Date Analyzed: 9/17/15

Volume(s) Analyzed: 0.050 ml(s)

Initial Pressure (psig): -2.51      Final Pressure (psig): 5.39

Canister Dilution Factor: 1.65

| Compound                     | Result<br>ppmV | MRL<br>ppmV | Data<br>Qualifier |
|------------------------------|----------------|-------------|-------------------|
| Methane                      | ND             | 17          |                   |
| C <sub>2</sub> as Ethane     | ND             | 17          |                   |
| C <sub>3</sub> as Propane    | 1,000,000      | 17          |                   |
| C <sub>4</sub> as n-Butane   | ND             | 17          |                   |
| C <sub>5</sub> as n-Pentane  | ND             | 17          |                   |
| C <sub>6</sub> as n-Hexane   | ND             | 17          |                   |
| C <sub>6</sub> + as n-Hexane | ND             | 33          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** LEED-70-100-70%-EC36CAN  
**Client Project ID:** LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

ALS Project ID: P1503761  
 ALS Sample ID: P1503761-007

**Test Code:** ASTM D1945-03  
**Instrument ID:** HP5890 II/GC8/FID  
**Analyst:** Nalini Lall  
**Sampling Media:** 6.0 L Silonite Canister  
**Test Notes:**  
**Container ID:** SSC00151

**Date Collected:** 9/2/15  
**Date Received:** 9/9/15  
**Date Analyzed:** 9/17/15  
**Volume(s) Analyzed:** 0.050 ml(s)

**Initial Pressure (psig):** -2.34      **Final Pressure (psig):** 5.26

**Canister Dilution Factor:** 1.61

| Compound                     | Result<br>ppmV | MRL<br>ppmV | Data<br>Qualifier |
|------------------------------|----------------|-------------|-------------------|
| Methane                      | ND             | 16          |                   |
| C <sub>2</sub> as Ethane     | ND             | 16          |                   |
| C <sub>3</sub> as Propane    | 1,000,000      | 16          |                   |
| C <sub>4</sub> as n-Butane   | ND             | 16          |                   |
| C <sub>5</sub> as n-Pentane  | ND             | 16          |                   |
| C <sub>6</sub> as n-Hexane   | ND             | 16          |                   |
| C <sub>6</sub> + as n-Hexane | ND             | 32          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated

**Client Sample ID:** LEED-90-100%-EC36CAN

**Client Project ID:** LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

ALS Project ID: P1503761

ALS Sample ID: P1503761-008

Test Code: ASTM D1945-03

Instrument ID: HP5890 II/GC8/FID

Analyst: Nalini Lall

Sampling Media: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00188

Date Collected: 9/3/15

Date Received: 9/9/15

Date Analyzed: 9/17/15

Volume(s) Analyzed: 0.050 ml(s)

Initial Pressure (psig): -2.60      Final Pressure (psig): 5.40

Canister Dilution Factor: 1.66

| Compound                     | Result<br>ppmV | MRL<br>ppmV | Data<br>Qualifier |
|------------------------------|----------------|-------------|-------------------|
| Methane                      | ND             | 17          |                   |
| C <sub>2</sub> as Ethane     | ND             | 17          |                   |
| C <sub>3</sub> as Propane    | 1,000,000      | 17          |                   |
| C <sub>4</sub> as n-Butane   | ND             | 17          |                   |
| C <sub>5</sub> as n-Pentane  | ND             | 17          |                   |
| C <sub>6</sub> as n-Hexane   | ND             | 17          |                   |
| C <sub>6</sub> + as n-Hexane | ND             | 33          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated

**Client Sample ID:** Method Blank

**Client Project ID:** LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

ALS Project ID: P1503761

ALS Sample ID: P150917-MB

**Test Code:** ASTM D1945-03

**Instrument ID:** HP5890 II/GC8/FID

**Analyst:** Nalini Lall

**Sampling Media:** 6.0 L Silonite Canister

**Test Notes:**

Date Collected: NA

Date Received: NA

Date Analyzed: 9/17/15

Volume(s) Analyzed: 1.0 ml(s)

| Compound                     | Result<br>ppmV | MRL<br>ppmV | Data<br>Qualifier |
|------------------------------|----------------|-------------|-------------------|
| Methane                      | ND             | 0.50        |                   |
| C <sub>2</sub> as Ethane     | ND             | 0.50        |                   |
| C <sub>3</sub> as Propane    | ND             | 0.50        |                   |
| C <sub>4</sub> as n-Butane   | ND             | 0.50        |                   |
| C <sub>5</sub> as n-Pentane  | ND             | 0.50        |                   |
| C <sub>6</sub> as n-Hexane   | ND             | 0.50        |                   |
| C <sub>6</sub> + as n-Hexane | ND             | 1.0         |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated

**Client Sample ID:** LEED-0-30-0%-EC36CAN

**Client Project ID:** LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

ALS Project ID: P1503761

ALS Sample ID: P1503761-005

Test Code: ASTM D1945-03

Instrument ID: HP5890 II/GC1/TCD

Analyst: Nalini Lall

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: 9/1/15

Date Received: 9/9/15

Date Analyzed: 9/17/15

Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -2.86

Final Pressure (psig): 5.13

Canister Dilution Factor: 1.67

| CAS #     | Compound        | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|-----------------|------------------|---------------|-------------------|
| 1333-74-0 | Hydrogen        | ND               | 0.17          |                   |
| 7782-44-7 | Oxygen +        |                  |               |                   |
| 7440-37-1 | Argon           | ND               | 0.17          |                   |
| 7727-37-9 | <b>Nitrogen</b> | <b>0.451</b>     | 0.17          |                   |
| 630-08-0  | Carbon Monoxide | ND               | 0.17          |                   |
| 74-82-8   | Methane         | ND               | 0.17          |                   |
| 124-38-9  | Carbon Dioxide  | ND               | 0.17          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated

**Client Sample ID:** LEED-30-70-30-EC36CAN

**Client Project ID:** LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

ALS Project ID: P1503761

ALS Sample ID: P1503761-006

Test Code: ASTM D1945-03

Instrument ID: HP5890 II/GC1/TCD

Analyst: Nalini Lall

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: 9/2/15

Date Received: 9/9/15

Date Analyzed: 9/17/15

Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -2.51

Final Pressure (psig): 5.39

Canister Dilution Factor: 1.65

| CAS #     | Compound        | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|-----------------|------------------|---------------|-------------------|
| 1333-74-0 | Hydrogen        | ND               | 0.17          |                   |
| 7782-44-7 | Oxygen +        |                  |               |                   |
| 7440-37-1 | Argon           | ND               | 0.17          |                   |
| 7727-37-9 | <b>Nitrogen</b> | <b>0.214</b>     | 0.17          |                   |
| 630-08-0  | Carbon Monoxide | ND               | 0.17          |                   |
| 74-82-8   | Methane         | ND               | 0.17          |                   |
| 124-38-9  | Carbon Dioxide  | ND               | 0.17          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated

**Client Sample ID:** LEED-70-100-70%-EC36CAN

**Client Project ID:** LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

ALS Project ID: P1503761

ALS Sample ID: P1503761-007

Test Code: ASTM D1945-03

Instrument ID: HP5890 II/GC1/TCD

Analyst: Nalini Lall

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: 9/2/15

Date Received: 9/9/15

Date Analyzed: 9/17/15

Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -2.34

Final Pressure (psig): 5.26

Canister Dilution Factor: 1.61

| CAS #     | Compound        | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|-----------------|------------------|---------------|-------------------|
| 1333-74-0 | Hydrogen        | ND               | 0.16          |                   |
| 7782-44-7 | Oxygen +        |                  |               |                   |
| 7440-37-1 | Argon           | ND               | 0.16          |                   |
| 7727-37-9 | <b>Nitrogen</b> | <b>0.312</b>     | 0.16          |                   |
| 630-08-0  | Carbon Monoxide | ND               | 0.16          |                   |
| 74-82-8   | Methane         | ND               | 0.16          |                   |
| 124-38-9  | Carbon Dioxide  | ND               | 0.16          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated

**Client Sample ID:** LEED-90-100%-EC36CAN

**Client Project ID:** LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

ALS Project ID: P1503761

ALS Sample ID: P1503761-008

**Test Code:** ASTM D1945-03

**Instrument ID:** HP5890 II/GC1/TCD

**Analyst:** Nalini Lall

**Sample Type:** 6.0 L Silonite Canister

**Test Notes:**

Date Collected: 9/3/15

Date Received: 9/9/15

Date Analyzed: 9/17/15

Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -2.60

Final Pressure (psig): 5.40

Canister Dilution Factor: 1.66

| CAS #     | Compound        | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|-----------------|------------------|---------------|-------------------|
| 1333-74-0 | Hydrogen        | ND               | 0.17          |                   |
| 7782-44-7 | Oxygen +        |                  |               |                   |
| 7440-37-1 | Argon           | ND               | 0.17          |                   |
| 7727-37-9 | <b>Nitrogen</b> | <b>0.321</b>     | 0.17          |                   |
| 630-08-0  | Carbon Monoxide | ND               | 0.17          |                   |
| 74-82-8   | Methane         | ND               | 0.17          |                   |
| 124-38-9  | Carbon Dioxide  | ND               | 0.17          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** Air Hygiene, Incorporated

**Client Sample ID:** Lab Control Sample

**Client Project ID:** LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

ALS Project ID: P1503761

ALS Sample ID: P150917-LCS

Test Code: ASTM D1945-03

Instrument ID: HP5890 II/GC1/TCD

Analyst: Nalini Lall

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 9/17/15

Volume(s) Analyzed: NA ml(s)

| CAS #     | Compound        | Spike Amount<br>ppmV | Result<br>ppmV | % Recovery | ALS<br>Acceptance<br>Limits | Data<br>Qualifier |
|-----------|-----------------|----------------------|----------------|------------|-----------------------------|-------------------|
| 1333-74-0 | Hydrogen        | 40,000               | 43,100         | 108        | 83-114                      |                   |
| 7782-44-7 | Oxygen +        |                      |                |            |                             |                   |
| 7440-37-1 | Argon           | 50,000               | 55,100         | 110        | 84-121                      |                   |
| 7727-37-9 | Nitrogen        | 50,000               | 53,600         | 107        | 88-122                      |                   |
| 630-08-0  | Carbon Monoxide | 50,000               | 55,300         | 111        | 87-118                      |                   |
| 74-82-8   | Methane         | 40,000               | 43,700         | 109        | 85-116                      |                   |
| 124-38-9  | Carbon Dioxide  | 50,000               | 53,700         | 107        | 84-117                      |                   |

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated

**Client Sample ID:** LEED-0-30-0%-EC36CAN

**Client Project ID:** LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

ALS Project ID: P1503761

ALS Sample ID: P1503761-005

Test Code: ASTM D3588-98

Analyst: Mike Conejo/Nalini Lall

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00137

Date Collected: 9/1/15

Date Received: 9/9/15

Initial Pressure (psig): -2.86

Final Pressure (psig): 5.13

Canister Dilution Factor: 1.67

| Components       | Result<br>Volume % | Result<br>Weight % | Data<br>Qualifier |
|------------------|--------------------|--------------------|-------------------|
| Hydrogen         | < 0.01             | < 0.01             |                   |
| Oxygen + Argon   | 0.12               | 0.09               |                   |
| Nitrogen         | 0.45               | 0.29               |                   |
| Carbon Monoxide  | < 0.01             | < 0.01             |                   |
| Methane          | < 0.01             | < 0.01             |                   |
| Carbon Dioxide   | < 0.01             | < 0.01             |                   |
| Hydrogen Sulfide | < 0.01             | < 0.01             |                   |
| C2 as Ethane     | < 0.01             | < 0.01             |                   |
| C3 as Propane    | 99.42              | 99.62              |                   |
| C4 as n-Butane   | < 0.01             | < 0.01             |                   |
| C5 as n-Pentane  | < 0.01             | < 0.01             |                   |
| C6 as n-Hexane   | < 0.01             | < 0.01             |                   |
| > C6 as n-Hexane | < 0.01             | < 0.01             |                   |
| <b>TOTALS</b>    | <b>99.99</b>       | <b>99.99</b>       |                   |

| Components     | Mole % | Weight % |
|----------------|--------|----------|
| Carbon         | 27.24  | 81.41    |
| Hydrogen       | 72.65  | 18.22    |
| Oxygen + Argon | < 0.10 | < 0.10   |
| Nitrogen       | < 0.10 | 0.29     |
| Sulfur         | < 0.10 | < 0.10   |

|                                                       |         |          |
|-------------------------------------------------------|---------|----------|
| Specific Gravity (Air = 1)                            |         | 1.5194   |
| Specific Volume                                       | ft3/lb  | 8.62     |
| Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)     | BTU/ft3 | 2,545.3  |
| Net Heating Value (Dry Gas @ 60 F, 14.696 psia)       | BTU/ft3 | 2,341.8  |
| Gross Heating Value (Water Saturated at 0.25636 psia) | BTU/ft3 | 2,457.9  |
| Net Heating Value (Water Saturated at 0.25636 psia)   | BTU/ft3 | 2,261.3  |
| Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)     | BTU/lb  | 21,949.1 |
| Net Heating Value (Dry Gas @ 60 F, 14.696 psia)       | BTU/lb  | 20,194.0 |
| Compressibility Factor "Z" (60 F, 14.696 psia)        |         | 0.9828   |



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated

**Client Sample ID:** LEED-30-70-30-EC36CAN

**Client Project ID:** LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

ALS Project ID: P1503761

ALS Sample ID: P1503761-006

Test Code: ASTM D3588-98

Analyst: Mike Conejo/Nalini Lall

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00099

Date Collected: 9/2/15

Date Received: 9/9/15

Initial Pressure (psig): -2.51

Final Pressure (psig): 5.39

Canister Dilution Factor: 1.65

| Components       | Result<br>Volume % | Result<br>Weight % | Data<br>Qualifier |
|------------------|--------------------|--------------------|-------------------|
| Hydrogen         | < 0.01             | < 0.01             |                   |
| Oxygen + Argon   | 0.05               | 0.03               |                   |
| Nitrogen         | 0.21               | 0.14               |                   |
| Carbon Monoxide  | < 0.01             | < 0.01             |                   |
| Methane          | < 0.01             | < 0.01             |                   |
| Carbon Dioxide   | < 0.01             | < 0.01             |                   |
| Hydrogen Sulfide | < 0.01             | < 0.01             |                   |
| C2 as Ethane     | < 0.01             | < 0.01             |                   |
| C3 as Propane    | 99.73              | 99.82              |                   |
| C4 as n-Butane   | < 0.01             | < 0.01             |                   |
| C5 as n-Pentane  | < 0.01             | < 0.01             |                   |
| C6 as n-Hexane   | < 0.01             | < 0.01             |                   |
| > C6 as n-Hexane | < 0.01             | < 0.01             |                   |
| <b>TOTALS</b>    | <b>99.99</b>       | <b>99.99</b>       |                   |

| Components     | Mole % | Weight % |
|----------------|--------|----------|
| Carbon         | 27.26  | 81.58    |
| Hydrogen       | 72.69  | 18.25    |
| Oxygen + Argon | < 0.10 | < 0.10   |
| Nitrogen       | < 0.10 | 0.14     |
| Sulfur         | < 0.10 | < 0.10   |

|                                                       |         |          |
|-------------------------------------------------------|---------|----------|
| Specific Gravity (Air = 1)                            |         | 1.5211   |
| Specific Volume                                       | ft3/lb  | 8.61     |
| Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)     | BTU/ft3 | 2,553.5  |
| Net Heating Value (Dry Gas @ 60 F, 14.696 psia)       | BTU/ft3 | 2,349.3  |
| Gross Heating Value (Water Saturated at 0.25636 psia) | BTU/ft3 | 2,465.5  |
| Net Heating Value (Water Saturated at 0.25636 psia)   | BTU/ft3 | 2,268.4  |
| Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)     | BTU/lb  | 21,996.0 |
| Net Heating Value (Dry Gas @ 60 F, 14.696 psia)       | BTU/lb  | 20,237.1 |
| Compressibility Factor "Z" (60 F, 14.696 psia)        |         | 0.9827   |

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated

**Client Sample ID:** LEED-70-100-70%-EC36CAN

**Client Project ID:** LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

ALS Project ID: P1503761

ALS Sample ID: P1503761-007

Test Code: ASTM D3588-98

Analyst: Mike Conejo/Nalini Lall

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00151

Date Collected: 9/2/15

Date Received: 9/9/15

Initial Pressure (psig): -2.34

Final Pressure (psig): 5.26

Canister Dilution Factor: 1.61

| Components       | Result<br>Volume % | Result<br>Weight % | Data<br>Qualifier |
|------------------|--------------------|--------------------|-------------------|
| Hydrogen         | < 0.01             | < 0.01             |                   |
| Oxygen + Argon   | <b>0.08</b>        | <b>0.06</b>        |                   |
| Nitrogen         | <b>0.31</b>        | <b>0.20</b>        |                   |
| Carbon Monoxide  | < 0.01             | < 0.01             |                   |
| Methane          | < 0.01             | < 0.01             |                   |
| Carbon Dioxide   | < 0.01             | < 0.01             |                   |
| Hydrogen Sulfide | < 0.01             | < 0.01             |                   |
| C2 as Ethane     | < 0.01             | < 0.01             |                   |
| C3 as Propane    | <b>99.60</b>       | <b>99.73</b>       |                   |
| C4 as n-Butane   | < 0.01             | < 0.01             |                   |
| C5 as n-Pentane  | < 0.01             | < 0.01             |                   |
| C6 as n-Hexane   | < 0.01             | < 0.01             |                   |
| > C6 as n-Hexane | < 0.01             | < 0.01             |                   |
| <b>TOTALS</b>    | <b>99.99</b>       | <b>99.99</b>       |                   |

| Components     | Mole %       | Weight %     |
|----------------|--------------|--------------|
| Carbon         | <b>27.25</b> | <b>81.51</b> |
| Hydrogen       | <b>72.68</b> | <b>18.24</b> |
| Oxygen + Argon | < 0.10       | < 0.10       |
| Nitrogen       | < 0.10       | <b>0.20</b>  |
| Sulfur         | < 0.10       | < 0.10       |

|                                                       |         |                 |
|-------------------------------------------------------|---------|-----------------|
| Specific Gravity (Air = 1)                            |         | <b>1.5204</b>   |
| Specific Volume                                       | ft3/lb  | <b>8.62</b>     |
| Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)     | BTU/ft3 | <b>2,550.1</b>  |
| Net Heating Value (Dry Gas @ 60 F, 14.696 psia)       | BTU/ft3 | <b>2,346.2</b>  |
| Gross Heating Value (Water Saturated at 0.25636 psia) | BTU/ft3 | <b>2,462.5</b>  |
| Net Heating Value (Water Saturated at 0.25636 psia)   | BTU/ft3 | <b>2,265.6</b>  |
| Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)     | BTU/lb  | <b>21,976.6</b> |
| Net Heating Value (Dry Gas @ 60 F, 14.696 psia)       | BTU/lb  | <b>20,219.2</b> |
| Compressibility Factor "Z" (60 F, 14.696 psia)        |         | <b>0.9827</b>   |

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated

**Client Sample ID:** LEED-90-100%-EC36CAN

**Client Project ID:** LEED Fabrication EC48-25 / leed\_brighton.co-comp#1

ALS Project ID: P1503761

ALS Sample ID: P1503761-008

Test Code: ASTM D3588-98

Analyst: Mike Conejo/Nalini Lall

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00188

Date Collected: 9/3/15

Date Received: 9/9/15

Initial Pressure (psig): -2.60

Final Pressure (psig): 5.40

Canister Dilution Factor: 1.66

| Components       | Result<br>Volume % | Result<br>Weight % | Data<br>Qualifier |
|------------------|--------------------|--------------------|-------------------|
| Hydrogen         | < 0.01             | < 0.01             |                   |
| Oxygen + Argon   | 0.08               | 0.06               |                   |
| Nitrogen         | 0.32               | 0.20               |                   |
| Carbon Monoxide  | < 0.01             | < 0.01             |                   |
| Methane          | < 0.01             | < 0.01             |                   |
| Carbon Dioxide   | < 0.01             | < 0.01             |                   |
| Hydrogen Sulfide | < 0.01             | < 0.01             |                   |
| C2 as Ethane     | < 0.01             | < 0.01             |                   |
| C3 as Propane    | 99.59              | 99.73              |                   |
| C4 as n-Butane   | < 0.01             | < 0.01             |                   |
| C5 as n-Pentane  | < 0.01             | < 0.01             |                   |
| C6 as n-Hexane   | < 0.01             | < 0.01             |                   |
| > C6 as n-Hexane | < 0.01             | < 0.01             |                   |
| <b>TOTALS</b>    | <b>99.99</b>       | <b>99.99</b>       |                   |

| Components     | Mole % | Weight % |
|----------------|--------|----------|
| Carbon         | 27.25  | 81.50    |
| Hydrogen       | 72.67  | 18.24    |
| Oxygen + Argon | < 0.10 | < 0.10   |
| Nitrogen       | < 0.10 | 0.20     |
| Sulfur         | < 0.10 | < 0.10   |

|                                                       |         |          |
|-------------------------------------------------------|---------|----------|
| Specific Gravity (Air = 1)                            |         | 1.5204   |
| Specific Volume                                       | ft3/lb  | 8.62     |
| Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)     | BTU/ft3 | 2,549.9  |
| Net Heating Value (Dry Gas @ 60 F, 14.696 psia)       | BTU/ft3 | 2,346.0  |
| Gross Heating Value (Water Saturated at 0.25636 psia) | BTU/ft3 | 2,462.3  |
| Net Heating Value (Water Saturated at 0.25636 psia)   | BTU/ft3 | 2,265.4  |
| Gross Heating Value (Dry Gas @ 60 F, 14.696 psia)     | BTU/lb  | 21,975.3 |
| Net Heating Value (Dry Gas @ 60 F, 14.696 psia)       | BTU/lb  | 20,218.0 |
| Compressibility Factor "Z" (60 F, 14.696 psia)        |         | 0.9827   |

**APPENDIX F**

**METHOD 3C RESULTS**



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2655 Park Center Dr., Suite A  
Simi Valley, CA 93065  
T: +1 805 526 7161  
F: +1 805 526 7270  
[www.alsglobal.com](http://www.alsglobal.com)

## LABORATORY REPORT

September 25, 2015

Min Lee  
Air Hygiene, Incorporated  
1600 West Tacoma Street  
Broken Arrow, OK 74012

**RE: leed-15-brighton-co-comp#1**

Dear Min:

Enclosed are the results of the samples submitted to our laboratory on September 4, 2015. For your reference, these analyses have been assigned our service request number P1503700.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.alsglobal.com](http://www.alsglobal.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**ALS | Environmental**

By Sue Anderson at 11:30 am, Sep 25, 2015

For Kelly Horiuchi  
Laboratory Director



2655 Park Center Dr., Suite A  
Simi Valley, CA 93065  
T: +1 805 526 7161  
F: +1 805 526 7270  
[www.alsglobal.com](http://www.alsglobal.com)

Client: Air Hygiene, Incorporated  
Project: leed-15-brighton-co-comp#1

Service Request No: P1503700

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## CASE NARRATIVE

The samples were received intact under chain of custody on September 4, 2015 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

### Fixed Gases Analysis

The samples were analyzed for fixed gases (oxygen/argon, nitrogen, methane and carbon dioxide) according to modified EPA Method 3C (triplicate injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This procedure is described in laboratory SOP VOA-EPA3C. This method is not included on the laboratory's NELAP or AIHA-LAP scope of accreditation.

ALS Simi Valley standard operating procedure states an initial calibration curve shall be performed annually. The curve was generated on 3/10/14. The EPA 3C method does not provide criteria for how often a calibration curve should be performed. Additionally, the instrument daily quality control parameters are within criteria, documenting the stability and performance of the instrument are acceptable, therefore data have not been affected.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.*

*Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.*



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[www.alsglobal.com](http://www.alsglobal.com)

ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

| Agency                 | Web Site                                                                                                                                                                                                                        | Number                     |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| AIHA                   | <a href="http://www.aihaaccreditedlabs.org">http://www.aihaaccreditedlabs.org</a>                                                                                                                                               | 101661                     |
| Arizona DHS            | <a href="http://www.azdhs.gov/lab/license/env.htm">http://www.azdhs.gov/lab/license/env.htm</a>                                                                                                                                 | AZ0694                     |
| DoD ELAP               | <a href="http://www.pjlabs.com/search-accredited-labs">http://www.pjlabs.com/search-accredited-labs</a>                                                                                                                         | L14-2                      |
| Florida DOH (NELAP)    | <a href="http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm">http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm</a>                                                                                                   | E871020                    |
| Maine DHHS             | <a href="http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm">http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm</a>                           | 2014025                    |
| Minnesota DOH (NELAP)  | <a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>                                                                                                                           | 876241                     |
| New Jersey DEP (NELAP) | <a href="http://www.nj.gov/dep/oqa/">http://www.nj.gov/dep/oqa/</a>                                                                                                                                                             | CA009                      |
| New York DOH (NELAP)   | <a href="http://www.wadsworth.org/labcert/elap/elap.html">http://www.wadsworth.org/labcert/elap/elap.html</a>                                                                                                                   | 11221                      |
| Oregon PHD (NELAP)     | <a href="http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a> | 4068-001                   |
| Pennsylvania DEP       | <a href="http://www.depweb.state.pa.us/labs">http://www.depweb.state.pa.us/labs</a>                                                                                                                                             | 68-03307<br>(Registration) |
| Texas CEQ (NELAP)      | <a href="http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html</a>                                                                                       | T104704413-15-6            |
| Utah DOH (NELAP)       | <a href="http://www.health.utah.gov/lab/labimp/certification/index.html">http://www.health.utah.gov/lab/labimp/certification/index.html</a>                                                                                     | CA01627201<br>5-5          |
| Washington DOE         | <a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>                                                                                     | C946                       |

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at [www.alsglobal.com](http://www.alsglobal.com), or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

# ALS ENVIRONMENTAL

## DETAIL SUMMARY REPORT

Client: Air Hygiene, Incorporated  
Project ID: leed-15-brighton-co-comp#1

Service Request: P1503700

Date Received: 9/4/2015  
Time Received: 09:35

3C Modified - Fxd Gases Bag 2X

| Client Sample ID   | Lab Code     | Matrix | Date Collected | Time Collected |   |
|--------------------|--------------|--------|----------------|----------------|---|
| R7-70-100-70%-EC36 | P1503700-001 | Air    | 9/2/2015       | 09:40          | X |
| R8-70-100-70%-EC36 | P1503700-003 | Air    | 9/2/2015       | 11:03          | X |
| R9-70-100-70%-EC36 | P1503700-005 | Air    | 9/2/2015       | 12:25          | X |
| R4-30-70-30%-EC36  | P1503700-007 | Air    | 9/2/2015       | 14:40          | X |
| R5-30-70-30%-EC36  | P1503700-009 | Air    | 9/2/2015       | 16:02          | X |
| R6-30-70-30%-EC36  | P1503700-011 | Air    | 9/2/2015       | 17:41          | X |
| R10-90-100%-EC36   | P1503700-013 | Air    | 9/3/2015       | 09:33          | X |
| R11-90-100%-EC36   | P1503700-015 | Air    | 9/3/2015       | 10:54          | X |
| R12-90-100%-EC36   | P1503700-017 | Air    | 9/3/2015       | 12:16          | X |
| R1-0-30-0%-EC36    | P1503700-019 | Air    | 9/1/2015       | 15:50          | X |
| R2-0-30-0%-EC36    | P1503700-021 | Air    | 9/1/2015       | 17:10          | X |
| R3-0-30-0%-EC36    | P1503700-023 | Air    | 9/1/2015       | 18:35          | X |



P1503700

| <div style="display: flex; justify-content: space-between; align-items: center;"> <div> <b>SAMPLE DESCRIPTION AND<br/>CHAIN OF CUSTODY RECORD</b> </div> <div>  <p>Air Hygiene International, Inc.<br/>1600 W Tacoma Street<br/>Broken Arrow, Oklahoma 74012<br/>(888) 461-8778<br/>www.airhygiene.com</p> </div> </div> |                              |                                         |       |            |                 |                 |          |         |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------|-------|------------|-----------------|-----------------|----------|---------|--|
| Project Number: lead-15-brighton.co-comp#1                                                                                                                                                                                                                                                                                                                                                                |                              | Laboratory Analysis Requested: Methd 3C |       |            |                 |                 |          |         |  |
| Person Taking Samples: MSL                                                                                                                                                                                                                                                                                                                                                                                |                              |                                         |       |            |                 |                 |          |         |  |
| Sample Number                                                                                                                                                                                                                                                                                                                                                                                             | Location                     | Date                                    | Time  | Volume (L) | Analysis Method |                 |          |         |  |
|                                                                                                                                                                                                                                                                                                                                                                                                           |                              |                                         |       |            | O <sub>2</sub>  | CO <sub>2</sub> | Nitrogen | Methane |  |
| 1. R7-70-100-70%-EC36                                                                                                                                                                                                                                                                                                                                                                                     | Broken Arrow Rental Facility | 2-Sep                                   | 9:40  | 10         | X               | X               | X        | X       |  |
| 2. R7-70-100-70%-EC36-backup                                                                                                                                                                                                                                                                                                                                                                              | Broken Arrow Rental Facility | 2-Sep                                   |       | 5          | X               | X               | X        | X       |  |
| 3. R8-70-100-70%-EC36                                                                                                                                                                                                                                                                                                                                                                                     | Broken Arrow Rental Facility | 2-Sep                                   | 11:03 | 10         | X               | X               | X        | X       |  |
| 4. R8-70-100-70%-EC36-backup                                                                                                                                                                                                                                                                                                                                                                              | Broken Arrow Rental Facility | 2-Sep                                   |       | 5          | X               | X               | X        | X       |  |
| 5. R9-70-100-70%-EC36                                                                                                                                                                                                                                                                                                                                                                                     | Broken Arrow Rental Facility | 2-Sep                                   | 12:25 | 10         | X               | X               | X        | X       |  |
| 6. R9-70-100-70%-EC36-backup                                                                                                                                                                                                                                                                                                                                                                              | Broken Arrow Rental Facility | 2-Sep                                   |       | 5          | X               | X               | X        | X       |  |
| 7. R4-30-70-30%-EC36                                                                                                                                                                                                                                                                                                                                                                                      | Broken Arrow Rental Facility | 2-Sep                                   | 14:40 | 10         | X               | X               | X        | X       |  |
| 8. R4-30-70-30%-EC36-Backup                                                                                                                                                                                                                                                                                                                                                                               | Broken Arrow Rental Facility | 2-Sep                                   |       | 5          | X               | X               | X        | X       |  |
| 9. R5-30-70-30%-EC36                                                                                                                                                                                                                                                                                                                                                                                      | Broken Arrow Rental Facility | 2-Sep                                   | 16:02 | 10         | X               | X               | X        | X       |  |
| 10. R5-30-70-30%-EC36-Backup                                                                                                                                                                                                                                                                                                                                                                              | Broken Arrow Rental Facility | 2-Sep                                   |       | 5          | X               | X               | X        | X       |  |
| 11. R6-30-70-30%-EC36                                                                                                                                                                                                                                                                                                                                                                                     | Broken Arrow Rental Facility | 2-Sep                                   | 17:41 | 10         | X               | X               | X        | X       |  |
| 12. R6-30-70-30%-EC36-Backup                                                                                                                                                                                                                                                                                                                                                                              | Broken Arrow Rental Facility | 2-Sep                                   |       | 5          | X               | X               | X        | X       |  |

Received by (Signature):  Date: 9/2/15 Time: 17:45

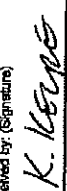
Relinquished by (Signature): \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

Received by (Signature):  Date: 9/2/15 Time: 0935

Relinquished by (Signature): \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

-15-brighton.co-comp#1-COC-EC-36

P1583760

| <b>SAMPLE DESCRIPTION AND CHAIN OF CUSTODY RECORD</b>                                                         |                              |  |       | Air Hygiene International, Inc.<br>1600 W Tacoma Street<br>Broken Arrow, Oklahoma 74012<br>(888) 461-8778<br>www.airhygiene.com |                                                         |
|---------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Project Number:                                                                                               | lead-15-brighton.co-comp#1   | Laboratory Analysis Requested:                                                    |       | Methd 3C                                                                                                                        |                                                         |
| Person Taking Samples:                                                                                        |                              | MSL                                                                               |       |                                                                                                                                 |                                                         |
| Sample Number                                                                                                 | Location                     | Date                                                                              | Time  | Volume (L)                                                                                                                      | Analysis Method                                         |
| R10-90-100%-EC36                                                                                              | Broken Arrow Rental Facility | 3-Sep                                                                             | 9:33  | 10                                                                                                                              | O <sub>2</sub> X CO <sub>2</sub> X Nitrogen X Methane X |
| R10-90-100%-EC36-Backup                                                                                       | Broken Arrow Rental Facility | 3-Sep                                                                             |       | 5                                                                                                                               | O <sub>2</sub> X CO <sub>2</sub> X Nitrogen X Methane X |
| R11-90-100%-EC36                                                                                              | Broken Arrow Rental Facility | 3-Sep                                                                             | 10:54 | 10                                                                                                                              | O <sub>2</sub> X CO <sub>2</sub> X Nitrogen X Methane X |
| R11-90-100%-EC36-Backup                                                                                       | Broken Arrow Rental Facility | 3-Sep                                                                             |       | 5                                                                                                                               | O <sub>2</sub> X CO <sub>2</sub> X Nitrogen X Methane X |
| R12-90-100%-EC36                                                                                              | Broken Arrow Rental Facility | 3-Sep                                                                             | 12:16 | 10                                                                                                                              | O <sub>2</sub> X CO <sub>2</sub> X Nitrogen X Methane X |
| R12-90-100%-EC36-Backup                                                                                       | Broken Arrow Rental Facility | 3-Sep                                                                             |       | 5                                                                                                                               | O <sub>2</sub> X CO <sub>2</sub> X Nitrogen X Methane X |
| Retrieved by: (Signature)  |                              | Date: 9/3/15                                                                      |       | Time: 12:20                                                                                                                     |                                                         |
| Retrieved by: (Signature)   |                              | Date: 9/4/15                                                                      |       | Time: 0935                                                                                                                      |                                                         |

P1503700

| <div style="display: flex; justify-content: space-between; align-items: center;"> <div> <b>SAMPLE DESCRIPTION AND CHAIN OF CUSTODY RECORD</b> </div> <div>  <p>Air Hygiene International, Inc.<br/>1600 W Tacoma Street<br/>Broken Arrow, Oklahoma 74012<br/>(888) 461-8778<br/>www.airhygiene.com</p> </div> </div> |                                                            |                            |       |             |                                |                          |          |              |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|----------------------------|-------|-------------|--------------------------------|--------------------------|----------|--------------|--|--|
| Project Number:                                                                                                                                                                                                                                                                                                                                                                                       |                                                            | leed-15-brighton.co-comp#1 |       |             | Laboratory Analysis Requested: |                          |          | Methd 3C     |  |  |
| Person Taking Samples:                                                                                                                                                                                                                                                                                                                                                                                |                                                            | MSL                        |       |             |                                |                          |          |              |  |  |
| Sample Number                                                                                                                                                                                                                                                                                                                                                                                         | Location                                                   | Date                       | Time  | Volume (L)  | Analysis Method                |                          |          |              |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                       |                                                            |                            |       |             | O <sub>2</sub>                 | CO <sub>2</sub>          | Nitrogen | Methane      |  |  |
| -019<br>R1-0-30-0%-EC36                                                                                                                                                                                                                                                                                                                                                                               | <del>Broken Arrow Rental Facility</del><br><i>Loveless</i> | 1-Sep                      |       | 10          | X                              | X                        | X        | X            |  |  |
| -020<br>R1-0-30-0%-EC36-Backup                                                                                                                                                                                                                                                                                                                                                                        | <del>Broken Arrow Rental Facility</del><br><i>Loveless</i> | 1-Sep                      | 15:50 | 5           | X                              | X                        | X        | X            |  |  |
| -021<br>R2-0-30-0%-EC36                                                                                                                                                                                                                                                                                                                                                                               | <del>Broken Arrow Rental Facility</del><br><i>Loveless</i> | 1-Sep                      | 17:10 | 10          | X                              | X                        | X        | X            |  |  |
| -022<br>R2-0-30-0%-EC36-Backup                                                                                                                                                                                                                                                                                                                                                                        | <del>Broken Arrow Rental Facility</del><br><i>Loveless</i> | 1-Sep                      |       | 5           | X                              | X                        | X        | X            |  |  |
| -023<br>R3-0-30-0%-EC36                                                                                                                                                                                                                                                                                                                                                                               | <del>Broken Arrow Rental Facility</del><br><i>Loveless</i> | 1-Sep                      |       | 10          | X                              | X                        | X        | X            |  |  |
| -024<br>R3-0-30-0%-EC36-Backup                                                                                                                                                                                                                                                                                                                                                                        | <del>Broken Arrow Rental Facility</del><br><i>Loveless</i> | 1-Sep                      | 18:35 | 5           | X                              | X                        | X        | X            |  |  |
| Relinquished by: (Signature)                                                                                                                                                                                                                                                                                                                                                                          |                                                            | Date: 9/1/15               |       | Time: 18:42 |                                | Received by: (Signature) |          | Date: 9/4/15 |  |  |
| Relinquished by: (Signature)                                                                                                                                                                                                                                                                                                                                                                          |                                                            | Date:                      |       | Time:       |                                | Received by: (Signature) |          | Date: 0935   |  |  |

COC submitted via e-mail after samples received.

-15-brighton.co-comp#1-COC-EC-36

# ALS Environmental Sample Acceptance Check Form

Client: Air Hygiene, Incorporated

Work order: P1503700

Project: leed-15-brighton-co-comp#1

Sample(s) received on: 9/4/15

Date opened: 9/4/15

by: KKELPE

**Note:** This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

|                                                                                                                  | <b>Yes</b>                          | <b>No</b>                           | <b>N/A</b>                          |
|------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| 1 Were <b>sample containers</b> properly marked with client sample ID?                                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 2 Container(s) <b>supplied by ALS</b> ?                                                                          | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| 3 Did <b>sample containers</b> arrive in good condition?                                                         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 4 Were <b>chain-of-custody</b> papers used and filled out?                                                       | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 5 Did <b>sample container labels</b> and/or tags agree with custody papers?                                      | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 6 Was <b>sample volume</b> received adequate for analysis?                                                       | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 7 Are samples within specified holding times?                                                                    | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 8 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?                          | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 9 Was a <b>trip blank</b> received?                                                                              | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| 10 Were <b>custody seals</b> on outside of cooler/Box?                                                           | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?                                                                          | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?                                                                                | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?                                                                                               | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were custody seals on outside of sample container?                                                               | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Location of seal(s)? _____ Sealing Lid?                                                                          | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?                                                                                | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?                                                                                               | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 11 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information? | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Is there a client indication that the submitted samples are <b>pH</b> preserved?                                 | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were <b>VOA vials</b> checked for presence/absence of air bubbles?                                               | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?        | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 12 <b>Tubes:</b> Are the tubes capped and intact?                                                                | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Do they contain moisture?                                                                                        | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 13 <b>Badges:</b> Are the badges properly capped and intact?                                                     | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Are dual bed badges separated and individually capped and intact?                                                | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

| Lab Sample ID   | Container Description | Required pH * | Received pH | Adjusted pH | VOA Headspace (Presence/Absence) | Receipt / Preservation Comments |
|-----------------|-----------------------|---------------|-------------|-------------|----------------------------------|---------------------------------|
| P1503700-001.01 | 10 L Tedlar Bag       |               |             |             |                                  |                                 |
| P1503700-002.01 | 5.0 L Tedlar Bag      |               |             |             |                                  |                                 |
| P1503700-003.01 | 10 L Tedlar Bag       |               |             |             |                                  |                                 |
| P1503700-004.01 | 5.0 L Tedlar Bag      |               |             |             |                                  |                                 |
| P1503700-005.01 | 10 L Tedlar Bag       |               |             |             |                                  |                                 |
| P1503700-006.01 | 5.0 L Tedlar Bag      |               |             |             |                                  |                                 |
| P1503700-007.01 | 10 L Tedlar Bag       |               |             |             |                                  |                                 |
| P1503700-008.01 | 5.0 L Tedlar Bag      |               |             |             |                                  |                                 |

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_

A COC was provided for samples -019 thru -024 via e-mail after sample receipt.

## ALS Environmental Sample Acceptance Check Form

Client: Air Hygiene, Incorporated

Work order: P1503700

Project: leed-15-brighton-co-comp#1

Sample(s) received on: 9/4/15

Date opened: 9/4/15

by: KKELPE

[illegible]

Explain any discrepancies: (include lab sample ID numbers):

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** R7-70-100-70%-EC36  
**Client Project ID:** leed-15-brighton-co-comp#1

ALS Project ID: P1503700  
ALS Sample ID: P1503700-001

**Test Code:** EPA Method 3C Modified  
**Instrument ID:** HP5890 II/GC1/TCD  
**Analyst:** Wade Henton  
**Sample Type:** 10 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 9/2/15  
**Date Received:** 9/4/15  
**Date Analyzed:** 9/4/15  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #     | Compound       | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|----------------|------------------|---------------|-------------------|
| 7782-44-7 | Oxygen +       |                  |               |                   |
| 7440-37-1 | Argon          | 14.5             | 0.10          |                   |
| 7727-37-9 | Nitrogen       | 79.9             | 0.10          |                   |
| 74-82-8   | Methane        | ND               | 0.10          |                   |
| 124-38-9  | Carbon Dioxide | 5.58             | 0.10          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** R8-70-100-70%-EC36  
**Client Project ID:** leed-15-brighton-co-comp#1

ALS Project ID: P1503700  
 ALS Sample ID: P1503700-003

**Test Code:** EPA Method 3C Modified  
**Instrument ID:** HP5890 II/GC1/TCD  
**Analyst:** Wade Henton  
**Sample Type:** 10 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 9/2/15  
**Date Received:** 9/4/15  
**Date Analyzed:** 9/4/15  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #     | Compound              | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|-----------------------|------------------|---------------|-------------------|
| 7782-44-7 | <b>Oxygen +</b>       |                  |               |                   |
| 7440-37-1 | <b>Argon</b>          | <b>14.7</b>      | 0.10          |                   |
| 7727-37-9 | <b>Nitrogen</b>       | <b>79.9</b>      | 0.10          |                   |
| 74-82-8   | Methane               | ND               | 0.10          |                   |
| 124-38-9  | <b>Carbon Dioxide</b> | <b>5.38</b>      | 0.10          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** R9-70-100-70%-EC36  
**Client Project ID:** leed-15-brighton-co-comp#1

ALS Project ID: P1503700  
 ALS Sample ID: P1503700-005

**Test Code:** EPA Method 3C Modified  
**Instrument ID:** HP5890 II/GC1/TCD  
**Analyst:** Wade Henton  
**Sample Type:** 10 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 9/2/15  
**Date Received:** 9/4/15  
**Date Analyzed:** 9/4/15  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #     | Compound              | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|-----------------------|------------------|---------------|-------------------|
| 7782-44-7 | <b>Oxygen +</b>       |                  |               |                   |
| 7440-37-1 | <b>Argon</b>          | <b>14.5</b>      | 0.10          |                   |
| 7727-37-9 | <b>Nitrogen</b>       | <b>80.0</b>      | 0.10          |                   |
| 74-82-8   | Methane               | ND               | 0.10          |                   |
| 124-38-9  | <b>Carbon Dioxide</b> | <b>5.53</b>      | 0.10          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** R4-30-70-30%-EC36  
**Client Project ID:** leed-15-brighton-co-comp#1

ALS Project ID: P1503700  
ALS Sample ID: P1503700-007

**Test Code:** EPA Method 3C Modified  
**Instrument ID:** HP5890 II/GC1/TCD  
**Analyst:** Wade Henton  
**Sample Type:** 10 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 9/2/15  
**Date Received:** 9/4/15  
**Date Analyzed:** 9/4/15  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #     | Compound       | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|----------------|------------------|---------------|-------------------|
| 7782-44-7 | Oxygen +       |                  |               |                   |
| 7440-37-1 | Argon          | 17.4             | 0.10          |                   |
| 7727-37-9 | Nitrogen       | 79.2             | 0.10          |                   |
| 74-82-8   | Methane        | ND               | 0.10          |                   |
| 124-38-9  | Carbon Dioxide | 3.39             | 0.10          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** R5-30-70-30%-EC36  
**Client Project ID:** leed-15-brighton-co-comp#1

ALS Project ID: P1503700  
 ALS Sample ID: P1503700-009

**Test Code:** EPA Method 3C Modified  
**Instrument ID:** HP5890 II/GC1/TCD  
**Analyst:** Wade Henton  
**Sample Type:** 10 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 9/2/15  
**Date Received:** 9/4/15  
**Date Analyzed:** 9/4/15  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #     | Compound              | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|-----------------------|------------------|---------------|-------------------|
| 7782-44-7 | <b>Oxygen +</b>       |                  |               |                   |
| 7440-37-1 | <b>Argon</b>          | <b>18.0</b>      | 0.10          |                   |
| 7727-37-9 | <b>Nitrogen</b>       | <b>79.0</b>      | 0.10          |                   |
| 74-82-8   | Methane               | ND               | 0.10          |                   |
| 124-38-9  | <b>Carbon Dioxide</b> | <b>3.01</b>      | 0.10          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** R6-30-70-30%-EC36  
**Client Project ID:** leed-15-brighton-co-comp#1

ALS Project ID: P1503700  
ALS Sample ID: P1503700-011

**Test Code:** EPA Method 3C Modified  
**Instrument ID:** HP5890 II/GC1/TCD  
**Analyst:** Wade Henton  
**Sample Type:** 10 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 9/2/15  
**Date Received:** 9/4/15  
**Date Analyzed:** 9/4/15  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #     | Compound              | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|-----------------------|------------------|---------------|-------------------|
| 7782-44-7 | <b>Oxygen +</b>       |                  |               |                   |
| 7440-37-1 | <b>Argon</b>          | <b>17.8</b>      | 0.10          |                   |
| 7727-37-9 | <b>Nitrogen</b>       | <b>79.1</b>      | 0.10          |                   |
| 74-82-8   | Methane               | ND               | 0.10          |                   |
| 124-38-9  | <b>Carbon Dioxide</b> | <b>3.15</b>      | 0.10          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** R10-90-100%-EC36  
**Client Project ID:** leed-15-brighton-co-comp#1

ALS Project ID: P1503700  
 ALS Sample ID: P1503700-013

**Test Code:** EPA Method 3C Modified  
**Instrument ID:** HP5890 II/GC1/TCD  
**Analyst:** Wade Henton  
**Sample Type:** 10 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 9/3/15  
**Date Received:** 9/4/15  
**Date Analyzed:** 9/4/15  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #     | Compound              | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|-----------------------|------------------|---------------|-------------------|
| 7782-44-7 | <b>Oxygen +</b>       |                  |               |                   |
| 7440-37-1 | <b>Argon</b>          | <b>15.8</b>      | 0.10          |                   |
| 7727-37-9 | <b>Nitrogen</b>       | <b>79.6</b>      | 0.10          |                   |
| 74-82-8   | Methane               | ND               | 0.10          |                   |
| 124-38-9  | <b>Carbon Dioxide</b> | <b>4.60</b>      | 0.10          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** R11-90-100%-EC36  
**Client Project ID:** leed-15-brighton-co-comp#1

ALS Project ID: P1503700  
ALS Sample ID: P1503700-015

**Test Code:** EPA Method 3C Modified  
**Instrument ID:** HP5890 II/GC1/TCD  
**Analyst:** Wade Henton  
**Sample Type:** 10 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 9/3/15  
**Date Received:** 9/4/15  
**Date Analyzed:** 9/4/15  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #     | Compound       | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|----------------|------------------|---------------|-------------------|
| 7782-44-7 | Oxygen +       |                  |               |                   |
| 7440-37-1 | Argon          | 15.3             | 0.10          |                   |
| 7727-37-9 | Nitrogen       | 79.7             | 0.10          |                   |
| 74-82-8   | Methane        | ND               | 0.10          |                   |
| 124-38-9  | Carbon Dioxide | 4.95             | 0.10          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** R12-90-100%-EC36  
**Client Project ID:** leed-15-brighton-co-comp#1

ALS Project ID: P1503700  
 ALS Sample ID: P1503700-017

**Test Code:** EPA Method 3C Modified  
**Instrument ID:** HP5890 II/GC1/TCD  
**Analyst:** Wade Henton  
**Sample Type:** 10 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 9/3/15  
**Date Received:** 9/4/15  
**Date Analyzed:** 9/4/15  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #     | Compound              | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|-----------------------|------------------|---------------|-------------------|
| 7782-44-7 | <b>Oxygen +</b>       |                  |               |                   |
| 7440-37-1 | <b>Argon</b>          | 15.5             | 0.10          |                   |
| 7727-37-9 | <b>Nitrogen</b>       | 79.7             | 0.10          |                   |
| 74-82-8   | Methane               | ND               | 0.10          |                   |
| 124-38-9  | <b>Carbon Dioxide</b> | 4.82             | 0.10          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** R1-0-30-0%-EC36  
**Client Project ID:** leed-15-brighton-co-comp#1

ALS Project ID: P1503700  
 ALS Sample ID: P1503700-019

**Test Code:** EPA Method 3C Modified  
**Instrument ID:** HP5890 II/GC1/TCD  
**Analyst:** Wade Henton  
**Sample Type:** 10 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 9/1/15  
**Date Received:** 9/4/15  
**Date Analyzed:** 9/5/15  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #     | Compound              | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|-----------------------|------------------|---------------|-------------------|
| 7782-44-7 | <b>Oxygen +</b>       |                  |               |                   |
| 7440-37-1 | <b>Argon</b>          | <b>19.0</b>      | 0.10          |                   |
| 7727-37-9 | <b>Nitrogen</b>       | <b>78.8</b>      | 0.10          |                   |
| 74-82-8   | Methane               | ND               | 0.10          |                   |
| 124-38-9  | <b>Carbon Dioxide</b> | <b>2.21</b>      | 0.10          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** R2-0-30-0%-EC36  
**Client Project ID:** leed-15-brighton-co-comp#1

ALS Project ID: P1503700  
ALS Sample ID: P1503700-021

**Test Code:** EPA Method 3C Modified  
**Instrument ID:** HP5890 II/GC1/TCD  
**Analyst:** Wade Henton  
**Sample Type:** 10 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 9/1/15  
**Date Received:** 9/4/15  
**Date Analyzed:** 9/5/15  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #     | Compound       | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|----------------|------------------|---------------|-------------------|
| 7782-44-7 | Oxygen +       |                  |               |                   |
| 7440-37-1 | Argon          | 19.2             | 0.10          |                   |
| 7727-37-9 | Nitrogen       | 78.7             | 0.10          |                   |
| 74-82-8   | Methane        | ND               | 0.10          |                   |
| 124-38-9  | Carbon Dioxide | 2.12             | 0.10          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** R3-0-30-0%-EC36  
**Client Project ID:** leed-15-brighton-co-comp#1

ALS Project ID: P1503700  
 ALS Sample ID: P1503700-023

**Test Code:** EPA Method 3C Modified  
**Instrument ID:** HP5890 II/GC1/TCD  
**Analyst:** Wade Henton  
**Sample Type:** 10 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 9/1/15  
**Date Received:** 9/4/15  
**Date Analyzed:** 9/5/15  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #     | Compound              | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|-----------------------|------------------|---------------|-------------------|
| 7782-44-7 | <b>Oxygen +</b>       |                  |               |                   |
| 7440-37-1 | <b>Argon</b>          | <b>19.3</b>      | 0.10          |                   |
| 7727-37-9 | <b>Nitrogen</b>       | <b>78.7</b>      | 0.10          |                   |
| 74-82-8   | Methane               | ND               | 0.10          |                   |
| 124-38-9  | <b>Carbon Dioxide</b> | <b>2.06</b>      | 0.10          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** Method Blank  
**Client Project ID:** leed-15-brighton-co-comp#1

ALS Project ID: P1503700  
ALS Sample ID: P150904-MB

**Test Code:** EPA Method 3C Modified  
**Instrument ID:** HP5890 II/GC1/TCD  
**Analyst:** Wade Henton  
**Sample Type:** 10 L Tedlar Bag  
**Test Notes:**

**Date Collected:** NA  
**Date Received:** NA  
**Date Analyzed:** 9/04/15  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #     | Compound       | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|----------------|------------------|---------------|-------------------|
| 7782-44-7 | Oxygen +       |                  |               |                   |
| 7440-37-1 | Argon          | ND               | 0.10          |                   |
| 7727-37-9 | Nitrogen       | ND               | 0.10          |                   |
| 74-82-8   | Methane        | ND               | 0.10          |                   |
| 124-38-9  | Carbon Dioxide | ND               | 0.10          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Air Hygiene, Incorporated  
**Client Sample ID:** Method Blank  
**Client Project ID:** leed-15-brighton-co-comp#1

ALS Project ID: P1503700  
ALS Sample ID: P150905-MB

**Test Code:** EPA Method 3C Modified  
**Instrument ID:** HP5890 II/GC1/TCD  
**Analyst:** Wade Henton  
**Sample Type:** 10 L Tedlar Bag  
**Test Notes:**

**Date Collected:** NA  
**Date Received:** NA  
**Date Analyzed:** 9/05/15  
**Volume(s) Analyzed:** 0.10 ml(s)

| CAS #     | Compound       | Result<br>%, v/v | MRL<br>%, v/v | Data<br>Qualifier |
|-----------|----------------|------------------|---------------|-------------------|
| 7782-44-7 | Oxygen +       |                  |               |                   |
| 7440-37-1 | Argon          | ND               | 0.10          |                   |
| 7727-37-9 | Nitrogen       | ND               | 0.10          |                   |
| 74-82-8   | Methane        | ND               | 0.10          |                   |
| 124-38-9  | Carbon Dioxide | ND               | 0.10          |                   |

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
 Data File : 09041504.D  
 Signal(s) : TCD1A.CH  
 Acq On : 4 Sep 2015 10:27 am  
 Operator : WH  
 Sample : 3700-001  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Sep 10 07:42:47 2015  
 Quant Method : I:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Tue Mar 11 11:04:23 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.168 | 220542   | 133455.915 ppm |
| 3) Nitrogen        | 2.294 | 1414263  | 736598.033 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.725 | 110634   | 51422.475 ppm  |
| -----              |       |          |                |

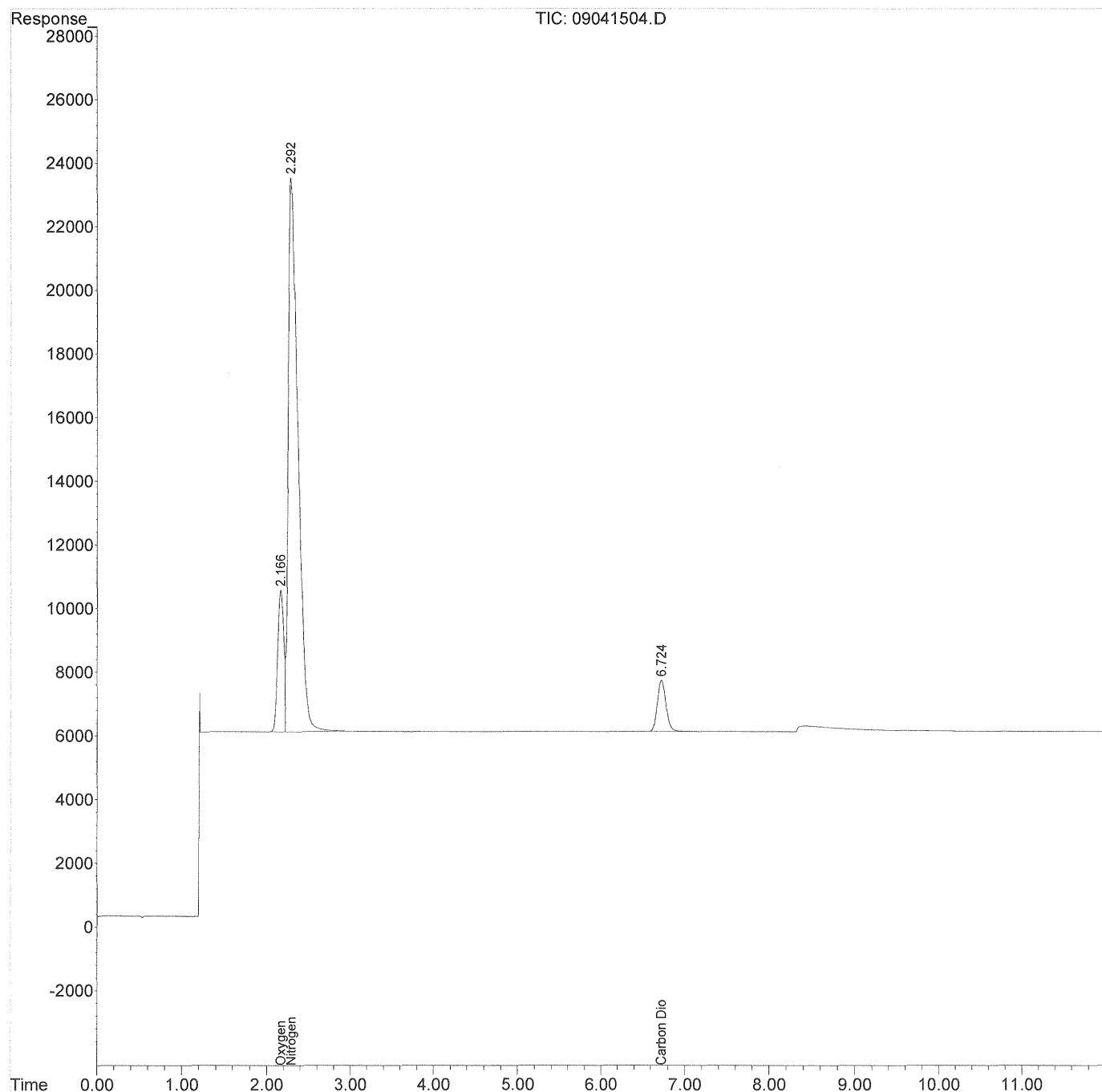
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041504.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 10:27 am  
Operator : WH  
Sample : 3700-001  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:42:47 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041505.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 10:43 am  
Operator : WH  
Sample : 3700-001  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:42:50 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc       | Units |
|--------------------|-------|----------|------------|-------|
| -----              |       |          |            |       |
| Target Compounds   |       |          |            |       |
| 1) Hydrogen        | 0.000 | 0        | N.D.       | ppm   |
| 2) Oxygen          | 2.151 | 221439   | 133998.824 | ppm   |
| 3) Nitrogen        | 2.277 | 1424655  | 742010.417 | ppm   |
| 4) Carbon Monoxide | 0.000 | 0        | N.D.       | ppm   |
| 5) Methane         | 0.000 | 0        | N.D.       | ppm   |
| 6) Carbon Dioxide  | 6.716 | 111417   | 51786.371  | ppm   |
| -----              |       |          |            |       |

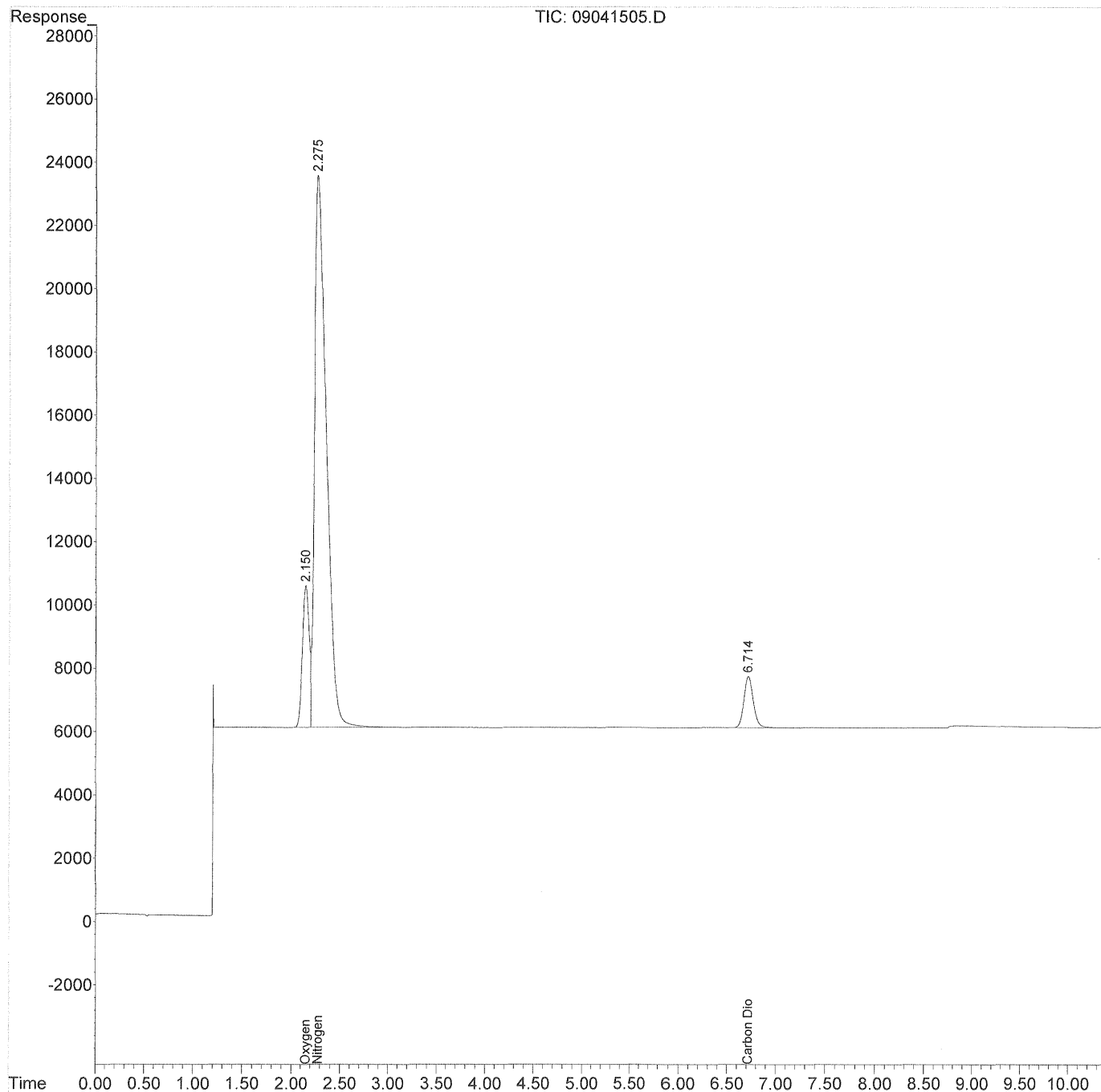
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041505.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 10:43 am  
Operator : WH  
Sample : 3700-001  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:42:50 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041506.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 10:58 am  
Operator : WH  
Sample : 3700-001  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:42:53 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.161 | 219339   | 132727.870 ppm |
| 3) Nitrogen        | 2.287 | 1405575  | 732072.869 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.719 | 110193   | 51217.119 ppm  |
| -----              |       |          |                |

(f)=RT Delta > 1/2 Window

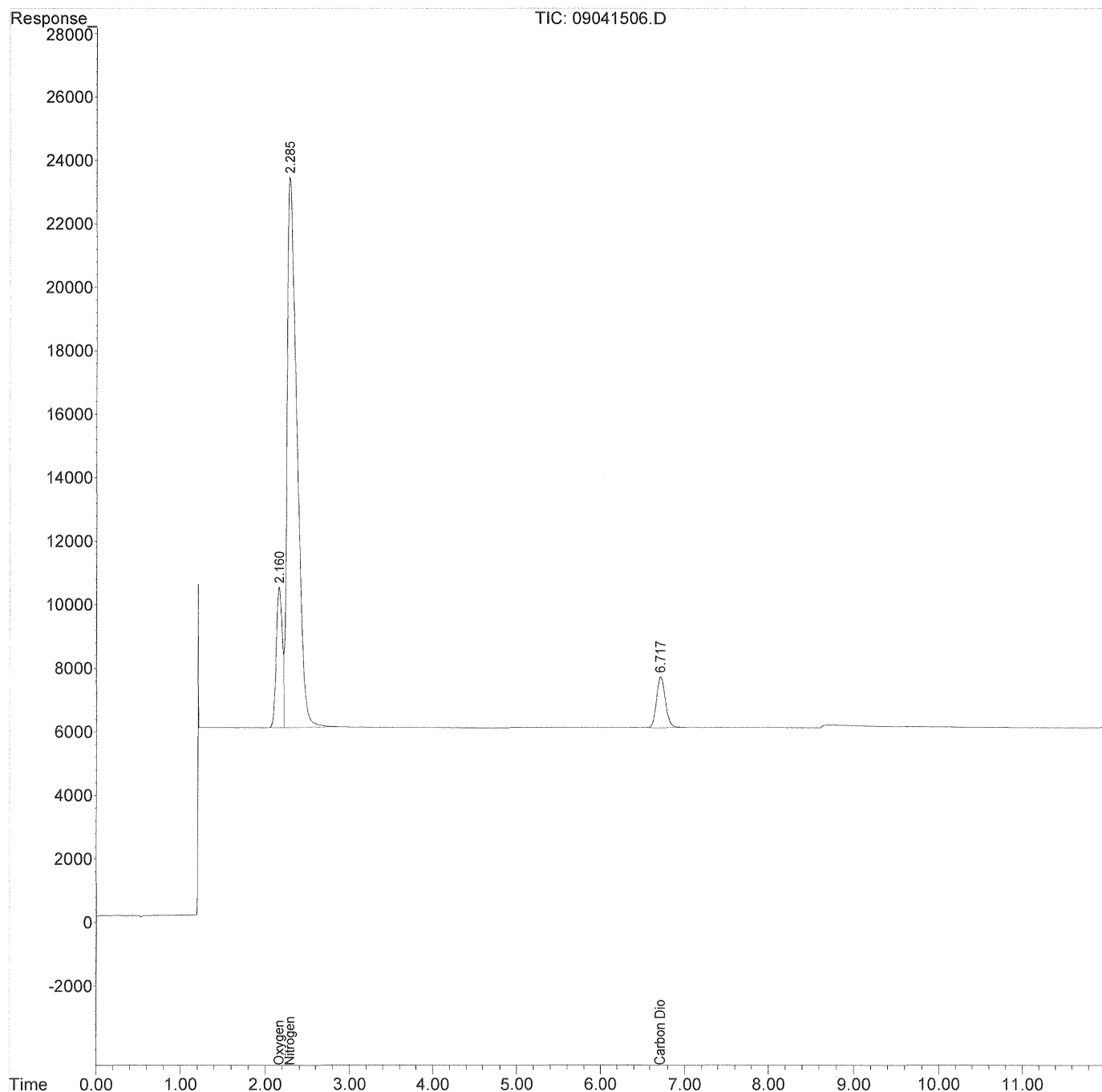
(m)=manual int.



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041506.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 10:58 am  
Operator : WH  
Sample : 3700-001  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:42:53 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041507.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 11:15 am  
Operator : WH  
Sample : 3700-003  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:42:56 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.161 | 224979   | 136141.158 ppm |
| 3) Nitrogen        | 2.287 | 1418660  | 738887.939 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.719 | 106925   | 49698.384 ppm  |
| -----              |       |          |                |

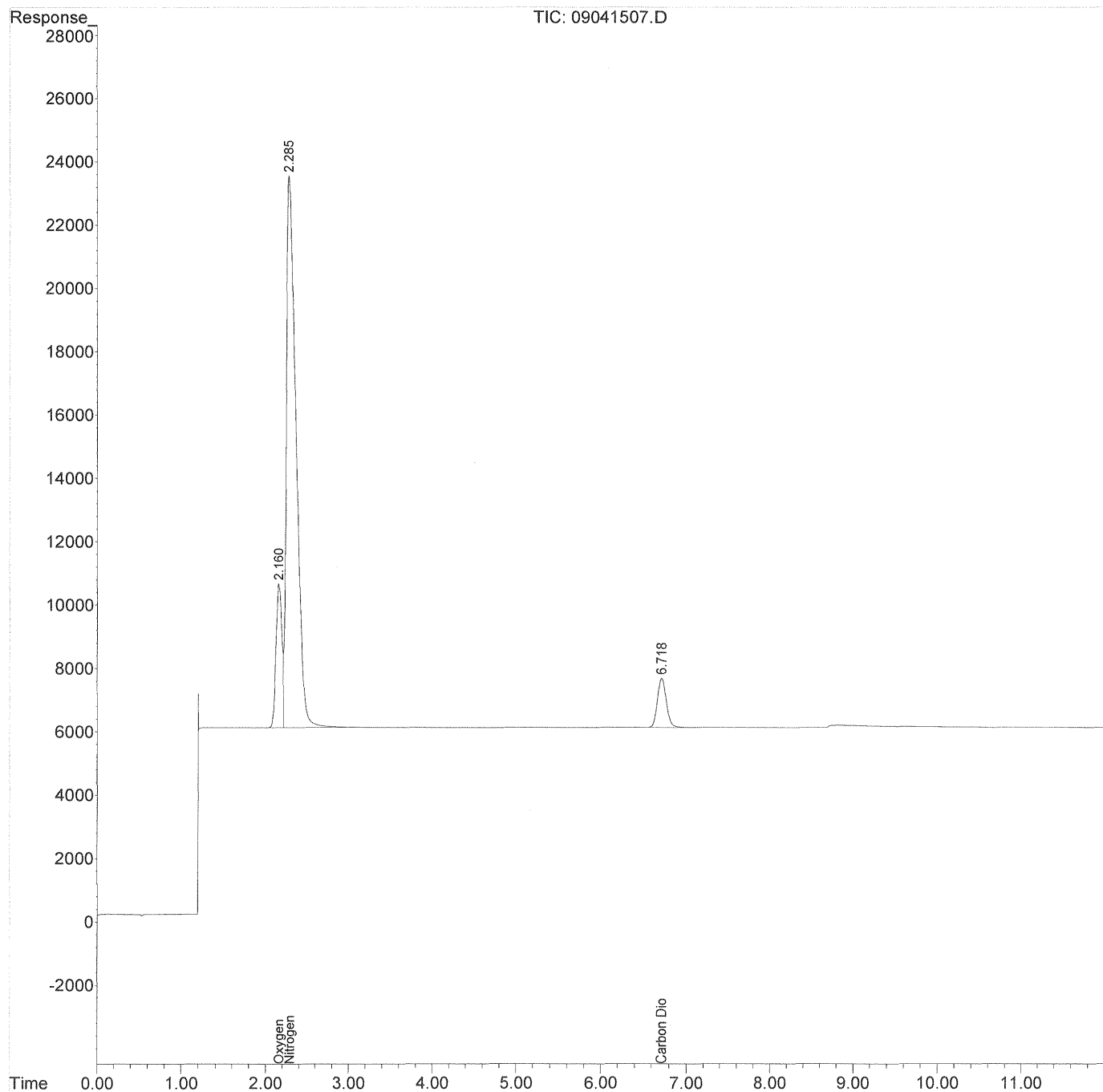
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
 Data File : 09041507.D  
 Signal(s) : TCD1A.CH  
 Acq On : 4 Sep 2015 11:15 am  
 Operator : WH  
 Sample : 3700-003  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Sep 10 07:42:56 2015  
 Quant Method : I:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Tue Mar 11 11:04:23 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
 Data File : 09041508.D  
 Signal(s) : TCD1A.CH  
 Acq On : 4 Sep 2015 11:37 am  
 Operator : WH  
 Sample : 3700-003  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Sep 10 07:42:59 2015  
 Quant Method : I:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Tue Mar 11 11:04:23 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.165 | 224185   | 135660.307 ppm |
| 3) Nitrogen        | 2.291 | 1409754  | 734249.570 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.721 | 106464   | 49484.199 ppm  |
| -----              |       |          |                |

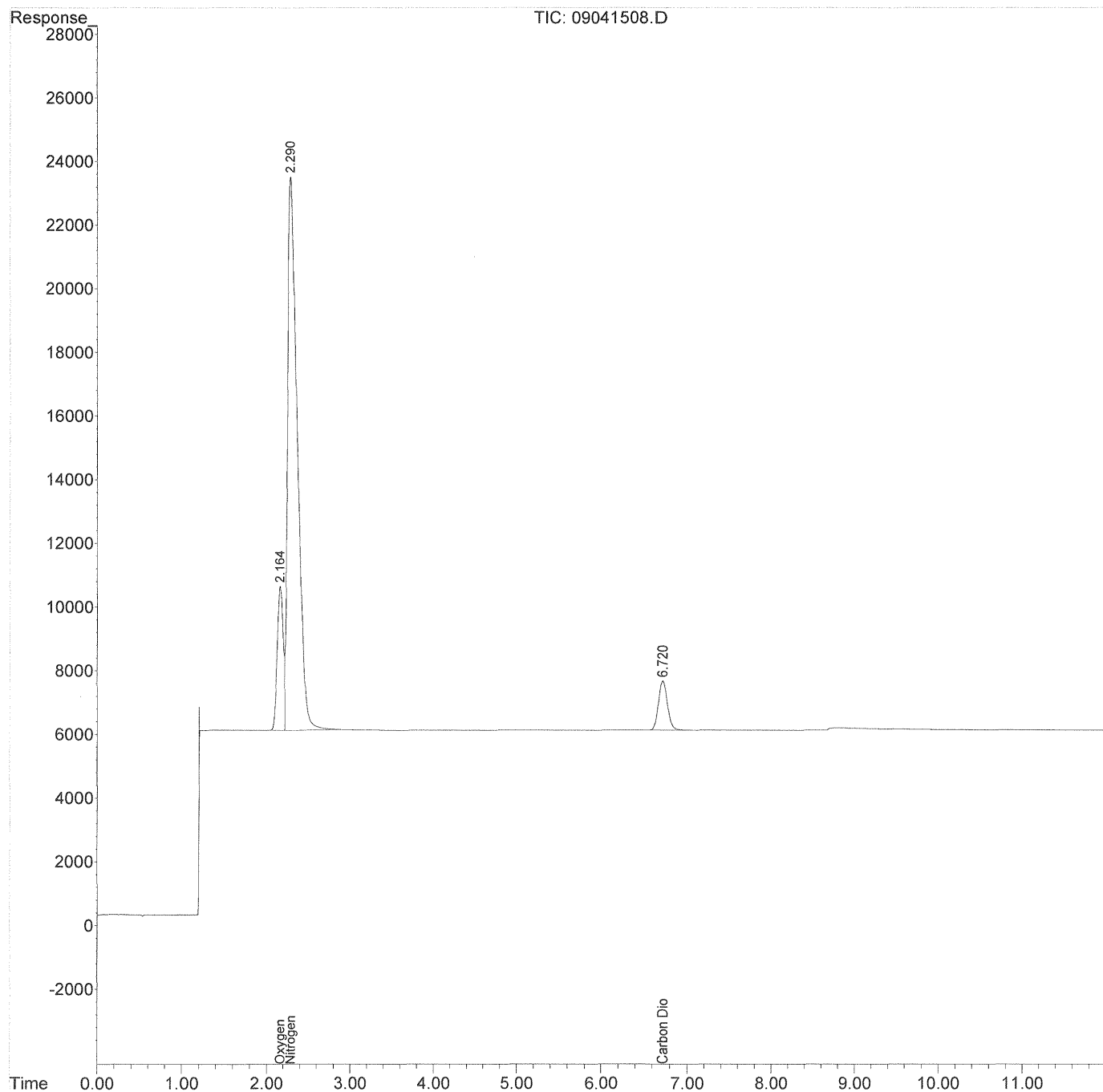
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041508.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 11:37 am  
Operator : WH  
Sample : 3700-003  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:42:59 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041509.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 11:53 am  
Operator : WH  
Sample : 3700-003  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:02 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.155 | 224532   | 135870.397 ppm |
| 3) Nitrogen        | 2.281 | 1416502  | 737764.068 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.717 | 106813   | 49646.491 ppm  |
| -----              |       |          |                |

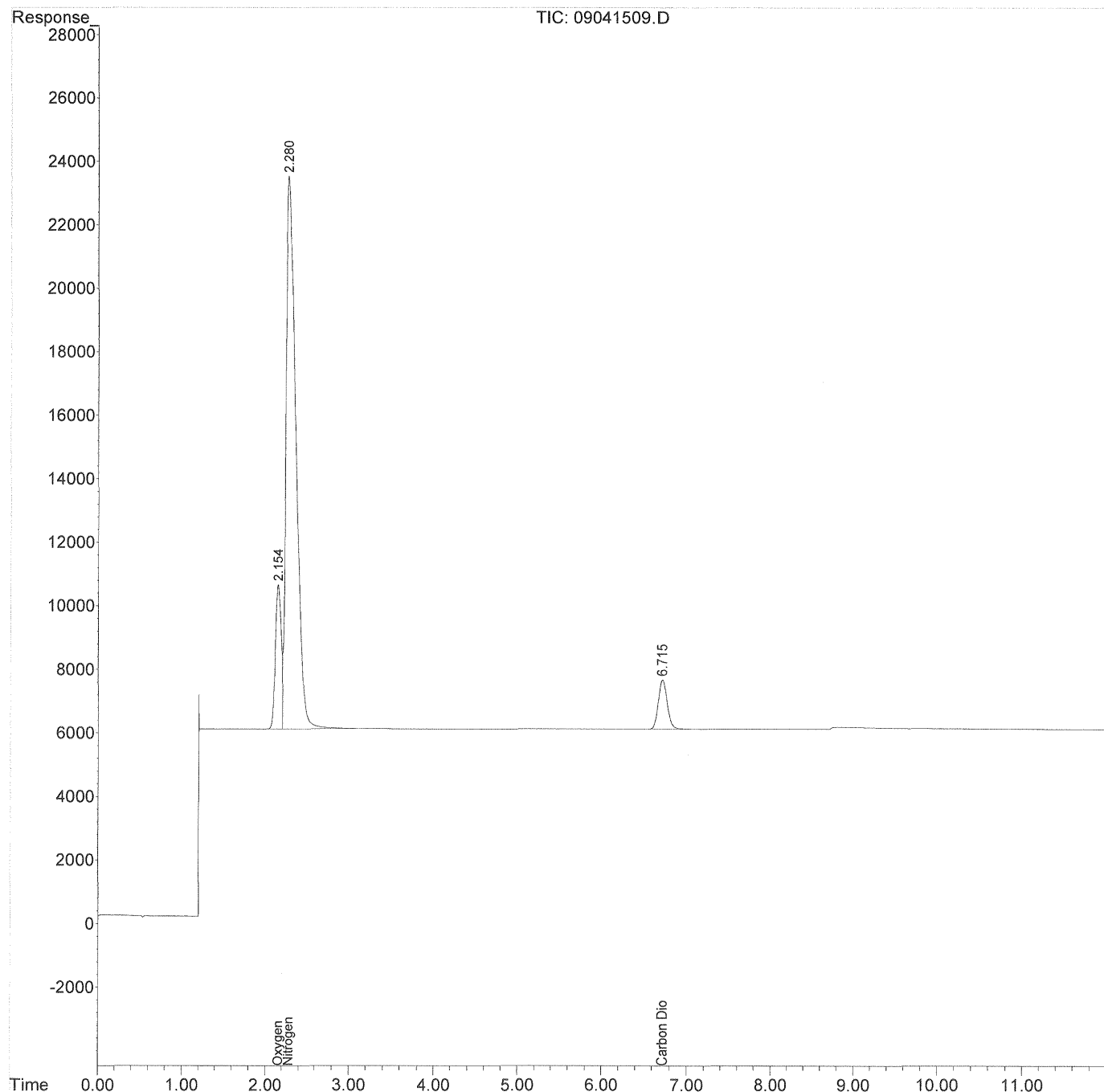
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041509.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 11:53 am  
Operator : WH  
Sample : 3700-003  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:02 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041517.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 2:54 pm  
Operator : WH  
Sample : 3700-005  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:05 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.134 | 221466   | 134014.781 ppm |
| 3) Nitrogen        | 2.259 | 1426030  | 742726.730 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.716 | 110443   | 51333.324 ppm  |
| -----              |       |          |                |

(f)=RT Delta > 1/2 Window

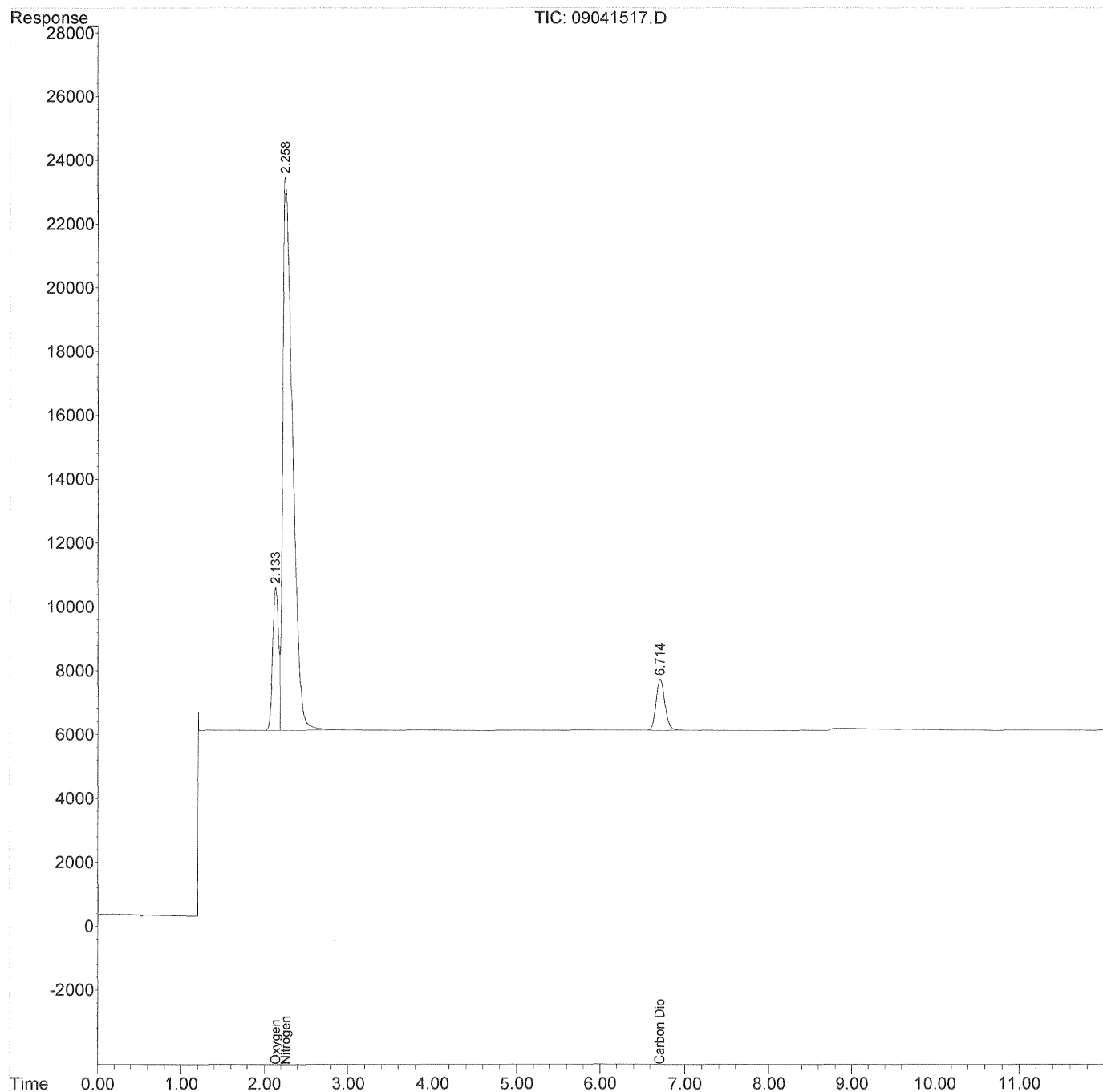
(m)=manual int.



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041517.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 2:54 pm  
Operator : WH  
Sample : 3700-005  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:05 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041518.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 3:13 pm  
Operator : WH  
Sample : 3700-005  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:08 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.167 | 221353   | 133946.923 ppm |
| 3) Nitrogen        | 2.292 | 1418428  | 738767.300 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.723 | 109884   | 51073.665 ppm  |
| -----              |       |          |                |

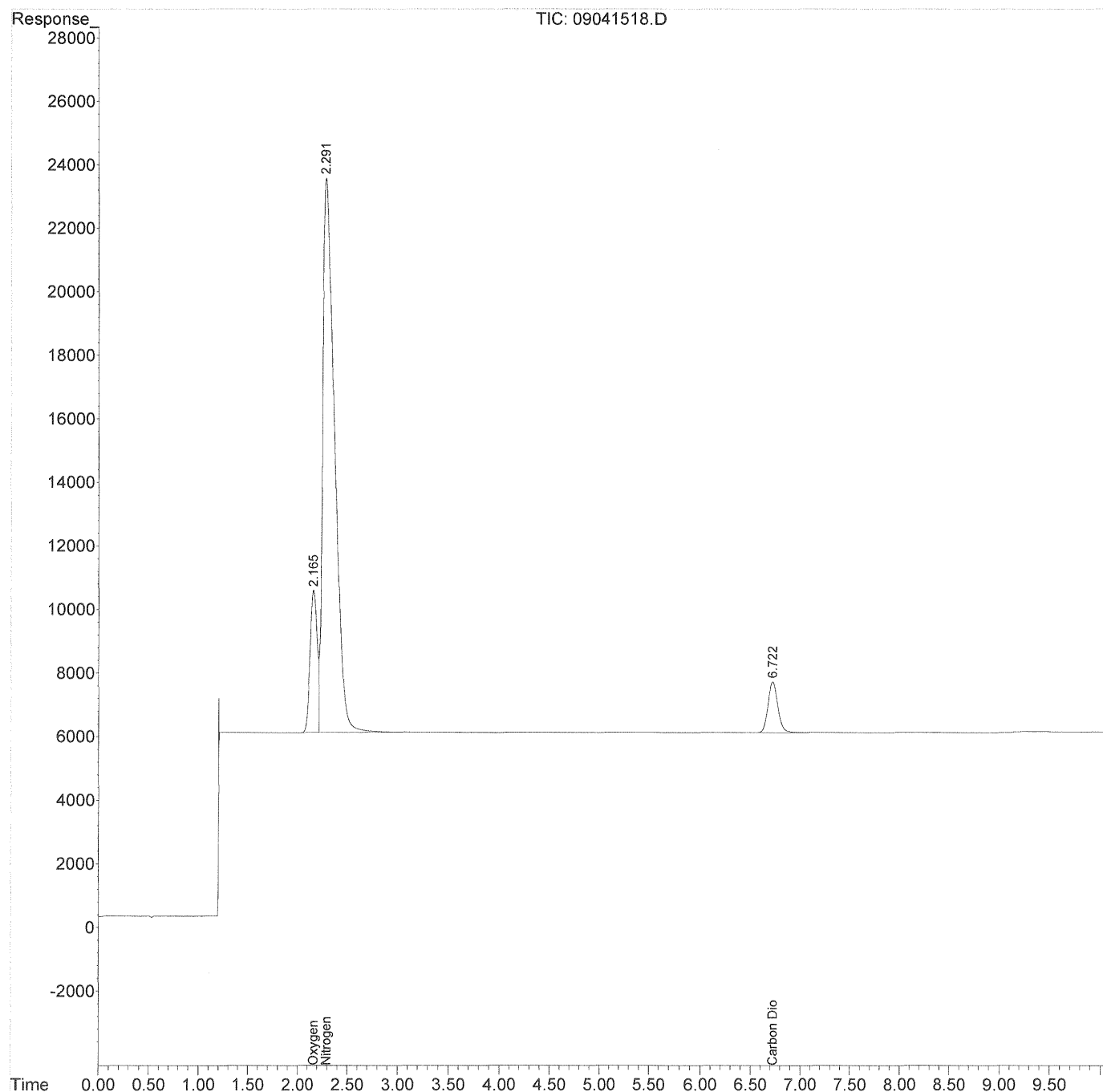
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041518.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 3:13 pm  
Operator : WH  
Sample : 3700-005  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:08 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041519.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 3:26 pm  
Operator : WH  
Sample : 3700-005  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:11 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.140 | 221861   | 134254.277 ppm |
| 3) Nitrogen        | 2.265 | 1427193  | 743332.368 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.716 | 110676   | 51441.993 ppm  |
| -----              |       |          |                |

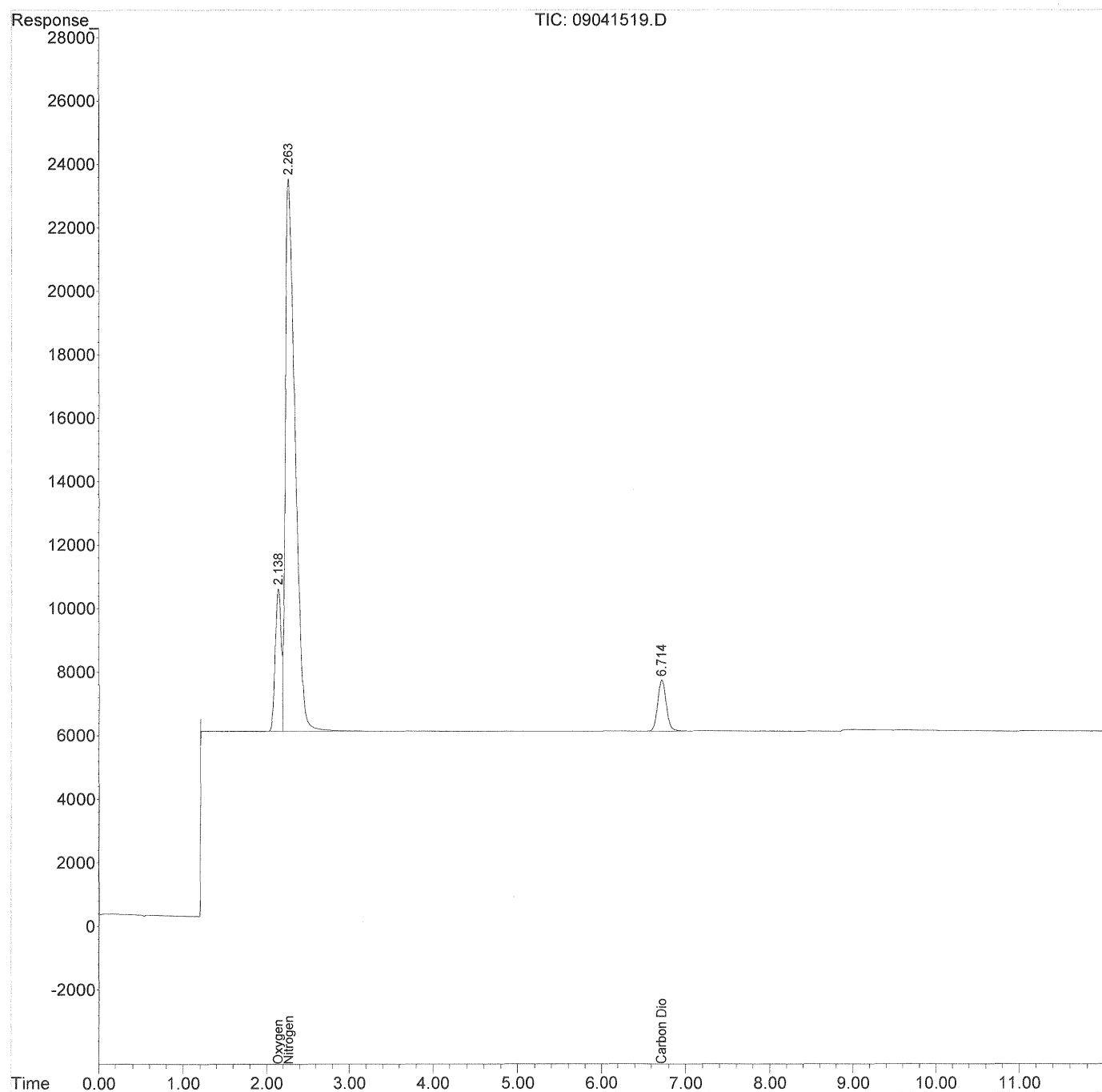
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041519.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 3:26 pm  
Operator : WH  
Sample : 3700-005  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:11 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041520.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 3:55 pm  
Operator : WH  
Sample : 3700-007  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:14 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.163 | 267123   | 161643.574 ppm |
| 3) Nitrogen        | 2.293 | 1407142  | 732889.329 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.728 | 67746    | 31488.140 ppm  |
| -----              |       |          |                |

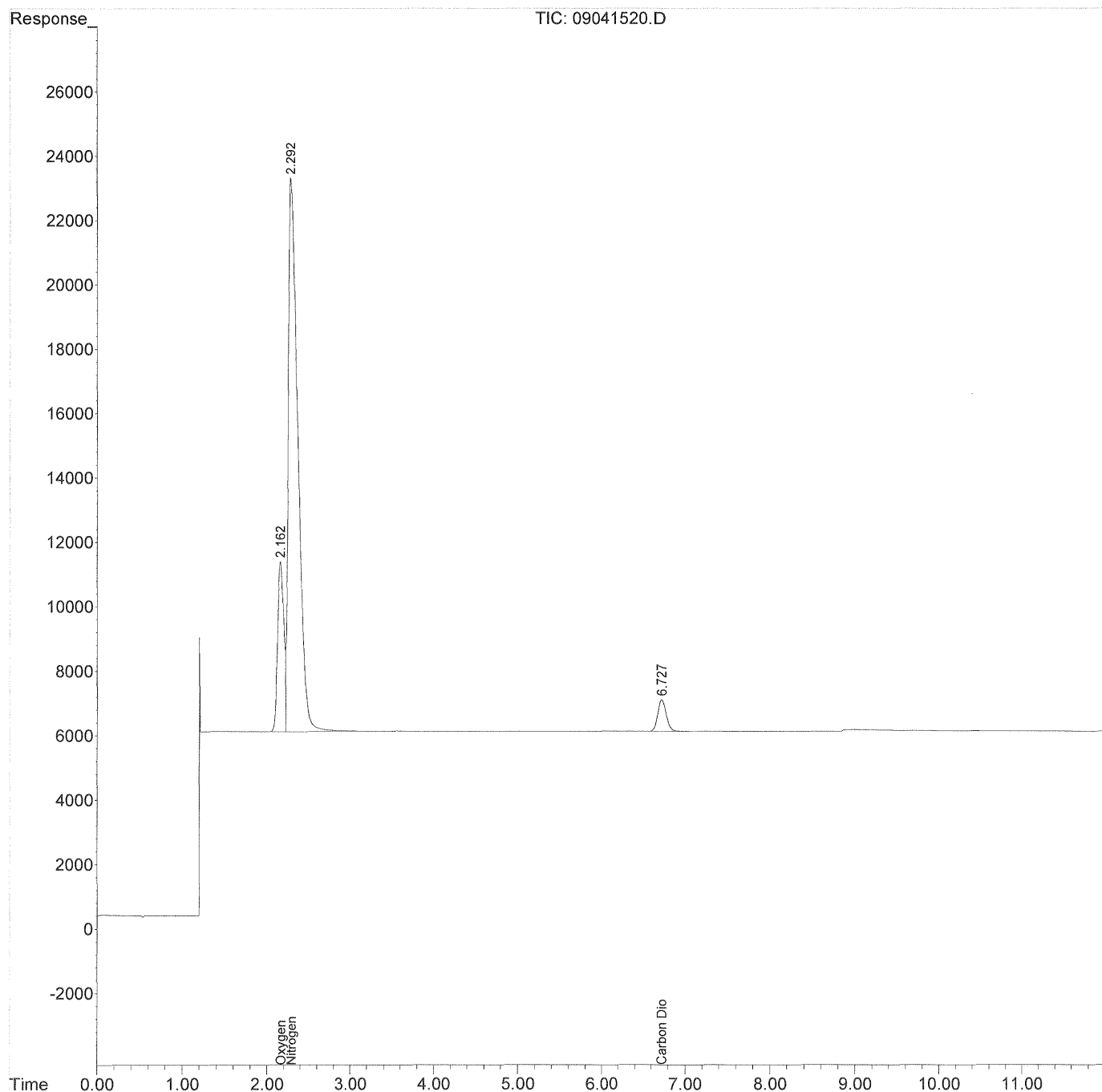
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041520.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 3:55 pm  
Operator : WH  
Sample : 3700-007  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:14 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041521.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 4:11 pm  
Operator : WH  
Sample : 3700-007  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:17 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.136 | 267788   | 162045.665 ppm |
| 3) Nitrogen        | 2.265 | 1415711  | 737352.053 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.720 | 67769    | 31498.971 ppm  |
| -----              |       |          |                |

(f)=RT Delta > 1/2 Window

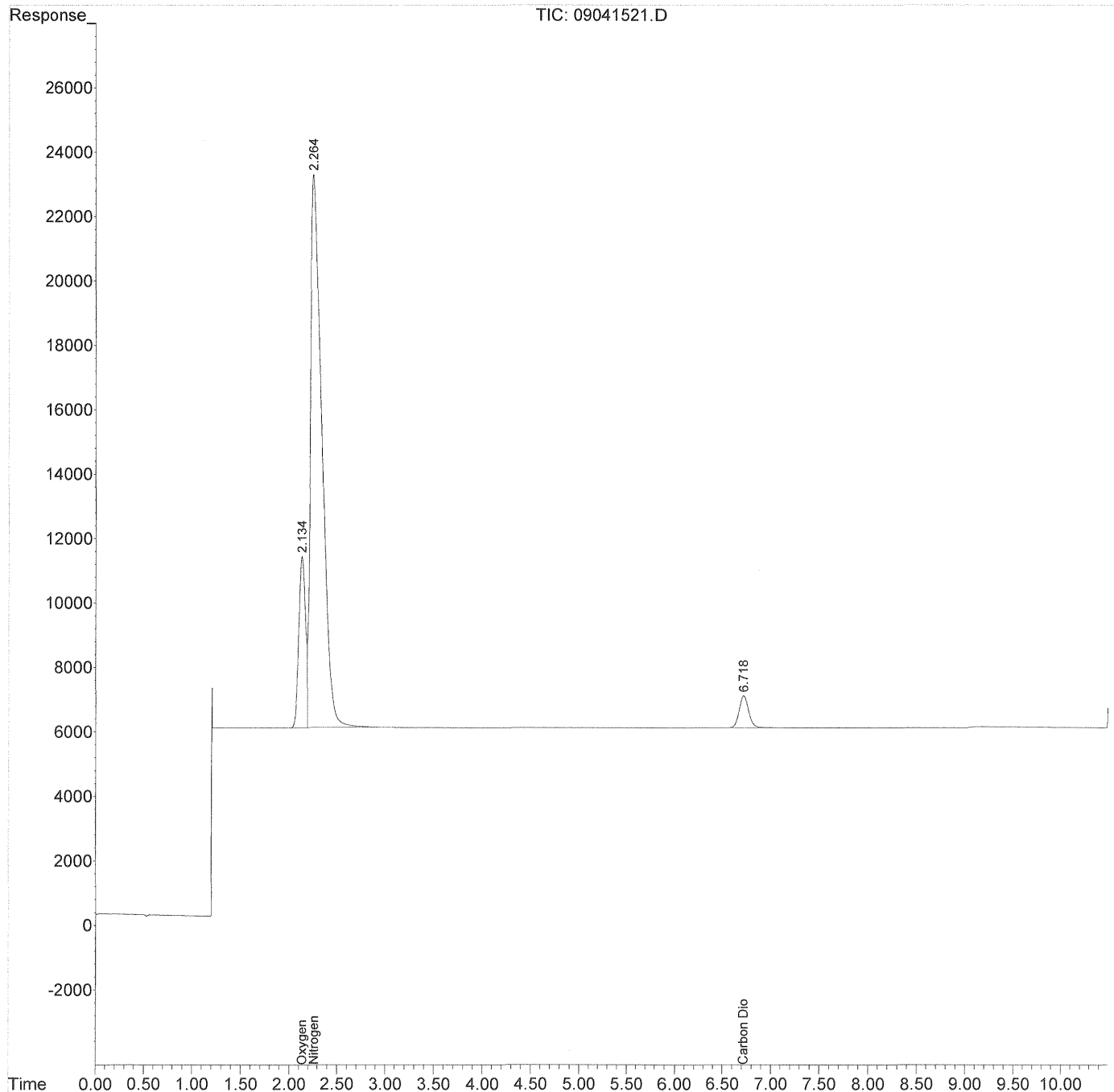
(m)=manual int.



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041521.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 4:11 pm  
Operator : WH  
Sample : 3700-007  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:17 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041522.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 4:26 pm  
Operator : WH  
Sample : 3700-007  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:20 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.159 | 267039   | 161592.700 ppm |
| 3) Nitrogen        | 2.289 | 1406360  | 732481.983 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.723 | 67408    | 31330.857 ppm  |
| -----              |       |          |                |

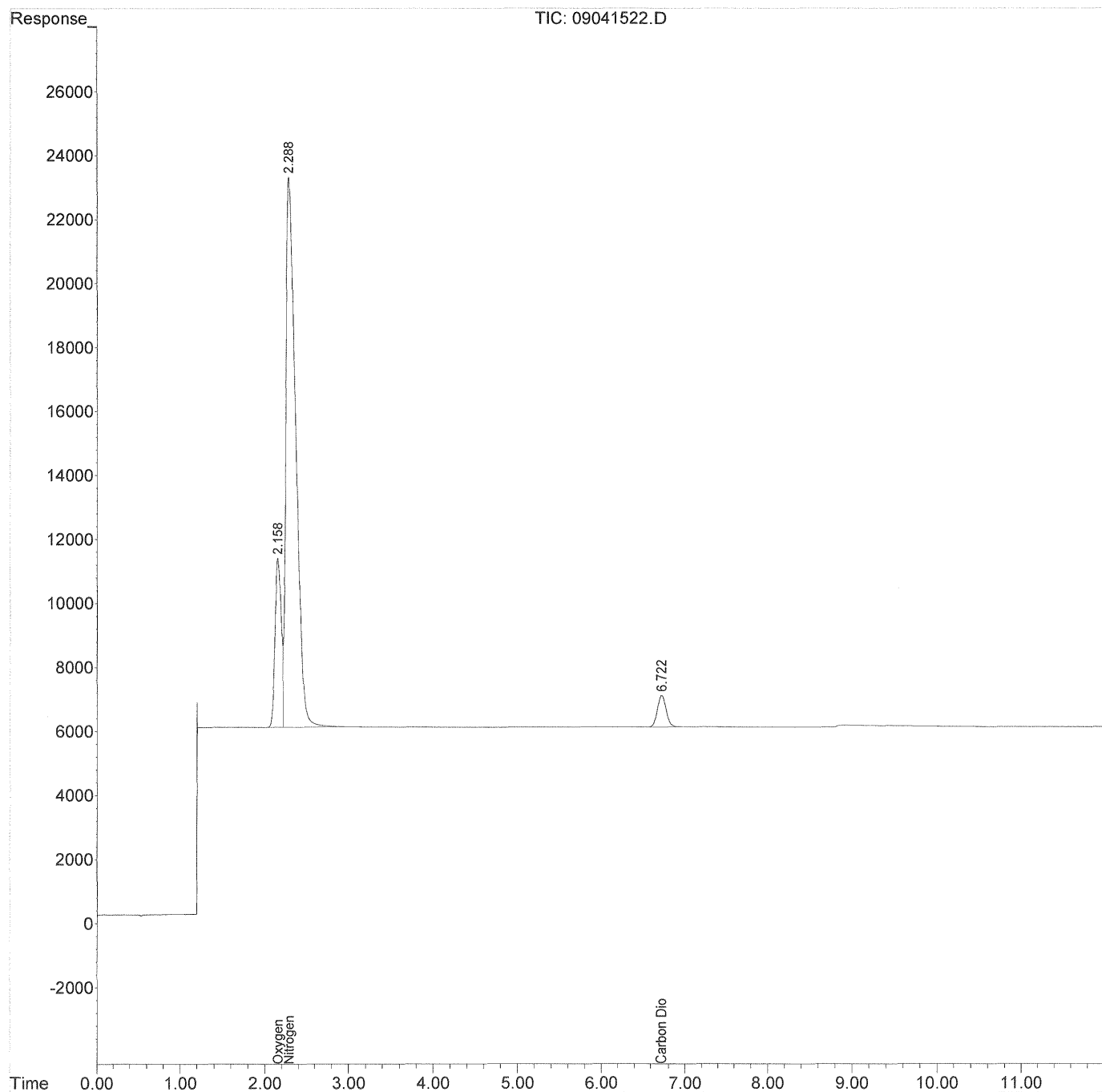
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041522.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 4:26 pm  
Operator : WH  
Sample : 3700-007  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:20 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041523.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 4:57 pm  
Operator : WH  
Sample : 3700-009  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:23 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.164 | 272731   | 165037.009 ppm |
| 3) Nitrogen        | 2.295 | 1390035  | 723979.033 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.728 | 58994    | 27420.281 ppm  |
| -----              |       |          |                |

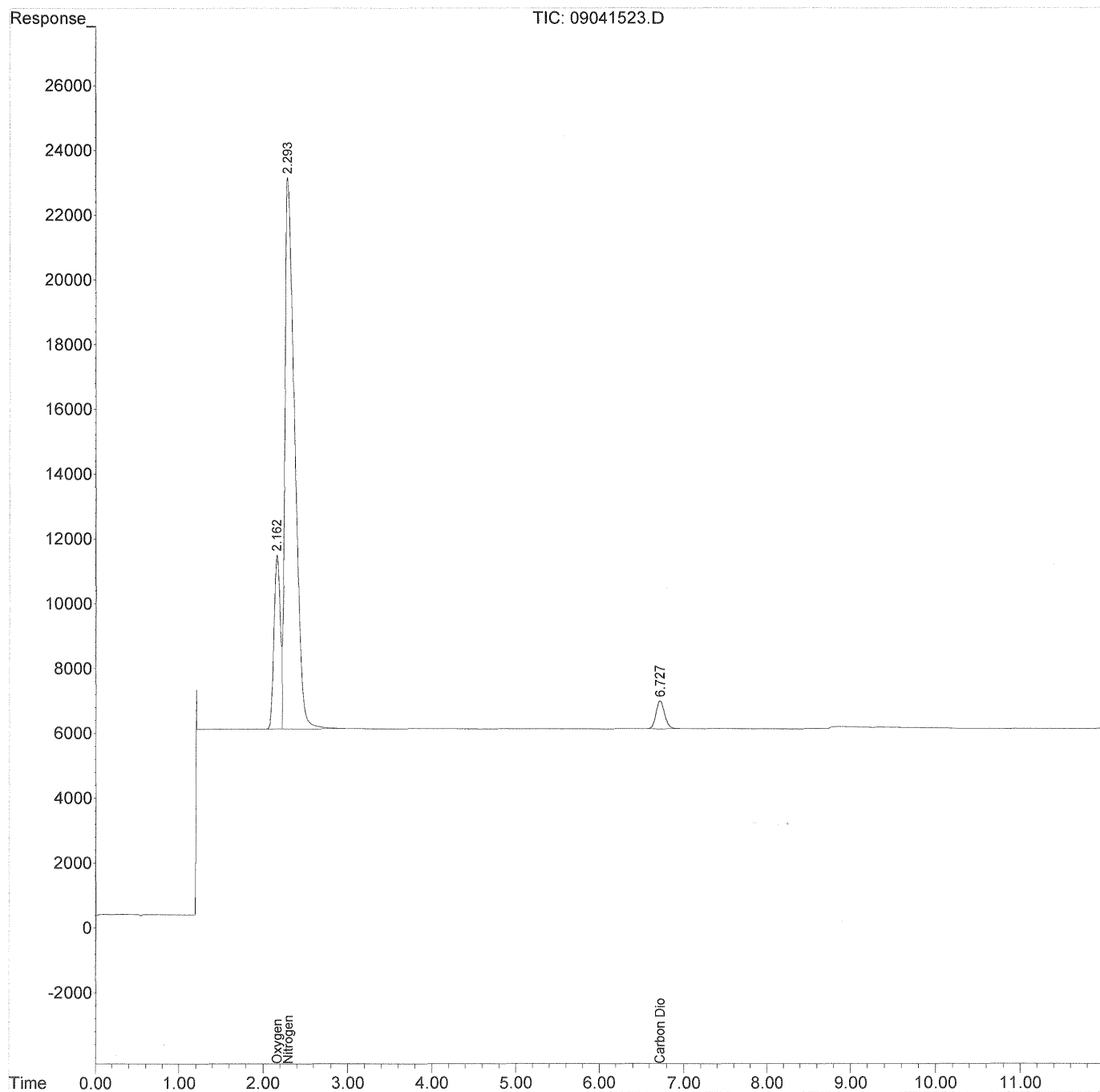
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041523.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 4:57 pm  
Operator : WH  
Sample : 3700-009  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:23 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041524.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 5:16 pm  
Operator : WH  
Sample : 3700-009  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:26 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.162 | 273585   | 165553.693 ppm |
| 3) Nitrogen        | 2.293 | 1394999  | 726564.397 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.726 | 59606    | 27704.762 ppm  |
| -----              |       |          |                |

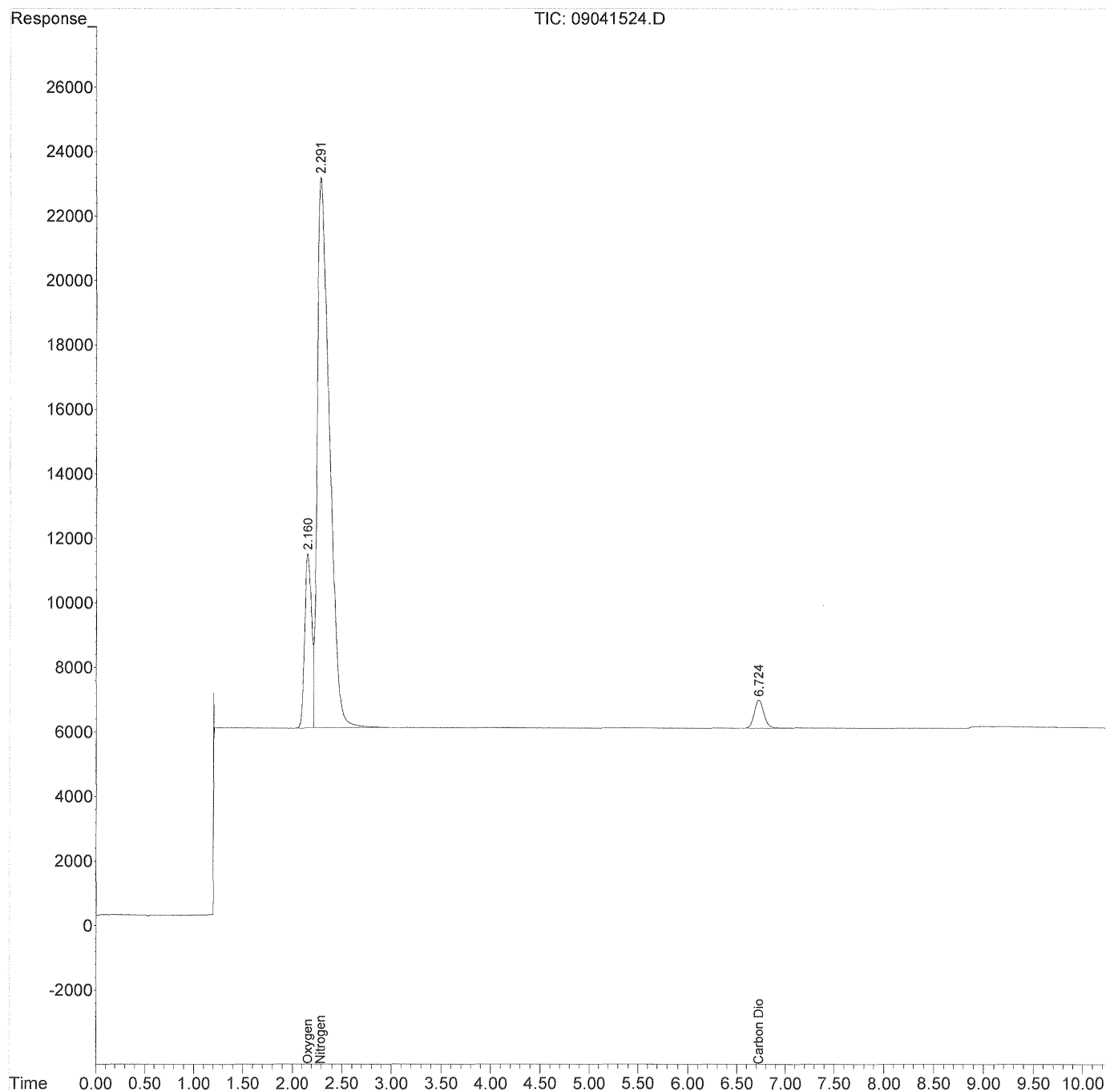
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041524.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 5:16 pm  
Operator : WH  
Sample : 3700-009  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:26 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041525.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 5:30 pm  
Operator : WH  
Sample : 3700-009  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:29 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.146 | 276119   | 167087.028 ppm |
| 3) Nitrogen        | 2.277 | 1407249  | 732945.088 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.722 | 60174    | 27968.770 ppm  |
| -----              |       |          |                |

(f)=RT Delta > 1/2 Window

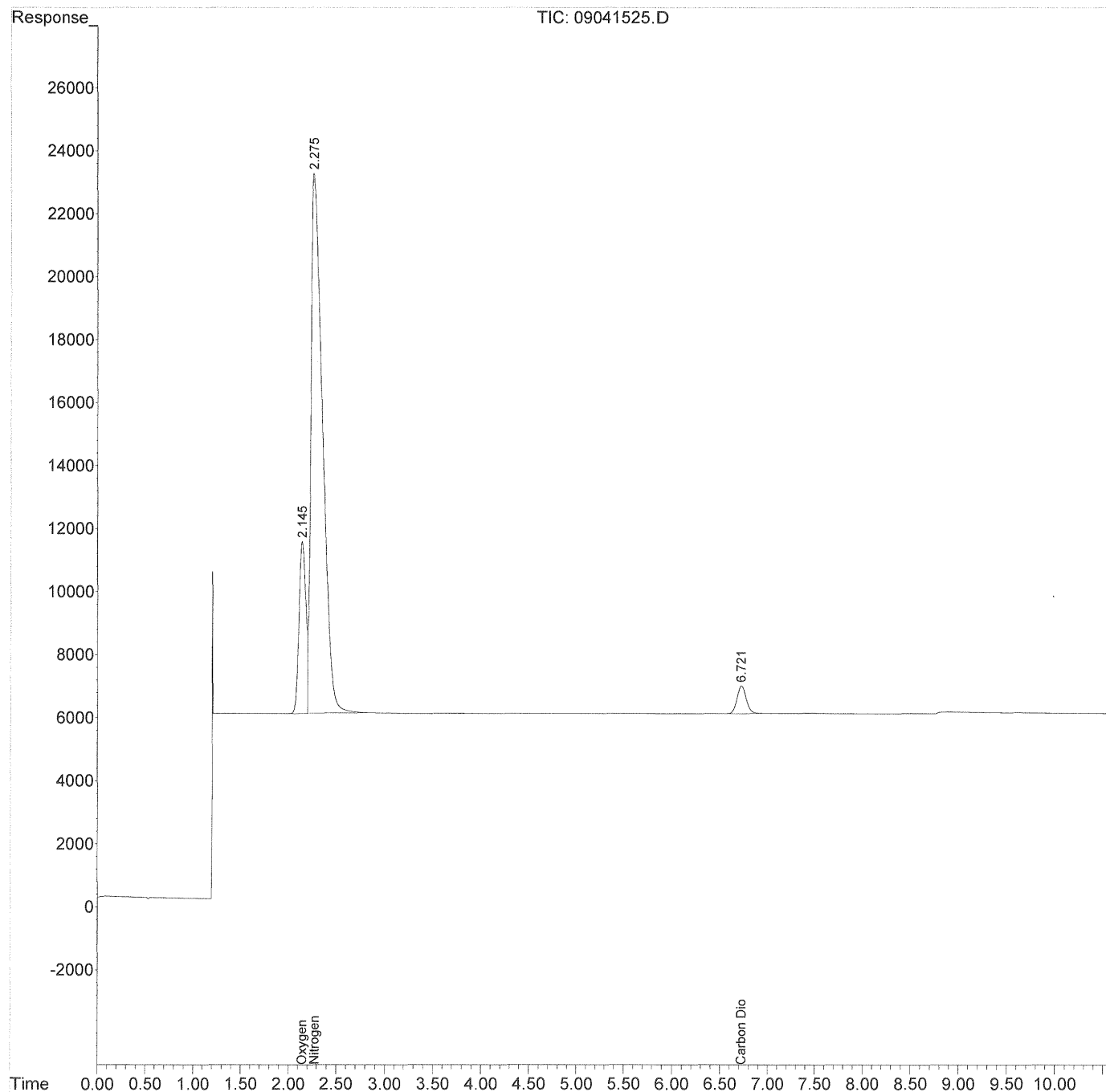
(m)=manual int.



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041525.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 5:30 pm  
Operator : WH  
Sample : 3700-009  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:29 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041526.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 5:45 pm  
Operator : WH  
Sample : 3700-011  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:32 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.151 | 272039   | 164618.088 ppm |
| 3) Nitrogen        | 2.282 | 1404836  | 731687.918 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.721 | 62651    | 29120.131 ppm  |
| -----              |       |          |                |

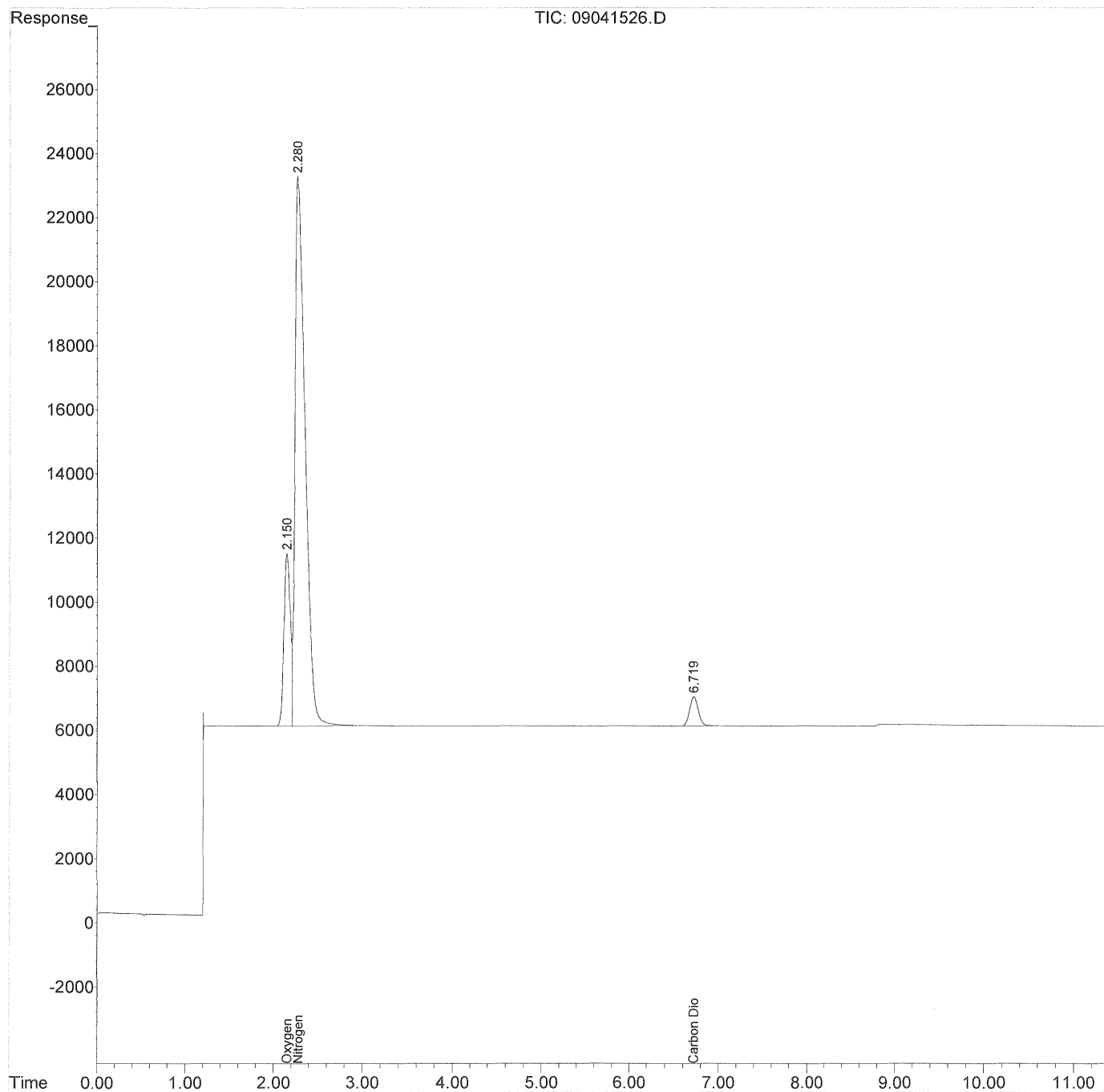
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041526.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 5:45 pm  
Operator : WH  
Sample : 3700-011  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:32 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041527.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 6:03 pm  
Operator : WH  
Sample : 3700-011  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:35 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.161 | 271004   | 163992.125 ppm |
| 3) Nitrogen        | 2.291 | 1397408  | 727819.218 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.724 | 62259    | 28937.835 ppm  |
| -----              |       |          |                |

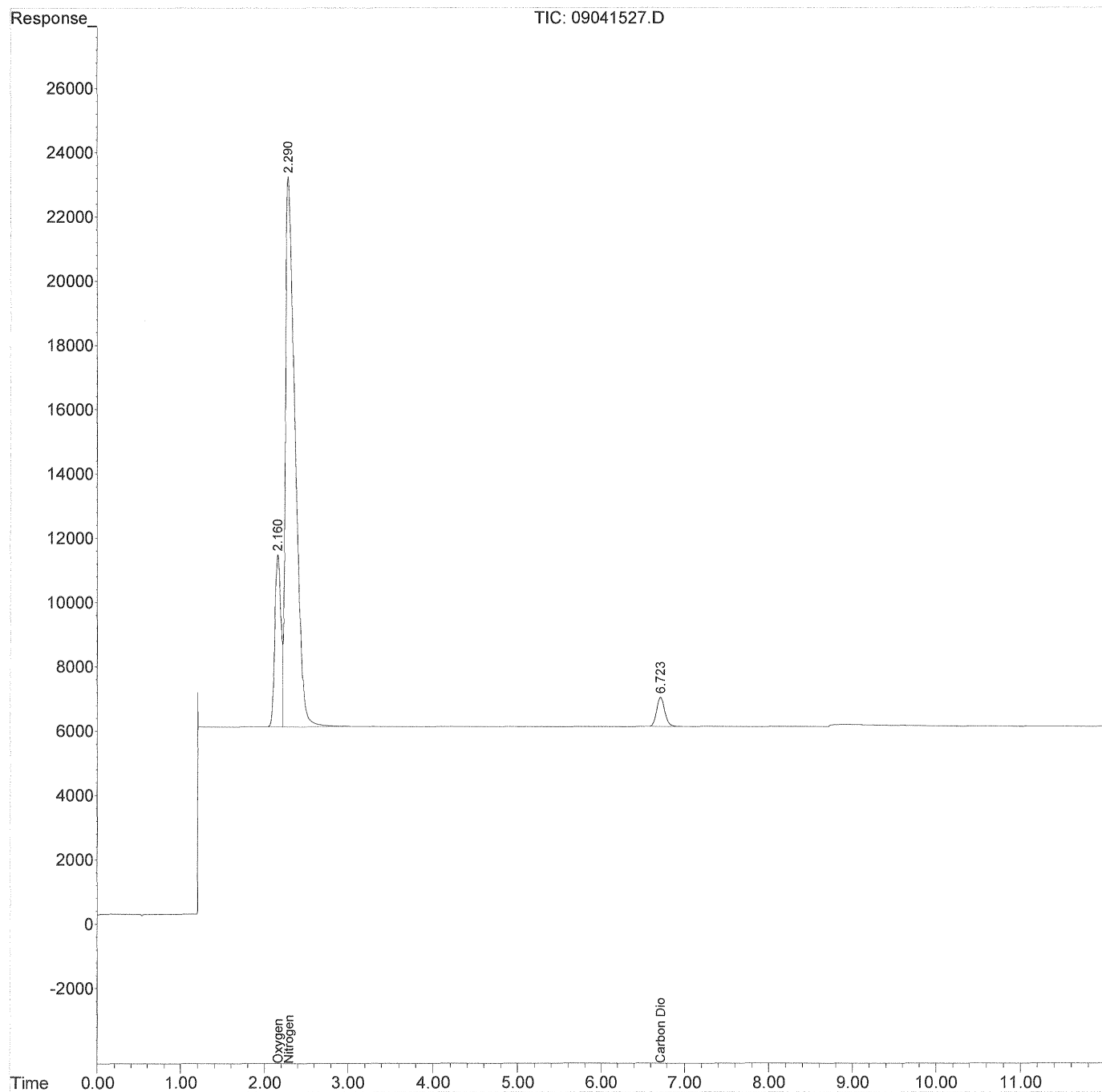
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041527.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 6:03 pm  
Operator : WH  
Sample : 3700-011  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:35 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041528.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 6:19 pm  
Operator : WH  
Sample : 3700-011  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:38 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.131 | 271458   | 164266.726 ppm |
| 3) Nitrogen        | 2.261 | 1405769  | 732174.298 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.716 | 62971    | 29268.727 ppm  |
| -----              |       |          |                |

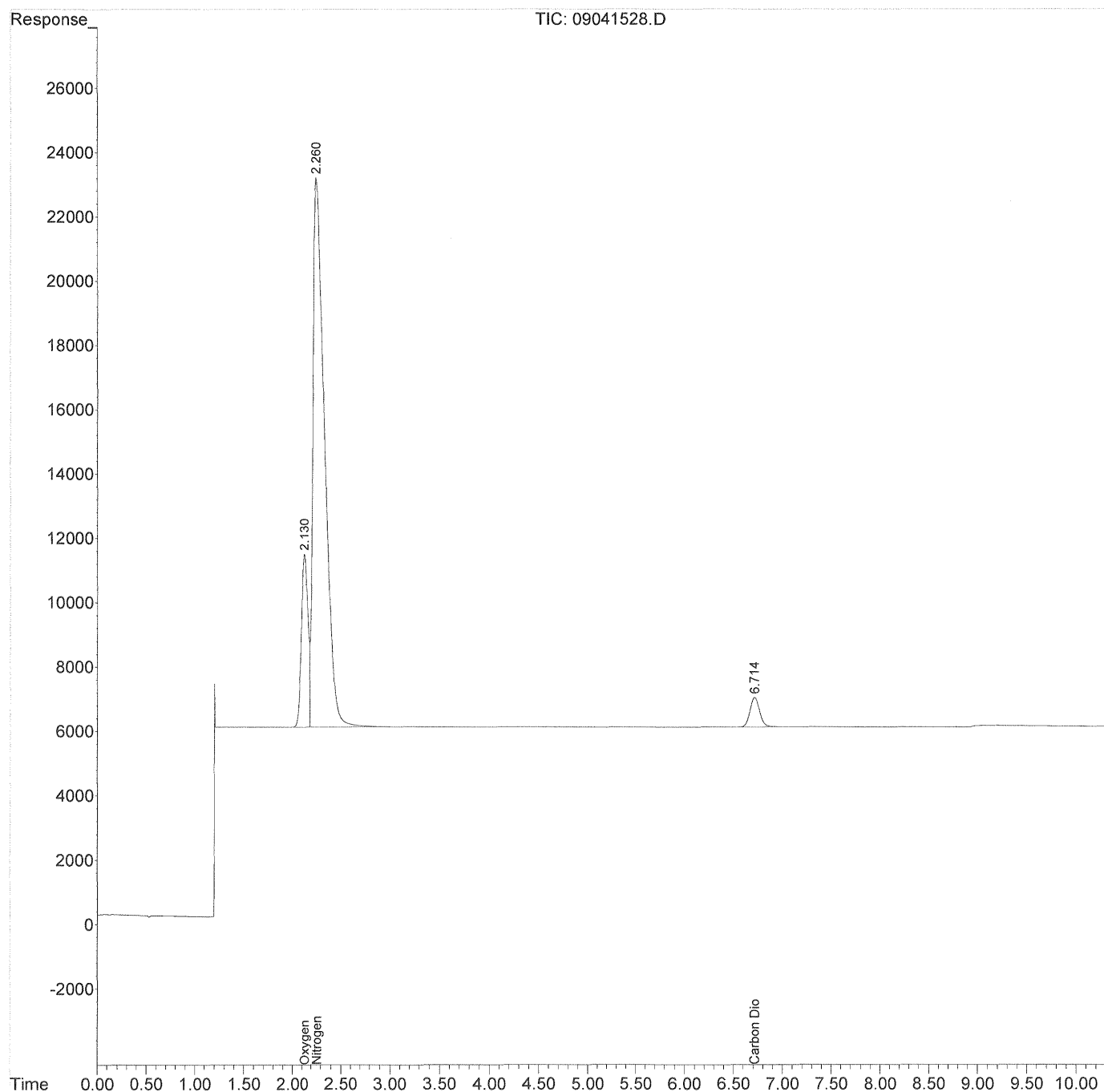
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041528.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 6:19 pm  
Operator : WH  
Sample : 3700-011  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:38 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
 Data File : 09041529.D  
 Signal(s) : TCD1A.CH  
 Acq On : 4 Sep 2015 6:33 pm  
 Operator : WH  
 Sample : 3700-013  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Sep 10 07:43:41 2015  
 Quant Method : I:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Tue Mar 11 11:04:23 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.147 | 240300   | 145412.047 ppm |
| 3) Nitrogen        | 2.275 | 1404793  | 731665.568 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.716 | 90809    | 42207.655 ppm  |
| -----              |       |          |                |

(f)=RT Delta > 1/2 Window

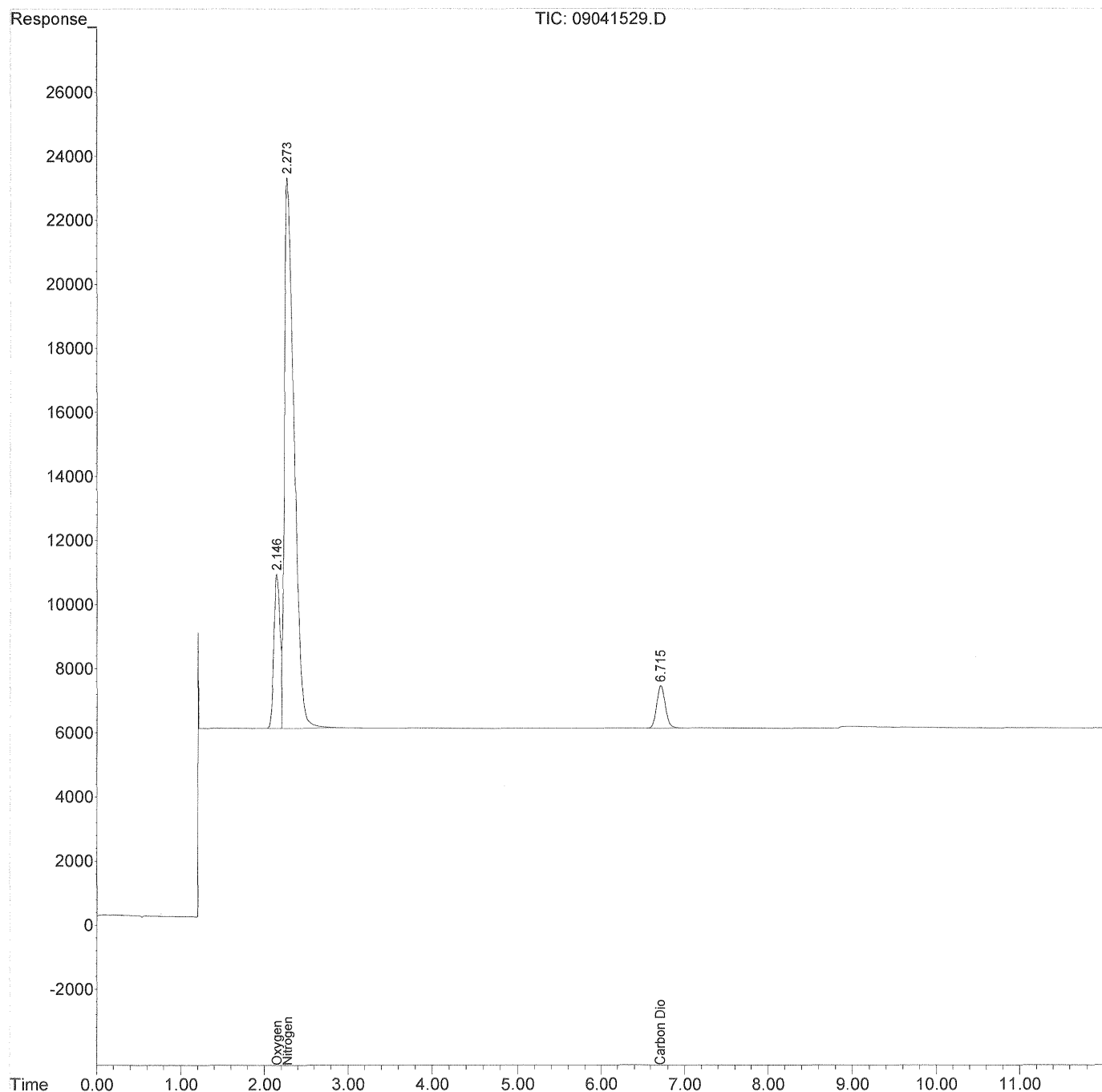
(m)=manual int.



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041529.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 6:33 pm  
Operator : WH  
Sample : 3700-013  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:41 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041530.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 6:48 pm  
Operator : WH  
Sample : 3700-013  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:44 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.135 | 238862   | 144541.790 ppm |
| 3) Nitrogen        | 2.262 | 1400216  | 729281.891 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.715 | 90868    | 42235.065 ppm  |
| -----              |       |          |                |

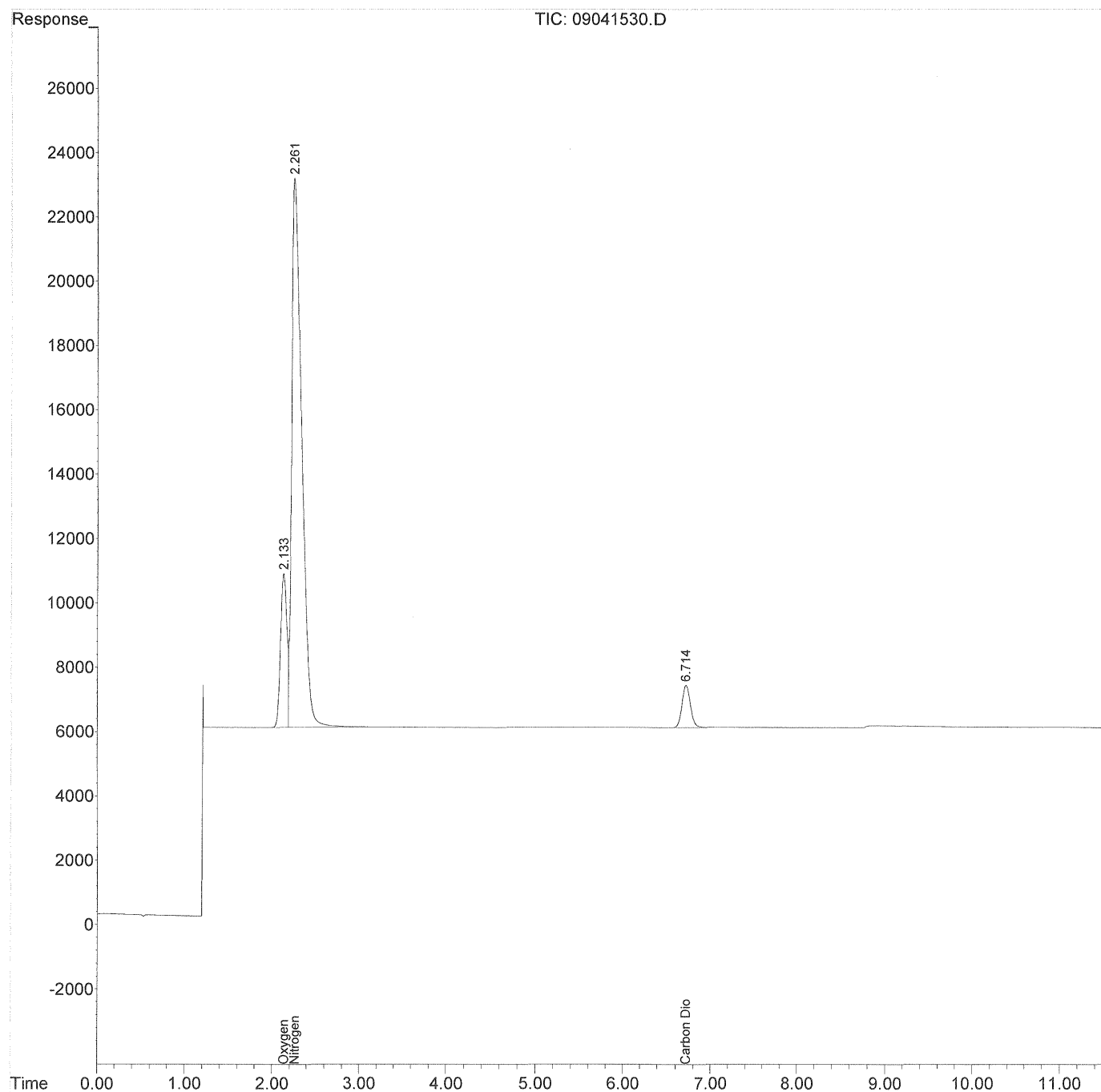
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041530.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 6:48 pm  
Operator : WH  
Sample : 3700-013  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:44 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041531.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 7:04 pm  
Operator : WH  
Sample : 3700-013  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:47 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.154 | 240688   | 145646.982 ppm |
| 3) Nitrogen        | 2.282 | 1406839  | 732731.519 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.719 | 91150    | 42366.317 ppm  |
| -----              |       |          |                |

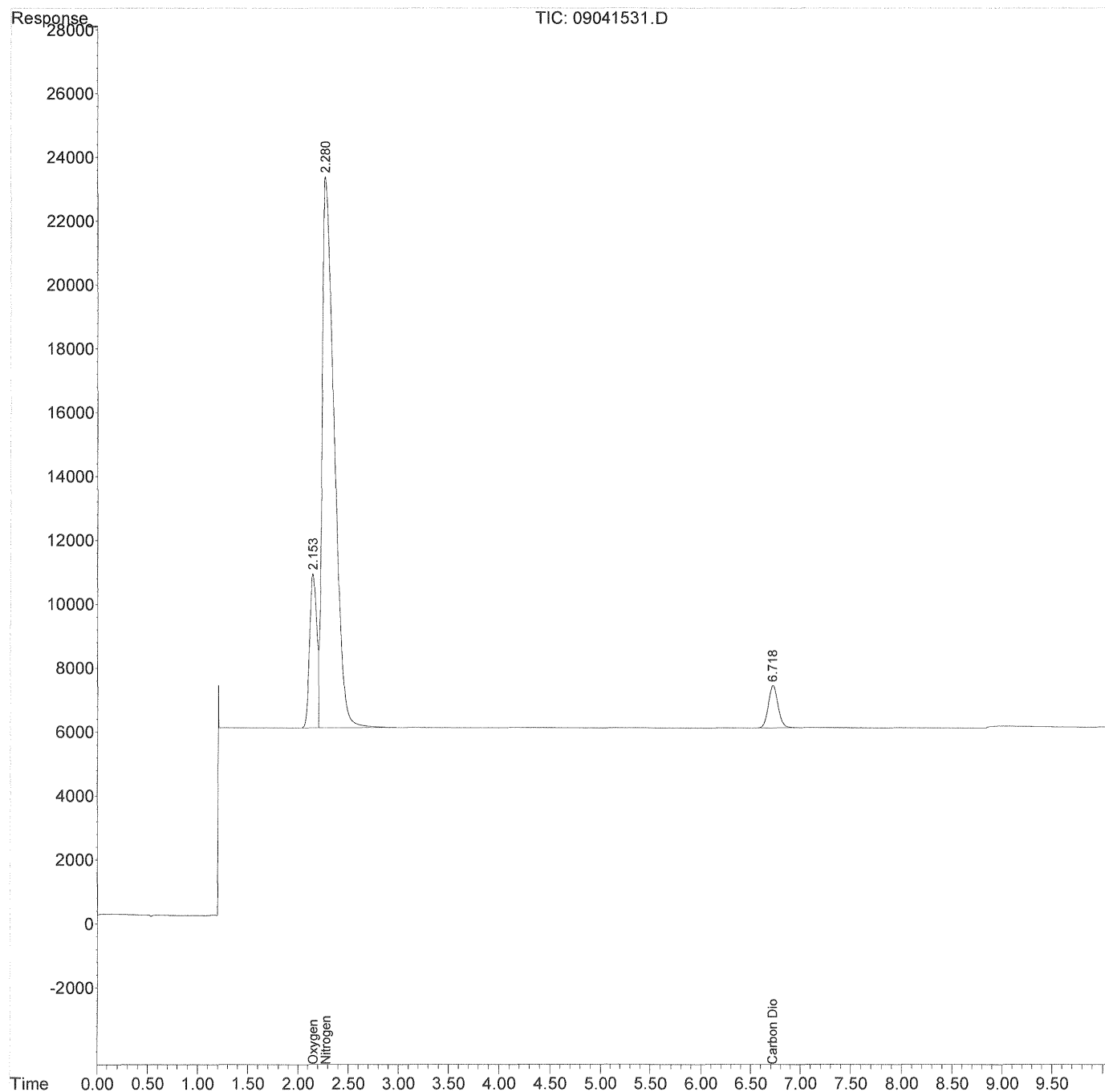
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041531.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 7:04 pm  
Operator : WH  
Sample : 3700-013  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:47 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041532.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 7:18 pm  
Operator : WH  
Sample : 3700-015  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:50 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.157 | 233375   | 141221.728 ppm |
| 3) Nitrogen        | 2.284 | 1409017  | 733865.843 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.720 | 98029    | 45563.694 ppm  |
| -----              |       |          |                |

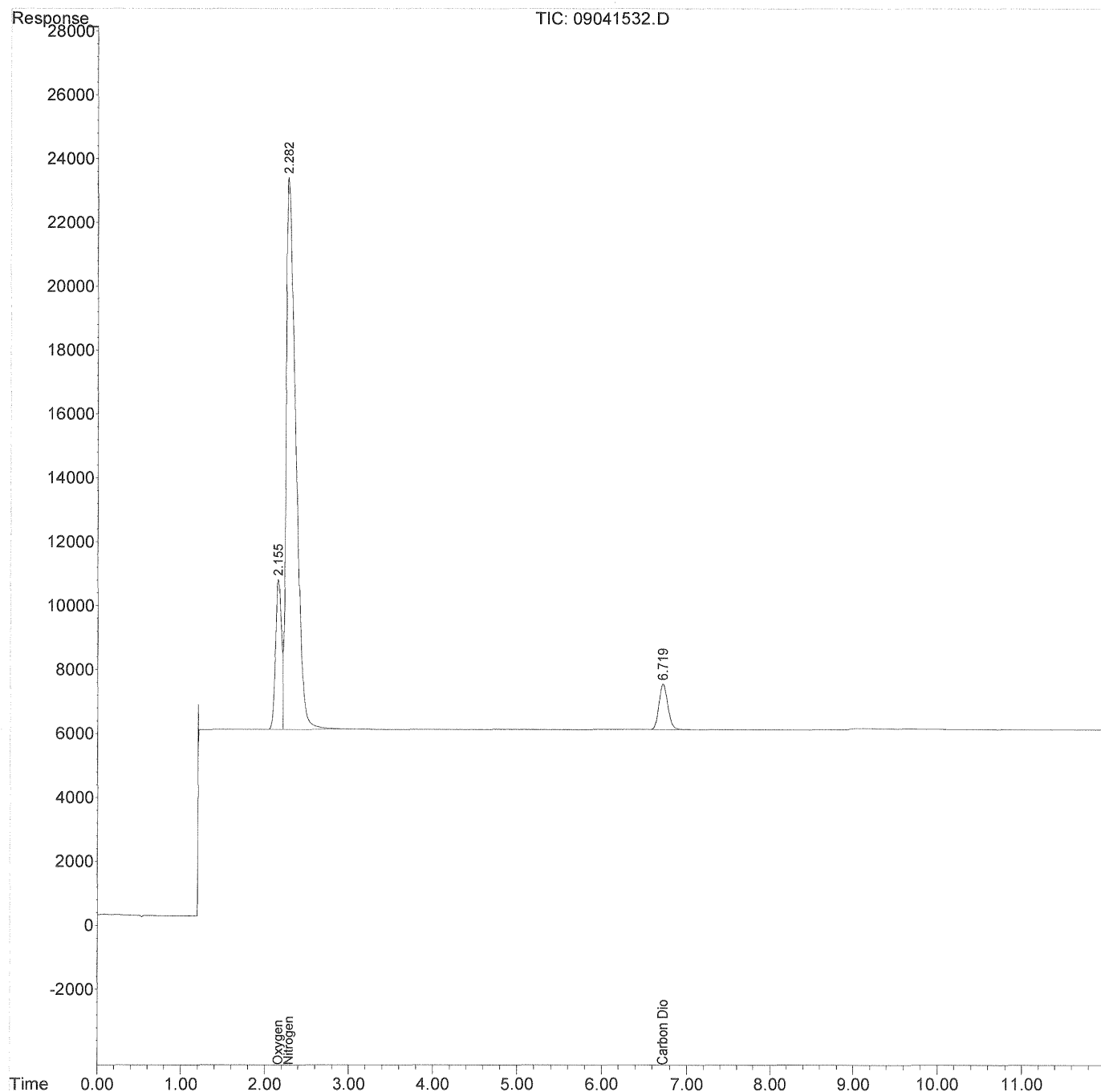
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041532.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 7:18 pm  
Operator : WH  
Sample : 3700-015  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:50 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041533.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 7:35 pm  
Operator : WH  
Sample : 3700-015  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:53 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.169 | 231940   | 140353.359 ppm |
| 3) Nitrogen        | 2.296 | 1398799  | 728543.968 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.728 | 97539    | 45335.876 ppm  |
| -----              |       |          |                |

(f)=RT Delta > 1/2 Window

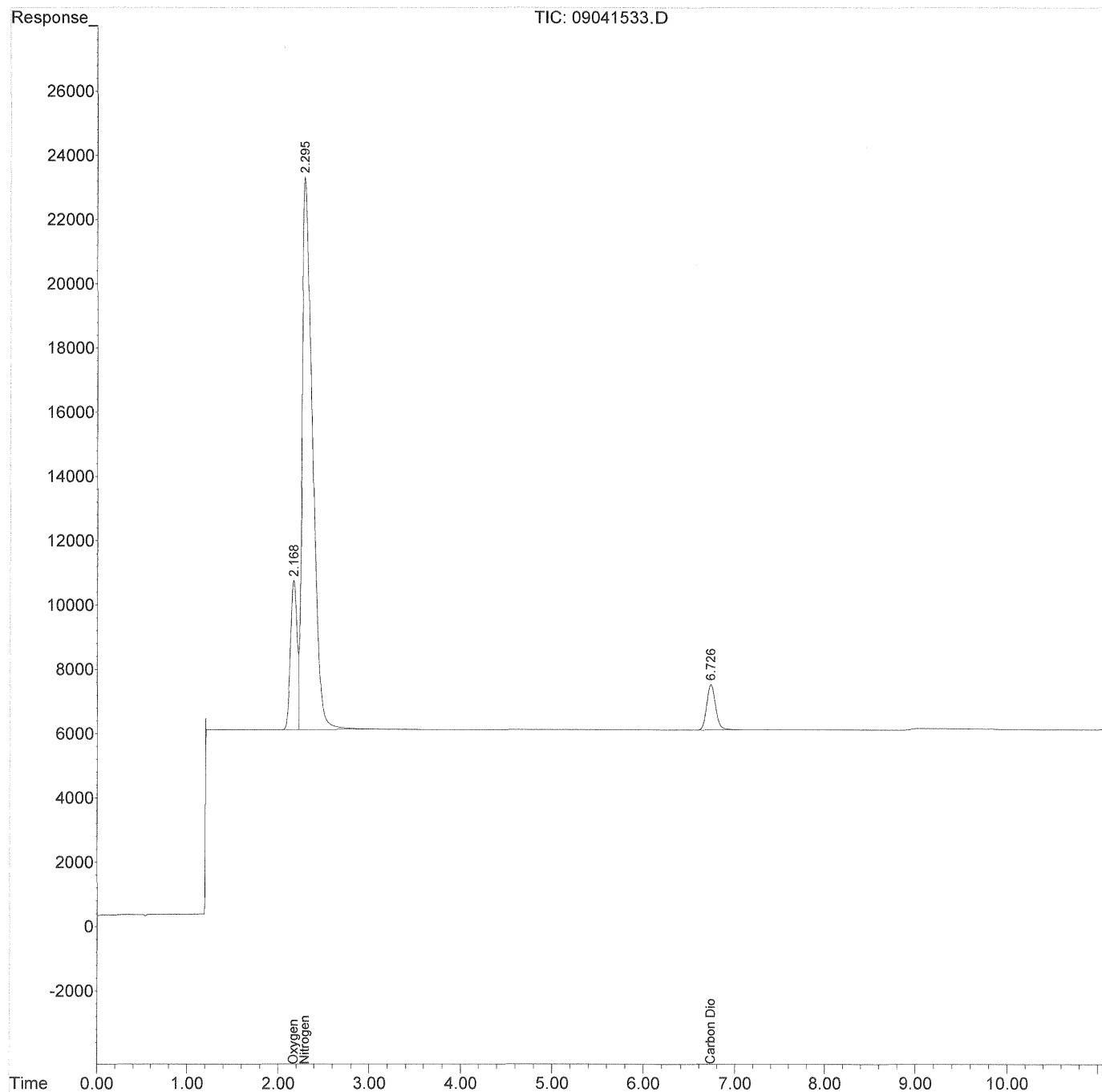
(m)=manual int.



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041533.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 7:35 pm  
Operator : WH  
Sample : 3700-015  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:53 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041534.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 7:51 pm  
Operator : WH  
Sample : 3700-015  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:56 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.168 | 232683   | 140802.798 ppm |
| 3) Nitrogen        | 2.295 | 1404801  | 731669.982 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.728 | 97892    | 45499.753 ppm  |
| -----              |       |          |                |

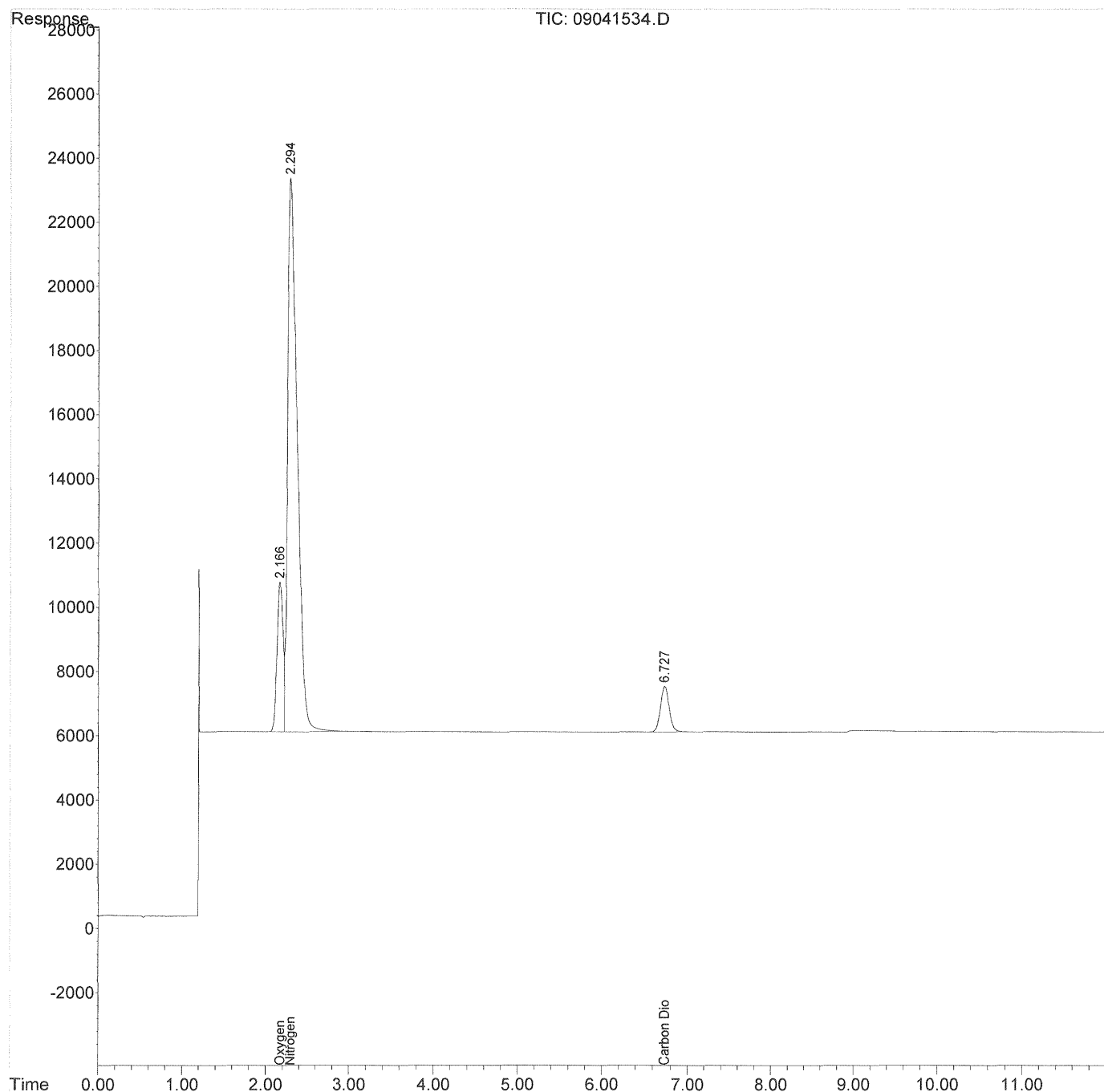
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041534.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 7:51 pm  
Operator : WH  
Sample : 3700-015  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:56 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041535.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 8:07 pm  
Operator : WH  
Sample : 3700-017  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:59 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.157 | 235492   | 142502.579 ppm |
| 3) Nitrogen        | 2.284 | 1407486  | 733068.454 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.728 | 95341    | 44313.932 ppm  |
| -----              |       |          |                |

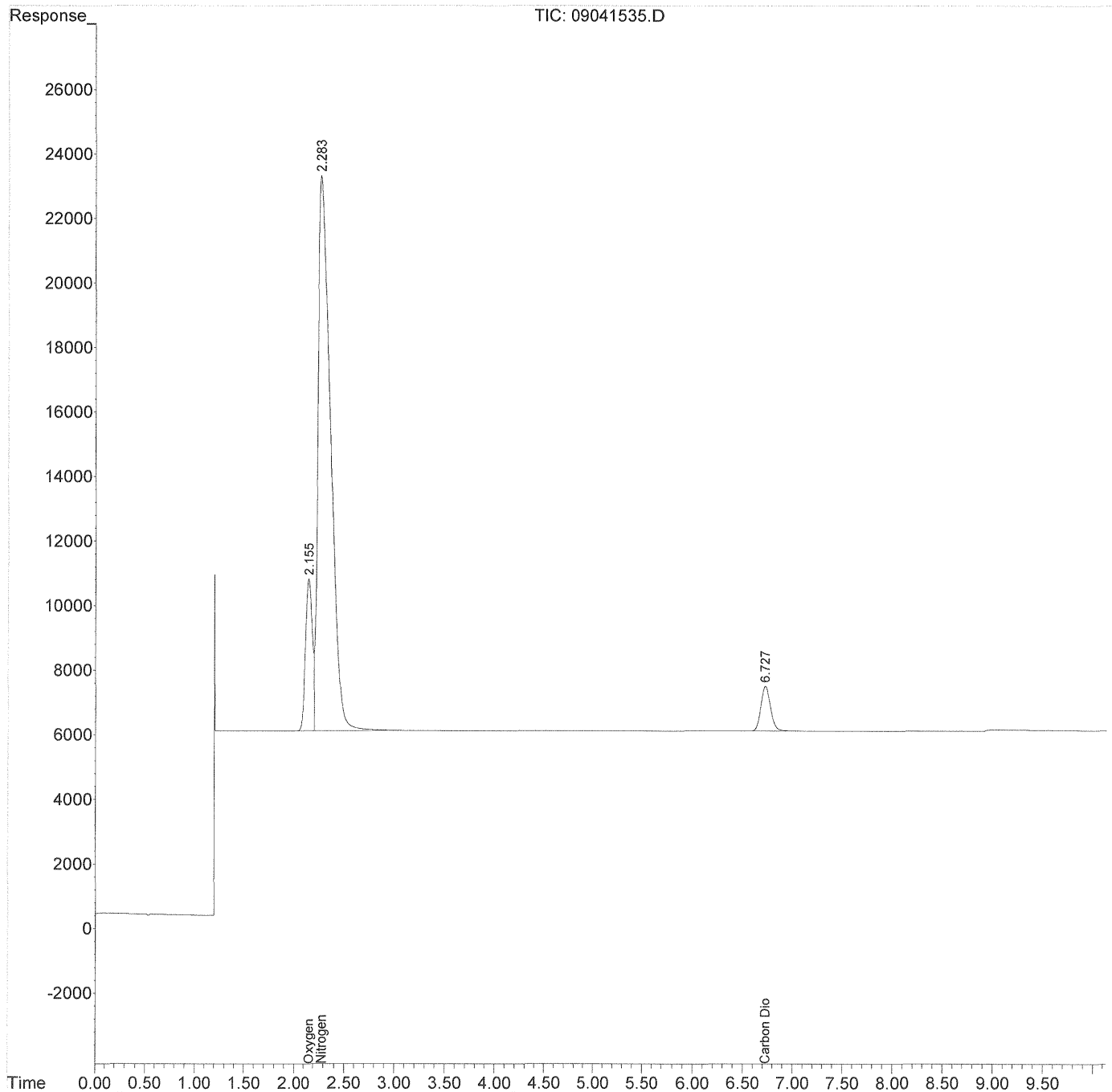
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041535.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 8:07 pm  
Operator : WH  
Sample : 3700-017  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:43:59 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041536.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 8:22 pm  
Operator : WH  
Sample : 3700-017  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:44:02 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.174 | 235804   | 142691.152 ppm |
| 3) Nitrogen        | 2.302 | 1406146  | 732370.391 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.733 | 95344    | 44315.355 ppm  |
| -----              |       |          |                |

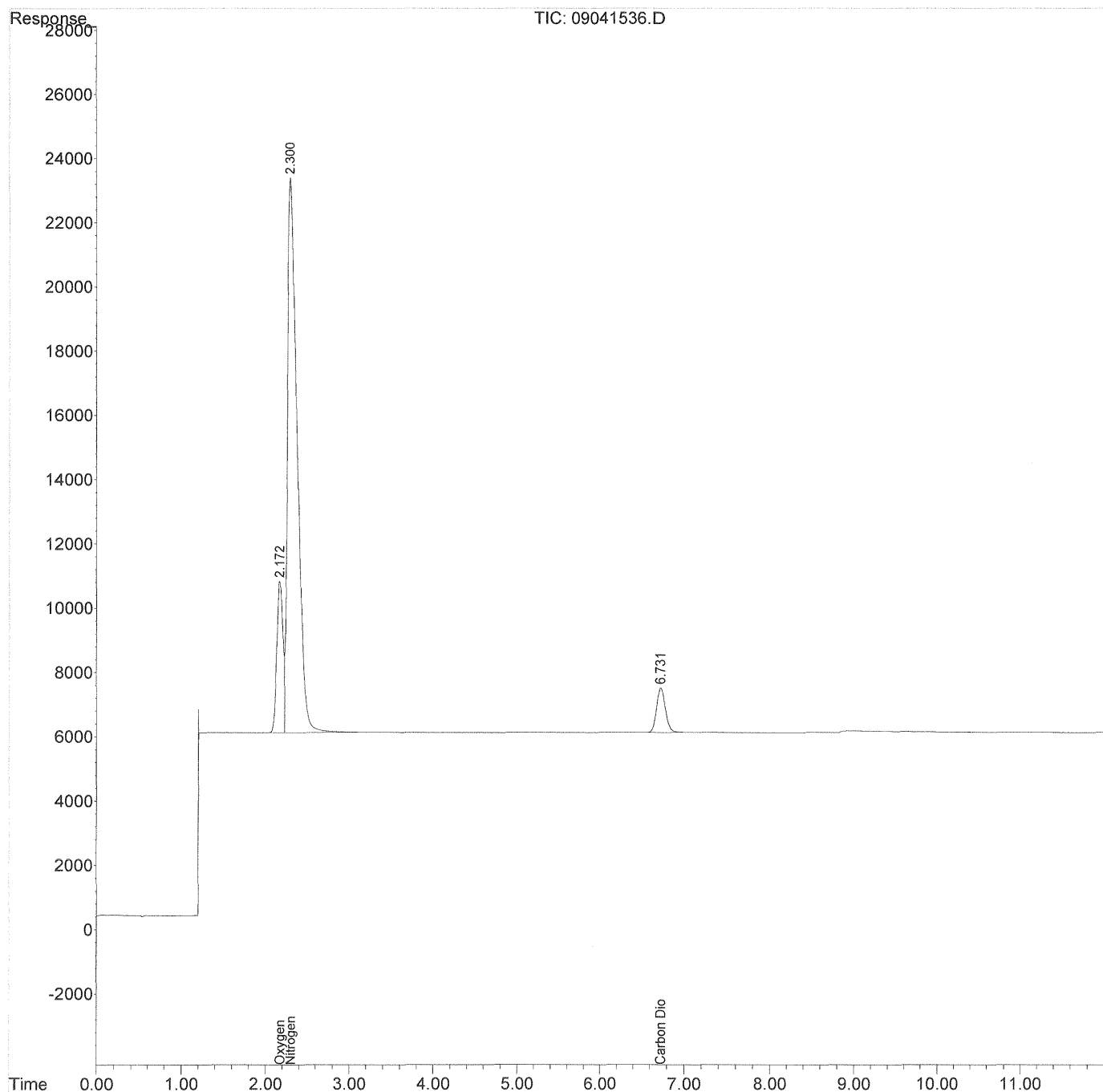
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041536.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 8:22 pm  
Operator : WH  
Sample : 3700-017  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:44:02 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041537.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 8:40 pm  
Operator : WH  
Sample : 3700-017  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:44:05 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.180 | 234991   | 142199.624 ppm |
| 3) Nitrogen        | 2.308 | 1401021  | 729700.896 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.737 | 94908    | 44112.812 ppm  |
| -----              |       |          |                |

(f)=RT Delta > 1/2 Window

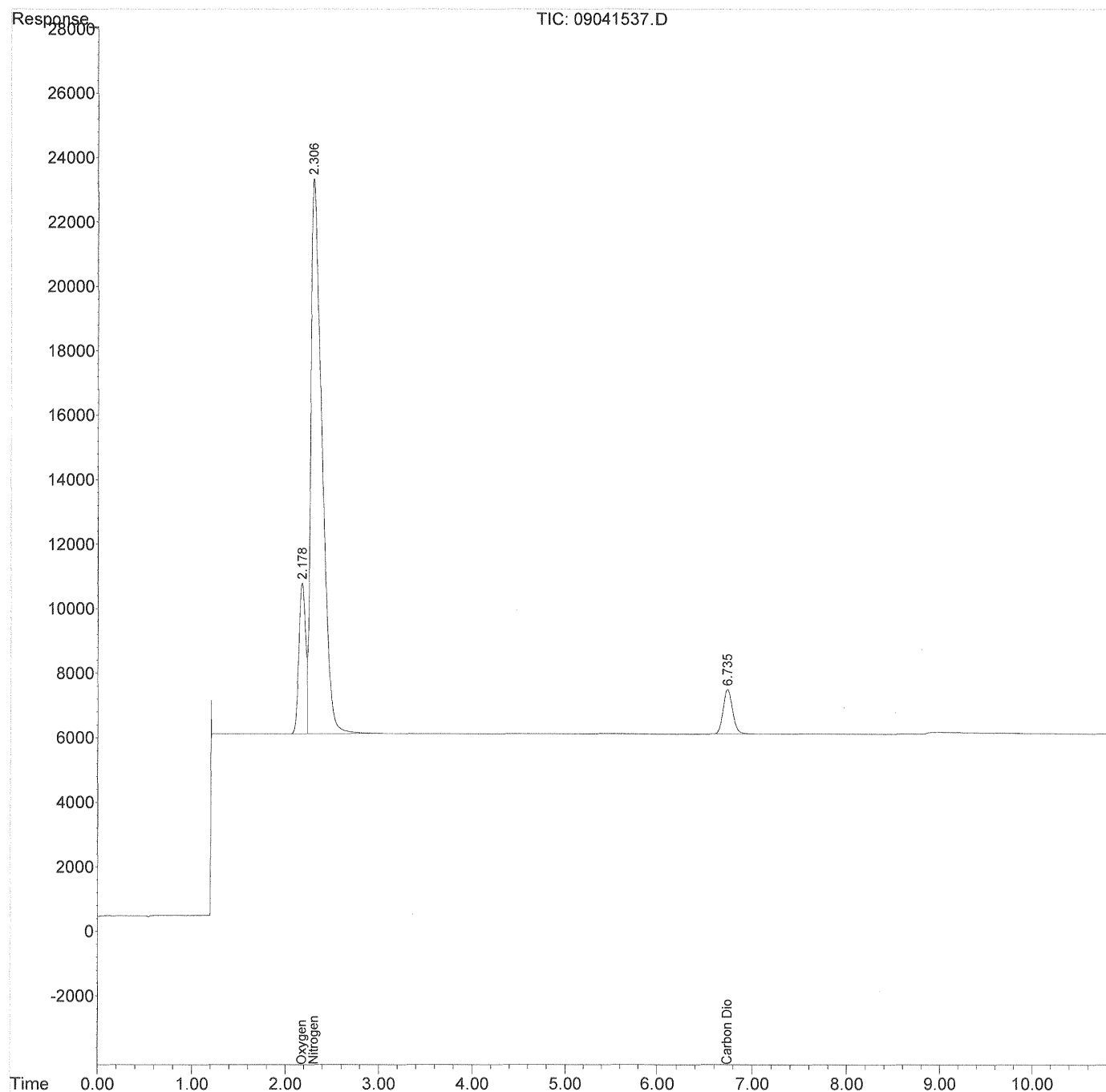
(m)=manual int.



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041537.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 8:40 pm  
Operator : WH  
Sample : 3700-017  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:44:05 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051504.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 2:22 pm  
Operator : WH  
Sample : 3700-019  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:51:54 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.155 | 287346   | 173880.622 ppm |
| 3) Nitrogen        | 2.287 | 1382523  | 720066.610 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.730 | 43608    | 20268.771 ppm  |
| -----              |       |          |                |

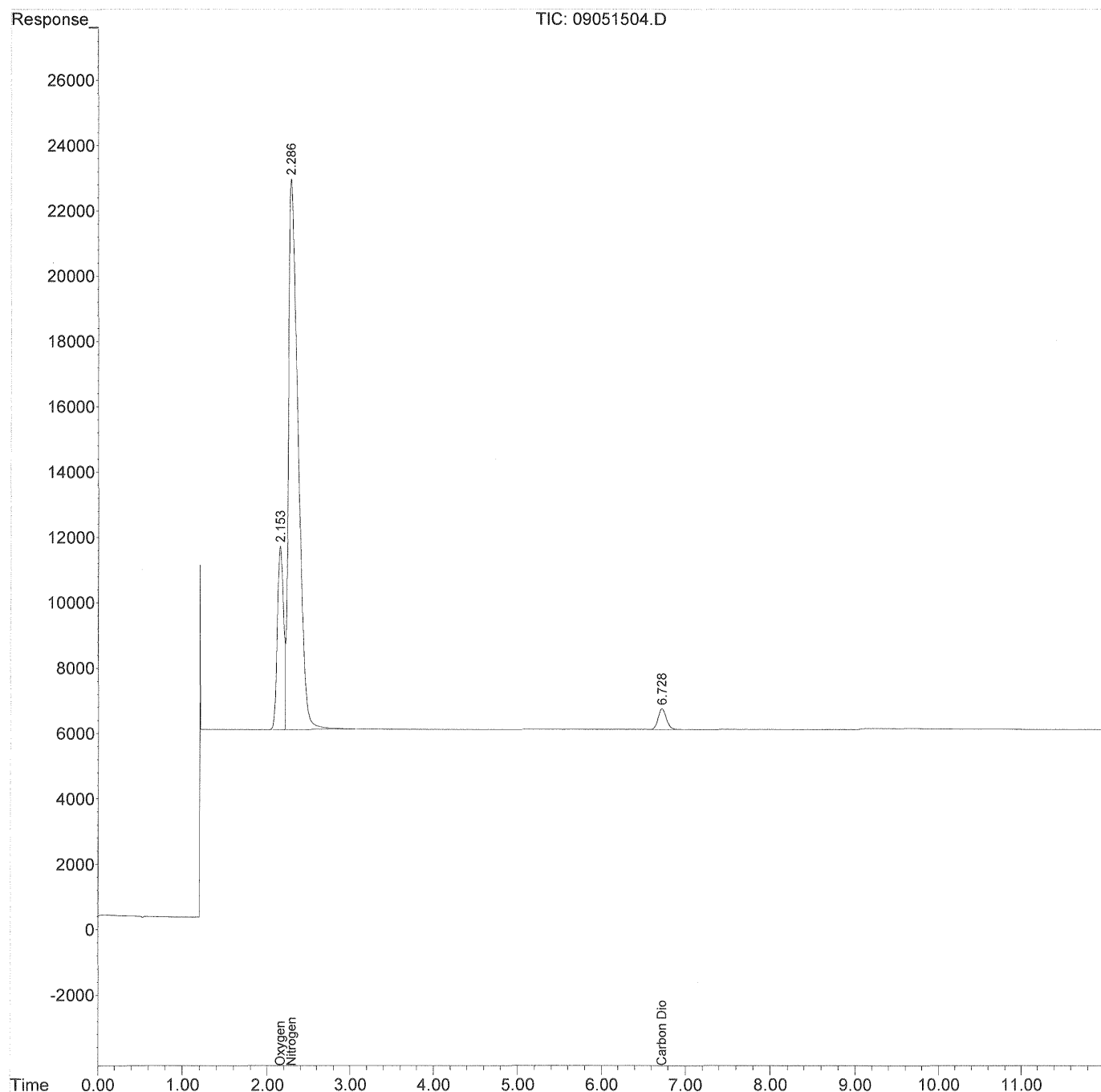
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051504.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 2:22 pm  
Operator : WH  
Sample : 3700-019  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:51:54 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051505.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 2:39 pm  
Operator : WH  
Sample : 3700-019  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:51:56 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.168 | 286457   | 173343.155 ppm |
| 3) Nitrogen        | 2.301 | 1377930  | 717674.762 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.734 | 43447    | 20193.867 ppm  |
| -----              |       |          |                |

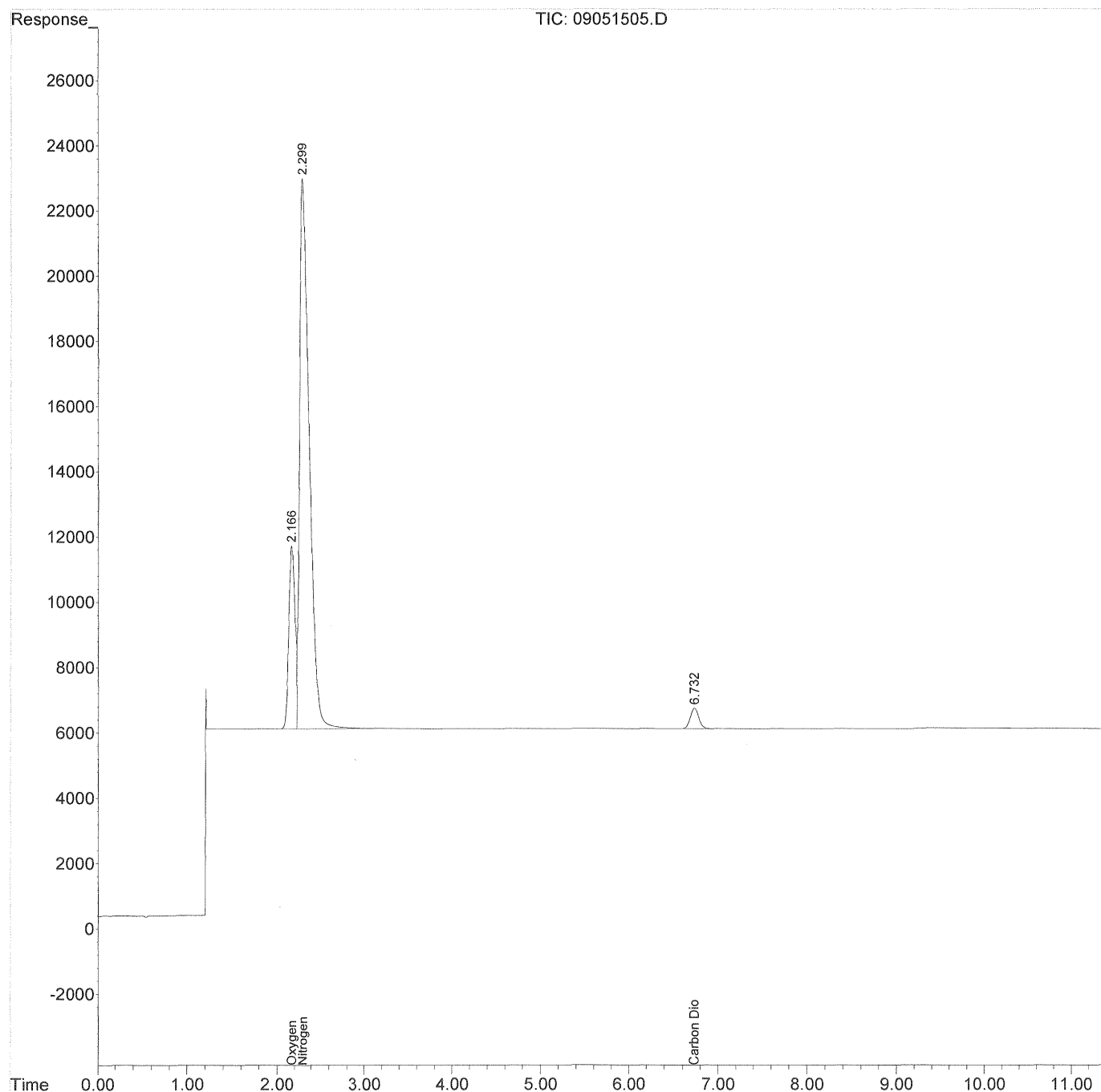
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051505.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 2:39 pm  
Operator : WH  
Sample : 3700-019  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:51:56 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051506.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 2:54 pm  
Operator : WH  
Sample : 3700-019  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:52:00 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.157 | 287401   | 173914.180 ppm |
| 3) Nitrogen        | 2.289 | 1383575  | 720614.763 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.731 | 43509    | 20222.878 ppm  |
| -----              |       |          |                |

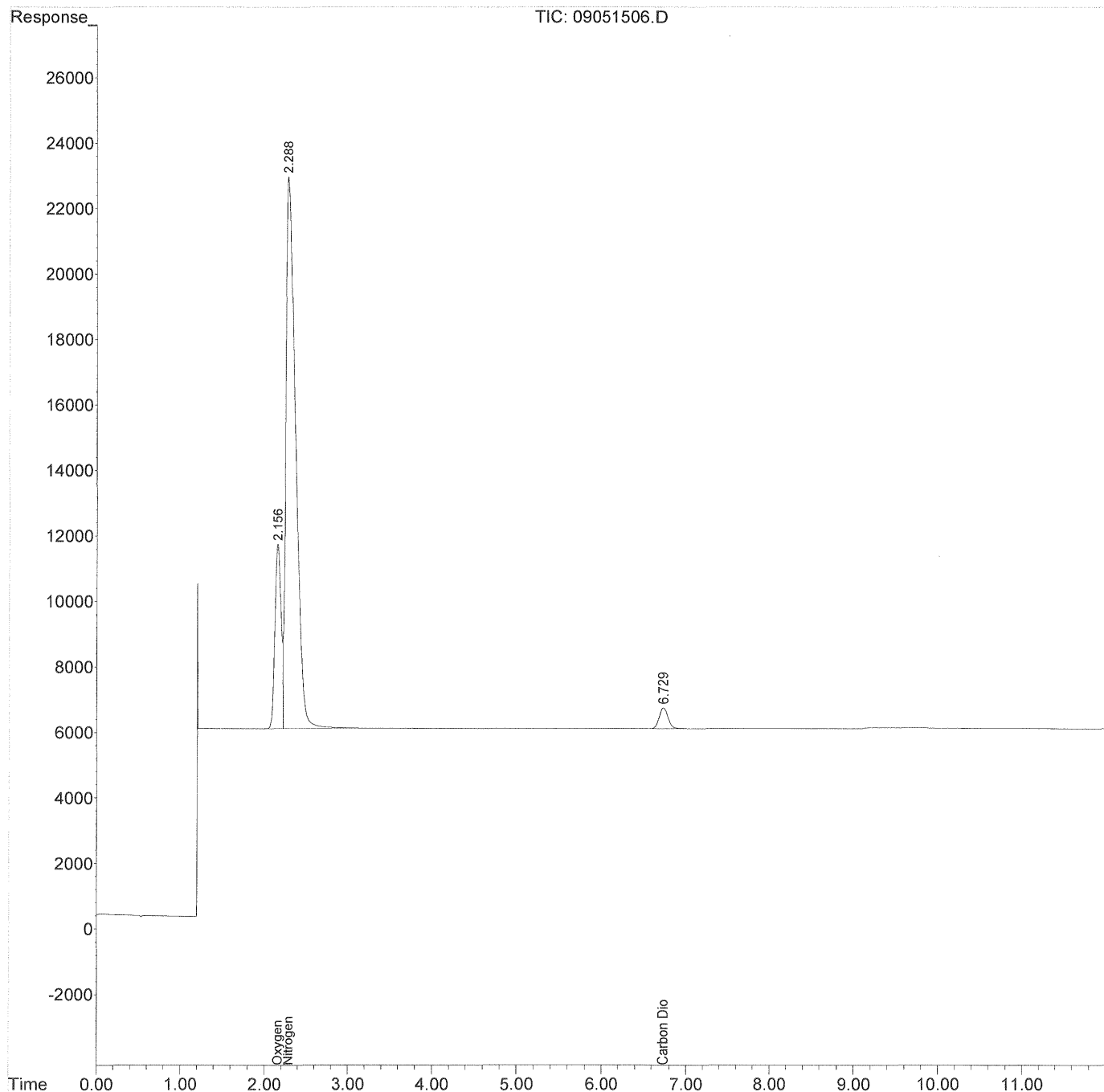
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051506.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 2:54 pm  
Operator : WH  
Sample : 3700-019  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:52:00 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051507.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 3:10 pm  
Operator : WH  
Sample : 3700-021  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:52:03 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.133 | 288012   | 174283.599 ppm |
| 3) Nitrogen        | 2.267 | 1375500  | 716409.074 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.728 | 41621    | 19345.349 ppm  |
| -----              |       |          |                |

(f)=RT Delta > 1/2 Window

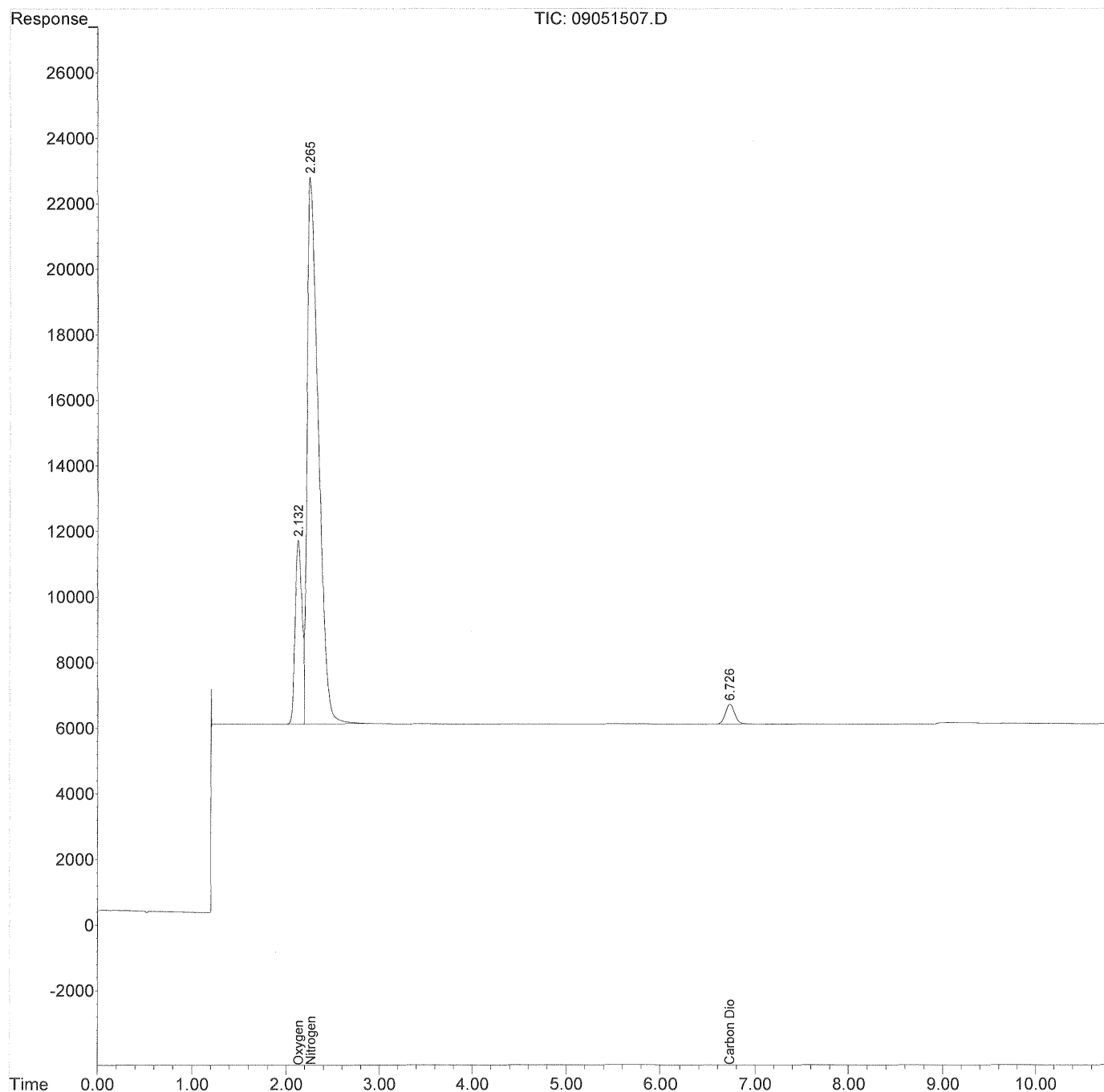
(m)=manual int.



Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051507.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 3:10 pm  
Operator : WH  
Sample : 3700-021  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:52:03 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051508.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 3:31 pm  
Operator : WH  
Sample : 3700-021  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:52:06 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.172 | 286372   | 173291.454 ppm |
| 3) Nitrogen        | 2.306 | 1362923  | 709858.272 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.738 | 41053    | 19081.476 ppm  |
| -----              |       |          |                |

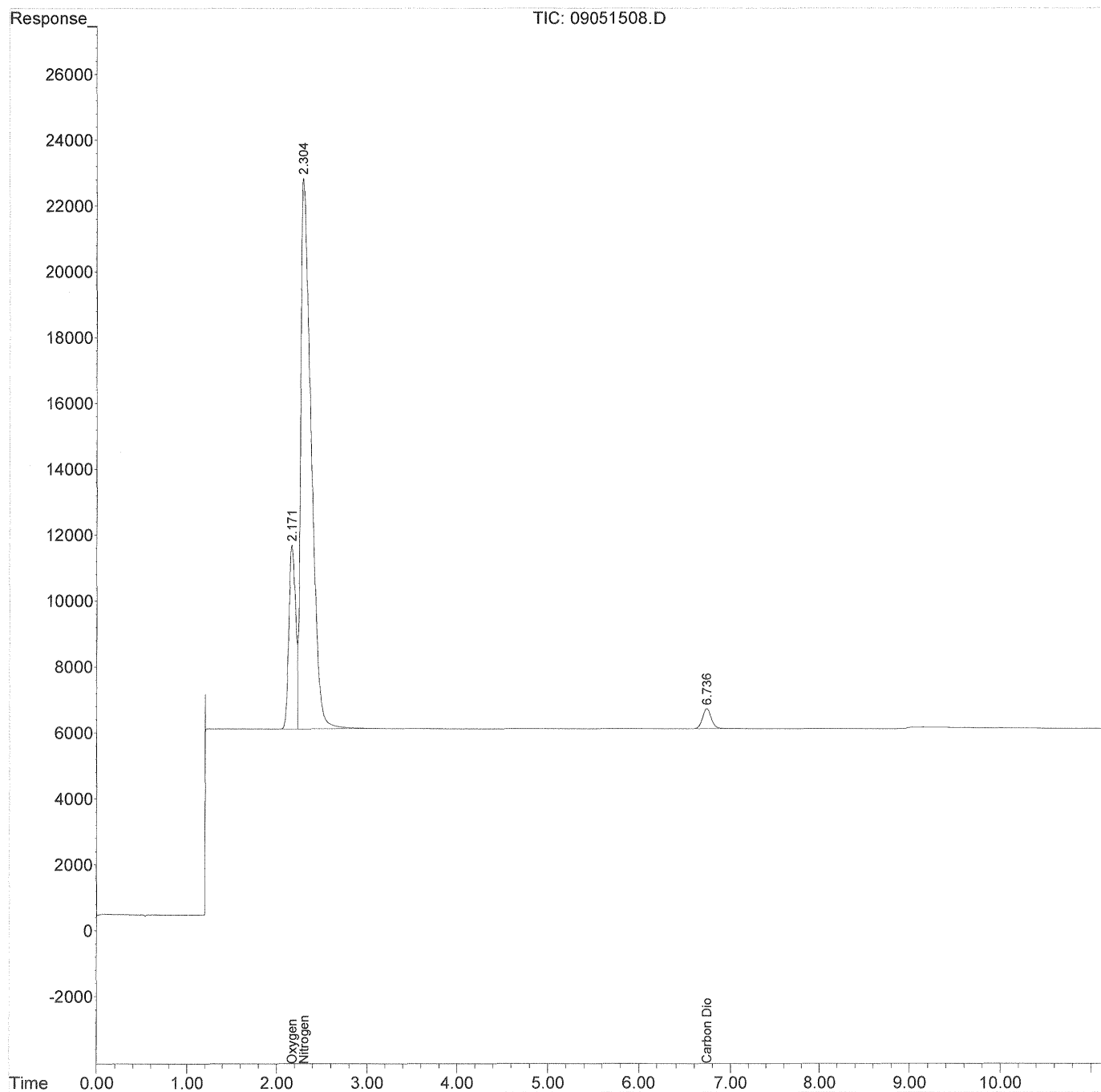
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051508.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 3:31 pm  
Operator : WH  
Sample : 3700-021  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:52:06 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051509.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 3:48 pm  
Operator : WH  
Sample : 3700-021  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:52:09 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.170 | 287533   | 173994.002 ppm |
| 3) Nitrogen        | 2.304 | 1369243  | 713150.049 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.736 | 41353    | 19220.921 ppm  |
| -----              |       |          |                |

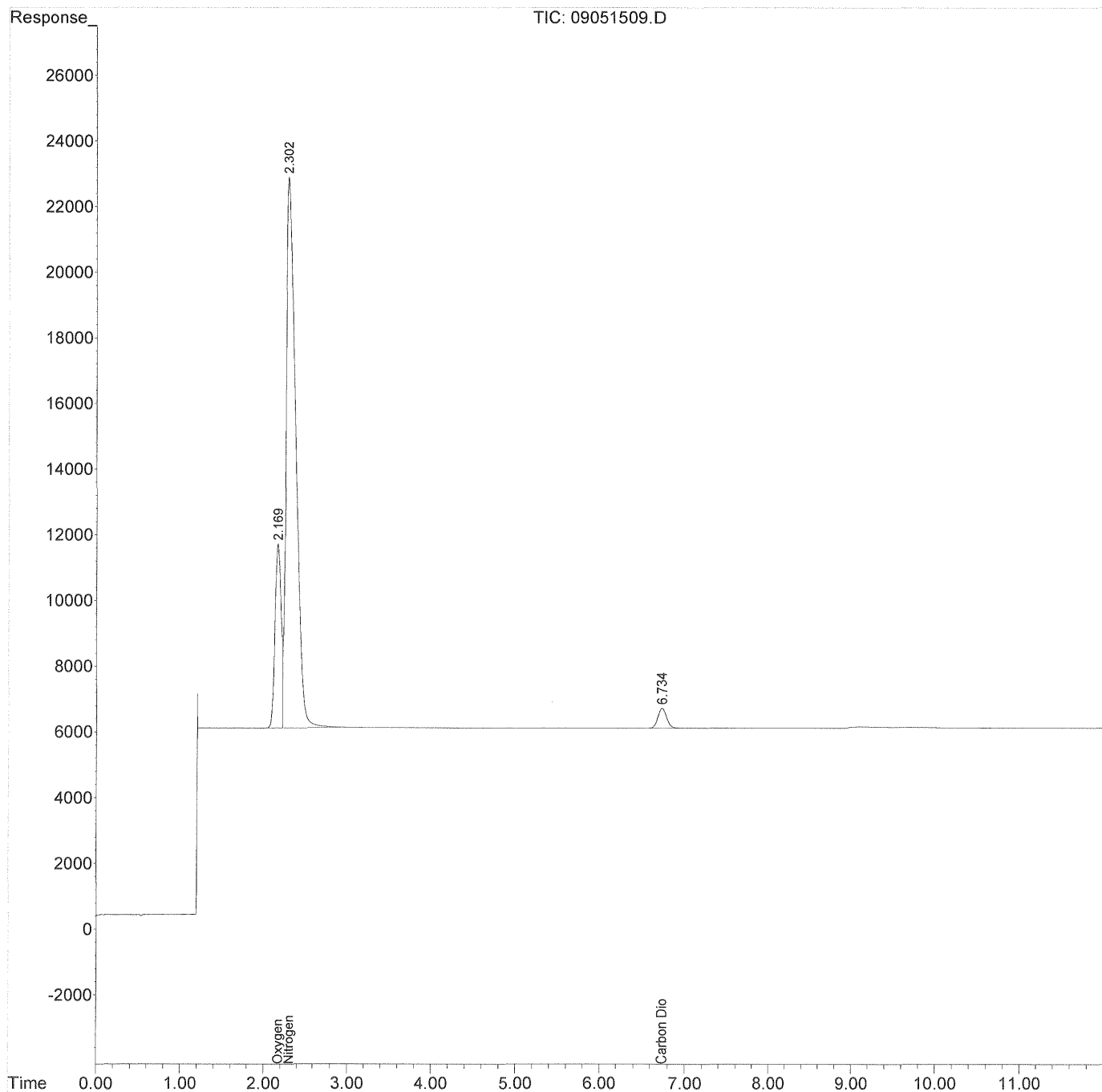
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051509.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 3:48 pm  
Operator : WH  
Sample : 3700-021  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:52:09 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051510.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 4:06 pm  
Operator : WH  
Sample : 3700-023  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:52:12 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.169 | 284688   | 172272.209 ppm |
| 3) Nitrogen        | 2.302 | 1349434  | 702832.802 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.735 | 39617    | 18413.631 ppm  |
| -----              |       |          |                |

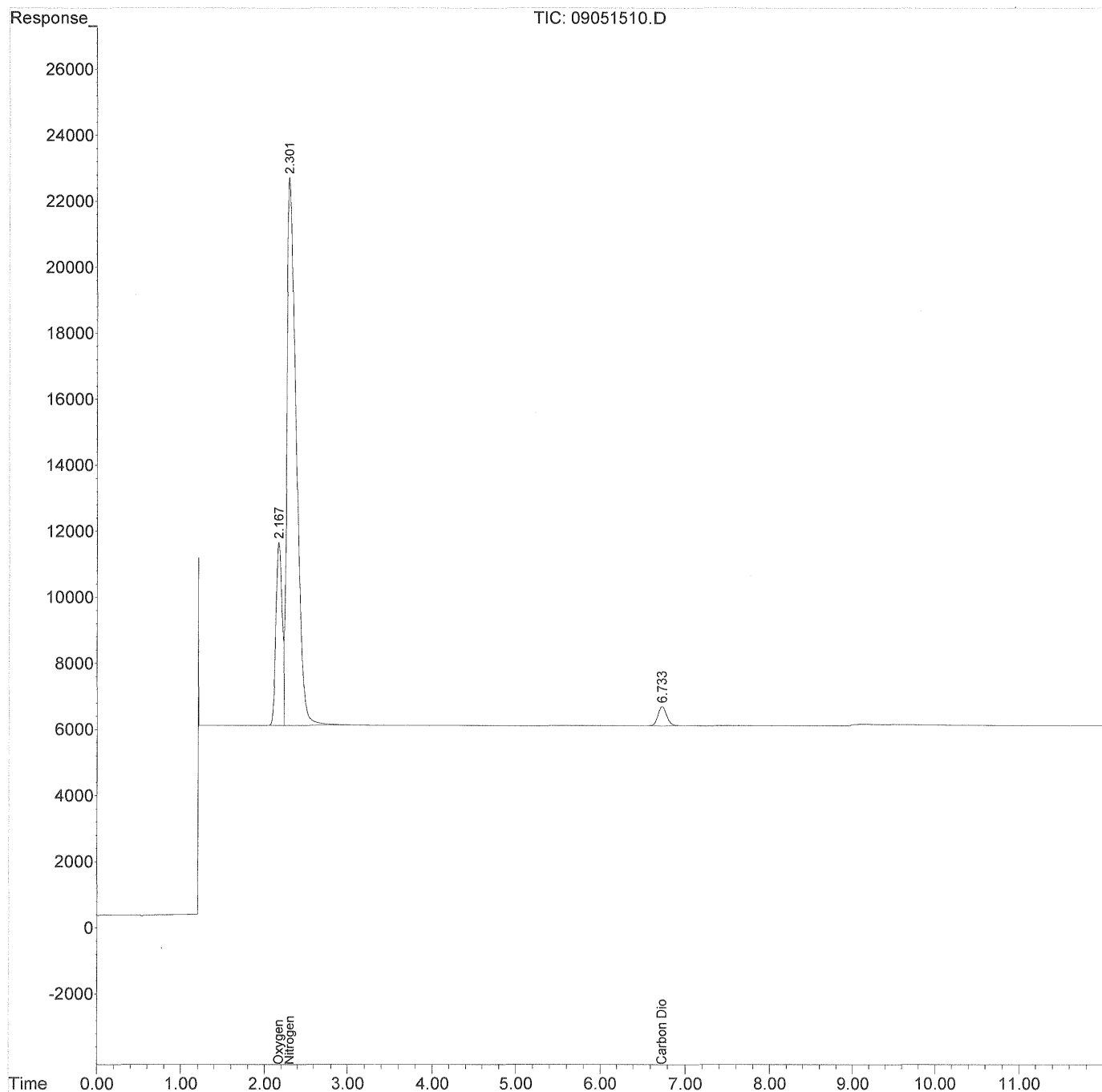
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
 Data File : 09051510.D  
 Signal(s) : TCD1A.CH  
 Acq On : 5 Sep 2015 4:06 pm  
 Operator : WH  
 Sample : 3700-023  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Sep 10 08:52:12 2015  
 Quant Method : I:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Tue Mar 11 11:04:23 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051511.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 4:22 pm  
Operator : WH  
Sample : 3700-023  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:52:14 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.161 | 285636   | 172845.995 ppm |
| 3) Nitrogen        | 2.294 | 1356473  | 706499.061 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.732 | 39808    | 18502.410 ppm  |
| -----              |       |          |                |

(f)=RT Delta > 1/2 Window

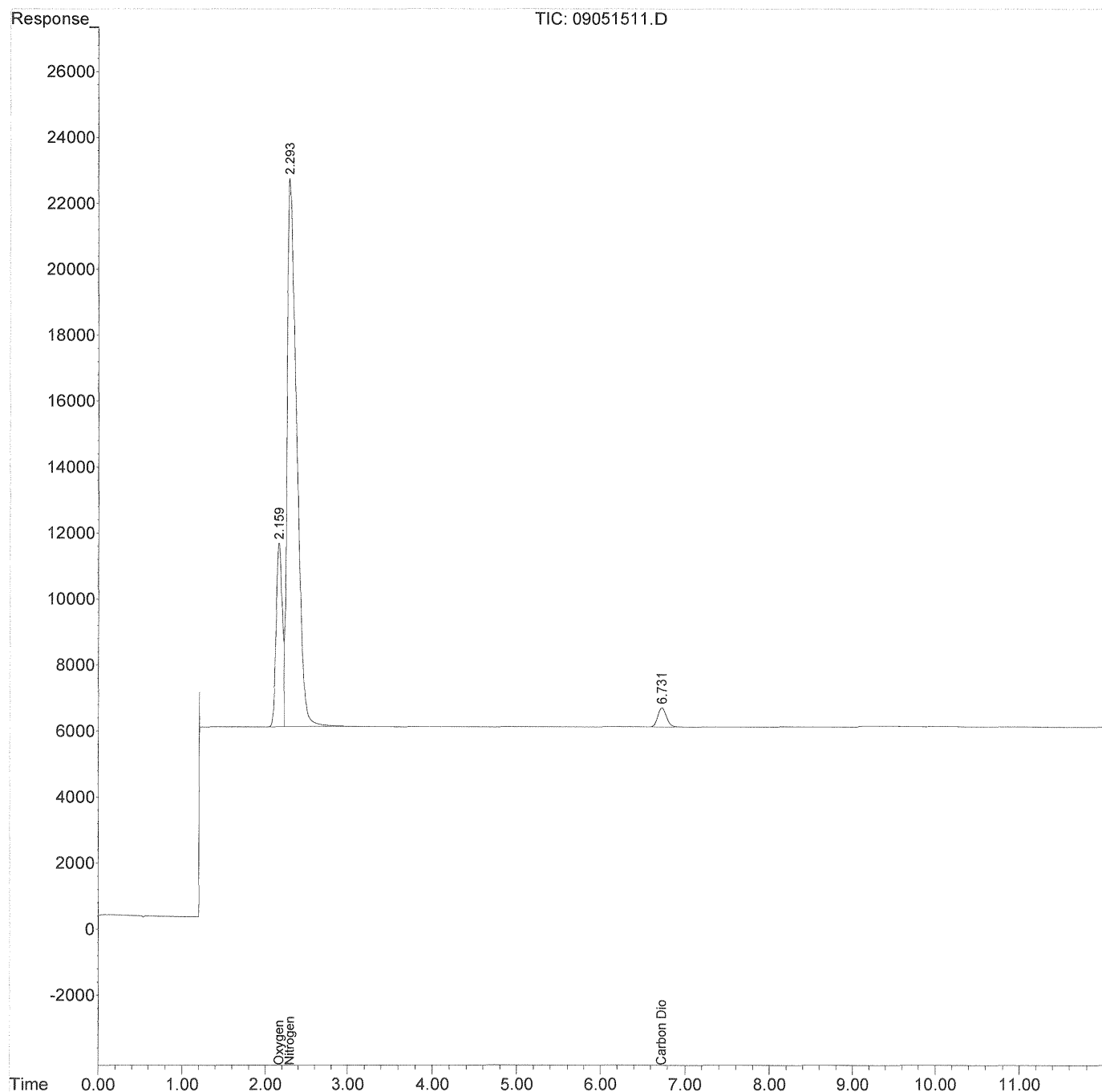
(m)=manual int.



Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
 Data File : 09051511.D  
 Signal(s) : TCD1A.CH  
 Acq On : 5 Sep 2015 4:22 pm  
 Operator : WH  
 Sample : 3700-023  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Sep 10 08:52:14 2015  
 Quant Method : I:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Tue Mar 11 11:04:23 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051512.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 4:40 pm  
Operator : WH  
Sample : 3700-023  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:52:17 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 2.171 | 284977   | 172447.579 ppm |
| 3) Nitrogen        | 2.304 | 1351522  | 703920.375 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.735 | 39654    | 18430.966 ppm  |
| -----              |       |          |                |

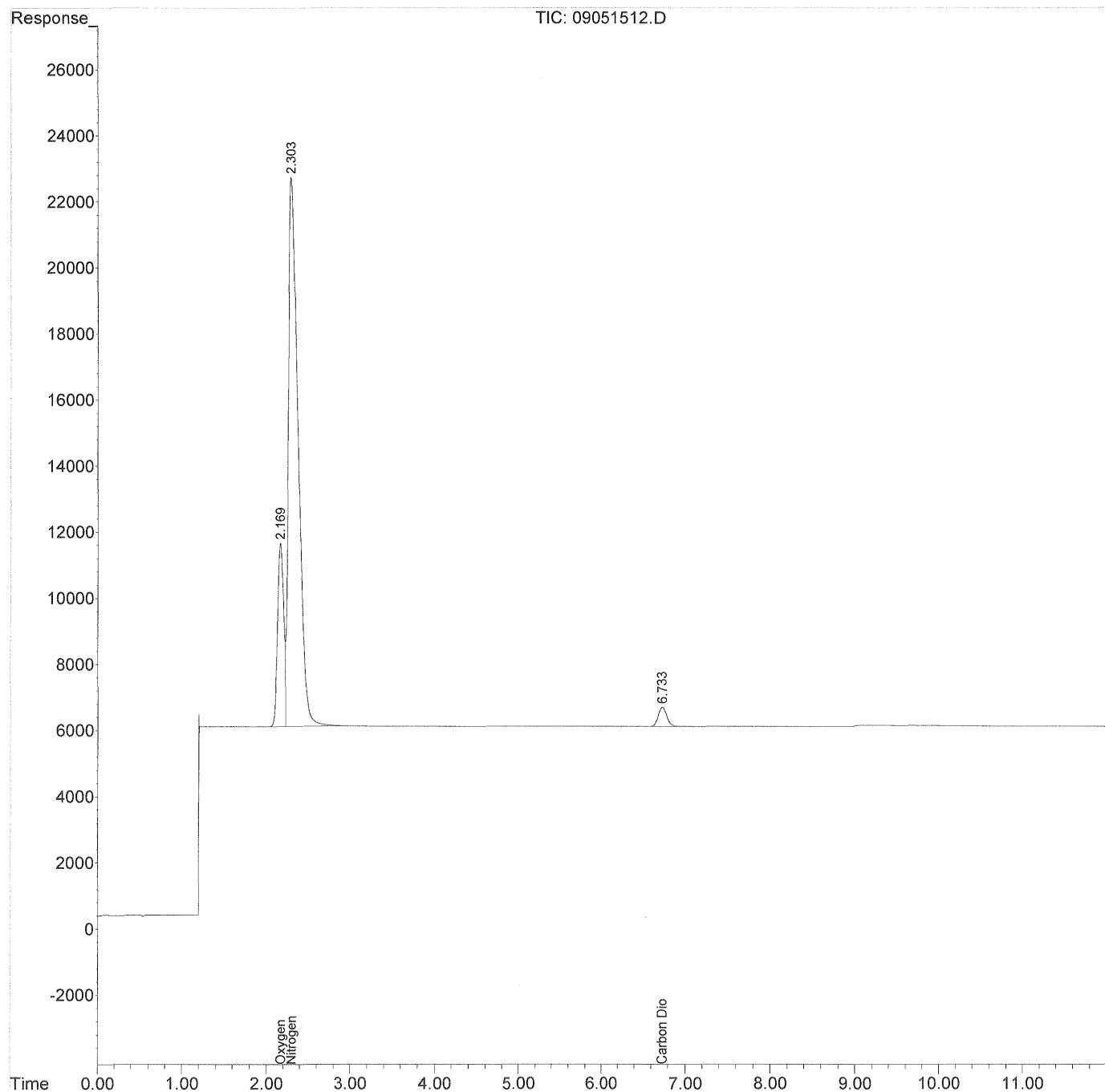
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
 Data File : 09051512.D  
 Signal(s) : TCD1A.CH  
 Acq On : 5 Sep 2015 4:40 pm  
 Operator : WH  
 Sample : 3700-023  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Sep 10 08:52:17 2015  
 Quant Method : I:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Tue Mar 11 11:04:23 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041502.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 7:52 am  
Operator : MC  
Sample : mb  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:42:41 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc | Units |
|--------------------|-------|----------|------|-------|
| -----              |       |          |      |       |
| Target Compounds   |       |          |      |       |
| 1) Hydrogen        | 0.000 | 0        | N.D. | ppm   |
| 2) Oxygen          | 0.000 | 0        | N.D. | ppm   |
| 3) Nitrogen        | 0.000 | 0        | N.D. | ppm   |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. | ppm   |
| 5) Methane         | 0.000 | 0        | N.D. | ppm   |
| 6) Carbon Dioxide  | 0.000 | 0        | N.D. | ppm   |
| -----              |       |          |      |       |

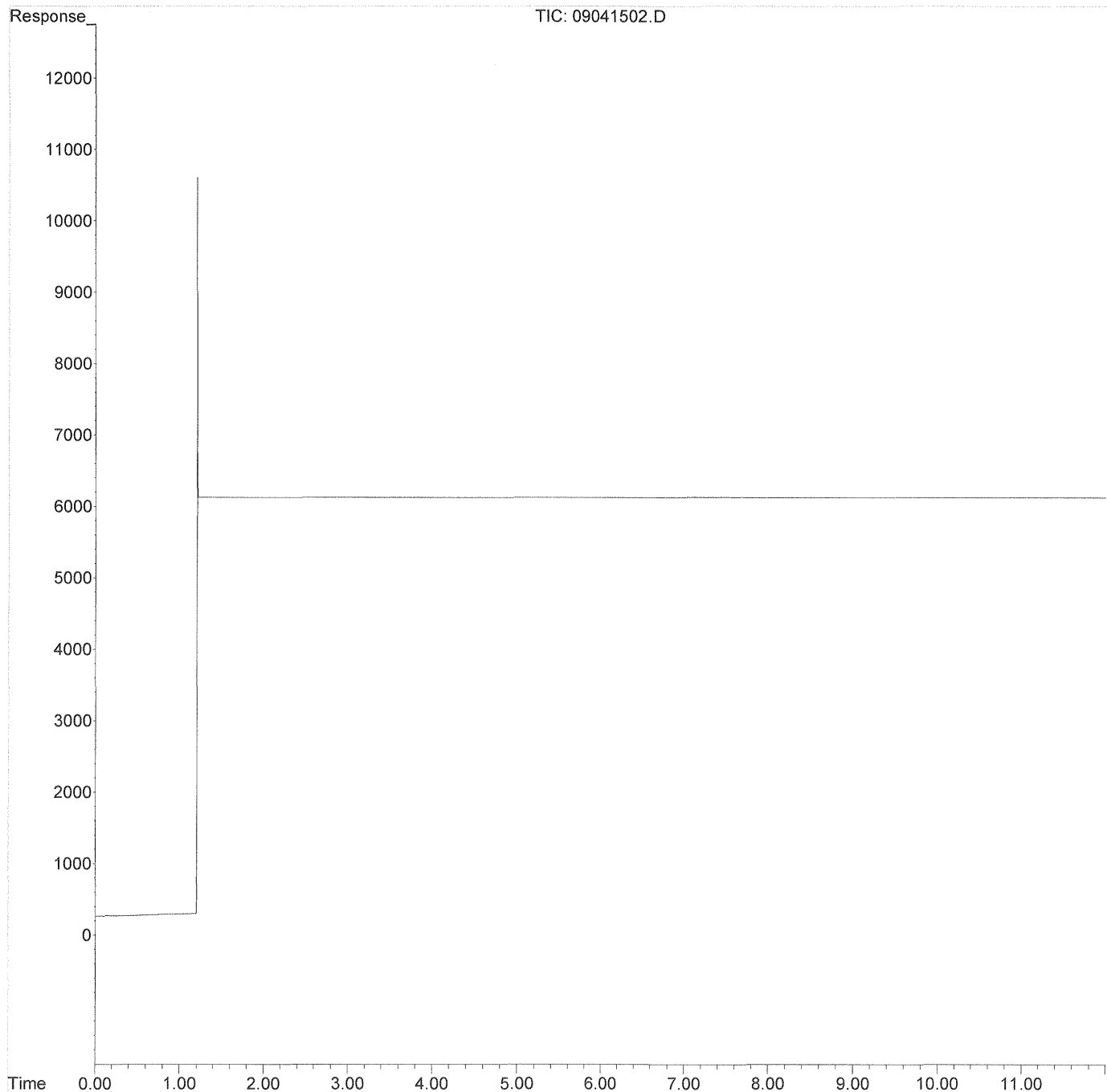
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
 Data File : 09041502.D  
 Signal(s) : TCD1A.CH  
 Acq On : 4 Sep 2015 7:52 am  
 Operator : MC  
 Sample : mb  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Sep 10 07:42:41 2015  
 Quant Method : I:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Tue Mar 11 11:04:23 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051502.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 1:51 pm  
Operator : WH  
Sample : mb  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:51:48 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc | Units |
|--------------------|-------|----------|------|-------|
| -----              |       |          |      |       |
| Target Compounds   |       |          |      |       |
| 1) Hydrogen        | 0.000 | 0        | N.D. | ppm   |
| 2) Oxygen          | 0.000 | 0        | N.D. | ppm   |
| 3) Nitrogen        | 0.000 | 0        | N.D. | ppm   |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. | ppm   |
| 5) Methane         | 0.000 | 0        | N.D. | ppm   |
| 6) Carbon Dioxide  | 0.000 | 0        | N.D. | ppm   |
| -----              |       |          |      |       |

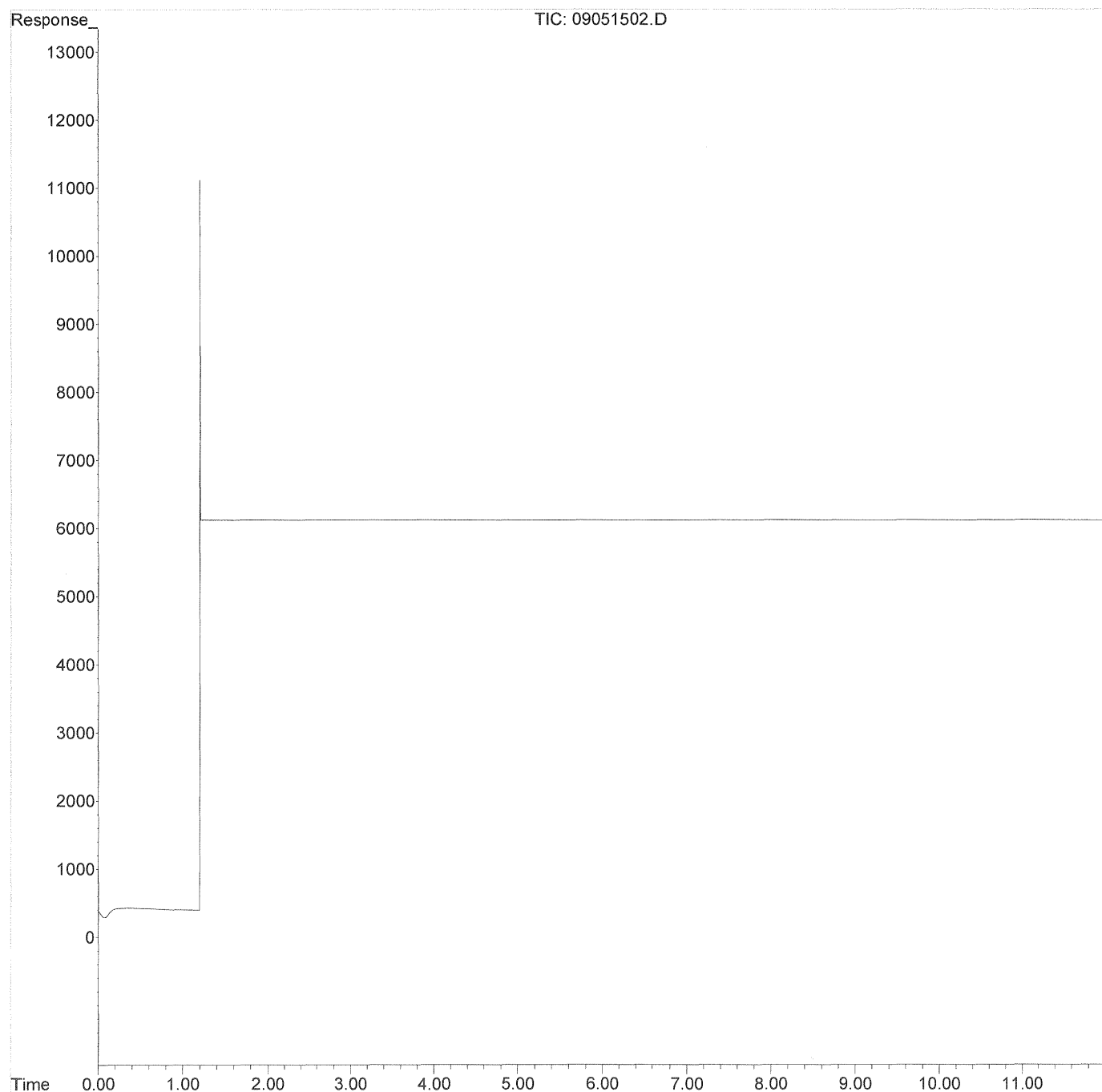
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051502.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 1:51 pm  
Operator : WH  
Sample : mb  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:51:48 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Method Path : J:\GC01\METHODS\  
 Method File : TR031014.M  
 Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 Last Update : Tue Mar 11 11:04:23 2014  
 Response Via : Initial Calibration

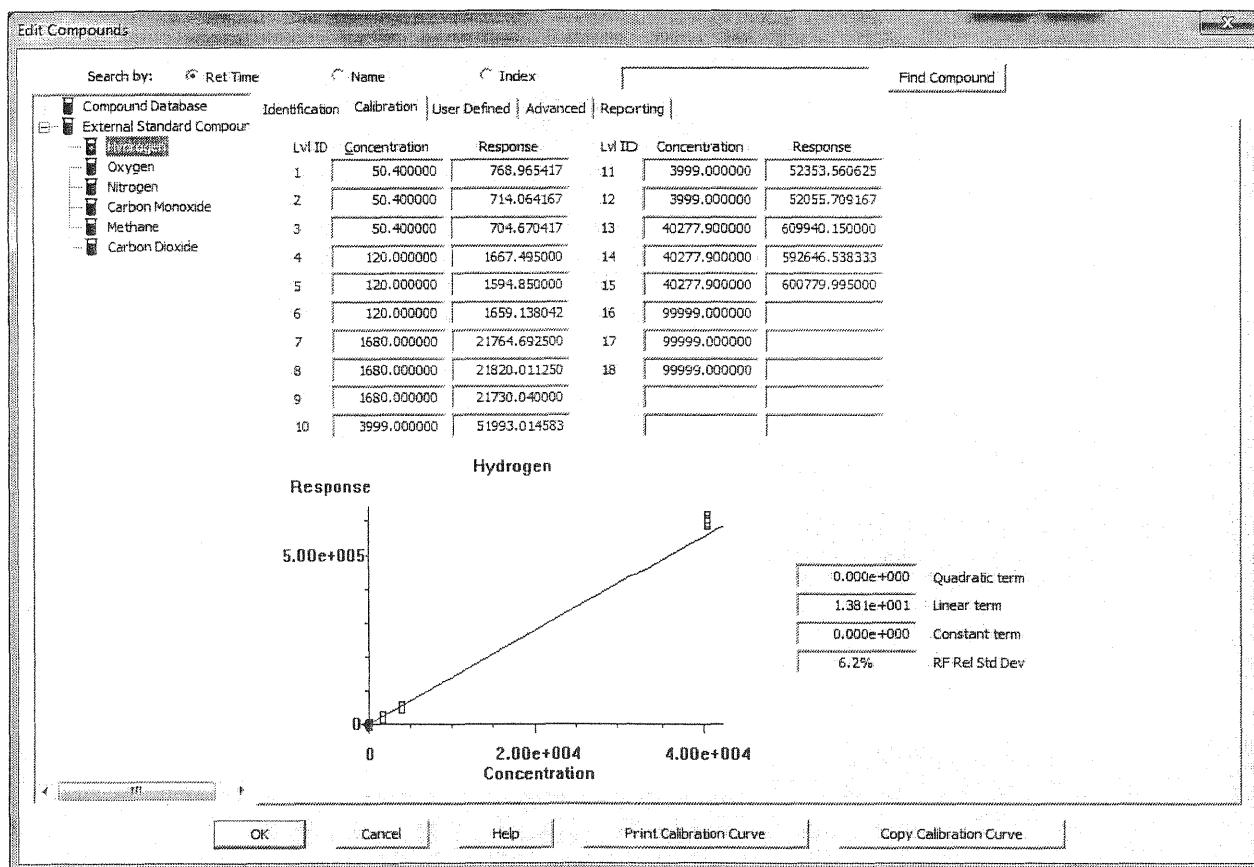
Calibration Files

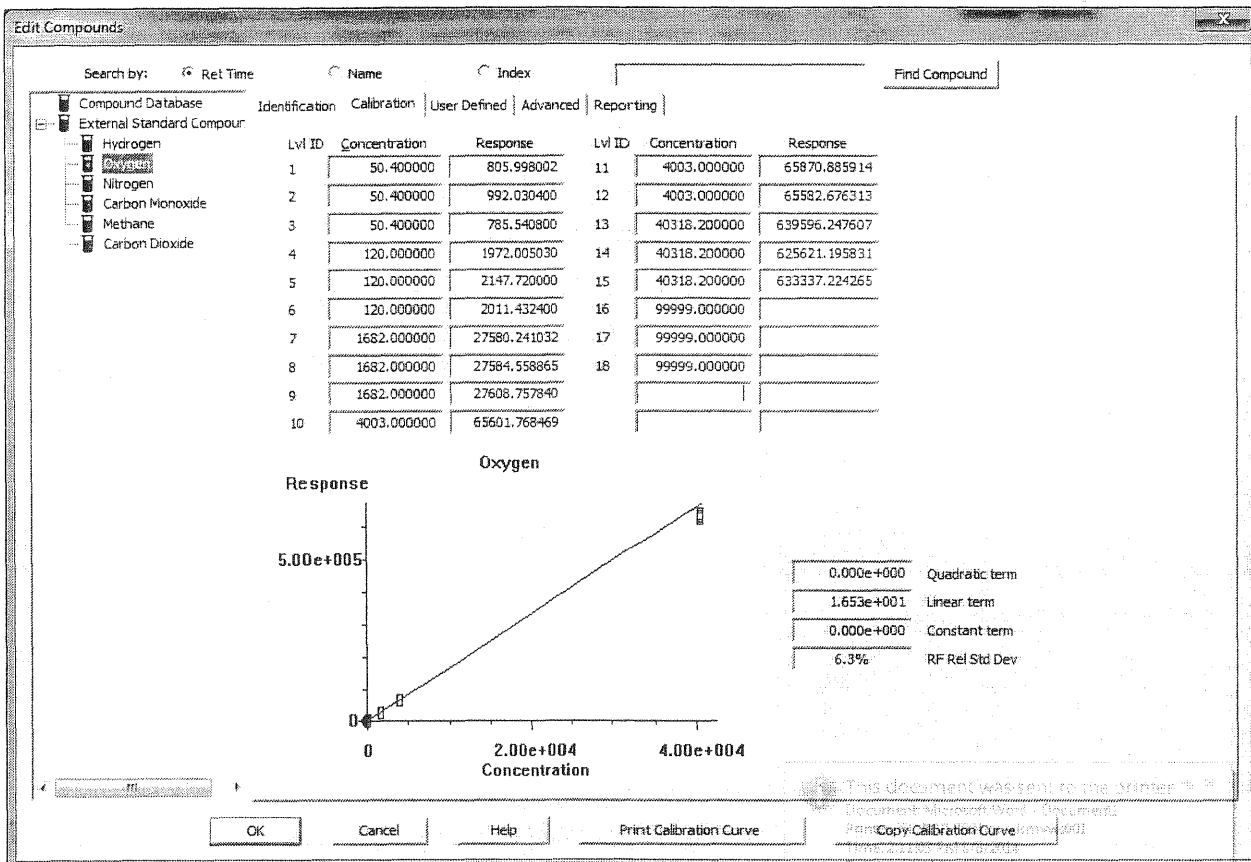
|   |             |   |             |   |             |
|---|-------------|---|-------------|---|-------------|
| 1 | =03101403.D | 2 | =03101404.D | 3 | =03101405.D |
| 4 | =03101406.D | 5 | =03101407.D | 6 | =03101408.D |

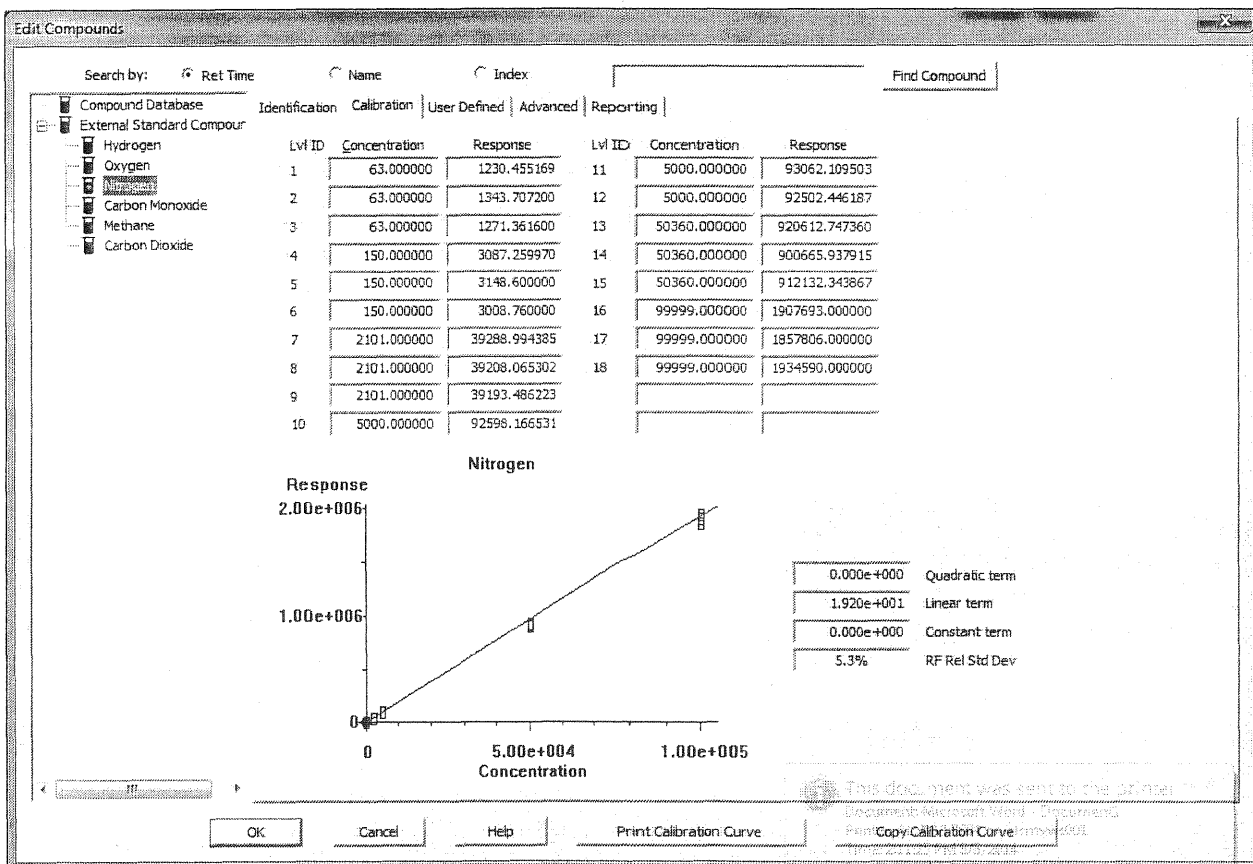
|    | Compound        | 1     | 2     | 3     | 4     | 5     | 6     | Avg   |    | %RSD |
|----|-----------------|-------|-------|-------|-------|-------|-------|-------|----|------|
| 1) | Hydrogen        | 1.526 | 1.417 | 1.398 | 1.390 | 1.329 | 1.383 | 1.381 | E1 | 6.22 |
| 2) | Oxygen          | 1.599 | 1.968 | 1.559 | 1.643 | 1.790 | 1.676 | 1.653 | E1 | 6.33 |
| 3) | Nitrogen        | 1.953 | 2.133 | 2.018 | 2.058 | 2.099 | 2.006 | 1.920 | E1 | 5.33 |
| 4) | Carbon Monoxide | 1.821 | 1.832 | 1.897 | 1.952 | 1.924 | 1.955 | 1.853 | E1 | 3.06 |
| 5) | Methane         | 1.435 | 1.340 | 1.378 | 1.499 | 1.440 | 1.406 | 1.396 | E1 | 3.12 |
| 6) | Carbon Dioxide  | 2.233 | 2.138 | 2.113 | 2.234 | 2.287 | 2.291 | 2.151 | E1 | 3.66 |

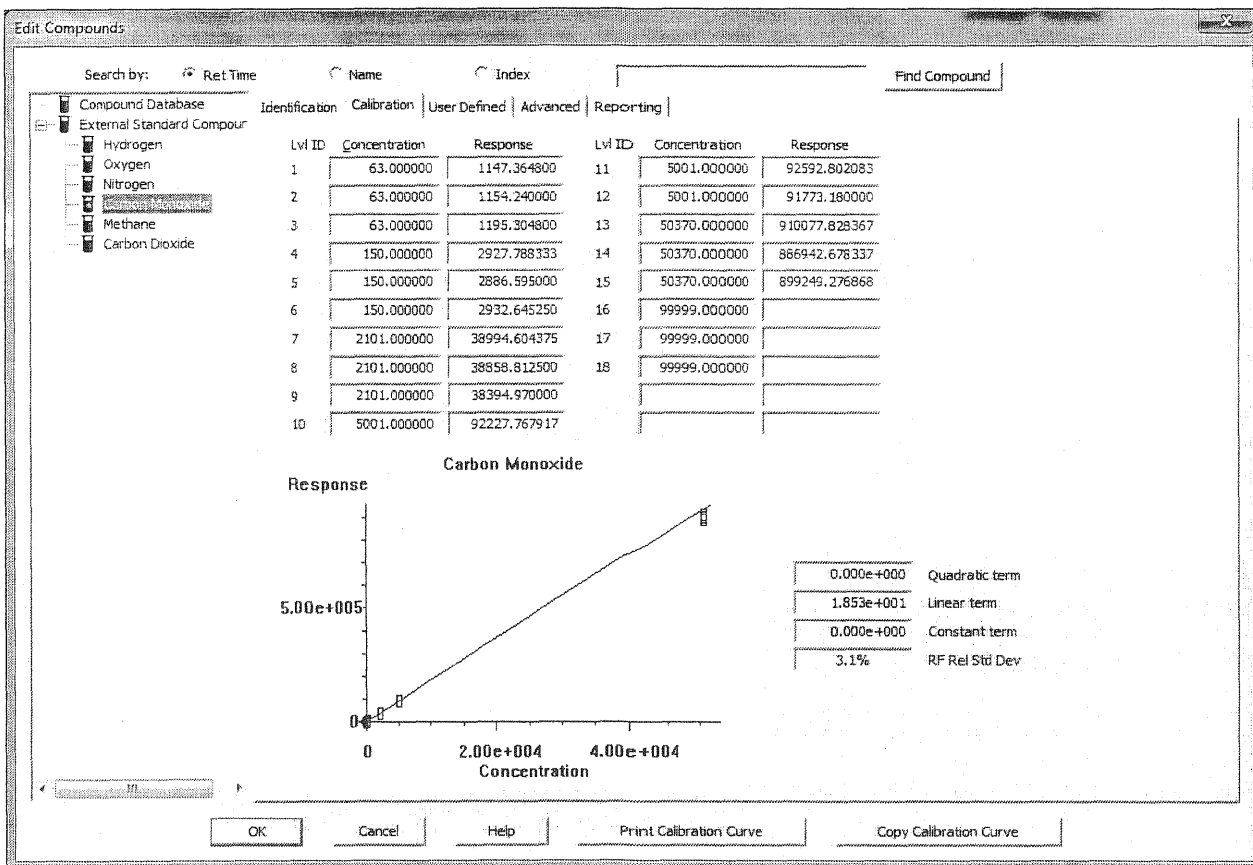
(#) = Out of Range ### Number of calibration levels exceeded format ###

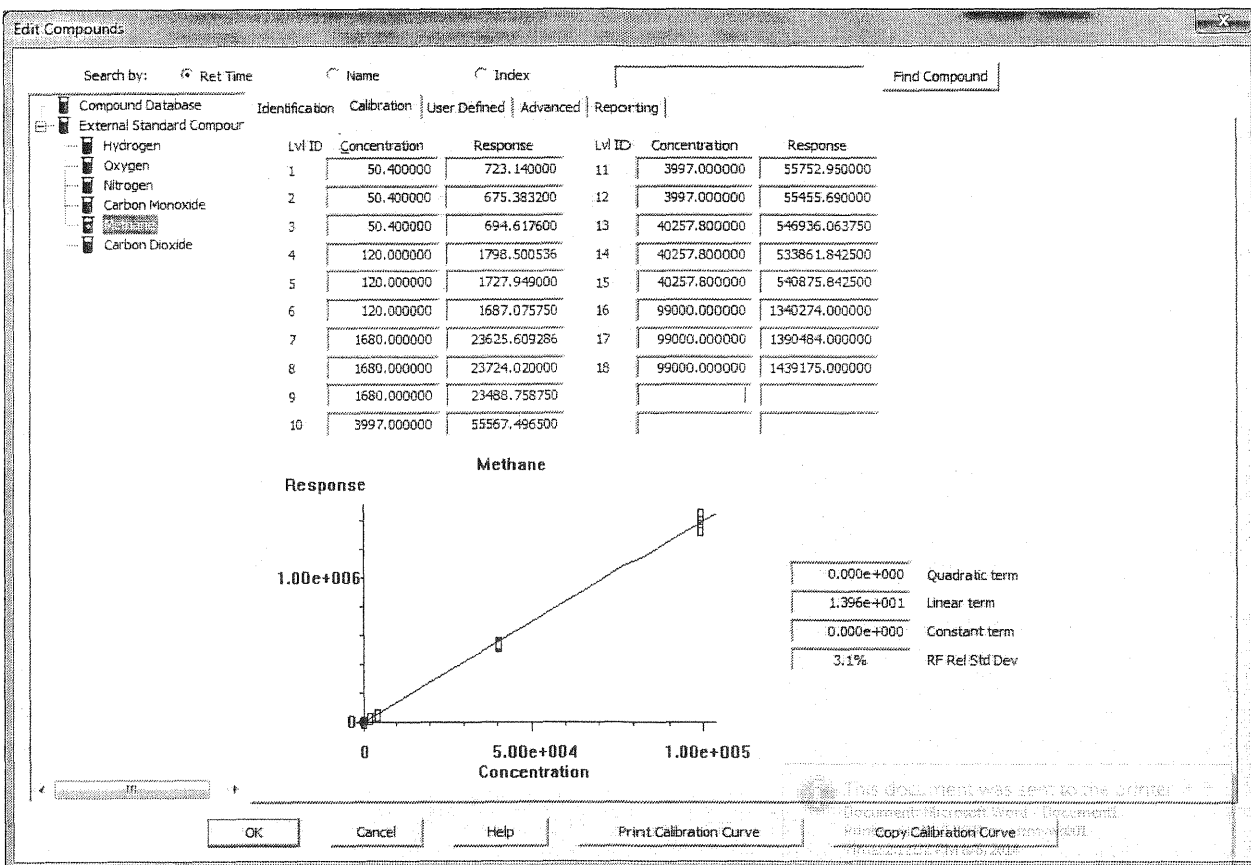


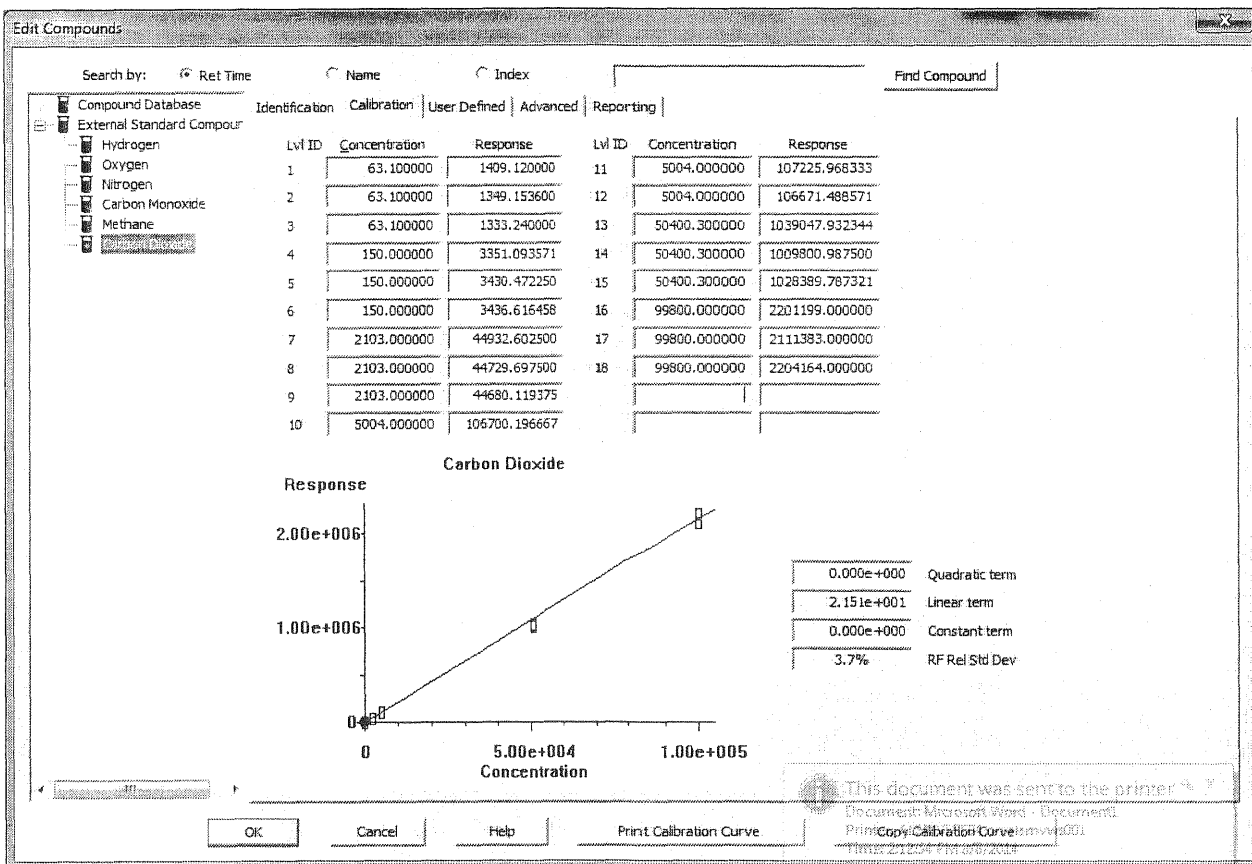








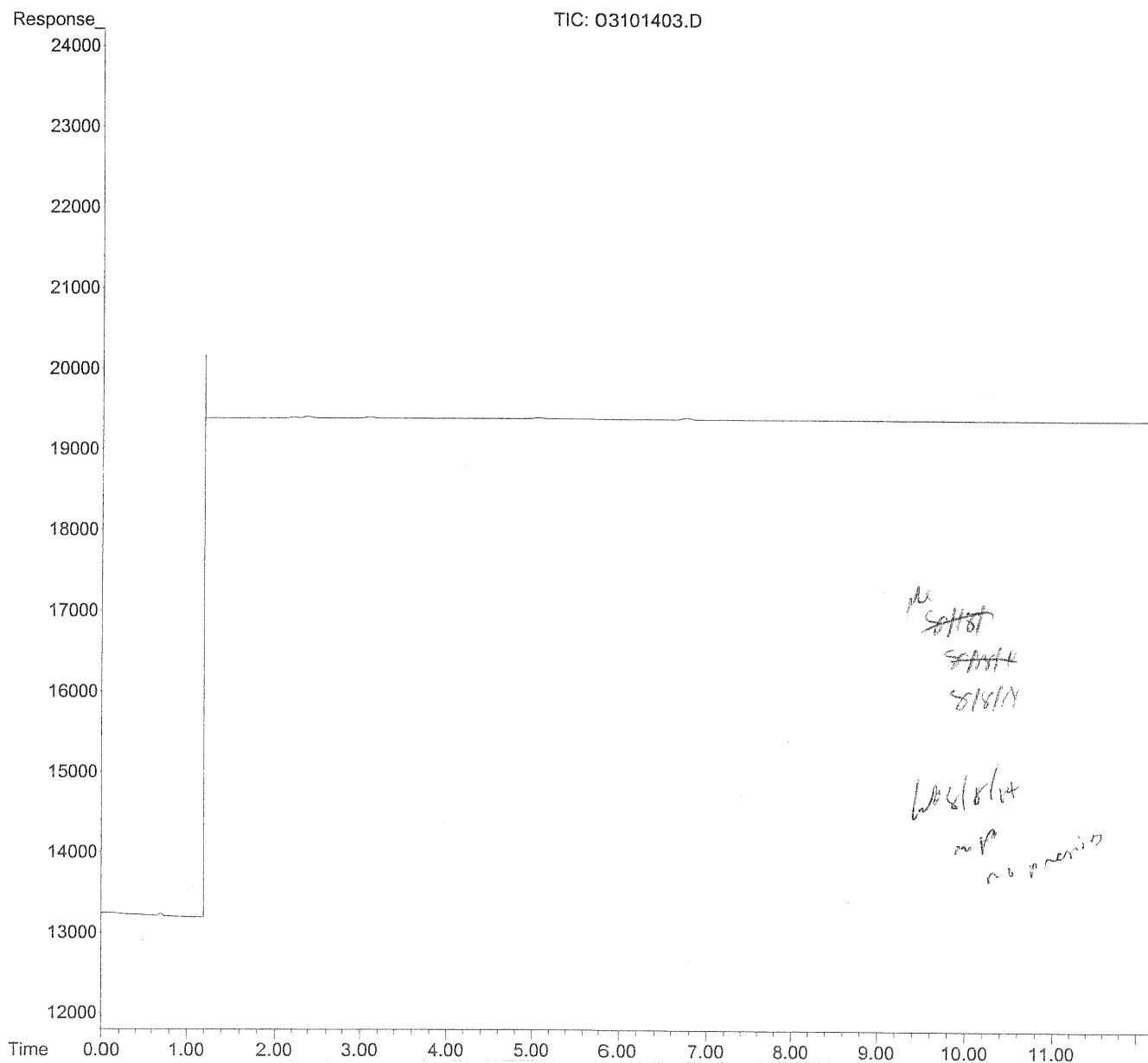




Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101403.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 10:59  
Operator : WH  
Sample : std 1 1  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 13:13:11 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 13:11:24 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101403.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 10:59  
Operator : WH  
Sample : std 1 1  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 13:13:11 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 13:11:24 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc  | Units |
|--------------------|-------|----------|-------|-------|
| -----              |       |          |       |       |
| Target Compounds   |       |          |       |       |
| 1) Hydrogen        | 0.700 | 769      | NoCal | ppm   |
| 2) Oxygen          | 2.227 | 806      | NoCal | ppm m |
| 3) Nitrogen        | 2.393 | 1230     | NoCal | ppm m |
| 4) Carbon Monoxide | 3.092 | 1147     | NoCal | ppm m |
| 5) Methane         | 5.085 | 723      | NoCal | ppm m |
| 6) Carbon Dioxide  | 6.748 | 1409     | NoCal | ppm m |
| -----              |       |          |       |       |

(f)=RT Delta > 1/2 Window

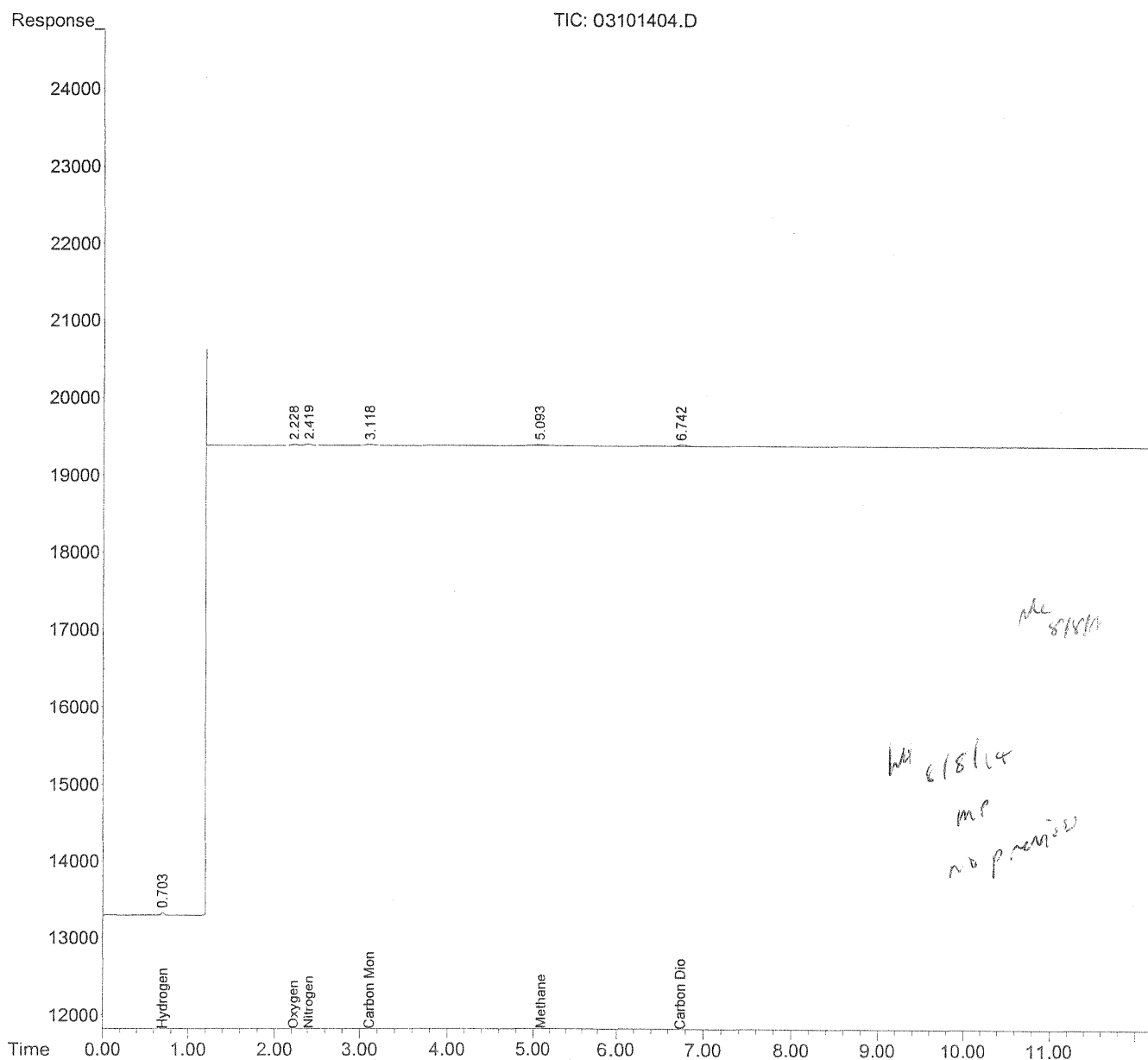
(m)=manual int.



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101404.D  
 Signal(s) : TCD1A.CH  
 Acq On : 10 Mar 2014 11:29  
 Operator : WH  
 Sample : std 1 2  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 10 14:56:49 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 13:13:33 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101404.D  
 Signal(s) : TCD1A.CH  
 Acq On : 10 Mar 2014 11:29  
 Operator : WH  
 Sample : std 1 2  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 10 14:56:49 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 13:13:33 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :

| Compound           | R.T.  | Response | Conc    | Units |
|--------------------|-------|----------|---------|-------|
| -----              |       |          |         |       |
| Target Compounds   |       |          |         |       |
| 1) Hydrogen        | 0.704 | 714      | 468.016 | ppm   |
| 2) Oxygen          | 2.228 | 992      | 620.328 | ppm m |
| 3) Nitrogen        | 2.419 | 1344     | 687.986 | ppm m |
| 4) Carbon Monoxide | 3.118 | 1154     | 633.775 | ppm m |
| 5) Methane         | 5.093 | 675      | 470.715 | ppm m |
| 6) Carbon Dioxide  | 6.742 | 1349     | 604.147 | ppm m |
| -----              |       |          |         |       |

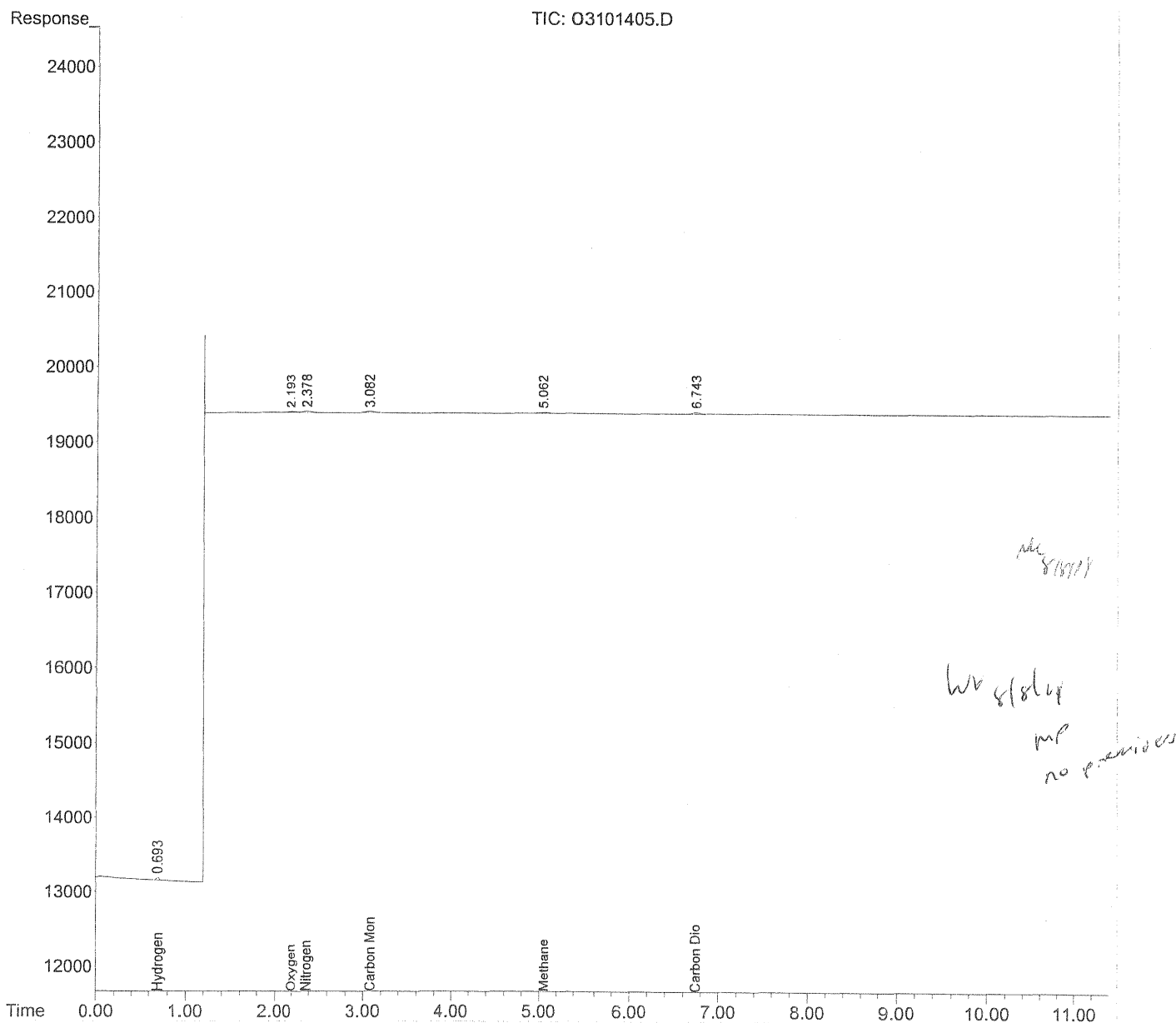
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101405.D  
 Signal(s) : TCD1A.CH  
 Acq On : 10 Mar 2014 11:44  
 Operator : WH  
 Sample : std 1 3  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 10 13:16:20 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 13:15:04 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101405.D  
 Signal(s) : TCD1A.CH  
 Acq On : 10 Mar 2014 11:44  
 Operator : WH  
 Sample : std 1 3  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 10 13:16:20 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 13:15:04 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :

| Compound           | R.T.  | Response | Conc    | Units |
|--------------------|-------|----------|---------|-------|
| -----              |       |          |         |       |
| Target Compounds   |       |          |         |       |
| 1) Hydrogen        | 0.695 | 705      | 478.957 | ppm   |
| 2) Oxygen          | 2.193 | 786      | 440.385 | ppm m |
| 3) Nitrogen        | 2.378 | 1271     | 592.487 | ppm m |
| 4) Carbon Monoxide | 3.082 | 1195     | 654.363 | ppm m |
| 5) Methane         | 5.062 | 695      | 500.653 | ppm m |
| 6) Carbon Dioxide  | 6.743 | 1333     | 610.001 | ppm m |
| -----              |       |          |         |       |

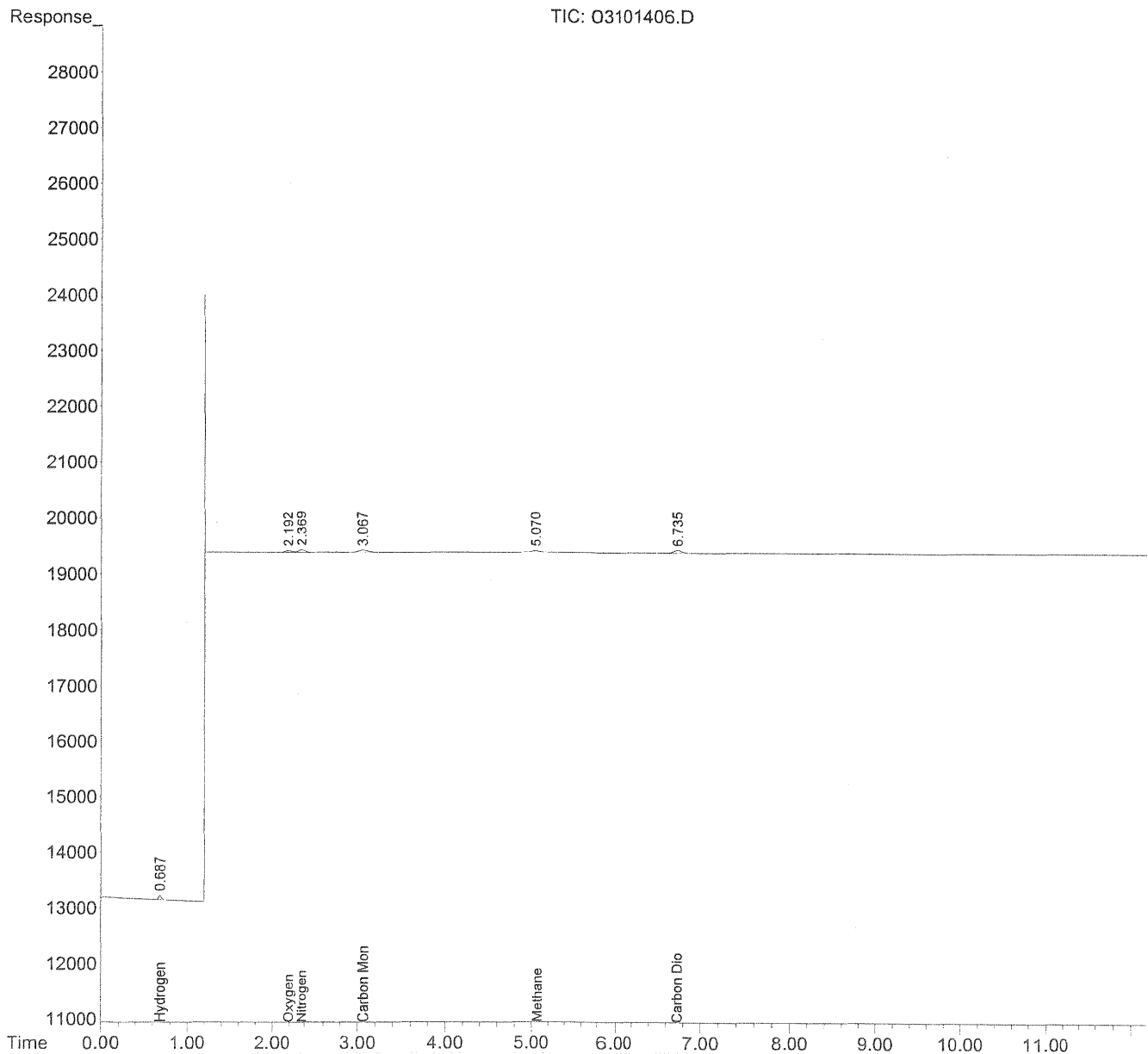
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101406.D  
 Signal(s) : TCD1A.CH  
 Acq On : 10 Mar 2014 11:59  
 Operator : WH  
 Sample : std 2 1  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 10 13:16:58 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 13:16:30 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :

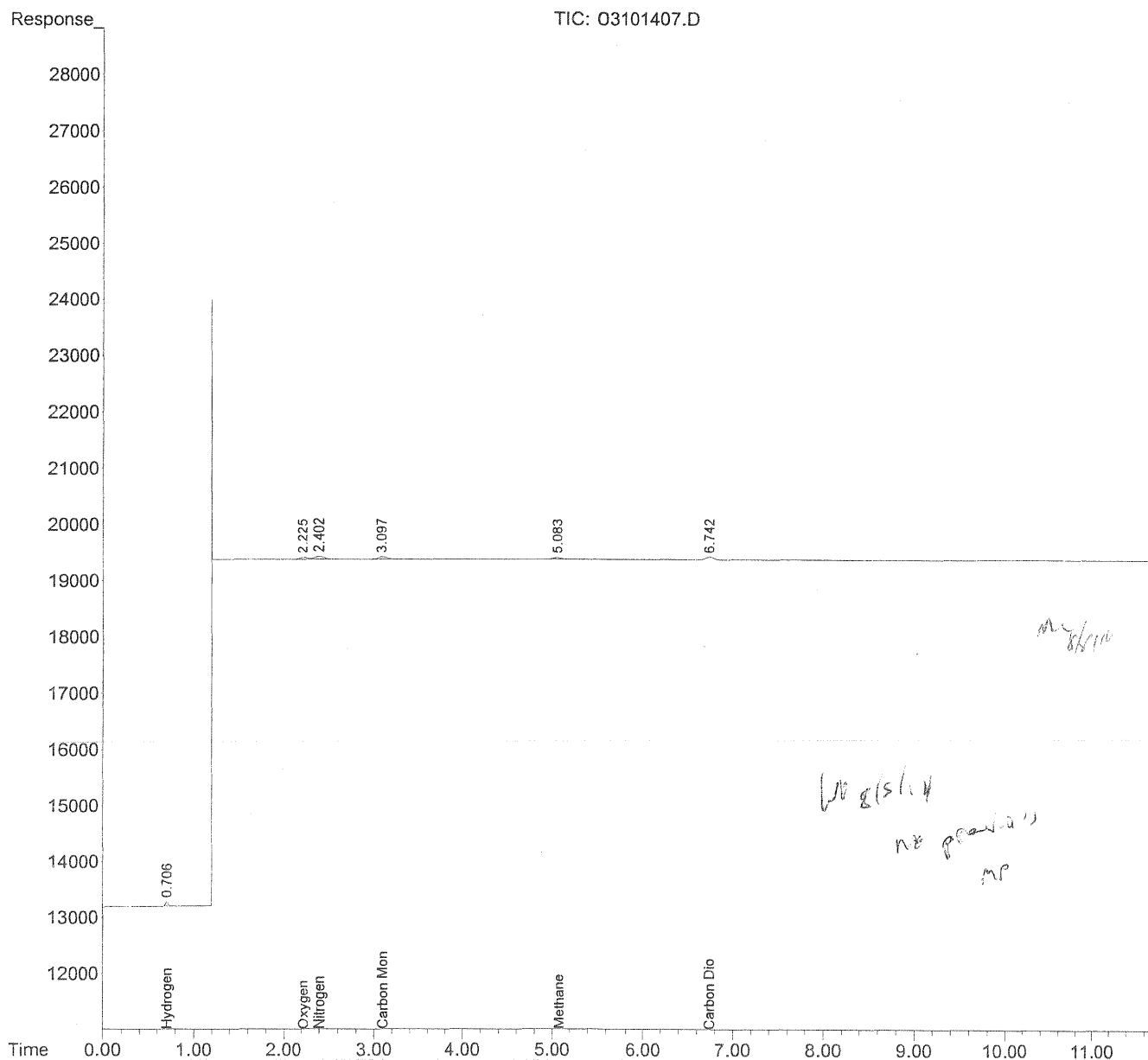




Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101407.D  
 Signal(s) : TCD1A.CH  
 Acq On : 10 Mar 2014 12:18  
 Operator : WH  
 Sample : std 2 2  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 10 13:18:19 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 13:17:31 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101407.D  
 Signal(s) : TCD1A.CH  
 Acq On : 10 Mar 2014 12:18  
 Operator : WH  
 Sample : std 2 2  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 10 13:18:19 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 13:17:31 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.708 | 1595     | 1113.284 ppm   |
| 2) Oxygen          | 2.225 | 2148     | 1269.063 ppm m |
| 3) Nitrogen        | 2.402 | 3149     | 1505.099 ppm m |
| 4) Carbon Monoxide | 3.106 | 2887     | 1539.002 ppm   |
| 5) Methane         | 5.082 | 1728     | 1222.935 ppm   |
| 6) Carbon Dioxide  | 6.744 | 3430     | 1573.930 ppm   |
| -----              |       |          |                |

(f)=RT Delta > 1/2 Window

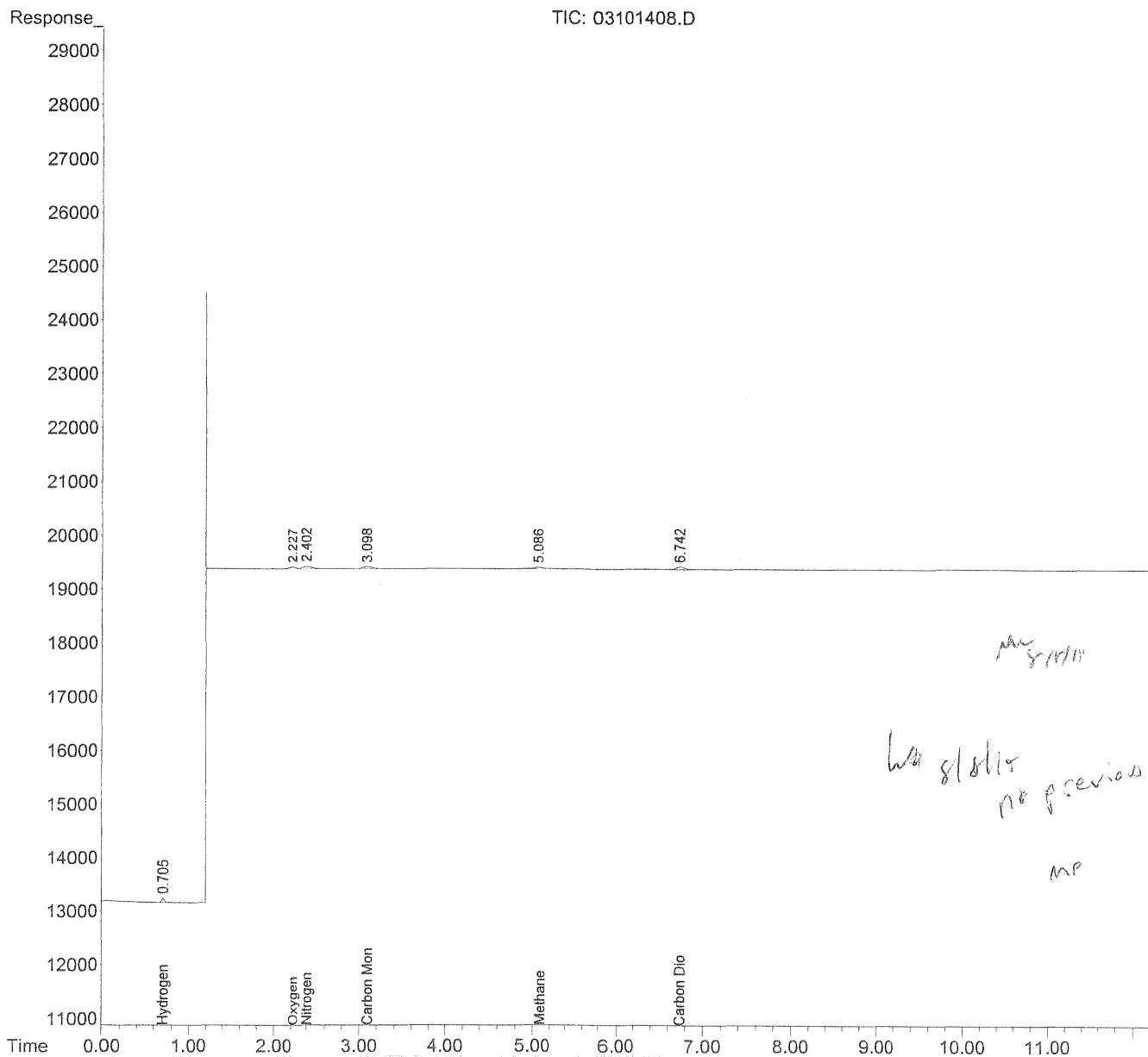
(m)=manual int.



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101408.D  
 Signal(s) : TCD1A.CH  
 Acq On : 10 Mar 2014 12:34  
 Operator : WH  
 Sample : std 2 3  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 10 13:19:15 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 13:18:37 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101408.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 12:34  
Operator : WH  
Sample : std 2 3  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 13:19:15 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 13:18:37 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc     | Units |
|--------------------|-------|----------|----------|-------|
| -----              |       |          |          |       |
| Target Compounds   |       |          |          |       |
| 1) Hydrogen        | 0.707 | 1659     | 1175.144 | ppm   |
| 2) Oxygen          | 2.227 | 2011     | 1175.007 | ppm m |
| 3) Nitrogen        | 2.402 | 3009     | 1437.275 | ppm m |
| 4) Carbon Monoxide | 3.103 | 2933     | 1555.465 | ppm   |
| 5) Methane         | 5.087 | 1687     | 1189.461 | ppm   |
| 6) Carbon Dioxide  | 6.745 | 3437     | 1561.358 | ppm   |
| -----              |       |          |          |       |

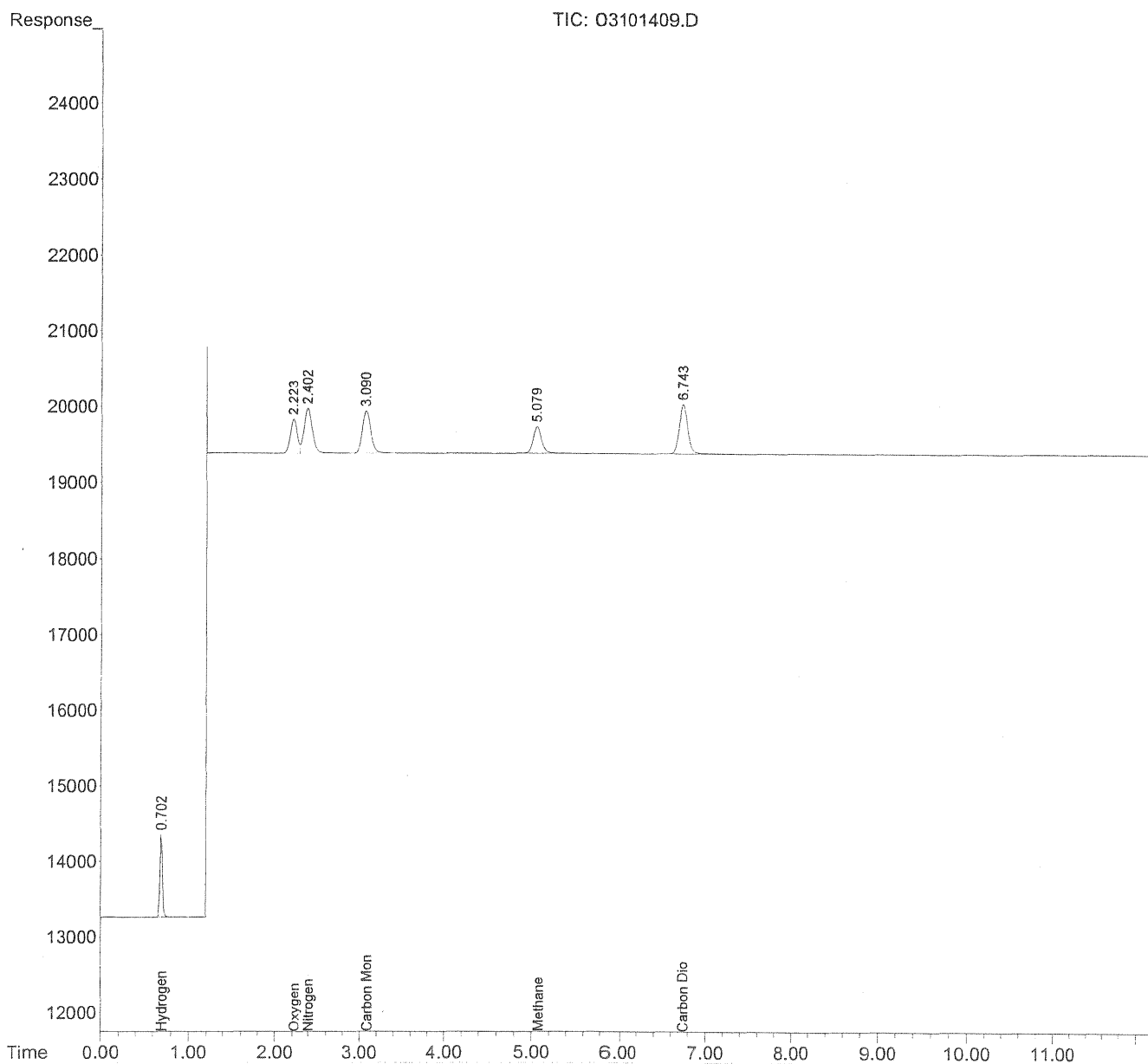
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101409.D  
 Signal(s) : TCD1A.CH  
 Acq On : 10 Mar 2014 13:05  
 Operator : WH  
 Sample : std 3 1  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 10 13:22:14 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 13:19:31 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101409.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 13:05  
Operator : WH  
Sample : std 3 1  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 13:22:14 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 13:19:31 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units    |
|--------------------|-------|----------|---------------|
| -----              |       |          |               |
| Target Compounds   |       |          |               |
| 1) Hydrogen        | 0.703 | 21765    | 15469.029 ppm |
| 2) Oxygen          | 2.225 | 27580    | 16167.517 ppm |
| 3) Nitrogen        | 2.402 | 39289    | 18899.954 ppm |
| 4) Carbon Monoxide | 3.092 | 38995    | 20555.928 ppm |
| 5) Methane         | 5.081 | 23626    | 16681.490 ppm |
| 6) Carbon Dioxide  | 6.744 | 44933    | 20275.995 ppm |
| -----              |       |          |               |

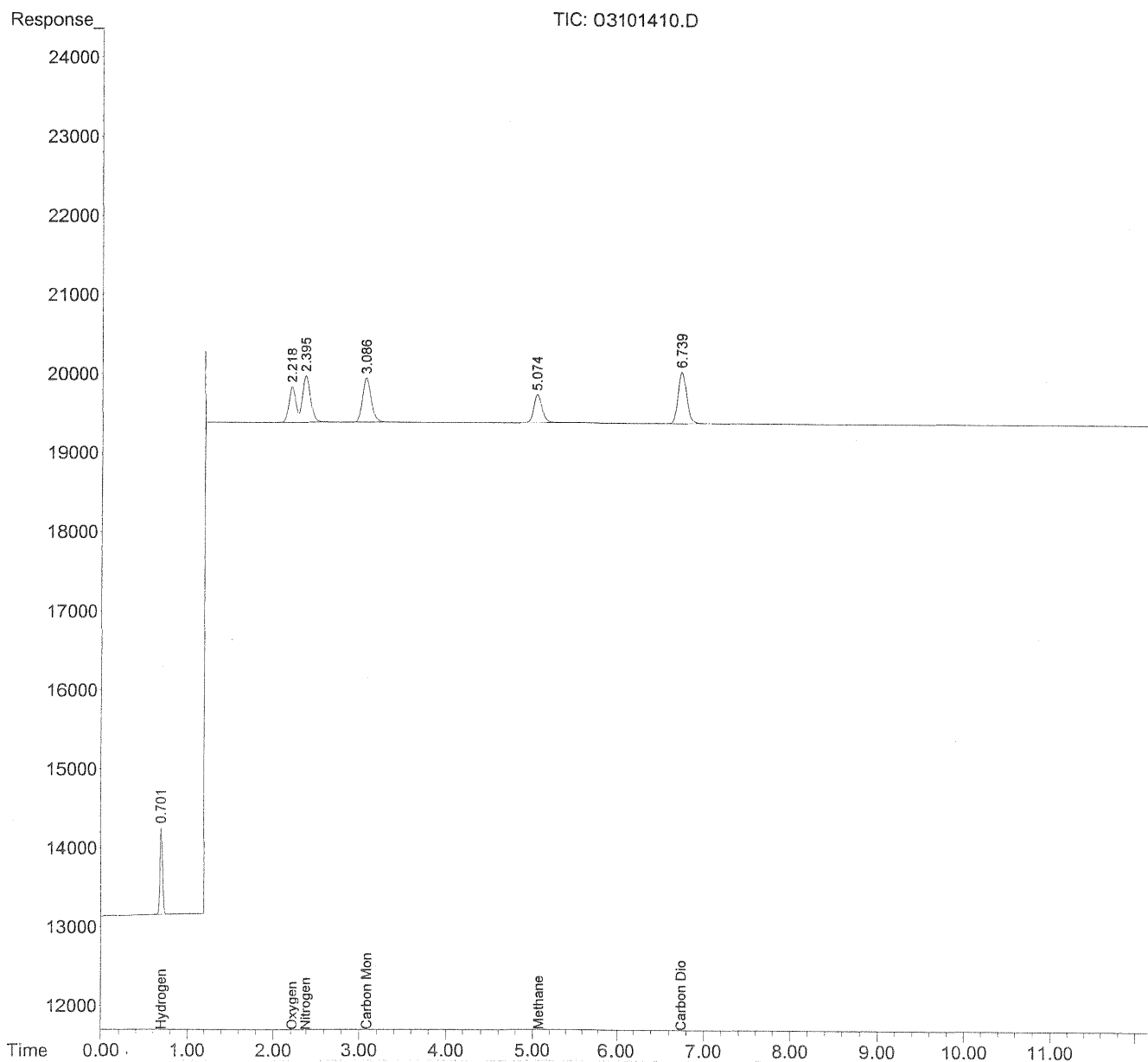
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101410.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 13:23  
Operator : WH  
Sample : std 3 2  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 14:12:14 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 13:22:44 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101410.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 13:23  
Operator : WH  
Sample : std 3 2  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 14:12:14 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 13:22:44 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units    |
|--------------------|-------|----------|---------------|
| -----              |       |          |               |
| Target Compounds   |       |          |               |
| 1) Hydrogen        | 0.702 | 21820    | 15685.875 ppm |
| 2) Oxygen          | 2.219 | 27585    | 16260.158 ppm |
| 3) Nitrogen        | 2.397 | 39208    | 19135.565 ppm |
| 4) Carbon Monoxide | 3.087 | 38859    | 20547.786 ppm |
| 5) Methane         | 5.076 | 23724    | 16767.873 ppm |
| 6) Carbon Dioxide  | 6.740 | 44730    | 20288.350 ppm |
| -----              |       |          |               |

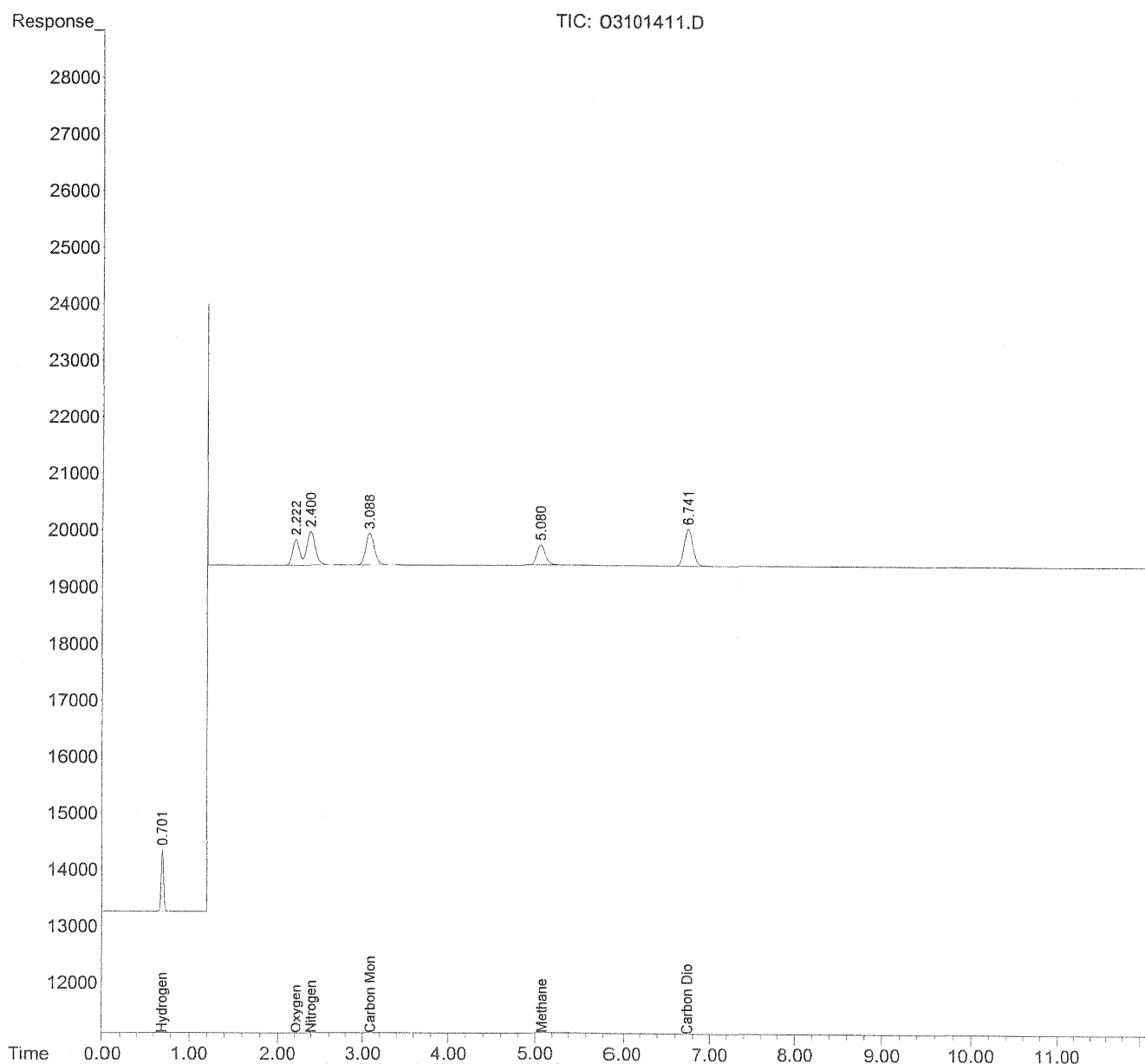
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101411.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 13:56  
Operator : WH  
Sample : std 3 3  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 14:12:37 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 14:12:27 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101411.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 13:56  
Operator : WH  
Sample : std 3 3  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 14:12:37 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 14:12:27 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units    |
|--------------------|-------|----------|---------------|
| -----              |       |          |               |
| Target Compounds   |       |          |               |
| 1) Hydrogen        | 0.703 | 21730    | 15751.773 ppm |
| 2) Oxygen          | 2.224 | 27609    | 16342.415 ppm |
| 3) Nitrogen        | 2.401 | 39193    | 19344.177 ppm |
| 4) Carbon Monoxide | 3.090 | 38395    | 20358.500 ppm |
| 5) Methane         | 5.081 | 23489    | 16605.562 ppm |
| 6) Carbon Dioxide  | 6.743 | 44680    | 20355.596 ppm |
| -----              |       |          |               |

(f)=RT Delta > 1/2 Window

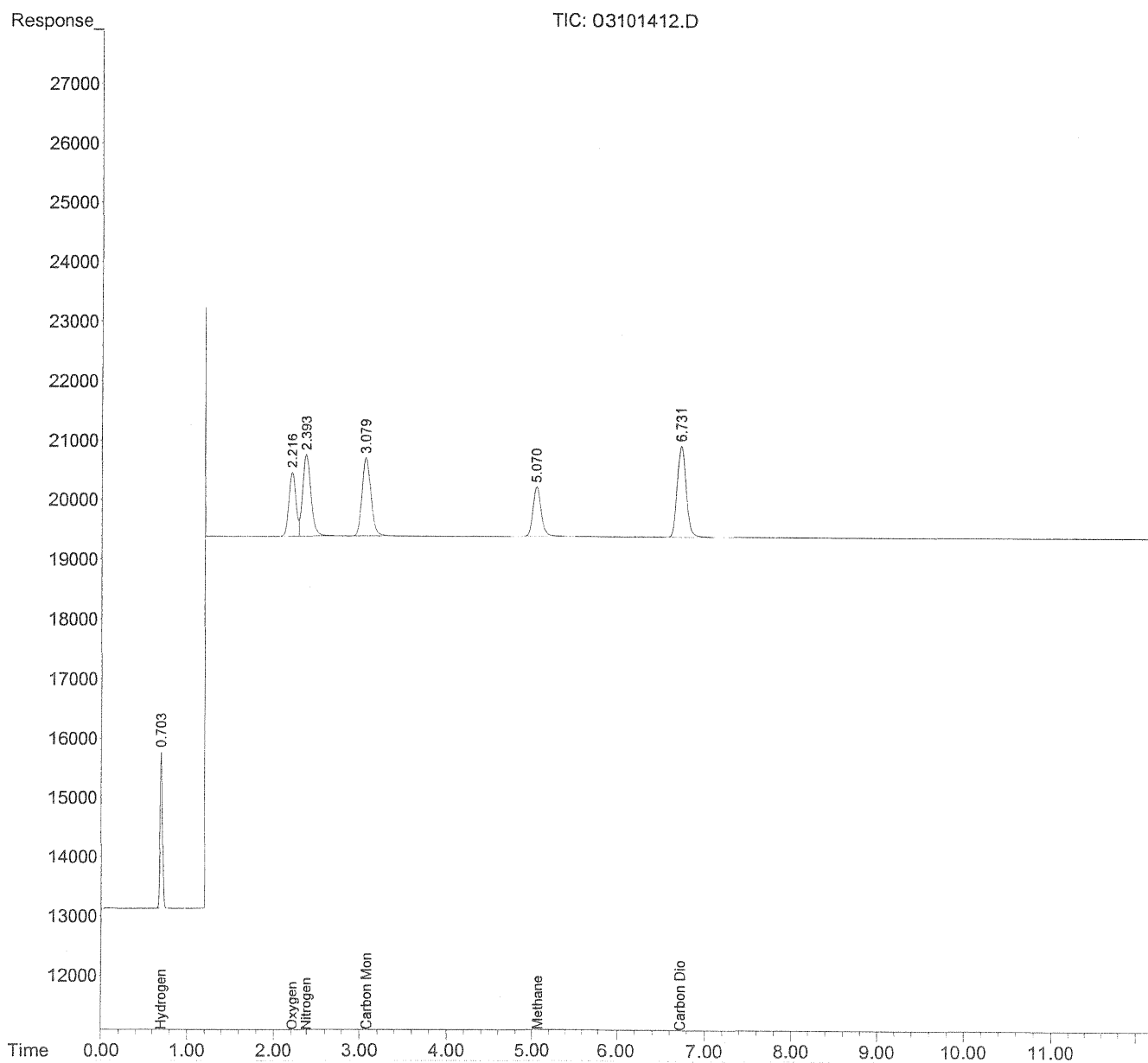
(m)=manual int.



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101412.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 14:15  
Operator : WH  
Sample : std 4 1  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 14:31:12 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 14:12:50 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101412.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 14:15  
Operator : WH  
Sample : std 4 1  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 14:31:12 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 14:12:50 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units    |
|--------------------|-------|----------|---------------|
| -----              |       |          |               |
| Target Compounds   |       |          |               |
| 1) Hydrogen        | 0.705 | 51993    | 37952.051 ppm |
| 2) Oxygen          | 2.217 | 65602    | 38954.464 ppm |
| 3) Nitrogen        | 2.394 | 92598    | 46108.575 ppm |
| 4) Carbon Monoxide | 3.081 | 92228    | 49071.809 ppm |
| 5) Methane         | 5.072 | 55567    | 39334.461 ppm |
| 6) Carbon Dioxide  | 6.733 | 106700   | 48784.847 ppm |
| -----              |       |          |               |

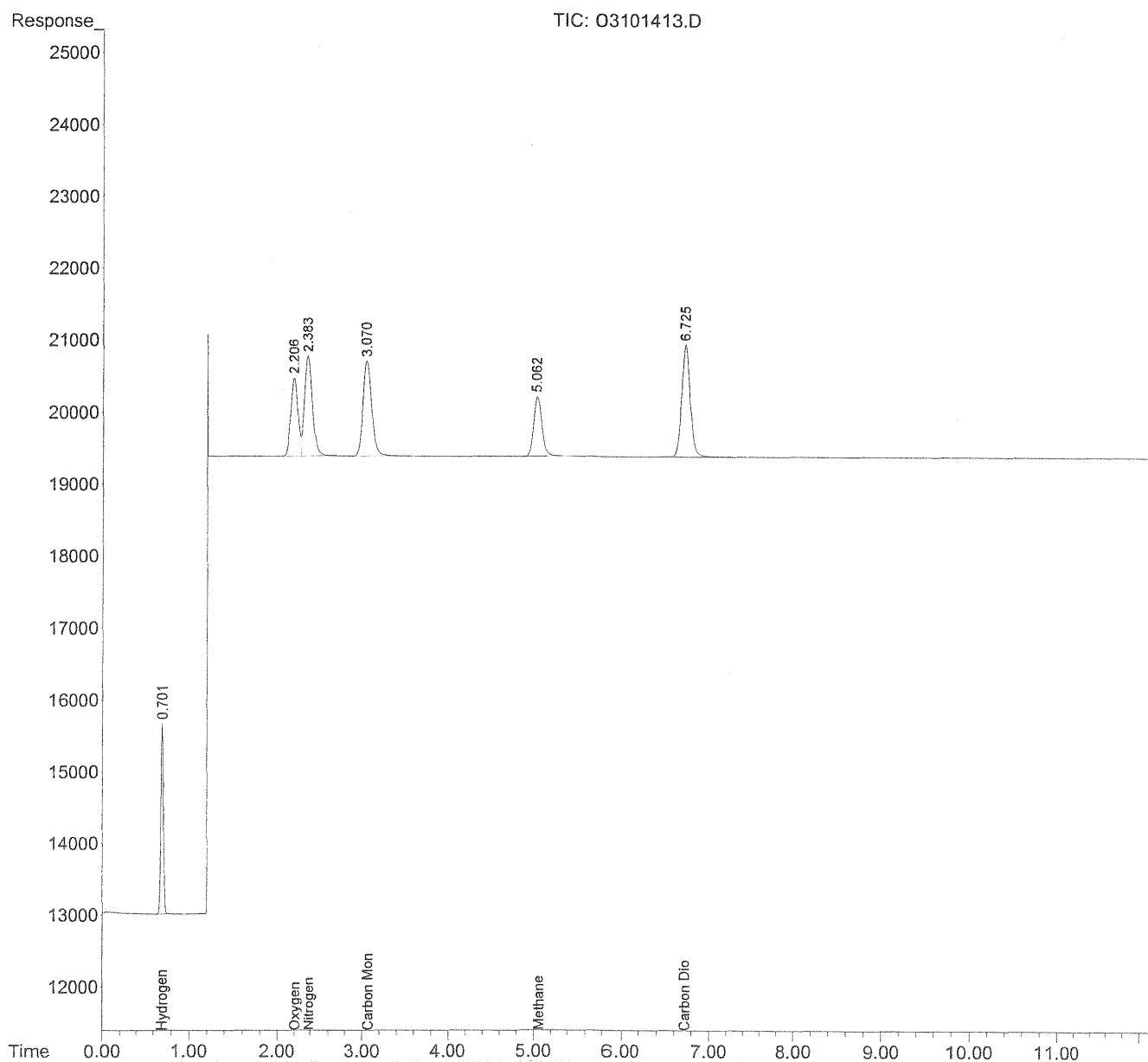
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101413.D  
 Signal(s) : TCD1A.CH  
 Acq On : 10 Mar 2014 14:32  
 Operator : WH  
 Sample : std 4 2  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 10 14:57:23 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 14:57:03 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101413.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 14:32  
Operator : WH  
Sample : std 4 2  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 14:57:23 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 14:57:03 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units    |
|--------------------|-------|----------|---------------|
| -----              |       |          |               |
| Target Compounds   |       |          |               |
| 1) Hydrogen        | 0.702 | 52354    | 38549.354 ppm |
| 2) Oxygen          | 2.208 | 65871    | 39291.954 ppm |
| 3) Nitrogen        | 2.385 | 93062    | 47432.408 ppm |
| 4) Carbon Monoxide | 3.072 | 92593    | 49417.144 ppm |
| 5) Methane         | 5.064 | 55753    | 39568.314 ppm |
| 6) Carbon Dioxide  | 6.726 | 107226   | 49228.245 ppm |
| -----              |       |          |               |

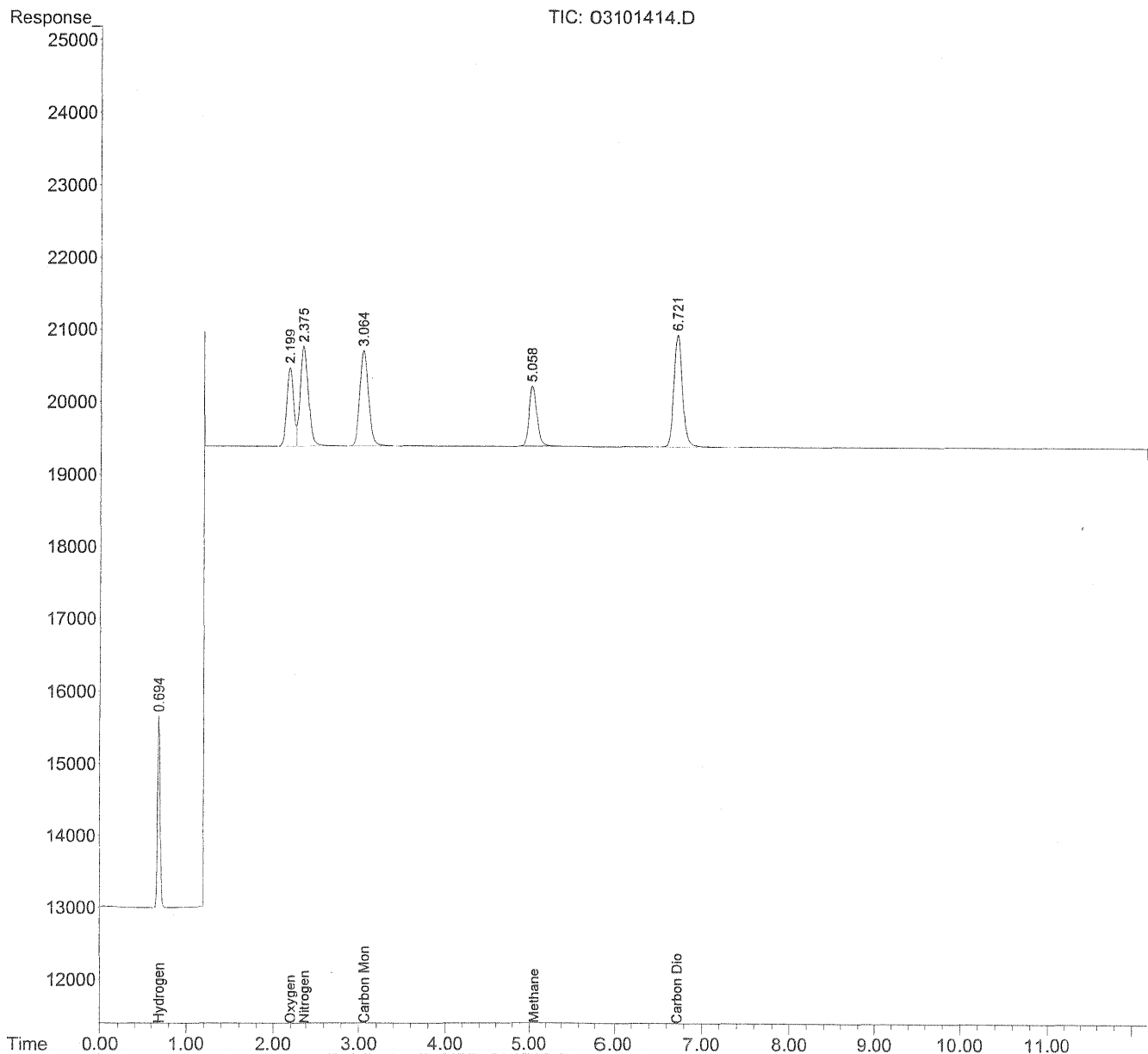
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101414.D  
 Signal(s) : TCD1A.CH  
 Acq On : 10 Mar 2014 14:49  
 Operator : WH  
 Sample : std 4 3  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 10 18:45:17 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 18:44:30 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101414.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 14:49  
Operator : WH  
Sample : std 4 3  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 18:45:17 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 18:44:30 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units    |
|--------------------|-------|----------|---------------|
| -----              |       |          |               |
| Target Compounds   |       |          |               |
| 1) Hydrogen        | 0.696 | 52056    | 37688.686 ppm |
| 2) Oxygen          | 2.200 | 65583    | 39685.849 ppm |
| 3) Nitrogen        | 2.377 | 92502    | 48078.649 ppm |
| 4) Carbon Monoxide | 3.065 | 91773    | 49520.215 ppm |
| 5) Methane         | 5.059 | 55456    | 39726.222 ppm |
| 6) Carbon Dioxide  | 6.723 | 106671   | 49580.495 ppm |
| -----              |       |          |               |

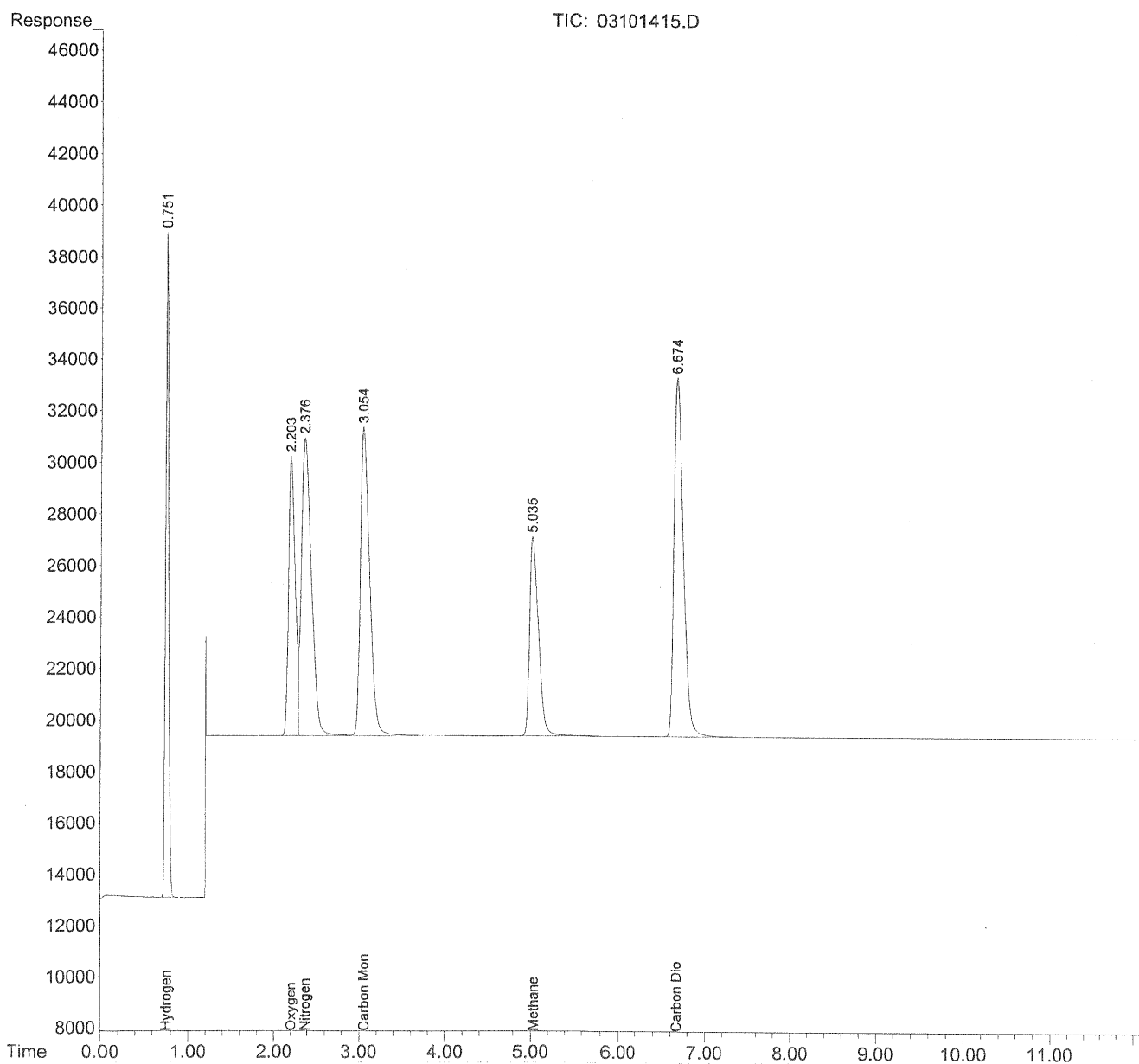
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101415.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 15:08  
Operator : WH  
Sample : std 5 1  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 15:28:26 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 15:28:13 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101415.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 15:08  
Operator : WH  
Sample : std 5 1  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 15:28:26 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 15:28:13 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.753 | 609940   | 450674.500 ppm |
| 2) Oxygen          | 2.204 | 639596   | 382242.968 ppm |
| 3) Nitrogen        | 2.378 | 920613   | 471464.666 ppm |
| 4) Carbon Monoxide | 3.056 | 910078   | 486547.441 ppm |
| 5) Methane         | 5.037 | 546936   | 388661.341 ppm |
| 6) Carbon Dioxide  | 6.676 | 1039048  | 477883.306 ppm |
| -----              |       |          |                |

(f)=RT Delta > 1/2 Window

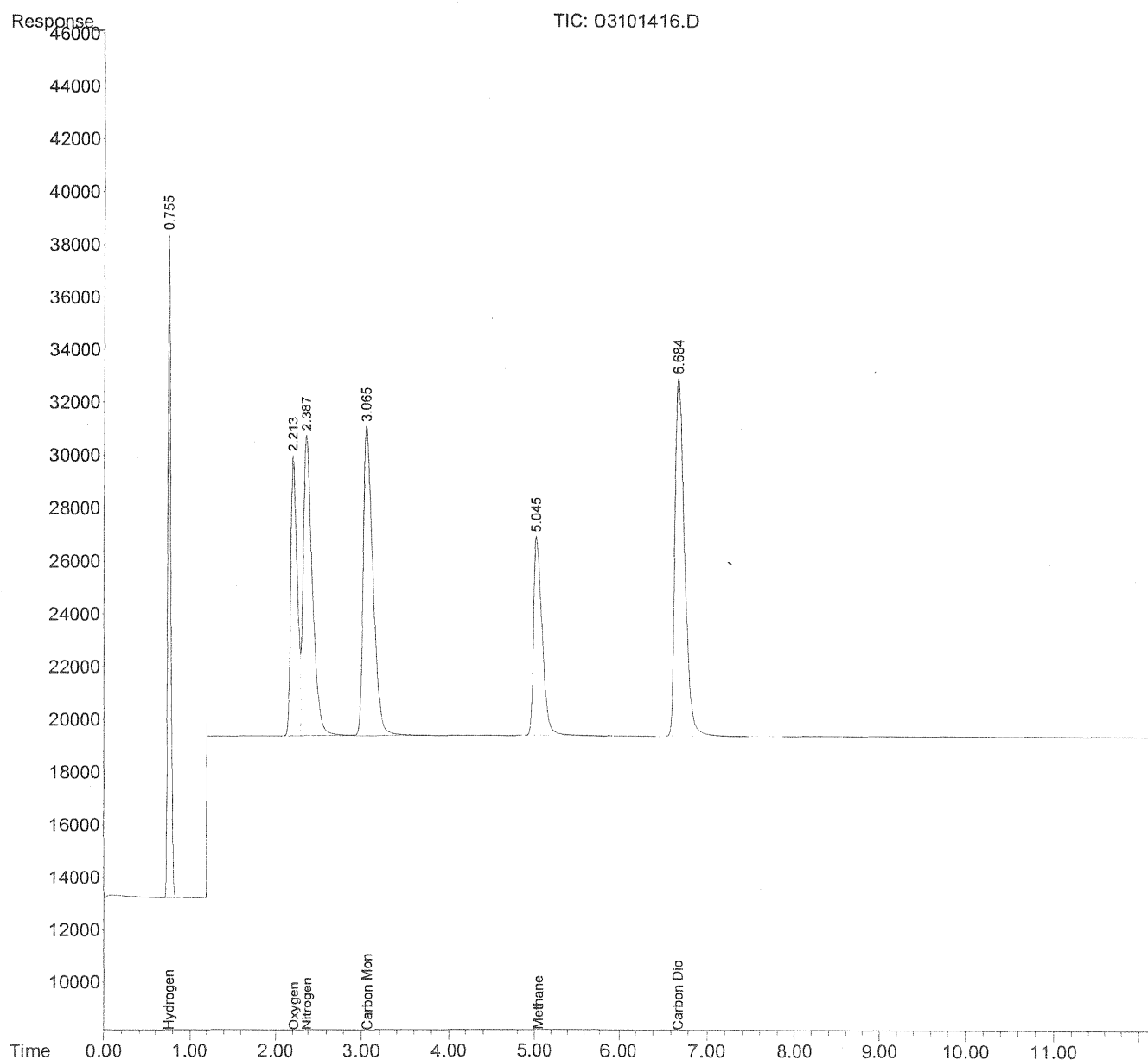
(m)=manual int.



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101416.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 15:34  
Operator : WH  
Sample : std 5 2  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 16:09:22 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 15:37:00 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101416.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 15:34  
Operator : WH  
Sample : std 5 2  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 16:09:22 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 15:37:00 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.757 | 592647   | 433927.352 ppm |
| 2) Oxygen          | 2.215 | 625621   | 375390.705 ppm |
| 3) Nitrogen        | 2.388 | 900666   | 463524.733 ppm |
| 4) Carbon Monoxide | 3.067 | 886943   | 475424.245 ppm |
| 5) Methane         | 5.047 | 533862   | 380382.085 ppm |
| 6) Carbon Dioxide  | 6.686 | 1009801  | 466290.795 ppm |
| -----              |       |          |                |

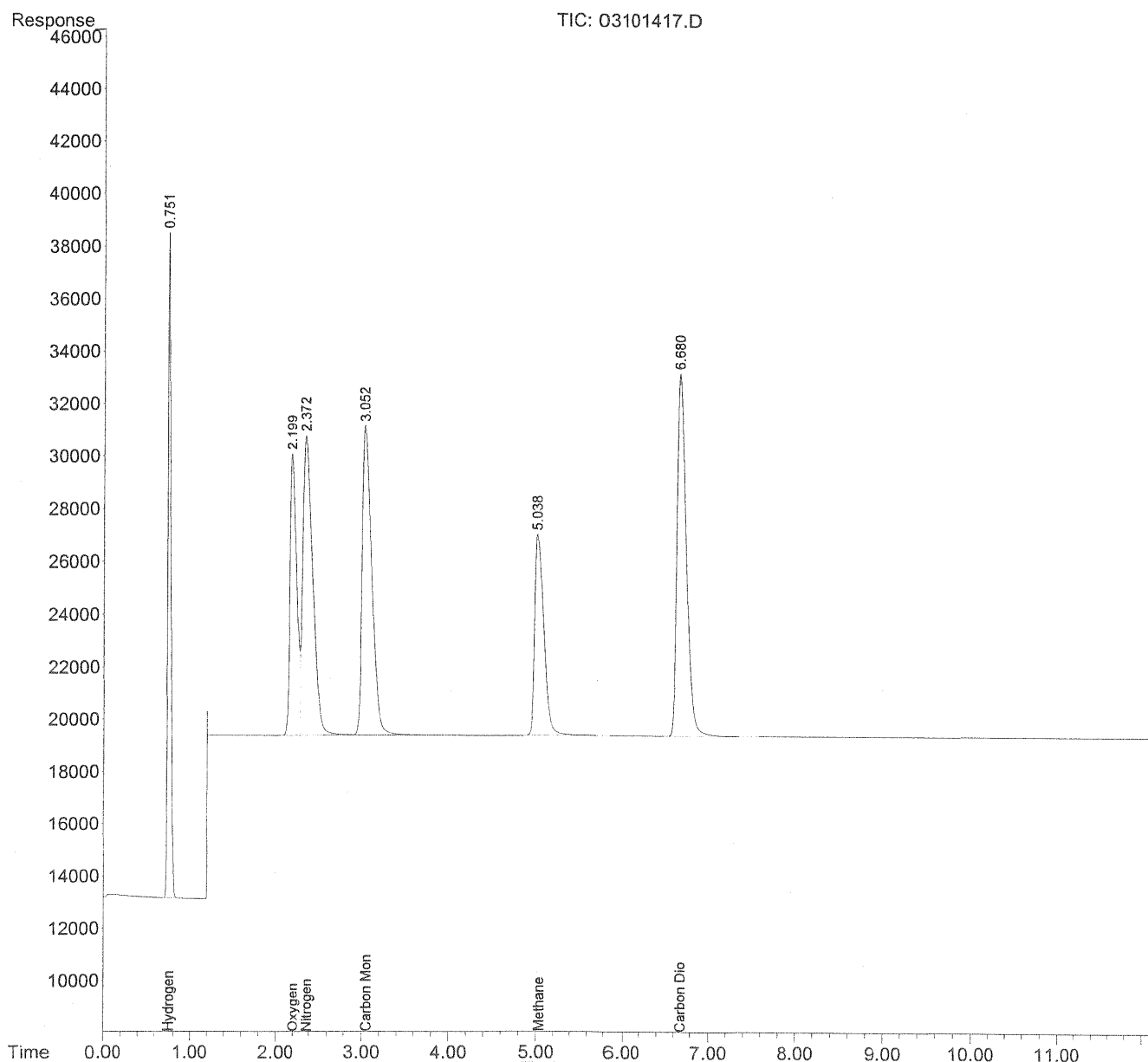
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101417.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 15:50  
Operator : WH  
Sample : std 5 3  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 16:09:37 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 15:37:00 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101417.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 15:50  
Operator : WH  
Sample : std 5 3  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 16:09:37 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 15:37:00 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.753 | 600780   | 437466.065 ppm |
| 2) Oxygen          | 2.200 | 633337   | 381900.857 ppm |
| 3) Nitrogen        | 2.374 | 912132   | 472109.403 ppm |
| 4) Carbon Monoxide | 3.054 | 899249   | 483961.452 ppm |
| 5) Methane         | 5.040 | 540876   | 386903.325 ppm |
| 6) Carbon Dioxide  | 6.681 | 1028390  | 477426.138 ppm |
| -----              |       |          |                |

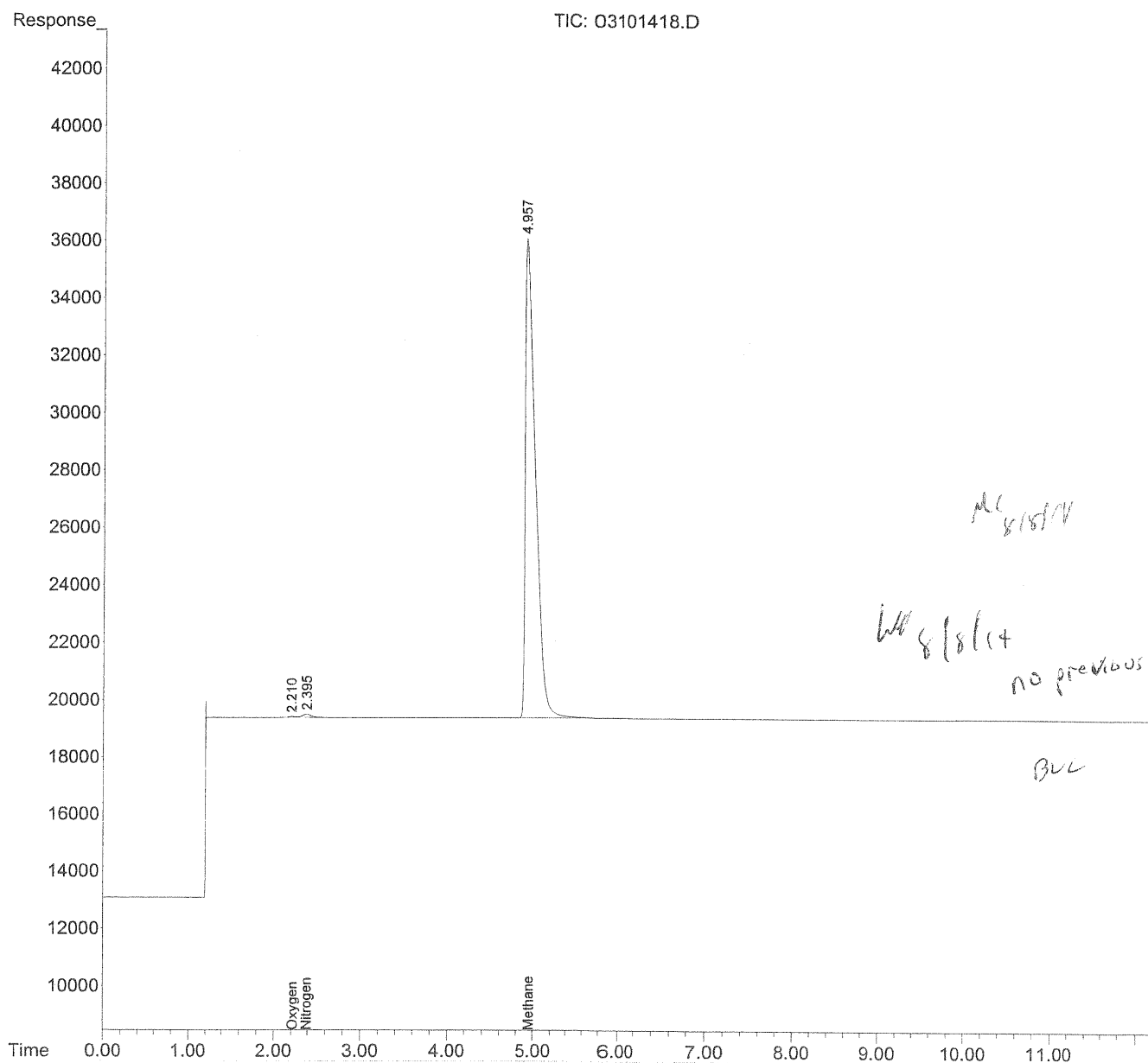
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101418.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 16:55  
Operator : WH  
Sample : std ch4 1  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 17:11:25 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 16:09:42 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101418.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 16:55  
Operator : WH  
Sample : std ch4 1  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 17:11:25 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 16:09:42 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc       | Units |
|--------------------|-------|----------|------------|-------|
| -----              |       |          |            |       |
| Target Compounds   |       |          |            |       |
| 1) Hydrogen        | 0.000 | 0        | N.D.       | ppm   |
| 2) Oxygen          | 2.225 | 1686     | 1020.031   | ppm   |
| 3) Nitrogen        | 2.395 | 7810     | 4059.131   | ppm   |
| 4) Carbon Monoxide | 0.000 | 0        | N.D.       | ppm   |
| 5) Methane         | 4.957 | 1340274  | 961229.509 | ppm m |
| 6) Carbon Dioxide  | 0.000 | 0        | N.D.       | ppm   |
| -----              |       |          |            |       |

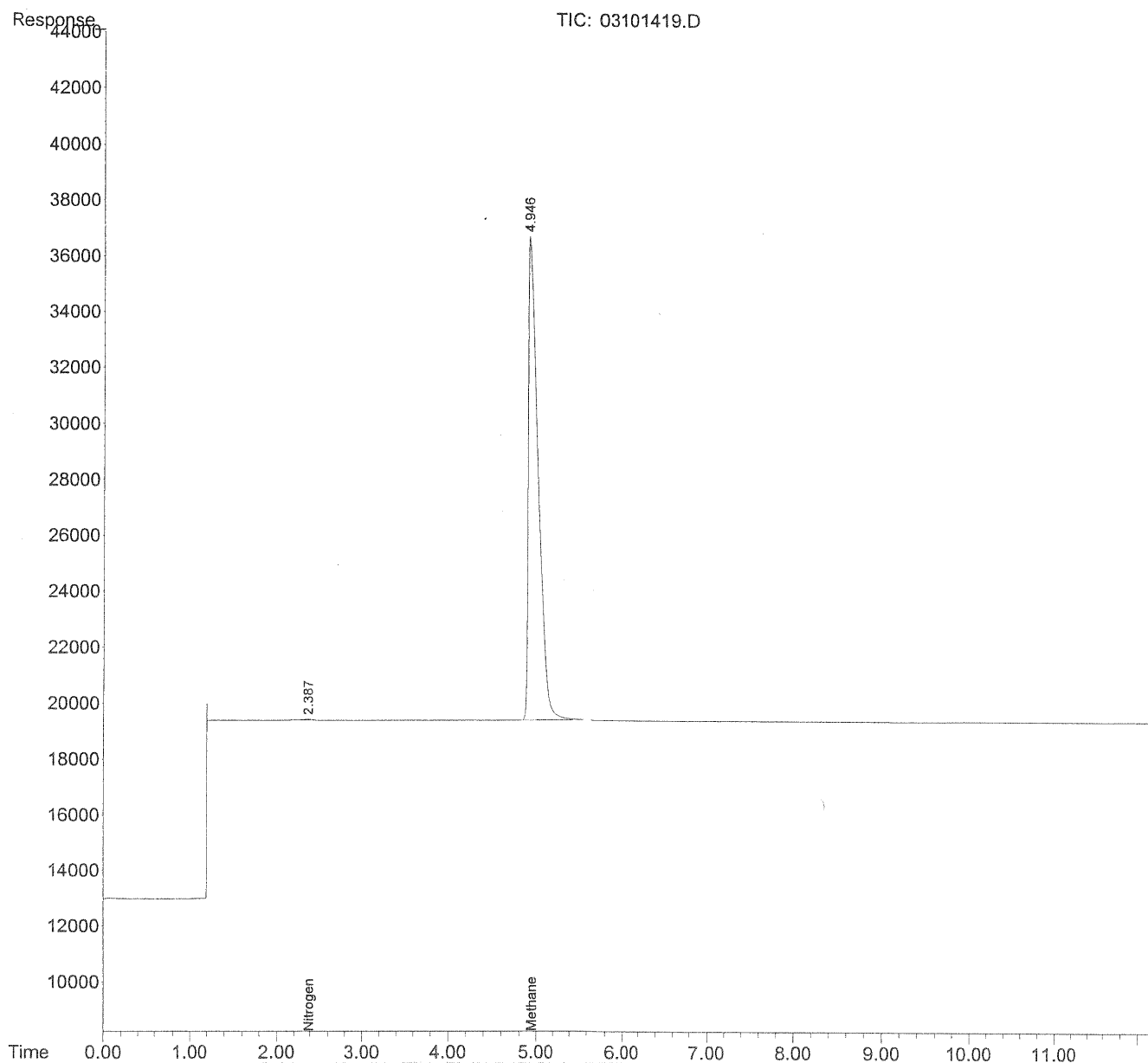
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101419.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 17:11  
Operator : WH  
Sample : std ch4 2  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 17:28:59 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 16:09:42 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101419.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 17:11  
Operator : WH  
Sample : std ch4 2  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 17:28:59 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 16:09:42 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 0.000 | 0        | N.D. ppm       |
| 3) Nitrogen        | 2.389 | 2357     | 1225.098 ppm   |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 4.948 | 1390484  | 997239.566 ppm |
| 6) Carbon Dioxide  | 0.000 | 0        | N.D. ppm       |
| -----              |       |          |                |

(f)=RT Delta > 1/2 Window

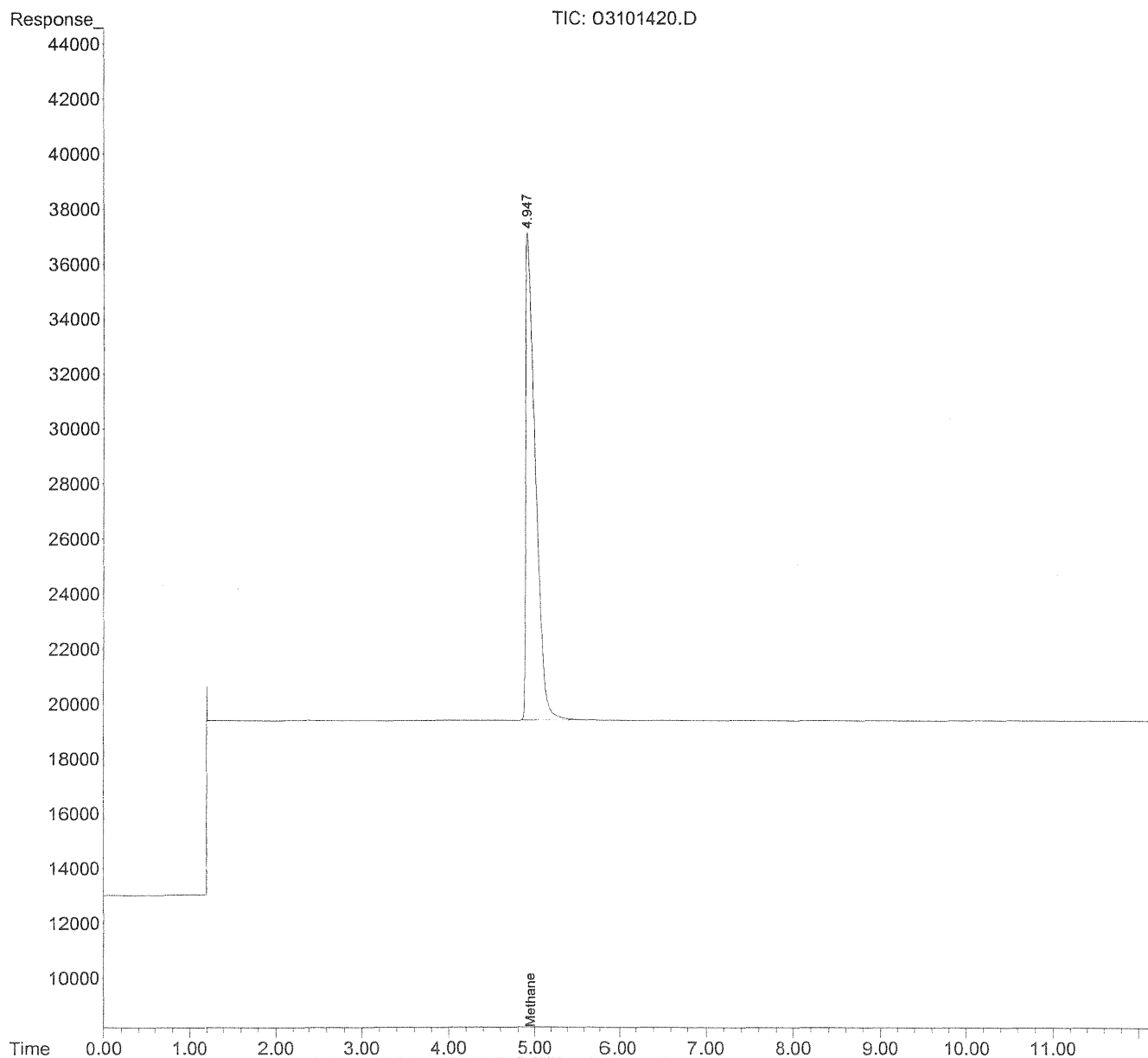
(m)=manual int.



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101420.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 17:29  
Operator : WH  
Sample : std ch4 3  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 17:46:24 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 16:09:42 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101420.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 17:29  
Operator : WH  
Sample : std ch4 3  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 17:46:24 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 16:09:42 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units      |
|--------------------|-------|----------|-----------------|
| -----              |       |          |                 |
| Target Compounds   |       |          |                 |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm        |
| 2) Oxygen          | 0.000 | 0        | N.D. ppm        |
| 3) Nitrogen        | 0.000 | 0        | N.D. ppm        |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm        |
| 5) Methane         | 4.949 | 1439175  | 1032160.623 ppm |
| 6) Carbon Dioxide  | 0.000 | 0        | N.D. ppm        |
| -----              |       |          |                 |

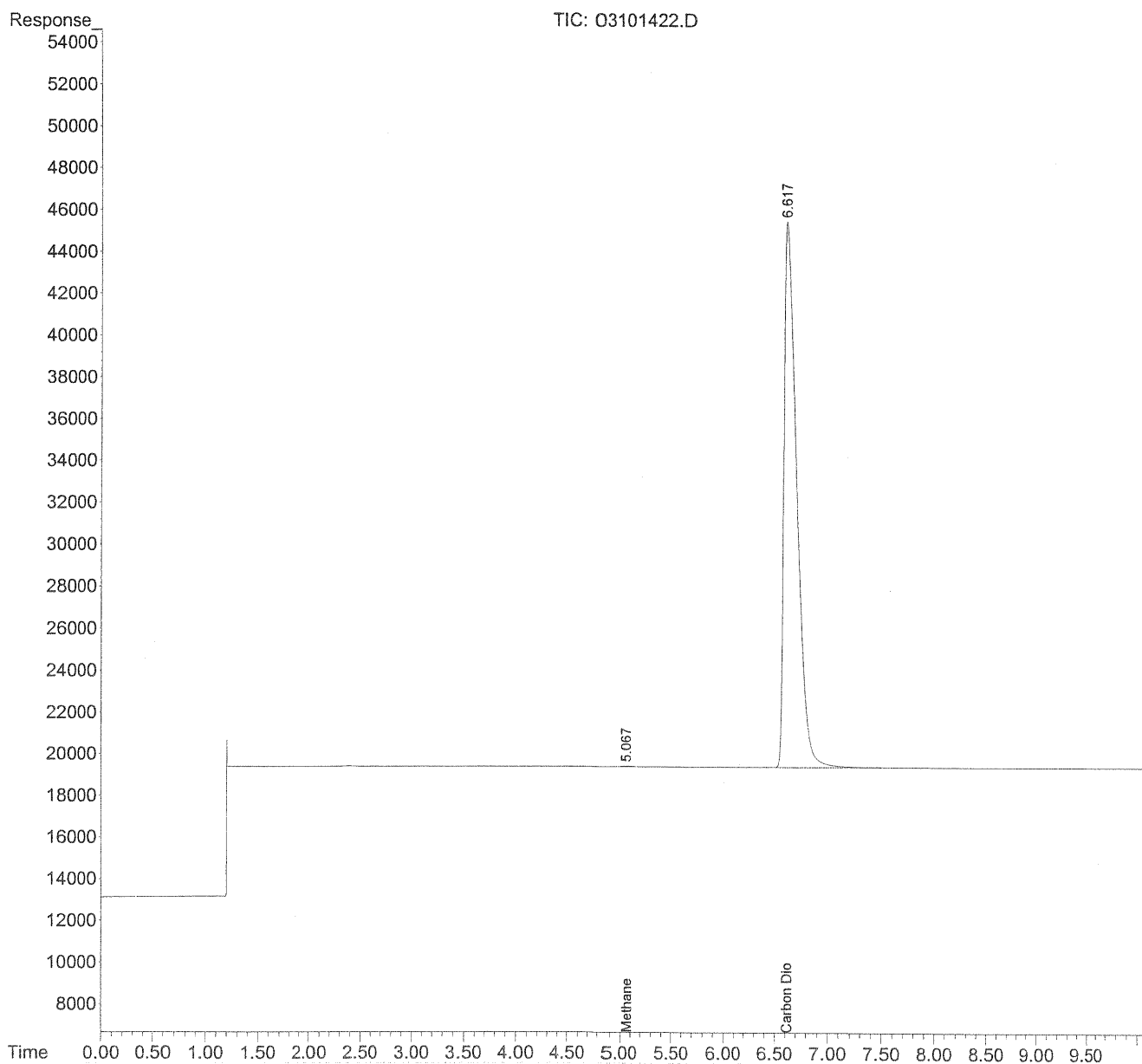
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101422.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 18:05  
Operator : WH  
Sample : std c02 1  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 18:17:25 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 17:51:34 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101422.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 18:05  
Operator : WH  
Sample : std c02 1  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 18:17:25 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 17:51:34 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units      |
|--------------------|-------|----------|-----------------|
| -----              |       |          |                 |
| Target Compounds   |       |          |                 |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm        |
| 2) Oxygen          | 0.000 | 0        | N.D. ppm        |
| 3) Nitrogen        | 0.000 | 0        | N.D. ppm        |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm        |
| 5) Methane         | 5.069 | 1775     | 1271.240 ppm    |
| 6) Carbon Dioxide  | 6.618 | 2201199  | 1025503.777 ppm |
| -----              |       |          |                 |

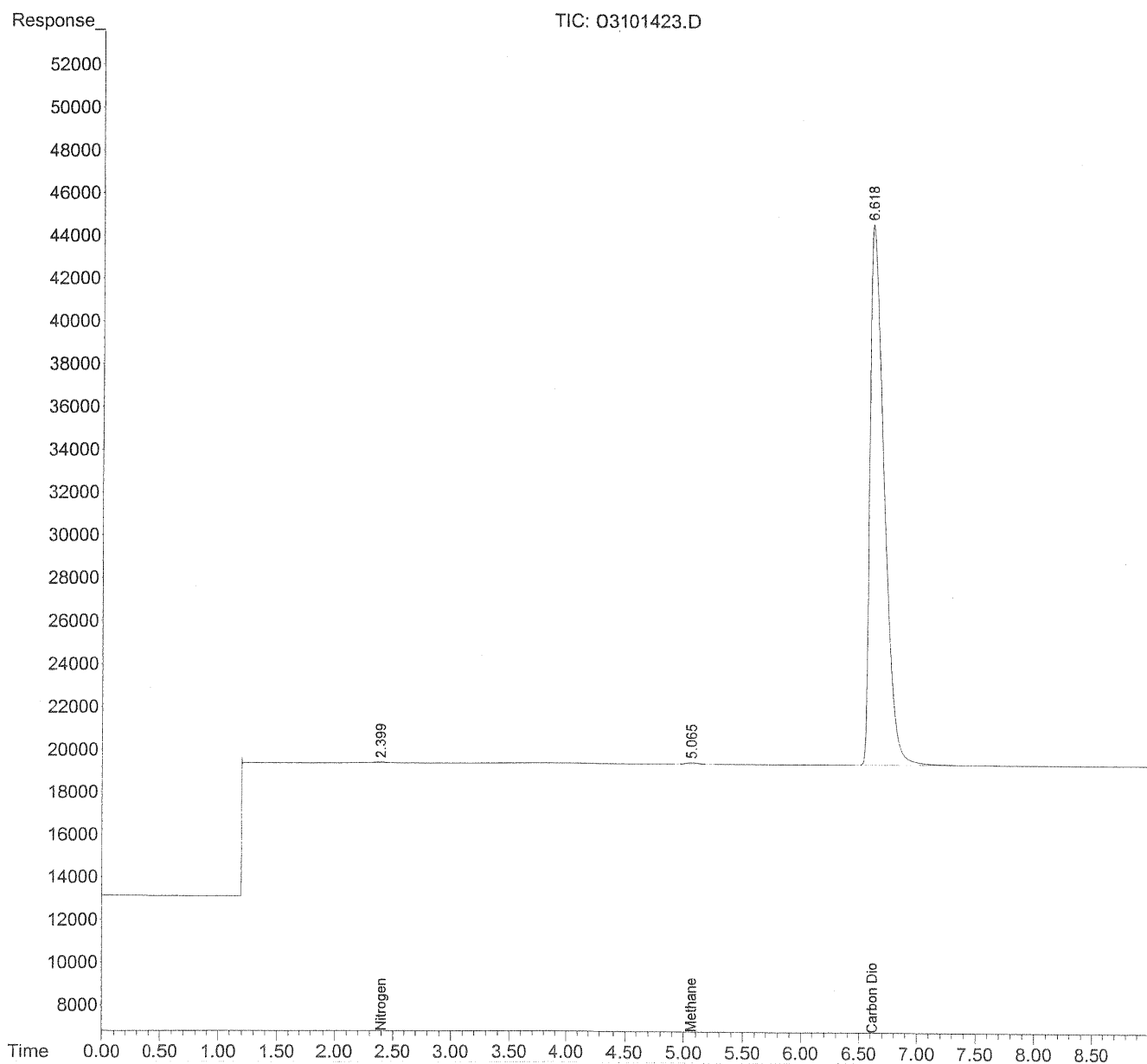
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101423.D  
Signal(s) : TCD1A.CH  
Acq On : 10 Mar 2014 18:19  
Operator : WH  
Sample : std c02 2  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 10 18:30:24 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 17:51:34 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101423.D  
 Signal(s) : TCD1A.CH  
 Acq On : 10 Mar 2014 18:19  
 Operator : WH  
 Sample : std c02 2  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 10 18:30:24 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 17:51:34 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 0.000 | 0        | N.D. ppm       |
| 3) Nitrogen        | 2.401 | 2050     | 1065.315 ppm   |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 5.069 | 4323     | 3097.155 ppm   |
| 6) Carbon Dioxide  | 6.619 | 2111383  | 983659.786 ppm |
| -----              |       |          |                |

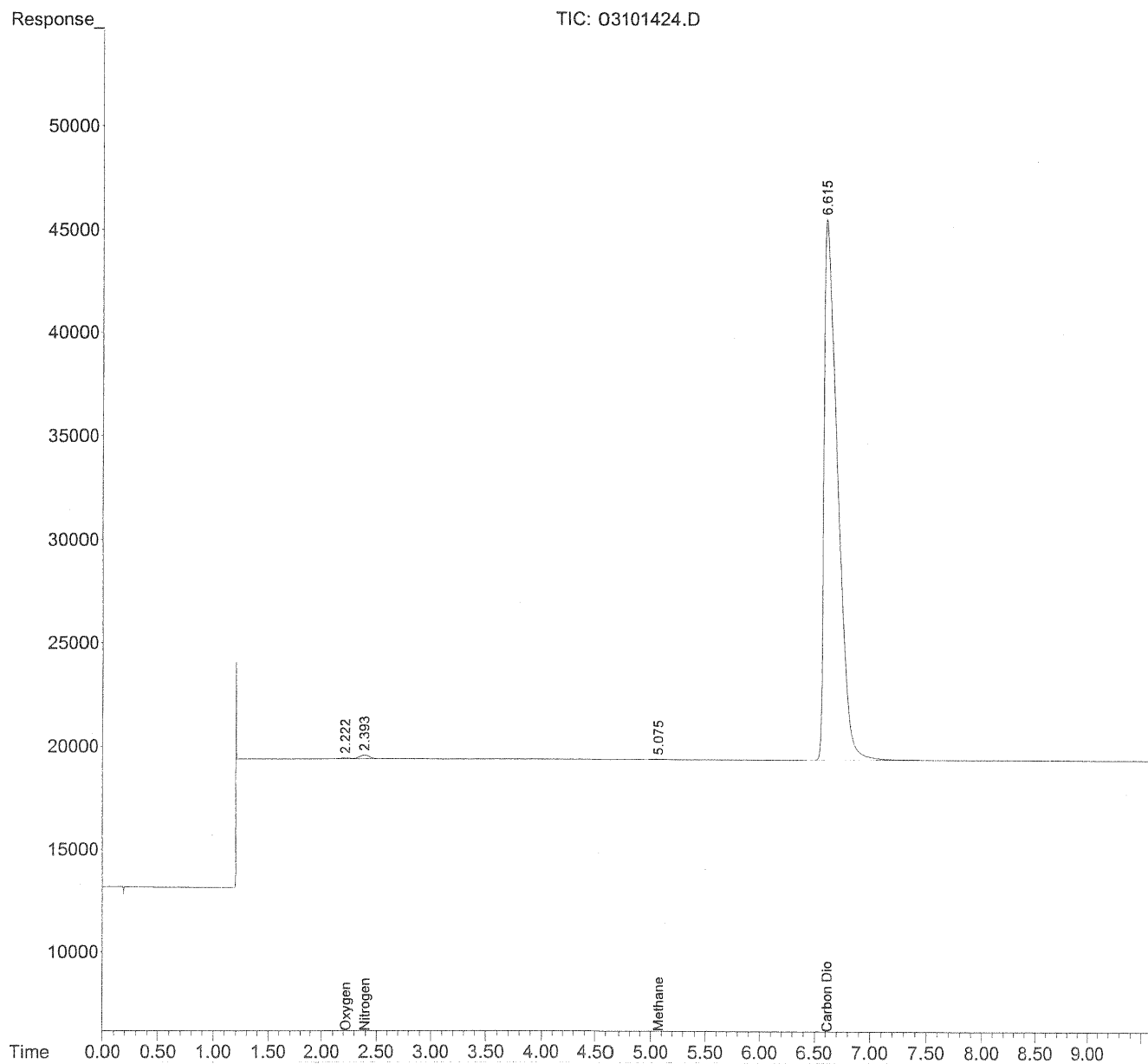
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101424.D  
 Signal(s) : TCD1A.CH  
 Acq On : 10 Mar 2014 18:32  
 Operator : WH  
 Sample : std c02 3  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 10 18:43:57 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 18:42:24 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101424.D  
 Signal(s) : TCD1A.CH  
 Acq On : 10 Mar 2014 18:32  
 Operator : WH  
 Sample : std c02 3  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 10 18:43:57 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 18:42:24 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :

| Compound           | R.T.  | Response | Conc Units      |
|--------------------|-------|----------|-----------------|
| -----              |       |          |                 |
| Target Compounds   |       |          |                 |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm        |
| 2) Oxygen          | 2.223 | 2425     | 1467.619 ppm    |
| 3) Nitrogen        | 2.396 | 11513    | 5983.691 ppm    |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm        |
| 5) Methane         | 5.076 | 523      | 374.374 ppm     |
| 6) Carbon Dioxide  | 6.617 | 2204164  | 1026088.843 ppm |
| -----              |       |          |                 |

(f)=RT Delta > 1/2 Window

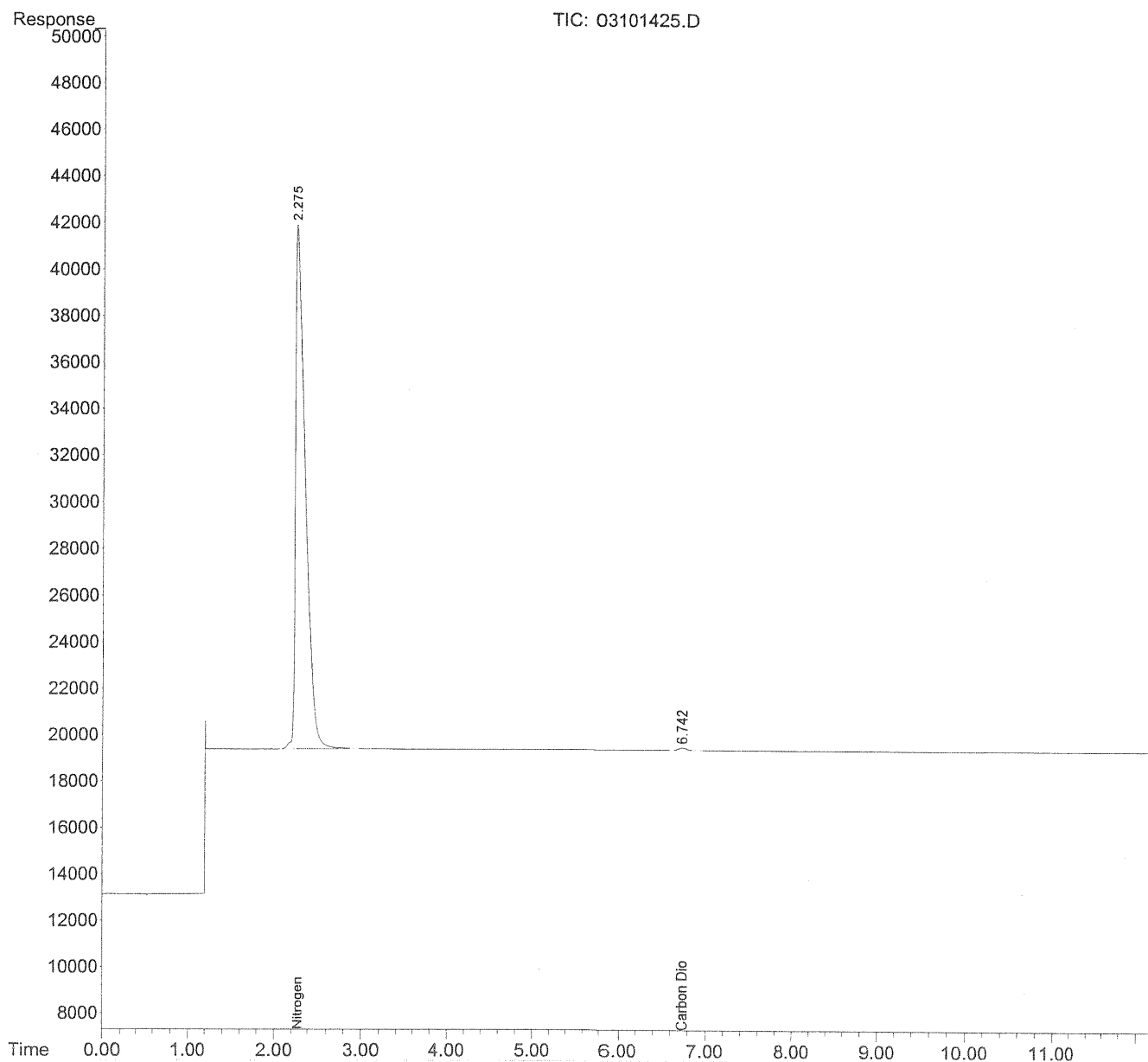
(m)=manual int.



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101425.D  
Signal(s) : TCD1A.CH  
Acq On : 11 Mar 2014 10:11  
Operator : WH  
Sample : std n2 1  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 11 10:26:33 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 18:45:38 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101425.D  
Signal(s) : TCD1A.CH  
Acq On : 11 Mar 2014 10:11  
Operator : WH  
Sample : std n2 1  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 11 10:26:33 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 18:45:38 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 0.000 | 0        | N.D. ppm d     |
| 3) Nitrogen        | 2.277 | 1907693  | 991533.750 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.744 | 7551     | 3509.651 ppm   |
| -----              |       |          |                |

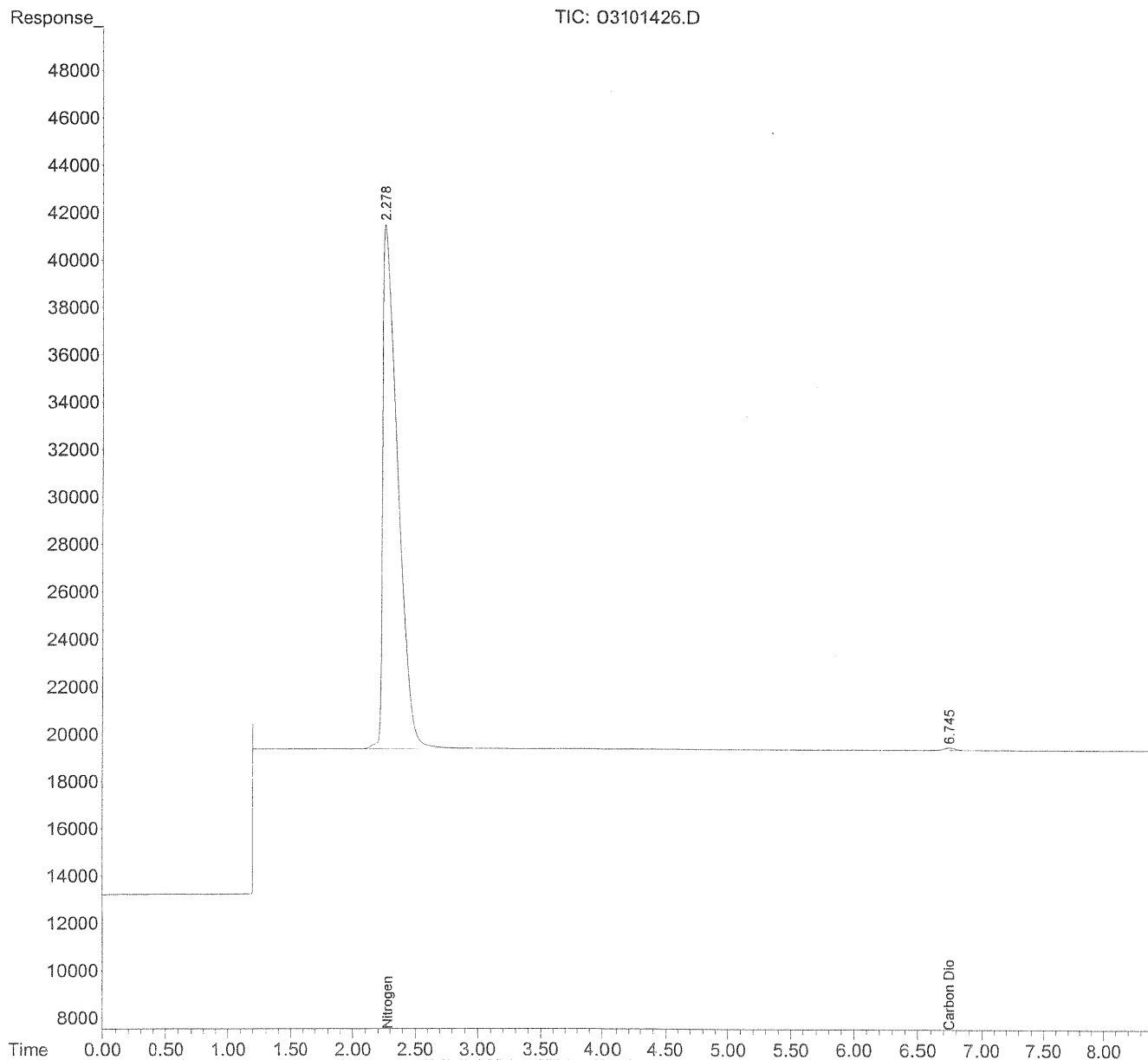
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101426.D  
 Signal(s) : TCD1A.CH  
 Acq On : 11 Mar 2014 10:30  
 Operator : WH  
 Sample : std n2 2  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 11 10:40:12 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 18:45:38 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101426.D  
Signal(s) : TCD1A.CH  
Acq On : 11 Mar 2014 10:30  
Operator : WH  
Sample : std n2 2  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 11 10:40:12 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 18:45:38 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units     |
|--------------------|-------|----------|----------------|
| -----              |       |          |                |
| Target Compounds   |       |          |                |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm       |
| 2) Oxygen          | 0.000 | 0        | N.D. ppm d     |
| 3) Nitrogen        | 2.280 | 1857806  | 965604.527 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm       |
| 5) Methane         | 0.000 | 0        | N.D. ppm       |
| 6) Carbon Dioxide  | 6.748 | 7247     | 3368.284 ppm   |
| -----              |       |          |                |

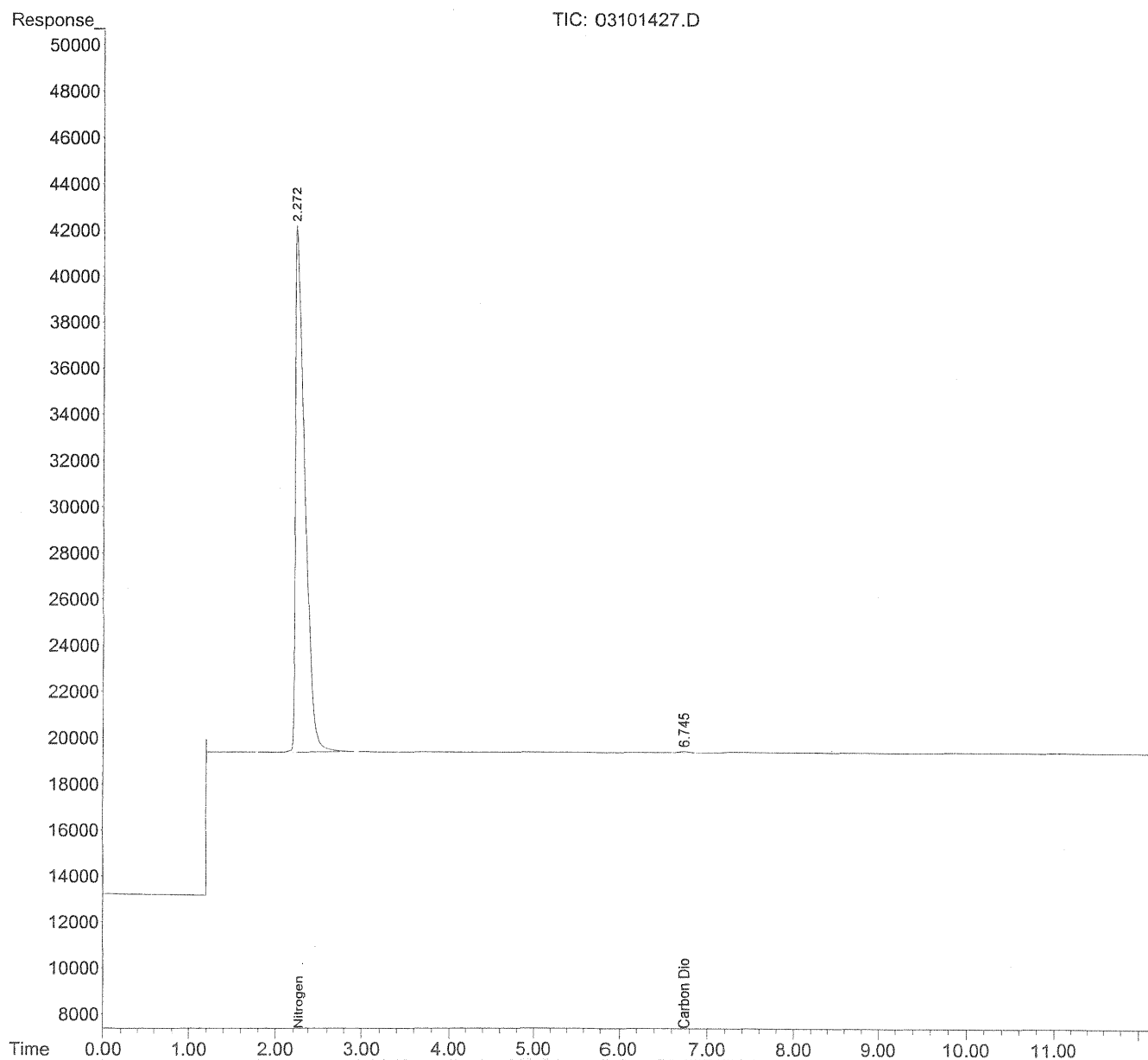
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101427.D  
Signal(s) : TCD1A.CH  
Acq On : 11 Mar 2014 10:42  
Operator : WH  
Sample : std n2 3  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 11 11:02:52 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Mon Mar 10 18:45:38 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
 Data File : 03101427.D  
 Signal(s) : TCD1A.CH  
 Acq On : 11 Mar 2014 10:42  
 Operator : WH  
 Sample : std n2 3  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Mar 11 11:02:52 2014  
 Quant Method : J:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Mon Mar 10 18:45:38 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :

| Compound           | R.T.  | Response | Conc Units      |
|--------------------|-------|----------|-----------------|
| -----              |       |          |                 |
| Target Compounds   |       |          |                 |
| 1) Hydrogen        | 0.000 | 0        | N.D. ppm        |
| 2) Oxygen          | 0.000 | 0        | N.D. ppm d      |
| 3) Nitrogen        | 2.273 | 1934590  | 1005513.839 ppm |
| 4) Carbon Monoxide | 0.000 | 0        | N.D. ppm        |
| 5) Methane         | 0.000 | 0        | N.D. ppm        |
| 6) Carbon Dioxide  | 6.747 | 3210     | 1492.185 ppm    |
| -----              |       |          |                 |

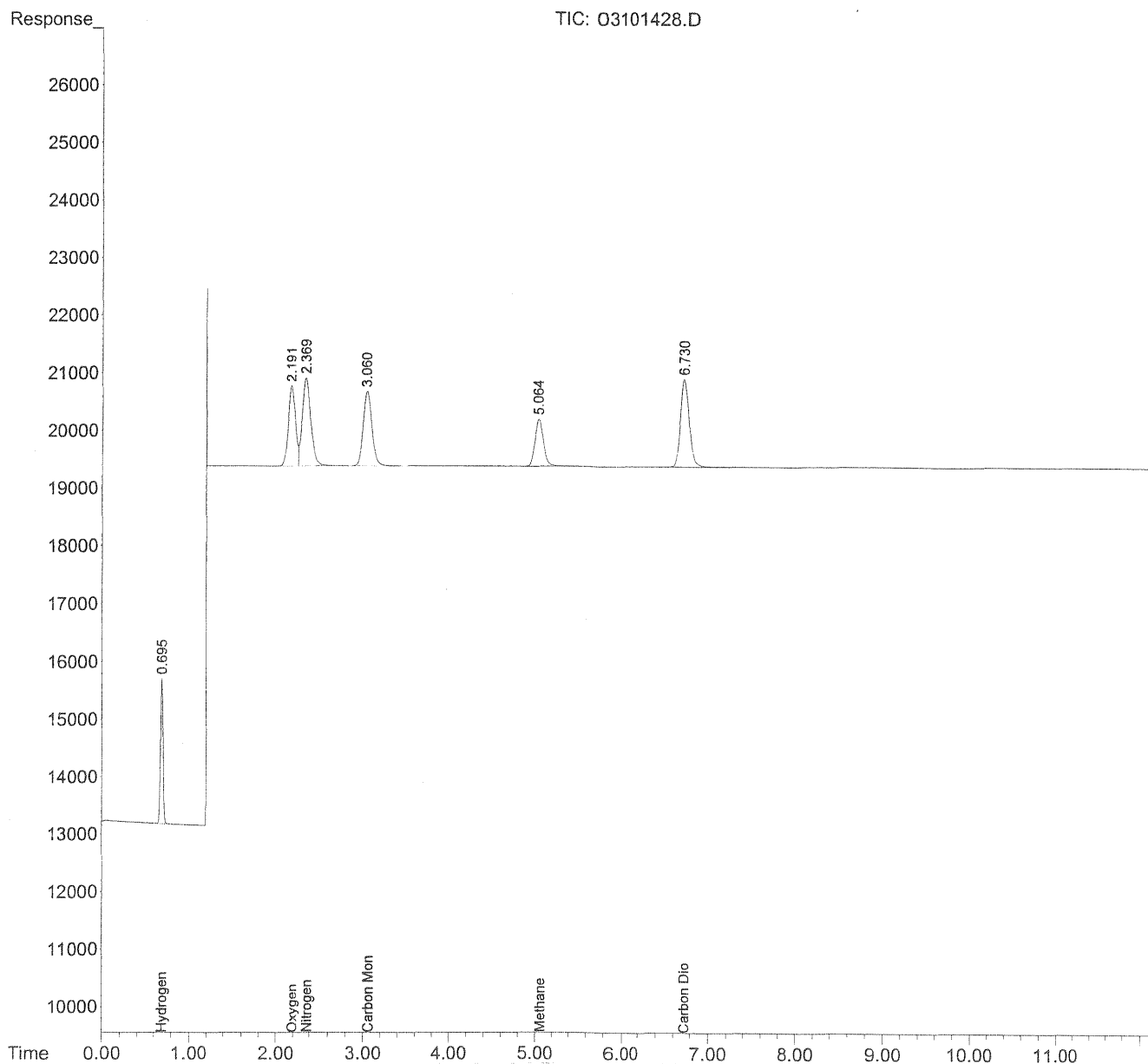
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101428.D  
Signal(s) : TCD1A.CH  
Acq On : 11 Mar 2014 11:20  
Operator : WH  
Sample : icv s30-02051401  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 11 11:35:58 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



Data Path : J:\GC01\DATA\FXG\2014\_03\10\  
Data File : 03101428.D  
Signal(s) : TCD1A.CH  
Acq On : 11 Mar 2014 11:20  
Operator : WH  
Sample : icv s30-02051401  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Mar 11 11:35:58 2014  
Quant Method : J:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | Actual ppm       | R.T.  | Response | Conc Units    | % Recovery |
|--------------------|------------------|-------|----------|---------------|------------|
| -----              |                  |       |          |               |            |
| Target Compounds   |                  |       |          |               |            |
| 1) Hydrogen        | <del>40000</del> | 0.696 | 49944    | 36159.891 ppm | 90.4 %     |
| 2) Oxygen          | <del>50000</del> | 2.193 | 85837    | 51942.494 ppm | 103.9 %    |
| 3) Nitrogen        | <del>50000</del> | 2.370 | 104375   | 54362.122 ppm | 108.7 %    |
| 4) Carbon Monoxide | <del>50000</del> | 3.061 | 91720    | 49491.765 ppm | 99.0 %     |
| 5) Methane         | <del>40000</del> | 5.066 | 55315    | 39625.390 ppm | 99.1 %     |
| 6) Carbon Dioxide  | <del>50000</del> | 6.732 | 105938   | 49239.725 ppm | 98.5 %     |
| -----              |                  |       |          |               |            |

(f)=RT Delta > 1/2 Window

(m)=manual int.

WA 8/8/14



# REPORT SUMMARYS FIXED GASES BY GC/TCD

Printed : 9/10/2015

CLIENT : Air Hygiene, Incorporated

Instrument : GC #1 / TCD #1

Analyst : NL

Date analyzed : 9/4/2015

PAI Job : P1503700

Sample amount : 100uL

## Sample Result

| Sample ID        | Hydrogen | Oxygen | Nitrogen | Carbon Monoxide | Methane | Carbon Dioxide |
|------------------|----------|--------|----------|-----------------|---------|----------------|
| STD S30-08311502 | 39621    | 39936  | 49652    | 49621           | 39731   | 49304          |
| ACTUAL           | 39990    | 40030  | 50000    | 50010           | 39970   | 50040          |
| % Difference     | 0.9%     | 0.2%   | 0.7%     | 0.8%            | 0.6%    | 1.5%           |
| Lab Air          | 203045   |        | 725051   |                 |         | 462            |
| MB               |          |        |          |                 |         |                |
| 3700-001         | 133456   | 0.0%   | 736598   | 0.0%            |         | 51422          |
| 3700-001 - 2     | 133998   | 0.5%   | 742010   | 0.7%            |         | 51786          |
| 3700-001 - 3     | 132728   | 0.5%   | 732073   | 0.7%            |         | 51217          |
| 3700-001 - Mean  | 133394   |        | 736894   |                 |         | 51475          |
| 3700-003         | 136141   | 0.2%   | 738888   | 0.3%            |         | 49698          |
| 3700-003 - 2     | 135660   | 0.2%   | 734250   | 0.4%            |         | 49484          |
| 3700-003 - 3     | 135870   | 0.0%   | 737764   | 0.1%            |         | 49646          |
| 3700-003 - Mean  | 135890   |        | 736967   |                 |         | 49610          |
| 3700-005         | 134015   | 0.0%   | 742727   | 0.2%            |         | 51333          |
| 3700-005 - 2     | 133947   | 0.1%   | 738767   | 0.4%            |         | 51074          |
| 3700-005 - 3     | 134254   | 0.1%   | 743332   | 0.2%            |         | 51442          |
| 3700-005 - Mean  | 134072   |        | 741609   |                 |         | 51283          |
| 3700-007         | 161644   | 0.1%   | 732889   | 0.2%            |         | 31488          |
| 3700-007 - 2     | 162046   | 0.2%   | 737352   | 0.4%            |         | 31499          |
| 3700-007 - 3     | 161593   | 0.1%   | 732482   | 0.2%            |         | 31331          |
| 3700-007 - Mean  | 161761   |        | 734241   |                 |         | 31439          |

REPORT SUMMARYS FIXED GASES BY GC/TCD

Printed : 9/10/2015

CLIENT : Air Hygiene, Incorporated

Instrument : GC #1 / TCD #1

Analyst : NL

Date analyzed : 9/4/2015

PAI Job : P1503700

Sample amount : 100uL

|                  |        |      |        |       |       |       |
|------------------|--------|------|--------|-------|-------|-------|
| 3700-009         | 165037 | 0.5% | 723979 | 0.5%  | 27420 | 1.0%  |
| 3700-009 - 2     | 165554 | 0.2% | 726564 | 0.2%  | 27705 | 0.0%  |
| 3700-009 - 3     | 167087 | 0.7% | 732945 | 0.7%  | 27969 | 1.0%  |
| 3700-009 - Mean  | 165893 |      | 727829 |       | 27698 |       |
| 3700-011         | 164618 | 0.2% | 731688 | 0.2%  | 29120 | 0.0%  |
| 3700-011 - 2     | 163992 | 0.2% | 727819 | 0.4%  | 28937 | 0.6%  |
| 3700-011 - 3     | 164267 | 0.0% | 732174 | 0.2%  | 29269 | 0.6%  |
| 3700-011 - Mean  | 164292 |      | 730560 |       | 29109 |       |
| 3700-013         | 145412 | 0.1% | 731666 | 0.1%  | 42208 | 0.1%  |
| 3700-013 - 2     | 144542 | 0.5% | 729282 | 0.3%  | 42235 | 0.1%  |
| 3700-013 - 3     | 145647 | 0.3% | 732732 | 0.2%  | 42366 | 0.2%  |
| 3700-013 - Mean  | 145200 |      | 731226 |       | 42270 |       |
| 3700-015         | 141222 | 0.3% | 733866 | 0.3%  | 45564 | 0.2%  |
| 3700-015 - 2     | 140353 | 0.3% | 728544 | 0.4%  | 45336 | 0.3%  |
| 3700-015 - 3     | 140803 | 0.0% | 731670 | 0.0%  | 45500 | 0.1%  |
| 3700-015 - Mean  | 140793 |      | 731360 |       | 45466 |       |
| 3700-017         | 142503 | 0.0% | 733068 | 0.2%  | 44314 | 0.2%  |
| 3700-017 - 2     | 142691 | 0.2% | 732370 | 0.1%  | 44315 | 0.2%  |
| 3700-017 - 3     | 142200 | 0.2% | 729701 | 0.3%  | 44113 | 0.3%  |
| 3700-017 - Mean  | 142464 |      | 731713 |       | 44247 |       |
| STD S30-08311502 | 37170  |      | 51464  | 46663 | 37344 | 46722 |
| ACTUAL           | 39990  |      | 50000  | 50010 | 39970 | 50040 |
| % Difference     | 7.1%   |      | 2.9%   | 6.7%  | 6.6%  | 6.6%  |

ny  
9/10/15

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041501.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 7:34 am  
Operator : MC  
Sample : std s30-08311502  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:42:37 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units    |
|--------------------|-------|----------|---------------|
| -----              |       |          |               |
| Target Compounds   |       |          |               |
| 1) Hydrogen        | 0.703 | 54725    | 39621.318 ppm |
| 2) Oxygen          | 2.215 | 65997    | 39936.487 ppm |
| 3) Nitrogen        | 2.390 | 95332    | 49652.277 ppm |
| 4) Carbon Monoxide | 3.078 | 91959    | 49620.510 ppm |
| 5) Methane         | 5.067 | 55463    | 39731.107 ppm |
| 6) Carbon Dioxide  | 6.729 | 106077   | 49304.286 ppm |
| -----              |       |          |               |

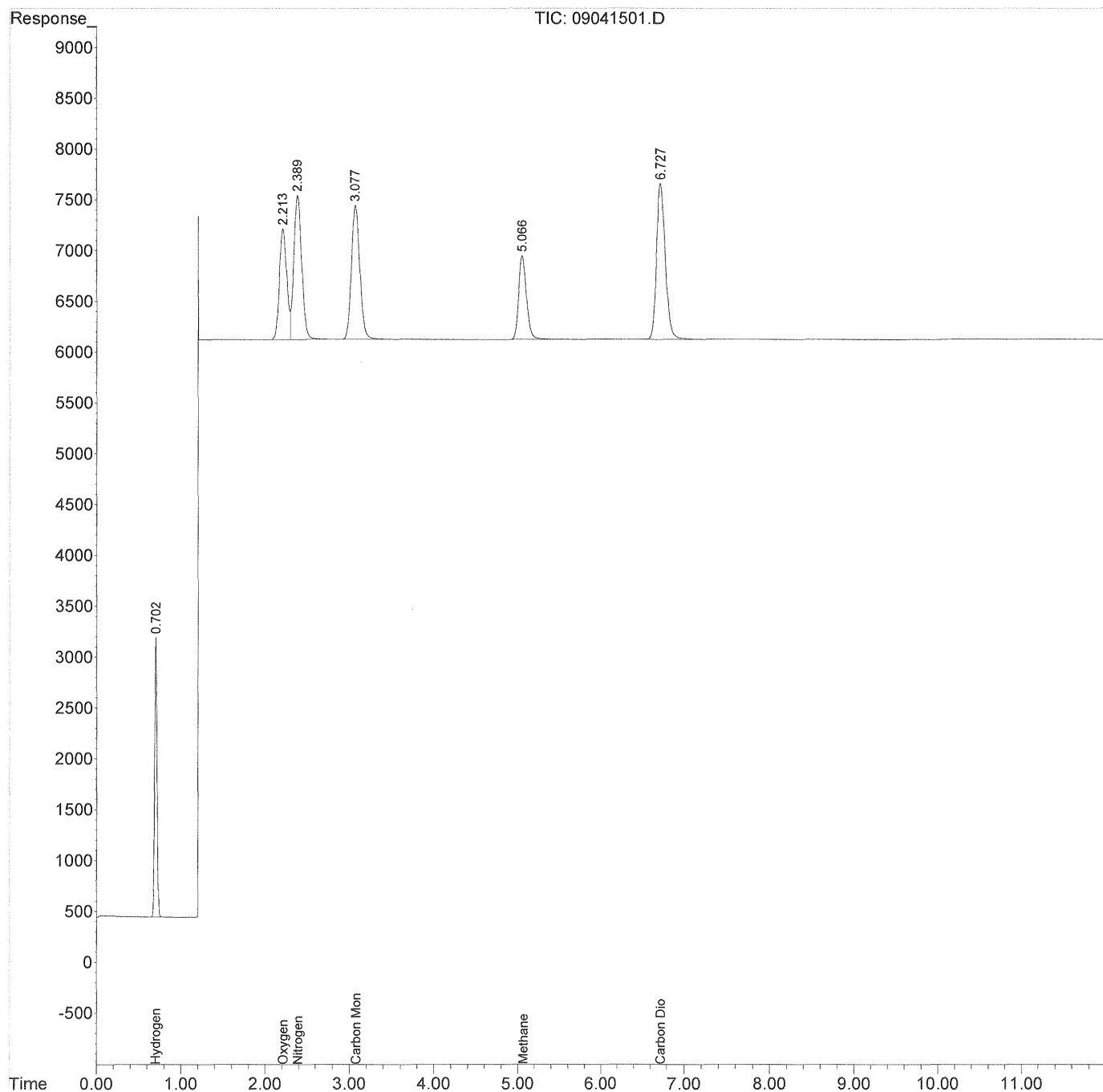
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
 Data File : 09041501.D  
 Signal(s) : TCD1A.CH  
 Acq On : 4 Sep 2015 7:34 am  
 Operator : MC  
 Sample : std s30-08311502  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Sep 10 07:42:37 2015  
 Quant Method : I:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Tue Mar 11 11:04:23 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
Data File : 09041538.D  
Signal(s) : TCD1A.CH  
Acq On : 4 Sep 2015 8:55 pm  
Operator : WH  
Sample : std  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 07:44:08 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc      | Units |
|--------------------|-------|----------|-----------|-------|
| -----              |       |          |           |       |
| Target Compounds   |       |          |           |       |
| 1) Hydrogen        | 0.712 | 51340    | 37170.489 | ppm   |
| 2) Oxygen          | 2.229 | 64272    | 38892.841 | ppm   |
| 3) Nitrogen        | 2.404 | 98810    | 51463.723 | ppm   |
| 4) Carbon Monoxide | 3.092 | 86478    | 46663.210 | ppm   |
| 5) Methane         | 5.083 | 52131    | 37344.408 | ppm   |
| 6) Carbon Dioxide  | 6.747 | 100520   | 46721.507 | ppm   |
| -----              |       |          |           |       |

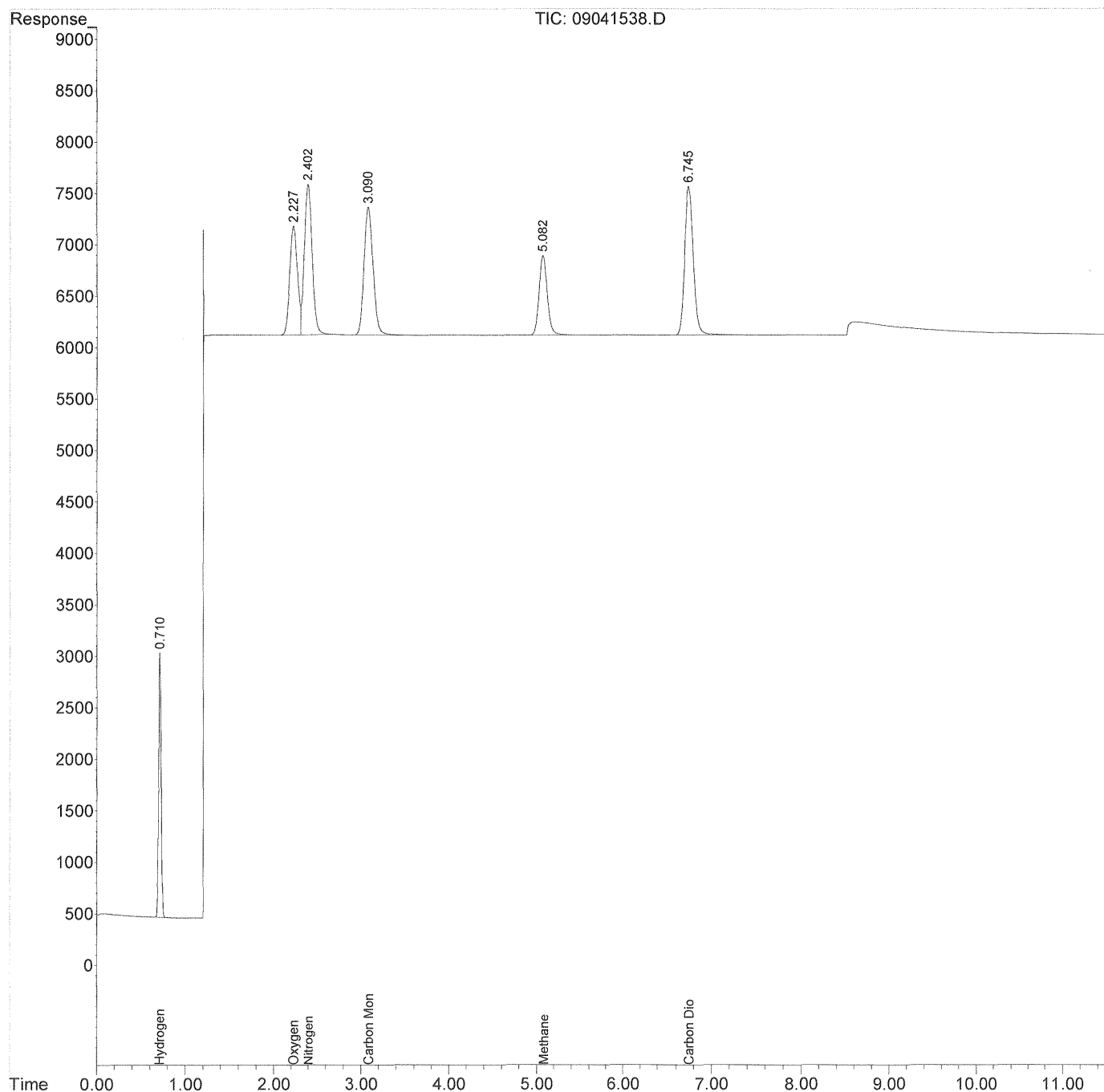
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\04\  
 Data File : 09041538.D  
 Signal(s) : TCD1A.CH  
 Acq On : 4 Sep 2015 8:55 pm  
 Operator : WH  
 Sample : std  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Sep 10 07:44:08 2015  
 Quant Method : I:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Tue Mar 11 11:04:23 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



mg 9/10/15

REPORT SUMMARYS FIXED GASES BY GC/TCD

Printed : 9/10/2015

CLIENT : Air Hygiene, Incorporated

Instrument : GC #1 / TCD #1

Analyst : NL

Date analyzed : 9/5/2015

PAI Job : P1503700

Sample amount : 100uL

**Sample Result**

| Sample ID        | Hydrogen | Oxygen | Nitrogen | Carbon Monoxide | Methane | Carbon Dioxide |
|------------------|----------|--------|----------|-----------------|---------|----------------|
| STD S30-08311502 | 38715    | 38720  | 47740    | 48409           | 38667   | 48328          |
| ACTUAL           | 39990    | 40030  | 50000    | 50010           | 39970   | 50040          |
| % Difference     | 3.2%     | 3.3%   | 4.5%     | 3.2%            | 3.3%    | 3.4%           |
| Lab Air          | 201956   |        | 716450   |                 |         | 424            |
| MB               |          |        |          |                 |         |                |
| 3700-019         | 173881   | 0.1%   | 720066   | 0.1%            |         | 20269          |
| 3700-019 - 2     | 173343   | 0.2%   | 717675   | 0.2%            |         | 20194          |
| 3700-019 - 3     | 173914   | 0.1%   | 720615   | 0.2%            |         | 20223          |
| 3700-019 - Mean  | 173713   |        | 719452   |                 |         | 20228          |
| 3700-021         | 174284   | 0.2%   | 716409   | 0.5%            |         | 19345          |
| 3700-021 - 2     | 173291   | 0.3%   | 709858   | 0.5%            |         | 19084          |
| 3700-021 - 3     | 173994   | 0.1%   | 713150   | 0.0%            |         | 19221          |
| 3700-021 - Mean  | 173856   |        | 713139   |                 |         | 19217          |
| 3700-023         | 172272   | 0.1%   | 702833   | 0.2%            |         | 18414          |
| 3700-023 - 2     | 172846   | 0.2%   | 706499   | 0.3%            |         | 18502          |
| 3700-023 - 3     | 172448   | 0.0%   | 703920   | 0.1%            |         | 18431          |
| 3700-023 - Mean  | 172522   |        | 704417   |                 |         | 18449          |
| STD S30-08311502 | 38219    | 38257  | 47207    | 47865           | 38436   | 47878          |
| ACTUAL           | 39990    | 40030  | 50000    | 50010           | 39970   | 50040          |
| % Difference     | 4.4%     | 4.4%   | 5.6%     | 4.3%            | 3.8%    | 4.3%           |

ny  
9/10/15

Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051501.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 1:38 pm  
Operator : WH  
Sample : std  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:51:44 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc      | Units |
|--------------------|-------|----------|-----------|-------|
| -----              |       |          |           |       |
| Target Compounds   |       |          |           |       |
| 1) Hydrogen        | 0.702 | 53474    | 38715.406 | ppm   |
| 2) Oxygen          | 2.204 | 63987    | 38720.211 | ppm   |
| 3) Nitrogen        | 2.378 | 91660    | 47739.653 | ppm   |
| 4) Carbon Monoxide | 3.066 | 89714    | 48409.001 | ppm   |
| 5) Methane         | 5.062 | 53977    | 38666.731 | ppm   |
| 6) Carbon Dioxide  | 6.727 | 103976   | 48327.609 | ppm   |
| -----              |       |          |           |       |

(f)=RT Delta > 1/2 Window

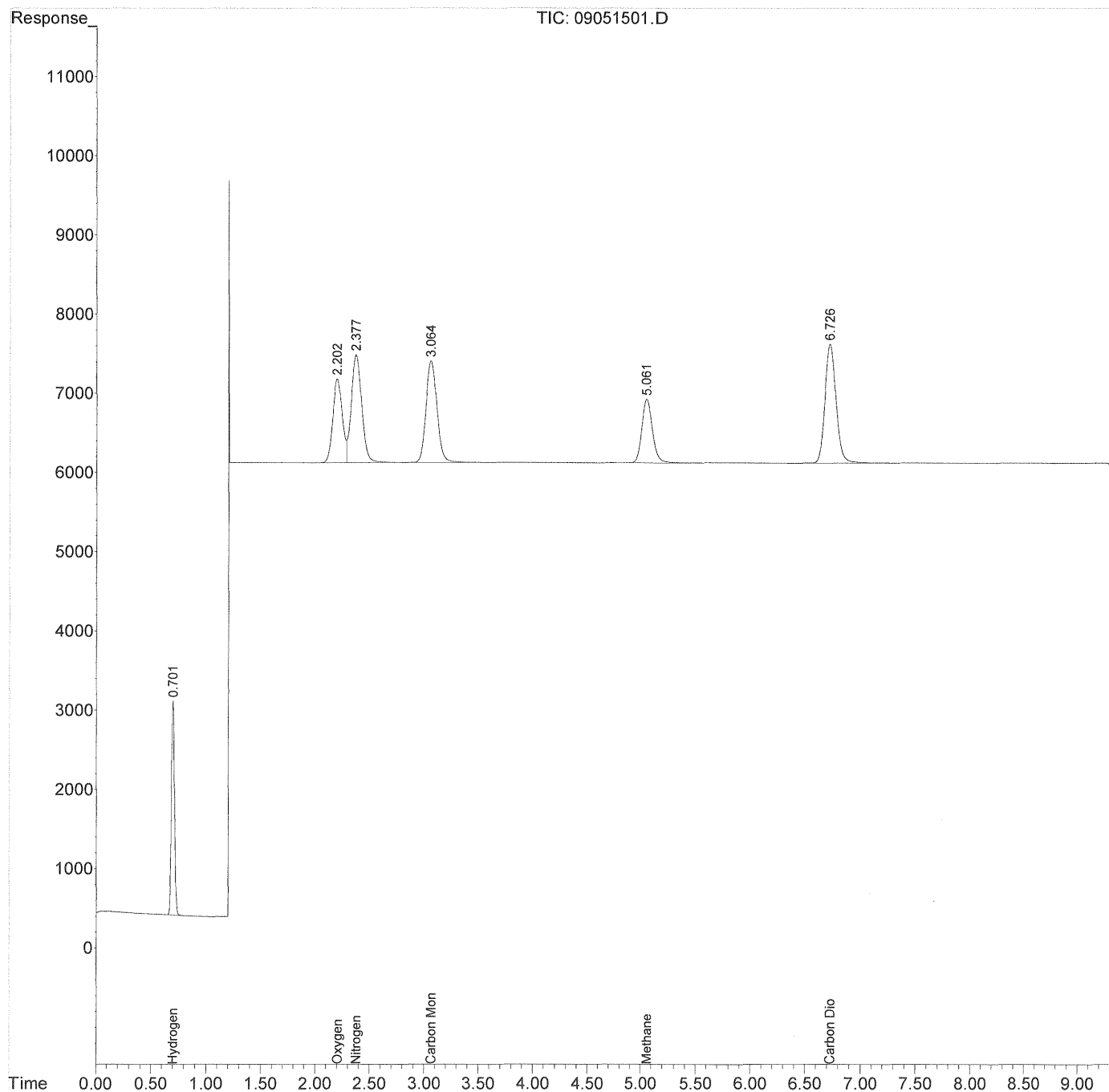
(m)=manual int.



Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
 Data File : 09051501.D  
 Signal(s) : TCD1A.CH  
 Acq On : 5 Sep 2015 1:38 pm  
 Operator : WH  
 Sample : std  
 Misc :  
 ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
 Quant Time: Sep 10 08:51:44 2015  
 Quant Method : I:\GC01\METHODS\TR031014.M  
 Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
 QLast Update : Tue Mar 11 11:04:23 2014  
 Response via : Initial Calibration  
 Integrator: ChemStation

Volume Inj. : 100ul  
 Signal Phase : CarboSieve Packed Column  
 Signal Info :



Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051514.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 5:12 pm  
Operator : WH  
Sample : std  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:52:23 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :

| Compound           | R.T.  | Response | Conc Units    |
|--------------------|-------|----------|---------------|
| -----              |       |          |               |
| Target Compounds   |       |          |               |
| 1) Hydrogen        | 0.706 | 52789    | 38219.376 ppm |
| 2) Oxygen          | 2.219 | 63221    | 38256.861 ppm |
| 3) Nitrogen        | 2.395 | 90637    | 47207.200 ppm |
| 4) Carbon Monoxide | 3.082 | 88707    | 47865.494 ppm |
| 5) Methane         | 5.077 | 53654    | 38435.512 ppm |
| 6) Carbon Dioxide  | 6.741 | 103010   | 47878.447 ppm |
| -----              |       |          |               |

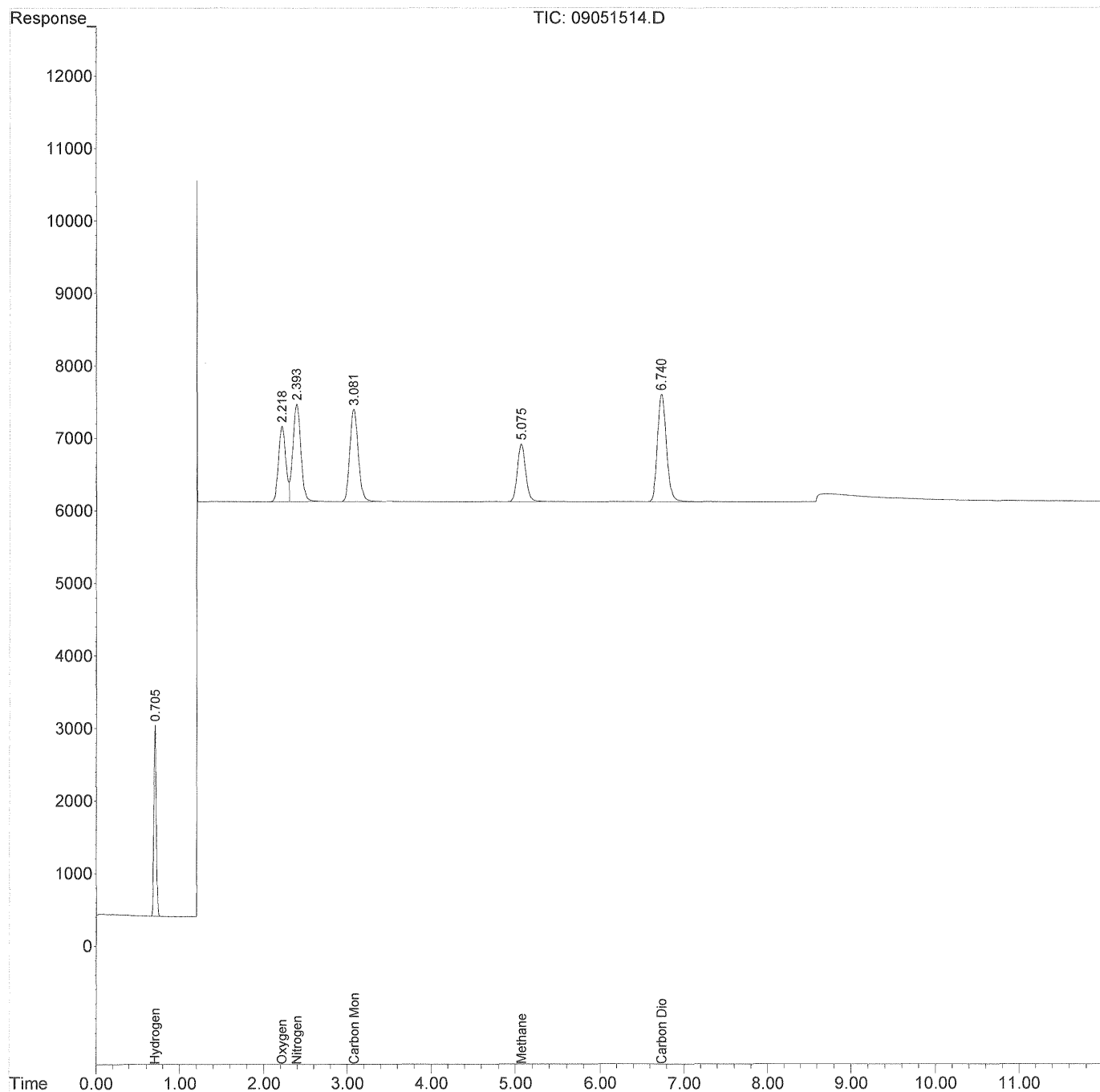
(f)=RT Delta > 1/2 Window

(m)=manual int.

Data Path : I:\GC01\DATA\FXG\2015\_09\05\  
Data File : 09051514.D  
Signal(s) : TCD1A.CH  
Acq On : 5 Sep 2015 5:12 pm  
Operator : WH  
Sample : std  
Misc :  
ALS Vial : 1 Sample Multiplier: 10

Integration File: autoint1.e  
Quant Time: Sep 10 08:52:23 2015  
Quant Method : I:\GC01\METHODS\TR031014.M  
Quant Title : EPA 3C GC/TCD Analysis for Fixed Gases  
QLast Update : Tue Mar 11 11:04:23 2014  
Response via : Initial Calibration  
Integrator: ChemStation

Volume Inj. : 100ul  
Signal Phase : CarboSieve Packed Column  
Signal Info :



# Injection Log

Directory: J:\GC01\DATA\FXG\2014\_03\10

| Line | Vial | FileName   | Multiplier | SampleName | Misc Info | Injected          |
|------|------|------------|------------|------------|-----------|-------------------|
| 1    | 1    | 03101401.d | 10.        | MB         |           | 10 Mar 2014 10:27 |
| 2    | 1    | 03101402.d | 10.        | xstd 1 1   |           | 10 Mar 2014 10:43 |
| 3    | 1    | 03101403.d | 10.        | std 1 1    |           | 10 Mar 2014 10:59 |
| 4    | 1    | 03101404.d | 10.        | std 1 2    |           | 10 Mar 2014 11:29 |
| 5    | 1    | 03101405.d | 10.        | std 1 3    |           | 10 Mar 2014 11:44 |
| 6    | 1    | 03101406.d | 10.        | std 2 1    |           | 10 Mar 2014 11:59 |
| 7    | 1    | 03101407.d | 10.        | std 2 2    |           | 10 Mar 2014 12:18 |
| 8    | 1    | 03101408.d | 10.        | std 2 3    |           | 10 Mar 2014 12:34 |
| 9    | 1    | 03101409.d | 10.        | std 3 1    |           | 10 Mar 2014 13:05 |
| 10   | 1    | 03101410.d | 10.        | std 3 2    |           | 10 Mar 2014 13:23 |
| 11   | 1    | 03101411.d | 10.        | std 3 3    |           | 10 Mar 2014 13:56 |
| 12   | 1    | 03101412.d | 10.        | std 4 1    |           | 10 Mar 2014 14:15 |
| 13   | 1    | 03101413.d | 10.        | std 4 2    |           | 10 Mar 2014 14:32 |
| 14   | 1    | 03101414.d | 10.        | std 4 3    |           | 10 Mar 2014 14:49 |
| 15   | 1    | 03101415.d | 10.        | std 5 1    |           | 10 Mar 2014 15:08 |
| 16   | 1    | 03101416.d | 10.        | std 5 2    |           | 10 Mar 2014 15:34 |
| 17   | 1    | 03101417.d | 10.        | std 5 3    |           | 10 Mar 2014 15:50 |
| 18   | 1    | 03101418.d | 10.        | std ch4 1  |           | 10 Mar 2014 16:55 |
| 19   | 1    | 03101419.d | 10.        | std ch4 2  |           | 10 Mar 2014 17:11 |
| 20   | 1    | 03101420.d | 10.        | std ch4 3  |           | 10 Mar 2014 17:29 |
| 21   | 1    | 03101421.d | 10.        | xstd c02 1 |           | 10 Mar 2014 17:47 |
| 22   | 1    | 03101422.d | 10.        | std c02 1  |           | 10 Mar 2014 18:05 |
| 23   | 1    | 03101423.d | 10.        | std c02 2  |           | 10 Mar 2014 18:19 |
| 24   | 1    | 03101424.d | 10.        | std c02 3  |           | 10 Mar 2014 18:32 |
| 25   | 1    | 03101425.d | 10.        | std n2 1   |           | 11 Mar 2014 10:11 |
| 26   | 1    | 03101426.d | 10.        | std n2 2   |           | 11 Mar 2014 10:30 |
| 27   | 1    | 03101427.d | 10.        | std n2 3   |           | 11 Mar 2014 10:42 |
| 28   | 1    | 03101428.d | 10.        | lcs        |           | 11 Mar 2014 11:20 |
| 29   | 1    | 03101429.d | 10.        | lab air    |           | 11 Mar 2014 11:37 |

# Injection Log

Directory: I:\GC01\DATA\FXG\2015\_09\04

| Line | Vial | FileName   | Multiplier | SampleName       | Misc Info | Injected         |
|------|------|------------|------------|------------------|-----------|------------------|
| 1    | 1    | 09041501.d | 10.        | std s30-08311502 |           | 4 Sep 2015 07:34 |
| 2    | 1    | 09041502.d | 10.        | mb               |           | 4 Sep 2015 07:52 |
| 3    | 1    | 09041503.d | 10.        | lab air          |           | 4 Sep 2015 08:08 |
| 4    | 1    | 09041504.d | 10.        | 3700-001         |           | 4 Sep 2015 10:27 |
| 5    | 1    | 09041505.d | 10.        | 3700-001         |           | 4 Sep 2015 10:43 |
| 6    | 1    | 09041506.d | 10.        | 3700-001         |           | 4 Sep 2015 10:58 |
| 7    | 1    | 09041507.d | 10.        | 3700-003         |           | 4 Sep 2015 11:15 |
| 8    | 1    | 09041508.d | 10.        | 3700-003         |           | 4 Sep 2015 11:37 |
| 9    | 1    | 09041509.d | 10.        | 3700-003         |           | 4 Sep 2015 11:53 |
| 10   | 1    | 09041510.d | 10.        | lcs              |           | 4 Sep 2015 12:26 |
| 11   | 1    | 09041511.d | 10.        | 3702-001         |           | 4 Sep 2015 12:45 |
| 12   | 1    | 09041512.d | 10.        | 3702-002         |           | 4 Sep 2015 13:05 |
| 13   | 1    | 09041513.d | 10.        | 3702-003         |           | 4 Sep 2015 13:24 |
| 14   | 1    | 09041514.d | 10.        | 3702-004         |           | 4 Sep 2015 13:42 |
| 15   | 1    | 09041515.d | 10.        | lcs s30-08131504 |           | 4 Sep 2015 14:08 |
| 16   | 1    | 09041516.d | 10.        | std s30-08311502 |           | 4 Sep 2015 14:40 |
| 17   | 1    | 09041517.d | 10.        | 3700-005         |           | 4 Sep 2015 14:54 |
| 18   | 1    | 09041518.d | 10.        | 3700-005         |           | 4 Sep 2015 15:13 |
| 19   | 1    | 09041519.d | 10.        | 3700-005         |           | 4 Sep 2015 15:26 |
| 20   | 1    | 09041520.d | 10.        | 3700-007         |           | 4 Sep 2015 15:55 |
| 21   | 1    | 09041521.d | 10.        | 3700-007         |           | 4 Sep 2015 16:11 |
| 22   | 1    | 09041522.d | 10.        | 3700-007         |           | 4 Sep 2015 16:26 |
| 23   | 1    | 09041523.d | 10.        | 3700-009         |           | 4 Sep 2015 16:57 |
| 24   | 1    | 09041524.d | 10.        | 3700-009         |           | 4 Sep 2015 17:16 |
| 25   | 1    | 09041525.d | 10.        | 3700-009         |           | 4 Sep 2015 17:30 |
| 26   | 1    | 09041526.d | 10.        | 3700-011         |           | 4 Sep 2015 17:45 |
| 27   | 1    | 09041527.d | 10.        | 3700-011         |           | 4 Sep 2015 18:03 |
| 28   | 1    | 09041528.d | 10.        | 3700-011         |           | 4 Sep 2015 18:19 |
| 29   | 1    | 09041529.d | 10.        | 3700-013         |           | 4 Sep 2015 18:33 |
| 30   | 1    | 09041530.d | 10.        | 3700-013         |           | 4 Sep 2015 18:48 |
| 31   | 1    | 09041531.d | 10.        | 3700-013         |           | 4 Sep 2015 19:04 |
| 32   | 1    | 09041532.d | 10.        | 3700-015         |           | 4 Sep 2015 19:18 |
| 33   | 1    | 09041533.d | 10.        | 3700-015         |           | 4 Sep 2015 19:35 |
| 34   | 1    | 09041534.d | 10.        | 3700-015         |           | 4 Sep 2015 19:51 |
| 35   | 1    | 09041535.d | 10.        | 3700-017         |           | 4 Sep 2015 20:07 |
| 36   | 1    | 09041536.d | 10.        | 3700-017         |           | 4 Sep 2015 20:22 |
| 37   | 1    | 09041537.d | 10.        | 3700-017         |           | 4 Sep 2015 20:40 |
| 38   | 1    | 09041538.d | 10.        | std              |           | 4 Sep 2015 20:55 |

# Injection Log

Directory: I:\GC01\DATA\FXG\2015\_09\05

| Line | Vial | FileName   | Multiplier | SampleName | Misc Info | Injected         |
|------|------|------------|------------|------------|-----------|------------------|
| 1    | 1    | 09051501.d | 10.        | std        |           | 5 Sep 2015 13:38 |
| 2    | 1    | 09051502.d | 10.        | mb         |           | 5 Sep 2015 13:51 |
| 3    | 1    | 09051503.d | 10.        | lab air    |           | 5 Sep 2015 14:06 |
| 4    | 1    | 09051504.d | 10.        | 3700-019   |           | 5 Sep 2015 14:22 |
| 5    | 1    | 09051505.d | 10.        | 3700-019   |           | 5 Sep 2015 14:39 |
| 6    | 1    | 09051506.d | 10.        | 3700-019   |           | 5 Sep 2015 14:54 |
| 7    | 1    | 09051507.d | 10.        | 3700-021   |           | 5 Sep 2015 15:10 |
| 8    | 1    | 09051508.d | 10.        | 3700-021   |           | 5 Sep 2015 15:31 |
| 9    | 1    | 09051509.d | 10.        | 3700-021   |           | 5 Sep 2015 15:48 |
| 10   | 1    | 09051510.d | 10.        | 3700-023   |           | 5 Sep 2015 16:06 |
| 11   | 1    | 09051511.d | 10.        | 3700-023   |           | 5 Sep 2015 16:22 |
| 12   | 1    | 09051512.d | 10.        | 3700-023   |           | 5 Sep 2015 16:40 |
| 13   | 1    | 09051513.d | 10.        | std        |           | 5 Sep 2015 16:56 |
| 14   | 1    | 09051514.d | 10.        | std        |           | 5 Sep 2015 17:12 |

## **APPENDIX G**

### **Field Data Sheets**

# RATA - FIELD DATA SHEET

# AIR HYGIENE



|                          |                              |
|--------------------------|------------------------------|
| Company:                 | Leed Fabrication Service Inc |
| Location:                | Loveland Facility            |
| Date:                    | 9/3/15                       |
| Unit Make and Model:     | EC336                        |
| Unit Number:             |                              |
| Serial Number:           |                              |
| Data Recorded By:        | msl / TP                     |
| Truck(s):                | 156                          |
| Trailer(s):              | 210                          |
| Tested With AHI Unit(s): |                              |
| LDEQ Warmup/Cal Req:     | On (Day/Time):               |

|                |  |
|----------------|--|
| Stack Dia. =   |  |
| Measured By:   |  |
| Measured With: |  |

| CYLINDER SERIAL NUMBERS | O <sub>2</sub>  |  |  |
|-------------------------|-----------------|--|--|
|                         | NO <sub>x</sub> |  |  |
|                         | CO              |  |  |
|                         |                 |  |  |
| Low                     |                 |  |  |
| Mid                     |                 |  |  |
| High                    |                 |  |  |

| CYLINDER SERIAL NUMBERS | O <sub>2</sub>  |  |  |
|-------------------------|-----------------|--|--|
|                         | NO <sub>x</sub> |  |  |
|                         | CO              |  |  |
|                         |                 |  |  |
| Low                     |                 |  |  |
| Mid                     |                 |  |  |
| High                    |                 |  |  |

| RUN INFORMATION               | Run #1                |  | Run #2               |  | Run #3                |  | Run #4               |  | Run #5                |  | Run #6               |  | Run #7                |  | Run #8               |  | Run #9                |  | Run #10              |  | Run #11               |  | Run #12              |  |
|-------------------------------|-----------------------|--|----------------------|--|-----------------------|--|----------------------|--|-----------------------|--|----------------------|--|-----------------------|--|----------------------|--|-----------------------|--|----------------------|--|-----------------------|--|----------------------|--|
|                               | Time Start (hh:mm:ss) |  | Time Stop (hh:mm:ss) |  | Time Start (hh:mm:ss) |  | Time Stop (hh:mm:ss) |  | Time Start (hh:mm:ss) |  | Time Stop (hh:mm:ss) |  | Time Start (hh:mm:ss) |  | Time Stop (hh:mm:ss) |  | Time Start (hh:mm:ss) |  | Time Stop (hh:mm:ss) |  | Time Start (hh:mm:ss) |  | Time Stop (hh:mm:ss) |  |
| Rated Power (MW or hp)        | 24.94                 |  | 24.94                |  | 24.94                 |  | 24.94                |  | 24.94                 |  | 24.94                |  | 24.94                 |  | 24.94                |  | 24.94                 |  | 24.94                |  | 24.94                 |  | 24.94                |  |
| Barometric Pressure (in. Hg)  | 29.94                 |  | 29.94                |  | 29.94                 |  | 29.94                |  | 29.94                 |  | 29.94                |  | 29.94                 |  | 29.94                |  | 29.94                 |  | 29.94                |  | 29.94                 |  | 29.94                |  |
| Ambient Temperature (°F)      | 69                    |  | 69                   |  | 69                    |  | 69                   |  | 69                    |  | 69                   |  | 69                    |  | 69                   |  | 69                    |  | 69                   |  | 69                    |  | 69                   |  |
| Relative Humidity (%)         | 54                    |  | 54                   |  | 54                    |  | 54                   |  | 54                    |  | 54                   |  | 54                    |  | 54                   |  | 54                    |  | 54                   |  | 54                    |  | 54                   |  |
| CEMS DATA for O <sub>2</sub>  |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |
| CEMS DATA for NO <sub>x</sub> |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |
| CEMS DATA for CO              |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |
| CEMS DATA for SO <sub>2</sub> |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |                       |  |                      |  |

| CALIBRATION | O <sub>2</sub> |        | CO    |        | THC   |        | CO <sub>2</sub> |        |
|-------------|----------------|--------|-------|--------|-------|--------|-----------------|--------|
|             | Conc.          | Actual | Conc. | Actual | Conc. | Actual | Conc.           | Actual |
| Zero Gas    | 0              | 0.08   | 0     | -0.04  | 0     | 0.04   | 0               | 0.02   |
| Low Gas     | 11.91          | 11.95  | 9.48  | 9.49   | 3.02  | 2.03   | 9.09            | 9.04   |
| Mid Gas     | 20.76          | 20.34  | 18.06 | 18.08  | 4.01  | 4.99   | 18.10           | 18.68  |
| High Gas    |                |        |       |        |       |        |                 |        |

| NO <sub>2</sub> CONVERSION    |  |
|-------------------------------|--|
| NO <sub>2</sub> Gas (ppm)     |  |
| NO Reading (ppm)              |  |
| NO <sub>x</sub> Reading (ppm) |  |
| Cylinder Num                  |  |

| BIAS              | O <sub>2</sub> |       | CO    |      | THC  |      | CO <sub>2</sub> |      |
|-------------------|----------------|-------|-------|------|------|------|-----------------|------|
|                   | Zero           | Mid   | Zero  | Mid  | Zero | Mid  | Zero            | Mid  |
| Initial Run #1    | 0.004          | 11.95 | 0.10  | 9.43 | 0.00 | 3.03 | 0.04            | 9.05 |
| Run #1 / Run #2   | -0.002         | 11.84 | -0.07 | 9.39 | 0.02 | 3.01 | 0.04            | 9.04 |
| Run #2 / Run #3   | 0.01           | 11.85 | -0.06 | 9.34 | 0.04 | 3.05 | 0.05            | 9.04 |
| Run #3 / Run #4   | 0.02           | 11.82 | -0.04 | 9.30 | 0.14 | 3.12 | 0.08            | 9.11 |
| Run #4 / Run #5   |                |       |       |      |      |      |                 |      |
| Run #5 / Run #6   |                |       |       |      |      |      |                 |      |
| Run #6 / Run #7   |                |       |       |      |      |      |                 |      |
| Run #7 / Run #8   |                |       |       |      |      |      |                 |      |
| Run #8 / Run #9   |                |       |       |      |      |      |                 |      |
| Run #9 / Run #10  |                |       |       |      |      |      |                 |      |
| Run #10 / Run #11 |                |       |       |      |      |      |                 |      |
| Run #11 / Run #12 |                |       |       |      |      |      |                 |      |
| Run #12 Final     |                |       |       |      |      |      |                 |      |

| REPORT INFORMATION |  |          |
|--------------------|--|----------|
| INSTRUMENT         |  | SERIAL # |
| O <sub>2</sub>     |  |          |
| NO <sub>x</sub>    |  |          |
| CO                 |  |          |
| THC                |  |          |
| CO <sub>2</sub>    |  |          |
| SO <sub>2</sub>    |  |          |

Bias Gas Actual Conc.

Signature



# RATA - FIELD DATA SHEET

# AIR HYGIENE



|                          |                                |
|--------------------------|--------------------------------|
| Company:                 | Lead Fabrication Service Inc   |
| Location:                | Loveland Facility              |
| Date:                    | 7/2/15                         |
| Unit Make and Model:     | EC36-23                        |
| Unit Number:             | EC36-23                        |
| Serial Number:           |                                |
| Data Recorded By:        |                                |
| Tested With AHI Unit(s): | Truck(s): 156 Trailer(s): 210  |
| LDEQ Warmup/Cal Req:     | On (Day/Time): Cal (Day/Time): |

|                |  |
|----------------|--|
| Stack Dia. =   |  |
| Measured By:   |  |
| Measured With: |  |

| CYLINDER SERIAL NUMBERS | O <sub>2</sub> |     |      | NO <sub>x</sub> |     |      | CO  |     |      |
|-------------------------|----------------|-----|------|-----------------|-----|------|-----|-----|------|
|                         | Low            | Mid | High | Low             | Mid | High | Low | Mid | High |
|                         |                |     |      |                 |     |      |     |     |      |
|                         |                |     |      |                 |     |      |     |     |      |

| CYLINDER SERIAL NUMBERS | THC |     |      | CO <sub>2</sub> |     |      | SO <sub>2</sub> |     |      |
|-------------------------|-----|-----|------|-----------------|-----|------|-----------------|-----|------|
|                         | Low | Mid | High | Low             | Mid | High | Low             | Mid | High |
|                         |     |     |      |                 |     |      |                 |     |      |
|                         |     |     |      |                 |     |      |                 |     |      |

| RUN INFORMATION               | Run #1  | Run #2   | Run #3   | Run #4   | Run #5   | Run #6   | Run #7 | Run #8 | Run #9 | Run #10 | Run #11 | Run #12 |
|-------------------------------|---------|----------|----------|----------|----------|----------|--------|--------|--------|---------|---------|---------|
|                               | 78      | 100      | 70       | 30       | 70       | 30       |        |        |        |         |         |         |
| Time Start (hh:mm:ss)         | 8:28:02 | 9:50:02  | 11:10:02 | 13:25:02 | 14:48:02 | 16:26:02 |        |        |        |         |         |         |
| Time Stop (hh:mm:ss)          | 9:38:02 | 11:00:02 | 12:30:02 | 14:35:02 | 15:58:02 | 17:36:02 |        |        |        |         |         |         |
| Rated Power (MW or hp)        |         |          |          |          |          |          |        |        |        |         |         |         |
| Actual Power (MW or hp)       |         |          |          |          |          |          |        |        |        |         |         |         |
| Barometric Pressure (in. Hg)  | 25.00   | 25.00    | 24.98    | 24.94    | 24.93    | 24.96    |        |        |        |         |         |         |
| Ambient Temperature (°F)      | 83      | 83       | 87       | 91       | 91       | 93       |        |        |        |         |         |         |
| Relative Humidity (%)         | 57      | 34       | 22       | 16       | 12       | 12       |        |        |        |         |         |         |
| CEMS DATA for O <sub>2</sub>  |         |          |          |          |          |          |        |        |        |         |         |         |
| CEMS DATA for NO <sub>x</sub> |         |          |          |          |          |          |        |        |        |         |         |         |
| CEMS DATA for CO              |         |          |          |          |          |          |        |        |        |         |         |         |
| CEMS DATA for SO <sub>2</sub> |         |          |          |          |          |          |        |        |        |         |         |         |

| CALIBRATION | O <sub>2</sub> |        | CO    |        | THC   |        | CO <sub>2</sub> |        |
|-------------|----------------|--------|-------|--------|-------|--------|-----------------|--------|
|             | Conc.          | Actual | Conc. | Actual | Conc. | Actual | Conc.           | Actual |
| Zero Gas    | 0              | 0.07   | 0     | 0.072  | 0     | 0.03   | 0               | 0.01   |
| Low Gas     | 11.91          | 11.88  | 9.48  | 9.50   | 5.61  | 5.01   | 9.09            | 9.09   |
| High Gas    | 20.86          | 20.36  | 18.06 | 18.00  | 7.97  | 8.02   | 18.66           | 18.60  |

| NO <sub>2</sub> CONVERSION    |  |
|-------------------------------|--|
| NO <sub>2</sub> Gas (ppm)     |  |
| NO Reading (ppm)              |  |
| NO <sub>x</sub> Reading (ppm) |  |
| Cylinder Num                  |  |

| BIAS              | O <sub>2</sub> |       | CO    |      | THC  |      | CO <sub>2</sub> |      |
|-------------------|----------------|-------|-------|------|------|------|-----------------|------|
|                   | Zero           | Mid   | Zero  | Mid  | Zero | Mid  | Zero            | Mid  |
| Initial Run #1    | -0.07          | 11.89 | 0.07  | 9.44 | 0.00 | 3.04 | 0.03            | 9.04 |
| Run #1 / Run #2   | -0.08          | 11.86 | 0.09  | 9.38 | 0.00 | 3.00 | 0.08            | 9.09 |
| Run #2 / Run #3   | -0.07          | 11.82 | 0.08  | 9.35 | 0.07 | 2.96 | 0.04            | 9.05 |
| Run #3 / Run #4   | -0.01          | 11.91 | 0.04  | 9.29 | 0.00 | 3.02 | 0.01            | 9.04 |
| Run #4 / Run #5   | 0.01           | 11.89 | 0.21  | 9.38 | 0.12 | 3.03 | 0.01            | 9.02 |
| Run #5 / Run #6   | -0.07          | 11.87 | -0.14 | 9.47 | 0.04 | 2.97 | 0.04            | 9.03 |
| Run #6 / Run #7   | -0.02          | 11.85 | 0.08  | 9.37 | 0.00 | 3.04 | 0.05            | 9.01 |
| Run #7 / Run #8   |                |       |       |      |      |      |                 |      |
| Run #8 / Run #9   |                |       |       |      |      |      |                 |      |
| Run #9 / Run #10  |                |       |       |      |      |      |                 |      |
| Run #10 / Run #11 |                |       |       |      |      |      |                 |      |
| Run #11 / Run #12 |                |       |       |      |      |      |                 |      |
| Run #12 Final     |                |       |       |      |      |      |                 |      |

| REPORT INFORMATION |          |  |
|--------------------|----------|--|
| INSTRUMENT         | SERIAL # |  |
| O <sub>2</sub>     |          |  |
| NO <sub>x</sub>    |          |  |
| CO                 |          |  |
| THC                |          |  |
| CO <sub>2</sub>    |          |  |
| SO <sub>2</sub>    |          |  |

Bias Gas Actual Conc.

Signature

# RATA - FIELD DATA SHEET

# AIR HYGIENE



|                          |                              |
|--------------------------|------------------------------|
| Company:                 | Lead Fabrication Service Inc |
| Location:                | Leveard Facility             |
| Date:                    | 9/1/15                       |
| Project Code:            |                              |
| Unit Make and Model:     | EC36                         |
| Serial Number:           |                              |
| Data Recorded By:        |                              |
| Truck(s):                | 156                          |
| Trailer(s):              | 210                          |
| Tested With AHJ Unit(s): |                              |
| LDEQ Warmup/Cal Req:     | On (Day/Time):               |

|                |  |
|----------------|--|
| Stack Dia. =   |  |
| Measured By:   |  |
| Measured With: |  |

| CYLINDER<br>SERIAL<br>NUMBERS | O <sub>2</sub> |     |      | NOx |     |      | CO  |     |      |
|-------------------------------|----------------|-----|------|-----|-----|------|-----|-----|------|
|                               | Low            | Mid | High | Low | Mid | High | Low | Mid | High |
|                               |                |     |      |     |     |      |     |     |      |

| CYLINDER<br>SERIAL<br>NUMBERS | THC |     |      | CO <sub>2</sub> |     |      | SO <sub>2</sub> |     |      |
|-------------------------------|-----|-----|------|-----------------|-----|------|-----------------|-----|------|
|                               | Low | Mid | High | Low             | Mid | High | Low             | Mid | High |
|                               |     |     |      |                 |     |      |                 |     |      |

| RUN INFORMATION               | Run #1                |          | Run #2   |          | Run #3   |  | Run #4 |  | Run #5 |  | Run #6 |  | Run #7 |  | Run #8 |  | Run #9 |  | Run #10 |  | Run #11 |  | Run #12 |  |
|-------------------------------|-----------------------|----------|----------|----------|----------|--|--------|--|--------|--|--------|--|--------|--|--------|--|--------|--|---------|--|---------|--|---------|--|
|                               | Time Start (hh:mm:ss) | 14:36:29 | 15:57:29 | 17:20:29 | 18:30:29 |  |        |  |        |  |        |  |        |  |        |  |        |  |         |  |         |  |         |  |
| Time Stop (hh:mm:ss)          | 15:46:29              | 17:03:29 | 18:30:29 |          |          |  |        |  |        |  |        |  |        |  |        |  |        |  |         |  |         |  |         |  |
| Rated Power (MW or hp)        |                       |          |          |          |          |  |        |  |        |  |        |  |        |  |        |  |        |  |         |  |         |  |         |  |
| Actual Power (MW or hp)       |                       |          |          |          |          |  |        |  |        |  |        |  |        |  |        |  |        |  |         |  |         |  |         |  |
| Barometric Pressure (in. Hg)  | 24.95                 | 24.93    | 24.94    |          |          |  |        |  |        |  |        |  |        |  |        |  |        |  |         |  |         |  |         |  |
| Ambient Temperature (°F)      | 90                    | 90       | 90       |          |          |  |        |  |        |  |        |  |        |  |        |  |        |  |         |  |         |  |         |  |
| Relative Humidity (%)         | 16                    | 17       | 11       |          |          |  |        |  |        |  |        |  |        |  |        |  |        |  |         |  |         |  |         |  |
| CEMS DATA for O <sub>2</sub>  |                       |          |          |          |          |  |        |  |        |  |        |  |        |  |        |  |        |  |         |  |         |  |         |  |
| CEMS DATA for NOx             |                       |          |          |          |          |  |        |  |        |  |        |  |        |  |        |  |        |  |         |  |         |  |         |  |
| CEMS DATA for CO              |                       |          |          |          |          |  |        |  |        |  |        |  |        |  |        |  |        |  |         |  |         |  |         |  |
| CEMS DATA for SO <sub>2</sub> |                       |          |          |          |          |  |        |  |        |  |        |  |        |  |        |  |        |  |         |  |         |  |         |  |

| CALIBRATION | O <sub>2</sub> |        | CO    |        | THC   |        | CO <sub>2</sub> |        |
|-------------|----------------|--------|-------|--------|-------|--------|-----------------|--------|
|             | Conc.          | Actual | Conc. | Actual | Conc. | Actual | Conc.           | Actual |
| Zero Gas    | 0              | 0.01   | 1.0   | -0.03  | 0     | 0.06   | 0               | 0.06   |
| Low Gas     |                |        |       |        | 3.02  | 3.04   |                 |        |
| Mid Gas     | 11.91          | 11.94  | 9.48  | 9.35   | 5.01  | 5.01   | 9.09            | 9.04   |
| High Gas    | 20.86          | 20.83  | 18.0  | 18.06  | 7.97  | 8.01   | 18.60           | 18.64  |

| NO <sub>2</sub> CONVERSION |  |
|----------------------------|--|
| NO <sub>2</sub> Gas (ppm)  |  |
| NO Reading (ppm)           |  |
| NOx Reading (ppm)          |  |
| Cylinder Num               |  |

| BIAS              | O <sub>2</sub> |       | CO    |      | THC   |      | CO <sub>2</sub> |      |
|-------------------|----------------|-------|-------|------|-------|------|-----------------|------|
|                   | Zero           | Mid   | Zero  | Mid  | Zero  | Mid  | Zero            | Mid  |
| Initial Run #1    | 0.07           | 11.94 | -0.04 | 9.32 | -0.04 | 3.08 | 0.06            | 9.00 |
| Run #1 / Run #2   | 0.03           | 11.91 | -0.10 | 9.41 | 0.05  | 3.03 | 0.01            | 9.04 |
| Run #2 / Run #3   | 0.05           | 11.92 | 0.02  | 9.39 | 0.02  | 3.03 | 0.03            | 9.03 |
| Run #3 / Run #4   | 0.04           | 11.91 | 0.06  | 9.44 | 0.00  | 0.04 | 0.04            | 9.04 |
| Run #4 / Run #5   |                |       |       |      |       |      |                 |      |
| Run #5 / Run #6   |                |       |       |      |       |      |                 |      |
| Run #6 / Run #7   |                |       |       |      |       |      |                 |      |
| Run #7 / Run #8   |                |       |       |      |       |      |                 |      |
| Run #8 / Run #9   |                |       |       |      |       |      |                 |      |
| Run #9 / Run #10  |                |       |       |      |       |      |                 |      |
| Run #10 / Run #11 |                |       |       |      |       |      |                 |      |
| Run #11 / Run #12 |                |       |       |      |       |      |                 |      |
| Run #12 Final     |                |       |       |      |       |      |                 |      |

| REPORT INFORMATION |            |          |
|--------------------|------------|----------|
|                    | INSTRUMENT | SERIAL # |
| O <sub>2</sub>     |            |          |
| NOx                |            |          |
| CO                 |            |          |
| THC                |            |          |
| CO <sub>2</sub>    |            |          |
| SO <sub>2</sub>    |            |          |

Bias Gas Actual Conc.

Signature

9/1/15

Lead - 0-30-0% - EC36 - can  
-25.11

-17.02

-11.84

-1.11

Lead - 30-70-30% - EC36 - can      did this after 70-100-70%

-25.10

-17.83

-10.05

-0.20

Lead - 70-100-70% - EC36 - can 9/1/15

-25.20

-18.05

-10.11

-0.10

Lead - 90-100% - EC36 - can 9/2/15

-25.18

-17.33

-9.26

-0.98

EC-36-25

9/2/15

AIR HYGIENE

## MOISTURE (EPA METHOD 4) DATA SHEET

Run: 4 Load: 30-70-30

|               |                                      | Impinger 1       | Impinger 2       | Impinger 3 | Impinger 4 | Impinger 5 | Impinger 6 | Impinger 7 | Impinger 8 |
|---------------|--------------------------------------|------------------|------------------|------------|------------|------------|------------|------------|------------|
|               |                                      | (g)              | (g)              | (g)        | (g)        |            |            |            |            |
| Contents      |                                      | H <sub>2</sub> O | H <sub>2</sub> O | -          | Sil Gel    |            |            |            |            |
| Final Value   | (V <sub>f</sub> ), (W <sub>f</sub> ) | 707.7            | 691.4            | 601.7      | 885.7      | 887.0      |            |            |            |
| Initial Value | (V <sub>i</sub> ), (W <sub>i</sub> ) | 700.4            | 684.7            | 597.7      | 875.6      |            |            |            |            |
| Net Value     | (V <sub>n</sub> ), (W <sub>n</sub> ) |                  |                  |            |            |            |            |            |            |

Run: 5 Load: 30-70-30

|               |                                      | Impinger 1       | Impinger 2       | Impinger 3 | Impinger 4 | Impinger 5 | Impinger 6 | Impinger 7 | Impinger 8 |
|---------------|--------------------------------------|------------------|------------------|------------|------------|------------|------------|------------|------------|
|               |                                      | (g)              | (g)              | (g)        | (g)        |            |            |            |            |
| Contents      |                                      | H <sub>2</sub> O | H <sub>2</sub> O | -          | Sil Gel    |            |            |            |            |
| Final Value   | (V <sub>f</sub> ), (W <sub>f</sub> ) | 718.6            | 697.6            | 604.5      | 873.8      |            |            |            |            |
| Initial Value | (V <sub>i</sub> ), (W <sub>i</sub> ) | 707.7            | 691.4            | 601.7      | 861.2      |            |            |            |            |
| Net Value     | (V <sub>n</sub> ), (W <sub>n</sub> ) |                  |                  |            |            |            |            |            |            |

Run: 6 Load: 30-70-30

|               |                                      | Impinger 1       | Impinger 2       | Impinger 3 | Impinger 4 | Impinger 5 | Impinger 6 | Impinger 7 | Impinger 8 |
|---------------|--------------------------------------|------------------|------------------|------------|------------|------------|------------|------------|------------|
|               |                                      | (g)              | (g)              | (g)        | (g)        |            |            |            |            |
| Contents      |                                      | H <sub>2</sub> O | H <sub>2</sub> O | -          | Sil Gel    |            |            |            |            |
| Final Value   | (V <sub>f</sub> ), (W <sub>f</sub> ) | 727.5            | 704.4            | 607.9      | 886.9      |            |            |            |            |
| Initial Value | (V <sub>i</sub> ), (W <sub>i</sub> ) | 718.6            | 697.6            | 604.5      | 873.8      |            |            |            |            |
| Net Value     | (V <sub>n</sub> ), (W <sub>n</sub> ) |                  |                  |            |            |            |            |            |            |

Run: 10 Load: 90-100

|               |                                      | Impinger 1       | Impinger 2       | Impinger 3 | Impinger 4 | Impinger 5 | Impinger 6 | Impinger 7 | Impinger 8 |
|---------------|--------------------------------------|------------------|------------------|------------|------------|------------|------------|------------|------------|
|               |                                      | (g)              | (g)              | (g)        | (g)        |            |            |            |            |
| Contents      |                                      | H <sub>2</sub> O | H <sub>2</sub> O | -          | Sil Gel    |            |            |            |            |
| Final Value   | (V <sub>f</sub> ), (W <sub>f</sub> ) | 745.6            | 711.3            | 610.6      | 898.8      |            |            |            |            |
| Initial Value | (V <sub>i</sub> ), (W <sub>i</sub> ) | 727.5            | 704.4            | 607.9      | 886.9      |            |            |            |            |
| Net Value     | (V <sub>n</sub> ), (W <sub>n</sub> ) |                  |                  |            |            |            |            |            |            |

Run: 11 Load: 90-100

|               |                                      | Impinger 1       | Impinger 2       | Impinger 3 | Impinger 4 | Impinger 5 | Impinger 6 | Impinger 7 | Impinger 8 |
|---------------|--------------------------------------|------------------|------------------|------------|------------|------------|------------|------------|------------|
|               |                                      | (g)              | (g)              | (g)        | (g)        |            |            |            |            |
| Contents      |                                      | H <sub>2</sub> O | H <sub>2</sub> O | -          | Sil Gel    |            |            |            |            |
| Final Value   | (V <sub>f</sub> ), (W <sub>f</sub> ) | 769.0            | 718.7            | 613.3      | 910.1      |            |            |            |            |
| Initial Value | (V <sub>i</sub> ), (W <sub>i</sub> ) | 745.6            | 711.3            | 610.6      | 898.8      |            |            |            |            |
| Net Value     | (V <sub>n</sub> ), (W <sub>n</sub> ) |                  |                  |            |            |            |            |            |            |

Run: 12 Load: 90-100

|               |                                      | Impinger 1       | Impinger 2       | Impinger 3 | Impinger 4 | Impinger 5 | Impinger 6 | Impinger 7 | Impinger 8 |
|---------------|--------------------------------------|------------------|------------------|------------|------------|------------|------------|------------|------------|
|               |                                      | (g)              | (g)              | (g)        | (g)        |            |            |            |            |
| Contents      |                                      | H <sub>2</sub> O | H <sub>2</sub> O | -          | Sil Gel    |            |            |            |            |
| Final Value   | (V <sub>f</sub> ), (W <sub>f</sub> ) | 793.7            | 726.1            | 615.6      | 863.9      |            |            |            |            |
| Initial Value | (V <sub>i</sub> ), (W <sub>i</sub> ) | 769.0            | 718.7            | 613.3      | 849.0      |            |            |            |            |
| Net Value     | (V <sub>n</sub> ), (W <sub>n</sub> ) |                  |                  |            |            |            |            |            |            |

EC-36-25

9/1/15

AIR HYGIENE

## MOISTURE (EPA METHOD 4) DATA SHEET

Run:

1

Load:

0-30-0

|               |                                      | Impinger 1       | Impinger 2       | Impinger 3 | Impinger 4 | Impinger 5 | Impinger 6 | Impinger 7 | Impinger 8 |
|---------------|--------------------------------------|------------------|------------------|------------|------------|------------|------------|------------|------------|
|               |                                      | (g)              | (g)              | (g)        | (g)        |            |            |            |            |
| Contents      |                                      | H <sub>2</sub> O | H <sub>2</sub> O | -          | Sil Gel    |            |            |            |            |
| Final Value   | (V <sub>f</sub> ), (W <sub>f</sub> ) | 719.0            | 719.8            | 583.7      | 858.4      |            |            |            |            |
| Initial Value | (V <sub>i</sub> ), (W <sub>i</sub> ) | 715.0            | 714.9            | 581.3      | 844.4      |            |            |            |            |
| Net Value     | (V <sub>n</sub> ), (W <sub>n</sub> ) |                  |                  |            |            |            |            |            |            |

Run:

2

Load:

0-30-0

|               |                                      | Impinger 1       | Impinger 2       | Impinger 3 | Impinger 4 | Impinger 5 | Impinger 6 | Impinger 7 | Impinger 8 |
|---------------|--------------------------------------|------------------|------------------|------------|------------|------------|------------|------------|------------|
|               |                                      | (g)              | (g)              | (g)        | (g)        |            |            |            |            |
| Contents      |                                      | H <sub>2</sub> O | H <sub>2</sub> O | -          | Sil Gel    |            |            |            |            |
| Final Value   | (V <sub>f</sub> ), (W <sub>f</sub> ) | 721.3            | 725.2            | 586.4      | 870.5      |            |            |            |            |
| Initial Value | (V <sub>i</sub> ), (W <sub>i</sub> ) | 719.0            | 719.8            | 583.7      | 858.4      |            |            |            |            |
| Net Value     | (V <sub>n</sub> ), (W <sub>n</sub> ) |                  |                  |            |            |            |            |            |            |

Run:

3

Load:

0-30-0

|               |                                      | Impinger 1       | Impinger 2       | Impinger 3 | Impinger 4 | Impinger 5 | Impinger 6 | Impinger 7 | Impinger 8 |
|---------------|--------------------------------------|------------------|------------------|------------|------------|------------|------------|------------|------------|
|               |                                      | (g)              | (g)              | (g)        | (g)        |            |            |            |            |
| Contents      |                                      | H <sub>2</sub> O | H <sub>2</sub> O | -          | Sil Gel    |            |            |            |            |
| Final Value   | (V <sub>f</sub> ), (W <sub>f</sub> ) | 726.9            | 730.5            | 588.8      | 883.0      |            |            |            |            |
| Initial Value | (V <sub>i</sub> ), (W <sub>i</sub> ) | 721.3            | 725.2            | 586.4      | 870.5      |            |            |            |            |
| Net Value     | (V <sub>n</sub> ), (W <sub>n</sub> ) |                  |                  |            |            |            |            |            |            |

Run:

7

Load:

70-100-70

|               |                                      | Impinger 1       | Impinger 2       | Impinger 3 | Impinger 4 | Impinger 5 | Impinger 6 | Impinger 7 | Impinger 8 |
|---------------|--------------------------------------|------------------|------------------|------------|------------|------------|------------|------------|------------|
|               |                                      | (g)              | (g)              | (g)        | (g)        |            |            |            |            |
| Contents      |                                      | H <sub>2</sub> O | H <sub>2</sub> O | -          | Sil Gel    |            |            |            |            |
| Final Value   | (V <sub>f</sub> ), (W <sub>f</sub> ) | 755.7            | 742.5            | 591.8      | 893.0      |            |            |            |            |
| Initial Value | (V <sub>i</sub> ), (W <sub>i</sub> ) | 726.9            | 730.5            | 588.8      | 883.0      |            |            |            |            |
| Net Value     | (V <sub>n</sub> ), (W <sub>n</sub> ) |                  |                  |            |            |            |            |            |            |

Run:

8

Load:

70-100-70

|               |                                      | Impinger 1       | Impinger 2       | Impinger 3 | Impinger 4 | Impinger 5 | Impinger 6 | Impinger 7 | Impinger 8 |
|---------------|--------------------------------------|------------------|------------------|------------|------------|------------|------------|------------|------------|
|               |                                      | (g)              | (g)              | (g)        | (g)        |            |            |            |            |
| Contents      |                                      | H <sub>2</sub> O | H <sub>2</sub> O | -          | Sil Gel    |            |            |            |            |
| Final Value   | (V <sub>f</sub> ), (W <sub>f</sub> ) | 776.7            | 752.7            | 594.9      | 869.6      |            |            |            |            |
| Initial Value | (V <sub>i</sub> ), (W <sub>i</sub> ) | 755.7            | 742.5            | 591.8      | 856.4      |            |            |            |            |
| Net Value     | (V <sub>n</sub> ), (W <sub>n</sub> ) |                  |                  |            |            |            |            |            |            |

Run:

9

Load:

70-100-70

|               |                                      | Impinger 1       | Impinger 2       | Impinger 3 | Impinger 4 | Impinger 5 | Impinger 6 | Impinger 7 | Impinger 8 |
|---------------|--------------------------------------|------------------|------------------|------------|------------|------------|------------|------------|------------|
|               |                                      | (g)              | (g)              | (g)        | (g)        |            |            |            |            |
| Contents      |                                      | H <sub>2</sub> O | H <sub>2</sub> O | -          | Sil Gel    |            |            |            |            |
| Final Value   | (V <sub>f</sub> ), (W <sub>f</sub> ) | 798.6            | 762.0            | 598.0      | 882.9      |            |            |            |            |
| Initial Value | (V <sub>i</sub> ), (W <sub>i</sub> ) | 776.7            | 752.7            | 594.9      | 869.6      |            |            |            |            |
| Net Value     | (V <sub>n</sub> ), (W <sub>n</sub> ) |                  |                  |            |            |            |            |            |            |

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**end of report**

**From:** [Braden Costello](#)  
**To:** [Mia, Marcia](#); [Jason Huckaby](#)  
**Cc:** [Garwood, Gerri](#); [Ryan McArthur](#)  
**Subject:** RE: Follow-Up on Manufacturer Performance Test under NSPS OOOO/MACT HH/HHH for LEED EC36 & EC48  
**Date:** Tuesday, February 02, 2016 3:19:49 PM  
**Attachments:** [image001.png](#)  
[Cover Letter-EPA response.pdf](#)  
[EC36-2S-FDS.pdf](#)  
[EC48-2S-FDS.pdf](#)

---

Hello Marcia and Jason,

Thank you very much for the clarification.

Our 3<sup>rd</sup> party testing company, Air Hygiene, has addressed No. 5 for the EC36-2S unit and Nos 1 and 5 for the EC48-2S unit with the attached documents. Please see the original e-mail below for my responses to the remaining queries in **red text**.

Please feel free to pass along any additional questions as needed. Thank you for your time.

Best Regards,

**Braden Costello**

Mechanical Engineer  
Leed Fabrication Services, Inc.  
12535 CR 2  
Brighton, CO 80603  
303-659-6801 – Office  
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---

**From:** Mia, Marcia [<mailto:Mia.Marcia@epa.gov>]

**Sent:** Wednesday, January 27, 2016 10:27 AM  
**To:** Jason Huckaby; Braden Costello  
**Cc:** Garwood, Gerri; Ryan McArthur  
**Subject:** RE: Follow-Up on Manufacturer Performance Test under NSPS OOOO/MACT HH/HHH for LEED EC36 & EC48

Thanks. Jason is correct.

Marcia B Mia  
Office of Compliance/Air Branch  
2227A WJCS  
U.S. Environmental Protection Agency  
202-564-7042

---

**From:** Jason Huckaby [<mailto:Jason.Huckaby@erg.com>]  
**Sent:** Wednesday, January 27, 2016 8:53 AM  
**To:** Braden Costello <[BCostello@leedfab.com](mailto:BCostello@leedfab.com)>; Mia, Marcia <[Mia.Marcia@epa.gov](mailto:Mia.Marcia@epa.gov)>  
**Cc:** Garwood, Gerri <[Garwood.Gerri@epa.gov](mailto:Garwood.Gerri@epa.gov)>; Ryan McArthur <[RMcArthur@leedfab.com](mailto:RMcArthur@leedfab.com)>  
**Subject:** RE: Follow-Up on Manufacturer Performance Test under NSPS OOOO/MACT HH/HHH for LEED EC36 & EC48

Hello Braden,

Speaking here on Marcia's behalf as I believe she may be out today. She was referring to Method 4 field data sheets. Perhaps you could clarify if the Method 4 sheets on pages 41-43, for example, were entered electronically at the time of the testing. If written sheets were taken at the time of testing, then would it be possible to send along scanned copies of them for EPA's records? We did not see them included in the field data sheet section at the end of the report.

Hope this helps, and thank you very much for your assistance.

Regards,  
Jason

Jason M. Huckaby  
Sr. Chemical Engineer  
Eastern Research Group  
(919) 468-7826

---

**From:** Braden Costello [<mailto:BCostello@leedfab.com>]  
**Sent:** Tuesday, January 26, 2016 5:56 PM  
**To:** Mia, Marcia <[Mia.Marcia@epa.gov](mailto:Mia.Marcia@epa.gov)>  
**Cc:** Jason Huckaby <[Jason.Huckaby@erg.com](mailto:Jason.Huckaby@erg.com)>; Garwood, Gerri <[Garwood.Gerri@epa.gov](mailto:Garwood.Gerri@epa.gov)>; Ryan McArthur <[RMcArthur@leedfab.com](mailto:RMcArthur@leedfab.com)>  
**Subject:** RE: Follow-Up on Manufacturer Performance Test under NSPS OOOO/MACT HH/HHH for LEED EC36 & EC48

Marcia,



Could you please clarify what is meant by 'Method 4C' in No. 5 below for the EC48-2S? I'm not familiar with any CFR testing protocol under that designation.

Please get back to me when you can. Thank you for your time.

Best Regards,

**Braden Costello**

Mechanical Engineer  
Leed Fabrication Services, Inc.  
12535 CR 2  
Brighton, CO 80603  
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[bcostello@leedfab.com](mailto:bcostello@leedfab.com)



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---

**From:** Mia, Marcia [<mailto:Mia.Marcia@epa.gov>]  
**Sent:** Tuesday, January 26, 2016 9:12 AM  
**To:** Braden Costello  
**Cc:** Jason Huckaby; Garwood, Gerri  
**Subject:** Follow-Up on Manufacturer Performance Test under NSPS OOOO/MACT HH/HHH for LEED EC36 & EC48

Braden,

We have completed our initial review of the LEED EC36-2S and EC48-2S. We need additional information or clarification on the following items. You may reply via email, or if you would like a call to discuss, let me know and I will schedule something.

**EC36-2S**

1. The test report is dated September 1-3, 2015, but the Cover Letter indicates the date is August 26-27, 2015. Please confirm the date of the performance test.

**The dates of testing for the EC36-2S unit were September 1-3, 2015.**

2. §60.5413(d)(12)(v)(I) requires a pilot flame indicator. It appears that the unit as tested is equipped with sight glass. Please specify how production units monitor pilot flame presence.

**The EC36-2S unit is equipped with a Kanthal flame detection rod and burner management system (BMS) for automatic pilot flame detection and reignition.**

3. §60.5413(d)(12)(v)(J) requires pilot flame design fuel and calculated/measured pilot fuel usage during test, if pilot fuel is used. The schematics indicate propane fuel for pilot, but the cover page states "Not applicable." Please confirm if pilot fuel was used during the test.

**The pilot was not used during the testing of the EC36-2S unit.**

4. §60.5413(d)(12)(v)(N) requires that exit flow rate is measured. Please explain why the 30-70-30 exit flow rate is less than 0-30-0 exit flow rate.

**Please see the explanation provided by Air Hygiene:**

For 0-30-0% Load:

Stoichiometric combustion with high excess air yield 37,621 dscfh, the data showed 41,285 dscfh which give 109%. This may be caused by wind and drag from the stack.

For 30-70-30% Load:

Stoichiometric combustion with high excess air yield 45,659 dscfh, the data showed 39,454 dscfh which give 86%. Which will be normal due to we can't get 100% stoichiometric rate.

The conclusion will be since 0-30-0% load burn rate is so low that outer atmosphere may be a leading factor to alter the flow profile.

5. EPA Quality assurance guidance requires Field Test Date sheets be submitted. There are no field test data sheets for Method 4C. Please confirm that Method 4C data was collected electronically/data logger; otherwise, please provide the Method 4C field data sheets.

**Please see the attached documents for an explanation provided by Air Hygiene.**

#### **EC48-2S**

1. §60.5413(d)(3), §60.5413(d)(12)(v)(M) and §60.5413(d)(3) require the combustion zone temperature to be recorded and strip charts provided. The exit temperature strip charts for 70-100-70 condition is missing. Please provide.

**Please see the attached documents for an explanation provided by Air Hygiene.**

2. §60.5413(d)(12)(v)(I) requires a pilot flame indicator. It appears that the unit as tested is equipped with sight glass. Please specify how production units monitor pilot flame presence.

**The EC48-2S unit is equipped with a Kanthal flame detection rod and burner management system (BMS) for automatic pilot flame detection and reignition.**

3. §60.5413(d)(12)(v)(J) requires pilot flame design fuel and calculated/measured pilot fuel usage during test, if pilot fuel is used. The schematics indicate propane fuel for pilot, but the cover page states "Not applicable." Please confirm if pilot fuel was used during the test.

**The pilot was not used during the testing of the EC48-2S unit.**

4. §60.5413(d)(12)(v)(N) requires that exit flow rate is measured. Please explain why the 30-70-30 exit flow rate is less than 0-30-0 exit flow rate.

**Please refer to the response provided to No. 4 for the EC36-2S unit.**

5. EPA Quality assurance guidance requires Field Test Date sheets be submitted. There are no field test data sheets for Method 4C. Please confirm that Method 4C data was collected electronically/data logger; otherwise, please provide the Method 4C field data sheets.

**Please see the attached documents for an explanation provided by Air Hygiene.**

Marcia B Mia  
Office of Compliance/Air Branch  
2227A WJCS  
U.S. Environmental Protection Agency  
202-564-7042



AIR HYGIENE, INC.

# *Testing Solutions for a Better World*

STACK EMISSIONS STUDY  
EPA 40 CFR PART 60 SUBPART 0000  
FOR THE  
COMBUSTION FLARE EC36-2S MODEL  
PREPARED FOR  
LEED FABRICATION SERVICES INC.  
AT THE  
LOVELAND FACILITY  
LOVELAND, COLORADO  
SEPTEMBER 1-3, 2015



**Corporate Headquarters**

1600 W Tacoma Street  
Broken Arrow, OK 74012



AIR HYGIENE, INC.

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Shreveport, LA 71115  
Miami, FL 33101  
Philadelphia, PA 19136

## **APPENDIX G**

### **Field Data Sheets**

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | FL 36-25                   |
| Project #         | lead-15-brighton-co-camp#1 |

|            |           |
|------------|-----------|
| Date       | 9/1/15    |
| Operator   | TP        |
| Run Number | 2-70-06-1 |

| Leak Checks |          |    |                         |    |       |
|-------------|----------|----|-------------------------|----|-------|
| Train       | Pre      | 8  | ft/min@                 | 15 | in Hg |
|             | Post     | 8  | ft/min@                 | 15 | in Hg |
| Pitot       | Pre (+)  | 16 | In H <sub>2</sub> O for | 15 | sec   |
|             | Pre (-)  | 21 | In H <sub>2</sub> O for | 15 | sec   |
|             | Post (+) | 17 | in H <sub>2</sub> O for | 15 | sec   |
|             | Post (-) | 2  | In H <sub>2</sub> O for | 15 | sec   |

| Sampling Equipment        |              |                     |
|---------------------------|--------------|---------------------|
| Meter Box Number          | SAMP-CP-0007 |                     |
| Orifice Meter Coefficient | 1.158        | ln H <sub>2</sub> O |

| Pressures           |                   |       |       |
|---------------------|-------------------|-------|-------|
| Barometric Pressure | (P <sub>b</sub> ) | 24.95 | in Hg |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 14:36 | End | 15:46 |

[illegible]

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|            |        |
|------------|--------|
| Date       | 9/1/15 |
| Operator   | TP     |
| Run Number | 2      |

| Sampling Equipment        |              |                     |
|---------------------------|--------------|---------------------|
| Meter Box Number          | SAMP-CP-0007 |                     |
| Orifice Meter Coefficient | 1.656        | in H <sub>2</sub> O |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 15:57 | End | 17:07 |

[illegible]

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|            |        |
|------------|--------|
| Date       | 9/1/15 |
| Operator   | TP     |
| Run Number | 3      |

| Sampling Equipment        |              |                     |
|---------------------------|--------------|---------------------|
| Meter Box Number          | SAMP-CP-0007 |                     |
| Orifice Meter Coefficient | 1.656        | in H <sub>2</sub> O |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 17:20 | End | 18:30 |

[illegible]



METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|            |              |
|------------|--------------|
| Date       | 9/2/15       |
| Operator   | TP           |
| Run Number | 30-70-30 1/4 |

| Sampling Equipment        |              |                     |
|---------------------------|--------------|---------------------|
| Meter Box Number          | SAMP-CP-0007 |                     |
| Orifice Meter Coefficient | 1.656        | in H <sub>2</sub> O |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 13:25 | End | 14:35 |

[illegible]

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | 36-25                      |
| Project #         | leed-15-brighton-co-comp#1 |

|             |        |
|-------------|--------|
| Date:       | 9/2/15 |
| Operator:   |        |
| Run Number: | 5      |

| Leak Checks |          |       |                         |    |       |
|-------------|----------|-------|-------------------------|----|-------|
| Train       | Pre      | 0     | ft <sup>3</sup> /min@   | 15 | in Hg |
|             | Post     | 0     | ft <sup>3</sup> /min@   | 15 | in Hg |
| Pitot       | Pre (+)  | -16.5 | in H <sub>2</sub> O for | 15 | sec   |
|             | Pre (-)  | .1    | in H <sub>2</sub> O for | 15 | sec   |
|             | Post (+) | -2    | in H <sub>2</sub> O for | 15 | sec   |
|             | Post (-) | -18   | in H <sub>2</sub> O for | 15 | sec   |

| Sampling Equipment        |              |                     |
|---------------------------|--------------|---------------------|
| Meter Box Number          | SAMP-CP-0007 |                     |
| Orifice Meter Coefficient | 1.656        | In H <sub>2</sub> O |

| Pressures           |                   |       |       |
|---------------------|-------------------|-------|-------|
| Barometric Pressure | (P <sub>b</sub> ) | 24.93 | In Hg |

|          |      |     |      |
|----------|------|-----|------|
| Run Time |      |     |      |
| Start    | 1448 | End | 1558 |

[illegible]

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | 36-25                      |
| Project #         | feed-15-brighton-co-comp#1 |

|            |        |
|------------|--------|
| Date       | 9/2/15 |
| Operator   | TP     |
| Run Number | 1      |

| Leak Checks |          |      |                         |    |       |
|-------------|----------|------|-------------------------|----|-------|
| Train       | Pre      | 0    | R/min@                  | 15 | In Hg |
|             | Post     | 0    | R/min@                  | 15 | In Hg |
| Pilot       | Pre (+)  | .1   | In H <sub>2</sub> O for | 15 | sec   |
|             | Pre (-)  | .165 | In H <sub>2</sub> O for | 15 | sec   |
|             | Post (+) | .125 | In H <sub>2</sub> O for | 15 | sec   |
|             | Post (-) | .2   | In H <sub>2</sub> O for | 15 | sec   |

| Sampling Equipment        |              |                     |
|---------------------------|--------------|---------------------|
| Meter Box Number          | SAMP-CP-0007 |                     |
| Orifice Meter Coefficient | 1.656        | In H <sub>2</sub> O |

| Pressures           |                   |       |       |
|---------------------|-------------------|-------|-------|
| Barometric Pressure | (P <sub>b</sub> ) | 24.90 | in Hg |

| Run Time |       |     |       |
|----------|-------|-----|-------|
| Start    | 16:26 | End | 17:36 |

[illegible]

## METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | 36-25                      |
| Project #         | lead-15-brighton.co-comp#1 |

|            |             |
|------------|-------------|
| Date       | 9/2/15      |
| Operator   | TP          |
| Run Number | 19-100-70-7 |

| Leak Checks |          |      |                         |    |       |
|-------------|----------|------|-------------------------|----|-------|
| Train       | Pro      | 0    | ft <sup>3</sup> /min@   | 15 | In Hg |
|             | Post     | 0    | ft <sup>3</sup> /min@   | 15 | In Hg |
| Pilot       | Pro (+)  | .09  | In H <sub>2</sub> O for | 15 | sec   |
|             | Pro (-)  | .095 | In H <sub>2</sub> O for | 15 | sec   |
|             | Post (+) | .15  | In H <sub>2</sub> O for | 15 | sec   |
|             | Post (-) | .175 | In H <sub>2</sub> O for | 15 | sec   |

| Sampling Equipment        |              |                     |
|---------------------------|--------------|---------------------|
| Meter Box Number          | SAMP-CP-0007 |                     |
| Orifice Meter Coefficient | 1.656        | In H <sub>2</sub> O |

| Pressures           |                   |       |       |
|---------------------|-------------------|-------|-------|
| Barometric Pressure | (P <sub>b</sub> ) | 25.12 | In Hg |

| Run Time |      |     |      |
|----------|------|-----|------|
| Start    | 8:28 | End | 9:38 |

| Traverse Point # | Sampling Time (h) | Timer Time (h:mm:ss) | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Snorkel Temp (240±25°F) | Impinger Exit Temp (≤68°F) | Meter Inlet Temp (t <sub>m</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum |
|------------------|-------------------|----------------------|-----------------------------------------|---------------------|--------------------------------------|------------------------------|-------------------------|----------------------------|------------------------------------|--------------------------------------|-------------|
|                  | min               |                      | ft <sup>3</sup>                         | In H <sub>2</sub> O | In H <sub>2</sub> O                  | °F                           | °F                      | °F                         | °F                                 | °F                                   | In Hg       |
| A-1              | 0.0               | 00:00:00             | 968.38                                  | 005                 | 1.7                                  | 1325                         | 254                     | 50                         | 75                                 | 65                                   | 3.5         |
| A-2              | 2.7               | 00:02:43             | 970.625                                 | 005                 | 1.7                                  | 1358                         | 254                     | 49                         | 76                                 | 65                                   | 3.5         |
| A-3              | 5.4               | 00:05:25             | 972.885                                 | 01                  | 1.7                                  | 1625                         | 254                     | 48                         | 77                                 | 66                                   | 3.5         |
| A-4              | 8.1               | 00:08:07             | 974.95                                  | 01                  | 1                                    | 1661                         | 254                     | 49                         | 78                                 | 67                                   | 3.5         |
| A-5              | 10.8              | 00:10:50             | 977.12                                  | 02                  |                                      | 1680                         | 254                     | 50                         | 78                                 | 68                                   | 3.5         |
| A-6              | 13.5              | 00:13:33             | 979.31                                  | 015                 |                                      | 1685                         | 254                     | 51                         | 79                                 | 68                                   | 3.5         |
| A-7              | 16.3              | 00:16:15             | 981.5                                   | 02                  |                                      | 1691                         | 254                     | 52                         | 80                                 | 69                                   | 3.5         |
| A-8              | 19.0              | 00:18:58             | 983.695                                 | 02                  |                                      | 1582                         | 254                     | 52                         | 80                                 | 70                                   | 3.5         |
| A-9              | 21.7              | 00:21:40             | 985.895                                 | 01                  |                                      | 1512                         | 254                     | 53                         | 80                                 | 71                                   | 3.5         |
| A-10             | 24.4              | 00:24:22             | 988.095                                 | 01                  |                                      | 1575                         | 254                     | 53                         | 81                                 | 71                                   | 3.5         |
| A-11             | 27.1              | 00:27:05             | 990.3                                   | 01                  |                                      | 1573                         | 254                     | 54                         | 81                                 | 73                                   | 3.5         |
| A-12             | 29.8              | 00:29:47             | 992.53                                  | 005                 |                                      | 1556                         | 254                     | 55                         | 82                                 | 74                                   | 3.5         |
| B-1              | 32.5              | 00:32:30             | 994.74                                  | 005                 |                                      | 1364                         | 254                     | 57                         | 79                                 | 75                                   | 3.5         |
| B-2              | 35.2              | 00:35:12             | 996.6                                   | 01                  |                                      | 1348                         | 254                     | 55                         | 80                                 | 75                                   | 3.5         |
| B-3              | 37.9              | 00:37:55             | 999.15                                  | 02                  |                                      | 1525                         | 254                     | 55                         | 80                                 | 75                                   | 3.5         |
| B-4              | 40.6              | 00:40:37             | 1001.335                                | 02                  |                                      | 1548                         | 254                     | 56                         | 79                                 | 75                                   | 3.5         |
| B-5              | 43.3              | 00:43:20             | 1003.55                                 | 02.5                |                                      | 1562                         | 254                     | 56                         | 79                                 | 75                                   | 3.5         |
| B-6              | 46.0              | 00:46:03             | 1005.75                                 | 02.5                |                                      | 1549                         | 254                     | 56                         | 78                                 | 74                                   | 3.5         |
| B-7              | 48.8              | 00:48:45             | 1007.9                                  | 02                  |                                      | 1331                         | 254                     | 56                         | 78                                 | 74                                   | 3.5         |
| B-8              | 51.5              | 00:51:28             | 1010.11                                 | 015                 |                                      | 1257                         | 254                     | 56                         | 77                                 | 73                                   | 3.5         |
| B-9              | 54.2              | 00:54:10             | 1012.3                                  | 01                  |                                      | 1457                         | 254                     | 56                         | 78                                 | 73                                   | 3.5         |
| B-10             | 56.9              | 00:56:53             | 1014.5                                  | 01                  |                                      | 1431                         | 254                     | 56                         | 77                                 | 73                                   | 3.5         |
| B-11             | 59.6              | 00:59:35             | 1016.69                                 | 015                 |                                      | 1433                         | 254                     | 56                         | 77                                 | 72                                   | 3.5         |
| B-12             | 62.3              | 01:02:18             | 1018.91                                 | 01                  |                                      | 1418                         | 254                     | 56                         | 77                                 | 72                                   | 3.5         |
| Last Pt          | 65.0              | 01:05:00             | 1021.165                                |                     |                                      | <del>1418</del>              | <del>254</del>          |                            |                                    |                                      |             |
| Final Val        | 65.0              | 01:05:00             |                                         |                     |                                      |                              |                         |                            |                                    |                                      | Max Vac     |
| Average Values   |                   |                      |                                         |                     | ✓                                    |                              |                         |                            |                                    |                                      |             |

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|            |        |
|------------|--------|
| Date       | 9/2/15 |
| Operator   | TP     |
| Run Number | 8      |

| Sampling Equipment        |              |                     |
|---------------------------|--------------|---------------------|
| Meter Box Number          | SAMP-CP-0007 |                     |
| Orifice Meter Coefficient | 1.656        | In H <sub>2</sub> O |

| Run Time |      |     |       |
|----------|------|-----|-------|
| Start    | 9:50 | End | 11:00 |





## METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | 36-25                      |
| Project #         | leed-15-brighton.co-comp#1 |

|            |              |
|------------|--------------|
| Date       | 9/3/15       |
| Operator   | TP           |
| Run Number | 90-100% - 10 |

| Leak Checks |          |     |                         |    |       |
|-------------|----------|-----|-------------------------|----|-------|
| Train       | Pre      | 0   | ft <sup>3</sup> /min@   | 15 | in Hg |
|             | Post     | 0   | ft <sup>3</sup> /min@   | 15 | in Hg |
| Pilot       | Pre (+)  | .22 | in H <sub>2</sub> O for | 15 | sec   |
|             | Pre (-)  | .06 | in H <sub>2</sub> O for | 15 | sec   |
|             | Post (+) | .13 | in H <sub>2</sub> O for | 15 | sec   |
|             | Post (-) | .1  | in H <sub>2</sub> O for | 15 | sec   |

| Sampling Equipment        |              |                     |
|---------------------------|--------------|---------------------|
| Meter Box Number          | SAMP-CP-0007 |                     |
| Orifice Meter Coefficient | 1.656        | in H <sub>2</sub> O |

| Pressures           |                   |       |       |
|---------------------|-------------------|-------|-------|
| Barometric Pressure | (P <sub>b</sub> ) | 24.94 | in Hg |

| Run Time |      |          |
|----------|------|----------|
| Start    | 8:19 | End 9:29 |

| Traverse Point # | Sampling Time (s) | Timer Time | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Snorkel Temp (248±25°F) | Impinger Exit Temp (≤68°F) | Meter Inlet Temp (t <sub>m</sub> ) | Meter Outlet Temp (t <sub>mo</sub> ) | Pump Vacuum |
|------------------|-------------------|------------|-----------------------------------------|---------------------|--------------------------------------|------------------------------|-------------------------|----------------------------|------------------------------------|--------------------------------------|-------------|
|                  | min               | hh:mm:ss   | ft <sup>3</sup>                         | in H <sub>2</sub> O | in H <sub>2</sub> O                  | °F                           | °F                      | °F                         | °F                                 | °F                                   | in Hg       |
| A-1              | 0.0               | 00:00:00   | 288.93                                  | 005                 | 1.7                                  | 1223                         | 254                     | 54                         | 69                                 | 67                                   | 3.5         |
| A-2              | 2.7               | 00:02:43   | 291.3                                   | 01                  | 1.7                                  | 1229                         | 254                     | 49                         | 70                                 | 67                                   | 3.5         |
| A-3              | 5.4               | 00:05:25   | 293.63                                  | 015                 |                                      | 1226                         | 254                     | 49                         | 72                                 | 67                                   | 3.5         |
| A-4              | 8.1               | 00:08:07   | 295.95                                  | 02                  |                                      | 1242                         | 254                     | 51                         | 74                                 | 67                                   | 3.5         |
| A-5              | 10.8              | 00:10:50   | 298.3                                   | 025                 |                                      | 1280                         | 254                     | 52                         | 75                                 | 68                                   | 3.5         |
| A-6              | 13.5              | 00:13:33   | 300.415                                 | 025                 |                                      | 1307                         | 254                     | 54                         | 76                                 | 69                                   | 3.5         |
| A-7              | 16.3              | 00:16:15   | 302.62                                  | 025                 |                                      | 1307                         | 254                     | 55                         | 78                                 | 69                                   | 3.5         |
| A-8              | 19.0              | 00:18:58   | 304.85                                  | 02                  |                                      | 1287                         | 254                     | 55                         | 78                                 | 70                                   | 3.5         |
| A-9              | 21.7              | 00:21:40   | 307.07                                  | 015                 |                                      | 1261                         | 254                     | 56                         | 79                                 | 71                                   | 3.5         |
| A-10             | 24.4              | 00:24:22   | 309.28                                  | 015                 |                                      | 1231                         | 254                     | 57                         | 79                                 | 72                                   | 3.5         |
| A-11             | 27.1              | 00:27:05   | 311.5                                   | 01                  |                                      | 1217                         | 254                     | 57                         | 79                                 | 73                                   | 3.5         |
| A-12             | 29.8              | 00:29:47   | 313.71                                  | 005                 |                                      | 1196                         | 254                     | 58                         | 78                                 | 74                                   | 3.5         |
| B-1              | 32.5              | 00:32:30   | 315.96                                  | 015                 |                                      | 1286                         | 254                     | 58                         | 75                                 | 73                                   | 3.5         |
| B-2              | 35.2              | 00:35:12   | 318.2                                   | 02                  |                                      | 1307                         | 254                     | 57                         | 77                                 | 73                                   | 3.5         |
| B-3              | 37.9              | 00:37:55   | 320.4                                   | 025                 |                                      | 1317                         | 254                     | 57                         | 77                                 | 72                                   | 3.5         |
| B-4              | 40.6              | 00:40:37   | 322.58                                  | 03                  |                                      | 1322                         | 254                     | 59                         | 77                                 | 72                                   | 3.5         |
| B-5              | 43.3              | 00:43:20   | 324.8                                   | 03                  |                                      | 1321                         | 254                     | 58                         | 77                                 | 71                                   | 3.5         |
| B-6              | 46.0              | 00:46:03   | 327                                     | 035                 |                                      | 1314                         | 254                     | 58                         | 77                                 | 71                                   | 3.5         |
| B-7              | 48.8              | 00:48:45   | 329.25                                  | 025                 |                                      | 1298                         | 254                     | 58                         | 77                                 | 71                                   | 3.5         |
| B-8              | 51.5              | 00:51:28   | 331.435                                 | 02                  |                                      | 1268                         | 254                     | 58                         | 77                                 | 70                                   | 3.5         |
| B-9              | 54.2              | 00:54:10   | 333.65                                  | 02                  |                                      | 1248                         | 254                     | 58                         | 77                                 | 70                                   | 3.5         |
| B-10             | 56.9              | 00:56:53   | 335.9                                   | 015                 |                                      | 1230                         | 254                     | 58                         | 78                                 | 70                                   | 3.5         |
| B-11             | 59.6              | 00:59:35   | 338.13                                  | 01                  |                                      | 1214                         | 254                     | 58                         | 77                                 | 70                                   | 3.5         |
| B-12             | 62.3              | 01:02:18   | 340.375                                 | 005                 |                                      | 1187                         | 254                     | 58                         | 78                                 | 70                                   | 3.5         |
| Last Pt          | 65.0              | 01:05:00   | 342.65                                  |                     |                                      |                              |                         |                            |                                    |                                      |             |
| Final Val        | 65.0              | 01:05:00   |                                         |                     |                                      |                              |                         |                            |                                    |                                      | Max Vac     |
| Average Values   |                   |            |                                         |                     | ✓                                    |                              |                         |                            |                                    |                                      |             |

METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | 36-25                      |
| Project #         | leed-15-brighton.co-comp#1 |

|            |        |
|------------|--------|
| Date       | 9/3/15 |
| Operator   | TP     |
| Run Number | 11     |

| Leak Checks |          |      |                         |    |       |
|-------------|----------|------|-------------------------|----|-------|
| Train       | Pre      | 0    | ft <sup>3</sup> /min@   | 15 | in Hg |
|             | Post     | 0    | ft <sup>3</sup> /min@   | 15 | in Hg |
| P/ltot      | Pre (+)  | .175 | in H <sub>2</sub> O for | 15 | sec   |
|             | Pre (-)  | .14  | in H <sub>2</sub> O for | 15 | sec   |
|             | Post (+) | .1   | in H <sub>2</sub> O for | 15 | sec   |
|             | Post (-) | .18  | in H <sub>2</sub> O for | 15 | sec   |

| Sampling Equipment        |              |                     |
|---------------------------|--------------|---------------------|
| Meter Box Number          | SAMP-CP-0007 |                     |
| Orifice Meter Coefficient | 1.656        | in H <sub>2</sub> O |

| Pressures           |                   |       |       |
|---------------------|-------------------|-------|-------|
| Barometric Pressure | (P <sub>b</sub> ) | 24.94 | in Hg |

| Run Time |      |     |       |
|----------|------|-----|-------|
| Start    | 9:41 | End | 10:51 |

[illegible]



METHOD 4 (MOISTURE) [MULTI POINT, NO VARIATION] SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

|                   |                            |
|-------------------|----------------------------|
| Plant Name        | Loveland Facility          |
| Sampling Location | 36-25                      |
| Project #         | leed-15-brighton.co-comp#1 |

|            |        |
|------------|--------|
| Date       | 9/3/15 |
| Operator   | TP     |
| Run Number | 12     |

| Leak Checks |          |      |                         |    |
|-------------|----------|------|-------------------------|----|
| Train       | Pre      | 0    | ft <sup>3</sup> /min@   | 15 |
|             | Post     | 0    | ft <sup>3</sup> /min@   | 15 |
| Pilot       | Pre (+)  | .2   | In H <sub>2</sub> O for | 15 |
|             | Pre (-)  | .13  | In H <sub>2</sub> O for | 15 |
|             | Post (+) | .165 | In H <sub>2</sub> O for | 15 |
|             | Post (-) | .1   | In H <sub>2</sub> O for | 15 |

| Sampling Equipment        |              |                     |
|---------------------------|--------------|---------------------|
| Meter Box Number          | SAMP-CP-0007 |                     |
| Orifice Meter Coefficient | 1.656        | In H <sub>2</sub> O |

| Pressures           |                   |             |
|---------------------|-------------------|-------------|
| Barometric Pressure | (P <sub>b</sub> ) | 24.93 In Hg |

| Run Time |       |           |
|----------|-------|-----------|
| Start    | 11:02 | End 12:12 |

| Traverse Point # | Sampling Time (°) | Timer Time | Dry Gas Meter Reading (V <sub>m</sub> ) | Velocity Head (Δp)  | Actual Orifice ΔH (ΔH <sub>a</sub> ) | Stack Temp (t <sub>s</sub> ) | Snorkel Temp (248±25°F) | Impinger Exit Temp (±68°F) | Meter Inlet Temp (t <sub>m</sub> ) | Meter Outlet Temp (t <sub>ma</sub> ) | Pump Vacuum |
|------------------|-------------------|------------|-----------------------------------------|---------------------|--------------------------------------|------------------------------|-------------------------|----------------------------|------------------------------------|--------------------------------------|-------------|
|                  | min               | hh:mm:ss   | ft <sup>3</sup>                         | In H <sub>2</sub> O | In H <sub>2</sub> O                  | °F                           | °F                      | °F                         | °F                                 | °F                                   | In Hg       |
| A-1              | 0.0               | 00:00:00   | 396.27                                  | 005                 | 1.7                                  | 1289                         | 254                     | 61                         | 75                                 | 74                                   | 3.5         |
| A-2              | 2.7               | 00:02:43   | 398.51                                  | 01                  |                                      | 1293                         | 254                     | 57                         | 80                                 | 74                                   | 3.5         |
| A-3              | 5.4               | 00:05:25   | 400.735                                 | 015                 |                                      | 1291                         | 254                     | 55                         | 81                                 | 74                                   | 3.5         |
| A-4              | 8.1               | 00:08:07   | 402.96                                  | 030                 |                                      | 1357                         | 254                     | 54                         | 82                                 | 74                                   | 3.5         |
| A-5              | 10.8              | 00:10:50   | 405.215                                 | 025                 |                                      | 1372                         | 254                     | 55                         | 82                                 | 74                                   | 3.5         |
| A-6              | 13.5              | 00:13:33   | 407.445                                 | 025                 |                                      | 1367                         | 254                     | 55                         | 82                                 | 75                                   | 3.5         |
| A-7              | 16.3              | 00:16:16   | 409.65                                  | 025                 |                                      | 1368                         | 254                     | 56                         | 83                                 | 75                                   | 3.5         |
| A-8              | 19.0              | 00:18:58   | 411.9                                   | 02                  |                                      | 1348                         | 254                     | 56                         | 83                                 | 75                                   | 3.5         |
| A-9              | 21.7              | 00:21:40   | 414.135                                 | 015                 |                                      | 1319                         | 254                     | 56                         | 83                                 | 75                                   | 3.5         |
| A-10             | 24.4              | 00:24:22   | 416.365                                 | 01                  |                                      | 1281                         | 254                     | 57                         | 83                                 | 76                                   | 3.5         |
| A-11             | 27.1              | 00:27:05   | 418.6                                   | 01                  |                                      | 1245                         | 254                     | 57                         | 83                                 | 76                                   | 3.5         |
| A-12             | 29.8              | 00:29:47   | 420.965                                 | 005                 |                                      | 1191                         | 254                     | 58                         | 84                                 | 76                                   | 3.5         |
| B-1              | 32.5              | 00:32:30   | 423.12                                  | 01                  |                                      | 1384                         | 254                     | 59                         | 80                                 | 76                                   | 3.5         |
| B-2              | 35.2              | 00:35:12   | 425.34                                  | 02                  |                                      | 1400                         | 254                     | 58                         | 83                                 | 76                                   | 3.5         |
| B-3              | 37.9              | 00:37:55   | 427.55                                  | 025                 |                                      | 1407                         | 254                     | 58                         | 84                                 | 76                                   | 3.5         |
| B-4              | 40.6              | 00:40:37   | 429.74                                  | 03                  |                                      | 1416                         | 254                     | 59                         | 84                                 | 77                                   | 3.5         |
| B-5              | 43.3              | 00:43:20   | 431.95                                  | 035                 |                                      | 1413                         | 254                     | 60                         | 84                                 | 77                                   | 3.5         |
| B-6              | 46.0              | 00:46:03   | 434.12                                  | 03                  |                                      | 1415                         | 254                     | 61                         | 84                                 | 77                                   | 3.5         |
| B-7              | 48.8              | 00:48:45   | 436.3                                   | 03                  |                                      | 1381                         | 254                     | 61                         | 85                                 | 77                                   | 3.5         |
| B-8              | 51.6              | 00:51:28   | 438.5                                   | 02                  |                                      | 1373                         | 254                     | 62                         | 85                                 | 77                                   | 3.5         |
| B-9              | 54.2              | 00:54:10   | 440.865                                 | 015                 |                                      | 1356                         | 254                     | 63                         | 85                                 | 77                                   | 3.5         |
| B-10             | 56.9              | 00:56:53   | 443.085                                 | 01                  |                                      | 1336                         | 254                     | 63                         | 85                                 | 77                                   | 3.5         |
| B-11             | 59.6              | 00:59:35   | 445.15                                  | 01                  |                                      | 1275                         | 254                     | 64                         | 85                                 | 77                                   | 3.5         |
| B-12             | 62.3              | 01:02:18   | 447.37                                  | 005                 |                                      | 1165                         | 254                     | 64                         | 85                                 | 77                                   | 3.5         |
| Last Pt          | 65.0              | 01:05:00   | 449.625                                 |                     |                                      |                              |                         |                            |                                    |                                      |             |
| Final Val        | 65.0              | 01:05:00   |                                         |                     |                                      |                              |                         |                            |                                    |                                      | Max Vac     |
| Average Values   |                   |            |                                         |                     | ✓                                    |                              |                         |                            |                                    |                                      |             |

**From:** [Jim Chick](#)  
**To:** [Mia. Marcia](#); [Braden Costello](#)  
**Cc:** [Jason Huckaby](#); [Garwood. Gerri](#); [Ryan McArthur](#); [Brett McFarland](#); [Josh Lindsey](#)  
**Subject:** RE: Follow-Up on Manufacturer Performance Test under NSPS OOOO/MACT HH/HHH for LEED EC36 & EC48  
**Date:** Monday, April 04, 2016 1:13:19 PM  
**Attachments:** [image001.png](#)  
[PF2100 MANUAL 2.32.pdf](#)

---

Marcia,

Attached is the manual for the ProFire BMS that most of our customers utilize. Please keep in mind that these systems are not manufactured by Leed, and are only supplied per our customers request. ProFire is a vendor of Leed's and they have a few systems we purchase and supply to our customers. More information about them can be found on their website below.

<http://www.profireenergy.com/>

Please do not hesitate to contact us with any further comments.

Regards,

Jim Chick  
Executive Vice President  
Leed Fabrication Services, Inc.

---

**From:** Mia, Marcia [mailto:[Mia.Marcia@epa.gov](mailto:Mia.Marcia@epa.gov)]  
**Sent:** Monday, April 04, 2016 11:01 AM  
**To:** Braden Costello  
**Cc:** Jason Huckaby; Garwood, Gerri; Ryan McArthur; Jim Chick; Brett McFarland; Josh Lindsey  
**Subject:** RE: Follow-Up on Manufacturer Performance Test under NSPS OOOO/MACT HH/HHH for LEED EC36 & EC48

Thank you Braden for your responses. Sorry for the delay in following up – Gerri and I have both been working on another issue with a tight deadline.

Can you please provide a manufacturer's description or brochure of Kanthal flame detection rod and burner management system (BMS). We may also have some follow-up questions on the stack flow rate discussed in question 4 for both units.

M

Marcia B Mia  
Office of Compliance/Air Branch  
2227A WJCS  
U.S. Environmental Protection Agency  
202-564-7042

---

**From:** Braden Costello [<mailto:BCostello@leedfab.com>]

**Sent:** Thursday, February 11, 2016 4:57 PM

**To:** Mia, Marcia <[Mia.Marcia@epa.gov](mailto:Mia.Marcia@epa.gov)>

**Cc:** Jason Huckaby <[Jason.Huckaby@erg.com](mailto:Jason.Huckaby@erg.com)>; Garwood, Gerri <[Garwood.Gerri@epa.gov](mailto:Garwood.Gerri@epa.gov)>; Ryan McArthur <[RMcArthur@leedfab.com](mailto:RMcArthur@leedfab.com)>; Jim Chick <[JChick@leedfab.com](mailto:JChick@leedfab.com)>; Brett McFarland <[BMcFarland@leedfab.com](mailto:BMcFarland@leedfab.com)>; Josh Lindsey <[JLindsey@leedfab.com](mailto:JLindsey@leedfab.com)>

**Subject:** FW: Follow-Up on Manufacturer Performance Test under NSPS OOOO/MACT HH/HHH for LEED EC36 & EC48

Good Afternoon Marcia,

I just wanted to follow up on this message to make sure that you've received our responses. I'd be happy to help answer any additional questions if they happen to come up.

Please get back to me when you can. I look forward to hearing back from you. Thank you for your time.

Best Regards,

**Braden Costello**

Mechanical Engineer

Leed Fabrication Services, Inc.

12535 CR 2

Brighton, CO 80603

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---

**From:** Braden Costello

**Sent:** Tuesday, February 02, 2016 1:19 PM

**To:** 'Mia, Marcia'; Jason Huckaby

**Cc:** Garwood, Gerri; Ryan McArthur

**Subject:** RE: Follow-Up on Manufacturer Performance Test under NSPS OOOO/MACT HH/HHH for LEED EC36 & EC48

Hello Marcia and Jason,

Thank you very much for the clarification.

Our 3<sup>rd</sup> party testing company, Air Hygiene, has addressed No. 5 for the EC36-2S unit and Nos 1 and 5 for the EC48-2S unit with the attached documents. Please see the original e-mail below for my responses to the remaining queries in **red text**.

Please feel free to pass along any additional questions as needed. Thank you for your time.

Best Regards,

**Braden Costello**

Mechanical Engineer  
Leed Fabrication Services, Inc.  
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Brighton, CO 80603  
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---

**From:** Mia, Marcia [<mailto:Mia.Marcia@epa.gov>]

**Sent:** Wednesday, January 27, 2016 10:27 AM

**To:** Jason Huckaby; Braden Costello

**Cc:** Garwood, Gerri; Ryan McArthur

**Subject:** RE: Follow-Up on Manufacturer Performance Test under NSPS OOOO/MACT HH/HHH for LEED EC36 & EC48

Thanks. Jason is correct.

Marcia B Mia  
Office of Compliance/Air Branch  
2227A WJCS  
U.S. Environmental Protection Agency  
202-564-7042

---

**From:** Jason Huckaby [<mailto:Jason.Huckaby@erg.com>]  
**Sent:** Wednesday, January 27, 2016 8:53 AM  
**To:** Braden Costello <[BCostello@leedfab.com](mailto:BCostello@leedfab.com)>; Mia, Marcia <[Mia.Marcia@epa.gov](mailto:Mia.Marcia@epa.gov)>  
**Cc:** Garwood, Gerri <[Garwood.Gerri@epa.gov](mailto:Garwood.Gerri@epa.gov)>; Ryan McArthur <[RMcArthur@leedfab.com](mailto:RMcArthur@leedfab.com)>  
**Subject:** RE: Follow-Up on Manufacturer Performance Test under NSPS OOOO/MACT HH/HHH for LEED EC36 & EC48

Hello Braden,

Speaking here on Marcia's behalf as I believe she may be out today. She was referring to Method 4 field data sheets. Perhaps you could clarify if the Method 4 sheets on pages 41-43, for example, were entered electronically at the time of the testing. If written sheets were taken at the time of testing, then would it be possible to send along scanned copies of them for EPA's records? We did not see them included in the field data sheet section at the end of the report.

Hope this helps, and thank you very much for your assistance.

Regards,  
Jason

Jason M. Huckaby  
Sr. Chemical Engineer  
Eastern Research Group  
(919) 468-7826

---

**From:** Braden Costello [<mailto:BCostello@leedfab.com>]  
**Sent:** Tuesday, January 26, 2016 5:56 PM  
**To:** Mia, Marcia <[Mia.Marcia@epa.gov](mailto:Mia.Marcia@epa.gov)>  
**Cc:** Jason Huckaby <[Jason.Huckaby@erg.com](mailto:Jason.Huckaby@erg.com)>; Garwood, Gerri <[Garwood.Gerri@epa.gov](mailto:Garwood.Gerri@epa.gov)>; Ryan McArthur <[RMcArthur@leedfab.com](mailto:RMcArthur@leedfab.com)>  
**Subject:** RE: Follow-Up on Manufacturer Performance Test under NSPS OOOO/MACT HH/HHH for LEED EC36 & EC48

Marcia,

Could you please clarify what is meant by 'Method 4C' in No. 5 below for the EC48-2S? I'm not familiar with any CFR testing protocol under that designation.

Please get back to me when you can. Thank you for your time.

Best Regards,

**Braden Costello**

Mechanical Engineer  
Leed Fabrication Services, Inc.  
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Brighton, CO 80603  
303-659-6801 – Office  
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---

**From:** Mia, Marcia [<mailto:Mia.Marcia@epa.gov>]  
**Sent:** Tuesday, January 26, 2016 9:12 AM  
**To:** Braden Costello  
**Cc:** Jason Huckaby; Garwood, Gerri  
**Subject:** Follow-Up on Manufacturer Performance Test under NSPS OOOO/MACT HH/HHH for LEED EC36 & EC48

Braden,

We have completed our initial review of the LEED EC36-2S and EC48-2S. We need additional information or clarification on the following items. You may reply via email, or if you would like a call to discuss, let me know and I will schedule something.

**EC36-2S**

1. The test report is dated September 1-3, 2015, but the Cover Letter indicates the date is August 26-27, 2015. Please confirm the date of the performance test.  
**The dates of testing for the EC36-2S unit were September 1-3, 2015.**
2. §60.5413(d)(12)(v)(I) requires a pilot flame indicator. It appears that the unit as tested is equipped with sight glass. Please specify how production units monitor pilot flame presence.  
**The EC36-2S unit is equipped with a Kanthal flame detection rod and burner**

**management system (BMS) for automatic pilot flame detection and reignition.**

3. §60.5413(d)(12)(v)(J) requires pilot flame design fuel and calculated/measured pilot fuel usage during test, if pilot fuel is used. The schematics indicate propane fuel for pilot, but the cover page states "Not applicable." Please confirm if pilot fuel was used during the test.

**The pilot was not used during the testing of the EC36-2S unit.**

4. §60.5413(d)(12)(v)(N) requires that exit flow rate is measured. Please explain why the 30-70-30 exit flow rate is less than 0-30-0 exit flow rate.

**Please see the explanation provided by Air Hygiene:**

For 0-30-0% Load:

Stoichiometric combustion with high excess air yield 37,621 dscfh, the data showed 41,285 dscfh which give 109%. This may be caused by wind and drag from the stack.

For 30-70-30% Load:

Stoichiometric combustion with high excess air yield 45,659 dscfh, the data showed 39,454 dscfh which give 86%. Which will be normal due to we can't get 100% stoichiometric rate.

The conclusion will be since 0-30-0% load burn rate is so low that outer atmosphere may be a leading factor to alter the flow profile.

5. EPA Quality assurance guidance requires Field Test Data sheets be submitted. There are no field test data sheets for Method 4C. Please confirm that Method 4C data was collected electronically/data logger; otherwise, please provide the Method 4C field data sheets.

**Please see the attached documents for an explanation provided by Air Hygiene.**

**EC48-2S**

1. §60.5413(d)(3), §60.5413(d)(12)(v)(M) and §60.5413(d)(3) require the combustion zone temperature to be recorded and strip charts provided. The exit temperature strip charts for 70-100-70 condition is missing. Please provide.

**Please see the attached documents for an explanation provided by Air Hygiene.**

2. §60.5413(d)(12)(v)(I) requires a pilot flame indicator. It appears that the unit as tested is equipped with sight glass. Please specify how production units monitor pilot flame presence.

**The EC48-2S unit is equipped with a Kanthal flame detection rod and burner management system (BMS) for automatic pilot flame detection and reignition.**

3. §60.5413(d)(12)(v)(J) requires pilot flame design fuel and calculated/measured pilot fuel usage during test, if pilot fuel is used. The schematics indicate propane fuel for pilot, but the cover page states "Not applicable." Please confirm if pilot fuel was used during the test.

**The pilot was not used during the testing of the EC48-2S unit.**

4. §60.5413(d)(12)(v)(N) requires that exit flow rate is measured. Please explain why the 30-70-30 exit flow rate is less than 0-30-0 exit flow rate.

**Please refer to the response provided to No. 4 for the EC36-2S unit.**

5. EPA Quality assurance guidance requires Field Test Data sheets be submitted. There are no field test data sheets for Method 4C. Please confirm that Method 4C data was collected electronically/data logger; otherwise, please provide the Method 4C field data sheets.

**Please see the attached documents for an explanation provided by Air Hygiene.**

Office of Compliance/Air Branch  
2227A WJCS  
U.S. Environmental Protection Agency  
202-564-7042





***PF2100 USER MANUAL***



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PF2100 MANUAL V2.32

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# 1 | INTRODUCTION

The PF2100 BMS (Burner Management System) is an electronic control and monitoring system designed for use on a wide array of natural draft burner industrial applications. It provides electronic pilot ignition, flame detection, temperature control, and remote monitoring. In addition to being an extremely useful tool, it improves safety by preventing the flame from being lit under unsafe conditions.

## 1.1 | Important Safety Information

Installation and use must conform to the directions in this manual.

System must be properly connected to earth-ground for effective operation of flame detection circuitry.

Electrical devices connected to the controller must meet certain electrical standards and be within voltage limits.

Replacement fuses must be ceramic and of correct rating.

Avoid unauthorized replacement of the fuse.

### **WARNINGS**

This equipment is suitable for use in class 1, division 2, groups abcd or non-hazardous locations only.

Do not service unless area is known to be non-hazardous.

Do not open when energized.

### **EXPLOSION HAZARD**

Do not disconnect while circuit is live unless area is known to be non-hazardous or equivalent.

Substitution of components may impair suitability for class 1, division 2.

### **FOR ANY QUESTIONS PLEASE VISIT OR CALL US.**

[www.profireenergy.com](http://www.profireenergy.com) | 1.855.PRO.FIRE



## 1.2 | HW & FW Versioning

This version of the manual was written for use with PF2100 systems that have the following hardware and firmware versions.

| ITEM          | HW VERSION | FW VERSION |
|---------------|------------|------------|
| Door Card     | v1.71      | E1.8.206   |
| Terminal Card | v2.2       | E1.8.206   |
| 4-20mA Card   | v3.0       | v4.1       |
| Modbus Card   | v2.0       | v4.3       |

System hardware and firmware versions can be found printed on separate labels inside of the enclosure on each circuit board.

## 1.3 | Approvals

CSA C22.2 No. 199, 3rd Edition  
ANSI Z21.20, 15th Edition  
UL 372, 6th Edition

Class I, Zone 2,  
AEx, nA IIC, T4, IP66  
Ex nA IIC T4 IP66



CSA C22.2 No. 0-M91  
CSA C22.2 No. 0.4-04  
CSA C22.2 No. 94-91  
CSA C22.2 No. 213-M1987  
CSA E60079-0:2007  
CSA C22.2 No. 60079-15:12  
ANSI-HSA-12.12.01-2007  
UL No. 60079-0, Ed. 6  
UL No. 60079-15, Ed. 4

## 1.4 | Available Models

The PF2100 is available in two configurations: Base Model and Internal Coil Model.

The Base Model is for use with externally mounted ignition coils. This is useful when the controller must be mounted more than 5m (15ft) away from the burner. An external ignition coil can be purchased separately from Profire for use with this model.

The Internal Coil Model includes a built-in ignition coil and can be used whenever the controller can be mounted less than 5m (15ft) away from the burner.

Optional expansion cards are also available:

- 4-20mA Expansion Card (1PS166)
- Modbus Expansion Card (1PS167)

BASE MODELS

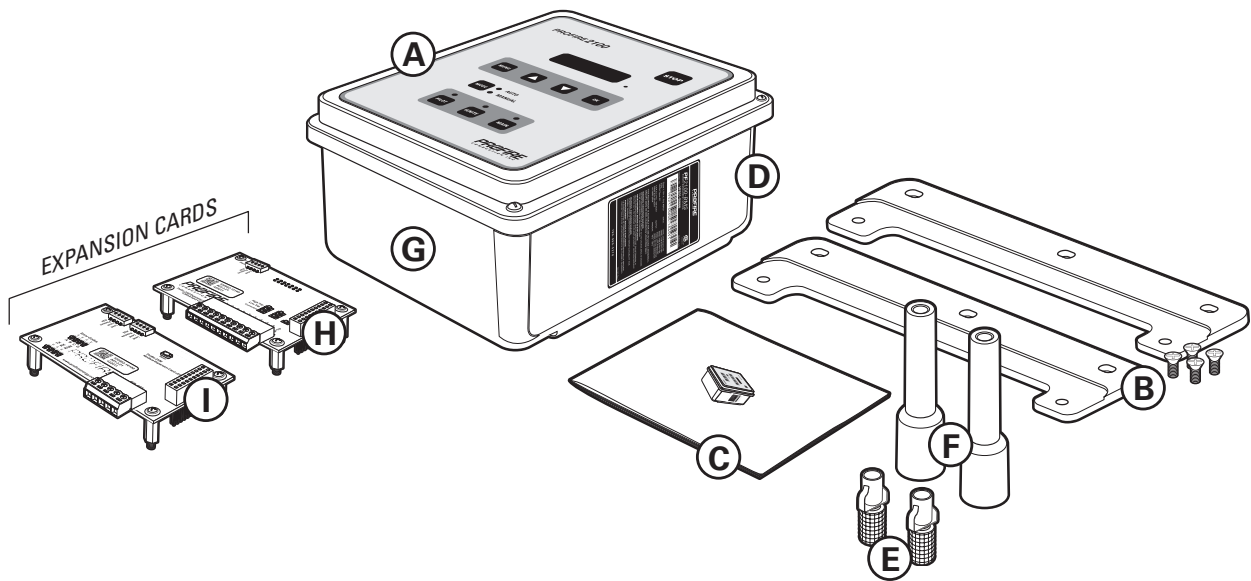
| MODEL # | MODEL DESCRIPTION                                               |
|---------|-----------------------------------------------------------------|
| E0000   | Base Model                                                      |
| E0400   | Base Model with 4-20mA Expansion Card                           |
| E0M00   | Base Model with Modbus Expansion Card                           |
| E04M0   | Base Model with 4-20mA Expansion Card and Modbus Expansion Card |

INTERNAL COIL MODELS

| MODEL # | MODEL DESCRIPTION                                                        |
|---------|--------------------------------------------------------------------------|
| EC000   | Internal Coil Model                                                      |
| EC400   | Internal Coil Model with 4-20mA Expansion Card                           |
| ECM00   | Internal Coil Model with Modbus Expansion Card                           |
| EC4M0   | Internal Coil Model with 4-20mA Expansion Card and Modbus Expansion Card |

1.5 | Included Components

| CODE | DESCRIPTION                 | E0000 | E0400 | E0M00 | E04M0 | EC000 | EC400 | ECM00 | EC4M0 |
|------|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| A    | PF2100                      | •     | •     | •     | •     | •     | •     | •     | •     |
| B    | Mounting Brackets & Screws  | •     | •     | •     | •     | •     | •     | •     | •     |
| C    | Installation Guide          | •     | •     | •     | •     | •     | •     | •     | •     |
| D    | Internal Coil               |       |       |       |       | •     | •     | •     | •     |
| E    | Ferrules (2)                |       |       |       |       | •     | •     | •     | •     |
| F    | Straight Silicone Boots (2) |       |       |       |       | •     | •     | •     | •     |
| G    | Ignition Cable (20ft)       |       |       |       |       | •     | •     | •     | •     |
| H    | 4-20mA Expansion Card       |       | •     |       | •     |       | •     |       | •     |
| I    | Modbus Expansion Card       |       |       | •     | •     |       |       | •     | •     |



## GENERAL FEATURES

- Designed for use with natural draft fire tube heaters
- Meets or exceeds all relevant codes and standards
- Easy installation with clearly marked component I/O
- Easily accessible removable terminal connections
- Rapid 3 second shut-down on flame-out
- Electronic spark ignition
- Low-power operating mode to accommodate solar panel or TEG applications
- Auto-relight or manual operation
- Transient protected and fail-safe circuits
- All solid state circuit components
- CSA compliant for Class I, Division 2 locations
- Certified for use on B.149 compliant valve trains
- Optional internal or external ignition coil

## INPUTS & OUTPUTS

- Digital inputs for safety interlock device connections (6)
- Digital outputs (5)
- 4-20mA output (1)
- Flame-rod input (1)
- Thermocouple inputs (3)

## TECHNICAL SPECIFICATIONS

| TEMPERATURE RATINGS | MIN           | MAX            |
|---------------------|---------------|----------------|
| Operating Range     | -40°C (-40°F) | +55°C (+130°F) |
| Storage Range       | -40°C (-40°F) | +80°C (176°F)  |

| POWER CONSUMPTION                | 12V         | 24V         |
|----------------------------------|-------------|-------------|
| Controller only, display ON      | 2.6 W       | 2.9 W       |
| Controller only, display OFF     | 1.1 W       | 1.2 W       |
| Maximum Total Current Draw       | 5A          | 5A          |
| Maximum Valve Current Draw       | 2A          | 2A          |
| Ignition Voltage (Internal Coil) | up to 20 kV | up to 40 kV |

| TERMINAL BLOCKS    | VALUE  |
|--------------------|--------|
| Maximum Wire Gauge | 12 AWG |

| STATUS CONTACT          | VALUE |
|-------------------------|-------|
| Type                    | Dry   |
| MAX Voltage             | 40VDC |
| MAX Continuous Current  | 250mA |
| Impedance (When Closed) | 15Ω   |

| PHYSICAL DIMENSIONS | VALUE              |
|---------------------|--------------------|
| Width               | 30.9 cm (12.15 in) |
| Height              | 23.4 cm (9.23 in)  |

| <b>PHYSICAL DIMENSIONS</b> | <b>VALUE</b>      |
|----------------------------|-------------------|
| Depth                      | 13.4 cm (5.28 in) |

| <b>WEIGHT</b> | <b>VALUE</b>   |
|---------------|----------------|
| E0000 Model   | 4.0lbs / 1.8kg |
| E0400 Model   | 4.5lbs / 2.0kg |
| E0M00 Model   | 4.5lbs / 2.0kg |
| EC000 Model   | 6.0lbs / 2.6kg |

| <b>FUSES</b>                    | <b>VALUE</b>                    |
|---------------------------------|---------------------------------|
| Main Fuse Rating                | 5A / 250 V Ceramic, Fast Blow   |
| Status Contact Fuse Rating      | 250mA / 125V Ceramic, Fast Blow |
| Replacement Main Fuse           | Littelfuse 0314005.HXP          |
| Replacement Status Contact Fuse | Littelfuse 0453.250 or 0451.250 |

## 1.6 | Common Applications & Optional Hardware

Below are examples of some of the many applications that the PF2100 can be used in.

|             |             |                     |
|-------------|-------------|---------------------|
| Line Heater | Tank Heater | Gas Production Unit |
| Dehydrator  | Separator   | Amine Reboiler      |
| Combustor   | Treater     | Thermal Oxidizer    |

Depending on your installation type, other components may be required. Commonly requested hardware includes:

### **Mounting Hardware**

Channel Bar  
Conduit Ports  
Liquid Tight Ports  
Rubber Grommets

### **Wire**

Ignition Wire  
Thermocouple Wire

### **Rods And Connectors**

Kanthal Ignition Rods (Various Lengths)

### **Valves**

DC Solenoids  
Safety Valves with Proof of Closure  
Proportional Valves





### **Thermocouples**

Single, Type K  
Dual Element, Type K

### **Pilot Assembly**

Nozzles  
Brackets  
Mixers  
Orifices

### **Autonomy**

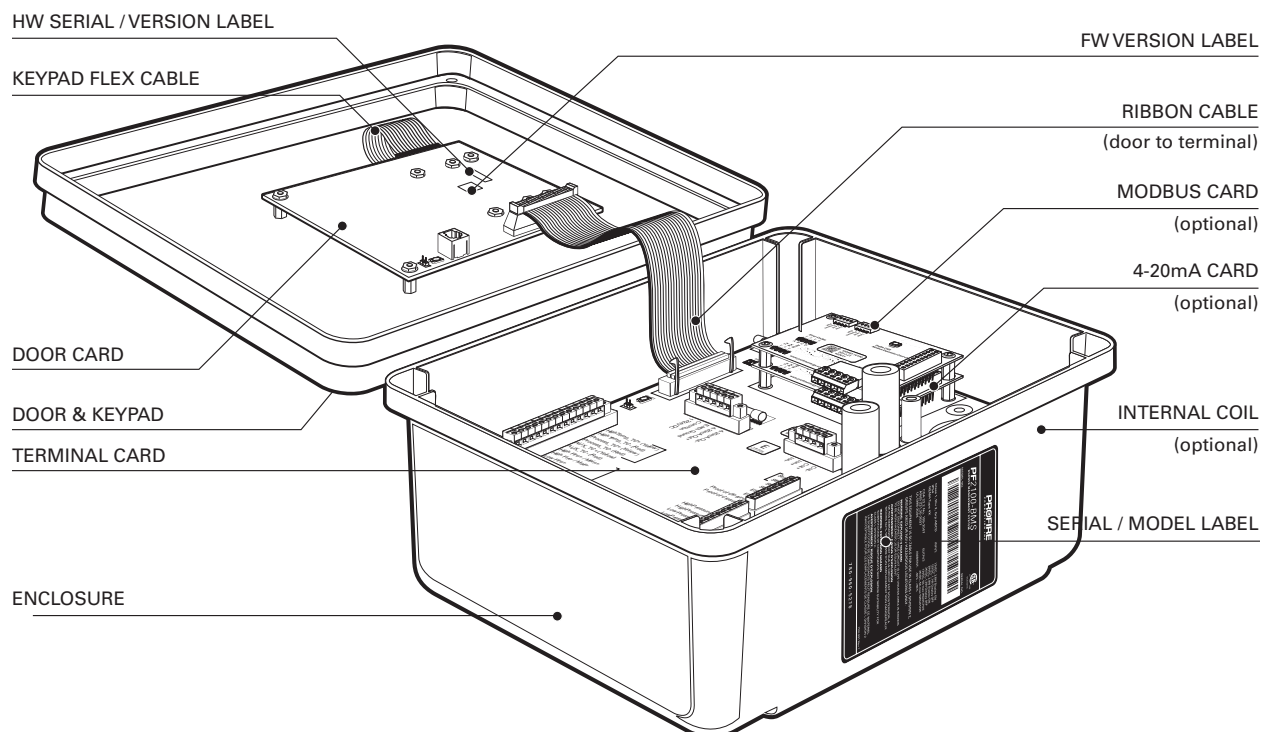
Batteries  
Solar Chargers  
Solar Panels

### **Accessories**

4-20mA Expansion Cards  
Modbus Expansion Cards  
External Ignition Coil

Please contact Profire Sales for further information.

## **1.7 | System Diagram**



## 1.8 | Terminal Card Descriptions

This table provides connection details and a brief description of each terminal.

| TERMINAL               | EXPECTED CONNECTIONS                                                                                            | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12/24VDC               | Input power from a DC source                                                                                    | Input power 10VDC- 28VDC, 5A MAX                                                                                                                                                                                                                                                                                                                                                          |
| Common                 | Ground back to DC source                                                                                        | Internally connected to EGND                                                                                                                                                                                                                                                                                                                                                              |
| EGND                   | Earth Ground                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                           |
| 4-20mA Out +           | Proportional Valve positive terminal or PLC 4-20mA positive input                                               | This output can be used for either Proportional Valve Control or echoing the Process Temperature to a PLC.                                                                                                                                                                                                                                                                                |
| 4-20mA Out -           | Ground return for the 4-20mA output                                                                             | A resistance of 120Ω to 250Ω is expected.                                                                                                                                                                                                                                                                                                                                                 |
| HighTemp_TC + (YELLOW) | High Temp Thermocouple positive lead                                                                            | "TYPE K" thermocouple must be connected between the "+" and "-" terminals and must not be electrically connected to ground.                                                                                                                                                                                                                                                               |
| HighTemp_TC - (RED)    | High Temp Thermocouple negative lead                                                                            |                                                                                                                                                                                                                                                                                                                                                                                           |
| Process_TC + (YELLOW)  | Process Thermocouple positive lead                                                                              | An uninterrupted connection using "TYPE K" thermocouple wire is required for an accurate reading.                                                                                                                                                                                                                                                                                         |
| Process_TC - (RED)     | Process Thermocouple negative lead                                                                              |                                                                                                                                                                                                                                                                                                                                                                                           |
| AUX_TC + (YELLOW)      | Aux Thermocouple positive lead                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                           |
| AUX_TC - (RED)         | Aux Thermocouple negative lead                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                           |
| High Fire/Main +       | High Fire / Main Valve positive terminal                                                                        | Solenoid valves must be connected between the "+" and "-" terminals. The negative terminal is not directly connected to ground so a common return wire for the High Fire, Low Fire and Pilot valves cannot be used.                                                                                                                                                                       |
| High Fire/Main -       | High Fire / Main Valve negative terminal. Do not connect to ground.                                             |                                                                                                                                                                                                                                                                                                                                                                                           |
| Low Fire +             | Low Fire Valve positive terminal                                                                                | Maximum continuous current is 2A. If Low Power mode is enabled, a peak load of 4A is permitted.                                                                                                                                                                                                                                                                                           |
| Low Fire -             | Low Fire Valve negative terminal. Do not connect to ground.                                                     |                                                                                                                                                                                                                                                                                                                                                                                           |
| Pilot +                | Pilot Valve positive terminal                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                           |
| Pilot -                | Pilot Valve negative terminal. Do not connect to ground.                                                        |                                                                                                                                                                                                                                                                                                                                                                                           |
| Ion +                  | Flame Detection positive input. Connect to flame rod or external coil Ion terminal (depending on configuration) | A Kanthal rod should be placed directly in the pilot flame and connected to this input. The pilot assembly must be grounded for the flame detection to function properly. Input is protected from high voltage and can be connected in series with the high voltage terminals of an external ignition coil, allowing a single flame rod to be used for both ignition and flame detection. |
|                        |                                                                                                                 | A 65VAC signal is applied to the flame rod. The source impedance is very high so there is no danger of sparking.                                                                                                                                                                                                                                                                          |
| Ion -                  | Flame Detection negative input. Connect to ground screw on pilot assembly or burner housing.                    | Ground return for flame detection.                                                                                                                                                                                                                                                                                                                                                        |
| Coil +                 | Driver for the low voltage primary of the ignition coil.                                                        | The primary of the ignition coil should be connected to this terminal. The 12/24VDC input power will be applied for 1 ms and turned off for 50 ms while sparking.                                                                                                                                                                                                                         |
| Coil -                 | Ground return for the ignition coil.                                                                            |                                                                                                                                                                                                                                                                                                                                                                                           |
|                        |                                                                                                                 | This output is protected by a 250mA thermal fuse.                                                                                                                                                                                                                                                                                                                                         |



| TERMINAL           | EXPECTED CONNECTIONS                                         | DESCRIPTION                                                                                                                                                                                                                                                                                                     |
|--------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status +           | Connect to PLC positive input contact or other alarm device. | The status "+" and "-" contacts will be closed when the system is running and opened when the system is shutdown. Dry contact output to indicate system status to an external device. ie. PLC. Note that the contacts are DC only and are not internally connected to power or ground.<br><br>40VDC, 250mA, 15Ω |
| Status -           | Connect to PLC negative input contact or other alarm device. |                                                                                                                                                                                                                                                                                                                 |
| Start +            | Remote start input from an external device. ie. PLC.         | Dry contact switch is expected. The input is internally pulled up to 9VDC via a 3.75kΩ resistance. Jumper "+" and "-" if not used.                                                                                                                                                                              |
| Start -            | Ground                                                       |                                                                                                                                                                                                                                                                                                                 |
| ESD +              | External Shutdown input, typically plant ESD loop.           | All input contacts can use a single common ground return if desired.                                                                                                                                                                                                                                            |
| ESD -              | Ground                                                       |                                                                                                                                                                                                                                                                                                                 |
| Proof of Closure + | Proof of Closure from main valve(s).                         |                                                                                                                                                                                                                                                                                                                 |
| Proof of Closure - | Ground                                                       |                                                                                                                                                                                                                                                                                                                 |
| High Pressure +    | Input from a mechanical High Pressure switch.                |                                                                                                                                                                                                                                                                                                                 |
| High Pressure -    | Ground                                                       |                                                                                                                                                                                                                                                                                                                 |
| Low Pressure +     | Input from a mechanical Low Pressure switch.                 |                                                                                                                                                                                                                                                                                                                 |
| Low Pressure -     | Ground                                                       |                                                                                                                                                                                                                                                                                                                 |
| Level +            | Input from a float-switch mounted in the bath.               | Dry contact switch is expected. The input is internally pulled up to 9VDC via a 3.75kΩ resistance. Jumper "+" and "-" if not used.<br><br>All input contacts can use a single common ground return if desired.                                                                                                  |
| Level -            | Ground                                                       |                                                                                                                                                                                                                                                                                                                 |

## 2 | INSTALLATION

The PF2100 can be used with many different systems. Before you begin installation, identify which system the BMS will be used to control. In addition to this document, Profire has an Installation Guide and several installation specific Whitepapers available describing common scenarios. These can be found at [www.profireenergy.com](http://www.profireenergy.com).

The steps provided here are general and can help you to identify questions that need to be answered to complete the installation process. If you are new to the PF2100, you should read this whole section and follow the instructions closely.

### Steps

1. Review all installation warnings
2. Install the system
3. Connect the required wiring including Power, Valves, Thermocouples, and Ignition Coil / Flame Detection wiring
4. Connect any additional wiring as required for your specific application. Commonly used lines include the Status Contact, Dry Contact Inputs, 4-20mA Temperature Output, and Expansion Cards

To know which options are required, you should consult the engineer or technician who designed the site. You should also be familiar with the local electrical and gas code for the site.

### 2.1 | Installation Warnings

Before installing the PF2100, please review the following list of warnings. Failure to consider these warnings may result in death, electrocution, property damage, product damage, and/or government fines.

1. The PF2100 is not intended for use on burners greater than 12.5 MMBtuh. It is against code in many locations.
2. To use the PF2100 on burners greater than 5 MMBtuh, it is recommended that the low fire feature with two safety shutoff valves be used. At least one of these valves should use Proof of Closure. This is required in many locations.
3. Failure to properly ground the pilot assembly back to the PF2100's Ion terminal may result in accidental electrocution, product damage, or simply failure to ignite the pilot.
4. The PF2100 generates 20kV- 40kV at its high voltage output terminal which can cause cardiac arrest. Do not touch or place any object near the ignition coil's high voltage terminal or connected ignition wire while the product is operating. Even without making physical contact with the terminal, it is possible to draw a spark from several inches away, especially if the pilot bracket is not properly grounded.
5. Never leave the PF2100 running unattended without the door screws securely tightened down. This is to prevent moisture from getting inside of the enclosure and damaging

the product. Moisture damage to the internal circuitry is not covered by the product warranty if the door has been left open.

6. All conduit ports drilled into the PF2100 enclosure must be CSA/NEMA Type 4 rated and be sealed in order to maintain the Type 4 rating.

## 2.2 | Mounting Considerations

The PF2100 is typically mounted near the burner it is controlling or in another location that is both safe and easily accessible. The recommended mounting height is 1.5m (5ft) above the ground or platform for the comfort of the operators.

### PLEASE CONSIDER THE FOLLOWING WHEN CHOOSING AN INSTALL LOCATION:

#### **Accessibility**

The system should be easily accessible so that the operator can change settings and observe its operation. It is preferable that the system be mounted facing away from the sun to make it easier to read the display and LED indicators on the front panel.

#### **Security**

In some situations, it may be desirable to mount the system in a location not accessible to the general public to prevent accidental or intentional tampering.

#### **Operator Safety**

Avoid placing the system in locations that are dangerous to the operator. Examine the area surrounding the potential installation site and look for such things as nearby open flames or close proximity to tanks that might overflow, and other harmful situations.

#### **Performance**

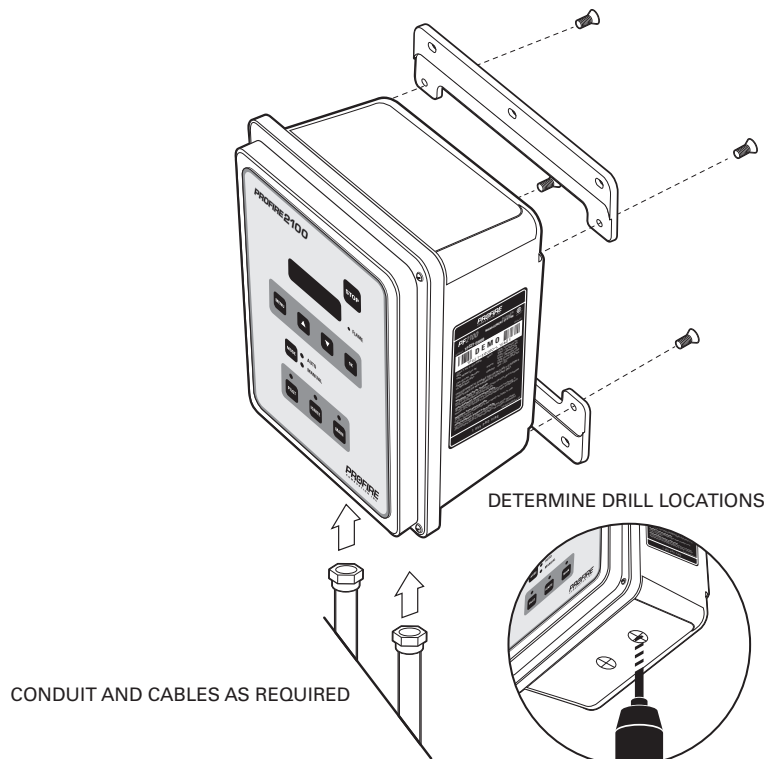
Choose a mounting location that allows ground and ignition wires to be kept as short as possible. This ensures the best ignition and flame detection.

#### **Product Protection**

To protect the system from being damaged, it should not be mounted:

1. Where chemicals may splatter or bubble over from a tank onto the system. Chemicals on the keypad may interfere with an operator's ability to control the product or view the display and LED indicators.
2. Directly to a heated tank where excessive heat may damage the product. Refer to the maximum operating temperature listed in this document.
3. On anything that may tip over due to wind or snow. Some examples include poles not set properly into the ground or tripods not secured with anchor bolts or guy wires.
4. In locations that may be prone to flooding.

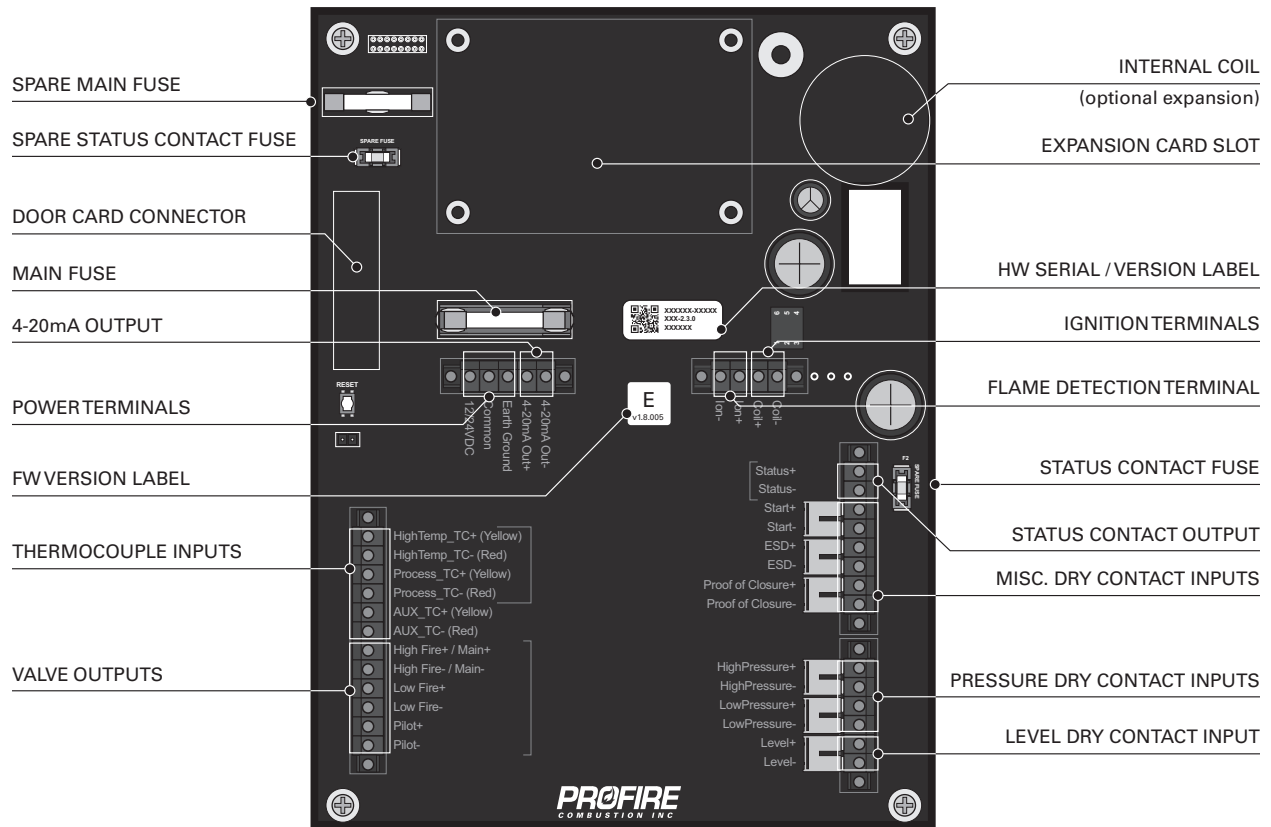
## CONDUIT AND CABLE CONSIDERATIONS



## MOUNTING INSTRUCTIONS

1. Remove the included bag of components taped to the mounting brackets.
2. Attach the two mounting brackets to the back of the PF2100 enclosure using the 4 provided screws.
3. Determine the best location to drill holes in the product enclosure for the wires to enter. It is recommended that these holes be drilled on the bottom of the enclosure (as shown).
4. Install grommets or conduit ports as required.
5. Securely mount the enclosure to a pole, structure or building as indicated by the site engineer or technician.

## 2.3 | Terminal Card Diagram



## 2.4 | Wiring

The wiring precautions in this section are important for all PF2100 installations. Please set up your installations accordingly.

NOTE: If you have not wired a PF2100 system, please refer to the PF 2100 Install Guide for detailed wiring instructions. Skipping or performing any steps in the guide incorrectly can result in the PF2100 not functioning properly.

### POWER

The PF2100 can be powered from 12VDC or 24VDC. The maximum current that the PF2100 can safely handle without blowing the main fuse is 5A. The system on its own draws about 100mA. The rest of the current is used by additional hardware such as valves. Make sure that you select a power supply that is rated appropriately for the total amount of current that will be consumed by all devices attached to it.

## VALVES

There are four valve control outputs on the PF2100: Pilot, Low Fire, 4-20mA Output, and High Fire/Main. Ensure that each valve has a separate return wire. Multiple valves sharing common return wires will not function properly.

### Pilot Valve

The Pilot valve is required and must be wired for all installations.

### Low Fire Valve

The Low Fire valve may also be required by local code or for proper operation of your particular application. Low Fire is often used on high Btuh burners (burners that exceed 5 MM Btuh) to establish a draft before opening the High Fire valve. Failure to do this on high Btuh burners can cause the burner to starve itself of oxygen which puts out the flame.

### 4-20mA Output

The 4-20mA Output can be used to control a proportional valve designed for a 4-20mA current loop. Using a proportional valve allows for finer control of the burner's temperature as opposed to the 2 or 3 levels possible with normal valves. Typically the 4-20mA Output is used in conjunction with a normal valve. The 4-20mA Output also supports low fire.

### High Fire/Main Valve

The High Fire valve is required and must be wired for all installations. This valve is sometimes called the Main Valve, especially when Low Fire is not used.

NOTE: It is possible to connect multiple valves to the same control output in parallel or series. If you do this, be sure that the configuration you are using meets local codes and does not exceed the total current rating of the PF2100.

NOTE: The negative valve control wires are NOT connected directly to ground. Therefore, you cannot use a common return wire for all valves.

## THERMOCOUPLES

The High Temp and Process thermocouple inputs are mandatory and must be connected to a Dual Element thermocouple. The Auxiliary thermocouple is only needed when a second process temperature (such as the outlet temperature on a line heater) must be monitored. Otherwise, the Auxiliary thermocouple terminals can be left unconnected.

All thermocouples are cold junction compensated. For this reason, it is important to make sure that Type-k thermocouple wire and connectors are used exclusively. The temperature compensation is done using an ambient temperature sensor located on the terminal card near the thermocouple terminals.

### Process Thermocouple

This thermocouple is normally used on the primary temperature control device. The system shuts down if an open circuit is detected on this thermocouple. It should be placed in the same thermowell as the High Temp thermocouple using a dual element thermocouple.

### High Temperature Thermocouple

This thermocouple is used for the high-temp shutdown. The system shuts down if an open circuit, short-circuit or short-to-ground is detected on this thermocouple. It should be placed in the same thermowell as the Process thermocouple using a dual element thermocouple.





### **AUX Thermocouple**

This thermocouple is optional and can be enabled in menu 5. It can be used to monitor stack temperature or to control a secondary process temperature. The system shuts down if an open circuit is detected and the AUX thermocouple is enabled.

### **All Thermocouples Must Be:**

Isolated from ground

Isolated from power

Type-k thermocouples

Connected with 20 AWG or larger Type-k extension wire

Placed a safe distance from high voltage lines and shielded when necessary

## **STATUS CONTACT**

The status contact is a dry contact output containing a solid state relay. It acts as a switch that the PF2100 controls. Neither contact is internally connected to power or ground so these connections must be provided externally as required. When the system is running, the contacts are internally connected together and when the system is not running, the contacts are open circuited. These contacts are often used for monitoring the PF2100's status remotely. An alarm, siren, trouble lamp, or PLC are examples of devices that might use this contact.

THE STATUS CONTACTS ARE RATED FOR DC ONLY so it is important to observe the correct polarity when attaching a device. The positive status contact terminal should always be at a voltage potential greater than or equal to the negative terminal. Do not exceed the voltage and current ratings which are 40VDC, 250mA. The impedance when closed is 15Ω. There is a fuse on the status contact to protect it. A spare fuse is also included.

## **DRY CONTACT INPUTS**

There are 6 dry contact inputs on the PF2100. The expected connection to each of these is a switch. These contacts must all be closed (shorted) in order for the system to start. Jumpers are provided for each of these by default. If you need to use a particular contact for your application, simply remove the associated jumper and connect a switch in its place.

### **Start Contact**

The Start Contact can be used to attach a remote start/stop switch. This is often connected to a PLC dry contact output. When the contact is open, the system is stopped. For safety reasons, a double action is required to start the system remotely via this contact. This is accomplished by closing the switch, opening it, and then closing it again. Once the system is running, open the switch again to stop it.

### **ESD Contact**

The ESD Contact can be used to attach an emergency shutdown switch. This is often connected to a mushroom switch mounted on a remote panel or to a PLC dry contact output. When the contact is open, the system is stopped. The system cannot be started via this contact but this contact must be closed in order to start the system.

### **Proof of Closure Contact**

The Proof of Closure Contact can be used to receive the feedback signal from a Main Valve that has a Proof of Closure output. If multiple main valves with Proof of Closure outputs are used, these can be wired together in series. Before the system attempts to light the pilot, it

will check that the Proof of Closure Contact is closed. If it is open, it will not light the pilot.

### **High Pressure Contact**

The High Pressure Contact can be connected to a High Pressure Switch installed in the fuel train. Typically, this switch is placed immediately after the Main valve in the fuel train. When the system initially starts, it ignores this input. It lights the pilot and opens the main valve as normal. If the High Pressure Contact is open after the mains are turned on, the system shuts down. See the [4-20mA Expansion Card](#) section for more details.

### **Low Pressure Contact**

The Low Pressure Contact can be connected to a Low Pressure Switch installed in the fuel train. Typically, this switch is placed immediately before the Main valve in the fuel train. The Low Pressure Contact operates using averaged time to help reject brief fluctuations in gas pressure. The contact must be open continuously for 2 or 6 seconds (depending on the "Pressure/Level Delay" setting) before the system will shut down. If "Auto Restart" is enabled, the system restarts automatically when the Low Pressure Contact re-closes. See the [4-20mA Expansion Card](#) section for more details.

## **IGNITION COIL / FLAME DETECTION**

This section provides some tips to set up the system for reliable ignition and flame detection.

### **Internal vs. External Coil**

If less than 5m (15ft) of ignition wire is required to connect the PF2100 to the burner housing, the internal coil configuration can be used. Otherwise the external coil configuration must be used.

The PF2100 system is available with an internal coil or an external coil can be purchased with or without a separate enclosure.

### **Wire Lengths**

When wiring the ignition and flame detection circuits, the wire length must be carefully considered. If the wire lengths are too long, the PF2100 may not be able to deliver enough energy to the ignition rod to ignite the pilot. The PF2100 may also fail to receive a signal from the flame rod for detecting flame.

### **Grounding**

Properly grounding the pilot assembly back to the PF2100 is critical for proper ignition and flame detection. A ground wire should run from the Ion- or EGND terminal of the PF2100 to the pilot assembly. This wire can either be connected to a ground screw on the pilot bracket or to the burner housing. If connected to the burner housing, use a multimeter to verify that the burner housing has electrical continuity with the pilot assembly. If not, another wire must be added to connect it.

### **Single Rod vs. Dual Rod**

A single Kanthal rod can be used for both ignition and flame detection to save cost if desired. This often results in a performance trade-off between ignition and flame detection. This option is only available with external coils.

Using two Kanthal rods (one for ignition and one for flame detection) allows for greater flexibility in rod placement and often yields better performance.

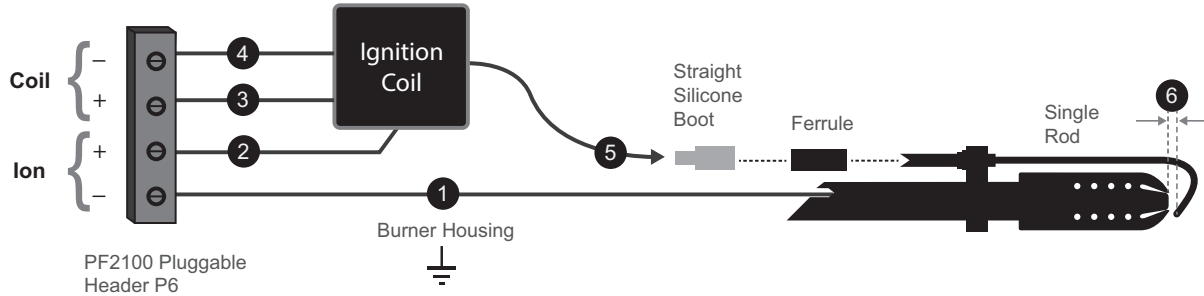


Note that there are three possible ways to wire the ignition coil and flame detection circuit with the PF2100 as illustrated in the table.

| CONFIGURATION (COIL TYPE) | SINGLE ROD | DUAL ROD |
|---------------------------|------------|----------|
| Internal Coil             |            | •        |
| External Coil             | •          | •        |

### Single Rod Coil Wiring

Use this configuration when you want to save cost by using a single rod.

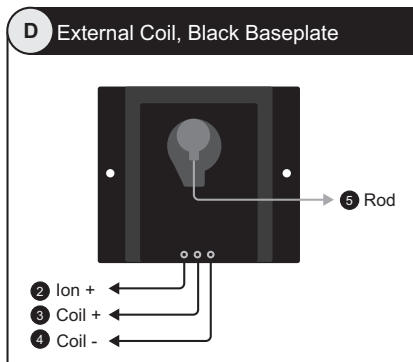
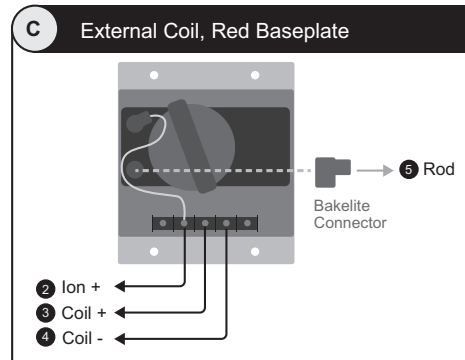
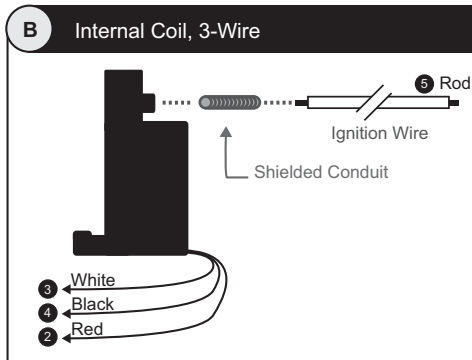


#### Compatible Ignition Coils:

B = Internal Coil, 3-Wire

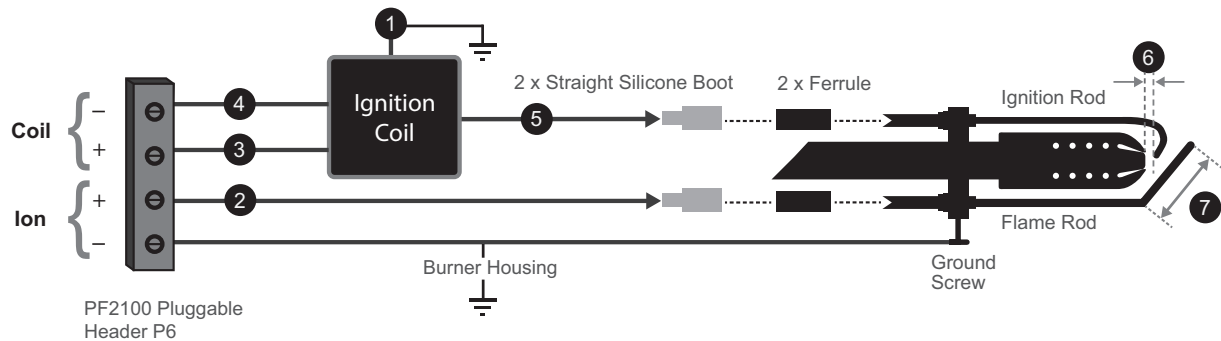
C = External Coil, Red Baseplate

D = External Coil, Black Baseplate

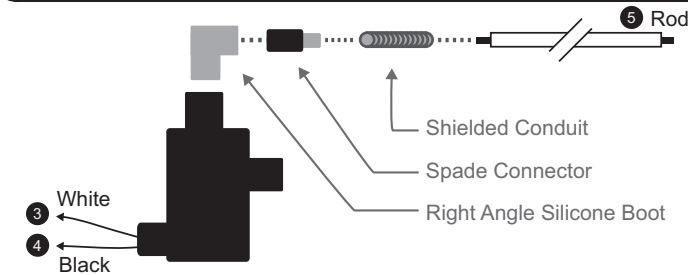


## Dual Rod Coil Wiring

Use this configuration when you want greater flexibility for rod placement.



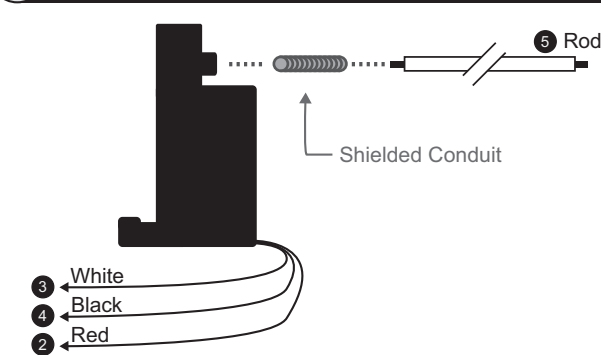
### A Internal Coil, 2-Wire



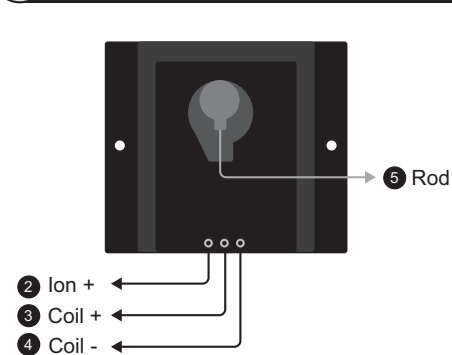
### Compatible Ignition Coils:

- A = Internal Coil, 2-Wire
- B = Internal Coil, 3-Wire
- C = External Coil, Red Baseplate
- D = External Coil, Black Baseplate
- E = XFR Coil

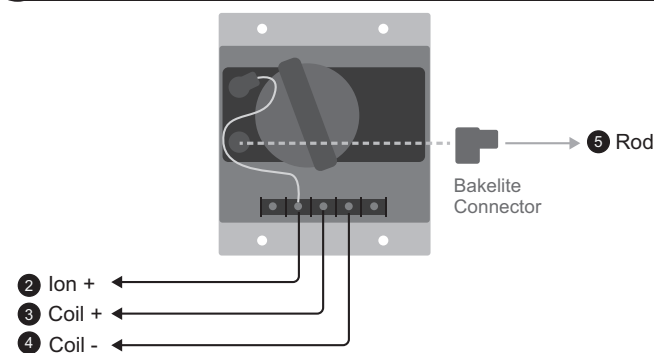
### B Internal Coil, 3-Wire



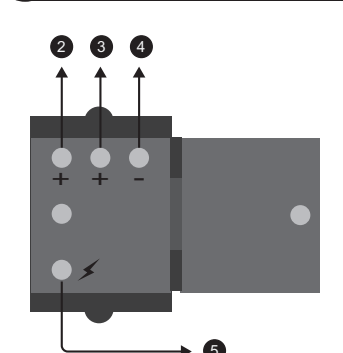
### D External Coil, Black Baseplate



### C External Coil, Red Baseplate



### E XFR Coil



### **Rod Positioning**

Rod positioning is important for proper ignition and flame detection. The ignition rod should be positioned (by bending it if necessary) so that there is a  $\frac{1}{8}$ " to  $\frac{1}{4}$ " gap between it and the front of the pilot nozzle. The flame rod should be positioned (by bending it if necessary) such that 2" to 3" of its length is within the pilot flame. Make sure the ignition rod and flame rod are not directly in line with each other. Otherwise, the ignition rod may cast a shadow on the flame rod and cause the system to determine that no flame is present at the flame rod.

### **Flame Anchoring**

Flame anchoring refers to how much in contact the flame is with the pilot nozzle. Poor flame anchoring causes poor flame detection. Poor flame anchoring can be caused when there is too much gas pressure resulting in the flame burning primarily outside of the nozzle as opposed to along the inside and outside surfaces of the nozzle. It can also be caused by wind or draft from the main burner.

### **Using Extra Rods to Improve Flame Detection**

In some challenging installations such as non-enclosed or high velocity burners, adding one or two additional rods may be necessary. A second flame detection rod can help in cases where the flame may blow away from the primary rod from time-to-time. The addition of a ground rod positioned further away from the nozzle tip can assist with detecting flames that are not well anchored.

## 3 | USER INTERFACE & SETTINGS

The user interface has keys, indicator lights, and a display screen for the software interface (including things such as menus and status screens).

### 3.1 | User Interface

The physical interface consists of three parts:

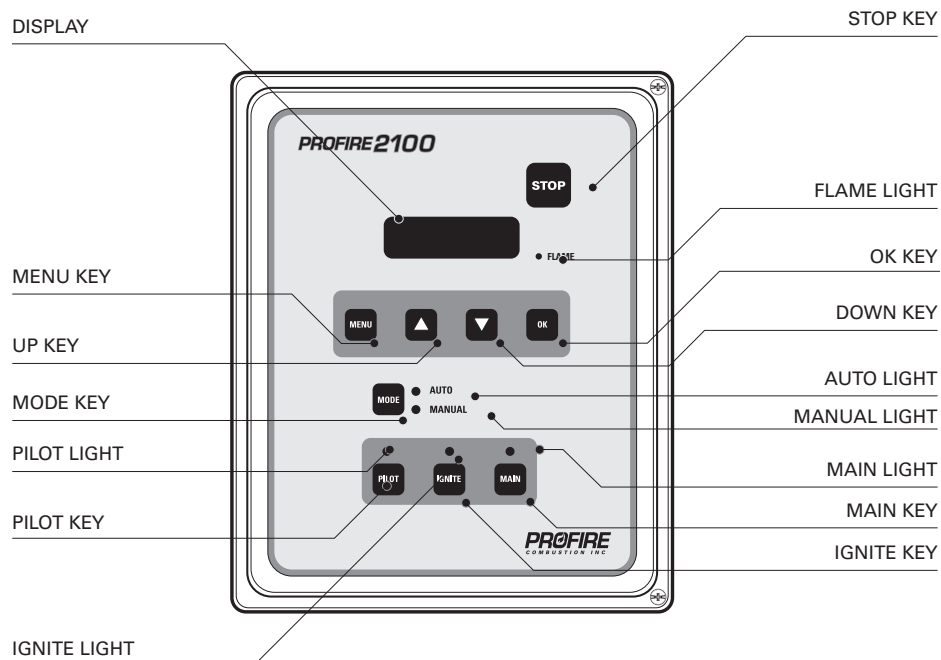
1. An illuminated display
2. Indicator lights
3. A keypad

#### DISPLAY

The screen on the PF2100 displays two lines of text which are used to show system status, warnings, alarms, prompts, and menus. It is illuminated for ease of reading in both bright sunlight and darkness.

When the system first powers on, the display will show the system name and firmware version for a few seconds, after this it will show the Home Screen.

#### KEYPAD DIAGRAM



## INDICATOR LIGHTS

### **Flame Light**

Indicates that the system is detecting the pilot flame.

### **Auto Light**

Indicates that the system is running in auto mode.

### **Manual Light**

Indicates that the system is running in manual mode.

### **Pilot Light**

Indicates that the pilot valve is open.

### **Ignite Light**

Indicates that the system is sparking to ignite the pilot.

### **Main Light**

Indicates that the main valve is open.

## KEYS

### **Stop Key**

Used to stop the system immediately or in other words, turn off the burner.

### **Menu Key**

Used to navigate through the menu.

### **Up Key**

Used to adjust a setting upwards and to scroll up through lists.

### **Down Key**

Used to adjust a setting downwards and to scroll down through lists.

### **OK Key**

Used to enter a menu, acknowledge a prompt, save an edited setting, or return to the home screen.

### **Mode Key**

Used to toggle between Manual and Auto modes of operation.

### **Pilot Key**

Used in Manual Mode to test the Pilot Valve.

### **Ignite Key**

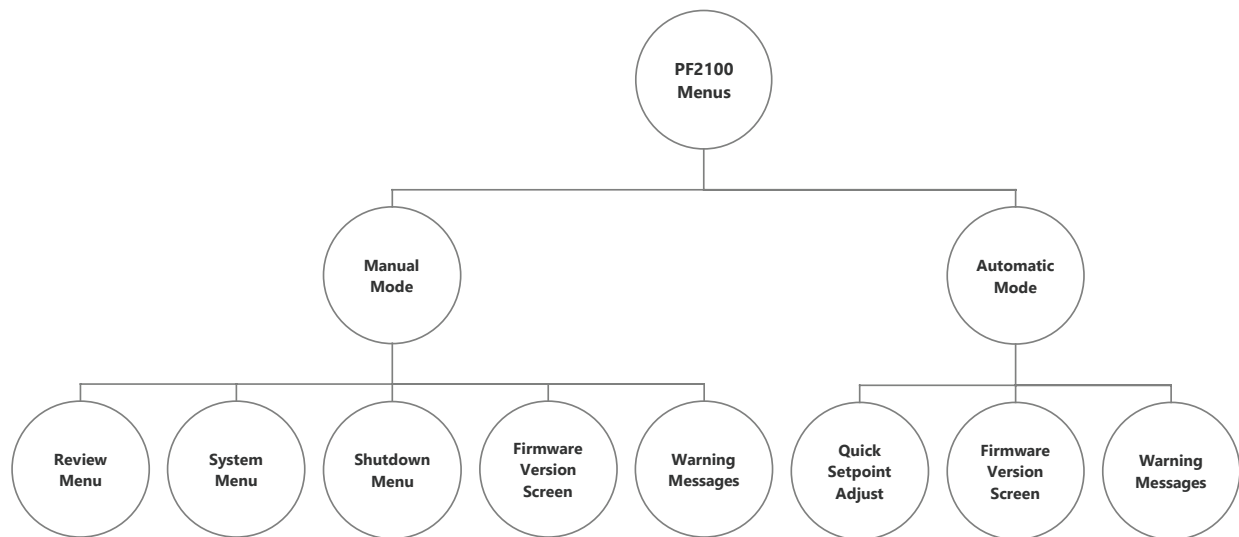
Used in Manual Mode to test the Ignition Circuit.

### **Main Key**

Used in Manual Mode to test the Main Valve.

## 3.2 | Menu Navigation

The software user interface is shown on the PF2100 display. While the system is powered, the state of the system is displayed on the screen. The user can also change settings via this interface. Below is a diagram showing the various types of information that can be accessed through the interface. The default system screen at startup and when idling is the Home Screen. Most items are accessed through the Home Screen but some can be accessed from anywhere in the interface.



Certain settings can be viewed only in Manual Mode or only in Auto Mode.

### MANUAL VS. AUTO MODE

When the system first powers on, it will normally be in Manual Mode. If the Auto Restart feature is enabled and no alarm conditions are present, it may switch automatically to Auto Mode after power up. Otherwise, the user must manually put the system into Auto Mode by using the Keypad, the Start Contact, or the Modbus Expansion Card. See the [System Start Up](#) section for more details.

The main difference between these two modes is that all settings can be adjusted in Manual Mode and a limited number of settings can be adjusted in Auto Mode. The following table illustrates the differences in menu access.

| ITEM                                                                                           | MANUAL MODE | AUTO MODE                 |
|------------------------------------------------------------------------------------------------|-------------|---------------------------|
| User Can View and Adjust Menu Settings                                                         | Yes*        | via Quick Setpoint Adjust |
| User Can Access the Review Menu                                                                | Yes         | No                        |
| Process Control Can Be Running                                                                 | Yes         | Yes                       |
| System will try to Relight the Burner if the Pilot is Turned Off Due to Normal Process Control | Yes         | Yes                       |
| System State Shown on the Home Screen                                                          | Always      | During State Change       |
| System will Attempt to Relight the Burner if the Flame Goes Out Unexpectedly                   | No          | Yes                       |
| Process Setpoint can be Easily Adjusted via the "Quick Setpoint Adjust" feature                | No          | Yes                       |
| The System can be Controlled Manually via the Pilot, Ignite, and Main keys                     | Yes         | No                        |
| Manual Indicator Light On                                                                      | Yes         | No                        |
| Auto Indicator Light On                                                                        | No          | Yes                       |

\*Menus 1-3 only when process control is running, all menus when stopped.





## HOME SCREEN

The Home Screen is shown on the display after power up, after waking the display from sleep, and after the user acknowledges a shutdown message. It is the starting point for most user interaction with the menu system. To return to the Home Screen from any point in the user interface, the user can press and hold the “OK” key for three seconds.

On the Home Screen, the Process Temperature is always shown on the bottom line of the display. The top line differs depending on mode. In Manual Mode, the top line shows the system state. In Auto Mode, it shows the Process Setpoint instead.

The accessibility of other features from the Home Screen also differs depending on mode. For example, the System Menus and Review Menu are only accessible in Manual Mode whereas the Quick Setpoint Adjust feature is only available in Auto Mode. For more information on which features are available in which modes, refer to the [Adjust Settings & Review Status](#) section.

## AVAILABLE FEATURES WITHIN OPERATIONAL MODES

| MODE   | DISPLAY                                 | MENUS | REVIEW | SETPOINT ADJUST |
|--------|-----------------------------------------|-------|--------|-----------------|
| Manual | System State<br>Process Temperature     | Yes   | Yes    | No              |
| Auto   | Process Setpoint<br>Process Temperature | No    | No     | Yes             |

## SYSTEM STATE

The System State is the Process Control State of the system. It is shown on the display for a few seconds before and after a state change. In Manual Mode, the top line of the Home Screen always shows the System State. Go to the [Process Control Settings](#) section for a complete list of the Process Control States.

## QUICK SETPOINT ADJUSTMENT

The Quick Setpoint Adjust feature is only available on the Home Screen while running in Auto Mode. It allows the user to quickly adjust the Process Setpoint using the up and down keys. The change takes effect immediately and does not need to be saved by pressing ok. If password protection is enabled, a password will need to be entered before this feature can be used. If the Pilot Off and/or Low Fire Setpoints are enabled, this feature will also adjust them. In this case, each press of the up or down key will adjust all of these setpoints by 1 degree up or down. All other setpoints are not affected by this feature.

## SYSTEM MENUS

The System Menus store all of the system settings in an organized fashion. These menus are also used to show historical and system status information as well as to provide access to calibration features. These menus cannot be accessed while the system is running in Auto Mode. Some menus can only be accessed while the system is stopped. Some menus require a Level 2 password and others require an optional Level 1 password.

## REVIEW MENU

The Review Menu provides a quick way for an operator to check key setpoints and system status (accessible only in Manual Mode).

## FIRMWARE VERSION SCREEN

The Firmware Version Screen shows the firmware version of all cards in the system including the Door Card, Terminal Card, and any installed Expansion Cards.

## WARNING MESSAGES

When the system detects a warning condition, it will flash a warning message across the bottom line of the Home Screen. Some messages can be dismissed by pressing the OK key (eg, "Unit restarted from LVL event"). Others persist until the warning condition is resolved (eg, "LO Volt Warning").

## SHUTDOWN SCREEN

When the system shuts down as a result of an alarm condition, it will flash the word "SHUTDOWN" in large text on the display alternately with a more detailed message explaining the reason that the system shut down. The Shutdown Screen can always be dismissed by pressing "OK," toggling the Start Contact, or sending the Start Command via Modbus.

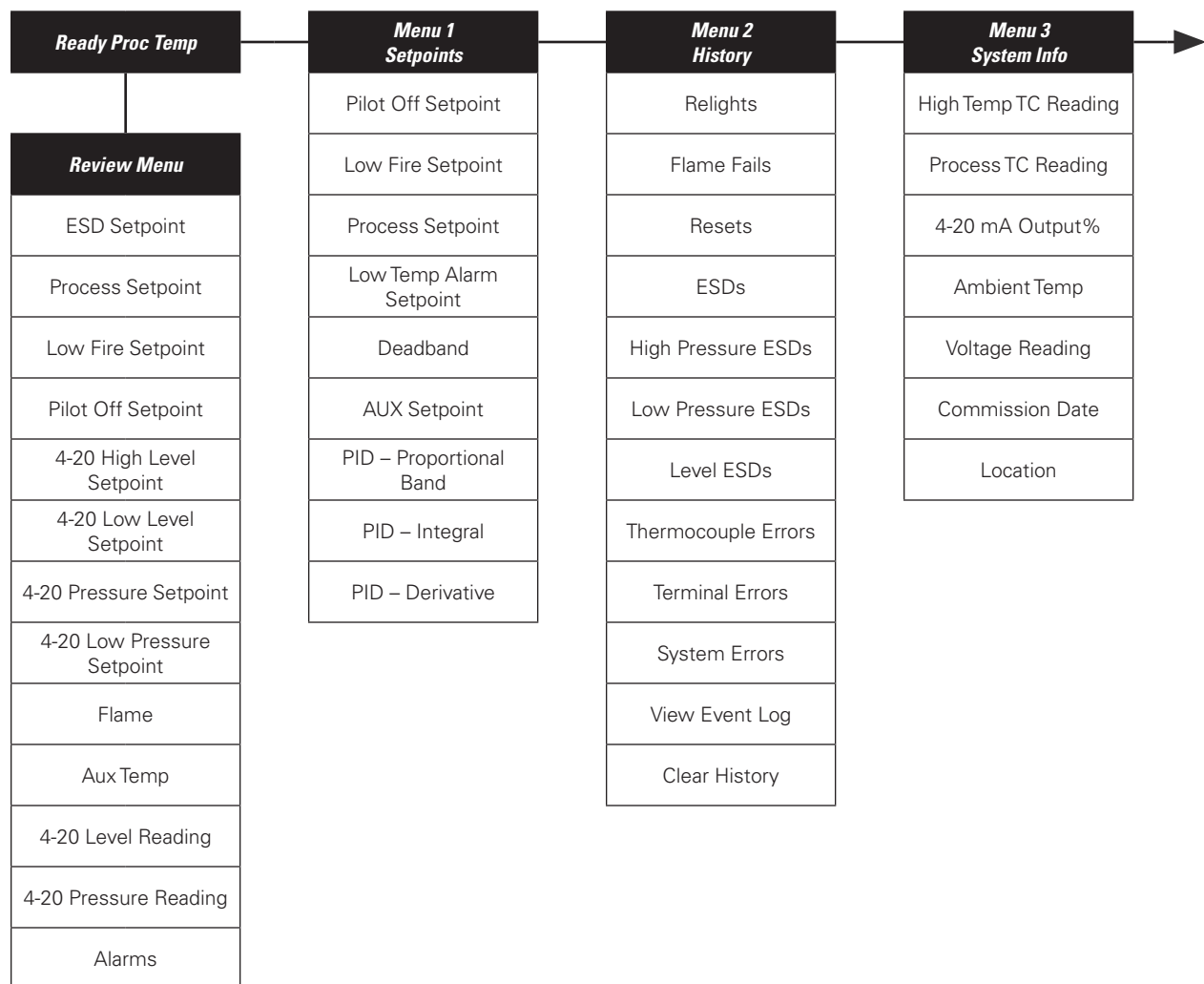
# 3.3 | Menu Map

For a complete description of each item, please refer to the menu definitions section. The debug functions are not shown here; if needed they are located in the [Field Calibration](#) section of the manual.

## NAVIGATION

1. Press MENU until you get to the desired menu.  
(The Review menu is accessible by pushing the Down arrow.)
2. Press OK to select an option.
3. Press MENU until you get to the submenu option you want to change/view.
4. Press  $\triangle$  or  $\nabla$  to adjust the selected setting.
5. Press OK to set the new value.
6. Press MENU to cancel changes.
7. Press OK to exit to the home screen.





| <b>Menu 4<br/>System Startup</b> | <b>Menu 5<br/>Control Setup</b> | <b>Menu 6<br/>Expansion Cards</b> |
|----------------------------------|---------------------------------|-----------------------------------|
| Auto Restart                     | High Temp ESD Setpoint          | 4-20 Expansion Card Enable        |
| Purge Time                       | Process Control In-put          | 4-20 Level Low Setpoint           |
| Pilot to Main Delay              | Low Fire Enable                 | 4-20 Level High Setpoint          |
| Restart Attempts                 | Low to High Fire Delay          | 4-20 Level Range                  |
| Level Event Restart              | Pilot off Enable                | 4-20 Level Units                  |
| Pressure/Level Delay             | AUX Temp Mode                   | 4-20 Pressure Low Setpoint        |
| Alarm Mode                       | 4-20 Output Mode                | 4-20 Pressure High Setpoint       |
| Password Enable                  | 4-20 Low Fire Setting           | 4-20 Pressure Range               |
| Display Sleep                    | 4-20 Gain Setting               | 4-20 Pressure Units               |
| Pilot Valve Power Setting        |                                 | MODBUS Enable/Address             |
| Main Valve Power Setting         |                                 | 4-20 Card FW Version              |
| System Voltage Setting           |                                 | MODBUS Card FW Version            |
| Temperature Display Units        |                                 |                                   |
| Commission Date Entry            |                                 |                                   |
| Commission Location Entry        |                                 |                                   |
| Rest to Factory Defaults         |                                 |                                   |



## SETPOINTS (MENU 1)

This menu is used to adjust the Process Control Setpoints.

| MENU MAP                | ON SCREEN             | BRIEF DESCRIPTION                                                                                                                                | RANGE                                    | DEFAULT SETTING       |
|-------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------|
| Pilot Off Setpoint      | Pilot Off Setpnt      | Adjusts the temperature at which the Pilot Valve will turn off when Pilot Off is enabled.                                                        | 1 to 1349°C<br>34 to 2460°F              | 85°C<br>185°F         |
| Low Fire Setpoint       | Low Fire Setpnt       | Adjusts the temperature at which the Low Fire Valve will turn off when Low Fire is enabled.                                                      | 2 to 1349°C<br>36 to 2460°F              | Hidden, 85°C<br>185°F |
| Process Setpoint        | Proc Setpnt           | Adjusts the temperature at which the High Fire/Main Valve will turn off                                                                          | 1 to 1349°C<br>34 to 2460°F              | 80°C<br>176°F         |
| Low Temp Alarm Setpoint | Low Temp Alarm Setpnt | Adjusts the temperature where the Status Contact will close, if enabled.                                                                         | Disabled,<br>1 to 1349°C<br>34 to 2460°F | Disabled              |
| Deadband                | Deadband              | Adjusts the Deadband. Used with the Process Setpoint and sometimes Low Fire and Aux Setpoints.                                                   | 1 to 150°C<br>1 to 240°F                 | 2°C<br>3°F            |
| Aux Setpoint            | AUX Setpnt            | Adjusts the Auxiliary Setpoint                                                                                                                   | 0 to 1350°C<br>32 to 2462°F              | Hidden, 20°C<br>68°F  |
| PID – Proportional Band | PID<br>PB:            | Expressed in percent, this is inversely proportional to the PID controller's proportional gain.                                                  | 0.0 to 999.9%                            | 10.0%                 |
| PID – Integral          | PID<br>I:             | Expressed in Minutes per Reset, this is the amount of time required for the PID integral term to yield the same output as the proportional term. | 0.0 to 999.9<br>min/rst                  | 4.0 min/rst           |
| PID – Derivative        | PID<br>D:             | Expressed in Minutes, this causes the PID to compensate based on the changing error. Disabled by default                                         | 0.0 to 999.9<br>min                      | 0.0 min               |

## HISTORY (MENU 2)

This menu contains informational event counters and the event log.

| MENU MAP             | ON SCREEN       | BRIEF DESCRIPTION                                      | RANGE     | DEFAULT SETTING |
|----------------------|-----------------|--------------------------------------------------------|-----------|-----------------|
| Relights             | Re-Lights       | Number of Pilot Relight attempts.                      | 0 to 1000 | N/A             |
| Flame Fails          | Flame Fails     | Number of Shutdowns due to failure to light the pilot. | 0 to 1000 | N/A             |
| Resets               | Resets          | Number of power failures or manual resets.             | 0 to 1000 | N/A             |
| ESDs                 | ESDs            | Number of system shutdowns caused by faults.           | 0 to 1000 | N/A             |
| High Pressure ESDs   | HPR ESDs        | Number of High Pressure Shutdowns.                     | 0 to 1000 | N/A             |
| Low Pressure ESDs    | LPR ESDs        | Number of Low Pressure Shutdowns.                      | 0 to 1000 | N/A             |
| Level ESDs           | LVL ESDs        | Number of Level Contact Shutdowns.                     | 0 to 1000 | N/A             |
| Thermocouple Errors  | TC Errs         | Number of Thermocouple Shutdowns.                      | 0 to 1000 | N/A             |
| Terminal Card Errors | Term Errs       | Number of Terminal Card Shutdowns.                     | 0 to 1000 | N/A             |
| System Errors        | Sys Errs        | Number of System Errors Shutdowns.                     | 0 to 1000 | N/A             |
| View Event Log       | View Event Log? | Log of recent events                                   | Yes/No    | No              |
| Clear History        | Clear History?  | Clears all History and logged events                   | Yes/No    | No              |

### SYSTEM INFO (MENU 3)

This menu contains diagnostic information about the system.

| MENU MAP                | ON SCREEN       | BRIEF DESCRIPTION                                                              | RANGE                           | DEFAULT SETTING |
|-------------------------|-----------------|--------------------------------------------------------------------------------|---------------------------------|-----------------|
| High Temp TC Reading    | Hi Temp TC      | Current High Temp Thermocouple reading                                         | -50°C to 1350°C                 | N/A             |
| Process Temp TC Reading | Proc TC         | Current Process Thermocouple reading                                           | -50°C to 1350°C                 | N/A             |
| 4-20mA Output Percent   | 4-20 Output     | Current status of the 4-20mA Output                                            | 0 to 100%                       | N/A             |
| Ambient Temp            | Ambient Temp    | Current ambient temperature. Used for thermocouple cold junction compensation. | -55°C to 65°C<br>-70°F to 150°F | N/A             |
| Voltage Reading         | System Voltage  | Current voltage applied to the system                                          | 8V to 35V                       | N/A             |
| Commision Date          | Commission Date | Date that the system was commissioned (if entered by user)                     | DD-MMM-YYYY                     | N/A             |
| Location                | Location        | The install location of the system (if entered by user)                        | N/A                             | N/A             |
| Control State           | Control State   | Debug Information                                                              | N/A                             | Hidden          |
| Terminal Card State     | Term Card       | Debug Information                                                              | N/A                             | Hidden          |

### SYSTEM SETUP (MENU 4)

This menu contains various optional system settings. It cannot be accessed while the PF2100 is running.

| MENU MAP                  | ON SCREEN           | BRIEF DESCRIPTION                                                                          | RANGE                         | DEFAULT SETTING |
|---------------------------|---------------------|--------------------------------------------------------------------------------------------|-------------------------------|-----------------|
| Auto Restart              | Auto Restart        | Enables system to restart from a power failure, low pressure, or high voltage event        | On/Off                        | Off             |
| Purge Time                | Purge Time          | Adjusts the time from all valves closed to Pilot relight attempts                          | 10- 900 sec                   | 30 sec          |
| Pilot to Main Delay       | Pilot to Main Delay | Adjusts the time from Pilot proven to Main Valve opening                                   | 5- 600 sec                    | 15 sec          |
| Restart Attempts          | Restart Attempts    | Adjusts the number of Restart Attempts after an unexpected flame failure before a shutdown | 0- 3                          | 3               |
| Level Event Restart       | Level Event Restart | Enables recovery from a Low Level event                                                    | On/Off                        | Off             |
| Pressure/Level Delay      | PRS/LVL Delay       | Pressure and Level shutdown delay                                                          | On/Off                        | Off             |
| Alarm Mode                | Alarm Mode          | Adjusts the behaviour of Status Contact relative to Start Contact                          | Alm when Off, No Alm When Off | No Alm when Off |
| Password Enable           | Password            | Enable Password Protection (Menu 1-3)                                                      | On/Off                        | Off             |
| Display Sleep             | Display Sleep       | Enable Sleep Mode for the Display                                                          | Never, After 10 Min           | Never           |
| Pilot Valve Power Setting | Pilot Solenoid PWM  | Adjusts the Pilot Valve PWM duty cycle                                                     | Off, 80%, 60%, 40%, 20%       | 60%             |
| Main Valve Power Setting  | Main Solenoid PWM   | Adjusts the Main Valve PWM duty cycle                                                      | Off, 80%, 60%, 40%, 20%       | 60%             |
| System Voltage Setting    | System Voltage      | Configures the expected input voltage for the system                                       | 12V, 24V                      | 12V             |



| <b>MENU MAP</b>           | <b>ON SCREEN</b>          | <b>BRIEF DESCRIPTION</b>                                   | <b>RANGE</b>        | <b>DEFAULT SETTING</b> |
|---------------------------|---------------------------|------------------------------------------------------------|---------------------|------------------------|
| Temperature Display Units | Temp Units                | Configures the temperature units displayed by the system   | Fahrenheit, Celsius | Celsius                |
| Commission Date Entry     | Commission Date           | Set the date that the system was commissioned              | DD-MMM-YYYY         | 01-JUN-2012            |
| Commission Location Entry | Commission Loc            | Set the install location of the system. 14 Characters Max. | A-Z, 0-9, -,/       |                        |
| Reset to Factory Defaults | Restore Factory Defaults? | Restore all settings to the factory default                | Yes/No              | No                     |

## CONTROL SETUP (MENU 5)

This menu contains various optional Process Control settings. It cannot be accessed while the PF2100 is running.

| <b>MENU MAP</b>        | <b>ON SCREEN</b>         | <b>BRIEF DESCRIPTION</b>                                                                                                                                                                                                                                      | <b>RANGE</b>                                       | <b>DEFAULT SETTING</b> |
|------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------------|
| High Temp ESD Setpoint | High Temp ESD Setpoint   | Adjusts the High Temperature shutdown setpoint                                                                                                                                                                                                                | 2 to 1350°C<br>36 to 2462°F                        | 90°C<br>194°F          |
| Process Control Input  | Process Control          | Configure the thermocouple used as the Process Temperature                                                                                                                                                                                                    | Process TC, AUXTC                                  | Process TC             |
| Low Fire Enable        | Low Fire                 | Enables Low Fire feature and setpoint                                                                                                                                                                                                                         | Disabled, on at Proc Setpnt, on at Low Fire Setpnt | Disabled               |
| Low to High Fire Delay | Low to High Fire Delay   | Adjusts the time from Low Fire Valve opening to High Fire Valve opening, when Low Fire is enabled. Values set above 255 seconds are automatically set to the value minus 255 seconds. For example, inputting 275 seconds sets the actual delay to 20 seconds. | 30- 300 sec                                        | Hidden, 30 sec         |
| Pilot Off Enable       | Pilot Off                | Enables Pilot Off feature and setpoint                                                                                                                                                                                                                        | Disabled, Enabled                                  | Enabled                |
| Aux Temp Mode          | AUX Temp Mode            | Configures how the Auxiliary Thermocouple is used.                                                                                                                                                                                                            | Disabled, Display Only, Temp Main Ctl, Temp ESD    | Disabled               |
| 4-20 Output Mode       | 4-20 Out Mode            | Configures 4-20 Output mode                                                                                                                                                                                                                                   | Valve Control 1<br>Valve Control 2, Temp Output    | Valve Control 1        |
| 4-20 Low Fire Setting  | 4-20 Out Lo Fire Setting | Sets the minimum output for the 4-20mA Output when used for Valve Control.                                                                                                                                                                                    | 0 to 70%                                           | 40%                    |
| 4-20 Gain Setting      | 4-20 Out Cntrl Gain      | Sets the adjustment speed of the control loop for the 4-20mA Output when used for Valve Control.                                                                                                                                                              | 0.1 to 1%/s                                        | 0.5%/s                 |

## EXPANSION CARDS (MENU 6)

This menu contains settings relating to [expansion cards](#).

| MENU MAP                    | ON SCREEN               | BRIEF DESCRIPTION                                        | RANGE                       | DEFAULT SETTING  |
|-----------------------------|-------------------------|----------------------------------------------------------|-----------------------------|------------------|
| 4-20 Input Card Enable      | 4-20 Input Card Enabled | Enable the 4-20mA Expansion Card and setpoints           | No/Yes                      | No               |
| 4-20 Level Units            | 4-20 LVL Units          | Adjusts the display units for the 4-20mA Level Input     | %, m3, BBL, GAL, L          | Hidden, m3       |
| 4-20 Level Range            | 4-20 LVL Range          | Adjusts Max Level of the tank                            | 0-10000                     | Hidden, 120m3    |
| 4-20 Level Zero Offset      | 4-20 LVL Zero Offset    | Adjusts the level reading corresponding to a 4mA input   | 0 to Low Setpoint           | Hidden, 0        |
| 4-20 Level Low Setpoint     | 4-20 LVL Low Setpnt     | Adjusts 4-20 Low Level trip point                        | 0-Max Volume                | Hidden, 60m3     |
| 4-20 Level High Setpoint    | 4-20 LVL High Setpnt    | Adjusts 4-20 High Level trip point                       | 0-Max Volume                | Hidden, 117m3    |
| 4-20 Pressure Units         | 4-20 PRS Units          | Adjusts the display units for the 4-20mA Pressure Input  | PSI, kPa, inWC, cmWC, ksc   | Hidden, PSI      |
| 4-20 Pressure Range         | 4-20 PRS Range          | Adjusts Max pressure of the fuel train                   | 0-2000                      | Hidden, 30.0 PSI |
| 4-20 Pressure Low Setpoint  | 4-20 PRS Low Setpnt     | Adjusts 4-20 Low Pressure trip point                     | 0-High Setpoint             | Hidden, 3.0 PSI  |
| 4-20 Pressure High Setpoint | 4-20 PRS High Setpnt    | Adjusts 4-20 High Pressure trip point                    | Low setpoint – Max Pressure | Hidden, 25.0 PSI |
| MODBUS Enable/Address       | Modbus Card             | Enable control and address for the Modbus Expansion Card | Disabled, 1-128             | Disabled         |
| 4-20 Card FW Version        | 4-20 FW                 | Display Expansion Card FW Version                        | N/A                         | N/A              |
| MODBUS Card FW Version      | MBUS FW                 | Display Expansion Card FW Version                        | N/A                         | N/A              |

## REVIEW MENU

This read only menu allows various commonly needed system settings and status parameters to be reviewed while the system is running.

| MENU MAP                    | ON SCREEN  | BRIEF DESCRIPTION                                                                    |
|-----------------------------|------------|--------------------------------------------------------------------------------------|
| ESD Setpoint                | ESD Setpnt | Temp at which system will shutdown                                                   |
| Process Setpoint            | ProcSetpnt | Temp at which High Fire / Main Valve will turn off                                   |
| Low Fire Setpoint           | LF Setpnt  | Temp at which Low Fire Valve will turn off if Low Fire is enabled                    |
| Pilot Off Setpoint          | Pilot off  | Temp at which Pilot Valve will turn off if Pilot is enabled                          |
| 4-20 High Level Setpoint    | HLV        | Level at which 4-20mA Output contacts will toggle                                    |
| 4-20 Low Level Setpoint     | LLV        | Level below which the system will shutdown or wait if Level Event Restart is enabled |
| 4-20 High Pressure Setpoint | HPR        | Pressure above which the system will shutdown after Main                             |
| 4-20 Low Pressure Setpoint  | LPR        | Pressure below which the system will shutdown or wait if Auto Restart is enabled     |
| Flame                       | Flame      | Current Flame Quality                                                                |
| Aux Temp                    | AUX Temp   | Current Aux Temp reading                                                             |
| 4-20 Level Reading          | LVL        | Current 4-20mA Level input reading                                                   |
| 4-20 Pressure Reading       | PRS        | Current 4-20mA Pressure input reading                                                |





| MENU MAP        | ON SCREEN                  | BRIEF DESCRIPTION                                                                                                                                                                                                                                                                                               |
|-----------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TC Debug Screen | DH=ww TH=xx<br>TP=yy TA=zz | Shows the current readings of all temperature sensors simultaneously always in degrees celsius regardless of the display unit setting<br><br>DH=Door Card High Temp, Thermocouple<br>TH=Terminal Card, High Temp Thermocouple<br>TP=Terminal Card Process Thermocouple<br>TA=Terminal Card Ambient Thermocouple |
| Alarms          | Alarms                     | Lists up to 3 simultaneous alarm codes if any are present                                                                                                                                                                                                                                                       |

## 3.4 | Initial System Settings

The following settings need to be modified for every installation.

1. Valve Modulation Settings (Pilot and Main)
2. System Voltage
3. Process Control Settings
4. Process Setpoints (High Temp ESD, Pilot Off, Process, Low Fire, Low Alarm, Deadband)

### VALVE MODULATION SETTINGS

The Pilot and Main Valve outputs can be modulated with a pulsed DC signal to conserve power using Pulse Width Modulation (PWM). The duty cycle of the modulation can be adjusted independently for each valve. Each can be set to 100%, 80%, 60%, 40%, or 20%. The 100% setting applies continuous DC voltage (ie, no modulation) to the valve and is the highest power option. The 20% setting applies DC voltage 20% of the time and is the lowest power option. Only valves that are compatible with modulation should be used with a duty cycle of less than 100%. These valves are sometimes called “Low Power” or “Peak-and-Hold” valves since they require only short periodic voltage pulses to hold the valve open. Do not use a duty cycle of 100% with low power valves as this can damage them.

If a multimeter is used to measure the valve power, the measured voltage will be reduced proportionally with the PWM setting.

The pilot and main valve power settings can be adjusted to match the needs of various applications.

#### Pilot Valve Power Setting (Menu 4)

Adjusts the PWM Duty Cycle of the Pilot Valve output.

#### Main Valve Power Setting (Menu 4)

Adjusts the PWM Duty Cycle of both the Low Fire and High Fire Valve outputs.

### SYSTEM VOLTAGE

The PF2100 is designed to operate with a nominal 12VDC or 24VDC Power Supply. The system will not be damaged by applying any voltage in or near this range regardless of menu settings. Note that attached valves are typically not designed to accept both 12VDC and 24VDC. If the valve voltage ratings are exceeded, the valves may become damaged.

### System Voltage Setting (Menu 4)

This setting defines voltage limits to protect and allow the proper operation of the attached valves. If the PF2100 detects that the input voltage is getting close to these limits, it will display a warning message. If the voltage exceeds these limits, the system will shut down and cut power to the valves.

The following options are available:

| VOLTAGE SETTING | CHOOSE THIS OPTION WHEN...                 |
|-----------------|--------------------------------------------|
| 12 V            | The Power Supply and all valves are 12 VDC |
| 24 V            | The Power Supply and all valves are 24 VDC |

The exact limits used are shown in the following table. Note that the high voltage limits also depend on the Pilot Valve Power Setting and Main Valve Power Setting which can also be found in Menu 4.

| V SETTING | PILOT / MAIN VALVE PWM SETTING | LOW V ALARM | LOW V WARNING | HIGH V WARNING | HIGH V ALARM |
|-----------|--------------------------------|-------------|---------------|----------------|--------------|
| 12V       | At least one equal to 100%     | <= 8.4V     | <= 9.9V       | >= 14.6V       | >= 15.6V     |
| 12V       | Both less than 100%            | <= 8.4V     | <= 9.9V       | >= 16.1V       | >= 16.8V     |
| 24V       | At least one equal to 100%     | <= 17.9V    | <= 19.9V      | >= 28.6V       | >= 30.0V     |
| 24V       | Both less than 100%            | <= 17.9V    | <= 19.9V      | >= 33.1V       | >= 40.0V     |

## PROCESS CONTROL SETTINGS

For the PF2100, Process Control refers to controlling the temperature of a process. This process usually involves heating fluid in a tank or pipe. A primary temperature control signal is required for Process Control. This is called the Process Temperature or Proc Temp. Optionally, an auxiliary temperature control signal can also be accepted. This signal is called the Auxiliary Temperature or Aux Temp.

Note that these two signals are not necessarily the same as Proc TC and Aux TC which are the names of the physical thermocouple inputs on the Terminal Card. The Aux Temp signal is only compared to the Aux Setpoint, if enabled.

There are four settings that directly affect Process Control: Process Control Input, Low Fire Enable, Pilot Off Enable, and Aux Temp Mode.

Note that changing any of these settings may cause the Process setpoints (High Temp ESD, Pilot Off, Low Fire, Process, Low Temp Alarm, Deadband, and Aux) to reset to factory defaults. A warning message will display if this occurs.

### Process Control Input (Menu 5)

This setting selects which thermocouple inputs will be used as the primary and auxiliary temperature control signals as shown in the following table.

| SETTING | PROC TEMP | AUX TEMP |
|---------|-----------|----------|
| Proc TC | Proc TC   | Aux TC   |
| Aux TC  | Aux TC    | Proc TC  |

In previous firmware versions this could also be set to Disabled. In this case, Process Control was disabled and the system allowed the burner to always be lit and running. The typical use for this was to have an external device, such as a PLC, controlling the process. The PLC would turn the system on and off using the Start contacts. This behaviour can still be achieved by setting all Process Setpoints to maximum.



### Low Fire Enable (Menu 5)

This setting is used to toggle the use of the Low Fire Setpoint for Primary Process Control. Low Fire can be enabled in two different modes: “On at Proc Setpoint” and “On at Low Fire Setpoint”. In the first case, the Low Fire Valve will close when it exceeds the Low Fire Setpoint but will not reopen until it drops below the Process Setpoint minus Deadband. In the second case, the Low Fire Valve will close when it exceeds the Low Fire Setpoint and will reopen after it drops below the Low Fire Setpoint minus Deadband.

### Pilot Off Enable (Menu 5)

This setting is used to enable/disable use of the Pilot Off Setpoint for Primary Process Control.

### Aux Temp Mode (Menu 5)

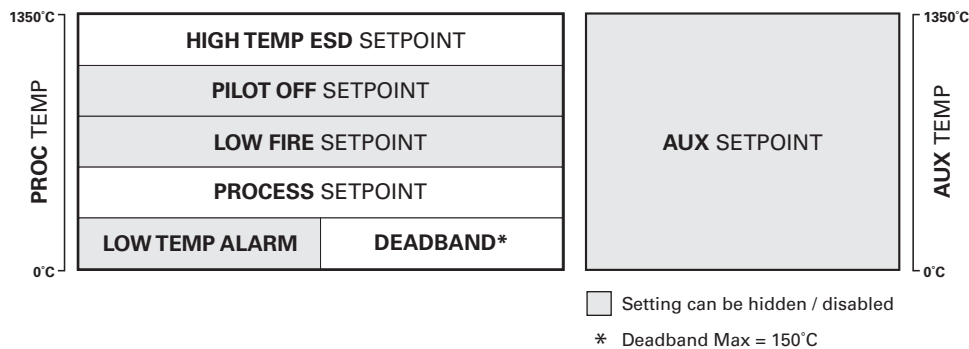
When this setting is set to Temp Main Ctl, Auxiliary Process Control is enabled. See the [Auxiliary Temperature Settings](#) section for more details.

## PROCESS SETPOINTS

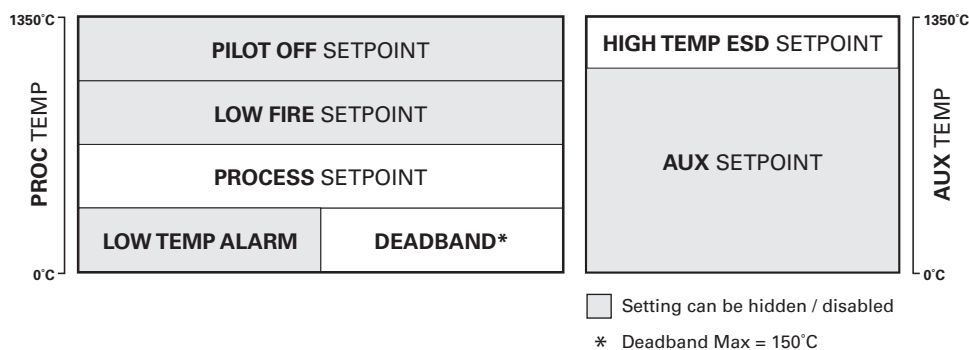
There are seven Process Setpoints in total, four of which may be disabled (hidden from menus). The order of the setpoints varies depending on the value of the Process Control Input setting.

The following diagrams illustrate the upper and lower bounds of each setpoint and their order. Setpoints that are shaded may be disabled. When a setpoint is disabled, the upper and lower bounds of the adjacent setpoints are adjusted accordingly.

### Process Control Input Setting: PROC TC



### Process Control Input Setting: AUX TC



For Process Control, the Proc Temp signal is the one compared to the Pilot Off, Low Fire, Process, and Deadband setpoints.

### **High Temp ESD Setpoint (Menu 5)**

This setting is used to protect the burner and other equipment from overheating. If either the High Temp or Process thermocouple readings exceed this setpoint, the burner will immediately shut down. This setting can be set to a maximum of 1350°C. The minimum value is 1°C higher than the setpoint below it. Depending on which settings are enabled, this will be the Pilot Off, Low Fire, or Process Setpoint.

### **Pilot Off Setpoint (Menu 1)**

If the Process Temperature goes above this setting, the Pilot Valve will close and the system state will change to "Waiting on Temp". This is often done to conserve pilot gas when it is not needed. This setting is hidden if Pilot Off in menu 5 is set to Disabled. This setting can be set to a maximum of 1°C below the High Temp ESD Setpoint. The minimum value is the same as the setpoint below it. Depending on which settings are enabled, this will be the Low Fire or Process Setpoint.

### **Low Fire Setpoint (Menu 1)**

If the Process Temperature goes above this setting, the Low Fire Valve will close and the system state will change to "Pilot On". This setting is hidden if Low Fire in menu 5 is set to Disabled. This setting can be set to a maximum of 1°C below the High Temp ESD Setpoint or the Pilot Off Setpoint if it is enabled. The minimum value is 1°C above the Process Setpoint.

### **Process Setpoint (Menu 1)**

If the Process Temperature goes above this setting, the Main Valve will close and the system state will change to "Low Fire". This setting can be set to a maximum of 1°C below the High Temp ESD Setpoint, the Pilot Off Setpoint if enabled, or 1°C below the Low Fire Setpoint if enabled. The minimum value is the Low Temp Alarm or Deadband (whichever is larger).

### **Low Temp Alarm Setpoint (Menu 1)**

If the Process Temperature goes below this setting, the Low Temp Alarm will be asserted and the status contact will open. This setting can be set to a maximum of the Process Setpoint value. The minimum value is 1°C. Set to 0°C to disable the Low Temp Alarm.

### **Deadband (Menu 1)**

The Deadband setting provides a temperature margin below the Process Setpoint. For the main valve to open, the temperature must be below Process Setpoint minus the Deadband setting.

The Deadband setting also provides a temperature margin below the Low Fire Setpoint when the Low Fire Enable setting is set to "On At Low Fire Setpoint". In this case, the Low Fire valve will open when the Process Temperature is below the Low Fire Setpoint minus the Deadband setting and will close when it is above the Low Fire Setpoint.

The Deadband setting also provides a temperature margin below the Aux Setpoint when the Aux Temp Mode setting is set to "Temp Main Ctl". In this case, the main valve(s) will open when the Auxiliary Temperature is below the Aux Setpoint minus the Deadband setting and will close when it is above the Aux Setpoint.

This setting can be set to a maximum of 150°C or the Process Setpoint, whichever is lower. The minimum value is 1°C.

### **AUX Setpoint (Menu 1)**

This setpoint is enabled only if Aux Temp Mode in menu 5 is set to "Temp Main Ctl" or "Temp ESD". In the first case, if the Auxiliary Temperature goes above the Aux Setpoint, the main valve(s) will close. The pilot will remain on until the Process Temp exceeds the Pilot Off Setpoint (if Pilot Off is enabled). In the second case, the system will shut down if the Auxiliary Temperature goes above the Aux Setpoint. This setting can be set to a maximum of 1350°C. The minimum value is 0°C.



## 3.5 | Optional Settings

### 4-20MA OUTPUT SETTINGS

The 4-20mA Output is built into the Terminal Card (not part of the 4-20mA Expansion Card). It can be used to echo the process temperature to a PLC or control a proportional valve.

#### 4-20 Output Mode (Menu 5)

Set the 4-20mA Output mode to Process Temperature, Valve Control 1, or Valve Control 2.

The 4-20mA Output is intended to drive a proportional valve. The signal is scaled such that 4mA = Valve Closed and 20mA = Valve Fully Open. A PID control loop based on Process Temperature feedback is used to determine how much the valve should be open at any given point in time. More details can be found in the [PID Controller](#) section.

The Valve Controls use a traditional safety solenoid valve connected to the PF2100's Low Fire outputs. The Low Fire setting must also be enabled by setting it to "On at Proc Setpoint."

1. Process Temperature  
In this mode, the 4-20mA Output will encode the Proc Temp signal as a 4-20mA signal. Note that the Proc Temp may correspond to either the Process Thermocouple or the AUX Thermocouple input depending on the Process Control setting. The signal is scaled such that 4mA = 0C and 20mA = the High Temp ESD Setpoint.
2. Valve Control 1  
When the PF2100 enters Low Fire, the proportional valve begins fully closed and linearly ramps so that it reaches the 4-20 Low Fire setting just as the Low to High Fire Delay elapses. Once High Fire begins, the PID Controller adjusts the valve accordingly.
3. Valve Control 2  
When the PF2100 starts, the proportional valve idles at the 4-20 Low Fire setting. Once High Fire begins, the PID Controller adjusts the valve accordingly.

#### 4-20 Low Fire Setting (Menu 5)

This setting is only available when the 4-20 Output Mode is set to Valve Control 1 or Valve Control 2. It specifies the minimum value that the proportional valve will ever be open. This is the starting position of the main valve each time it is turned on. It can be set to any value from 0% to 70%.

### ALARM / STATUS CONTACT SETTINGS

The Status Contact will always open if the system is shut down due to an alarm condition. There are two settings that affect the behavior of the Status Contact: Alarm Mode and Low Temp Alarm Setpoint.

#### Alarm Mode (Menu 4)

The Alarm Mode is used to select whether the Status Contact will open when the unit is stopped remotely via the Start Contact. It can be set to:

1. Alarm When Off  
The Status Contact opens when the unit is stopped (turned off) remotely via the Start Contact.

2. No Alarm When Off  
The Status Contact remains closed when the unit is stopped (turned off) remotely via the Start Contact.

#### **Low Temp Alarm Setpoint (Menu 1)**

When enabled the Status Contact will remain open until the Process Temperature exceeds this setpoint. See the [Process Setpoints](#) section for more detail.

### **AUXILIARY TEMPERATURE SETTINGS**

There are two settings that affect the way that the Auxiliary Temperature signal is used by the system: Process Control and Aux Temp Mode.

#### **Process Control (Menu 5)**

This setting is used to select the thermocouple input that is associated with the Auxiliary Temperature signal. See the [Process Control Settings](#) section for more details.

#### **AUX Temp Mode (Menu 5)**

Aux Temp mode can be set to any of the following:

1. Disabled  
The Aux Temp signal is ignored by the system.
2. Display Only  
The Aux Temp signal is only used for display purposes. It can be read on the PF2100 display in manual mode via the Review Menu. It can also be read remotely via the Modbus Expansion Card if it is installed and enabled.
3. Temp Main Ctl  
The Aux Temp signal is used as a secondary Process Control input. This modifies the normal Process Control by adding the additional requirement that the signal be below the Aux Setpoint for the main valve(s) to open.
4. Temp ESD  
The Aux Temp signal is used as an auxiliary ESD input. In addition to the normal Process Control, if the Aux Temp signal ever rises above the Aux Setpoint, the system will shut down.

### **COMMISSIONING SETTINGS**

The date and location of commissioning can be stored in the PF2100. This information is optional and can be input by the customer directly. These two settings can be viewed in menu 3 and edited in menu 4.

#### **Commission Date (Menu 4)**

This is the date on which the PF2100 was commissioned. Use the Up and Down keys to edit the date and OK to advance to the next date field.

#### **Commission Location (Menu 4)**

This is the location where the PF2100 was installed. Use the Up and Down keys to edit each character and OK to advance to the next character.

### **DISPLAY SETTINGS**

There are two settings that affect the behavior of the display: Display Sleep and Temperature Display Units.



### Display Sleep (Menu 4)

When enabled, the display will turn off to conserve power after 10 minutes of inactivity (no user key presses). Otherwise, the display will always remain on.

### Temperature Display Units (Menu 4)

The PF2100 always operates in Celsius. This includes storage of temperature setpoints, thermocouple measurements, temperature calculations, and modbus communications. This setting only affects the temperature units on the display. This may lead to small rounding errors when operating in Fahrenheit.

## PASSWORD SETTING

There are two levels of password protection. Menus 1-3 and the Quick Setpoint Adjust feature may be optionally protected by the Level 1 Password. Menus 4-7 are always protected by the Level 2 Password. These passwords cannot be modified.

Level 1 Password: ▲ ▼ ▲ ▲ ■

Level 2 Password: ▲ ▼ ▲ ▲ ▼ ▲ ■

For convenience, once a password has been entered it unlocks all menus that it protects for a period of time. Therefore it does not need to be re-entered when returning to the menu later. The menus will remain unlocked for 10 minutes or until the user manually locks the menus again. To lock the menus manually, press and hold the OK button for 3 or more seconds. The display will briefly show "Password Logout" to indicate that the menus are locked again.

### Password Enable (Menu 4)

When enabled, the Level 1 or Level 2 Password must be entered to access menus 1-3 and the Quick Setpoint Adjust feature.

## PID CONTROLLER

A PID Controller is a type of feedback control algorithm commonly used in industrial control applications. The purpose of the controller is to maintain a process variable as close as possible to a user defined setpoint. This is accomplished by continuously measuring the difference between the current value of the process variable and the desired setpoint value and then adjusting some manipulated variable to compensate for the difference. The PID Controller gets its name from the initials of the three tuning coefficients that are built into the control algorithm: the Proportional coefficient, the Integral coefficient, and the Derivative coefficient. These coefficients set the Controller's response to three types of errors: the current error (Proportional), the sum of all past errors (Integral), and the predicted future error (Derivative).

### PF2100 PID Controller

The PID Controller is used to maintain the Process Temperature as closely as possible to the Process Setpoint. The Controller adjusts the 4-20mA output signal which in turn drives a proportional valve. The more the valve is open, the more gas passes through, and the more heat is applied to the process. Feedback is provided to the control algorithm by subtracting the thermocouple measurement (the Process Temperature) from the desired temperature (the Process Setpoint).

### PID Controller (Menu 1)

To perform temperature control with a proportional valve, the PF2100 uses a PID Controller with temperature as its input. The PID Controller uses three parameters to specify how it performs its control: PID-Proportional Band, PID-Integral, PID-Derivative. The default

parameters are sufficient for most common heater applications, but they can be tuned for faster control if necessary. See [Appendix A](#) for the recommended tuning procedure for the PID Controller.

## RESTART SETTINGS

The PF2100 can be configured to automatically restart after certain alarm conditions clear. The number of restart attempts is configurable. There are three settings that affect restart behavior: Auto Restart, Level Event Restart, and Restart Attempts.

The number of restart attempts the system will make differs depending on the mode and the reason that the burner is being re-lit.

| MODE   | PROCESS CONTROL | FLAME OUT         |
|--------|-----------------|-------------------|
| Manual | 3               | 0                 |
| Auto   | 3               | User Configurable |

### Auto Restart (Menu 4)

If this setting is enabled, the system will restart automatically once all alarm conditions are cleared and if the reason that the system stopped running was any of the following:

1. System Input Voltage too low (including power cycle)
2. System Input Voltage too high
3. Low Pressure Contact open
4. 4-20mA Pressure Input below Low Setpoint

### Level Event Restart (Menu 4)

If this setting is enabled, the system will restart automatically once all alarm conditions are cleared and if the reason that the system stopped running was any of the following:

1. Level Contact open
2. 4-20mA Level Input below Low Setpoint

### Restart Attempts (Menu 4)

A restart attempt is an attempt by the system to light the burner. These can occur under two types of circumstances:

1. As a result of normal process control. Examples Include:  
The system is started by a user by switching to Auto Mode.  
The system is started remotely via the Start Contact.  
The Pilot Turns off as a result of process control and then is automatically turned back on after the temperature drops below the Pilot Off Setpoint.  
The system automatically restarts after recovering from one of the situations described in the [Auto Restart](#) or [Level Restart](#) sections.
2. As a result of the pilot flame unexpectedly going out.  
Examples Include:  
The gas supply is cut off.  
Excessive wind blows out the burner flame.  
Insufficient oxygen supply snuffs out the burner flame.  
The flame detection rod becomes dirty and unable to detect flame.





## TIMING DELAY SETTINGS

There are four time delay settings that can be adjusted to match the needs of various applications.

### Purge Time (Menu 4)

This setting is used to set the minimum amount of time that must elapse between when all valves are known to be closed and the next time that the pilot is lit. This will be the minimum elapsed time between relights and also the minimum amount of time before lighting the burner after a loss of power. The purge time ensures that dangerous amounts of gas are not present in the fire tube before the pilot is lit thus reducing the risk of an explosion. Generally, the larger the burner, the larger the purge time should be. Local codes may dictate the amount of purge time required for a given application. This setting can be set to a minimum of 10s and a maximum of 900s.

### Pilot-To-Main Delay (Menu 4)

This setting is used to set the minimum amount of time that must elapse between the pilot successfully lighting and the main (or low fire) valve opening. The Pilot-to-Main Delay is used to ensure that enough draft is established before opening the main valve. If this is not done, the volume of gas flowing through the main valve can snuff out the flame due to insufficient oxygen supply. Generally, the larger the burner, the larger the delay should be. This setting can be set to a minimum of 5s and a maximum of 600s.

### Low-To-High Fire Delay (Menu 5)

This setting is used to set the minimum amount of time that must elapse between the low fire valve opening and the high fire valve opening. This setting is only available if Low Fire is enabled in menu 5. The Low-to-High Fire Delay is used to ensure that enough draft is established before switching to high fire. If this is not done, the volume of gas flowing through the high fire valve can snuff out the flame due to insufficient oxygen supply. Generally, the larger the burner, the larger the delay should be. This setting can be set to a minimum of 30s and a maximum of 300s. Values set above 255s are automatically set to the value minus 255s.

### Pressure/Level Delay (Menu 4)

This setting is used to reject spurious electrical noise that may be present on the Low Pressure Contact, Level Contact, and the 4-20mA Expansion Card (if installed). This noise can come from electrical interference, mechanical vibration, or small oscillations in gas pressure and tank level. The rejection is accomplished by requiring these contacts to remain open for a continuous period of time (called the "delay") before shutting down. In the case of the 4-20mA Expansion Card, the Pressure and Level readings must remain below their respective low setpoints for the delay time before shutting down. If the Level Event Restart is enabled in the restart settings, the delays are applied before entering a waiting state as opposed to shutting down.

This setting can be set to either enabled or disabled. When disabled, there is a small delay. When enabled, the delay is lengthened. There are separate delays for Pressure and Level, as well as for contacts and 4-20mA input readings. The following tables list the delays used in all cases.

**Pressure Delay Table**

| SETTING  | LOW PRESSURE |         |         |         | HIGH PRESSURE |         |         |         |
|----------|--------------|---------|---------|---------|---------------|---------|---------|---------|
|          | Rising       | Falling | Opening | Closing | Rising        | Falling | Opening | Closing |
| Enabled  | 2s           | 6s      | 6s      | 0s      | 2s            | 2s      | 0s      | 0s      |
| Disabled | 2s           | 2s      | 2s      | 0s      | 2s            | 2s      | 0s      | 0s      |

**Level Delay Table**

| SETTING  | LOW LEVEL |         |         |         | HIGH LEVEL |         |         |         |
|----------|-----------|---------|---------|---------|------------|---------|---------|---------|
|          | Rising    | Falling | Opening | Closing | Rising     | Falling | Opening | Closing |
| Enabled  | 2s        | 20s     | 20s     | 0s      | 0s         | 0s      | N/A     | N/A     |
| Disabled | 2s        | 2s      | 2s      | 0s      | 0s         | 0s      | N/A     | N/A     |

## 3.6 | System Operation

This section includes information about how to start and stop the system, how to review key system settings, how to adjust setpoints while the system is running, and how to check the system firmware versions.

### STARTING THE SYSTEM

There are five different ways to start the system:

#### Auto Mode Option

The system is set to Manual Mode by default. Setting the system to Auto Mode is the most common way to start the system.

1. Make sure the system is stopped, all alarms are clear, and the Home Screen displays "Ready".
2. Press the Mode Key. A confirmation prompt will show on the Display.
3. Press the OK Key to confirm that you want to start the system.

This changes the system to Auto Mode. Based on the defined system settings, the system will automatically restart from faults. The system will take over turning the valves on and off according to the system settings and the current Process Temperature.

#### System Test And Start Option

This method is used during the initial installation when testing the pilot valve, main valve, ignition circuit, and flame detection circuitry in a slow sequence.

1. Make sure the system is set to Manual Mode and is stopped with all alarms clear. The Home Screen should display "Ready".
2. Press and hold the Pilot Key to open the Pilot Valve. Listen for the Pilot Valve to click open and let the gas through. Continue to hold the Pilot Key and press and hold the Ignite Key to begin sparking. Check the Pilot Nozzle for sparks and flame. If you cannot see the Pilot Nozzle, listen for the sound of sparking and try to determine if it is coming from the ignition rod.
3. Release the Ignite Key and check that the display shows a Flame Quality of 100%.
4. After about 5 seconds, the display will show "Pilot On" if the



Pilot lit successfully.

5. Press the Main Key to open the Main Valve. The system will count down the Pilot-to-Main Delay and then open the Main Valve if the Process Temperature is within the expected range.
6. The system will take over turning the valves on and off according to the system settings and the current Process Temperature.
7. Press the Mode Key to switch the system into Auto Mode. This allows the system to automatically restart from faults specified in the system settings.

If any of these checks fail, consult the [troubleshooting](#) section of this guide.

### **Automatic Restarts**

If the Auto Restart feature is enabled, the system will attempt to automatically start after a power failure. This will only succeed if all alarms are clear.

### **Start Contact Option**

The Start Contact option can be used to start the system from a remote switch located elsewhere on the site or through a PLC output contact.

1. If there are any Shutdown Messages showing on the display, open the Start Contact and then close it again to acknowledge those messages.
2. Open the Start Contact and then close it again to remotely start the system in Auto Mode. This will only work if all alarms are clear.

### **Modbus Card Option (if installed)**

This method can be used to start the system via a remote device over a Modbus RTU network.

1. Have the remote device write "1234" to the 40100 register to place the system into Auto Mode.
2. Set the remote device to poll the 40100 register and wait for it to clear to zero. This indicates that the system has processed the command.
3. Set the remote device to poll the 10001 register and wait for it to change to 1. This indicates that the system is running.

## **STOPPING THE SYSTEM**

There are five different ways to stop the system:

### **Stop Key Option**

This is the most common way to stop the system.

1. Press the Stop key. The system will stop immediately.

### **Auto Key Option**

This method of stopping the system is used during the initial installation when testing the pilot valve, main valve, ignition circuit, and flame detection circuitry in a slow sequence.

1. Press the Mode Key to switch the system into Manual Mode. This prevents the system from automatically restarting from faults specified in the system settings.

2. Press the Main Key to close the Main Valve and disable process control.
3. Press the Pilot Key to close the Pilot Valve and stop the system.

### **Start Contact Stop**

The system can be stopped using the same remote switch or PLC output as with starting the system using the Start Contact input.

1. Open the Start Contact and leave it open. The system will stop immediately.

### **Shutdown Conditions**

Whenever any shutdown condition is present, the system will stop and stay stopped until the condition is removed and the fault is acknowledged. Shutdown condition examples include the Process Temperature rising above the High Temp ESD Setpoint, the High Pressure Contact Opening, the ESD Contact Opening, etc. Many conditions can cause shutdowns. Some conditions will only trigger a shutdown if it is enabled in the system settings. See the fault chart in this guide for more details.

### **Modbus Card Option (if installed)**

This method can be used to stop the system using a remote device over a Modbus RTU network.

1. Have the remote device write "4321" to the 40100 register to stop the system.
2. Set the remote device to poll the 40100 register and wait for it to clear to zero. This indicates that the system has processed the command.
3. Set the remote device to poll the 10001 register and wait for it to change to 0. This indicates that the system has stopped.

## **ADJUST SETTINGS & REVIEW STATUS**

There are four ways to check and adjust system settings and to view system status:

### **Home Screen**

The Home Screen is accessible at any time. Press and hold the OK Key for 3 seconds.

1. Manual Mode: The Home Screen displays the System State and the Process Temperature.
2. Auto Mode: The Home Screen displays the Process Setpoint and the Process Temperature.

### **Quick Setpoint Adjust (auto mode only)**

This feature allows some Process Setpoints to be adjusted as a group even when the system is running. Affected setpoints are the Low Fire Setpoint (if enabled), the Process Setpoint, and the Pilot Off Setpoint (if enabled). These Process Setpoints can be adjusted directly from the Home Screen using the Up and Down Keys. The adjustments are limited by the maximum ranges of the Process Setpoints. Any changes made take effect immediately. This feature is protected by the L1 Password when password protection is enabled in Menu 4.

### **Review Menu (manual mode only)**

The Review Menu is a diagnostic menu used to check key setpoints and view real time system measurements such as temperature, pressure, and level. To access it, press the Up or Down Key while on the Home Screen.



## System Menus

Menus 1, 4, 5, and 6 are used for checking and adjusting settings. Menus 2 and 3 show diagnostic values. Menu 7 is used for calibration and is hidden by default. The System Menus are accessed by pressing the Menu Key from the Home Screen while in Manual Mode. Some menus are not accessible while the system is running. Menu 3 contains some system status information not found elsewhere in the menu system. Refer to the Menu Map table for more details.

When the system is stopped, all settings can be checked and adjusted. When the system is running, only some settings may be checked or adjusted. The following table illustrates the circumstances under which various settings can be checked and adjusted. For more information about the menu system and the user interface, see the [Menu Map](#) section.

| <b>MODE</b>                    | <b>HOME SCREEN</b>                      | <b>QUICK SETPOINT CHANGE AVAILABLE</b> | <b>REVIEW MENU AVAILABLE</b> | <b>SYSTEM MENUS AVAILABLE</b> |
|--------------------------------|-----------------------------------------|----------------------------------------|------------------------------|-------------------------------|
| Manual Mode,<br>System Stopped | System State<br>Process Temperature     | No                                     | Yes                          | 1-6 (and sometimes 7)         |
| Manual Mode,<br>System Running | System State<br>Process Temperature     | No                                     | Yes                          | 1-3                           |
| Auto Mode,<br>System Running   | Process Setpoint<br>Process Temperature | Yes                                    | No                           | None                          |

## DIAGNOSTIC OPTIONS

### Viewing Event Counters

Menu 2 contains a series of counters that increment automatically in response to various events. These counters can be used to troubleshoot issues with a particular installation. Each counter will count to a maximum of 1000 and then will stop incrementing. At the bottom of Menu 2 is an option to clear these counters. Clearing the counters also clears the event log.

1. ESDs: Increments each time the system shuts down as a result of the ESD Contact opening, the High Temp ESD Setpoint being exceeded by either Process Temp or Aux Temp (if enabled), or a high or low voltage alarm.
2. Flame Fails: Increments each time the system shuts down as a result of failing to ignite the pilot within the allocated number of retries.
3. High Pressure ESDs: Increments each time the system shuts down as a result of the High Pressure Contact opening or the 4-20 Pressure reading exceeding the 4-20 High Pressure Setpoint.
4. Level ESDs: Increments each time the system shuts down as a result of the Level Contact opening or the 4-20 Level reading dropping below the 4-20 Low Level Setpoint.
5. Low Pressure ESDs: Increments each time the system shuts down as a result of the Low Pressure Contact opening or the 4-20 Pressure reading dropping below the 4-20 Low Pressure Setpoint.
6. Thermocouple Errors: Increments each time the system shuts down as a result of a thermocouple issue such as a short circuit, open circuit, or ground short.
7. Relights: Increments each time the system attempts to

automatically re-ignite the pilot. The first ignition attempt after a manual start is not counted.

8. Resets: Increments each time the door card is reset by a power loss or by manually pressing the reset button.
9. System Errors: Increments each time the system shuts down as a result of an internal system error.
10. Terminal Card Errors: Increments each time the system shuts down as a result of a terminal card error.

### Viewing the Event Log

The Event Log can be accessed from the end of Menu 2. The log contains entries for various types of events such as System Starts, Stops, Shutdowns, Menu Accesses, etc. The log holds a maximum of 32 events. The first event (#1) is the most recent and the last event (#32) is the oldest.

When the log is full, the oldest event is removed from the list to make room for the next newest event. Navigate through the log using the up and down arrow keys. Press OK to return to the Home Screen. The log can be cleared using the item at the end of Menu 2. Clearing the log also resets all event counters to zero.

The following is an alphabetical list of all possible Event Log entries including a brief description of their meaning and the associated counter which will increment when that event occurs:

| ENTRY      | DESCRIPTION                                                                                                                                                  | ASSOCIATED COUNTER |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| AUTO       | The system switched to Auto Mode because the user pressed the MODE and OK button.                                                                            |                    |
| AUX ESD    | The "Aux Temp Mode" setting is set to "Temp ESD" and the Aux Temp signal exceeded the "Aux Setpoint".                                                        | ESDs               |
| ESD        | The system shut down as a result of the ESD contact being open.                                                                                              | ESDs               |
| FLAME FAIL | The pilot went out and could not be relit automatically within the specified number of attempts (3 attempts on initial start; user defined for other cases). | Flame Fails        |
| HI PRS ESD | The system shut down because the High Pressure Contact was opened or the "4-20mA High Pressure Setpoint" was exceeded.                                       | High Pressure ESDs |
| HI VOLT    | The system input voltage exceeded the High Voltage Alarm threshold.                                                                                          | ESDs               |
| HT ESD     | The "High Temp ESD Setpoint" was exceeded by either "Proc Temp" or "Aux Temp" (if enabled) and caused the system to shutdown.                                | ESDs               |
| LEVEL ESD  | The system shut down because the Level Contact was opened or the "4-20mA Low Level Setpoint" was dropped below.                                              | Level ESDs         |
| LO PRS ESD | The system shut down because the Low Pressure Contact was opened or the "4-20mA Low Pressure Setpoint" was dropped below.                                    | Low Pressure ESDs  |
| LO VOLT    | The system input voltage dropped below the Low Voltage Alarm threshold.                                                                                      | ESDs               |
| LOW ALARM  | The "Proc Temp" signal dropped below the "Low Temp Alarm Setpoint".                                                                                          |                    |
| MANUAL     | The system switched to Manual Mode because the user pressed the MODE button.                                                                                 |                    |
| MENU:CTL   | Menu 5 "Control" was entered. This will show even if no settings are modified.                                                                               |                    |
| MENU:SETPT | Menu 1 "Setpoints" was entered. This will show even if no settings are modified.                                                                             |                    |
| MENU:SYS   | Menu 4 "System" was entered. This will show even if no settings are modified.                                                                                |                    |
| POC STOP   | The "Proof of Closure Contact" was open when it should not have been causing the system to shutdown.                                                         |                    |



| ENTRY      | DESCRIPTION                                                                                                                                                                                                                                                                                          | ASSOCIATED COUNTER   |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| RELIGHT    | The pilot was successfully relit after it went out unexpectedly.                                                                                                                                                                                                                                     | Relights             |
| RESET      | The system was reset due to a loss of power or a manual press of the Door Card's reset button.                                                                                                                                                                                                       | Resets               |
| RETRY      | The Pilot failed to light and one or more retry attempts were made.                                                                                                                                                                                                                                  |                      |
| RUNNING    | The system successfully lit the pilot.                                                                                                                                                                                                                                                               |                      |
| START      | The system switched to Auto mode at a point in time when the pilot was not lit.                                                                                                                                                                                                                      |                      |
| STOPPED    | The system stopped because the user pressed the STOP button while the Pilot Valve was open.                                                                                                                                                                                                          |                      |
| SYSTEM ERR | An internal system error has occurred.                                                                                                                                                                                                                                                               | System Errors        |
| TCERR:AUX  | The AUX Thermocouple is out of range.                                                                                                                                                                                                                                                                | Thermocouple Errors  |
| TCERR:HT   | The High Temp Thermocouple is out of range or grounded.                                                                                                                                                                                                                                              | Thermocouple Errors  |
| TCERR:PROC | The Process Thermocouple is out of range.                                                                                                                                                                                                                                                            | Thermocouple Errors  |
| TC NOT EQ  | The system detected an unacceptable difference between the Process and High Temp Thermocouple readings. The acceptable difference varies with the HT ESD Setpoint (ESD) as follows:<br><br>15C when ESD < 200C<br>25C when 200C <= ESD < 400C<br>35C when 400C <= ESD < 800C<br>45C when 800C <= ESD |                      |
| TERM ERR   | Communications between the Terminal Card and the Door Card has been interrupted.                                                                                                                                                                                                                     | Terminal Card Errors |

### Viewing Firmware Versions

From anywhere in the User Interface, press the Up and Down Keys simultaneously. The system will show four different firmware versions in sequence:

| CARD                  | CURRENT FW VERSION | NOTE                                                    |
|-----------------------|--------------------|---------------------------------------------------------|
| Door Card             | DC FW: E1.8.115    |                                                         |
| Terminal Card         | TC FW: E1.8.101    |                                                         |
| 4-20mA Expansion Card | 4-20 FW: v4.1      | Will show "—" if not installed or not enabled in Menu 6 |
| Modbus Expansion Card | MBUS FW: v4.1      | Will show "—" if not installed or not enabled in Menu 6 |

## 4 | SYSTEM BEHAVIOR

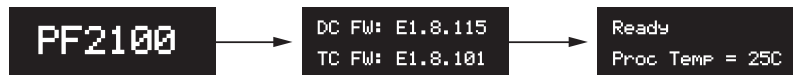
This section of the manual describes the behavior of the PF2100 when various features are enabled vs disabled. Simplified state diagrams are provided and discussed to give a high level understanding of how the system works.

### 4.1 | System Behavior

The following diagrams illustrate the behavior of the PF2100 during common system events. Note that when the PF2100 changes states while in Auto mode, the new state will be shown momentarily on the display. In Manual Mode, the current state is always shown on the display.

#### SYSTEM START UP

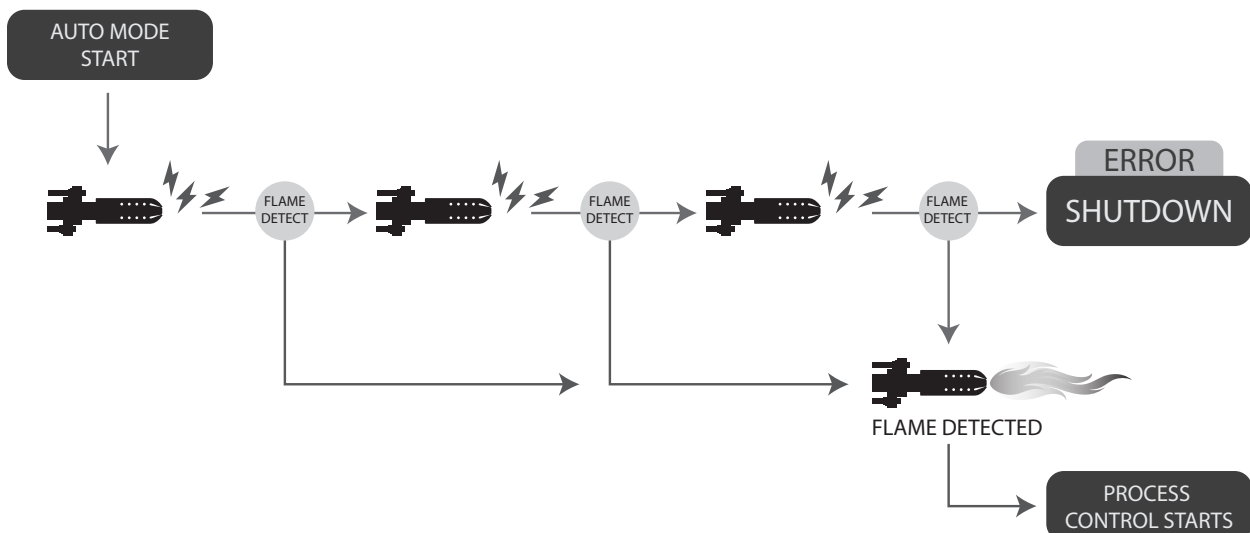
When the system is powered on, the start up sequence is as follows:



1. PF2100 displayed in large text
2. Firmware versions of the Door and Terminal Card
3. The Home Screen showing the system state. The system state will be "Ready" if no alarms are present. Otherwise, the state will be "Alarm".

#### STARTING IN AUTO MODE

When the system is started in Auto Mode (by pressing the Mode and OK Keys), it will run through the ignition sequence automatically. In Auto Mode, the PF2100 will automatically attempt to relight the pilot if it ever goes out unexpectedly.



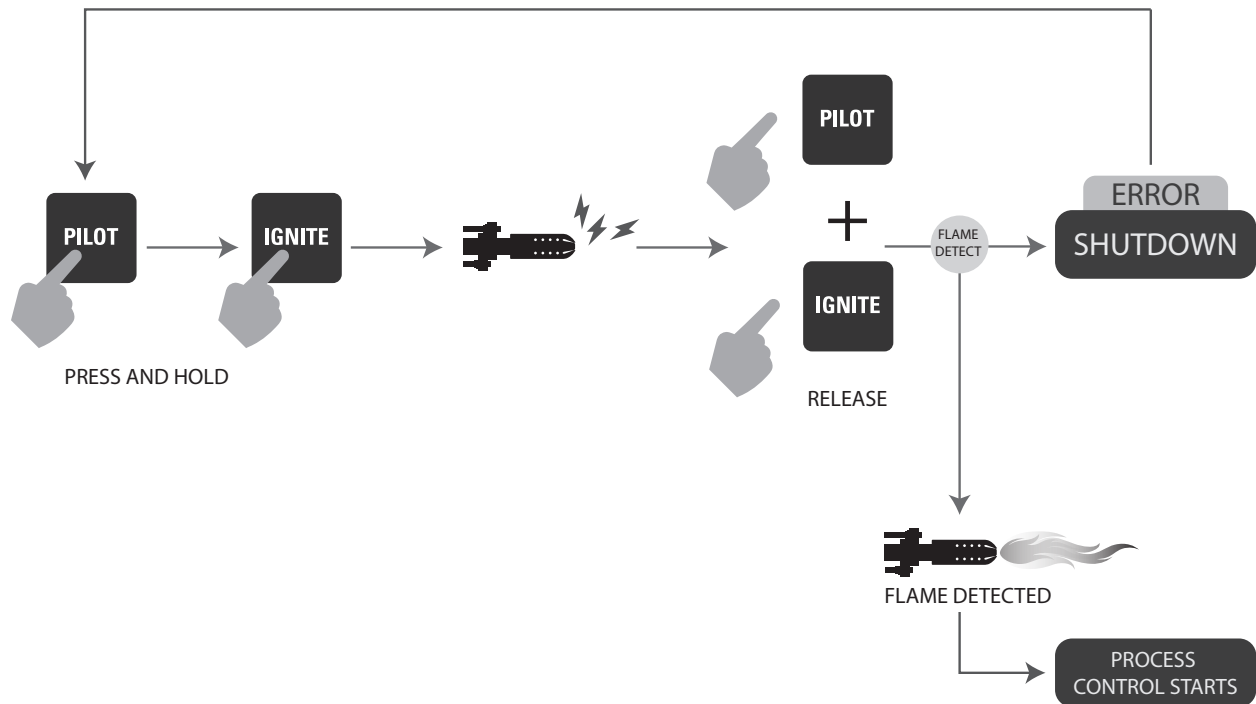
The [Process Control](#) sequence will be explained in more detail later.





## STARTING IN MANUAL MODE

When the system is started in Manual Mode (using the Pilot, Ignite, and Main Keys), it must be manually moved through the ignition sequence. In Manual Mode, the PF2100 will NOT automatically attempt to relight the pilot if it ever goes out unexpectedly. It will only attempt to relight the pilot if it was turned off by the system as a result of normal process control (ie, Waiting on Temp, Waiting for Level, etc).

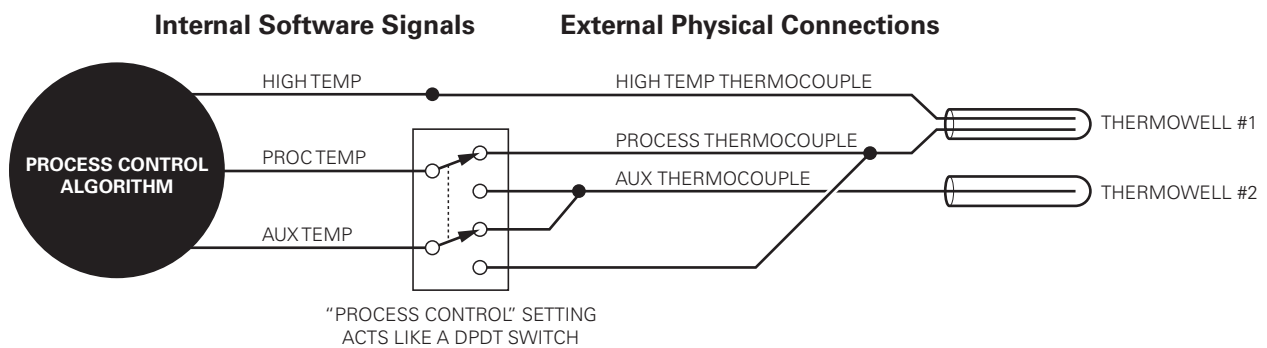


The [Process Control](#) sequence will be explained in more detail later.

## 4.2 | Process Control

The PF2100 maintains a process at a user specified temperature. The system monitors the temperature and adjusts to increase or decrease the temperature as needed. This is an automated sequence of events based on user settings. This process of monitoring and controlling is called Process Control. The system uses a gas fired heater with an electronic ignition circuit and several electronic fuel valves (also called solenoids). It also has a flame detection circuit and up to three temperature measuring thermocouples.

The PF2100 has three inputs: High Temp, Proc Temp, and Aux Temp. By default, these signals correspond to the High Temp Thermocouple, the Process Thermocouple, and the Aux Thermocouple respectively. The Process Control setting allows the Process and Aux thermocouples to be swapped. This is useful in circumstances that will be explained later.



It is expected that the High Temp Thermocouple and the Process Thermocouple will always be mounted in a common thermowell. This is usually accomplished by using a duel element thermocouple. The software uses these two thermocouples as a check for each other as a failsafe. If the readings from these two thermocouples do not agree within a specified amount of error, the system will shut down.

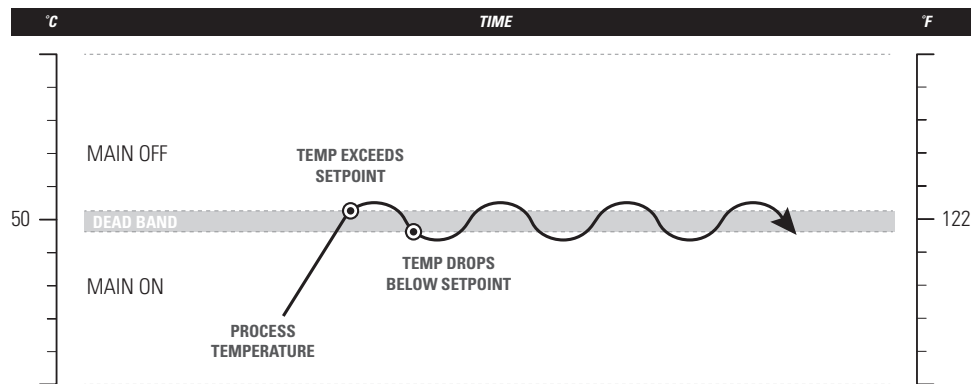
The High Temp signal is used to protect the burner and other process equipment from being damaged due to excessive heat. It cannot be disabled through any combination of process control settings.

The Proc Temp signal is the primary control signal for Process Control. This signal is compared to the Deadband, Low Temp Alarm Setpoint, Process Setpoint, Low Fire Setpoint, and the Pilot Off Setpoints in order to control the temperature of the process.

The Aux Temp signal can be used as a secondary control signal. The way that this signal is used will vary depending on the Aux Temp Mode setting. If enabled, an Aux Setpoint gets compared to this signal.

## STANDARD PROCESS CONTROL

Using very basic settings, the PF2100 behaves as follows.

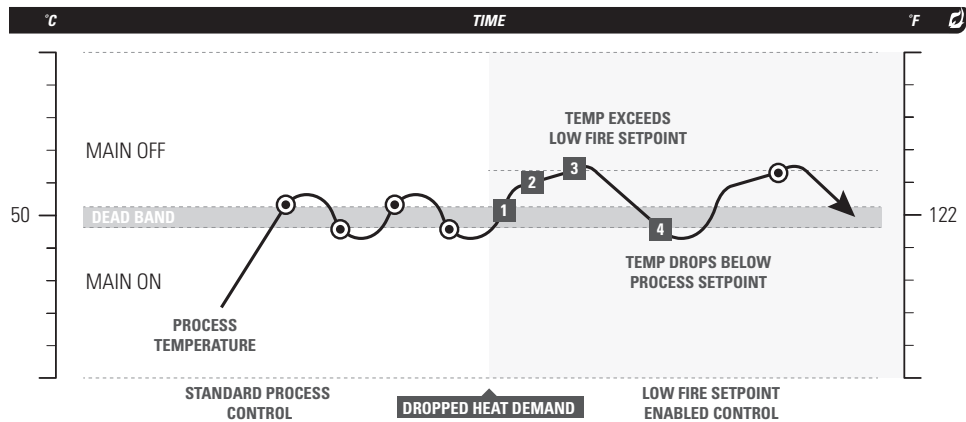


1. The Main Valve opens and the Process Temperature increases.
2. The Process Temperature exceeds Process Setpoint, the Main Valve closes, and the Process Temperature begins to drop.
3. The Process Temperature drops below the Process Setpoint minus Deadband, the Main Valve opens, and the Process Temperature begins to increase again.

## LOW FIRE: ON AT PROC SETPOINT

This example has the Process (High Fire) and Low Fire Setpoints enabled. It has been set to turn on at the Process Setpoint. This example uses two valves, a Low Fire valve and a High Fire valve. Both valves start open in this example.

The system behaves the same as in the [standard process control](#) diagram until the demand for heat drops.



1. The Process Temperature reaches the Process Setpoint and the main valve closes.
2. The Process Temperature continues to rise.
3. The Process Temperature exceeds the Low Fire Setpoint, the Low Fire Valve closes, and the Process Temperature drops.
4. The Process Temperature drops below the Process Setpoint minus the Deadband, the High Fire Valve opens, and the Process Temperature begins to increase again.

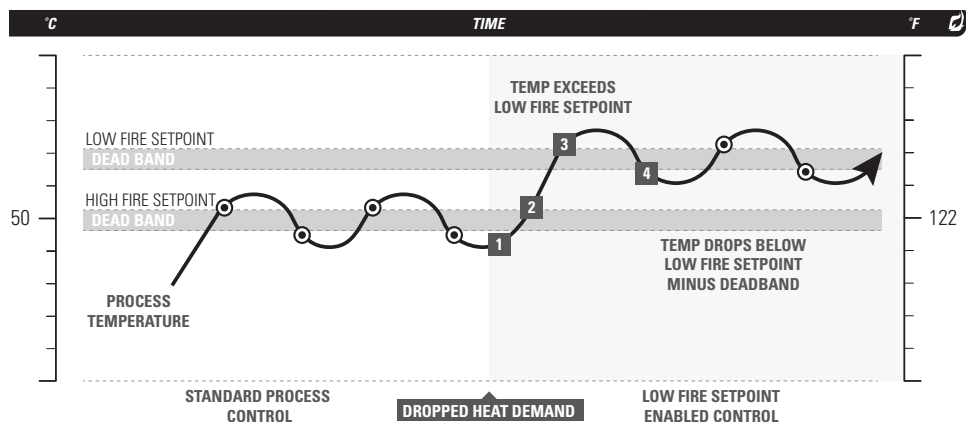
## PROPORTIONAL VALVE CONTROL

The Low Fire: On Proc Setpoint can be used in conjunction with a proportional valve connected to the 4-20mA Output. In this mode, the PID Controller adjusts the proportional valve and attempts to fix the temperature at the Process Setpoint.

### LOW FIRE: ON AT LOW FIRE SETPOINT

This example has the Low Fire feature enabled and set to "On at Low Fire Setpoint." In this case, the Low Fire Valve will close when it exceeds the Low Fire Setpoint, and will reopen after it drops below the Low Fire Setpoint minus Deadband.

The system behaves the same as in the [standard process control](#) diagram until the demand for heat drops.

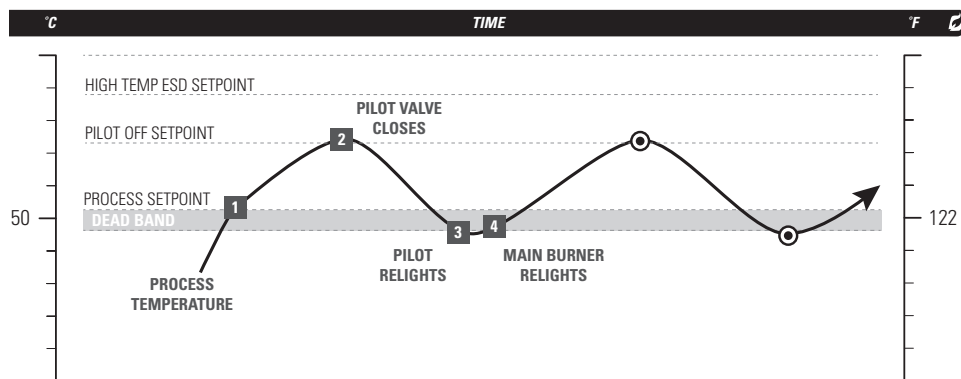


1. The Process Temperature continues to rise.
2. The Process Temperature exceeds the High Fire Setpoint, the High Fire Valve closes, and the Process Temperature continues to rise.
3. The Process Temperature exceeds the Low Fire Setpoint, the Low Fire Valve closes, and the Process Temperature drops.
4. The Process Temperature drops below the Low Fire Setpoint minus Deadband, the Low Fire Valve opens, and the Process Temperature begins to rise again.

## PILOT OFF

This scenario is the same as the basic scenario except that the Pilot Off feature has now been enabled. In this case, when the Proc Temp rises above the Pilot Off Setpoint the Pilot Valve will close and will not re-light until the temperature is below the Process Setpoint minus Deadband.

The system behaves the same as in the [standard process control](#) diagram with the added ability to shut off the pilot as needed.



1. The temperature exceeds the Proc Setpoint and the Main Valve closes.
2. The temperature continues to rise and the Proc Temp exceeds the Pilot Off Setpoint, the Pilot Valve closes, and the Proc Temp begins to decrease.
3. The Proc Temp drops below the Process Setpoint minus Deadband, the pilot relights, and the Proc Temp begins to increase again.
4. The Pilot-to-Main Delay elapses, the Main Valve opens, and the Proc Temp begins to increase faster.

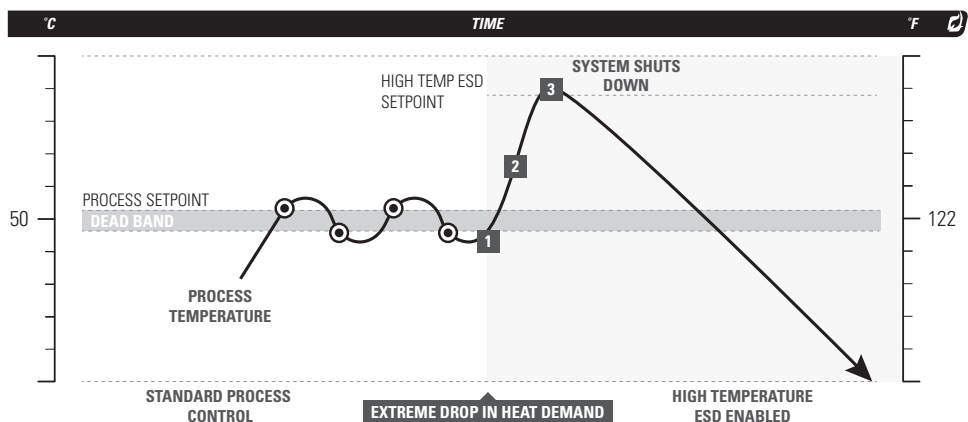
## HIGH TEMP ESD

The High Temp ESD Setpoint is always compared against the High Temp Thermocouple regardless of the Process Control setting. The system will immediately shut down if this thermocouple exceeds this setpoint. Because the High Temp Thermocouple and Process Thermocouple must always be in the same thermowell, these two thermocouples can be thought of as being the same. Note that the internal signal to which the Process Thermocouple is associated (Proc Temp or Aux Temp) will change depending on the Process Control setting.

This particular graph is a representation of a high temperature shutdown. Once the Process Temperature exceeds the High Temp ESD Setpoint, the system will shut down and require user input to acknowledge the error.



The system behaves the same as in the [standard process control](#) diagram until the demand for heat drops.



1. Heat demand suddenly and substantially decreases. This could be caused by a rapid decrease in flow by the line heater or a sudden emptying of a tank heater.
2. The Process Temp rises sharply.
3. The High Temp Thermocouple temperature rises above the High Temp ESD Setpoint, the system immediately shuts down, and the High Temp Thermocouple temperature begins to decrease slowly.

### AUX TEMP MODE: TEMP MAIN CTL

When Aux Temp Mode is set to Temp Main Ctl, it enables the Auxiliary Temperature input. The Proc Temp signal measures the outlet temperature of a line heater and the Aux Temp signal measures the bath temperature. If the heat demand increases, the bath temperature may rise quickly. The Aux Setpoint is used to shut off the Main Valves to protect the bath and fire tube in the event of excessive bath temperature.

### AUX TEMP MODE: TEMP ESD

If the Aux Temp Mode is set to Temp ESD, then the Aux Temp signal must be below the Aux Setpoint or the system will shut down. Normally this happens independent of the High Temp ESD previously described. However, it is possible for the High Temp ESD Setpoint and the Aux ESD Setpoint to both be applied to the same thermocouple. This happens when Process Control is set to Aux TC and Aux Temp Mode is set to Temp ESD. In this case, whichever setpoint is lower will be used.

In this mode, the Aux Setpoint is used as another ESD setpoint. It is always compared against the Auxiliary Temperature signal which depends on the Process Control setting. The system will immediately shut down if this signal exceeds this setpoint.

### AUTOMATIC RESTART EVENTS

In all waiting states, the system turns off the burner and pilot and waits for some event to occur before restarting. There are two other groups of waiting states which may be optionally enabled: Auto Restart and Level Event Restart. Each of these states can be entered automatically from any other Process Control state if the associated condition is satisfied.

Several waiting states are enabled when the Auto Restart feature is enabled. The conditions and the triggering states are as follows:

- Waiting on Low Voltage- System Voltage below Low Alarm
- Waiting on High Voltage- System Voltage above High Alarm,
- Waiting on Low Pressure- Low Pressure Contact open or 4-20mA Pressure below Setpoint

One waiting state is enabled when the Level Event Restart feature is enabled:

- Waiting on Low Level- Level Contact Open or 4-20mA Level below Low Setpoint

Once the triggering condition is cleared, the system will automatically restart via the Relight procedure.

## RELIGHT PROCEDURE

After the system has been initially started, if it needs to be automatically relit, the system responds based on the reason the pilot is off. If the event is a controlled one, the PF2100 follows the Process Control sequence using the system settings. If the pilot goes out unexpectedly, the PF2100 checks to see which mode it is in. In Manual mode, the system goes straight to shutdown; in Auto mode, the system goes through [Auto Mode Start Up](#). Note that the number of retries varies depending on the reason for pilot being off, three for Process Control, none for Manual mode, and the user defined amount in Auto mode.

## 4.3 | Contact Behavior

This section discusses the behavior of the PF2100's input and output contacts and its response to external signals.

### STATUS OUTPUT

The Status Output Contact is generally used to remotely determine whether the system is operating normally. It can be connected to a PLC and used to trigger a remote alarm so that a service technician can be sent to the site in the event of trouble.

In general, the contact will be closed when the system is running and it will be open when the system is not running. Five exceptions to this are as follows:

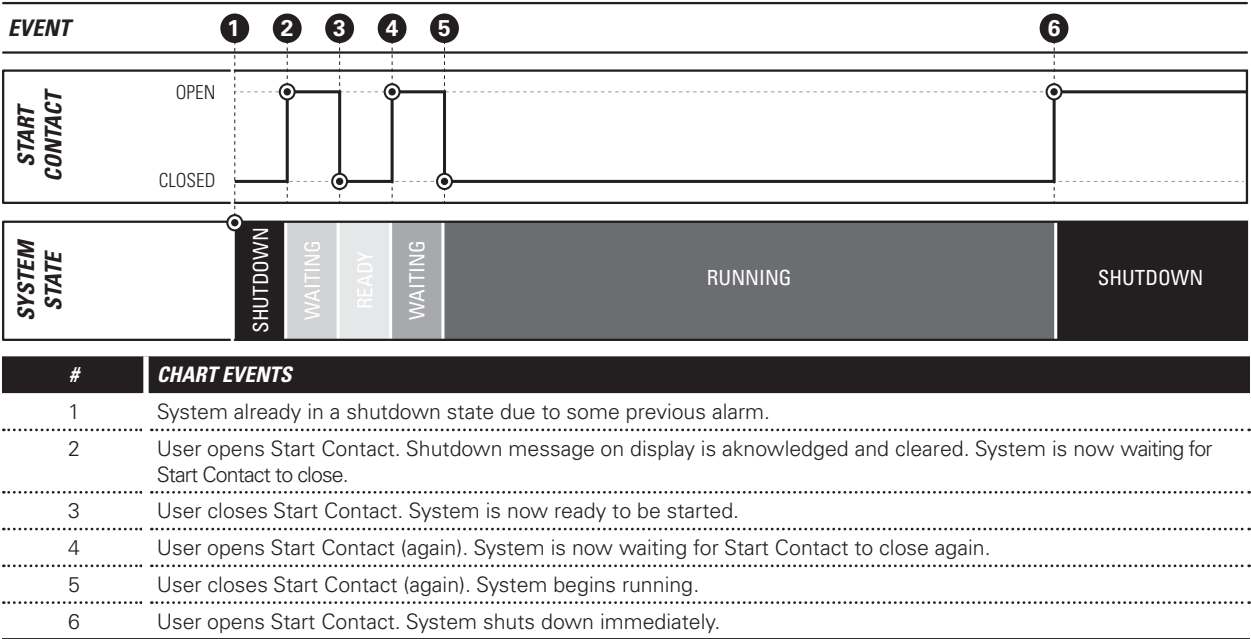
1. On Start: When the system is first started, the status contact will remain open until after the pilot has been successfully lit.
2. Alarm Mode: If the Alarm Mode setting in menu 4 is No Alarm When Off, the contact will remain closed if the system is stopped because the Start Contact is open.
3. Low Temp Alarm: If the Low Temp Alarm feature is enabled in menu 1 and the Process Temperature is currently below the Low Temp Alarm Setpoint, the Status Contact will be open. The contact will close again as soon as the temperature rises above the Low Temp Alarm Setpoint.
4. While Waiting: If the system is in a waiting state, the status contact will remain closed.



- 5. While Restarting: If the flame blows out and the system is in the process of relighting the pilot, the status contact will remain closed. If the pilot fails to relight within the specified number of relight attempts, then the contact will open.

START INPUT

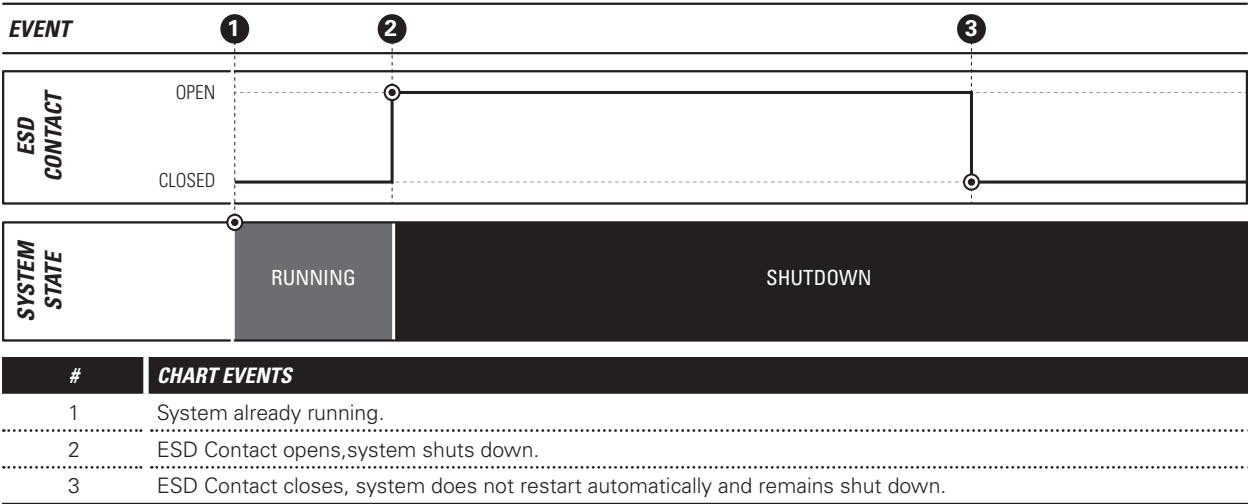
The Start Input Contact is used to remotely stop and start the PF2100. This can be done by connecting it to an output relay on a PLC or to a switch located elsewhere on the site. Generally speaking, the system will begin running when the contact is closed and will stop running when the contact is open. The exception to this is when the system shuts down as a result of an alarm condition. In this case, the contact must be closed to acknowledge the shutdown condition and must then be opened and closed again to restart the system. The status contact can give some idea as to whether the system is shutdown. However, it is not always possible to do so, so it is recommended to always start the system using the close-open-close sequence described above. This will always work even if the system is not waiting for a shutdown message to be acknowledged. Once the start sequence has been entered, the system will start after the purge time has elapsed. When the start contact is opened, the system will always stop immediately.



If this contact is not needed, it must be shorted out with the provided jumper or a wire.

ESD INPUT

The ESD Input Contact is used to stop the PF2100 in the event of an emergency. This is normally done by connecting the contact to the site’s ESD Loop. The PF2100 will shutdown immediately when the contact is opened and cannot be restarted until the contact is closed. The PF2100 will not restart automatically if the ESD contact is subsequently reclosed but must instead be restarted via the start contact, the keypad, or the Modbus card (if installed).



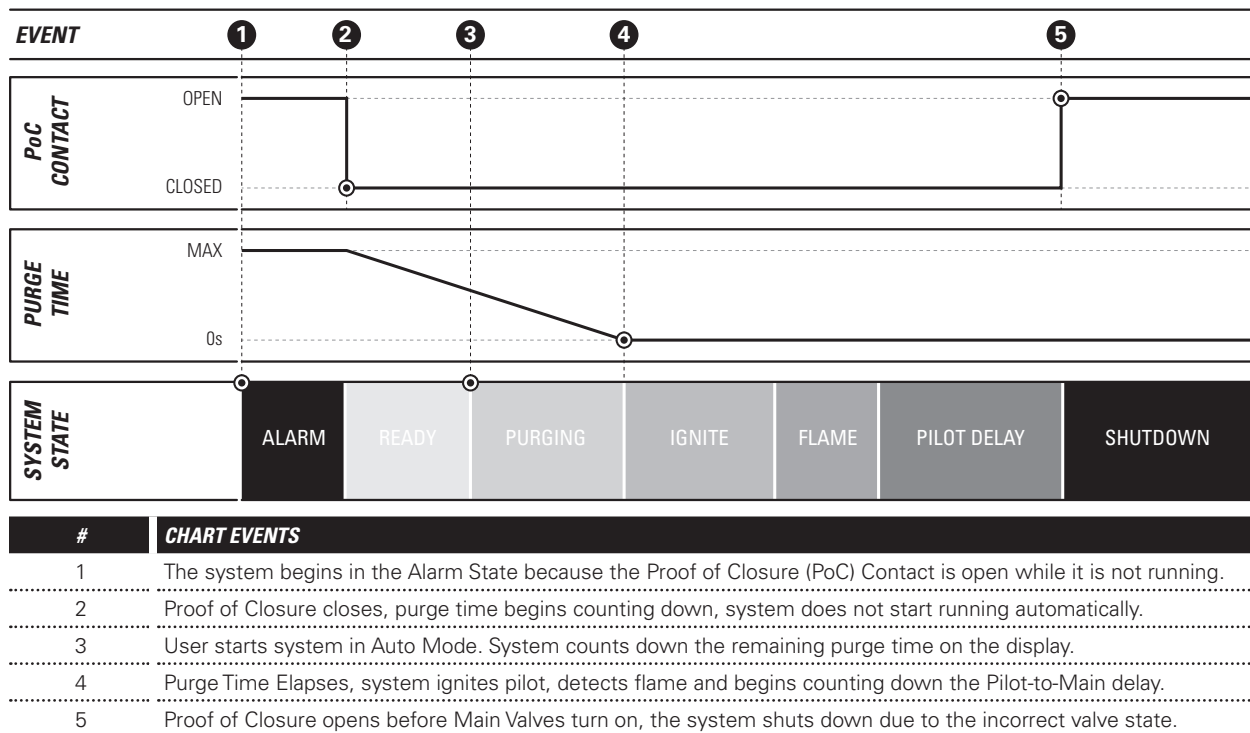
If this contact is not needed, it must be shorted out with the provided jumper or a wire.

PROOF OF CLOSURE INPUT

When the PF2100 is started, it drives the Main Valves to the closed position. If, for some reason, the valves do not close, a dangerous situation can result. This condition might arise if a valve is mechanically damaged, frozen open, or has been wired incorrectly. If undetected, the PF2100 may attempt to light the burner while a dangerous amount of gas is present resulting in an explosion. To prevent this, the Proof of Closure Input Contact can be used to monitor the mechanical position of the Main Valves. This feature requires the use of valves that have a built-in Proof of Closure output. If more than one Main Valve is used, the Proof of Closure outputs from each valve are wired together in series before being connected to the PF2100’s Proof of Closure input.

The Proof of Closure contact must be closed in order for the Purge Timer to count down. If it is ever opened while the system is not running, the Purge Timer is reset and must count down again before the system can be started. In short, the Proof of Closure contact must be closed for the entire duration of the Purge Time or the system will not start. While running, if the Proof of Closure contact ever opens when it is not expected to be open, the system will shut down.





If this contact is not needed, it must be shorted out with the provided jumper or a wire.

## LEVEL INPUT

The Level Input is generally used in tank heater applications. A level switch is installed in the tank to determine when the tank fluid level drops below to position of the fire tube. This switch is then connected to the Level Input Contact on the PF2100. If the fluid level drops below the switch position, the switch opens and the PF2100 will stop heating the tank. This is to prevent damage to the tank and fire tube which may result from applying heat to the empty tank. Generally, this situation arises when a tanker truck arrives on site and empties the tank into the truck. The system can be setup to begin heating the tank again automatically after the level of fluid rises back above the switch position. This is done by enabling the "Level Event Restart" setting in menu 4.

The response to the contact opening is delayed by 2s to reject electrical noise that is common on some sites. If long periods of severe noise are common on a particular site, the delay can be increased to 20s by enabling the "Pressure/Level Delay" feature in menu 4.

If this contact is not needed, it must be shorted out with the provided jumper or a wire.

Chart 1: Level Event Restart = Disabled

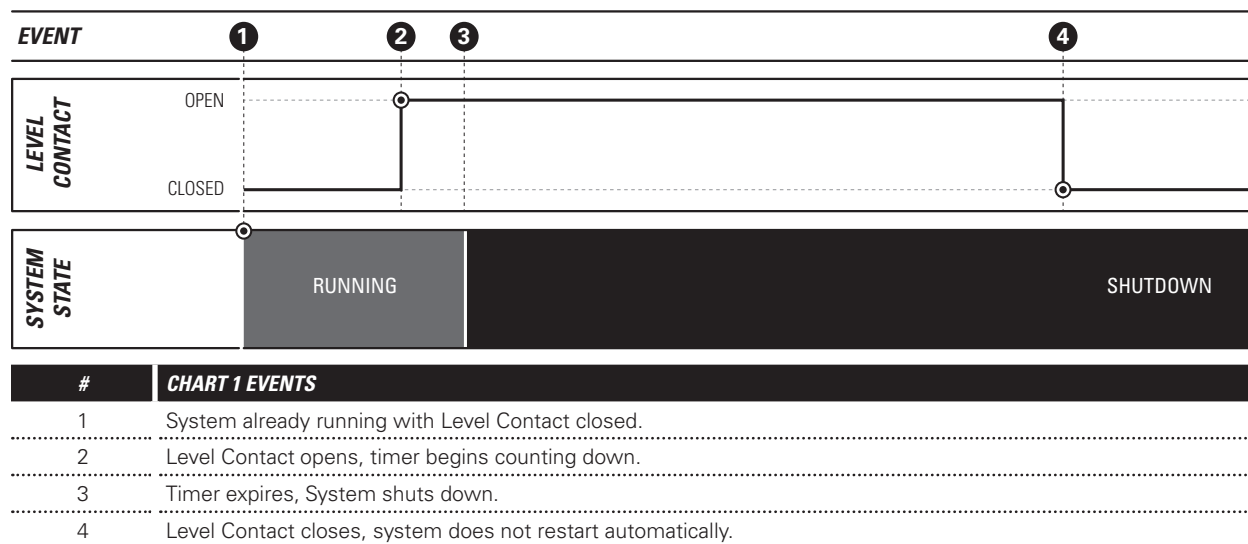
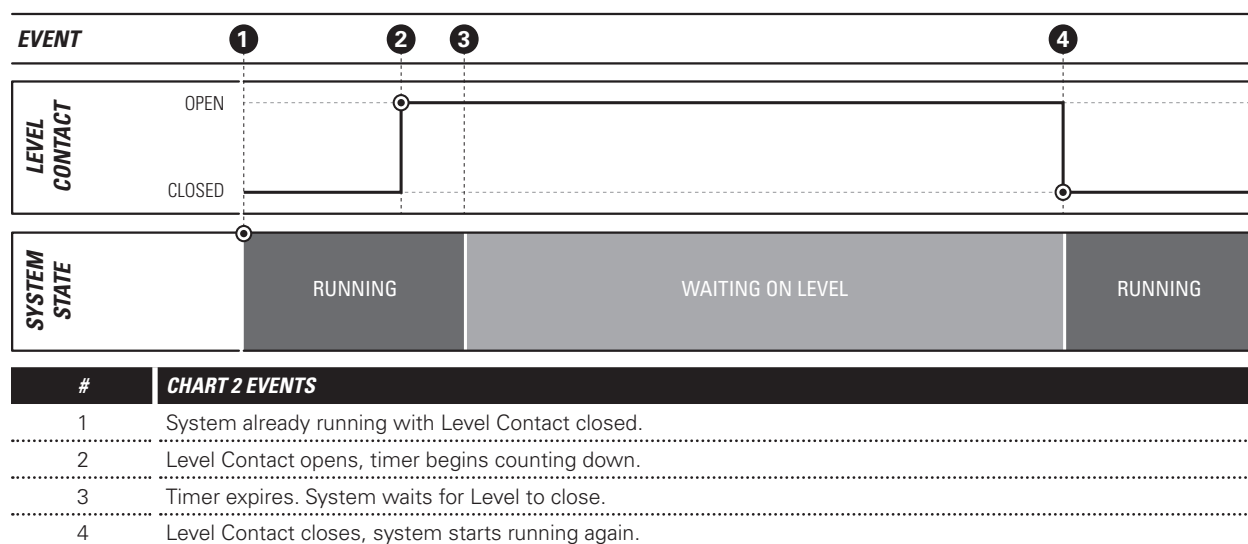


Chart 2: Level Event Restart = Enabled



## LOW PRESSURE INPUT

The Low Pressure Input is used to monitor fuel train pressure. Insufficient fuel pressure may result in the flame burning back into the fuel train causing damage or improper operation. A low pressure switch can be installed on the fuel train and then connected to the Low Pressure Input Contact on the PF2100. If the fuel pressure drops below the switch's mechanically set pressure setting, the switch opens and the PF2100 will close all valves and stop running. The system can be setup to begin running again automatically after the pressure returns above the switch's pressure setting. This is done by enabling the Auto Restart feature in menu 4.

The response to the contact opening is delayed by 2s to reject electrical noise that is common on some sites. If long periods of severe noise are common on a particular site, the delay can be increased to 6s by enabling the "Pressure/Level Delay" feature in menu 4.



If this contact is not needed, it must be shorted out with the provided jumper or a wire.

Chart 1: Low Pressure Restart=Disabled

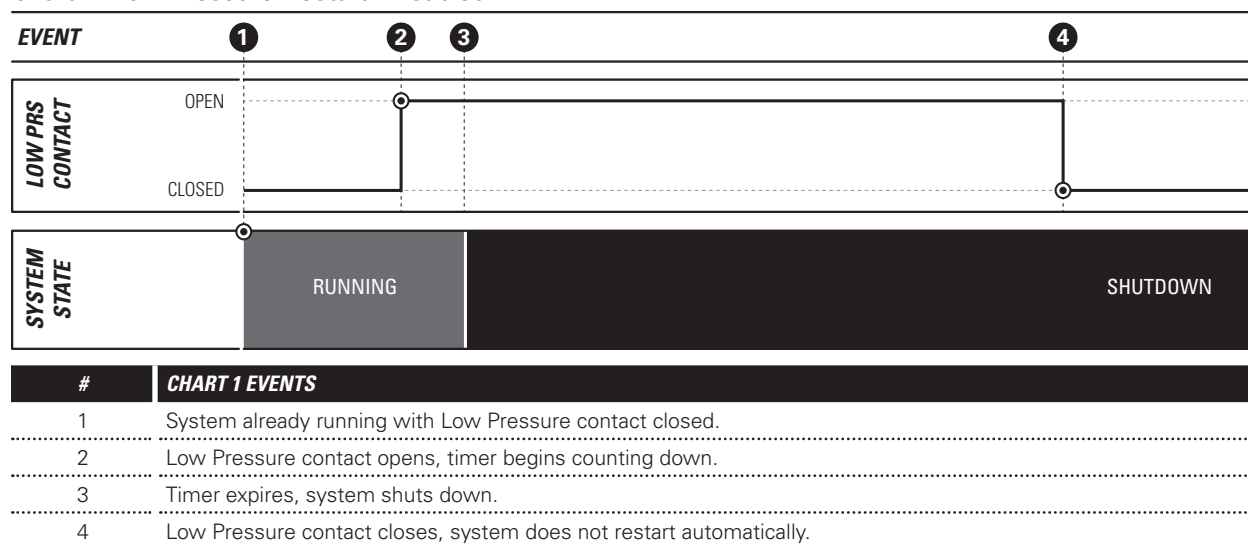
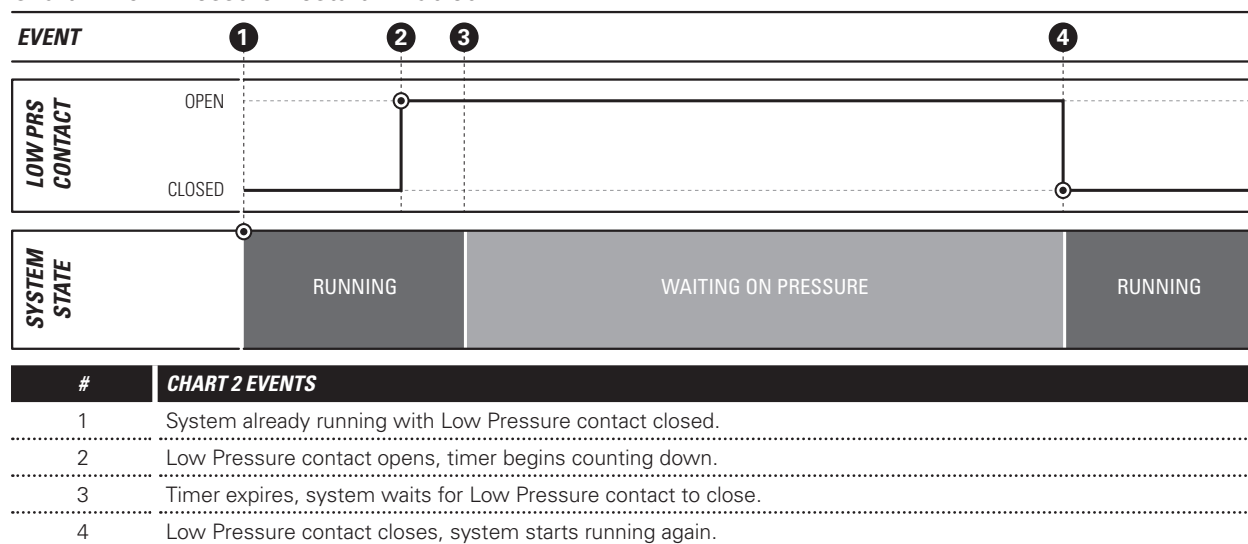


Chart 2: Low Pressure Restart=Enabled



## HIGH PRESSURE INPUT

The High Pressure Input Contact is used to monitor fuel train pressure when excess fuel pressure may result in damage to the pilot nozzle or otherwise cause improper operation. A high pressure switch can be installed on the fuel train and then connected to the High Pressure Input Contact on the PF2100. If the fuel pressure increases above the switch's mechanically set pressure setting, the switch opens and the PF2100 will close all valves and stop running. The system always shuts down from a High Pressure Event and cannot be programmed to automatically restart if the event clears.

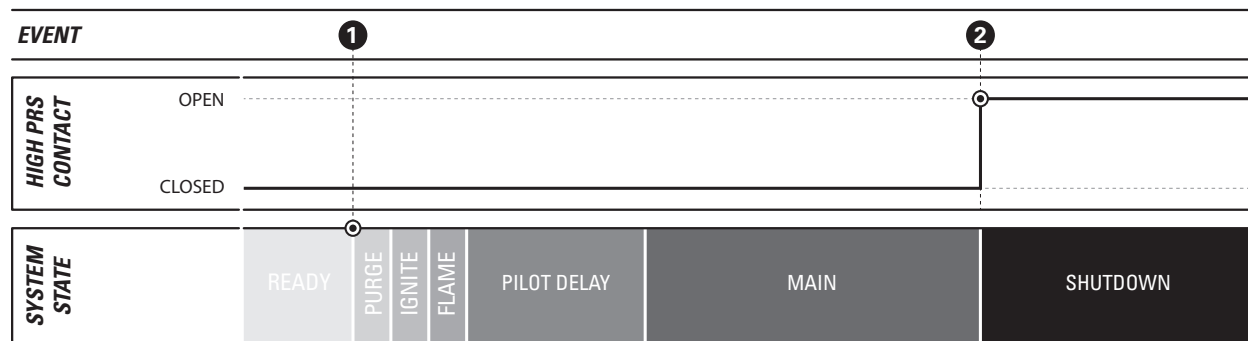
The system can be started when the High Pressure Contact is open. This is to allow for easy recovery from the common issue of leaky regulators. If the regulator upstream from the high pressure switch is leaky, it can allow pressure to accumulate at the switch's position over time while the system is not

running. Since there is no way to relieve this pressure other than to open a downstream valve, the system must be allowed to start running under this condition. So the system will start, light the pilot, and open the main valve to allow the built-up pressure to be relieved. If the pressure does not drop low enough to close the High Pressure Contact within 2s after the main valve has been opened, the system will shutdown. Otherwise, it will continue running.

The response to the contact opening is always immediate and cannot be configured.

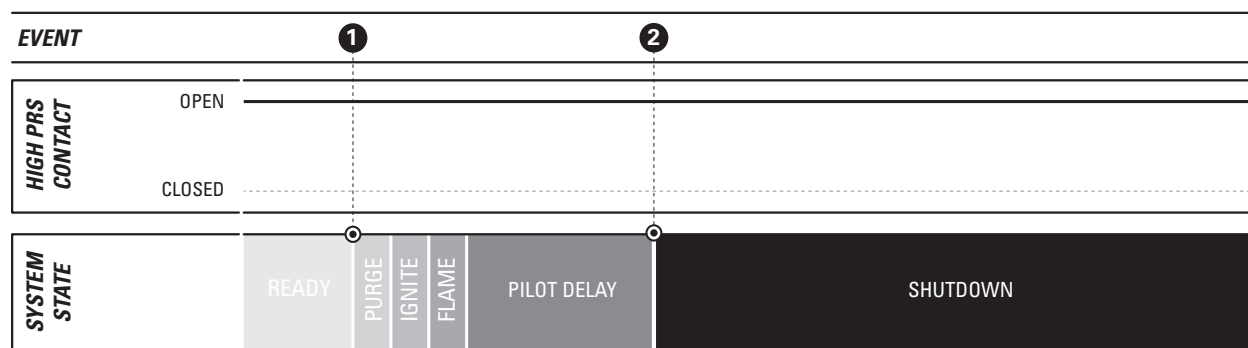
If this contact is not needed, it must be shorted out with the provided jumper or a wire.

Chart 1: High Pressure Contact Opens While Running



| # | CHART 1 EVENTS                                                                                  |
|---|-------------------------------------------------------------------------------------------------|
| 1 | System started by user with High Pressure Contact closed.                                       |
| 2 | High Pressure Contact opens while the system is running with the mains open. System shuts down. |

Chart 2: High Pressure Contact Open On Start



| # | CHART 2 EVENTS                                                                                       |
|---|------------------------------------------------------------------------------------------------------|
| 1 | System started by user with High Pressure Contact open.                                              |
| 2 | Main valve opens, system reads that the High Pressure Contact is open and goes straight to shutdown. |



## 5 | EXPANSION CARDS

### 5.1 | 4-20mA Expansion Card

An optional 4-20mA Expansion Card can be installed in the PF2100 which provides two 4-20mA inputs as well as a pair of complementary dry contact outputs:

#### 4-20MA FUEL TRAIN PRESSURE MEASUREMENT

This card can be used as an alternative to the High and Low Pressure Contacts which are built into the PF2100. This input can be wired to a 4-20mA Pressure Transmitter to obtain an actual reading of the fuel train pressure. The transmitter range and units can be set along with low and high pressure thresholds. The reading can be displayed on the PF2100 display or read remotely via Modbus if the optional Modbus Expansion Card is also installed.

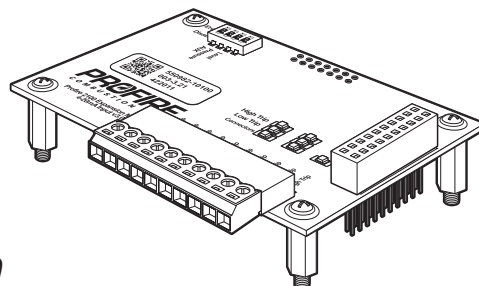
#### 4-20MA TANK LEVEL MEASUREMENT

This can be used as an alternative to the Level Contact which is built into the PF2100. This input can be wired to a 4-20mA Level Transmitter to obtain an actual reading of the tank level. The transmitter range and units can be set along with low and high level thresholds. The reading can be displayed on the PF2100 display or read remotely via Modbus if the optional Modbus Expansion Card is also installed.

#### TANK HIGH LEVEL DRY CONTACTS

Both Normally Open (NO) and Normally Closed (NC) contacts are provided. When the Level reading is above the High Level Setpoint, the NO contact will close and the NC contact will open. The opposite is true whenever the Level reading is below the High Level Setpoint. This can be used to control auxiliary equipment such as a warning light, an alarm, or the pump that is filling the tank.

Refer to the “4-20mA Expansion Card Manual” for details on installation and operation of this card.



#### 4-20mA *EXPANSION CARD*

Some PF2100 models come with this card pre-installed.

#### 4-20MA EXPANSION CARD SETTINGS

These settings all apply to the 4-20mA Expansion Card which must be installed in the PF2100's expansion slot. These settings can all be found in Menu 6. Some of these settings will be hidden if the card is not installed or enabled.

## 4-20 EXPANSION CARD ENABLE (MENU 6)

For the Tank Level Settings to be visible, the LVL DIP Switch on the 4-20mA Input Card must be enabled.

### Tank Level Settings:

1. 4-20 LEVEL ZERO OFFSET (menu 6): Specifies the offset value for the tank's level transmitter.
2. 4-20 LOW LEVEL SETPOINT (menu 6): If the 4-20mA LVL input drops below this setpoint, the burner will turn off to prevent damage to the tank and fire tube.
3. 4-20 HIGH LEVEL SETPOINT (menu 6): If the 4-20mA LVL input exceeds this setpoint, the LVL output contacts on the 4-20mA Input Card will toggle.
4. 4-20 LEVEL RANGE (menu 6): Specifies the maximum capacity of the tank's 4-20mA level transmitter.
5. 4-20 LEVEL UNITS (menu 6): Specifies the units of measurement. Note that this may have an impact on measurement accuracy.

### Fuel Train Pressure Settings

For the Fuel Train Pressure Settings to be visible, the PRS DIP Switch on the 4-20mA Input Card must be enabled.

1. 4-20 LOW PRESSURE SETPOINT (menu 6): If the 4-20mA PRS input drops below this setpoint, the burner will turn off to prevent flame from burning back into the fuel train.
2. 4-20 HIGH PRESSURE SETPOINT (menu 6): If the 4-20mA PRS input exceeds this setpoint, the system will shut down.
3. 4-20 PRESSURE RANGE (menu 6): Specifies the maximum capacity of the tank's 4-20mA Pressure transmitter.
4. 4-20 PRESSURE UNITS (menu 6): Specifies the units of measurement. Note that this may have an impact on measurement accuracy.

## 4-20MA EXPANSION CARD BEHAVIOR

The 4-20mA Expansion Card provides an alternate method of monitoring tank level and fuel train pressure. This is via 4-20mA loop transmitters. These devices can be used in place of the switches attached to the level and pressure contacts on the PF2100. Using transmitters allows actual measurements of the level and pressure to be shown on the PF2100's display or read remotely via Modbus (if the Modbus Card is installed).

## 4-20MA LEVEL INPUT & OUTPUT CONTACTS

The 4-20mA Level Input is used to monitor tank level in the same way as the Level Contact. The behavior and features are identical to those described in the previous [Contact Behavior](#) section. The difference is that a Level Transmitter is used instead of a Level Switch and the Low Level setpoint is set via a menu instead of the physical position of the switch on the tank. When the 4-20mA signal is below the Low Level setpoint, the system will stop. When it is above the setpoint, the system will run.

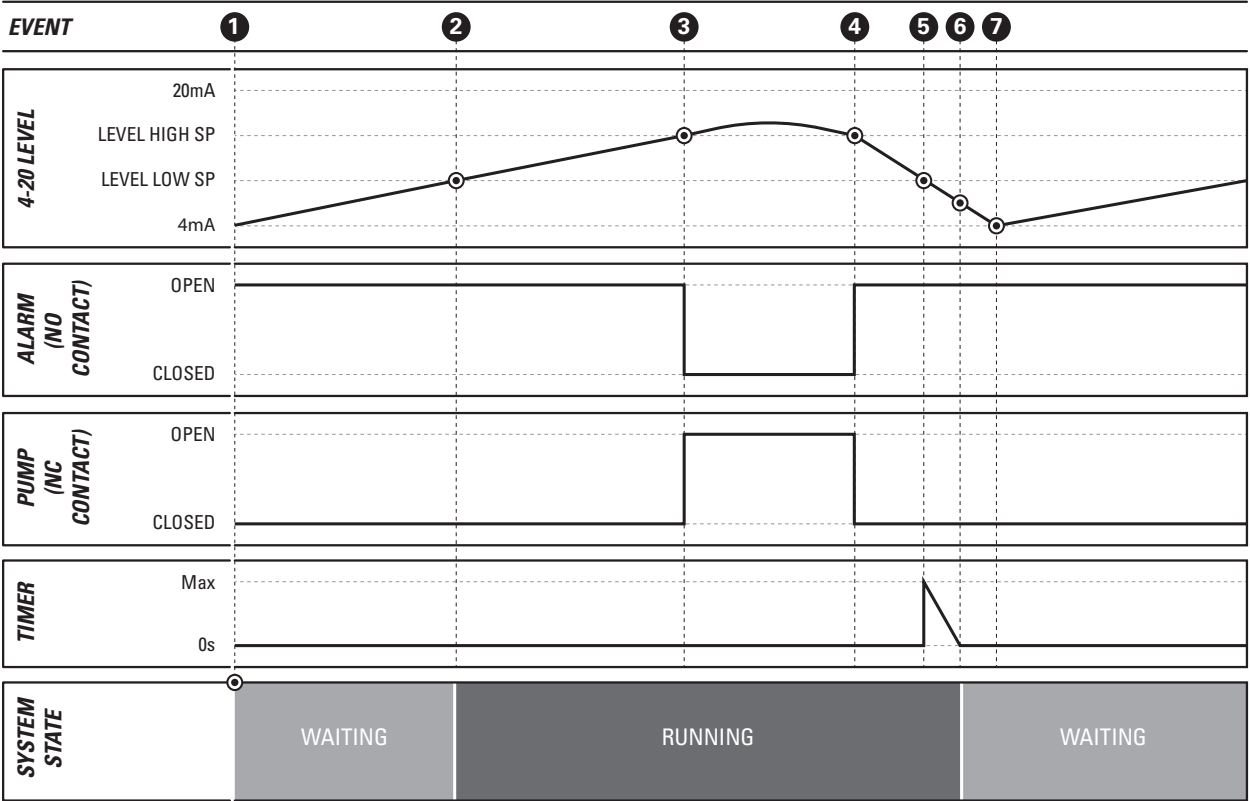
The 4-20mA Expansion Card also has a pair of High Level Output Contacts which toggle when the Level Input exceeds the Level High Setpoint. One contact is normally open and the other is normally closed. "Normally," in this case, means "when the level is below the high setpoint." The normally closed contact could be used to turn off the pump that is filling the tank and the normally open contact could be used to



sound a remote alarm to signal that the tank is full.

**To use the 4-20mA Level Input, it must be setup as follows:**

- 1. Attach a properly calibrated Level Transmitter to the 4-20 Level Input
- 2. Enable the Level DIP Switch on the 4-20 Card
- 3. Enable the 4-20 Card in menu 6
- 4. Set the Level Low Setpoint, High Setpoint, Range, and Units in menu 6
- 5. Disable the Level Contact by installing a jumper in it



| # | CHART 1 EVENTS                                                                                                                                                                         |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | System started with tank empty. Pump starts filling tank. Burner is off and system is waiting on level input because 4-20mA level input is below the low setpoint.                     |
| 2 | Tank level rises above low setpoint. System begins running (heating tank).                                                                                                             |
| 3 | Tank level rises above the high setpoint, the pump turns off and the remote alarm turns on to signal a truck to come and empty the tank.                                               |
| 4 | An operator arrives on site and begins emptying the tank into a tanker truck. The pump turns back on and the alarm turns off.                                                          |
| 5 | The tank level drops below the low setpoint and the level delay timer begins counting down.                                                                                            |
| 6 | The level delay timer reaches zero after 2 or 20s (depending on the "Pressure/Level Delay" setting) and the system stops heating the tank and returns to the "Waiting on Level" state. |
| 7 | The tank is empty and the tanker truck leaves the site. The tank level begins rising again.                                                                                            |

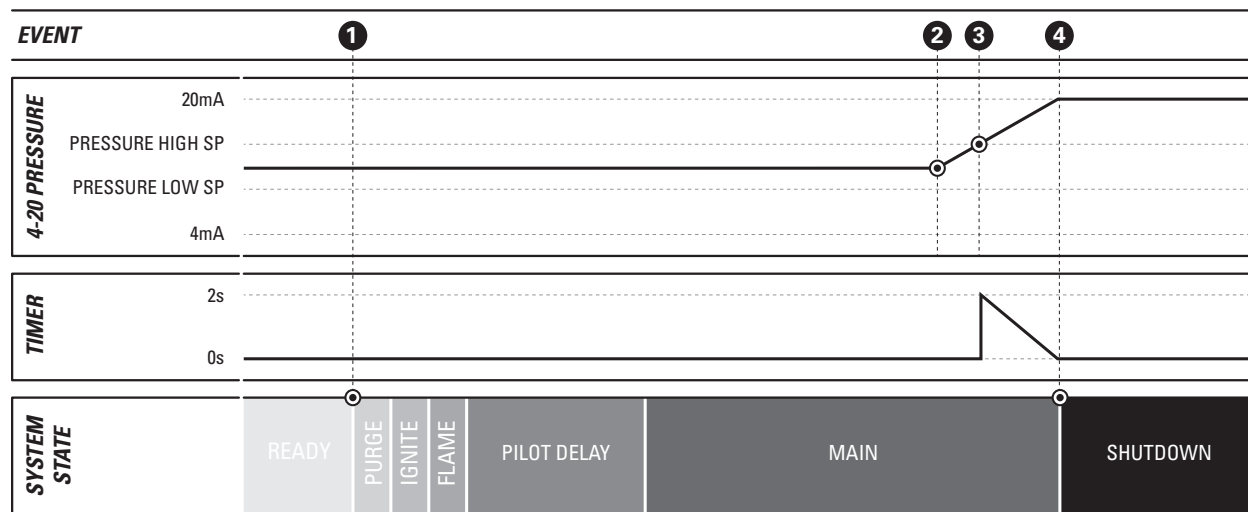
## 4-20MA PRESSURE INPUT

The 4-20 Pressure Input is used to monitor fuel train pressure in the same way as the Pressure Contacts. The behavior and features are identical to those described in the previous [Low Pressure Contact](#) and [High Pressure Contact](#) sections. The difference is that a Pressure Transmitter is used instead of a pair of Pressure Switches and the setpoints are set via a menu instead of mechanically on the switches. When the 4-20 signal is below the low setpoint or above the high setpoint, the system will stop. When it is between the two setpoints, it will run. It can be setup to restart from a low event but not from a high event.

### To use the 4-20 Pressure Input, it must be setup as follows:

1. Attach a properly calibrated Pressure Transmitter to the 4-20 Pressure Input
2. Enable the Pressure DIP Switch on the 4-20 Card
3. Enable the 4-20 Card in menu 6
4. Set the Pressure Low Setpoint, High Setpoint, Range, and Units in menu 6
5. Disable the Low Pressure and High Pressure Contacts by installing a jumper in each of them

Chart 1: Pressure Increases While Running



| # | CHART 1 EVENTS                                                                      |
|---|-------------------------------------------------------------------------------------|
| 1 | System started by user with pressure between low and high setpoints.                |
| 2 | Pressure regulator fails while the mains are turned on. Pressure begins increasing. |
| 3 | Pressure exceeds High Setpoint. High pressure timer begins counting down.           |
| 4 | Pressure continues to climb. After 2s, system shuts down.                           |





Chart 2: Pressure High From Start

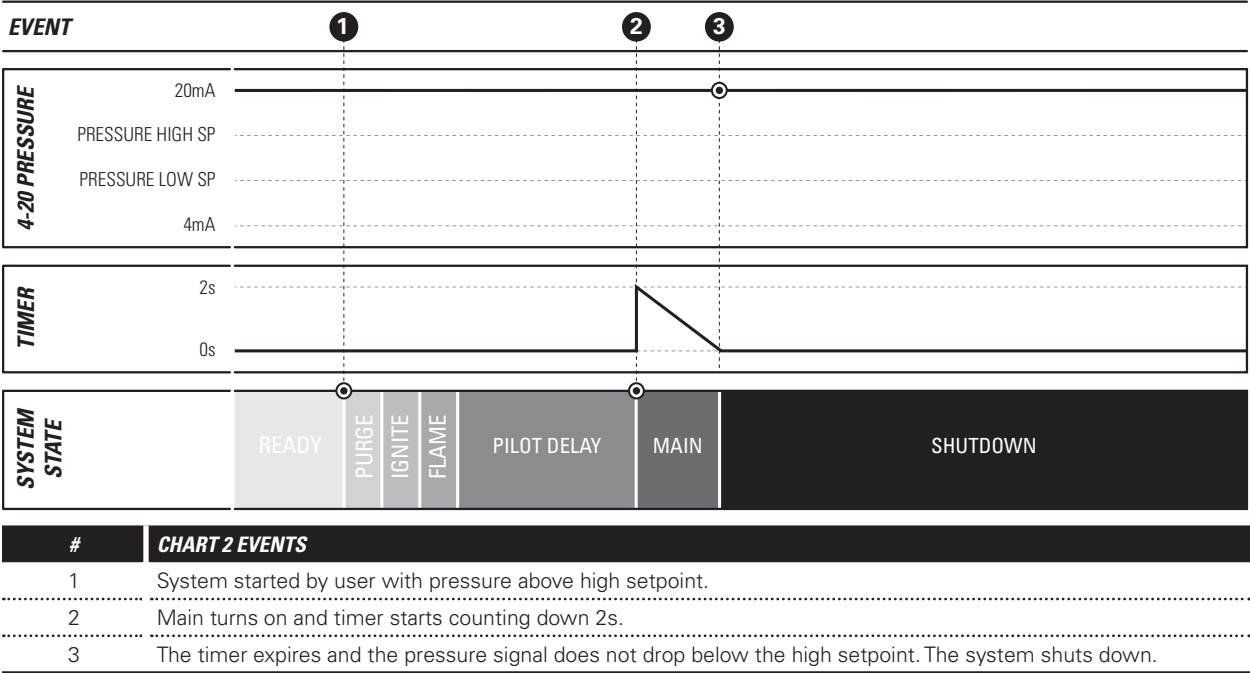


Chart 3: Pressure High On Start But Clears When Main Opens

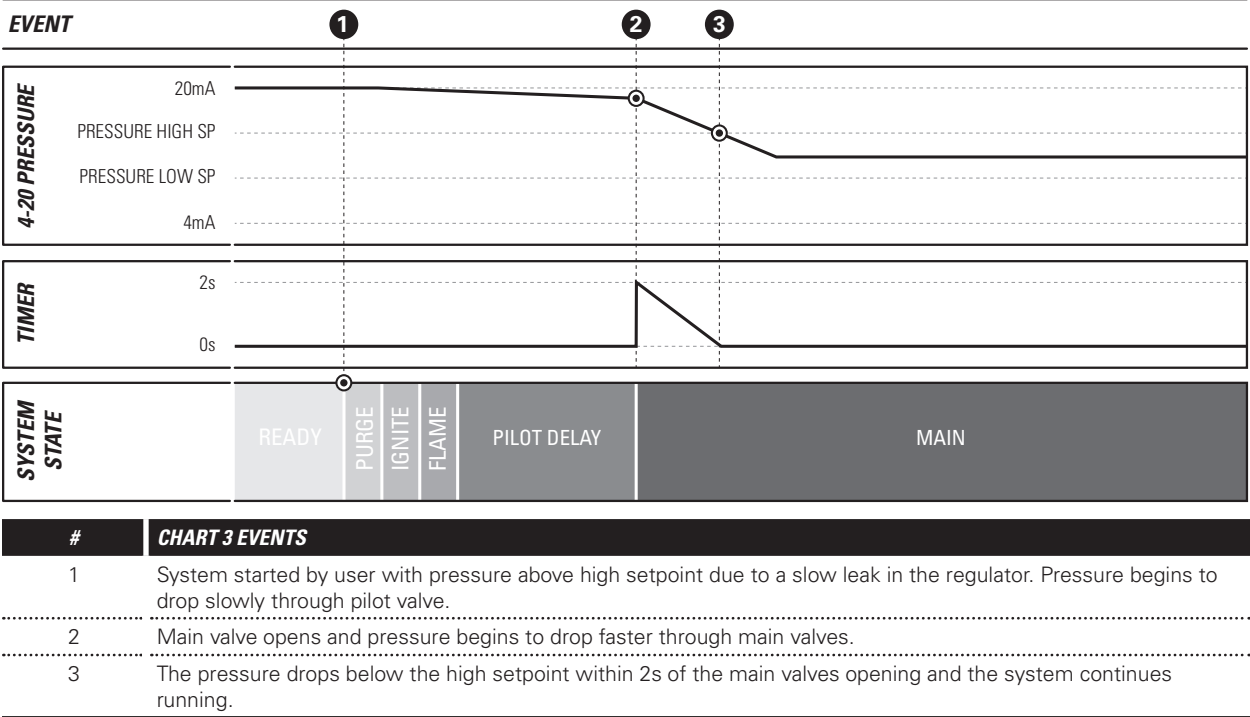


Chart 4: Auto Restart = Enabled

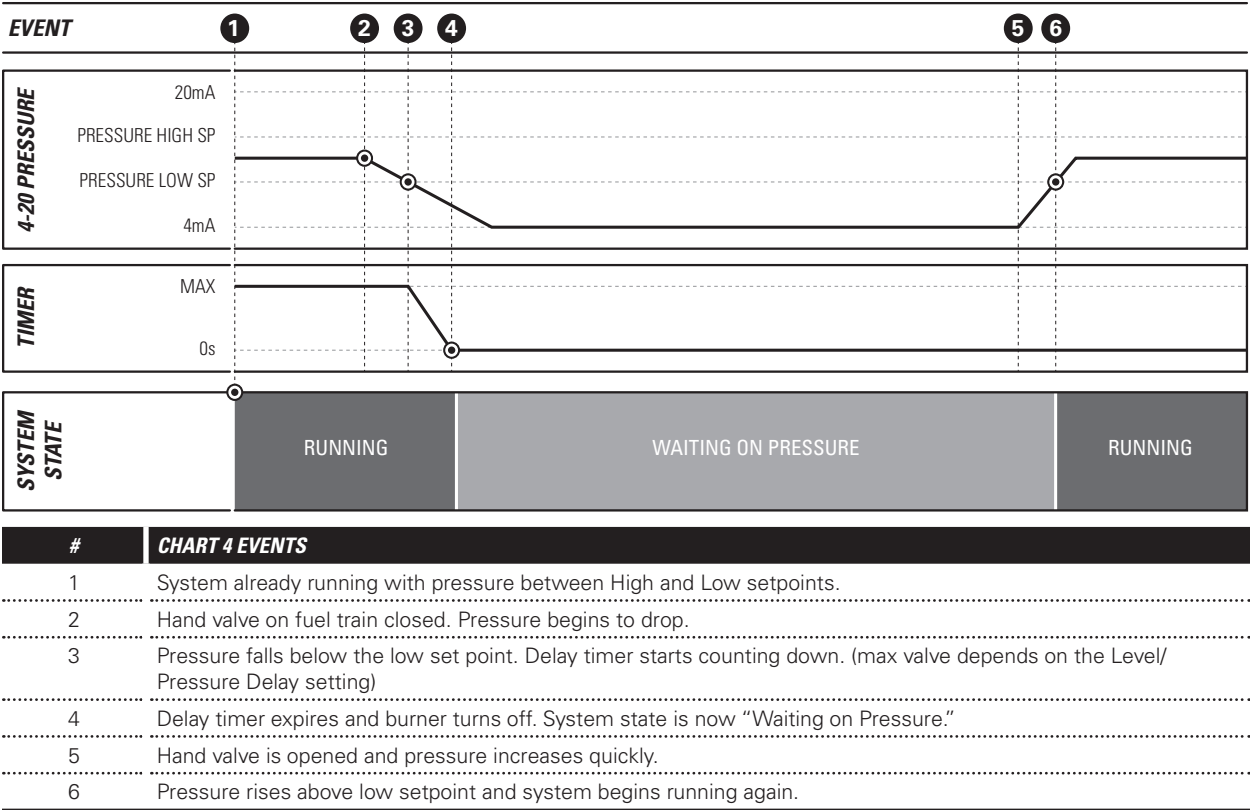
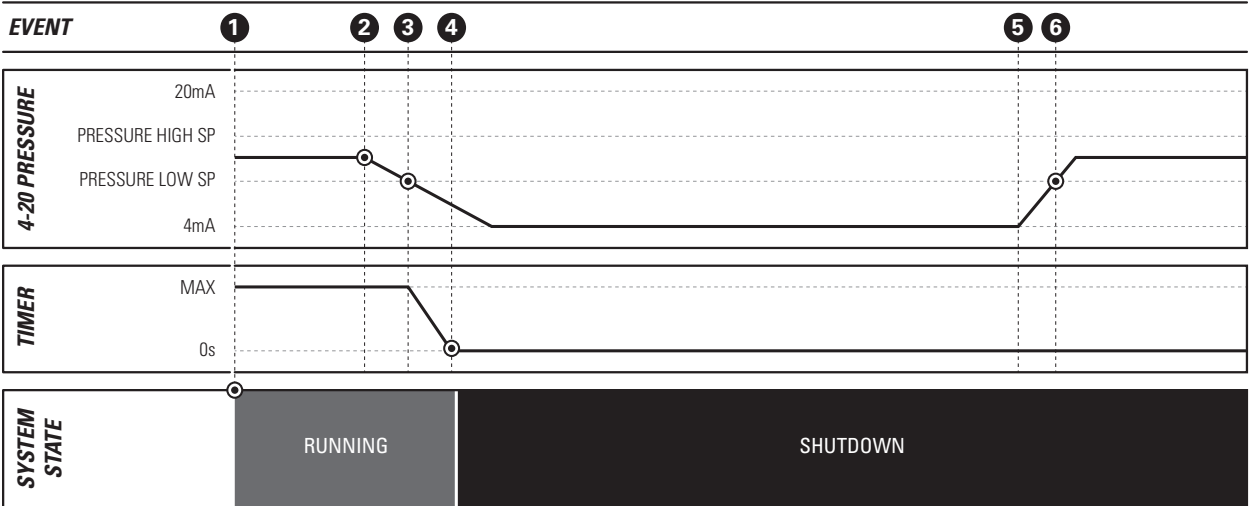


Chart 5: Level Event Restart = Disabled



| # | CHART 5 EVENTS                                                                                                                    |
|---|-----------------------------------------------------------------------------------------------------------------------------------|
| 1 | System already running with pressure between High and Low setpoints.                                                              |
| 2 | Hand valve on fuel train closed. Pressure begins to drop.                                                                         |
| 3 | Pressure falls below the low set point. Delay timer starts counting down. (max valve depends on the Level/Pressure Delay setting) |
| 4 | Delay timer expires and system shuts down.                                                                                        |
| 5 | Hand valve is opened and pressure increases quickly.                                                                              |
| 6 | Pressure rises above low setpoint but system does not restart and remains shut down.                                              |

#### 4-20mA TEMPERATURE OUTPUT

If the 4-20mA Output is not being used to control a proportional valve, it can be configured to output the process temperature encoded as a 4-20mA signal. This is useful if a PLC on site needs to know the process temperature. In this case, wire the PF2100's 4-20mA Output to a PLC's 4-20mA Input. Note that the PF2100 provides the loop power. The PLC resistance is expected to be in the range of 120 Ohms and 250 Ohms.

The 4-20mA output signal will be scaled such that 4mA represents OC and 20mA represents HT ESD Setpoint.

## 5.2 | Modbus Expansion Card

An optional Modbus Expansion Card can be installed in the PF2100 which provides the following additional features:

### REMOTE MONITORING

This card allows for remote monitoring of the PF2100 status including process temperature, auxiliary temperature, and 4-20mA Input Card status (if installed).

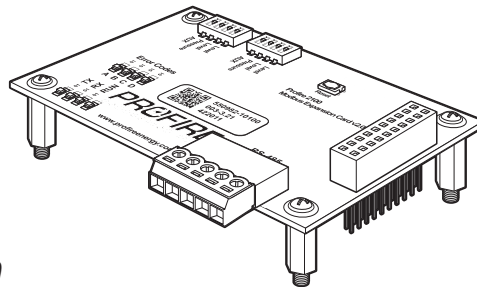
### REMOTE START / STOP

This card can also be used to remotely start and stop the system and to adjust some setpoint values.

### REMOTE SETPOINT ADJUSTMENT

This card can be used to remotely adjust some setpoints such as High Fire, Low Fire, and Pilot Off setpoints. Note that these settings are not stored in memory. If the system is powered off and then on again, these settings will revert back to the last values entered directly using the keypad.

Refer to the “Modbus Expansion Card Manual” for further details on installation and operation of this card.



## MODBUS EXPANSION CARD

Some PF2100 models come with this card pre-installed.

### MODBUS EXPANSION CARD SETTINGS

This setting applies to the Modbus Expansion Card which must be installed in the PF2100's expansion slot.

#### Modbus Enable/Address (menu 6)

The Modbus Card is disabled by setting the address to zero and enabled by setting the address to any non-zero value. The address is shown on the display as a decimal number which can be set to any value in the range of 1 to 254. This corresponds to hexadecimal values 0x01 to 0xFE.

# 6 | TROUBLESHOOTING

This section is designed to help you troubleshoot the PF2100. A list of common issues and solutions, reference tables containing Shutdown Messages, Alarm Codes, and Warning Messages, and step-by-step guides for troubleshooting specific issues are included in this section.

If you are having trouble with your PF2100 System, please consult the following resources in this order:

1. Consult this section for solutions to see if one matches your needs.
2. Consult the support section of our website at [www.profireenergy.com](http://www.profireenergy.com).
3. Contact us on our support line at 1-855-PRO-FIRE (776-3473).

## 6.1 | Common Issues & Solutions

Under each issue is a list of possible solutions.

### EXPANSION CARDS

#### **Cannot Write Setpoints via Modbus**

1. Check that the system has the latest firmware. Firmware older than v1.8.005 did not support this feature.
2. Check that the Modbus Card has the latest firmware. Firmware older than v4.0 did not support this feature.

### FLAME DETECTION

#### **System Has Visible Flame But Cannot Detect It**

1. The flame rod, pilot assembly and the gap between them should be fully engulfed in flame. If not, adjust the rod positioning.
2. Check that the flame detection wiring does not exceed the recommended maximum length.
3. Check that the Ion+ wire is securely connected as per the appropriate wiring diagram.
4. Check that the ground connection between the PF2100 and the pilot assembly is secure.
5. Put the PF2100 into Manual Mode and use the Review Menu to check the flame quality level.
6. Consult the instructions in the Flame Detection Troubleshooting Guide for further details on Flame Detection.

## SHUTDOWN

### **System Shuts Down with a High/Low Voltage Message Shutdown**

1. Make sure that the system voltage setting matches the power supply's nominal voltage.
2. Check that the system has the latest firmware. Firmware older than v1.8.005 was prone to shutdown on transient voltage spikes and dips.
3. Make sure that some other load is not causing the supply to drop periodically. Remove other devices from the supply or, monitor the supply voltage with a data logger.
4. Make sure the power supply is rated appropriately for the valves and other peripheral devices attached to the PF2100.

### **System Shuts Down On High Temperature ESD**

1. Check that the HT ESD setpoint is not set too close to the operating temperature of the system. Measurement accuracy and process control overshoot can cause the system to shutdown if they are too close.

### **System Shuts Down On an Open TC Error**

1. Check the thermocouple connections inside the PF2100.  
Note that both the Process and High Temp thermocouples are required.
2. Check for breaks in the thermocouple wiring.

### **System Shuts Down On TCS Not Being Equal**

1. Press the Up and Down arrows together.
2. Press the Up arrow until you get to a screen with 4 temperature readings, DH, TH, TP and TA.
3. If the TH and TP readings are close but DH is different, follow these steps:
4. Go to the calibration menu.
5. Step through the menu to Cal High Temp = xxxC.
6. Press the Up arrow once.
7. Press OK.
8. Go back to the screen with the temperature readings and make sure the issue is corrected.

## SOLAR POWER

### **Solar Output Voltage is 12V when 24V is Expected**

1. Check solar panel wiring. They should be wired in parallel rather than in series.

### **Expected Battery Life is Not Achieved**

1. The PF2100 is not set up by default to use low power valves with a PWM setting of 20%.
2. The PF2100 is not set up to put the display to sleep when not in use.
3. The solar panel is undersized.
4. The solar panel is shaded or not located in full sun.



### **The Battery is Not Being Charged at All**

1. Check the Solar Charger for damage or defective parts. Look for flashing error codes on the controller's LEDs.
2. The solar panel is undersized.
3. The solar panel is shaded or not located in full sun.
4. The battery is defective.

## **SOLENOIDS**

### **Valves Are Not Opening**

1. Check if the positive and negative wires are reversed.
2. Make sure that each valve has a separate negative return wire connected to the correct terminal. A common ground wire cannot be used and will not work.
3. Check if the proper PWM setting is used for each valve.
4. Check if the valve voltage ratings match the system voltage (12V or 24V).

### **System Shuts Down With Terminal Card Command Refused, Master Power, Solenoid Feedback.**

Check the solenoid wiring to make sure that no wires are crossed and that separate return wires are used for each valve.

## **STATUS CONTACT**

### **Status Contact Opens but System Continues To Run**

Check that the system has the latest firmware. Some firmware versions older than v1.8.005 had a bug that might lead to this under certain circumstances. If you can't update your firmware immediately, repositioning the flame rod so that it is more fully immersed in the flame can lessen the occurrence of this issue.

### **Status Contact Remains Closed Even When The System is Stopped**

The status contacts are polarity sensitive. Try reversing the Status+ and Status- wires.

### **Status Contact Never Closes**

The current or voltage ratings on the status contact may have been exceeded. Verify that you are not exceeding these ratings. If the ratings were exceeded, check the terminal Card HW version to determine the appropriate solution. (v1.6: Replace the Terminal Card.) (v1.7: Replace the Status Contact Fuse on the Terminal Card.)

## **THERMOCOUPLES**

### **Thermocouple Readings are Bouncing**

1. Verify that the Valve PWM Settings are correct for the valves

being used. Using incorrect settings for a valve can result in more noise than necessary. The lowest noise will result when the PWM setting is set to 20% for low power valves and 100% for regular valves.

2. Verify that proper system grounding is in place. Especially check that all solenoids are connected to earth ground.

#### Thermocouple Readings are Incorrect

1. Check if the thermocouple wiring polarity is reversed. Yellow should be connected to positive, and red to negative.
2. Check that no thermocouple pairs are crossed (ie, positive from one TC paired with negative from another TC).
3. Make sure that only Type-k thermocouple wire and connectors are used. Even small sections of other types of wire can significantly disrupt the measurement.
4. If a head connection is used, verify that none of the above wiring issues exist there either.
5. Check if the thermocouple is defective by trying a different thermocouple that is known to be good or by connecting the suspect thermocouple to a process calibrator.
6. Check that the PF2100 is in proper calibration using a process calibrator. If not, recalibrate the system.

## 6.2 | Shutdown Messages

The following is a list of messages that may flash on the PF2100 display after the system has shutdown. Typically, the word "SHUTDOWN" in large text will flash alternately with one of the messages below. These messages indicate the reason that the system last shutdown and can be cleared by pressing the OK key (except where noted). Use the table below to determine the meaning of these messages. This table is organized alphabetically.

| ON SCREEN                 | DESCRIPTION                                                                                           | POSSIBLE SOLUTIONS                                                                                                                                                                         |
|---------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ambient Temps Not Equal   | The Ambient Temperature read by the Door Card does not match the one reported by the Terminal Card.   | The door card and terminal card are different temperatures. Check to see if one board is being heated by an external source such as direct sun on the door or being mounted on a hot tank. |
| Aux High Temp             | Aux Temp Mode is set to "Temp ESD" and the Auxiliary Temperature exceeded the High Temp ESD Setpoint. | Verify proper settings and check for issues outside the system.                                                                                                                            |
| Aux Thermocouple Error    | The Auxiliary Thermocouple is open.                                                                   | Check wiring.                                                                                                                                                                              |
| Comparison Setpoints      | One of the Setpoints in the Door Card does not match the corresponding value in the Terminal Card.    | Reset system to factory defaults.                                                                                                                                                          |
| Comparison:<br>C_byte x y | The Door Card's internal control byte (x) did not match the Terminal Card's internal status byte (y). | Remove solenoid wires; if the problem is resolved check the solenoid wiring. If the problem remains the same, the boards or ribbon cable may need to be replaced.                          |





| ON SCREEN                                                | DESCRIPTION                                                                                                                         | POSSIBLE SOLUTIONS                                                                                                                                                 |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Comparison:<br>ESD DC:xxx TC:xxx                         | The Door Card and Terminal Card do not agree on the state of the ESD Contact. "xxx" will be either "ON" or "OFF".                   | Remove ESD wires and jumper the terminals, if the problem is resolved check the wiring. If the problem remains the boards or ribbon cable may need to be replaced. |
| Comparison:<br>LVL DC:xxx TC:xxx                         | The Door Card and Terminal Card do not agree on the state of the Level Contact. "xxx" will be either "ON" or "OFF".                 | Remove ESD wires and jumper the terminals, if the problem is resolved check the wiring. If the problem remains the boards or ribbon cable may need to be replaced. |
| Comparison:<br>MAN DC:xxx TC:xxx                         | The Door Card and Terminal Card do not agree on the state of the Main Valve Output. "xxx" will be either "ON" or "OFF".             | Remove solenoid wires; if the problem is resolved check the solenoid wiring. If the problem remains the same, the boards or ribbon cable may need to be replaced.  |
| Comparison:<br>PLT DC:xxx TC:xxx                         | The Door Card and Terminal Card do not agree on the state of the Pilot Valve Output. "xxx" will be either "ON" or "OFF".            | Remove solenoid wires; if the problem is resolved check the solenoid wiring. If the problem remains the same, the boards or ribbon cable may need to be replaced.  |
| Comparison:<br>PoC DC:xxx TC:xxx                         | The Door Card and Terminal Card do not agree on the state of the Proof of Closure Contact. "xxx" will be either "ON" or "OFF".      | Remove ESD wires and jumper the terminals, if the problem is resolved check the wiring. If the problem remains the boards or ribbon cable may need to be replaced. |
| Comparison:<br>PRH DC:xxx TC:xxx                         | The Door Card and Terminal Card do not agree on the state of the High Pressure Contact. "xxx" will be either "ON" or "OFF".         | Remove ESD wires and jumper the terminals, if the problem is resolved check the wiring. If the problem remains the boards or ribbon cable may need to be replaced. |
| Comparison:<br>PRL DC:xxx TC:xxx                         | The Door Card and Terminal Card do not agree on the state of the Low Pressure Contact. "xxx" will be either "ON" or "OFF".          | Remove ESD wires and jumper the terminals, if the problem is resolved check the wiring. If the problem remains the boards or ribbon cable may need to be replaced. |
| Comparison:<br>STRT DC:xxx TC:xxx                        | The Door Card and Terminal Card do not agree on the state of the Start Contact. "xxx" will be either "ON" or "OFF".                 | Remove ESD wires and jumper the terminals, if the problem is resolved check the wiring. If the problem remains the boards or ribbon cable may need to be replaced. |
| Control Error                                            | The Internal Control State is not valid.                                                                                            | One of the boards will likely need to be replaced.                                                                                                                 |
| DC MSP430 No Communications                              | The TC430 Temperature chip on the Door Card is not responding.                                                                      | Faulty Door Card                                                                                                                                                   |
| EEPROM Error                                             | The EEPROM settings are corrupted.                                                                                                  | Faulty Door Card                                                                                                                                                   |
| ESD Input                                                | The ESD Input was open while the system was running or attempting to start.                                                         | Check wiring.                                                                                                                                                      |
| Expansion Card Error / 4-20<br>Exp Card: 4-20 Level Low  | The 4-20mA Level Input was below the Level Low Setpoint while the system was running with the Level Event Restart feature disabled. | Verify proper settings and check for issues outside the system.                                                                                                    |
| Expansion Card Error / 4-20<br>Exp Card: 4-20 Level Open | The 4-20mA Level Input is open (reading below ~ 3.75mA)                                                                             | Check wiring.                                                                                                                                                      |
| Expansion Card Error / 4-20<br>Exp Card: 4-20 PRS High   | The 4-20mA Pressure Input was above the Pressure High Setpoint while the system was running with the Main Valve open.               | Verify proper settings and check for issues outside the system.                                                                                                    |
| Expansion Card Error / 4-20<br>Exp Card: 4-20 PRS Low    | The 4-20mA Pressure Input was below the Pressure Low Setpoint while the system was running with the Auto Restart feature disabled.  | Verify proper settings and check for issues outside the system.                                                                                                    |
| Expansion Card Error / 4-20<br>Exp Card: 4-20 PRS Open   | The 4-20mA Pressure Input is open (reading below ~ 3.75mA)                                                                          | Check wiring.                                                                                                                                                      |
| Expansion Card Error / 4-20<br>Exp Card: Card Fail       | The 4-20mA Expansion Card is not responding.                                                                                        | This may indicate that the card is not installed correctly or that the feature is enabled when the card is not present.                                            |

| ON SCREEN                                        | DESCRIPTION                                                                                                                                                                                                                                             | POSSIBLE SOLUTIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Expansion Card Error / Modbus Card: Card Fail    | The Modbus Expansion Card is not responding.                                                                                                                                                                                                            | This may indicate that the card is not installed correctly or that the feature is enabled when the card is not present.                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Flame detected before start                      | Flame was detected prior to the system igniting the pilot.                                                                                                                                                                                              | This may indicate a leaky valve, inadequate purge time, or a faulty Terminal Card.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Flame Fail                                       | The system failed to ignite the pilot within the allocated number of retry attempts.                                                                                                                                                                    | See the Flame Detection Troubleshooting section.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Flame Rod Test Error / Adjust Flame Rod Position | The Flame Rod or associated wiring may be shorted to ground thus preventing it from properly detecting flame.                                                                                                                                           | <p>If the error shows up immediately and does not allow you to start the system, remove the 4 pin terminal block to the ignition coil and try starting again. If you can start the system, there is a wiring problem. If you cannot start the system, one of the boards or the ribbon cable may be faulty.</p> <p>If the system runs for a while and then shuts down with this error after a random amount of time, the problem is that the flickering of the flame is lining up with the internal self test. Usually moving the rod more into the flame will resolve this issue.</p> |
| High Pressure                                    | The High Pressure Contact remained open for more than 2s after the main valve opened. This error can also be triggered by the 4-20 Input Card if the Pressure reading remains above the 4-20 Pressure High Setpoint for 2s after the main valve opened. | Verify proper settings and check for issues outside the system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| High Temp                                        | The Process Temperature rose above the High Temp ESD Setpoint.                                                                                                                                                                                          | Verify proper settings and check for issues outside the system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| High Temp Setpoint Mismatch                      | The Door Card and Terminal Card do not agree on the value of the High Temp ESD Setpoint.                                                                                                                                                                | Reset to factory defaults.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| High Voltage xx.x Volts                          | The system voltage remained above the High Voltage Alarm point for 20s or more and Auto Restart is disabled. "xx.x" is the voltage reading at the point in time when the shutdown occurred.                                                             | Verify proper settings and check for issues outside the system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| HT Thermocouple Error                            | The High Temp Thermocouple is open.                                                                                                                                                                                                                     | Check wiring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Ignite Key Stuck                                 | The Ignite Key was held for more than 30s while in manual mode.                                                                                                                                                                                         | Check for mechanical failure of the key.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Key Stuck Error / xxxx                           | <p>One of the keypad keys was stuck at System Startup. The particular key stuck will be displayed in place of xxxx and will be one of the following:</p> <p>DOWN, IGN, MAIN, MODE, OK, PLT, MENU, STOP, UP</p>                                          | This may indicate a defective keypad. This error must be resolved in order to continue using the system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Level Input                                      | The Level Contact is open and "Level Event Restart" is set to "Off". This error can also be triggered by the 4-20 Input Card if the Level reading is below the 4-20 Level Low Setpoint and "Level Event Restart" is set to "Off".                       | Verify proper settings and check for issues outside the system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Low Pressure                                     | The Low Pressure Contact is open and "Auto Restart" is set to "Off". This error can also be triggered by the 4-20 Input Card if the Pressure reading is below the 4-20 Pressure Low Setpoint and "Auto Restart" is set to "Off".                        | Verify proper settings and check for issues outside the system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |



| ON SCREEN                                       | DESCRIPTION                                                                                                                                                                                     | POSSIBLE SOLUTIONS                                                                                                                                                                                                                                                                      |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low Voltage xx.x Volts                          | The system voltage remained below the Low Voltage Alarm point for 20s or more and "Auto Restart" is set to "Off" "xx.x" is the voltage reading at the point in time when the shutdown occurred. | Verify proper settings and check for issues outside the system.                                                                                                                                                                                                                         |
| Master Power Error                              | The Master Power switch to the powered valve outputs was in the wrong state.                                                                                                                    | Remove all valve wires and run the system. If the problem resolves, there is a wiring issue with the solenoids. If the problem remains, the Terminal Card is likely damaged. Check the solenoid connections for shorts to ground or across the terminals before installing a new board. |
| Modbus Card: Shutdown                           | The system shut down because a remote shutdown command was received via Modbus.                                                                                                                 | Check the data being sent through the Modbus connection.                                                                                                                                                                                                                                |
| Modbus Card: Shutdown / Remote Cmd Error        | The system received an undefined command from the Modbus Expansion Card.                                                                                                                        | Check the data being sent through the Modbus connection.                                                                                                                                                                                                                                |
| Pilot Key Stuck                                 | The Pilot Key was held for more than 30s while in manual mode.                                                                                                                                  | Check for mechanical failure of the key.                                                                                                                                                                                                                                                |
| Pro Thermocouple Error                          | The Process Thermocouple is open or shorted.                                                                                                                                                    | Check wiring.                                                                                                                                                                                                                                                                           |
| Proof of Closure / Should be Closed             | The Proof of Closure Contact was detected to be Open when it was not expected to be.                                                                                                            | This may indicate a faulty valve or wiring.                                                                                                                                                                                                                                             |
| Purge Values Mismatch                           | The Door Card and Terminal Card do not agree on the value of the Purge Time Setting.                                                                                                            | Reset to factory defaults.                                                                                                                                                                                                                                                              |
| Run CRC Error                                   | Main Program Memory CRC Error                                                                                                                                                                   | Reset to factory defaults.                                                                                                                                                                                                                                                              |
| Solenoid Feedback Error / Check Solenoid Wiring | The solenoids were observed to have a state opposite to the one being driven by the PF2100.                                                                                                     | Remove all valve wires and run the system. If the problem resolves, there is a wiring issue with the solenoids. If the problem remains, the Terminal Card is likely damaged. Check the solenoid connections for shorts to ground or across the terminals before installing a new board. |
| System Error                                    | Illegal Process Control or Display State                                                                                                                                                        | Reset to factory defaults.                                                                                                                                                                                                                                                              |
| Terminal Card Ambient Fail                      | The Terminal Card could not measure the ambient temperature. The Door Card failed to detect this.                                                                                               | Reset to factory defaults. Likely a faulty terminal card.                                                                                                                                                                                                                               |
| Terminal Card Command Refused                   | The Terminal Card received a valid command from the Door Card but the command was refused because it would result in an invalid or unsafe state. The Door Card failed to detect this.           | Remove all valve wires and run the system. If the problem resolves, there is a wiring issue with the solenoids. If the problem remains, the Terminal Card is likely damaged.                                                                                                            |
| Terminal Card Communication                     | The Terminal Card is not communicating with the Door Card. This may indicate a faulty ribbon cable or incompatible firmware. The Door Card failed to detect this.                               | Make sure the ribbon cable is properly installed. Likely a fault with door, ribbon or terminal.                                                                                                                                                                                         |
| Terminal Card High TC Grounded                  | The Terminal Card detected that the High Temp Thermocouple was shorted to ground. The Door Card failed to detect this.                                                                          | Check for continuity from the high temp TC to ground. If there is no connection remove the thermocouple and replace it with a jumper. If the problem persists it is likely a door or terminal card fault.                                                                               |
| Terminal Card High Temp Alarm                   | The Terminal Card detected that the High Temp Thermocouple exceeded the High Temp ESD Setpoint. The Door Card failed to detect this.                                                            | Check for continuity from the high temp TC to ground. If there is no connection remove the thermocouple and replace it with a jumper. If the problem persists it is likely a door or terminal card fault.                                                                               |

| <b>ON SCREEN</b>                          | <b>DESCRIPTION</b>                                                                                                                                          | <b>POSSIBLE SOLUTIONS</b>                                                                                                                                        |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Terminal Card<br>Reciprocal Comp          | The Terminal Card detected that the Door Card status or High Temp ESD Setpoint did not match. The Door Card failed to detect this.                          | Reset to factory defaults. Remove all wires but power, install default jumpers. If the problem persists there is likely a problem with the one of the boards.    |
| Terminal Card<br>Shutdown Detect          | The Terminal Card detected an alarm condition. The Door Card failed to detect this.                                                                         | Reset to factory defaults. Remove all wires except power; install default jumpers. If the problem persists there is likely a problem with the one of the boards. |
| Terminal Card<br>Voltage Sense            | The Terminal Card detected that the system voltage was outside of allowable limits. The Door Card failed to detect this.                                    | Reset to factory defaults. Remove all wires except power; install default jumpers. If the problem persists there is likely a problem with the one of the boards. |
| Thermocouples<br>Not Equal / Check Wiring | The High Temp and Process Thermocouples are reading temperatures that are too far apart.<br><br>This may indicate a failed thermocouple or improper wiring. | Check thermocouple readings with dry block or process calibrator.                                                                                                |
| User Stop                                 | The user pressed the Stop key on the keypad.                                                                                                                |                                                                                                                                                                  |

## 6.3 | Alarm Codes

The following is a list of alarm codes that may show on the Alarm screen of the PF2100 display. These codes indicate a persistent problem that must be cleared before the system can be restarted. Use the table below to determine the meaning of these codes.

| <b>ON SCREEN</b> | <b>DESCRIPTION</b>                                                                                                               | <b>POSSIBLE SOLUTIONS</b>                                       |
|------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| 4-20Lvl          | The 4-20 Input Card's Level Input is reading a value below the 4-20 Level Low Setpoint and "Level Event Restart" is set to "Off" | Verify proper settings and check for issues outside the system. |
| 4-20Prs          | The 4-20 Input Card's Pressure Input is reading a value below the 4-20 Pressure Low Setpoint and "Auto Restart" is set to "Off"  | Verify proper settings and check for issues outside the system. |
| AuxTC            | The system is in a mode that requires the Aux Thermocouple and the Aux Thermocouple is open or otherwise wired incorrectly.      | Check wiring.                                                   |
| DC_TC            | The TC430 temperature sensor on the Door Card is not responding.                                                                 |                                                                 |
| ESD_Inp          | The ESD Contact is Open.                                                                                                         | Check wiring.                                                   |
| FlmTest          | There is a problem with the Flame Detection wiring or circuitry.                                                                 | Check wiring.                                                   |
| PoC_Inp          | The Proof of Closure contact is open.                                                                                            | Check wiring.                                                   |
| HiVolt           | The system voltage is above the High Voltage Alarm point.                                                                        | Verify proper settings and check for issues outside the system. |
| HT_ESD           | The Process Temperature is above the High Temp ESD Setpoint.                                                                     | Verify proper settings and check for issues outside the system. |



| ON SCREEN | DESCRIPTION                                                                                                                                                                                   | POSSIBLE SOLUTIONS                                                                                  |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| HT_TC     | The High Temp Thermocouple is open or otherwise wired incorrectly.                                                                                                                            | Check wiring.                                                                                       |
| LoVolt    | The system voltage is below the Low Voltage Alarm point.                                                                                                                                      | Verify proper settings and check for issues outside the system.                                     |
| LowPrs    | The Low Pressure Contact is Open or the 4-20mA Expansion Card's Pressure Input is reading a value below the 4-20 Pressure Low Setpoint. In either case, "Auto Restart" is set to "Off"        | Verify proper settings and check wiring.                                                            |
| Lvl_Inp   | The Low Level Contact is Open or the 4-20mA Expansion Card's Level Input is reading a value below the 4-20 Level Low Setpoint. In either case, "Level Event Restart" is set to "Off"          | Verify proper settings and check wiring.                                                            |
| MbusErr   | The Modbus Card is not responding.                                                                                                                                                            | This may indicate that it is not installed correctly or that it is enabled when not present at all. |
| ProcTC    | The Process Thermocouple is open or otherwise wired incorrectly.                                                                                                                              | Check wiring.                                                                                       |
| RemShut   | Modbus Shutdown Command Received                                                                                                                                                              | Check the data being sent through the Modbus connection.                                            |
| Sys_Err   | System Error – The Terminal Card is not communicating with the Door Card.                                                                                                                     | This may indicate a faulty ribbon cable or incompatible firmware.                                   |
| TC_MM     | The High Temp and Process Thermocouples are reading temperatures that are too far apart.<br><br>This may indicate a failed thermocouple, improper wiring, or a damaged Door or Terminal Card. | Check thermocouple readings with dry block or process calibrator.                                   |
| Val_MM    | The Door and Terminal Card's setpoints do not match.                                                                                                                                          | Reset to factory defaults.                                                                          |

## 6.4 | Warning Messages

The following is a list of warning messages that may flash periodically on the PF2100 display. These messages indicate a problem that may be developing or a condition from which the system may automatically restart once cleared. Use the table below to determine the meaning of these messages.

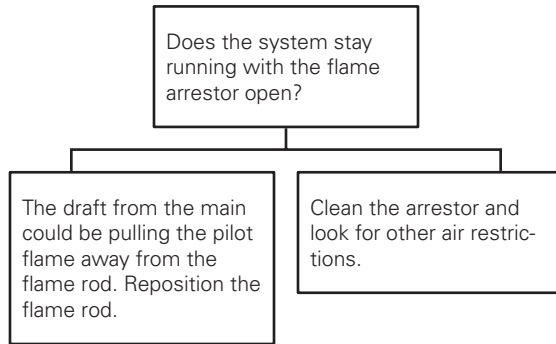
| ON SCREEN                                        | DESCRIPTION                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Check all settings / Other settings have changed | A major process control setting was changed and the process control setpoints were reset to factory defaults. This includes the High Temp ESD Setpoint, the Pilot Off Setpoint, the Low Fire Setpoint, the Process Setpoint, the Low Temp Alarm Setpoint, the Deadband setting, and the Aux Setpoint. |
| HI Volt Warning                                  | The system voltage is getting close to the High Voltage Alarm threshold and may stop or shutdown soon.                                                                                                                                                                                                |
| High Prs Warning                                 | The High Pressure Contact is open or the 4-20 Pressure Input is above the 4-20 Pressure High Setpoint. The contact must be closed shortly after the main valve opens and the 4-20 Pressure is below the setpoint or the system will shutdown.                                                         |
| LO Volt Warning                                  | The system voltage is getting close to the Low Voltage Alarm threshold and may stop or shutdown soon.                                                                                                                                                                                                 |
| Low Temp Alarm                                   | The process temperature is below the Low Temp Alarm Setpoint and the Status Contact is Open.                                                                                                                                                                                                          |
| Unit restarted from LVL event                    | The system has recently restarted from a Level event. Press OK to clear this message.                                                                                                                                                                                                                 |
| Unit restarted from PRS event                    | The system has recently restarted from a Low Pressure event. Press OK to clear this message.                                                                                                                                                                                                          |
| Unit restarted from VLT event                    | The system has recently restarted from a Low or High Voltage event. Press OK to clear this message.                                                                                                                                                                                                   |
| Waiting: 420 LVL                                 | The system will automatically restart once the 4-20 Input Card's Level Input rises above the Low Setpoint.                                                                                                                                                                                            |
| Waiting: 420 PRS                                 | The system will automatically restart once the 4-20 Input Card's Pressure Input drops below the High Setpoint.                                                                                                                                                                                        |
| Waiting: HiVolt                                  | The system will automatically restart once the system voltage falls below the High Voltage Alarm Threshold.                                                                                                                                                                                           |
| Waiting: LoVolt                                  | The system will automatically restart once the system voltage rises above the Low Voltage Alarm Threshold.                                                                                                                                                                                            |
| Waiting: Low PRS                                 | The system will automatically restart once the Low Pressure Contact is closed.                                                                                                                                                                                                                        |
| Waiting: LVL                                     | The system will automatically restart once the Level Contact is closed.                                                                                                                                                                                                                               |
| Waiting:STRT Inp                                 | The system will automatically restart once the Start Contact is closed.                                                                                                                                                                                                                               |



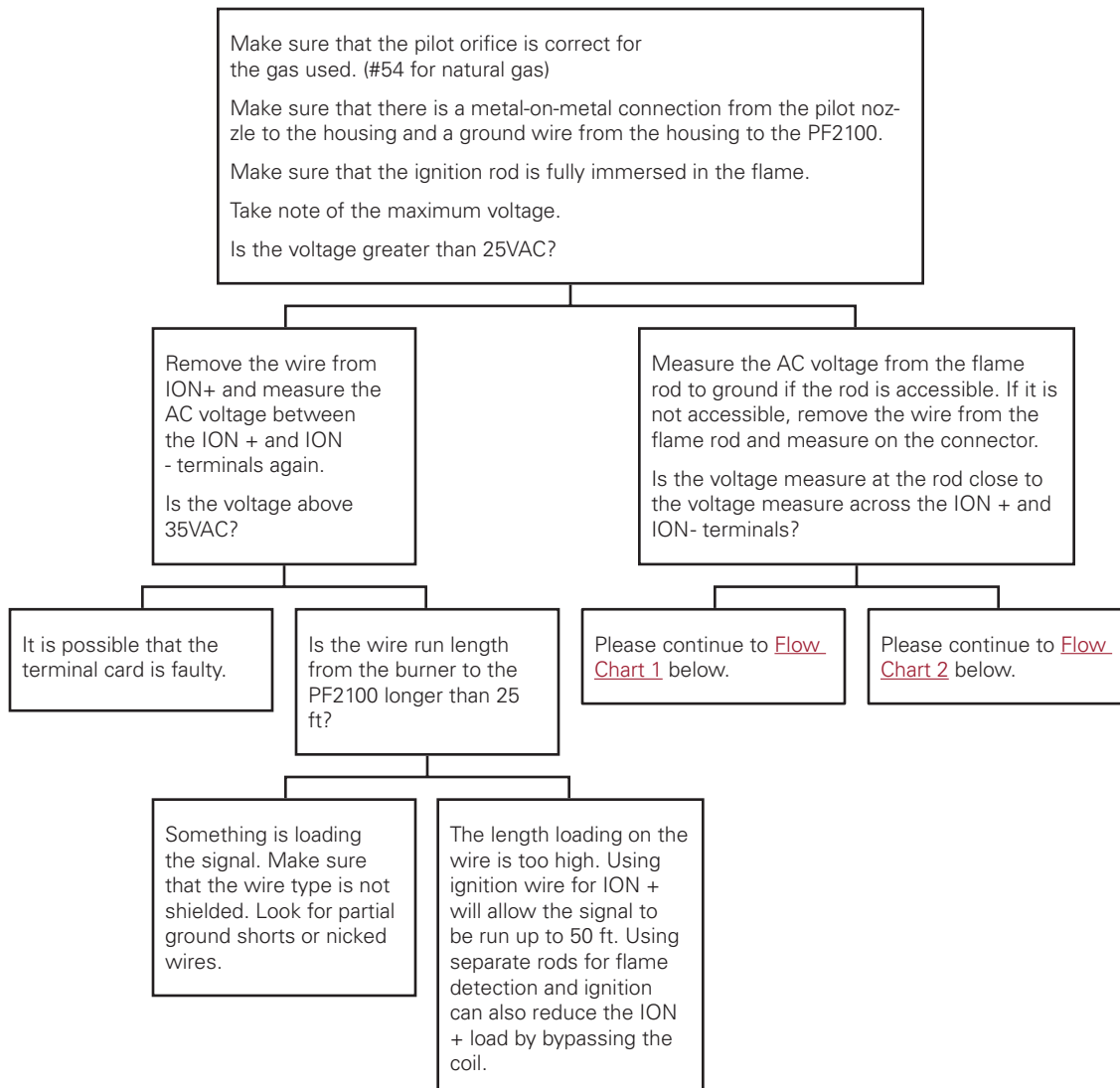
## 6.5 | Flame Detection Troubleshooting Guide

### SYSTEM IS NOT DETECTING FLAME.

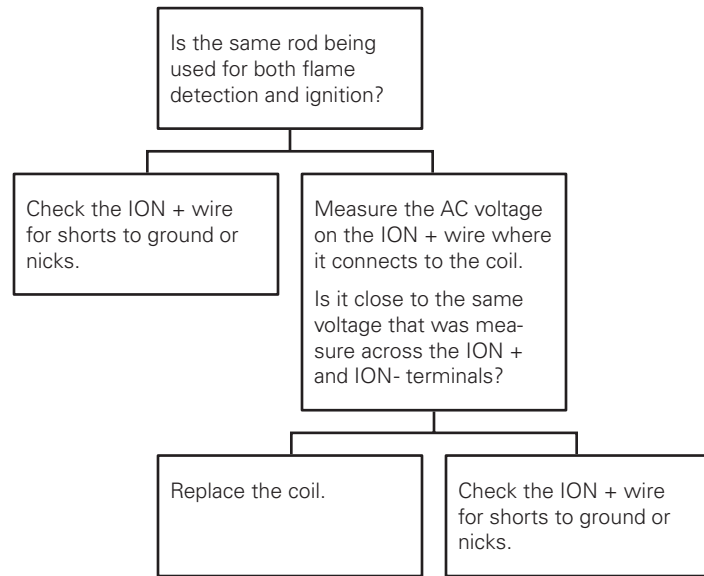
The flame quality drops from 100% (pilot) when the main comes on.



Flame quality remains 100% (pilot) when the main comes on.

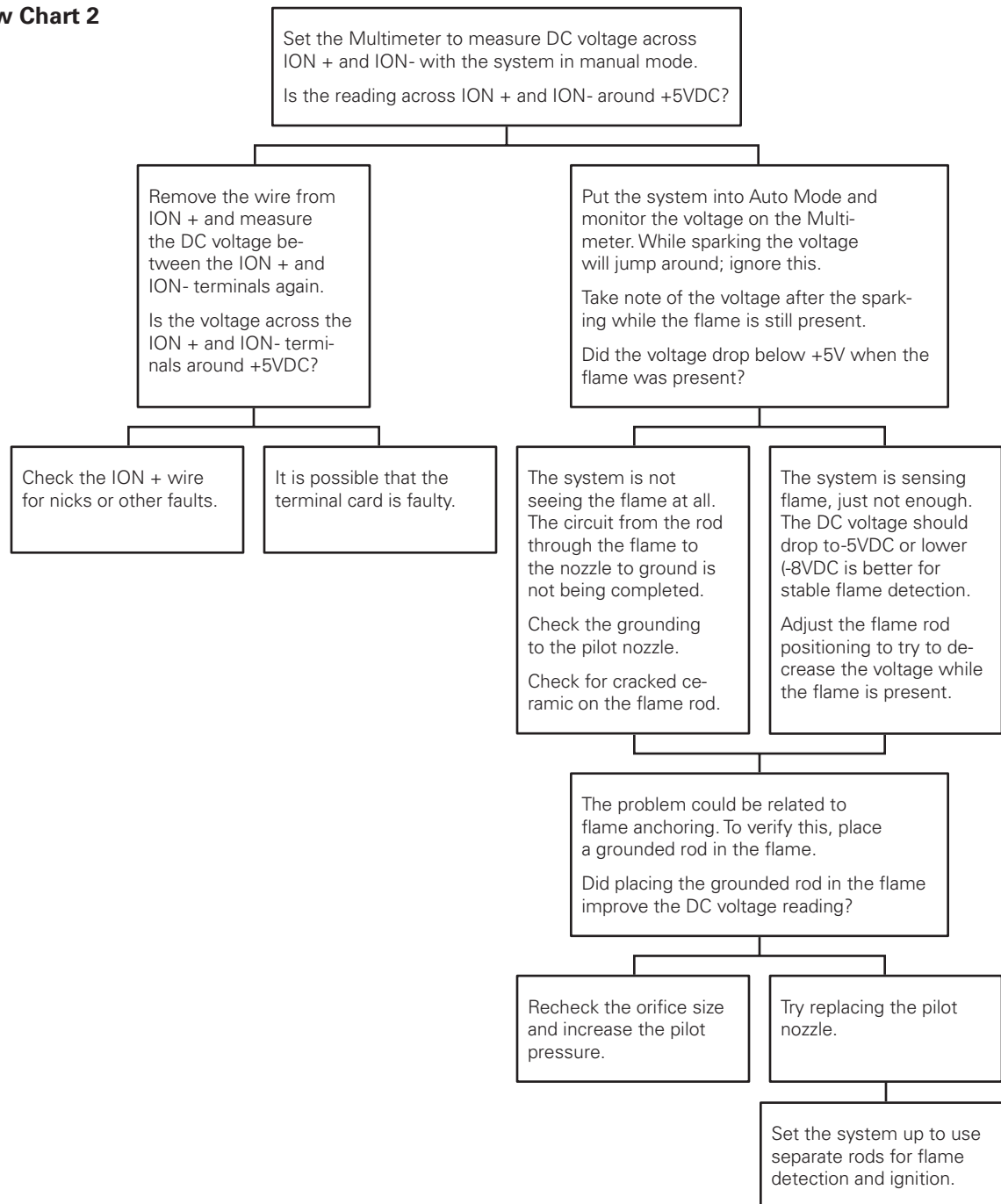


## Flow Chart 1



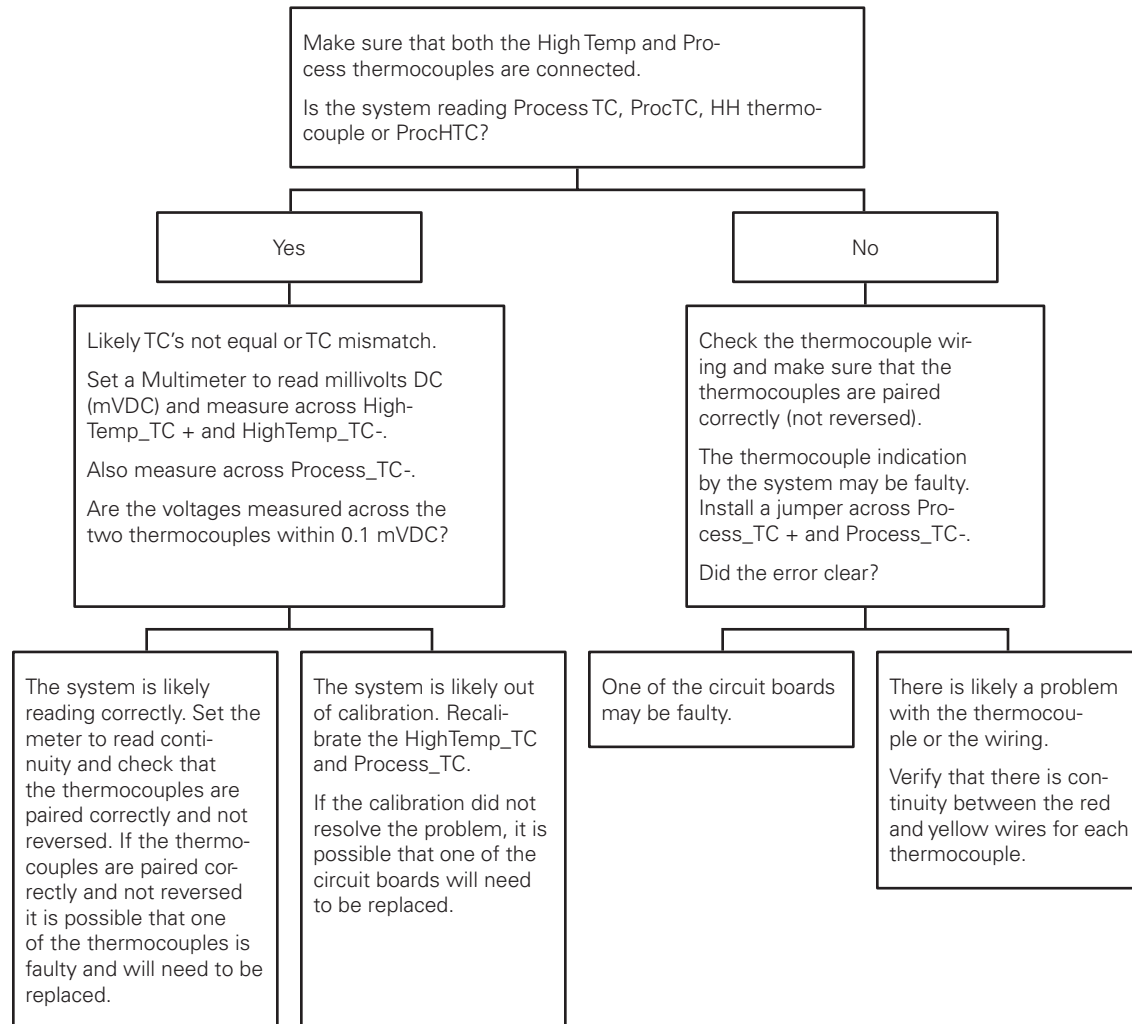


**Flow Chart 2**



## 6.6 | Thermocouple Troubleshooting Guide

Problem with Thermocouples.



# APPENDICES

## A | PID Tuning Procedure

The PF2100's default PID settings should result in good temperature control in most common heater applications. If the temperature control is unstable or if faster control response is needed, the following procedure can be followed to adjust the PID settings. This procedure is not a comprehensive method for adjusting PID Controllers but provides some general guidelines. This procedure is iterative and therefore may require a significant amount of time to follow.

### TUNE THE PROPORTIONAL BAND SETTING

1. Start with the Proportional Band Setting set to a large value such as 500% and with the Integral and Derivative settings set to their default values (4.0min/rst and 0.0min respectively).
2. Make a small step change (such as 5%) to the Process Setpoint and monitor the resulting temperature change.
3. Repeat decreasing the Proportional Band Setting in 50% steps until a Process Setpoint change results in overshoot of the Process Setpoint or until oscillation results.
4. Increase the Proportional Band Setting until overshoot and oscillation no longer occur.

### TUNE THE INTEGRAL SETTING

1. Set the Integral setting to 10min/rst.
2. Make a small change to the Process Setpoint and monitor the temperature change.
3. Repeat decreasing the Integral in ½ minute steps until a Process Setpoint change results in overshoot of the Process Setpoint or until oscillation results.
4. Increase the Integral Setting until stable.

### TUNE THE DERIVATIVE SETTING

If there is noise on the thermocouple inputs, using the Derivative Setting can dampen the effects of the Proportional and Integral Settings. For this reason, the Derivative Setting can usually be left set at zero unless a very fast response is needed. If it is required, follow this tuning procedure:

1. Set the Derivative Setting to 10 minutes.
2. Decrease the Derivative Setting until a small Process Setpoint change results in a fast response with some oscillation.
3. Increase the Derivative Setting until the oscillation in response to a Process Setpoint change is dampened.

## B | Field Calibration

It is possible to field calibrate the thermocouples, the 4-20mA Output, and the two 4-20mA Inputs on the 4-20mA Expansion Card. In general, it should not be necessary to do this in the field because the system has already been calibrated at the factory. However, there are circumstances where this may be necessary such as if the door or terminal card was replaced in the field or if the system is very old and has drifted out of calibration. Before recalibrating the system, it is strongly recommended that you explore all other possible solutions first. Be sure to verify that system settings are correct and that the devices attached to the system are calibrated correctly. If it is deemed necessary to proceed with recalibrating the PF2100, follow the procedures below carefully. Failure to perform the calibration correctly may result in worse performance than if the system had been left alone.

The PF2100 uses a two-point calibration system to provide readings with greater accuracy than a single-point offset calibration. The first point compensates for any fixed offset in the system and the second point defines the slope. If the calibration fails for any reason, there is an option in the calibration menu to clear all calibration data.

### CALIBRATING THE THERMOCOUPLES

For thermocouples, the first calibration point is zero volts which corresponds to the ambient temperature of the terminal block where the thermocouple plugs into the Terminal Card. The second calibration point is referenced to a known temperature that is well above the ambient temperature. This temperature is typically the hottest temperature at which the system will operate but should not be higher than 1350°C and should not be lower than ambient + 20°C.

1. Make sure that the system is stopped.
2. Remove the 3 pairs of thermocouple wires (High Temp, Process, and Aux) from the P8 Pluggable Header on the Terminal Card.
3. Press the UP and Down Keys simultaneously to unlock the Calibration Menu (menu 7) and to show the temperature debug screen in the ready menu, which are normally hidden.
4. Short each pair of thermocouple inputs individually using a jumper or short piece of copper wire (ie, short HT+ to HT-, short Proc+ to Proc-, and short Aux+ to Aux-) and make note of the TH, TP, and TA temperature values show on the debug screen (press down or up on the ready screen until all temperatures are shown at once).
5. Reconnect the 3 pairs of thermocouple wires (High Temp, Process, and Aux) using the full length of wire used at the installation to the P8 Pluggable Header on the Terminal Card.
6. Set the High Temp, Process, and Aux thermocouples to a calibrated reference temperature equal to the temperature values read in step 4 using a dry block or other calibrated reference.
7. Press the Menu Key repeatedly until menu 7 is shown.
8. Press OK. If prompted, enter the L2 Password: ▲▼▲▲▼▲■
9. "Cal Proc TC Zero" will show on the display.
10. Press OK and the message "Calibrating Wait..." will appear on the display for about 5 seconds. Afterwards, the message "Parameter Saved" will show on the display briefly.
11. Press the Menu Key to go to the next item.
12. Repeat steps 10 and 11 for the "Cal HiTemp TC Zero" and "Cal



Aux TC Zero" menu items.

13. Set the High Temp, Process, and Aux thermocouples to a known reference temperature using a dry block or other calibrated reference. The reference temperature should be at least 20C above the ambient temperature and preferably close to the maximum planned operating temperature.
14. "Cal Proc TC Span" will show on the display.
15. Use the Up and Down Keys to adjust the temperature displayed on the PF2100 to match the temperature being applied to the thermocouple. Note that multiple key presses may be required before the temperature value on the display changes. This is because each key press is adjusting a fractional multiplication factor internal to the system.
16. Press OK and the message "Parameter Saved" will show on the display briefly.
17. Press the Menu Key to go to the next item.
18. Repeat steps 15-17 for the "Cal HiTemp TC Span" and "Cal Aux TC Span" menu items.
19. Press and hold the OK key for 3 seconds until the message "Password Logout" is displayed on the screen. The Calibration Menu is now hidden again.

NOTE: If using a dry block for calibration, make sure that the thermocouple is removed from the bath and inserted into the dry block long enough for the temperature reading to settle before executing the calibration. If a process calibrator is used, ensure that the thermocouple wire is inserted directly into the process calibrator to avoid extra sources of error and be aware that the length of wire within the thermocouple will not be accounted for, resulting in a less accurate calibration result.

## CALIBRATING THE 4-20mA OUTPUT

For the 4-20mA Output, the first calibration point is 4mA and the second calibration point is 20mA. You will need a current meter capable of measuring current to 0.1mA accuracy.

1. Make sure that the system is stopped.
2. Connect a current meter in series with the 4-20mA Output.
3. Set the current meter to a range setting that covers both 4mA and 20mA.
4. Press the UP and Down Keys simultaneously to unlock the Calibration Menu (Menu 7) which is normally hidden.
5. Press the Menu Key repeatedly until Menu 7 is shown.
6. Press OK. If prompted, enter the L2 Password: ▲▼▲▲▼▲■
7. Press the Menu Key repeatedly until "Cal 4-20 Out Zero" is shown on the display.
8. Use the Up and Down Keys to adjust the output current until the current meter reads 4.0mA.
9. Press OK and the message "Parameter Saved" will show on the display briefly.
10. Press the Menu Key repeatedly until "Cal 4-20 Out Span" is shown on the display.
11. Use the Up and Down Keys to adjust the output current until the current meter reads 20.0mA.
12. Press OK and the message "Parameter Saved" will show on

the display briefly.

13. Press and hold the OK key for 3 seconds until the message "Password Logout" is displayed on the screen. The Calibration Menu is now hidden again.

## **CALIBRATING THE 4-20mA INPUTS**

For the 4-20mA Output, the first calibration point is 4mA and the second calibration point is 20mA. You will need a handheld process calibrator such as the Fluke 725.

1. Make sure that the system is stopped.
2. Make sure that the card is installed and enabled in menu 6. The LVL and PRS DIP switches must also be enabled on the 4-20 mA card.
3. Press the UP and DOWN Keys.
4. Press the Menu Key repeatedly until menu 7 is shown.
5. Press OK. If prompted, enter the L2 Password: ▲▼▲▲▼▲■
6. Connect the process calibrator's negative lead to the ground pin on the 4-20mA Input Card.

### **Calibrate the Level Zero**

1. Press the Menu Key repeatedly until "4-20 Level Zero Calibration = No" is shown on the display.
2. Use the Up or Down key to select "Yes" and begin the calibration process. The display will now read "Apply 4mA then press OK"
3. Disconnect any wiring that is connected to the Level input and instead attach the process calibrator's positive lead in its place.
4. Turn on the process calibrator and set it to source a current of 4mA (0%).
5. Press the OK key and the message "Calibrating Wait..." will appear for several seconds followed by the message "Parameter Set" after the calibration has successfully completed.

### **Calibrate the Level Input's Span point:**

1. Press the Menu Key repeatedly until "Calibrate 4-20 LVL Span?" is shown on the display.
2. Use the Up or Down key to select "Yes" and begin the calibration process. The display will now read "Apply 20mA then press OK"
3. Set the process calibrator to source a current of 20mA (100%).
4. Press the OK key and the message "Calibrating Wait..." will appear for several seconds followed by the message "Parameter Set" after the calibration has successfully completed.
5. Disconnect the process calibrator from the Level input and reconnect any wiring that was removed from it previously.

### **Calibrate the Pressure Input's Zero point:**

1. Press the Menu Key repeatedly until "Calibrate 4-20 PRS Zero?" is shown on the display.



2. Use the Up or Down key to select "Yes" and begin the calibration process. The display will now read "Apply 4mA then press OK"
3. Disconnect any wiring that is connected to the Pressure input and instead attach the process calibrator's positive lead in its place.
4. Turn on the process calibrator and set it to source a current of 4mA (0%).
5. Press the OK key and the message "Calibrating Wait..." will appear for several seconds followed by the message "Parameter Set" after the calibration has successfully completed.

#### **Calibrate the Pressure Input's Span point:**

1. Press the Menu Key repeatedly until "Calibrate 4-20 PRS Span?" is shown on the display.
2. Use the Up or Down key to select "Yes" and begin the calibration process. The display will now read "Apply 20mA then press OK"
3. Set the process calibrator to source a current of 20mA (100%).
4. Press the OK key and the message "Calibrating Wait..." will appear for several seconds followed by the message "Parameter Set" after the calibration has successfully completed.
5. Disconnect the process calibrator from the Pressure input and reconnect any wiring that was removed from it previously.

Disconnect the process calibrator's negative lead from the ground pin on the 4-20mA Input Card.

## **RESETTING CALIBRATION DATA**

If you want to reset the calibration settings to default, use the "Cal Data" option at the end of menu 7.

#### **This process resets the following calibrations to defaults:**

Calibration of the Thermocouples  
Calibration of the 4-20mA Output  
Calibration of the 4-20mA Input

1. Make sure that the system is stopped
2. Press the UP and Down Keys simultaneously to unlock the Calibration Menu (menu 7) which is normally hidden.
3. Press the Menu Key repeatedly until menu 7 is shown.
4. Press OK. If prompted, enter the L2 Password: ▲▼▲▲▼▲■
5. Press the Menu Key repeatedly until "Cal Data" is shown on the display
6. Use the Up or Down keys to select "Yes"
7. Press OK and the message "Parameter Saved" will show on the display briefly.
8. Press and hold the OK key for 3 seconds until the message "Password Logout" is displayed on the screen. The Calibration Menu is now hidden again.

## CALIBRATION (MENU 7)

This menu is used to adjust the calibration of thermocouples, 4-20mA Output, and 4-20mA Expansion Card inputs. This menu is hidden by default.

| MENU MAP                 | ON SCREEN                  | BRIEF DESCRIPTION                                                                                              | RANGE  | DEFAULT SETTING | SECTION |
|--------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------|--------|-----------------|---------|
| Cal Process TC Zero      | Cal Proc TC Zero?          | Calibrate Process Thermocouple zero point by shorting the Input                                                | N/A    | N/A             |         |
| Cal High Temp TC Zero    | Cal HiTemp TC Zero?        | Calibrate High Temp Thermocouple zero point by shorting the Input                                              | N/A    | N/A             |         |
| Cal Aux TC Zero          | Cal AUX TC Zero?           | Calibrate Aux Thermocouple zero point by shorting the Input                                                    | N/A    | N/A             |         |
| Cal Process TC Span      | Cal Proc TC Span: xx°C     | Calibrate Process Thermocouple span point by applying a calibrated reference then adjust the on screen value   | N/A    | N/A             |         |
| Cal High Temp TC Span    | Cal HiTemp TC Span: xx°C   | Calibrate High Temp Thermocouple span point by applying a calibrated reference then adjust the on screen value | N/A    | N/A             |         |
| Cal Aux TC Span          | Cal AUX TC Span: xx°C      | Calibrate Aux Thermocouple span point by applying a calibrated reference then adjust the on screen value       | N/A    | N/A             |         |
| Cal 4-20 Level Zero      | Calibrate 4-20 LVL Zero?   | Calibrate 4-20mA Level Input zero point by applying a calibrated 4mA reference                                 | N/A    | N/A             |         |
| Cal 4-20 Level Span      | Calibrate 4-20 LVL Span?   | Calibrate 4-20mA Level Input span point by applying a calibrated 20mA reference                                | N/A    | N/A             |         |
| Cal 4-20 Pressure Zero   | Calibrate 4-20 PRS Zero?   | Calibrate 4-20mA Pressure Input zero point by applying a calibrated 4mA reference                              | N/A    | N/A             |         |
| Cal 4-20 Pressure Span   | Calibrate 4-20 PRS Span?   | Calibrate 4-20mA Pressure Input span point by applying a calibrated 20mA reference                             | N/A    | N/A             |         |
| Cal 4-20 Out Zero        | Cal 4-20 Out Zero: x       | Calibrate 4-20mA Output zero point by adjusting until a multimeter reads 4mA                                   | N/A    | N/A             |         |
| Cal 4-20 Out Span        | Cal 4-20 Out Span: x       | Calibrate 4-20mA Output zero point by adjusting until a multimeter reads 20mA                                  | N/A    | N/A             | 3.5.8   |
| Display TC Zero Factors  | Cal Factors Zero w x y z   | Thermocouple zero point calibration factors for Debug                                                          | N/A    | N/A             | 3.5.8   |
| Display TC Span Factors  | Cal Factors Span w x y z   | Thermocouple span point calibration factors for Debug                                                          | N/A    | N/A             | 3.5.8   |
| Display 4-20 PRS Factors | 4-20 PRS Factors Z=x S=y   | 4-20mA Pressure zero point and span point calibration factors for Debug                                        | N/A    | N/A             | 3.5.8   |
| Display 4-20 LVL Factors | 4-20 LVL Factors Z=x S=y   | 4-20mA Level zero point and span point calibration factors for Debug                                           | N/A    | N/A             | 3.5.8   |
| Clear Cal                | Clear All Cal Capital Data | Restore all calibration factors to 0                                                                           | Yes/No | No              | 3.5.8   |





## C | Resetting to Defaults

The system settings can all be reset to factory defaults by following these instructions:

1. Make sure that the system is stopped.
2. Navigate to the “Reset to Factory Defaults” menu item at the bottom of Menu 4.
3. Use the Arrow keys to change the setting to “Yes” and then press the OK key.
4. The system will display “Parameter Saved” and will then reboot.
5. After rebooting, the system will display the message “CONFIGURATION RESET TO DEFAULT” alternating with “Check Settings and Setpoints.”
6. Press the OK key to acknowledge this warning.

This process only resets the user settings back to factory defaults and does not affect the calibration settings. To reset the calibration settings to defaults, refer to the [Field Calibration](#) section.

Note that older versions of firmware did reset both the user settings and the calibration settings to defaults. Also note that all settings are stored on the Door Card. If the Door Card is replaced for any reason, the settings will need to be re-entered and calibration may need to be performed.

**FOR ANY QUESTIONS PLEASE VISIT OR CALL US.**

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