

Note: This is a reference cited in AP 42, *Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources*. AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

**EMISSION TESTING AT ZACKY FARMS
KEWANEE BOILER
DINUBA, CALIFORNIA**

July 16, 1993

7/26/93
g/s

Prepared for

Zacky Farms
P. O. Box 12566
Fresno, California 93778

July 1993

Prepared by

Steiner Environmental, Inc.
4930 Boylan Street
Bakersfield, California 93308

Report PS-93-3148/Project 7367-93

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SECTION 1

INTRODUCTION

At the request of Zacky Farms (formerly Poppy Foods), Steiner Environmental conducted a series of emission tests on the effluent of a boiler (San Joaquin Valley Unified Air Pollution Control District Permit Number S-1331-0002-00) to determine compliance with SJVUAPCD rules and regulations. This was a re-test and it was done on July 16, 1993.

The Kewanee Classic III boiler (Model H3530G0) is rated at 12.53 MMBtu/hr, firing natural gas or propane. The unit is equipped with a Gordon-Piatt steam injection system for NO_x control. The tests done on June 7, 1993 indicated a NO_x violation due to a defective valve in the steam injection system.

Three hours of testing for NO_x , CO, CO_2 and O_2 were conducted on the effluent of the boiler using CARB Method 1-100. A sample of the natural gas fired in the boiler was collected and analyzed for CHNOS, specific gravity, moisture and Btu using ASTM methods. The fuel gas flowrate, the fuel gas analysis and the excess O_2 in the stack gas were used to convert the ppm values to lb/hr.

Mr. Jim McSweeney of Steiner Environmental, Inc. conducted these tests. Mr. Bob Watts of Zacky Farms was on hand to oversee the operation

of the boiler. Mr. Glenn Slitor of the SJVUAPCD was present to observe the boiler operation and the test work.

Section 2 presents the test matrix for this program.

SECTION 2
TEST MATRIX

Table 2-1 summarizes the tests performed on the boiler. The boiler was at 100% of rated capacity during these tests.

Section 3 of this report presents the test results.

TABLE 2-1. ZACKY FARMS KEWANEE BOILER TEST MATRIX

Date	Test No.	Test Parameter	Test Time
7/16/93	1	NO _x /CO/CO ₂ /O ₂	10:05 am - 10:35 am
	2	NO _x /CO/CO ₂ /O ₂	10:45 am - 11:15 am
	3	NO _x /CO/CO ₂ /O ₂	11:35 am - 12:35 pm
	4	NO _x /CO/CO ₂ /O ₂	12:50 pm - 1:50 pm

SECTION 3

TEST RESULTS

Table 3-1 summarizes the results of the tests performed on the boiler.

The authority to construct limits NO_x emissions to 30 ppm at 3% O_2 . The boiler passed this limit on all tests (averaged 28.45 ppm at 3% O_2). The CO emissions are limited to 0.1540 lb/MMBtu and an average emission factor of 0.0005 lb/MMBtu was obtained.

TABLE 3-1. SUMMARY OF EMISSIONS

PLANT : ZACKY FARMS
 SOURCE : BOILER OUTLET
 DATE : JULY 16, 1993

Temp. Std. : 60 dF
 Press. Std.: 29.92 in. Hg. 3 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	11092.70	11002.29	10929.10	11008.03
Heat Input, MMBtu/hr	12.07	11.97	11.89	11.98
Oxygen, %	4.66	4.32	4.14	4.37
NOx, ppm	25.13	27.03	26.66	26.27
NOx, ppm @ O2 corr.	27.70	29.18	28.47	28.45
NOx, lb/MMBtu	0.0334	0.0351	0.0343	0.0343
NOx, lb/hr	0.40	0.42	0.41	0.41
CO, ppm	0.64	0.38	0.77	0.60
CO, ppm @ O2 corr.	0.71	0.41	0.82	0.65
CO, lb/MMBtu	0.0005	0.0003	0.0006	0.0005
CO, lb/hr	0.01	0.00	0.01	0.01

$$1088 \times 11092.7 =$$

SECTION 4

SAMPLING EQUIPMENT AND PROCEDURES

This section of the report describes the equipment and procedures used to conduct the gaseous tests on this program.

4.1 SAMPLING PROCEDURES FOR CONTINUOUS MONITORING

The continuous monitors used in the Steiner Environmental Mobile Monitoring Lab are shown in Table 4-1. Figure 4-1 is a schematic of the continuous monitoring system. The procedures used to continuously monitor stack gases for NO_x , O_2 , CO and CO_2 strictly follow CARB Method 1-100.

Sample was taken from the stack (at a single point) using a 316 stainless steel probe. A heated Balston filter holder and fiberglass filter (99.9999 percent efficiency retention of 0.6 micron particles) was connected to the outlet of the probe. Sample gas was transported through heated Teflon sample line (maintained at $>250^\circ\text{F}$) by a Teflon-lined diaphragm pump to a 316 stainless steel refrigeration type conditioner (Hankison Model E-4G-SS). The sample gas was passed through the conditioner two separate times under vacuum before entering the pump, then two additional times under pressure. The clean, dry sample gas ($\sim 35^\circ\text{F}$) was then transported to the continuous analyzer system through

TABLE 4-1. CONTINUOUS MONITORING LAB - TRAILERS 1, 2 AND 4

NO_x CHEMILUMINESCENT ANALYZER - THERMO ELECTRON MODEL 10

Response Time (0-90%)	1.5 sec -- NO mode; 1.7 sec -- NO _x mode
Zero Drift	Negligible after 1/2 hour warmup
Linearity	±1% of full scale
Accuracy	Derived from the NO or NO ₂ calibration gas, ±1% of full scale
Output	0-10 V
Operating Ranges	0-2, 10, 25, 100, 250, 1000, 2500 and 10,000 ppm
Flowrate = 2 scfh	0-2.5

O₂ ANALYZER, FUEL TYPE - TELEDYNE MODEL 326

Response Time (0-90%)	60 seconds
Accuracy	±1% of scale at constant temperatures; ±1% of scale of ±5% of reading, whichever is greater, over the operating temperature range
Output	0-1 V
Operating Ranges	0-5%, 10%, 25% O ₂
Flowrate	2 scfh

CO₂/CO INFRARED ANALYZER - ANARAD MODEL AR-600

Response Time (0-90%)	5 seconds
Zero Drift	±1%
Span Drift	±1%
Linearity	1%
Resolution	Less than 1% of full scale
Output	0-1 V
Operating Ranges	0-20% CO ₂ /0-10,000 ppm CO
Flowrate	1000 cc/min

CO GAS FILTER CORRELATION - THERMO ELECTRON MODEL 48

Response Time (0-95%)	1 minute
Zero Drift	±0.2 ppm CO
Span Drift	Less than 1% full scale in 24 hours
Linearity	±1% full scale, all ranges
Accuracy	±0.1 ppm CO
Output	0-10 V
Operating Ranges	1, 2, 5, 10, 20, 50, 100, 200, 500, 1000 ppm
Flowrate	.5 - 2 lpm

SO₂ UV ANALYZER - DUPONT MODEL 400

Response Time (0-90%)	Less than 60 seconds
Zero Drift	Less than 2% full scale in 24 hours
Linearity	±1% full scale
Accuracy	±2% full scale
Output	0-5 V
Operating Ranges	0-100 ppm, 1-1000 ppm
Flowrate	500 - 1500 cc/min

STRIP CHART RECORDERS (3) - LINSEIS 7025

Pen Response	0.35 seconds Full Scale
Input Spans	1, 2, 5, 10, 20, 50, 100 MV
Zero Set	Stable across entire chart-width ±100%
Accuracy	.35% of Span
Dead Band	.15% of Span
Linearity	.25% of Span
Chart Speed	1, 2, 5, 10, 20, 50, 100 cm/min; 1, 2, 5, 10, 20, 50 cm/hr; fast advance 100 cm/min; LED indicator; forward and reverse selector
Recording Pen	Fiber tip pen
Chart Width	250 mm

SCOTSMAN TRAILER

Fully Insulated	Air Conditioned -- 8 feet x 14 feet x 11 feet
-----------------	---

1. Filter 0.6 μ , 99.9999 percent efficient
2. Duct
3. 316 stainless steel probe
4. 3/8-inch, heated (250°F) Teflon
5. Four-pass conditioner-dryer, 316 stainless steel internals
6. 3/8-inch, unheated Teflon
7. Teflon-lined sample pump
8. 3/8-inch unheated Teflon
9. Rotameter
10. 1/4-inch Teflon tubing
11. Calibration gas manifold
12. Calibration gas selector valve
13. Calibration gas cylinders
14. Backpressure regulator
15. Auxiliary analysis port

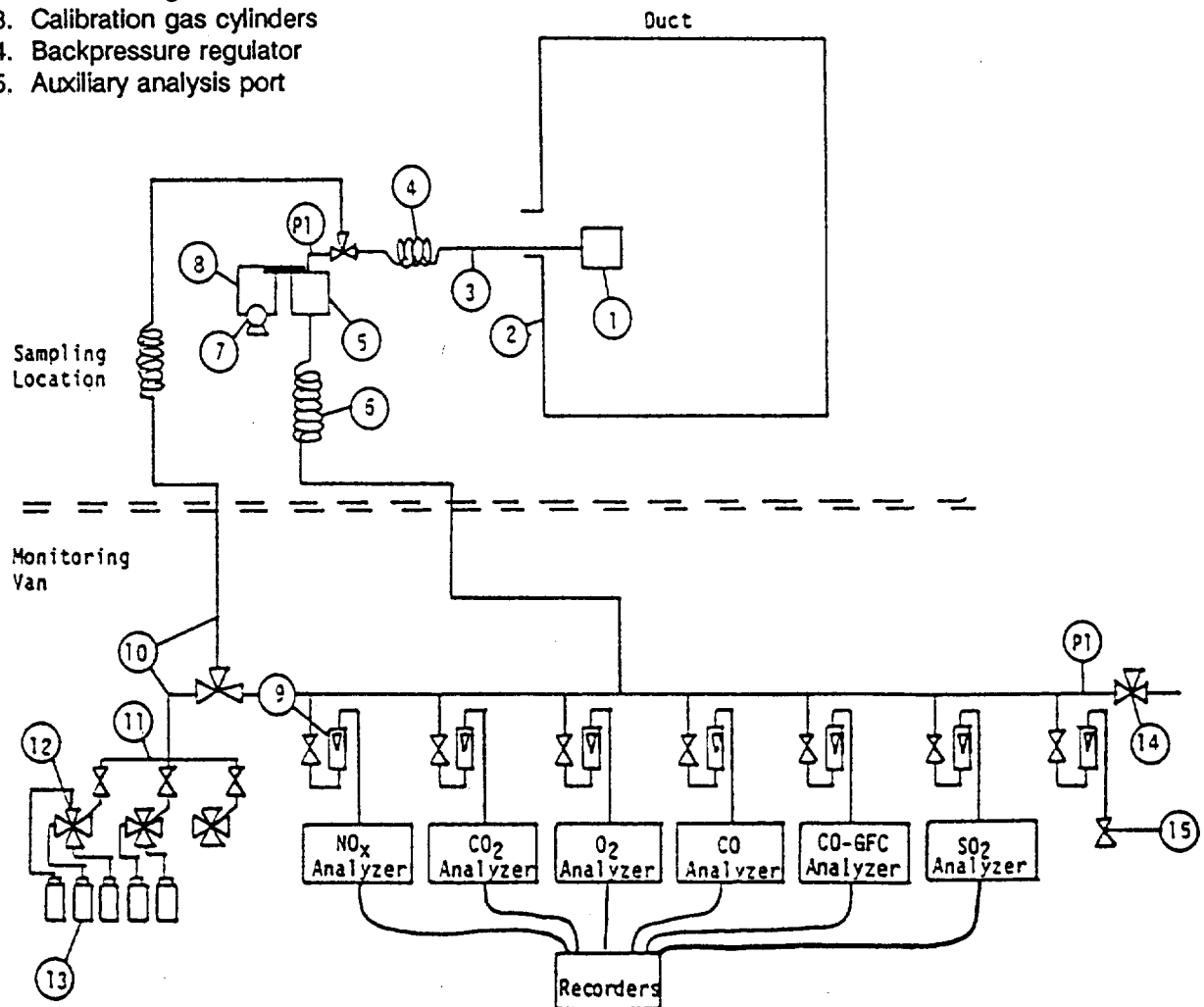


FIGURE 4-1. SCHEMATIC OF CONTINUOUS MONITORING SYSTEM

an unheated Teflon line. A series of flowmeters, valves, and regulators maintain constant flow through the system at a constant pressure.

Calibrations of the continuous analyzers were performed using EPA Protocol 1 calibration gases ($\pm 1\%$) for NO_x and NBS certified calibration gases ($\pm 1\%$) for CO , CO_2 and O_2 . Copies of the gas certifications are included in the appendix of this report. All pertinent data (date, time, test locations, analyzer range, cal gas value) were recorded on both the field data sheets and continuous analyzer strip charts in the field.

At the start of a test day, a leak-check was performed. The sample probe was removed from the stack and the end was sealed. A leak-check was successful only if pressure at the analyzer system and flow through the rotameters to the individual analyzers all dropped to zero. A mandatory leak-check was performed at the completion of each test day.

An initial calibration was performed at the start of a test period by introducing zero and span gases for each analyzer and making the necessary adjustments. Calibration gas values were recorded on the continuous monitor strip charts and field data sheets. A calibration check was completed at the end of a test and adjustments (if necessary) to the analyzers were made in preparation for another test.

An external calibration of the sampling system was performed at the start of a test day. EPA Protocol 1 gas was flowed through the entire sampling system from the probe tip. The response of the analyzers had to be within $\pm 5\%$ of the certified tank value before testing could proceed. An external calibration was also performed at the end of each test day. Test data were collected by recording 10-minute averages from the strip chart recordings onto the field data sheets. Data collected over the test period were averaged and reported.

SECTION 5

ANALYTICAL PROCEDURES

5.1 FUEL

A sample of the fuel fired during this test program was collected and sent to Pacific Gas Technology for analysis. Analysis was performed by PGT in accordance with EPA Title 40 Section 60.45. The specific procedures are itemized in Table 5-1. The results appear at the end of this section.

TABLE 5-1. FUEL ANALYSIS METHODS
LABORATORY TEST PROCEDURES FOR FUEL OILS AND FUEL GASES

Reference: EPA Title 40, Section 60.45

FUEL OIL TESTS:

Sediment and Water, Vol. %	ASTM D4007-81
Gravity by Hydrometer (API)	ASTM D1298-80
API Gravity Corrected to 60°F	ASTM Table 5A
Gross Calorific Value (Btu/lb)	ASTM D2015-77
Ultimate Analysis (C, H, O, N, S, wt. %)	
Carbon, Hydrogen	ASTM D3178-73
Nitrogen (chemiluminescence detector)	ASTM D3431-80
Sulfur	ASTM D2622-82
Ash	ASTM D482
Oxygen	ASTM D3176-74

GASEOUS FUELS BY GAS-LIQUID CHROMATOGRAPHY:

Gas Analysis	ASTM D1945-81
Sulfur Analysis	CPA B16
Calculation of Gross Calorific Value	ASTM D3588-81
Component Weight %, F-factor calculations	EPA 40:60.45

PROCEDURES FOR SCRUBBER LIQUOR ANALYSIS:

Specific Gravity	ASTM D1429
Chlorides	ASTM D512-67

PACIFIC GAS TECHNOLOGY



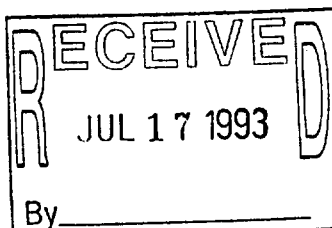
2122 G Street
Bakersfield, California 93301
805/324-1317
Fax: 805/324-2746

GAS ANALYSIS BY CHROMATOGRAPH

STEINER ENVIRONMENTAL, INC
4930 Boylan Street
Bakersfield, CA 93308

Attention: Vernon McKnight

Sample ID : ZACKY FARMS
BOILER OUTLET
NATURAL GAS



SAMPLED: 16-Jul-93

SUBMITTED: 16-Jul-93

REPORTED: 16-Jul-93

LAB No.: 6426-1

STEINER ID No. : 3591

ANALYZED GAS

MOLE %

WT %

CHONS WT %

OXYGEN	0.14	0.24	CARBON	72.81
NITROGEN	1.00	1.50	HYDROGEN	22.55
CARBON DIOXIDE	1.69	3.99	OXYGEN	3.14
HYDROGEN	ND	0.00	NITROGEN	1.50
CARBON MONOXIDE	ND	0.00	SULFUR	0.00
HYDROGEN SULFIDE	ND	0.00		
METHANE	86.59	74.54		
ETHANE	7.80	12.59		
PROPANE	2.22	5.25		
iso-BUTANE	0.16	0.50		
n-BUTANE	0.28	0.87		
iso-PENTANE	0.04	0.15		
n-PENTANE	0.02	0.08		
HEXANE +	0.06	0.28		
TOTAL:	100.00			

SPECIFIC GRAVITY * : 0.644

SPECIFIC
VOLUME : 20.46 cu ft/lb

TOTAL SULFUR as
Hydrogen Sulfide : ppm (GC/FPD)

TOTAL * DRY : 1088
BTU/cu ft
WET : 1069

NET * DRY : 983
BTU/cu ft
WET : 966

BTU/lb : 22266

BTU/lb : 20114

SECTION 6

QUALITY ASSURANCE

6.1 CONTINUOUS MONITORS QUALITY ASSURANCE

The NO_x analyzer is calibrated before and after each test using an EPA Protocol 1 gas ($\pm 1\%$) traceable to NBS. The CO, CO₂ and O₂ analyzers are calibrated before and after each test using a NBS certified gas mixture ($\pm 1\%$). Copies of the calibration gas certificates appear in the Appendix of this report.

A sampling system check was performed at the beginning and end of each test day. This was done by introducing an EPA Protocol 1 gas at the sampling probe and measuring the system response. The purpose of this was to check the system for leaks and sample loss.

Multi-point calibration linearity checks of the continuous analyzers were performed on February 20, 1993 through February 22, 1993. These results were well within CARB limitations of $\pm 2\%$ of full scale. Tables 6-1 through 6-6 list the results of these checks.

TABLE 6-1. NO_x CALIBRATION SUMMARY

Monitoring Trailer: 4		Calibrated by: PES 2/20/93	
Analyzer:	TECO	Calibrator Manufacturer:	Environics
Model:	10 AR	Model:	201-1520
Serial Number:	14751-150	Serial Number:	1122
NO _x Standard: CC7204, CC40135, CC101291, CC88868			
Concentration: 9760 ppm, 205.1 ppm, 19.34 ppm, 82.4 ppm			
Cylinder Pressure: 1720 psi			

NO_x CALIBRATION AND LINEARITY CHECKS

Range 0-10 ppm

Calibration Points	Flow, Dil. cc/min	Flow, Std. cc/min	NO _x out ppm	Chart ppm	% Difference +2% Full Scale
Zero	4024.0	0	0	0	0
80% URL	1195.0	834.0	7.960	7.90	- 0.60
1	1400.7	616.9	5.910	5.99	+ 0.80
2	1605.6	412.2	3.950	4.03	+ 0.80
3	1813.1	207.8	1.988	2.04	+ 0.52

Range 0-100 ppm

Calibration Points	Flow, Dil. cc/min	Flow, Std. cc/min	NO _x out ppm	Chart ppm	% Difference +2% Full Scale
Zero	2024.0	0	0	0	0
80% URL	1238.3	786.2	79.65	79.4	- 0.25
1	1433.2	582.0	59.17	60.0	+ 0.83
2	1628.1	388.9	39.55	40.3	+ 0.75
3	1823.0	196.6	19.97	20.5	+ 0.53

TABLE 6-1. NO_x CALIBRATION AND LINEARITY CHECKS (Concluded)

TECO Model 10-AR/Trailer #4/February 20, 1993

Range 0-250 ppm

Calibration Points	Flow, Dil. cc/min	Flow, Std. cc/min	NO _x out ppm	Chart ppm	% Difference +2% Full Scale
Zero	10,039	0	0	0	0
80% URL	9835	206.5	200.7	202.75	0.82
1	9887	155.7	151.3	153.25	0.78
2	9937	105.1	102.4	105.0	1.04
3	9989	54.6	53.0	56.8	1.52

Range 0-1000 ppm

Calibration Points	Flow, Dil. cc/min	Flow, Std. cc/min	NO _x out ppm	Chart ppm	% Difference +2% Full Scale
Zero	6028	0	0	0	0
80% URL	5539	490.3	793.65	794.0	0.035
1	5661	368.3	596.59	608.0	1.141
2	5783	246.9	399.58	416.0	1.642
3	5906	125.5	203.0	215.0	1.200

TABLE 6-2. CO CALIBRATION SUMMARY

Monitoring Trailer:	4	Calibrated by:	PES 2/21/93
Analyzer:	Fugi	Calibrator Manufacturer:	EnviroNics
Model:	ZRH	Model:	201-1520
Serial Number:	N2L1485T	Serial Number:	1122
CO Standard:	CC83868		
Concentration:	15.9%		
Cylinder Pressure:	1950 psi		

CO CALIBRATION AND LINEARITY CHECKS

Range 0-10 %

Calibration Points	Flow, Dil. cc/min	Flow, Std. cc/min	CO out ppm	Chart ppm	% Difference +2% Full Scale
Zero	2023.0	0	0	0	0
80% URL	1013.4	1013.8	7.95	7.99	0.40
1	1265.8	749.0	5.92	5.99	0.70
2	1515.7	500.6	3.95	4.04	0.90
3	1768.1	252.0	1.99	2.18	1.90

Range 0-20 %

Calibration Points	Flow, Dil. cc/min	Flow, Std. cc/min	CO out ppm	Chart ppm	% Difference +2% Full Scale
Zero	1024.0	0	0	0	0
80% URL	86.1	950.5	14.61	14.66	0.25
1	268.0	749.4	11.73	11.90	0.85
2	1008.4	1013.8	7.97	8.22	1.25
3	1513.2	500.4	3.95	4.08	0.65

TABLE 6-3. CO CALIBRATION SUMMARY

Monitoring Trailer: 4		Calibrated by: PES 2/20/93	
Analyzer:	TECO	Calibrator Manufacturer:	Enviroics
Model:	48	Model:	201-1520
Serial Number:	25149	Serial Number:	1122
CO Standard:		CC345, CC519, CC105014	
Concentration:		999 ppm, 200.7 ppm, 16.39 ppm	
Cylinder Pressure:		1900 psi	

CO CALIBRATION AND LINEARITY CHECKS

Range 0-10 ppm

Calibration Points	Flow, Dil. cc/min	Flow, Std. cc/min	CO out ppm	Chart ppm	% Difference +2% Full Scale
Zero	2024.0	0	0	0	0
80% URL	1033.3	966.3	7.92	7.92	0
1	1278.3	737.3	5.99	5.93	- 0.60
2	1523.1	484.8	3.96	3.94	- 0.20
3	1768.1	244.0	1.99	2.02	+ 0.30

Range 0-100 ppm

Calibration Points	Flow, Dil. cc/min	Flow, Std. cc/min	CO out ppm	Chart ppm	% Difference +2% Full Scale
Zero	1520.6	0	0	0	0
80% URL	1220.8	803.2	79.6	79.40	- 0.20
1	1420.7	593.3	59.1	58.60	- 0.50
2	1620.6	396.6	39.5	38.80	- 0.70
3	1820.5	199.9	19.8	19.66	- 0.14

TABLE 6-3. CO CALIBRATION AND LINEARITY CHECKS (Concluded)

TECO Model 48/Trailer #4/February 20, 1993

Range 0-500 ppm

Calibration Points	Flow, Dil. cc/min	Flow, Std. cc/min	CO out ppm	Chart ppm	% Difference +2% Full Scale
Zero	3025.6	0	0	0	0
80% URL	1218.3	806.0	397.8	399.0	+ 0.24
1	1418.2	596.1	295.6	300.5	+ 0.98
2	1620.6	398.6	197.2	203.0	+ 1.16
3	1820.5	201.3	99.5	102.0	+ 0.50

Range 0-1000 ppm

Calibration Points	Flow, Dil. cc/min	Flow, Std. cc/min	CO out ppm	Chart ppm	% Difference +2% Full Scale
Zero	2025.0	0	0	0	0
80% URL	258.7	969.1	786.9	786.0	- 0.09
1	658.5	968.8	594.8	602.0	+ 0.72
2	978.4	635.8	393.5	407.0	+ 1.35
3	1620.6	398.8	197.2	206.0	+ 0.88

TABLE 6-4. CO₂ CALIBRATION SUMMARY

Monitoring Trailer: 4		Calibrated by: PES 2/21/93	
Analyzer:	Fugi	Calibrator	
Model:	ZRH	Manufacturer:	Enviro-nics
Serial Number:	N2L1485T	Model:	201-1520
		Serial Number:	1122
CO ₂ Standard:	CC86353		
Concentration:	41.2%		
Cylinder Pressure:	600 psi		

CO₂ CALIBRATION AND LINEARITY CHECKS

Range 0-5 %

Calibration Points	Flow, Dil. cc/min	Flow, Std. cc/min	CO ₂ out %	Chart %	% Difference +2% Full Scale
Zero	4024.7	0	0	0	0
80% URL	3637.3	386.2	3.950	3.975	+ 0.50
1	3734.0	290.4	2.970	3.025	+ 1.10
2	3829.8	194.5	1.994	2.070	+ 1.52
3	5883.9	146.8	1.003	1.085	+ 1.64

Range 0-25 %

Calibration Points	Flow, Dil. cc/min	Flow, Std. cc/min	CO ₂ out %	Chart %	% Difference +2% Full Scale
Zero	2017.9	0	0	0	0
80% URL	943.4	878.2	19.86	19.900	+ 0.16
1	1163.3	659.5	14.91	14.975	+ 0.26
2	1383.2	433.7	9.85	9.900	+ 0.20
3	1600.6	218.3	4.95	4.925	- 0.10

TABLE 6-5. O₂ CALIBRATION SUMMARY

Monitoring Trailer: 4		Calibrated by: PES 2/21/93	
Analyzer:	Teledyne	Calibrator Manufacturer:	EnviroNics
Model:	326A	Model:	201-1520
Serial Number:	57064	Serial Number:	1122
O ₂ Standard:	Ultra Zero Air		
Concentration:	20.95%		
Cylinder Pressure:	2000 psi		

O₂ CALIBRATION AND LINEARITY CHECKSRange 0-10 %

Calibration Points	Flow, Dil. cc/min	Flow, Std. cc/min	O ₂ out %	Chart %	% Difference +2% Full Scale
Zero	3012.0	0	0	0	0
80% URL	1255.8	770.1	7.96	7.96	0
1	1448.2	568.7	5.91	5.99	0.80
2	1638.1	380.4	3.95	4.05	1.00
3	1828.0	191.9	1.99	2.09	1.00

Range 0-25 %

Calibration Points	Flow, Dil. cc/min	Flow, Std. cc/min	O ₂ out %	Chart %	% Difference +2% Full Scale
Zero	2020.5	0	0	0	0
80% URL	68.7	961.4	19.55	19.625	0.30
1	301.1	710.2	14.79	15.175	1.54
2	538.6	474.4	9.82	10.175	1.42
3	776.0	239.2	4.94	5.275	1.34

APPENDIX A
STEINER ENVIRONMENTAL, INC. RAW DATA

CONTINUOUS MONITOR DATA SHEET

Plant BACKY FARMS APCD Witness/Number GLENN SLATOR
 Date 7-16-93 Run No. 1,2,43 Client Rep _____
 Test Location BOILER OUTLET Generator Type _____
 Operator JM Burner Type _____
 Fuel Type NAT GAS Trailer No. 4 O₂ Controller Type _____

[Dry Uncorrected]

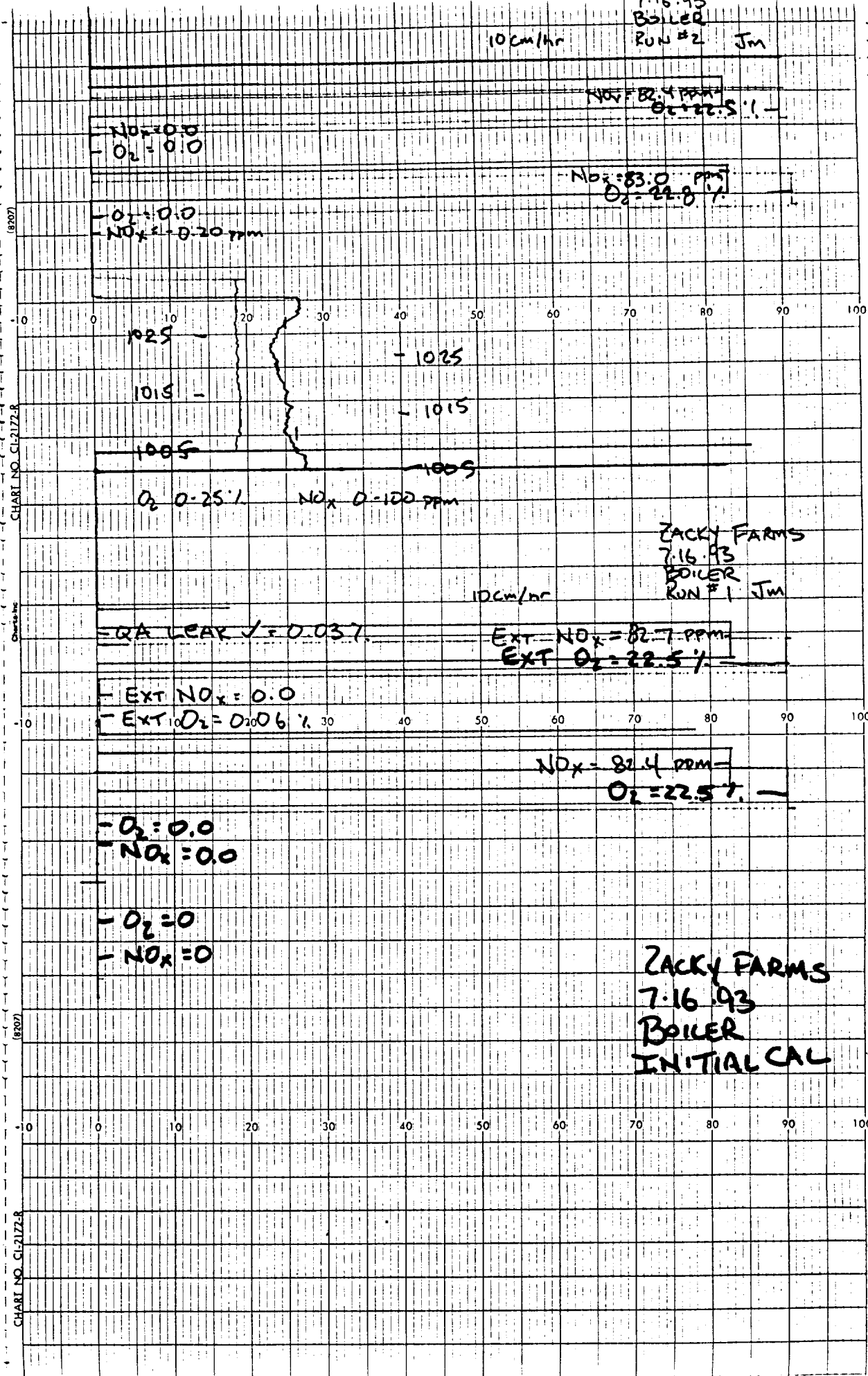
Time	Sample Point	O ₂ %	CO ₂ %	CO ppm	SO ₂ ppm	NO ppm	NO _x ppm	Comments	Miscellaneous Information
		22.50	16.44	86.1			87.4	HIGH VALUE	
		0.0	0.0	0.0			0.0	ZERO	NO _x <u>CC 8886B</u>
		22.50	16.00	84.2			82.7	HIGH BIAS	SO ₂ _____
		0.06	0.0	0.0			0.0	ZERO	CO <u>CC 563</u>
		0.03						QA LEAK V	CO/CO ₂ /O ₂ <u>CC 86398</u>
1005		4.75	9.25	1.0			26.2	RUN #1	Wet Bulb: _____ Dry Bulb: _____
15		4.70	9.25	0.1			23.9		Barometric Press: _____
25		4.70	9.25	0.1			25.0	35916 FG AU	
		0.0	0.0	0.0			-0.28	ZERO	RESPONSE TIME
		22.5	16.03	86.5			88.0	SPAN	Upscale: _____ Downscale: _____
								RECALIBRATE	Upscale: _____ Downscale: _____
1045		4.72	9.30	2.0			25.4	RUN #2	
55		4.58	9.44	0.1			25.0		Fuel Flow: _____
05		4.45	9.45	0.1			24.8		Steam Flow: _____
									Rating: _____
		0.0	0.0	-0.3			0.0	ZERO	PROCESS DATA
		22.45	16.35	86.2			81.2	SPAN	
								RECALIBRATE	Converter Gas
1135		4.40	9.50	0.8			25.9	RUN #3	Cal Gas Values Actual Values
45		4.33	9.50	0.3			27.8		NO _____
55		4.30	9.50	0.3			26.6		NO ₂ _____
									Conv. Efficiency: _____

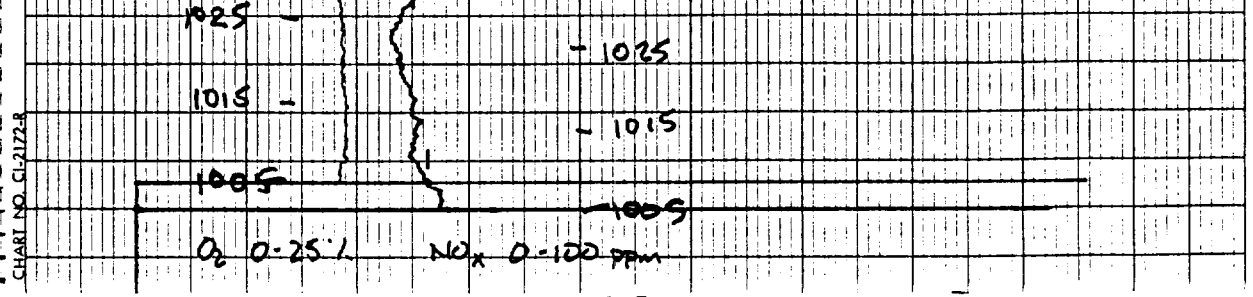
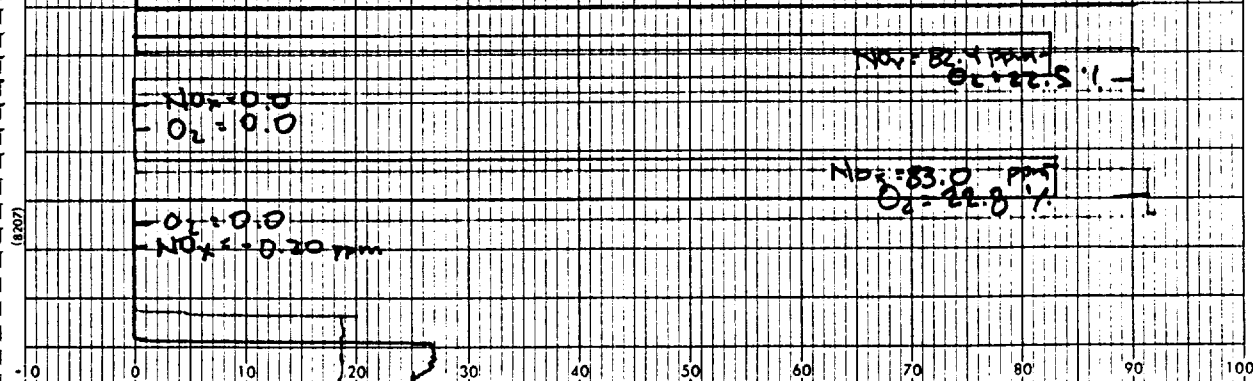
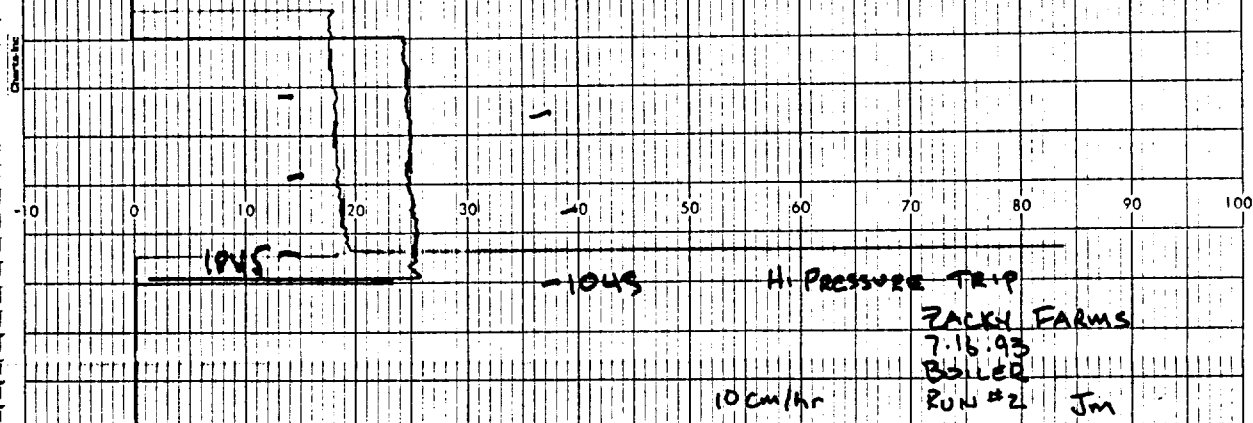
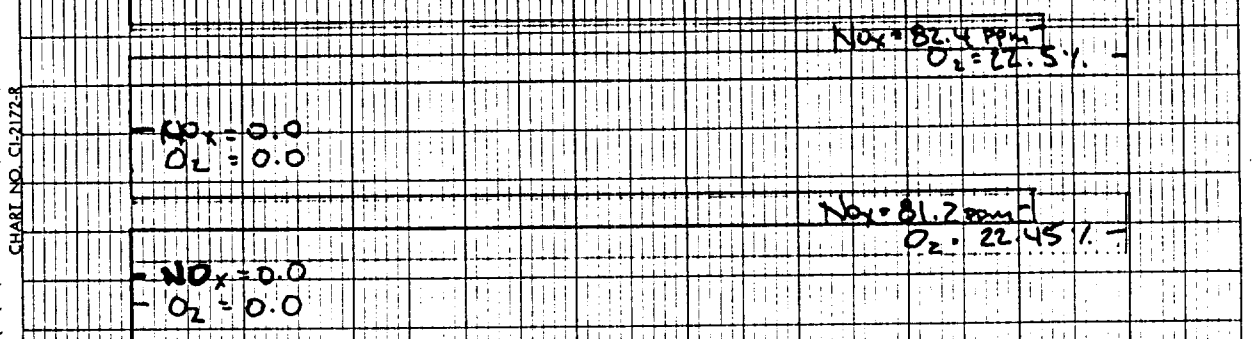
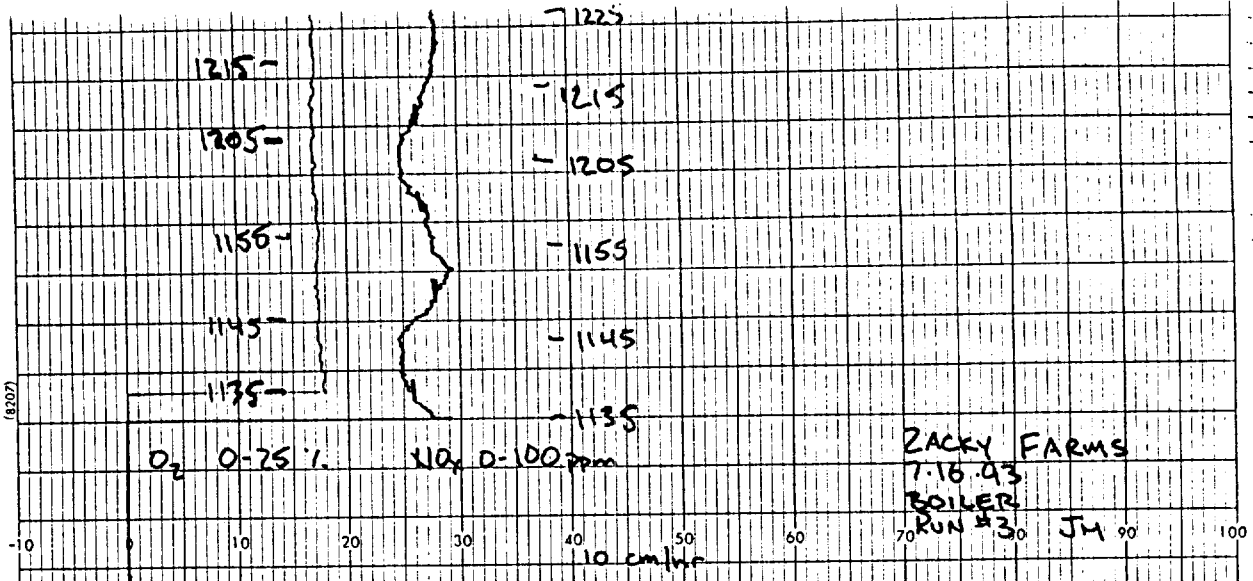
CONTINUOUS MONITOR DATA SHEET

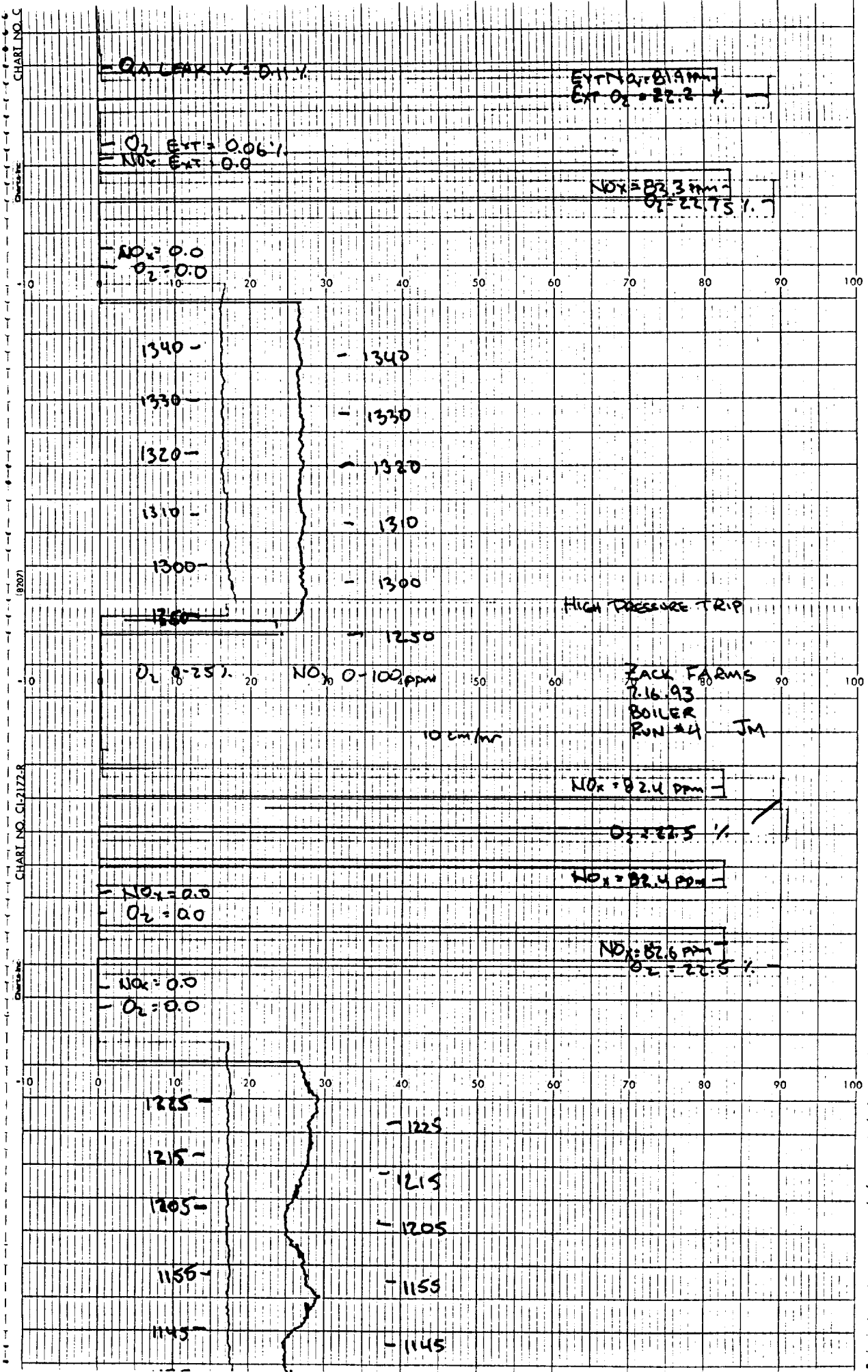
Plant ZACKY FARMS APCD Witness/Number GUENN SLATOR
 Date 7-16-93 Run No. 34 Client Rep _____
 Test Location BOILER OUTLET Generator Type _____
 Operator JM Burner Type _____
 Fuel Type NAT. GAS Trailer No. 4 O₂ Controller Type _____

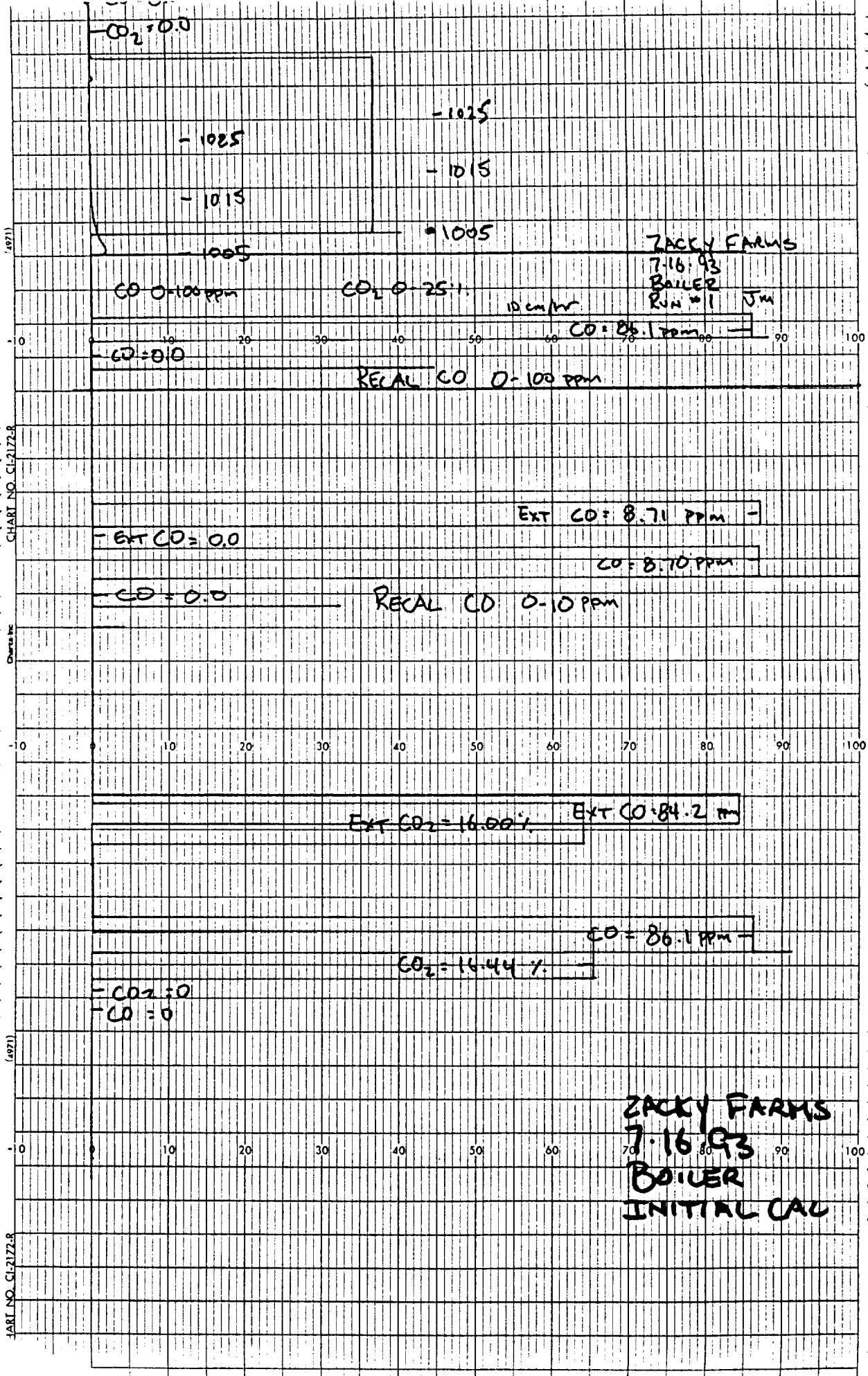
Dry Uncorrected

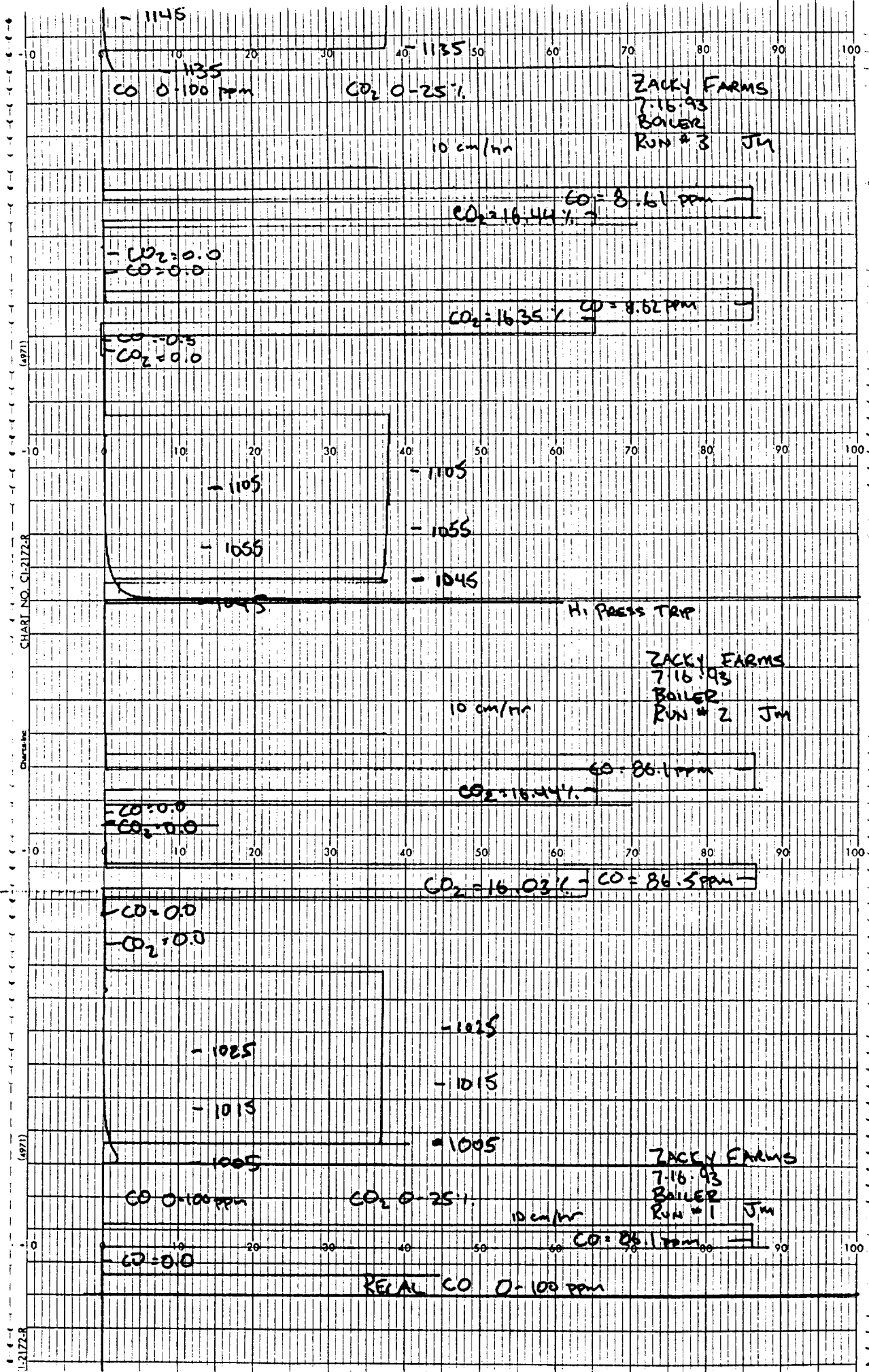
Time	Sample Point	O ₂ %	CO ₂ %	CO ppm	SO ₂ ppm	NO ppm	NO _x ppm	Comments	Miscellaneous Information
		22.50	16.44	86.1			82.4	HIGH VALUE	CALIBRATION GASES NO _x _____ SO ₂ _____ CO _____ CO/CO ₂ /O ₂ _____
		0.0	0.0	0.0			0.0	ZERO	
05		4.30	9.55	0.3			26.3	RUN # 3 CONT.	
15		4.30	9.55	0.3			28.0		
25		4.28	9.55	0.3			27.8		
		0.0	0.0	0.0			0.0	ZERO	Wet Bulb: _____ Dry Bulb: _____ Barometric Press: _____
		22.5	16.33	86.1			82.6	SPAN	
								RECALIBRATE	RESPONSE TIME Upscale: _____ Downscale: _____ Upscale: _____ Downscale: _____ Upscale: _____ Downscale: _____
12.50		4.37	9.52	2.80			26.8	RUN # 4	
00		4.22	9.58	0.6			26.6		
10		4.13	9.62	0.3			26.6		
20		4.06	9.55	0.3			26.6		PROCESS DATA Fuel Flow: _____ Steam Flow: _____ Rating: _____
30		4.06	9.55	0.3			26.5		
40		4.00	9.55	0.3			26.4		
		0.0	0.0	0.0			0.0	ZERO	CONVERTER GAS Cal Gas Values Actual Values NO _____ NO ₂ _____ Conv. Efficiency: _____
		22.75	16.41	86.1			83.3	SPAN	
		0.06	0.05	0.0			0.0	BIAS ZERO	
		22.2	16.25	85.5			81.9	BIAS SPAN	
		0.11						QA LEAK ✓	











1497

CHART NO. CI-2172.8

Outside

1497

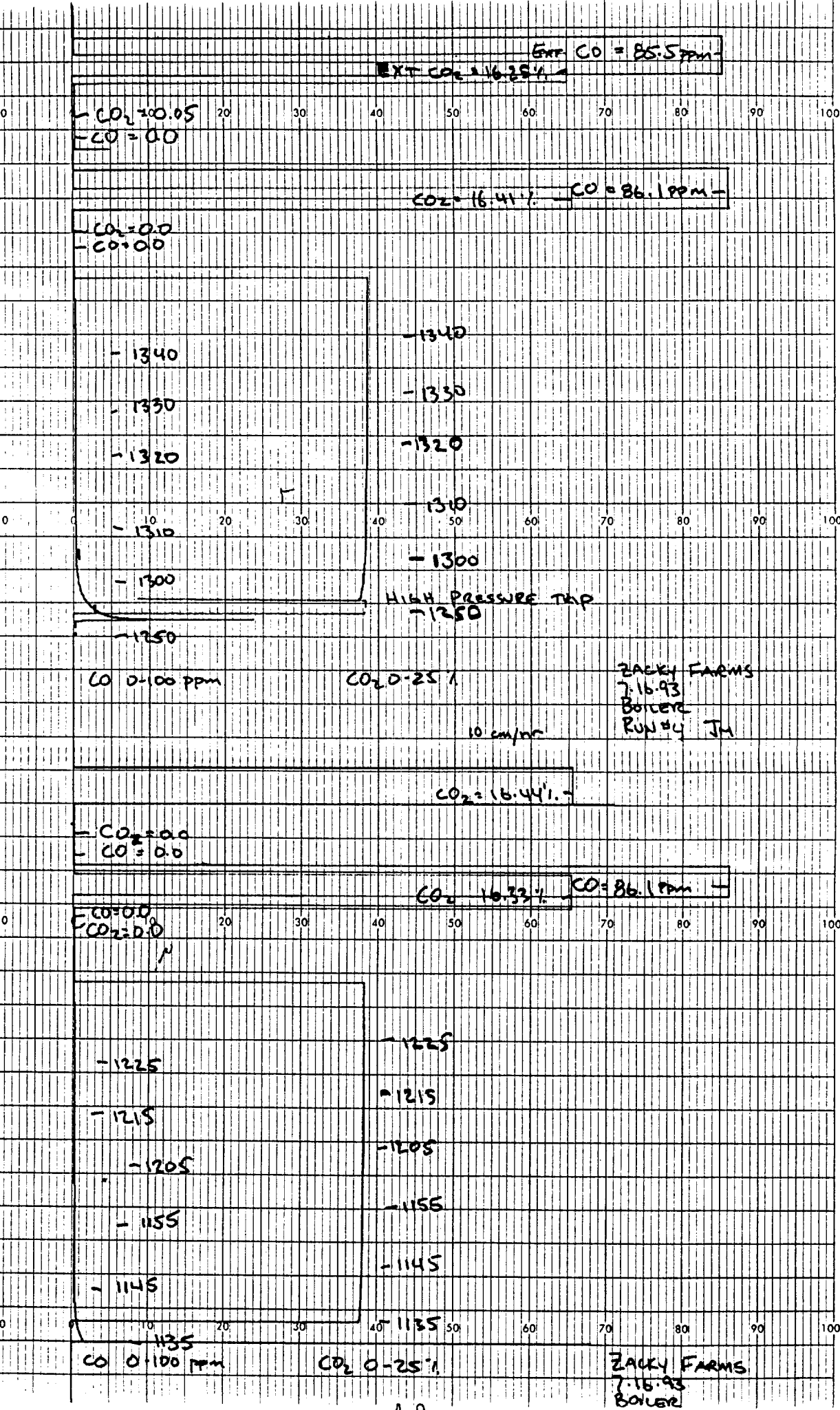
CHART NO. CI-2172.8

Outside

CHART NO. CI-2172.8

Outside

1497



A. CALIBRATION AND CORRECTION DATA

Company : ZACKY FARMS Date : 7/16/93
 Station : BOILER OUTLET Test Run : 1
 Test Condition:

Concentration : Drift Uncorrected (A) / Corrected (B)										
Point #	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
1	4.75		9.25	9.29	1.00	1.00			26.20	26.19
2	4.70		9.25	9.37	0.10	0.10			23.90	23.88
3	4.70		9.25	9.45	0.10	0.10			25.00	24.96
MEAN	4.72			9.37		0.40				25.01

	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Zero Check	0.00		0.00	0.00					-0.20	
Span Check	22.50		16.03		86.50				83.00	
Cal. Gas	22.50		16.44		86.10				82.40	
Scf			-0.00831		0.00155				0.00324	
Zcf			0.00000		0.00000				-0.06667	

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
 Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
 Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
 B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : ZACKY FARMS Date : 7/16/93
 Station : BOILER OUTLET Test Run : 2
 Test Condition:

Concentration : Drift Uncorrected (A) / Corrected (B)													
Point #	%O2		%CO2		ppm CO		ppm SO2		ppm NOx				
	A	B	A	B	A	B	A	B	A	B			
1	4.72	4.72	9.30	9.31	2.00	2.05			25.40	25.46			
2	4.58	4.59	9.44	9.47	0.10	0.25			25.00	25.18			
3	4.45	4.46	9.45	9.49	0.10	0.35			24.80	25.10			
MEAN		4.59		9.42		0.88					25.25		

%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00	-0.30		0.00
Span Check	22.45	86.20		81.20
Cal. Gas	22.50	86.10		82.40
Scf	-0.00074	0.00155		-0.00485
Zcf	0.00000	-0.10000		0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
 Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
 Cz, Zero Corr. Concentration = measured value - {Zcf x (Point # - 0.5)}
 B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : ZACKY FARMS Date : 7/16/93
 Station : BOILER OUTLET Test Run : 3
 Test Condition:

Concentration : Drift Uncorrected (A) / Corrected (B)										
Point #	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
1	4.40		9.50	9.51	0.80				25.90	25.89
2	4.33		9.50	9.52	0.30				27.80	27.78
3	4.30		9.50	9.53	0.30				26.60	26.57
4	4.30		9.55	9.59	0.30				26.30	26.26
5	4.30		9.55	9.60	0.30				28.00	27.95
6	4.28		9.55	9.61	0.30				27.80	27.74
MEAN	4.32			9.56	0.38					27.03

	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Zero Check		0.00		0.00		0.00				0.00
Span Check		22.50		16.33		86.10				82.60
Cal. Gas		22.50		16.44		86.10				82.40
Scf				-0.00112						0.00040
Zcf				0.00000						0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
 Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
 Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
 B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : ZACKY FARMS Date : 7/16/93
 Station : BOILER OUTLET Test Run : 4
 Test Condition:

Concentration : Drift Uncorrected (A) / Corrected (B)										
Point #	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
1	4.37	4.37	9.52	9.53	2.80	2.80			26.80	26.81
2	4.22	4.22	9.58	9.60	0.60	0.60			26.60	26.64
3	4.13	4.13	9.62	9.66	0.30	0.30			26.60	26.67
4	4.06	4.06	9.55	9.60	0.30	0.30			26.60	26.69
5	4.06	4.06	9.55	9.62	0.30	0.30			26.50	26.62
6	4.00	4.00	9.55	9.63	0.30	0.30			26.40	26.55
MEAN		4.14		9.61		0.77				26.66

	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Zero Check		0.06		0.05		0.00				0.00
Span Check		22.20		16.25		85.50				81.90
Cal. Gas		22.50		16.44		86.10				82.40
Scf		-0.00267		-0.00243		-0.00116				-0.00101
Zcf		0.01000		0.00833		0.00000				0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
 Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
 Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
 B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : ZACKY FARMS

Date : 7/16/93

Station : BOILER OUTLET

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	22.50	16.44	86.10		82.40
Measured Span	22.50	16.03	86.50		83.00
Zero Drift	0.00	0.00	0.00		-0.20
Final, Actual Span	22.50	16.03	86.50		83.20
Percent Drift	0.0	-2.5	0.5		1.0
*****	*****	*****	*****	*****	*****
Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	22.50	16.44	86.10		82.40
Measured Span	22.45	16.35	86.20		81.20
Zero Drift	0.00	0.00	-0.30		0.00
Final, Actual Span	22.45	16.35	86.50		81.20
Percent Drift	-0.2	-0.5	0.5		-1.5
*****	*****	*****	*****	*****	*****
Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	22.50	16.44	86.10		82.40
Measured Span	22.50	16.33	86.10		82.60
Zero Drift	0.00	0.00	0.00		0.00
Final, Actual Span	22.50	16.33	86.10		82.60
Percent Drift	0.0	-0.7	0.0		0.2

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : ZACKY FARMS

Date : 7/16/93

Station : BOILER OUTLET

Run 4	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	22.50	16.44	86.10		82.40
Measured Span	22.20	16.25	85.50		81.90
Zero Drift	0.06	0.05	0.00		0.00
Final, Actual Span	22.14	16.20	85.50		81.90
Percent Drift	-1.6	-1.5	-0.7		-0.6
*****	*****	*****	*****	*****	*****
Run	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span					
Measured Span					
Zero Drift					
Final, Actual Span					
Percent Drift					
*****	*****	*****	*****	*****	*****
Run	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span					
Measured Span					
Zero Drift					
Final, Actual Span					
Percent Drift					

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

 Steiner Environmental, Inc.

Date: 7.16.93

Test Location: ZACKY FARMS
BOILER

SAMPLE HANDLING/LOG-IN

NO	SAMPLE TYPE	VOLUME	COMMENTS
1	35916 <u>ASTM</u> <u>EG</u> <u>ALL</u> Meth Sample Test		
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

CHAIN-OF-CUSTODY

Signature

Date/Time

Signature

Date/Time

James E. McCarty 7.16.93/1642
Dustin Croghan 7/16/93

EMISSION RATE CALCULATIONS

PLANT : ZACKY FARMS
SOURCE : BOILER OUTLET
DATE : JULY 16, 1993

Temp. Std. : 60 dF
Press. Std.: 29.92 in. Hg. 3 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	4.66	4.32	4.14	4.37
Qs(std), dscfm	2201.21	2138.50	2101.46	2147.06
NOx, ppm	25.13	27.03	26.66	26.27
CO, ppm	0.64	0.38	0.77	0.60
HC, ppm				
F-Factor	8503.28	8503.28	8503.28	8503.28

NOx, MW = 46.005

NOx, lb/hr	0.40	0.42	0.41	0.41
NOx, ppm @ O2	27.70	29.18	28.47	28.45
NOx, lb/MMBtu	0.0334	0.0351	0.0343	0.0343

CO, MW = 28.010

CO, lb/hr	0.01	0.00	0.01	0.01
CO, ppm @ O2	0.71	0.41	0.82	0.65
CO, lb/MMBtu	0.0005	0.0003	0.0006	0.0005

HC, MW = 16.043

HC, lb/hr
HC, ppm @ O2
HC, lb/MMBtu

$$* \text{ lb/hr} = 8.223\text{E-}5 \times Qs(\text{std}) \times MW \times \text{ppm} / (T\text{std} + 460)$$

$$* \text{ ppm @ O2} = \text{ppm measured} \times [(20.9 - \text{O2\% correction}) / (20.9 - \text{\%O2 measured})]$$

$$* \text{ lb/MMBtu} = F\text{-Factor} \times MW \times [1.3711\text{E-}6 / (T\text{std} + 460)] \times [20.9 / (20.9 - \text{O2\%})] \times \text{ppm}$$



6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (714) 653-6780 • FAX (714) 653-2430

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

STEIØ1

TO:

SUE POWERS
STEINER ENVIRONMENTAL, INC.
4930 BOYLAN STREET
BAKERSFIELD, CA 93308-

DATE : 05/21/92

CUSTOMER ORDER NUMBER: SP-2750-90 R.59

PAGE 1

COMPONENT	CONCENTRATION (v/v)	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.: CC88868					
Nitric Oxide	82.4 ± 0.8 ppm	GMIS	Monitor Labs Model 8440		05/08/92 05/21/92
NOx	82.4 ppm	Cylinder #	S/N 136	11/21/93	82.5 ppm 82.5 ppm
Nitrogen, O2-Free Balance		CC106651	Continuous		82.3 ppm 82.4 ppm
Cylinder Pressure: 2000 psig		@ 98.9 ppm	Chemiluminescence		82.5 ppm 82.4 ppm
				Mean: 82.4 ppm	82.4 ppm
CYLINDER NO.: CC93703					
Nitric Oxide	82.9 ± 0.8 ppm	GMIS	Monitor Labs Model 8440		05/08/92 05/21/92
NOx	82.9 ppm	Cylinder #	S/N 136	11/21/93	83.0 ppm 82.7 ppm
Nitrogen, O2-Free Balance		CC106651	Continuous		82.9 ppm 83.1 ppm
Cylinder Pressure: 2000 psig		@ 98.9 ppm	Chemiluminescence		82.8 ppm 82.9 ppm
				Mean: 82.9 ppm	82.9 ppm
CYLINDER NO.: CC98696					
Nitric Oxide	83.2 ± 0.8 ppm	GMIS	Monitor Labs Model 8440		05/08/92 05/21/92
NOx	83.2 ppm	Cylinder #	S/N 136	11/21/93	83.2 ppm 83.2 ppm
Nitrogen, O2-Free Balance		CC106651	Continuous		83.0 ppm 83.1 ppm
Cylinder Pressure: 2000 psig		@ 98.9 ppm	Chemiluminescence		83.3 ppm 82.9 ppm
				Mean: 83.2 ppm	83.1 ppm

ppm = umole/mole % = mole-%

The above analyses were performed in accordance with EPA-1987 Traceability Protocol # 1, Section 3.0.4, Procedure G1.

Analyst: B. E. Gross

Approved:



J.T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

PAGE 2
12/09/92

[illegible]A-19



6531 BOX SPRINGS BLVD. • RIVERSIDE, CA 92507
TELEPHONE (714) 653-6780 • FAX (714) 653-2430

REPORT OF ANALYSIS
NIST TRACEABLE GAS MIXTURES

STEIØ1

TO:

SUE POWERS
STEINER ENVIRONMENTAL SERVICES
4930 BOYLAN ST
BAKERSFIELD, CA 93308-

DATE: 04/28/93

CUSTOMER ORDER NUMBER: SP 2750 90 R.86

PAGE 1

[illegible]

CYLINDER NUMBER	COMPONENT	CONCENTRATION (v/v)	NIST TRACEABLE REFERENCE STANDARD
CC86398	Carbon Dioxide	16.44 + 0.16 %	SRM 1675b
	Oxygen	22.50 + 0.23 %	SRM 2659
	Nitrogen	Balance	

$$\text{ppm} = \mu\text{mole/mole}$$

% = mole-%

The above analyses are traceable to the National Institute of Standards and Technology by intercomparison with the reference standards listed above. Where indicated, volumetric and gravimetric reference standards are traceable thru use of our analytical balance. NIST Report No. MMAP 232.09/202491.

Analyst:

M.S. Calhoun

Approved:

J.T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

A-20

APPENDIX B
ZACKY FARMS BOILER OPERATING DATA

**INTERNAL COMBUSTION ENGINE
COMPLIANCE DATA
CHECK LIST**

COMPANY NAME: <u>ZACKY FARMS</u>	DATE: <u>7.16.93</u>
MANUFACTURER: <u>KEWANEE</u>	TEST LOCATION: <u>BOILER OUTLET</u>
UNIT NO: <u>CLASSIC III</u>	TYPE OF CONTROL DEVICE: <u>STEAM INJECTION</u>
UNIT MODEL NO: <u>H3530040</u>	CONTROL DEVICE MODEL NO: <u>GORDON - PIATT</u>

RUN #	1	2	3	4
Fuel Flow	142.9	140.0	140.4	139.5
Fuel Flow Units	CFM	CFM	CFM	CFM
Fuel Gas Pressure	5.45	5.45	5.45	5.45
Fuel Gas Pressure Units	PSI	PSI	PSI	PSI
Fuel Gas Temperature (°F)	85	85	90	96
Wet Bulb Temperature (°F)				
Dry Bulb Temperature (°F)				
Relative Humidity (%)				
Barometric Pressure ("Hg)	29.89	29.89	29.86	29.85
Brake Horse Power (Rated)				
Brake Horse Power (Actual)				
Kilowatts (Rated)				
Kilowatts (Actual)				
Revolutions Per Minute (Rated)				
Revolutions Per Minute (Actual)				

COMMENTS: _____

ICE-CK.LST