Compliance Test

PM, NO_X, CO, SO_2, THC & HCl

CCR Vent Scrubber

TPI Refining Company

Ardmore Petroleum Refinery
Ardmore, Oklahoma
January 4-5, 2006

CETCON

PRELIMINARY TEST - Methods 1A, 2C, 3A, 5, 6C, 7E, 10, 25A & 26
CCR Vent Scrubber

TPI Refining Company
Ardmore Petroleum Refinery

Test Date:
January 4-5, 2006

Report Date: February 1, 2006
CETCON Job Number: CJ-4113

" We certify that we have personally examined and we are familiar with the information submitted herein, and based on our inquiries of those individuals immediately responsible for obtaining the information, we believe the submitted information is true, accurate, and complete."

John R. Van Meter
Sr. Project Coordinator

Jared R. Howard
Sr. Environmental Specialist

J. Jeff Abel
Sr. Environmental Specialist

Glenn A. Davis
Sr. Environmental Specialist

CETCON

TABLE OF CONTENTS

EXECUTIVE SUMMARY

SUMMARY OF RESULTS

ANALYTICAL PROCEDURES AND SAMPLING METHODS

DESCRIPTION OF TEST

APPENDIX A - UNIT DIAGRAM AND SAMPLE POINT LOCATION

APPENDIX B - PLANT OPERATIONAL DATA

APPENDIX C - FIELD DATA

APPENDIX D - CALIBRATION DATA

APPENDIX E - LAB ANALYSIS

APPENDIX F - EQUATIONS

APPENDIX G - ORIGINAL TEST PROPOSAL

APPENDIX H - RESUMES

APPENDIX I - RAW FIELD DATA

EXECUTIVE SUMMARY

Compliance testing for Particulate Matter (PM), Hydrochloric Acid (HCl), oxides of nitrogen (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2), total hydrocarbons (THC), oxygen (O_2) and carbon dioxide (CO_2) was performed on the CCR Scrubber Vent Stack at the TPI Refinery located near Ardmore, Oklahoma.

A series of three, 64-minute reference method 26 (RM 26) tests were conducted for HCl on January 4, 2006. Following each RM 26 test run, a 60-minute pollutant test run was conducted for NO_x, CO, SO_2, O_2, and CO_2. The testing was conducted to demonstrate compliance with the source performance standards of the Code of Federal Regulation, Tile 40, Part 63, Subpart UUU (Refinery MACT II). Testing was conducted using procedures set forth in the Code of Federal Regulations (CFR) Title 40, Part 60, Appendix A, Reference Methods 1A, 2C, 3A, 4, 6C, 7E, 10 and 26. During the third test run, the plant experienced an upset. The data acquired for the first three test runs, labeled C1 – C3, were not used to determine compliance with the emission limits.

A series of three, 64-minute reference method 5 (RM 5) tests were conducted for PM on January 5, 2006. Following each RM 5 test run, a 60-minute pollutant test run was conducted for NO_x, CO, SO_2, THC, O_2, and CO_2. The testing was conducted to demonstrate compliance with the source performance standards of the Code of Federal Regulation, Tile 40, Part 63, Subpart UUU (Refinery MACT II). Testing was conducted using procedures set forth in the Code of Federal Regulations (CFR) Title 40, Part 60, Appendix A, Reference Methods 1A, 2C, 3A, 4, 5, 6C, 7E, 10 and 25A.

The average HCl emission results for the three 64-minute test runs conducted on January 4, 2006 were summarized in the following table. The average PM, NO_x, CO, SO_2, and THC emission results for the three test runs conducted on January 5, 2006 were also summarized in the following table.

EXECUTIVE SUMMARY (continued)

Parameter	Concentration, lb/dscf *10^{-6}	Emission Rate, lb/hr	Emission Rate, ppm @ 3% O_2
HCl	0.020	0.000	0.186
Parameter	**Concentration, lb/dscf *10^{-6}**	**Emission Rate, lb/hr**	**Emission Rate, Lb/1000lb Coke Burn**
PM	0.563	0.003	0.127
Parameter	**Concentration, ppmvd**	**Emission Rate, lb/hr**	**Emission Rate, TPY**
NO_x	0.36	0.00	0.00
CO	189.09	0.07	0.31
SO_2	0.00	0.00	0.00
Parameter	**Concentration, ppmvw**	**Concentration, ppmvd**	**Concentration, ppmvd @ 3% O_2**
THC (Propane)	18.55	19.17	17.16
THC (Hexane)	N/A	N/A	8.58

The CCR Scrubber Vent Stack demonstrated compliance with the HCl emission standard specified in 40CFR63, Subpart UUU of 10.00 ppm HCl @ 3% O_2.

The CCR Scrubber Vent Stack demonstrated compliance with the particulate emission standard specified in 40CFR63, Subpart UUU of 1.0 lb PM/1000 of Coke Burn-Off.

A complete breakdown of all test data can be found on the following two pages of this report titled "Summary of Results".

CETCON, Inc.

Summary Of Results

Unit Designation: CCR Scrubber Vent

PARAMETERS:					
Test Number:	C1	C2	C3		
Date:	1/4/2006	1/4/2006	1/4/2006		
Start Time:	1115	1400	1640		
End Time:	1237	1527	1752		
Test Duration, min.	64	64	64		
OPERATING DATA:				**Average:**	
Catalyst Recirculation, lb/hr	567.66	558.04	558.04	561.25	
Coke Burn, lb/hr	28.3	27.8	27.8	28.0	
Reformer Charge, MBPD	17.5	17.6	17.5	17.5	
Reformer Charge Perchloroethylene Equivalent, ppm	470	570	667	569	
Lower Air, MSCFH	2.80	2.80	2.80	2.80	
Upper Air, MSCFH	1.69	1.41	1.39	1.50	
Upper Air O2, % Volume	1.05	1.05	1.05	1.05	
Regeneration Zone Temp., °F	957	937	939	944	
Regeneration Flue Gas Temp., °F	957	941	944	947	
Inlet Regenerator Flue Gas, ASCFM	275	255	255	262	
Scrubber Venturi Flow, gal/min	29.2	28.5	28.0	28.6	
Scrubber Liquid, pH	12	12	12	12	
Scrubber Venturi Liquid/Gas Ratio	1.81	1.88	1.85	1.85	
FLUE GAS:					
Stack Temperature, °F	81	84	85	83	
O_2, % dry	0.98	0.97	0.86	0.93	
CO_2, % dry	16.53	16.78	12.24	15.18	
% Moisture	2.87	3.78	3.94	3.53	
Stack Flow, ACFM	114	97	95	102	
Stack Flow, DSCFM	106	88	86	94	
% Isokinetic	98	100	99	99	
EMISSION DATA:					Permit:
HCl, lb/dscf ($x10^{-6}$)	0.031	0.014	0.013	0.020	
HCl, ppm	0.333	0.150	0.139	0.207	
HCl, ppm @ 3% O_2	0.299	0.134	0.125	0.186	10.00
HCl, lb/hr	0.000	0.000	0.000	0.000	
HCl, ton/yr	0.000	0.000	0.000	0.000	
NO_X, ppmvd	0.51	0.59	0.39	0.50	
NO_X, lb/hr	0.00	0.00	0.00	0.00	1.20
NO_X, ton/yr	0.00	0.00	0.00	0.00	5.20
CO, ppmvd	183.13	182.90	110.42	158.82	
CO, lb/hr	0.08	0.07	0.04	0.07	0.20
CO, ton/yr	0.37	0.31	0.18	0.29	0.80
SO_2, ppmvd	0.41	0.43	0.00	0.28	
SO_2, lb/hr	0.00	0.00	0.00	0.00	0.70
SO_2, ton/yr	0.00	0.00	0.00	0.00	2.90

Date: 2/3/2006

© 2003 CETCON, Inc. All Rights Reserved

SUMMARY.XLS

CETCON, Inc.

Summary Of Results

Unit Designation: CCR Scrubber Vent

PARAMETERS:					
Test Number:	C4	C5	C6		
Date:	1/5/2006	1/5/2006	1/5/2006		
Start Time:	1050	1443	1718		
End Time:	1204	1557	1826		
Test Duration, min.	64	64	64		
OPERATING DATA:				**Average:**	
Catalyst Recirculation, lb/hr	558.04	558.04	558.04	558.04	
Coke Burn, lb/hr	23.4	23.4	23.4	23.4	
Reformer Charge, MBPD	18.9	19.0	18.8	18.9	
Reformer Charge Perchloroethylene Equivalent, ppm	733	648	653	678	
Lower Air, MSCFH	2.80	2.80	2.80	2.80	
Upper Air, MSCFH	1.45	1.50	1.36	1.44	
Upper Air O2, % Volume	1.03	1.05	1.05	1.04	
Regeneration Zone Temp., °F	932	940	939	937	
Regeneration Flue Gas Temp., °F	933	939	939	937	
Inlet Regenerator Flue Gas, ASCFM	256	260	252	256	
Scrubber Venturi Flow, gal/min	29.1	30.0	35.6	31.6	
Scrubber Liquid, pH	12	12	12	12	
Scrubber Venturi Liquid/Gas Ratio	1.91	1.95	2.38	2.08	
FLUE GAS:					
Stack Temperature, °F	80	82	77	80	
O_2, % dry	0.89	0.91	0.89	0.90	
CO_2, % dry	17.67	17.62	17.60	17.63	
% Moisture	3.26	3.40	3.09	3.25	
Stack Flow, ACFM	96	97	86	93	
Stack Flow, DSCFM	89	90	81	87	
% Isokinetic	97	100	100	99	
EMISSION DATA:					**Permit:**
PM, lb/dscf ($x10^{-6}$)	0.931	0.510	0.248	0.563	
PM, lb/hr	0.005	0.003	0.001	0.003	0.60
PM, ton/yr	0.022	0.012	0.005	0.013	2.50
PM, lb/1000lb Coke Burn	0.213	0.118	0.052	0.127	1.000
NO_X, ppmvd	0.44	0.28	0.36	0.36	
NO_X, lb/hr	0.00	0.00	0.00	0.00	1.20
NO_X, ton/yr	0.00	0.00	0.00	0.00	5.20
CO, ppmvd	186.27	191.82	189.18	189.09	
CO, lb/hr	0.07	0.08	0.07	0.07	0.20
CO, ton/yr	0.32	0.33	0.29	0.31	0.80
SO_2, ppmvd	0.00	0.00	0.00	0.00	
SO_2, lb/hr	0.00	0.00	0.00	0.00	0.70
SO_2, ton/yr	0.00	0.00	0.00	0.00	2.90
THC, ppmvw as Propane	16.53	20.16	18.96	18.55	
THC, ppmvd as Propane	17.08	20.87	19.57	19.17	
THC as Propane @ 3% O2	15.28	18.68	17.51	17.16	20.00
THC, as Hexane @ 3% O2 ✓	7.64	9.34	8.75	8.58	

Date: 2/3/2006

© 2003 CETCON, Inc. All Rights Reserved

SUMMARY.XLS

SAMPLING METHODS

Pollutants are measured according to EPA Reference Methods (RM's) and Performance Specifications (PS's) described in the Code of Federal Regulations (CFR), Title 40, Chapter 1, Part 51, Appendix M, Part 60, Appendix A, Appendix B, and Appendix F, Part 61, Appendix B and Part 63, Appendix A. The following methods were used:

RM-1A — Sample and velocity traverses for stationary sources with small stacks or ducts. Determination of measurement site and sample point locations for particulate testing in stacks or ducts > 4 in. and < 12 in. in diameter (or > 12.57 in.^{2} and < 113 in.^{2} in cross-sectional area).

RM-2C — Determination of stack gas velocity and volumetric flow rate in small stacks or ducts. For stack diameters > 4 in. and < 12 in. (or > 12.57 in.^{2} and < 113 in.^{2} in cross-sectional area), a standard pitot tube is used in conjunction with an inclined manometer to measure average gas velocity and for quantifying gas flow.

RM-3A — Determination of Oxygen (O_2) and Carbon Dioxide (CO_2) concentrations in emissions from stationary sources (Instrumental Analyzer Procedure). Servomex 1400B4 series analyzers are used to continuously measure the concentrations of O_2 and CO_2. O_2 and CO_2 concentrations are determined by paramagnetic and non-dispersive infrared detectors, respectively. The instruments are calibrated either with gases prepared according to EPA Protocol One or with gases that have been certified using an Orsat analyzer (RM-3).

RM-4 — Determination of moisture content in stack gases. A gas sample is extracted from the source through an impinger sampling train which condenses the moisture. The volume of the gas sample leaving the impinger train is determined using a calibrated dry gas meter. The impingers are weighed before and after the test run to determine moisture content.

RM-5 — Determination of particulate emissions from stationary sources. Particulate matter is extracted isokinetically from the source and collected in a heated probe and heated glass fiber filter which are maintained at 248 ± 25 °F. An impinger train is used to remove the moisture and condensible particulate matter from the gas sample. Gas sample volume is determined using a calibrated dry gas meter. The mass of particulate matter is determined gravimetrically.

RM-6C — Determination of Sulfur Dioxide (SO_2) emissions from stationary sources (Instrumental Analyzer Procedure). A Bovar (Western Research) Model 721AT2 or 721M ultraviolet photometric analyzer is used to continuously measure the concentration of SO_2. The instrument is calibrated with gases prepared according to EPA Protocol One.

SAMPLING METHODS, continued

RM-7E — Determination of Nitrogen Oxides (NO_X) emissions from stationary sources (Instrumental Analyzer Procedure). A Thermo Environmental Instruments Company Model 10S, 42H or 42C chemiluminescent analyzer is used to continuously measure the concentration of NO_X. The instrument is calibrated with gases prepared according to EPA Protocol One.

RM-10 — Determination of Carbon Monoxide (CO) emissions from stationary sources (Instrumental Analyzer Procedure). A Thermo Environmental Instruments Company Model 48 or 48C gas filter correlation infrared analyzer is used to continuously measure the concentration of CO. The instrument is calibrated with gases prepared according to EPA Protocol One.

RM-25A — Determination of total gaseous organic concentration using a flame ionization analyzer (FIA). A gas sample is extracted from the source through a heated sample line and heated filter (if necessary). A J.U.M. Model 3-100 or VE-7 or Eagle Monitoring Systems Model EM-7000 FIA is used to continuously measure the concentration of total hydrocarbons (THC). The instruments are calibrated with gases prepared according to EPA Protocol One consisting of Methane (CH_4) or Propane (C_3H_8) in a balance of Nitrogen (N_2) or air. THC concentrations are expressed in units of ppm as C_3H_8 or as Carbon.

RM-26 — Determination of Hydrogen Halide (HCl, HBr and HF) and Halogen (Cl_2 and Br_2) emissions from stationary sources. A gas sample is extracted from the source at a constant rate through a heated glass probe and heated Teflon filter and passed through midget impingers containing 0.1N sulfuric acid (H_2SO_4) where the Hydrogen Halides are absorbed. The Halogens, having low solubility in acidic solutions, pass through and are absorbed in impingers containing 0.1N sodium hydroxide (NaOH). Gas sample volume is determined using a calibrated dry gas meter. The collected samples are analyzed by Ion Chromatography.

DESCRIPTION OF TEST

John Van Meter, Jared Howard, Jeff Abel, and Glenn Davis of CETCON, Inc. (Combustion and Environmental Testing CONsultants) arrived at the Valero Ardmore Refinery on Tuesday, January 3, 2006 at 2:00 PM. The purpose of our visit was to conduct compliance tests for particulate (PM), hydrochloric acid (HCl), oxides of nitrogen (NO_x), carbon monoxide (CO), oxygen (O_2), sulfur dioxide (SO_2), total hydrocarbons (THC), and carbon dioxide (CO_2) on the CCR scrubber vent stack.

On Tuesday, January 3, 2006 CETCON personnel arrived at the plant at 2:00 PM. After obtaining security badges and signing in at the unit control room, the test trailer referred to as CETCON I was positioned next to the scaffolding around the scrubber vent stack. Power was provided in the form of five (5) 110 VAC circuits via the plants portable power transformer. The scaffolding was incomplete upon arrival and was completed and inspected around 4:30 PM. Testing equipment was raised to the testing platform and the reference method analyzers were energized and allowed to warm up overnight. CETCON personnel departed the plant at 7:30 PM.

On Wednesday, January 4, 2006 CETCON personnel returned to the plant at 7:00 AM. The reference method (RM) NOx, CO, O2, SO2, THC and CO_2 analyzers were calibrated followed by a system bias and response time test. Appropriate leak checks were performed on the pollutant sample system and the HCl sampling train. The HCl sampling system was leak checked and inserted into the stack. The first test run, labeled HCLC1, began at 11:15 AM and concluded at 12:37 PM. The sampling system was leak checked at the end of the test and the train was recovered in the test trailer. While the HCl train was being recovered, the pollutant probe was inserted into the stack and allowed to reach full response. A one hour test was conducted for the pollutants between each HCl run. Upon completion of the test run an analyzer drift and sample system bias test was conducted to provide corrections to the final concentration data. Testing continued alternating HCl and pollutant runs until the end of the third and final pollutant test run. During the last one hour pollutant test, the CCR unit experienced an upset. The test was allowed to complete itself, however the three pollutant runs would be redone on the following day in concurrence with the PM testing. At the conclusion of the third pollutant run, a NO_x converter test was successfully conducted. Personnel departed the facility at 8:30 PM.

On Thursday, January 5, 2006 CETCON personnel returned to the plant at 7:00 AM. The RM analyzers were calibrated followed by a sample system bias test. The PM sampling system was leak checked and inserted into the stack. The first test run, labeled PMC4, began at 10:50 AM and concluded at 12:04 PM. The sampling system was leak checked at the end of the test and the train was recovered in the test trailer. While the PM train was being recovered, the pollutant probe was inserted into the stack and allowed to reach full response. A one hour test was conducted for the pollutants between each PM run. Upon completion of the test run an analyzer drift and sample system bias test was conducted to provide corrections to the final concentration data. Testing continued alternating PM and pollutant runs until the end of the third and final pollutant test run. Personnel departed the facility at 8:00 PM.

DESCRIPTION OF TEST, continued

On Friday, January 6, 2006 CETCON personnel returned to the plant at 8:30 AM. The testing equipment was dismantled and the test trailer was packed for departure. Personnel departed the facility at 10:30 AM,

In conclusion, compliance tests for HCl, PM, NO_x, CO, SO_2, O_2, THC, and CO_2 were performed on the CCR Scrubber Vent stack. A series of three (3) 64-minute test runs were performed for HCl and PM with a 60-minute run of pollutants between each run. Following each test run the sampling system was challenged with calibration standards to monitor analyzer drift and sample system bias. Each test run was identical in technique and procedure.

The following people were present during portions or all of testing conducted on January 4 and 5, 2006:

Tracy Watson	Valero
David Schutz	Oklahoma DEQ
Donna Litzenhiser	Oklahoma DEQ
DeeJay Famuagun	Oklahoma DEQ
John Van Meter	CETCON, Inc.
Jared Howard	CETCON, Inc.
Jeff Abel	CETCON, Inc.
Glenn Davis	CETCON, Inc.

Unit Diagram
and
Sample Point Location

APPENDIX A

CETCON, Inc.

Job No:	CJ-4113	Rectangular Duct? (Y/N):	N
Customer:	TPI	Duct Width, in.:	
Unit:	CCR Vent	Duct Depth, in.:	
Date:	January 3, 2006	Equivalent Diameter, in.:	
Time:	4:00 PM	Isokinetic Test? (Y/N):	Y

PRELIMINARY VELOCITY TRAVERSE DATA
AND
SAMPLING LOCATION DATA

Number of Ports: 2

	Port A	Port B	Port C	Port D	A&B Ave.	C&D Ave.
Port & Inside Diameter (in.)	9-03/08	9-03/08	9-03/08	9-03/08	9.375	9.375
Port & Wall Thickness (in.)	5-03/08	5-03/08	5-03/08	5-03/08	4.375	4.375
Inside Stack Diameter, D (in.)	4-00/08	4-00/08	4-00/08	4-00/08	4.000	4.000

A & B Sampling Ports:	4 ft.	6 in.	Distance A-Port to downstream disturbance =	13.50	stack diameters
	3 ft.	2 in.	Distance B-Port to upstream disturbance =	9.50	stack diameters
C & D Sampling Ports:	0 ft.	8 in.	Distance A-Port to downstream disturbance =	2.00	stack diameters
	4 ft.	6 in.	Distance B-Port to upstream disturbance =	13.50	stack diameters

Pitot Tube No: Std

C_P = 0.990

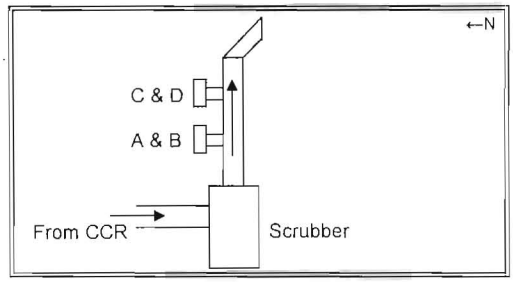
P_B = 29.16 Hg

P_S = 0.00 H_2O

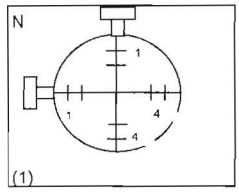
A_S(2) = 12.57 $in.^2$

0.09 $ft.^2$

Stack Schematic



Cross Section



Stack Height 35 ft.

Sampling Port Hgt 30 ft.

Point Number	Percent Diameter	Distance From Port Opening (decimal in.)(4)	Distance From Port Opening (decimal in.)(4)	Port A ΔP	Port A T_S	Port A α	Port B ΔP	Port B T_S	Port B α	Port C ΔP	Port C T_S	Port C α	Port D ΔP	Port D T_S	Port D α	Port E ΔP	Port E T_S	Port E α
Reference Method 1A/2C Sample Traverse Points																		
1	6.7	4.88	4 14 / 16							0.12	78		0.12	79				
2	25.0	5.38	5 6 / 16							0.13	78		0.13	79				
3	75.0	7.38	7 6 / 16							0.12	78		0.12	79				
4	93.3	7.88	7 14 / 16							0.10	78		0.09	79				
Reference Method 1A/2C Velocity Traverse Points																		
1	6.7	4.88	4 14 / 16															
2	25.0	5.38	5 6 / 16															
3	75.0	7.38	7 6 / 16															
4	93.3	7.88	7 14 / 16															

Cyclonic Flow Calculation(3)

Average Absolute Value of Cyclonic Flow Null Angle, α = **0.0 °** *α Must Be ≤ 20° For Acceptable Flow Conditions*

Average Stack Temperature, T_S = **79 °F** Average ΔP_S= **0.116 in. H_2O** Average $\sqrt{\Delta P_S}$= **0.340 in. $H_2O^{1/2}$**

Notes: (1) Clockwise from ladder or plant north (stacks w/o ladders) - sample port designation in sequence A, B, C, & D for circular ducts.
Left to right for rectangular ducts with sample port designation in sequence A, B, C, D, & E.
Higher traverse numbers for both rectangular and circular duct toward outside wall.

(2) $A_S = \pi D^2 \div 4$

(3) Cyclonic flow indication measured positive in clockwise rotation from null position.

(4) Points nearest stack walls are adjusted to a minimum of 0.5 in. (D ≤ 24 in.) or 1.0 in. (D > 24 in.).

QA/QC Check:

Completeness_____ Legibility_____ Accuracy_____ Specifications_____ Reasonableness_____

Checked by:

2/1/2006

2-1-2006
Operator (Signature/Date)

© 2001 CETCON, Inc. All Rights Reserved

Project Coordinator (Signature/Date)

PRELIM.XLS

Plant Operational Data

APPENDIX B

CETCON

CCR Engineering Performance Test Data

Beginning	Ending	SPENT CATALYST CARBON WT% 11:CAT951.D2	REGENERATED CATLAYST CARBON WT% 11:CAT952.D2	CATALYST CIRCULATION RATE #/HR 11:CCR	COKE ON CATALYST % 11:COKE	COKE BURN RATE LBS/HR (MANUAL)	REFORMER REACTOR PERCHLOROETHYLENE INJECTION RATE (GPM) 11:F362.C	REFORMER CHARGE RATE (MBPD) 11:F146	REFORMER CHARGE API (DEG) 17:LIQ165.1D
1/4/2006 11:15	1/4/2006 12:37	5.15	0.08	567.66	5.07	28.3	1.55	17.5	57.30
1/4/2006 14:00	1/4/2006 15:27	5.15	0.08	558.04	5.07	27.8	1.88	17.6	57.30
1/4/2006 16:40	1/4/2006 17:52	5.15	0.08	558.04	5.07	27.8	2.19	17.5	57.30
1/5/2006 10:50	1/5/2006 12:04	4.40	0.10	558.04	4.30	23.4	2.60	18.9	57.30
1/5/2006 14:43	1/5/2006 15:57	4.40	0.10	558.04	4.30	23.4	2.30	19.0	57.30
1/5/2006 17:18	1/5/2006 18:26	4.40	0.10	558.04	4.30	23.4	2.30	18.8	57.30

REFORMER REACTOR PERCHLOROETHYLENE INJECTION RATE (LBS/MIN) (MANUAL)	REFORMER CHARGE PERCHLOROETHYLENE PPMW EQUIVALENT	LOWER AIR MSCFH 11:F380	UPPER AIR MSCFH 11:F379	UPPER AIR O2 VOL% 11:A383	REGENERATION ZONE TEMP (F) DEG F 11:T369F	REGENERATION ZONE TEMP (G) DEG F 11:T369G	REGENERATION ZONE TEMP (H) DEG F 11:T369H	REGENERATION ZONE TEMP (J) DEG F 11:T369J
11.57	470	2.80	1.69	1.05	1098	1032	984	957
14.05	570	2.80	1.41	1.05	1050	990	956	937
16.37	667	2.80	1.39	1.05	1053	994	959	939
19.42	733	2.80	1.45	1.03	1037	984	951	932
17.22	648	2.80	1.50	1.05	1054	999	962	940
17.23	653	2.80	1.36	1.05	1048	994	959	939

REGENERATION ZONE TEMP (K) DEG F 11:T369K	REGENERATION FLUE GAS TEMPERATURE DEG F 11:T370	INLET REGENERATOR FLUE GAS DSCFM	INLET REGENERATOR FLUE GAS WSCFM	INLET REGENERATOR FLUE GAS ASCFM	SCRUBBER VENTURI FLOW RATE (GPM) 11:FI402055	SCRUBBER LIQUID Ph	SCRUBBER VENTURI LIQUID TO GAS RATIO MANUAL	SCRUBBER OUTLET REGENERATOR FLUE GAS TEMPERATURE (F)	SCRUBBER OUTLET REGENERATOR FLUE GAS ACFM
952	957	94	97	275	29.2	12	1.81	79.6	112
934	941	88	91	255	28.5	12	1.88	80.6	105
936	944	88	91	255	28.0	12	1.86	79.3	104
928	933	89	92	256	29.1	12	1.91	78.6	106
937	939	90	93	260	30.0	12	1.95	80.6	107
936	939	87	90	252	35.6	12	2.38	75.7	103

Field Data

APPENDIX C

CETCON, Inc.

ISOKINETIC SAMPLING WORKSHEET

Job Number:	CJ-4113
Customer:	TPI Petroleum, Inc.
Unit:	CCR Vent Scrubber
Date:	January 4, 2005

Assumed Or Preliminary Flue Gas Data:	P_B, in. Hg	29.31
	P_s, in. H_2O	0.03
	P_S, in. Hg	29.31
	T_S, °F	79
	T_{SR}, °R	539
	$\%O_2$	1.00
	$\%CO_2$	17.00
	$\%N_2$	82.00
	%M	5.00
	M_D	0.9500
	M_d, lb/lbmole	30.76
	M_S, lb/lbmole	30.12

Calibration Data:	CM#	1
	C_F	1.009
	$\Delta H@$, in. H_2O	1.553
	Pitot#	Std
	C_P	0.990
	Nozzle#	T-Q5
	D_n, in.	0.312
Assumed Or Preliminary Test Data:	T_m, °F	75
	T_{mR}, °R	535
	ΔP_S, in. H_2O	0.116
	$\sqrt{\Delta P_S}$, in. $H_2O^{0.5}$	0.340
	T_R, min.	64

Shaded Cells Above Are Calculated

K-Factor = **11.198**

$\Delta H = K \times \Delta P_S$

$$K = (851.4 \bullet C_P^2 \bullet D_n^4 \bullet \Delta H@ \bullet M_d \bullet M_D^2 \bullet P_S \bullet T_{mR}) \div (P_m \bullet T_{SR} \bullet M_S)$$

Based On The Average ΔP_S And D_n Entered Above, The ΔH Required For Isokinetic Sampling Is:	1.30
Based On The Test Duration T_R Entered Above, The Total Sample Volume In DSCF Would Be:	41.83
Based On The Test Duration T_R Entered Above, The Sampling Rate In DSCFM Would Be:	0.654
Based On The % Moisture Estimated, The Condensate Volume In ml Would Be:	46.7

What Is The Desired Sample Volume In DSCF? 35.00

The Ideal Nozzle Size Required To Obtain This Sample Volume Isokinetically Is: 0.286

NOMENCLATURE

P_B = Barometric Pressure, in. Hg
P_s = Stack Differential Pressure, in. H_2O
P_S = Stack Absolute Pressure, in. Hg
T_S = Stack Temperature, °F
T_{SR} = Stack Temperature, °R
$\%O_2$ = Stack Oxygen Concentration, % dry
$\%CO_2$ = Stack Carbon Dioxide Concentration, % dry
$\%N_2$ = Stack Nitrogen Concentration, % dry
%M = Stack Moisture Concentration, %
M_D = Stack Gas Dry Fraction
M_d = Stack Gas Dry Molecular Weight, lb/lbmole
M_S = Stack Gas Wet Molecular Weight, lb/lbmole
C_F = Dry Gas Meter Correction Factor, dimensionless
$\Delta H@$ = Orifice Calibration Factor, in. H_2O
C_P = Pitot Tube Coefficient, dimensionless
D_n = Nozzle Diameter, in.
T_m = Average Dry Gas Meter Temperature, °F
T_{mR} = Average Dry Gas Meter Temperature, °R
ΔP_S = Average Pitot Pressure Drop, in. H_2O
$\sqrt{\Delta P_S}$ = Average Square Root of Pitot Pressure Drop, in. $H_2O^{0.5}$
T_R = Test Duration, min

QA/QC Check:
Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

1/4/2006

1/4/2006
Operator (Signature/Date)

2-1-2006
Project Coordinator (Signature/Date)

© 1999 CETCON, Inc. All Rights Reserved

ISOSHEET.XLS

CETCON, Inc.

Job No.:	CJ-4113	Field Data:	HCL	Barometer No.:	CET I	Barometric Pressure, P_B:	29.37	C_F:	1.009		
Date:	1/4/2006	Run No.:	C1	Pitot Tube No.:	Std	Ambient Temp., °F:	67	ΔH@:	1.553	in. H_2O	
Customer:	TPI	Time of Run, T_R:	64 min.	Pitot Tube, C_P:	0.990	Stack Pressure, P_S:	-0.03	in. H_2O =	29.37	in. Hg	
Unit:	CCR Vent	Time per Point, T_S:	4 min.	Initial Pitot Leak:	X	Initial Leak @:	15.0	in. Hg =	0.000	cfm	
Operator:	JJA	Sample Box No.:	1	Final Pitot Leak:	X	Final Leak @:	4.0	in. Hg =	0.004	cfm	
Method:	RM-26A	Meter Box No.:	CM#1	Nozzle No.:	T-Q5	Assumed T_S:	79	Assumed K:	11.198		
Filter No.:	NA	Stack Area, A_S:	12.57 in.^{2}	Nozzle Dia., D_N:	0.312 in.	Assumed T_M:	77	Calculated K:	11.572		
File Name:	HCL1	Assumed %M:	(default)	N_2 Purge@:	NA SCFH	For:	NA min.	N_2 Cylinder No.:	NA		

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP_S	Orifice ΔH P_M, in. H_2O Desired	Orifice ΔH P_M, in. H_2O Actual	Sample Vacuum in. Hg	Stack Temp. °F T_S	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	% Isokinetic
C 4	1115	489.450	0.13	1.46	1.46	3.0	79	250	252	62	72	72	99.7
	1119	492.303	0.12	1.33	1.35	3.0	78	256	252	59	72	73	105.1
3	1123	495.200	0.13	1.44	1.45	3.0	81	250	263	59	73	73	94.3
	1127	497.900	0.13	1.44	1.45	3.0	81	250	267	59	74	73	96.0
2	1131	500.650	0.11	1.22	1.22	3.0	81	250	274	62	74	72	100.6
	1135	503.300	0.12	1.33	1.33	3.0	81	252	276	64	75	72	92.6
1	1139	505.850	0.11	1.22	1.22	3.0	81	250	254	67	75	72	102.5
	1143	508.552	0.12	1.33	1.33	3.0	81	250	257	68	76	72	95.1
END	1147	511.173											
D 4	1205	512.030	0.11	1.22	1.22	3.0	81	259	300	70	73	72	104.3
	1209	514.776	0.10	1.10	1.10	3.0	82	258	300	68	75	72	94.1
3	1213	517.139	0.10	1.11	1.10	3.0	82	249	260	66	76	72	107.4
	1217	519.841	0.09	1.00	1.00	3.0	82	240	264	65	76	72	90.5
2	1221	522.000	0.10	1.11	1.10	3.0	82	254	268	65	76	72	93.1
	1225	524.341	0.10	1.11	1.10	3.0	82	257	270	66	77	72	97.1
1	1229	526.786	0.09	1.00	1.00	3.0	82	257	267	66	77	73	98.9
	1233	529.150	0.09	1.00	1.00	3.0	82	264	268	66	77	72	96.7
END	1237	531.459											

C_{qa} =	1.012	%Δ Must	Avg ΔP_S	0.109	Avg P_M	1.214	Avg T_S	81	Avg T_M	74	
%Δ =	0.3	Be ≤ 5.0	Avg ($\Delta P_S^{1/2}$)	0.330	Max Vacuum	3.0	Volume DGM	41.152 ,ft^3 x C_F	1.009	=V_M	41.522 ft^3

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	626.2	719.2	510.1	942.4			2797.9
Initial Wt, gm	632.9	701.7	506.8	931.2			2772.6
Difference, gm	-6.7	17.5	3.3	11.2			25.3 = V_W

$V_{M\,std} = 17.64 \times V_M \times [(P_B+(P_M / 13.6)) \div T_M]$	40.407	DSCF
$Q_{M\,std} = V_{Mstd} \div T_R$	0.631	DSCFM
$V_{W\,gas} = 0.04715 \times V_W$	1.193	SCF
$\%M = V_{W\,gas} \times 100 \div (V_{M\,std} + V_{W\,gas})$	2.868	%
$M_D = (100 - \%M) \div 100$	0.971	dry fract.
$MW_D = (\%CO_2 x0.44)+(\%O_2 x0.32)+((\%N_2+\%CO)x0.28)$	30.683	lb/lbmole
$MW = M_D \times MW_D + 18 (1 - M_D)$	30.319	lb/lbmole
$V_S = 5129.4 \times C_p \times (T_S \div (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$	1306.4	FPM
$Q_A = (V_S \times A_S) \div 144$	114.01	ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) \div T_S$	106.04	DSCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) \div (M_D \times P_S \times V_S \times T_R \times D_N^2)$	97.9	%

RM 3 or 3A Data	
$\%CO_2$	16.525
$\%O_2$	0.976
%CO	0.000
$\%N_2$	82.499
% Excess Air	4.671

Avg ΔP	0.109	in. H_2O
Avg ($\Delta P_S^{1/2}$)	0.330	
Avg. P_M	1.214	in. H_2O
Avg. T_S	81	°F
Avg. T_S	541	°R
Avg.T_M	74	°F
Avg.T_M	534	°R

QA/QC Check:

Completeness	✓
Legibility	✓
Accuracy	✓
Specifications	✓
Reasonableness	✓

Checked by:

Operator (Signature/Date) 2/3/2006

Project Coordinator (Signature/Date) 2/3/2006

© 1999 CETCON, Inc. All Rights Reserved

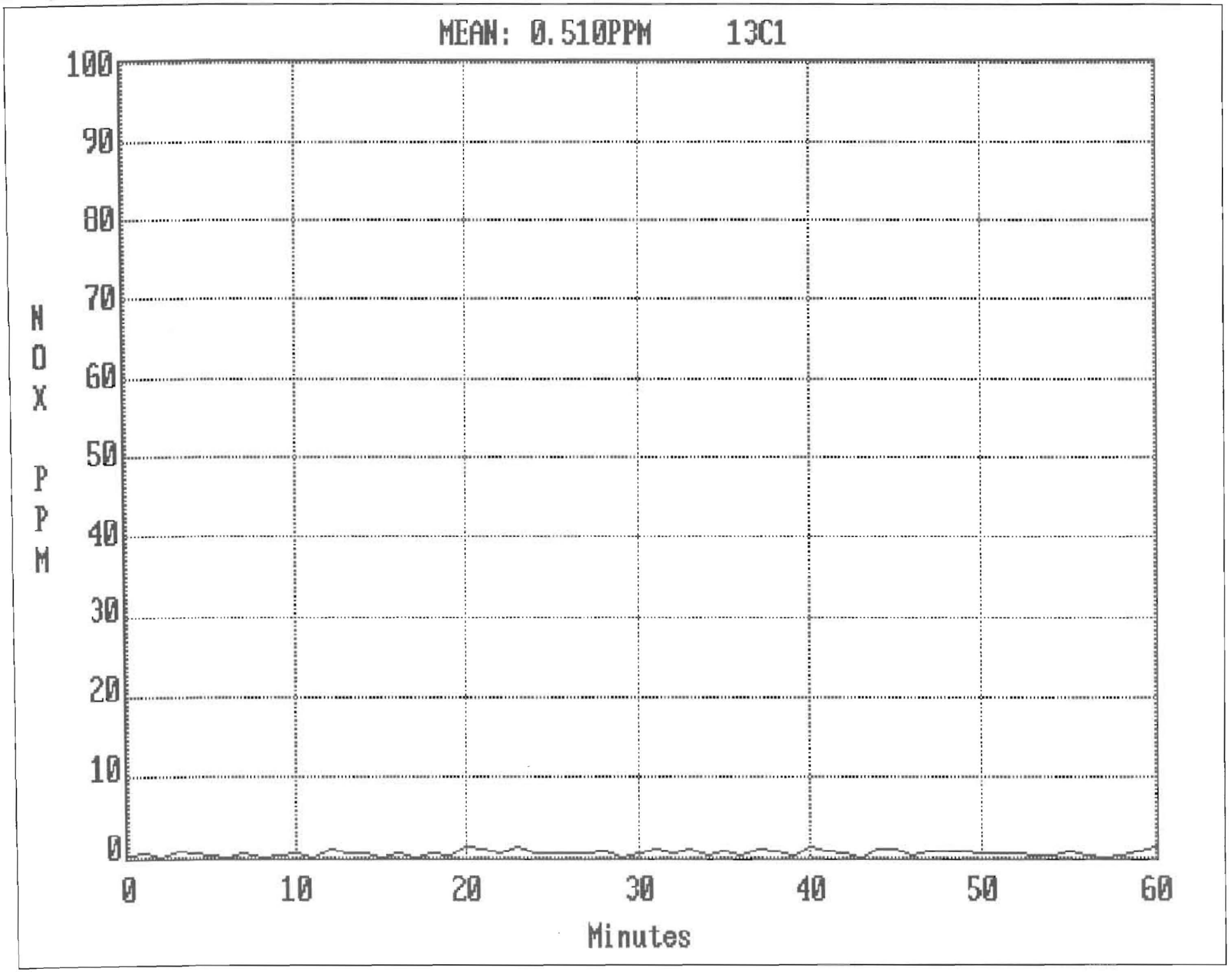
FIELDISO.XLS

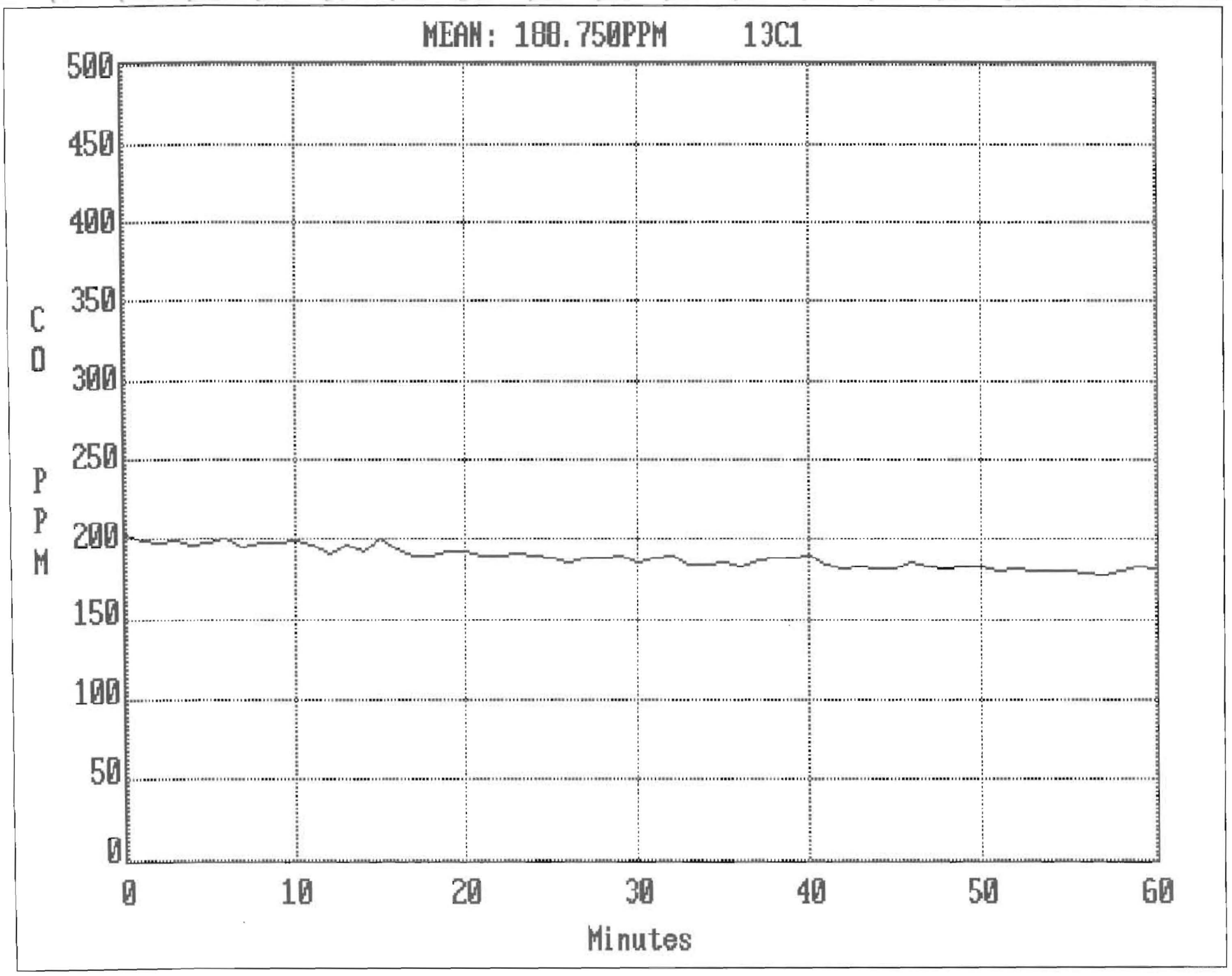
CJ4113/TPI-ARDMORE/CCR/C1

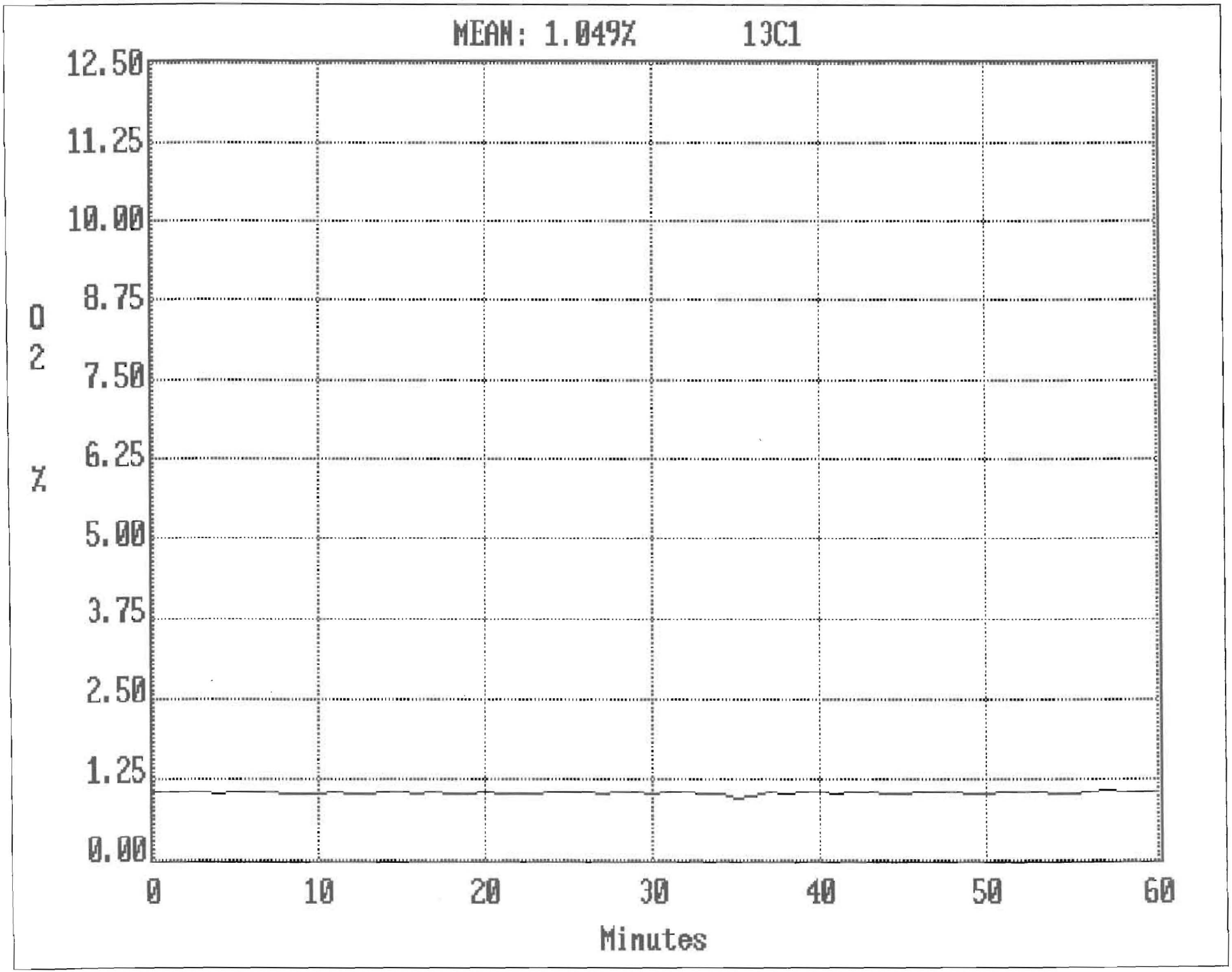
TEST DATE : 01-04-2006
START TIME: 12:40:27
FILE NAME : C:\DAQ\13C1 .ID%

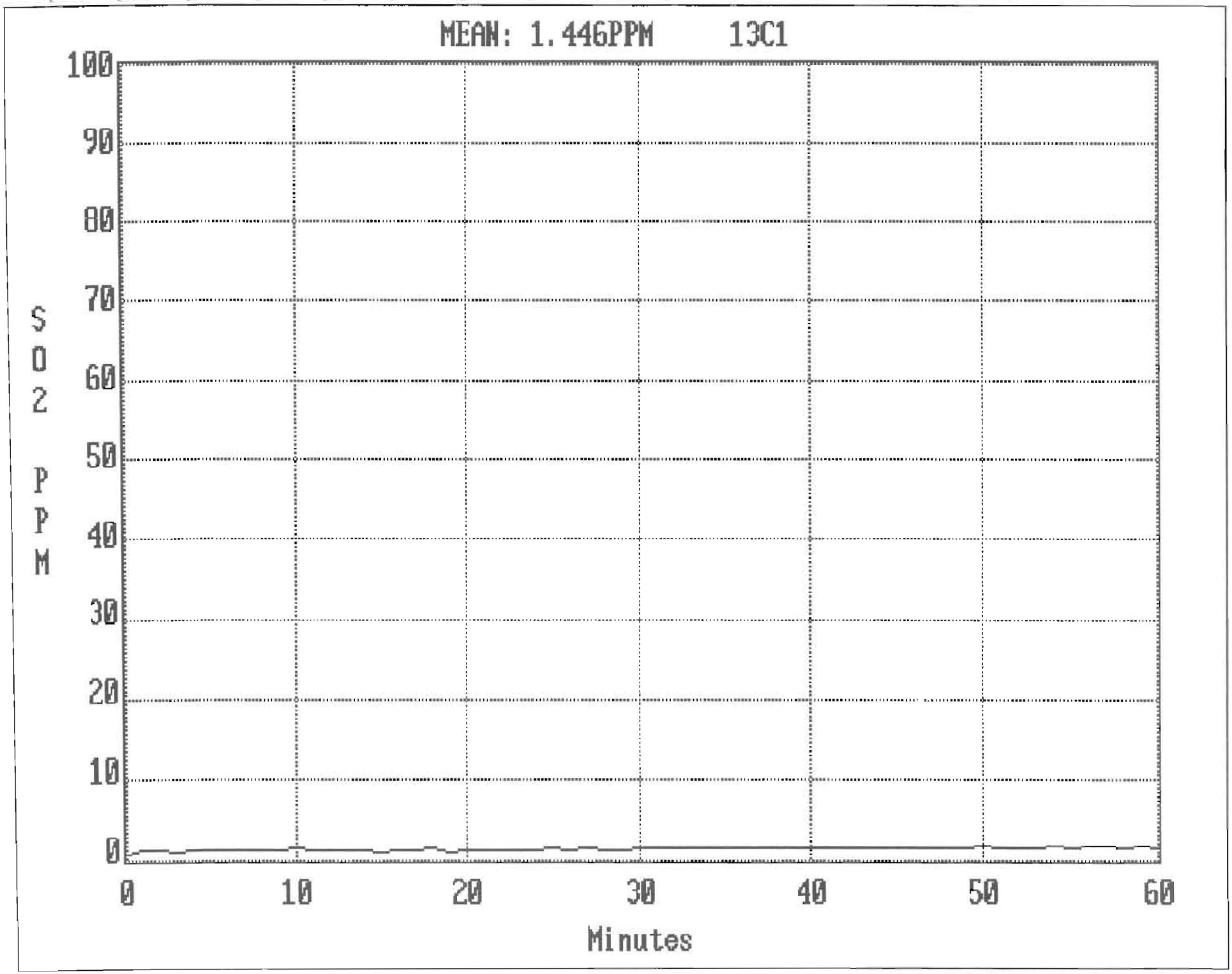
CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
<MIN>			<ANALYZER OUTPUT-VDC>					
0	0.032	3.997	0.422	0.085	0.000	6.848	3.711	0.000
1	0.055	3.900	0.424	0.131	0.000	6.864	3.678	0.006
2	0.000	3.881	0.426	0.117	0.000	6.855	3.650	0.044
3	0.079	3.894	0.427	0.102	0.000	6.842	3.663	0.043
4	0.037	3.844	0.415	0.138	0.000	6.838	3.659	0.044
5	0.028	3.877	0.419	0.129	0.000	6.851	3.669	0.028
6	0.002	3.945	0.422	0.134	0.000	6.847	3.695	0.065
7	0.059	3.823	0.426	0.133	0.000	6.838	3.656	0.033
8	0.007	3.871	0.416	0.134	0.000	6.830	3.687	0.000
9	0.018	3.874	0.412	0.123	0.000	6.840	3.668	0.015
10	0.034	3.905	0.418	0.148	0.000	6.845	3.682	0.064
11	0.000	3.860	0.420	0.127	0.000	6.832	3.673	0.086
12	0.104	3.744	0.415	0.120	0.000	6.833	3.669	0.000
13	0.034	3.853	0.418	0.133	0.000	6.838	3.669	0.000
14	0.046	3.780	0.423	0.137	0.000	6.816	3.702	0.043
15	0.000	3.922	0.423	0.099	0.000	6.803	3.653	0.036
16	0.055	3.810	0.418	0.119	0.000	6.796	3.656	0.007
17	0.000	3.728	0.419	0.137	0.000	6.812	3.678	0.007
18	0.043	3.716	0.413	0.140	0.000	6.807	3.669	0.020
19	0.028	3.772	0.417	0.111	0.000	6.819	3.694	0.063
20	0.120	3.771	0.420	0.113	0.000	6.824	3.660	0.041
21	0.104	3.726	0.418	0.118	0.000	6.812	3.669	0.000
22	0.054	3.721	0.415	0.127	0.000	6.814	3.691	0.031
23	0.117	3.743	0.406	0.120	0.000	6.805	3.651	0.027
24	0.059	3.718	0.426	0.138	0.000	6.811	3.660	0.023
25	0.055	3.697	0.432	0.147	0.000	6.819	3.659	0.031
26	0.054	3.650	0.423	0.118	0.000	6.809	3.641	0.052
27	0.037	3.693	0.416	0.151	0.000	6.820	3.608	0.035
28	0.078	3.699	0.421	0.136	0.000	6.821	3.621	0.035
29	0.000	3.713	0.431	0.138	0.000	6.829	3.626	0.000
30	0.040	3.638	0.416	0.139	0.000	6.827	3.633	0.019
31	0.102	3.682	0.425	0.151	0.000	6.811	3.614	0.000
32	0.055	3.724	0.421	0.150	0.000	6.808	3.635	0.044
33	0.088	3.606	0.415	0.147	0.000	6.791	3.647	0.000
34	0.030	3.612	0.416	0.147	0.000	6.799	3.639	0.000
35	0.072	3.632	0.392	0.151	0.001	6.795	3.647	0.035
36	0.013	3.583	0.403	0.145	0.000	6.804	3.658	0.043
37	0.101	3.657	0.422	0.142	0.000	6.812	3.656	0.013
38	0.085	3.687	0.415	0.155	0.002	6.824	3.657	0.049
39	0.009	3.706	0.426	0.164	0.000	6.820	3.669	0.032
40	0.135	3.711	0.422	0.146	0.000	6.819	3.674	0.000
41	0.085	3.622	0.410	0.153	0.000	6.777	3.648	0.081
42	0.041	3.575	0.419	0.163	0.000	6.774	3.622	0.061
43	0.007	3.595	0.420	0.139	0.000	6.771	3.638	0.024
44	0.090	3.556	0.417	0.144	0.000	6.787	3.626	0.028
45	0.103	3.576	0.417	0.147	0.000	6.779	3.588	0.000
46	0.020	3.639	0.427	0.160	0.000	6.797	3.632	0.028
47	0.068	3.590	0.432	0.163	0.000	6.822	3.637	0.024
48	0.081	3.556	0.425	0.160	0.000	6.836	3.652	0.058
49	0.069	3.597	0.417	0.164	0.000	6.833	3.634	0.027
50	0.034	3.597	0.416	0.174	0.000	6.820	3.634	0.017
51	0.055	3.536	0.421	0.164	0.000	6.802	3.626	0.000

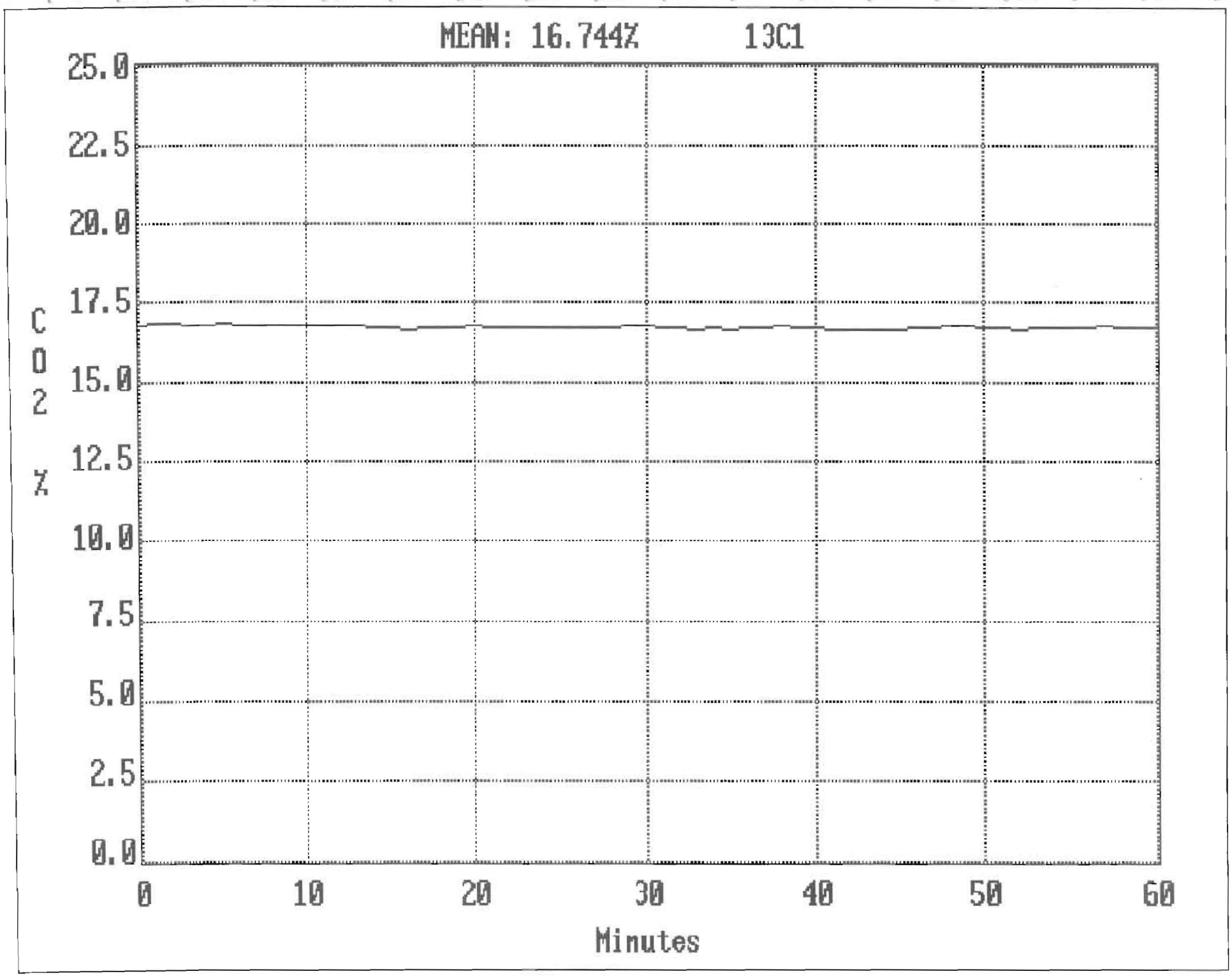
52	0.037	3.555	0.419	0.151	0.000	6.792	3.644	0.029
53	0.018	3.532	0.420	0.164	0.000	6.803	3.641	0.106
54	0.022	3.550	0.418	0.180	0.000	6.810	3.643	0.033
55	0.072	3.545	0.411	0.151	0.000	6.806	3.655	0.000
56	0.020	3.510	0.429	0.171	0.000	6.817	3.667	0.020
57	0.001	3.479	0.433	0.176	0.000	6.826	3.682	0.018
58	0.033	3.525	0.421	0.151	0.000	6.821	3.662	0.055
59	0.068	3.588	0.430	0.167	0.000	6.805	3.664	0.085
60	0.114	3.558	0.426	0.159	0.000	6.820	3.670	0.036
MEAN	0.051	3.699	0.420	0.142	0.000	6.817	3.655	0.030
END TIME:	13:40:17							
FULLSPAN	97.300	449.000	11.230	97.200	0.000	22.550	0.000	0.000
SPAN VDC	9.746	8.906	4.504	9.575	0.000	9.180	0.000	0.000
MID SPAN	52.000	249.000	5.570	54.200	0.000	11.570	0.000	0.000
MID VDC	5.217	5.164	2.131	5.479	0.000	4.651	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.022	0.066	0.000	0.000	0.000	0.000	0.000	0.000


MEAN: 0.510PPM 13C1
NOX PPM
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
Minutes


MEAN: 188.750PPM 13C1
500
450
400
350
300
250
200
150
100
50
0
CO PPM
0
10
20
30
40
50
60
Minutes


MEAN: 1.049%
13C1
12.50
11.25
10.00
8.75
7.50
6.25
5.00
3.75
2.50
1.25
0.00
O2 %
0
10
20
30
40
50
60
Minutes


MEAN: 1.446PPM 13C1
100
90
80
70
60
50
40
30
20
10
0
SO2 PPM
0
10
20
30
40
50
60
Minutes


MEAN: 16.744%
13C1
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
CO2 %
0
10
20
30
40
50
60
Minutes

CETCON, Inc.

Job No.:	CJ-4113	Field Data:	HCL	Barometer No.:	CET I	Barometric Pressure, P_B:	29.31	C_F:	1.009		
Date:	1/4/2006	Run No.:	C2	Pitot Tube No.:	Std	Ambient Temp., °F:	67	$\Delta H@$:	1.553	in. H_2O	
Customer:	TPI	Time of Run, T_R:	64 min.	Pitot Tube, C_P:	0.990	Stack Pressure, P_S:	-0.02	in. H_2O =	29.31	in. Hg	
Unit:	CCR Vent	Time per Point, T_P:	4 min.	Initial Pitot Leak:	X	Initial Leak @:	15.0	in. Hg =	0.003	cfm	
Operator:	JJA	Sample Box No.:	1	Final Pitot Leak:	X	Final Leak @:	5.0	in. Hg =	0.003	cfm	
Method:	RM-26A	Meter Box No.:	CM#1	Nozzle No.:	T-Q5	Assumed T_S:	82	Assumed K:	11.198		
Filter No.:	NA	Stack Area, A_S:	12.57 in.^{2}	Nozzle Dia., D_N:	0.312 in.	Assumed T_M:	75	Calculated K:	11.315		
File Name:	HCLC2	Assumed %M:	(default)	N_2 Purge@:	NA SCFH	For:	NA min.	N_2 Cylinder No.:	NA		

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP_S	Orifice ΔH P_M, in. H_2O Desired	Orifice ΔH P_M, in. H_2O Actual	Sample Vacuum in. Hg	Stack Temp. °F T_S	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	% Isokinetic
C 4	1400	532.430	0.07	0.78	0.80	3.0	83	248	283	72	72	73	109.4
	1404	534.709	0.07	0.78	0.78	3.0	83	258	282	66	73	73	97.7
3	1408	536.746	0.07	0.78	0.78	3.0	83	257	280	65	73	73	97.1
	1412	538.770	0.09	1.00	1.00	3.0	83	260	278	63	74	72	95.4
2	1416	541.025	0.09	1.00	1.00	3.0	83	265	279	63	74	72	97.4
	1420	543.325	0.10	1.11	1.10	3.0	83	263	283	64	75	72	96.8
1	1424	545.737	0.08	0.89	0.90	3.0	83	250	264	66	76	72	99.3
	1428	547.953	0.08	0.89	0.90	3.0	83	253	267	67	76	72	98.3
END	1432	550.147											
D 4	1455	550.870	0.09	1.00	1.00	4.0	83	250	253	72	73	72	105.9
	1459	553.370	0.09	1.00	1.00	4.0	84	275	270	68	75	72	98.6
3	1503	555.700	0.08	0.89	0.89	4.0	84	278	268	68	75	72	97.2
	1507	557.865	0.08	0.89	0.88	4.0	84	280	260	68	76	72	99.3
2	1511	560.080	0.07	0.78	0.78	4.0	84	275	285	66	76	72	97.4
	1515	562.112	0.07	0.78	0.78	4.0	84	270	280	67	76	72	100.1
1	1519	564.200	0.06	0.67	0.68	4.0	85	272	270	67	76	72	103.6
	1523	566.200	0.06	0.67	0.68	3.0	85	272	270	67	76	72	98.7
END	1527	568.105											

C_{qa} =	1.009	%Δ Must	Avg ΔP_S	0.078	Avg P_M	0.872	Avg T_S	84	Avg T_M	73	
%Δ =	0.0	Be ≤ 5.0	Avg ($\Delta P_S^{1/2}$)	0.279	Max Vacuum	4.0	Volume DGM	34.952 ,ft^3 x C_F	1.009	=V_M	35.267 ft^3

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	656.3	608.0	575.1	910.8			2750.2
Initial Wt, gm	648.9	599.3	571.9	901.5			2721.6
Difference, gm	7.4	8.7	3.2	9.3			28.6 = V_W

$V_{M\,std} = 17.64 \times V_M \times [(P_B+(P_M / 13.6)) \div T_M]$	34.285	DSCF
$Q_{M\,std} = V_{Mstd} \div T_R$	0.536	DSCFM
$V_{W\,gas} = 0.04715 \times V_W$	1.348	SCF
$\%M = V_{W\,gas} \times 100 \div (V_{M\,std} + V_{W\,gas})$	3.784	%
$M_D = (100 - \%M) \div 100$	0.962	dry fract.
$MW_D = (\%CO_2 \times 0.44)+(\%O_2 \times 0.32)+((\%N_2+\%CO) \times 0.28)$	30.723	lb/lbmole
$MW = M_D \times MW_D + 18\,(1 - M_D)$	30.242	lb/lbmole
$V_S = 5129.4 \times C_p \times (T_S \div (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$	1109.1	FPM
$Q_A = (V_S \times A_S) \div 144$	96.78	ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) \div T_S$	88.50	DSCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) \div (M_D \times P_S \times V_S \times T_R \times D_N^2)$	99.6	%

RM 3 or 3A Data	
$\%CO_2$	16.779
$\%O_2$	0.967
%CO	0.000
$\%N_2$	82.254
% Excess Air	4.640

Avg ΔP	0.078	in. H_2O
Avg ($\Delta P_S^{1/2}$)	0.279	
Avg. P_M	0.872	in. H_2O
Avg. T_S	84	°F
Avg. T_S	544	°R
Avg. T_M	73	°F
Avg. T_M	533	°R

QA/QC Check:
Completeness
Legibility
Accuracy
Specifications
Reasonableness

Checked by:

Jeff Cabral 2/3/2006
Operator (Signature/Date)

Project Coordinator (Signature/Date)
2/3/2006

© 1999 CETCON, Inc. All Rights Reserved

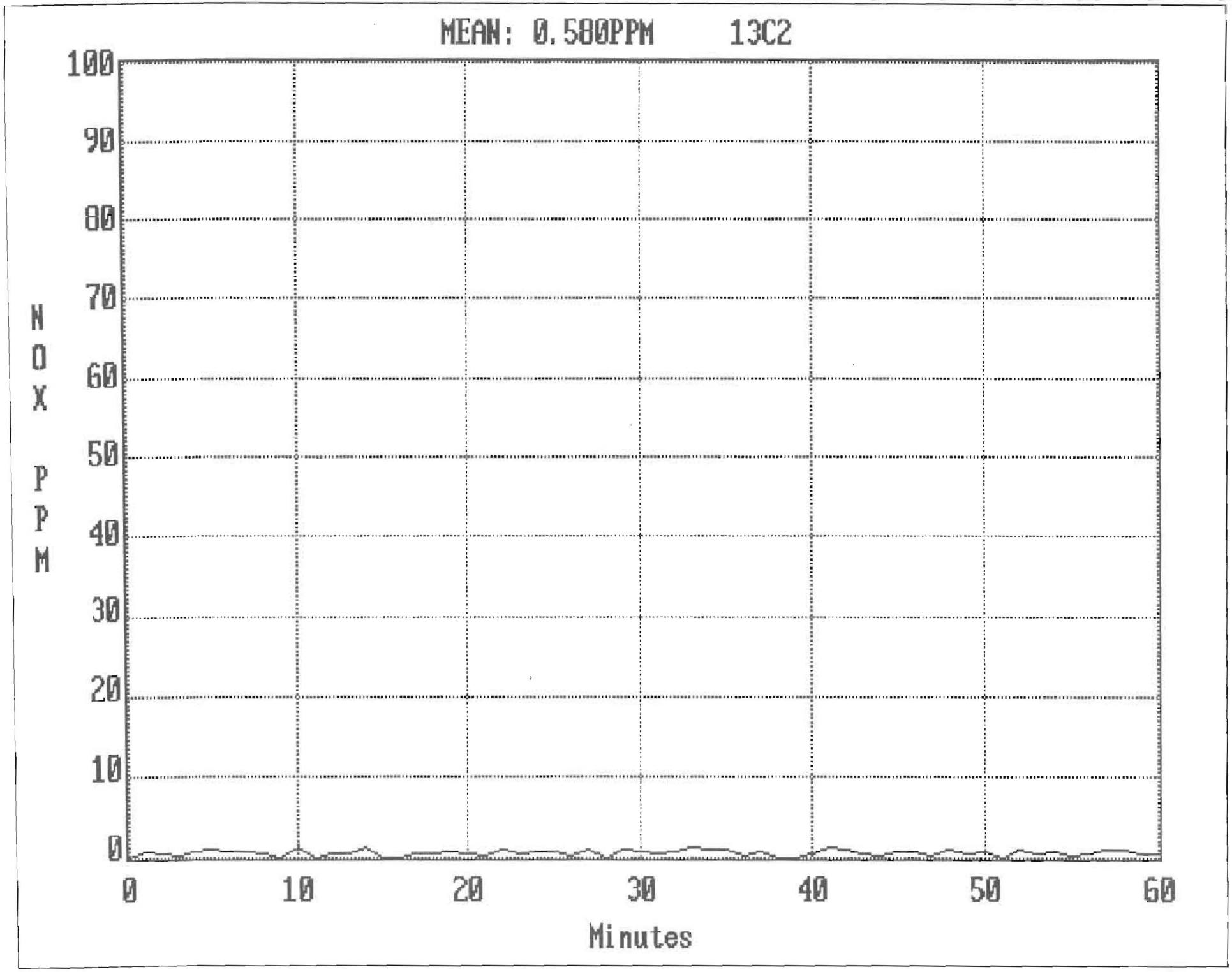
TITLE: CJ4113/TPI-ARDMORE/CCR/C2
DATE : 01-04-2006
TIME : 15:30:35
FILE : 13C2

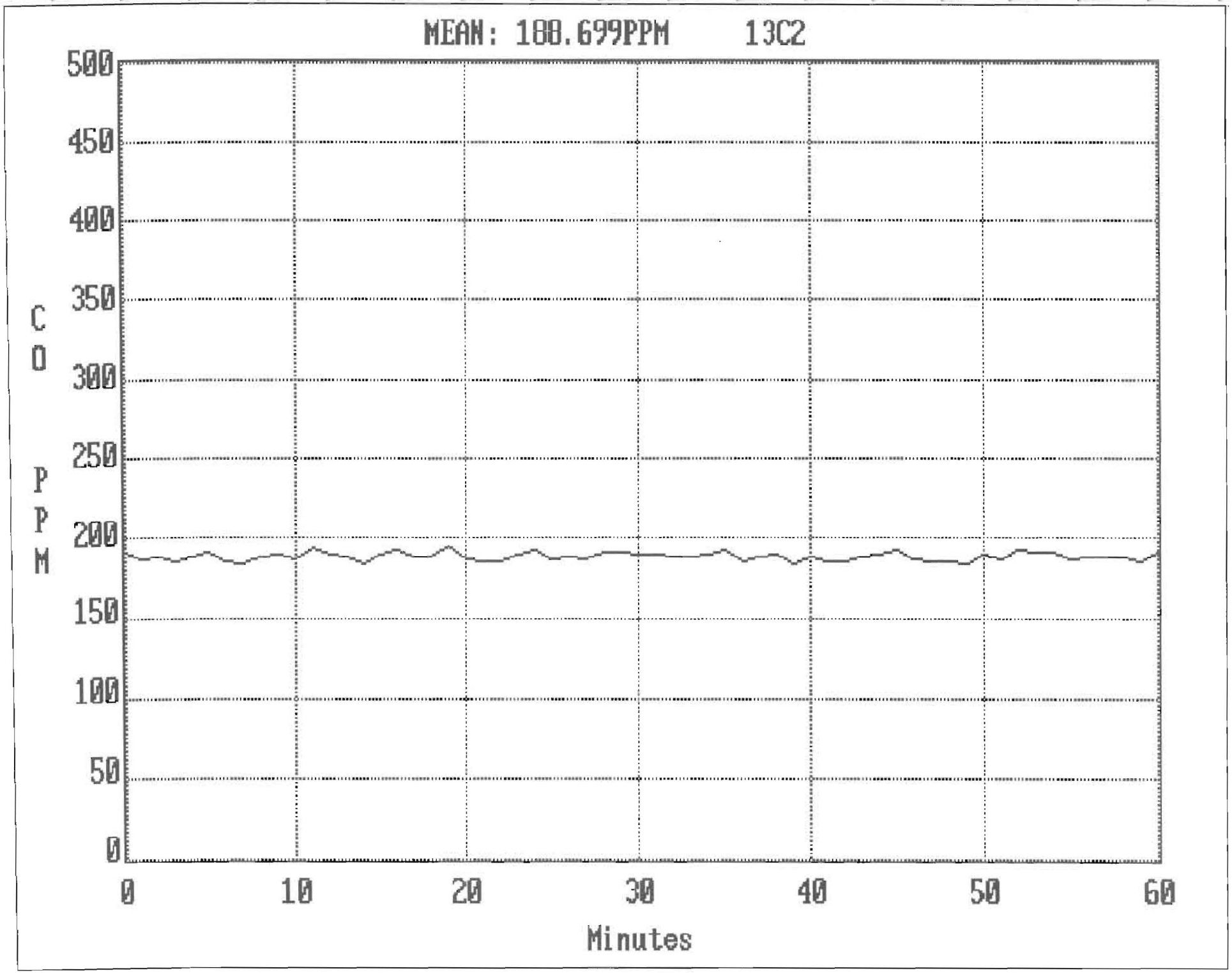
CHANNEL# CH.UNITS	OFF PPM	CO PPM	O2 %	SO2 PPM	OFF PPM	CO2 %	OFF OFF	OFF OFF
0	0.000	3.740	0.417	0.210	0.000	6.882	3.645	0.000
1	0.080	3.662	0.440	0.210	0.000	6.868	3.667	0.090
2	0.055	3.704	0.426	0.203	0.000	6.871	3.672	0.059
3	0.020	3.632	0.426	0.210	0.000	6.855	3.683	0.036
4	0.074	3.707	0.418	0.216	0.000	6.870	3.700	0.005
5	0.109	3.751	0.421	0.197	0.000	6.862	3.695	0.081
6	0.084	3.641	0.428	0.238	0.000	6.869	3.676	0.025
7	0.076	3.614	0.413	0.228	0.000	6.869	3.659	0.057
8	0.045	3.686	0.418	0.229	0.000	6.882	3.695	0.045
9	0.000	3.720	0.421	0.208	0.000	6.875	3.668	0.064
10	0.120	3.666	0.413	0.225	0.000	6.895	3.679	0.000
11	0.000	3.789	0.421	0.258	0.000	6.890	3.704	0.026
12	0.055	3.708	0.419	0.239	0.000	6.893	3.709	0.008
13	0.035	3.700	0.426	0.219	0.000	6.874	3.691	0.041
14	0.116	3.620	0.414	0.238	0.000	6.888	3.699	0.046
15	0.000	3.730	0.407	0.244	0.000	6.884	3.718	0.037
16	0.000	3.762	0.421	0.251	0.000	6.879	3.690	0.033
17	0.042	3.706	0.411	0.252	0.000	6.901	3.707	0.031
18	0.058	3.697	0.415	0.243	0.000	6.891	3.730	0.043
19	0.083	3.825	0.417	0.252	0.000	6.892	3.703	0.018
20	0.058	3.678	0.402	0.250	0.000	6.907	3.690	0.046
21	0.017	3.652	0.417	0.245	0.000	6.908	3.713	0.000
22	0.096	3.647	0.418	0.246	0.000	6.900	3.698	0.005
23	0.044	3.723	0.410	0.249	0.000	6.898	3.726	0.006
24	0.086	3.773	0.423	0.260	0.000	6.889	3.715	0.071
25	0.061	3.669	0.419	0.255	0.000	6.895	3.730	0.001
26	0.020	3.684	0.419	0.241	0.000	6.900	3.702	0.022
27	0.108	3.667	0.417	0.246	0.000	6.897	3.711	0.007
28	0.000	3.738	0.409	0.248	0.000	6.905	3.683	0.000
29	0.094	3.753	0.424	0.256	0.000	6.913	3.699	0.042
30	0.076	3.727	0.417	0.253	0.000	6.914	3.674	0.073
31	0.037	3.723	0.420	0.239	0.000	6.900	3.643	0.046
32	0.087	3.691	0.413	0.270	0.000	6.888	3.634	0.000
33	0.129	3.690	0.416	0.278	0.000	6.892	3.678	0.000
34	0.098	3.711	0.426	0.267	0.000	6.886	3.664	0.044
35	0.094	3.761	0.422	0.264	0.000	6.908	3.672	0.009
36	0.012	3.652	0.405	0.260	0.000	6.908	3.651	0.054
37	0.065	3.690	0.416	0.257	0.000	6.918	3.702	0.023
38	0.000	3.709	0.410	0.270	0.000	6.929	3.698	0.000
39	0.005	3.617	0.426	0.265	0.000	6.925	3.705	0.016
40	0.050	3.700	0.415	0.263	0.000	6.917	3.709	0.043
41	0.114	3.638	0.411	0.273	0.000	6.903	3.706	0.008
42	0.096	3.646	0.422	0.259	0.000	6.908	3.716	0.011
43	0.050	3.695	0.420	0.246	0.000	6.921	3.735	0.036
44	0.018	3.716	0.425	0.290	0.000	6.908	3.708	0.041
45	0.075	3.769	0.426	0.247	0.000	6.917	3.734	0.048
46	0.065	3.671	0.410	0.251	0.000	6.892	3.726	0.002
47	0.017	3.646	0.417	0.268	0.000	6.906	3.757	0.007
48	0.091	3.647	0.409	0.259	0.000	6.907	3.728	0.026
49	0.059	3.618	0.408	0.264	0.000	6.913	3.695	0.011
50	0.085	3.729	0.411	0.251	0.000	6.917	3.709	0.088

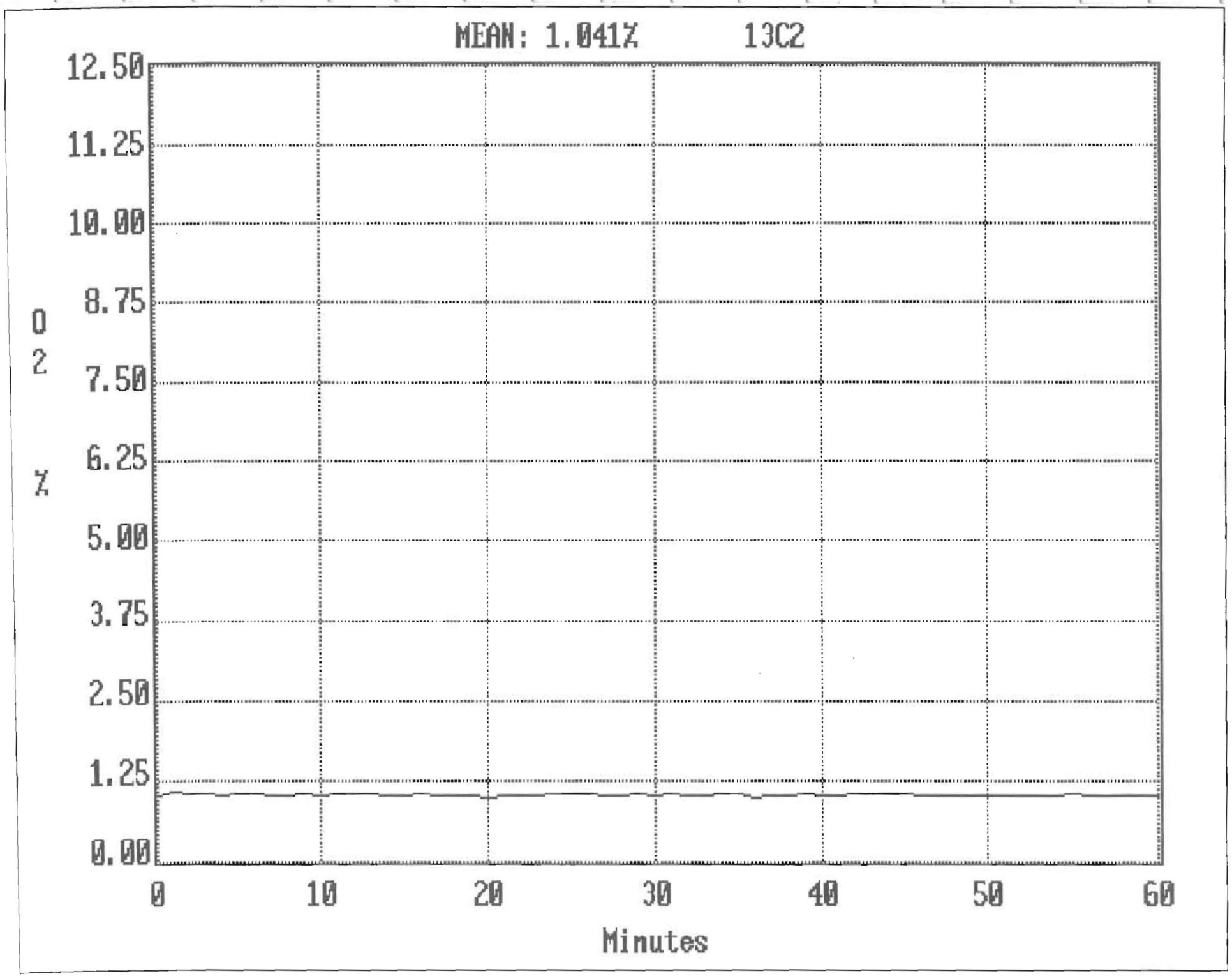
51	0.000	3.665	0.414	0.283	0.000	6.945	3.743	0.007
52	0.103	3.772	0.409	0.259	0.000	6.951	3.739	0.000
53	0.051	3.743	0.412	0.255	0.000	6.969	3.708	0.010
54	0.070	3.752	0.408	0.269	0.000	6.962	3.695	0.065
55	0.008	3.665	0.420	0.259	0.000	6.971	3.700	0.035
56	0.048	3.691	0.412	0.273	0.000	6.982	3.694	0.029
57	0.098	3.685	0.416	0.277	0.000	6.969	3.705	0.020
58	0.097	3.703	0.414	0.295	0.000	6.974	3.713	0.032
59	0.059	3.649	0.413	0.273	0.000	6.964	3.692	0.000
60	0.046	3.743	0.407	0.278	0.000	6.959	3.722	0.037
MEAN	0.058	3.698	0.417	0.251	0.000	6.907	3.699	0.029

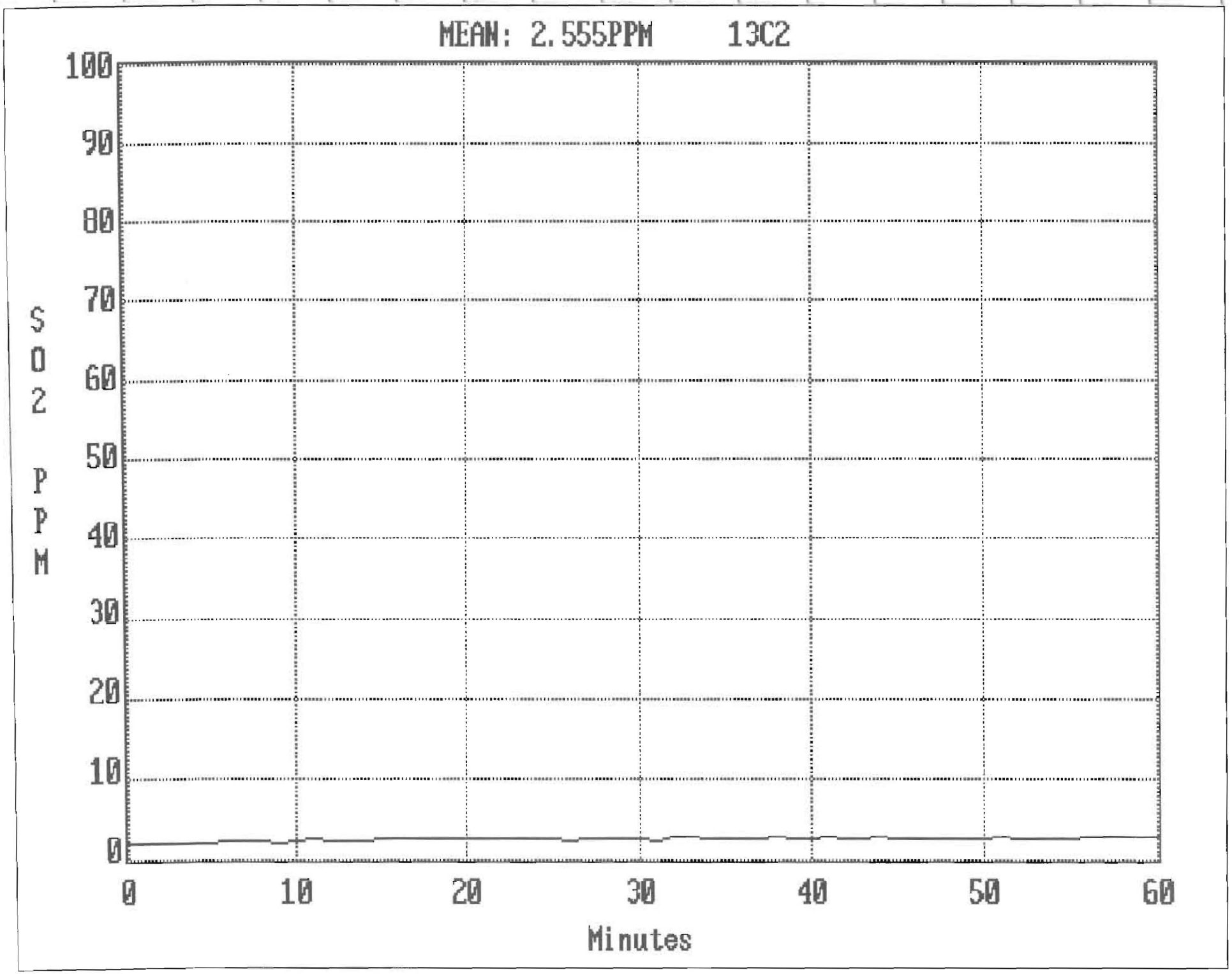
END TIME: 16:30:25

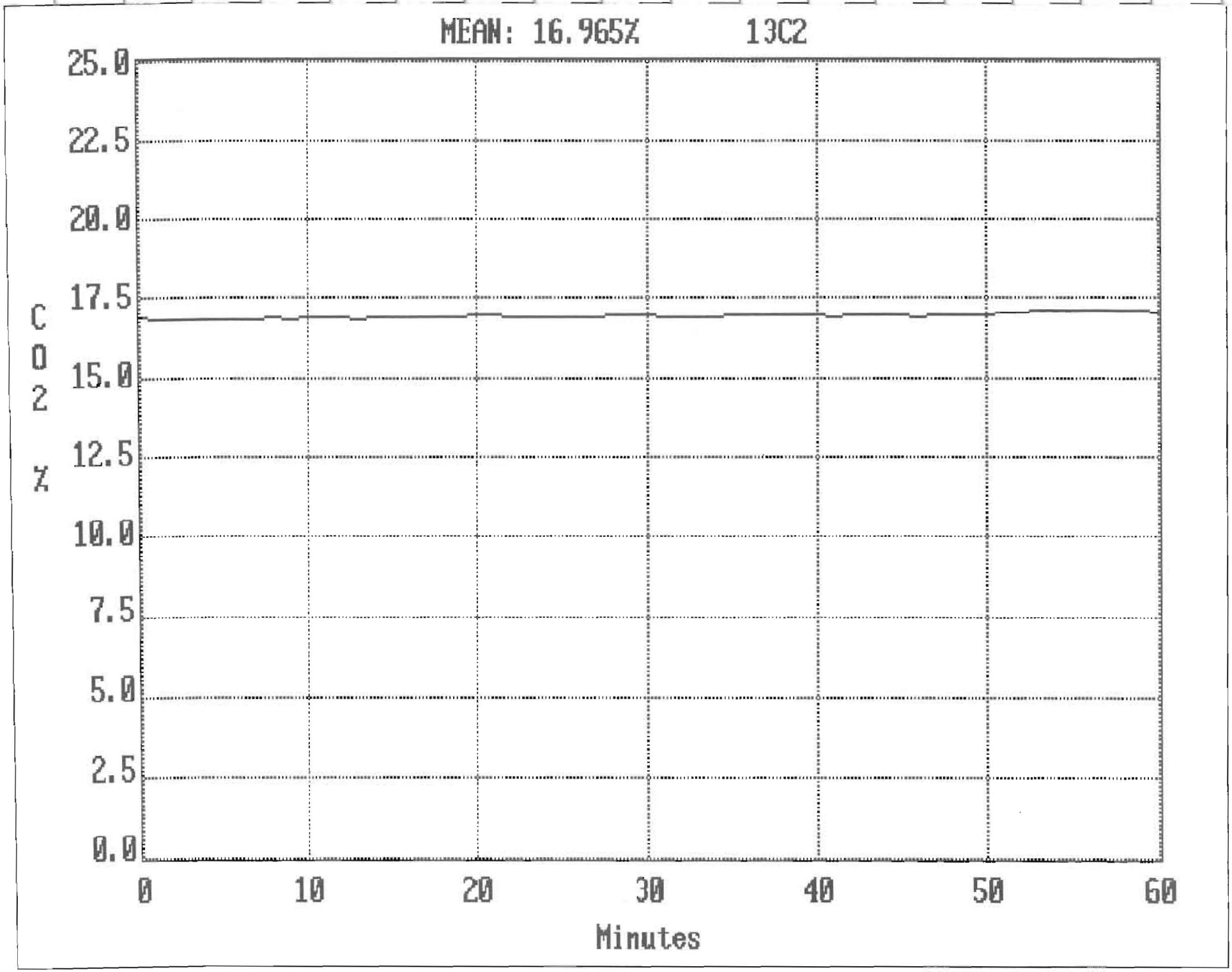
FULLSPAN	97.30	449.00	11.23	97.20	0.00	22.55	0.00	0.00
FULL VDC	9.746	8.906	4.504	9.575	0.000	9.180	0.000	0.000
MID SPAN	52.00	249.00	5.57	54.20	0.00	11.57	0.00	0.00
MID VDC	5.217	5.164	2.131	5.479	0.000	4.651	0.000	0.000
ZERO GAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ZERO VDC	0.022	0.066	0.000	0.000	0.000	0.000	0.000	0.000


MEAN: 0.580PPM 13C2
NOX PPM
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
Minutes


MEAN: 188.699PPM 13C2
500
450
400
350
300
250
200
150
100
50
0
CO PPM
0
10
20
30
40
50
60
Minutes


MEAN: 1.041%
13C2
12.50
11.25
10.00
8.75
7.50
6.25
5.00
3.75
2.50
1.25
0.00
O2 %
0
10
20
30
40
50
60
Minutes


MEAN: 2.555PPM 13C2
100
90
80
70
60
50
40
30
20
10
0
SO2 PPM
0
10
20
30
40
50
60
Minutes


MEAN: 16.965%
13C2
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
CO2 %
0
10
20
30
40
50
60
Minutes

CETCON, Inc.

Job No.:	CJ-4113	Field Data:	HCL	Barometer No.:	CET I	Barometric Pressure, P_B:	29.31	C_F:	1.009
Date:	1/4/2006	Run No.:	C3	Pitot Tube No.:	Std	Ambient Temp., °F:	67	ΔH@:	1.553 in. H_2O
Customer:	TPI	Time of Run, T_R:	64 min.	Pitot Tube, C_P:	0.990	Stack Pressure, P_S:	-0.02	in. H_2O =	29.31 in. Hg
Unit:	CCR Vent	Time per Point, T_P:	4 min.	Initial Pitot Leak:	X	Initial Leak @:	15.0	in. Hg =	0.000 cfm
Operator:	JJA	Sample Box No.:	1	Final Pitot Leak:	X	Final Leak @:	4.0	in. Hg =	0.000 cfm
Method:	RM-26A	Meter Box No.:	CM#1	Nozzle No.:	T-Q5	Assumed T_S:	84	Assumed K:	11.198
Filter No.:	NA	Stack Area, A_S:	12.57 in.^{2}	Nozzle Dia., D_N:	0.312 in.	Assumed T_M:	75	Calculated K:	11.265
File Name:	HCLC3	Assumed %M:	(default)	N_2 Purge@:	NA SCFH	For:	NA min.	N_2 Cylinder No.:	NA

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP_S	Orifice ΔH P_M, in. H_2O Desired	Orifice ΔH P_M, in. H_2O Actual	Sample Vacuum in. Hg	Stack Temp.°F T_S	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	% Isokinetic
A 4	1640	568.700	0.06	0.67	0.70	2.0	88	256	262	65	72	72	114.8
	1644	570.900	0.06	0.66	0.66	2.0	88	258	270	58	72	72	85.6
3	1648	572.540	0.06	0.66	0.66	2.0	88	250	260	58	73	72	97.2
	1652	574.405	0.06	0.66	0.66	2.0	88	252	262	56	73	72	98.3
2	1656	576.290	0.07	0.78	0.78	2.0	87	293	255	56	73	72	97.0
	1700	578.300	0.10	1.11	1.11	2.0	86	280	256	56	74	72	98.8
1	1704	580.750	0.10	1.11	1.10	3.0	86	275	258	54	75	67	99.6
	1708	583.212	0.10	1.11	1.10	3.0	85	274	254	54	76	72	99.9
END	1712	585.696											
B 4	1720	586.000	0.05	0.56	0.56	2.0	83	250	292	57	73	72	101.7
	1724	587.790	0.06	0.67	0.67	2.0	83	252	282	55	74	72	98.0
3	1728	589.680	0.09	1.01	1.00	3.0	83	282	286	53	75	72	98.7
	1732	592.012	0.09	1.01	1.00	3.0	83	280	270	51	76	72	101.0
2	1736	594.400	0.08	0.90	0.90	3.0	82	263	273	51	76	72	99.1
	1740	596.612	0.08	0.90	0.90	3.0	82	265	275	52	77	72	102.0
1	1744	598.890	0.07	0.79	0.80	2.0	81	253	265	52	77	72	98.3
	1748	600.946	0.07	0.79	0.80	2.0	81	257	263	52	77	72	99.1
END	1752	603.019											

C_{qa} =	1.013	%Δ Must	Avg ΔP_S	0.075	Avg P_M	0.838	Avg T_S	85	Avg T_M	73	
%Δ =	0.4	Be ≤ 5.0	Avg ($\Delta P_S^{1/2}$)	0.272	Max Vacuum	3.0	Volume DGM	34.015 ,ft^3	x C_F	1.009	=V_M 34.321 ft^3

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	645.0	711.3	511.3	949.5			2817.1
Initial Wt, gm	632.5	702.9	510.2	942.5			2788.1
Difference, gm	12.5	8.4	1.1	7.0			29.0 = V_W

$V_{M\,std} = 17.64 \times V_M \times [(P_B+(P_M / 13.6)) \div T_M]$	33.363	DSCF
$Q_{M\,std} = V_{Mstd} \div T_R$	0.521	DSCFM
$V_{W\,gas} = 0.04715 \times V_W$	1.367	SCF
$\%M = V_{W\,gas} \times 100 \div (V_{M\,std} + V_{W\,gas})$	3.937	%
$M_D = (100 - \%M) \div 100$	0.961	dry fract.
$MW_D = (\%CO_2 \times 0.44)+(\%O_2 \times 0.32)+((\%N_2+\%CO) \times 0.28)$	30.703	lb/lbmole
$MW = M_D \times MW_D + 18\,(1 - M_D)$	30.203	lb/lbmole
$V_S = 5129.4 \times C_p \times (T_S \div (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$	1084.9	FPM
$Q_A = (V_S \times A_S) \div 144$	94.68	ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) \div T_S$	86.28	DSCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) \div (M_D \times P_S \times V_S \times T_R \times D_N^2)$	99.4	%

RM 3 or 3A Data	
$\%CO_2$	16.652
$\%O_2$	0.971
%CO	0.000
$\%N_2$	82.377
% Excess Air	4.656

Avg ΔP	0.075	in. H_2O
Avg ($\Delta P_S^{1/2}$)	0.272	
Avg. P_M	0.838	in. H_2O
Avg. T_S	85	°F
Avg. T_S	545	°R
Avg.T_M	73	°F
Avg.T_M	533	°R

QA/QC Check:
Completeness ✓
Legibility ✓
Accuracy ✓
Specifications ✓
Reasonableness ✓

Checked by:

Operator (Signature/Date) 2/3/2006

Project Coordinator (Signature/Date) 2/3/2006

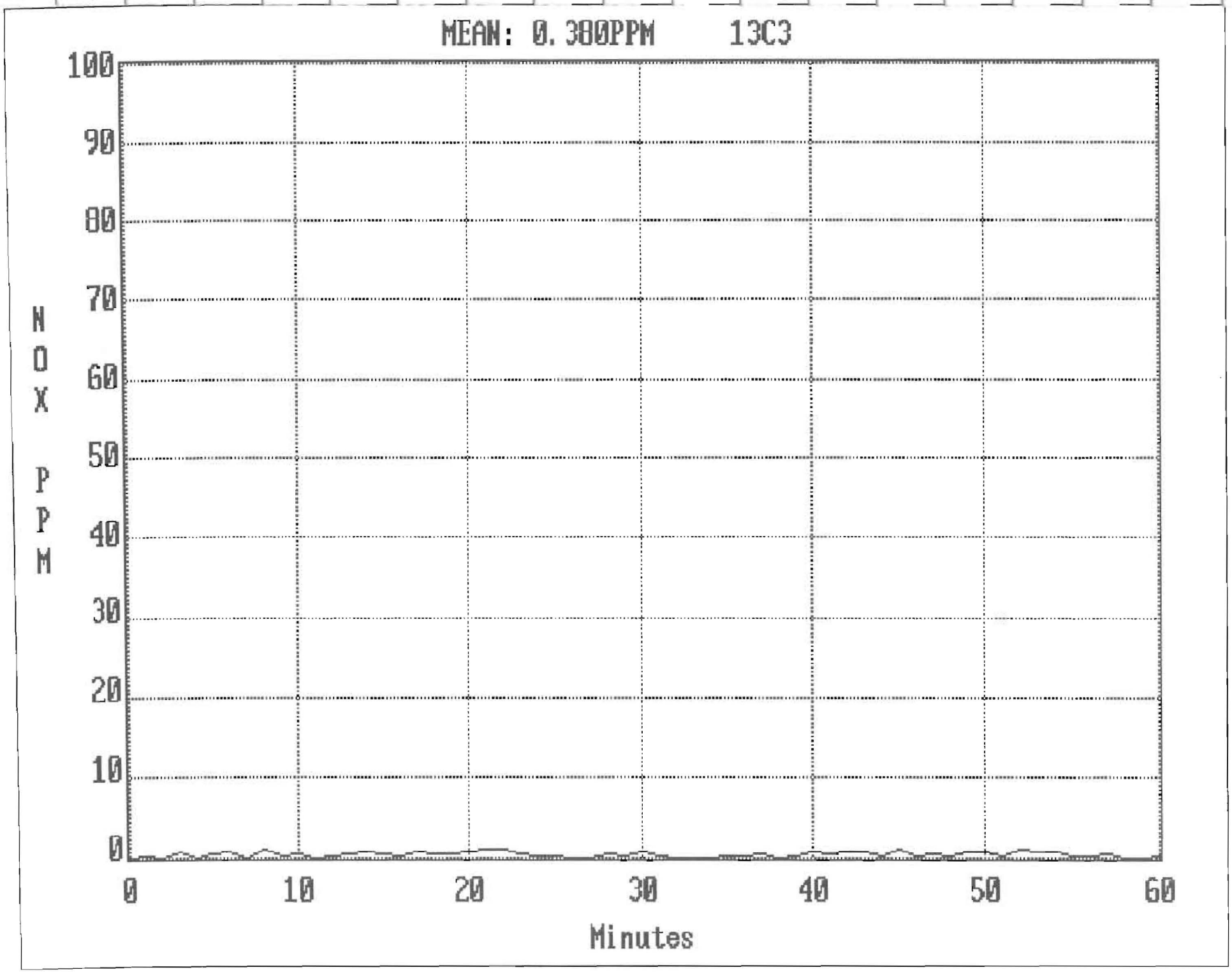
© 1999 CETCON, Inc. All Rights Reserved

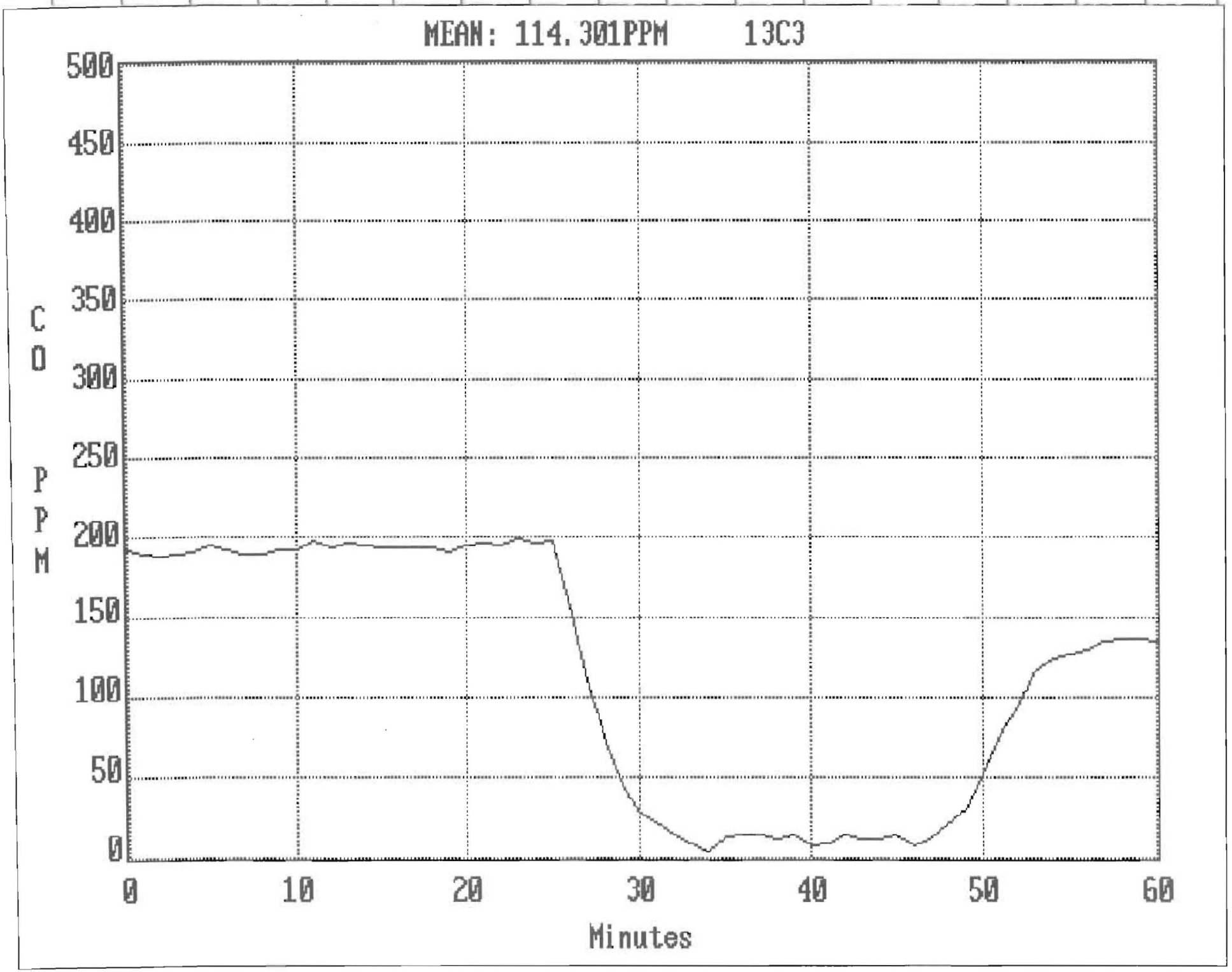
CJ4113/TPI-AEDMORE/CCR/C3

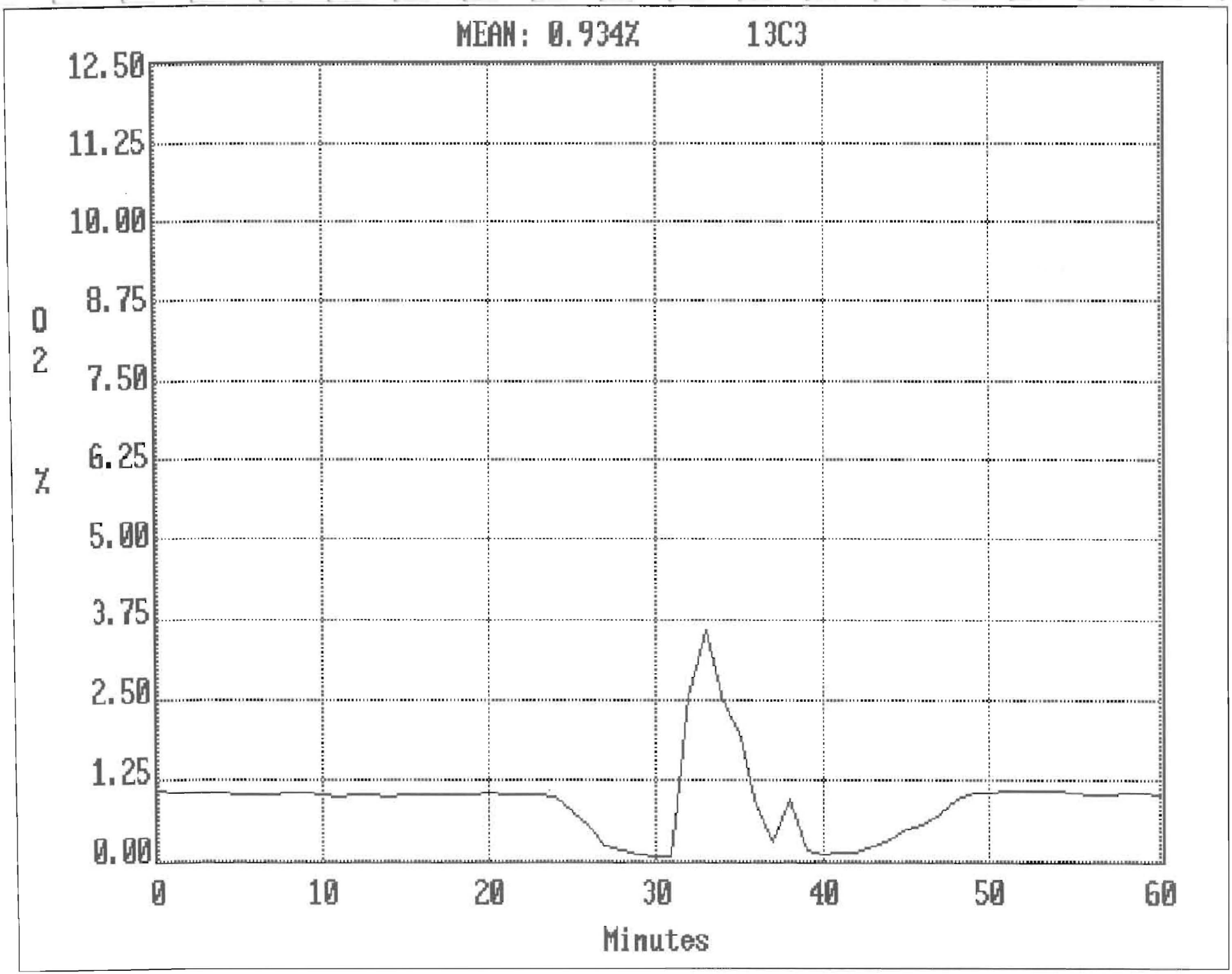
TEST DATE : 01-04-2006
START TIME: 17:55:04
FILE NAME : C:\DAQ\13C3 .ID%

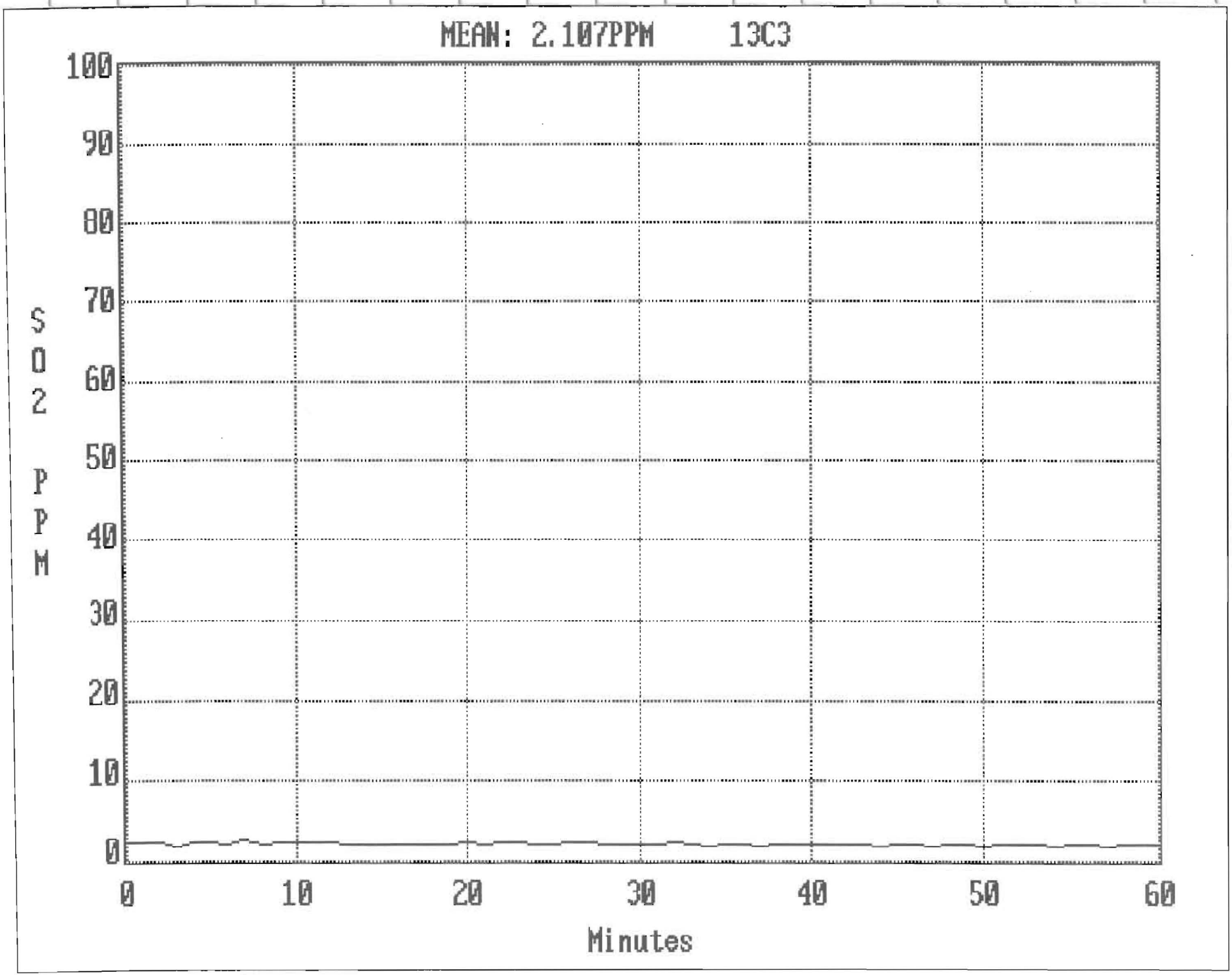
CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
<MIN>			<ANALYZER OUTPUT-VDC>					
0	0.000	3.777	0.435	0.225	0.000	7.117	3.743	0.000
1	0.011	3.709	0.426	0.233	0.000	7.138	3.823	0.011
2	0.001	3.699	0.426	0.217	0.000	7.110	3.835	0.000
3	0.086	3.724	0.422	0.190	0.000	7.125	3.844	0.049
4	0.000	3.752	0.429	0.218	0.000	7.141	3.856	0.025
5	0.059	3.826	0.415	0.229	0.000	7.139	3.839	0.078
6	0.083	3.772	0.418	0.209	0.000	7.139	3.848	0.008
7	0.000	3.730	0.415	0.246	0.000	7.148	3.853	0.049
8	0.098	3.714	0.419	0.209	0.000	7.151	3.823	0.024
9	0.026	3.786	0.431	0.221	0.000	7.151	3.866	0.007
10	0.039	3.781	0.409	0.221	0.612	7.118	3.866	0.020
11	0.000	3.870	0.403	0.219	0.000	7.126	3.841	0.028
12	0.033	3.812	0.409	0.225	0.000	7.124	3.826	0.072
13	0.042	3.861	0.407	0.211	0.000	7.137	3.821	0.050
14	0.061	3.827	0.404	0.208	0.000	7.139	3.853	0.033
15	0.041	3.790	0.413	0.215	0.000	7.138	3.861	0.059
16	0.013	3.809	0.413	0.207	0.000	7.148	3.855	0.026
17	0.076	3.792	0.411	0.206	0.000	7.131	3.840	0.081
18	0.037	3.807	0.414	0.202	0.000	7.117	3.843	0.051
19	0.047	3.758	0.412	0.216	0.000	7.136	3.822	0.025
20	0.063	3.818	0.424	0.217	0.000	7.126	3.856	0.044
21	0.098	3.840	0.407	0.200	0.000	7.123	3.845	0.000
22	0.096	3.821	0.413	0.225	0.000	7.134	3.850	0.000
23	0.037	3.909	0.409	0.222	0.000	7.153	3.828	0.010
24	0.033	3.863	0.400	0.205	0.000	7.171	3.877	0.036
25	0.028	3.887	0.308	0.206	0.000	6.432	3.634	0.034
26	0.007	3.066	0.207	0.238	0.000	4.993	2.860	0.000
27	0.004	2.181	0.088	0.219	0.000	3.670	2.132	0.029
28	0.038	1.400	0.059	0.216	0.000	2.620	1.503	0.013
29	0.015	0.894	0.035	0.204	0.000	2.059	1.175	0.052
30	0.062	0.557	0.030	0.205	0.000	1.864	0.981	0.016
31	0.028	0.430	0.019	0.203	0.000	1.859	0.955	0.015
32	0.001	0.282	1.031	0.224	0.000	1.490	0.852	0.000
33	0.000	0.186	1.431	0.199	0.000	1.178	0.687	0.030
34	0.000	0.066	0.986	0.190	0.007	1.027	0.584	0.015
35	0.031	0.249	0.774	0.198	0.000	0.999	0.527	0.037
36	0.008	0.288	0.343	0.195	0.000	1.068	0.546	0.044
37	0.042	0.287	0.111	0.184	0.000	1.150	0.570	0.068
38	0.000	0.242	0.387	0.198	0.000	1.174	0.600	0.029
39	0.011	0.293	0.059	0.208	0.000	1.274	0.617	0.066
40	0.080	0.138	0.037	0.202	0.000	1.304	0.647	0.000
41	0.049	0.170	0.050	0.212	0.000	1.354	0.672	0.000
42	0.077	0.274	0.045	0.203	0.000	1.417	0.694	0.000
43	0.083	0.222	0.087	0.198	0.000	1.549	0.746	0.011
44	0.029	0.229	0.131	0.190	0.000	1.876	0.875	0.000
45	0.094	0.292	0.199	0.200	0.000	2.364	1.116	0.037
46	0.018	0.144	0.229	0.194	0.000	2.859	1.391	0.029
47	0.038	0.236	0.287	0.184	0.000	3.340	1.615	0.008
48	0.014	0.406	0.384	0.214	0.000	4.197	2.042	0.000
49	0.064	0.588	0.422	0.202	0.000	4.998	2.463	0.023
50	0.066	1.021	0.432	0.188	0.000	5.554	2.815	0.069
51	0.024	1.529	0.445	0.193	0.000	5.965	3.095	0.041

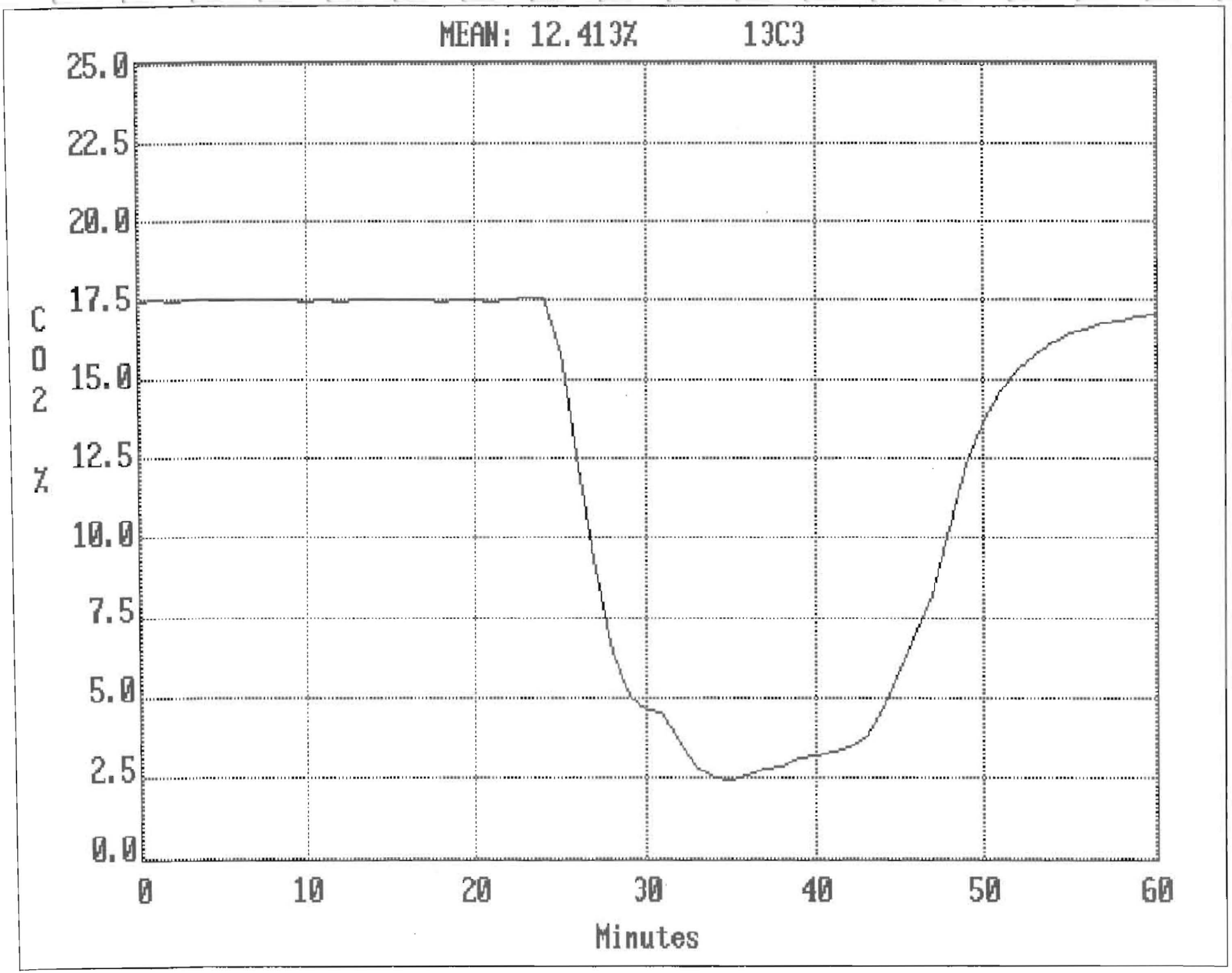
52	0.093	1.852	0.435	0.195	0.000	6.252	3.274	0.025
53	0.065	2.274	0.433	0.195	0.000	6.440	3.430	0.000
54	0.078	2.437	0.442	0.186	0.000	6.584	3.490	0.037
55	0.011	2.498	0.424	0.203	0.000	6.688	3.564	0.016
56	0.023	2.552	0.413	0.197	0.000	6.768	3.590	0.025
57	0.042	2.650	0.409	0.188	0.000	6.843	3.650	0.034
58	0.000	2.661	0.422	0.203	0.000	6.876	3.648	0.000
59	0.000	2.671	0.419	0.195	0.000	6.925	3.660	0.000
60	0.016	2.644	0.417	0.208	0.000	6.935	3.697	0.031
MEAN	0.038	2.240	0.374	0.207	0.010	5.054	2.695	0.027
END TIME:	18:54:53							
FULLSPAN	97.300	449.000	11.230	97.200	0.000	22.550	0.000	0.000
SPAN VDC	9.746	8.906	4.504	9.575	0.000	9.180	0.000	0.000
MID SPAN	52.000	249.000	5.570	54.200	0.000	11.570	0.000	0.000
MID VDC	5.217	5.164	2.131	5.479	0.000	4.651	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.022	0.066	0.000	0.000	0.000	0.000	0.000	0.000


MEAN: 0.380PPM 13C3
NOX PPM
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
Minutes


MEAN: 114.301PPM 13C3
500
450
400
350
300
250
200
150
100
50
0
CO PPM
0
10
20
30
40
50
60
Minutes


MEAN: 0.934%
13C3
12.50
11.25
10.00
8.75
7.50
6.25
5.00
3.75
2.50
1.25
0.00
O2 %
0
10
20
30
40
50
60
Minutes


MEAN: 2.107PPM 13C3
100
90
80
70
60
50
40
30
20
10
0
SO2 PPM
0
10
20
30
40
50
60
Minutes


MEAN: 12.413%
13C3
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
CO2 %
0
10
20
30
40
50
60
Minutes

CETCON, Inc.

ISOKINETIC SAMPLING WORKSHEET

Job Number:	CJ-4113
Customer:	TPI Petroleum, Inc.
Unit:	CCR Vent Scrubber
Date:	January 4, 2006

Assumed Or Preliminary Flue Gas Data:	P_B, in. Hg	29.48
	P_s, in. H_2O	0.03
	P_S, in. Hg	29.48
	T_S, °F	82
	T_{SR}, °R	542
	$\%O_2$	1.00
	$\%CO_2$	17.00
	$\%N_2$	82.00
	%M	5.00
	M_D	0.9500
	M_d, lb/lbmole	30.76
	M_S, lb/lbmole	30.12

Calibration Data:	CM#	1
	C_F	1.009
	$\Delta H@$, in. H_2O	1.553
	Pitot#	Std
	C_P	0.990
	Nozzle#	T-Q6
	D_n, in.	0.314
Assumed Or Preliminary Test Data:	T_m, °F	75
	T_{mR}, °R	535
	ΔP_S, in. H_2O	0.078
	$\sqrt{\Delta P_S}$, in. $H_2O^{0.5}$	0.279
	T_R, min.	64

Shaded Cells Above Are Calculated

K-Factor = **11.436**

$\Delta H = K \times \Delta P_S$

$$K = (851.4 \bullet C_P^2 \bullet D_n^4 \bullet \Delta H@ \bullet M_d \bullet M_D^2 \bullet P_S \bullet T_{mR}) \div (P_m \bullet T_{SR} \bullet M_S)$$

Based On The Average ΔP_S And D_n Entered Above, The ΔH Required For Isokinetic Sampling Is:	0.89
Based On The Test Duration T_R Entered Above, The Total Sample Volume In DSCF Would Be:	34.73
Based On The Test Duration T_R Entered Above, The Sampling Rate In DSCFM Would Be:	0.543
Based On The % Moisture Estimated, The Condensate Volume In ml Would Be:	38.8

What Is The Desired Sample Volume In DSCF? 40.00

The Ideal Nozzle Size Required To Obtain This Sample Volume Isokinetically Is: **0.337**

NOMENCLATURE

P_B = Barometric Pressure, in. Hg
P_s = Stack Differential Pressure, in. H_2O
P_S = Stack Absolute Pressure, in. Hg
T_S = Stack Temperature, °F
T_{SR} = Stack Temperature, °R
$\%O_2$ = Stack Oxygen Concentration, % dry
$\%CO_2$ = Stack Carbon Dioxide Concentration, % dry
$\%N_2$ = Stack Nitrogen Concentration, % dry
%M = Stack Moisture Concentration, %
M_D = Stack Gas Dry Fraction
M_d = Stack Gas Dry Molecular Weight, lb/lbmole
M_S = Stack Gas Wet Molecular Weight, lb/lbmole
C_F = Dry Gas Meter Correction Factor, dimensionless
$\Delta H@$ = Orifice Calibration Factor, in. H_2O
C_P = Pitot Tube Coefficient, dimensionless
D_n = Nozzle Diameter, in.
T_m = Average Dry Gas Meter Temperature, °F
T_{mR} = Average Dry Gas Meter Temperature, °R
ΔP_S = Average Pitot Pressure Drop, in. H_2O
$\sqrt{\Delta P_S}$ = Average Square Root of Pitot Pressure Drop, in. $H_2O^{0.5}$
T_R = Test Duration, min

QA/QC Check:
Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

1/13/2006

1-13-2006
Operator (Signature/Date)

Project Coordinator (Signature/Date)
2/3/2006

© 1999 CETCON, Inc. All Rights Reserved

ISOSHEET.XLS

CETCON, Inc.

Job No.:	CJ-4113	Field Data:	PM	Barometer No.:	CET I	Barometric Pressure, P_B:	29.52	C_F:	1.009		
Date:	1/5/2006	Run No.:	C4	Pitot Tube No.:	Std	Ambient Temp., °F:	66	$\Delta H@$:	1.553	in. H_2O	
Customer:	TPI	Time of Run, T_R:	64 min.	Pitot Tube, C_P:	0.990	Stack Pressure, P_S:	-0.03	in. H_2O =	29.52	in. Hg	
Unit:	CCR Vent	Time per Point, T_P:	4 min.	Initial Pitot Leak:	√	Initial Leak @:	15.0	in. Hg =	0.005	cfm	
Operator:	JRH/JJA/GAD	Sample Box No.:	1	Final Pitot Leak:	√	Final Leak @:	5.0	in. Hg =	0.005	cfm	
Method:	RM-5	Meter Box No.:	CM#1	Nozzle No.:	T-Q6	Assumed T_S:	80	Assumed K:	11.436		
Filter No.:	A-783	Stack Area, A_S:	12.57 in.^{2}	Nozzle Dia., D_N:	0.314 in.	Assumed T_M:	80	Calculated K:	11.752		
File Name:	PMC4	Assumed %M:	(default)	N_2 Purge@:	NA SCFH	For:	NA min.	N_2 Cylinder No.:	N/A		

	Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP_S	Orifice ΔH P_M, in. H_2O Desired	Orifice ΔH P_M, in. H_2O Actual	Sample Vacuum in. Hg	Stack Temp. °F T_S	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	% Isokinetic
A	4	1050	604.265	0.08	0.91	0.78	2.0	80	251	243	64	68	69	107.8
		1054	606.680	0.09	1.01	0.88	2.0	80	251	243	61	70	69	84.2
	3	1058	608.685	0.08	0.90	0.90	2.0	80	233	243	59	70	69	96.0
		1102	610.840	0.10	1.12	1.10	2.0	80	233	243	58	71	69	95.2
	2	1106	613.230	0.08	0.90	0.90	2.0	81	237	243	58	72	69	99.7
		1110	615.470	0.09	1.01	1.00	2.0	81	237	243	59	73	68	102.0
	1	1114	617.900	0.07	0.78	0.78	2.0	81	238	230	61	73	69	90.8
		1118	619.810	0.08	0.90	0.90	2.0	81	238	230	62	73	70	97.3
	END	1122	622.000											
B	4	1132	622.280	0.10	1.13	1.10	4.0	80	263	246	63	73	70	96.1
		1136	624.700	0.08	0.90	0.90	2.0	80	263	246	57	74	70	96.2
	3	1140	626.870	0.07	0.79	0.79	2.0	80	256	255	55	74	71	93.7
		1144	628.850	0.07	0.79	0.78	2.0	80	256	255	55	74	71	99.4
	2	1148	630.950	0.07	0.79	0.79	2.0	80	252	274	54	75	71	114.5
		1152	633.370	0.07	0.79	0.79	2.0	80	252	274	54	75	71	87.5
	1	1156	635.220	0.06	0.68	0.68	2.0	80	240	263	54	76	71	105.6
		1200	637.290	0.06	0.68	0.68	2.0	81	240	263	54	75	71	84.6
	END	1204	638.945											

C_{qa} =	1.010	%Δ Must	Avg ΔP_S	0.078	Avg P_M	0.859	Avg T_S	80	Avg T_M	71	
%Δ =	0.1	Be ≤ 5.0	Avg ($\Delta P_S^{1/2}$)	0.279	Max Vacuum	4.0	Volume DGM	34.400 ft^3 x C_F 1.009	=V_M	34.710	ft^3

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	626.0	711.2	508.0	954.8			2800.0
Initial Wt, gm	613.0	705.7	507.5	949.4			2775.6
Difference, gm	13.0	5.5	0.5	5.4			24.4 = V_W

RM 3 or 3A Data	
$\%CO_2$	17.671
$\%O_2$	0.892
%CO	0.000
$\%N_2$	81.436
% Excess Air	4.313

Avg ΔP	0.078	in. H_2O
Avg ($\Delta P_S^{1/2}$)	0.279	
Avg. P_M	0.859	in. H_2O
Avg. T_S	80	°F
Avg. T_S	540	°R
Avg.T_M	71	°F
Avg.T_M	531	°R

$V_{M\,std} = 17.64 \times V_M \times [(P_B+(P_M / 13.6)) \div T_M]$	34.111	DSCF
$Q_{M\,std} = V_{Mstd} \div T_R$	0.533	DSCFM
$V_{W\,gas} = 0.04715 \times V_W$	1.150	SCF
$\%M = V_{W\,gas} \times 100 \div (V_{M\,std} + V_{W\,gas})$	3.263	%
$M_D = (100 - \%M) \div 100$	0.967	dry fract.
$MW_D = (\%CO_2 x0.44)+(\%O_2 x0.32)+((\%N_2+\%CO)x0.28)$	30.863	lb/lbmole
$MW = M_D \times MW_D + 18\ (1 - M_D)$	30.443	lb/lbmole
$V_S = 5129.4 \times C_p \times (T_S \div (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$	1097.2	FPM
$Q_A = (V_S \times A_S) \div 144$	95.75	ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) \div T_S$	89.31	DSCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) \div (M_D \times P_S \times V_S \times T_R \times D_N^2)$	96.9	%

QA/QC Check:

Completeness	✓
Legibility	✓
Accuracy	✓
Specifications	✓
Reasonableness	✓

Checked by:

2-6-2006
Operator (Signature/Date)

Project Coordinator (Signature/Date)
2/3/2006

© 1999 CETCON, Inc. All Rights Reserved

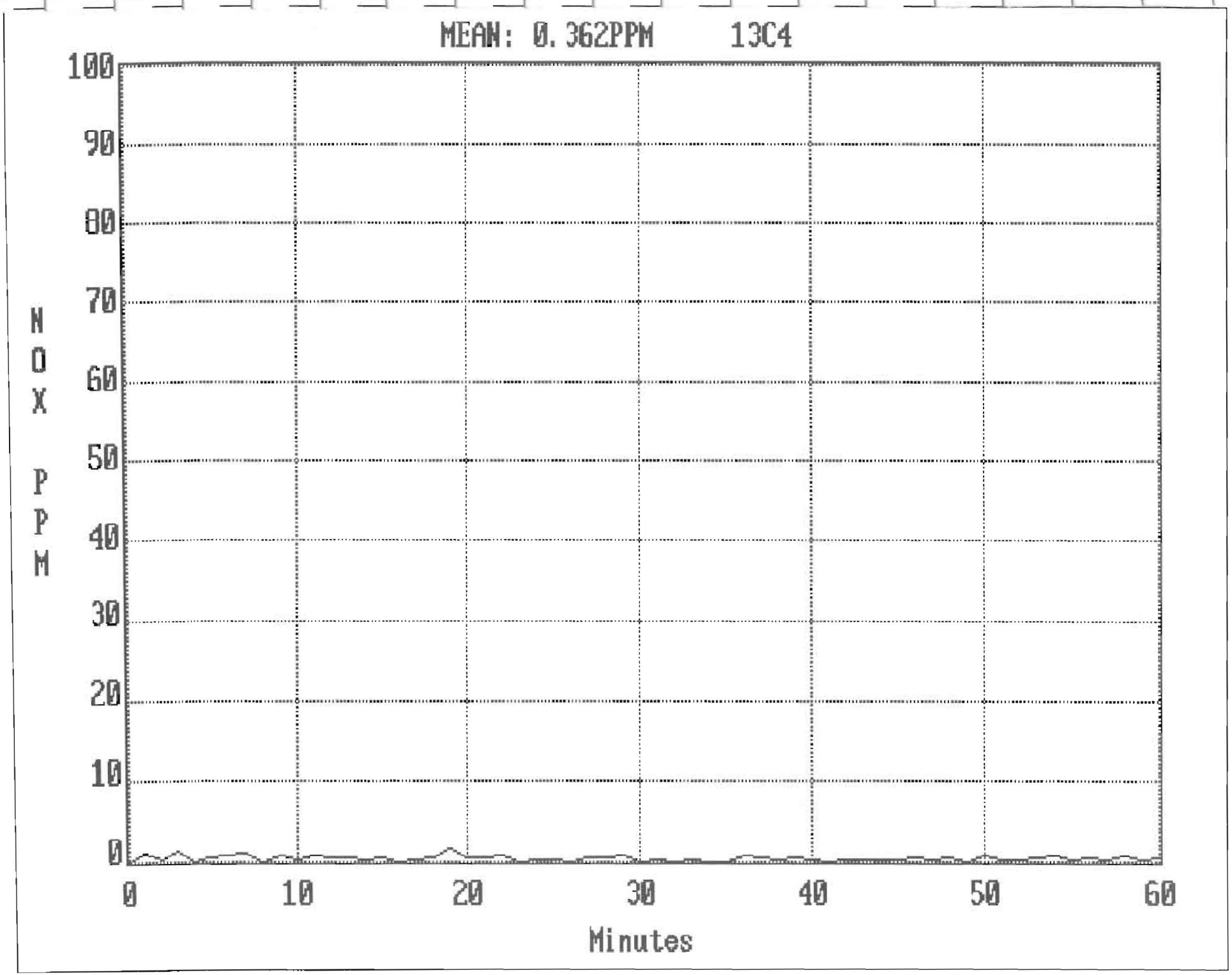
FIELDISO.XLS

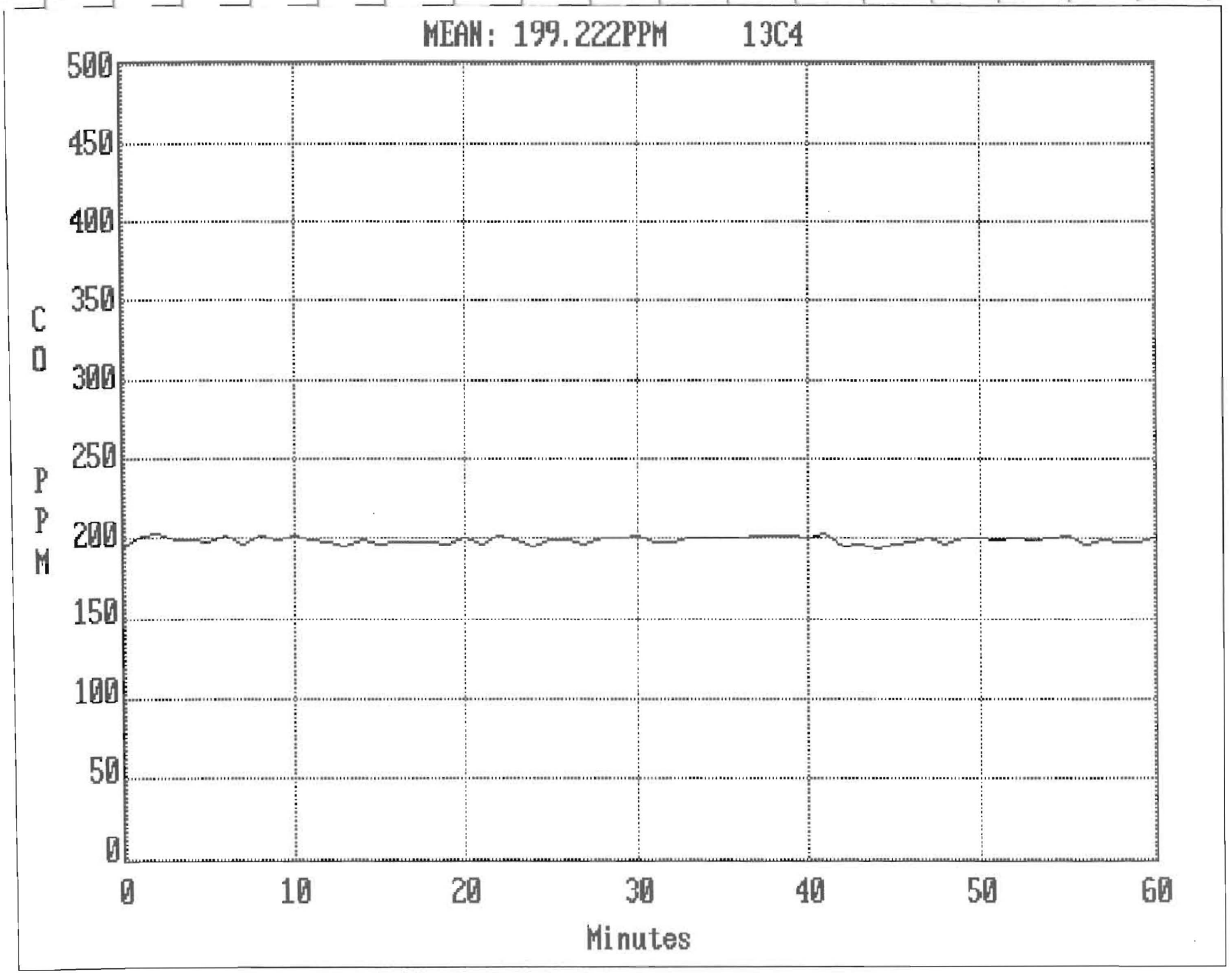
CJ4113/TPI-ARDMORE/CCR/C4

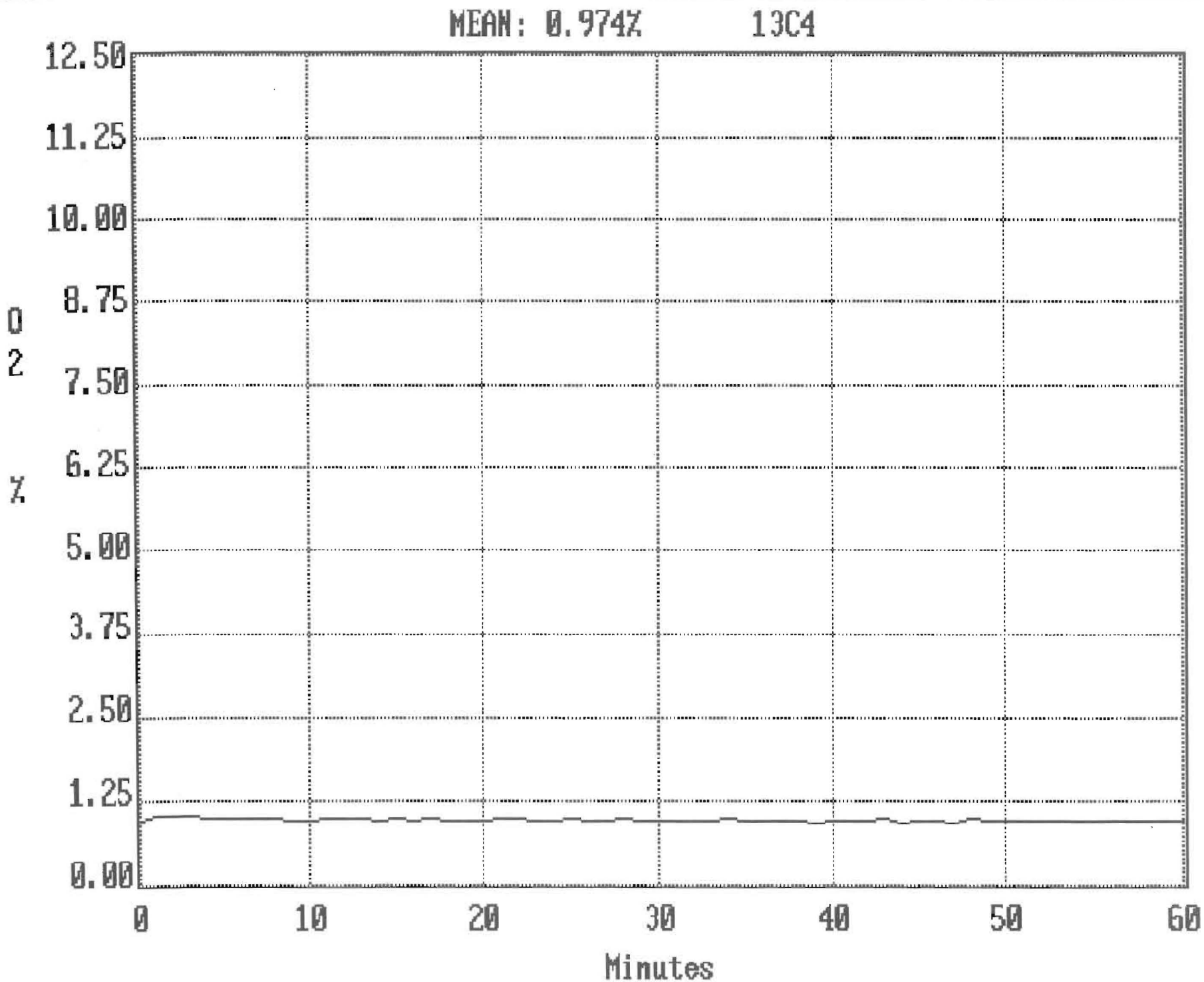
TEST DATE : 01-05-2006
START TIME: 09:48:29
FILE NAME : C:\DAQ\13C4 .ID%

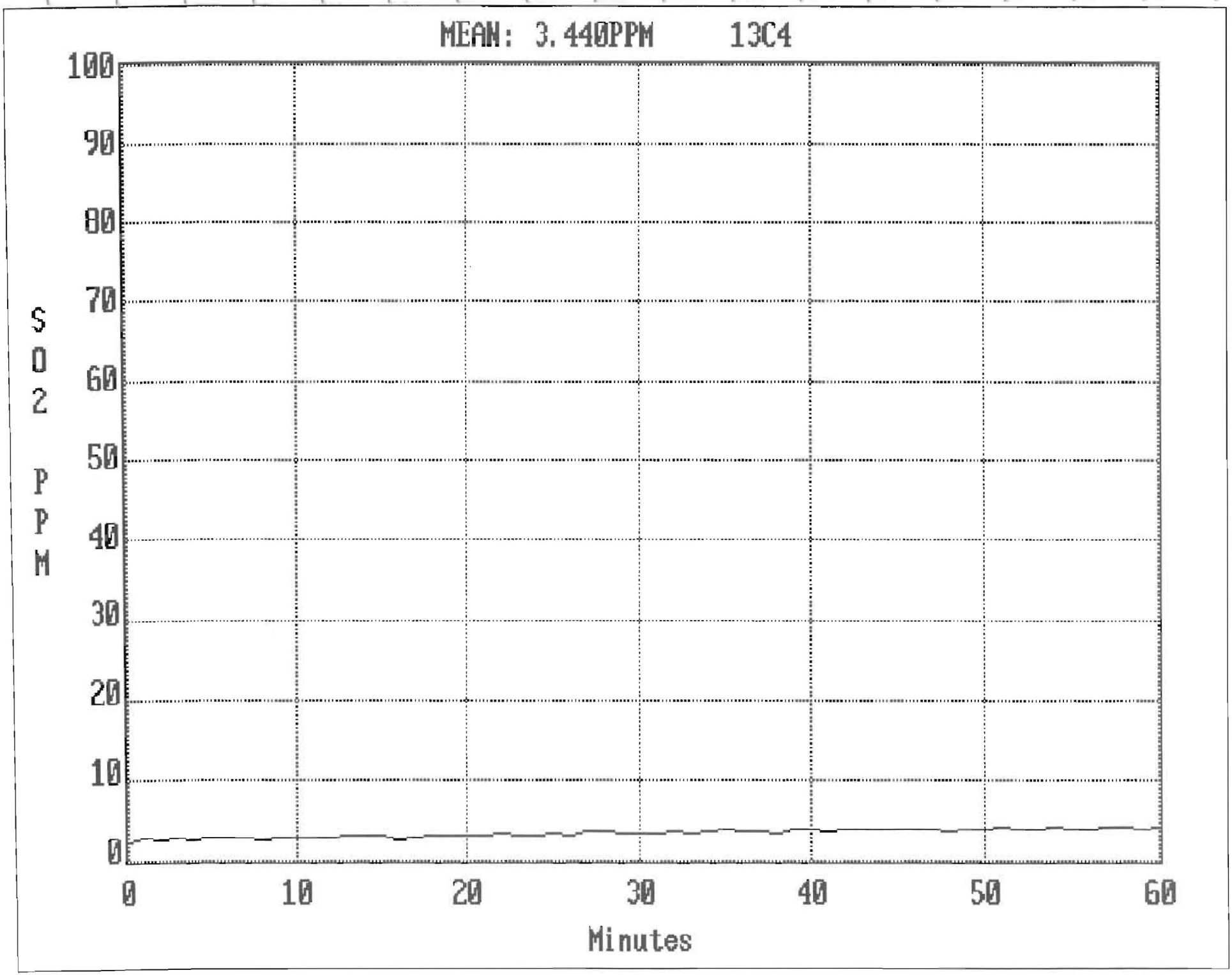
CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
<MIN>			<ANALYZER OUTPUT-VDC>					
0	0.000	3.828	0.386	0.237	1.526	6.802	3.601	0.000
1	0.098	3.954	0.412	0.279	1.584	6.842	3.713	0.033
2	0.012	3.971	0.416	0.264	1.609	6.826	3.738	0.000
3	0.125	3.892	0.408	0.281	1.593	6.831	3.748	0.007
4	0.000	3.898	0.404	0.265	1.531	6.822	3.754	0.017
5	0.042	3.861	0.400	0.282	1.602	6.830	3.716	0.000
6	0.069	3.945	0.398	0.287	1.587	6.823	3.751	0.020
7	0.091	3.831	0.400	0.282	1.518	6.828	3.760	0.024
8	0.000	3.957	0.395	0.262	1.590	6.838	3.768	0.049
9	0.079	3.886	0.393	0.277	1.544	6.836	3.753	0.000
10	0.032	3.955	0.390	0.274	1.561	6.833	3.786	0.005
11	0.078	3.906	0.394	0.276	1.545	6.866	3.747	0.075
12	0.052	3.872	0.404	0.291	1.494	6.862	3.757	0.030
13	0.050	3.810	0.396	0.307	1.579	6.862	3.742	0.040
14	0.015	3.881	0.393	0.300	1.489	6.860	3.749	0.014
15	0.055	3.844	0.396	0.321	1.545	6.855	3.767	0.030
16	0.000	3.879	0.387	0.271	1.563	6.869	3.751	0.000
17	0.007	3.863	0.399	0.298	1.496	6.867	3.768	0.000
18	0.043	3.866	0.388	0.324	1.559	6.883	3.765	0.069
19	0.144	3.838	0.387	0.316	1.524	6.894	3.794	0.028
20	0.039	3.923	0.392	0.323	1.513	6.900	3.792	0.029
21	0.059	3.848	0.396	0.318	1.558	6.921	3.788	0.010
22	0.065	3.940	0.396	0.336	1.524	6.913	3.809	0.007
23	0.000	3.907	0.382	0.321	1.575	6.928	3.812	0.060
24	0.023	3.825	0.382	0.308	1.540	6.934	3.794	0.067
25	0.011	3.897	0.400	0.330	1.502	6.929	3.787	0.000
26	0.000	3.902	0.390	0.319	1.570	6.940	3.792	0.036
27	0.050	3.844	0.391	0.355	1.503	6.934	3.795	0.000
28	0.043	3.910	0.396	0.361	1.558	6.951	3.802	0.024
29	0.078	3.926	0.384	0.338	1.512	6.955	3.818	0.059
30	0.000	3.953	0.388	0.334	1.475	6.952	3.831	0.000
31	0.008	3.880	0.387	0.337	1.545	6.978	3.823	0.000
32	0.000	3.879	0.390	0.357	1.488	6.972	3.814	0.008
33	0.009	3.910	0.382	0.339	1.518	6.978	3.812	0.000
34	0.000	3.917	0.398	0.355	1.532	6.982	3.847	0.013
35	0.001	3.925	0.391	0.387	1.489	6.964	3.836	0.000
36	0.081	3.913	0.386	0.356	1.552	6.978	3.822	0.002
37	0.056	3.960	0.381	0.355	1.510	6.988	3.799	0.000
38	0.024	3.945	0.385	0.352	1.549	6.981	3.830	0.024
39	0.043	3.942	0.378	0.394	1.572	6.989	3.838	0.028
40	0.011	3.927	0.390	0.393	1.493	6.993	3.845	0.027
41	0.000	3.962	0.386	0.364	1.639	6.996	3.866	0.005
42	0.007	3.816	0.384	0.395	1.650	6.982	3.836	0.000
43	0.010	3.846	0.400	0.382	1.607	6.986	3.832	0.002
44	0.009	3.787	0.377	0.400	1.596	6.981	3.819	0.027
45	0.024	3.843	0.391	0.406	1.550	6.998	3.833	0.024
46	0.047	3.855	0.385	0.391	1.524	7.019	3.846	0.026
47	0.015	3.924	0.379	0.392	1.475	7.042	3.870	0.037
48	0.059	3.836	0.395	0.378	1.413	7.056	3.874	0.041
49	0.002	3.925	0.386	0.392	1.510	7.064	3.870	0.000
50	0.085	3.918	0.383	0.395	1.381	7.058	3.884	0.021
51	0.012	3.895	0.381	0.407	1.458	7.078	3.900	0.011

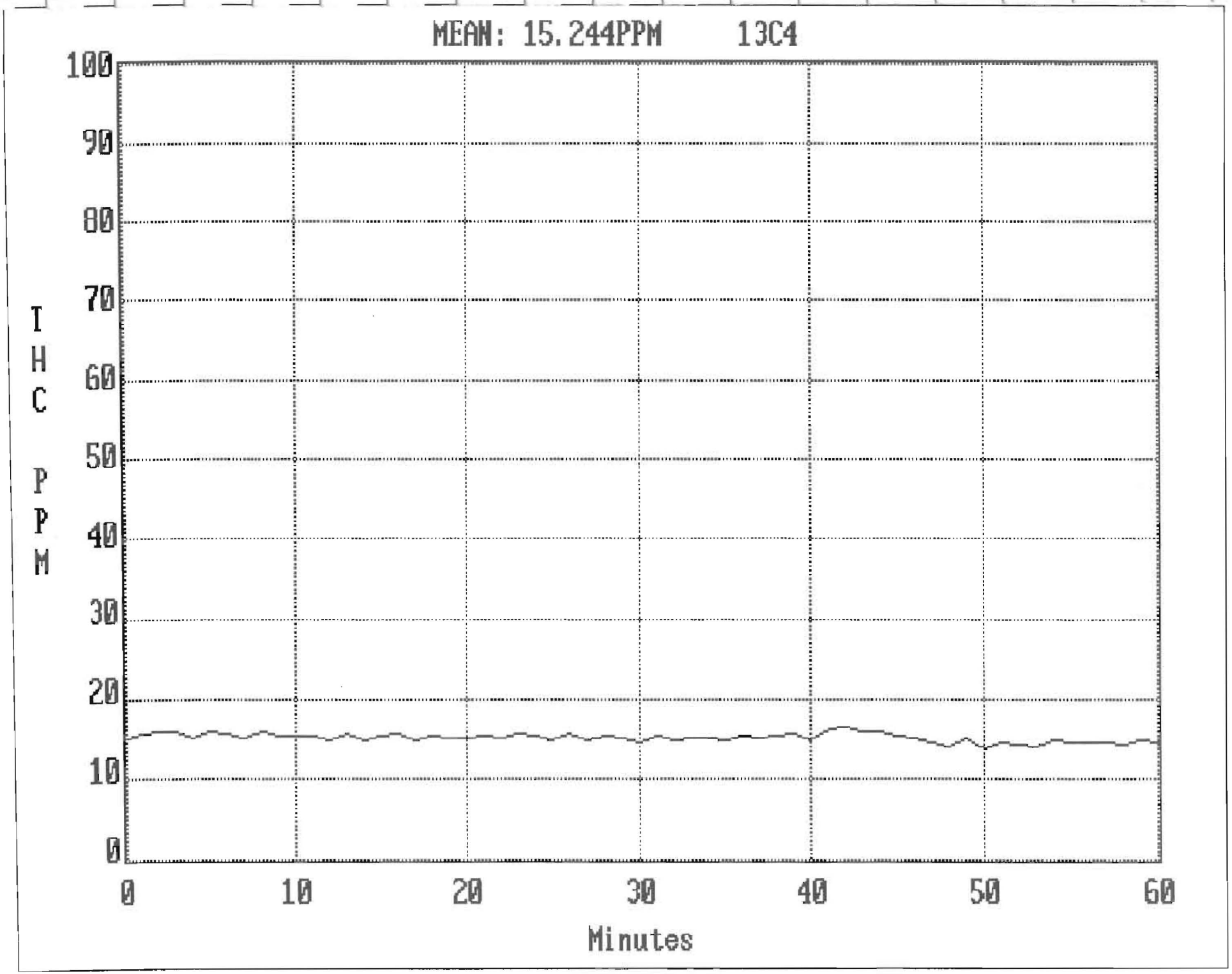
52	0.026	3.932	0.385	0.383	1.449	7.096	3.927	0.033
53	0.040	3.888	0.391	0.389	1.402	7.089	3.903	0.000
54	0.072	3.923	0.384	0.413	1.497	7.077	3.912	0.002
55	0.017	3.937	0.386	0.393	1.458	7.084	3.893	0.006
56	0.050	3.850	0.389	0.399	1.466	7.089	3.885	0.042
57	0.028	3.895	0.388	0.407	1.462	7.091	3.888	0.000
58	0.066	3.857	0.387	0.435	1.451	7.085	3.886	0.028
59	0.012	3.871	0.387	0.402	1.499	7.092	3.883	0.020
60	0.041	3.929	0.386	0.416	1.458	7.110	3.905	0.042
MEAN	0.036	3.894	0.391	0.343	1.526	6.952	3.812	0.020
END TIME:	10:48:19							
FULLSPAN	97.300	449.000	11.230	97.200	85.200	22.550	0.000	0.000
SPAN VDC	9.746	8.850	4.521	9.683	8.528	9.092	0.000	0.000
MID SPAN	52.000	249.000	5.570	54.200	45.100	11.570	0.000	0.000
MID VDC	5.063	5.212	2.107	5.327	4.504	4.578	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.076	0.000	0.002	0.000	0.000	0.000	0.000	0.000

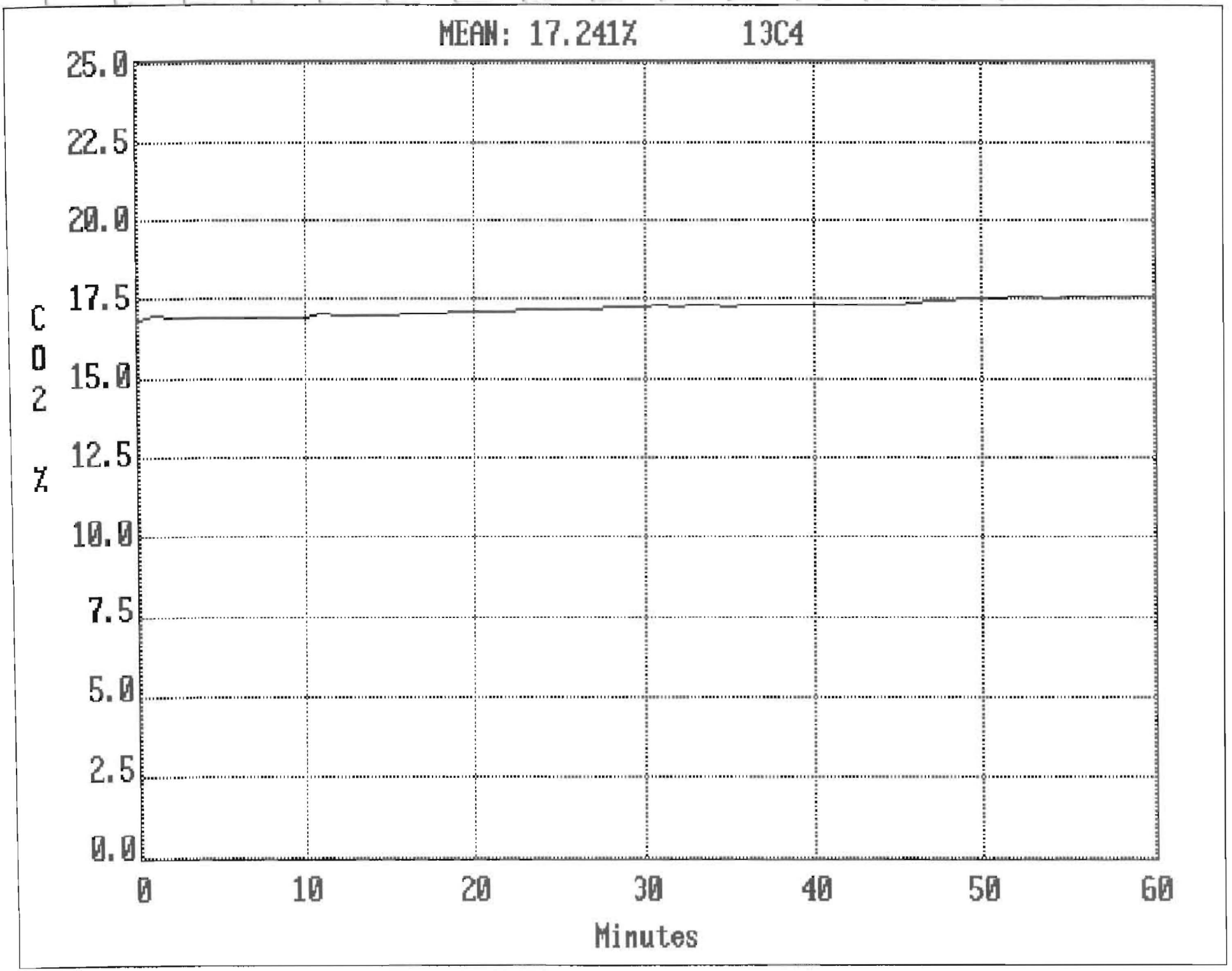

MEAN: 0.362PPM 13C4
NOX PPM
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
Minutes


MEAN: 199.222PPM 13C4
CO PPM
500
450
400
350
300
250
200
150
100
50
0
0
10
20
30
40
50
60
Minutes


MEAN: 0.974%
13C4
12.50
11.25
10.00
8.75
7.50
6.25
5.00
3.75
2.50
1.25
0.00
O2 %
0
10
20
30
40
50
60
Minutes


MEAN: 3.440PPM 13C4
100
90
80
70
60
50
40
30
20
10
0
SO2 PPM
0
10
20
30
40
50
60
Minutes


MEAN: 15.244PPM 13C4
THC PPM
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
Minutes


MEAN: 17.241%
13C4
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
CO2 %
0
10
20
30
40
50
60
Minutes

CETCON, Inc.

Job No.:	CJ-4113	Field Data:	PM	Barometer No.:	CET I	Barometric Pressure, P_B:	29.46	C_F:	1.009		
Date:	1/5/2006	Run No.:	C5	Pitot Tube No.:	Std	Ambient Temp., °F:	73	ΔH@:	1.553	in. H_2O	
Customer:	TPI	Time of Run, T_R:	64 min.	Pitot Tube, C_P:	0.990	Stack Pressure, P_S:	0.00	in. H_2O =	29.46	in. Hg	
Unit:	CCR Vent	Time per Point, T_P:	4 min.	Initial Pitot Leak:	√	Initial Leak @:	15.0	in. Hg =	0.005	cfm	
Operator:	JRH/JJA/GAD	Sample Box No.:	2	Final Pitot Leak:	√	Final Leak @:	5.0	in. Hg =	0.000	cfm	
Method:	RM-5	Meter Box No.:	CM#1	Nozzle No.:	T-Q6	Assumed T_S:	80	Assumed K:	11.436		
Filter No.:	A-784	Stack Area, A_S:	12.57 in.^{2}	Nozzle Dia., D_N:	0.314 in.	Assumed T_M:	80	Calculated K:	11.726		
File Name:	PMC5	Assumed %M:	(default)	N_2 Purge@:	NA SCFH	For:	NA min.	N_2 Cylinder No.:	N/A		

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP_S	Orifice ΔH P_M, in. H_2O Desired	Orifice ΔH P_M, in. H_2O Actual	Sample Vacuum in. Hg	Stack Temp.°F T_S	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	% Isokinetic
B 4	1443	640.635	0.05	0.57	0.57	0.0	83	237	267	68	73	72	115.1
	1447	642.685	0.08	0.90	0.90	1.0	82	237	267	63	73	72	88.5
3	1451	644.680	0.08	0.90	0.90	1.0	82	234	263	58	73	72	97.9
	1455	646.885	0.08	0.90	0.90	1.0	82	234	263	56	73	72	101.4
2	1459	649.170	0.09	1.01	1.00	2.0	82	230	232	55	73	72	94.6
	1503	651.430	0.08	0.90	0.90	2.0	82	230	232	55	74	72	100.0
1	1507	653.685	0.08	0.90	0.90	2.0	82	260	260	56	74	72	92.9
	1511	655.780	0.08	0.90	0.90	2.0	82	260	260	57	74	72	99.3
END	1515	658.020											
A 4	1525	658.470	0.08	0.90	0.90	3.0	82	270	223	64	72	72	123.5
	1529	661.250	0.08	0.90	0.90	3.0	81	270	223	54	74	72	96.6
3	1533	663.430	0.09	1.01	1.00	3.0	81	249	240	54	74	71	96.6
	1537	665.740	0.07	0.79	0.79	2.5	81	249	240	54	75	71	102.7
2	1541	667.910	0.07	0.79	0.79	2.5	81	246	258	54	75	71	98.5
	1545	669.990	0.09	1.01	1.00	3.0	81	248	258	55	75	71	91.1
1	1549	672.170	0.09	1.01	1.00	3.0	81	243	260	55	76	71	100.0
	1553	674.565	0.09	1.01	1.00	3.0	81	243	260	56	77	71	103.2
END	1557	677.040											

C_{qa} =	0.990	%Δ Must	Avg ΔP_S	0.080	Avg P_M	0.897	Avg T_S	82	Avg T_M	73	
%Δ =	1.8	Be ≤ 5.0	Avg ($\Delta P_S^{1/2}$)	0.282	Max Vacuum	3.0	Volume DGM	35.955 ft^3 x C_F	1.009	=V_M	36.279 ft^3

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	622.2	709.3	507.4	961.9			2800.8
Initial Wt, gm	608.4	704.1	507.0	954.8			2774.3
Difference, gm	13.8	5.2	0.4	7.1			26.5 = V_W

RM 3 or 3A Data	
%CO_2	17.625
%O_2	0.907
%CO	0.000
%N_2	81.469
% Excess Air	4.384

Avg ΔP	0.080	in. H_2O
Avg ($\Delta P_S^{1/2}$)	0.282	
Avg. P_M	0.897	in. H_2O
Avg. T_S	82	°F
Avg. T_S	542	°R
Avg.T_M	73	°F
Avg.T_M	533	°R

$V_{M\,std} = 17.64 \times V_M \times [(P_B+(P_M / 13.6)) \div T_M]$	35.451	DSCF
$Q_{M\,std} = V_{Mstd} \div T_R$	0.554	DSCFM
$V_{W\,gas} = 0.04715 \times V_W$	1.249	SCF
$\%M = V_{W\,gas} \times 100 \div (V_{M\,std} + V_{W\,gas})$	3.405	%
$M_D = (100 - \%M) \div 100$	0.966	dry fract.
$MW_D = (\%CO_2 \times 0.44)+(\%O_2 \times 0.32)+((\%N_2+\%CO) \times 0.28)$	30.856	lb/lbmole
$MW = M_D \times MW_D + 18\,(1 - M_D)$	30.419	lb/lbmole
$V_S = 5129.4 \times C_p \times (T_S \div (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$	1114.6	FPM
$Q_A = (V_S \times A_S) \div 144$	97.26	ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) \div T_S$	90.08	DSCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) \div (M_D \times P_S \times V_S \times T_R \times D_N^2)$	99.9	%

QA/QC Check:

Completeness	✓
Legibility	✓
Accuracy	✓
Specifications	✓
Reasonableness	✓

Checked by:

2-6-2006

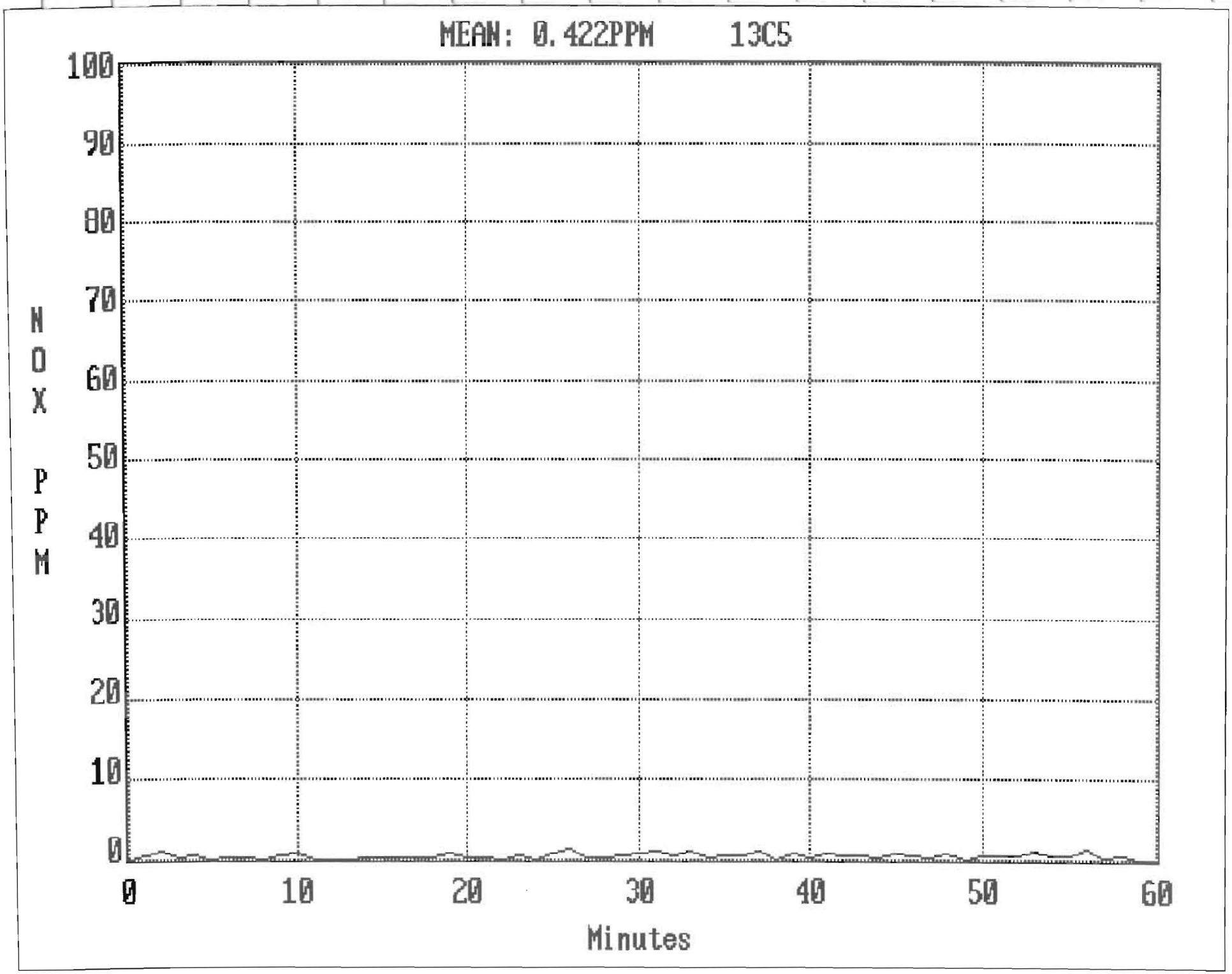
Operator (Signature/Date)

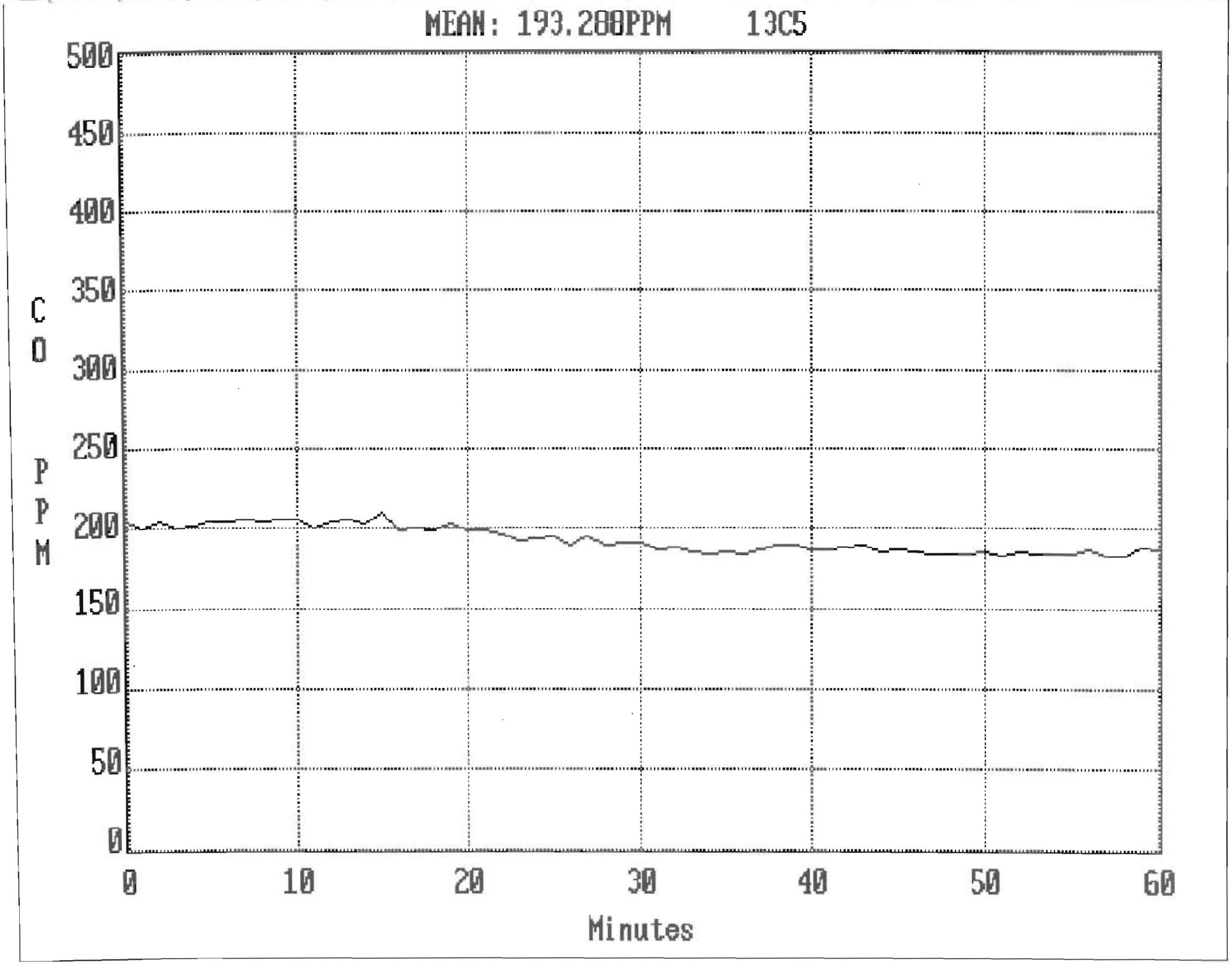
Project Coordinator (Signature/Date)

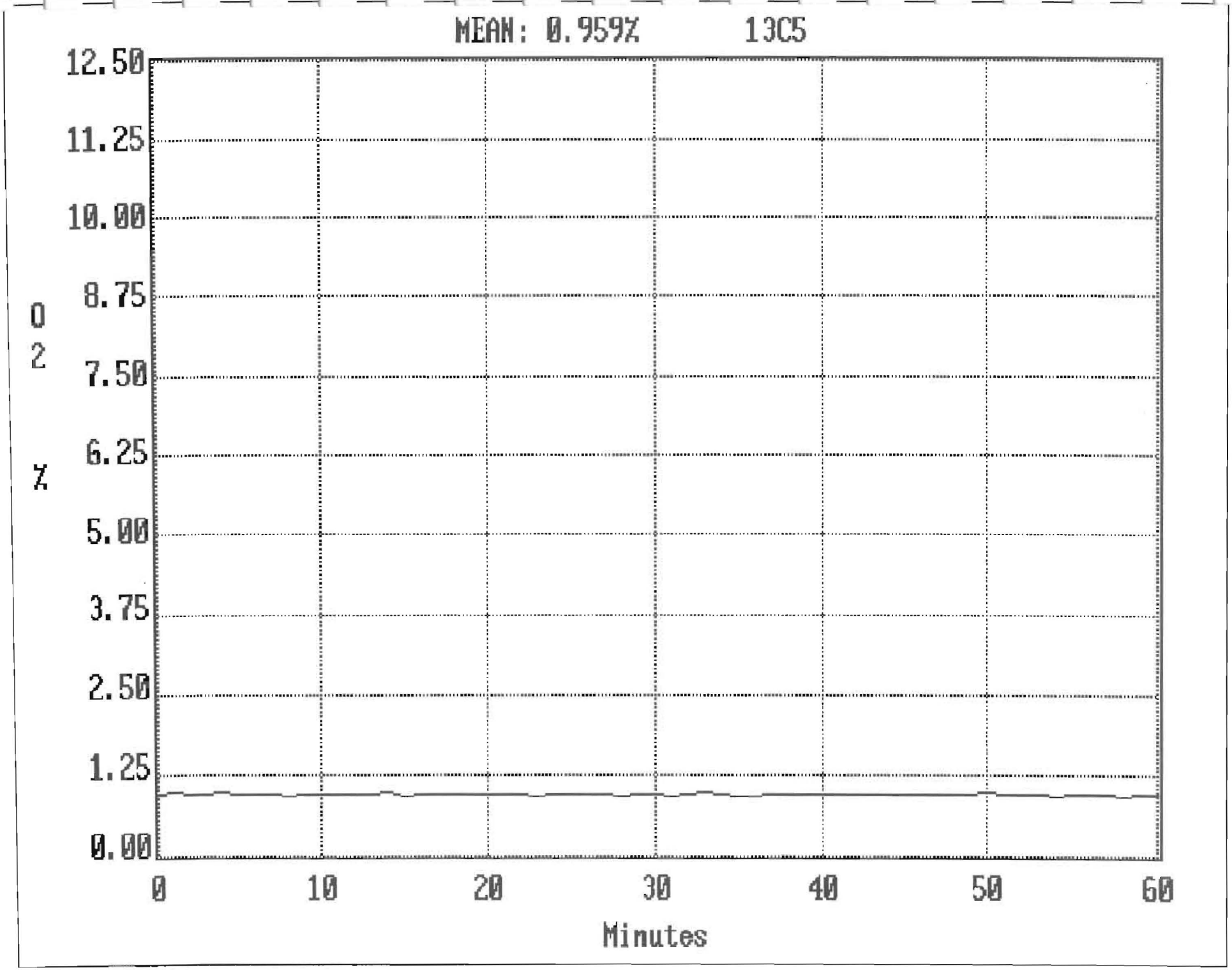
© 1999 CETCON, Inc. All Rights Reserved

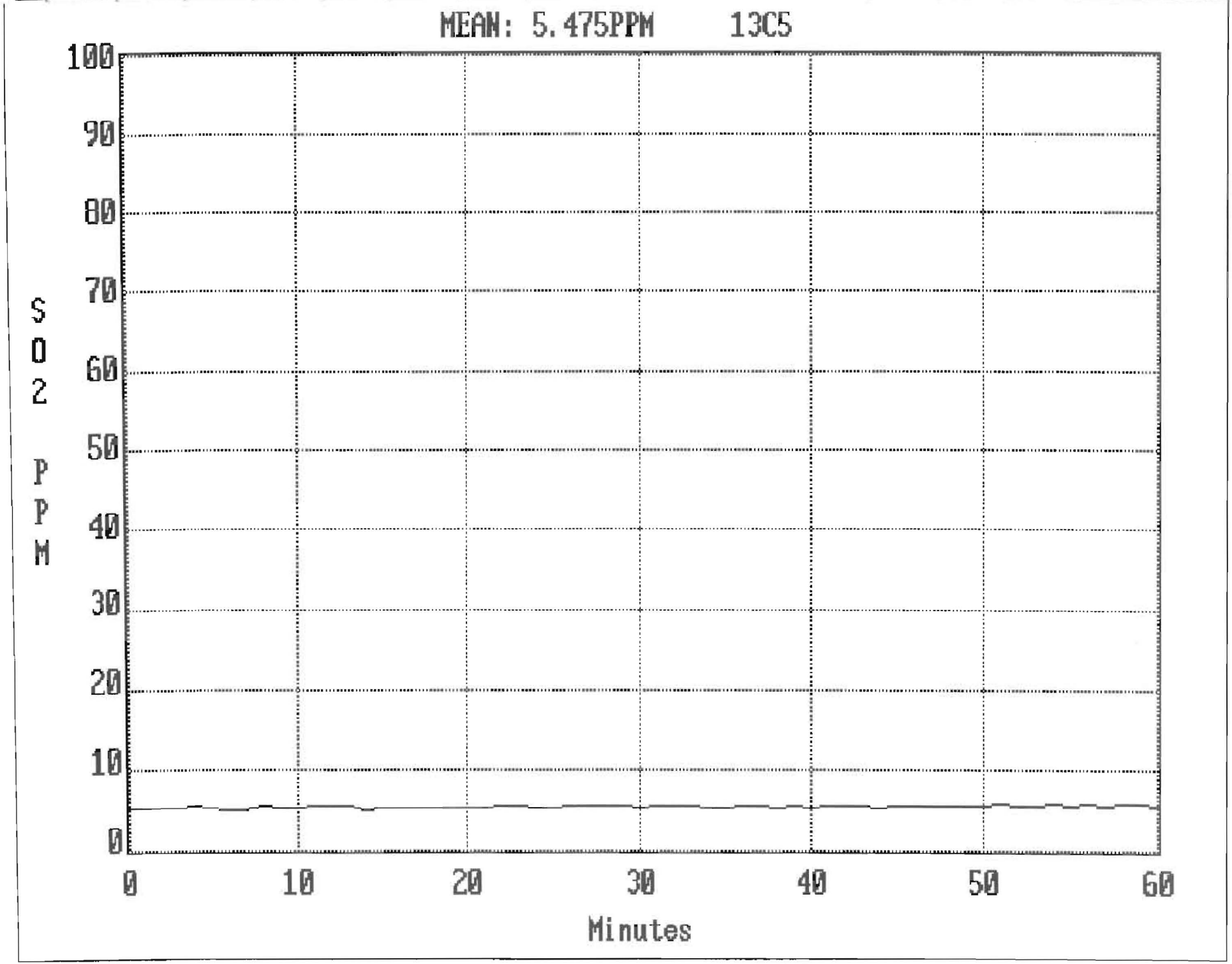
FIELDISO.XLS

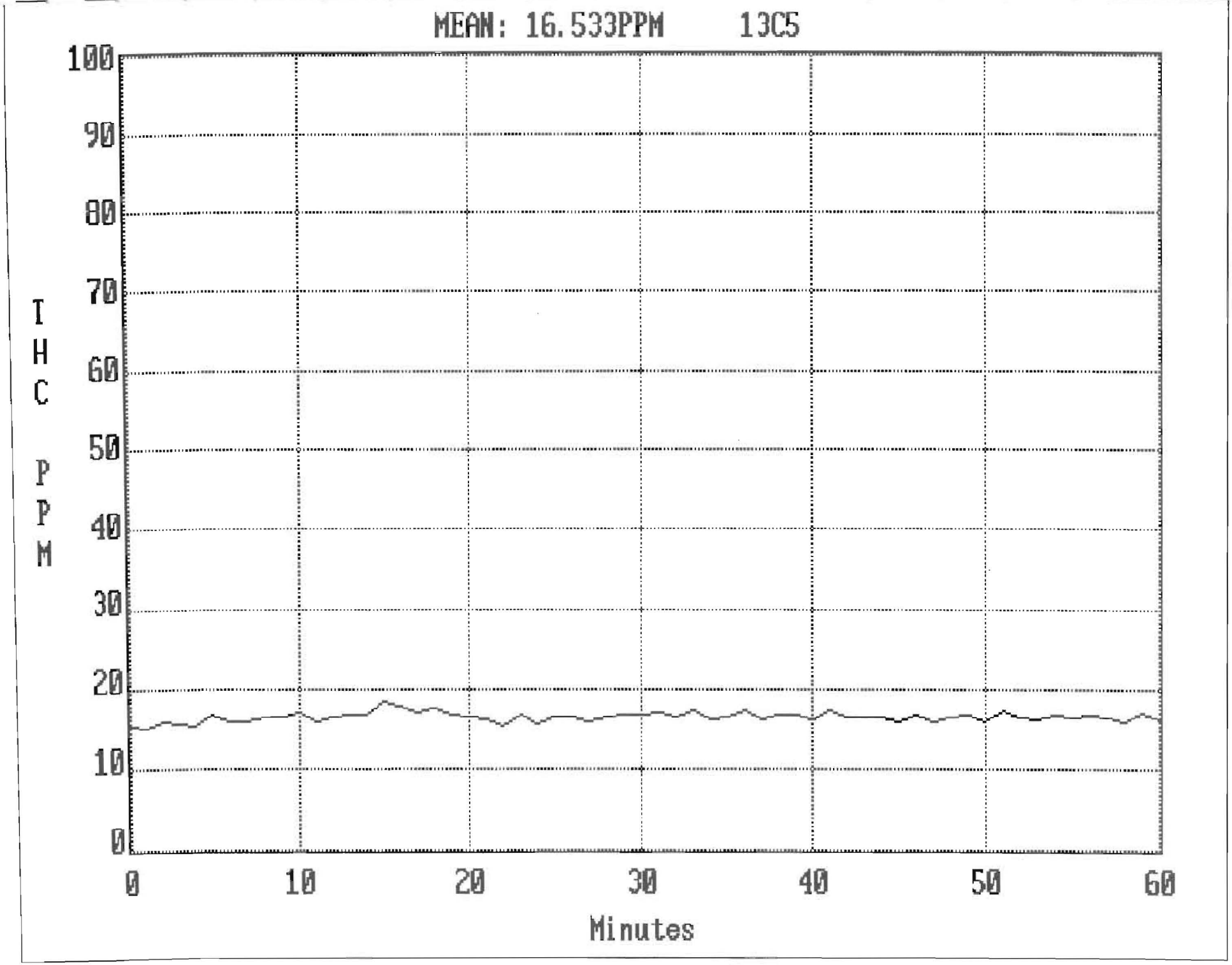
52	0.042	3.645	0.387	0.548	1.645	7.103	3.893	0.014
53	0.105	3.612	0.389	0.567	1.628	7.117	3.923	0.052
54	0.035	3.615	0.377	0.569	1.695	7.128	3.905	0.031
55	0.052	3.609	0.384	0.566	1.645	7.114	3.901	0.027
56	0.121	3.653	0.384	0.582	1.685	7.109	3.899	0.016
57	0.022	3.574	0.387	0.566	1.658	7.114	3.900	0.027
58	0.055	3.578	0.374	0.572	1.611	7.096	3.923	0.000
59	0.000	3.672	0.384	0.580	1.697	7.118	3.908	0.034
60	0.000	3.647	0.385	0.565	1.632	7.116	3.910	0.010
MEAN	0.042	3.778	0.385	0.546	1.655	7.118	3.906	0.025
END TIME:	13:19:06							
FULLSPAN	97.300	449.000	11.230	97.200	85.200	22.550	0.000	0.000
SPAN VDC	9.746	8.850	4.521	9.683	8.528	9.092	0.000	0.000
MID SPAN	52.000	249.000	5.570	54.200	45.100	11.570	0.000	0.000
MID VDC	5.063	5.212	2.107	5.327	4.504	4.578	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.076	0.000	0.002	0.000	0.000	0.000	0.000	0.000

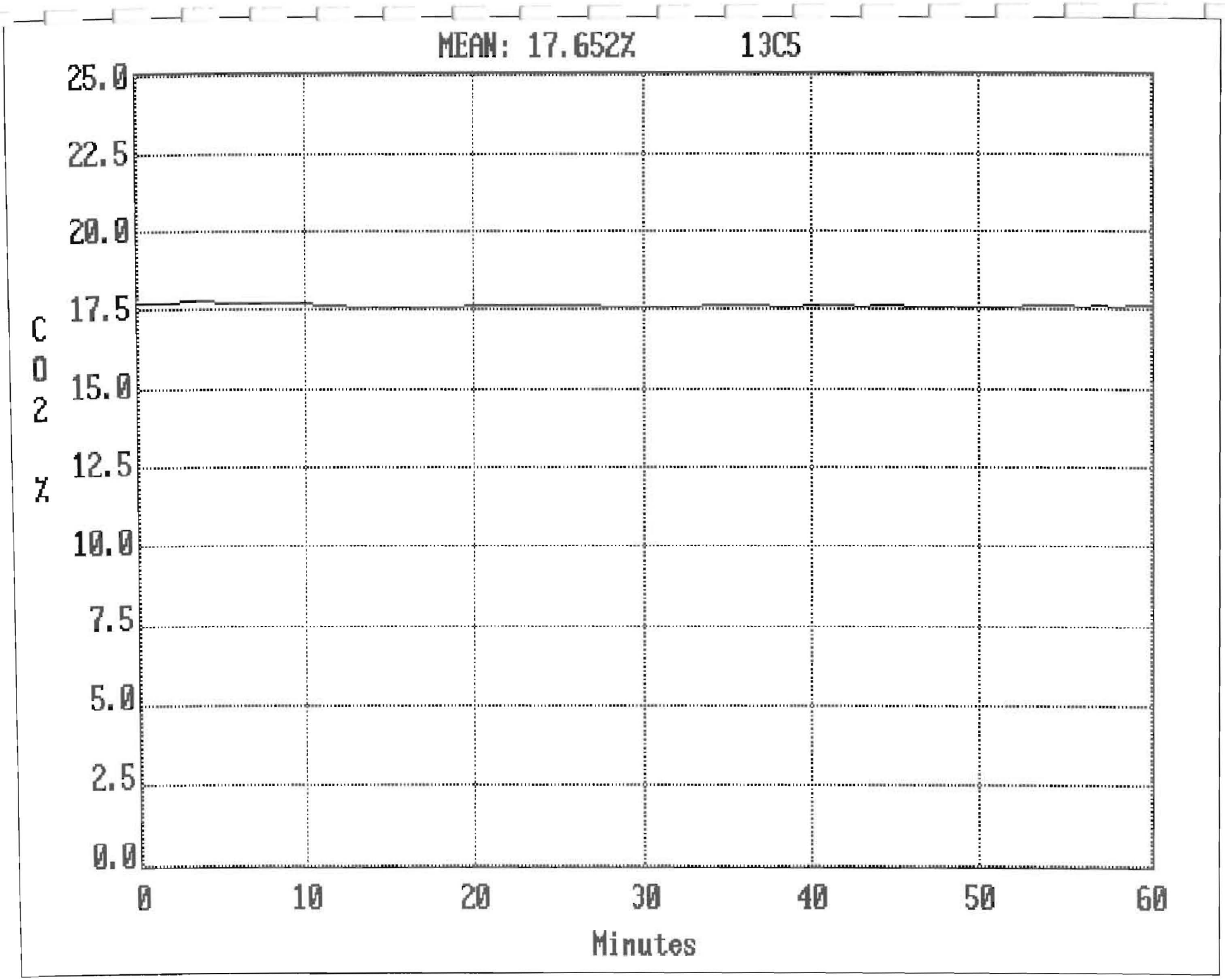

MEAN: 0.422PPM 13C5
NOX PPM
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
Minutes


MEAN: 193.288PPM 13C5
500
450
400
350
300
250
200
150
100
50
0
C O P P M
0
10
20
30
40
50
60
Minutes


MEAN: 0.959%
13C5
12.50
11.25
10.00
8.75
7.50
6.25
5.00
3.75
2.50
1.25
0.00
O2 %
0
10
20
30
40
50
60
Minutes


MEAN: 5.475PPM 13C5
100
90
80
70
60
50
40
30
20
10
0
SO2 PPM
0
10
20
30
40
50
60
Minutes


MEAN: 16.533PPM 13C5
THC PPM
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
Minutes


MEAN: 17.652%
13C5
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
CO2 %
0
10
20
30
40
50
60
Minutes

CETCON, Inc.

Job No.:	CJ-4113	Field Data:	PM	Barometer No.:	CET I	Barometric Pressure, P_B:	29.47	C_F:	1.009
Date:	1/5/2006	Run No.:	C6	Pitot Tube No.:	Std	Ambient Temp., °F:	61	ΔH@:	1.553 in. H_2O
Customer:	TPI	Time of Run, T_R:	64 min.	Pitot Tube, C_P:	0.990	Stack Pressure, P_S:	-0.02	in. H_2O =	29.47 in. Hg
Unit:	CCR Vent	Time per Point, T_P:	4 min.	Initial Pitot Leak:	√	Initial Leak @:	15.0	in. Hg =	0.000 cfm
Operator:	JJA/JRH/GAD	Sample Box No.:	1	Final Pitot Leak:	√	Final Leak @:	3.0	in. Hg =	cfm
Method:	RM-5	Meter Box No.:	CM#1	Nozzle No.:	T-Q6	Assumed T_S:	80	Assumed K:	11.436
Filter No.:	A-783	Stack Area, A_S:	12.57 in.^{2}	Nozzle Dia., D_N:	0.314 in.	Assumed T_M:	80	Calculated K:	11.897
File Name:	PMC6	Assumed %M:	(default)	N_2 Purge@:	NA SCFH	For:	NA min.	N_2 Cylinder No.:	N/A

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP_s	Orifice ΔH P_M, in. H_2O Desired	Orifice ΔH P_M, in. H_2O Actual	Sample Vacuum in. Hg	Stack Temp.°F T_S	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	% Isokinetic
A 4	1718	677.535	0.06	0.69	0.69	1.0	78	252	236	68	71	71	92.6
	1722	679.350	0.06	0.68	0.68	2.0	78	252	238	54	72	71	96.4
3	1726	681.240	0.07	0.79	0.79	2.0	78	263	253	52	73	71	98.8
	1730	683.335	0.08	0.90	0.90	2.0	78	263	253	50	73	71	92.3
2	1734	685.425	0.07	0.79	0.79	2.0	77	240	268	49	74	71	109.5
	1738	687.750	0.07	0.79	0.79	2.0	77	240	268	50	74	71	96.1
1	1742	689.790	0.07	0.79	0.79	2.0	77	237	264	50	75	71	94.1
	1746	691.790	0.05	0.57	0.57	2.0	77	237	264	51	75	71	101.5
END	1750	693.615											
B 4	1754	693.805	0.05	0.57	0.57	2.0	76	253	270	57	74	71	99.9
	1758	695.600	0.07	0.80	0.80	2.0	76	253	270	51	75	71	103.9
3	1802	697.810	0.06	0.68	0.68	2.0	76	273	281	50	76	71	97.9
	1806	699.740	0.06	0.68	0.68	2.0	76	273	281	51	75	71	99.2
2	1810	701.695	0.06	0.68	0.68	2.0	76	270	281	51	76	71	124.5
	1814	704.150	0.06	0.68	0.68	2.0	76	270	281	51	76	71	107.0
1	1818	706.260	0.07	0.80	0.80	2.0	76	263	277	52	76	72	90.6
	1822	708.190	0.06	0.68	0.68	2.0	75	263	277	52	77	71	100.2
END	1826	710.170											

C_{qa} =	0.986	%Δ Must	Avg ΔP_s	0.064	Avg P_M	0.723	Avg T_S	77		Avg T_M	73
%Δ =	2.3	Be ≤ 5.0	Avg ($\Delta P_s^{1/2}$)	0.252	Max Vacuum	2.0	Volume DGM	32.445 ,ft^3	x C_F	1.009	=V_M 32.737 ft^3

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	625.5	699.8	507.9	968.1			2801.3
Initial Wt, gm	615.6	695.0	507.2	961.9			2779.7
Difference, gm	9.9	4.8	0.7	6.2			21.6 = V_W

RM 3 or 3A Data	
%CO_2	17.602
%O_2	0.894
%CO	0.000
%N_2	81.505
% Excess Air	4.315

Avg ΔP	0.064	in. H_2O
Avg ($\Delta P_S^{1/2}$)	0.252	
Avg. P_M	0.723	in. H_2O
Avg. T_S	77	°F
Avg. T_S	537	°R
Avg. T_M	73	°F
Avg. T_M	533	°R

$V_{M\,std} = 17.64 \times V_M \times [(P_B+(P_M / 13.6)) \div T_M]$	31.987	DSCF
$Q_{M\,std} = V_{Mstd} \div T_R$	0.500	DSCFM
$V_{W\,gas} = 0.04715 \times V_W$	1.018	SCF
$\%M = V_{W\,gas} \times 100 \div (V_{M\,std} + V_{W\,gas})$	3.086	%
$M_D = (100 - \%M) \div 100$	0.969	dry fract.
$MW_D = (\%CO_2 \times 0.44)+(\%O_2 \times 0.32)+((\%N_2+\%CO) \times 0.28)$	30.852	lb/lbmole
$MW = M_D \times MW_D + 18\,(1 - M_D)$	30.455	lb/lbmole
$V_S = 5129.4 \times C_p \times (T_S \div (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$	989.9	FPM
$Q_A = (V_S \times A_S) \div 144$	86.39	ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) \div T_S$	81.04	DSCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) \div (M_D \times P_S \times V_S \times T_R \times D_N^2)$	100.1	%

QA/QC Check:

Completeness ✓
Legibility ✓
Accuracy ✓
Specifications ✓
Reasonableness ✓

Checked by:

2-6-2006
Operator (Signature/Date)

Project Coordinator (Signature/Date)
2/3/2006

© 1999 CETCON, Inc. All Rights Reserved

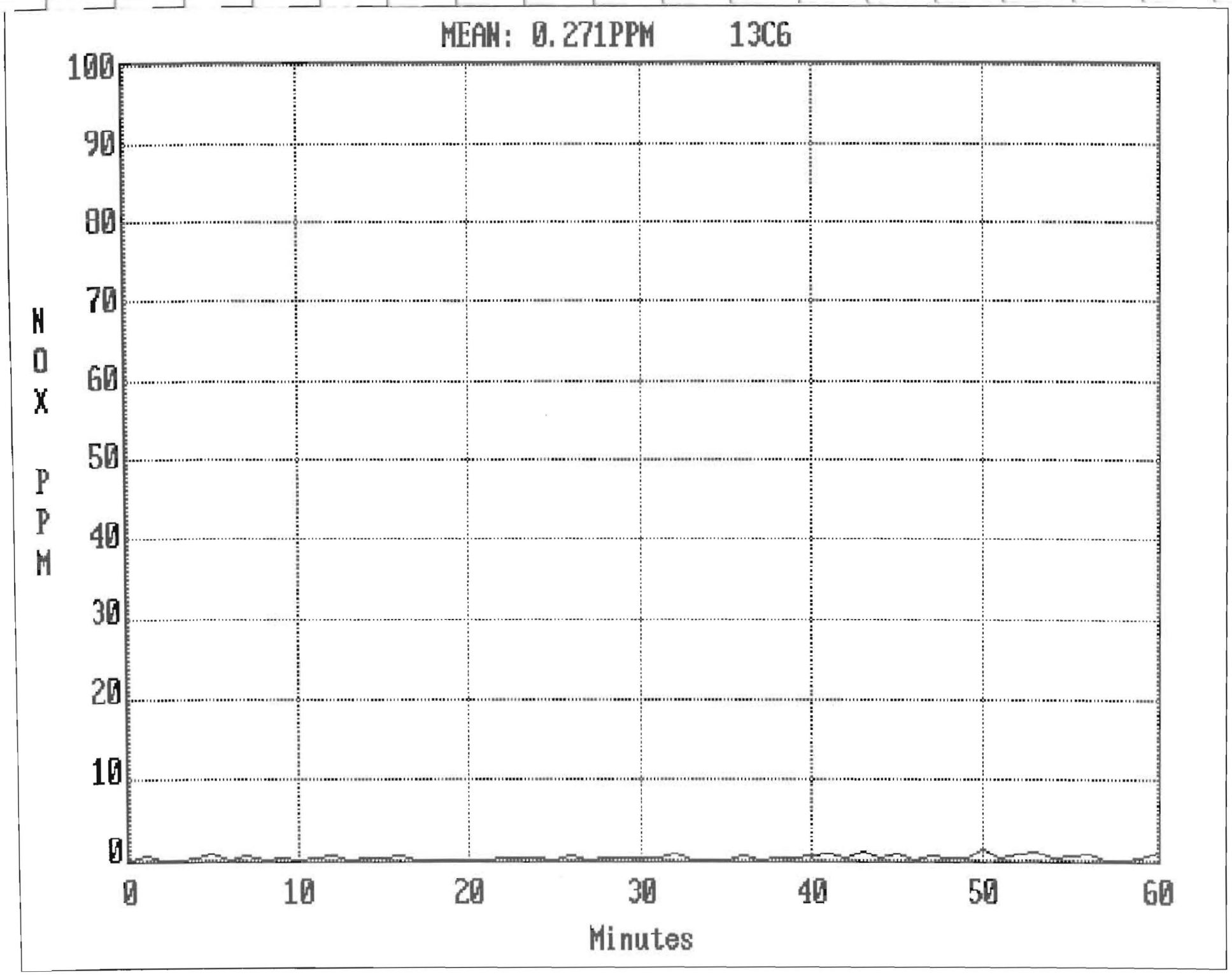
FIELDISO.XLS

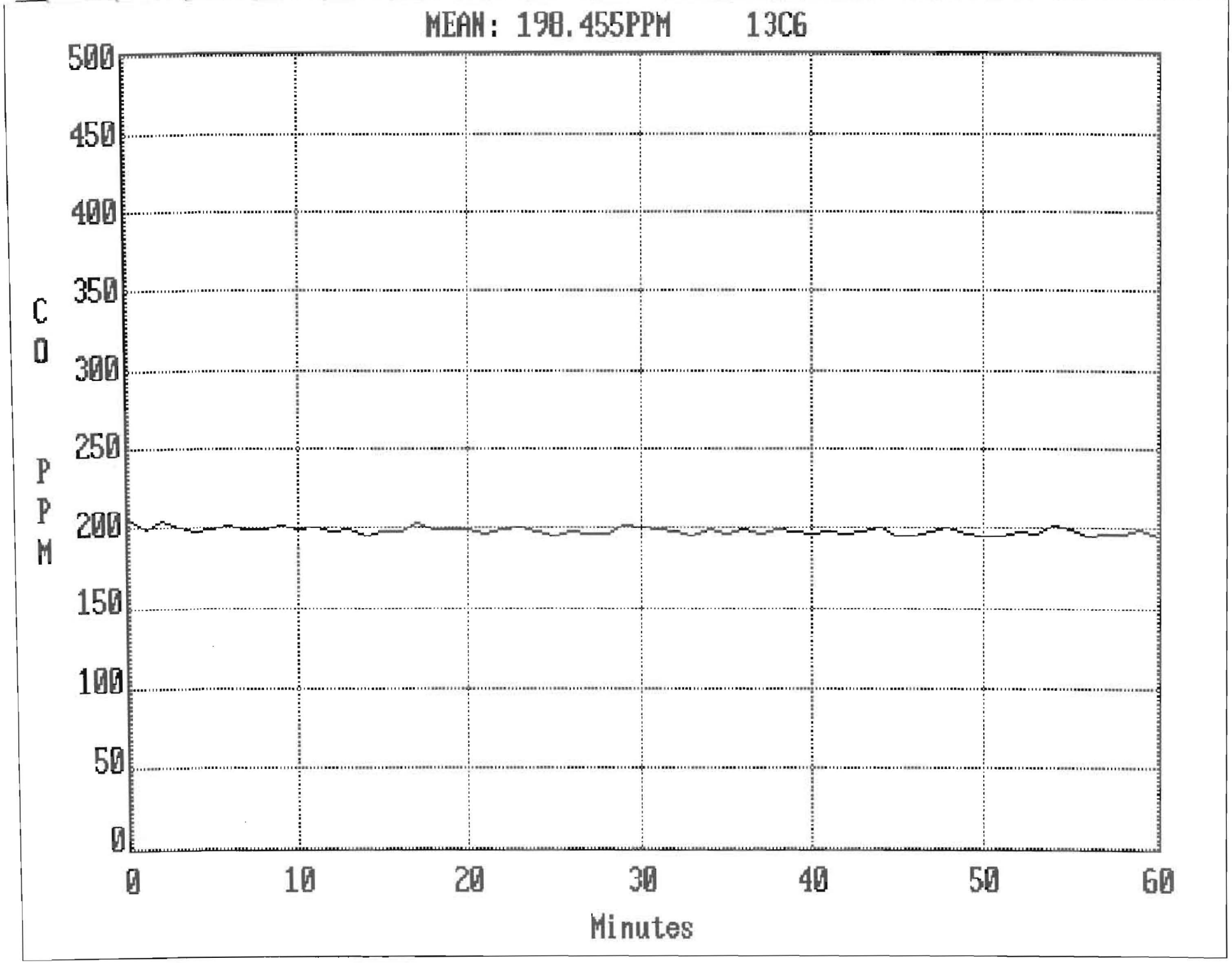
CJ4113/TPI-ARDMORE/CCR/13C6

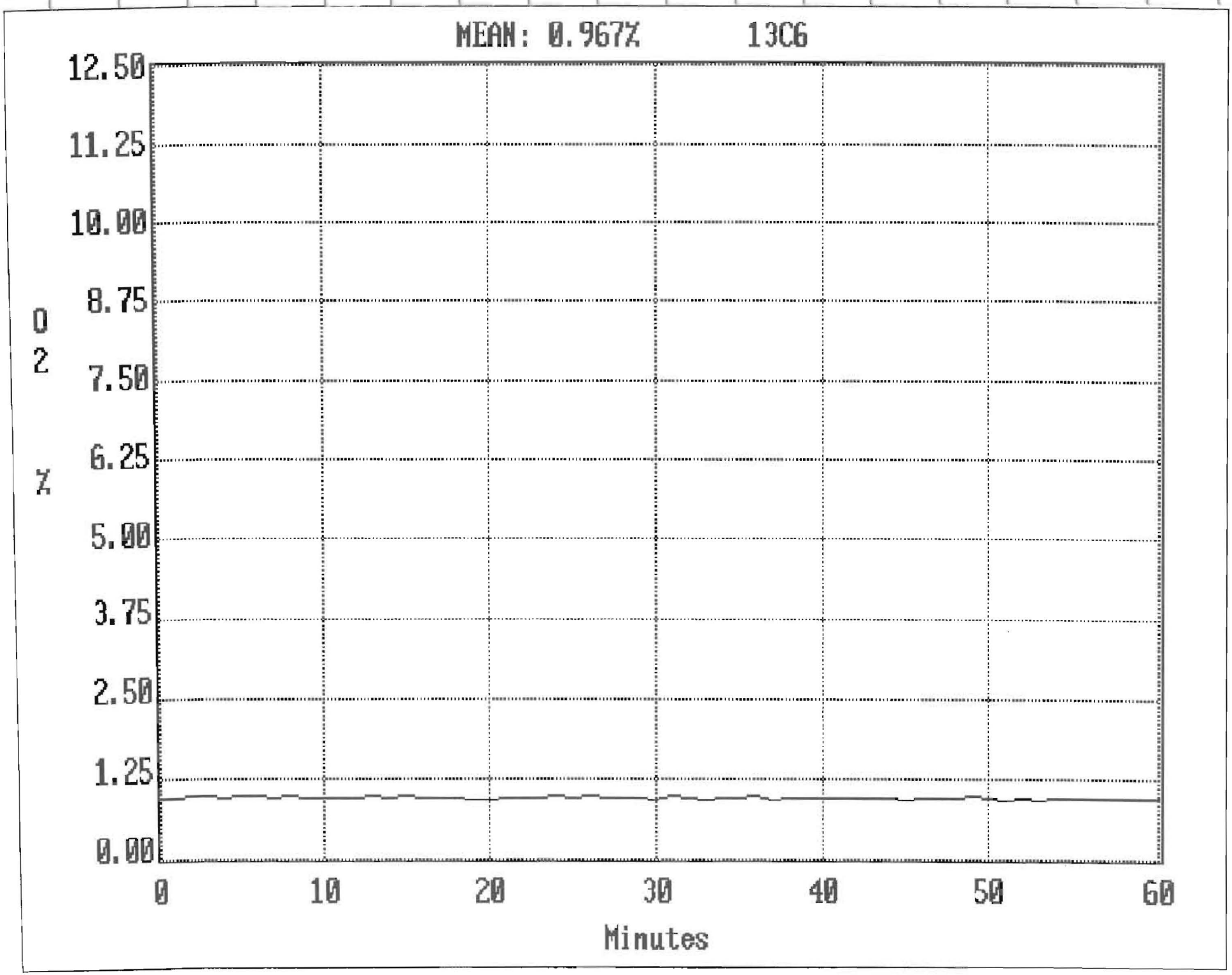
TEST DATE : 01-05-2006
START TIME: 16:15:21
FILE NAME : C:\DAQ\13C6 .ID%

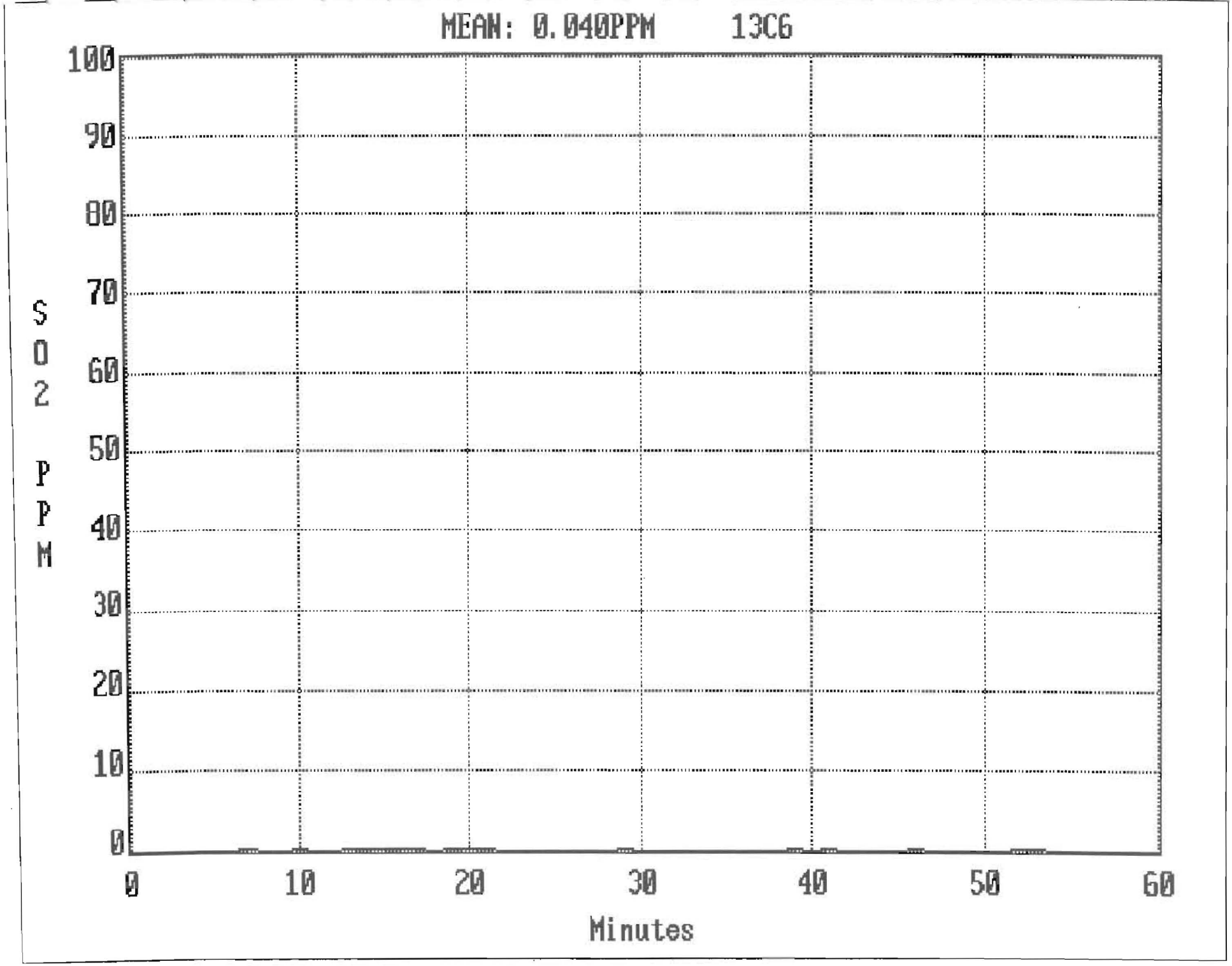
CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
<MIN>			<ANALYZER OUTPUT-VDC>					
0	0.000	4.033	0.383	0.000	2.031	7.080	3.748	0.000
1	0.051	3.901	0.390	0.000	2.004	7.068	3.849	0.002
2	0.000	4.001	0.394	0.000	1.976	7.072	3.883	0.042
3	0.000	3.933	0.394	0.000	2.026	7.043	3.858	0.000
4	0.009	3.861	0.383	0.000	2.166	7.039	3.849	0.003
5	0.080	3.893	0.396	0.002	2.066	7.026	3.856	0.015
6	0.000	3.956	0.399	0.003	2.039	7.041	3.847	0.016
7	0.034	3.904	0.387	0.008	1.975	7.063	3.861	0.036
8	0.000	3.883	0.398	0.001	1.899	7.073	3.875	0.000
9	0.033	3.955	0.387	0.004	1.937	7.096	3.861	0.000
10	0.000	3.907	0.381	0.016	1.828	7.105	3.851	0.000
11	0.016	3.910	0.388	0.000	1.869	7.100	3.879	0.053
12	0.058	3.866	0.384	0.006	1.856	7.106	3.843	0.053
13	0.000	3.899	0.398	0.015	1.769	7.085	3.879	0.049
14	0.019	3.817	0.388	0.011	1.953	7.102	3.871	0.021
15	0.023	3.858	0.396	0.009	1.823	7.086	3.863	0.000
16	0.040	3.855	0.393	0.011	1.835	7.092	3.858	0.031
17	0.000	3.987	0.387	0.011	1.905	7.104	3.885	0.007
18	0.000	3.884	0.389	0.002	1.850	7.092	3.875	0.015
19	0.000	3.881	0.375	0.021	1.919	7.096	3.891	0.000
20	0.000	3.906	0.376	0.011	1.930	7.092	3.888	0.028
21	0.000	3.853	0.392	0.007	1.934	7.090	3.867	0.013
22	0.011	3.896	0.387	0.003	1.952	7.083	3.863	0.000
23	0.012	3.925	0.387	0.000	1.861	7.086	3.887	0.000
24	0.024	3.866	0.396	0.002	1.922	7.082	3.884	0.031
25	0.003	3.812	0.391	0.002	1.908	7.083	3.871	0.031
26	0.046	3.863	0.400	0.000	1.858	7.067	3.845	0.000
27	0.006	3.849	0.382	0.000	2.026	7.057	3.877	0.001
28	0.017	3.847	0.383	0.002	1.910	7.080	3.855	0.020
29	0.020	3.937	0.386	0.008	1.935	7.078	3.877	0.011
30	0.019	3.929	0.372	0.003	1.907	7.096	3.855	0.009
31	0.013	3.883	0.397	0.001	1.878	7.085	3.821	0.028
32	0.081	3.879	0.387	0.005	1.950	7.091	3.887	0.000
33	0.000	3.805	0.374	0.002	1.930	7.085	3.846	0.020
34	0.002	3.905	0.391	0.000	1.919	7.088	3.881	0.000
35	0.000	3.847	0.385	0.004	1.947	7.083	3.866	0.034
36	0.038	3.893	0.400	0.006	1.850	7.078	3.860	0.025
37	0.000	3.840	0.376	0.002	1.982	7.065	3.867	0.001
38	0.011	3.883	0.386	0.002	1.912	7.075	3.868	0.008
39	0.011	3.879	0.385	0.007	1.869	7.071	3.855	0.000
40	0.055	3.846	0.390	0.000	1.977	7.096	3.844	0.029
41	0.074	3.862	0.391	0.007	1.899	7.091	3.840	0.000
42	0.007	3.844	0.391	0.000	1.926	7.078	3.858	0.012
43	0.112	3.874	0.391	0.003	1.908	7.078	3.844	0.018
44	0.011	3.914	0.391	0.002	1.893	7.069	3.844	0.047
45	0.068	3.804	0.377	0.001	1.951	7.083	3.848	0.070
46	0.006	3.808	0.392	0.008	1.836	7.083	3.852	0.026
47	0.049	3.864	0.382	0.000	1.964	7.091	3.866	0.000
48	0.023	3.923	0.386	0.003	1.920	7.074	3.835	0.024
49	0.028	3.853	0.394	0.004	1.817	7.074	3.852	0.031
50	0.125	3.806	0.382	0.003	1.956	7.089	3.858	0.028
51	0.021	3.803	0.377	0.000	1.882	7.109	3.852	0.029

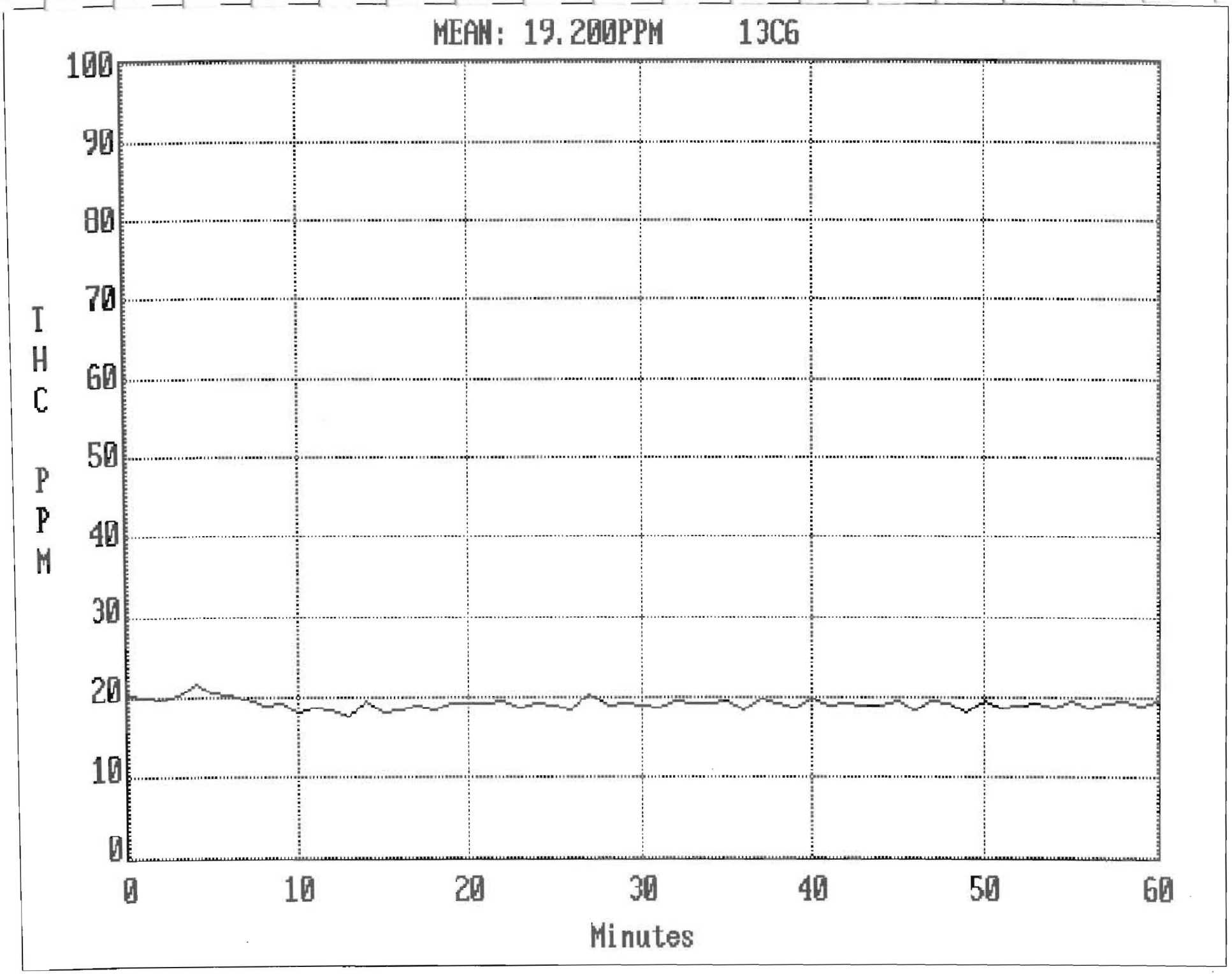
52	0.068	3.867	0.389	0.007	1.891	7.075	3.858	0.000
53	0.099	3.831	0.374	0.017	1.930	7.083	3.850	0.030
54	0.016	3.945	0.387	0.000	1.877	7.074	3.854	0.000
55	0.040	3.882	0.385	0.000	1.943	7.081	3.860	0.048
56	0.083	3.826	0.387	0.000	1.862	7.085	3.855	0.000
57	0.000	3.842	0.392	0.000	1.924	7.086	3.868	0.009
58	0.000	3.845	0.381	0.000	1.963	7.069	3.857	0.046
59	0.015	3.902	0.392	0.002	1.887	7.084	3.849	0.007
60	0.089	3.821	0.389	0.002	1.956	7.083	3.842	0.023
MEAN	0.027	3.879	0.388	0.004	1.922	7.081	3.859	0.018
END TIME:	17:15:10							
FULLSPAN	97.300	449.000	11.230	97.200	85.200	22.550	0.000	0.000
SPAN VDC	9.746	8.850	4.521	9.683	8.528	9.092	0.000	0.000
MID SPAN	52.000	249.000	5.570	54.200	45.100	11.570	0.000	0.000
MID VDC	5.063	5.212	2.107	5.327	4.504	4.578	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.076	0.000	0.002	0.000	0.000	0.000	0.000	0.000

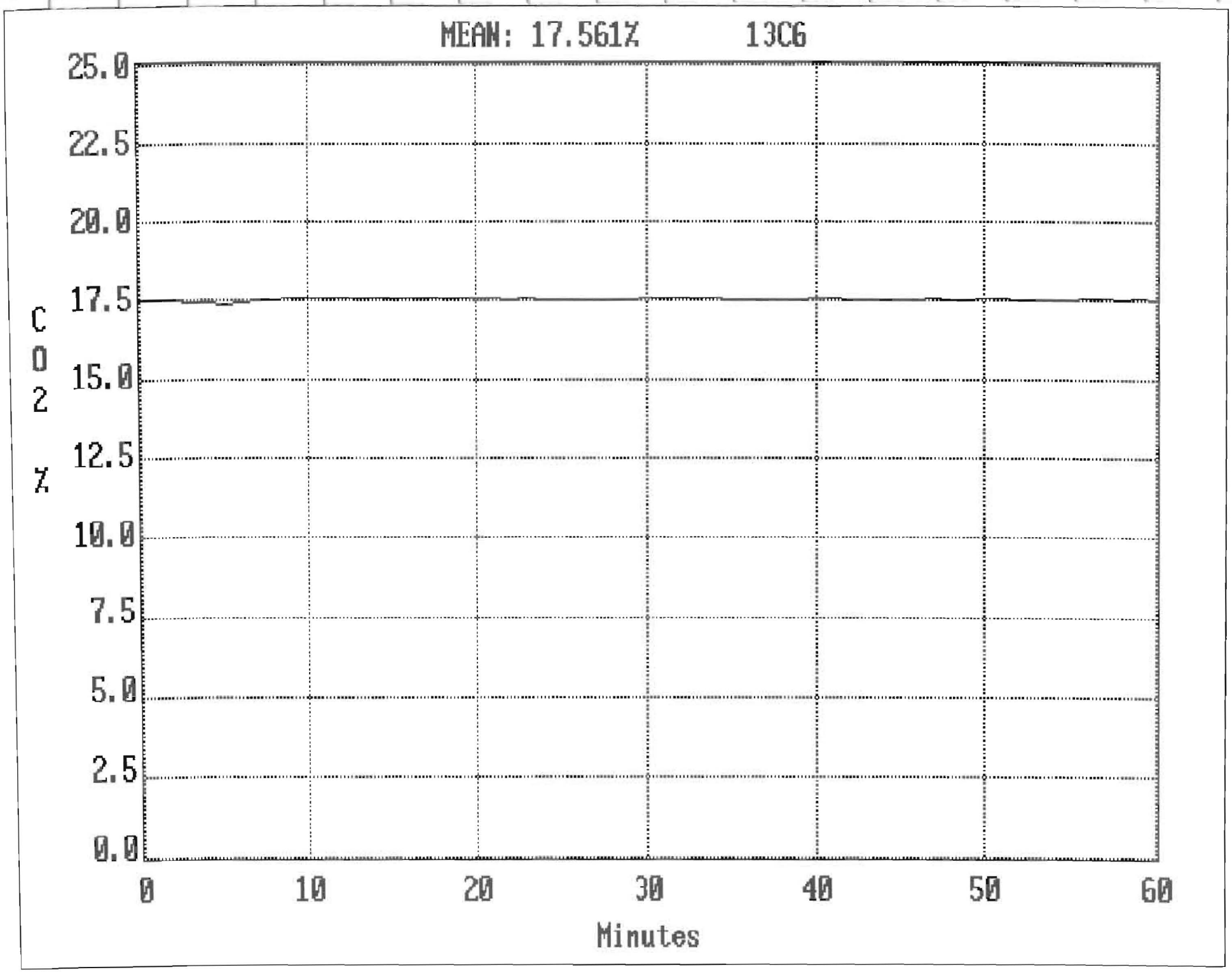

MEAN: 0.271PPM 13C6
NOX PPM
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
Minutes


MEAN: 198.455PPM 13C6
500
450
400
350
300
250
200
150
100
50
0
CO PPM
0
10
20
30
40
50
60
Minutes


MEAN: 0.967%
13C6
12.50
11.25
10.00
8.75
7.50
6.25
5.00
3.75
2.50
1.25
0.00
O2 %
0
10
20
30
40
50
60
Minutes


MEAN: 0.040PPM 13C6
SO2 PPM
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
Minutes


MEAN: 19.200PPM 13C6
THC PPM
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
Minutes

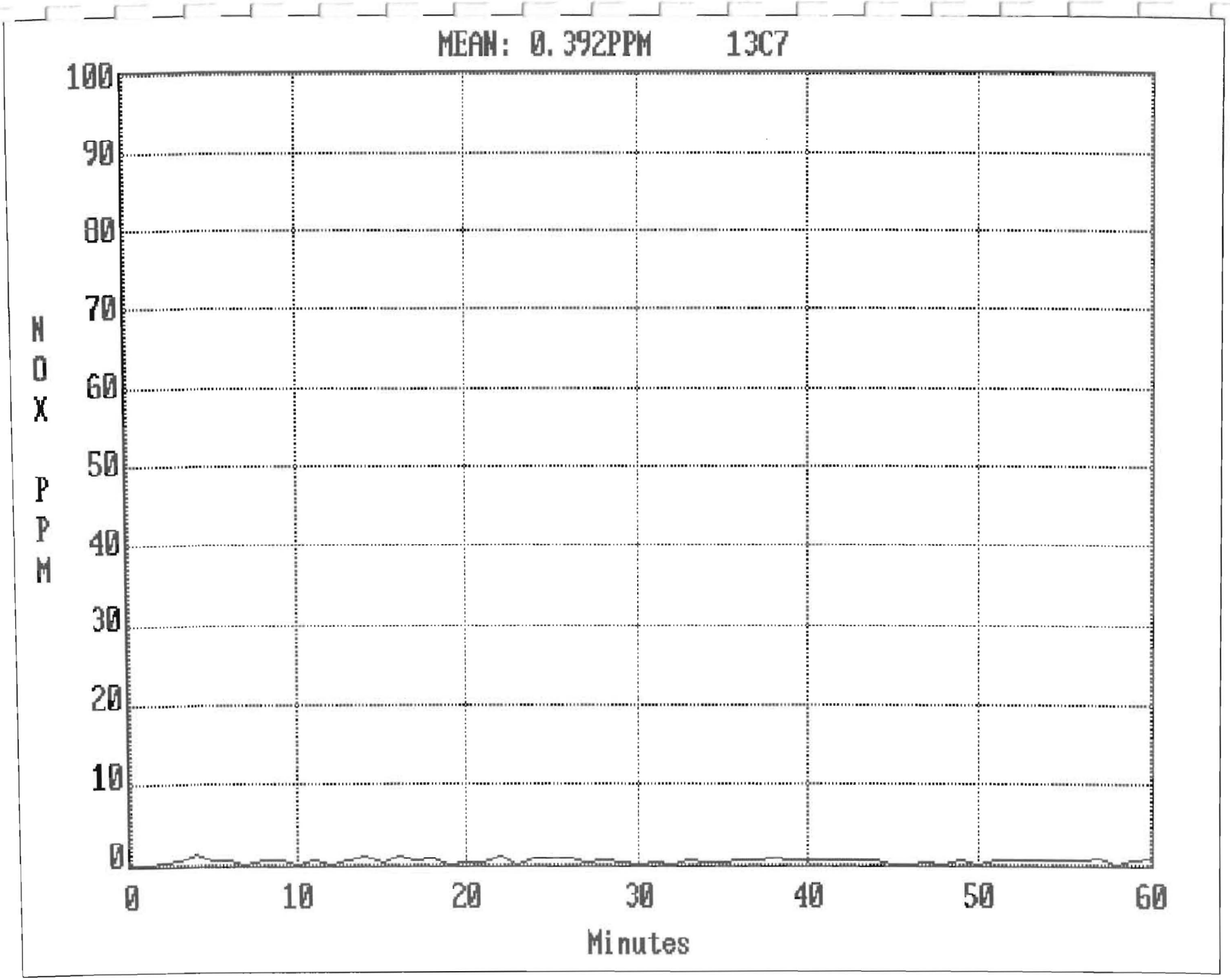

MEAN: 17.561%
13C6
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
CO2 %
0
10
20
30
40
50
60
Minutes

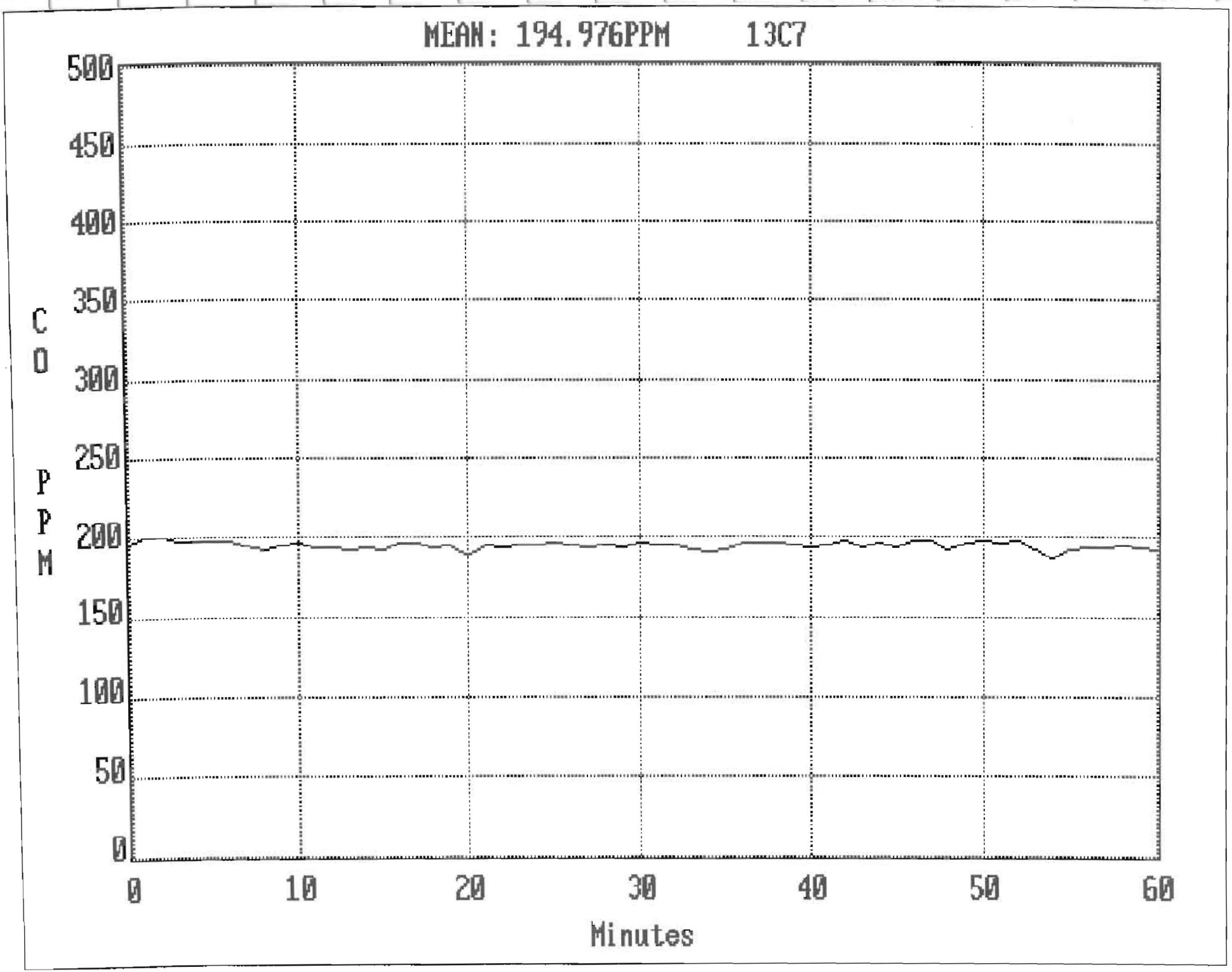
CJ4113/TPI-ARDMORE/CCR/13C7

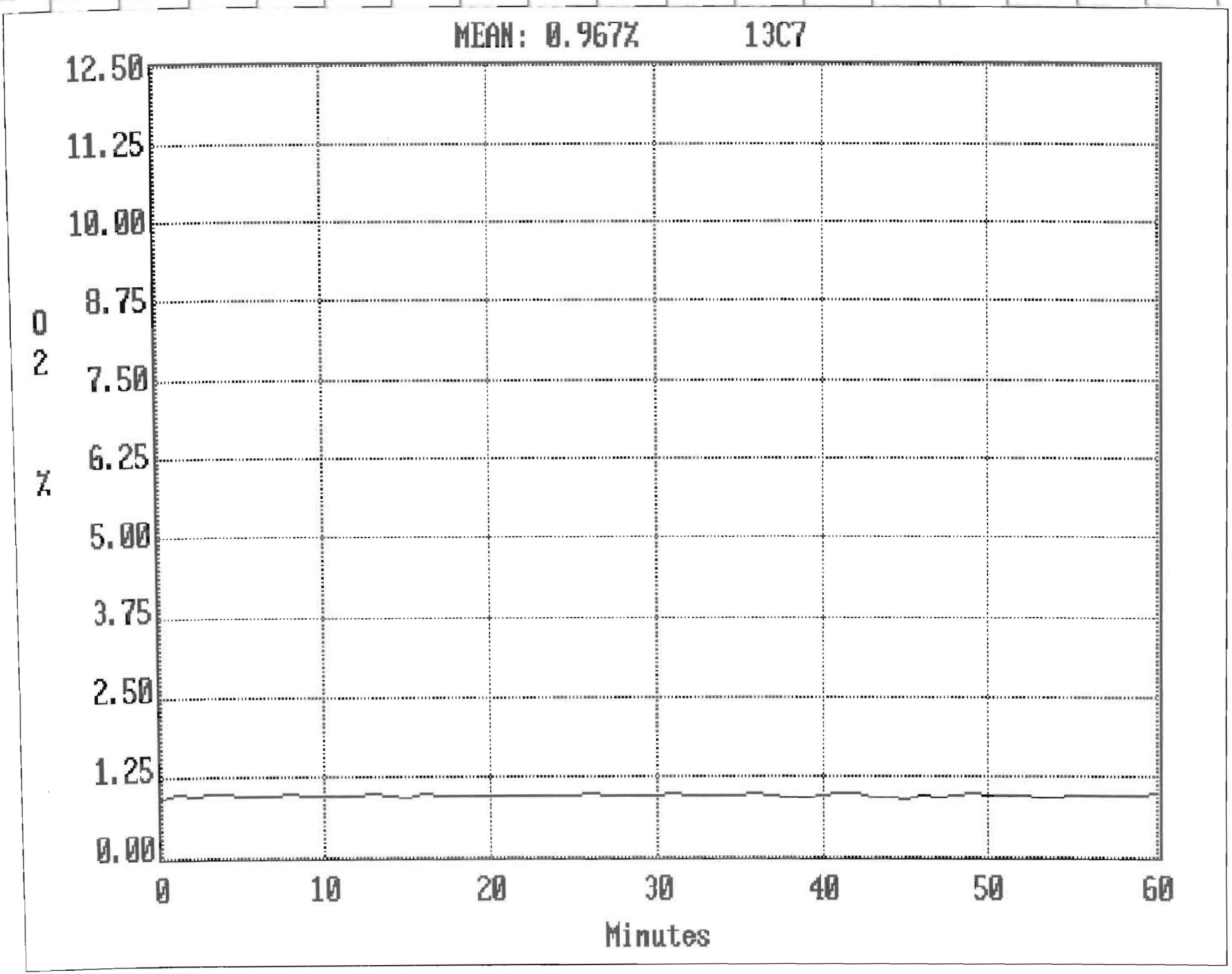
TEST DATE : 01-05-2006
START TIME: 17:51:56
FILE NAME : C:\DAQ\13C7 .ID%

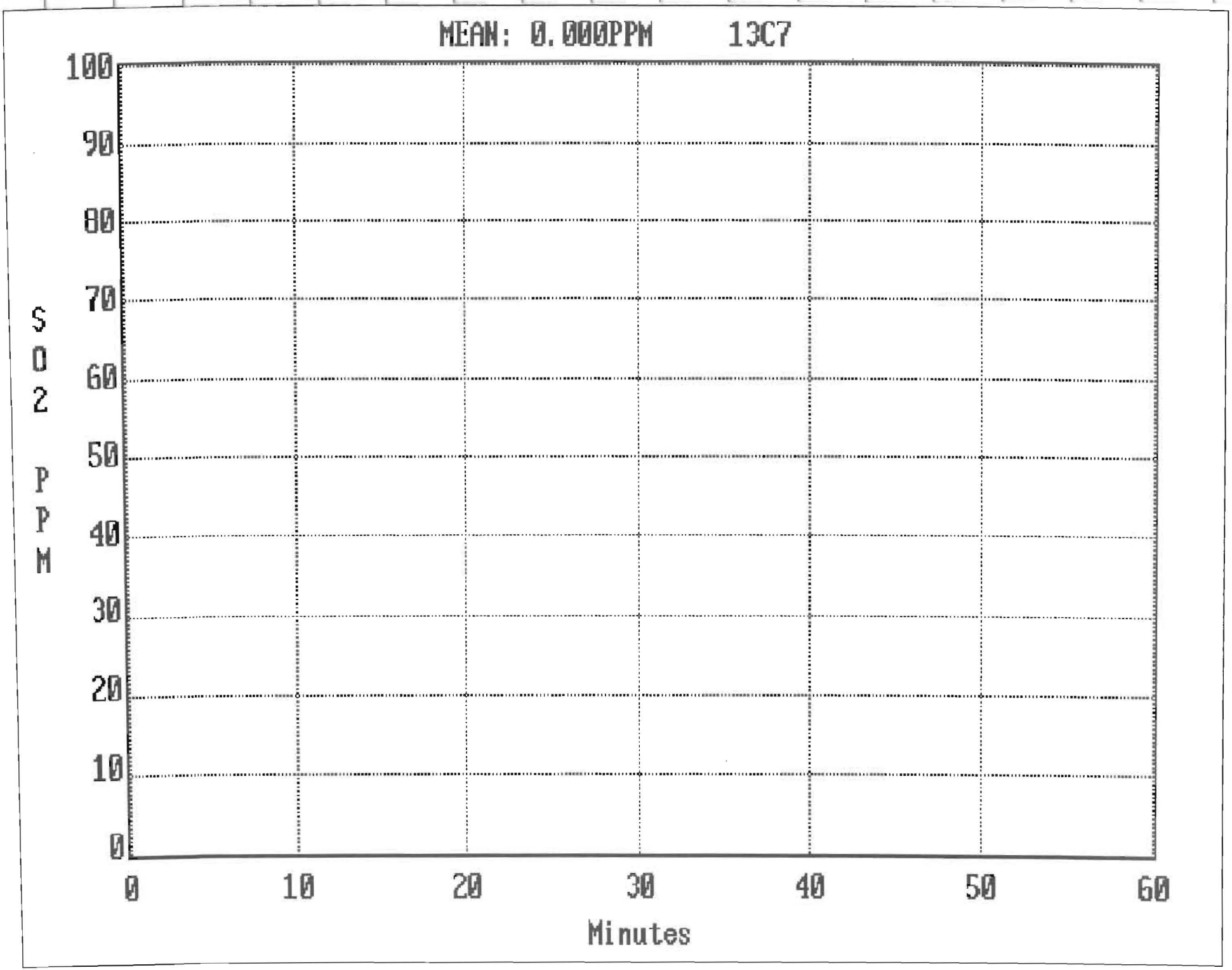
CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
<MIN>			<ANALYZER OUTPUT-VDC>					
0	0.000	3.853	0.378	0.000	1.926	7.095	3.826	0.088
1	0.000	3.933	0.401	0.000	1.832	7.075	3.831	0.027
2	0.032	3.909	0.387	0.000	1.847	7.087	3.857	0.021
3	0.041	3.878	0.402	0.001	1.750	7.082	3.812	0.037
4	0.135	3.862	0.404	0.000	1.823	7.089	3.867	0.000
5	0.056	3.855	0.391	0.000	1.781	7.097	3.843	0.000
6	0.037	3.864	0.393	0.000	1.750	7.090	3.845	0.000
7	0.000	3.811	0.391	0.000	1.817	7.100	3.860	0.047
8	0.046	3.772	0.399	0.000	1.737	7.095	3.859	0.028
9	0.045	3.803	0.384	0.000	1.804	7.091	3.853	0.011
10	0.000	3.840	0.388	0.000	1.748	7.088	3.854	0.000
11	0.044	3.802	0.390	0.000	1.732	7.074	3.853	0.000
12	0.000	3.789	0.391	0.000	1.785	7.096	3.853	0.000
13	0.042	3.754	0.398	0.000	1.691	7.080	3.836	0.031
14	0.111	3.786	0.391	0.000	1.767	7.086	3.840	0.000
15	0.011	3.751	0.378	0.000	1.779	7.085	3.850	0.028
16	0.102	3.840	0.396	0.000	1.746	7.090	3.848	0.000
17	0.045	3.836	0.390	0.000	1.779	7.078	3.859	0.043
18	0.061	3.783	0.382	0.000	1.679	7.093	3.857	0.032
19	0.003	3.810	0.390	0.000	1.707	7.092	3.865	0.060
20	0.013	3.674	0.390	0.000	1.715	7.096	3.868	0.000
21	0.022	3.822	0.388	0.000	1.654	7.066	3.855	0.012
22	0.105	3.794	0.383	0.000	1.761	7.081	3.836	0.039
23	0.000	3.821	0.387	0.000	1.689	7.085	3.845	0.034
24	0.062	3.805	0.385	0.000	1.700	7.074	3.829	0.030
25	0.082	3.833	0.381	0.000	1.729	7.090	3.851	0.000
26	0.085	3.810	0.396	0.000	1.647	7.068	3.853	0.000
27	0.012	3.787	0.385	0.000	1.720	7.091	3.843	0.015
28	0.050	3.808	0.382	0.000	1.678	7.098	3.847	0.024
29	0.024	3.800	0.389	0.000	1.650	7.106	3.857	0.011
30	0.002	3.844	0.385	0.000	1.715	7.100	3.853	0.033
31	0.014	3.804	0.396	0.000	1.632	7.093	3.871	0.024
32	0.000	3.826	0.392	0.000	1.651	7.073	3.854	0.000
33	0.045	3.766	0.382	0.000	1.682	7.083	3.875	0.020
34	0.019	3.732	0.386	0.000	1.632	7.085	3.875	0.000
35	0.007	3.765	0.382	0.000	1.747	7.087	3.870	0.000
36	0.042	3.831	0.394	0.000	1.672	7.078	3.857	0.034
37	0.037	3.843	0.383	0.000	1.732	7.083	3.875	0.015
38	0.081	3.834	0.377	0.000	1.700	7.096	3.859	0.000
39	0.050	3.813	0.378	0.000	1.635	7.088	3.872	0.007
40	0.046	3.783	0.387	0.000	1.698	7.093	3.865	0.022
41	0.059	3.817	0.400	0.000	1.635	7.100	3.851	0.000
42	0.042	3.864	0.396	0.000	1.701	7.081	3.864	0.050
43	0.045	3.791	0.371	0.000	1.684	7.083	3.866	0.036
44	0.053	3.835	0.378	0.000	1.603	7.066	3.875	0.006
45	0.000	3.795	0.366	0.000	1.733	7.074	3.826	0.033
46	0.004	3.875	0.387	0.000	1.682	7.074	3.880	0.000
47	0.027	3.861	0.378	0.000	1.649	7.078	3.867	0.020
48	0.002	3.759	0.386	0.000	1.714	7.074	3.842	0.000
49	0.046	3.837	0.400	0.000	1.663	7.076	3.853	0.025
50	0.000	3.858	0.392	0.000	1.703	7.082	3.847	0.042
51	0.042	3.848	0.386	0.000	1.794	7.081	3.849	0.000

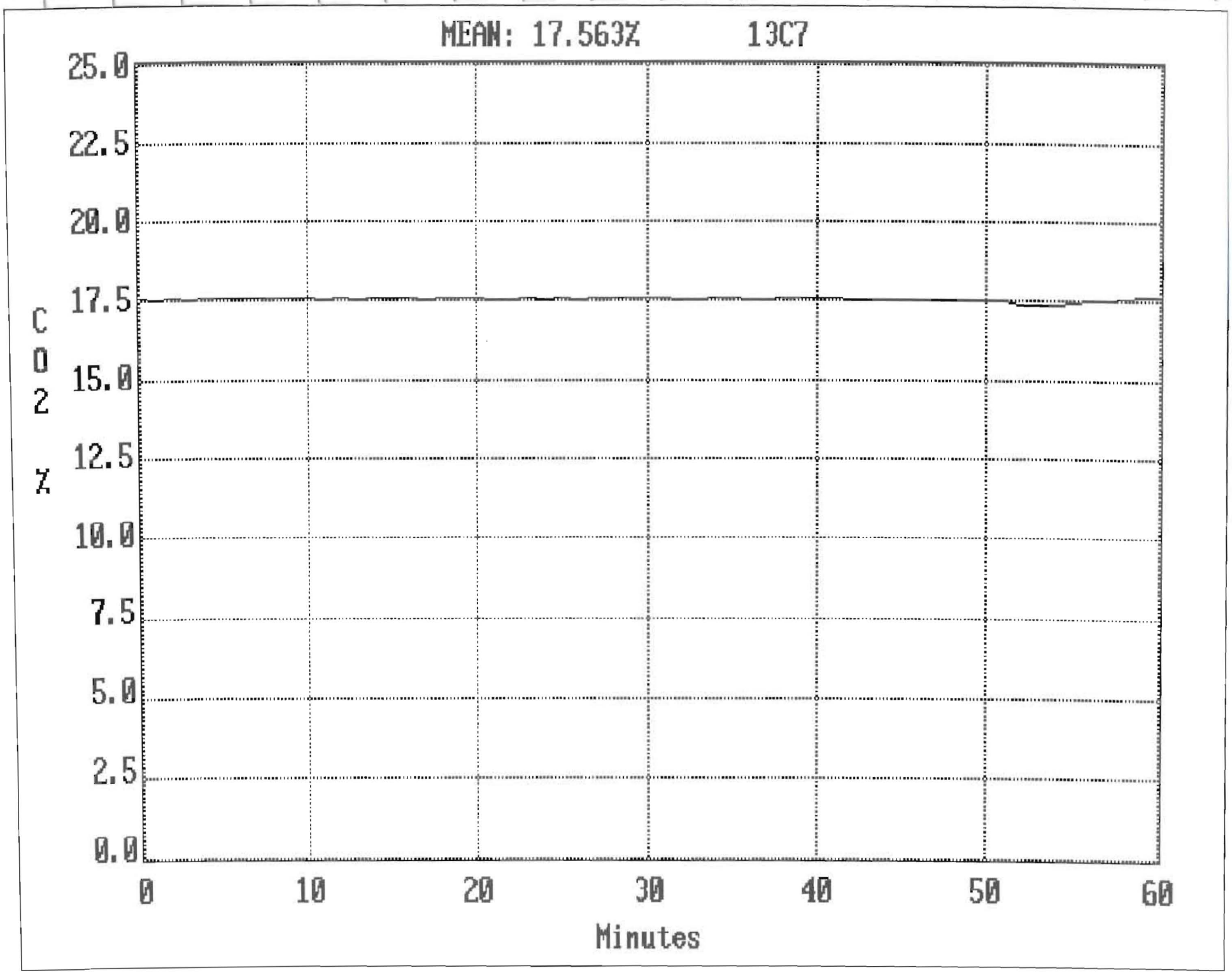
52	0.053	3.861	0.387	0.000	1.810	7.016	3.837	0.028
53	0.048	3.773	0.378	0.000	1.844	7.025	3.870	0.020
54	0.050	3.663	0.378	0.000	1.746	7.024	3.809	0.041
55	0.057	3.757	0.383	0.000	1.789	7.039	3.836	0.002
56	0.037	3.778	0.384	0.000	1.715	7.060	3.844	0.059
57	0.064	3.787	0.387	0.000	1.599	7.073	3.844	0.040
58	0.000	3.815	0.388	0.000	1.715	7.091	3.861	0.000
59	0.045	3.799	0.388	0.000	1.623	7.113	3.876	0.010
60	0.071	3.773	0.397	0.000	1.605	7.112	3.863	0.000
MEAN	0.039	3.811	0.388	0.000	1.720	7.082	3.853	0.019
END TIME:	18:51:45							
FULLSPAN	97.300	449.000	11.230	97.200	85.200	22.550	0.000	0.000
SPAN VDC	9.746	8.850	4.521	9.683	8.528	9.092	0.000	0.000
MID SPAN	52.000	249.000	5.570	54.200	45.100	11.570	0.000	0.000
MID VDC	5.063	5.212	2.107	5.327	4.504	4.578	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.076	0.000	0.002	0.000	0.000	0.000	0.000	0.000


MEAN: 0.392PPM 13C7
NOX PPM
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
Minutes


MEAN: 194.976PPM 13C7
500
450
400
350
300
250
200
150
100
50
0
CO PPM
0
10
20
30
40
50
60
Minutes


MEAN: 0.967%
13C7
12.50
11.25
10.00
8.75
7.50
6.25
5.00
3.75
2.50
1.25
0.00
O2 %
0
10
20
30
40
50
60
Minutes


MEAN: 0.000PPM 13C7
SO2 PPM
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
Minutes


MEAN: 17.563%
13C7
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
CO2 %
0
10
20
30
40
50
60
Minutes

Calibration Data

APPENDIX D

CETCON

CEDAQ- CALIBRATION TABLE

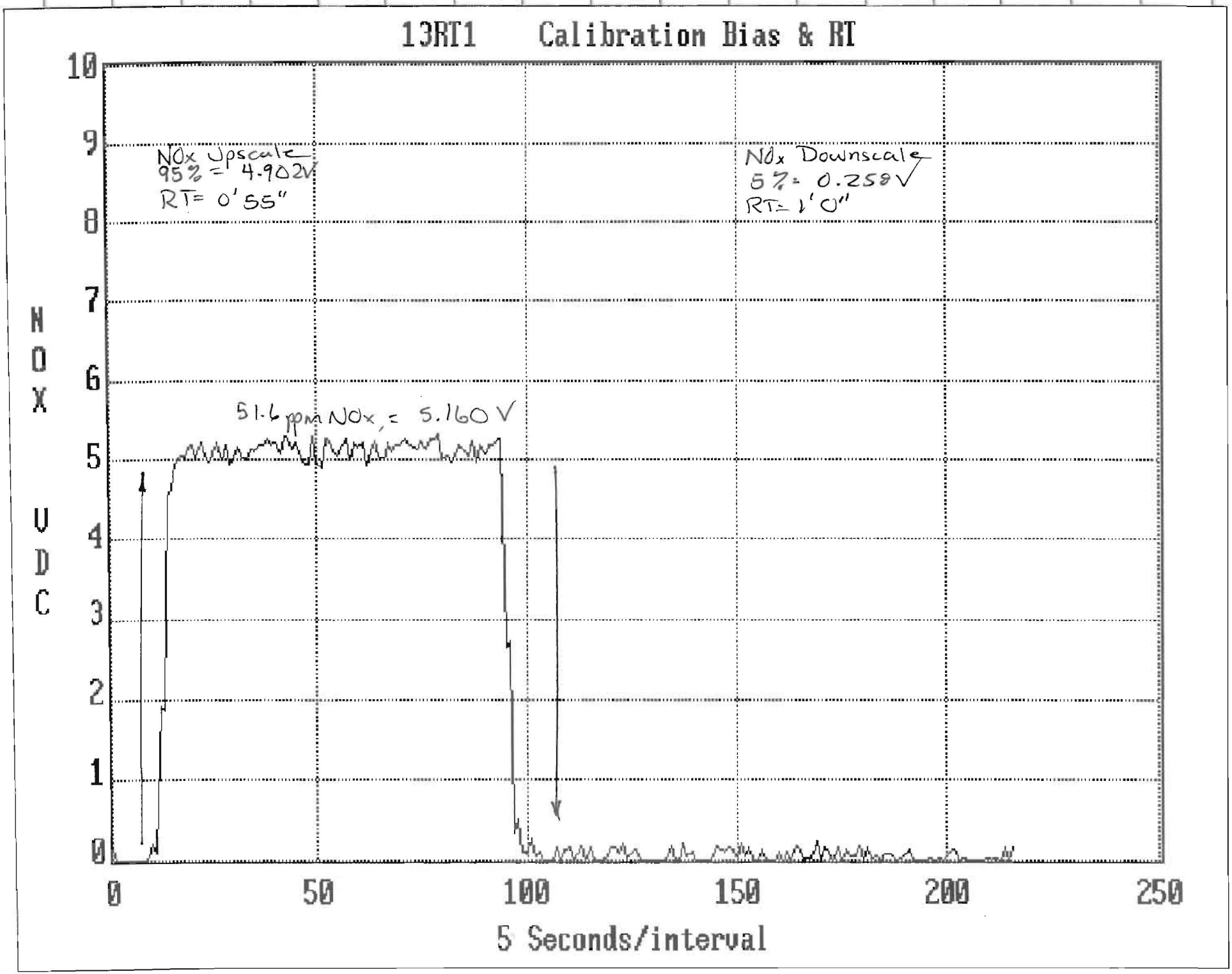
DATE:01-04-2006
TIME:10:41:29
FILE:C:\DAQ\13C1.CAL

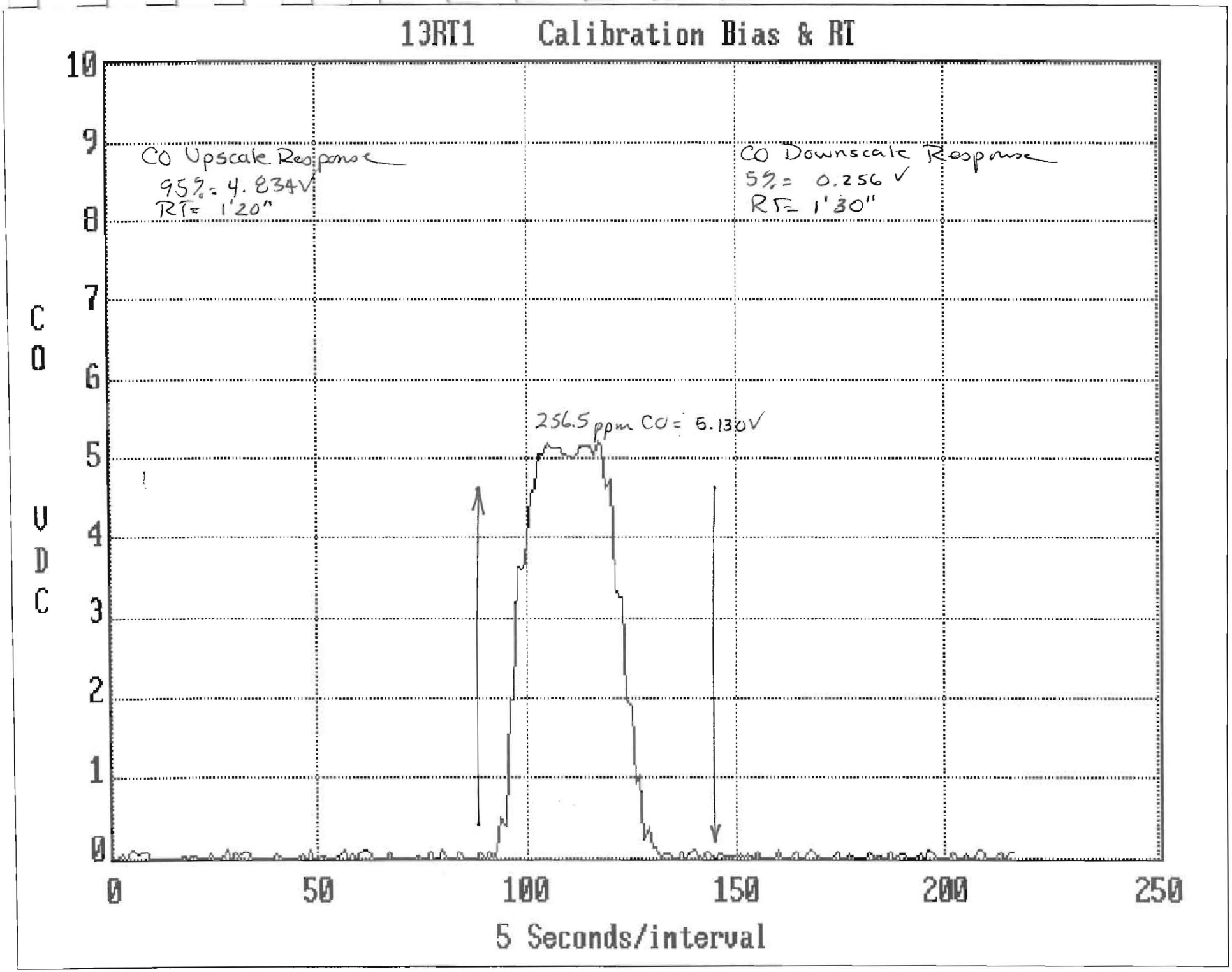
CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
FULLSPAN	97.300	449.000	11.230	97.200	0.000	22.550	0.000	0.000
SPAN VDC	9.746	8.906	4.504	9.575	0.000	9.180	0.000	0.000
MID SPAN	52.000	249.000	5.570	54.200	0.000	11.570	0.000	0.000
SPAN VDC	5.217	5.164	2.131	5.479	0.000	4.651	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.022	0.066	0.000	0.000	0.000	0.000	0.000	0.000

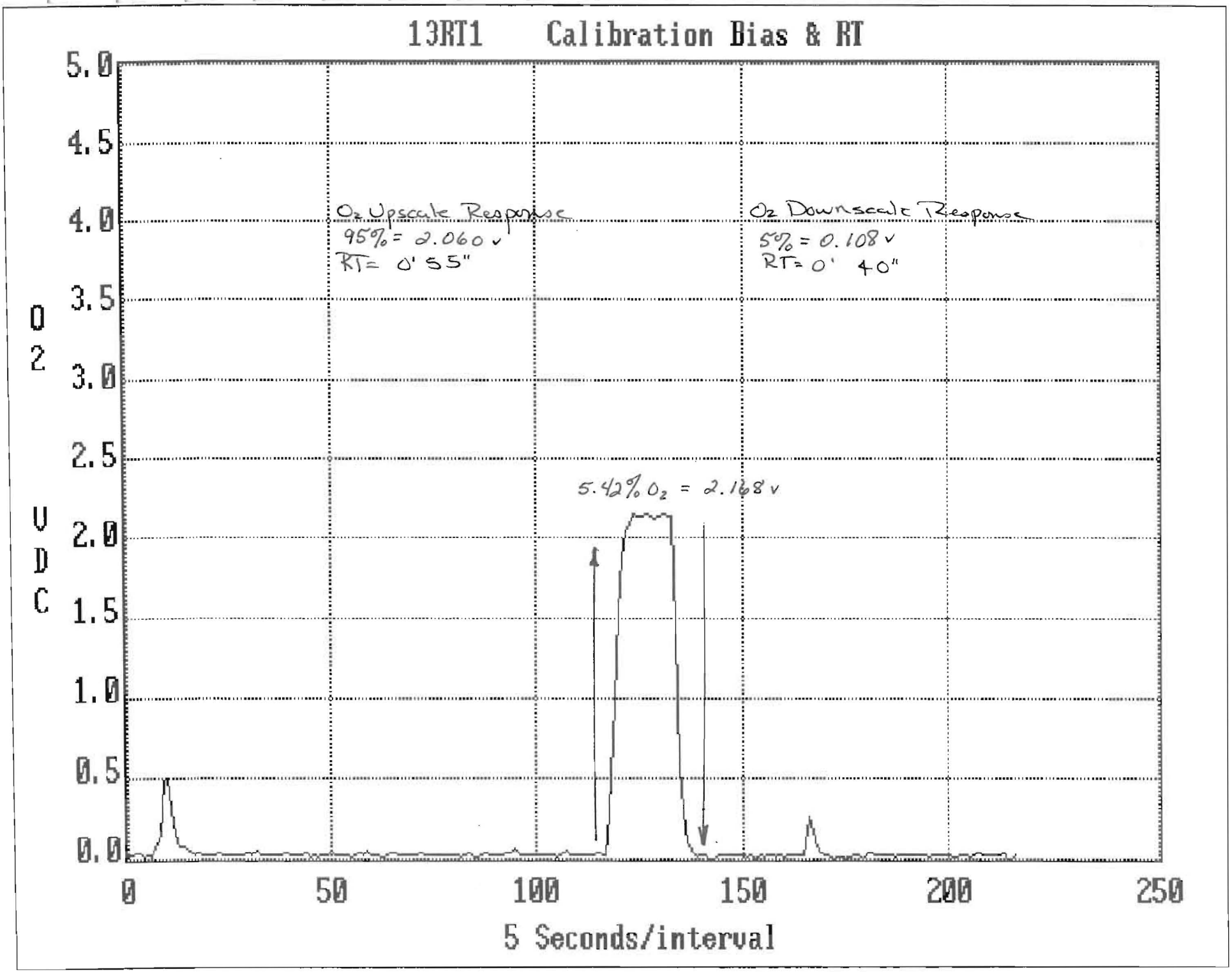
CEDAQ- CALIBRATION TABLE

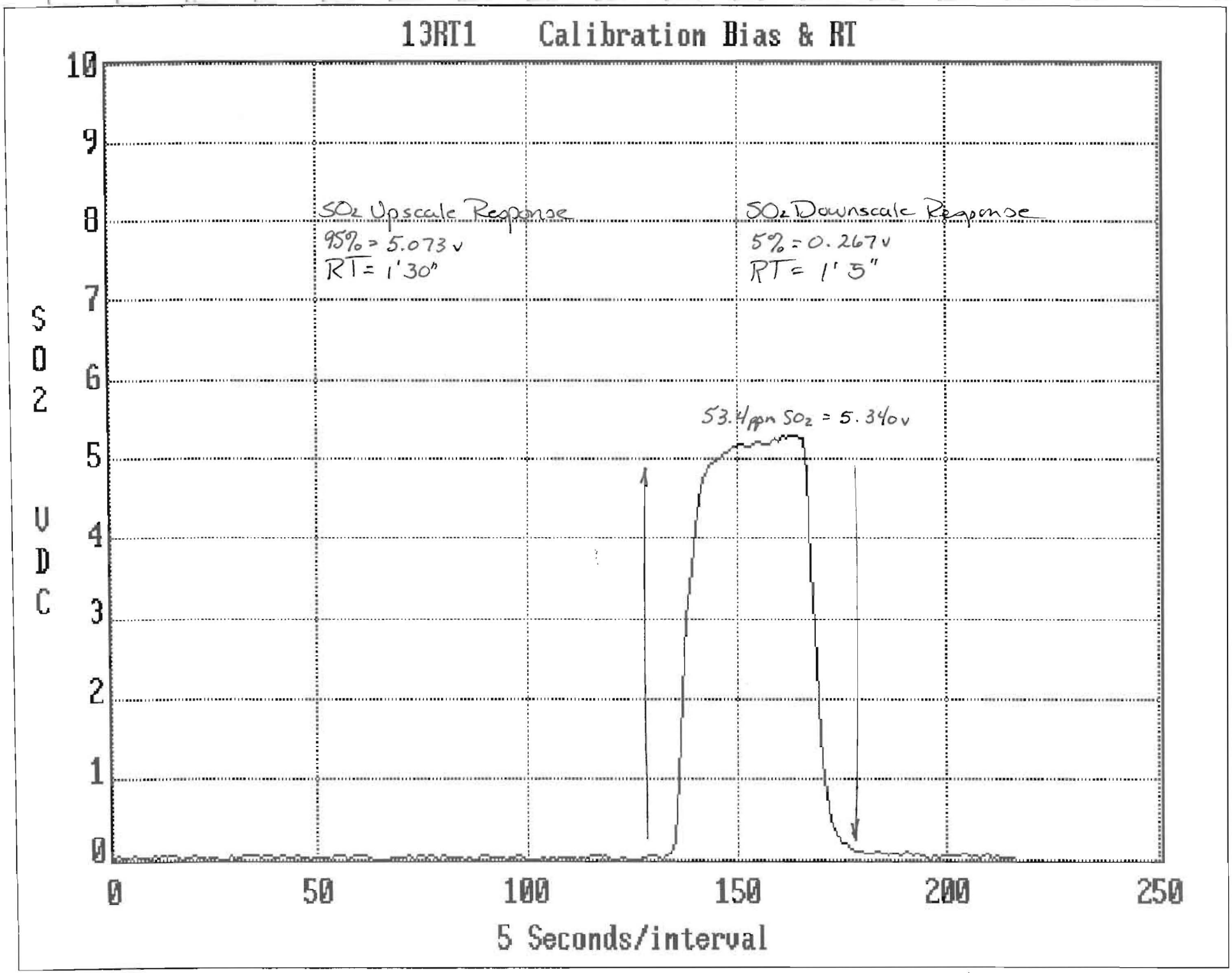
DATE:01-05-2006
TIME:08:56:03
FILE:C:\DAQ\13C4.CAL

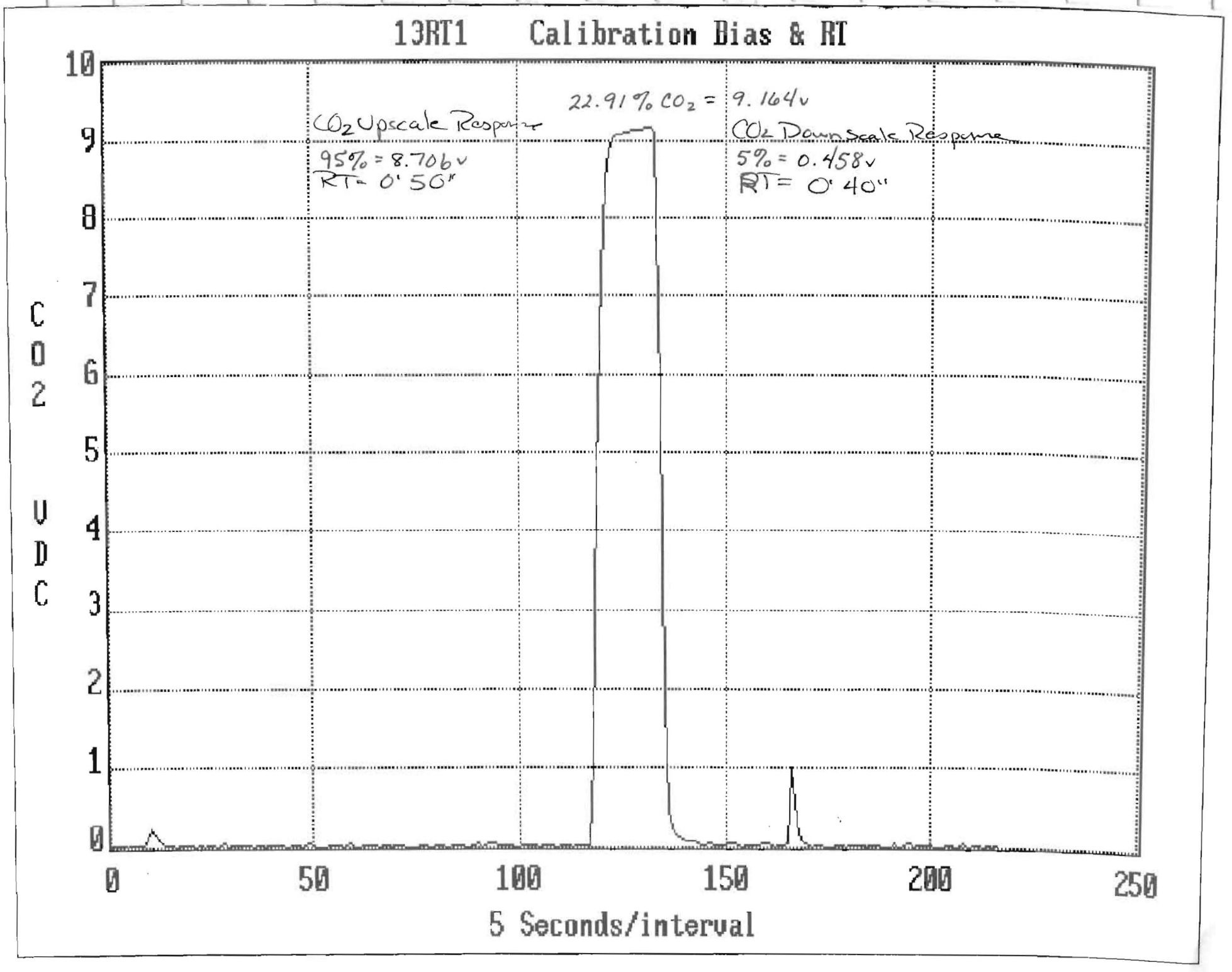
CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
FULLSPAN	97.300	449.000	11.230	97.200	85.200	22.550	0.000	0.000
SPAN VDC	9.746	8.850	4.521	9.683	8.528	9.092	0.000	0.000
MID SPAN	52.000	249.000	5.570	54.200	45.100	11.570	0.000	0.000
SPAN VDC	5.063	5.212	2.107	5.327	4.504	4.578	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.076	0.000	0.002	0.000	0.000	0.000	0.000	0.000


13RT1 Calibration Bias & RT
NOx Upscale
95% = 4.902V
RT= 0'55"
NOx Downscale
5% = 0.258V
RT= 1'0"
51.6 ppm NOx = 5.160 V
NOX VDC
0
1
2
3
4
5
6
7
8
9
10
0
50
100
150
200
250
5 Seconds/interval


13RT1 Calibration Bias & RT
CO Upscale Response
95% = 4.834V
RT = 1'20"
CO Downscale Response
5% = 0.256 V
RT = 1'30"
256.5 ppm CO = 5.130V
CO VDC
10
9
8
7
6
5
4
3
2
1
0
0
50
100
150
200
250
5 Seconds/interval


13RT1 Calibration Bias & RT
O2 VDC
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
50
100
150
200
250
5 Seconds/interval
O2 Upscale Response
95% = 2.060 v
RT = 0' 55"
O2 Downscale Response
5% = 0.108 v
RT = 0' 40"
5.42% O2 = 2.168 v


13RT1 Calibration Bias & RT
SO2 VDC
10
9
8
7
6
5
4
3
2
1
0
SO2 Upscale Response
95% = 5.073 v
RT = 1'30"
SO2 Downscale Response
5% = 0.267 v
RT = 1' 5"
53.4 ppm SO2 = 5.340 v
0
50
100
150
200
250
5 Seconds/interval


13RT1 Calibration Bias & RT
CO2 VDC
10
9
8
7
6
5
4
3
2
1
0
0
50
100
150
200
250
5 Seconds/interval
CO2 Upscale Response
95% = 8.706v
RT = 0' 50"
22.91% CO2 = 9.164v
CO2 Downscale Response
5% = 0.458v
RT = 0' 40"

CEDAQ-ANALYZER RESPONSE TIME TEST (each interval=5 sec.)

END TIME: 01-04-2006
START TIME:11:05:07
FILE NAME:C:\DAQ\13RT1 .ID%
TEST NAME:CJ4113-TPI/ARDMORE/13RT1

CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
0	0.166	0.000	0.029	0.000	0.000	0.000	0.259	0.012
1	0.000	0.000	0.029	0.039	0.000	0.020	0.229	0.061
2	0.000	0.034	0.032	0.012	0.000	0.027	0.183	0.000
3	0.000	0.000	0.034	0.015	0.000	0.027	0.117	0.059
4	0.000	0.081	0.005	0.002	0.000	0.000	0.076	0.000
5	0.000	0.090	0.017	0.046	0.000	0.010	0.081	0.000
6	0.000	0.056	0.010	0.022	0.000	0.027	0.063	0.076
7	0.000	0.083	0.071	0.022	0.000	0.010	0.085	0.002
8	0.000	0.081	0.144	0.027	0.000	0.022	0.068	0.000
9	0.034	0.000	0.488	0.000	0.000	0.139	0.088	0.010
10	0.198	0.000	0.510	0.039	0.000	0.242	0.095	0.000
11	0.110	0.000	0.325	0.017	0.000	0.154	0.105	0.000
12	1.926	0.000	0.159	0.042	0.000	0.068	0.088	0.000
13	1.868	0.000	0.083	0.032	0.000	0.024	0.110	0.005
14	4.534	0.000	0.071	0.039	0.000	0.032	0.125	0.000
15	4.663	0.000	0.044	0.039	0.000	0.017	0.186	0.010
16	4.963	0.000	0.034	0.012	0.000	0.000	0.190	0.029
17	5.063	0.027	0.029	0.005	0.000	0.012	0.166	0.000
18	5.034	0.000	0.037	0.032	0.000	0.015	0.217	0.000
19	5.154	0.022	0.022	0.017	0.000	0.012	0.208	0.066
20	5.186	0.012	0.027	0.051	0.000	0.027	0.225	0.000
21	5.022	0.000	0.024	0.029	0.000	0.000	0.247	0.110
22	5.217	0.000	0.022	0.015	0.000	0.010	0.244	0.000
23	5.068	0.000	0.034	0.007	0.000	0.005	0.232	0.000
24	4.973	0.034	0.020	0.024	0.000	0.015	0.208	0.000
25	5.081	0.000	0.024	0.012	0.000	0.020	0.247	0.083
26	5.212	0.000	0.024	0.005	0.000	0.000	0.244	0.125
27	4.995	0.010	0.029	0.000	0.000	0.017	0.234	0.051
28	5.198	0.098	0.027	0.007	0.000	0.037	0.215	0.000
29	4.956	0.000	0.027	0.034	0.000	0.000	0.232	0.000
30	5.032	0.066	0.032	0.000	0.000	0.024	0.239	0.000
31	5.176	0.027	0.027	0.032	0.000	0.015	0.259	0.000
32	5.029	0.083	0.044	0.037	0.000	0.024	0.249	0.015
33	4.998	0.078	0.020	0.044	0.000	0.017	0.273	0.000
34	5.139	0.000	0.022	0.051	0.000	0.029	0.242	0.144
35	5.100	0.000	0.027	0.059	0.000	0.000	0.254	0.095
36	5.188	0.000	0.029	0.022	0.000	0.017	0.232	0.100
37	5.181	0.000	0.020	0.042	0.000	0.032	0.227	0.000
38	5.273	0.000	0.029	0.039	0.000	0.007	0.247	0.000
39	5.195	0.000	0.034	0.032	0.000	0.012	0.247	0.000
40	5.215	0.049	0.027	0.032	0.000	0.017	0.249	0.061
41	5.076	0.000	0.027	0.049	0.000	0.020	0.254	0.000
42	5.300	0.000	0.029	0.015	0.000	0.032	0.251	0.095
43	5.278	0.000	0.027	0.027	0.000	0.005	0.266	0.000
44	5.127	0.000	0.032	0.024	0.000	0.005	0.227	0.000
45	5.208	0.000	0.012	0.037	0.000	0.024	0.247	0.000
46	5.020	0.044	0.020	0.024	0.000	0.022	0.249	0.000
47	4.954	0.000	0.015	0.015	0.000	0.000	0.266	0.000
48	4.956	0.088	0.022	0.007	0.000	0.015	0.232	0.000
49	5.303	0.000	0.020	0.022	0.000	0.034	0.237	0.000
50	4.968	0.000	0.044	0.029	0.000	0.020	0.234	0.000

0'SS"

upscale =

Nox

51	4.888	0.020	0.020	0.027	0.000	0.000	0.249	0.000
52	5.264	0.000	0.024	0.010	0.000	0.000	0.212	0.029
53	5.232	0.000	0.020	0.007	0.000	0.005	0.261	0.120
54	5.115	0.000	0.027	0.037	0.000	0.012	0.256	0.000
55	5.044	0.029	0.015	0.042	0.000	0.017	0.259	0.007
56	5.198	0.098	0.020	0.034	0.000	0.012	0.220	0.022
57	5.283	0.000	0.032	0.000	0.000	0.007	0.273	0.068
58	4.993	0.037	0.024	0.022	0.000	0.020	0.247	0.000
59	5.217	0.000	0.054	0.037	0.000	0.034	0.266	0.000
60	5.161	0.066	0.024	0.042	0.000	0.005	0.254	0.002
61	5.205	0.090	0.027	0.049	0.000	0.000	0.271	0.000
62	4.912	0.073	0.012	0.022	0.000	0.024	0.254	0.103
63	5.117	0.000	0.012	0.000	0.000	0.027	0.256	0.139
64	5.251	0.000	0.024	0.000	0.000	0.015	0.225	0.000
65	5.061	0.000	0.034	0.005	0.000	0.012	0.234	0.000
66	4.993	0.000	0.037	0.000	0.000	0.000	0.244	0.032
67	5.229	0.063	0.027	0.000	0.000	0.017	0.242	0.054
68	5.107	0.000	0.027	0.015	0.000	0.022	0.232	0.083
69	5.200	0.000	0.027	0.010	0.000	0.002	0.237	0.117
70	5.186	0.000	0.029	0.024	0.000	0.015	0.244	0.000
71	5.281	0.000	0.020	0.024	0.000	0.010	0.242	0.000
72	5.188	0.000	0.032	0.034	0.000	0.007	0.227	0.000
73	5.176	0.000	0.024	0.002	0.000	0.005	0.254	0.146
74	5.137	0.015	0.017	0.034	0.000	0.005	0.261	0.000
75	5.244	0.000	0.017	0.034	0.000	0.000	0.193	0.059
76	5.144	0.007	0.029	0.020	0.000	0.024	0.251	0.000
77	5.278	0.085	0.024	0.034	0.000	0.022	0.208	0.000
78	5.283	0.000	0.024	0.020	0.000	0.000	0.251	0.000
79	5.313	0.000	0.029	0.007	0.000	0.007	0.247	0.000
80	5.017	0.088	0.027	0.044	0.000	0.015	0.256	0.112
81	5.049	0.000	0.029	0.020	0.000	0.020	0.244	0.034
82	4.990	0.000	0.005	0.015	0.000	0.000	0.256	0.000
83	5.071	0.000	0.017	0.027	0.000	0.000	0.242	0.000
84	5.198	0.078	0.039	0.015	0.000	0.027	0.247	0.000
85	5.112	0.000	0.012	0.000	0.000	0.024	0.242	0.000
86	5.066	0.000	0.012	0.022	0.000	0.020	0.234	0.056
87	5.249	0.000	0.027	0.005	0.000	0.000	0.232	0.000
88	4.990	0.000	0.032	0.007	0.000	0.000	0.259	0.056
89	5.183	0.073	0.024	0.034	0.000	0.012	0.259	0.000
90	5.073	0.000	0.027	0.034	0.000	0.034	0.217	0.000
91	5.181	0.085	0.020	0.032	0.000	0.000	0.242	0.093
92	5.195	0.000	0.027	0.027	0.000	0.024	0.247	0.151
93	5.254	0.107	0.039	0.024	0.000	0.056	0.259	0.100
94	5.264	0.510	0.039	0.022	0.000	0.034	0.259	0.083
95	2.644	0.386	0.061	0.007	0.000	0.017	0.234	0.000
96	2.715	1.953	0.020	0.017	0.000	0.017	0.208	0.032
97	0.349	1.965	0.020	0.015	0.000	0.015	0.200	0.000
98	0.508	3.630	0.020	0.039	0.000	0.015	0.210	0.027
99	0.103	3.608	0.024	0.027	0.000	0.007	0.208	0.088
100	0.073	3.713	0.022	0.005	0.000	0.000	0.171	0.000
101	0.271	4.558	0.020	0.000	0.000	0.010	0.210	0.117
102	0.049	4.658	0.022	0.000	0.000	0.027	0.227	0.000
103	0.090	5.068	0.020	0.000	0.000	0.027	0.251	0.000
104	0.000	5.068	0.020	0.032	0.000	0.027	0.239	0.000
105	0.000	5.198	0.015	0.002	0.000	0.002	0.237	0.129
106	0.000	5.144	0.020	0.027	0.000	0.022	0.259	0.000
107	0.161	5.125	0.051	0.002	0.000	0.027	0.266	0.039
108	0.000	5.144	0.027	0.017	0.000	0.017	0.276	0.105
109	0.120	5.049	0.020	0.032	0.000	0.000	0.249	0.024
110	0.154	5.027	0.029	0.012	0.000	0.017	0.269	0.000

NO_x Downscale RF= 1/6 ⌀

CO Upscale RF= 1/20

111	0.000	5.005	0.022	0.010	0.000	0.017	0.271	0.000
112	0.076	5.059	0.029	0.000	0.000	0.010	0.212	0.000
113	0.176	5.171	0.020	0.010	0.000	0.002	0.256	0.000
114	0.000	5.154	0.022	0.002	0.000	0.015	0.247	0.046
115	0.146	5.166	0.034	0.037	0.000	0.027	0.271	0.098
116	0.000	5.044	0.020	0.039	0.000	0.027	0.232	0.000
117	0.000	5.215	0.020	0.039	0.000	0.015	0.271	0.103
118	0.000	5.168	0.286	0.032	0.000	1.108	0.391	0.000
119	0.020	4.629	0.977	0.034	0.000	4.668	1.118	0.000
120	0.142	4.739	1.543	0.007	0.000	7.310	2.163	0.000
121	0.146	3.406	1.880	0.002	0.000	8.477	3.088	0.095
122	0.063	3.267	2.039	0.000	0.000	8.862	3.855	0.000
123	0.195	3.274	2.104	0.015	0.000	9.016	4.355	0.015
124	0.012	1.965	2.158	0.000	0.000	9.067	4.724	0.000
125	0.110	1.887	2.146	0.002	0.000	9.087	4.971	0.103
126	0.125	0.918	2.139	0.000	0.000	9.097	5.039	0.042
127	0.000	1.035	2.158	0.002	0.000	9.106	5.103	0.000
128	0.000	0.247	2.144	0.032	0.000	9.121	5.195	0.115
129	0.000	0.381	2.129	0.037	0.000	9.138	5.225	0.015
130	0.000	0.115	2.146	0.034	0.000	9.133	5.239	0.010
131	0.000	0.137	2.158	0.022	0.000	9.143	5.288	0.000
132	0.000	0.000	2.146	0.007	0.000	9.153	5.308	0.000
133	0.000	0.044	2.134	0.039	0.000	9.094	5.276	0.088
134	0.168	0.054	1.428	0.068	0.000	5.701	4.690	0.029
135	0.000	0.000	0.576	0.244	0.000	1.838	3.591	0.000
136	0.000	0.000	0.188	1.018	0.000	0.483	2.671	0.000
137	0.203	0.073	0.083	2.034	0.010	0.234	1.978	0.002
138	0.046	0.000	0.039	3.020	0.032	0.144	1.440	0.000
139	0.090	0.068	0.015	3.611	0.073	0.093	1.099	0.000
140	0.000	0.098	0.029	4.180	0.073	0.063	0.835	0.015
141	0.000	0.024	0.029	4.504	0.071	0.081	0.730	0.103
142	0.000	0.000	0.000	4.771	0.100	0.073	0.583	0.000
143	0.000	0.068	0.000	4.866	0.117	0.049	0.515	0.000
144	0.000	0.051	0.027	4.941	0.098	0.029	0.491	0.017
145	0.171	0.000	0.024	4.971	0.081	0.022	0.410	0.115
146	0.120	0.049	0.017	5.002	0.115	0.044	0.381	0.000
147	0.112	0.015	0.027	5.095	0.112	0.032	0.349	0.000
148	0.164	0.020	0.022	5.085	0.103	0.012	0.361	0.061
149	0.137	0.024	0.024	5.151	0.088	0.017	0.334	0.002
150	0.012	0.000	0.022	5.164	0.125	0.032	0.371	0.125
151	0.205	0.042	0.015	5.178	0.107	0.034	0.359	0.095
152	0.037	0.000	0.022	5.171	0.081	0.034	0.313	0.120
153	0.154	0.054	0.000	5.161	0.093	0.012	0.271	0.000
154	0.005	0.000	0.020	5.178	0.122	0.000	0.313	0.127
155	0.000	0.076	0.007	5.212	0.103	0.029	0.305	0.000
156	0.137	0.000	0.027	5.186	0.100	0.022	0.305	0.046
157	0.000	0.000	0.029	5.200	0.107	0.010	0.295	0.000
158	0.000	0.000	0.010	5.195	0.122	0.017	0.295	0.000
159	0.000	0.000	0.022	5.271	0.093	0.034	0.291	0.000
160	0.088	0.088	0.010	5.229	0.107	0.046	0.298	0.000
161	0.000	0.000	0.017	5.295	0.107	0.010	0.303	0.120
162	0.090	0.000	0.027	5.269	0.110	0.000	0.283	0.042
163	0.000	0.000	0.017	5.291	0.110	0.029	0.271	0.000
164	0.193	0.081	0.020	5.288	0.083	0.027	0.317	0.098
165	0.129	0.000	0.024	5.271	0.122	0.056	0.315	0.000
166	0.000	0.000	0.259	5.264	0.115	1.006	0.442	0.068
167	0.032	0.054	0.176	4.812	0.073	0.586	0.508	0.083
168	0.017	0.103	0.073	3.665	0.061	0.166	0.476	0.071
169	0.239	0.027	0.034	2.463	0.034	0.059	0.347	0.107
170	0.002	0.000	0.017	1.514	0.000	0.012	0.273	0.000

CO Downscale RT = 1'30"

O_2 Upscale RT = 0'55"

O_2 Downscale RT = 0'40"

SO_2 Upscale RT = 1'30"

RT = 1'05"

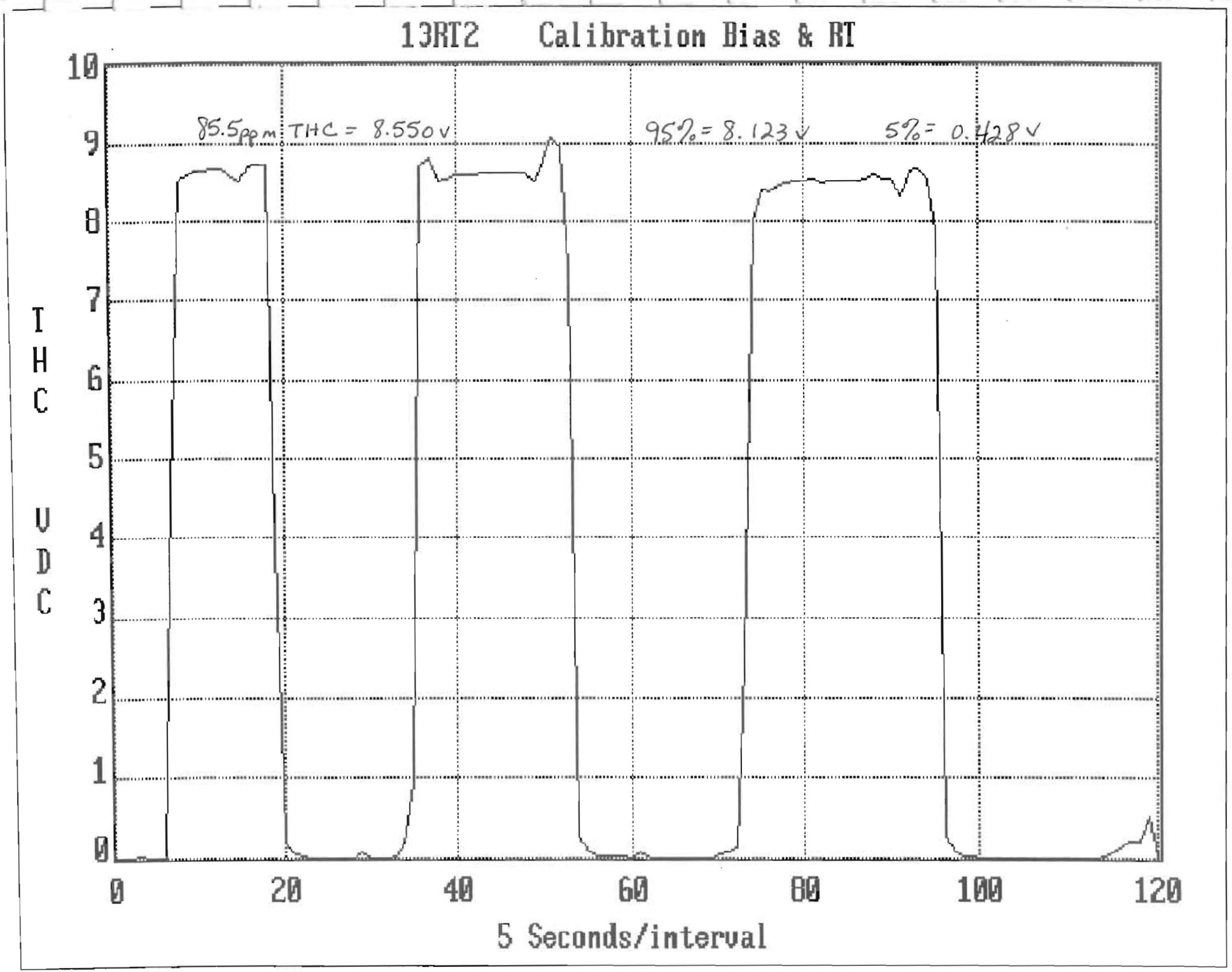
CO_2 Upscale RT = 0'50"

CO_2 Downscale RT = 0'40"

171	0.144	0.000	0.029	1.008	0.000	0.007	0.242	0.044
172	0.105	0.000	0.000	0.627	0.000	0.022	0.193	0.000
173	0.000	0.000	0.015	0.410	0.000	0.024	0.127	0.000
174	0.146	0.061	0.015	0.288	0.000	0.000	0.120	0.034
175	0.000	0.000	0.000	0.210	0.000	0.000	0.054	0.044
176	0.122	0.000	0.007	0.203	0.000	0.000	0.051	0.000
177	0.034	0.037	0.020	0.122	0.000	0.022	0.110	0.107
178	0.044	0.000	0.022	0.093	0.000	0.024	0.059	0.000
179	0.173	0.000	0.000	0.112	0.000	0.000	0.012	0.000
180	0.000	0.000	0.024	0.081	0.000	0.020	0.066	0.125
181	0.154	0.000	0.034	0.071	0.000	0.010	0.061	0.000
182	0.027	0.063	0.020	0.076	0.000	0.017	0.046	0.000
183	0.042	0.000	0.029	0.095	0.000	0.022	0.020	0.000
184	0.000	0.022	0.020	0.081	0.000	0.000	0.000	0.083
185	0.085	0.000	0.017	0.066	0.000	0.015	0.063	0.046
186	0.078	0.007	0.022	0.054	0.000	0.032	0.061	0.000
187	0.051	0.073	0.012	0.061	0.000	0.015	0.029	0.000
188	0.000	0.000	0.027	0.066	0.000	0.002	0.042	0.083
189	0.029	0.051	0.020	0.042	0.000	0.000	0.042	0.000
190	0.068	0.042	0.020	0.090	0.000	0.007	0.039	0.000
191	0.117	0.000	0.017	0.063	0.000	0.034	0.000	0.083
192	0.000	0.000	0.024	0.056	0.000	0.005	0.054	0.000
193	0.000	0.000	0.017	0.076	0.000	0.007	0.054	0.107
194	0.000	0.056	0.017	0.059	0.000	0.037	0.037	0.085
195	0.000	0.005	0.015	0.029	0.000	0.039	0.046	0.073
196	0.017	0.090	0.017	0.007	0.000	0.000	0.051	0.032
197	0.000	0.083	0.029	0.034	0.000	0.017	0.063	0.039
198	0.029	0.000	0.020	0.012	0.000	0.020	0.039	0.000
199	0.000	0.000	0.020	0.039	0.000	0.010	0.022	0.000
200	0.049	0.000	0.017	0.046	0.000	0.027	0.022	0.000
201	0.095	0.000	0.010	0.044	0.000	0.005	0.046	0.120
202	0.132	0.073	0.012	0.049	0.000	0.005	0.061	0.049
203	0.007	0.007	0.020	0.044	0.000	0.007	0.024	0.000
204	0.022	0.000	0.024	0.071	0.000	0.012	0.024	0.000
205	0.000	0.039	0.012	0.059	0.000	0.012	0.051	0.098
206	0.000	0.000	0.017	0.024	0.000	0.000	0.051	0.000
207	0.000	0.000	0.032	0.037	0.000	0.000	0.059	0.056
208	0.000	0.093	0.017	0.027	0.000	0.037	0.042	0.049
209	0.000	0.073	0.022	0.046	0.000	0.007	0.024	0.000
210	0.027	0.000	0.024	0.066	0.000	0.002	0.051	0.002
211	0.000	0.000	0.027	0.005	0.000	0.017	0.039	0.010
212	0.017	0.000	0.020	0.044	0.000	0.020	0.015	0.071
213	0.000	0.076	0.042	0.010	0.000	0.005	0.005	0.125
214	0.156	0.000	0.000	0.010	0.000	0.020	0.044	0.061
215	0.000	0.046	0.000	0.032	0.000	0.005	0.056	0.000
216	0.161	0.083	0.020	0.010	0.000	0.015	0.022	0.127
MEAN	0.161	0.083	0.020	0.032	0.122	0.015	0.056	0.127

END TIME: 11:22:20

FULLSPAN	97.30	449.00	11.23	97.20	0.00	22.55	0.00	0.00
FULL VDC	9.746	8.906	4.504	9.575	0.000	9.180	0.000	0.000
MID SPAN	52.00	249.00	5.57	54.20	0.00	11.57	0.00	0.00
MID VDC	5.217	5.164	2.131	5.479	0.000	4.651	0.000	0.000
ZERO GAS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ZERO VDC	0.022	0.066	0.000	0.000	0.000	0.000	0.000	0.000


13RT2 Calibration Bias & RT
85.5ppm THC = 8.550v
95% = 8.123v
5% = 0.428v
THC VDC
0
1
2
3
4
5
6
7
8
9
10
0
20
40
60
80
100
120
5 Seconds/interval

CEDAQ-ANALYZER RESPONSE TIME TEST (each interval=5 sec.)

END TIME: 01-05-2006
START TIME:09:02:12
FILE NAME:C:\DAQ\13RT2 .ID%
TEST NAME:CJ4113/TPI-ARDMORE/THC/13RT2

CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
0	0.049	0.049	0.027	0.083	0.000	0.000	0.337	0.007
1	0.000	0.000	0.012	0.083	0.000	0.000	0.222	0.000
2	0.000	0.039	0.024	0.068	0.000	0.000	0.166	0.000
3	0.000	0.000	0.017	0.059	0.027	0.000	0.149	0.000
4	0.000	0.027	0.017	0.073	0.000	0.002	0.107	0.083
5	0.063	0.000	0.020	0.044	0.000	0.027	0.076	0.000
6	0.061	0.051	0.017	0.076	0.000	0.000	0.056	0.027
7	0.100	0.076	0.066	0.093	4.607	0.010	0.125	0.000
8	0.012	0.054	1.655	0.056	8.521	0.000	0.271	0.000
9	0.000	0.000	4.568	0.083	8.586	0.002	0.356	0.000
10	0.042	0.078	6.514	0.061	8.652	0.000	0.491	0.020
11	0.000	0.000	7.495	0.044	8.647	0.000	0.627	0.044
12	0.000	0.024	7.927	0.056	8.662	0.007	0.718	0.046
13	0.146	0.000	8.105	0.042	8.672	0.010	0.784	0.076
14	0.029	0.000	8.174	0.071	8.591	0.000	0.808	0.000
15	0.000	0.000	8.198	0.068	8.523	0.029	0.879	0.000
16	0.054	0.000	8.228	0.088	8.699	0.000	0.920	0.000
17	0.117	0.000	8.218	0.049	8.723	0.012	0.928	0.049
18	0.000	0.029	8.215	0.071	8.718	0.017	0.964	0.090
19	0.000	0.000	8.179	0.071	3.970	0.000	0.869	0.000
20	0.000	0.000	6.946	0.066	0.193	0.000	0.676	0.049
21	0.000	0.000	4.141	0.051	0.054	0.007	0.549	0.000
22	0.088	0.054	1.887	0.093	0.020	0.002	0.454	0.000
23	0.142	0.000	0.774	0.122	0.007	0.000	0.344	0.000
24	0.105	0.029	0.325	0.071	0.000	0.007	0.212	0.000
25	0.000	0.000	0.159	0.103	0.000	0.007	0.200	0.093
26	0.000	0.000	0.085	0.078	0.000	0.005	0.156	0.000
27	0.000	0.000	0.068	0.107	0.000	0.015	0.098	0.000
28	0.132	0.051	0.046	0.081	0.000	0.000	0.098	0.051
29	0.012	0.000	0.044	0.110	0.076	0.000	0.073	0.020
30	0.134	0.000	0.054	0.071	0.000	0.000	0.076	0.012
31	0.027	0.000	0.027	0.044	0.000	0.005	0.044	0.022
32	0.000	0.000	0.027	0.081	0.000	0.000	0.012	0.083
33	0.000	0.000	0.022	0.076	0.012	0.000	0.046	0.000
34	0.000	0.049	0.042	0.063	0.171	0.000	0.032	0.081
35	0.000	0.002	0.085	0.059	0.938	0.012	0.032	0.000
36	0.000	0.090	0.583	0.061	8.687	0.000	0.222	0.005
37	0.024	0.029	3.279	0.056	8.799	0.022	0.349	0.000
38	0.129	0.007	5.730	0.068	8.501	0.000	0.466	0.000
39	0.000	0.000	7.102	0.059	8.545	0.000	0.620	0.000
40	0.005	0.000	7.734	0.034	8.582	0.005	0.671	0.103
41	0.000	0.000	8.008	0.059	8.594	0.002	0.740	0.120
42	0.010	0.000	8.127	0.083	8.584	0.000	0.837	0.073
43	0.022	0.000	8.169	0.059	8.618	0.010	0.828	0.000
44	0.000	0.000	8.193	0.100	8.613	0.007	0.867	0.000
45	0.115	0.078	8.191	0.100	8.608	0.000	0.918	0.000
46	0.078	0.000	8.220	0.100	8.621	0.000	0.903	0.000
47	0.049	0.000	8.223	0.061	8.623	0.000	0.925	0.000
48	0.000	0.044	8.215	0.076	8.625	0.005	0.955	0.000
49	0.142	0.061	8.223	0.049	8.516	0.007	0.903	0.000
50	0.000	0.000	8.235	0.085	8.772	0.000	0.967	0.085

Upscale RT = 0' 30"

Downscale RT = 0' 25"

Upscale RT = 0' 20"

Downscale RT = 0' 25"

51	0.024	0.032	8.235	0.095	9.065	0.000	0.986	0.000
52	0.000	0.000	8.230	0.078	8.953	0.020	0.999	0.000
53	0.000	0.000	8.203	0.083	7.400	0.010	0.972	0.029
54	0.000	0.032	7.629	0.081	0.251	0.005	0.845	0.000
55	0.083	0.007	5.342	0.090	0.066	0.007	0.671	0.000
56	0.137	0.078	2.751	0.093	0.029	0.000	0.510	0.000
57	0.000	0.000	1.221	0.076	0.017	0.005	0.381	0.000
58	0.000	0.046	0.525	0.076	0.010	0.000	0.266	0.000
59	0.000	0.029	0.259	0.073	0.010	0.000	0.200	0.007
60	0.000	0.005	0.129	0.083	0.000	0.000	0.171	0.000
61	0.017	0.000	0.095	0.085	0.073	0.002	0.146	0.000
62	0.000	0.078	0.059	0.054	0.005	0.010	0.071	0.000
63	0.127	0.000	0.051	0.063	0.000	0.000	0.061	0.051
64	0.000	0.000	0.032	0.056	0.000	0.000	0.085	0.000
65	0.000	0.000	0.032	0.071	0.000	0.000	0.042	0.000
66	0.000	0.076	0.032	0.083	0.000	0.017	0.029	0.000
67	0.142	0.000	0.005	0.093	0.000	0.000	0.061	0.000
68	0.000	0.024	0.022	0.073	0.000	0.000	0.027	0.000
69	0.090	0.000	0.022	0.081	0.000	0.015	0.017	0.000
70	0.022	0.000	0.024	0.100	0.039	0.000	0.034	0.088
71	0.000	0.000	0.022	0.098	0.081	0.007	0.034	0.000
72	0.051	0.063	0.051	0.095	0.122	0.000	0.020	0.000
73	0.000	0.000	0.081	0.051	2.424	0.000	0.061	0.000
74	0.000	0.000	1.265	0.095	8.008	0.002	0.212	0.107
75	0.000	0.095	3.931	0.068	8.411	0.012	0.400	0.061
76	0.000	0.000	6.001	0.068	8.386	0.000	0.505	0.000
77	0.103	0.000	7.144	0.078	8.459	0.000	0.581	0.000
78	0.000	0.000	7.734	0.049	8.484	0.000	0.681	0.000
79	0.000	0.000	7.988	0.088	8.506	0.000	0.757	0.000
80	0.046	0.090	8.113	0.093	8.503	0.005	0.784	0.000
81	0.007	0.000	8.145	0.066	8.528	0.000	0.884	0.000
82	0.000	0.037	8.184	0.063	8.491	0.000	0.952	0.000
83	0.081	0.000	8.196	0.056	8.525	0.020	0.989	0.000
84	0.000	0.000	8.203	0.081	8.521	0.005	0.969	0.000
85	0.059	0.000	8.206	0.088	8.523	0.000	0.972	0.000
86	0.137	0.000	8.218	0.107	8.506	0.000	1.011	0.022
87	0.122	0.000	8.210	0.049	8.528	0.000	0.940	0.000
88	0.000	0.000	8.218	0.115	8.601	0.000	0.938	0.000
89	0.000	0.007	8.223	0.083	8.530	0.000	0.989	0.000
90	0.078	0.090	8.223	0.090	8.533	0.000	0.986	0.000
91	0.120	0.000	8.228	0.083	8.323	0.017	0.986	0.076
92	0.000	0.000	8.232	0.105	8.655	0.000	0.977	0.000
93	0.061	0.000	8.228	0.076	8.677	0.000	1.006	0.000
94	0.000	0.000	8.210	0.066	8.547	0.002	0.986	0.000
95	0.000	0.068	8.181	0.095	7.900	0.000	0.974	0.000
96	0.024	0.000	7.375	0.122	0.271	0.002	0.791	0.000
97	0.142	0.000	4.807	0.122	0.063	0.015	0.662	0.000
98	0.000	0.000	2.307	0.125	0.029	0.000	0.513	0.000
99	0.000	0.000	0.994	0.107	0.024	0.002	0.356	0.000
100	0.000	0.000	0.413	0.093	0.000	0.005	0.273	0.000
101	0.000	0.037	0.190	0.076	0.000	0.007	0.269	0.000
102	0.000	0.000	0.098	0.137	0.000	0.027	0.164	0.017
103	0.000	0.000	0.078	0.103	0.000	0.000	0.098	0.000
104	0.010	0.095	0.054	0.098	0.000	0.000	0.112	0.005
105	0.049	0.000	0.042	0.088	0.000	0.017	0.100	0.000
106	0.005	0.000	0.037	0.100	0.000	0.000	0.063	0.000
107	0.000	0.000	0.017	0.085	0.000	0.000	0.024	0.000
108	0.000	0.000	0.024	0.085	0.000	0.010	0.088	0.083
109	0.000	0.000	0.032	0.085	0.000	0.007	0.066	0.000
110	0.000	0.000	0.010	0.107	0.000	0.000	0.039	0.000

RT = 1/6" upscale

Downscale RT = ∅ 25"

111	0.132	0.076	0.017	0.090	0.000	0.005	0.032	0.042
112	0.129	0.051	0.027	0.107	0.000	0.000	0.034	0.029
113	0.022	0.061	0.010	0.088	0.000	0.007	0.049	0.000
114	0.076	0.000	0.022	0.076	0.012	0.010	0.027	0.090
115	0.037	0.000	0.022	0.066	0.083	0.002	0.002	0.110
116	0.000	0.093	0.029	0.100	0.161	0.000	0.042	0.000
117	0.000	0.000	0.027	0.061	0.205	0.000	0.054	0.000
118	0.000	0.073	0.046	0.093	0.205	0.000	0.044	0.110
119	0.024	0.046	0.042	0.098	0.520	0.020	0.039	0.085
120	0.000	0.042	0.073	0.068	0.032	0.000	0.017	0.000
MAX	0.024	0.073	0.073	0.098	0.520	0.020	0.054	0.110
END TIME:	09:11:46							
FULLSPAN	97.300	449.000	11.230	97.200	85.200	22.550	0.000	0.000
SPAN VDC	9.746	8.850	4.521	9.683	8.528	9.092	0.000	0.000
MID SPAN	52.000	249.000	5.570	54.200	45.100	11.570	0.000	0.000
MID VDC	5.063	5.212	2.107	5.327	4.504	4.578	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.076	0.000	0.002	0.000	0.000	0.000	0.000	0.000

Date:	January 4, 2006	Operator:	JRV
Plant:	TPI Petroleum, Inc.	Job No.:	CJ-4113
Unit:	CCR Vent Scrubber		

CETCON, Inc.

NO_X/CO ANALYZER CALIBRATION DATA

NO_X

							Value, ppm	% of Span	Cylinder #
Analyzer:		Serial Number:			65868-350	Zero Gas:	0.0	0.0	SSG-1255
Make:	TECO	Span:	100	=	10	Mid Range Gas:	52.0	52.0	CC-55299
Model:	42C	Units:	ppm	=	VDC	High Range Gas:	97.3	97.3	CC-103379

Mid Range: 40-60%, High Range 80-100%

Calibration Error Test	Zero	Error, % Span	Mid	Error, % Span	High	Error, % Span	*Error*
Analyzer Response	0.0	0.0	51.7	-0.3	97.7	0.4	*≤ 2% Span*

System Bias Test	Zero	Bias, % Span	Mid	Bias, % Span	*Bias*	95% Response Time	Upscale	Downscale
System Response	0.0	0.0	51.6	-0.1	*≤ 5% Span*	Minutes:Seconds	0:55	1:00

Bias Gas Used (Mid/High)?	Mid	=	52.0	ppm	Calibration Error Response =	51.7	ppm

Sample Run #	C_{0i} ppm	C_{0f} ppm	Zero Drift % Span	Zero Bias % Span	C_{mi} ppm	C_{mf} ppm	Cal Drift % Span	Cal Bias % Span	C_{Ave} ppm	Corrected Conc., ppm
C1	0.0	0.0	0.0	0.0	51.6	51.8	0.2	0.1	0.510	0.513
C2	0.0	0.0	0.0	0.0	51.8	51.3	-0.5	-0.4	0.580	0.585
C3	0.0	0.0	0.0	0.0	51.3	50.3	-1.0	-1.4	0.380	0.389

Drift ≤ 3% Span, Bias ≤ 5% Span

CO

							Value, ppm	% of Span	Cylinder #
Analyzer:		Serial Number:			0401404630	Zero Gas:	0.0	0.0	SSG-1255
Make:	TECO	Span:	500	=	10	Mid Range Gas:	249.0	49.8	CC-180906
Model:	48C	Units:	ppm	=	VDC	High Range Gas:	449.0	89.8	CC-103311

Mid Range: 40-60%, High Range 80-100%

Calibration Error Test	Zero	Error, % Span	Mid	Error, % Span	High	Error, % Span	*Error*
Analyzer Response	0.0	0.0	256.1	1.4	446.1	-0.6	*≤ 2% Span*

System Bias Test	Zero	Bias, % Span	Mid	Bias, % Span	*Bias*	95% Response Time	Upscale	Downscale
System Response	0.4	0.1	256.5	0.1	*≤ 5% Span*	Minutes:Seconds	1:20	1:30

Bias Gas Used (Mid/High)?	Mid	=	249.0	ppm	Calibration Error Response =	256.1	ppm

Sample Run #	C_{0i} ppm	C_{0f} ppm	Zero Drift % Span	Zero Bias % Span	C_{mi} ppm	C_{mf} ppm	Cal Drift % Span	Cal Bias % Span	C_{Ave} ppm	Corrected Conc., ppm
C1	0.4	0.4	0.0	0.1	256.5	256.5	0.0	0.1	188.750	183.128
C2	0.4	0.4	0.0	0.1	256.5	257.0	0.1	0.2	188.699	182.900
C3	0.4	0.4	0.0	0.1	257.0	257.5	0.1	0.3	114.301	110.420

Drift ≤ 3% Span, Bias ≤ 5% Span

C_{0i}: Initial Zero Gas Response, ppm
C_{0f}: Final Zero Gas Response, ppm
C_0: Average Zero Gas Response, ppm

C_{mi}: Initial Span Gas Response, ppm
C_{mf}: Final Span Gas Response, ppm
C_m: Average Span Gas Response, ppm

C_{ma}: Span Gas Value, ppm
C_{Ave}: Average From Test, ppm

Drift Corrected Concentration, ppm = $(C_{Ave} - C_0) \bullet C_{ma} \div (C_m - C_0)$

Method 6C Equation: 6C-1

QA/QC Check:

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

2/1/2006

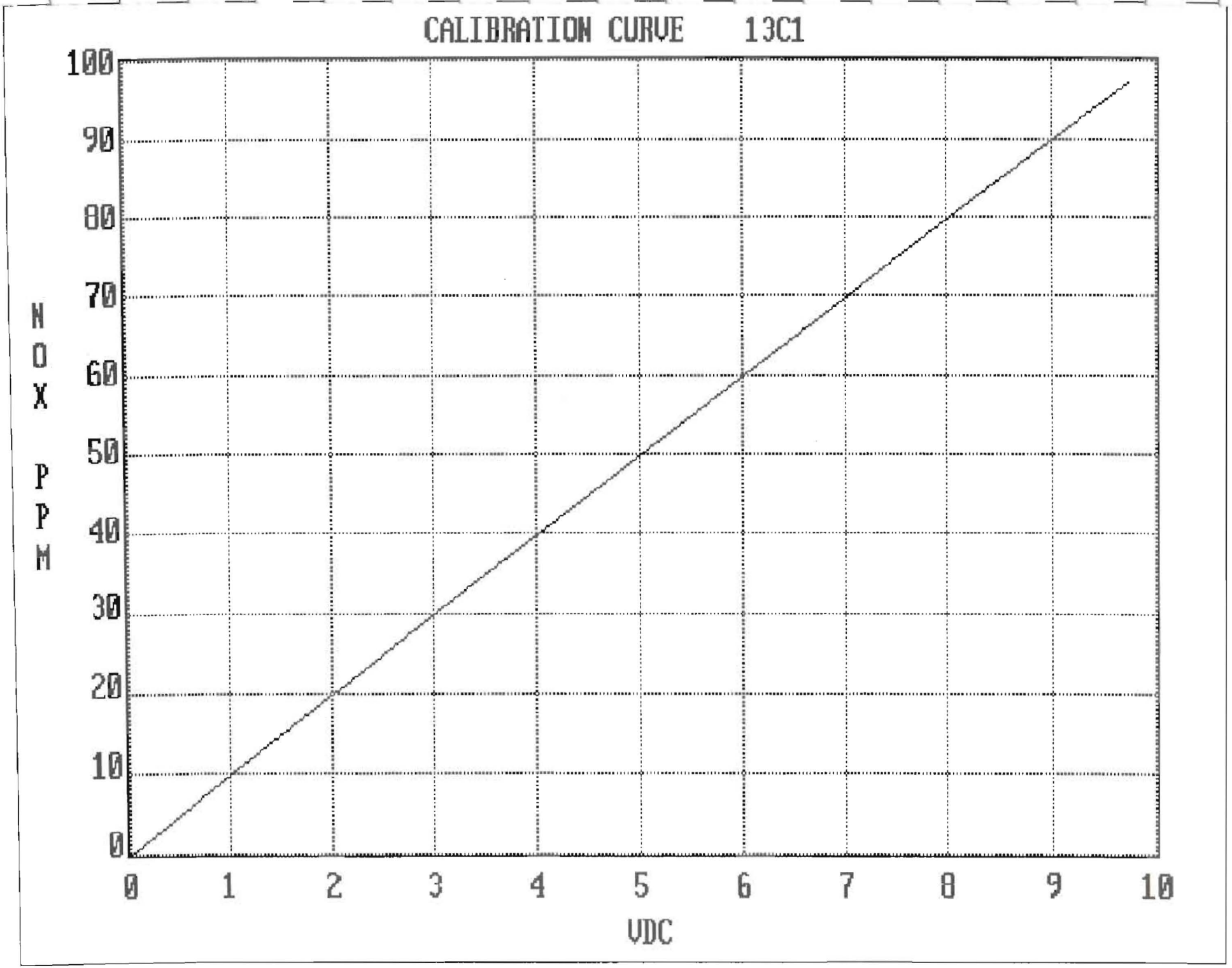
Operator (Signature/Date)

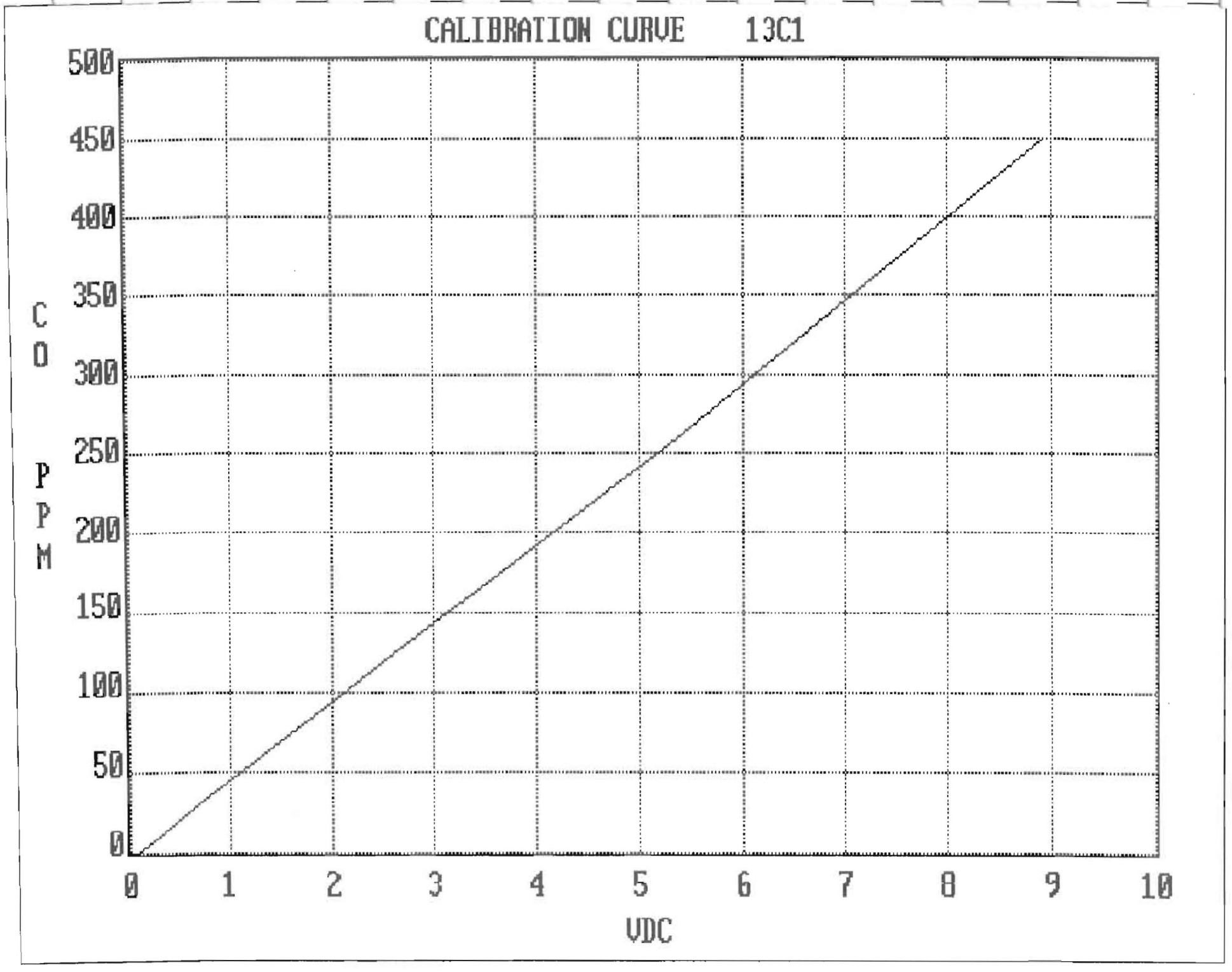
2-1-2006

Project Coordinator (Signature/Date)

© 2002 CETCON, Inc. All Rights Reserved

CALNOXCO.XLS


CALIBRATION CURVE 13C1
NOX PPM
100
90
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
6
7
8
9
10
VDC


CALIBRATION CURVE 13C1
CO PPM
500
450
400
350
300
250
200
150
100
50
0
0
1
2
3
4
5
6
7
8
9
10
VDC

Date:	January 5, 2006	Operator:	JRV
Plant:	TPI Petroleum, Inc.	Job No.:	CJ-4113
Unit:	CCR Vent Scrubber		

CETCON, Inc.

NO_X/CO ANALYZER CALIBRATION DATA

NO_X

							Value, ppm	% of Span	Cylinder #
Analyzer:		Serial Number:			65868-350	Zero Gas:	0.0	0.0	SSG-1255
Make:	TECO	Span:	100	=	10	Mid Range Gas:	52.0	52.0	CC-55299
Model:	42C	Units:	ppm	=	VDC	High Range Gas:	97.3	97.3	CC-103379

Mid Range: 40-60%, High Range 80-100%

Calibration Error Test	Zero	Error, % Span	Mid	Error, % Span	High	Error, % Span	*Error*
Analyzer Response	0.0	0.0	51.4	-0.6	97.0	-0.3	*≤ 2% Span*

System Bias Test	Zero	Bias, % Span	Mid	Bias, % Span	*Bias*	95% Response Time	Upscale	Downscale
System Response	0.0	0.0	50.4	-1.0	*≤ 5% Span*	Minutes:Seconds	0:55	1:00

Bias Gas Used (Mid/High)?	Mid	=	52.0	ppm	Calibration Error Response =	51.4	ppm

Sample Run #	C_{0i} ppm	C_{0f} ppm	Zero Drift % Span	Zero Bias % Span	C_{mi} ppm	C_{mf} ppm	Cal Drift % Span	Cal Bias % Span	C_{Ave} ppm	Corrected Conc., ppm
C5	0.0	0.0	0.0	0.0	50.4	50.4	0.0	-1.0	0.422	0.435
C6	0.0	0.0	0.0	0.0	50.4	49.7	-0.7	-1.7	0.271	0.282
C7	0.0	0.1	0.1	0.1	49.7	49.6	-0.1	-1.8	0.392	0.359

Drift ≤ 3% Span, Bias ≤ 5% Span

CO

							Value, ppm	% of Span	Cylinder #
Analyzer:		Serial Number:			0401404630	Zero Gas:	0.0	0.0	SSG-1255
Make:	TECO	Span:	500	=	10	Mid Range Gas:	249.0	49.8	CC-180906
Model:	48C	Units:	ppm	=	VDC	High Range Gas:	449.0	89.8	CC-103311

Mid Range: 40-60%, High Range 80-100%

Calibration Error Test	Zero	Error, % Span	Mid	Error, % Span	High	Error, % Span	*Error*
Analyzer Response	0.0	0.0	257.1	1.6	448.6	-0.1	*≤ 2% Span*

System Bias Test	Zero	Bias, % Span	Mid	Bias, % Span	*Bias*	95% Response Time	Upscale	Downscale
System Response	0.4	0.1	258.0	0.2	*≤ 5% Span*	Minutes:Seconds	1:20	1:30

Bias Gas Used (Mid/High)?	Mid	=	249.0	ppm	Calibration Error Response =	257.1	ppm

Sample Run #	C_{0i} ppm	C_{0f} ppm	Zero Drift % Span	Zero Bias % Span	C_{mi} ppm	C_{mf} ppm	Cal Drift % Span	Cal Bias % Span	C_{Ave} ppm	Corrected Conc., ppm
C5	0.4	0.4	0.0	0.1	258.0	258.5	0.1	0.3	193.288	186.268
C6	0.4	0.4	0.0	0.1	258.5	256.5	-0.4	-0.1	198.455	191.815
C7	0.4	0.4	0.0	0.1	256.5	256.5	0.0	-0.1	194.976	189.182

Drift ≤ 3% Span, Bias ≤ 5% Span

C_{0i}: Initial Zero Gas Response, ppm
C_{0f}: Final Zero Gas Response, ppm
C_0: Average Zero Gas Response, ppm
Drift Corrected Concentration, ppm =

C_{mi}: Initial Span Gas Response, ppm
C_{mf}: Final Span Gas Response, ppm
C_m: Average Span Gas Response, ppm
$(C_{Ave} - C_0) \cdot C_{ma} \div (C_m - C_0)$

C_{ma}: Span Gas Value, ppm
C_{Ave}: Average From Test, ppm

Method 6C Equation. 6C-1

QA/QC Check:

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

2/1/2006

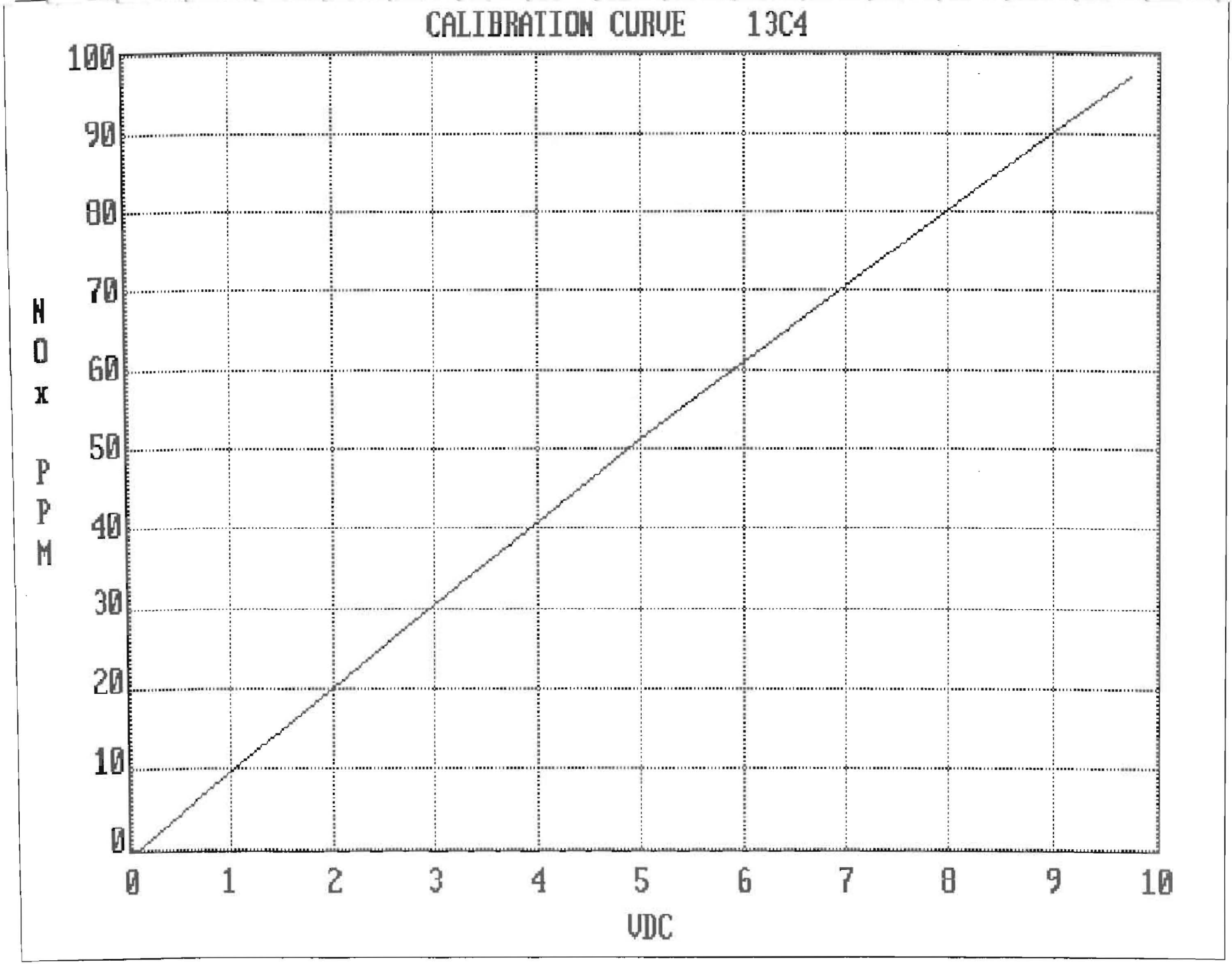
Operator (Signature/Date)

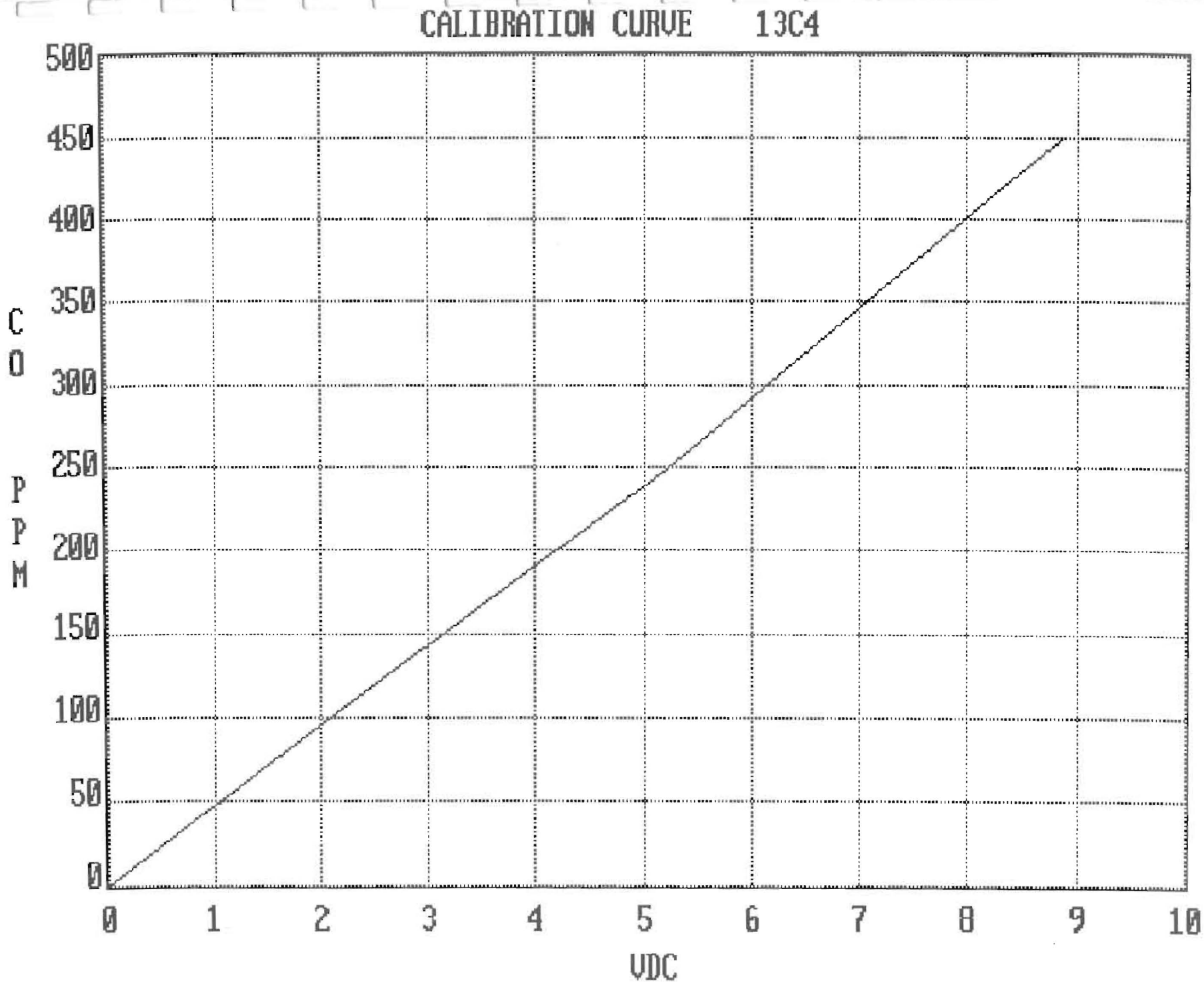
2-1-2006

Project Coordinator (Signature/Date)

© 2002 CETCON, Inc. All Rights Reserved

CALNOXCO.XLS


CALIBRATION CURVE 13C4
NOx PPM
100
90
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
6
7
8
9
10
VDC


CALIBRATION CURVE 13C4
CO PPM
500
450
400
350
300
250
200
150
100
50
0
0
1
2
3
4
5
6
7
8
9
10
VDC

Inv.

Superior Specialty Gas Services, Inc.

P.O. Box 470466
Tulsa, Ok 74147
(918) 592-0081
Fax: (918) 592-0095

CERTIFICATE OF CONFORMANCE

October 31, 2005

Cetcon
4953 S. 45th West Ave.
Tulsa, OK 74170

Purchase Order: 9329

Product: Nitrogen, Ultra High Purity Grade

Cylinder SN#: SSG-1354, ~~SSG-1255~~ ZERO GAS

REPORTED IN MOLE %

Minimum Purity	Component	Analysis
99.999%	Nitrogen	
	Oxygen	<2.0 ppm
	Moisture	<2.0 ppm
	THC	<0.5 ppm

Brian Roper

Analyst: Brian Roper

CETCON I

AIR LIQUIDE

CERTIFICATE OF ANALYSIS
Interference-Free Multi-Component EPA Protocol Gases

Note: Analytical uncertainty and NIST traceability are in compliance with EPA-600/R-97/121
Section No. 2.2, Procedure . G-1

Cylinder Number: CC55299

Customer: CETCON
TULSA, OK
P.O. Number: 9005
Item Number:

Shipping Order Number 15331592
Transfer Number: 15331632
Lot Number: SFS77489
Valve: CGA 660
Cyl. Pressure:* 2000PSIG
*Cylinder should not be used when gas pressure is below 150 psig

Assay Date: 1-Mar-05

Expiration Date: 1-Mar-07

Component	REQUESTED Concentration	ASSAY Concentration		
Nitric Oxide	**50-53.6 ppm**	**52.0**	**± 0.8**	**ppm**
NOx		**52.0**	**ppm**	
Nitrogen	**Balance**	**Balance**		

Reference Standard Employed For Analysis:

Concentration				Component	Balance	Cyl. No.	SRM or GMIS NTRM No.	Exp. Date	Sample No.	Type
51.2	±	0.6	ppm	Nitric Oxide	Nitrogen	CC69882	SFS60187	03/25/06	NT	GMIS

Analysis Information:

Component	Nitric Oxide		First Triad Analysis 02/22/05					Second Triad Analysis 03/01/05				
Analyzer Information			Trial 1	Trial 2	Trial 3	Units			Trial 4	Trial 5	Trial 6	Units
Manufacturer:	Beckman	Zero	0	0	0	ppm		Zero	0	0	0	ppm
Model Number:	951A	Reference	509	508	509	ppm		Reference	514	515	515	ppm
Serial Number:	00100508	Candidate	517	517	517	ppm		Candidate	522	522	522	ppm
MPR Last Calibrated:	02/25/05	Result	52.00	52.11	52.00	ppm		Result	52.00	51.90	51.90	ppm
Analytical Principle:	Chemiluminescent	Evaluation	VALID	VALID	VALID			Evaluation	VALID	VALID	VALID	
			MEAN ANALYTICAL RESULT:			52.04	ppm		MEAN ANALYTICAL RESULT:			51.93	ppm

Analyst Signature: _____ Thuan Tran

Approved by: _____ Eric Barron

Air Liquide America L.P.
8832 Dice Road, Santa Fe Spring, CA 90670-2516

AIR LIQUIDE

CERTIFICATE OF ANALYSIS

Interference-Free Multi-Component EPA Protocol Gases

Note: Analytical uncertainty and NIST traceability are in compliance with EPA-600/R-97/121
Section No. 2.2, Procedure . G-1

Cylinder Number: CC103379

Customer: CETCON
TULSA, OK
P.O. Number: 9113
Item Number:

Shipping Order Number 16404034
Transfer Number: 16404034
Lot Number: SFS86087
Valve: CGA 660
Cyl. Pressure:* 2000PSIG
*Cylinder should not be used when gas pressure is below 150 psig

Assay Date: 23-May-05

Expiration Date: 23-May-07

Component	REQUESTED Concentration	ASSAY Concentration		
Nitric Oxide	**96-98 ppm**	**97.1**	**± 2.2**	**ppm**
NOx		**97.3**	**ppm**	
Nitrogen	**Balance**	**Balance**		

Reference Standard Employed For Analysis:

Concentration				Component	Balance	Cyl. No.	SRM or GMIS NTRM No.	Exp. Date	Sample No.	Type
100	±	2	ppm	Nitric Oxide	Nitrogen	CC 155872	SFS52228	05/13/05	MC	GMIS

Analysis Information:

Component	Nitric Oxide		First Triad Analysis 05/16/05					Second Triad Analysis 05/23/05				
Analyzer Information			Trial 1	Trial 2	Trial 3	Units			Trial 4	Trial 5	Trial 6	Units
Manufacturer:	Beckman	Zero	0	0	0	Vdc		Zero	0	0	0	Vdc
Model Number:	951A	Reference	1003	1004	1003	Vdc		Reference	1006	1007	1005	Vdc
Serial Number:	00100508	Candidate	975	975	974	Vdc		Candidate	977	978	977	Vdc
MPR Last Calibrated:	04/29/05	Result	97.21	97.11	97.11	ppm		Result	97.12	97.12	97.21	ppm
Analytical Principle:	Chemiluminescent	Evaluation	VALID	VALID	VALID			Evaluation	VALID	VALID	VALID	
		MEAN ANALYTICAL RESULT:				97.14	ppm	MEAN ANALYTICAL RESULT:				97.15	ppm

Analyst Signature: _____ Thuan Tran

Approved by: _____ Eric Barron

AIR LIQUIDE AMERICA, L.P. Region Office • 8822 Dice Road, Santa Fe Springs, CA 90670-2569
Phone: (562) 945-1383 • Fax: (562) 693-1156

AIR LIQUIDE

CERTIFICATE of ANALYSIS

EPA Protocol Gases

Cyl. Number:	Cyl. Pressure:*	Lot Number:
CC103311	2000 PSIG	SFS77496
Assay Date:	**Expiration Date:**	**Document Number:**
02/22/05	02/22/08	15331661
Customer:	**P.O. Number:**	**Item Number:**
CETCON TULSA, OK	9005	SO # 15331592

COMPONENT Name	REQUESTED Concentration	ASSAY Concentration
Carbon Monoxide	427.5-472.5 ppm	449 ± 6 ppm
Nitrogen	Balance	Balance

*Mixture is valid only to 150 psig

EPA Protocol
Section No. 2.2, Procedure . G-1

REFERENCE STANDARD EMPLOYED FOR ANALYSIS

Concentration	Component	Balance	Cyl. No.	SRM or GMIS NTRM No.	Exp. Date	Sample No.	Type
500 ± 4 ppm	Carbon Monoxide	Nitrogen	CC 150327	SFS48669	04/02/05	LU	GMIS

Analyst: Eric Barron
Approved by: Thuan Tran

Carbon Monoxide

GAS ANALYZER EMPLOYED

Manufacturer:	Varian(B)
Model Number:	3400
Serial Number:	2806
MPR Last Calibrated:	02/22/05
Analytical Principle:	FID & TCD

ANALYSIS SUMMARY

	02/15/05 Triad 1	02/15/05 Triad 2	02/15/05 Triad 3	Carbon Monoxide Units
Zero	0	0	0	ppm
Reference	505.5	504.0	502.0	ppm
Candidate	451.4	450.4	451.1	ppm
Result	446.5	446.8	449.3	ppm
Evaluation	VALID	VALID	VALID	
MEAN ANALYTICAL RESULT:				447.5 ppm

	02/22/05 Triad 4	02/22/05 Triad 5	02/22/05 Triad 6	Carbon Monoxide Units
Zero	0	0	0	ppm
Reference	505.6	505.6	504.7	ppm
Candidate	454.8	454.9	455.6	ppm
Result	449.8	449.9	451.4	ppm
Evaluation	VALID	VALID	VALID	
MEAN ANALYTICAL RESULT:				450.3 ppm

Analyst:	Approved by:
Eric Barron	

Air Liquide America L.P.
8832 Dice Road, Santa Fe Spring, CA 90670-2516
Phone: (562) 945-1383 Fax: (562) 693-1156

Date:	January 4, 2006			Operator:	JRV
Plant:	TPI Petroleum, Inc.			Job No.:	CJ-4113
Unit:	CCR Vent Scrubber				

CETCON, Inc.

O_2/CO_2 ANALYZER CALIBRATION DATA

Analyzer:	O_2	Serial Number:			X1440D173B	Zero Gas:	Value, %	% of Span	Cylinder #
Make:	Servomex	Span:	12.5	=	5	Mid Range Gas:	0.00	0.0	SSG-1255
Model:	1440	Units:	%	=	VDC	High Range Gas:	5.57	44.6	CC-120705
							11.23	89.8	CC-98423

Mid Range: 40-60%, High Range 80-100%

Calibration Error Test	Zero	Error, % Span	Mid	Error, % Span	High	Error, % Span	*Error*
Analyzer Response	0.07	0.6	5.42	-1.2	11.37	1.1	*≤ 2% Span*

System Bias Test	Zero	Bias, % Span	Mid	Bias, % Span	*Bias*	95% Response Time	Upscale	Downscale
System Response	0.12	0.4	5.42	0.0	*≤ 5% Span*	Minutes:Seconds	0:55	0:40

Bias Gas Used (Mid/High)? Mid = 5.57 % Calibration Error Response = 5.42 %

Sample Run #	C_{0i} %	C_{0f} %	Zero Drift % Span	Zero Bias % Span	C_{mi} %	C_{mf} %	Cal Drift % Span	Cal Bias % Span	C_{Ave} %	Corrected Conc., %
C1	0.12	0.13	0.1	0.5	5.42	5.38	-0.3	-0.3	1.049	0.976
C2	0.13	0.13	0.0	0.5	5.38	5.38	0.0	-0.3	1.041	0.967
C3	0.13	0.11	-0.2	0.3	5.38	5.40	0.2	-0.2	0.934	0.860

Drift ≤ 3% Span, Bias ≤ 5% Span

Analyzer:	CO_2	Serial Number:			X1440D173A	Zero Gas:	Value, %	% of Span	Cylinder #
Make:	Servomex	Span:	25	=	10	Mid Range Gas:	0.00	0.0	SSG-1255
Model:	1440	Units:	%	=	VDC	High Range Gas:	11.57	46.3	CC-98423
							22.55	90.2	CC-120705

Mid Range: 40-60%, High Range 80-100%

Calibration Error Test	Zero	Error, % Span	Mid	Error, % Span	High	Error, % Span	*Error*
Analyzer Response	0.05	0.2	11.64	0.3	23.01	1.8	*≤ 2% Span*

System Bias Test	Zero	Bias, % Span	High	Bias, % Span	*Bias*	95% Response Time	Upscale	Downscale
System Response	0.15	0.4	22.91	-0.4	*≤ 5% Span*	Minutes:Seconds	0:50	0:40

Bias Gas Used (Mid/High)? HIGH = 22.55 % Calibration Error Response = 23.01 %

Sample Run #	C_{0i} %	C_{0f} %	Zero Drift % Span	Zero Bias % Span	C_{mi} %	C_{mf} %	Cal Drift % Span	Cal Bias % Span	C_{Ave} %	Corrected Conc., %
C1	0.15	0.12	-0.1	0.3	22.91	22.77	-0.6	-1.0	16.774	16.525
C2	0.12	0.11	0.0	0.2	22.77	22.75	-0.1	-1.0	16.965	16.779
C3	0.11	0.12	0.0	0.3	22.75	22.81	0.2	-0.8	12.413	12.236

Drift ≤ 3% Span, Bias ≤ 5% Span

C_{0i}: Initial Zero Gas Response, %
C_{0f}: Final Zero Gas Response, %
C_0: Average Zero Gas Response, %
C_{mi}: Initial Span Gas Response, %
C_{mf}: Final Span Gas Response, %
C_m: Average Span Gas Response, %
C_{ma}: Span Gas Value, %
C_{Ave}: Average From Test, %

Drift Corrected Concentration, % = $(C_{Ave} - C_0) \bullet C_{ma} \div (C_m - C_0)$

Method 6C Equation: 6C-1

QA/QC Check:

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

2/1/2006

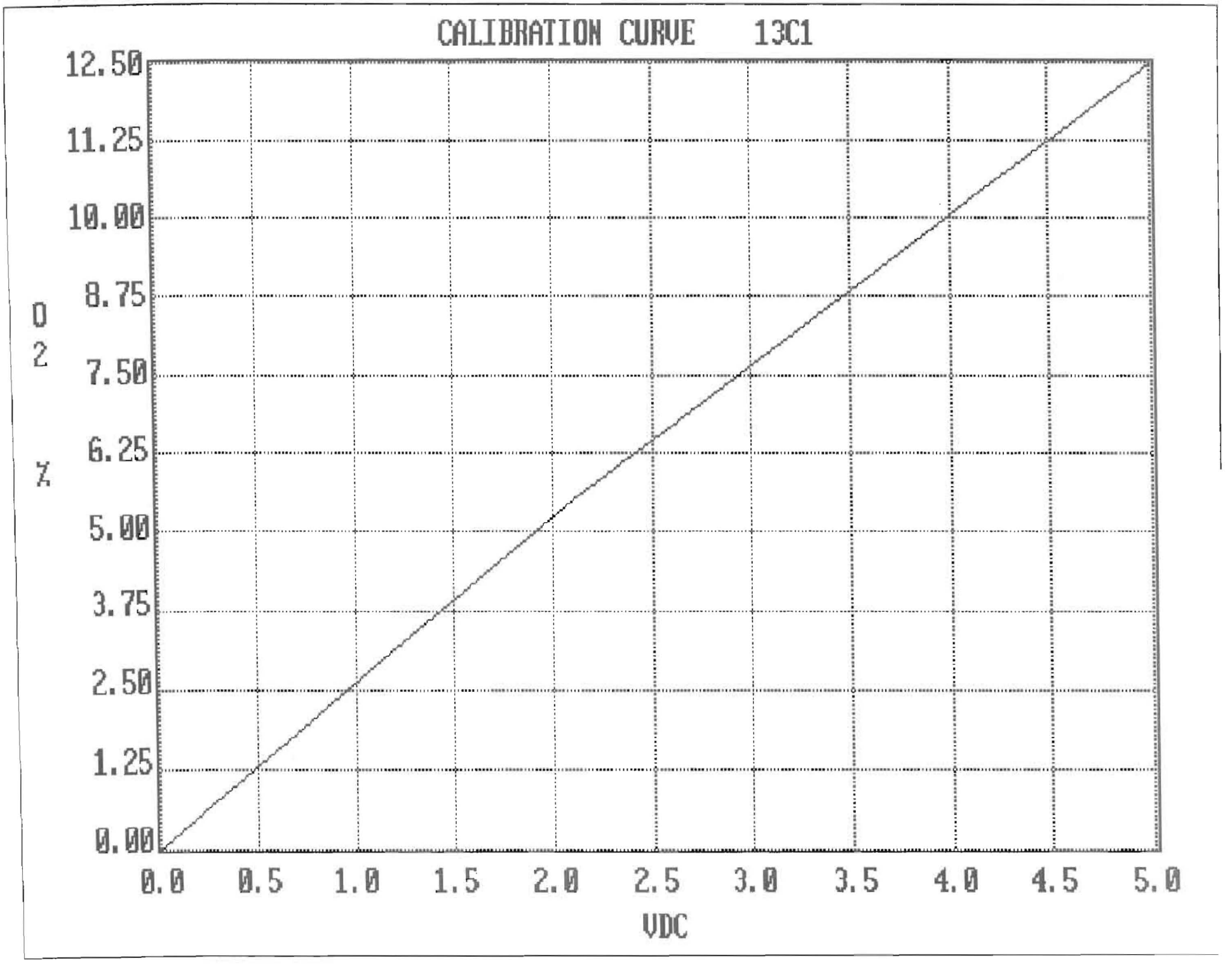
Operator (Signature/Date)

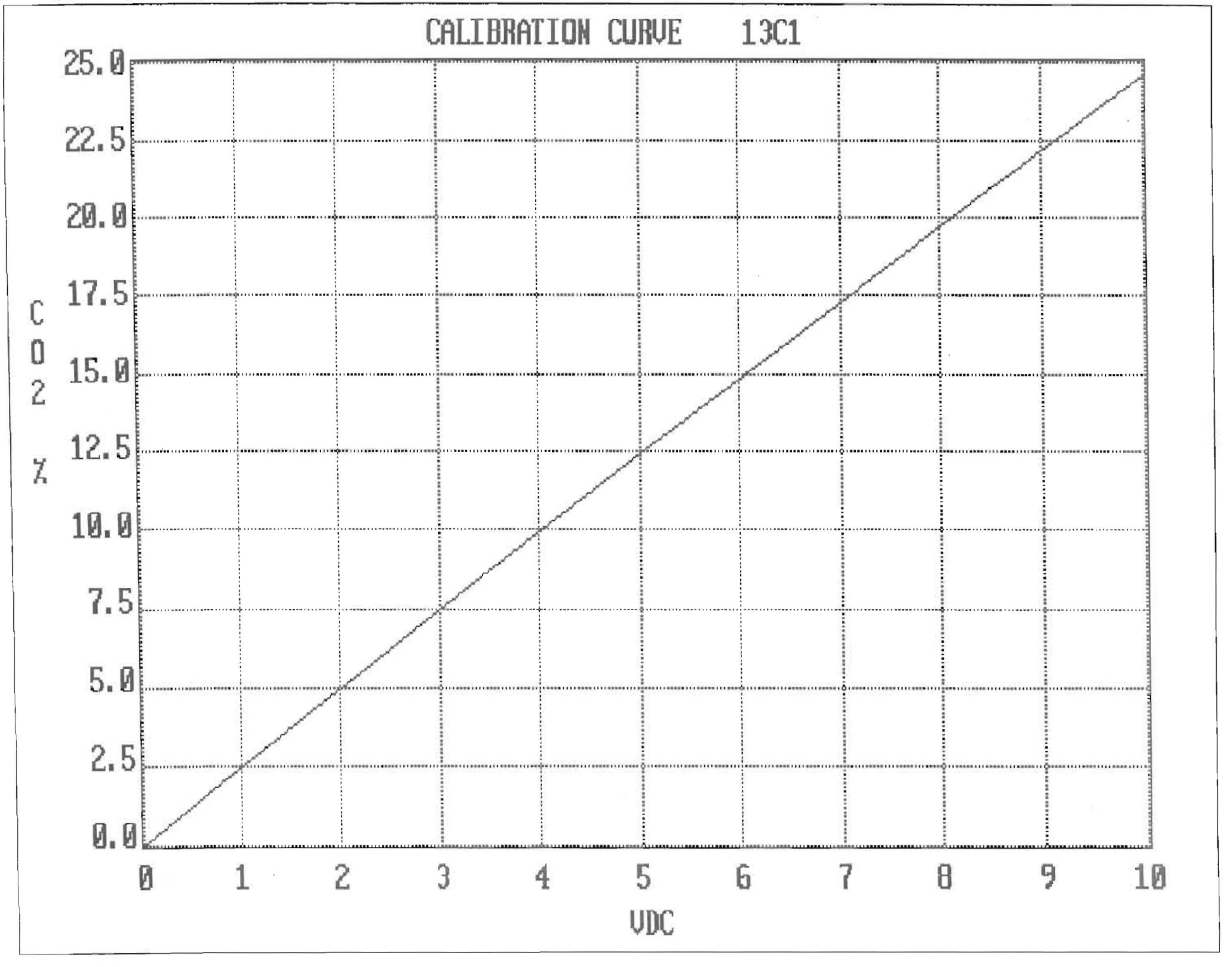
2-2-2006

Project Coordinator (Signature/Date)

CALO2CO2.XLS

© 2002 CETCON, Inc. All Rights Reserved


CALIBRATION CURVE 13C1
12.50
11.25
10.00
8.75
7.50
6.25
5.00
3.75
2.50
1.25
0.00
O2 %
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
VDC


CALIBRATION CURVE 13C1
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
CO2 %
0
1
2
3
4
5
6
7
8
9
10
VDC

Date: January 5, 2006
Plant: TPI Petroleum, Inc.
Unit: CCR Vent Scrubber

CETCON, Inc.

O_2/CO_2 ANALYZER CALIBRATION DATA

Operator: JRV
Job No.: CJ-4113

O_2

							Value, %	% of Span	Cylinder #
Analyzer:	O_2	Serial Number:			X1440D173B	Zero Gas:	0.00	0.0	SSG-1255
Make:	Servomex	Span:	12.5	=	5	Mid Range Gas:	5.57	44.6	CC-120705
Model:	1440	Units:	%	=	VDC	High Range Gas:	11.23	89.8	CC-98423

Mid Range: 40-60%, High Range 80-100%

Calibration Error Test	Zero	Error, % Span	Mid	Error, % Span	High	Error, % Span	*Error*
Analyzer Response	0.04	0.3	5.41	-1.3	11.37	1.1	*≤ 2% Span*

System Bias Test	Zero	Bias, % Span	Mid	Bias, % Span	*Bias*	95% Response Time	Upscale	Downscale
System Response	0.12	0.6	5.42	0.1	*≤ 5% Span*	Minutes:Seconds	0:55	0:40

Bias Gas Used (Mid/High)? Mid = 5.57 % Calibration Error Response = 5.41 %

Sample Run #	C_{0i} %	C_{0f} %	Zero Drift % Span	Zero Bias % Span	C_{mi} %	C_{mf} %	Cal Drift % Span	Cal Bias % Span	C_{Ave} %	Corrected Conc., %
C5	0.12	0.10	-0.2	0.5	5.42	5.40	-0.2	-0.1	0.959	0.892
C6	0.10	0.11	0.1	0.6	5.40	5.40	0.0	-0.1	0.967	0.907
C7	0.11	0.13	0.2	0.7	5.40	5.40	0.0	-0.1	0.967	0.894

Drift ≤ 3% Span, Bias ≤ 5% Span

CO_2

							Value, %	% of Span	Cylinder #
Analyzer:	CO_2	Serial Number:			X1440D173A	Zero Gas:	0.00	0.0	SSG-1255
Make:	Servomex	Span:	25	=	10	Mid Range Gas:	11.57	46.3	CC-98423
Model:	1440	Units:	%	=	VDC	High Range Gas:	22.55	90.2	CC-120705

Mid Range: 40-60%, High Range 80-100%

Calibration Error Test	Zero	Error, % Span	Mid	Error, % Span	High	Error, % Span	*Error*
Analyzer Response	0.05	0.2	11.53	-0.2	22.82	1.1	*≤ 2% Span*

System Bias Test	Zero	Bias, % Span	High	Bias, % Span	*Bias*	95% Response Time	Upscale	Downscale
System Response	0.10	0.2	22.58	-1.0	*≤ 5% Span*	Minutes:Seconds	0:50	0:40

Bias Gas Used (Mid/High)? HIGH = 22.55 % Calibration Error Response = 22.82 %

Sample Run #	C_{0i} %	C_{0f} %	Zero Drift % Span	Zero Bias % Span	C_{mi} %	C_{mf} %	Cal Drift % Span	Cal Bias % Span	C_{Ave} %	Corrected Conc., %
C5	0.10	0.12	0.1	0.6	22.58	22.41	-0.7	-1.6	17.652	17.671
C6	0.12	0.12	0.0	0.3	22.41	22.46	0.2	-1.4	17.561	17.625
C7	0.12	0.13	0.0	0.3	22.46	22.47	0.0	-1.4	17.563	17.602

Drift ≤ 3% Span, Bias ≤ 5% Span

C_{0i}: Initial Zero Gas Response, %
C_{0f}: Final Zero Gas Response, %
C_0: Average Zero Gas Response, %

C_{mi}: Initial Span Gas Response, %
C_{mf}: Final Span Gas Response, %
C_m: Average Span Gas Response, %

C_{ma}: Span Gas Value, %
C_{Ave}: Average From Test, %

Drift Corrected Concentration, % = $(C_{Ave} - C_0) \bullet C_{ma} + (C_m - C_0)$

Method 6C Equation: 6C-1

QA/QC Check:

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

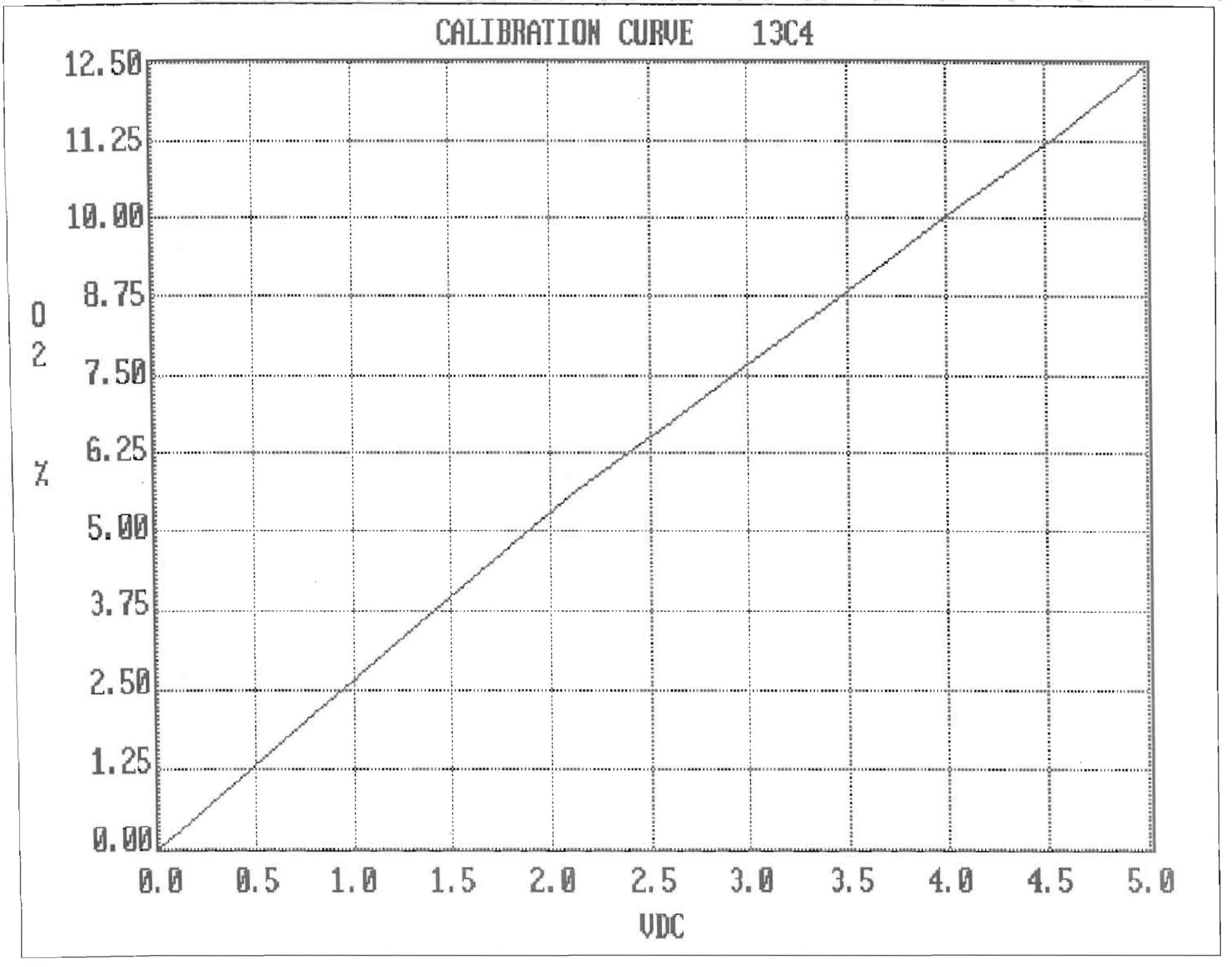
2/1/2006

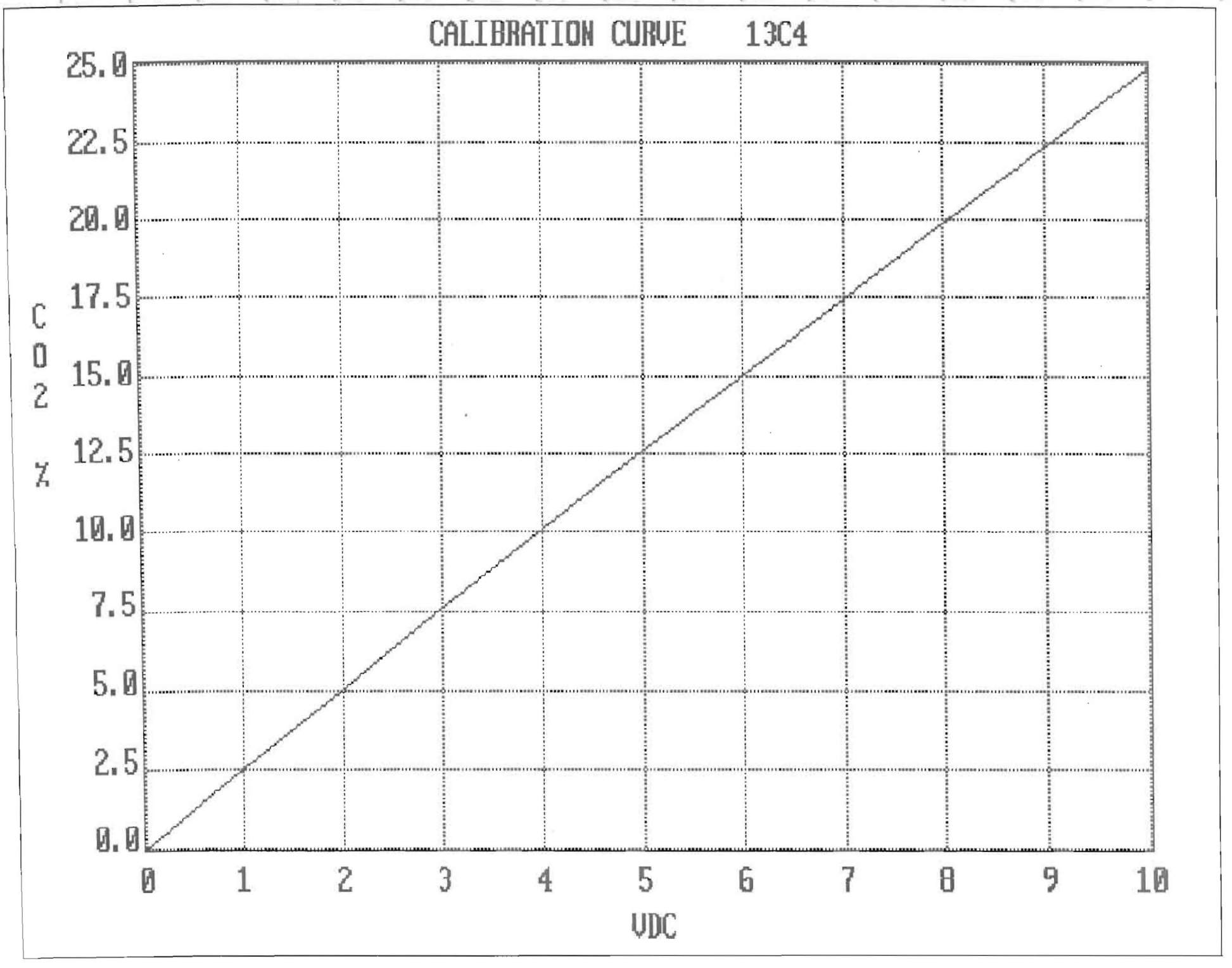
Operator (Signature/Date)

2-1-2006
Project Coordinator (Signature/Date)

© 2002 CETCON, Inc. All Rights Reserved

CALO2CO2.XLS


CALIBRATION CURVE 13C4
12.50
11.25
10.00
8.75
7.50
6.25
5.00
3.75
2.50
1.25
0.00
O2 %
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
VDC


CALIBRATION CURVE 13C4
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
CO2 %
0
1
2
3
4
5
6
7
8
9
10
VDC

Superior Specialty Gas Services, Inc.

1102 W. 36th Street N.
Tulsa, OK 74127
(918) 592-0081
(918) 592-0095

Certificate of Analysis

Cetcon
4953 S. 45th W. Ave.
Tulsa, OK 74170

PURCHASE ORDER : 9242

ID NUMBER : 1956
CGA TYPE : 590

GRAVIMETRIC STANDARD

REPORTED IN MOLE %

CYLINDER # : CC120705

COMPONENTS	CONCENTRATION
OXYGEN	5.0-6.0%
CARBON DIOXIDE	21.0-24.0%
NITROGEN	Balance

CYLINDER PRESSURE : 2000 psia
CYLINDER VOLUME : 148.6 cf
SHELF LIFE : 12 months
PRODUCED: August 11, 2005
EXPIRES : August 11, 2006

Gravimetric mixture manufactured on scales calibrated to N.I.S.T. traceable weights. N.I.S.T. test #s 822/254143-94, 523/240932.

Analyst : Brian Roper

CETCON, Inc.

Cylinder # CC-120705
Range 5.0% O2 - 22.0% CO2

GAS CYLINDER
ORSAT ANALYSIS

TEST #	TIME	COMPONENTS	RUN# 1	RUN # 2	RUN # 3	AVG
1	10:30	CO_2	22.6	22.6	22.5	22.57
		SUM	28.2	28.1	28.1	
		O_2	5.6	5.5	5.6	5.57
		N_2	71.8	71.9	71.9	71.87
2	11:30	CO_2	22.6	22.5	22.5	22.53
		SUM	28.2	28.0	28.1	
		O_2	5.6	5.5	5.6	5.57
		N_2	71.8	72.0	71.9	71.90

CERTIFICATION

Analysis #	1	2	3	4	5	6
Deviation From Average $\%O_3$ %	0.6	-1.2	0.6	0.6	-1.2	0.6
Deviation From Average $\%CO_3$ %	0.2	0.2	-0.2	0.2	-0.2	-0.2

Deviation For O_2 and CO_2 Must Be ≤ 5%"

ORSAT ID:	CET - VI	DATE:	Dec. 2, 2005
SERIAL #:	SN / 02	EXPIRATION:	June 2, 2006
ANALYST:	BCJ	$\%O_2$:	5.57
SIGNATURE:		$\%CO_2$:	22.55

CYLCERT.XLS

12/2/2005

© 1996 CETCON, Inc. All Rights Reserved

Superior Specialty Gas Services, Inc.

P.O. Box 470466
Tulsa, Ok 74147
(918) 592-0081
Fax: (918) 592-0095

CERTIFICATE OF CONFORMANCE

February 14, 2005

Cetcon
4953 S. 45th West Ave.
Tulsa, OK 74170

Purchase Order: 9006 **ID Number:** 1956

CGA Type: 590 **Cylinder SN#:** CC98423

REPORTED IN MOLE %

Component	Concentratiion
Oxygen	11.0-12.0%
Carbon Dioxide	11.0-12.0%
Nitrogen	Balance

Cylinder Pressure: 2000 psia

Cylinder Volume: 159.0 cf

Shelf Life: 12 Months

Produced: February 14, 2005

Expires: February 14, 2006

Gravimetric mixture manufactured on scales calibrated to N.I.S.T. traceable weights. N.I.S.T. test #'s 822/254143-94, 523/240932.

Brian Roper

CETCON, Inc.

Cylinder # CC98423
Range 11%O2/11%CO2

GAS CYLINDER ORSAT ANALYSIS

TEST #	TIME	COMPONENTS	RUN# 1	RUN # 2	RUN # 3	AVG
1	15:30	CO_2	11.50	11.50	11.50	11.50
		SUM	23.00	23.00	23.00	
		O_2	11.50	11.50	11.50	11.50
		N2	77.00	77.00	77.00	77.00

RECERTIFICATION

Previous $\%O_2$	11.23	New $\%O_2$	11.50	% Difference	2.4
Previous $\%CO_2$	11.57	New $\%CO_2$	11.50	% Difference	-0.6

Analysis #	1	2	3
Deviation From Average $\%O_2$	0.0	0.0	0.0
Deviation From Average $\%CO_2$	0.0	0.0	0.0

Must Be ± 5%

ORSAT ID:	CET VI	DATE:	11/29/2005
SERIAL #:	006	EXPIRATION:	5/29/2006
ANALYST:	GTM	**Certified $\%O_2$(1):**	**11.23**
SIGNATURE:		**Certified $\%CO_2$(1):**	**11.57**

(1) If % Difference is ≤ 5.0%, the previous tag value is used."
(1) If % Difference is ≥ 5.0%, six runs must be conducted and the new average is used."

© 1996 CETCON, Inc. All Rights Reserved

Date:	January 4, 2006	Operator:	JRV
Plant:	TPI Petroleum, Inc.	Job No.:	CJ-4113
Unit:	CCR Vent Scrubber		

CETCON, Inc.

SO_{2+F62} ANALYZER CALIBRATION DATA

	SO_2							Value, ppm	% of Span	Cylinder #
Analyzer:		Serial Number:			8196-8	Zero Gas:		0.0	0.0	SSG-1255
Make:	Bovar	Span:	100	=	10	Mid Range Gas:		54.2	54.2	CC-70144
Model:	721M	Units:	ppm	=	VDC	High Range Gas:		97.2	97.2	CC-61941

Mid Range: 40-60%, High Range 80-100%

Calibration Error Test	Zero	Error, % Span	Mid	Error, % Span	High	Error, % Span	*Error*
Analyzer Response	0.0	0.0	55.2	1.0	96.1	-1.1	*≤ 2% Span*

System Bias Test	Zero	Bias, % Span	Mid	Bias, % Span	*Bias*	95% Response Time	Upscale	Downscale
System Response	0.5	0.5	53.4	-1.8	*≤ 5% Span*	Minutes:Seconds	1:30	1:05

Bias Gas Used (Mid/High)?	Mid	=	54.2	ppm	Calibration Error Response =	55.2	ppm

Sample Run #	C_{0i} ppm	C_{0f} ppm	Zero Drift % Span	Zero Bias % Span	C_{mi} ppm	C_{mf} ppm	Cal Drift % Span	Cal Bias % Span	C_{Ave} ppm	Corrected Conc., ppm
C1	0.5	1.6	1.1	1.6	53.4	52.4	-1.0	-2.8	1.446	0.414
C2	1.6	2.7	1.1	2.7	52.4	54.5	2.1	-0.7	2.555	0.428
C3	2.7	2.2	-0.5	2.2	54.5	53.8	-0.7	-1.4	2.107	0.000

Drift ≤ 3% Span, Bias ≤ 5% Span

QA/QC Check:

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

2/1/2006

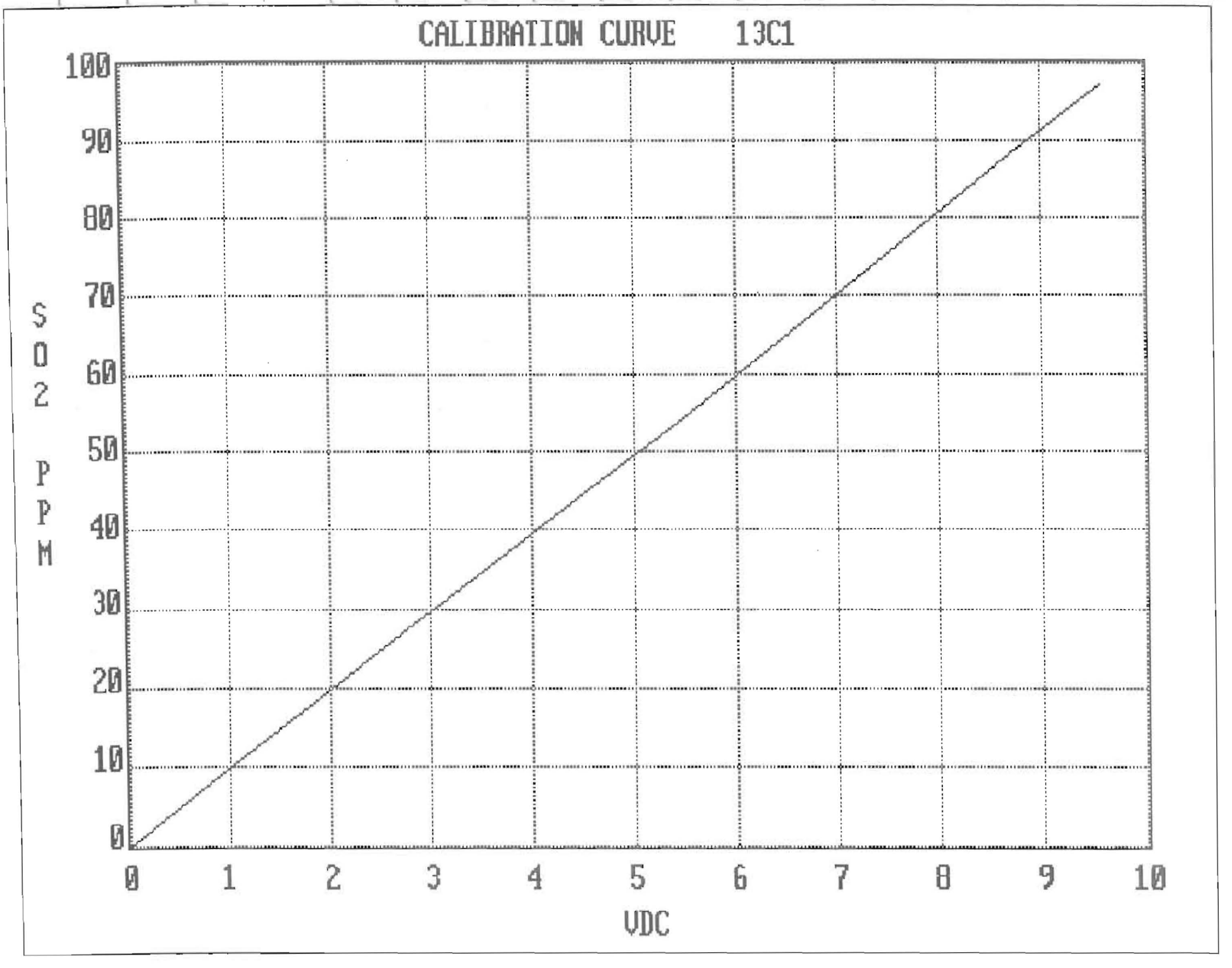
Operator (Signature/Date)

© 2002 CETCON, Inc. All Rights Reserved

2-1-2006

Project Coordinator (Signature/Date)

CALNOXCO.XLS


CALIBRATION CURVE 13C1
SO2 PPM
100
90
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
6
7
8
9
10
VDC

Date: January 5, 2006
Plant: TPI Petroleum, Inc.
Unit: CCR Vent Scrubber

CETCON, Inc.

SO_{2+F62} ANALYZER CALIBRATION DATA

Operator: JRV
Job No.: CJ-4113

SO_2

Analyzer:		Serial Number:			8196-8	Zero Gas:	Value, ppm	% of Span	Cylinder #
Make:	Bovar	Span:	100	=	10	Mid Range Gas:	0.0	0.0	SSG-1255
Model:	721M	Units:	ppm	=	VDC	High Range Gas:	54.2	54.2	CC-70144
							97.2	97.2	CC-61941

Mid Range: 40-60%, High Range 80-100%

Calibration Error Test	Zero	Error, % Span	Mid	Error, % Span	High	Error, % Span	*Error*
Analyzer Response	0.0	0.0	53.9	-0.3	97.0	-0.2	*≤ 2% Span*
System Bias Test	**Zero**	**Bias, % Span**	**Mid**	**Bias, % Span**	*Bias*	95% Response Time	**Upscale** / **Downscale**
System Response	3.8	3.8	54.9	1.0	*≤ 5% Span*	Minutes:Seconds	1:30 / 1:05

Bias Gas Used (Mid/High)?	Mid	=	54.2	ppm	Calibration Error Response =	53.9	ppm

Sample Run #	C_{0i} ppm	C_{0f} ppm	Zero Drift % Span	Zero Bias % Span	C_{mi} ppm	C_{mf} ppm	Cal Drift % Span	Cal Bias % Span	C_{Ave} ppm	Corrected Conc., ppm
C5	3.8	4.6	0.8	4.6	54.9	55.1	0.2	1.2	5.475	1.360
C6	1.0	0.0	-1.0	0.0	51.3	50.5	-0.8	-3.4	0.040	0.000
C7	0.0	0.0	0.0	0.0	50.5	50.6	0.1	-3.3	0.000	0.000

THC

Analyzer:		Serial Number:			10730292	Zero Gas:	Value, ppm	% of Span	Cylinder #
Make:	J.U.M.	Span:	100	=	10	Low Range Gas:	0.00	0.0	SSG-1255
Model:	VE-7	Units:	ppm	=	VDC	Mid Range Gas:	25.70	25.7	CC-144285
						High Range Gas:	45.10	45.1	CC-153091
							85.20	85.2	CC-153438

Mid Range: 40-60%, High Range 80-100%

Calibration Error Test	Zero	Error, % Span	Low	Error, % Value	Mid	Error, % Value	High	Error, % Value	*Error*
Analyzer Response	0.2	0.2	26.2	1.9	45.5	0.9	85.5	0.4	*≤ 5% Value*
						95% Response Time		**Upscale**	**Downscale**
						Minutes:Seconds		0:50	0:25

Bias Gas Used (Mid/High)?	low	=	25.7	ppm	Calibration Error Response =	26.2	ppm

Sample Run #	C_{0i} ppm	C_{0f} ppm	Zero Drift % Span	Zero Bias % Span	C_{mi} ppm	C_{mf} ppm	Cal Drift % Span	Cal Bias % Span	C_{Ave} ppm	Corrected Conc., ppm
C5	0.2	0.2	0.0	NA	26.2	25.0	-1.2	NA	16.533	16.526
C6	0.2	0.0	-0.2	NA	25.0	23.9	-1.1	NA	19.200	20.159
C7	0.0	0.2	0.2	NA	23.9	22.6	-1.3	NA	17.182	18.964

Drift ≤ 3% Span, Bias ≤ 5% Span

C_{0i}: Initial Zero Gas Response, ppm
C_{0f}: Final Zero Gas Response, ppm
C_0: Average Zero Gas Response, ppm

C_{mi}: Initial Span Gas Response, ppm
C_{mf}: Final Span Gas Response, ppm
C_m: Average Span Gas Response, ppm

C_{ma}: Span Gas Value, ppm
C_{Ave}: Average From Test, ppm

Drift Corrected Concentration, ppm = $(C_{Ave} - C_0) \cdot C_{ma} \div (C_m - C_0)$

Method 6C Equation, 6C-1

QA/QC Check:

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

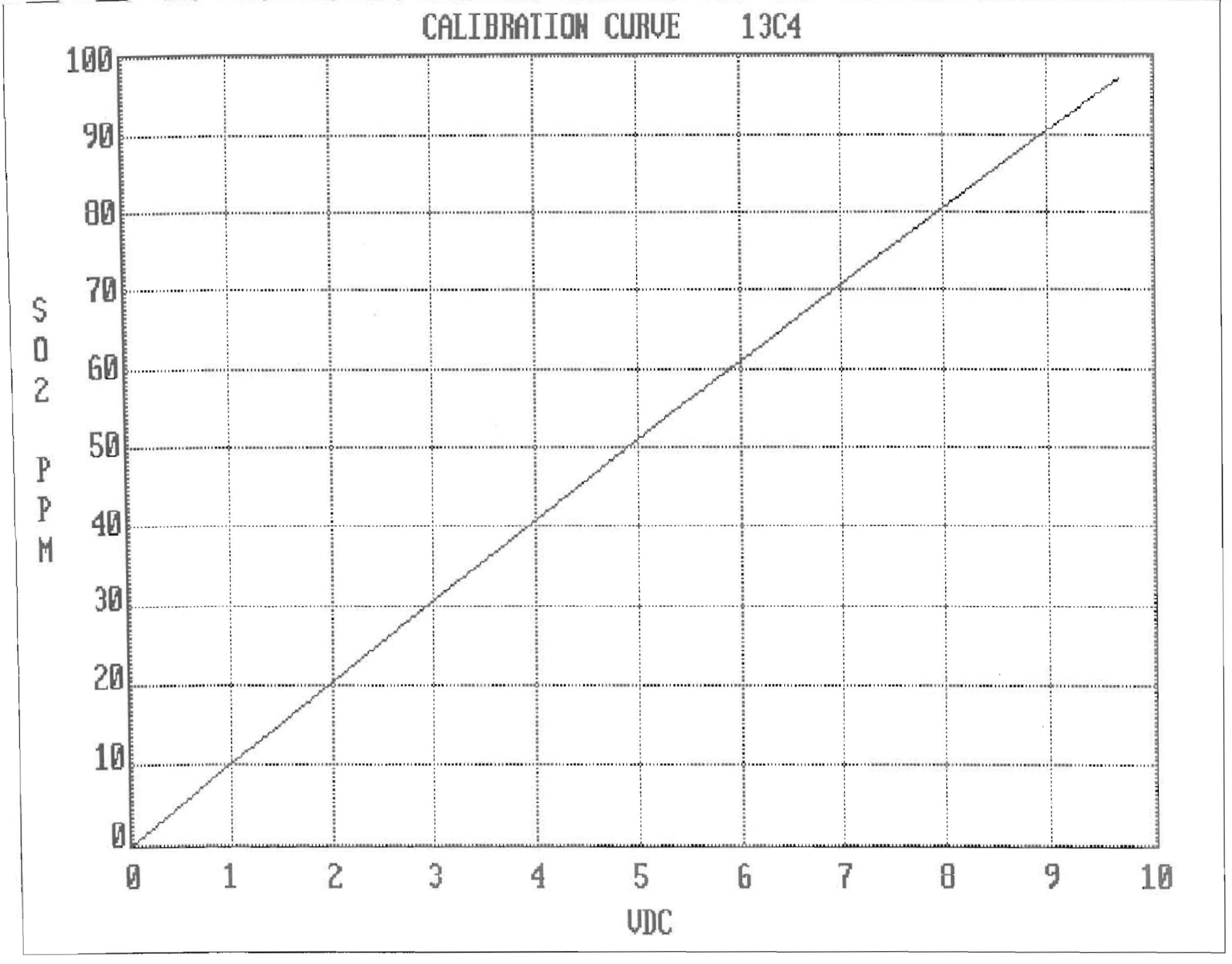
2/1/2006

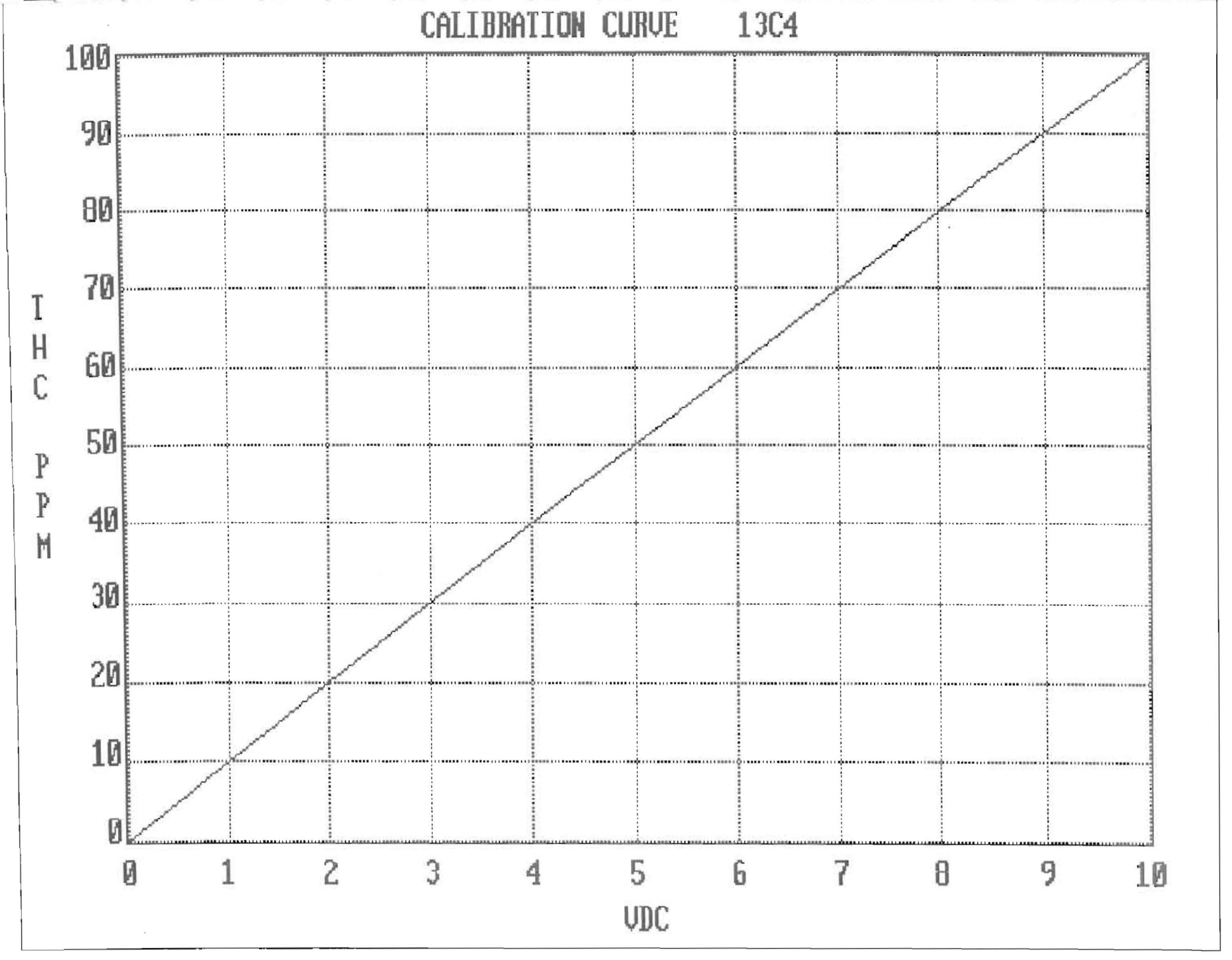
Operator (Signature/Date)

© 2002 CETCON, Inc. All Rights Reserved

2-1-2006
Project Coordinator (Signature/Date)

CALNOXCO.XLS


CALIBRATION CURVE 13C4
SO2 PPM
100
90
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
6
7
8
9
10
VDC


CALIBRATION CURVE 13C4
THC PPM
100
90
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
6
7
8
9
10
VDC

AIR LIQUIDE™

CERTIFICATE OF ANALYSIS

Interference-Free Multi-Component EPA Protocol Gases

Note: Analytical uncertainty and NIST traceability are in compliance with EPA-600/R-97/121
Section No. 2.2, Procedure . G-1

Cylinder Number: CC70144

Customer: CETCON
TULSA, OK
P.O. Number: 9113
Item Number:

Shipping Order Number 16403834
Transfer Number: 16403834
Lot Number: SFS86098
Valve: CGA 660
Cyl. Pressure:* 2000PSIG
*Cylinder should not be used when gas pressure is below 150 psig

Assay Date: 18-May-05

Expiration Date: 18-May-07

Component	REQUESTED Concentration	ASSAY Concentration		
Sulfur Dioxide	51.3-56.7 ppm	54.2	± 0.8	ppm
Nitrogen	Balance	Balance		

Reference Standard Employed For Analysis:

Concentration				Component	Balance	Cyl. No.	SRM or GMIS NTRM No.	Exp. Date	Sample No.	Type
51.1	±	0.6	ppm	Sulfur Dioxide	Nitrogen	CC71593	970803	11/17/06	QV	GMIS

Analysis Information:

Component	Sulfur Dioxide		First Triad Analysis 05/11/05					Second Triad Analysis 05/18/05				
Analyzer Information			Trial 1	Trial 2	Trial 3	Units			Trial 4	Trial 5	Trial 6	Units
Manufacturer:	Horiba	Zero	-2	-2	-2	Vdc		Zero	-2	-2	-2	Vdc
Model Number:	CMA-331A	Reference	469	470	469	Vdc		Reference	477	478	477	Vdc
Serial Number:	56674503	Candidate	498	498	498	Vdc		Candidate	506	506	506	Vdc
MPR Last Calibrated:	05/18/05	Result	54.25	54.13	54.25	ppm		Result	54.19	54.08	54.19	ppm
Analytical Principle:	NDIR	Evaluation	VALID	VALID	VALID			Evaluation	VALID	VALID	VALID	
			MEAN ANALYTICAL RESULT:			54.21	ppm		MEAN ANALYTICAL RESULT:			54.16	ppm

Analyst Signature: Thuan Tran

Approved by: Eric Barron

AIR LIQUIDE AMERICA, L.P. Region Office • 8832 Dice Road, Santa Fe Springs, CA 90670-2516
Phone: (562) 945-1383 • Fax: (562) 693-1156

AIR LIQUIDE™

CERTIFICATE OF ANALYSIS

Interference-Free Multi-Component EPA Protocol Gases

Note: Analytical uncertainty and NIST traceability are in compliance with EPA-600/R-97/121
Section No. 2.2, Procedure . G-1

Cylinder Number: CC61941

Customer: CETCON
TULSA, OK
P.O. Number: 9113
Item Number:

Shipping Order Number 16403834
Transfer Number: 16403834
Lot Number: SFS86099
Valve: CGA 660
Cyl. Pressure:* 2000PSIG
*Cylinder should not be used when gas pressure is below 150 psig

Assay Date: 18-May-05

Expiration Date: 18-May-07

Component	REQUESTED Concentration	ASSAY Concentration		
Sulfur Dioxide	96-98 ppm	97.2	± 1.4	ppm
Nitrogen	Balance	Balance		

Reference Standard Employed For Analysis:

Concentration				Component	Balance	Cyl. No.	SRM or GMIS NTRM No.	Exp. Date	Sample No.	Type
102.0	±	1.0	ppm	Sulfur Dioxide	Nitrogen	CC 69288	81694	07/01/06	98080102	NTRM

Analysis Information:

Component	Sulfur Dioxide		First Triad Analysis 05/11/05					Second Triad Analysis 05/18/05				
Analyzer Information			Trial 1	Trial 2	Trial 3	Units			Trial 4	Trial 5	Trial 6	Units
Manufacturer:	Horiba	Zero	0	0	0	Vdc		Zero	0	0	0	Vdc
Model Number:	CMA-331A	Reference	107	107	107	Vdc		Reference	106	106	106	Vdc
Serial Number:	56674503	Candidate	102	102	102	Vdc		Candidate	101	101	101	Vdc
MPR Last Calibrated:	04/18/05	Result	97.23	97.23	97.23	ppm		Result	97.19	97.19	97.19	ppm
Analytical Principle:	NDIR	Evaluation	VALID	VALID	VALID			Evaluation	VALID	VALID	VALID	
			MEAN ANALYTICAL RESULT:			97.23	ppm		MEAN ANALYTICAL RESULT:			97.19	ppm

Analyst Signature: Thuan Tran

Approved by: Eric Barron

AIR LIQUIDE AMERICA, L.P. Region Office • 8832 Dice Road, Santa Fe Springs, CA 90670-2516
Phone: (562) 945-1383 • Fax: (562) 693-1156

AIR LIQUIDE

CERTIFICATE of ANALYSIS

EPA Protocol Gases

Cyl. Number:	Cyl. Pressure:*	Lot Number:
CC144285	2000PSIG	SFS71712
Assay Date:	Expiration Date:	Document Number:
08/31/04	08/31/07	13256777
Customer:	P.O. Number:	Item Number:
CETCON TULSA, OK	8747	SO# 13256783

COMPONENT Name	REQUESTED Concentration	ASSAY Concentration
Propane	25-27 ppm	25.7 ± 0.3 ppm
Air	Balance	Balance

*Mixture is valid only to 150 psig

EPA Protocol
Section No. 2.2, Procedure . G-1

REFERENCE STANDARD EMPLOYED FOR ANALYSIS					SRM or GMIS			
Concentration		Component	Balance	Cyl. No.	NTRM No.	Exp. Date	Sample No.	Type
49.54	± 0.26 ppm	Propane	Air	CAL-011859	1667b	09/19/06	83-09-H	SRM

Analyst: Eric Barron
Approved by: Jason Unger

Propane
GAS ANALYZER EMPLOYED

Manufacturer:	Varian(A)
Model Number:	3400
Serial Number:	2805
MPR Last Calibrated:	08/31/04
Analytical Principle:	FID & TCD

ANALYSIS SUMMARY

	08/31/04 Triad 1	08/31/04 Triad 2	08/31/04 Propane Triad 3	Units
Zero	0	0	0	Area
Reference	8522858	8512883	8520634	Area
Candidate	4426076	4418348	4419902	Area
Result	25.73	25.71	25.70	ppm
Evaluation	VALID	VALID	VALID	

MEAN ANALYTICAL RESULT: 25.71 ppm

Analyst:	Approved by:
Eric Barron	Rafael L. Mattea

Air Liquide America L.P.
8832 Dice Road, Santa Fe Spring, CA 90670-2516
Phone: (562) 945-1383 Fax: (562) 693-1156

AIR LIQUIDE™

CERTIFICATE of ANALYSIS

EPA Protocol Gases

Cyl. Number:	Cyl. Pressure:*	Lot Number:
CC153091	2000PSIG	SFS71713
Assay Date:	**Expiration Date:**	**Document Number:**
08/31/04	08/31/07	13256777
Customer:	**P.O. Number:**	**Item Number:**
CETCON TULSA, OK	8747	SO# 13256783

COMPONENT Name	REQUESTED Concentration	ASSAY Concentration
Propane	45-47.5 ppm	45.1 ± 0.5 ppm
Air	Balance	Balance

*Mixture is valid only to 150 psig

EPA Protocol
Section No. 2.2, Procedure . G-1

Analyst: Eric Barron
Approved by: Jason Unger

REFERENCE STANDARD EMPLOYED FOR ANALYSIS

Concentration	Component	Balance	Cyl. No.	SRM or GMIS NTRM No.	Exp. Date	Sample No.	Type
49.54 ± 0.26 ppm	Propane	Air	CAL-011859	1667b	09/19/06	83-09-H	SRM

Propane
GAS ANALYZER EMPLOYED

Manufacturer:	Varian(A)
Model Number:	3400
Serial Number:	2805
MPR Last Calibrated:	08/31/04
Analytical Principle:	FID & TCD

ANALYSIS SUMMARY

	08/31/04 Triad 1	08/31/04 Triad 2	08/31/04 Triad 3	Propane Units
Zero	0	0	0	Area
Reference	8522858	8512883	8520634	Area
Candidate	7767548	7757703	7759082	Area
Result	45.15	45.15	45.11	ppm
Evaluation	VALID	VALID	VALID	
MEAN ANALYTICAL RESULT:				45.14 ppm

Analyst: Eric Barron

Approved by: Rafael L. Mattos

Air Liquide America L.P.
8832 Dice Road, Santa Fe Spring, CA 90670-2516
Phone: (562) 945-1383 Fax: (562) 693-1156

AIR LIQUIDE

CERTIFICATE of ANALYSIS

EPA Protocol Gases

Cyl. Number:	Cyl. Pressure:*	Lot Number:
CC153438	2000PSIG	SFS71714
Assay Date:	Expiration Date:	Document Number:
08/31/04	08/31/07	13256777
Customer:	P.O. Number:	Item Number:
CETCON TULSA, OK	8747	SO# 13256783

COMPONENT Name	REQUESTED Concentration	ASSAY Concentration
Propane	80.75-89.25 ppm	85.2 ± 1.2 ppm
Air	Balance	Balance

*Mixture is valid only to 150 psig

EPA Protocol
Section No. 2.2, Procedure . G-1

Analyst: Eric Barron
Approved by: Jason Unger

REFERENCE STANDARD EMPLOYED FOR ANALYSIS

Concentration	Component	Balance	Cyl. No.	SRM or GMIS NTRM No.	Exp. Date	Sample No.	Type
99.5 ± 1.0 ppm	Propane	Nitrogen	CC 55441	L99-013	03/15/06	GN	GMIS

Propane

GAS ANALYZER EMPLOYED

Manufacturer:	Varian(A)
Model Number:	3400
Serial Number:	2805
MPR Last Calibrated:	08/31/04
Analytical Principle:	FID & TCD

ANALYSIS SUMMARY

	08/31/04 Triad 1	08/31/04 Triad 2	08/31/04 Triad 3	Propane Units
Zero	0	0	0	Area
Reference	17284638	17253898	17272756	Area
Candidate	14801955	14786469	14785523	Area
Result	85.21	85.27	85.17	ppm
Evaluation	VALID	VALID	VALID	
MEAN ANALYTICAL RESULT:				85.22 ppm

Analyst: Eric Barron

Approved by: Rafael L Mattia

Air Liquide America L.P.
8832 Dice Road, Santa Fe Spring, CA 90670-2516
Phone: (562) 945-1383 Fax: (562) 693-1156

CETCON, Inc.

EPA Reference Method 20
NO_X Analyzer Interference Response Test

CETCON I

Test Gas Concentrations

CO	500 ± 50 ppm	SO_2	300 ± 20 ppm	CO_2	10.0 ± 1.0 %	O_2	20.9 ± 1.0 %

Date of Test: 9-23-04
Analyzer Model: 42C
Analyzer Type: Chemiluminscent
Serial Number: 65868-350
Span Value, ppm: 250

Test Gas	Concentration	Cylinder Number	Analyzer Response, ppm	Interference, % of Span (1)
CO	446.00	CC58893	0.0	0.0
SO_2	234.00	CC169434	0.6	0.2
CO_2	11.65%	CC96504	0.0	0.0
O_2	20.93	Ambient	0.02	0.0

Sum of Interference Responses: 0.2 (2)

Notes: (1) Interference, % of Span = Analyzer Response, ppm x 100 ÷ Span Value, ppm

(2) Sum of Interference Responses must be ≤ 2.0 %

QA/QC Check:

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by.

9/24/2004

Deke Wise 9/24/04
Operator (Signature/Date)

John Van Wieren 9/27/2004
Project Coordinator (Signature/Date)

© 2002 CETCON, Inc. All Rights Reserved

NOXINT20.XLS

CETCON, Inc.

EPA Reference Method 20
CO Analyzer Interference Response Test

CETCON I

Test Gas Concentrations

NO_X	200 ± 20 ppm	SO_2	200 ± 20 ppm	CO_2	10.0 ± 1.0 %	O_2	20.9 ± 1.0 %

Date of Test: April 8, 2005
Analyzer Model: 48C
Analyzer Type: Infrared
Serial Number: 401404630
Span Value, ppm: 500

Test Gas	Concentration	Cylinder Number	Analyzer Response, ppm	Interference, % of Span (1)
NO_X	209.00	CC192210	0.00	0.0
SO_2	224.00	CC67518	0.00	0.0
CO_2	10.60%	CC180136	0.00	0.0
O_2	20.90%	Ambient	1.00	0.2

0

Sum of Interference Responses: 0.2 (2)

Notes: (1) Interference, % of Span = Analyzer Response, ppm x 100 ÷Span Value, ppm

(2) Sum of Interference Responses must be ≤ 2.0 %

QA/QC Check:

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

4/28/2005

Debe Weise 4/29/2005
Operator (Signature/Date)

Project Coordinator (Signature/Date)
4/29/2005

© 2002 CETCON, Inc. All Rights Reserved

COINT20.XLS

CETCON, Inc.

EPA Reference Method 20
O_2 Analyzer Interference Response Test

CETCON I

Test Gas Concentrations

CO	500 ± 50 ppm	SO_2	200 ± 20 ppm	CO_2	10.0 ± 1.0 %	NO_X	200 ± 20 ppm

Date of Test: April 8, 2005
Analyzer Model: 1440
Analyzer Type: Paramagnetic
Serial Number: X1440D173B
Span Value, %: 25

Test Gas	Concentration	Cylinder Number	Analyzer Response, %	Interference, % of Span (1)
CO	457.00	CC148526	0.04	0.2
SO_2	224.00	CC67518	0.03	0.1
CO_2	10.02%	See Note #3	0.13	0.5
NO_X	209.00	CC192210	0.03	0.1

Sum of Interference Responses: 0.9 (2)

Notes:
(1) Interference, % of Span = Analyzer Response, % x 100 ÷Span Value, %

(2) Sum of Interference Responses must be ≤ 2.0 %

(3) Diluted 40% CO2 with Nitrogen to 10.02% CO2

QA/QC Check:

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

4/28/2005

Pete Wise 4/28/2005
Operator (Signature/Date)

© 2002 CETCON, Inc. All Rights Reserved

Project Coordinator (Signature/Date)
4/28/2005 O2INT20.XLS

CETCON, Inc.

EPA Reference Method 20
CO_2 Analyzer Interference Response Test

CETCON I

Test Gas Concentrations

CO	500 ± 50 ppm	SO_2	200 ± 20 ppm	NO_X	200 ± 20 ppm	O_2	20.9 ± 1.0 %

Date of Test: April 8, 2005
Analyzer Model: 1440
Analyzer Type: Infared
Serial Number: X1440D173A
Span Value, %: 25

Test Gas	Concentration	Cylinder Number	Analyzer Response, %	Interference, % of Span (1)
CO	457.00	CC148526	0.07	0.3
SO_2	224.00	CC67518	0.07	0.3
NO_X	209.00	CC192210	0.07	0.3
O_2	20.90%	Ambient	0.11	0.4

Sum of Interference Responses: 1.3 (2)

Notes: (1) Interference, % of Span = Analyzer Response, % x 100 ÷Span Value, %

(2) Sum of Interference Responses must be ≤ 2.0 %

QA/QC Check:

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

4/28/2005

Operator (Signature/Date) 4/28/2005

Project Coordinator (Signature/Date) 4/28/2005

© 2002 CETCON, Inc. All Rights Reserved

CO2INT20.XLS

CETCON, Inc.

EPA Reference Method 20
SO_2 Analyzer Interference Response Test

CETCON I

Test Gas Concentrations

CO	500 ± 50 ppm	NO_X	200 ± 20 ppm	CO_2	10.0 ± 1.0 %	O_2	20.9 ± 1.0 %

Date of Test: April 8, 2005
Analyzer Model: 721-M
Analyzer Type: Photometric
Serial Number: 94-721M-8196-8
Span Value, ppm: 300

Test Gas	Concentration	Cylinder Number	Analyzer Response, ppm	Interference, % of Span (1)
CO	457.00	CC148526	0.0	0.0
NO_X	209.00	CC192210	0.0	0.0
CO_2	10.60%	See Note #3	0.0	0.0
O_2	20.90%	Ambient	0.02	0.0

Sum of Interference Responses: 0.0 (2)

Notes: (1) Interference, % of Span = Analyzer Response, ppm x 100 ÷ Span Value, ppm

(2) Sum of Interference Responses must be ≤ 2.0 %

QA/QC Check:

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

7/27/2005

Operator (Signature/Date)

Project Coordinator (Signature/Date) 7/27/2005

© 2002 CETCON, Inc. All Rights Reserved

SO2INT20.XLS

CETCON, Inc.

Reference Method 7E or 20 NO_X Analyzer

NO_2 to NO Converter Efficiency Test

Analyzer Model:	TECO 42C
Serial Number:	65868-350
Operator:	JRV
Date:	1/4/2006

ANALYZER CONVERSION EFFICIENCY DATA

Test Length: 30 Minutes **Analyzer Span:** 100 ppm

Comments: Tedlar Bag Mixed ≈1:1 With Air And NO_X Calibration Gas		Cylinder ID#	Cal Gas Value	Initial Value Analyzer Response NO_X, ppm	Final Value Analyzer Response NO_X, ppm	Decrease In Response (1) %
Zero gas	Air	Ambient Air	0.00	28.8	29.1	-1.0
Mid range	NO_X	CC-55299	52.00			

NOTES:
1. Final Value Cannot Decrease By More Than 2.0% Of The Initial Peak Value.
2. Concentration Of Oxygen In Tedlar Bag = 9.32 %

QA/QC Check:

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

2/1/2006

2-1-2006
Operator (Signature/Date)

Project Coordinator (Signature/Date)
2/3/2006

©1999 CETCON, Inc. All Rights Reserved

CONVEFF.XLS

CETCON, Inc.

DRY GAS METER CALIBRATION
METERING SYSTEM CALIBRATION - CFR40, Part 60, Appendix A, Reference Method 5
CRITICAL ORIFICE METHOD

Control Module:	CM#1	**Previous Calibration Values:**	
DGM Serial Number:	684551	C_F:	1.008
Calibration Date:	11/23/2005	ΔH@:	1.558
Calibrator:	BCJ		
Vac. Leak Check, in. Hg:	26	**Deviation From Pre-Test Cal:**	
Press. Leak Check, in. H_2O:	7.3		
C_F:	**1.009**	→	0.06 %
ΔH@:	**1.553**	→	-0.29 %

Orifice Serial Number	1399S-12	1399S-16	1399S-19	1399S-24	1399S-31	1403S-1
Orifice Coefficient, K'	0.3187	0.4365	0.5066	0.6507	0.8347	0.9970
Run Time, R (min)	12.020	8.730	7.420	5.930	5.000	5.000
Barometric Pressure, P_B (in.Hg)	29.27	29.27	29.28	29.28	29.03	29.02
Ambient Temp, T_A (°F)	85	85	84	84	60	60
Pump Vacuum (in. Hg)	23.0	21.9	21.3	20.0	18.2	17.0
Orifice Pressure Drop, ΔH (in. H_2O)						
Start	0.51	0.92	1.20	1.91	2.90	4.00
Finish	0.51	0.92	1.20	1.91	2.90	4.00
Average	0.51	0.92	1.20	1.91	2.90	4.00
Inlet Temp DGM, T_i (°F) :						
Start	85	85	85	84	72	69
Finish	85	85	85	85	73	72
Average	85	85	85	85	73	71
Outlet Temp DGM, T_o (°F) :						
Start	81	81	81	80	63	61
Finish	81	81	81	81	64	63
Average	81	81	81	81	64	62
Average Temp DGM, T_m (°F) :	83	83	83	83	68	66
DGM Volume, V_m (ft^3):						
Finish	739.000	732.800	726.600	715.000	394.334	386.338
Start	734.000	727.800	721.600	710.000	389.000	380.000
Difference	5.000	5.000	5.000	5.000	5.334	6.338
V_{crstd}, ft^3 (1)	4.803	4.778	4.719	4.844	5.313	6.344
Flow Rate, Q, scfm	0.400	0.547	0.636	0.817	1.063	1.269
V_{mstd}, ft^3 (2)	4.760	4.765	4.770	4.783	5.211	6.228
C_F (3)	1.009	1.003	0.989	1.013	1.020	1.019
C_F Dev (4)	0.000	-0.006	-0.019	0.004	0.011	0.010
ΔH@ (5)	1.713	1.651	1.598	1.548	1.422	1.388
ΔH@ Dev (6)	0.160	0.098	0.044	-0.005	-0.131	-0.166

NOTE:

1. $V_{crstd} = K' \times R \times P_B \div ((T_A+460)^{0.5})$
2. $V_{mstd} = 17.64 \times V_m \times (P_B + DH/13.6) \div (T_m + 460)$
3. $C_F = V_{crstd} \div V_{mstd}$
4. C_F Dev = $C_F(i) - C_F(\text{average})$; (Allowable Deviation = ± 0.02)
5. $\Delta H@ = 0.0319 \times \Delta H \times (Tm + 460) \times R^2 \div (P_B \times C_F^2 \times V_m^2)$
6. ΔH Dev = ΔH(i) - ΔH@(average) ; (Allowable Deviation = ± 0.20)

Completeness X Legibility X Accuracy X Specifications X Reasonableness X

Checked by:

11/23/05 Operator (Signature/Date)

11/23/2005 Project Coordinator (Signature/Date)

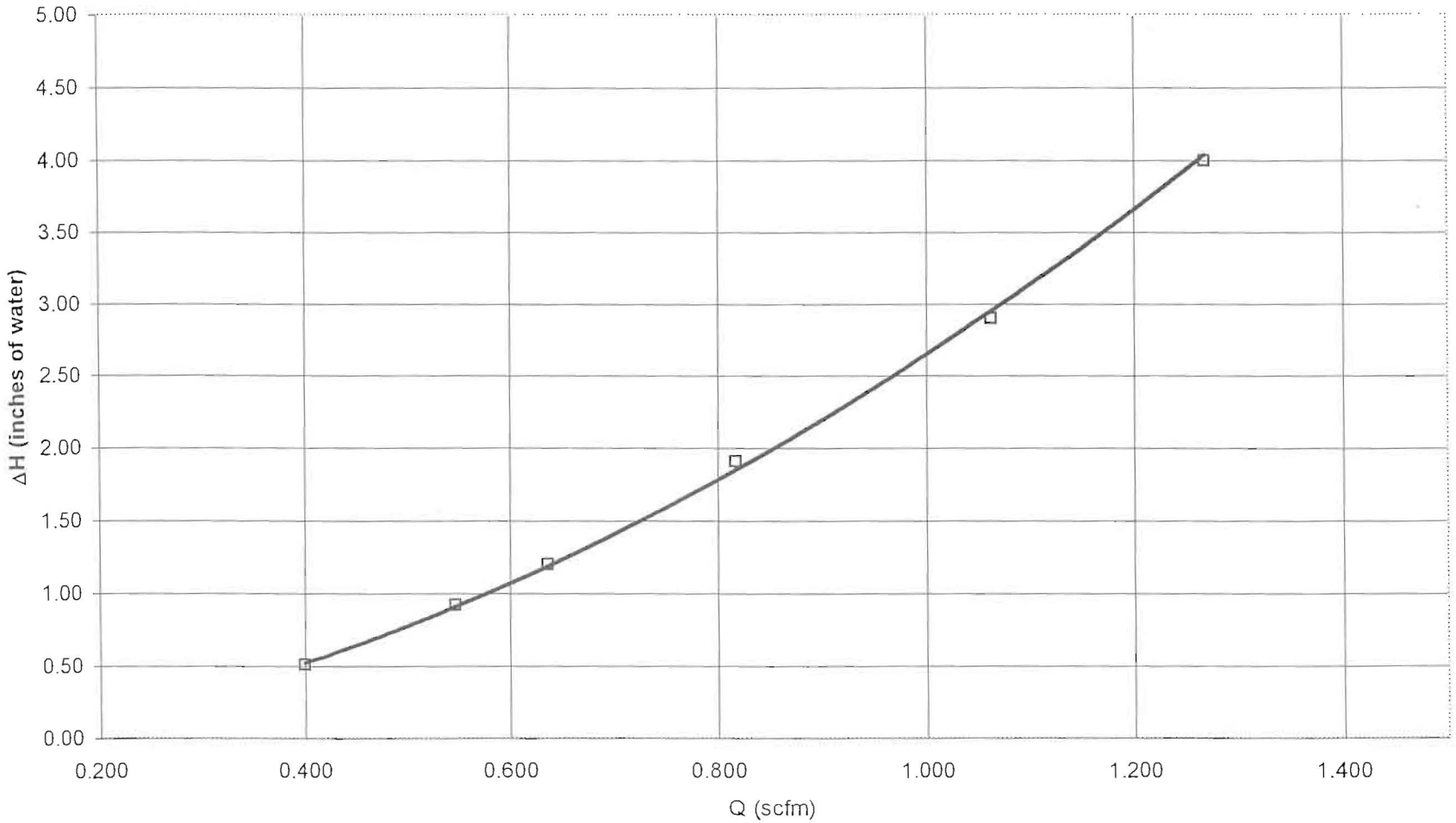
11/23/2005

© 2002 CETCON, Inc. All Rights Reserved

CM1CAL.XLS

CETCON, INC.

CM#1 ORIFICE CURVE - November 23rd, 2005



11/23/2005

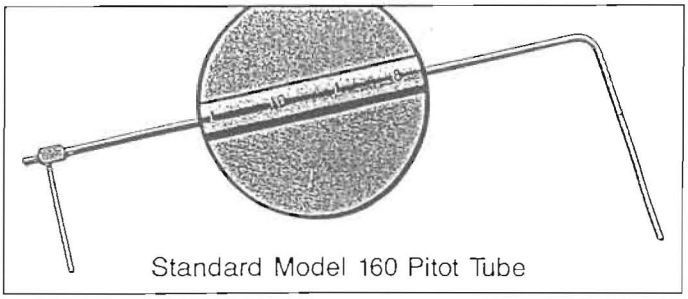
CM1GRAPH.XLS

Series 160

Stainless Steel Pitot Tubes

$C_p = 0.990$

ASME Design Meets AMCA and ASHRAE Codes.



Standard Model 160 Pitot Tube

Ideal for use with our precision manometers and air velocity gages, Dwyer Pitot Tubes are constructed from corrosion resistant stainless steel for a lifetime of service. ASME design meets AMCA and ASHRAE specifications for maximum accuracy over a wide variety of flow conditions. No correction factors required as ASHRAE tip design yields a calibration factor of 1. ASHRAE design needs no calibration! Permanent, stamped insertion depth graduation on sides of 160 series facilitate accurate positioning. Static pressure port is parallel to sensing tube allowing quick, easy alignment of tube with air flow. Low sensitivity to misalignment gives accurate reading even when tube is misaligned up to 15 degrees. Various standard sizes are available for use in ducts as small as 4" dia. or as large as 36 ft. dia. A universal model fits user supplied ¾" schedule 40 (standard) pipe in any length. Several convenient mounting options are available for permanent installations.

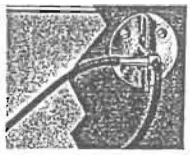
- No calibration needed.
- Precisely located, burr-free static pressure holes.
- Hemispherical tip design, best for accuracy if imperfectly aligned and nearly impossible to damage.
- Long lasting 304 stainless steel construction.
- Silver soldered connections for leak-proof operation.
- ASME design meets AMCA and ASHRAE specifications.
- Coefficient of "1."
- 5/16" models rated to 1500°F, ⅛" models to 800°F.
- Extended static connection helps guide tip within recommended 15° of air flow direction.
- Inch graduations on sides of 160 series to quickly determine exact insertion depth.
- Dwyer Air Velocity Calculator, direct reading flow charts and instructions included.
- Use ⅛" models in ducts as small as 4", 5/16" models in ducts 10" or larger.
- Optional mounting gland or split flange make permanent installation fast and simple.

ACCESSORIES

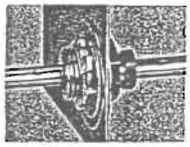
No. A-158 Split Flange Mounting can be added to any Dwyer No. 160 Standard Pitot Tube. Cadmium plated steel. Gasket is pattern for mounting holes. Secure flange loosely to tube, adjust tube depth and tighten screws. Gasket of 1/16" Neoprene fits tightly around tube and against duct for leak-proof seal. Nuts, washers included.

No. A-159 Mounting Gland – Versatile adapter slips on any Series 160, 5/16" standard pitot tube made after Dec. 1990. Two-part stainless steel fitting slides over tube and provides permanent, secure mounting. Where duct interior is accessible, use the washers and jam nut supplied. For blind applications or in thicker materials, install in a standard 1/2" pipe flange. Once tube is adjusted to proper depth and angle, tighten smaller hex bushing to lock position. Graphite bushing inside assures leak-proof seal even at higher temperatures. Teflon bushing also available. NOTE: For full insertion with this fitting, order next longer pitot tube.

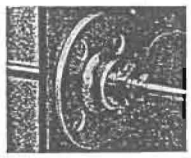
No. A-397 Step Drill. For fast, convenient installation of pitot tubes in sheet metal ducts. No center punch needed; automatic de-burring. Drills six sizes from 3/16" – 1/2" in 1/16" increments.



A-158 Split Flange Mounting

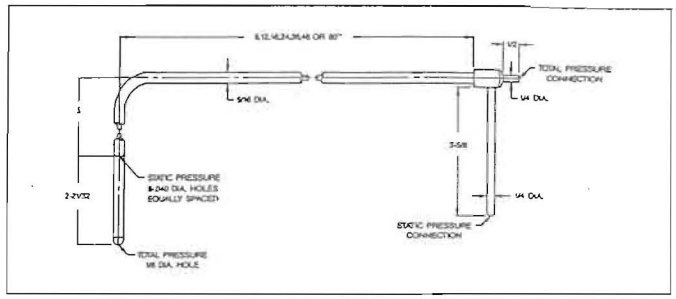


A-159 Duct Mounting Gland

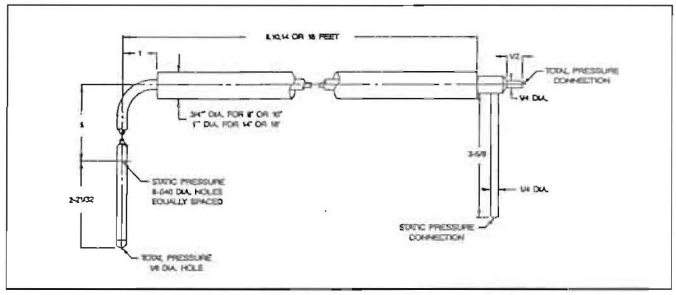


A-159 Flange Mounting Gland

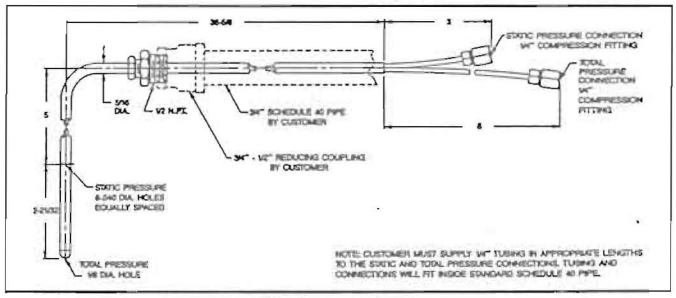
A-397 Step Drill



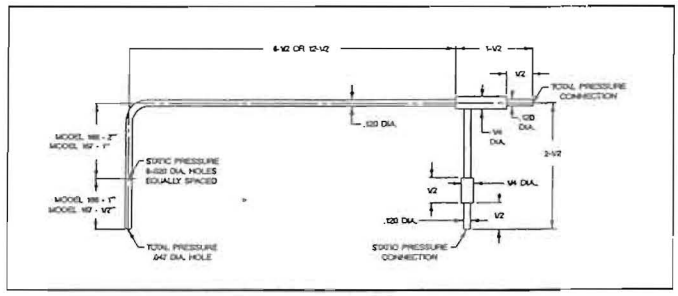
160 SERIES



160 SERIES LONGER MODELS WITH STIFFENER



MODEL 160-U



166/167 SERIES

MODEL NUMBERS & SIZES

MODEL NUMBER	INSERTION LENGTH	DIAMETER
STANDARD 5/16" MODELS		
160-8	8"	5/16"
160-12	12"	5/16"
160-18	18"	5/16"
160-24	24"	5/16"
160-36	36"	5/16"
160-48	48"	5/16"
160-60	60"	5/16"
UNIVERSAL MODEL FOR 3/4" PIPE		
160-U	DETERMINED BY PIPE*	3/4" PIPE

MODEL NUMBER	INSERTION LENGTH	DIAMETER
LONGER MODELS WITH STIFFENER		
160-96	96"(8 ft)	3/4"
160-120	120"(10ft)	3/4"
160-168	168"(14ft)	1"
160-216	216"(18ft)	1"
POCKET SIZE 1/8" MODELS		
166-6	6"	1/8"
166-12	12"	1/8"
167-6	6"	1/8"
167-12	12"	1/8"

*Universal model for permanent installation and connection to metal tubing. Create any length pitot tube with your own 3/4" sch. 40 pipe, 3/4" - 1/2" reducing coupling and 1/4" metal tubing.

CETCON, Inc.

NOZZLE CALIBRATION

NOZZLE SET NO. QUARTZ (Tapered)

DATE: April 1, 2005

CALIBRATOR: DWP/JPF/JJA/BCJ/JRH

		Q1	Q3	Q5	Q7	Q9	Q11	Q13	Q15
READING	1	0.193	0.239	0.311	0.379	0.428	0.498	0.629	0.749
READING	2	0.193	0.239	0.311	0.379	0.428	0.499	0.628	0.748
READING	3	0.193	0.239	0.311	0.378	0.427	0.498	0.628	0.749
READING	4	0.194	0.239	0.312	0.378	0.428	0.497	0.629	0.749
READING	5	0.194	0.239	0.312	0.378	0.427	0.498	0.628	0.749
READING	6	0.194	0.238	0.312	0.379	0.426	0.498	0.629	0.749
READING	7	0.194	0.238	0.312	0.378	0.427	0.498	0.629	0.749
READING	8	0.193	0.237	0.312	0.378	0.428	0.498	0.629	0.749
READING	9	0.195	0.239	0.313	0.379	0.428	0.498	0.627	0.749
READING	10	0.193	0.239	0.313	0.379	0.428	0.498	0.629	0.749
AVERAGE		**0.194**	**0.239**	**0.312**	**0.379**	**0.428**	**0.498**	**0.629**	**0.749**
MAX DEVIATION (1)		**0.002**	**0.002**	**0.002**	**0.001**	**0.002**	**0.002**	**0.002**	**0.001**

		Q2	Q4	Q6	Q8	Q10	Q12	Q14
READING	1	0.192	0.240	0.316	0.378	0.424	0.495	0.630
READING	2	0.193	0.240	0.314	0.379	0.425	0.497	0.630
READING	3	0.193	0.239	0.316	0.378	0.426	0.496	0.629
READING	4	0.193	0.239	0.314	0.379	0.426	0.497	0.629
READING	5	0.194	0.239	0.314	0.379	0.426	0.496	0.629
READING	6	0.194	0.239	0.314	0.380	0.424	0.497	0.628
READING	7	0.194	0.238	0.313	0.379	0.425	0.496	0.630
READING	8	0.193	0.239	0.314	0.377	0.425	0.497	0.628
READING	9	0.194	0.238	0.315	0.379	0.425	0.497	0.629
READING	10	0.193	0.239	0.314	0.379	0.424	0.497	0.630
AVERAGE		**0.193**	**0.239**	**0.314**	**0.379**	**0.425**	**0.497**	**0.629**
MAX DEVIATION (1)		**0.002**	**0.002**	**0.003**	**0.003**	**0.002**	**0.002**	**0.002**

(1) The Difference Between The Largest And Smallest Measurement Must Be ≤ 0.003 in.

QA/QC Check

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

4/1/2005

4-1-2005

Operator (Signature/Date)

04/01/2005

Project Coordinator (Signature/Date)

© 1992 CETCON, Inc. All Rights Reserved

Qtztno-1

CETCON, Inc.

INSTRUMENT CALIBRATION DATA

Digital Temperature Indicator (DTI) No: CM #1
SGI AP5500E

Calibration Date: September 27, 2005
Calibrator: SDW

MEDIA	TIME	Mercury Thermometer (°F)	Temperature Indicator (°F)	Difference (°F)	
ICE BATH	10:00	34	34	0	(1)
AMBIENT AIR	10:30	74	74	0	(1)
BOILING WATER	10:45	213	208	-5	(1)
OVEN	11:15	123	126	3	(2)
OVEN	11:45	267	269	2	(2)
OVEN	13:30	302	304	2	(2)
OVEN	14:11	280	282	2	(2)

Average 0.6

Required Accuracy (1): -2.0 ≤ Difference (°F) ≤ 2.0
Required Accuracy (2): -5.4 ≤ Difference (°F) ≤ 5.4

	YES	NO
Adjustment Required?		X

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

9/28/2005

Operator (Signature/Date) 9/27/2005

Project Coordinator (Signature/Date) 10/3/2005

© 2002 CETCON, Inc. All Rights Reserved

CM1TEMP.XLS

CETCON, Inc.

INSTRUMENT CALIBRATION DATA

Digital Temperature Indicator (DTI) No: CET 1 SGI Control Module
CM-1
AP 5500E

Calibration Date: September 27, 2005
Calibrator: SDW

Temperature Simulator: Transmation
Model No.: 1062
Serial No.: B11605JK
Thermocouple Type: K

OMEGA Temp. Simulator (°F)	TIME	Temp. Indicator (°F)	Difference (°F)	Error, %
0	13:10	0	0	NA
NIST 78	13:10	78	0	0.0
100	13:11	101	1	1.0
200	13:11	200	0	0.0
300	13:11	300	0	0.0
400	13:11	399	-1	-0.3
500	13:12	498	-2	-0.4
600	13:12	597	-3	-0.5
700	13:12	698	-2	-0.3
800	13:12	797	-3	-0.4
900	13:12	898	-2	-0.2
1000	13:12	998	-2	-0.2
1100	13:12	1098	-2	-0.2
1200	13:13	1199	-1	-0.1
1300	13:13	1299	-1	-0.1
1400	13:13	1399	-1	-0.1
1500	13:13	1500	0	0.0
1600	13:13	1599	-1	-0.1
1700	13:13	1700	0	0.0
1800	13:14	1801	1	0.1
1900	13:14	1902	2	0.1
2000	13:14	2002	2	0.1
2100	13:14	2105	5	0.2
		Average:	-0.4	-0.1
		Required Accuracy:		***-1.5 ≤ Error, % ≤ 1.5***

	YES	NO
Adjustment Required?		X

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

9/28/2005

Operator (Signature/Date) 9/27/2005

Project Coordinator (Signature/Date) 10/03/2005

© 2002 CETCON, Inc. All Rights Reserved

CM1SIM.XLS

CETCON, Inc.

CETCON ELECTRONIC BALANCE
INSTRUMENT CALIBRATION VERIFICATION

Model: OHAUS Navigator - 2100
Serial Number: CET-1

Calibration Verification Date: September 27, 2005

NIST Class S Stainless Steel Weight (g)	Time	Electronic Balance Display (g)	Magnitude of the Difference (g)	Comments
100.0	1300	99.9	0.1	
200.0	1310	200.0	0.0	
300.0	1315	299.9	-0.1	
500.0	1320	499.9	-0.1	
800.0	1330	799.7	-0.3	
1000.0	1340	999.8	-0.2	
2000.0	1350	1999.6	-0.4	

Average Difference -0.14
Must be ≤ 0.5g

Calibration Adjustment?

YES	NO
	X

S.S. Weight, g	Serial Number
100.0	52387
200.0	70041
500.0	70667
1000.0	4280402
2000.0	4280403

Trailer Reference Weight, No. 001 = 699.9 g

QA/QC Check:
Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

9/28/2005

Deke Wise 9/27/2005
Operator (Signature/Date)

Project Coordinator (Signature/Date)
10/3/2005

©2003 CETCON, Inc. All Rights Reserved

CETCON1CAL.xls

CETCON, Inc.

Barometer Calibration

Date: 27-Sep-05
Barometer ID: CETCON I
Calibrator: SDW

Absolute Pressure at (Station Pressure) Tulsa International Airport 918-838-7838 National Weather Service: 29.396

@ Elevation, ft: 676

@ Temperature, °F: 70

National Weather Service barometer corrected to elevation of CETCON's Tulsa, Oklahoma Office: 29.34

CETCON Barometer Reading: 29.39

@ Elevation, ft: 730

@ Temperature, °F: 70

Variation: 0.05

Barometer Adjustment Required ? YES _____ NO X

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

9/28/2005

Operator (Signature/Date) 9/27/2005

Project Coordinator (Signature/Date) 10/3/2005

© 2002 CETCON, Inc. All Rights Reserved

BARO4.XLS

Lab Analysis

APPENDIX E

CETCON, Inc.

PARTICULATE ANALYSIS SUMMARY

JOB NO: CJ-4113
JOB NAME: TPI
LOCATION: Ardmore, Oklahoma

DATE ANALYSIS: 1/31/2006
UNIT TESTED: CCR Vent
LAB ANALYST: CAF

TEST ID	C4	C5	C6
FILTER NUMBER	A-783	A-784	A-783
ACETONE BLANK VOLUME (ml)	150	150	150
FINAL ACETONE BLANK WEIGHT (mg)	2238.1	2238.1	2238.1
INITIAL ACETONE BLANK WEIGHT (mg)	2237.9	2237.9	2237.9
ACETONE BLANK RESIDUE (mg)	0.2	0.2	0.2
DI WATER BLANK VOLUME (ml)	400	400	400
FINAL DI WATER BLANK WEIGHT (mg)	2237.1	2237.1	2237.1
INITIAL DI WATER BLANK WEIGHT (mg)	2235.7	2235.7	2235.7
DI WATER RESIDUE (mg)	1.4	1.4	1.4
FINAL FILTER WEIGHT (mg)	706.5	699.9	697.1
INITIAL FILTER WEIGHT (mg)	708.4	700.5	697.5
PARTICULATE ON FILTER (mg) (6)	0.0	0.0	0.0
FRONT WASH VOLUME (ml)	150	150	150
FINAL FRONT WASH WEIGHT (mg)	2215.3	2211.4	2210.5
INITIAL FRONT WASH WEIGHT (mg)	2212.6	2209.2	2208.4
PARTICULATE IN FRONT WASH (mg) (1)	2.5	2.0	1.9
FRONT HALF PARTICULATE (mg)	2.5	2.0	1.9
BACK WASH VOLUME USED (ml)	400	400	400
FINAL BACK WASH WEIGHT (mg)	2246.5	2239.4	2254.1
INITIAL BACK WASH WEIGHT (mg)	2233.2	2231.8	2251.0
BACK HALF PARTICULATE (mg) (2)	11.9	6.2	1.7
TOTAL PARTICULATE (mg)	14.4	8.2	3.6

RUN NO.		C4	C5	C6	AVG
V_{Mstd} (dscf)		34.111	35.451	31.987	33.850
Stack Flow (dscfm)		89	90	81	87
Front Half PM (mg) ;	(from above)	2.5	2.0	1.9	2.1
Front Half PM (lb/dscf) (4)	x 10^{-6}	0.16	0.12	0.13	0.14
Front Half PM (lb/hr) (5)		0.00	0.00	0.00	0.00
Back Half PM (mg);	(from above)	11.9	6.2	1.7	6.6
Back Half PM (lb/dscf) (4)	x 10^{-6}	0.77	0.39	0.12	0.42
Back Half PM (lb/hr) (5)		0.00	0.00	0.00	0.00
Total PM (mg);	(from above)	14.4	8.2	3.6	8.7
Total PM (lb/dscf) (4)	x 10^{-6}	0.93	0.51	0.25	0.56
Total PM (lb/hr) (5)		0.005	0.003	0.001	0.003
%Isokinetic		96.9	99.9	100.1	99.0

1. Final Weight - Initial Weight - (Acetone Blank Residue x Front Wash Volume/Blank Volume)
2. Final Weight - Initial Weight - (DI Water Blank Residue x Back Wash Volume/Blank Volume)
3. Corrected Back Half (mg) = Back Half (mg) x Total Volume (ml) ÷ (Total Volume (ml) - Aliquot Volume (ml))
4. PM (lb/dscf) = 2.2046 x 10^{-6} x PM (mg) ÷ V_{Mstd} (dscf)
5. PM (lb/hr) = PM (lb/dscf) x Stack Flow (dscfm) x 60 (min/hr)
6. Final Filter Weight less than initial Tare Weight

QA/QC Check:

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by: 2-6-2006 Operator (Signature/Date) Project Coordinator (Signature/Date) 2/3/2006

2/3/2006

© 1996 CETCON, Inc. All Rights Reserved

PMLAB.XLS

CETCON, Inc.

Date: 1/13/2006
Plant: TPI Petroleum
Unit: CCR Vent Scrubber
Job No.: CJ-4113

Method: 5
Analyst: CAF

PARTICULATE ANALYSIS REPORT

FILTER

Run Number	Filter Number	Final Weight (mg)	Tare Weight (mg)	Weight Gain (mg)
C4	A-783	706.5	708.4	-1.9
C5	A-785	699.9	700.5	-0.6
C6	A-784	697.1	697.5	-0.4

PROBE WASH

Run Number	Dish Number	Final Weight (mg)	Tare Weight (mg)	Weight Gain (mg)
C4	1919	2215.3	2212.6	2.7
C5	1920	2211.4	2209.2	2.2
C6	1921	2210.5	2208.4	2.1

IMPINGER CATCH

Run Number	Dish Number	Final Weight (mg)	Tare Weight (mg)	Weight Gain (mg)
C4	1922	2246.5	2233.2	13.3
C5	1923	2239.4	2231.8	7.6
C6	1924	2254.1	2251.0	3.1

BLANK

Run Number	Dish Number	Final Weight (mg)	Tare Weight (mg)	Weight Gain (mg)
Acetone	1925	2238.1	2237.9	0.2
DI Water	1926	2237.1	2235.7	1.4

Detection Limit = 0.1 mg

Analyst's Signature:

CETCON, Inc.

Date: 1/11/2006
Plant: TPI Petroleum
Unit: CCR Vent Scrubber
Job No.: CJ-4113

PARTICULATE ANALYSIS REPORT

Method: 5
Analyst: CAF

FILTER FINAL WEIGHTS:

	Filter Number	Date In Desiccator	Time In Desiccator	Weight 1/31 @ 1440	Weight 2/1 @ 810	Weight @	Weight @
C4	A-783	1/17/2006	1600	706.5	706.5		
C5	A-785	1/17/2006	1600	700.0	699.9		
C6	A-784	1/17/2006	1600	697.1	697.1		

DISH FINAL WEIGHTS

	Dish Number	Date In Desiccator	Time In Desiccator	Weight 1/31 @ 1443	Weight 2/1 @ 813	Weight @	Weight @
C4 F 1/2	1919	1/20/2006	1016	2215.3	2215.3		
C5 F 1/2	1920	1/20/2006	1016	2211.3	2211.4		
C6 F 1/2	1921	1/20/2006	1016	2210.2	2210.5		
C4 B 1/2	1922	1/19/2006	1300	2246.4	2246.5		
C5 B 1/2	1923	1/19/2006	1300	2239.2	2239.4		
C6 B 1/2	1924	1/19/2006	1300	2254.4	2254.1		
Acetone Blank 100 ml	1925	1/20/2006	1016	2238.0	2238.1		
DI Blank 200 ml	1926	1/19/2006	1300	2237.1	2237.1		

Analyst's Signature: Craig Lay

CETCON, Inc.

PARTICULATE - LAB ANALYSIS REPORT

FILTER TARE WEIGHTS

Filter Number	Date In Desiccator	Time In Desiccator	1st Weight, mg	1st Date	1st Time	2nd Weight, mg	2nd Date	2nd Time	3rd Weight, mg	3rd Date	3rd Time	Final Weight, mg
A781	3/30/2005	1100	677.4	4/6/2005	845	677.4	4/7/2005	1030	NA0	NA	NA	677.4
A782	3/30/2005	1100	702.3	4/6/2005	845	702.4	4/7/2005	1030	NA0	NA	NA	702.4
A783	3/30/2005	1100	708.3	4/6/2005	845	708.4	4/7/2005	1030	NA0	NA	NA	708.4
A784	3/30/2005	1100	697.3	4/6/2005	845	697.5	4/7/2005	1030	NA0	NA	NA	697.5
A785	3/30/2005	1100	700.4	4/6/2005	845	700.5	4/7/2005	1030	NA0	NA	NA	700.5
A786	3/30/2005	1100	699.7	4/6/2005	845	699.8	4/7/2005	1030	NA0	NA	NA	699.8
A787	3/30/2005	1100	698.1	4/6/2005	845	698.1	4/7/2005	1030	NA0	NA	NA	698.1
A788	3/30/2005	1100	699.9	4/6/2005	845	700.0	4/7/2005	1030	NA0	NA	NA	700.0
A789	3/30/2005	1100	701.4	4/6/2005	845	701.3	4/7/2005	1030	NA0	NA	NA	701.3
A790	3/30/2005	1100	704.7	4/6/2005	845	705.1	4/7/2005	1030	NA0	NA	NA	705.1
A791	3/30/2005	1100	707.2	4/6/2005	845	707.3	4/7/2005	1030	NA0	NA	NA	707.3
A792	3/30/2005	1100	706.5	4/6/2005	845	706.5	4/7/2005	1030	NA0	NA	NA	706.5
A793	3/30/2005	1100	679.1	4/6/2005	845	679.1	4/7/2005	1030	NA0	NA	NA	679.1
A794	3/30/2005	1100	672.5	4/6/2005	845	672.4	4/7/2005	1030	NA0	NA	NA	672.4
A795	3/30/2005	1100	673.5	4/6/2005	845	673.4	4/7/2005	1030	NA0	NA	NA	673.4
A796	3/30/2005	1100	703.8	4/6/2005	845	703.9	4/7/2005	1030	NA0	NA	NA	703.9
A797	3/30/2005	1100	699.7	4/6/2005	845	699.6	4/7/2005	1030	NA0	NA	NA	699.6
A798	3/30/2005	1100	707.4	4/6/2005	845	707.5	4/7/2005	1030	NA0	NA	NA	707.5
A799	3/30/2005	1100	703.5	4/6/2005	845	703.4	4/7/2005	1030	NA0	NA	NA	703.4
A800	3/30/2005	1100	703.2	4/6/2005	845	703.3	4/7/2005	1030	NA0	NA	NA	703.3
A801	3/30/2005	1100	705.4	4/6/2005	845	705.5	4/7/2005	1030	NA0	NA	NA	705.5
A802	3/30/2005	1100	707.5	4/6/2005	845	707.4	4/7/2005	1030	NA0	NA	NA	707.4
A803	3/30/2005	1100	707.6	4/6/2005	845	707.5	4/7/2005	1030	NA0	NA	NA	707.5
A804	3/30/2005	1100	707.6	4/6/2005	845	707.5	4/7/2005	1030	NA0	NA	NA	707.5
A805	3/30/2005	1100	684.1	4/6/2005	845	684.3	4/7/2005	1030	NA0	NA	NA	684.3

Manufacturer: Pall Corp. Lot No.: 23327

Analyst's Signature: Craig Fox 1-11-2006 DATE

CETCON, Inc.

PARTICULATE - LAB ANALYSIS REPORT

DISH TARE WEIGHTS

Dish Number	Date In Desiccator	Time In Desiccator	1st Weight, mg	1st Date	1st Time	2nd Weight, mg	2nd Date	2nd Time	3rd Weight, mg	3rd Date	3rd Time	Final Weight, mg
1896	10/4/2005	1051	2238.9	10/5/2005	1105	2238.9	10/6/2005	840	NA	NA	NA	2238.9
1897	10/4/2005	1051	2229.1	10/5/2005	1105	2229.2	10/6/2005	840	NA	NA	NA	2229.2
1898	10/4/2005	1051	2250.2	10/5/2005	1105	2250.2	10/6/2005	840	NA	NA	NA	2250.2
1899	10/4/2005	1051	2237.6	10/5/2005	1105	2237.6	10/6/2005	840	NA	NA	NA	2237.6
1900	10/4/2005	1051	2230.0	10/5/2005	1105	2229.9	10/6/2005	840	NA	NA	NA	2229.9
1901	10/4/2005	1051	2216.2	10/5/2005	1105	2216.3	10/6/2005	840	NA	NA	NA	2216.3
1902	10/4/2005	1051	2197.8	10/5/2005	1105	2197.7	10/6/2005	840	NA	NA	NA	2197.7
1903	10/4/2005	1051	2211.4	10/5/2005	1105	2211.4	10/6/2005	840	NA	NA	NA	2211.4
1904	10/4/2005	1051	2194.7	10/5/2005	1105	2194.8	10/6/2005	840	NA	NA	NA	2194.8
1905	10/4/2005	1051	2213.5	10/5/2005	1105	2213.5	10/6/2005	840	NA	NA	NA	2213.5
1906	10/4/2005	1051	2221.1	10/5/2005	1105	2221.1	10/6/2005	840	NA	NA	NA	2221.1
1907	10/4/2005	1051	2227.0	10/5/2005	1105	2227.1	10/6/2005	840	NA	NA	NA	2227.1
1908	10/4/2005	1051	2215.6	10/5/2005	1105	2215.5	10/6/2005	840	NA	NA	NA	2215.5
1909	10/4/2005	1051	2226.0	10/5/2005	1105	2226.0	10/6/2005	840	NA	NA	NA	2226.0
1910	10/4/2005	1051	2235.5	10/5/2005	1105	2235.4	10/6/2005	840	NA	NA	NA	2235.4
1911	10/4/2005	1051	2218.6	10/5/2005	1105	2218.6	10/6/2005	840	NA	NA	NA	2218.6
1912	10/4/2005	1051	2228.2	10/5/2005	1105	2228.2	10/6/2005	840	NA	NA	NA	2228.2
1913	10/4/2005	1051	2226.7	10/5/2005	1105	2226.7	10/6/2005	840	NA	NA	NA	2226.7
1914	10/4/2005	1051	2217.9	10/5/2005	1105	2217.9	10/6/2005	840	NA	NA	NA	2217.9
1915	10/4/2005	1051	2261.6	10/5/2005	1105	2261.5	10/6/2005	840	NA	NA	NA	2261.5
1916	10/4/2005	1051	2220.6	10/5/2005	1105	2220.6	10/6/2005	840	NA	NA	NA	2220.6
1917	10/4/2005	1051	2225.5	10/5/2005	1105	2225.5	10/6/2005	840	NA	NA	NA	2225.5
1918	10/4/2005	1051	2224.3	10/5/2005	1105	2224.4	10/6/2005	840	NA	NA	NA	2224.4
1919	10/4/2005	1051	2212.6	10/5/2005	1105	2212.6	10/6/2005	840	NA	NA	NA	2212.6

Analyst's Signature: Craig Fox

1-17-2006
Date

CETCON, Inc.

PARTICULATE - LAB ANALYSIS REPORT

DISH TARE WEIGHTS

Dish Number	Date In Desiccator	Time In Desiccator	1st Weight, mg	1st Date	1st Time	2nd Weight, mg	2nd Date	2nd Time	3rd Weight, mg	3rd Date	3rd Time	Final Weight, mg
1920	10/4/2005	1051	2209.3	10/31/2005	905	2209.2	11/1/2005	822	NA	NA	NA	2209.2
1921	10/4/2005	1051	2208.4	10/31/2005	905	2208.4	11/1/2005	822	NA	NA	NA	2208.4
1922	10/4/2005	1051	2233.0	10/31/2005	905	2233.2	11/1/2005	822	NA	NA	NA	2233.2
1923	10/4/2005	1051	2232.0	10/31/2005	905	2231.8	11/1/2005	822	NA	NA	NA	2231.8
1924	10/4/2005	1051	2251.0	10/31/2005	905	2251.0	11/1/2005	822	NA	NA	NA	2251.0
1925	10/4/2005	1051	2237.9	10/31/2005	905	2237.9	11/1/2005	822	NA	NA	NA	2237.9
1926	10/4/2005	1051	2235.8	10/31/2005	905	2235.7	11/1/2005	822	NA	NA	NA	2235.7
1927	10/4/2005	1051	2223.2	10/31/2005	905	2223.3	11/1/2005	822	NA	NA	NA	2223.3
1928	10/4/2005	1051	2191.9	10/31/2005	905	2191.9	11/1/2005	822	NA	NA	NA	2191.9
1929	10/4/2005	1051	2216.1	10/31/2005	905	2216.2	11/1/2005	822	NA	NA	NA	2216.2
1930	10/4/2005	1051	2232.2	10/31/2005	905	2232.1	11/1/2005	822	NA	NA	NA	2232.1
1931	10/4/2005	1051	2230.0	10/31/2005	905	2230.0	11/1/2005	822	NA	NA	NA	2230.0
1932	10/4/2005	1051	2210.0	10/31/2005	905	2210.0	11/1/2005	822	NA	NA	NA	2210.0
1933	10/4/2005	1051	2195.7	10/31/2005	905	2195.9	11/1/2005	822	NA	NA	NA	2195.9
1934	10/4/2005	1051	2220.6	10/31/2005	905	2220.6	11/1/2005	822	NA	NA	NA	2220.6
1935	10/4/2005	1051	2220.8	10/31/2005	905	2220.6	11/1/2005	822	NA	NA	NA	2220.6
1936	10/4/2005	1051	2226.1	10/31/2005	905	2226.1	11/1/2005	822	NA	NA	NA	2226.1
1937	10/4/2005	1051	2224.0	10/31/2005	905	2224.0	11/1/2005	822	NA	NA	NA	2224.0
1938	10/4/2005	1051	2219.7	10/31/2005	905	2219.5	11/1/2005	822	NA	NA	NA	2219.5
1939	10/4/2005	1051	2226.0	10/31/2005	905	2226.1	11/1/2005	822	NA	NA	NA	2226.1
1940	10/4/2005	1051	2230.4	10/31/2005	905	2230.3	11/1/2005	822	NA	NA	NA	2230.3
1941	10/4/2005	1051	2237.4	10/31/2005	905	2237.3	11/1/2005	822	NA	NA	NA	2237.3
1942	10/4/2005	1051	2203.0	10/31/2005	905	2203.0	11/1/2005	822	NA	NA	NA	2203.0
1943	10/4/2005	1051	2218.2	10/31/2005	905	2218.4	11/1/2005	822	NA	NA	NA	2218.4

Analyst's Signature: Craig Fox

1-17-2006
Date

CETCON, Inc.

INSTRUMENT CALIBRATION VERIFICATION

Analytical Electronic Balance Serial Number: 1553

Calibration Verification Date: 1/31/2006

NIST Class S Stainless Steel Weight (mg)	Time	Ohaus Electronic Balance Result (mg)	Difference (mg)	Comments
200.0	1435	200.0	0.0	
300.0	1435	300.0	0.0	
500.0	1436	499.9	0.1	
700.0	1436	700.0	0.0	
850.0	1436	850.0	0.0	

Note: Average Difference >.1mg requires recalibration or a calibration adjustment

Average Difference 0.02

NIST Class S Stainless Steel Weight (grams)	Time	Ohaus Electronic Balance Result (g)	Difference (g)	Comments
1.0000	1436	1.0000	0.0000	
2.0000	1437	2.0000	0.0000	
3.0000	1437	3.0000	0.0000	

Note: Average Difference >0.0001g requires recalibration or a calibration adjustment

Average Difference 0.0000

Calibration Adjustment?

YES	NO
	X

Analyst's Signature: [signature]

CETCON, Inc.

CHAIN OF CUSTODY

JOB NO: CJ-4113

CUSTOMER: TPI Petroleum, Inc.

UNIT: CCR Vent Scrubber

LOCATION: Ardmore, Oklahoma

DATE(S) SAMPLED: January 5, 2006

NUMBER OF TESTS: 3

DATE RESULTS REQUIRED: Normal

DESCRIPTION	NO. OF CONTAINERS	SAMPLE VOLUME, ml	PARTICULATE	HCl	SO_2	H_2S	H_2SO_4	METALS	BTEX
FILTER CONTAINER	3	NA	X						
FRONT HALF (ACETONE)	3	100	X						
BACK HALF (DI H_2O)	3	400	X						
ACETONE BLANK	1	100	X						
DI H_2O BLANK	1	200	X						

SPECIAL INSTRUCTIONS

Standard Method 5 Analysis with Back Half

OUTSIDE ANALYSIS

FIRM: CETCON, Inc.

ANALYSIS FOR: CETCON, Inc.

DATE TAKEN:

RUN NUMBER	SAMPLE FRACTION	TIME	DATE	LOCATION	RECOVERED BY
C4	Glass Fiber Filter ~~A-781~~	A-783		Trailer	JRH/JRV
C4	Probe Wash Acetone			Trailer	JRH/JRV
C4	Back Half DI H_2O			Trailer	JRH/JRV
C5	Glass Fiber Filter ~~A-782~~	A-785		Trailer	JRH/JRV
C5	Probe Wash Acetone			Trailer	JRH/JRV
C5	Back Half DI H_2O			Trailer	JRH/JRV
C6	Glass Fiber Filter ~~A-783~~	A-784		Trailer	JRH/JRV
C6	Probe Wash Acetone			Trailer	JRH/JRV
C6	Back Half DI H_2O			Trailer	JRH/JRV
Blank	Acetone			Trailer	JRH/JRV
Blank	DI H_2O			Trailer	JRH/JRV

Relinquished By: Date/Time: 1-13-2006 10:18 Recieved By: Date/Time: 1-13-2006

Relinquished By: Date/Time: Recieved By: Date/Time:

Relinquished By: Date/Time: Recieved By: Date/Time:

© 1999 CETCON, Inc. All Rights Reserved

CETCON, Inc.

Hydrogen Chloride Analysis Summary
Reference Method 26A

JOB NO:	CJ-4113	DATE ANALYSIS:	January 11, 2006
JOB NAME:	TPI	UNIT TESTED:	CCR Vent
LOCATION:	Ardmore, Oklahoma	LAB ANALYST:	Enthalpy Analytical, In

TEST ID	C1	C2	C3	AVG
Mass of Cl^- in Sample, S_{Cl} (µg)	948.0	601.0	581.0	
Mass of Cl^- in Blank, B_{Cl} (µg)	387.0	387.0	387.0	
Total Mass of Cl^-, (µg) (1)	**561.0**	**214.0**	**194.0**	**323.0**
Total Mass of HCl, (µg) (2)	**576.9**	**220.1**	**199.5**	**332.2**

BDL: Below Detection Limit

RUN NO.	C1	C2	C3	AVG
V_{Mstd} (dscf)	40.407	34.285	33.363	36.018
Stack Flow (dscfm)	106	88	86	94

HCl, lb/scf ($x10^{-6}$) (3)	0.031	0.014	0.013	0.020
HCl, ppm (4)	0.333	0.150	0.139	0.207
HCl, lb/hr (5)	0.000	0.000	0.000	0.000

NOTES:

(1) The analytical detection limit was used to calculate mass of HCl, µg when samples were below the detection limit.

(2) Mass of HCl, µg = [Mass of Cl^-, µg] x [Molecular Weight of HCl, lb/lbmole] ÷ [Atomic Weight of Cl, lb/lbmole]

(3) HCl, lb/scf = [2.2046 x 10^{-9}, lb/µg] x [Mass of HCl, µg] ÷ [V_{Mstd}, dscf]

(4) HCl, ppm = [HCl, lb/scf] x [385.3 x 10^6, ppm·scf/lbmole] ÷ [Molecular Weight of HCl, lb/lbmole]

(5) HCl, lb/hr = [HCl, lb/scf] x [Stack Flow, scf/min] x [60, min/hr]

QA/QC Check:

Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Reasonableness ✓

Checked by:

2/3/2006

2-6-2006
Operator (Signature/Date)

2/3/2006
Project Coordinator (Signature/Date)

© 1999 CETCON, Inc. All Rights Reserved

HCLLAB.XLS

CETCON, Inc.

4953 South 45th West Avenue
Tulsa, OK 74107

TPI Petroleum, Inc
Ardmore, OK
Job # CJ-4113

Analytical Report
(0106-34)

EPA Method 26

Hydrogen Chloride

Enthalpy Analytical, Inc.
Phone: (919) 850 - 4392 / Fax: (919) 850 - 9012 / www.enthalpy.com
2202 Ellis Road Durham, NC 27703 - 5518

I certify that to the best of my knowledge all analytical data presented in this report:

- Have been checked for completeness
- Are accurate, error-free, and legible
- Have been conducted in accordance with approved protocol, and that all deviations and analytical problems are summarized in the appropriate narrative(s)
- This analytical report was prepared in Portable Document Format (.PDF) and contains 62 pages.

Michael Steven Schapira

QA Review Performed by: Michael Steven Schapira

Summary of Results

Company	CETCON, Inc
Analyst Initials	KAM
Parameters	EPA Method 26
# Samples	3 runs & 1 blank

Client #	CJ-4113
Job #	0106-34
PO #	Verbal
Report Date	1/23/2006

Compound	Sample ID / Catch Weight (ug)			
	Run C1	***Run C2***	***Run C3***	***Blank***
Hydrogen chloride	948	601 J	581 J	387 J

Results

Company	CETCON, Inc
Analyst Initials	KAM
Parameters	EPA Method 26
# Samples	3 runs & 1 blank

Client #	CJ-4113
Job #	0106-34
PO #	Verbal
Report Date	1/23/2006

MDL 0.0421 (ug/mL)
LOQ 0.400 (ug/mL)
Compound Hydrogen chloride

Lower Curve Limit 0.635 (ug/mL)
Upper Curve Limit 13.3 (ug/mL)

Sample ID	Lab ID # 1	Lab ID # 2	Analysis Method	Ret Time # 1	Ret Time # 2	% Diff Ret	Conc # 1	Conc # 2	% Diff Conc	Avg Conc (ug/mL)	Vol (mL)	DF	Catch Weight (ug)	Qual
Run C1	031-3001.D	031-3002.D	0106-34R.	3.35	3.35	0.1	0.499	0.497	0.3	0.498	470	4.05	948	
Run C2	032-3101.D	032-3102.D	0106-34R.	3.35	3.35	0.0	0.328	0.331	0.4	0.330	450	4.05	601	J
Run C3	033-3201.D	033-3202.D	0106-34R.	3.35	3.35	0.1	0.326	0.326	0.1	0.326	440	4.05	581	J
Blank	034-3301.D	034-3302.D	0106-34R.	3.35	3.36	0.1	0.232	0.234	0.5	0.233	410	4.05	387	J
Lab blank H2SO4	008-2801.D	008-2802.D	0106-34R.	3.36	3.36	0.0	0.193	0.191	0.6	0.192	1.00	1	0.192	J
Lab blank H2O	009-2901.D	009-2902.D	0106-34R.	NA	NA	NA	0.0421	0.0421	NA	0.0421	1.00	1	0.0421	ND
MS/Run C1	035-3401.D	035-3402.D	0106-34R.	3.35	3.36	0.1	2.61	2.62	0.1	2.61	0.525	1	1.37	
												spike amount (ug)	1.29	
												native amount (ug)	0.249	
												spike recovery (%)	87.4%	

Narrative Summary

Enthalpy Analytical Narrative Summary

Company:	CETCON, Inc.
Client #:	CJ-4113 / TPI Petroleum
PO #:	Verbal

Enthalpy #:	0106-34
Analyst:	KAM
Parameters:	EPA Method 26A

Custody

Scott Grosshandler of Enthalpy Analytical, Inc. received the samples at 12.9 °C on 1/11/05 after being relinquished by CETCON, Inc. No apparent container problems were noted upon receipt. Prior to analysis the samples were kept under lock with access only by authorized personnel of Enthalpy Analytical, Inc.

Analysis

The samples were analyzed according to the procedures outlined in EPA Method 26A. The acid (H_2SO_4) matrix samples were analyzed for the chloride (Cl^-) ion.

Quantitation was performed using a Hewlett-Packard series 1100 High Performance Liquid Chromatograph equipped with a Dionex ED40 Electrochemical detector and a Dionex ASRS-ULTRA® 4-mm autosuppressor.

Separation

Separation was accomplished by a Dionex IonPac AS-14A 4 mm x 250 mm column. A copy of the analytical method (1105-90.M) is included.

Before and after sample analysis, calibration curves were prepared and analyzed. Chloride eluted at approximately 3.4 minutes, separated well, and was easily identified.

Matrix Spikes

A 0.500-mL aliquot of a 4.05-fold diluted sample ***Run Cl*** was spiked with 1.29 μg of hydrogen chloride (25.0 μL of a 51.4 μg/mL solution). The spiked sample was analyzed in the same manner as the other samples. The calculated spike recovery was 87.4%.

Blanks

One blank sample, ***Blank***, was analyzed and reported. No blank adjustments were made to any of the reported data.

Reporting Notes

The H_2SO_4 matrix samples were analyzed for Cl^- but are reported as HCl. The peaks listed in the "Sample Chromatograms" section are labeled hydrogen chloride. The additional molecular weight contribution from the H^+ is included in the results listed on each chromatogram and throughout the report.

General Reporting Notes

The following are general reporting notes that are applicable to all Enthalpy Analytical, Inc. reports, unless specifically noted otherwise.

- The symbol ***MDL*** represents the Minimum Detection Limit. Below this value the laboratory cannot confim the presence of the analyte of interest reliably.
- The symbol ***LOQ*** represents the Limit of Quantification. Below this value the laboratory cannot quantitate the analyte of interest within the criteria of the method.
- The symbol ***ND*** following a value indicates a non-detect or analytical result below the MDL.
- The symbol ***J*** following a value indicates an analytical result between the MDL and the LOQ. A J flag indicates that the laboratory can positively identify the analyte of interest as present, but the value should be considered an estimate.
- The symbol ***E*** following a value indicates an analytical result exceeding 100% of the highest calibration point.
- The symbol ***DF*** represents a Dilution Factor. This number represents dilutions during the extraction and/or laboratory stages of sample treatment. The analytical result taken from a laboratory instrument is multiplied by the DF to get final results.
- The Sample ID ***MS*** represents a Matrix Spike. An aliquot of an actual sample is spiked with a known amount of analyte so that a percent recovery value can be determined. This shows what effect the sample matrix may have on the target analyte, i.e. whether or not anything in the sample matrix prohibits analysis for the analyte(s).
- The Sample ID ***MSD*** represents a Matrix Spike Duplicate. Prepared in the same manner as an MS, the use of duplicate matrix spikes allows further confirmation of laboratory quality by showing the consistency of results gained by performing the same steps multiple times. Most methods performed by Enthalpy do not require analysis of an MSD.
- The Sample ID ***BS*** represents a Blind Spike. A member of the Quality Assurance department has created BS samples for many of the analytes Enthalpy tests for, and only QA and the Enthalpy Analytical ownership have access to the actual values of these samples. The laboratory analyzes them without knowledge of the actual value, and the spreadsheets get completed for these samples solely by the QA group.
- The Sample ID ***LCS*** represents a Laboratory Control Sample. Whenever spikes are prepared for our clients more spikes are prepared than needed. The extras (randomly chosen) are kept in-house at the appropriate temperature conditions. When the spike samples come back from the client for analysis, the LCSs (usually two are saved) are analyzed to confirm that the analyte could be recovered from the media, separate from the spike samples which were used on the project and which may have had issues caused during collection and/or transport.
- **Significant Figures**: Where the reported value is much greater than unity (1.00) in the units expressed (specifically values of 1,000 or greater), the number is rounded to a whole number of units, rather than to 3 significant figures. For example, a value of 10,456.45 ug catch is rounded to 10,456 ug. There are five significant digits reported, but no confidence should be placed on more than three significant digits.

Sample Custody

CETCON, Inc.

CHAIN OF CUSTODY

JOB NO: CJ-4113

CUSTOMER: TPI Petroleum, Inc.

UNIT: CCR Vent Scrubber

LOCATION: Ardmore, Oklahoma

DATE(S) SAMPLED: January 4, 2006

NUMBER OF TESTS: 3

DATE RESULTS REQUIRED: Normal

DESCRIPTION	NO. OF CONTAINERS	SAMPLE VOLUME, ml	PARTICULATE	HCl	SO_2	H_2S	H_2SO_4	METALS	BTEX
BACK HALF H_2O (ALIQUOT)	3	50		X					
BLANK H_2O (ALIQUOT)	1	50		X					

SPECIAL INSTRUCTIONS

Standard Method 26 Analysis

OUTSIDE ANALYSIS

FIRM: Enthalpy Analytical, Inc.

ANALYSIS FOR: CETCON, Inc.

DATE TAKEN:

RUN NUMBER	SAMPLE FRACTION	TIME	DATE	LOCATION	RECOVERED BY
C1	0.1N H_2SO_4			Trailer	JJA
C2	0.1N H_2SO_4			Trailer	JJA
C3	0.1N H_2SO_4			Trailer	JJA
Blank	0.1N H_2SO_4			Trailer	JJA

Relinquished By: _____ Date/Time: _____ Recieved By: [signature] Date/Time: 1-11-06/9:45 AM

Relinquished By: _____ Date/Time: _____ Recieved By: 12.96 Date/Time: _____

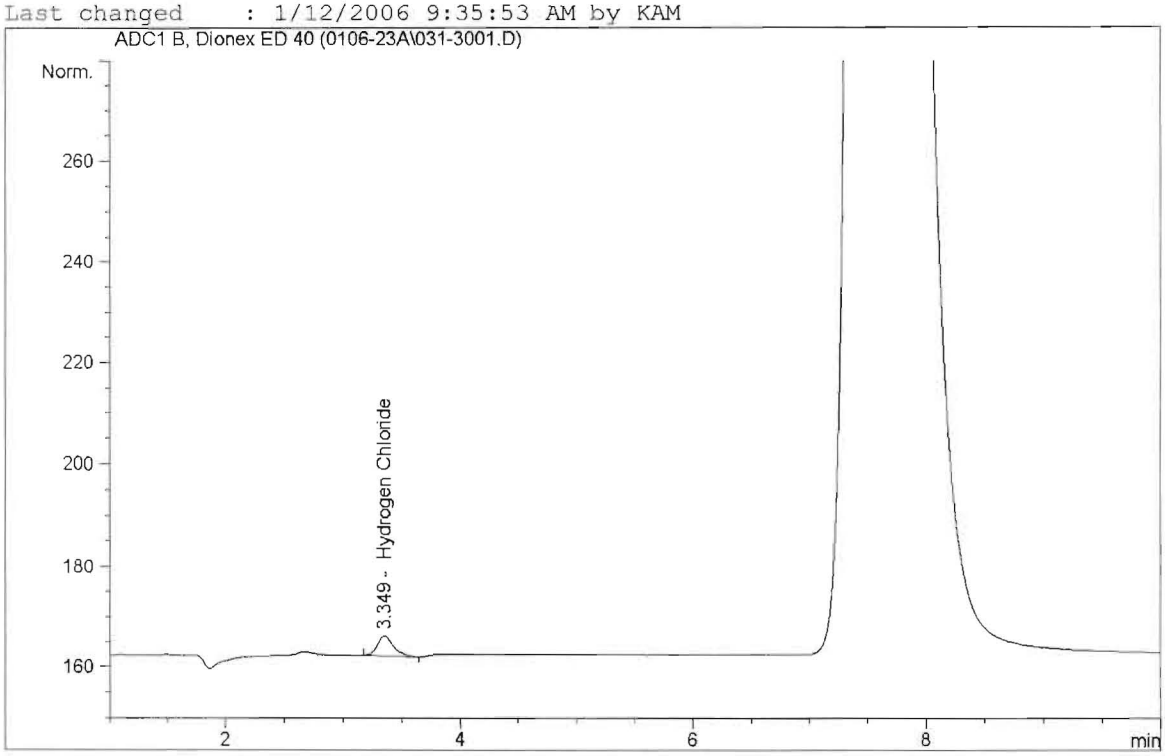
Relinquished By: _____ Date/Time: _____ Recieved By: _____ Date/Time: _____

© 1999 CETCON, Inc. All Rights Reserved

Sample Chromatograms

0106-34

Injection Date	: 1/11/2006 4:48:35 PM	Seq. Line :	30
Sample Name	: Run C1*4.05	Location :	Vial 31
Acq. Operator	: KAM	Inj :	1
Acq. Instrument	: Gonzo	Inj Volume :	25 µl
Acq. Method	: C:\LC2005Q4\GONZO\METHODS\1105-90.M		
Last changed	: 1/11/2006 10:03:40 AM by KAM		
Analysis Method	: H:\LC2006Q1\GONZO\METHOD\0106-34R.M		
Last changed	: 1/12/2006 9:35:53 AM by KAM		



External Standard Report

Sorted By	:	Signal
Calib. Data Modified	:	Thursday, January 12, 2006 9:33:23 AM
Multiplier	:	1.0000
Dilution	:	1.0000

Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime [min]	Type	Area [uS*s]	Amt/Area	Amount [ug/mL]	Grp	Name
3.349	BP	40.41893	1.23516e-2	4.99237e-1		Hydrogen Chloride

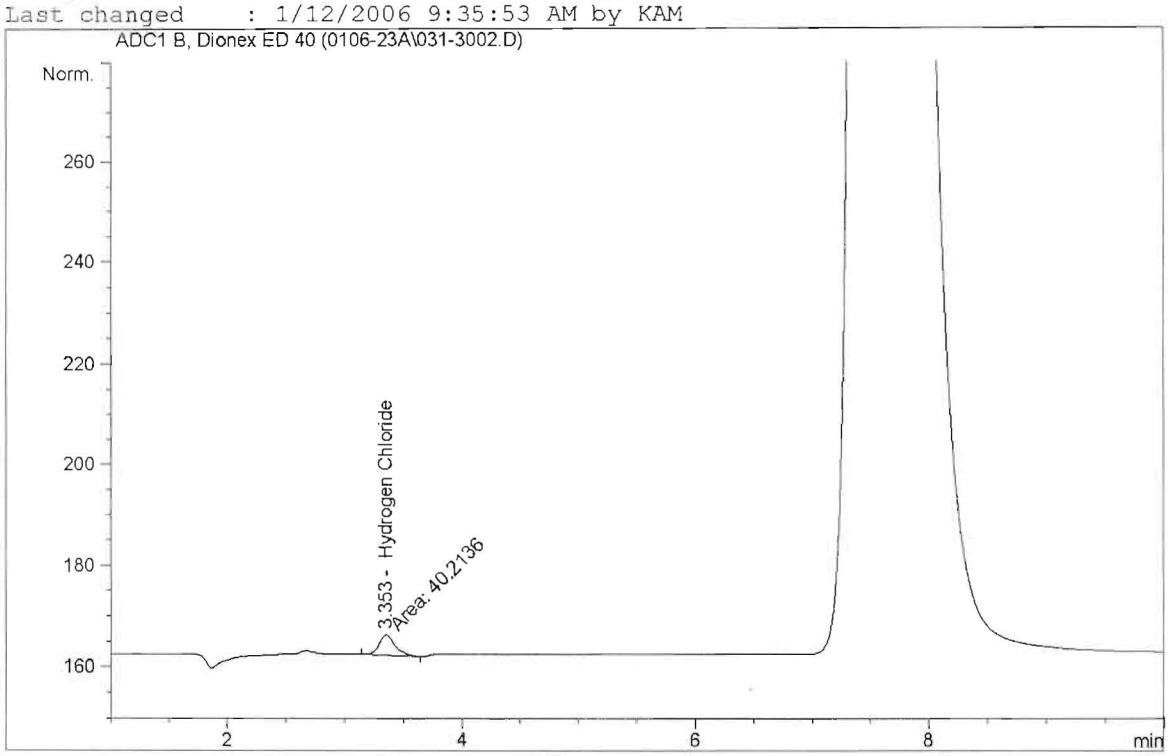
Totals : 4.99237e-1

Results obtained with enhanced integrator!

*** End of Report ***

0106-34

```
==================================================================
Injection Date  : 1/11/2006 5:00:28 PM          Seq. Line :  30
Sample Name     : Run C1*4.05                    Location : Vial 31
Acq. Operator   : KAM                                 Inj :   2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```

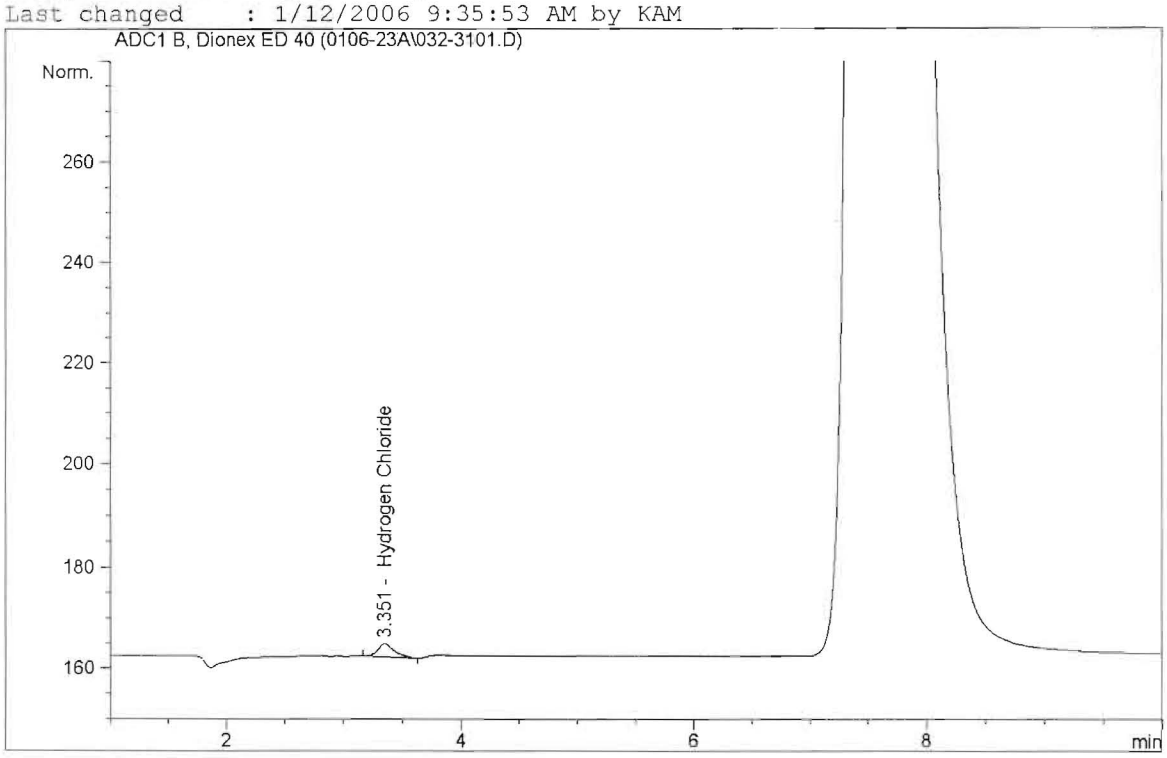



```
==================================================================
                      External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.353 MM       40.21362 1.23516e-2 4.96701e-1     Hydrogen Chloride

Totals :                              4.96701e-1

 Results obtained with enhanced integrator!
==================================================================
                        *** End of Report ***
```

Manual Integration (KAM)

0106-34

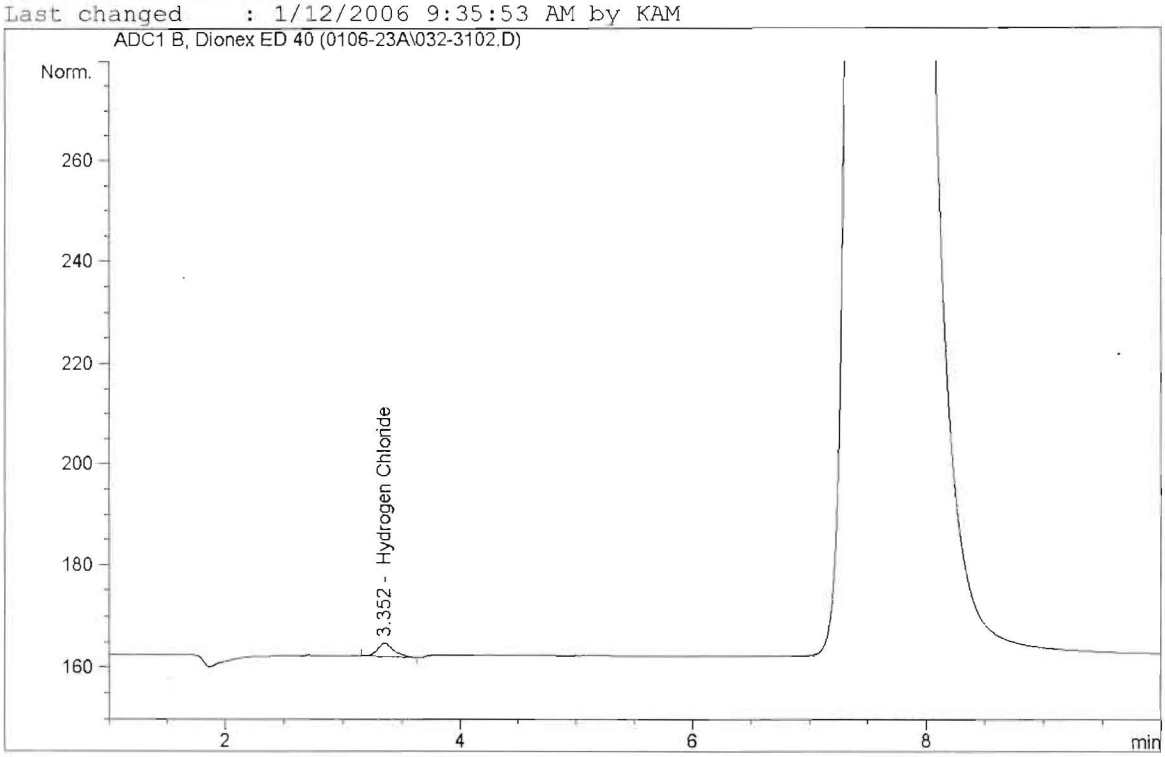
```
==================================================================
Injection Date  : 1/11/2006 5:12:21 PM          Seq. Line :  31
Sample Name     : Run C2*4.05                    Location : Vial 32
Acq. Operator   : KAM                                 Inj :   1
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```




```
==================================================================
                      External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.351 BP       26.59182 1.23516e-2 3.28450e-1     Hydrogen Chloride

Totals :                               3.28450e-1

 Results obtained with enhanced integrator!
==================================================================
                         *** End of Report ***
```

0106-34

Injection Date	: 1/11/2006 5:24:14 PM	Seq. Line :	31
Sample Name	: Run C2*4.05	Location :	Vial 32
Acq. Operator	: KAM	Inj :	2
Acq. Instrument	: Gonzo	Inj Volume :	25 µl
Acq. Method	: C:\LC2005Q4\GONZO\METHODS\1105-90.M		
Last changed	: 1/11/2006 10:03:40 AM by KAM		
Analysis Method	: H:\LC2006Q1\GONZO\METHOD\0106-34R.M		
Last changed	: 1/12/2006 9:35:53 AM by KAM		



External Standard Report

Sorted By	:	Signal
Calib. Data Modified	:	Thursday, January 12, 2006 9:33:23 AM
Multiplier	:	1.0000
Dilution	:	1.0000

Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

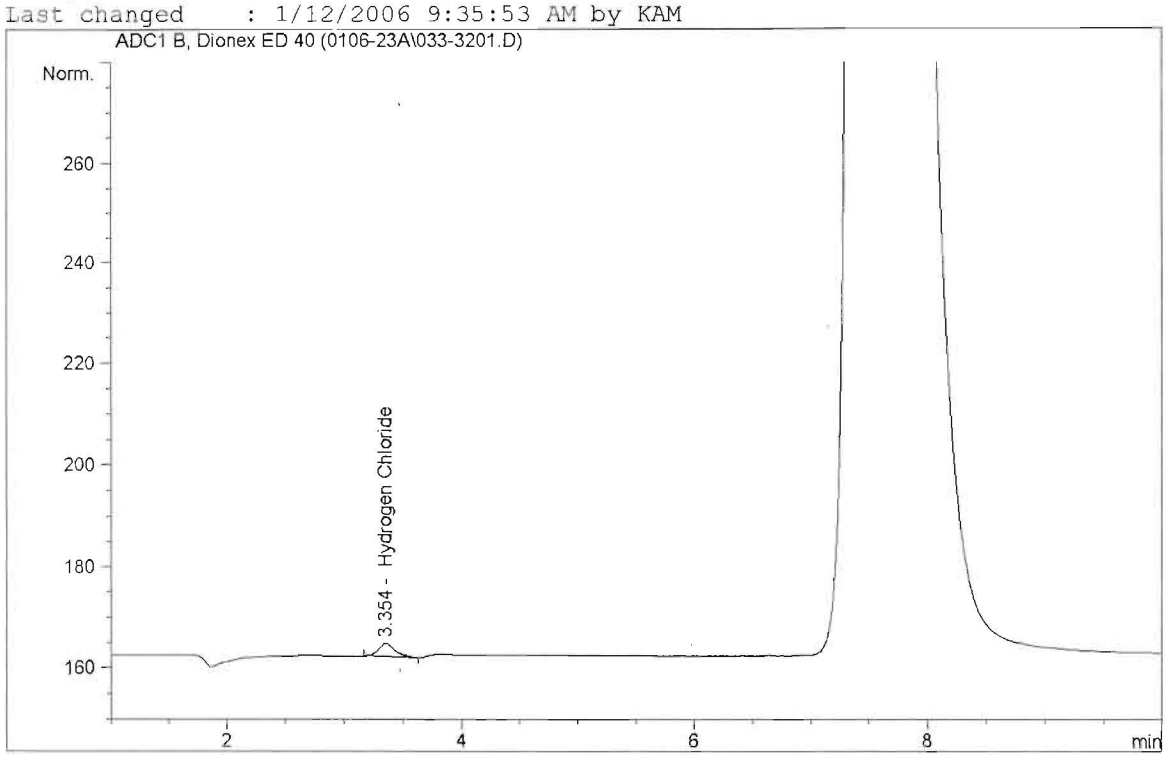
RetTime [min]	Type	Area [uS*s]	Amt/Area	Amount [ug/mL]	Grp	Name
3.352	BB	26.80304	1.23516e-2	3.31059e-1		Hydrogen Chloride
Totals :				3.31059e-1		

Results obtained with enhanced integrator!

*** End of Report ***

0106-34

Injection Date	: 1/11/2006 5:35:54 PM	Seq. Line	: 32
Sample Name	: Run C3*4.05	Location	: Vial 33
Acq. Operator	: KAM	Inj	: 1
Acq. Instrument	: Gonzo	Inj Volume	: 25 µl
Acq. Method	: C:\LC2005Q4\GONZO\METHODS\1105-90.M		
Last changed	: 1/11/2006 10:03:40 AM by KAM		
Analysis Method	: H:\LC2006Q1\GONZO\METHOD\0106-34R.M		
Last changed	: 1/12/2006 9:35:53 AM by KAM		



External Standard Report

Sorted By : Signal
Calib. Data Modified : Thursday, January 12, 2006 9:33:23 AM
Multiplier : 1.0000
Dilution : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime [min]	Type	Area [uS*s]	Amt/Area	Amount [ug/mL]	Grp	Name
3.354	BP	26.36503	1.23516e-2	3.25649e-1		Hydrogen Chloride

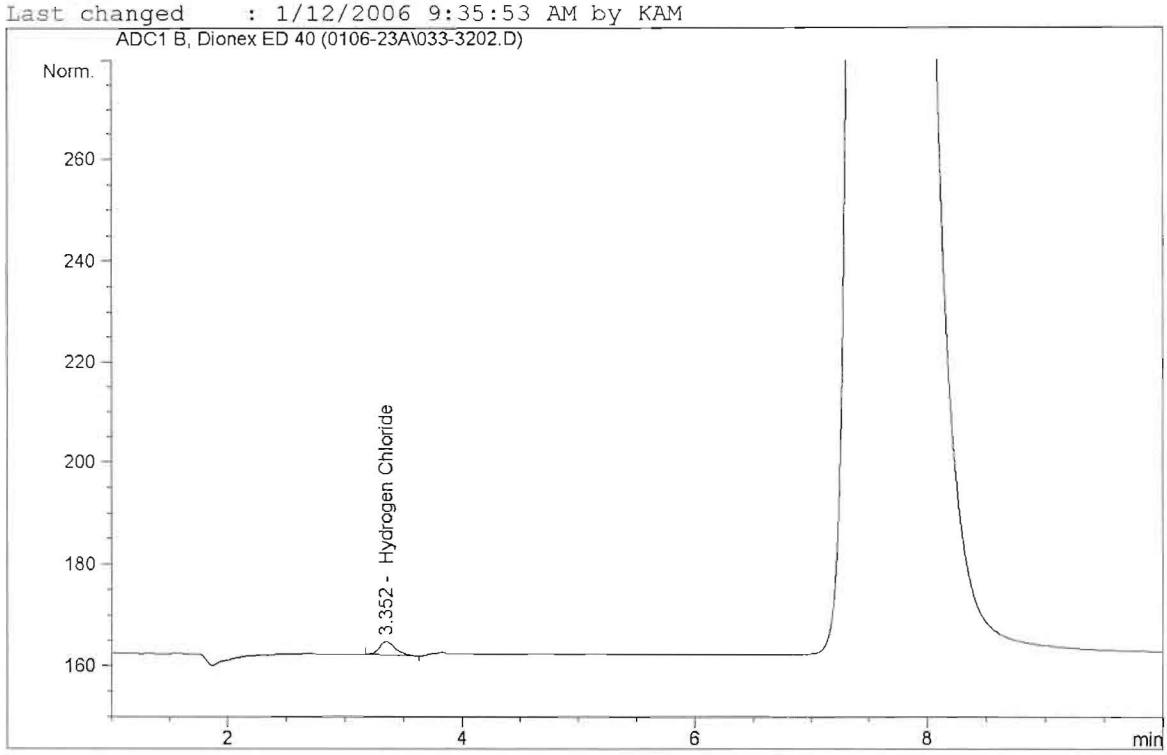
Totals : 3.25649e-1

Results obtained with enhanced integrator!

*** End of Report ***

0106-34

Injection Date	: 1/11/2006 5:47:40 PM	Seq. Line :	32
Sample Name	: Run C3*4.05	Location :	Vial 33
Acq. Operator	: KAM	Inj :	2
Acq. Instrument	: Gonzo	Inj Volume :	25 µl
Acq. Method	: C:\LC2005Q4\GONZO\METHODS\1105-90.M		
Last changed	: 1/11/2006 10:03:40 AM by KAM		
Analysis Method	: H:\LC2006Q1\GONZO\METHOD\0106-34R.M		
Last changed	: 1/12/2006 9:35:53 AM by KAM		



External Standard Report

Sorted By	:	Signal
Calib. Data Modified	:	Thursday, January 12, 2006 9:33:23 AM
Multiplier	:	1.0000
Dilution	:	1.0000

Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime [min]	Type	Area [uS*s]	Amt/Area	Amount [ug/mL]	Grp	Name
3.352	BP	26.41274	1.23516e-2	3.26238e-1		Hydrogen Chloride
Totals :				3.26238e-1		

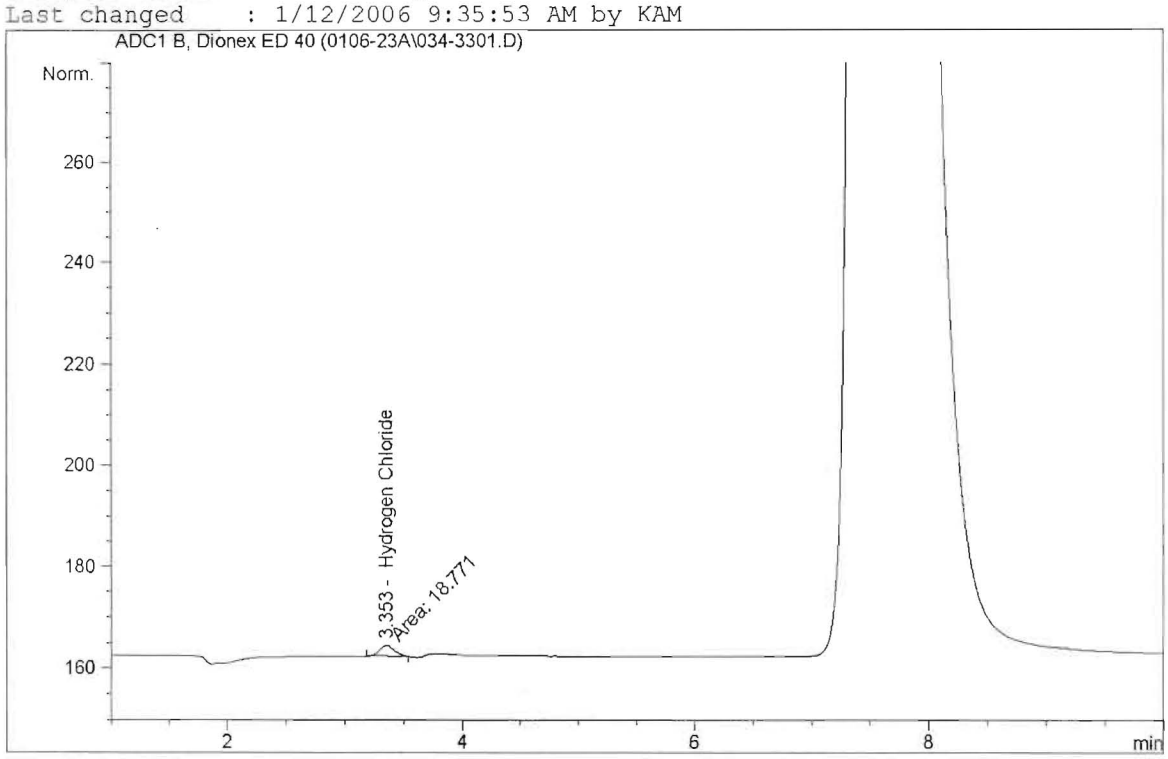
Results obtained with enhanced integrator!

*** End of Report ***

0106-34 Sample Blank

==========

Injection Date : 1/11/2006 5:59:20 PM Seq. Line : 33
Sample Name : Blank*4.05 Location : Vial 34
Acq. Operator : KAM Inj : 1
Acq. Instrument : Gonzo Inj Volume : 25 µl
Acq. Method : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed : 1/12/2006 9:35:53 AM by KAM



==========

External Standard Report

==========

Sorted By : Signal
Calib. Data Modified : Thursday, January 12, 2006 9:33:23 AM
Multiplier : 1.0000
Dilution : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime [min]	Type	Area [uS*s]	Amt/Area	Amount [ug/mL]	Grp	Name
3.353	MM	18.77098	1.23516e-2	2.31851e-1		Hydrogen Chloride

Manual Integration (KAM)

Totals : 2.31851e-1

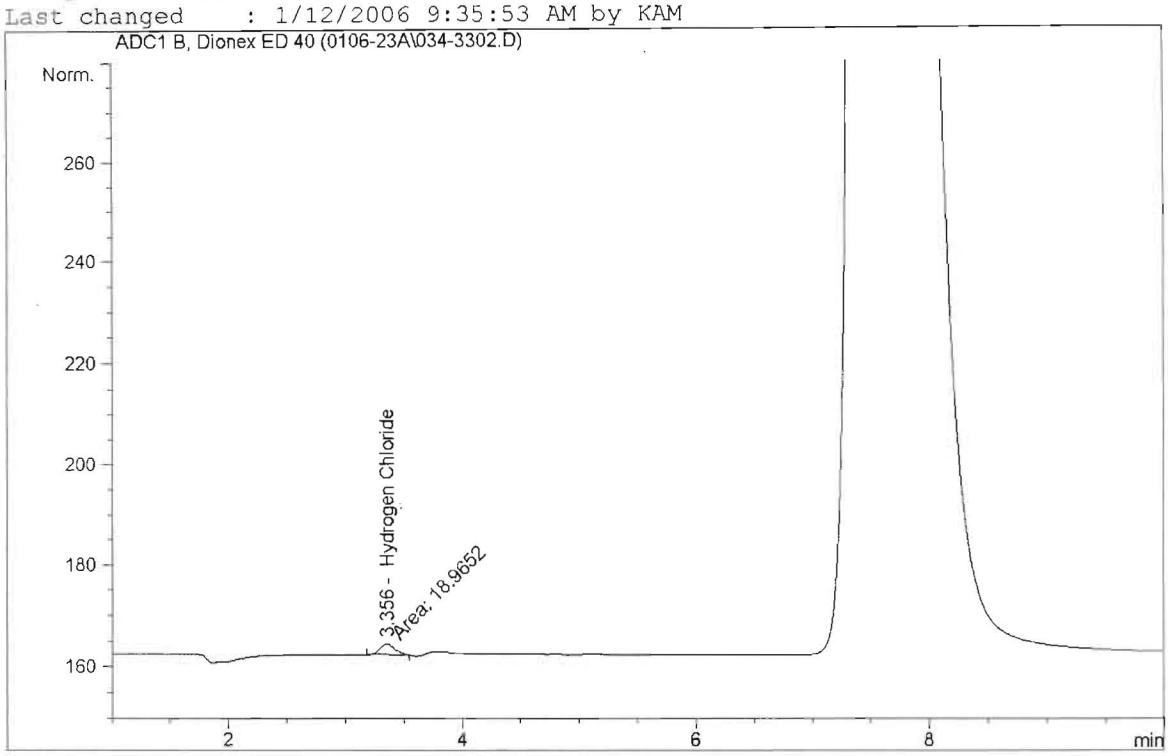
Results obtained with enhanced integrator!

==========

*** End of Report ***

0106-34 Sample Blank

Injection Date	: 1/11/2006 6:11:18 PM	Seq. Line	: 33
Sample Name	: Blank*4.05	Location	: Vial 34
Acq. Operator	: KAM	Inj	: 2
Acq. Instrument	: Gonzo	Inj Volume	: 25 µl
Acq. Method	: C:\LC2005Q4\GONZO\METHODS\1105-90.M		
Last changed	: 1/11/2006 10:03:40 AM by KAM		
Analysis Method	: H:\LC2006Q1\GONZO\METHOD\0106-34R.M		
Last changed	: 1/12/2006 9:35:53 AM by KAM		



External Standard Report

Sorted By	:	Signal
Calib. Data Modified	:	Thursday, January 12, 2006 9:33:23 AM
Multiplier	:	1.0000
Dilution	:	1.0000

Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime [min]	Type	Area [uS*s]	Amt/Area	Amount [ug/mL]	Grp	Name
3.356	MM	18.96520	1.23516e-2	2.34250e-1		Hydrogen Chloride
Totals :				2.34250e-1		

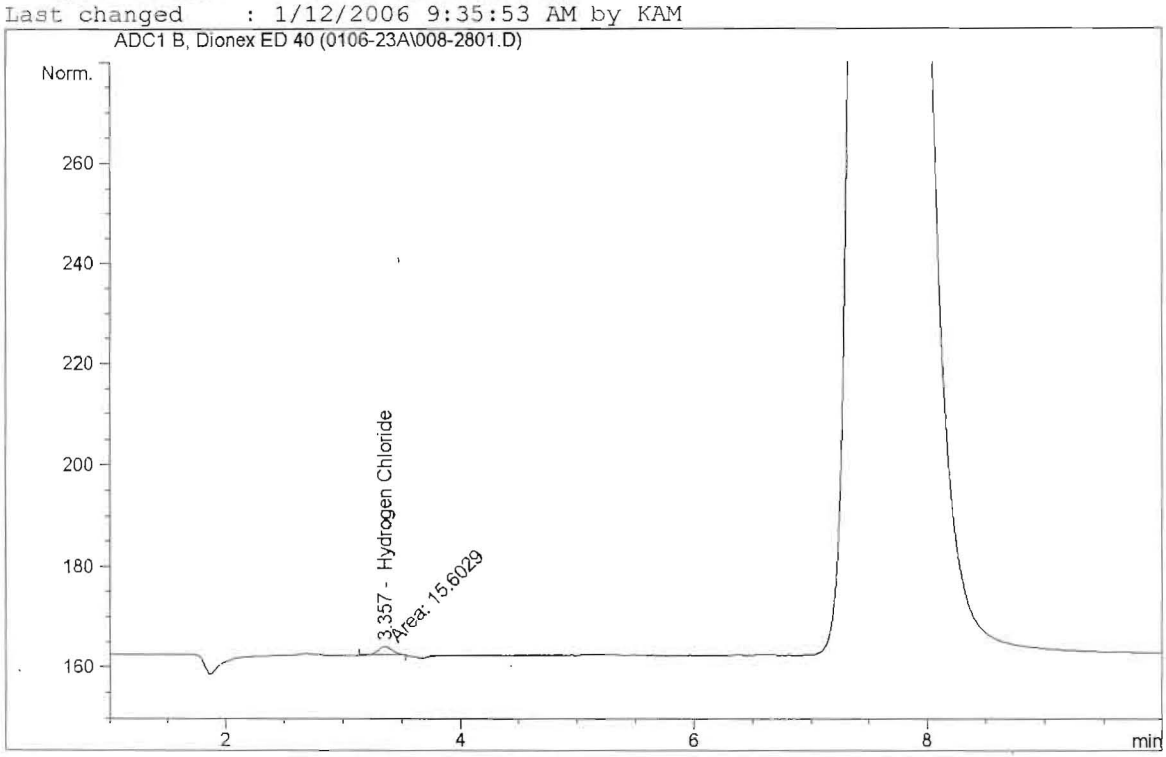
Manual Integration (KAM)

Results obtained with enhanced integrator!

*** End of Report ***

0.01N H2SO4 pH=7

```
==================================================================
Injection Date  : 1/11/2006 4:01:05 PM          Seq. Line :  28
Sample Name     : Lab blank H2SO4                Location : Vial 8
Acq. Operator   : KAM                                 Inj :   1
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```

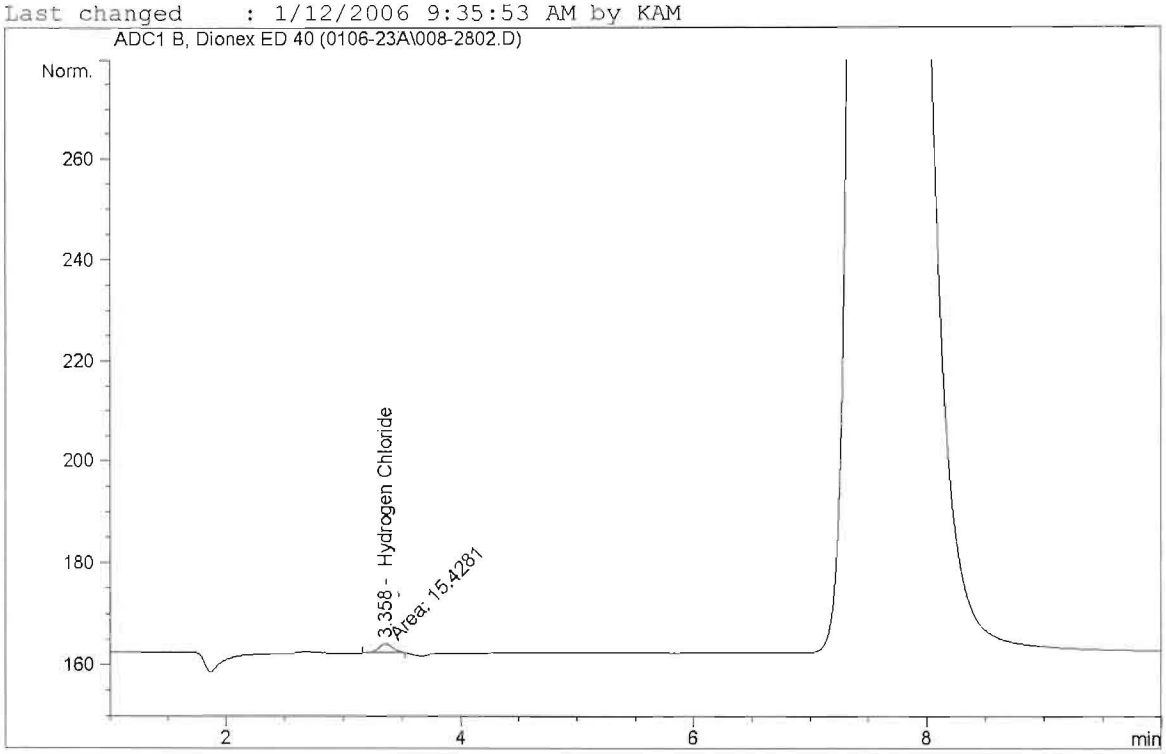



```
==================================================================
                      External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|-----------------
  3.357 MM       15.60287 1.23516e-2 1.92720e-1     Hydrogen Chloride

Totals :                              1.92720e-1

 Results obtained with enhanced integrator!
==================================================================
                        *** End of Report ***
```

Manual Integration (KAM)

0.01N H2SO4 pH=7

```
==========================================================================
Injection Date  : 1/11/2006 4:12:48 PM          Seq. Line :  28
Sample Name     : Lab blank H2SO4                Location : Vial 8
Acq. Operator   : KAM                                 Inj :   2
Acq. Instrument : Gonzo                        Inj Volume : 25 µl
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```

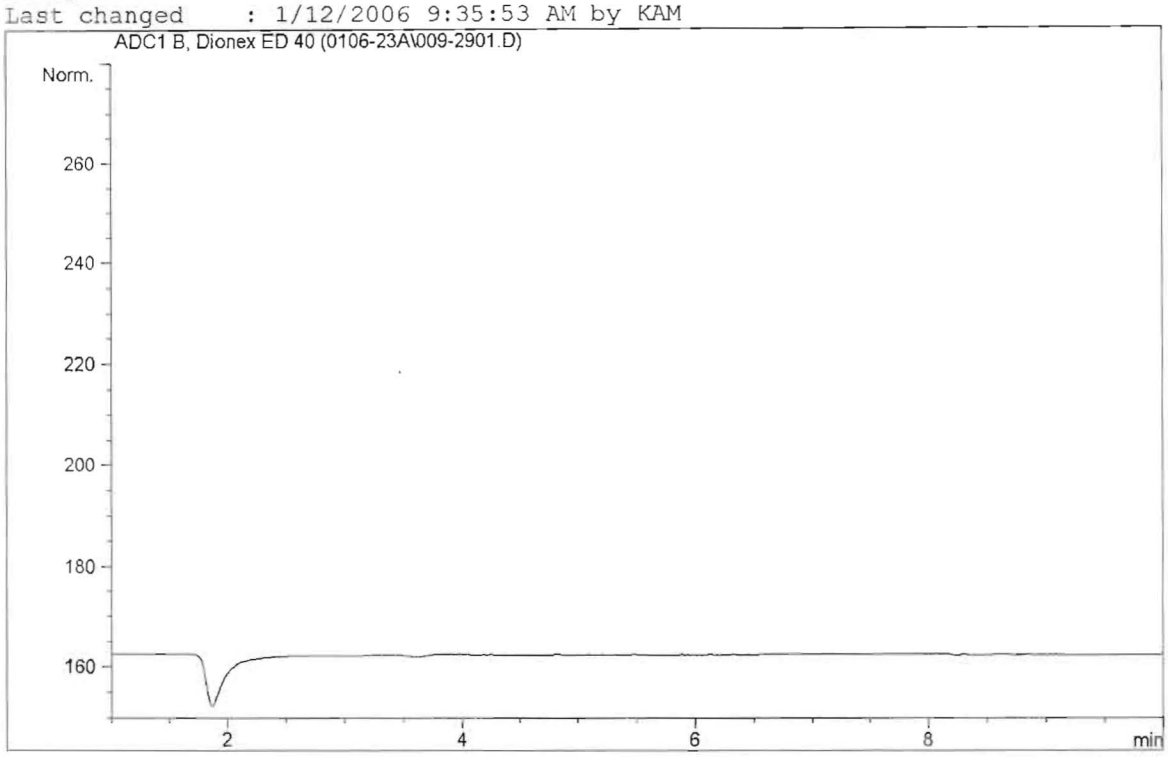



```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.358 MM       15.42805 1.23516e-2 1.90560e-1     Hydrogen Chloride

Totals :                               1.90560e-1

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

Manual Integration (KAM)

DIUF used to dilute samples

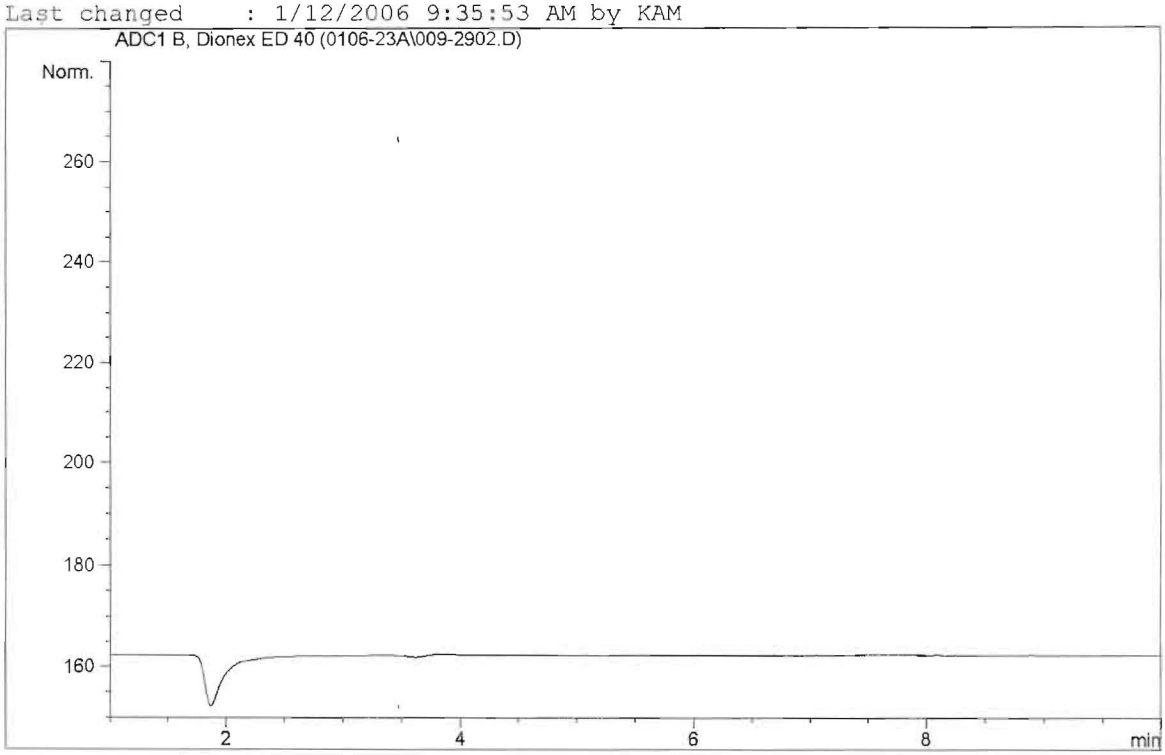
```
==================================================================
Injection Date  : 1/11/2006 4:24:49 PM          Seq. Line :  29
Sample Name     : Lab blank H2O                  Location : Vial 9
Acq. Operator   : KAM                                 Inj :   1
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```




```
==================================================================
                    External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.352           -          -          -         Hydrogen Chloride

Totals :                                0.00000

 Results obtained with enhanced integrator!
1 Warnings or Errors :

Warning : Calibrated compound(s) not found

==================================================================
```

DIUF used to dilute samples

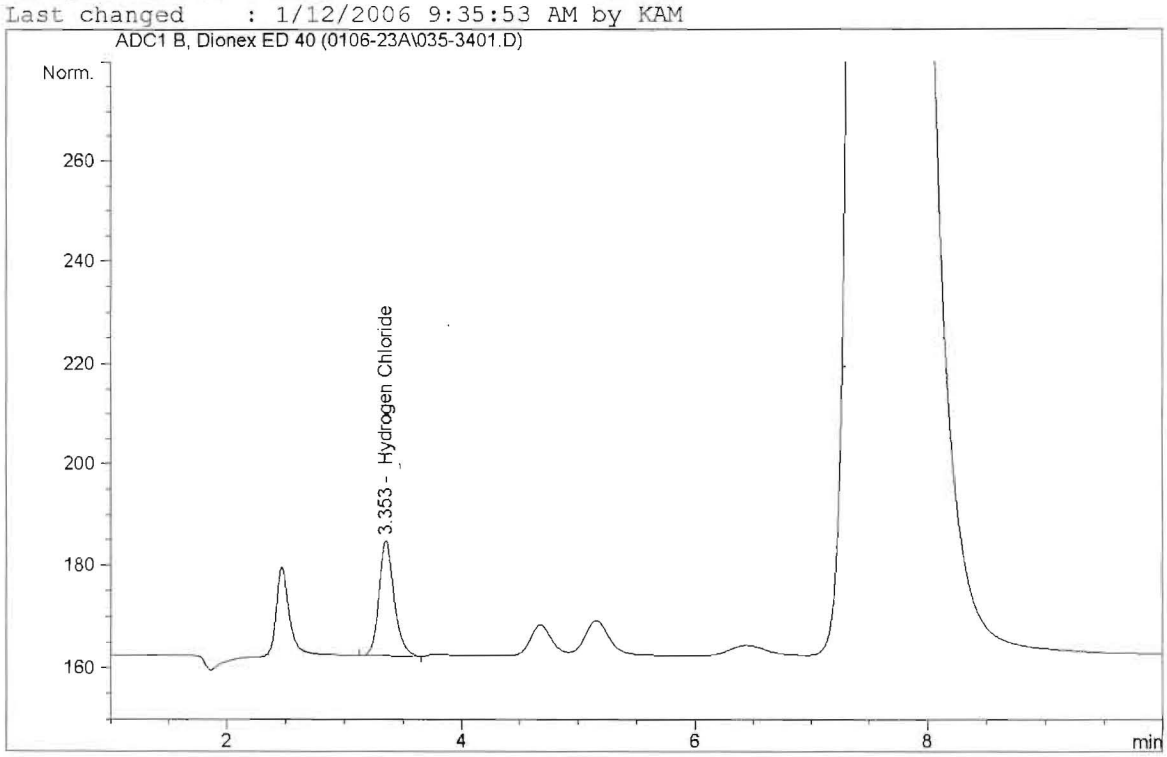
```
==================================================================
Injection Date  : 1/11/2006 4:36:43 PM          Seq. Line :  29
Sample Name     : Lab blank H2O                  Location : Vial 9
Acq. Operator   : KAM                                 Inj :   2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```




```
==================================================================
                      External Standard Report
==================================================================

Sorted By             :      Signal
Calib. Data Modified  :      Thursday, January 12, 2006 9:33:23 AM
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.352           -          -          -         Hydrogen Chloride

Totals :                                0.00000

 Results obtained with enhanced integrator!
1 Warnings or Errors :

Warning : Calibrated compound(s) not found

==================================================================
```

0106-34 Matrix Spike

Injection Date	: 1/11/2006 6:23:01 PM	Seq. Line :	34
Sample Name	: MS/Run C1*4.05	Location :	Vial 35
Acq. Operator	: KAM	Inj :	1
Acq. Instrument	: Gonzo	Inj Volume :	25 µl
Acq. Method	: C:\LC2005Q4\GONZO\METHODS\1105-90.M		
Last changed	: 1/11/2006 10:03:40 AM by KAM		
Analysis Method	: H:\LC2006Q1\GONZO\METHOD\0106-34R.M		
Last changed	: 1/12/2006 9:35:53 AM by KAM		



External Standard Report

Sorted By : Signal
Calib. Data Modified : Thursday, January 12, 2006 9:33:23 AM
Multiplier : 1.0000
Dilution : 1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

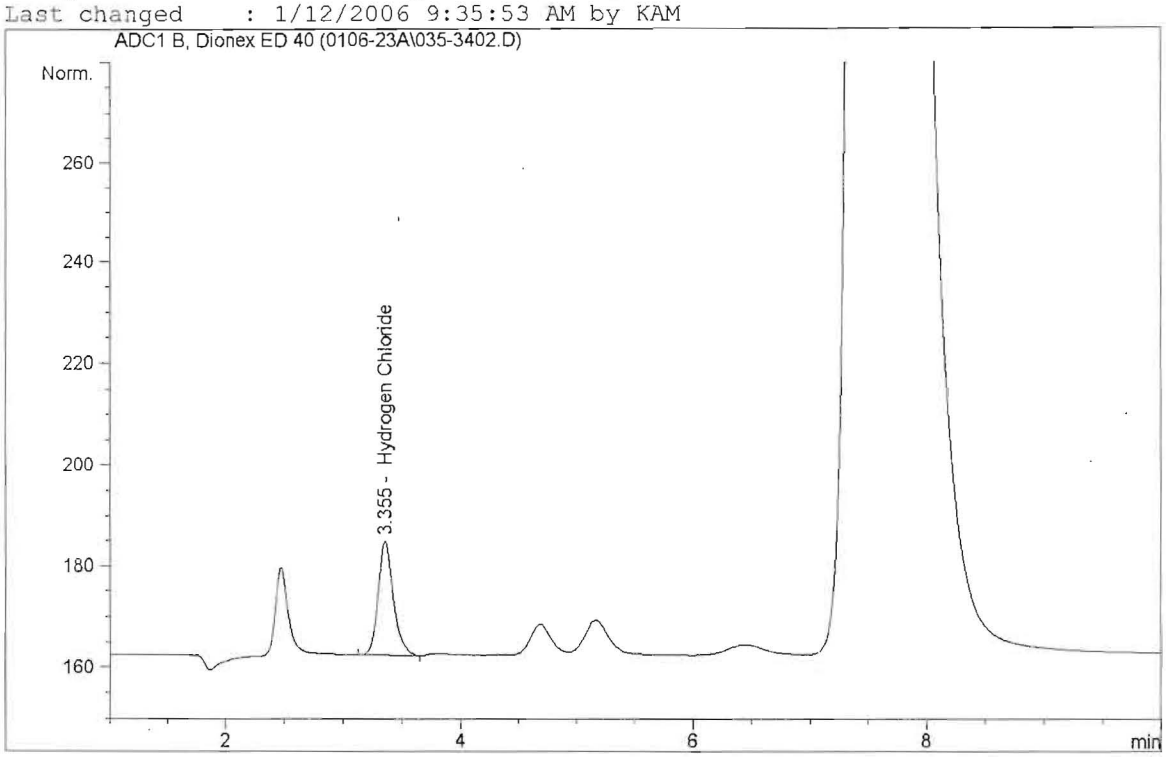
RetTime [min]	Type	Area [uS*s]	Amt/Area	Amount [ug/mL]	Grp	Name
3.353	VP	202.91786	1.28582e-2	2.60916		Hydrogen Chloride
Totals :				2.60916		

Results obtained with enhanced integrator!

*** End of Report ***

0106-34 Matrix Spike

```
==================================================================
Injection Date  : 1/11/2006 6:34:52 PM          Seq. Line :  34
Sample Name     : MS/Run C1*4.05                 Location : Vial 35
Acq. Operator   : KAM                                 Inj :   2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```




```
==================================================================
                      External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.355 BP      203.41130 1.28586e-2    2.61559    Hydrogen Chloride

Totals :                                2.61559

 Results obtained with enhanced integrator!
==================================================================
                        *** End of Report ***
```

Curve(s)/QA Point(s) Chromatograms

Calibration Table

Calib. Data Modified : Thursday, January 12, 2006 9:33:23 AM

Calculate : External Standard
Based on : Peak Area

Rel. Reference Window : 5.000 %
Abs. Reference Window : 0.000 min
Rel. Non-ref. Window : 5.000 %
Abs. Non-ref. Window : 0.000 min
Use Multiplier & Dilution Factor with ISTDs
Uncalibrated Peaks : not reported
Partial Calibration : Yes, identified peaks are recalibrated
Correct All Ret. Times: No, only for identified peaks

Curve Type : Linear
Origin : Connected
Weight : Equal

Recalibration Settings:
Average Response : Average all calibrations
Average Retention Time: Floating Average New 75%

Calibration Report Options :
Printout of recalibrations within a sequence:
Calibration Table after Recalibration
Normal Report after Recalibration
If the sequence is done with bracketing:
Results of first cycle (ending previous bracket)

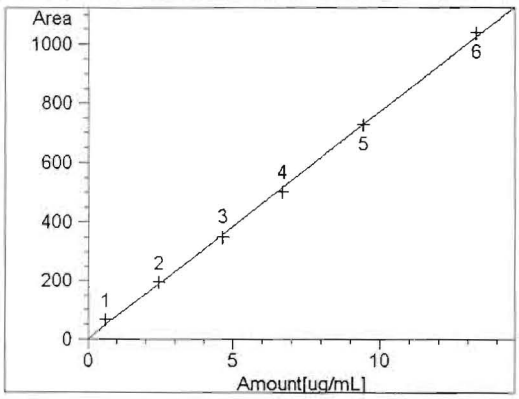
Signal 1: ADC1 B, Dionex ED 40

RetTime [min]	Sig	Lvl	Amount [ug/mL]	Area	Amt/Area	Ref	Grp	Name
3.352	1	1	6.35000e-1	65.35980	9.71545e-3			Hydrogen Chloride
		2	2.45000	193.74500	1.26455e-2			
		3	4.67000	350.12543	1.33381e-2			
		4	6.70000	500.58625	1.33843e-2			
		5	9.44000	725.16023	1.30178e-2			
		6	13.30000	1035.62366	1.28425e-2			

Peak Sum Table

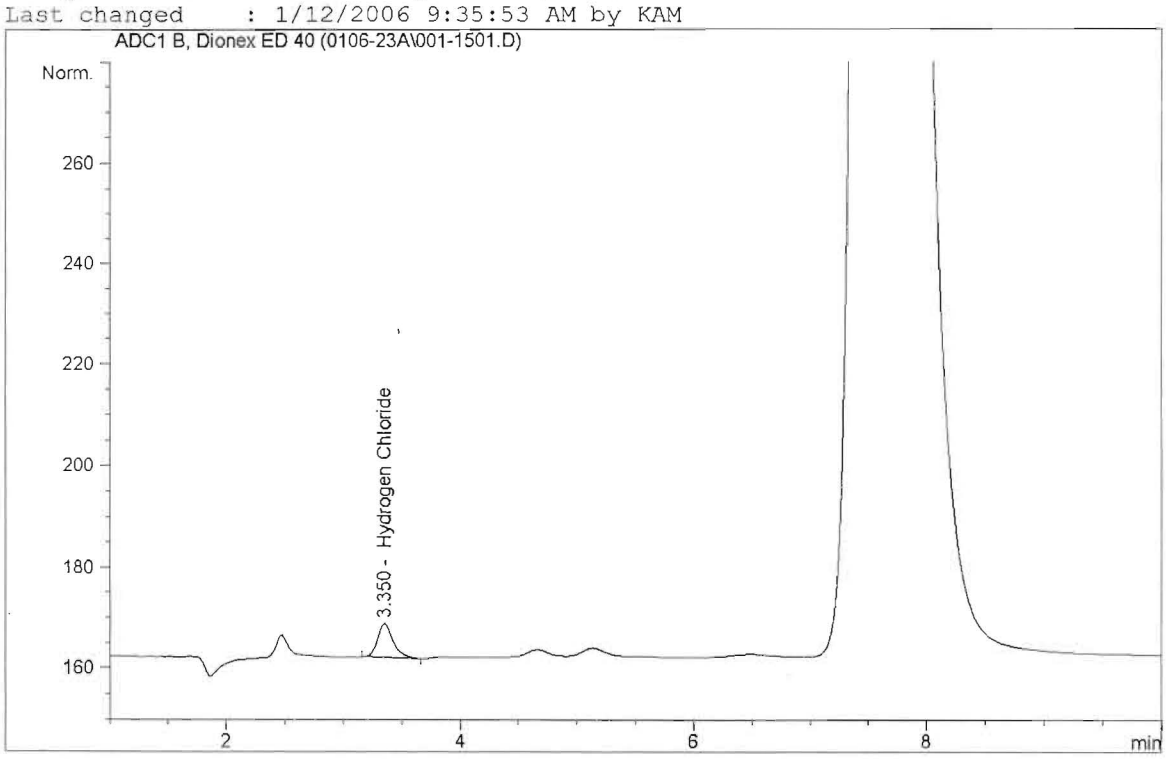
No Entries in table

Calibration Curves



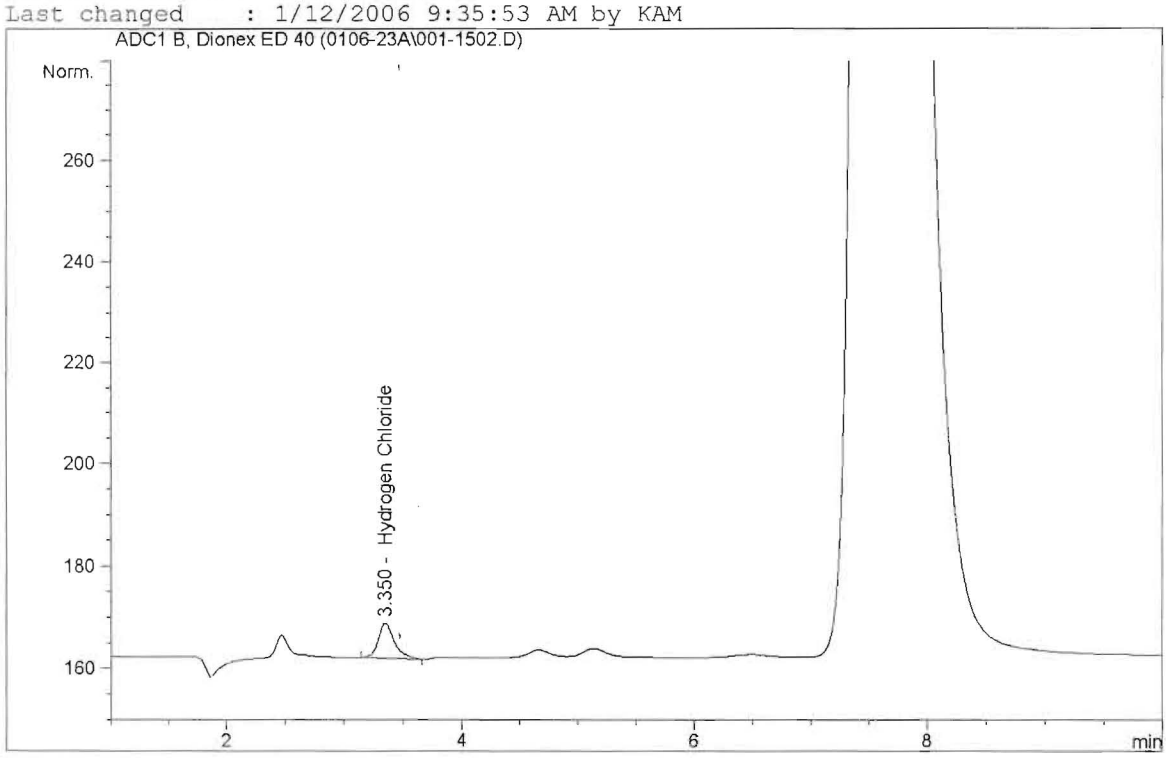
Hydrogen Chloride at exp. RT: 3.352
ADC1 B, Dionex ED 40
Correlation: 0.99942
Residual Std. Dev.: 13.62547
Formula: y = mx + b
m: 76.74516
b: 2.67734
x: Amount[ug/mL]
y: Area

```
==================================================================
Injection Date  : 1/10/2006 10:23:27 PM          Seq. Line :  15
Sample Name     : Standard 1                      Location : Vial 1
Acq. Operator   : KAM                                 Inj :   1
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/10/2006 10:21:30 PM by KAM
                  (modified after loading)
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



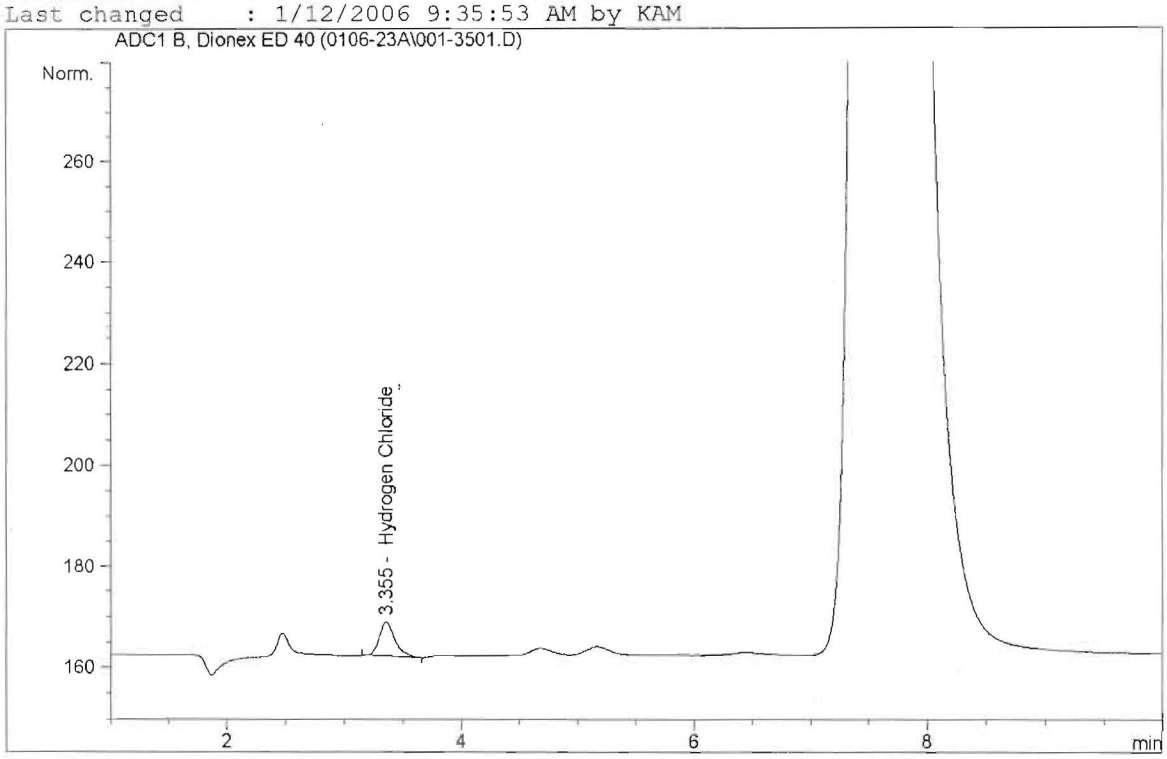

```
==================================================================
                      External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.350 BB       64.37262 1.24882e-2 8.03898e-1     Hydrogen Chloride

Totals :                              8.03898e-1

 Results obtained with enhanced integrator!
==================================================================
                        *** End of Report ***
```

```
==================================================================
Injection Date  : 1/10/2006 10:35:20 PM          Seq. Line :  15
Sample Name     : Standard 1                      Location : Vial 1
Acq. Operator   : KAM                                  Inj :   2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/10/2006 10:33:23 PM by KAM
                  (modified after loading)
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



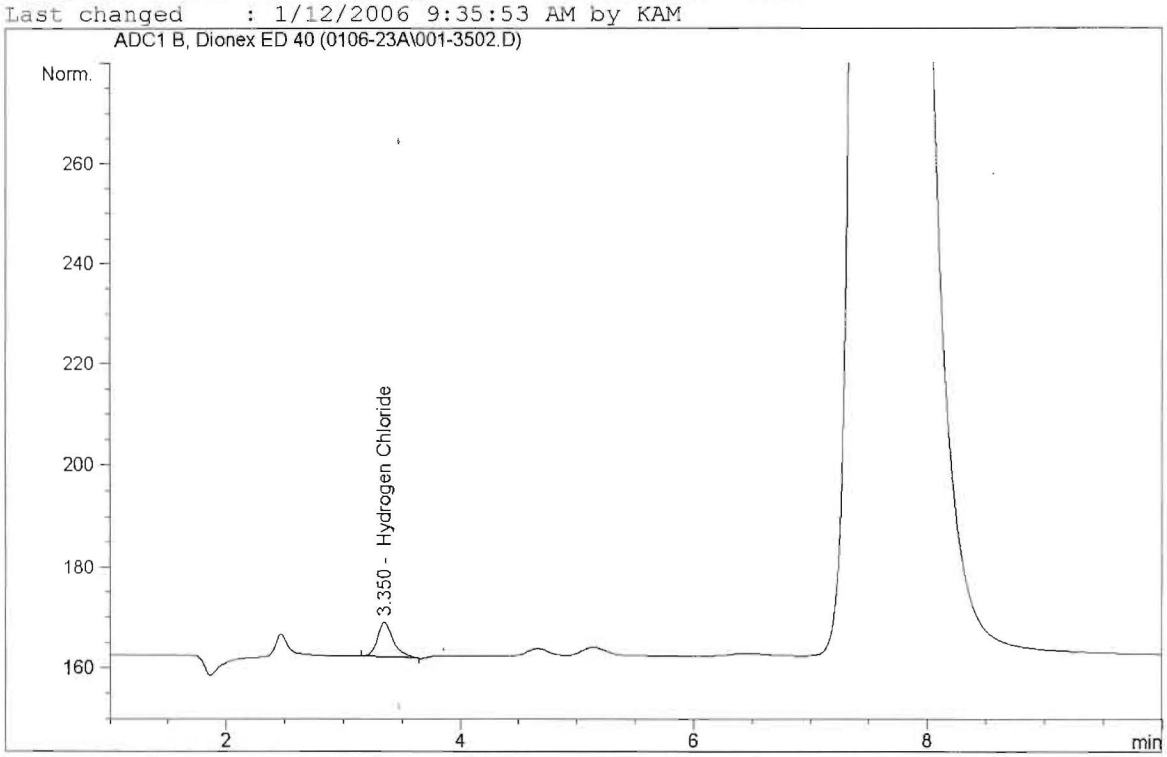

```
==================================================================
                      External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.350 BP       66.27156 1.25037e-2 8.28641e-1     Hydrogen Chloride

Totals :                              8.28641e-1

 Results obtained with enhanced integrator!
==================================================================
                        *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/11/2006 6:46:46 PM          Seq. Line :  35
Sample Name     : Standard 1                     Location : Vial 1
Acq. Operator   : KAM                                 Inj :   1
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



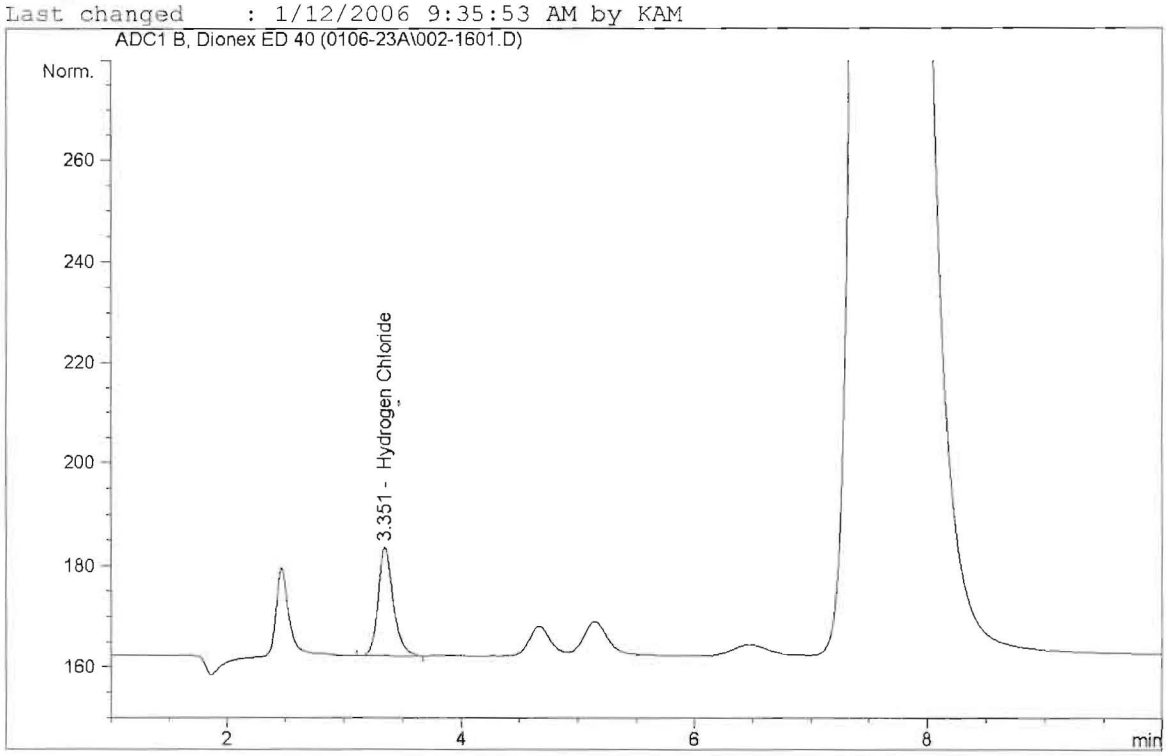

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.355 BP       65.23396 1.24954e-2 8.15121e-1    Hydrogen Chloride

Totals :                               8.15121e-1

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/11/2006 6:58:37 PM          Seq. Line :  35
Sample Name     : Standard 1                     Location : Vial 1
Acq. Operator   : KAM                                 Inj :   2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



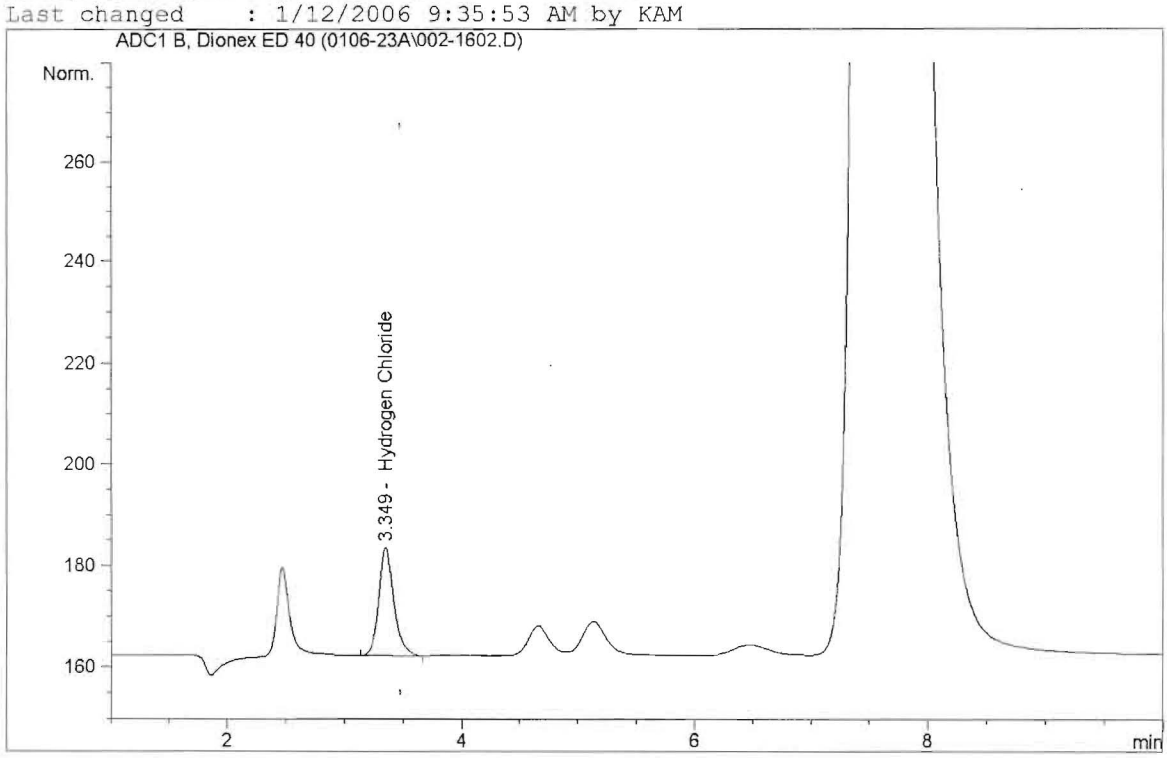

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.350 BP       65.56107 1.24980e-2 8.19384e-1     Hydrogen Chloride

Totals :                              8.19384e-1

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/10/2006 10:47:14 PM          Seq. Line :  16
Sample Name     : Standard 2                      Location : Vial 2
Acq. Operator   : KAM                                  Inj :  1
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/10/2006 10:45:16 PM by KAM
                  (modified after loading)
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



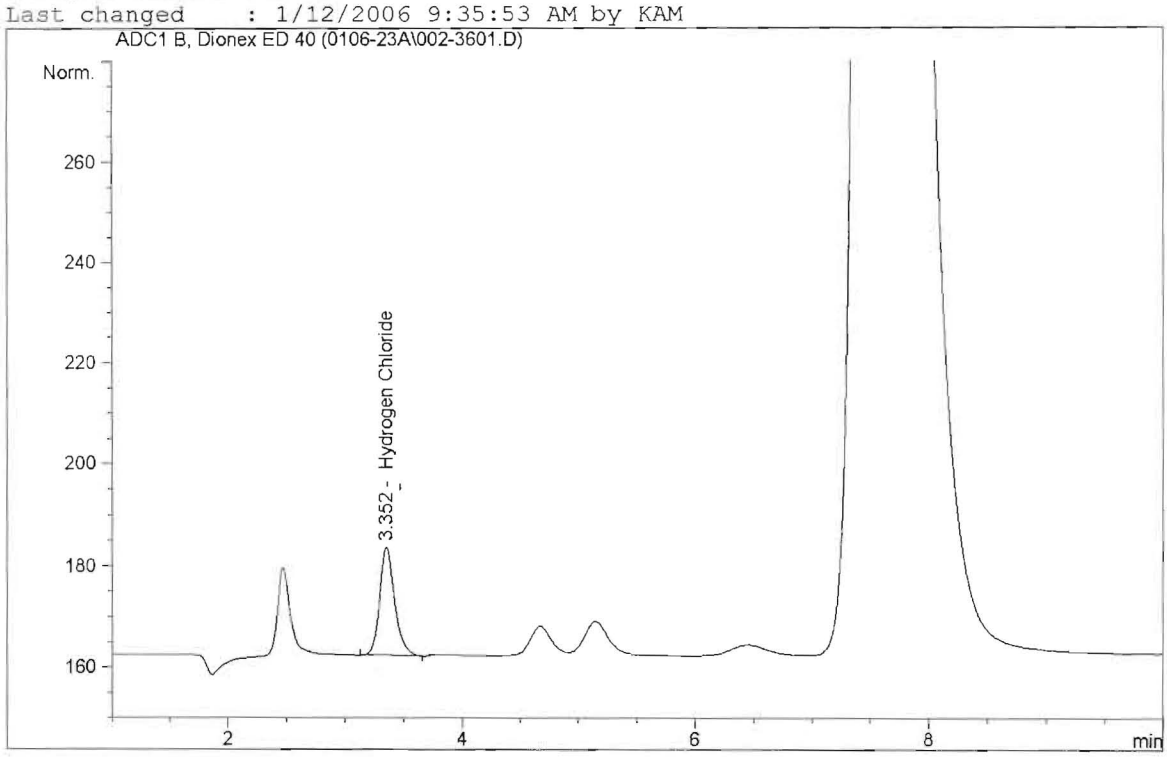

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.351 BP      193.90004 1.28502e-2    2.49166     Hydrogen Chloride

Totals :                                2.49166

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/10/2006 10:59:06 PM          Seq. Line :  16
Sample Name     : Standard 2                      Location : Vial 2
Acq. Operator   : KAM                                 Inj :   2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/10/2006 10:57:09 PM by KAM
                  (modified after loading)
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



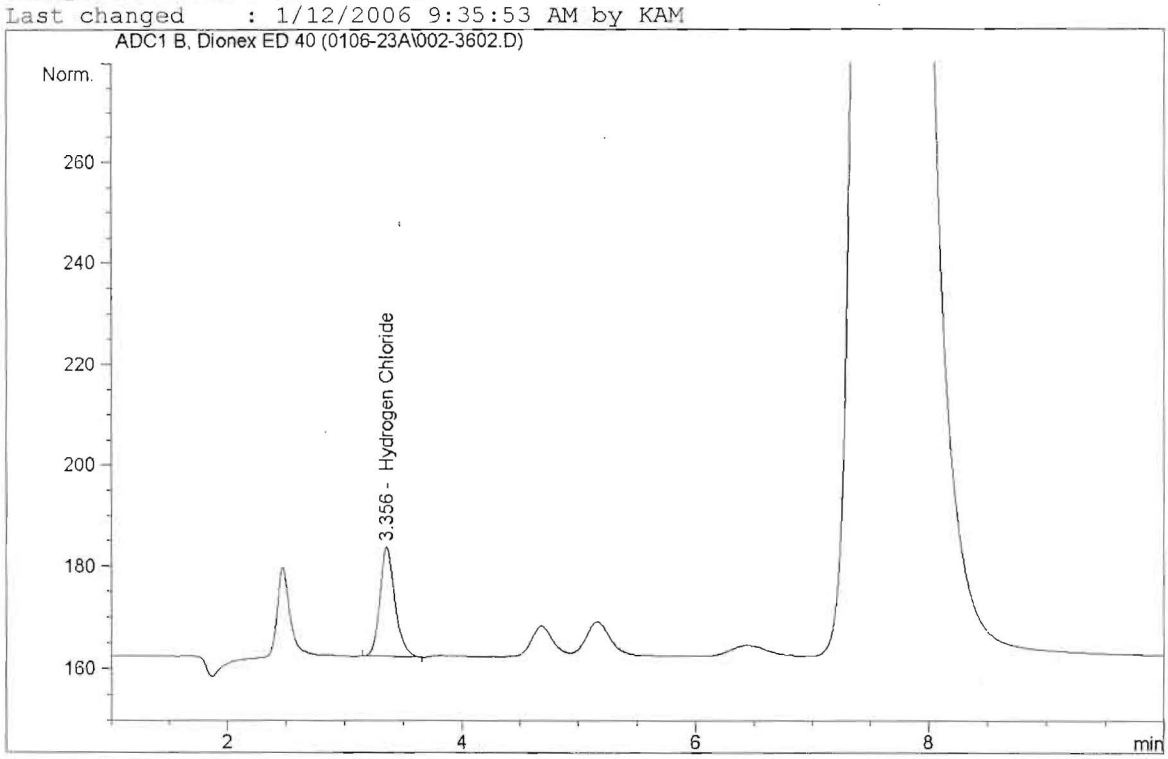

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.349 BP      192.67894 1.28491e-2    2.47575     Hydrogen Chloride

Totals :                                2.47575

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/11/2006 7:10:32 PM          Seq. Line :  36
Sample Name     : Standard 2                     Location : Vial 2
Acq. Operator   : KAM                                 Inj :  1
Acq. Instrument : Gonzo                        Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



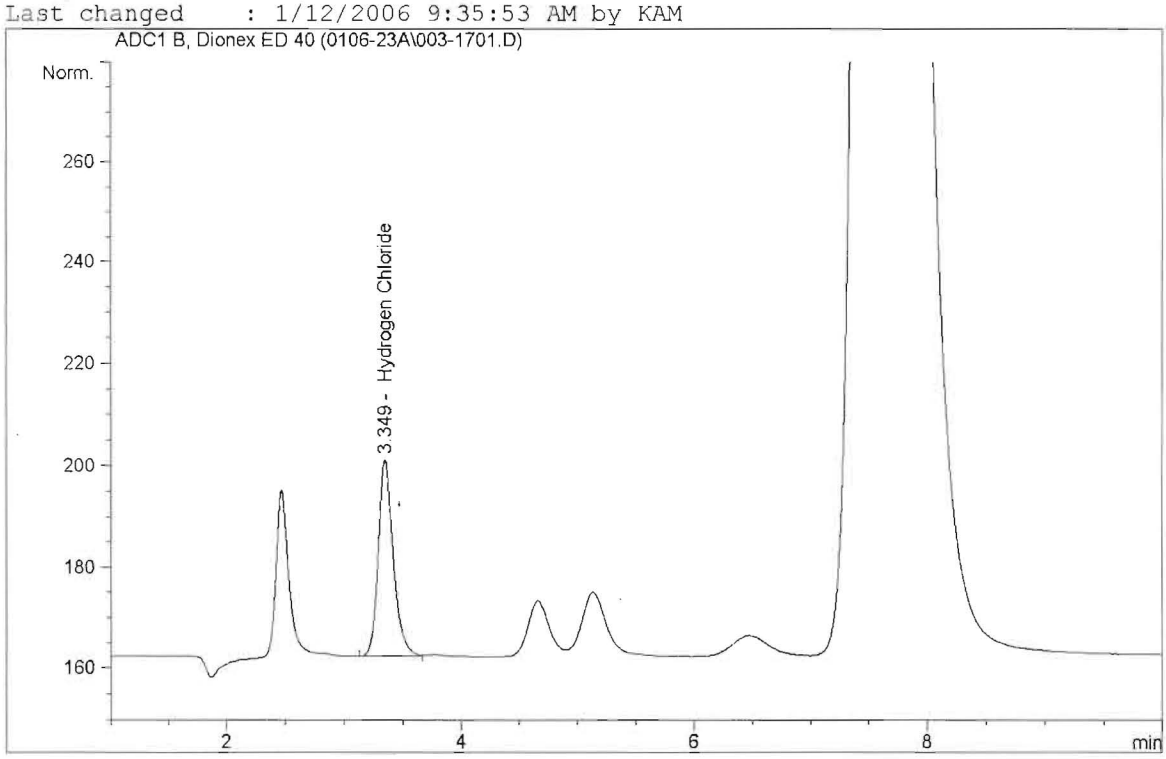

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|-----------------
  3.352 BP      194.21915 1.28505e-2    2.49582    Hydrogen Chloride

Totals :                                2.49582

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/11/2006 7:22:16 PM          Seq. Line :  36
Sample Name     : Standard 2                     Location : Vial 2
Acq. Operator   : KAM                                 Inj :  2
Acq. Instrument : Gonzo                        Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



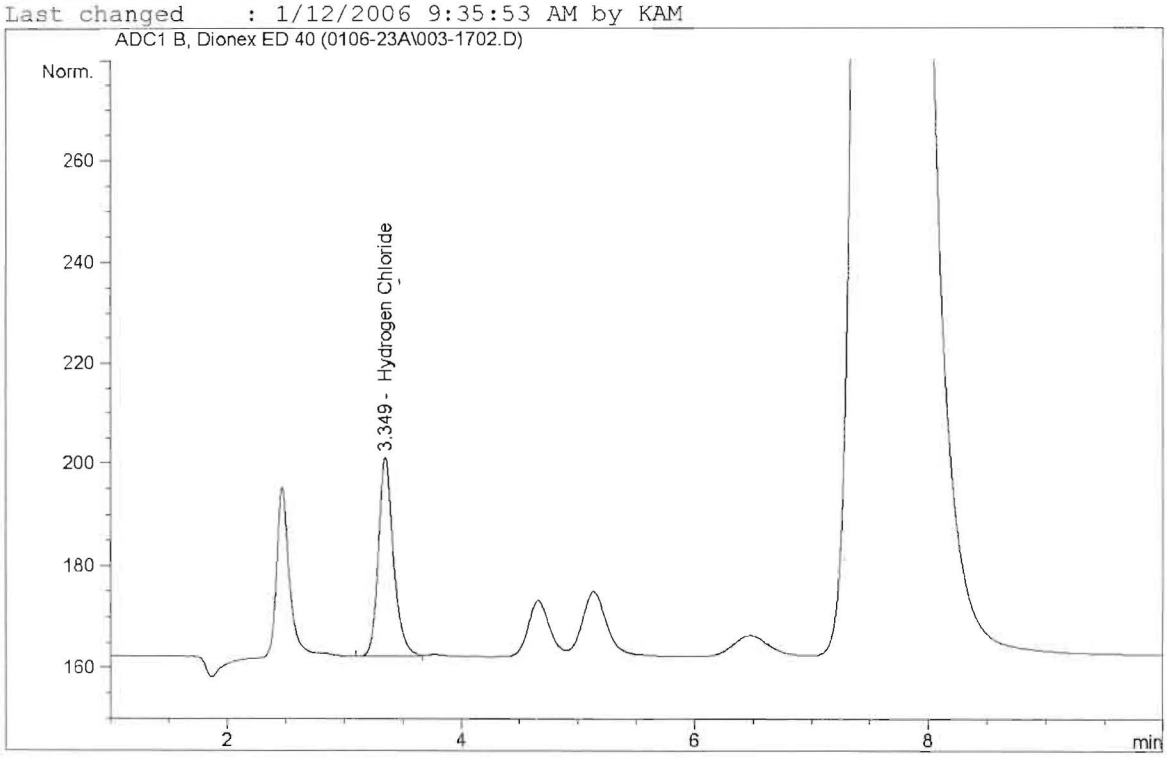

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|-----------------
  3.356 BP      194.18185 1.28505e-2    2.49533    Hydrogen Chloride

Totals :                                2.49533

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==================================================================
Injection Date  : 1/10/2006 11:11:00 PM          Seq. Line :  17
Sample Name     : Standard 3                      Location : Vial 3
Acq. Operator   : KAM                                 Inj :   1
Acq. Instrument : Gonzo                          Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/10/2006 11:09:02 PM by KAM
                  (modified after loading)
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



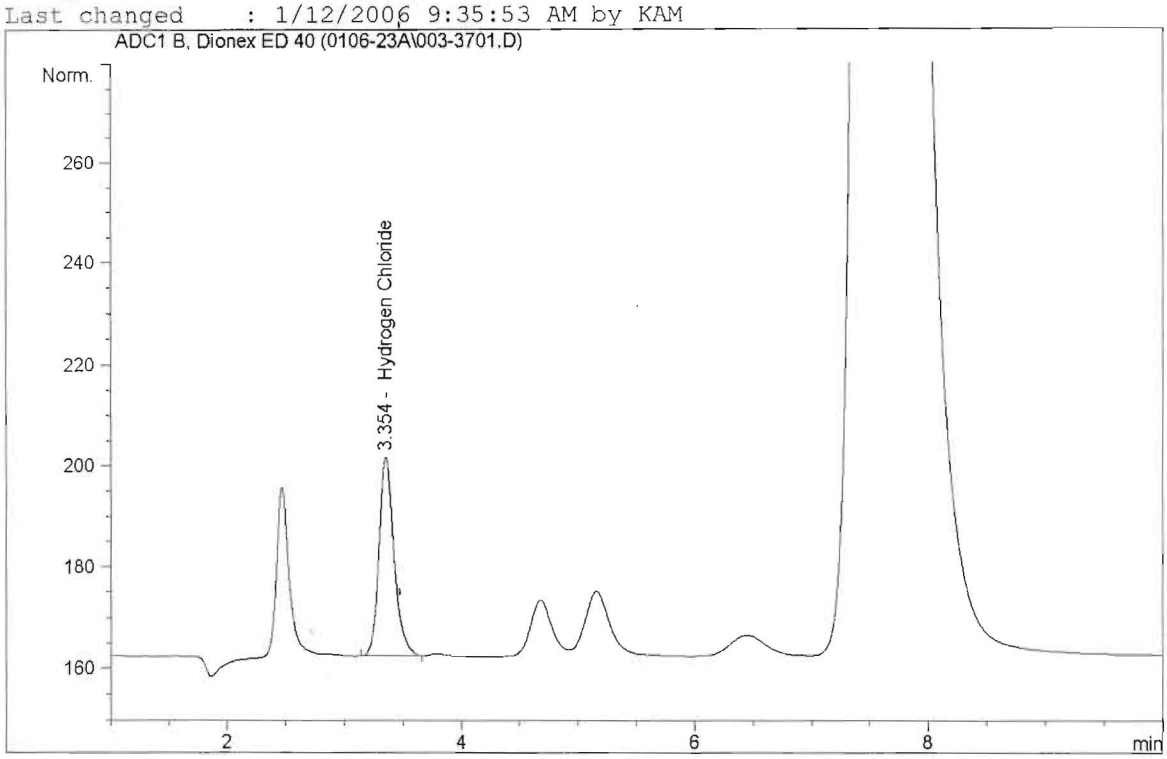

```
==================================================================
                     External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.349 BB      349.85721 1.29304e-2    4.52380     Hydrogen Chloride

Totals :                                4.52380

 Results obtained with enhanced integrator!
==================================================================
                      *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/10/2006 11:22:43 PM          Seq. Line :  17
Sample Name     : Standard 3                      Location : Vial 3
Acq. Operator   : KAM                                 Inj :   2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/10/2006 11:20:57 PM by KAM
                  (modified after loading)
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



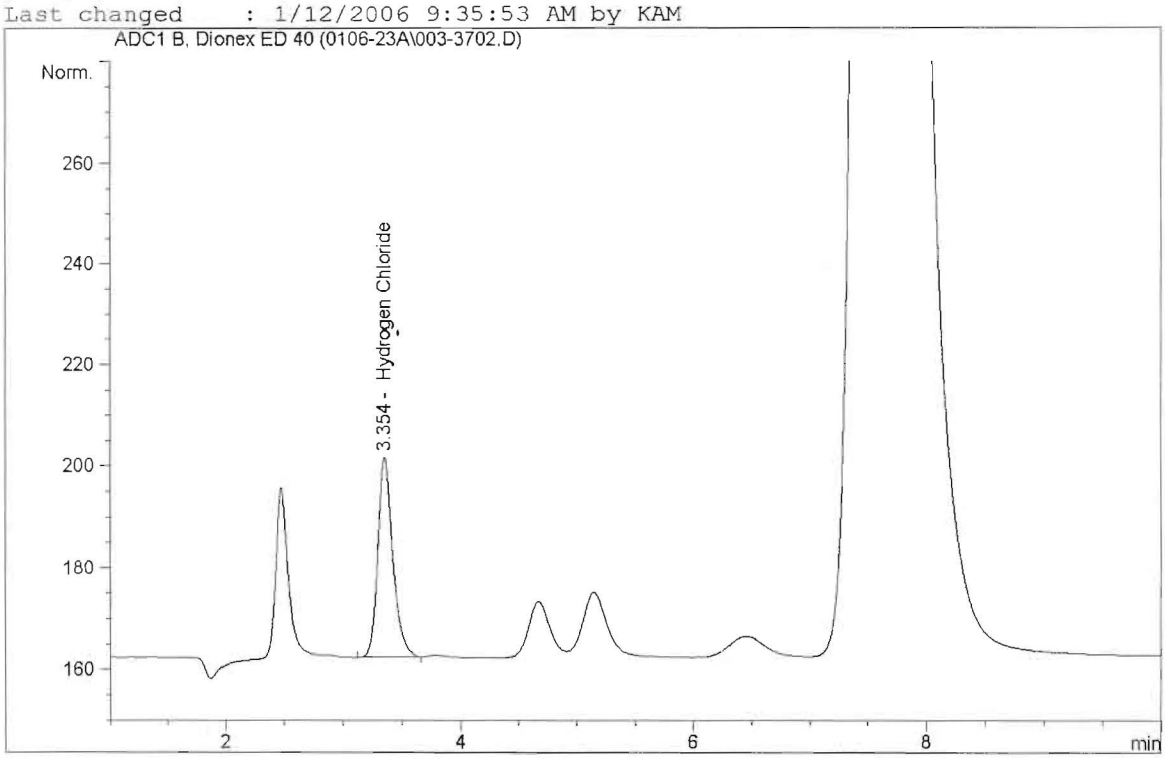

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|-----------------
  3.349 BB      349.80945 1.29304e-2    4.52318     Hydrogen Chloride

Totals :                                4.52318

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==================================================================
Injection Date  : 1/11/2006 7:34:19 PM          Seq. Line :  37
Sample Name     : Standard 3                     Location : Vial 3
Acq. Operator   : KAM                                 Inj :   1
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



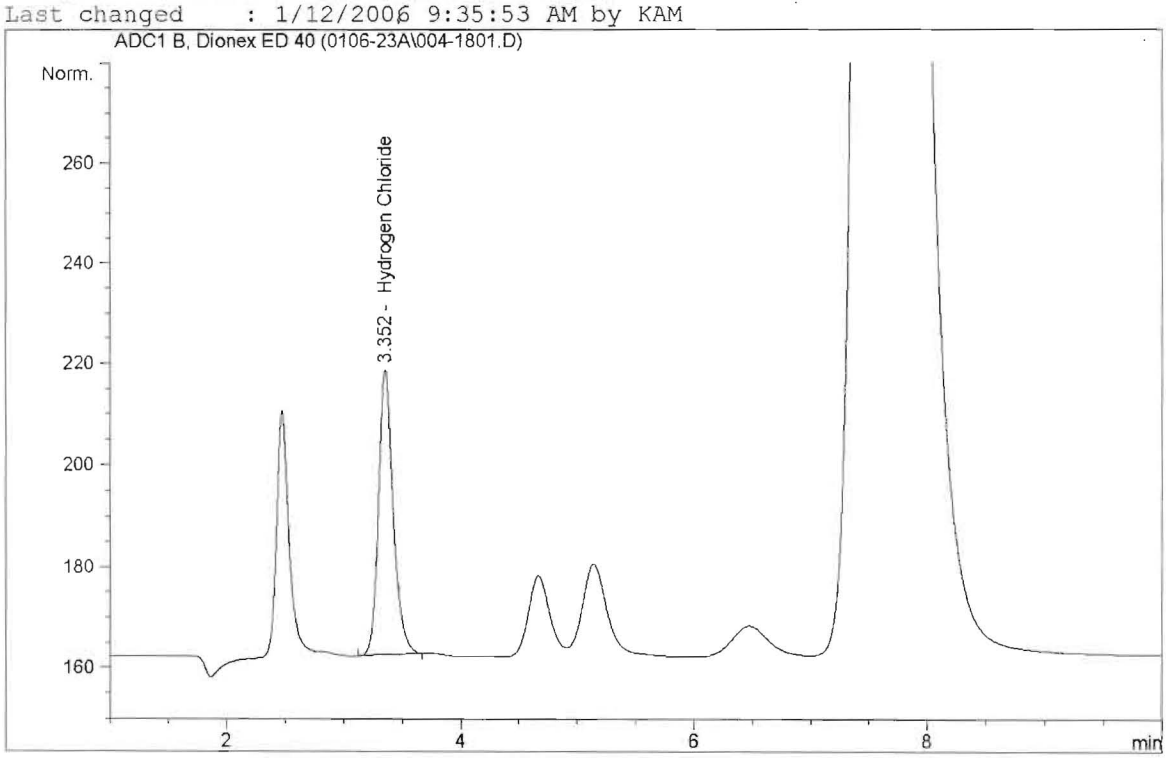

```
==================================================================
                      External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.354 BB      350.54810 1.29306e-2    4.53280     Hydrogen Chloride

Totals :                                4.53280

 Results obtained with enhanced integrator!
==================================================================
                        *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/11/2006 7:46:15 PM          Seq. Line :  37
Sample Name     : Standard 3                     Location : Vial 3
Acq. Operator   : KAM                                 Inj :   2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



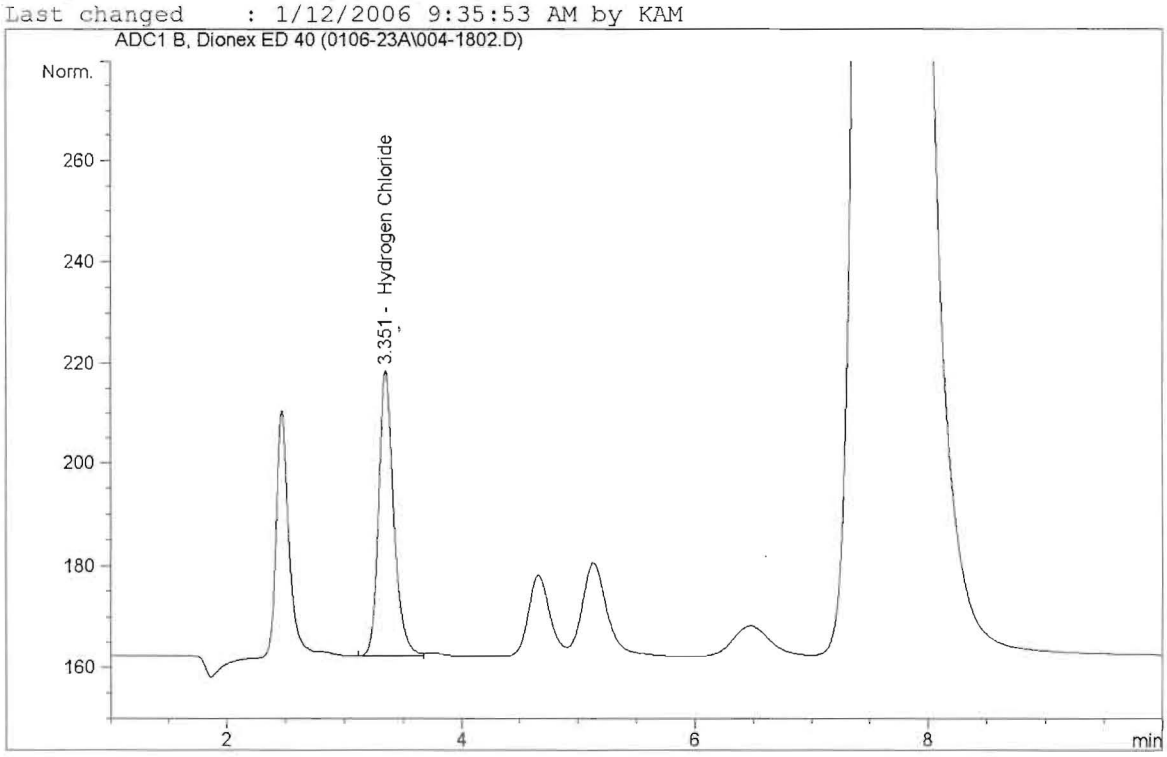

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.354 PB      350.28696 1.29305e-2    4.52940    Hydrogen Chloride

Totals :                                4.52940

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/10/2006 11:34:49 PM          Seq. Line :  18
Sample Name     : Standard 4                      Location : Vial 4
Acq. Operator   : KAM                                 Inj :   1
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/10/2006 11:32:48 PM by KAM
                  (modified after loading)
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



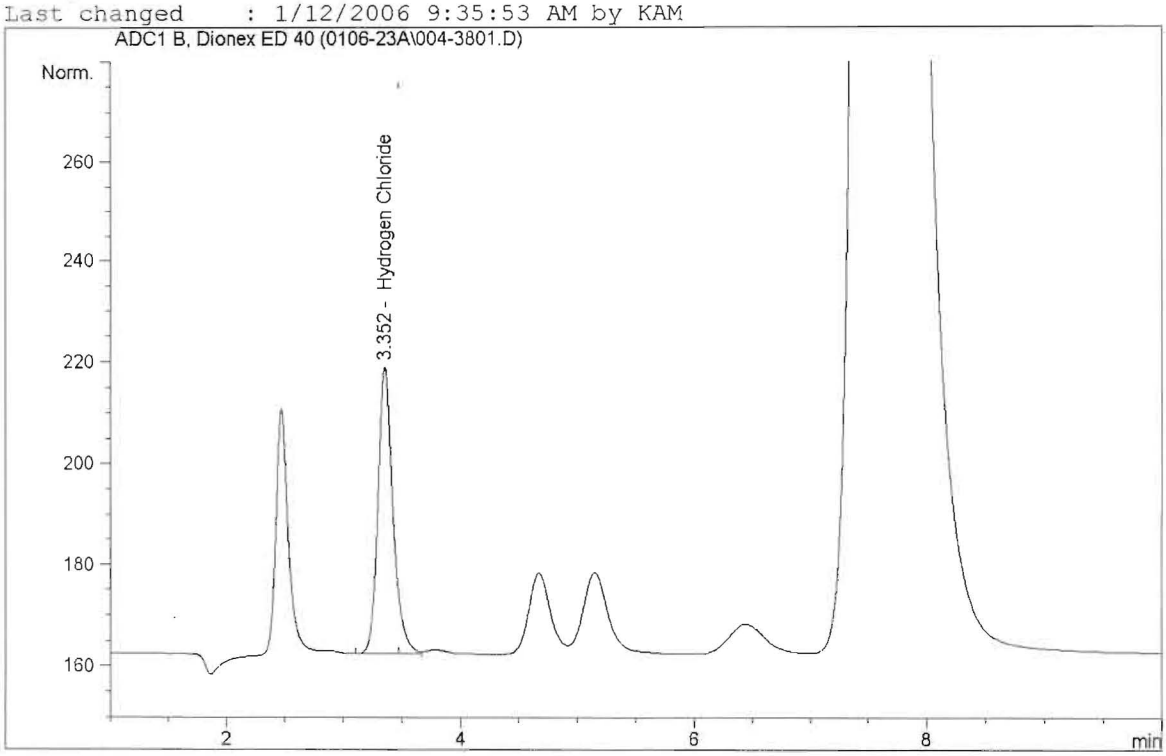

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.352 PB      494.10547 1.29595e-2    6.40338     Hydrogen Chloride

Totals :                                6.40338

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/10/2006 11:46:45 PM          Seq. Line :  18
Sample Name     : Standard 4                      Location : Vial 4
Acq. Operator   : KAM                                 Inj :   2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/10/2006 11:44:45 PM by KAM
                  (modified after loading)
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



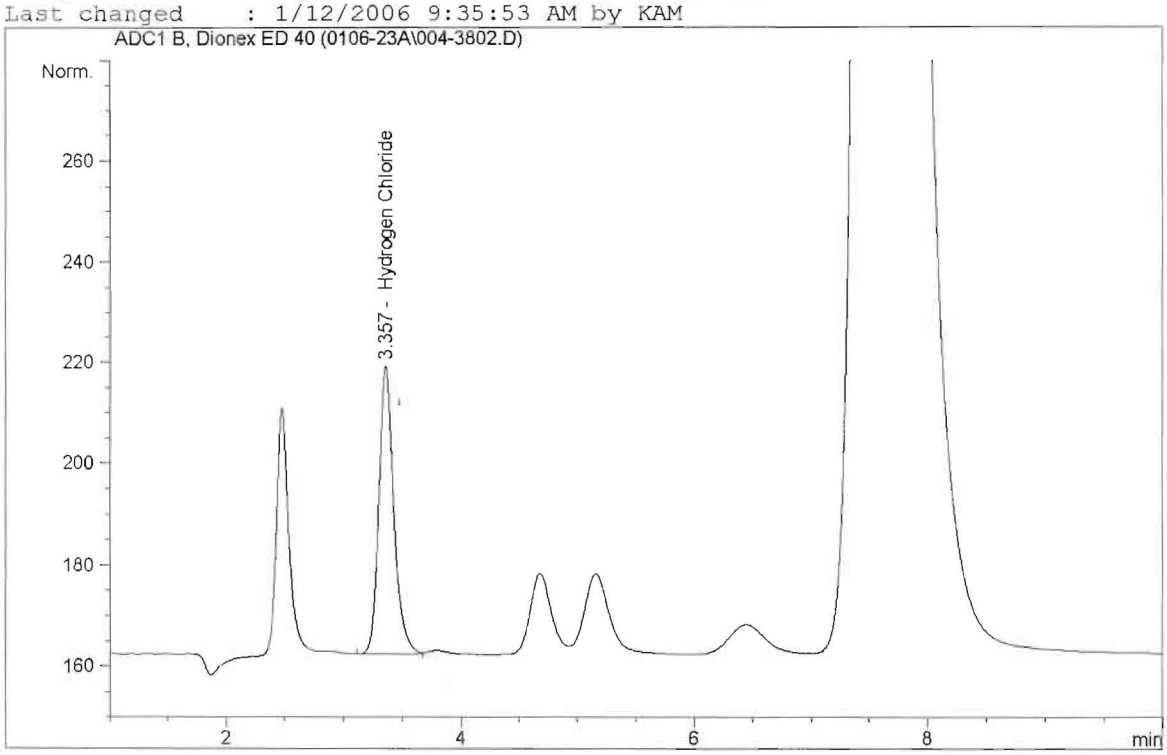

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.351 PB      503.09485 1.29608e-2    6.52051     Hydrogen Chloride

Totals :                                6.52051

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==================================================================
Injection Date  : 1/11/2006 7:58:11 PM          Seq. Line :  38
Sample Name     : Standard 4                     Location : Vial 4
Acq. Operator   : KAM                                 Inj :  1
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



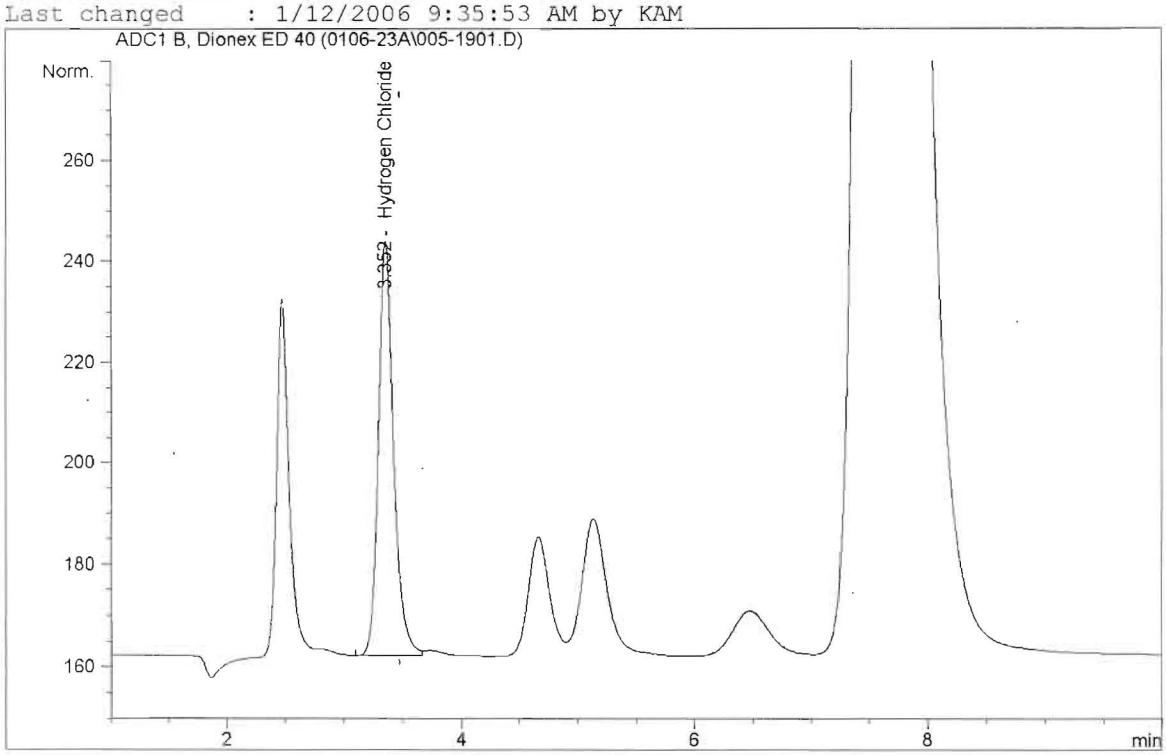

```
==================================================================
                      External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.352 PB      503.30927 1.29608e-2    6.52330     Hydrogen Chloride

Totals :                                6.52330

 Results obtained with enhanced integrator!
==================================================================
                        *** End of Report ***
```

```
==================================================================
Injection Date  : 1/11/2006 8:10:03 PM          Seq. Line :  38
Sample Name     : Standard 4                     Location : Vial 4
Acq. Operator   : KAM                                 Inj :   2
Acq. Instrument : Gonzo                        Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



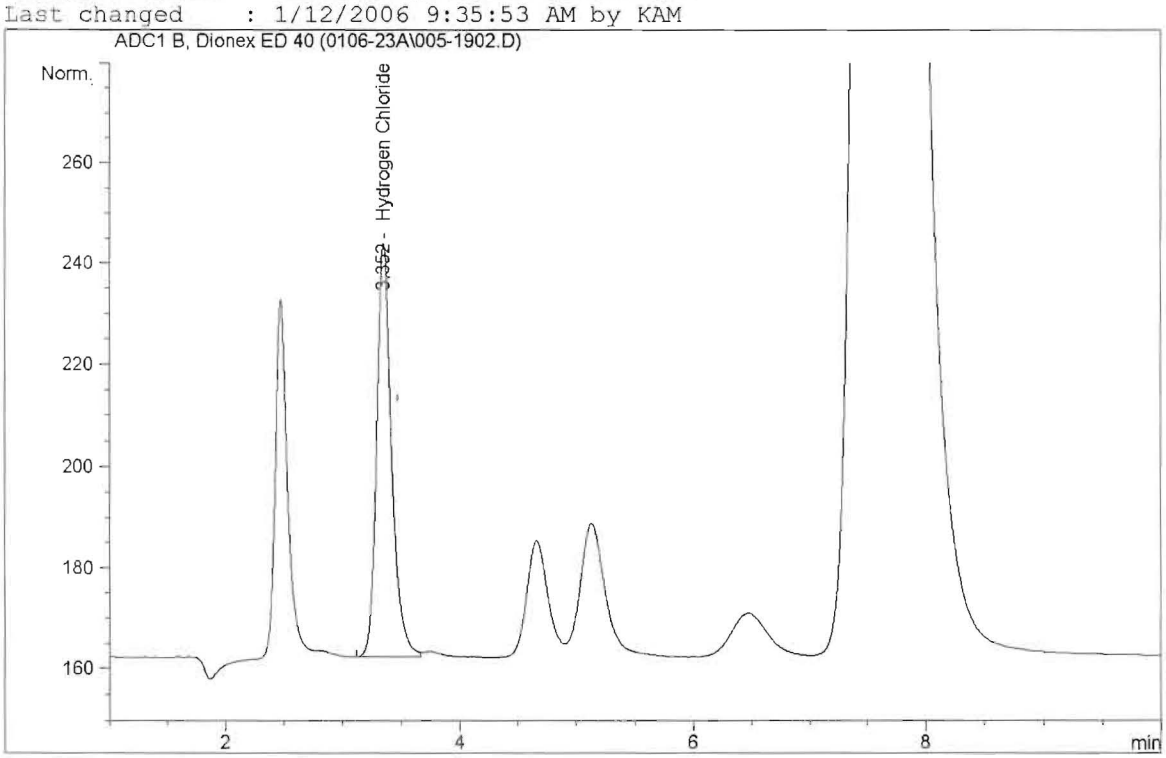

```
==================================================================
                      External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.357 BB      501.83542 1.29606e-2    6.50410     Hydrogen Chloride

Totals :                                6.50410

 Results obtained with enhanced integrator!
==================================================================
                        *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/10/2006 11:58:40 PM          Seq. Line :  19
Sample Name     : Standard 5                      Location : Vial 5
Acq. Operator   : KAM                                 Inj :   1
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/10/2006 11:56:40 PM by KAM
                  (modified after loading)
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



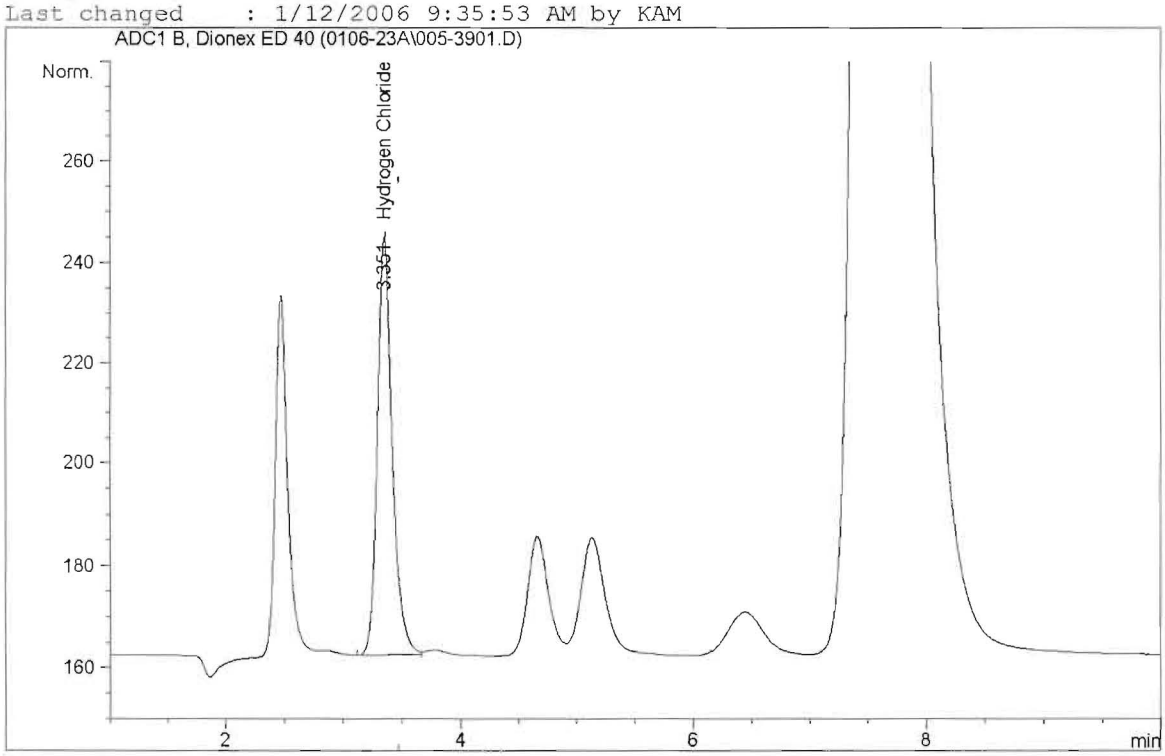

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.352 PV      726.57611 1.29821e-2    9.43250     Hydrogen Chloride

Totals :                                9.43250

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==================================================================
Injection Date  : 1/11/2006 12:10:36 AM          Seq. Line :  19
Sample Name     : Standard 5                      Location : Vial 5
Acq. Operator   : KAM                                 Inj :   2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 12:08:36 AM by KAM
                  (modified after loading)
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



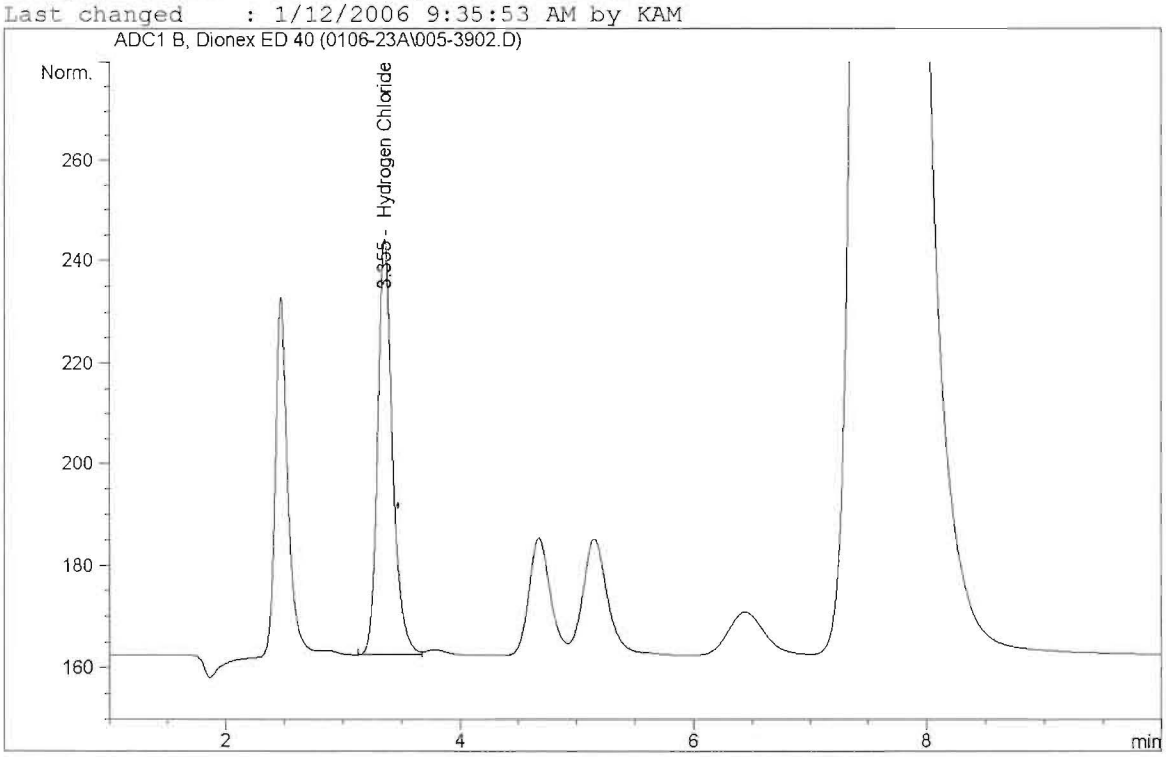

```
==================================================================
                      External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|-----------------
  3.352 BB      724.75885 1.29820e-2    9.40882     Hydrogen Chloride

Totals :                                9.40882

 Results obtained with enhanced integrator!
==================================================================
                        *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/11/2006 8:21:53 PM          Seq. Line :  39
Sample Name     : Standard 5                     Location : Vial 5
Acq. Operator   : KAM                                 Inj :   1
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



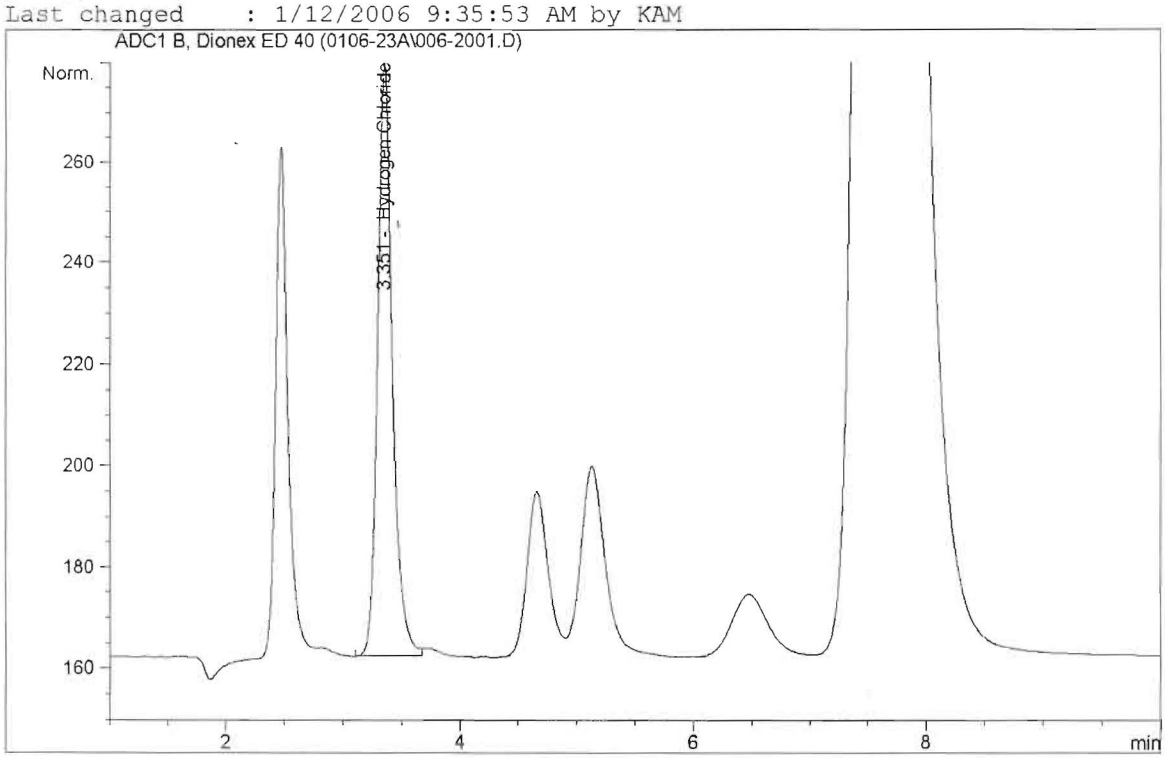

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.351 PB      725.80151 1.29821e-2    9.42241     Hydrogen Chloride

Totals :                                9.42241

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==================================================================
Injection Date  : 1/11/2006 8:33:45 PM          Seq. Line :  39
Sample Name     : Standard 5                     Location : Vial 5
Acq. Operator   : KAM                                 Inj :   2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



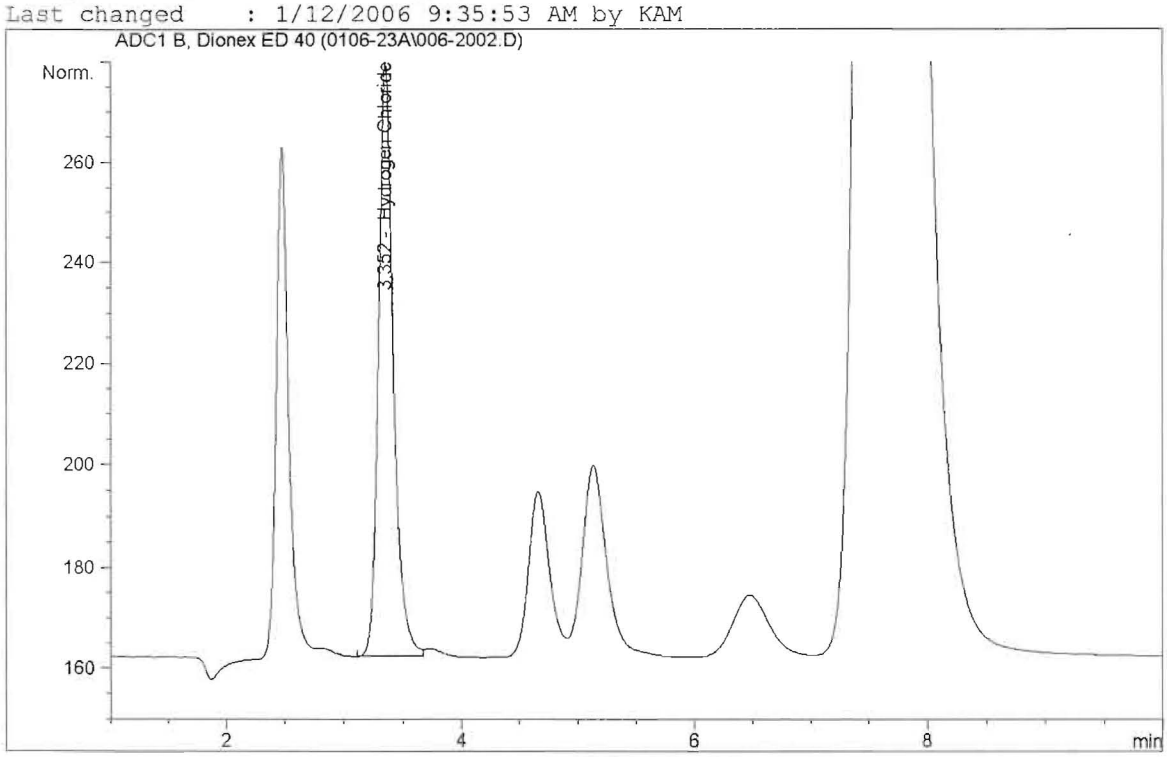

```
==================================================================
                    External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.355 BB      723.50446 1.29819e-2    9.39248     Hydrogen Chloride

Totals :                                9.39248

 Results obtained with enhanced integrator!
==================================================================
                      *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/11/2006 12:22:27 AM          Seq. Line :  20
Sample Name     : Standard 6                      Location : Vial 6
Acq. Operator   : KAM                                 Inj :   1
Acq. Instrument : Gonzo                          Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 12:20:33 AM by KAM
                  (modified after loading)
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



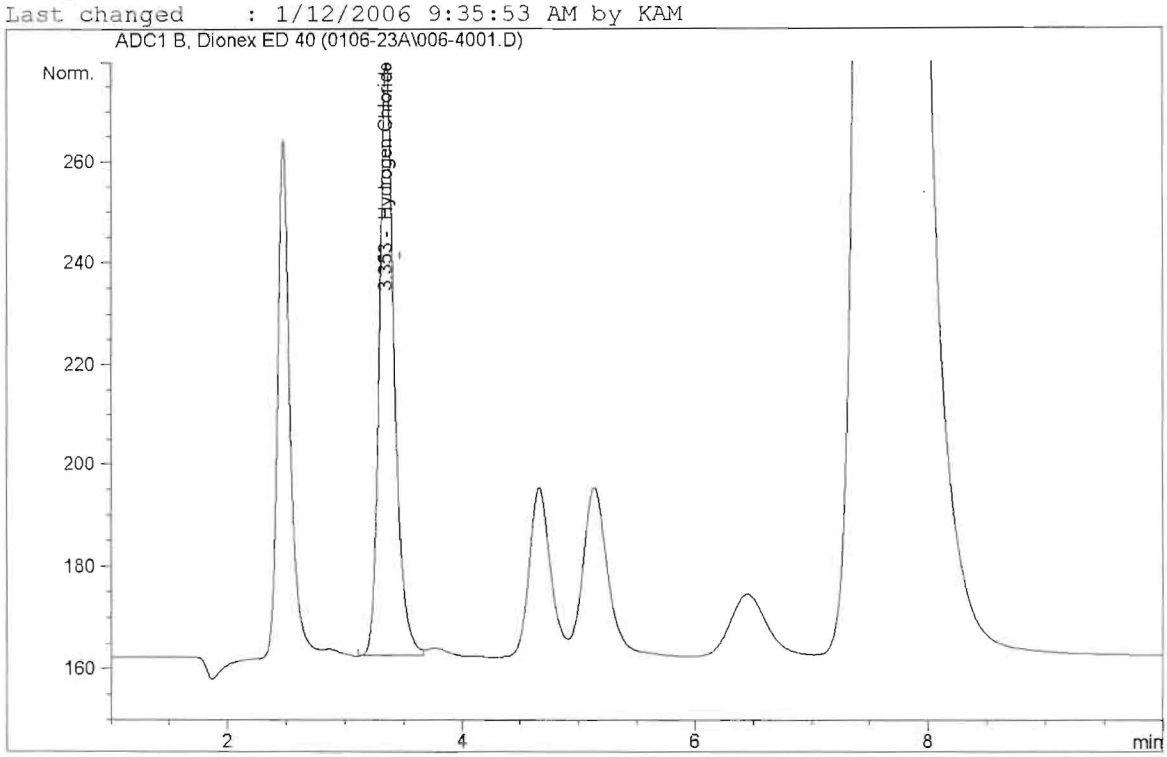

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.351 BB     1034.92810 1.29964e-2   13.45037     Hydrogen Chloride

Totals :                               13.45037

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/11/2006 12:34:19 AM          Seq. Line :  20
Sample Name     : Standard 6                      Location : Vial 6
Acq. Operator   : KAM                                  Inj :   2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 12:32:23 AM by KAM
                  (modified after loading)
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



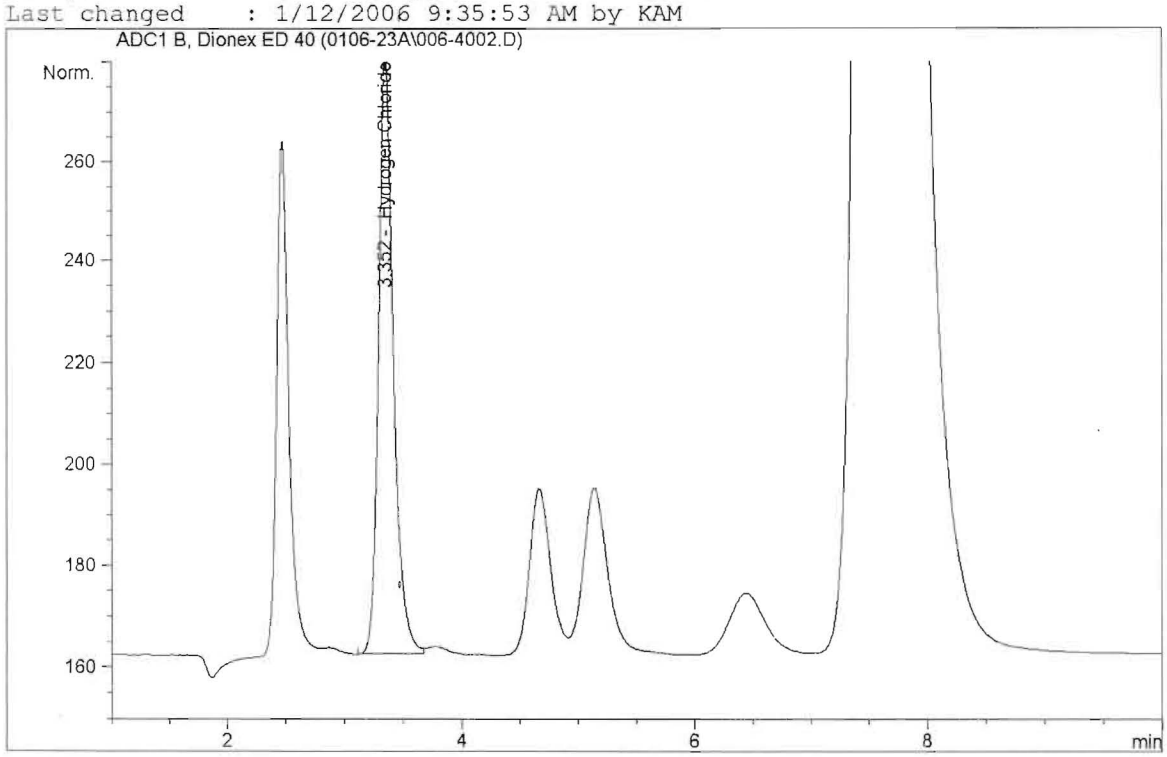

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.352 BB     1034.94312 1.29964e-2   13.45056     Hydrogen Chloride

Totals :                                13.45056

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==================================================================
Injection Date  : 1/11/2006 8:45:37 PM          Seq. Line :  40
Sample Name     : Standard 6                     Location : Vial 6
Acq. Operator   : KAM                                 Inj :   1
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 8:45:28 PM by KAM
                  (modified after loading)
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



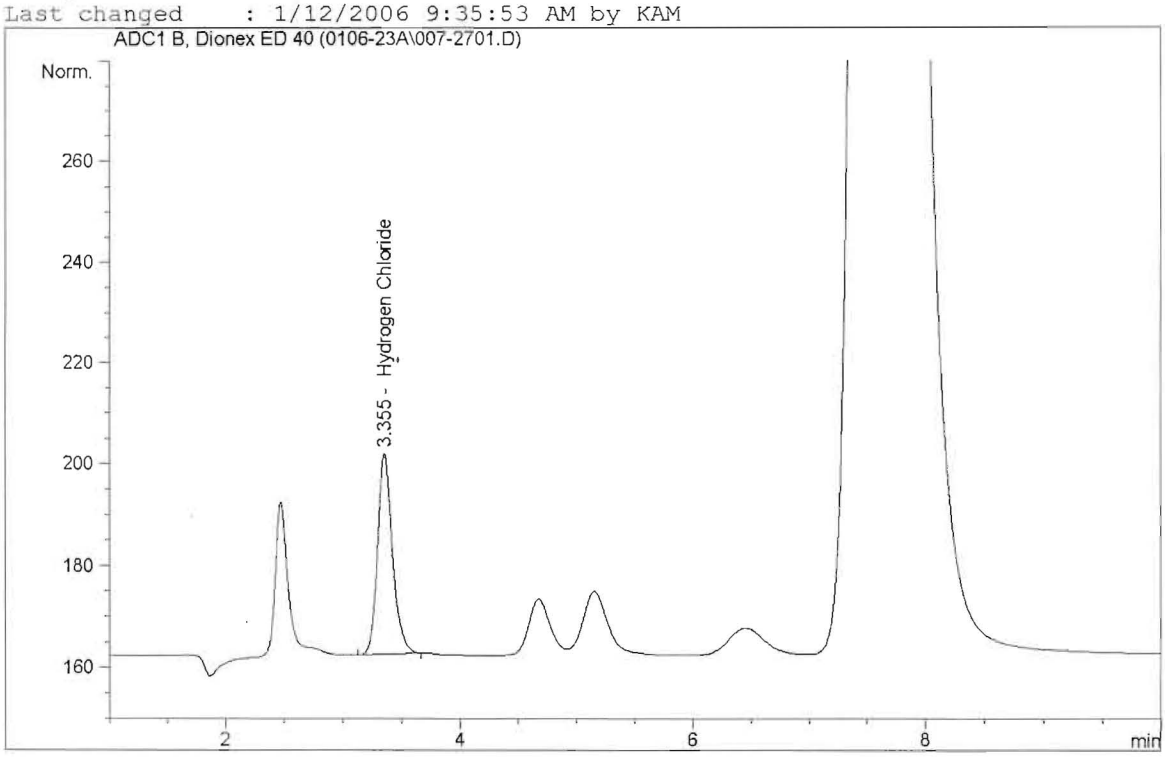

```
==================================================================
                      External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|-----------------
  3.353 PB     1036.14771 1.29965e-2   13.46626     Hydrogen Chloride

Totals :                               13.46626

 Results obtained with enhanced integrator!
==================================================================
                        *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/11/2006 8:57:28 PM          Seq. Line :  40
Sample Name     : Standard 6                     Location : Vial 6
Acq. Operator   : KAM                                 Inj :   2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 8:55:32 PM by KAM
                  (modified after loading)
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



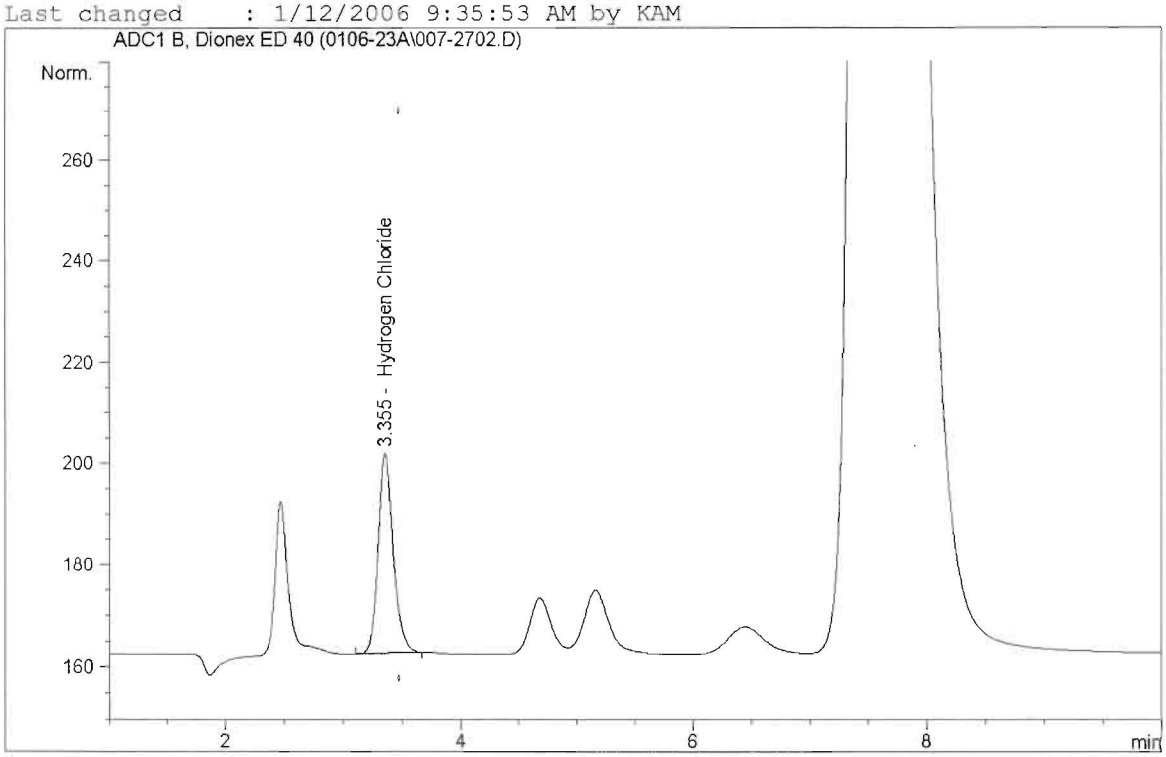

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.352 BB     1036.47571 1.29965e-2   13.47053     Hydrogen Chloride

Totals :                                13.47053

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/11/2006 3:37:21 PM          Seq. Line :  27
Sample Name     : Standard SS                    Location : Vial 7
Acq. Operator   : KAM                                 Inj :  1
Acq. Instrument : Gonzo                        Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



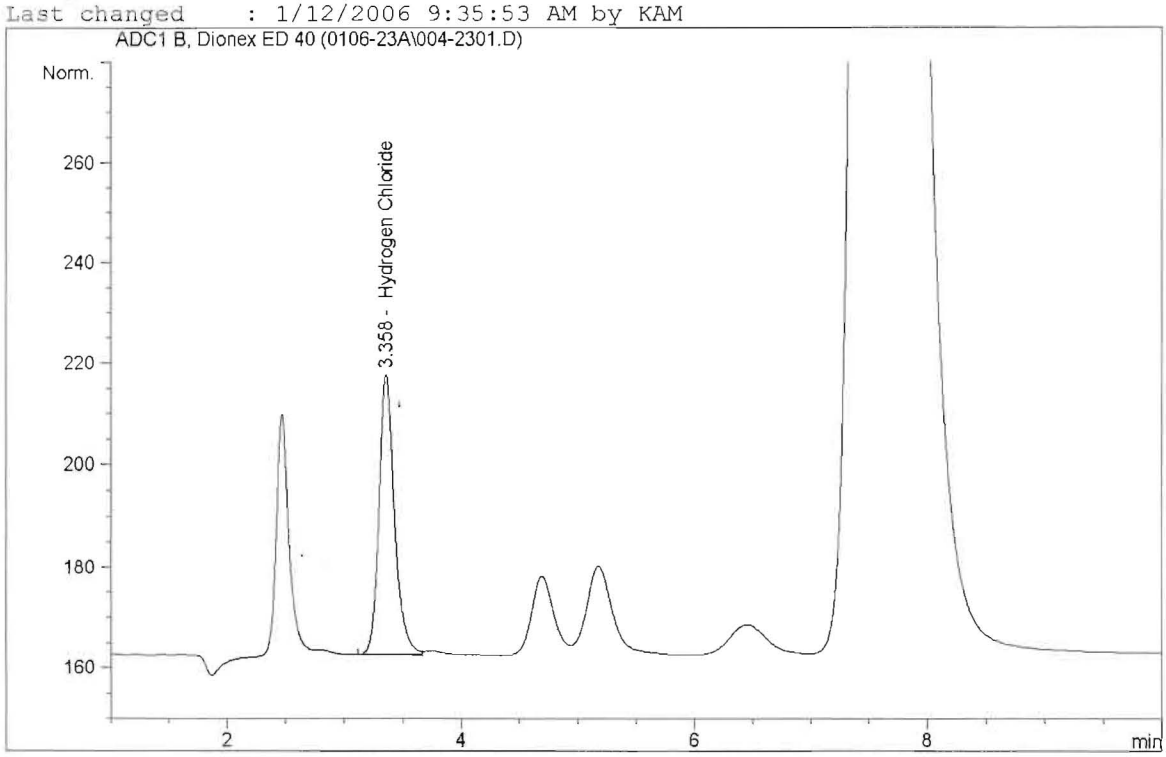

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.355 BB      349.26062 1.29303e-2    4.51603     Hydrogen Chloride

Totals :                                4.51603

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/11/2006 3:49:15 PM          Seq. Line :  27
Sample Name     : Standard SS                    Location : Vial 7
Acq. Operator   : KAM                                 Inj :  2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```



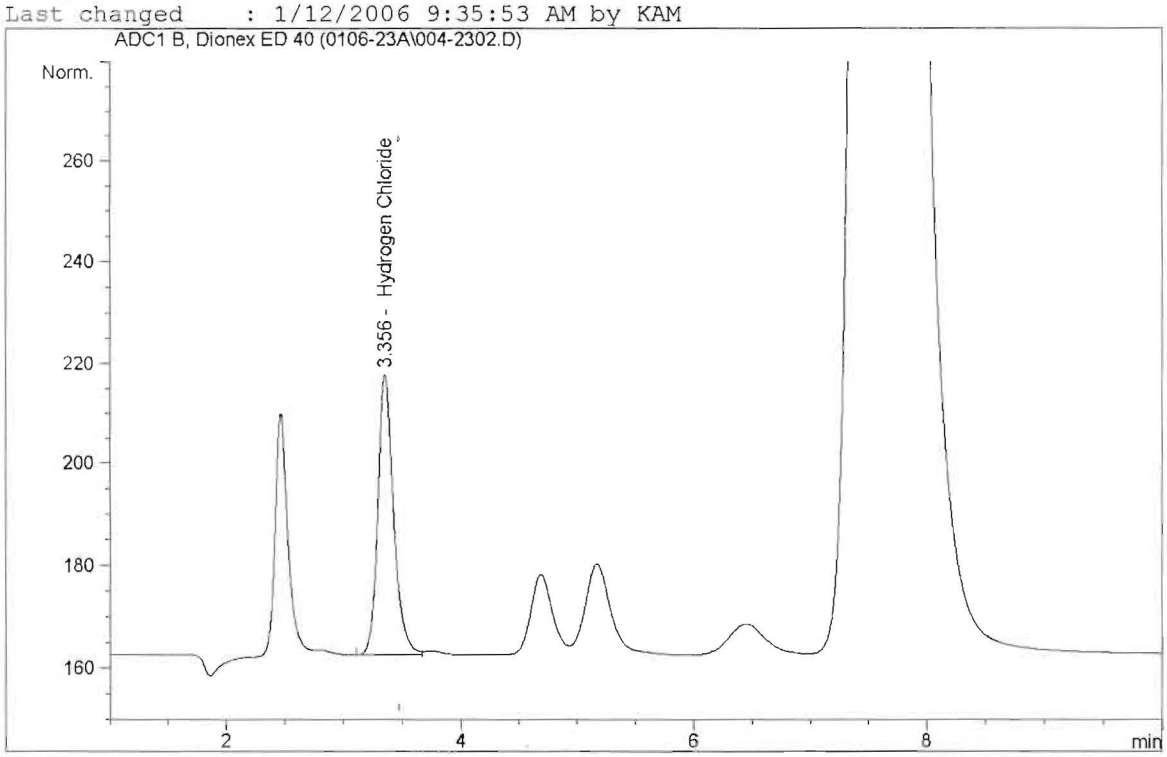

```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.355 PP      349.35999 1.29303e-2    4.51732     Hydrogen Chloride

Totals :                                4.51732

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==========================================================================
Injection Date  : 1/11/2006 11:09:48 AM          Seq. Line :  23
Sample Name     : Standard 4                      Location : Vial 4
Acq. Operator   : KAM                                 Inj :  1
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```




```
==========================================================================
                        External Standard Report
==========================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|------------------
  3.358 BB      504.91330 1.29610e-2    6.54420     Hydrogen Chloride

Totals :                                6.54420

 Results obtained with enhanced integrator!
==========================================================================
                          *** End of Report ***
```

```
==================================================================
Injection Date  : 1/11/2006 11:21:42 AM          Seq. Line :  23
Sample Name     : Standard 4                      Location : Vial 4
Acq. Operator   : KAM                                  Inj :   2
Acq. Instrument : Gonzo                         Inj Volume : 25 µl
Sequence File   : H:\LC2006Q1\GONZO\SEQUENCE\0106-23A.S
Acq. Method     : C:\LC2005Q4\GONZO\METHODS\1105-90.M
Last changed    : 1/11/2006 10:03:40 AM by KAM
Analysis Method : H:\LC2006Q1\GONZO\METHOD\0106-34R.M
Last changed    : 1/12/2006 9:35:53 AM by KAM
```




```
==================================================================
                      External Standard Report
==================================================================

Sorted By              :      Signal
Calib. Data Modified   :      Thursday, January 12, 2006 9:33:23 AM
Multiplier             :      1.0000
Dilution               :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 1: ADC1 B, Dionex ED 40

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [uS*s]                [ug/mL]
-------|------|----------|----------|----------|--|-----------------
  3.356 BB      503.53848 1.29609e-2    6.52629    Hydrogen Chloride

Totals :                                6.52629

 Results obtained with enhanced integrator!
==================================================================
                        *** End of Report ***
```

Sequence Table:

Method and Injection Info Part:

Line	Location	SampleName	Method	Inj	SampleType	InjVolume	DataFile
1	Vial 1	Standard 1	1105-90	2	Sample		
2	Vial 2	Standard 2	1105-90	2	Sample		
3	Vial 3	Standard 3	1105-90	2	Sample		
4	Vial 4	Standard 4	1105-90	2	Sample		
5	Vial 5	Standard 5	1105-90	2	Sample		
6	Vial 6	Standard 6	1105-90	2	Sample		
7	Vial 7	Standard SS	1105-90	2	Sample		
8	Vial 8	Lab blank H2SO4	1105-90	2	Sample		
9	Vial 9	Lab blank H2O	1105-90	2	Sample		
10	Vial 11	H-8*100	1105-90	2	Sample		
11	Vial 12	H-13*100	1105-90	2	Sample		
12	Vial 13	H-16*10	1105-90	2	Sample		
13	Vial 14	H-17*100	1105-90	2	Sample		
14	Vial 15	MS/H-8*100	1105-90	2	Sample		
15	Vial 1	Standard 1	1105-90	2	Sample		
16	Vial 2	Standard 2	1105-90	2	Sample		
17	Vial 3	Standard 3	1105-90	2	Sample		
18	Vial 4	Standard 4	1105-90	2	Sample		
19	Vial 5	Standard 5	1105-90	2	Sample		
20	Vial 6	Standard 6	1105-90	2	Sample		
21	Vial 16	Chloride BS A1	1105-90	2	Sample		
22	Vial 17	Chloride BS A2	1105-90	2	Sample		
23	Vial 4	Standard 4	1105-90	2	Sample		
24	Vial 21	Run C1*10	1105-90	1	Sample		
25	Vial 22	Run C2*10	1105-90	1	Sample		
26	Vial 23	Run C3*10	1105-90	1	Sample		
27	Vial 7	Standard SS	1105-90	2	Sample		
28	Vial 8	Lab blank H2SO4	1105-90	2	Sample		
29	Vial 9	Lab blank H2O	1105-90	2	Sample		
30	Vial 31	Run C1*4.05	1105-90	2	Sample		
31	Vial 32	Run C2*4.05	1105-90	2	Sample		
32	Vial 33	Run C3*4.05	1105-90	2	Sample		
33	Vial 34	Blank*4.05	1105-90	2	Sample		
34	Vial 35	MS/Run C1*4.05	1105-90	2	Sample		
35	Vial 1	Standard 1	1105-90	2	Sample		
36	Vial 2	Standard 2	1105-90	2	Sample		
37	Vial 3	Standard 3	1105-90	2	Sample		
38	Vial 4	Standard 4'	1105-90	2	Sample		
39	Vial 5	Standard 5	1105-90	2	Sample		
40	Vial 6	Standard 6	1105-90	2	Sample		

Method Information

Dionex IonPac AS-14A 4-mm analytical (4x250mm) column.
Flow rate 1.2 mL/min
8mM Na2CO3/1mM NaHCO3 mobile phase
Suppressed anion conductivity detection

==========

ANALOG DIGITAL CONVERTER

==========

	Signal 1
Description:	Dionex ED 40
Source:	Signal
Unit:	uS
Units/Volt:	1000.000
Peakwidth (Data Rate):	0.027 Min (10.00 Hz)
Stop Time:	No Limit
Data Storage:	All

Start Signal Source: External Device Will Start 35900

Timed Event Table:
<no events>

1100 Quaternary Pump 1

Control

Column Flow	:	1.200 ml/min
Stoptime	:	10.00 min
Posttime	:	Off

Solvents

Solvent A	:	0.0 % ( )
Solvent B	:	0.0 % ( )
Solvent C	:	100.0 % (8.0mM Na2CO3/1.0mM NaHCO3)
Solvent D	:	Off

PressureLimits

Minimum Pressure	:	0 bar
Maximum Pressure	:	400 bar

Auxiliary

Maximal Flow Ramp	:	100.00 ml/min^2
Primary Channel	:	Auto
Compressibility	:	83*10^-6/bar
Minimal Stroke	:	Auto

Store Parameters

Store Ratio A	:	Yes
Store Ratio B	:	Yes
Store Ratio C	:	Yes
Store Ratio D	:	Yes
Store Flow	:	Yes
Store Pressure	:	Yes

Agilent 1100 Autosampler 1

Injection

Injection Mode	:	Needle Wash
Injector volume	:	25.00 µl
Wash Vial	:	100
Optimization	:	none

Auxiliary

Drawspeed	:	100 µl/min
Ejectspeed	:	1000 µl/min
Draw position	:	2.0 mm

Time

Stoptime	:	As Pump
Posttime	:	Off

Agilent 1100 Column Thermostat 1

Temperature settings

Left temperature	:	30.0°C
Right temperature	:	Same as left
Enable analysis	:	When Temp. is within setpoint +/- 0.8°C
Store left temperature	:	No
Store right temperature	:	No

Time

Stoptime	:	As pump
Posttime	:	Off

Column Switching Valve : Column 1

Equations

APPENDIX F

NOMENCLATURE

General Equations

A_s	Stack cross sectional area, sq. in.
BAF	Bias adjustment factor (Part 75)
CF	Cubic feet
C_{adj}	Emission concentration corrected to 15% O_2 on a dry basis
C_d	Emission concentration (ppm), dry basis
C_{dCorr}	Emission concentration corrected to 15% O_2 on a dry basis
CE	Calibration Error check percentage (Part 75)
C_F	Wet gas meter orifice correction factor
CFM	Cubic feet per minute
C_P	Pitot tube coefficient
C_{PM}	Particulate matter concentrations, lb/dscf
D	Stack diameter, in.
D_e	Equivalent stack diameters for rectangular ducts, in.
DGM	Dry gas meter
D_N	Nozzle diameter, in.
E	Emission ratio, lb/MMBtu
%EA	Percent of excess air
F_d	Fuel factor or F-factor, ratio of flue gas volume to fuel volume, dscf/MMBtu
F_c	Fuel factor, ratio of CO_2 volume to fuel volume, dry basis
F_o	Fuel factor, based on ratio of CO_2 volume to O_2 volume, dry basis
Hg	Mercury
%I	Percent isokinetic
K_P	Pitot tube constant, 85.49(ft/s)[(lb/lb-mole)(in. Hg) / (°R) (in. H_2O)]$^{1/2}$
L	Length, in.
L	Volume of fuel loaded, liters during Subpart XX testing.
LE	Linearity Error check percentage (Part 75)
M_D	Volume fraction of dry gas
MW_d	Dry molecular weight of stack gas, g/g- mole (lb/lb-mole).
MT	Total Particulate, mg
MW	Molecular weight of flue gas
MW_D	Molecular weight of dry flue gas
%M	Percent moisture
$\%O_2$	Percent oxygen in flue gas, dry basis
$\%O_{2d}$	Percent oxygen in flue gas, dry basis
P_B	Barometric pressure, in. Hg
P_{bar}	Barometric pressure at sampling site, mm Hg (in. Hg).
PM	Particulate matter emission, lb/hr
P_M	Pressure drop across orifice, in. water
P_S	Stack static pressure, in. water or in. Hg
ΔP	Stack gas velocity head, in. water

S:\MASTER \WP \EQUAT ~1 \EQUATION.EQU

NOMENCLATURE, continued

General Equations

PPMVD	Parts per million by volume, dry basis
Q_A	Actual stack flow, acfm
Q_S	Dry stack flow, scfm
Q_{fuel}	Heat input on higher (HHV) or lower (LHV) heating value, MMBtu/hr
RV	Reference value or protocal gas value (Part 75)
SCFM	Standard cubic feet per minute
T_M	Mean gas meter temperature, °F or °R
T_R	Test run time, min.
T_S	Average stack temperature, °F or °R
V_M	Volume of dry gas at meter conditions, scf
V_{Mstd}	Wet gas meter volume in std conditions, scf
V_S	Stack flow velocity, fpm
V_W	Total water collected, gm
V_{Wgas}	Volume of moisture in flue gas, scf
V_{sei}	Volume of voc/air exhaust from vapor recovery unit, cubic meter
VOC	Volatile organic compounds (THC) concentration (Subpart XX)
W	Width, in.
X_{CO2}	CO_2 correction factor for 15% O_2 (Method 19)

EQUATIONS

1. Stack cross sectional area, sq. in

$$A_S = \frac{\pi}{4} \cdot D^2$$

$$D_e = \frac{2LW}{(L+W)}, \text{ equivalent stack diameters for rectangular ducts.}$$

2. Dry gas volume samples at standard conditions (29.92″Hg, 528°R)

$$V_{Mstd} = 17.65\ V_M[(P_B + (P_M/13.6))/T_M]$$

3. Water vapor volume collected at standard conditions, scf

$$V_{Wgas} = 0.0472 \cdot V_W$$

4. Percent moisture content

$$\%M = V_{Wgas}/(V_{Mstd} + V_{Wgas}) \cdot 100$$

5. Dry gas mole fraction

$$M_D = (100 - \%M)/100$$

6. Mean molecular weight of dry stack gas

$$MW_D = (\%CO_2 \cdot 0.44) + (\%O_2 \cdot 0.32) + (\%N_2 \cdot 0.28)$$

7. Molecular weight of stack gas

$$MW = M_D \cdot MW_D + 18(1 - M_D)$$

8. Stack velocity, fpm

$$V_S = K_P \cdot 60 \cdot C_P(T_S/(P_S \cdot MW))^{1/2} \cdot Avg(\Delta P_S^{1/2})\ ;\ K_P = 85.397 \text{ (pitot tube constant)}$$

9. Volumetric flow at stack conditions, ACFM

$$Q_A = (V_S \cdot A_S)/144$$

10. Volumetric flow at standard conditions, SCFM

$$Q_S = 0.123 \cdot V_S \cdot M_D \cdot P_S \cdot A_S/T_S$$

11. Percentage of excess air

$$\%EA = 100 \cdot (\%O_2 - 0.5 \cdot \%CO)/(0.265 \cdot \%N_2 - \%O_2 + 0.5 \cdot \%CO)$$

12. Stack pressure, ″Hg

$$P_S = P_B + P_S \text{ (in water)}/13.6$$

S:\MASTER \WP \EQUAT ~1 \EQUATION.EQU

CETCON

13. Particulate matter concentrations, lb/dscf

$$C_{PM}(lb/dscf) = 2.20\,(10^{-6}) \bullet MT\ (mg)/V_{Mstd}(scf)$$

14. Particulate matter emission, lb/hr

$$PM(lb/hr) = C_{PM}(lb/dscf) \bullet SCFM \bullet 60(\text{min}/hr)$$

15. Emission ratio, lb/MMBtu

$$E(lb/MMBtu) = \frac{lb/hr\ emission}{MMBtu/hr}$$

16. Fuel factors or F-factors (CFR Method 19)

F_d = 8710 (*Natural Gas*) ; F_d = 9780 (*Bituminous Coal*) ; F_d (*CFR* 60, *Table* 19-1)

$$F_d = \frac{[\ 3.64\bullet(\%H) + 1.53\bullet(\%C) + 0.57\bullet(\%S) + 0.14\bullet(\%N) - 0.46\bullet(\%O)\ ]\ (10^6)}{GCV}$$

17. Emission ratio (F-factor method)

$$E(lb/MMBtu) = C_d(lb/scf) \bullet F_d \bullet [20/(20.9 - \%O_{2d})]$$

$$E(lb/MMBtu) = C_d(lb/scf) \bullet F_d \bullet [100/(\%CO_{2d})]$$

18. Nitrogen oxide emission, lb/hr

$$NO_X(lb/hr) = 7.17(10^{-6}) \bullet SCFM \bullet NO_x(ppm)$$

19. Nitrogen oxide emission for F-factor method

$$NO_X\ (lb/hr) = E \bullet Q_{in}$$

20. Carbon monoxide emissions, lb/hr

$$CO(lb/hr) = 4.36(10^{-6}) \bullet SCFM \bullet CO(ppm)$$

21. Carbon monoxide emission for F-factor method

$$CO\ (lb/hr) = E \bullet Q_{in}$$

22. Sulfur dioxide emissions, lb/hr

$$SO_2(lb/hr) = 9.97(10^{-6}) \bullet SCFM \bullet SO_2(ppm)$$

23. Sulfur dioxide emission for F-factor method

$$SO_2\ (lb/hr) = E \bullet Q_{in}$$

S:\MASTER \WP \EQUAT ~1 \EQUATION.EQU

CETCON

24. Total Hydrocarbon emissions (non-methane), lb/hr

$$THC(lb/hr) = 6.87(10^{-6}) \bullet SCFM \bullet THC(ppm) \text{ ; [Reported as propane]}$$

$$THC(lb/hr) = 1.87(10^{-6}) \bullet SCFM \bullet THC(ppm) \text{ ; [Reported as carbon]}$$

25. Total Hydrocarbon (non-methane) emission for F-factor method

$$THC\ (lb/hr) = E \bullet Q_{in}$$

26. Carbon dioxide (CO_2) emissions, lb/hr (Part 75)

$$CO_2\ (lb/hr) = 1.90\ (10^{-5}) \bullet \%CO_2 \bullet (SCFM)$$

27. Dry Emission Concentration Oxygen Correction factor

$$C_{d\ Corr} = C_d \frac{(\ \%O_{2\ Corr,\ desired} - 20.9\ )}{(20.9 - \%O_{2d,\ measured})}$$

28. Percent isokinetics

$$\%I = (1039 \bullet V_{Mstd} \bullet T_S)/(M_D \bullet P_S \bullet V_S \bullet T_R \bullet D_N^2)$$

29. Engine emission ratio, grams/hp-hr (TNRCC)

$$E\ (grams/hp\text{-}hr) = \frac{Emission(lb/hr) \bullet 454(grams/lb)}{Engine\ HP}$$

30. Bias Adjustment Factor, BAF (Part 75)

$$BAF = 1 + \frac{|\ \overline{d}\ |}{|\ \overline{CEM}\ |}$$

31. Bias Adjustment (Part 75)

$$CEM_{ADJ} = CEM_i \bullet BAF$$

32. Linearity Error (Part 75)

$$\%\ L\ E = \frac{|\ RV - CEM_i\ |}{RV} \bullet 100$$

33. Calibration Error (Part 75)

$$\%\ C\ E = \frac{|\ RV - CEM_i\ |}{SPAN_{CEM}} \bullet 100$$

S:\MASTER \WP \EQUAT ~1 \EQUATION.EQU

34. Emission concentration correction to 15% O_2 (CFR Method 19)

$$C_{adj} = C_d \bullet \frac{(5.9)}{(20.9 - \%O_{2d})}$$

$$C_{adj} = C_d \bullet \left[\frac{\chi_{CO_2}}{\%CO_2}\right] \qquad \chi_{CO_2} = \frac{5.9}{F_o}$$

35. Fuel factor for CO_2 diluent measurements, F_o

$$F_o = 0.209 \bullet \left[\frac{F_d}{F_c}\right]$$

36. Ratio CO_2 volume per GCV gas volume, F_c

$$F_c = 1040 \ (Natural\ Gas)\ ;\ F_c = 1800\ (Bituminous\ Coal)$$

$$F_c = \left[\frac{321(10^3) \bullet \%C}{GCV}\right]\ ;\ (\ optional\ CO_2\ flue\ gas\ ratio)$$

37. VOC emission concentration reported as propane, mg VOC/liter fuel (Subpart XX)

$$E\ (\ mg/\ell\ ) = \frac{1.83\ (10^6) \bullet V_{sei}\ (scm) \bullet VOC_{out}(ppm)}{L_{fuel\ loaded}\ (liters) \bullet (10^{-6})}$$

$$K = VOC_{propane}\ gas\ density = 1.83(10^6)\ ,\ mg/cm$$

S:\MASTER \WP \EQUAT ~1 \EQUATION.EQU

CETCON

REFERENCE METHOD 5 ORIFICE EQUATIONS

General Orifice Equation:

$$Q_o = C_o \times [\Delta H]^{0.5} \times [(T_o + 460) \div (P_o \times M_d)]^{0.5}$$

Q_o = Orifice Flowrate, ft^3/min

C_o = Orifice Coefficient

ΔH = Orifice Pressure Drop, in H_2O

T_o = Orifice Temperature, °F

P_o = Orifice Pressure, in Hg

M_d = Dry Molecular Weight, lb/lbmol

By Definition:

$\Delta H@$ is the orifice pressure drop that will result in a flowrate of 0.75 ft^3/min flowing ambient air (M_d = 28.84) at STP (P_{std} = 29.921 and T_{std} = 68)

Therefore:

$$0.75 = C_o \times [\Delta H@]^{0.5} \times [(68 + 460) \div (29.921 \times 28.84)]^{0.5}$$

$$C_o = 0.9588 \div [\Delta H@]^{0.5}$$

$$Q_{std} = 17.64 \times Q_o \times P_o \div (T_o + 460)$$

$$Q_{std} = 17.64 \times 0.9588 \times [\Delta H]^{0.5} \times P_o \times [T_o + 460]^{0.5} \div ([\Delta H@ \times P_o \times M_d]^{0.5} \times (T_o + 460))$$

$$Q_{std} = 16.9133 \times [\Delta H \times P_o]^{0.5} \div [\Delta H@ \times M_d \times (T_o + 460)]^{0.5}$$

Assume T_o and P_o = Meter Temperature and Pressure, T_m and P_m

$$[\Delta H]^{0.5} = Q_{std} \times [(\Delta H@ \times M_d \times (T_m + 460)]^{0.5} \div (16.9133 \times [P_m]^{0.5})$$

$$\Delta H = Q_{std}^2 \times \Delta H@ \times M_d \times (T_m + 460) \div (286.0598 \times P_m)$$

$Q_{std} = V_{mstd} \div T_R$

V_{mstd} = Dry Standard Sample Volume, ft^3

T_R = Sample Time, minutes

$$\Delta H = V_{mstd}^2 \times \Delta H@ \times M_d \times (T_m + 460) \div (286.0598 \times P_m \times T_R^2)$$

$$P_m = P_B + (\Delta H \div 13.6)$$

The Resulting Quadratic Equation Has The Form: $a\Delta H^2 + b\Delta H + c = 0$

$a = 21.0338 \times T_R^2$, $b = 286.0598 \times P_B \times T_R^2$, $c = -(V_{mstd}^2 \times \Delta H@ \times M_d \times (T_m + 460))$

The Two Solutions For This Quadratic Equation Are: $\Delta H = (-b \pm [b^2 - 4ac]^{0.5}) \div 2a$

$(-b - [b^2 - 4ac]^{0.5}) \div 2a$ Results In A Negative ΔH And Therefore Is Ignored

$(-b + [b^2 - 4ac]^{0.5}) \div 2a$ Results In A Positive ΔH And Is The Actual Solution

Replacing a, b and c With Their Actual Values Results In The Following Equation:

$$\Delta H = ([(972.6033 \times P_B^2 \times T_R^2) + (V_{mstd}^2 \times \Delta H@ \times M_d \times (T_m + 460))]^{0.5} - (31.1866 \times P_B \times T_R)) \div (4.5863 \times T_R)$$

This Equation Allows Calculation Of The ΔH Required To Obtain A Given Standard Sample Volume (V_{mstd}) In Any Length Of Time (T_R) Specified.

REFERENCE METHOD 5 ORIFICE EQUATIONS
(Isokinetic Sampling)

Prediction Of Standard Sample Volume

$\Delta H = ([(972.6033 \times P_B^2 \times T_R^2) + (V_{mstd}^2 \times \Delta H@ \times M_d \times (T_m + 460))]^{0.5} - (31.1866 \times P_B \times T_R)) \div (4.5863 \times T_R)$ *From Page 1*

Rearranging And Solving For V_{mstd} Results In:

$$\mathbf{V_{mstd} = [(((4.5863 \times \Delta H \times T_R) + (31.1866 \times P_B \times T_R))^2 - (972.6033 \times P_B^2 \times T_R^2)) \div (\Delta H@ \times M_d \times (T_m + 460))]^{0.5}}$$

Prediction Of Ideal Nozzle Size

$\%I = 1039.4 \times V_{mstd} \times (T_S + 460) \div (V_S \times P_S \times D_n^2 \times M_D \times T_R)$ *From Page 2*

Setting %I = 100, Rearranging And Solving For D_n Results In:

$D_n = 3.2240 \times [(V_{mstd} \times (T_S + 460)) \div (V_S \times P_S \times M_D \times T_R)]^{0.5}$ *V_S In ft/min*

$V_S = 85.49 \times C_P \times [\Delta P_S]^{0.5} \times [(T_S + 460) \div (M_S \times P_S)]^{0.5}$ *V_S In ft/sec*

$V_S = 5129.4 \times C_P \times [\Delta P_S]^{0.5} \times [(T_S + 460) \div (M_S \times P_S)]^{0.5}$ *V_S In ft/min*

$$\mathbf{D_n = 0.04501 \times [V_{mstd} \div (M_D \times T_R \times C_P \times (\Delta P_S)^{0.5})]^{0.5} \times [(T_S + 460) \times M_S \div P_S]^{0.25}}$$

REFERENCE METHOD 5 ORIFICE EQUATIONS
(Isokinetic Sampling)

General Isokinetic Equation:

$V_n = V_s$

V_n = Velocity Through Nozzle, ft/sec

$V_n = Q_n \div (A_n \times 60)$

Q_n = Flowrate Through Nozzle, ft^3/min

A_n = Nozzle Area, ft^2

$A_n = \pi \times D_n^2 \div 576$

D = Nozzle Diameter, in

$Q_n = Q_{nstd} \times (T_s + 460) \div (17.64 \times P_s)$

Q_{nstd} = Nozzle Flowrate At STP, ft^3/min

$Q_{nstd} = Q_{mstd} \div M_D$

Q_{mstd} = Meter Flowrate At STP, ft^3/min

M_D = Stack Gas Dry Fraction

$M_D = (100 - \%M) \div 100$

V_s = Velocity Of Stack Gas, ft/sec

$V_s = 85.49 \times C_P \times [\Delta P_s]^{0.5} \times [(T_s + 460) \div (P_s \times M_s)]^{0.5}$

C_P = Pitot Tube Coefficient

ΔP_s = Pitot Tube Pressure Drop, in H_2O

T_s = Stack Temperature, °F

P_s = Stack Pressure, in Hg

M_s = Stack Gas Molecular Weight, lb/lbmol

$M_s = (M_D \times M_d) + 18 \times (1 - M_D)$

M_d = Stack Gas Dry Molecular Weight, lb/lbmol

$M_d = 0.32 \times \%O_2 + 0.44 \times \%CO_2 + 0.28 \times \%N_2$

%M = Stack Gas Moisture Content, %v

$$V_n = Q_{mstd} \times (T_s + 460) \div (1.8375 \times \pi \times P_s \times D_n^2 \times M_D)$$

$$Q_{mstd} = 16.9133 \times [\Delta H \times P_m]^{0.5} \div [\Delta H@ \times M_d \times (T_m + 460)]^{0.5}$$ *From Page 1*

$$V_n = 2.9299 \times [\Delta H \times P_m]^{0.5} \times (T_s + 460) \div ((P_s \times D_n^2 \times M_D) \times [\Delta H@ \times M_d \times (T_m + 460)]^{0.5}$$

$$V_s = 85.49 \times C_P \times [\Delta P_s]^{0.5} \times [(T_s + 460) \div (M_s \times P_s)]^{0.5}$$ *From Above*

Set $V_n = V_s$, Consolidate Like Terms And Rearrange Into The Form: $\Delta H = K \times \Delta P_s$

$[\Delta H]^{0.5} = \{29.1785 \times C_P \times D_n^2 \times M_D \times [P_s \times \Delta H@ \times M_d \times (T_m + 460)]^{0.5} \div [M_s \times P_m \times (T_s + 460)]^{0.5}\} \times [\Delta P_s]^{0.5}$

$\Delta H = \{851.3831 \times C_P^2 \times D_n^4 \times M_D^2 \times P_s \times \Delta H@ \times M_d \times (T_m + 460) \div (M_s \times P_m \times (T_s + 460))\} \times \Delta P_s$

$$K = 851.3831 \times C_P^2 \times D_n^4 \times M_D^2 \times P_s \times \Delta H@ \times M_d \times (T_m + 460) \div (M_s \times P_m \times (T_s + 460))$$

If P_m Is Replaced With $P_B + (\Delta H \div 13.6)$ The Result Is A Quadratic Equation Which Can Be Solved. However, The Result Would No Longer Have The Form $\Delta H = K \times \Delta P_s$ And Would Not Be Practical For Use In The Field. The Practical Approach Is To Use Iteration To Obtain The Value Of The K–Factor (K) Assume $P_m = P_B$ For The First Iteration And Calculate K_1. Multiply K_1 By The Average ΔP_s To Obtain ΔH_1 For The Second Iteration, Use ΔH_1 To Calculate P_{m2} And Use P_{m2} To Calculate K_2. Multiply K_2 By The Average ΔP_s To Obtain ΔH_2. Conduct The Iteration One Final Time Using ΔH_2 To Calculate P_{m3} And K. Three Iterations Will Provide Accuracy Greater Than The Precision Of The ΔH Or ΔP_s Measurements.

Calculation Of Percent Isokinetic From Test Data

$\%I = V_n \times 100 \div V_s$

$V_n = Q_{mstd} \times (T_s + 460) \div (1.8375 \times \pi \times P_s \times D_n^2 \times M_D)$ *From Above*

$Q_{mstd} = V_{mstd} \div T_R$

$V_n = V_{mstd} \times (T_s + 460) \div (1.8375 \times \pi \times P_s \times D_n^2 \times M_D \times T_R)$

$$\%I = 17.3230 \times V_{mstd} \times (T_s + 460) \div (V_s \times P_s \times D_n^2 \times M_D \times T_R)$$ *V_S In ft/sec*

$$\%I = 1039.4 \times V_{mstd} \times (T_s + 460) \div (V_s \times P_s \times D_n^2 \times M_D \times T_R)$$ *V_S In ft/min*

METHOD 19

Oxygen Based "F" Factor

Method 19 F-Factor or fuel factor method is the ratio of the products of combustion to the higher heating value (HHV) of the fuel supply. Concentrations of SO_2, NO_x, CO and NMHC (Non-Methane Hydrocarbons) are measured using Reference Methods 6C, 7E, 10 and 25A. Concentrations of O_2 are measured using RM 3 or 3A.

F-Factors are used to determine the ratio of pollutant emissions to heat input (lb/mmbtu). The following calculations demonstrate the use of F-factors to document emissions.

Nomenclature:

E - emission ratio, lb/MMBtu
C_d - emission ppm dry basis
F_d - F-factor (fuel factor), dry basis
F_d = 8710 dscf/MMBtu for natural gas.
$\%O_{2d}$ = $\%O_2$ in exhaust gases, dry basis
K_1 = 1.194 (10^{-7}) conversion from NO_x ppm to NO_x lb/scf
K_2 = 0.727 (10^{-7}) conversion from CO ppm to CO lb/scf
K_3 = 1.664 (10^{-7}) conversion from SO_2 ppm to SO_2 lb/scf
K_4 = 1.143 (10^{-7}) conversion from NMHC ppm to NMHC lb/scf (reported as propane)
K_5 = 0.312 (10^{-7}) conversion from NMHC ppm to NMHC lb/scf (reported as carbon)

Equations:

$$Q_{FUEL}(MMBtu/hr) = HHV\left(\frac{BTU}{SCF}\right) \bullet Fuelflow\left(\frac{SCF}{HR}\right) \bullet \frac{MMBtu}{10^6\ BTU}$$

$$Ehaust\ Flow\ DSCFM = Q_{FUEL}(MMBtu/hr) \bullet F_d\left(\frac{dscf}{MMBtu}\right) \bullet \left(\frac{HR}{60\min}\right) \bullet \frac{20.9}{(20.9 - \%O_{2d})}$$

$$E_{NO_x}(lb/MMBtu),\ NO_x = K_1 \bullet C_d \bullet F_d\ [20.9/(20.9 - \%O_{2d})]$$
$$E_{CO}(lb/MMBtu),\ CO = K_2 \bullet C_d \bullet F_d\ [20.9/(20.9 - \%O_{2d})]$$
$$E_{SO_2}(lb/MMBtu),\ SO_2 = K_3 \bullet C_d \bullet F_d\ [20.9/(20.9 - \%O_{2d})]$$
$$E_{NMHC}(lb/MMBtu),\ NMHC = K_{4\ or\ 5} \bullet C_d \bullet F_d\ [20.9/(20.9 - \%O_{2d})]$$

$$NO_x\ lb/hr = E_{NO_x} \bullet Q_{FUEL}\ (MMBtu/hr)$$
$$CO\ lb/hr = E_{CO} \bullet Q_{FUEL}\ (MMBtu/hr)$$
$$SO_2\ lb/hr = E_{SO_2} \bullet Q_{FUEL}\ (MMBtu/hr)$$
$$NMHC\ lb/hr = E_{NMHC} \bullet Q_{FUEL}(MMBtu/hr) \quad (reported\ as\ propane\ or\ carbon)$$

S:\MASTER \WP \EQUATI ~1 \RM19_O2.EQU

CETCON

IDEAL GAS LAW EQUATIONS

Ideal Gas Law: P • V = n • R • T

R=	21.845	$(ft^3 \bullet in.\ Hg) / (°R \bullet lbmole)$
T, °R=	T, °F + 459.72	
T_{std}=	68	°F
T_{std}=	527.72	°R
P_{std}=	29.921	in. Hg

Molar Volume Of Ideal Gas @ T_{std} & P_{std} = $V_{std} \div n = R \bullet T_{std} \div P_{std}$

V_{std} / n =	385.3	ft^3 / lbmole

Concentration Conversion Factors For Ideal Gas:

f_i=	Fraction Of Ideal Gas (i) In Sample
$ppmvd_i$ =	$f_i \bullet 1000000$
$\%vd_i$ =	$f_i \bullet 100$
lb_i / ft^3 =	MW_i, (lb / lbmole) • $f_i \div 385.3$, (ft^3 / lbmole)
lb_i / ft^3 =	MW_i, (lb / lbmole) • $ppmvd_i \div$ [385.3, (ft^3 / lbmole) • 1000000]
lb_i / ft^3 =	MW_i, (lb / lbmole) • $\%vd_i \div$ [385.3, (ft^3 / lbmole) • 100]

Ideal Gas Name	Formula	MW	lb/dscf / %dv
Nitric Oxide	NO	30.0061	$0.7788 \bullet 10^{-7}$
Nitrogen Dioxide	NO_2	46.0055	$1.1940 \bullet 10^{-7}$
Nitrogen Oxides	NO_X	46.0055	$1.1940 \bullet 10^{-7}$
Sulfur Dioxide	SO_2	64.0628	$1.6627 \bullet 10^{-7}$
Sulfur Trioxide	SO_3	80.0622	$2.0779 \bullet 10^{-7}$
Sulfuric Acid	H_2SO_4	98.0774	$2.5455 \bullet 10^{-7}$
Carbon Monoxide	CO	28.0106	$0.7270 \bullet 10^{-7}$
Carbon	C	12.0112	$0.3117 \bullet 10^{-7}$
Methane	CH_4	16.0428	$0.4164 \bullet 10^{-7}$
Propane	C_3H_8	44.0968	$1.1445 \bullet 10^{-7}$
1,3-Butadiene	C_4H_6	54.0914	$1.4039 \bullet 10^{-7}$
Formaldehyde	H_2CO	30.0264	$0.7793 \bullet 10^{-7}$
Hydrogen Sulfide	H_2S	34.0798	$0.8845 \bullet 10^{-7}$
Carbonyl Sulfide	COS	60.0746	$1.5592 \bullet 10^{-7}$
Carbon Disulfide	CS_2	76.1392	$1.9761 \bullet 10^{-7}$
Methyl Mercaptan	CH_3SH	48.1068	$1.2486 \bullet 10^{-7}$
Dimethyl Sulfide	C_2H_6S	62.1338	$1.6126 \bullet 10^{-7}$
Dimethyl Disulfide	$C_2H_6S_2$	94.1978	$2.4448 \bullet 10^{-7}$
Hydrogen Chloride	HCl	36.4609	$0.9463 \bullet 10^{-7}$
Hydrogen Fluoride	HF	20.0063	$0.5192 \bullet 10^{-7}$
Ammonia	NH_3	17.0304	$0.4420 \bullet 10^{-7}$
Ideal Gas Name	**Formula**	**MW**	**lb/dscf / %dv**
Oxygen	O_2	31.9988	$0.8305 \bullet 10^{-3}$
Carbon Dioxide	CO_2	44.0100	$1.1422 \bullet 10^{-3}$
Nitrogen	N_2	28.0134	$0.7271 \bullet 10^{-3}$
Hydrogen Sulfide	H_2S	34.0798	$0.8845 \bullet 10^{-3}$

Calculation Of Mass Emission Rate

E_i =	Mass Emission Rate Of Ideal Gas (i), lb/hr
E_i =	lb_i / dscf • Stack Flow (dscf/min) · 60 (min/hr)

Original Test Proposal

APPENDIX G

EMISSION TESTING PROPOSAL

TPI Petroleum, Inc.
Engineering Performance Test
Platformer Catalyst Regeneration Vent (CCR)
Oklahoma Department of Environmental Quality
Permit No.:98-172-C (M-17) (PSD)
Emission Unit: CCR
Point No.: P-150
Ardmore Petroleum Refinery – Ardmore, Oklahoma

Engineering performance test for Sulfur Dioxide (SO_2), Nitrogen Oxide (NOx), Carbon Monoxide (CO), Total Hydrocarbon (THC), Chloride (HCl) and Particulate Matter (PM) emission limits will be demonstrated by following procedures and guidelines presented in Code of Federal Regulations, Title 40 (CFR40), Part 60, Appendix A, Reference Methods (RM's) 1, 2, 4, 3A, 5, 6C, 7E, 10, 25A and 26.

Project Specifics

A series of three one-hour test runs will be conducted to document SO_2, NOx, CO, THC, HCl and PM concentrations while the unit is operating at 90% of permit or process capacity using RM's 6C, 7E, 10, 25A, 26 and 5, respectively. The velocity traverse and a moisture determination from the PM test will be used to determine volumetric stack flow for the SO_2, NOx CO and THC emission rates. The volumetric stack flow rate and the pollutant concentrations obtained during each test run will be used to determine mass emission rates. The results from each SO_2, NOx, CO, THC and PM test run will be averaged to determine emission rates in units of pounds per hour (lb/hr) and tons per year (TPY). The results from each HCl test run will be averaged to determine emissions in units of parts per million (ppm).

The particulate emissions test run time may extend beyond 60 minutes depending on number of sampling points and flue gas conditions. The total sampling time will be such that the sampling time per point is not less than 2 minutes. In general, a particulate sample run is approximately 60 minutes in duration.

Operating parameters will be recorded to verify that the unit is running at the required load(s) during the sampling period. Operating parameters will be documented by TPI Petroleum, Inc. personnel coinciding with each test run and will be forwarded to CETCON, Inc. for inclusion into the test report.

CETCON would like to take exception to RM's 10 and 25A. Attached are detailed descriptions of each analytical method exception.

Attached are detailed descriptions of each analytical method proposed along with the schematic of the sample trains.

SAMPLE METHODS SUMMARY

Pollutants are measured according to EPA Reference Methods (RM's) described in the Code of Federal Regulations (CFR), Title 40, Part 60, Appendix A. The following methods will be used:

RM-1 Sample and velocity traverses for stationary sources. Determination of measurement site and sample point location.

RM-2 Determination of stack gas velocity and volumetric flow rate. A calibrated Type S pitot tube is used in conjunction with an inclined manometer to determine average gas velocity and for quantifying gas flow.

RM-3A Determination of Oxygen (O_2) and Carbon Dioxide (CO_2) concentrations in emissions from stationary sources (Instrumental Analyzer Procedure). Servomex 1400B4 series analyzers are used to continuously measure the concentrations of O_2 and CO_2. O_2 and CO_2 concentrations are determined by paramagnetic and non-dispersive infrared detectors, respectively. The instruments are calibrated either with gases prepared according to EPA Protocol One or with gases that have been certified using an Orsat analyzer (RM-3).

RM-4 Determination of moisture content in stack gases. A gas sample is extracted from the source through an impinger sampling train which condenses the moisture. The volume of the gas sample leaving the impinger train is determined using a calibrated dry gas meter. The impingers are weighed before and after the test run to determine moisture content.

RM-5 Determination of particulate emissions from stationary sources. Particulate matter is extracted isokinetically from the source and collected in a heated probe and heated glass fiber filter which are maintained at 248 ± 25 °F. An impinger train is used to remove the moisture and condensable particulate matter from the gas sample. Gas sample volume is determined using a calibrated dry gas meter. The mass of particulate matter is determined gravimetrically.

RM-6C Determination of Sulfur Dioxide (SO_2) emissions from stationary sources (Instrumental Analyzer Procedure). A Bovar (Western Research) Model 721AT2 or 721M ultraviolet photometric analyzer is used to continuously measure the concentration of SO_2. The instrument is calibrated with gases prepared according to EPA Protocol One.

RM-7E Determination of Nitrogen Oxides (NO_X) emissions from stationary sources (Instrumental Analyzer Procedure). A Thermo Environmental Instruments Company Model 10S, 42H or 42C chemiluminescent analyzer is used to continuously measure the concentration of NO_X. The instrument is calibrated with gases prepared according to EPA Protocol One.

SAMPLE METHODS SUMMARY, cont.

RM-10 Determination of Carbon Monoxide (CO) emissions from stationary sources (Instrumental Analyzer Procedure). A Thermo Environmental Instruments Company Model 48 or 48C gas filter correlation infrared analyzer is used to continuously measure the concentration of CO. The instrument is calibrated with gases prepared according to EPA Protocol One.

RM-25A Determination of total gaseous organic concentration using a flame ionization analyzer (FIA). A gas sample is extracted from the source through a heated sample line and heated filter (if necessary). A J.U.M. Model 3-100 or VE-7 or Eagle Monitoring Systems Model EM-7000 FIA is used to continuously measure the concentration of total hydrocarbons (THC). The instruments are calibrated with gases prepared according to EPA Protocol One consisting of Methane (CH_4) or Propane (C_3H_8) in a balance of Nitrogen (N_2) or air. THC concentrations are expressed in units of ppm as C_3H_8 or as Carbon.

RM-26 Determination of Hydrogen Halide (HCl, HBr and HF) and Halogen (Cl_2 and Br_2) emissions from stationary sources. A gas sample is extracted from the source at a constant rate through a heated glass probe and heated Teflon filter and passed through midget impingers containing 0.1N sulfuric acid (H_2SO_4) where the Hydrogen Halides are absorbed. The Halogens, having low solubility in acidic solutions, pass through and are absorbed in impingers containing 0.1N sodium hydroxide (NaOH). Gas sample volume is determined using a calibrated dry gas meter. The collected samples are analyzed by Ion Chromatography.

EMISSIONS TESTING PROCEDURE – METHODS 1, 2, 3A, & 4

Oxygen (O_2), Carbon Dioxide (CO_2) and Moisture (H_2O) concentrations as well as stack gas velocity and volumetric flow rate are determined according to procedures set forth in the Code of Federal Regulations, Title 40 (CFR40), Part 60, Appendix A, Reference Methods 1, 2, 3A and 4.

Sampling Procedure

Reference Methods 1 and 2 are used to measure the stack gas velocity and volumetric flow rate. Method 1 is used to select the sampling site and number of traverse points. Method 2 is used to perform the actual velocity measurement. A calibrated S-Type pitot tube connected to an inclined manometer and equipped with a thermocouple for temperature measurement is used to measure the stack gas velocity. The pitot tube pressure drop and stack gas temperature at each traverse point are recorded. The barometric pressure and stack pressure are also measured and recorded. A cyclonic flow test is conducted to validate the acceptability of the sampling location. The pitot tube is held perpendicular to the flow and rotated until a pressure drop of zero is obtained. The amount of rotation required to obtain a zero reading is called the null angle. The average null angle of all traverse points must be less than 20° for the location to be acceptable.

Reference Method 3A is used to determine O_2 and CO_2 concentrations and stack gas dry molecular weight. Flue gas is extracted continuously from the stack through a heated probe, filter and sample line, all of which are operated at approximately 250 °F. A thermo-electrically cooled sample conditioner equipped with a sample pump is used to dry and cool the sample. Condensed water is continuously removed from the system by a peristaltic pump. The conditioned sample is conveyed to the testing trailer at grade through 3/8 inch O.D. Teflon tubing. The flow panel in the trailer distributes a portion of the sample to the O_2 and CO_2 analyzers and the remainder is vented to the outside. The O_2 and CO_2 concentrations measured by the analyzers are recorded by a personal computer equipped with an analog to digital converter and data acquisition software. CEDAQ (CETCON Data Acquisition) software is configured to sample the output of the analyzers every fifteen seconds and record the data as 1-minute averages (average of four readings). A strip chart recorder is used for backup and visual purposes.

Reference Method 4 is used to measure the moisture content of the stack gas. Flue gas is extracted from the stack through a heated probe and filter into a standard impinger train. The first, third and fourth impingers are of the Greenburg-Smith design, modified by replacing the tip with a 1/2 inch I.D. glass tube extending to 1/2 inch from the bottom of the flask. The second impinger is of the Greenburg-Smith design with the standard tip. The first two impingers contain known quantities of water and the fourth impinger contains a known quantity of silica gel. The dried flue gas leaving the impinger train is pumped through a dry gas meter to measure sample volume. The dry gas meter is equipped with an orifice and inclined manometer to measure the sample. A minimum sample volume of 21 dscf is required at a sample rate no greater than 0.75 cfm. At the conclusion of the test run, the quantities of water and silica gel in the impingers are determined gravimetrically. The difference between the final and initial weights of water and silica gel is recorded and used to calculate the stack gas moisture content.

Analysis

O_2 and CO_2 concentrations are determined using Servomex 1400 Series analyzers. The O_2 measuring version of the instrument uses a magneto-dynamic paramagnetic detector. The CO_2 measuring version of the instrument uses a single beam, single wavelength infrared detector. The analyzers are equipped to output a 0-1 Volt D.C. signal that is proportional to the O_2 and CO_2 concentrations. The full-scale range of both instruments is 25%.

The moisture content is determined gravimetrically using an impinger train containing known quantities of water and silica gel.

The velocity and volumetric flow rate is determined using an S-Type pitot tube. The pressure drop of the pitot tube and the stack gas temperature are measured at each traverse point. The barometric pressure and differential stack pressure are measured and used to calculate the absolute stack pressure. The O_2, CO_2, N_2 (assumed to be the balance of the dry gas) and H_2O concentrations are used to calculate the actual molecular weight of the stack gas. This data is then used to calculate the average stack gas velocity. The volumetric flow rate is calculated by multiplying the velocity by the area of the stack cross section.

Conclusion

Oxygen (O_2) and Carbon Dioxide (CO_2) concentrations are measured by Reference Method 3A using Paramagnetic and Infrared analyzers, respectively. The analyzers are calibrated using standards that have been prepared according to EPA Protocol Number 1 or have been certified using an Orsat analyzer (Reference Method 3). The concentrations measured by the analyzers are recorded by computer data acquisition and on a strip chart recorder.

Moisture (H_2O) concentration is measured by Reference Method 4 using a standard impinger train. The quantity of water collected is measured gravimetrically.

Stack gas velocity and volumetric flow rate is measured by Reference Methods 1 and 2 using an S-Type pitot tube. Data obtained from Reference Methods 3A and 4 is also used in the velocity calculations.

EMISSIONS TESTING PROCEDURE – METHOD 5

Mass emission rates of Particulate Matter (PM) will be determined in accordance with Code of Federal Regulations, (CFR) Title 40, Part 60, Appendix A, Reference Methods (RM's) 1, 2, 3 or 3A, 4 and 5.

Sampling Procedure

For determination of PM emissions preliminary testing may be necessary to determine the isokinetic sampling rate. The preliminary test includes RM-1, RM-2, RM-3 or 3A and RM-4. Once the isokinetic sampling rate is determined, the PM testing will be performed. A RM-5 sample train is assembled and a pretest leak check is conducted. The probe nozzle is then properly positioned at the first traverse point. The stack gas is drawn isokinetically from the source at each of the pre-determined traverse points, per RM-1. The particulate matter is collected in the nozzle and probe and on a glass fiber filter. Both the probe and filter assembly are heated to 248 ± 25 °F. Stack velocity, per RM-2, will be measured at each of the traverse points by means of an S type pitot, which is incorporated as part of the RM-5 sample train. The sample is then drawn through a RM-4 impinger train in order to determine % moisture (water vapor) in the flue gas, which is used in stack gas molecular weight and velocity calculations. The RM-4 impinger train consists of four impingers. The first two impingers contain a known quantity of water followed by an empty impinger then a desiccant impinger containing silica gel. The clean dry gas sample then passes through a pump and a calibrated dry gas meter. A post-test leak check is performed at the conclusion of the sample run. After validation of the test run the sampling train is disassembled.

A RM-3 or RM-3A sample train will run in conjunction with the RM-5 in order to determine the O_2 and CO_2 concentrations for dry molecular weight. The appropriate emission testing procedure is attached.

Analysis

After each test run the filter is removed from the filter holder and stored in a clean, labeled container. The probe, nozzle, and front half of the filter holder are rinsed with acetone and the residue collected in a pre-cleaned glass jar. The condensate from the impinger train is also collected if the determination of the condensable particulate matter is required. The particulate matter is determined gravimetrically after the samples have been desiccated.

Conclusion

RM-5 will determine PM emitted by stationary sources. The particulate matter is collected in a heated probe and filter assembly and in a RM-4 impinger train. Laboratory analysis includes the desiccation of the collected samples and subsequent gravimetric determination of particulate matter collected. The PM emissions will be reported in units of pounds per hour (lb/hr) and tons per year (TPY).

EMISSIONS TESTING PROCEDURE – METHOD 6C

Sulfur Dioxide (SO_2) concentration in flue gas streams is determined according to procedures set forth in the Code of Federal Regulations, Title 40 (CFR40), Part 60, Appendix A, Reference Method 6C.

Sampling Procedure

Flue gas is extracted continuously from the stack through a heated probe, filter and sample line, all of which are operated at approximately 250 °F. A thermo-electrically cooled sample conditioner equipped with a sample pump is used to dry and cool the sample. Condensed water is continuously removed from the system by a peristaltic pump. The conditioned sample is conveyed to the testing trailer at grade through unheated 3/8 inch O.D. Teflon tubing. The flow panel in the trailer distributes a portion of the sample to the SO_2 analyzer and the remainder is vented to the outside. The SO_2 concentration measured by the analyzer is recorded by a personal computer equipped with an analog to digital converter and data acquisition software. CEDAQ (CETCON Data Acquisition) software is configured to sample the output of the analyzer every fifteen seconds and record the data as 1-minute averages (average of four readings). A strip chart recorder is also used to record the analyzer output for backup and visual purposes.

Analysis

SO_2 concentration is determined using an analyzer utilizing an Ultraviolet (UV) Photometric detector. The analyzers are equipped to output a 0-10 Volt D.C. signal that is proportional to the SO_2 concentration. A full-scale range is selected based on the expected concentration of the flue gas. Typical ranges used are 0-100 ppm, 0-250 ppm, 0-500 ppm and 0-1000 ppm.

Conclusion

Sulfur dioxide (SO_2) concentration is measured by Reference Method 6C using a UV Photometric analyzer. The analyzer is calibrated using standards that have been prepared according to EPA Protocol Number 1. The concentration measured by the analyzer is recorded by computer data acquisition and on a strip chart recorder.

EMISSIONS TESTING PROCEDURE – METHODS 7E, & 10

Nitrogen Oxides (NO_X), and Carbon Monoxide (CO) concentration in flue gas streams is determined according to procedures set forth in the Code of Federal Regulations, Title 40 (CFR40), Part 60, Appendix A, Reference Method (RM) 7E, and 10.

Sampling Procedure

Flue gas is extracted continuously from the stack through a heated probe, filter and sample line, all of which are operated at approximately 250 ^{O}F. A moisture removal system equipped with a sample pump is used to dry and cool the sample. Condensed water is continuously removed from the system by a peristaltic pump. The conditioned sample is conveyed to the testing trailer at grade through unheated 3/8 inch O.D. Teflon tubing. The flow panel in the trailer distributes a portion of the sample to the NO_X and CO analyzers and the remainder is vented to the outside. The NO_X and CO concentrations measured by the analyzers are recorded by a personal computer equipped with an analog to digital converter and data acquisition software. CEDAQ (CETCON Data Acquisition) software is configured to sample the output of the analyzer every fifteen seconds and record the data as 1 minute averages (average of four readings). A strip chart recorder is also used to record the analyzer output for backup and visual purposes.

Analysis

NO_X concentration is determined using a Thermo Environmental Instruments Company (TECO) Model 10S or 42H chemiluminescent analyzer. The analyzers are equipped to output a 0-10 Volt D.C. signal that is proportional to the NO_X concentration. A full scale range is selected based on the expected concentration of the flue gas.

CO concentration is determined using a Thermo Environmental Instruments Company (TECO) Model 48 analyzer. This analyzer uses a Gas Filter Correlation - Infrared (GFC-IR) detection system. The analyzer is equipped to output a 0-10 Volt D.C. signal that is proportional to the CO concentration. A full scale range is selected based on the expected concentration of the flue gas.

Conclusion

Nitrogen Oxides (NO_X) concentration is measured by Reference Method 7E using a Chemiluminescent analyzer. Carbon Monoxide (CO) concentration is measured by Reference Method 10 using a GFC-IR analyzer. The analyzers are calibrated using standards that have been prepared according to EPA Protocol Number 1. The concentration measured by the analyzer is recorded by computer data acquisition and on a strip chart recorder.

REFERENCE METHOD EXCEPTIONS

CETCON would like to propose the following exceptions to Reference Method 10:

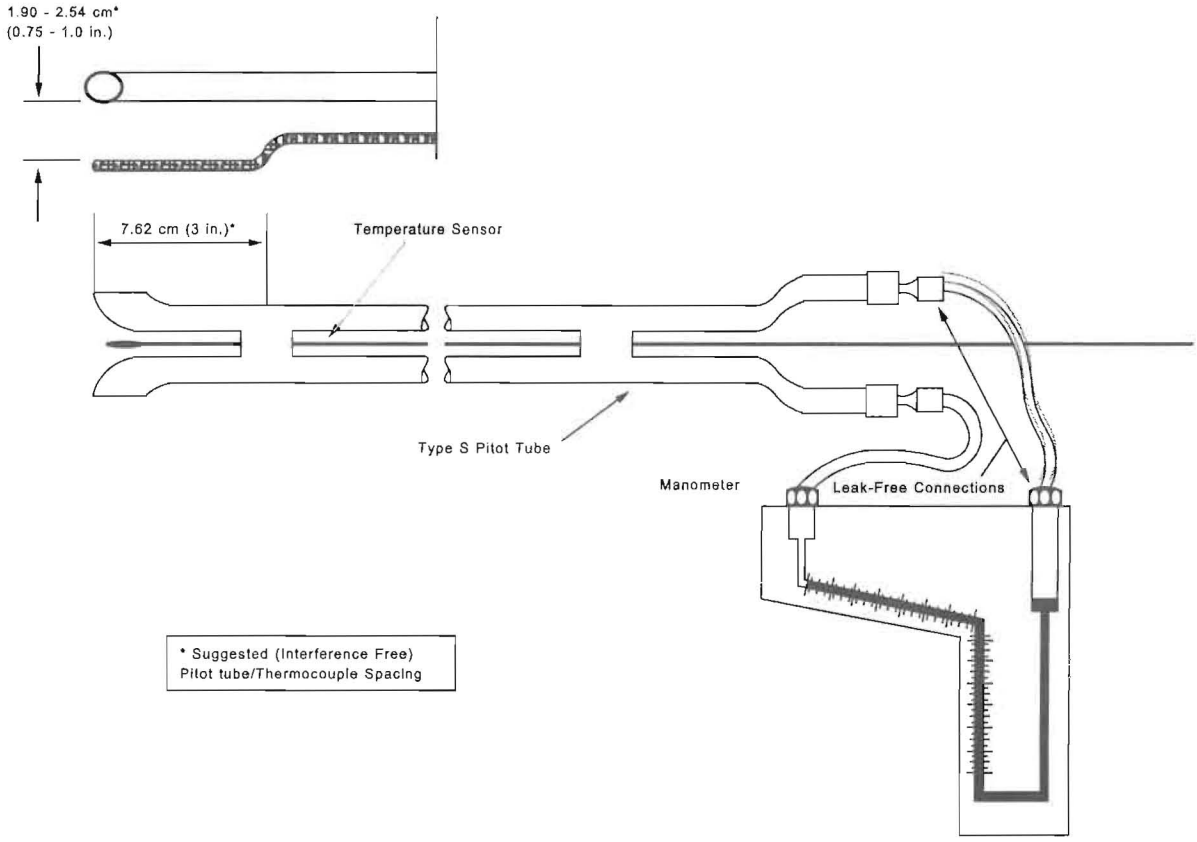
1. Use of the calibration procedures of RM-6C. RM-10 specifies calibration gas values of approximately 100%, 60%, 30% and 0% of analyzer span. There are no procedures in RM-10 for correcting the data for calibration bias and drift. CETCON proposes to use calibration gases of 80-100%, 40-60% and 0% of analyzer span. The mid range gas will be used to conduct a bias test before and after each test run. The average concentration recorded for the test run will be corrected for calibration bias and drift using these data. CETCON feels that this exception will improve the quality of the data obtained.

2. Elimination of the Carbon Dioxide (CO_2) removal tube from the sample train, which eliminates the need to correct the measured concentration of Carbon Monoxide (CO) for the CO_2 concentration of the stack gas. CETCON can demonstrate that there is no interference caused by CO_2 in the TECO Model 48 or 48C CO analyzer. These analyzers use a Gas Filter Correlation Infrared (GFC-IR) detection principle, which eliminates the CO_2 interference common in Non-Dispersive Infrared (NDIR) CO analyzers. CETCON feels that this exception will improve the quality of the data obtained.

CETCON would like to propose the following exception to Reference Method 25A:

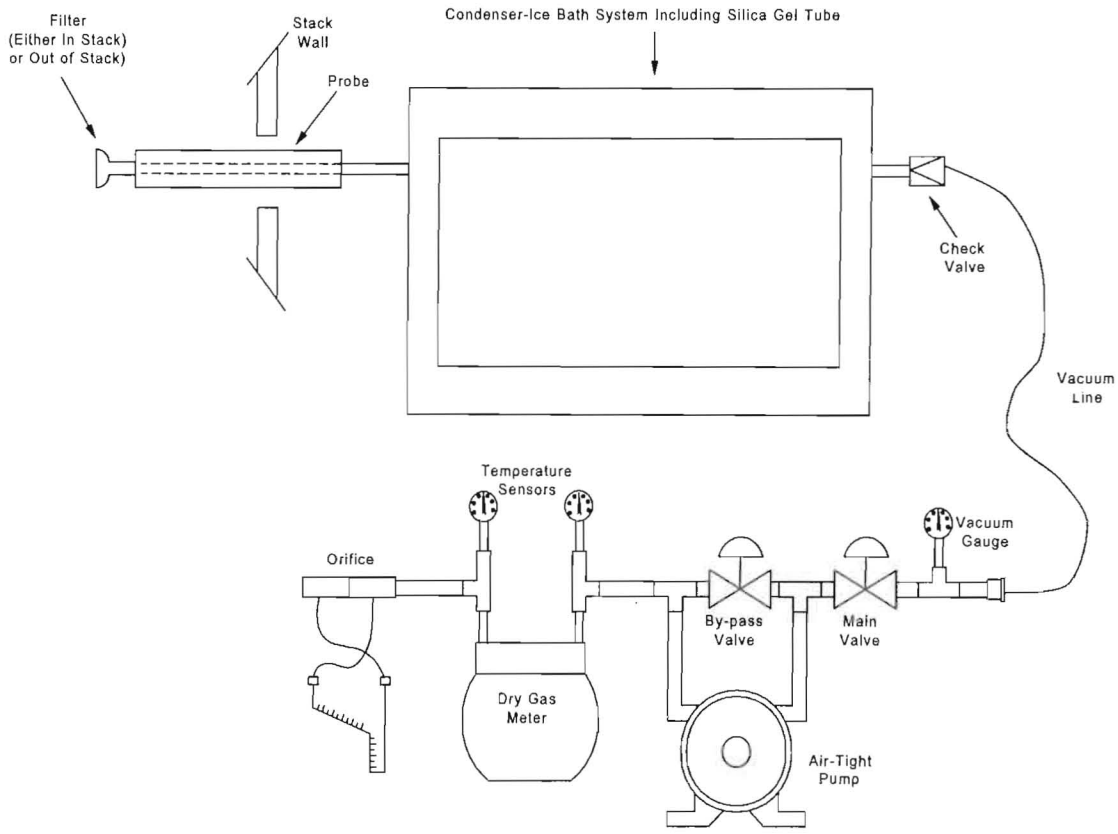
1. RM-25A specifies calibration gas values of 25 to 35%, 45 to 55% and 80 to 90% of analyzer span. When expected concentrations or an applicable regulation requires an analyzer span setting of either 50 ppm or 500 ppm CETCON's high level calibration gas standards are greater than 90% of these span settings. The two high-level calibration gases for these two span settings are no greater than 95% of span but are greater than the method's requirement of 90%. CETCON does not believe that the quality of the data obtained will be affected by this exception.

Reference Method 2 Type S Pitot Tube Manometer Assembly

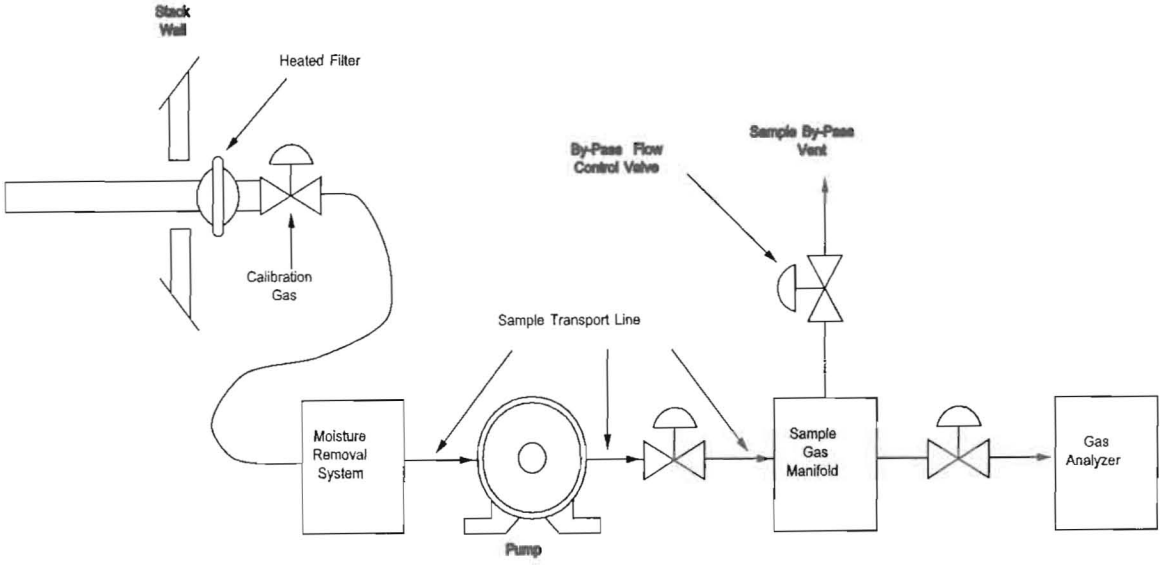


CETCON
Combustion & Environmental Testing Consultants

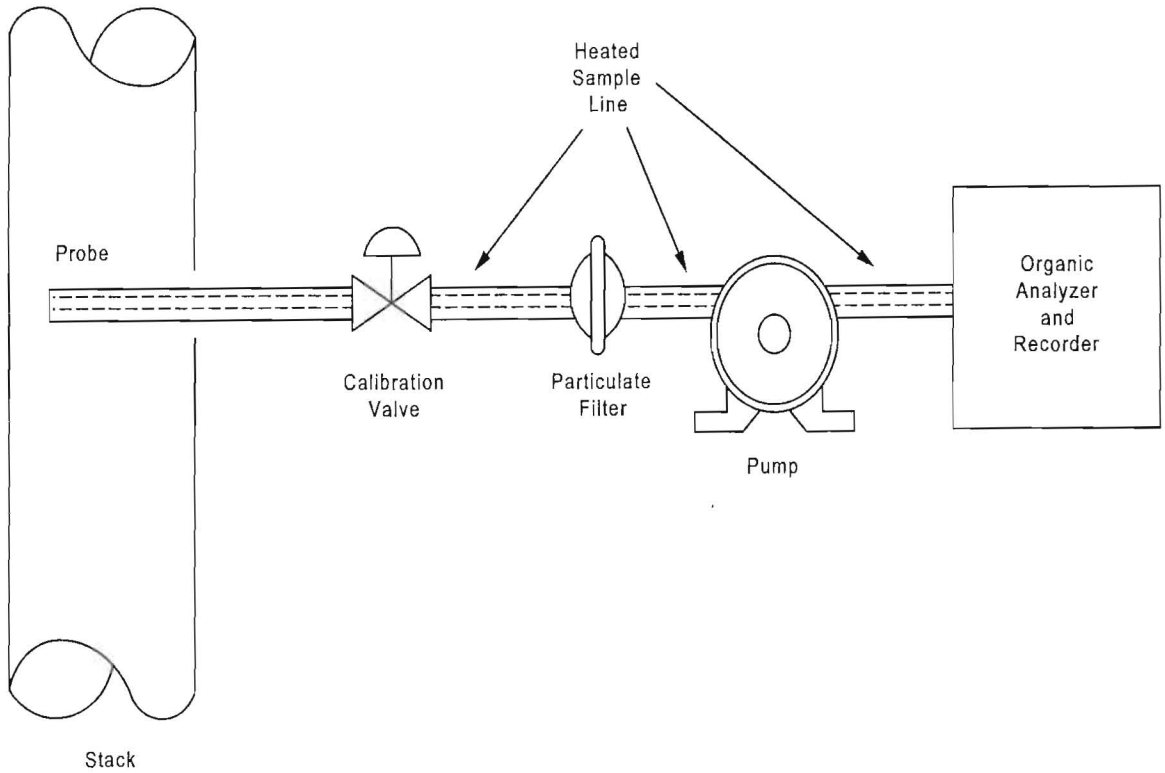
Reference Method 4 Moisture Train



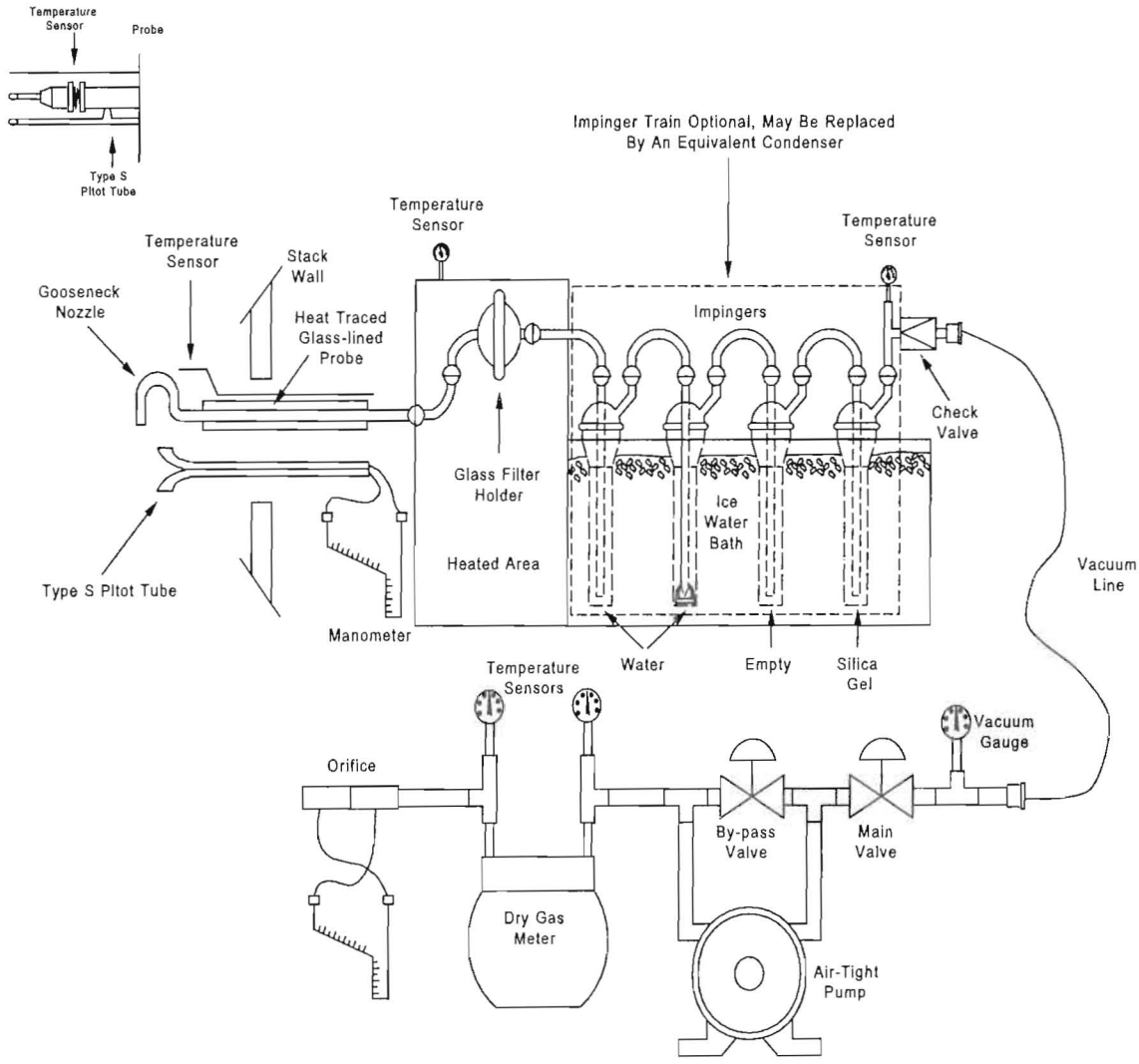
Reference Methods 3A, 6C, 7E and 10 Sampling Train



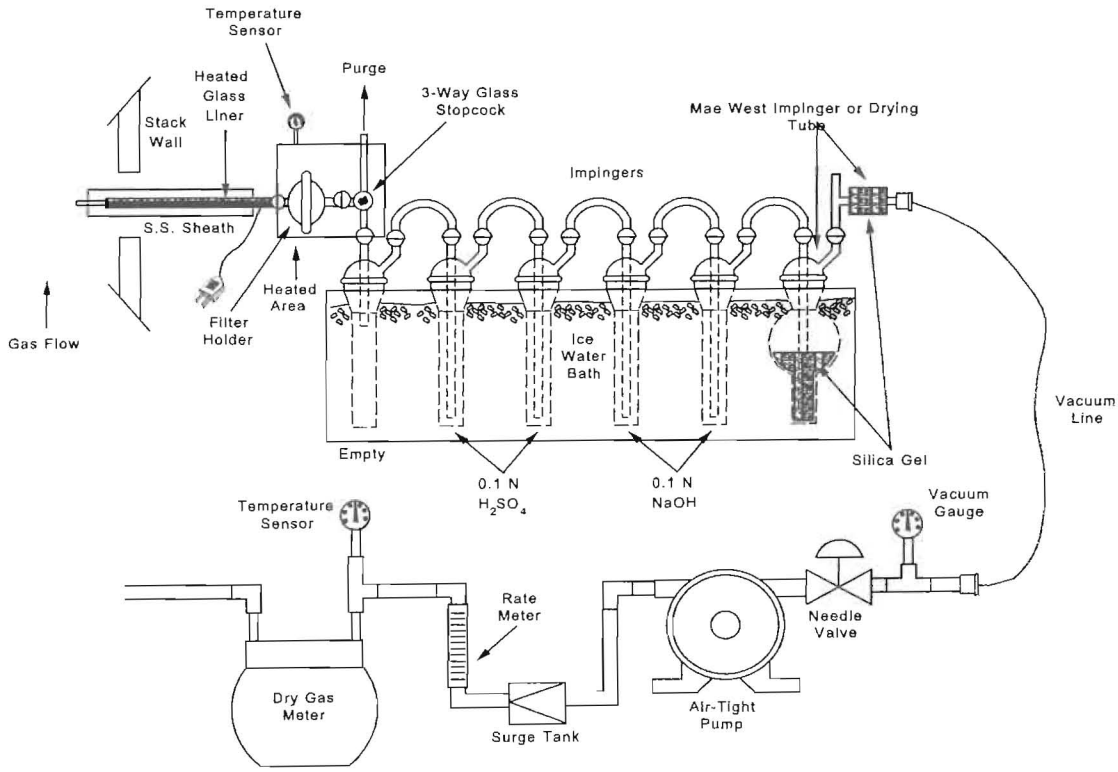
Reference Method 25A Sample Train



Reference Method 5 Particulate Train



RM 26 SAMPLE TRAIN



Resumes

APPENDIX H

CETCON

John Van Meter
Electrical Engineer / Project Coordinator

QUALIFICATION SUMMARY

During the two years preceding his employment with CETCON, Inc., Mr. Van Meter was providing engineering services to vendors of fired equipment and incinerators for the petrochemical and petroleum industries. Mr. Van Meter has participated in the design, fabrication, field installation, and start up of instrumentation / control systems for fired equipment.

Since his employment with CETCON, Mr. Van Meter has been involved with all aspects of emissions testing on a variety of emissions sources. Responsibilities have included on stack equipment operation, test equipment troubleshooting, sample gathering / analysis equipment operation, project coordination, and report generation. Mr. Van Meter has also become familiar with EPA Reference Test Methods.

EDUCATION

B.S. Electrical Engineering, May 1990, Texas Tech University, Lubbock, Tx.

Passed the Fundamentals of Engineering Exam for the Texas State Board of Registration for Professional Engineers.

Additional training in the following areas:

Statistical Process Control	Total Quality Management
Procurement Ethics	Basics of Supervision
Computer Aided Test Systems	Computerized Control Systems

EXPERIENCE

CETCON, INC. - 11/94 to Present
Project Coordinator. Responsible for customer interface, project organization, quality test performance, and test instrument operations.

TECHSERV, INC. Tulsa, OK. - 3/93 to 11/94
Electrical Engineer. Responsible for design and installation of instrument / control systems for fired equipment.

TEXAS INSTRUMENTS INC, Dallas, Tx. - 5/90 to 12/92
Electrical Engineer. Responsible for product development and testing with the Defense Systems Group (Electronics Division).

CETCON

Jared R. Howard
Sr. Environmental Specialist

QUALIFICATION SUMMARY

Mr. Howard has three years of experience as an Environmental Programs Specialist for the Compliance and Enforcement Section of the Oklahoma Department of Environmental Quality, Air Quality Division (ODEQ). He was involved in the preparation and approval of the ODEQ's portable analyzer guidance document. He also has over one and half years of experience as a Testing Manager for another emissions testing company before joining CETCON.

Mr. Howard is involved with the preparation of written reports and is familiar with EPA Reference Testing Methods and stack testing procedures.

EDUCATION

University of Central Oklahoma
Bachelor of Science, Biology, May 2000

University of Texas at Arlington
Southwest Environmental Education Training (SWEET) Center
Air Pollution Field Enforcement, Course 444
Advanced Inspection Techniques, Course 455
Inspection Procedures and Safety, Course 446
Continuous Emissions Monitoring Systems, Course 474

College of the Mainland, Texas City, TX
OP-Leaks Detection & Repair

EXPERIENCE

CETCON, Inc.
Sr. Environmental Specialist
March 2005 to Present

Air Hygiene International, Inc.
Testing Manager
August 2003 to March 2005

Oklahoma Department of Environmental Quality, Air Quality Division
Environmental Programs Specialist II
May 2000 to August 2003

Jeff J. Abel
Sr. Environmental Specialist

QUALIFICATION SUMMARY

Jeff has a strong background in project management, along with considerable experience with systems analysis and design of computer systems. He has lead multi-million dollar projects to develop computer systems in both the Gas Pipeline and Telecommunications industries. He has directed the efforts of diversified project teams spanning several departments consisting of system developers, database analysts, testers, infrastructure analysts, and network architects.

Some of the larger projects where Jeff has performed in a leadership role include: The successful development and implementation of a 10 million dollar project for Williams Communications that provided the backbone business system for the Vyvx Ads Group, one of their subsidiaries. Jeff was also one of the lead design analysts for the Uni5 project for Williams Gas Pipelines. This was a $200 million dollar project to develop one consistent computer system for handling all the gas measurement, volume allocations, and customer billing for all five of the main pipeline subsidiaries that comprise Williams Gas Pipelines.

EDUCATION

Bachelor of Science Degree in Management of Human Resources - Southern Nazarene University 1996

Associates Degree in Computer Science - Tulsa Community College - 1991

EXPERIENCE

CETCON, Inc.: September 2002 to Present
Title: Senior Environmental Specialist

Williams Communications - VYVX Service: September 2000 to May 2002
Title: Supervisor of Business Systems Development / Staff Analyst

Williams Gas Pipelines, Central (WGPC): May 1994 to December 1999
Title: Lead Design Analyst, January 1999 to December 1999; Staff Analyst, June 1996 to January 1999;
Senior Systems Analyst, May 1994 to June of 1996; Systems Analyst, May 1991 to May 1994

Williams Information Services, Inc. (WISC): October 1989 to May 1991
Title: Customer Service Technician

Glenn A. Davis
Sr. Environmental Specialist

Qualification Summary

Mr. Davis has 22 years experience as a Customer Service Field Technician working on Gas Chromatograph and Continuous Analyzers for ABB / Applied Automation. While working with ABB and Applied Automation he has developed strong customer relationships. He has worked closely with local sales members to communicate customer needs and foster business relationships. He was a recipient of Employee and Customer Recognition Award from Williams Field Service for outstanding performance He also has two years experience working in the Education Institution at the University of Arkansas .He worked on various types of lab equipment, filled NMR Magnets with Liquid Helium and Liquid Nitrogen, and worked closely with the Professors and Students on special Chemistry / Biochemistry projects.

Mr. Davis is in the process of gaining knowledge of EPA reference methods thru field deployments with CETCON.

Education

State Technical Institute, Memphis, Tennessee
Associates in Electronic Technology

Experience

CETCON, INC.
Sr. Environmental Specialist
April 2005 to Present

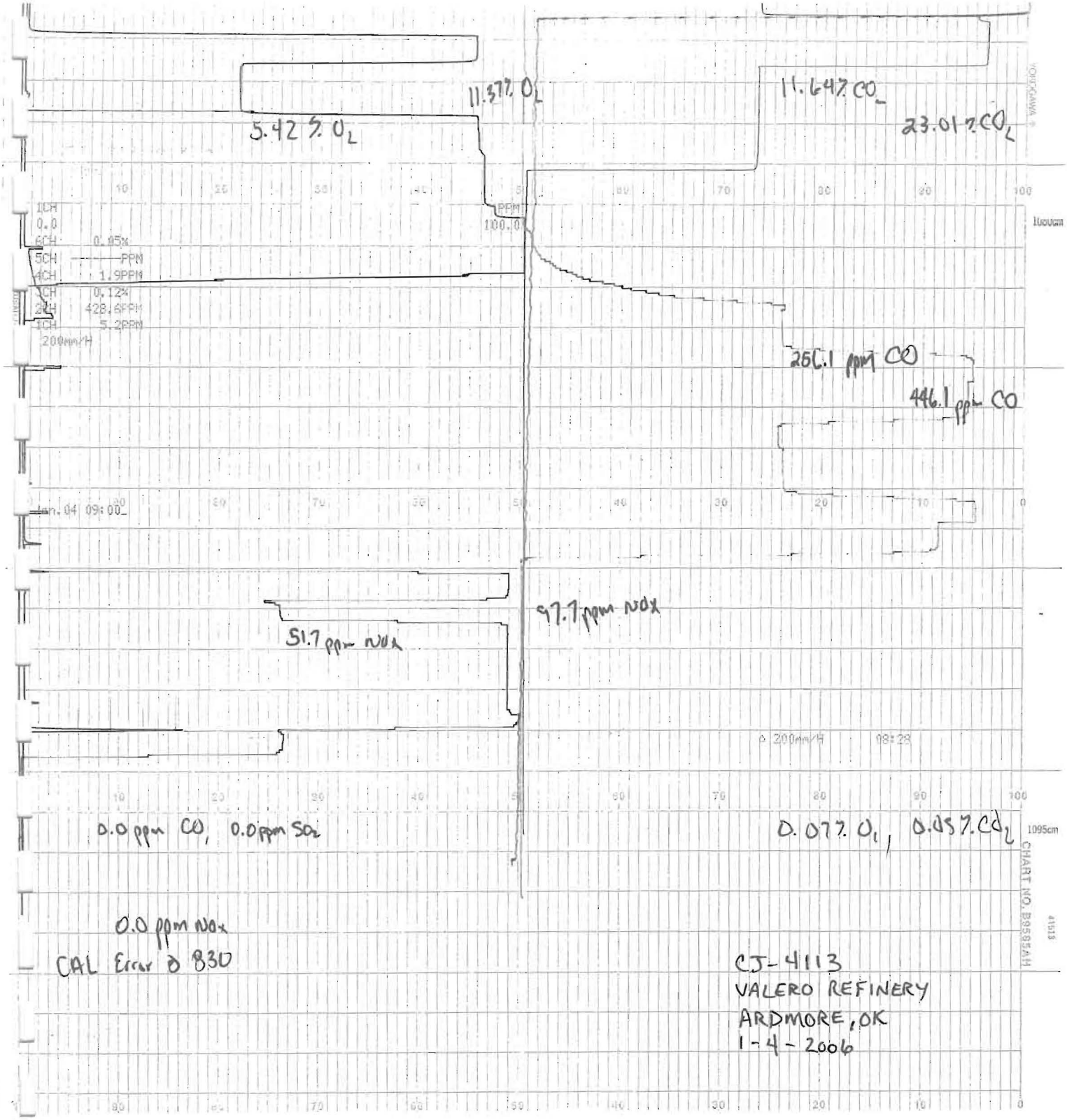
University of Arkansas
Chemistry / Biochemistry
Master Scientific Research Technician
April 2003 to March 2005

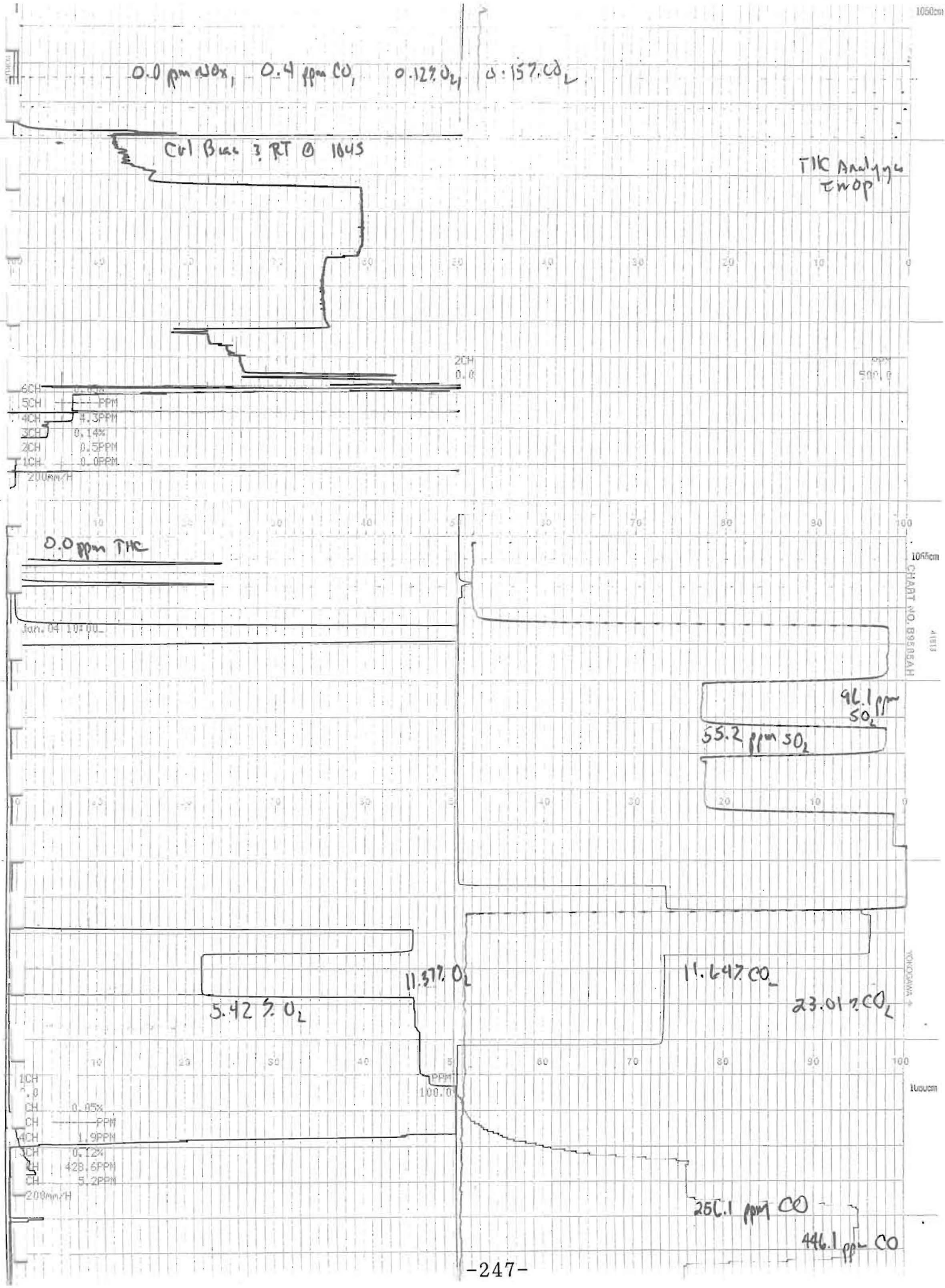
ABB / Applied Automation Analytical Division
Customer Service Field Technician
Final Testing Technician
May 1981 to December 2002

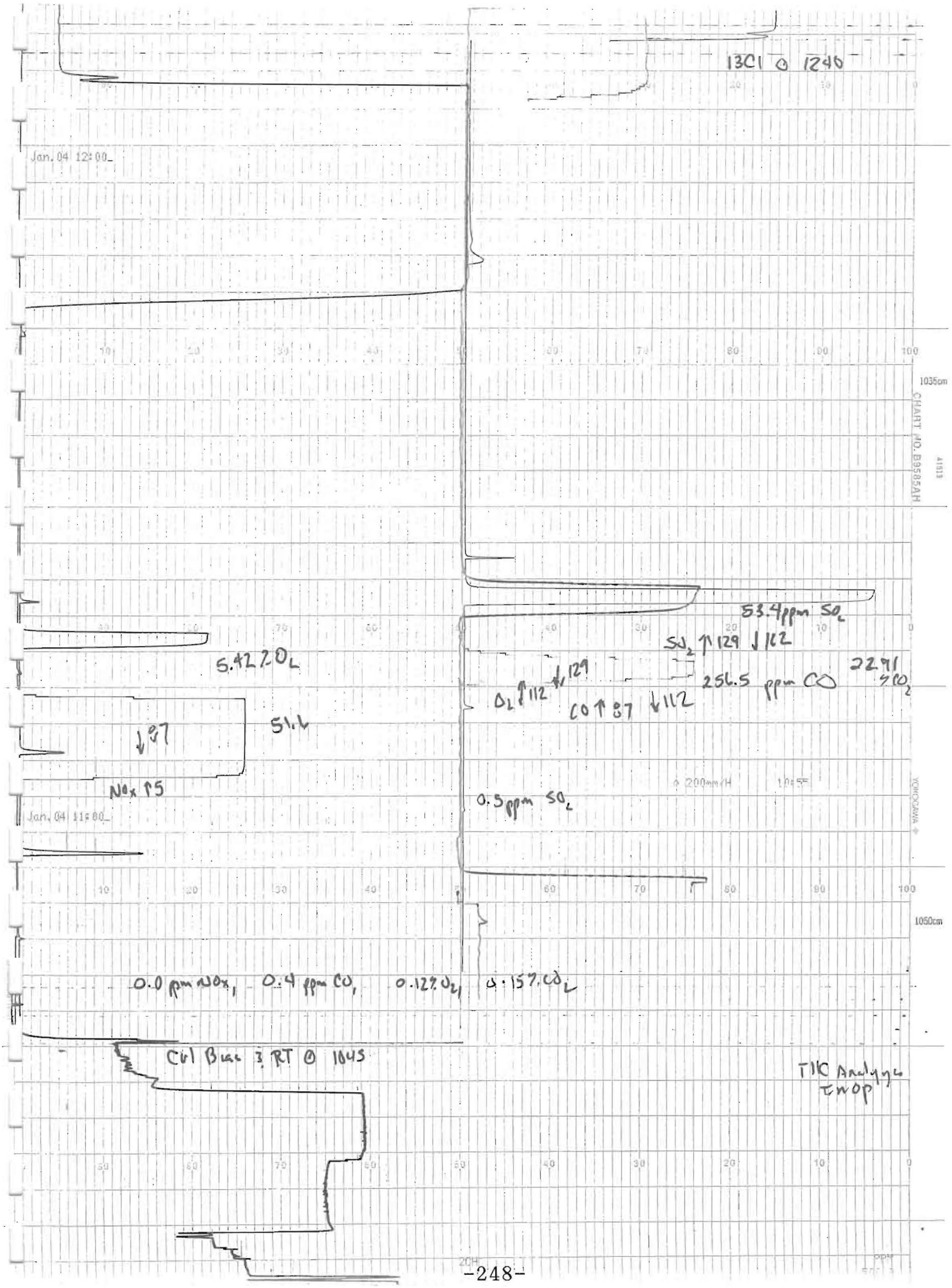
Raw Field Data

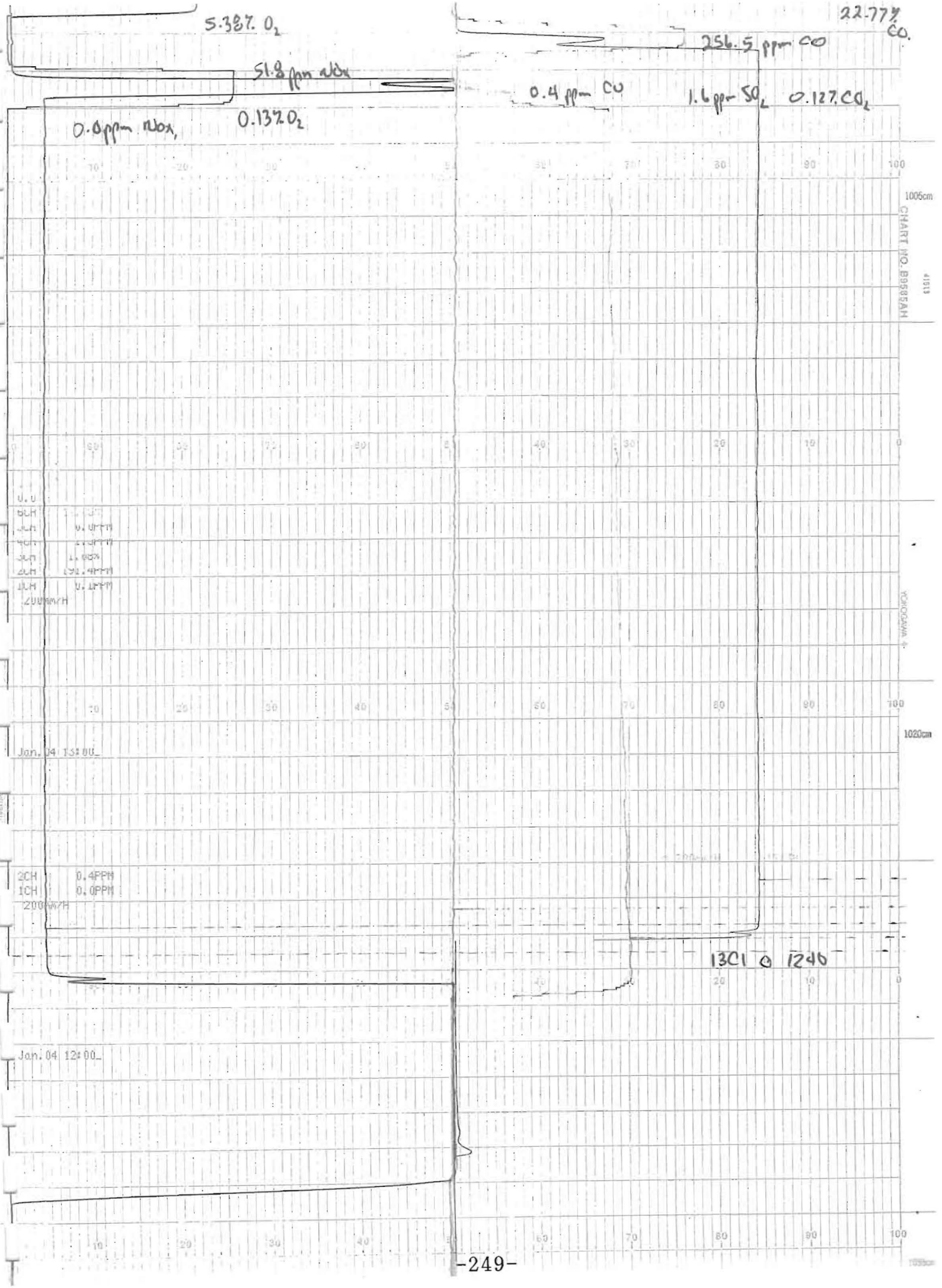
APPENDIX I

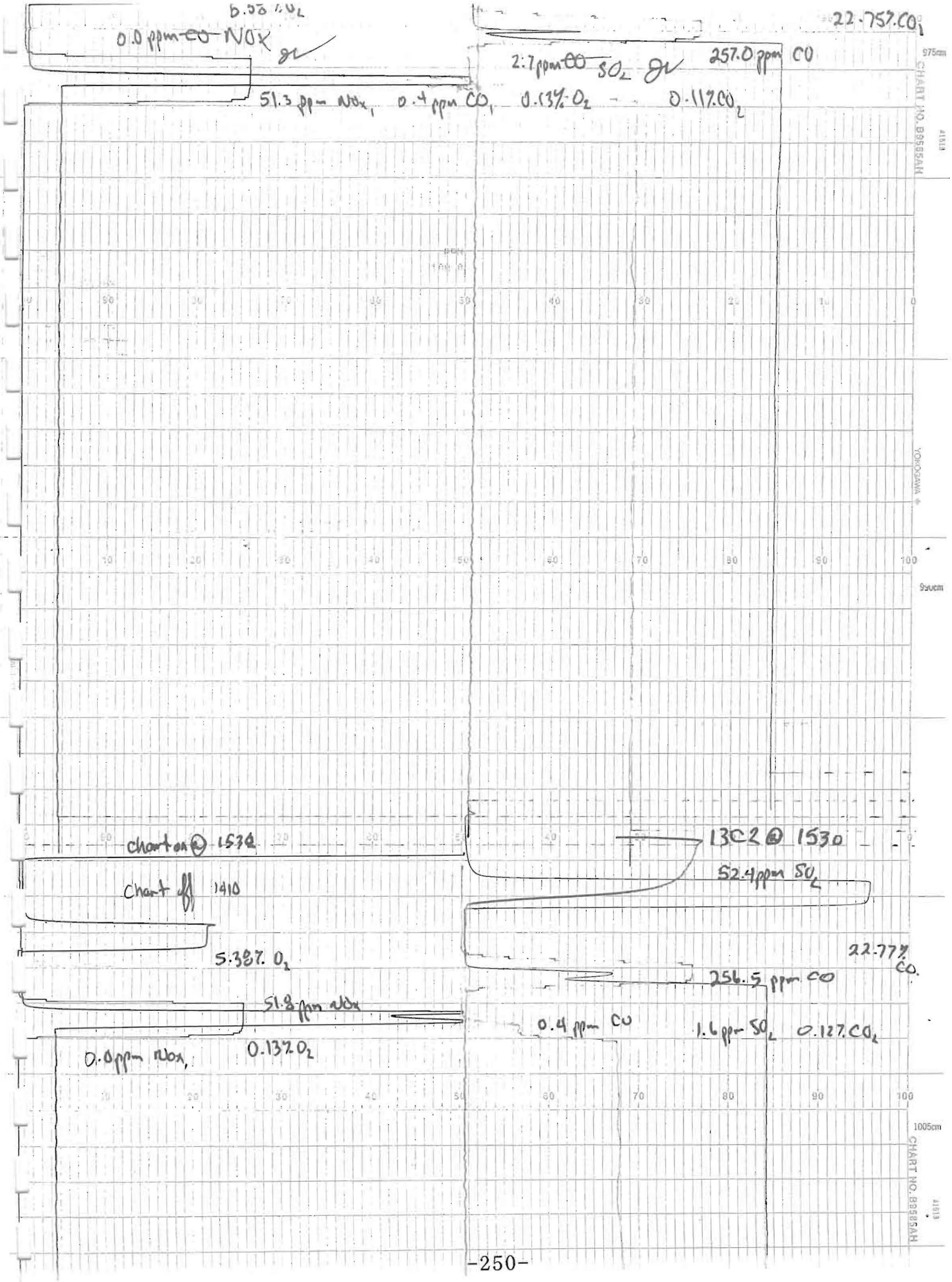
CETCON

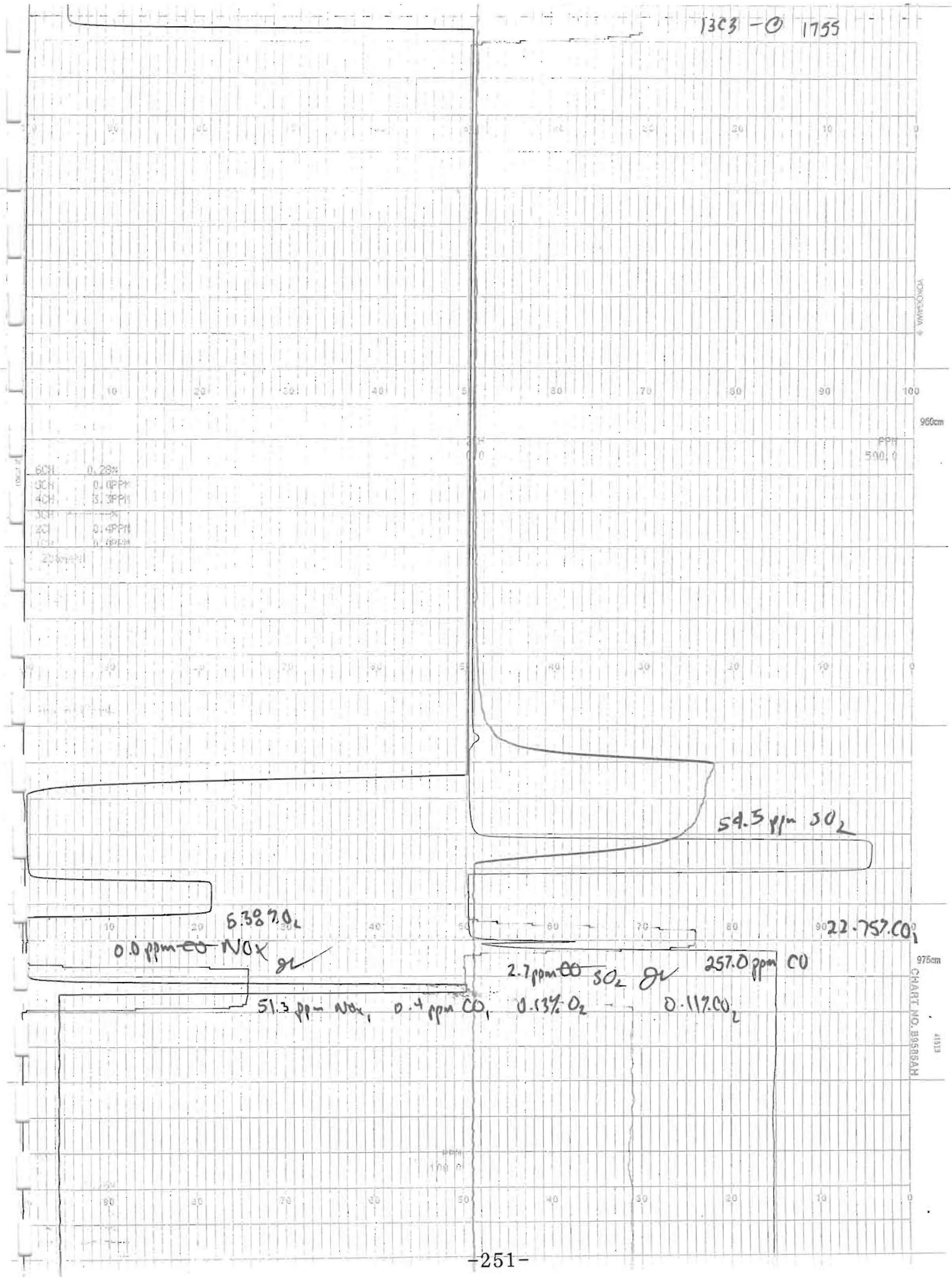

5.42% O_2
11.37% O_2
11.64% CO_2
23.01% CO_2
1CH 0.0
6CH 0.05%
5CH ------PPM
4CH 1.9PPM
3CH 0.12%
2CH 428.6PPM
1CH 5.2PPM
200mm/H
PPM
100.0
Jan.04 09:00
250.1 ppm CO
446.1 ppm CO
51.7 ppm NOx
97.7 ppm NOx
200mm/H 08:28
0.0 ppm CO, 0.0 ppm SO_2
0.07% O_2, 0.05% CO_2
0.0 ppm NOx
CAL Error @ 830
CJ-4113
VALERO REFINERY
ARDMORE, OK
1-4-2006

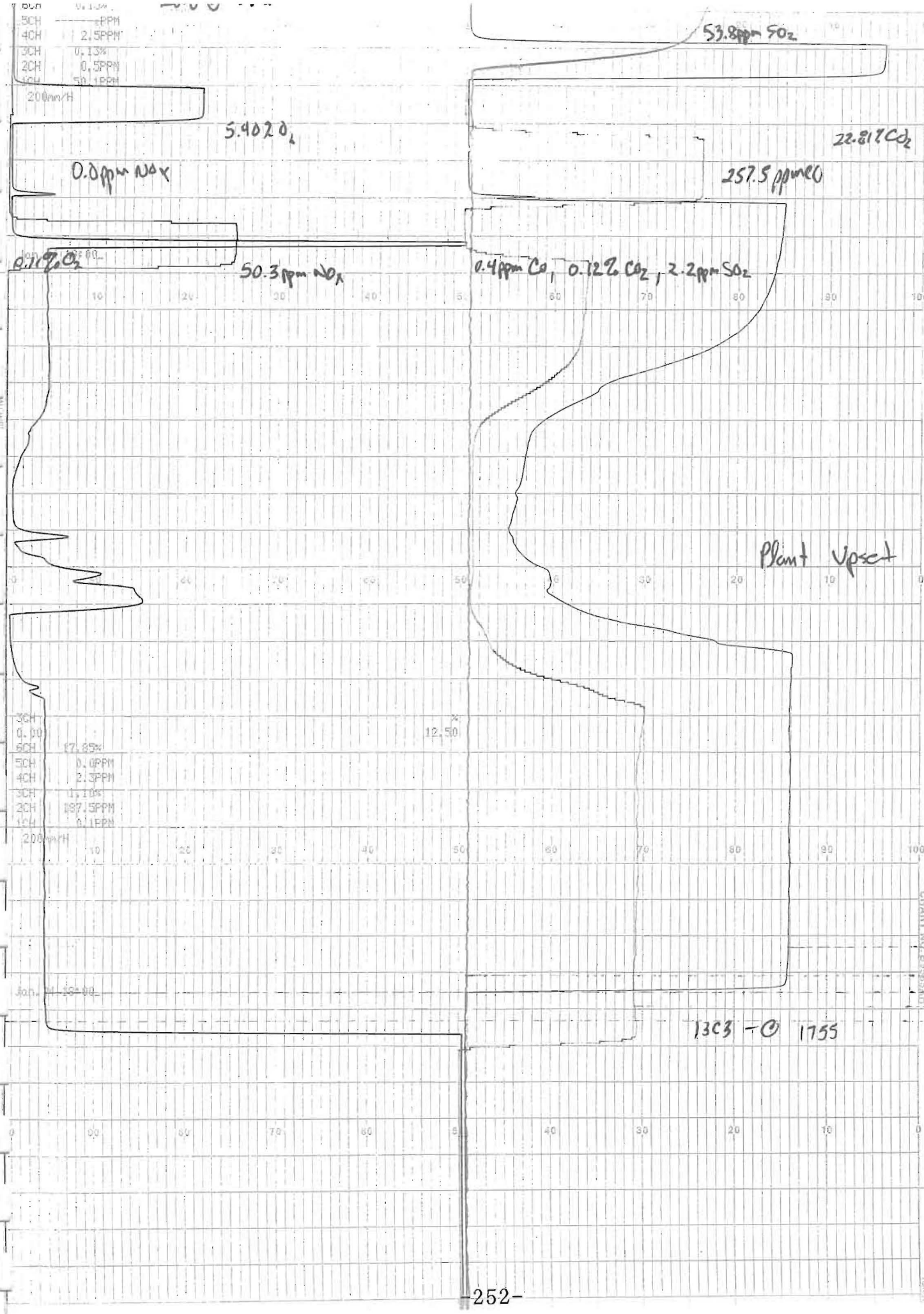

0.0 ppm NOx, 0.4 ppm CO, 0.12% O2, 0.15% CO2
Col Blue 3 RT @ 1045
TIC Analyze Twop
2CH 0.0
500.0
6CH 0.0%
5CH PPM
4CH 4.3PPM
3CH 0.14%
2CH 0.5PPM
1CH 0.0PPM
200mm/H
0.0 ppm THC
Jan.04 10:00
96.1 ppm SO2
55.2 ppm SO2
11.37% O2
5.42% O2
11.64% CO2
23.01% CO2
1CH 0.0
PPM
100.0
CH 0.05%
CH PPM
4CH 1.9PPM
CH 0.12%
CH 428.6PPM
CH 5.2PPM
200mm/H
250.1 ppm CO
446.1 ppm CO
CHART NO. B9805AH
YOKOGAWA

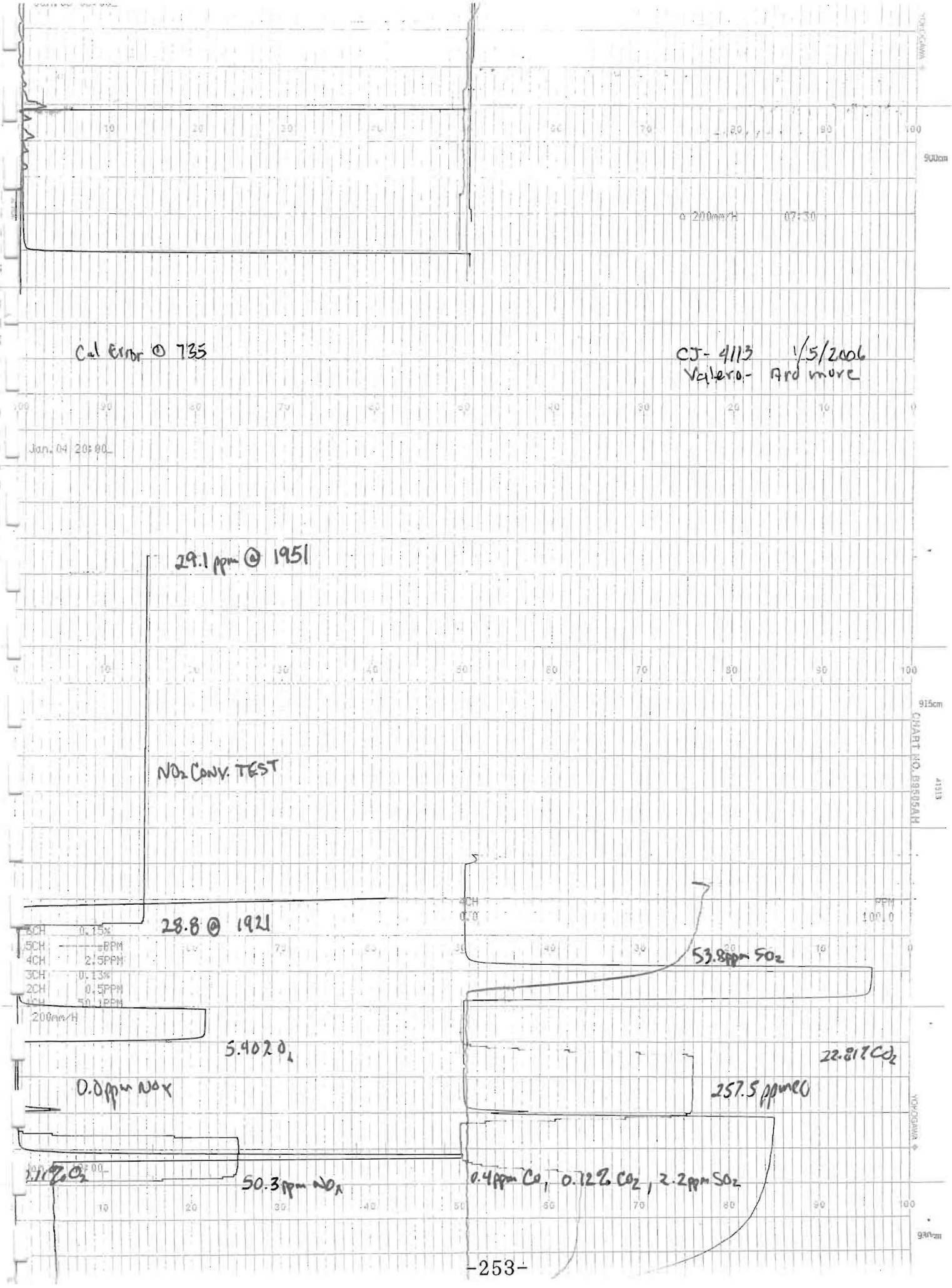

13C1 @ 1240
Jan. 04 12:00
1035cm
CHART NO. B9585AH
53.4ppm SO2
SO2 ↑129 ↓112
5.42% O2
O2 ↑112 ↓129
256.5 ppm CO
2291 ppm CO2
CO ↑87 ↓112
↓87
51.6
NOx ↑5
0.5ppm SO2
Jan. 04 11:00
YOKOGAWA
1050cm
0.0 ppm NOx, 0.4 ppm CO, 0.12% O2, 0.15% CO2
Cal Blue 3 RT @ 1045
TIC Analyzer
Exop

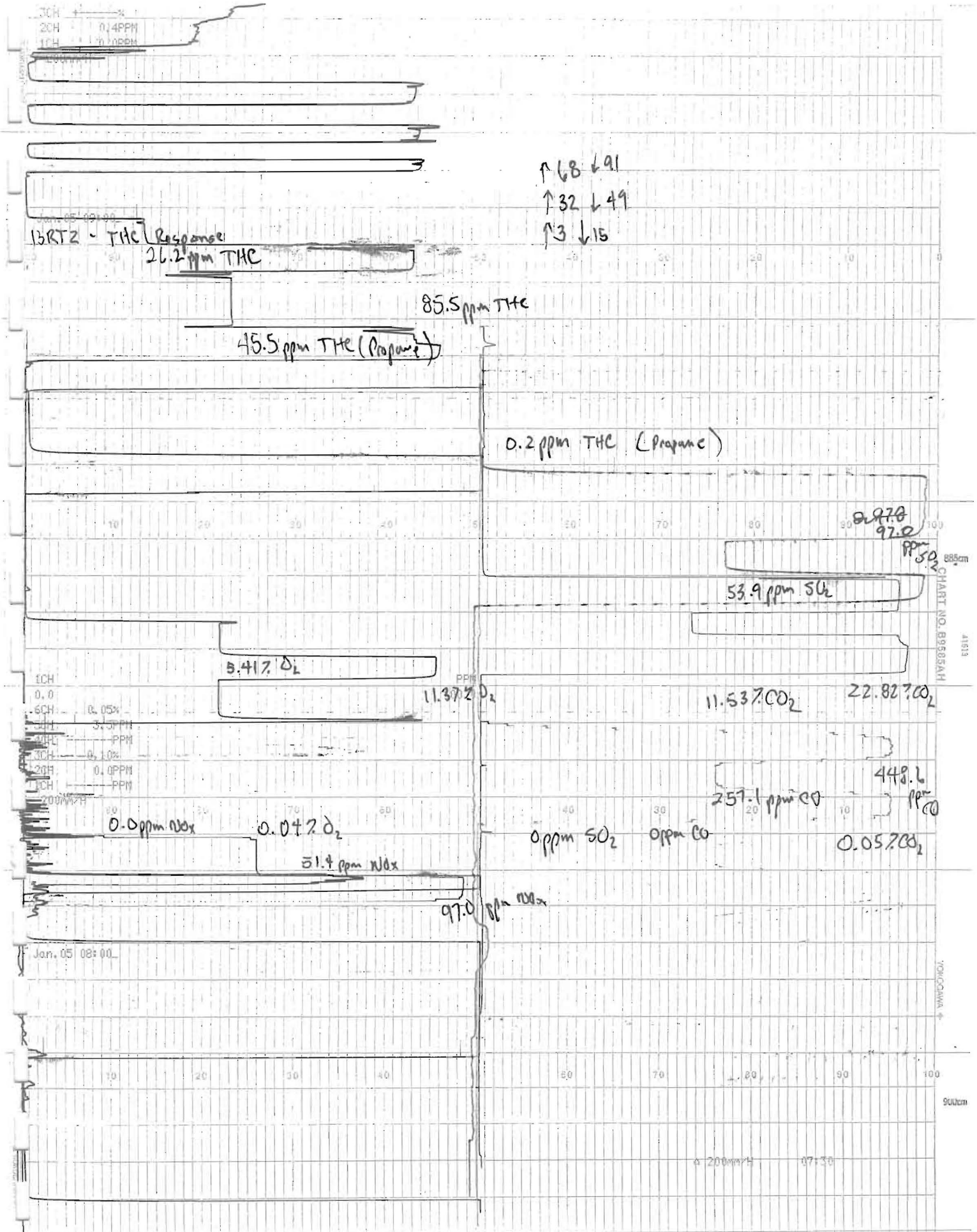

5.38% O_2
51.8 ppm NOx
0.0 ppm NOx,
0.13% O_2
256.5 ppm CO
0.4 ppm CO
1.6 ppm SO_2
0.12% CO_2
22.77% CO.
1006cm
CHART NO. B9585AH
4/13
YOKOGAWA
1020cm
Jan. 04 13:00
2CH 0.4PPM
1CH 0.0PPM
200mm/H
13C1 @ 1240
Jan. 04 12:00


0.0 ppm ~~CO~~ NOX
22.75% CO_2
2.7 ppm ~~CO~~ SO_2
257.0 ppm CO
51.3 ppm NO_x, 0.4 ppm CO, 0.13% O_2 - 0.11% CO_2
Chart on @ 1530
1302 @ 1530
52.4 ppm SO_2
Chart off 1410
5.38% O_2
22.77% CO.
256.5 ppm CO
51.8 ppm NOx
0.4 ppm CO
1.6 ppm SO_2 0.12% CO_2
0.0 ppm NOx,
0.13% O_2


1303 - 0 1755
6CH 0.28%
5CH 0.0PPM
4CH 3.3PPM
3CH
2CH 0.4PPM
1CH 0.0PPM
PPM
500.0
960cm
54.5 ppm SO2
6.38% O2
0.0 ppm ~~CO~~ NOx
22.75% CO2
2.7 ppm ~~CO~~ SO2
257.0 ppm CO
51.3 ppm NOx, 0.4 ppm CO, 0.13% O2 - 0.11% CO2
975cm
CHART NO. B968SAH
PPM
100.0

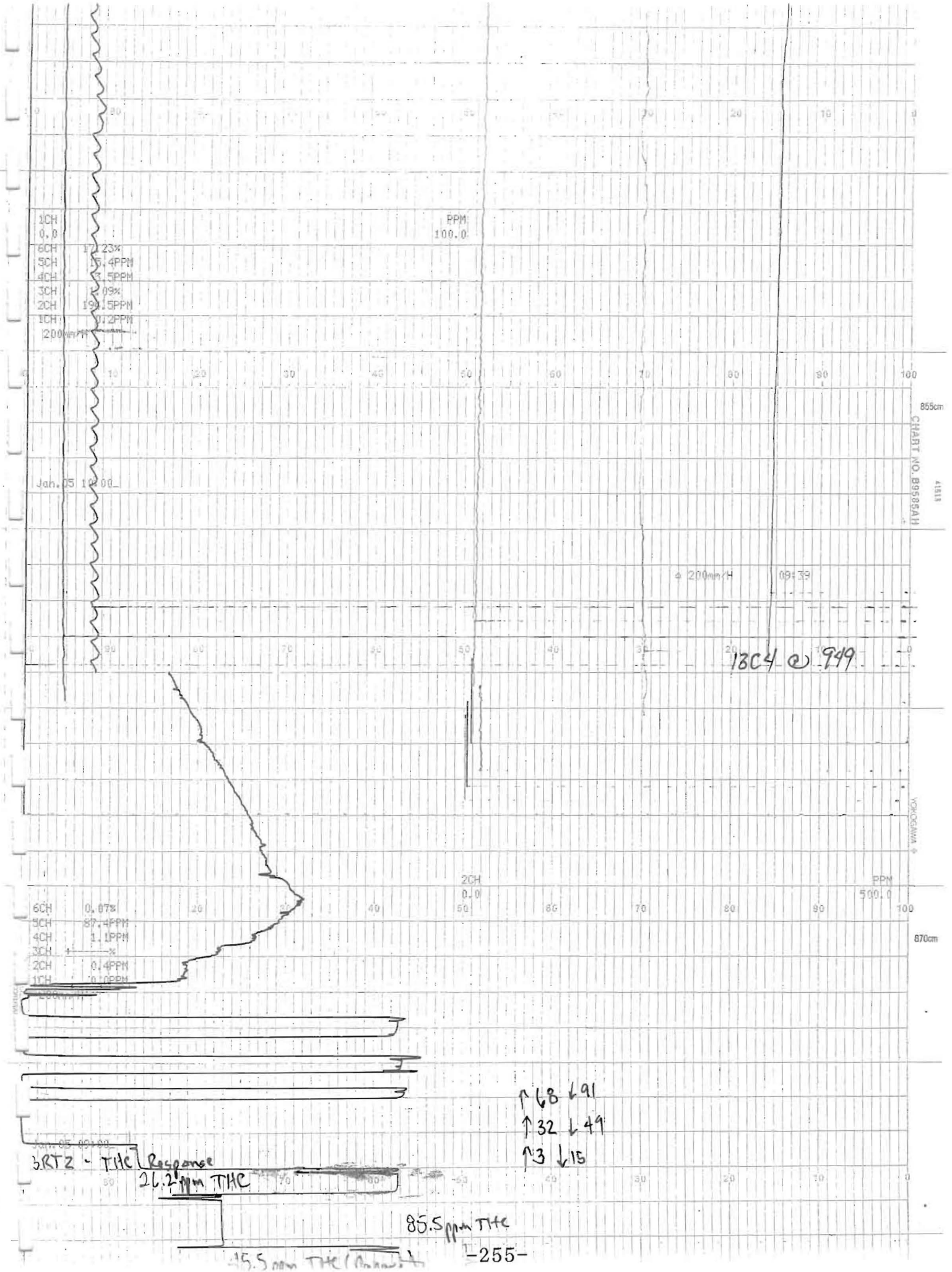

5CH ---PPM
4CH 2.5PPM
3CH 0.13%
2CH 0.5PPM
1CH 50.1PPM
200mm/H
53.8ppm SO2
5.40% O2
22.81% CO2
0.0ppm NOx
257.5 ppm CO
0.11% O2
50.3ppm NOx
0.4ppm CO, 0.12% CO2, 2.2ppm SO2
Plant Upset
930cm
3CH 0.00
6CH 17.85%
5CH 0.0PPM
4CH 2.3PPM
3CH 0.10%
2CH 187.5PPM
1CH 0.1PPM
200mm/H
12.50
945cm
CHART NO. B9965AH
1303 - 1755

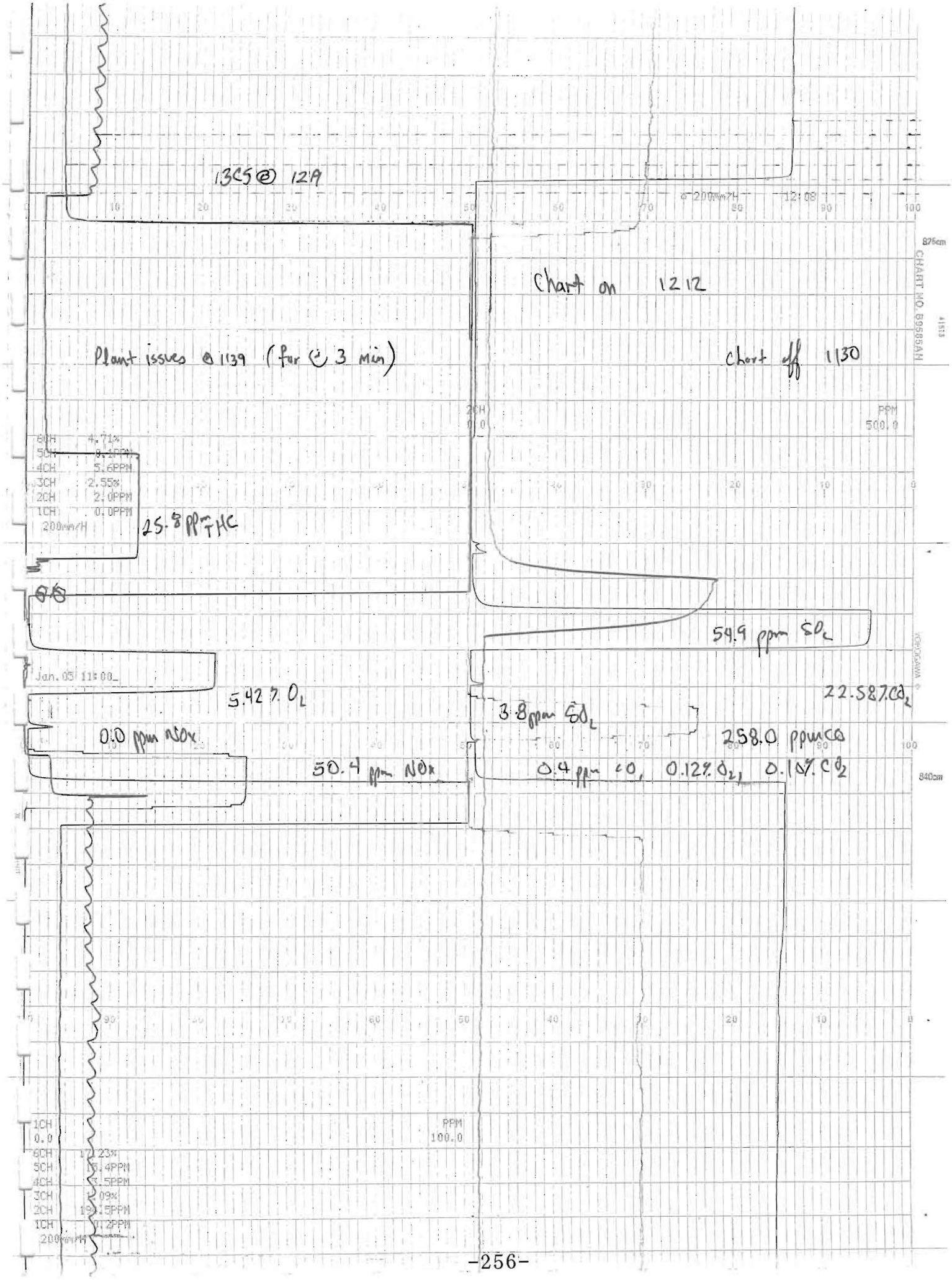

Cal Error @ 735
CJ- 4113 1/5/2006
Valero- Ardmore
29.1 ppm @ 1951
NO2 CONV. TEST
28.8 @ 1921
53.8ppm SO2
5.40% O2
22.81% CO2
0.0ppm NOx
257.5 ppm CO
50.3ppm NOx
0.4ppm CO, 0.12% CO2, 2.2ppm SO2
CHART NO. B9505AM
4113
YOKOGAWA

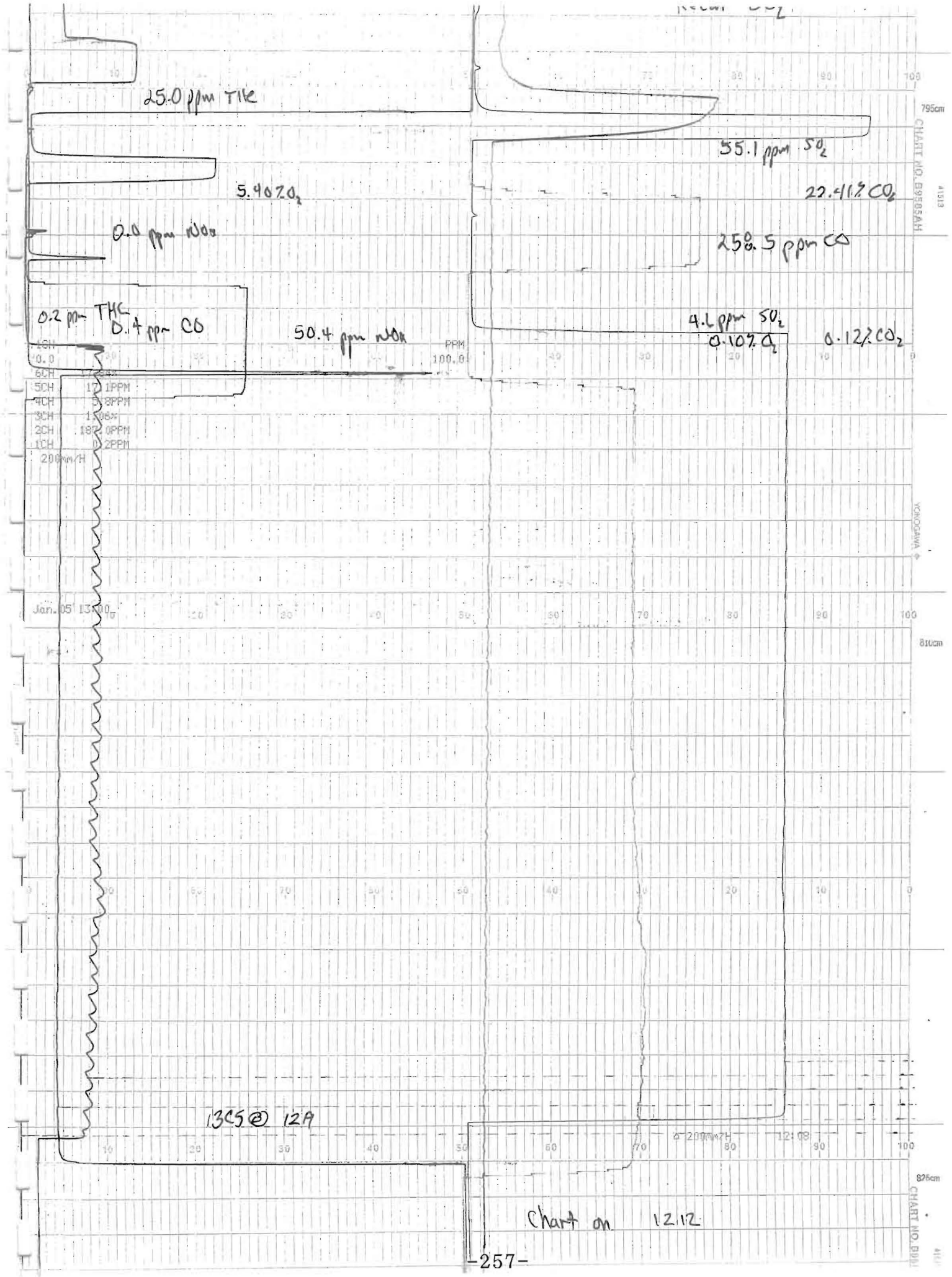


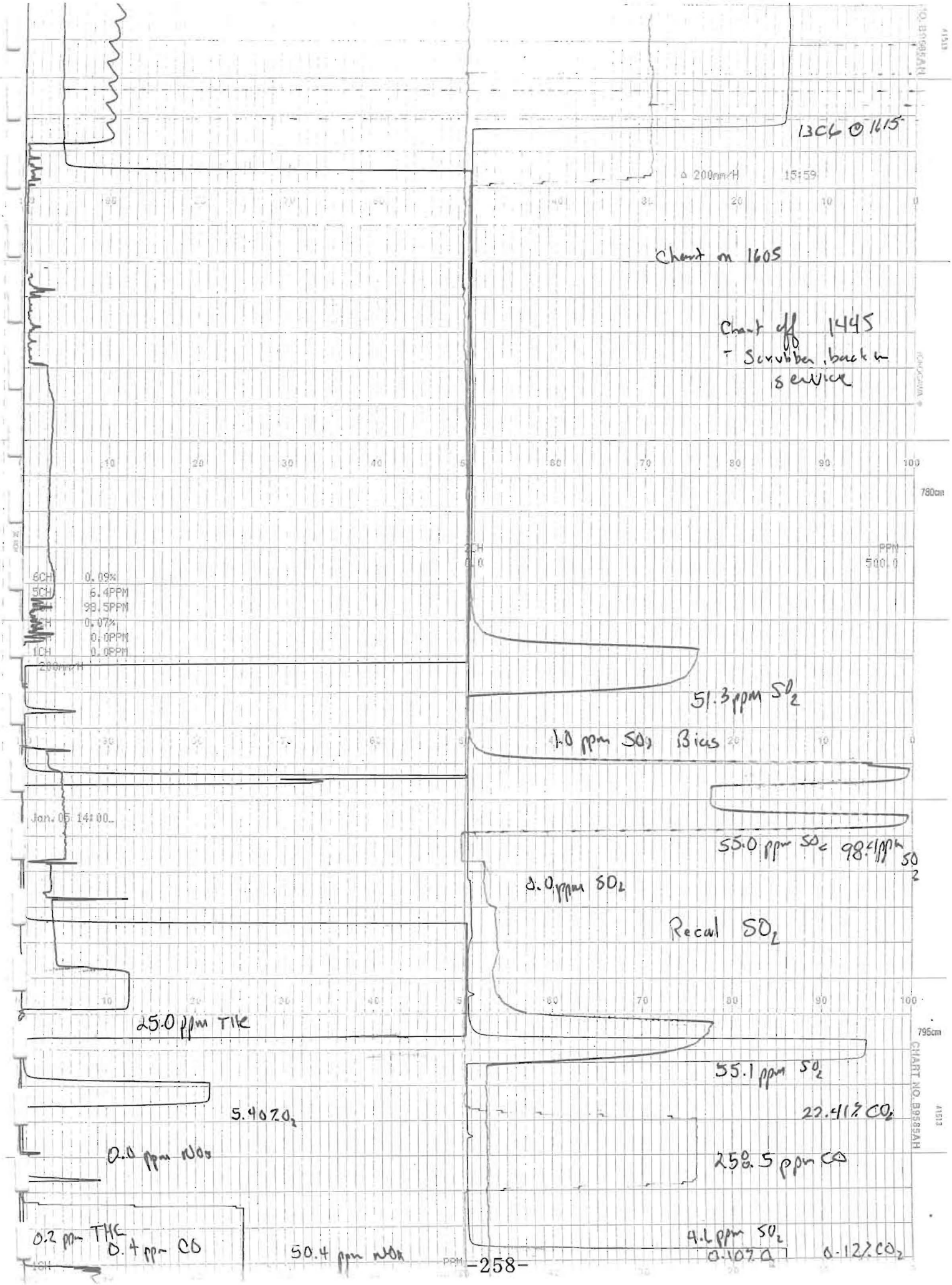
Cal error @ 735

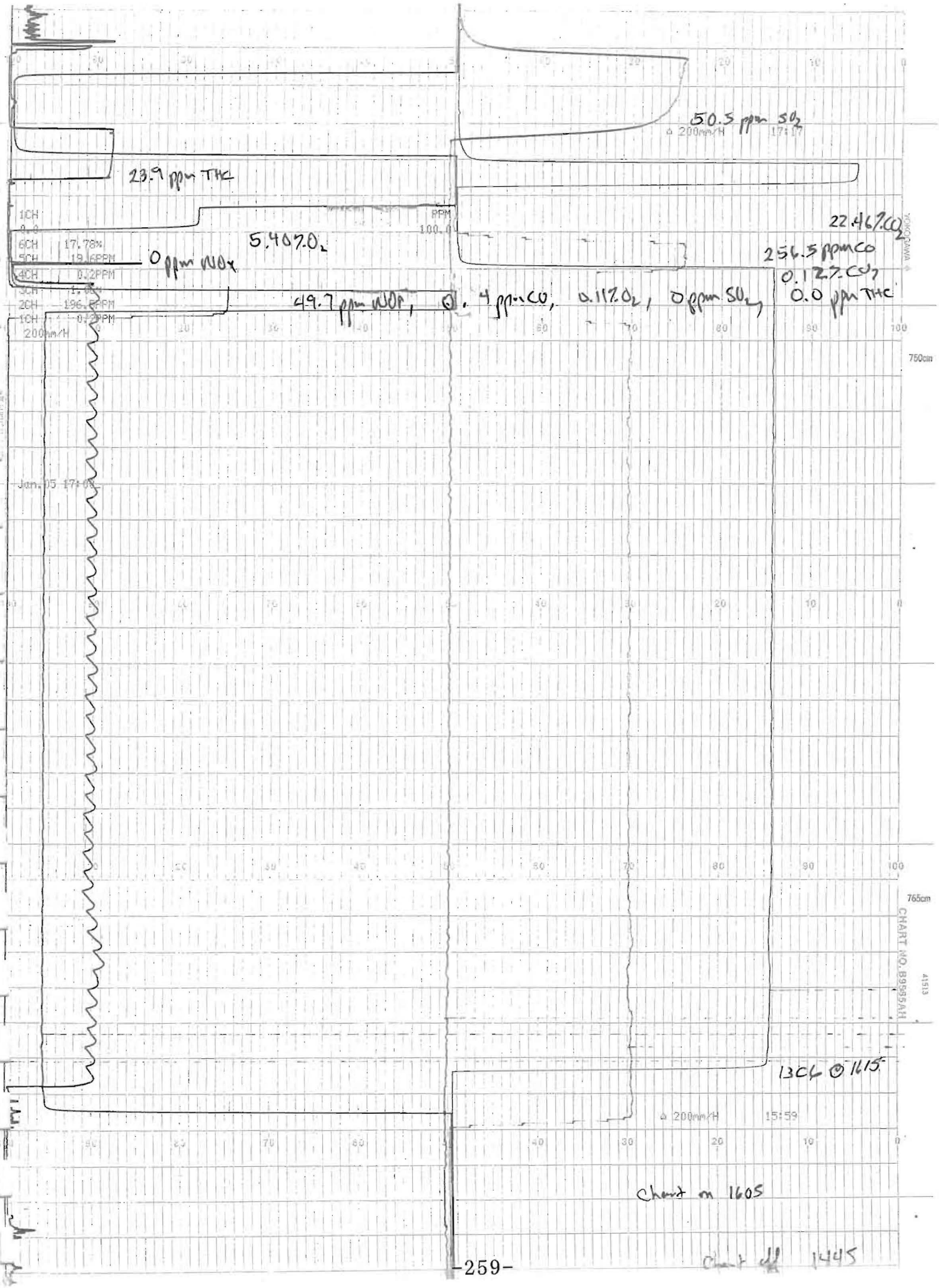
CJ-4113 1/5/2006

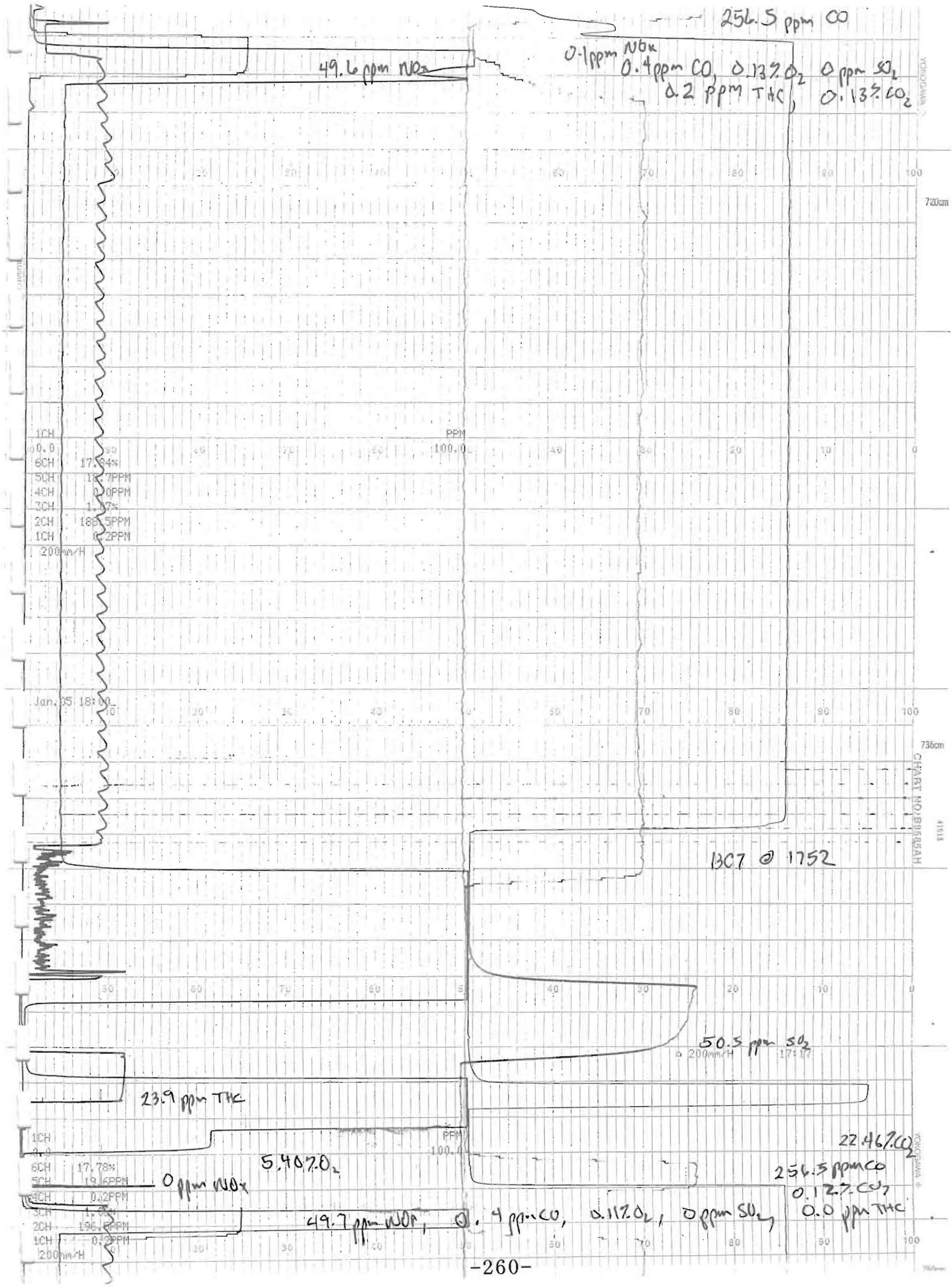

1CH
0.0
RPM
100.0
6CH 17.23%
5CH 15.4PPM
4CH 3.5PPM
3CH 1.09%
2CH 194.5PPM
1CH 0.2PPM
200mm/H
855cm
CHART NO. B9585AH
Jan.05 10:00
200mm/H
09:39
13C4 @ 949
2CH
0.0
PPM
500.0
6CH 0.07%
5CH 87.4PPM
4CH 1.1PPM
3CH %
2CH 0.4PPM
1CH 0.0PPM
870cm
↑68 ↓91
↑32 ↓49
↑3 ↓15
Jan.05 09:00
3RT2 - THC Response
26.2 ppm THC
85.5 ppm THC
15.5 ppm THC (Propane)

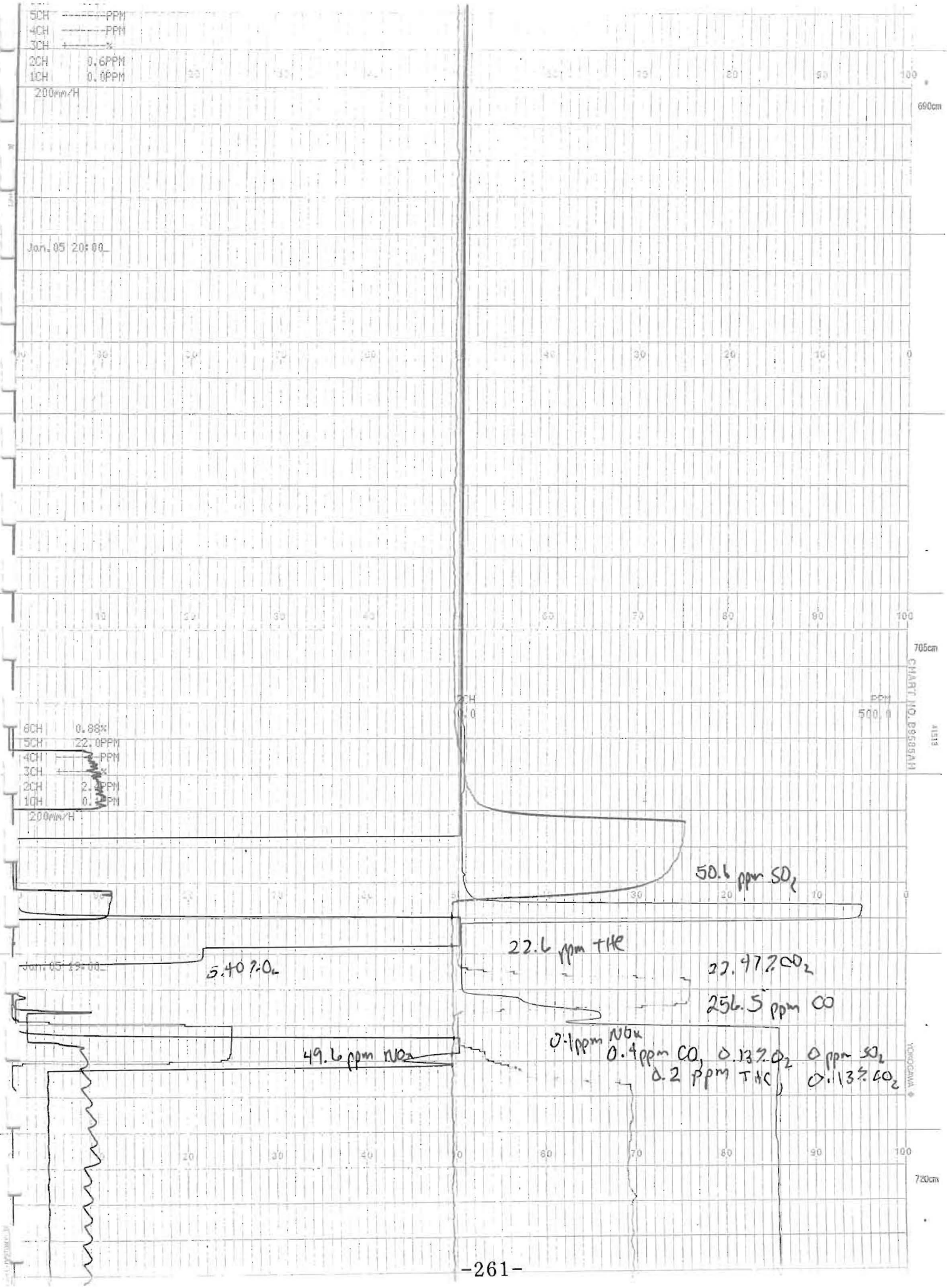

1305 @ 1219
Chart on 1212
Plant issues @ 1139 (for ≈ 3 min)
Chart off 1130
6CH 4.71%
5CH 8.1PPM
4CH 5.6PPM
3CH 2.55%
2CH 2.0PPM
1CH 0.0PPM
200mmAH
25.8 ppm THC
54.9 ppm SO2
Jan. 03 11:00
5.42% O2
22.58% CO2
3.8 ppm SO2
0.0 ppm NOx
258.0 ppm CO
50.4 ppm NOx
0.4 ppm CO, 0.12% O2, 0.10% CO2
1CH 0.0
PPM 100.0
6CH 17.23%
5CH 15.4PPM
4CH 3.5PPM
3CH 1.09%
2CH 19.5PPM
1CH 0.12PPM
200mmAH


25.0 ppm THC
5.4% O_2
0.0 ppm NOx
0.2 ppm THC
0.4 ppm CO
50.4 ppm NOx
55.1 ppm SO_2
22.41% CO_2
250.5 ppm CO
4.6 ppm SO_2
0.10% O_2
0.12% CO_2
PPM
100.0
Jan.05 13:00
1355 @ 12:9
Chart on 12:12
CHART NO. B9585AH
YOKOGAWA


13CC @ 1615
Chart on 1605
Chart off 1445
+ Scrubber back in service
51.3 ppm SO2
1.0 ppm SO2 Bias
55.0 ppm SO2 98.4 ppm SO2
0.0 ppm SO2
Recal SO2
25.0 ppm THC
55.1 ppm SO2
5.4% O2
22.41% CO2
0.0 ppm NOx
250.5 ppm CO
0.2 ppm THC
0.4 ppm CO
50.4 ppm NOx
4.6 ppm SO2
0.10% O2
0.12% CO2
6CH 0.09%
5CH 6.4PPM
98.5PPM
0.07%
0.0PPM
1CH 0.0PPM
200mm/H
Jan. 05 14:00
780cm
795cm
CHART NO. B9585AH


50.5 ppm SO2
23.9 ppm THC
22.46% CO2
5.40% O2
0 ppm NOx
256.5 ppm CO
0.12% CO2
0.0 ppm THC
49.7 ppm NOx, 0.4 ppm CO, 0.11% O2, 0 ppm SO2
1CH
6CH 17.78%
5CH 19.6PPM
4CH 0.2PPM
3CH 1.0PPM
2CH 196.8PPM
1CH 0.2PPM
Jan.05 17:08
1304 @ 1615
Chart on 1605
Chart off 1445


256.5 ppm CO
0.1ppm NOx
0.4ppm CO, 0.13% O2 0 ppm SO2
0.2 ppm THC, 0.13% CO2
49.6 ppm NO2
720cm
1CH
0.0
PPM
100.0
6CH 17.94%
5CH 19.7PPM
4CH 0.0PPM
3CH 1.37%
2CH 185.5PPM
1CH 0.2PPM
200mm/H
Jan.05 18:00
736cm
CHART NO.B9545AH
13C7 @ 1752
50.5 ppm SO2
@ 200mm/H 17:07
23.9 ppm THC
22.46% CO2
5.40% O2
0 ppm NOx
256.5 ppm CO
0.12% CO2
0.0 ppm THC
49.7 ppm NOx, 0.4 ppm CO, 0.11% O2, 0 ppm SO2


5CH PPM
4CH PPM
3CH %
2CH 0.6PPM
1CH 0.0PPM
200mm/H
Jan.05 20:00
690cm
705cm
CHART NO. P9585AH
8CH 0.88%
5CH 22.0PPM
4CH PPM
3CH %
2CH PPM
1CH PPM
200mm/H
50.6 ppm SO2
22.6 ppm THC
5.40 % O2
22.47 % CO2
256.5 ppm CO
0.1ppm NOx
49.6 ppm NO2
0.4ppm CO, 0.13% O2 0 ppm SO2
0.2 ppm THC, 0.13% CO2
720cm

CETCON, Inc.

Job No.:	CJ-4113	Field Data:	HCL	Barometer No.:	CET I	Barometric Pressure, P_B:	29.37	C_F:	1.009
Date:	1/4/2005	Run No.:	[illegible]	Pitot Tube No.:	Std	Ambient Temp., °F:	67	ΔH@:	1.553 in. H_2O
Customer:	TPI Petroleum, Inc.	Time of Run, T_R:	64 min.	Pitot Tube, C_P:	0.990	Stack Pressure, P_S:	-0.03	in. H_2O =	29.37 in. Hg
Unit:	CCR Vent Scrubber	Time per Point, T_P:	4 min.	Initial Pitot Leak√:	X	Initial Leak @:	15.0	in. Hg =	0.000 cfm
Operator:	JJA	Sample Box No.:	1	Final Pitot Leak√:	X	Final Leak @:	4.0	in. Hg =	0.004 cfm
Method:	RM-5	Meter Box No.:	CM#1	Nozzle No.:	T-Q5	Assumed T_S:	79	Assumed K:	11.178
Filter No.:	NA	Stack Area, A_S:	12.57 in.^{2}	Nozzle Dia., D_N:	0.312 in.	Assumed T_M:	77	Calculated K:	#DIV/0!
File Name:	HCL1	Assumed %M:	(default)	N_2 Purge@:	NA SCFH	For:	NA min.	N_2 Cylinder No.:	

Point		Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP_S	Orifice ΔH P_M, in. H_2O Desired	Orifice ΔH P_M, in. H_2O Actual	Sample Vacuum in. Hg	Stack Temp.°F T_S	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	% Isokinetic
A	4	1115	489.450	0.13	1.46	1.46	3	79	250	252	62	72	72	
		1119	492.303	0.12	1.35	1.35	3	78	256	252	59	72	73	
	3	1123	495.200	0.13	1.44	1.45	3	81	250	263	59	73	73	
		1127	497.900	0.13	1.44	1.45	3	81	250	267	59	74	73	
	2	1131	500.650	0.11	1.22	1.22	3	81	250	274	62	74	72	
		1135	503.300	0.12	1.33	1.33	3	81	252	276	64	75	72	
	1	1139	505.850	0.11	1.22	1.22	3	81	250	254	67	75	72	
		1143	508.552	0.12	1.33	1.33	3	81	250	257	68	76	72	
	END	1147	511.173											
B	4	1205	512.070	0.11	1.22	1.22	3	81	259	300	70	73	72	
		1209	514.776	0.10	1.10	1.10	3	82	258	300	68	75	72	
	3	1213	517.139	0.10	1.11	1.10	3	82	249	260	66	76	72	
		1217	519.841	0.09	1.00	1.00	3	82	240	264	65	76	72	
	2	1221	522.000	0.10	1.11	1.10	3	82	254	268	65	76	72	
		1225	524.341	0.10	1.11	1.10	3	82	257	270	66	77	72	
	1	1229	526.786	0.09	1.00	1.00	3	82	257	267	66	77	73	
		1233	529.150	0.09	1.00	1.00	3	82	264	268	66	77	72	
	END	1237	531.459											

C_{qa} =		%Δ Must	Avg ΔP_S	Avg P_M		Avg T_S				Avg T_M	
%Δ =		Be ≤ 5.0	Avg ($\Delta P_S^{1/2}$)	Max Vacuum		Volume DGM 41.152 ft^3	x	C_F 1.009	=V_M		ft^3

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	626.2	719.2	510.1	942.4			
Initial Wt, gm	~~648.9~~	~~599.3~~	~~571.9~~	~~901.5~~			
Difference, gm	632.9	701.7	506.8	931.2	JJA		= V_W

RM 3 or 3A Data	
%CO_2	16.525
%O_2	0.976
%CO	0.000
%N_2	
% Excess Air	

Avg ΔP		in. H_2O
Avg ($\Delta P_S^{1/2}$)		
Avg. P_M		in. H_2O
Avg. T_S		°F
Avg. T_S		°R
Avg. T_M		°F
Avg. T_M		°R

$V_{M\,std} = 17.64 \times V_M \times [(P_B+(P_M / 13.6)) + T_M]$		DSCF
$Q_{M\,std} = V_{Mstd} \div T_R$		DSCFM
$V_{W\,gas} = 0.04715 \times V_W$		SCF
$\%M = V_{W\,gas} \times 100 \div (V_{M\,std} + V_{W\,gas})$		%
$M_D = (100 - \%M) \div 100$		dry fract.
$MW_D = (\%CO_2 \times 0.44)+(\%O_2 \times 0.32)+((\%N_2+\%CO) \times 0.28)$		lb/lbmole
$MW = M_D \times MW_D + 18 (1 - M_D)$		lb/lbmole
$V_S = 5129.4 \times C_p \times (T_S \div (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$		FPM
$Q_A = (V_S \times A_S) \div 144$		ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) \div T_S$		DSCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) \div (M_D \times P_S \times V_S \times T_R \times D_N^2)$	#DIV/0!	%

QA/QC Check:
Completeness
Legibility
Accuracy
Specifications
Reasonableness

Checked by:

1/4/2006 Page #1

Operator (Signature/Date) 1/4/2006

© 1999 CETCON, Inc. All Rights Reserved

Project Coordinator (Signature/Date)

FIELDISO.XLS

CETCON, Inc.

Job No.:	CJ-4113	Field Data:	HCL	Barometer No.:	CET I	Barometric Pressure, P_B:	29.31	C_F:	1.009
Date:	1/4/2005	Run No.:	C2	Pitot Tube No.:	Std	Ambient Temp., °F:	67.	ΔH@:	1.553 in. H_2O
Customer:	TPI Petroleum, Inc.	Time of Run, T_R:	64 min.	Pitot Tube, C_P:	0.990	Stack Pressure, P_S:	-0.03	in. H_2O =	29.31 in. Hg
Unit:	CCR Vent Scrubber	Time per Point, T_P:	4 min.	Initial Pitot Leak√:	X	Initial Leak @:	15.0	in. Hg =	0.003 cfm
Operator:	JJA	Sample Box No.:	1	Final Pitot Leak√:	X	Final Leak @:	5.0	in. Hg =	0.003 cfm
Method:	~~RM-5~~ RM-26A	Meter Box No.:	CM#1	Nozzle No.:	T-Q5	Assumed T_S:	82	Assumed K:	11.178
Filter No.:	NA	Stack Area, A_S:	12.57 in.^{2}	Nozzle Dia., D_N:	0.312 in.	Assumed T_M:	75	Calculated K:	#DIV/0!
File Name:	~~HCLT~~ HCL C2	Assumed %M:	(default)	N_2 Purge@:	NA SCFH	For:	NA min.	N_2 Cylinder No.:	

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP_S	Orifice ΔH P_M, in. H_2O Desired	Orifice ΔH P_M, in. H_2O Actual	Sample Vacuum in. Hg	Stack Temp.°F T_S	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	% Isokinetic
C 4	1400	532.430	0.07	0.78	0.78	3.0	83	248	283	72	72	73	
	1404	534.709	0.07	0.78	0.78	3.0	83	258	282	66	73	73	
3	1408	536.746	0.07	0.78	0.78	3.0	83	257	280	65	73	73	
	1412	538.770	0.09	1.00	1.00	3.0	83	260	278	63	74	72	
2	1416	541.025	0.09	1.00	1.00	3.0	83	265	279	63	74	72	
	1420	543.325	0.10	1.11	1.10	3.0	83	263	283	64	75	72	
1	1424	545.737	0.08	0.89	0.90	3.0	83	250	244	66	76	72	
	1428	547.953	0.08	0.89	0.90	3.0	83	253	267	67	76	72	
END	1432	550.147											
B 4	1455	550.870	0.09	1.00	1.00	4.0	88	250	253	72	73	72	
	1459	553.370	0.09	1.00	1.00	4.0	84	275	270	68	75	72	
3	1503	555.700	0.08	0.89	0.89	4.0	84	278	268	68	75	72	
	1507	557.865	0.08	0.89	0.88	4.0	84	280	260	68	76	72	
2	1511	560.080	0.07	0.78	0.78	4.0	84	275	285	66	76	72	
	1515	562.112	0.07	0.78	0.78	4.0	84	270	280	67	76	72	
1	1519	564.200	0.06	0.67	0.68	4.0	85	272	270	67	76	72	
	1523	566.200	0.06	0.67	0.68	3.0	85	272	270	67	76	72	
END	1527	568.105											

C_{qa} =		%Δ Must	Avg ΔP_S		Avg P_M		Avg T_S		Avg T_M
%Δ =		Be ≤ 5.0	Avg ($\Delta P_S^{1/2}$)		Max Vacuum		Volume DGM	34.952 ft^3 x C_F 1.009	=V_M ft^3

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	654.3	608.0	575.1	910.8			
Initial Wt, gm	648.9	599.3	571.9	901.5			2721.6
Difference, gm							= V_W

RM 3 or 3A Data	
%CO_2	16.779
%O_2	0.967
%CO	0.000
%N_2	
% Excess Air	

Avg ΔP		in. H_2O
Avg ($\Delta P_S^{1/2}$)		
Avg. P_M		in. H_2O
Avg. T_S		°F
Avg. T_S		°R
Avg. T_M		°F
Avg. T_M		°R

$V_{M\,std} = 17.64 \times V_M \times [(P_B+(P_M / 13.6)) + T_M]$		DSCF
$Q_{M\,std} = V_{Mstd} \div T_R$		DSCFM
$V_{W\,gas} = 0.04715 \times V_W$		SCF
$\%M = V_{W\,gas} \times 100 \div (V_{M\,std} + V_{W\,gas})$		%
$M_D = (100 - \%M) \div 100$		dry fract.
$MW_D = (\%CO_2 \times 0.44)+(\%O_2 \times 0.32)+((\%N_2+\%CO) \times 0.28)$		lb/lbmole
$MW = M_D \times MW_D + 18 (1 - M_D)$		lb/lbmole
$V_S = 5129.4 \times C_p \times (T_S \div (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$		FPM
$Q_A = (V_S \times A_S) \div 144$		ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) \div T_S$		DSCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) \div (M_D \times P_S \times V_S \times T_R \times D_N^2)$	#DIV/0!	%

QA/QC Check:

Completeness	✓
Legibility	✓
Accuracy	✓
Specifications	✓
Reasonableness	✓

Checked by:

1/4/2006 Page #1

1/4/2006
Operator (Signature/Date)

Project Coordinator (Signature/Date)

© 1999 CETCON, Inc. All Rights Reserved

FIELDISO.XLS

CETCON, Inc.

Job No.:	CJ-4113	Field Data:	HCL	Barometer No.:	CET I	Barometric Pressure, P_B:	29.31	C_F:	1.009		
Date:	1/4/2005	Run No.:	C3	Pitot Tube No.:	Std	Ambient Temp., °F:	67	ΔH@:	1.553	in. H_2O	
Customer:	TPI Petroleum, Inc.	Time of Run, T_R:	64 min.	Pitot Tube, C_P:	0.990	Stack Pressure, P_S:	-0.02	in. H_2O =		in. Hg	
Unit:	CCR Vent Scrubber	Time per Point, T_P:	4 min.	Initial Pitot Leak√:	X	Initial Leak @:	15.0	in. Hg =	0.000	cfm	
Operator:	JJA	Sample Box No.:	1	Final Pitot Leak√:	X	Final Leak @:	4.0	in. Hg =	0.000	cfm	
Method:	~~RM-5~~ RM-26A	Meter Box No.:	CM#1	Nozzle No.:	T-Q5	Assumed T_S:	84	Assumed K:	11.198		
Filter No.:	NA	Stack Area, A_S:	12.57 in.^{2}	Nozzle Dia., D_N:	0.312 in.	Assumed T_M:	75	Calculated K:	#DIV/0!		
File Name:	~~HCL1~~ HCLC3	Assumed %M:	(default)	N_2 Purge@:	NA SCFH	For:	NA min.	N_2 Cylinder No.:			

Point		Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP_S	Orifice ΔH P_M, in. H_2O Desired	Orifice ΔH P_M, in. H_2O Actual	Sample Vacuum in. Hg	Stack Temp.°F T_S	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	% Isokinetic
A	4	1640	568.700	0.06	0.67	0.70	2.0	88	256	262	65	72	72	
		1644	570.900	0.06	0.66	0.66	2.0	88	258	270	58	72	72	
	3	1648	572.540	0.06	0.66	0.66	2.0	88	250	260	58	73	72	
		1652	574.405	0.05	0.66	0.66	2.0	88	252	262	56	73	72	
	2	1656	576.290	0.07	0.78	0.78	2.0	87	293	255	56	73	72	
		1700	578.300	0.10	1.11	1.11	2.0	87	280	256	56	74	72	
	1	1704	580.750	0.10	1.10	1.10	3.0	86	275	258	54	75	72	
		1708	583.212	0.10	1.11	1.10	3.0	85	274	254	54	76	72	
	END	1712	585.696											
B	4	1720	586.000	0.05	0.56	0.56	2.0	83	250	292	57	73	72	
		1724	587.790	0.06	0.67	0.67	2.0	83	252	282	55	74	72	
	3	1728	589.680	0.09	1.01	1.00	3.0	83	282	286	53	75	72	
		1732	592.012	0.09	1.01	1.00	3.0	83	280	270	51	76	72	
	2	1736	594.400	0.08	0.90	0.90	3.0	82	263	273	51	76	72	
		1740	596.612	0.08	0.90	0.90	3.0	82	265	275	52	77	72	
	1	1744	598.890	0.07	0.79	0.80	2.0	81	253	265	52	77	72	
		1748	600.946	0.07	0.79	0.80	2.0	81	257	263	52	77	72	
	END	1752	603.019											

C_{qa} =		%Δ Must	Avg ΔP_S		Avg P_M		Avg T_S			Avg T_M	
%Δ =		Be ≤ 5.0	Avg ($\Delta P_S^{1/2}$)		Max Vacuum		Volume DGM	34.015 ft^3	x C_F	1.009	=V_M ft^3

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	645.0	711.3	511.3	949.5			
Initial Wt, gm	632.5	702.9	510.2	942.5			
Difference, gm							= V_W

RM 3 or 3A Data	
$\%CO_2$	16.652
$\%O_2$	0.971
%CO	0.000
$\%N_2$	
% Excess Air	

Avg ΔP		in. H_2O
Avg ($\Delta P_S^{1/2}$)		
Avg. P_M		in. H_2O
Avg. T_S		°F
Avg. T_S		°R
Avg.T_M		°F
Avg.T_M		°R

$V_{M\,std} = 17.64 \times V_M \times [(P_B+(P_M / 13.6)) + T_M]$		DSCF
$Q_{M\,std} = V_{Mstd} \div T_R$		DSCFM
$V_{W\,gas} = 0.04715 \times V_W$		SCF
$\%M = V_{W\,gas} \times 100 \div (V_{M\,std} + V_{W\,gas})$		%
$M_D = (100 - \%M) \div 100$		dry fract.
$MW_D = (\%CO_2 \times 0.44)+(\%O_2 \times 0.32)+((\%N_2+\%CO) \times 0.28)$		lb/lbmole
$MW = M_D \times MW_D + 18\,(1 - M_D)$		lb/lbmole
$V_S = 5129.4 \times C_p \times (T_S \div (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$		FPM
$Q_A = (V_S \times A_S) \div 144$		ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) \div T_S$		DSCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) \div (M_D \times P_S \times V_S \times T_R \times D_N^2)$	#DIV/0!	%

QA/QC Check:

Completeness	
Legibility	
Accuracy	
Specifications	
Reasonableness	

Checked by:

1/4/2006 Page #1

Operator (Signature/Date) 1/4/2006

Project Coordinator (Signature/Date)

© 1999 CETCON, Inc. All Rights Reserved

FIELDISO.XLS

CETCON, Inc.

Job No.:	CJ-4113	Field Data:	PM	Barometer No.:	CET I	Barometric Pressure, P_B:	29.52	C_F:	1.009		
Date:	1/5/2006	Run No.:	~~01~~ C4	Pitot Tube No.:	Std	Ambient Temp., °F:	66	$\Delta H@$:	1.553	in. H_2O	
Customer:	TPI Petroleum, Inc.	Time of Run, T_R:	64 min.	Pitot Tube, C_P:	0.990	Stack Pressure, P_S:	-0.03	in. H_2O =	29.52	in. Hg	
Unit:	CCR Vent Scrubbe	Time per Point, T_P:	4 min.	Initial Pitot Leak√:	W OK	Initial Leak @:	15.0	in. Hg =	0.005	cfm	
Operator:	JRH/JJA/GAD	Sample Box No.:	1	Final Pitot Leak√:	✓	Final Leak @:	5.0	in. Hg =	0.005	cfm	
Method:	RM-5	Meter Box No.:	CM#1	Nozzle No.:	T-Q6	Assumed T_S:	80	Assumed K:	11.436		
Filter No.:	A-783	Stack Area, A_S:	12.57 in.^{2}	Nozzle Dia., D_N:	0.314 in.	Assumed T_M:	80	Calculated K:	#DIV/0!		
File Name:	~~PMCT~~ PMC4	Assumed %M:	3.5 (default)	N_2 Purge@:	NA SCFH	For:	NA min.	N_2 Cylinder No.:			

Point		Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP_B	Orifice ΔH P_M, in. H_2O Desired	Orifice ΔH P_M, in. H_2O Actual	Sample Vacuum in. Hg	Stack Temp.°F T_S	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	% Isokinetic
A	4	1050	604.265	0.08	0.78	0.78	2.0	80	251	243	64	68	69	
		1054	606.680	0.09	0.88	0.88	2.0	80	251	243	61	70	69	0.03
	3	1058	608.685	0.08	0.90	0.90	2.0	80	233	243	59	70	69	
		1102	610.840	0.10	1.12	1.1	2.0	80	233	243	58	71	69	
	2	1106	613.230	0.08	0.90	0.90	2.0	81	237	243	58	72	69	
		1110	615.470	0.09	1.01	1.0	2.0	81	237	243	59	73	68	
	1	1114	617.900	0.07	0.78	0.78	2.0	81	238	230	61	73	69	
		1118	619.810	0.08	0.90	0.90	2.0	81	238	230	62	73	70	
	END	1122	622.0											
B	4	1132	622.280	0.10	1.13	1.1	4.0	80	263	246	63	73	70	
		1136	624.70	0.08	0.90	0.90	2.0	80	263	246	57	74	70	
	3	1140	626.87	0.07	0.79	0.79	2.0	80	256	255	55	74	71	
		1144	628.85	0.07	0.78	0.78	2.0	80	256	255	55	74	71	
	2	1148	630.95	0.07	0.79	0.79	2.0	80	252	274	54	75	71	
		1152	633.37	0.07	0.79	0.79	2.0	80	252	274	54	75	71	
	1	1156	635.22	0.06	0.68	0.68	2.0	80	240	263	54	76	71	
		1200	637.29	0.06	0.68	0.68	2.0	81	240	263	54	75	71	
	END	1204	638.945											

C_{qa} = | %Δ Must Be ≤ 5.0 | Avg ΔP_S | Avg P_M | Avg T_S | Avg T_M

%Δ = | Avg ($\Delta P_S^{1/2}$) | Max Vacuum | Volume DGM 34.400 ft^3 x C_F 1.009 = V_M ft^3

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	626.0	711.2	508.0	954.8			
Initial Wt, gm	613.0	705.7	507.5	949.4			2775.6
Difference, gm							= V_W

RM 3 or 3A Data	
$\%CO_2$	17.000
$\%O_2$	1.060
%CO	0.000
$\%N_2$	81.940
% Excess Air	5.132

Avg ΔP		in. H_2O
Avg ($\Delta P_S^{1/2}$)		
Avg. P_M		in. H_2O
Avg. T_S		°F
Avg. T_S		°R
Avg. T_M		°F
Avg. T_M		°R

$V_{M\,std} = 17.64 \times V_M \times [(P_B+(P_M / 13.6)) \div T_M]$		DSCF
$Q_{M\,std} = V_{Mstd} \div T_R$		DSCFM
$V_{W\,gas} = 0.04715 \times V_W$		SCF
$\%M = V_{W\,gas} \times 100 \div (V_{M\,std} + V_{W\,gas})$		%
$M_D = (100 - \%M) \div 100$		dry fract.
$MW_D = (\%CO_2 x0.44)+(\%O_2 x0.32)+((\%N_2+\%CO)x0.28)$	30.762	lb/lbmole
$MW = M_D \times MW_D + 18 (1 - M_D)$	18.000	lb/lbmole
$V_S = 5129.4 \times C_p \times (T_S \div (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$		FPM
$Q_A = (V_S \times A_S) \div 144$		ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) \div T_S$		DSCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) \div (M_D \times P_S \times V_S \times T_R \times D_N^2)$	#DIV/0!	%

QA/QC Check:
Completeness
Legibility
Accuracy
Specifications
Reasonableness

Checked by:

1-5-2006
Operator (Signature/Date)

Project Coordinator (Signature/Date)

© 1999 CETCON, Inc. All Rights Reserved

CETCON, Inc.

Job No.:	CJ-4113	Field Data:	PM	Barometer No.:	CET I	Barometric Pressure, P_B:	29.46	C_F:	1.009
Date:	1/5/2006	Run No.:	~~C2~~ C5	Pitot Tube No.:	Std	Ambient Temp., °F:	73	ΔH@:	1.553 in. H_2O
Customer:	TPI Petroleum, Inc.	Time of Run, T_R:	64 min.	Pitot Tube, C_P:	0.990	Stack Pressure, P_S:	0.0	in. H_2O =	29.46 in. Hg
Unit:	CCR Vent Scrubber	Time per Point, T_P:	4 min.	Initial Pitot Leak√:	✓	Initial Leak @:	15.0	in. Hg =	0.005 cfm
Operator:	~~LKS/NEU~~ JRH/JA	Sample Box No.:	2	Final Pitot Leak√:	✓	Final Leak @:	5.0	in. Hg =	0.000 cfm
Method:	RM-5	Meter Box No.:	CM#1	Nozzle No.:	T-Q6	Assumed T_S:	80	Assumed K:	11.436
Filter No.:	A-784	Stack Area, A_S:	12.57 in.^{2}	Nozzle Dia., D_N:	0.314 in.	Assumed T_M:	80	Calculated K:	#DIV/0!
File Name:	~~PMC2~~ PMC5	Assumed %M:	(default)	N_2 Purge@:	NA SCFH	For:	NA min.	N_2 Cylinder No.:	

Point		Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP_s	Orifice ΔH P_M, in. H_2O Desired	Orifice ΔH P_M, in. H_2O Actual	Sample Vacuum in. Hg	Stack Temp.°F T_s	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	% Isokinetic
B	4	1443	640.635	0.05	0.57	0.57	0	83	237	267	68	73	72	
		1447	642.685	0.08	0.90	0.90	1.0	82	237	267	65	73	72	
	3	1451	644.68	0.08	0.90	0.90	1.0	82	234	263	58	73	72	
		1455	646.885	0.08	0.90	0.90	1.0	82	234	263	56	73	72	
	2	1459	649.17	0.09	1.01	1.0	2.0	82	230	232	55	73	72	
		1503	651.43	0.08	0.90	0.90	2.0	82	230	232	55	74	72	
	1	1507	653.685	0.08	0.90	0.90	2.0	82	260	260	56	74	72	
		1511	655.78	0.08	0.90	0.90	2.0	82	260	260	57	74	72	
	END	1515	658.020											
A	4	1525	658.476	0.08	0.90	0.90	3.0	82	270	223	64	72	72	
		1529	661.25	0.08	0.90	0.90	3.0	81	270	223	54	74	72	
	3	1533	663.43	0.09	1.01	1.0	3.0	81	249	240	54	74	71	
		1537	665.74	0.07	0.79	0.79	2.5	81	249	240	54	75	71	
	2	1541	667.91	0.07	0.79	0.79	2.5	81	246	258	54	75	71	
		1545	669.990	0.09	1.01	1.0	3.0	81	246	258	55	75	71	
	1	1549	672.170	0.09	1.01	1.0	3.0	81	243	260	55	76	71	
		1553	674.565	0.09	1.01	1.0	3.0	81	243	260	56	77	71	
	END	1557	677.04											

C_{qa} =		%Δ Must	Avg ΔP_s		Avg P_M		Avg T_s		Avg T_M
%Δ =		Be ≤ 5.0	Avg ($\Delta P_s^{1/2}$)		Max Vacuum		Volume DGM	,ft^3 x C_F 1.009	=V_M ft^3

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	622.2	709.3	507.4	961.9			
Initial Wt, gm	608.4	704.1	507.0	954.8			
Difference, gm							= V_W

RM 3 or 3A Data	
$\%CO_2$	17.65
$\%O_2$	0.9
%CO	0.000
$\%N_2$	
% Excess Air	

Avg ΔP		in. H_2O
Avg ($\Delta P_s^{1/2}$)		
Avg. P_M		in. H_2O
Avg. T_s		°F
Avg. T_s		°R
Avg. T_M		°F
Avg. T_M		°R

$V_{M\,std} = 17.64 \times V_M \times [(P_B+(P_M / 13.6)) + T_M]$		DSCF
$Q_{M\,std} = V_{Mstd} \div T_R$		DSCFM
$V_{W\,gas} = 0.04715 \times V_W$		SCF
$\%M = V_{W\,gas} \times 100 \div (V_{M\,std} + V_{W\,gas})$		%
$M_D = (100 - \%M) \div 100$		dry fract.
$MW_D = (\%CO_2 \times 0.44)+(\%O_2 \times 0.32)+((\%N_2+\%CO) \times 0.28)$		lb/lbmole
$MW = M_D \times MW_D + 18\,(1 - M_D)$		lb/lbmole
$V_S = 5129.4 \times C_p \times (T_S \div (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$		FPM
$Q_A = (V_S \times A_S) \div 144$		ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) \div T_S$		DSCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) \div (M_D \times P_S \times V_S \times T_R \times D_N^2)$	#DIV/0!	%

QA/QC Check:
Completeness
Legibility
Accuracy
Specifications
Reasonableness

Checked by:

1-5-2006
Operator (Signature/Date)

Project Coordinator (Signature/Date)

© 1999 CETCON, Inc. All Rights Reserved

CETCON, Inc.

Job No.:	CJ-4113	Field Data:	PM	Barometer No.:	CET I	Barometric Pressure, P_B:	29.47	C_F:	1.009
Date:	1/5/2006	Run No.:	~~C3~~ C6	Pitot Tube No.:	Std	Ambient Temp., °F:	61	ΔH@:	1.553 in. H_2O
Customer:	TPI Petroleum, Inc.	Time of Run, T_R:	64 min.	Pitot Tube, C_P:	0.990	Stack Pressure, P_S:	0.02 in. H_2O =		29.47 in. Hg
Unit:	CCR Vent Scrubber	Time per Point, T_P:	4 min.	Initial Pitot Leak√:	✓	Initial Leak @:	15.0 in. Hg =		0.000 cfm
Operator:	LKS/NEU	Sample Box No.:	1	Final Pitot Leak√:		Final Leak @:	5.0 in. Hg =		0.000 cfm
Method:	RM-5	Meter Box No.:	CM#1	Nozzle No.:	T-Q6	Assumed T_S:	80	Assumed K:	11.436
Filter No.:	A-783	Stack Area, A_S:	12.57 in.^{2}	Nozzle Dia., D_N:	0.314 in.	Assumed T_M:	80	Calculated K:	#DIV/0!
File Name:	~~PMC3~~ PMC6	Assumed %M:	(default)	N_2 Purge@:	NA SCFH	For:	NA min.	N_2 Cylinder No.:	

Point	Clock Time	Dry Gas Meter, CF	Pitot in. H_2O ΔP_S	Orifice ΔH P_M, in. H_2O Desired	Orifice ΔH P_M, in. H_2O Actual	Sample Vacuum in. Hg	Stack Temp.°F T_S	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	% Isokinetic
A 4	1718	677.535	0.06	0.69	0.69	1.0	78	252	236	68	71	71	
	1722	679.350	0.06	0.68	0.68	2.0	78	252	236	54	72	71	
3	1726	681.24	0.07	0.79	0.79	2.0	78	263	253	52	73	71	
	1730	683.335	0.08	0.90	0.90	2.0	78	263	253	50	73	71	
2	1734	685.425	0.07	0.79	0.79	2.0	77	240	268	49	74	71	
	1738	687.750	0.07	0.79	0.79	2.0	77	240	268	50	74	71	
1	1742	689.790	0.07	0.79	0.79	2.0	77	237	264	50	75	71	
	1746	691.790	0.05	0.57	0.57	2.0	77	237	264	51	75	71	
END	1750	693.615											
B 4	1754	693.805	0.05	0.57	0.57	2.0	76	253	270	57	74	71	
	1758	695.600	0.07	0.80	0.80	2.0	76	253	270	51	75	71	
3	1802	697.810	0.06	0.68	0.68	2.0	76	273	281	50	76	71	
	1806	699.740	0.06	0.68	0.68	2.0	76	273	281	51	75	71	
2	1810	701.695	0.06	0.68	0.68	2.0	76	270	281	51	76	71	
	1814	704.150	0.06	0.68	0.68	2.0	76	270	281	51	76	71	
1	1818	706.26	0.07	0.80	0.80	2.0	76	263	277	52	76	72	
	1822	708.190	0.06	0.68	0.68	2.0	75	263	277	52	77	71	
END	1824	710.170											

C_{qa} = | %Δ Must Be ≤ 5.0 | Avg ΔP_S | Avg P_M | Avg T_S | Avg T_M

%Δ = | Avg ($\Delta P_S^{1/2}$) | Max Vacuum | Volume DGM ____ ft^3 x C_F 1.009 = V_M ____ ft^3

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	625.5	694.8	507.9	968.1			
Initial Wt, gm	615.6	695.0	507.2	961.9			
Difference, gm							= V_W

RM 3 or 3A Data	
$\%CO_2$	17.625
$\%O_2$	0.907
%CO	0.000
$\%N_2$	
% Excess Air	

Avg ΔP		in. H_2O
Avg ($\Delta P_S^{1/2}$)		
Avg. P_M		in. H_2O
Avg. T_S		°F
Avg. T_S		°R
Avg. T_M		°F
Avg. T_M		°R

$V_{M\,std} = 17.64 \times V_M \times [(P_B+(P_M / 13.6)) \div T_M]$		DSCF
$Q_{M\,std} = V_{Mstd} \div T_R$		DSCFM
$V_{W\,gas} = 0.04715 \times V_W$		SCF
$\%M = V_{W\,gas} \times 100 \div (V_{M\,std} + V_{W\,gas})$		%
$M_D = (100 - \%M) \div 100$		dry fract.
$MW_D = (\%CO_2 \times 0.44)+(\%O_2 \times 0.32)+((\%N_2+\%CO) \times 0.28)$		lb/lbmole
$MW = M_D \times MW_D + 18\,(1 - M_D)$		lb/lbmole
$V_S = 5129.4 \times C_p \times (T_S \div (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$		FPM
$Q_A = (V_S \times A_S) \div 144$		ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) \div T_S$		DSCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) \div (M_D \times P_S \times V_S \times T_R \times D_N^2)$	#DIV/0!	%

QA/QC Check:

Completeness ____

Legibility ____

Accuracy ____

Specifications ____

Reasonableness ____

Checked by:

1-5-2006

Operator (Signature/Date)

Project Coordinator (Signature/Date)

© 1999 CETCON, Inc. All Rights Reserved

FIELDISO.XLS