COMPLIANCE TEST
NO_X, SO_2, CO, THC & TRS

Sulfur Recovery Unit / Tail Gas Incinerator

TOTAL PETROLEUM, INC.

Ardmore Refinery – Ardmore, Oklahoma

July 18, 1996

CETCON

COMPLIANCE TEST – Methods 1, 2, 3A, 4, 6C, 7E, 10, 15 & 25A

Sulfur Recovery Unit / Tail Gas Incinerator

Total Petroleum, Incorporated
Ardmore Refinery
Ardmore, Oklahoma

Test Date:
July 18, 1996

Report Date: August 7, 1996
CETCON Job Number: CJ–1593

" 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."

L. Kelly Sandberg
Consulting Engineer

Robert A. Stenberg
Sr. Environmental Technician

CETCON

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EXECUTIVE SUMMARY

Compliance testing of the Sulfur Recovery Unit (SRU) / Tail Gas Incinerator at Total Petroleum, Inc.'s Ardmore Refinery located in Ardmore, Oklahoma was conducted on Thursday, July 18, 1996. Testing was conducted to document mass emission rates of Nitrogen Oxides (NO_X), Carbom Monoxide (CO), Sulfur Dioxide (SO_2), Total Hydrocarbons (THC) and Total Reduced Sulfur (TRS) compounds. The purpose of the test was to demonstrate compliance with Oklahoma Department of Air Quality (ODEQ) Permit Number 95-506-C.

Testing was conducted in accordance with procedures and guidelines presented in the Code of Federal Regulations, Title 40 (CFR40), Part 60, Subpart J and Appendix A, Reference Methods 1, 2, 3A, 4, 6C, 7E, 10, 15 and 25A.

The average NO_X, CO, SO_2, THC and TRS emissions from the three (3) test runs were as follows:

Pollutant	Units	Average	Permit
NO_X	lb/hr	0.54	1.23
CO	lb/hr	0.16	0.17
SO_2	lb/hr	6.20	7.81
SO_2	ppm @ 0%O_2	178.85	250.00
THC	lb/hr	0.01	0.03
TRS	ppmd	<1.68	None
TRS	lb/hr (as SO_2)	<0.07	None
TRS	lb/hr (as H_2S)	<0.04	None

No TRS compounds were detected in the bag samples collected. The detection limit for each compound (0.421 ppmd) was used to calculate the total TRS concentration.

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

CETCON, Inc.

SUMMARY OF RESULTS

Unit Designation: Total Petroleum, Inc. – Ardmore, OK
Sulfur Recovery Unit Stack

PARAMETERS:

Test No.	C4	C5	C6
Date	7-18-96	7-18-96	7-18-96
Start Time	1008	1150	1335
Test Duration (min.)	60	60	60

EQUIPMENT DESIGN DATA:

Equipment Description:	SRU / Tail Gas Incinerator
Capacity, LTPD	98

OPERATING DATA:

				Average:
Sulfur Production, LTPD	98.8	84.7	84.7	89.4
Sulfur Production, % Capacity	100.8	86.4	86.4	91.2
Process Gas To Incinerator, MSCFD	155.4	152.1	151.3	152.9
Incinerator Stack Temp, °F	1300	1301	1301	1301
Fuel Heating Value, BTU/SCF, HHV	1074.7	1074.7	1074.7	1074.7
Tail Gas H_2S, %	0.915	0.920	0.927	0.921
Tail Gas SO_2, %	0.556	0.491	0.547	0.531
Acid Gas Feed, MSCFH	98.56	100.8	100.4	99.92
Sour Water Stripper Acid Gas To SRC, MSCFH	24.18	25.98	26.06	25.41

FLUE GAS:

Stack Temp, ° F	1082	1084	1092	1086
O_2, %d	2.54	2.46	2.46	2.49
CO_2, %d	5.27	5.43	5.61	5.43
% Moisture	13.84	14.02	13.93	13.93
Stack Flow, ACFM	13700	13699	13880	13760
Stack Flow, DSCFM	3946	3931	3964	3947

EMISSION DATA:

					Permit Limit:
NO_x, ppmd	18.78	18.91	19.28	18.99	
NO_x, lb/hr	0.53	0.53	0.55	0.54	1.23
CO, ppmd	10.03	8.63	8.97	9.21	
CO, lb/hr	0.17	0.15	0.16	0.16	0.17
SO_2, ppmd	151.75	157.02	163.99	157.59	
SO_2, ppmd @ 0% O_2 (1)	172.71	177.96	185.88	178.85	250.00
SO_2, lb/hr	5.96	6.15	6.47	6.20	7.81
THC, ppmw (2)	0.14	0.31	0.28	0.24	
THC, ppmd (3)	0.16	0.36	0.32	0.28	
THC, lb/hr	0.00	0.01	0.01	0.01	0.03
TRS, ppmd (4)(5)	<1.68	<1.68	<1.68	<1.68	
TRS, lb/hr (as SO_2)	<0.07	<0.07	<0.07	<0.07	
TRS, lb/hr (as H_2S)	<0.04	<0.04	<0.04	<0.04	

(0.28 ppmd)(20.9 − 3 / 20.9)

NOTES:

(1) SO_2, ppmd @ 0% O_2 = SO_2, ppmd x 20.9 / (20.9 − O_2, %)
(2) Total Hydrocarbons (THC) reported as propane
(3) THC, ppmd = THC, ppmw x 100 / (100 − % Moisture)
(4) TRS, ppmd = H_2S, ppmd + COS, ppmd + 2 x CS_2, ppmd
(5) Based on the detection limit (.421 ppmd) of each compound

SAMPLING METHODS

Pollutants are measured according to EPA Reference Methods (RM's) described in the Code of Federal Regulations (CFR), Title 40, Chapter 1, Part 60, Appendix A. The following methods were 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-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 10AR or 10S 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 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.

SAMPLING METHODS, continued

RM-15 Determination of total reduced sulfur (TRS) emissions from stationary sources (gas chromatography technique). A gas sample is extracted from the stack and analyzed for Hydrogen Sulfide (H_2S), Carbonyl Sulfide (COS) and Carbon Disulfide (CS_2). A gas chromatograph equipped with a flame photometric detector (GC-FPD) is used for the analysis. The TRS concentration in ppm is the sum of the H_2S, COS and twice the CS_2 concentrations.

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 Byron Model 301 or Eagle Monitoring Systems Model EM-7000 FIA is used to continuously measure the concentration of nonmethane hydrocarbons (NMHC) or total hydrocarbons (THC), respectively. 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 or NMHC concentrations are expressed in units of ppm as C_3H_8 or as Carbon.

DESCRIPTION OF TEST

Personnel from CETCON, Inc., Combustion & Environmental Testing Consultants, arrived at Total Petroleum, Inc.'s refinery in Ardmore, Oklahoma at approximately 8:00 AM on Wednesday, July 17, 1996. The trailer had been parked and powered up near the Sulfur Recovery Unit (SRU) the previous Monday for an attempted RATA conducted Tuesday. All necessary testing equipment was moved to the Tail Gas Incinerator stack. Calibration Error, System Bias and Response Time tests were conducted on CETCON's analyzers and sampling system and were all within the specifications of the Reference Methods (RM's). The Pitot tube (RM's 1-2) and moisture train (RM-4) were successfully leak tested. The first test run (labeled C1) to document mass emission rates of Nitrogen Oxides (NO_X), Carbon Monoxide (CO), Sulfur Dioxide (SO_2), Total Hydrocarbons (THC) and Total Reduced Sulfur (TRS) compounds started at 12:14 PM and concluded at 1:14 PM. NO_X, CO, SO_2, THC and TRS concentrations were measured using RM's 7E, 10, 6C, 25A and 15, respectively. Oxygen (O_2) and Carbon Dioxide (CO_2) concentrations were also measured using RM-3A in order to determine the molecular weight of the stack gas which is necessary for calculating stack gas velocity. All pollutants were monitored on a continuous basis with the exception of TRS. Tedlar bag samples were collected from the sample manifold vent to be analyzed for TRS compounds. Two additional test runs (labeled C2 and C3) were conducted. Dave Schutz and several other members of the Oklahoma Department of Environmental Quality (ODEQ) were present to observe the testing conducted. After reviewing the test results with Total Petroleum personnel, it was discovered that the CO emission rates were higher than permit levels. The Tail Gas Incinerator stack temperature was raised from 1200 °F to 1300 °F in an attempt to bring the CO concentration down to acceptable levels. Upon further investigation, it was discovered that the burner on the incinerator was partially plugged. The unit would have to be shut down in order to clear the burner. It was decided that this would be done and the compliance test would be repeated on the following day. The Tedlar bags containing TRS samples were evacuated, filled with Nitrogen and evacuated again to be used for collecting new samples. CETCON personnel left the refinery at approximately 9:45 PM.

CETCON personnel returned to the refinery at approximately 8:00 AM on Thursday, July 18, 1996. All necessary quality control checks were conducted on CETCON's sampling equipment. The first test run (labeled C4) for NO_X, CO, O_2, SO_2, THC, CO_2 and TRS began at 10:08 AM and ended at 11:08 AM. Testing continued uninterrupted until the conclusion of the third test run (labeled C6) at 2:35 PM. All pollutants were within permit limits and no further testing was required. The Tedlar bag samples were packaged and sent to Enthalpy Analytical Laboratories for analysis of TRS compounds by gas chromatography - flame photometric detection (GC-FPD). The individual TRS compounds analyzed for were Hydrogen Sulfide (H_2S), Carbonyl Sulfide (COS) and Carbon Disulfide (CS_2). Some additional preliminary testing for SO_2 and O_2 was conducted in an attempt to diagnose the Relative Accuracy problems with the Tail Gas Incinerator's Continuous Emissions Monitoring System (CEMS). CETCON personnel left the refinery at approximately 4:00 PM.

APPENDIX A

Unit Diagram
and
Sample Point Location

CETCON, INC.

Job No: CJ-1593
Customer: Total - Ardmore, OK
Unit: SRU
Date: 7-17-96
Time: 12:00 PM

PRELIMINARY VELOCITY TRAVERSE DATA AND SAMPLING LOCATION DATA

	Port A	Port B	Port C	Port D	Port E	Average
Port & Inside Diameter (in.)	39-06/16	39-06/16				39.3750
Port & Wall Thickness (in.)	8-01/16	8-01/16				8.0625
Inside Stack Diameter (in.)	31-05/16	31-05/16				31.3125

Sampling Ports are 15 ft. 0 in. Distance A-Port to downstream disturbance = 5.7 stack diameters

30 ft. 0 in. Distance B-Port to upstream disturbance = 11.5 stack diameters

Pitot Tube No: 1

C_P = 0.772

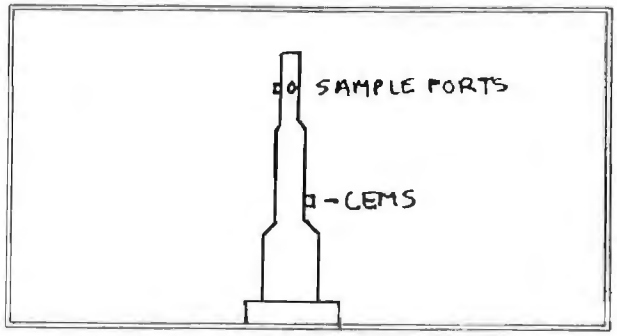
P_B = 29.23 "Hg

P_S = -0.35 "H_2O

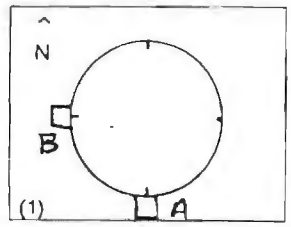
A_S (2) = 769.67 $in.^2$

5.34 $ft.^2$

Stack Schematic



Cross Section



Stack Height 105 ft.

Sampling Port Hgt 90 ft.

Point Number	Percent Diameter	Distance From Ref. Point (decimal in.)	Distance From Ref. Point (fractional in.)	Cyclonic Flow Calculation (3)														
				Port A			Port B			Port C			Port D			Port E		
				ΔP	T_S	a	ΔP	T_S	a	ΔP	T_S	a	ΔP	T_S	a	ΔP	T_S	a
1	2.1		8 -11/16	0.16	1011		0.19	1014										
2	6.7		10 -02/16	0.21	1015		0.22	1028										
3	11.8		11 -12/16	0.26	1028		0.24	1037										
4	17.7		13 -09/16	0.29	1039		0.28	1051										
5	25.0		15 -14/16	0.30	1048		0.30	1058										
6	35.6		19 -03/16	0.32	1061		0.31	1065										
7	64.4		28 -03/16	0.30	1060		0.30	1065										
8	75.0		31 -08/16	0.26	1046		0.27	1056										
9	82.3		33 -13/16	0.21	1018		0.27	1053										
10	88.2		35 -10/16	0.18	996		0.24	1046										
11	93.3		37 -04/16	0.13	962		0.12	974										
12	97.9		38 -11/16	0.08	950		0.07	966										

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) $A_s = \frac{3.14\ D^2}{4}$

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

TRAVERSE Ver2.0-CETCON STACK TRAVERSE PROGRAM
Written by R.J.SWEDEEN 6/17/94
CETCON, Combustion and Environmental Testing CONsultants

UNIT:Total SRU
TEST:Compliance
DATE:7/17/96
TIME:12:00 PM

DUCT TYPE:CIRCULAR
W: 0 D: 0
STACK ID, inch: 31.3125
DOWNSTREAM-A, ft.: 15
UPSTREAM-B, ft.: 30
DOWNSTREAM DIA's: 5.7
UPSTREAM DIA's:11.5
STACK AREA, in*2: 769.6711
REFERENCE LENGTH, inch.: 8.0625
NUMBER OF POINTS: 12

DISTANCE FROM PROBE TIP TO TRAVERSE POINT(incl.REFERENCE LENGTH)

POINT	LENGTH w/REF,inchs	(w/o REF),inchs	PERCENT ID.
1	8 & 11 /16th	(0 & 10 /16th)	2.1
2	10 & 2 /16th	(2 & 1 /16th)	6.7
3	11 & 12 /16th	(3 & 11 /16th)	11.8
4	13 & 9 /16th	(5 & 8 /16th)	17.7
5	15 & 14 /16th	(7 & 13 /16th)	25.0
6	19 & 3 /16th	(11 & 2 /16th)	35.6
7	28 & 3 /16th	(20 & 2 /16th)	64.4
8	31 & 8 /16th	(23 & 7 /16th)	75.0
9	33 & 13 /16th	(25 & 12 /16th)	82.3
10	35 & 10 /16th	(27 & 9 /16th)	88.2
11	37 & 4 /16th	(29 & 3 /16th)	93.3
12	38 & 11 /16th	(30 & 10 /16th)	97.9

APPENDIX B

Plant Operational Data

CETCON

SULFUR TEST PERFORMANCE RUN
18-Jul-96

SULFUR UNIT CHARGE RATE
BASED ON SULFUR PIT OUTAGES

TIME	*PIT GAUGE*	*PIT INCREASE IN INCHES*	*TONS PER DAY*
900	4' - 5.75"		0
1000	4' - 4.875"	0.875	98.80390313
1100	4' - 4"	0.875	98.80390313
1200	4' - 3.25"	0.75	84.68905982
1300	4' - 2.5"	0.75	84.68905982
1400	4' - 1.75"	0.75	84.68905982
1500	4' - 1"	0.75	84.68905982
1600			0
1700			0
1800			0
1900			0

TOTAL	89.39401

Feed Sour Water Stripper Acid Gas

7/18/96 10:08	Process Gas	Incin Temp	Tail Gas H_2S	Tail Gas SO_2	Acid Gas	Acid Gas
7/18/96 11:09	MSCFD	°F	%	%	MSCFH	MSCFH
	30:F5220	30:T5123	30:A5621A	30:A5621B	30:F5212A	30:F502001
18-Jul-96 10:08:00	156.643	1300.712	0.9128723	0.5150097	99.664276	24.233263
18-Jul-96 10:09:00	156.6414	1299.451	0.9129315	0.519353	98.74604	24.226995
18-Jul-96 10:10:00	156.6398	1298.054	0.9129907	0.5228164	97.827782	24.220753
18-Jul-96 10:11:00	156.6383	1296.375	0.91305	0.5262027	97.838867	24.214727
18-Jul-96 10:12:00	156.6365	1295.596	0.9131092	0.5313047	99.203773	24.208759
18-Jul-96 10:13:00	156.6263	1296.693	0.9131685	0.5373707	100.53013	24.202785
18-Jul-96 10:14:00	156.6121	1298.33	0.9132277	0.5434368	100.20516	24.196814
18-Jul-96 10:15:00	156.5979	1300.963	0.9132869	0.5495028	99.167595	24.190844
18-Jul-96 10:16:00	156.5837	1303.626	0.9133462	0.5555688	98.658226	24.184874
18-Jul-96 10:17:00	156.5695	1305.28	0.9134054	0.5616348	98.236885	24.178902
18-Jul-96 10:18:00	156.5553	1304.852	0.9134647	0.5677009	97.815536	24.17293
18-Jul-96 10:19:00	156.5412	1303.593	0.9135239	0.5737669	97.394196	24.166958
18-Jul-96 10:20:00	156.527	1300.754	0.9135832	0.5789798	97.050369	24.160988
18-Jul-96 10:21:00	156.5128	1297.866	0.9136425	0.5833396	97.02523	24.155018
18-Jul-96 10:22:00	156.4986	1296.027	0.9137016	0.5876994	97.230596	24.149046
18-Jul-96 10:23:00	156.4844	1295.715	0.9137608	0.5920591	97.840286	24.143076
18-Jul-96 10:24:00	156.4702	1295.416	0.9138201	0.584592	98.565643	24.137104
18-Jul-96 10:25:00	156.456	1296.224	0.9138793	0.5527319	99.301376	24.131134
18-Jul-96 10:26:00	156.4418	1298.646	0.9139386	0.5317305	98.740601	24.125164
18-Jul-96 10:27:00	156.4276	1301.081	0.9139978	0.5584098	97.864143	24.119192
18 Jul 96 10:28:00	156.4134	1303.24	0.9140571	0.5902439	96.987679	24.11322
18-Jul-96 10:29:00	156.3992	1304.995	0.9141163	0.6220778	96.554192	24.107246
18-Jul-96 10:30:00	156.3377	1305.363	0.9141756	0.6539117	96.781601	24.101276
18-Jul-96 10:31:00	156.2289	1303.716	0.9142348	0.6857458	93.353584	24.095306
18-Jul-96 10:32:00	156.1201	1301.26	0.9142941	0.6901071	94.648575	24.089336
18-Jul-96 10:33:00	156.0112	1298.013	0.9143533	0.6378064	98.798386	24.083364
18-Jul-96 10:34:00	155.9024	1296.326	0.9144125	0.5837886	99.31926	24.077394
18-Jul-96 10:35:00	155.7936	1296.198	0.9144717	0.5498217	99.636086	24.071423
18-Jul-96 10:36:00	155.6848	1296.915	0.914531	0.5572097	98.349747	24.065453
18-Jul-96 10:37:00	155.576	1298.479	0.9145902	0.5658509	97.471085	24.059483
18-Jul-96 10:38:00	155.4672	1300.043	0.9146495	0.5744921	97.806999	24.053509
18-Jul-96 10:39:00	155.3584	1301.607	0.9147087	0.5831333	98.628098	24.047539
18-Jul-96 10:40:00	155.2495	1303.17	0.914768	0.5917745	98.278915	24.041567
18-Jul-96 10:41:00	155.1407	1303.801	0.9148272	0.6004156	97.047501	24.035597
18-Jul-96 10:42:00	155.0319	1303.499	0.9148864	0.6090569	96.087265	24.029625
18-Jul-96 10:43:00	154.9231	1303.197	0.9149457	0.6176981	95.191742	24.023653
18-Jul-96 10:44:00	154.8143	1302.894	0.915005	0.6374884	93.433365	24.017687
18-Jul-96 10:45:00	154.7055	1301.766	0.9150643	0.6735209	95.50959	24.011713
18-Jul-96 10:46:00	154.5966	1299.433	0.9151234	0.7064279	98.687848	24.005741
18-Jul-96 10:47:00	154.4878	1297.091	0.9151827	0.6316535	102.09789	24.005709
18-Jul-96 10:48:00	154.379	1297.084	0.9152419	0.50467	102.02369	24.03009
18-Jul-96 10:49:00	154.2702	1299.414	0.9153011	0.4337534	99.727142	24.057112
18-Jul-96 10:50:00	154.1614	1301.743	0.9153604	0.4445147	99.014549	24.084131
18-Jul-96 10:51:00	154.0526	1303.204	0.9154196	0.4559681	99.603828	24.111151
18 Jul 96 10:52:00	153.9438	1303.4	0.9154789	0.4674215	100.59628	24.138174
18-Jul-96 10:53:00	153.8349	1303.585	0.9155382	0.478875	99.538223	24.165194
18-Jul-96 10:54:00	153.7616	1302.752	0.9155973	0.4903283	98.563316	24.192213
18-Jul-96 10:55:00	153.8343	1300.436	0.9156566	0.5017818	98.788628	24.219234
18-Jul-96 10:56:00	153.9227	1298.176	0.9157158	0.5132352	99.050301	24.246253
18-Jul-96 10:57:00	154.0111	1296.018	0.9157751	0.5236694	99.311981	24.273275
18-Jul-96 10:58:00	154.0995	1295.435	0.9158343	0.5246757	99.815346	24.300295
18-Jul-96 10:59:00	154.1879	1297.146	0.9158935	0.5233887	100.50877	24.327318
18-Jul-96 11:00:00	154.2764	1298.876	0.9159527	0.5221018	100.23299	24.354338

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	18-Jul-96 11:01:00	154.3648	1300.607	0.916012	0.520815	99.601967	24.381357
	18-Jul-96 11:02:00	154.4532	1302.242	0.9160712	0.519528	100.17473	24.408379
	18-Jul-96 11:03:00	154.5416	1303.739	0.9161305	0.5182411	100.41019	24.435398
	18-Jul-96 11:04:00	154.63	1304.3	0.9161897	0.5169542	99.224586	24.46242
	18-Jul-96 11:05:00	154.7184	1303.499	0.916249	0.5156637	98.889786	24.489441
	18-Jul-96 11:06:00	154.8069	1302.688	0.9163082	0.5139602	100.39859	24.516462
	18-Jul-96 11:07:00	154.8953	1301.495	0.9163674	0.5119728	101.60105	24.543482
	18-Jul-96 11:08:00	154.9837	1299.748	0.9164267	0.5099856	101.3503	24.570503
		155.434	1300.358	0.9146495	0.5565231	98.565449	24.179695

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					Feed	Sour Water Stripper
7/18/96 11:50	Process Gas	Incin Temp	Tail Gas H_2S	Tail Gas SO_2	Acid Gas	Acid Gas
7/18/96 12:51	MSCFD	°F	%	%	MSCFH	MSCFH
	30:F5220	30:T5123	30:A5621A	30:A5621B	30:F5212A	30:F502001
18-Jul-96 11:50:00	157.7708	1304.117	0.9189149	0.5351509	100.86561	25.70537
18-Jul-96 11:51:00	157.5029	1303.282	0.918974	0.5366997	100.51974	25.732389
18-Jul-96 11:52:00	157.235	1302.373	0.9190332	0.5380729	99.932045	25.759411
18-Jul-96 11:53:00	156.9671	1301.939	0.9190925	0.5395463	100.73506	25.786434
18-Jul-96 11:54:00	156.6992	1302.866	0.9191518	0.5410196	101.76783	25.81345
18-Jul-96 11:55:00	156.4314	1303.186	0.919211	0.5424929	100.69988	25.840471
18-Jul-96 11:56:00	156.1635	1301.97	0.9192702	0.5439662	100.39993	25.867493
18-Jul-96 11:57:00	155.8956	1301.141	0.9193295	0.5454395	100.91683	25.894514
18-Jul-96 11:58:00	155.6277	1301.563	0.9193888	0.5468261	100.00778	25.921534
18-Jul-96 11:59:00	155.3598	1302.063	0.9194479	0.5379804	99.092545	25.948555
18-Jul-96 12:00:00	155.0919	1302.079	0.9195071	0.5221107	99.51664	25.975579
18-Jul-96 12:01:00	154.824	1301.095	0.9195665	0.5062411	100.37313	25.996111
18-Jul-96 12:02:00	154.5561	1300.08	0.9196257	0.4904309	100.75996	25.997854
18-Jul-96 12:03:00	154.2882	1299.066	0.9196848	0.4816383	100.98469	25.998401
18-Jul-96 12:04:00	154.0203	1298.435	0.9197441	0.4776629	101.20942	25.998955
18-Jul-96 12:05:00	153.7524	1298.596	0.9198034	0.4736875	101.60469	25.999506
18-Jul-96 12:06:00	153.4845	1298.781	0.9198627	0.469712	102.38847	26.000055
18-Jul-96 12:07:00	153.2166	1299.701	0.9199218	0.4657366	101.53613	26.000608
18-Jul-96 12:08:00	152.9487	1302.137	0.9199811	0.4617611	100.2458	26.001158
18-Jul-96 12:09:00	152.6808	1303.975	0.9200404	0.4577857	99.520393	26.001707
18 Jul 96 12:10:00	152.4129	1303.944	0.9200996	0.4542148	99.107559	26.00226
18-Jul-96 12:11:00	152.145	1302.801	0.9201589	0.4530714	99.423576	26.00281
18-Jul-96 12:12:00	151.8771	1298.782	0.9202181	0.4523326	99.785774	26.003359
18-Jul-96 12:13:00	151.6092	1296.432	0.9202774	0.4515937	100.14797	26.003908
18-Jul-96 12:14:00	151.3681	1296.78	0.9203366	0.4508548	100.73606	26.004461
18-Jul-96 12:15:00	151.2881	1297.15	0.9203959	0.450116	101.40121	26.005011
18-Jul-96 12:16:00	151.2349	1298.383	0.9204551	0.4493771	101.02109	26.005562
18-Jul-96 12:17:00	151.1816	1300.872	0.9205143	0.4486382	100.50641	26.006113
18-Jul-96 12:18:00	151.1284	1302.116	0.9205735	0.4478993	101.25491	26.006662
18-Jul-96 12:19:00	151.0752	1301.534	0.9206328	0.4471605	101.4922	26.007214
18-Jul-96 12:20:00	151.022	1301.784	0.9206919	0.4519181	99.902939	26.007763
18-Jul-96 12:21:00	150.9688	1303.269	0.9207513	0.4621723	100.12981	26.008314
18-Jul-96 12:22:00	150.9155	1303.371	0.9208105	0.4724266	100.56879	26.008867
18-Jul-96 12:23:00	150.8623	1301.444	0.9208698	0.4826808	101.31423	26.009417
18-Jul-96 12:24:00	150.8091	1299.5	0.920929	0.492935	101.03672	26.009966
18-Jul-96 12:25:00	150.7559	1297.556	0.9209883	0.5155594	99.022545	26.010517
18-Jul-96 12:26:00	150.7027	1296.503	0.9210474	0.5453299	101.03904	26.011068
18-Jul-96 12:27:00	150.6494	1297.588	0.9211067	0.5437566	101.29318	26.011618
18-Jul-96 12:28:00	150.5962	1299.906	0.921166	0.5369594	100.3822	26.012169
18-Jul-96 12:29:00	150.543	1301.222	0.9212252	0.530162	100.91528	26.012718
18-Jul-96 12:30:00	150.4898	1301.064	0.9212844	0.5234203	100.62253	26.013269
18-Jul-96 12:31:00	150.4366	1300.883	0.9213437	0.5232309	99.39698	26.013821
18-Jul-96 12:32:00	150.3833	1300.722	0.9214029	0.5275394	100.10592	26.01437
18-Jul-96 12:33:00	150.3301	1300.084	0.9214622	0.5318479	100.11689	26.014923
18 Jul 96 12:34:00	150.2769	1298.785	0.9215214	0.5361564	99.904282	26.015472
18-Jul-96 12:35:00	150.2237	1298.202	0.9215807	0.5404649	100.14159	26.016024
18-Jul-96 12:36:00	150.1705	1298.748	0.92164	0.5447734	100.82878	26.016571
18-Jul-96 12:37:00	150.1173	1298.914	0.9216992	0.5481066	101.51599	26.017124
18-Jul-96 12:38:00	150.064	1298.512	0.9217584	0.5360512	101.73134	26.017677
18-Jul-96 12:39:00	150.0108	1298.732	0.9218176	0.5186858	100.14517	26.018223
18-Jul-96 12:40:00	149.9576	1300.244	0.9218768	0.5013203	100.53132	26.018776
18-Jul-96 12:41:00	149.9044	1301.332	0.9219361	0.4839548	101.67039	26.019329
18-Jul-96 12:42:00	149.8512	1301.743	0.9219953	0.4665894	102.67735	26.019876

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	18-Jul-96 12:43:00	149.7979	1303.075	0.9220546	0.4492239	102.46235	26.020428
	18-Jul-96 12:44:00	149.7447	1304.492	0.9221138	0.43218	101.95008	26.020977
	18-Jul-96 12:45:00	149.6915	1304.08	0.9221731	0.4257493	101.74475	26.021528
	18-Jul-96 12:46:00	149.6396	1303.653	0.9222323	0.4244643	102.4289	26.022081
	18-Jul-96 12:47:00	149.7399	1303.226	0.9222915	0.4231793	102.23991	26.022633
	18-Jul-96 12:48:00	149.9448	1301.923	0.9223508	0.4218943	101.12141	26.02318
	18-Jul-96 12:49:00	150.1497	1298.817	0.92241	0.4206094	101.05009	26.023731
	18-Jul-96 12:50:00	150.3546	1297.077	0.9224693	0.4193244	102.49368	26.024281
		152.1138	1300.716	0.920692	0.4910129	100.7957	25.980059

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					Feed	Sour Water Stripper
7/18/96 13:35	Process Gas	Incin Temp	Tail Gas H_2S	Tail Gas SO_2	Acid Gas	Acid Gas
7/18/96 14:36	MSCFD	°F	%	%	MSCFH	MSCFH
	30:F5220	30:T5123	30:A5621A	30:A5621B	30:F5212A	30:F502001
18-Jul-96 13:35:00	154.0686	1302.236	0.9251351	0.6090816	100.10123	26.049059
18-Jul-96 13:36:00	153.9982	1300.825	0.9251943	0.6072166	100.95279	26.04961
18-Jul-96 13:37:00	153.9278	1299.372	0.9252536	0.6053516	100.80317	26.050159
18-Jul-96 13:38:00	153.8575	1298.566	0.9253128	0.6034866	100.01551	26.050709
18-Jul-96 13:39:00	153.787	1299.091	0.9253721	0.6016216	99.370506	26.051258
18-Jul-96 13:40:00	153.7167	1299.657	0.9254313	0.5997565	99.189667	26.051811
18-Jul-96 13:41:00	153.6463	1300.223	0.9254906	0.5978915	99.671867	26.052364
18-Jul-96 13:42:00	153.5759	1300.807	0.9255499	0.5947872	100.15969	26.052912
18-Jul-96 13:43:00	153.5055	1301.425	0.925609	0.5842463	100.64751	26.053463
18-Jul-96 13:44:00	153.4351	1300.684	0.9256683	0.5724662	101.13533	26.054012
18-Jul-96 13:45:00	153.3647	1298.45	0.9257275	0.5606861	101.62315	26.054564
18-Jul-96 13:46:00	153.2943	1298.838	0.9257867	0.5489059	101.83486	26.055115
18-Jul-96 13:47:00	153.2239	1299.308	0.925846	0.5401719	100.38992	26.055664
18-Jul-96 13:48:00	153.1535	1299.778	0.9259052	0.5497147	100.04416	26.056215
18-Jul-96 13:49:00	153.0831	1300.918	0.9259645	0.5623035	99.848442	26.056767
18-Jul-96 13:50:00	153.0127	1303.439	0.9260238	0.5741199	97.941048	26.057318
18-Jul-96 13:51:00	152.9423	1303.861	0.9260829	0.5737481	100.48878	26.057865
18-Jul-96 13:52:00	152.8719	1299.865	0.9261422	0.5691702	101.69218	26.058416
18-Jul-96 13:53:00	152.8148	1296.86	0.9262015	0.5645925	101.35561	26.058969
18-Jul-96 13:54:00	152.7711	1296.373	0.9262607	0.5600147	99.863602	26.059519
18 Jul 96 13:55:00	152.7274	1297.278	0.9263199	0.5554369	99.99028	26.060072
18-Jul-96 13:56:00	152.6837	1298.184	0.9263791	0.5508592	100.22047	26.060617
18-Jul-96 13:57:00	152.64	1299.09	0.9264385	0.5472524	100.45163	26.061171
18-Jul-96 13:58:00	152.5963	1299.996	0.9264977	0.549472	100.71406	26.06172
18-Jul-96 13:59:00	152.5526	1300.844	0.9265569	0.5526625	100.99165	26.062273
18-Jul-96 14:00:00	152.5088	1301.634	0.9266161	0.5558531	100.95228	26.062822
18-Jul-96 14:01:00	152.4651	1302.425	0.9266754	0.5589611	99.609764	26.063372
18-Jul-96 14:02:00	152.4214	1303.215	0.9267346	0.5523255	99.883575	26.063921
18-Jul-96 14:03:00	152.3777	1302.713	0.9267938	0.5390016	101.42971	26.064474
18-Jul-96 14:04:00	152.334	1300.919	0.9268531	0.5256776	101.97578	26.065027
18-Jul-96 14:05:00	152.2903	1299.124	0.9269124	0.5123537	102.13865	26.065573
18-Jul-96 14:06:00	152.2465	1298.312	0.9269716	0.5117368	100.85078	26.066126
18-Jul-96 14:07:00	152.2028	1298.483	0.9270307	0.5238268	99.406044	26.066679
18-Jul-96 14:08:00	152.1591	1298.654	0.92709	0.5359169	99.583824	26.067226
18-Jul-96 14:09:00	152.1154	1298.825	0.9271494	0.5480068	101.63032	26.067778
18-Jul-96 14:10:00	152.0717	1300.893	0.9272086	0.5600969	100.73048	26.068327
18-Jul-96 14:11:00	151.9999	1304.759	0.9272677	0.5721869	99.738289	26.068878
18-Jul-96 14:12:00	151.7597	1305.396	0.927327	0.5842769	98.738922	26.069429
18-Jul-96 14:13:00	151.4915	1304.469	0.9273863	0.5957686	97.502594	26.069981
18-Jul-96 14:14:00	151.2232	1303.541	0.9274455	0.5875207	97.940163	26.07053
18-Jul-96 14:15:00	150.955	1302.613	0.9275047	0.5697019	100.16649	26.071081
18-Jul-96 14:16:00	150.6867	1301.685	0.9275639	0.5518913	101.74648	26.071632
18-Jul-96 14:17:00	150.4185	1300.758	0.9276232	0.5350589	101.99348	26.072182
18-Jul-96 14:18:00	150.1502	1299.872	0.9276825	0.518898	102.20006	26.072735
18 Jul 96 14:19:00	149.882	1300.369	0.9277416	0.502737	102.40664	26.07328
18-Jul-96 14:20:00	149.6137	1301.537	0.9278009	0.486576	101.60133	26.073833
18-Jul-96 14:21:00	149.3455	1302.678	0.9278602	0.4785209	99.802849	26.074389
18-Jul-96 14:22:00	149.0772	1302.94	0.9279194	0.493956	99.038086	26.074938
18-Jul-96 14:23:00	148.809	1302.776	0.9279786	0.5108798	100.09209	26.075487
18-Jul-96 14:24:00	148.5407	1302.613	0.9280378	0.5260906	101.09248	26.076036
18-Jul-96 14:25:00	148.2725	1302.449	0.9280971	0.5254551	100.75325	26.076582
18-Jul-96 14:26:00	148.0042	1302.285	0.9281564	0.520965	100.62476	26.077137
18-Jul-96 14:27:00	147.736	1302.08	0.9282156	0.516475	100.64874	26.07769

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	18-Jul-96 14:28:00	147.4677	1300.534	0.9282748	0.5119846	100.67271	26.078239
	18-Jul-96 14:29:00	147.1995	1299.656	0.9283341	0.5074947	100.69669	26.078791
	18-Jul-96 14:30:00	146.9312	1299.688	0.9283934	0.5030047	100.71949	26.079342
	18-Jul-96 14:31:00	146.663	1299.72	0.9284525	0.4985146	100.7029	26.079889
	18-Jul-96 14:32:00	146.3948	1299.758	0.9285117	0.4940245	100.31203	26.080441
	18-Jul-96 14:33:00	146.1265	1300.432	0.928571	0.492186	98.642525	26.08099
	18-Jul-96 14:34:00	145.8583	1301.516	0.9286303	0.4980316	99.666626	26.081541
	18-Jul-96 14:35:00	145.59	1299.503	0.9286894	0.5043642	99.925613	26.082092
		151.2564	1300.734	0.9269123	0.5466449	100.4117	26.065575

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APPENDIX C

Field Data

CETCON

CETCON, Inc.

Job No. CJ-1593 | Field Data: Vel/Moist | Barometer No.: CET I | Barometric Pressure, P_B: 29.25
Date 7-18-96 | Run No.: C4 | Pitot Tube No.: 1 | Ambient Temp., °F: 97
Customer Total Petroleum, Inc. | Time of Run, T_R: 80 min. | Pitot Tube, C_P: 0.772 | Stack Pressure, P_S: -0.34 in. H_2O = 29.23 in. Hg
Unit Ardmore SRU | Sample Box No.: 1 | Nozzle No.: NA | Initial Leak @: 15.0 in. Hg = 0.000 cfm
Operator LKS/RAS | Meter Box No.: CM #1 | Nozzle Dia., D_N: NA in. | Final Leak @: 11.0 in. Hg = 0.000 cfm
File Name 1593C4.WK1 | Stack Area, A_S: 769.67 in^2 | Assumed %M: (default only) | Purge To: Time:

Point	Clock Time	Dry Gas Meter, CF	Pitot "H_2O ΔP_s	Orifice ΔH P_M in. H_2O Desired	Orifice ΔH P_M in. H_2O Actual	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	Remarks
A 12	1008	778.361	0.18	1.00	1.00	10.0	1077	NA	NA	67	74	72	
11	1013	782.200	0.20	1.00	1.00	10.0	1083	NA	NA	63	75	72	
10	1018	784.900	0.25	1.00	1.00	10.0	1096	NA	NA	63	76	72	
9	1023	788.000	0.28	1.00	1.00	10.0	1104	NA	NA	64	78	73	
8	1028	791.070	0.29	1.00	1.00	10.0	1108	NA	NA	64	79	73	
7	1033	794.280	0.30	1.00	1.00	10.0	1114	NA	NA	70	80	74	
6	1038	797.460	0.27	1.00	1.00	10.0	1106	NA	NA	65	81	74	
5	1043	800.600	0.23	1.00	1.00	10.0	1094	NA	NA	66	83	75	
4	1048	803.610	0.23	1.00	1.00	10.0	1085	NA	NA	66	84	76	
3	1053	806.840	0.19	1.00	1.00	10.0	1064	NA	NA	66	84	76	
2	1058	809.925	0.15	1.00	1.00	10.0	1033	NA	NA	66	85	76	
1	1103	813.080	0.08	1.00	1.00	10.0	980	NA	NA	66	85	77	
12 END	1108	816.292	0.19				1086						
11			0.22				1092						
10			0.25				1098						
9			0.27				1103						
8			0.29				1111						
7			0.29				1114						
6			0.30				1119						
5			0.26				1109						
		Avg ΔP_s	0.223	Avg P_M	1.000	Avg T_s	1082				Avg T_M	77	
		Avg($\Delta P_s^{1/2}$)	0.467		Max Vacuum	10.0							

Volume DGM 37.931 ,CF x C_F 1.017 = V_M 38.576 SCF

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	694.8	595.7	524.6	797.9			2613.0
Initial Wt, gm	585.0	588.0	522.0	791.4			2486.4
Difference, gm	109.8	7.7	2.6	6.5			126.6 = V_W

Filter No.	
Final Wt., gm	
Initial Wt., gm	
Difference, gm	
V_W (gm)	126.6000
SO_2 gm (-)	
V_W =	

RM 3 or 3A Data	
$\%CO_2$	5.269
$\%O_2$	2.537
%CO	
$\%N_2$	92.194
% Excess Air	11.587

Avg ΔP	0.223	in. H_2O
Avg($\Delta P_s^{1/2}$)	0.467	
Avg. P_M	1.000	in. H_2O
Avg. T_s	1082	°F
Avg. T_s	1542	°R
Avg.T_M	77	°F
Avg.T_M	537	°R

$V_{M\,std} = 17.64\, V_M\, [(P_B + (P_M / 13.6)) / T_M]$	37.158	SCF
$Q_{M\,std} = V_{Mstd} / T_R$	0.619	SCFM
$V_{Wgas} = 0.04715 \times V_W$	5.969	SCF
$\%M = V_{W\,gas} / (V_{M\,std} + V_{W\,gas}) \times 100$	13.841	%
$M_D = (100 - \%M) / 100$	0.8616	dry fract.
$MW_D = (\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 \times 0.28)$	28.945	lb/lbmole
$MW = M_D \times MW_D + 18\,(1 - M_D)$	27.430	lb/lbmole
$V_S = 5129.4 \times C_p\, (T_S / (P_S \times MW))^{1/2} \times Avg(\Delta P_s^{1/2})$	2563.2	FPM
$Q_A = (V_S \times A_S)/144$	13700	ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) / T_S$	3946	SCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) / (M_D \times P_S \times V_S \times T_R \times D_N^2)$		%

CETCON, Inc.

Job No. CJ-1593
Date 7-18-96
Customer Total Petroleum, Inc.
Unit Ardmore SRU

Run No. C4
File Name 1593C4.WK1
Field Data Vel/Moist
Operator LKS/RAS

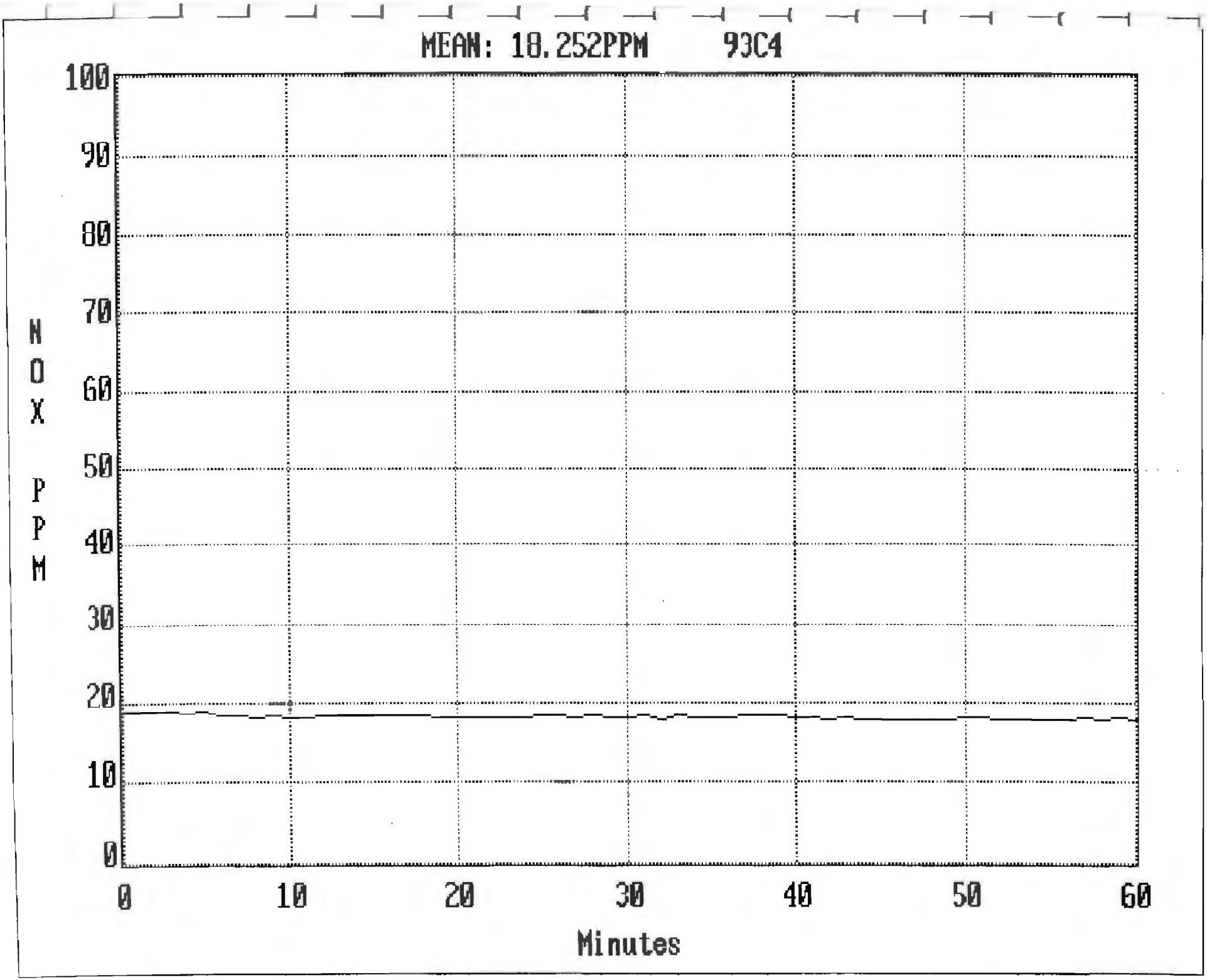
Cont. from Page 1 Point	Clock Time	Dry Gas Meter, CF	Pitot "H_2O ΔP_s	Orifice ΔH P_M in. H_2O Desired	Orifice ΔH P_M in. H_2O Actual	Vacuum in. Hg	Stack Temp. °F T_s	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	Remarks
B 4			0.23				1091						
3			0.20				1077						
2			0.13				1040						
1			0.08				976						

CJ-1593/SRU COMPLIANCE/C4

TEST DATE : 07-18-1996
START TIME: 10:08:00
FILE NAME : C:\DAQ\93C4 .ID%

CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
<MIN>			<ANALYZER OUTPUT-VDC>					
0	1.890	1.013	0.107	5.544	0.010	0.210	0.906	5.583
1	1.898	1.115	0.099	5.558	0.002	0.210	0.683	3.056
2	1.894	1.090	0.106	5.736	0.008	0.196	0.568	1.563
3	1.877	1.313	0.103	5.771	0.000	0.209	0.545	1.148
4	1.860	1.598	0.105	5.675	0.010	0.201	0.542	1.029
5	1.899	1.370	0.104	5.557	0.005	0.196	0.533	0.998
6	1.838	1.116	0.099	5.405	0.011	0.208	0.510	0.977
7	1.833	1.106	0.098	5.304	0.010	0.201	0.496	0.955
8	1.814	0.882	0.094	5.551	0.006	0.207	0.492	0.950
9	1.828	0.736	0.098	5.695	0.004	0.203	0.489	0.943
10	1.809	0.755	0.095	5.806	0.011	0.204	0.498	0.942
11	1.818	0.795	0.098	5.941	0.011	0.202	0.505	0.940
12	1.833	0.894	0.104	5.806	0.015	0.210	0.512	0.951
13	1.842	1.208	0.107	5.529	0.017	0.199	0.508	0.956
14	1.839	1.500	0.112	5.400	0.007	0.205	0.505	0.960
15	1.833	1.592	0.102	5.272	0.006	0.208	0.497	0.959
16	1.835	1.331	0.104	5.393	0.012	0.204	0.508	0.954
17	1.838	1.234	0.107	5.320	0.007	0.206	0.492	0.958
18	1.835	1.220	0.104	5.172	0.014	0.207	0.489	0.956
19	1.807	1.065	0.098	5.567	0.015	0.213	0.497	0.947
20	1.814	0.914	0.097	5.932	0.015	0.209	0.510	0.947
21	1.803	0.706	0.094	5.985	0.012	0.211	0.504	0.943
22	1.812	0.592	0.098	5.923	0.013	0.208	0.500	0.935
23	1.807	0.768	0.092	5.610	0.012	0.210	0.494	0.943
24	1.809	0.852	0.103	5.582	0.013	0.212	0.487	0.939
25	1.847	1.061	0.103	5.426	0.009	0.198	0.493	0.946
26	1.841	1.161	0.112	5.175	0.011	0.201	0.480	0.960
27	1.816	1.772	0.112	4.936	0.014	0.206	0.478	0.959
28	1.830	1.395	0.103	5.397	0.017	0.207	0.488	0.960
29	1.816	1.184	0.101	5.870	0.012	0.202	0.515	0.959
30	1.803	1.108	0.101	5.938	0.013	0.204	0.512	0.951
31	1.825	0.820	0.098	5.872	0.019	0.208	0.510	0.955
32	1.792	0.806	0.097	5.789	0.017	0.207	0.478	0.947
33	1.830	0.830	0.102	5.838	0.020	0.199	0.486	0.948
34	1.804	0.774	0.103	5.832	0.019	0.210	0.499	0.949
35	1.804	1.033	0.107	5.780	0.018	0.199	0.487	0.949
36	1.811	0.938	0.102	5.800	0.015	0.203	0.487	0.948
37	1.825	0.908	0.106	5.677	0.020	0.204	0.496	0.955
38	1.841	0.726	0.107	5.466	0.017	0.208	0.474	0.963
39	1.836	1.130	0.108	4.937	0.008	0.204	0.439	0.958
40	1.817	1.330	0.109	4.911	0.024	0.212	0.458	0.959
41	1.797	1.272	0.095	5.256	0.016	0.207	0.455	0.951
42	1.789	0.933	0.096	5.943	0.026	0.210	0.496	0.948
43	1.795	0.685	0.097	6.534	0.018	0.208	0.509	0.951
44	1.777	0.838	0.098	6.512	0.009	0.199	0.515	0.946
45	1.788	0.764	0.096	6.351	0.020	0.200	0.504	0.946
46	1.784	0.748	0.090	6.229	0.008	0.203	0.505	0.951
47	1.782	0.866	0.090	6.059	0.013	0.203	0.499	0.944
48	1.792	0.937	0.107	5.841	0.021	0.194	0.479	0.939
49	1.784	1.389	0.103	5.548	0.021	0.201	0.477	0.951
50	1.805	1.525	0.099	5.464	0.016	0.202	0.478	0.959
51	1.799	1.354	0.099	5.443	0.016	0.203	0.473	0.959

52	1.781	0.997	0.099	5.557	0.015	0.202	0.463	0.953
53	1.781	1.011	0.102	5.823	0.023	0.199	0.474	0.938
54	1.792	0.894	0.097	6.011	0.021	0.204	0.492	0.955
55	1.776	0.715	0.091	6.020	0.027	0.210	0.494	0.950
56	1.777	0.614	0.092	6.073	0.028	0.203	0.430	0.940
57	1.794	0.709	0.094	5.995	0.024	0.207	0.508	0.953
58	1.789	0.837	0.098	5.816	0.027	0.203	0.471	0.964
59	1.798	0.842	0.098	5.780	0.012	0.203	0.456	0.965
60	1.772	0.911	0.092	5.766	0.030	0.205	0.459	0.955
MEAN	1.817	1.026	0.101	5.684	0.015	0.205	0.503	1.077
END TIME:	11:07:59							
FULLSPAN	95.500	62.900	21.000	207.000	87.500	20.900	0.000	0.000
SPAN VDC	9.561	6.292	0.840	8.267	8.750	0.815	0.000	0.000
MID SPAN	52.200	32.900	12.200	93.900	53.400	11.500	0.000	0.000
MID VDC	5.068	3.267	0.469	3.672	5.344	0.457	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.054	0.000	0.000	0.000	0.000	0.000	0.000	0.000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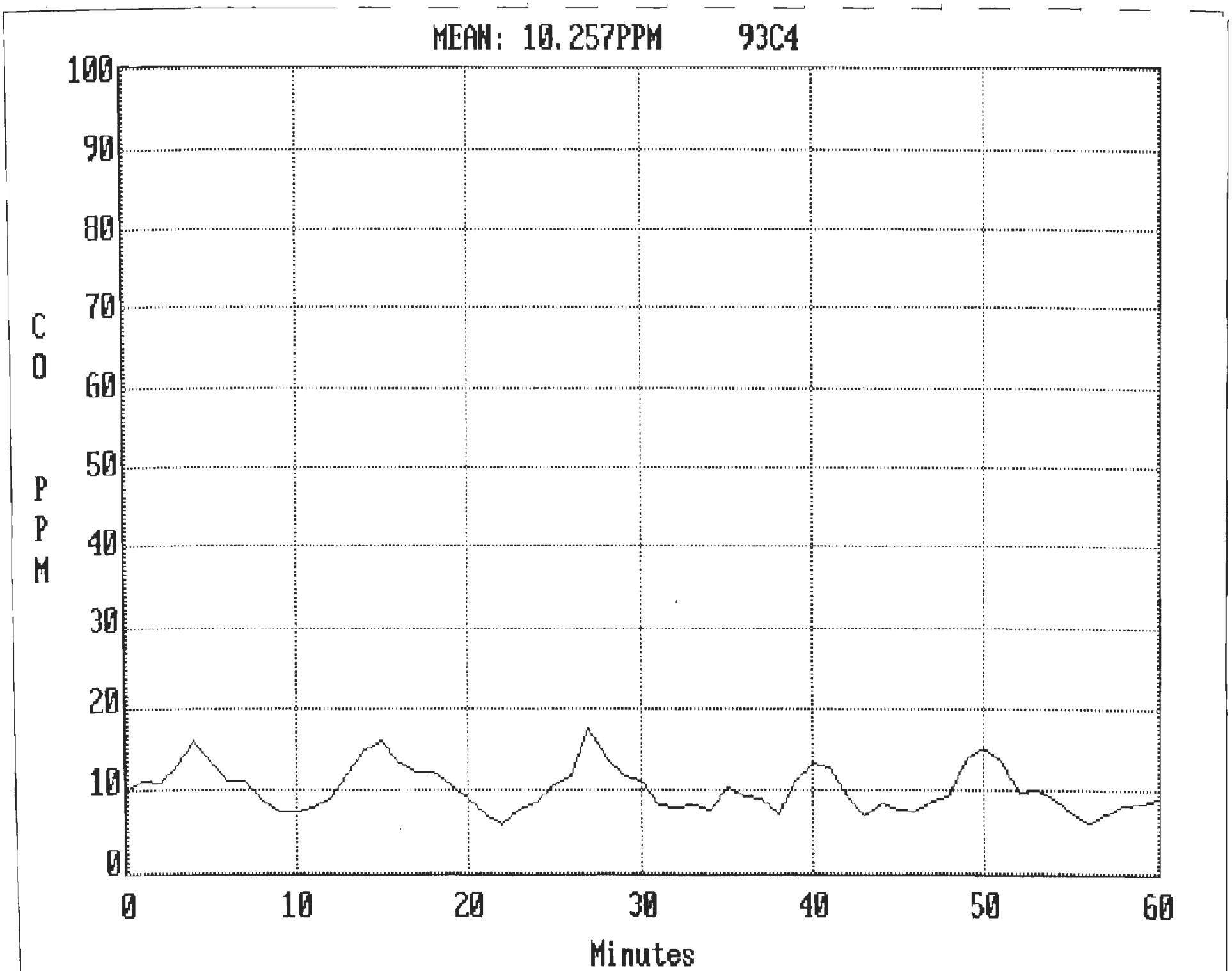
90
80
70
60
50
40
30
20
10
0
NOX PPM
0
10
20
30
40
50
60
Minutes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100
90
80
70
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30
20
10
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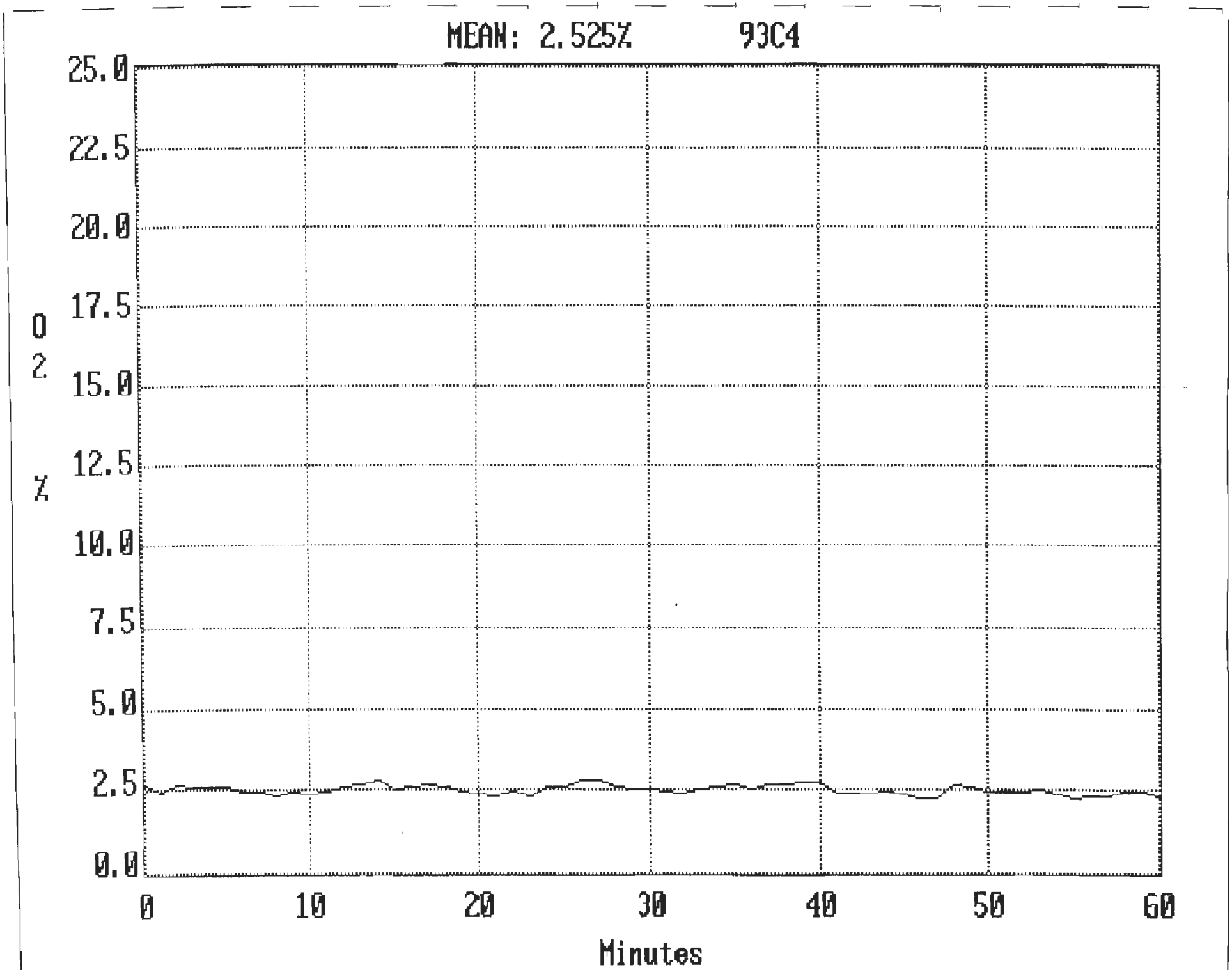
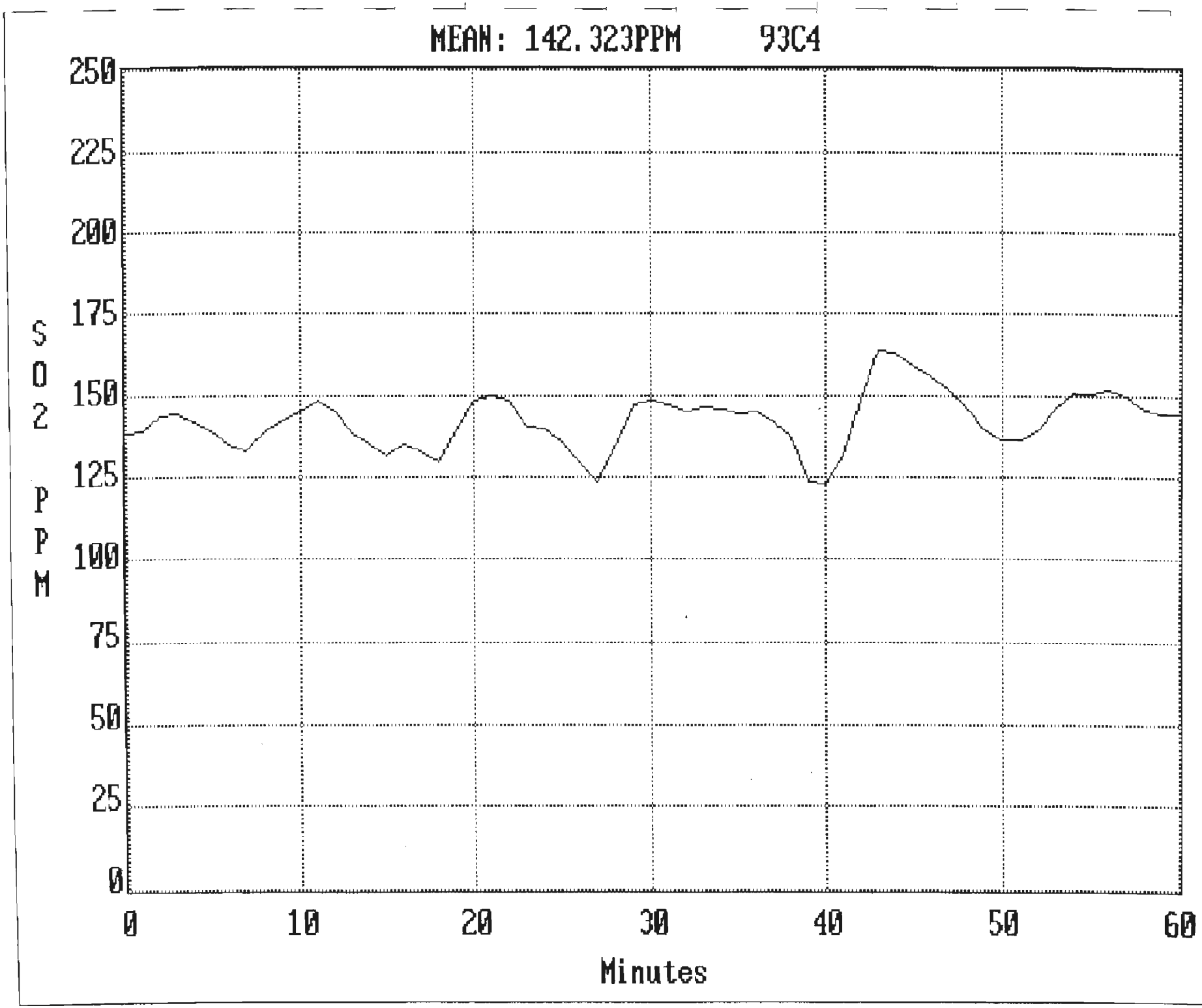
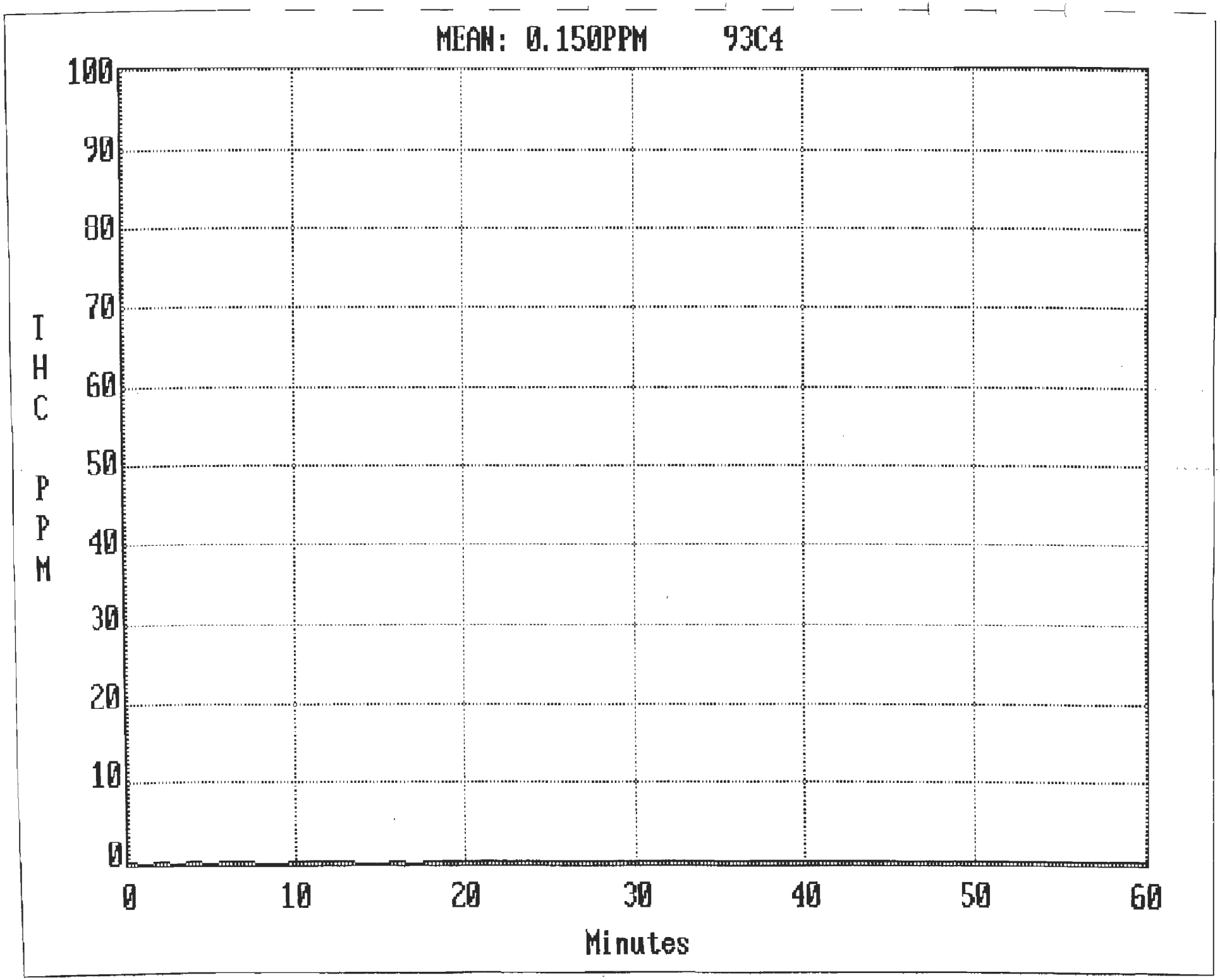
C
O
P
P
M
0
10
20
30
40
50
60
Minutes


MEAN: 2.525%
93C4
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
O
2
%
0
10
20
30
40
50
60
Minutes


MEAN: 142.323PPM 93C4
250
225
200
175
150
125
100
75
50
25
0
SO2 PPM
0
10
20
30
40
50
60
Minutes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90
80
70
60
50
40
30
20
10
0
THC PPM
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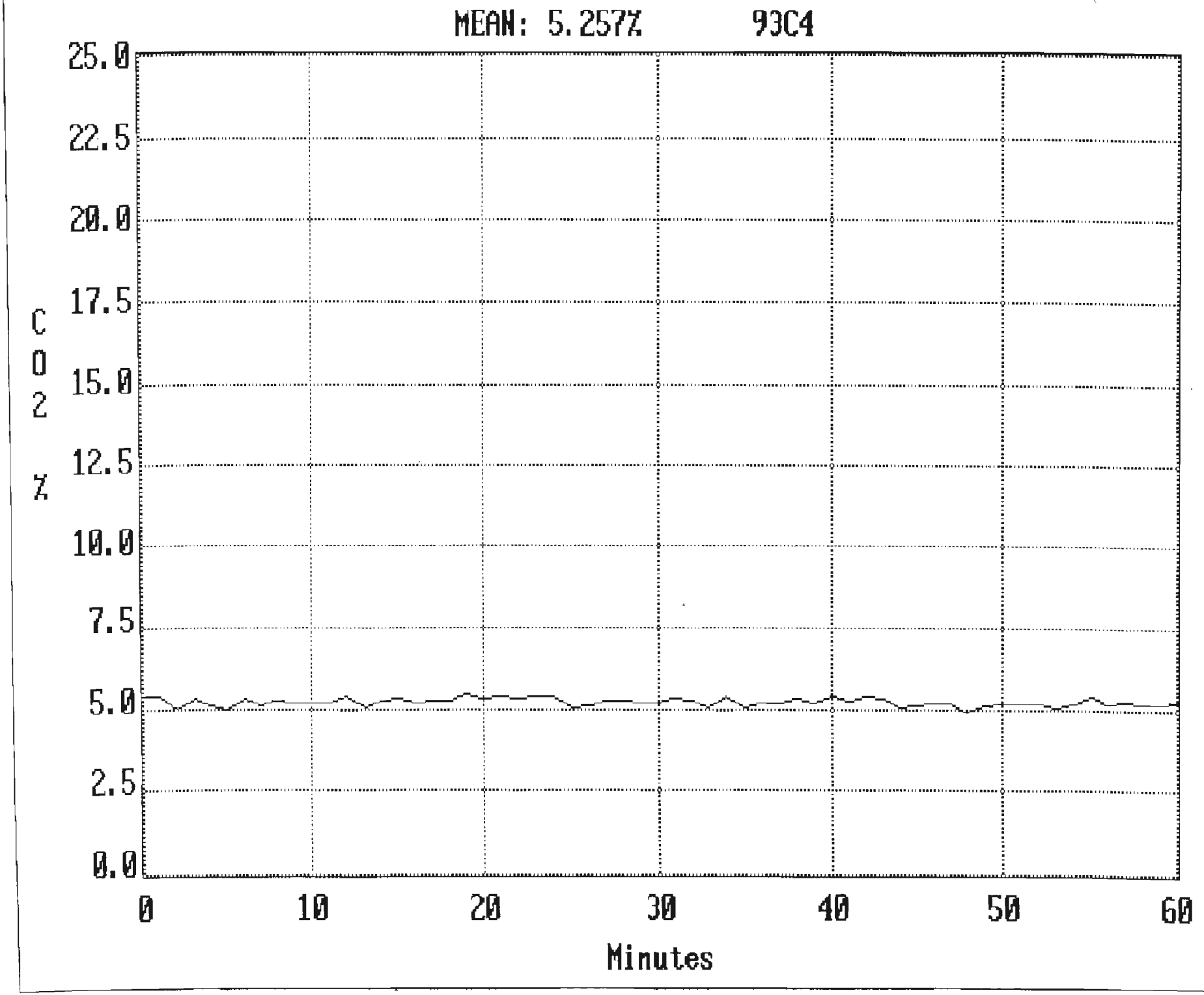
10
20
30
40
50
60
Minutes


MEAN: 5.257%
93C4
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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-1593	Field Data	Vel/Moist	Barometer No.	CET I	Barometric Pressure, P_B	29.24		
Date	7-18-96	Run No.	C5	Pitot Tube No.	1	Ambient Temp., °F	99		
Customer	Total Petroleum, Inc.	Time of Run, T_R	60 min.	Pitot Tube, C_P	0.772	Stack Pressure, P_S	-0.35	in. H_2O =	29.21 in. Hg
Unit	Ardmore SRU	Sample Box No.	2	Nozzle No.	NA	Initial Leak @	15.0	in. Hg =	0.000 cfm
Operator	LKS/RAS	Meter Box No.	CM #1	Nozzle Dia., D_N	NA in.	Final Leak @	11.5	in. Hg =	0.000 cfm
File Name	1593C5.WK1	Stack Area, A_S	769.67 in^2	Assumed %M	(default only)	Purge To:		Time:	

Point	Clock Time	Dry Gas Meter, CF	Pitot "H_2O ΔP_S	Orifice ΔH P_M in. H_2O Desired	Orifice ΔH P_M in. H_2O Actual	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	Remarks
A 12	1150	816.730	0.18	1.00	1.00	10.5	1082	NA	NA	66	83	81	
11	1155	820.210	0.24	1.00	1.00	10.5	1094	NA	NA	65	84	81	
10	1200	823.390	0.26	1.00	1.00	10.5	1103	NA	NA	67	85	81	
9	1205	826.510	0.30	1.00	1.00	10.5	1117	NA	NA	67	86	81	
8	1210	830.110	0.31	1.00	1.00	10.5	1122	NA	NA	67	87	81	
7	1215	832.880	0.29	1.00	1.00	10.5	1122	NA	NA	67	88	81	
6	1220	836.100	0.26	1.00	1.00	10.5	1111	NA	NA	67	88	82	
5	1225	839.270	0.23	1.00	1.00	10.5	1102	NA	NA	67	89	82	
4	1230	842.450	0.20	1.00	1.00	10.5	1083	NA	NA	67	90	83	
3	1235	845.630	0.15	1.00	1.00	10.5	1041	NA	NA	67	90	83	
2	1240	848.810	0.12	1.00	1.00	10.5	1000	NA	NA	67	90	83	
1	1245	852.000	0.08	1.00	1.00	10.5	962	NA	NA	67	91	84	
12 END	1250	855.230	0.19				1083						
11			0.21				1090						
10			0.26				1101						
9			0.27				1104						
8			0.29				1112						
7			0.29				1118						
6			0.28				1117						
5			0.26				1112						
		Avg ΔP_S	0.223	Avg P_M	1.000	Avg T_S	1084				Avg T_M	85	
		Avg($\Delta P_S^{1/2}$)	0.466		Max Vacuum	10.5							

Volume DGM 38.500 CF x C_F 1.017 = V_M 39.155 SCF

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	705.0	611.1	521.4	761.2			2598.7
Initial Wt, gm	595.2	604.1	519.1	751.8			2470.2
Difference, gm	109.8	7.0	2.3	9.4			128.5 = V_W

$V_{M\,std} = 17.64\ V_M\ [(P_B + (P_M / 13.6)) / T_M]$	37.149	SCF
$Q_{M\,std} = V_{Mstd} / T_R$	0.619	SCFM
$V_{Wgas} = 0.04715 \times V_W$	6.059	SCF
$\%M = V_{W\,gas} / (V_{M\,std} + V_{W\,gas}) \times 100$	14.022	%
$M_D = (100 - \%M) / 100$	0.8598	dry frac.
$MW_D = (\%CO_2 \times 0.44) + (\%O_2 \times 0.32) + (\%N_2 \times 0.28)$	28.967	lb/lbmole
$MW = M_D \times MW_D + 18\ (1 - M_D)$	27.429	lb/lbmole
$V_S = 5129.4 \times C_p\ (T_S / (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$	2563.0	FPM
$Q_A = (V_S \times A_S)/144$	13699	ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) / T_S$	3931	SCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) / (M_D \times P_S \times V_S \times T_R \times D_N^2)$		%

Filter No.	
Final Wt., gm	
Initial Wt., gm	
Difference, gm	
V_W (gm)	128.5000
SO_2 gm (-)	
V_W =	

RM 3 or 3A Data	
$\%CO_2$	5.428
$\%O_2$	2.459
%CO	
$\%N_2$	92.113
% Excess Air	11.202

Avg ΔP	0.223	in. H_2O
Avg($\Delta P_S^{1/2}$)	0.466	
Avg. P_M	1.000	in. H_2O
Avg. T_S	1084	°F
Avg. T_S	1544	°R
Avg.T_M	85	°F
Avg.T_M	545	°R

CETCON, Inc.

Job No. CJ-1593
Date 7-18-96
Customer Total Petroleum, Inc.
Unit Ardmore SRU

Run No. C5
File Name 1593C5.WK1
Field Data Vel/Moist
Operator LKS/RAS

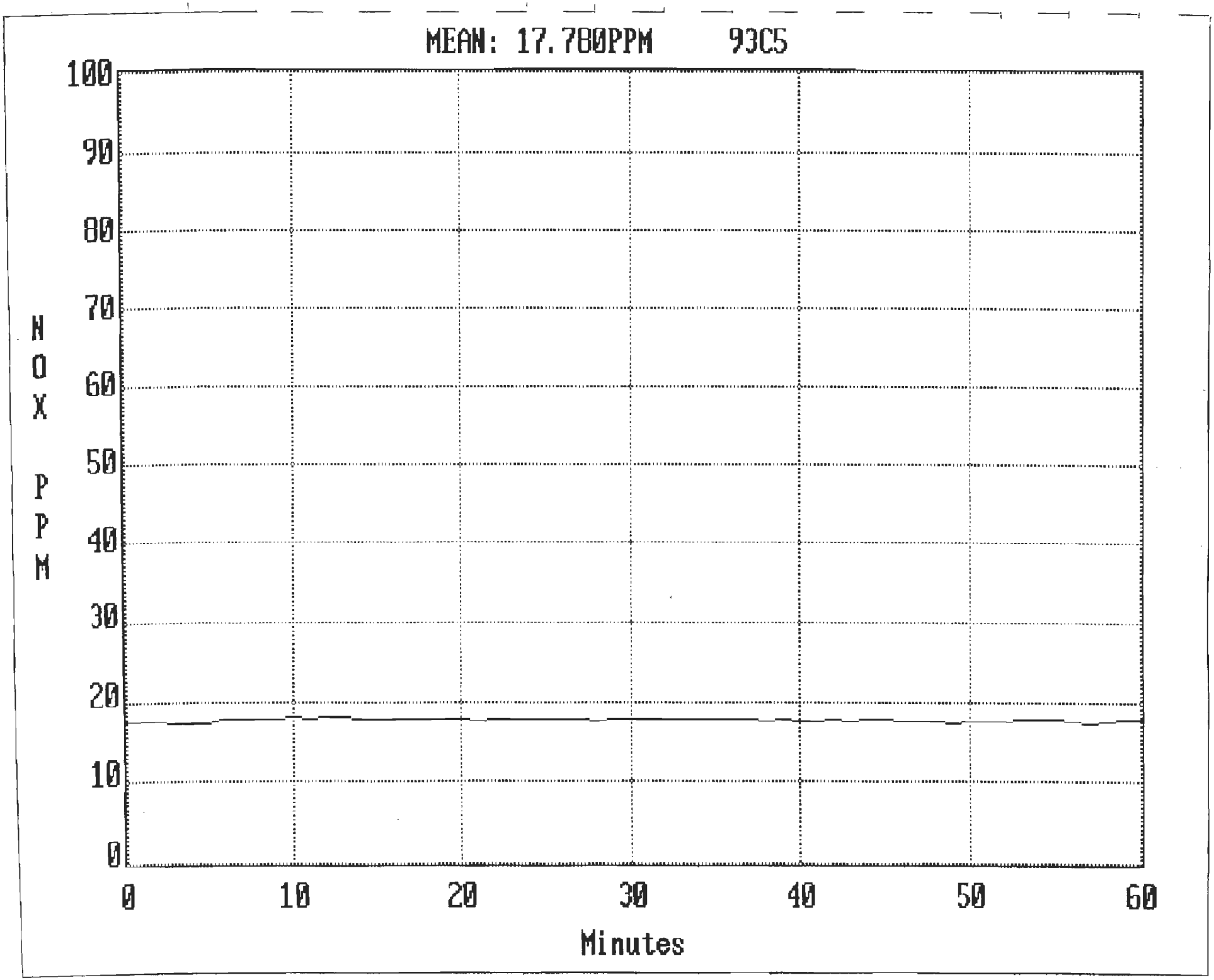
Cont. from Page 1 Point	Clock Time	Dry Gas Meter, CF	Pitot "H_2O ΔP_s	Orifice ΔH P_M in. H_2O Desired	Orifice ΔH P_M in. H_2O Actual	Vacuum In. Hg	Stack Temp.°F T_s	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	Remarks
B 4			0.24				1102						
3			0.18				1077						
2			0.16				1053						
1			0.10				1005						

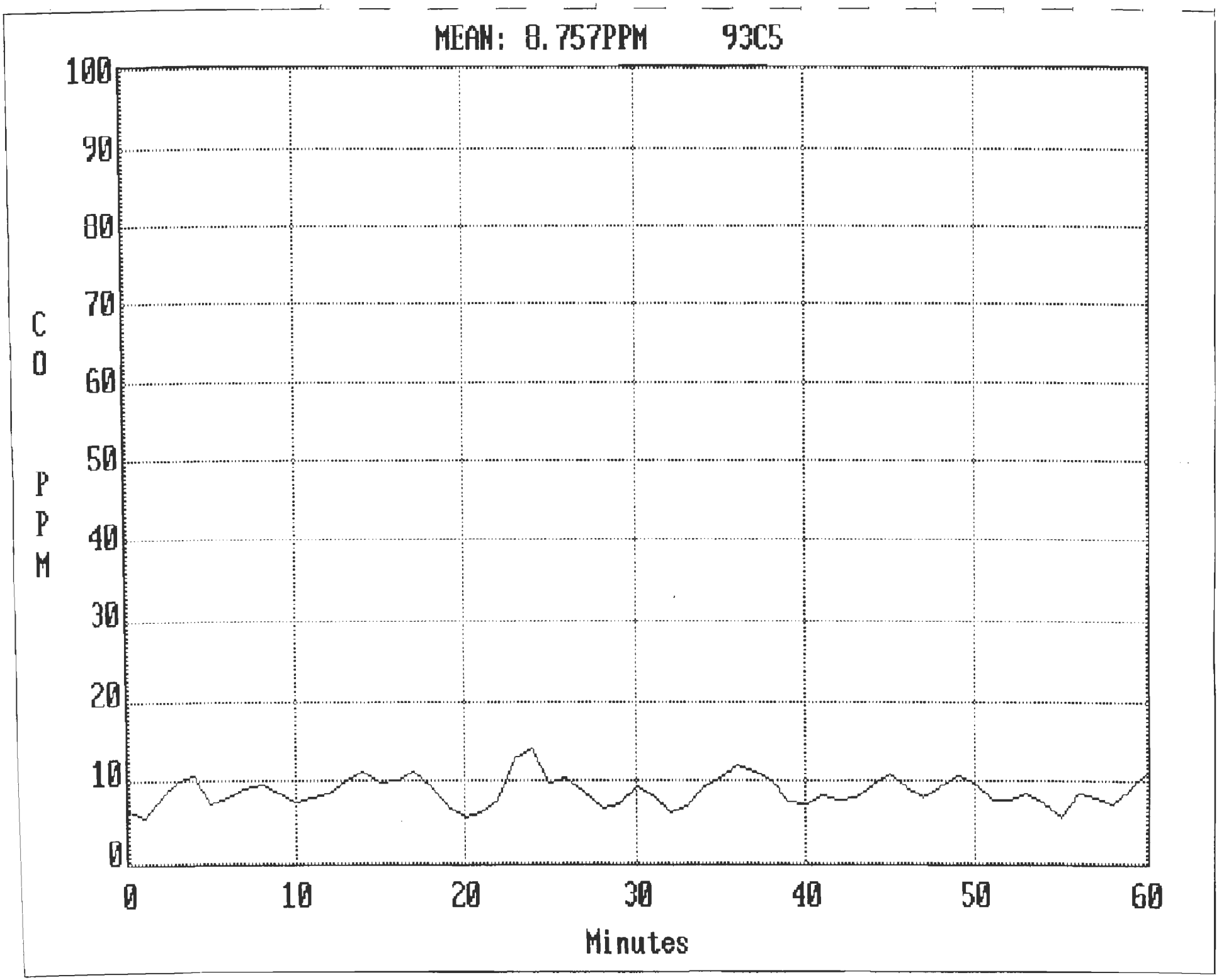
CJ-1593/SRU COMPLIANCE/C5

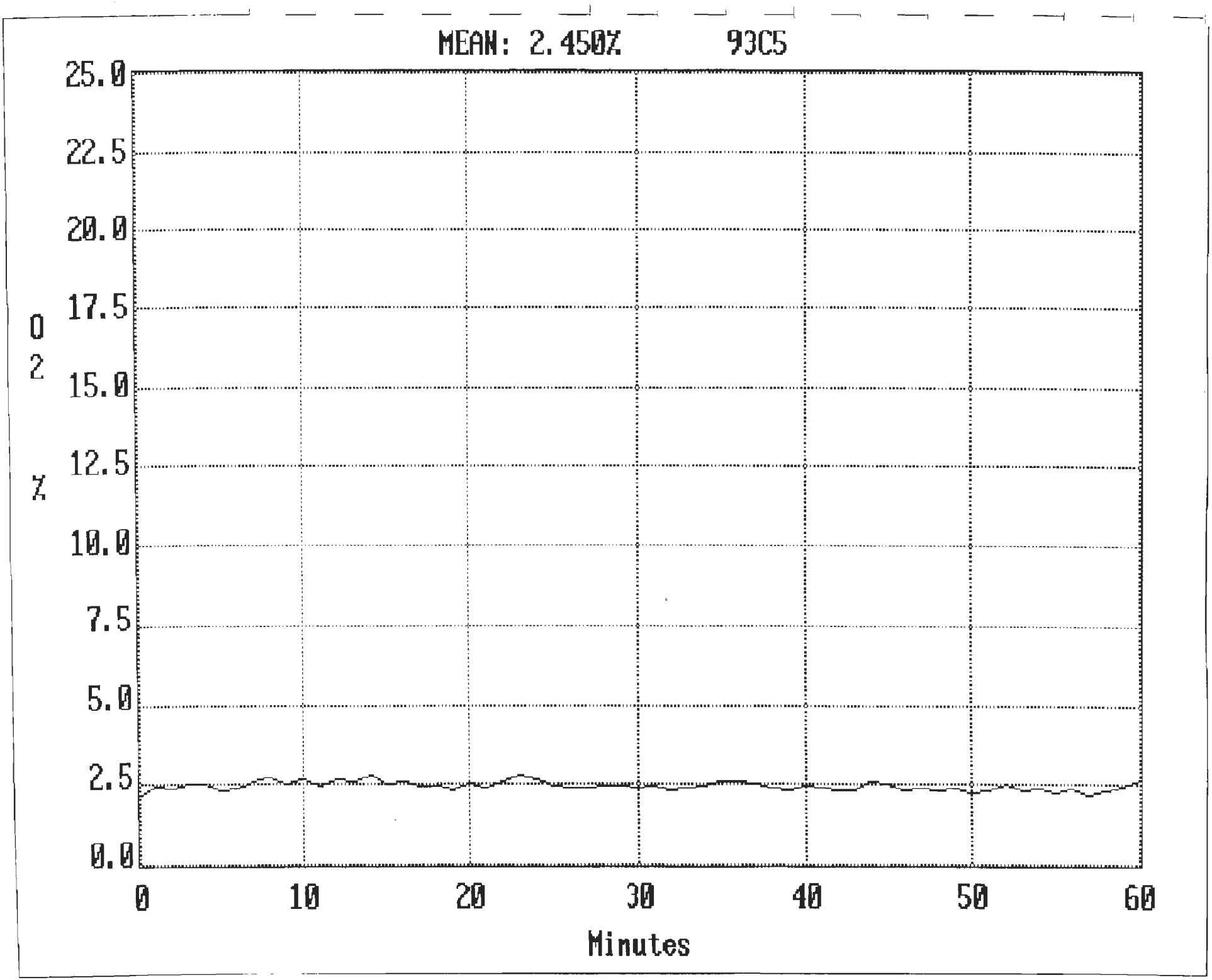
TEST DATE : 07-18-1996
START TIME: 11:49:58
FILE NAME : C:\DAQ\93C5 .ID%

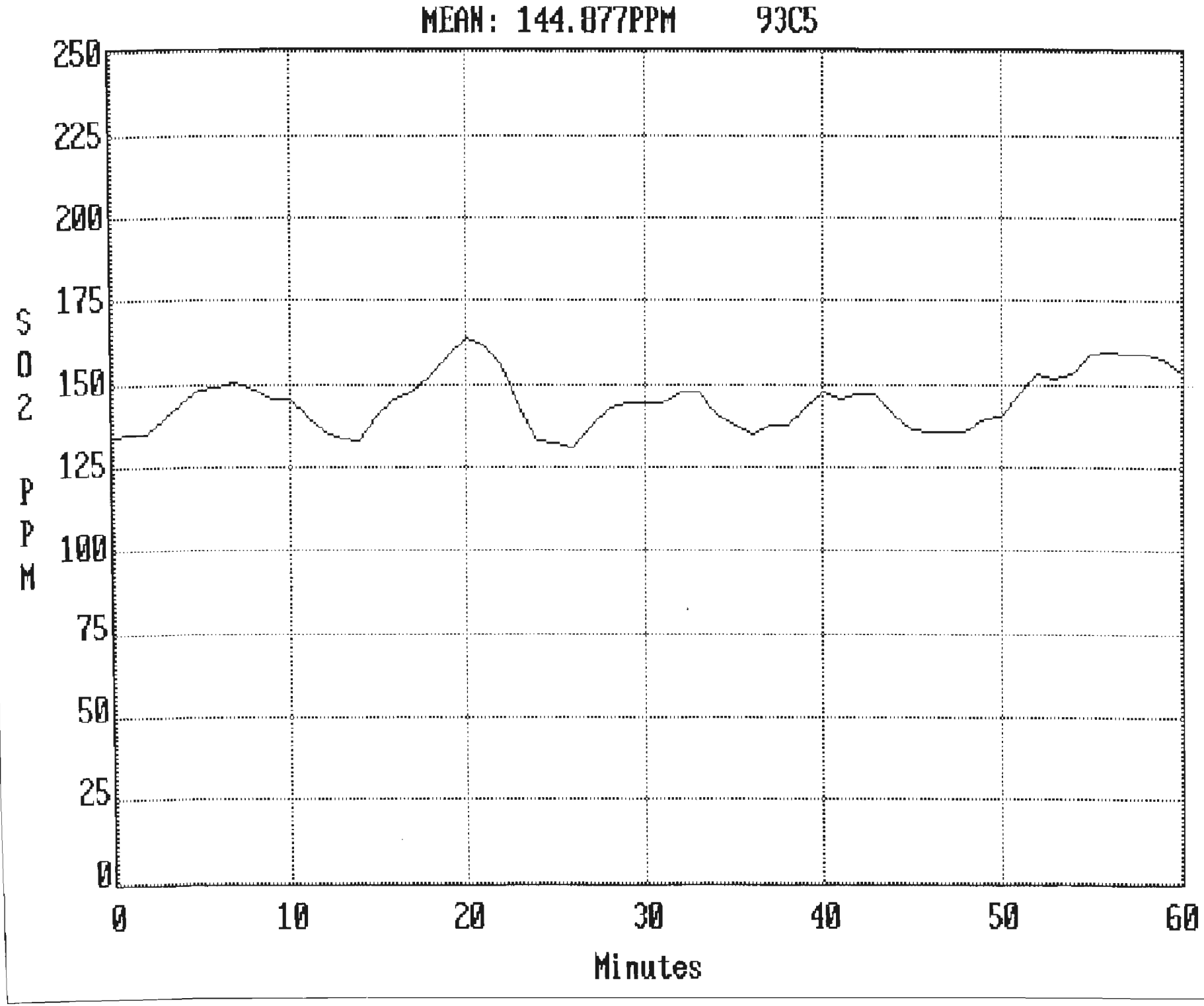
CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
<MIN>			<ANALYZER OUTPUT-VDC>					
0	1.748	0.642	0.088	5.359	0.024	0.205	0.840	6.121
1	1.755	0.556	0.098	5.396	0.029	0.212	0.531	2.572
2	1.746	0.795	0.097	5.385	0.030	0.203	0.426	1.218
3	1.729	1.016	0.102	5.580	0.034	0.209	0.427	1.010
4	1.732	1.054	0.100	5.771	0.038	0.212	0.453	0.972
5	1.729	0.726	0.092	5.938	0.035	0.212	0.426	0.968
6	1.772	0.794	0.097	5.966	0.033	0.205	0.443	0.972
7	1.773	0.903	0.103	6.018	0.030	0.213	0.435	0.983
8	1.766	0.955	0.108	5.919	0.040	0.207	0.443	0.983
9	1.771	0.855	0.101	5.828	0.038	0.208	0.419	0.971
10	1.796	0.737	0.107	5.835	0.037	0.206	0.429	0.987
11	1.791	0.796	0.098	5.605	0.034	0.208	0.425	0.986
12	1.797	0.852	0.107	5.417	0.036	0.213	0.421	0.989
13	1.799	1.024	0.103	5.334	0.035	0.210	0.407	0.981
14	1.790	1.125	0.111	5.313	0.042	0.209	0.416	0.986
15	1.785	0.994	0.101	5.618	0.033	0.204	0.423	0.972
16	1.785	1.002	0.104	5.831	0.039	0.211	0.438	0.978
17	1.774	1.105	0.098	5.892	0.035	0.208	0.436	0.976
18	1.780	0.927	0.098	6.093	0.040	0.212	0.449	0.983
19	1.772	0.691	0.094	6.340	0.039	0.208	0.444	0.981
20	1.777	0.566	0.100	6.536	0.036	0.212	0.457	0.980
21	1.759	0.614	0.095	6.454	0.037	0.208	0.457	0.972
22	1.786	0.762	0.104	6.222	0.039	0.204	0.449	0.977
23	1.789	1.275	0.111	5.718	0.034	0.200	0.433	0.990
24	1.791	1.411	0.107	5.320	0.034	0.206	0.417	0.990
25	1.786	0.973	0.098	5.286	0.041	0.212	0.405	0.984
26	1.773	1.028	0.097	5.242	0.037	0.205	0.404	0.976
27	1.777	0.876	0.097	5.472	0.033	0.213	0.408	0.976
28	1.759	0.667	0.098	5.729	0.035	0.216	0.407	0.973
29	1.766	0.706	0.099	5.772	0.037	0.209	0.414	0.967
30	1.777	0.943	0.095	5.759	0.040	0.209	0.425	0.984
31	1.781	0.817	0.098	5.770	0.042	0.219	0.427	0.982
32	1.788	0.607	0.092	5.914	0.037	0.218	0.416	0.986
33	1.778	0.696	0.096	5.904	0.033	0.214	0.378	0.972
34	1.771	0.927	0.099	5.640	0.046	0.211	0.412	0.981
35	1.782	1.034	0.103	5.500	0.042	0.212	0.421	0.985
36	1.777	1.200	0.105	5.408	0.045	0.210	0.408	0.980
37	1.787	1.120	0.101	5.496	0.040	0.208	0.417	0.979
38	1.764	1.009	0.097	5.504	0.050	0.212	0.422	0.981
39	1.777	0.745	0.093	5.716	0.032	0.211	0.399	0.979
40	1.759	0.710	0.098	5.911	0.043	0.204	0.414	0.972
41	1.764	0.831	0.097	5.812	0.048	0.212	0.433	0.978
42	1.780	0.774	0.094	5.870	0.043	0.203	0.417	0.970
43	1.762	0.802	0.092	5.882	0.046	0.209	0.404	0.978
44	1.769	0.963	0.103	5.649	0.037	0.212	0.420	0.975
45	1.774	1.094	0.100	5.461	0.037	0.194	0.395	0.971
46	1.757	0.918	0.094	5.428	0.038	0.216	0.384	0.979
47	1.755	0.806	0.097	5.417	0.050	0.213	0.392	0.976
48	1.756	0.929	0.094	5.412	0.049	0.216	0.411	0.979
49	1.737	1.073	0.096	5.590	0.040	0.207	0.401	0.961
50	1.746	0.981	0.090	5.623	0.047	0.219	0.412	0.971
51	1.748	0.758	0.093	5.875	0.046	0.215	0.410	0.968

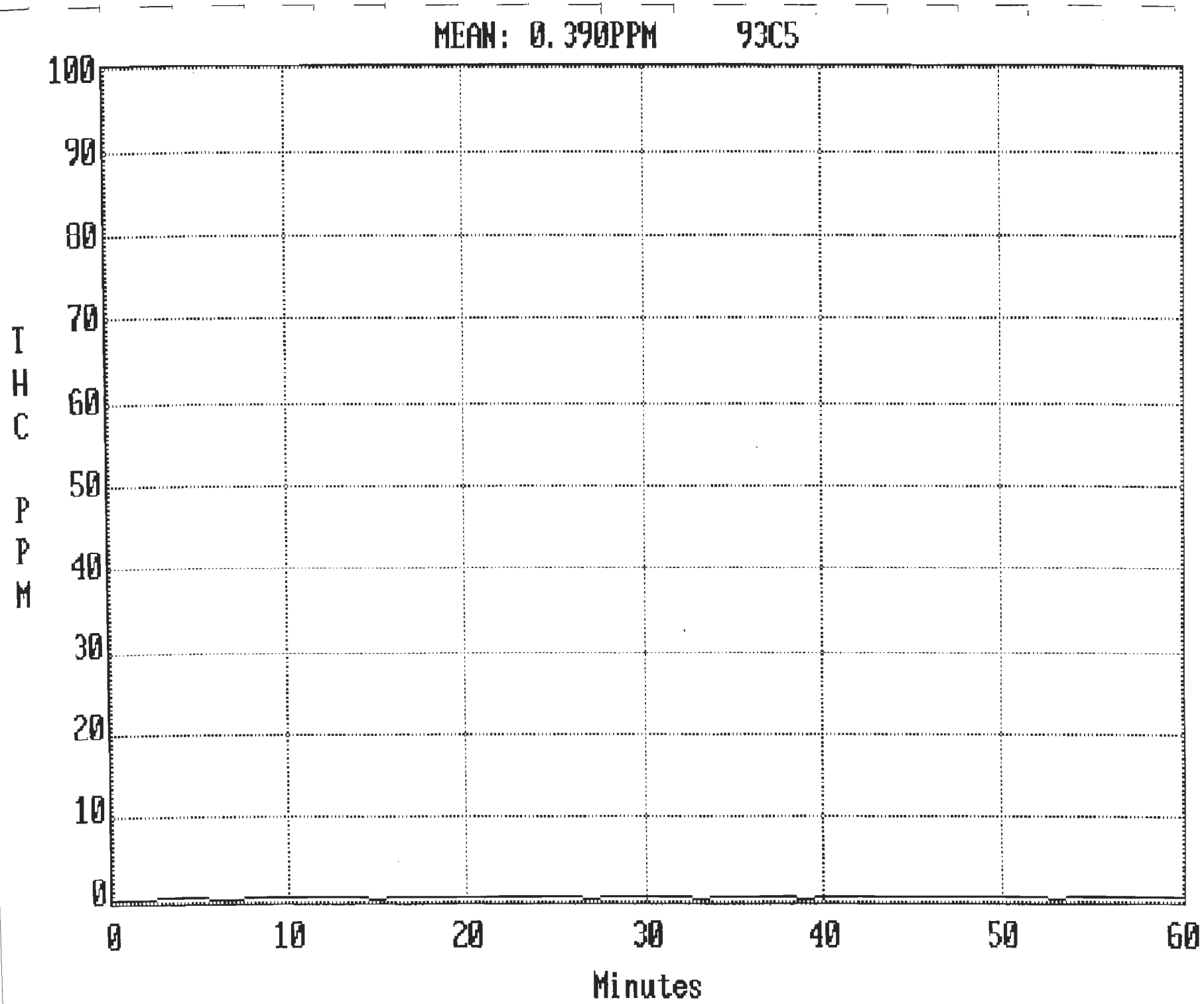
52	1.760	0.765	0.100	6.114	0.046	0.209	0.421	0.966
53	1.772	0.863	0.094	6.071	0.033	0.209	0.417	0.979
54	1.789	0.725	0.096	6.133	0.046	0.209	0.443	0.980
55	1.783	0.550	0.091	6.349	0.042	0.213	0.444	0.983
56	1.764	0.849	0.096	6.380	0.039	0.212	0.438	0.981
57	1.737	0.789	0.088	6.369	0.042	0.213	0.433	0.977
58	1.756	0.713	0.092	6.368	0.041	0.205	0.436	0.977
59	1.772	0.903	0.098	6.309	0.047	0.204	0.419	0.978
60	1.773	1.128	0.106	6.134	0.048	0.202	0.439	0.990
MEAN	1.770	0.876	0.098	5.786	0.039	0.210	0.431	1.093
END TIME:	12:49:59							
FULLSPAN	95.500	62.900	21.000	207.000	87.500	20.900	0.000	0.000
SPAN VDC	9.561	6.292	0.840	8.267	8.750	0.815	0.000	0.000
MID SPAN	52.200	32.900	12.200	93.900	53.400	11.500	0.000	0.000
MID VDC	5.068	3.267	0.469	3.672	5.344	0.457	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.054	0.000	0.000	0.000	0.000	0.000	0.000	0.000


MEAN: 17.780PPM 93C5
100
90
80
70
60
50
40
30
20
10
0
NOX PPM
0
10
20
30
40
50
60
Minutes


MEAN: 8.757PPM 93C5
100
90
80
70
60
50
40
30
20
10
0
C
O
P
P
M
0
10
20
30
40
50
60
Minutes


MEAN: 2.450%
93C5
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
O
2
%
0
10
20
30
40
50
60
Minutes


MEAN: 144.877PPM 93C5
250
225
200
175
150
125
100
75
50
25
0
SO2 PPM
0
10
20
30
40
50
60
Minutes


MEAN: 0.390PPM 93C5
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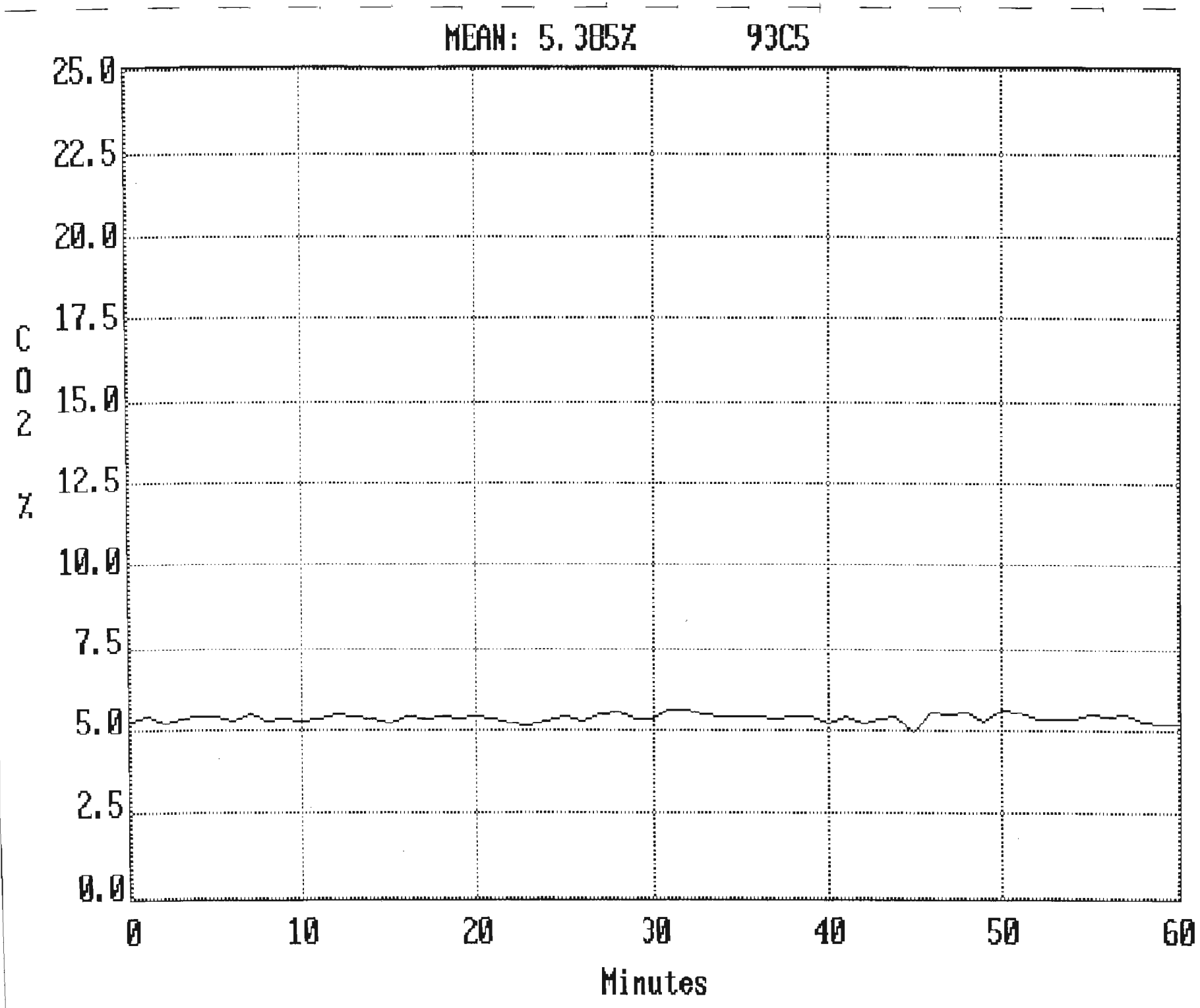
90
80
70
60
50
40
30
20
10
0
THC PPM
0
10
20
30
40
50
60
Minutes


MEAN: 5.385%
93C5
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-1593	Field Data	Vel/Moist	Barometer No.	CET I	Barometric Pressure, P_B	29.22		
Date	7-18-96	Run No.	C6	Pitot Tube No.	1	Ambient Temp., °F	103		
Customer	Total Petroleum, Inc.	Time of Run, T_R	60 min.	Pitot Tube, C_P	0.772	Stack Pressure, P_S	-0.33	in. H_2O =	29.20 in. Hg
Unit	Ardmore SRU	Sample Box No.	1	Nozzle No.	NA	Initial Leak @	15.0	in. Hg =	0.000 cfm
Operator	LKS/RAS	Meter Box No.	CM #1	Nozzle Dia., D_N	NA in.	Final Leak @	11.0	in. Hg =	0.000 cfm
File Name	1593C6.WK1	Stack Area, A_S	769.67 in^2	Assumed %M	(default only)	Purge To:		Time:	

Point	Clock Time	Dry Gas Meter, CF	Pitot "H_2O ΔP_S	Orifice ΔH P_M in. H_2O Desired	Orifice ΔH P_M in. H_2O Actual	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	Remarks
A 12	1335	855.230	0.17	1.00	1.00	10.0	1084	NA	NA	67	87	86	
11	1340	858.400	0.22	1.00	1.00	10.0	1095	NA	NA	68	88	86	
10	1345	861.610	0.28	1.00	1.00	10.0	1114	NA	NA	66	89	86	
9	1350	864.700	0.29	1.00	1.00	10.0	1123	NA	NA	64	90	86	
8	1355	867.940	0.31	1.00	1.00	10.0	1125	NA	NA	63	90	86	
7	1400	871.140	0.30	1.00	1.00	10.0	1131	NA	NA	62	91	86	
6	1405	874.300	0.28	1.00	1.00	10.0	1120	NA	NA	62	91	86	
5	1410	877.570	0.24	1.00	1.00	10.0	1104	NA	NA	62	93	87	
4	1415	880.670	0.21	1.00	1.00	10.0	1087	NA	NA	62	93	87	
3	1420	883.850	0.16	1.00	1.00	10.0	1045	NA	NA	62	93	87	
2	1425	887.030	0.12	1.00	1.00	10.0	1001	NA	NA	62	93	88	
1	1430	890.200	0.06	1.00	1.00	10.0	968	NA	NA	62	94	88	
12 END	1435	893.393	0.16				1074						
11			0.24				1102						
10			0.28				1112						
9			0.29				1116						
8			0.32				1127						
7			0.33				1131						
6			0.31				1129						
5			0.28				1124						
		Avg ΔP_S	0.230	Avg P_M	1.000	Avg T_S	1092				Avg T_M	89	
		Avg($\Delta P_S^{1/2}$)	0.471		Max Vacuum	10.0							

Volume DGM 38.163 ,CF x C_F 1.017 =V_M 38.812 SCF

Impinger No.	(1)	(2)	(3)	(4)	(5)	(6)	Total
Final Wt, gm	805.2	604.2	526.8	802.2			2738.4
Initial Wt, gm	694.8	595.7	524.6	797.9			2613.0
Difference, gm	110.4	8.5	2.2	4.3			125.4 = V_W

$V_{M\,std} = 17.64\, V_M\, [(P_B + (P_M / 13.6)) / T_M]$	36.531	SCF
$Q_{M\,std} = V_{Mstd} / T_R$	0.609	SCFM
$V_{Wgas} = 0.04715 \times V_W$	5.913	SCF
$\%M = V_{W\,gas} / (V_{M\,std} + V_{W\,gas}) \times 100$	13.931	%
$M_D = (100 - \%M) / 100$	0.8607	dry fract.
$MW_D = (\%\,CO_2 \times 0.44) + (\%\,O_2 \times 0.32) + (\%\,N_2 \times 0.28)$	28.996	lb/lbmole
$MW = M_D \times MW_D + 18\,(1 - M_D)$	27.464	lb/lbmole
$V_S = 5129.4 \times C_p\, (T_S / (P_S \times MW))^{1/2} \times Avg(\Delta P_S^{1/2})$	2596.8	FPM
$Q_A = (V_S \times A_S)/144$	13880	ACFM
$Q_S = (0.1225 \times V_S \times M_D \times P_S \times A_S) / T_S$	3964	SCFM
$\%I = (1040.1 \times V_{Mstd} \times T_S) / (M_D \times P_S \times V_S \times T_R \times D_N^2)$		%

Filter No.	
Final Wt., gm	
Initial Wt., gm	
Difference, gm	
V_W (gm)	125.4000
SO_2 gm (-)	
V_W =	

RM 3 or 3A Data	
$\%CO_2$	5.607
$\%O_2$	2.462
%CO	
$\%N_2$	91.931
% Excess Air	11.243

Avg ΔP	0.230	in. H_2O
Avg($\Delta P_S^{1/2}$)	0.471	
Avg. P_M	1.000	in. H_2O
Avg. T_S	1092	°F
Avg. T_S	1552	°R
Avg.T_M	89	°F
Avg.T_M	549	°R

CETCON, Inc.

Job No. CJ-1593
Date 7-18-96
Customer Total Petroleum, Inc.
Unit Ardmore SRU

Run No. C6
File Name 1593C6.WK1
Field Data Vel/Moist
Operator LKS/RAS

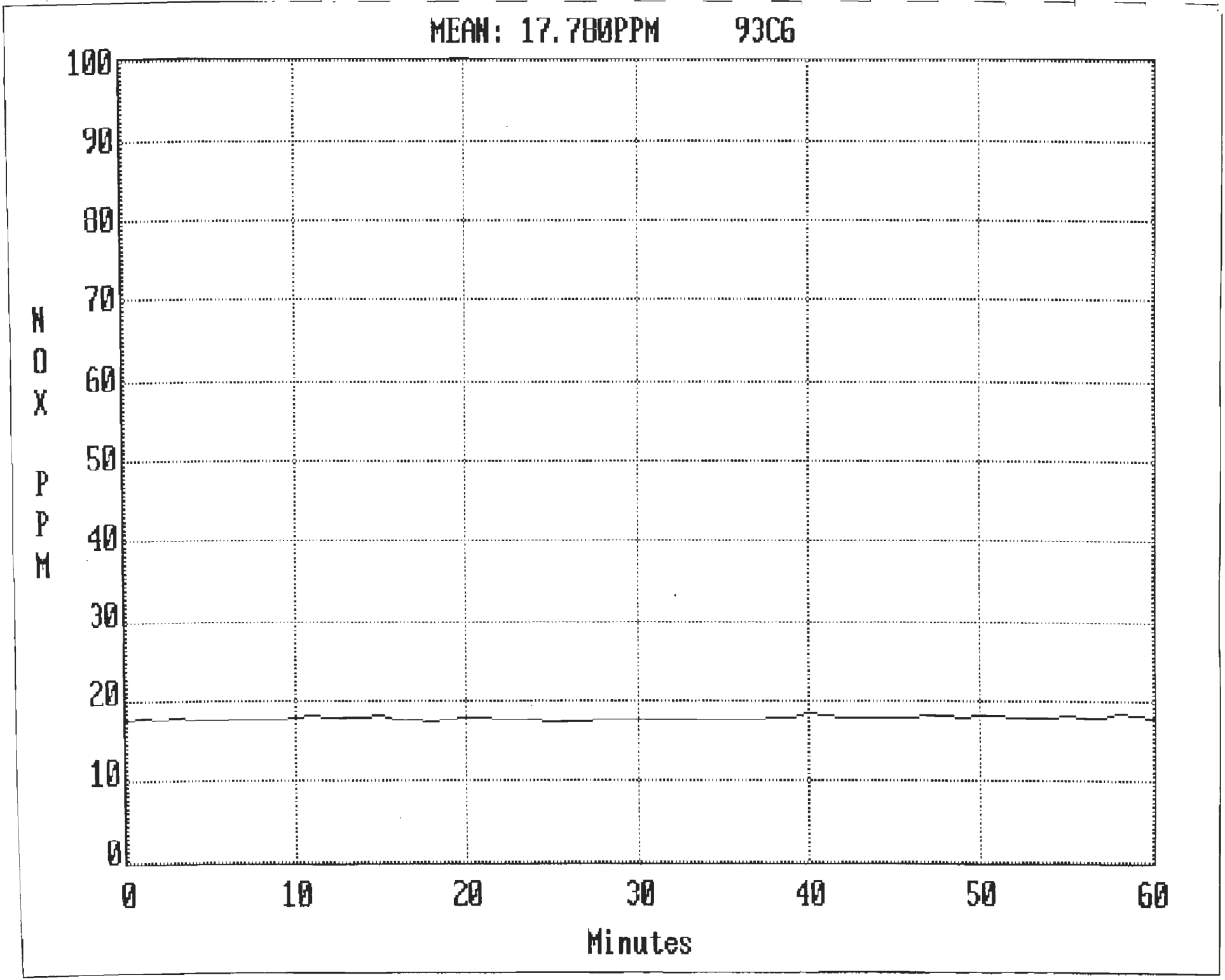
Cont. from Page 1 Point	Clock Time	Dry Gas Meter, CF	Pitot "H_2O ΔP_s	Orifice ΔH P_M in. H_2O Desired	Orifice ΔH P_M in. H_2O Actual	Vacuum In. Hg	Stack Temp. °F T_s	Probe Temp. °F	Oven Temp. °F	Effluent Temp. °F	Dry Gas Temp. °F T_M Inlet	Dry Gas Temp. °F T_M Outlet	Remarks
B 4			0.22				1103						
3			0.20				1097						
2			0.14				1072						
1			0.10				1033						

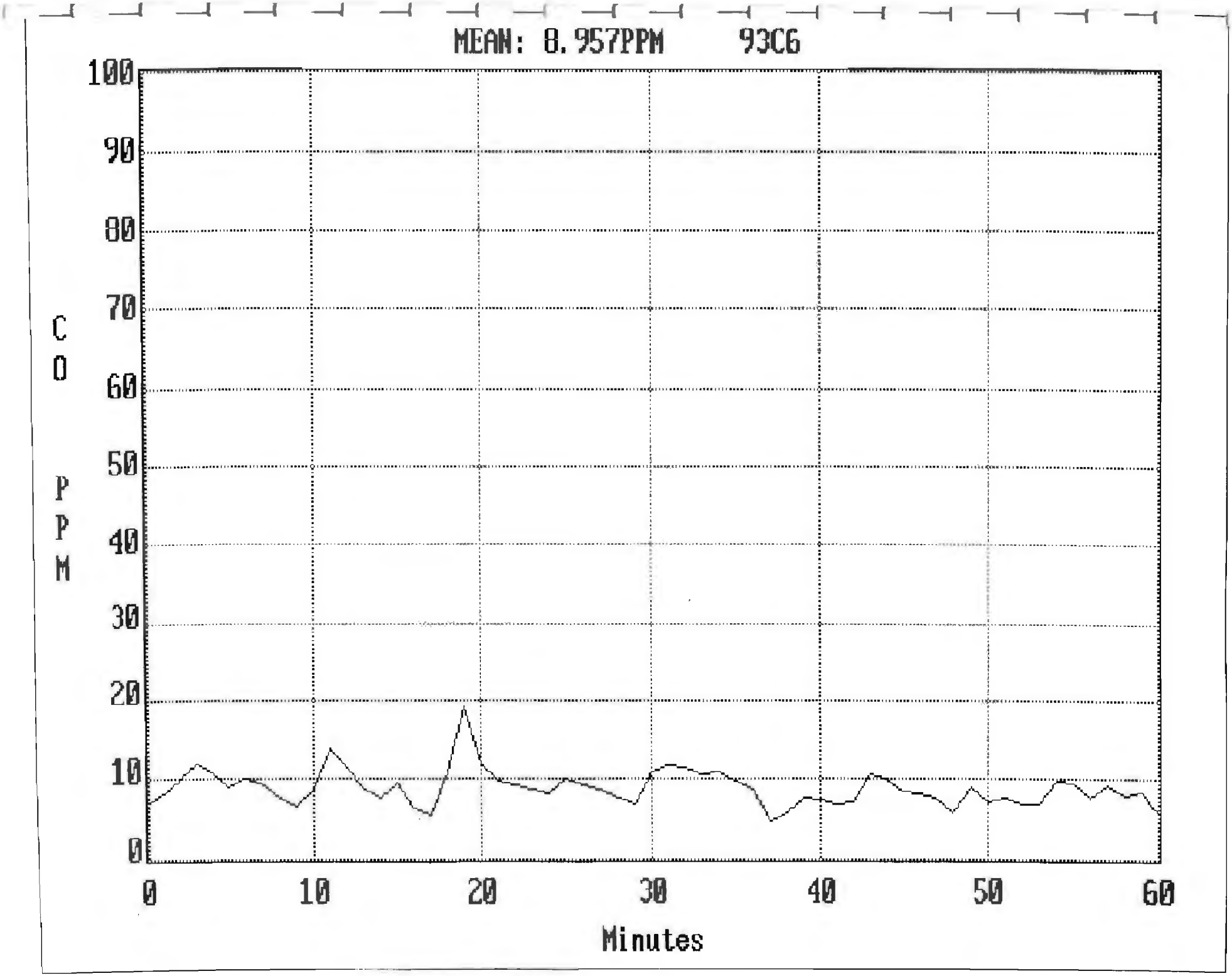
CJ-1593/SRU COMPLIANCE/C6

TEST DATE : 07-18-1996
START TIME: 13:34:57
FILE NAME : C:\DAQ\93C6 .ID%

CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
<MIN>			<ANALYZER OUTPUT-VDC>					
0	1.750	0.720	0.098	5.896	0.044	0.227	0.872	6.101
1	1.773	0.815	0.092	5.847	0.047	0.216	0.500	2.114
2	1.751	1.021	0.098	5.648	0.040	0.212	0.374	1.106
3	1.767	1.198	0.101	5.545	0.047	0.212	0.378	1.028
4	1.764	1.084	0.094	5.735	0.049	0.211	0.402	1.016
5	1.751	0.909	0.095	5.936	0.051	0.219	0.409	1.005
6	1.763	1.009	0.102	5.938	0.060	0.219	0.400	1.005
7	1.755	0.946	0.098	5.955	0.058	0.208	0.405	0.996
8	1.755	0.771	0.091	6.059	0.058	0.223	0.404	1.003
9	1.764	0.653	0.091	5.945	0.060	0.216	0.396	1.006
10	1.775	0.866	0.103	5.745	0.063	0.216	0.396	1.003
11	1.794	1.383	0.107	5.540	0.061	0.216	0.387	1.012
12	1.766	1.132	0.103	5.655	0.060	0.221	0.391	1.011
13	1.769	0.890	0.097	5.981	0.060	0.221	0.400	1.008
14	1.781	0.779	0.100	6.265	0.062	0.213	0.408	1.002
15	1.800	0.964	0.098	6.029	0.059	0.214	0.413	1.017
16	1.742	0.648	0.090	6.077	0.055	0.224	0.396	0.996
17	1.756	0.564	0.094	6.200	0.059	0.221	0.397	0.991
18	1.720	1.090	0.098	5.854	0.063	0.212	0.396	0.988
19	1.754	1.917	0.107	5.438	0.056	0.214	0.393	1.000
20	1.768	1.190	0.099	5.641	0.059	0.218	0.399	1.001
21	1.772	0.988	0.106	5.912	0.065	0.221	0.396	1.010
22	1.754	0.918	0.090	6.103	0.059	0.216	0.403	1.003
23	1.757	0.882	0.103	6.082	0.062	0.212	0.400	0.997
24	1.752	0.826	0.100	6.042	0.053	0.212	0.393	0.997
25	1.731	0.999	0.103	5.933	0.061	0.217	0.398	0.986
26	1.727	0.919	0.100	6.013	0.063	0.213	0.396	0.976
27	1.739	0.889	0.100	6.161	0.060	0.214	0.400	0.994
28	1.763	0.781	0.094	6.092	0.054	0.226	0.391	0.996
29	1.749	0.702	0.098	5.979	0.066	0.218	0.398	0.994
30	1.742	1.082	0.101	5.588	0.067	0.218	0.389	0.988
31	1.741	1.184	0.100	5.530	0.058	0.221	0.384	0.990
32	1.742	1.158	0.103	5.588	0.065	0.215	0.390	0.980
33	1.758	1.067	0.106	5.710	0.070	0.220	0.391	0.997
34	1.754	1.092	0.110	5.916	0.071	0.216	0.399	0.987
35	1.759	0.994	0.106	6.023	0.068	0.210	0.396	0.990
36	1.753	0.881	0.092	6.038	0.066	0.223	0.405	0.996
37	1.763	0.485	0.090	6.293	0.061	0.218	0.400	0.999
38	1.771	0.591	0.099	6.357	0.073	0.221	0.412	1.001
39	1.787	0.761	0.095	6.268	0.069	0.215	0.400	1.016
40	1.821	0.741	0.105	5.976	0.062	0.216	0.390	1.023
41	1.796	0.702	0.100	5.661	0.055	0.210	0.378	1.021
42	1.790	0.722	0.094	5.425	0.068	0.217	0.371	1.014
43	1.779	1.065	0.104	5.366	0.063	0.222	0.368	1.010
44	1.790	1.006	0.096	5.694	0.063	0.212	0.392	1.013
45	1.791	0.859	0.095	6.135	0.066	0.212	0.401	1.011
46	1.776	0.824	0.091	6.420	0.062	0.216	0.407	1.012
47	1.793	0.781	0.100	6.519	0.065	0.221	0.409	1.015
48	1.806	0.572	0.095	6.727	0.063	0.215	0.400	1.021
49	1.790	0.893	0.098	6.379	0.068	0.218	0.474	1.033
50	1.809	0.717	0.105	6.204	0.058	0.215	0.413	1.035
51	1.800	0.776	0.101	5.770	0.068	0.219	0.384	1.014

52	1.785	0.684	0.088	5.671	0.067	0.218	0.374	1.020
53	1.777	0.699	0.091	5.802	0.069	0.220	0.410	1.021
54	1.788	0.979	0.103	5.754	0.068	0.203	0.365	1.012
55	1.794	0.960	0.098	5.664	0.069	0.212	0.387	1.014
56	1.785	0.776	0.100	5.917	0.072	0.221	0.392	1.007
57	1.784	0.920	0.097	6.088	0.063	0.212	0.369	1.015
58	1.826	0.799	0.099	6.176	0.067	0.214	0.386	1.025
59	1.794	0.841	0.094	6.123	0.071	0.214	0.395	1.016
60	1.780	0.584	0.090	6.359	0.059	0.206	0.402	1.005
MEAN	1.770	0.896	0.098	5.941	0.061	0.216	0.405	1.109
END TIME:	14:34:57							
FULLSPAN	95.500	62.900	21.000	207.000	87.500	20.900	0.000	0.000
SPAN VDC	9.561	6.292	0.840	8.267	8.750	0.815	0.000	0.000
MID SPAN	52.200	32.900	12.200	93.900	53.400	11.500	0.000	0.000
MID VDC	5.068	3.267	0.469	3.672	5.344	0.457	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.054	0.000	0.000	0.000	0.000	0.000	0.000	0.000


MEAN: 17.780PPM 93C6
100
90
80
70
60
50
40
30
20
10
0
NOX PPM
0
10
20
30
40
50
60
Minutes


MEAN: 8.957PPM 93C6
100
90
80
70
60
50
40
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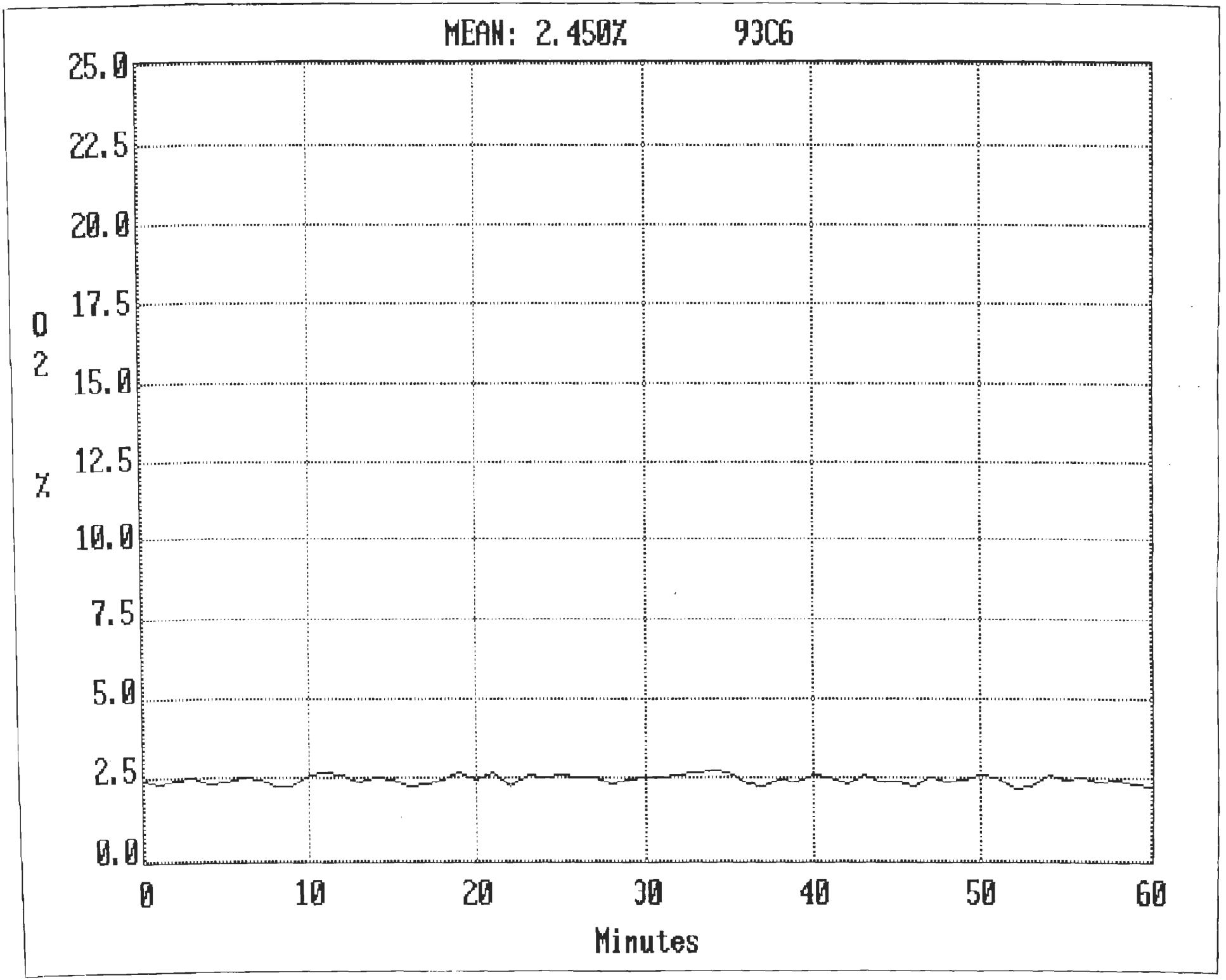
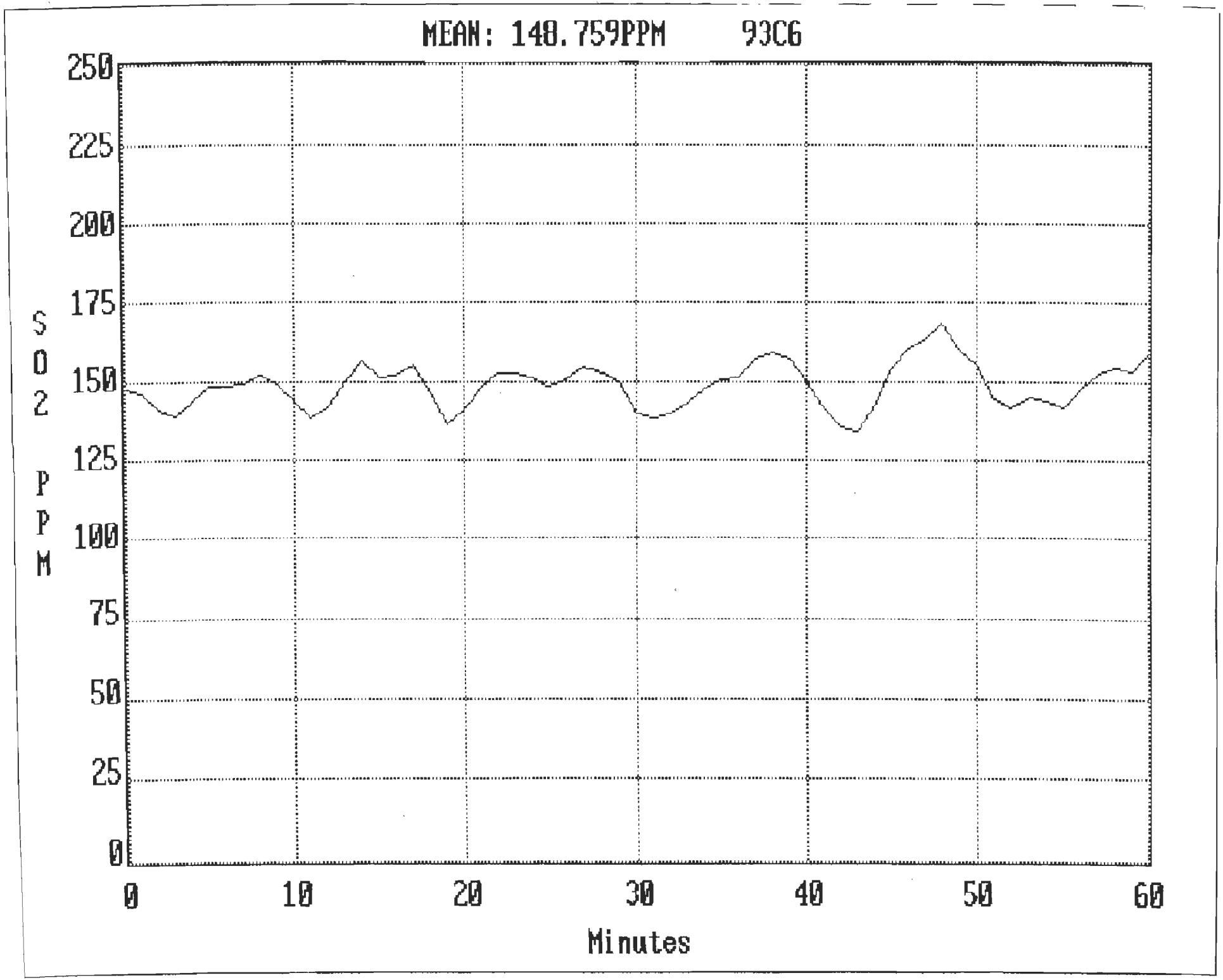
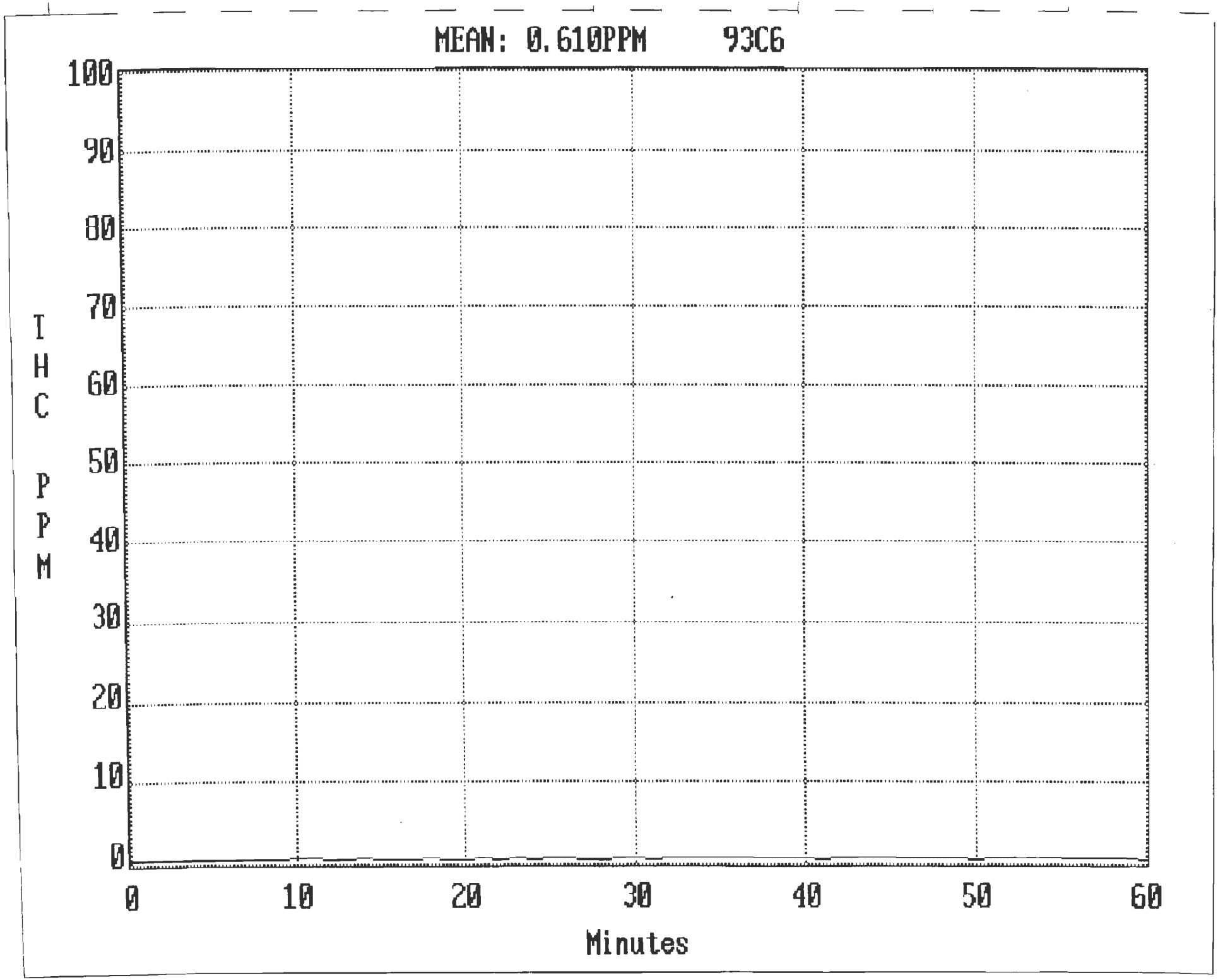
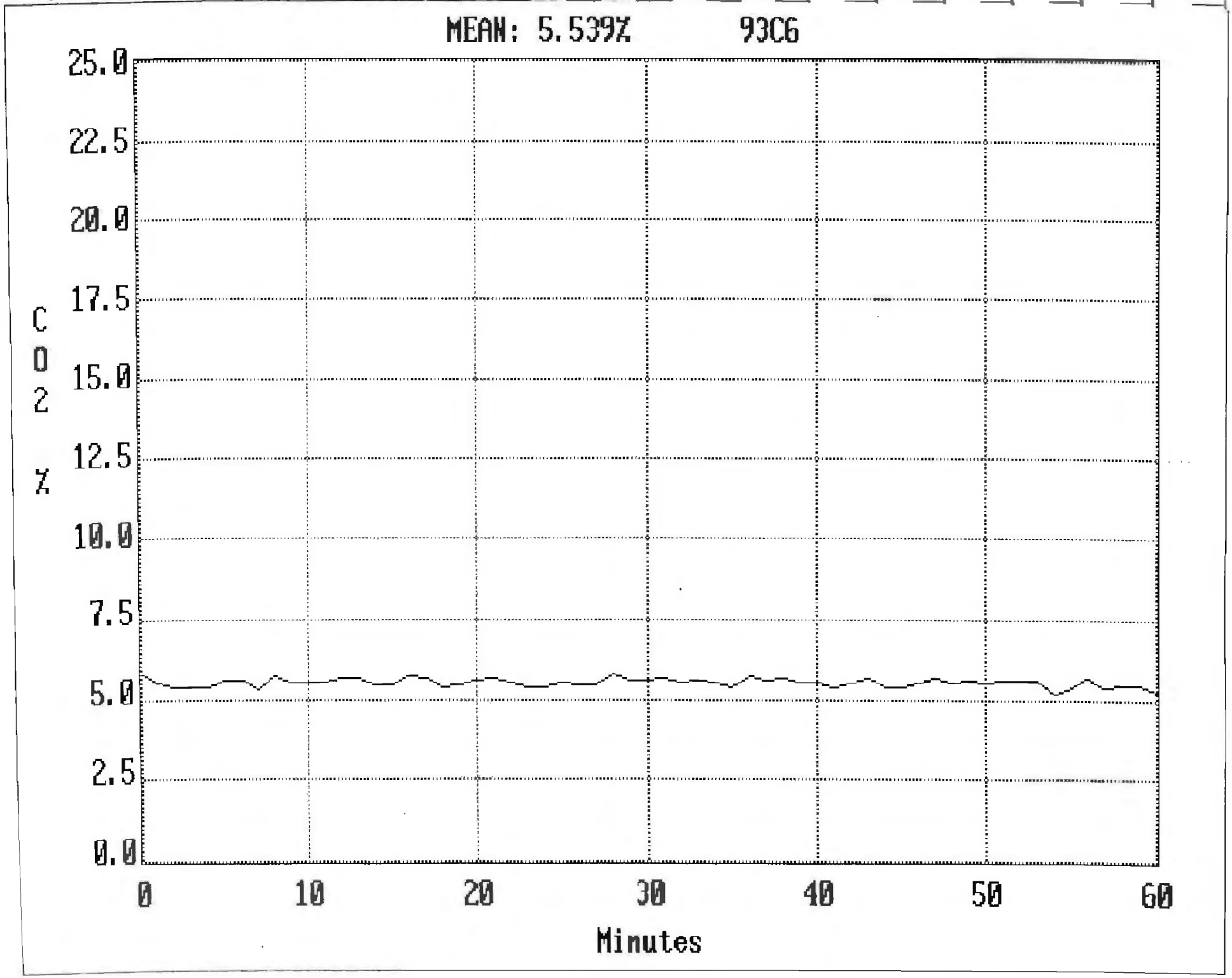
20
10
0
C
O
P
P
M
0
10
20
30
40
50
60
Minutes


MEAN: 2.450%
93C6
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
O
2
%
0
10
20
30
40
50
60
Minutes


MEAN: 148.759PPM 93C6
250
225
200
175
150
125
100
75
50
25
0
SO2 PPM
0
10
20
30
40
50
60
Minutes


MEAN: 0.610PPM 93C6
100
90
80
70
60
50
40
30
20
10
0
THC PPM
0
10
20
30
40
50
60
Minutes


MEAN: 5.539%
93C6
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
C
O
2
%
0
10
20
30
40
50
60
Minutes

APPENDIX D

Calibration Data

CETCON

Date:	7–18–96
Plant:	Total Petroleum, Inc.
Unit:	Armore SRU
Operator:	LKS
Job No.:	CJ–1593

CETCON, Inc.

ANALYZER CALIBRATION ERROR AND SYSTEM BIAS DATA

Cal No.	C4
Test Numbers:	
NO_x:	C4–C6
CO:	C4–C6
O_2:	C4–C6
CO_2:	C4–C6
SO_2:	C4–C6
THC:	C4–C6

Analyzer: NO_x	Span:	100	=	10	High Span:	95.50	Cyl. No.:	CC–34532
Serial No.: 30759–238	Units:	ppm	=	VDC	Mid Span:	52.20	Cyl. No.:	CC–34731

Calibration Error	Zero	Error, %	Mid	Error, %	High	Error, %		
Analyzer Response:	0.5	0.5	50.9	–1.3	95.5	0.0		
System Bias	Zero	Bias, %	Mid	Bias, %	95% Response Time:		Upscale	Downscale
System Response:	0.9	0.4	50.3	–0.6	Minutes:		0:40	0:45

Analyzer: CO	Span:	100	=	10	High Span:	62.90	Cyl. No.:	CC–22650
Serial No.: 30892–239	Units:	ppm	=	VDC	Mid Span:	32.90	Cyl. No.:	CC–92141

Calibration Error	Zero	Error, %	Mid	Error, %	High	Error, %		
Analyzer Response:	0.1	0.1	32.9	0.0	63.0	0.1		
System Bias	Zero	Bias, %	Mid	Bias, %	95% Response Time:		Upscale	Downscale
System Response:	0.5	0.4	32.6	–0.3	Minutes:		1:15	1:20

Analyzer: O_2	Span:	25	=	1	High Span:	21.00	Cyl. No.:	CC–35704
Serial No.: 1420B/272	Units:	%	=	VDC	Mid Span:	12.20	Cyl. No.:	CC–54162

Calibration Error	Zero	Error, %	Mid	Error, %	High	Error, %		
Analyzer Response:	0.01	0.0	12.02	–0.7	21.37	1.5		
System Bias	Zero	Bias, %	Mid	Bias, %	95% Response Time:		Upscale	Downscale
System Response:	0.05	0.2	11.95	–0.3	Minutes:		0:50	0:45

Analyzer: CO_2	Span:	25	=	1	High Span:	20.90	Cyl. No.:	CC–35704
Serial No.: 1415B/120	Units:	%	=	VDC	Mid Span:	11.50	Cyl. No.:	CC–54162

Calibration Error	Zero	Error, %	Mid	Error, %	High	Error, %		
Analyzer Response:	0.05	0.2	11.51	0.0	20.51	–1.6		
System Bias	Zero	Bias, %	Mid	Bias, %	95% Response Time:		Upscale	Downscale
System Response:	0.06	0.0	11.45	–0.2	Minutes:		1:05	0:50

Analyzer: SO_2	Span:	250	=	10.0	High Span:	207.00	Cyl. No.:	CC–11047
Serial No.: 8196–8	Units:	%	=	VDC	Mid Span:	93.90	Cyl. No.:	CC–92135

Calibration Error	Zero	Error, %	Mid	Error, %	High	Error, %		
Analyzer Response:	0.0	0.0	92.0	–0.8	207.1	0.0		
System Bias	Zero	Bias, %	Mid	Bias, %	95% Response Time:		Upscale	Downscale
System Response:	0.2	0.1	88.5	–1.4	Minutes:		2:10	2:40

Analyzer: THC	Span:	100	=	10	High Span:	87.50	Cyl. No.:	CC–35253
Serial No.: 556493	Units:	ppm	=	VDC	Mid Span:	53.40	Cyl. No.:	CC–100404
					Low Span:	24.90	Cyl. No.:	CC–43358

Calibration Error	Zero	Error, %	Low	Error, %	Mid	Error, %	High	Error, %
System Response:	0.0	0.0	25.5	2.4	53.6	0.4	87.6	0.1
					95% Response Time:		Upscale	Downscale
					Minutes:		0:55	0:20

Calibration Error Test

CEDAQ- CALIBRATION TABLE

DATE:07-18-1996
TIME:09:10:20
FILE:C:\DAQ\93C4 .CAL

CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
FULLSPAN	95.500	62.900	21.000	207.000	87.500	20.900	0.000	0.000
SPAN VDC	9.561	6.292	0.840	8.267	8.750	0.815	0.000	0.000
% CHANGE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MID SPAN	52.200	32.900	12.200	93.900	53.400	11.500	0.000	0.000
SPAN VDC	5.068	3.267	0.469	3.672	5.344	0.457	0.000	0.000
% CHANGE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.054	0.000	0.000	0.000	0.000	0.000	0.000	0.000
% CHANGE	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

U.S. SPECIALTY GAS SERVICES, INC.
4301 E. PINE PLACE ● TULSA, OKLAHOMA 74115-4148 ● 918/832-8774

DATE: APRIL 3, 1996

CUSTOMER: CETCON, INC.
P.O. BOX 702800
TULSA, OK 74170

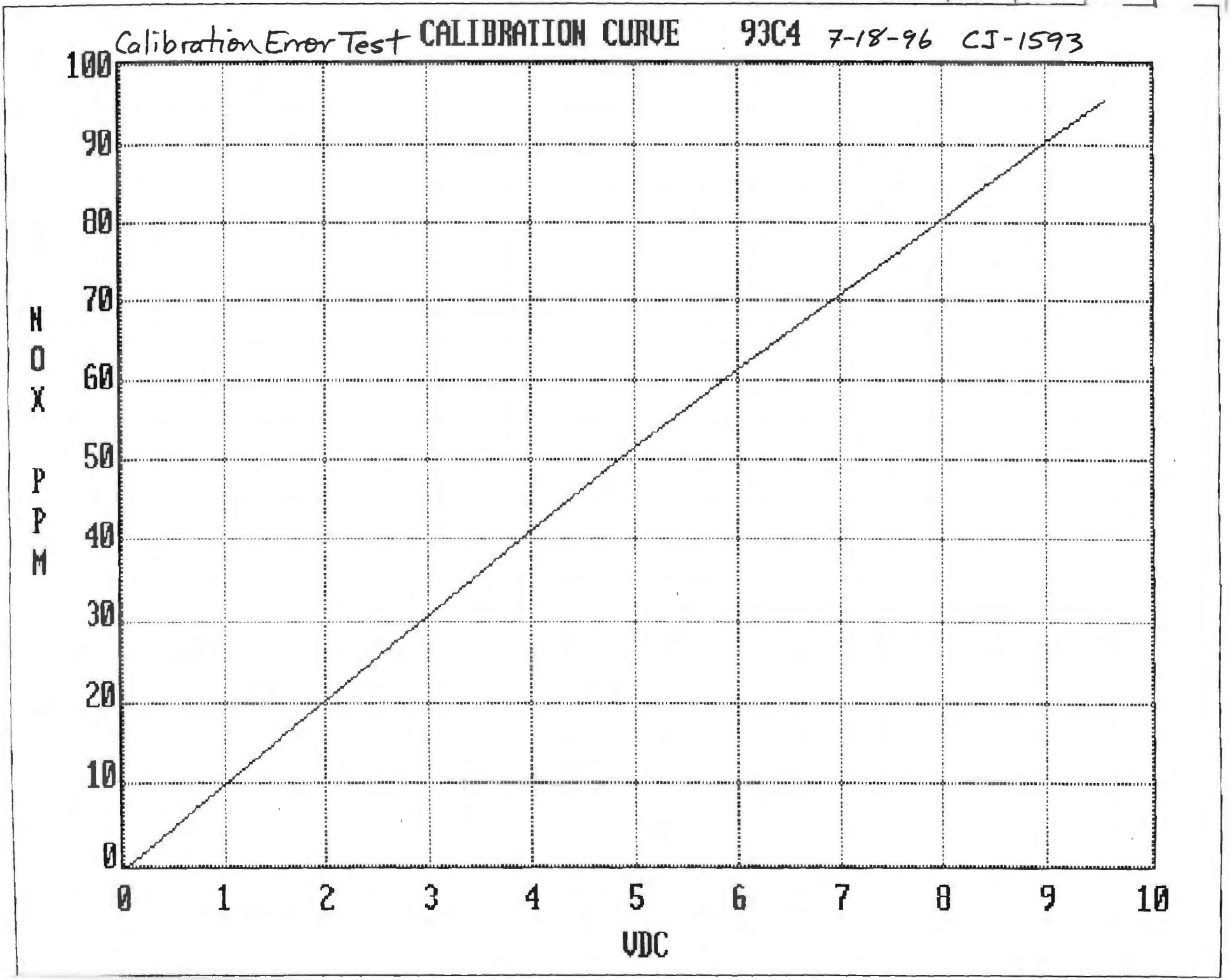
CERTIFICATE OF ANALYSIS

PRODUCT: NITROGEN, INDUSTRIAL **MIN. PURITY:** 99.9%

TYPICAL ANALYSIS:

SERIAL # 3-1587

SIGNED: J. Babaridge


Calibration Error Test
CALIBRATION CURVE
93C4 7-18-96 CJ-1593
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

AGA

AGA Gas, Inc.

Specialty & Medical Gases Division

CERTIFICATE OF ANALYSIS

EPA PROTOCOL

PERFORMED ACCORDING TO SECTION 2.2, PROCEDURE G1

Production Number: 12951489
Cylinder Number: CC34731
Cylinder Pressure: 2000 psig

NOTICE, THIS CYLINDER IS NOT TO BE USED WHEN PRESSURE IS UNDER 150 psig

Certified Component	Certified Concentration	Date of Certification	Analytical Method
Nitric Oxide	52.2 ± 0.5 ppm	2/12/96	Chemiluminescence

Expiration Date: 2/12/98
Balance Gas: Nitrogen

REFERENCE STANDARD DATA:

SRM Number	Cylinder Number	Concentration
GMIS	CC328	49.21 ppm Nitric Oxide

CERTIFIED AT:

AGA Gas inc.
Specialty & Medical Gas Division
6421 Monclova Road
Maumee, Ohio 43537

Michael Sickmiller
Quality Control Supervisor

AGA

AGA Gas, Inc.

Specialty & Medical Gases Division

CERTIFICATE OF ANALYSIS

EPA PROTOCOL

PERFORMED ACCORDING TO SECTION 2.2, PROCEDURE G1

Production Number: 10950016
Cylinder Number: CC34532
Cylinder Pressure: 2000 psi

NOTICE, THIS CYLINDER IS NOT TO BE USED WHEN PRESSURE IS UNDER 150 psig

Certified Component	Certified Concentration	Date of Certification	Analytical Method
Nitric Oxide	95.5 ± 0.9 ppm	10/23/95	Chemiluminescence

Expiration Date: 10/23/97
Balance Gas: Nitrogen

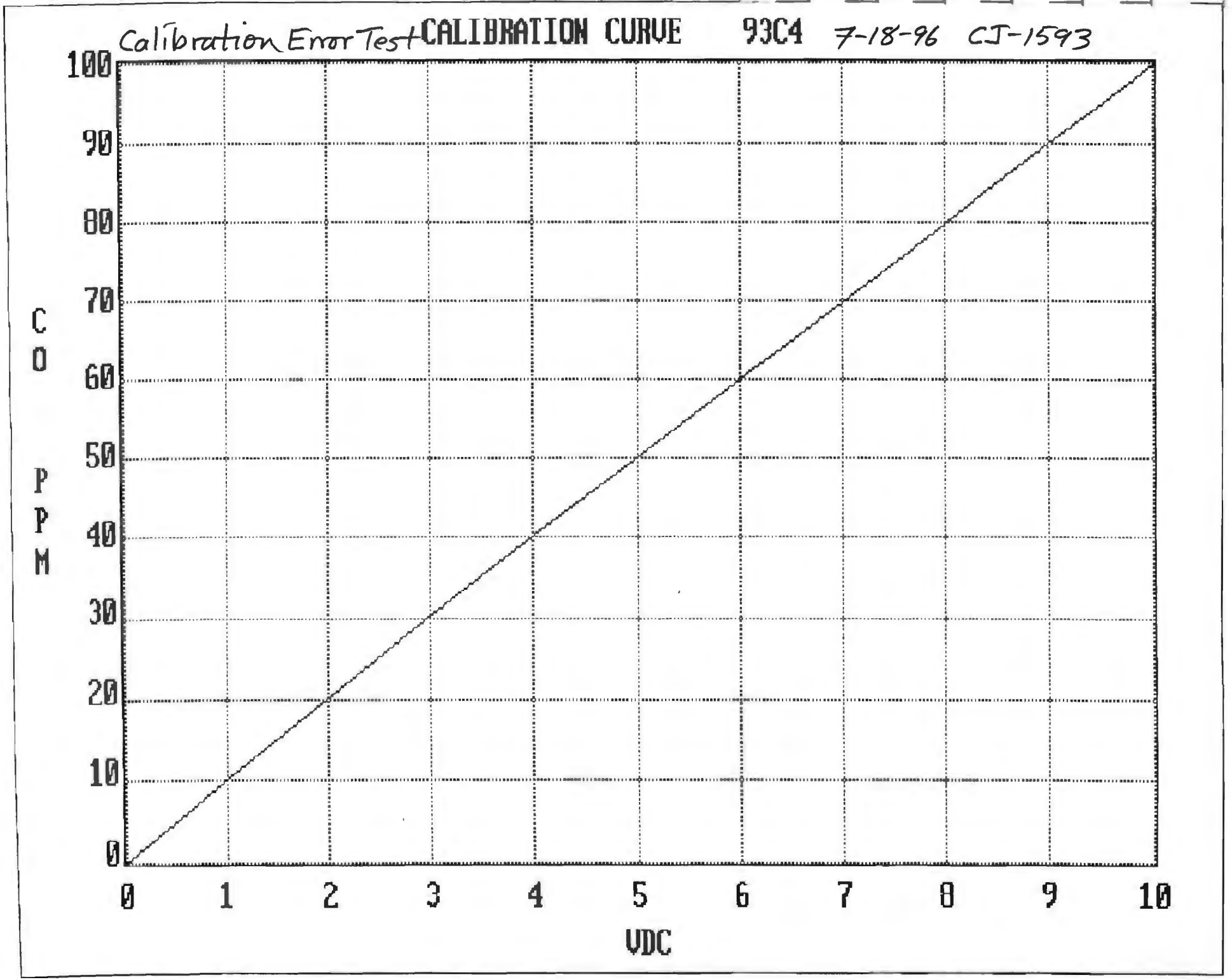
REFERENCE STANDARD DATA:

SRM Number	Cylinder Number	Concentration
GMIS	CC10245	98.79 ppm Nitric Oxide

CERTIFIED AT:

AGA Gas inc.
Specialty & Medical Gas Division
6421 Monclova Road
Maumee, Ohio 43537

Michael Sickmiller
Quality Control Supervisor


Calibration Error Test
CALIBRATION CURVE 93C4 7-18-96 CJ-1593
100
90
80
70
60
50
40
30
20
10
0
C
O
P
P
M
0
1
2
3
4
5
6
7
8
9
10
VDC

CETCON I

AGA

AGA Gas, Inc.

Specialty & Medical Gases Division

CERTIFICATE OF ANALYSIS

EPA PROTOCOL

PERFORMED ACCORDING TO SECTION 2.2, PROCEDURE G1

Production Number: 10941416
Cylinder Number: CC92141
Cylinder Pressure: 2000 psi

NOTICE, THIS CYLINDER IS NOT TO BE USED WHEN PRESSURE IS UNDER 150 psig

Certified Component	Certified Concentration	Date of Certification	Analytical Method
Carbon Monoxide	82.9 ± 0.3 ppm	11/21/94	Non-Dispersive Infared

Expiration Date: 11/21/97
Balance Gas: Nitrogen

REFERENCE STANDARD DATA:

SRM Number	Cylinder Number	Concentration
GMIS	CC41041	48.29 ppm Carbon Monoxide

CERTIFIED AT:

AGA Gas inc.
Specialty & Medical Gas Division
6421 Monclova Road
Maumee, Ohio 43537

Michael Sickmiller
Quality Control Supervisor

AGA

AGA Gas, Inc.

Specialty & Medical Gases Division

CERTIFICATE OF ANALYSIS

EPA PROTOCOL

PERFORMED ACCORDING TO SECTION 2.2, PROCEDURE G1

Production Number: 10951654
Cylinder Number: CC22650
Cylinder Pressure: 2000 psig

NOTICE, THIS CYLINDER IS NOT TO BE USED WHEN PRESSURE IS UNDER 150 psig

Certified Component	Certified Concentration	Date of Certification	Analytical Method
Carbon Monoxide	62.9 ± 0.6 ppm	11/22/95	Non-Dispersive Infrared

Expiration Date: 11/22/98
Balance Gas: Nitrogen

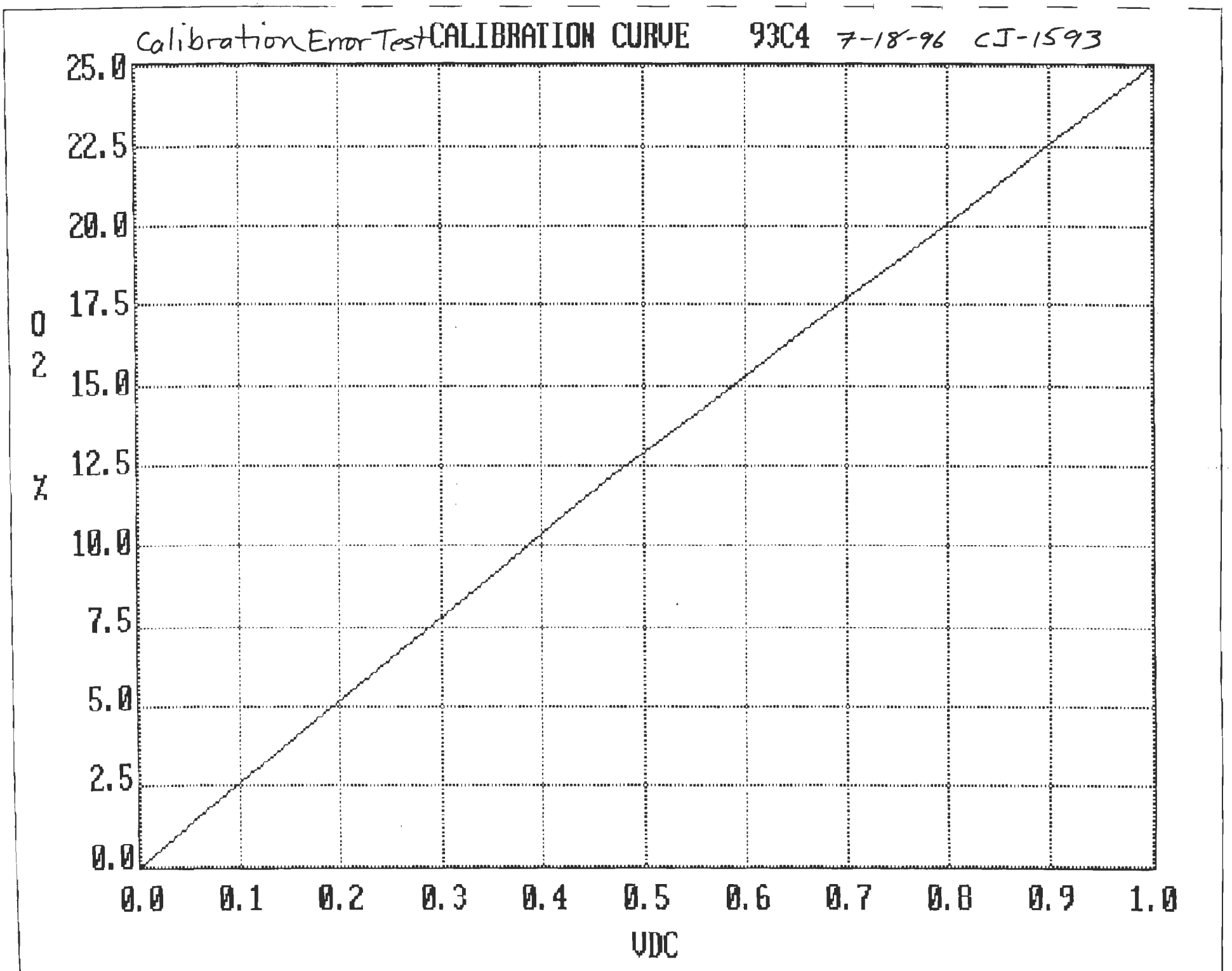
REFERENCE STANDARD DATA:

SRM Number	Cylinder Number	Concentration
GMIS	CC4047	100.7 ppm Carbon Monoxide

CERTIFIED AT:

AGA Gas inc.
Specialty & Medical Gas Division
6421 Monclova Road
Maumee, Ohio 43537

Michael Sickmiller
Quality Control Supervisor


Calibration Error Test CALIBRATION CURVE 93C4 7-18-96 CJ-1593
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
O2 %
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
VDC

U.S. SPECIALTY GAS SERVICES, INC.
4301 E. PINE PLACE • TULSA, OKLAHOMA 74115-4148 • 918/832-8774

DATE: JUNE 6, 1996

CUSTOMER: CETCON, INC.
P.O. BOX 702800
TULSA, OK 74170

P.O. #: 5963

CERTIFICATE OF ANALYSIS

CYLINDER NUMBER	MIXTURE REQUESTED	REQUESTED COMPOSITION	CERTIFIED COMPOSITION
CC 54162	CARBON DIOXIDE	11-12.5%	11.50 % CO_2
	OXYGEN	11-12.5%	12.20 % O_2
	NITROGEN	BALANCE	BALANCE

CERTIFIED BY RM 3 (OKSAT)
ON 7/8/96

SIGNED: J. Baldwin
(AUTHORIZED SIGNATURE)

CETCON, Inc.

Cylinder # CC–54162
Range 11.0 – 12.5

GAS CYLINDER ORSAT ANALYSIS

TEST #	TIME	COMPONENTS	RUN# 1	RUN # 2	RUN # 3	AVG
1	2:00 p.m.	CO_2	11.5	11.6	11.4	11.50
		SUM	23.7	23.8	23.6	
		O_2	12.2	12.2	12.2	12.20
		N_2	76.3	76.2	76.4	76.30
2		CO_2				
		SUM				
		O_2				
		N_2				

CERTIFICATION

ORSAT ID:	CET I	DATE:	7/8/96
SERIAL #:		EXPIRATION:	1/8/96
ANALYST:	RAS / JRV	$\%O_2$:	**12.20**
SIGNATURE:		$\%CO_2$:	**11.50**

CERT I

U.S. SPECIALTY GAS SERVICES, INC.
4301 E. PINE PLACE ● TULSA, OKLAHOMA 74115-4148 ● 918/832-8774

DATE: OCTOBER 5, 1995

CUSTOMER: CETCON, INC.
P.O. BOX 702800
TULSA, OK 74170-2800

P.O. #: 10775

CERTIFICATE OF ANALYSIS

CYLINDER NUMBER	MIXTURE REQUESTED	REQUESTED COMPOSITION	CERTIFIED COMPOSITION	
CC35704	OXYGEN	20.0-22.0%	21.18%	21.0%
	CARBON DIOXIDE	20-.0-22.0%	20.58%	20.9%
	NITROGEN	BALANCE	BALANCE	

CERTIFIED BY
RM3 02-14-96
M. L. McCloskey

SIGNED: J. Baldridge
(AUTHORIZED SIGNATURE)

Plant CETCON LAB

Unit: Cylinder Audit

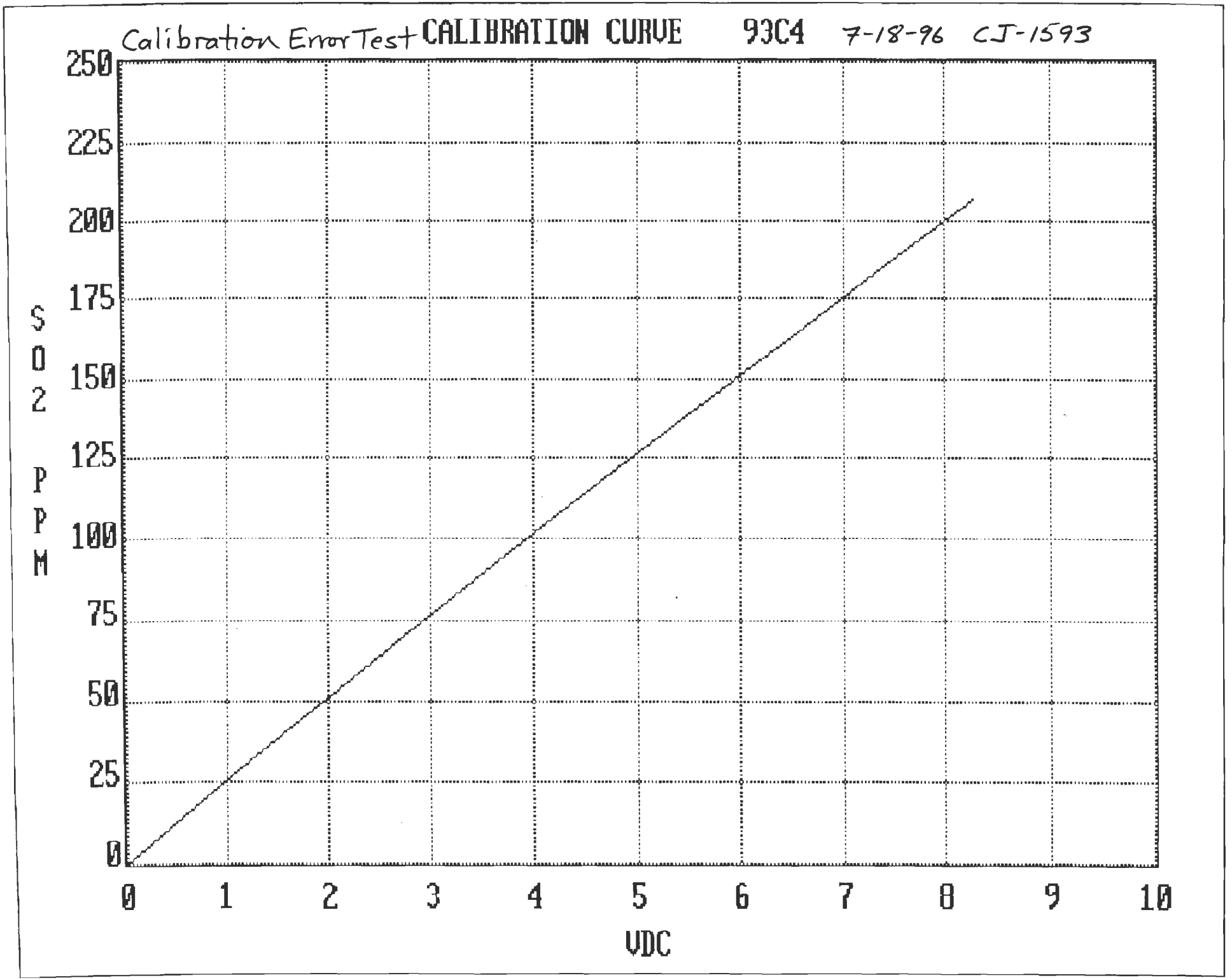
Operator: GLM

CJ– # CC35704

CETCON, Inc.

ORSAT ANALYSIS (RM–3)

TEST # or BAG #	DATE and TIME	COMPONENTS	RUN# 1	RUN # 2	RUN # 3	AVG
1	02–14–96 1100	CO_2	20.9	20.7	20.8	20.8
		SUM	41.9	41.6	41.8	
		O_2	21.0	20.9	21.0	21.0
		N_2	58.1	58.4	58.2	58.2
2	02–14–96 1110	CO_2	20.9	20.8	20.9	20.9
		SUM	41.8	41.8	41.8	
		O_2	20.9	21.0	20.9	20.9
		N_2	58.2	58.2	58.2	58.2
3	02–14–96 1120	CO_2	20.9	20.8	20.9	20.9
		SUM	41.9	41.8	41.8	
		O_2	21.0	21.0	20.9	21.0
		N_2	58.1	58.2	58.2	58.2
4		CO_2				
		SUM				
		O_2				
		N_2				
5		CO_2				
		SUM				
		O_2				
		N_2				
6		CO_2				
		SUM				
		O_2				
		N_2				
7		CO_2				
		SUM				
		O_2				
		N_2				
8		CO_2				
		SUM				
		O_2				
		N_2				
9		CO_2				
		SUM				
		O_2				
		N_2				
10		CO_2				
		SUM				
		O_2				
		N_2				
11		CO_2				
		SUM				
		O_2				
		N_2				
12		CO_2				
		SUM				
		O_2				
		N_2				


Calibration Error Test
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93C4
7-18-96
CJ-1593
250
225
200
175
150
125
100
75
50
25
0
SO2 PPM
0
1
2
3
4
5
6
7
8
9
10
VDC

CET I

AGA

AGA Gas, Inc.

Specialty & Medical Gases Division

CERTIFICATE OF ANALYSIS

EPA PROTOCOL

PERFORMED ACCORDING TO SECTION 2.2, PROCEDURE G1

Production Number: 4950464
Cylinder Number: CC92135
Cylinder Pressure: 2000 psi

NOTICE, THIS CYLINDER IS NOT TO BE USED WHEN PRESSURE IS UNDER 150 psig

Certified Component	Certified Concentration	Date of Certification	Analytical Method
Sulfur Dioxide	93.9 ± 0.9 ppm	4/25/95	Non-Dispersive Infrared

Expiration Date: 4/25/97
Balance Gas: Nitrogen

REFERENCE STANDARD DATA:

SRM Number	Cylinder Number	Concentration
GMIS	CC10245	98.79 ppm Sulfur Dioxide

CERTIFIED AT:

AGA Gas inc.
Specialty & Medical Gas Division
6421 Monclova Road
Maumee, Ohio 43537

Michael Sickmiller
Quality Control Supervisor

CGT I

AGA

AGA Gas, Inc.

Specialty & Medical Gases Division

CERTIFICATE OF ANALYSIS

EPA PROTOCOL

PERFORMED ACCORDING TO SECTION 2.2, PROCEDURE G1

Production Number: 11951061-1
Cylinder Number: CC11047
Cylinder Pressure: 2000 psig

NOTICE, THIS CYLINDER IS NOT TO BE USED WHEN PRESSURE IS UNDER 150 psig

Certified Component	Certified Concentration	Date of Certification	Analytical Method
Sulfur Dioxide	207 ± 2 ppm	12/28/95	Non-Dispersive Infrared

Expiration Date: 12/28/97
Balance Gas: Nitrogen

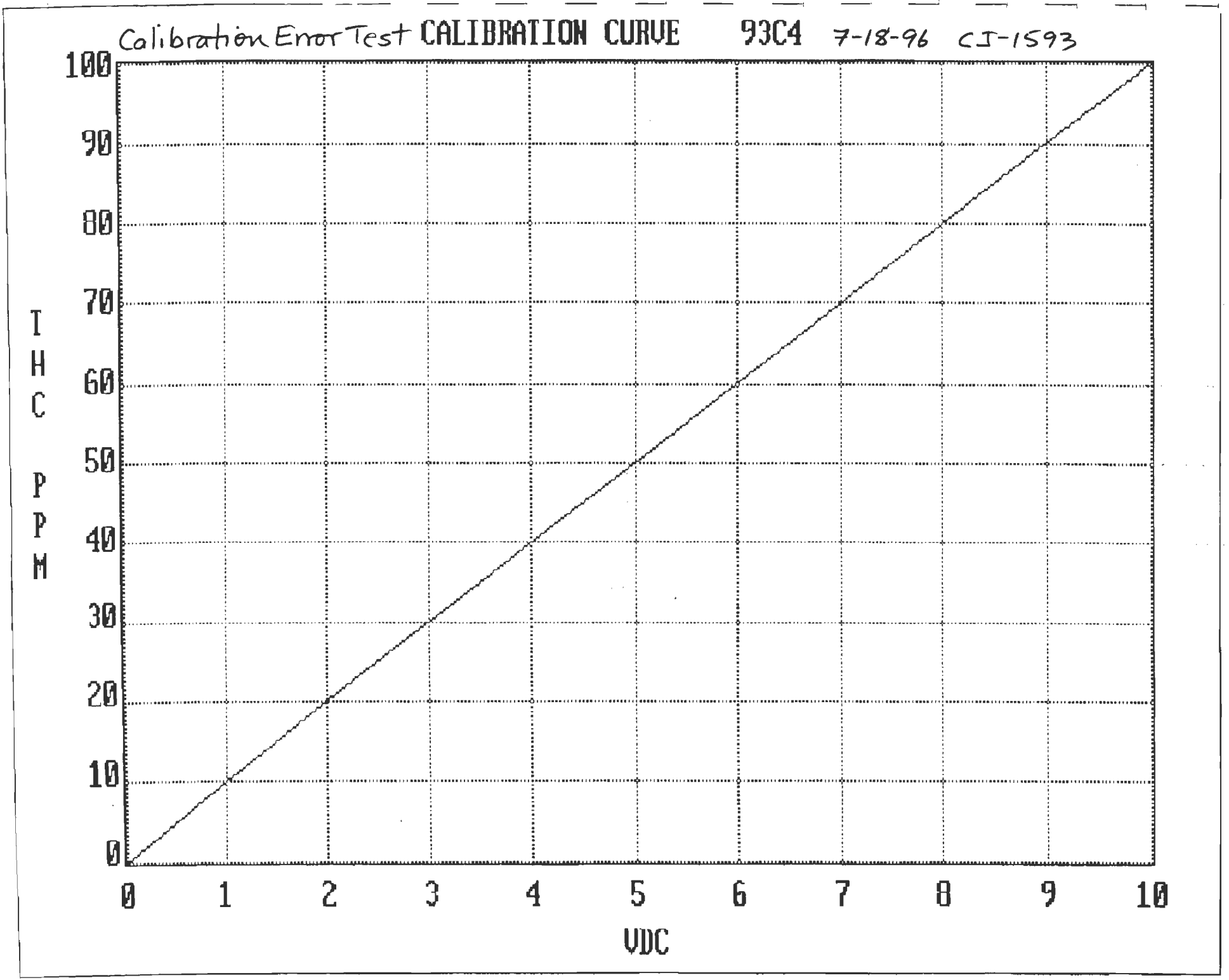
REFERENCE STANDARD DATA:

SRM Number	Cylinder Number	Concentration
GMIS	CC22654	248.1 ppm Sulfur Dioxide

CERTIFIED AT:

AGA Gas inc.
Specialty & Medical Gas Division
6421 Monclova Road
Maumee, Ohio 43537

Michael Sickmiller
Quality Control Supervisor


Calibration Error Test CALIBRATION CURVE 93C4 7-18-96 CJ-1593
100
90
80
70
60
50
40
30
20
10
0
THC PPM
0
1
2
3
4
5
6
7
8
9
10
VDC

5.20

U.S. SPECIALTY GAS SERVICES, INC.

4301 E. PINE PLACE ● TULSA, OKLAHOMA 74115-4148 ● 918/832-8774

DATE: SEPTEMBER 1, 1995

CUSTOMER: CETCON, INC.
P.O. BOX 702800
TULSA, OK 74170-2800

CERTIFICATE OF ANALYSIS

PRODUCT: HYDROGEN, UHP
SERIAL #3-1461

MIN. PURITY: 99.999%

TYPICAL ANALYSIS:

MOISTURE	LESS THAN	3ppm
NITROGEN	LESS THAN	6ppm
OXYGEN	LESS THAN	2ppm
THC	LESS THAN	1ppm

SIGNED: J. Baldridge

U.S. SPECIALTY GAS SERVICES, INC.
4301 E. PINE PLACE • TULSA, OKLAHOMA 74115-4148 • 918/832-8774

DATE: JUNE 6, 1996

CUSTOMER: CETCON, INC.
P.O. BOX 702800
TULSA, OK 74170

CERTIFICATE OF ANALYSIS

PRODUCT: AIR, ULTRA ZERO
SERIAL #3-1636

MIN. PURITY: N/A

TYPICAL ANALYSIS:

OXYGEN		18-21%
CARBON MONOXIDE	LESS THAN	1ppm
NITRIC OXIDE	LESS THAN	1ppm
THC	LESS THAN	0.1ppm
MOISTURE	LESS THAN	2ppm

SIGNED: J. Baldridge

Shop

AGA

AGA Gas, Inc.

Specialty & Medical Gases Division

CERTIFICATE OF ANALYSIS

EPA PROTOCOL

PERFORMED ACCORDING TO SECTION 2.2, PROCEDURE G1

Production Number: 2961541
Cylinder Number: CC43358
Cylinder Pressure: 2000 psig

NOTICE, THIS CYLINDER IS NOT TO BE USED WHEN PRESSURE IS UNDER 150 psig

Certified Component	Certified Concentration	Date of Certification	Analytical Method
Propane	24.9 ± 0.27 ppm	3/18/96	Flame Ionization

Expiration Date: 3/18/99
Balance Gas: Air

REFERENCE STANDARD DATA:

SRM Number	Cylinder Number	Concentration
GMIS	CC88963	50.00 ppm Propane

CERTIFIED AT:

AGA Gas inc.
Specialty & Medical Gas Division
6421 Monclova Road
Maumee, Ohio 43537

Michael Sickmiller
Quality Control Supervisor

SHOP

AGA

AGA Gas, Inc.

Specialty & Medical Gases Division

CERTIFICATE OF ANALYSIS

EPA PROTOCOL

PERFORMED ACCORDING TO SECTION 2.2, PROCEDURE G1

Production Number: 12940650
Cylinder Number: CC100404
Cylinder Pressure: 2000 psi

NOTICE, THIS CYLINDER IS NOT TO BE USED WHEN PRESSURE IS UNDER 150 psig

Certified Component	Certified Concentration	Date of Certification	Analytical Method
Propane	[redacted] ± 0.5 ppm	12/19/94	Flame Ionization

Expiration Date: 12/19/97
Balance Gas: Air

REFERENCE STANDARD DATA:

SRM Number	Cylinder Number	Concentration
GMIS [redacted]	CC88863	50.00 ppm Propane

CERTIFIED AT:

AGA Gas Inc.
Specialty & Medical Gas Division
6421 Monclova Road
Maumee, Ohio 43537

Michael Sickmiller
Quality Control Supervisor

AGA

AGA Gas, Inc.

Specialty & Medical Gases Division

CERTIFICATE OF ANALYSIS

EPA PROTOCOL

PERFORMED ACCORDING TO SECTION 2.2, PROCEDURE G1

Production Number: 10950015
Cylinder Number: CC35253
Cylinder Pressure: 2000 psi

NOTICE, THIS CYLINDER IS NOT TO BE USED WHEN PRESSURE IS UNDER 150 psig

Certified Component	Certified Concentration	Date of Certification	Analytical Method
Propane	87.5 ± 0.8 ppm	10/13/95	Flame Ionization

Expiration Date: 10/13/98
Balance Gas: Air

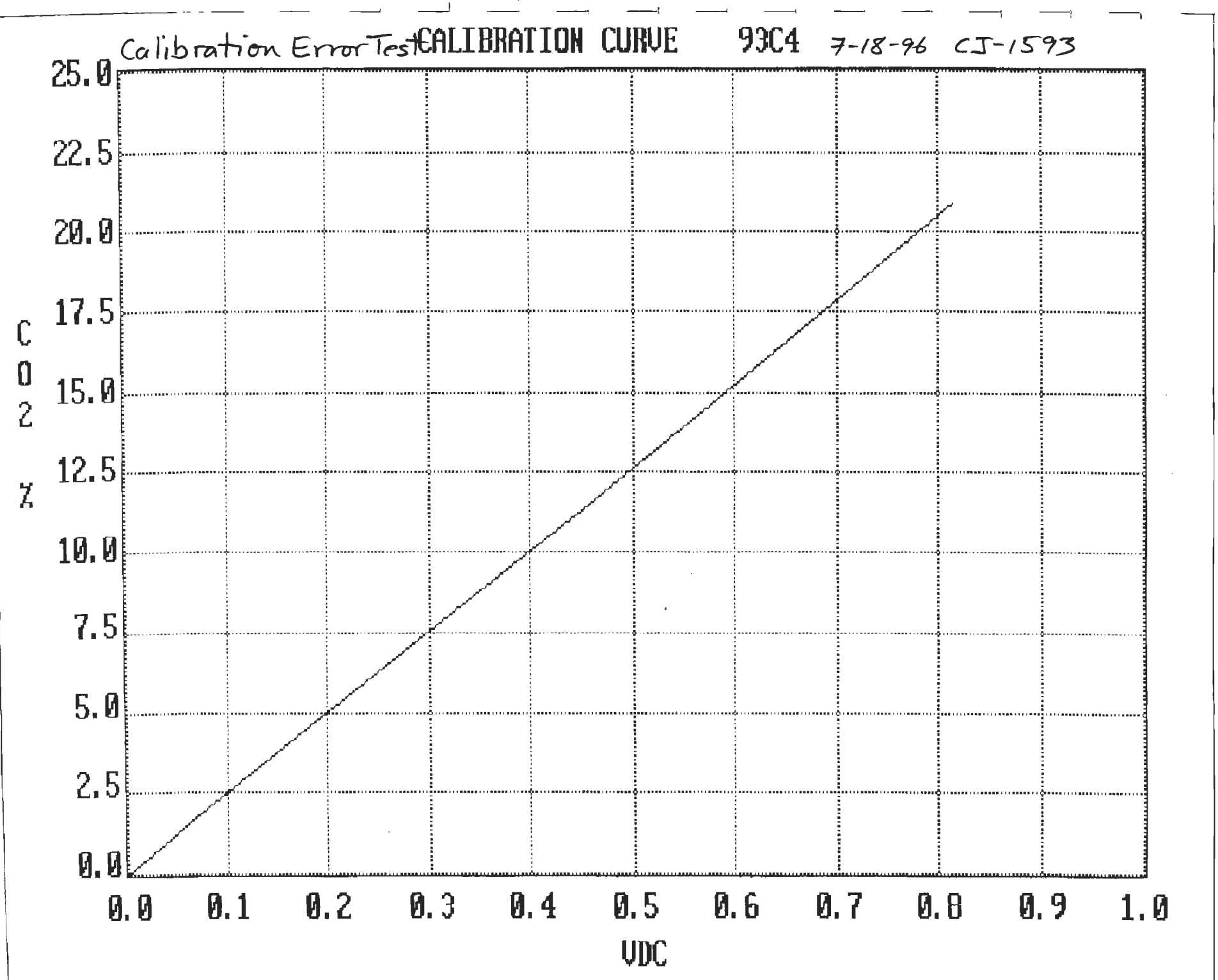
REFERENCE STANDARD DATA:

SRM Number	Cylinder Number	Concentration
GMIS	CC56207	101.4 ppm Propane

CERTIFIED AT:

AGA Gas inc.
Specialty & Medical Gas Division
6421 Monclova Road
Maumee, Ohio 43537

Michael Sickmiller
Quality Control Supervisor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CALIBRATION CURVE 93C4 7-18-96 CJ-1593
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
CO2 %
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
VDC

U.S. SPECIALTY GAS SERVICES, INC.
4301 E. PINE PLACE • TULSA, OKLAHOMA 74115-4148 • 918/832-8774

DATE: JUNE 6, 1996

CUSTOMER: CETCON, INC.
P.O. BOX 702800
TULSA, OK 74170

P.O. #: 5963

CERTIFICATE OF ANALYSIS

CYLINDER NUMBER	MIXTURE REQUESTED	REQUESTED COMPOSITION	CERTIFIED COMPOSITION
CC 54162	CARBON DIOXIDE	11-12.5%	11.50 % CO_2
	OXYGEN	11-12.5%	12.20 % O_2
	NITROGEN	BALANCE	BALANCE

CERTIFIED BY RM 3 (OKSAT)
ON 7/8/96

SIGNED: J. Baldridge
(AUTHORIZED SIGNATURE)

CETCON, Inc.

Cylinder # CC–54162
Range 11.0 – 12.5

GAS CYLINDER ORSAT ANALYSIS

TEST #	TIME	COMPONENTS	RUN# 1	RUN # 2	RUN # 3	AVG
1	2:00 p.m.	CO_2	11.5	11.6	11.4	11.50
		SUM	23.7	23.8	23.6	
		O_2	12.2	12.2	12.2	12.20
		N_2	76.3	76.2	76.4	76.30
2		CO_2				
		SUM				
		O_2				
		N_2				

CERTIFICATION

ORSAT ID: CET I
SERIAL #:
ANALYST: RAS / JRV
SIGNATURE:

DATE: 7/8/96
EXPIRATION: 1/8/96
$\%O_2$: **12.20**
$\%CO_2$: **11.50**

EXH. I

U.S. SPECIALTY GAS SERVICES, INC.
4301 E. PINE PLACE • TULSA, OKLAHOMA 74115-4148 • 918/832-8774

DATE: OCTOBER 5, 1995

CUSTOMER: CETCON, INC.
P.O. BOX 702800
TULSA, OK 74170-2800

P.O. #: 10775

CERTIFICATE OF ANALYSIS

CYLINDER NUMBER	MIXTURE REQUESTED	REQUESTED COMPOSITION	CERTIFIED COMPOSITION	
CC35704	OXYGEN	20.0-22.0%	21.18%	21.0%
	CARBON DIOXIDE	20-.0-22.0%	20.58%	20.9%
	NITROGEN	BALANCE	BALANCE	

CERTIFIED BY
RM3 02-14-96
M. L. McCloskey

SIGNED: J. Baldridge
(AUTHORIZED SIGNATURE)

Plant CETCON LAB

Unit: Cylinder Audit

Operator: GLM

CJ– # CC35704

CETCON, Inc.

ORSAT ANALYSIS (RM–3)

TEST # or BAG #	DATE and TIME	COMPONENTS	RUN# 1	RUN # 2	RUN # 3	AVG
1	02–14–96 1100	CO_2	20.9	20.7	20.8	20.8
		SUM	41.9	41.6	41.8	
		O_2	21.0	20.9	21.0	21.0
		N_2	58.1	58.4	58.2	58.2
2	02–14–96 1110	CO_2	20.9	20.8	20.9	20.9
		SUM	41.8	41.8	41.8	
		O_2	20.9	21.0	20.9	20.9
		N_2	58.2	58.2	58.2	58.2
3	02–14–96 1120	CO_2	20.9	20.8	20.9	20.9
		SUM	41.9	41.8	41.8	
		O_2	21.0	21.0	20.9	21.0
		N_2	58.1	58.2	58.2	58.2
4		CO_2				
		SUM				
		O_2				
		N_2				
5		CO_2				
		SUM				
		O_2				
		N_2				
6		CO_2				
		SUM				
		O_2				
		N_2				
7		CO_2				
		SUM				
		O_2				
		N_2				
8		CO_2				
		SUM				
		O_2				
		N_2				
9		CO_2				
		SUM				
		O_2				
		N_2				
10		CO_2				
		SUM				
		O_2				
		N_2				
11		CO_2				
		SUM				
		O_2				
		N_2				
12		CO_2				
		SUM				
		O_2				
		N_2				

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

END TIME: 07-17-1996
START TIME:09:54:43
FILE NAME:C:\DAQ\TEST.ID%
TEST NAME:CJ-1593/~~INITIAL BIAS~~/RT

Response Time Test

CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
0	0.00	0.00	0.84	0.00	100 2.49	0.00	0.66	5.34
1	0.002	0.000	0.840	0.000	2.158	0.000	0.564	4.587
2	0.000	0.000	0.835	0.000	0.593	0.000	0.417	3.958
3	0.000	0.000	0.823	0.000	0.142	0.000	0.361	3.408
4	1.006	0.000	0.696	0.000	95 0.073	0.000	0.269	2.947
5	3.313	0.000	0.337	0.002	0.037	0.000	0.269	2.703
6	4.302	0.000	0.142	0.000	0.020	0.000	0.303	2.534
7	4.651	0.000	0.056	0.000	0.022	0.000	0.288	2.393
8	95 4.807	0.000	0.027	0.000	0.024	0.002	0.320	2.271
9	4.890	0.000	0.005	0.000	0.027	0.000	0.332	2.200
10	4.895	0.000	0.000	0.000	0.034	0.005	0.317	2.107
11	4.924	0.000	0.000	0.000	0.017	0.000	0.342	2.043
12	4.946	0.000	0.000	0.000	0.007	0.000	0.349	1.982
13	4.927	0.000	0.000	0.000	0.010	0.000	0.320	1.926
14	4.934	0.000	0.000	0.000	0.010	0.000	0.337	1.882
15	4.966	0.000	0.000	0.000	0.020	0.000	0.349	1.846
16	4.961	0.000	0.000	0.000	0.007	0.000	0.322	1.804
17	4.949	0.000	0.000	0.000	0.002	0.000	0.347	1.780
18	4.983	0.000	0.000	0.000	0.010	0.000	0.352	1.755
19	4.951	0.000	0.000	0.000	0.015	0.002	0.322	1.714
20	4.946	0.000	0.000	0.002	100 0.000	0.000	0.339	1.714
21	4.958	0.000	0.000	0.000	0.017	0.000	0.354	1.697
22	4.963	0.000	0.000	0.000	0.017	0.000	0.334	1.667
23	4.951	0.000	0.000	0.000	0.005	0.000	0.332	1.665
24	4.976	0.000	0.000	0.000	0.015	0.000	0.356	1.655
25	100 4.978	0.000	0.000	0.000	0.010	0.000	0.330	1.648
26	4.963	0.000	0.000	0.000	0.007	0.000	0.320	1.631
27	4.958	0.000	0.000	0.000	0.115	0.000	0.344	1.628
28	4.993	0.000	0.000	0.000	0.076	0.002	0.342	1.609
29	4.888	0.000	0.000	0.000	0.037	0.000	0.322	1.606
30	3.455	0.000	0.010	0.000	0.000	0.007	0.300	1.550
31	1.187	0.000	0.005	0.000	0.000	0.000	0.242	1.365
32	0.396	0.000	0.000	0.076	0.005	0.000	0.146	1.140
33	95 0.146	0.000	0.000	0.337	0.000	0.000	0.090	0.967
34	0.093	0.000	0.000	0.708	0.015	0.000	0.088	0.813
35	0.073	0.000	0.000	1.140	0.007	0.000	0.063	0.657
36	0.032	0.000	0.000	1.582	0.000	0.000	0.037	0.535
37	0.024	0.000	0.000	1.960	0.005	0.000	0.068	0.452
38	0.022	0.000	0.000	2.271	0.002	0.000	0.073	0.364
39	0.020	0.000	0.000	2.510	0.010	0.005	0.071	0.283
40	0.010	0.000	0.000	2.646	0.012	0.000	0.100	0.222
41	0.032	0.000	0.000	2.810	0.005	0.000	0.125	0.173
42	0.015	0.000	0.000	2.930	0.007	0.005	0.107	0.122
43	0.002	0.000	0.000	3.013	0.000	0.000	0.132	0.063
44	0.017	0.000	0.000	3.091	0.000	0.000	0.164	0.056
45	0.005	0.000	0.000	3.152	0.000	0.000	0.129	0.024
46	0.000	0.000	0.000	3.203	0.000	0.000	0.151	0.000
47	0.007	0.000	0.000	3.254	0.000	0.000	0.159	0.000
48	0.007	0.000	0.000	3.291	0.000	0.000	0.166	0.000
49	0.000	0.000	0.000	3.315	0.002	0.000	0.151	0.000
50	0.002	0.000	0.000	95 3.342	0.012	0.000	0.186	0.000

5.2 ppm NO_X →

Upscale 95% Response Time

NO_X: 0:40
CO : 1:15
O_2 : 0:50
SO_2 : 2:10
THC: 0:55
CO_2 : 1:05

93.9 ppm SO_2 →

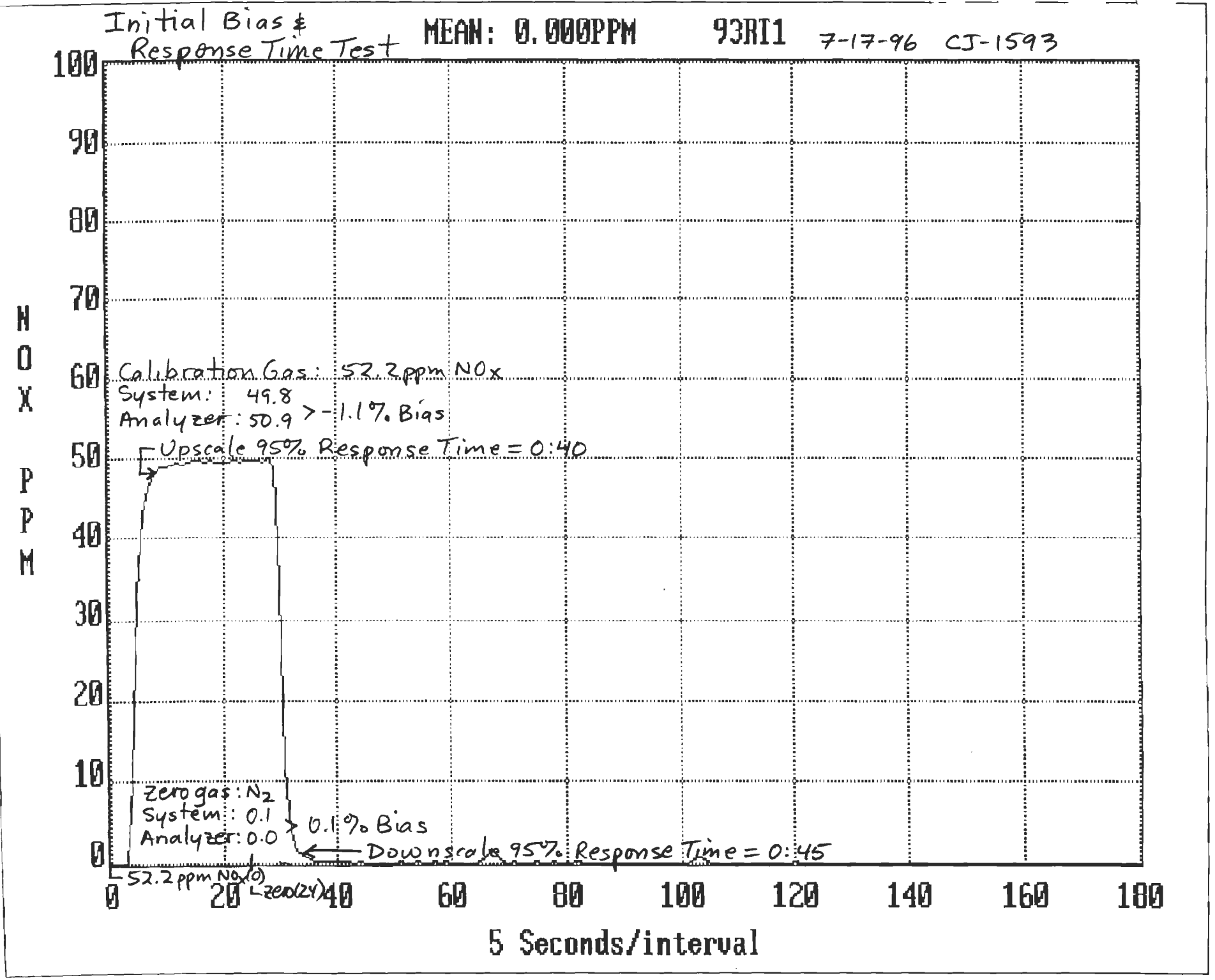
Downscale 95% Response Time

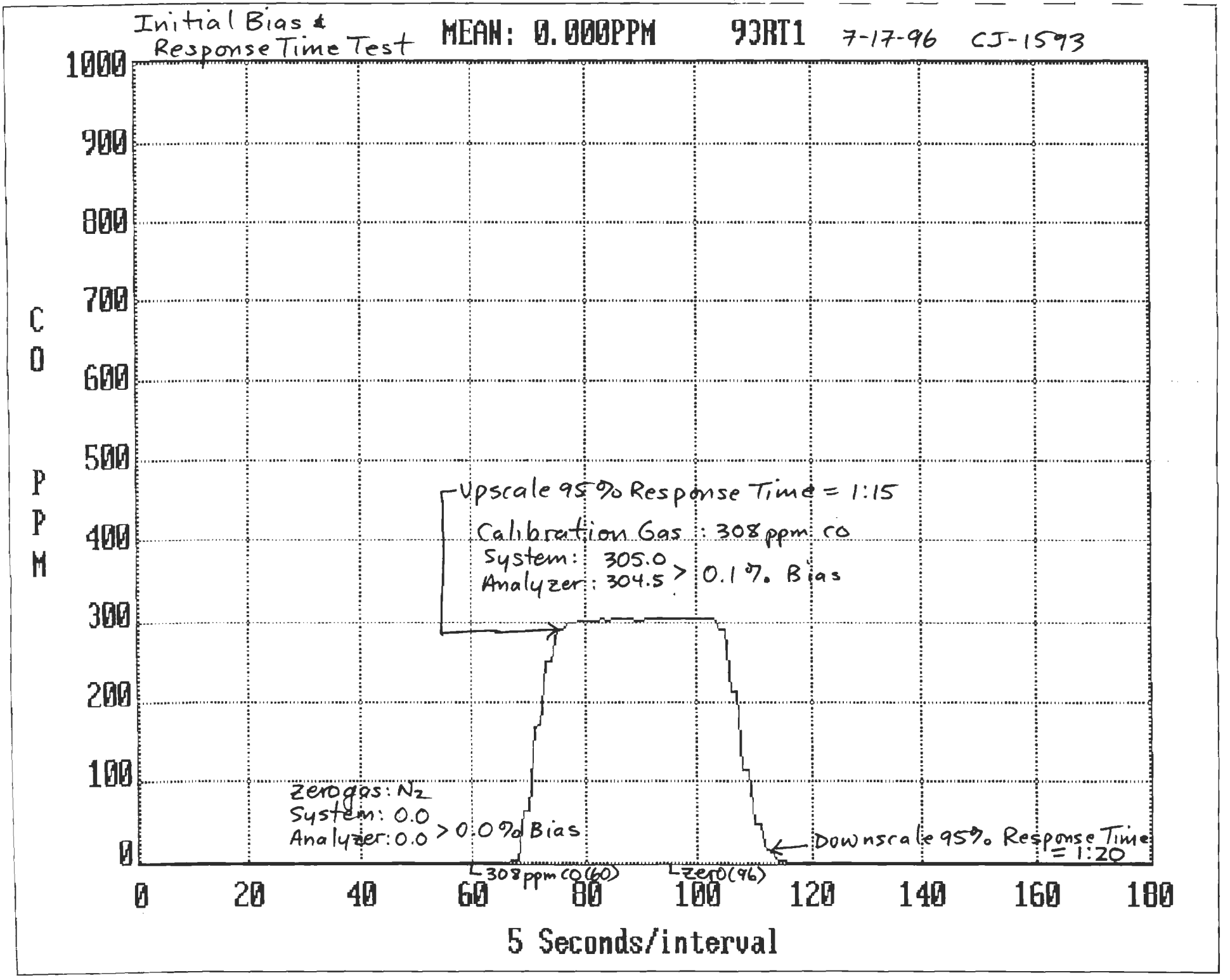
NO_X: 0:45
CO : 1:20
O_2 : 0:45
SO_2 : 2:40
THC: 0:20
CO_2 : 0:50

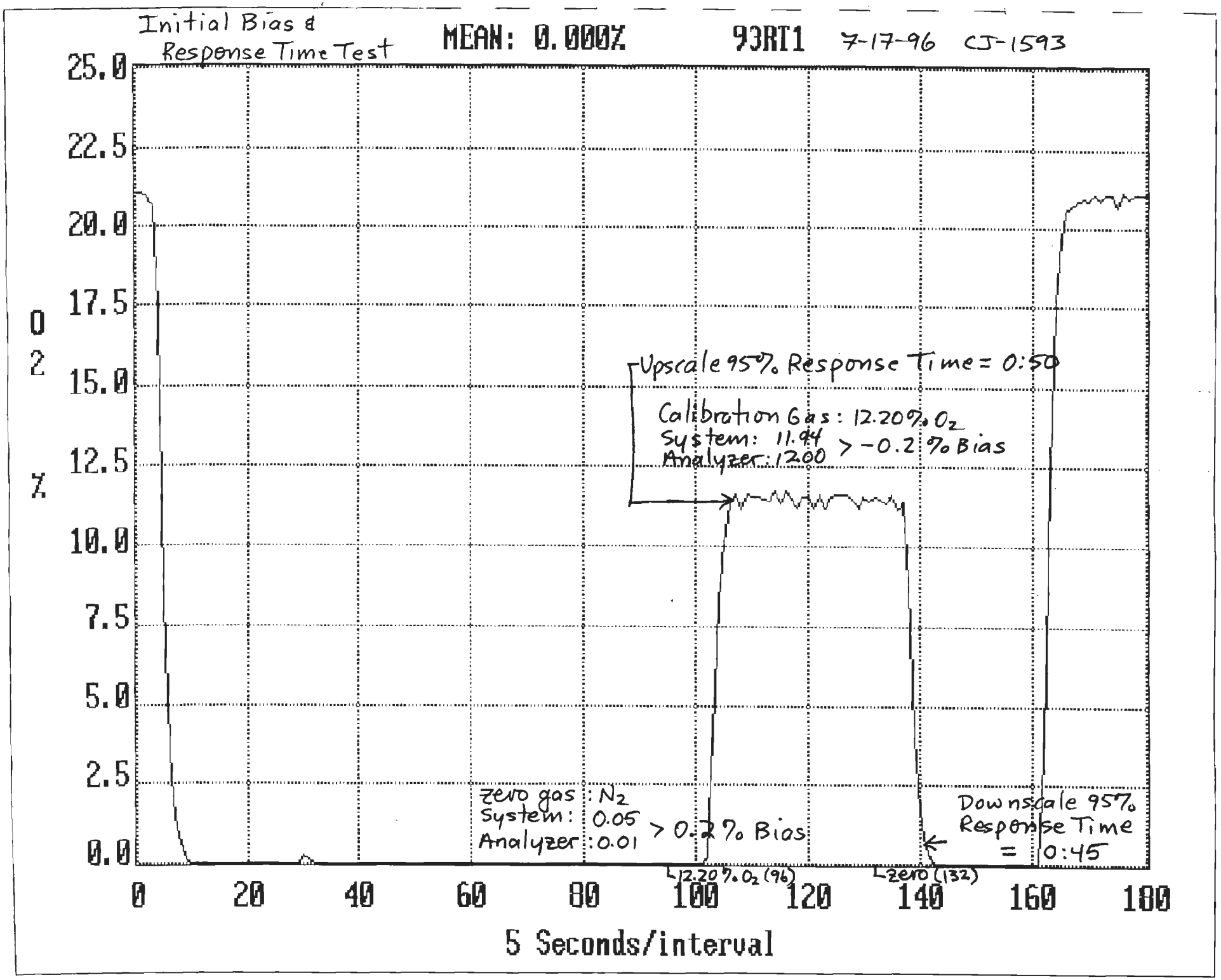
51	0.010	0.000	0.000	3.364	0.000	0.010	0.188	0.000
52	0.000	0.000	0.000	3.379	0.000	0.000	0.161	0.000
53	0.002	0.000	0.000	3.403	0.000	0.000	0.198	0.000
54	0.012	0.000	0.000	3.396	0.000	0.000	0.195	0.000
55	0.000	0.000	0.000	3.428	0.000	0.000	0.178	0.000
56	0.002	0.000	0.000	3.428	0.007	0.000	0.203	0.000
57	0.015	0.000	0.000	3.435	0.002	0.000	0.190	0.000
58	0.000	0.000	0.000	3.447	0.002	0.000	0.188	0.000
59	0.010	0.000	0.000	3.467	0.007	0.000	0.208	0.000
~28ppm CO → 60	0.000	0.000	0.000	3.477	0.000	0.005	0.181	0.000
61	0.000	0.000	0.000	3.477	0.005	0.000	0.193	0.000
62	0.005	0.000	0.000	100 3.501	0.000	0.010	0.200	0.000
63	0.000	0.000	0.000	3.494	0.000	0.000	0.181	0.000
64	0.000	0.000	0.000	3.496	0.005	0.000	0.203	0.000
65	0.012	0.000	0.000	3.508	0.000	0.000	0.210	0.000
66	0.083	0.000	0.000	3.530	0.000	0.000	0.186	0.000
67	0.190	0.015	0.000	3.521	0.007	0.000	0.205	0.000
68	0.100	0.032	0.000	3.472	0.015	0.000	0.217	0.000
69	0.010	0.637	0.000	3.262	0.000	0.000	0.198	0.000
70	0.000	0.637	0.000	2.886	0.000	0.000	0.190	0.000
71	0.017	1.685	0.000	2.437	0.017	0.007	0.232	0.000
72	0.007	1.689	0.000	2.000	0.010	0.000	0.195	0.000
73	0.000	2.505	0.000	1.621	0.005	0.007	0.200	0.000
74	0.002	2.507	0.000	1.326	0.005	0.000	0.212	0.000
75	0.010	95 2.898	0.000	1.101	0.000	0.002	0.212	0.000
76	0.000	2.898	0.000	0.942	0.000	0.000	0.164	0.000
77	0.000	2.983	0.000	0.798	0.000	0.000	0.195	0.000
78	0.010	2.981	0.000	0.674	0.007	0.000	0.205	0.000
79	0.000	3.005	0.000	0.598	0.000	0.000	0.154	0.000
80	0.000	3.003	0.000	0.527	0.000	0.000	0.173	0.000
81	0.005	3.015	0.000	0.454	0.002	0.000	0.190	0.000
82	0.010	3.008	0.000	0.415	0.000	0.010	0.173	0.000
83	0.000	100 3.040	0.000	0.376	0.007	0.000	0.149	0.000
84	0.000	3.018	0.000	0.332	0.000	0.007	0.181	0.000
85	0.000	3.030	0.000	0.310	0.000	0.000	0.161	0.000
86	0.000	3.025	0.000	0.278	0.005	0.000	0.142	0.000
87	0.000	3.035	0.000	0.261	0.007	0.000	0.151	0.000
88	0.007	3.035	0.000	0.229	0.010	0.000	0.161	0.000
89	0.000	3.013	0.000	0.220	0.000	0.000	0.132	0.000
90	0.000	3.015	0.000	0.200	0.000	0.000	0.127	0.000
91	0.002	3.022	0.000	0.190	0.015	0.000	0.154	0.000
92	0.000	3.027	0.000	95 0.176	0.010	0.000	0.132	0.000
93	0.000	3.032	0.000	0.168	0.000	0.007	0.115	0.000
94	0.000	3.032	0.000	0.164	0.000	0.007	0.144	0.000
95	0.002	3.037	0.000	0.149	0.000	0.000	0.132	0.000
12.20% O_2 → 96	0.000	3.035	0.000	0.144	0.000	0.000	0.107	0.000
1.50% CO_2 97	0.000	3.037	0.000	0.132	0.000	0.000	0.142	0.000
98	0.002	3.040	0.000	0.122	0.000	0.000	0.117	0.000
99	0.000	3.037	0.000	0.112	0.010	0.000	0.120	0.000
100	0.000	3.025	0.000	0.115	0.032	0.000	0.142	0.000
101	0.000	3.027	0.000	0.107	0.056	0.000	0.132	0.000
102	0.034	3.022	0.007	0.098	0.066	0.000	0.122	0.000
103	0.066	3.022	0.161	0.085	0.054	0.078	0.156	0.000
104	0.034	2.908	0.330	0.095	0.054	0.283	0.186	0.000
105	0.000	2.908	0.405	0.105	0.044	0.410	0.212	0.000
106	0.000	2.126	95 0.452	0.081	0.073	0.405	0.249	0.000
107	0.005	2.139	0.464	0.083	0.063	0.442	0.264	0.000
108	0.000	1.135	0.444	0.085	0.051	0.432	0.229	0.000
109	0.000	1.133	0.464	0.078	0.068	95 0.439	0.242	0.000
110	0.007	0.466	0.461	0.071	0.068	0.432	0.237	0.000

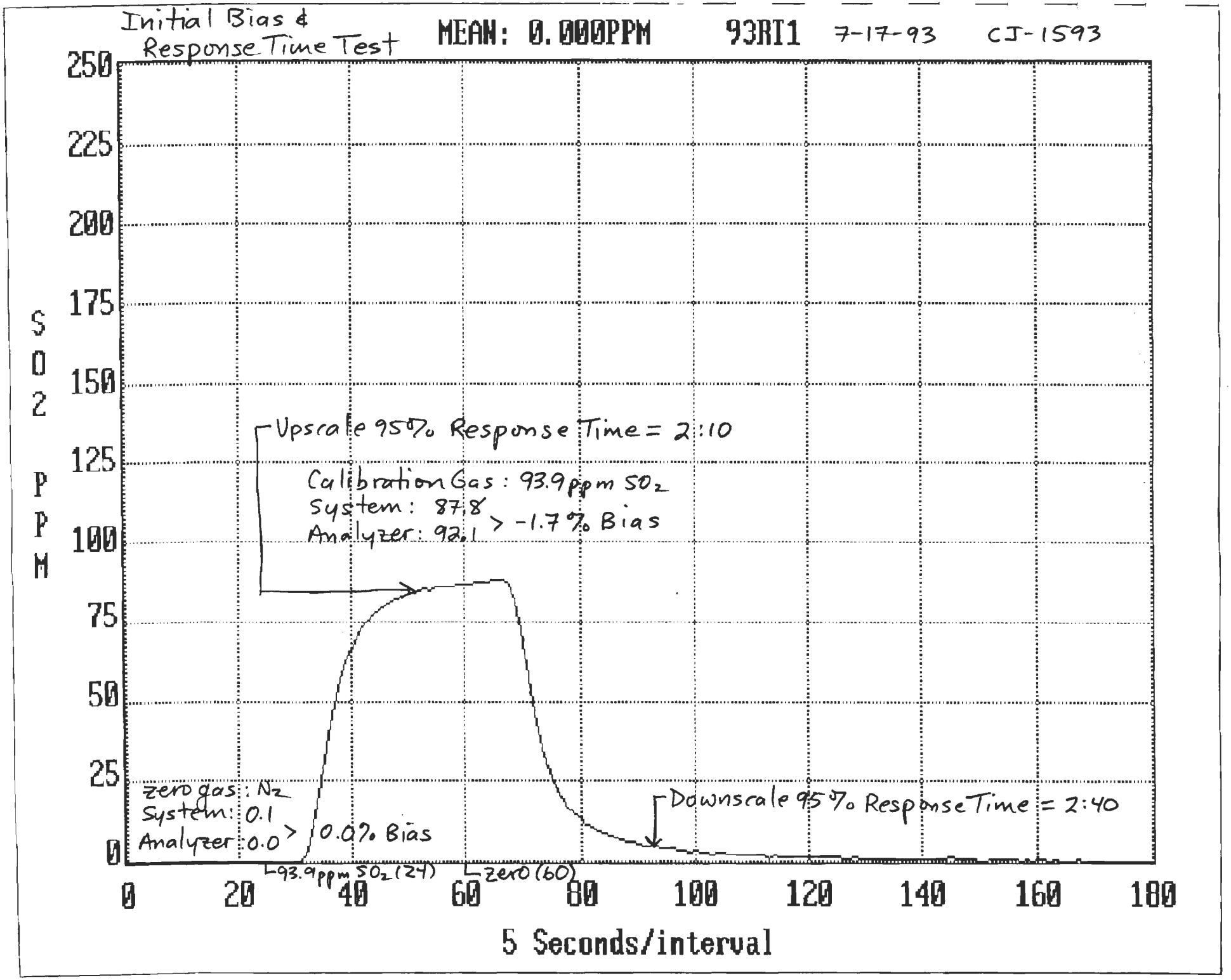
111	0.000	0.466	0.461	0.063	0.073	0.442	0.193	0.000
112	0.000	95 0.144	0.459	0.071	0.068	0.447	0.190	0.000
113	0.007	0.134	0.457	0.032	0.076	0.422	0.190	0.000
114	0.000	0.032	0.469	0.066	0.068	0.464	0.142	0.000
115	0.000	0.020	0.452	0.054	0.073	0.449	0.159	0.000
116	0.007	0.000	0.469	0.056	0.066	0.459	0.171	0.000
117	0.000	0.000	0.459	0.051	0.059	0.439	0.142	0.000
118	0.000	0.000	0.449	0.051	0.071	0.449	0.129	0.000
119	0.000	0.000	0.461	0.037	0.071	0.439	0.156	0.000
120	0.010	0.000	0.461	0.044	0.071	0.452	0.137	0.000
121	0.000	0.000	0.449	0.051	0.068	0.449	0.125	0.000
122	0.000	0.000	0.464	0.037	0.068	0.439	0.149	0.000
123	0.000	0.000	0.447	0.042	0.068	0.452	0.146	0.000
124	0.000	0.000	0.461	0.039	0.068	0.449	0.115	0.000
125	0.000	0.000	100 0.464	0.039	0.073	0.466	0.137	0.000
126	0.007	0.000	0.464	0.024	0.068	0.447	0.144	0.000
127	0.000	0.000	0.464	0.029	0.073	100 0.457	0.117	0.000
128	0.000	0.000	0.459	0.037	0.066	0.442	0.129	0.000
129	0.000	0.000	0.449	0.027	0.061	0.435	0.149	0.000
130	0.000	0.000	0.461	0.020	0.066	0.439	0.125	0.000
131	0.000	0.000	0.457	0.024	0.071	0.437	0.122	0.000
N_2 → 132	0.000	0.000	0.461	0.032	0.051	0.454	0.125	0.000
133	0.002	0.000	0.459	0.029	0.066	0.439	0.125	0.000
134	0.000	0.000	0.452	0.024	0.051	0.454	0.112	0.000
135	0.000	0.000	0.464	0.015	0.068	0.454	0.137	0.000
136	0.000	0.000	0.444	0.022	0.027	0.466	0.137	0.000
137	0.000	0.000	0.457	0.017	0.017	0.454	0.110	0.000
138	0.000	0.000	0.354	0.017	0.010	0.374	0.120	0.000
139	0.005	0.000	0.166	0.017	0.000	0.183	0.088	0.000
140	0.000	0.000	0.066	0.020	0.010	0.061	0.020	0.000
141	0.000	0.000	95 0.022	0.020	0.007	0.027	0.005	0.000
142	0.005	0.000	0.002	0.020	0.010	95 0.000	0.000	0.000
143	0.000	0.000	0.000	0.027	0.000	0.012	0.000	0.000
144	0.000	0.000	0.000	0.029	0.000	0.000	0.000	0.000
145	0.002	0.000	0.000	0.044	0.002	0.017	0.000	0.000
146	0.000	0.000	0.000	0.017	0.000	0.000	0.000	0.000
147	0.000	0.000	0.000	0.017	0.017	0.000	0.000	0.000
148	0.005	0.000	0.000	0.017	0.007	0.010	0.000	0.000
149	0.000	0.000	0.000	0.020	0.000	0.000	0.000	0.000
150	0.000	0.000	0.000	0.002	0.000	0.005	0.000	0.000
151	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000
152	0.000	0.000	0.000	0.017	0.000	0.000	0.000	0.000
153	0.000	0.000	0.000	0.012	0.005	0.000	0.000	0.000
154	0.000	0.000	0.000	0.015	0.000	0.000	0.000	0.000
155	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000
4.9ppm C_3H_8 → 156	0.000	0.000	0.000	0.015	0.000	0.000	0.000	0.000
157	0.000	0.000	0.000	0.005	0.000	0.010	0.000	0.000
158	0.000	0.000	0.000	0.012	0.000	0.002	0.000	0.000
159	0.000	0.000	0.000	0.000	0.259	0.000	0.000	0.000
160	0.005	0.000	0.000	0.015	1.516	0.000	0.000	0.000
161	0.000	0.000	0.000	0.010	1.885	0.000	0.000	0.000
162	0.000	0.000	0.139	0.005	2.002	0.000	0.010	0.000
163	0.000	0.000	0.493	0.015	2.061	0.000	0.012	0.000
164	0.000	0.000	0.701	0.005	2.114	0.000	0.039	0.000
165	0.000	0.000	0.784	0.002	2.131	0.000	0.083	0.000
166	0.000	0.000	0.818	0.000	2.178	0.000	0.081	0.000
167	0.000	0.000	0.825	0.010	95 2.190	0.000	0.083	0.000
168	0.007	0.000	0.830	0.000	2.217	0.000	0.129	0.000
169	0.000	0.000	0.835	0.000	2.244	0.000	0.115	0.000
170	0.000	0.000	0.833	0.005	2.246	0.000	0.117	0.000

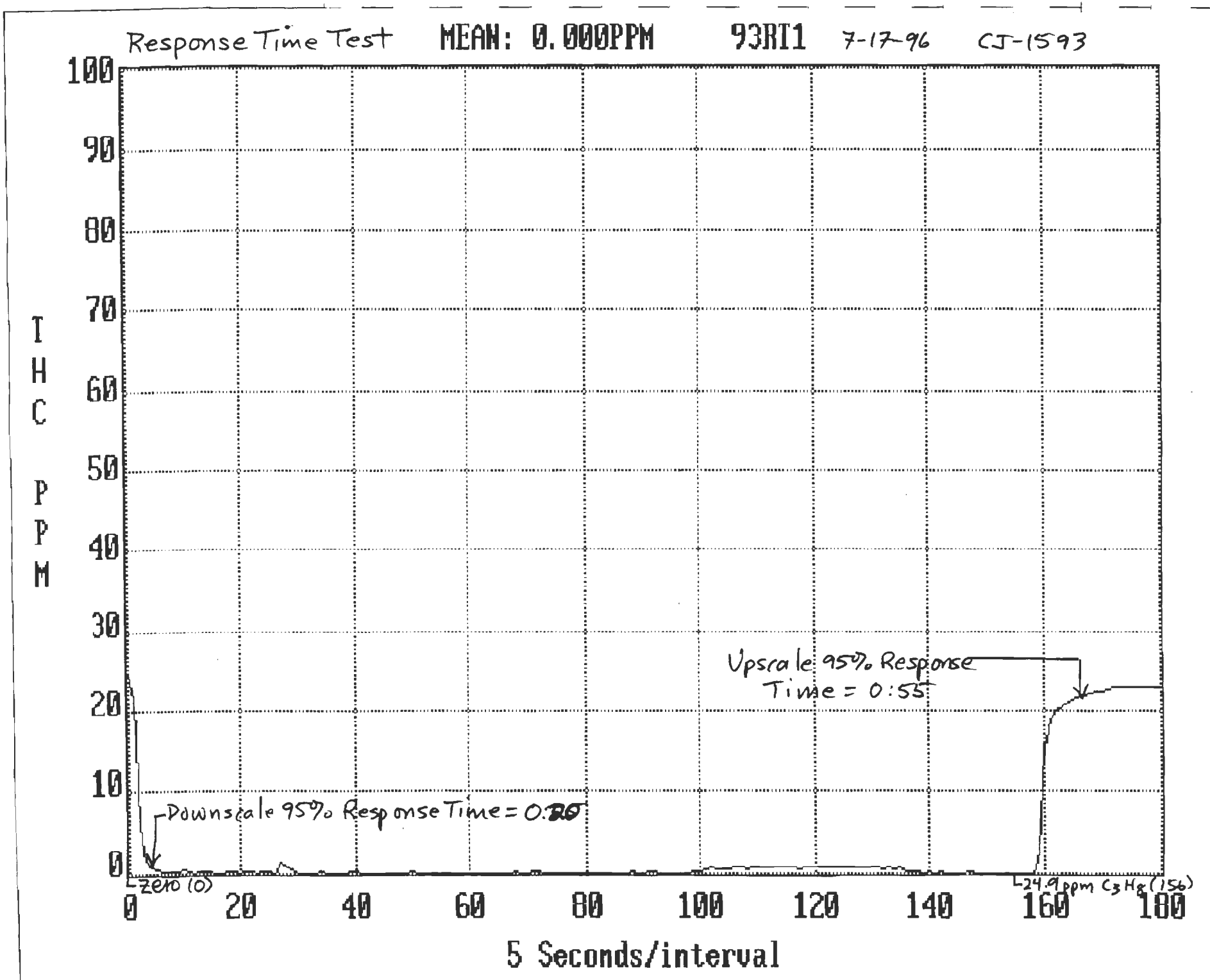
171	0.000	0.000	0.840	0.005	2.271	0.000	0.151	0.000
172	0.000	0.000	0.833	0.000	2.295	0.000	0.132	0.000
173	0.000	0.000	0.840	0.005	2.288	0.000	0.132	0.000
174	0.002	0.000	0.840	0.000	2.300	0.000	0.164	0.000
175	0.000	0.000	0.825	0.002	2.285	0.000	0.122	0.000
176	0.000	0.000	0.842	0.005	2.288	0.000	0.151	0.000
177	0.007	0.000	0.835	0.000	2.305	0.000	0.161	0.000
178	0.000	0.000	0.840	0.000	2.288	0.000	0.139	0.000
179	0.000	0.000	0.840	0.000	2.300	0.002	0.164	0.000
180	0.002	0.000	0.840	0.000	2.307	0.002	0.151	0.000
END TIME:	10:09:36							
FULLSPAN	95.500	609.000	21.000	207.000	87.500	20.900	0.000	0.000
SPAN VDC	9.543	6.064	0.837	8.254	8.740	0.828	0.000	0.000
MID SPAN	52.200	308.000	12.200	93.900	53.400	11.500	0.000	0.000
MID VDC	5.054	3.042	0.457	3.662	5.288	0.459	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

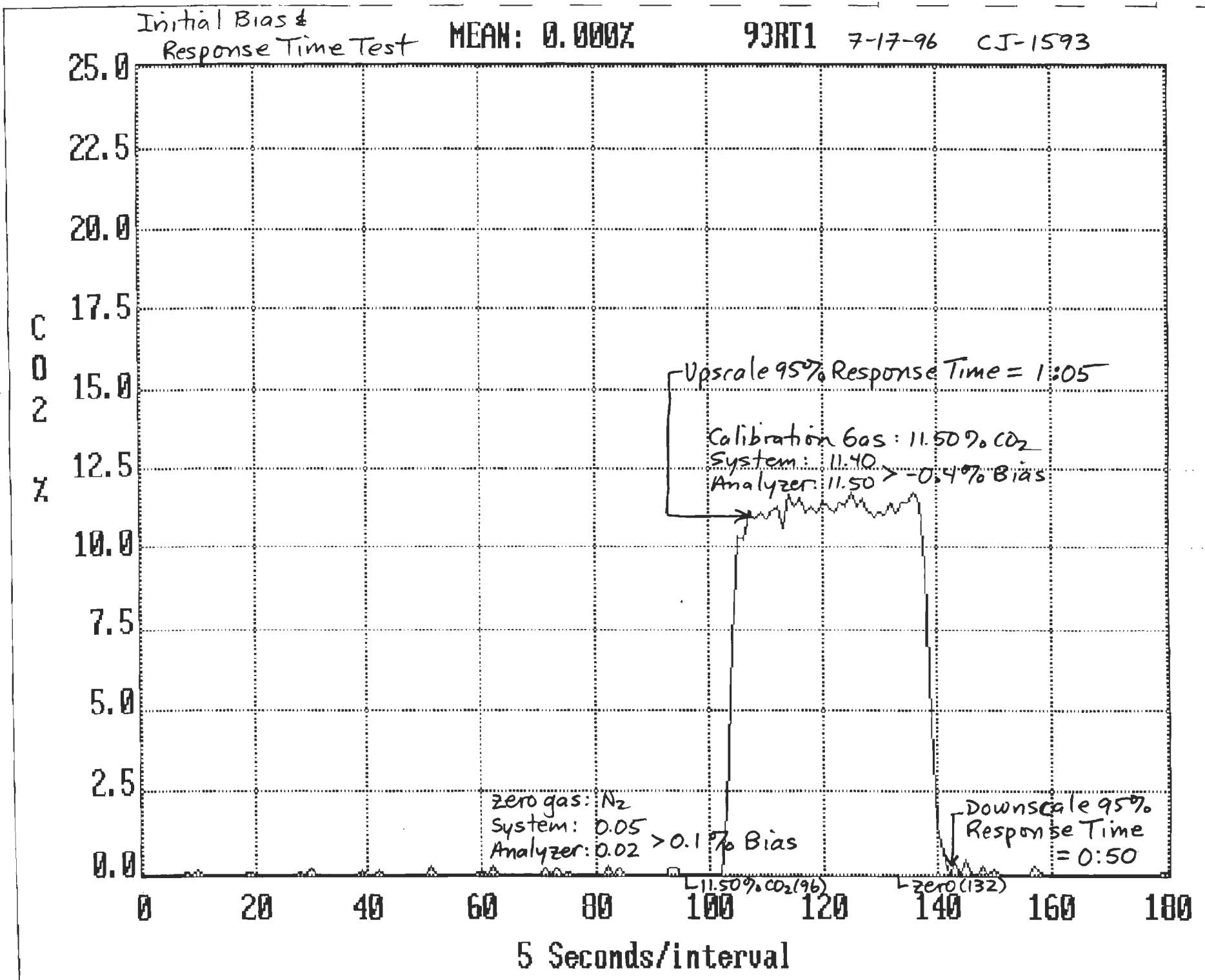

Initial Bias & Response Time Test
MEAN: 0.000PPM
93RI1
7-17-96
CJ-1593
NOx PPM
100
90
80
70
60
50
40
30
20
10
0
Calibration Gas: 52.2ppm NOx
System: 49.8
Analyzer: 50.9 > -1.1% Bias
Upscale 95% Response Time = 0:40
Zero gas: N2
System: 0.1
Analyzer: 0.0 > 0.1% Bias
Downscale 95% Response Time = 0:45
52.2ppm NOx(0)
Zero(24)
0
20
40
60
80
100
120
140
160
180
5 Seconds/interval


Initial Bias & Response Time Test
MEAN: 0.000PPM
93RT1
7-17-96
CJ-1593
CO PPM
1000
900
800
700
600
500
400
300
200
100
0
Upscale 95% Response Time = 1:15
Calibration Gas : 308 ppm CO
System: 305.0
Analyzer: 304.5 > 0.1% Bias
Zero gas: N2
System: 0.0
Analyzer: 0.0 > 0.0% Bias
Downscale 95% Response Time = 1:20
308 ppm CO (60)
zero (96)
0
20
40
60
80
100
120
140
160
180
5 Seconds/interval


Initial Bias & Response Time Test
MEAN: 0.000%
93RT1 7-17-96 CJ-1593
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
O2 %
Upscale 95% Response Time = 0:50
Calibration Gas: 12.20% O2
System: 11.94
Analyzer: 1200
> -0.2 % Bias
Zero gas: N2
System: 0.05
Analyzer: 0.01
> 0.2 % Bias
Downscale 95% Response Time = 0:45
12.20% O2 (96)
Zero (132)
0
20
40
60
80
100
120
140
160
180
5 Seconds/interval


Initial Bias & Response Time Test
MEAN: 0.000PPM
93RI1
7-17-93
CJ-1593
250
225
200
175
150
125
100
75
50
25
0
SO2 PPM
Upscale 95% Response Time = 2:10
Calibration Gas: 93.9ppm SO2
System: 87.8
Analyzer: 92.1 > -1.7% Bias
zero gas: N2
System: 0.1
Analyzer: 0.0 > 0.0% Bias
Downscale 95% Response Time = 2:40
93.9ppm SO2 (24)
zero (60)
0
20
40
60
80
100
120
140
160
180
5 Seconds/interval


Response Time Test
MEAN: 0.000PPM
93RI1
7-17-96
CJ-1593
THC PPM
100
90
80
70
60
50
40
30
20
10
0
Upscale 95% Response Time = 0:55
Downscale 95% Response Time = 0:20
Zero (0)
24.9 ppm C3H8 (156)
0
20
40
60
80
100
120
140
160
180
5 Seconds/interval


Initial Bias & Response Time Test
MEAN: 0.000%
93RT1
7-17-96
CJ-1593
CO2 %
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
Upscale 95% Response Time = 1:05
Calibration Gas: 11.50% CO2
System: 11.40
Analyzer: 11.50 > -0.4% Bias
zero gas: N2
System: 0.05
Analyzer: 0.02 > 0.1% Bias
Downscale 95% Response Time = 0:50
11.50% CO2(96)
zero(132)
0
20
40
60
80
100
120
140
160
180
5 Seconds/interval

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

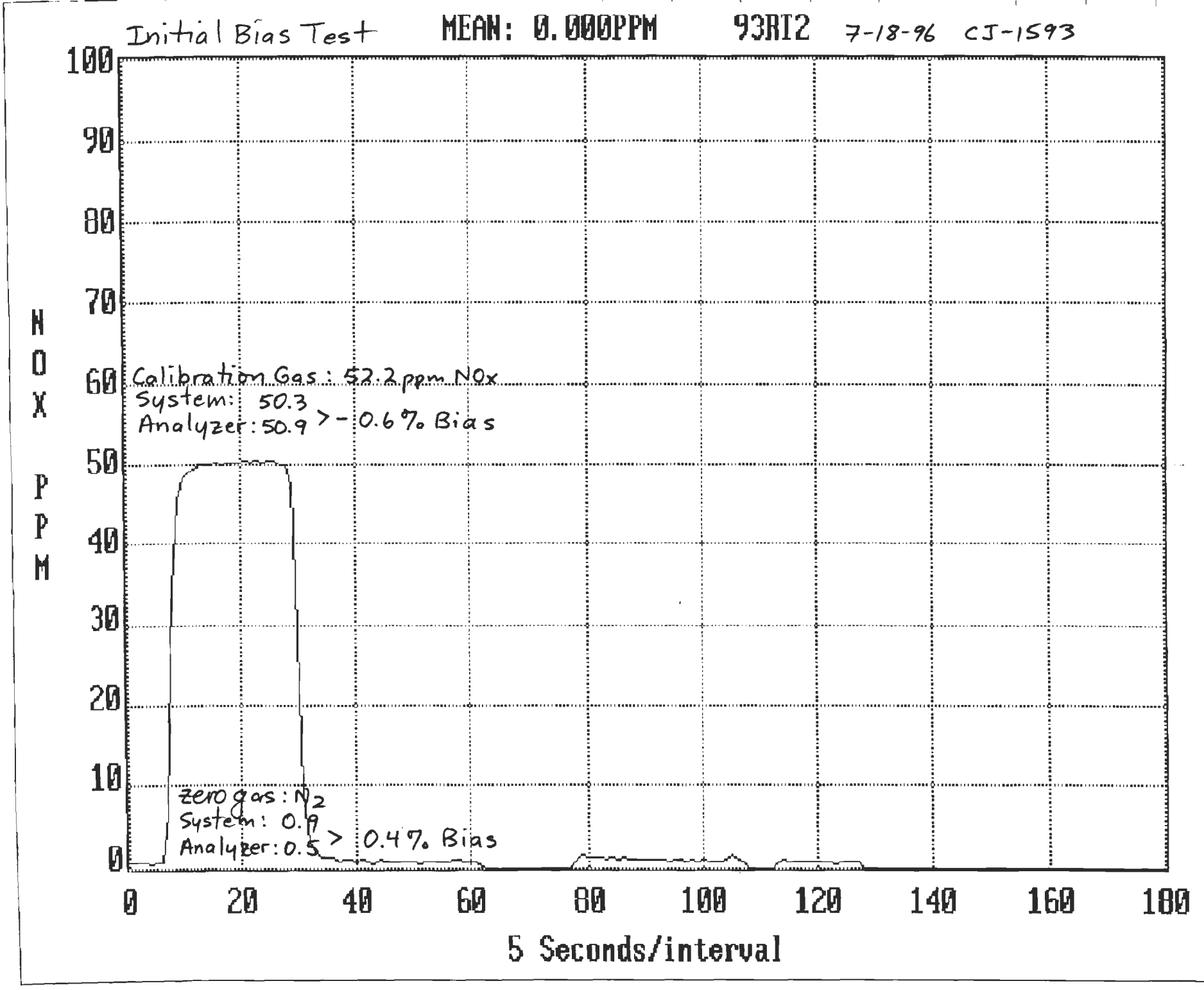
END TIME: 07-18-1996
START TIME:09:12:49
FILE NAME:C:\DAQ\TEST.ID%
TEST NAME:CJ-1593/INITIAL BIAS

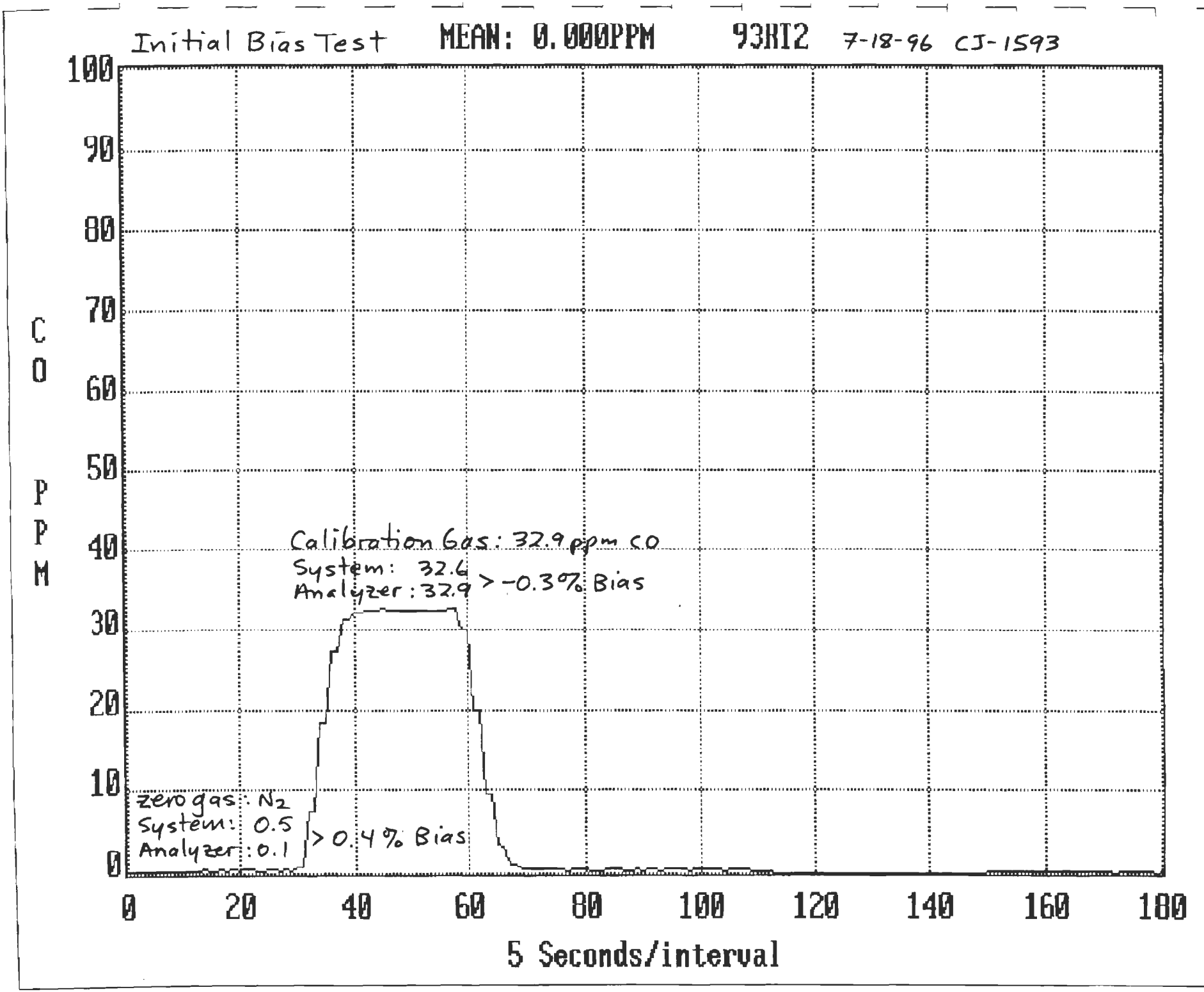
CHANNEL#	NOX	CO	O2	SO2	THC	CO2	OFF	OFF
CH.UNITS	PPM	PPM	%	PPM	PPM	%	OFF	OFF
0	0.06	0.02	0.84	0.00	2.56	0.00	1.12	5.06
1	0.061	0.020	0.845	0.000	2.561	0.000	0.901	4.438
2	0.073	0.024	0.837	0.000	2.476	0.002	0.754	3.892
3	0.085	0.022	0.842	0.000	2.429	0.000	0.637	3.398
4	0.044	0.022	0.830	0.000	2.500	0.000	0.547	2.974
5	0.078	0.022	0.845	0.000	0.825	0.000	0.457	2.588
6	0.078	0.027	0.842	0.005	0.198	0.000	0.327	2.249
7	0.669	0.020	0.757	0.000	0.059	0.000	0.273	1.956
8	3.433	0.024	0.371	0.000	0.029	0.000	0.276	1.858
9	4.541	0.022	0.120	0.000	0.012	0.000	0.273	1.804
10	4.832	0.027	0.037	0.007	0.015	0.000	0.305	1.765
11	4.910	0.022	0.000	0.000	0.000	0.000	0.303	1.729
12	4.939	0.022	0.002	0.000	0.000	0.000	0.310	1.692
13	4.976	0.032	0.000	0.007	0.000	0.000	0.347	1.667
14	4.993	0.034	0.000	0.002	0.000	0.005	0.313	1.643
15	4.983	0.024	0.000	0.000	0.000	0.000	0.354	1.624
16	5.012	0.032	0.000	0.000	0.000	0.005	0.356	1.604
17	4.985	0.034	0.000	0.000	0.000	0.000	0.330	1.589
18	5.010	0.032	0.000	0.000	0.000	0.000	0.369	1.572
19	5.007	0.037	0.000	0.000	0.000	0.000	0.337	1.555
20	5.017	0.022	0.000	0.000	0.000	0.000	0.366	1.555
21	5.029	0.034	0.000	0.000	0.000	0.000	0.347	1.545
22	5.015	0.034	0.000	0.000	0.000	0.000	0.347	1.533
23	5.037	0.032	0.000	0.000	0.000	0.000	0.371	1.533
24	4.998	0.032	0.000	0.000	0.000	0.000	0.339	1.521
25	5.024	0.034	0.000	0.000	0.000	0.012	0.369	1.519
26	5.024	0.037	0.000	0.000	0.000	0.000	0.342	1.514
27	4.980	0.032	0.000	0.000	0.012	0.005	0.347	1.504
28	4.993	0.037	0.000	0.000	0.000	0.000	0.349	1.499
29	4.751	0.032	0.000	0.000	0.000	0.000	0.315	1.482
30	2.869	0.078	0.000	0.000	0.000	0.000	0.308	1.389
31	0.908	0.073	0.000	0.000	0.000	0.000	0.208	1.216
32	0.325	0.747	0.000	0.000	0.000	0.000	0.181	1.028
33	0.210	0.752	0.000	0.000	0.000	0.000	0.137	0.889
34	0.139	1.833	0.000	0.000	0.000	0.000	0.098	0.735
35	0.125	1.841	0.000	0.000	0.000	0.000	0.093	0.637
36	0.127	2.717	0.000	0.000	0.000	0.012	0.073	0.532
37	0.078	2.717	0.000	0.000	0.000	0.000	0.103	0.447
38	0.110	3.118	0.000	0.000	0.000	0.012	0.168	0.374
39	0.093	3.120	0.000	0.000	0.000	0.000	0.151	0.305
40	0.073	3.210	0.000	0.000	0.000	0.000	0.154	0.251
41	0.100	3.206	0.000	0.000	0.000	0.000	0.168	0.205
42	0.081	3.232	0.000	0.000	0.000	0.000	0.146	0.149
43	0.059	3.240	0.000	0.000	0.000	0.000	0.151	0.125
44	0.090	3.242	0.000	0.000	0.005	0.000	0.171	0.093
45	0.083	3.250	0.000	0.000	0.000	0.007	0.142	0.063
46	0.068	3.235	0.000	0.000	0.000	0.000	0.151	0.039
47	0.073	3.245	0.000	0.000	0.000	0.010	0.168	0.022
48	0.061	3.235	0.000	0.000	0.000	0.010	0.139	0.000
49	0.071	3.237	0.000	0.000	0.000	0.000	0.151	0.000
50	0.078	3.237	0.000	0.000	0.000	0.002	0.151	0.000

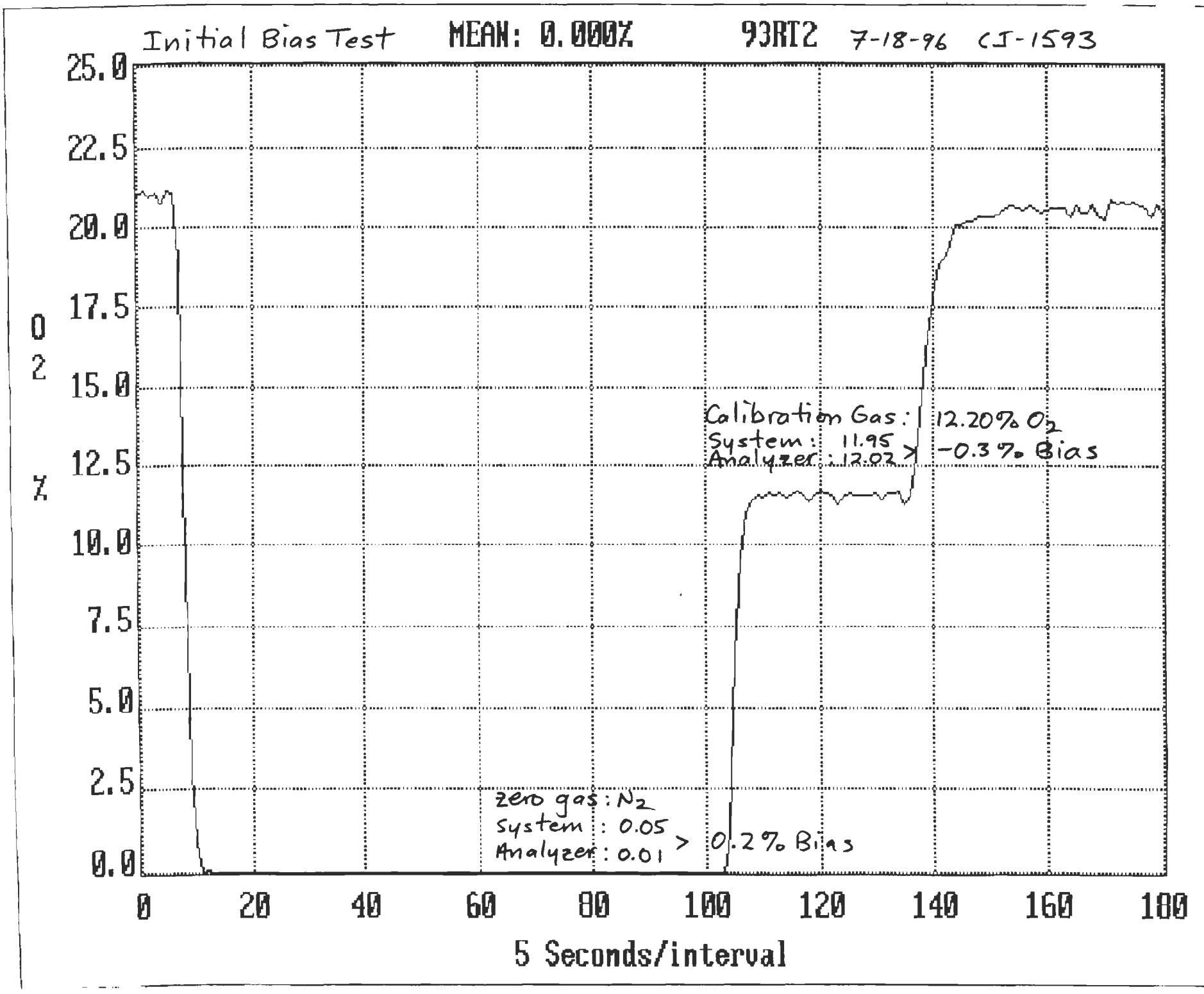
51	0.059	3.245	0.000	0.000	0.000	0.000	0.134	0.000
52	0.068	3.247	0.000	0.000	0.000	0.000	0.161	0.000
53	0.071	3.240	0.000	0.000	0.000	0.000	0.144	0.000
54	0.063	3.247	0.000	0.000	0.000	0.000	0.142	0.000
55	0.085	3.242	0.000	0.000	0.076	0.000	0.161	0.000
56	0.073	3.242	0.000	0.000	0.015	0.000	0.144	0.000
57	0.110	3.250	0.000	0.000	0.000	0.012	0.166	0.000
58	0.098	3.257	0.000	0.000	0.000	0.000	0.154	0.000
59	0.063	3.000	0.000	0.049	0.000	0.010	0.139	0.000
60	0.085	2.993	0.000	0.244	0.000	0.000	0.168	0.000
61	0.073	2.009	0.000	0.625	0.000	0.000	0.129	0.000
62	0.010	2.014	0.000	1.094	0.000	0.000	0.129	0.000
63	0.000	0.964	0.000	1.558	0.000	0.000	0.115	0.000
64	0.000	0.967	0.000	1.982	0.000	0.000	0.110	0.000
65	0.000	0.334	0.000	2.268	0.000	0.000	0.120	0.000
66	0.000	0.325	0.000	2.539	0.000	0.000	0.105	0.000
67	0.000	0.107	0.000	2.732	0.000	0.000	0.129	0.000
68	0.000	0.103	0.000	2.886	0.000	0.010	0.132	0.000
69	0.000	0.042	0.000	2.996	0.000	0.000	0.132	0.000
70	0.000	0.044	0.000	3.091	0.000	0.000	0.159	0.000
71	0.000	0.034	0.000	3.152	0.000	0.000	0.134	0.000
72	0.000	0.037	0.000	3.210	0.000	0.002	0.164	0.000
73	0.000	0.034	0.000	3.257	0.000	0.000	0.159	0.000
74	0.000	0.037	0.000	3.303	0.000	0.002	0.154	0.000
75	0.000	0.037	0.000	3.325	0.000	0.000	0.186	0.000
76	0.000	0.034	0.000	3.357	0.000	0.000	0.159	0.000
77	0.000	0.029	0.000	3.369	0.000	0.000	0.193	0.000
78	0.063	0.042	0.000	3.391	0.000	0.000	0.166	0.000
79	0.166	0.039	0.000	3.408	0.000	0.012	0.198	0.000
80	0.139	0.037	0.000	3.420	0.000	0.000	0.188	0.000
81	0.125	0.027	0.000	3.442	0.000	0.000	0.195	0.000
82	0.132	0.027	0.000	3.442	0.000	0.000	0.205	0.000
83	0.112	0.029	0.000	3.450	0.000	0.000	0.200	0.000
84	0.125	0.037	0.000	3.462	0.000	0.000	0.212	0.000
85	0.090	0.034	0.000	3.474	0.000	0.000	0.195	0.000
86	0.120	0.034	0.000	3.481	0.000	0.000	0.203	0.000
87	0.112	0.017	0.000	3.477	0.000	0.000	0.190	0.000
88	0.110	0.032	0.000	3.491	0.000	0.010	0.227	0.000
89	0.107	0.042	0.000	3.491	0.000	0.000	0.198	0.000
90	0.095	0.029	0.000	3.501	0.000	0.002	0.220	0.000
91	0.107	0.039	0.000	3.499	0.000	0.000	0.212	0.000
92	0.088	0.037	0.000	3.511	0.000	0.000	0.203	0.000
93	0.110	0.015	0.000	3.506	0.000	0.000	0.225	0.000
94	0.081	0.034	0.000	3.518	0.000	0.000	0.200	0.000
95	0.100	0.034	0.000	3.521	0.000	0.000	0.225	0.000
96	0.098	0.037	0.000	3.528	0.000	0.000	0.200	0.000
97	0.076	0.034	0.000	3.530	0.000	0.000	0.225	0.000
98	0.107	0.032	0.000	3.516	0.000	0.000	0.212	0.000
99	0.073	0.034	0.000	3.535	0.000	0.007	0.203	0.000
100	0.100	0.037	0.000	3.528	0.000	0.000	0.225	0.000
101	0.066	0.037	0.000	3.535	0.000	0.000	0.205	0.000
102	0.083	0.034	0.000	3.535	0.034	0.000	0.234	0.000
103	0.083	0.037	0.000	3.552	0.051	0.000	0.208	0.000
104	0.107	0.029	0.049	3.567	0.063	0.000	0.232	0.000
105	0.159	0.034	0.261	3.555	0.063	0.095	0.247	0.000
106	0.098	0.034	0.386	3.472	0.056	0.317	0.278	0.000
107	0.063	0.056	0.442	3.193	0.081	0.398	0.322	0.000
108	0.000	0.049	0.454	2.734	0.076	0.430	0.320	0.000
109	0.000	0.032	0.464	2.219	0.078	0.422	0.339	0.000
110	0.000	0.024	0.459	1.777	0.071	0.449	0.298	0.000

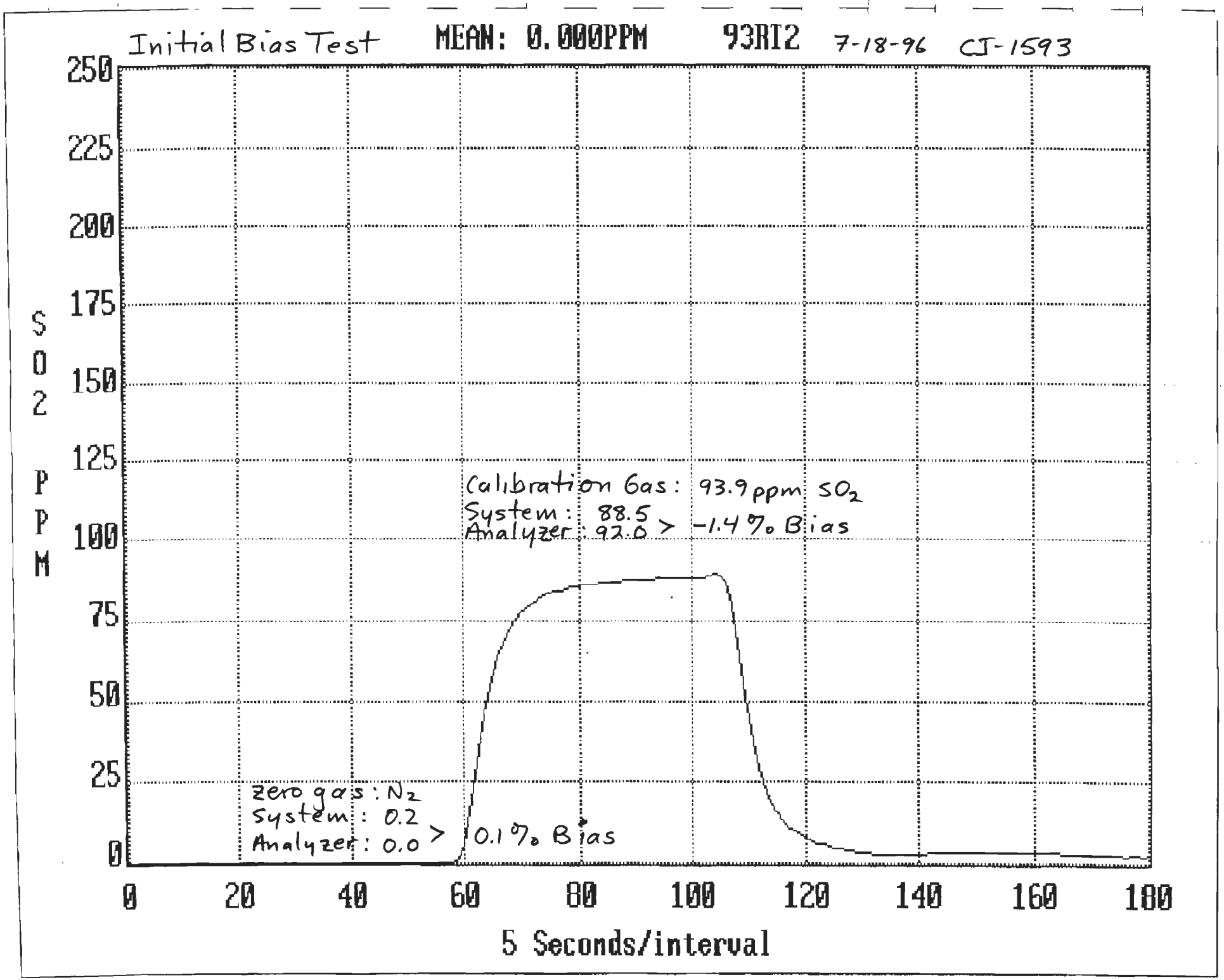
111	0.000	0.027	0.466	1.382	0.063	0.464	0.305	0.000
112	0.000	0.022	0.464	1.094	0.063	0.452	0.247	0.000
113	0.076	0.005	0.466	0.889	0.073	0.454	0.266	0.000
114	0.093	0.005	0.459	0.723	0.059	0.439	0.220	0.000
115	0.073	0.000	0.464	0.596	0.076	0.437	0.234	0.000
116	0.083	0.000	0.469	0.513	0.061	0.439	0.220	0.000
117	0.071	0.000	0.464	0.432	0.081	0.442	0.208	0.000
118	0.068	0.000	0.454	0.388	0.073	0.439	0.210	0.000
119	0.071	0.000	0.464	0.352	0.076	0.442	0.186	0.000
120	0.083	0.000	0.469	0.313	0.073	0.466	0.190	0.000
121	0.061	0.000	0.466	0.264	0.071	0.432	0.159	0.000
122	0.085	0.000	0.464	0.244	0.078	0.464	0.139	0.000
123	0.054	0.000	0.452	0.222	0.061	0.439	0.144	0.000
124	0.083	0.000	0.461	0.198	0.073	0.452	0.183	0.000
125	0.068	0.000	0.466	0.183	0.066	0.442	0.159	0.000
126	0.076	0.000	0.464	0.171	0.068	0.454	0.166	0.000
127	0.071	0.000	0.464	0.156	0.076	0.437	0.107	0.000
128	0.000	0.000	0.464	0.144	0.068	0.442	0.098	0.000
129	0.000	0.000	0.464	0.129	0.049	0.449	0.125	0.000
130	0.000	0.000	0.466	0.125	0.024	0.439	0.144	0.000
131	0.000	0.000	0.457	0.120	0.000	0.461	0.132	0.000
132	0.000	0.000	0.466	0.110	0.000	0.447	0.127	0.000
133	0.000	0.000	0.466	0.098	0.000	0.452	0.071	0.000
134	0.000	0.000	0.469	0.105	0.000	0.437	0.000	0.000
135	0.000	0.000	0.452	0.112	0.000	0.449	0.134	0.000
136	0.000	0.000	0.464	0.110	0.000	0.442	0.120	0.000
137	0.000	0.000	0.513	0.107	0.000	0.400	0.154	0.000
138	0.000	0.000	0.588	0.110	0.000	0.315	0.122	0.000
139	0.000	0.000	0.667	0.103	0.000	0.212	0.112	0.000
140	0.000	0.000	0.715	0.093	0.000	0.134	0.146	0.000
141	0.000	0.000	0.754	0.098	0.000	0.088	0.105	0.000
142	0.000	0.000	0.762	0.115	0.000	0.085	0.005	0.000
143	0.000	0.000	0.779	0.117	0.000	0.044	0.000	0.000
144	0.000	0.000	0.803	0.115	0.000	0.044	0.000	0.000
145	0.000	0.000	0.803	0.129	0.000	0.032	0.000	0.000
146	0.000	0.000	0.808	0.115	0.000	0.000	0.000	0.000
147	0.000	0.000	0.808	0.127	0.000	0.022	0.000	0.000
148	0.000	0.000	0.813	0.127	0.000	0.002	0.000	0.000
149	0.000	0.002	0.813	0.137	0.000	0.022	0.000	0.000
150	0.000	0.015	0.813	0.129	0.000	0.002	0.000	0.000
151	0.000	0.017	0.813	0.132	0.000	0.020	0.000	0.000
152	0.000	0.024	0.820	0.132	0.000	0.015	0.000	0.000
153	0.000	0.017	0.825	0.117	0.000	0.010	0.000	0.000
154	0.000	0.020	0.828	0.132	0.000	0.022	0.000	0.000
155	0.000	0.027	0.825	0.134	0.000	0.000	0.000	0.000
156	0.000	0.015	0.823	0.134	0.000	0.012	0.034	0.000
157	0.000	0.015	0.828	0.120	0.000	0.000	0.239	0.000
158	0.000	0.027	0.825	0.127	0.000	0.010	0.000	0.000
159	0.000	0.027	0.820	0.120	0.000	0.000	0.000	0.000
160	0.000	0.020	0.823	0.125	0.000	0.002	0.107	0.000
161	0.000	0.024	0.825	0.120	0.000	0.000	0.085	0.000
162	0.000	0.015	0.825	0.117	0.000	0.010	0.042	0.000
163	0.000	0.022	0.825	0.115	0.000	0.017	0.017	0.000
164	0.000	0.020	0.815	0.117	0.000	0.005	0.024	0.000
165	0.000	0.022	0.828	0.107	0.000	0.010	0.000	0.000
166	0.000	0.027	0.820	0.107	0.000	0.000	0.000	0.000
167	0.000	0.027	0.820	0.112	0.000	0.007	0.000	0.000
168	0.000	0.012	0.830	0.100	0.000	0.000	0.000	0.000
169	0.000	0.015	0.815	0.105	0.000	0.005	0.000	0.000
170	0.000	0.024	0.811	0.100	0.000	0.000	0.000	0.000

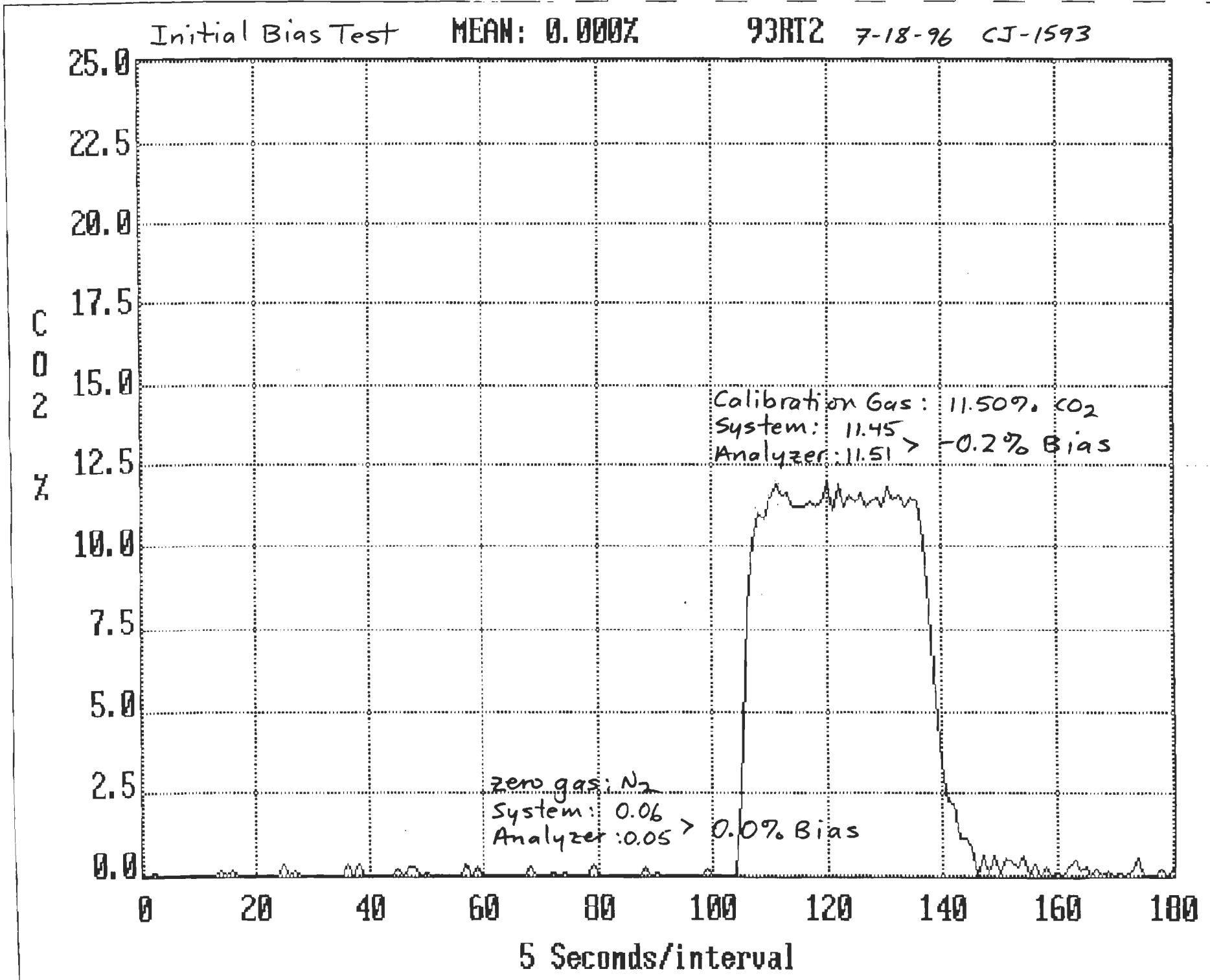
171	0.000	0.024	0.835	0.103	0.000	0.002	0.032	0.000
172	0.000	0.005	0.830	0.090	0.000	0.000	0.000	0.000
173	0.000	0.012	0.833	0.095	0.000	0.005	0.000	0.000
174	0.000	0.015	0.830	0.098	0.000	0.020	0.000	0.000
175	0.000	0.015	0.833	0.093	0.000	0.000	0.000	0.000
176	0.000	0.010	0.828	0.085	0.000	0.000	0.000	0.000
177	0.000	0.017	0.825	0.093	0.000	0.000	0.000	0.000
178	0.000	0.015	0.813	0.088	0.000	0.007	0.000	0.000
179	0.000	0.005	0.830	0.076	0.000	0.000	0.000	0.000
180	0.000	0.027	0.820	0.098	0.000	0.007	0.010	0.000
END TIME:	09:27:43							
FULLSPAN	95.500	62.900	21.000	207.000	87.500	20.900	0.000	0.000
SPAN VDC	9.561	6.292	0.840	8.267	8.750	0.815	0.000	0.000
MID SPAN	52.200	32.900	12.200	93.900	53.400	11.500	0.000	0.000
MID VDC	5.068	3.267	0.469	3.672	5.344	0.457	0.000	0.000
ZERO GAS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ZERO VDC	0.054	0.000	0.000	0.000	0.000	0.000	0.000	0.000


Initial Bias Test
MEAN: 0.000PPM
93RI2
7-18-96
CJ-1593
NOX PPM
100
90
80
70
60
50
40
30
20
10
0
Calibration Gas : 52.2 ppm NOx
System: 50.3
Analyzer: 50.9 > -0.6% Bias
zero gas : N2
System: 0.9
Analyzer: 0.5 > 0.4% Bias
0
20
40
60
80
100
120
140
160
180
5 Seconds/interval


Initial Bias Test
MEAN: 0.000PPM
93RI2 7-18-96 CJ-1593
CO PPM
100
90
80
70
60
50
40
30
20
10
0
Calibration Gas: 32.9 ppm CO
System: 32.6
Analyzer: 32.9
> -0.3% Bias
zero gas: N2
System: 0.5
Analyzer: 0.1
> 0.4% Bias
0
20
40
60
80
100
120
140
160
180
5 Seconds/interval


Initial Bias Test
MEAN: 0.000%
93RT2 7-18-96 CJ-1593
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
O2 %
Calibration Gas: 12.20% O2
System: 11.95
Analyzer: 12.02 > -0.3% Bias
zero gas: N2
System: 0.05
Analyzer: 0.01 > 0.2% Bias
0
20
40
60
80
100
120
140
160
180
5 Seconds/interval


Initial Bias Test
MEAN: 0.000PPM
93RI2
7-18-96
CJ-1593
250
225
200
175
150
125
100
75
50
25
0
SO2 PPM
Calibration Gas: 93.9 ppm SO2
System: 88.5
Analyzer: 92.0 > -1.4% Bias
zero gas: N2
System: 0.2
Analyzer: 0.0 > 0.1% Bias
0
20
40
60
80
100
120
140
160
180
5 Seconds/interval


Initial Bias Test
MEAN: 0.000%
93RT2 7-18-96 CJ-1593
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
C
O
2
%
Calibration Gas: 11.50% CO_2
System: 11.45
Analyzer: 11.51 > -0.2% Bias
zero gas: N_2
System: 0.06
Analyzer: 0.05 > 0.0% Bias
0
20
40
60
80
100
120
140
160
180
5 Seconds/interval

Date: 7-18-96
Plant: Total Petroleum, Inc.
Unit: Ardmore SRU
Operator: LKS
Job No.: CJ-1593

CETCON, Inc.

ANALYZER CALIBRATION
DRIFT AND BIAS DATA

Analyzer:	NO_x	Serial Number:			30759-238	Calibration Gas Value:	0.00	52.20
Make:	TECO	Span:	100	=	10.0	Calibration Error Response:	0.50	50.90
Model:	10S	Units:	ppm	=	VDC	Cylinder Number:	3-1587	CC-34731

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} (1) ppm	Corrected Conc., ppm
C4	0.9	0.1	-0.8	-0.4	50.3	49.4	-0.9	-1.5	18.252	18.777
C5	0.1	0.0	-0.1	-0.5	49.4	48.6	-0.8	-2.3	17.780	18.907
C6	0.0	0.0	0.0	-0.5	48.6	47.7	-0.9	-3.2	17.780	19.276

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 Response From Run, ppm

Drift Corrected Concentration, ppm = $(C_{Ave} - C_0) * C_{ma} / (C_m - C_0)$ *Method 6C Equation: 6C-1*

(1) C_{Ave}, ppm = Average Analyzer Concentration Recorded During Test Run

Date: 7-18-96
Plant: Total Petroleum, Inc.
Unit: Ardmore SRU
Operator: LKS
Job No.: CJ-1593

CETCON, Inc.

ANALYZER CALIBRATION
DRIFT AND BIAS DATA

Analyzer:	CO	Serial Number:			30892-239	Calibration Gas Value:	0.00	32.90
Make:	TECO	Span:	100	=	10.0	Calibration Error Response:	0.10	32.90
Model:	48	Units:	ppm	=	VDC	Cylinder Number:	3-1587	CC-92141

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} (1) ppm	Corrected Conc., ppm
C4	0.5	0.5	0.0	0.4	32.6	32.4	-0.2	-0.5	10.257	10.031
C5	0.5	0.3	-0.2	0.2	32.4	32.1	-0.3	-0.8	8.757	8.633
C6	0.3	0.3	0.0	0.2	32.1	32.0	-0.1	-0.9	8.957	8.971

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 Response From Run, ppm

Drift Corrected Concentration, ppm = $(C_{Ave} - C_0) * C_{ma} / (C_m - C_0)$ *Method 6C Equation: 6C-1*

(1) C_{Ave}, ppm = Average Analyzer Concentration Recorded During Test Run

Date: 7-18-96
Plant: Total Petroleum, Inc.
Unit: Ardmore SRU
Operator: LKS
Job No.: CJ-1593

CETCON, Inc.

ANALYZER CALIBRATION
DRIFT AND BIAS DATA

Analyzer:	O_2	Serial Number:		1420B/272	Calibration Gas Value:	0.00	12.20
Make:	Servomex	Span:	25 =	1.0	Calibration Error Response:	0.01	12.02
Model:	1400B4	Units:	% =	VDC	Cylinder Number:	3-1587	CC-54162

Sample Run #	C_{0i} %	C_{0f} %	Zero Drift % Span	Zero Bias % Span	C_{mi} %	C_{mf} %	Cal Drift % Span	Cal Bias % Span	C_{Ave} (1) %	Corrected Conc., %
C4	0.05	0.05	0.0	0.2	11.95	11.95	0.0	-0.3	2.525	2.537
C5	0.05	0.05	0.0	0.2	11.95	11.96	0.0	-0.2	2.450	2.459
C6	0.05	0.05	0.0	0.2	11.96	11.93	-0.1	-0.4	2.450	2.462

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 Response From Run, %

Drift Corrected Concentration, % = $(C_{Ave} - C_0) * C_{ma} / (C_m - C_0)$ *Method 6C Equation: 6C-1*

(1) C_{Ave}, % = Average Analyzer Concentration Recorded During Test Run

Date: 7-18-96
Plant: Total Petroleum, Inc.
Unit: Ardmore SRU
Operator: LKS
Job No.: CJ-1593

CETCON, Inc.

ANALYZER CALIBRATION
DRIFT AND BIAS DATA

Analyzer:	SO_2	Serial Number:		8196-8	Calibration Gas Value:	0.00	93.90
Make:	Bovar	Span:	250.0 =	10.0	Calibration Error Response:	0.00	92.00
Model:	721-M	Units:	ppm =	VDC	Cylinder Number:	3-1587	CC-92135

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} (1) ppm	Corrected Conc., ppm
C4	0.2	1.8	0.6	0.7	88.5	88.4	0.0	-1.4	142.323	151.746
C5	1.8	2.0	0.1	0.8	88.4	86.4	-0.8	-2.2	144.877	157.024
C6	2.0	1.6	-0.2	0.6	86.4	85.5	-0.4	-2.6	148.759	163.986

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 Response From Run, ppm

Drift Corrected Concentration, ppm = $(C_{Ave} - C_0) * C_{ma} / (C_m - C_0)$ *Method 6C Equation: 6C-1*

(1) C_{Ave}, ppm = Average Analyzer Concentration Recorded During Test Run

Date: 7-18-96
Plant: Total Petroleum, Inc.
Unit: Ardmore SRU
Operator: LKS
Job No.: CJ-1593

CETCON, Inc.

ANALYZER CALIBRATION DRIFT AND BIAS DATA

Analyzer:	THC	Serial Number:			556493	Calibration Gas Value:	0.00	24.90
Make:	Eagle	Span:	100	=	10.0	Calibration Error Response:	0.00	25.50
Model:	EM-7000	Units:	ppm	=	VDC	Cylinder Number:	3-1587	CC-43358

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} (1) ppm	Corrected Conc., ppm
C4	0.0	0.0	0.0	NA	25.5	27.3	1.8	NA	0.150	0.141
C5	0.0	0.1	0.1	NA	27.3	28.0	0.7	NA	0.390	0.307
C6	0.1	0.5	0.4	NA	28.0	28.5	0.5	NA	0.610	0.276

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 Response From Run, ppm

Drift Corrected Concentration, ppm = $(C_{Ave} - C_0) * C_{ma} / (C_m - C_0)$ *Method 6C Equation: 6C-1*

(1) C_{Ave}, ppm = Average Analyzer Concentration Recorded During Test Run

Date: 7-18-96
Plant: Total Petroleum, Inc.
Unit: Ardmore SRU
Operator: LKS
Job No.: CJ-1593

CETCON, Inc.

ANALYZER CALIBRATION DRIFT AND BIAS DATA

Analyzer:	CO_2	Serial Number:			1415B/120	Calibration Gas Value:	0.00	11.50
Make:	Servomex	Span:	25	=	1.0	Calibration Error Response:	0.05	11.51
Model:	1400B4	Units:	%	=	VDC	Cylinder Number:	3-1587	CC-54162

Sample Run #	C_{0i} %	C_{0f} %	Zero Drift % Span	Zero Bias % Span	C_{mi} %	C_{mf} %	Cal Drift % Span	Cal Bias % Span	C_{Ave} (1) %	Corrected Conc., %
C4	0.06	0.04	-0.1	0.0	11.45	11.38	-0.3	-0.5	5.257	5.269
C5	0.04	0.03	0.0	-0.1	11.38	11.36	-0.1	-0.6	5.385	5.428
C6	0.03	0.03	0.0	-0.1	11.36	11.30	-0.2	-0.8	5.539	5.607

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 Response From Run, %

Drift Corrected Concentration, % = $(C_{Ave} - C_0) * C_{ma} / (C_m - C_0)$ *Method 6C Equation: 6C-1*

(1) C_{Ave}, % = Average Analyzer Concentration Recorded During Test Run

CETCON, Inc.

ASPIRATOR DGM CALIBRATION ASTM D1071–55
CRITICAL ORIFICE CM CALIBRATION 40 CFR 60, APP.A, METHOD–5

Control Module: CM#1
Serial Number: CM #053, Meter serial #681291
Calibration Date: May 6, 1996
Calibrator: GLM
Leak Check: 36.1 in. W.C.
C_F : 1.017 Deviation from last Cal 1.93%

						Average
Rotometer flow(cfm) or K' (1)	0.8125	0.7035	0.5420	0.3745	0.2640	
Run Time, R (min)	4.767	5.517	7.017	10.250	14.917	
Bar Pressure, P_B (in.Hg) (2)	29.30	29.30	29.29	29.29	29.28	
Ambient Temp, T_A (F)	81	82	82	83	83	
Pump Vacuum, in. Hg.	20.0	20.0	21.0	21.5	21.5	
DGM Vap Pres., P_M (in.wc)	NA	NA	NA	NA	NA	
DGM Orifice ΔH (in.wc) :						
Start	2.40	1.90	1.20	0.59	0.31	
Finish	2.40	1.90	1.20	0.59	0.31	
Average (Δ H)	2.40	1.90	1.20	0.59	0.31	
Inlet Temp DGM (°F) :						
Start	82.0	83.0	83.5	84.5	85.0	
Finish	83.0	83.5	84.5	85.0	85.0	
Average (T_M)	82.5	83.3	84.0	84.8	85.0	
Water Temp. (°F):						
Start	NA	NA	NA	NA	NA	
Finish	NA	NA	NA	NA	NA	
Average (T_W)	0	0	0	0	0	
DGM Volume (cf):						
Finish	8.800	15.200	21.300	27.300	33.700	
Start	3.800	10.200	16.300	22.300	28.600	
Difference (V_M)	5.000	5.000	5.000	5.000	5.100	
Water Liq. Volume, V_C (gal)	NA	NA	NA	NA	NA	
Water Gas Vol., V_W (cf) (3)	3.873	3.881	3.803	3.839	3.938	
Flow Rate (cfh)	62.933	54.377	42.753	29.268	20.514	
Sp.Gr. of Water @ T_W	1.000	1.000	1.000	1.000	1.000	
V_W Corr (4)	4.879	4.885	4.785	4.825	4.948	
C_F (5)	1.018	1.022	1.005	1.016	1.023	1.017
C_F Dev (6)	−0.001	−0.005	0.012	0.001	−0.006	0.000

NOTE:

1. K' is defined as the critical orifice calibrated flow (cfm).
2. Barometric pressure corrected, P_B (in.Hg.) = P_B (mean sea level) − 0.676
3. $V_W = 0.134 \times V_C$ or $V_W = K' \times R$ (min.) : Critical orifice calibration method.
4. V_W Corr = V_W x SpGr. water @ T_W or V_W Corr = K' x R (min.) x P_B / (T_A, (R)) ^ 0.5 ; (Enter Sp.Gr. Water=1.000 for critical orifice).
5. $C_F = [V_W \text{ Corr } (P_B + P_W / 13.6) (T_M + 460)] / [V_M (P_B + (dH + P_M) / 13.6) (T_W + 460)]$: Water aspirator calibration method
   or $C_F = V_W \text{ Corr} / [17.64 \times V_M \times (P_B + (dH/13.6)) / T_M (R)]$: Critical orifice calibration method.
6. C_F Dev = (C_F AVE − C_F(i)) / C_F AVE : (Allowable Deviation = ± 0.02)

ORIFICE CALIBRATION

Date: May 6, 1996

Stack Unit Orifice No: CM #1

Dry Gas Meter Calibration Factor (C_F): 1.017

ΔH = 0.5

T_M (°F)

	In		Out		Time	P_B
	86	Avg	85	Avg	0:00	29.27
	87	87	85	85	3:00	

Dry Gas Meter Reading

End 36.451

Start 35.100

Vol_{DGM} 1.351

$T_M = (T_{in\ avg} + T_{out\ avg}) / 2$ = 86 °F R = 3.0 min.

$V_M = Vol_{DGM} \times C_F$ = 1.374

T_M = °F + 460 = 546 °R

$V_{M\ std} = 17.65 \times V_M \times [P_B + (\Delta H / 13.6)] / T_M$ (°R)

Meter Flow Rate = $V_{M\ std}$ / R

$V_{M\ std}$ = 17.65 x 1.374 x [(29.27 + (0.5 / 13.6)) / (545)] = (1.302) dscf Flow Rate = 1.302 / 3.0 = 0.434 dscfm

ORIFICE CALIBRATION

Date: May 6, 1996

Stack Unit Orifice No: CM #1

Dry Gas Meter Calibration Factor (C_F): 1.017

ΔH = 1.0

T_M (°F)

	In		Out		Time	P_B
	87	Avg	85	Avg	0:00	29.27
	91	89	85	85	3:00	

Dry Gas Meter Reading

End 39.335

Start 37.400

Vol_{DGM} 1.935

$T_M = (T_{in\ avg} + T_{out\ avg}) / 2$ = 87 °F R = 3.0 min.

$V_M = Vol_{DGM} \times C_F$ = 1.968

T_M = °F + 460 = 547 °R

$V_{M\ std} = 17.65 \times V_M \times [P_B + (\Delta H / 13.6)] / T_M$ (°R)

Meter Flow Rate = $V_{M\ std}$ / R

$V_{M\ std}$ = 17.65 x 1.968 x [(29.27 + (1 / 13.6)) / (547)] = (1.863) dscf Flow Rate = 1.863 / 3.0 = 0.621 dscfm

ORIFICE CALIBRATION

Date: May 6, 1996

Stack Unit Orifice No: CM #1

Dry Gas Meter Calibration Factor (C_F): 1.017

ΔH = 2.0

T_M (°F)

	In		Out		Time	P_B
	91	Avg	85	Avg	0:00	29.28
	91	91	85	85	3:00	

Dry Gas Meter Reading

End 43.045

Start 40.200

Vol_{DGM} 2.845

$T_M = (T_{in\ avg} + T_{out\ avg}) / 2$ = 88 °F R = 3.0 min.

$V_M = Vol_{DGM} \times C_F$ = 2.893

T_M = °F + 460 = 548 °R

$V_{M\ std} = 17.65 \times V_M \times [P_B + (\Delta H / 13.6)] / T_M$ (°R)

Meter Flow Rate = $V_{M\ std}$ / R

$V_{M\ std}$ = 17.65 x 2.893 x [(29.28 + (2 / 13.6)) / (548)] = (2.742) dscf Flow Rate = 2.742 / 3.0 = 0.914 dscfm

CETCON, INC.
ORIFICE-DGM ORIFICE CALIBRATION CURVE PROGRAM
WRITTEN BY: RANDALL J. SWEDEEN 7-12-92
CALIBRATION DATE: 05-06-96
DGM UNIT#: CM-1

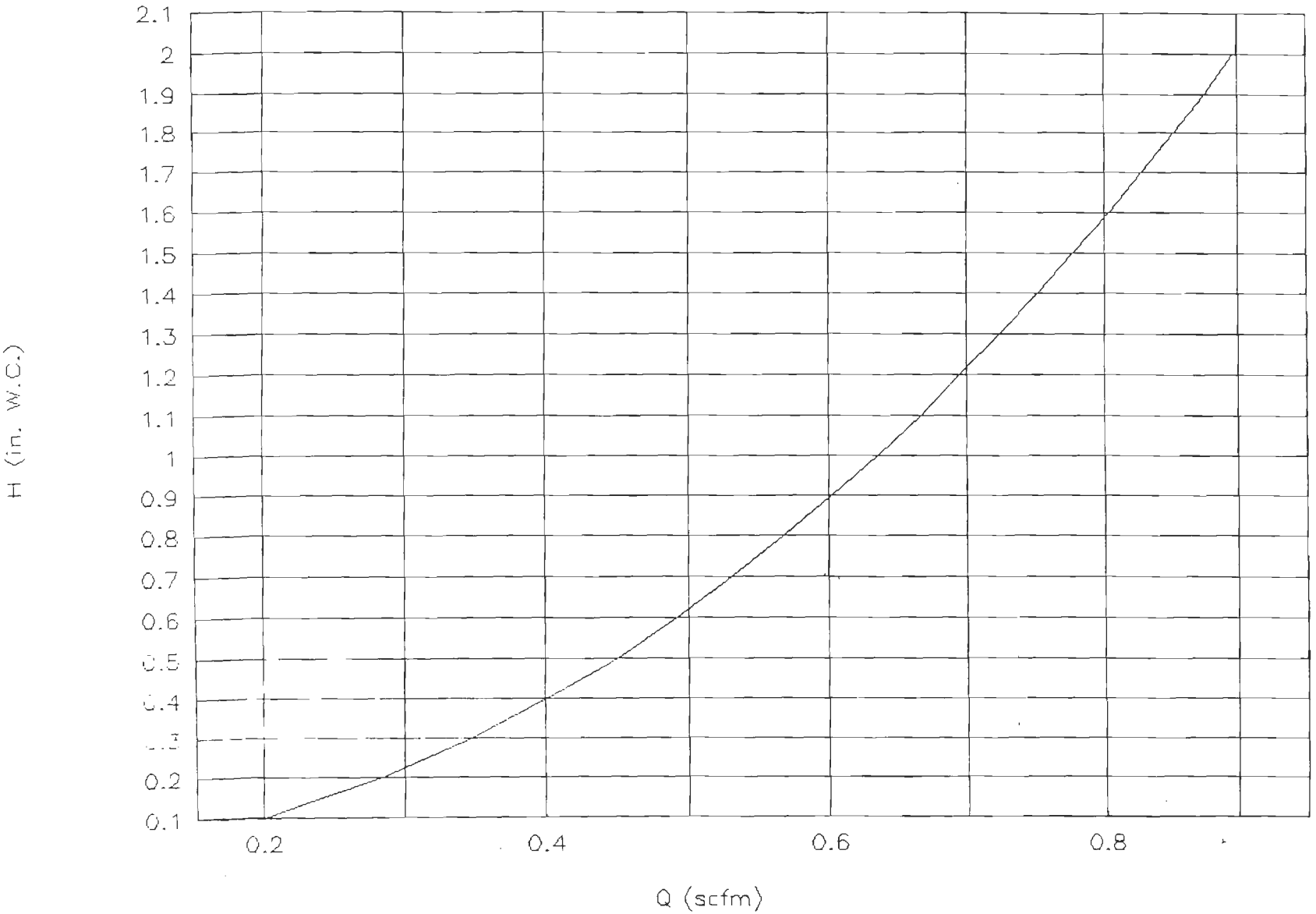
CORRECTED ORIFICE CURVE - DELTA H VERSUS CORRECTED FLOW

H(in.wc)	Q(dscfm)
0.1	0.201
0.2	0.284
0.3	0.348
0.4	0.401
0.5	0.449
0.6	0.492
0.7	0.531
0.8	0.568
0.9	0.602
1.0	0.635
1.1	0.666
1.2	0.695
1.3	0.724
1.4	0.751
1.5	0.777
1.6	0.803
1.7	0.827
1.8	0.851
1.9	0.875
2.0	0.897

* ORIFICE EQUATION FOR CURVE FIT: H(in.wc.) =2.483 * [Q(dscfm)]^2

CETCON, INC.

CM1 ORIFICE CURVE 05-06-96



CETCON, Inc.

INSTRUMENT CALIBRATION DATA

Digital Temperature Indicator (DTI) No: Control Mod. No.1

Calibration Date: May 6, 1996

MEDIA	TIME	MERCURY THERMOMETER (°F)	DTI (°F)	COMMENTS
ICE BATH	1950	34	35	
AMBIENT AIR	2000	82	83	
BOILING WATER	2115	211	212	
OVEN (No. 1 Impinger Case)	2020	195	197	
OVEN (No. 1 Impinger Case)	2030	229	234	
OVEN (No. 1 Impinger Case)	2100	254	257	
OVEN (No. 1 Impinger Case)	2110	280	277	

Calibration Adjustment ?

YES	NO
X	

Signature of Calibrator: H. L. McCluskey

CETCON, Inc.

INSTRUMENT CALIBRATION DATA

Digital Temperature Indicator (DTI) No: CM #1

Calibration Date: 05/06/96

Omega Temperature Simulator:
Model No.: CL-300-2100F
Serial No.: 303
Thermocouple Type: K

OMEGA Temp Simulator (°F)	TIME	Temp. Indicator (°F)	Difference (°F)	COMMENTS
0	1720	0	0	
100	1720	100	0	
200	1720	202	2	
300	1720	300	0	
400	1720	399	-1	
500	1720	498	-2	
600	1720	599	-1	
700	1720	698	-2	
800	1720	800	0	
900	1720	898	-2	
1000	1720	1000	0	

AVERAGE DIFFERENCE -0.55

Calibration Adjustment ?	YES	NO
	X	

Signature of Calibrator: H. L. McCloskey

CETCON, Inc.

INSTRUMENT CALIBRATION DATA

Digital Temperature Indicator (DTI) No: Fluke #1 (CETCON I)

Calibration Date: 05/06/96

Omega Temperature Simulator:
Model No.: CL-300-2100F
Serial No.: 303
Thermocouple Type: K

OMEGA Temp Simulator (°F)	TIME	Fluke Model 80TK Temp. Indicator (°F)	Difference (°F)	COMMENTS
0	1845	0	0	
100	1845	97	-3	
200	1845	199	-1	
300	1845	297	-3	
400	1845	394	-6	
500	1845	493	-7	
600	1845	595	-5	
700	1845	697	-3	
800	1845	801	1	
900	1845	902	2	
1000	1845	1007	7	

AVERAGE DIFFERENCE -1.6

Calibration Adjustment ?	YES	NO
		X

Signature of Calibrator: K. L. McCloskey

CETCON, Inc.

INSTRUMENT CALIBRATION DATA

Digital Temperature Indicator (DTI) No: Fluke #2 (CETCON I)

Calibration Date: 05/06/96

Omega Temperature Simulator:
Model No.: CL-300-2100F
Serial No.: 303
Thermocouple Type: K

OMEGA Temp Simulator (°F)	TIME	Fluke Model 80TK Temp. Indicator (°F)	Difference (°F)	COMMENTS
0	1744	0	0	
100	1744	99	1	
200	1744	202	1	
300	1744	300	0	
400	1744	398	-2	
500	1744	496	-4	
600	1744	598	-2	
700	1744	698	-2	
800	1744	804	4	
900	1744	905	5	
1000	1744	1010	10	

AVERAGE DIFFERENCE 1.0

Calibration Adjustment ?	YES	NO
		X

Signature of Calibrator: M. C. McCloskey

CETCON, Inc.

NO_x ANALYZER

NO_2 to NO Conversion Efficiency

CETCON I

Analyzer Model: Thermo Environmental 10S
Serial No.: 30759--238
Operator: GLM
Date: October 5, 1995

ANALYZER CONVERSION EFFICIENCY DATA

Test Length: 30 Minutes Analyzer Span: 0-- 100 PPM

Comments: Tedlar bag mixed 1:1 with air and 92.1 ppm NO		Cylinder ID#	Cal Gas Value	Initial value	Final value	Percent conversion efficiency
				Analyzer Response NOx, ppm	(1) Analyzer Response NOx, ppm	
Zero gas	Air	Purified Amb. Air	0.0			
Mid range	NO	CC24137	92.10	50.9	51.0	100.0

NOTES: 1. Final value cannot decrease more than 2.0% of initial peak value.

CETCON, Inc.

Method 20
Interference Test Gas
Concentration

CO....	500 ± 50 ppm.....	CO_2.....	10 ± 1 percent.
SO_2....	200 ± 20 ppm.....	O_2.....	20.9 ± 1 percent.

Method 20
Interference Response

Date of test: April 22, 1996
Analyzer Model: Teco 10S
Analyzer Type: Chemiluminescent
Serial No.: 30759-238 (CETCON I)
Anayzer Span: 0 - 1000 PPM

Test gas type	Concentration, ppm,%	Analyzer output response	% of span (1)
CO	609.0 ppm	0.0 %	0.0
SO_2	207.0 ppm	0.0 %	0.0
CO_2	11.5 %	0.0 %	0.0
O_2	21.0 %	0.0 %	0.0

Sum of Interference = 0.0 (2)

Notes: (1)

$$\% \text{ of span} = \frac{\text{Analyzer output response}}{\text{Instrument span}} \times 100$$

(2) Sum of interference response must be \ 2% of analyzer span.

CETCON, Inc.

Method 20
Interference Test Gas
Concentration

CO....	500 ± 50 ppm.....	CO_2.....	10 ± 1 percent.
SO_2....	200 ± 20 ppm.....	NO.....	500 ± 50 ppm.....

Method 20
Interference Response

Date of test: April 22, 1996
Analyzer Model: Servomex 1400
Analyzer Type: O_2 Paramagnetic
Serial No.: 1420B / 272 (CETCON I)
Anayzer Span: 0 - 25%

Test gas type	Concentration, ppm, %	Analyzer output response	% of span (1)
CO	609.0 ppm	0.0 %	0.0
SO_2	207.0 ppm	0.0 %	0.0
CO_2	11.5 %	0.0 %	0.0
NO	524.0 ppm	0.0 %	0.0

Sum of Interference = 0.0 (2)

Notes: (1) $$\% \text{ of span} = \frac{\text{Analyzer output response}}{\text{Instrument span}} \times 100$$

(2) Sum of interference response must be ≤ 2% of analyzer span.

CETCON, Inc.

Method 20
Interference Test Gas
Concentration

CO....	500 ± 50 ppm.....	CO_2.....	10 ± 1 percent.
NO....	500 ± 50 ppm.....	O_2.....	20.9 ± 1 percent.

Method 20
Interference Response

Date of test: April 22, 1996
Analyzer Model: Weatern Research 721M
Analyzer Type: SO_2 - UV
Serial No.: 94-721M-8117-5 (CETCON I)
Anayzer Span: 0 - 250 PPM

Test gas type	Concentration, ppm, %	Analyzer output response	% of span (1)
CO	609.0 ppm	0.0 %	0.0
NO	524.0 ppm	0.0 %	0.0
CO_2	11.5 %	0.0 %	0.0
O_2	21.0 %	0.0 %	0.0

Sum of Interference = 0.0 (2)

Notes: (1)

$$\% \text{ of span} = \frac{\text{Analyzer output response}}{\text{Instrument span}} \times 100$$

(2) Sum of interference response must be ≤ 2% of analyzer span.

CETCON, Inc.

Method 20
Interference Test Gas
Concentration

CO....	500 ± 50 ppm.....	O_2.....	20.9 ± 1 percent.
SO_2....	200 ± 20 ppm.....	NO.....	500 ± 50 ppm.....

Method 20
Interference Response

Date of test: April 22, 1996
Analyzer Model: Servomex 1400
Analyzer Type: CO_2 - NDIR
Serial No.: 1415B / 120 (CETCON I)
Anayzer Span: 0 - 25%

Test gas type	Concentration, ppm, %	Analyzer output response	% of span (1)
CO	609.0 ppm	0.0 %	0.0
SO_2	207.0 ppm	0.0 %	0.0
O_2	21.1 %	0.0 %	0.0
NO	524.0 ppm	0.0 %	0.0

Sum of Interference = 0.0 (2)

Notes: (1)

$$\% \text{ of span} = \frac{\text{Analyzer output response}}{\text{Instrument span}} \times 100$$

(2) Sum of interference response must be ≤ 2% of analyzer span.

CETCON, Inc.

Pitot Tube No:	1 / CETCON I	C_{Pstd}:	0.99 (18" probe)
Length, ft.:	3	C_P:	0.772
P_B (in. Hg):	29.25 / 80 °F	Cal. Date:	May 7, 1996
$P_A + P_B$, in.:	0.540 (6) (7)	Due Date:	November 1996
D_t, in.:	0.25	Calibrator:	GLM

	Run No.	Target ΔP_{std} (in. w.c.)	Target Velocity (fpm)	Std Pitot ΔP_{std} (in. w.c.)	S–Type ΔP_s (in. w.c.)	C_P (1)	Deviation From Mean (2)
High Side (A)	1	0.15	1550	0.15	0.25	0.767	−0.009
	2	0.25	2000	0.25	0.41	0.773	−0.003
	3	0.50	2830	0.50	0.80	0.783	0.006
	4	0.75	3475	0.75	1.20	0.783	0.006
	5	0.95	3950	0.95	1.45	0.801	0.025
	Avg					0.776	0.005
Low Side (B)	1	0.15	1550	0.15	0.26	0.752	−0.016
	2	0.25	2000	0.25	0.42	0.764	−0.004
	3	0.50	2830	0.50	0.81	0.778	0.010
	4	0.75	3475	0.75	1.21	0.779	0.011
	5	0.95	3950	0.95	1.55	0.775	0.007
	Avg					0.768	0.001

SUMMARY

C_P avg. (A)	C_P avg. (B)	C_P (3)	$\lvert C_P$ avg. (A) − C_P avg. (B)$\rvert$ (4)	DEV avg. (A)	DEV avg. (B)
0.776	0.768	0.772	0.008	0.005	0.001

1. $C_P = C_{Pstd} (\Delta P_{std} / \Delta P_s)^{1/2}$
2. Deviation = C_P (i) − C_P avg. (A or B) Note: Used when calibrating at a single velocity.
3. $C_P = [C_P$ avg. (A) + C_P avg. (B)] / 2
4. $\lvert C_P$ avg. (A) − C_P avg. (B) $\rvert$ (Must Be <= 0.01)
5. |DEV avg (A)| or |DEV avg (B)| (Must Be <= 0.01)
6. Pa+Pb min.= 2 x (D_t x 1.05)= 0.525
7. Pa+Pb max.= 2 x (D_t x 1.50)= 0.750

CETCON, Inc.

Barometer Calibration

Date: May 13, 1996
Barometer ID: CETCON I

Absolute Pressure at (Station Pressure)	Tulsa, Oklahoma	National Weather Service	29.43
	@ Elevation, ft		676
	@ Temperature, °F		60
National Weather Service barometer corrected to elevation of CETCON's Tulsa, Oklahoma Office.			29.476
	CETCON Barometer Reading		29.48
	@ Elevation, ft		630
	@ Temperature, °F		60
	Variation		0.004

Barometer Adjusted ? YES X NO

Verification: Kenneth E. Laine

13-May-96

BAROCAL.WK

APPENDIX E

Lab Analysis

BTU3 Ver3.O-FUEL GAS HEATING VALUE PROGRAM
WRITTEN BY RANDALL J. SWEDEEN
CETCON, INC.

FUEL GAS COMPOSITION
TOTAL - ARDMORE

7/18/96 8:00 AM

COMPONENT	MW	MOLE%	BTU (LHV)	BTU (HHV)
METHANE, CH4, C1	16.0	19.500	177.3	196.9
ETHANE, C2H6, C2	30.1	7.500	121.4	132.7
ETHYLENE, C2H4, C2-	28.0	5.600	83.9	89.6
PROPANE, C3H8, C3	44.1	5.500	127.4	138.4
PROPYLENE, C3H6, C3-	42.1	5.600	122.2	130.7
ISO-BUTANE, IC4H10, IC4	58.1	1.500	45.0	48.8
N-BUTANE, NC4H10, NC4	58.1	3.200	96.4	104.4
BUTYLENES, C4H8, C4-	58.1	0.400	11.5	12.3
ISO-PENTANE, IC5H12, IC5	72.2	0.800	29.6	32.0
N-PENTANE, NC5H12, NC5	72.2	0.400	14.8	16.0
PENTENES, 1-C5H10, 1-C5-	70.1	0.000	0.0	0.0
HEXANE, NC6H14, NC6	86.2	0.500	22.0	23.8
OXYGEN, O2,	32.0	0.000	0.0	0.0
NITROGEN, N2,	28.0	3.400	0.0	0.0
HYDROGEN, H2,	2.0	46.000	126.0	149.0
CARBON MONOXIDE, CO,	28.0	0.000	0.0	0.0
CARBON DIOXIDE, CO2,	44.0	0.100	0.0	0.0
WATER,H20,	18.0	0.000	0.0	0.0
BENZENE,C6H6,	78.1	0.000	0.0	0.0
TOLUENE,C7H8,	92.1	0.000	0.0	0.0
ETHYLBENZENE,C8C10,	106.2	0.000	0.0	0.0
XYLENE,C8C10,	106.2	0.000	0.0	0.0
TOTAL		100.000%	977.5 (LHV)	1074.7 (HHV)

FG TEMP(F): 70
FG PRES(psia): 14.7
FGmw(lb/lb-mole): 17.9
DENSITY(lb/scf):0.046

GAS CHROMATOGRAPHY
(MOL %) PAGE #1

TOTAL PETROLEUM, INC.
ARDMORE REFINERY

TECH: FT SMITH
DATE: 7-18-96

	PRODUCT	H2	O2	N2	C1	CO	CO2	C2-	C2	C3	C3-	IC4	NC4	C4-	1,3-B	IC5	NC5	C5-	C6+	H2S	BTU CU FT	SPG	SUL PPM
CRUDE UNIT	RECONT OFF GAS	21.9	.4	72.1	20.6	.8	1.6	.1	2.0	7.2	.1	2.6	7.7			3.0	3.4		4.5	2.0	1213	1.04	
	LSR											.1	2.1			8.7	10.9		78.2			.66	
	RECONT BTMS								.5	4.2		12.4	16.1			2.3	4.0		73.7			.64	
	NATURAL GASOLINE																						
	SAT DEPROP BTMS									0.1		28.6	66.8			4.0	0.5					.58	
	SAT DEETH OH GAS		.3	1.7	.7		2.0	.3	4.5	60.0	.6									15.0	1816	1.36	
	SAT PROPANE								0.1	99.3	0.2	0.4										.51	
	REF LPG TO SAT GAS																						
	REFINERY FUEL GAS	46.0		3.4	19.5		.1	5.6	7.5	5.5	5.6	1.5	3.2	.4		.8	.4		.5		997	.62	
	NATURAL GAS																						
	CRUDE FLARE GAS																						
	MEROX VENT GAS																						
	DEETH CHARGE				1.3				2.5	33.9		19.4	42.2			0.4	0.3					.55	
	DEBUT CHARGE				.1				1.4	10.2		4.9	13.1			2.3	3.8		64.2			.63	
	DHDS RECYCLE H2	87.1			8.1				3.0	.5		.1	.1			.5	.2		.4		422	.18	
DHDS UNIT	LP FLASH GAS	59.2		.2	20.8				12.6	2.8			.2							4.2	650	.38	
	STRIPPER OFF GAS	57.9		.2	15.4				13.9	5.2		.6	.5						.4	6.0	726	.45	
	SCOT H2 FEED																						
	CITY GAS																						
	AAG FEED																						
	SWS MIXED FEED																						
	DHDS FLARE																						

Cetcon, Inc.
Total Petroleum
7/18/96

Analytical Report
0796-17

Hydrogen Sulfide, Carbonyl Sulfide &
Carbon Disulfide

Enthalpy Analytical, Inc.
3211 Bramer Drive
Raleigh, NC 27604
919/850-4392

Summary of Results

ENTHALPY analytical, inc.

Company:	Cetcon/Total Petroleum	Client #:	CJ-1593
Analyst:	SJE	Enthalpy #:	0796-17
Parameters:	TRS	PO#:	Verbal
# Samples:	3	Date:	08/09/96

Sample Id	CONCENTRATION (ppm)		
	Hydrogen Sulfide	Carbonyl Sulfide	Carbon Disulfide
Test #4 1	< 0.421	< 0.421	< 0.421
Test #4 2	< 0.421	< 0.421	< 0.421
Test #4 3	< 0.421	< 0.421	< 0.421
Average	< 0.421	< 0.421	< 0.421
Test #5 1	< 0.421	< 0.421	< 0.421
Test #5 2	< 0.421	< 0.421	< 0.421
Test #5 3	< 0.421	< 0.421	< 0.421
Average	< 0.421	< 0.421	< 0.421
Test #6 1	< 0.421	< 0.421	< 0.421
Test #6 2	< 0.421	< 0.421	< 0.421
Test #6 3	< 0.421	< 0.421	< 0.421
Average	< 0.421	< 0.421	< 0.421

Results

Company:	Cetcon/Total Petroleum	**Client #:**	CJ-1593
Analyst:	SJE	**Enthalpy**	0796-17
Parameters:	TRS	**PO #:**	Verbal
# Samples:	3	**Date:**	08/09/96

Hydrogen Sulfide -- Calibration

Concentration	Area Count #1	Area Count #2	Area Count #3	Area Count Average	Predicted Concentration
2.00	76	82.4	70.87	76	2.00
4.00	246	254.9	259.8	253	3.98
8.00	838	825.3	912.9	859	8.02

Hydrogen Sulfide -- Analysis

Sample Identification		Area Count #1	Dilution Ratio	THC Readout	Ave. Area	Range Adjuster	Concentration ppm
Test #4 1	<	5	1	N/A	5	1	< 0.421
Test #4 2	<	5	1	N/A	5	1	< 0.421
Test #4 3	<	5	1	N/A	5	1	< 0.421
						AVG	< 0.421
Test #5 1	<	5	1	N/A	5	1	< 0.421
Test #5 2	<	5	1	N/A	5	1	< 0.421
Test #5 3	<	5	1	N/A	5	1	< 0.421
						AVG	< 0.421
Test #6 1	<	5	1	N/A	5	1	< 0.421
Test #6 2	<	5	1	N/A	5	1	< 0.421
Test #6 3	<	5	1	N/A	5	1	< 0.421
						AVG	< 0.421

Company:	Cetcon/Total Petroleum	**Client #:**	CJ-1593
Analyst:	SJE	**Enthalpy #:**	0796-17
Parameters:	TRS	**PO #:**	Verbal
# Samples:	3	**Date:**	08/09/96

Carbon Disulfide -- Calibration

Concentration	Area Count #1	Area Count #2	Area Count #3	Area Count Average	Predicted Concentration
2.00	76	82.4	70.87	76	2.00
4.00	246	254.9	259.8	253	3.98
8.00	838	825.3	912.9	859	8.02

Carbon Disulfide -- Analysis

Sample Identification		Area Count #1	Dilution Ratio	THC Readout	Ave. Area	Range Adjuster	Concentration ppm
Test #4 1	<	5	1	N/A	5	1	< 0.421
Test #4 2	<	5	1	N/A	5	1	< 0.421
Test #4 3	<	5	1	N/A	5	1	< 0.421
						AVG	< 0.421
Test #5 1	<	5	1	N/A	5	1	< 0.421
Test #5 2	<	5	1	N/A	5	1	< 0.421
Test #5 3	<	5	1	N/A	5	1	< 0.421
						AVG	< 0.421
Test #6 1	<	5	1	N/A	5	1	< 0.421
Test #6 2	<	5	1	N/A	5	1	< 0.421
Test #6 3	<	5	1	N/A	5	1	< 0.421
						AVG	< 0.421

Company:	Cetcon/Total Petroleum	**Client #:**	CJ-1593
Analyst:	SJE	**Enthalpy #:**	0796-17
Parameters:	TRS	**PO #:**	Verbal
# Samples:	3	**Date:**	08/09/96

Carbonyl Sulfide -- Calibration

Concentration	Area Count #1	Area Count #2	Area Count #3	Area Count Average	Predicted Concentration
2.00	76	82.4	70.87	76	2.00
4.00	246	254.9	259.8	253	3.98
8.00	838	825.3	912.9	859	8.02

Carbonyl Sulfide -- Analysis

Sample Identification		Area Count #1	Dilution Ratio	THC Readout	Ave. Area	Range Adjuster	Concentration ppm
Test #4 1	<	5	1	N/A	5	1	< 0.421
Test #4 2	<	5	1	N/A	5	1	< 0.421
Test #4 3	<	5	1	N/A	5	1	< 0.421
						AVG	< 0.421
Test #5 1	<	5	1	N/A	5	1	< 0.421
Test #5 2	<	5	1	N/A	5	1	< 0.421
Test #5 3	<	5	1	N/A	5	1	< 0.421
						AVG	< 0.421
Test #6 1	<	5	1	N/A	5	1	< 0.421
Test #6 2	<	5	1	N/A	5	1	< 0.421
Test #6 3	<	5	1	N/A	5	1	< 0.421
						AVG	< 0.421

Narrative Summary

ENTHALPY analytical, inc.

Enthalpy Analytical Narrative Summary

Company:	Cetcon/Total Petroleum.
Client #:	CJ-1593
PO #	Verbal

Enthalpy #:	0796-17
Analyst:	DMB
Parameter:	TRS

Custody

Samples were picked up on 7/18/96 after being relinquished by Kelly Sandberg of Cetcon, Inc. and received by Steve Eckard of Enthalpy Analytical, Inc. The bag samples were at ambient temperature and impinger samples chilled upon receipt with no visible container problems. Samples were kept under lock with access only to authorized personnel of Enthalpy Analytical, Inc. prior to and during analysis.

Separation/Analysis

The following compounds were quantified from the bag samples: hydrogen sulfide (H_2S), carbonyl sulfide (COS), carbon disulfide (CS2).

All samples were separated using a RTX-1 60M × 0.53 mm capillary column all compounds chromatographed well.

All samples were analyzed using a 5890 Hewlett Packard gas chromatograph with flame photometric detection.

Chromatographic Conditions

Initial temperature:	55°C
Ramp:	12°C per minute to 140°C hold for 2.00 min.
Net Run Time	10.0 minutes
Pressure Constant:	9.0 psi at 55°
Detector temperature:	225°C

Reproducibility

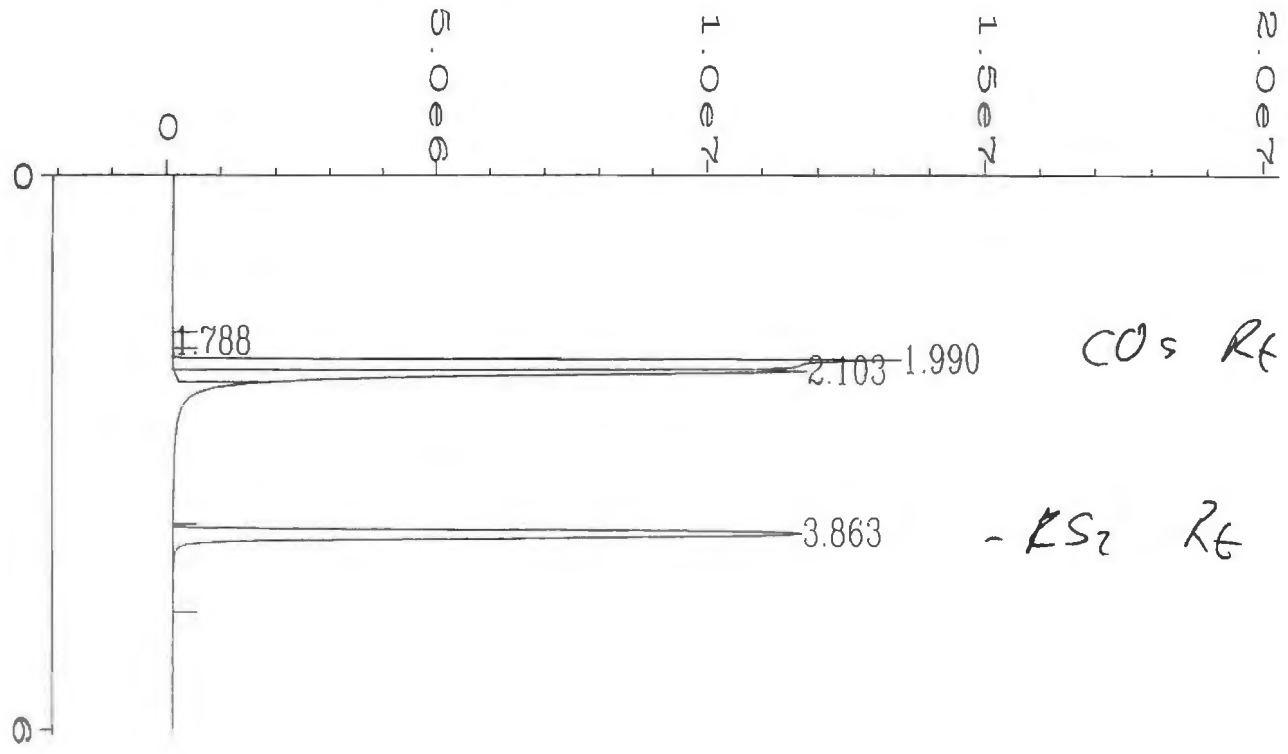
All standards were within 10% of their tag value.

Quality of Data

OK

Additional Notes

No COS or CS2 standards were available on the day the samples arrived. Therefore, H2S was used to calibrate the instrument. COS and CS2 were injected later to verify the retention times. No hits were recorded for either compound. Detection limits are based on the H2S calibration.



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Area Percent Report.

==========

Data File Name : C:\HPCHEM\1\DATA\CO2\NV-F0126.D
Operator : SJE
Instrument : HARPO
Sample Name : [redacted] Retention time check.
Run Time Bar Code:
Acquired on : 09 Aug 96 11:29 AM
Report Created on: 09 Aug 96 11:35 AM

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: 0796-01A.MTH
Analysis Method : 0796-01A.MTH

Sig. 1 in C:\HPCHEM\1\DATA\CO2\NV-F0126.D

Pk#	Ret Time	Area	Height	Type	Width	Area %
1	1.788	18454	3514	PH	0.072	0.0093
2	1.990	7.94796E+007	1.37449E+007	HH	0.090	39.9313
3	2.103	5.06066E+007	1.18469E+007	HBA	0.071	25.4252
4	3.863	6.89364E+007	1.16363E+007	PV	0.098	34.6343

Total area = 1.99041E+008

==========

Sample Custody

ENTHALPY analytical, inc.

CETCON, Inc.

CHAIN OF CUSTODY

JOB NO: CJ–1593

CUSTOMER: Total Petroleum, Inc.

UNIT: SRU

LOCATION: Ardmore, OK

DATE(S) SAMPLED: 7–18–96

NUMBER OF TESTS: 3

DATE RESULTS REQUIRED: ASAP

DESCRIPTION	NO. OF CONTAINERS	H_2S	COS	CS_2					BTEX
Tedlar Bag Gas Sample	3	X	X	X					

SPECIAL INSTRUCTIONS

Analyze for TRS compounds using RM–15

OUTSIDE ANALYSIS

FIRM: Enthalpy Analytical

ANALYSIS FOR: CETCON,INC

DATE TAKEN:

SAMPLE NO.	TIME	DATE	LOCATION	RECOVERED BY
C4	1008	7–18–96	TRAILER	LKS/RAS
C5	1150	7–18–96	TRAILER	LKS/RAS
C6	1335	7–18–96	TRAILER	LKS/RAS

SAMPLES RECEIVED BY: [signature] FOR TRANSPORT TIME: 1530 DATE: 7/18/96

SAMPLES REC'D AT LAB BY: [signature] TIME: 1000 DATE: 7/19/96

SAMPLES ANALYZED BY: TIME: DATE:

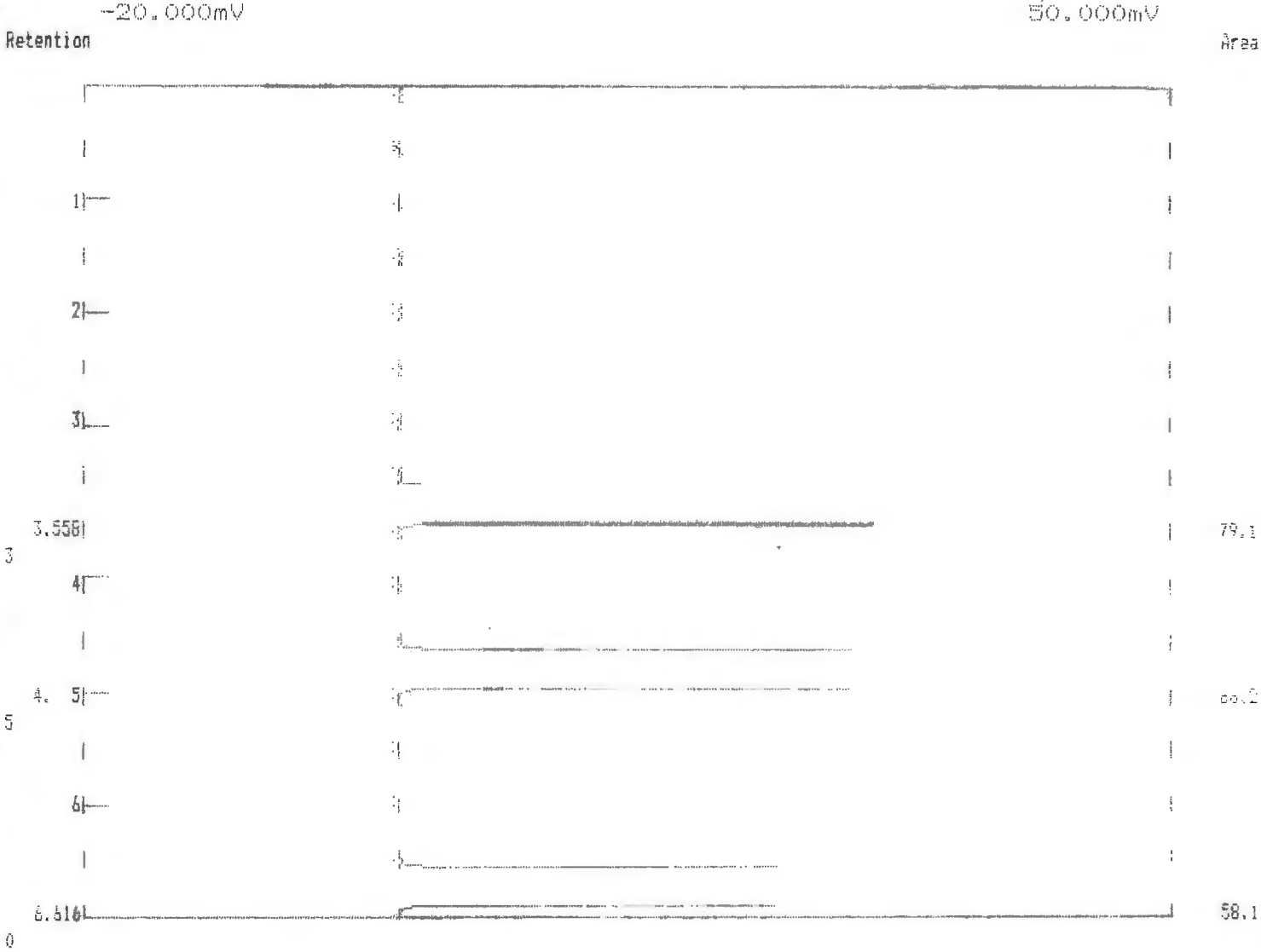
18–Jul–96

CHAINCUS.WK1

Chromatograms

ENTHALPY analytical, inc.

Operator :
Description : Cetcon
File : CETCN-27.CHR
Date : 07/19/1996
Time : 18:46:58



Component	Retention	Area
	3.558	79.13
	4.833	66.25
	6.616	58.10
3		203.48

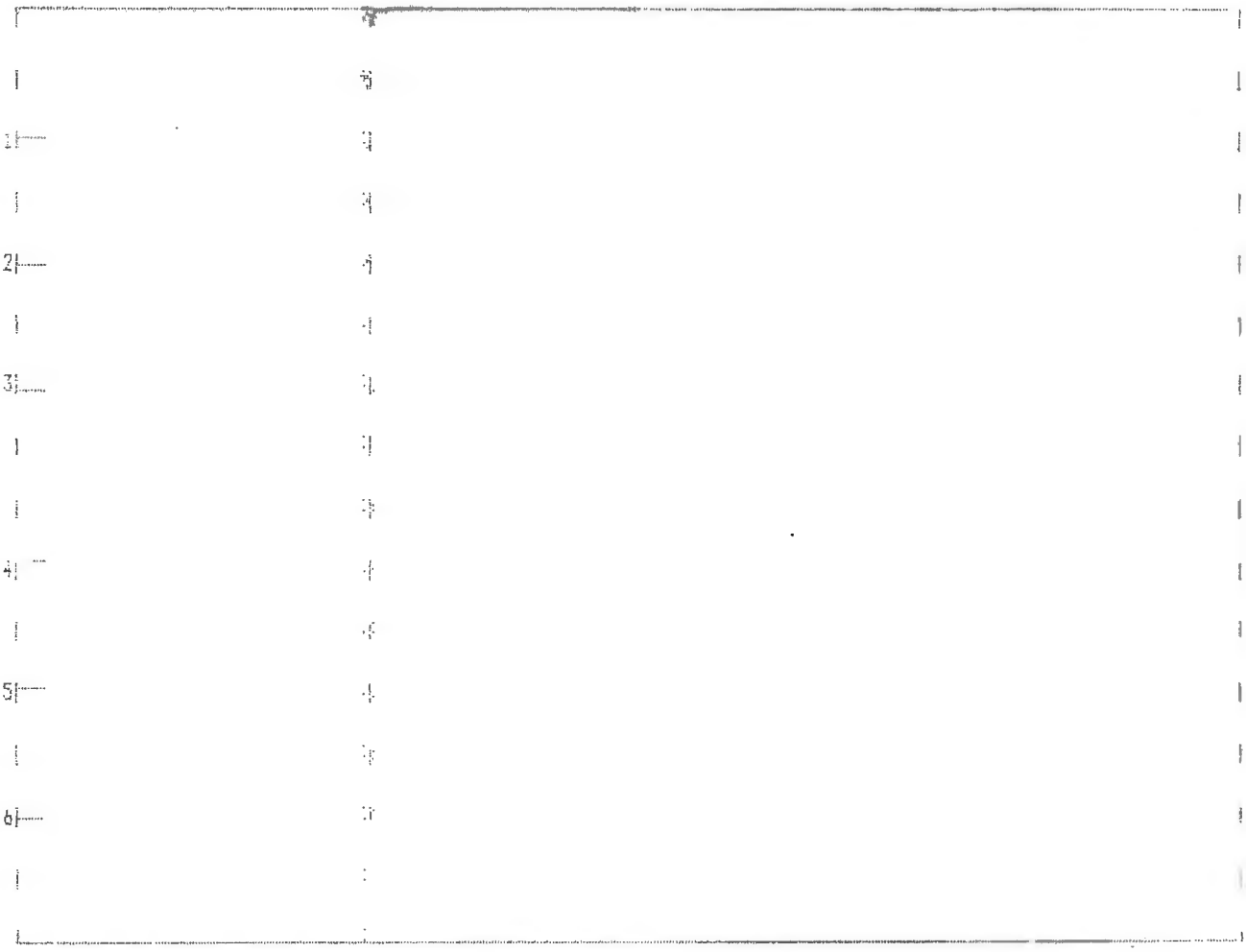
Operator :
Description : Cetcon
File : CETCN-26.CHR
Date : 07/19/1996
Time : 18:33:35

Component	Retention	Area
	0.558	6.12
1		6.12

Operator :
Description : Cetcon
File : CETCN-25.CHR
Date : 07/19/1996
Time : 18:26:56

-20.000mV 50.000mV

Retention Area

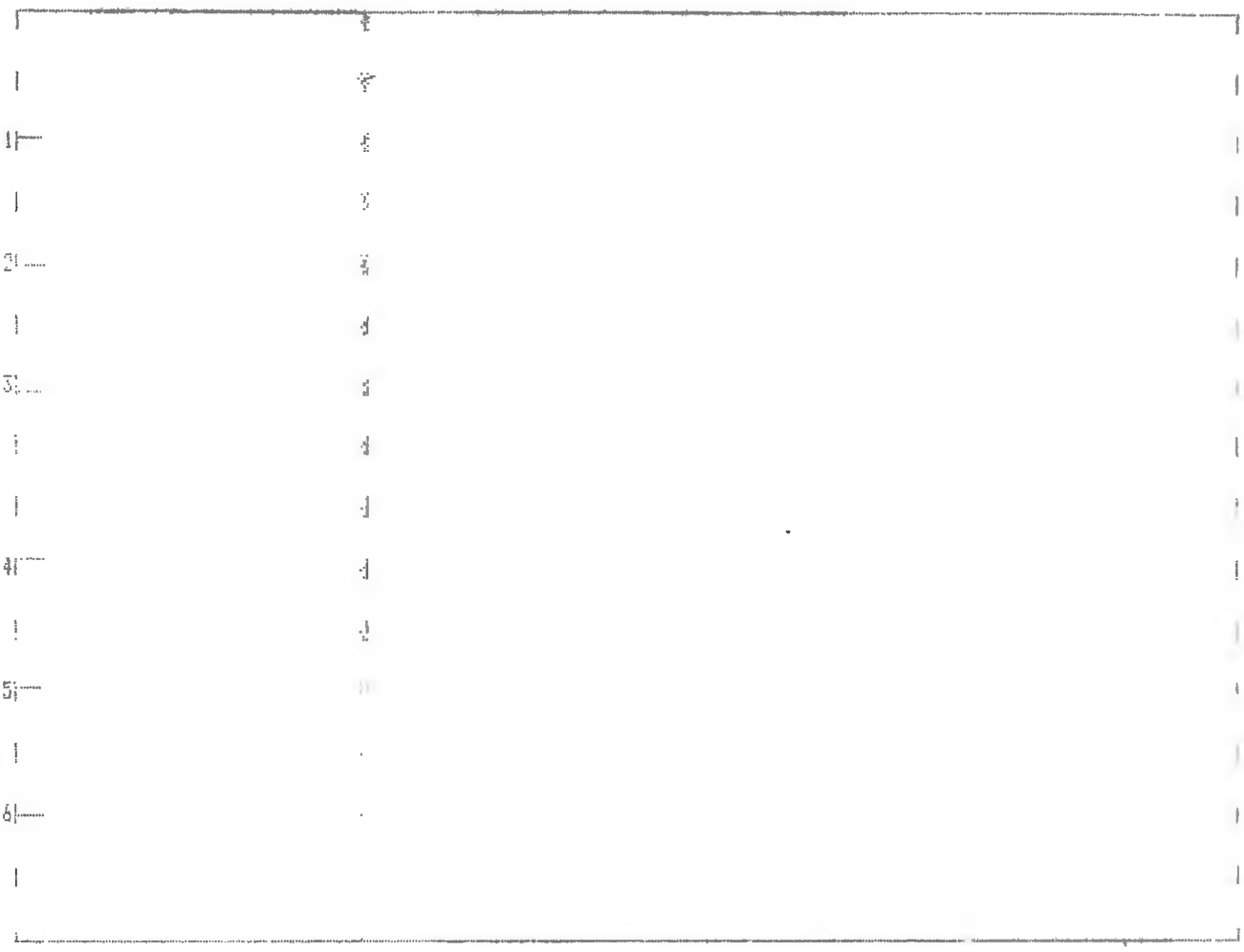


Component	Retention	Area
0		0.00

Operator :
Description : Cetcon
File : CETCN-24.CHR
Date : 07/19/1996
Time : 18:21:13

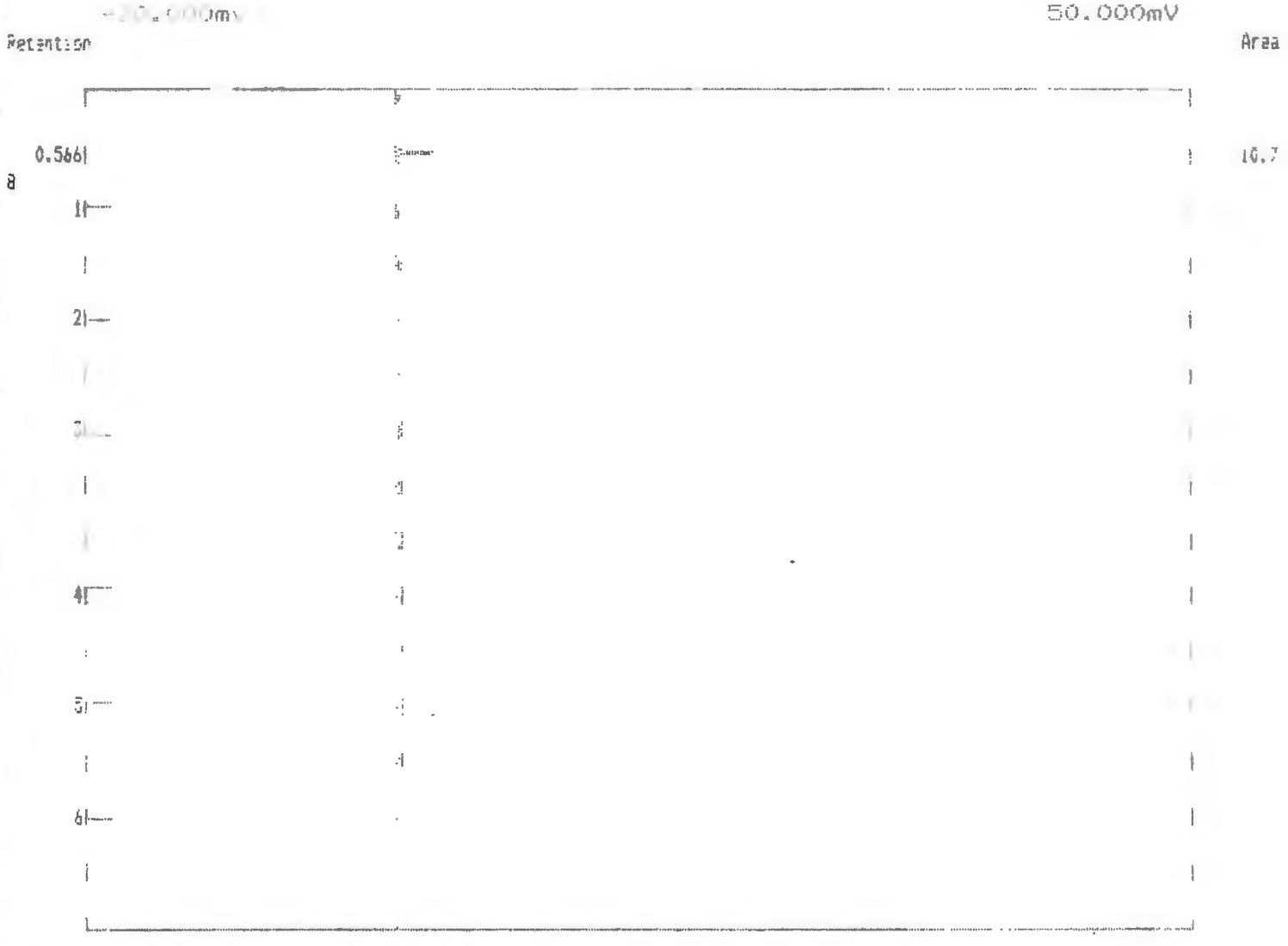
-20.000mV 50.000mV

Retention Area



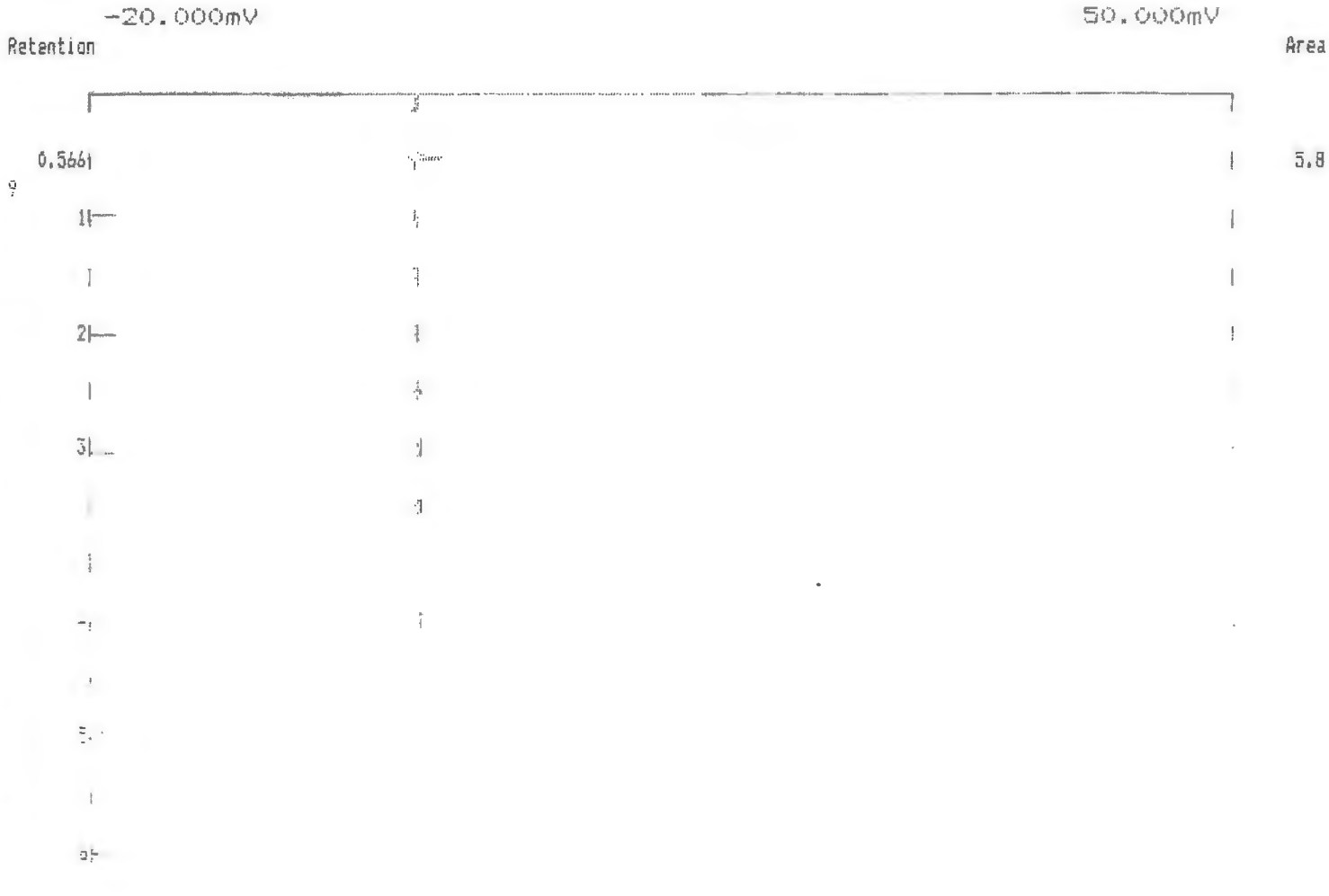
Component	Retention	Area
0		0.00

Operator :
Description : Catcon
File : CETCN-23.CHR
Date : 07/19/1996
Time : 18:12:27



Component	Retention	Area
	0.566	10.78
1		10.78

Operator :
Description : Cetcon
File : CETCN-22.CHR
Date : 07/19/1996
Time : 18:05:22

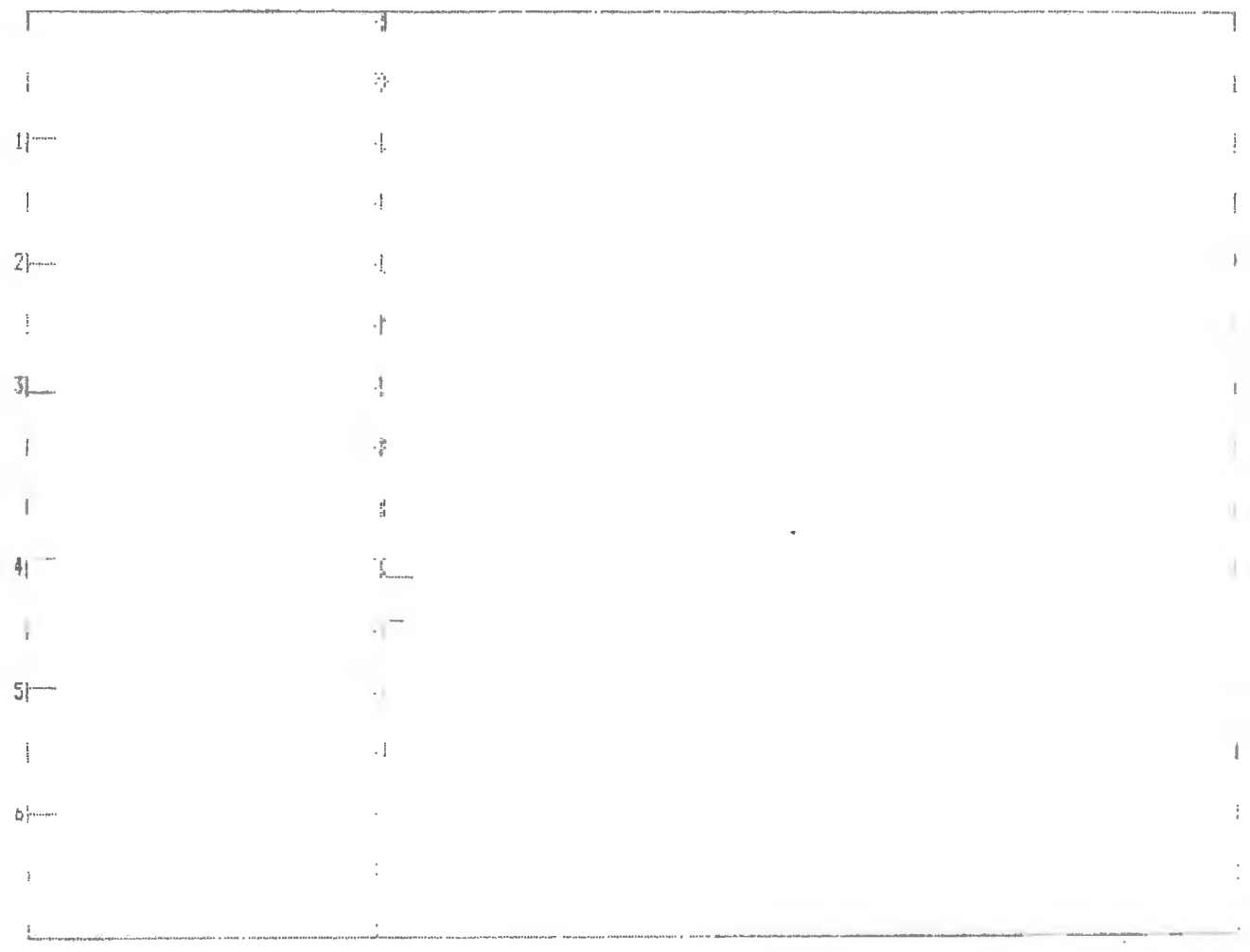


Component	Retention	Area
1		5.89

Operator :
Description : Cetcon
File : CETCN-21.CHR
Date : 07/19/1996
Time : 17:58:19

-20.000mV 50.000mV

Retention Area

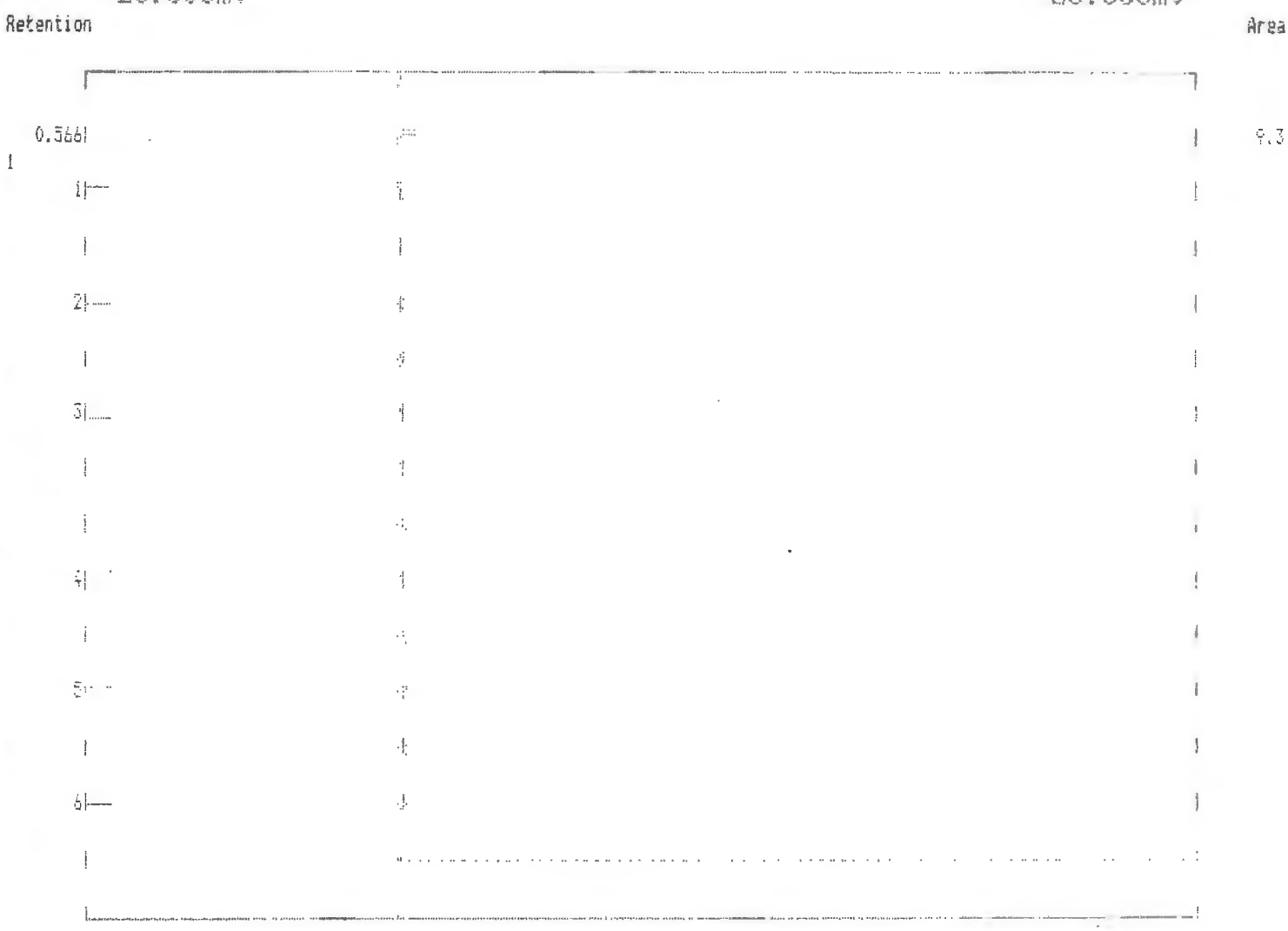


Component	Retention	Area
0		0.00

Operator :
Description : Cetcon
File : CETCN-20.CHR
Date : 07/19/1996
Time : 17:42:45

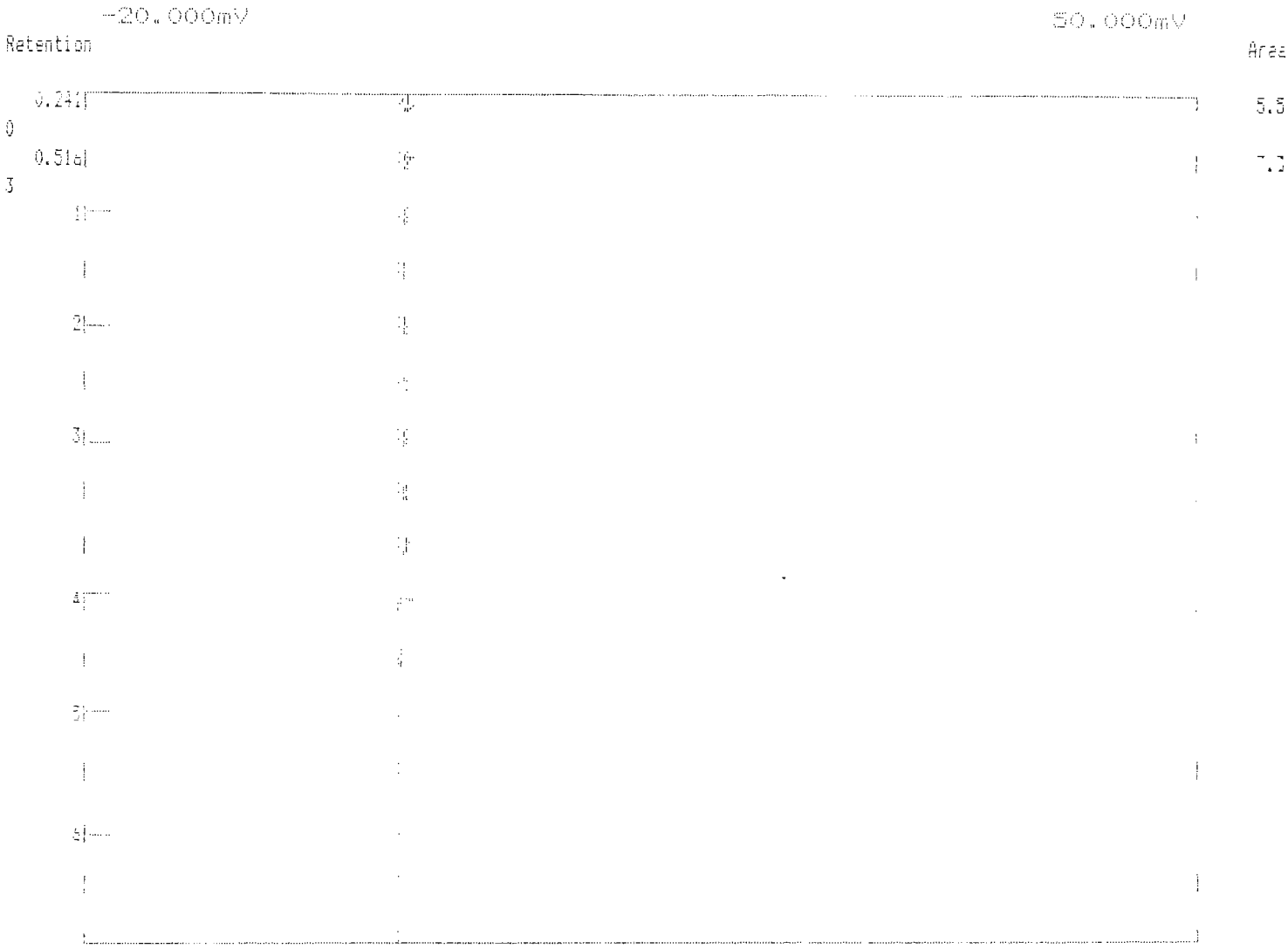
Component	Retention	Area
	0.508	7.58
1		7.58

Operator :
Description : Cetcon
File : CETCN-19.CHR
Date : 07/19/1996
Time : 17:34:28



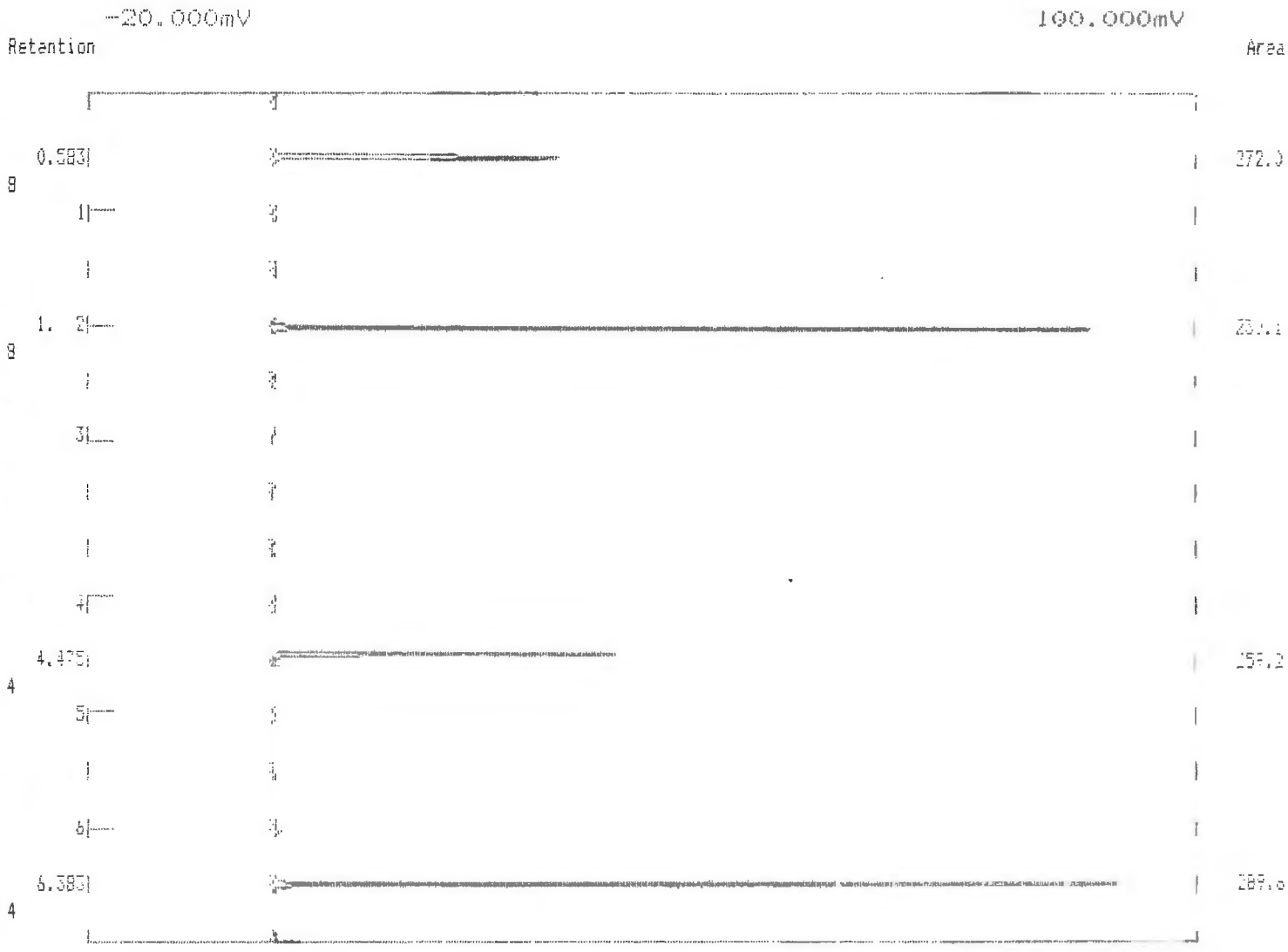
Component	Retention	Area
	0.566	9.31
1		9.31

Operator :
Description : Cetcon
File : CETCN-18.CHR
Date : 07/19/1996
Time : 17:29:30



Component	Retention	Area
	0.241	5.50
	0.516	7.33
2		12.82

Operator :
Description : Cetcon
File : CETCN-29.CHR
Date : 07/19/1996
Time : 18:59:40

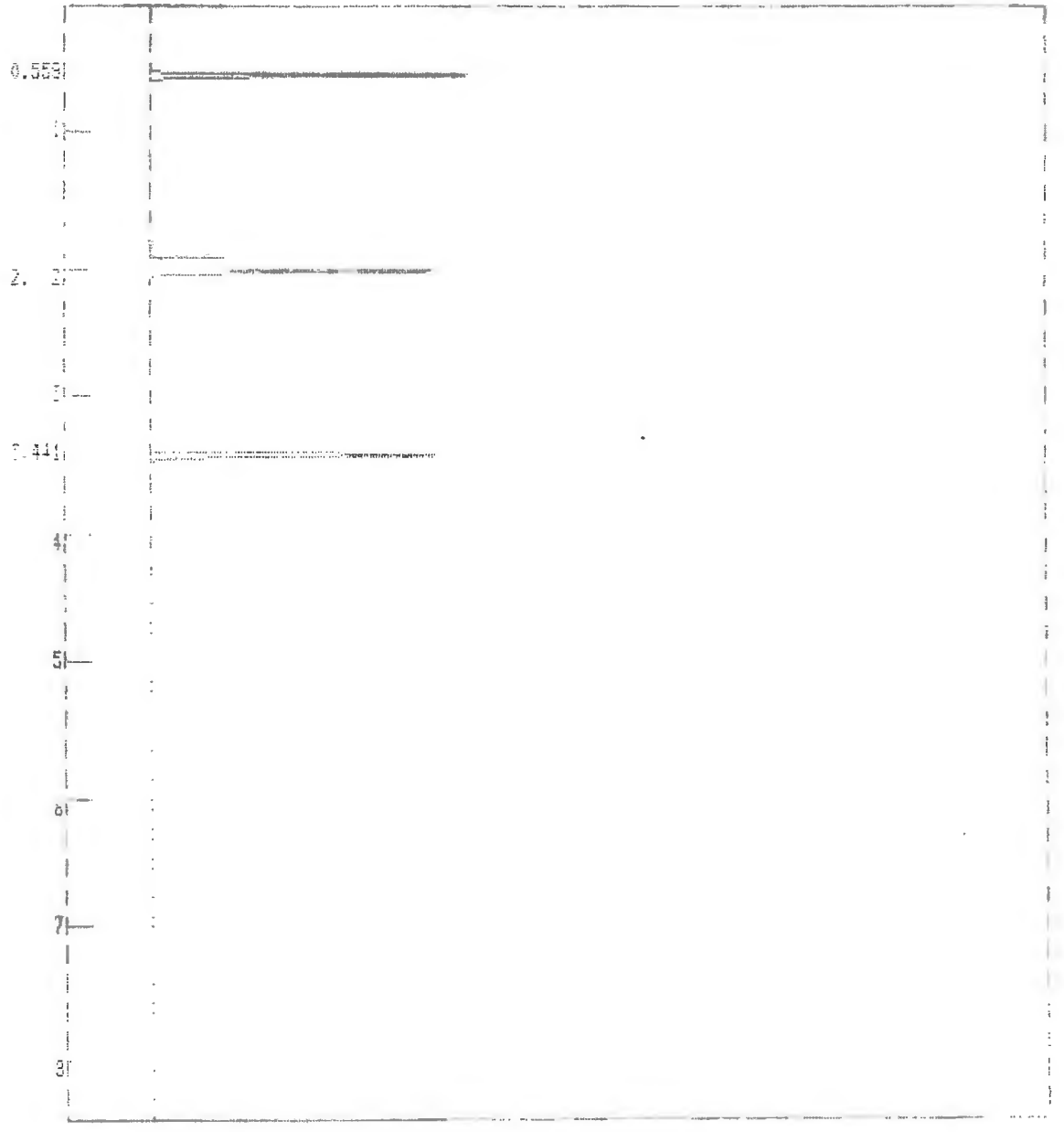


Component	Retention	Area
	0.583	272.08
	1.983	230.18
	4.475	259.24
	6.383	289.64
	7.675	268.69
5		1319.83

Operator :
Description : Cetcon
File : CETCN-15.CHR
Date : 07/19/1996
Time : 16:57:53

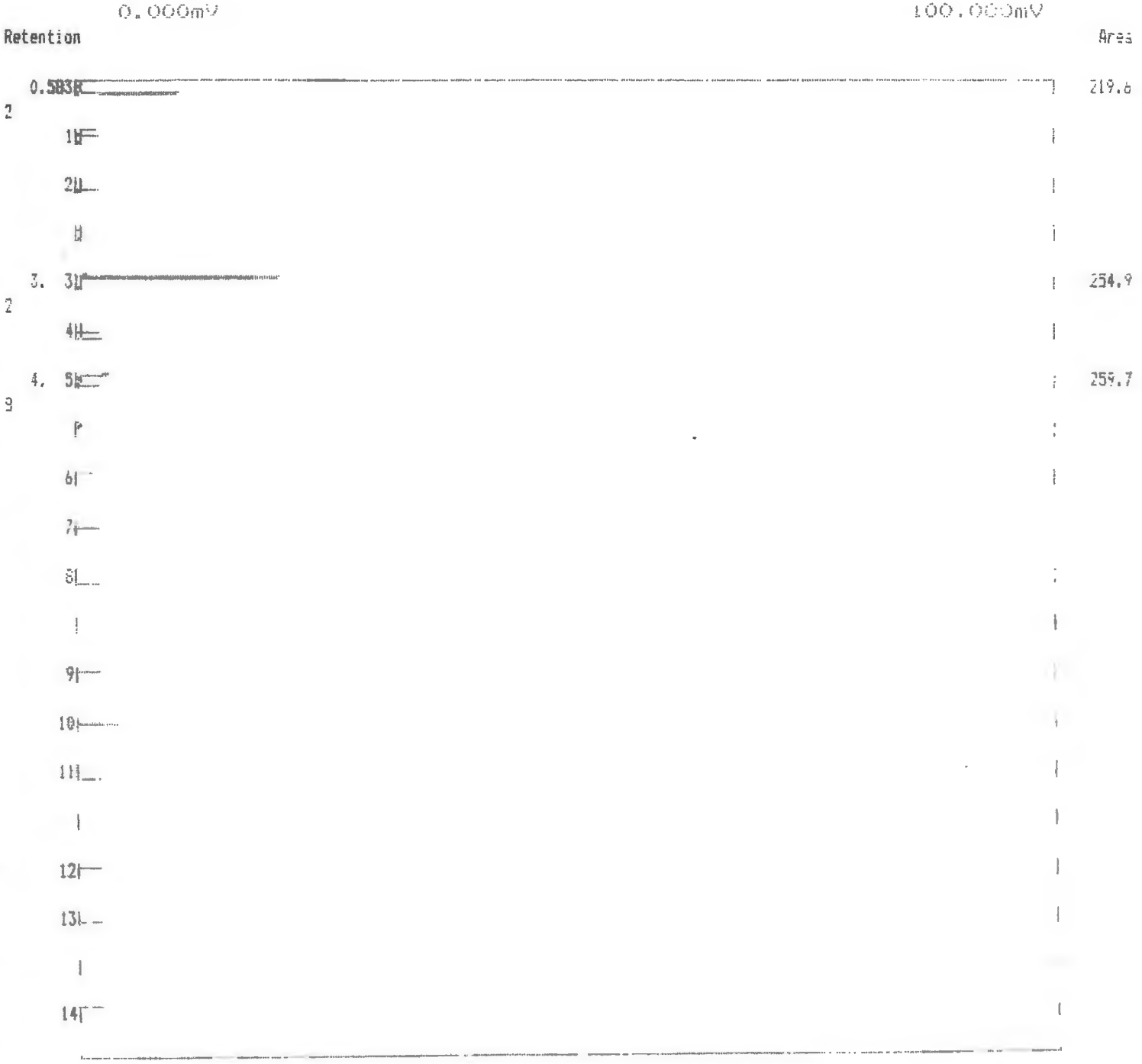
-100.000mV 1000.000mV

Component Retention Area



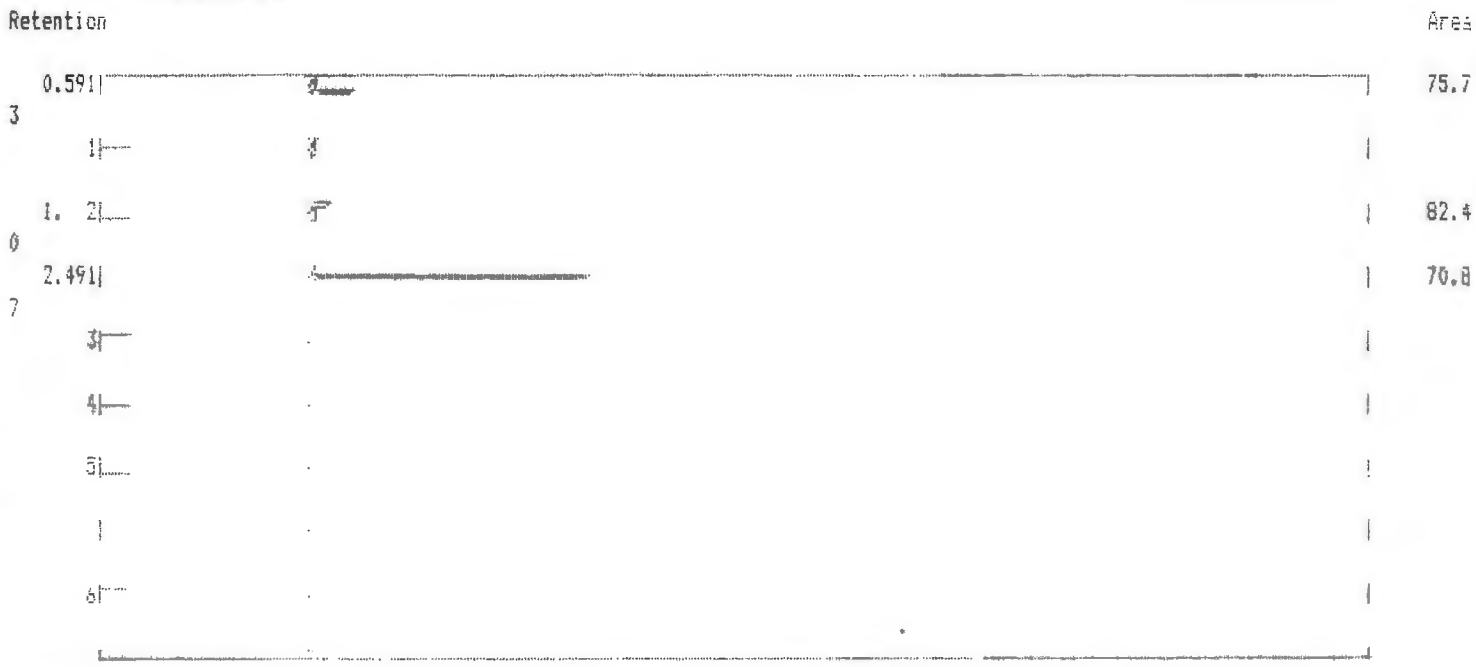
Component	Retention	Area
	0.558	837.96
	2.000	825.30
	3.441	912.90
3		2576.16

Operator :
Description : Cetcon
File : CETCN-17.CHR
Date : 07/19/1996
Time : 17:16:04



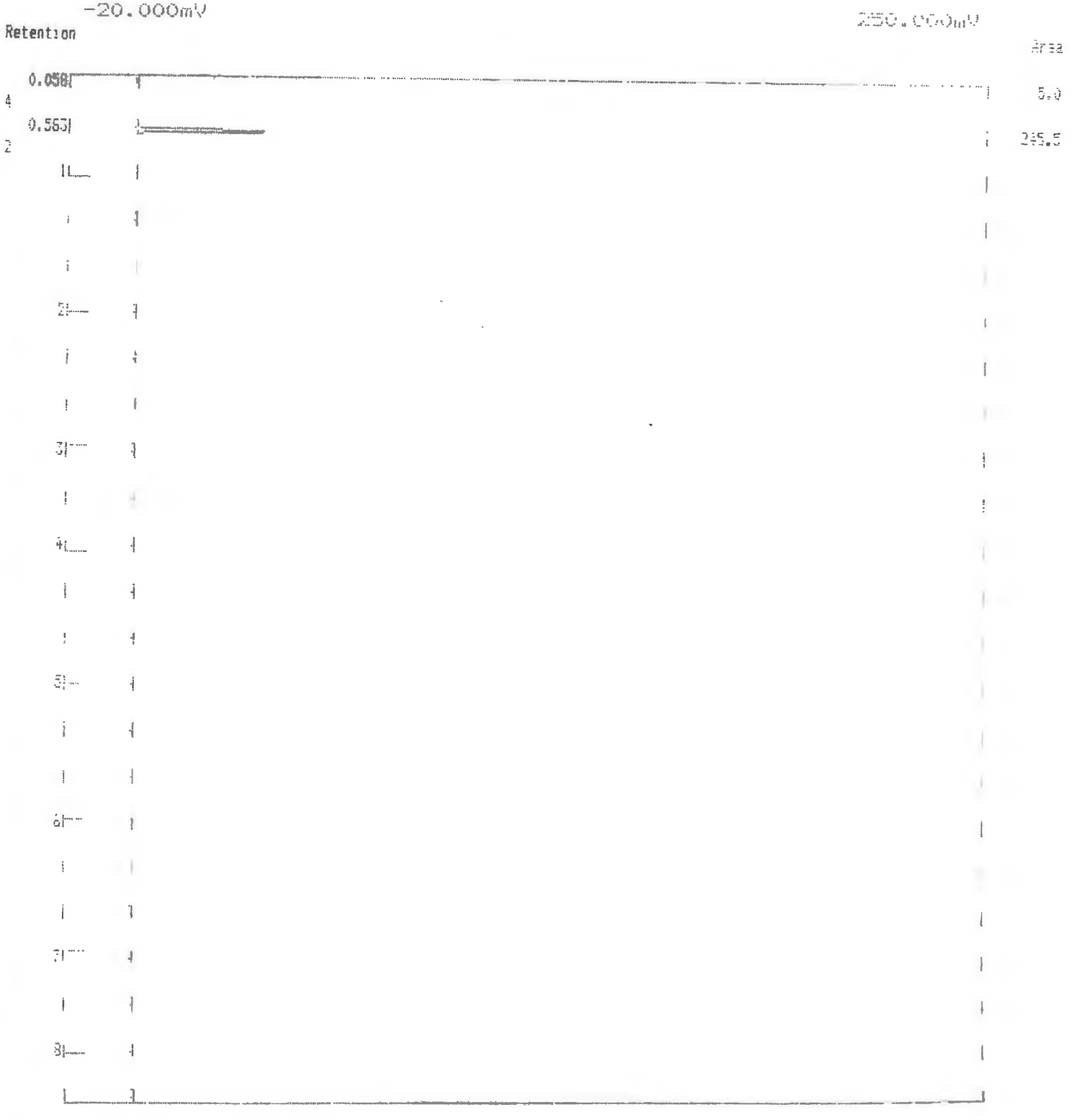
Component	Retention	Area
	0.583	219.62
	3.025	254.92
	4.391	259.78

Operator :
Description : Cetcon
File : CETCN-28.CHR
Date : 07/19/1996
Time : 18:55:41



Component	Retention	Area
	0.091	5.19
	0.591	75.73
	1.533	82.40
	2.491	70.87
4		234.19

Operator :
Description : Cetcon
File : CETCN-16.CHR
Date : 07/19/1996
Time : 17:04:59



Component	Retention	Area

APPENDIX F

Equations

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) / ($^\circ$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
PPM	Parts per million
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

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

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

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

$$V_{Mstd} = 17.64\ V_M[(P_B + (P_M/13.6))/T_M]$$

3. Water vapor volume collected at standard conditions, scf

$$V_{Wgas} = 0.04715 \cdot V_W$$

4. Percent moisture content

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

5. Dry gas mole fraction

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

6. Dry molecular weight of 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

$$V_S = K_P \cdot 60 \cdot C_P(T_S/(P_S \cdot MW))^{1/2} \cdot Avg(\Delta P_S^{1/2})\ ;\ K_P = 85.49\ (\textit{pitot tube constant})$$

9. Volumetric flow at stack conditions, ACFM

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

10. Volumetric flow at standard conditions, SCFM

$$Q_S = 0.1225 \cdot V_S \cdot M_D \cdot P_S \cdot A_S/T_S$$

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

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

13. Particulate matter concentrations, lb/dscf

$$C_{PM}(lb/dscf) = 2.205\,(10^{-6}) \bullet MT\ (mg) / V_{Mstd}(scf)$$

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)

$$F_d = 8710\ (Natural\ Gas)\ ;\ F_d = 9780\ (Bituminous\ Coal)\ ;\ F_d\ (CFR\ 60,\ Table\ 19\text{-}1)$$

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

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

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

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

$$THC(lb/hr) = 6.87(10^{-6}) \bullet SCFM \bullet THC(ppm) \; ; \; [Reported\ as\ propane]$$
$$THC(lb/hr) = 1.87(10^{-6}) \bullet SCFM \bullet THC(ppm) \; ; \; [Reported\ as\ carbon]$$

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 (TACB)

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

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)

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

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*)

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

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

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

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

APPENDIX G

Original Test Proposal

PERMIT TO CONSTRUCT
AIR POLLUTION CONTROL FACILITY
SPECIFIC CONDITIONS

Total Petroleum
Sulfur Recovery Unit Expansion — Permit No. 95-506-C

The permittee is authorized to construct in conformity with the specifications submitted to Air Quality on November 28, 1995, and analyzed in AQ's Evaluation of Permit Application No. 95-506-C, dated December 4, 1995. Commencing construction or operations under this permit constitutes acceptance of, and consent to, the conditions contained herein:

1. Points of emissions and emission limitations for each point:

A. Fugitive VOC Emissions (All from New Sources)

Emissions Points	Emissions Factor (lb/hr/source)	Number of Sources	Average VOC Content	Control Efficiency Percent	Fugitive Emissions lb/hr	(TPY)
Valves (gas/vapor)	0.0591	707	38.44%	92%	1.28	5.63
Valves (lt liquid)	0.0240	412	52.81%	80%	1.04	4.57
Valves (hvy liquid)	0.0005	338	23.14%	0%	0.04	0.17
Pumps (lt liquid)	0.2513	27	58.35%	88%	0.48	2.08
Pumps (hvy liquid)	0.0463	7	22.59%	0%	0.07	0.32
Flanges	0.0006	2914	42.72%	0%	0.75	3.27
Compressors	1.4021	3	28.33%	99%	0.01	0.01
Pressure-reliefs	0.3527	22	61.64%	99%	0.05	0.21
Process drains	0.0331	69	100.00%	80%	0.46	2.00
Junction boxes	0.0331	3	100.00%	80%	0.02	0.09

B. Point Sources

Source ID	Description	Capacity (MMBTUH)	PM lb/hr (TPY)	SO_2 lb/hr (TPY)	NOx lb/hr lb/MMBTU (TPY)	VOC lb/hr (TPY)	CO lb/hr (TPY)
HI-501	SRU oxidizer	8.2	0.04	7.81	1.23 0.10	0.03	0.17
			0.16	34.20	5.36	0.14	0.75
H-603	DHDS heater	109.8	3.92	0.107	11.77 0.107	0.41	5.82
			3.95	17.15	51.46	1.79	25.51
H-6501	FCCU feed htr	80.6	2.87	0.12	9.67 0.12	0.30	3.74
			2.90	12.59	42.36	1.31	16.39
H-6502	FCCU stripper	47.5	1.69	0.107	5.08 0.107	0.18	2.21
			1.71	7.42	22.26	0.77	9.66
H-15001	hydrogen plt	293.3	3.80	0.037	10.85 0.037	0.80	8.80
			5.78	16.63	47.53	3.51	38.54

2. Upon issuance of an operating permit, the permittee shall be authorized to operate the facility 365 days per year, 24 hours per day, 8,760 hours per year.

3. NESHAPS 40 CFR 61 Subpart FF affects the wastewater discharge from the system. The permittee shall comply with the applicable sections:

a. 61.340, Applicability
b. 61.341, Definitions
c. 61.342, Standards: General
d. 61.343, Standards: Tanks
e. 61.344, Standards: Surface Impoundments
f. 61.345, Standards: Containers
g. 61.346, Standards: Individual Drain Systems
h. 61.347, Standards: Oil-Water Separators
i. 61.348, Standards: Treatment Processes
j. 61.349, Standards: Closed Vent Systems and Control Devices
k. 61.350, Standards: Delay of Repair
l. 61.351, Alternative Standards for Tanks
m. 61.352, Alternative Standards for Oil-Water Separators
n. 61.353, Alternate Means of Emissions Limitations
o. 61.354, Monitoring of Operations
p. 61.355, Test Methods, Procedures, and Compliance Provisions
q. 61.356, Recordkeeping Requirements
r. 61.357, Reporting Requirements

4. NSPS 40 CFR 60 Subpart GGG applies to the following affected facilities added by the modification: each compressor, valve, pump, pressure relief device, sampling connection system, open-ended valve or line, and flange or other connector in VOC service. The permittee shall comply with the following sections:

a. 60.590: Standards, general
b. 60.591, Definitions (including the applicable definitions contained in Subparts A and VV of Part 60)
c. 60.592, Standards (including the following sections of Subpart VV):
   i. 60.482-1: Standards, general
   ii. 60.482-2: Standards, pumps in light liquid service
   iii. 60.482-3: Standards, compressors
   iv. 60.482-4: Standards, pressure-relief devices in gas/vapor service
   v. 60.482-5: Standards, sampling connection systems
   vi. 60.482-6: Standards, open-ended valves or lines
   vii. 60.482-7: Standards, valves in gas/vapor or light liquid service
   viii. 60.482-8: Standards, pumps and valves in heavy liquid service, pressure relief devices in light liquid or heavy liquid service, and flanges or other connectors
   ix. 60.482-9: Standards, delay of repair
   x. 60.482-10: Standards, closed vent systems and control devices
   xi. 60.483-1: Alternate standards for valves - allowable percentage of valves leaking
   xii. 60.483-2: Alternate standards for valves - skip periods of leak detection and repair
   xiii. 60.484: Equivalence of means of emissions limitation
   xiv. 60.485: test methods and procedures
   xv. 60.486: Record keeping requirements
   xvi. 60.487: Reporting requirements
d. 60.593: Exceptions

5. NSPS 40 CFR 60 Subpart QQQ applies to the individual drain system and aggregate facility for process wastewater collection and treatment. The permittee shall comply with the applicable sections:

a. 60.692-2: Standards, individual drain systems
b. 60.692-3: Standards, oil-water separators
c. 60.692-4: Standards, aggregate facility
d. 60.692-5: Standards, closed vent systems and control devices
e. 60.692-6: Standards, delay of repair
f. 60.692-7: Standards, delay of compliance
g. 60.693-1: Alternative standards for individual drain systems
h. 60.693-2: Alternative standards for oil/water separators
i. 60.694: Permission to use alternative means of emission limitation
j. 60.695: Monitoring of operations
k. 60.696: Performance test methods and procedures and compliance provisions
l. 60.697: Record keeping requirements
m. 60.698: Reporting requirements

6. The new flare is subject to federal New Source Performance Standards, 40 CFR 60, Subpart A, and shall comply with all applicable requirements for flares in 40 CFR 60.18. The flare shall be monitored for the presence of a pilot flame and be operated with no visible emissions.

7. As specified in 40 CFR 60.7(b), any owner or operator subject to the provisions of NSPS shall maintain records of the occurrence and duration of any start-up, shutdown, or malfunction in the operation of the air pollution control equipment.

8. As specified in 40 CFR 60.7(c), any owner or operator subject to the continuous emissions monitoring provisions of NSPS shall submit each calendar quarter a report of any excess emissions recorded during the calendar quarter. If no excess emissions occur, the permittee shall make a negative declaration for the quarter.

9. As specified in 40 CFR 60.7(d), any owner or operator subject to the provisions of NSPS shall maintain a file of all measurements and all other information required by this part recorded in a permanent file suitable for inspection. This file shall be retained on-site for at least two years following the date of such measurements, maintenance, and records.

10. This is a permit to construct in accordance with and under the authority of the Oklahoma Clean Air Act and the rules promulgated thereunder. It does not relieve the holder of the obligation to comply with other applicable federal, state, or local statutes, regulations, rules, or ordinances.

11. The permittee shall maintain a temperature indicating-recording instrument, certified accurate to $\pm$ 3 percent of temperature measured, to monitor the temperature of the gas leaving the combustion zone of the tail gas incinerator. This temperature shall be maintained at no less than 500°F. Any temperatures recorded below this level shall be reported with the semiannual report required by Specific Condition 18.

12. No smoke, fumes, mist, gas, aerosol, particulate matter, or any combination therefore of a shade or density greater than 10% opacity shall be discharged into the atmosphere.

13. The sulfur recovery unit is subject to federal New Source Performance Standards, 40 CFR 60 Subpart J - Standards of Performance for Petroleum Refineries, and shall comply with all applicable standards contained therein.

14. All fuel-burning equipment listed in Specific Condition No. 1 shall be fueled with gas fuel containing less than or equal to 0.10 gr/DSCF H_2S. H_2S of the fuel gas shall be continuously monitored using a CEMS system which is certified in accordance with 40 CFR 60 Subpart J and 40 CFR 60 Appendices B and F.

15. The permittee shall maintain continuous emission monitoring systems to ensure compliance with the limitations of NSPS Subpart J for the SRU. The monitors shall be quality-assured each calendar quarter using a cylinder gas audit as described in 40 CFR Part 60, Appendix F.

16. Upon commencement of construction, Permit No. 91-160-O, will become null and void.

17. Within 60 days after achieving the maximum/design operating capacity of the proposed facility, but in any case not later than 180 days after initial start-up, compliance with the maximum allowable rates for the pollutants sulfur dioxide (SO_2), total reduced sulfur compounds (TRS), hydrogen sulfide (H_2S), and any stack plume opacity limitations, listed in Specific Condition 1 for the SRU shall be demonstrated by performance testing. Operating loads during the performance test shall at a minimum equal 80% of the capacity for which permitting authorization is sought when processing feed gas of representative composition. Test methods shall be those set out in 40 CFR Part 60, Appendix A, plus related procedures incorporated by reference:

Method 1, Sample and Velocity Traverse
Method 2, Stack Gas Velocity and Volumetric Flow Rate
Method 3 or 3A, Carbon Dioxide, Excess Air and Dry Molecular Weight
Method 4, Moisture in Stack Gases
Method 6 or 6C, Sulfur Dioxide Emissions
Method 9, Visual Determination of Opacity
Method 16A, Reduced Sulfur Compounds Emissions to prove negligible H2S
Tutwiler Method/ASTM E-260, H2S Concentration in Acid Gas

18. Following start-up, the permittee shall submit a written report of excess emissions to Air Quality semiannually. For the purpose of these reports, excess emissions are defined as emissions for any 24-hour period having an average sulfur dioxide reduction efficiency less than the minimum required by OAC 252:100-31-25(c)(1).

19. A means shall be provided for logging the time and rate/quantity of SO_2 emissions produced by flaring during those start-up, shutdown and malfunction periods when the SRU feed input is shunted to the refinery flare system or an equivalent oxidation device. Following start-up of the facility, a summary of such flaring events shall be included with the semiannual excess-emissions reports.

20. Incineration and emission of sulfur dioxide during periods of acid gas flaring shall be subject to the reporting requirements of OAC 252:100-9, "Reports Required: Excess Emissions During Start-up, Shutdown and Malfunction of Equipment". Such flaring shall be subject to the prevailing state regulatory policy on excess emissions with regard to the time/quantity of such emissions allowable without penalty.

PERMIT TO CONSTRUCT
AIR POLLUTION CONTROL FACILITY
(continued)

Standard Provisions for New Source Performance Standards, Environmental Protection Agency, Title 40 Code of Federal Regulations Part 60

1. Notification of the date construction is commenced postmarked no later than 30 days after such date.

2. Notification of the anticipated date of initial startup postmarked no more than 60 days nor less than 30 days prior to such date.

3. Notification of the actual date of initial startup postmarked within 15 days after such date.

4. If a continuous emission monitoring system is included in this construction, notification of the date upon which test demonstration of the system performance commences, along with submittal of the pretest plan. This notification and pretest plan shall be postmarked not less than 30 days prior to such date.

5. Performance test(s) shall be conducted by the owner or operator within 60 days after achieving the maximum production rate at which the facility will be operated, but not later than 180 days after the initial startup. At least 30 days prior notice of the performance test date shall be provided and a pretest plan submitted.

APPENDIX H

Resumes

Robert A. Stenberg
Sr. Environmental Technician / Safety Coordinator

QUALIFICATION SUMMARY

During the past three years, Mr. Stenberg has been directly involved with hundreds of emission tests within the petrochemical, gas processing and utilitiy industries. He is familiar with EPA stack testing methods and field testing procedures.

Mr. Stenberg is currently a Sr. Environmental Technician responsible for field instrument operations and maintaining field testing equipment. In addition, Mr. Stenberg is CETCON's Safety Coordinator and field safety representative. He is also responsible for CETCON's general safety concerns and associated safety training.

EDUCATION

B.S. Geology, 1988, Stephen F. Austin State University, Nacogdoches, TX.

Completed Petroleum Education Council's Safety Instructor Training Program.

Completion of Aetna's ASPER Industrial Hygiene Program.

Member of American Society of Safety Engineers (ASSE)

Member of American Association of Petroleum Geologists (AAPG)

EXPERIENCE

CETCON, Inc., Tulsa, Ok. - 3/93 to Present.
Sr. Environmental Technician responsible for performing quality emission testing as an instrument operator and environmental testing technician.

AETNA Life & Casualty, Houston, TX. and Tulsa, OK. 1/89 to 12/92
Senior Engineering Representative responsible for evaluating and reporting on the insurability of commercial insurance customers and provided loss control services for AETNA customers in an effort to reduce accidents and injuries. Mr. Stenberg was responsible for communicating OSHA and NFPA code concerns with customers to maintain fire safety and workplace safety.