FINAL REPORT FOR EMISSIONS COMPLIANCE TESTING OF ONE WAUKESHA ENGINE GENERATOR

Browning-Ferris Gas Services, Inc.
Chicopee, MA

February 1994

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Prepared for

Browning-Ferris Gas Services, Inc.
Chicopee, MA

(TRC Ref. 15147-0010-00000)

February 1994

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INTRODUCTION

1.1 OVERVIEW

TRC Environmental Corporation, under contract to Browning-Ferris Gas Services, Inc., (BFGSI) conducted an emissions compliance test program on one Waukesha engine generator on December 14, 1993. The engine generator is located at BFGSI's Chicopee, Massachusetts facility. This compliance test program determined the gaseous pollutant and visible emission rates from the engine generator. All compliance testing was conducted in accordance with 40 CFR 60 Appendix A reference methods.

1.2 REPORT SUMMARY

This report presents the results of the test program completed at BFGSI's Chicopee facility. Included in the following pages are descriptions of the sampling location, sampling and analytical procedures, and TRC's QA procedures which ensure the integrity of the reported data. A summary of all test results is presented in Section 2. Additionally, appendices are included which contain all relevant field sampling data sheets, continuous emissions monitoring data sheets, gas chromatograph data sheets, visible emission observation data and certification sheet, and facility process data.

SECTION 2
SUMMARY OF RESULTS

This section presents a summary of the emission testing results on the Waukesha engine generator. The field sampling data sheets are located in Appendix A. Continuous emissions monitoring data can be found in Appendix B. Gas chromatograph data is located in Appendix C. The visible observation data and certification sheet can be found in Appendix D. The facility process data can be found in Appendix E. Calibration data sheets can be found in Appendix F.

2.1 WAUKESHA ENGINE EMISSIONS RESULTS

Three 60-minute test runs were conducted at the outlet stack on the Waukesha engine generator. This engine is designed to produce 1025 Kilowatts per hour (KW/hr). The emission results for NO_x, CO, SO_2, and TGNMO for the three test runs are presented in terms of parts per million (ppm), pounds per hour (lbs/hr), and grams per horse power hour (gm/HP·hr). These results are presented Table 2-1. Sampling parameters and flow rates obtained during each test run are presented in Table 2-2. The emission limits stated in the permit were met. The field data sheets can be found in Appendix A. The continuous emissions monitoring data can be found in Appendix B and the gas chromatograph data can be found in Appendix C.

2.2 VISIBLE EMISSIONS RESULTS

Three 60-minute visible emissions observation test runs were conducted December 14, 1993 on the engine generator. Readings were obtained from the flue gas exiting the stack. The overall percent opacity for the engine generator was 0. Table 2-3 presents the average opacity recorded during each observation test run. Tables 2-4 through 2-6 presents the visible emissions data summary for each run. The field data recordings and certification sheet can be found in Appendix D.

TABLE 2-1. BFI CHICOPEE ENGINE EMISSIONS AVERAGES

PARAMETER	EXHAUST GAS FLOW RATE (dscfm)	NOx (ppm)	CO (ppm)	THC (ppm)	METHANE (ppm)	TGNMO (ppm)	SO2 (ppm)
Landfill Gas Average Run 1	3,257	78.01	447.84	2120.53	2044.9	75.6	0.00
Landfill Gas Average Run 2	3,274	74.40	447.01	2146.28	2054.5	91.8	0.00
Landfill Gas Average Run 3	3,286	65.96	437.14	2156.12	1994.6	161.5	1.10
AVERAGE	3,272	72.79	444.00	2140.98	2031.3	109.6	0.37

EMISSION (lbs/hr)				EMISSION (gm/HP.hr)			EMISSION (tons/year)*			
NOx	CO	TGNMO	SO2	NOx	CO	TGNMO	NOx	CO	TGNMO	SO2
1.82	6.36	0.61	0.00	0.30	1.05	0.10	7.97	27.86	2.69	0.00
1.74	6.38	0.75	0.00	0.29	1.05	0.12	7.64	27.95	3.28	0.00
1.55	6.26	1.32	0.04	0.26	1.03	0.22	6.80	27.43	5.79	0.16
1.71	6.33	0.89	0.01	0.28	1.04	0.15	7.47	27.75	3.92	0.05

* . Tons/year based on 365 days/year, 24 hours/day

ENGINE EMISSION LIMITS

PARAMETER	EMISSION (ppm)	EMISSION (lbs/hr)				EMISSION (gm/HP.hr)			EMISSION (tons/year)			
	SO2	NOx	CO	TGNMO	SO2	NOx	CO	TGNMO	NOx	CO	TGNMO	SO2
Landfill Gas	14.8	8.8	21.9	2.4	1.6	0.9	2.25	0.25	38.0	96.00	11.00	7.00

Fuel flow avg. = 22.017 MMBTU/HR (avg from 2 runs)

$$NOx\ EF = \frac{1.71\ lbs/hr}{22.017\ MMBTU/HR} = 7.77 \times 10^{-2}\ lbs/MMBTU$$

$$CO\ EF = \frac{6.33\ lbs/hr}{22.017\ MMBTU/HR} = 2.88 \times 10^{-1}\ lbs./MMBTU.$$

TABLE 2-2. BFI - CHICOPEE
METHOD 4/CEM SAMPLING PARAMETERS - RUNS 1-3

Run No.	1	2	3	
Date	14-Dec-93	14-Dec-93	14-Dec-93	
Start Time	11:49	13:42	15:30	
Stop Time	12:49	14:42	16:30	AVERAGES
Barometric Pressure, in. Hg	29.39	29.39	29.39	29.39
Net Sampling Time, minutes	30.0	30.0	30.0	30.0
Volume Metered, cf	22.115	22.361	22.528	22.335
Avg. DGM Temp, F	95	100	100	98
AVG Delta H, in of H2O	2.0	2.0	2.0	2.0
AVG Delta H, in of Hg	0.1471	0.1460	0.1471	0.1467
DGM Calibration Factor	0.980	0.980	0.980	0.980
Volume of Gas Collected, dscf	20.344	20.407	20.555	20.435
Total Water Collected, mL	51.6	54.4	57.5	54.5
Volume of Water Vapor, scf	2.433	2.565	2.711	2.570
Moisture, %	10.7	11.2	11.7	11.2
Dry Mole Fraction, 100-%M	0.8932	0.8883	0.8835	0.8883
CO2 at Stack, % dry	11.00	11.08	10.97	11.02
O2 at Stack, % dry	8.94	9.16	9.33	9.14
CO + N2, % dry	80.06	79.76	79.70	79.84
Dry Molecular Weight, lb/lb mole	30.12	30.14	30.13	30.13
Wet Molecular Weight, lb/lb mole	28.82	28.78	28.72	28.77
Excess Air at Stack, %	73.3	77.0	79.7	76.7
Stack Area, sq. in. (14-in ID)	153.9	153.9	153.9	153.9
Static Pressure, in. of H2O	1.50	2.00	2.25	1.92
Stack Pressure, in. of Hg	29.50	29.54	29.56	29.53
Avg. Stack Temp., F	710	711	708	710
Avg. Sqroot of Delta P	1.5167	1.5316	1.5411	1.5298
SDE Average	51.887	52.408	52.672	52.322
Pitot Coefficient	0.84	0.84	0.84	0.84
Stack Gas Velocity, afpm	7,668	7,745	7,791	7,735
Stack Flowrate, wet acfm	8,197	8,280	8,329	8,268
Stack Flowrate, dry scfm	3,257	3,274	3,286	3,272

BFI-1-3.wk1

TABLE 2-3
VISIBLE EMISSION TEST RESULTS

Date	Run No.	Time Period	Process	% Opacity Run Averages
12/14/93	1	11:00 to 12:00	Engine Generator	0
12/14/93	2	12:00 to 13:00	Engine Generator	0
12/14/93	3	13:00 to 14:00	Engine Generator	0
			Overall % Opacity:	**0**

BRCVERE.WK1

TABLE 2–4. VISIBLE EMISSION DATA SUMMARY – RUN 1

Company: Browning–Ferris Gas Services, Inc.
Facility: Chicopee, MA

Date: 12/14/93

Run: 1

Process: Landfill Gas Engine Generator

Observer: Timothy J. Senger

Start Time: 11:00
Stop Time: 11:30

Set No.	Reading Interval 0 sec.	15 sec.	30 sec.	45 sec.	1–min avgs.	6–min avgs.	Rolling 6–min avgs.	Comments
1	0	0	0	0	0			
2	0	0	0	0	0			
3	0	0	0	0	0			
4	0	0	0	0	0			
5	0	0	0	0	0			
6	0	0	0	0	0	0	0	
7	0	0	0	0	0		0	
8	0	0	0	0	0		0	
9	0	0	0	0	0		0	
10	0	0	0	0	0		0	
11	0	0	0	0	0		0	
12	0	0	0	0	0	0	0	
13	0	0	0	0	0		0	
14	0	0	0	0	0		0	
15	0	0	0	0	0		0	
16	0	0	0	0	0		0	
17	0	0	0	0	0		0	
18	0	0	0	0	0	0	0	
19	0	0	0	0	0		0	
20	0	0	0	0	0		0	
21	0	0	0	0	0		0	
22	0	0	0	0	0		0	
23	0	0	0	0	0		0	
24	0	0	0	0	0	0	0	
25	0	0	0	0	0		0	
26	0	0	0	0	0		0	
27	0	0	0	0	0		0	
28	0	0	0	0	0		0	
29	0	0	0	0	0		0	
30	0	0	0	0	0	0	0	

30 Minute Average: 0 % Opacity

EPIC–VE1 9/91

TABLE 2–4. VISIBLE EMISSION DATA SUMMARY – RUN 1 (continued)

Company: Browning–Ferris Gas Services, Inc.
Facility: Chicopee, MA

Date: 12/14/93

Process: Landfill Gas Engine Generator

Run: 1

Observer: Timothy J. Senger

Start Time: 11:30
Stop Time: 12:00

Set No.	Reading Interval 0 sec.	15 sec.	30 sec.	45 sec.	1–min avgs.	6–min avgs.	Rolling 6–min avgs.	Comments
1	0	0	0	0	0			
2	0	0	0	0	0			
3	0	0	0	0	0			
4	0	0	0	0	0			
5	0	0	0	0	0			
6	0	0	0	0	0	0	0	
7	0	0	0	0	0		0	
8	0	0	0	0	0		0	
9	0	0	0	0	0		0	
10	0	0	0	0	0		0	
11	0	0	0	0	0		0	
12	0	0	0	0	0	0	0	
13	0	0	0	0	0		0	
14	0	0	0	0	0		0	
15	0	0	0	0	0		0	
16	0	0	0	0	0		0	
17	0	0	0	0	0		0	
18	0	0	0	0	0	0	0	
19	0	0	0	0	0		0	
20	0	0	0	0	0		0	
21	0	0	0	0	0		0	
22	0	0	0	0	0		0	
23	0	0	0	0	0		0	
24	0	0	0	0	0	0	0	
25	0	0	0	0	0		0	
26	0	0	0	0	0		0	
27	0	0	0	0	0		0	
28	0	0	0	0	0		0	
29	0	0	0	0	0		0	
30	0	0	0	0	0	0	0	

BFIC–VE1 WK1

30 Minute Average: 0 % Opacity

Run Average: 0 % Opacity

TABLE 2–5. VISIBLE EMISSION DATA SUMMARY – RUN 2

Company: Browning–Ferris Gas Services, Inc.
Facility: Chicopee, MA

Date: 12/14/93

Process: Landfill Gas Engine Generator

Run: 2

Observer: Timothy J. Senger

Start Time: 12:00
Stop Time: 12:30

Set No.	Reading Interval 0 sec.	15 sec.	30 sec.	45 sec.	1–min avgs.	6–min avgs.	Rolling 6–min avgs.	Comments
1	0	0	0	0	0			
2	0	0	0	0	0			
3	0	0	0	0	0			
4	0	0	0	0	0			
5	0	0	0	0	0			
6	0	0	0	0	0	0	0	
7	0	0	0	0	0		0	
8	0	0	0	0	0		0	
9	0	0	0	0	0		0	
10	0	0	0	0	0		0	
11	0	0	0	0	0		0	
12	0	0	0	0	0	0	0	
13	0	0	0	0	0		0	
14	0	0	0	0	0		0	
15	0	0	0	0	0		0	
16	0	0	0	0	0		0	
17	0	0	0	0	0		0	
18	0	0	0	0	0	0	0	
19	0	0	0	0	0		0	
20	0	0	0	0	0		0	
21	0	0	0	0	0		0	
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23	0	0	0	0	0		0	
24	0	0	0	0	0	0	0	
25	0	0	0	0	0		0	
26	0	0	0	0	0		0	
27	0	0	0	0	0		0	
28	0	0	0	0	0		0	
29	0	0	0	0	0		0	
30	0	0	0	0	0	0	0	

30 Minute Average: 0 % Opacity

BFIC–VET.WK1

TABLE 2–5. VISIBLE EMISSION DATA SUMMARY – RUN 2 (continued)

Company: Browning–Ferris Gas Services, Inc.
Facility: Chicopee, MA

Date: 12/14/93

Process: Landfill Gas Engine Generator

Run: 2

Start Time: 12:30
Stop Time: 13:00

Observer: Timothy J. Senger

Set No.	Reading Interval 0 sec.	15 sec.	30 sec.	45 sec.	1–min avgs.	6–min avgs.	Rolling 6–min avgs.	Comments
1	0	0	0	0	0			
2	0	0	0	0	0			
3	0	0	0	0	0			
4	0	0	0	0	0			
5	0	0	0	0	0			
6	0	0	0	0	0	0	0	
7	0	0	0	0	0		0	
8	0	0	0	0	0		0	
9	0	0	0	0	0		0	
10	0	0	0	0	0		0	
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15	0	0	0	0	0		0	
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24	0	0	0	0	0	0	0	
25	0	0	0	0	0		0	
26	0	0	0	0	0		0	
27	0	0	0	0	0		0	
28	0	0	0	0	0		0	
29	0	0	0	0	0		0	
30	0	0	0	0	0	0	0	

BFIC–VE1 WK1

30 Minute Average: 0 % Opacity

Run Average: 0 % Opacity

TABLE 2–6. VISIBLE EMISSION DATA SUMMARY – RUN 3

Company: Browning–Ferris Gas Services, Inc.
Facility: Chicopee, MA

Date: 12/14/93

Process: Landfill Gas Engine Generator

Run: 3

Observer: Timothy J. Senger

Start Time: 13:00
Stop Time: 13:30

Set No.	Reading Interval 0 sec.	15 sec.	30 sec.	45 sec.	1–min avgs.	6–min avgs.	Rolling 6–min avgs.	Comments
1	0	0	0	0	0			
2	0	0	0	0	0			
3	0	0	0	0	0			
4	0	0	0	0	0			
5	0	0	0	0	0			
6	0	0	0	0	0	0	0	
7	0	0	0	0	0		0	
8	0	0	0	0	0		0	
9	0	0	0	0	0		0	
10	0	0	0	0	0		0	
11	0	0	0	0	0		0	
12	0	0	0	0	0	0	0	
13	0	0	0	0	0		0	
14	0	0	0	0	0		0	
15	0	0	0	0	0		0	
16	0	0	0	0	0		0	
17	0	0	0	0	0		0	
18	0	0	0	0	0	0	0	
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21	0	0	0	0	0		0	
22	0	0	0	0	0		0	
23	0	0	0	0	0		0	
24	0	0	0	0	0	0	0	
25	0	0	0	0	0		0	
26	0	0	0	0	0		0	
27	0	0	0	0	0		0	
28	0	0	0	0	0		0	
29	0	0	0	0	0		0	
30	0	0	0	0	0	0	0	

30 Minute Average: 0 % Opacity

BRC–VE1.WK1

TABLE 2–6. VISIBLE EMISSION DATA SUMMARY – RUN 3 (continued)

Company: Browning–Ferris Gas Services, Inc.
Facility: Chicopee, MA

Date: 12/14/93

Process: Landfill Gas Engine Generator

Run: 3

Start Time: 13:30
Stop Time: 14:00

Observer: Timothy J. Senger

Set No.	Reading Interval 0 sec.	15 sec.	30 sec.	45 sec.	1–min avgs.	6–min avgs.	Rolling 6–min avgs.	Comments
1	0	0	0	0	0			
2	0	0	0	0	0			
3	0	0	0	0	0			
4	0	0	0	0	0			
5	0	0	0	0	0			
6	0	0	0	0	0	0	0	
7	0	0	0	0	0		0	
8	0	0	0	0	0		0	
9	0	0	0	0	0		0	
10	0	0	0	0	0		0	
11	0	0	0	0	0		0	
12	0	0	0	0	0	0	0	
13	0	0	0	0	0		0	
14	0	0	0	0	0		0	
15	0	0	0	0	0		0	
16	0	0	0	0	0		0	
17	0	0	0	0	0		0	
18	0	0	0	0	0	0	0	
19	0	0	0	0	0		0	
20	0	0	0	0	0		0	
21	0	0	0	0	0		0	
22	0	0	0	0	0		0	
23	0	0	0	0	0		0	
24	0	0	0	0	0	0	0	
25	0	0	0	0	0		0	
26	0	0	0	0	0		0	
27	0	0	0	0	0		0	
28	0	0	0	0	0		0	
29	0	0	0	0	0		0	
30	0	0	0	0	0	0	0	

BFIC–VE1.WK1

30 Minute Average: 0 % Opacity

Run Average: 0 % Opacity

SECTION 3
PROCESS DESCRIPTION

The Waukesha engine generator located at BFGSI's Chicopee facility is an industrial engine generator fitted with a Woodward hydraulic governor and utilizes fuel at a rate of 7,350 BTU/hp-hr. The engine will fire 450 SCFM of landfill gas with an average methane content of approximately 44 percent. The engine is rated to produce 985 KW/hr. The gross heating value of methane gas is 909 Btu per cubic foot which will provide for an input rating of 10.8 million Btu per hour. For this test program, the engine generator was at the highest possible load producing 1025 KW/hr. The load obtained during this program was beyond normal operation for the generator. Facility process data can be found in Appendix E.

$$\frac{10.8}{x} = \frac{985}{1025}$$

$$x = 11.24$$

SECTION 4
SAMPLING LOCATION

Sampling of the flue gas emissions were conducted from two 90° sample ports located on the outlet stack of the engine generator. Each of the three test runs were 60 minutes in length consisting of a velocity profile before and after each. Percent moisture was determined for each sample run.

Figure 4-1 presents a schematic diagram of the sampling location of the outlet stack. The outlet stack was 14-inches in diameter which corresponds to an internal stack area of 153.9 in^2. The matrix of the 8 velocity sampling points within the 14-inch stack, as defined by Method 1. Percent moisture was determined from a single point of average velocity within the flue gas. Flue gas emissions for NO_x, CO, SO_2, TGNMO, O_2 and CO_2 were determined from a three point traverse across the sample plane.

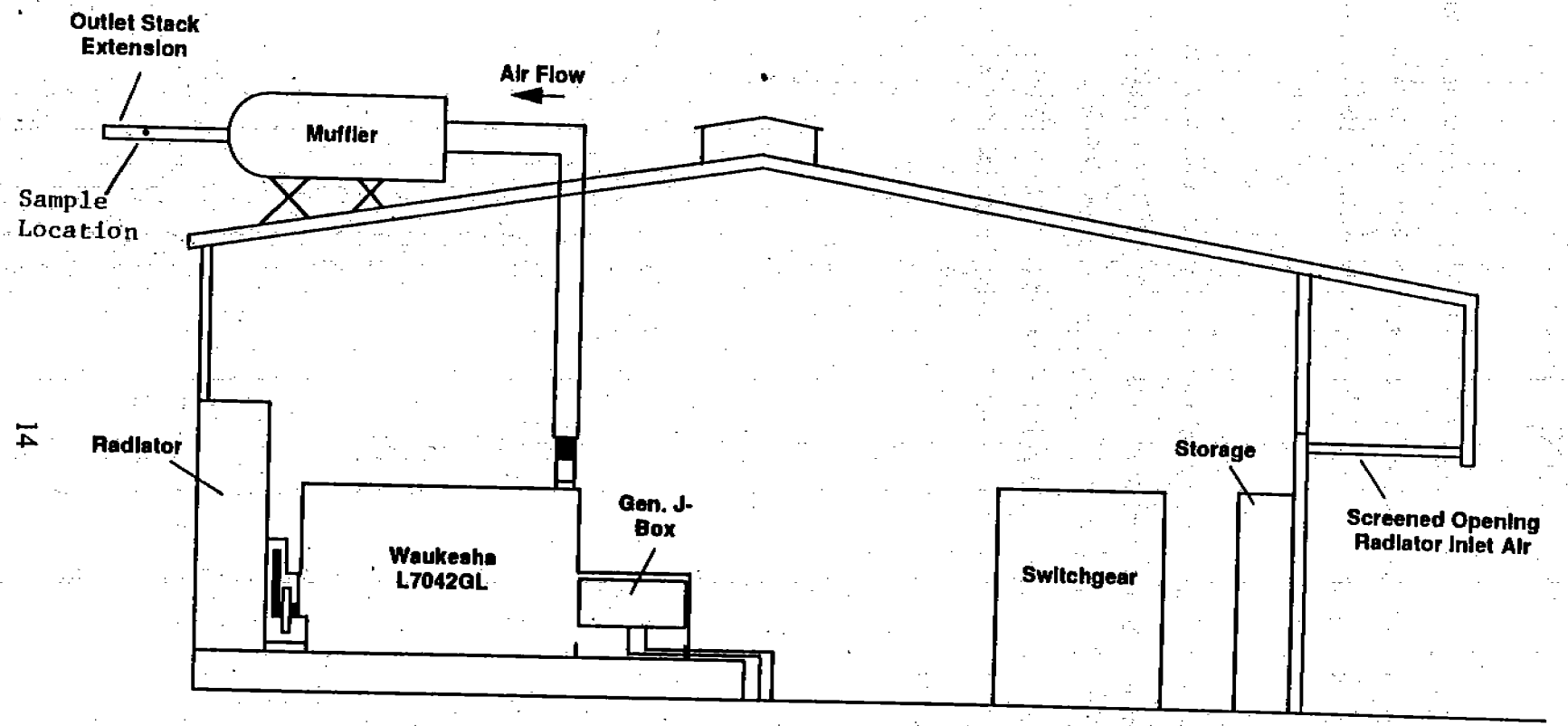


Figure 4-1. Stack Sampling Location.

SECTION 5
SAMPLING AND ANALYTICAL PROCEDURES

5.1 OVERVIEW

The compliance test program consisted of three test runs at the outlet location of the engine generator. Each test run was 60 minutes in length with a 30 minute moisture train per run. The test methods utilized, in accordance to 40 CFR Part 60 Appendix A, were as follows:

- Methods 1 and 2 — Velocity Profile
- Method 3A — O_2 and CO_2 Determination
- Method 4 — Percent Moisture
- Method 9 — Visible Emissions
- Method 6C — SO_2 Determination
- Method 7E — NO_x Determination
- Method 10 — CO Determination
- Method 18 — Methane Determination
- Method 25A — Total Hydrocarbon Determination

5.2 PRESAMPLING ACTIVITIES

Presampling activities included: Equipment calibration; cleaning of the sample train glassware; and setup of the continuous emissions monitoring system for NO_x, CO, SO_2, THC, O_2, CO_2, and methane. The setup of the TCEMS and subsystems are described in detail in the following subsection.

5.2.1 Continuous Emission Monitoring

TRC followed procedures outlined in the EPA publication 340/1-83-016 regarding setup and operation of its transportable continuous emissions monitoring systems (TCEMS). The TCEMS

consists of three subsystems: sample acquisition/conditioning, sample analysis, and a data acquisition system (see Figure 5-1). The sample acquisition/conditioning unit is designed to deliver a representative sample of the stack gas stream to the sample analysis subsystem. Since the stream must be clean and dry for proper analyzer operation, a spun glass fiber filter, non-contact glass impinger train condenser, and a Permapure dryer were used for particulate and moisture removal. The sample line was heat traced to ensure that the flue gas maintained its vapor state as it was drawn to the monitors. Prior to the condensation removal system, a sample of the flue gas was analyzed for total hydrocarbons and methane.

Sample analyses were conducted using the following analyzers:

- a Horiba MFA 311A oxygen analyzer;
- a Siemens Ultramat 5E carbon monoxide analyzer;
- a Thermo Electron Model 10 oxide of nitrogen analyzer;
- a Horiba PIR2000 carbon dioxide analyzer;
- a Western Research sulfur dioxide analyzer;
- a Ratfisch total hydrocarbon analyzer;
- and a Hewlett Packard 5890 Series 2 FID/ECD gas chromatograph (GC).

In each case, accurate interpretation of analyzer response requires the systematic calibration of the instrument against gases of known concentrations. A calibration equation is determined from a linear regression of known gas concentrations versus instrument response. The equation used to convert instrument signal to concentration units follows:

$$\text{Concentration} = m * (\text{response}) + b$$

where:

- m = slope of calibration curve
- response = instrument signal (volts)
- b = y - intercept of calibration curve

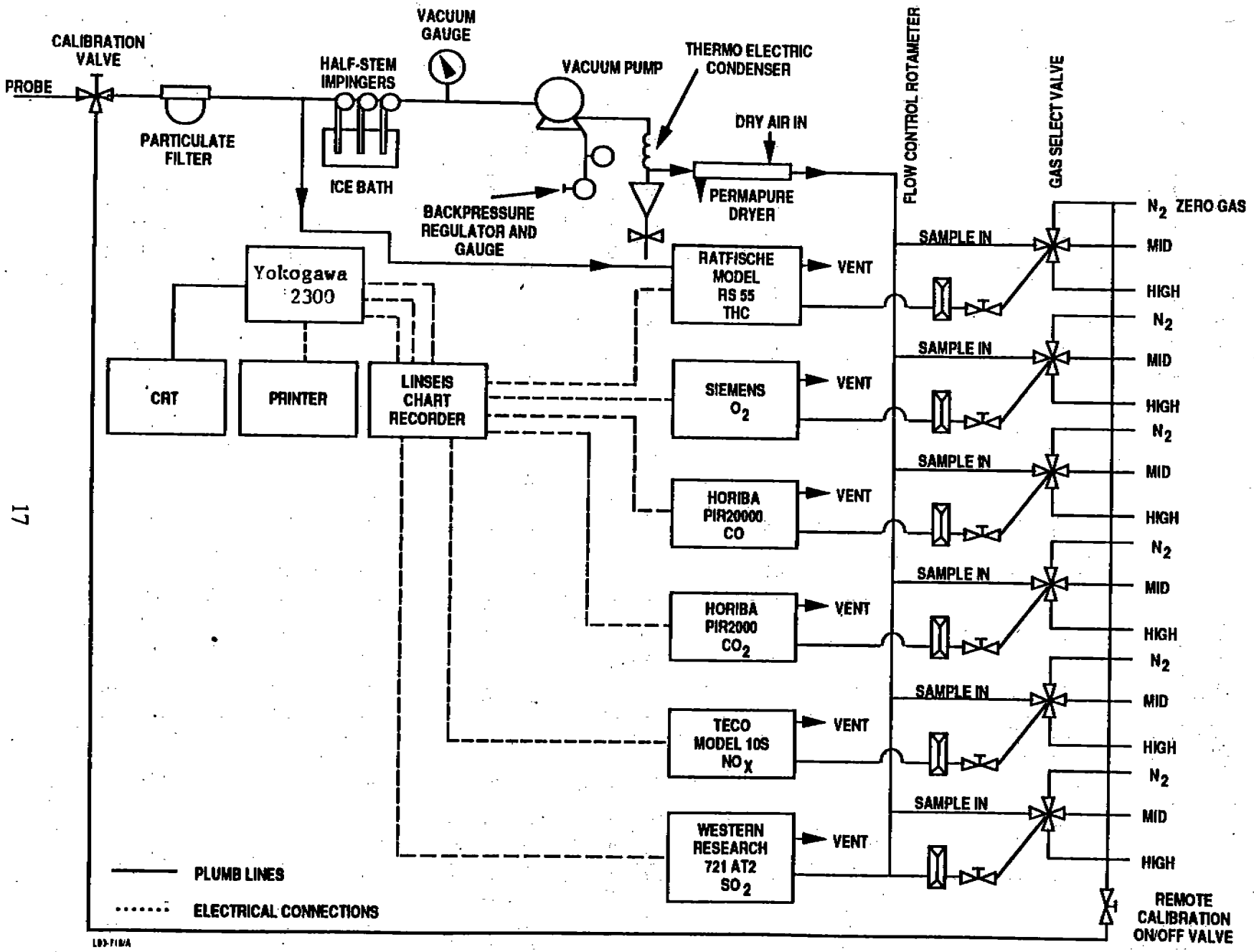


Figure 5-1. TCEM System Schematic.

TRC

The data acquisition subsystem consists of a Yokogawa data acquisition monitor which is designed to receive and log instrument signals (raw voltages) at user defined intervals. In addition, the Yokogawa was programmed to perform the previously mentioned concentration calculation.

Once the system was set up, the TCEMS was connected to a power source and brought on-line. Prior to sampling, the sample acquisition/conditioning system was leak checked by the following procedure:

a. plug the system calibration line;
b. observe that the flow of the rotameter's reaches zero Lpm;
c. observe vacuum; and
d. confirm that sample vacuum during sampling does not exceed vacuum attained during leak check.

The initial phase of instrumental analysis methods required calibration of all involved monitors. At the beginning of the day, direct instrument calibrations for zero and at minimum two upscale gases were performed prior to initiation of testing. Following the direct calibrations, system calibrations were performed both prior to and following each run using zero and one upscale gas concentration. These procedures allow for the determination of initial and final system bias, as well as system drift.

The calibration gas values and instrument range settings are listed below:

Gas	Calibration Gas Value	Instrument Range
NO_x	0, 122, 278, 505 ppm	0 - 1000 ppm
CO	0, 452, 957 ppm	0 - 1000 ppm
SO_2	0, 21.1, 231, ppm	0 - 500 ppm

THC	0, 48.9, 102, 984 ppm	0 - 3000 ppm
CO_2	0, 4.97, 10.1, 19.9 %	0 - 25 %
O_2	0, 4.98, 10.1, 20.1 %	0 - 25 %

Calibration gases used are traceable to National Bureau of Standards Reference Materials. The measurement system performance specifications in 40 CFR 60 Appendix A Method 6C and 25A are listed below and were the performance criteria for this program.

Procedure	**Performance Criteria (M6C)**
Zero Calibration Error	< ± 2% of the range
Calibration Error	< ± 2% of the range
Zero Drift	< ± 3% of the range
Calibration Drift	< ± 3% of the range
Zero Bias	< ± 5% of the range
Calibration Bias	< ± 5% of the range
Response Time	≤ 30 seconds
Interference Response	< ± 2% of the range
NO_2 to NO Converter	> 90% conversion efficiency

Corrections to the measurement system or analyzer were made if the performance specifications were not met.

5.3 ONSITE SAMPLING ACTIVITIES

Onsite sampling activities included the determination of the response time of the CEM system, emission testing of the portable engine generator, and the collection of operational data.

5.3.1 Determination of the CEM System Response Time

After the CEM system was set up, response time was determined. Zero gas was introduced at the CEM system calibration gas valve assembly until a stable zero response was achieved. Once achieved, calibration gas was sent through the system with time allowed for a stable response. This procedure was conducted three times. A downscale response time was also conducted three times starting at a high span calibration value and switching to zero calibration gas. Time was allowed for a stable response. The performance specifications required that each measurement point be the sample time plus twice the response time.

5.3.2 Emission Testing for NO_x, CO, SO_2, THC, O_2, and CO_2

EPA Reference Methods 3A, 6C, 7E, 10, and 25A of 40 CFR 60 Appendix A were adhered to quantify emissions of O_2, CO_2, SO_2, NO_x, CO, and THC respectively. Emissions results are reported as ppm, lbs/hr and gm/HP·hr.

Prior to the testing of the engine, each analyzer was calibrated directly and through the system. Direct calibrations involved challenging the TCEMS with EPA Protocol 1 gas and setting the analyzers with zero and one upscale gas. The analyzer was then challenged with a second upscale gas. System calibration consisted of challenging the sampling system with zero gas and only one upscale gas. System calibration was conducted before and after each run with the final calibration the initial for the proceeding test run.

5.3.3 Emission Testing for Methane, Gas Chromatograph Analysis

Outlet flue gas samples were collected for methane utilizing EPA Method 18. An integrated flue gas sample was collected using a bag-in-drum technique. This procedure utilized a Tedlar bag placed inside a rigid container. The Tedlar bag was evacuated and attached to a 1/4 inch Teflon sample line which is attached to a stainless steel probe. Once the rigid container was placed under a slight vacuum equalization occurred and a sample of flue gas was drawn through the

sample line into the Tedlar bag. Sampling was conducted at an approximate rate of 0.35 Lpm for 60 minutes to yield a total sample volume of about 21 liters. These Tedlar bag samples were then analyzed by TRC's GC FID/ECD according to EPA Method 25C. Figure 5-2 presents a schematic of the Tedlar bag sampling system. GC data sheets are located in Appendix C. Total Gaseous Non-Methane Organic's (TGNMO) were determined using the difference between the THC ppm results and the methane ppm results. The following calculation was used:

$$\text{THC ppm} - \text{CH}_4 \text{ ppm} = \text{TGNMO ppm}$$

5.3.4 Visible Emission Observation

Method 9 of Appendix A Section 60 of the Federal Register and Section 3.12 of Volume III of the Quality Assurance Handbook were the basis of the visual observation procedures. Method 9 involves the determination of plume opacity by an EPA certified observer. Visible emissions observations were recorded on standard EPA-approved data forms following the procedures given in EPA Method 9. Readings were recorded every 15 seconds, in groups of four, for the duration of three 1-hour test runs. The field data sheets and the EPA certified observer's certificate can be found in Appendix D.

5.3.5 Velocity Measurements

Velocity measurements at the sampling location were made following EPA Reference Methods 1 and 2. A Type-S pitot tube with an attached inclined manometer was used to measure the exhaust velocities at the sampling location. An attached Type-K thermocouple with remote digital display was used to determine the flue gas temperature. During the test program, velocity measurements were made before and after each test. The required number of velocity measurements points for the sampling location was determined following EPA Method 1 for a nonparticulate gas stream.

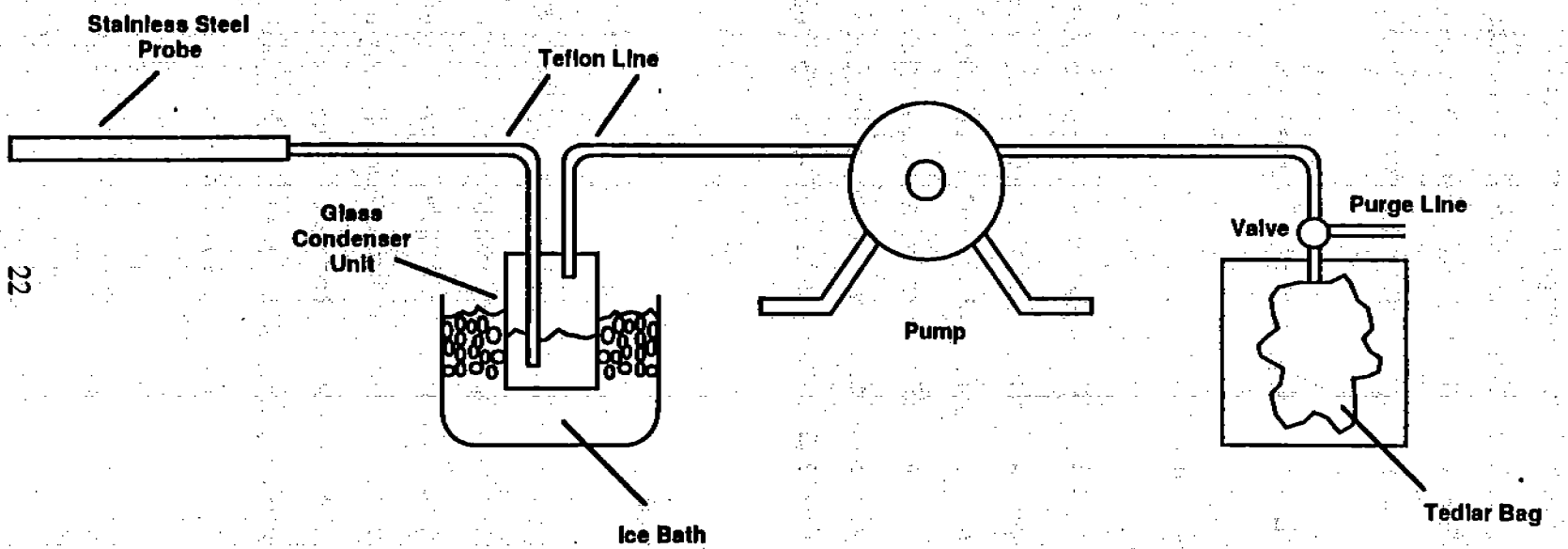


Figure 5-2. Tedlar Bag Sampling Schematic.

TRC

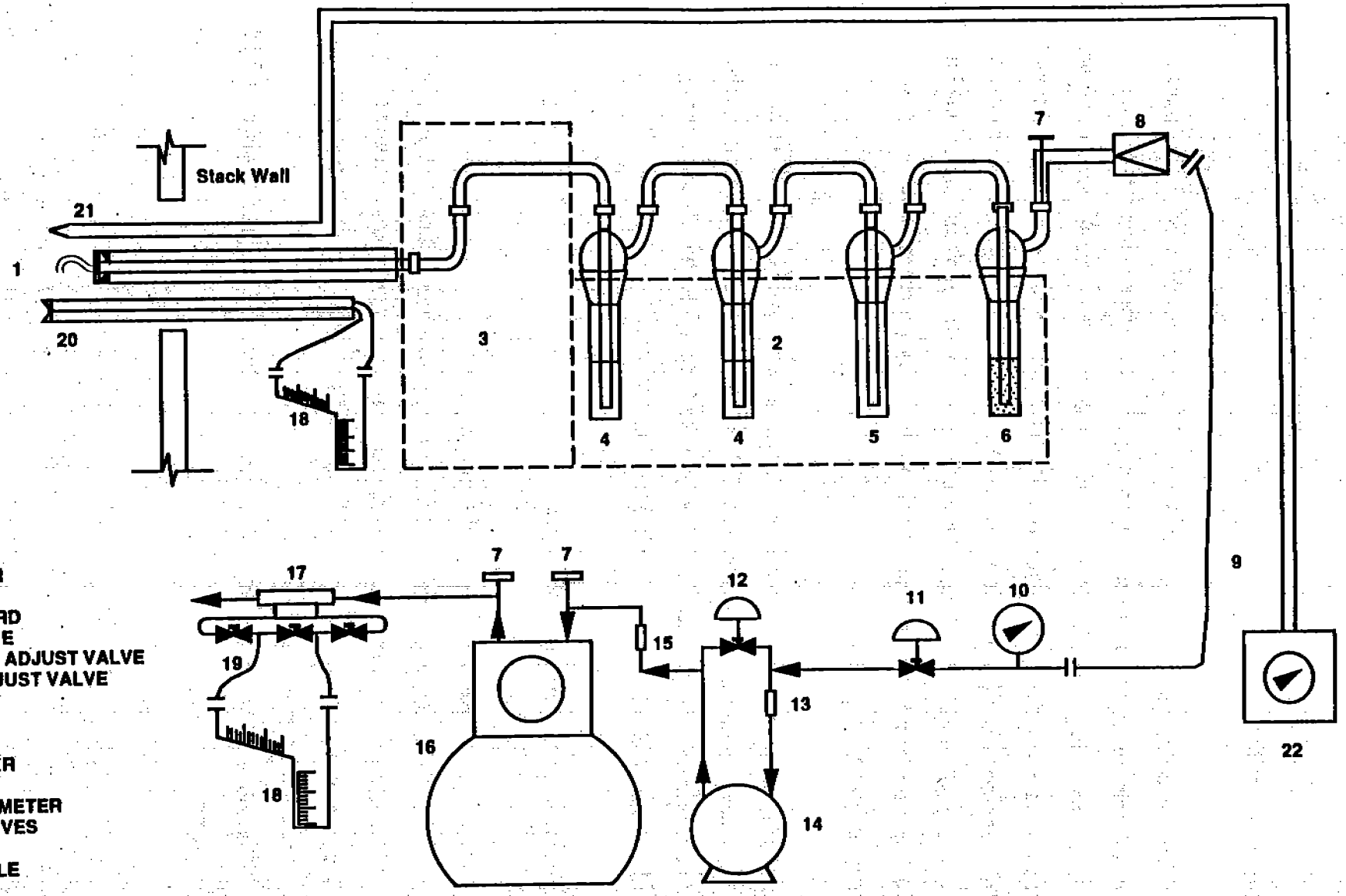
5.3.6 Moisture Determination

Moisture was determined for each test run according to EPA Reference Method 4. The moisture train was sampled from a single point positioned at the point of average velocity within the flue gas stream. A schematic diagram of the Method 4 train is given in Figure 5-3. Sample gas was drawn through a stainless steel probe into a series of four impingers designed for collection of moisture. The impinger system was as follows: 1st and 2nd - 100 ml deionized water; 3rd - empty; 4th - 200 g silica gel (for drying the gas stream and for moisture determination). Following the impinger system, the gas was drawn through a dry gas meter, a calibrated orifice and a leak-free oil fiber vane pump.

Leak checks on the train were performed before and after each sampling run. All leak checks and leakage rates were documented on the relevant field test data sheet. The acceptance criteria for the train is a maximum leakage rate of ≤ 0.02 cfm at the highest vacuum obtained during the run (post-test). The leak checks for every train passed this criteria.

Recovery procedures for the sampling train were:

1. Removed the sampling train to the recovery site.
2. Noted the condition of the train (i.e., impinger condition, silica gel color, etc.).
3. The contents of the first, second, and third impingers were measured in a precleaned graduated cylinder for moisture gain. Measurements were noted and the contents were discarded.
4. The silica gel was returned to its original container and weighed to obtain a final weight.



1). PROBE
2). ICE BATH
3). OVEN
4). 100 ml DI H_2O
5). EMPTY
6). SILICA GEL
7). THERMOMETER
8). CHECK VALVE
9). UMBILICAL CORD
10). VACUUM GAUGE
11). COURSE FLOW ADJUST VALVE
12). FINE FLOW ADJUST VALVE
13). OILER
14). VACUUM PUMP
15). FILTER
16). DRY GAS METER
17). ORIFICE TUBE
18). INCLINE MANOMETER
19). SOLENOID VALVES
20). PITOT
21). THERMOCOUPLE
22). PYROMETER

Figure 5-3. Method 4 Sampling Train Schematic.

SECTION 6
QUALITY ASSURANCE

6.1 OVERVIEW

TRC Environmental Corporation management is fully committed to an effective Quality Assurance/Quality Control Program whose objective is the delivery of a quality product. For much of TRC's work, that product is data resulting from field measurements, sampling, and analysis activities, engineering assessments, and the analysis of gathered data for planning purposes. The quality assurance program works to provide complete, precise, accurate, representative data in a timely manner for each project, considering both the project's needs and budget constraints. The company QA Director coordinates and directs the overall quality program with strong management support.

TRC's QA program conforms with EPA and NIOSH recommendations and is directed by the Company QA Director, a full-time professional who reports directly to the Company President. This give the QA Director the necessary authority and independence to find and correct any existing quality problems. A QA Scientist reports to the QA Director and assists in implementing the Company QA Program. Division QC Coordinators are responsible for the QC Program within each technical division; they report to both to their Division Manager and the Company QA Director.

This section highlights the specific QA/QC procedures followed on this test program. The responsible QA Officer for this program is the Company QA Scientist. He reviewed and approved the Protocol for this program and attended project review meetings to ensure that appropriate QA/QC procedures were being followed.

6.1.1 Calibration Procedures

Calibration of the field sampling equipment was performed prior to the field sampling effort.

Copies of the calibration sheets were submitted to the field team leader to take onsite and for the project file. Calibrations were performed as described in the EPA publication "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods, EPA-600/4-77-027B". Equipment calibrated includes the sample metering system and pitot tubes. Calibration data sheets can be found in Appendix F.

6.1.2 Equipment Leak Checks

Prior to sampling, each sampling train was leak checked according to the procedures outlined in the applicable EPA Reference Method. Final leak checks were performed to ensure that no leaks developed in the train during the course of the test runs. Results of all leak checks performed can be found on the field data sheets presented in Appendix A.

6.1.3 Cyclonic Flow Check

The presence of cyclonic flow within the outlet stack was checked during the preliminary traverses. Cyclonic flow was not present in the outlet stack.

6.1.4 Calibration Gases

All calibration gases used to conduct instrument calibrations were prepared according to EPA Protocol 1, traceable to National Bureau of Standards Reference Materials.

6.1.5 Method 4 Sample Train

Prior to and at the conclusion of each run, the moisture train was leak checked to ensure that a representative moisture sample was obtained. All leak checks were completed successfully. Moisture gain was measured gravimetrically from the impingers and silica gel using an OHAUS triple beam balance accurate to 0.1 gram.

6.2 DATA REDUCTION AND VALIDATION

Extensive QC measures were used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data was a primary goal in this project.

6.2.1 Data Reduction

Data reduction performed in the field was limited to the following:

- EPA Method 4 Testing -- Check runs for sample volume, moisture, and associated parameters. These values were hand calculated on standardized forms (Appendix A) with an HP-11C Programmable Calculator and were also checked on a spreadsheet file with a portable computer.

Final data reduction included rechecking field calculations and logging all data into a calculating spreadsheet file via an AST PC.

6.2.2 Data Validation

The following criteria were used to evaluate data:

- use of approved test procedures;
- steady-state operation of the process being tested;
- use of properly operating and calibrated equipment;
- collection of the proper sample volumes as per the applicable methods.

APPENDIX A

FIELD SAMPLING DATA SHEETS

APPENDIX B

CEM DATA AND CALIBRATION SHEETS

APPENDIX C

GAS CHROMATOGRAPH DATA AND CALIBRATION SHEETS

APPENDIX D

V.E. OBSERVATION DATA AND CERTIFICATION SHEET

APPENDIX E

FACILITY PROCESS DATA

APPENDIX F

CALIBRATION SHEETS

APPENDIX A

FIELD SAMPLING DATA SHEETS

Traverse Point Location for Circular and Rectangular Ducts

Project No.: _____

Client: RFI Chicopee

Date: 12/13/93

Sampling Location: outlet stack

Internal Stack Diameter: 14"

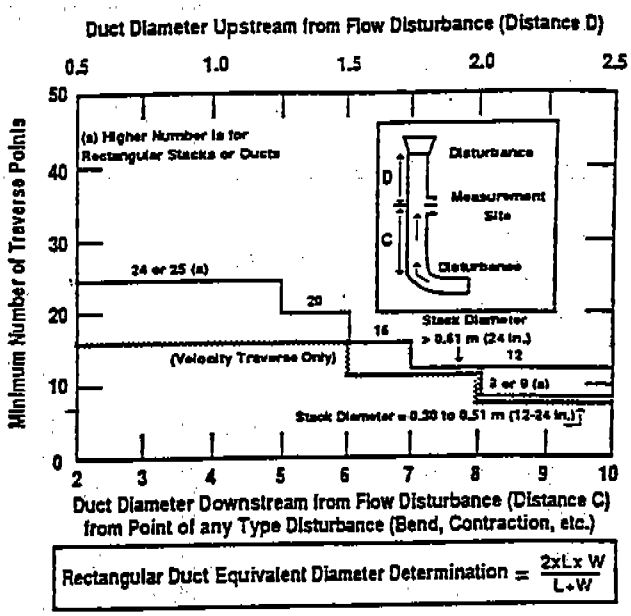
Nipple Length: 3 1/2"

Total Stack Diameter: 17 1/2"

Nearest Upstream Disturbance (C): _____

Nearest Downstream Disturbance (D): _____

Calculator: _____



Rectangular Duct Equivalent Diameter Determination = $\frac{2xLxW}{L+W}$

Traverse Point Number	1 Fraction of Stack ID ($\frac{1}{100}$)	2 Stack ID	3 Traverse Point (1 x 2=Point)	4 Nipple Length	5 Traverse Point Inside of Far Wall to Outside of Port Nipple (3 + 4 = Point)
1	.032	14	.448	3.5	3.95
2	.105	14	1.47	~~4.97~~	4.97
3	.194	14	2.716	~~6.22~~	6.22
4	.323	14	4.522		8.02
5	.677	14	9.478		12.77
6	.806	14	11.28		14.78
7	.895	14	12.53		16.03
8	.965	14	13.55	→	17.05
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					

Location of Traverse Points in Circular Stacks

	4	6	8	10	12	14	16	18	20	22	24
1	5.7	4.4	3.2	2.6	2.1	1.3	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.5	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

Location of Traverse Points in Rectangular Stacks

	2	3	4	5	6	7	8	9	10	11	12
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	15.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5				90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50.0	45.8
7						92.9	81.3	72.2	65.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	85.4	79.2
11										95.5	87.5
12											95.8

TRC

Field Moisture Determination

Client: BFI

Project No.:

Location: Chicopee

Date: 12/14/93

Run No.: 1

Operator: B. Il Kissel

Data

Min	Clock Time (MIN SEC)	Gas Meter C.F. VM	TM In	TM Out	PM Orifice In. H_2O (+)	PM Vac. Gage In. Hg (-)	Imp temp
0	0:00	236.124	92	92	2.0	9.25	75
5	4:59	238 890	93	93	2.0	9.50	71
10	9:59	243.560	95	93	2.0	9.50	73
15	15:01	247.260	97	93	2.0	9.50	75
20	19 57	250. 890	99	94	2 0	9.50	77
25	25:16	254 760	101	94	2 0	9.50	79
30	30:00	258 239	103	95	2.0	9.50	80
Total/Avg							

Impingers

	1	2	3
Final mL	147	100	0
Initial mL	100ml	100ml	0
Net mL	47	0	0

Total moisture (Net mL + Net gm) =

Silica Gel

Container No.

Final gm 331.40

Initial gm 326.80

Net gm

Calculations

(1) PB = 29.39 Meterbox No. 8130

(2) VM Net = Y = DGM Calibration Factor = .98 Dial 1.68

(3) TM Avg = TM + 460

(4) PM Avg = ± Orifice In. H_2O x $\frac{1}{13.6}$ = ± orifice In. Hg.

= - Vacuum gage In. Hg (when meter is before pump)

(5) VMSTD = $\frac{528 \times VM\ (PB + PM)\ (Y)}{29.92 \times (TM + 460)}$ =

(6) VW = mL H_2O + gm Silica gel =

(7) VW Gas = VW x 0.04715 =

(8) %M = $\frac{100 \times VW\ Gas}{VMSTD + VW\ Gas}$ = $\frac{100 \times (\quad)}{(\quad) + (\quad)}$ = $\frac{(\quad)}{(\quad)}$ =

AF-252

Leak check @ 7 cfm Hg = .009 initial

Field Moisture Determination

Client: BFI

Project No.:

Location: Chicopee

Date: 12/14

Run No.: 2

Operator: B. Il Kim

Data

Min	Clock Time	Gas Meter C.F. VM	TM In	TM Out	PM Orifice In. H_2O (+)	PM Vac. Gage In. Hg (-)	Imp temp
0	0:00	259.913	95	95	2.0	5.0	76
5	5:04	263.630	100	96	1.9	5.0	75
10	10:10	267.420	103	96	2.0	5.5	75
15	15:05	271.080	105	97	2.0	5.5	78
20	20:04	274.830	105	97	2.0	5.5	79
25	25:03	278.560	106	97	2.0	5.5	81
30	30:00	282.274	107	97	2.0	5.5	82
Total/Avg							

Impingers

	1	2	3
Final mL	148	100	0
Initial mL	100	100	0
Net mL			

Total moisture (Net mL + Net gm) =

Silica Gel

Container No.

Final gm 351.00g

Initial gm 344.60g

Net gm

Calculations

(1) PB = 29.39 Meterbox No. 8130

(2) VM Net =

(3) TM Avg = Y = DGM Calibration Factor = .98 ΔH@ 1.88

TM + 460

(4) PM Avg = ± Orifice In. H_2O x $\frac{1}{13.6}$ = ± orifice In. Hg.

= - Vacuum gage In. Hg (when meter is before pump)

(5) VMSTD = $\frac{528 \times VM \cdot (PB + PM) (Y)}{29.92 \times (TM + 460)}$ =

(6) VW = mL H_2O + gm Silica gel =

(7) VW Gas = VW x 0.04715 =

(8) %M = $\frac{100 \times VW\ Gas}{VMSTD + VW\ Gas}$ = $\frac{100 \times (\quad)}{(\quad) + (\quad)}$ = $\frac{(\quad)}{(\quad)}$ =

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Leak check initial @ 10 mm Hg .011

@ 7 mm Hg .005

Field Moisture Determination

Client: BFI

Project No.:

Location: Chicopee

Date: 12/14/93

Run No.: 3

Operator: B. Kissel

Data

Min	Clock Time	Gas Meter C.F. VM	TM In	TM Out	PM Orifice In. H_2O (+)	PM Vac. Gage In. Hg (-)	Imp temp
0	0:00	282.679	96	95	2.0	7.0	73
5	4.55	286.370	97 100	97	2.0	6.75	73
10	9.55	290 120	103	97	2.0	6.75	72
15	14.54	293.810	105	97	2.0	6.75	77
20	20:20	297.920	106	97	2.0	6.75	~~81~~ 77
25	25:07	301.510	106	97	2.0	6.75	81
30	30:00	305.207	105	97			81
Total/Avg							

Impingers

	1	2	3
Final mL	149	100	0
Initial mL	100	100	0
Net mL	49	0	0

Total moisture (Net mL + Net gm) = 57.49

Silica Gel

Container No.

Final gm 328.50

Initial gm 320.01

Net gm 8.49

Calculations

(1) PB = 29.39

Meterbox No.

(2) VM Net =

Y = DGM Calibration Factor =

(3) TM Avg =

TM + 460

(4) PM Avg = + Orifice In. H_2O x $\frac{1}{13.6}$ = + orifice In. Hg.

= - Vacuum gage In. Hg (when meter is before pump)

(5) $VMSTD = \frac{528 \times VM \cdot (PB + PM)\ (Y)}{29.92 \times (TM + 460)} =$

(6) VW = mL H_2O + gm Silica gel =

(7) VW Gas = VW x 0.04715 =

(8) $\%M = \frac{100 \times VW\ Gas}{VMSTD + VW\ Gas} = \frac{100 \times (\quad)}{(\quad) + (\quad)} = \frac{(\quad)}{(\quad)} =$

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Leak check @ 10 min

Stack Geometry & Gas Velocity Data

Page __ of __

Project No. _____ Source _____

Client BFI Sample Location Outlet Stack

Plant Chicopee Run No. 1

Operator B. Kinsel Static, In. H_2O _____

Meter Box No. 8130

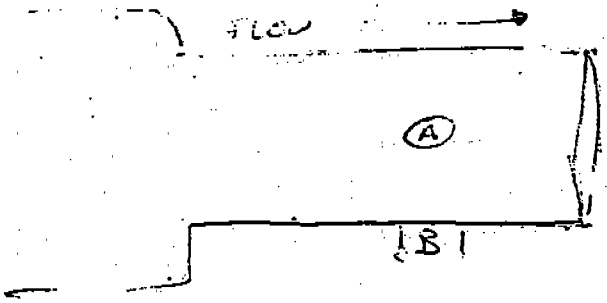
Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
1131	1A	706	2.0	
...	2A	709	2.1	
	3A	713	2.3	
	4A	718	2.3	
	5A	721	2.4	
	6A	720	2.3	
	7A	717	2.4	
1132	8A	680	2.2	
134	1B	704	2.4	
	2B	708	2.1	
	3B	712	2.3	
	4B	716	2.3	
	5B	719	2.3	
	6B	720	2.4	
	7B	717	2.4	
1136	8B1	715	2.4	

Sketch of Sampling Location

Stack Diameter _____

Diameters Upstream _____

Diameters Downstream _____



Wet Bulb _____

Dry Bulb _____

%M _____

TRC

Stack Geometry & Gas Velocity Data

Page ___ of ___

Project No. _____

Client BFI

Plant Pinecrest

Operator Site Crew

Meter Box No. 830

Source _____

Sample Location Outlet Stack

Run No. Final Run / Initial 2

Static, In. H_2O -1.5

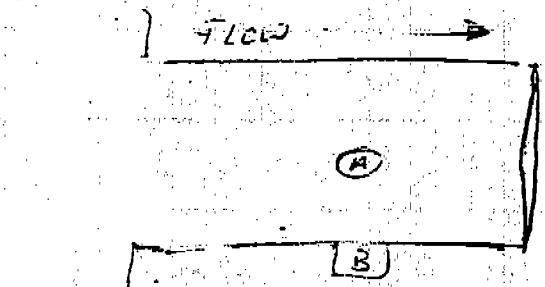
Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
1316	1A	696	2.0	
...	2A	698	2.1	
	3A	708	2.3	
	4A	714	2.3	
	5A	715	2.3	
	6A	716	2.3	
	7A	714	2.5	
1318	8A	680	2.3	
1319	1B	698	2.1	
	2B	705	2.1	
	3B	712	2.2	
	4B	715	2.3	
	5B	718	2.6	
	6B	718	2.5	
	7B	716	2.6	
	8B	713	2.6	

Sketch of Sampling Location

Stack Diameter 14"

Diameters Upstream _____

Diameters Downstream _____



Wet Bulb _____

Dry Bulb _____

%M _____

TRC

Stack Geometry & Gas Velocity Data

Page __ of __

Project No. _____ Source _____

Client BP Sample Location Outlet Stack

Plant Sheepee Run No. Run 2 Initial Run 3

Operator Bill Kent Static, In. H_2O 2.50

Meter Box No. SB0

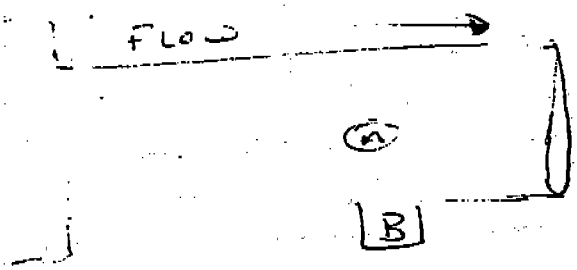
Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
2 & 1500	1A	704	2.20	
...	2A	711	2.30	
	3A	717	2.30	
	4A	720	2.40	
	5A	720	2.40	
	6A	719	2.50	
	7A	716	2.50	
1523	8A	706	2.40	
1505	1B	690	1.80	
	2B	705	2.20	
	3B	714	2.30	
	4B	718	2.50	
	5B	720	2.60	
	6B	721	2.60	
	7B	717	2.60	
1508	8B	713	2.50	

Sketch of Sampling Location

Stack Diameter _____

Diameters Upstream _____

Diameters Downstream _____



Wet Bulb _____

Dry Bulb _____

%M _____

TRC

Page __ of __

Project No. _____

Client BFI

Plant Chicopee

Operator Bill Kind

Meter Box No. 8130

Source _____

Sample Location Outlet Stack

Run No. 3 Final Run

Static, In. H_2O 2.0

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
1637	1A	674	2.0	
...	2A	698	2.2	
	3A	704	2.4	
	4A	708	2.5	
	5A	712	2.5	
	6A	713	2.6	
	7A	712	2.6	
1639	8A	708	2.5	
1641	1A	660	1.6	
	2A	693	2.2	
	3A	704	2.5	
	4A	709	2.5	
	5A	714	2.5	
	6A	716	2.6	
	7A	715	2.5	
1642	8A	707	2.4	

Sketch of Sampling Location

Stack Diameter _____

Diameters Upstream _____

Diameters Downstream _____

Wet Bulb _____

Dry Bulb _____

%M _____

TRC

BFI CHICOPEE

STACK #1
14 December 1993

	Run #1		Run #2		Run #3	
	Area Counts	Concentration (PPM)	Area Counts	Concentration (PPM)	Area Counts	Concentration (PPM)
Injection #1	1181868	2020.9	1212805	2074.2	1165685	1993.0
Injection #2	1193205	2040.4	1199243	2050.8	1173062	2005.7
Injection #3	1212390	2073.5	1192089	2038.5	1181044	1985.0
Average	1195821	2044.9	1201979	2054.5	1186597	1994.6

DRAFT

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 1

To Mike O'Brien	From Tim Senger
Co. TRC/c/o BFI	Co. TRC
Dept. Air	Phone # x5158
Fax # 413 592 8169	Fax # 508 453 1995

APPENDIX B

CEM DATA AND CALIBRATION SHEETS

FACILITY: BFI CHICOPEE LANDFILL
SOURCE: DIESEL ENGINE GENERATOR
MONTH/YR: DECEMBER 14, 1993

CEM DATA CORRECTION PROGRAM

INSTRUMENTAL REFERENCE METHODS - 3A,7E,10,

		O2 %		CO2 %		NOx, ppm		SO2, ppm		THC, ppm		CO, ppm	
RUN 1 12/14/93	SLOPE/ Y-INT	25	0	25	0	1000	0	500	0	3000	0	1000	0
	SYS CAL VALUES ZERO/SPAN	0	10.1	0	10.1	0	505	0	231	0	984	0	452.2
	DIR CAL ZERO VDC/CONC		0.04		0.03		1		0		0		1
	DIR CAL SPAN VDC/CONC		10.01		10.08		505		235		988		448
	INT SYS ZERO VDC/CONC		0.00		0.04		11		0		0		1
	FIN SYS ZERO VDC/CONC		0.00		0.03		15		3		0		2
	INT SYS SPAN VDC/CONC		9.95		10.02		504		207		983		445
	FIN SYS SPAN VDC/CONC		9.88		9.95		506		215		991		445
	INT/FIN SYS BIAS ZERO %	-0.16	-0.16	0.04	0.00	1.00	1.40	0.00	0.60	0.00	0.00	0.00	0.10
	INT/FIN SYS BIAS SPAN %	-0.24	-0.52	-0.24	-0.52	-0.10	0.10	-5.60	-4.00	-0.17	0.10	-0.30	-0.30
	ZERO/SPAN SYS DRIFT %	0.00	-0.28	-0.04	-0.28	0.40	0.20	0.60	1.60	0.00	0.27	0.10	0.00
	ANALYZER SCALE(SPAN)	25		25		1000		500		3000		1000	
	RUN AVG	8.78		10.87		89.00		1.00		2127.00		495.00	
	CORR. AVG	8.94		11.00		78.01		-0.55		2120.53		447.84	

		O2 %		CO2 %		NOx, ppm		SO2, ppm		THC, ppm		CO, ppm	
RUN 2 12/14/93	SLOPE/ Y-INT	25	0	25	0	1000	0	500	0	3000	0	1000	0
	SYS CAL VALUES ZERO/SPAN	0	10.1	0	10.1	0	505	0	231	0	984	0	452.2
	DIR CAL ZERO VDC/CONC		0.04		0.03		1		0		0		1
	DIR CAL SPAN VDC/CONC		10.01		10.08		505		235		988		448
	INT SYS ZERO VDC/CONC		0.00		0.03		15		3		0		2
	FIN SYS ZERO VDC/CONC		-0.04		0.03		19		2		4		1
	INT SYS SPAN VDC/CONC		9.88		9.95		506		215		991		445
	FIN SYS SPAN VDC/CONC		9.41		9.83		519		214		989		444
	INT/FIN SYS BIAS ZERO %	-0.16	-0.32	0.00	0.00	1.40	1.80	0.60	0.40	0.00	0.13	0.10	0.00
	INT/FIN SYS BIAS SPAN %	-0.52	-2.40	-0.52	-1.00	0.10	1.40	-4.00	-4.20	0.10	0.03	-0.30	-0.40
	ZERO/SPAN SYS DRIFT %	-0.16	-1.88	0.00	-0.48	0.40	1.30	-0.20	-0.20	0.13	-0.07	-0.10	-0.10
	ANALYZER SCALE(SPAN)	25		25		1000		500		3000		1000	
	RUN AVG	8.75		10.85		90.00		2.00		2157.00		494.00	
	CORR. AVG	9.16		11.08		74.40		-0.54		2146.28		447.01	

		O2 %		CO2 %		NOx, ppm		SO2, ppm		THC, ppm		CO, ppm	
RUN 3 12/14/93	SLOPE/ Y-INT	25	0	25	0	1000	0	500	0	3000	0	1000	0
	SYS CAL VALUES ZERO/SPAN	0	10.1	0	10.1	0	505	0	231	0	984	0	452.2
	DIR CAL ZERO VDC/CONC		0.04		0.03		1		0		0		1
	DIR CAL SPAN VDC/CONC		10.01		10.08		505		235		988		448
	INT SYS ZERO VDC/CONC		-0.04		0.03		19		2		4		1
	FIN SYS ZERO VDC/CONC		-0.04		0.03		16		2		1		1
	INT SYS SPAN VDC/CONC		9.41		9.83		519		214		989		444
	FIN SYS SPAN VDC/CONC		9.84		9.92		519		218		988		444
	INT/FIN SYS BIAS ZERO %	-0.32	-0.32	0.00	0.00	1.80	1.50	0.40	0.40	0.13	0.03	0.00	0.00
	INT/FIN SYS BIAS SPAN %	-2.40	-0.68	-1.00	-0.64	1.40	1.40	-4.20	-3.40	0.03	0.00	-0.40	-0.40
	ZERO/SPAN SYS DRIFT %	0.00	1.72	0.00	0.36	-0.30	0.00	0.00	0.80	-0.10	-0.03	0.00	0.00
	ANALYZER SCALE(SPAN)	25		25		1000		500		3000		1000	
	RUN AVG	8.89		10.72		83.00		3.00		2163.00		482.00	
	CORR. AVG	9.33		10.97		65.96		1.08		2156.12		437.14	

ANALYZER DAILY CALIBRATION CHECK

Location BFI Chicopee

Date 12/14/93

Day

TIME START/STOP 0940

PERFORMED BY WCBrice

Contract

INSTRUMENT RESPONSE Direct Cal

Instrument	Zero Conc.	Zero Response	1 Conc.	1 Response	2 Conc.	2 Response	3 Conc.	3 Response	4 Conc.	4 Response
O_2 0-25	0	0.04	4.98	4.55	10.1	(10.01)	20.1	19.97		
CO_2 0-25	0	0.03	4.97	4.78	10.1	(10.08)	19.9	19.49		
CO 0-1000	0	1.0			452.2	(448)	95.7	947		
SO_2 0-500	0	0.0	21.1	20.0	231	(235)	~~237~~			
NO_x 0-1000	0	1	122	130	278	287	505	(505)		
THC 0-300	0	0	48.9	47	102	95	984.0	(988)		
THC										

CALIBRATION EQUATION

$y = mx + b$

	O_2	CO_2	CO	SO_2	NO_x	HCl
m =						
b =						
corr. coeff r^2 =						

616-90a

TRC

ANALYZER DAILY CALIBRATION CHECK

Location BF/Chicopee

Date 12/14/93

Day

TIME START/STOP

PERFORMED BY MOBrien

Contract

Initial Run 1 Eng #1 INSTRUMENT RESPONSE Initial System CAL Final Run 1

Instrument	Zero		1		2		3		4	
	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response
O_2	0	0.00	10.1	9.95			0	0.00	10.1	9.88
CO_2	0	0.04	10.1	10.02			0	0.03	10.1	9.95
CO	0	1	452.2	445			0	2.0	452.2	445
SO_2	0	0.0	231	207			0	3	231	215
NO_x	0	11	505	504			0	15	505	506
THC	0	0	984	983			0	0	984	991
THC										

CALIBRATION EQUATION

$y = mx + b$

	O_2	CO_2	CO	SO_2	NO_x	HCl
m =						
b =						
corr. coeff r^2 =						

616-900

TRC

ANALYZER DAILY CALIBRATION CHECK

Location BFI Chicopee MA

Date 12/14/93

Day

TIME START/STOP

PERFORMED BY MO'Brien

Contract

Final Run 2

INSTRUMENT RESPONSE

Final Run 3

Instrument	Zero Conc.	Zero Response	1 Conc.	1 Response	2 Conc.	2 Response	3 Conc.	3 Response	4 Conc.	4 Response
O_2	0	-0.04	10.1	9.41			0	-0.04	10.1	9.84
CO_2	0	0.03	10.1	9.83			0	0.03	10.1	9.92
CO	0	1.0	4520	444			0	1.0	4520	444
SO_2	0	2.0	231	214			0	2.0	231	218
NO_x	0	19	505	519			0	16.0	505	519
THC	0	4.0	984	989			0	1.0	984	988
THC										

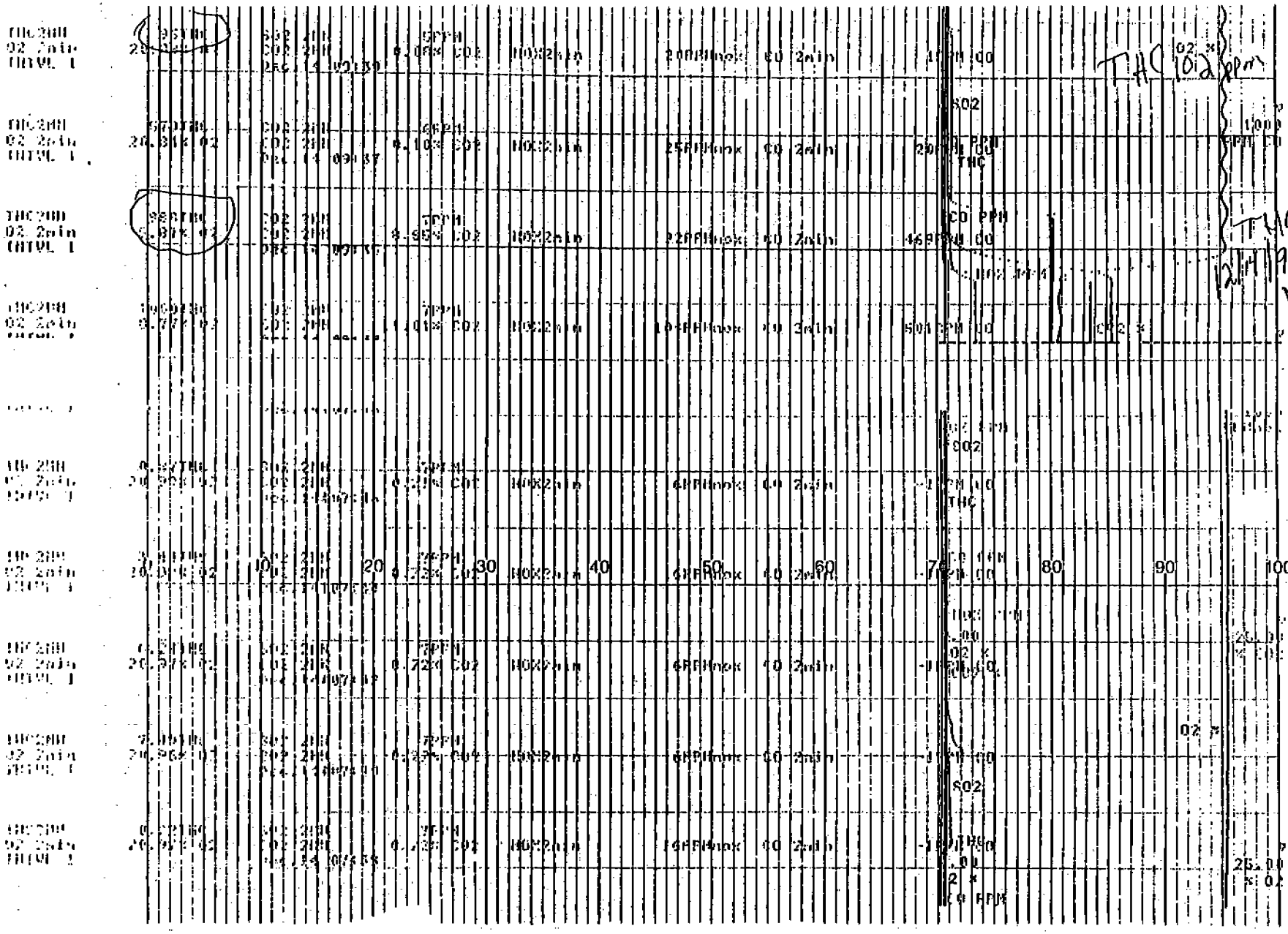
CALIBRATION EQUATION

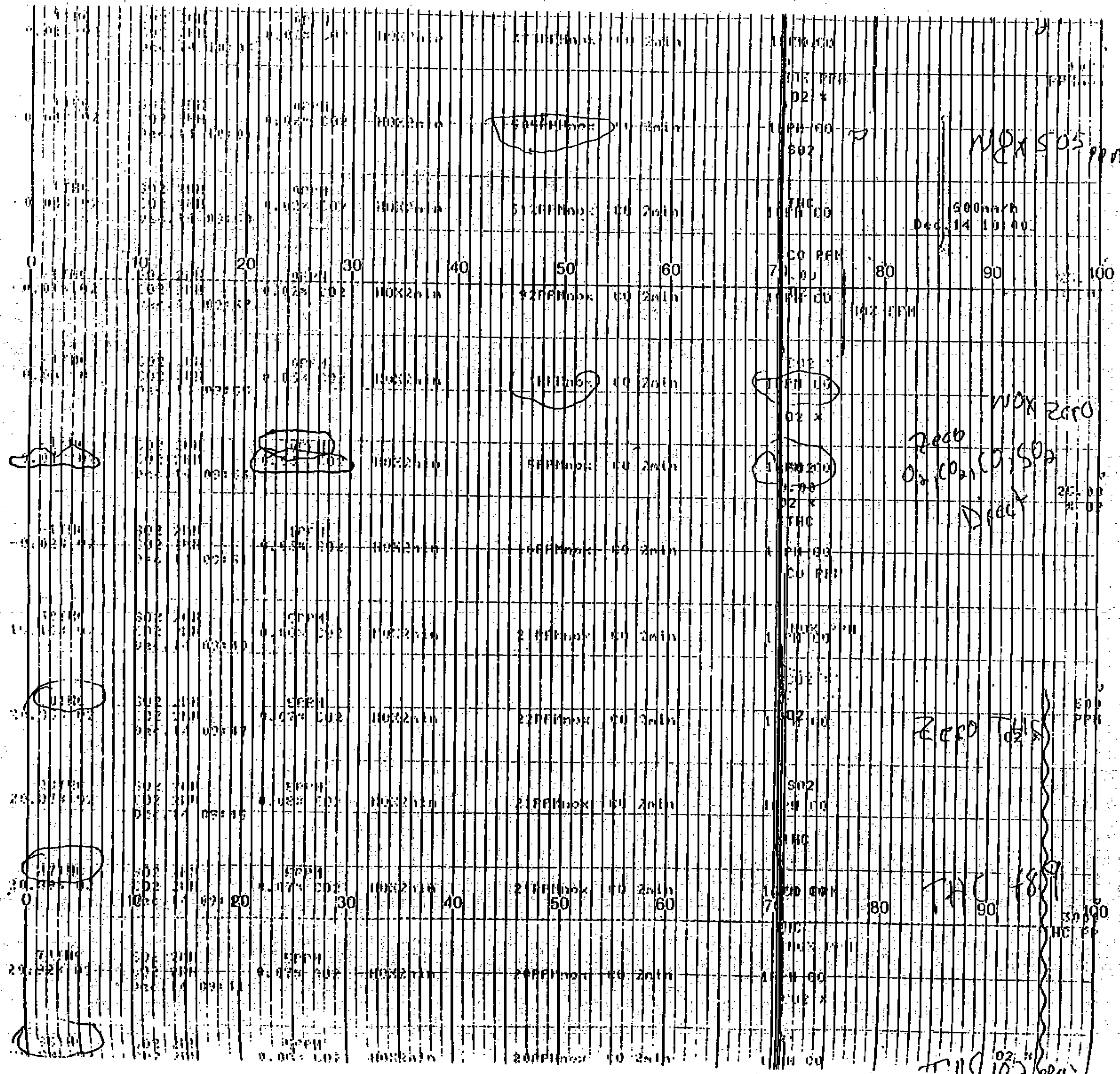
$y = mx + b$

	O_2	CO_2	CO	SO_2	NO_x	HCl
m =						
b =						
corr. coeff r^2 =						

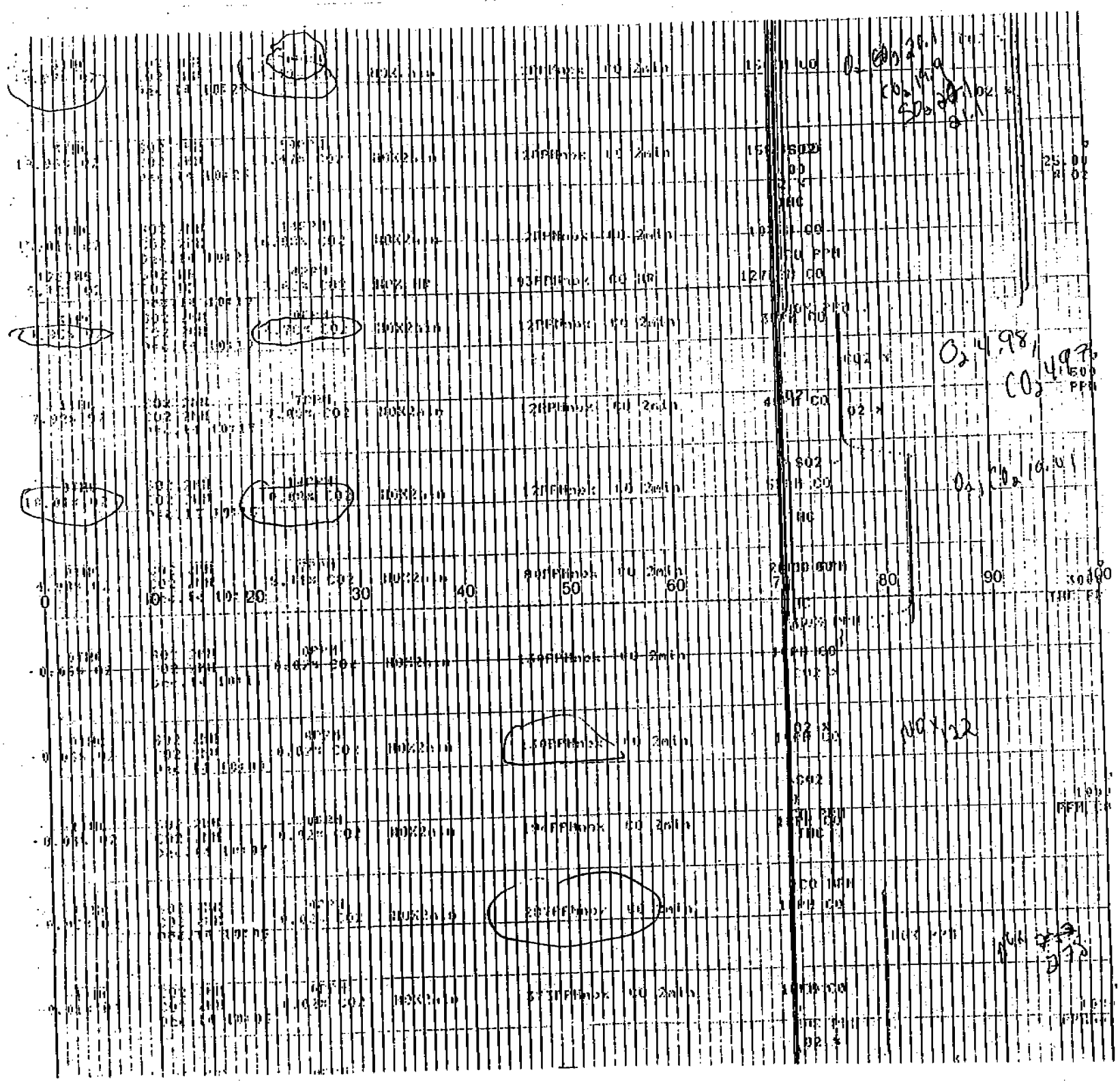
616-900

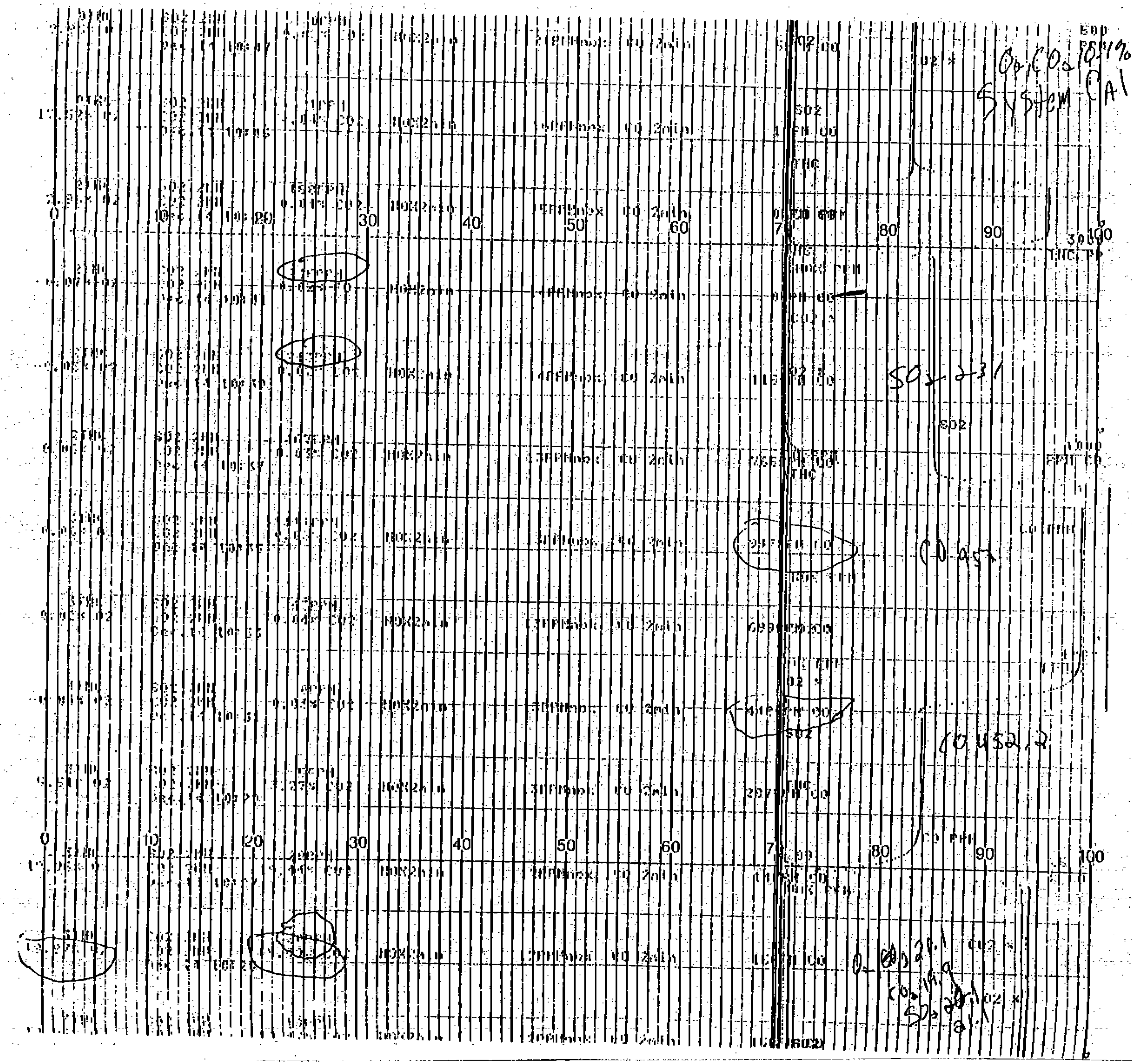
TRC


THC
02
ppm
THC 98
02 93
Direc

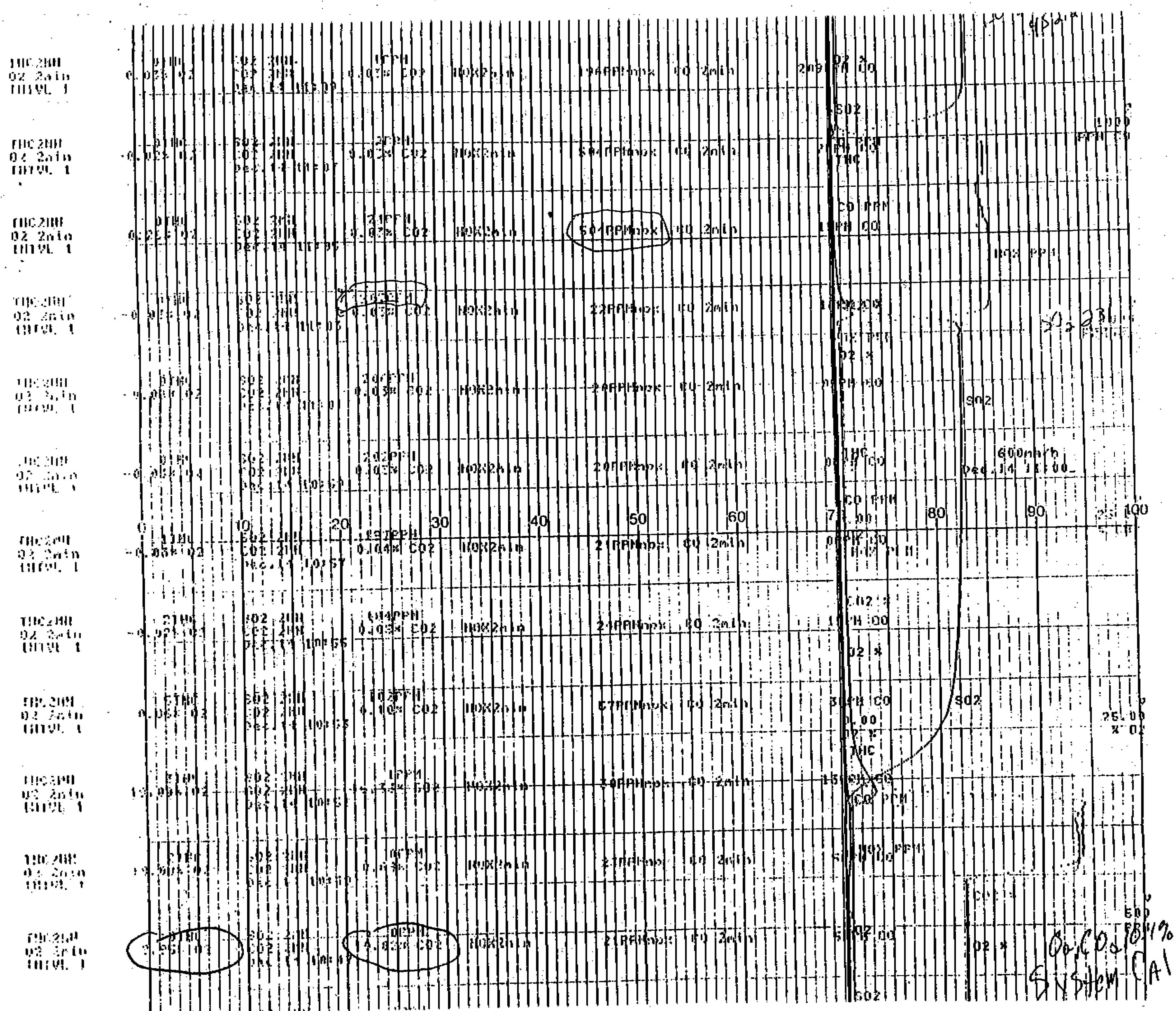


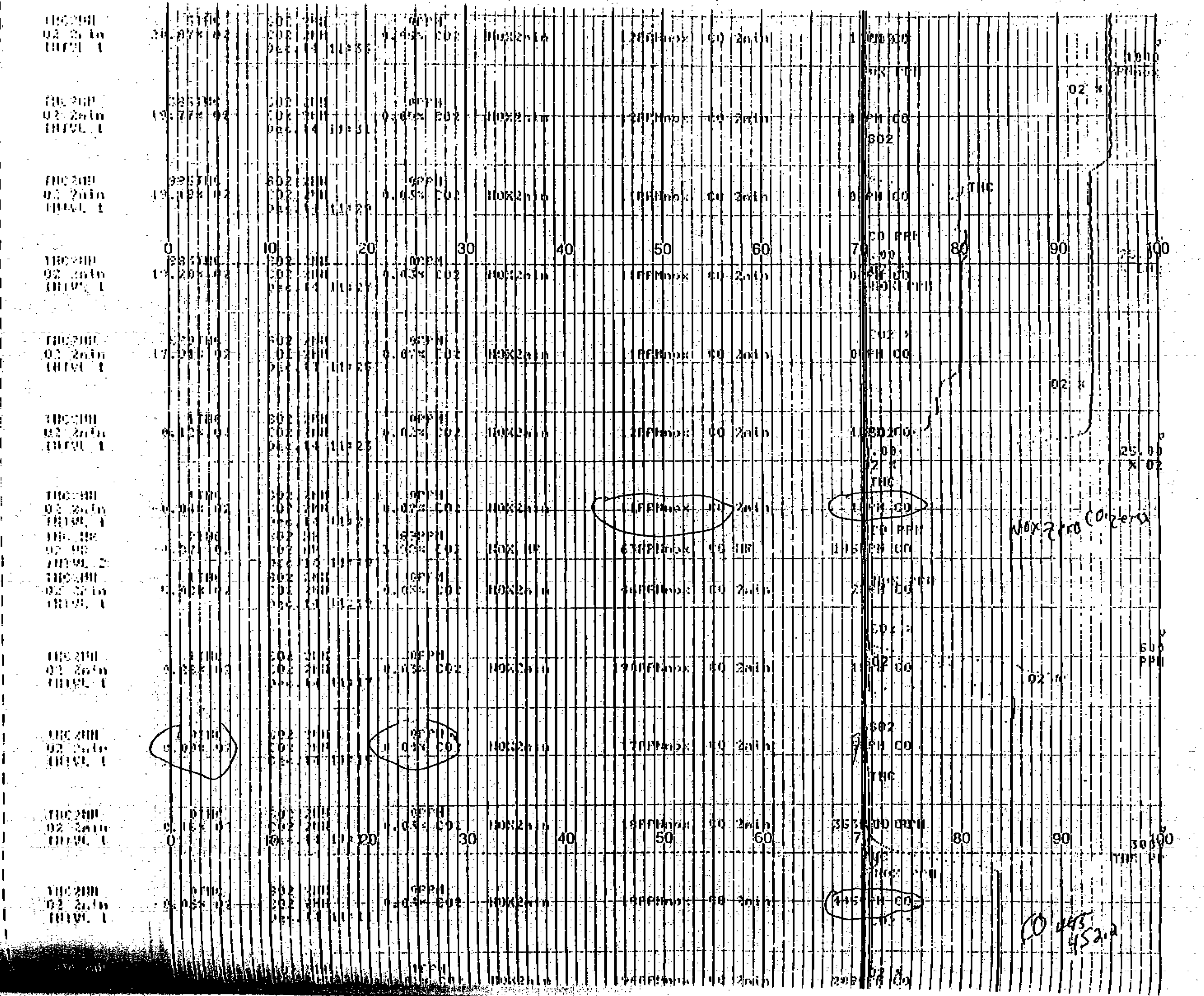
0 10 20 30 40 50 60 70 80 90 100
500mm/h
Dec 14 10:00
CO PPM
NOX PPM
THC
SO2
O2 %
NOX zero
Decay
THC

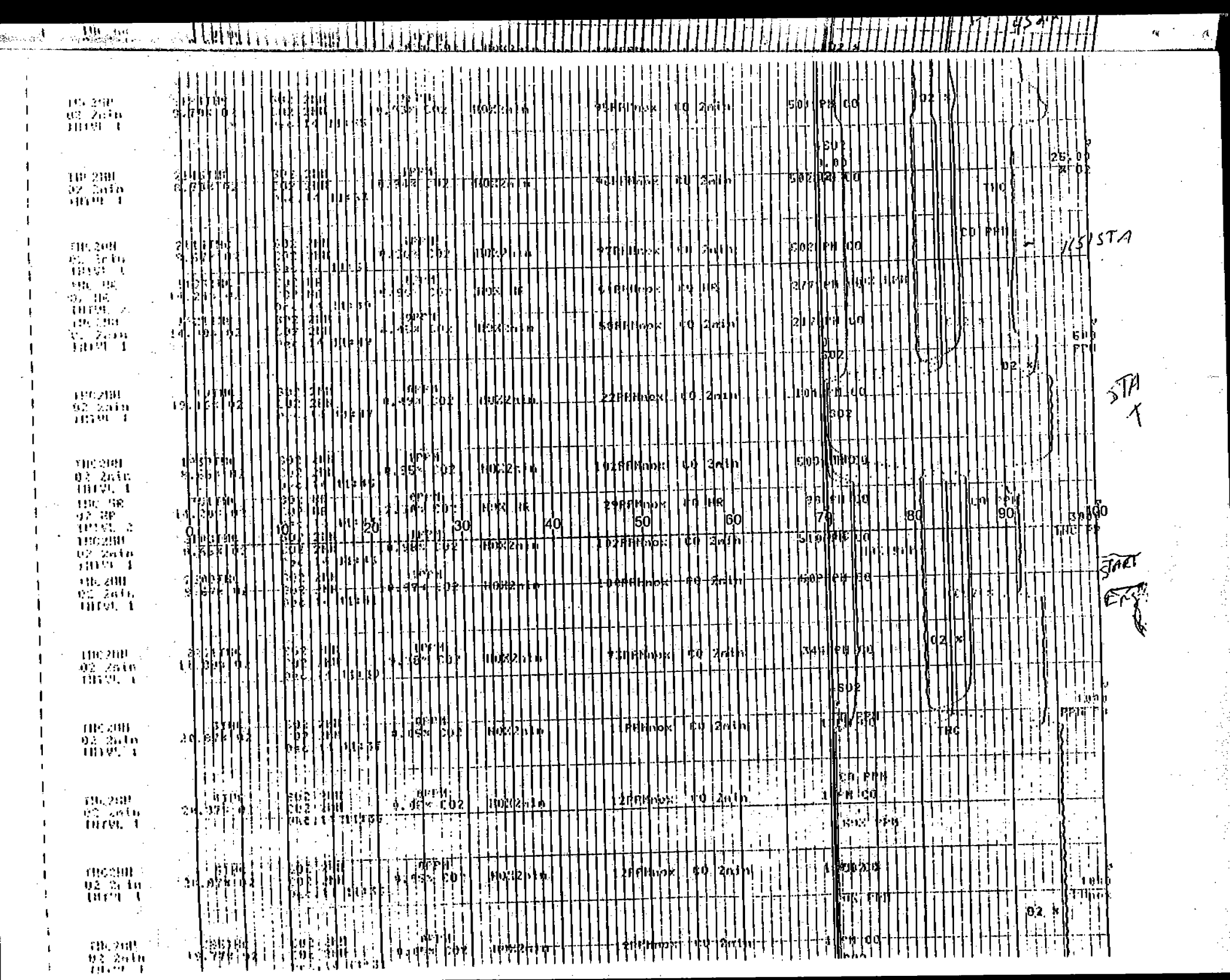


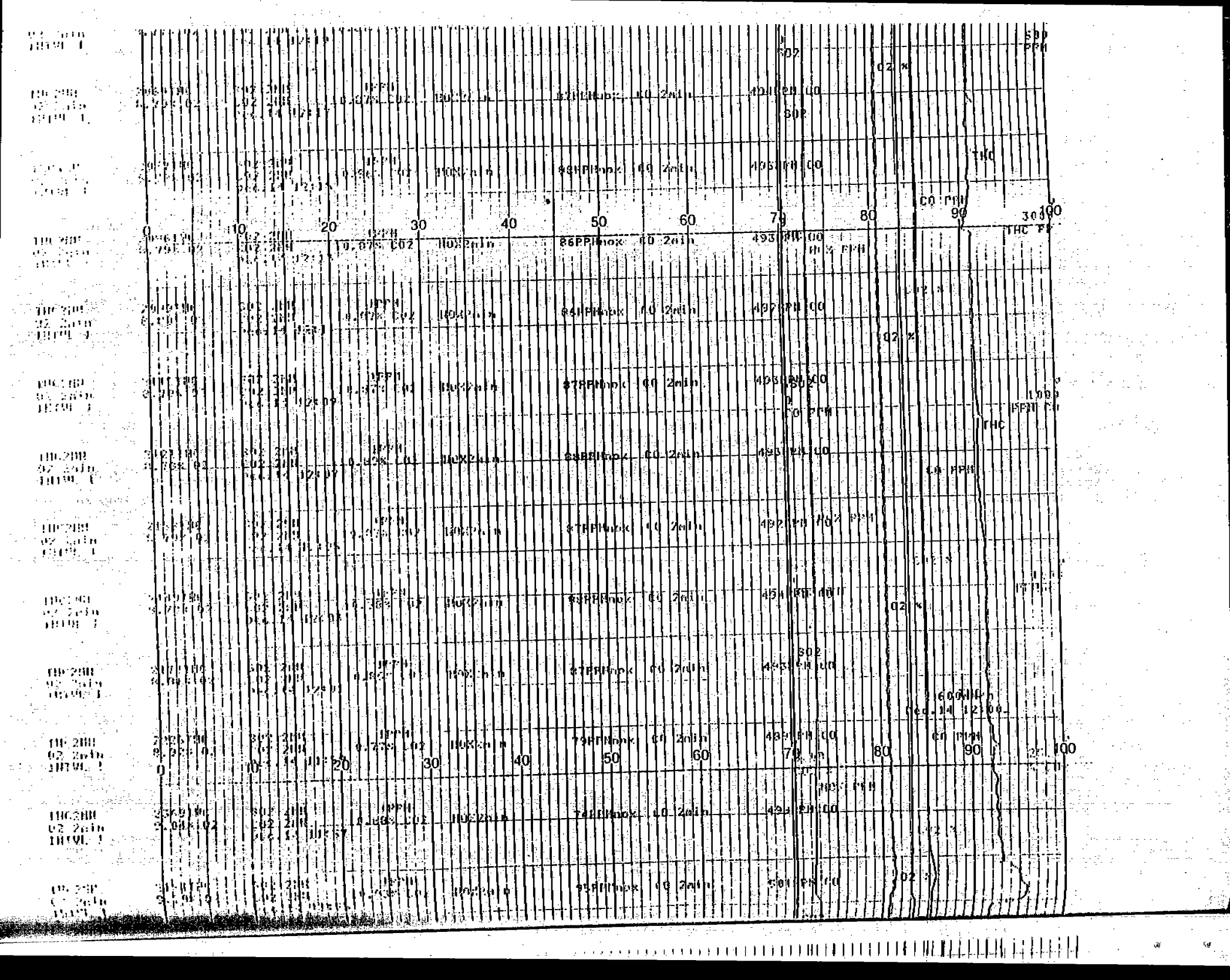


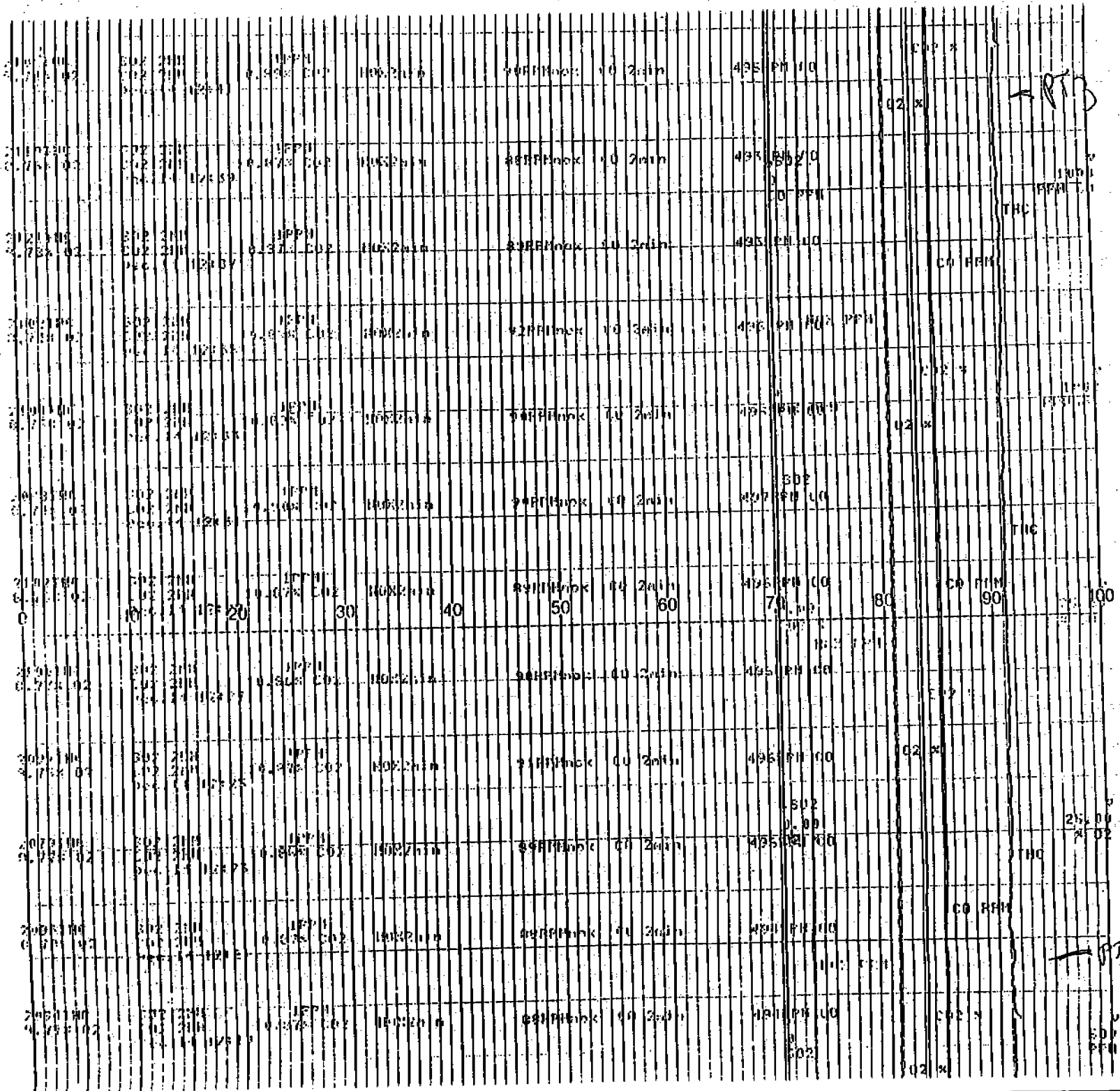
0
10
20
30
40
50
60
70
80
90
100
SO2
THC
O2
O2/CO2 18.1%
System Cal
SO2 231
CO 457
CO 452.2

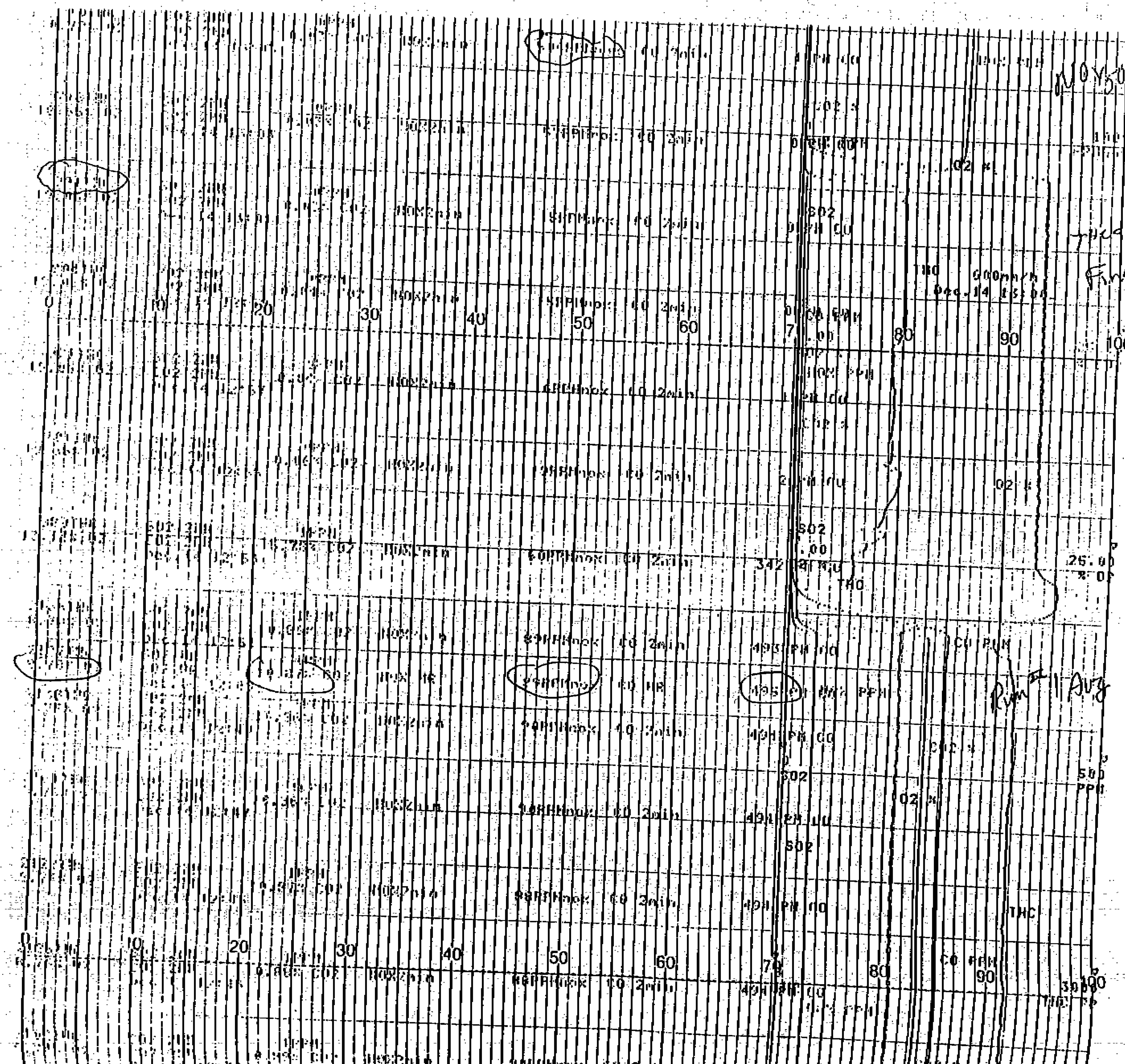

0
10
20
30
40
50
60
70
80
90
100
SO2
THC
CO PPM
O2 %
NOX PPM


0
10
20
30
40
50
60
70
80
90
100
THC
02 %
25.00
% 02
NOx zero (O2 zero)
CO 445
452.2

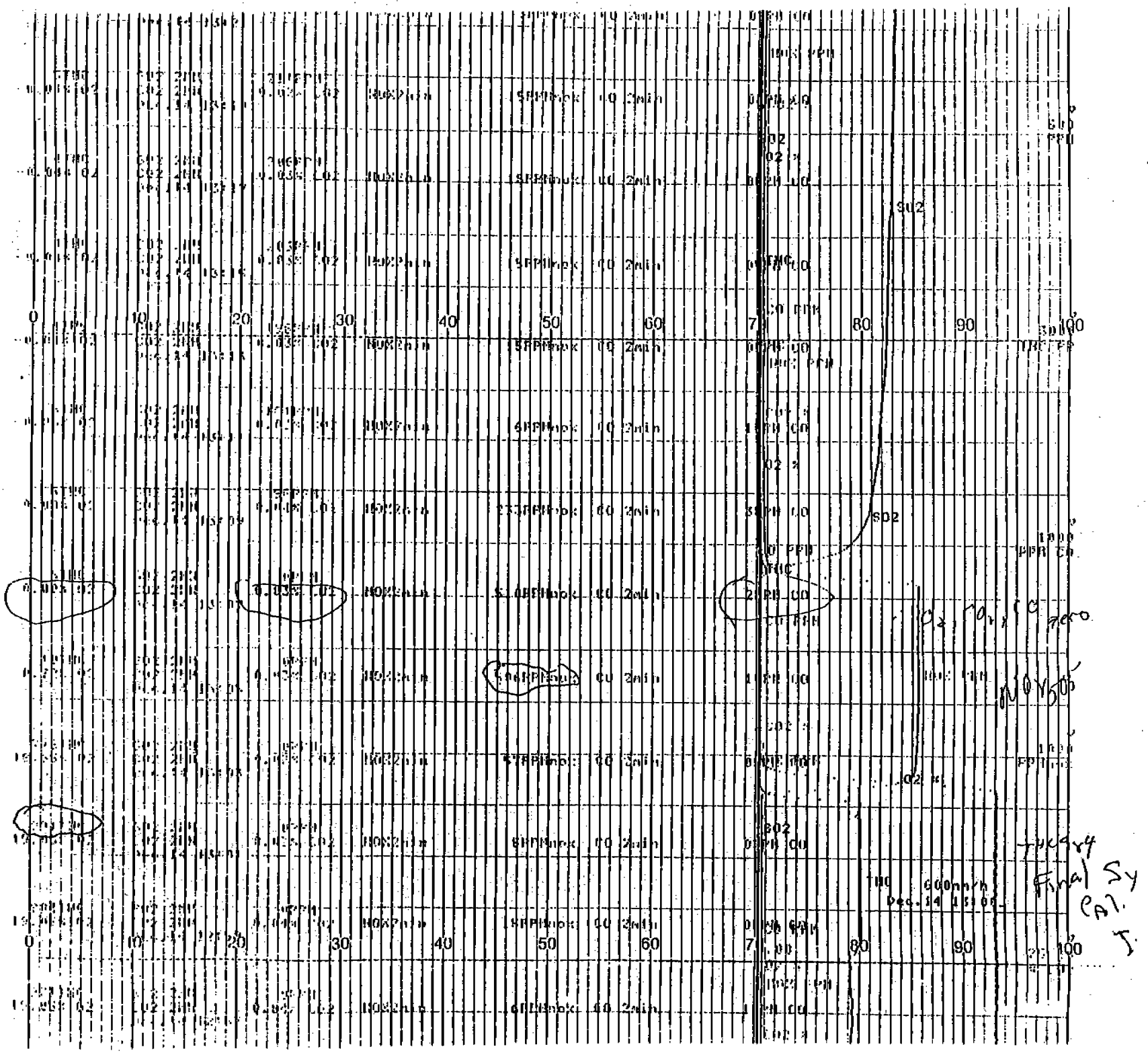

0
10
20
30
40
50
60
70
80
90
100
CO PPM
TRC
O2 %
SO2
STA 1
START
END

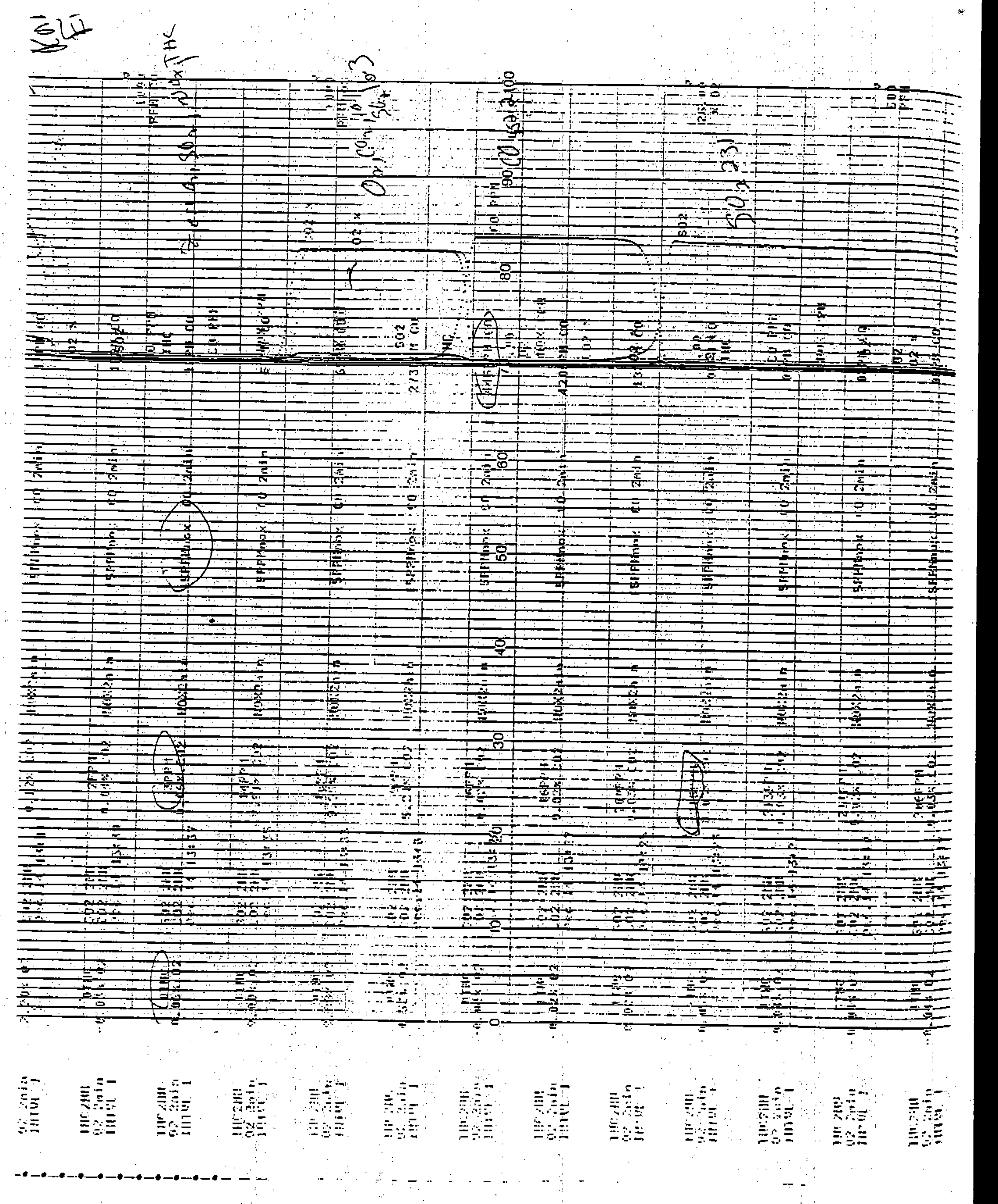

CO PPM
THC PPM
O2 %
0
10
20
30
40
50
60
70
80
90
100

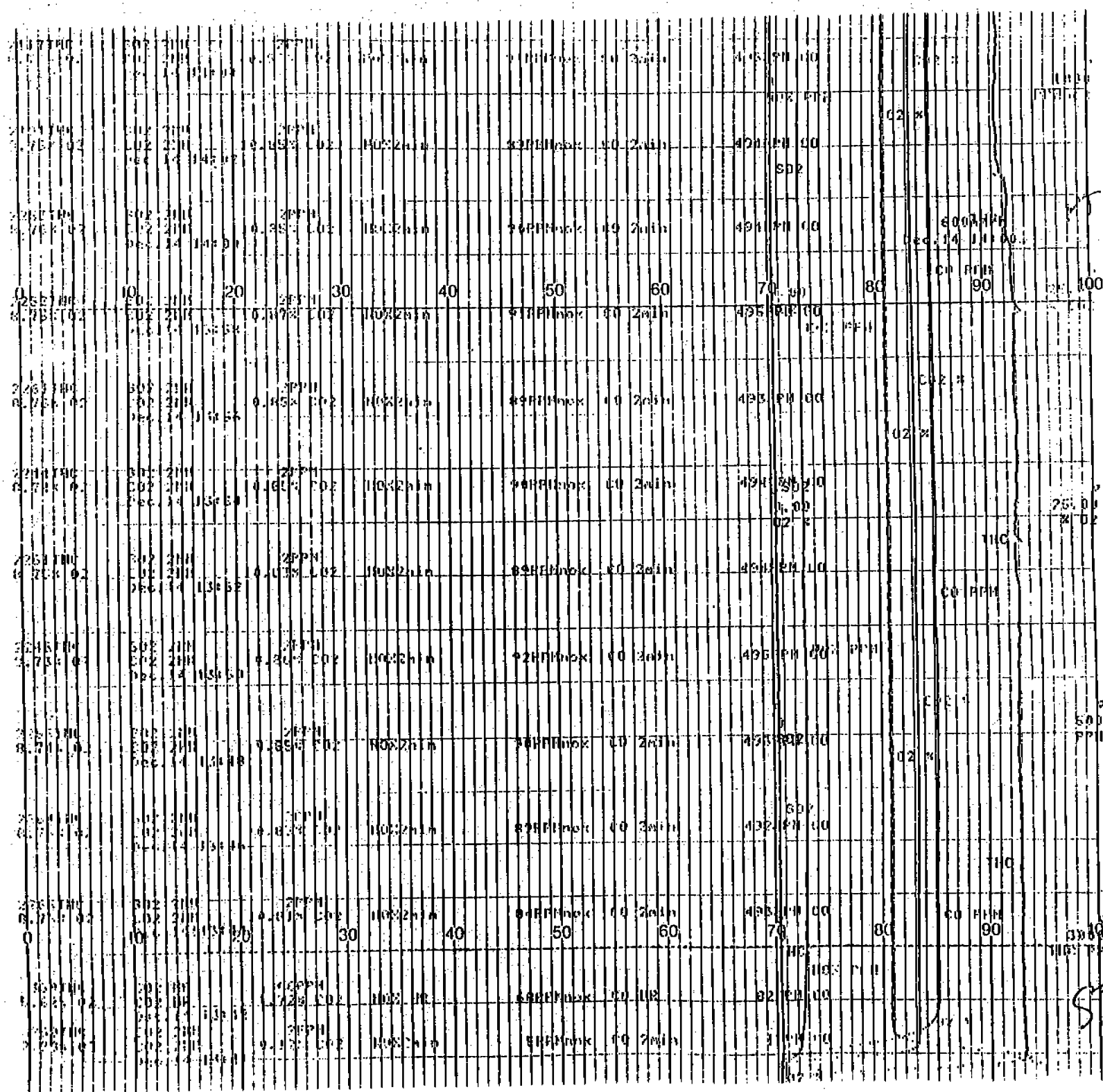

THC
CO PPM
0
10
20
30
40
50
60
70
80
90
100

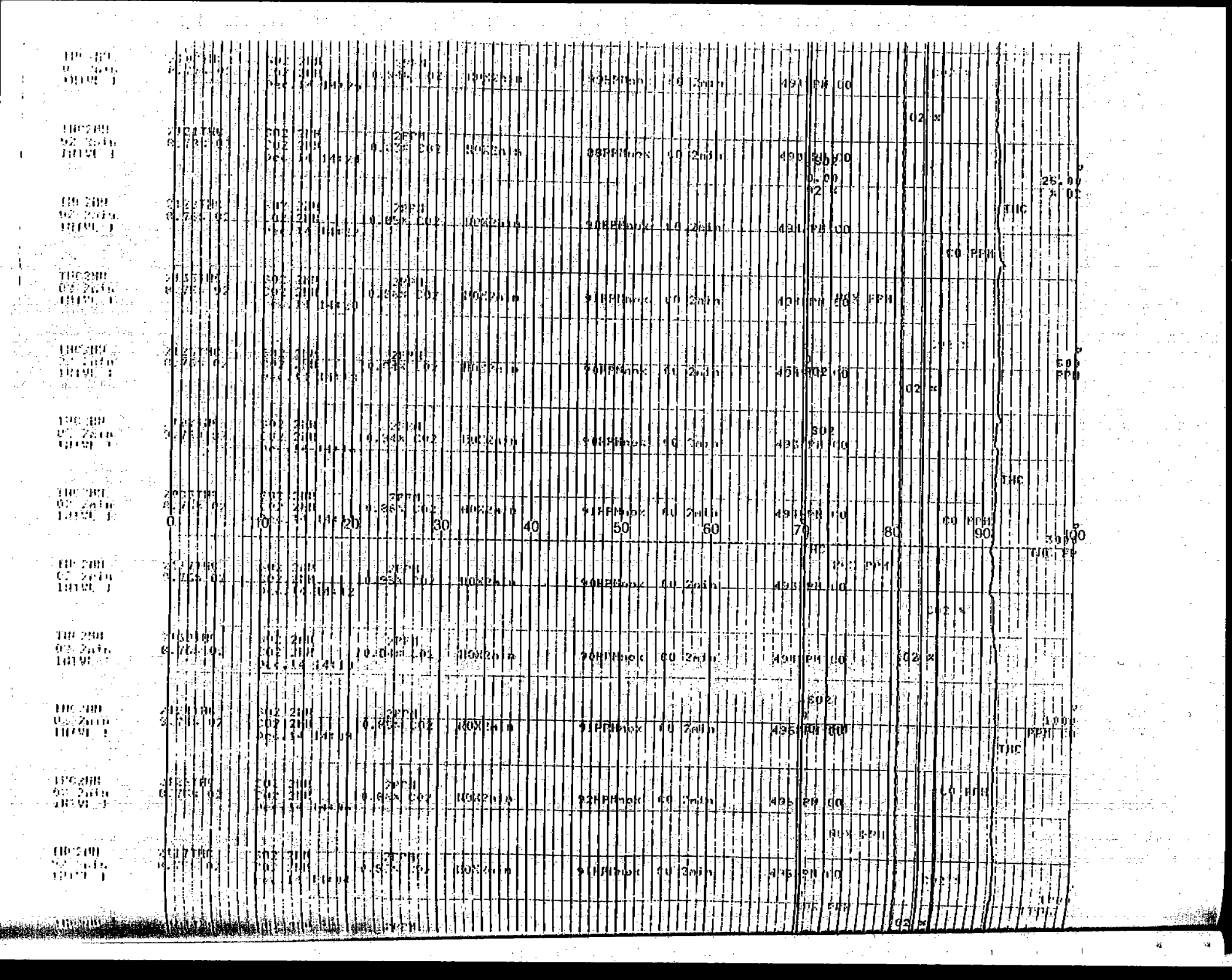


NOX 500
Run #11 Avg
THC
O2 %
SO2
CO PPM


0
10
20
30
40
50
60
70
80
90
100
SO2
Dec. 14 15:00
Final Sy
Cal.




PT2
START
Ran
Fr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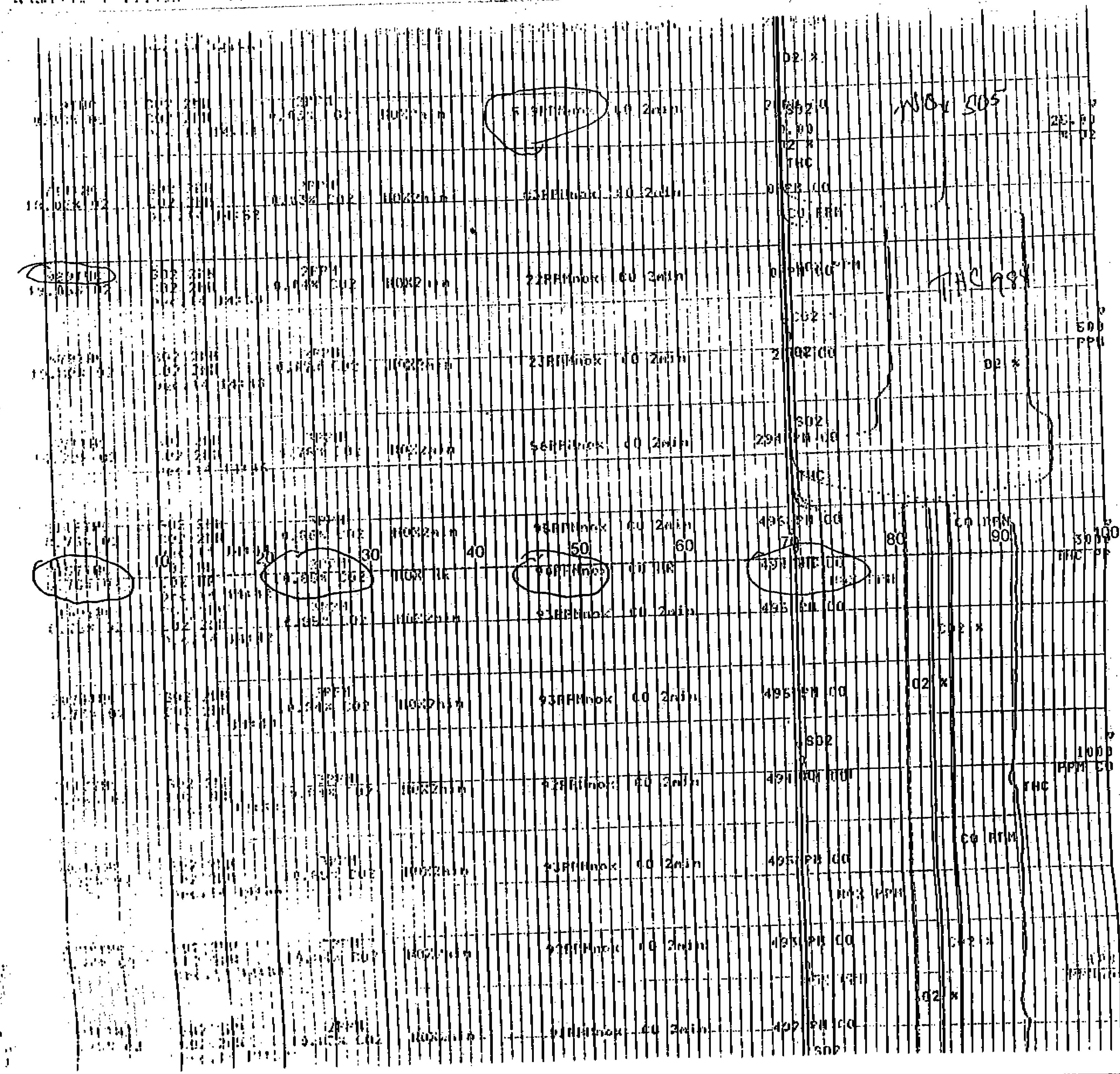
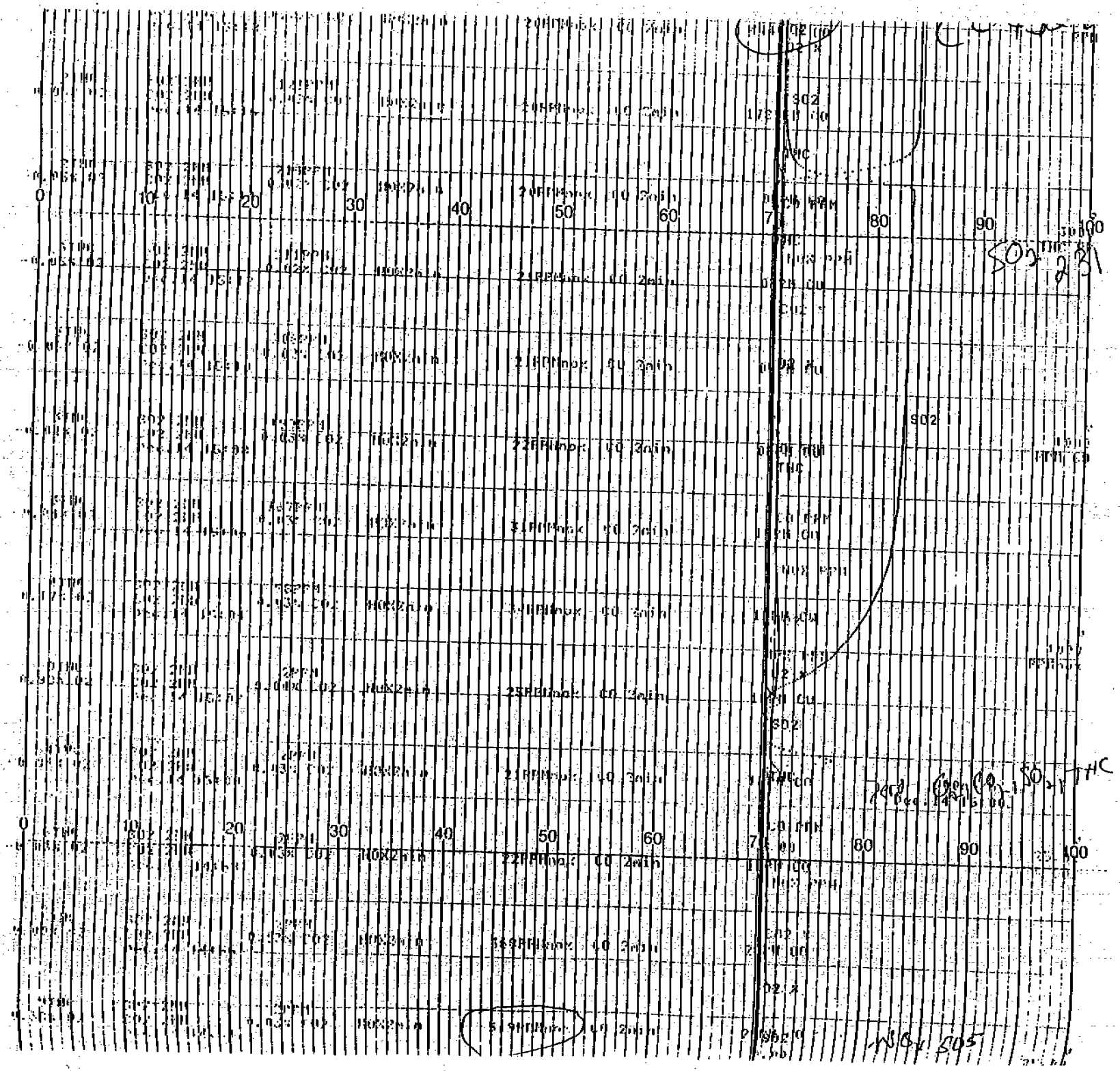
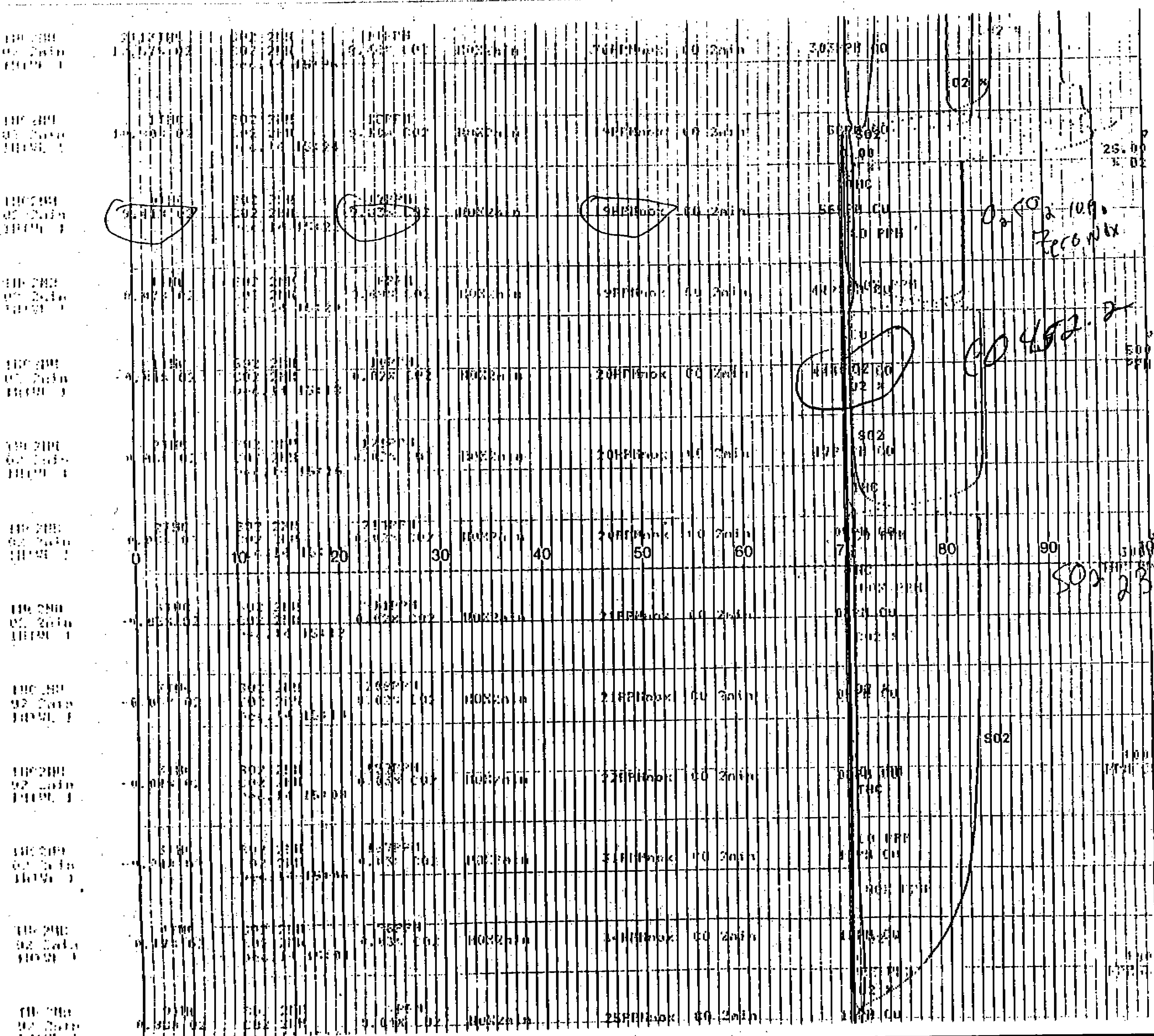
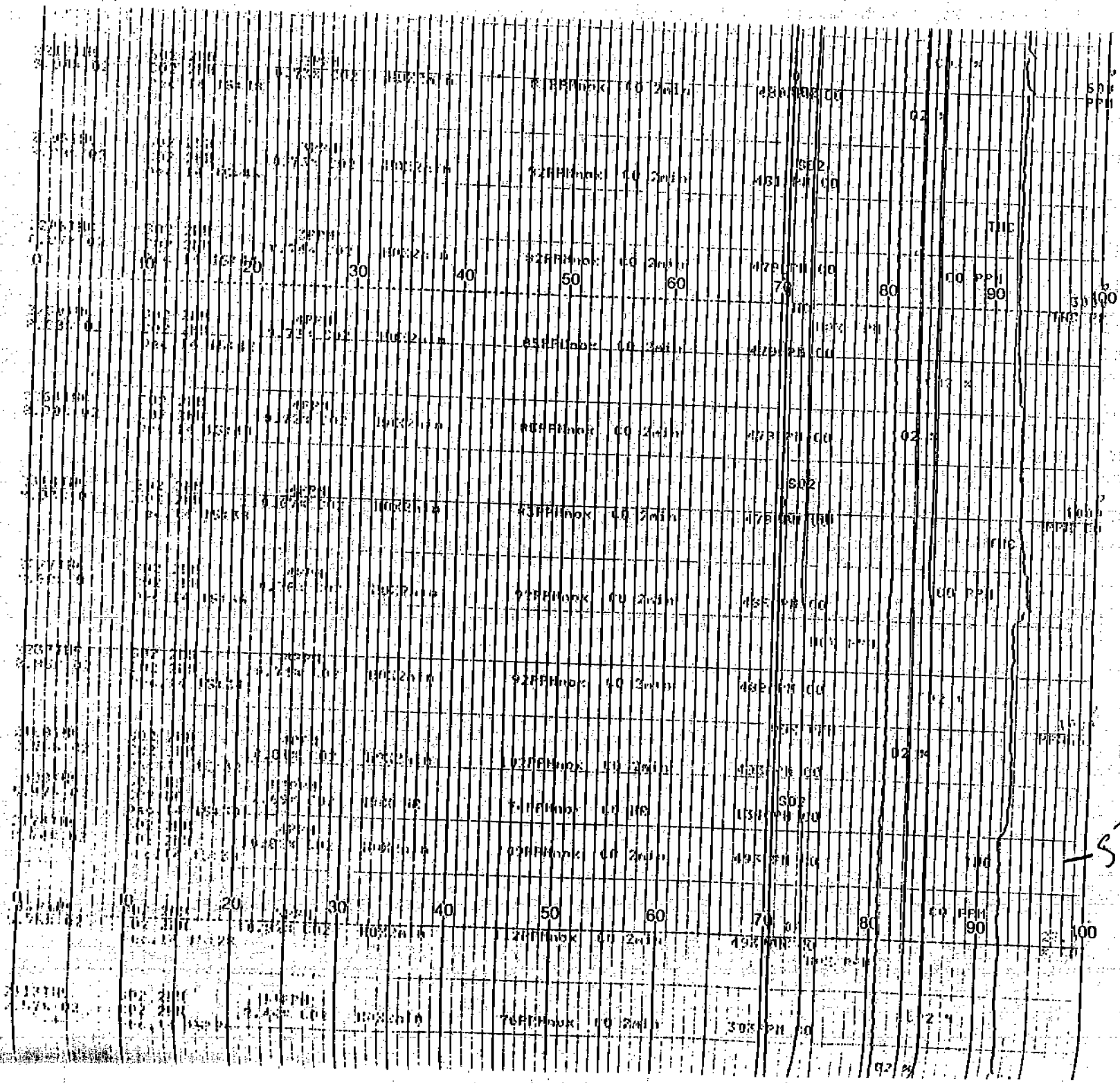
10
20
30
40
50
60
70
80
90
100
THC
CO PPM
SO2
PPM

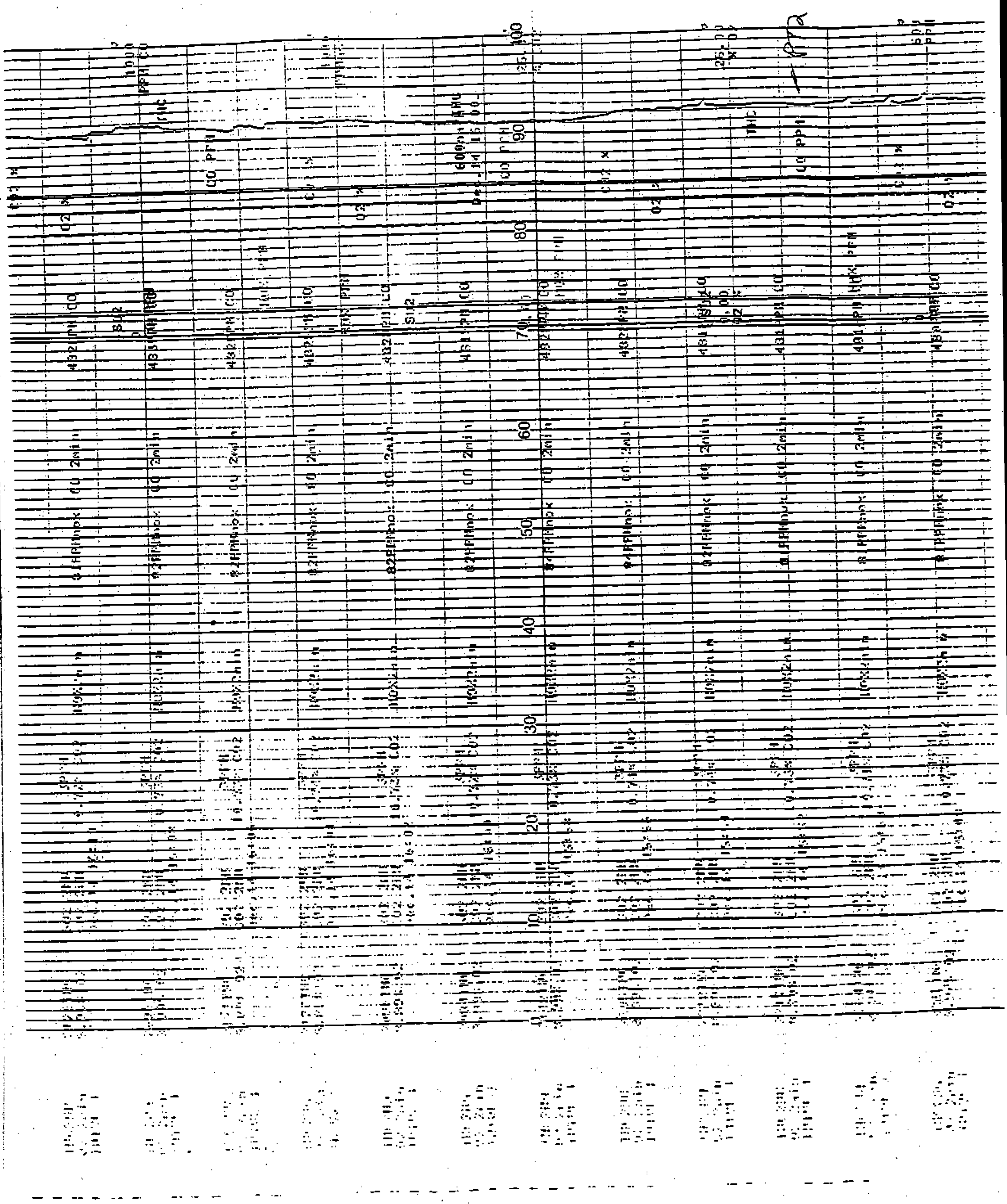


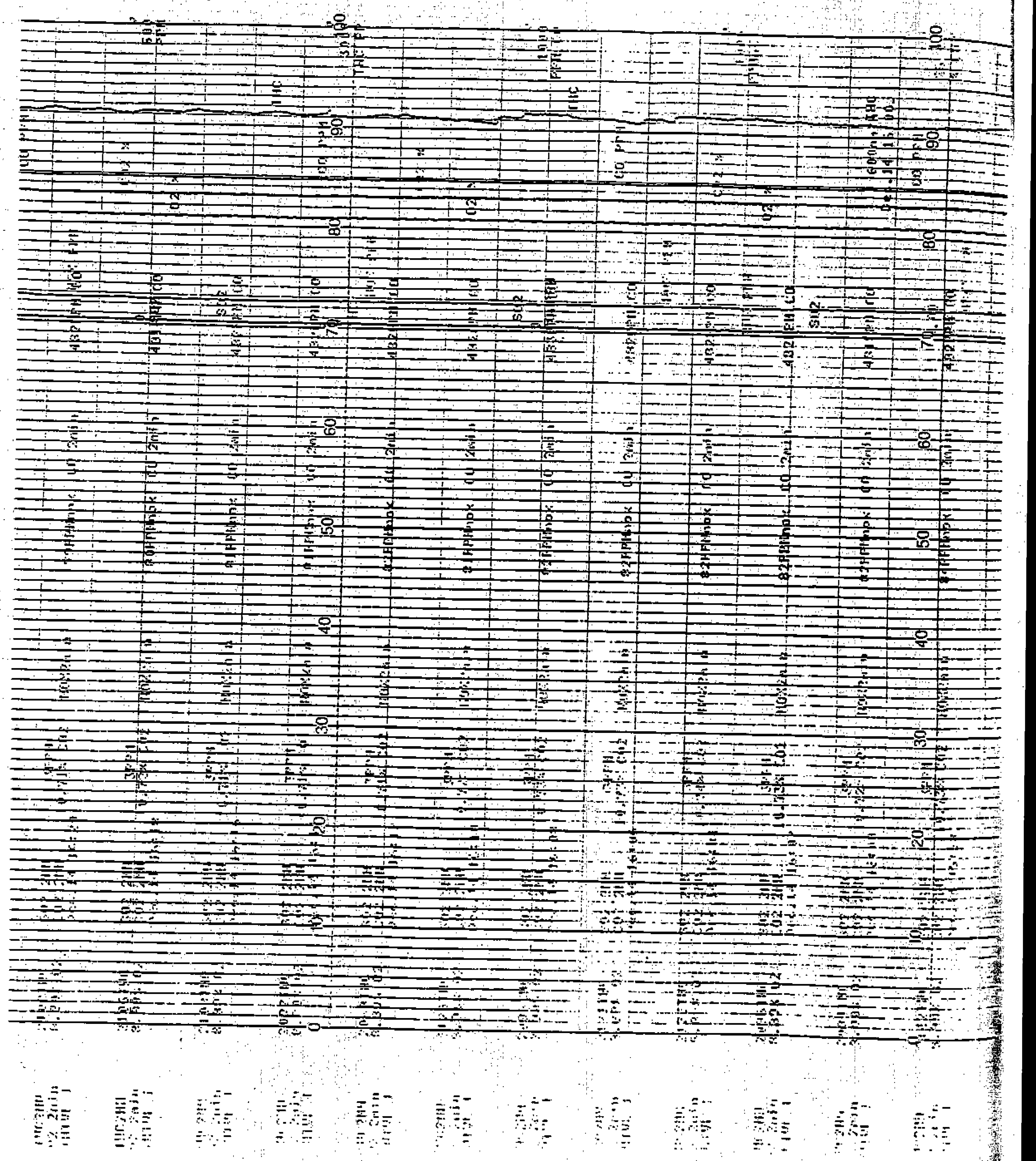
10
20
30
40
50
60
70
80
90
100
THC
SO2
O2 %
CO PPM
500 PPM
1000 PPM CO
22PPMnox CO 2min
23PPMnox CO 2min
93PPMnox CO 2min
495 PPM CO

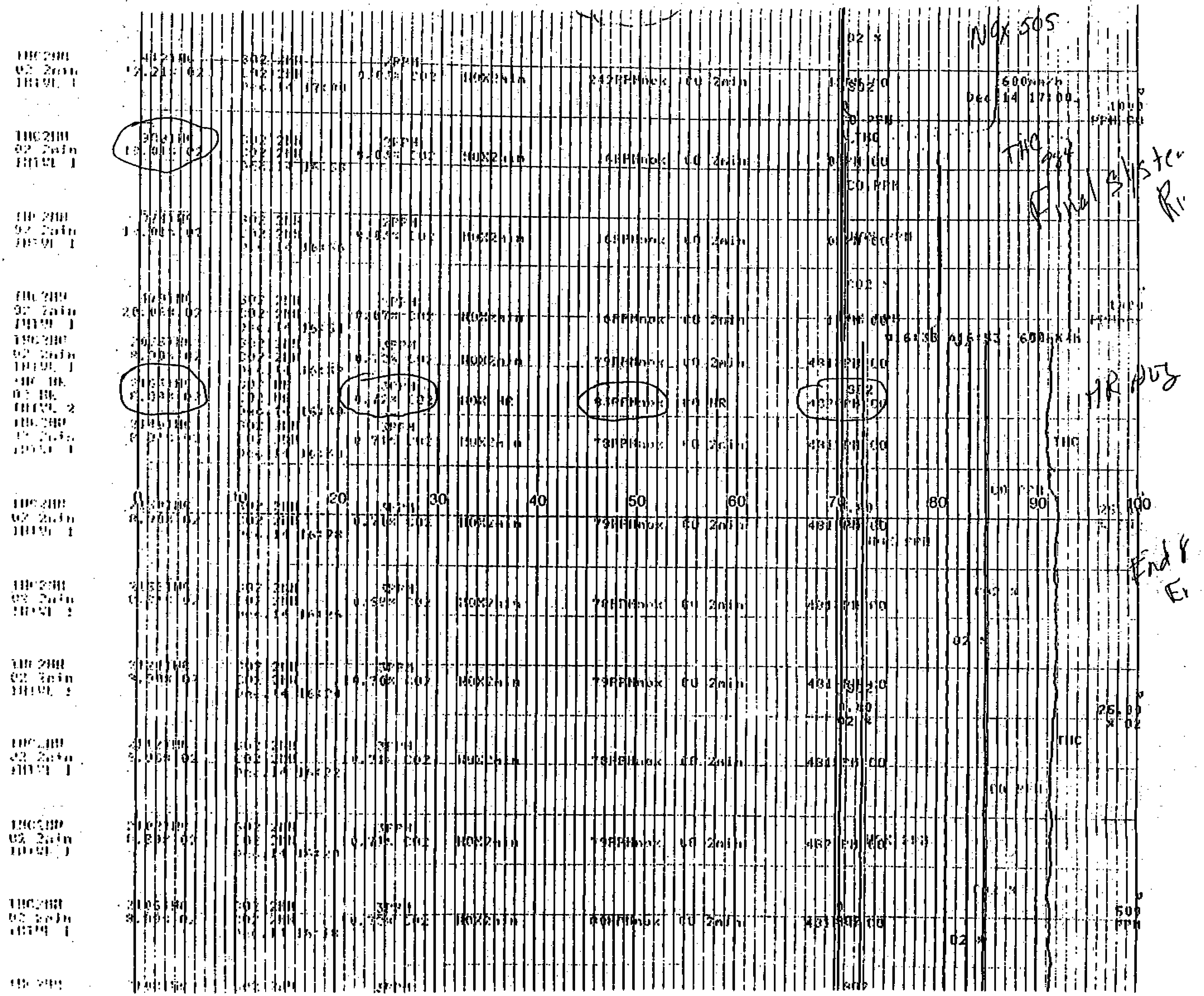

0
10
20
30
40
50
60
70
80
90
100
SO2
THC
SO2 + THC
Dec. 14 15:00
-WSW 805


0
10
20
30
40
50
60
70
80
90
100
SO2
THC
O2 %
25.00
% O2
500
PPM

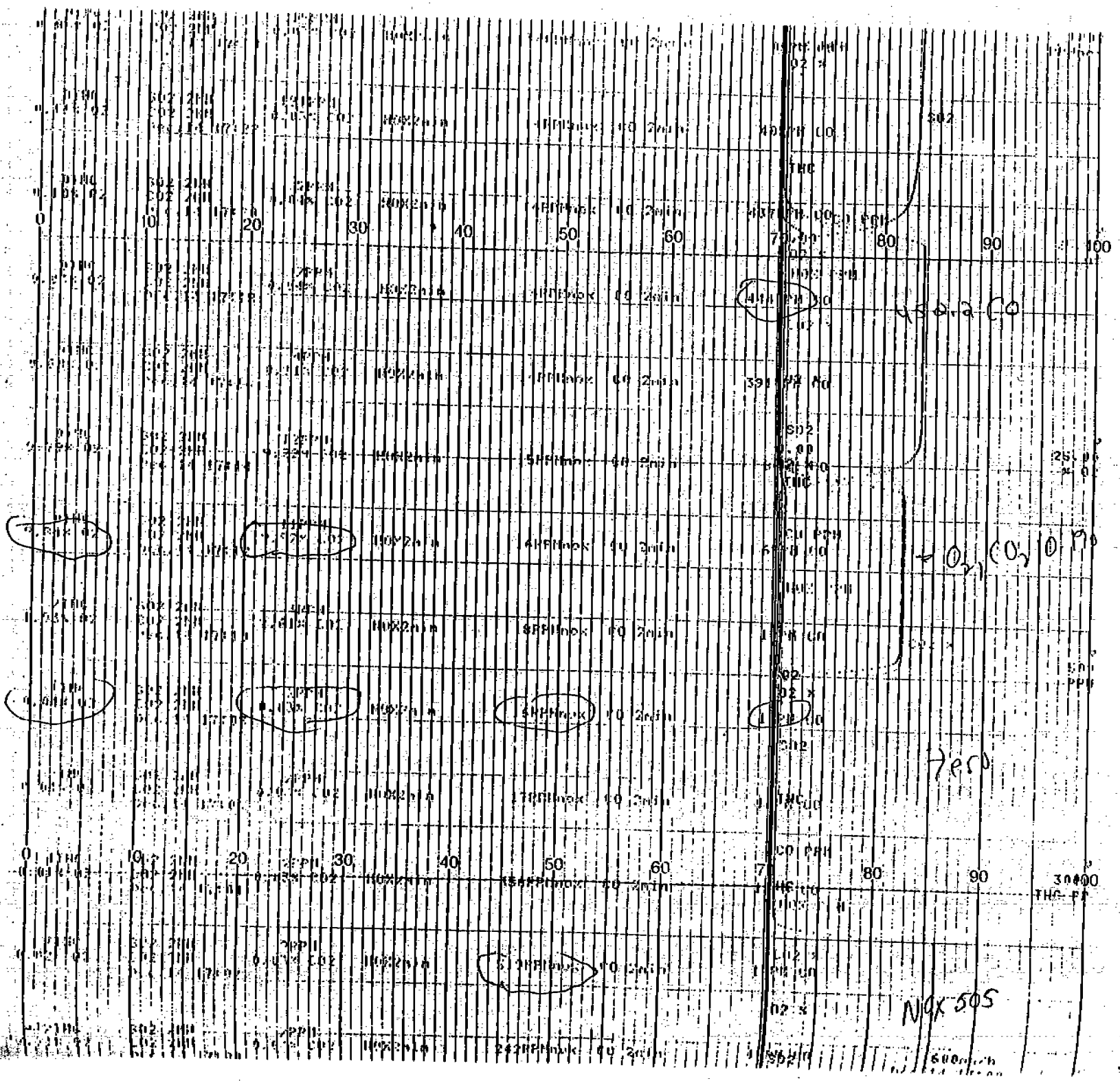

START
Run 3
End

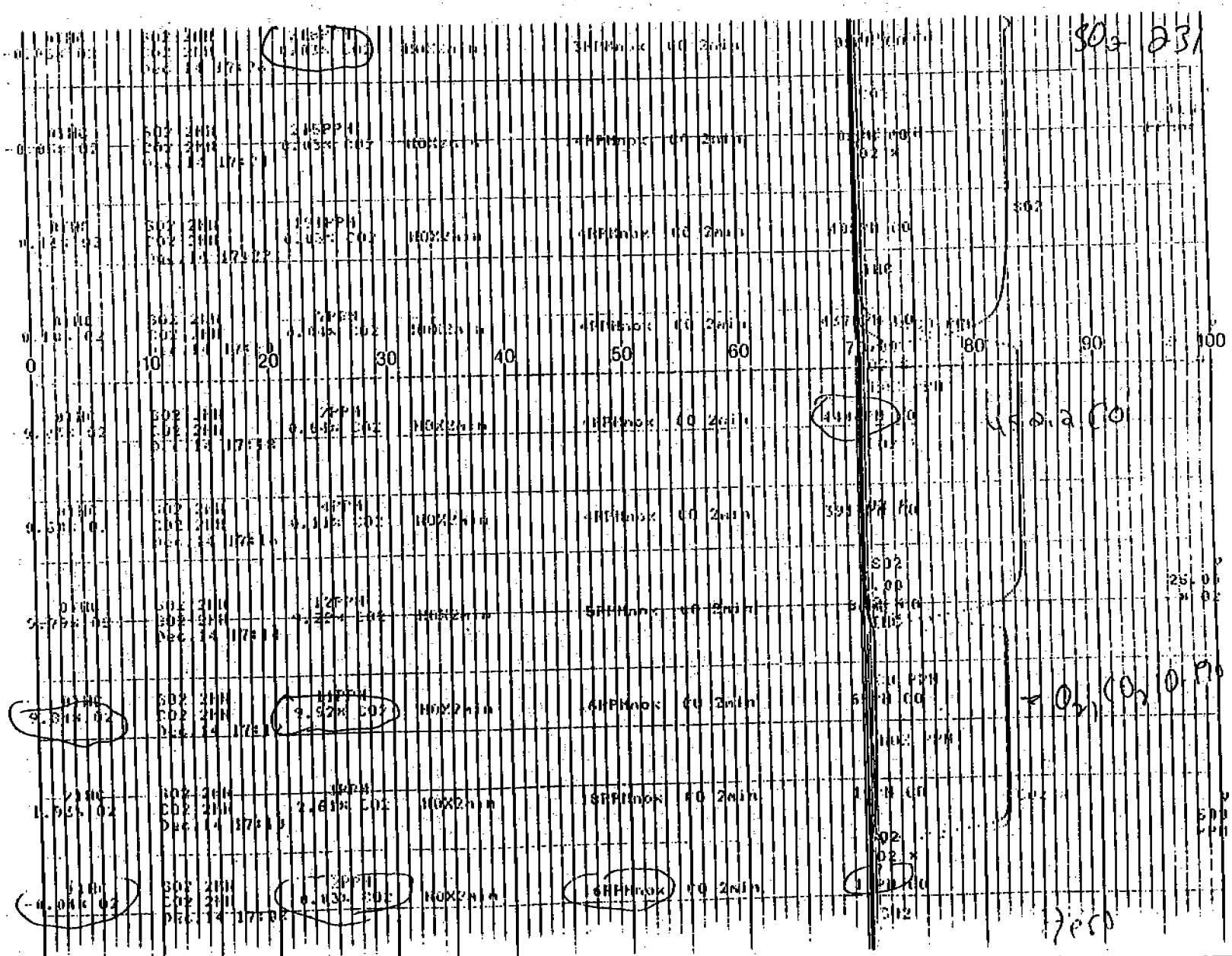

CO PPM
O2 %
CO2 %
THC
SO2
2min
10
20
30
40
50
60
70
80
90
100


CO PPM
O2 %
THC PPM
SO2



NOx 505
600mm/h
Dec 14 17:00
THC
CO PPM
02 %
10
20
30
40
50
60
70
80
90
100
HR AVG


0
10
20
30
40
50
60
70
80
90
100
THC
CO PPM
SO2
NOX 505
THC FF
30400


0
10
20
30
40
50
60
70
80
90
100

Scott Specialty Gases, Inc.

6141 EASTON ROAD, P.O. BOX 310, PLUMSTEADVILLE, PA 18949-0310 (215) 766-8861 FAX: (215) 766-0320

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
Trc Environmental
Boott Mills South
Foot Of John Street
Lowell, MA. 01852

Assay Laboratory
Scott Specialty Gases, Inc.
6141 Easton Road
P.O. Box 310
Plumsteadville, PA 18949-0310

Purchase Order T01497
Scott Project # 01-51034-001

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure #G1, Section Number 3.0.4

Cylinder Number ALM040160
Cylinder Pressure 1900 psig
Certification Date 11-30-93
Previous Certification Dates None
Expiration Date 05-15-94

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
Carbon dioxide	4.97 %	±1% NIST Directly Traceable
Carbon monoxide	6.98 ppm	±2% NIST Directly Traceable
Oxygen	4.98 %	±1% NIST Directly Traceable
Balance Gas: Nitrogen		

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement process.

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM1675	09-28-95	ALM032667	14.01 % CO_2 in N_2
GMIS	01-22-93	ALM018741	15.1 ppm CO in N_2
NTRM2658	05-15-94	ALM015517	9.56 % O_2 in N_2

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
CO2: Horiba/AIAZ3/8506580523	10-22-93	NDIR
CO: Horiba/GFA510A/474091	11-20-93	NDIR
O2: Beckman/755/2002452	10-04-93	Paramagnetic

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

Carbon dioxide

First Triad Analysis — Date: 11-23-93, Response Units: Volts

Z1=0.0000	R1=0.5280	T1=0.4140
R2=0.5270	Z2=0.0000	T2=0.4130
Z3=0.0000	T3=0.4140	R3=0.5270

Avg. Conc. of Cust. Cyl. 4.97 %

Second Triad Analysis

Calibration Curve

Concentration = $A+Bx+Cx^2+Dx^3+Ex^4$

r=1.00000	NTRM1675
Constants:	A=-4.6901E-04
B=1.1185E+01	C=-2.8934E+00
D=1.1875E+01	E=0.0000E+00

Carbon monoxide

First Triad Analysis — Date: 11-20-93, Response Units: Volts

Z1=0.0000	R1=0.5260	T1=0.5590
R2=0.5270	Z2=0.0000	T2=0.5610
Z3=0.0000	T3=0.5600	R3=0.5300

Avg. Conc. of Cust. Cyl. 6.98 ppm

Second Triad Analysis — Date: 11-30-93, Response Units: Volts

Z1=0.0000	R1=0.6250	T1=0.3740
R2=0.6280	Z2=0.0000	T2=0.3780
Z3=0.0000	T3=0.3740	R3=0.6250

Avg. Conc. of Cust. Cyl. 6.97 ppm

Calibration Curve

Concentration = $A+Bx+Cx^2+Dx^3+Ex^4$

r=0.99999	
Constants:	A=0.0000E+00
B=0.0000E+00	C=0.0000E+00
D=0.0000E+00	E=0.0000E+00

Oxygen

First Triad Analysis — Date: 11-19-93, Response Units: Volts

Z1=0.0000	R1=0.9338	T1=0.4874
R2=0.9334	Z2=0.0000	T2=0.4859
Z3=0.0000	T3=0.4856	R3=0.9332

Avg. Conc. of Cust. Cyl. 4.98 %

Second Triad Analysis

Calibration Curve

Concentration = $A+Bx+Dx^3+Ex^4$

r=0.99999	NTRM2658
Constants:	A=7.8199E-03
B=1.0207E+01	C=0.0000E+00
D=0.0000E+00	E=0.0000E+00

Special Notes

Analyst Walter Sabitus

Scott Specialty Gases, Inc.

2330 HAMILTON BOULEVARD SOUTH PLAINFIELD NJ 07080 (908)754-7700 FAX:(908)754-7303

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
TRC ENVIRONMENTAL
Boott Mills South
Foot of John Street
Lowell MA 01852
Attn.: CAREN O'BRIEN

Assay Laboratory
Scott Specialty Gases
2330 Hamilton Blvd
South Plainfield NJ 07080

Purchase order T01497
Scott Project #0723455

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure #G1 Section Number 3.0.4

Cylinder Number 1L2110
Cylinder Pressure 2000psig

Certification Date 10-25-1993
Previous Certification Dates

Expiration Date 4-25-1994

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
CARBON DIOXIDE	10.1%	+/-1%NIST Directly Traceable
CARBON MONOXIDE	10.2ppm	+/-1%NIST Directly Traceable
Nitrogen	Balance	

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
CRM1675	03/20/94	ALM001140	14.02 %CO2 in N2
CRM1677	wait	AAL9208	9.9 ppmCO in N2

INSTRUMENTATION

Instrument/Model/Serial#	Date Last Calibrated	Analytical Principle
CO2:Varian-3700-31608928 -	09/03/1993	GC TCD
CO: Ecolyzer 2000 - 1709 -	08/01/1993	Electrochemical

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

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
CARBON DIOXIDE	Date: 10-25-1993 Response units: % Z1=0 R1= 14.02 T1=10.1 R2= 14.02 Z2=0 T2=10.1 Z3=0 T3=10.1 R3= 14.02 Ave. Conc. of Cust. Cyl.= 10.1		Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.9999919 Constants: A= -3.7268E-02 B=5.7325E-05 C= D= E=
CARBON MONOXIDE	Date: 10-11-1993 Response units: ppm Z1=0 R1= 9.9 T1=10.3 R2= 9.9 Z2=0 T2=10.3 Z3=0 T3=10.3 R3= 9.9 Ave. Conc. of Cust. Cyl.= 10.3	Date: 10-25-1993 Response units: ppm Z1=0 R1= 9.9 T1=10.2 R2= 9.9 Z2=0 T2=10.1 Z3=0 T3=10.2 R3= 9.9 Ave. Conc. of Cust. Cyl.= 10.2	Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.9999961 Constants: A= 4.2212E-01 B=1.0308E-03 C= D= E=

Special Notes

Analyst Adela Sy

Scott Specialty Gases, Inc.

2330 HAMILTON BOULEVARD SOUTH PLAINFIELD NJ 07080 (908)754-7700 FAX:(908)754-7303

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
TRC ENVIRONMENTAL
Boott Mills South
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2330 Hamilton Blvd
South Plainfield NJ 07080

Purchase order T01497
Scott Project #0723455

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure #G1 Section Number 3.0.4

Cylinder Number 1L2110
Cylinder Pressure 2000psig

Certification Date 10-25-1993
Previous Certification Dates

Expiration Date 4-25-1994

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
OXYGEN	10.1%	+/-1%NIST Directly Traceable
SULFUR DIOXIDE	16.3ppm	+/-1%NIST Directly Traceable
Nitrogen	Balance	

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
CRM2658	05/14/94	ALM017572	9.56 %O2 in N2
CRM1693	09/28/94	ALM024299	47.2 ppmSO2 in N2

INSTRUMENTATION

Instrument/Model/Serial#		Date Last Calibrated	Analytical Principle
O2:Varian-3700-31608928	-	09/14/1993	GC TCD
SO2:Wilks Miran-1A-1047	-	10-25-1993	Infra Red Spectrophotometry

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

OXYGEN

First Triad Analysis
Date: 10-25-1993 Response units: %
Z1=0 R1= 9.56 T1=10.1
R2= 9.56 Z2=0 T2=10.2
Z3=0 T3=10.1 R3= 9.56
Ave. Conc. of Cust. Cyl.= 10.1

Second Triad Analysis

Calibration Curve
Concentration=A+Bx+Cx^2+Dx^3+Ex^4
r=0.9999926
Constants: A= 1.5815E-01
B=4.7835E-05 C=
D= E=

SULFUR DIOXIDE

First Triad Analysis
Date: 10-13-1993 Response units: ppm
Z1=0 R1= 47.2 T1=16.4
R2= 47.2 Z2=0 T2=16.5
Z3=0 T3=16.4 R3= 47.2
Ave. Conc. of Cust. Cyl.= 4

Second Triad Analysis
Date: 10-25-1993 Response units: ppm
Z1=0 R1= 47.2 T1=16.2
R2= 47.2 Z2=0 T2=16.2
Z3=0 T3=16.2 R3= 47.2
Ave. Conc. of Cust. Cyl.= 4042

Calibration Curve
Concentration=A+Bx+Cx^2+Dx^3+Ex^4
r=.9999968
Constants: A= -8.617049
B=.7894195 C= 2.9886E-04
D=-4.3646E-07 E=

Special Notes

Analyst John O'shea

Scott Specialty Gases, Inc.

2330 HAMILTON BOULEVARD SOUTH PLAINFIELD NJ 07080 (908)754-7700 FAX:(908)754-7303

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
TRC ENVIRONMENTAL
Boott Mills South
Foot of John Street
Lowell MA 01852
Attn.: CAREN O'BRIEN

Assay Laboratory
Scott Specialty Gases
2330 Hamilton Blvd
South Plainfield NJ 07080

Purchase order T01497
Scott Project #0723455

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure #G1 Section Number 3.0.4

Cylinder Number ALM015679
Cylinder Pressure 2000psig

Certification Date 10-25-1993
Previous Certification Dates

Expiration Date 4-25-1994

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
CARBON DIOXIDE	19.9%	+/-1%NIST Directly Traceable
CARBON MONOXIDE	19.2ppm	+/-1%NIST Directly Traceable
Nitrogen	Balance	

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
CRM1675	03/20/94	ALM001140	14.02 %CO2 in N2
SRM2635A	03/22/95	FF30354	24 ppmCO in N2

INSTRUMENTATION

Instrument/Model/Serial#	Date Last Calibrated	Analytical Principle
CO2:Varian-3700-31608928	09/03/1993	GC TCD
CO: Ecolyzer 2000-1709	08/01/1993	Electrochemical

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

Components	First Triad Analysis	Second Triad Analysis	Calibration Curve
CARBON DIOXIDE	Date: 10-25-1993 Response units: % Z1=0 R1= 14.02 T1=19.9 R2= 14.02 Z2=0 T2=19.9 Z3=0 T3=19.9 R3= 14.02 Ave. Conc. of Cust. Cyl.= 19.9		Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.9999919 Constants: A= -3.7268E-02 B=5.7325E-05 C= D= E=
CARBON MONOXIDE	Date: 10-11-1993 Response units: ppm Z1=0 R1= 24 T1=19.1 R2= 24 Z2=0 T2=19.1 Z3=0 T3=19.1 R3= 24 Ave. Conc. of Cust. Cyl.= 19.1	Date: 10-25-1993 Response units: ppm Z1=0 R1= 24 T1=19.3 R2= 24 Z2=0 T2=19.3 Z3=0 T3=19.3 R3= 24 Ave. Conc. of Cust. Cyl.= 19.3	Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.9999961 Constants: A= 4.2212E-01 B=1.0308E-03 C= D= E=

Special Notes

Analyst John O'shea

Scott Specialty Gases, Inc.

2330 HAMILTON BOULEVARD SOUTH PLAINFIELD NJ 07080 (908)754-7700 FAX:(908)754-7303

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
TRC ENVIRONMENTAL
Boott Mills South
Foot of John Street
Lowell MA 01852
Attn.: CAREN O'BRIEN

Assay Laboratory
Scott Specialty Gases
2330 Hamilton Blvd
South Plainfield NJ 07080

Purchase order T01497
Scott Project #0723455

ANALYTICAL INFORMATION

Certified to exceed the minimum specifications of EPA Protocol 1 Procedure #G1 Section Number 3.0.4

Cylinder Number ALM015679
Cylinder Pressure 2000psig

Certification Date 10-25-1993
Previous Certification Dates

Expiration Date 4-25-1994

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
OXYGEN	20.0%	+/-1%NIST Directly Traceable
SULFUR DIOXIDE	21.1ppm	+/-1%NIST Directly Traceable
Nitrogen	Balance	

*Analytical uncertainty is inclusive of usual known error sources which at least includes reference standard error & precision of the measurement processes

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
CRM2659	05/14/94	ALM017576	20.63 %O2 in N2
CRM1693	09/28/94	ALM024299	47.2 ppmSO2 in N2

INSTRUMENTATION

Instrument/Model/Serial#	Date Last Calibrated	Analytical Principle
O2:Varian-3700-31608928	09/14/1993	GC TCD
SO2:Wilks Miran-1A-1047	10-25-1993	Infra Red Spectrophotometry

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

OXYGEN

First Triad Analysis
Date: 10-25-1993 Response units: %
Z1=0 R1= 20.63 T1=20.0
R2= 20.63 Z2=0 T2=20.0
Z3=0 T3=20.0 R3= 20.63
Ave. Conc. of Cust. Cyl.= 20

Second Triad Analysis

Calibration Curve
Concentration=A+Bx+Cx^2+Dx^3+Ex^4
r=0.9999926
Constants: A= 1.5815E-01
B=4.7835E-05 C=
D= E=

SULFUR DIOXIDE

First Triad Analysis
Date: 10-11-1993 Response units: ppm
Z1=0 R1= 47.2 T1=21.0
R2= 47.2 Z2=0 T2=20.9
Z3=0 T3=21.0 R3= 47.2
Ave. Conc. of Cust. Cyl.= 21

Second Triad Analysis
Date: 10-25-1993 Response units: ppm
Z1=0 R1= 47.2 T1=21.2
R2= 47.2 Z2=0 T2=21.2
Z3=0 T3=21.2 R3= 47.2
Ave. Conc. of Cust. Cyl.= 21.2

Calibration Curve
Concentration=A+Bx+Cx^2+Dx^3+Ex^4
r=.9999968
Constants: A= -8.617049
B=.7894195 C= 2.9886E-04
D=-4.3646E-07 E=

Special Notes

Analyst John O'shea

... STREET, TROY, MICHIGAN 48084 (313) 588-2950

Your P.O. # : 5911-71500

Customer :
C A E INSTRUMENT RENTAL
244 WOODWORK LANE
PALATINE IL 60067

****** CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES ******
PERFORMED ACCORDING TO SECTION 3.0.4

Certified Per Traceability Protocol # 1 — Procedure # G1

File # FO-4167

Certified Accuracy ± 1 % NBS Traceable

Expiration Date : 2-5-94

Cylinder Number : ALK016146

Cylinder Pressure 1900 psig

1 of 1 Component(s)

CERTIFIED EPA PROTOCOL

ANALYZED CYLINDER	
COMPONENT	CERTIFIED CONC.
CARBON MONOXIDE	452.2 PPM

BALANCE GAS : NITROGEN

REFERENCE STD

SRM # (CRM #)	CYLINDER NUMBER	CONC.
1680	AAL15177	475.00 PPM
2636	ALK013393	243.40 PPM

INSTRUMENTATION

INST/MODEL/SERIAL#	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
BECKMAN 751A 270-0626998	6-1-92	NON-DISPERSIVE INFRARED

FIRST ANALYSIS — DATE : 2-5-92

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	REFERENCE GAS (mV)	RESULTS PPM
.00	167.00	452.50	475.00 PPM	175.00	475.00
.00	167.00	452.50		175.00	475.00
.00	167.00	452.50		175.00	475.00

CALCULATED RESULTS: 452.50, 452.50, 452.50

AVERAGE : 452.50 PPM

SECOND ANALYSIS — DATE : 2-5-92

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	REFERENCE GAS (mV)	RESULTS PPM
0.00	165.80	451.74	475.00 PPM	175.00	475.00
0.00	165.80	451.74		175.00	475.00
0.00	165.80	451.74		175.00	475.00

CALCULATED RESULTS: 451.74, 451.74, 451.74

AVERAGE : 451.74 PPM

CALIBRATION CURVE — 2 nd DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
1680	475.00	100	175.00	475.00	0.00
2636	243.40	51	91.60	244.14	0.30
GMIS	240.40	51	87.90	239.52	-0.37
1679	96.57	20	36.80	96.86	0.19
	0.00	0	0.00	0.00	0.00
		0		0.0000	0.00
		0		0.00	0.00
2636	243.4	LOW	91.60	244.14	0.00
1680	475.00	HIGH	175.00	475.00	0.00

GMIS - GAS MANUFACTURER'S INTERNAL STANDARD

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

Analyst : [signature]   Approved By : [signature]

Scott Specialty Gases

2330 Hamilton Blvd South Plainfield NJ
PHONE 908-754-7700 FAX 908-754-7303

CERTIFICATION OF ANALYSIS-EPA PROTOCOL

Date Shipped 07-15-1992 Our Project 0716175 Your P.O. 22436
certified per Protocol#1 Procedure 3.0.4-G1 Top Pressure 2000psig
cylinder # ALM027031 ✓ REFERENCE STD GAS ANALYZER

MINOR comp.	CERT. conc.	CRM/SRM num	CYL. num	STD conc.	MAKE/ model	LAST cal.	ANAL prin.
Sulfur Dioxide	231ppm+/-1%	1661	ALM007085	454 ppm	Wilks Miran-1A-1047-Infra Red		Spectrophotometry

BALANCE Nitrogen EXPIRES 1-15-1994

ANALYZER READINGS

Component	*First Analysis*	*Second Analysis*
Sulfur Dioxide	*Date: 07-08-1992 Mean test assay 229*	*Date: 07-15-1992 Mean test assay 232*
all values as ppm	*Zero= 0 Ref.= 454 Test=229*	*Zero= 0 Ref.= 454 Test=232*
	Ref.= 454 Zero= 0 Test=229	*Ref= 454 Zero= 0 test=232*
	Zero= 0 Test=229 Ref.= 454	*Zero= 0 Test= 232 Ref.= 454*

ANALYST _____ APPROVED BY _____

...908-754-7303

CERTIFICATION OF ANALYSIS-EPA PROTOCOL

Date Shipped 06-29-1993 Our Project 0721482 Your P.O. T00635
certified per Protocol#1 Procedure 3.0.4-G1 Top Pressure 2000psig
cylinder # ALM037636

MINOR Comp.	CERT. conc.	CRM/SRM num	REFERENCE STD CYL. num	STD conc.	GAS ANALYZER MAKE/model	LAST cal.	ANAL prin.
Carbon Monoxide	957ppm+/-1%	1001	ALM024748	968 ppm	Per.Elm.-Sigma 2000-004381001115	4/16/93	GC FID
Sulfur Dioxide	932ppm+/-1%	1002	ALM008872	1006 ppm	Wilks Miran-1A-1047		Infra Red Spectrophotometry

BALANCE Nitrogen

EXPIRES 6-29-1995 (general)
12-29-1993 (acid rain)

ANALYZER READINGS

Component	First Analysis			Second Analysis		
Carbon Monoxide all values as ppm	Date: 06-16-1993Mean test assay 958			Date: 06-29-1993Mean test assay 958		
	Zero= 0	Ref.= 968	Test=958	Zero= 0	Ref.= 968	Test=958
	Ref.= 968	Zero= 0	Test=957	Ref= 968	Zero= 0	test=959
	Zero= 0	Test=958	Ref.= 968	Zero= 0	Test= 958	Ref.= 968
Sulfur Dioxide all values as ppm	Date: 06-16-1993Mean test assay 930			Date: 06-29-1993Mean test assay 933		
	Zero= 0	Ref.= 1006	Test=929	Zero= 0	Ref.= 1006	Test=934
	Ref.= 1006	Zero= 0	Test=930	Ref= 1006	Zero= 0	test=933
	Zero= 0	Test=930	Ref.= 1006	Zero= 0	Test= 933	Ref.= 1006

ANALYST Adela Sy

APPROVED BY John O'shea

Scott Specialty Gases

2330 Hamilton Blvd South Plainfield NJ
PHONE 908-754-7700 FAX 908-754-7303

CERTIFICATION OF ANALYSIS-EPA PROTOCOL

Date Shipped 07-15-1992 Our Project 0716223 Your P.O. A-8434
certified per Protocol#1 Procedure 3.0.4-G1 Top Pressure 2000psig
cylinder # ALM027507

MINOR comp.	CERT. conc.	REFERENCE STD CRM/SRM num	CYL. num	STD conc.	MAKE/ model	GAS ANALYZER LAST cal.	ANAL prin.
Nitric Oxide	122ppm+/-1%	1685	ALM8711	250 ppm	TECO-10S-20404	225-S/15/92-Chemiluminescence	

BALANCE Nitrogen o2 free EXPIRES 1-15-1994

ANALYZER READINGS

Component	First Analysis	Second Analysis
Nitric Oxide	Date: 07-08-1992Mean test assay 122	Date: 07-15-1992Mean test assay 122
all values as ppm	Zero= 0 Ref.= 250 Test=122	Zero= 0 Ref.= 250 Test=122
	Ref.= 250 Zero= 0 Test=122	Ref= 250 Zero= 0 test=122
	Zero= 0 Test=122 Ref.= 250	Zero= 0 Test= 122 Ref.= 250

ANALYST Adela Sy

APPROVED BY John O'shea

CERTIFICATION OF ANALYSIS-EPA PROTOCOL

Date Shipped 12-07-1992 Our Project 0718209 Your P.O. a9560
certified per Protocol#1 Procedure 3.0.4-G1 Top Pressure 2000psig
cylinder # ALM008187 REFERENCE STD GAS ANALYZER

MINOR comp.	CERT. conc.	CRM/SRM num	CYL. num	STD conc.	MAKE/ model	LAST cal.	ANAL prin.
Nitric Oxide	276ppm+/-1%	1960	CLM14979	244.4 ppm	TECO-109-26404	225-11/15/92	Chemiluminescence

BALANCE Nitrogen o2 free EXPIRES 6-07-1994

ANALYZER READINGS

Component	First Analysis	Second Analysis
Nitric Oxide all values as ppm	Date: 11-30-1992 Mean test assay 278 Zero= 0 Ref.= 244.4 Test=279 Ref.= 244.4 Zero= 0 [illegible] Zero= 0 Test=278 Ref.= 244.4	Date: 12-07-1992 Mean test assay 277 Zero= 0 Ref.= 244.4 Test=276 [illegible] Zero= 0 test=278 Zero= 0 Test= 278 Ref.= 244.4

ANALYST _____
Adela Sy

APPROVED BY _____
John O'shea

SCOTT GASES = NJ → SCOTT MASS

002

PHONE 908-754-7700 [illegible] South Plainfield NJ
FAX 908-754-7303

CERTIFICATION OF ANALYSIS-EPA PROTOCOL

Date Shipped 06-24-1993 Our Project 0721482 Your P.O. t00635
certified per Protocol#1 Procedure 3.0.4-G1 Top Pressure 2000psig
cylinder # ALM033324

MINOR comp.	CERT. conc.	REFERENCE STD CRM/SRM num	CYL. num	STD conc.	GAS ANALYZER MAKE/ model	LAST cal.	ANAL prin.
Nitric Oxide	505ppm+/-1%	1667	ALM19804	967.5 ppm	TECO-10S-29404	225-5/15/93	CHEMILUMINESCENCE
NOx	505ppm						

BALANCE Nitrogen o2 free

EXPIRES 12-24-1994 (acid rain)
6-24-1995 (general)

ANALYZER READINGS

Component	First Analysis	Second Analysis
Nitric Oxide all values as ppm	Date: 06-14-1993 Mean test assay 505 Zero= 0 Ref.= 967.5 Test=505 Ref.= 967.5 Zero= 0 Test=505 Zero= 0 Test=505 Ref.= 967.5	Date: 06-24-1993 Mean test assay 504 Zero= 0 Ref.= 967.5 Test=504 Ref= 967.5 Zero= 0 test=504 Zero= 0 Test= 504 Ref.= 967.5

ANALYST _____
Adela Sy

APPROVED BY _____
John O'shea

APPENDIX C

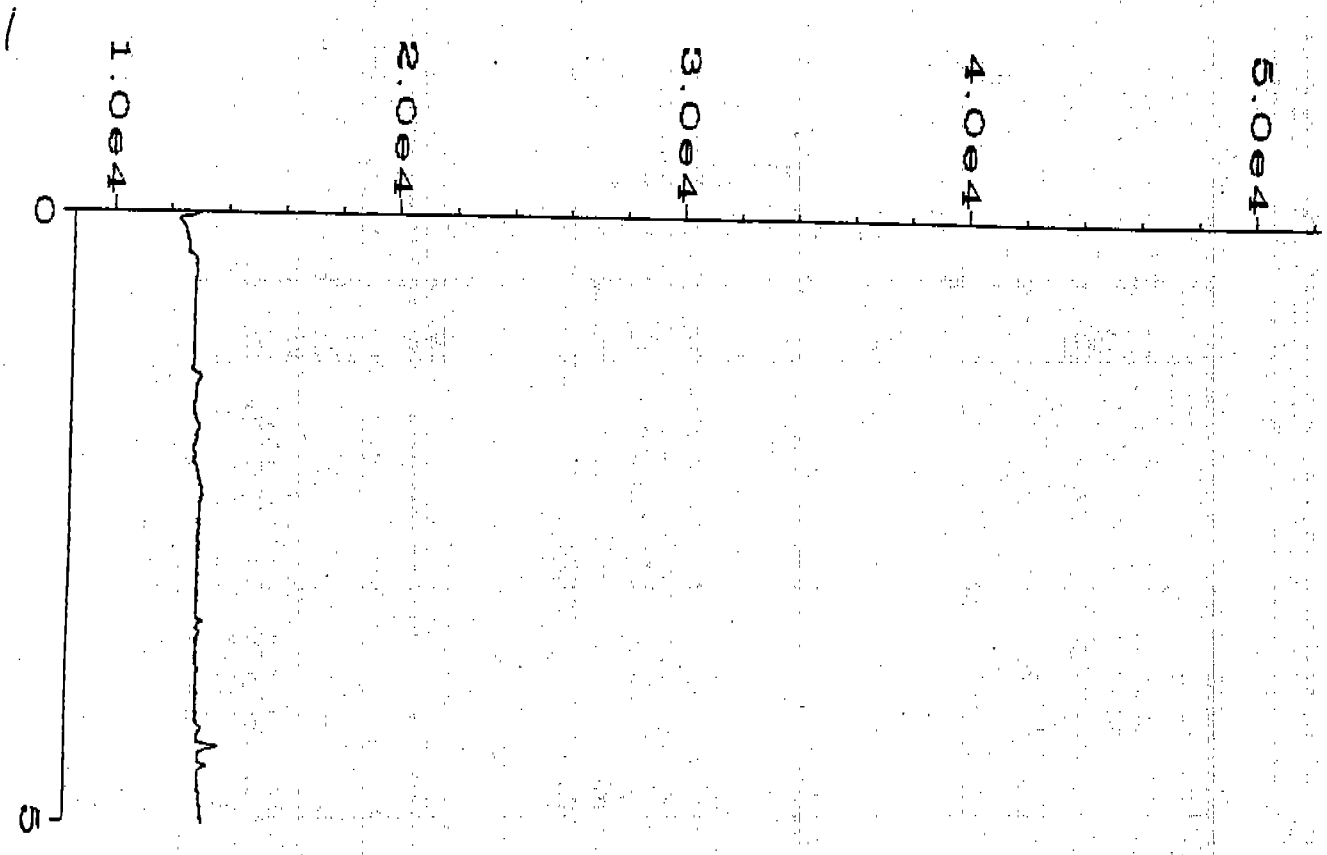
GAS CHROMATOGRAPH DATA AND CALIBRATION SHEETS

BFI Chicopee
Engine #1 - Methane Emissions

Date	Run #	Injection #	Methane (ppm)
12/14/93	1	1	2,020.9
12/14/93	1	2	2,040.4
12/14/93	1	3	2,073.5
		AVERAGE	2,044.9
12/14/93	2	1	2,074.2
12/14/93	2	2	2,050.8
12/14/93	2	3	2,038.5
		AVERAGE	2,054.5
12/14/93	3	1	1,993.0
12/14/93	3	2	2,005.7
12/14/93	3	3	1,985.0
		AVERAGE	1,994.6
		TOTAL AVERAGE	**2,031.3**

BFIC-M-1.WK1

Zero Methane #1



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Area Percent Report

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rator	:		
rument	: FID/FPD	Page Number	: 1
ple Name	:	Vial Number	:
Time Bar Cons:		Injection Numbe:	:
ured on	: 14 Dec 93 04:18 PM	Sequence Line	:
ort Created on:	14 Dec 93 04:28 PM	Instrument Method:	MMT5.MTH
		Analysis Method	: MMT5.MTH

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PK#	Ret Time	Area	Height	Type	Width	Area %

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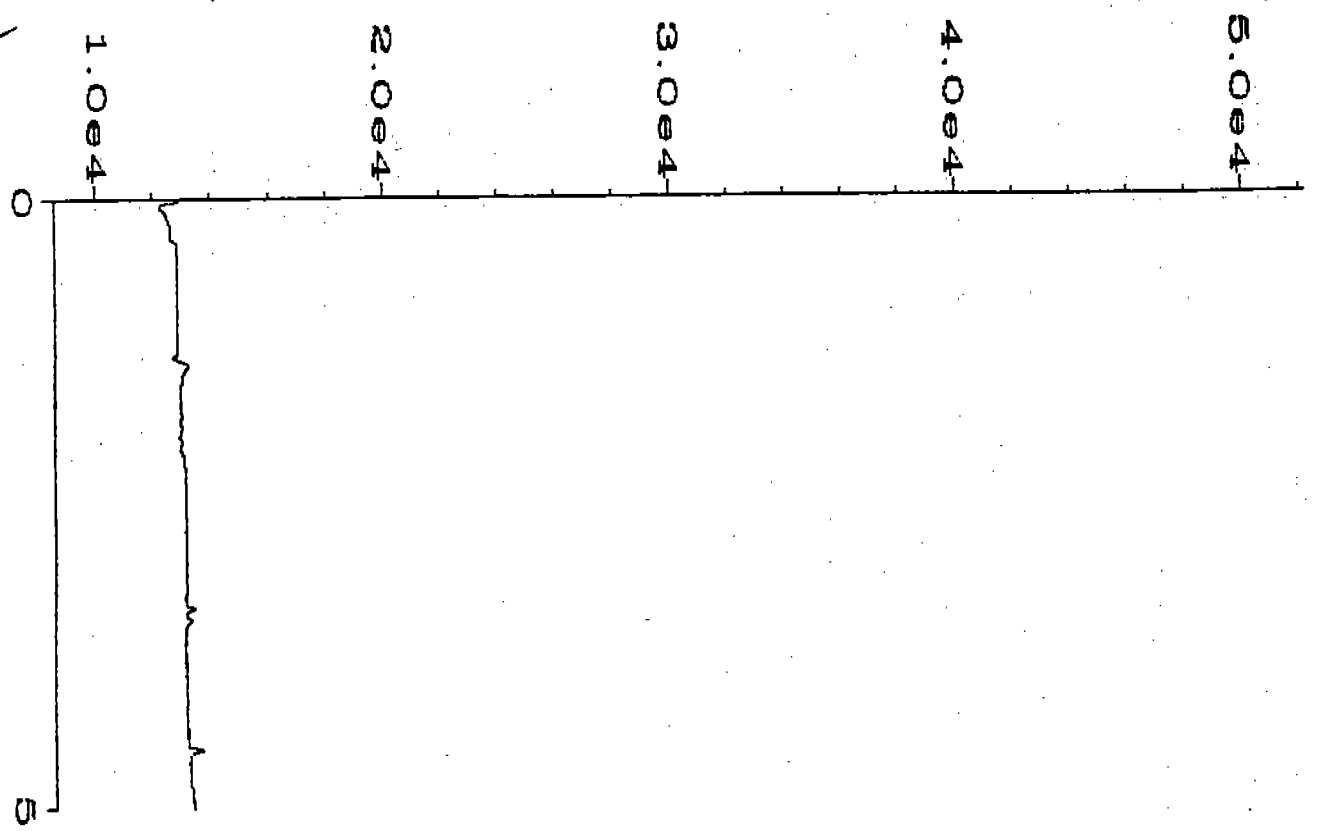
#2



ibrated report not possible because no calibration table exists

Area Percent Report

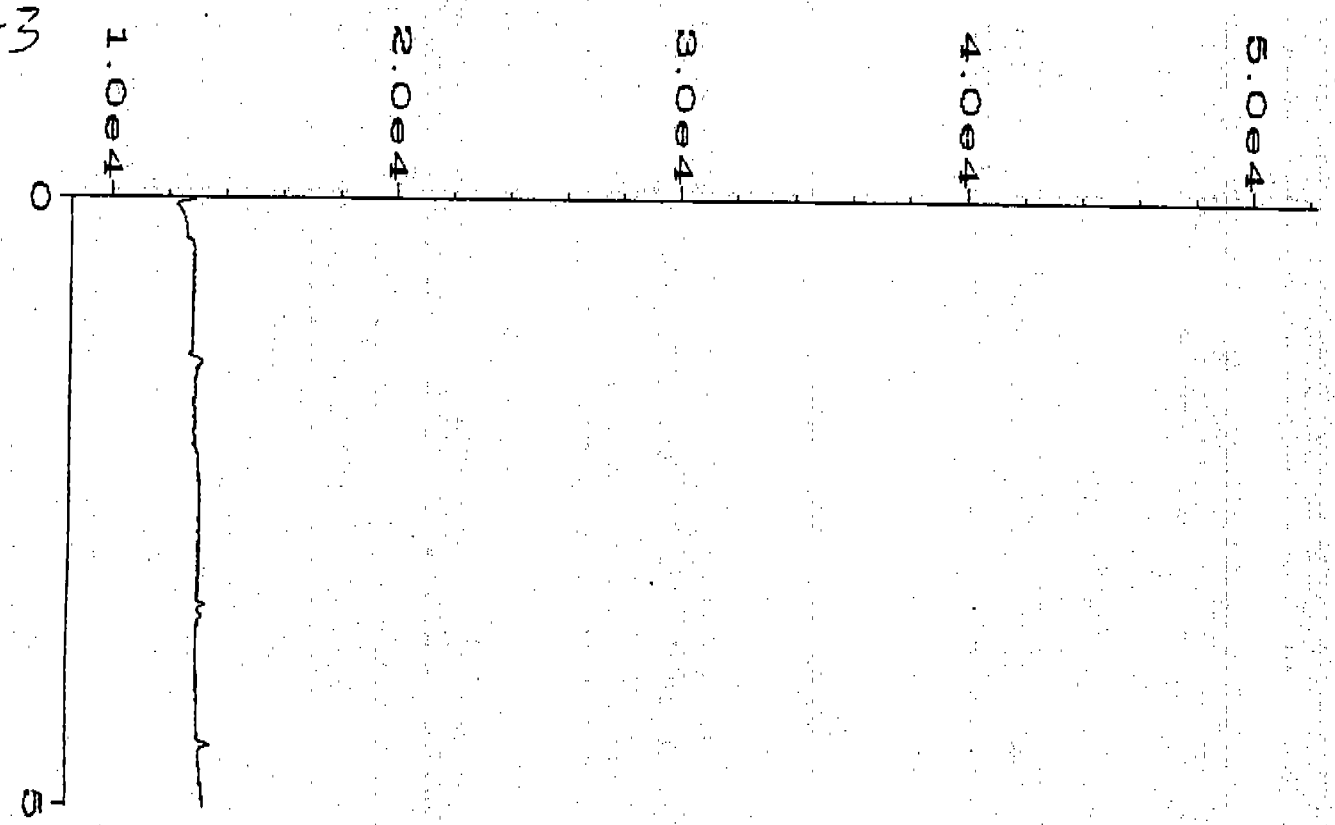
File Name	: C:\HPCHEM\1\DATA\NV-F0401.D		
Operator	:	Page Number	: 1
Instrument	: FID/FPD	Vial Number	:
Sample Name	:	Injection Number	:
Time Bar Code:		Sequence Line	:
Acquired on	: 14 Dec 93 06:29 PM	Instrument Method:	MMT5.MTH
Last treated on:	14 Dec 93 06:35 PM	Analysis Method	: MMT5.MTH

Data in C:\HPCHEM\1\DATA\NV-F0401.D

Peak	Ret Time	Area	Height	Type	Width	Area %

1 area = 0

in Methane
#3



brated report not possible because no calibration table exists

Area Percent Report

File Name : C:\HPCHEM\1\DATA\NV-F0482.D
ator :
rument : FID/FPD
le Name :
Time Bar Code:
ured on : 14 Dec 93 06:37 PM
rt Created on: 14 Dec 93 06:43 PM

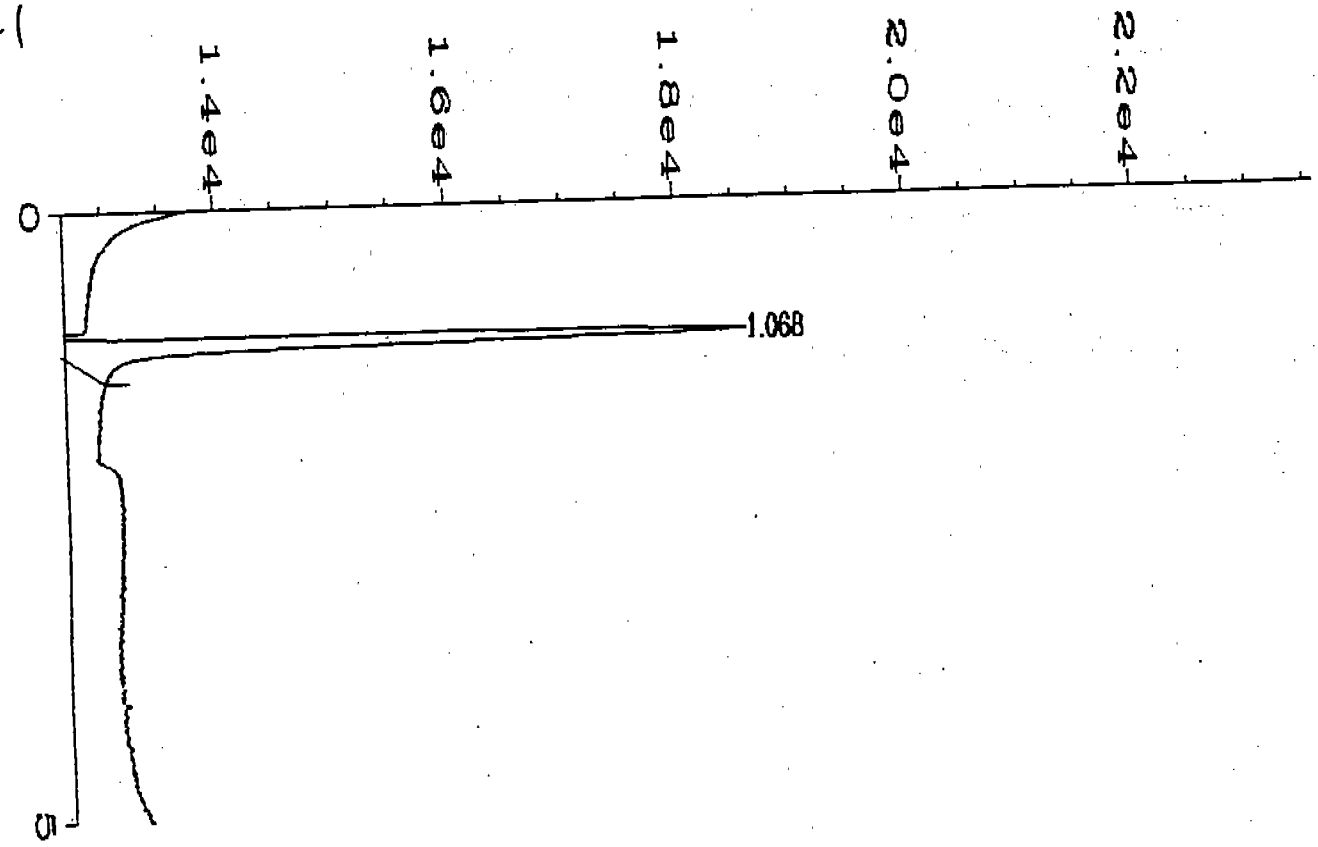
Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: MMT5.MTH
Analysis Method : MMT5.MTH

1 in C:\HPCHEM\1\DATA\NV-F0482.D

Pk#	Ret Time	Area	Height	Type	Width	Area %

1 area = 0

1 ppm Methane
#1



External Standard Report

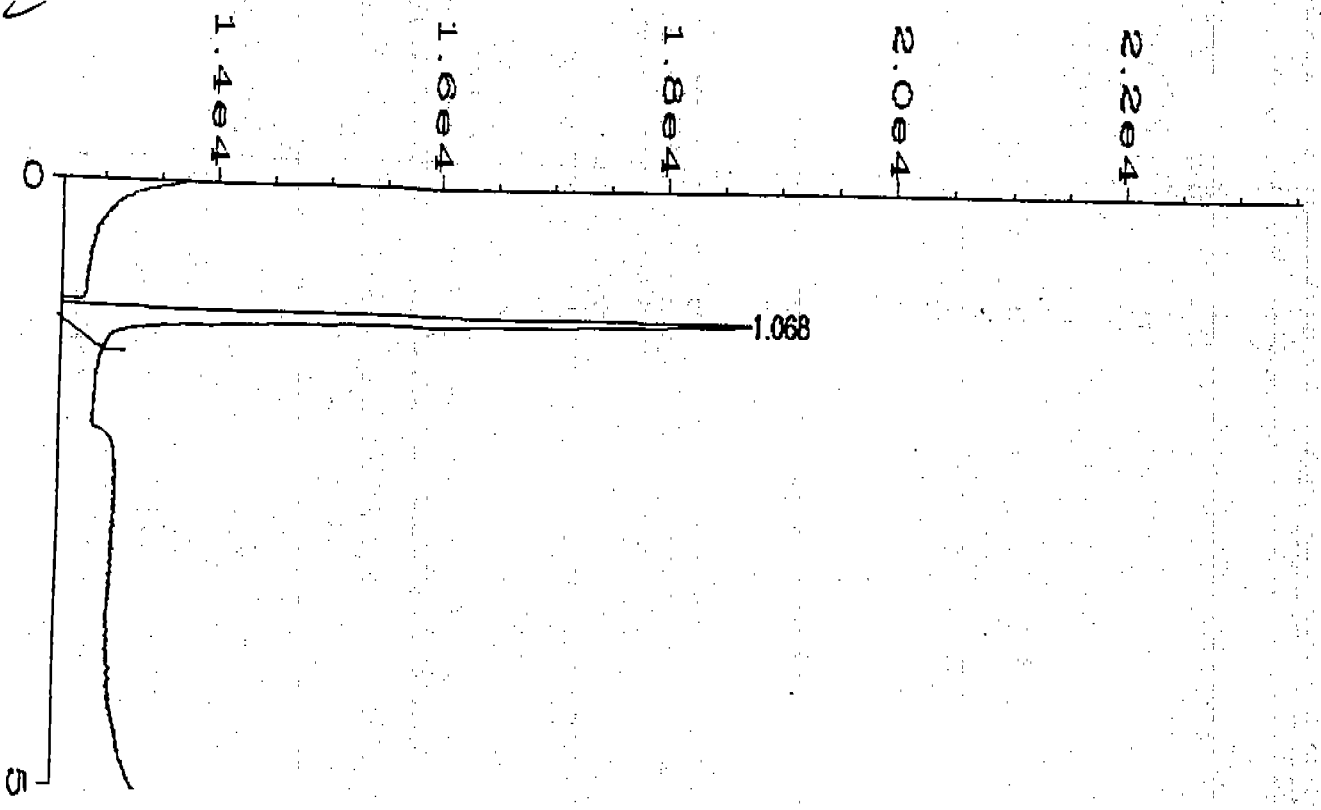
Data File Name	: C:\HPCHEM\1\DATA\NV-F0484.D	Page Number	: 1
Operator	:	Vial Number	:
Instrument	: FID/FPD	Injection Number	:
Sample Name	:	Sequence Line	:
Time Bar Code:		Instrument Method:	MMT5.MTH
Acquired on	: 14 Dec 93 06:58 PM	Analysis Method	: MMT5.MTH
Report Created on:	14 Dec 93 07:06 PM	Sample Amount	: 0
Last Recalib on	: 14 Dec 93 07:05 PM	ISTD Amount	:
Multiplier	: 1		

1 in C:\HPCHEM\1\DATA\NV-F0484.D

Time	Area	Type	Width	Ref#	PPM	Name
1.068	36026	BB	0.094	1-R	48.900	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.068	1.068	0.0%

1 ppm Methane
#2



External Standard Report

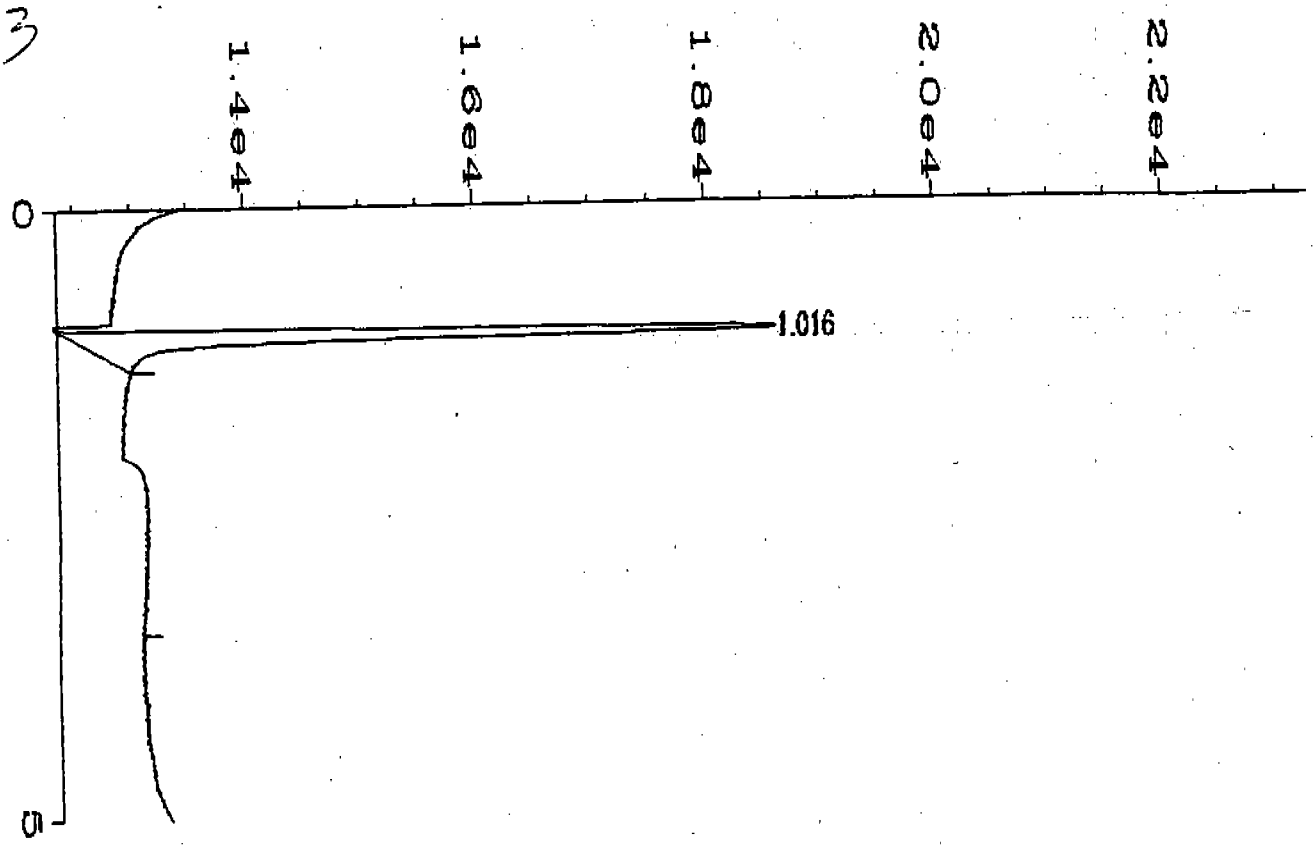
File Name	: C:\HPCHEM\1\DATA\NV-F0485.D		
ator	:		
rument	: FID(FPD		
le Name	:		
Time Bar Code	:		
ired on	: 14 Dec 97 07:06 PM	Page Number	: 1
rt Created on	: 14 Dec 97 07:14 PM	Vial Number	:
Recal t on	: 14 Dec 97 07:12 PM	Injection Number	:
iplier	: 1	Sequence Line	:
		Instrument Method	: MMT5.MTH
		Analysis Method	: MMT5.MTH
		Sample Amount	: 0
		ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0485.D

Time	Area	Type	Width	Ref#	PPM	Name
1.068	35291	BB	0.091	1-R	48.396	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.068	1.068	0.0%

ppm Methane
#3



External Standard Report

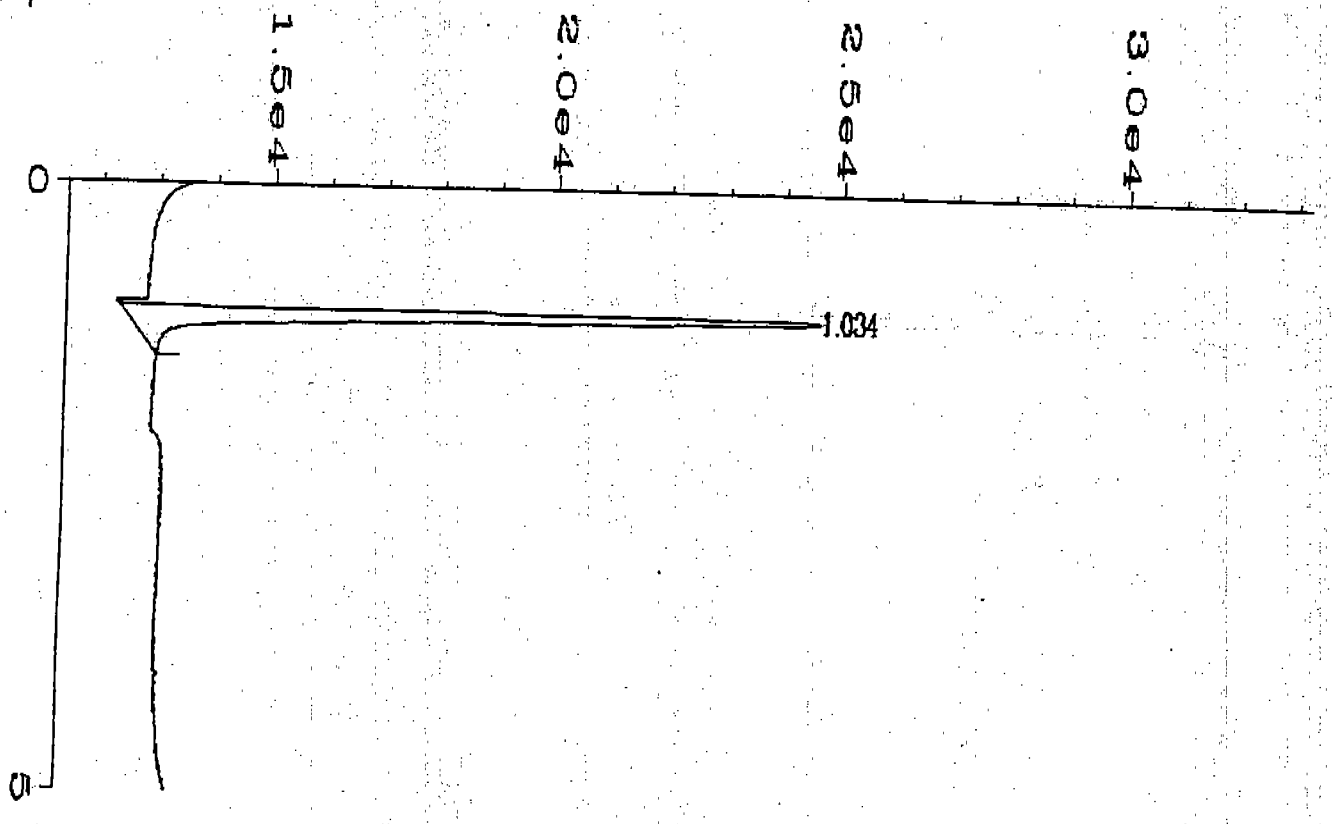
File Name	: C:\HPCHEM\1\DATA\NV-F0486.D		
ator	:	Page Number	: 1
rument	: FID/FPD	Vial Number	:
le Name	:	Injection Number	:
Time Bar Code:		Sequence Line	:
ired on	: 14 Dec 93 07:15 PM	Instrument Method	: MMT5.MTH
rt Created on	: 14 Dec 93 07:24 PM	Analysis Method	: MMT5.MTH
Recalib on	: 14 Dec 93 07:24 PM	Sample Amount	: 0
iplier	: 1	ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0486.D

Time	Area	Type	Width	Ref#	PPM	Name
.016	35184	BB	0.090	1-R	48.464	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.027	1.016	-1.0%

ppm Methane
#1



External Standard Report

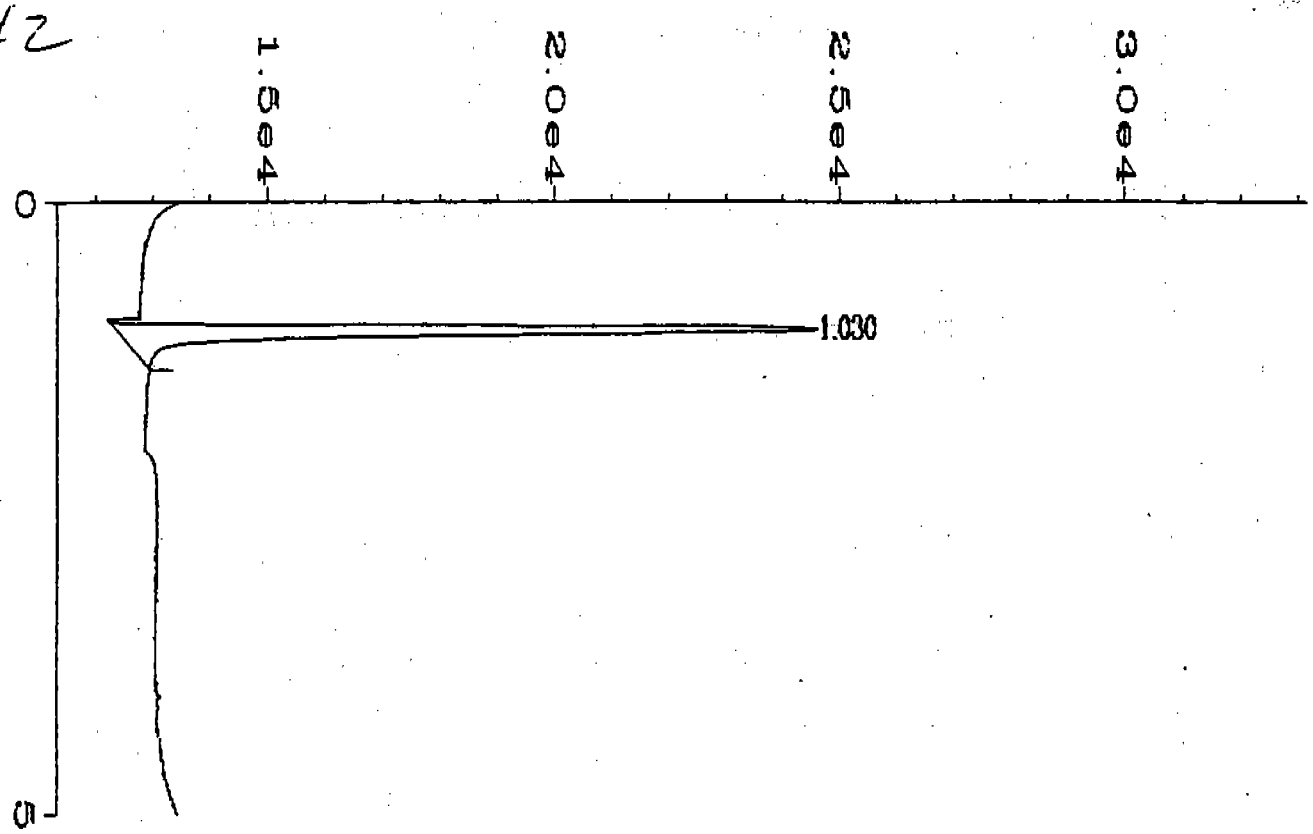
File Name	: D:\HPCHEM\1\DATA\NV-F0487.D		
ator	:		
rument	: FID/FPD	Page Number	: 1
le Name	:	Vial Number	:
Time Bar Code:		Injection Number	:
ired on	: 14 Dec 93 07:25 PM	Sequence Line	:
rt Created on:	14 Dec 93 07:33 PM	Instrument Method:	MMT5.MTH
Recalib on	: 14 Dec 93 07:32 PM	Analysis Method	: MMT5.MTH
iple:	: 1	Sample Amount	: 0
		ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0487.D

Time	Area	Type	Width	Ref#	PPM	Name
.034	71025	BB	0.092	1-R	102.000	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.027	1.034	0.7%

2 ppm Methane
y #2



External Standard Report

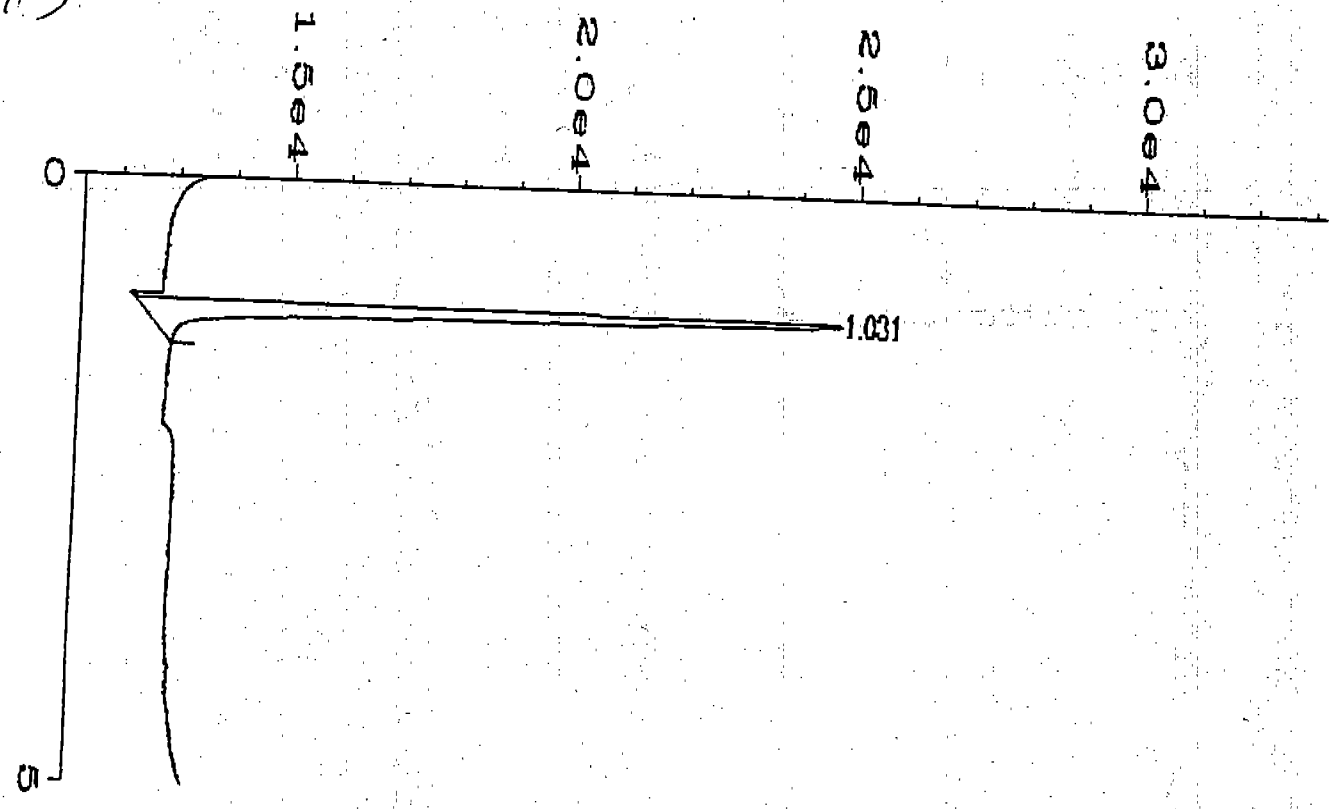
File Name	: C:\HPCHEM\1\DATA\NV-F0489.D		
ator	:	Page Number	: 1
rument	: FID/FPD	Vial Number	:
le Name	:	Injection Number	:
Time Bar Code	:	Sequence Line	:
ired on	: 14 Dec 93 07:42 PM	Instrument Method	: MMT5.MTH
rt Created on	: 14 Dec 93 07:49 PM	Analysis Method	: MMT5.MTH
Recalib on	: 14 Dec 93 07:48 PM	Sample Amount	: 0
iplier	: 1	ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0489.D

Time	Area	Type	Width	Ref#	PPM	Name
.030	70338	BB	0.092	1-R	101.482	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.038	1.030	-0.7%

ppm Methane
#3



External Standard Report

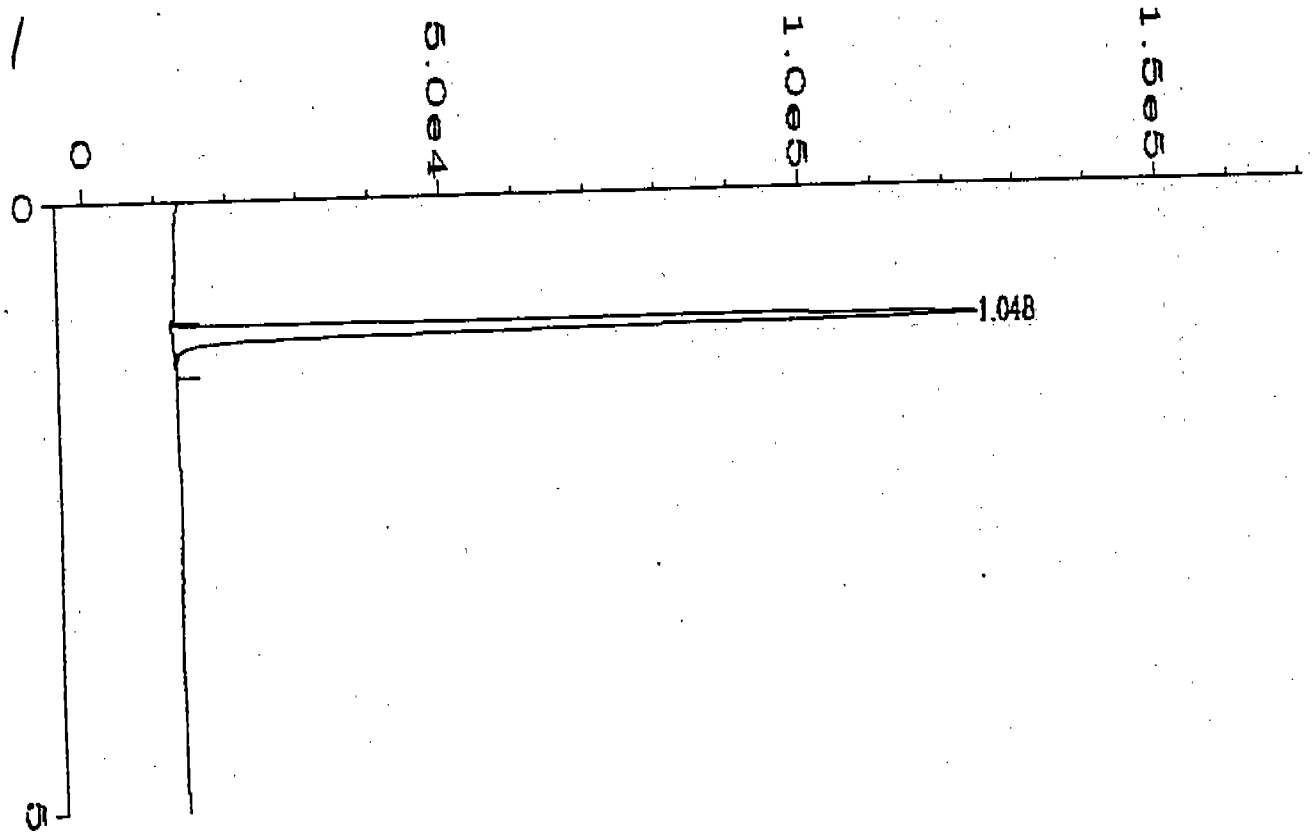
File Name	: C:\HPCHEM\1\DATA\NV-F0491.D		
ator	:		
rument	: FID/FP-D	Page Number	: 1
le Name	:	Vial Number	:
Time Bar Code:		Injection Number	:
ured on	: 14 Dec 93 07:59 PM	Sequence Line	:
rt Created on:	14 Dec 93 08:05 PM	Instrument Method	: PMTS.MTH
Recalib on	: 14 Dec 93 08:05 PM	Analysis Method	: PMTS.MTH
plier	: 1	Sample Amount	: 0
		ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0491.D

Time	Area	Type	Width	Ref#	PPM	Name
1.031	70458	BB	0.090	1-R	101.774	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.036	1.031	-0.5%

4 ppm Methane
#1



External Standard Report

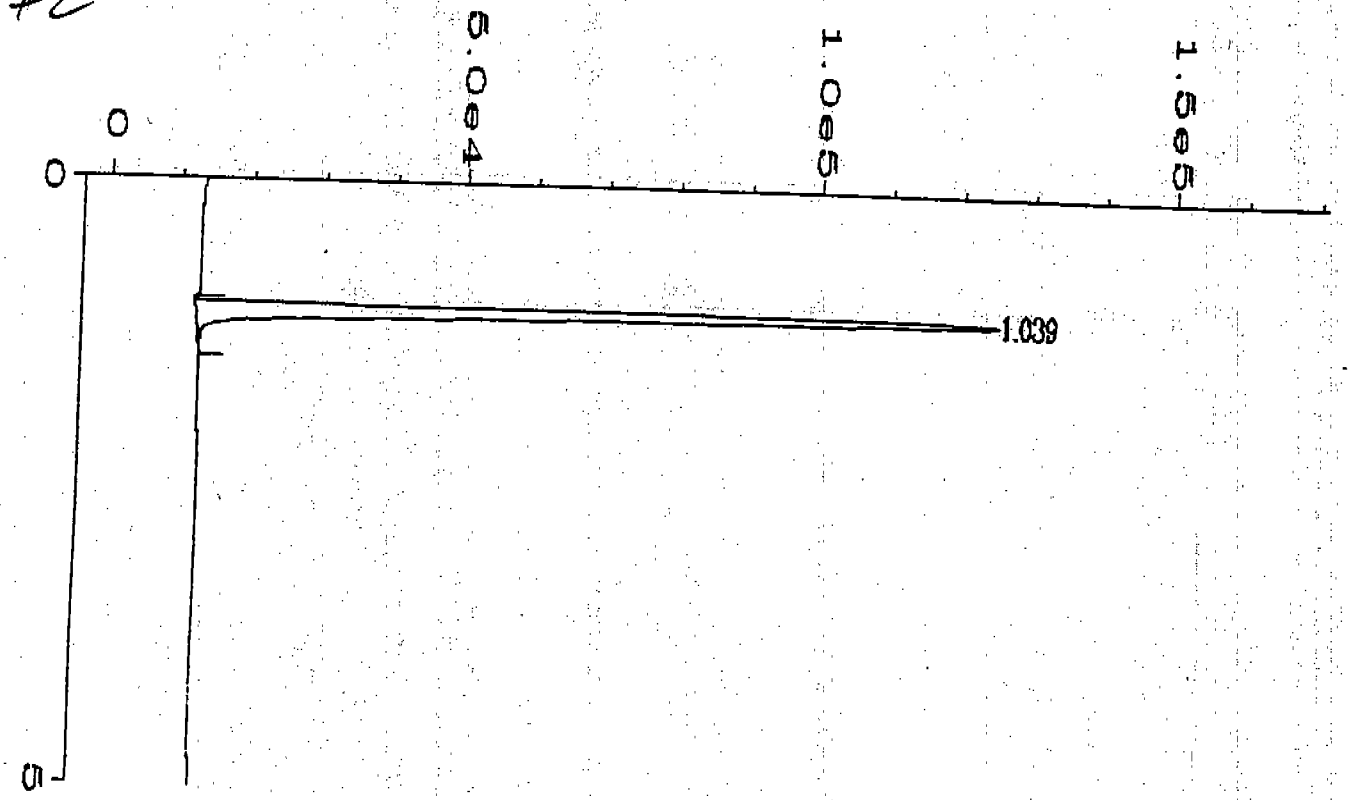
a File Name	: C:\HPCHEM\1\DATA\NV-F0492.D	Page Number	: 1
ator	:	Vial Number	:
trument	: FID/FPD	Injection Number	:
ple Name	:	Sequence Line	:
Time Bar Code	:	Instrument Method	: MMT5.MTH
ured on	: 14 Dec 93 08:07 PM	Analysis Method	: MMT5.MTH
rt Created on	: 14 Dec 93 08:14 PM	Sample Amount	: 0
Recalib on	: 14 Dec 93 08:13 PM	ISTD Amount	:
tiplier	: 1		

1 in C:\HPCHEM\1\DATA\NV-F0492.D

Time	Area	Type	Width	Ref#	PPM	Name
1.048	582098	BB	0.084	1-R	983.790	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.036	1.048	1.2%

1 ppm Methane
#2



External Standard Report

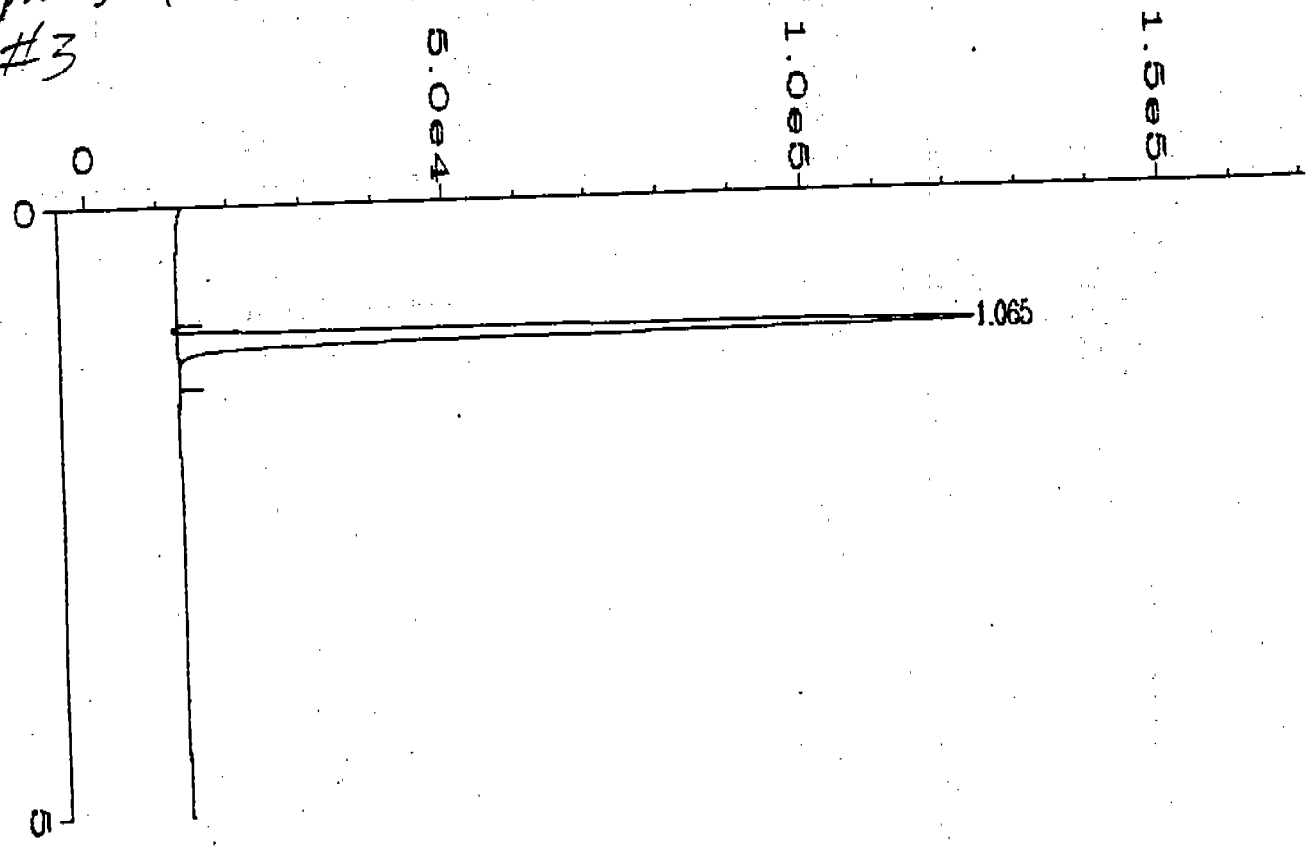
File Name	: C:\HPCHEM\1\DATA\NV-F0493.D		
Operator	:		
Instrument	: FID/FPD	Page Number	: 1
Sample Name	:	Vial Number	:
Run Time Bar Code:		Injection Number	:
Acquired on	: 14 Dec 93 08:16 PM	Sequence Line	:
Report Created on:	14 Dec 93 08:22 PM	Instrument Method:	MMT5.MTH
Last Recalib on	: 14 Dec 93 08:21 PM	Analysis Method	: MMT5.MTH
Multiplier	: 1	Sample Amount	: 0
		ISTD Amount	:

Signal 1 in C:\HPCHEM\1\DATA\NV-F0493.D

Time	Area	Type	Width	Ref#	PPM	Name
1.039	580609	BB	0.083	1-R	982.508	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.037	1.039	0.2%

34 ppm Methane
Inj #3



External Standard Report

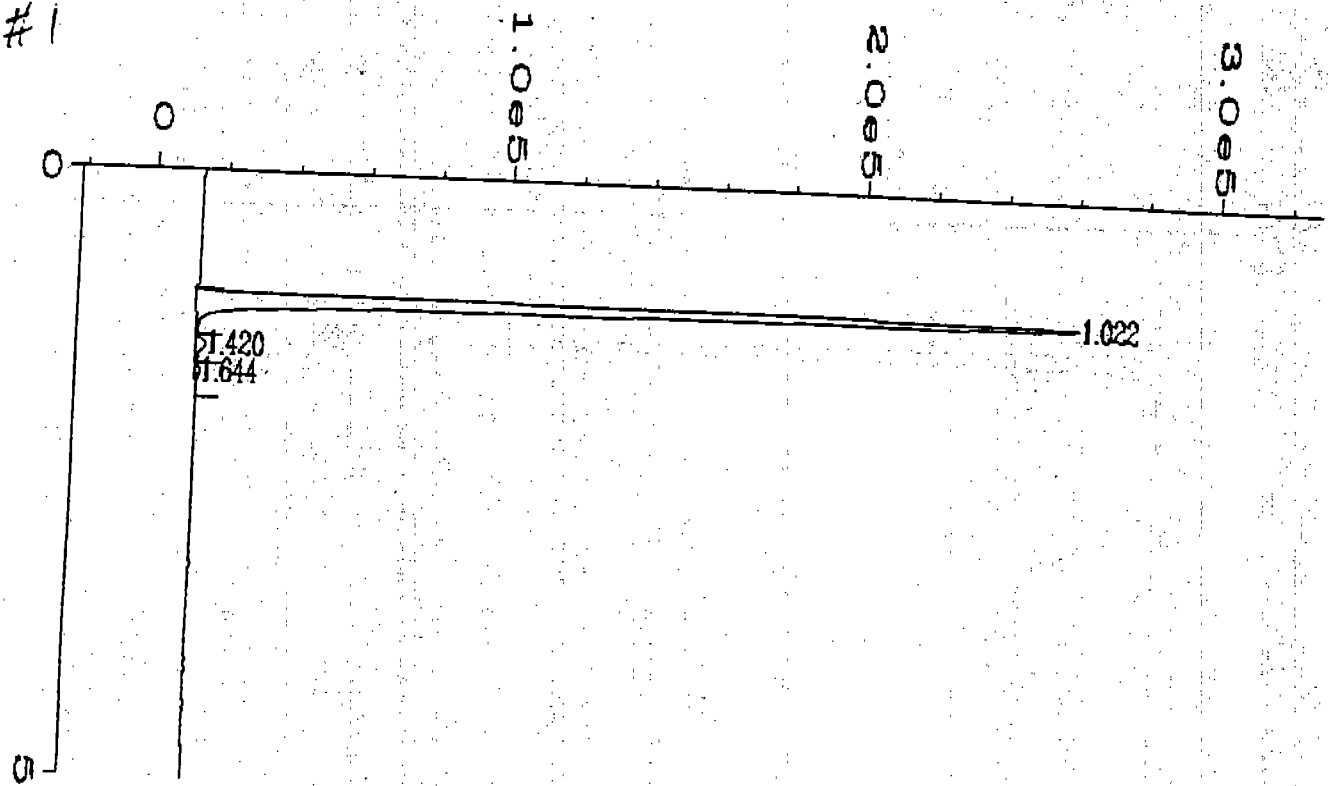
A File Name	: C:\HPCHEM\1\DATA\NV-F0494.D	Page Number	: 1
rator	:	Vial Number	:
trumen.t	: FID/FPD	Injection Number	:
ple Name	:	Sequence Line	:
Time Bar Code:		Instrument Method:	MMT5.MTH
ured on	: 14 Dec 93 08:24 PM	Analysis Method	: MMT5.MTH
ort Created on:	14 Dec 93 08:32 PM	Sample Amount	: 0
t Recei)h on	: 14 Dec 93 08:31 PM	ISTD Amount	:
tiplier	: 1		

. 1 in C:\HPCHEM\1\DATA\NV-F0494.D

Time	Area	Type	Width	Ref#	PPM	Name
1.065	577506	BB	0.085	1-R	979.363	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.054	1.065	1.1%

ICR #1
in #1
j #1



External Standard Report

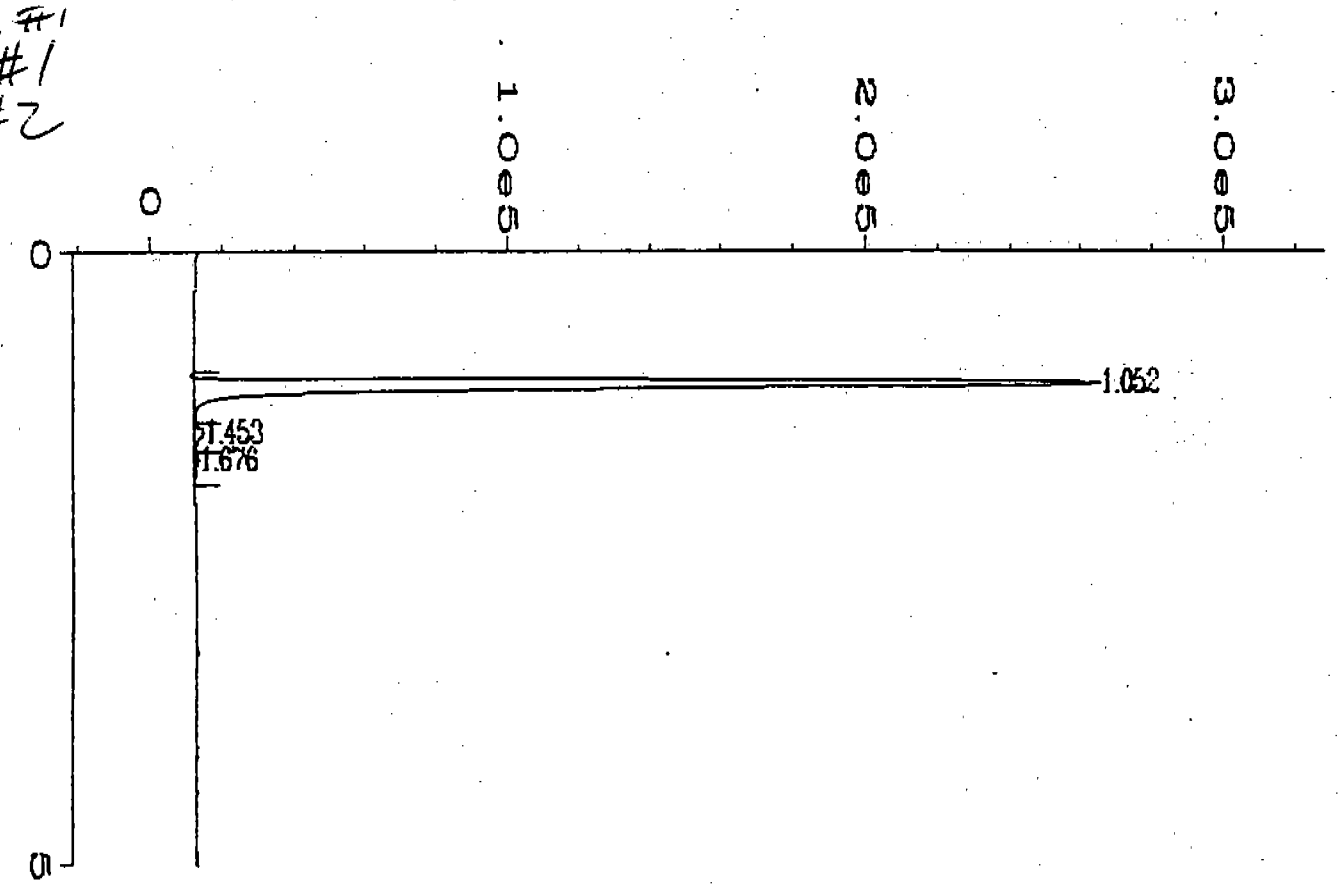
File Name	: C:\HPCHEM\1\DATA\NV-F0495.D		
ator	:		
rument	: FID/FPD		
ple Name	:	Page Number	: 1
Time Bar Code	:	Vial Number	:
ired on	: 14 Dec 93 08:34 PM	Injection Number	:
rt Created on	: 14 Dec 93 08:42 PM	Secuence Line	:
Recalib on	: 14 Dec 93 08:31 PM	Instrument Method	: MMTS.MTH
plier	: 1	Analysis Method	: MMTS.MTH
		Sample Amount	: 0
		ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0495.D

Time	Area	Type	Width	Ref#	PPM	Name
1.022	1181868	BV	0.076	1-R	2020.879	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.030	1.022	-0.8%

CK #1
~ #1
#2



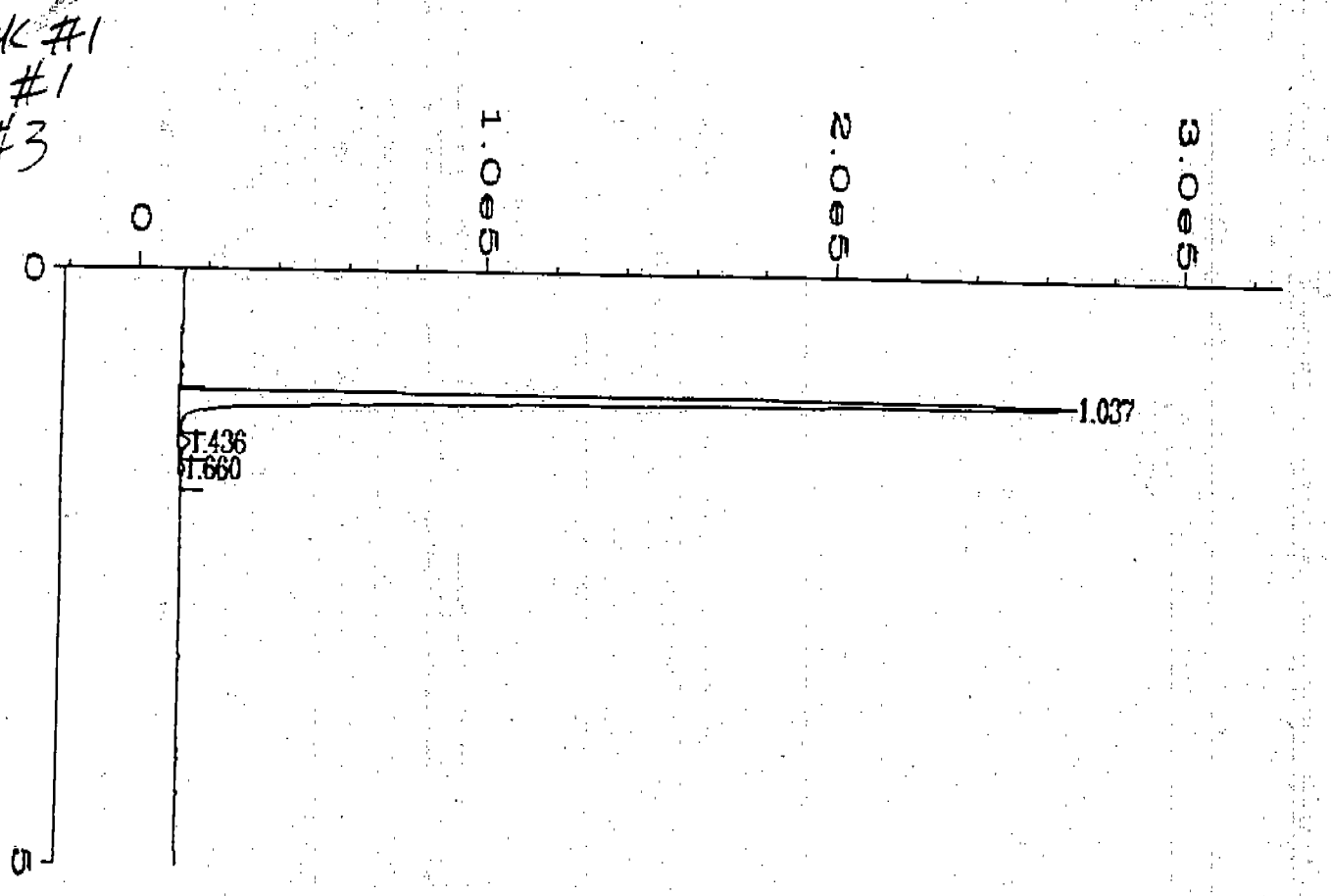
External Standard Report

File Name	: C:\HPCHEM\1\DATA\NV-F0496.D		
Operator	:	Page Number	: 1
Instrument	: FID/FPD	Vial Number	:
Sample Name	:	Injection Number	:
Time Bar Code:		Sequence Line	:
Acquired on	: 14 Dec 93 08:43 PM	Instrument Method	: MMT5.MTH
Report Created on	: 14 Dec 93 08:49 PM	Analysis Method	: MMT5.MTH
Last Recalib on	: 14 Dec 93 08:31 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0496.D

Time	Area	Type	Width	Ref#	PPM	Name
1.052	1193205	BV	0.076	1-R	2040.417	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.030	1.052	2.1%



External Standard Report

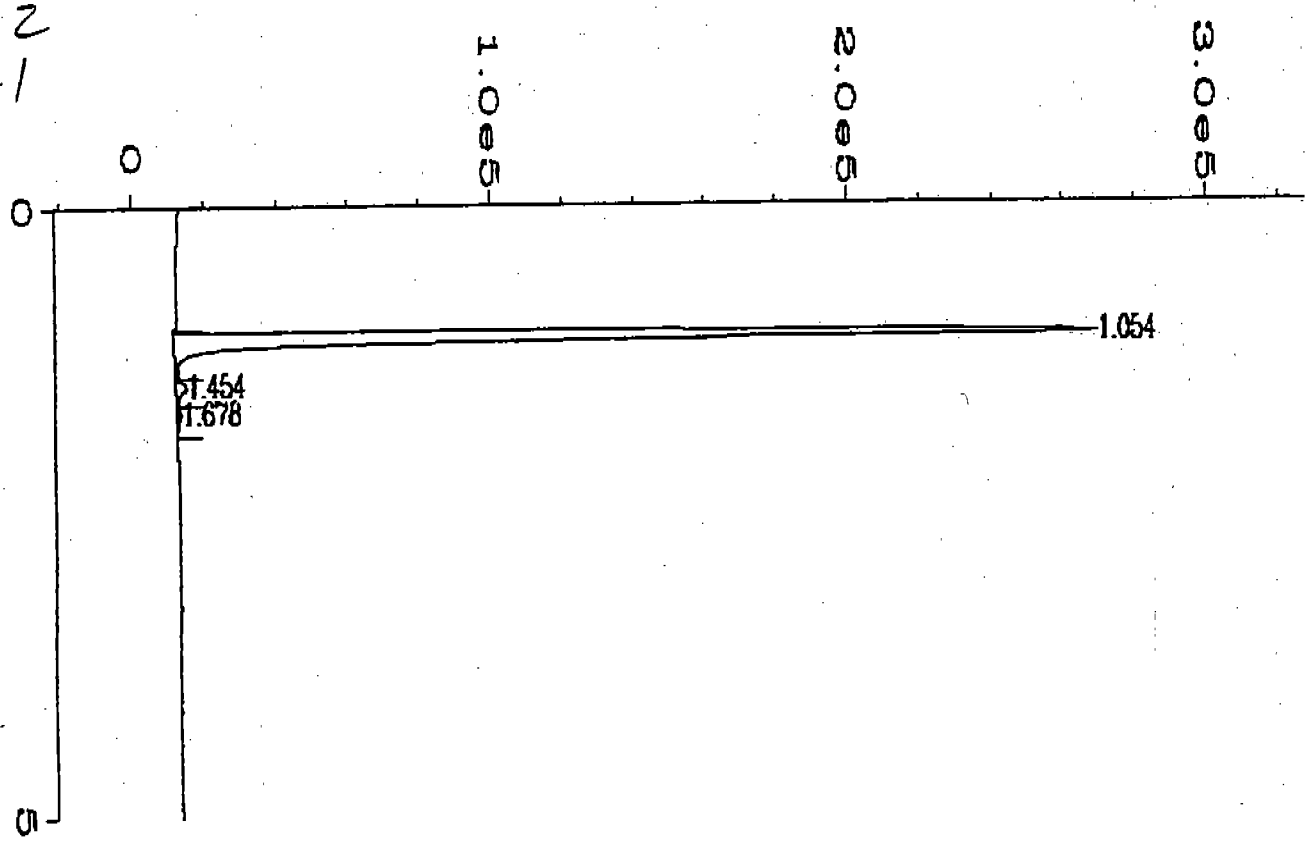
File Name	: C:\HPCHEM\1\DATA\NV-F0497.D		
Operator	:		
Instrument	: FID/FPD	Page Number	: 1
Sample Name	:	Vial Number	:
Time Bar Code:		Injection Number	:
Acquired on	: 14 Dec 93 08:52 PM	Sequence Line	:
Report Created on:	14 Dec 93 08:58 PM	Instrument Method:	MMT5.MTH
Last Recalib on	: 14 Dec 93 08:31 PM	Analysis Method	: MMT5.MTH
Multiplier	: 1	Sample Amount	: 0
		ISTD Amount	:

Signal 1 in C:\HPCHEM\1\DATA\NV-F0497.D

Time	Area	Type	Width	Ref#	PPM	Name
1.037	1212390	BV	0.076	1-R	2073.479	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.030	1.037	0.7%

ck #1
#2
#1



External Standard Report

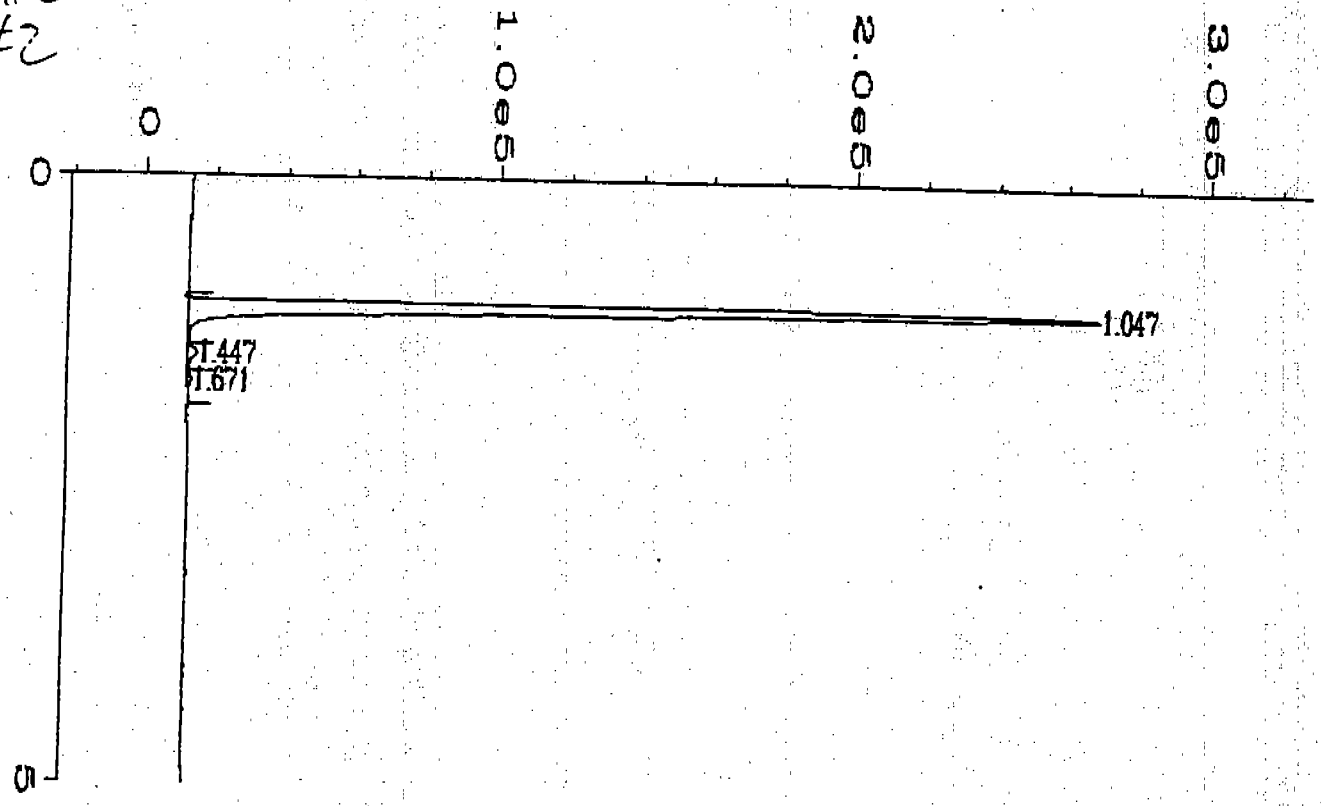
File Name	: C:\HPCHEM\1\DATA\NV-F0498.D		
Vator	:	Page Number	: 1
Instrument	: FID/FPD	Vial Number	:
ple Name	:	Injection Number	:
Time Bar Code	:	Sequence Line	:
ured on	: 14 Dec 93 09:00 PM	Instrument Method	: MMT5.MTH
ort Created on	: 14 Dec 93 09:06 PM	Analysis Method	: MMT5.MTH
Recalib on	: 14 Dec 93 08:31 PM	Sample Amount	: 0
ultiplier	: 1	ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0498.D

Time	Area	Type	Width	Ref#	PPM	Name
1.054	1212805	BV	0.076	1-R	2074.195	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.030	1.054	2.3%

ck #1
~#2
#2



External Standard Report

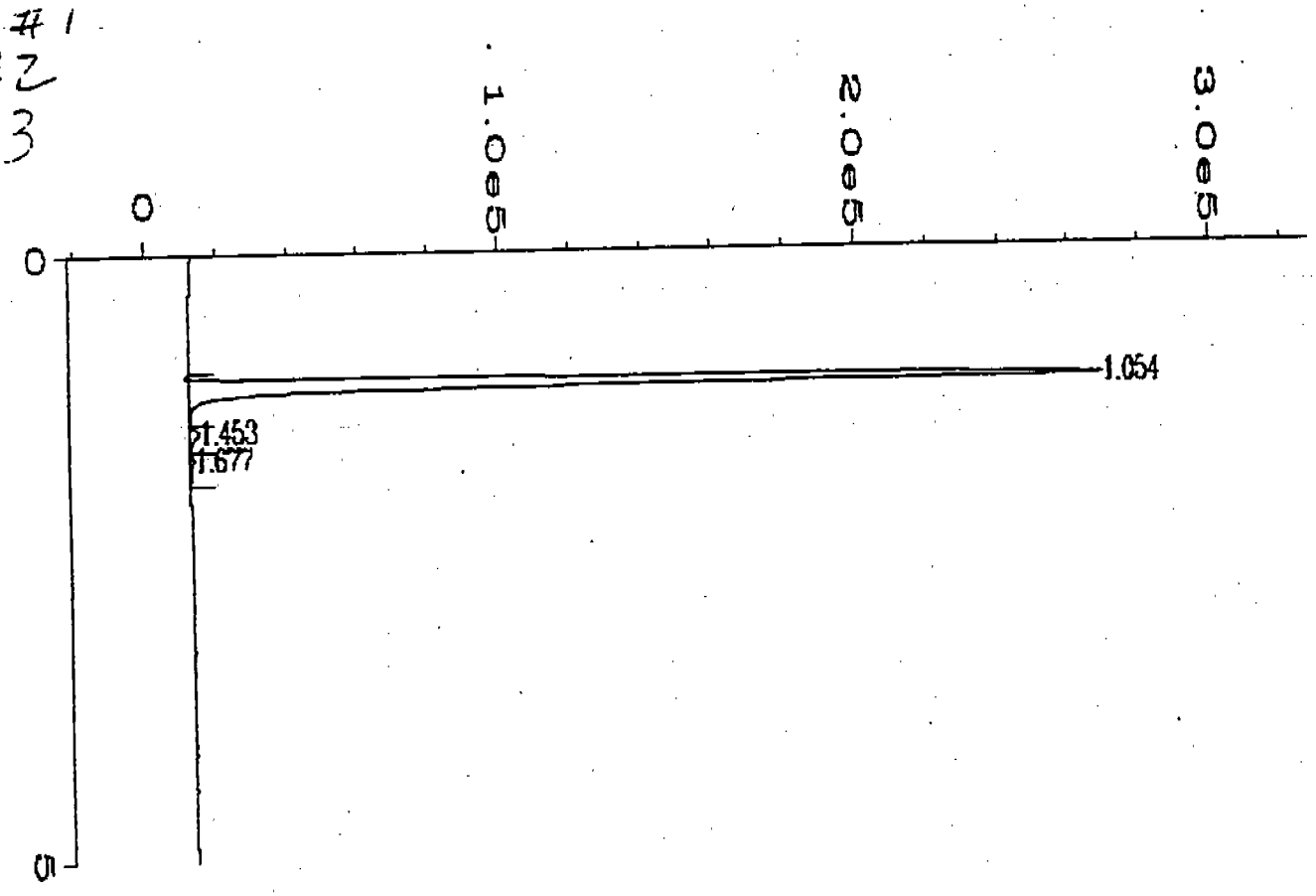
File Name	: C:\HPCHEM\1\DATA\NV-F0499.D		
ator	:		
rument	: FID/FPD	Page Number	: 1
le Name	:	Vial Number	:
Time Bar Code:		Injection Number	:
ured on	: 14 Dec 93 09:09 PM	Sequence Line	:
rt Created on:	14 Dec 93 09:14 PM	Instrument Method:	MMTE.MTH
Recalib on	: 14 Dec 93 08:31 PM	Analysis Method	: MMT5.MTH
ipler	: 1	Sample Amount	: 0
		ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0499.D

Time	Area	Type	Width	Ref#	PPM	Name
.047	1199243	BV	0.075	1-R	2050.823	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.030	1.047	1.7%

K #1
#2
#3



External Standard Report

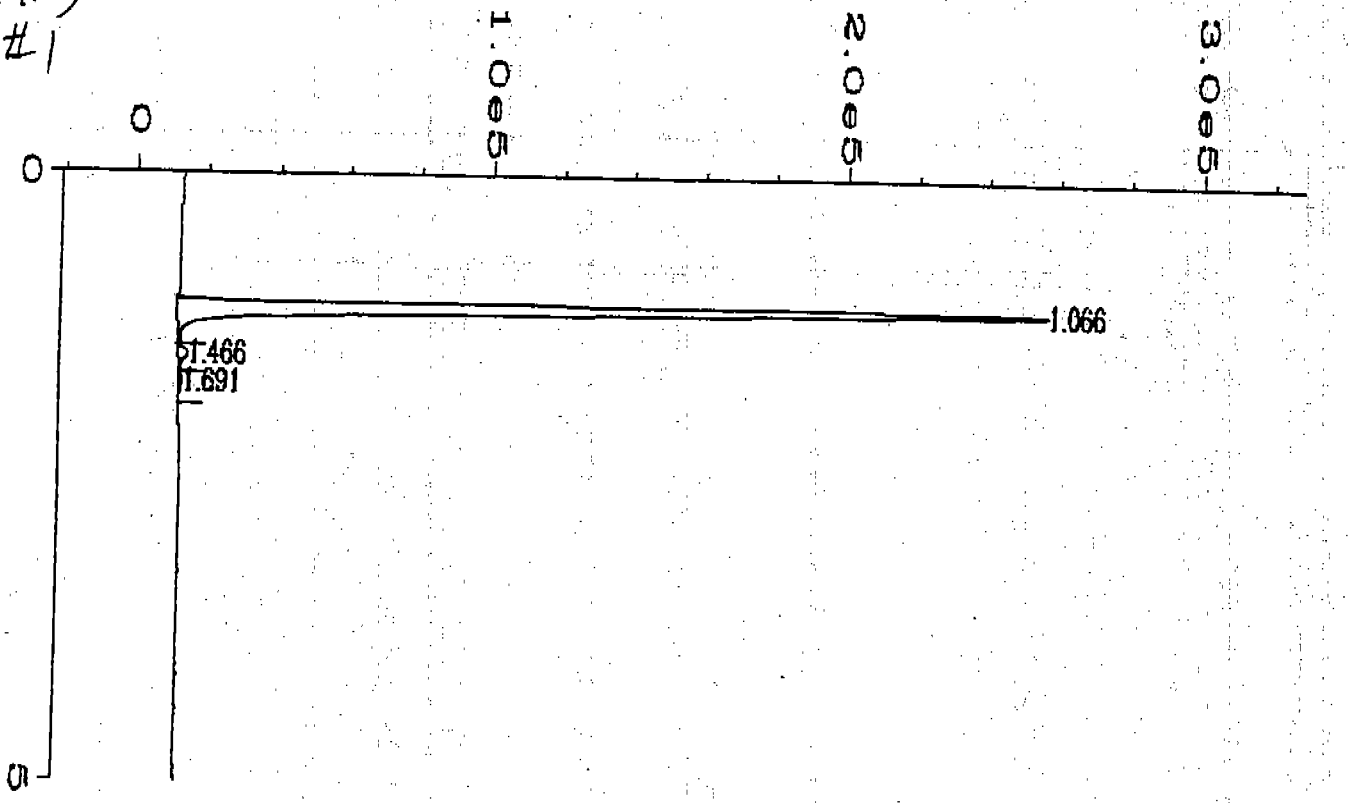
a File Name	: C:\HPCHEM\1\DATA\NV-F0501.D		
rator	:	Page Number	: 1
trument	: FID/FPD	Vial Number	:
ple Name	:	Injection Number	:
Time Bar Code:		Sequence Line	:
ured on	: 14 Dec 93 09:17 PM	Instrument Metho	: MMT5.MTH
ort Created on	: 14 Dec 93 09:23 PM	Analysis Method	: MMT5.MTH
Recalib on	: 14 Dec 93 08:31 PM	Sample Amount	: 0
tiplier	: 1	ISTD Amount	:

. 1 in C:\HPCHEM\1\DATA\NV-F0501.D

Time	Area	Type	Width	Ref#	PPM	Name
1.054	1192089	BV	0.075	1-R	2038.495	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.030	1.054	2.3%

ck #1
un #3
j #1



External Standard Report

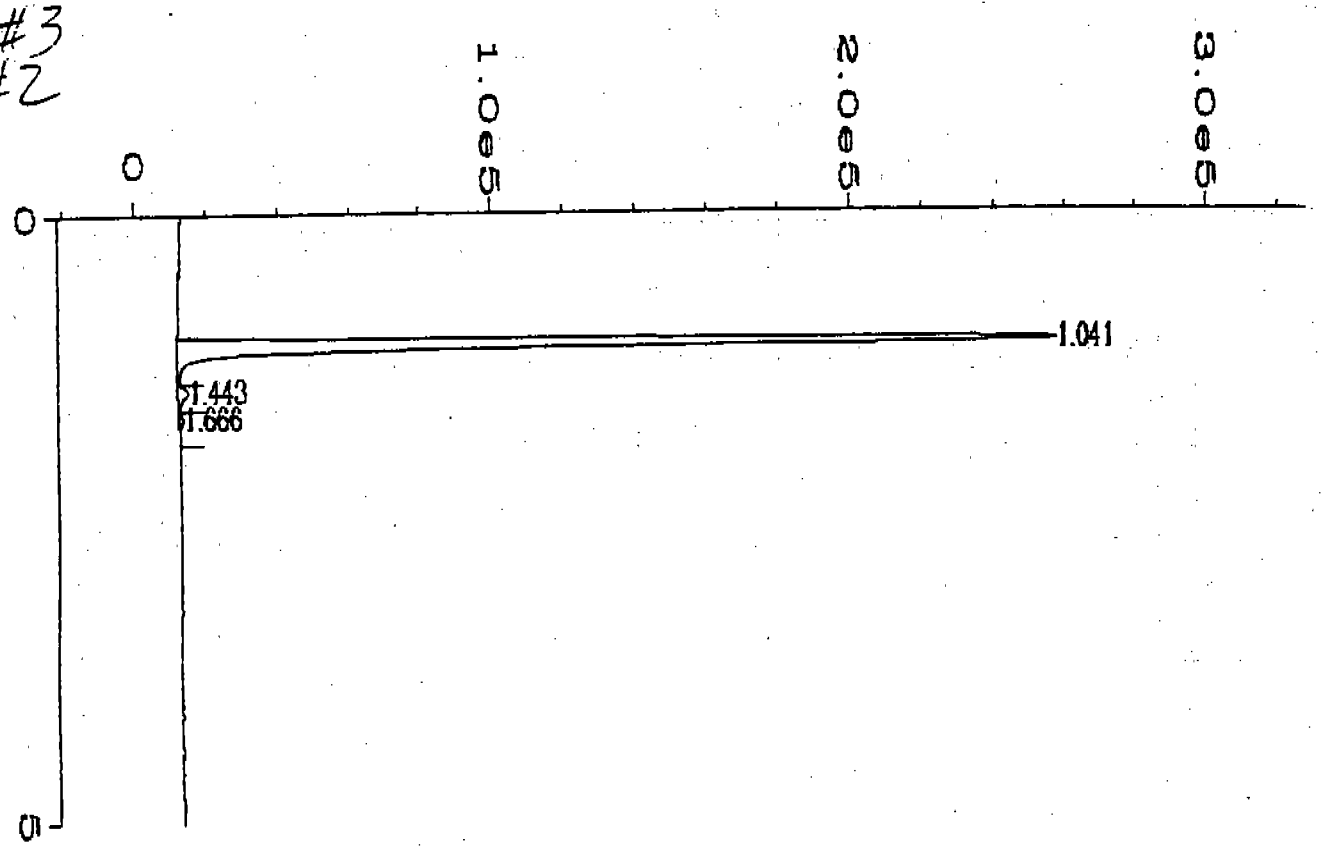
File Name	: C:\HPCHEM\1\DATA\NV-F0502.D		
ator	:		
rument	: PID/FPD	Page Number	: 1
le Name	:	Vial Number	:
Time Bar Code:		Injection Number	:
ired on	: 14 Dec 93 09:26 PM	Sequence Line	:
rt Created on	: 14 Dec 93 09:32 PM	Instrument Method	: MMTS.MTH
Recalib on	: 14 Dec 93 08:31 PM	Analysis Method	: MMTS.MTH
iplier	: 1	Sample Amount	: 0
		ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0502.D

Time	Area	Type	Width	Ref#	PPM	Name
.066	1165685	BV	0.077	1-R	1992.991	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.060	1.066	0.6%

ack #1
n #3
j #2



External Standard Report

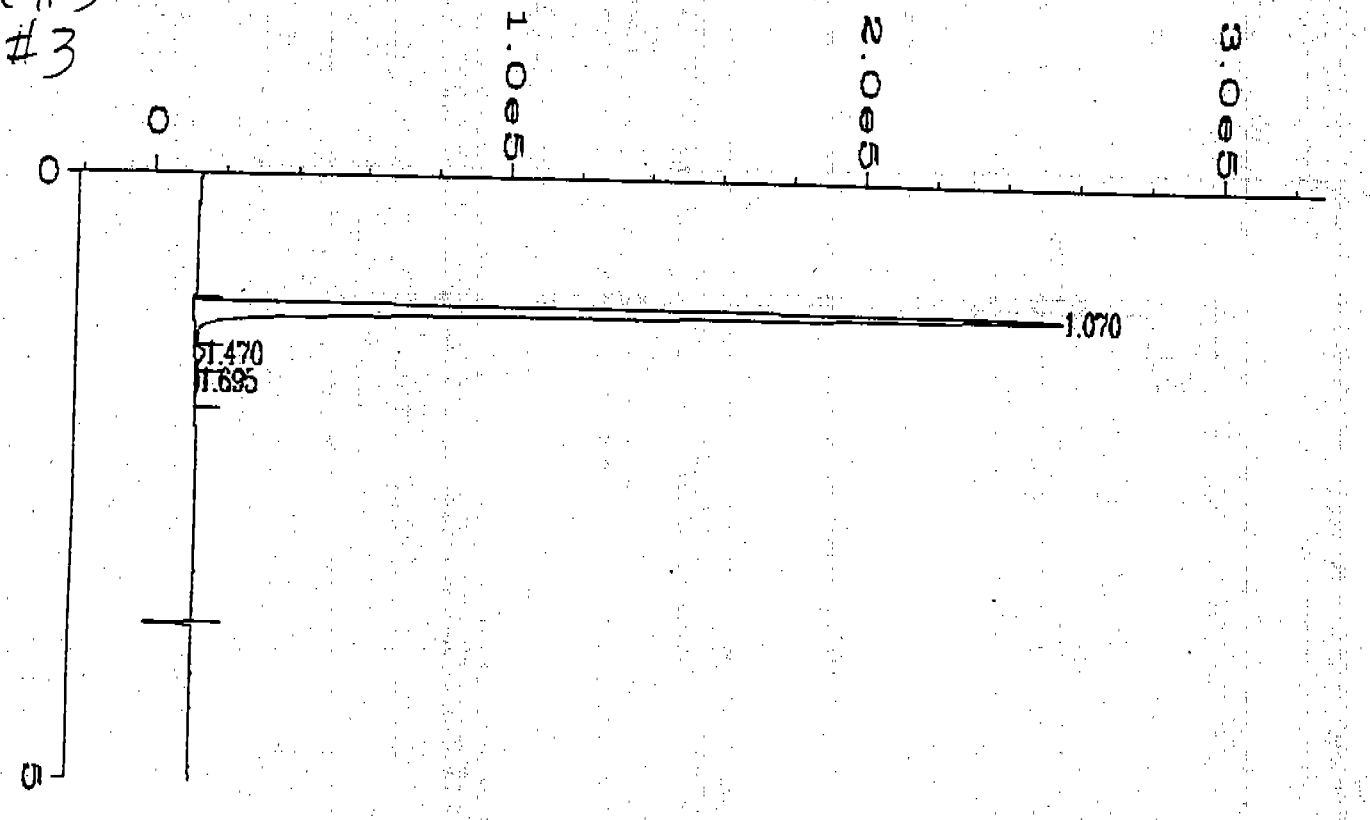
File Name	: C:\HPCHEM\1\DATA\NV-FC503.D		
ator	:	Page Number	: 3
rument	: FID/PPD	Vial Number	:
ple Name	:	Injection Number	:
Time Bar Corrected		Sequence Line	:
ired on	: 14 Dec 93 09:34 PM	Instrument Method	: MMT5.MTH
rt Created on	: 14 Dec 93 09:40 PM	Analysis Method	: MMT5.MTH
Reviewed on	: 14 Dec 93 08:3: PM	Sample Amount	: 0
plier	: 1	ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-FC503.D

Time	Area	Type	Width	Ref#	PPM	Name
.041	1173062	BV	0.077	1-R	2005.703	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.060	1.041	-1.8%

zck #1
n #3
j #3



External Standard Report

File Name : C:\HPCHEM\1\DATA\NV-F0504.D
ator :
rument : FID/FPD
le Name :
Time Bar Code:
ired on : 14 Dec 93 09:42 PM
rt Created on: 14 Dec 93 09:48 PM
Recalib on : 14 Dec 93 08:31 PM
ption : 1

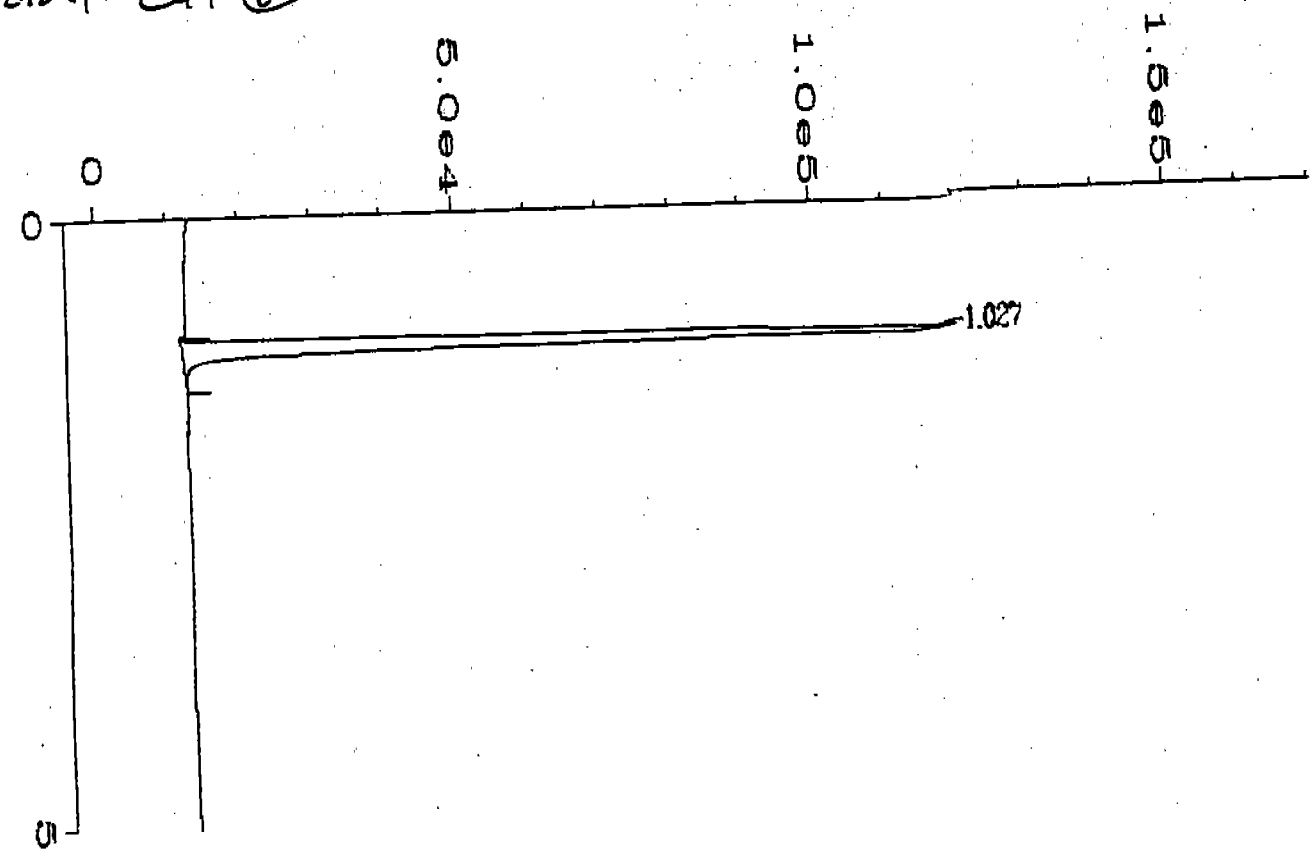
Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: MMT5.MTH
Analysis Method : MMT5.MTH
Sample Amount : 0
ISTD Amount :

1 in C:\HPCHEM\1\DATA\NV-F0504.D

Time	Area	Type	Width	Ref#	PPM	Name
1.070	1161044	BV	0.077	1-R	1984.993	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.060	1.070	0.9%

Intermediate Cal (V)



External Standard Report

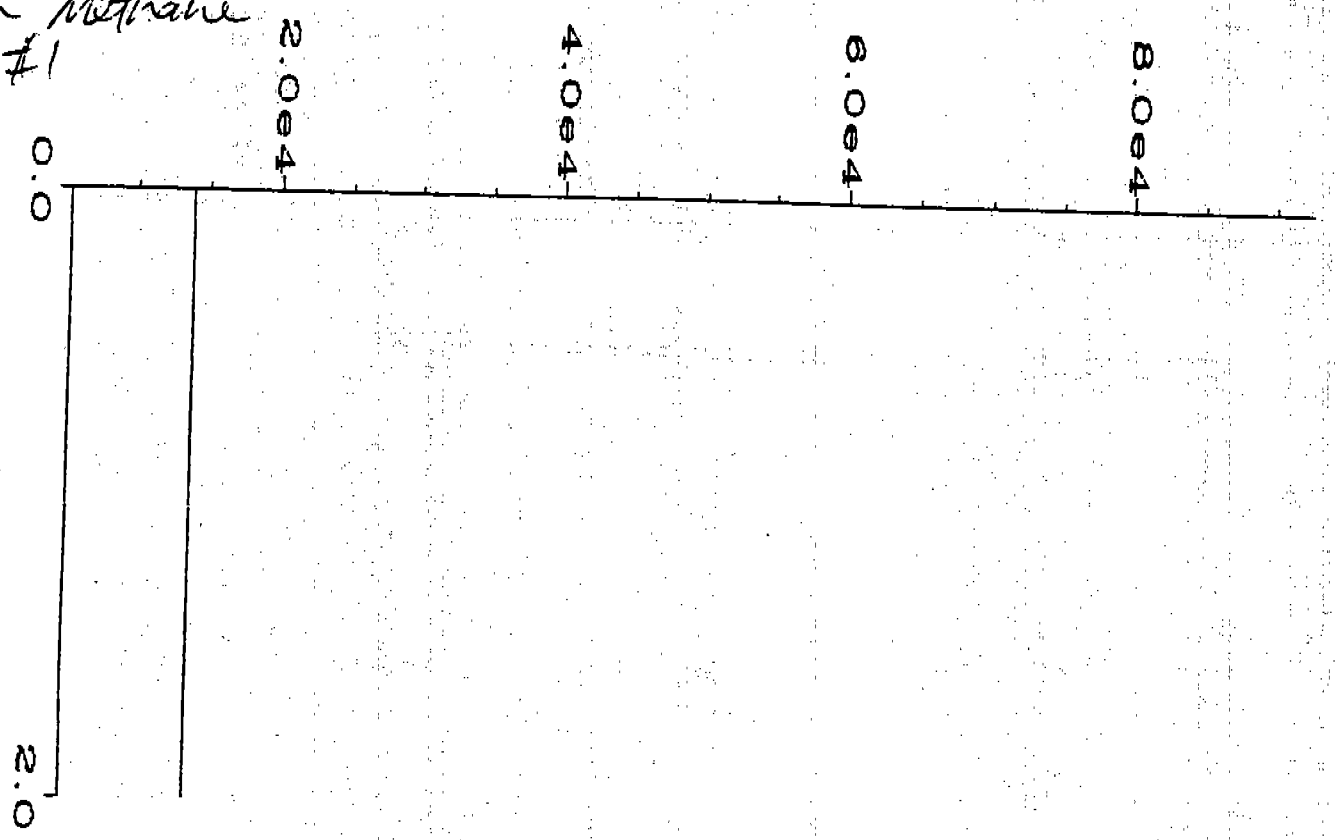
Data File Name	: C:\HPCHEM\1\DATA\NV-F0505.D	Page Number	: 1
Operator	:	Vial Number	:
Instrument	: FID/PPD	Injection Number	:
Sample Name	:	Sequence Line	:
Run Time Bar Code	:	Instrument Method	: MMT5.MTH
Acquired on	: 14 Dec 93 09:51 PM	Analysis Method	: MMT5.MTH
Report Created on	: 14 Dec 93 09:57 PM	Sample Amount	: 0
Recalculated on	: 14 Dec 93 08:31 PM	ISTD Amount	:
Multiplier	: 1		

1 in C:\HPCHEM\1\DATA\NV-F0505.D

Time	Area	Type	Width	Ref#	PPM	Name
1.027	580465	BB	0.086	1-R	984.463	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.040	1.027	-1.3%

Cal in Methane #1



External Standard Report

File Name : C:\HPCHEM\1\DATA\NV-F0528.D
ator :
rument : FID/FPD
le Name :
Time Bar Code:
ured on : 16 Dec 93 11:09 PM
Created on: 16 Dec 93 11:17 PM
Recalc'd on : 14 DEC 93 08:31 PM
plier : 1

Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: BFICHIC.MTH
Analysis Method : BFICHIC.MTH
Sample Amount : 0
ISTD Amount :

1 in C:\HPCHEM\1\DATA\NV-F0528.D

Time	Area	Type	Width	Ref#	PPM	Name
.070	* not found *			1-R		METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.070	* not found *	

d not find time reference peak:
No peak of Number 1 s description at 1.070 + 0.027 - 0.027 min.
all time reference peaks were found

Area Percent Report

File Name : C:\HPCHEM\1\DATA\NV-F0528.D
ator :
rument : FID/FPD

Page Number : 1
Vial Number :

quired on : 16 Dec 93 11:09 PM
port Created on: 16 Dec 93 11:17 PM
t Recalib on : 14 DEC 93 08:31 PM
ltiple : 1

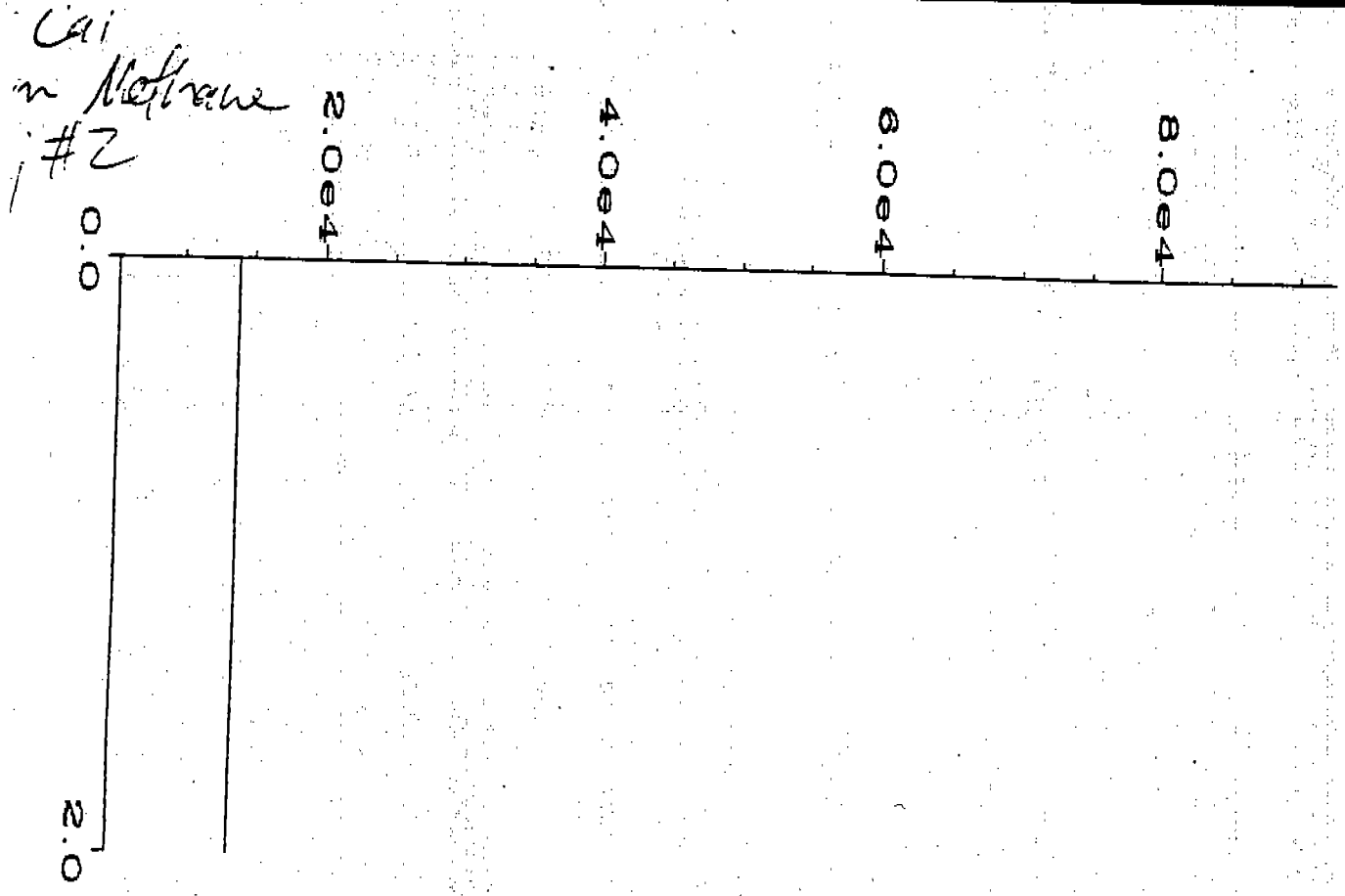
Instrument Method: BFICHIC.MTH
Analysis Method : BFICHIC.MTH
Sample Amount : 0
ISTD Amount :

1 in C:\HPCHEM\1\DATA\JV-F0528.D

Pk#	Ret Time	Area	Height	Type	Width	Area %

1 amount = 0

Cal
in Methane
#2



External Standard Report

File Name	: C:\HPCHEM\1\DATA\NV-F0529.D		
Operator	:		
Instrument	: FID/FPD	Page Number	: 1
Sample Name	:	Vial Number	:
Run Time Bar Code:		Injection Number	:
Acquired on	: 14 Dec 93 10:12 PM	Sequence Line	:
Report Created on:	14 Dec 93 11:17 PM	Instrument Method:	RFICHIC.MTH
Recalibrated on	: 14 Dec 93 08:31 PM	Analysis Method	: RFICHIC.MTH
Multiplier	: 1	Sample Amount	: 0
		ISTD Amount	:

Peaks in C:\HPCHEM\1\DATA\NV-F0529.D

Time	Area	Type	Width	Ref#	PPM	Name
1.070	* not found *			1	1-R	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.070	* not found *	

Could not find time reference peak:
No peak of Number 1 's description at 1.070 + 0.027 - 0.027 min.
All time reference peaks were found

Area Percent Report

File Name	: C:\HPCHEM\1\DATA\NV-F0529.D		
Operator	:		
Instrument	: FID/FPD	Page Number	: 1
Sample Name	:	Vial Number	:
		Injection Number	:

ired on : 16 Dec 93 11:12 PM
rt Created on: 16 Dec 93 11:17 PM
t Recalib on : 14 DEC 93 08:31 PM
ltiplier : 1

Instrument Method: BFICHIC.MTH
Analysis Method : BFICHIC.MTH
Sample Amount : 0
ISTD Amount :

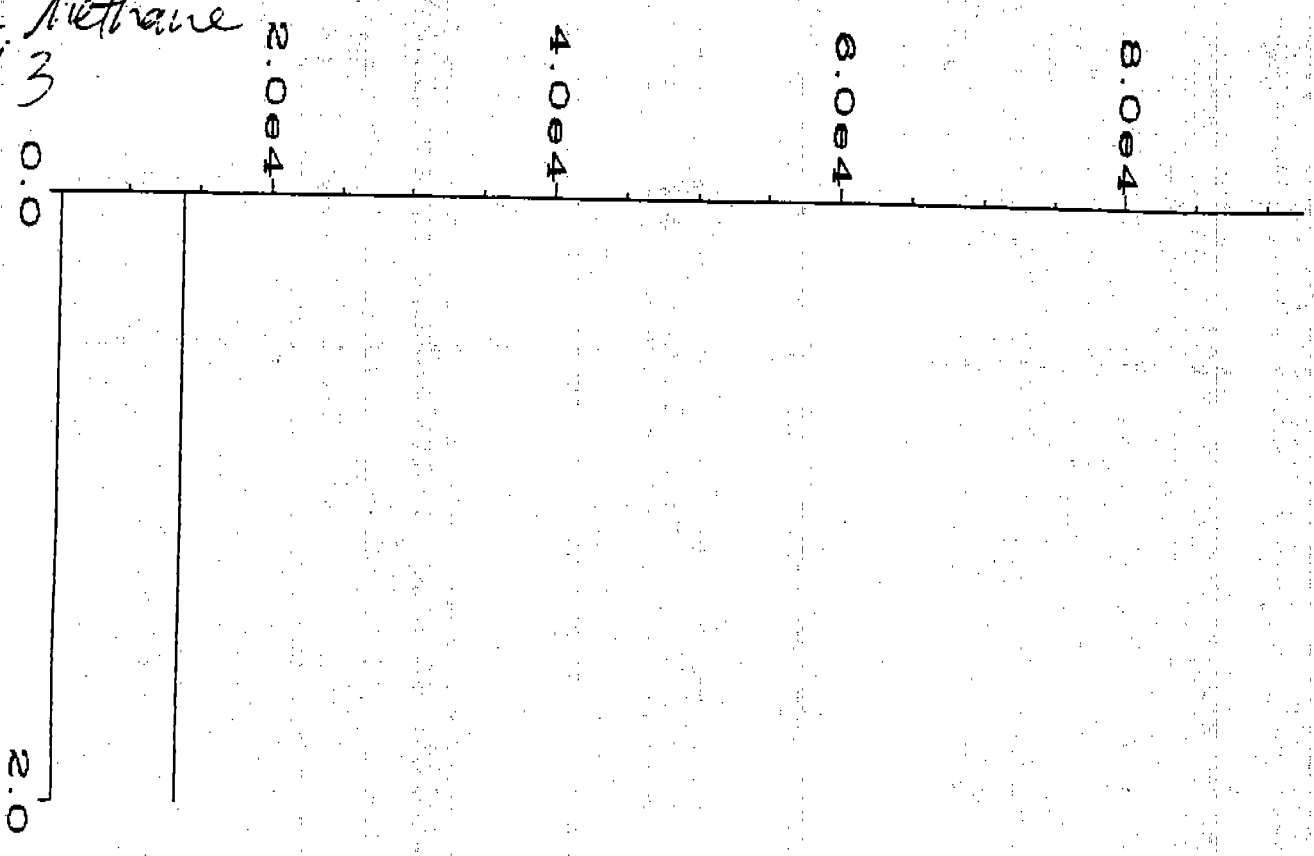
1 in C:\HPCHEM\1\DATA\NV-F0529.D

mp#	Ret. Time	Area	Height	Type	Width	Area %

l amount = 0

===

Cal in Methane #3



External Standard Report

a File Name	: C:\HPCHEM\1\DATA\NV-F0530.D		
rator	:		
trument	: FID/FPD	Page Number	: 1
ple Name	:	Vial Number	:
Time Bar Code:		Injection Number	:
ired on	: 16 Dec 93 11:10 PM	Sequence Line	:
ort Created on:	16 Dec 93 11:20 PM	Instrument Method:	BFICHIC.MTH
Recalib on	: 14 DEC 93 09:51 PM	Analysis Method	: BFICHIC.MTH
tiplier	: 1	Sample Amount	: 0
		ISTD Amount	:

. 1 in C:\HPCHEM\1\DATA\NV-F0530.D

Time	Area	Type	Width	Ref#	PPM	Name
1.070	* not found *			1-R		METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.070	* not found *	

ld not find time reference peak:
No peak of Number 1's description at 1.070 + 0.027 - 0.027 min.
all time reference peaks were found

Area Percent Report

a File Name	: C:\HPCHEM\1\DATA\NV-F0530.D		
rator	:		
trument	: FID/FPD	Page Number	: 1
		Vial Number	:

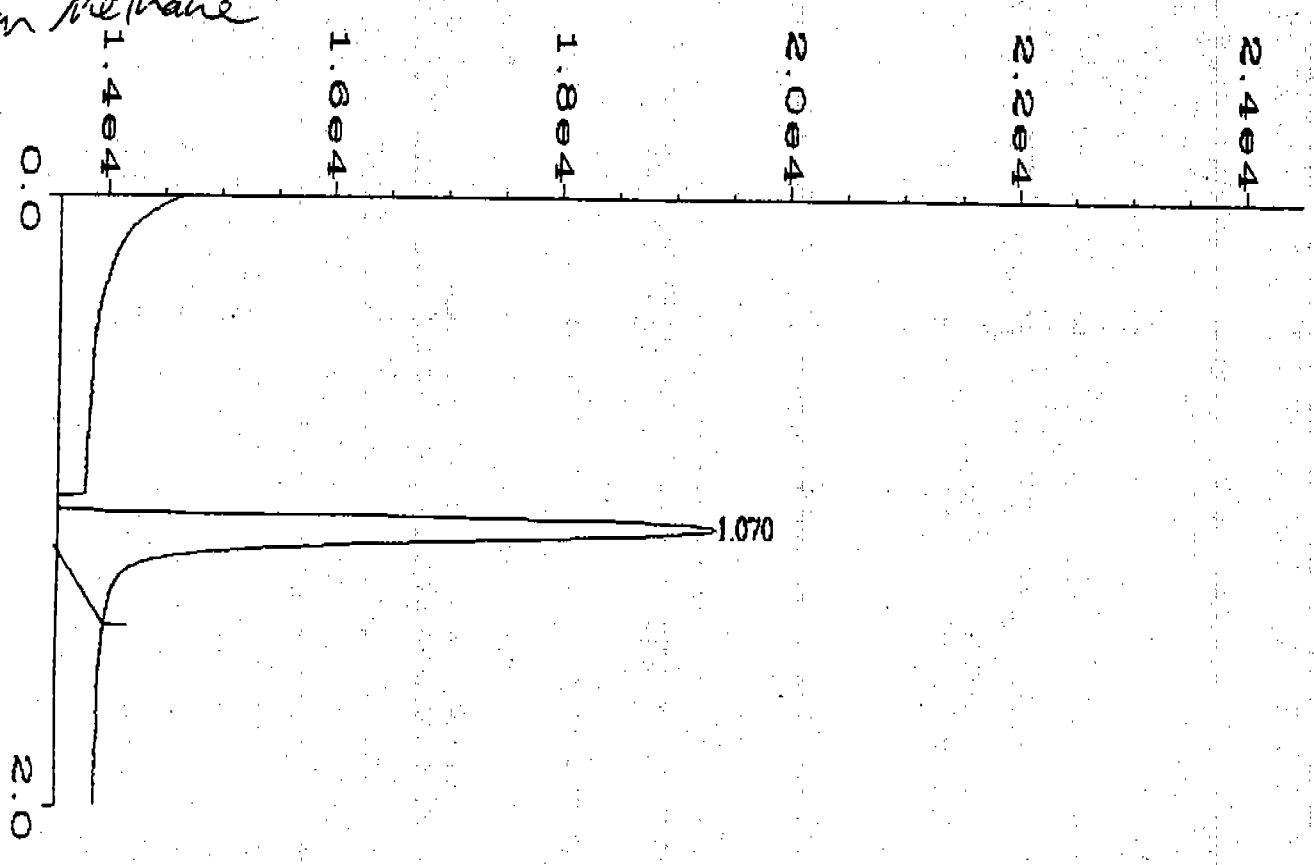
```
ired on       : 16 Dec 93  11:18 PM          Instrument Method: BFICHIC.MTH
rt Created on: 16 Dec 93  11:20 PM          Analysis Method  : BFICHIC.MTH
 Recalib on   : 14 DEC 93 08:31 PM          Sample Amount    : 0
plier         : 1                           ISTD Amount      :

  1 in C:\HPCHEM\1\DATA\NV-F0530.D
Pk#  Ret Time      Area          Height      Type    Width      Area %
---  --------  ----------  ----------  ----  --------  ----------

  amount = 0

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

Cal
1ppm Methane



External Standard Report

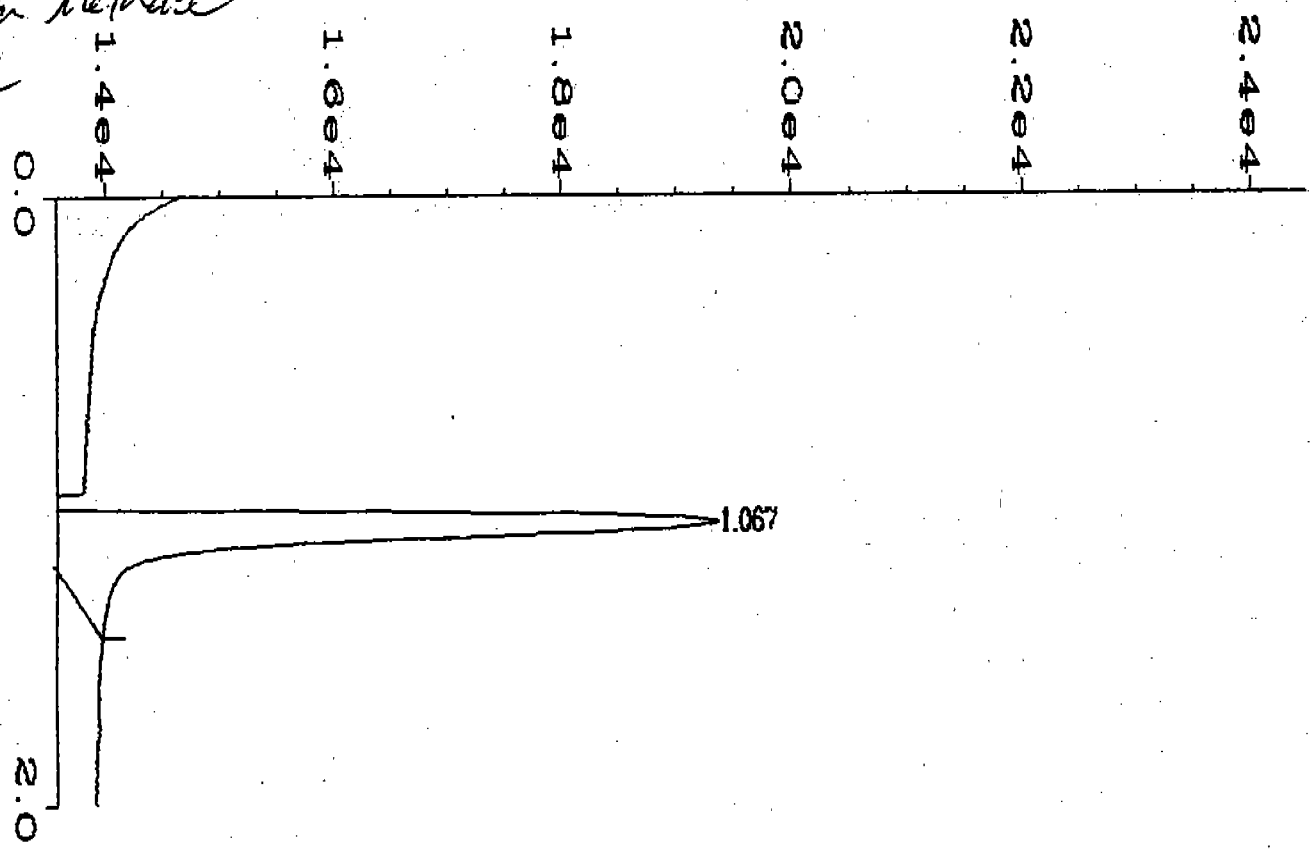
s File Name	: C:\HPCHEM\1\DATA\NV-F0531.D		
tator	:		
rument	: FID/FPD	Page Number	: 1
le Name	:	Vial Number	:
Time Bar Code:		Injection Number	:
ired on	: 16 Dec 93 11:25 PM	Sequence Line	:
rt Created on:	14 Dec 93 11:28 PM	Instrument Method:	BFICHIC.MTH
Recalib on	: 14 DEC 93 08:31 PM	Analysis Method	: BFICHIC.MTH
tiplier	: 1	Sample Amount	: 0
		ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0531.D

Time	Area	Type	Width	Ref#	PPM	Name
1.070	36163	BB	0.097	1-R	47.050	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.070	1.070	0.0%

ial
Gas Methane
#2



External Standard Report

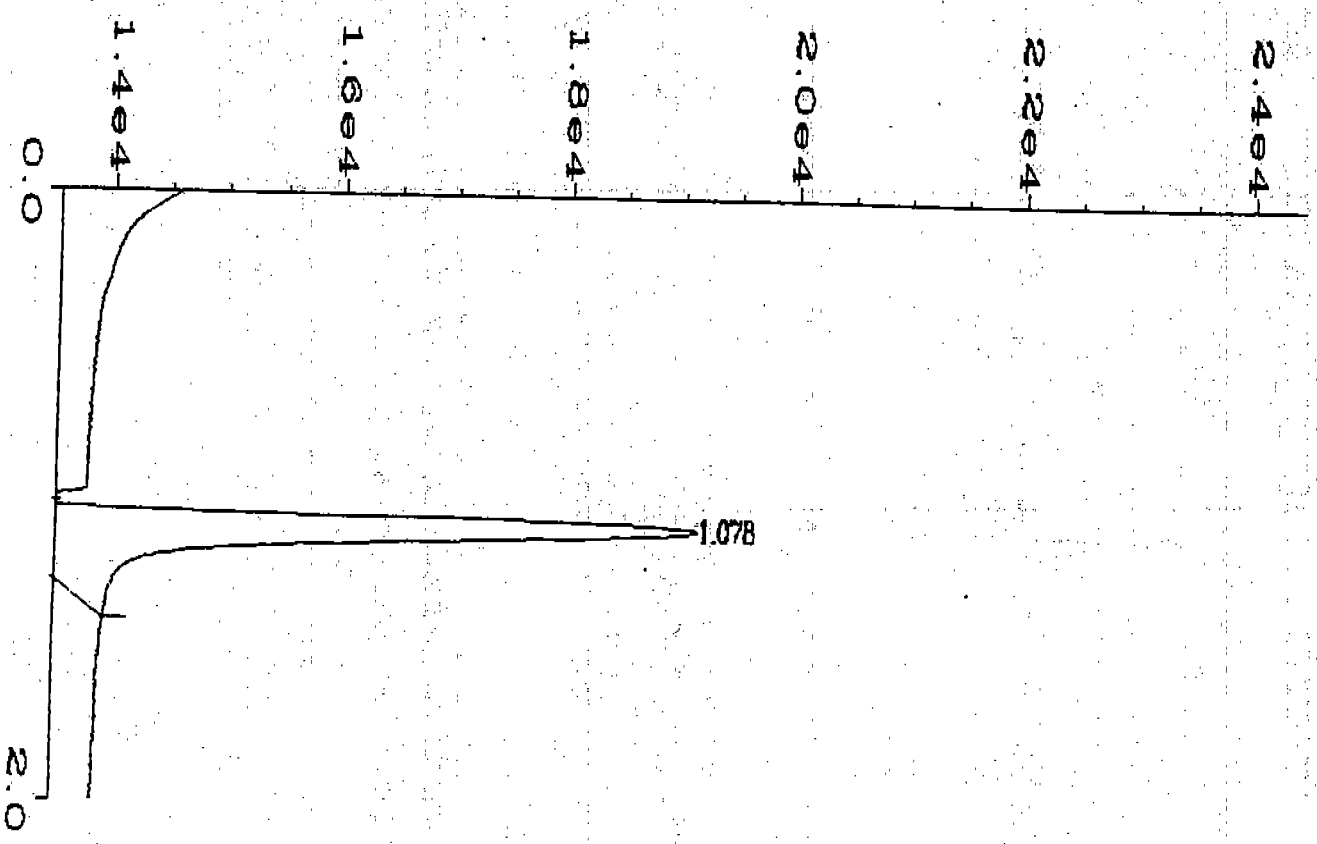
Data File Name	: C:\HPCHEM\1\DATA\NV-F0532.D		
Operator	:	Page Number	: 1
Instrument	: FID/FPD	Vial Number	:
Sample Name	:	Injection Number	:
Time Bar Code:		Sequence Line	:
Acquired on	: 16 Dec 93 11:29 PM	Instrument Method:	BFICHIC.MTH
Report Created on:	16 Dec 93 11:32 PM	Analysis Method	: BFICHIC.MTH
Last Recalib on:	14 DEC 93 08:31 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Data: 1 in C:\HPCHEM\1\DATA\NV-F0532.D

Time	Area	Type	Width	Ref#	PPM	Name
1.067	39907	BB	0.103	1-R	52.902	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.070	1.067	-0.3%

Gal
ffm Methane
-3



External Standard Report

File Name : C:\HPCHEM\1\DATA\NV-F0535.D
ator :
trument : FID/FPD
ple Name :
Time Bar Code:
ired on : 16 Dec 93 11:41 PM
ort Created on: 16 Dec 93 11:42 PM
Recalib on : 14 DEC 93 08:31 PM
ficier : 1

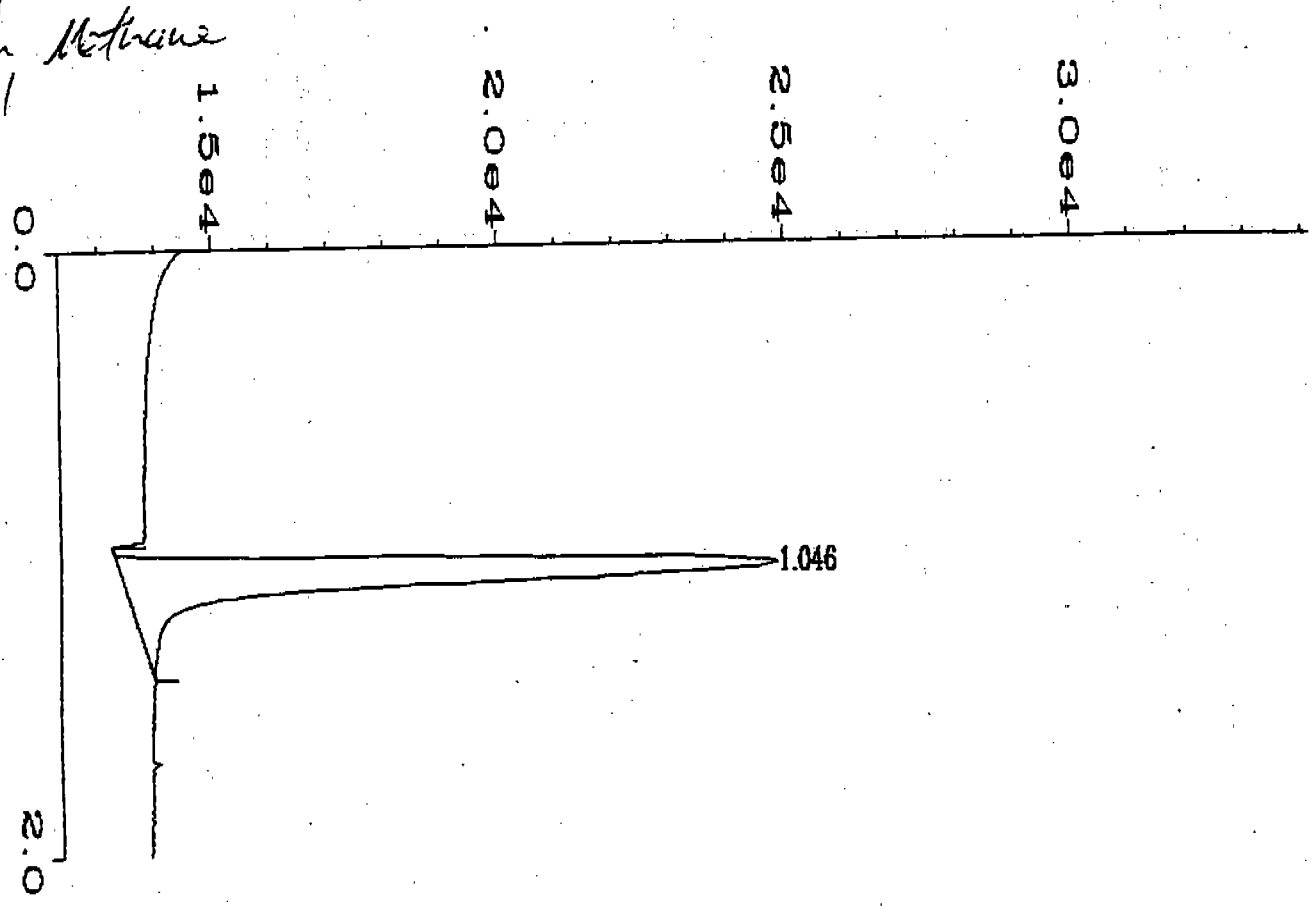
Page Number : 1
Vial Number :
Injection Number :
Sequence Line :
Instrument Method: DEICHIC.MTH
Analysis Method : BFICHIC.MTH
Sample Amount : 0
ISTD Amount :

1 in C:\HPCHEM\1\DATA\NV-F0535.D

Time	Area	Type	Width	Ref#	PPM	Name
1.078	42273	BB	0.102	1-R	56.979	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.070	1.078	0.7%

Cal Gas Methane #1



External Standard Report

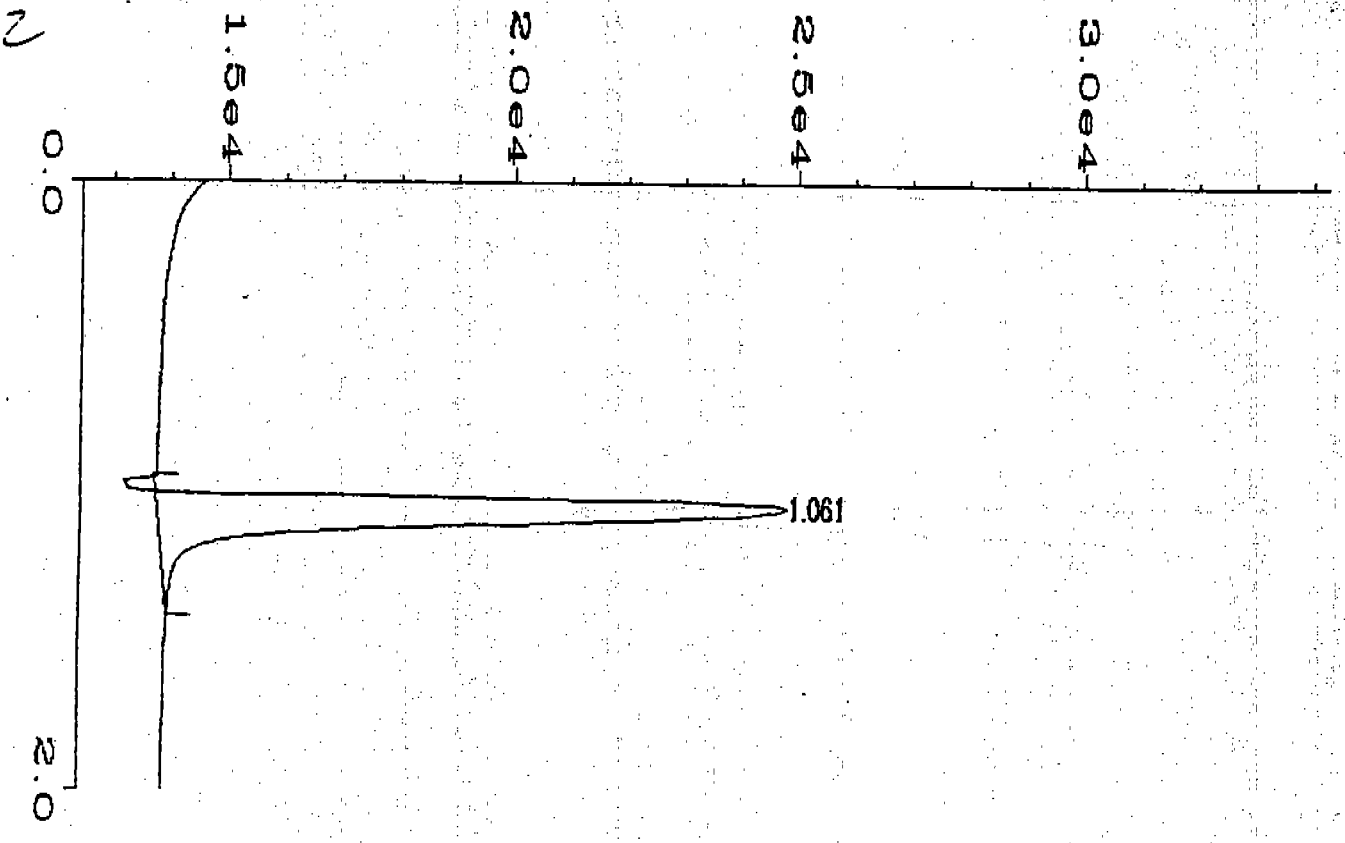
a File Name	: C:\HPCHEM\1\DATA\NV-F0536.D		
rator	:	Page Number	: 1
trument	: FID/FPD	Vial Number	:
ple Name	:	Injection Number	:
Time Bar Code:		Sequence Line	:
uired on	: 16 Dec 93 11:45 PM	Instrument Method	: BFICHIC.MTH
ort Created on	: 16 Dec 93 11:48 PM	Analysis Method	: BFICHIC.MTH
t Recalib on	: 14 DEC 93 08:31 PM	Sample Amount	: 0
tiplier	: 1	ISTD Amount	:

. 1 in C:\HPCHEM\1\DATA\NV-F0536.D

Time	Area	Type	Width	Ref#	PPM	Name
1.046	68786	BB	0.095	1-R	102.670	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.070	1.046	-2.2%

.cal
ppm Methane
#2



External Standard Report

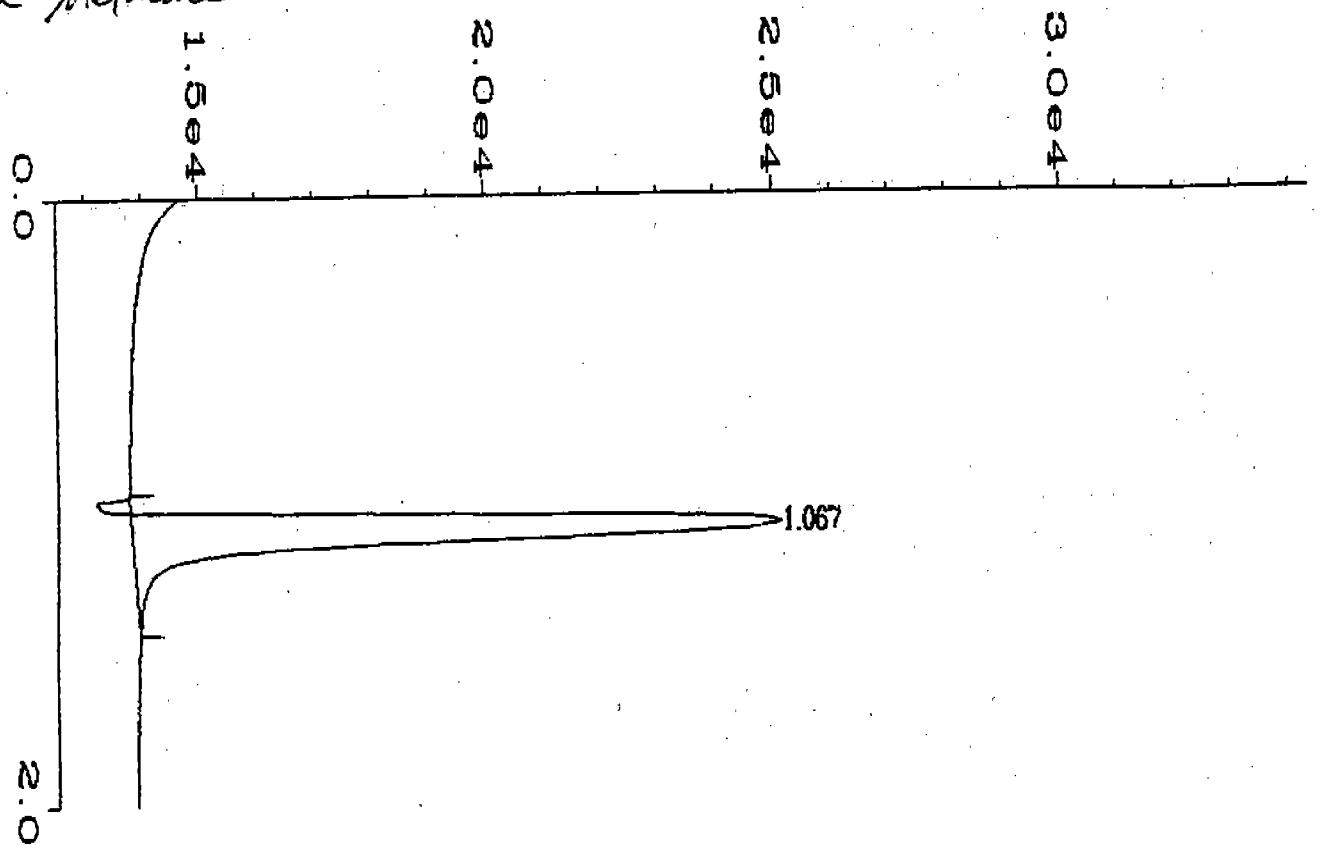
e File Name	: C:\HPCHEM\1\DATA\NV-F0539.D		
rator	:		
trument	: FID/FPD	Page Number	: 1
ple Name	:	Vial Number	:
Time Bar Code:		Injection Number	:
uired on	: 16 Dec 93 11:56 PM	Sequence Line	:
ort Created on:	16 Dec 93 11:59 PM	Instrument Method:	BFICHIC.MTH
Recalib on	: 14 DEC 93 08:31 PM	Analysis Method	: BFICHIC.MTH
tiplier	: 1	Sample Amount	: 0
		ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0539.D

Time	Area	Type	Width	Ref#	PPM	Name
1.061	63378	BB	0.092	1-R	93.349	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.070	1.061	-0.8%

2ml
Spin Methane
E3



External Standard Report

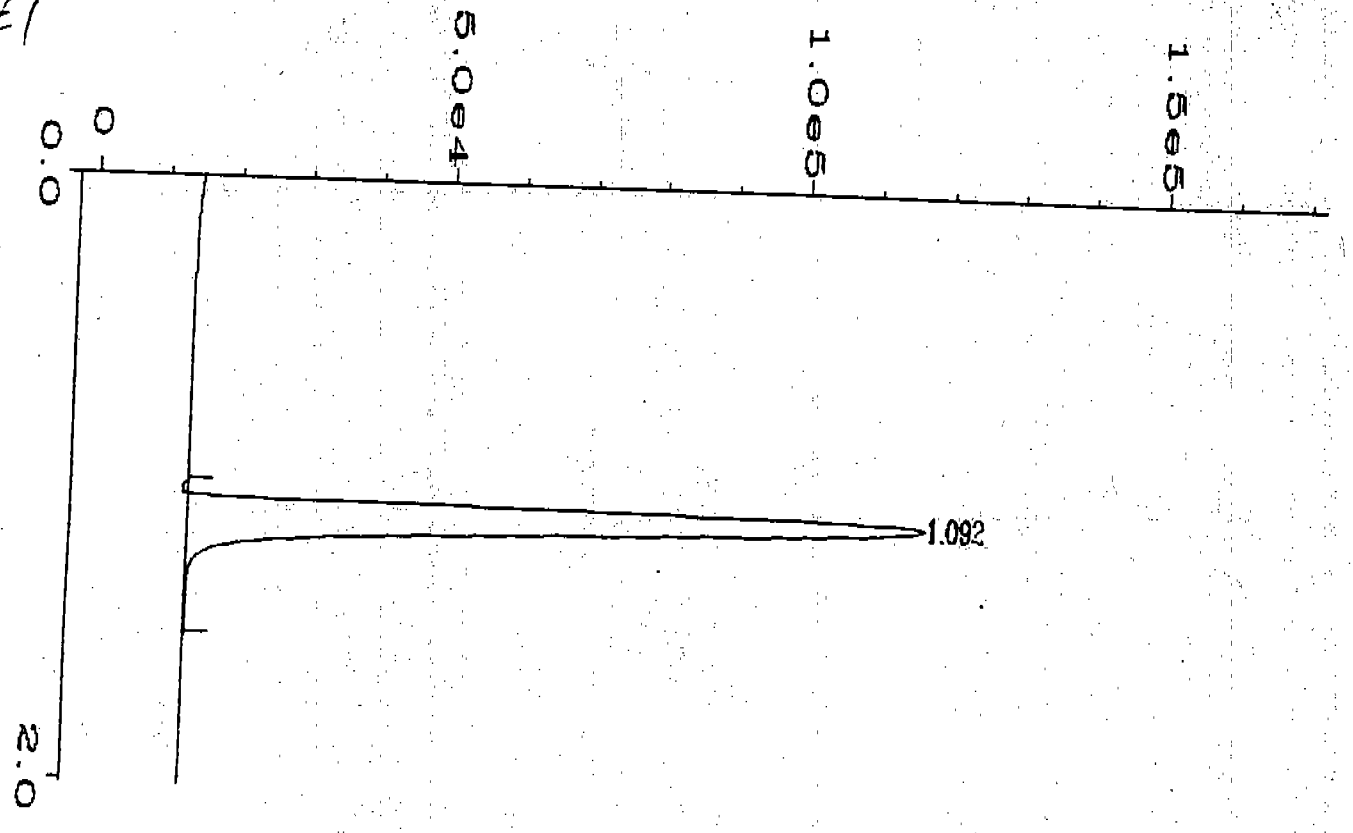
File Name	: C:\HPCHEM\1\DATA\NV-F0540.D		
ator	:	Page Number	: 1
rument	: FID/FPD	Vial Number	:
le Name	:	Injection Number	:
Time Bar Code	:	Sequence Line	:
ired on	: 17 Dec 93 00:00 AM	Instrument Method	: BFICHIC.MTH
t Created on	: 17 Dec 93 00:02 AM	Analysis Method	: BFICHIC.MTH
Recalib on	: 14 DEC 93 09:31 PM	Sample Amount	: 0
tplier	: 1	ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0540.D

Time	Area	Type	Width	Ref#	PPM	Name
.067	66142	BB	0.094	1-R	98.113	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.070	1.067	-0.3%

Lab
in Methane
#1



External Standard Report

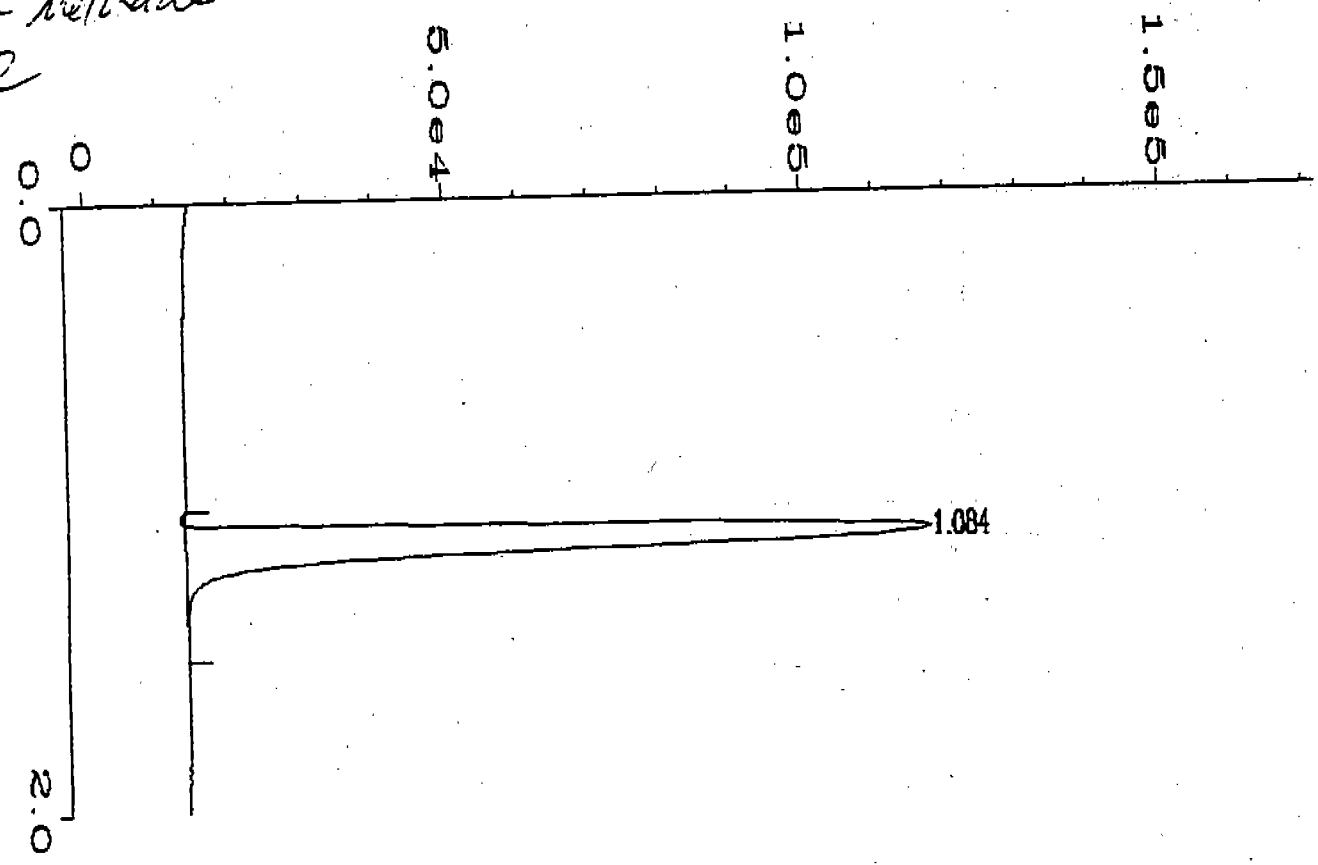
File Name	: C:\HPCHEM\1\DATA\NV-F0542.D		
ator	:		
rument	: FID/FPD	Page Number	: 1
le Name	:	Vial Number	:
Time Bar Code:		Injection Number	:
ured on	: 17 Dec 93 00:00 AM	Sequence Line	:
rt Created on:	17 Dec 93 00:11 AM	Instrument Method:	BFICHIC.MTH
Recalib on	: 14 DEC 93 08:31 PM	Analysis Method	: BFICHIC.MTH
iplier	: 1	Sample Amount	: 0
		ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0542.D

Time	Area	Type	Width	Ref#	PPM	Name
1.092	546093	BB	0.088	1-R	959.696	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.075	1.092	1.6%

Cal gas Methane #2



External Standard Report

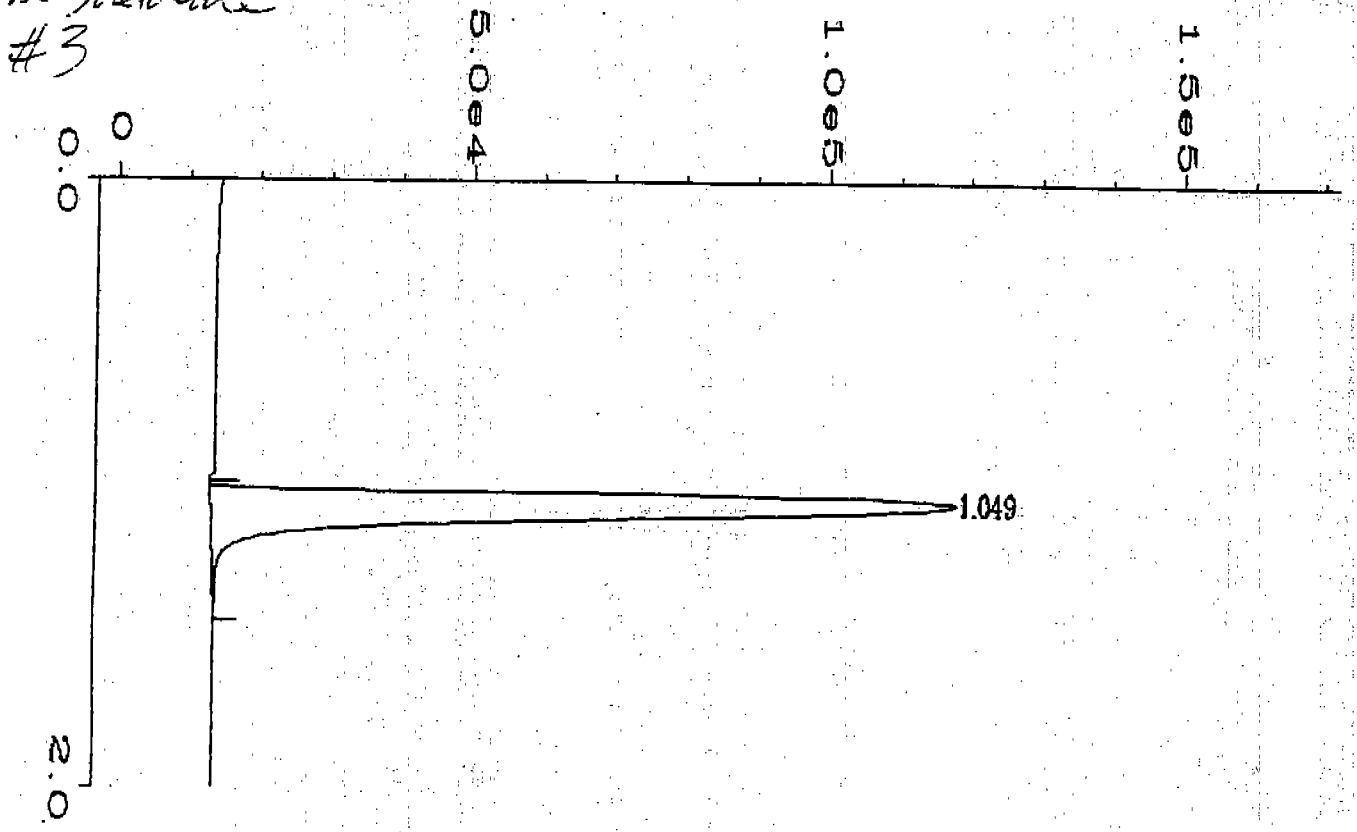
a File Name	: C:\HPCHEM\1\DATA\NV-F0543.D		
rator	:	Page Number	: 1
rument	: FID/FPD	Vial Number	:
ple Name	:	Injection Number	:
Time Bar Code:		Sequence Line	:
uired on	: 17 Dec 93 00:12 AM	Instrument Method	: BFICHIC.MTH
ort Created on	: 17 Dec 93 00:15 AM	Analysis Method	: BFICHIC.MTH
t Recelit on	: 14 DEC 93 08:31 PM	Sample Amount	: 0
tiplier	: 1	ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0543.D

Time	Area	Type	Width	Ref#	PPM	Name
1.084	570145	BB	0.089	1-R	966.678	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.075	1.084	0.8%

Cal
Gas Methane
#3



External Standard Report

Data File Name	: C:\HPCHEM\1\DATA\NV-F0544.D		
Operator	:	Page Number	: 1
Instrument	: FID/FPD	Vial Number	:
Sample Name	:	Injection Number	:
Time Event Code:		Sequence Line	:
Acquired on	: 17-Dec-93 08:16 AM	Instrument Method	: BFICHIC.MTH
Data Analyzed on	: 17 Dec 93 08:18 AM	Analysis Method	: BFICHIC.MTH
Quantitated on	: 14 DEC 93 08:31 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

1 in C:\HPCHEM\1\DATA\NV-F0544.D

Time	Area	Type	Width	Ref#	PPM	Name
1.049	582404	BB	0.090	1-R	987.804	METHANE

Time Reference Peak	Expected RT	Actual RT	Difference
1	1.075	1.049	-2.4%

APPENDIX D

V.E. OBSERVATION DATA AND CERTIFICATION SHEET

United States
Environmental Protection Agency
Region 1
Environmental Services Division

Certifies That
TIMOTHY J. SENGER

Meets the qualifications prescribed by the Code of Federal Regulations
Vol.40; Part 60, Method 9 for the evaluation of Visible Emissions
Issued this 5th Day of October 1993.

Director
Environmental Services Division

Course Instructor

This Certificate Expires April 5th 1994.

Visible Emission Observation Form

Company Name: BFI

Street Address: 845 Burnett Road

City: Chicopee | State: MA | Zip: 01020

Phone (key contact): (413) 592-8168 | Source ID Number: Stack #1

Process Equipment: Landfill gas fired generator | Operating Mode: Full

Control Equipment: Muffler | Operating Mode: Full/Normal

Describe Emission Point: Muffler Vent (Horizontal)

Height Above Ground Level: 23' | Height Relative to Observer: Start 17' End 17'

Distance from Observer: Start 100' End 100' | Direction from Observer: Start NW End NW

Describe Emissions: Start No Physical Char. End No Physical Char.

Emission Color: Start None End None | If Water Droplet Plume: Attached ☐ Detached ☐

Point in the Plume at which Opacity was Determined: Start End of outlet End End of outlet

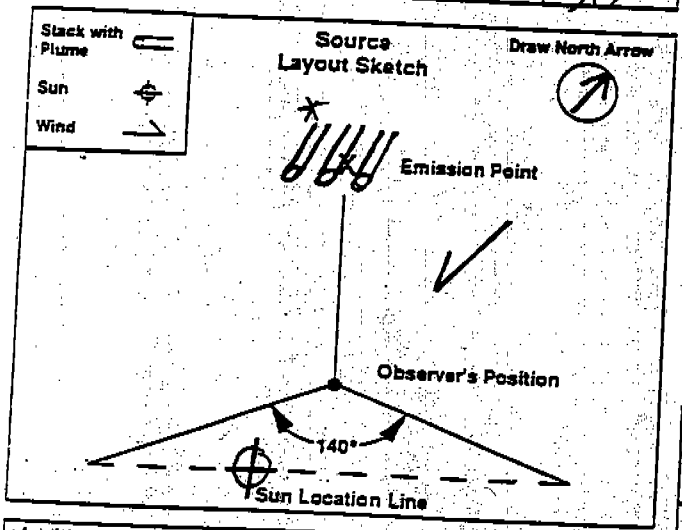
Describe Plume Background: Start Overcast White Sky End Overcast White Sky

Background Color: Start White End White | Sky Conditions: Start Overcast End Overcast

Wind Speed: Start 0 mph End 0 mph | Wind Direction: Start 0° N End 0° N

Ambient Temp: Start 45°F End 45°F | Wet Bulb Temp: 38°F | RH, Percent: 50

Source Layout Sketch



Observation date: 14 Dec 93 | Start Time: 1100 | End Time: 1130

MIN \ SEC	0	15	30	45	Comments
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (print): Timothy J. Senger

Observer's Signature: Timothy J. Senger | 14 Dec 93

Organization: TRC Environmental Corp

Certified By: EPA Region 1 | 5 Oct 93

Continued on VEO Form Number:

Additional Information: Stack #1 Run #1

Sheet 1 of 2

TRC

Visible Emission Observation Form

Company Name	BFI
Street Address	845 Burnett Road
City	Chicopee
State	MA
Zip	01020
Phone (key contact)	(413) 592-8168
Source ID Number	Stack #1

Process Equipment	Landfill gas fired generator
Operating Mode	Full
Control Equipment	Muffler
Operating Mode	Full/Normal

Describe Emission Point	Muffler Vent (Horizontal)
Height Above Ground Level	23'
Height Relative to Observer	Start 17' End 17'
Distance from Observer	Start 100' End 100'
Direction from Observer	Start NW End NW

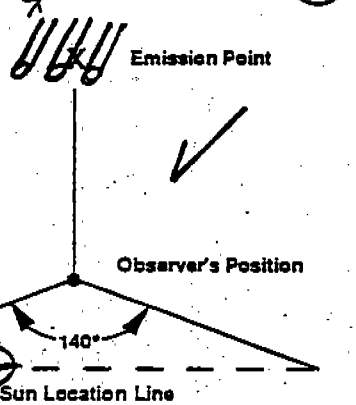
Describe Emissions	Start No Physical Char. End No Physical Char.
Emission Color	Start None End None
If Water Droplet Plume	Attached ☐ Detached ☐
Point in the Plume at which Opacity was Determined	Start End of outlet End End of outlet

Describe Plume Background	Start Overcast White Sky	End Overcast White Sky	
Background Color	Start White	End White	
Sky Conditions	Start Overcast	End Overcast	
Wind Speed	Start 10mph	End 15mph	
Wind Direction	Start 0° N	End 0° N	
Ambient Temp	Start 45°F	End 44°F	
Wet Bulb Temp	37°F		
RH, Percent	50		

Stack with Plume
Sun
Wind

Source Layout Sketch

Draw North Arrow



Additional Information	Stack #1 Run #1
	Sheet 2 of 2

Observation date	14 Dec 93		Start Time	1130	End Time	1200

SEC / MIN	0	15	30	45	Comments
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (print)	Timothy J. Senger	
Observer's Signature	Timothy J. Senger	14 Dec 93
Organization	TRC Environmental Corp.	
Certified By	EPA Region 1	5 Oct 93
Continued on VEO Form Number		

TRC

Visible Emission Observation Form

Company Name: BFI

Street Address: 845 Burnett Road

City: Chicopee | State: MA | Zip: 01020

Phone (key contact): (413) 592-8168 | Source ID Number: Stack #1

Process Equipment: Landfill gas fired generator | Operating Mode: Full

Control Equipment: Muffler | Operating Mode: Full/Normal

Describe Emission Point: Muffler Vent (Horizontal)

Height Above Ground Level: 23' | Height Relative to Observer: Start 17' End 17'

Distance from Observer: Start 100' End 100' | Direction from Observer: Start NW End NW

Describe Emissions: Start No Physical Char. End No Physical Char.

Emission Color: Start None End None | If Water Droplet Plume: Attached ☐ Detached ☐

Point in the Plume at which Opacity was Determined: Start End of outlet End End of outlet

Describe Plume Background: Start Overcast White Sky End Overcast White Sky

Background Color: Start White End White | Sky Conditions: Start Overcast End Overcast

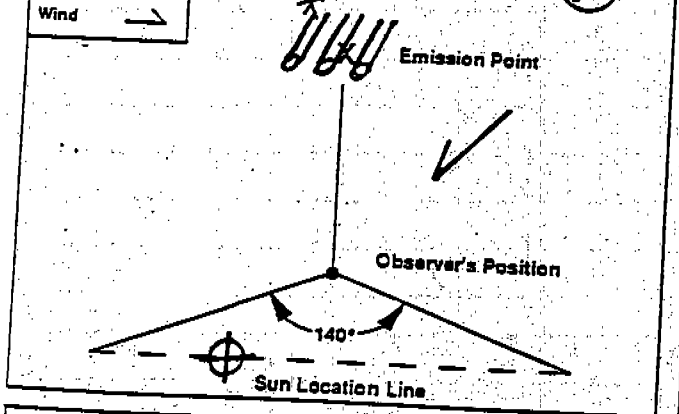
Wind Speed: Start 5mph End 15mph | Wind Direction: Start 0° N End 0° N

Ambient Temp: Start 44°F End 43°F | Wet Bulb Temp: 36°F | RH, Percent: 50

Stack with Plume ⟹ | Sun ⊕ | Wind →

Source Layout Sketch

Draw North Arrow



SEC / MIN	0	15	30	45	Comments
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27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observation date: 14Dec93 | Start Time: 1200 | End Time: 1230

Observer's Name (print): Timothy J. Senger

Observer's Signature: Timothy J. Senger | 14Dec93

Organization: TRC Environmental Corp.

Certified By: EPA Region 1 | 5 Oct 93

Additional Information: Stack #1 Run #2

Sheet 1 of 2

Continued on VEO Form Number:

TRC

Visible Emission Observation Form

Company Name	BFI
Street Address	845 Burnett Road
City	Chicopee
State	MA
Zip	01020
Phone (key contact)	(413) 592-8168
Source ID Number	Stack #1

Process Equipment	Landfill gas fired generator
Operating Mode	Full
Control Equipment	Muffler
Operating Mode	Full/Normal

Describe Emission Point	Muffler Vent (Horizontal)
Height Above Ground Level	23'
Height Relative to Observer	Start 17' End 17'
Distance from Observer	Start 100' End 100'
Direction from Observer	Start NW End NW

Describe Emissions	Start No Physical Char. End No Physical Char.
Emission Color	Start None End None
If Water Droplet Plume	Attached ☐ Detached ☐
Point in the Plume at which Opacity was Determined	Start End of outlet End End of outlet

Describe Plume Background	Start Overcast White Sky	End Overcast White Sky	
Background Color	Start White	End White	
Sky Conditions	Start Overcast	End Overcast	
Wind Speed	Start 15mph	End 15mph	
Wind Direction	Start 0° N	End 0° N	
Ambient Temp	Start 43°F	End 43°F	
Wet Bulb Temp	36°F		
RH, Percent	50		

Stack with Plume

Sun

Wind

Source Layout Sketch

Draw North Arrow

Emission Point

Observer's Position

140°

Sun Location Line

Additional Information	Stack #1 Run #2
	Sheet 2 of 2

Observation date	14 Dec 93	Start Time	1230	End Time	1300

SEC / MIN	0	15	30	45	Comments
1	0	0	0	0	
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26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (print)	Timothy J. Senger
Observer's Signature	Timothy J. Senger 14 Dec 93
Organization	TRC Environmental Corp.
Certified By	EPA Region 1 5 Oct 93
Continued on VEO Form Number	

TRC

Visible Emission Observation Form

Company Name: BFI

Street Address: 845 Burnett Road

City: Chicopee | State: MA | Zip: 01020

Phone (key contact): (413) 592-8168 | Source ID Number: Stack #1

Process Equipment: Landfill gas fired generator | Operating Mode: Full

Control Equipment: Muffler | Operating Mode: Full / Normal

Describe Emission Point: Muffler Vent (Horizontal)

Height Above Ground Level: 23' | Height Relative to Observer: Start 17' End 17'

Distance from Observer: Start 100' End 100' | Direction from Observer: Start NW End NW

Describe Emissions: Start No Physical Char. End No Physical Char.

Emission Color: Start None End None | If Water Droplet Plume: Attached ☐ Detached ☐

Point in the Plume at which Opacity was Determined: Start End of outlet End End of outlet

Describe Plume Background: Start Overcast White Sky End Overcast White Sky

Background Color: Start White End White | Sky Conditions: Start Overcast End Overcast

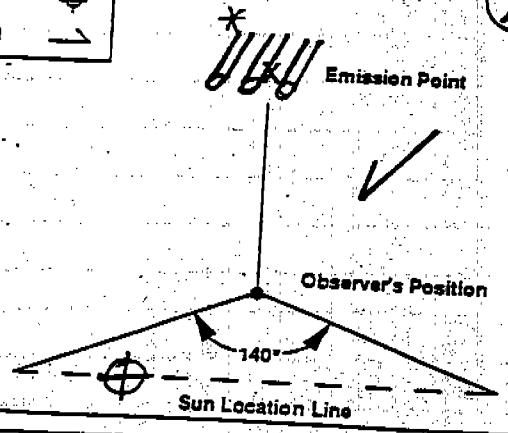
Wind Speed: Start 15mph End 15mph | Wind Direction: Start 0° N End 0° N

Ambient Temp.: Start 43°F End 42°F | Wet Bulb Temp: 35°F | RH, Percent: 50

Stack with Plume ⟹ | Sun ⊕ | Wind →

Source Layout Sketch

Draw North Arrow ↑



Observation date: 14 Dec 93	Start Time: 1300	End Time: 1330

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26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (print): Timothy J. Senger

Observer's Signature: Timothy J. Senger | 14 Dec 93

Organization: TRC Environmental Corp.

Certified By: EPA Region 1 | 5 Oct 93

Additional Information: Stack #1 Run #3

Sheet 1 of 2

Continued on VEO Form Number

TRC

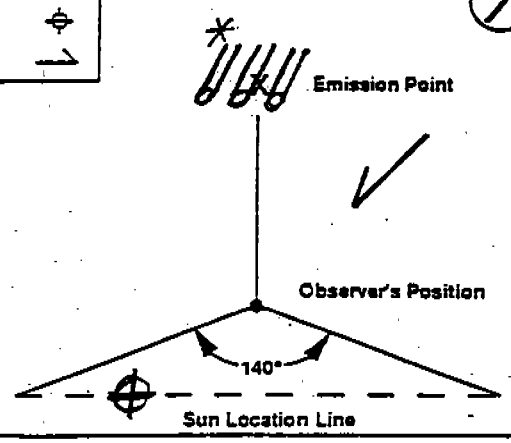
Visible Emission Observation Form

Company Name	BFI
Street Address	845 Burnett Road
City	Chicopee
State	MA
Zip	01020
Phone (key contact)	(413) 592-8168
Source ID Number	Stack #1
Process Equipment	Landfill gas fired generator
Operating Mode	Full
Control Equipment	Muffler
Operating Mode	Full/Normal
Describe Emission Point	Muffler Vent (Horizontal)
Height Above Ground Level	23'
Height Relative to Observer Start	17'
Height Relative to Observer End	17'
Distance from Observer Start	100'
Distance from Observer End	100'
Direction from Observer Start	NW
Direction from Observer End	NW
Describe Emissions Start	No Physical Char.
Describe Emissions End	No Physical Char.
Emission Color Start	None
Emission Color End	None
If Water Droplet Plume	Attached ☐ Detached ☐
Point in the Plume at which Opacity was Determined Start	End of outlet
Point in the Plume at which Opacity was Determined End	End of outlet
Describe Plume Background Start	Overcast White Sky
Describe Plume Background End	Overcast White Sky
Background Color Start	White
Background Color End	White
Sky Conditions Start	Overcast
Sky Conditions End	Overcast
Wind Speed Start	5mph
Wind Speed End	10mph
Wind Direction Start	0° N
Wind Direction End	0° N
Ambient Temp. Start	42°F
Ambient Temp. End	43°F
Wet Bulb Temp	36°F
RH, Percent	50

Stack with Plume
Sun
Wind

Source Layout Sketch

Draw North Arrow



Observation date	14 Dec 93	Start Time	1330	End Time	1400	

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26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (print)	Timothy J. Senger	
Observer's Signature	Timothy J. Senger	14 Dec 93
Organization	TRC Environmental Corp.	
Certified By	EPA Region 1	5 Oct 93

Additional Information: Stack #1 Run #3

Sheet 2 of 2

Continued on VEO Form Number

TRC

APPENDIX E

FACILITY PROCESS DATA

	A	B	C	D	E	F	G	H
1	MAIN FUEL STATIC PSIG	MAIN FUEL DIFF. IN H2O	MAIN FUEL FLOW TEMP. ° F	MAIN FUEL FLOW CFM	MAIN FUEL FLOW MMBTU/HR	TOTAL FUEL FLOW MMBTU/HR	COMBINED GENERATOR KW	STATION AMBIENT ° F
	10.9	18.10	78.0	706	22.178	22.954	3081	42.5
2	PRECHAMBER FUEL PSIG	PRECHAMBER FUEL "H2O-DIFF.	PRECHAMBER FUEL ° F	PRECHAMBER FUEL FLOW CFM	PRECHAMBER FUEL FLOW MMBTU/HR	EXPORT HEAT RATE BTU/KW-HR	ENGINE HEAT RATE BTU/KW-HR	GEN SETS LOAD LEVELS
	50.1	13.6	53.8	25	0.776	7749	7451	
3	STATION EXPORT kW	EXPORTED POWER kW-HR	STATION PARASITIC kW	PARASITIC POWER kW-HR	LANDFILL GAS BTU DRY	LANDFILL GAS BTU SAT'D	LANDFILL GAS S. GRAVITY	LANDFILL GAS COMPR'BLTY
	2962	28396.94	121	1409.05	532.9	523.8	0.982	0.997
4	STATION FUEL PROCESSING GRAPHIC	STATION ENGINE GENERATOR GRAPHIC	UNIT #1 ENGINE GENERATOR GRAPHIC	UNIT #2 ENGINE GENERATOR GRAPHICS	UNIT #3 ENGINE GENERATOR GRAPHICS	Unit #1 LOAD kW	Unit #2 LOAD kW	Unit #3 LOAD kW
						1027.1	1021.8	1026.8
5	LANDFILL SUCTION "HG	LANDFILL SUCTION IN H20	OUTPUT TO VFD PSIG	SETPOINT TO VFD PSIG	TOTAL FUEL FLOW/DAY MMBTU	ENGINE #1 HORSEPOWER HP	ENGINE #2 HORSEPOWER HP	ENGINE #3 HORSEPOWER HP
	-0.5	-6.8	0.0	11.5	220.90	1449	1441	1448
6	PLANT PROCESS GROUP	COMPRESSOR DISCHARGE PSIG	OUTPUT TO BYPASS	SETPOINT TO BYPASS	MAIN UTILITY BREAKER	UNIT#1 52A BREAKER	UNIT#2 52A BREAKER	UNIT#3 52A BREAKER
		12.9	21.5	13.0	CLOSED	CLOSED	CLOSED	CLOSED

Page 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 Scanning...

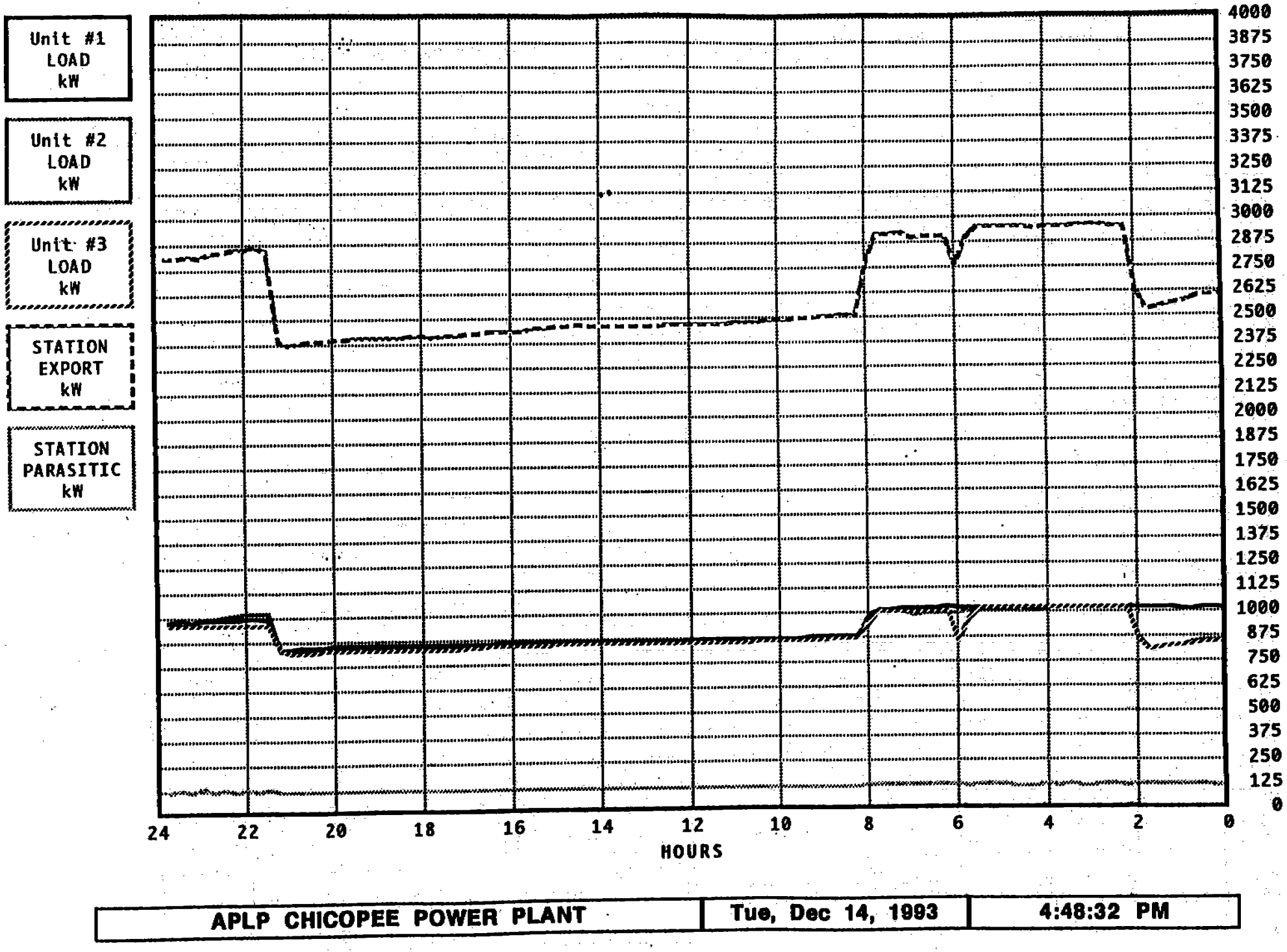
APLP CHICOPEE POWER PLANT | Tue, Dec 14, 1993 | 10:37:40 AM

	A	B	C	D	E	F	G	H
1	MAIN FUEL STATIC PSIG	MAIN FUEL DIFF. IN H2O	MAIN FUEL FLOW TEMP. ° F	MAIN FUEL FLOW CFM	MAIN FUEL FLOW MMBTU/HR	TOTAL FUEL FLOW MMBTU/HR	COMBINED GENERATOR KW	STATION AMBIENT ° F
	11.2	14.70	78.4	644	20.275	21.080	2732	45.5
2	PRECHAMBER FUEL PSIG	PRECHAMBER FUEL "H2O-DIFF.	PRECHAMBER FUEL ° F	PRECHAMBER FUEL FLOW CFM	PRECHAMBER FUEL FLOW MMBTU/HR	EXPORT HEAT RATE BTU/KW-HR	ENGINE HEAT RATE BTU/KW-HR	GEN SETS LOAD LEVELS
	41.0	17.0	52.9	26	0.804	7988	7717	
3	STATION EXPORT kW	EXPORTED POWER kW-HR	STATION PARASITIC kW	PARASITIC POWER kW-HR	LANDFILL GAS BTU DRY	LANDFILL GAS BTU SAT'D	LANDFILL GAS S. GRAVITY	LANDFILL GAS COMPR'BLTY
	2639	45073.66	124	2177.52	533.5	524.4	0.982	0.997
4	STATION FUEL PROCESSING GRAPHIC	STATION ENGINE GENERATOR GRAPHIC	UNIT #1 ENGINE GENERATOR GRAPHIC	UNIT #2 ENGINE GENERATOR GRAPHICS	UNIT #3 ENGINE GENERATOR GRAPHICS	Unit #1 LOAD kW	Unit #2 LOAD kW	Unit #3 LOAD kW
						1021.5	881.4	855.1
5	LANDFILL SUCTION "HG	LANDFILL SUCTION IN H20	OUTPUT TO VFD PSIG	SETPOINT TO VFD PSIG	TOTAL FUEL FLOW/DAY MMBTU	ENGINE #1 HORSEPOWER HP	ENGINE #2 HORSEPOWER HP	ENGINE #3 HORSEPOWER HP
	-0.5	-6.4	0.0	11.5	347.48	1441	1243	1206
6	PLANT PROCESS GROUP	COMPRESSOR DISCHARGE PSIG	OUTPUT TO BYPASS	SETPOINT TO BYPASS	MAIN UTILITY BREAKER	UNIT#1 52A BREAKER	UNIT#2 52A BREAKER	UNIT#3 52A BREAKER
		12.9	10.6	13.0	CLOSED	CLOSED	CLOSED	CLOSED

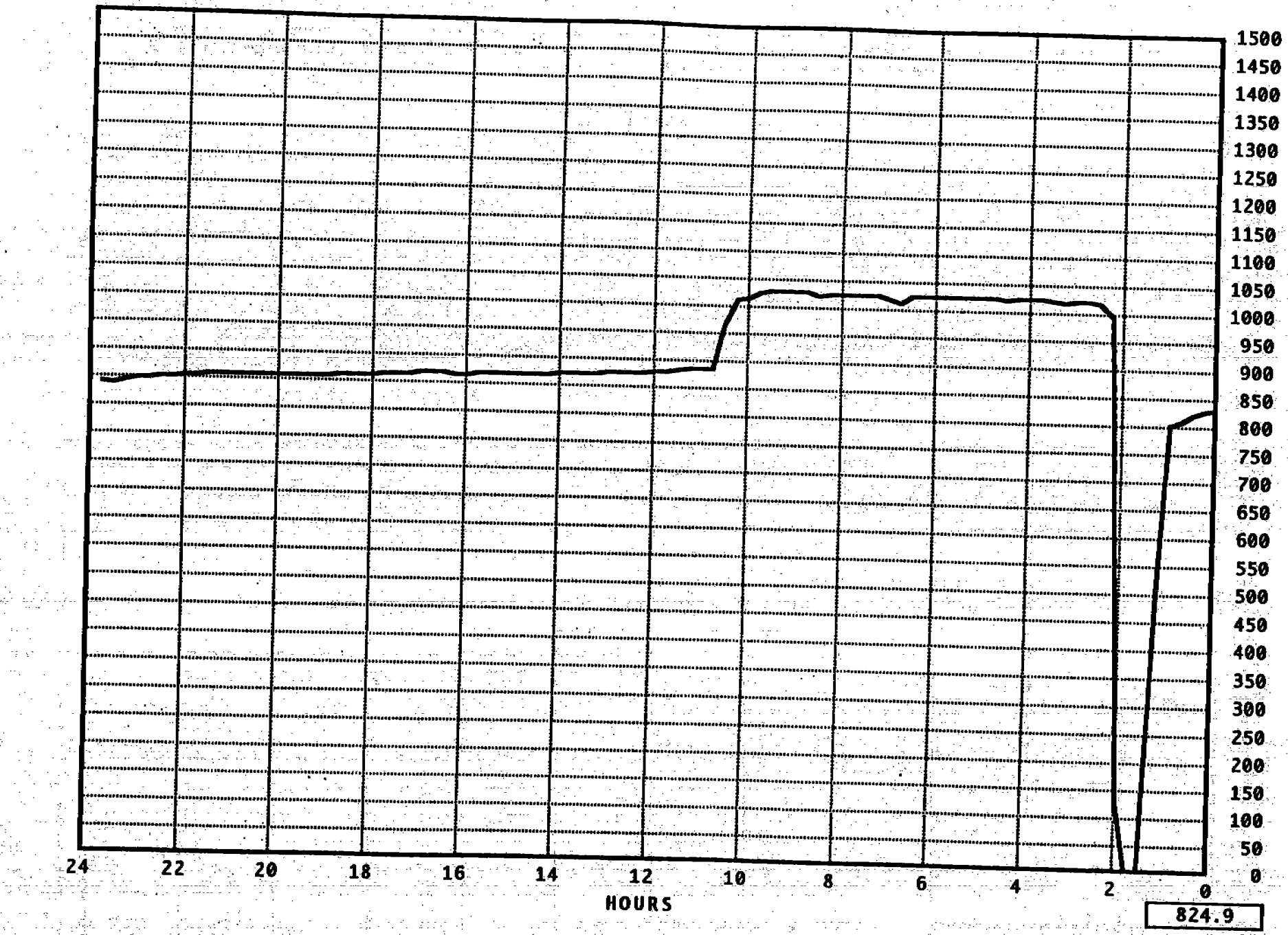
Page 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 Scanning...

Total load = 2758

APLP CHICOPEE POWER PLANT | Tue, Dec 14, 1993 | 4:47:18 PM



APLP CHICOPEE POWER PLANT	Tue, Dec 14, 1993	4:48:32 PM



APLP CHICOPEE POWER PLANT	Tue, Dec 14, 1993	7:25:00 PM

APPENDIX F

CALIBRATION SHEETS

Dry Gas Meter Calibration

Calibrated By Scott Tibbetts

Barometric Pressure, Pb= 30.18 in. Hg

Date 1/12/94

Meter Box No. 8130

Orifice manometer setting ΔH, in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry test meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Temperature: Dry gas meter Outlet t_{do}, °F	Temperature: Dry gas meter Average t_d, °F	Time θ, °F	Y	ΔHə	Deviation Y	Deviation ΔHə
0.5	5.67	6.013	67.3	87.9	84	85.95	15	.975	1.879	0.000	-.062
1.0	7.893	8.398	67.3	91	85	88	15	.974	1.935	-.001	-.006
2.0	10.955	11.636	67.3	93.5	85	89.4	15	.976	2.009	+.001	+.068
							Average	.975	1.941		

Calculations

Y	ΔHə
$\frac{V_w \; P_b \; (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\frac{0.0317 \; \Delta H}{P_b(t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$

Y = Ratio of accuracy of wet test meter to dry test meter.
Tolerance = ± 0.01

ΔHə = Orifice pressure differential that gives 0.75 cfm of air as 68° F and 29.92 inches of mercury, in. H_2O.
Tolerance = ± 0.15

METER BOX CALIBRATION WORKSHEET

Time Minutes	Inlet Temp.	Outlet Temp.	Meter Box Ser. # 8130	Date 1/12/21
0	87	84	DGM Serial #	BAR Press (PB) 30.15
2	88	84	ΔH (5) 1.0 2.0	Calibrated by
4	85	84		BT
6	86	84	Final DGM 682.002	Final WTM 7880.545
8	85	84	Initial DGM 675.989	Initial WTM 7874.845
10	85	84	Net DGM	Net WTM
12	88	84	6.013	5.67
14	88	84	Vac. in. HG.	Average DGM Temperature
15	88	84	4	85.45 (545.45)
Avg.	87.9	84 (544)	$y = \frac{5.67 \times 30.18 \times 545.45}{6.013 \times (30.15 + \frac{4}{13.6}) \times 527.3} = .975$ (.97)	
			$\Delta H = \frac{.0317 \times .5}{30.18 \times 544} \left[\frac{527.3 \times 15}{5.67}\right]^2 = 1.879$	
		Wet Test Meter Temperature		67.3 (527.3)
		Total Time, minutes; seconds		15.0

Calculations

Y	ΔHa
$\frac{V_w \; P_b \; (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right) (t_w + 460)}$	$\frac{0.0317 \; \Delta H}{P_b(t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$

METER BOX CALIBRATION WORKSHEET

Time Minutes	Inlet Temp.	Outlet Temp.	Meter Box Ser. # 5130	Date 1/12/94
0	91	85	DGM Serial #	BAR Press (PB) 30.15
2	91	85	ΔH .5 (1.0) 2.0	Calibrated by
4	91	85		87
6	91	85	Final DGM 674.214	Final WTM 7873.175
8	91	85	Initial DGM 665.816	Initial WTM 7865.282
10	91	85	Net DGM	Net WTM
12	91	85	8.398	7.893
14	91	85	Vac. in. HG.	Average DGM Temperature
15	91	85	4	88 (548)
Avg.	91	85	$y = \frac{7.893 \times 30.15 \times 545}{8.398 \times (30.15 + 13.6) \times 527.3} = .974$	
		545		
			$\Delta H = \frac{.0317}{30.15 \times 545} \left[\frac{527.3 \times 15}{7.893}\right]^2 = 1.135$	
		Wet Test Meter Temperature	67.3 (527.3	
		Total Time, minutes; seconds	15.0	

Calculations

Y	ΔHθ
$\frac{V_w \; P_b \; (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right) (t_w + 460)}$	$\frac{0.0317 \; \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$

METER BOX CALIBRATION WORKSHEET

Time Minutes	Inlet Temp.	Outlet Temp.	Meter Box Ser. # 8130	Date 1/12/94
0	92	85	DGM Serial #	BAR Press (PB) 30.18
2	92	85	ΔH .5 1.0 (2.0)	Calibrated by 87
4	93	85		
6	94	85	Final DGM 663.592	Final WTM 756 3.48
8	94	85	Initial DGM 652.256	Initial WTM 745 2.525
10	94	85	Net DGM	Net WTM
12	95	85	11.636	10.955
14	95	85	Vac. in. HG.	Average DGM Temperature
15	95	85	4	84.4 (544.4)
	93.8	85	$y = \frac{10.955 \times 30.15 \times 544.4}{11.636 \times (30.15 - \frac{2}{13.6}) \times 527.3} = .976$	
		545		
			$\Delta H = \frac{.0317 \times 2}{30.15 \times 545} \left[\frac{527.3 \times 15}{10.955}\right]^2 = 2.09$	
		Wet Test Meter Temperature	67.3 (527.3)	
		Total Time, minutes; seconds	15.0	

Calculations

Y	ΔHa
$\frac{V_w \; P_b \; (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right) (t_w + 460)}$	$\frac{0.0317 \; \Delta H}{P_b(t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$

Thermocouple Calibration Form

Thermocouple Number	Temperature Reading 1	Reference Temperature 1	Temperature Reading 2	Reference Temperature 2	Temperature Reading 3	Reference Temperature 3
Meter Box S.N = 5130						
1	33°	32° F	75°	75° F	1500°	1500° F
2	32°	32° F	75°	75° F	1499°	1500° F
3	32°	32° F	75°	75° F	1501°	1500° F
4	32°	32° F	75°	75° F	1501°	1500° F
5	33°	32° F	75°	75° F	1500°	1500° F

[signature] 1/12/94

Signature of Person Performing Calibration

Calibration Date

Dry Gas Meter Calibration

Calibrated By S. T. Hoffs

Date 11/24/93

Barometric Pressure, Pb= 30.54 in. Hg

Meter Box No. 5130

Orifice manometer setting ΔH, in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry test meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Temperature: Dry gas meter Outlet t_{do}, °F	Temperature: Dry gas meter Average t_d, °F	Time θ, min	Y	ΔHa	Deviation Y	Deviation ΔHa
.75	5.755	6.057	64.2	83	78	80.5	15	.98	1.90	.00	.08
1.0	7.93	8.31	64.2	84.8	77.1	80.9	15	.98	1.89	.00	.01
2.0	11.087	11.582	64.2	85.9	74.8	80.3	15	.98	1.95	.00	.07
						Average		.98	1.85		

Calculations

Y	ΔHa
$\frac{V_w \; P_b \; (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right) (t_w + 460)}$	$\frac{0.0317 \; \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$

Y = Ratio of accuracy of wet test meter to dry test meter.
Tolerance = ± 0.01

ΔHa = Orifice pressure differential that gives 0.75 cfm of air as 68° F and 29.92 inches of mercury, in. H_2O.
Tolerance = ± 0.15

METER BOX CALIBRATION WORKSHEET

Time Minutes	Inlet Temp.	Outlet Temp.	Meter Box Ser. # 8130	Date 11/24
0	82	78	DGM Serial #	BAR Press (PB) 30.54
2	83	78	Δ H (.5) 1.0 2.0	Calibrated by
4	83	78		SJ
6	83	78	Final DGM 846.244	Final WTM 5909.580
8	83	78	Initial DGM 840.187	Initial WTM 5903,825
10	84	78	Net DGM	Net WTM
12	83	78	6057	5.755
14	83	78	Vac. in. HG.	Average DGM Temperature
15	83	78	4	80.5 (540.5)
Avg.	83	78	$y = \frac{(5.755)(30.54)(540.5)}{(6.057)(30.54 - \frac{4}{13.6})(524.2)} = .979$	
		538		
			$\Delta H = \frac{.0317(5)}{30.54 \times 538}\left[\frac{524.2(15)}{5.755}\right]^2 = 1.80$	
		Wet Test Meter Temperature	64.2 (524.2)	
		Total Time, minutes; seconds	15.0	

Calculations

Y	ΔH@
$\frac{V_w \; P_b \; (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)\left(t_w + 460\right)}$	$\frac{0.0317 \; \Delta H}{P_b(t_d + 460)}\left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$

METER BOX CALIBRATION WORKSHEET

Time Minutes	Inlet Temp.	Outlet Temp.	Meter Box Ser. # 8130	Date 11/24
0	82	76	DGM Serial #	BAR Press (PB) 30.54
2	84	77	ΔH .5 (1.0) 2.0	Calibrated by SJ
4	85	77		
6	85	77	Final DGM 839.64	Final WTM 5903.314
8	85	77	Initial DGM 831.332	Initial WTM 5895.380
10	85	77	Net DGM 8.308	Net WTM 7.934
12	85	77		
14	86	78	Vac. in. HG. 4	Average DGM Temperature 80.94 (540.94)
15	86	78		
	84.78	77.1	$y = \frac{7.934 \times 30.54 \times 540.94}{8.308 \times (30.54 \times \frac{1}{13.6}) \times 524.2} = .983$	
		537.1		
			$\Delta H = \frac{.0317(1)}{30.54 \times 537.1}\left[\frac{524.2 \times 15}{7.934}\right]^2 = 1.898$	
		Wet Test Meter Temperature	64.2 (524.2)	
		Total Time, minutes; seconds	15.0	

Calculations

Y	ΔHa@
$\frac{V_w \; P_b \; (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\frac{0.0317 \; \Delta H}{P_b(t_d + 460)}\left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$

METER BOX CALIBRATION WORKSHEET

Time Minutes	Inlet Temp.	Outlet Temp.	Meter Box Ser. # 8130	Date 11/24
0	81	73	DGM Serial #	BAR Press (PB) 30.54
2	84	74	ΔH .5 1.0 (2.0)	Calibrated by
4	85	74		87
6	86	74	Final DGM 530.214	Final WTM 5894.316
8	87	75	Initial DGM 518.632	Initial WTM 5883.229
10	87	75	Net DGM	Net WTM
12	87	76	11.582	11.087
14	86	76	Vac. in. HG.	Average DGM Temperature
15	86	76	4	80.34 (540.34)
Avg.	85.86	74.75	$y = \frac{11.087 \times 30.54 \times 540.34}{11.582(30.54 + \frac{2}{13.6}) \times 524.2} = .982$	
		534.75		
			$\Delta H = \frac{.0317(2)}{30.54 \times 534.75}\left[\frac{524.2 \times 15}{11.087}\right]^2 = 1.953$	
		Wet Test Meter Temperature	64.2 (524.2)	
		Total Time, minutes; seconds	15.0	

Calculations

Y	ΔH@
$\frac{V_w \; P_b \; (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$	$\frac{0.0317 \; \Delta H}{P_b(t_d + 460)}\left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$

Thermocouple Calibration Form

Thermocouple Number	Temperature Reading 1	Reference Temperature 1	Temperature Reading 2	Reference Temperature 2	Temperature Reading 3	Reference Temperature 3
SN9130						
1	32°F	32°F	74°	75°F	1501°	1500°F
2	33°F	32° F	77°	75°F	1502°	1500 F
3	32°	32° F	75°	75°F	1503°	1500 F
4	32°	32° F	74°	75°F	1502°	1500 F

Signature of Person Performing Calibration

Calibration Date