BFI, Richmond
LEG 37 EFD 68 AP42 (5)

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

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

...NAL REPORT FOR
...STING OF
...ERATORS

THREE WA...

Browning-Ferris Gas Services, Inc.
Richmond, VA

...ary, 1991

This report is intended for ...
documents between TRC E...
and reports generated by TR...
The information, statements ...
and contract terms and condit...
persons or entities who were n...
expressly disclaims any liabilit...
any way or for any purpose.

...ified
...d in the contract.
...nce with the work statement
...ns and/or may be misinterpreted by third
...n process. TRC Environmental Corporation therefore
...ng-Ferris Gas Services, Inc. who may use or rely upon this report

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLES

FIGURES

SECTION 1
INTRODUCTION

1.1 OVERVIEW

TRC Environmental Corporation, under contract to Browning-Ferris Gas Services, Inc., (BFGSI) conducted on February 15 - 16, 1994, an emissions compliance test program on three Waukesha engine generators. These engine generators are located at BFGSI's Richmond, Virginia facility. This compliance test program determined the gaseous pollutant and visible emission rates from each engine generator. This compliance test program also determined the total accumulated time that visible emissions, as smoke, were present during a two hour test period from the landfill flare. 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 Richmond 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, visible emission observation data and certification sheet, facility process data, and calibration sheets.

SECTION 2
SUMMARY OF RESULTS

This section presents a summary of the emission testing results on the three Waukesha engine generators at BFGSI's Richmond, VA facility. The field sampling data sheets are located in Appendix A. Continuous emissions monitoring data can be found in Appendix B. The engine visible observation data and certification sheet can be found in Appendix C. The flare visible observation data 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 stacks of three Waukesha engine generators resulting in a total of nine test runs. Each engine is designed to produce 1025 Kilowatts per hour (KW/hr). The emission results for NO_x for each series of three test runs are presented in terms of parts per million (ppm), pounds per hour (lbs/hr), grams per horse power hour (gm/HP-hr) and tons per year (tons/yr). The results for Engine #1 (Serial Number C-11033/2) are presented in Table 2-1. The results for Engine #2 (Serial Number C-10812/3) are presented in Table 2-2 and the results for Engine #3 (Serial Number C-10622/7) are presented in Table 2-3. Sampling parameters and flow rates obtained during each test run are presented in Tables 2-4 through 2-6. The field data sheets can be found in Appendix A and the continuous emissions monitoring data can be found in Appendix B.

2.2 VISIBLE EMISSIONS RESULTS

One 60-minute V.E. test run was conducted February 15, 1994 on the three engine generators. Readings were obtained from the flue gas exiting each stack. The overall percent opacity for each engine was 0. Tables 2-7 through 2-9 presents the average opacity recorded during each observation test run. The visible emissions data summary for each run can be found in Appendix C as well as the field data recordings and certification sheet.

TABLE 2-1. BFI RICHMOND ENGINE #1 EMISSIONS AVERAGES

(Engine Serial Number C-11033/2)

TEST RUN	DATE	STACK FLOW RATE (dscfm)	HORSE POWER	NOx (ppm)	EMISSION NOx (lbs/hr)	EMISSION NOx (gm/HP.hr)	EMISSION NOx (tons/yr)*
Run 1	02/15/94	3,554	2,775	71.8	1.83	0.30	8.01
Run 2	02/15/94	3,460	2,781	63.2	1.57	0.26	6.86
Run 3	02/15/94	3,551	2,777	62.3	1.58	0.26	6.94
AVERAGE		3,522	2,778	65.8	1.66	0.27	7.27

NOTE: Horsepower In Calculation ((Fuel Flow Final (CFM) - Fuel Flow Initial (CFM)) / Process Run Time (min)) * 60 min/hr * BTU SATD / 2545.1 BTU/HP

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

See next page for details on calcs.

Fuel ER = 638 ft³/min ; 566 BTU/ft³

$$\frac{638 \times 566 \times 60}{10^6} = 21.667$$

NO_x EF = 1.66/21.667 = 7.66×10^{-2} lb/mmBTU

Overall avg (pg 5) = 8.97×10^{-2} lb/MMBtu

.. normalize to 3% O_2 avg O_2 = 9.57 avg NOx conc = 70.0 ppm

$$70\text{ppm} \times \left[\frac{20.9-3}{20.9-9.57}\right] = 110.6\text{ppm}$$

$$\frac{C_1}{C_2} = \frac{ER_1}{ER_2} \qquad ER_2 = \frac{ER_1 C_2}{C_1} = 3\ \frac{(8.97\times10^{-2})\,110.6}{70.0} = 0.142\ \frac{lb}{MMBtu}$$

TABLE 2-2. BFI RICHMOND ENGINE #2 EMISSIONS AVERAGES

(Engine Serial Number C-10812/3)

TEST RUN	DATE	STACK FLOW RATE (dscfm)	HORSE POWER	NOx (ppm)	EMISSION NOx (lbs/hr)	EMISSION NOx (gm/HP-hr)	EMISSION NOx (tons/yr)*
Run 4	02/16/94	3,510	2,770	107.1	2.69	0.44	11.79
Run 5	02/16/94	3,474	2,659	73.1	1.82	0.31	7.97
Run 6	02/16/94	3,551	2,659	76.7	1.95	0.33	8.55
AVERAGE		3,512	2,696	85.6	2.15	0.36	9.44

NOTE: Horsepower In Calculation ((Fuel Flow Final (CFM) - Fuel Flow Initial (CFM)) / Process Run Time (min)) * 60 min/hr * BTU SATD / 2545.1 BTU/HP

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

avg. Fuel FR = 636 ft³/min ; 559 BTU/ft³

$$\frac{6360\ ft^3\ LFG}{min} \times \frac{559\ BTU}{ft^3\ LFG} \times \frac{60\ min}{hr} \times \frac{MMBTU}{10^6\ BTU} = 21.331\ MMBTU/hr.$$

Avg. Fuel rate = 220 cfm (pg. 15)

CH_4 rate = (220)(.56) = 123.2 scfm

(123.2)(909)(60)(10^{-6}) = 6.719 MMBTU/hr

↑ CH_4 Heat Value (pg. 15)

$$NO_x\ EF = \frac{2.15\ lbs/hr}{21.331\ MMBTU/HR} = 1.01 \times 10^{-1}\ lb/MMBTU.$$

641
637
635.5
636

TABLE 2-3. BFI RICHMOND ENGINE #3 EMISSIONS AVERAGES

(Engine Serial Number C-10622/7)

TEST RUN	DATE	STACK FLOW RATE (dscfm)	HORSE POWER	NOx (ppm)	EMISSION NOx (lbs/hr)	EMISSION NOx (gm/HP-hr)	EMISSION NOx (tons/yr)*
Run 7	02/16/94	3,527	2,543	57.5	1.45	0.26	6.36
Run 8	02/16/94	3,537	2,691	62.2	1.58	0.27	6.90
Run 9	02/16/94	3,487	2,664	55.9	1.40	0.24	6.12
AVERAGE		3,517	2,633	58.5	1.47	0.25	6.46

SPREADSH.WK1

NOTE: Horsepower In Calculation $\frac{\text{(Fuel Flow Final (CFM) - Fuel Flow Initial (CFM)) / Process Run Time (min)) * 60 min/hr * BTU SATD}}{\text{2545.1 BTU/HP}}$

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

Fuel FF = 198.5
619.5
618.0
479.

1559 BTU/ft³

$$\frac{479 \times 559 \times 60}{10^6} = 16.066 \text{ MMBTU/HR}$$

$$NO_x EF = \frac{1.47}{16.066} = 9.15 \times 10^{-2} \text{ lb/MMBTU}$$

$$\text{Overall avg. } NO_x EF = \frac{0.0766 + 0.101 + .0915}{3} = \frac{8.97 \times 10^{-2} \text{ lb}}{\text{MMBTU.}}$$

TABLE 2.4.

METHOD 4/CEM SAMPLING PARAMETERS - ENGINE #1

	Engine No. 1	Engine No. 1	Engine No. 1	
Run No.	1	2	3	
Date	15-Feb-94	15-Feb-94	15-Feb-94	
Start Time	09:30	12:35	14:05	
Stop Time	10:30	13:05	14:35	AVERAGES
Barometric Pressure, in. Hg	30.06	30.06	30.06	30.06
Net Sampling Time, minutes	30.0	30.0	30.0	30.0
Volume Metered, cf	21.697	22.105	22.113	21.972
Avg. DGM Temp, F	71	79	86	78
AVG Delta H, in of H2O	2.00	1.98	2.00	1.99
AVG Delta H, in of Hg	0.1471	0.1458	0.1471	0.1467
DGM Calibration Factor	1.022	1.022	1.022	1.022
Volume of Gas Collected, dscf	22.268	22.338	22.084	22.230
Total Water Collected, mL	37.3	63.7	53.2	51.4
Volume of Water Vapor, scf	1.759	3.003	2.508	2.424
Moisture, %	7.3	11.9	10.2	9.8
Dry Mole Fraction, 100-%M	0.9268	0.8815	0.8980	0.9021
CO2 at Stack, % dry	10.78	10.70	10.63	10.70
O2 at Stack, % dry	9.39	9.21	9.20	9.27
CO + N2, % dry	79.83	80.09	80.17	80.03
Dry Molecular Weight, lb/lb mole	30.10	30.08	30.07	30.08
Wet Molecular Weight, lb/lb mole	29.21	28.65	28.84	28.90
Excess Air at Stack, %	80.4	77.2	76.9	78.1
Stack Area, sq. in. (14-in ID)	153.9	153.9	153.9	153.9
Static Pressure, in. of H2O	1.60	1.60	1.60	1.60
Stack Pressure, in. of Hg	30.18	30.18	30.18	30.18
Avg. Stack Temp., F	658	650	647	652
Avg. Sqroot of Delta P	1.5522	1.5671	1.5821	1.5671
SDE Average	51.910	52.207	52.633	52.250
Pitot Coefficient	0.84	0.84	0.84	0.84
Stack Gas Velocity, afpm	7,534	7,651	7,688	7,624
Stack Flowrate, wet acfm	8,054	8,179	8,219	8,151
Stack Flowrate, dry scfm	3,554	3,460	3,551	3,522

TABLE 2-5.
METHOD 4/CEM SAMPLING PARAMETERS - ENGINE #2

	Engine No. 2	Engine No. 2	Engine No. 2	
Run No.	**4**	**5**	**6**	
Date	**16-Feb-94**	**16-Feb-94**	**16-Feb-94**	
Start Time	**09:05**	**11:00**	**14:20**	
Stop Time	**09:35**	**11:30**	**14:50**	**AVERAGES**
Barometric Pressure, in. Hg	30.24	30.24	30.24	30.24
Net Sampling Time, minutes	30.0	30.0	30.0	30.0
Volume Metered, cf	21.661	21.740	22.207	21.869
Avg. DGM Temp, F	80	85	87	84
AVG Delta H, in of H2O	2.00	2.00	2.00	2.00
AVG Delta H, in of Hg	0.1471	0.1471	0.1471	0.1471
DGM Calibration Factor	1.022	1.022	1.022	1.022
Volume of Gas Collected, dscf	22.004	21.871	22.263	22.046
Total Water Collected, mL	46.9	55.1	53.2	51.7
Volume of Water Vapor, scf	2.211	2.598	2.508	2.439
Moisture, %	9.1	10.6	10.1	10.0
Dry Mole Fraction, 100-%M	0.9087	0.8938	0.8987	0.9004
CO2 at Stack, % dry	10.83	10.53	10.52	10.63
O2 at Stack, % dry	8.98	9.39	9.39	9.25
CO + N2, % dry	80.19	80.08	80.09	80.12
Dry Molecular Weight, lb/lb mole	30.09	30.06	30.06	30.07
Wet Molecular Weight, lb/lb mole	28.99	28.78	28.84	28.87
Excess Air at Stack, %	73.7	79.9	79.9	77.8
Stack Area, sq. in. (14-in ID)	153.9	153.9	153.9	153.9
Static Pressure, in. of H2O	1.80	1.80	1.80	1.80
Stack Pressure, in. of Hg	30.37	30.37	30.37	30.37
Avg. Stack Temp., F	660	653	651	654
Avg. Sqroot of Delta P	1.5534	1.5526	1.5787	1.5615
SDE Average	51.980	51.789	52.617	52.129
Pitot Coefficient	0.84	0.84	0.84	0.84
Stack Gas Velocity, afpm	7,549	7,548	7,661	7,586
Stack Flowrate, wet acfm	8,070	8,069	8,190	8,110
Stack Flowrate, dry scfm	3,510	3,474	3,551	3,512

FINAL REPORT FOR EMISSIONS COMPLIANCE TESTING OF THREE WAUKESHA ENGINE GENERATORS

Prepared for

Browning-Ferris Gas Services, Inc.
Richmond, VA

(TRC Ref. 15549-0010-00000)

February 1994

TRC ENVIRONMENTAL CORPORATION
Boott Mills South
Foot of John Street
Lowell, Massachusetts 01852
(508) 970-5600

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLES

FIGURES

SECTION 1
INTRODUCTION

1.1 OVERVIEW

TRC Environmental Corporation, under contract to Browning-Ferris Gas Services, Inc., (BFGSI) conducted on February 15 - 16, 1994, an emissions compliance test program on three Waukesha engine generators. These engine generators are located at BFGSI's Richmond, Virginia facility. This compliance test program determined the gaseous pollutant and visible emission rates from each engine generator. This compliance test program also determined the total accumulated time that visible emissions, as smoke, were present during a two hour test period from the landfill flare. 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 Richmond 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, visible emission observation data and certification sheet, facility process data, and calibration sheets.

SECTION 2
SUMMARY OF RESULTS

This section presents a summary of the emission testing results on the three Waukesha engine generators at BFGSI's Richmond, VA facility. The field sampling data sheets are located in Appendix A. Continuous emissions monitoring data can be found in Appendix B. The engine visible observation data and certification sheet can be found in Appendix C. The flare visible observation data 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 stacks of three Waukesha engine generators resulting in a total of nine test runs. Each engine is designed to produce 1025 Kilowatts per hour (KW/hr). The emission results for NO_x for each series of three test runs are presented in terms of parts per million (ppm), pounds per hour (lbs/hr), grams per horse power hour (gm/HP-hr) and tons per year (tons/yr). The results for Engine #1 (Serial Number C-11033/2) are presented in Table 2-1. The results for Engine #2 (Serial Number C-10812/3) are presented in Table 2-2 and the results for Engine #3 (Serial Number C-10622/7) are presented in Table 2-3. Sampling parameters and flow rates obtained during each test run are presented in Tables 2-4 through 2-6. The field data sheets can be found in Appendix A and the continuous emissions monitoring data can be found in Appendix B.

2.2 VISIBLE EMISSIONS RESULTS

One 60-minute V.E. test run was conducted February 15, 1994 on the three engine generators. Readings were obtained from the flue gas exiting each stack. The overall percent opacity for each engine was 0. Tables 2-7 through 2-9 presents the average opacity recorded during each observation test run. The visible emissions data summary for each run can be found in Appendix C as well as the field data recordings and certification sheet.

TABLE 2-1. BFI RICHMOND ENGINE #1 EMISSIONS AVERAGES

(Engine Serial Number C-11033/2)

TEST RUN	DATE	STACK FLOW RATE (dscfm)	HORSE POWER	NOx (ppm)	EMISSION NOx (lbs/hr)	EMISSION NOx (gm/HP.hr)	EMISSION NOx (tons/yr)*
Run 1	02/15/94	3,554	2,775	71.8	1.83	0.30	8.01
Run 2	02/15/94	3,460	2,781	63.2	1.57	0.26	6.86
Run 3	02/15/94	3,551	2,777	62.3	1.58	0.26	6.94
AVERAGE		3,522	2,778	65.8	1.66	0.27	7.27

BFIRMN1.WK1

NOTE: Horsepower In Calculation ((Fuel Flow Final (CFM) - Fuel Flow Initial (CFM)) / Process Run Time (min)) * 60 min/hr * BTU SATD / 2545.1 BTU/HP

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

See next page for details on calcs.

Fuel ER = 638 ft³/min ; 566 BTU/ft³

$$\frac{638 \times 566 \times 60}{10^6} = 21.667$$

NO_x EF = 1.66/21.667 = 7.66×10^{-2} lb/mmBTU

Overall avg (pg 5) = 8.97×10^{-2} lb/MMBtu

.. normalize to 3% O_2 avg O_2 = 9.57 avg NOx conc = 70.0 ppm

$$70\text{ppm} \times \left[\frac{20.9-3}{20.9-9.57}\right] = 110.6\text{ppm}$$

$$\frac{C_1}{C_2} = \frac{ER_1}{ER_2} \qquad ER_2 = \frac{ER_1 C_2}{C_1} = 3\ \frac{(8.97 \times 10^{-2})\ 110.6}{70.0} = 0.142\ \frac{lb}{MMBtu}$$

TABLE 2-2. BFI RICHMOND ENGINE #2 EMISSIONS AVERAGES

(Engine Serial Number C-10812/3)

TEST RUN	DATE	STACK FLOW RATE (dscfm)	HORSE POWER	NOx (ppm)	EMISSION NOx (lbs/hr)	EMISSION NOx (gm/HP.hr)	EMISSION NOx (tons/yr)*
Run 4	02/16/94	3,510	2,770	107.1	2.69	0.44	11.79
Run 5	02/16/94	3,474	2,659	73.1	1.82	0.31	7.97
Run 6	02/16/94	3,551	2,659	76.7	1.95	0.33	8.55
AVERAGE		3,512	2,696	85.6	2.15	0.36	9.44

NOTE: Horsepower In Calculation ((Fuel Flow Final (CFM) - Fuel Flow Initial (CFM)) / Process Run Time (min)) * 60 min/hr * BTU SATD / 2545.1 BTU/HP

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

avg. Fuel FR = 636 ft^3/min ; 559 BTU/ft^3

$$\frac{6360\ ft^3\ LFG}{min} \times \frac{559\ BTU}{ft^3\ LFG} \times \frac{60\ min}{hr} \times \frac{MMBTU}{10^6\ BTU} = 21.331\ MMBTU/hr.$$

Avg. Fuel rate = 220 cfm (pg. 15)

CH_4 rate = (220)(.56) = 123.2 scfm (pg. 15)

(123.2)(909)(60)(10^{-6}) = 6.719 MMBTU/hr (CH_4 heating Value (pg. 15))

$$NO_x\ EF = \frac{2.15\ lbs/hr}{21.331\ MMBTU/HR} = 1.01 \times 10^{-1}\ lb/MMBTU.$$

641
637
635.5
636

TABLE 2-3. BFI RICHMOND ENGINE #3 EMISSIONS AVERAGES

(Engine Serial Number C-10622/7)

TEST RUN	DATE	STACK FLOW RATE (dscfm)	HORSE POWER	NOx (ppm)	EMISSION NOx (lbs/hr)	EMISSION NOx (gm/HP.hr)	EMISSION NOx (tons/yr)*
Run 7	02/16/94	3,527	2,543	57.5	1.45	0.26	6.36
Run 8	02/16/94	3,537	2,691	62.2	1.58	0.27	6.90
Run 9	02/16/94	3,487	2,664	55.9	1.40	0.24	6.12
AVERAGE		3,517	2,633	58.5	1.47	0.25	6.46

NOTE: Horsepower In Calculation $\frac{\text{(Fuel Flow Final (CFM) - Fuel Flow Initial (CFM)) / Process Run Time (min)) * 60 min/hr * BTU SATD}}{\text{2545.1 BTU/HP}}$

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

Fuel FR = 198.5
619.5
618.0
479.

1559 BTU/ft³

$$\frac{479 \times 559 \times 60}{10^6} = 16.066 \text{ MMBTU/HR.}$$

$$NOx\,EF = \frac{1.47}{16.066} = 9.15 \times 10^{-2} \text{ lb/MMBTU}$$

$$\text{Overall avg. NOx EF} = \frac{0.0766 + 0.101 + .0915}{3} = \frac{8.97 \times 10^{-2} \text{ lb}}{\text{MMBTU.}}$$

TABLE 2.4.

METHOD 4/CEM SAMPLING PARAMETERS - ENGINE #1

	Engine No. 1	Engine No. 1	Engine No. 1	
Run No.	1	2	3	
Date	15-Feb-94	15-Feb-94	15-Feb-94	
Start Time	09:30	12:35	14:05	
Stop Time	10:30	13:05	14:35	AVERAGES
Barometric Pressure, in. Hg	30.06	30.06	30.06	30.06
Net Sampling Time, minutes	30.0	30.0	30.0	30.0
Volume Metered, cf	21.697	22.105	22.113	21.972
Avg. DGM Temp, F	71	79	86	78
AVG Delta H, in of H2O	2.00	1.98	2.00	1.99
AVG Delta H, in of Hg	0.1471	0.1458	0.1471	0.1467
DGM Calibration Factor	1.022	1.022	1.022	1.022
Volume of Gas Collected, dscf	22.268	22.338	22.084	22.230
Total Water Collected, mL	37.3	63.7	53.2	51.4
Volume of Water Vapor, scf	1.759	3.003	2.508	2.424
Moisture, %	7.3	11.9	10.2	9.8
Dry Mole Fraction, 100-%M	0.9268	0.8815	0.8980	0.9021
CO2 at Stack, % dry	10.78	10.70	10.63	10.70
O2 at Stack, % dry	9.39	9.21	9.20	9.27
CO + N2, % dry	79.83	80.09	80.17	80.03
Dry Molecular Weight, lb/lb mole	30.10	30.08	30.07	30.08
Wet Molecular Weight, lb/lb mole	29.21	28.65	28.84	28.90
Excess Air at Stack, %	80.4	77.2	76.9	78.1
Stack Area, sq. in. (14-in ID)	153.9	153.9	153.9	153.9
Static Pressure, in. of H2O	1.60	1.60	1.60	1.60
Stack Pressure, in. of Hg	30.18	30.18	30.18	30.18
Avg. Stack Temp., F	658	650	647	652
Avg. Sqroot of Delta P	1.5522	1.5671	1.5821	1.5671
SDE Average	51.910	52.207	52.633	52.250
Pitot Coefficient	0.84	0.84	0.84	0.84
Stack Gas Velocity, afpm	7,534	7,651	7,688	7,624
Stack Flowrate, wet acfm	8,054	8,179	8,219	8,151
Stack Flowrate, dry scfm	3,554	3,460	3,551	3,522

SRR-1-3.wk1

TABLE 2-5.

METHOD 4/CEM SAMPLING PARAMETERS - ENGINE #2

	Engine No. 2	Engine No. 2	Engine No. 2	
Run No.	**4**	**5**	**6**	
Date	**16-Feb-94**	**16-Feb-94**	**16-Feb-94**	
Start Time	**09:05**	**11:00**	**14:20**	
Stop Time	**09:35**	**11:30**	**14:50**	**AVERAGES**
Barometric Pressure, in. Hg	30.24	30.24	30.24	30.24
Net Sampling Time, minutes	30.0	30.0	30.0	30.0
Volume Metered, cf	21.661	21.740	22.207	21.869
Avg. DGM Temp, F	80	85	87	84
AVG Delta H, in of H2O	2.00	2.00	2.00	2.00
AVG Delta H, in of Hg	0.1471	0.1471	0.1471	0.1471
DGM Calibration Factor	1.022	1.022	1.022	1.022
Volume of Gas Collected, dscf	22.004	21.871	22.263	22.046
Total Water Collected, mL	46.9	55.1	53.2	51.7
Volume of Water Vapor, scf	2.211	2.598	2.508	2.439
Moisture, %	9.1	10.6	10.1	10.0
Dry Mole Fraction, 100-%M	0.9087	0.8938	0.8987	0.9004
CO2 at Stack, % dry	10.83	10.53	10.52	10.63
O2 at Stack, % dry	8.98	9.39	9.39	9.25
CO + N2, % dry	80.19	80.08	80.09	80.12
Dry Molecular Weight, lb/lb mole	30.09	30.06	30.06	30.07
Wet Molecular Weight, lb/lb mole	28.99	28.78	28.84	28.87
Excess Air at Stack, %	73.7	79.9	79.9	77.8
Stack Area, sq. in. (14-in ID)	153.9	153.9	153.9	153.9
Static Pressure, in. of H2O	1.80	1.80	1.80	1.80
Stack Pressure, in. of Hg	30.37	30.37	30.37	30.37
Avg. Stack Temp., F	660	653	651	654
Avg. Sqroot of Delta P	1.5534	1.5526	1.5787	1.5615
SDE Average	51.980	51.789	52.617	52.129
Pitot Coefficient	0.84	0.84	0.84	0.84
Stack Gas Velocity, afpm	7,549	7,548	7,661	7,586
Stack Flowrate, wet acfm	8,070	8,069	8,190	8,110
Stack Flowrate, dry scfm	3,510	3,474	3,551	3,512

TABLE 2-6.

METHOD 4/CEM SAMPLING PARAMETERS - ENGINE #3

	Engine No. 3	Engine No. 3	Engine No. 3	
Run No.	**7**	**8**	**9**	
Date	**16-Feb-94**	**16-Feb-94**	**16-Feb-94**	
Start Time	**18:20**	**20:00**	**21:25**	
Stop Time	**18:50**	**20:30**	**21:55**	**AVERAGES**
Barometric Pressure, in. Hg	30.27	30.27	30.27	30.27
Net Sampling Time, minutes	30.0	30.0	30.0	30.0
Volume Metered, cf	21.810	21.837	21.576	21.741
Avg. DGM Temp, F	82	84	85	84
AVG Delta H, in of H2O	2.00	2.00	2.00	2.00
AVG Delta H, in of Hg	0.1471	0.1471	0.1471	0.1471
DGM Calibration Factor	1.022	1.022	1.022	1.022
Volume of Gas Collected, dscf	22.058	22.038	21.704	21.933
Total Water Collected, mL	47.5	55.5	56.0	53.0
Volume of Water Vapor, scf	2.240	2.617	2.640	2.499
Moisture, %	9.2	10.6	10.8	10.2
Dry Mole Fraction, 100-%M	0.9078	0.8939	0.8915	0.8977
CO2 at Stack, % dry	10.44	10.48	10.41	10.44
O2 at Stack, % dry	9.59	9.50	9.58	9.56
CO + N2, % dry	79.97	80.02	80.01	80.00
Dry Molecular Weight, lb/lb mole	30.05	30.06	30.05	30.05
Wet Molecular Weight, lb/lb mole	28.94	28.78	28.74	28.82
Excess Air at Stack, %	83.2	81.7	83.0	82.6
Stack Area, sq. in. (14-in ID)	153.9	153.9	153.9	153.9
Static Pressure, in. of H2O	1.50	1.50	1.50	1.50
Stack Pressure, in. of Hg	30.38	30.38	30.38	30.38
Avg. Stack Temp., F	670	664	663	666
Avg. Sqroot of Delta P	1.5684	1.5885	1.5681	1.5750
SDE Average	52.729	53.260	52.551	52.847
Pitot Coefficient	0.84	0.84	0.84	0.84
Stack Gas Velocity, afpm	7,663	7,762	7,663	7,696
Stack Flowrate, wet acfm	8,192	8,298	8,192	8,227
Stack Flowrate, dry scfm	3,527	3,537	3,487	3,517

BFR-7-9.wk1

TABLE 2-7.
VISIBLE EMISSION TEST RESULTS - ENGINE #1

Date	Run No.	Time Period	Process	% Opacity Run Averages
2/15/93	1	11:25 to 12:25	Engine Generator	0

Overall % Opacity: **0**

BRRVERE.WK1

TABLE 2-8.
VISIBLE EMISSION TEST RESULTS - ENGINE #2

Date	Run No.	Time Period	Process	% Opacity Run Averages
2/15/93	1	11:25 to 12:25	Engine Generator	0

Overall % Opacity: **0**

BFIRVERE.WK1

TABLE 2-9.
VISIBLE EMISSION TEST RESULTS - ENGINE #3

Date	Run No.	Time Period	Process	% Opacity Run Averages
2/15/93	1	11:25 to 12:25	Engine Generator	0

Overall % Opacity: **0**

BARVERE.WK1

2.3 VISIBLE EMISSIONS EVALUATION TEST - FLARE

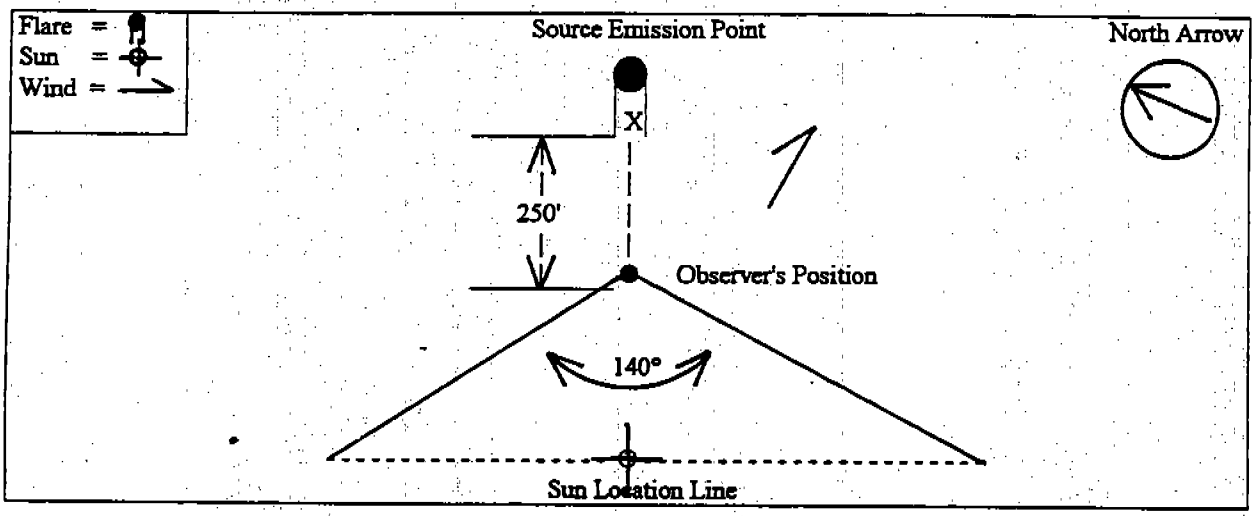
A visible emissions evaluation test was conducted February 17, 1994 on the landfill flare. Readings were obtained from the flue gas exiting the flare. The total accumulated time that visible emissions, as smoke, were present during this two hour period was 47.35 seconds. Table 2-10 presents the visible emissions evaluation for the two-hour test period. The field data recordings and certification sheet can be found in Appendix D.

TABLE 2-10. VISIBLE EMISSIONS EVALUATION TEST - FLARE

FUGITIVE OR SMOKE EMISSION INSPECTION
OUTDOOR LOCATION

Company	Browning-Ferris Gas Services, Inc.	Observer	Timothy J. Senger
Location	Richmond, Virginia	Affiliation	TRC Environmenal Corporation
Company representative	Jamie Terzulli	Date	17 February 1994
Sky Conditions	Mostly Sunny	Wind direction	From the west towards the east
Precipitation	None	Wind speed	5 mph
Industry	Landfill Gas	Process unit	Landfill Flare

Sketch process unit; indicate observer position relative to source and sun; indicate potential emission points and/or actual emission points.



OBSERVATIONS

	Clock Time	Observation period duration min:sec	Accumulated emission time min:sec
Begin Observation	1500		
	1520	20:00	0:12.72
5 minute break	—		
	1525		
	1545	20:00	0:05.50
5 minute break	—		
	1550		
	1610	20:00	0:06.49
5 minute break	—		
	SUB TOTAL	60:00	0:24.71

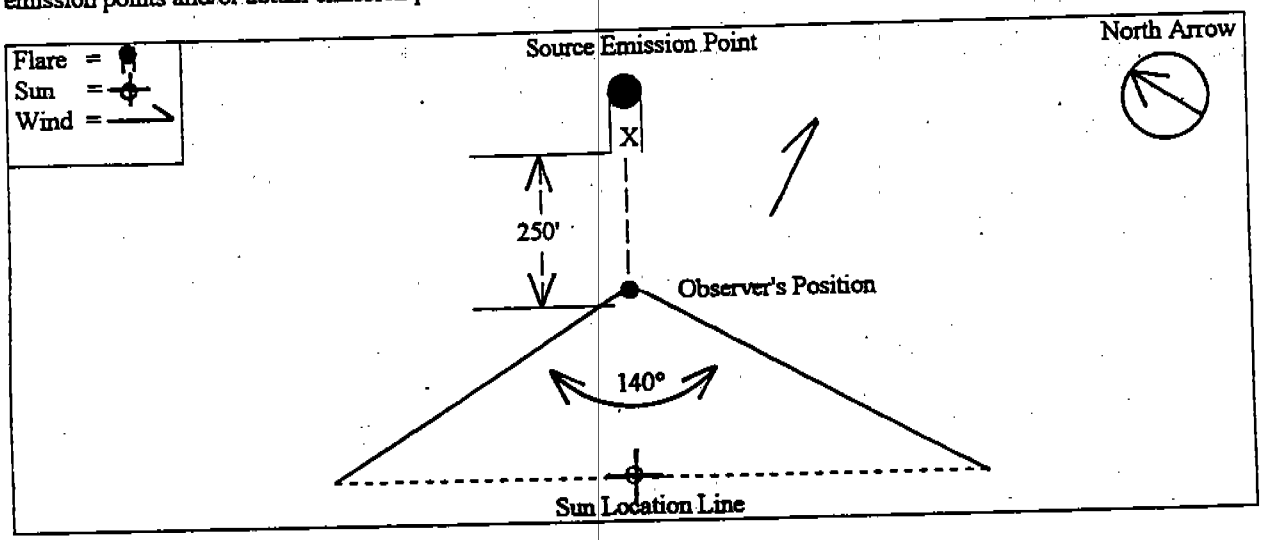
FLARE.WK1

TABLE 2-10. VISIBLE EMISSIONS EVALUATION TEST - FLARE

FUGITIVE OR SMOKE EMISSION INSPECTION
OUTDOOR LOCATION

Company	Browning-Ferris Gas Services, Inc.	Observer	Timothy J. Senger
Location	Richmond, Virginia	Affiliation	TRC Environmenal Corporation
Company representative	Jamie Terzulli	Date	17 February 1994
Sky Conditions	Mostly Sunny	Wind direction	From the west
Precipitation	None	Wind speed	5 mph
Industry	Landfill Gas	Process unit	Landfill Flare

Sketch process unit; indicate observer position relative to source and sun; indicate potential emission points and/or actual emission points.



OBSERVATIONS

	Clock Time	Observation period duration min:sec	Accumulated emission time min:sec
Begin Observation	1615	20:00	0:04.30
	1635		
5 minute break	----		
	1640	20:00	0:04.56
	1700		
5 minute break	—		
	1705	20:00	0:13.78
	1725		
5 minute break	----		
	SUB TOTAL	60:00	0:22.64
	TOTAL	**120:00**	**0:47.35**

FLARE.WK1

SECTION 3
PROCESS DESCRIPTION

The Waukesha engine generators located at BFGSI's Richmond facility are industrial engine generators. Each are fitted with a Woodward hydraulic governor and utilize fuel at a rate of 7,350 BTU/hp-hr. Each engine will fire 220 scfm of landfill gas with an average methane content of approximately 56 percent. Each 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, each engine generator was at the highest possible load producing 1021.5 KW/hr. Facility process data can be found in Appendix E.

$$\frac{10.8 \text{ mmBTU/hr}}{X} = \frac{985 \text{ KW/hr}}{1021.5 \text{ KW/hr}}$$

$$X = 11.20 \text{ mmBTU/hr}$$

SECTION 4
SAMPLING LOCATIONS

Sampling of the flue gas emissions were conducted from two 90° sample ports located on the outlet stacks of each 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 locations of each outlet stack. Each 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 were 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, O_2 and CO_2 were determined from a single point of average velocity.

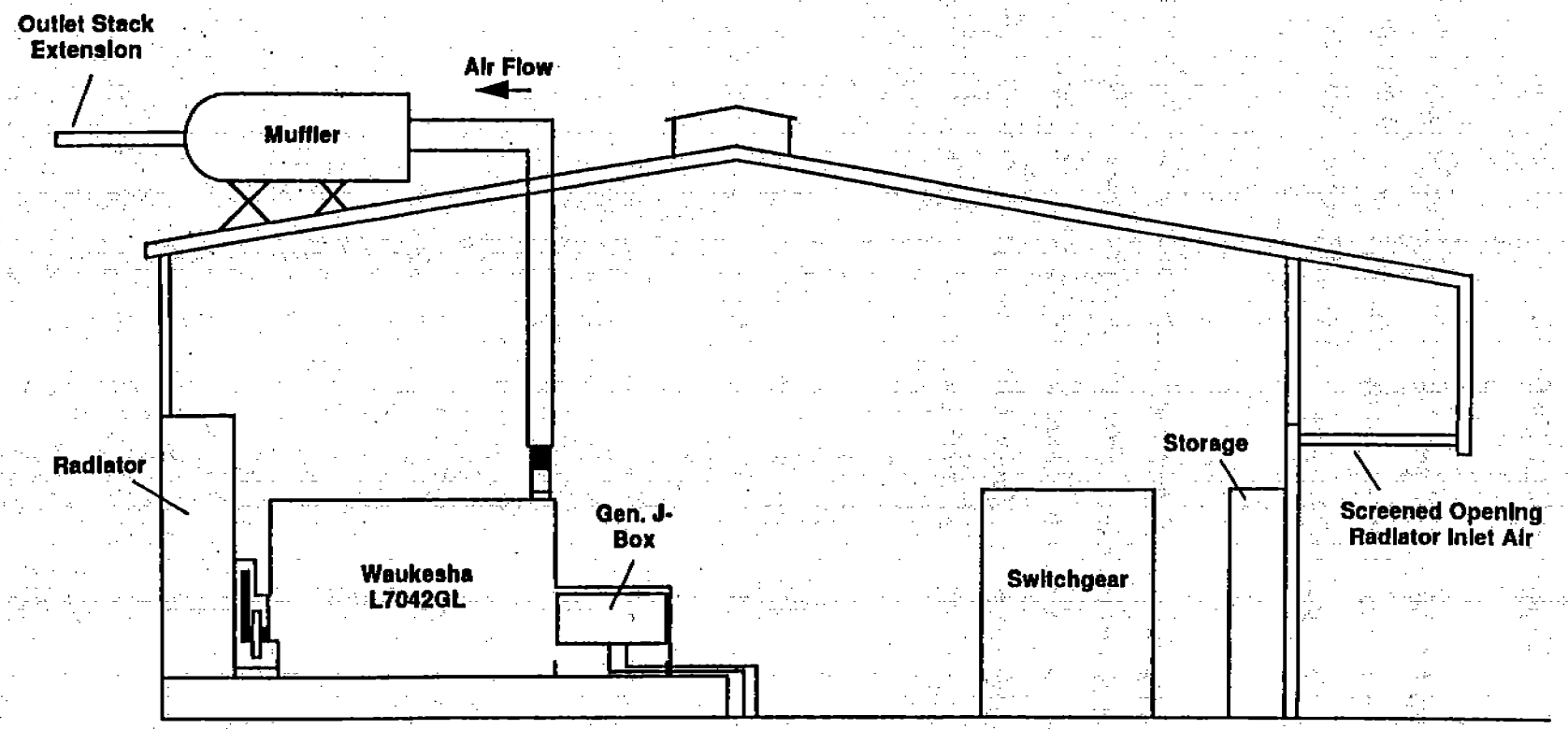


Figure 4-1. Stack Sampling Location.

TRC

SECTION 5
SAMPLING AND ANALYTICAL PROCEDURES

5.1 OVERVIEW

The compliance test program consisted of three test runs at the outlet locations of three engine generators resulting in a total of nine test runs. 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 7E — NO_x Determination
- Method 9 — Visible Emissions
- Method 22 — Visible Emissions Evaluation of Flares

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, O_2, and, CO_2. 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

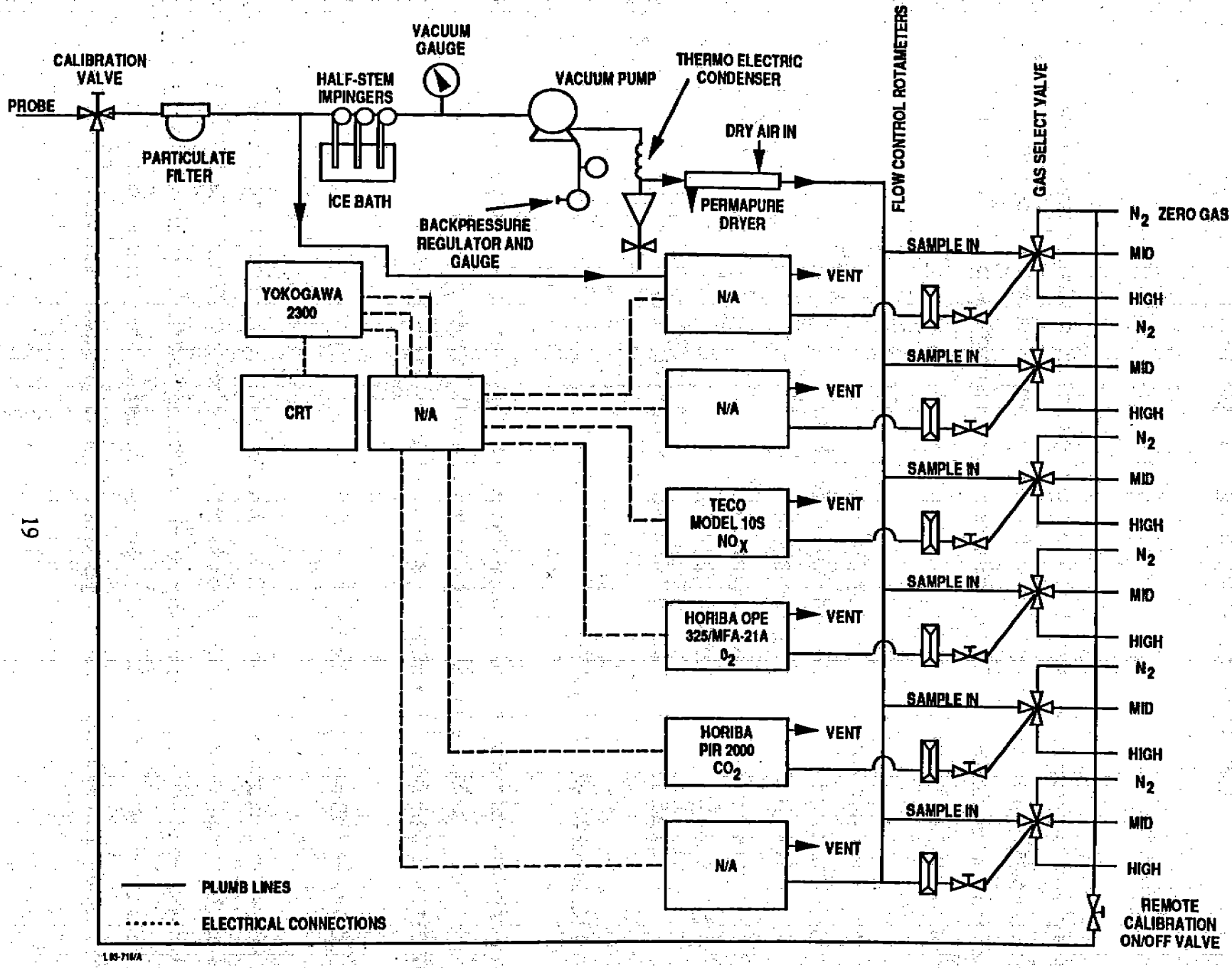


Figure 5-1. TCEM System Schematic.

TRC

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.

Sample analyses were conducted using the following analyzers:

- a Horiba MFA 311A oxygen analyzer;
- a Thermo Electron Model 10S oxide of nitrogen analyzer;
- a Horiba PIR2000 carbon dioxide analyzer;

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:

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

where:

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

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, 278, 505, 886.7 ppm	0 - 1000 ppm
CO_2	0, 6.04, 11.9, 20.0 %	0 - 25 %
O_2	0, 4.98, 9.99, 19.9 %	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 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
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 engine generator, visible emissions of the engine generator and flare, 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.

5.3.2 Emission Testing for NO_x, O_2, and CO_2

EPA Reference Methods 3A and 7E of 40 CFR 60 Appendix A were adhered to quantify emissions of O_2, CO_2, and NO_x respectively. Emissions results are reported as ppm, lbs/hr,

gm/HP-hr, and tons/yr.

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 becoming the initial calibration for the proceeding test run.

5.3.3 Engine Visible Emissions 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 C.

5.3.4 Flare Visible Emissions Observation

Method 22 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 22 involves the determination of the total accumulated time that visible emissions, as smoke, are present during any consecutive two hour period. This observation was conducted by an EPA certified Method 9 observer. Visible emissions observations were recorded on standard EPA-approved data forms following the procedures given in EPA Method 22. 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.

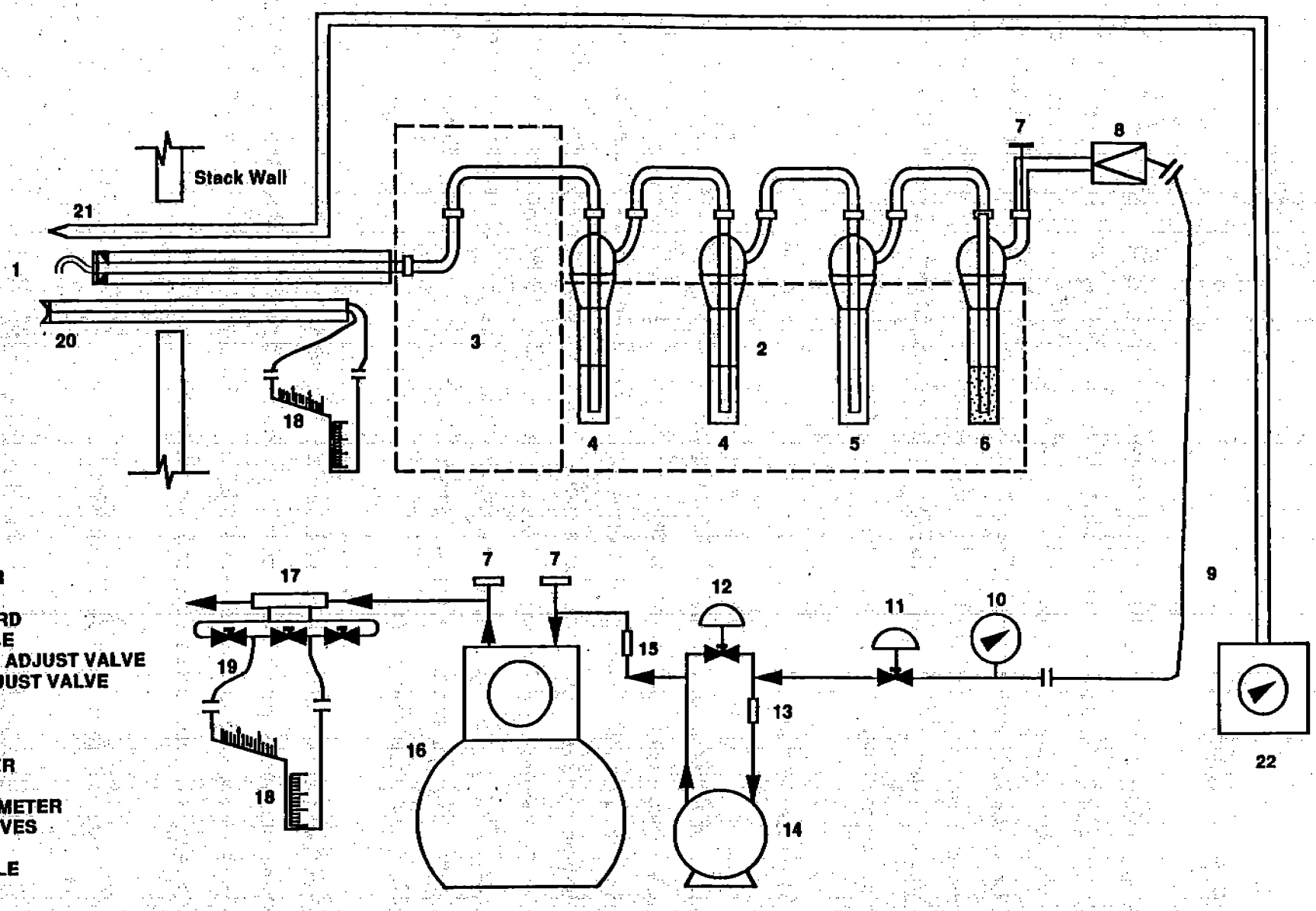
5.3.6 Moisture Determination

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 5-2. 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.).



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 5-2. Method 4 Sampling Train Schematic.

TRC

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.

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 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 prior to the first run on each engine. Cyclonic flow was not present in the outlet stacks.

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

Field Moisture Determination

Client: BFI Richmond

Project No.:

Location: Engine #1

Date: 15 Feb 94

Run No.: 1

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 (-)
0	0930	665.218	71	68	2.0	9.0
5		668.800	72	70	2.0	10.0
10		672.400	70	70	2.0	10.0
15		676.000	69	73	2.0	10.0
20		679.600	70	72	2.0	10.0
25		683.200	70	75	2.0	10.0
30	1000	686.915				
Total/Avg						

Impingers

	1	2	3
Final mL	129	100	1
Initial mL	100	100	C
Net mL	29	~~100~~ 0	1

Total moisture (Net mL + Net gm) =

Silica Gel

Container No.

Final gm 334.0

Initial gm 326.7

Net gm 7.3

Calculations

(1) PB = 30.06 Meterbox No. 80737

(2) VM Net = Y = DGM Calibration Factor = 1.022

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

Leak Check

Initial 0.000 for 60 sec @ 15" Hg

Final 0.001 for 60 sec @ 15" Hg

AF-252

Field Moisture Determination

Client: BFI Richmond

Project No.: 05549-0010-06003

Location: Engine #1

Date: 15 & 14 Feb 94

Run No.: 2

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 (-)
0	1235	687.751	77	77	2.0	12
5		690.95	77	77	2.0	-13
10		695.000	77	80	2.0	13
15		700.00	77	82	~~2.0~~ 1.9	13
20		702.300	78	84	2.0	13.5
25		705.700	78	85	2.0	13.5
30	1305	709.356				
Total/Avg						

Impingers

	1	2	3
Final mL	145	106	4
Initial mL	100	100	0
Net mL	45	6	4

Total moisture (Net mL + Net gm) = _____

Silica Gel

Container No. _____

Final gm 351.5

Initial gm 342.8

Net gm 8.7

Calculations

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

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

(7) VW Gas = VW x 0.04715 = _____

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

Leak Check Initial 0.000 for 1 min @ 14
Final 0.000 for 1 min @ 14

AF-252

Field Moisture Determination

Client: BFI Richmond

Location: Engine #1

Run No.: 3

Project No.:

Date: 15 & 14 Feb 94

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 (-)
0	1405	710.727	83	83	2.0	12.0
5		714.600	81	85	2.0	13.0
10		718.200	82	88	2.0	13.0
15		721.800	82	90	2.0	13.0
20		725.600	83	92	2.0	13.0
25		729.200	83	94	2.0	13.0
30	1435	732.840				
Total/Avg						

Impingers

	1	2	3
Final mL	144	102	0
Initial mL	100	100	0
Net mL	44	2	0

Total moisture (Net mL + Net gm) = _____

Silica Gel

Container No. _____

Final gm 341.2

Initial gm 325.6 334.0

Net gm 7.2

Calculations

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

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

(7) VW Gas = VW x 0.04715 = _____

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

Leak check
Initial: 0.000 for 60 sec @ 15" Hg
Final: 0.001 for 60 sec

AF-232

Stack Geometry & Gas Velocity Data

Page __ of __

Project No. _____

Client BFI

Plant Richmond 2/15/96

Operator B. Kissel

Meter Box No. 80737

Source Engine #1

Sample Location Engine #1 Outlet

Run No. 1 Initial

Static, In. H_2O (A) 1.70/1.50 (B)

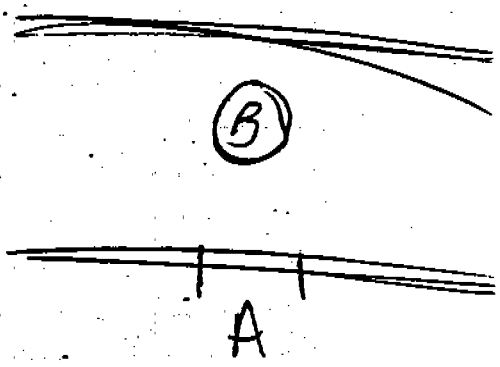
Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
0900	1A	650	1.60	5°
	2A	655	1.80	5°
	3A	660	2.35	0°
	4A	665	2.50	5°
	5A	672	2.70	2°
	6A	671	2.80	0°
	7A	671	3.00	0°
0910	8A	668	2.90	0°
0915	1B	650	1.50	0°
	2B	655	1.80	0°
	3B	660	2.30	0°
	4B	667	2.60	0°
	5B	665	2.60	0°
	6B	666	2.40	0°
	7B	663	2.60 ~~2.00~~ 2.50	2°
0925	8B	662		5°

Sketch of Sampling Location

Stack Diameter _____

Diameters Upstream _____

Diameters Downstream _____



Wet Bulb _____

Dry Bulb _____

%M _____

Pitot tube Leak Check ✓ Initial

TRC

Stack Geometry & Gas Velocity Data

Page __ of __

Project No. _____

Client BFI

Plant Richmond 2/14/95 15

Operator B. Kissel

Source Engine #1

Sample Location Engine #1 Outlet

Run No. 1 Final / 2 Initial

Static, In. H_2O _____

Meter Box No. _____

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
1045 ~~0945~~	1A	640	2.00	
	2A	645	2.10	
	3A	650	2.40	
	4A	650	2.50	
	5A	660	2.70	
	6A	657	3.00	
	7A	657	3.00	
1050 ~~0950~~	8A	655	3.00	
1055 ~~0955~~	1B	650	2.00	
	2B	655	2.00	
	3B	662	2.40	
	4B	661	2.40	
	5B	662	2.50	
	6B	660	2.60	
	7B	656	2.60	
1100 ~~1000~~	8B	650	2.50	

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 GFI

Plant Richmond

Operator B. Kisse 2/17/94

Meter Box No. 80737 13

Source Engine #1

Sample Location Engine #1 Outlet

Run No. 2 Final / 3 Initial

Static, In. H_2O _____

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
1340	1A	640	2.40	
	2A	645	2.50	
	3A	648	2.90	
	4A	649	2.70	
	5A	642	2.80	
	6A	645	2.80	
	7A	645	2.20	
1345	8A	640	2.10	
1350	1B	635	1.90	
	2B	640	2.00	
	3B	647	2.40	
	4B	653	2.40	
	5B	654	2.40	
	6B	651	2.60	
	7B	648	2.60	
1355	8B	641	~~1.90~~ 2.50	

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 BPI

Plant Richmond

Operator B. Kisse 2/15/94

Meter Box No. 80737

Source Engine #1

Sample Location Engine #1 Outlet

Run No. 3 Final

Static, in. H_2O _____

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
1510	1A	640	2.50	
	2A	645	2.60	
	3A	647	2.60	
	4A	649	2.70	
	5A	650	2.70	
	6A	649	2.80	
	7A	646	2.50	
1515	8A	647	2.70	
1520	1B	640	2.20	
	2B	645	2.20	
	3B	649	2.40	
	4B	653	2.40	
	5B	654	2.50	
	6B	654	2.60	
	7B	653	2.80	
1525	8B	653	2.90	

Sketch of Sampling Location

Stack Diameter _____

Diameters Upstream _____

Diameters Downstream _____

Wet Bulb _____

Dry Bulb _____

%M _____

TRC

Field Moisture Determination

Client: BFI Richmond

Project No.:

Location: Engine #2

Date: 16 Feb 94

Run No.: 4

Operator: R. Kissel

Data

Min	Clock Time	Gas Meter C.F. VM	TM In	TM Out	PM Orifice In. H_2O (+)	PM Vac. Gage In. Hg (-)
0	0905	772.682	77	77	2.0	13.0
5		776.400	78	77	2.0	13.0
10		780.100	78	79	2.0	13.0
15		783.800	78	81	2.0	13.0
20		787.600	79	85	2.0	13.0
25		791.000	79	86	2.0	13.0
30	0935	794.343				
Total/Avg						

Impingers

	1	2	3
Final mL	138	100	0
Initial mL	100	100	0
Net mL	38	0	0

Total moisture (Net mL + Net gm) = _____

Silica Gel

Container No.

Final gm 334.5

Initial gm 325.6

Net gm 8.9

Calculations

(1) PB = 30.24 Meterbox No. 80737

(2) VM Net = _____ Y = DGM Calibration Factor = 1.022

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

Leak ✓

Initial: 0.001 for 60sec @ 18"

Final: 0.000 for 60sec @

AF-252

Field Moisture Determination

Client: BFI Richmond

Project No.:

Location: Engine #2

Date: 16 & 17 Feb 94

Run No.: Run #1 #5

Operator: B. Kistler

Data

Min	Clock Time	Gas Meter C.F. VM	TM In	TM Out	PM Orifice In. H_2O (+)	PM Vac. Gage In. Hg (-)
0	1100	794.595	83	83	2.0	14.0
5		798.000	83	84	2.0	15.0
10		801.800	83	86	2.0	15.0
15		805.400	83	87	2.0	17.0
20		809.000	84	88	2.0	17.0
25		812.600	84	89	2.0	17.0
30	1130	816.335				
Total/Avg						

Impingers

	1	2	3
Final mL	145	100	0
Initial mL	100	100	0
Net mL	45	0	0

Total moisture (Net mL + Net gm) =

Silica Gel

Container No.

Final gm 331.6

Initial gm 321.5

Net gm 10.1

Calculations

(1) PB =

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

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

(7) VW Gas = VW x 0.04715 =

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

Leak ✓
Initial: 0.000 for 60sec @ 18" Hg
Final: 0.004 for 60sec @ 20" Hg

AF-252

Field Moisture Determination

Client: BFI Richmond

Project No.:

Location: Engine #2

Date: 16 Feb 94

Run No.: #6

Operator: B. Kistel

Data

Min	Clock Time	Gas Meter C.F. VM	TM In	TM Out	PM Orifice In. H_2O (+)	PM Vac. Gage In. Hg (-)
0	1420	816.615	86	86	2.0	14.0
5		820.400	85	85	2.0	14.0
10		824.000	85	87	2.0	14.0
15		827.800	85	88	2.0	14.0
20		831.600	85	90	2.0	14.0
25		835.400	86	92	2.0	14.0
30	1450	838.822				
Total/Avg						

Impingers

	1	2	3
Final mL	147	103	1
Initial mL	100	100	0
Net mL	47	3	1

Total moisture (Net mL + Net gm) =

Silica Gel

Container No.

Final gm 341.7

Initial gm 334.5

Net gm 7.2

Calculations

(1) PB =

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

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

(7) VW Gas = VW x 0.04715 =

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

Initial: 0.000 for Orifice @ 18" Hg

AF-252

Stack Geometry & Gas Velocity Data

Page __ of __

Project No. _____

Client BFI

Plant Richmond

Operator B. Kissel 1604-6694

Meter Box No. 80737

Source Engine #2

Sample Location Engine #2 Outlet

Run No. ~~#5 Final / #6 Int~~ #4 Init

Static, In. H_2O 1.80

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
0850	1A	650	2.40	0°
	2A	665	2.50	0°
	3A	670	2.40	0°
	4A	672	2.50	0°
	5A	673	2.60	0°
	6A	673	2.50	2°
	7A	671	2.20	0°
0855	8A	666	2.10	0°
0900	1B	650	2.20	0°
	2B	660	2.50	0°
	3B	670	2.50	0°
	4B	674	2.50	0°
	5B	673	2.70	0°
	6B	672	2.70	2°
	7B	669	2.60	0°
0905	8B	666	2.30	0°

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 Richmond

Operator B. Kisse / 16th Feb 94

Meter Box No. 80737

Source Engine #2

Sample Location Engine #2 Outlet

Run No. ~~#4~~ #5 Final / ~~#5~~ #5 Init

Static, In. H₂O _____

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H₂O	Cyclonic Flow Null Angle
1030	1A	646	2.20	
	2A	650	2.70	
	3A	646	2.40	
	4A	657	2.50	
	5A	656	~~2.40~~ 2.50	
	6A	655	~~2.70~~ 2.60	
	7A	653	~~2.30~~ 2.60	
1035	8A	649	2.30	
1040	1B	640	2.20	
	2B	645	2.30	
	3B	650	2.40	
	4B	655	2.60	
	5B	657	2.40	
	6B	660	2.40	
	7B	660	2.30	
1045	8B	655	2.20	

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 Richmond 16 & 24 Feb 94

Operator B. Kisse

Meter Box No. 80737

Source Engine #2

Sample Location Engine #2 Outlet

Run No. #5 & #7 Final ~~#6 Test~~ #6 2

Static, In. H_2O _____

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
1105	1A	640	2.30	
	2A	645	2.40	
	3A	650	2.30	
	4A	655	2.40	
	5A	656	2.50	
	6A	655	2.50	
	7A	652	2.40	
1210	8A	650	2.50	
1215	1B	640	2.30	
	2B	650	2.40	
	3B	655	2.50	
	4B	658	2.50	
	5B	602	2.60	
	6B	601	2.70	
	7B	600	2.60	
1220	8B	658	2.20	

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 Sheridan

Operator B. Kissel 16Feb94

Meter Box No. 80737

Source Engine #2

Sample Location Engine #2 Outlet

Run No. 6-Initial

Static, In. H_2O _____

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
1350	1A	640	2.20	
	2A	645	2.20	
	3A	650	2.40	
	4A	650	2.90	
	5A	651	2.70	
	6A	655	2.60	
	7A	655	2.40	
1355	8A	650	2.20	
1400	1B	640	2.20	
	2B	645	2.50	
	3B	650	2.60	
	4B	655	2.60	
	5B	658	2.70	
	6B	657	2.70	
	7B	656	2.60	
1405	8B	655	2.40	

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 BEI

Plant Richmond

Operator B. Kissel 16Feb94

Meter Box No. 80737

Source Engine #2

Sample Location Engine #2 Outlet

Run No. #6 Final

Static, In. H_2O _____

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
1525	1A	640	2.10	
	2A	645	2.20	
	3A	650	2.30	
	4A	652	2.90	
	5A	654	2.80	
	6A	657	2.70	
	7A	657	2.30	
1530	8A	650	2.60	
1535	1B	640	2.30	
	2B	645	2.40	
	3B	650	2.50	
	4B	655	2.60	
	5B	658	2.60	
	6B	656	2.70	
	7B	654	2.60	
1540	8B	653	2.40	

Sketch of Sampling Location

Stack Diameter _____

Diameters Upstream _____

Diameters Downstream _____

Wet Bulb _____

Dry Bulb _____

%M _____

TRC

Field Moisture Determination

Client: BFI Richmond

Project No.:

Location: Engine #3

Date: 16 Feb 94

Run No.: 8

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 (-)
0	2000	861.188	82	82	2.0	15.0
5		865.000	82	82	2.0	15.0
10		868.700	82	84	2.0	15.0
15		872.400	82	86	2.0	15.0
20		876.000	82	88	2.0	15.0
25		879.600	82	89	2.0	15.0
30	2030	883.025			2?	
Total/Avg						

Impingers

	1	2	3
Final mL	146	101	1
Initial mL	100	100	0
Net mL	46	1	1

Total moisture (Net mL + Net gm) =

Silica Gel

Container No.

Final gm 349.2

Initial gm 341.7

Net gm 7.5

Calculations

(1) PB =

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

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

(7) VW Gas = VW x 0.04715 =

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

Leak ✓
Initial: 0.000 for 60 sec @ 20
Final: 0.000 for 60 sec @ 18

AF-252

Field Moisture Determination

Client: BFI Richmond

Project No.:

Location: Engine #3

Date: 16Feb94

Run No.: 9

Operator: B. Kiffel

Data

Min	Clock Time	Gas Meter C.F. VM	TM In	TM Out	PM Orifice In. H_2O (+)	PM Vac. Gage In. Hg (-)
0	2125 2130	883.441	83	84	2.0	15.0
5		887.000	83	86	2.0	15.0
10		890.600	83	88	2.0	17.0
15		894.000	83	89	2.0	17.0
20		897.400	83	90	2.0	17.0
25		901.000	84	88	2.0	17.0
30	2155	905.017				
Total/Avg						

Impingers

	1	2	3
Final mL	148	101	1
Initial mL	100	100	0
Net mL	48	1	1

Total moisture (Net mL + Net gm) = _____

Silica Gel

Container No. _____

Final gm 345.7

Initial gm 339.7

Net gm 6.0

Calculations

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

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

(7) VW Gas = VW x 0.04715 = _____

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

Initial: 0.000 for 60sec @ 20" Hg

Final: 0.001 for 60sec @ 20" Hg

AF-252

Field Moisture Determination

Client: BFI Richmond

Project No.:

Location: Engine #3

Date: 16Feb94

Run No.: 7

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 (-)
0	1800 ~~1715~~	839.100	81	81	2.0	14.0
5		842.800	82	81	2.0	15.0
10		846.500	82	82	2.0	16.0
15		850.100	82	83	2.0	16.0
20		854.000	83	84	2.0	16.0
25		857.600	83	85	2.0	16.0
30	1850 ~~1745~~	860.910				
Total/Avg						

Impingers

	1	2	3
Final mL	137	101	1
Initial mL	100	100	0
Net mL	37	1	1

Total moisture (Net mL + Net gm) = _____

Silica Gel

Container No. _____

Final gm 339.7

Initial gm 331.2

Net gm 8.5

Calculations

(1) PB = 30.27 Meterbox No. 80737

(2) VM Net = _____ Y = DGM Calibration Factor = 1.022

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

Leak ✓
Initial: 0.000 for 60 sec @ 20
Final: 0.001 for 60 sec @ 20

AF-252

Stack Geometry & Gas Velocity Data

Page __ of __

Project No. _____

Client BFI

Plant Richmond

Operator B. Kissel 16 Feb 94

Meter Box No. 80737

Source Engine #3

Sample Location Engine #3 Outlet

Run No. Final 18 Jun f

Static, In. H_2O _____

Time (24 hr. Clock)	Sample Point	Stack Temp. (°F) or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
1920	1A	650	2.50	
	2A	660	2.70	
	3A	665	2.70	
	4A	670	2.70	
	5A	673	2.80	
	6A	672	2.60	
	7A	668	2.20	
1925	8A	659	1.90	
1930	1B	650	2.30	
	2B	660	2.40	
	3B	665	2.60	
	4B	668	2.70	
	5B	671	2.90	
	6B	670	2.90	
	7B	667	2.80	
1935	8B	658	2.80	

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 Richmond

Operator B. Kissel

Meter Box No. 80737

Source Engine #3

Sample Location Engine #3 Outlet

Run No. 8 final / 19 Inf

Static, In. H_2O _____

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
2100	1A	650	2.40	
	2A	665	2.50	
	3A	675	2.80	
	4A	675	2.80	
	5A	675	2.70	
	6A	674	2.10	
	7A	670	2.20	
2105	8A	657	~~2.50~~ 3.00	
2110	1B	645	2.00	
	2B	650	2.30	
	3B	655	2.50	
	4B	665	2.50	
	5B	671	2.70	
	6B	670	2.80	
	7B	669	2.70	
2115	8B	660	2.50	

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 Richmond

Operator B. Kissel 16Feb94

Meter Box No. ~~80373~~ 80737

Source Engine #3

Sample Location Engine #3 Outlet

Run No. 7 Int

Static, In. H_2O @ 1.30 / 1.70 @

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
1700	1A	660	~~1.80~~ 1.10	~~0°~~ 1°
	2A	670	~~1.90~~ 1.10	0°
	3A	675	2.30	1°
	4A	677	3.00	0°
	5A	684	2.70	0°
	6A	683	2.30	0°
	7A	679	1.90	0°
1705	8A	675	1.60	0°
1710	~~1A~~ 1B	660	1.85	0°
	~~2A~~ 2B	670	2.00	0°
	3B	675	2.50	2°
	4B	683	2.40	0°
	5B	687	2.70	2°
	6B	685	2.80	2°
	7B	682	2.80	1°
1715	8B	678	2.60	1°

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 Richmond

Operator B. Kirke 16Feb94

Meter Box No. 80737

Source Engine #3

Sample Location Engine #3 Outlet

Run No. 9 Final

Static, In. H_2O _____

Time (24 hr. Clock)	Sample Point	Stack Temp. °F or C°	Manom. Reading In. H_2O	Cyclonic Flow Null Angle
	1A	645	2.30	
	2A	650	2.50	
	3A	655	2.60	
	4A	660	2.70	
	5A	666	2.80	
	6A	670	2.40	
	7A	667	1.90	
	8A	661	1.90	
	1B	650	2.00	
	2B	666	2.10	
	3B	665	2.40	
	4B	670	2.60	
	5B	673	2.80	
	6B	672	3.00	
	7B	670	2.90	
	8B	659	2.60	

Sketch of Sampling Location

Stack Diameter _____

Diameters Upstream _____

Diameters Downstream _____

Wet Bulb _____

Dry Bulb _____

%M _____

TRC

APPENDIX B

CEM DATA AND CALIBRATION SHEETS

FACILITY: BFI RICHMOND LANDFILL
SOURCE: LANDFILL GAS ENGINE GENERATOR
MONTH/YR: DECEMBER 15 – 16, 1993

CEM DATA CORRECTION PROGRAM

INSTRUMENTAL REFERENCE METHODS 3A & 7E

		O2 %		CO2 %		NOx, ppm	
RUN 1	SLOPE/ Y–INT	25	0	25	0	1000	0
12/15/93	SYS CAL VALUES ZERO/SPAN	0	9.99	0	11.9	0	506.5
ENG.#1	DIR CAL ZERO VDC/CONC		−0.01		0.00		−0.4
S.N.# C–11033/2	DIR CAL SPAN VDC/CONC		10.00		12.15		506.6
	INT SYS ZERO VDC/CONC		0.10		−0.01		0.0
	FIN SYS ZERO VDC/CONC		−0.02		−0.01		−0.6
	INT SYS SPAN VDC/CONC		10.05		12.05		508.8
	FIN SYS SPAN VDC/CONC		10.41		10.82		513.1
	INT/FIN SYS BIAS ZERO %	0.44	−0.04	−0.04	−0.04	0.04	−0.02
	INT/FIN SYS BIAS SPAN %	0.20	1.64	−0.40	−5.32	0.22	0.65
	ZERO/SPAN SYS DRIFT %	−0.48	1.44	0.00	−4.92	−0.06	0.43
	ANALYZER SCALE(SPAN)	25		25		1000	
	RUN AVG	9.62		10.36		72.2	
	CORR. AVG	9.39		10.78		71.8	

		O2 %		CO2 %		NOx, ppm	
RUN 2	SLOPE/ Y–INT	25	0	25	0	1000	0
12/15/93	SYS CAL VALUES ZERO/SPAN	0	9.99	0	11.9	0	506.5
ENG.#1	DIR CAL ZERO VDC/CONC		−0.02		0.00		−0.6
S.N.# C–11033/2	DIR CAL SPAN VDC/CONC		10.00		12.05		511.1
	INT SYS ZERO VDC/CONC		0.00		0.00		0.4
	FIN SYS ZERO VDC/CONC		0.00		0.04		2.3
	INT SYS SPAN VDC/CONC		9.98		11.98		504.0
	FIN SYS SPAN VDC/CONC		9.93		11.98		514.2
	INT/FIN SYS BIAS ZERO %	0.08	0.08	0.00	0.16	0.10	0.29
	INT/FIN SYS BIAS SPAN %	−0.08	−0.28	−0.28	−0.28	−0.71	0.31
	ZERO/SPAN SYS DRIFT %	0.00	−0.20	0.16	0.00	0.19	1.02
	ANALYZER SCALE(SPAN)	25		25		1000	
	RUN AVG	9.18		10.77		64.7	
	CORR. AVG	9.21		10.70		63.2	

		O2 %		CO2 %		NOx, ppm	
RUN 3	SLOPE/ Y–INT	25	0	25	0	1000	0
12/15/93	SYS CAL VALUES ZERO/SPAN	0	9.99	0	11.9	0	506.5
ENG.#1	DIR CAL ZERO VDC/CONC		−0.02		0.00		−0.6
S.N.# C–11033/2	DIR CAL SPAN VDC/CONC		10.00		12.05		511.1
	INT SYS ZERO VDC/CONC		0.00		0.04		2.3
	FIN SYS ZERO VDC/CONC		0.04		0.03		1.7
	INT SYS SPAN VDC/CONC		9.93		11.98		514.2
	FIN SYS SPAN VDC/CONC		9.97		11.94		528.0
	INT/FIN SYS BIAS ZERO %	0.08	0.24	0.16	0.12	0.29	0.23
	INT/FIN SYS BIAS SPAN %	−0.28	−0.12	−0.28	−0.44	0.31	1.69
	ZERO/SPAN SYS DRIFT %	0.16	0.16	−0.04	−0.16	−0.06	1.38
	ANALYZER SCALE(SPAN)	25		25		1000	
	RUN AVG	9.16		10.69		65.9	
	CORR. AVG	9.20		10.63		62.3	

FACILITY: BFI RICHMOND LANDFILL — CEM DATA CORRECTION PROGRAM
SOURCE: LANDFILL GAS ENGINE GENERATOR
MONTH/YR: DECEMBER 15 - 16, 1993 — INSTRUMENTAL REFERENCE METHODS 3A & 7E

		O2 %		CO2 %		NOx, ppm	
RUN 4	SLOPE/ Y-INT	25	0	25	0	1000	0
12/16/93	SYS CAL VALUES ZERO/SPAN	0	9.99	0	11.9	0	506.5
ENG.#2	DIR CAL ZERO VDC/CONC		-0.05		-0.01		0.0
S.N.# C-10812/3	DIR CAL SPAN VDC/CONC		9.99		12.06		508.6
	INT SYS ZERO VDC/CONC		0.05		0.01		-0.2
	FIN SYS ZERO VDC/CONC		-0.02		0.00		2.2
	INT SYS SPAN VDC/CONC		10.05		11.99		512.5
	FIN SYS SPAN VDC/CONC		9.95		11.95		516.8
	INT/FIN SYS BIAS ZERO %	0.40	0.12	0.08	0.04	-0.02	0.22
	INT/FIN SYS BIAS SPAN %	0.24	-0.16	-0.28	-0.44	0.39	0.82
	ZERO/SPAN SYS DRIFT %	-0.28	-0.40	-0.04	-0.16	0.24	0.43
	ANALYZER SCALE(SPAN)	25		25		1000	
	RUN AVG	8.99		10.89		109.6	
	CORR. AVG	8.98		10.83		107.1	

		O2 %		CO2 %		NOx, ppm	
RUN 5	SLOPE/ Y-INT	25	0	25	0	1000	0
12/15/93	SYS CAL VALUES ZERO/SPAN	0	9.99	0	11.9	0	506.5
ENG.#2	DIR CAL ZERO VDC/CONC		-0.05		-0.01		0.2
S.N.# C-10812/3	DIR CAL SPAN VDC/CONC		9.99		12.06		509.7
	INT SYS ZERO VDC/CONC		-0.02		0.00		0.4
	FIN SYS ZERO VDC/CONC		-0.01		0.02		1.1
	INT SYS SPAN VDC/CONC		9.95		11.95		508.5
	FIN SYS SPAN VDC/CONC		9.95		12.00		519.1
	INT/FIN SYS BIAS ZERO %	0.12	0.16	0.04	0.12	0.02	0.09
	INT/FIN SYS BIAS SPAN %	-0.16	-0.16	-0.44	-0.24	-0.12	0.94
	ZERO/SPAN SYS DRIFT %	0.04	0.00	0.08	0.20	0.07	1.06
	ANALYZER SCALE(SPAN)	25		25		1000	
	RUN AVG	9.35		10.62		74.8	
	CORR. AVG	9.39		10.55		73.1	

		O2 %		CO2 %		NOx, ppm	
RUN 6	SLOPE/ Y-INT	25	0	25	0	1000	0
12/15/93	SYS CAL VALUES ZERO/SPAN	0	9.99	0	11.9	0	506.5
ENG.#2	DIR CAL ZERO VDC/CONC		-0.05		-0.01		0.3
S.N.# C-10812/3	DIR CAL SPAN VDC/CONC		9.99		12.06		510.8
	INT SYS ZERO VDC/CONC		-0.01		0.02		0.0
	FIN SYS ZERO VDC/CONC		-0.01		0.02		2.5
	INT SYS SPAN VDC/CONC		9.95		12.00		506.8
	FIN SYS SPAN VDC/CONC		9.97		12.01		519.6
	INT/FIN SYS BIAS ZERO %	0.16	0.16	0.12	0.12	-0.03	0.22
	INT/FIN SYS BIAS SPAN %	-0.16	-0.08	-0.24	-0.20	-0.40	0.88
	ZERO/SPAN SYS DRIFT %	0.00	0.08	0.00	0.04	0.25	1.28
	ANALYZER SCALE(SPAN)	25		25		1000	
	RUN AVG	9.36		10.62		78.8	
	CORR. AVG	9.39		10.52		76.7	

FACILITY: BFI RICHMOND LANDFILL — **CEM DATA CORRECTION PROGRAM**
SOURCE: LANDFILL GAS ENGINE GENERATOR
MONTH/YR: DECEMBER 15 – 16, 1993 — **INSTRUMENTAL REFERENCE METHODS 3A & 7E**

		O2 %		CO2 %		NOx, ppm	
RUN 7	SLOPE/ Y–INT	25	0	25	0	1000	0
12/16/93	SYS CAL VALUES ZERO/SPAN	0	9.99	0	11.9	0	506.5
ENG.#3	DIR CAL ZERO VDC/CONC		−0.05		−0.01		0.3
S.N.# C–10622/7	DIR CAL SPAN VDC/CONC		9.99		12.06		510.8
	INT SYS ZERO VDC/CONC		−0.01		0.02		2.5
	FIN SYS ZERO VDC/CONC		−0.02		0.00		1.4
	INT SYS SPAN VDC/CONC		9.97		12.01		519.6
	FIN SYS SPAN VDC/CONC		9.99		11.89		517.1
	INT/FIN SYS BIAS ZERO %	0.16	0.12	0.12	0.04	0.22	0.11
	INT/FIN SYS BIAS SPAN %	−0.08	0.00	−0.20	−0.68	0.88	0.63
	ZERO/SPAN SYS DRIFT %	−0.04	0.08	−0.08	−0.48	−0.11	−0.25
	ANALYZER SCALE(SPAN)	25		25		1000	
	RUN AVG	9.58		10.49		60.6	
	CORR. AVG	9.59		10.44		57.5	

		O2 %		CO2 %		NOx, ppm	
RUN 8	SLOPE/ Y–INT	25	0	25	0	1000	0
12/16/93	SYS CAL VALUES ZERO/SPAN	0	9.99	0	11.9	0	506.5
ENG.#3	DIR CAL ZERO VDC/CONC		−0.05		−0.01		0.3
S.N.# C–10622/7	DIR CAL SPAN VDC/CONC		9.99		12.06		510.8
	INT SYS ZERO VDC/CONC		−0.02		0.00		1.4
	FIN SYS ZERO VDC/CONC		−0.01		0.01		1.8
	INT SYS SPAN VDC/CONC		9.99		11.89		517.1
	FIN SYS SPAN VDC/CONC		10.02		11.83		508.0
	INT/FIN SYS BIAS ZERO %	0.12	0.16	0.04	0.08	0.11	0.15
	INT/FIN SYS BIAS SPAN %	0.00	0.12	−0.68	−0.92	0.63	−0.28
	ZERO/SPAN SYS DRIFT %	0.04	0.12	0.04	−0.24	0.04	−0.91
	ANALYZER SCALE(SPAN)	25		25		1000	
	RUN AVG	9.51		10.45		64.3	
	CORR. AVG	9.50		10.48		62.2	

		O2 %		CO2 %		NOx, ppm	
RUN 9	SLOPE/ Y–INT	25	0	25	0	1000	0
12/16/93	SYS CAL VALUES ZERO/SPAN	0	9.99	0	11.9	0	506.5
ENG.#3	DIR CAL ZERO VDC/CONC		−0.05		−0.01		0.3
S.N.# C–10622/7	DIR CAL SPAN VDC/CONC		9.99		12.06		510.8
	INT SYS ZERO VDC/CONC		−0.01		0.01		1.8
	FIN SYS ZERO VDC/CONC		−0.01		0.00		2.0
	INT SYS SPAN VDC/CONC		10.02		11.83		508.0
	FIN SYS SPAN VDC/CONC		10.05		11.78		515.2
	INT/FIN SYS BIAS ZERO %	0.16	0.16	0.08	0.04	0.15	0.17
	INT/FIN SYS BIAS SPAN %	0.12	0.24	−0.92	−1.12	−0.28	0.44
	ZERO/SPAN SYS DRIFT %	0.00	0.12	−0.04	−0.20	0.02	0.72
	ANALYZER SCALE(SPAN)	25		25		1000	
	RUN AVG	9.62		10.33		58.2	
	CORR. AVG	9.58		10.41		55.9	

Channel	O2	CO2	Time	CO2 value	NOx	NOx value
02 2min INT90 1	19.01% O2	CO2 2MIN	Feb.14 07:[illegible]	2.3[illegible]% CO2	NOX2min	1.0PPMnox
02 2min INT90 1	19.06% O2	CO2 2MIN	Feb.14 07:28	12.32% CO2	NOX2min	3.7PPMnox
02 2min INT90 1	[illegible].12% O2	CO2 2MIN	Feb.14 07:27	5.74% CO2	NOX2min	505.3PPMnox
02 2min INT90 1	0.02% O2	CO2 2MIN	Feb.14 07:[illegible]	0.00% CO2	NOX2min	672.6PPMnox
02 2min INT90 1	-0.05% O2	CO2 2MIN	Feb.14 07:25	0.00% CO2	NOX2min	500.1PPMnox
02 2min INT90 1	-0.01% O2	CO2 2MIN	Feb.14 07:[illegible]	0.00% CO2	NOX2min	305.5PPMnox
02 2min INT90 1	0.02% O2	CO2 2MIN	Feb.14 07:23	0.00% CO2	NOX2min	369.3PPMnox
02 2min INT90 1	-0.02% O2	CO2 2MIN	Feb.14 07:[illegible]	0.00% CO2	NOX2min	369.7PPMnox
02 2min INT90 1	0.09% O2	CO2 2MIN	Feb.14 07:[illegible]	0.00% CO2	NOX2min	351.9PPMnox
02 2min INT90 1	-0.02% O2	CO2 2MIN	Feb.14 07:[illegible]	0.00% CO2	NOX2min	506.3PPMnox
02 2min INT90 1	-0.05% O2	CO2 2MIN	Feb.14 07:[illegible]	0.00% CO2	NOX2min	509.3PPMnox
02 2min INT90 1	-0.03% O2	CO2 2MIN	Feb.14 07:18	0.00% CO2	NOX2min	176.2PPMnox
02 2min INT90 1	-0.01% O2	CO2 2MIN	Feb.14 07:17	0.00% CO2	NOX2min	266.5PPMnox
02 2min INT90 1	-0.06% O2	CO2 2MIN	Feb.14 07:[illegible]	0.00% CO2	NOX2min	0.5PPMnox
02 2min INT90 1	[illegible].06% O2	CO2 2MIN	Feb.14 07:[illegible]	0.01% CO2	NOX2min	0.1PPMnox
02 2min INT90 1	-0.01% O2	CO2 2MIN	Feb.14 07:14	0.03% CO2	NOX2min	-0.4PPMnox
02 2min INT90 1	[illegible] O2	CO2 2MIN	Feb.14 07:[illegible]	0.03% CO2	NOX2min	0.2PPMnox
02 2min INT90 1	0.05% O2	CO2 2MIN	Feb.14 07:[illegible]	0.03% CO2	NOX2min	0.3PPMnox
02 2min INT90 1	0.05% O2	CO2 2MIN	Feb.14 07:[illegible]	0.07% CO2	NOX2min	158.0PPMnox
02 2min INT90 1	[illegible] O2	CO2 2MIN	Feb.14 07:[illegible]	0.13% CO2	NOX2min	126.1PPMnox
02 2min INT90 1	21.16% O2	CO2 2MIN	Feb.14 07:[illegible]	0.13% CO2	NOX2min	0.4PPMnox

0 10 20 30 40 50 60 70 80 90 100

O2 9.99
CO2 11.9

NOx 896.7 ppm

NOx 506.5 ppm

260

Direct Cal. 2/14/94

25.00 % O2

BFG51 RICHMOND VA
TRC ENVIRONMENTAL CORPORATION
LOWELL MA
FEBRUARY 14 1994

02 2min INTVL 1		CO2 2MIN Feb.14 07:4?		NOX2min	0.1PPMnox
02 2min INTVL 1	1?.31% O2	CO2 2MIN Feb.14 07:4?	0.04% CO2	NOX2min	2.9PPMnox
02 2min INTVL 1	20.91% O2	CO2 2MIN Feb.14 07:4?	0.07% CO2	NOX2min	2.4PPMnox
02 2min INTVL 1	20.0?% O2	CO2 2MIN Feb.14 07:4?	0.03% CO2	NOX2min	253.1PPMnox
02 2min INTVL 1	20.90% O2	CO2 2MIN Feb.14 07:4?	0.07% CO2	NOX2min	276.4PPMnox
02 2min INTVL 1	20.07% O2	CO2 2MIN Feb.14 07:4?	0.07% CO2	NOX2min	275.0PPMnox
02 2min INTVL 1	19.67% O2	CO2 2MIN Feb.14 07:4?	0.40% CO2	NOX2min	70.1PPMnox
02 2min INTVL 1	?.20% O2	CO2 2MIN Feb.14 07:3?	5.35% CO2	NOX2min	-0.2PPMnox
02 2min INTVL 1	?.02% O2	CO2 2MIN Feb.14 07:38	6.10% CO2	NOX2min	-0.3PPMnox
02 2min INTVL 1	?.01% O2	CO2 2MIN Feb.14 07:3?	6.1?% CO2	NOX2min	-0.2PPMnox
02 2min INTVL 1	11.89% O2	CO2 2MIN Feb.14 07:34	13.72% CO2	NOX2min	1.4PPMnox
02 2min INTVL 1	20.92% O2	CO2 2MIN Feb.14 07:3?	0.03% CO2	NOX2min	-0.1PPMnox
02 2min INTVL 1	20.01% O2	CO2 2MIN Feb.14 07:3?	0.00% CO2	NOX2min	-0.1PPMnox
02 2min INTVL 1	20.02% O2	CO2 2MIN Feb.14 07:3?	0.50% CO2	NOX2min	0.0PPMnox
02 2min INTVL 1	20.08% O2	CO2 2MIN Feb.14 07:3?	0.61% CO2	NOX2min	0.0PPMnox
02 2min INTVL 1	19.55% O2	CO2 2MIN Feb.14 07:3?	2.40% CO2	NOX2min	2.2PPMnox
02 2min INTVL 1	10.35% O2	CO2 2MIN Feb.14 07:30	13.60% CO2	NOX2min	1.8PPMnox
02 2min INTVL 1	10.01% O2	CO2 2MIN Feb.14 07:?	2.33% CO2	NOX2min	1.0PPMnox
02 2min INTVL 1	10.05% O2	CO2 2MIN Feb.14 07:28	12.32% CO2	NOX2min	5.7PPMnox
02 2min INTVL 1	7.12% O2	CO2 2MIN Feb.14 07:2?	5.74% CO2	NOX2min	585.3PPMnox
02 2min INTVL 1	-0.02% O2	CO2 2MIN Feb.14 07:2?	0.00% CO2	NOX2min	572.6PPMnox
02 2min INTVL 1	-0.05% O2	CO2 2MIN Feb.14 07:2?	0.09% CO2	NOX2min	509.1PPMnox
02 2min INTVL 1	-0.01% O2	CO2 2MIN Feb.14 07:2?	0.00% CO2	NOX2min	1006.5PPMnox
02 2min INTVL 1	-0.02% O2	CO2 2MIN Feb.14 07:2?	0.00% CO2	NOX2min	869.3PPMnox
02 2min INTVL 1	-0.02% O2	CO2 2MIN Feb.14 07:2?	?.00% CO2	NOX2min	869.7PPMnox

0 10 20 30 40 50 60 70 80 90 100

NOX PPM 0.00 O2 % 25.00 % O2

Run 1

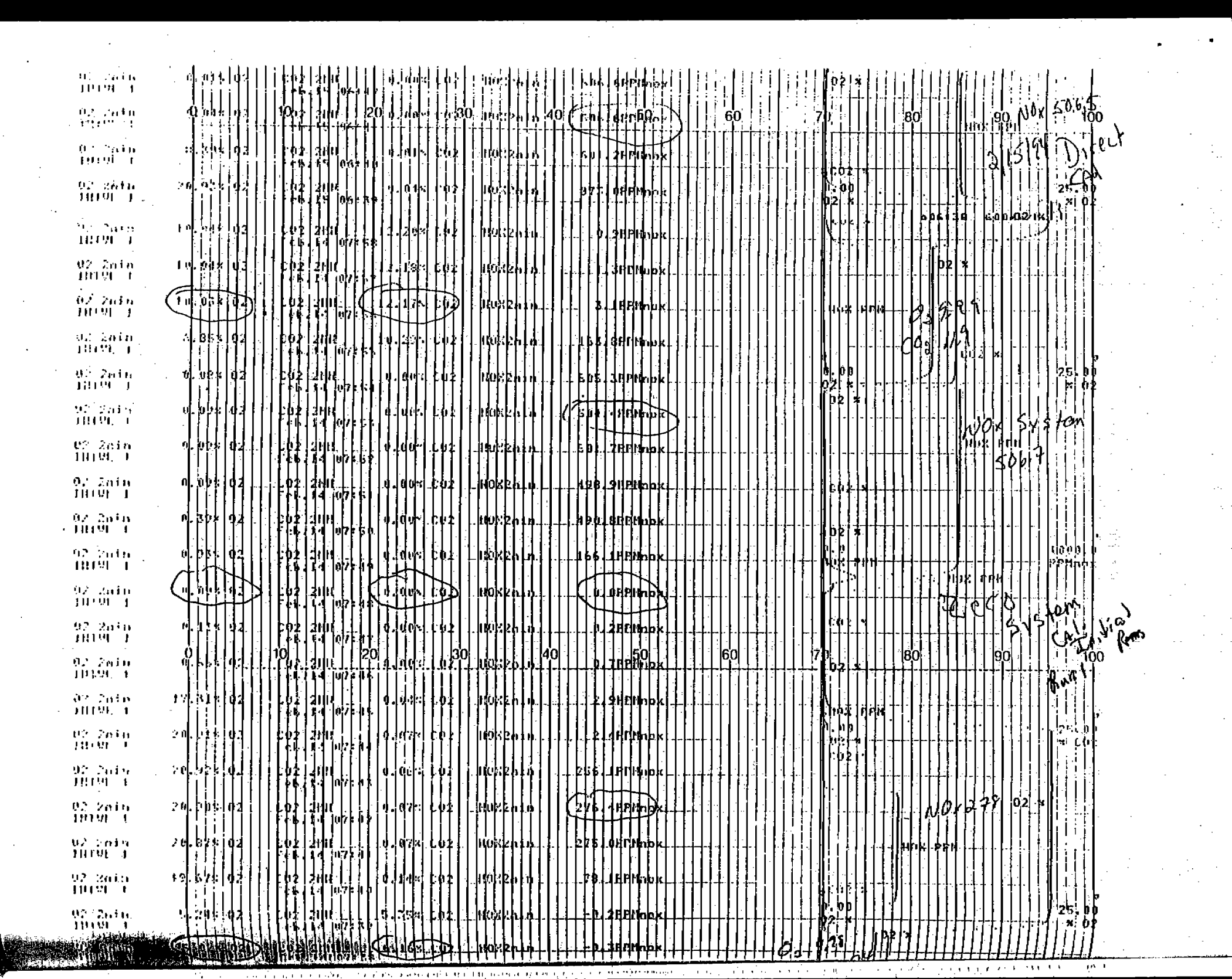
NOx 278

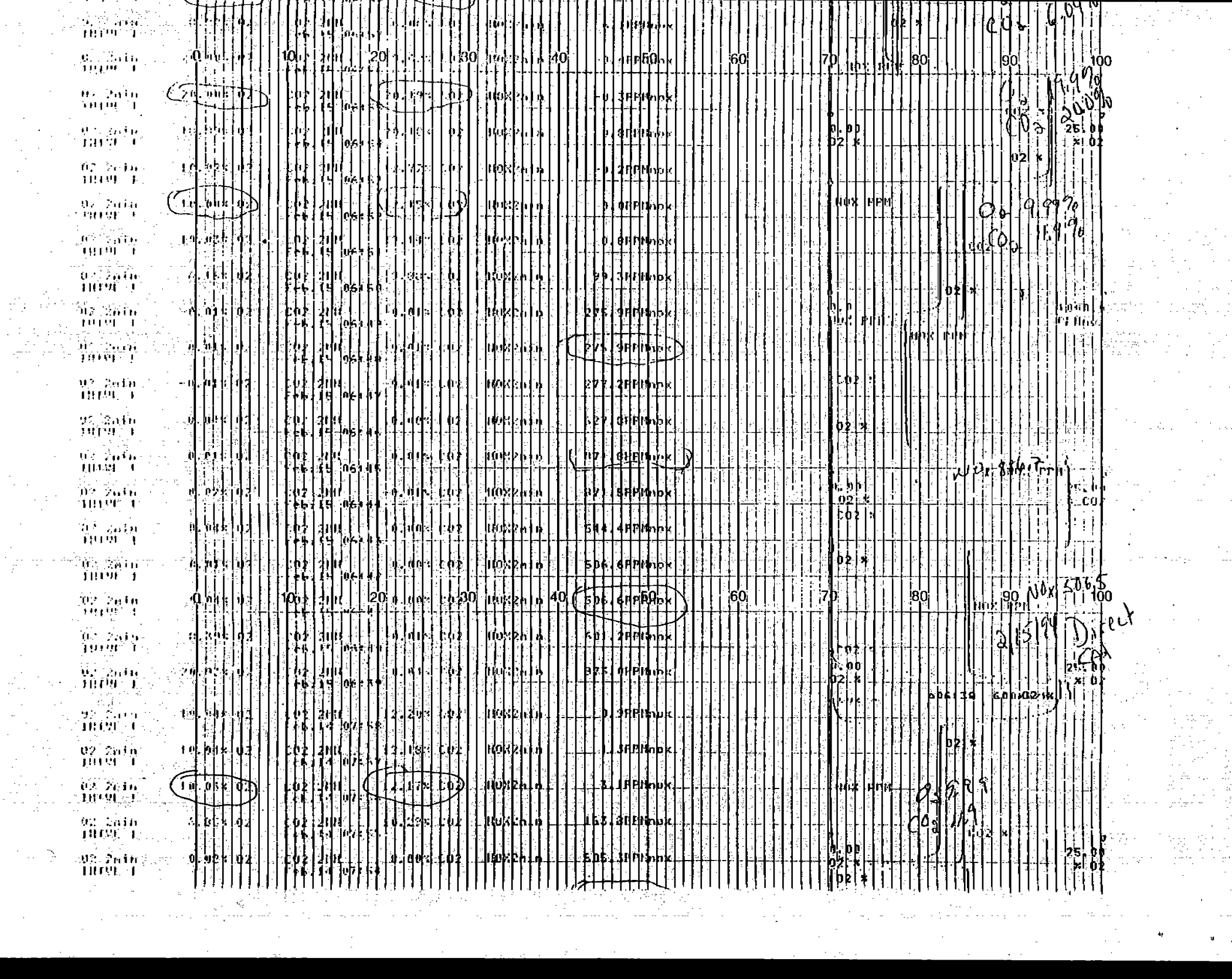
O_2 ?.78
CO_2 6.04

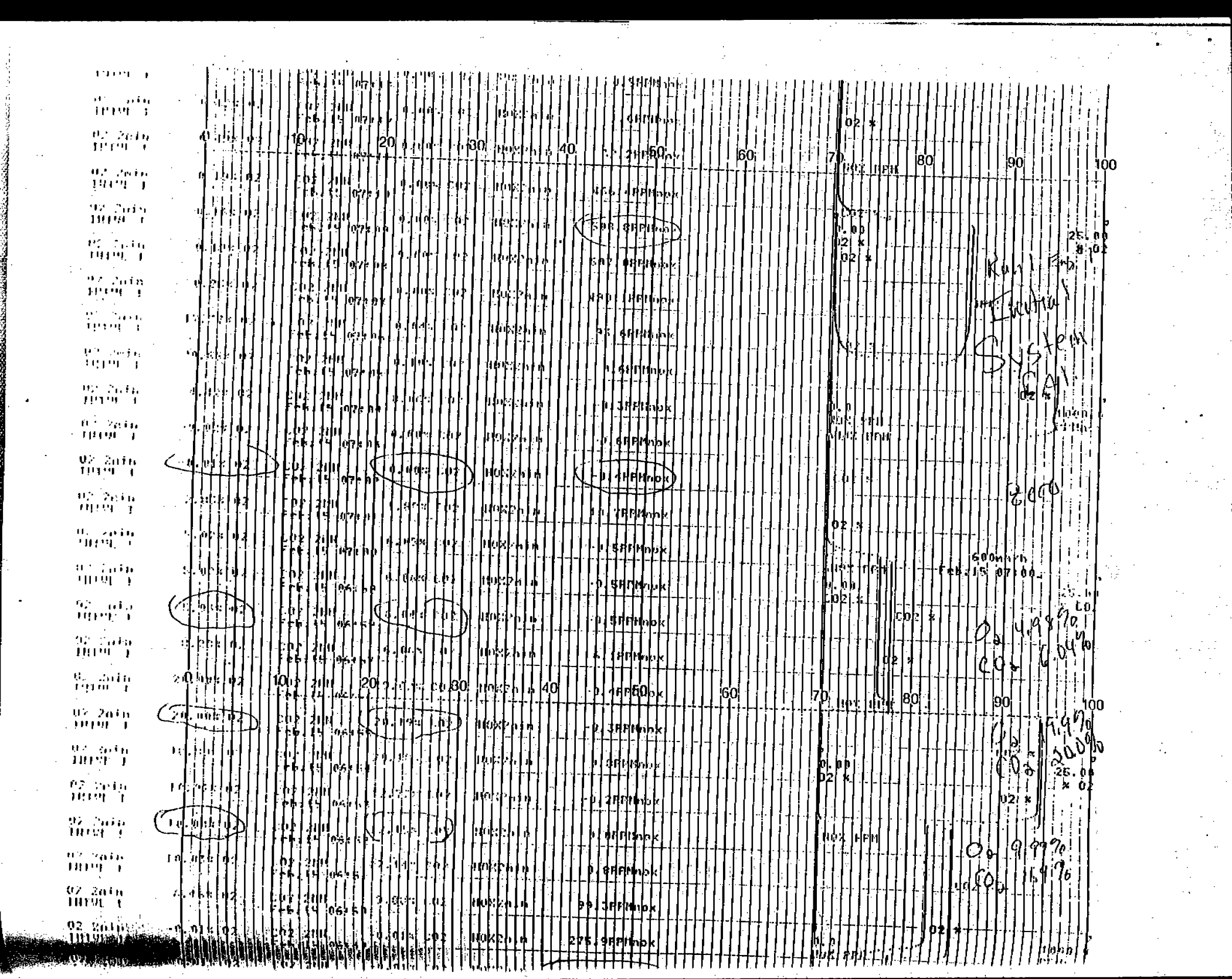
O_2 19.9
CO_2 .000

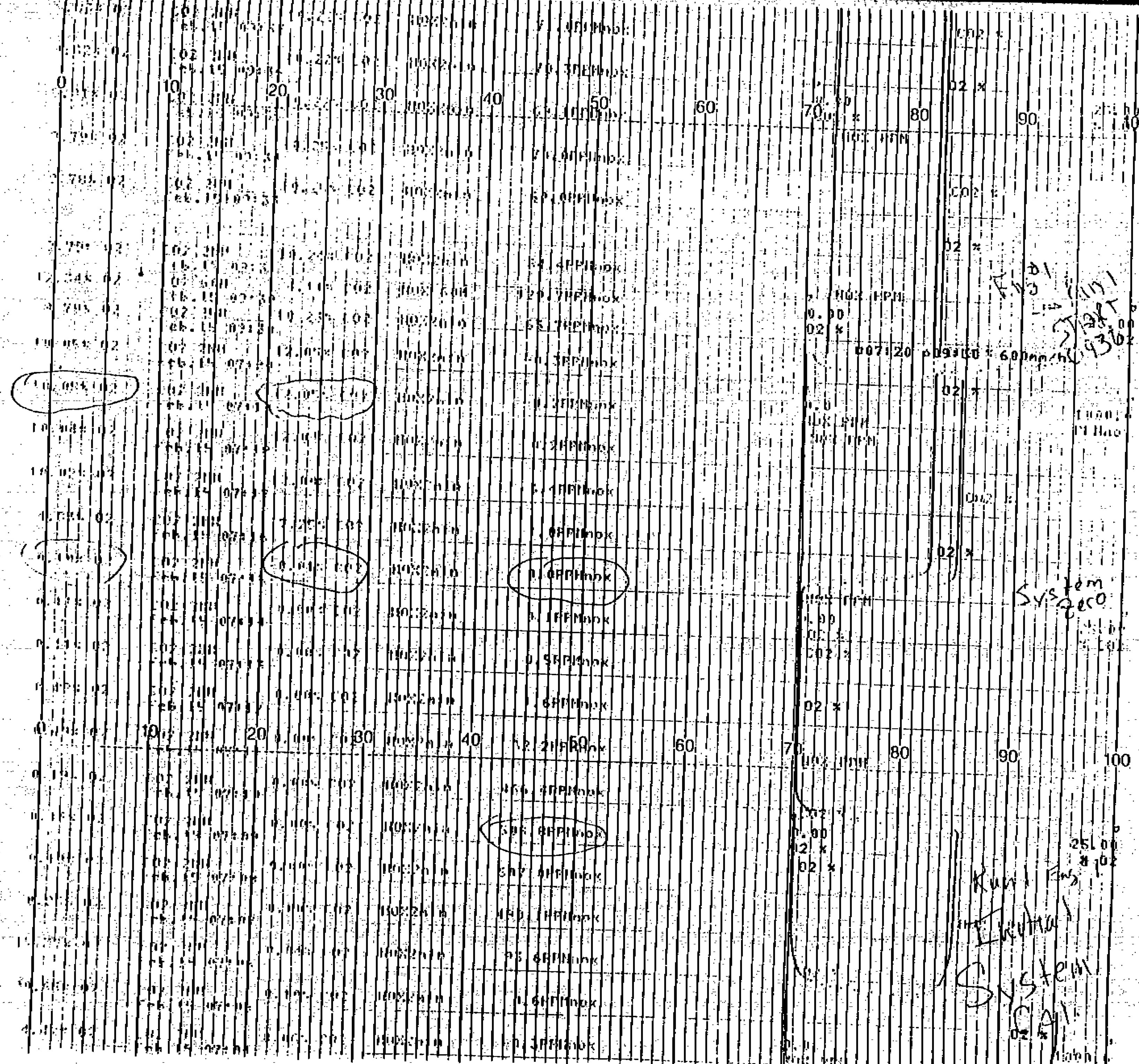
O_2 9.99
CO_2 11.9

NOx 869.7

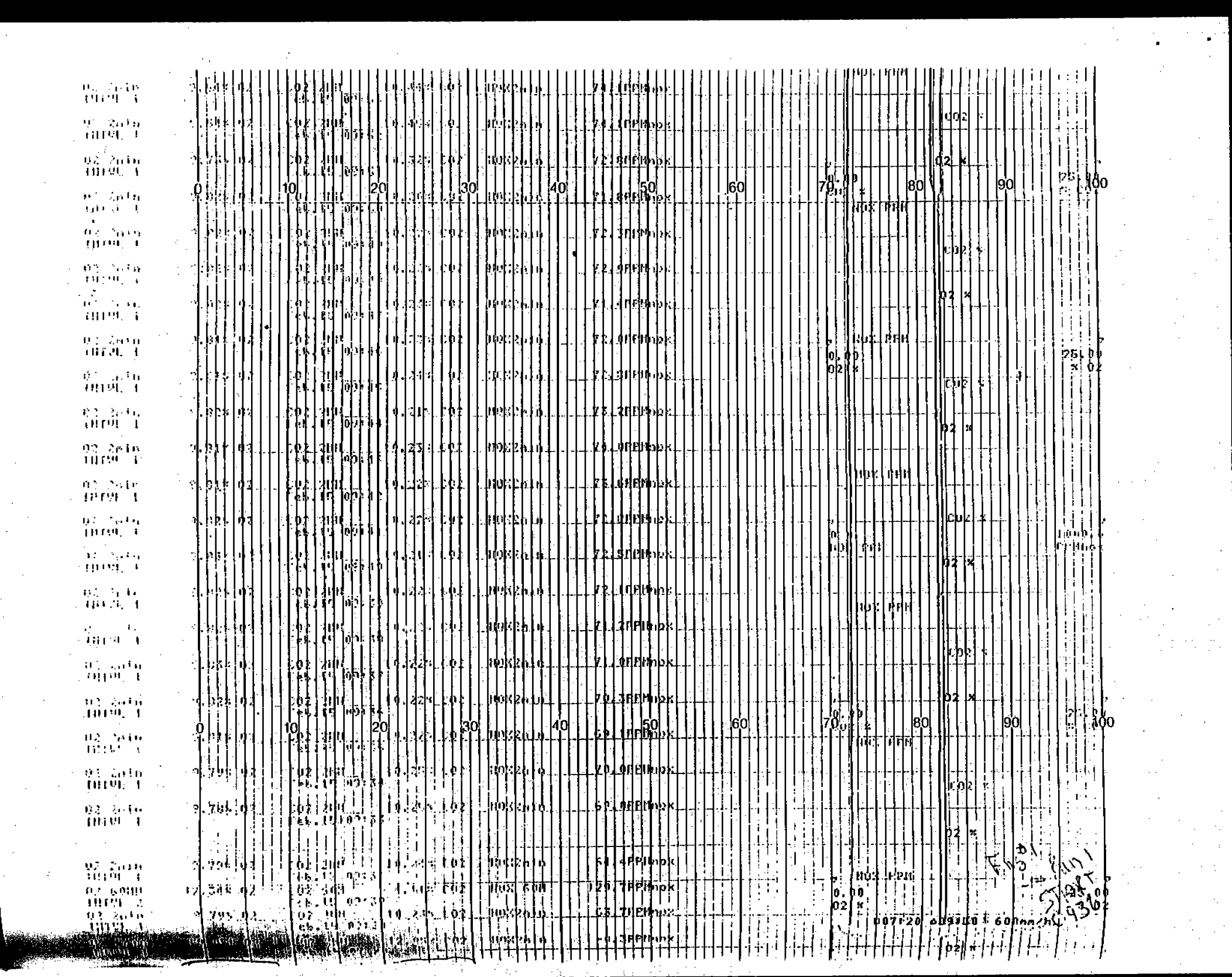

NOx 506.5
NOx System
506.7
NOx 279
Direct
System
Cal
Run

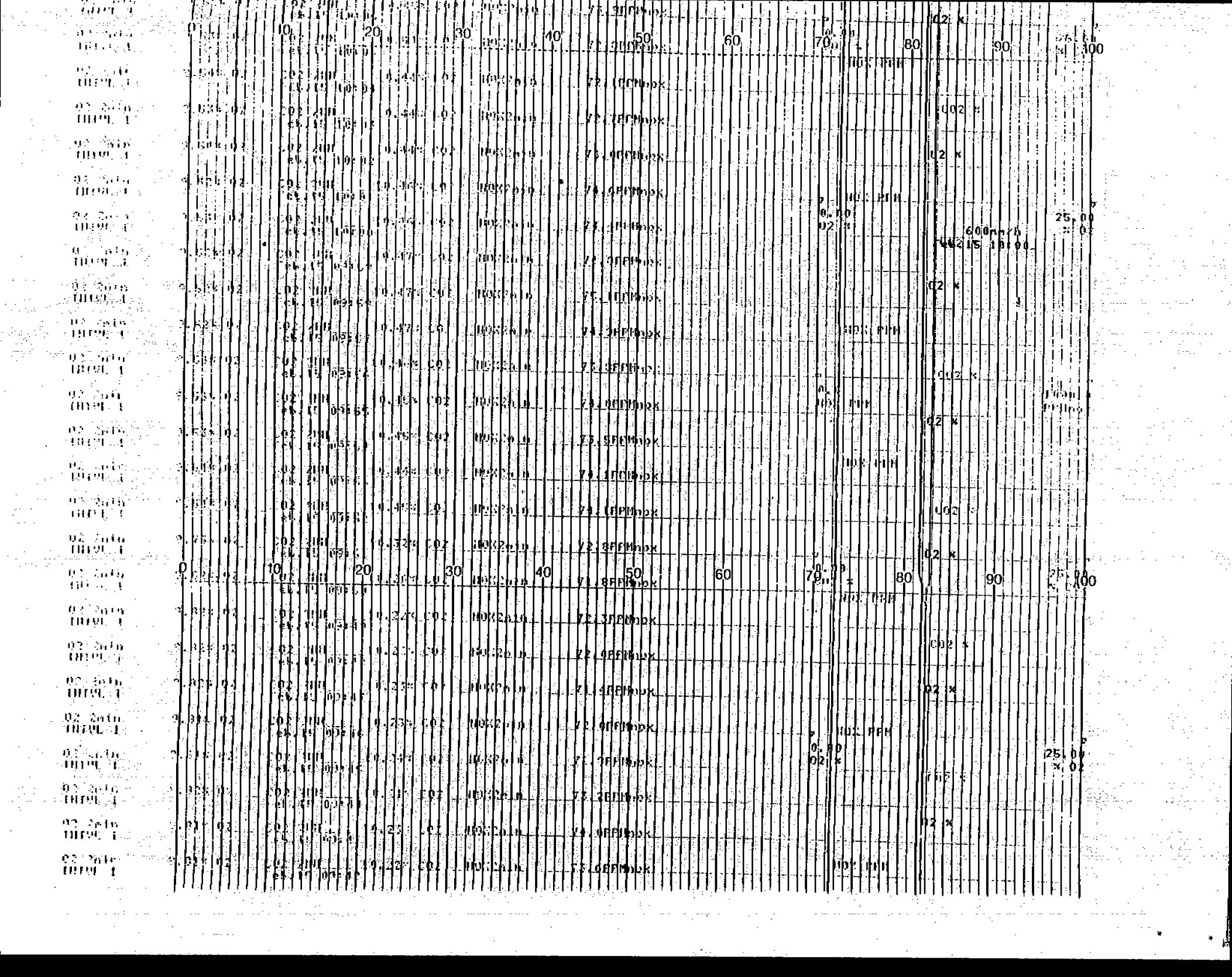


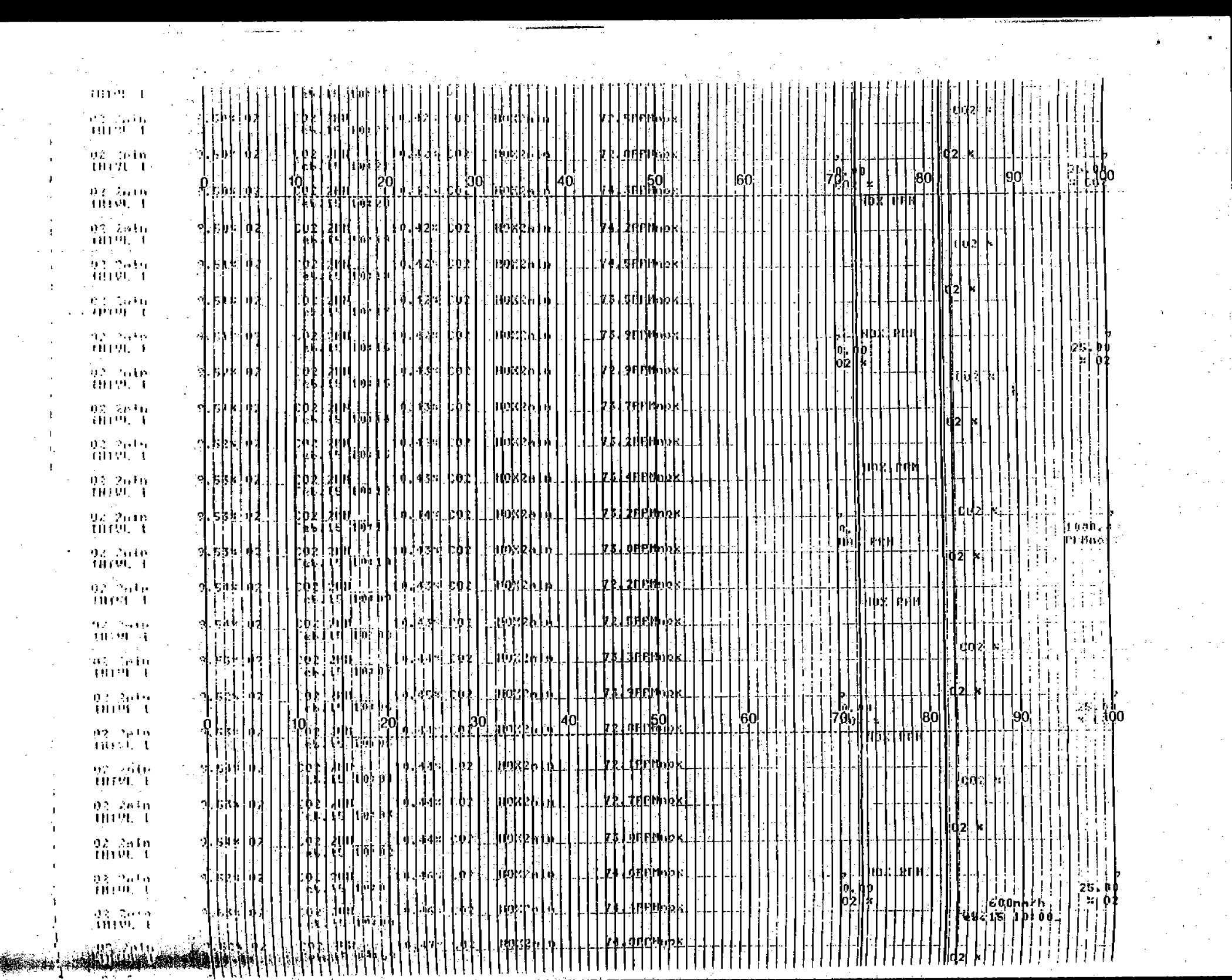


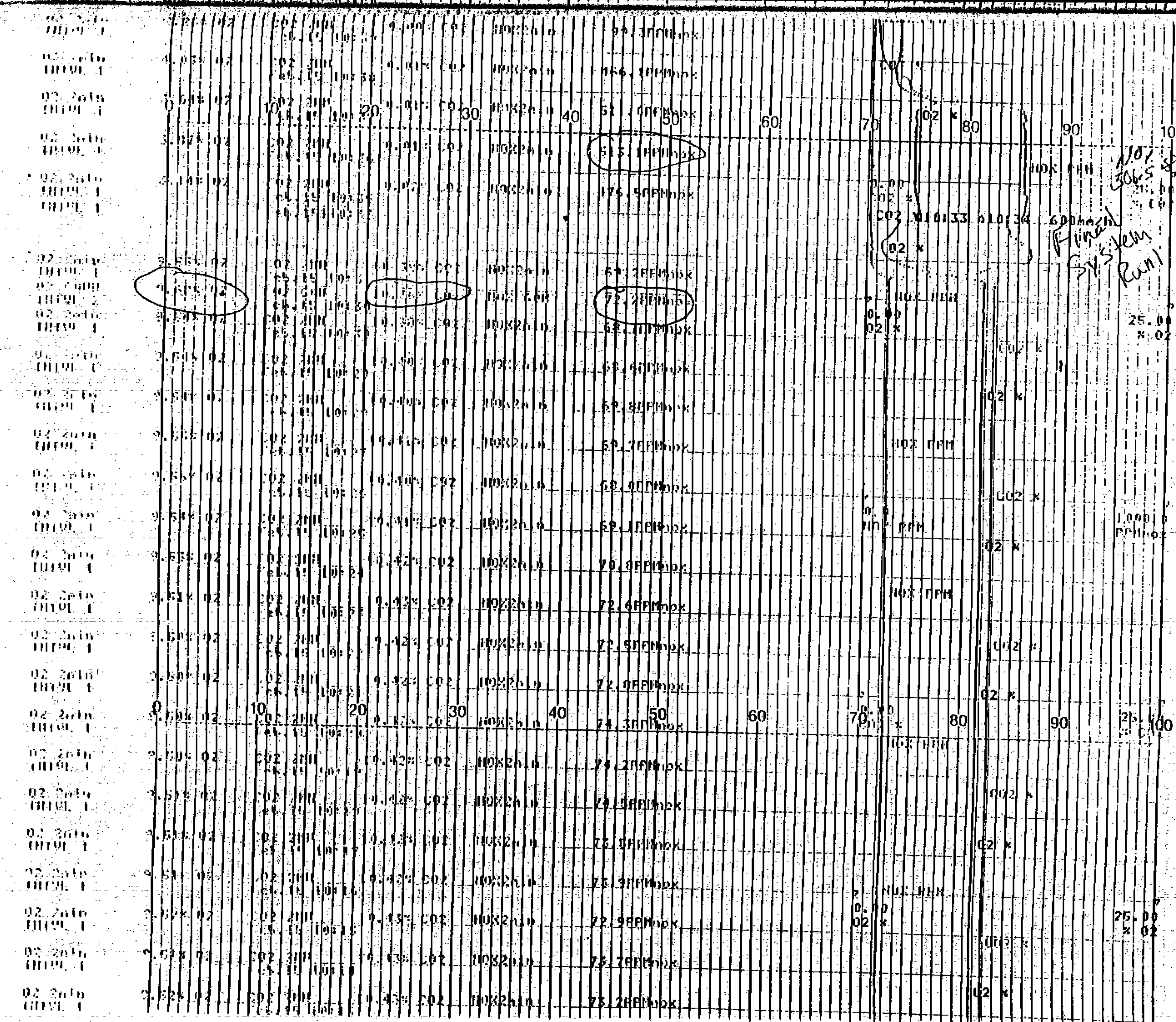


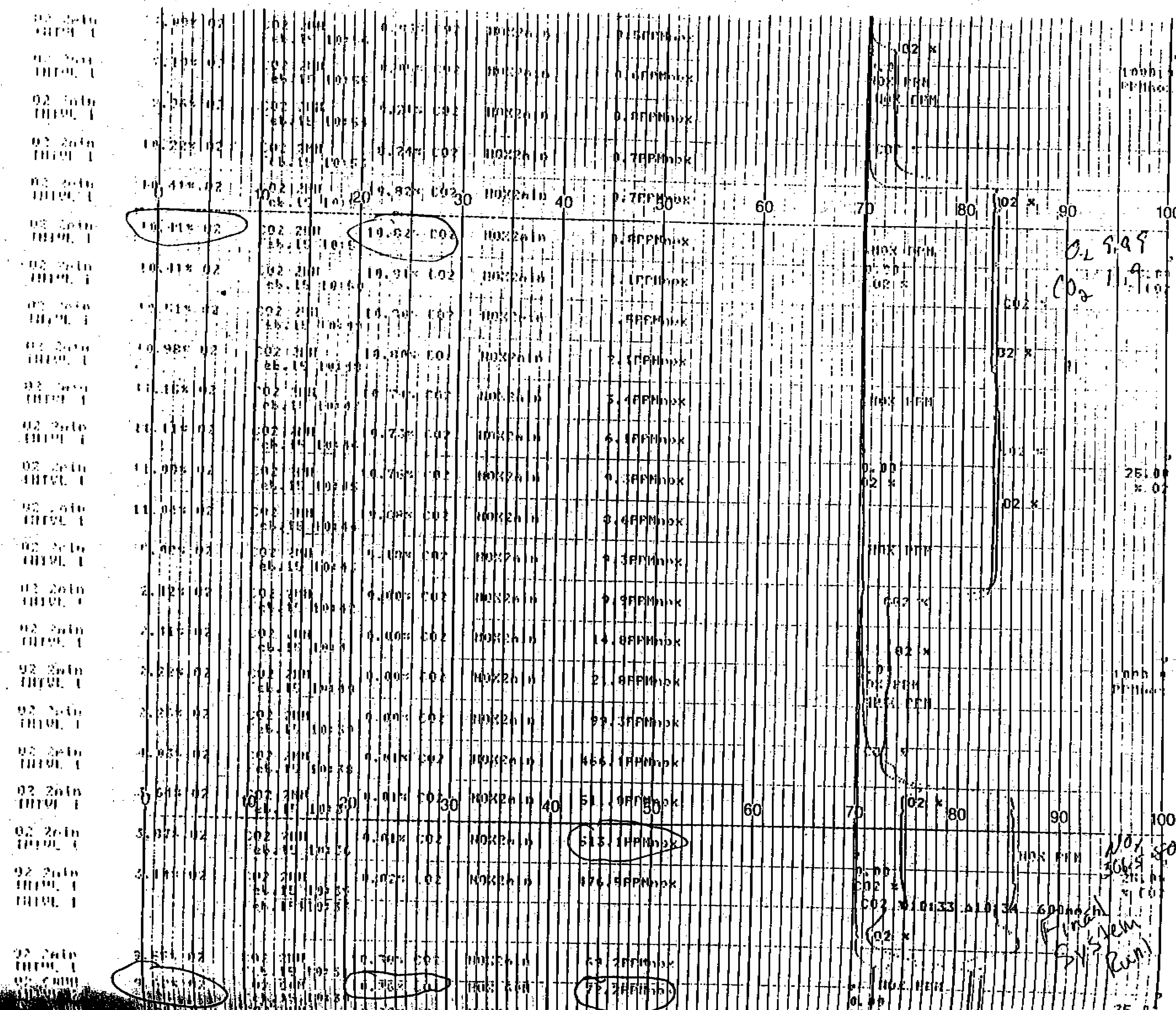
0 10 20 30 40 50 60 70 80 90 100
007:20 p09:00 : 600mm/h
02 %
System zero




0
10
20
30
40
50
60
70
80
90
100
25.00
02 %
PPM




0 10 20 30 40 50 60 70 80 90 100
NOx PPM
O2 %
CO2 %
25.00 % O2
176.5PPMnox
72.6PPMnox
NOx 306.5 #06
Final System Run



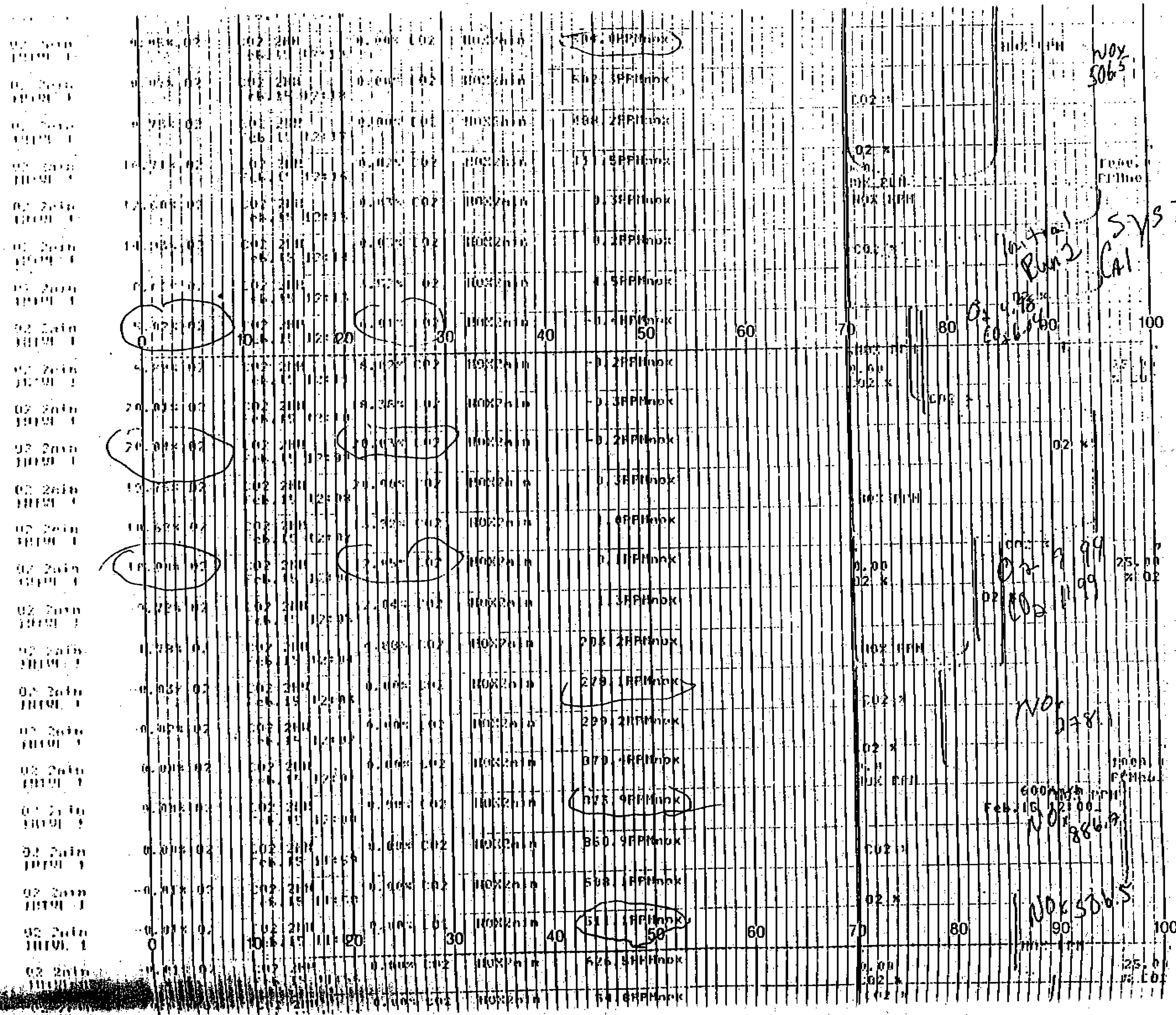
O2 2min INTVL 1
10.41% O2
CO2 2MIN
10.82% CO2
10.91% CO2
10.80% CO2
NOX2min
0.7PPMnox
0.8PPMnox
2.1PPMnox
3.4PPMnox
6.1PPMnox
9.9PPMnox
14.8PPMnox
21.8PPMnox
99.3PPMnox
466.1PPMnox
513.1PPMnox
176.9PPMnox
0 10 20 30 40 50 60 70 80 90 100
O2 x
NOX PPM
O2 5.99
CO2 11.9
Final System Run

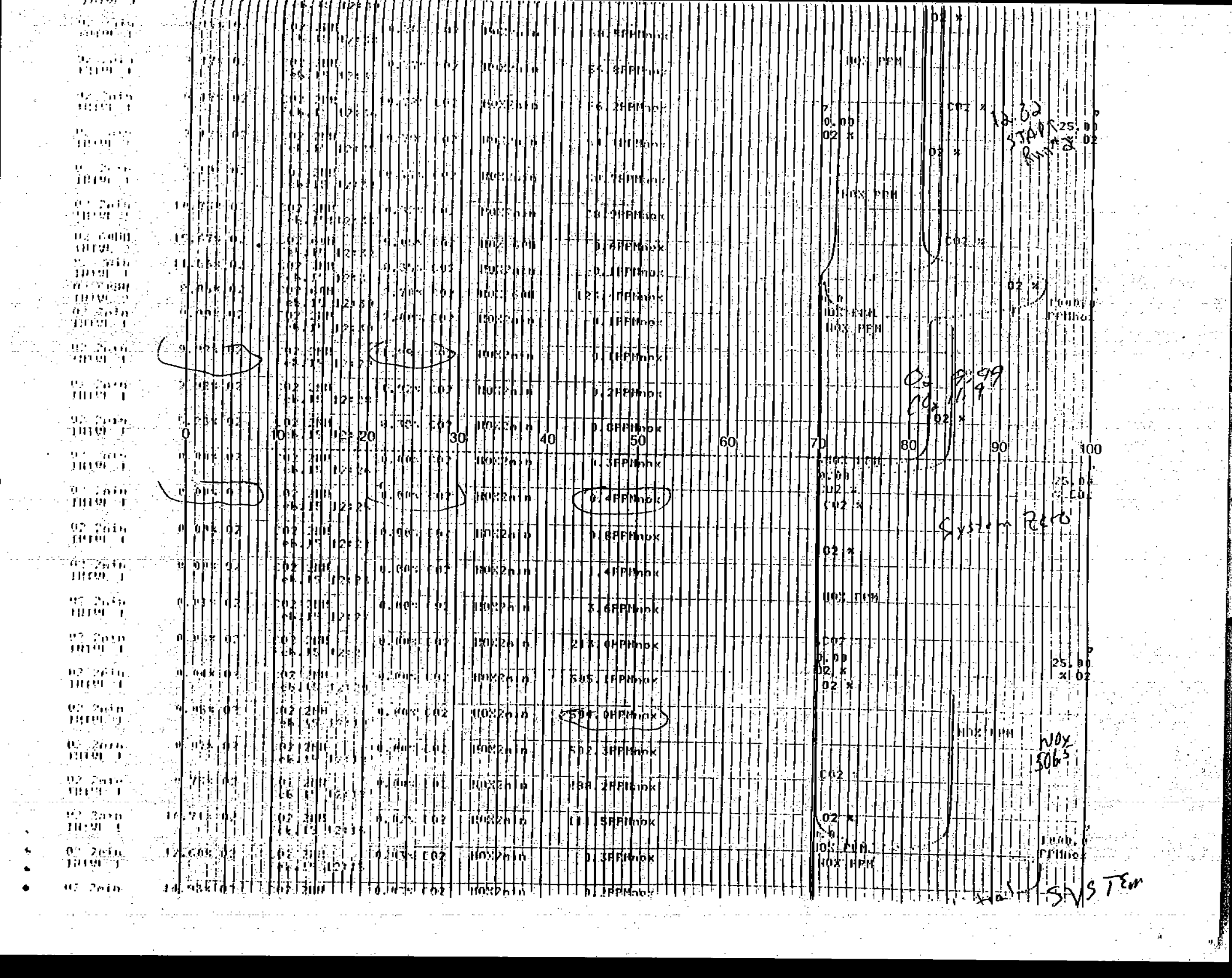
0 10 20 30 40 50 60 70 80 90 100

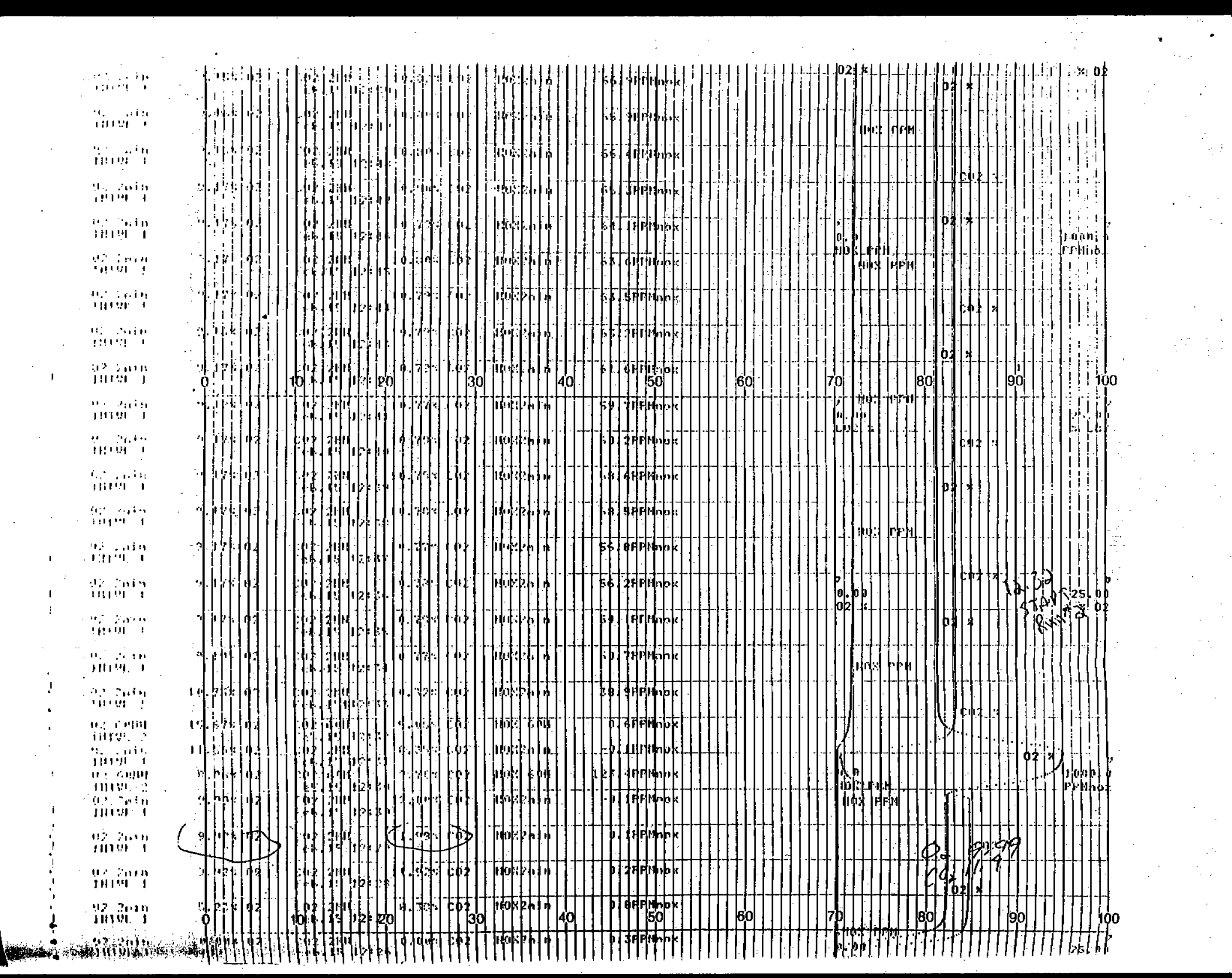
O2 2min	[illegible] O2	CO2 2min	0.00% CO2	NOX2min	278.1PPMnox
O2 2min	[illegible] O2	CO2 2min	0.00% CO2	NOX2min	209.2PPMnox
O2 2min	[illegible] O2	CO2 2min	0.00% CO2	NOX2min	870.4PPMnox
O2 2min	[illegible] O2	CO2 2min	[illegible] CO2	NOX2min	677.4PPMnox
O2 2min	[illegible] O2	CO2 2min	0.00% CO2	NOX2min	850.9PPMnox
O2 2min	[illegible] O2	CO2 2min	0.00% CO2	NOX2min	508.1PPMnox
O2 2min	[illegible] O2	CO2 2min	0.00% CO1	NOX2min	51.1PPMnox
O2 2min	[illegible] O2	CO2 2min	0.00% CO2	NOX2min	826.5PPMnox
O2 2min	[illegible] O2	CO2 2min	0.00% CO2	NOX2min	54.6PPMnox
O2 2min	[illegible] O2	CO2 2min	0.00% CO2	NOX2min	0.4PPMnox
O2 2min	[illegible] O2	CO2 2min	0.00% CO2	NOX2min	5.6PPMnox
O2 2min	[illegible] O2	CO2 2min	0.00% CO2	NOX2min	0.6PPMnox
O2 2min	[illegible] O2	CO2 2min	0.00% CO2	NOX2min	0.7PPMnox
O2 2min	[illegible] O2	CO2 2min	0.01% CO2	NOX2min	0.6PPMnox
O2 2min	0.71% O2	CO2 2min	0.00% CO2	NOX2min	14.2PPMnox
O2 2min	[illegible] O2	CO2 2min	0.03% CO2	NOX2min	0.5PPMnox
O2 2min	[illegible] O2	CO2 2min	0.07% CO2	NOX2min	0.6PPMnox
O2 2min	[illegible] O2	CO2 2min	0.21% CO2	NOX2min	0.8PPMnox
O2 2min	10.22% O2	CO2 2min	0.24% CO2	NOX2min	0.7PPMnox
O2 2min	10.41% O2	CO2 2min	9.82% CO2	NOX2min	0.7PPMnox
O2 2min	10.41% O2	CO2 2min	10.02% CO2	NOX2min	0.8PPMnox
O2 2min	10.41% O2	CO2 2min	10.01% CO2	NOX2min	[illegible]PPMnox

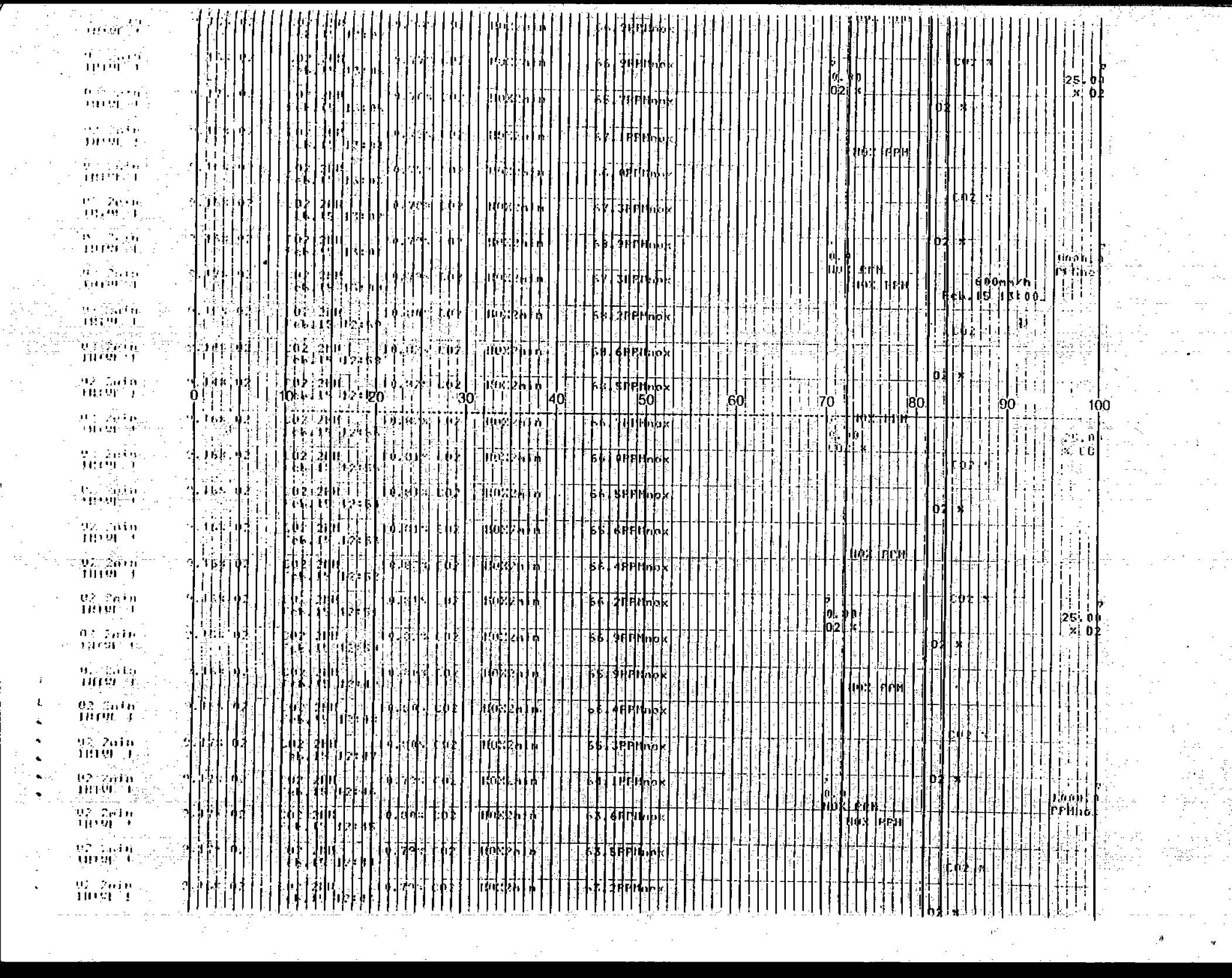
Feb.15 02:00 600mm/h
02 % 10:59 01:190 600mm/h

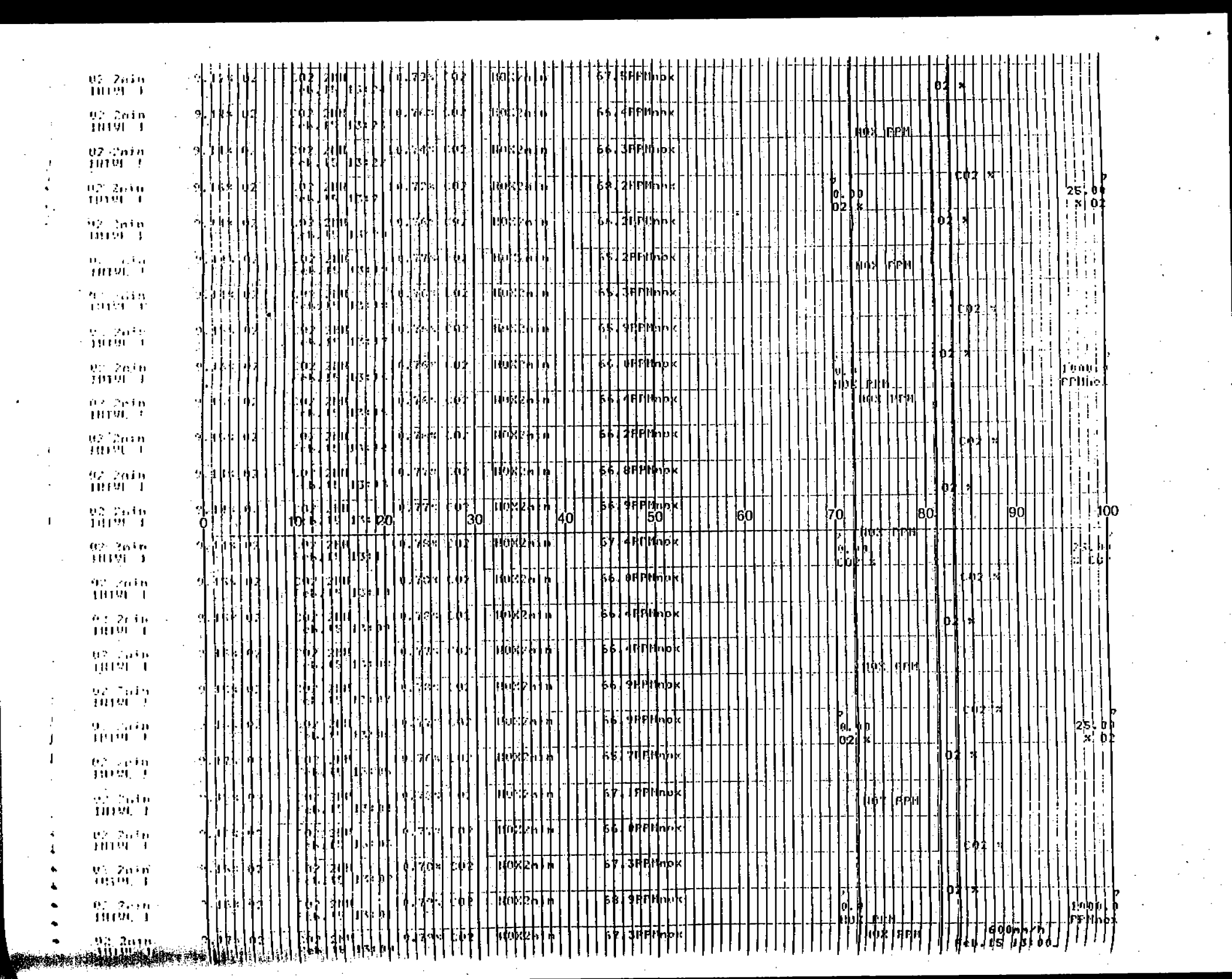
NOx 278.1
NOx 886.7
NOx 586.5
Zero
Ref Direct
Ref System
O2 5.97
CO2 11.9

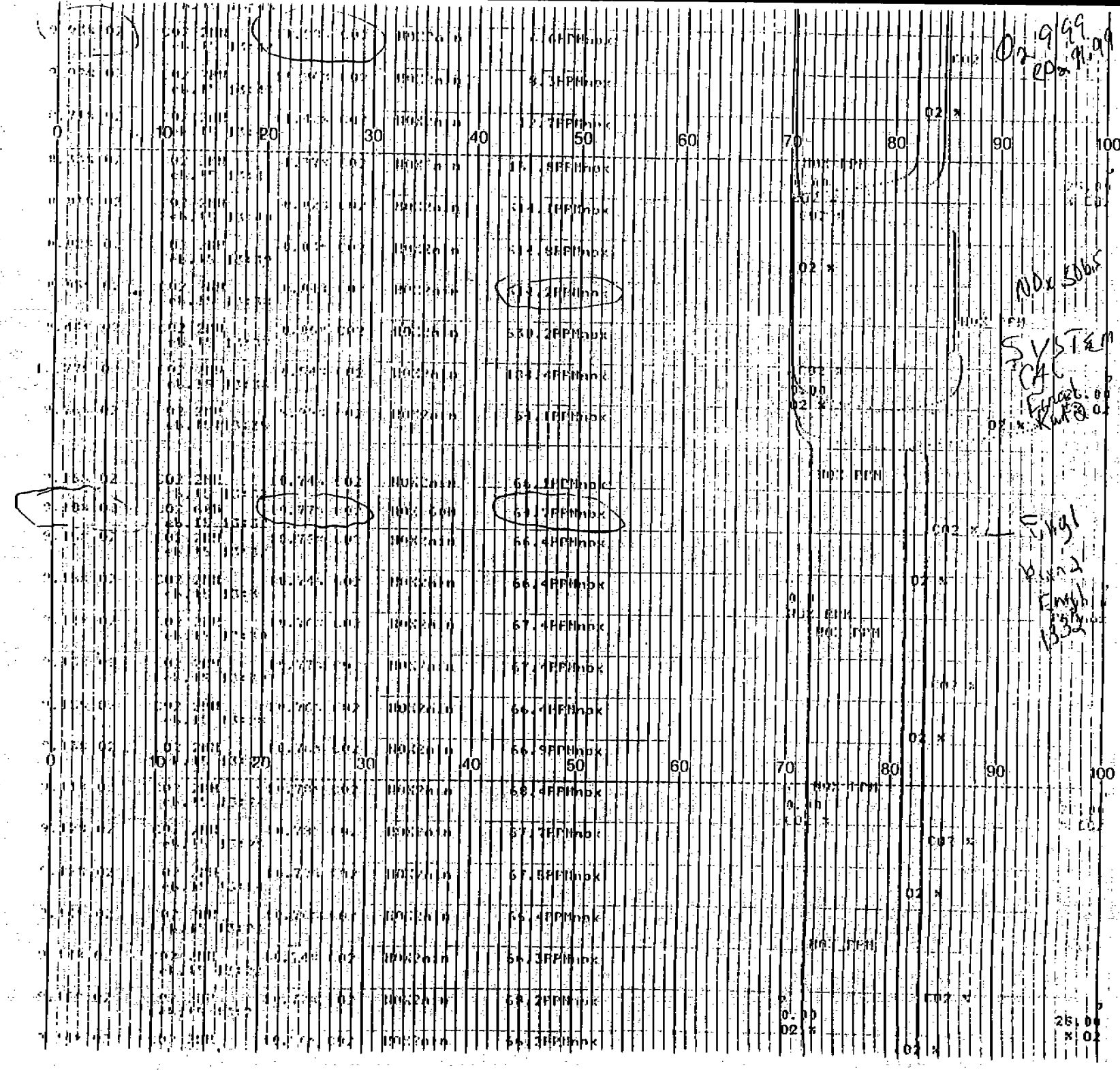

NOx 506.5
SYSTEM CAL
Initial Run 2
NOx 878
NOx 886.7
NOx 506.5
0 10 20 30 40 50 60 70 80 90 100
O2 2min
HOX2min
Feb.16 12:00

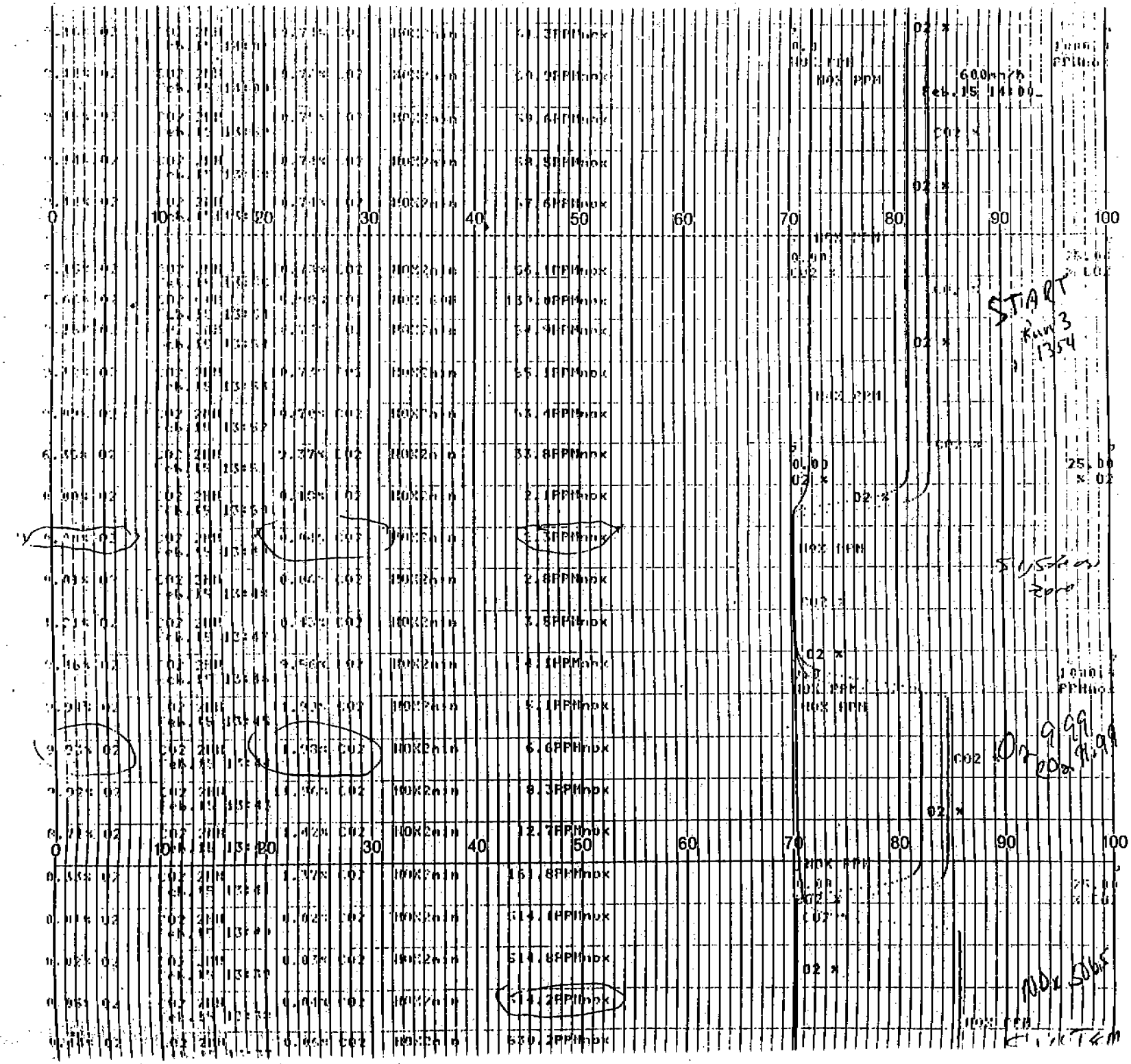

0
10
20
30
40
50
60
70
80
90
100
NOx PPM
CO2 %
02 %
SYSTEM ZERO
NOx SYSTEM

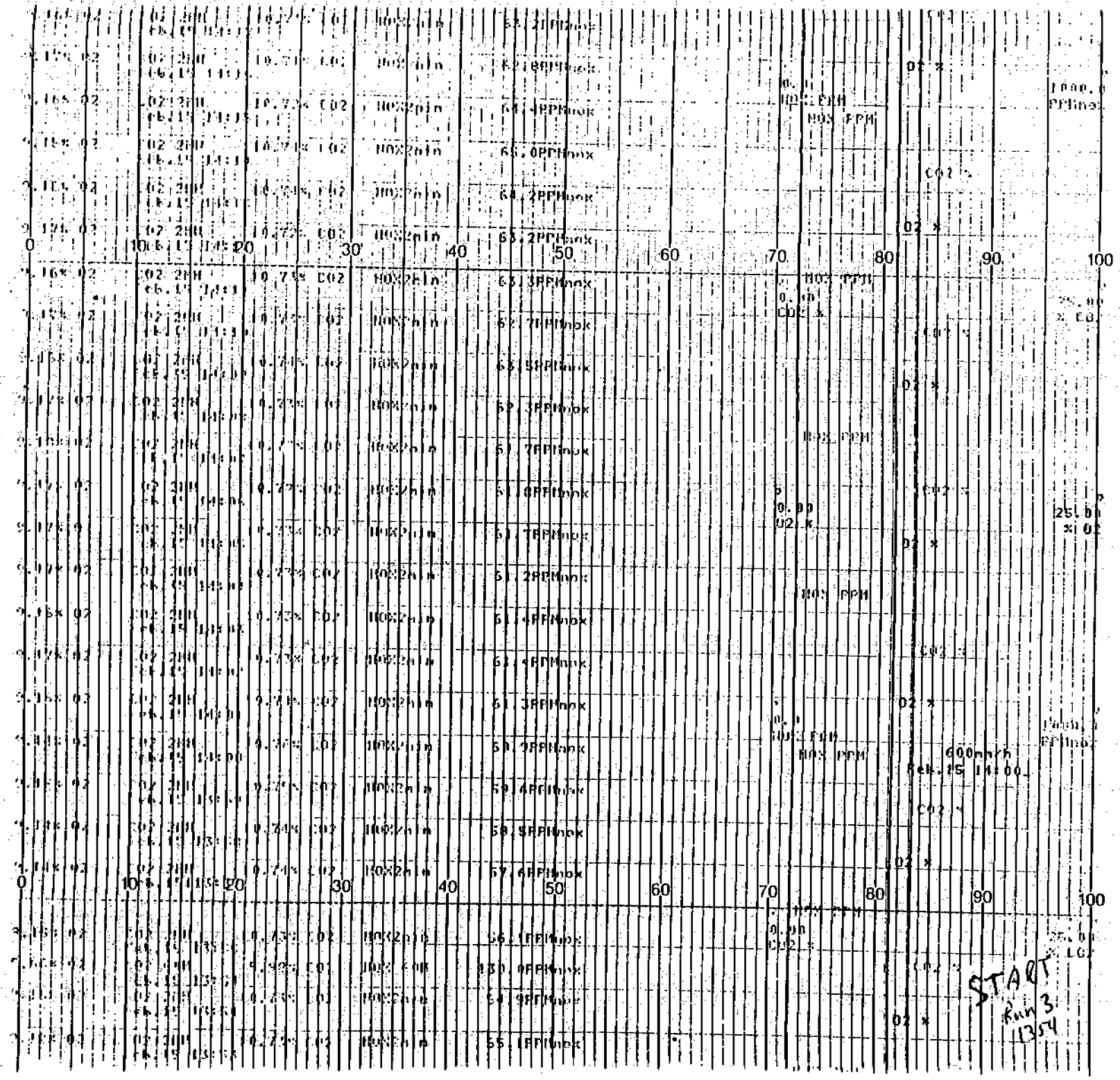

0
10
20
30
40
50
60
70
80
90
100
02 %
CO2 %
NOX PPM
NO PPM
0.00
25.00

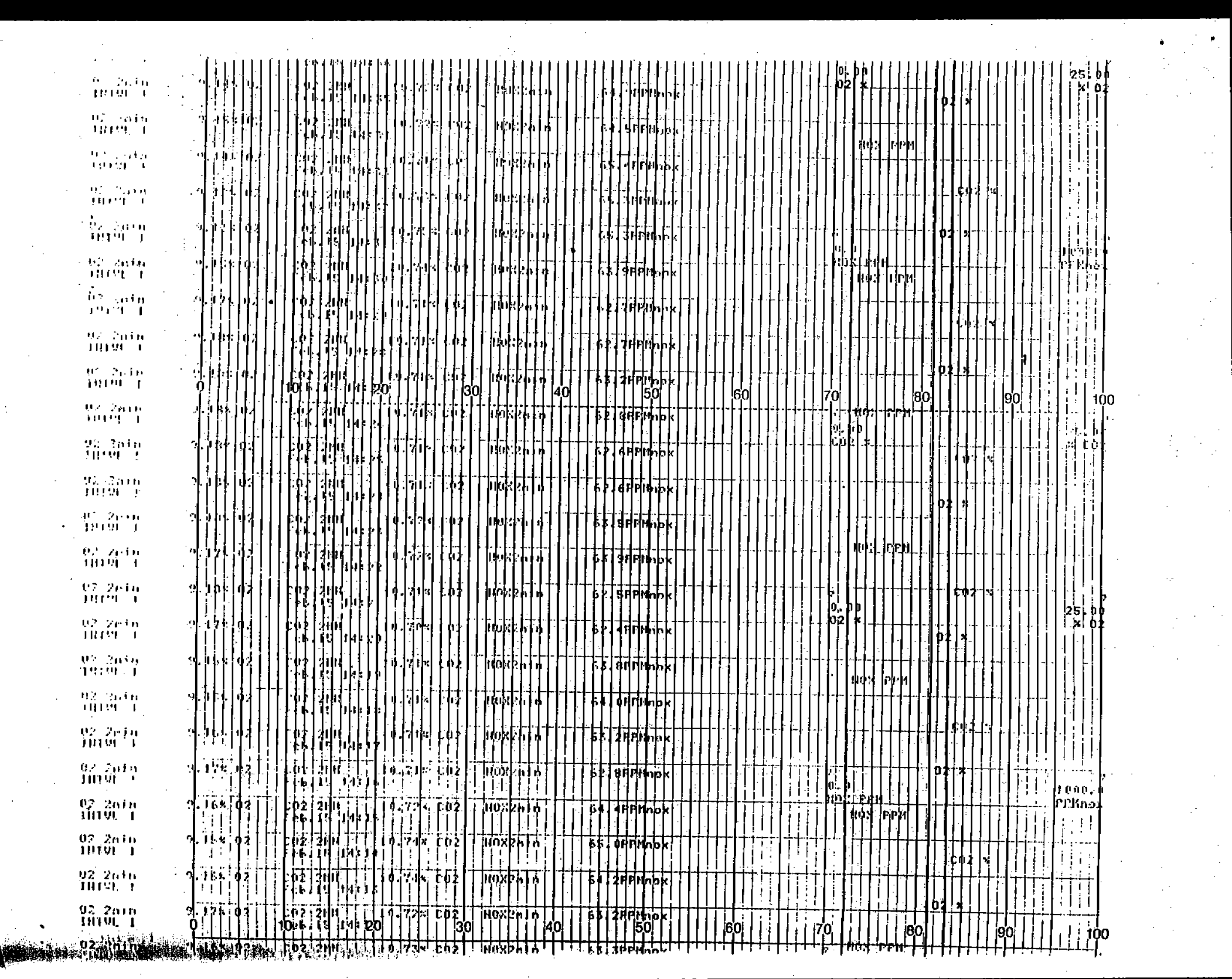

0
10
20
30
40
50
60
70
80
90
100

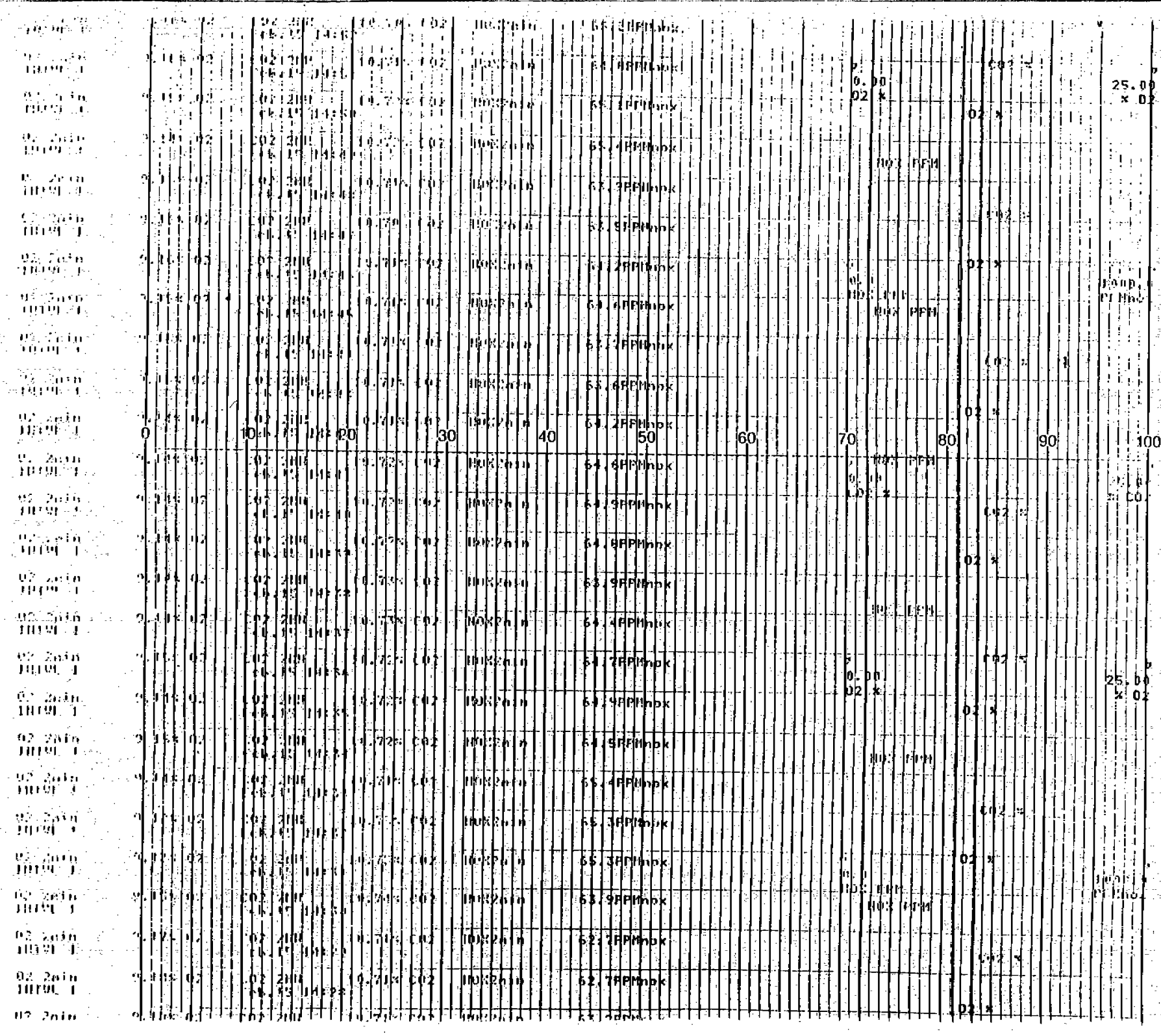

0
10
20
30
40
50
60
70
80
90
100
02 %
CO2 %
RPMmax
600mm/h

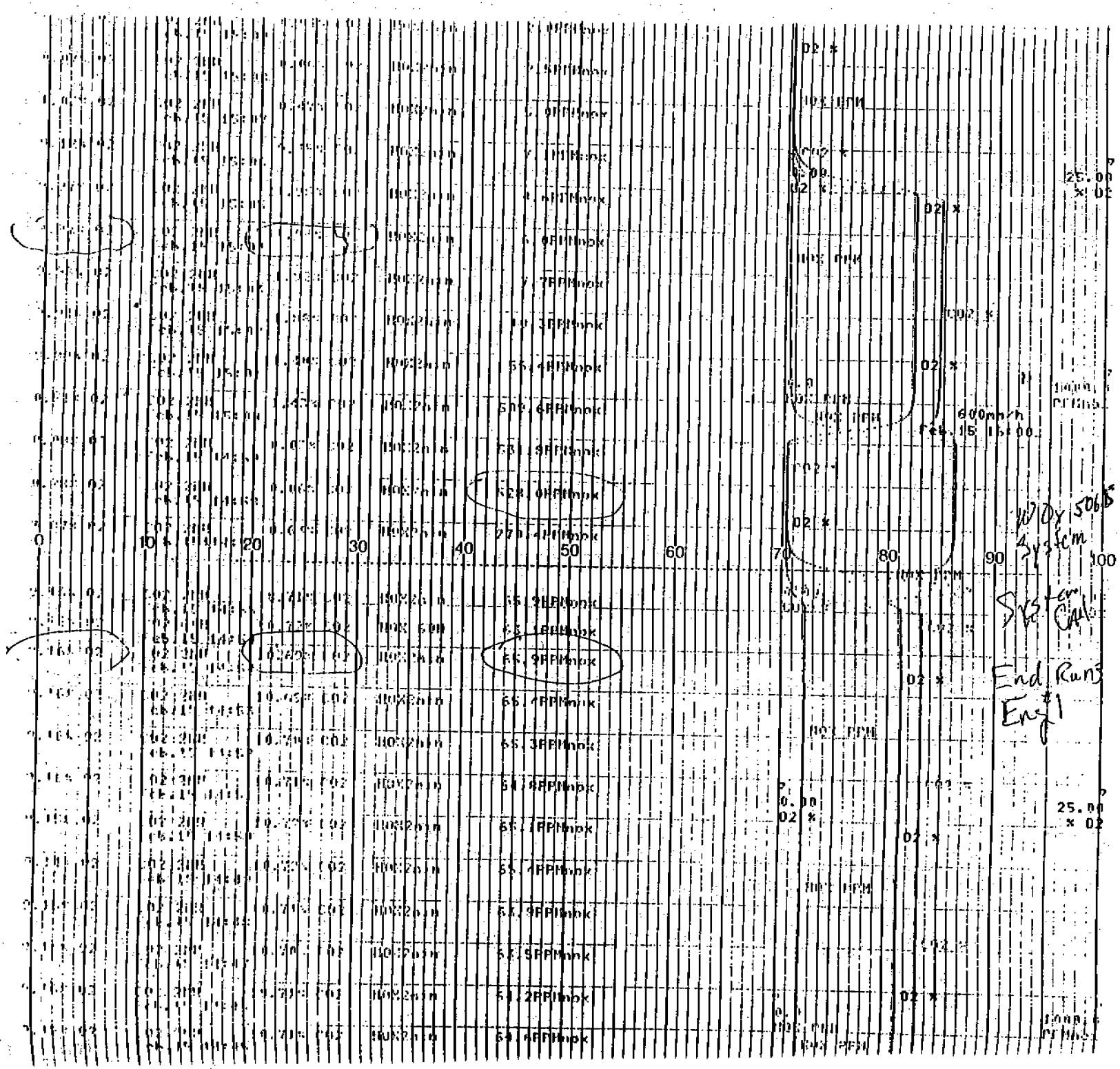

0 10 20 30 40 50 60 70 80 90 100
0 10 20 30 40 50 60 70 80 90 100

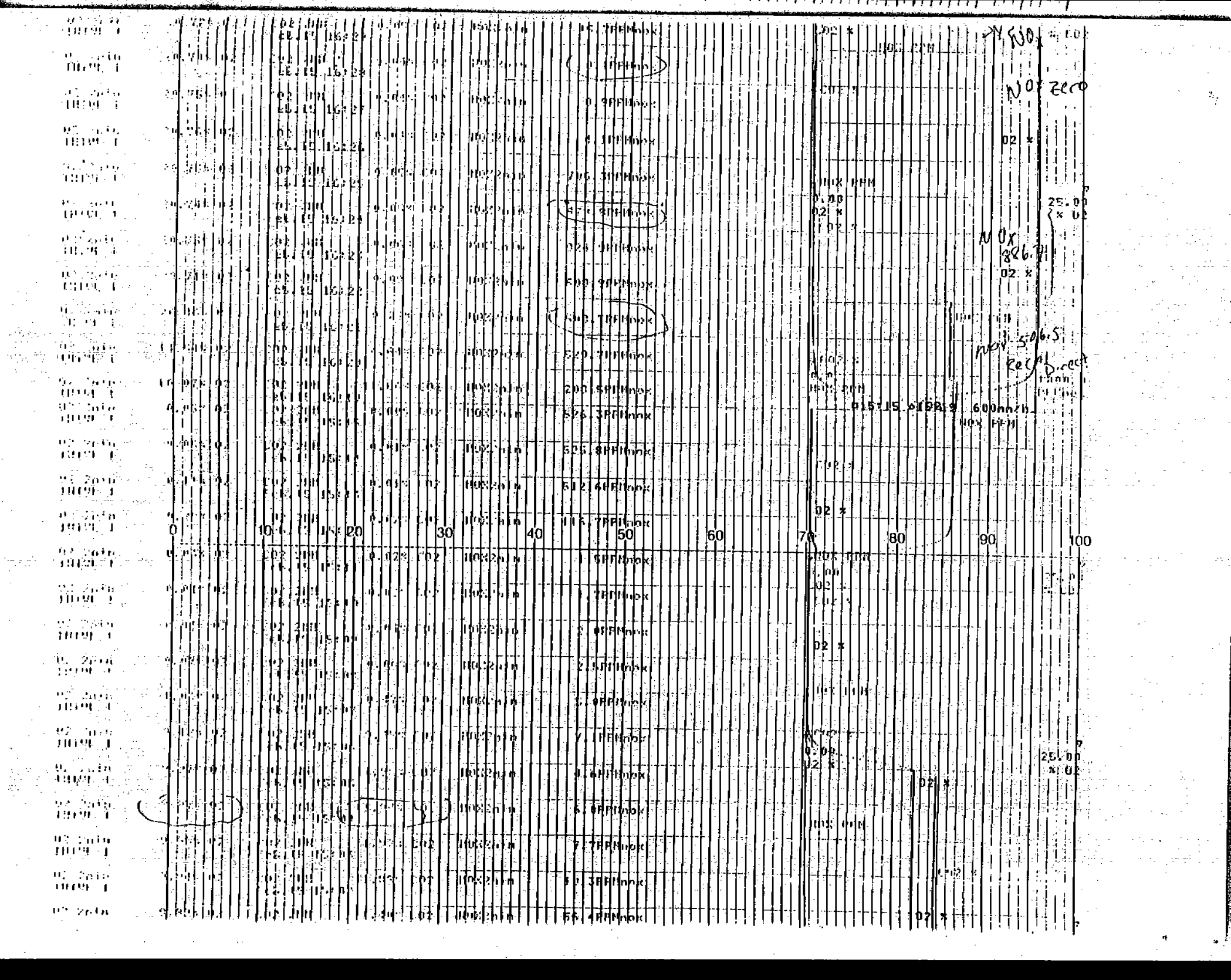

START
Run 3
1354
0 10 20 30 40 50 60 70 80 90 100
0 10 20 30 40 50 60 70 80 90 100

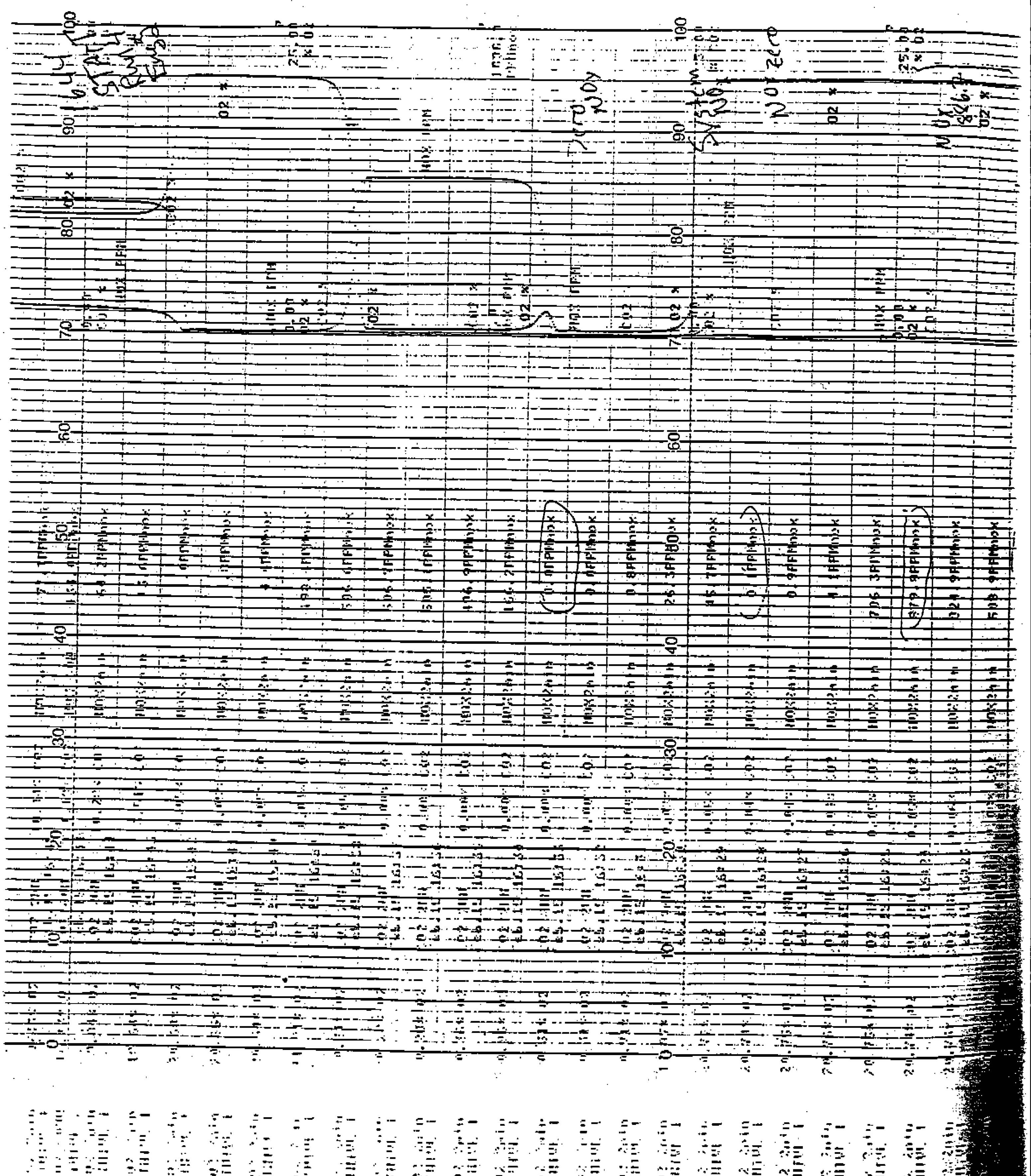

0
10
20
30
40
50
60
70
80
90
100
START
Run 3
1354

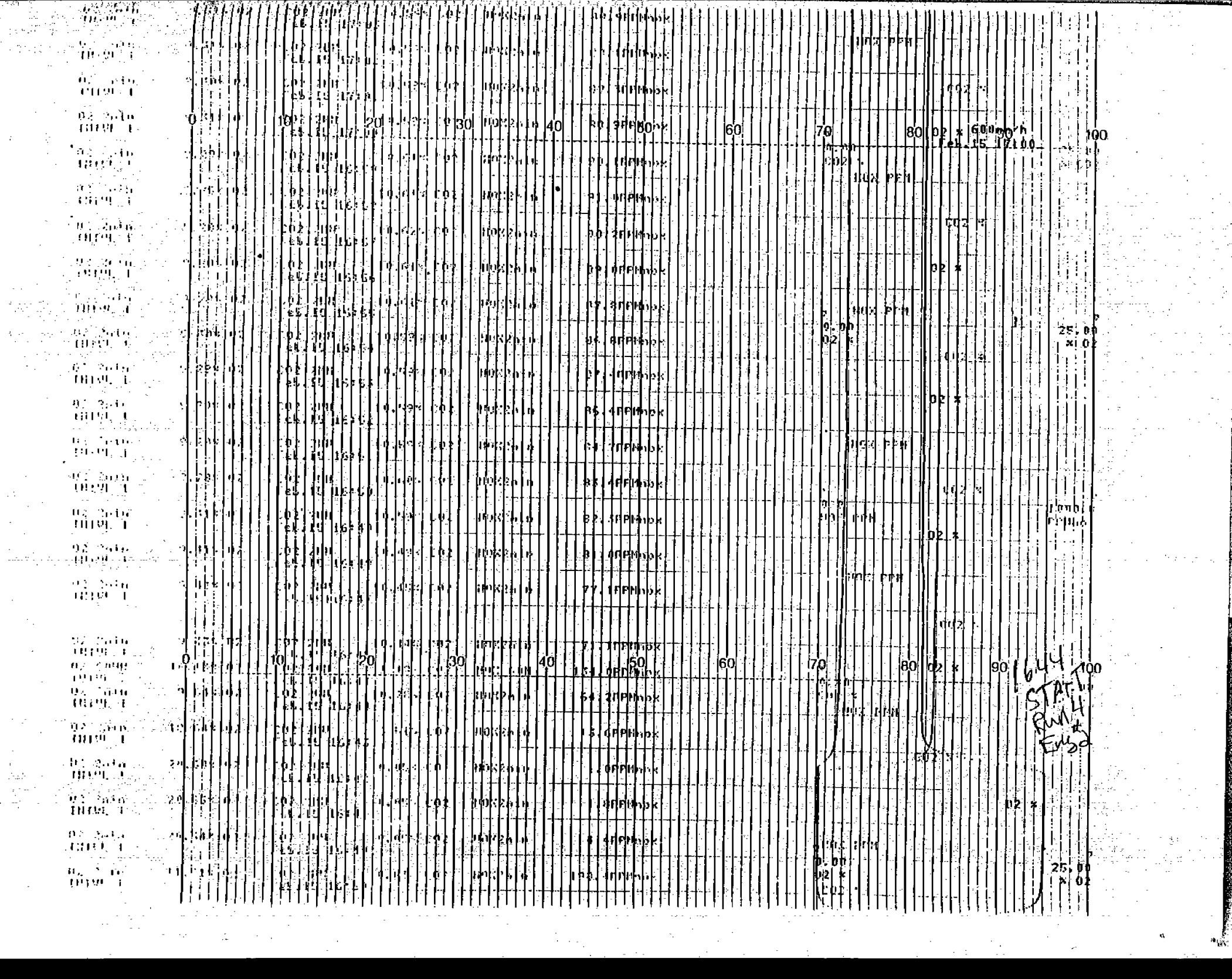

0
10
20
30
40
50
60
70
80
90
100
NOX PPM
CO2 %
02 %
0.00
25.00
1000.0
PPMnox

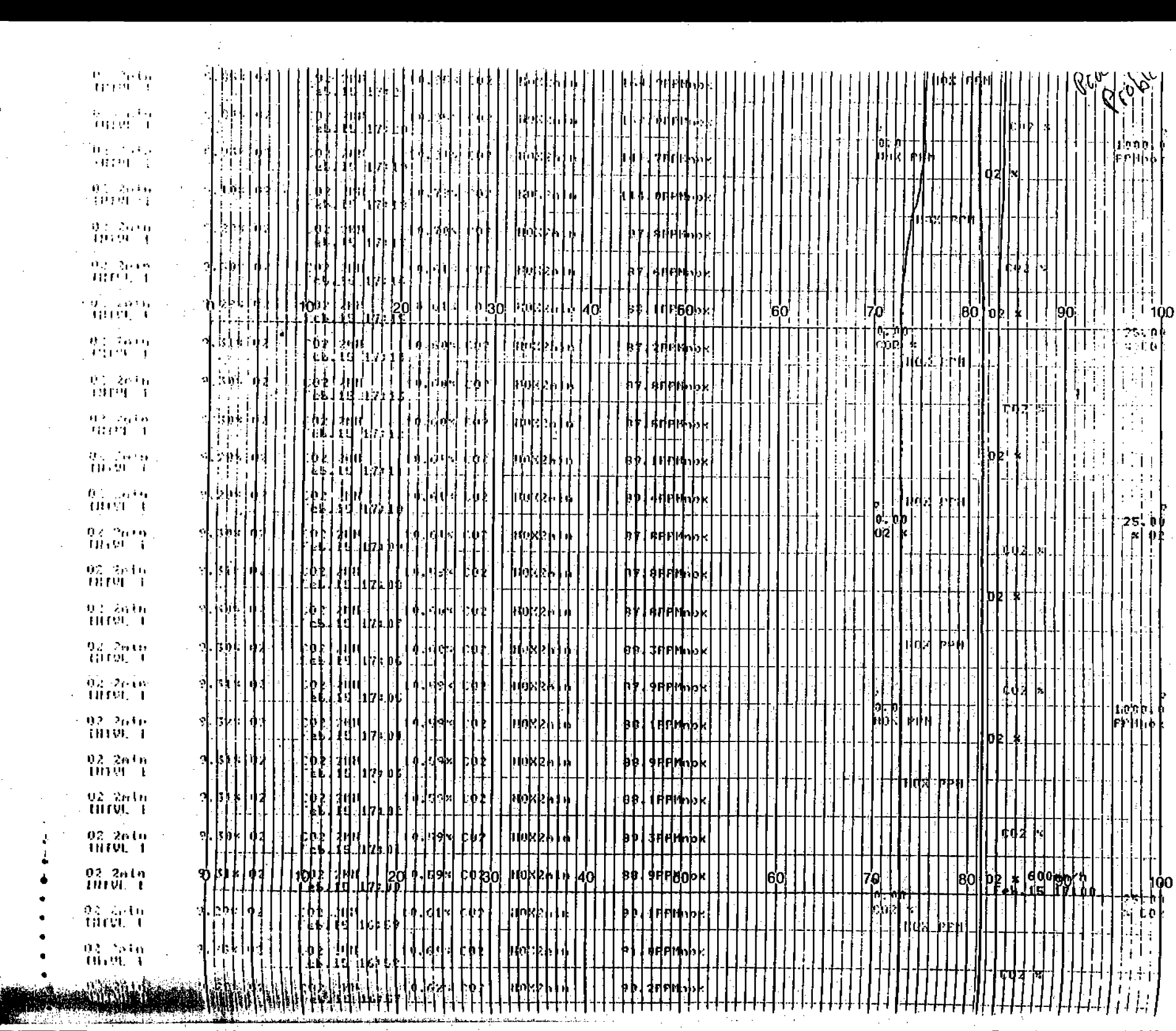

0
10
20
30
40
50
60
70
80
90
100
25.00
x 02
PPH

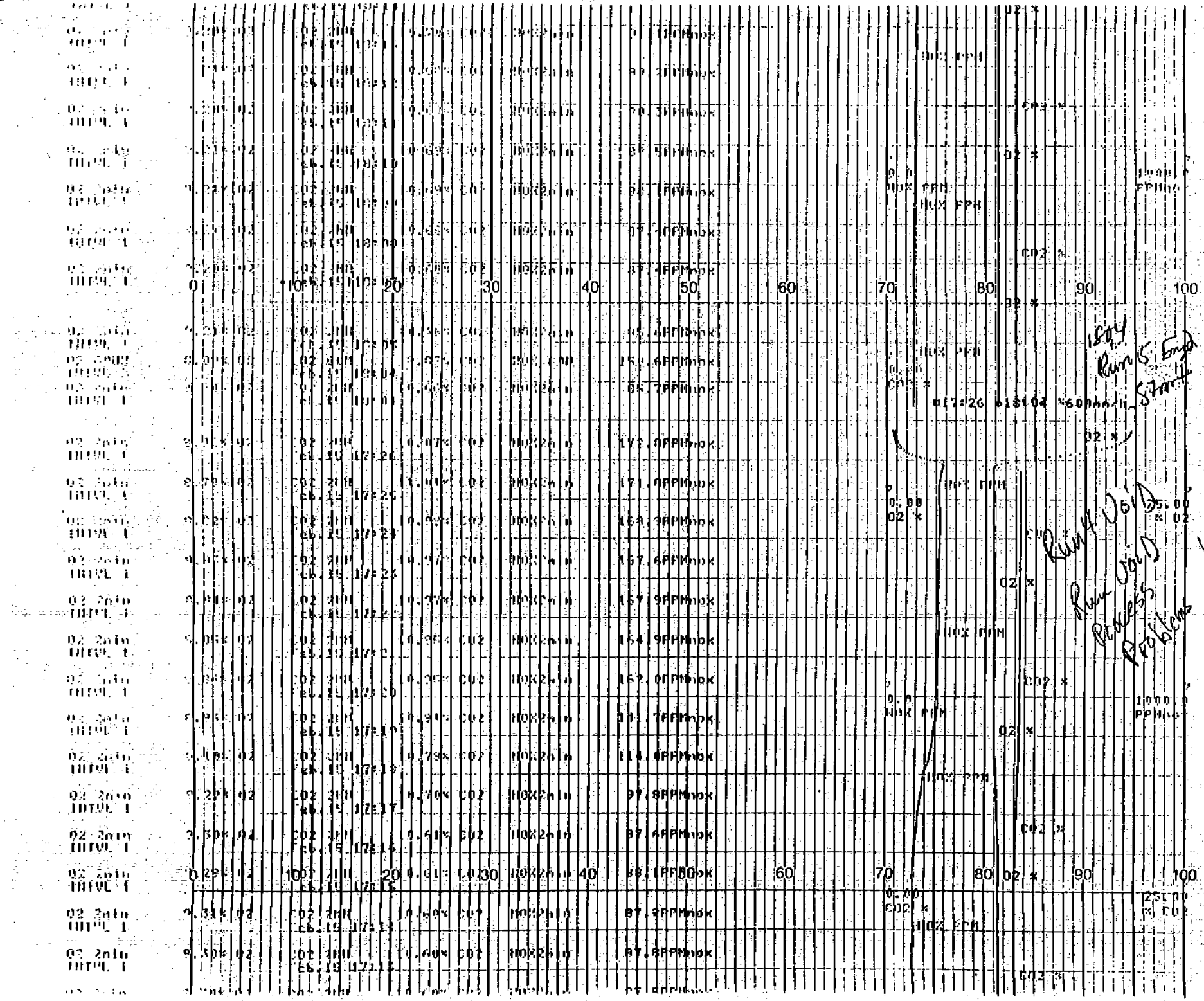

0
10
20
30
40
50
60
70
80
90
100
600mm/h
Feb.15 16:00
25.00
02 %
02 PPM
100 PPM
End Run
Eng #1
System Cal

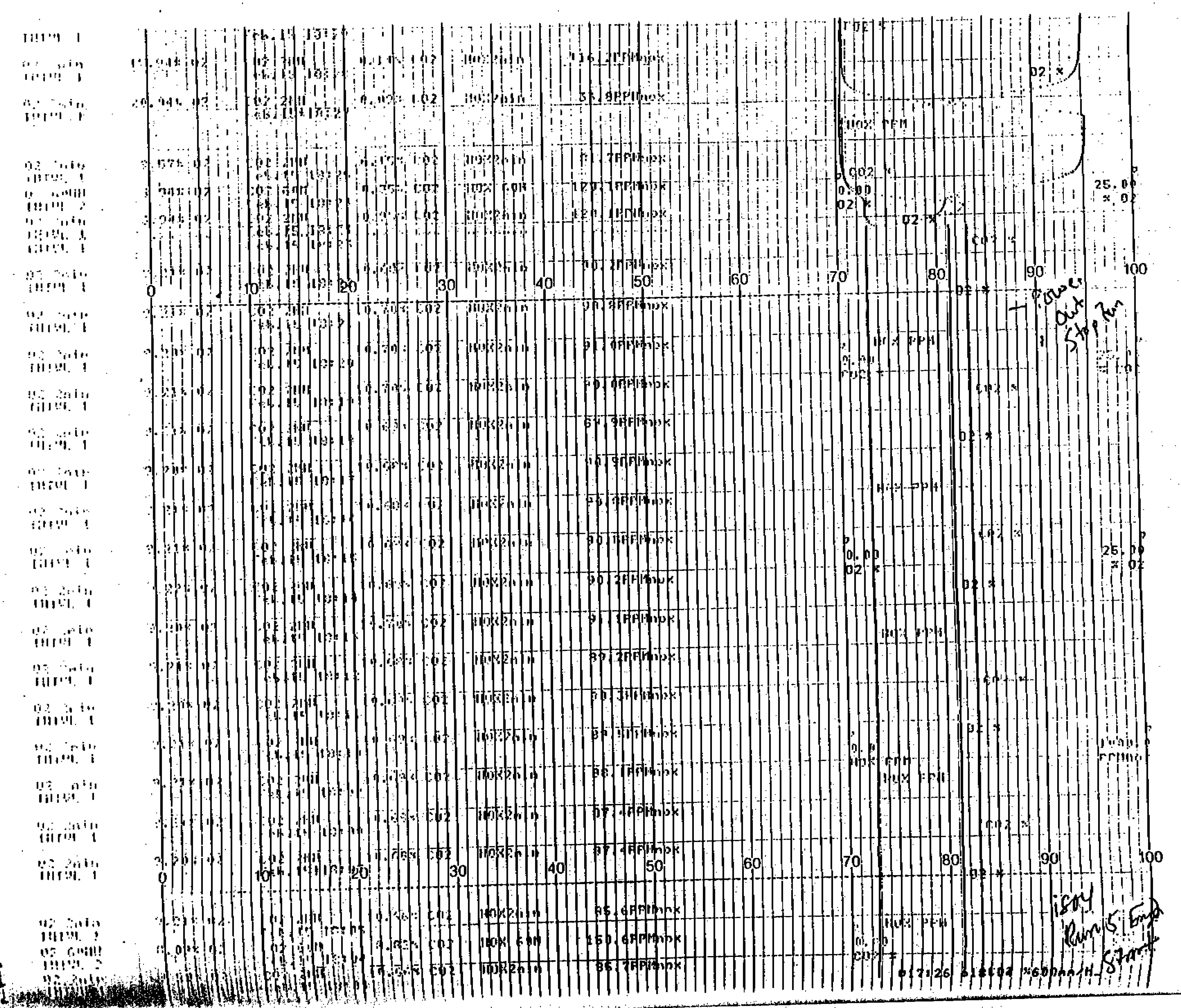

NOx Zero
NOx 886.7
Recirculated
0
10
20
30
40
50
60
70
80
90
100



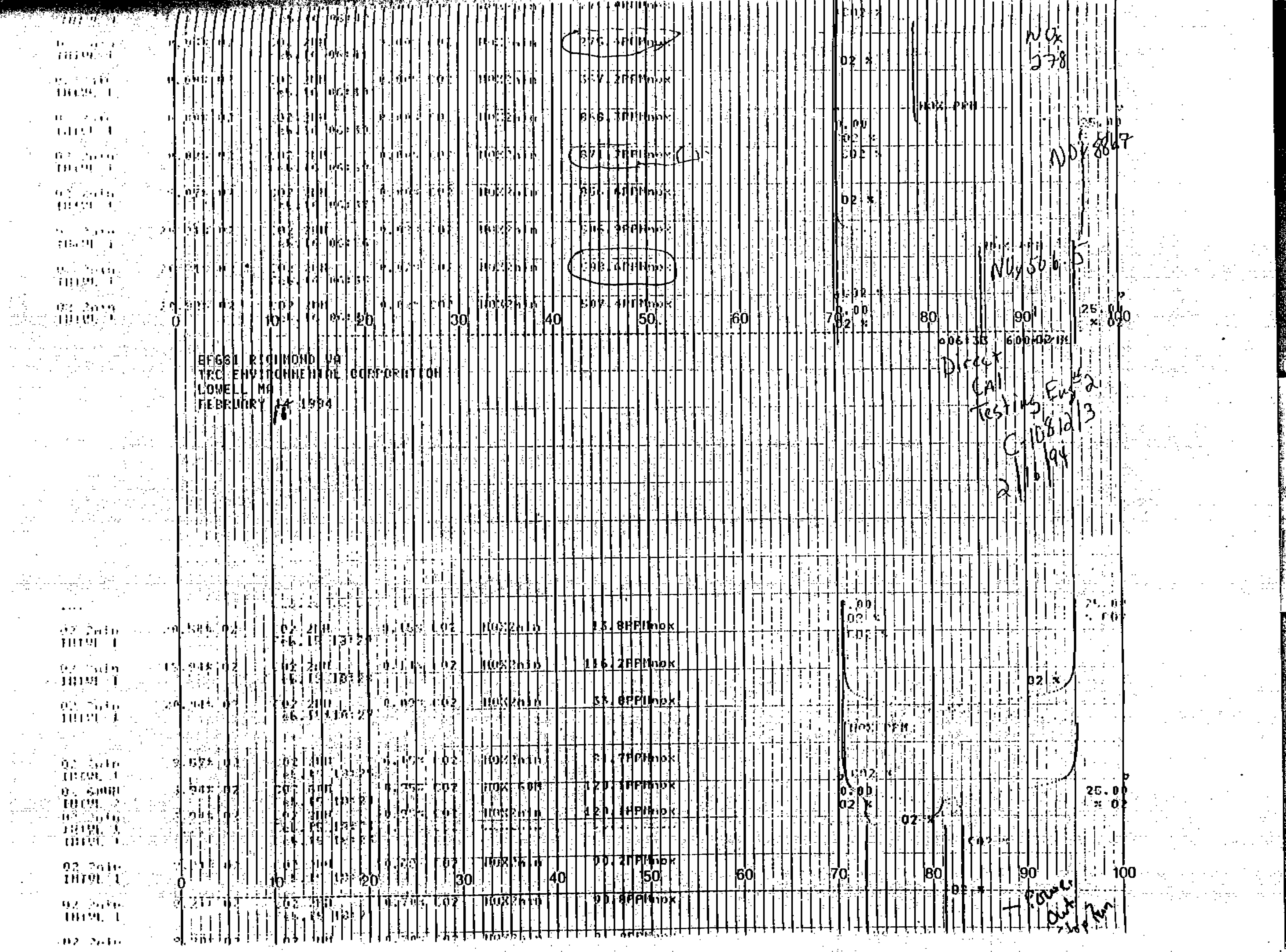

0
10
20
30
40
50
60
70
80
90
100
Feb 15 17:00
644
STAT
RWH
Eval

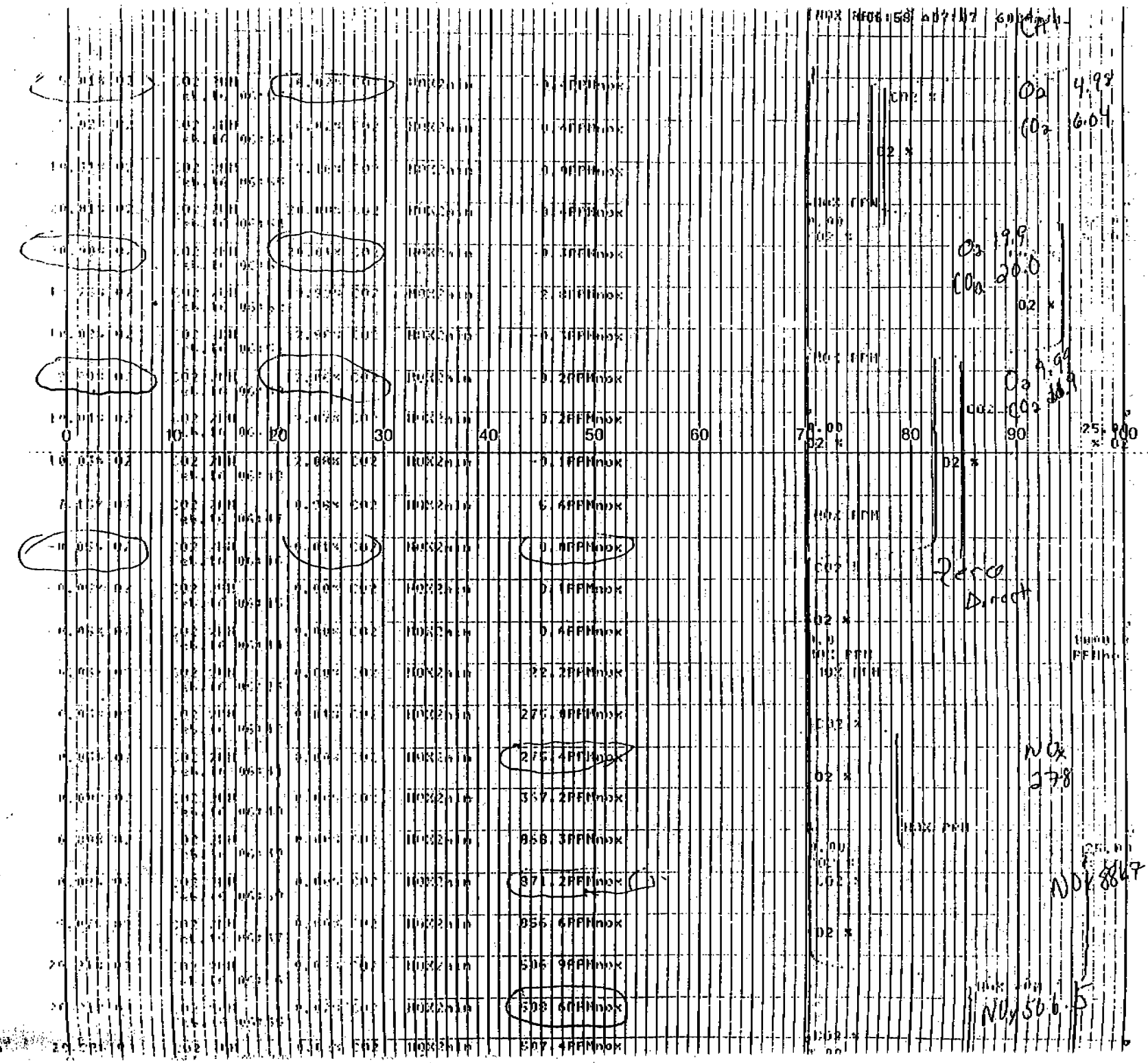


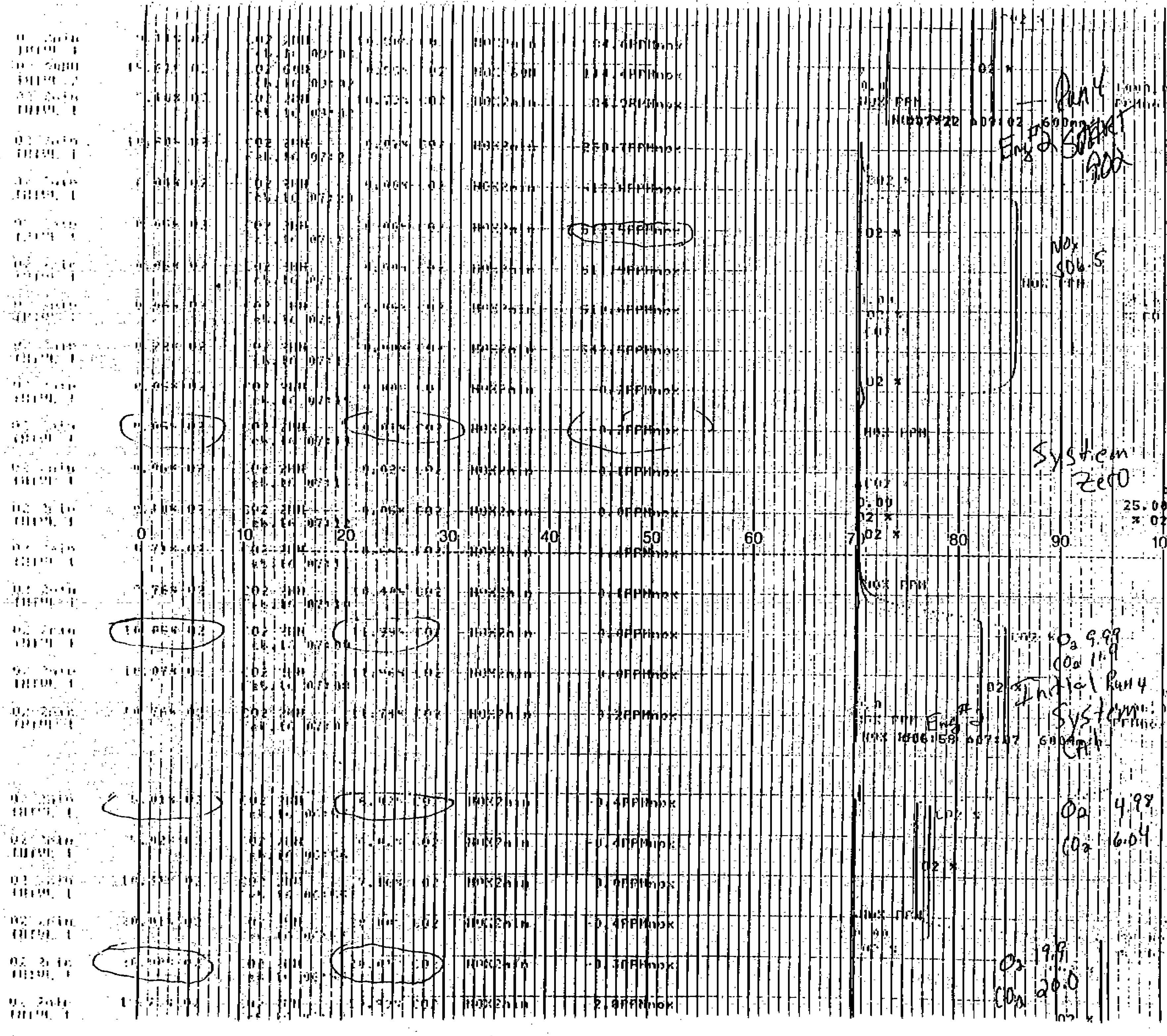

0
10
20
30
40
50
60
70
80
90
100
Run 4 Void
Run Void
Process
Problems
VOID
Run
Run 5 Empty
Start

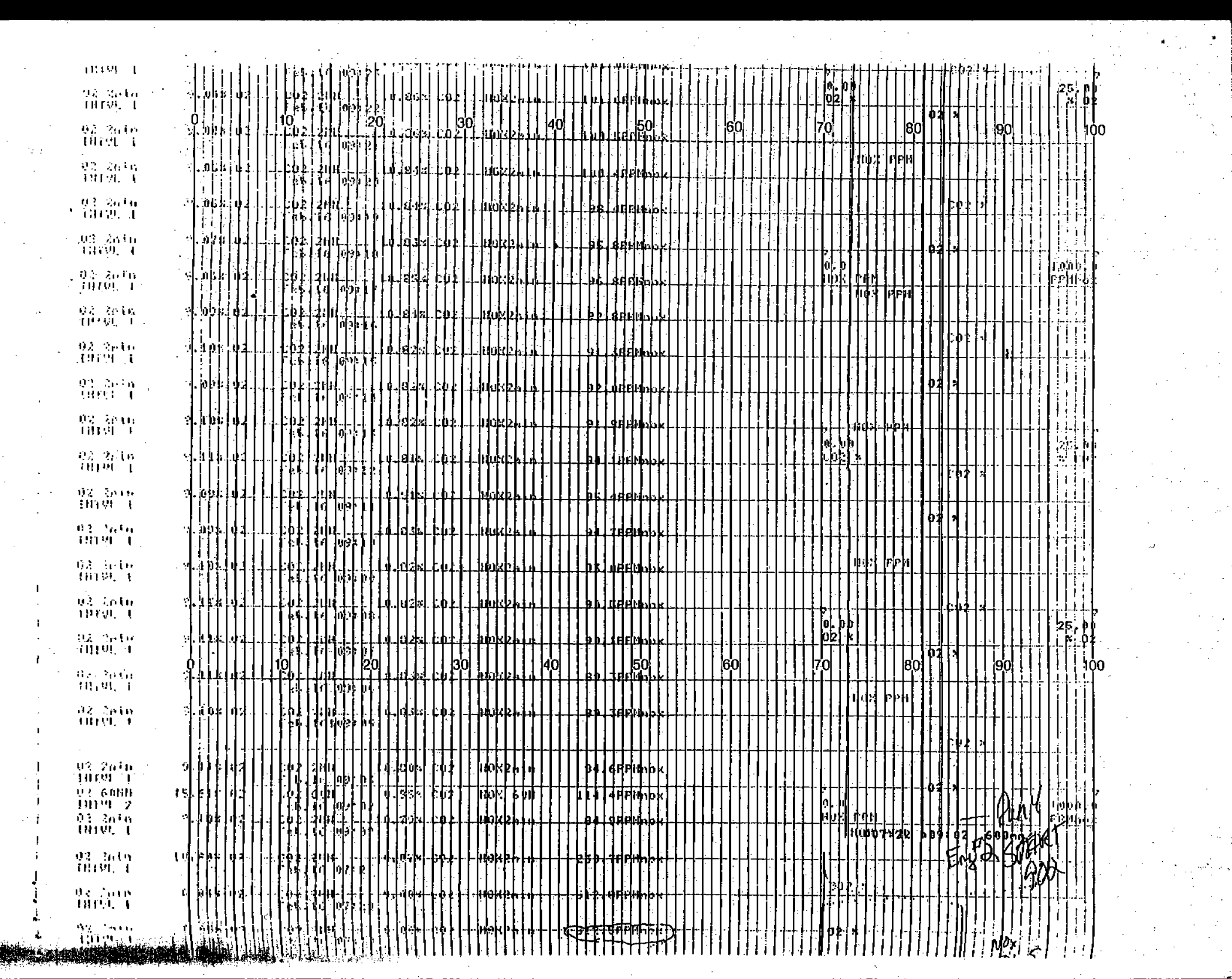


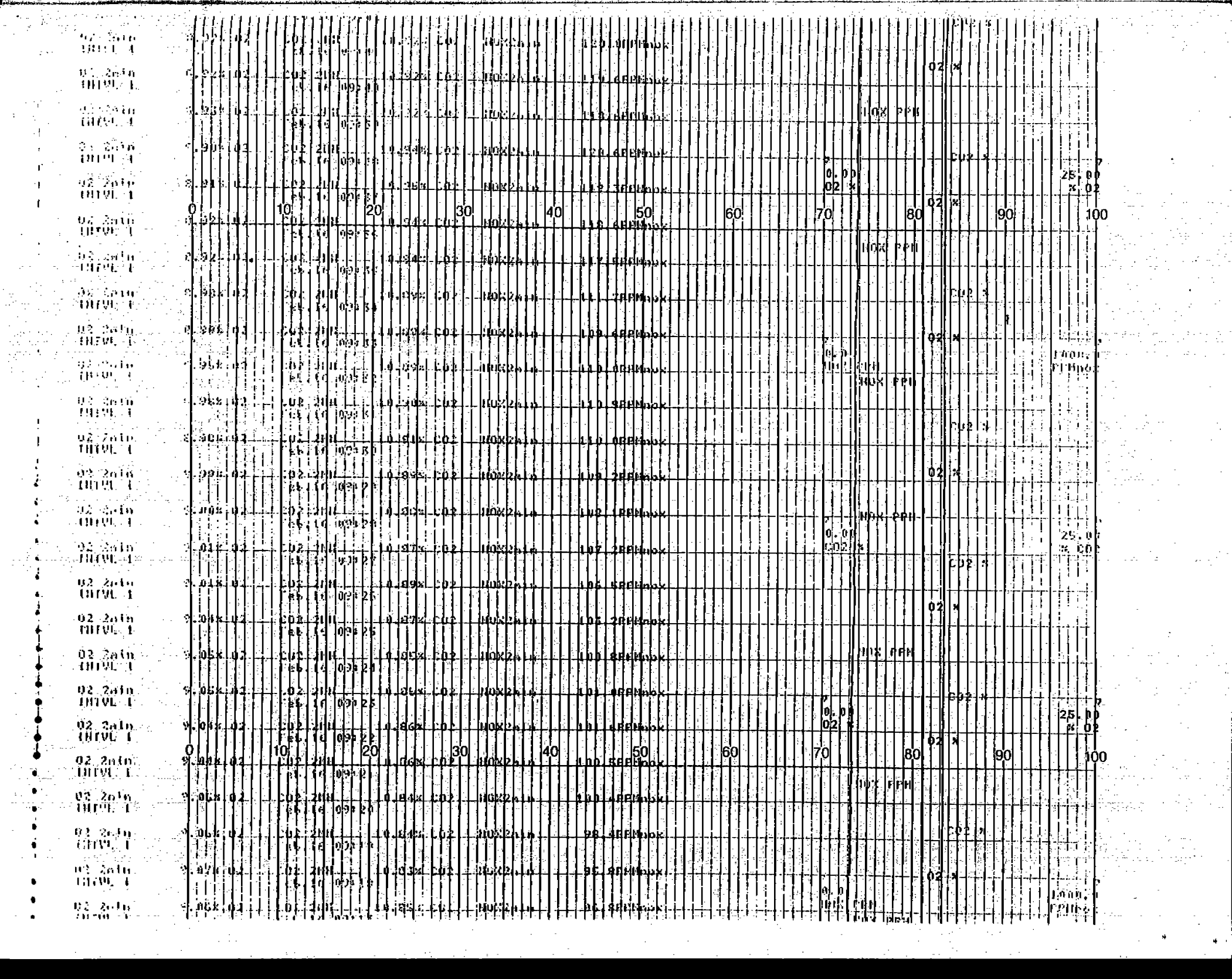
0
10
20
30
40
50
60
70
80
90
100
116.2PPMnox
NOX PPM
CO2 %
O2 %
25.00
Run 5 End

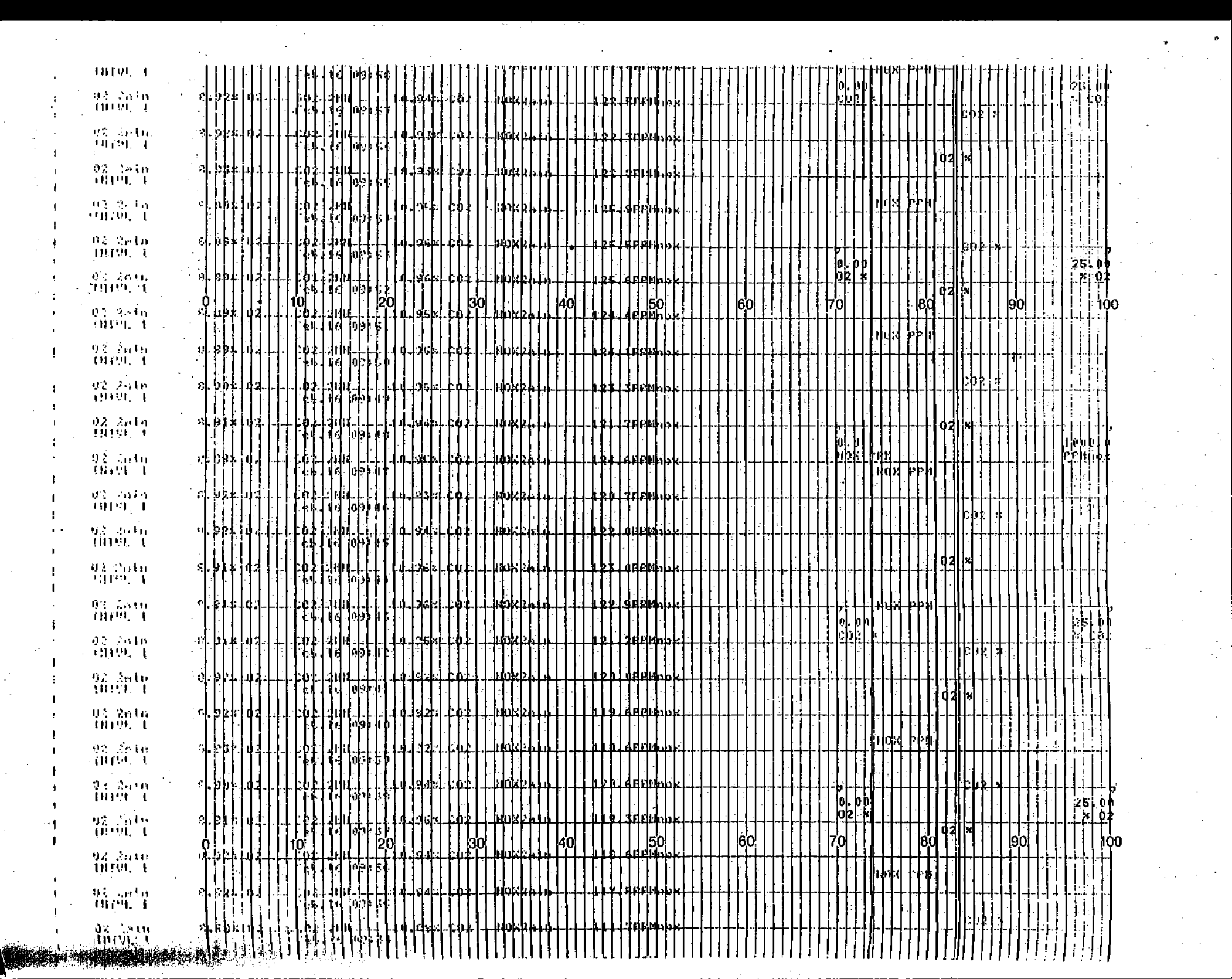

EFGG1 RICHMOND VA
TRC ENVIRONMENTAL CORPORATION
LOWELL MA
FEBRUARY 1994
NOx PPM
O2 %
0
10
20
30
40
50
60
70
80
90
100
Direct
Cal
2/16/94

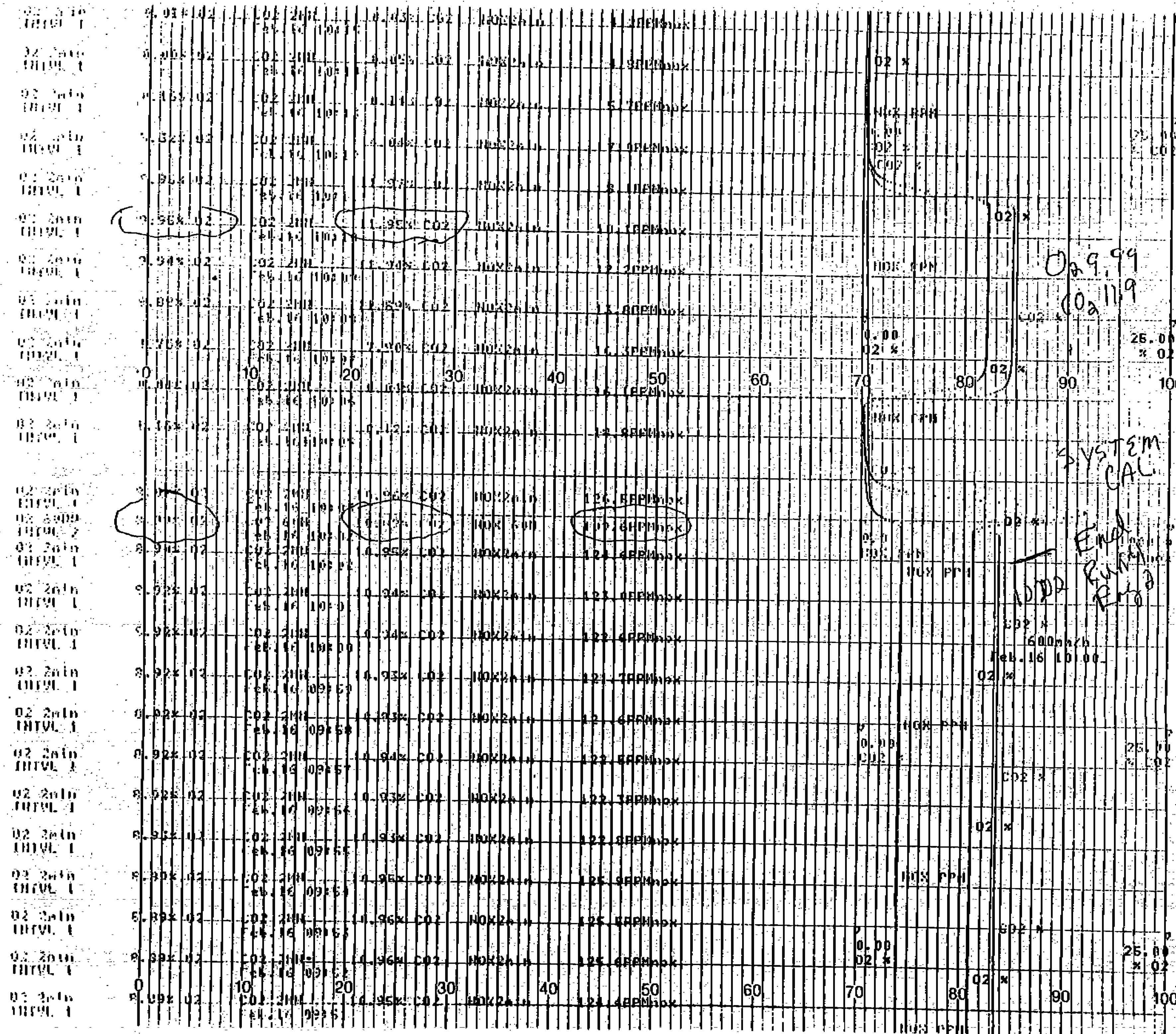

0
10
20
30
40
50
60
70
80
90
100
CH1
Qa
4.98
CO2
6.04
O2 %
O2
19.9
CO2
20.0
Zero
Drift
NOx
278
NOx 8847
NOx 5065

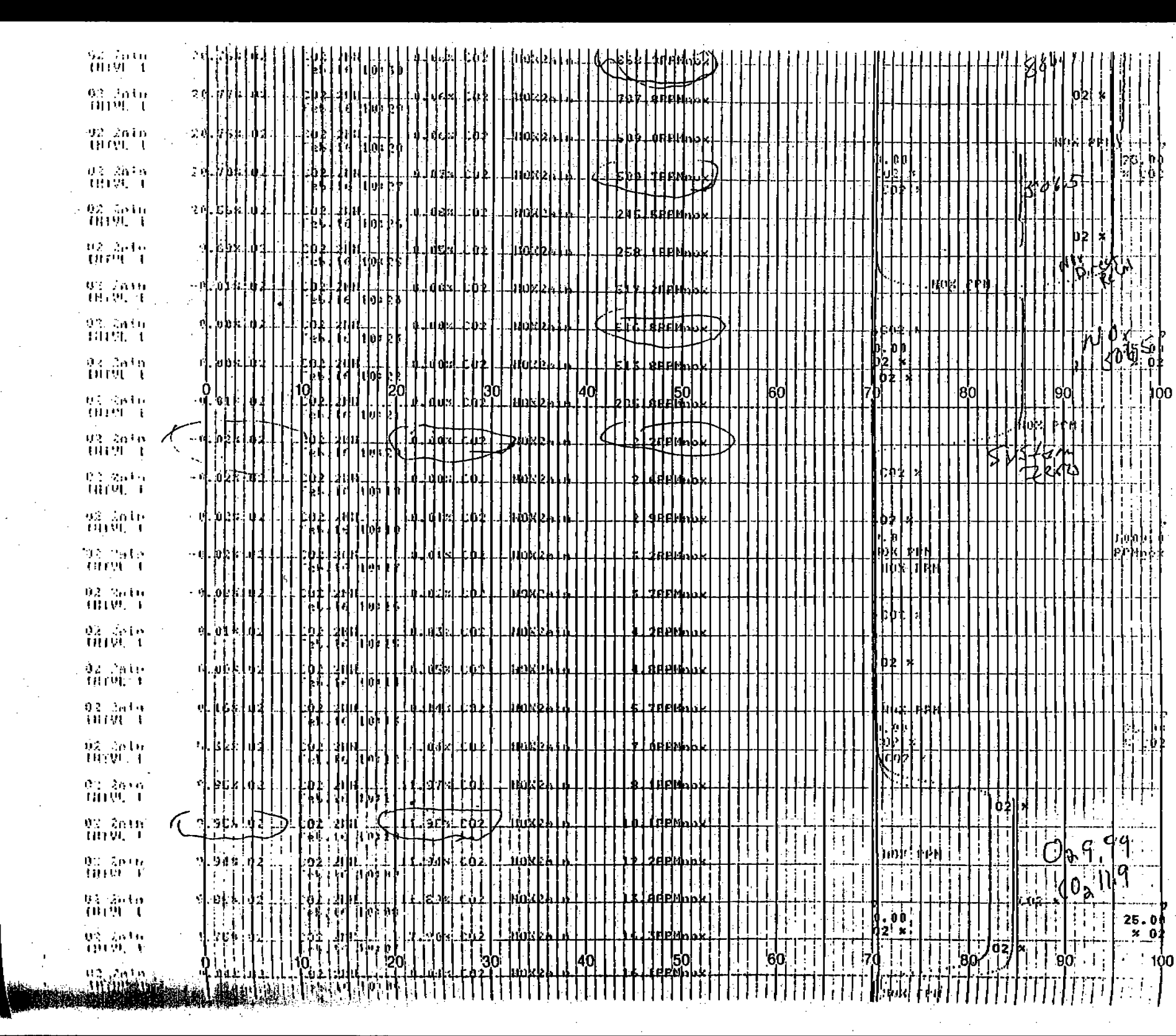

Run 4
Eng 2 Start
Sys 5
System Zero
25.00
% O2
0
10
20
30
40
50
60
70
80
90
100
O2 9.99
CO2 11.9
Initial Run 4
System Cal
O2 4.98
CO2 6.04
O3 9.9
CO2 20.0

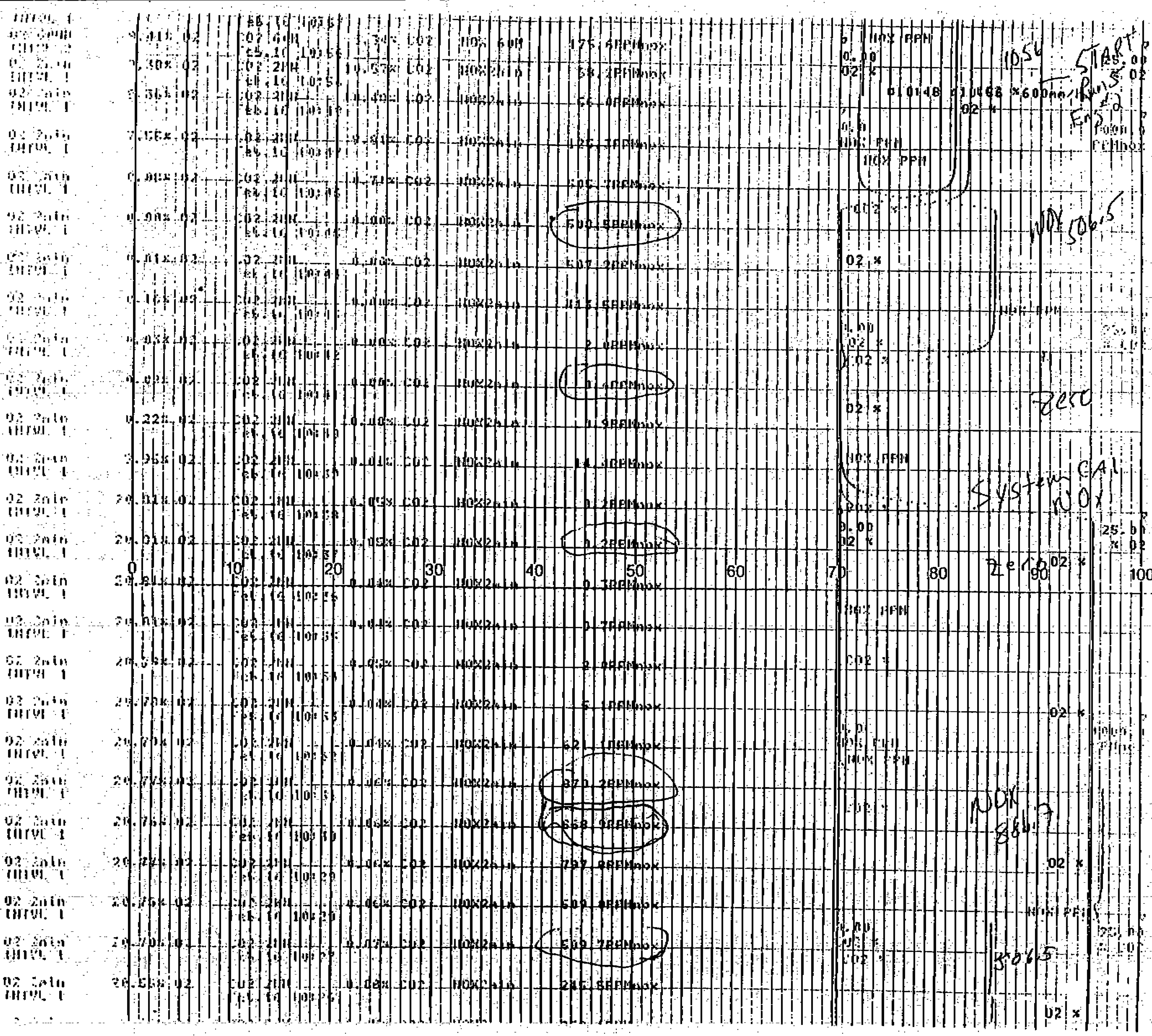



0
10
20
30
40
50
60
70
80
90
100
02 %
CO2 %
100% PPH

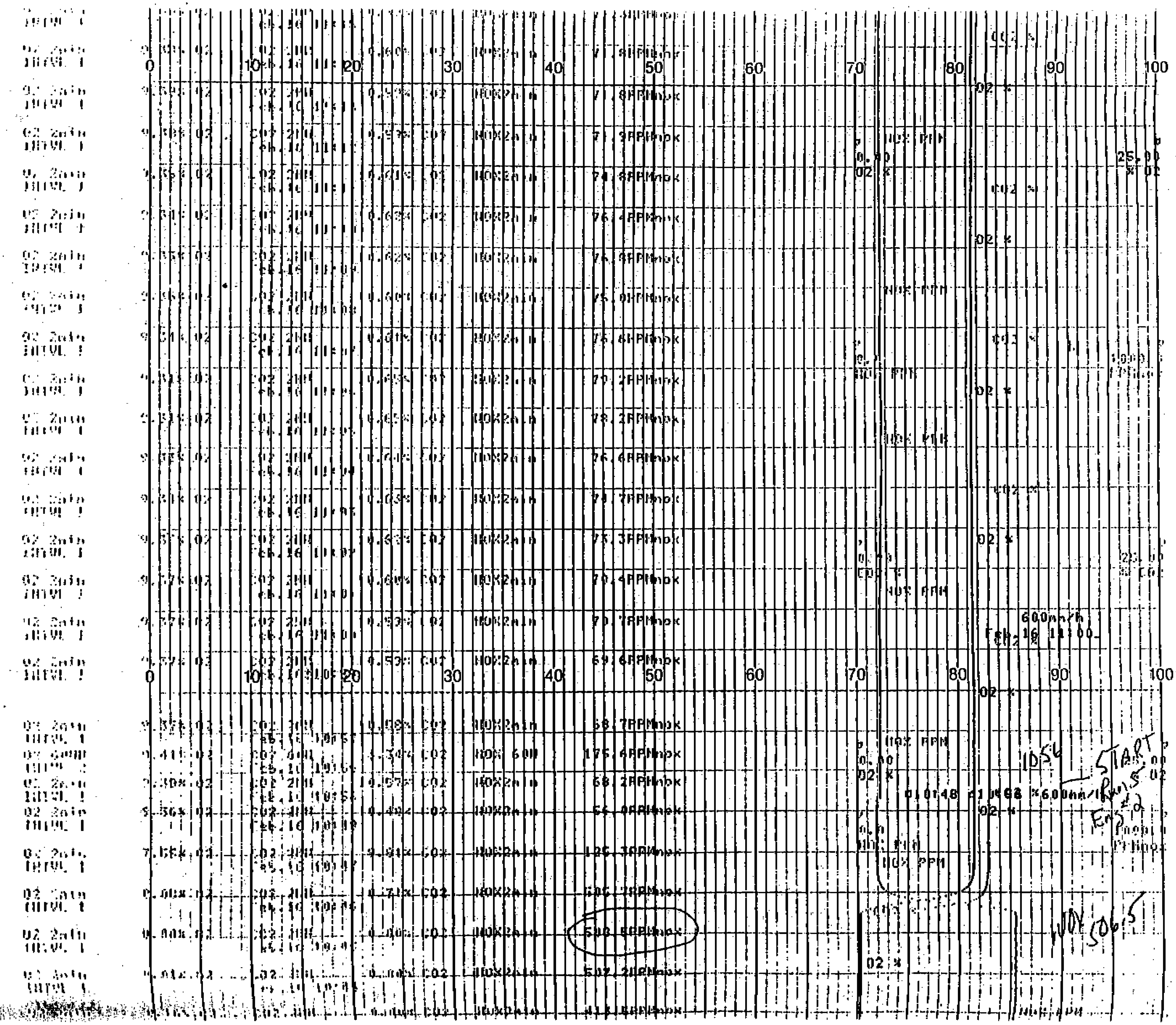

0
10
20
30
40
50
60
70
80
90
100


0
10
20
30
40
50
60
70
80
90
100
25.00
% O2
600mm/h
Feb.16 10:00
SYSTEM CAL

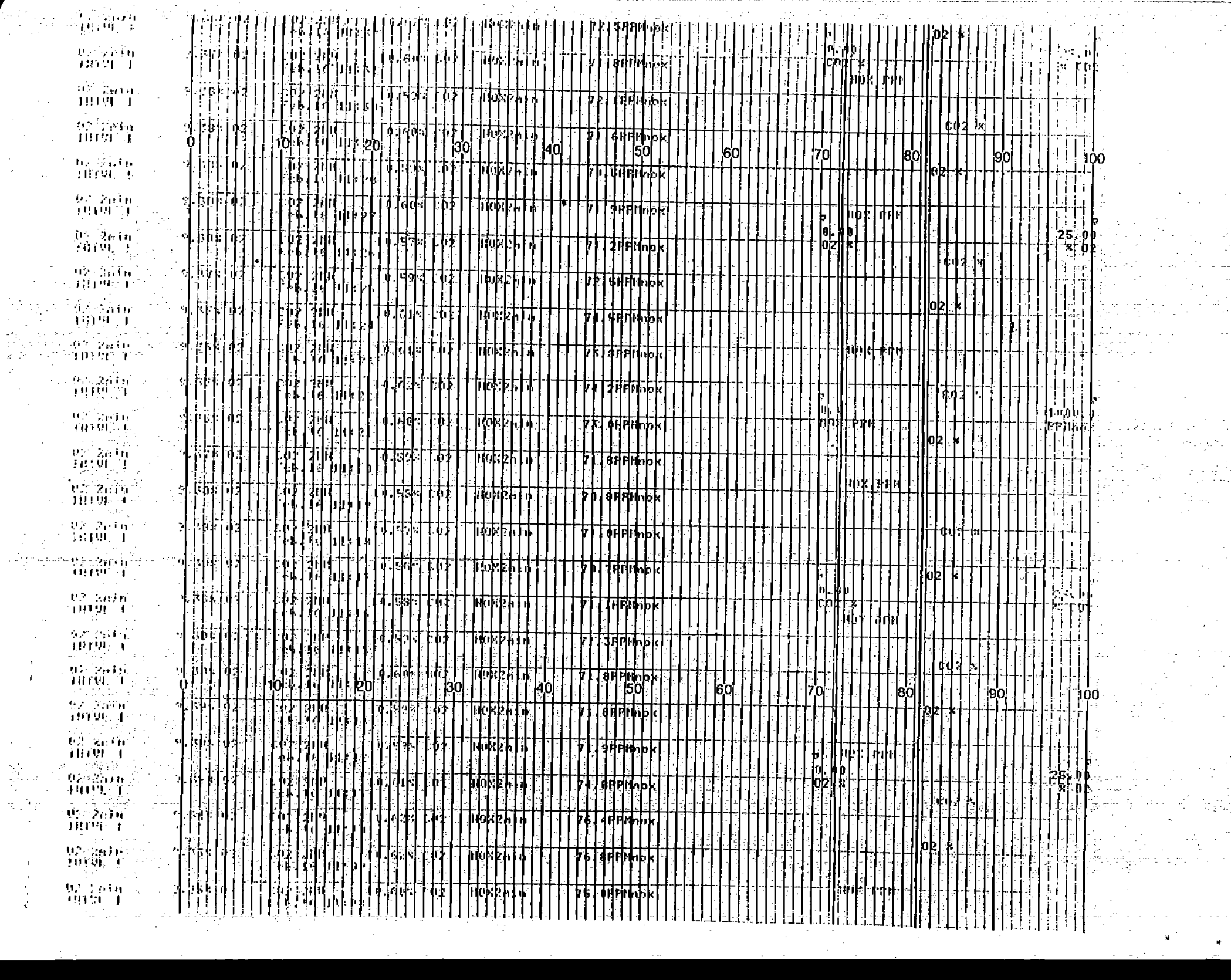

0 10 20 30 40 50 60 70 80 90 100
NOx PPM
02 %
CO2 %
System Zero
O2 9.99
O2 11.9
25.00 % O2

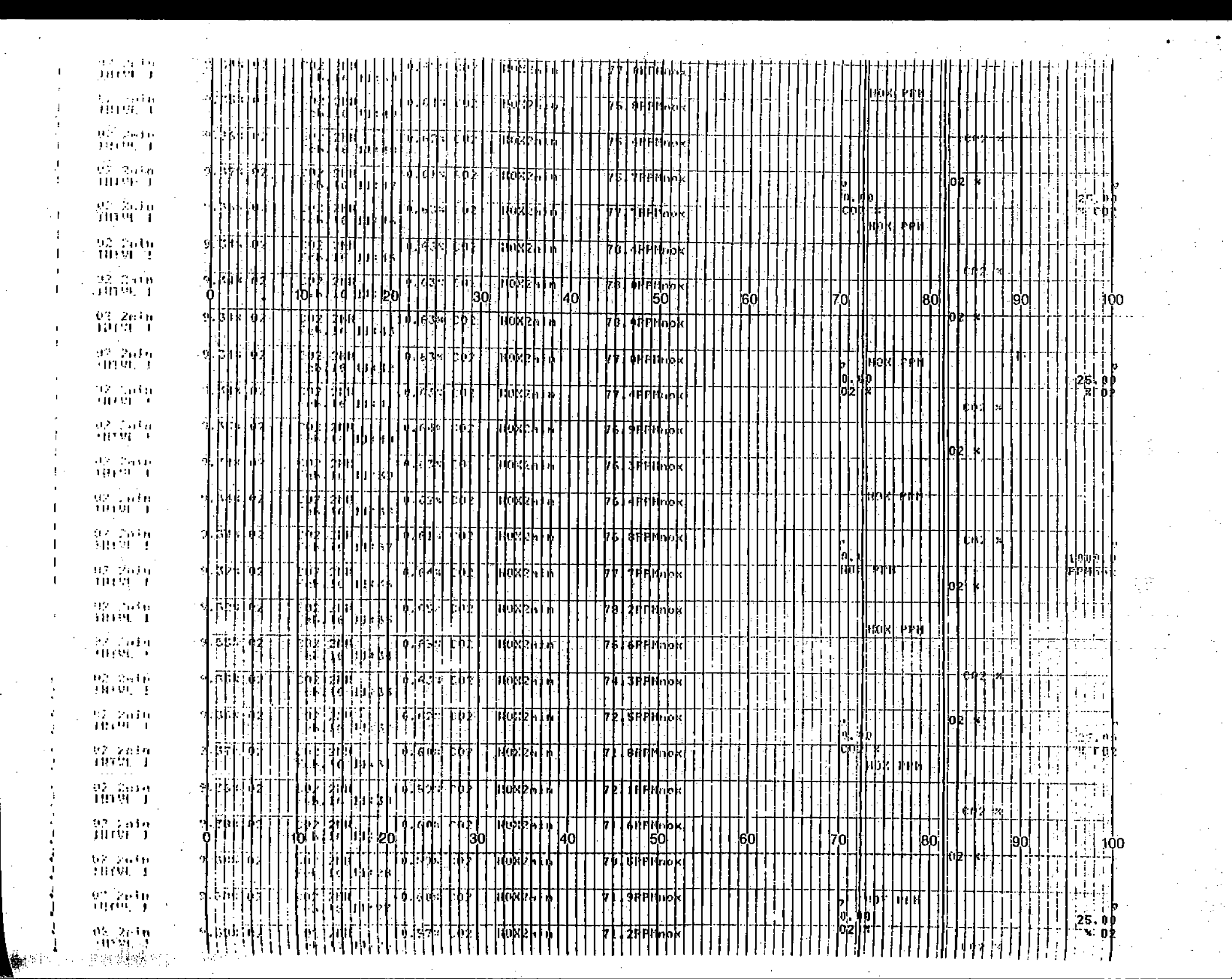


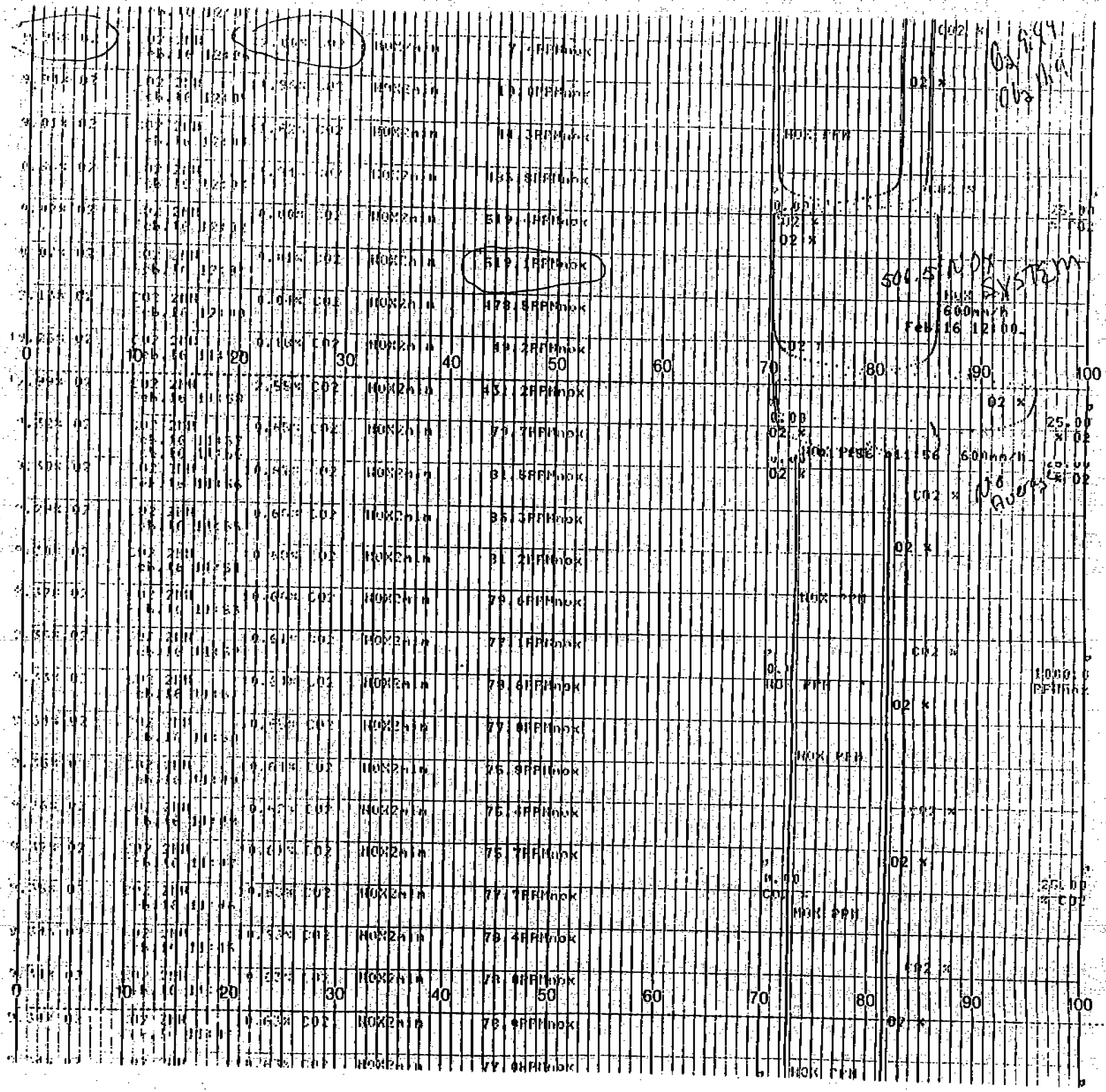
START
1056
Runs
End
NOX 5065
Zero
System CAL
NOX
Zero
NOX 8867
5065
NOX PPM
02 %
0
10
20
30
40
50
60
70
80
90
100

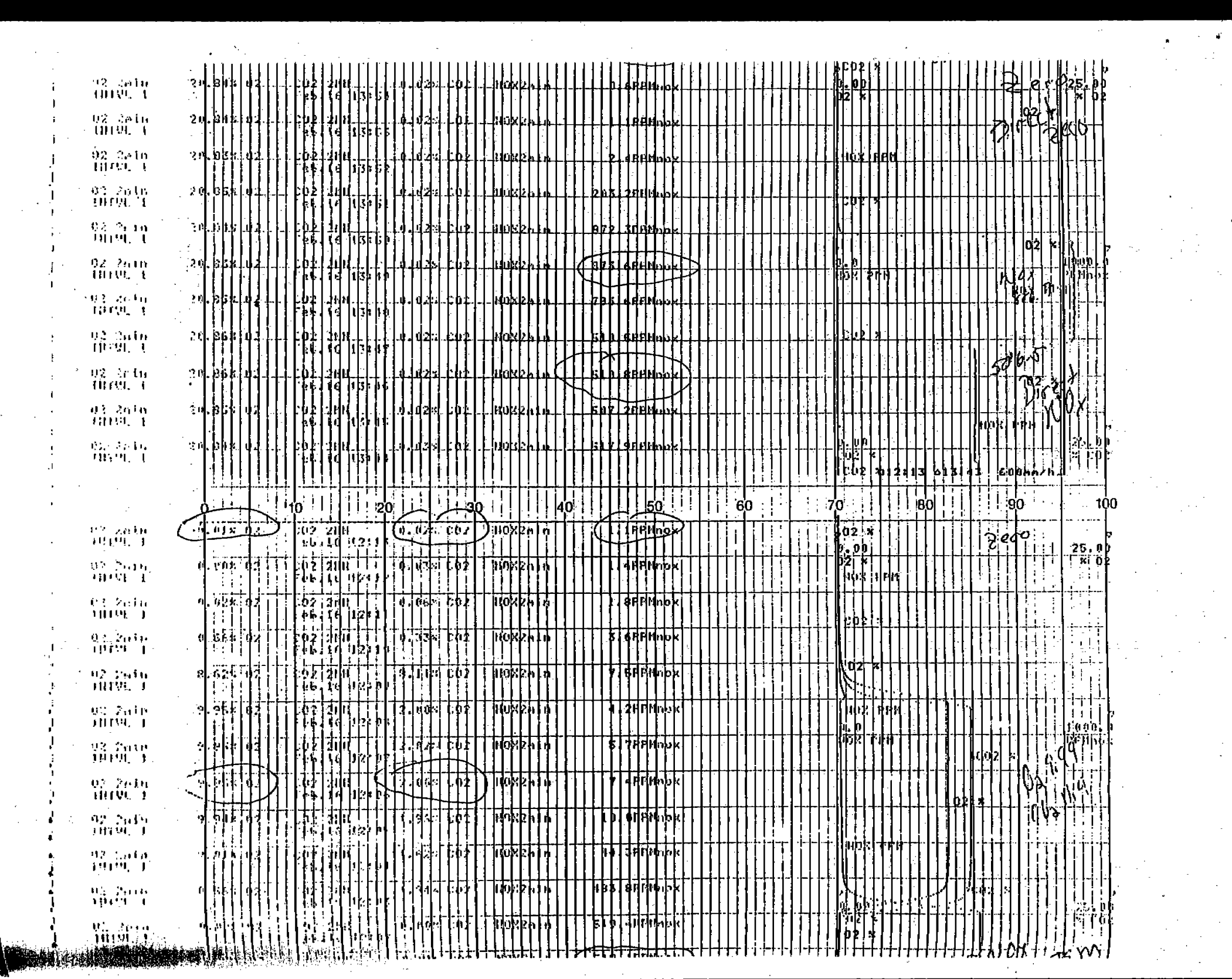


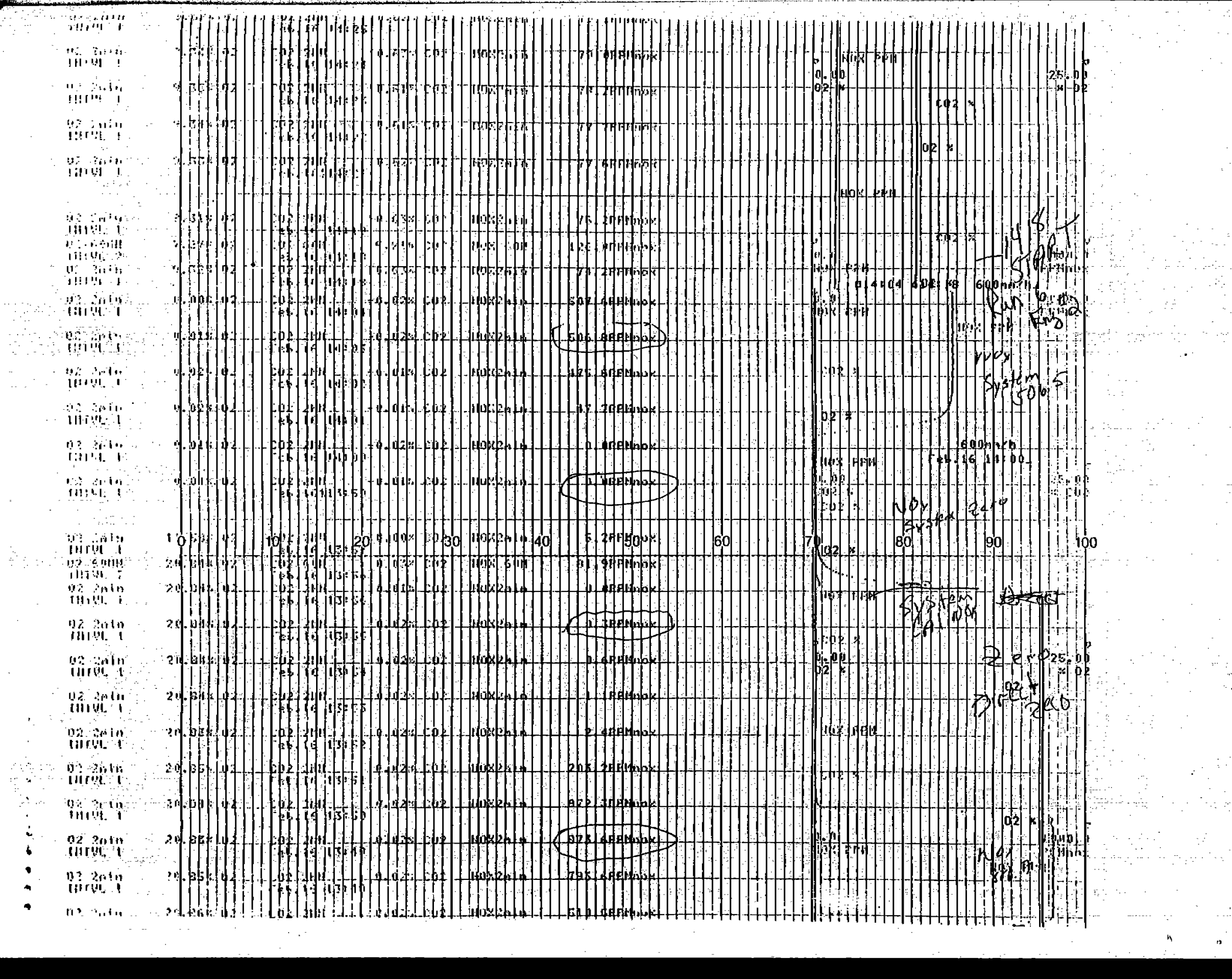
0 10 20 30 40 50 60 70 80 90 100
02 2min INTVL 1
NOX2min
71.8PPMnox
NOX PPM
02 %
CO2 %
Feb. 16 11:00
600mm/h
69.6PPMnox
175.6PPMnox
508.6PPMnox
1056
START
Run 5
End #2
NOx 506.5

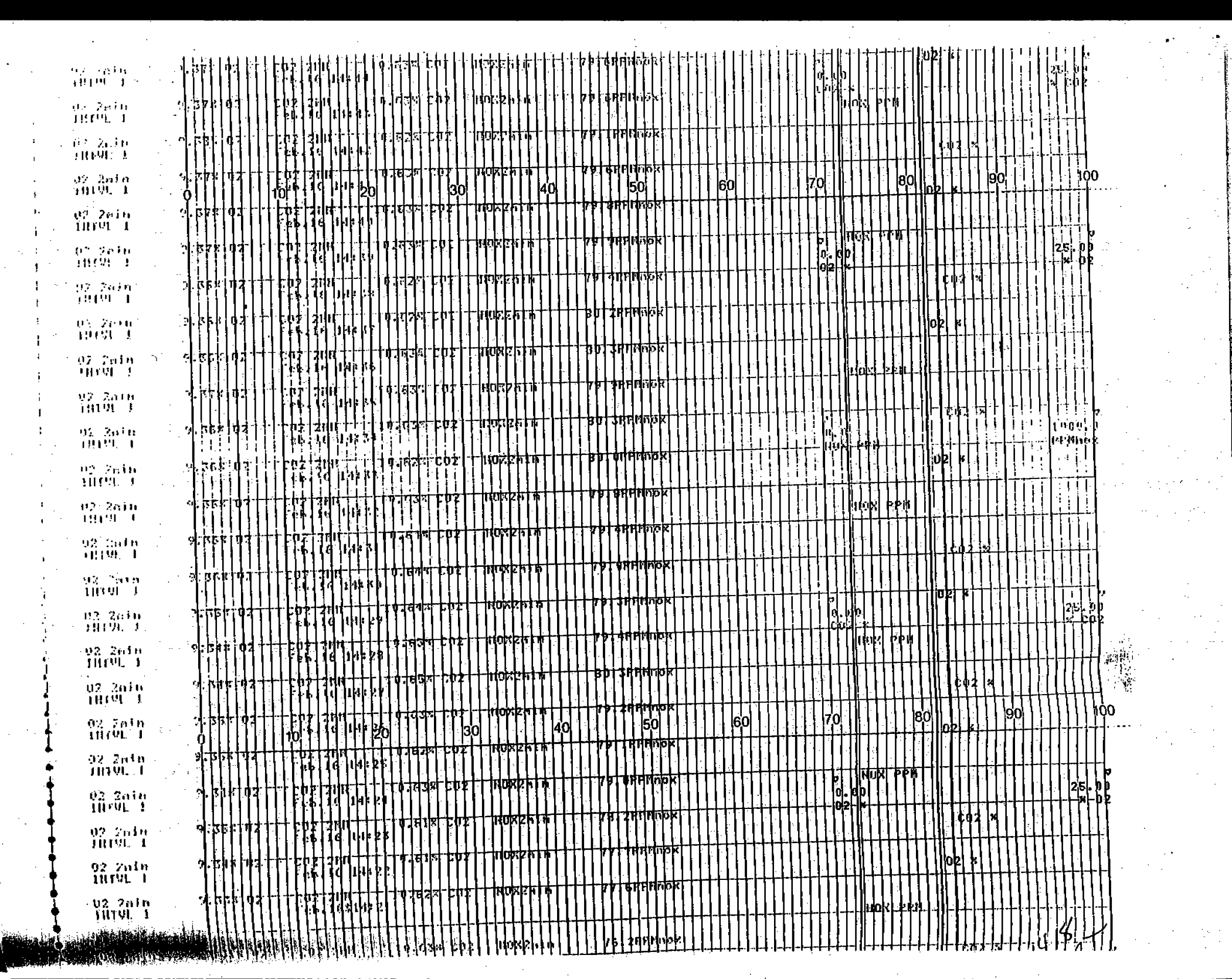


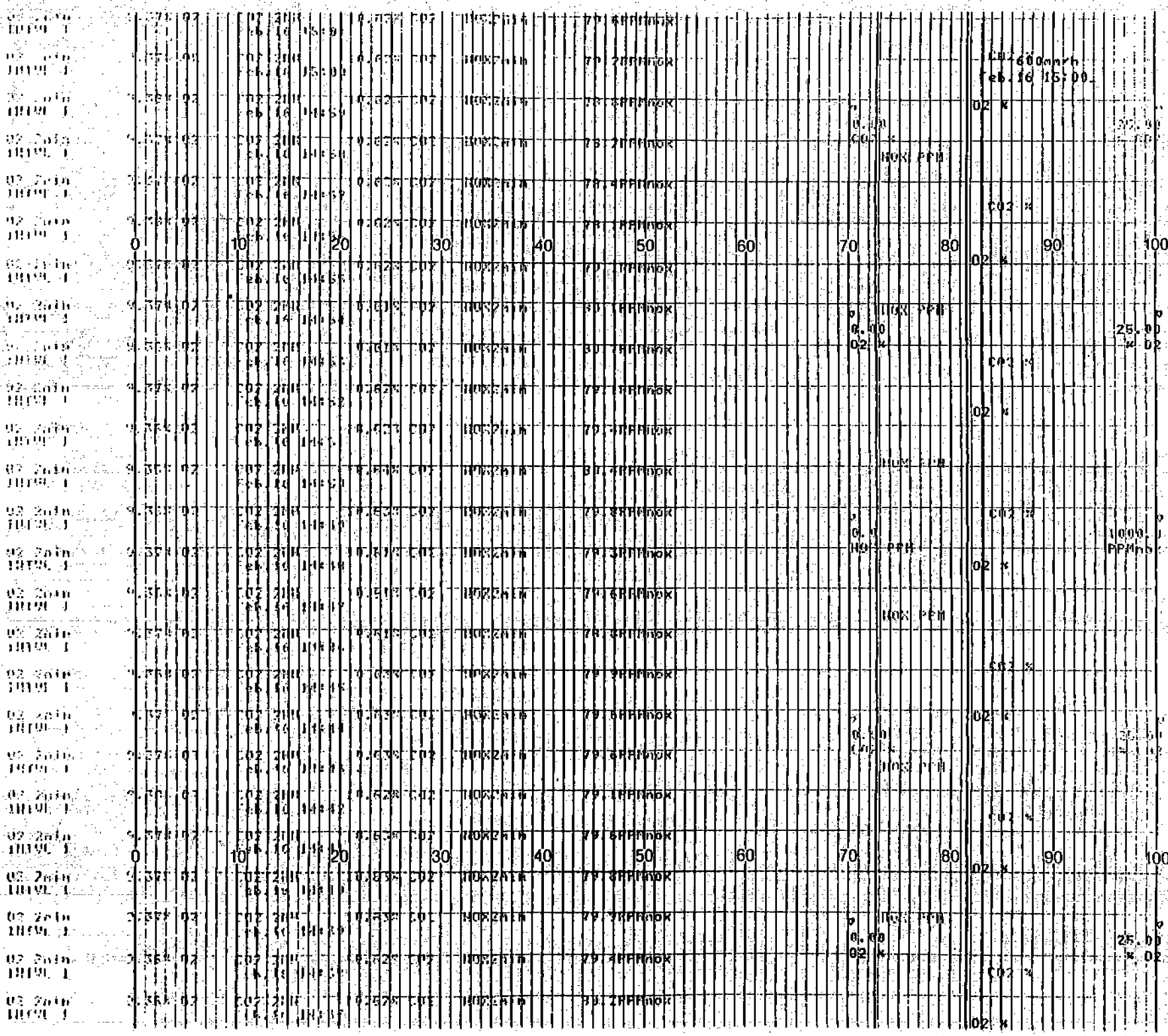

0
10
20
30
40
50
60
70
80
90
100
NOX PPM
CO2 %
02 %

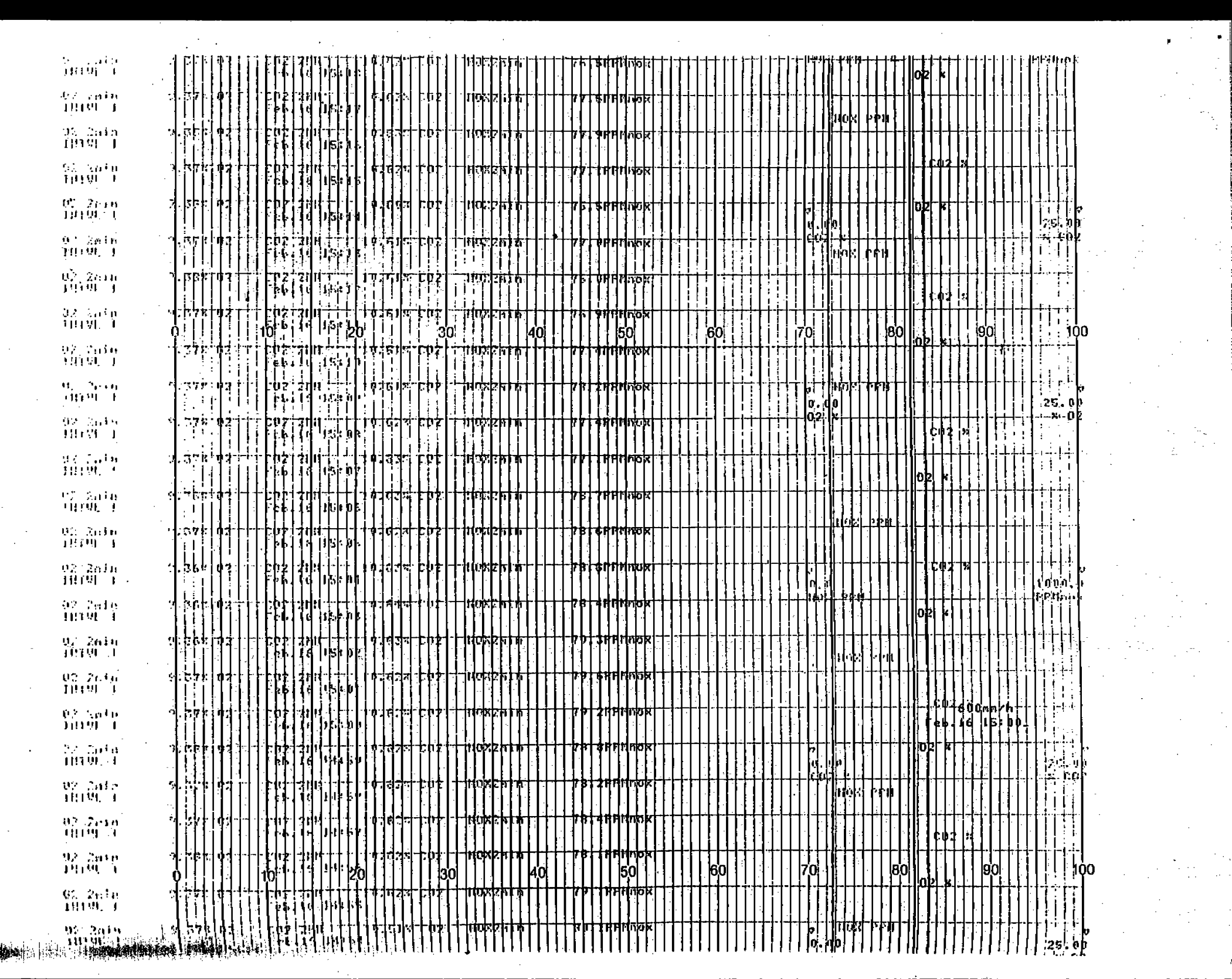

504.5 NOx SYSTEM
Feb 16 12:00
0 10 20 30 40 50 60 70 80 90 100
0 10 20 30 40 50 60 70 80 90 100

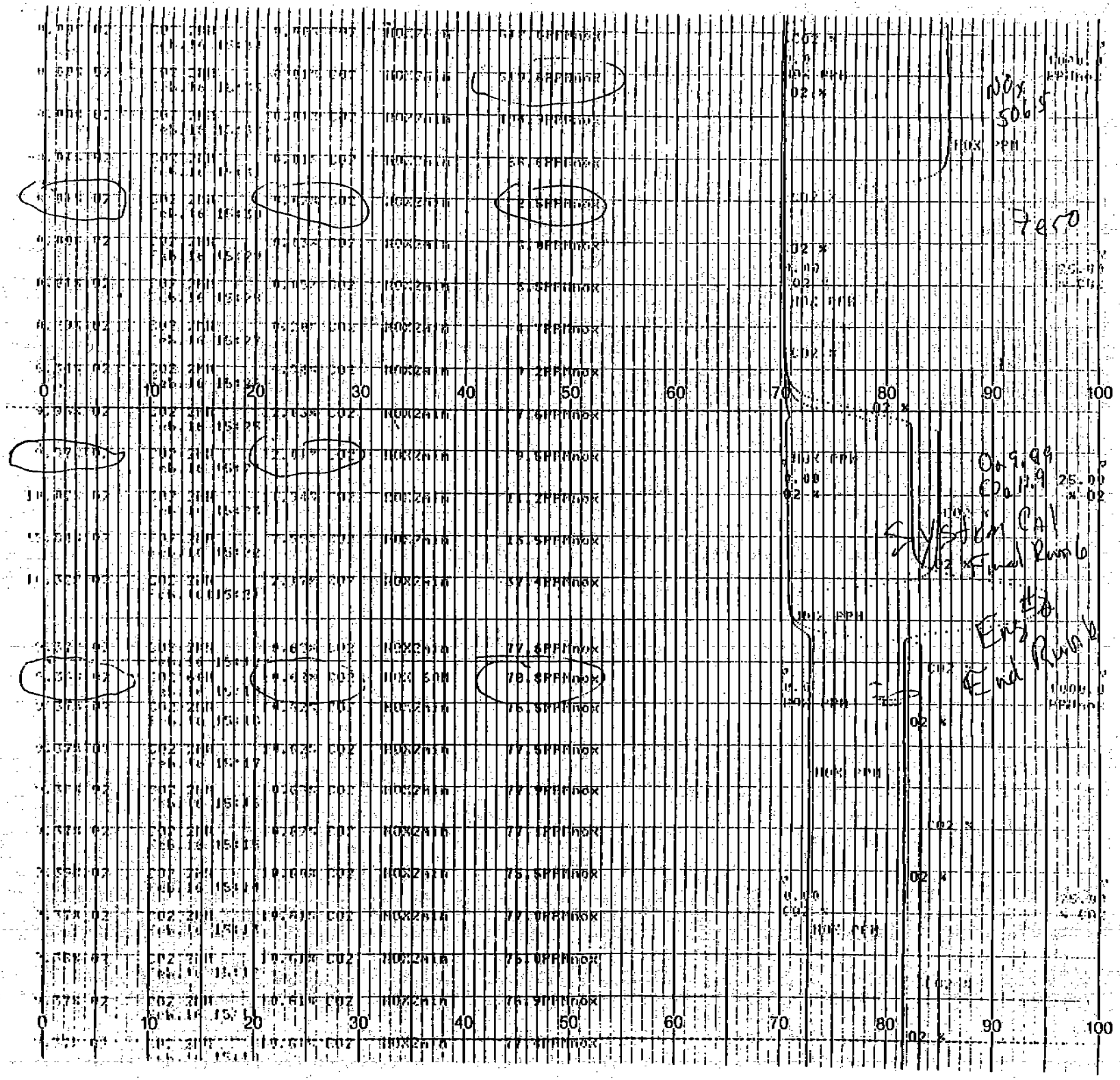

0
10
20
30
40
50
60
70
80
90
100


NOx PPM
0.00
02 %
25.00
02 %
600mmHg
Feb.16 11:00
NOx PPM
02 %
600mmHg
Feb.16 11:00
NOx PPM
02 %
0.00
02 %
25.00
02 %
NOx PPM
02 %
NOx PPM
02 %
NOx PPM
02 %
0
10
20
30
40
50
60
70
80
90
100




CO2 600mmrh
Feb.16 15:00
0 10 20 30 40 50 60 70 80 90 100
02 %
CO2 %
NOX PPM
0.00
25.00
1000
PPMnb


0
10
20
30
40
50
60
70
80
90
100
02 %
CO2 %
NOX PPM
CO 600mm/h
Feb.16 15:00


NOx
SO2
Zero
O2 9.9%
CO2 7.9
Final Run 6
Final Run 5
0
10
20
30
40
50
60
70
80
90
100

02 2min INTVL 1	[illegible]	CO2 2MN Feb.16 [illegible]	[illegible] CO2	NOX2min	62.9PPMnox
02 2min INTVL 1	9.56% O2	CO2 2MN Feb.16 13:2[illegible]	0.56% CO2	NOX2min	63.1PPMnox
02 2min INTVL 1	9.55% O2	CO2 2MN Feb.16 13:[illegible]	0.55% CO2	NOX2min	63.8PPMnox
02 2min INTVL 1	9.53% O2	CO2 2MN Feb.16 13:[illegible]	0.55% CO2	NOX2min	64.3PPMnox
02 2min INTVL 1	9.55% O2	CO2 2MN Feb.16 13:[illegible]	0.55% CO2	NOX2min	64.4PPMnox
02 2min INTVL 1	9.55% O2	CO2 2MN Feb.16 13:[illegible]	0.57% CO2	NOX2min	65.1PPMnox
02 2min INTVL 1	9.58% O2	CO2 2MN Feb.16 13:[illegible]	0.56% CO2	NOX2min	66.8PPMnox
02 SAMP INTVL 2	[illegible]	CO2 SMP Feb.16 13:[illegible]	0.55% CO2	NOX SMP	130.8PPMnox
02 2min INTVL 1	9.58% O2	CO2 2MN Feb.16 13:[illegible]	0.55% CO2	NOX2min	65.7PPMnox
02 2min INTVL 1	9.55% O2	CO2 2MN Feb.16 13:[illegible]	0.57% CO2	NOX2min	66.4PPMnox
02 2min INTVL 1	[illegible]	CO2 2MN Feb.16 13:[illegible]	0.56% CO2	NOX2min	309.8PPMnox
02 SAMP INTVL 2	[illegible]	CO2 SMP Feb.16 1[illegible]	[illegible]	NOX SMP	[illegible]PPMnox
02 2min INTVL 1	[illegible]	CO2 2MN Feb.16 14:[illegible]	0.93% CO2	NOX2min	32.8PPMnox
02 2min INTVL 1	[illegible]	CO2 2MN Feb.16 14:[illegible]	0.32% CO2	NOX2min	84.7PPMnox
02 2min INTVL 1	20.77% O2	CO2 2MN Feb.16 15:[illegible]	0.06% CO2	NOX2min	2.2PPMnox
02 2min INTVL 1	20.70% O2	CO2 2MN Feb.16 15:3[illegible]	0.05% CO2	NOX2min	5.7PPMnox
02 2min INTVL 1	10.78% O2	CO2 2MN Feb.16 15:[illegible]	0.06% CO2	NOX2min	40.1PPMnox
02 2min INTVL 1	0.07% O2	CO2 2MN Feb.16 15:[illegible]	0.01% CO2	NOX2min	190.7PPMnox
02 2min INTVL 1	0.00% O2	CO2 2MN Feb.16 15:[illegible]	0.00% CO2	NOX2min	518.6PPMnox
02 2min INTVL 1	0.00% O2	CO2 2MN Feb.16 15:[illegible]	0.01% CO2	NOX2min	519.6PPMnox
02 2min INTVL 1	0.00% O2	CO2 2MN Feb.16 15:[illegible]	0.01% CO2	NOX2min	494.3PPMnox
02 2min INTVL 1	-0.01% O2	CO2 2MN Feb.16 15:[illegible]	0.01% CO2	NOX2min	59.6PPMnox
02 2min INTVL 1	9.01% O2	CO2 2MN Feb.16 15:[illegible]	7.02% CO2	NOX2min	2.5PPMnox

0 10 20 30 40 50 60 70 80 90 100

P 0.00 O2 % — 25.00 % O2

NOX PPM — 1000 PPMnox

O2 %   CO2 %   NOX PPM

11:08 08M1 010:13 600mm/h

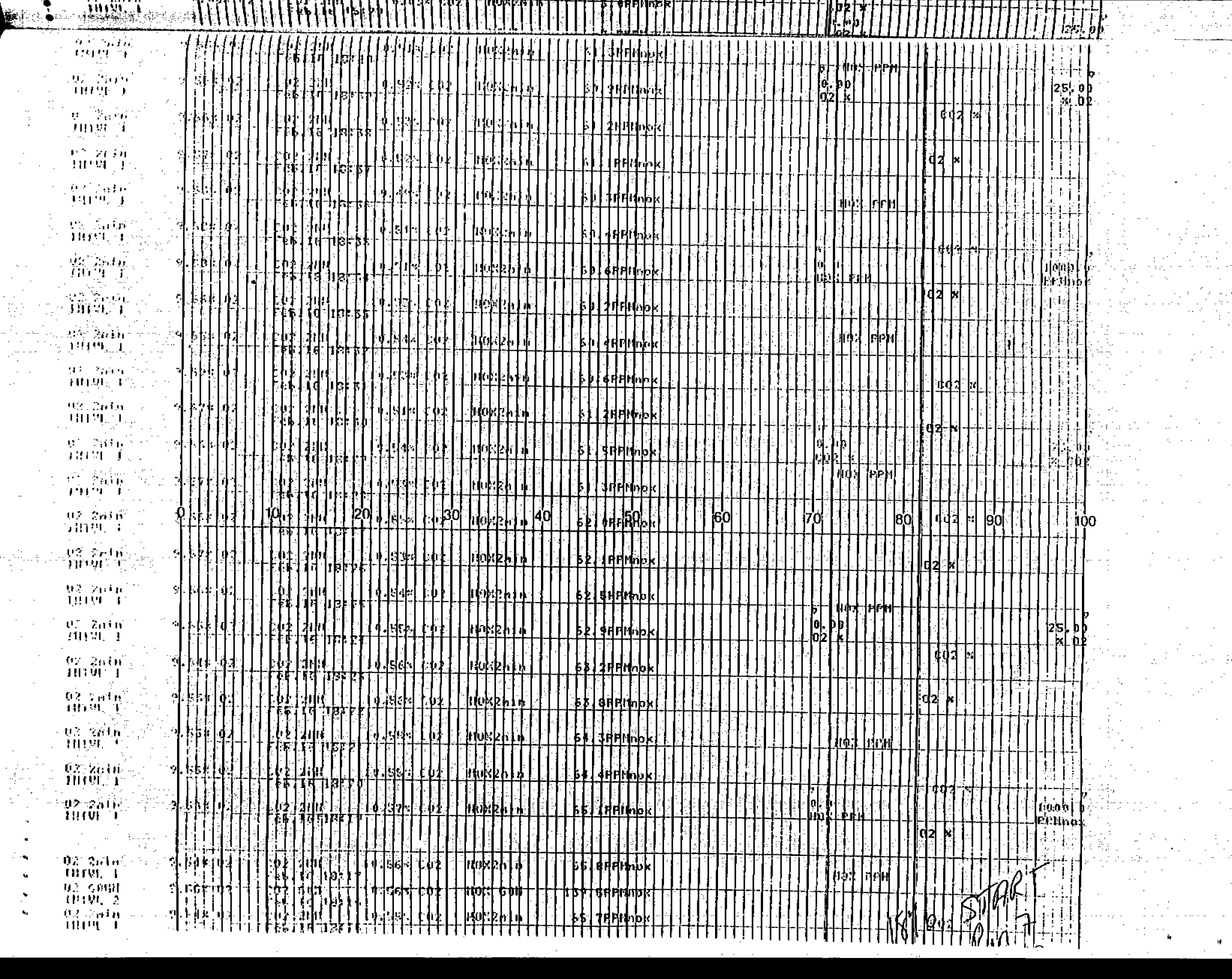
11:15:23B 017:08 600mm/h

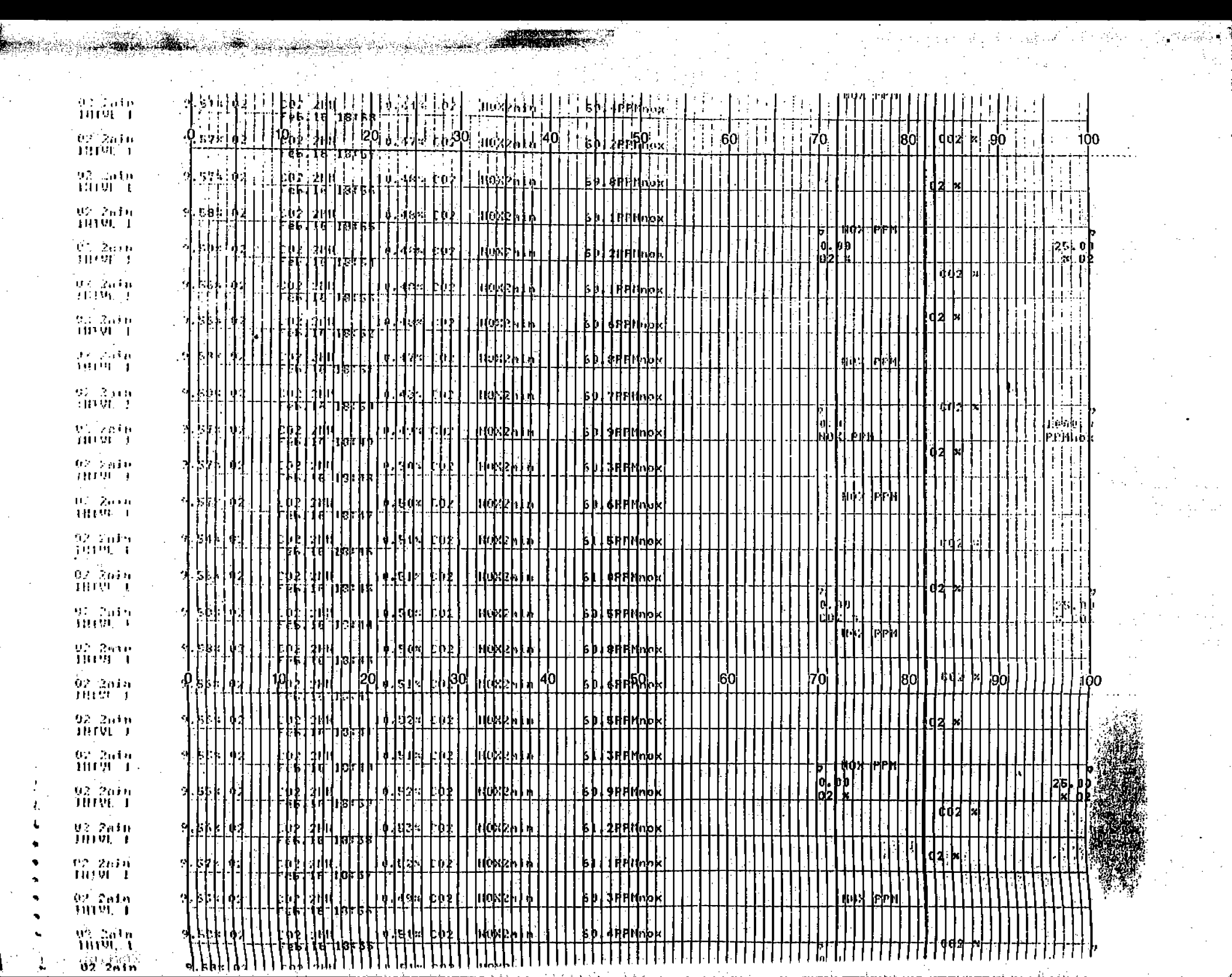
START Run 7 #3 Eng

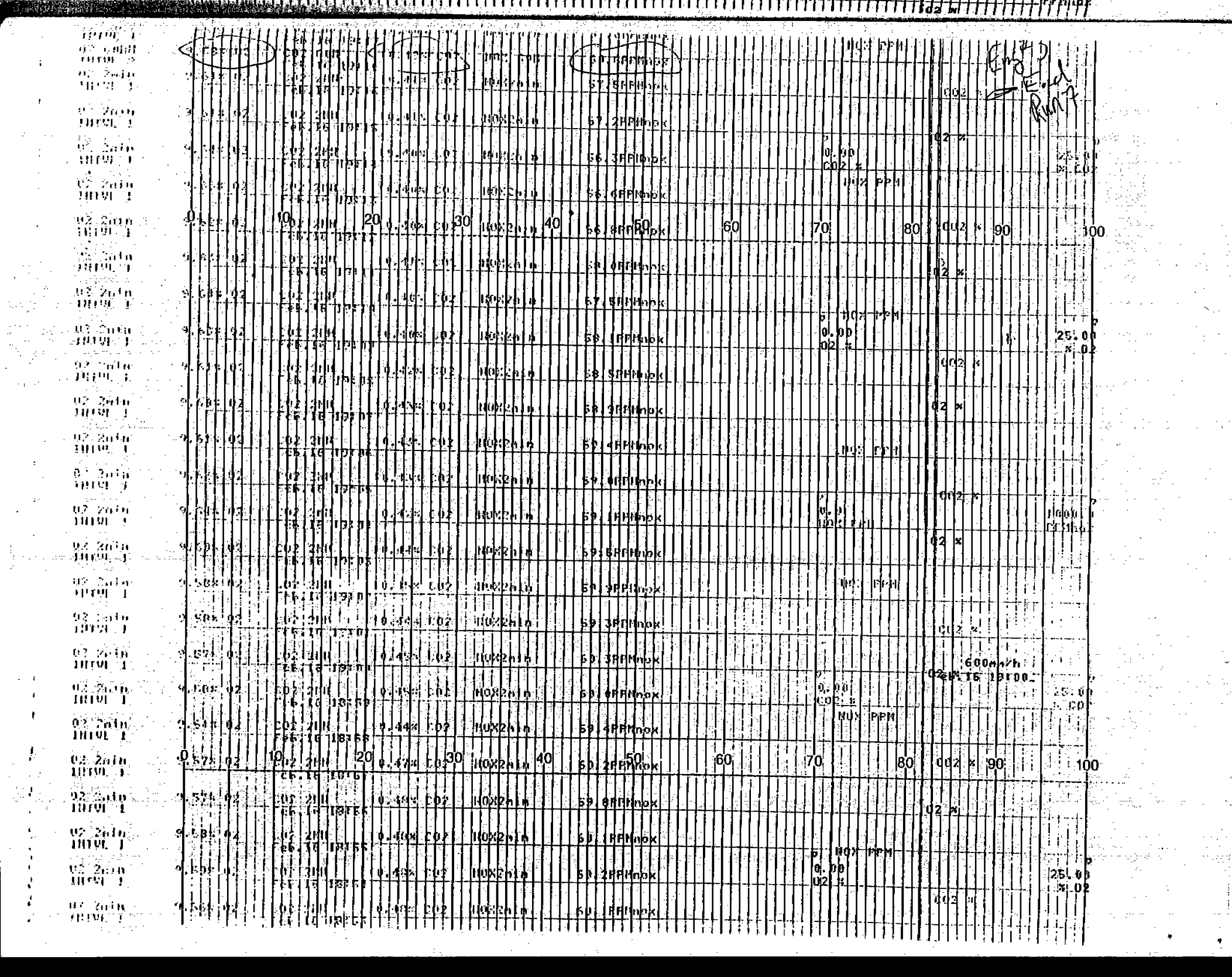
18% O2

NOX 506.5

END

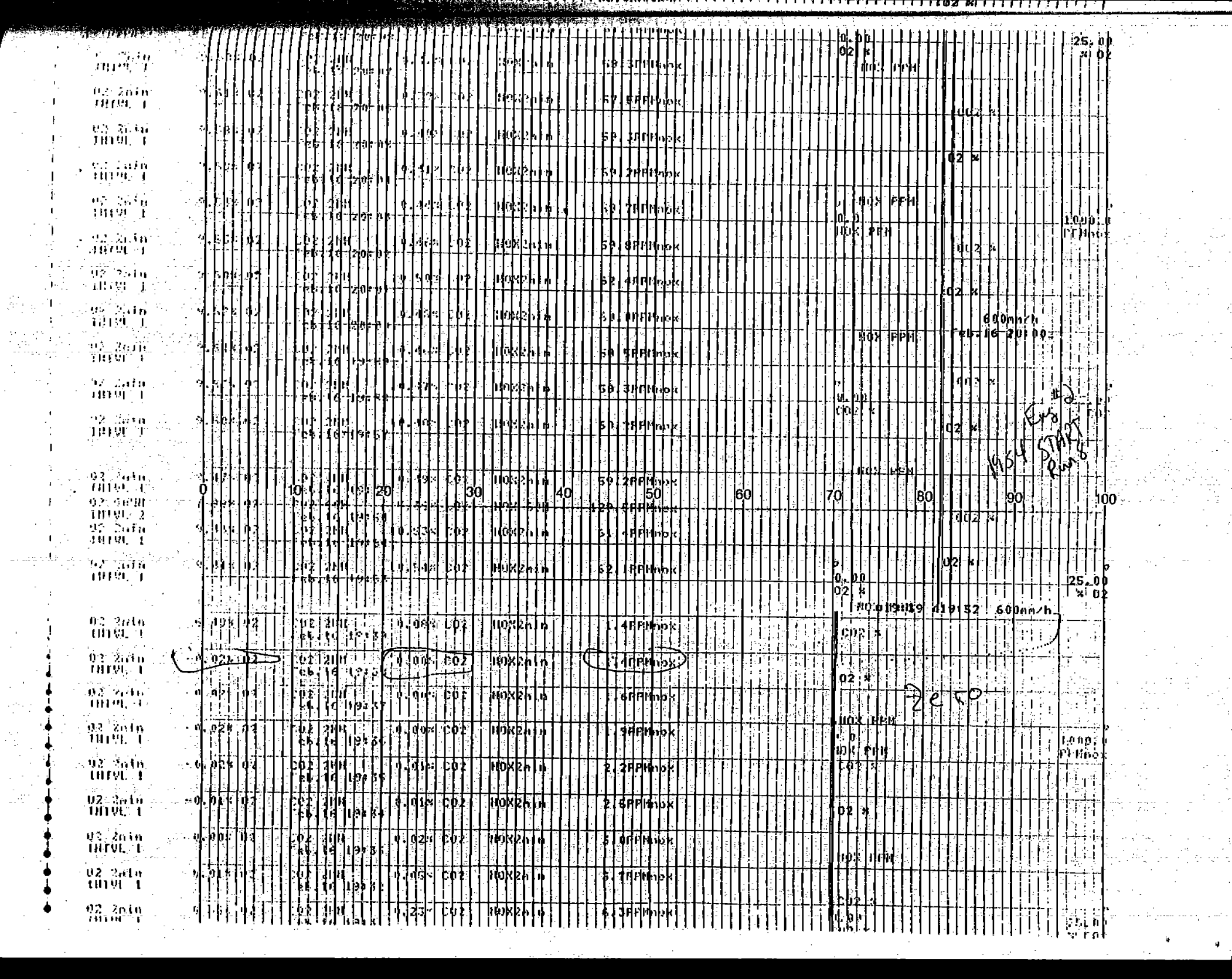

0
10
20
30
40
50
60
70
80
90
100
START

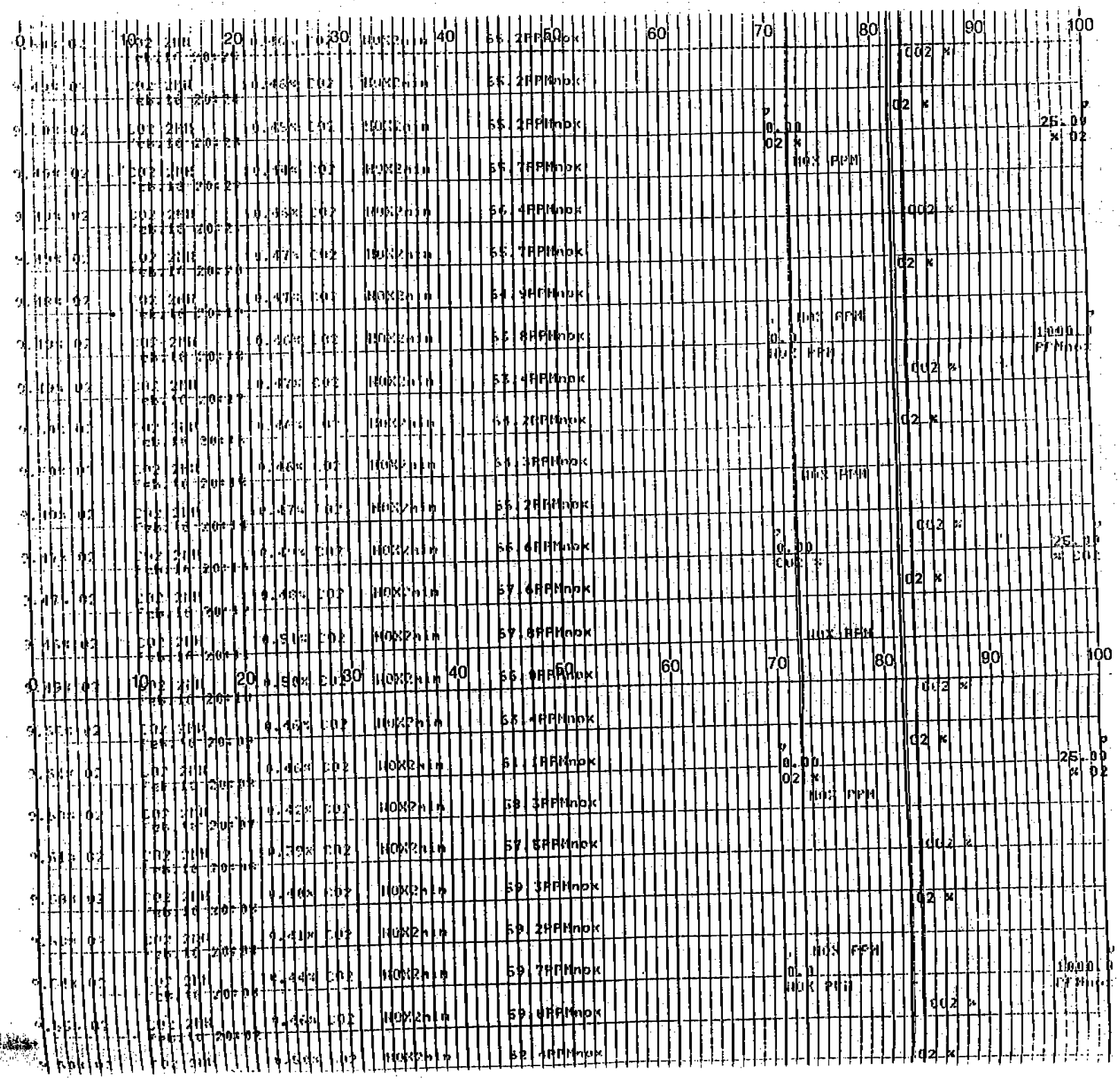


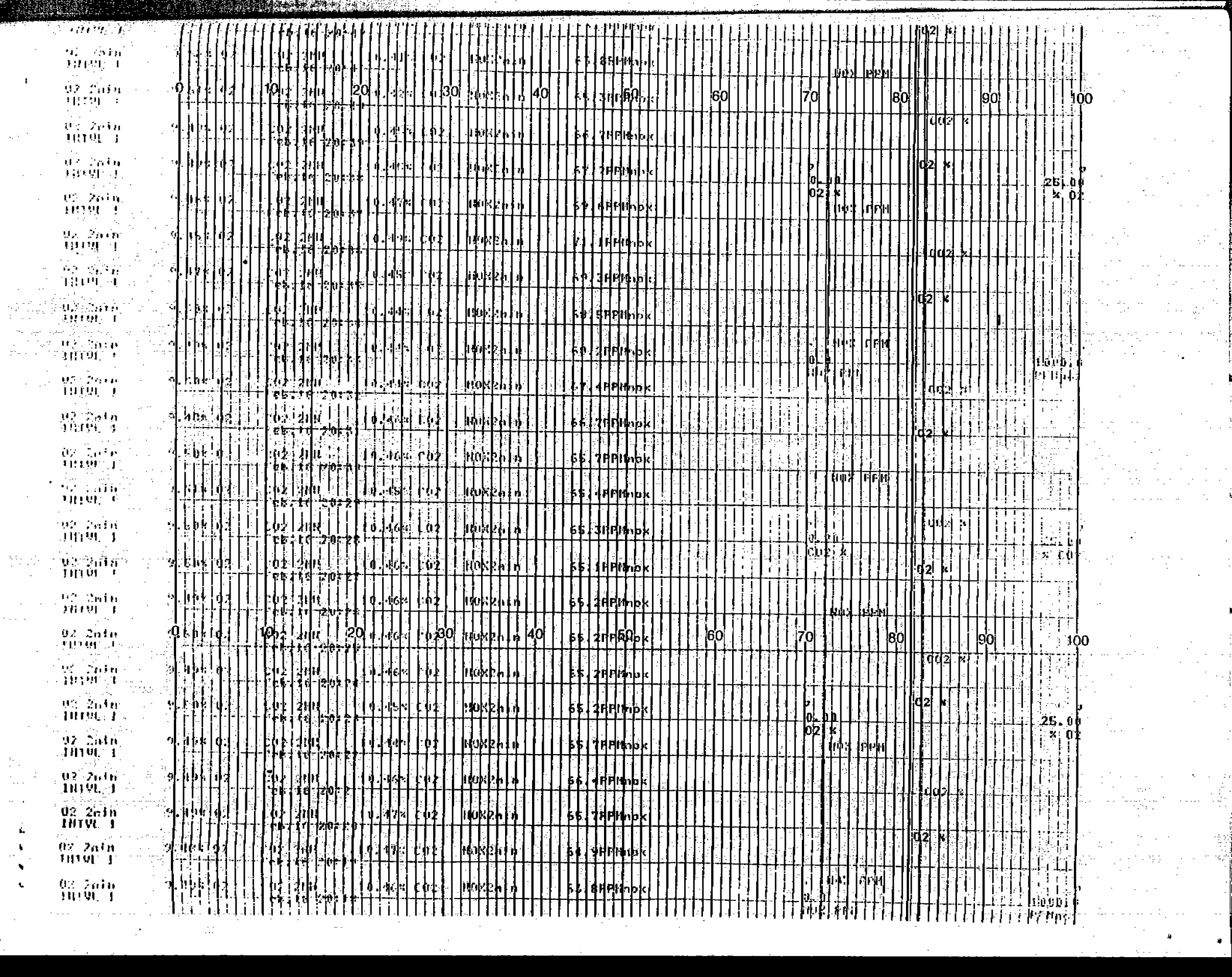

NOX PPM
CO2 %
0.00
25.00
0
10
20
30
40
50
60
70
80
90
100
600m³/h

Interval	O2	CO2 time	CO2	NOX	NOX PPM
O2 2min INTVL 1	0.02[illegible]% O2	CO2 2MIN FEB.16 19:3[illegible]	0.00[illegible]% CO2	NOX2min	1.9PPMnox
O2 2min INTVL 1	0.0[illegible]% O2	CO2 2MIN FEB.16 19:3[illegible]	0.01% CO2	NOX2min	2.2PPMnox
O2 2min INTVL 1	0.01[illegible]% O2	CO2 2MIN FEB.16 19:3[illegible]	0.0[illegible]% CO2	NOX2min	2.8PPMnox
O2 2min INTVL 1	0.00[illegible]% O2	CO2 2MIN FEB.16 19:3[illegible]	0.02[illegible]% CO2	NOX2min	5.0PPMnox
O2 2min INTVL 1	0.01[illegible]% O2	CO2 2MIN FEB.16 19:3[illegible]	0.0[illegible]% CO2	NOX2min	5.7PPMnox
O2 2min INTVL 1	0.3[illegible]% O2	CO2 2MIN FEB.16 19:3[illegible]	0.23% CO2	NOX2min	6.3PPMnox
O2 2min INTVL 1	7.1[illegible]% O2	CO2 2MIN FEB.16 19:[illegible]	[illegible]% CO2	NOX2min	24.4PPMnox
O2 2min INTVL 1	10.0[illegible]% O2	CO2 2MIN FEB.16 19:2[illegible]	1.94% CO2	NOX2min	7.3PPMnox
O2 2min INTVL 1	10.0[illegible]% O2	CO2 2MIN FEB.16 19:2[illegible]	1.93% CO2	NOX2min	8.9PPMnox
O2 2min INTVL 1	[illegible]% O2	CO2 2MIN FEB.16 19:2[illegible]	1.99% CO2	NOX2min	11.[illegible]PPMnox
O2 2min INTVL 1	0.7[illegible]% O2	CO2 2MIN FEB.16 19:2[illegible]	0.1[illegible]% CO2	NOX2min	156.4PPMnox
O2 2min INTVL 1	0.0[illegible]% O2	CO2 2MIN FEB.16 19:2[illegible]	0.11% CO2	NOX2min	511.1PPMnox
O2 2min INTVL 1	0.0[illegible]% O2	CO2 2MIN FEB.16 19:2[illegible]	0.01% CO2	NOX2min	517.1PPMnox
O2 2min INTVL 1	0.0[illegible]% O2	CO2 2MIN FEB.16 19:2[illegible]	0.02% CO2	NOX2min	517.1PPMnox
O2 2min INTVL 1	1.1[illegible]% O2	CO2 2MIN FEB.16 19:2[illegible]	0.06% CO2	NOX2min	507.4PPMnox
O2 2min INTVL 1	16.2[illegible]% O2	CO2 2MIN FEB.16 19:2[illegible]	0.61% CO2	NOX2min	100.3PPMnox
O2 2min INTVL 1	9.5[illegible]% O2	CO2 2MIN FEB.16 19:17	0.39% CO2	NOX2min	56.8PPMnox
O2 2min INTVL 1	9.6[illegible]% O2	CO2 2MIN FEB.16 19:1[illegible]	[illegible]% CO2	NOX2min	57.8PPMnox
O2 60MIN INTVL 2	[illegible]% O2	CO2 60MIN FEB.16 19:1[illegible]	[illegible]% CO2	NOX 60M	[illegible]PPMnox
O2 2min INTVL 1	9.6[illegible]% O2	CO2 2MIN FEB.16 19:1[illegible]	0.41% CO2	NOX2min	57.8PPMnox
O2 2min INTVL 1	9.61% O2	CO2 2MIN FEB.16 19:15	0.41% CO2	NOX2min	57.2PPMnox
O2 2min INTVL 1	9.60% O2	CO2 2MIN FEB.16 19:14	0.40% CO2	NOX2min	56.3PPMnox
O2 2min INTVL 1	9.63% O2	CO2 2MIN FEB.16 19:13	0.40% CO2	NOX2min	56.6PPMnox
[illegible]	[illegible] O2	CO2 2MIN FEB.16 19:1[illegible]	0.40% CO2	NOX2min	56.[illegible]PPMnox

O2 9.49
CO2 1.189
NOx 506.5
System Cal. RUN
End #3 End Run


NOX FPH
600mm/h
0
10
20
30
40
50
60
70
80
90
100
25.00
02 %





0 10 20 30 40 50 60 70 80 90 100

NOX PPM

NOX Feb 16 21:00 600ppm

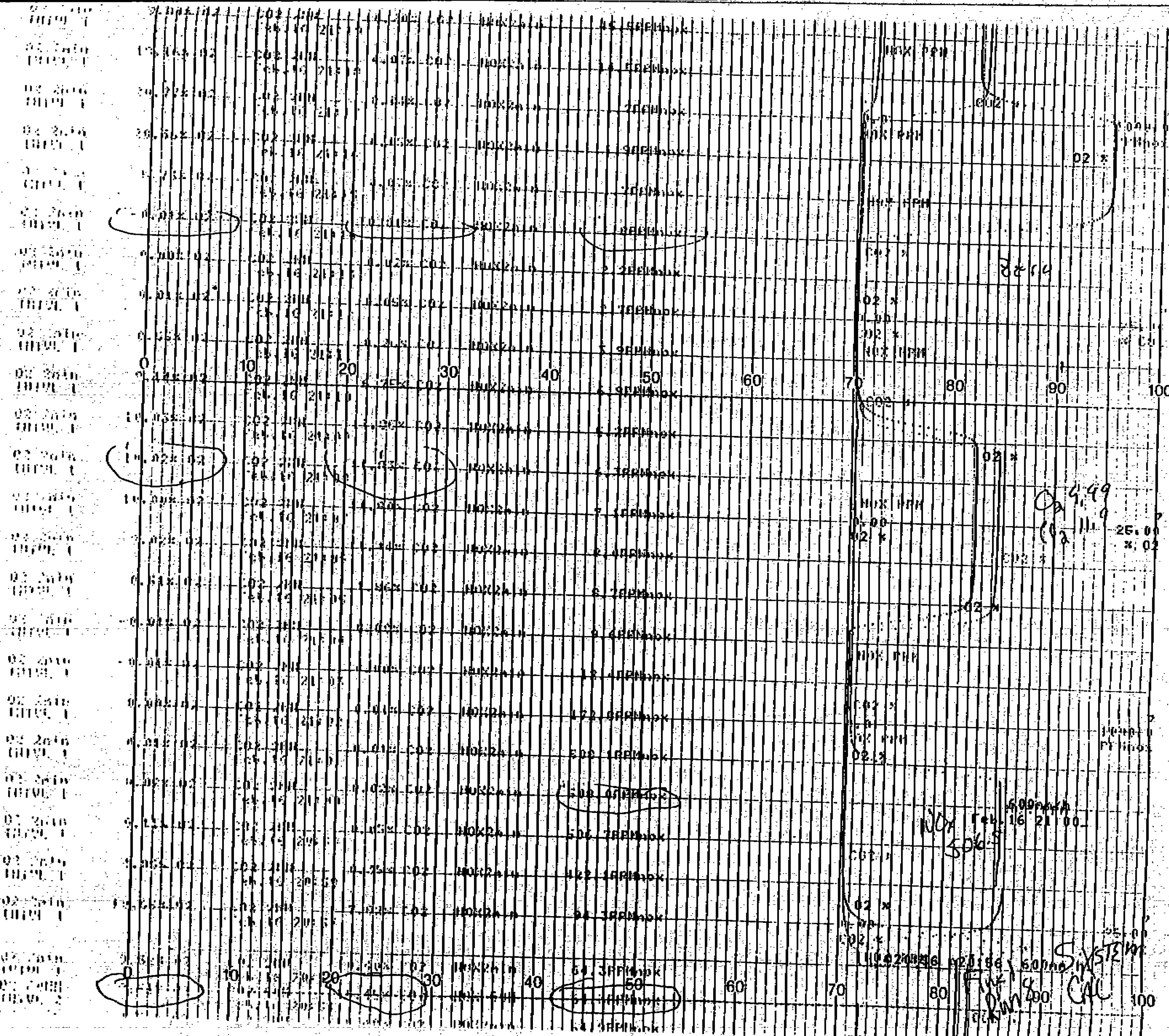
506 S

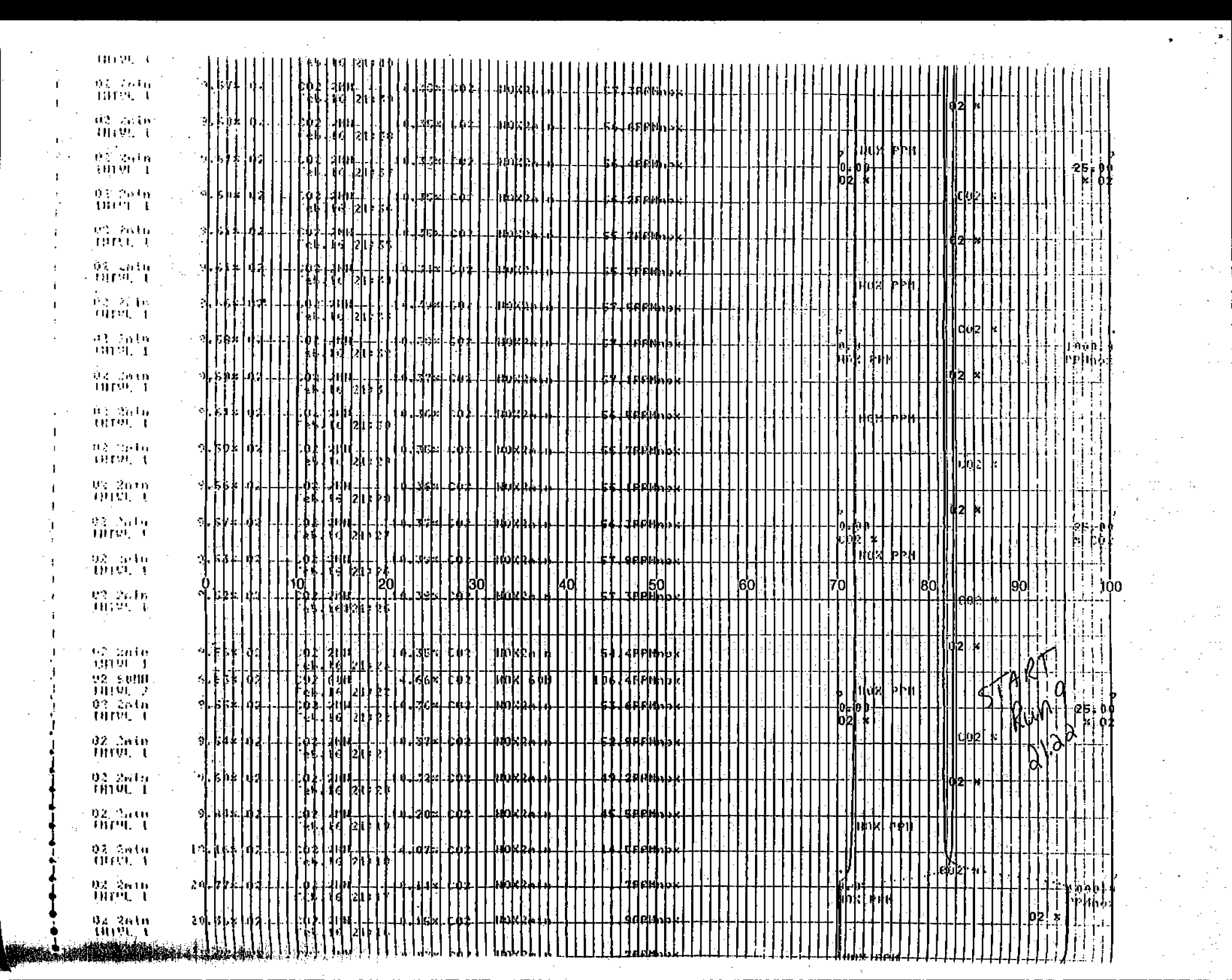
System CAL 600ppm

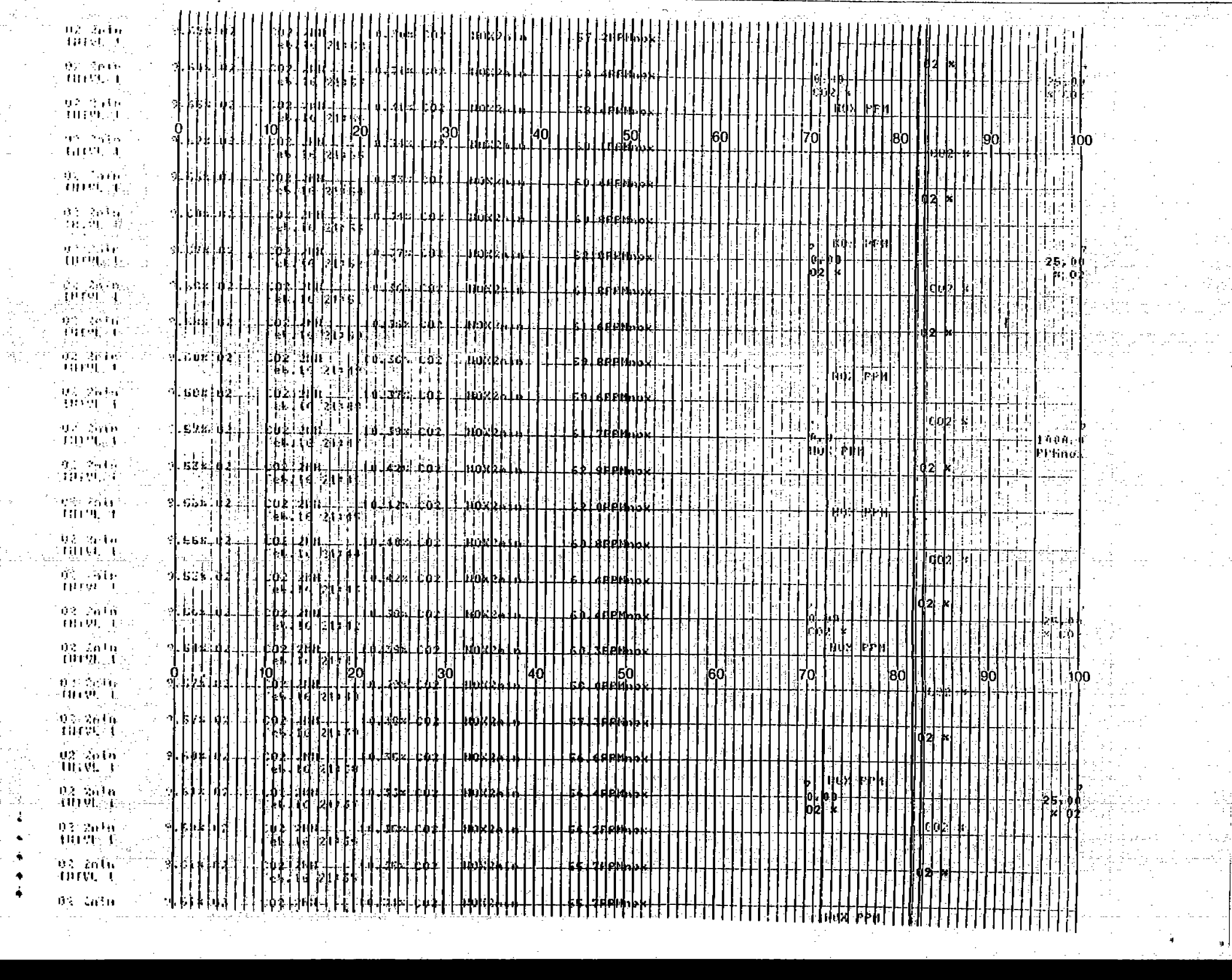
Fw 1 Run 8

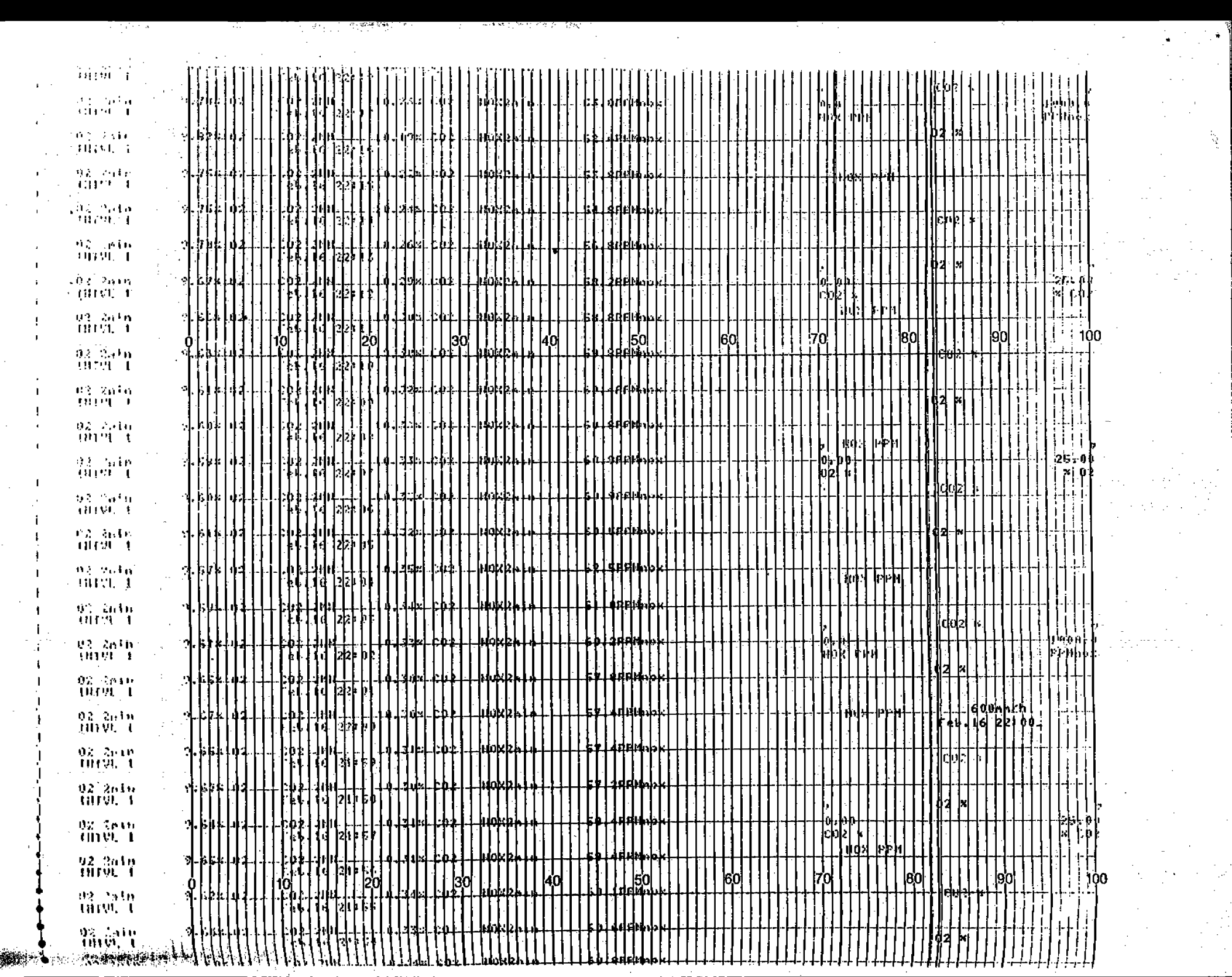
2054 End Run 8

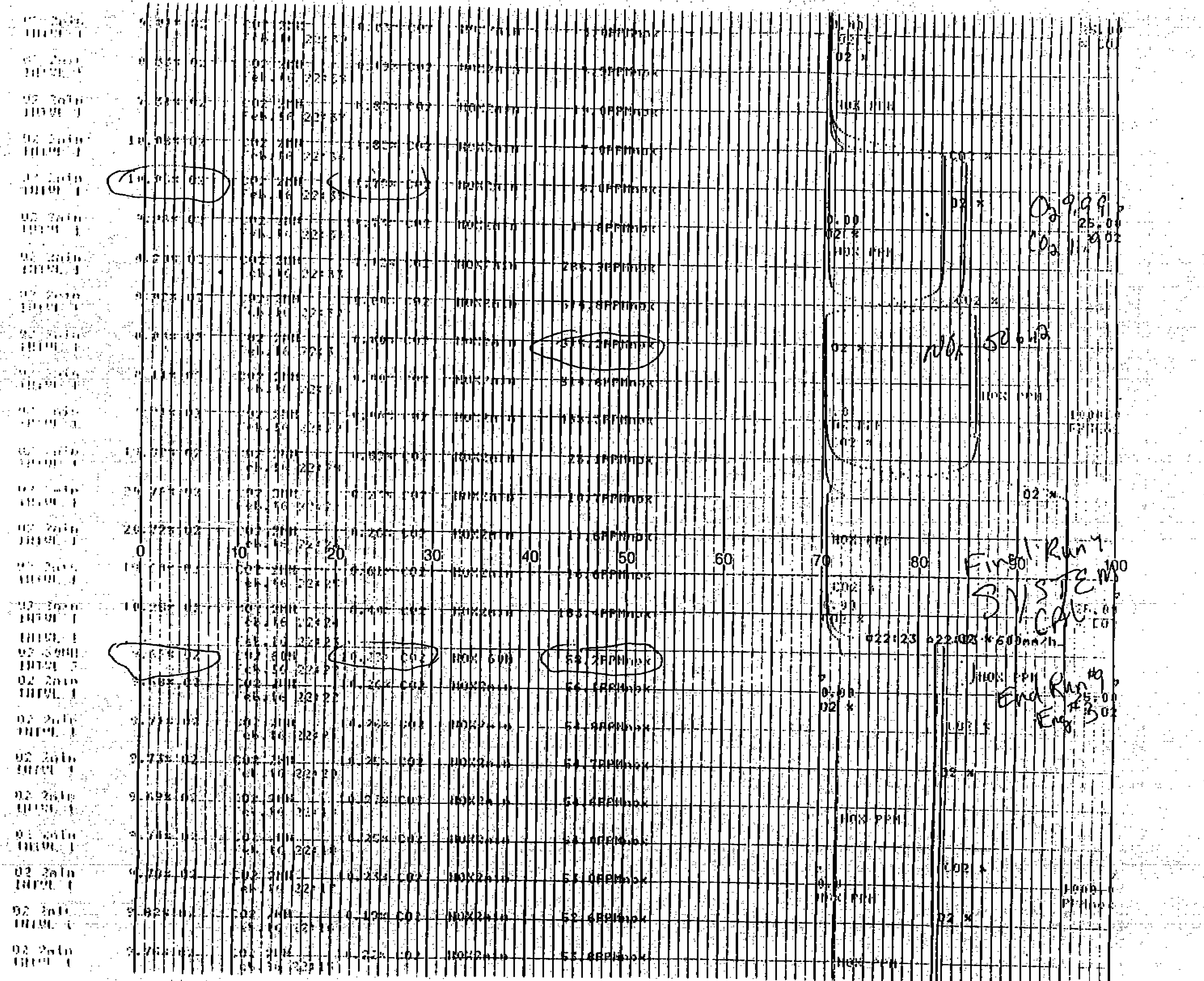
NOx
500.?PPMnox
500.0PPMnox
406.?PPMnox
422.?PPMnox
84.3PPMnox
64.3PPMnox
64.4PPMnox
64.2PPMnox
65.6PPMnox
65.4PPMnox
65.7PPMnox
66.6PPMnox
66.3PPMnox
66.1PPMnox
66.7PPMnox
65.7PPMnox
64.3PPMnox
63.5PPMnox
63.3PPMnox
63.3PPMnox
63.6PPMnox
65.3PPMnox
66.7PPMnox
67.2PPMnox
69.6PPMnox


Feb. 16 21 00
600 ppm
SYSTEM CAL
Run 4

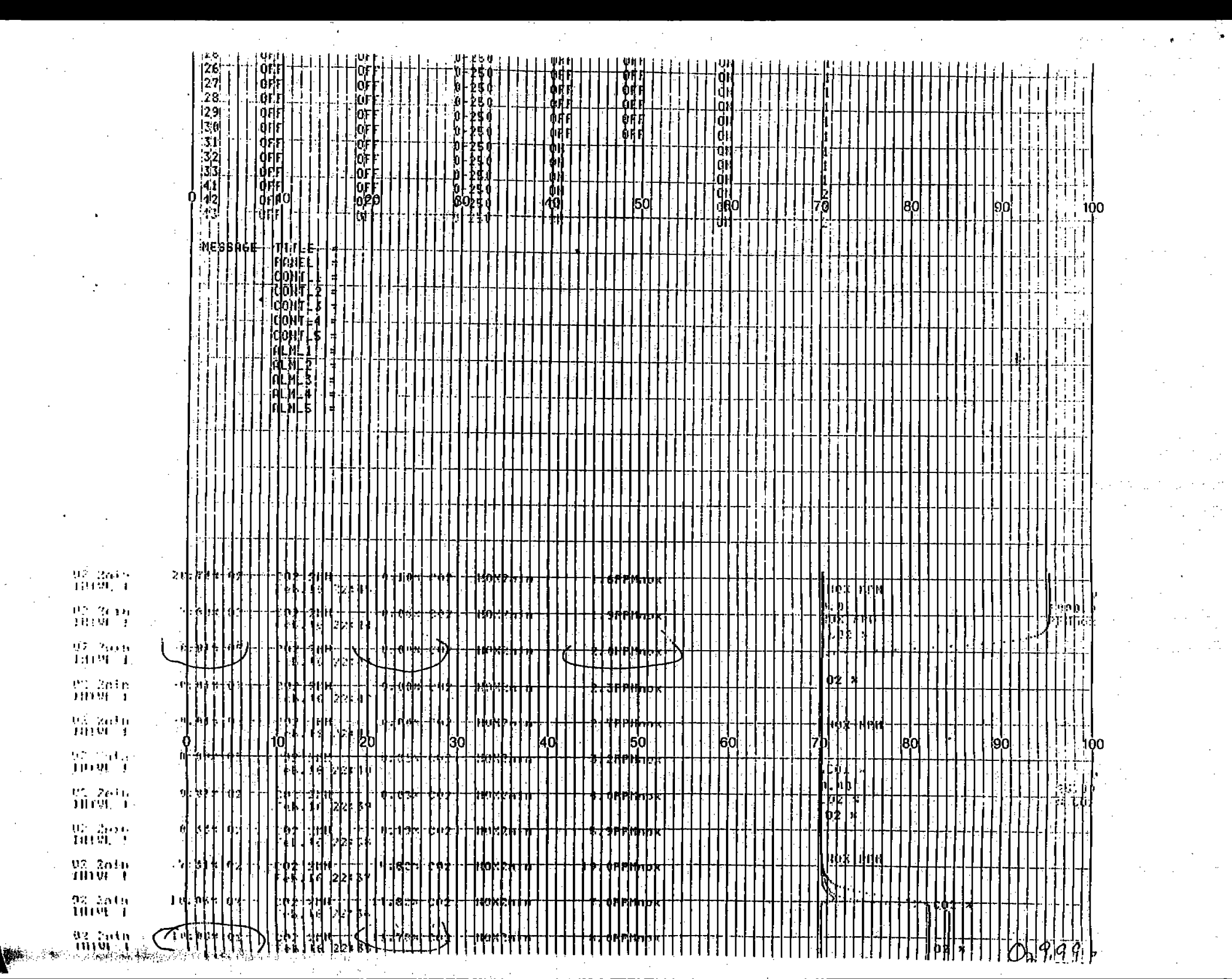

0
10
20
30
40
50
60
70
80
90
100
START
Run 9
2.1.22

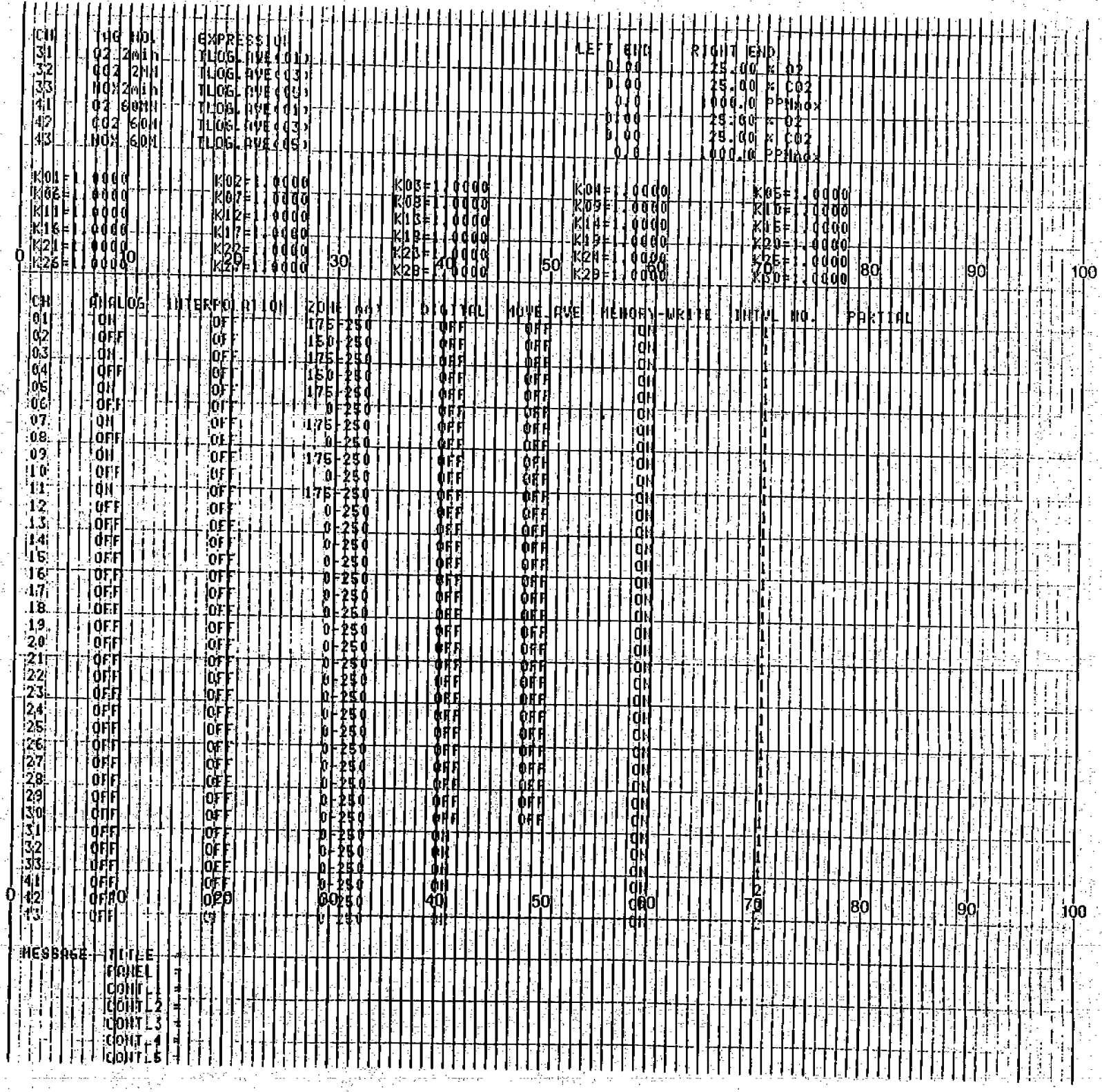

0
10
20
30
40
50
60
70
80
90
100
NOX PPM
CO2 %
02 %

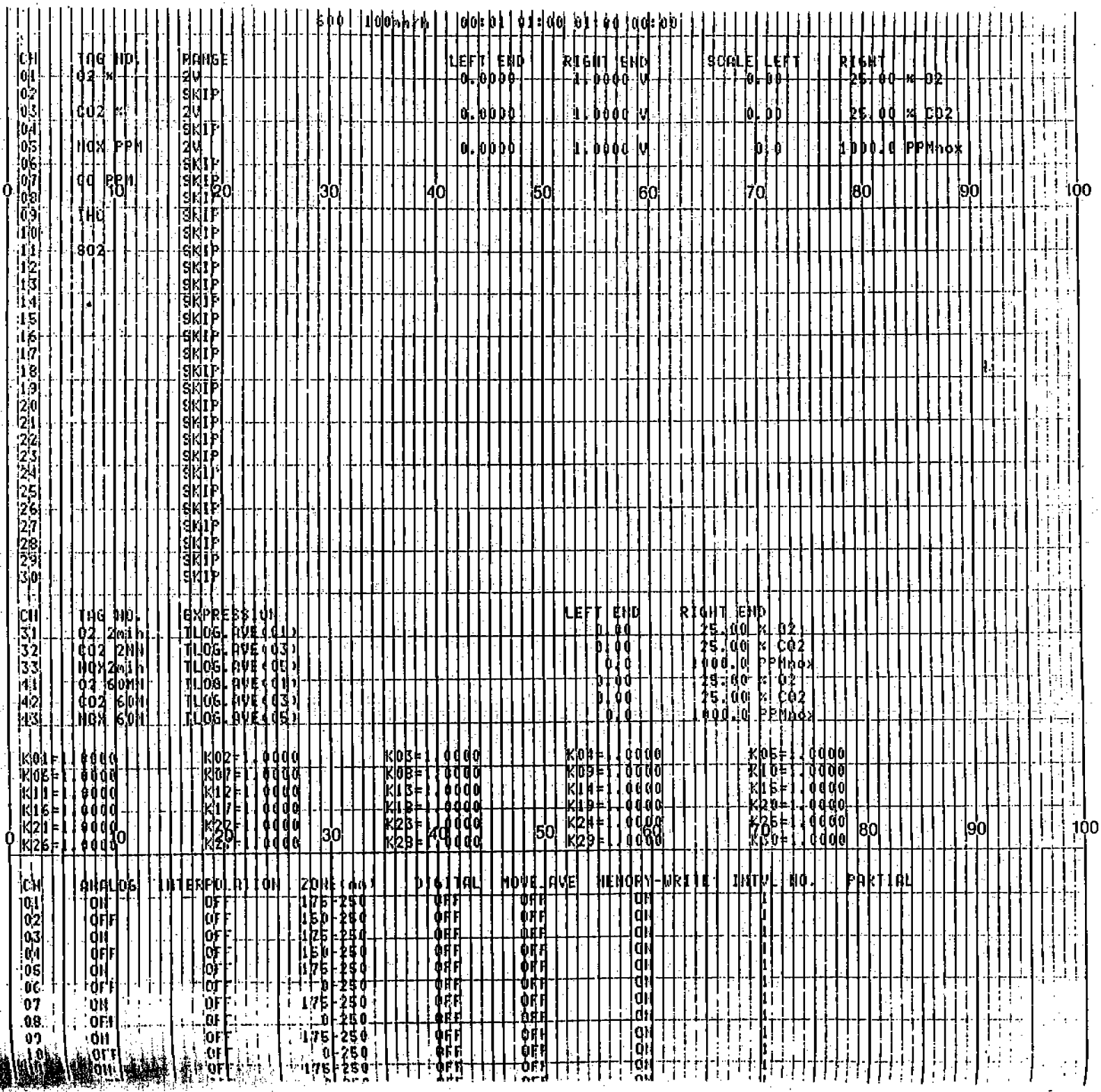

0
10
20
30
40
50
60
70
80
90
100
CO2 %
O2 %
NOX PPM
600mmHg
Feb. 16 22:00

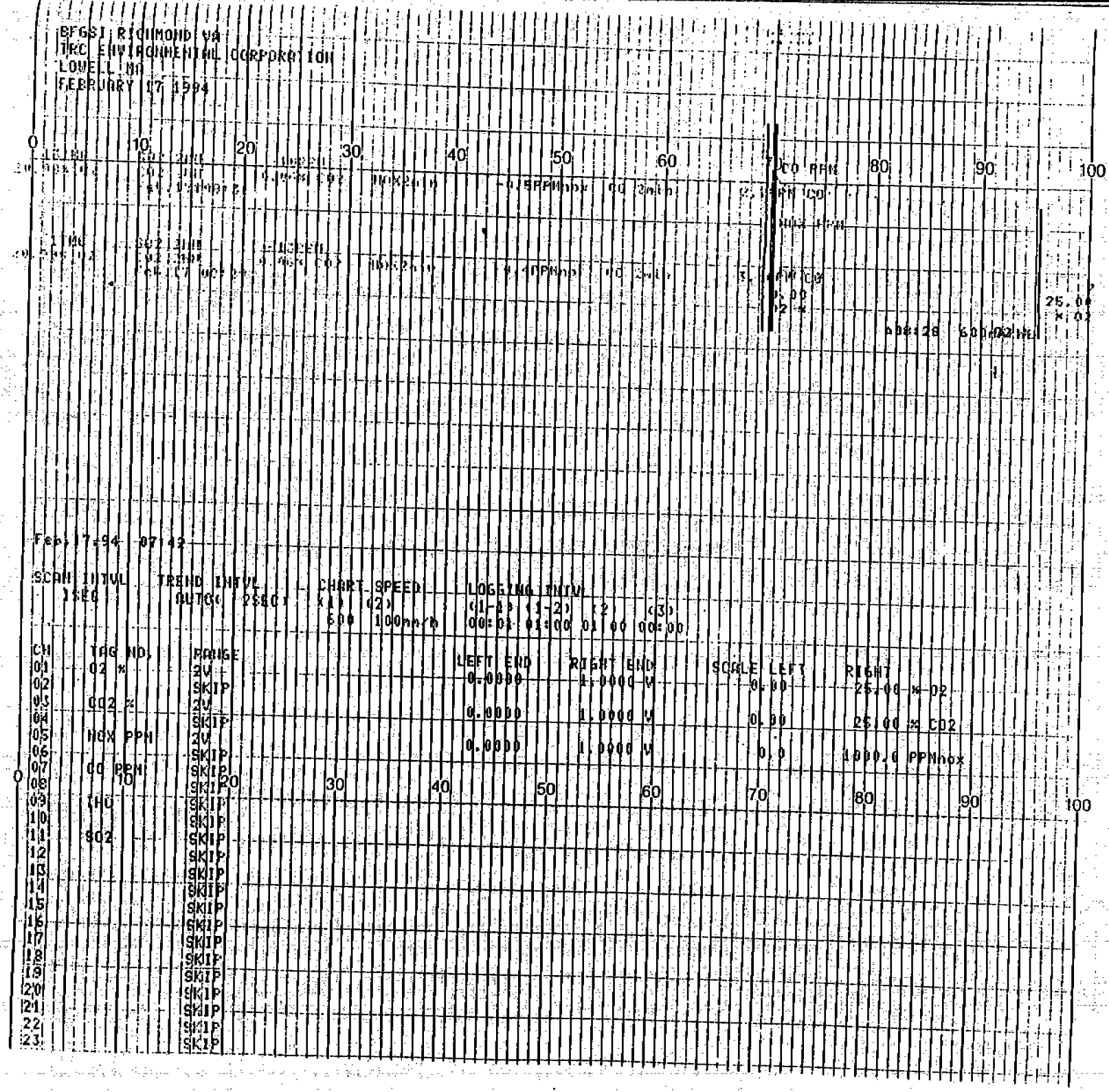


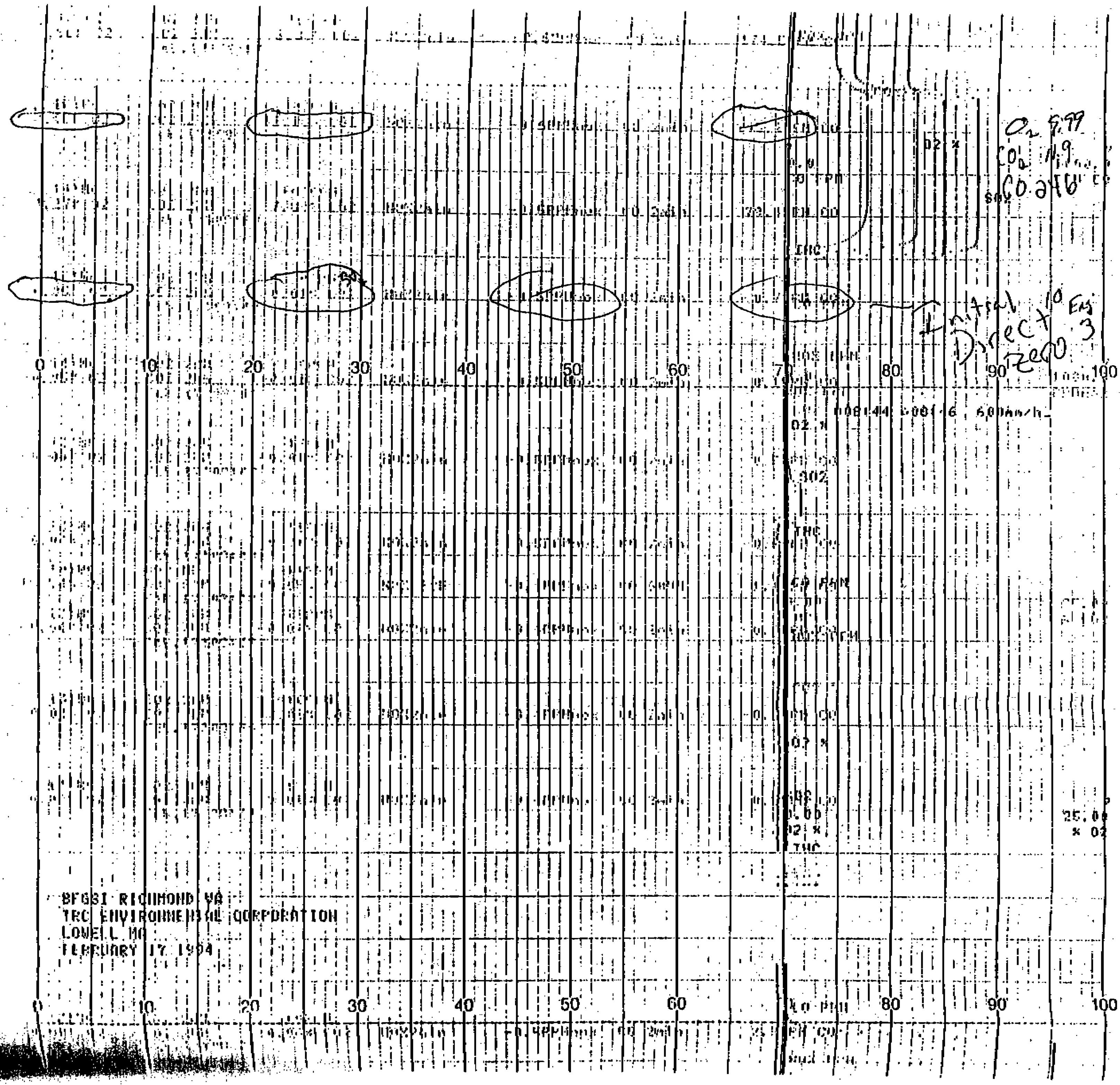
0
10
20
30
40
50
60
70
80
90
100
SYSTEM CAL
End Run #9


MESSAGE TITLE
PANEL
CONT_1
CONT_2
CONT_3
CONT_4
CONT_5
ALM_1
ALM_2
ALM_3
ALM_4
ALM_5
0
10
20
30
40
50
60
70
80
90
100

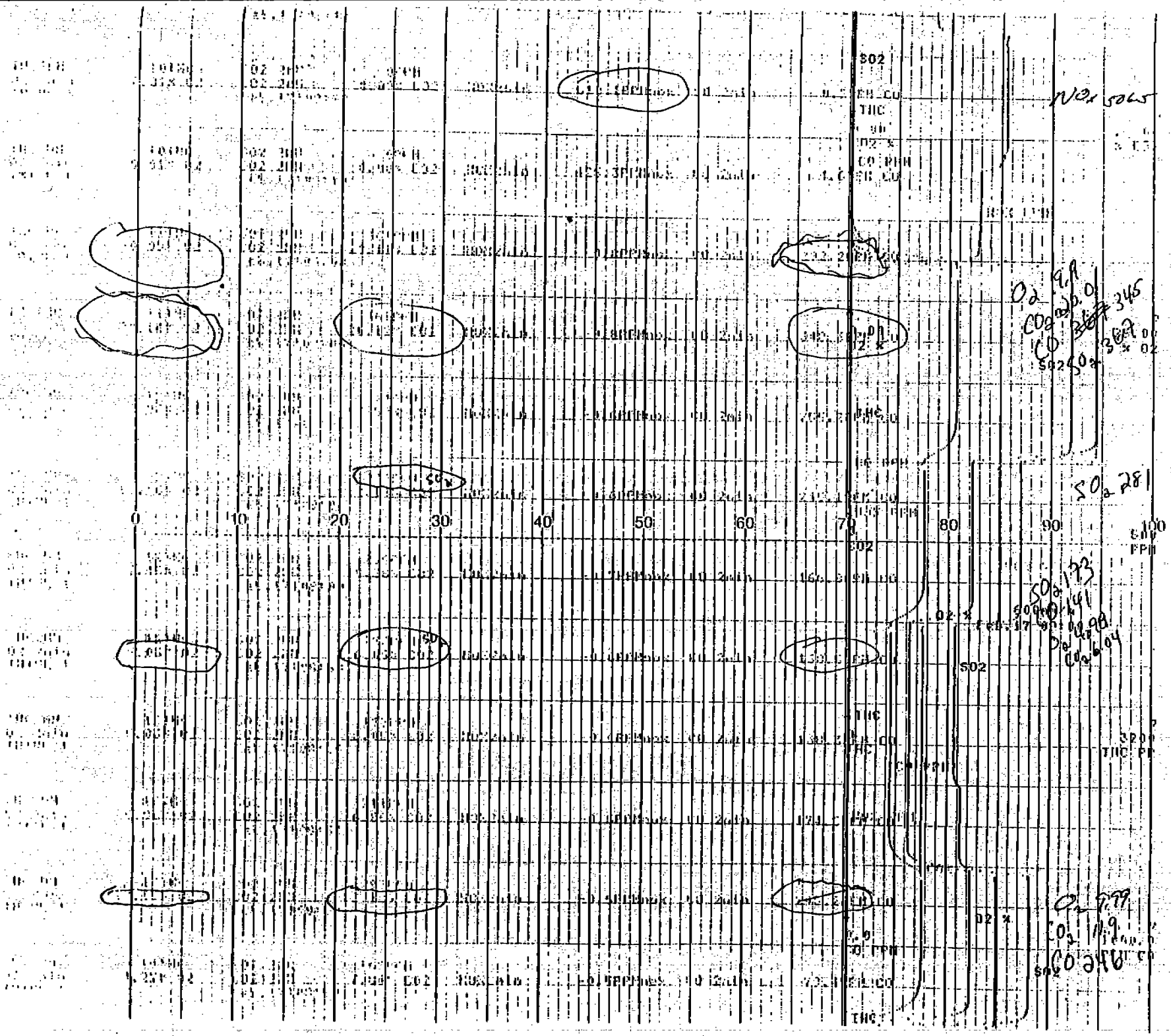

CH
31
32
33
41
42
43
EXPRESS UI
LEFT END
RIGHT END
K01=
K02=
K03=
K04=
K05=
K06=
K07=
K08=
K09=
K10=
K11=
K12=
K13=
K14=
K15=
K16=
K17=
K18=
K19=
K20=
K21=
K22=
K23=
K24=
K25=
K26=
K27=
K28=
K29=
K30=
0
10
20
30
40
50
60
70
80
90
100
CH
ANALOG
INTERFACE
ZONE
DIGITAL
MOVE AVE
MEMORY-WRITE
INITIAL NO.
PARTIAL
HESSAGE TITLE
PANEL
CONTL1
CONTL2
CONTL3
CONTL4
CONTL5

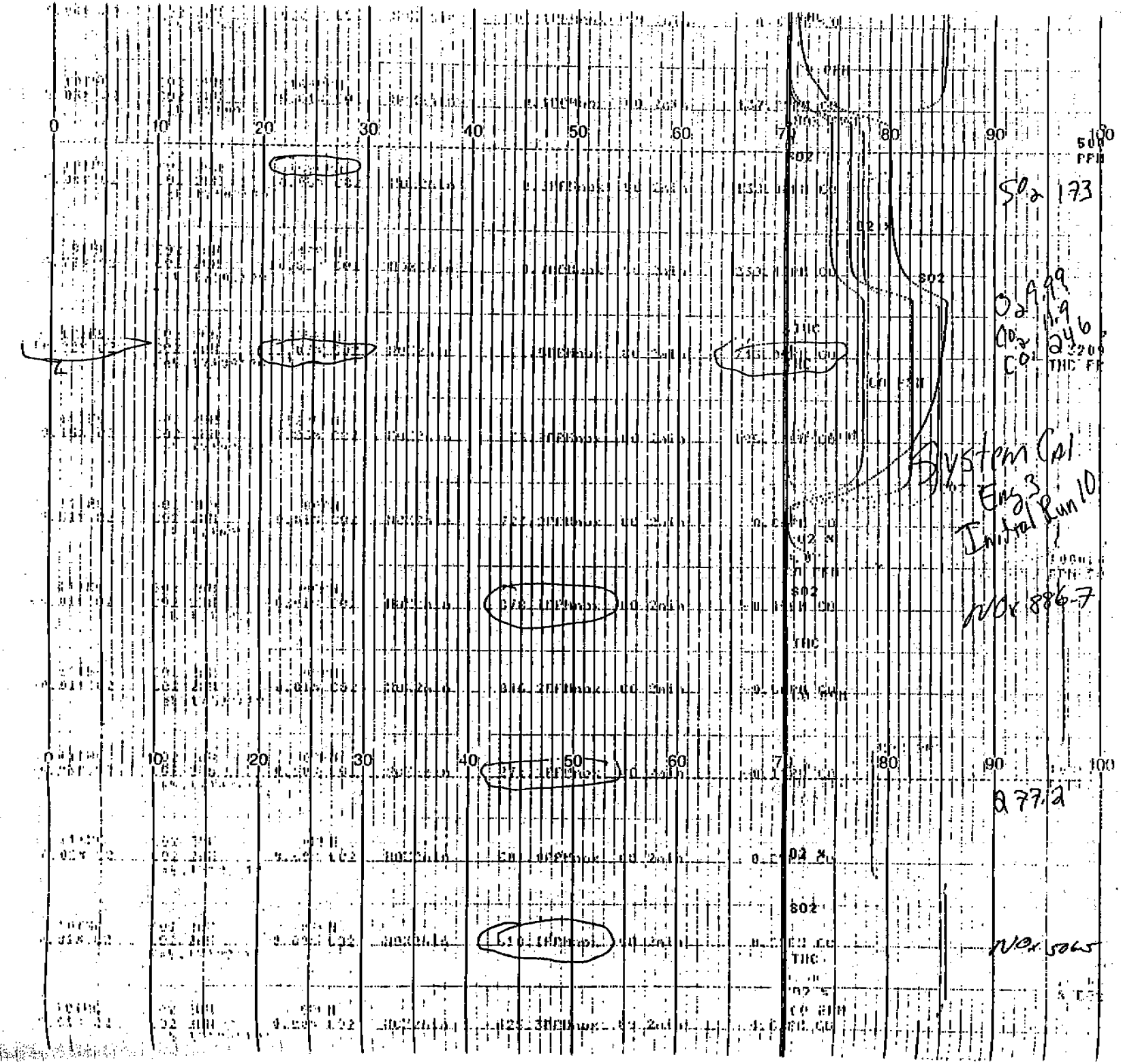

600 100mm/h 00:01 01:00 01:00 00:00
CH TAG NO. RANGE LEFT END RIGHT END SCALE LEFT RIGHT
01 02 % 2V 0.0000 1.0000 V 0.00 25.00 % 02
02 SKIP
03 CO2 % 2V 0.0000 1.0000 V 0.00 25.00 % CO2
04 SKIP
05 NOX PPM 2V 0.0000 1.0000 V 0.0 1000.0 PPMnox
06 SKIP
07 CO PPM SKIP
08 SKIP
09 THC SKIP
10 SKIP
11 SO2 SKIP
12 SKIP
13 SKIP
14 SKIP
15 SKIP
16 SKIP
17 SKIP
18 SKIP
19 SKIP
20 SKIP
21 SKIP
22 SKIP
23 SKIP
24 SKIP
25 SKIP
26 SKIP
27 SKIP
28 SKIP
29 SKIP
30 SKIP
CH TAG NO. EXPRESSION LEFT END RIGHT END
31 02 2min TLOG.AVE(01) 0.00 25.00 % 02
32 CO2 2MN TLOG.AVE(03) 0.00 25.00 % CO2
33 NOX 2min TLOG.AVE(05) 0.0 1000.0 PPMnox
41 02 60MN TLOG.AVE(01) 0.00 25.00 % 02
42 CO2 60M TLOG.AVE(03) 0.00 25.00 % CO2
43 NOX 60M TLOG.AVE(05) 0.0 1000.0 PPMnox
K01=1.0000 K02=1.0000 K03=1.0000 K04=1.0000 K05=1.0000
K06=1.0000 K07=1.0000 K08=1.0000 K09=1.0000 K10=1.0000
K11=1.0000 K12=1.0000 K13=1.0000 K14=1.0000 K15=1.0000
K16=1.0000 K17=1.0000 K18=1.0000 K19=1.0000 K20=1.0000
K21=1.0000 K22=1.0000 K23=1.0000 K24=1.0000 K25=1.0000
K26=1.0000 K27=1.0000 K28=1.0000 K29=1.0000 K30=1.0000
CH ANALOG INTERPOLATION ZONE(dd) DIGITAL MOVE AVE MEMORY-WRITE INTVL NO. PARTIAL
01 ON OFF 175-250 OFF OFF ON 1
02 OFF OFF 150-250 OFF OFF ON 1
03 ON OFF 175-250 OFF OFF ON 1
04 OFF OFF 150-250 OFF OFF ON 1
05 ON OFF 175-250 OFF OFF ON 1
06 OFF OFF 0-250 OFF OFF ON 1
07 ON OFF 175-250 OFF OFF ON 1
08 OFF OFF 0-250 OFF OFF ON 1
09 ON OFF 175-250 OFF OFF ON 1
10 OFF OFF 0-250 OFF OFF ON 1
11 ON OFF 175-250 OFF OFF ON 1
0 10 20 30 40 50 60 70 80 90 100
0 10 20 30 40 50 60 80 90 100

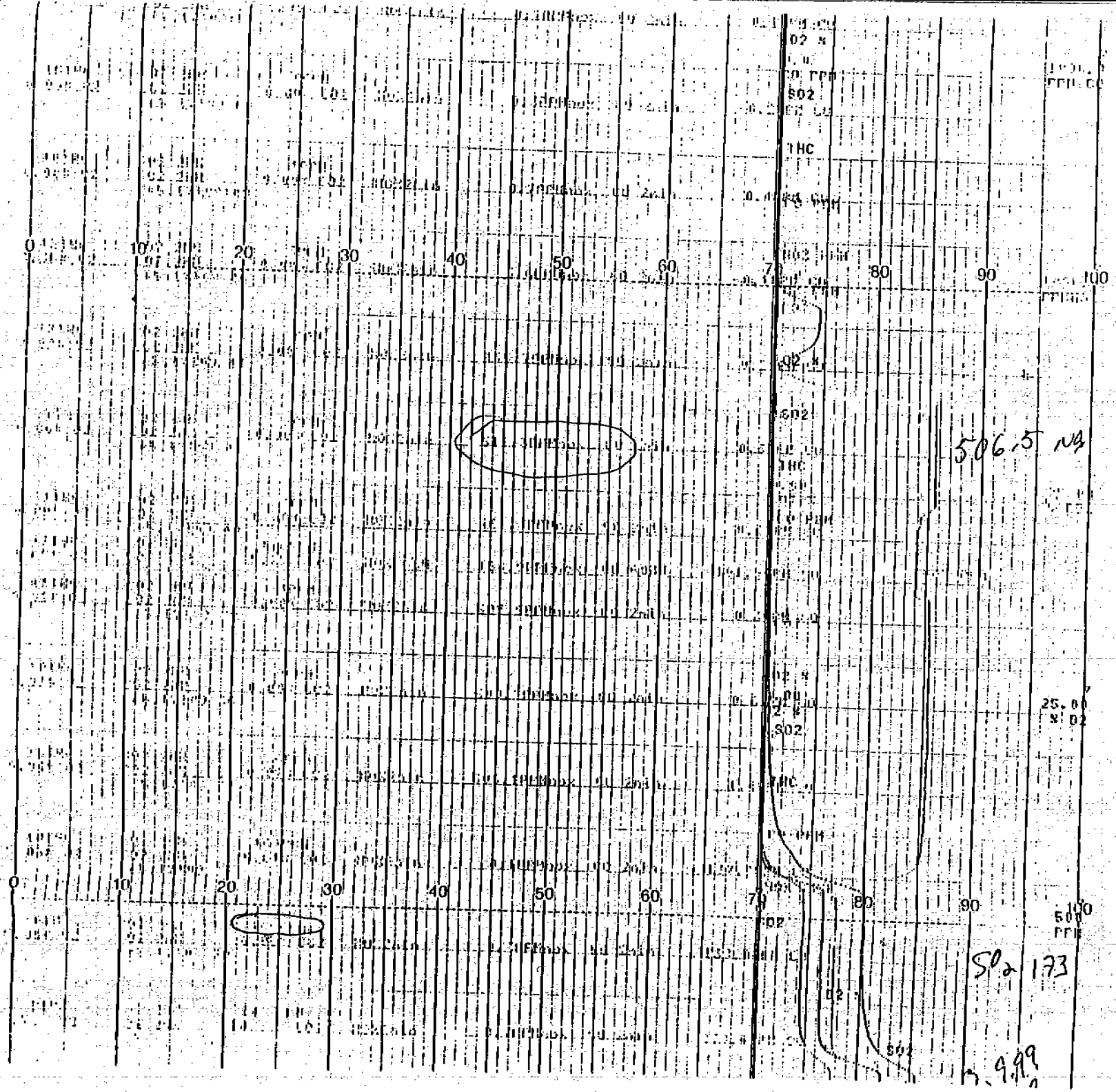

BFGSI RICHMOND VA
TRC ENVIRONMENTAL CORPORATION
LOWELL MA
FEBRUARY 17 1994
Feb 17 94 07:42
SCAN INTVL
TREND INTVL
CHART SPEED
LOGGING INTV
CH TAG NO. RANGE LEFT END RIGHT END SCALE LEFT RIGHT
01 02 % 2V 0.0000 1.0000 V 0.00 25.00 % 02
02 SKIP
03 CO2 % 2V 0.0000 1.0000 V 0.00 25.00 % CO2
04 SKIP
05 NOX PPM 2V 0.0000 1.0000 V 0.0 1000.0 PPMnox
06 SKIP
07 CO PPM SKIP
08 SKIP
09 THC SKIP
10 SKIP
11 SO2 SKIP
12 SKIP
13 SKIP
14 SKIP
15 SKIP
16 SKIP
17 SKIP
18 SKIP
19 SKIP
20 SKIP
21 SKIP
22 SKIP
23 SKIP

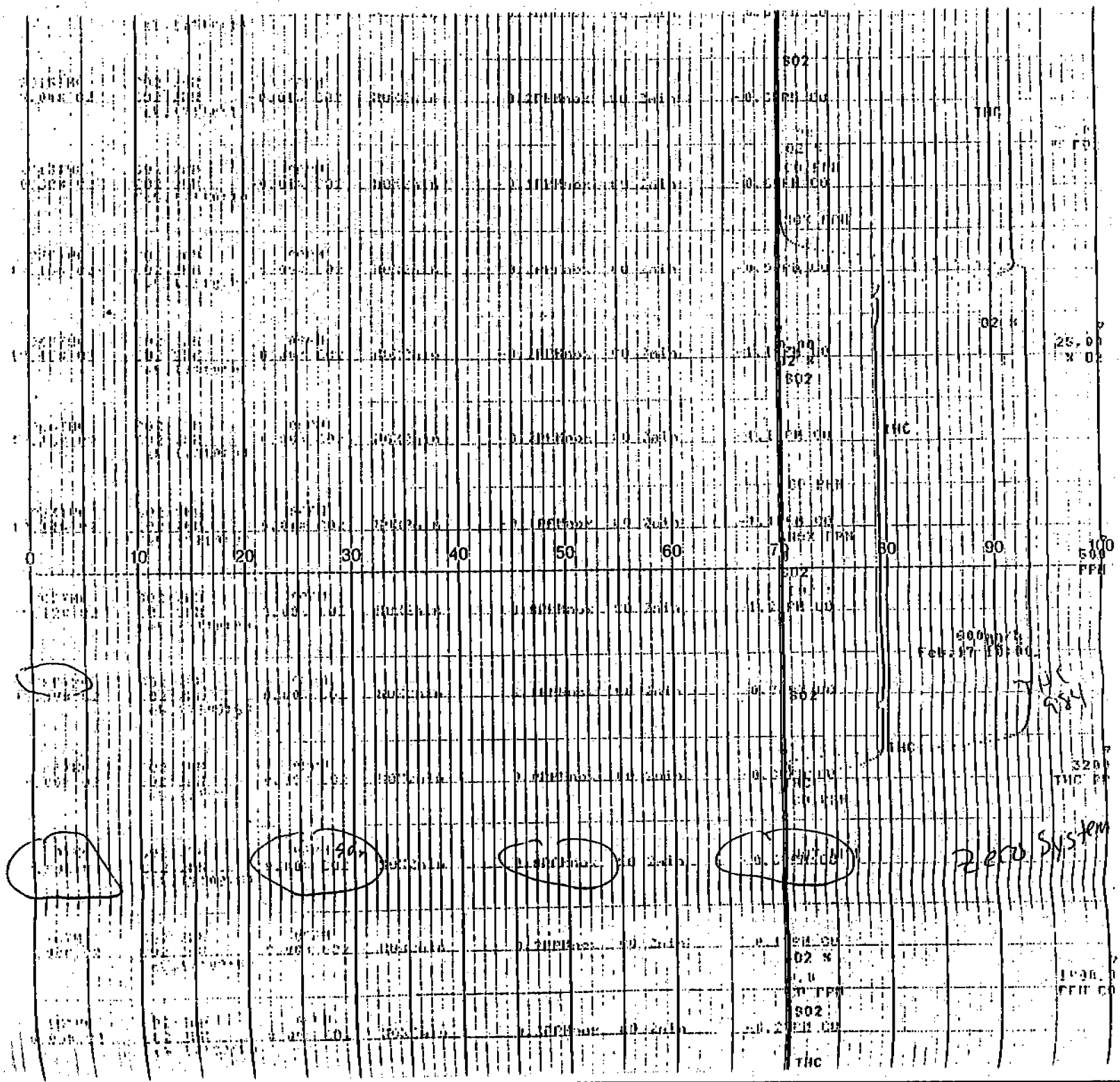


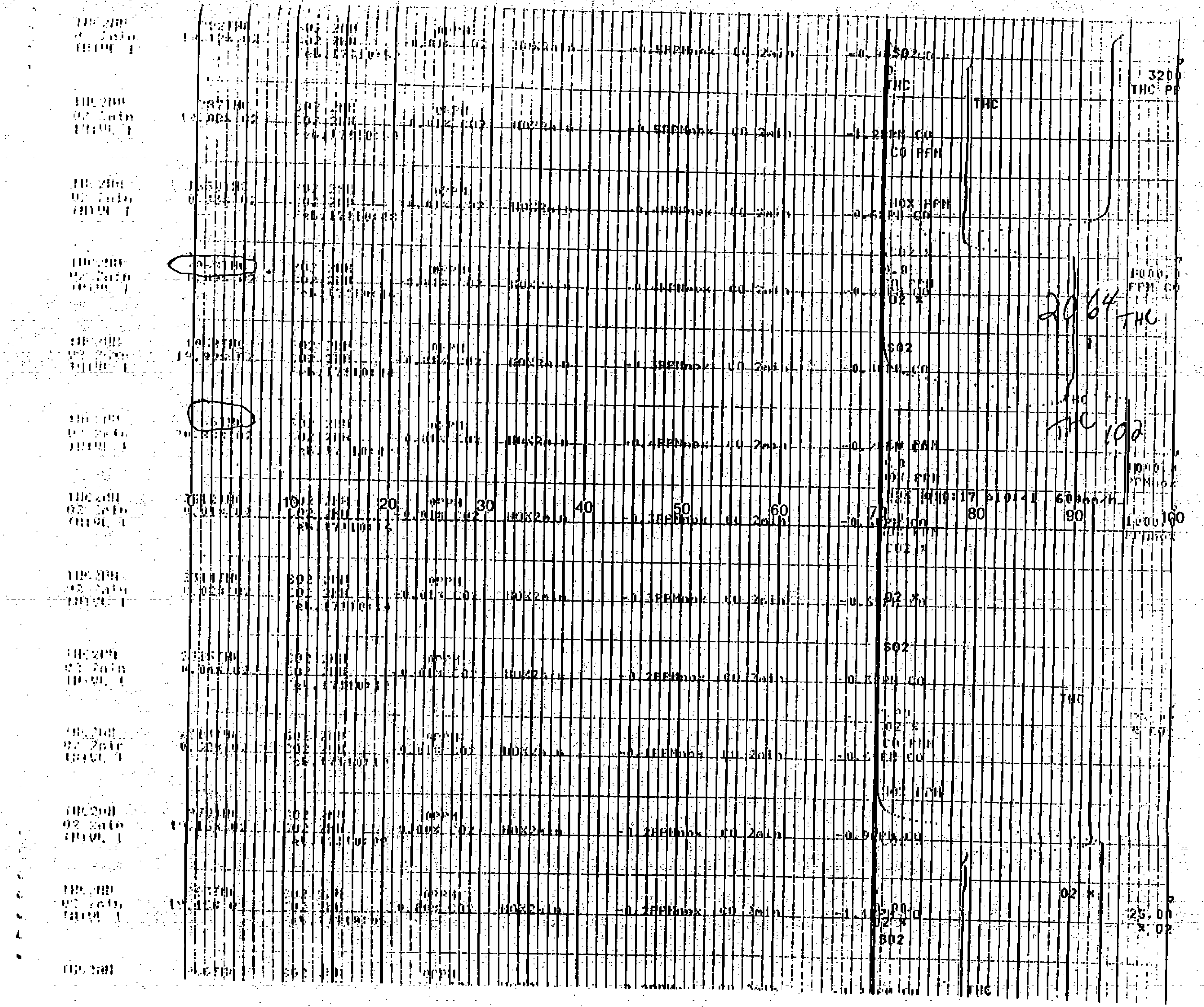
BFGSI RICHMOND VA
TRC ENVIRONMENTAL CORPORATION
LOWELL MA
FEBRUARY 17 1994
0
10
20
30
40
50
60
70
80
90
100
O2 %
THC
CO PPM
SO2
25.0
% O2
O₂ 9.99
SO₂ CO 248
Initial 10 Em
Direct 3
Zero


SO2
THC
CO PPM
O2 %
0
10
20
30
40
50
60
70
80
90
100
O2 19.9
CO2 0.0
CO 345
SO2 0*
SO2 281
SO2 173
SO2 141
SO2 98
CO2 6.4
O2 19.9
CO 246


0
10
20
30
40
50
60
70
80
90
100
500 PPM
SO2
O2
THC
CO
SO2 173
O2 9.99
9.9
CO2 2.46
THC FF
System Cal
Eng 3
Initial Run 10
NOx 886.7
O2 9.77
NOx 886.7


O2 %
SO2
THC
0
10
20
30
40
50
60
70
80
90
100
506.5 ug
25.00
% O2
500
PPM
SO2 173
3.99


SO2
THC
O2 %
25.0
SO2
THC
0
10
20
30
40
50
60
70
80
90
100
500
PPM
Feb 17 15:00
THC
320
THC PPM
90%
Zero System
O2 %
SO2
THC


3200
THC PP
THC
CO PPM
NOX PPM
O2 %
SO2
2064 THC
THC 102
10
20
30
40
50
60
70
80
90
100
25.00
% O2

ANALYZER DAILY CALIBRATION CHECK

Location BF651 Richmond

Date 2/15/94

Day

TIME START/STOP

PERFORMED BY MO'Brien

Contract

INSTRUMENT RESPONSE Direct Cal

Instrument	Zero		1		2		3		4	
	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response
O_2	0	-0.01	4.98	5.03	9.89	10.00	19.9	20.00		
CO_2	0	0.00	6.04	6.04	11.9	12.15	20.0	20.19		
CO										
SO_2										
NO_x	0	-0.4	278	275.9	506.5	506.6	586.7	571.8		
THC										
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 BF651 Richmond VA

Date 2/15/94

Day

TIME START/STOP

PERFORMED BY

Contract

Initial Run 1 Eng # 1 INSTRUMENT RESPONSE System Final Run 1 (Initial Run 2

Instrument	Zero Conc.	Zero Response	1 Conc.	1 Response	2 Conc.	2 Response	3 Conc.	3 Response	4 Conc.	4 Response
O_2	0	0.10	9.99	10.05			0	-0.02	9.89	10.41
CO_2	0	-0.01	11.9	12.05			0	-0.01	11.59	12.82
CO										
SO_2										
NO_x	0	0.0	506.5	508.8			0	-0.6	506.5	513.1
THC										
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

78°

ANALYZER DAILY CALIBRATION CHECK

Location BFGSI Richmond CA

Date 2/15/94

Day _____

TIME START/STOP _____

PERFORMED BY MLOBrien

Contract _____

INSTRUMENT RESPONSE Direct Cal

Instrument	Zero		1		2		3		4	
	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response
O_2	0	-0.02	4.94	5.02	9.89	(10.00)	19.9	20.04		
CO_2	6	5.00	6.64	6.01	11.9	(12.05)	20.0	20.03		
CO										
SO_2										
NO_x	0	-0.6	278	278.1	556.5	(511.1)	8867	873.9		
THC										
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 200 BFGS Richland

Date 2/15/94

Day

TIME START/STOP

PERFORMED BY MO'Brien

Contract 0153-0010-0003

Run 2 Initial

INSTRUMENT RESPONSE System ~~Initial~~ Cal

Final Run 2 Initial 3

Instrument	Zero		1		2		3		4	
	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response
O_2	0	0.00	19.99	9.98			0	0.06	9.9	9.93
CO_2	0	0.00	11.9	11.98			0	0.04	11.9	11.98
CO										
SO_2										
NO_x	0	0.4	506.5	504.0						
THC							0	2.3	506.5	514.2
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 BF651 Richmond TIME START/STOP _____ Contract _____

Date 8/15 PERFORMED BY MO'Brien

Day _____

Final Run 3 Initial Run 4 INSTRUMENT RESPONSE ~~Final Run~~ 3. System Cal

Instrument	Zero		1		2		3		4	
	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response
O_2	0	0.04	9.99	9.97						
CO_2	0	0.03	11.9	11.94						
CO										
SO_2										
NO_x	0	1.7	506.5	528.0						
THC	0	0.0	506.5	506.7						
THC										

NOx Recal & System Check. Results on next page

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 BF&SI Richmond

Date 2/15/94

Day

TIME START/STOP

PERFORMED BY M O'Brien

Contract

INSTRUMENT RESPONSE Direct / Recal NOx

Instrument	Zero		1		2		3		4	
	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response
O_2										
CO_2										
CO										
SO_2										
Direct NO_x	0	0.1	506.5	506.7	886.7	879.8				
System NO_x	0	0.0	506.5	506.7						
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 REGSI Richmond VA

Date 2/16/94

Day

TIME START/STOP

PERFORMED BY M O'Brien

Contract

INSTRUMENT RESPONSE Direct Cal

Instrument	Zero		1		2		3		4	
	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response
O_2	0	-0.05	4.98	5.01	9.99	9.99	19.9	20.00		
CO_2	0	-0.01	6.04	6.03	11.9	12.06	20.0	20.01		
CO										
SO_2										
NO_x	0	0.0	278	275.4	506.5	508.6	886.7	871.2		
THC										
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 RF651 Richmond

Date 12/16/94

Day

TIME START/STOP

PERFORMED BY MO'Brien

Contract

Initial Run 4

INSTRUMENT RESPONSE System Cal

Final Run 4 Initial 5

Instrument	Zero Conc.	Zero Response	1 Conc.	1 Response	2 Conc.	2 Response	3 Conc.	3 Response	4 Conc.	4 Response
O_2	0	0.05	9.99	10.05						
CO_2	0	0.01	11.9	11.99			0	-0.02	9.99	9.95
CO							0	0.00	11.9	11.95
SO_2										
NO_x	0	-0.2	506.5	512.5						
Recal THC NOx Initial Runs							0	2.2	506.5	516.8
After System Cal THC Run 4							0	0.4	506.5	508.5

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 BFGSI

Date 2/16/94

Day

TIME START/STOP 1025/

PERFORMED BY MOBrien

Contract 15549-0610-00003

INSTRUMENT RESPONSE Recal NOx

Instrument	Zero Conc.	Zero Response	1 Conc.	1 Response	2 Conc.	2 Response	3 Conc.	3 Response	4 Conc.	4 Response
O_2										
CO_2										
CO										
SO_2										
Direct NO_x	0	0.2	506.5	509.7	886.7	870.2				
System THC	0	0.4	506.5	508.5						
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 BFGS1 Richmond

Date 2/16/94

Day

TIME START/STOP

PERFORMED BY MO'Brien

Contract

Final Run 5 Initial 6 INSTRUMENT RESPONSE

Final Run 6 Initial Run 7

Instrument	Zero Conc.	Zero Response	1 Conc.	1 Response	2 Conc.	2 Response	3 Conc.	3 Response	4 Conc.	4 Response
O_2	0	-0.01	9.99	9.95			6	-0.01	9.99	9.97
CO_2	0	0.02	11.9	12.00			0	0.02	11.9	12.01
CO										
SO_2										
NO_x	0	1.1	506.5	519.1						
THC NOx	0	0.0	506.5	506.8						
THC							0	2.5	506.5	519.6

4:00 Recal NOx Initial Run 6 Only

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 BF151

Date 2/16/94

Day

TIME START/STOP 1400

PERFORMED BY M O'Brien

Contract 15349-0010-0003

INSTRUMENT RESPONSE Recal NOx

Instrument	Zero		1		2		3		4	
	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response
O_2										
CO_2										
CO										
SO_2										
Initial #6 Run Final System Cal Direct NO_x	0	0.3	506.5	510.8	886.7	873.6				
System THC NOX	0	0.0	506.5	506.8						
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 BFGSI Richmond VA

Date 3/16/94

Day

TIME START/STOP

PERFORMED BY M O'Boyer

Contract

Final Run 7 Initial Run 8

INSTRUMENT RESPONSE System Cal

Final Run 8 Initial Run 9

Instrument	Zero		1		2		3		4	
	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response
O_2	0	-0.02	9.99	9.99			0	0.01	9.99	10.02
CO_2	0	0.00	11.9	11.89			0	0.01	11.9	11.83
CO										
SO_2										
NO_x	0	1.4	506.5	517.1			0	1.8	506.5	508.0
THC										
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 BFGSI Richmond VA TIME START/STOP _____ Contract 15549-6010 00003

Date 2/16/94 PERFORMED BY MO'Brien

Day _____

Final Run 9 INSTRUMENT RESPONSE System

Instrument	Zero		1		2		3		4	
	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response	Conc.	Response
O_2	0	-0.01	9.99	10.05						
CO_2	0	0.00	11.9	11.78						
CO										
SO_2										
NO_x	0	2.0	506.5	515.2						
THC										
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

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

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 # ALM006187

MINOR comp.	CERT. conc.	REFERENCE STD CRM/SRM num	CYL. num	STD conc.	GAS ANALYZER MAKE/ model	LAST cal.	ANAL prin.
Nitric Oxide	270ppm+/-1%	1669D	ALM4979	244.4 ppm	TECO-100-20404	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: 11-30-1992Mean test assay 270 Zero= 0 Ref.= 244.4 Test=279 Ref.= 244.4 Zero= 0 Test=270 Zero= 0 Test=278 Ref.= 244.4	Date: 12-07-1992Mean test assay 277 Zero= 0 Ref.= 244.4 Test=276 Ref= 244.4 Zero= 0 test=278 Zero= 0 Test= 276 Ref.= 244.4

ANALYST _____
Adela Sy

APPROVED BY _____
John O'shea

Scott Specialty Gases

North American Weather Consultants

CERTIFIC/ TE OF ANALYSIS

PO N 1470

EPA PROTOCOL GAS

EPA Protocol # 1 Procedure #G1, Section Number 3.0.4

Nitric Oxide	502.5 ppm	+1% NIST Directly Traceable
Nitrogen Oxides	506.5 ppm	Reference Value Only
Nitrogen	Balance	

Cylinder No: ALM-023388 QC Batch: 2412931T

Reorder / Service Contact (303) 442-4700 LONG IT CO 80501

CGA 660 2000 psig Projec. , 0811754

Cylinder No. ALM-023388

Assay Laboratory

Scott Specialty Gases, Inc.
500 Weaver Park Road
Longmont, CO 80501

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM 1687	07/23/95	ALM-022418	951.0ppm NO / N2

Certification Date 10/ 93 Expiration Date 10/12/95

Analyst: David Cha nan

Scott Specialty Gases

CERTIFICATE OF ANALYSIS

North American Weather Consultants

PO No. 1471

EPA PROTOCOL GAS

EPA Protocol #1 Procedure #G1, Section Number 3.0.4

Nitric Oxide	878.7 ppm	+1% NIST Directly Traceable
Nitrogen Oxides	886.7 ppm	Reference Value Only
Nitrogen	Balance	

Cylinder No. AAL-17222 QC Batch: 28229308

Reorder / Service Contact (303) 442-4700 LONGMONT CO 80501

CGA 660 2000 psig Project No. 03-11580

Cylinder No. AAL-17222

Assay Laboratory

Scott Specialty Gases, Inc.
500 Weaver Park Road
Longmont, CO 80501

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
NTRM 1687	07/30/93	ALM-016020	965.5ppm NO / N2

Certification Date 09/21/93 Expiration Date 09/21/95

Analyst: David C[illegible]man

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 T-01888
Scott Project #0724584

ANALYTICAL INFORMATION

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

Cylinder Number ALM034560 | Certification Date 12-21-1993 | Expiration Date12-21-1995
Cylinder Pressure 2000psig | Previous Certification Dates

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
CARBON DIOXIDE	6.04%	+/-1%NIST Directly Traceable
CARBON MONOXIDE	141ppm	+/-1%NIST Directly Traceable
OXYGEN	4.98%	+/-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 process

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
CRM1674	09/28/95	ALM032690	6.98 %CO2 in N2
CRM2636	01/24/94	ALM024968	243 ppmCO in N2
CRM2658	05/14/94	ALM017572	9.56 %O2 in N2

INSTRUMENTATION

Instrument/Model/Serial#		Date Last Calibrated	Analytical Principle
CO2:Varian 3700-31608928	-	11/27/1993	GC TCD
CO:Ecolyzer 2000-1709	-	12/09/1993	Electrochemical
O2:Varian 3700-31608928	-	11/23/1993	GC TCD

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

CARBON DIOXIDE

First Triad Analysis: Date: 12-21-1993 Response units: %
Z1=0 R1= 6.98 T1=6.05
R2= 6.98 Z2=0 T2=6.02
Z3=0 T3=6.04 R3= 6.98
Ave. Conc. of Cust. Cyl.= 6.04

Second Triad Analysis: (blank)

Calibration Curve: 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

First Triad Analysis: Date: 12-14-1993 Response units: ppm
Z1=0 R1= 243 T1=141
R2= 243 Z2=0 T2=141
Z3=0 T3=141 R3= 243
Ave. Conc. of Cust. Cyl.= 141

Second Triad Analysis: Date: 12-21-1993 Response units: ppm
Z1=0 R1= 243 T1=141
R2= 243 Z2=0 T2=141
Z3=0 T3=141 R3= 243
Ave. Conc. of Cust. Cyl.= 141

Calibration Curve: Concentration=A+Bx+Cx^2+Dx^3+Ex^4
r=0.9999999
Constants: A= -7.8316E-03
B=1.0783E-04 C=
D= E=

OXYGEN

First Triad Analysis: Date: 12-21-1993 Response units: %
Z1=0 R1= 9.56 T1=5.00
R2= 9.56 Z2=0 T2=4.96
Z3=0 T3=4.98 R3= 9.56
Ave. Conc. of Cust. Cyl.= 4.98

Second Triad Analysis: (blank)

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=

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 T-01888
Scott Project #0724584

ANALYTICAL INFORMATION

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

Cylinder Number ALM034564
Cylinder Pressure 2000psig

Certification Date 12-21-1993
Previous Certification Dates

Expiration Date12-21-1995

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
CARBON DIOXIDE	11.9%	+/-1%NIST Directly Traceable
CARBON MONOXIDE	246ppm	+/-1%NIST Directly Traceable
OXYGEN	9.99%	+/-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
CRM2636	01/24/94	ALM024968	243 ppmCO in N2
CRM2658	05/14/94	ALM017572	9.56 %O2 in N2

INSTRUMENTATION

Instrument/Model/Serial#	Date Last Calibrated	Analytical Principle
CO2:Varian 3700-31608928	11/27/1993	GC TCD
CO:Ecolyzer 2000-1709	12/09/1993	Electrochemical
O2:Varian 3700-31608928	11/23/1993	GC TCD

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

CARBON DIOXIDE

First Triad Analysis — Date: 12-21-1993 Response units: %

Z1=0	R1= 14.02	T1=11.9
R2= 14.02	Z2=0	T2=11.9
Z3=0	T3=11.9	R3= 14.02

Ave. Conc. of Cust. Cyl.= 11.9

Second Triad Analysis

Calibration Curve

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

First Triad Analysis — Date: 12-13-1993 Response units: ppm

Z1=0	R1= 243	T1=246
R2= 243	Z2=0	T2=246
Z3=0	T3=246	R3= 243

Ave. Conc. of Cust. Cyl.= 246

Second Triad Analysis — Date: 12-21-1993 Response units: ppm

Z1=0	R1= 243	T1=245
R2= 243	Z2=0	T2=244
Z3=0	T3=245	R3= 243

Ave. Conc. of Cust. Cyl.= 245

Calibration Curve

Concentration=A+Bx+Cx^2+Dx^3+Ex^4
r=0.9999999

Constants:	A= -7.8316E-03
B=1.0783E-04	C=
D=	E=

OXYGEN

First Triad Analysis — Date: 12-21-1993 Response units: %

Z1=0	R1= 9.56	T1=9.99
R2= 9.56	Z2=0	T2=10.0
Z3=0	T3=9.98	R3= 9.56

Ave. Conc. of Cust. Cyl.= 9.99

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=

Special Notes

Analyst Adela Sy

Scott Specialty Gases, Inc.

2330 HAMILTON BOULEVARD SOUTH PLAINFIELD NJ 07080 (908)754-7700 FAX:(908)754-7383

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 T-01888
Scott Project #0724584

ANALYTICAL INFORMATION

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

Cylinder Number ALM034555 | Certification Date 12-21-1993 | Expiration Date12-21-1995
Cylinder Pressure 2000psig | Previous Certification Dates

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
CARBON DIOXIDE	20.0%	+/-1%NIST Directly Traceable
CARBON MONOXIDE	345ppm	+/-1%NIST Directly Traceable
OXYGEN	19.9%	+/-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
SRM2745	10/30/97	SX20316	15.75 %CO2 in N2
CRM1680	12/23/94	ALM024734	474 ppmCO in N2
CRM2659	05/14/94	ALM017576	20.63 %O2 in N2

INSTRUMENTATION

Instrument/Model/Serial#		Date Last Calibrated	Analytical Principle
CO2:Varian 3700-31608928	-	11/27/1993	GC TCD
CO:Ecolyzer 200-1709	-	12/09/1993	Electrochemical
O2:Varian 3700-31608928	-	11/23/1993	GC TCD

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: 12-21-1993 Response units: % Z1=0 R1= 15.75 T1=20.0 R2= 15.75 Z2=0 T2=20.1 Z3=0 T3=20.0 R3= 15.75 Ave. Conc. of Cust. Cyl.= 20		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: 12-14-1993 Response units: ppm Z1=0 R1= 474 T1=344 R2= 474 Z2=0 T2=344 Z3=0 T3=344 R3= 474 Ave. Conc. of Cust. Cyl.= 344	Date: 12-21-1993 Response units: ppm Z1=0 R1= 474 T1=344 R2= 474 Z2=0 T2=347 Z3=0 T3=344 R3= 474 Ave. Conc. of Cust. Cyl.= 345	Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.9999999 Constants: A= -7.8316E-03 B=1.0783E-04 C= D= E=
OXYGEN	Date: 12-21-1993 Response units: % Z1=0 R1= 20.63 T1=19.8 R2= 20.63 Z2=0 T2=20.0 Z3=0 T3=19.8 R3= 20.63 Ave. Conc. of Cust. Cyl.= 19.9		Concentration=A+Bx+Cx^2+Dx^3+Ex^4 r=0.9999926 Constants: A= 1.5815E-01 B=4.7835E-05 C= D= E=

Special Notes

Analyst Adela Sy

14:57:00	0.2328	232.8
14:58:00	0.2327	232.7
14:59:00	0.2324	232.4
15:00:00	0.2324	232.4
15:01:00	0.2325	232.5

Thermo Environmental
NO-NO_2-NO_x Analyzer
Model 10S
SN 10S-35196-249
Tag # L00327
Converter Test
1/28/94
Scott Tillett

2 TRC ENVIRONMENTAL CORPORATION CONTINUOUS EMISSION MONITORING SYSTEM
0051 01 02 03 04 05 06 07 08 09 10 11
100
200
300
400
500
600

TRC ENVIRONMENTAL CORPORATION
LOWELL MA
NOX CONVIRTOR TEST

NOX

15:02:00	0.2324	232.4
15:03:00	0.2324	232.4
15:04:00	0.2324	232.4
15:05:00	0.2323	232.3
15:06:00	0.2324	232.4
15:07:00	0.2325	232.5
15:08:00	0.2324	232.4
15:09:00	0.2325	232.5
15:10:00	0.2323	232.3
15:11:00	0.2325	232.5
15:12:00	0.2324	232.4
15:13:00	0.2324	232.4
15:14:00	0.2324	232.4
15:15:00	0.2322	232.2
15:16:00	0.2321	232.1
15:17:00	0.2321	232.1
15:18:00	0.2319	231.9
15:19:00	0.2314	231.4
15:20:00	0.2237	223.7

Bag Empty

APPENDIX C

VISIBLE EMISSIONS OBSERVATION DATA AND CERTIFICATION SHEET

VISIBLE EMISSION DATA SUMMARY - ENGINE #1 - RUN 1

Company:	**Browning-Ferris Gas Services, Inc.**	**Date:**	**2/15/94**
Facility:	**Richmond, VA**		
		Process:	**Landfill Gas Engine Generator**
Run:	**1**		
		Start Time:	**11:25**
Observer:	**Timothy J. Senger**	**Stop Time:**	**11:55**

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	

BFR-VE1.WK1

30 Minute Average: **0 % Opacity**

VISIBLE EMISSION DATA SUMMARY - ENGINE #1 - RUN 1 (continued)

Company:	**Browning-Ferris Gas Services, Inc.**	**Date:**	**2/15/94**
Facility:	**Richmond, VA**	**Process:**	**Landfill Gas Engine Generator**
Run:	**1**	**Start Time:**	**11:55**
Observer:	**Timothy J. Senger**	**Stop Time:**	**12:25**

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	

BFIR-VE1.WK1

30 Minute Average: **0 % Opacity**

Run Average: **0 % Opacity**

VISIBLE EMISSION DATA SUMMARY - ENGINE #2 - RUN 1

Company:	**Browning-Ferris Gas Services, Inc.**	**Date:**	**2/15/94**
Facility:	**Richmond, VA**		
		Process:	**Landfill Gas Engine Generator**
Run:	**1**		
		Start Time:	**11:25**
Observer:	**Timothy J. Senger**	**Stop Time:**	**11:55**

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	

BFR-VE2.WK1

30 Minute Average: **0 % Opacity**

VISIBLE EMISSION DATA SUMMARY - ENGINE #2 - RUN 1 (continued)

Company:	Browning-Ferris Gas Services, Inc.	**Date:**	2/15/94
Facility:	Richmond, VA	**Process:**	Landfill Gas Engine Generator
Run:	1	**Start Time:**	11:55
Observer:	Timothy J. Senger	**Stop Time:**	12:25

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	

BFR-VE2.WK1

30 Minute Average: 0 % Opacity

Run Average: 0 % Opacity

VISIBLE EMISSION DATA SUMMARY - ENGINE #3 - RUN 1

Company:	Browning-Ferris Gas Services, Inc.	**Date:**	2/15/94
Facility:	Richmond, VA		
Run:	1	**Process:**	Landfill Gas Engine Generator
Observer:	Timothy J. Senger	**Start Time:**	11:25
		Stop Time:	11:55

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**

BFR-VE3.WK1

VISIBLE EMISSION DATA SUMMARY - ENGINE #3 - RUN 1 (continued)

Company: Browning-Ferris Gas Services, Inc.
Facility: Richmond, VA
Run: 1
Observer: Timothy J. Senger

Date: 2/15/94
Process: Landfill Gas Engine Generator
Start Time: 11:55
Stop Time: 12:25

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	

&FIR-VE3.WK1

30 Minute Average: 0 % Opacity

Run Average: 0 % Opacity

Visible Emission Observation Form

Company Name: BFI			
Street Address: 2325 Charles City Road			
P.O. Box 50128			
City: Richmond	State: VA	Zip: 23250	
Phone (key contact): (804) 236-1463	Source ID Number: Engine #1		

Process Equipment: Landfill Gas Generator	Operating Mode: Peak Load
Control Equipment: Exhaust Muffler	Operating Mode: Peak Load

Describe Emission Point: Horizontal Exhaust Duct (Cylinder)

Height Above Ground Level: 40'	Height Relative to Observer: Start 36' End 36'
Distance from Observer: Start 100' End 100'	Direction from Observer: Start NE End NE

Describe Emissions: Start Heat Plume	End Heat Plume
Emission Color: Start None End None	If Water Droplet Plume: Attached ☐ Detached ☐
Point in the Plume at which Opacity was Determined: Start End of Stack	End End of Stack

Describe Plume Background: Start Clear blue sky	End Clear blue sky		
Background Color: Start Blue	End Blue	Sky Conditions: Start Clear	End Clear
Wind Speed: Start 5mph	End 5mph	Wind Direction: Start N-NE	End N-NE
Ambient Temp.: Start 55°F	End 56°F	Wet Bulb Temp 28°F	RH, Percent 70%

Stack with Plume — Sun — Wind

Source Layout Sketch

Draw North Arrow

Emission Point

Observer's Position

140°

Sun Location Line

Additional Information

Observation date: 13 + 14 Feb 94 | Start Time: 1125 | End Time: 1155

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 — 15 Feb 94
Organization	TRC
Certified By	EPA Region — 5 Oct 93
Continued on VEO Form Number	

TRC

Visible Emission Observation Form

Company Name	BFI
Street Address	2325 Charles City Road
	P.O. Box 50128
City	Richmond
State	VA
Zip	23250
Phone (key contact)	(804) 236-1463
Source ID Number	Engine #1

Process Equipment	Landfill Gas Generator
Operating Mode	Peak Load
Control Equipment	Exhaust Muffler
Operating Mode	Peak Load

Describe Emission Point	Horizontal Exhaust Duct (Cylinder)
Height Above Ground Level	40'
Height Relative to Observer	Start 36' End 36'
Distance from Observer	Start 100' End 100'
Direction from Observer	Start NE End NE

Describe Emissions	Start Heat Plume	End Heat Plume
Emission Color	Start None End None	If Water Droplet Plume: Attached ☐ Detached ☐
Point in the Plume at which Opacity was Determined	Start End of Stack	End End of Stack

Describe Plume Background	Start Clear Blue Sky	End Clear Blue Sky	
Background Color	Start Blue End Blue	Sky Conditions: Start Clear End Clear	
Wind Speed	Start 5mph End 5mph	Wind Direction: Start N-NE End N-NE	
Ambient Temp.	Start 56°F End 57°F	Wet Bulb Temp 28°F	RH, Percent 72%

Stack with Plume — Sun — Wind

Source Layout Sketch

Draw North Arrow

Emission Point

Observer's Position

140°

Sun Location Line

Additional Information

Observation date: 15 Feb 94	Start Time 1155	End Time 1225

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 A. Seeger
Observer's Signature	Timothy A. Seeger 15Feb94
Organization	TRC
Certified By	EPA Region 1 — 5Oct93
Continued on VEO Form Number	

TRC

Visible Emission Observation Form

Company Name	BFI
Street Address	2325 Charles City Road
	P.O. Box 50128
City	Richmond
State	VA
ZIP	23250
Phone (key contact)	(804) 236-1463
Source ID Number	Engine #2

Process Equipment	Landfill Gas Generator
Operating Mode	Peak Load
Control Equipment	Exhaust Muffler
Operating Mode	Peak Load

Describe Emission Point	Horizontal Exhaust Duct (Cylinder)
Height Above Ground Level	40'
Height Relative to Observer	Start 36' End 36'
Distance from Observer	Start 100' End 100'
Direction from Observer	Start NE End NE

Describe Emissions	Start Heat Plume	End Heat Plume
Emission Color	Start None	End None
If Water Droplet Plume	Attached ☐	Detached ☐
Point in the Plume at which Opacity was Determined	Start End of Stack	End End of Stack

Describe Plume Background	Start Clear Blue Sky	End Clear Blue Sky	
Background Color	Start Blue	End Blue	
Sky Conditions	Start Clear	End Clear	
Wind Speed	Start 5mph	End 5mph	
Wind Direction	Start N-NE	End N-NE	
Ambient Temp	Start 55°F	End 56°F	
Wet Bulb Temp	28°F		
RH, Percent	72%		

Stack with Plume — Sun — Wind

Source Layout Sketch

Draw North Arrow

Emission Point

Observer's Position

140°

Sun Location Line

Observation date	15 Feb 94	Start Time	1125	End Time	1155

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. Springer
Observer's Signature	Timothy J. Springer 15 Feb 94
Organization	TRC
Certified By	EPA Region 1 — 5 Oct 93

Additional Information

Continued on VEO Form Number

TRC

Visible Emission Observation Form

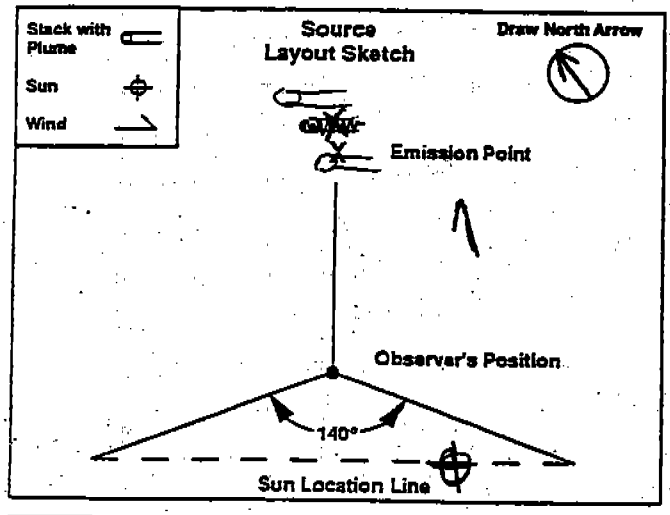
Company Name	BFI
Street Address	2325 Charles City Road
	P.O. Box 50128
City	Richmond
State	VA
Zip	23250
Phone (key contact)	(804) 236-1463
Source ID Number	Engine #2

Process Equipment	Landfill Gas Generator
Operating Mode	Peak Load
Control Equipment	Exhaust Muffler
Operating Mode	Peak Load

Describe Emission Point	Horizontal Exhaust Duct (Cylinder)
Height Above Ground Level	40'
Height Relative to Observer	Start 36' End 36'
Distance from Observer	Start 100' End 100'
Direction from Observer	Start NE End NE

Describe Emissions	Start Heat Plume	End Heat Plume	
Emission Color	Start None	End None	If Water Droplet Plume: Attached ☐ Detached ☐
Point in the Plume at which Opacity was Determined	Start End of Stack	End End of Stack	

Describe Plume Background	Start Clear Blue Sky	End Clear Blue Sky	
Background Color	Start Blue	End Blue	Sky Conditions: Start Clear End Clear
Wind Speed	Start 5mph	End 5mph	Wind Direction: Start N-NE End N-NE
Ambient Temp.	Start 56°F	End 57°F	Wet Bulb Temp 28°F / RH, Percent 72%



Additional Information

Observation date 15 Feb 94 (7) | Start Time 1155 | End Time 1225

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 15Feb94
Organization	TRC
Certified By	EPA Region I 5Oct 93
Continued on VEO Form Number	

TRC

Visible Emission Observation Form

Company Name	BFI
Street Address	2325 Charles City Road
	P.O. Box 50128
City	Richmond
State	VA
Zip	23250
Phone (key contact)	(804) 230-1463
Source ID Number	Engine #3

Process Equipment	Landfill Gas Generator
Operating Mode	Peak Load
Control Equipment	Exhaust Muffler
Operating Mode	Peak Load

Describe Emission Point	Horizontal Exhaust Duct (Cylinder)
Height Above Ground Level	40'
Height Relative to Observer	Start 36' End 36'
Distance from Observer	Start 100' End 100'
Direction from Observer	Start NE End NE

Describe Emissions	Start Heat Plume End Heat Plume
Emission Color	Start None End None
If Water Droplet Plume	Attached ☐ Detached ☐
Point in the Plume at which Opacity was Determined	Start End of Stack End End of Stack

Describe Plume Background	Start Clear Blue Sky End Clear Blue Sky
Background Color	Start Blue End Blue
Sky Conditions	Start Clear End Clear
Wind Speed	Start 5mph End 5mph
Wind Direction	Start N-NE End N-NE
Ambient Temp	Start 55°F End 56°F
Wet Bulb Temp	28°F
RH Percent	42%

Stack with Plume

Sun

Wind

Source Layout Sketch

Draw North Arrow

Emission Point

1

Observer's Position

140°

Sun Location Line

Observation date	15 Feb 94
Start Time	1125
End Time	1155

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 Jay Seniger
Observer's Signature	Timothy J Seniger 15Feb94
Organization	TRC
Certified By	EPA Region I 20Oct93
Continued on VEO Form Number	

Additional Information

TRC

Visible Emission Observation Form

Company Name	BFI
Street Address	2325 Charles City Road
	P.O. Box 50128
City	Richmond
State	VA
Zip	23250
Phone (key contact)	(804) 236-1463
Source ID Number	Engine #3

Process Equipment	Landfill Gas Generator
Operating Mode	Peak Load
Control Equipment	Exhaust Muffler
Operating Mode	Peak Load

Describe Emission Point	Horizontal Exhaust Duct (Cylinder)
Height Above Ground Level	40'
Height Relative to Observer: Start	36'
End	36'
Distance from Observer: Start	100'
End	100'
Direction from Observer: Start	NE
End	NE

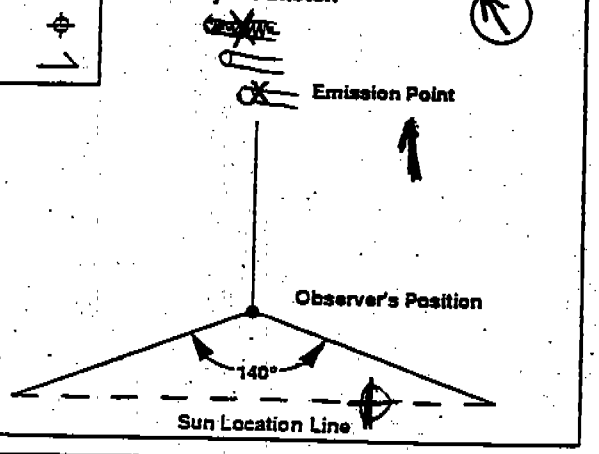
Describe Emissions: Start	Heat Plume
End	Heat Plume
Emission Color: Start	None
End	None
If Water Droplet Plume: Attached ☐	Detached ☐
Point in the Plume at which Opacity was Determined: Start	End of Stack
End	End of Stack

Describe Plume Background: Start	Clear Blue Sky
End	Clear Blue Sky
Background Color: Start	Blue
End	Blue
Sky Conditions: Start	Clear
End	Clear
Wind Speed: Start	5mph
End	5mph
Wind Direction: Start	N-NE
End	N-NE
Ambient Temp: Start	56°F
End	57°F
Wet Bulb Temp	28°F
RH, Percent	70%

Stack with Plume
Sun
Wind

Source Layout Sketch

Draw North Arrow



Observation Date	15 Feb 94	Start Time	1155	End Time	1225

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

Observer's Name (print)	Timothy J. Seniger
Observer's Signature	Timothy J. Seniger 15 Feb 94
Organization	TRC
Certified By	EPA Region I 5 Oct 93

Additional Information	
Continued on VEO Form Number	

TRC

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.

APPENDIX D

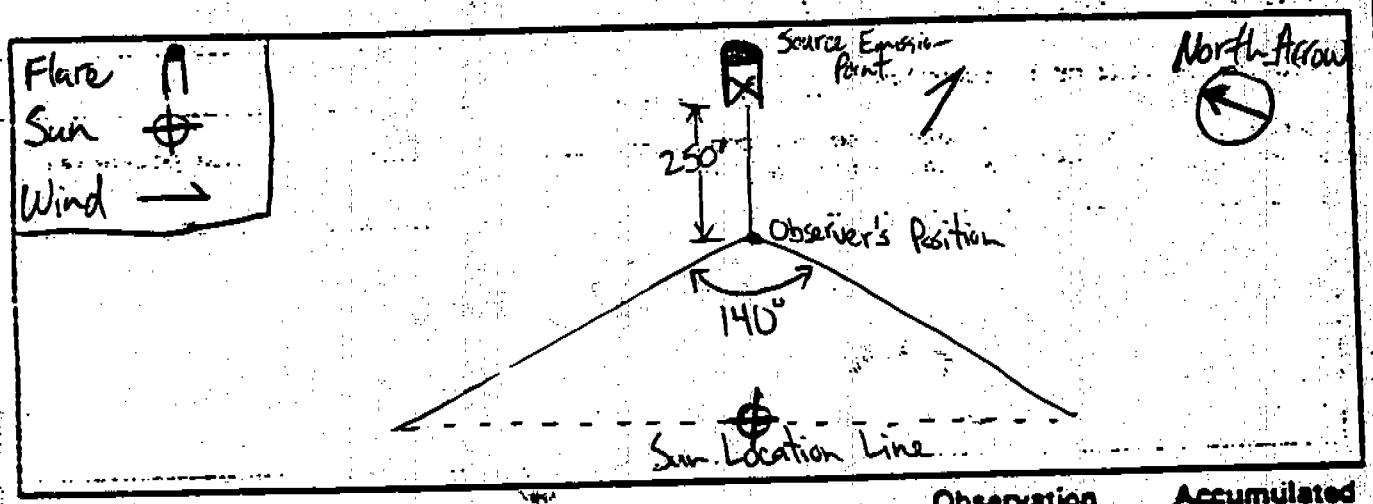
VISIBLE EMISSIONS EVALUATION TEST DATA

Environmental Protection Agency **Pt. 60, App. A, Meth. 22**

FUGITIVE OR SMOKE EMISSION INSPECTION
OUTDOOR LOCATION

Company BFI	Observer Timothy J. Senger
Location Richmond, VA	Affiliation TRC Environmental Corp.
Company representative Jamie Terzulli	Date 17Feb94
Sky Conditions Mostly Sunny	Wind direction From the west towards east
Precipitation None	Wind speed 5 mph
Industry Landfill Gas	Process unit: Landfill Flare

Sketch process unit; indicate observer position relative to source and sun; indicate potential emission points and/or actual emission points.



OBSERVATIONS

	Clock time	Observation period duration, min:sec	Accumulated emission time, min:sec
Begin Observation	1500	20:00	0:12.72 sec
	1520		
5 min Break			
	1525	20:00	0:05.50
	1545		
5 min Break			
	1550	20:00	0:06.49
	1610		
5 min Break			
End observation		SUBTOTAL 60:00	0:24.71

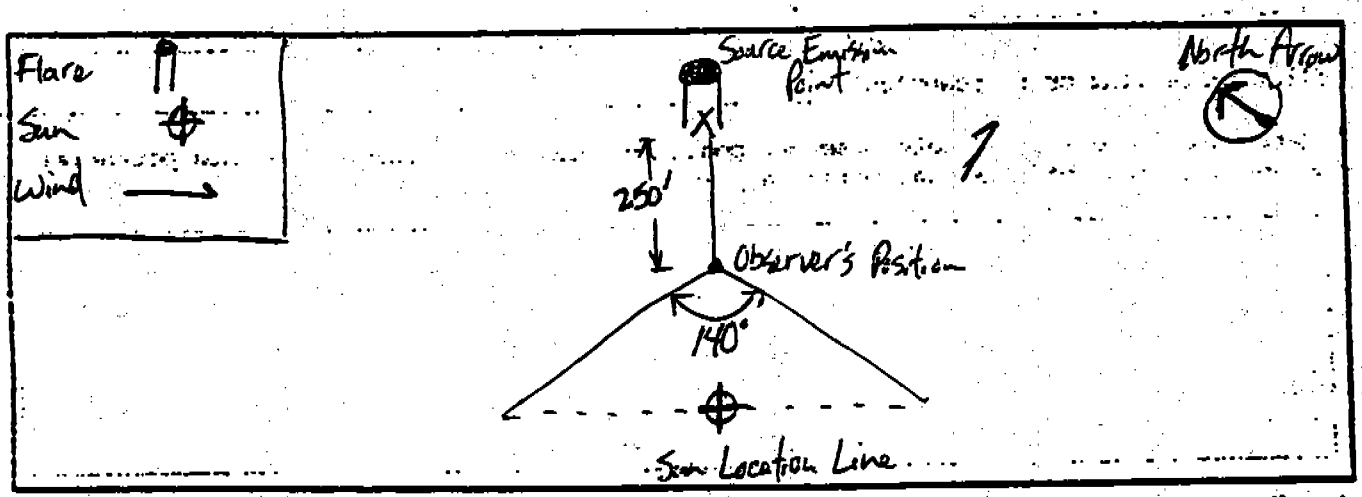
Environmental Protection Agency

Pt. 60, App. A, Meth. 22

FUGITIVE OR SMOKE EMISSION INSPECTION
OUTDOOR LOCATION

Company: BFI	Observer: Timothy J. Senger
Location: Richmond, VA	Affiliation: TRC Environmental Corp.
Company representative: Jamie Terzulli	Date: 17Feb94
Sky Conditions: Mostly Sunny	Wind direction: From the west
Precipitation: None	Wind speed: 5mph
Industry: Landfill Gas	Process unit: Landfill Flare

Sketch process unit; indicate observer position relative to source and sun; indicate potential emission points and/or actual emission points.



OBSERVATIONS

	Clock time	Observation period duration, min:sec	Accumulated emission time, min:sec
Begin Observation	1615	20:00	0:04.30
	1635		
5min Break			
	1640	20:00	0:04.56
	1700		
5min Break			
	1705	20:00	0:13.78
	1725		
End observation	TOTAL	120:00	0:47.35

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.

APPENDIX E

FACILITY PROCESS DATA

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 119472	UNIT #2 FUEL GAS SCF 132898	UNIT #3 FUEL GAS SCF 135084	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 634	UNIT #1 FUEL GAS MMBTU 67.55	UNIT #2 FUEL GAS MMBTU 75.13	UNIT #3 FUEL GAS MMBTU 76.37	TOTAL FUEL FLOW SCF 387454		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

U1 let run start

REFRIGERATION SYSTEM ALARMS | Tue, Feb 15, 1994 | 9:41:15 AM

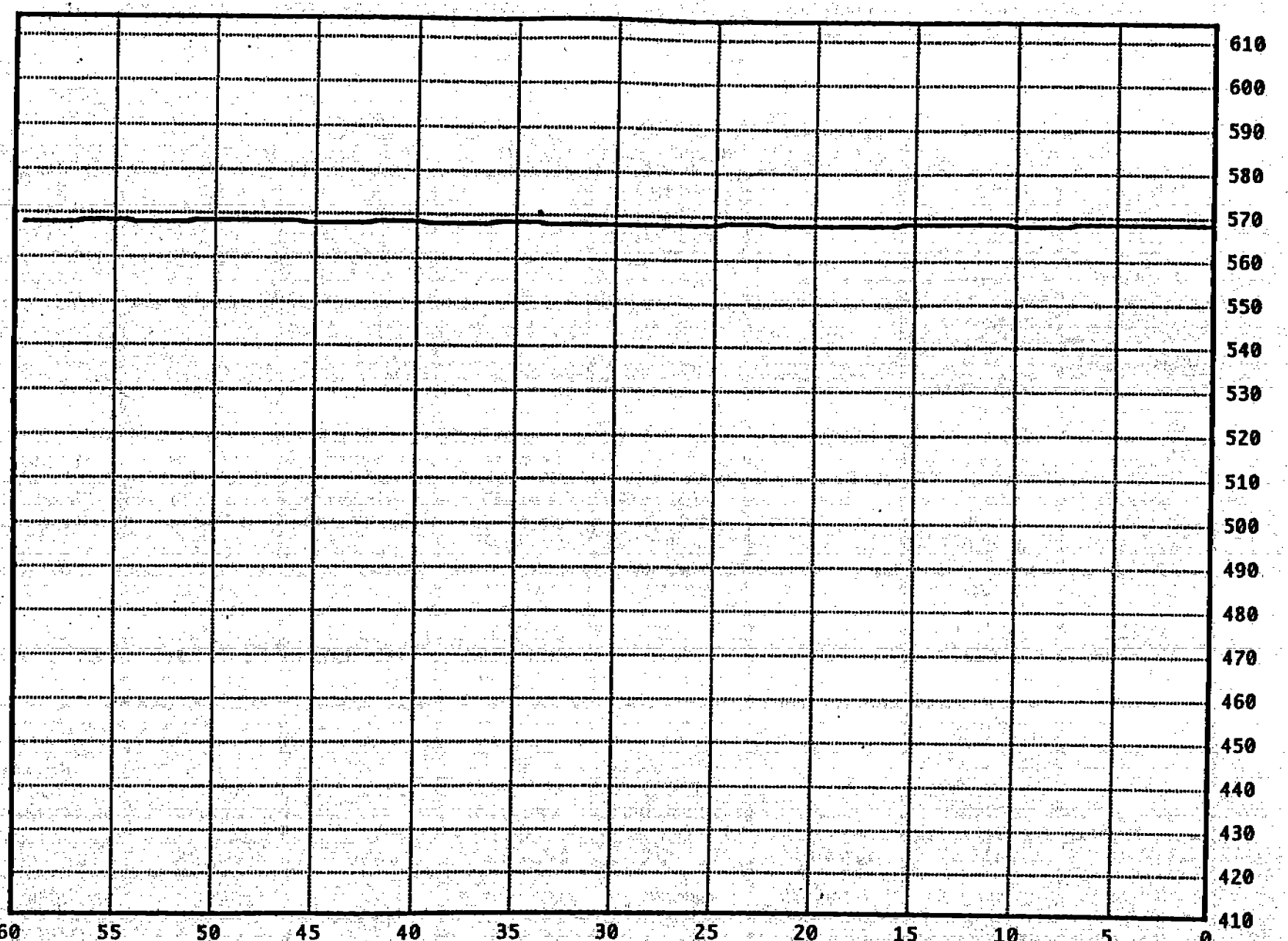
	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 131986	UNIT #2 FUEL GAS SCF 145415	UNIT #3 FUEL GAS SCF 147635	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 637	UNIT #1 FUEL GAS MMBTU 74.67	UNIT #2 FUEL GAS MMBTU 82.25	UNIT #3 FUEL GAS MMBTU 83.50	TOTAL FUEL FLOW SCF 425040		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

U1 last run end

REFRIGERATION SYSTEM ALARMS | Tue, Feb 15, 1994 | 10:41:42 AM

LANDFILL GAS HEATING V. 20E - SATURATED - RICHMOND



U1 1st run

RICHMOND ELECTRIC	Tue, Feb 15, 1994	10:42:41 AM

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 157293	UNIT #2 FUEL GAS SCF 170728	UNIT #3 FUEL GAS SCF 173034	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 634	UNIT #1 FUEL GAS MMBTU 89.06	UNIT #2 FUEL GAS MMBTU 96.64	UNIT #3 FUEL GAS MMBTU 97.94	TOTAL FUEL FLOW SCF 501060		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

U1 End run start

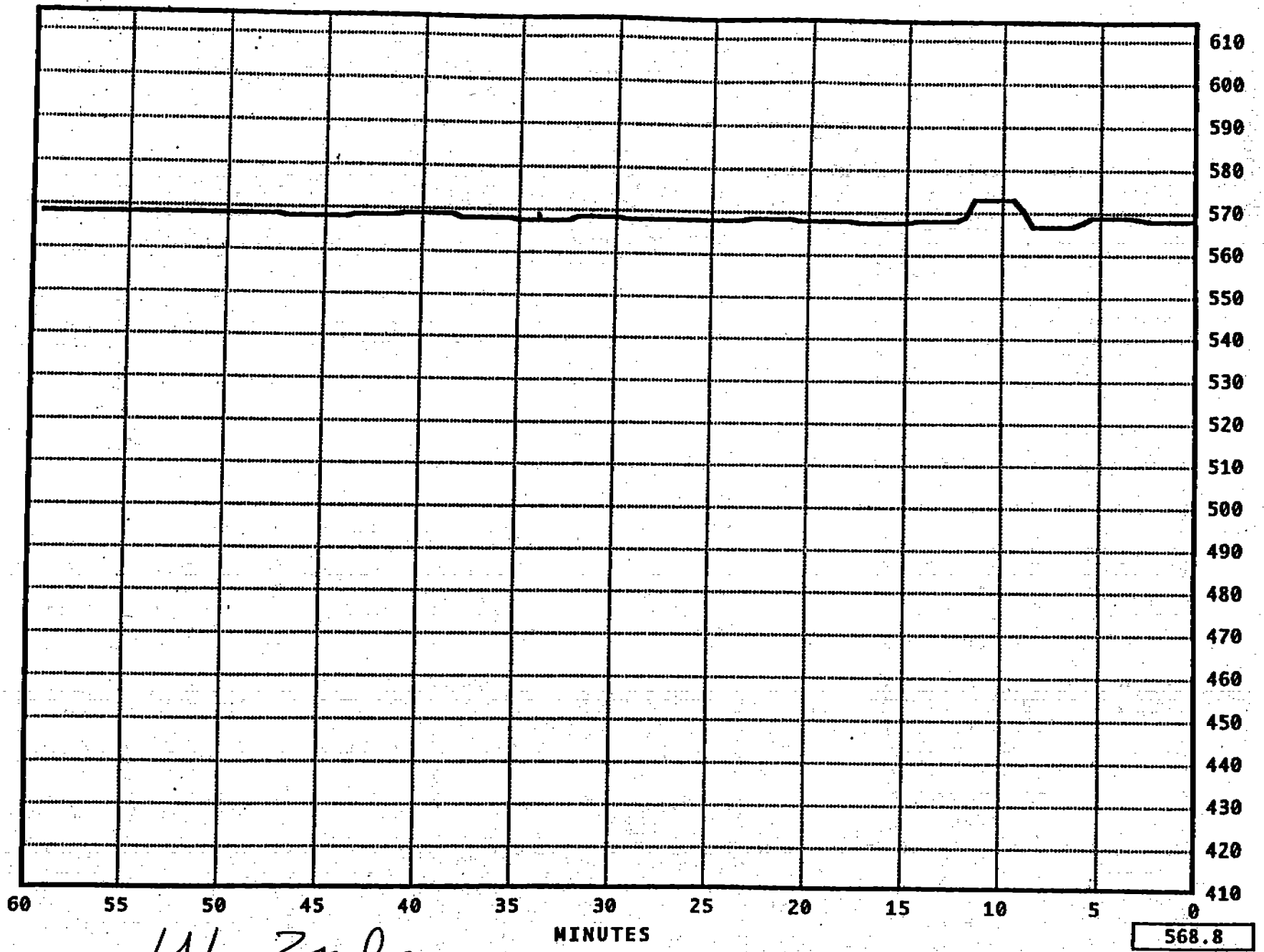
REFRIGERATION SYSTEM ALARMS | Tue, Feb 15, 1994 | 12:43:54 PM

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 170872	UNIT #2 FUEL GAS SCF 184352	UNIT #3 FUEL GAS SCF 186692	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 640	UNIT #1 FUEL GAS MMBTU 96.78	UNIT #2 FUEL GAS MMBTU 104.38	UNIT #3 FUEL GAS MMBTU 105.71	TOTAL FUEL FLOW SCF 541921		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

U1 end 2nd

REFRIGERATION SYSTEM ALARMS | Tue, Feb 15, 1994 | 1:49:23 PM



U1 Zndrm

RICHMOND ELECTRIC	Tue, Feb 15, 1994	1:50:28 PM

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 174692	UNIT #2 FUEL GAS SCF 188169	UNIT #3 FUEL GAS SCF 190539	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 641	UNIT #1 FUEL GAS MMBTU 98.95	UNIT #2 FUEL GAS MMBTU 106.55	UNIT #3 FUEL GAS MMBTU 107.89	TOTAL FUEL FLOW SCF 553405		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

U1 3rd run start

REFRIGERATION SYSTEM ALARMS | Tue, Feb 15, 1994 | 2:07:47 PM

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 187125	UNIT #2 FUEL GAS SCF 200611	UNIT #3 FUEL GAS SCF 203141	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 641	UNIT #1 FUEL GAS MMBTU 106.01	UNIT #2 FUEL GAS MMBTU 113.62	UNIT #3 FUEL GAS MMBTU 115.05	TOTAL FUEL FLOW SCF 590882		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

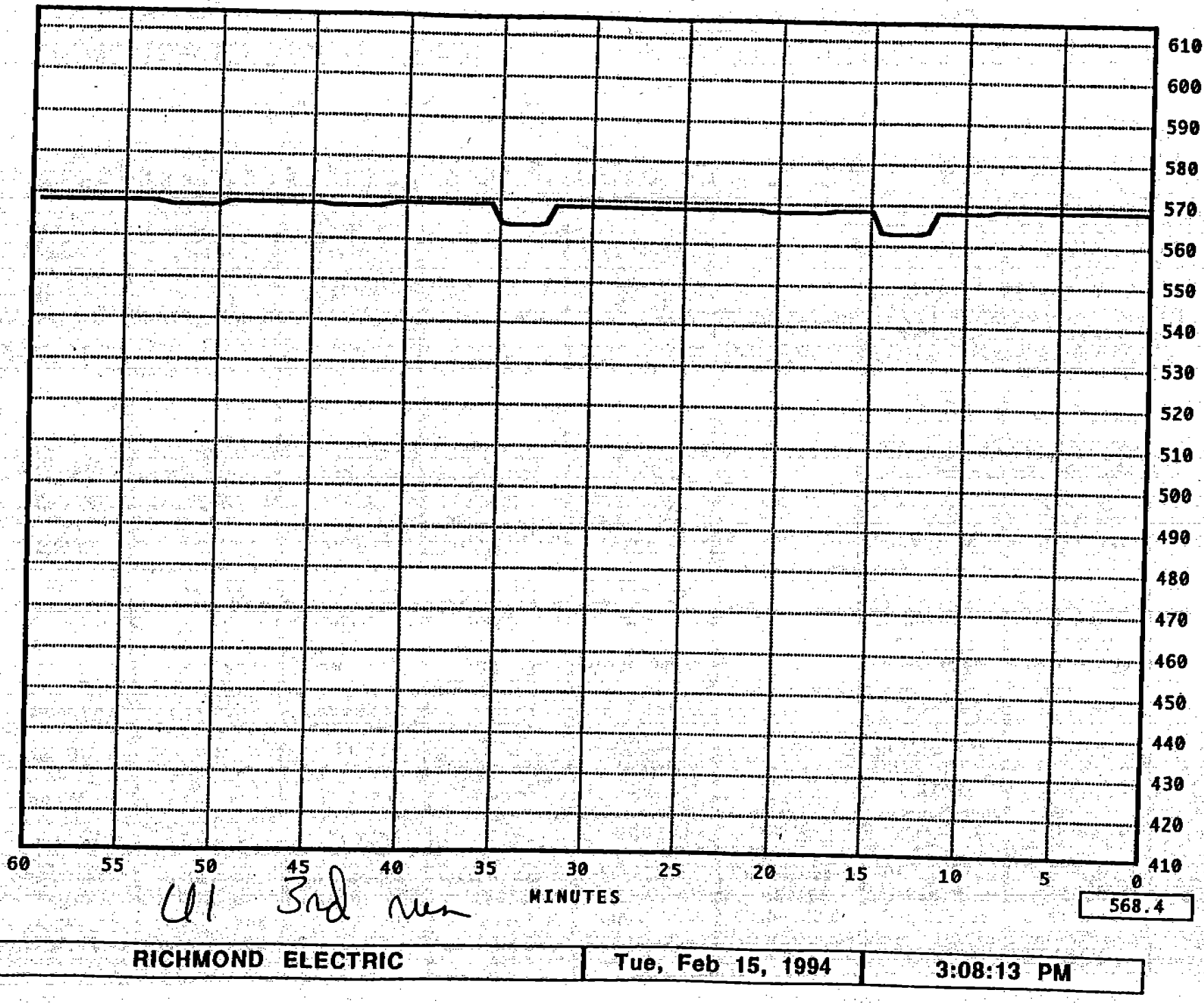
Page 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 Scanning...

U1 3rd run end

REFRIGERATION SYSTEM ALARMS | Tue, Feb 15, 1994 | 3:07:47 PM

LANDFILL GAS HEATING VALUE - SATURATED - RICHMOND

70 SAT



U1 3rd run

RICHMOND ELECTRIC	Tue, Feb 15, 1994	3:08:13 PM

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 126119	UNIT #2 FUEL GAS SCF 126531	UNIT #3 FUEL GAS SCF 127530	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 656	UNIT #1 FUEL GAS MMBTU 70.45	UNIT #2 FUEL GAS MMBTU 70.68	UNIT #3 FUEL GAS MMBTU 71.25	TOTAL FUEL FLOW SCF 380179		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

42 lotrun start

REFRIGERATION SYSTEM ALARMS | Wed, Feb 16, 1994 | 9:15:29 AM

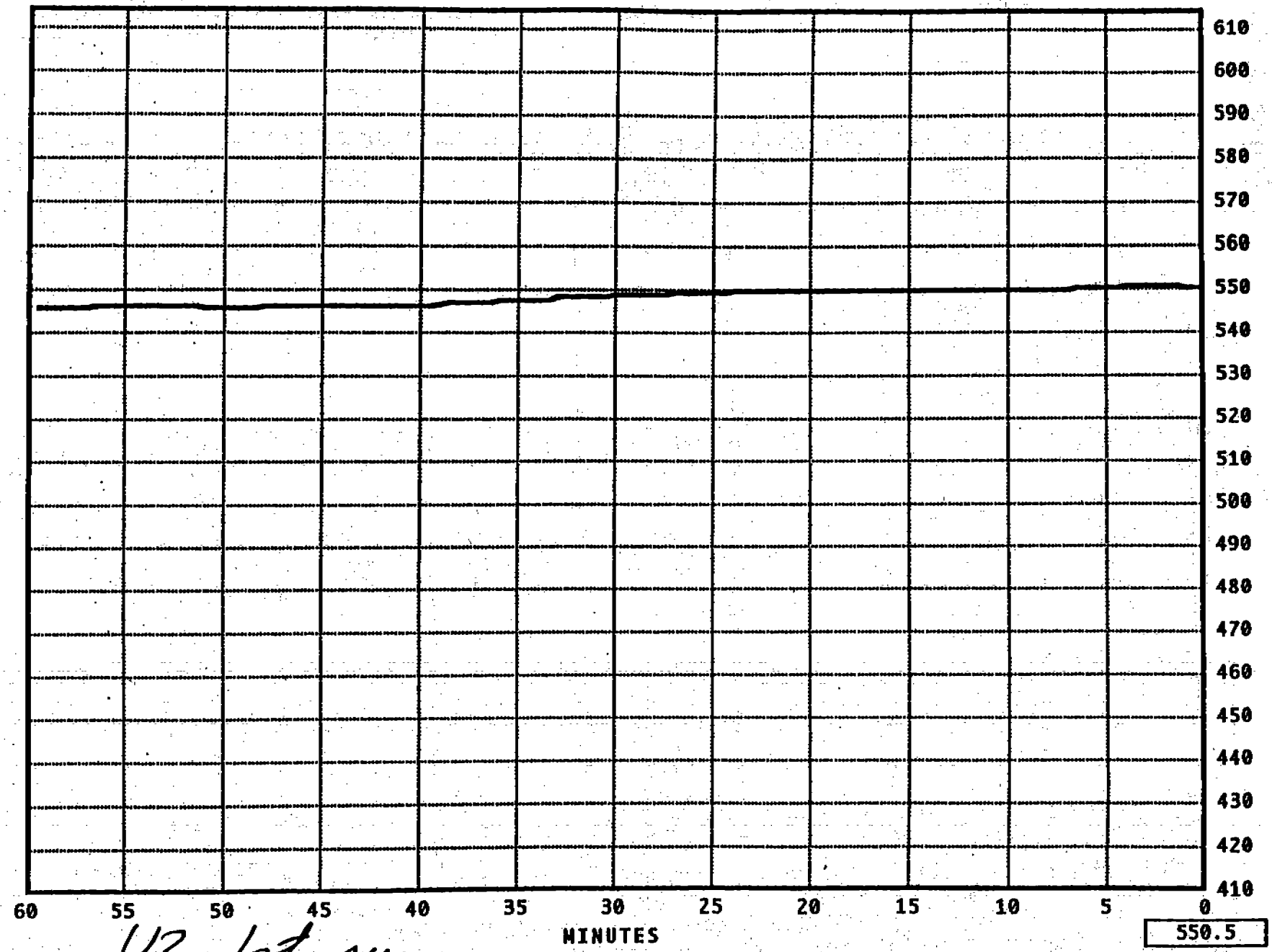
	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 138767	UNIT #2 FUEL GAS SCF 139220	UNIT #3 FUEL GAS SCF 140128	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 653	UNIT #1 FUEL GAS MMBTU 77.39	UNIT #2 FUEL GAS MMBTU 77.64	UNIT #3 FUEL GAS MMBTU 78.16	TOTAL FUEL FLOW SCF 418114		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

U2 lat rm end

REFRIGERATION SYSTEM ALARMS | Wed, Feb 16, 1994 | 10:14:56 AM

LANDFILL GAS HEATING \ ..UE - SATURATED - RICHMOND ;U SAT



42 1st run

RICHMOND ELECTRIC	Wed, Feb 16, 1994	10:15:27 AM

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 149327	UNIT #2 FUEL GAS SCF 149030	UNIT #3 FUEL GAS SCF 150677	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 628	UNIT #1 FUEL GAS MMBTU 83.20	UNIT #2 FUEL GAS MMBTU 83.04	UNIT #3 FUEL GAS MMBTU 83.97	TOTAL FUEL FLOW SCF 449032		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

U2 2nd run start

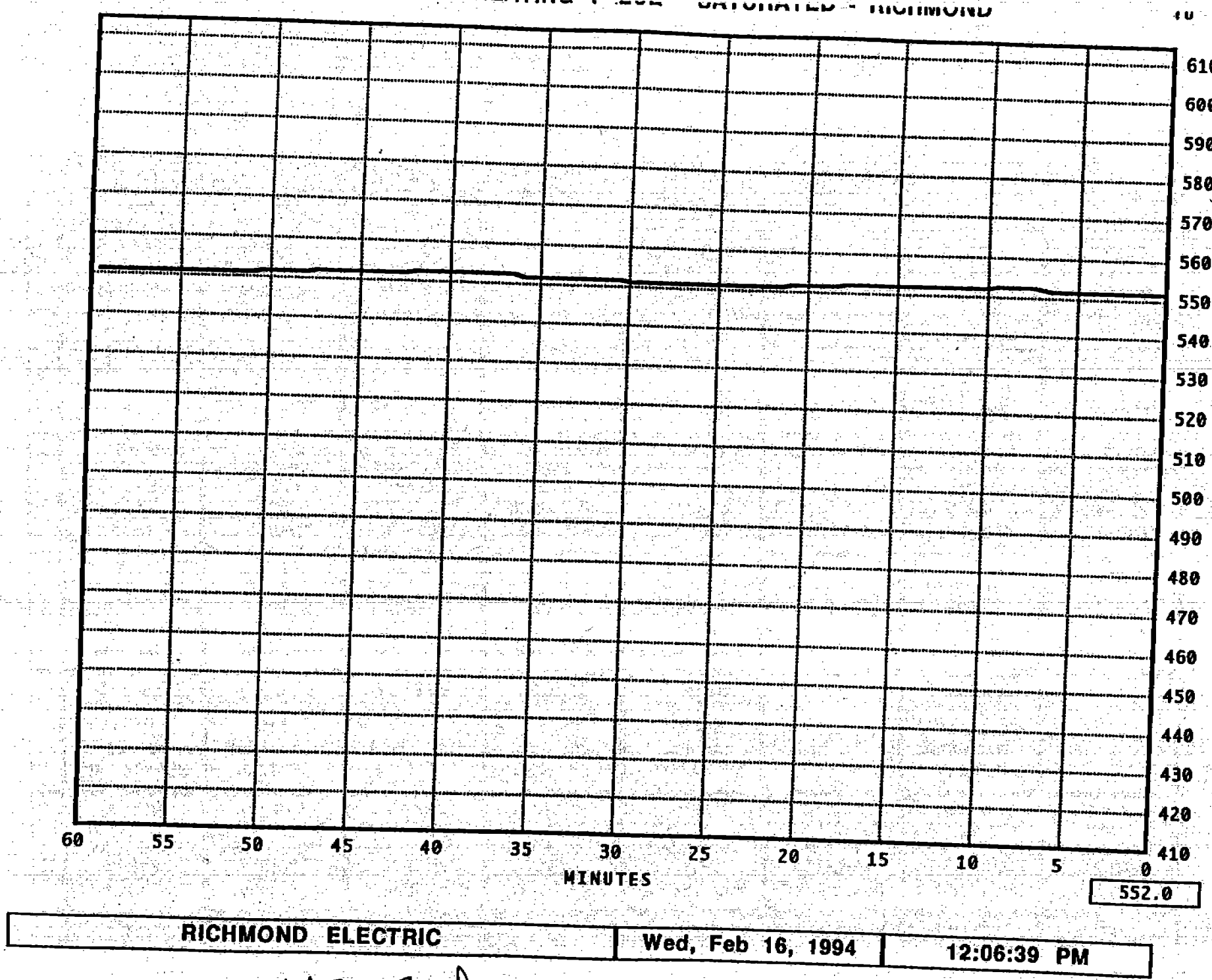
REFRIGERATION SYSTEM ALARMS | Wed, Feb 16, 1994 | 11:06:02 AM

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 161569	UNIT #2 FUEL GAS SCF 161307	UNIT #3 FUEL GAS SCF 162942	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 634	UNIT #1 FUEL GAS MMBTU 89.96	UNIT #2 FUEL GAS MMBTU 89.82	UNIT #3 FUEL GAS MMBTU 90.74	TOTAL FUEL FLOW SCF 485817		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

U2 2nd run end

REFRIGERATION SYSTEM ALARMS | Wed, Feb 16, 1994 | 12:06:07 PM


610
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
60
55
50
45
40
35
30
25
20
15
10
5
0
MINUTES
552.0
RICHMOND ELECTRIC
Wed, Feb 16, 1994
12:06:39 PM

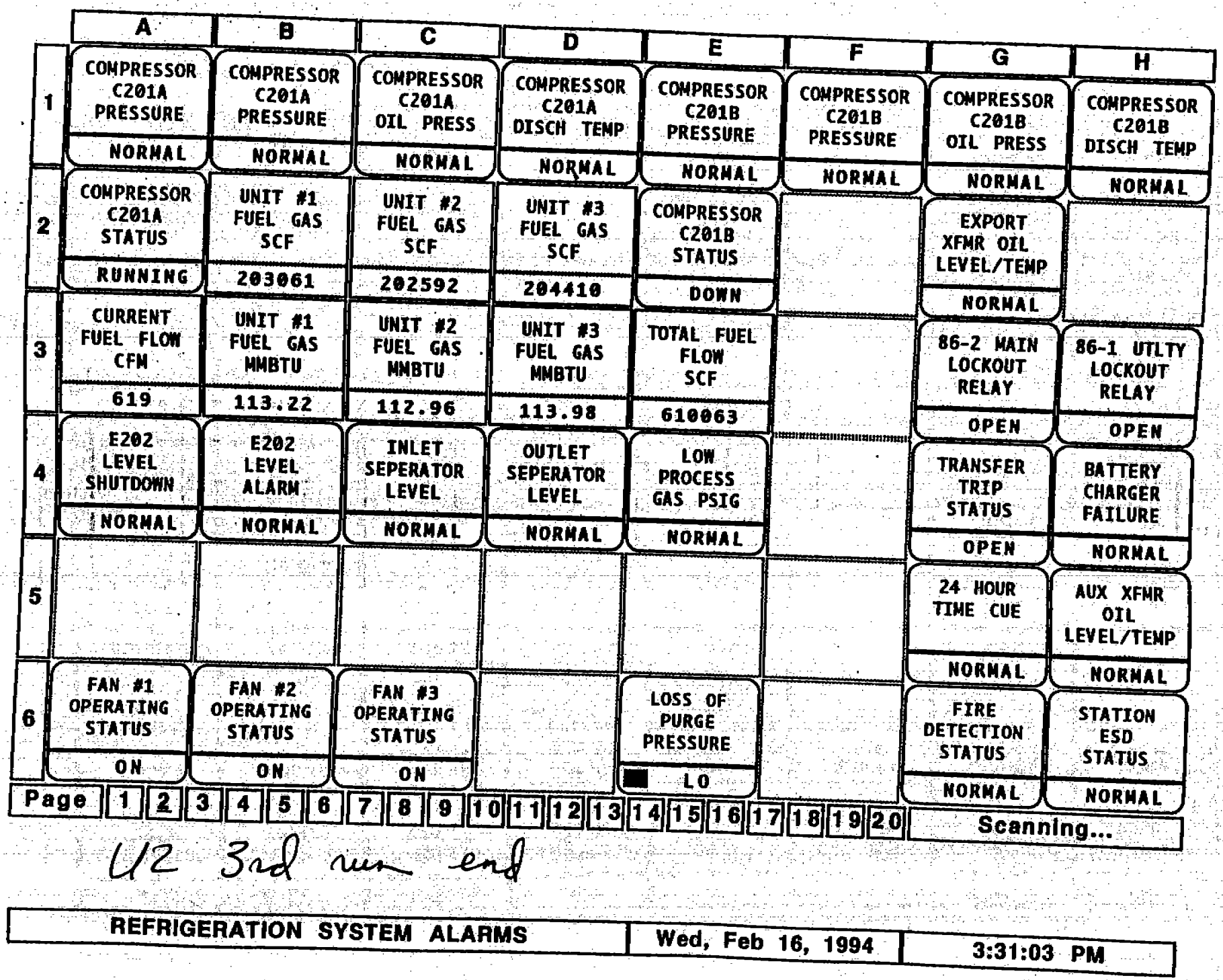
U2 2nd run

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 190985	UNIT #2 FUEL GAS SCF 190630	UNIT #3 FUEL GAS SCF 192325	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 625	UNIT #1 FUEL GAS MMBTU 106.42	UNIT #2 FUEL GAS MMBTU 106.22	UNIT #3 FUEL GAS MMBTU 107.17	TOTAL FUEL FLOW SCF 573938		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

U2 3rd run start

REFRIGERATION SYSTEM ALARMS | Wed, Feb 16, 1994 | 2:31:21 PM

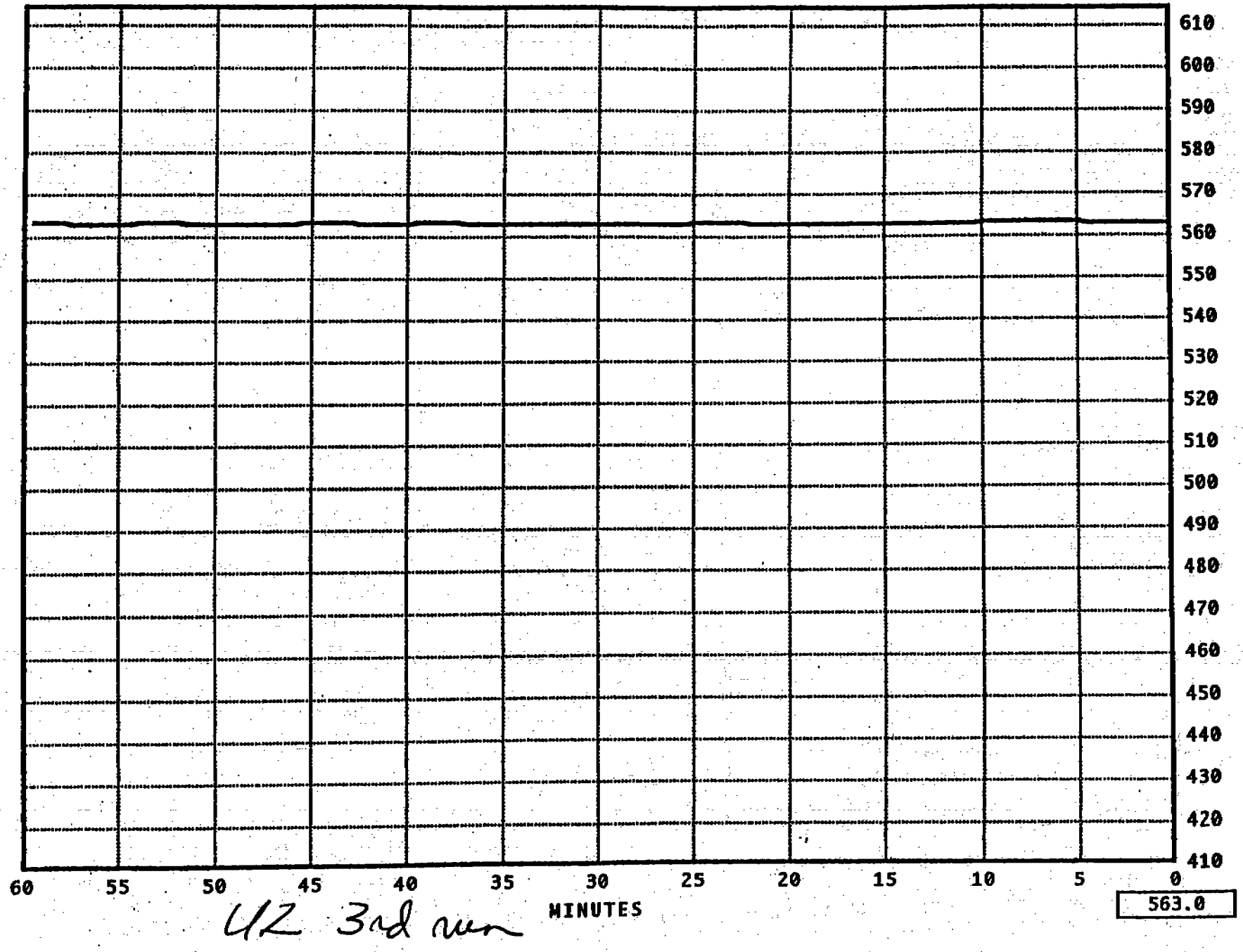


U2 3rd run end

REFRIGERATION SYSTEM ALARMS | Wed, Feb 16, 1994 | 3:31:03 PM

LANDFILL GAS HEATING V..UE - SATURATED - RICHMOND

BTU SAT



UZ 3rd run

RICHMOND ELECTRIC	Wed, Feb 16, 1994	3:31:29 PM

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 215549	UNIT #2 FUEL GAS SCF 205893	UNIT #3 FUEL GAS SCF 232773	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 198	UNIT #1 FUEL GAS MMBTU 120.24	UNIT #2 FUEL GAS MMBTU 114.82	UNIT #3 FUEL GAS MMBTU 129.99	TOTAL FUEL FLOW SCF 654212		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

U3 last run start

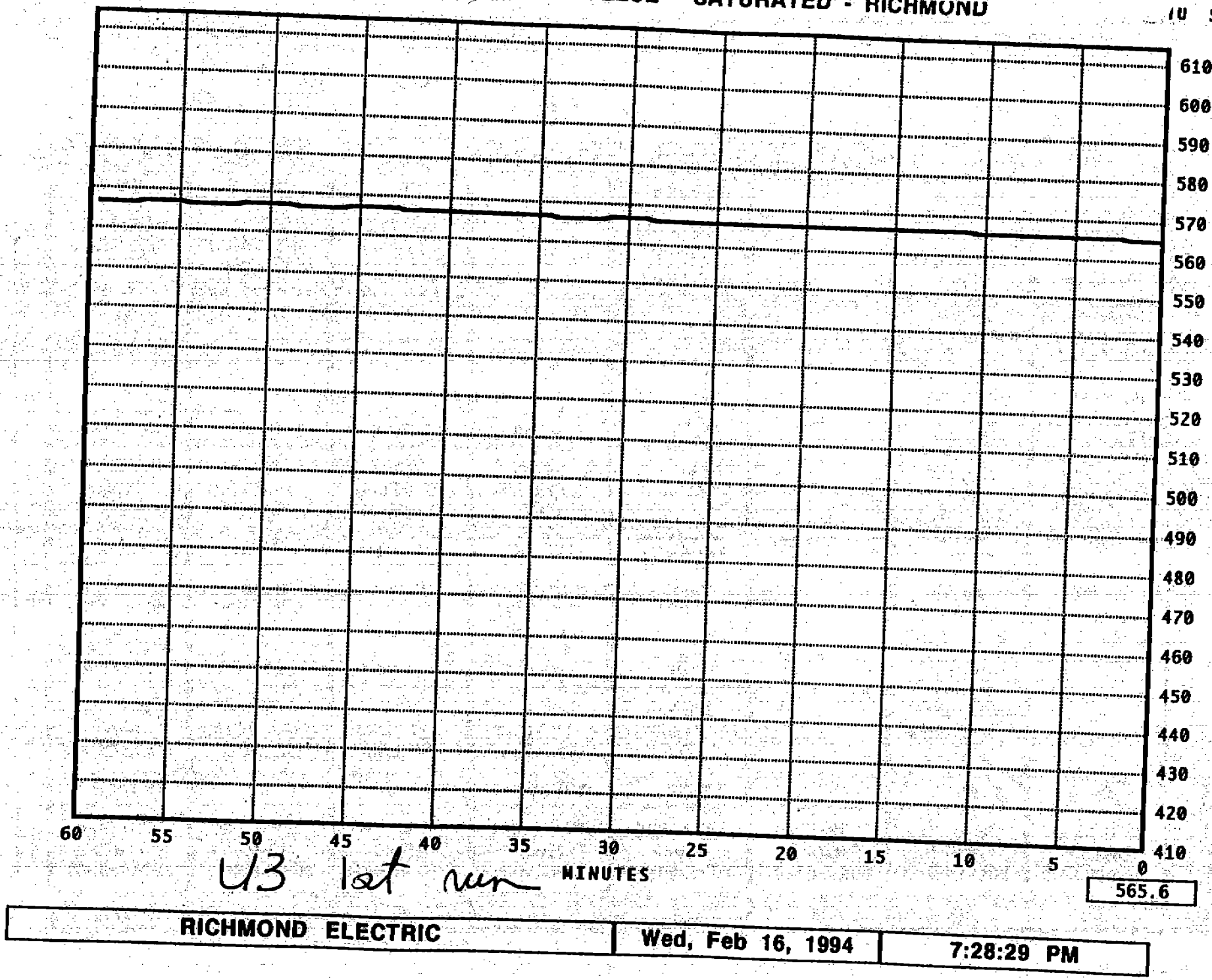
REFRIGERATION SYSTEM ALARMS | Wed, Feb 16, 1994 | 6:28:31 PM

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 215523	UNIT #2 FUEL GAS SCF 205897	UNIT #3 FUEL GAS SCF 244144	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 199	UNIT #1 FUEL GAS MMBTU 120.22	UNIT #2 FUEL GAS MMBTU 114.82	UNIT #3 FUEL GAS MMBTU 136.43	TOTAL FUEL FLOW SCF 665562		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

U3 last run end

REFRIGERATION SYSTEM ALARMS | Wed, Feb 16, 1994 | 7:28:09 PM


LANDFILL GAS HEATING VALUE - SATURATED - RICHMOND
BTU SAT
610
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
60
55
50
45
40
35
30
25
20
15
10
5
0
MINUTES
565.6
RICHMOND ELECTRIC
Wed, Feb 16, 1994
7:28:29 PM

U3 last run

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 217952	UNIT #2 FUEL GAS SCF 206794	UNIT #3 FUEL GAS SCF 252170	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 616	UNIT #1 FUEL GAS MMBTU 121.58	UNIT #2 FUEL GAS MMBTU 115.32	UNIT #3 FUEL GAS MMBTU 140.95	TOTAL FUEL FLOW SCF 676915		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

U3 2nd run start

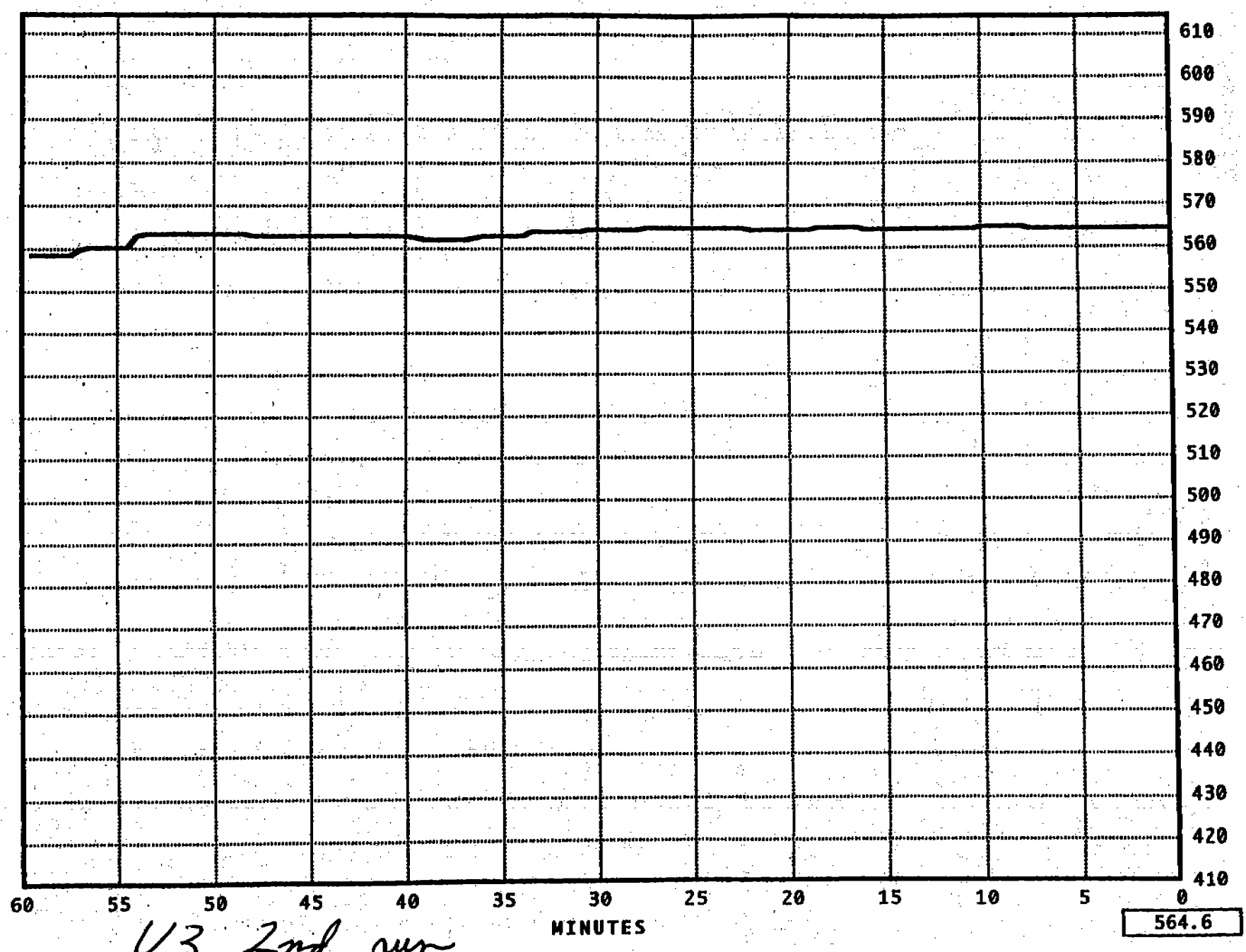
REFRIGERATION SYSTEM ALARMS | Wed, Feb 16, 1994 | 8:02:26 PM

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 230094	UNIT #2 FUEL GAS SCF 219080	UNIT #3 FUEL GAS SCF 264586	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 623	UNIT #1 FUEL GAS MMBTU 128.43	UNIT #2 FUEL GAS MMBTU 122.25	UNIT #3 FUEL GAS MMBTU 147.95	TOTAL FUEL FLOW SCF 713759		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

43 2nd run end

REFRIGERATION SYSTEM ALARMS | Wed, Feb 16, 1994 | 9:03:51 PM



43 2nd run

RICHMOND ELECTRIC	Wed, Feb 16, 1994	9:04:13 PM

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 236057	UNIT #2 FUEL GAS SCF 224992	UNIT #3 FUEL GAS SCF 270578	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 616	UNIT #1 FUEL GAS MMBTU 131.79	UNIT #2 FUEL GAS MMBTU 125.59	UNIT #3 FUEL GAS MMBTU 151.33	TOTAL FUEL FLOW SCF 731625		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

43 3rd run start

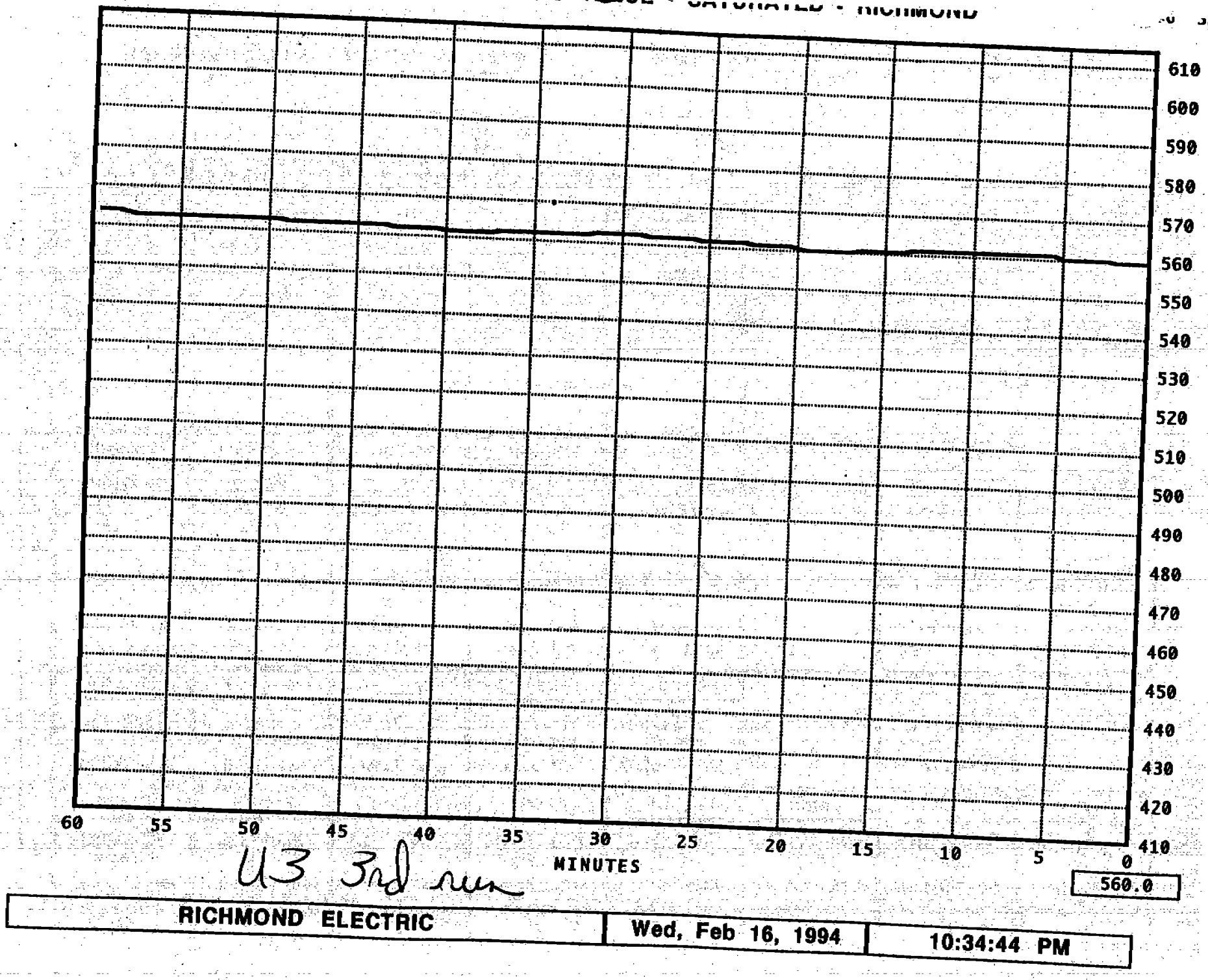
REFRIGERATION SYSTEM ALARMS | Wed, Feb 16, 1994 | 9:33:28 PM

	A	B	C	D	E	F	G	H
1	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A PRESSURE NORMAL	COMPRESSOR C201A OIL PRESS NORMAL	COMPRESSOR C201A DISCH TEMP NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B PRESSURE NORMAL	COMPRESSOR C201B OIL PRESS NORMAL	COMPRESSOR C201B DISCH TEMP NORMAL
2	COMPRESSOR C201A STATUS RUNNING	UNIT #1 FUEL GAS SCF 248292	UNIT #2 FUEL GAS SCF 237078	UNIT #3 FUEL GAS SCF 282748	COMPRESSOR C201B STATUS DOWN		EXPORT XFMR OIL LEVEL/TEMP NORMAL	
3	CURRENT FUEL FLOW CFM 620	UNIT #1 FUEL GAS MMBTU 138.67	UNIT #2 FUEL GAS MMBTU 132.38	UNIT #3 FUEL GAS MMBTU 158.17	TOTAL FUEL FLOW SCF 768117		86-2 MAIN LOCKOUT RELAY OPEN	86-1 UTLTY LOCKOUT RELAY OPEN
4	E202 LEVEL SHUTDOWN NORMAL	E202 LEVEL ALARM NORMAL	INLET SEPERATOR LEVEL NORMAL	OUTLET SEPERATOR LEVEL NORMAL	LOW PROCESS GAS PSIG NORMAL		TRANSFER TRIP STATUS OPEN	BATTERY CHARGER FAILURE NORMAL
5							24 HOUR TIME CUE NORMAL	AUX XFMR OIL LEVEL/TEMP NORMAL
6	FAN #1 OPERATING STATUS ON	FAN #2 OPERATING STATUS ON	FAN #3 OPERATING STATUS ON		LOSS OF PURGE PRESSURE NORMAL		FIRE DETECTION STATUS NORMAL	STATION ESD STATUS NORMAL

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

U3 3rd sum end

REFRIGERATION SYSTEM ALARMS | Wed, Feb 16, 1994 | 10:33:47 PM


610
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
60
55
50
45
40
35
30
25
20
15
10
5
0
MINUTES
560.0
U3 3rd run
RICHMOND ELECTRIC
Wed, Feb 16, 1994
10:34:44 PM

Flare Stack Test

2/17/94

	Flow	temp °F	Flow (SCF
3:00	26.5	1654	942
3:15	26.5	1662	942
3:30	26.5	1656	942
3:45	26.5	1660	942
4:00	27.0	1643	956
4:15	26.5	1640	942
4:30	26.5	1655	942
4:45	26.0	1627	928
5:00	26.0	1630	928
5:15	26.0	1625	928
5:25	26.0	1620	928

Scale
Range: 200 - 3000 SCFM

APPENDIX F

CALIBRATION SHEETS

Minutes	Temp.	Temp.	80737	2/9/94
0	79	80	DGM Serial #	BAR Press (PB) 30.25
2	78	82	ΔH (5) 1.0 2.0	Calibrated by Bill Kissel
4	78	82		
6	78	81	Final DGM 664.607	Final WTM 8421.801
8	79	81	Initial DGM 658.660	Initial WTM 8415.261
10	78	81	Net DGM 5.947	Net WTM 6.540
12	78	82		
14	79	82	Vac. in. HG. 4.0	Average DGM Temperature 541.3
15	79	81		
AVG	78.4	81.3	$y = \frac{\quad}{\quad} = 1.13$	
AVG °K	538.4	541.3		
			$\Delta H = \frac{\quad}{\left[\quad\right]^2} = 1.4$	
		Wet Test Meter Temperature 64.5 (524.5°K)		
		Total Time, minutes; seconds 15.0		

Calculations

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

TRC

Minutes	Temp.	Temp.	80737	2/9/94
0	79	84	DGM Serial #	BAR Press (PB) 30.25
2	79	84	ΔH .5 (1.0) 2.0	Calibrated by Bill Kissel
4	79	84		
6	79	84	Final DGM 658.326	Final WTM 8415.161
8	79	84	Initial DGM 650.057	Initial WTM 8407.272
10	79	84	Net DGM 8.269	Net WTM 7.889
12	79	84		
14	79	84	Vac. in. HG. 4.0	Average DGM Temperature 541.4°K
15	79	83		
AVG	79	83.9	y = ——— = .98	
AVG °K	539	543.9		
			ΔH = ——— [———]² = 1.92	
		Wet Test Meter Temperature	64.5 (524.5°K)	
		Total Time, minutes; seconds	15.0	

Calculations

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

TRC

Minutes	Temp.	Temp.	80737	2/9/94
0	81	85	DGM Serial #	BAR Press (PB) 30.25
2	80	86	ΔH .5 1.0 (2.0)	Calibrated by Bill Kisel
4	79	86		
6	79	86	Final DGM 649.944	Final WTM 8406.681
8	79	86	Initial DGM 637.944	Initial WTM 8396.018
10	79	87	Net DGM 11.477	Net WTM 10.663
12	79	87		
14	80	87	Vac. in. HG 4.0	Average DGM Temperature 542.8
15	79	86		
AVG	79.4	86.2		
AVG °K	539.4	546.2	Y = ____ = .956	
			ΔH = ____ = 2.0	
			Wet Test Meter Temperature 69.5 (524.5 °K)	
			Total Time, minutes; seconds 15.0	

Calculations

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

TRC