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

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

EMISSION TESTING AT BFI's ARBOR HILLS LANDFILL NORTHVILLE, MICHIGAN

September 22 through 25, 1992

Prepared for

AtmAA, Inc.
21354 Nordhoff Street, Suite 113
Chatsworth, California 91311

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Prepared by

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

Report PS-92-2926/Project 7244-92

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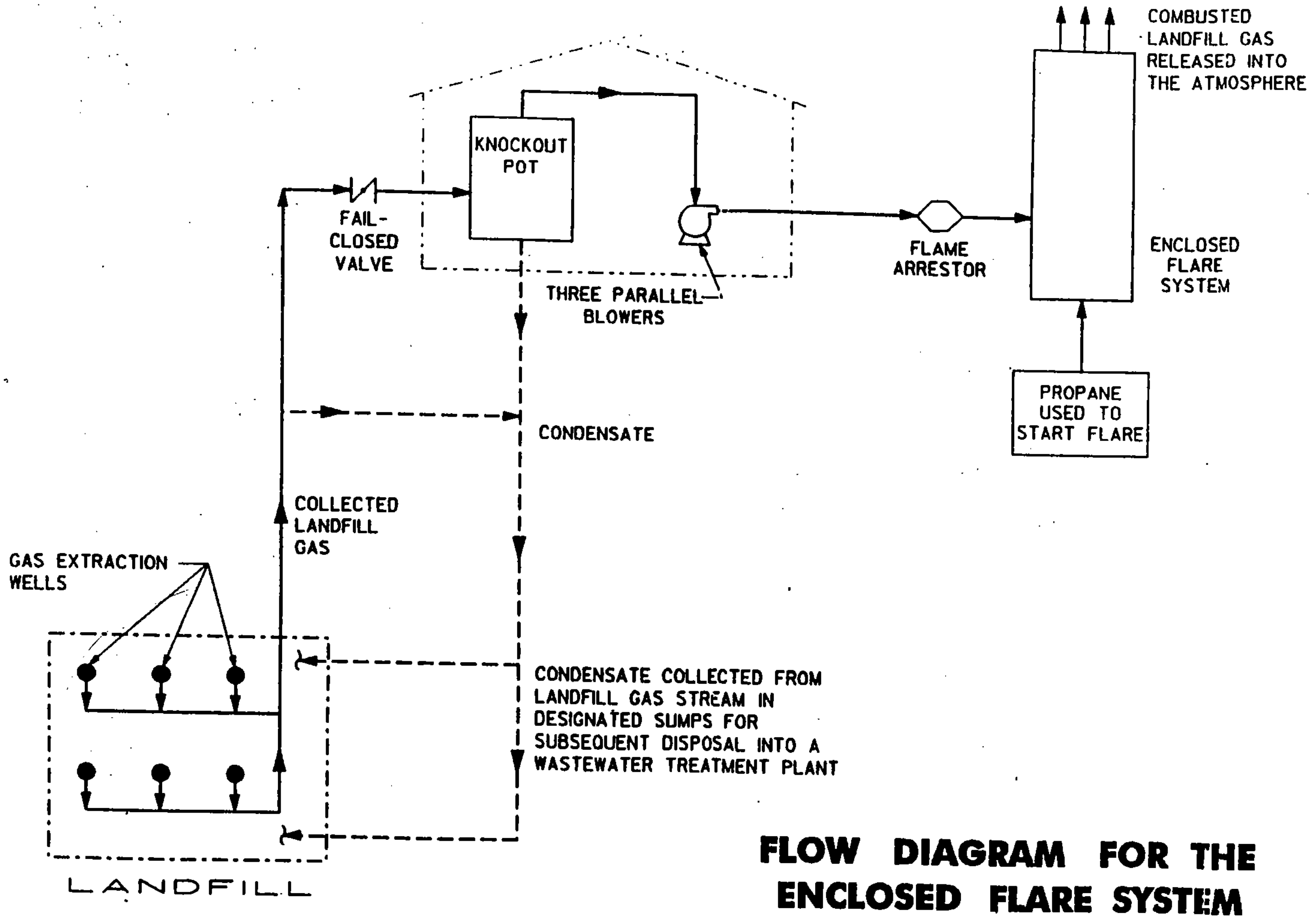
SECTION 1

INTRODUCTION

At the request of AtmAA, Inc., on behalf of Browning-Ferris Industries (BFI), Steiner Environmental, Inc. conducted a series of emission tests on the enclosed flare system combusting the landfill gas generated at the Arbor Hills sanitary landfill located near Northville, Michigan. The primary purpose of these tests was to determine compliance with the emission limits contained in the permit to construct. A secondary purpose was to evaluate the accuracy of the landfill gas flowmeter which measures and records the volume of gas burned in the flare. The destruction efficiency of several organic compounds in the flare was also determined.

Figure 1 depicts the process of the landfill gas extraction and enclosed flare system. Basically, landfill gas from 78 wells is drawn through the collection system and transported to the flare. The volumetric flowrate of these gases is measured and recorded by a mass flowmeter. At the flare, the landfill gas goes through a water knockout and into two blowers. These blowers deliver the gas to the eight burners in the bottom of the flare. Air for combustion is admitted into the bottom of the flare through manually and automatically controlled dampers. The flare is refractory lined (1-inch AP Green Inswool-HTZ rated at 2700°F backed with 1-inch AP Green Inswool-AP rated at 2400°F)



FLOW DIAGRAM FOR THE ENCLOSED FLARE SYSTEM AT THE ARBOR HILLS LANDFILL

BROWNING – FERRIS INDUSTRIES
OF SOUTHEASTERN MICHIGAN, INC.

FIGURE 1. Process of the Landfill Gas Extraction and Enclosed Flare System

REV	DESCRIPTION	DATE	BY

BROWNING-FERRIS INDUSTRIES
GAS SYSTEMS

FLOW DIAGRAM
FOR ENCLOSED FLARE
GAS EXTRACTION DETAILS
ARBOR HILLS LANDFILL
NORTHVILLE, MICHIGAN

carbon steel shell which is 50 feet tall. Sample ports have been installed at the 44 foot level on the flare.

Testing at the inlet of the flare was conducted to determine the volumetric flowrate, moisture and fixed gas composition of the landfill gas. The moisture content of the landfill gas was determined using EPA Method 2. The flowrate was determined using EPA Method 4. The fixed gas composition and methane and non-methane hydrocarbon were determined using summa canisters and FID/TCA analysis. Samples of the landfill gases were also collected in Tedlar bags for trace organic analysis. Finally, landfill gas samples were collected in stainless steel bombs for CHNOS, specific gravity, moisture and Btu analysis using ASTM Methods.

Testing at the outlet of the flare was conducted to continuously measure the emissions of NO_x, CO, CO_2 and O_2 using EPA Methods 7E and 3A under two different flare operating temperatures - 1600°F and 2000°F. Testing was also conducted to determine emissions of SO_2 and SO_3 using EPA Method 8 and emissions of HCl and Cl_2 using EPA Method 26A. Tedlar bag samples of the exhaust gases were also collected to determine specific trace organic species.

Section 2 of this report describes the test matrix for this program.

SECTION 2

TEST MATRIX

Table 2-1 summarizes the tests performed on this program. It was originally planned to conduct tests at 1600° and 2000°F which represent the minimum and maximum limits specified in the permit to construct. Due to ambient conditions (wind blowing into the louvers at the base of the flare) it was difficult to sustain a specific operating temperature. A malfunction in the flare temperature setpoint controller (diagnosed on the last day of testing) also made it difficult to set a precise operating condition. The faulty thermocouple for the setpoint controller was replaced toward the end of the test program (Test #6) and the flare operation was steady from that point.

Section 3 presents the results of these tests.

TABLE 2-1. ARBOR HILLS TEST MATRIX

Date	Test Location	Test Number	Test Condition	Test Parameter	Test Time
9/23/92	Outlet	1[A]	1904°F	$NO_x/CO/CO_2/O_2$/Flowrate/H_2O	11:14 am - 1:04 pm
		2[A]	1861°F	$NO_x/CO/CO_2/O_2$/Flowrate/H_2O	2:35 pm - 4:26 pm
9/24/92	Outlet	3[A]	1848°F	$NO_x/CO/CO_2/O_2/HCl/Cl_2$	10:27 am - 12:09 pm
				Fixed Gases/CH_4	2:12 pm - 2:13 pm
				Trace Organics	2:18 pm - 2:25 pm
		4[B]	1891°F	$NO_x/CO/CO_2/O_2/HCl/Cl_2$	2:48 pm - 4:45 pm
				Fixed Gases/CH_4	5:00 pm - 5:01 pm
				Trace Organics	5:05 pm - 5:11 pm
	Inlet	3		Flowrate	12:29 pm - 12:34 pm
				H_2O	1:20 pm - 1:55 pm
				Fixed Gases/CH_4	2:12 pm - 2:13 pm
				Trace Organics	2:18 pm - 2:20 pm
		4		Flowrate	5:29 pm - 5:34 pm
				H_2O	5:46 pm - 6:21 pm
				Fixed Gases/CH_4	5:00 pm - 5:01 pm
				Trace Organics	5:05 pm - 5:07 pm
9/25/92	Outlet	5[B]	1799°F	$NO_x/CO/CO_2/O_2/SO_2/SO_3$	12:29 pm - 2:05 pm
				Fixed Gases/CH_4	11:23 am - 11:24 am
				Trace Organics	11:27 am - 11:32 am
		6[B,C]	1700°F	$NO_x/CO/CO_2/O_2/SO_2/SO_3$	3:44 pm - 5:16 pm

[A] = Deadband on setpoint controller set at 20° and changed to 30°

[B] = Deadband on setpoint controller set at 50°

[C] = Changed out thermocouple for setpoint controller

SECTION 3

TEST RESULTS

All emission data is referenced to 68°F and 29.92 inches Hg. Table 3-1 summarizes the measurements made at the inlet of the flare. Tables 3-2 to 3-4 present the results of the tests conducted at the flare outlet. Table 3-5 compares the measured emissions at the flare outlet to those allowed by the permit. Finally, Table 3-6 presents the VOC reduction efficiencies achieved by the flare on this test program.

3.1 INLET

The volumetric flowrate of the landfill gas entering the flare was measured by EPA Methods 2 and 4 and was compared to the mass flowmeter installed in the gas line leading to the flare. The volumetric flowrates measured by the pitot tube for Tests #3, #4 and #5 were 4970 dscfm, 4893 dscfm, and 4982 dscfm versus the mass flowmeter reading of approximately 7700 scfm (see pages C-2 through C-4). However, it is not known what the "standard temperature or pressure" is for the mass flowmeter or what moisture factor was used to convert acfm to scfm. A different standard temperature or pressure or moisture factor could account for the observed differences.

Using the volumetric flowrates measured by pitot tube at the flare inlet, the excess O_2 in the flare exhaust, and the F-Factor (dscf/MMBtu) for the landfill gas, it was possible to <u>calculate</u> volumetric flowrates for the flare exhaust and to compare these values with the flowrates measured by the pitot tube during the emission tests. Calculated flare exhaust flowrates for Tests #3, #4 and #5 were 46,635 dscfm, 45,685 dscfm, and 52,733 dscfm versus measured values of 49,403 dscfm, 47,420 dscfm and 53,219 dscfm. The average variation between calculated and measured flare exhaust flowrate was 3.4%.

3.2 OUTLET

Table 3-5 on page 3-9 summarizes the results of the source test and individual comments for each run. An examination of the strip charts for the continuous NO_x, CO, CO_2 and O_2 monitors presents a realistic view of the flare's operation throughout the test program. At the beginning of the test program, it became clear that ambient wind conditions determined, to a large extent, the operational status of the flare. Any attempts to set a particular flare operating temperature using the setpoint controller were defeated by wind blowing into the manual and automatic louvers installed at the base of the flare.

The strip charts for Tests #5 and #6 reveal that the swings present in the earlier tests were now minimized and the flare operated in a more consistent and steady manner. The stack gas temperatures were reduced to 1800°F and 1700°F for Tests #5 and #6 and fluctuations in stack gas temperature were also reduced. NO_x and CO were in compliance for Test #5 but CO emissions were over the limit during the 1700°F test.

Emissions for HCl, Cl_2, SO_2 and SO_3 are not dramatically affected by the flare operating temperature. These species are directly related to the composition of the gas being extracted from the landfill. The SO_2 emissions from the flare were in compliance with the permit limits.

There are no limits for SO_3 emissions and these emissions were very low. No Cl_2 was found in the flare exhaust at the detection level of the method. HCl emissions were higher than the permitted values.

Greater than methane hydrocarbon emissions ($>C_1$) are influenced by the flare operation. $>C_1$ hydrocarbon emissions were greater than the permitted values for all three tests (#3, #4 and #5). Using the inlet and outlet $>C_1$ hydrocarbon emission rates, VOC destruction efficiencies for the flare averaged 97.38%.

The results of the trace organics analysis conducted by AtmAA, Inc. at the inlet and outlet of the flare are contained in Appendix D.

TABLE 3-1. SUMMARY OF SOURCE EMISSION TEST DATA (68 dF)

Unit Tested : BFI ARBOR HILLS
FLARE INLET

Date : SEPT 24,25,1992

Test Number	3	4	5	Average
Test Condition				
Barometric Pressure (in. Hg)	29.31	29.3	29.21	29.27
Stack Pressure (in. Hg)	19.91	20.10	19.81	19.94
Stack Area (ft2)	1.40	1.40	1.40	1.40
Elapsed Sampling Time (min.)	35.0	35.0	35.0	35.00
Volume Gas Sampled (dscf)	19.739	20.068	19.785	19.864

$1.40\,ft^2 \cdot \frac{93.86\,ft}{s} \times \frac{60\,s}{min} = 7884$ cFM

GAS DATA				
Average Gas Velocity (fps)	94.52	92.12	94.94	93.86
Average Gas Temperature (dF)	75.17	75.08	74.33	74.86
Gas Flowrate (dscfm)	4,970	4,893	4,982	4,948
Gas Analysis (Volume %)				
Carbon Dioxide, dry	40.80	41.00	40.40	40.73
Oxygen, dry	0.49	0.46	0.44	0.46
Water	4.40	4.35	4.27	4.34
EMISSION CONCENTRATION				
analysis 1 Methane %	54.31%	54.19%	54.89%	54.46%
analysis 2 " "				57.73%
>C1 HC (ppm) as CH4 as Hexane =	8610.00	11000.00	8090.00	9233.33 1539
EMISSION RATE - lb/hr				
>C1 HC	106.92	134.48	100.69	114.03

TABLE 3-2. SUMMARY OF SOURCE EMISSION TEST DATA (68 dF)

Unit Tested : BFI ARBOR HILLS
FLARE OUTLET

Date : SEPT 23,1992

Test Number	1	2	Average
Test Condition	1904 dF	1861 dF	
Barometric Pressure (in. Hg)	29.23	29.32	29.28
Stack Pressure (in. Hg)	29.23	29.32	29.27
Stack Area (ft2)	106.14	106.14	106.14
Elapsed Sampling Time (min.)	72.0	72.0	72.00
Volume Gas Sampled (dscf)	55.945	53.506	54.726
F-Factor	8388.01	8388.01	8388.01
GAS DATA			
Average Gas Velocity (fps)	38.49	37.49	37.99
Average Gas Temperature (dF)	1904.04	1860.79	1882.42
Gas Flowrate (dscfm)	49,935 ✓	47,706 ✓	48,821
Gas Analysis (Volume %)			
Carbon Dioxide, dry	9.67	9.63	9.65
Oxygen, dry	11.03	11.15	11.09
Water	6.62	10.37	8.50
EMISSION CONCENTRATION			
CO (ppm)	73.06	95.37	84.22
NOx (ppm)	19.04	18.20	18.62
EMISSION RATE - lb/hr			
CO	15.91	19.84	17.87
NOx	6.81	6.22	6.52
EMISSION FACTOR - lb/MMBtu			
CO	0.0944	0.1247	0.1096
NOx	0.0404	0.0391	0.0397
EMISSION FACTOR - tons/yr			
CO	69.69	86.90	78.29
NOx	29.83	27.24	28.54

TABLE 3-3. SUMMARY OF SOURCE EMISSION TEST DATA (68 dF)

Unit Tested : BFI ARBOR HILLS
FLARE OUTLET

Date : SEPT 24,1992

Test Number	3	4	Average
Test Condition	1848 dF	1891 dF	
Barometric Pressure (in. Hg)	29.33	29.31	29.32
Stack Pressure (in. Hg)	29.33	29.31	29.32
Stack Area (ft2)	106.14	106.14	106.14
Elapsed Sampling Time (min.)	72.0	72.0	72.00
Volume Gas Sampled (dscf)	60.250	59.553	59.901
F-Factor	8386.65	8386.65	8386.65
GAS DATA			
Average Gas Velocity (fps)	38.95	37.88	38.41
Average Gas Temperature (dF)	1848.08	1891.29	1869.69
Gas Flowrate (dscfm)	49,403	47,420	48,411
Gas Analysis (Volume %)			
Carbon Dioxide, dry	9.67	9.64	9.66
Oxygen, dry	10.85	10.80	10.83
Water	11.17	10.63	10.90
EMISSION CONCENTRATION			
HCl (ppm)	6.58	6.24	6.41
CO (ppm)	69.36	14.31	41.84
Cl2 (ppm)	<0.01	<0.01	<0.01
NOx (ppm)	17.42	18.44	17.93
> C1 HC (ppm)	28.80	16.40	22.60
EMISSION RATE - lb/hr			
HCl	1.85	1.68	1.77
CO	14.94	2.96	8.95
Cl2	<0.01	<0.01	<0.01
NOx	6.17	6.26	6.21
> C1 HC	3.55	1.94	2.75
EMISSION FACTOR - lb/MMBtu			
HCl	0.0109	0.0102	0.0106
CO	0.0880	0.0181	0.0530
Cl2	<0.00003	<0.00003	<0.00003
NOx	0.0363	0.0382	0.0373
> C1 HC	0.0209	0.0119	0.0164
EMISSION FACTOR - tons/yr			
HCl	8.10	7.36	7.73
CO	65.44	12.96	39.20
Cl2	<0.04	<0.04	<0.04
NOx	27.02	27.42	27.22
> C1 HC	15.55	8.50	12.02

TABLE 3-4. SUMMARY OF SOURCE EMISSION TEST DATA (68 dF)

Unit Tested : BFI ARBOR HILLS
FLARE OUTLET

Date : SEPT 25,1992

Only test #6 data were used — Problems c̄ Sampling during other tests

	5 1799 dF	6 1700 dF	Average
in. Hg)	29.21	29.14	29.18
g)	29.20	29.13	29.17
	106.14	106.14	106.14
(min.)	72.0	72.0	72.00
scf)	59.368	58.484	58.926
	8323.36	8323.36	8323.36
GAS DATA			
Average Gas Velocity (fps)	40.82	40.21	40.51
Average Gas Temperature (dF)	1798.79	1700.00	1749.40
Gas Flowrate (dscfm)	53,219	54,669	53,944
Gas Analysis (Volume %)			
Carbon Dioxide, dry	9.02	8.41	8.72
Oxygen, dry	11.45	12.09	11.77
Water	10.26	10.30	10.28
Methane content (From pg. 5-7)		56.93%	
EMISSION CONCENTRATION			
LFG FR. = 4982 (from pg. 3-1)			
SO3 (ppm)	0.46	0.69	0.38
CO (ppm)	91.07	394.29	242.68
SO2 (ppm)	3.17	3.10	3.14
NOx (ppm)	14.92	11.69	13.31
> C1 HC (ppm)	23.50		23.50
EMISSION RATE - lb/hr			
SO3	0.31	0.47	0.39
CO	21.13	94.00 lbs/hr	57.57
SO2	1.68	1.69	1.69
NOx	5.69	4.58	5.13
> C1 HC	3.12		3.12
EMISSION FACTOR - lb/MMBtu			
SO3	0.0018	0.0028	0.0023
CO	0.1219	0.5663	0.3441
SO2	0.0097	0.0102	0.0100
NOx	0.0328	0.0276	0.0302
> C1 HC	0.0180		0.0180
EMISSION FACTOR - tons/yr			
SO3	1.36	2.06	1.71
CO	92.55	411.72	252.14
SO2	7.36	7.40	7.38
NOx	24.92	20.06	22.49

Avg CO = (0.3441 + 0.0530)/2

TABLE 3-5. ARBOR HILLS LANDFILL EMISSION CALCULATIONS

	CARBON MONOXIDE (CO)			NITROGEN OXIDES (NO_x)			VOC		SO_2		HCl		Cl_2		SO_3	
	lbs/hr	tons/yr	lbs/MMBtu	lbs/hr	tons/yr	lbs/MMBtu	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
Run #1 * 1904°F	15.91	69.69	0.0944	6.81	29.83	0.0404	---	---	---	---	---	---	---	---	---	---
Tests #1 and #2: Attempts to set a particular flare operating temperature were defeated by wind blowing into manual/automatic louvers at base of flare; it was not known that the thermocouple for flare temperature setpoint controller was faulty or that setpoint controller deadband was too low (20°F); louvers continually "hunted" for setpoint creating swings in emissions (O_2 ~7%, NO_x ~25 ppm, CO ~400 ppm). Attempts to block wind with tarp were unsuccessful.																
Run #2 * 1861°F	19.84	86.90	0.1247	6.22	27.24	0.0391	---	---	---	---	---	---	---	---	---	---
See comments under Run #1																
Run #3 * 1848°F * 7,918 acfm * 4,970 dscfm * 5,199 scfm (Inlet Flowrates)	14.94	65.44	0.0880	6.17	27.02	0.0363	3.55	15.55	---	---	1.85	8.10	<0.01	<0.04	---	---
Test #3: Deadband on temperature setpoint controller changed from 20°F to 30°F. Swings in emissions greatly reduced (O_2 ~2.5%, NO_x ~10 ppm).																
Run #4 * 1891°F * 7,717 acfm * 4,893 dscfm * 5,118 scfm (Inlet Flowrates)	2.96	12.96	0.0181	6.26	27.42	0.0382	1.94	8.50	---	---	1.68	7.86	<0.01	<0.04	---	---
Tests #4 and #5: Deadband on temperature setpoint controller changed from 30°F to 50°F. Swings in emissions reduced even more.																

TABLE 3-5. ARBOR HILLS LANDFILL EMISSION CALCULATIONS (Concluded)

	CARBON MONOXIDE (CO)			NITROGEN OXIDES (NO_x)			VOC		SO_2		HCl		Cl_2		SO_3	
	lbs/hr	tons/yr	lbs/MMBtu	lbs/hr	tons/yr	lbs/MMBtu	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
Run #5 • 1799°F • 7,954 acfm • 4,982 dscfm • 5,206 scfm (Inlet Flowrates)	21.13	92.55	0.1219	5.69	24.92	0.0328	3.12	13.67	1.68	7.36	---	---	---	---	0.31	1.36
See comments for Run #4.																
Run #6 • 1700°F	94.00	411.72	0.5663	4.58	20.06	0.0276	---	---	1.69	7.40	---	---	---	---	0.47	2.06
Run #6: Replaced faulty thermocouple for temperature setpoint controller; emission swings completely minimized.																
Permit Conditions • ≥1600°F	54.94	240.46	0.33	20.0	87.6	0.12	0.1	0.438	1.8	7.88	1.0	4.38	not regulated	not regulated	not regulated	not regulated
No comments.																

TABLE 3-6. FLARE NMOC VOC REDUCTION EFFICIENCY

Date	Test No.	Inlet VOC (lb/hr)	Outlet VOC (lb/hr)	Reduction[A] (%)
9/24/92	3	106.92	3.55	96.68
	4	134.48	1.94	98.56
9/25/92	5	100.69	3.12	96.90

$$A = \frac{Inlet - Outlet}{Inlet} X \, 100$$

SECTION 4

SAMPLING EQUIPMENT AND PROCEDURES

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

4.1 PRELIMINARY MEASUREMENTS

Before conducting the stack tests a series of preliminary measurements were made to determine:

- The location of the sampling site and the number and location of the sampling points to be used (EPA Method 1)
- The velocity, temperature and pressure of the gases in the stack (EPA Method 2)
- The composition of the stack gases (EPA Method 3A)
- The moisture content of the stack gases (EPA Method 4)

4.2 PREPARATION OF THE SO_2/SO_3 SAMPLING TRAIN

All sampling train components were cleaned in the laboratory (soap and water, tap water rinse, distilled water rinse, and IPA rinse) to eliminate previous contamination. The sampling train components were sealed and transported to the sampling site in a mobile lab. The EPA Method 8 equipment used to measure SO_2 and SO_3 consisted of:

- A Quartz nozzle for constant rate sampling

- A water cooled Quartz sampling probe (6 feet long) equipped with an S-type pitot tube and a thermocouple to measure stack velocity, pressure and temperature
- A heated Pyrex glass filter holder containing an untared 100-mm Whatman 934 AH glass fiber filter
- A Pyrex glass impinger train in an icebath (impinger 1 contained 100-ml 80% IPA; a Pyrex glass filter holder containing a 47-mm Whatman 934 AH filter; bubbler 2 and impinger 3 each contained 100-ml of 3% H_2O_2; bubbler 4 contained a weighed amount of silica gel)
- An umbilical to connect the probe and sample box to the control module
- A control module containing a vacuum pump, a calibrated dry gas meter and a calibrated orifice meter to measure the pressure, temperature and flowrate throughout the train.

The sampling train was charged in the mobile lab using freshly prepared reagents. Each impinger and its contents was weighed to the nearest 0.1 gm on a calibrated electronic balance. Blanks of all filters and reagents were retained for subsequent analysis. The sampling point locations were marked on the probe using a high-temperature marker. The sampling train was completely assembled and lifted to the sampling site.

4.3 SAMPLING PROCEDURES FOR SO_2/SO_3 SAMPLING TRAIN

Prior to a test, the sampling train was heated and leak-checked at 15-inches Mercury to insure leakage was less than 0.02 or 4% of the average sampling rate. The S-type pitot tube was also leak-checked. The sampling train was installed on the unirail and the probe was inserted into the stack at the farthest point. A constant sampling rate was calculated using an HP-41CV calculator for each sampling point on the traverse (6 points per traverse; 4 traverses at 90°). Each point was sampled for an equal period of time (3 minutes) and all pertinent data were recorded on the data sheet every 3 minutes for each point. The probe and sample box were maintained at 250°F throughout the traverse. The gases leaving the impinger train were maintained at <68°F. At the end of a traverse, the probe was withdrawn from the stack and the entire sampling train was transferred intact to the next sampling port. The remaining traverses of the stack were completed and the sampling train was withdrawn for the final leak-check. This leak-check was performed at 15-inches Mercury or at the highest vacuum achieved during the test. The S-type pitot tube was also checked at this time. The sampling train was then purged with ambient air for 15-minutes using the highest ΔH measured during the test. After the train was purged, the sample box and impinger train were sealed with aluminum foil and lowered to the mobile lab for sample recovery.

4.4 SAMPLE RECOVERY PROCEDURES FOR SO_2/SO_3 SAMPLING TRAIN

Sample recovery for the nozzle and probe occurred on the stack. The nozzle and probe were brushed and rinsed three times using 80% IPA into a polyethylene sample bottle. Sample recovery for the filter holder and impinger train occurred in the mobile lab. The 100-mm filter was removed from the 4-inch filter holder and sealed in its petri dish. The glass fibers stuck to the gasket were scraped off and put into the petri dish. The front half of the 4-inch glass filter holder was brushed and rinsed with 80% IPA. Each impinger was removed from the icebath, wiped dry and weighed to the nearest 0.1 gm. The contents of impinger 1 were transferred to a polyethylene sample bottle. The back half of the 4-inch glass filter holder, the glass connectors, impinger 1 and the front half of the 2-inch filter holder were rinsed with 80% IPA and the rinsings were transferred to this same bottle. The 47-mm filter from the 2-inch filter holder was sealed in its petri dish. The contents of bubbler 2 and impinger 3 were transferred to a polyethylene sample bottle. Distilled water rinsings of the back half of the 2-inch filter holder, bubbler 2, the connector and impinger 3 were transferred to this same bottle. All sample bottles and petri dishes were marked and labeled. A chain-of-custody log was completed and the field data sheet was also labeled with the sample ID numbers. The sampling train was then recharged in preparation for the next test.

4.5 PREPARATION OF THE HCl/Cl_2 SAMPLING TRAIN

All sampling train components were cleaned in the laboratory (soap and water, tap water rinse, distilled water rinse, and IPA rinse) to eliminate previous contamination. The sampling train components were sealed and transported to the sampling site in a mobile lab. The EPA Method 26A equipment used to measure HCl and Cl_2 consisted of:

- A Quartz glass nozzle for constant rate sampling
- A water cooled Quartz sampling probe (6 feet long) equipped with an S-type pitot tube and a thermocouple to measure stack velocity, pressure and temperature
- A heated Pyrex glass filter holder containing an untared, Teflon coated, 100-mm Whatman 934 AH glass fiber filter

- A Pyrex glass impinger train in an icebath (impingers 1 and 2 contained 100-ml of 0.1N H_2SO_4; impingers 3 and 4 contained 100-ml of 0.1N NaOH; bubbler 5 contained a weighed amount of silica gel)
- An umbilical to connect the probe and sample box to the control module
- A control module containing a vacuum pump, a calibrated dry gas meter and a calibrated orifice meter to measure the pressure, temperature and flowrate throughout the train.

The sampling train was charged in the mobile lab using freshly prepared reagents. Each impinger and its contents was weighed to the nearest 0.1 gm on a calibrated electronic balance. Blanks of all filters and reagents were retained for subsequent analysis. The sampling point locations were marked on the probe using a high-temperature marker. The sampling train was completely assembled and lifted to the sampling site.

4.6 SAMPLING PROCEDURES FOR HCl/Cl_2 SAMPLING TRAIN

Prior to a test, the sampling train was heated and leak-checked at 15-inches Mercury to insure leakage was less than 0.02 cfm or 4% of the average sampling rate. The S-type pitot tube was also leak-checked. The sampling train was installed on the unirail and the probe was inserted into the stack at the farthest point. A constant sampling rate was calculated using an HP-41CV calculator for each sampling point on the traverse (6 points per traverse; 4 traverses at 90°). Each point was sampled for an equal period of time (3 minutes) and all pertinent data were recorded on the data sheet for each point. The probe and sample box were maintained at 250°F throughout the traverse. The gases leaving the impinger train were maintained at <68°F. At the end of a traverse, the probe was withdrawn from the stack and the entire sampling train was transferred intact to the next sampling port. The remaining traverses of the stack were completed and the sampling train was withdrawn for the final leak-check. This leak-check was performed at 15-inches Mercury or at the highest vacuum achieved during the test. The S-type pitot tube was also checked at this time. If liquid droplets were present in the filter holder, the train was purged for 15 minutes with clean ambient air to evaporate the droplets. The filter holder and impinger train were sealed with aluminum foil and lowered to the mobile lab for sample recovery.

4.7 SAMPLE RECOVERY PROCEDURES FOR HCl/Cl_2 SAMPLING TRAIN

Sample recovery for the nozzle and probe occurred on the stack. The nozzle and probe were brushed and rinsed three times using distilled water into a polyethylene sample bottle.. Sample recovery for the filter holder and impinger train occurred in the mobile lab. The 100-mm filter was removed from the 4-inch filter holder and sealed in its petri dish. The front half of the 4-inch glass filter holder was brushed and rinsed with distilled water. Each impinger was removed from the icebath, wiped dry and weighed to the nearest 0.1 gm. The contents of impingers 1 and 2, and 3 and 4 were transferred to separate glass sample bottles. The back half of the 4-inch glass filter holder, the glass connectors, impingers 1 and 2 were rinsed with distilled water and the rinsings were transferred to the glass sample bottle. The glass connectors and impingers 3 and 4 were rinsed with distilled water and the rinsings were transferred to the other glass sample bottle. All sample bottles and petri dishes were marked, labeled and sealed. A chain-of-custody log was completed and the field data sheet was also labeled with the sample ID numbers. The sampling train was then recharged in preparation for the next test.

4.8 SAMPLING PROCEDURES FOR CONTINUOUS MONITORING

The continuous monitors used in the Steiner Environmental Mobile Monitoring Lab are shown in Table 4-1. Figure 4-1 is a schematic of the continuous emission monitoring system (CEMS). The procedures used to continuously monitor the stack gases for NO_x, CO, CO_2 and O_2 strictly follow EPA Methods 7E and 3A.

Sample was taken from the stack (24 points) using a water cooled 316 stainless steel probe. Sample gas was transported through a heated Teflon sample line (maintained at >250°F) by a Teflon-lined diaphragm pump to a 316 stainless steel refrigeration type conditioner (Hankison Model E-4G-SSO. The sample gas was passed through the conditioner two separate times under vacuum before entering the pump, then two additional times under pressure. The clean, dry sample gas (approximately 35°F) was then transported to the continuous analyzer system through an unheated Teflon line. A series of flowmeters, valves, and regulators maintained constant flow through the system at a constant pressure.

Prior to the test program, the CEMS was assembled and leak-checked. The water cooled sample probe was sealed with a cap and the flow through the individual rotameters was observed. The leak-check was successful if the pressure at the analyzer system and the flow through the rotameters all dropped to zero. A leak-check of the entire CEMS was performed before and after each test to insure no leaks occurred during movement of the sample probe from port to port.

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

NO_x CHEMILUMINESCENT ANALYZER – THERMO ELECTRON MODEL 10

Response Time (0-90%)	1.5 sec – NO mode; 1.7 sec – NO_x mode
Zero Drift	Negligible after 1/2 hour warmup
Linearity	±1% of full scale
Accuracy	Derived from the NO or NO_2 calibration gas, ±1% of full scale
Output	0-10 V
Operating Ranges	0-2, 10, 25, 100, 250, 1000, 2500 and 10,000 ppm
Flowrate = 2 scfh	0-2.5

O_2 ANALYZER, FUEL TYPE – TELEDYNE MODEL 326

Response Time (0-90%)	60 seconds
Accuracy	±1% of scale at constant temperatures; ±1% of scale of ±5% of reading, whichever is greater, over the operating temperature range
Output	0-1 V
Operating Ranges	0-5%, 10%, 25% O_2
Flowrate	2 scfh

CO_2/CO INFRARED ANALYZER – ANARAD MODEL AR-600

Response Time (0-90%)	5 seconds
Zero Drift	±1%
Span Drift	±1%
Linearity	1%
Resolution	Less than 1% of full scale
Output	0-1 V
Operating Ranges	0-20% CO_2/0-10,000 ppm CO
Flowrate	1000 cc/min

CO GAS FILTER CORRELATION – THERMO ELECTRON MODEL 48

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

SO_2 UV ANALYZER – DUPONT MODEL 400

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

STRIP CHART RECORDERS (3) – LINSEIS 7025

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

SCOTSMAN TRAILER

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

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

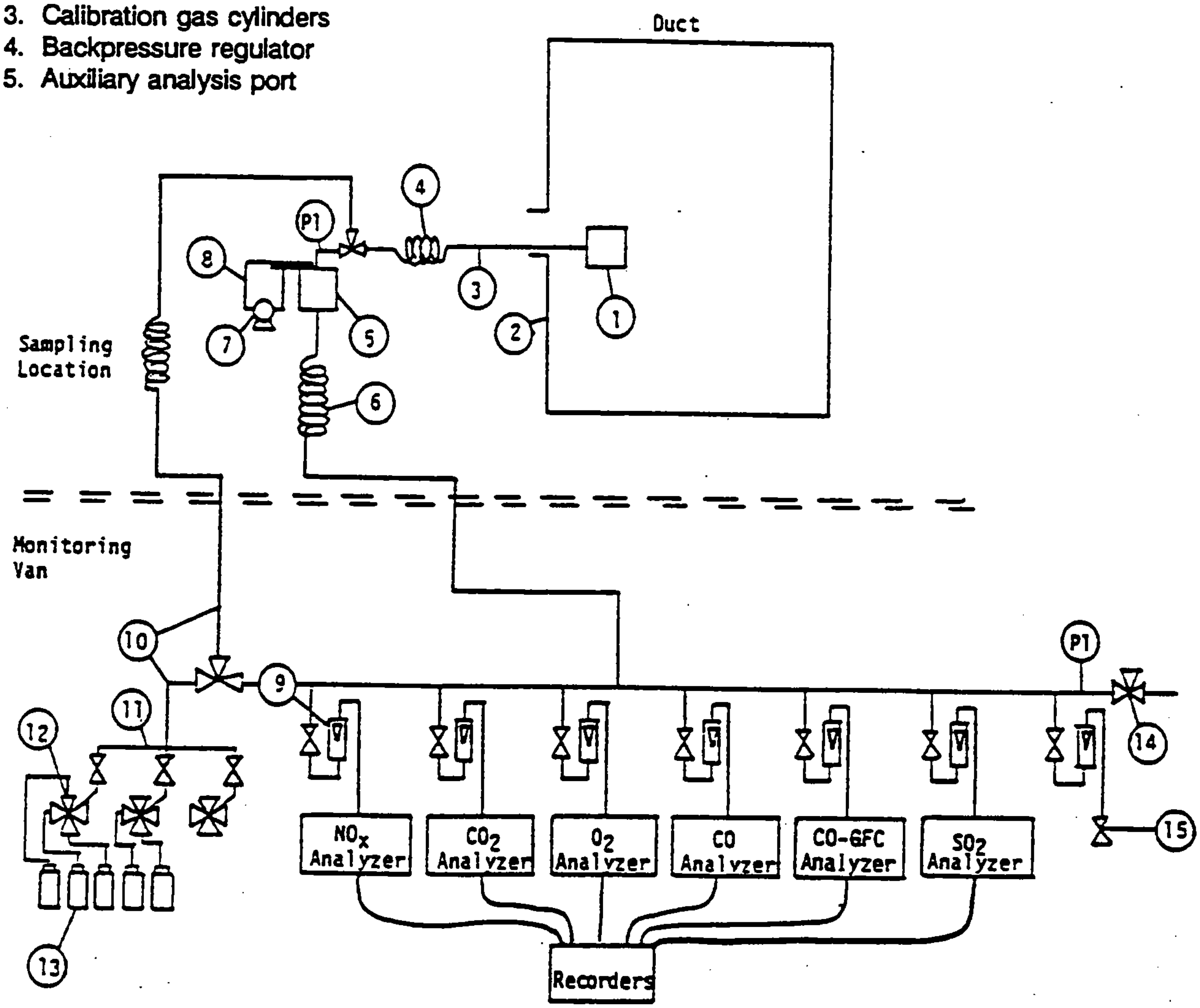


FIGURE 4-1. SCHEMATIC OF CONTINUOUS MONITORING SYSTEM

High range calibration gases (EPA Protocol 1) for NO_x CO, CO_2 and O_2 were then introduced into each analyzer to calibrate the analyzer and recorder via a Environics gas diluter. Once these adjustments were completed, the analyzer calibration error checks were performed. Zero, mid-range and high-range calibration gases were introduced to the gas analyzers. No adjustments were made to the system except those necessary to achieve the proper calibration gas flowrate. The analyzer responses to each calibration gas were recorded on the CEMS field data sheet. If the difference between the gas concentration exhibited by each gas analyzer and the known concentration of each calibration gas, when each calibration gas was introduced directly to each analyzer, was less than ±2% of span for any calibration gas, the check was considered successful. Next, a sampling system bias check was performed by introducing calibration gases at the sample probe. A zero gas and either the mid-range or high-range calibration gas, whichever most closely approximated the stack gas concentrations, was used for this check. No adjustments were made to the system except those necessary to achieve the proper calibration gas flowrate. At the same time, the measurement system response time (95% of gas value) was determined for both the zero and upscale gases. The sampling system bias check was considered valid if the difference between the gas concentrations displayed by the measurement system for the analyzer calibration error check and the sampling system bias check were less than ±5% of span.

The CEMS was now ready for the interference response test for NO_x, CO, CO_2 and O_2 which was performed in accordance with Section 5.4 of EPA Method 20. Each high-range calibration gas was introduced into the measurement system and the responses for the individual analyzers was recorded. If the response of each analyzer to the other interfering gases was less than ±2% of span, the system was considered to be interference free.

An EPA Protocol 1 gas was introduced directly into the NO_x analyzer (by passing the Environics dilution device) to audit the calibration of the NO_x analyzer.

Each reference method run was 72 minutes in duration.

At the end of each run, the zero and upscale sampling system bias check was repeated. Zero drift and calibration drift determinations were made by calculating the difference in the measurement system output reading from the initial and final calibration response for both the zero and upscale gases. If the drift in either case was less than ±3% of span, then the drift was considered acceptable. If the sampling system bias check was less than ±5% of span, the run was considered valid.

The measured gas concentrations were corrected for sampling system bias in accordance with Section 8 equation 6C-1 of EPA Method 6C.

4.9 SAMPLING PROCEDURES FOR FIXED GASES AND HYDROCARBONS

The sampling train for the fixed gases and hydrocarbons consisted of a probe (4 feet of stainless steel) and a Summa canister. A single point grab sample of the stack gases was collected over a one minute period. After sample collection, the canister was lowered to the mobile lab for subsequent analysis. Triplicate grab samples were collected during the test series.

4.10 SAMPLING PROCEDURES FOR TRACE HYDROCARBONS

The sampling train for hydrocarbons consisted of a probe (4 feet of stainless steel), a Teflon sample line, a Xitech bag sampler and a

Tedlar bag. The entire train was purged with stack gas three times before collecting a sample. An integrated grab sample of the stack gases was collected over a two minute test period. After sample collection, the Tedlar bag was lowered to the mobile lab for subsequent analysis. Triplicate grab samples were collected during the test series.

SECTION 5

ANALYSIS PROCEDURES

This section of the report describes the procedures used to analyze the samples collected during the test program. All SO_2, SO_3, HCl and Cl_2 analyses were performed in the Steiner Environmental climate-controlled laboratory in Bakersfield. All fixed gas and hydrocarbon analyses were performed by AtmAA, Inc. in Chatsworth, California. Analysis of the landfill gas was done by Pacific Gas Technology (PGT) in Bakersfield, California.

5.1 ANALYSIS OF SO_2/SO_3 SAMPLES

5.1.1 Filterable Particulate Sulfate

The 80% IPA washings residue and the 100-mm filter were combined and then leached with distilled water to remove sulfate and the leachate was diluted to 100-ml. An aliquot was passed through ion exchange resin and titrated against 0.01N $BaCl_2$ (which was previously standardized against 0.0100N H_2SO_4) using the barium-thorin titration procedure specified in EPA Method 8. The acetone blank and 100-mm filter blank were treated in an identical manner.

5.1.2 SO_3

The 47-mm glass fiber filter was leached with distilled water and the leachate was added to the contents and washings from impinger 1. The volume was measured and a 10-ml aliquot was removed for sulfate analysis using the barium-thorin titration procedure. A blank 47-mm filter and 80% IPA solution were treated in the same manner.

5.1.3 SO_2

The volume of contents and washings from bubbler 2 and impinger 3 was measured and an aliquot was analyzed for sulfate using the barium-thorin procedure. A 3% H_2O_2 blank was treated in the same manner.

5.2 ANALYSIS OF HCl SAMPLES

The total volume of sample was measured. A 25-ml aliquot of the liquid was taken from the sample bottle. The Cl^- content was determined directly using a calibrated (two points) specific ion electrode. The 25-ml aliquot was placed in a 100-ml beaker with a Teflon stir bar. Chloride ionic strength adjuster (CISA) solution was added to the sample solution (1:1). The electrode was rinsed with distilled water, immersed in the liquid and allowed to reach a stable reading. A blank of the 0.1N H_2SO_4 impinger solution was treated in an identical manner. Some samples were analyzed in duplicate while others were spiked. A known standard was analyzed with the samples.

5.3 ANALYSIS OF Cl_2 SAMPLES

The total volume of sample was measured. A 25-ml aliquot of the liquid was taken from the sample bottle. The Cl^- content was determined directly using a calibrated (two points) specific ion electrode. The 25-ml aliquot was placed in a 100-ml beaker with a Teflon stir bar. Chloride ionic strength adjuster (CISA) solution was added to the sample solution (1:1). The electrode was rinsed with distilled water, immersed in the liquid and allowed to reach a stable reading. A blank of the 0.1N NaOH impinger solution was treated in an identical manner. Some samples were analyzed in duplicate while others were spiked. A known standard was analyzed with the samples.

5.4 ANALYSIS OF THE FIXED GASES AND THE HYDROCARBON SAMPLES

The organic content of the sample fraction collected in each canister was measured by injecting a portion into the FID/TCA analysis system which used two-phase gas chromatography (GC) column to separate carbon monoxide (CO), methane (CH_4) and carbon dioxide (CO_2) from each other and from the total gaseous non-methane organics (TGNMO) which were eluted as a backflush peak. All eluted components were first oxidized to CO_2 by a hopcalite catalyst and then reduced to methane by a nickel catalyst. The resulting methane was detected using the flame ionization detector.

A gas standard containing CO, CH_4, CO_2 and propane, prepared by Scott Specialty Gases, traceable to NBS, was used to calibrate the FID/TCA analysis system.

5.5 FUEL

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

TABLE 5-1. FUEL ANALYSIS METHODS

LABORATORY TEST PROCEDURES FOR FUEL OILS AND FUEL GASES

Reference: EPA Title 40, Section 60.45

FUEL OIL TESTS:	
Sediment and Water, Vol. %	ASTM D4007-81
Gravity by Hydrometer (API)	ASTM D1298-80
API Gravity Corrected to 60°F	ASTM Table 5A
Gross Calorific Value (Btu/lb)	ASTM D2015-77
Ultimate Analysis (C, H, O, N, S, wt. %)	
Carbon, Hydrogen	ASTM D3178-73
Nitrogen (chemiluminescence detector)	ASTM D3431-80
Sulfur	ASTM D2622-82
Ash	ASTM D482
Oxygen	ASTM D3176-74
GASEOUS FUELS BY GAS-LIQUID CHROMATOGRAPHY:	
Gas Analysis	ASTM D1945-81
Sulfur Analysis	CPA B16
Calculation of Gross Calorific Value	ASTM D3588-81
Component Weight %, F-factor calculations	EPA 40:60.45
PROCEDURES FOR SCRUBBER LIQUOR ANALYSIS:	
Specific Gravity	ASTM D1429
Chlorides	ASTM D512-67

PACIFIC GAS TECHNOL

PGT

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

GAS ANALYSIS BY CHROMATOGRAPH

STEINER ENVIRONMENTAL, INC
4930 Boylan Street
Bakersfield, CA 93308

Attention: Jim Steiner

RECEIVED
OCT 07 1992
By

SAMPLED: SEPTEMBER 23, 1992
SUBMITTED: SEPTEMBER 30, 1992
REPORTED: OCTOBER 6, 1992
LAB # 4706-1

Sample ID : BFI\ARBOR HILLS, MI
FLARE INLET
TEST #1 & #2
METHANE GAS

STEINER ID # 33753

ANALYZED GAS	MOLE %	WT %	CHONS WT %	
OXYGEN	1.60	1.84	CARBON	39.53
NITROGEN	6.68	6.71	HYDROGEN	7.69
CARBON DIOXIDE	38.52	60.83	OXYGEN	46.07
HYDROGEN	ND	0.00	NITROGEN	6.71
CARBON MONOXIDE	ND	0.00	SULFUR	0.00
HYDROGEN SULFIDE	ND	0.00		
METHANE	53.20	30.62		
ETHANE	ND	0.00		
PROPANE	ND	0.00		
iso-BUTANE	ND	0.00		
n-BUTANE	ND	0.00		
iso-PENTANE	ND	0.00		
n-PENTANE	ND	0.00		
HEXANE +	ND	0.00		
TOTAL:	100.00			

SPECIFIC GRAVITY * : 0.962

SPECIFIC VOLUME : 15.15 cu ft/lb

HYDROGEN SULFIDE : ppm (GC/FPD)
STEINER ID# :

TOTAL * BTU/cu ft	DRY :	537		NET * BTU/cu ft	DRY :	484
	WET :	528			WET :	475
BTU/lb	:	8133		BTU/lb	:	7324

* CALCULATED ACCORDING TO : ASTM D-3588

PACIFIC GAS TECHNOLOGY

PGT

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

GAS ANALYSIS BY CHROMATOGRAPH

STEINER ENVIRONMENTAL, INC
4930 Boylan Street
Bakersfield, CA 93308

Attention: Jim Steiner

RECEIVED
OCT 07 1992
By

SAMPLED: SEPTEMBER 24, 1992
SUBMITTED: SEPTEMBER 30, 1992
REPORTED: OCTOBER 6, 1992
LAB # 4706-2

Sample ID : BFI\ARBOR HILLS, MI
FLARE INLET
TEST #3 & #4
METHANE GAS

STEINER ID # 33771

ANALYZED GAS	MOLE %	WT %	CHONS WT %	
OXYGEN	1.57	1.80	CARBON	39.62
NITROGEN	6.45	6.48	HYDROGEN	7.71
CARBON DIOXIDE	38.67	61.04	OXYGEN	46.19
HYDROGEN	ND	0.00	NITROGEN	6.48
CARBON MONOXIDE	ND	0.00	SULFUR	0.00
HYDROGEN SULFIDE	ND	0.00		
METHANE	53.31	30.67		
ETHANE	ND	0.00		
PROPANE	ND	0.00		
iso-BUTANE	ND	0.00		
n-BUTANE	ND	0.00		
iso-PENTANE	ND	0.00		
n-PENTANE	ND	0.00		
HEXANE +	ND	0.00		
TOTAL:	100.00			

SPECIFIC GRAVITY * : 0.962

SPECIFIC VOLUME : 15.15 cu ft/lb

HYDROGEN SULFIDE : ppm (GC/FPD)
STEINER ID# :

TOTAL * BTU/cu ft	DRY :	538	NET * BTU/cu ft	DRY	:	485
	WET :	529		WET	:	476
BTU/lb	:	8149	BTU/lb		:	7340

* CALCULATED ACCORDING TO : ASTM D-3588

TECHNOLOGY

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

GAS ANALYSIS BY CHROMATOGRAPH

RECEIVED
OCT 07 1992
By

ER ENVIRONMENTAL, INC
Boylan Street
ersfield, CA 93308

Attention: Jim Steiner

SAMPLED: SEPTEMBER 25, 1992
SUBMITTED: SEPTEMBER 30, 1992
REPORTED: OCTOBER 6, 1992
LAB # 4706-3

Sample ID : BFI\ARBOR HILLS, MI
FLARE INLET
TEST #5 & #6
METHANE ~~GAS~~

STEINER ID # 33794

ANALYZED GAS	MOLE %	WT %	CHONS WT %	
OXYGEN	0.37	0.43	CARBON	42.35
NITROGEN	1.73	1.75	HYDROGEN	8.27
CARBON DIOXIDE	40.97	64.93	OXYGEN	47.64
HYDROGEN	ND	0.00	NITROGEN	1.75
CARBON MONOXIDE	ND	0.00	SULFUR	0.00
HYDROGEN SULFIDE	ND	0.00		
METHANE	56.93	32.89		
ETHANE	ND	0.00		
PROPANE	ND	0.00		
iso-BUTANE	ND	0.00		
n-BUTANE	ND	0.00		
iso-PENTANE	ND	0.00		
n-PENTANE	ND	0.00		
HEXANE +	ND	0.00		
TOTAL:	100.00			

SPECIFIC GRAVITY * : 0.958

SPECIFIC VOLUME : 15.30 cu ft/lb

HYDROGEN SULFIDE : ppm (GC/FPD)
STEINER ID# :

TOTAL * BTU/cu ft	DRY :	575		NET * BTU/cu ft	DRY :	518
	WET :	565			WET :	509
BTU/lb	:	8798		BTU/lb	:	7919

* CALCULATED ACCORDING TO : ASTM D-3588

SECTION 6

QUALITY ASSURANCE

6.1 MANUAL SAMPLING EQUIPMENT

A detailed record of repair and maintenance to each sampling train is kept. Preventative maintenance to each system is performed periodically to avoid complete component breakdown during a field test.

A detailed record of sampling system calibrations is also kept. Calibration data for the sampling nozzles, pitot tubes, dry gas meters and orifice meters are available for review. Results of the EPA Quality Assurance Branch biannual audits of the dry gas meter and orifice meter combinations are also logged and verify our in-house calibration data. The calibration data for the equipment used on this program can be found in Appendices A and B.

6.2 LAB ANALYSIS

All field samples are assigned a label and an ID number. This ID is also affixed to a chain-of-custody log and to the field data sheet to eliminate any chance of sample mixup.

Prior to analysis, all glassware is thoroughly cleaned (soap and water, tap water rinse, distilled water rinse, IPA rinse) to eliminate any contamination. The evaporating dishes used to evaporate the washings are treated the same as a sample (dried in an oven, desiccated and weighed repeatedly at 6-hour intervals until a constant weight is achieved). The glassware used to measure volumes and make transfers and dilutions are all NBS Class A to insure accurate measurements. All weighings are carried out on a Sartorius Research Model R160P electronic semi-micro balance supported by a marble table in a separate room from the main analytical laboratory. The balance is calibrated regularly against an NBS Class S-1 weight.

All reagents used in the field and in the laboratory are ACS reagent grade and blanks of these reagents are evaluated for every set of tests. Blanks are taken in the field from the squeeze bottles and not the original container. Records are kept on these blanks to insure consistent quality of the reagents. Prior to use, the IPA is also analyzed to insure no peroxides are present which could lead to high SO_3 and low SO_2 values.

A quality control program consisting of duplicate analyses (to measure precision), spikes (to measure recovery efficiency) or analysis of blind standards supplied by EPA's Quality Assurance Branch (to measure accuracy) is implemented for each test program. Table 6-1 summarizes the results of the QC checks on this program. Records of our lab's participation in the EPA biannual audits for SO_2 are kept on file and verify our in-house QA/QC effort.

6.3 QUALITY ASSURANCE/QUALITY CONTROL FOR CONTINUOUS MONITORS

The results of the checks performed on the Steiner Environmental CEMS during the test program appear in the Appendix B. All checks were within the limits specified by the test methods.

The interference tests performed on the NO_x and O_2 analyzers using EPA Method 20 were all negative (no interference).

The results of the NO_x audits performed directly at the NO_x analyzer using a separate EPA Protocol 1 gas (39.6 ppm NO_x) were as follows: Tests #1 and #2 - 40.0 ppm; Tests #3 and #4 - 38.5 ppm; Tests #5 and #6 - 39.6 ppm. The multipoint calibration of the analyzers performed with EPA Protocol 1 gases and the Environics gas diluter were in excellent agreement with the audits.

TABLE 6-1. QA/QC RESULTS

Test No.	Test Parameter	Duplicate (%)	Recovery (%)
3	HCl	102.5	
4	HCl		95.5
3	Cl_2	100.0	
4	Cl_2		95.2
5	Filterable Sulfate	96.9	
6	Filterable Sulfate		98.4
	EPA SO_2 Lot 0584 5XXX		99.6
5	SO_3		100.4
6	SO_3	98.8	
5	SO_2	103.0	
6	SO_2		100.0
	EPA SO_2 Lot 0584 5XXX		99.9

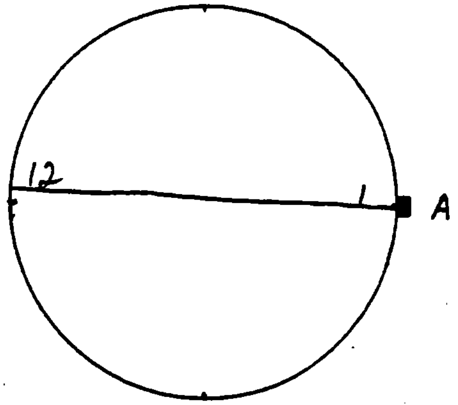
APPENDIX A

STEINER ENVIRONMENTAL INLET DATA

Steiner Environmental, Inc.

SAMPLING POINT LOCATION DATA SHEET

Plant B.F.I. Arbor Hills
Date 9-22-92
Test Location Flare inlet
Upstream Dist./Dia. 31" / 1.94 Ø
Downstream Dist./Dia. 32" / 2.0 Ø
No. of Sampling Points 12
Stack Dimension 16"
Coupling Length 1"
1 - .5 -inch MPT/[✓ FPT]/Flange



XEQ PNT

Sample Point	Dist	Sample Point	Dist	Sample Point	Dist	Sample Point	Dist
1	1.3						
2	2.1						
3	2.9						
4	3.8						
5	5.0						
6	6.7						
7	11.3						
8	13.0						
9	14.2						
10	15.1						
11	15.9						
12	16.7						

SAMPLING POINT RELOCATION: #1 to 1.5
#12 to 16.5

Steiner Environmental, Inc.

VELOCITY TRAVERSE DATA SHEET

Plant BFI Arbor Hills
Date 9-24-92
Test Location Flare Inlet
Static Pressure (in. wg) 0 - 9.4" Hg
Barometric Pressure 29.33
Probe Type/Length N/A
Pitot Coefficient 0.99
Stack Dimension 16.0"

Time: 12:29 Time: Time: Time:

Smpl Pt.	ΔP	T_s	Smpl Pt.	ΔP	T_s	Smpl Pt.	ΔP	T_s	Smpl Pt.	ΔP	T_s
A-1	0.73	75									
2	1.30	76									
3	1.55	76									
4	1.65	76									
5	1.70	76									
6	1.55	76									
7	1.45	76									
8	1.30	75									
9	1.15	75									
10	1.15	75									
11	1.03	75									
12	0.90	71									

0.10

34

SAMPLING POINT RELOCATION #1 to 1.5"
#12 to 16.5"

7487 acfm
4871 dscfm

Avg. $\sqrt{\Delta P}$ = 1.1271
Avg. ΔP =
Avg. T_s = 75.17

VelTrav.Frm (1/91)

VELOCITY TRAVERSE DATA SHEET

Plant BFI Arbor Hills

Date 9/24/92

Test Location Inlet

Static Pressure (in. wg) -9.2" Hg

Barometric Pressure 29.31

Probe Type/Length SS/3'

Pitot Coefficient 0.99

Stack Dimension 16

Time: 5:29 | Time: | Time: | Time:

Sample Point	ΔP	T_s	Angle	Sample Point	ΔP	T_s	Angle	Sample Point	ΔP	T_s	Angle	Sample Point	ΔP	T_s	Angle
A 1	0.85	75													
2	1.35	75													
3	1.40	75													
4	1.70	75													
5	1.65	75													
6	1.50	75													
7	1.55	75													
8	1.35	75													
9	1.20	75													
10	1.00	75													
11	0.90	75													
12	0.80	76													

SAMPLING POINT RELOCATION

VELTRAV.FRM(9/92)

Avg. $\sqrt{\Delta P}$ = 1.1054

Avg. ΔP =

Avg. T_s = 75.08

Angle ° =

VELOCITY TRAVERSE DATA SHEET

Plant BFI Arbor Hills
Date 9/25/92
Test Location Inlet
Static Pressure (in. wg) - 9.4 "Hg

Barometric Pressure 29.21
Probe Type/Length SS/3'
Pitot Coefficient 0.99
Stack Dimension 16

Time: 11:08 | Time: | Time: | Time:

Sample Point	ΔP	T_s	Angle	Sample Point	ΔP	T_s	Angle	Sample Point	ΔP	T_s	Angle	Sample Point	ΔP	T_s	Angle
A 1	0.98	75													
2	1.45	75													
3	1.45	75													
4	1.60	75													
5	1.65	74													
6	1.55	74													
7	1.50	74													
8	1.55	74													
9	1.20	74													
10	1.05	74													
11	0.93	74													
12	0.75	74													

11:15

SAMPLING POINT RELOCATION

VELTRAV.FRM(9/92)

Avg. $\sqrt{\Delta P}$ = 1.1275

Avg. ΔP =

Avg. T_s = 74.33

Angle ° =

PLANT B.F.I. Arbor Hills TEST TYPE M-2/4 FIELD TEST DATA SHEET (Page 1 of 1)

Date 9-24-92
Test Location Flare Inlet
Run Number # 1
Stack Diameter 16.0"
Operator SW
Filter No. N/A

Barometric Pressure 29.31 "
Static in.wg. N/A
Probe Type/Length N/A
Pitot Coefficient N/A
Meter Box No./Y 6825355/0.9832
Nozzle No./Size STRAIGHT

IMPINGER	VOLUMES/WEIGHTS		
Contents	Final	Initial	Net
DI	561.4	547.1	14.3
DI	520.4	519.7	0.7
DRY	435.3	435.3	0.0
S.G.	648.5	641.9	6.6
		TOTAL	21.6

GAS COMPOSITION			
Time	CO_2	O_2	CO
Leakrate	cfm		"Hg
Initial	0.007		MAX
Final	0.007		MAX

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft³	TEMPERATURE °F						Pump Vacuum in.Hg	√ΔP	Comments
					Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out			
1	13:20	N/A	N/A	012.937	N/A	N/A	N/A	62	N/A	71	MAX	N/A	
	5			015.855				62		72			
	10			018.711				64		72			
	15			022.140				63		73			
	20			025.006				64		73			
	25			027.453				64		73			
	30			030.659				65		74			
END TEST	13:55			033.557									
T/A	35 MIN			20,620						72.57			

Forms: Fielddat.frm

Steiner Environmental, Inc.

PLANT BFI Arbor Hills TEST TYPE M-2-4 FIELD TEST DATA SHEET (Page 1 of 1)

Date 9-24-92
Test Location FLARE INLET
Run Number #2
Stack Diameter 16.0"
Operator SW
Filter No. N/A

Barometric Pressure 29.30
Static in.wg. N/A
Probe Type/Length N/A
Pitot Coefficient N/A
Meter Box No./Y 6825355/0.9832
Nozzle No./Size STRAIGHT

[IMPINGER VOLUMES/WEIGHTS]

Contents	Final	Initial	Net
DI	577.8	561.4	16.4
DI	521.4	520.4	1.0
DRY	435.5	435.3	0.2
S.G.	654.8	648.5	6.3
		TOTAL	23.9

[GAS COMPOSITION]

Time	CO_2	O_2	CO
Leakrate		"Hg
Initial	0.003	MAX
Final	0.003	MAX

[TEMPERATURE °F]

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft³	Stack	Probe	Oven	Imp.	Gas Meter IN	Gas Meter OUT	Pump Vacuum in.Hg	√ΔP	Comments
1	17:46	N/A	N/A	034.385	N/A	N/A	N/A	65	N/A	71	MAX	N/A	
	5			037.375				62		71			
	10			040.380				61		72			
	15			043.372				60		71			
	20			046.360				59		71			
	25			049.338				59		71			
	30			052.320				59		71			
END TEST	18:21			055.299									
T/A	35.MIN			20.914						71.14			

Steiner Environmental, Inc.

PLANT BFI Arbor Hills TEST TYPE M/2/4 FIELD TEST DATA SHEET (Page 1 of 1)

Date 9-25-92
Test Location Flare Inlet
Run Number #3
Stack Diameter 16.0"
Operator SW
Filter No. N/A

Barometric Pressure 29.
Static in.wg. N/A
Probe Type/Length N/A
Pitot Coefficient N/A
Meter Box No./Y 6825355/0.9832
Nozzle No./Size STRAIGHT

[IMPINGER VOLUMES/WEIGHTS]

Contents	Final	Initial	Net
DI	5739	559.4	14.5
DI	529.8	528.3	1.5
dry	435.7	435.5	.2
S.G.	659.9	652.4	7.5
		TOTAL	23.7

[GAS COMPOSITION]

Time	CO₂	O₂	CO

Leakrate		"Hg
Initial	0.002	MAX
Final	0.003	MAX

[TEMPERATURE °F]

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft³	Stack	Probe	Oven	Imp.	Gas Meter		Pump Vacuum in.Hg	√ΔP	Comments
									IN	OUT			
1	11:40	N/A	N/A	055.952	N/A	N/A	N/A	70	N/A	88	Max	N/A	
	5			059.023				68		89			
	10			062.097				66		89			
	15			065.121				62		91			
	20			068.258				63		91			
	25			071.317				61		92			
	30			074.398				64		92			
END TEST	12:15			077.380									
T/A	35 min			21.428						90.28			

SOURCE TEST CALCULATIONS - SYMBOLS

```
 PLANT :                                         RUN NO.:
                                                 DATE   :

                      T(std)   =        68 DEG. F

 METER TEMP.     = Tm      DEG. F   !   STATIC PRESS.=  Pstatic    in. H2O
 STACK TEMP.     = Ts      DEG. F   !   Cp           =      0.840
 SQ.RT. dP       =         in. H2O  !   STACK I.D.   =             inch
 METER ORIFICE   = dH      in. H2O  !   DUCT LENGTH  =             inch
 METER VOLUME    = Vm      Cu.Ft.   !   DUCT WIDTH   =             inch
 METER Y         = Y                !   STACK AREA   =  As         Sq.Ft.
 BAR. PRESSURE   = Pb      in.Hg    !   TEST TIME    =  Time       min.
 COND.(Vlc)      = Vlc     ml       !   NOZZLE DIA.  =             inch

 GAS ANALYSIS    :    0.00  % O2           0.00  % CO
                      0.00  % CO2        100.00  % N2

************************************************************************

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460)......      =           dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vic       =           scf

Bws = Vw(std) / (Vm(std) + Vw(std))............      =         ! Lower
                                                               ! Bws
Bws @ Saturated Conditions = Vapor Press. of H2O               ! value
@ Dew Point Temp. / (Ps, in.Hg.)  .............      =         ! used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]    =

Ms = (Md x (1-Bws)) + (18.0 x Bws).............      =

P(stack) = Pbar + [Pstatic / 13.6] ............     =          in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
      / (Ms x Ps)] ............................      =           ft/sec

Qs = vs x As x 60 .............................      =          acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (Ps/29.92) ........................     =          dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std)/(Tstd +
    460)/ 29.92] x 100 / (Time x Ps x An x vs x 60) =           %
```

SOURCE TEST CALCULATIONS

PLANT : BFI ARBOR HILLS
FLARE INLET

RUN NO.: 3
DATE : SEPT 24,25,1992

STANDARD TEMP.: 68 DEG. F

METER TEMP. = 72.57 DEG. F
STACK TEMP. = 75.17 DEG. F
SQ.RT. dP = 1.1271 in. H20
METER ORIFICE = 1.00 in. H20
METER VOLUME = 20.620 Cu.Ft.
METER Y = 0.9832
BAR. PRESSURE = 29.31 in.Hg
COND.(Vlc) = 21.6 ml

STATIC PRESS.= -127.84 in. H20
Cp = 0.990
STACK I.D. = 16.00 inch
DUCT LENGTH = inch
DUCT WIDTH = inch
STACK AREA = 1.396 Sq.Ft.
TEST TIME = 35.00 min.
NOZZLE DIA. = inch

GAS ANALYSIS = 0.49 % O2 0.00 % CO
40.80 % CO2 58.71 % N2

****

Vm(std) = [T(std) + 460 / 29.92] x Vm x Y x
(Pb + (dH / 13.6)) / (Tm + 460)...... = 19.739 dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vic = 1.017 scf

Bws = Vw(std) / (Vm(std) + Vw(std))............ = 0.049 ! Lower

Bws @ Saturated Conditions = Vapor Press. of H20 ! Bws
@ Dew Point Temp. / (Ps, in.Hg.) .... ! value
= 0.044 ! used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 = 3.26

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)] = 27.81

Ms = (Md x (1-Bws)) + (18.0 x Bws).............. = 27.38

P(stack) = Pbar + [Pstatic / 13.6] .... = 19.91 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
/ (Ms x Ps)] .... = 94.52 ft/sec

Qs = vs x As x 60 .... = 7,918 acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
x (Ps/29.92) .... = 4,970 dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std)/(Tstd +
460)/ 29.92] x 100 / (Time x Ps x An x vs x 60) = %

SOURCE TEST CALCULATIONS

```
PLANT : BFI ARBOR HILLS                          RUN NO.:          4
        FLARE INLET                              DATE    : SEPT 24,25,1992

                    STANDARD TEMP.:      68 DEG. F

METER TEMP.     =    71.14 DEG. F    !   STATIC PRESS.=     -125.12 in. H2O
STACK TEMP.     =    75.08 DEG. F    !   Cp           =       0.990
SQ.RT. dP       =   1.1054 in. H2O   !   STACK I.D.   =      16.00 inch
METER ORIFICE   =     1.00 in. H2O   !   DUCT LENGTH  =            inch
METER VOLUME    =   20.914 Cu.Ft.    !   DUCT WIDTH   =            inch
METER Y         =   0.9832           !   STACK AREA   =      1.396 Sq.Ft.
BAR. PRESSURE   =    29.30 in.Hg     !   TEST TIME    =      35.00 min.
COND.(Vlc)      =     23.9 ml        !   NOZZLE DIA.  =            inch

GAS ANALYSIS    :     0.46  % O2             0.00  % CO
                     41.00  % CO2           58.54  % N2

*******************************************************************************

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460)......       =    20.068    dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc         =     1.125    scf

Bws = Vw(std) / (Vm(std) + Vw(std)).............       =     0.053 ! Lower
                                                                   ! Bws
Bws @ Saturated Conditions = Vapor Press. of H2O                   ! value
@ Dew Point Temp. / (Ps, in.Hg.)  ..............       =     0.044 ! used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =       3.07

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]      =     27.89

Ms = (Md x (1-Bws)) + (18.0 x Bws)..............       =     27.46

P(stack) = Pbar + [Pstatic / 13.6] ............       =     20.10 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x Ps)] ..............................       =     92.12    ft/sec

Qs = vs x As x 60 ..............................       =     7,717   acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (Ps/29.92) .........................       =     4,893   dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std)/(Tstd +
    460)/ 29.92] x 100 / (Time x Ps x An x vs x 60) =                %
```

SOURCE TEST CALCULATIONS

PLANT : BFI ARBOR HILLS
FLARE INLET

RUN NO.: 5
DATE : SEPT 24,25,1992

STANDARD TEMP.: 68 DEG. F

METER TEMP. = 90.28 DEG. F
STACK TEMP. = 74.33 DEG. F
SQ.RT. dP = 1.1275 in. H20
METER ORIFICE = 1.00 in. H20
METER VOLUME = 21.428 Cu.Ft.
METER Y = 0.9832
BAR. PRESSURE = 29.21 in.Hg
COND.(Vlc) = 23.7 ml

STATIC PRESS.= -127.84 in. H20
Cp = 0.990
STACK I.D. = 16.00 inch
DUCT LENGTH = inch
DUCT WIDTH = inch
STACK AREA = 1.396 Sq.Ft.
TEST TIME = 35.00 min.
NOZZLE DIA. = inch

GAS ANALYSIS : 0.44 % O2 0.00 % CO
40.40 % CO2 59.16 % N2

****

Vm(std) = [T(std) + 460 / 29.92] x Vm x Y x
(Pb + (dH / 13.6)) / (Tm + 460)...... = 19.785 dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vic = 1.116 scf

Bws = Vw(std) / (Vm(std) + Vw(std)).............. = 0.053 ¦ Lower

Bws @ Saturated Conditions = Vapor Press. of H20
@ Dew Point Temp. / (Ps, in.Hg.) .... = 0.043

¦ Bws ¦ value ¦ used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 = 2.90

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)] = 27.66

Ms = (Md x (1-Bws)) + (18.0 x Bws)............. = 27.25

P(stack) = Pbar + [Pstatic / 13.6] .... = 19.81 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
/ (Ms x Ps)] .... = 94.94 ft/sec

Qs = vs x As x 60 .... = 7,954 acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
x (Ps/29.92) .... = 4,982 dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std)/(Tstd +
460)/ 29.92] x 100 / (Time x Ps x An x vs x 60) = %

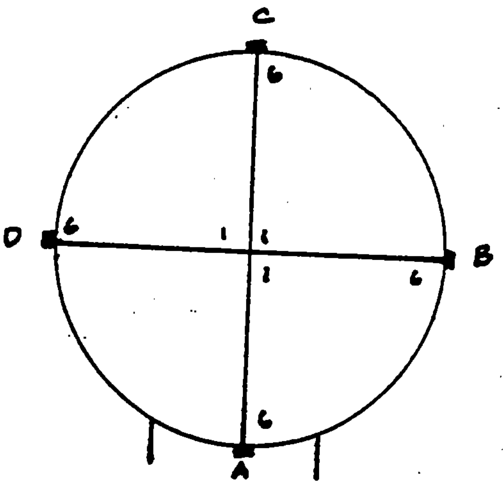
APPENDIX B

STEINER ENVIRONMENTAL OUTLET DATA

Steiner Environmental, Inc.

SAMPLING POINT LOCATION DATA SHEET

Plant BFI Arbor Hills
Date 9/22/92
Test Location Flare Outlet
Upstream Dist./Dia. 72.75"/ 0.5 Ø
Downstream Dist./Dia. 408.375"/ 2.9 Ø
No. of Sampling Points 24
Stack Dimension 139.5
Coupling Length 8
4, 3-inch [✓ MPT]/FPT/Flange



has hooks
needs scaffold
water cooled probe
heat blankets

50' rope
100' power

XEQ PNT

Sample Point	Dist	Sample Point	Dist	Sample Point	Dist	Sample Point	Dist
1	11.0						
2	17.3						
3	24.5						
4	32.7						
5	42.9						
6	57.6						

SAMPLING POINT RELOCATION: none

Steiner Environmental, Inc.

PLANT BFI Arbor Hills TEST TYPE M2/4 FIELD TEST DATA SHEET (Page 1 of 2)

Date 9/23/92

Test Location Flare Out

Run Number 1 - 2000°

Stack Diameter 189.6

Operator JB

Filter No. blank

Barometric Pressure 29.23

Static in.wg. -0.045

Probe Type/Length Q/7'

Pitot Coefficient 0.84

Meter Box No./γ 21313 /1.0098

Nozzle No./Size straight

[IMPINGER VOLUMES/WEIGHTS]

Contents	Final	Initial	Net
DI	611.2	557.9	53.3
DI	542.3	530.6	11.7
dry	435.8	432.8	3.0
S.G.	672.7	656.4	16.3
		TOTAL	84.3

[GAS COMPOSITION]

Time	CO₂	O₂	CO

Leakrate		"Hg
Initial	0.018	15
Final	0.010	5.

[TEMPERATURE °F]

Sample Point	1114 Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft³	Stack	Probe	Oven	Imp.	Gas Meter IN	Gas Meter OUT	Pump Vacuum in.Hg	√ΔP	Comments
C 1	0	0.11	2.00	413.480	1890	253	251	70	71	69	5.0	0.332	pitot ok
2		0.15	2.00	415.750	1854	208	238	68	71	69	5.0	0.387	
3	6	0.13	2.00	418.240	1960	265	243	67	70	68	5.0	0.361	Bwo = 0.0668
4		0.16	2.00	420.700	1967	285	245	67	70	66	5.0	0.400	ACFM = 245,025.62
5	12	0.12	2.00	422.870	1958	271	255	65	70	67	5.0	0.346	Qs = 49,885.90
6		0.10	2.00	425.268	1966	267	257	65	70	66	5.0	0.316	
	18			427.581									
B 1	1847 0	0.11	2.00	427.581	1876	228	229	69	76	72	5.0	0.332	
2		0.15	2.00	429.930	1997	252	243	65	76	72	5.0	0.387	
3	6	0.16	2.00	432.280	1914	252	227	58	75	71	5.0	0.400	
4		0.12	2.00	434.646	1973	254	225	59	75	71	5.0	0.346	
5	12	0.10	2.00	436.980	1909	253	223	60	74	69	5.0	0.316	
6		0.06	2.00	439.345	1964	251	226	60	74	69	5.0	0.245	
	18			441.900									

Steiner Environmental, Inc.

PLANT BFI Arbor Hills TEST TYPE M2/4 FIELD TEST DATA SHEET (Page 2 of 2

DATE 9/23/92 RUN NO. 1

TEST LOCATION Flare Out OPERATOR JB

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft³	TEMPERATURE °F						Pump Vacuum in.Hg	√ΔP	Comments
					Stack	Probe	Oven	Imp.	Gas Meter				
	12:16								In	Out			
A 1	0	0.12	2.08	441.900	1933	246	241	56	84	80	5.0	0.346	
2		0.10	2.00	444.245	1984	250	246	49	83	78	5.0	0.316	
3	6	0.11	2.00	446.600	1969	253	243	55	84	79	5.0	0.332	
4		0.09	2.00	448.942	1950	254	245	55	83	79	5.0	0.300	
5	12	0.09	2.00	451.310	1738	256	246	56	83	80	5.0	0.300	
6		0.04	2.00	453.690	1726	250	238	56	83	79	5.0	0.200	
	18			456.101									
B 1	12:46 0	0.10	2.00	456.101	1760	240	239	60	91	88	5.0	0.316	
2		0.10	2.00	458.420	1918	226	246	55	91	88	4.5	0.316	
3	6	0.10	2.00	460.870	1875	256	251	54	90	86	4.5	0.316	
4		0.13	2.00	463.175	1998	248	249	56	89	86	4.5	0.361	
5	12	0.08	2.00	465.555	1904	247	247	58	90	86	4.5	0.283	
6		0.03	2.00	467.979	1775	247	249	56	91	86	4.5	0.173	
	18			470.428									pitot ok
	72		2.00	56.948	1904.04				77.88			0.3220	

B-4

Steiner Environmental, Inc.

PLANT B.F.I. Arbor Hill TEST TYPE M 2/4 FIELD TEST DATA SHEET (Page 1 of 2

Date 9-23-92
Test Location Flare Out
Run Number #2
Stack Diameter 1895
Operator JF
Filter No. UNTARED

Barometric Pressure 29.32
Static in.wg. -0.05
Probe Type/Length Q/7'
Pitot Coefficient 0.84
Meter Box No./γ 21313/1.0098
Nozzle No./Size Straight

[IMPINGER VOLUMES/WEIGHTS]

Contents	Final	Initial	Net
DI	706.7	611.6	95.1
DI	605.7	584.5	21.2
DRY	444.4	441.4	3.0
S.G.	731.3	719.1	12.2
		TOTAL	131.5

[GAS COMPOSITION]

Time	CO₂	O₂	CO
Leakrate			"Hg
Initial	0.012		15
Final	0.005		5

[TEMPERATURE °F]

Sample Point	2:35 Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft³	Stack	Probe	Oven	Imp.	Gas Meter IN	Gas Meter OUT	Pump Vacuum in.Hg	√ΔP	Comments
D 1	0	0.12	2.00	473.096	1915	235	263	66	104	104	3.0	0.346	pitot ok
2		0.12	2.00	475.600	1936	254	252	62	109	105	3.0	0.346	
3	6	0.10	2.00	477.810	1950	253	246	62	109	105	3.0	0.316	
4		0.09	2.00	480.175	1787	256	253	62	108	104	3.0	0.300	
5	12	0.10	2.00	482.530	1858	255	260	62	107	103	3.0	0.316	
6		0.04	2.00	484.985	1799	254	261	63	105	103	3.0	0.200	
	18			487.399									
A 1	3:10 0	0.13	2.00	487.399	1926	241	242	66	107	106	3.0	0.361	
2		0.12	2.00	489.775	1985	258	254	59	108	106	3.0	0.346	
3	6	0.07	2.00	492.145	1732	257	247	57	108	105	3.0	0.265	
4		0.11	2.00	494.522	1790	256	251	57	106	104	3.0	0.332	
5	12	0.10	2.00	496.936	1908	258	251	57	105	102	3.0	0.316	
[illegible]		0.04	2.00	499.360	1837	256	259	58	102	101	3.0	0.200	
	18			501.775									

PLANT BFI Arbor Hills TEST TYPE M2/4 FIELD TEST DATA SHEET (Page 2 of 2)
DATE 9/23/92 RUN NO. 2
TEST LOCATION Flare Out OPERATOR JB

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	TEMPERATURE °F						Pump Vacuum in.Hg	√ΔP	Comments
					Stack	Probe	Oven	Imp.	Gas Meter				
									In	Out			
	3:42												
B 1	0	0.15	2.00	501.775	1945	242	248	69	100	98	3.0	0.387	
2		0.12	2.00	504.135	1943	265	259	68	99	97	3.0	0.346	
3	6	0.10	2.00	506.495	1827	264	242	68	100	98	3.0	0.316	
4		0.11	2.00	508.900	1843	258	248	67	100	99	3.0	0.332	
5	12	0.07	2.00	511.300	1750	257	254	65	100	98	3.0	0.265	
6		0.07	2.00	513.730	1779	256	242	65	99	97	3.0	0.265	
	18			516.144									
C 1	4:08 0	0.15	2.00	516.144	1912	240	254	69	99	98	3.0	0.387	
2		0.12	2.00	518.480	1792	265	256	69	99	97	3.0	0.346	
3	6	0.14	2.00	520.900	1999	264	258	65	98	97	3.0	0.374	
4		0.16	2.00	523.190	1919	263	260	66	99	97	3.0	0.400	
5	12	0.07	2.00	525.575	1887	258	260	67	100	98	3.0	0.265	
6		0.05	2.00	527.950	1791	257	257	67	101	99	3.0	0.224	pitot ok
	18			530.349									
	72		2.00	57.253	1860.79				101.88			0.3146	

Steiner Environmental, Inc.

PLANT BFI Arbor Hills TEST TYPE M26A FIELD TEST DATA SHEET (Page 1 of 2)

Date 9/24/92
Test Location Flare Out
Run Number 3
Stack Diameter 139.5
Operator JS
Filter No. 77-TFE

Barometric Pressure 29.33
Static in.wg. -0.05
Probe Type/Length Q/7'
Pitot Coefficient 0.84
Meter Box No./Y 21313 / 1.0098
Nozzle No./Size straight

[IMPINGER VOLUMES/WEIGHTS]

Contents	Final	Initial	Net
H_2SO_4	702.7	585.1	117.6
H_2SO_4	571.1	546.8	24.3
NaOH	530.3	527.4	2.9
NaOH	529.2	528.5	0.7
S.G.	730.2	714.7	15.5
		TOTAL	161.0

[GAS COMPOSITION]

Time	CO_2	O_2	CO

Leakrate		"Hg
Initial	0.012	15
Final	0.002	5.5

[TEMPERATURE °F]

Sample Point	10:29 Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft³	Stack	Probe	Oven	Imp.	Gas Meter IN	Gas Meter OUT	Pump Vacuum in.Hg	√ΔP	Comments
C 1	0	0.11	2.5	531.889	1785	225	249	62	102	101	5.0	0.332	pitot ok
2		0.11	2.5	534.525	1866	292	292	47	95	95	5.0	0.332	
3	6	0.16	2.5	537.149	1794	360	332	48	95	94	5.0	0.400	MAW 33754
4		0.12	2.5	539.805	1855	338	352	49	93	93	5.0	0.346	
5	12	0.12	2.5	542.480	1926	366	332	49	91	92	5.0	0.346	MR 33755
6		0.06	2.5	545.085	1735	371	329	49	91	91	5.0	0.245	
	18			547.768									H_2SO_4 33756
B 1	10:52 0	0.16	2.5	547.768	1775	195	191	61	91	91	5.0	0.400	
2		0.12	2.5	550.500	1872	326	264	51	91	91	5.0	0.346	NaOH 33757
3	6	0.14	2.5	553.014	1828	346	283	51	92	91	5.0	0.374	
4		0.14	2.5	555.665	1860	338	287	53	92	91	5.0	0.374	can 3 33758
5	12	0.13	2.5	558.250	1915	316	285	55	92	91	5.0	0.361	
6		0.08	2.5	560.080	1808	298	286	55	91	90	5.0	0.283	bag 3 33759
	18			563.524									

Steiner Environmental, Inc.

PLANT BFI Arbor Hills TEST TYPE M26A FIELD TEST DATA SHEET (Page 2 of 2)
DATE 9/24/92 RUN NO. 3
TEST LOCATION Flare Out OPERATOR JS

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft³	TEMPERATURE °F						Pump Vacuum in.Hg	√ΔP	Comments
									Gas Meter				
	11:24				Stack	Probe	Oven	Imp.	In	Out			
A 1	0	0.13	2.5	563.524	1909	251	225	70	90	89	5.0	0.361	Can 3 33760
2		0.15	2.5	566.135	1855	252	262	66	90	89	5.0	0.387	
3	6	0.11	2.5	568.752	1895	281	265	66	89	88	5.0	0.332	Bag 3 33761
4		0.10	2.6	571.385	1902	315	255	66	90	88	5.0	0.316	
5	12	0.11	2.5	574.010	1898	329	266	66	90	89	5.0	0.332	
6		0.07	2.5	576.645	1830	351	272	67	90	88	5.0	0.265	
	18			579.264									
D 1	18:51 0	0.12	2.5	579.264	1839	206	263	71	90	88	5.0	0.346	
2		0.12	2.5	581.840	1914	296	289	69	90	88	5.0	0.346	
3	6	0.08	2.5	584.444	1803	259	301	69	90	88	5.0	0.283	
4		0.09	2.6	587.070	1857	315	267	68	90	88	6.0	0.300	
5	12	0.06	2.5	589.710	1877	348	269	67	90	88	5.0	0.245	
6		0.04	2.5	592.340	1756	373	261	67	90	88	5.0	0.200	pitot ok
	18			595.003									
	72		2.5	63.114	1848.08				90.94			0.3272	

Steiner Environmental, Inc.

PLANT BFI Arbor Hills TEST TYPE M26A FIELD TEST DATA SHEET (Page 1 of 2 1)

Date 9/24/92
Test Location Flare Out
Run Number 4
Stack Diameter 139.5
Operator JS
Filter No. 82 TFE

Barometric Pressure 29.31
Static in.wg. - 0.04
Probe Type/Length Q/7'
Pitot Coefficient 0.84
Meter Box No./Y 21313/1.0098
Nozzle No./Size straight

[IMPINGER VOLUMES/WEIGHTS]

Contents	Final	Initial	Net
H_2SO_4	645.4	545.7	99.7
H_2SO_4	575.7	548.8	26.9
NaOH	539.1	536.1	3.0
NaOH	546.3	545.3	1.0
S.G.	681.0	661.1	19.9
		TOTAL	150.5

[GAS COMPOSITION]

Time	CO_2	O_2	CO

Leakrate		"Hg
Initial	0.011	15
Final	0.007	11

[TEMPERATURE °F]

Sample Point	2:48 Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Stack	Probe	Oven	Imp.	Gas Meter IN	Gas Meter OUT	Pump Vacuum in.Hg	√ΔP	Comments
B 1	0	0.13	2.5	595.518	1894	259	265	71	97	95	10.0	0.361	pitot ok
2		0.11	2.5	598.140	1907	261	237	69	97	95	10.0	0.332	
3	6	0.09	2.5	600.762	1854	301	226	67	97	95	10.0	0.300	can 2:13:30
4		0.07	2.5	603.385	1876	334	256	67	97	95	10.0	0.265	2:13:00 DB@ 50°
5	12	0.06	2.5	606.024	1829	346	278	67	97	94	10.0	0.245	bag 2:18:00
6		0.04	2.5	608.646	1756	357	250	67	97	94	10.0	0.200	2:25:00
	18			611.281									
A 1	3:17 0	0.06	2.5	611.281	1937	235	253	71	98	97	10.0	0.245	26 A 33762 FHW MAHANS 33753
2		0.13	2.5	613.915	1880	227	243	65	99	97	10.0	0.361	
3	6	0.11	2.5	616.525	1890	241	230	65	100	97	10.0	0.332	HF 33763 33771 Gas 3:4
4		0.10	2.5	619.149	1868	303	271	65	100	98	10.0	0.316	
5	12	0.08	2.5	621.810	1839	341	243	66	100	98	10.0	0.283	33764 H_2SO_4
6		0.06	2.5	624.388	1786	303	251	66	100	98	10.0	0.245	
	18			626.995									NaOH 33765

PLANT BFI Arbor Hills TEST TYPE M26A FIELD TEST DATA SHEET (Page 2 of 2)
DATE 9/24/92 RUN NO. 4
TEST LOCATION Flare Out OPERATOR JS

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	TEMPERATURE °F Stack	Probe	Oven	Imp.	Gas Meter In	Out	Pump Vacuum in.Hg	√ΔP	Comments
B 1	4:00 0	0.14	2.5	626.695	1983	230	250	68	100	98	9.0	0.374	
2		0.13	2.5	629.620	1960	318	253	53	100	98	9.0	0.361	
3	6	0.14	2.5	632.270	1940	325	247	55	100	97	9.5	0.374	Bag 5:05:45
4		0.14	2.5	634.905	1927	387	249	56	100	96	9.5	0.374	'A'
5	12	0.13	2.5	637.650	1813	373	240	54	100	96	9.5	0.361	5:11:45
6		0.10	2.5	640.190	1859	367	257	55	99	97	9.5	0.316	
	18			642.879									Can 5:00:30
C 1	4:27 0	0.12	2.5	642.879	1984	225	234	64	97	95	9.5	0.361	5:01:00
2		0.13	2.5	645.465	1950	363	253	54	97	94	9.5	0.361	'A'
3	6	0.13	2.5	648.035	1953	394	245	54	97	95	9.5	0.361	
4		0.11	2.5	650.650	1947	374	261	56	97	95	9.5	0.332	
5	12	0.10	2.5	653.321	1915	420	251	56	97	94	9.5	0.316	33769 Bag
6		0.04	2.5	655.963	1904	415	253	56	98	95	9.5	0.200	
	18			658.650									pitotok
													33766 Can
					33772 FAN BL	33773 HF BL	33774 H2SO4 BL	33775 NaOH BL					33767 Bag 4
	72		2.5	63.132	1891.29				97.17			0.3155	33768 Can

Steiner Environmental, Inc.

PLANT *BFI Arbor Hills* TEST TYPE *MB* FIELD TEST DATA SHEET (Page *1* of *2*)

Date *9/25/92*
Test Location *Flare Out*
Run Number *5*
Stack Diameter *139.5*
Operator
Filter No. *962*

Barometric Pressure *29.21*
Static in.wg. *-0.10*
Probe Type/Length *Q/7'*
Pitot Coefficient *0.84*
Meter Box No./Y *21313/1.0098*
Nozzle No./Size *straight*

[IMPINGER VOLUMES/WEIGHTS]

Contents	Final	Initial	Net
80% IPA	570.5	533.3	37.2
3% H_2O_2	595.1	549.1	46.0
3% H_2O_2	558.1	535.1	23.0
S.G.	758.4	720.4	38.0
		TOTAL	144.2

[GAS COMPOSITION]

Time	CO_2	O_2	CO

Leakrate		"Hg
Initial	0.016	15
Final	0.007	7.5

[TEMPERATURE °F]

Sample Point	12:29 Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	Stack	Probe	Oven	Imp.	Gas Meter IN	Gas Meter OUT	Pump Vacuum in.Hg	√ΔP	Comments
A 1	0	0.17	2.5	659.639	1873	194	262	75	102	101	7.0	0.412	pitot ok
2		0.13	2.5	662.217	1899	354	267	64	102	99	7.5	0.361	
3	6	0.15	2.5	664.865	1856	385	270	65	100	98	7.5	0.387	can 00251 11:23:30
4		0.13	2.5	668.508	1822	372	265	65	99	96	7.5	0.361	11:24:00
5	12	0.14	2.5	670.150	1805	356	258	65	98	95	7.5	0.374	bag 11:27:15
6		0.07	2.5	672.785	1831	366	270	65	97	94	7.5	0.265	11:32:15
	18			675.525									33789 Can 5. 33790 H_2O_2 BL
B 1	12:33 0	0.16	2.5	675.525	1850	246	263	75	99	96	7.5	0.400	
2		0.15	2.5	678.145	1846	369	275	67	98	97	7.5	0.387	33788 Bag 5 33791 AMF BL
3	6	0.16	2.5	680.790	1774	393	271	67	98	96	7.5	0.400	
4	12	0.15	2.5	683.480	1823	398	269	67	98	96	7.5	0.387	33787 Can 5 33792 MF BL
5	12	0.15	2.5	686.130	1776	414	260	67	97	94	7.5	0.387	
6		0.09	2.5	688.793	1827	390	269	67	96	94	7.5	0.360	33786 Bag 5 33793 IPA BL
	18			691.485									

Steiner Environmental, Inc.

PLANT BFI Arbor Hills TEST TYPE M8 FIELD TEST DATA SHEET (Page 2 of 2)
DATE 9/25/92 RUN NO. 5
TEST LOCATION Flare Outlet OPERATOR

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft³	TEMPERATURE °F						Pump Vacuum in.Hg	√ΔP	Comments
					Stack	Probe	Oven	Imp.	Gas Meter In	Gas Meter Out			
A 1	1:23 0	0.15	2.5	691.485	1853	227	253	75	97	96	7.0	0.387	
2		0.12	2.5	694.054	1849	294	300	70	98	95	7.5	0.346	33776 FNW
3	6	0.12	2.5	696.645	1827	238	306	69	98	95	7.5	0.346	
4		0.14	2.5	699.265	1768	272	292	69	98	96	7.5	0.374	33777 MF
5	12	0.12	2.5	701.900	1789	270	301	68	99	97	7.5	0.346	
6		0.04	2.5	704.522	1763	328	301	68	100	97	7.5	0.200	33778 IPA
	18			707.177									
D 1	1:47 0	0.16	2.5	707.177	1788	300	256	75	103	100	7.0	0.400	33779 AMF
2		0.10	2.5	709.720	1759	289	320	71	103	100	7.0	0.316	
3	6	0.11	2.5	712.364	1733	235	320	69	104	100	7.5	0.332	33780 H₂O₂
4		0.07	2.5	714.989	1701	254	314	67	104	101	7.5	0.265	
5	12	0.08	2.5	717.642	1686	257	327	67	105	101	7.5	0.283	
6		0.07	2.5	720.286	1673	239	320	67	105	101	7.5	0.265	pitot ok
	18			722.952									
	72		2.5	63.313	1798.79				98.60			0.3451	

Steiner Environmental, Inc.

PLANT BFI Arbor Hills TEST TYPE MB FIELD TEST DATA SHEET (Page 1 of 2)

Date 9/25/92
Test Location Flare Out
Run Number 6
Stack Diameter 139.6
Operator JS
Filter No. 966

Barometric Pressure 29.14
Static in.wg. − 0.09
Probe Type/Length Q/7'
Pitot Coefficient 0.84
Meter Box No./Y 21313/1.0098
Nozzle No./Size straight

[IMPINGER VOLUMES/WEIGHTS]

Contents	Final	Initial	Net
80% IPA	568.5	520.3	48.2
3% H_2O_2	573.1	532.3	40.8
3% H_2O_2	581.2	558.5	22.7
S.G.	646.9	616.0	30.9
		TOTAL	142.6

[GAS COMPOSITION]

Time	CO_2	O_2	CO

Leakrate		"Hg
Initial	0.009	15
Final	0.009	13

[TEMPERATURE °F]

Sample Point		3:44 Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft³	Stack	Probe	Oven	Imp.	Gas Meter IN	Gas Meter OUT	Pump Vacuum in.Hg	√ΔP	Comments
D	1	0	0.13	2.5	723.406	1702	252	237	78	93	93	9.0	0.361	pitot ok
	2		0.12	2.5	725.990	1787	265	242	66	95	93	9.0	0.346	
	3	6	0.14	2.5	728.575	1713	269	257	66	96	94	9.0	0.374	changed out
	4		0.13	2.5	731.150	1723	274	254	66	97	94	11.0	0.361	setpoint TC
	5	12	0.13	2.5	733.765	1652	294	261	67	99	95	12.5	0.361	
	6		0.05	2.5	736.373	1642	283	256	67	100	96	13.0	0.224	33781
		18			739.005									FHW
C	1	4:09 0	0.15	2.5	739.005	1650	239	274	71	104	101	10.0	0.387	33782
	2		0.16	2.5	741.630	1725	298	255	65	103	100	11.0	0.400	HF
	3	6	0.14	2.5	744.238	1628	295	268	66	104	100	12.0	0.374	33783
	4		0.15	2.5	746.864	1662	297	259	66	104	101	12.5	0.387	IPA
	5	12	0.14	2.5	749.480	1693	298	262	66	105	102	13.0	0.374	33784
	6		0.11	2.5	752.116	1623	297	262	67	106	102	13.0	0.332	AHF
		18			754.768									33785 H_2O_2

Steiner Environmental, Inc.

PLANT BFI Arbor Hills TEST TYPE MB FIELD TEST DATA SHEET (Page 2 of 2)
DATE 9/25/92 RUN NO. 6
TEST LOCATION Flare Out OPERATOR

Sample Point	Time	ΔP in wg	ΔH in wg	Gas Meter Volume Ft^3	TEMPERATURE °F						Pump Vacuum in.Hg	√ΔP	Comments
					Stack	Probe	Oven	Imp.	Gas Meter				
									In	Out			
	4:36												
B 1	0	0.15	2.5	754.768	1706	247	240	72	110	105	9.0	0.387	33794 ASTM 5,6
2		0.14	2.5	757.395	1740	277	235	61	108	103	9.5	0.374	
3	6	0.16	2.5	760.035	1751	315	241	63	108	103	9.5	0.400	
4		0.13	2.5	762.660	1706	349	233	60	107	101	9.5	0.361	
5	12	0.12	2.5	765.320	1704	342	231	60	107	101	9.5	0.346	
6		0.07	2.5	767.980	1620	366	252	59	107	101	9.5	0.265	
	18			770.639									
	4:58												
C 1	0	0.15	2.5	770.639	1769	269	233	66	107	103	9.5	0.387	
2		0.14	2.5	773.275	1744	318	248	66	107	102	9.5	0.374	
3	6	0.12	2.5	775.560	1740	292	233	65	107	101	9.5	0.346	
4		0.10	2.5	778.262	1790	296	240	64	107	100	9.5	0.316	
5	12	0.06	2.5	780.914	1730	313	246	63	106	101	9.5	0.245	
6		0.07	2.5	783.610	1600	324	234	63	105	100	9.5	0.265	pitot ok
	18			786.277									
	72		2.5	62.871	1700.00				101.75			0.3478	purge ports

~ 2000 .

CONTINUOUS MONITOR DATA SHEET

Plant BFI
Date 9/23/92 Run No. CALIBRATION/CHECKS
Test Location ARBOR HILL FLARE
Operator PES
Fuel Type METHANE SOUR Trailer No. 2 EQUIP

APCD Witness/Number
Client Rep CHUCK CASSIE
Generator Type
Burner Type
O_2 Controller Type

ENVIRONICS MODEL # 201-1520-00-00 S/N 1122

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	Comments
		Dry Uncorrected						
0810		19.50	15.9	4025	—	—	80.4	SPAN GAS VALUES
		0	0	0	—	—	0	ZERO
		—	—	—	—	—	—	"MID-LEVEL" CHECKS
0823		—	—	—	—	—	42.0	NOx GAS = 41.2 PPM
0840		15.10	—	—	—	—	—	O_2 GAS = 14.75%
0855		-	-	260.0	-	-	-	CO GAS = 255.0 ppm
0920		-	11.96	-	-	-	-	CO_2 GAS = 11.80%
0940		0.0	—	—	—	—	—	EXTERNAL LEAK CHECK
		—	—	—	—	—	—	EXTERNAL CHECKS Z/S
0945		0.0	—	—	—	—	—	O_2 ZERO (N_2)
0950		15.25	-	-	-	-	-	O_2 SPAN (14.94)
		—	—	—	—	—	1.40	NOx ZERO (N_2)
		—	—	—	—	—	41.2	NOx SPAN (40.3)
1010		-	-	2.50	—	—	-	CO ZERO (N_2)
		—	-	256.5	—	—	—	CO SPAN (255.5)
1020		—	0.0	~	—	—	—	CO_2 ZERO (N_2)
		—	11.86	—	—	—	—	CO_2 SPAN (12.0%)
								NOx TEST AUDIT
							40.0	PROTOCOL 1 39.60 PPM
								CYL # CC389

Miscellaneous Information

CALIBRATION GASES

NO_x CC389 CC72048
~~SO_2~~ CO_2 CC86353
CO CC81181
~~CO/CO_2~~ O_2 CC81154 AIR

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME

Upscale: 23 Downscale: 22
Upscale: 29 Downscale: 22
Upscale: 33 Downscale: 22

PROCESS DATA

Fuel Flow:
Steam Flow:
Rating: @ ~ 2000°F

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

CONTINUOUS MONITOR DATA SHEET

Plant BFI
Date 9/23/92 Run No. #1
Test Location ARBOR HILL FLARE
Operator RCS
Fuel Type METHANE SOUR Trailer No. 2 EQUIP

APCD Witness/Number
Client Rep
Generator Type
Burner Type
O_2 Controller Type

		Dry Uncorrected						
Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	Comments
1111	B1	9.80	11.0	65.0	—	—	25.3	START RUN #1 @ 1111HRS
1119	B2	9.75	10.9	70.5	—	—	24.6	PORT "B"
1122	B3	10.33	10.3	62.5	—	—	22.4	
1125	B4	10.80	10.0	56.5	—	—	21.2	
1128	B5	11.40	9.4	40.0	—	—	19.3	
1131	B6	11.93	8.8	45.5	—	—	18.0	
					—	—		PORT "A" @ 1143
1143	A1	10.88	9.5	89.0	—	—	21.5	
1146	A2	11.13	9.8	75.0	—	—	21.0	
1149	A3	10.65	10.0	126.0	—	—	23.1	
1152	A4	11.10	9.6	101.0	—	—	20.0	
1155	A5	12.30	8.7	105.5	—	—	17.5	
1158	A6	12.90	7.9	103.0	—	—	15.1	
					—	—		PORT "D" @ 1213
1213	D1	11.50	9.5	91.0	—	—	19.5	
1216	D2	11.20	9.7	80.0	—	—	20.3	
1219	D3	11.40	9.1	91.0	—	—	19.9	
1222	D4	12.15	9.1	95.0	—	—	18.5	
1225	D5	12.58	8.6	117.0	—	—	17.0	
1228	D6	12.85	8.5	72.0	—	—	16.3	
					—	—		
					—	—		
					—	—		
					—	—		
					—	—		
					—	—		

Miscellaneous Information

CALIBRATION GASES

NO_x
SO_2
CO
$CO/CO_2/O_2$

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME

Upscale: Downscale:
Upscale: Downscale:
Upscale: Downscale:

PROCESS DATA

Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

Cal Gas Values		Actual Values
NO		
NO_2		

Conv. Efficiency:

CONTINUOUS MONITOR DATA SHEET

Plant BFI
Date 9/23/92 Run No. #1
Test Location ARBOR HILL FLARE
Operator PCS
Fuel Type METHANE SOUR Trailer No. 2 EQUIP

APCD Witness/Number
Client Rep
Generator Type
Burner Type
O_2 Controller Type

		Dry Uncorrected							
Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	Comments	Miscellaneous Information
1243	C1	11.00	9.78	83.5	—	—	20.3	PORT "C" @ 1243	
1246	C2	11.00	10.00	87.0	—	—	20.8		
1249	C3	10.45	10.34	68.0	—	—	22.0		
1252	C4	11.18	10.00	61.5	—	—	20.0		
1255	C5	11.38	9.64	26.0	—	—	18.8		
1258	C6	11.75	9.20	21.5	—	—	17.5		
					—	—		EXTERNAL CAL CHECKS	
1305		0.0	0.0	6.0	—	—	1.25	ZERO - NO ADJUST	
		—	—	—	—	—	40.4	NOX SPAN (39.8)	
		15.40	—	—	—	—	—	O2 SPAN (14.97)	
		—	—	256.5	—	—	—	CO SPAN (250.1)	
		—	11.86	—	—	—	—	CO2 SPAN (12.0)	
	Avg	11.31	9.56	76.38			20.00		

CALIBRATION GASES

NO_x
SO_2
CO
$CO/CO_2/O_2$

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME

Upscale: Downscale:
Upscale: Downscale:
Upscale: Downscale:

PROCESS DATA

Fuel Flow:
Steam Flow:
Rating: @ ~ 2000°F

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

CONTINUOUS MONITOR DATA SHEET

Plant BFI
Date 9/23/92 Run No. #2
Test Location ARBOR HILL FLARE
Operator PES
Fuel Type METHANE SOUR Trailer No. 2 EQUIP

APCD Witness/Number
Client Rep
Generator Type
Burner Type
O_2 Controller Type

Time	Sample Point	Dry Uncorrected O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	Comments
1305		0.0	0.0	6.0	—	—	1.25	EXTERNAL ZERO CHECK
		15.40	11.86	265.6	—	—	40.4	EXTERNAL SPAN CHECK
								(FROM RUN #1)(FINAL)
								START RUN #2 @ 1432
1432	C1	10.73	9.84	55.0			21.0	PORT "C"
1435	C2	10.25	10.20	56.0			21.5	
1438	C3	10.73	9.92	55.0			20.6	
1441	C4	11.18	9.50	37.0			19.6	
1444	C5	12.03	8.90	65.0			17.3	
1447	C6	11.88	8.98	43.0			16.2	
								PORT "D" @ 1513
1513	D1	11.83	9.32	117.0			17.3	
1516	D2	11.18	9.92	115 ★			19.2	★ CO SPIKE TO 355 PPM
1519	D3	11.75	9.70	153 ★			17.8	★ CO SPIKE TO 318 PPM
1522	D4	12.13	8.80	158 ★			16.4	★ CO SPIKE TO 329 PPM
1525	D5	13.05	8.20	186 ★			14.4	★ CO SPIKES TO 380 PPM
1528	D6	13.13	8.00	128.0			13.7	
								PORT "A" @ 1539
1539	A1	11.50	9.84	91.0			18.5	
1542	A2	11.43	9.76	59.5			18.2	
1545	A3	11.55	9.68	101.5★			19.8	★ CO SPIKE TO 319 PPM
1548	A4	11.58	9.16	153			16.0	
1551	A5	12.52	9.50	149			17.5	
1554	A6	12.62	8.30	92.5★			15.3	★ CO SPIKE TO 309 PPM

Miscellaneous Information

CALIBRATION GASES

NO_x
SO_2
CO
$CO/CO_2/O_2$

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME

Upscale: Downscale:
Upscale: Downscale:
Upscale: Downscale:

PROCESS DATA

Fuel Flow:
Steam Flow:
Rating: @ ~ 2000 °F

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

~ 2000 F

~ 2000 F

CONTINUOUS MONITOR DATA SHEET

Plant BFI
Date 9/23/92 Run No. #2
Test Location ARBOR HILL FLARE
Operator RES
Fuel Type METHANE SOUR Trailer No. 2 EQUIP

APCD Witness/Number
Client Rep
Generator Type
Burner Type
O_2 Controller Type

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	Comments
		Dry Uncorrected						
1305		0.0	0.0	6.0	—	–	1.25	EXT. ZERO CHECK
		15.40	11.86	265.6	—	–	40.4	EXT. SPAN CHECK
					—	–		(FROM RUN #1-FINAL✓)
					—	–		PORT "B" @ 1605
1605	B1	10.63	10.30	92.5	—	—	22.0	
1608	B2	10.18	10.80	96.5	—	—	23.5	
	B3	9.95	10.64	74.0	—	—	23.1	
	B4	10.00	10.10	103.0	—	—	21.6	
	B5	10.55	9.92	86.5	—	–	20.2	
	B6	11.48	9.20	58.0	—	—	17.2	
				~~0.0~~	—	—		EXTERNAL CAL CHECKS
		0.0	-0.04	0.0	—	—	+1.00	ZERO - NO ADJUST
		—	—	—	—	–	39.5	NO_x SPAN✓ (39.8)
		15.18	—	—	—	—	—	O_2 SPAN✓ (14.89)
		—	—	252.5	—	—	—	CO SPAN✓ (250.2)
		–	11.88	—	—	—	—	CO_2 SPAN✓ (12.0)
	Avg	11.41	9.52	96.88			18.66	

Miscellaneous Information

CALIBRATION GASES

NO_x
SO_2
CO
$CO/CO_2/O_2$

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME

Upscale: Downscale:
Upscale: Downscale:
Upscale: Downscale:

PROCESS DATA

Fuel Flow:
Steam Flow:
Rating: @ ~ 2000°F

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

CONTINUOUS MONITOR DATA SHEET

Plant BFI
Date 9/24/92 Run No. #3
Test Location ARBOR HILLS FLARE
Operator RES
Fuel Type METHANE SOUR Trailer No. 2 EQUIP

APCD Witness/Number
Client Rep
Generator Type
Burner Type
O_2 Controller Type

Dry Uncorrected

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	Comments
0625		19.50	14.75	403	—	—	80.2	SPAN GAS VALUES
		0	0	0	—	—	0	ZERO
		—	—	—	—	—	—	MID-LEVEL CHECKS
0710		—	—	—	—	—	40.0	NOx GAS = 41.0 PPM
0735		12.3	—	—	—	—	—	O_2 GAS = 11.82 %
0755		—	—	207	—	—	—	CO GAS = 206 PPM
0825		—	10.0	—	—	—	—	CO_2 GAS = 9.9 %
0830		—	—	—	—	—	80.2	RESET NOx ZERO &
		—	—	—	—	—	0	SPAN DUE TO TEMP DRIFT
		—	—	—	—	—	41.0	NOx "MID" GAS = 41.0 PPM
		0	0	0	—	—	0	INTERFERENCE CHECKS
0840		0.0	—	—	—	—	—	EXTERNAL LEAK CHECKS
0850		—	—	—	—	—	—	EXT. Z/S CHECKS
		0.0	—	—	—	—	—	O_2 Zero (N_2)
		12.5	—	—	—	—	—	O_2 SPAN (11.95%)
		—	—	—	—	—	0.0	NOx ZERO (N_2)
		—	—	—	—	—	39.6	NOx SPAN (39.8 PPM)
		—	—	0.0	—	—	—	CO Zero (N_2)
		—	—	205	—	—	—	CO SPAN (202 PPM)
		—	0.0	—	—	—	—	CO_2 Zero (N_2)
		—	9.88	—	—	—	—	CO_2 SPAN (10.0%)
					—	—		
					—	—		NOx TEST AUDIT
1000					—	—	38.5	PROTOCOL 1 39.60 PPM
					—	—		CYL # CC389
					—	—		

Miscellaneous Information

CALIBRATION GASES

NO_x CC389 CC72048
~~SO_2~~ CO_2 CC86353
CO CC 81181
~~CO/CO_2~~ O_2 CC 81154 AIR

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME

Upscale: 32 Downscale: 28
Upscale: 33 Downscale: 33
Upscale: 34 Downscale: 32

PROCESS DATA

Fuel Flow:
Steam Flow:
Rating: @ ~ 1600 °F

CONVERTER GAS

Cal Gas Values		Actual Values
NO		
NO_2		

Conv. Efficiency:

CONTINUOUS MONITOR DATA SHEET

Plant BFI
Date 9/24/92 Run No. #3
Test Location ARBOR HILLS FLARE
Operator PCS
Fuel Type METHANE SOUR Trailer No. 2 EQUIP

APCD Witness/Number
Client Rep
Generator Type
Burner Type
O_2 Controller Type

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	Comments
		Dry Uncorrected						
		—	—	—	—	—		INITIAL EXT ✓ VALUES
		12.5	9.88	205	—	–	39.6	SPAN VALUES }
		0.0	0.0	0.0	—	–	0.0	ZERO VALUES } FROM PG #1
								START RUN #3 @ 1013
1013	B1		SCRUB @		1015 HRS			
								RESTART RUN #3 @ 1024
1024	B1	9.88	10.34	120			22.2	PORT "B"
	B2	10.58	9.74	213			18.8	
	B3	10.88	9.52	235*			17.4	* CO SPIKE TO 490 PPM
	B4	11.28	* 9.51	148			17.0	* CO2 PEN. STUCK ON
	B5	11.50	9.50	127			16.0	CHART RECORDER
	B6	11.75	9.52	96			16.4	
								PORT "A" @ 1048
1048	A1	11.20	9.52	103			17.3	
1051	A2	11.35	9.44	87			16.5	
1054	A3	10.88	9.66	38			18.1	
	A4	12.03	9.20	100			14.3	
	A5	12.53	8.26	98			12.4	
	A6	12.80	8.18	123			12.8	
								PORT "D" @ 1121
1121	D1	10.93	10.00	21.0			18.6	
1124	D2	11.15	9.60	13.5			18.0	
1127	D3	11.45	9.60	23.0			16.2	
1130	D4	11.93	8.46	23.0			15.3	
1133	D5	12.50	8.86	70.0			14.0	
1136	D6	13.25	7.68	36.0			12.0	

Miscellaneous Information

CALIBRATION GASES

NO_x
SO_2
CO
$CO/CO_2/O_2$

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME

Upscale: Downscale:
Upscale: Downscale:
Upscale: Downscale:

PROCESS DATA

Fuel Flow:
Steam Flow:
Rating: @ ~ 1600°F

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

~ 1600

CONTINUOUS MONITOR DATA SHEET

Plant BFI
Date 9/24/92 Run No. #3
Test Location ARBOR HILLS FLARE
Operator PES
Fuel Type METHANE SOUR Trailer No. 2 EQUIP

APCD Witness/Number
Client Rep
Generator Type
Burner Type
O_2 Controller Type

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	Comments
		Dry Uncorrected						
					—	—		INITIAL EXT ✓ VALUES
		12.5	9.88	205	—	—	39.6	EXT SPAN VALUE } FROM PAGE 1
		0	0	0	—	—	0	EXT ZERO VALUE } FROM PAGE 1
					—	—		PORT "C" @ 1148
1148	C1	10.05	10.52	5.0	—	—	20.5	
1151	C2	9.38	11.40	6.5	—	—	22.9	
1154	C3	10.15	10.68	6.0	—	—	20.6	★
1157	C4	9.85	10.56	3.0	—	—	20.3	
1200	C5	10.30	10.40	1.5	—	—	19.0	
1203	C6	10.85	9.68	<1.0	—	—	17.6	
					—	—		EXTERNAL CHECK-NO ADJ
1215		0	0	0	—	—	-0.4	ZERO VALUE
		—	—	—	—	—	39.8	NOx SPAN V = 39.9 PPM
		—	—	207	—	—	—	CO SPAN = 202 PPM
		—	9.94	—	—	—	—	CO2 SPAN = 10.00%
		12.13	—	—	—	—	—	O2 SPAN = 11.86%
	Avg	11.18	9.58	70.73			17.26	

★ NOTE: TEMPERATURE CONTROLLER FOR FLARE "DEADBAND" CHANGED FROM 22°F TO 30°F. TIME: APPROX 1034 HRS.

Miscellaneous Information

CALIBRATION GASES

NO_x
SO_2
CO
$CO/CO_2/O_2$

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME

Upscale: Downscale:
Upscale: Downscale:
Upscale: Downscale:

PROCESS DATA

Fuel Flow:
Steam Flow:
Rating: @ ~ 1600°F

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

CONTINUOUS MONITOR DATA SHEET

Plant BFI
Date 9/21/92 Run No. #4
Test Location ARBOR HILLS FLARE
Operator PES
Fuel Type METHANE SOUR Trailer No. 2 EQUIP

APCD Witness/Number
Client Rep
Generator Type
Burner Type
O_2 Controller Type

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	Comments
		Dry Uncorrected						
		0	0	0	—	—	0	EXTERNAL ZERO CHECK
		12.5	9.88	205	—	—	39.6	EXTERNAL SPAN CHECK
					—	—		(FROM RUN #3 INITIAL √s)
					—	—		START RUN #4 @ 1445
1445	C1	9.25	11.00	8.00	—	—	23.1	PORT "C"
1448	C2	9.00	11.28	6.00	—	—	24.0	
1451	C3	9.55	10.72	6.00	—	—	21.8	
1454	C4	9.38	10.70	6.00	—	—	22.2	
1457	C5	10.00	10.40	1.50	—	—	20.9	
1500	C6	10.90	9.56	<1.00	—	—	17.5	
					—	—		PORT "D" @ 1514
1514	D1	10.95	9.70	8.00	—	—	18.8	
1517	D2	11.38	9.48	27.50	—	—	17.3	
1520	D3	11.85	8.90	25.0	—	—	16.0	
1523	D4	12.20	8.50	28.0	—	—	14.6	
1526	D5	12.45	8.28	15.0	—	—	14.2	
1529	D6	13.05	7.78	31.5	—	—	13.4	
					—	—		
					—	—		
					—	—		
★ NOTE:	AT 1400 HRS, FLARE TEMPERATURE CONTROLLER SET FOR							
	A "DEADBAND" OF 50°F.					—		
					—	—		
					—	—		
					—	—		
					—	—		

Miscellaneous Information

CALIBRATION GASES

NO_x
SO_2
CO
$CO/CO_2/O_2$

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME

Upscale: Downscale:
Upscale: Downscale:
Upscale: Downscale:

PROCESS DATA

Fuel Flow:
Steam Flow:
Rating: @ ~ 1600°F

CONVERTER GAS

Cal Gas Values		Actual Values
NO		
NO_2		

Conv. Efficiency:

CONTINUOUS MONITOR DATA SHEET

Plant BFI
Date 9/24/92 Run No. #4
Test Location ARBOR HILLS FLARE
Operator RES
Fuel Type METHANE SOUR Trailer No. 2 EQUIP

APCD Witness/Number
Client Rep
Generator Type
Burner Type
O_2 Controller Type

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	Comments
		Dry Uncorrected						
		0	0	0	—	—	0	EXT ZERO } FROM RUN #3
		12.5	9.88	205	—	—	39.6	EXT SPAN } INITIAL EXT ✓.
								PORT "A" @ 1556
1556	A1	11.38	9.12	10.0			17.0	
1559	A2	11.38	9.42	18.0			17.2	
1602	A3	11.63	9.20	13.5			16.9	
1605	A4	12.18	8.60	23.0			15.0	
1608	A5	12.20	8.54	43.0			14.6	
1611	A6	12.38	8.32	36.0			14.0	
								PORT "B" @ 1624
1624	B1	10.53	10.04	2.00			20.3	
1627	B2	10.30	10.10	4.0			20.6	
1630	B3	10.90	9.70	9.5			18.5	
1633	B4	10.73	9.84	8.5			19.0	
1636	B5	10.45	9.84	7.5			18.6	
1639	B6	11.38	9.24	15.0			16.0	
								FINAL EXTERNAL CHECKS
		0	0	0			-0.7	ZERO VALUES
		—	—	—	—	—	39.1	NOx SPAN ✓ (39.8)
		12.35	—	—	—	—	—	O2 SPAN ✓
		—	—	209	—	—	—	CO SPAN ✓ (206)
		—	9.80	—	—	—	—	CO2 SPAN ✓ (10.0)
	Avg	11.06	9.51	14.73			17.98	

Miscellaneous Information

CALIBRATION GASES

NO_x
SO_2
CO
$CO/CO_2/O_2$

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME

Upscale: Downscale:
Upscale: Downscale:
Upscale: Downscale:

PROCESS DATA

Fuel Flow:
Steam Flow:
Rating: @ ~~~2000~~ 1600°F

CONVERTER GAS

Cal Gas Values		Actual Values
NO		
NO_2		

Conv. Efficiency:

CONTINUOUS MONITOR DATA SHEET

Plant BFI
Date 9/25/92 Run No. #5
Test Location ARBOR HILLS FLARE
Operator RCS
Fuel Type METHANE SOUR Trailer No. 2 EQUIP

APCD Witness/Number
Client Rep
Generator Type
Burner Type
O_2 Controller Type

Time	Sample Point	Dry Uncorrected						Comments
		O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	
0700		19.50	16.0	402	—	—	80.2	SPAN GAS VALUES
		0	0	0	—	—	0	ZERO VALUES
		—	—	—	—	—	—	MID-LEVEL CHECKS
		—	—	—	—	—	40.9	NOx (41.0 PPM)
		12.35	—	—	—	—	—	O2 (11.8%)
		—	—	207.5	—	—	—	CO (206 PPM)
		—	—	44.5	—	—	—	CO (44.5 PPM)
		—	—	24.0	—	—	—	CO (23.9 PPM)
		—	10.04	—	—	—	—	CO2 (9.90%)
		—	—	—	—	—	—	RECAL NOx DUE TO TEMP DRIFT
		—	—	—	—	—	0	NOx ZERO VALUE
		—	—	—	—	—	80.6	NOx SPAN VALUE
		—	—	—	—	—	41.0	NOx-MID ✓ (41.1 ppm)
1055	★	+0.05	—	—	—	—	—	EXT LEAK CHECK
	NOTE: FURTHER TIGHTENING OF PROBE PRODUCED A LEAK CHECK OF 0.0% AT 1115 HRS. LEAK CHECK AT 1055 HRS INVALID.	12.55	—	—	—	—	—	O2 EXT ✓ (11.96%)
		—	—	—	—	—	41.0	NOx EXT ✓ (39.8 PPM)
		—	—	—	—	—	0	NOx EXT Zero ✓ (N2)
1115		0.0	—	—	—	—	—	O2 EXT Zero ✓ (N2)
		—	—	0.0	—	—	—	CO EXT Zero ✓ (N2)
		—	—	192.5	—	—	—	CO EXT SPAN ✓ (202 PPM)
		—	—	45.0	—	—	—	CO LOW EXT ✓ (45.5 PPM)
		—	0.0	—	—	—	—	CO2 Zero EXT ✓ (N2)
		—	10.04	—	—	—	—	CO2 EXT SPAN ✓ (10.02%)
		0	0	0	—	—	0	INTERFERENCE CHECKS
					—	—		TEST AUDIT (NOx 39.6)
	★				—	—	39.6	PROTOCOL 1 CC389

Miscellaneous Information

CALIBRATION GASES

NO_x
SO_2
CO
$CO/CO_2/O_2$

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME

Upscale: 23 Downscale: 18
Upscale: 22 Downscale: 17
Upscale: 22 Downscale: 19

PROCESS DATA

Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

CONTINUOUS MONITOR DATA SHEET

Plant BFI - ARBOR HILLS FLARE
Date 9/25/92 Run No. 5
Test Location ARBOR HILLS FLARE
Operator PES
Fuel Type METHANE Trailer No. 2 EQUIP

APCD Witness/Number
Client Rep
Generator Type
Burner Type
O_2 Controller Type

		Dry Uncorrected						
Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	Comments
		0.0	0.0	0.0	—	—	0.0	INITIAL EXT V's - ZERO
		12.55	10.04	192.5	—	—	41.0	INITIAL EXT V's - SPAN
								START RUN #5 @ 1226
1226	B1	11.15	9.64	15.00			17.4	PORT "B"
1229	B2	10.90	9.82	2.50			17.8	
1232	B3	11.40	9.44	10.00			16.2	
1235	B4	10.88	9.80	7.00			17.3	
1238	B5	11.28	9.60	15.00			16.3	
1241	B6	11.80	9.10	4.00			14.5	
								PORT "A" @ 1250
1250	A1	12.18	9.30	90.0			15.6	
1253	A2	11.60	9.16	25.0			16.3	
1256	A3	12.25	8.60	77.0			13.8	
1259	A4	12.65	8.22	81.0			13.4	
1302	A5	13.15	7.74	146.0			12.2	
1305	A6	13.88	7.36	154.0			11.3	
								PORT "D" @ 1320
1320	D1	11.45	9.52	37.0			17.4	
1323	D2	12.38	8.70	140.0			15.0	
1326	D3	13.08	8.06	199.0			18.2	
1329	D4	13.33	7.46	495*			12.0	*CO SPIKES TO 838 PPM
1332	D5	14.03	7.80	243			13.3	
1335	D6	13.25	7.60	320*			12.2	*CO SPIKES TO 667 PPM

Miscellaneous Information

CALIBRATION GASES

NO_x
SO_2
CO
$CO/CO_2/O_2$

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME

Upscale: Downscale:
Upscale: Downscale:
Upscale: Downscale:

PROCESS DATA

Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

Cal Gas Values		Actual Values
NO		
NO_2		

Conv. Efficiency:

Steiner Environmental, Inc.

CONTINUOUS MONITOR DATA SHEET

Plant BFI
Date 9/25/92 Run No. #5
Test Location ARBOR HILLS FLARE
Operator RES
Fuel Type METHANE Trailer No. 2 EQUIP

APCD Witness/Number
Client Rep
Generator Type
Burner Type
O_2 Controller Type

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	Comments
		Dry Uncorrected						
		0	0	0	—	—	0	INITIAL EXT✓ - ZERO
		12.55	10.04	192.5	—	—	41.0	INITIAL EXT✓ - SPAN
1344	C1	10.95	9.92	27.0			17.2	PORT "C" @ 1344
1347	C2	10.70	10.14	33.0			18.5	
1350	C3	10.70	10.04	7.5			19.2	
1353	C4	11.18	9.60	7.5			16.5	
1356	C5	11.55	9.00	11.0			15.1	
1359	C6	11.65	9.14	9.5			16.1	
		0	0	0	—	—	+0.8	EXT ZERO CHECKS - NO ADJ
		—	—	—	—	—	40.5	NOx EXT✓ (39.8 PPM)
		—	—	206	—	—	—	CO EXT✓ (202ppm)
		—	—	45.5	—	—	—	CO EXT✓ (44.5ppm)
		—	9.84	—	—	—	—	CO_2 EXT✓ (10.01 %)
		12.45	—	—	—	—	—	O_2 EXT✓ (11.89 %)

Miscellaneous Information

CALIBRATION GASES
NO_x
SO_2
CO
$CO/CO_2/O_2$

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME
Upscale: Downscale:
Upscale: Downscale:
Upscale: Downscale:

PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

CONTINUOUS MONITOR DATA SHEET

Plant BFI
Date 9/25/92 Run No. #6
Test Location ARBOR HILLS FLARE
Operator PES
Fuel Type METHANE Trailer No. 2 EQUIP

APCD Witness/Number
Client Rep
Generator Type
Burner Type
O_2 Controller Type

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	Comments
				Dry Uncorrected				
		0	0	0	—	—	0	INITIAL EXT √ - ZERO
		12.55	10.04	192.5		41.0		INITIAL EXT √ - SPAN
								START RUN #6 @ 1542
1542	C1	11.10	9.70	231			17.0	PORT "C"
1545	C2	11.00	9.76	178			16.8	
1548	C3	11.58	9.06	263			15.1	
1551	C4	12.45	8.32	355			12.9	
1554	C5	12.70	8.12	311			12.3	
1557	C6	13.63	7.52	375			10.8	
1606	D1	12.70	8.20	625*			12.10	PORT "D" @ 1606
1609	D2	12.38	8.56	470			13.2	* CO OFFSCALE FOR MOST
1612	D3	12.58	8.22	530			12.3	OF THIS POINT. CHANGE
1615	D4	12.58	8.28	508			12.1	RANGE TO 1000PPM @ 1609
1618	D5	12.95	8.10	575			11.2	
1621	D6	13.15	7.80	458			11.0	
1632	A1	12.80	8.14	628			10.8	PORT "A" @ 1632
1635	A2	12.95	7.96	590			11.7	
1638	A3	12.73	8.24	398			12.9	
1641	A4	13.40	7.70	540			11.3	
1644	A5	13.40	7.70	516			11.4	
1647	A6	14.15	7.00	426			10.0	

Miscellaneous Information

CALIBRATION GASES

NO_x
SO_2
CO
$CO/CO_2/O_2$

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME

Upscale: Downscale:
Upscale: Downscale:
Upscale: Downscale:

PROCESS DATA

Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

CONTINUOUS MONITOR DATA SHEET

Plant *BFI*
Date *9/25/92* Run No. *#6*
Test Location *ARBOR HILLS FLARE*
Operator *PES*
Fuel Type *METHANE* Trailer No. *2 EQUIP*

APCD Witness/Number
Client Rep
Generator Type
Burner Type
O_2 Controller Type

		Dry Uncorrected						
Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	NO ppm	NO_x ppm	Comments
								PORT "B" @ 1654
1654	B1	12.55	8.40	215			12.7	
1657	B2	12.58	8.34	250			12.2	
1700	B3	12.65	8.42	260			12.1	
1703	B4	12.83	8.24	290			11.2	
1706	B5	12.88	7.80	298			10.5	
1709	B6	13.30	7.86	290			9.8	CO RANGE = 1000PPM
		0.10	0.0	0.0			0.20	EXTERNAL ZERO CHECK
		12.7	~~9.98~~	—	—	—	—	O_2 SPAN EXT ✓ (11.80%)
		—	9.78	—	—	—	—	CO_2 SPAN EXT ✓ (10.01%)
		—	—	792	—	—	—	CO EXT CHECKS (794 ppm)
		—	—	599	—	—	—	CO EXT ✓ (598 PPM)
		—	—	400	—	—	—	CO EXT ✓ (400 PPM)
		—	—	203	—	—	—	CO EXT ✓ (204 PPM)
		—	—	164	—	—	—	CO EXT ✓ (167 PPM)
		—	—	54.0	—	—	—	CO EXT ✓ (52.5 PPM)
		—	—	—	—	—	40.4	NO_x EXT ✓ (39.8 PPM)

Miscellaneous Information

CALIBRATION GASES

NO_x
SO_2
CO
$CO/CO_2/O_2$

Wet Bulb: Dry Bulb:
Barometric Press:

RESPONSE TIME

Upscale: Downscale:
Upscale: Downscale:
Upscale: Downscale:

PROCESS DATA

Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

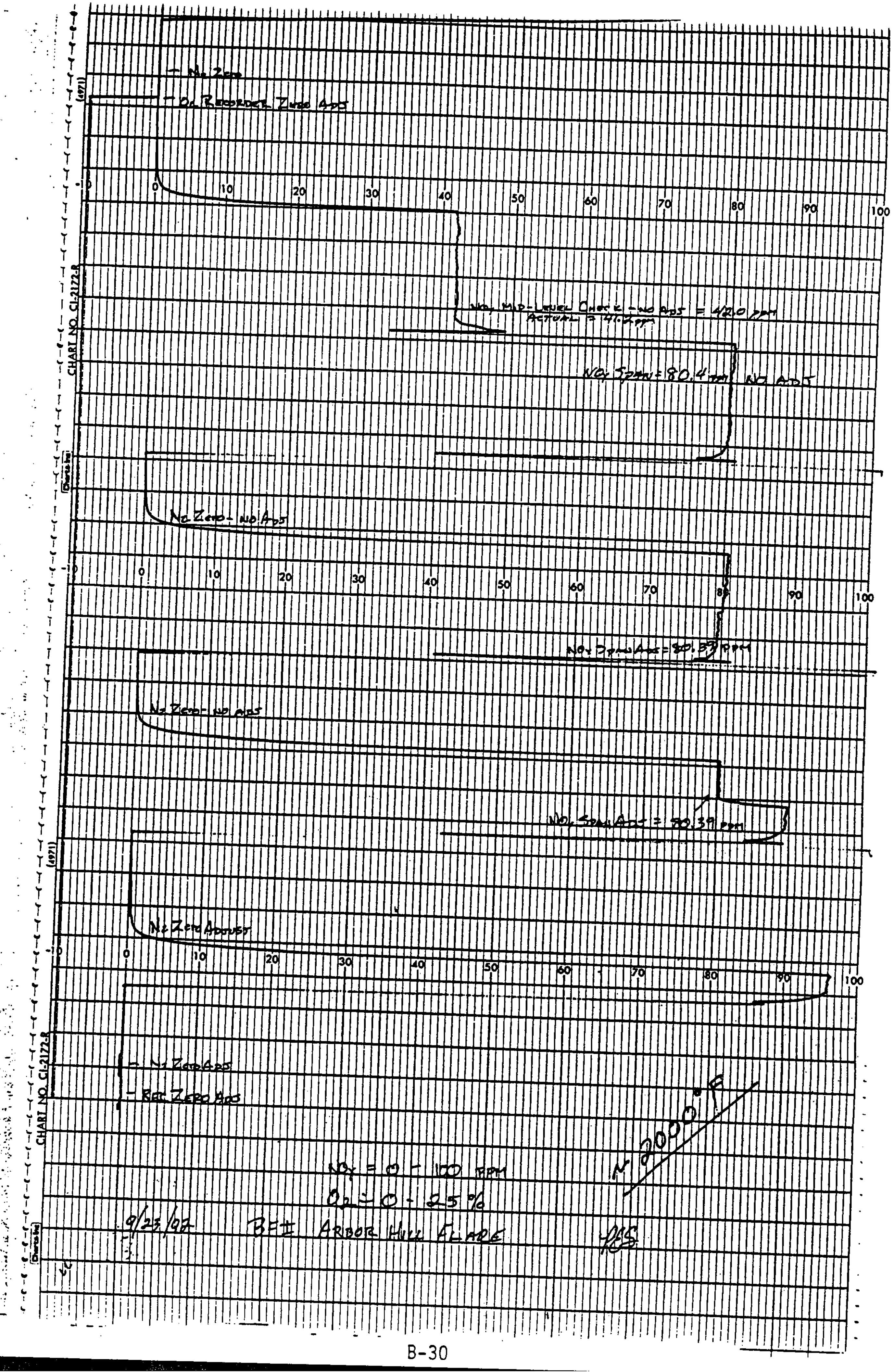
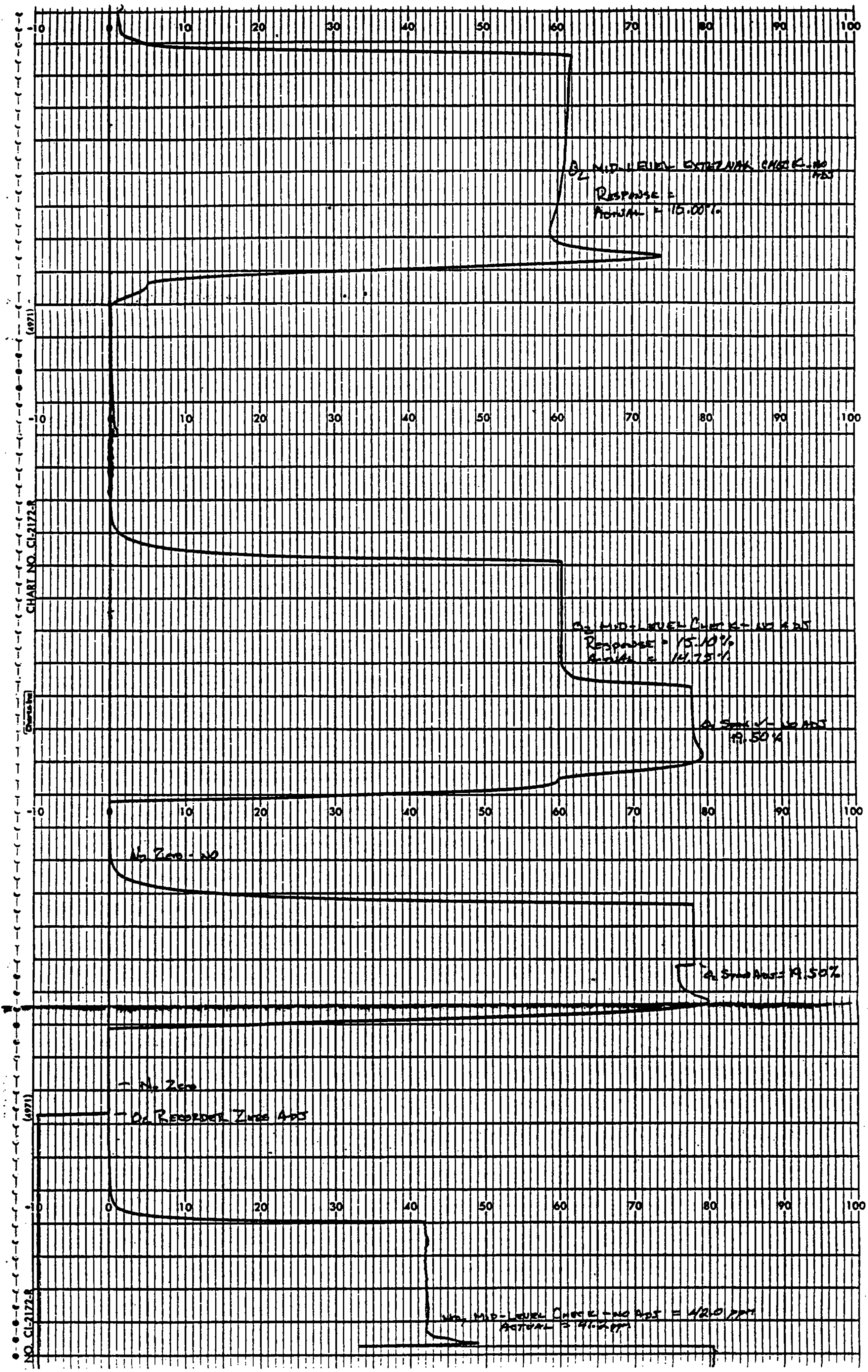


CHART NO CI-2172-R
(4971)
– N₂ Zero
– O₂ Recorder Zero Adj
0
10
20
30
40
50
60
70
80
90
100
NOx Mid-Level Check – No Adj = 42.0 ppm
Actual = 41.2 ppm
NOx Span = 80.4 ppm No Adj
N₂ Zero – No Adj
NOx Span Adj = 80.39 PPM
N₂ Zero – No Adj
NOx Span Adj = 80.39 ppm
N₂ Zero Adjust
– N₂ Zero Adj
– Rec Zero Adj
NOx = 0 – 100 PPM
O₂ = 0 – 25 %
9/25/97
BF II
Arbor Hill Flare
~2000°F
RES



O2 MID-LEVEL EXTERNAL CHECK-NO ADJ
RESPONSE =
ACTUAL = 10.00%

O2 MID-LEVEL CHECK - NO ADJ
RESPONSE = 15.10%
ACTUAL = 14.75%

O2 SPAN ✓ - NO ADJ
19.50%

N2 ZERO - NO

O2 SPAN ADJ = 19.50%

N2 ZERO

O2 RECORDER ZERO ADJ

NOx MID-LEVEL CHECK - NO ADJ = 42.0 ppm
ACTUAL = 41.2 ppm

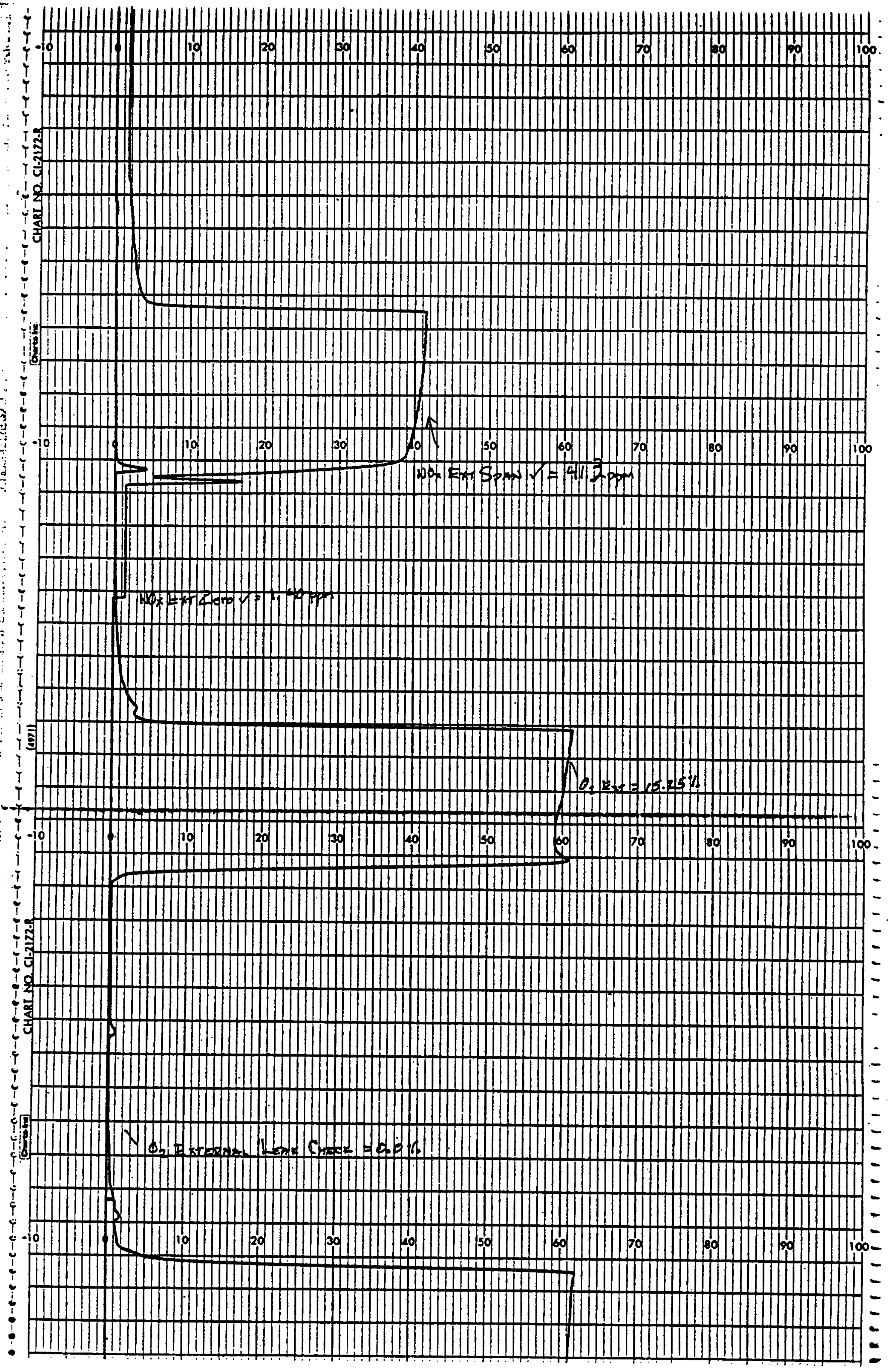
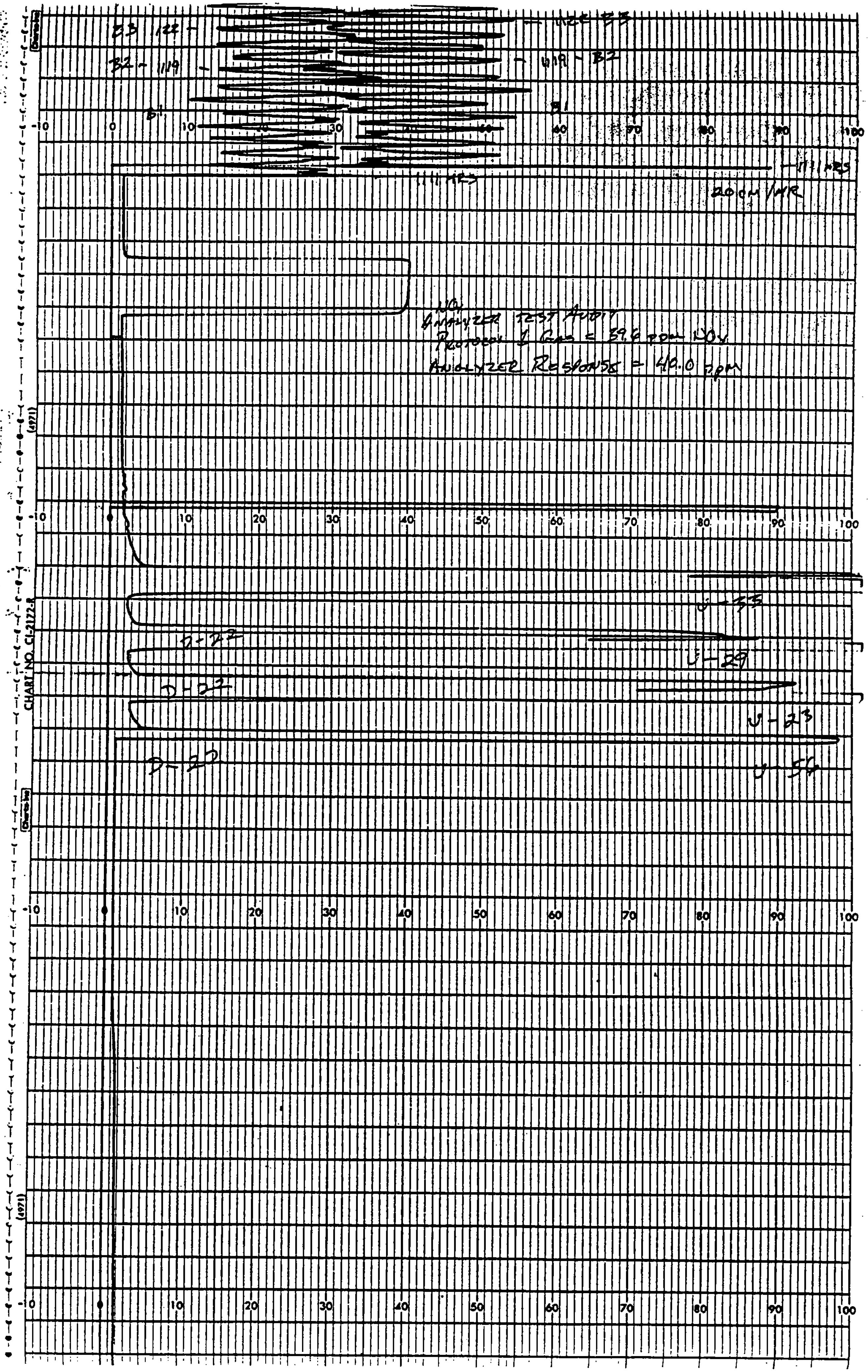
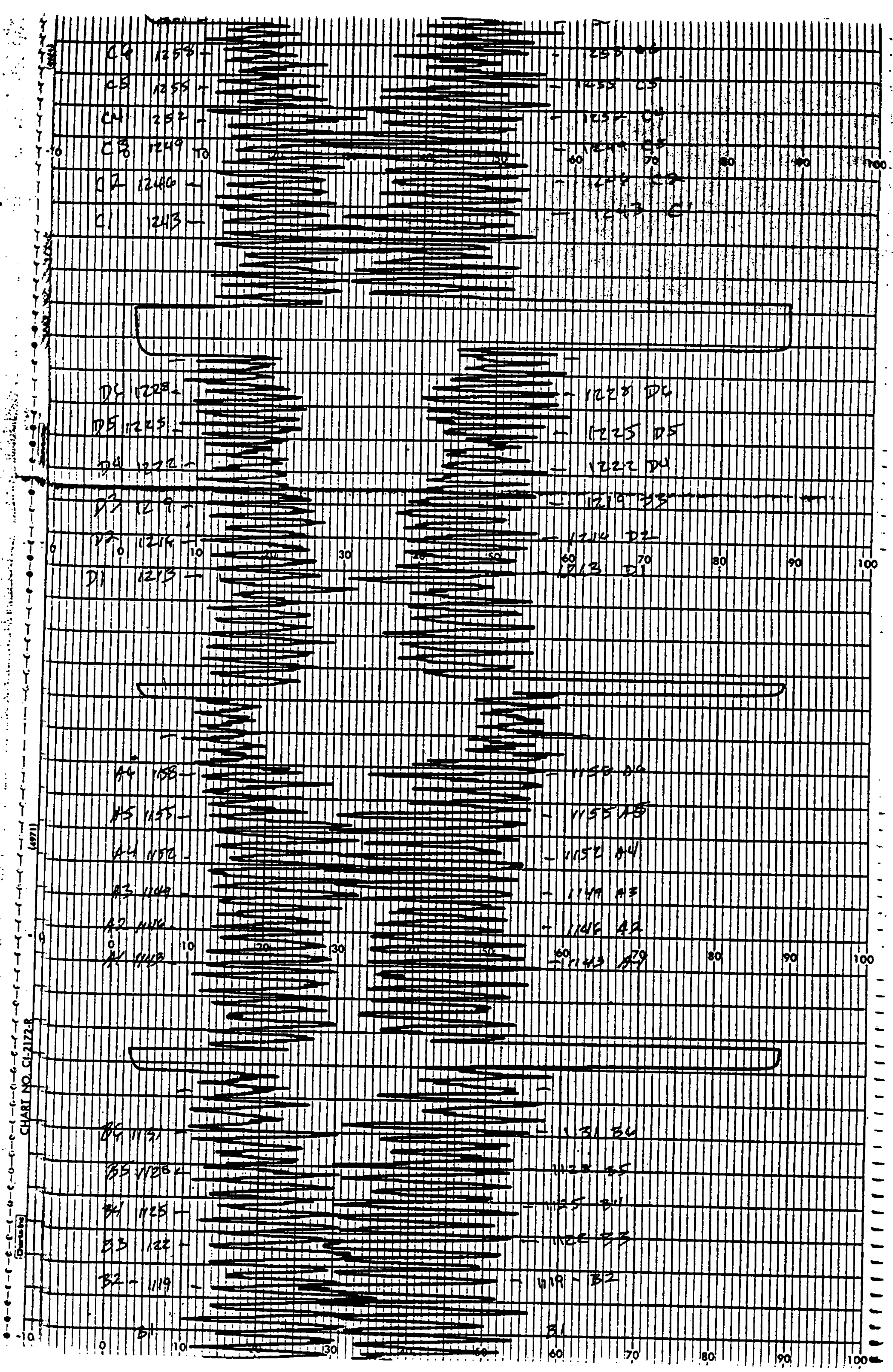
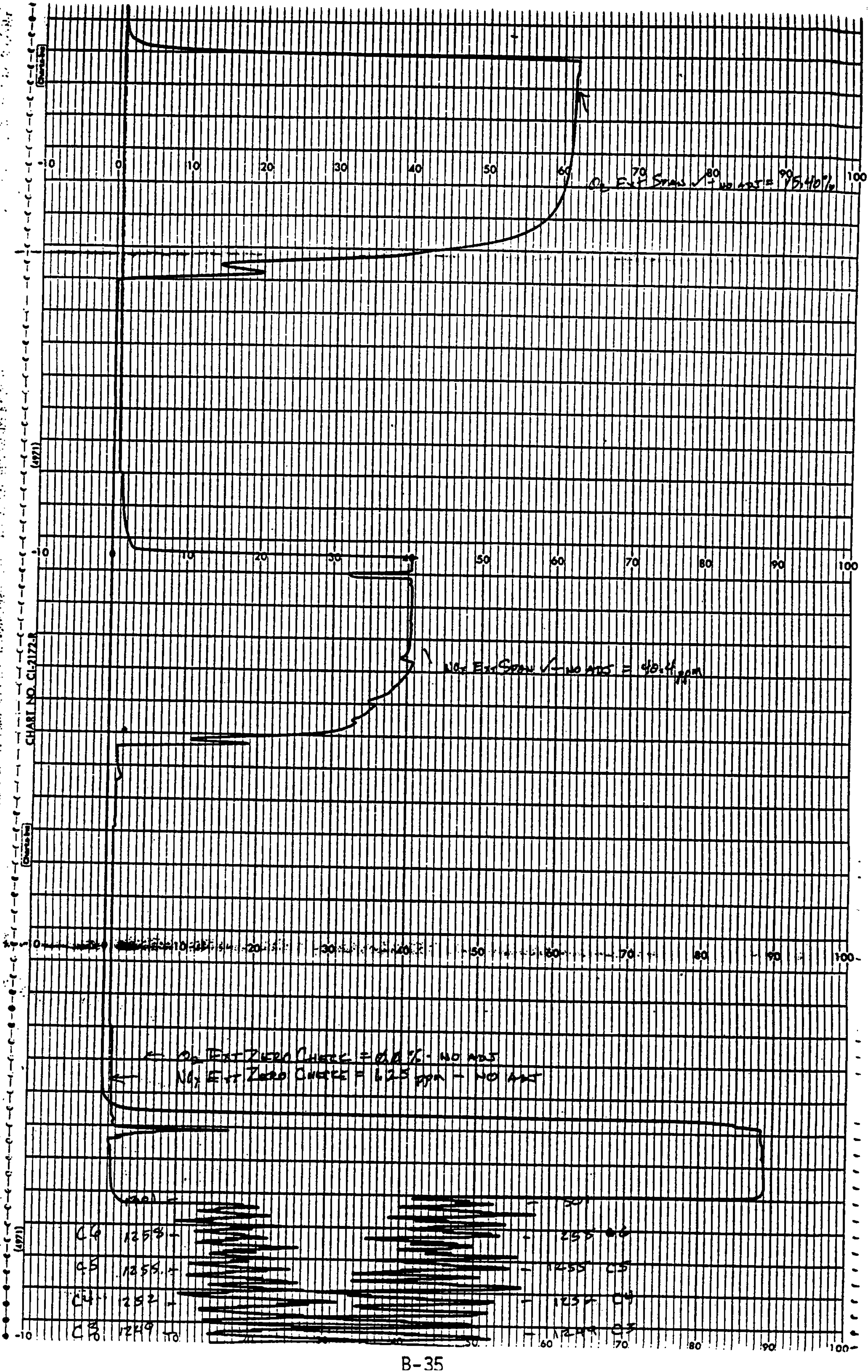


CHART NO CI-2172-R
Charts Inc
(4971)
-10
0
10
20
30
40
50
60
70
80
90
100
NOx Ext Span √ = 41.3 ppm
NOx Ext Zero √ = 1.40 ppm
O2 Ext = 15.25%
O2 External Leak Check = 0.0%



NOx
Analyzer Test Audit
Protocol 1 Gas = 39.6 ppm NOx
Analyzer Response = 40.0 ppm


C6 1258
C5 1255
C4 1252
C3 1249
C2 1246
C1 1243
1258 C6
1255 C5
1252 C4
1249 C3
1246 C2
1243 C1
D6 1228
D5 1225
D4 1222
D3 1219
D2 1216
D1 1213
1228 D6
1225 D5
1222 D4
1219 D3
1216 D2
1213 D1
A6 1158
A5 1155
A4 1152
A3 1149
A2 1146
A1 1143
1158 A6
1155 A5
1152 A4
1149 A3
1146 A2
1143 A1
B6 1131
B5 1128
B4 1125
B3 1122
B2 1119
B1
1131 B6
1128 B5
1125 B4
1122 B3
1119 B2
B1
0
10
20
30
40
50
60
70
80
90
100
CHART NO. CL-2172-8



O_2 Ext Span ✓ - no adj = 15.40%

NO_x Ext Span ✓ - no adj = 40.4 ppm

← O_2 Ext Zero Check = 0.0% - no adj

← NO_x Ext Zero Check = 6.25 ppm - no adj

1301 -

C6 1258 -

C5 1255 -

C4 1252 -

C3 1249 to

- 1301

- 1255 C6

- 1255 C5

- 1252 C4

- 1249 C3

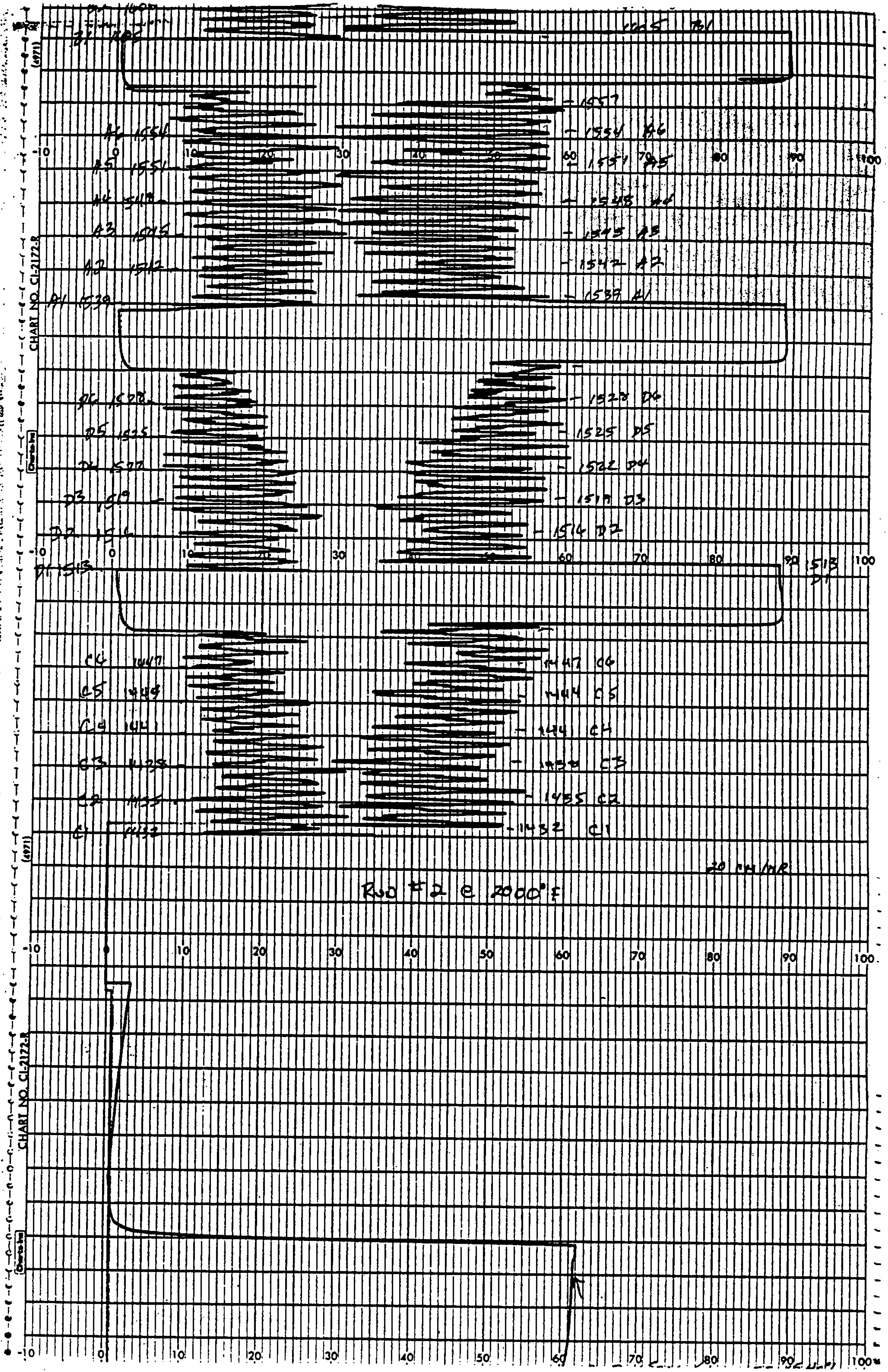
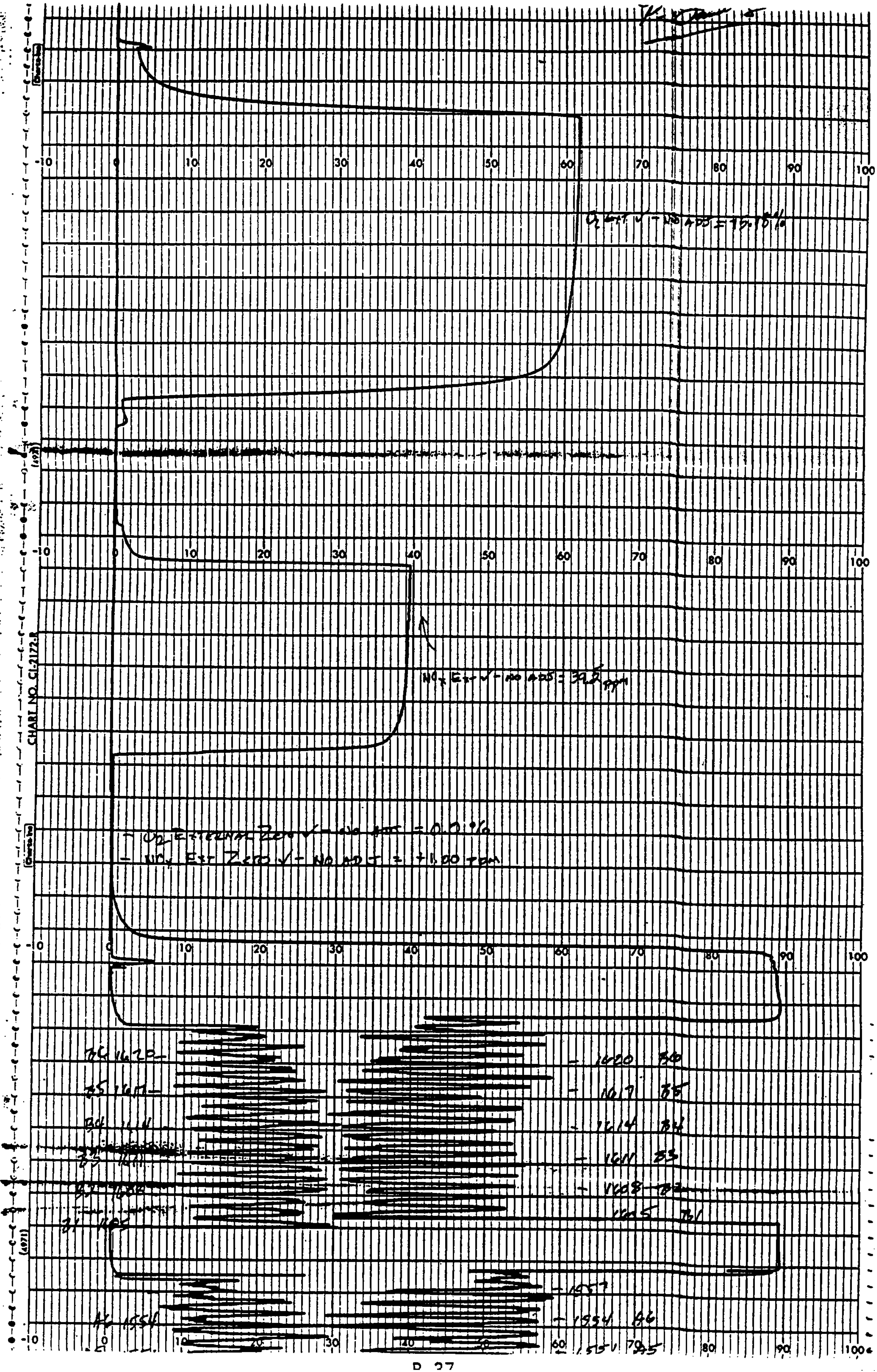


CHART NO CL-2172-R
(4971)
-10
0
10
20
30
40
50
60
70
80
90
100
A6 1554
- 1557
- 1554 A6
A5 1551
- 1551 A5
A4 1548
- 1548 A4
A3 1545
- 1545 A3
A2 1542
- 1542 A2
A1 1539
- 1539 A1
D6 1528
- 1528 D6
D5 1525
- 1525 D5
D4 1522
- 1522 D4
D3 1519
- 1519 D3
D2 1516
- 1516 D2
D1 1513
1513 D1
C6 1447
1447 C6
C5 1444
1444 C5
C4 1441
1441 C4
C3 1438
1438 C3
C2 1435
1435 C2
C1 1432
1432 C1
20 CM/HR
RUN #2 @ 2000°F



O_2 Ext ✓ - NO ADJ = 15.10%

NO_x Ext ✓ - NO ADJ = 39.2 ppm

- O_2 EXTERNAL ZERO ✓ - NO ADJ = 0.0%
- NO_x EXT ZERO ✓ - NO ADJ = +1.00 ppm

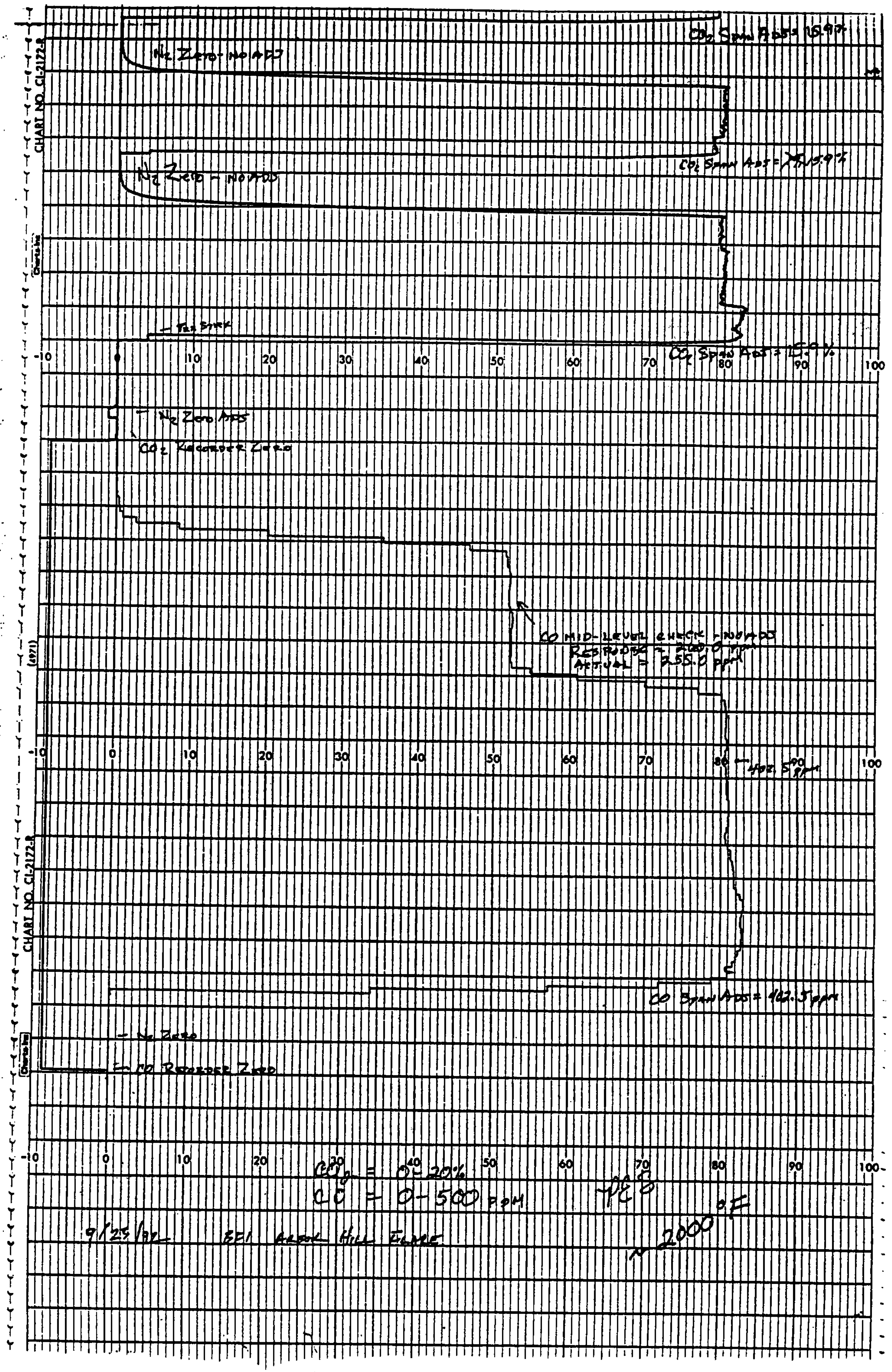


CHART NO. CL-2172-R
Chart Inc
(6971)
-10
0
10
20
30
40
50
60
70
80
90
100
CO2 SPAN ADJ = 15.9%
N2 ZERO - NO ADJ
CO2 SPAN ADJ = 15.9%
N2 ZERO - NO ADJ
- TO STACK
CO2 SPAN ADJ = 15.9%
N2 ZERO ADJ
CO2 RECORDER ZERO
CO MID-LEVEL CHECK - NO ADJ
RESPONSE = 260.0 ppm
ACTUAL = 255.0 ppm
← 402.5 ppm
CO SPAN ADJ = 402.5 ppm
- N2 ZERO
← CO RECORDER ZERO
CO2 = 0-20%
CO = 0-500 PPM
PEB
9/25/92 EEI ARBOR HILL FLARE
~2000 °F

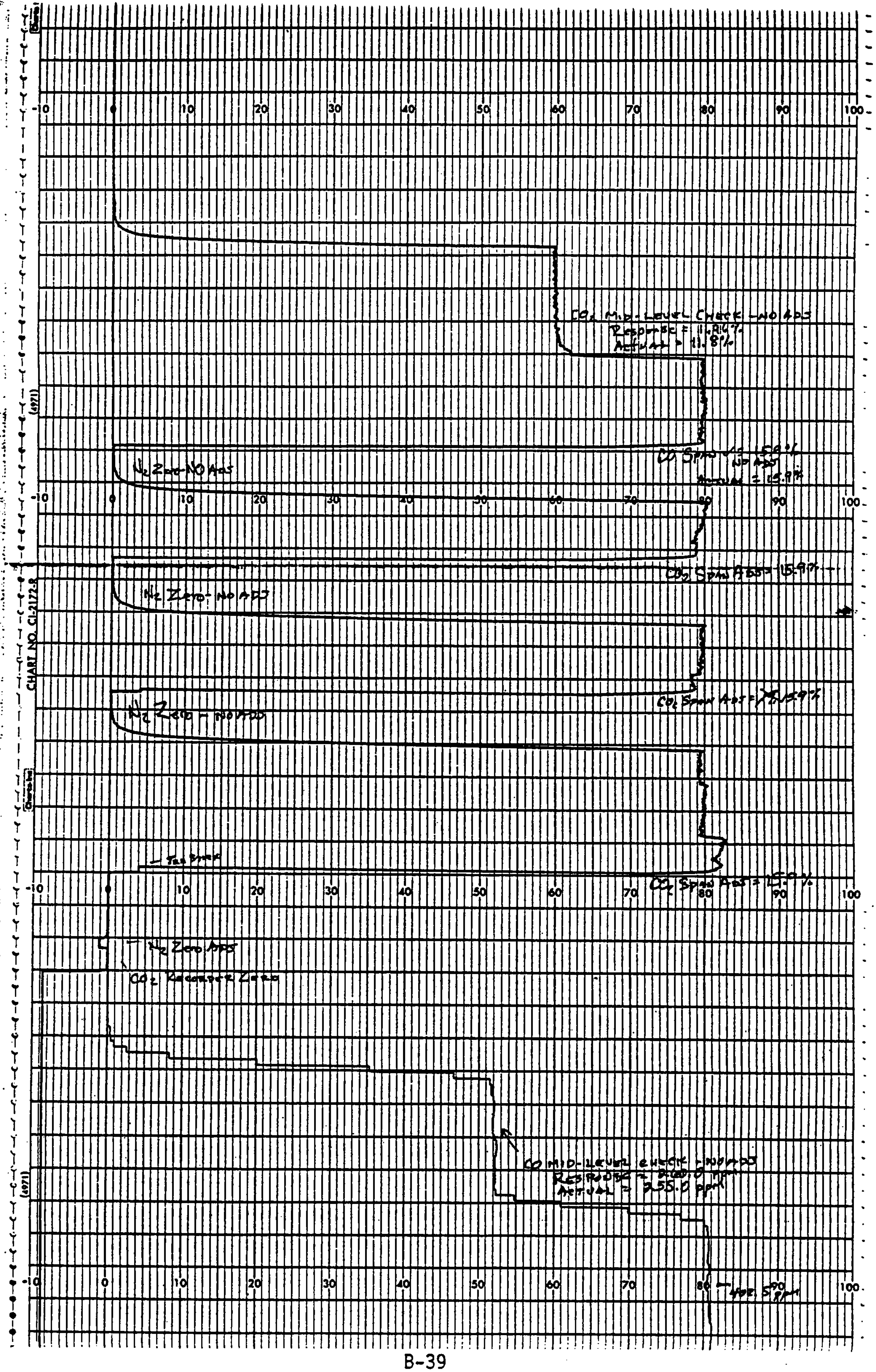
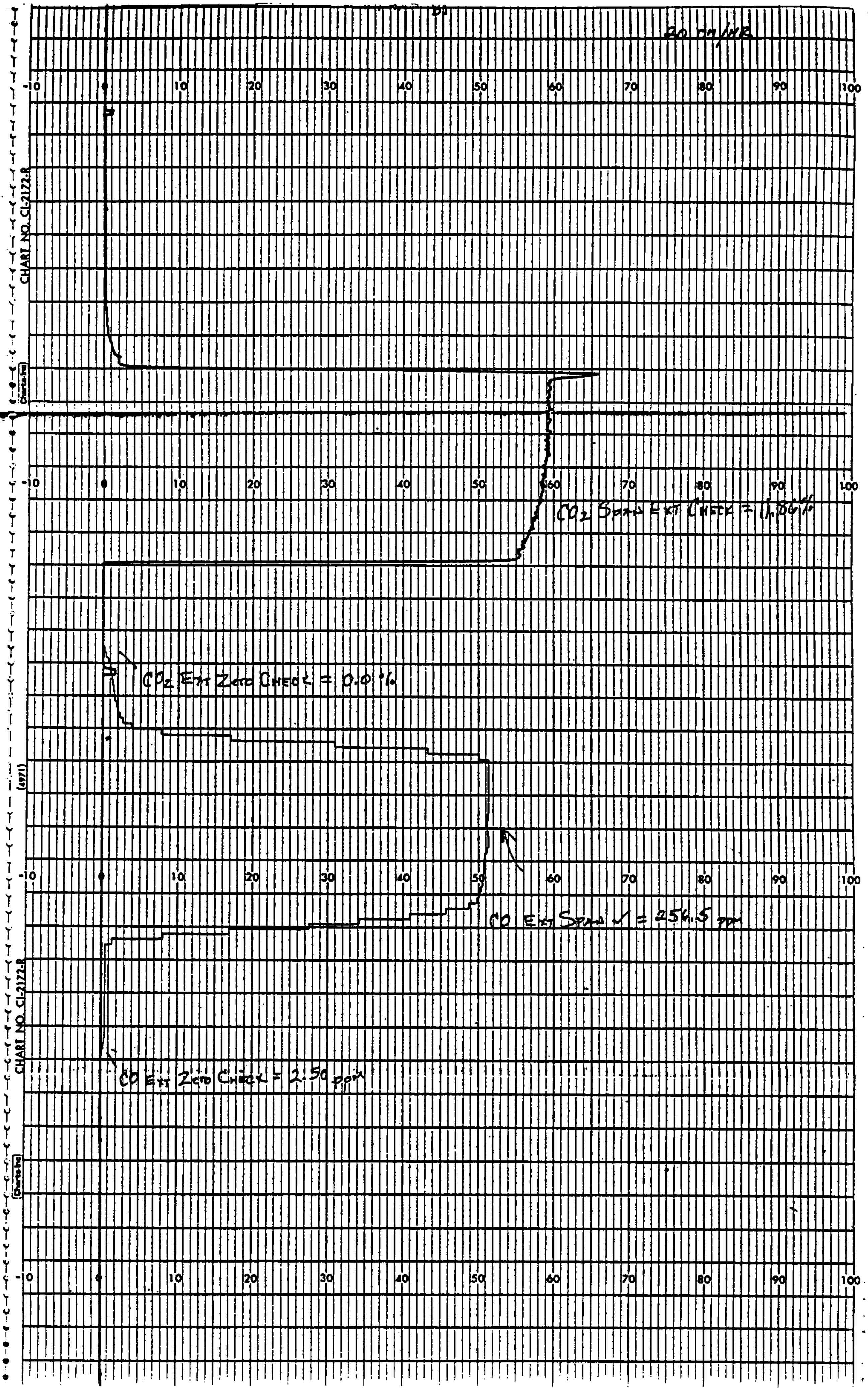


CHART NO. CI-2172-8
(4971)
-10 0 10 20 30 40 50 60 70 80 90 100
CO₂ MID-LEVEL CHECK - NO ADJ
Response = 11.84%
Actual = 11.8%
N₂ Zero-NO ADJ
CO₂ Span = 15.8%
NO ADJ
Actual = 15.9%
N₂ Zero - NO ADJ
CO₂ Span ADJ = 15.9%
N₂ Zero - NO ADJ
CO₂ Span ADJ = ~~16.~~ 15.9%
— Tan Stack
CO₂ Span ADJ = 15.9%
— N₂ Zero ADJ
CO₂ Recorder Zero
CO MID-LEVEL CHECK - NO ADJ
Response = 260.0 ppm
Actual = 255.0 ppm
— 402.5 ppm

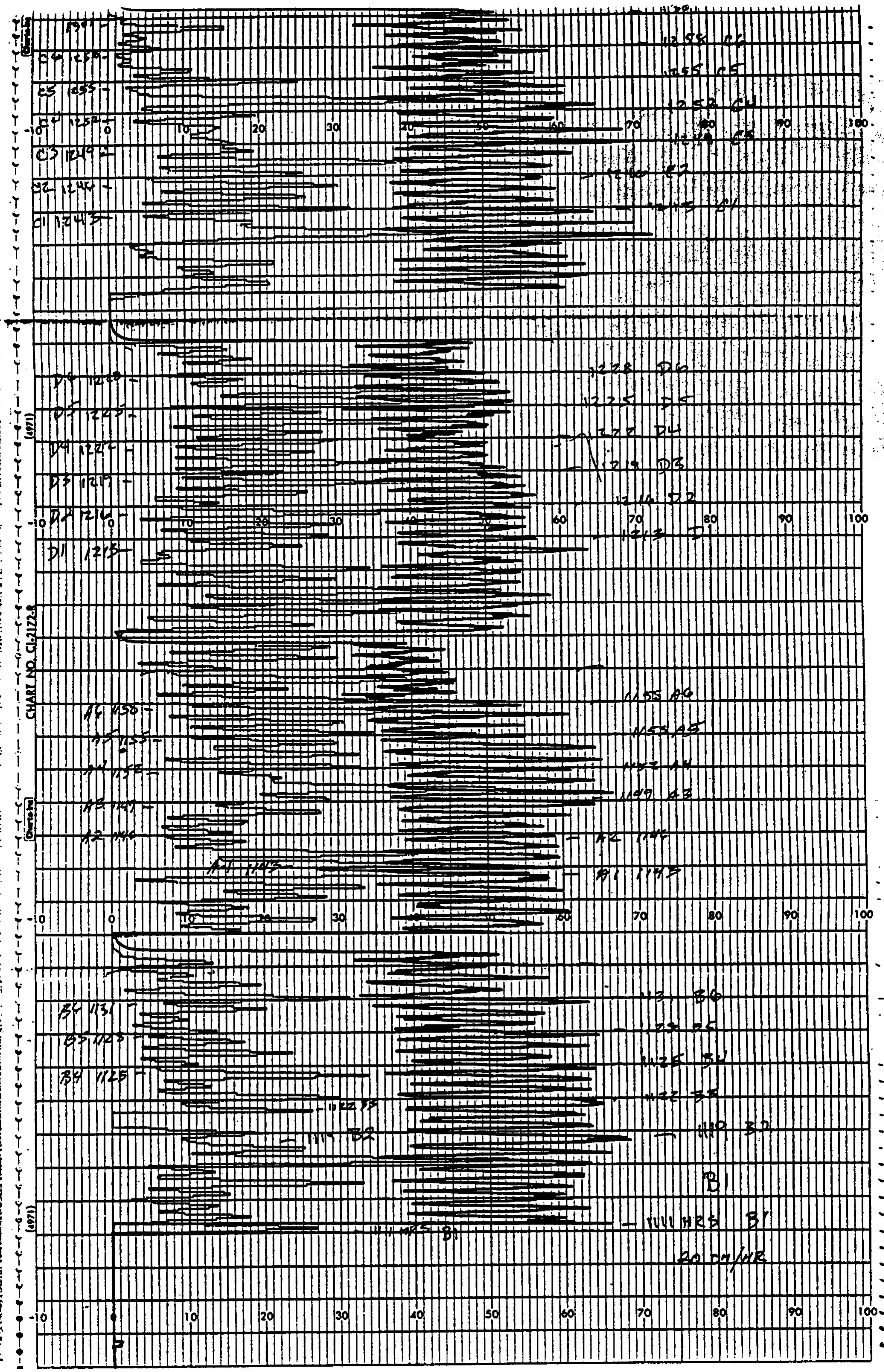


CO2 SPAN EXT CHECK = 11.86%

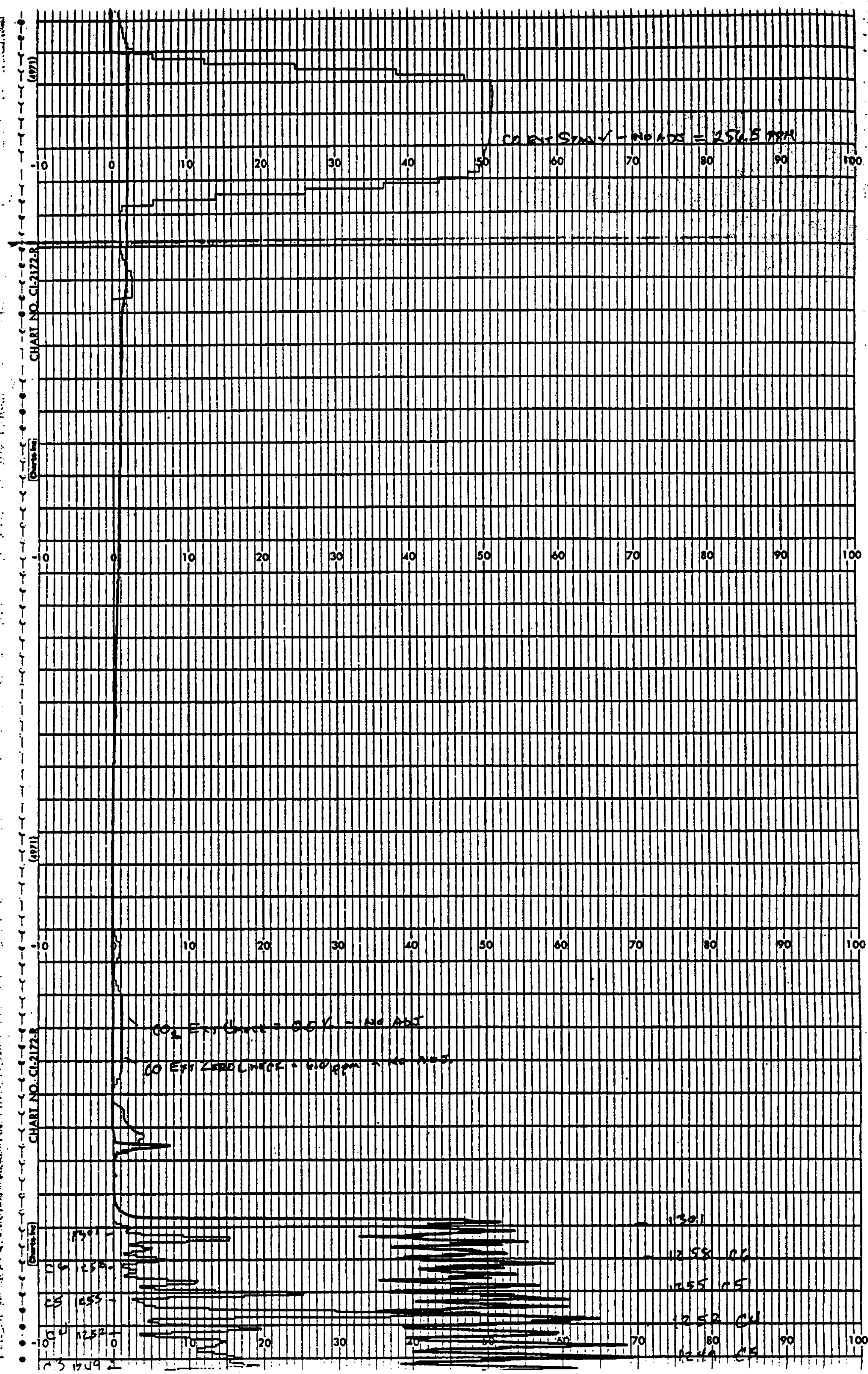
CO2 EXT ZERO CHECK = 0.0%

CO EXT SPAN ✓ = 256.5 ppm

CO EXT ZERO CHECK = 2.50 ppm



C6 1258
C5 1255
C4 1252
C3 1249
C2 1246
C1 1243
1258 C6
1255 C5
1252 C4
1249 C3
1246 C2
1243 C1
-10
0
10
20
30
40
50
60
70
80
90
100
D6 1228
D5 1225
D4 1222
D3 1219
D2 1216
D1 1213
1228 D6
1225 D5
1222 D4
1219 D3
1216 D2
1213 D1
CHART NO. CL-2172-R
A6 1158
A5 1155
A4 1152
A3 1149
A2 1146
A1 1143
1155 A6
1155 A5
1152 A4
1149 A3
A2 1146
A1 1143
B6 1131
B5 1128
B4 1125
1131 B6
1128 B5
1125 B4
1122 B3
1119 B2
1122 B3
1119 B2
B
1111 HRS B1
1111 HRS B1
20 cm/HR



CO EXT SPAN ✓ - NO ADJ = 256.5 PPM

CO2 EXT CHECK = 0.0 % - NO ADJ

CO EXT ZERO CHECK = 6.0 ppm - NO ADJ.

1301

C6 1258

C5 1255

C4 1252

C3 1249

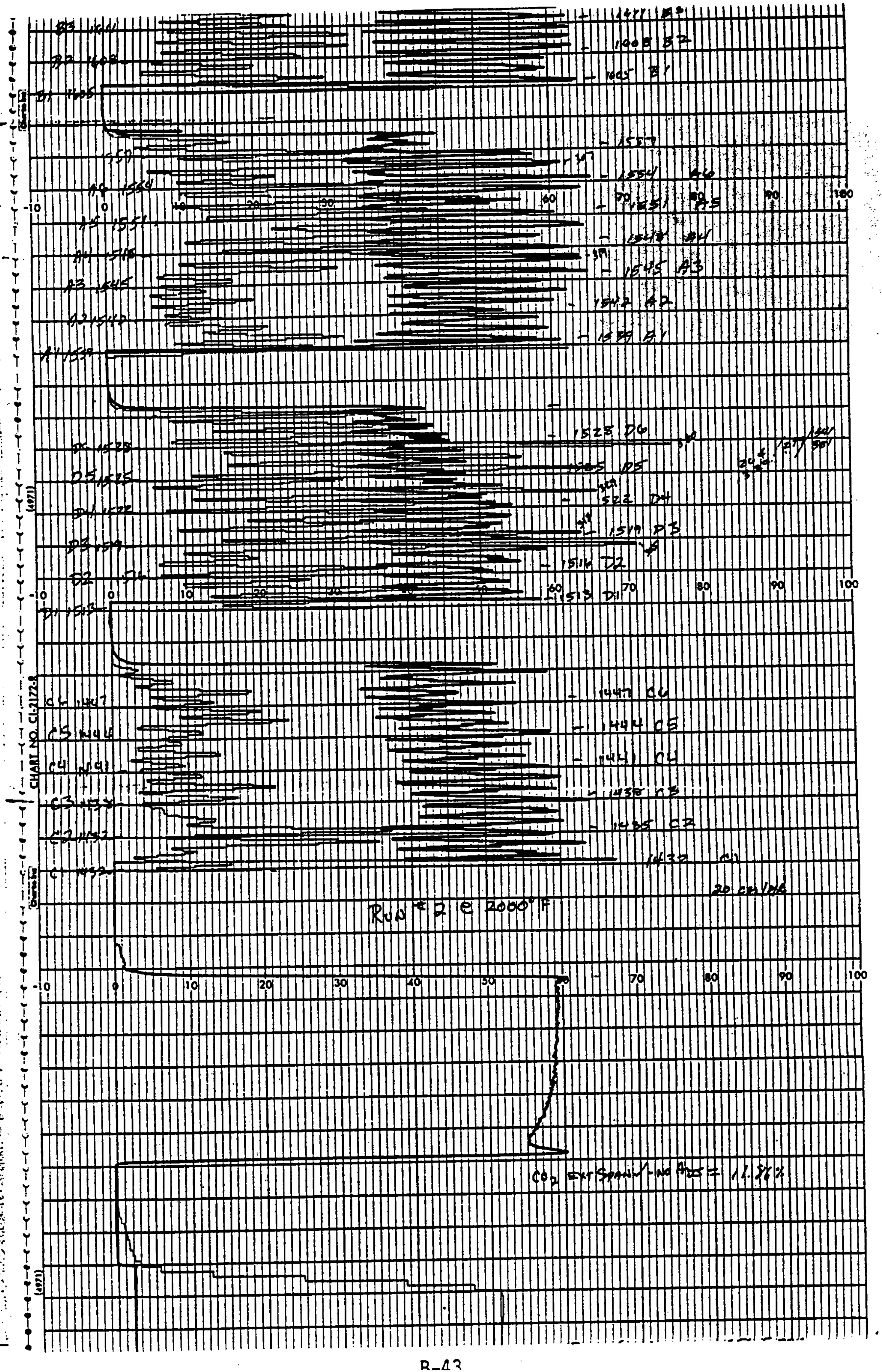
1301

1258 C6

1255 C5

1252 C4

1249 C3


B3 1611
B2 1608
B1 1605
1611 B3
1608 B2
1605 B1
1557
1554 A6
1551 A5
1548 A4
1545 A3
1542 A2
1539 A1
A6 1554
A5 1551
A4 1548
A3 1545
A2 1542
A1 1539
D6 1528
D5 1525
D4 1522
D3 1519
D2 1516
D1 1513
1528 D6
1525 D5
1522 D4
1519 D3
1516 D2
1513 D1
C6 1447
C5 1444
C4 1441
C3 1438
C2 1435
C1 1432
1447 C6
1444 C5
1441 C4
1438 C3
1435 C2
1432 C1
20 cm/hr
RUN #2 @ 2000°F
CO₂ EXT SPAN / NO ADS = 11.5%
-10
0
10
20
30
40
50
60
70
80
90
100
CHART NO. CL-2172-8
(4971)

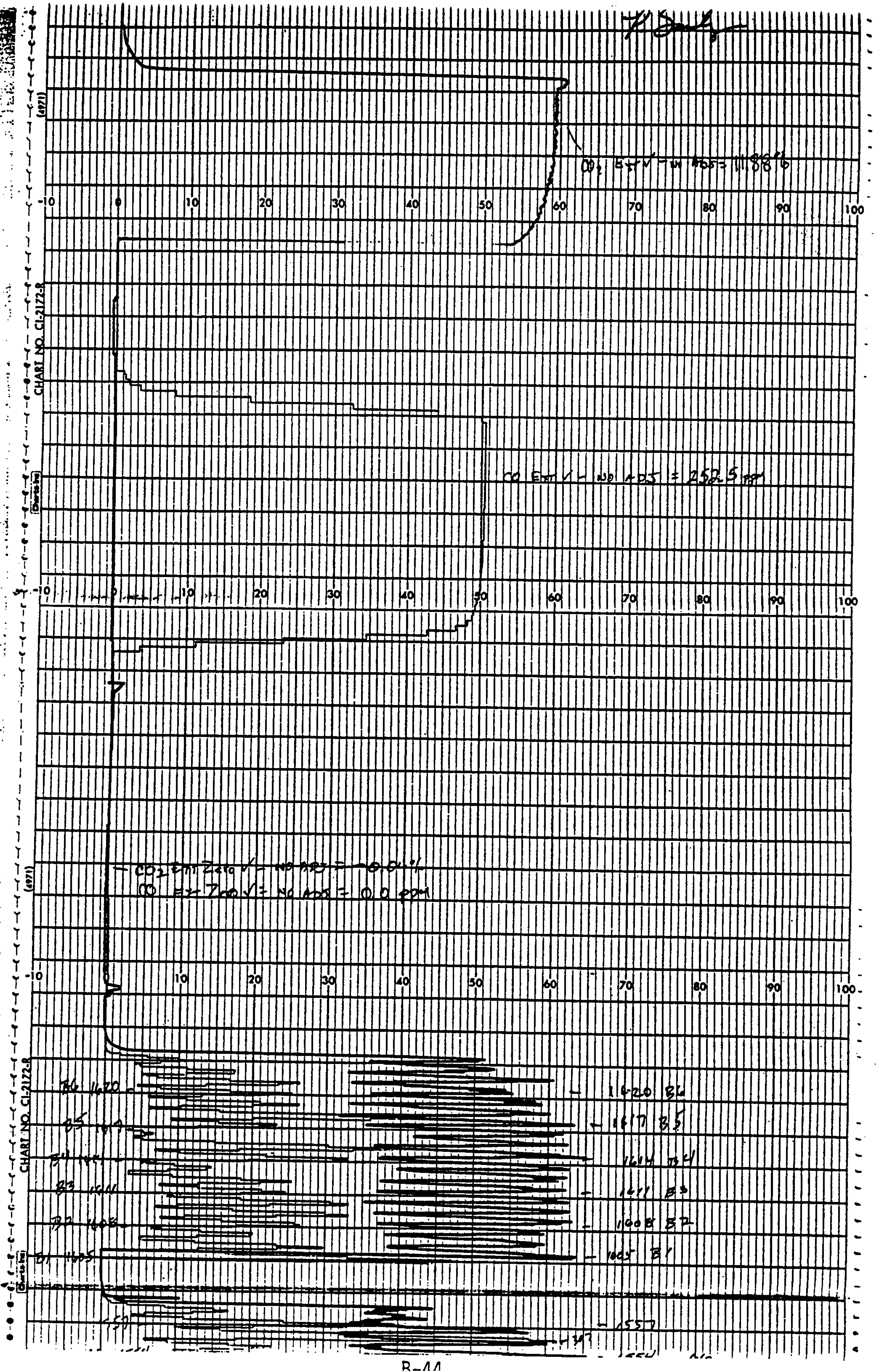
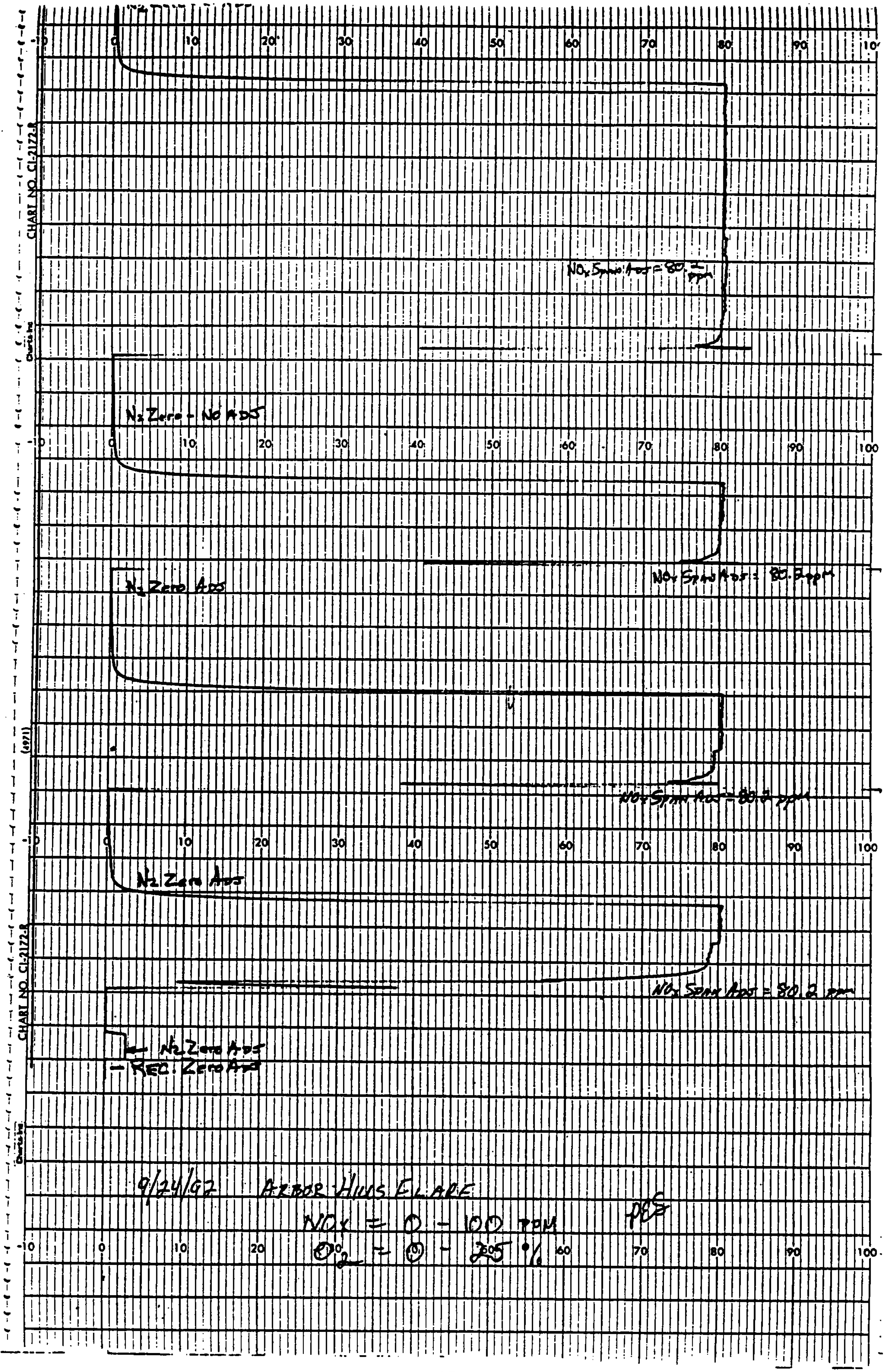


CHART NO. CL-2172-B
(4971)
-10 0 10 20 30 40 50 60 70 80 90 100
CO2 EXT √ – NO ADJ = 11.88%
CO EXT √ – NO ADJ = 252.5 ppm
CO2 EXT ZERO √ – NO ADJ = 0.0%
CO EXT ZERO √ = NO ADJ = 0.0 ppm
B6 1620
B5 1617
B4 1614
B3 1611
B2 1608
B1 1605
1620 B6
1617 B5
1614 B4
1611 B3
1608 B2
1605 B1
1557
1557
1554

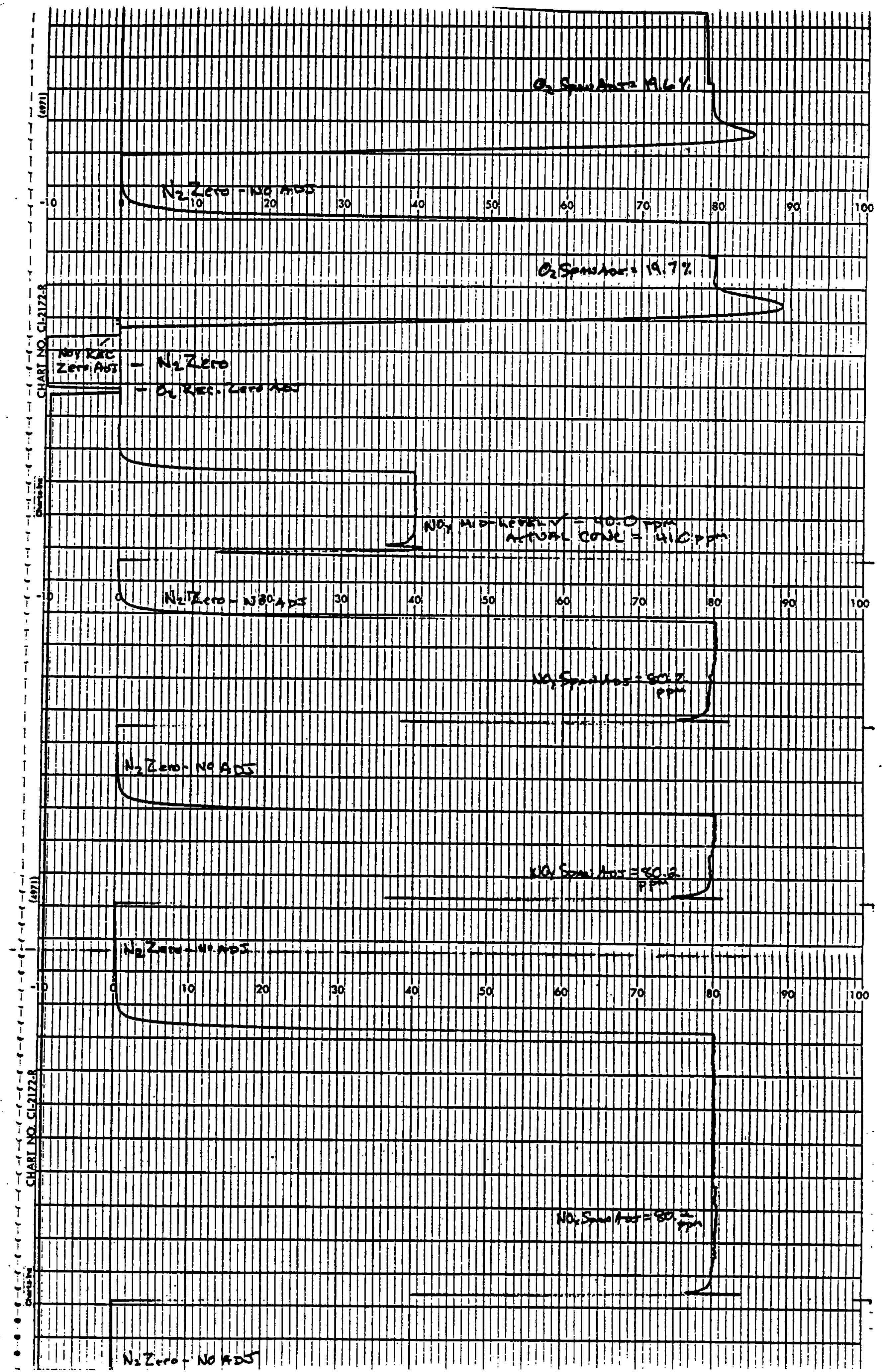


9/24/97 ARBOR HILLS FLARE

NOx = 0 - 100 ppm

O_2 = 0 - 25 %

PES



O2 Span Adj = 19.6%
N2 Zero - No ADJ
-10
0
10
20
30
40
50
60
70
80
90
100
O2 Span Adj = 19.7%
CHART NO. CL-2172-R
NOx Rec Zero Adj ✓
- N2 Zero
- O2 Rec. Zero Adj
NOx MID LEVEL ✓ - 40.0 ppm
ACTUAL CONC = 41.0 ppm
N2 Zero - No ADJ
-10
0
30
40
50
60
70
80
90
100
NOx Span Adj = 80.2 ppm
N2 Zero - No ADJ
NOx Span Adj = 80.2 ppm
N2 Zero - No ADJ
-10
0
10
20
30
40
50
60
70
80
90
100
CHART NO. CL-2172-R
NOx Span Adj = 80.2 ppm
N2 Zero - No ADJ

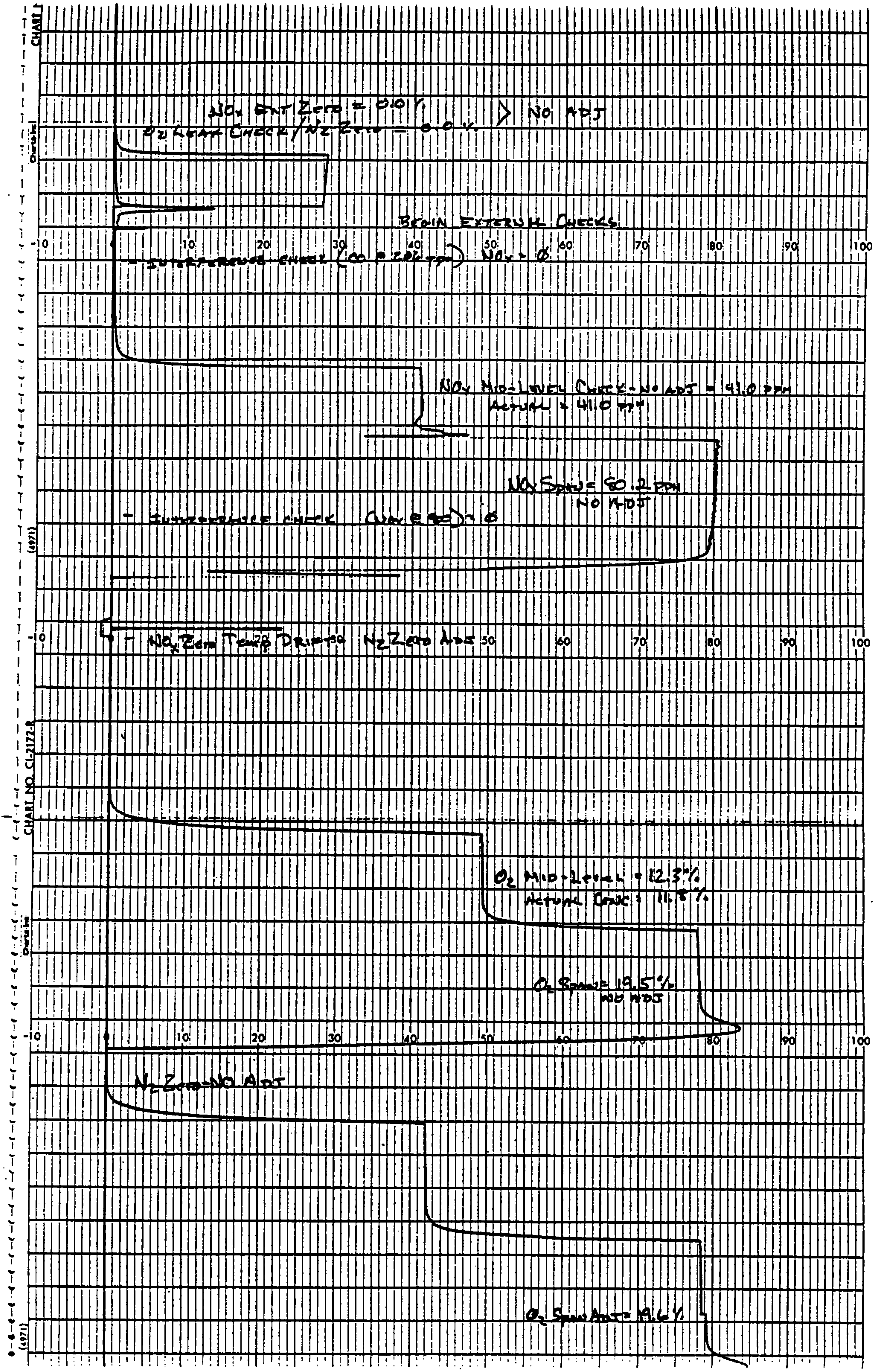
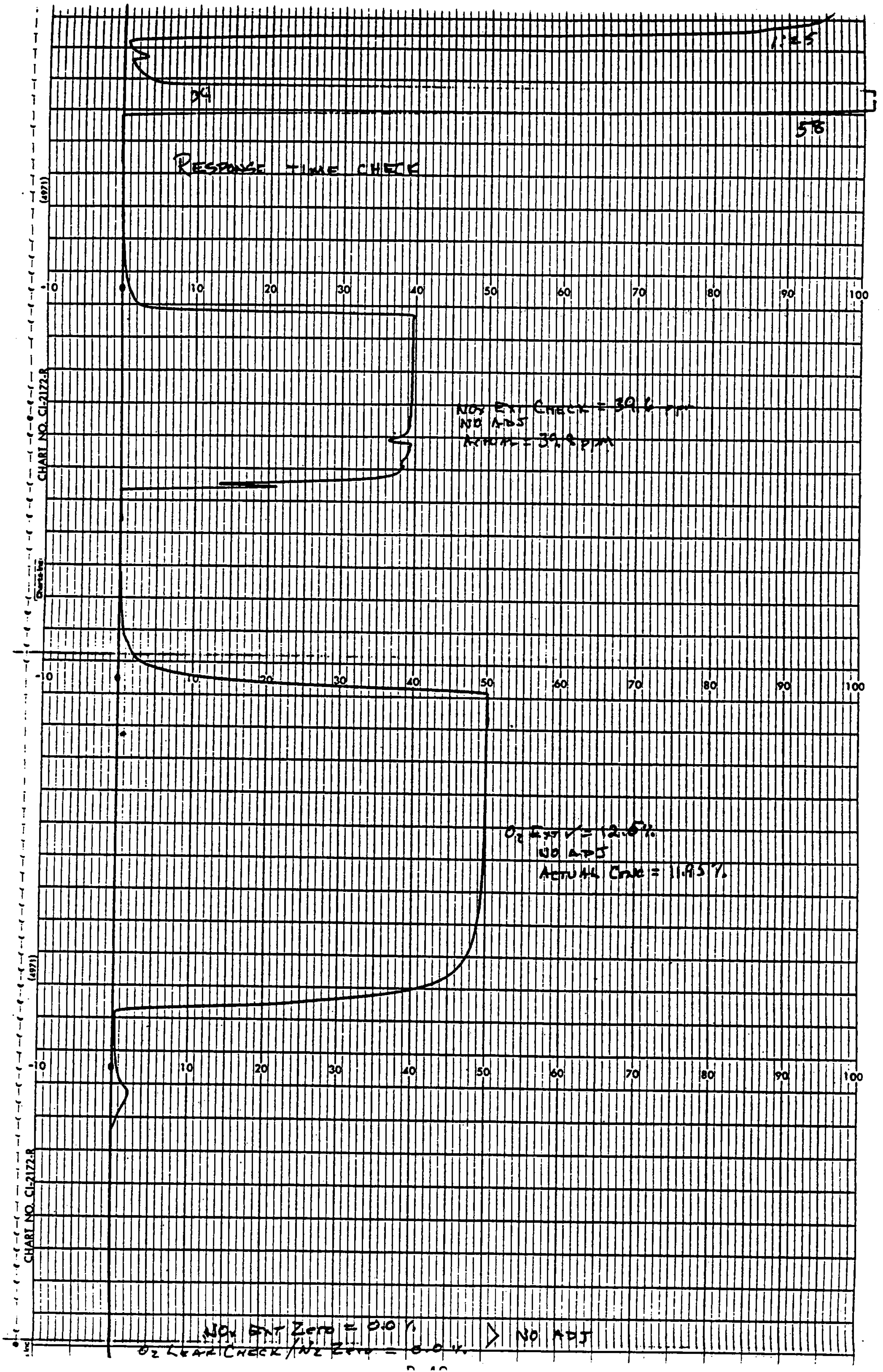


CHART 1
NOx INT ZERO = 0.0 %) NO ADJ
O2 LEAK CHECK/N2 ZERO = 0.0 %
BEGIN EXTERNAL CHECKS
- INTERFERENCE CHECK (CO @ 206 PPM) NOx = 0
NOx MID-LEVEL CHECK - NO ADJ = 41.0 PPM
ACTUAL = 41.0 PPM
NOx SPAN = 80.2 PPM
NO ADJ
- INTERFERENCE CHECK (CO2 @ [illegible]) = 0
- NOx ZERO TEMP DRIFT N2 ZERO ADJ
(4971)
CHART NO. CL-2172-R
O2 MID-LEVEL = 12.3 %
ACTUAL CONC = 11.8 %
O2 SPAN = 19.5 %
NO ADJ
N2 ZERO - NO ADJ
O2 SPAN ADJ = 19.6 %
-10
0
10
20
30
40
50
60
70
80
90
100

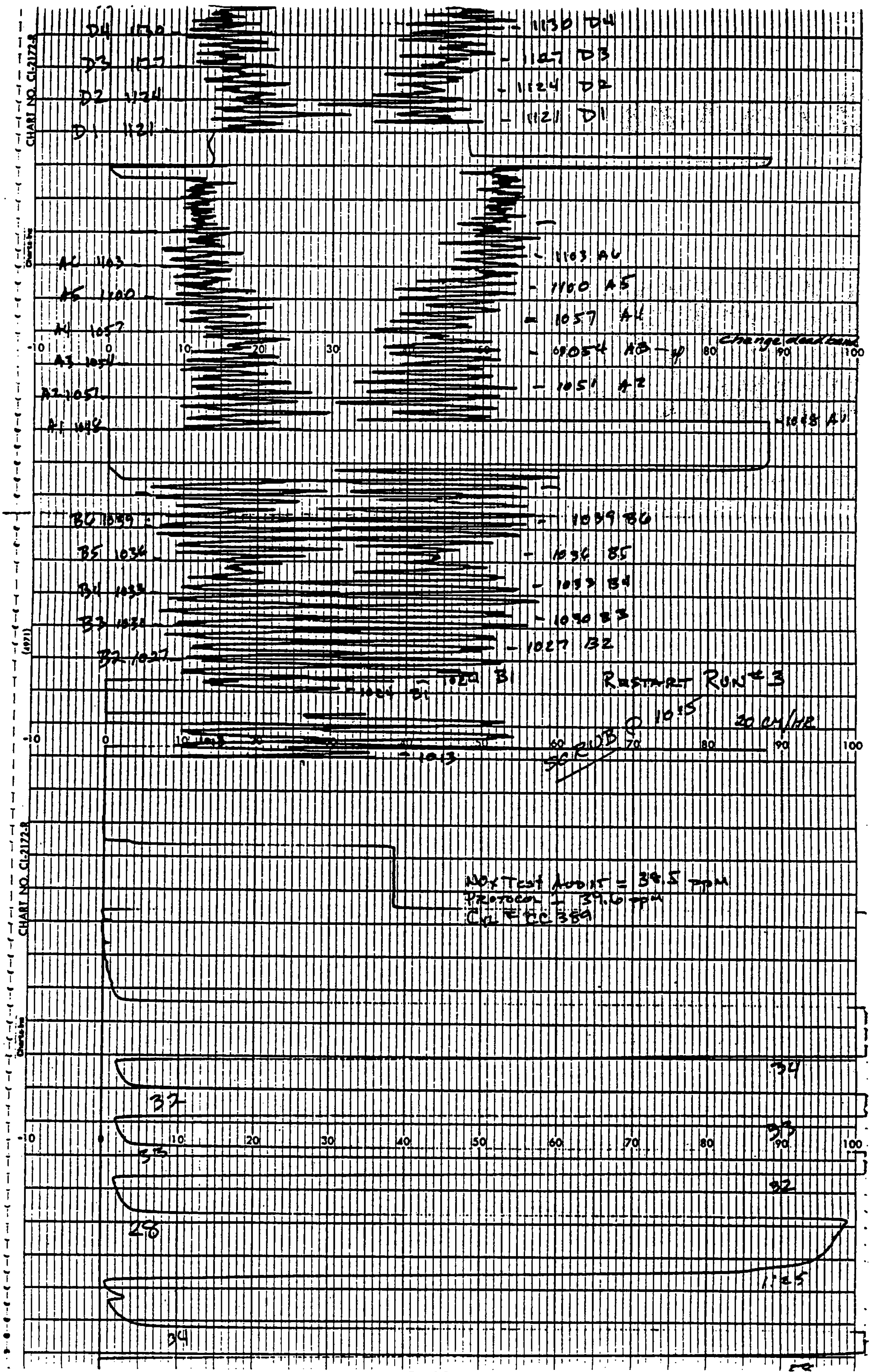


RESPONSE TIME CHECK

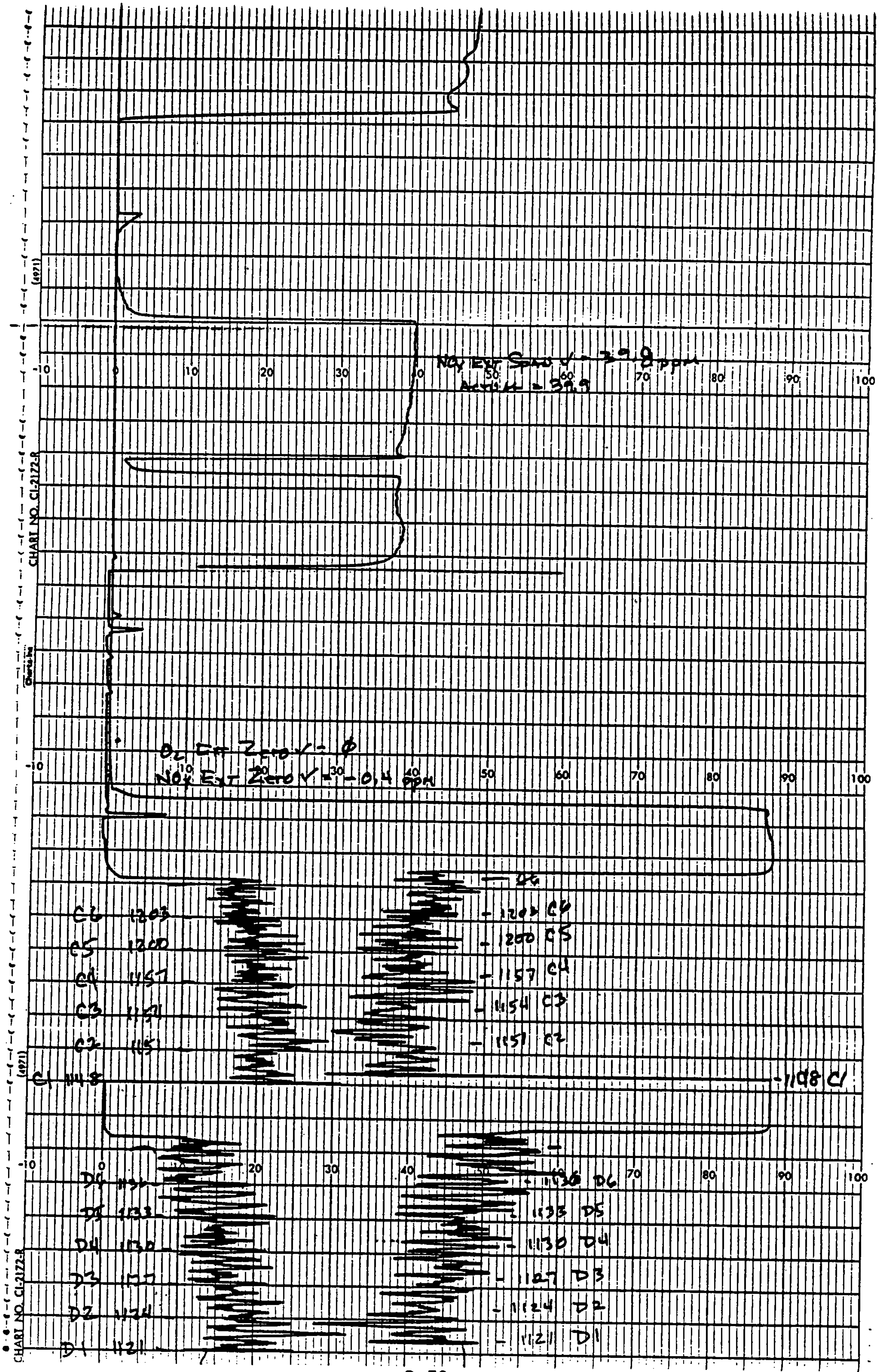
NOx EXT CHECK = 39.6 ppm
NO ADJ
ACTUAL = 39.8 PPM

O2 EXT ✓ = 12.0%
NO ADJ
ACTUAL CONC = 11.95%

NOx EXT ZERO = 0.0%
O2 LEAK CHECK / N2 ZERO = 0.0% 〉 NO ADJ

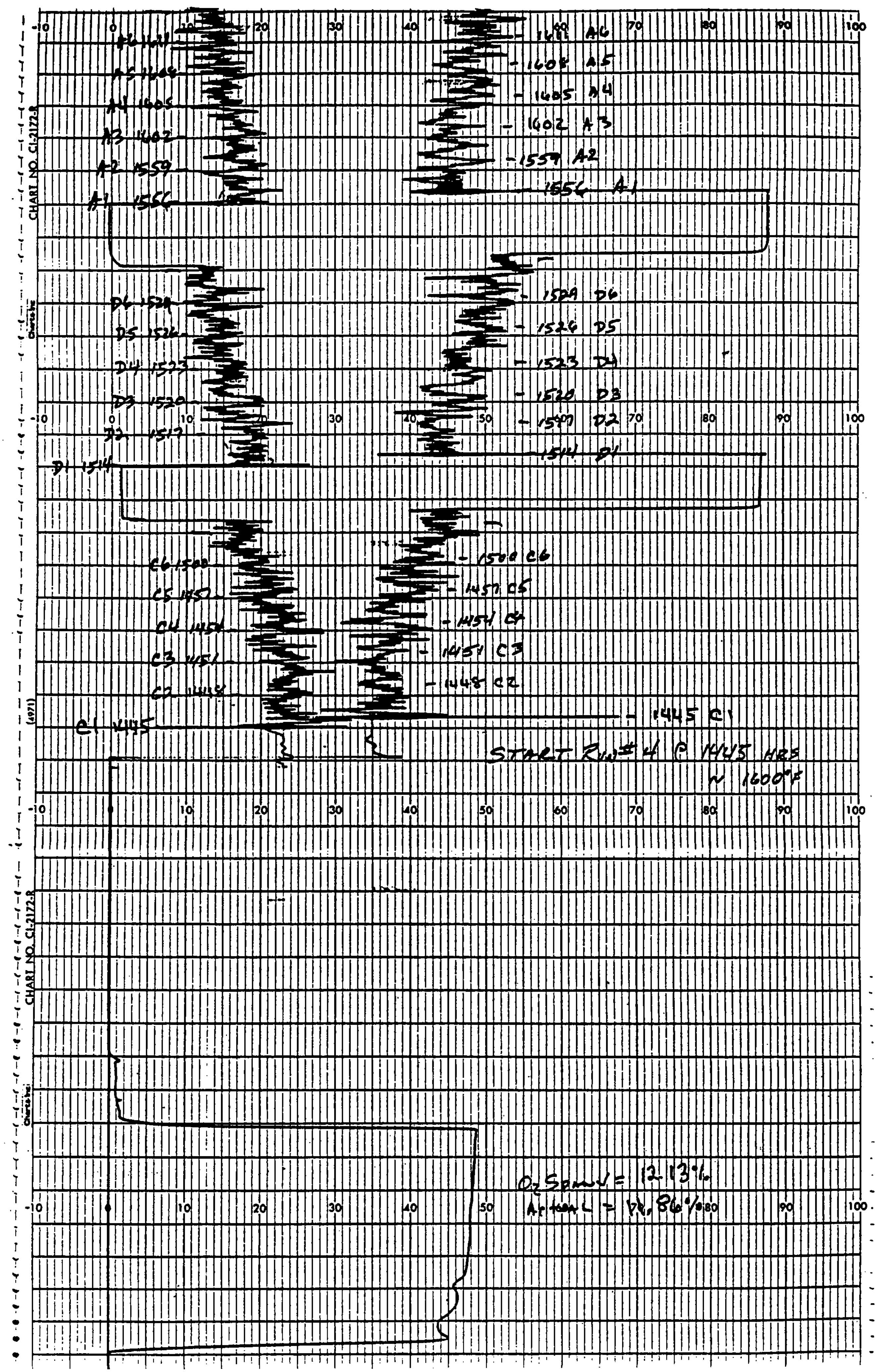


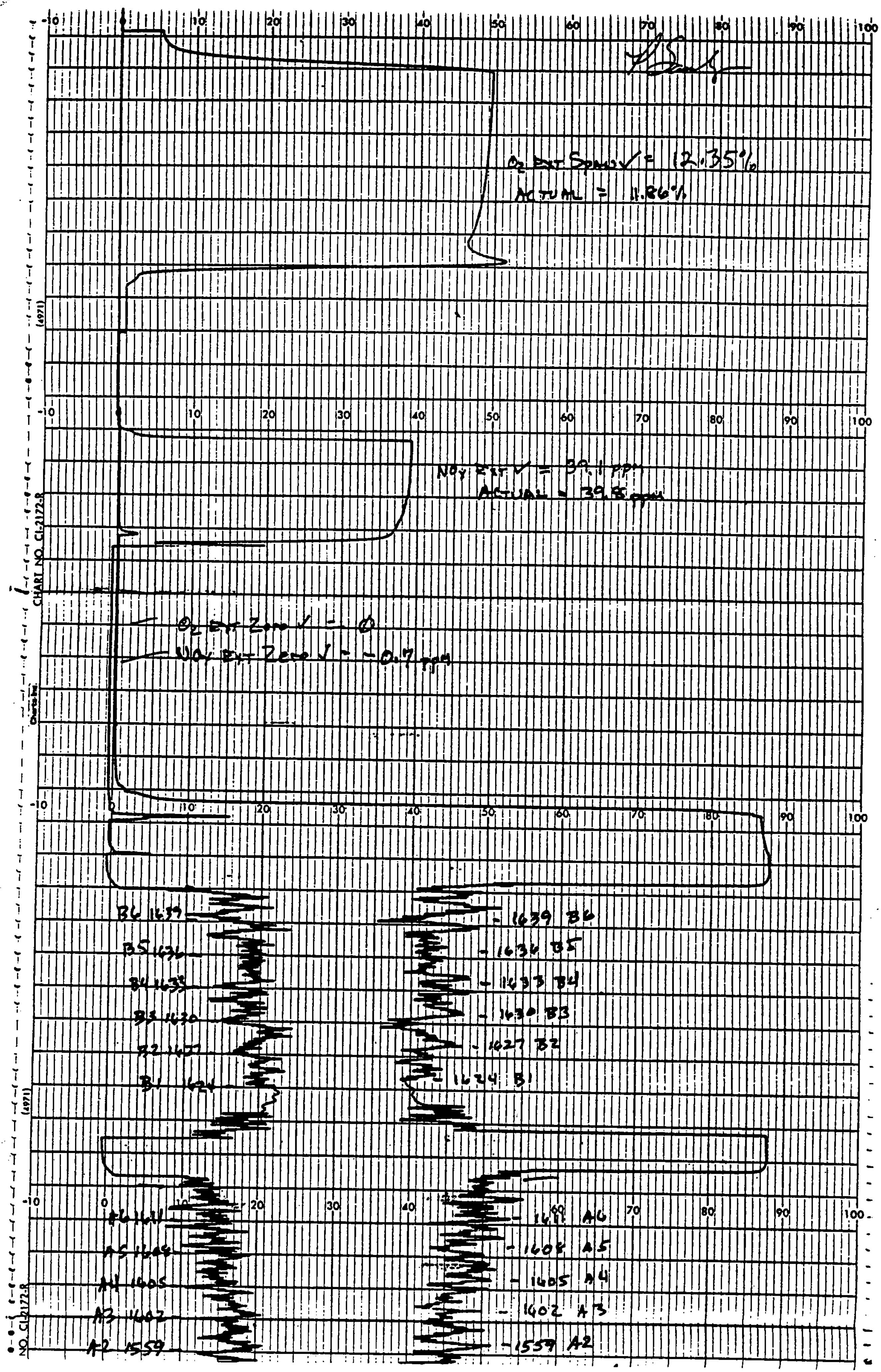
NOx Test Audit = 38.5 ppm
Protocol = 39.6 ppm
Cyl # CC 359



NOx Ext Span ✓ = 39.8 ppm
Actual = 39.9

O2 CF Zero ✓ = 0
NOx Ext Zero ✓ = -0.4 ppm

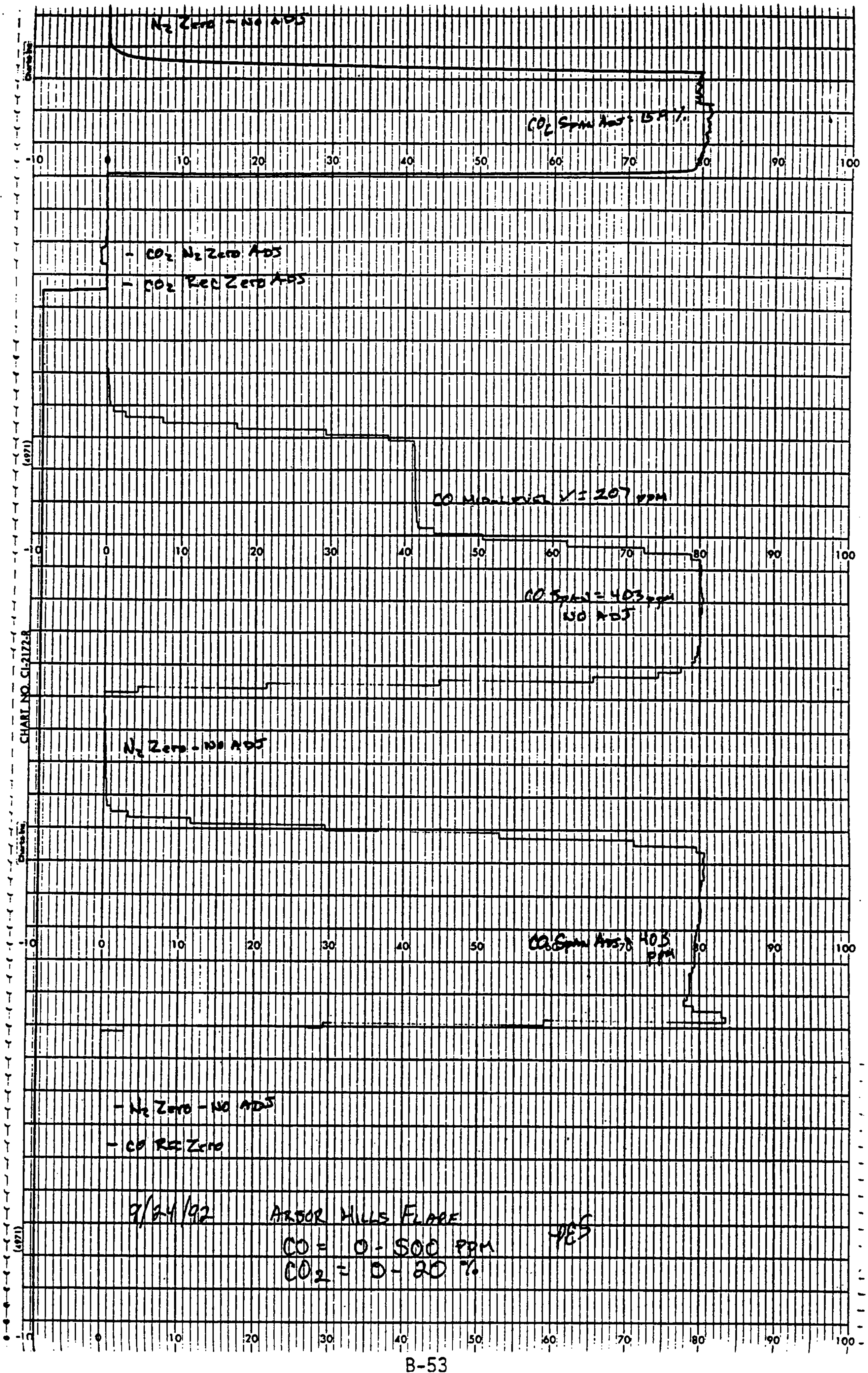

A6 1611
A5 1608
A4 1605
A3 1602
A2 1559
A1 1556
- 1611 A6
- 1608 A5
- 1605 A4
- 1602 A3
- 1559 A2
1556 A1
D6 1529
D5 1526
D4 1523
D3 1520
D2 1517
D1 1514
- 1529 D6
- 1526 D5
- 1523 D4
- 1520 D3
- 1517 D2
- 1514 D1
C6 1500
C5 1457
C4 1454
C3 1451
C2 1448
C1 1445
- 1500 C6
- 1457 C5
- 1454 C4
- 1451 C3
- 1448 C2
- 1445 C1
START RUN # 4 @ 1445 HRS
~ 1600°F
O2 SPAN = 12.13%
Ar tank = 12.86%
CHART NO. CL-2172-R
-10
0
10
20
30
40
50
60
70
80
90
100

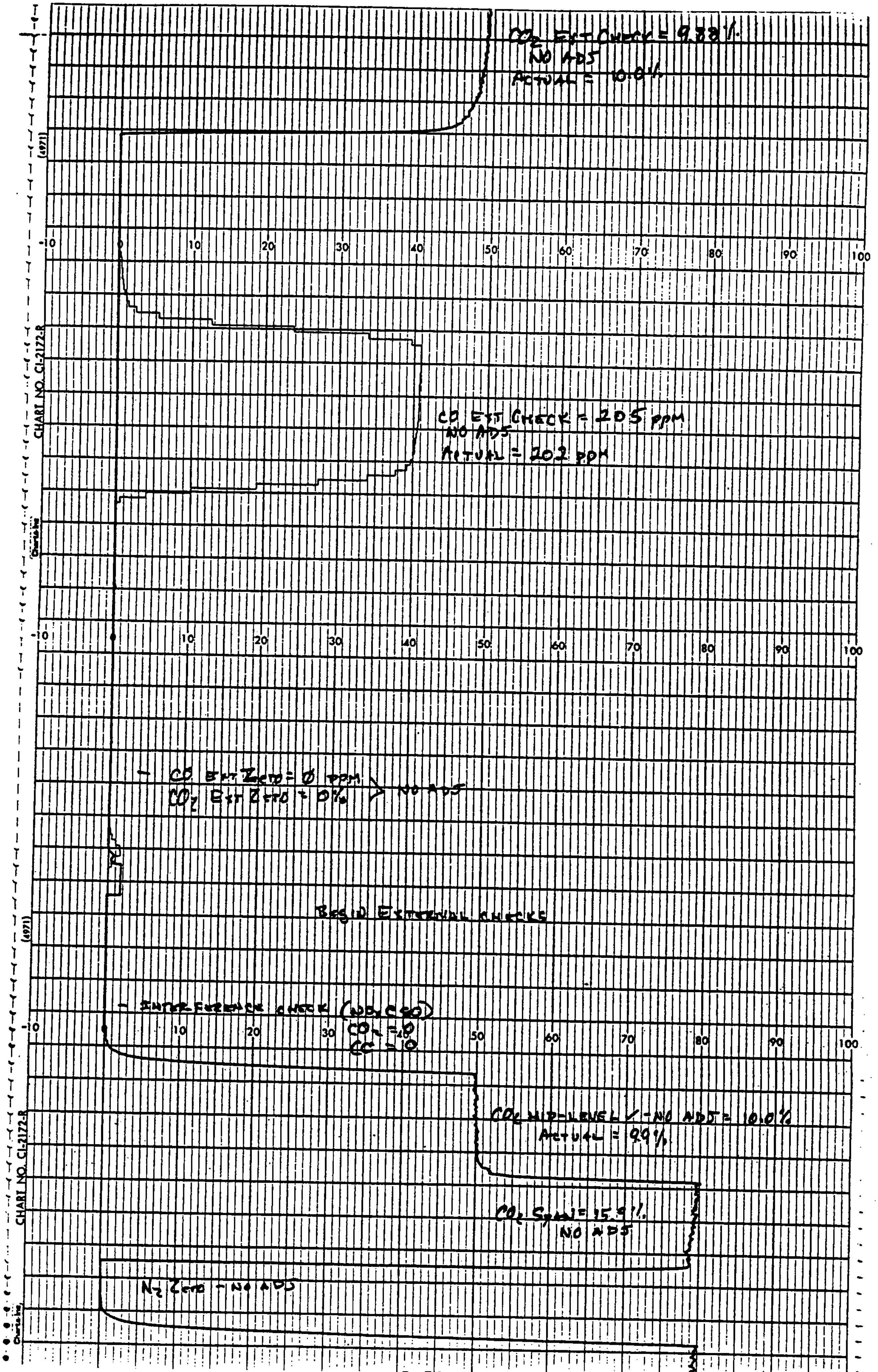


O_2 EXT SPAN ✓ = 12.35%
ACTUAL = 11.86%

NOx EXT ✓ = 39.1 ppm
ACTUAL = 39.8 ppm

O_2 EXT ZERO ✓ = 0
NOx EXT ZERO ✓ = -0.7 ppm


N2 Zero - NO ADJ
CO2 Span ADJ = 15.9 %
-10
0
10
20
30
40
50
60
70
80
90
100
- CO2 N2 Zero ADJ
- CO2 Rec Zero ADJ
CO Mid-level V = 207 ppm
CO Span = 403 ppm
NO ADJ
N2 Zero - NO ADJ
CO Span ADJ = 403 ppm
- N2 Zero - NO ADJ
- CO Rec Zero
9/24/92 ARBOR HILLS FLARE
CO = 0-500 PPM
CO2 = 0-20 %
PES
CHART NO CL-2172-8
(4971)



CO_2 EXT CHECK = 9.88%
NO ADJ
ACTUAL = 10.0%

CO EXT CHECK = 205 PPM
NO ADJ
ACTUAL = 202 PPM

- CO EXT ZERO = 0 PPM
CO_2 EXT ZERO = 0% } NO ADJ

BEGIN EXTERNAL CHECKS

- INTERFERENCE CHECK (NO, CO_2)
CO_2 = 0
CO = 0

CO_2 MID-LEVEL ✓ - NO ADJ = 10.0%
ACTUAL = 9.9%

CO_2 SPAN = 15.9%
NO ADJ

N_2 ZERO - NO ADJ

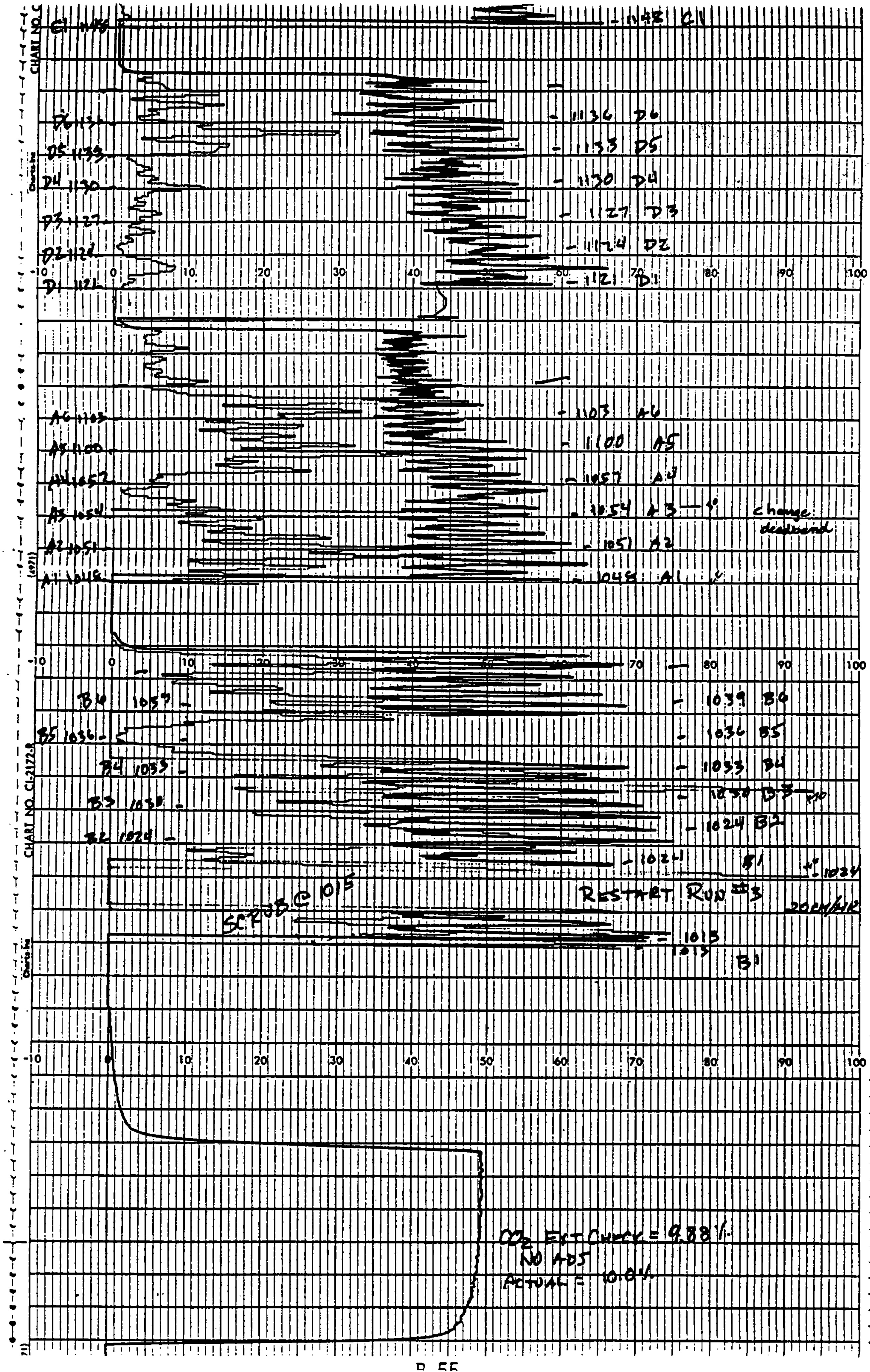
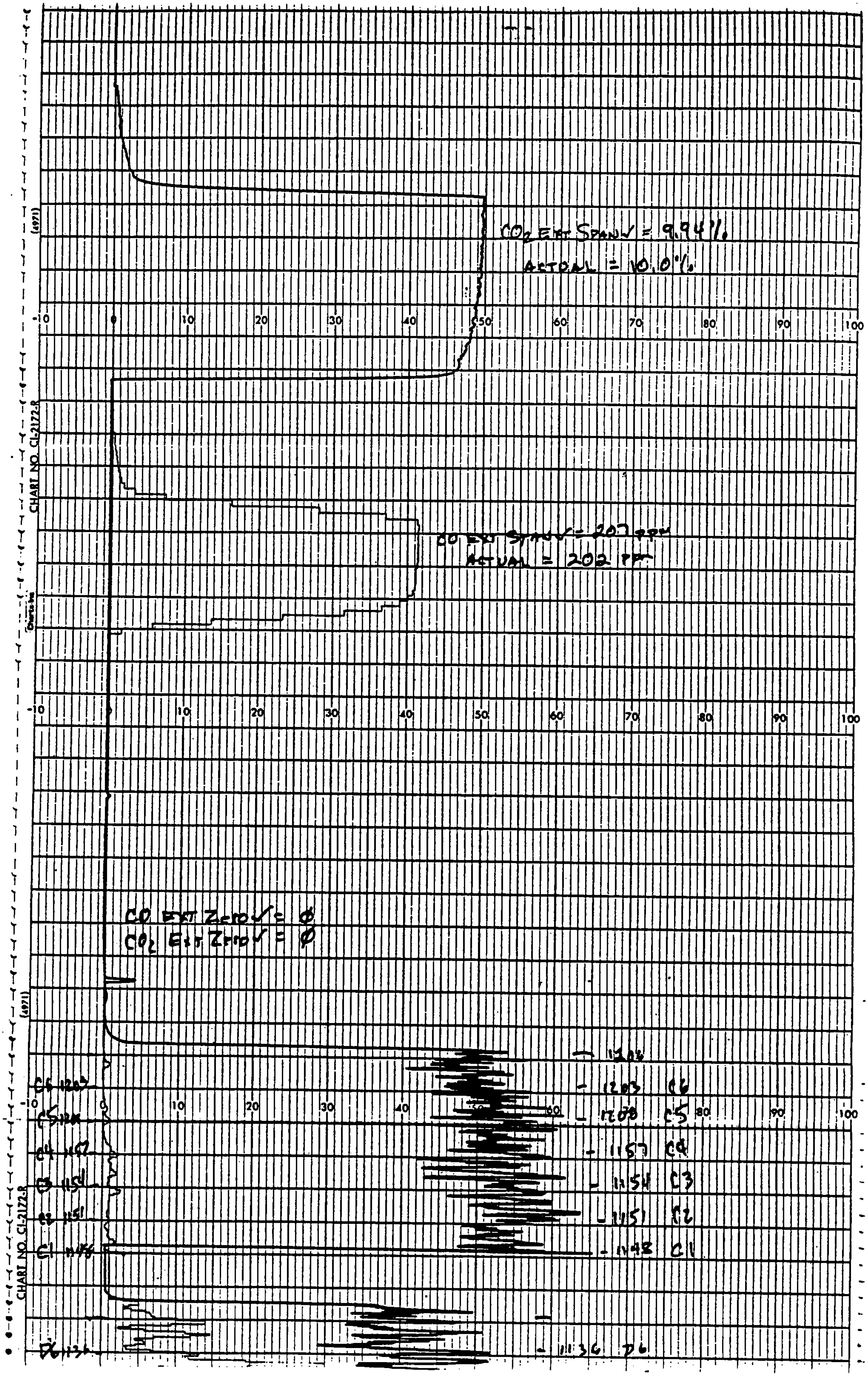


CHART NO. C
C1 1148 — 1148 C1
D6 1136 — 1136 D6
D5 1133 — 1133 D5
D4 1130 — 1130 D4
D3 1127 — 1127 D3
D2 1124 — 1124 D2
-10 0 10 20 30 40 50 60 70 80 90 100
D1 1121 — 1121 D1
A6 1103 — 1103 A6
A5 1100 — 1100 A5
A4 1057 — 1057 A4
A3 1054 — 1054 A3
change deadband
A2 1051 — 1051 A2
A1 1048 — 1048 A1
-10 0 10 20 30 40 50 60 70 80 90 100
B6 1039 — 1039 B6
B5 1036 — 1036 B5
B4 1033 — 1033 B4
B3 1030 — 1030 B3
B2 1024 — 1024 B2
1021 B1
1024
CHART NO. CL-2172-8
SCRUB @ 1015
RESTART RUN #3
20PM/HR
1015
1015 B1
-10 0 10 20 30 40 50 60 70 80 90 100
CO2 EXT CHECK = 9.88%
NO ADS
ACTUAL = 10.0%



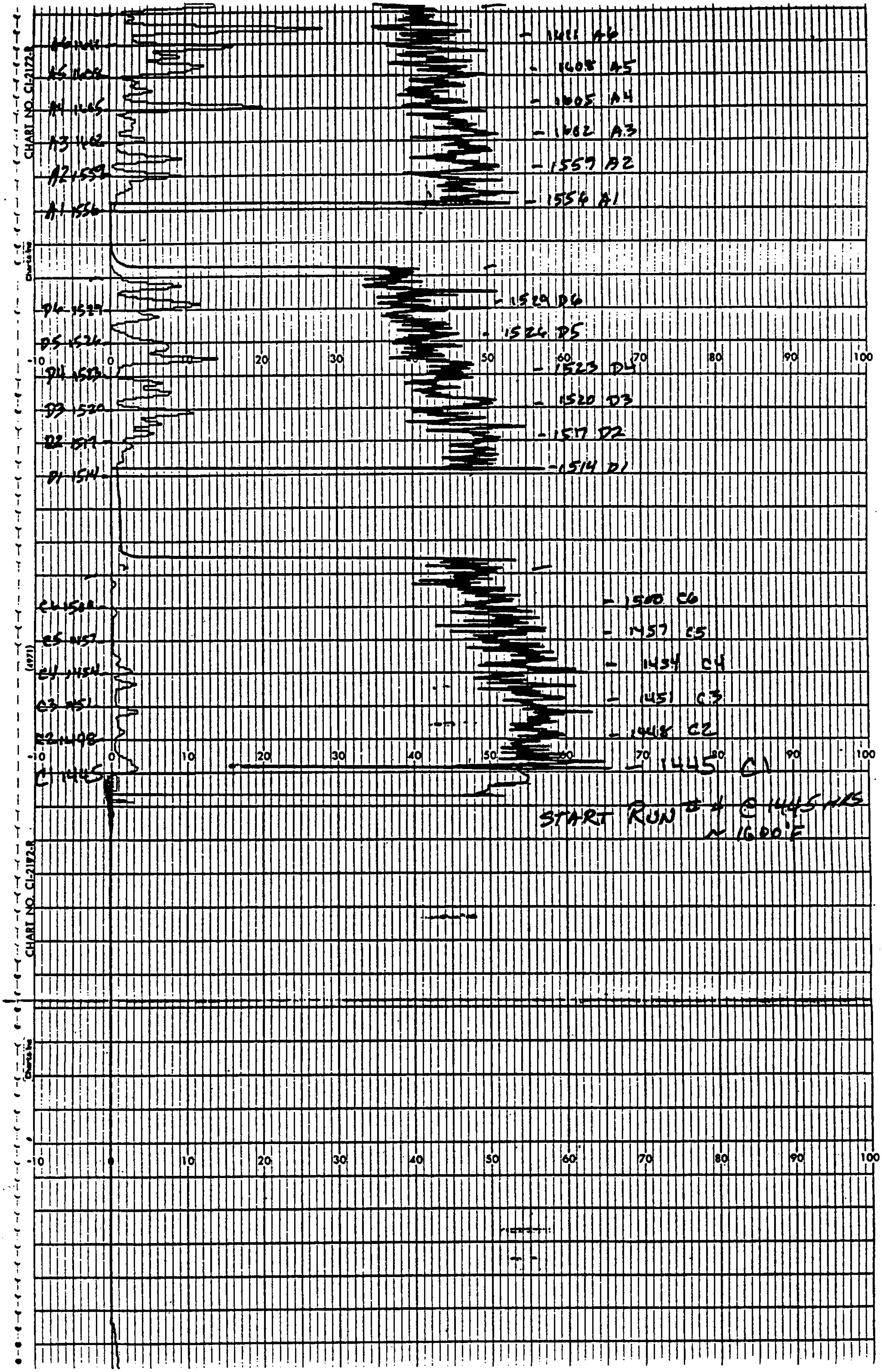
CO2 EXT SPAN✓ = 9.94%
ACTUAL = 10.0%

CO EXT SPAN✓ = 207 PPM
ACTUAL = 202 PP

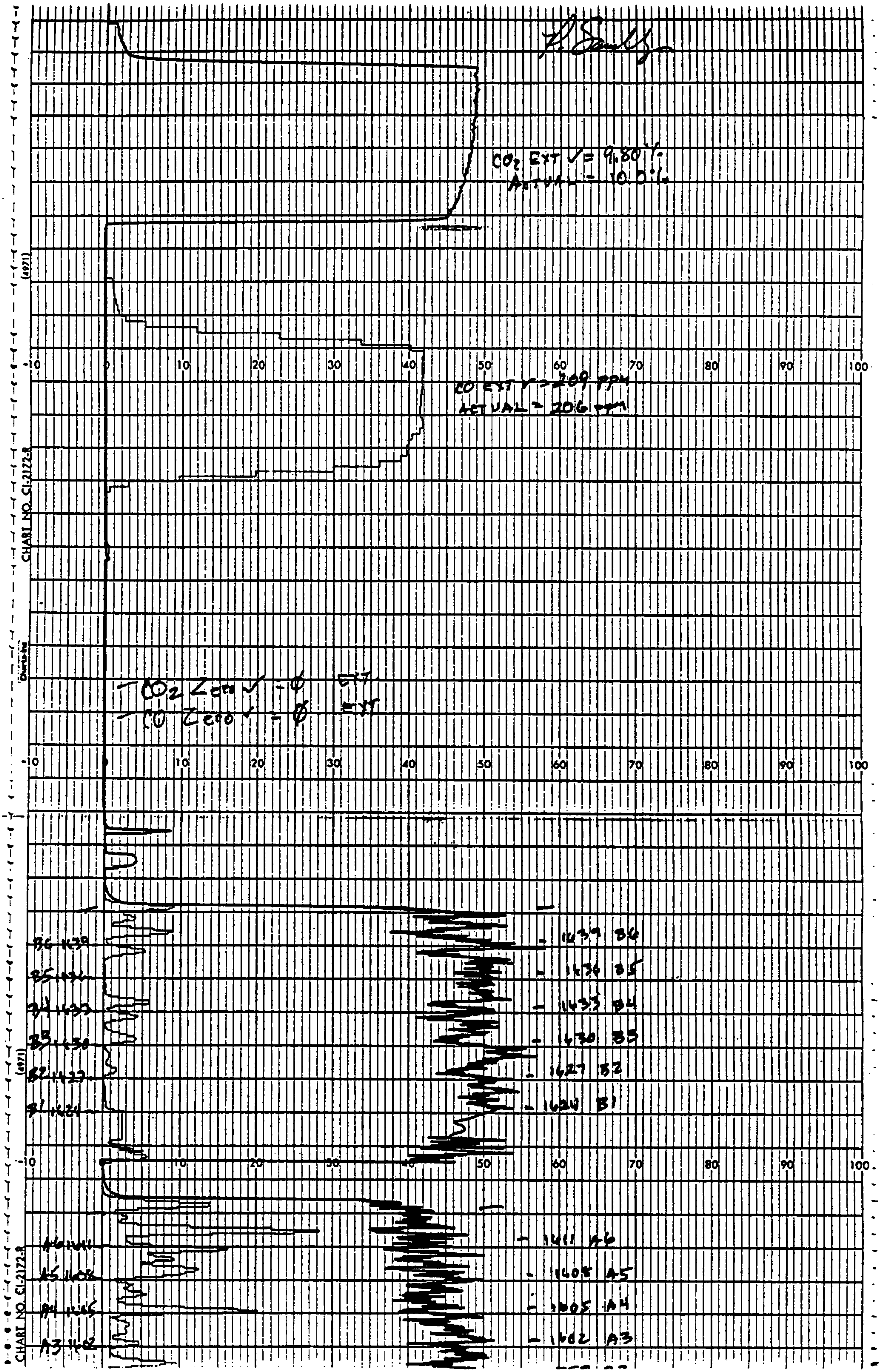
CO EXT ZERO✓ = 0
CO2 EXT ZERO✓ = 0

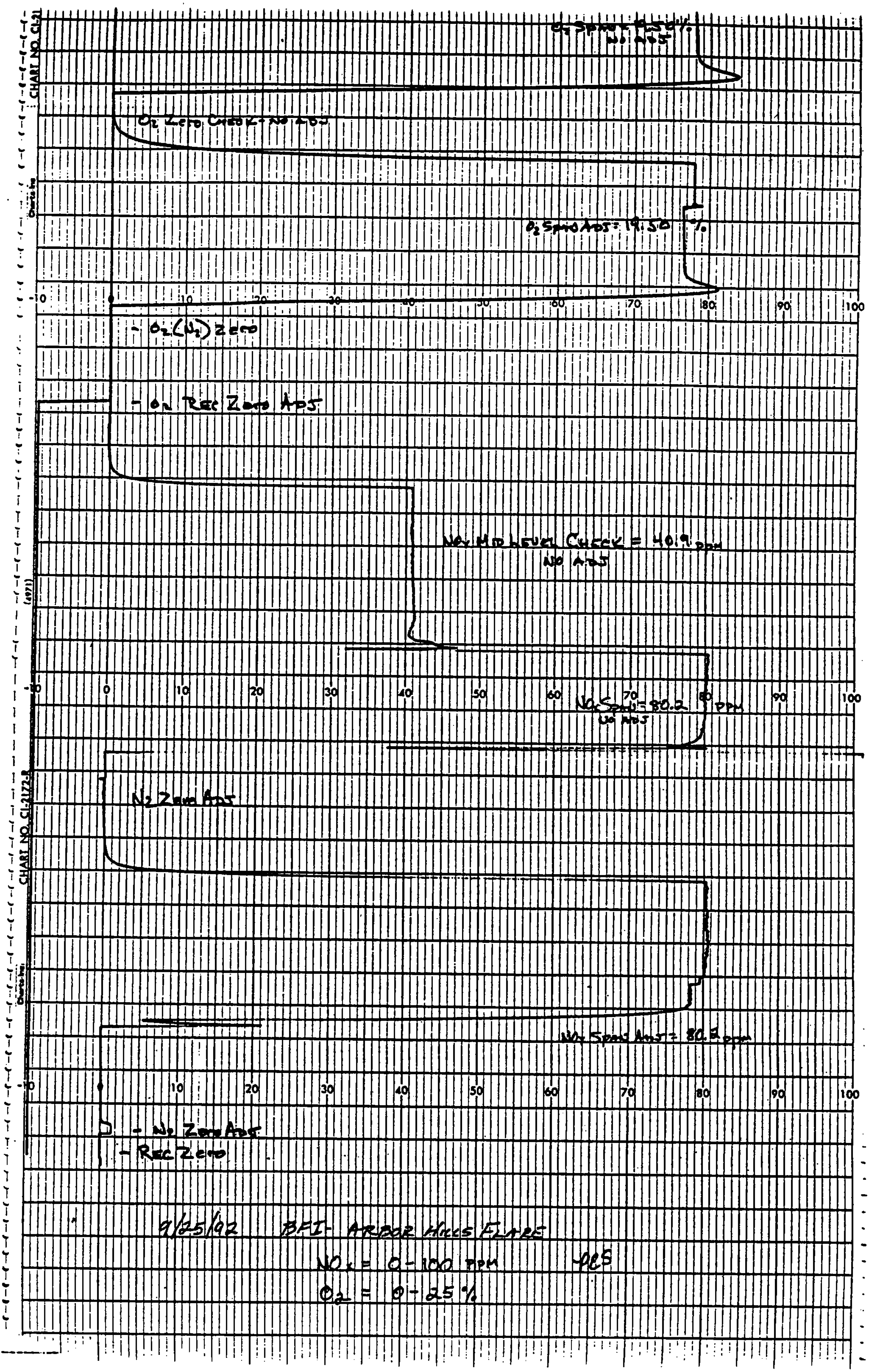
C6 1203
C5 1200
C4 1157
C3 1154
C2 1151
C1 1148
D6 1136

— 1206
— 1203 C6
— 1200 C5
— 1157 C4
— 1154 C3
— 1151 C2
— 1148 C1
— 1136 D6



START RUN # 4 @ 1445 HRS
~ 1600°F

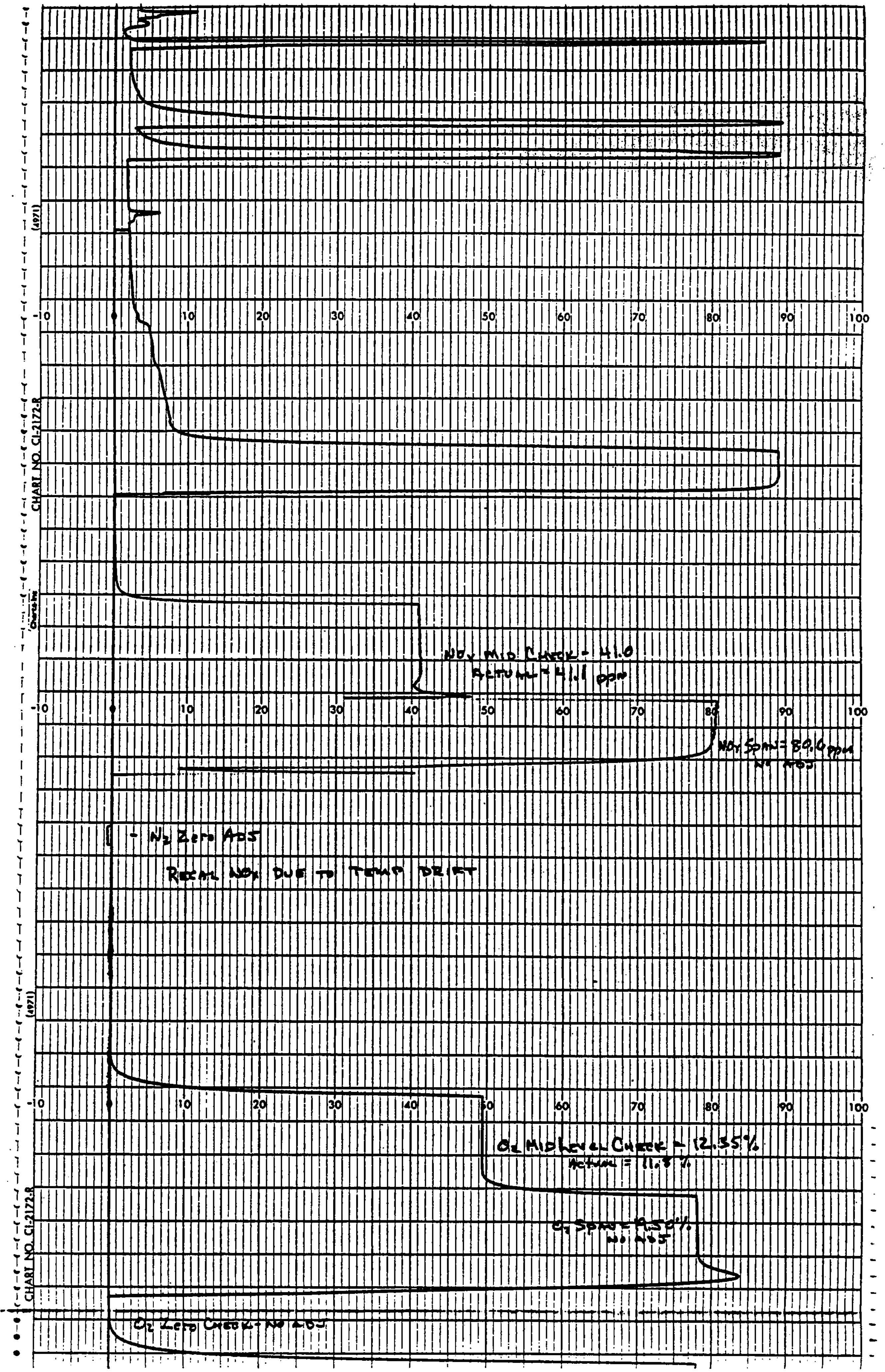
CO2 EXT ✓ = 9.80%
ACTUAL = 10.0%
-10
0
10
20
30
40
50
60
70
80
90
100
CO EXT ✓ = 209 PPM
ACTUAL = 206 PPM
CHART NO. CL-2172-R
(4971)
CO2 ZERO ✓ - Ø EXT
CO ZERO ✓ - Ø EXT
B6 1639
B5 1636
B4 1633
B3 1630
B2 1627
B1 1624
- 1639 B6
- 1636 B5
- 1633 B4
- 1630 B3
- 1627 B2
- 1624 B1
A6 1611
A5 1608
A4 1605
A3 1602
- 1611 A6
- 1608 A5
- 1605 A4
- 1602 A3



9/25/92 BFI- ARBOR HILLS FLARE

NO_x = 0-100 PPM RES

O_2 = 0-25%



NOx MID CHECK - 41.0
ACTUAL = 41.1 ppm

NOx SPAN = 80.0 ppm
NO ADJ

- N2 Zero ADJ

RECAL NOx DUE TO TEMP DRIFT

O2 MIDLEVEL CHECK = 12.35%
ACTUAL = 11.8 %

O2 SPAN = 19.50%
NO ADJ

O2 ZERO CHECK - NO ADJ

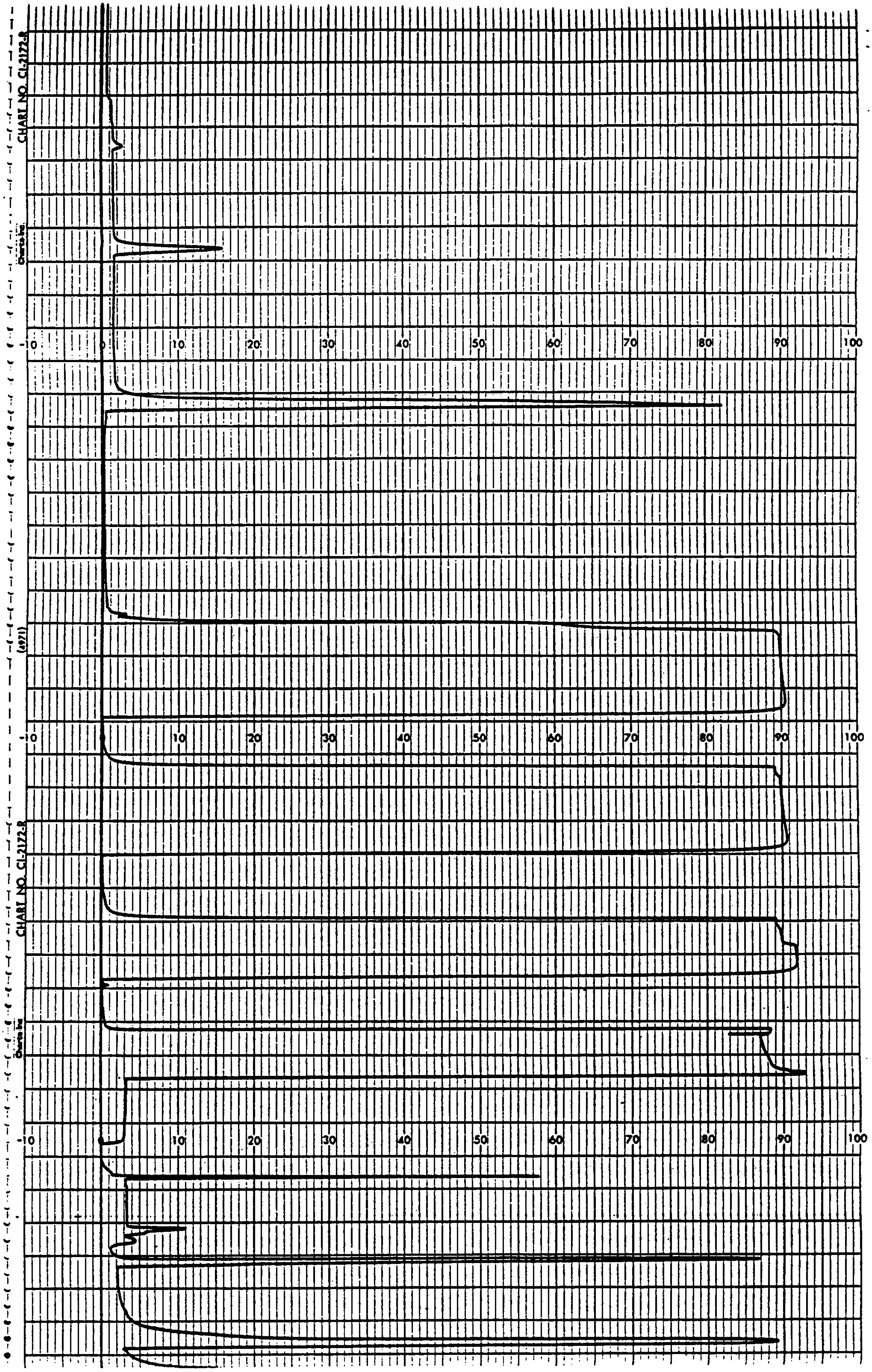
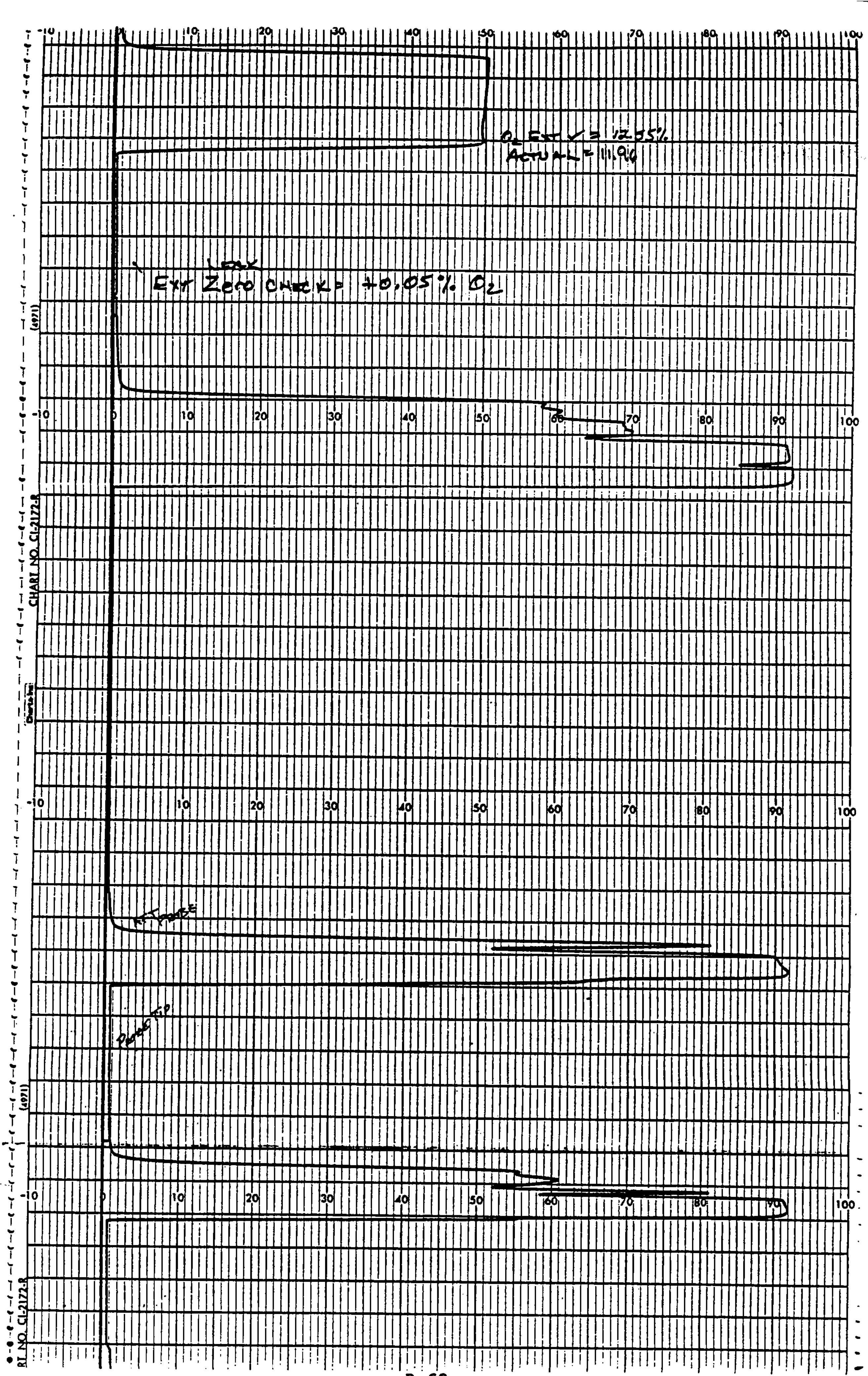
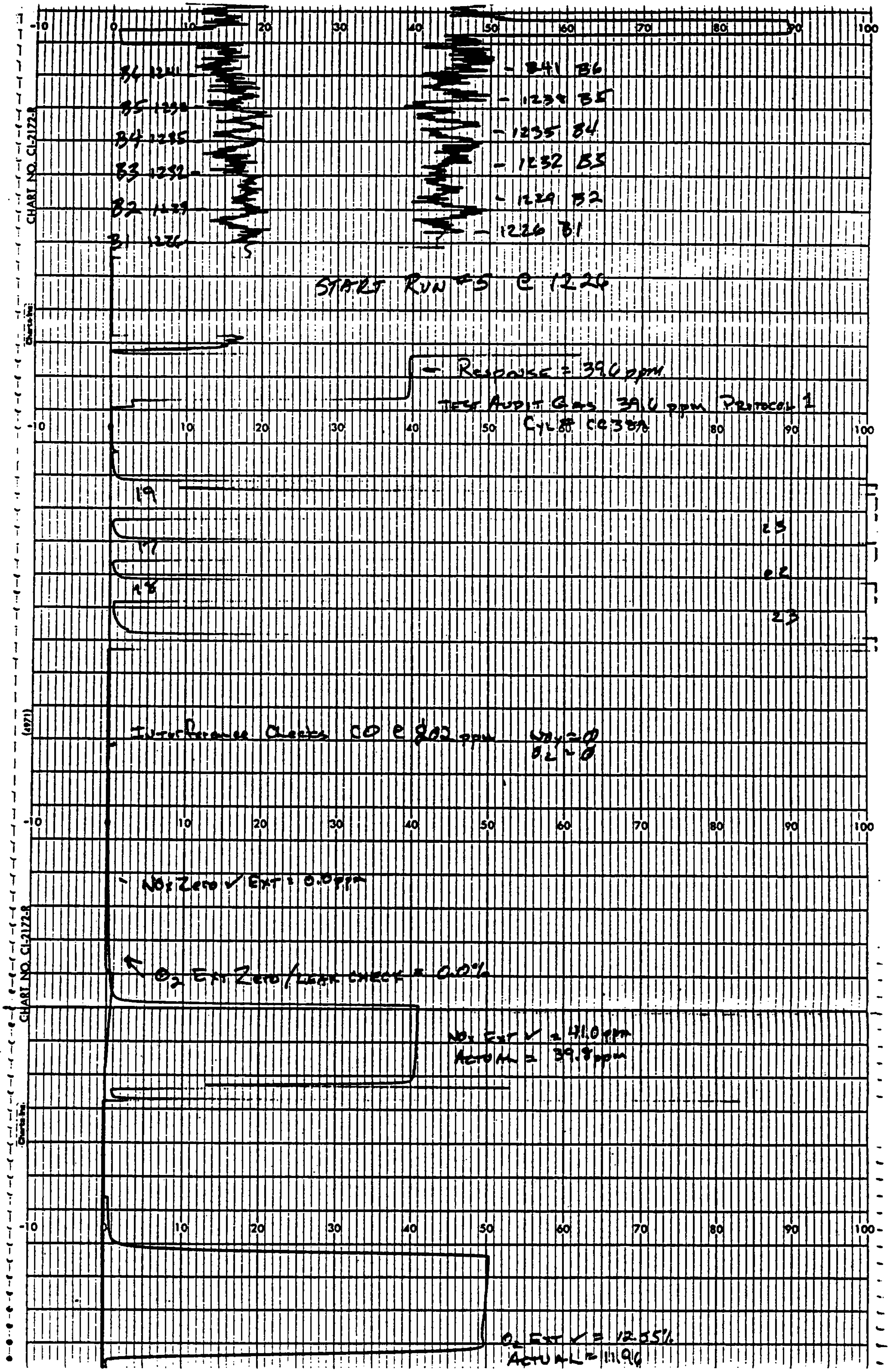


CHART NO. CL-2172-B
Charts Inc
-10
0
10
20
30
40
50
60
70
80
90
100
(4971)
-10
0
10
20
30
40
50
60
70
80
90
100
CHART NO. CL-2172-B
Charts Inc
-10
0
10
20
30
40
50
60
70
80
90
100


-10
0
10
20
30
40
50
60
70
80
90
100
O2 EXT = 12.55%
ACTUAL = 11.96
LEAK
Ext Zero CHECK = +0.05% O2
AT PROBE
PROBE TIP
CHART NO. CL-2172-R
(4971)



B6 1241 — 1241 B6
B5 1238 — 1238 B5
B4 1235 — 1235 B4
B3 1232 — 1232 B3
B2 1229 — 1229 B2
B1 1226 — 1226 B1

START RUN #5 @ 1226

← Response = 39.6 ppm

Test Audit Gas 39.6 ppm Protocol 1
Cyl# CC 38?A

Interference Checks CO @ 802 ppm
NO_x = 0
O_2 = 0

NOx Zero ✓ Ext = 0.0ppm

← O_2 Ext Zero/Leak check = 0.0%

NOx Ext ✓ = 41.0 ppm
Actual = 39.8 ppm

O_2 Ext ✓ = 12.55%
Actual = 11.96

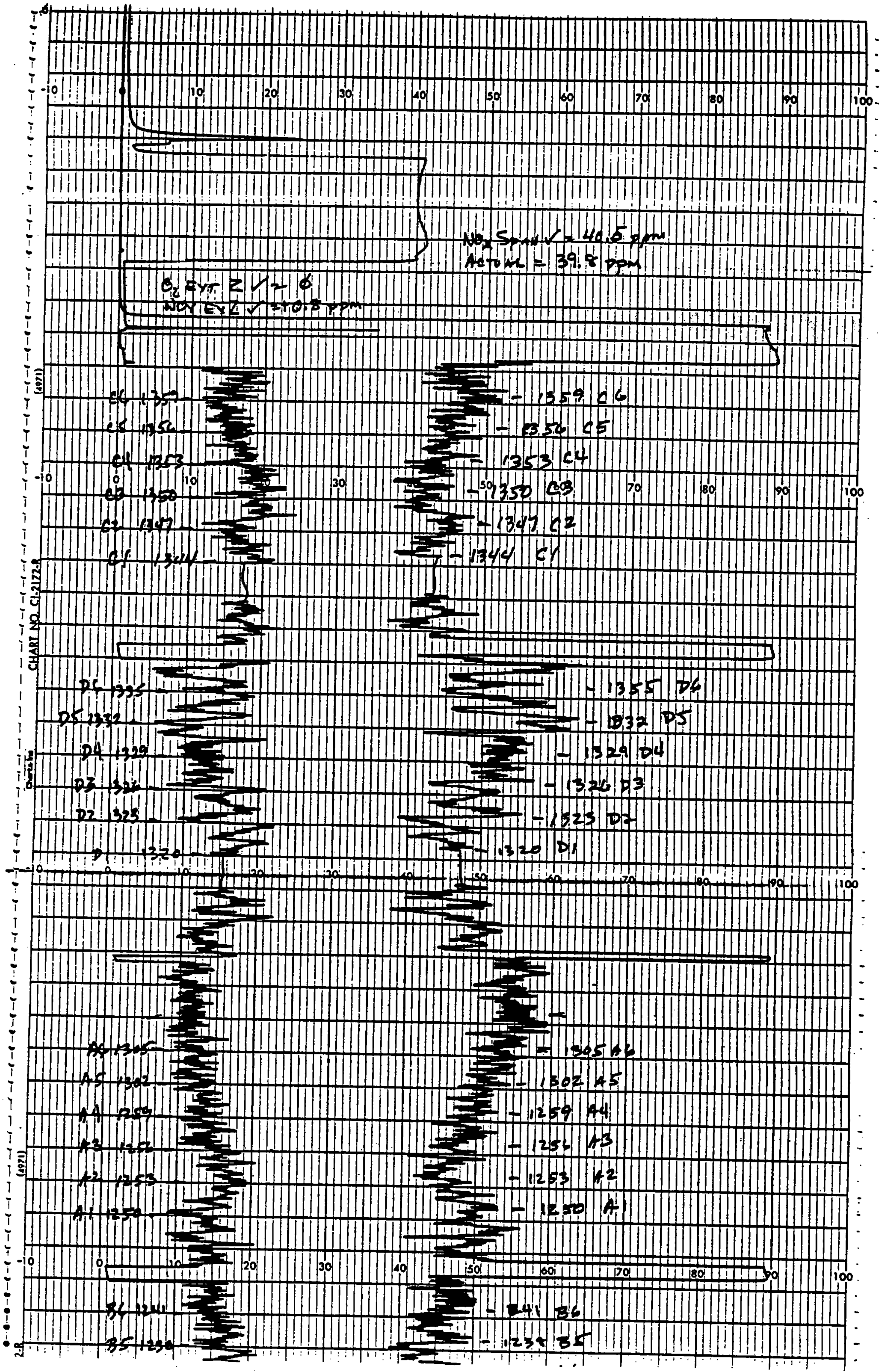


CHART NO. CL-2172-8
(4971)
10
0
10
20
30
40
50
60
70
80
90
100
NOx Span ✓ = 40.6 ppm
Actual = 39.8 ppm
O2 Ext Z ✓ = 0
NOx Ext Z ✓ = ±0.8 ppm
C6 1359
C5 1356
C4 1353
C3 1350
C2 1347
C1 1344
– 1359 C6
– 1356 C5
– 1353 C4
– 1350 C3
– 1347 C2
– 1344 C1
D6 1335
D5 1332
D4 1329
D3 1326
D2 1323
D1 1320
– 1335 D6
– 1332 D5
– 1329 D4
– 1326 D3
– 1323 D2
– 1320 D1
A6 1305
A5 1302
A4 1259
A3 1256
A2 1253
A1 1250
– 1305 A6
– 1302 A5
– 1259 A4
– 1256 A3
– 1253 A2
– 1250 A1
B6 1241
B5 1238
– 1241 B6
– 1238 B5

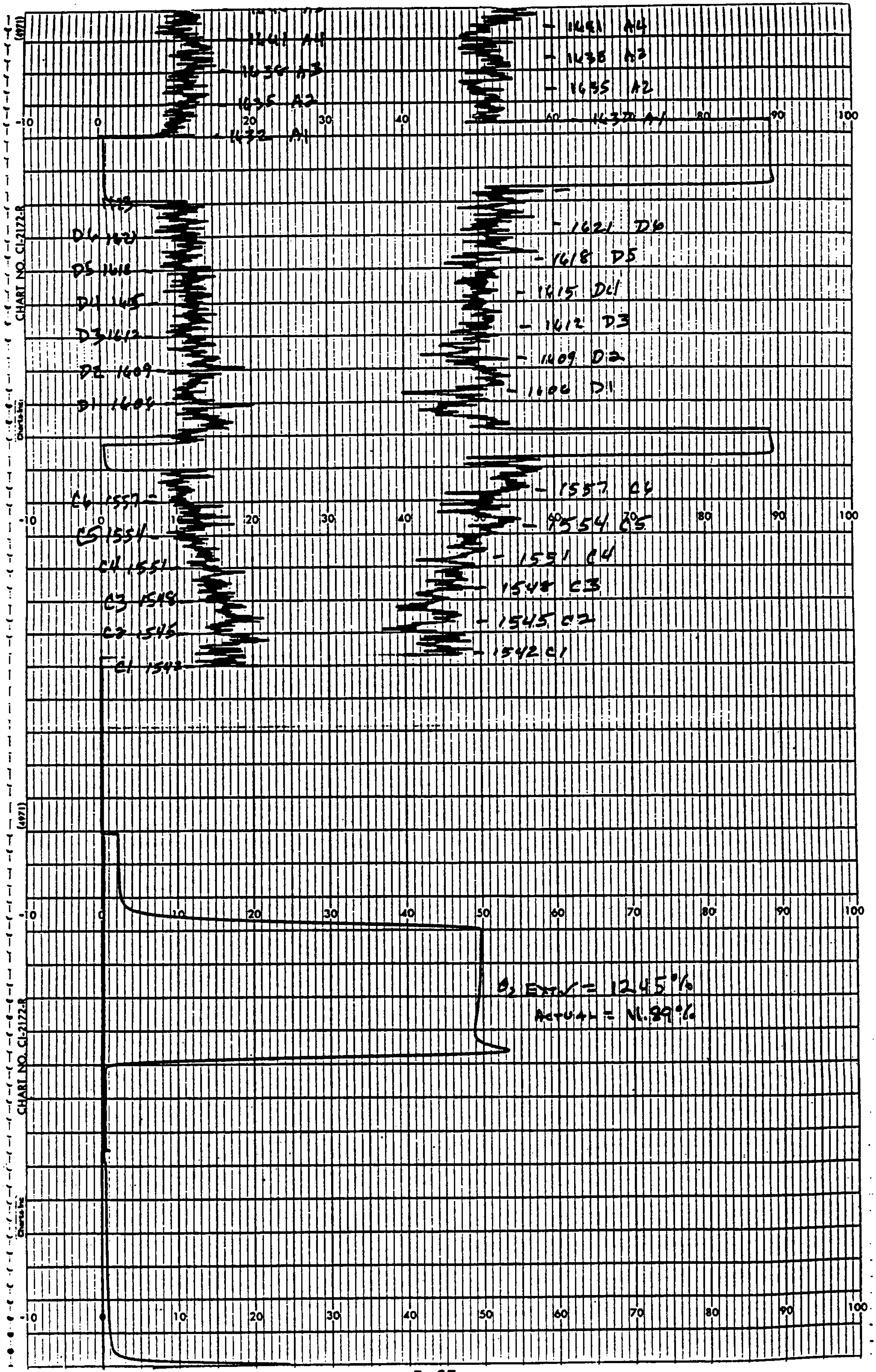
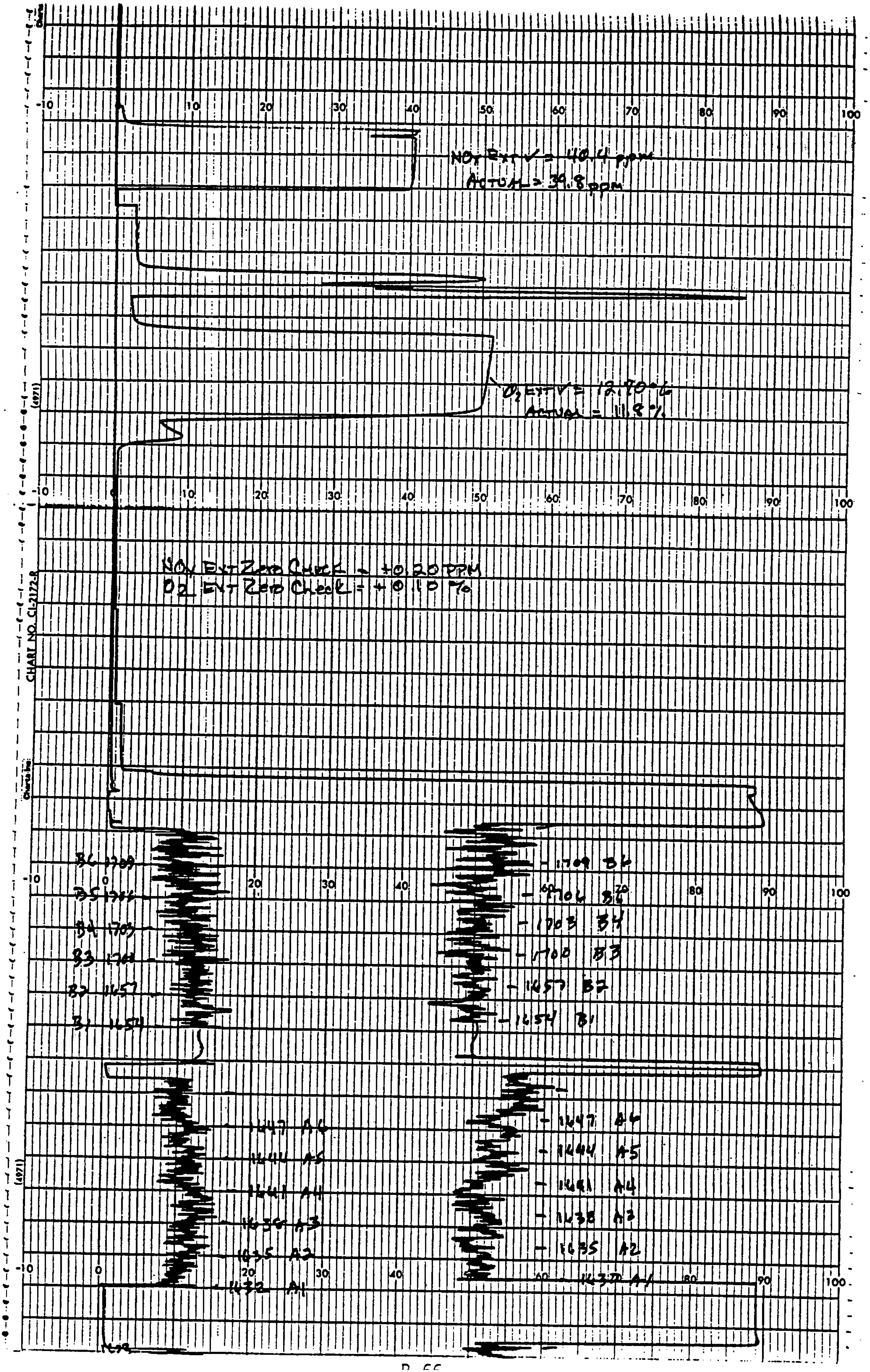


CHART NO. CL-2172-R
-10
0
10
20
30
40
50
60
70
80
90
100
1641 A4
1638 A3
1635 A2
1632 A1
1641 A4
1638 A3
1635 A2
1632 A1
1623
D6 1621
D5 1618
D4 1615
D3 1612
D2 1609
D1 1606
1621 D6
1618 D5
1615 D4
1612 D3
1609 D2
1606 D1
C6 1557
C5 1554
C4 1551
C3 1548
C2 1545
C1 1542
1557 C6
1554 C5
1551 C4
1548 C3
1545 C2
1542 C1
O2 EXTr = 12.45%
Actual = 11.89%



NOx Ext V = 40.4 ppm
Actual = 39.8 ppm

O2 Ext V = 12.70 %
Actual = 11.8 %

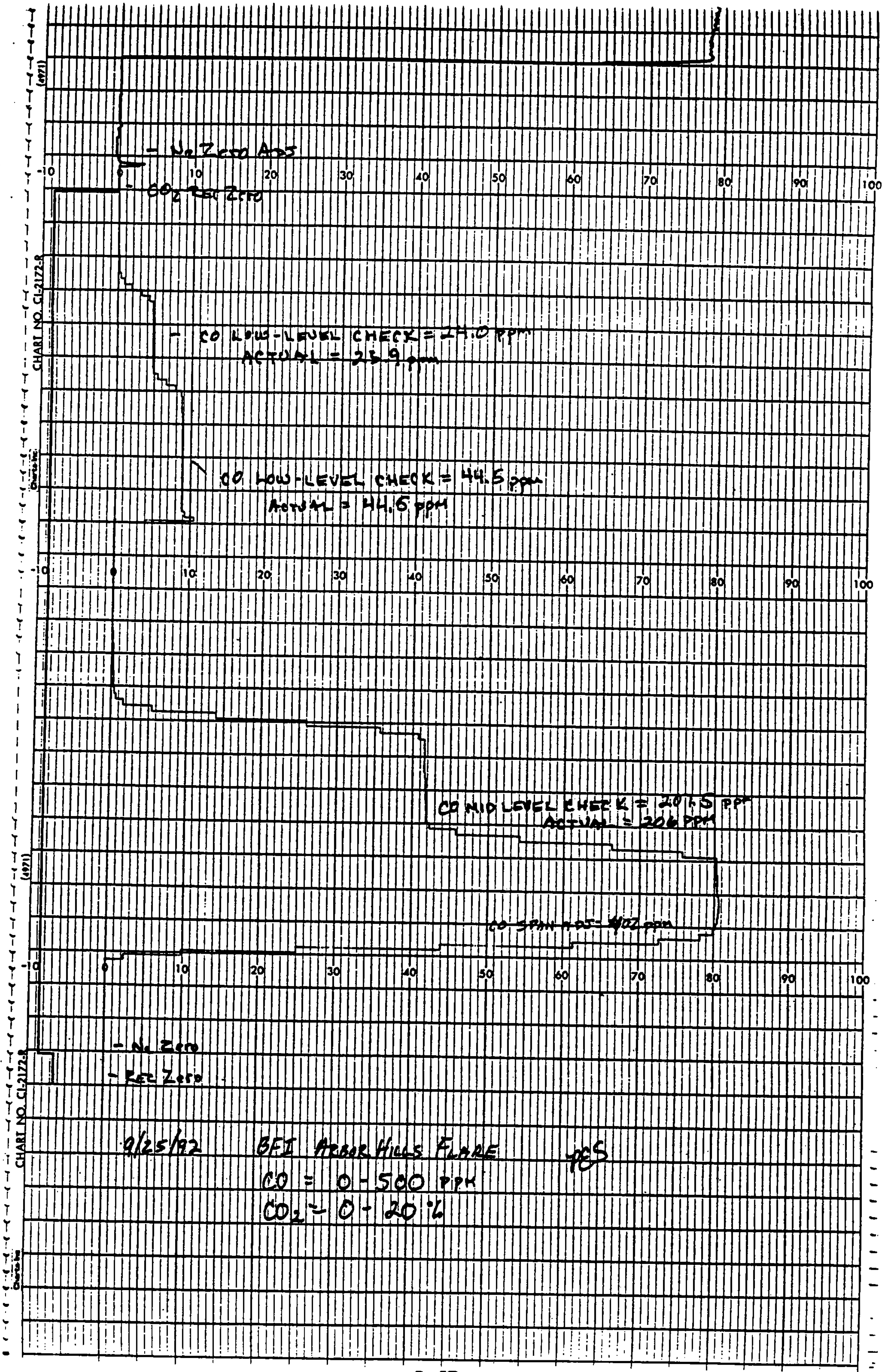
NOx Ext Zero Check = +0.20 PPM
O2 Ext Zero Check = +0.10 %

B6 1709
B5 1706
B4 1703
B3 1700
B2 1657
B1 1654

1709 B6
1706 B5
1703 B4
1700 B3
1657 B2
1654 B1

1647 A6
1644 A5
1641 A4
1636 A3
1635 A2
1632 A1

1647 A6
1644 A5
1641 A4
1638 A3
1635 A2
1632 A1



- N₂ Zero ADJ

- CO₂ Rec Zero

- CO LOW-LEVEL CHECK = 24.0 ppm
ACTUAL = 23.9 ppm

CO LOW-LEVEL CHECK = 44.5 ppm
ACTUAL = 44.6 ppm

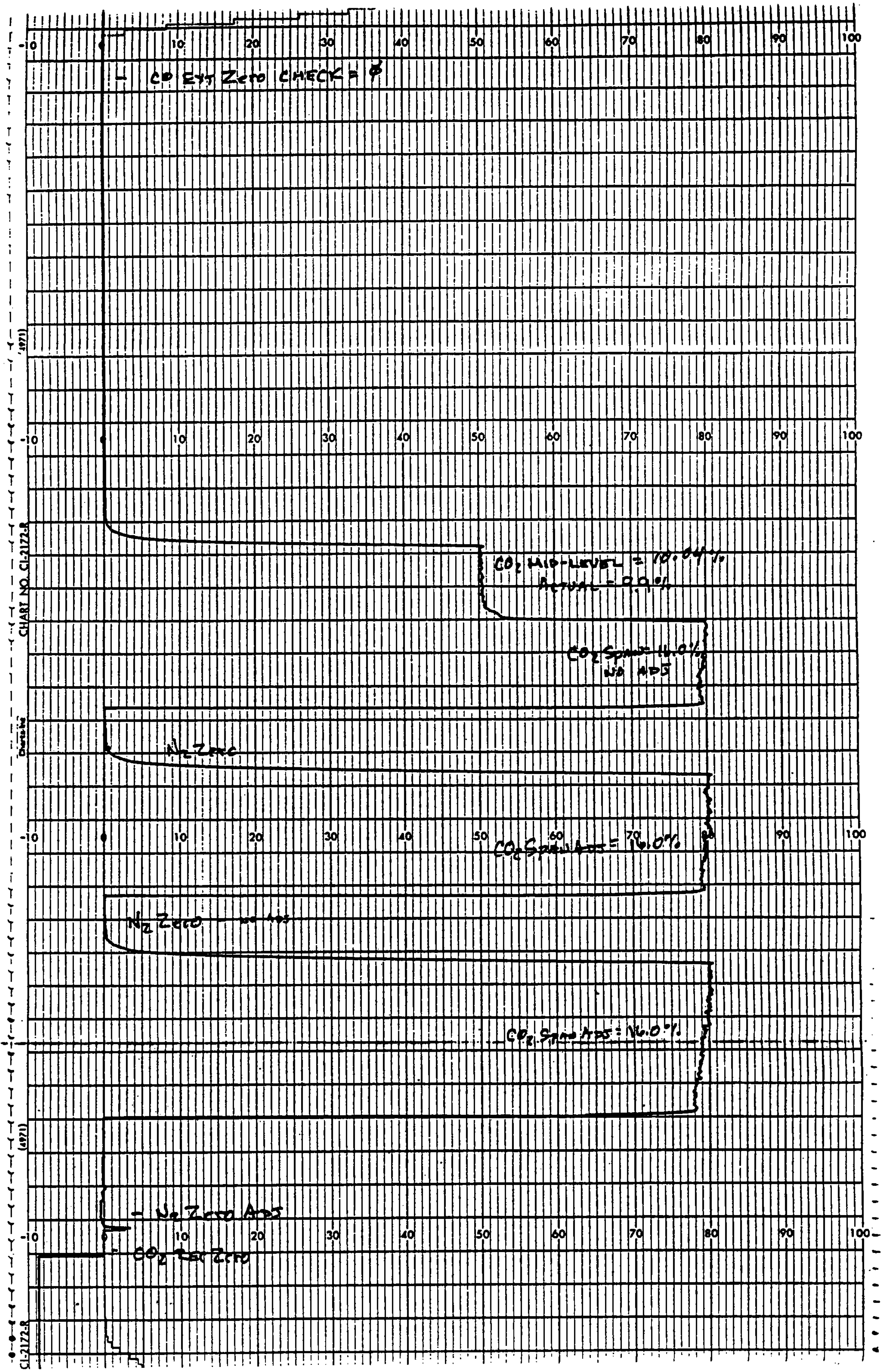
CO MID LEVEL CHECK = 201.5 ppm
ACTUAL = 206 PPM

CO SPAN ADJ = 402 ppm

- N₂ Zero

- Rec Zero

9/25/92 BFI ARBOR HILLS FLARE PES
CO = 0 - 500 PPM
CO₂ = 0 - 20 %


0
10
20
30
40
50
60
70
80
90
100
CO EXT ZERO CHECK = 0
CHART NO. CL-2172-8
CO2 MID-LEVEL = 10.04%
ACTUAL = 9.9%
CO2 SPAN 16.0%
NO ADJ
N2 ZERO
CO2 SPAN ADJ = 16.0%
N2 ZERO - no ADJ
CO2 SPAN ADJ = 16.0%
- N2 ZERO ADJ
- CO2 REC ZERO

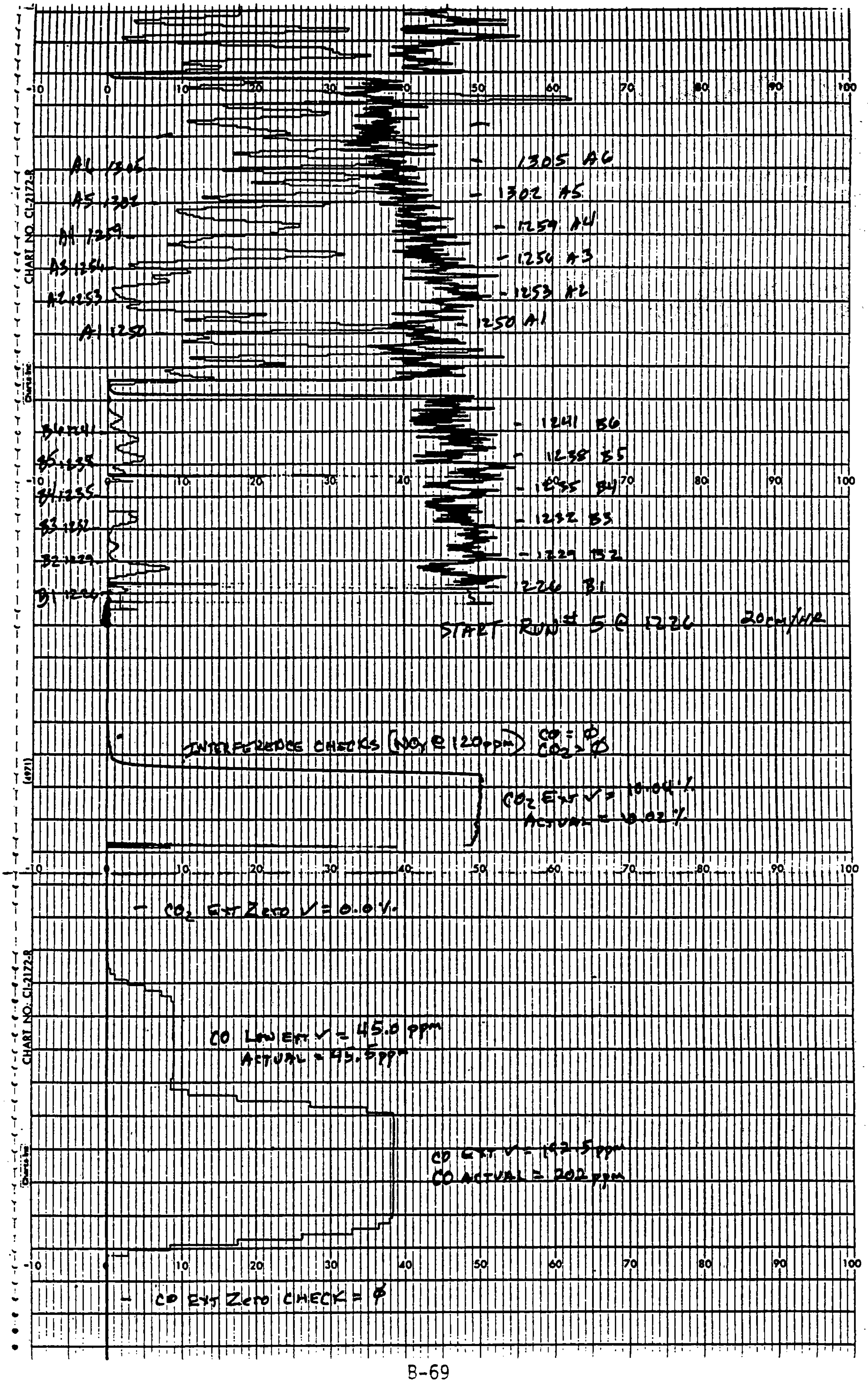


CHART NO. CL-2172-R
-10
0
10
20
30
40
50
60
70
80
90
100
A6 1305
A5 1302
A4 1259
A3 1256
A2 1253
A1 1250
- 1305 A6
- 1302 A5
- 1259 A4
- 1256 A3
- 1253 A2
- 1250 A1
B6 1241
B5 1238
B4 1235
B3 1232
B2 1229
B1 1226
- 1241 B6
- 1238 B5
- 1235 B4
- 1232 B3
- 1229 B2
1226 B1
START RUN # 5 @ 1226
20cm/HR
INTERFERENCE CHECKS (NOx @ 120ppm) CO = Ø CO2 = Ø
CO2 Ext ✓ = 10.04 %
ACTUAL = 10.02 %
- CO2 Ext Zero ✓ = 0.0 %
CO Low Ext ✓ = 45.0 ppm
ACTUAL = 43.5 ppm
CO Ext ✓ = 197.5 ppm
CO ACTUAL = 202 ppm
- CO Ext Zero CHECK = Ø

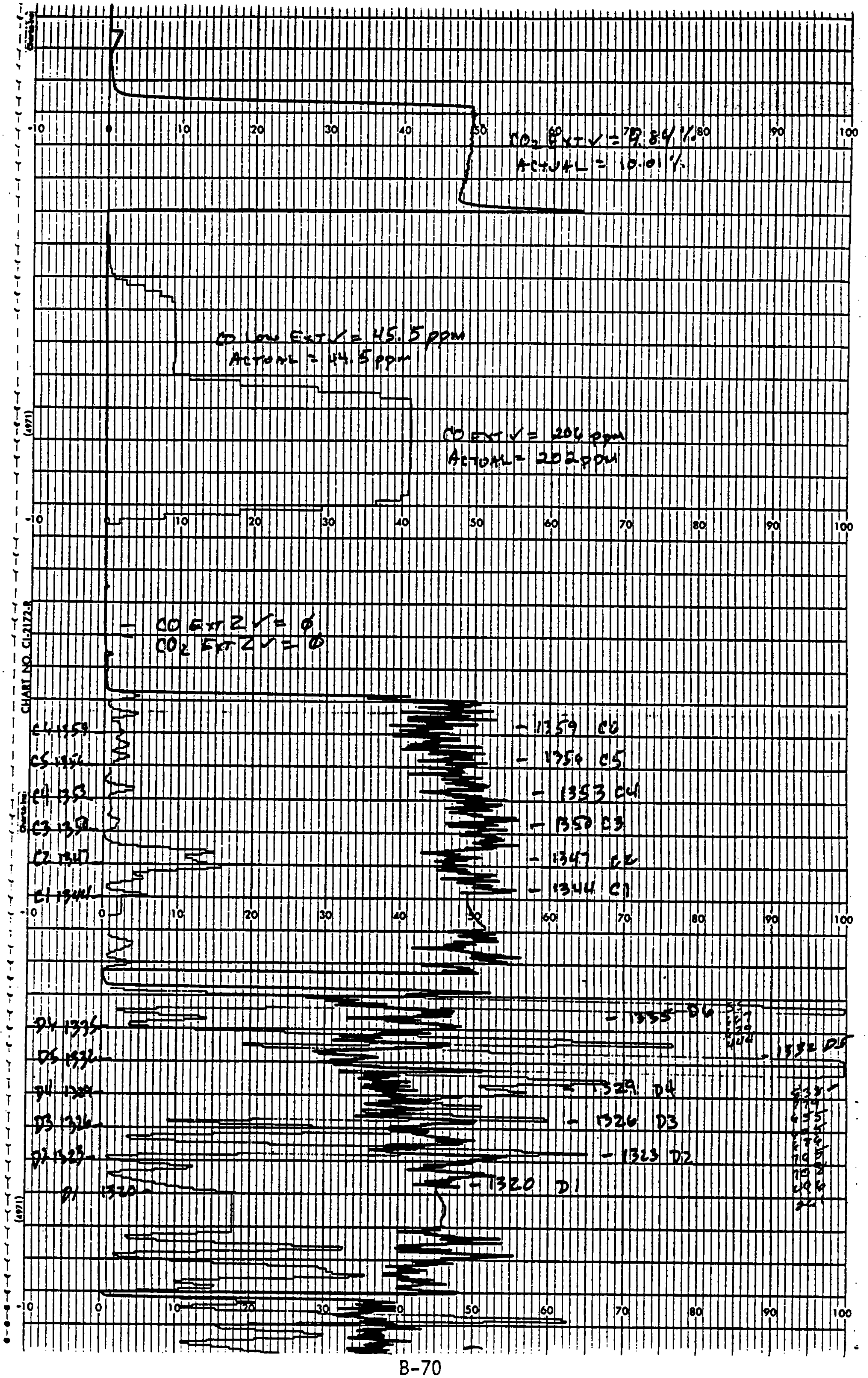


CHART NO. CL-2172-B
(4971)
-10
0
10
20
30
40
50
60
70
80
90
100
CO_2 EXT ✓ = 9.84 %
ACTUAL = 10.01 %
CO LOW EXT ✓ = 45.5 ppm
ACTUAL = 44.5 ppm
CO EXT ✓ = 206 ppm
ACTUAL = 202 ppm
CO EXT Z ✓ = 0
CO_2 EXT Z ✓ = 0
C6 1359
C5 1356
C4 1353
C3 1350
C2 1347
C1 1344
- 1359 C6
- 1356 C5
- 1353 C4
- 1350 C3
- 1347 C2
- 1344 C1
D6 1335
D5 1332
D4 1329
D3 1326
D2 1323
D1 1320
- 1335 D6
- 1332 D5
- 1329 D4
- 1326 D3
- 1323 D2
- 1320 D1

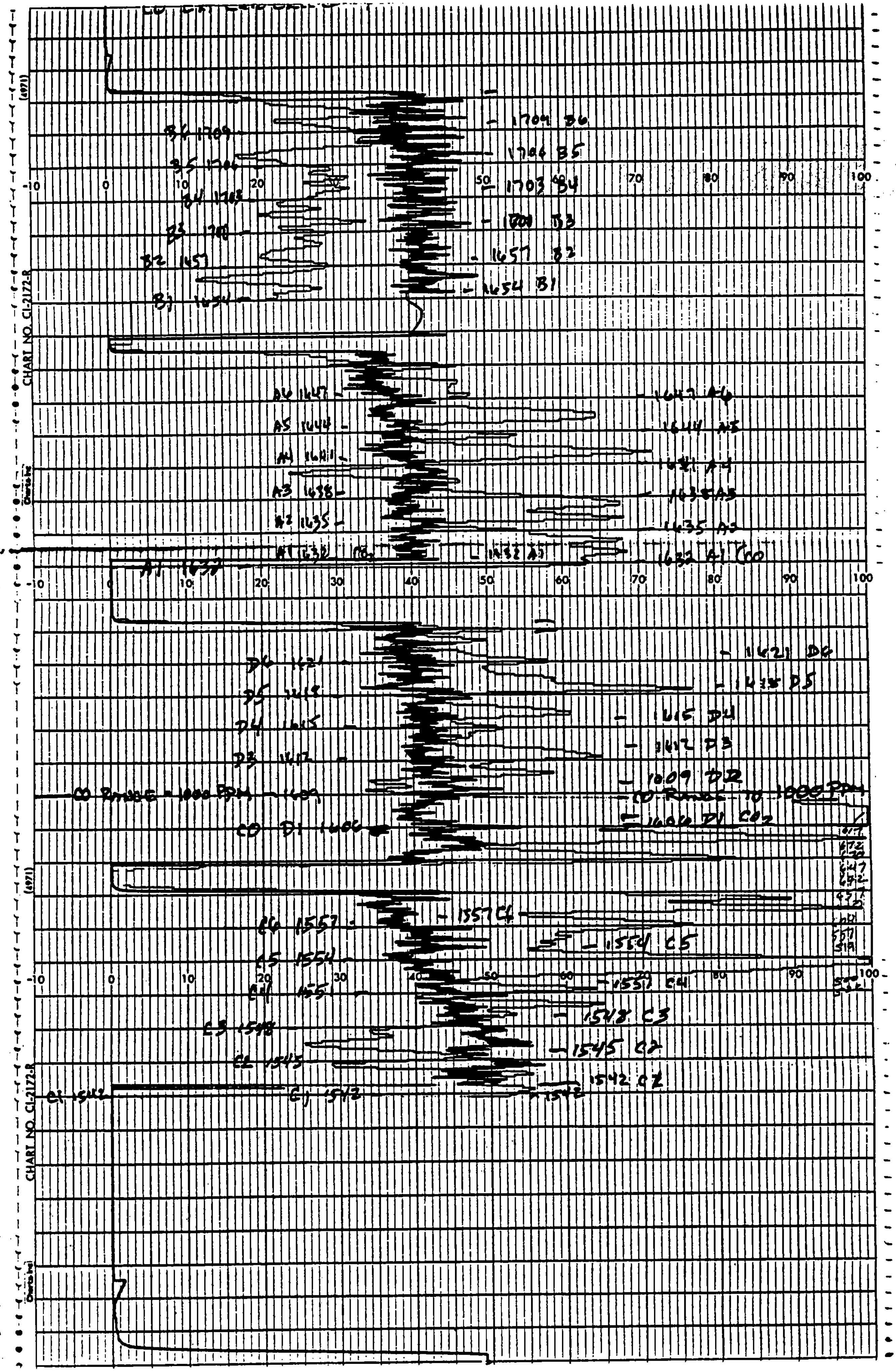
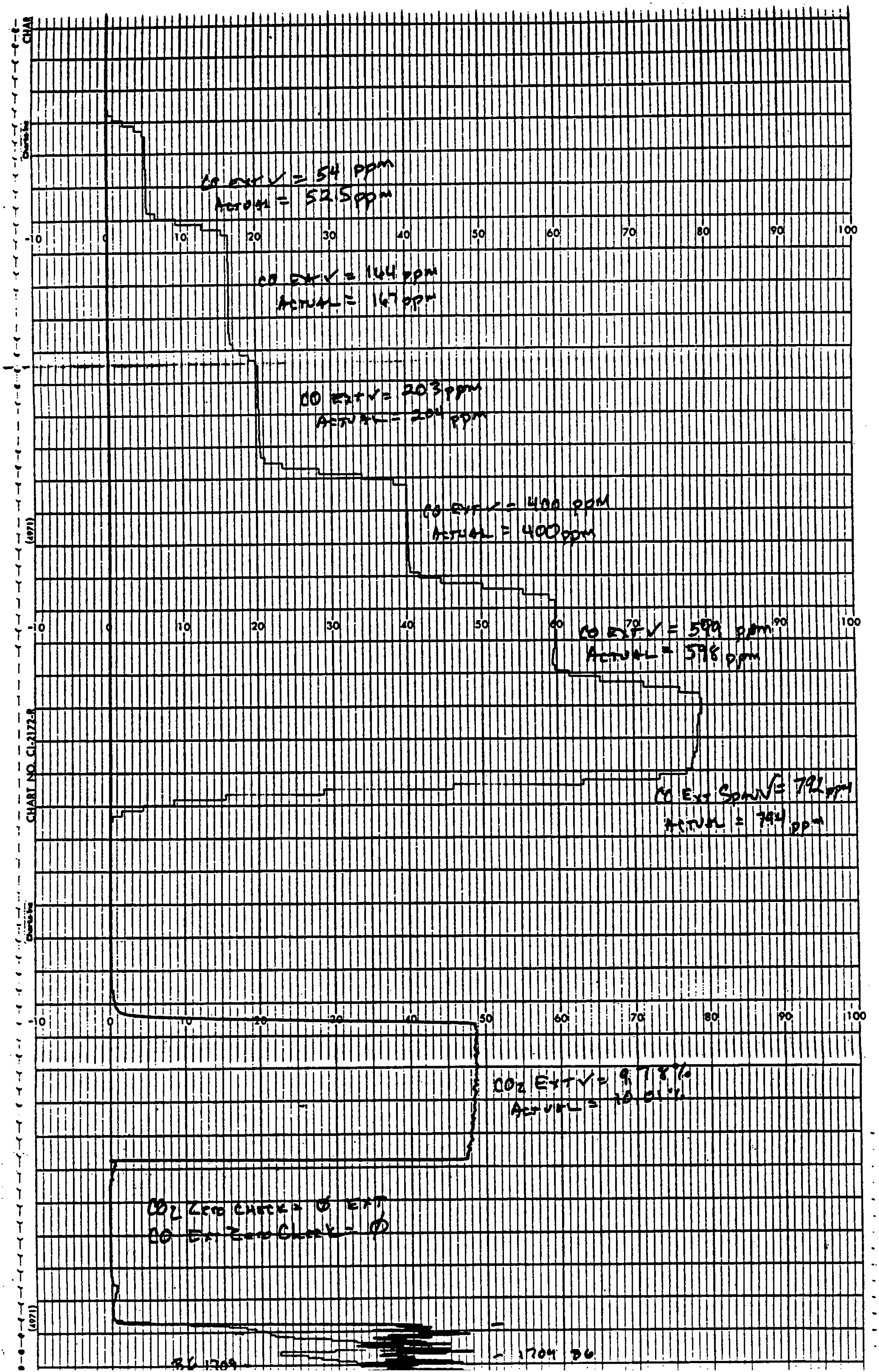


CHART NO. CI-2172-R
(4971)
-10
0
10
20
30
40
50
60
70
80
90
100
B6 1709
- 1709 B6
B5 1706
1706 B5
B4 1703
- 1703 B4
B3 1700
- 1700 B3
B2 1657
- 1657 B2
B1 1654
- 1654 B1
A6 1647
- 1647 A6
A5 1644
1644 A5
A4 1641
1641 A4
A3 1638
- 1638 A3
A2 1635
1635 A2
A1 1632 CO₂
1632 A1
1632 A1 CO
A1 1632
D6 1621
- 1621 D6
D5 1618
- 1618 D5
D4 1615
- 1615 D4
D3 1612
- 1612 D3
- 1609 D2
CO RANGE = 1000 PPM 1609
CO RANGE TO 1000 PPM
CO D1 1606
- 1606 D1 CO2
C6 1557
- 1557 C6
C5 1554
- 1554 C5
C4 1551
- 1551 C4
C3 1548
- 1548 C3
C2 1545
- 1545 C2
1542 C2
C1 1542
C1 1542
1542



CO EXT √ = 54 PPM
ACTUAL = 52.5 PPM

CO EXT √ = 144 PPM
ACTUAL = 147 PPM

CO EXT √ = 203 PPM
ACTUAL = 204 PPM

CO EXT √ = 400 PPM
ACTUAL = 400 PPM

CO EXT √ = 599 PPM
ACTUAL = 598 PPM

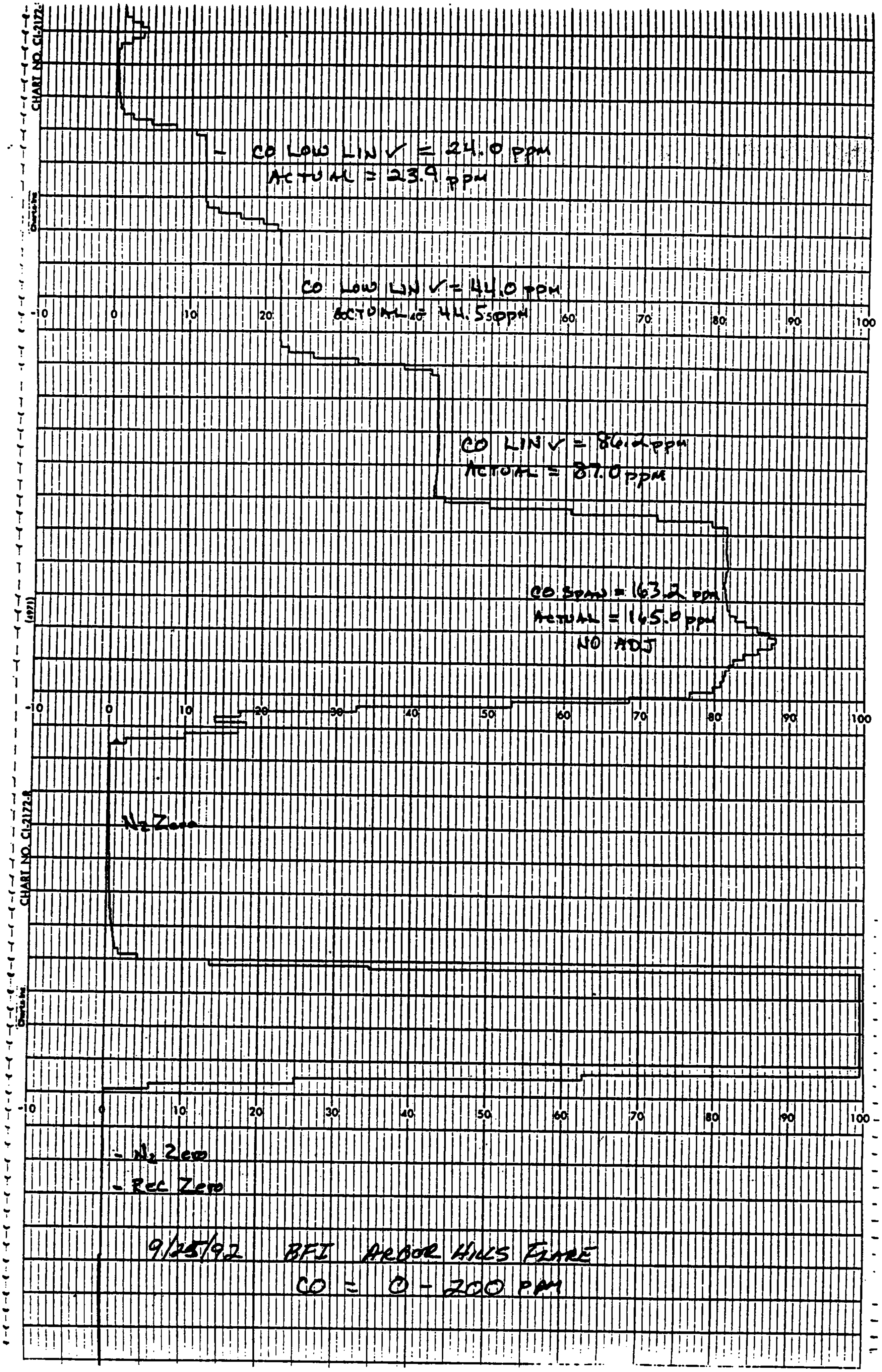
CO EXT SPAN √ = 792 PPM
ACTUAL = 794 PPM

CO2 EXT √ = 9.78%
ACTUAL = 10.01%

CO2 ZERO CHECK = 0 EXT
CO EXT ZERO CHECK = 0

BC 1709

~ 1704 DG



- CO LOW LIN ✓ = 24.0 ppm
ACTUAL = 23.9 ppm

CO LOW LIN ✓ = 44.0 ppm
ACTUAL = 44.5 ppm

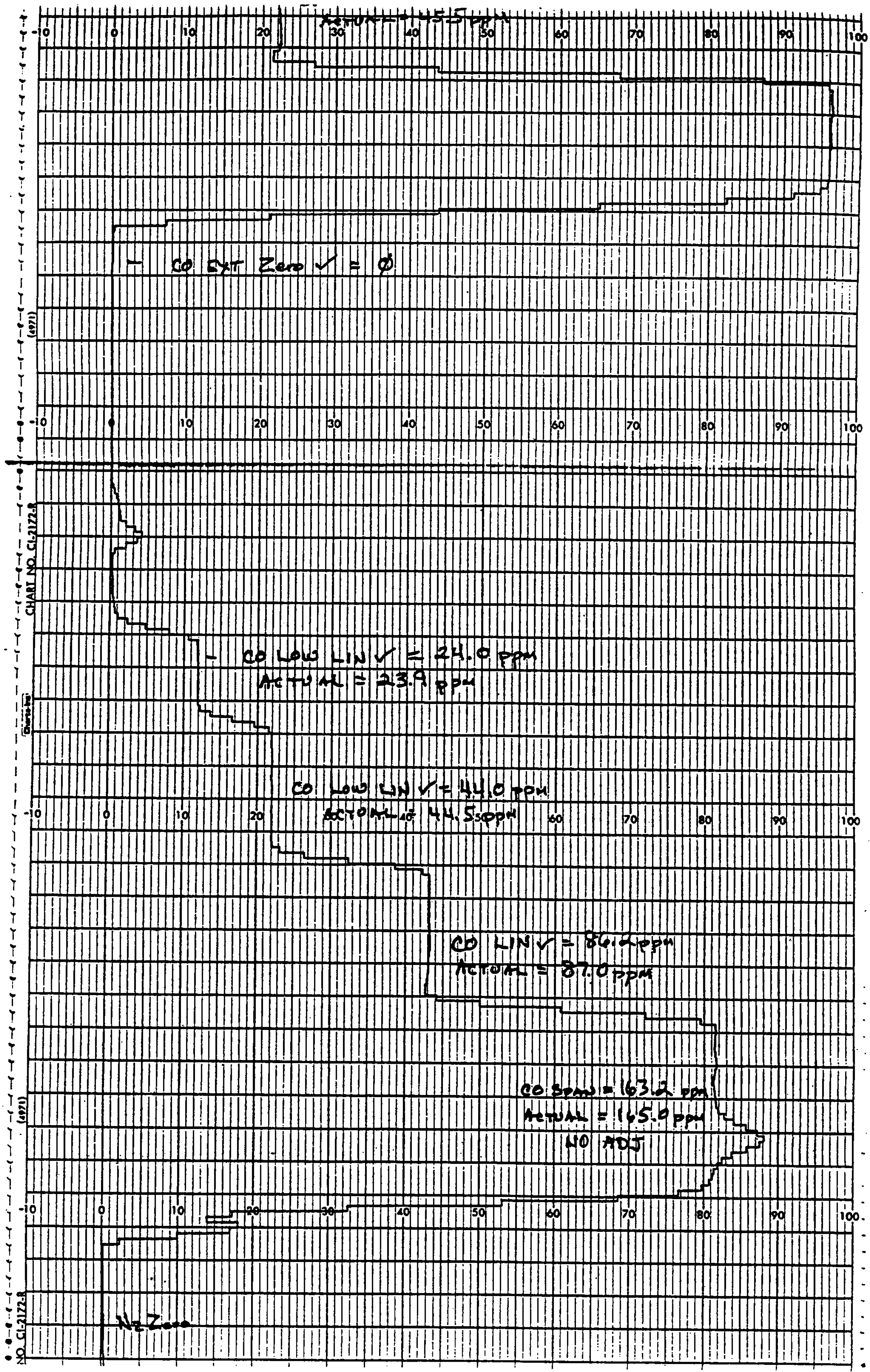
CO LIN ✓ = 86.2 ppm
ACTUAL = 87.0 ppm

CO SPAN = 163.2 ppm
ACTUAL = 165.0 ppm
NO ADJ

N₂ Zero

- N₂ Zero
- Rec Zero

9/25/92 BFI ARBOR HILLS FLARE
CO = 0 - 200 PPM



ACTUAL = 145.5 ppm

CO EXT Zero ✓ = 0

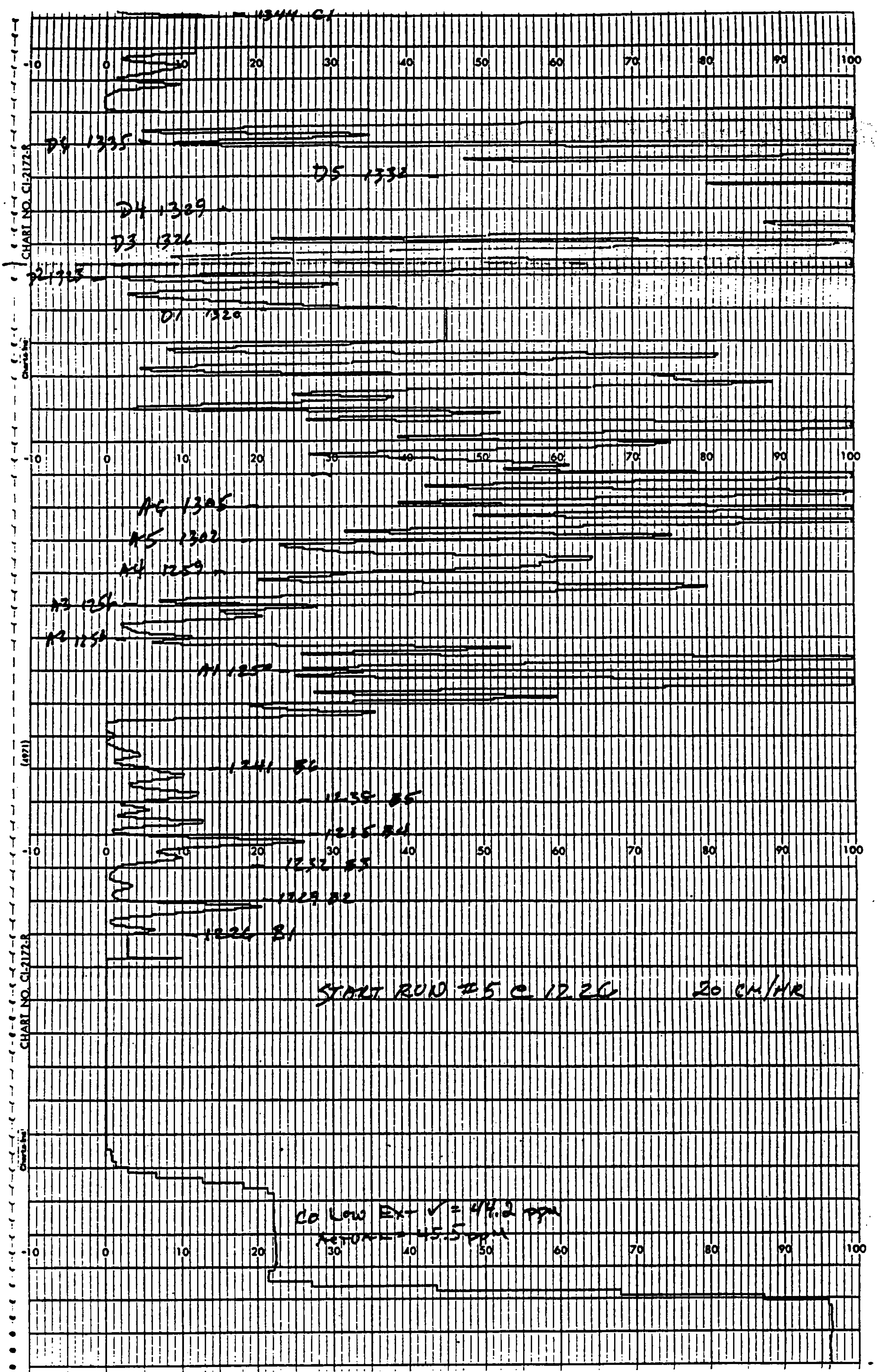
CO LOW LIN ✓ = 24.0 PPM
ACTUAL = 23.9 PPM

CO LOW LIN ✓ = 44.0 PPM
ACTUAL = 44.5 PPM

CO LIN ✓ = 86.2 ppm
ACTUAL = 87.0 ppm

CO SPAN = 163.2 ppm
ACTUAL = 165.0 ppm
NO ADJ

N_2 Zero



1344 C1

D4 1335

D5 1332

D4 1329

D3 1326

D2 1323

D1 1320

A6 1305

A5 1302

A4 1259

A3 1256

A2 1253

A1 1250

1241 B6

1238 B5

1235 B4

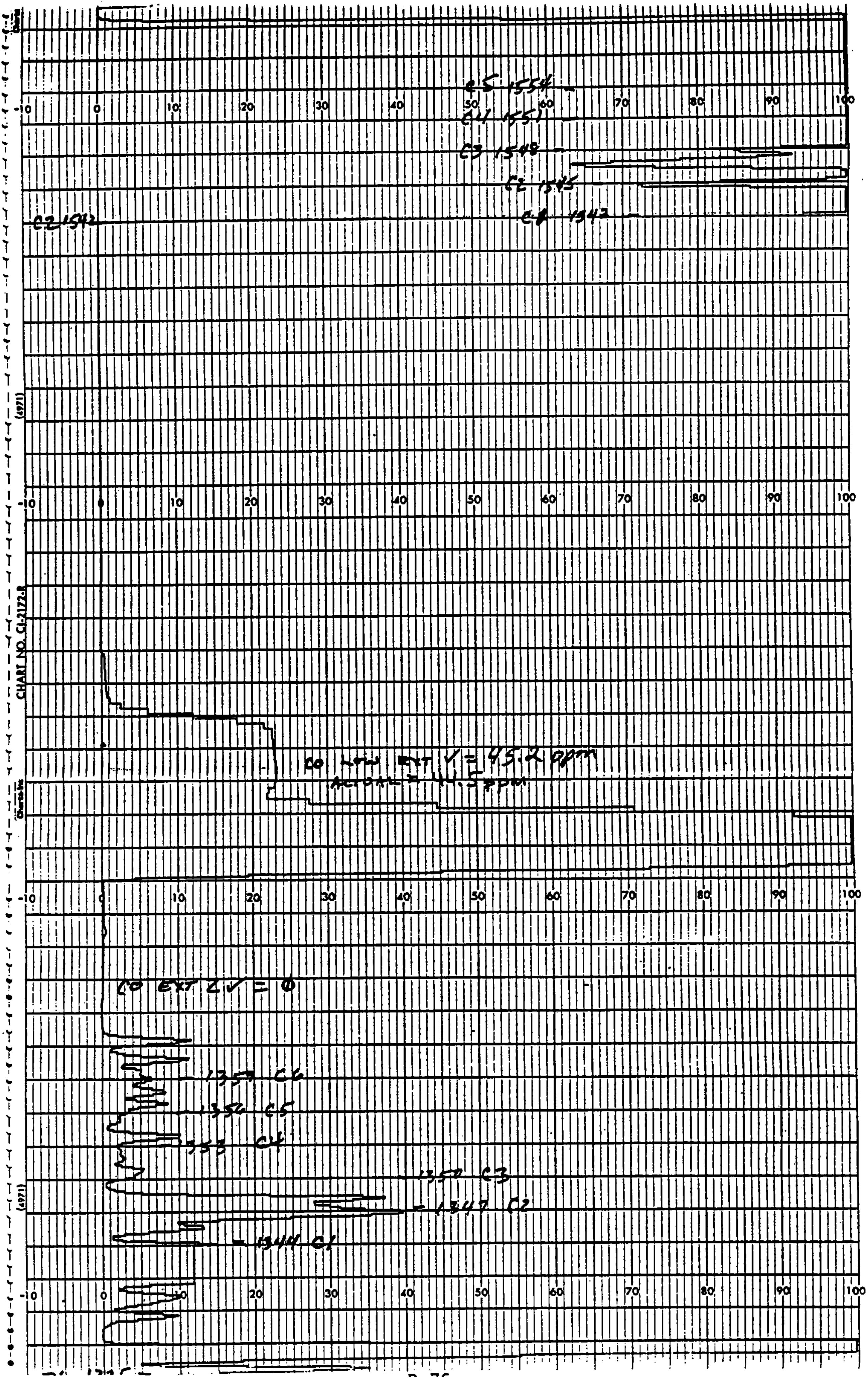
1232 B3

1229 B2

1226 B1

START RUN #5 @ 1226 20 CM/HR

CO Low Ext ✓ = 44.2 ppm
Actual = 45.5 ppm



C5 1554

C4 1551

C3 1548

C2 1545

C1 1542

C2 1542

CO LOW EXT √ = 45.2 ppm
ACTUAL = 41.5 ppm

CO EXT ZV = 0

1359 C6

1356 C5

1353 C4

1350 C3

1347 C2

1344 C1

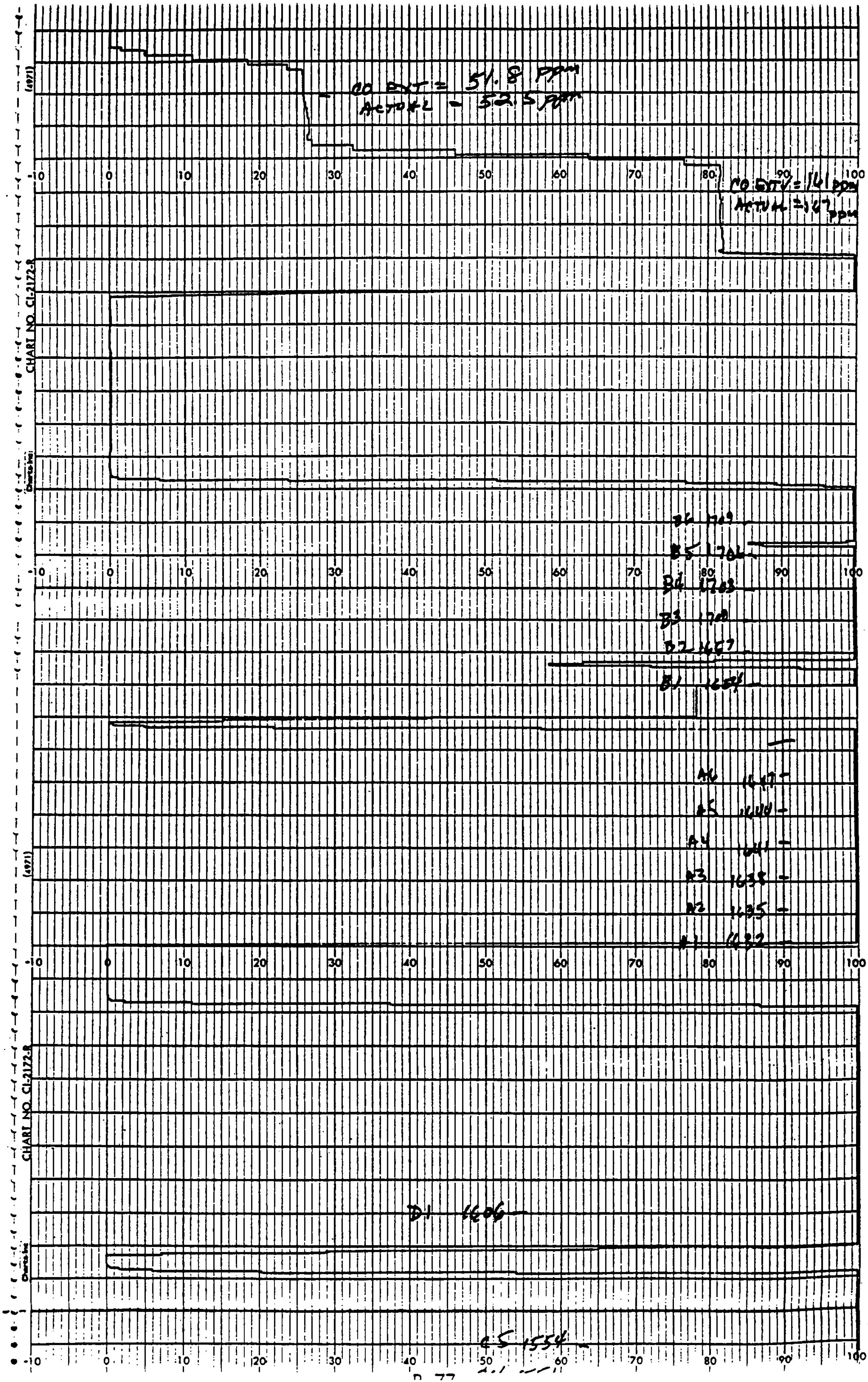

CO EXT = 51.8 PPM
ACTO#2 = 52.5 PPM
CO EXTV = 141 PPM
ACTUAL = 147 PPM
B6 1709
B5 1706
B4 1703
B3 1700
B2 1657
B1 1654
A6 1647
A5 1640
A4 1641
A3 1638
A2 1635
A1 1632
D1 1606
C5 1554
-10
0
10
20
30
40
50
60
70
80
90
100
CHART NO. CI-2172-R
(4971)
Charts Inc

TABLE A-1. CEMS ANALYZER CALIBRATION ERROR TEST RESULTS (TESTS #1 + #2)

	High Range Span Gas Value	Analyzer Calibration Response	Absolute Difference	Absolute Difference (% of span)	Allowable (% of span)
O2 (%)	19.50	19.50	0.00	0.0	+-2
NOx (ppm)	80.40	80.40	0.00	0.0	+-2
CO (ppm)	402.50	402.50	0.00	0.0	+-2
CO2 (%)	15.90	15.90	0.00	0.0	+-2

	Mid Range Span Gas Value	Analyzer Calibration Response	Absolute Difference	Absolute Difference (% of span)	Allowable (% of span)
O2 (%)	14.75	15.10	0.35	1.4	+-2
NOx (ppm)	41.20	42.00	0.80	0.8	+-2
CO (ppm)	255.00	260.00	5.00	1.0	+-2
CO2 (%)	11.80	11.96	0.16	0.8	+-2

	Zero Span Gas Value	Analyzer Calibration Response	Absolute Difference	Absolute Difference (% of span)	Allowable (% of span)
O2 (%)	0.00	0.00	0.00	0.0	+-2
NOx (ppm)	0.00	0.00	0.00	0.0	+-2
CO (ppm)	0.00	0.00	0.00	0.0	+-2
CO2 (%)	0.00	0.00	0.00	0.0	+-2

	Instrument Span Range 0 to :
O2 (%)	25
NOx (ppm)	100
CO (ppm)	500
CO2 (%)	20

TABLE A-1. CEMS ANALYZER CALIBRATION ERROR TEST RESULTS (Tests #3+#4)

	High Range Span Gas Value	Analyzer Calibration Response	Absolute Difference	Absolute Difference (% of span)	Allowable (% of span)
O2 (%)	19.50	19.50	0.00	0.0	+-2
NOx (ppm)	80.20	80.20	0.00	0.0	+-2
CO (ppm)	403.00	403.00	0.00	0.0	+-2
CO2 (%)	14.75	14.75	0.00	0.0	+-2

	Mid Range Span Gas Value	Analyzer Calibration Response	Absolute Difference	Absolute Difference (% of span)	Allowable (% of span)
O2 (%)	11.82	12.30	0.48	1.9	+-2
NOx (ppm)	41.00	40.00	1.00	1.0	+-2
CO (ppm)	206.00	207.00	1.00	0.2	+-2
CO2 (%)	9.90	10.00	0.10	0.5	+-2

	Zero Span Gas Value	Analyzer Calibration Response	Absolute Difference	Absolute Difference (% of span)	Allowable (% of span)
O2 (%)	0.00	0.00	0.00	0.0	+-2
NOx (ppm)	0.00	0.00	0.00	0.0	+-2
CO (ppm)	0.00	0.00	0.00	0.0	+-2
CO2 (%)	0.00	0.00	0.00	0.0	+-2

	Instrument Span Range 0 to :
O2 (%)	25
NOx (ppm)	100
CO (ppm)	500
CO2 (%)	20

TABLE A-1. CEMS ANALYZER CALIBRATION ERROR TEST RESULTS (TESTS #5 + #6)

	High Range Span Gas Value	Analyzer Calibration Response	Absolute Difference	Absolute Difference (% of span)	Allowable (% of span)
O2 (%)	19.50	19.50	0.00	0.0	+-2
NOx (ppm)	80.20	80.60	0.40	0.4	+-2
CO (ppm)	402.00	402.00	0.00	0.0	+-2
CO2 (%)	16.00	16.00	0.00	0.0	+-2

	Mid Range Span Gas Value	Analyzer Calibration Response	Absolute Difference	Absolute Difference (% of span)	Allowable (% of span)
O2 (%)	11.80	12.35	0.55	2.2	+-2
NOx (ppm)	41.10	41.00	0.10	0.1	+-2
CO (ppm)	206.00	207.50	1.50	0.3	+-2
CO2 (%)	9.90	10.04	0.14	0.7	+-2

	Zero Span Gas Value	Analyzer Calibration Response	Absolute Difference	Absolute Difference (% of span)	Allowable (% of span)
O2 (%)	0.00	0.00	0.00	0.0	+-2
NOx (ppm)	0.00	0.00	0.00	0.0	+-2
CO (ppm)	0.00	0.00	0.00	0.0	+-2
CO2 (%)	0.00	0.00	0.00	0.0	+-2

	Instrument Span Range 0 to :
O2 (%)	25
NOx (ppm)	100
CO (ppm)	500
CO2 (%)	20

TABLE A-2. CEMS ZERO DRIFT TEST RESULTS

	Test No.	Initial Zero	Final Zero	Absolute Difference	Difference (% of span)	Zero Drift Allowable (% of span)
O2 (%)	1	0.00	0.00	0.00	0.0	+-3
	2	0.00	0.00	0.00	0.0	+-3
NOx (ppm)	1	1.40	1.25	0.15	0.1	+-3
	2	1.25	1.00	0.25	0.3	+-3
CO (ppm)	1	2.50	6.00	3.50	0.7	+-3
	2	6.00	0.00	6.00	1.2	+-3
CO2 (%)	1	0.00	0.00	0.00	0.0	+-3
	2	0.00	-0.04	0.04	0.2	+-3

TABLE A-2. CEMS ZERO DRIFT TEST RESULTS

	Test No.	Initial Zero	Final Zero	Absolute Difference	Difference (% of span)	Zero Drift Allowable (% of span)
O2 (%)	3	0.00	0.00	0.00	0.0	+-3
	4	0.00	0.00	0.00	0.0	+-3
NOx (ppm)	3	0.00	-0.40	0.40	0.4	+-3
	4	-0.40	-0.70	0.30	0.3	+-3
CO (ppm)	3	0.00	0.00	0.00	0.0	+-3
	4	0.00	0.00	0.00	0.0	+-3
CO2 (%)	3	0.00	0.00	0.00	0.0	+-3
	4	0.00	0.00	0.00	0.0	+-3

TABLE A-2. CEMS ZERO DRIFT TEST RESULTS

	Test No.	Initial Zero	Final Zero	Absolute Difference	Difference (% of span)	Zero Drift Allowable (% of span)
O2 (%)	5	0.00	0.00	0.00	0.0	+-3
	6	0.00	0.10	0.10	0.4	+-3
NOx (ppm)	5	0.00	0.80	0.80	0.8	+-3
	6	0.80	0.20	0.60	0.6	+-3
CO (ppm)	5	0.00	0.00	0.00	0.0	+-3
	6	0.00	0.00	0.00	0.0	+-3
CO2 (%)	5	0.00	0.00	0.00	0.0	+-3
	6	0.00	0.00	0.00	0.0	+-3

TABLE A-3. CEMS CALIBRATION DRIFT TEST RESULTS

	Test	Initial Calibration Response	Final Calibration Response	Absolute Difference	Absolute Difference (% of span)	Calibration Drift Allowable (% of span)
O2 (%)	1	15.25	15.40	0.15	0.6	+-3
	2	15.40	15.18	0.22	0.9	+-3
NOx (ppm)	1	41.30	40.40	0.90	0.9	+-3
	2	40.40	39.50	0.90	0.9	+-3
CO (ppm)	1	256.50	256.50	0.00	0.0	+-3
	2	256.50	252.50	4.00	0.8	+-3
CO2 (%)	1	11.86	11.86	0.00	0.0	+-3
	2	11.86	11.88	0.02	0.1	+-3

TABLE A-3. CEMS CALIBRATION DRIFT TEST RESULTS

	Test	Initial Calibration Response	Final Calibration Response	Absolute Difference	Absolute Difference (% of span)	Calibration Drift Allowable (% of span)
O2 (%)	3	12.50	12.13	0.37	1.5	+-3
	4	12.13	12.35	0.22	0.9	+-3
NOx (ppm)	3	39.60	39.80	0.20	0.2	+-3
	4	39.80	39.10	0.70	0.7	+-3
CO (ppm)	3	205.00	207.00	2.00	0.4	+-3
	4	207.00	209.00	2.00	0.4	+-3
CO2 (%)	3	9.88	9.94	0.06	0.3	+-3
	4	9.94	9.80	0.14	0.7	+-3

TABLE A-3. CEMS CALIBRATION DRIFT TEST RESULTS

	Test	Initial Calibration Response	Final Calibration Response	Absolute Difference	Absolute Difference (% of span)	Calibration Drift Allowable (% of span)
O2 (%)	5	12.55	12.45	0.10	0.4	+-3
	6	12.45	12.70	0.25	1.0	+-3
NOx (ppm)	5	41.00	40.50	0.50	0.5	+-3
	6	40.50	40.40	0.10	0.1	+-3
CO (ppm)	5	192.50	206.00	13.50	2.7	+-3
	6	206.00	203.00	3.00	0.6	+-3
CO2 (%)	5	10.04	9.84	0.20	1.0	+-3
	6	9.84	9.78	0.06	0.3	+-3

TABLE A-4. CEMS UPSCALE GAS SAMPLING SYSTEM BIAS TEST RESULTS

	Test No.	Initial System Calibration Response	Analyzer Calibration Response	Absolute Difference	Sampling System Bias (% of span)	Final System Calibration Response	Analyzer Calibration Response	Absolute Difference	Sampling System Bias (% of span)	Allowable Sampling System Bias (% of span)
O2 (%)	1	15.25	15.10	0.15	0.6	15.40	15.10	0.30	1.2	+-5
	2	15.40	15.10	0.30	1.2	15.18	15.10	0.08	0.3	+-5
NOx (ppm)	1	41.30	42.00	0.70	0.7	40.40	42.00	1.60	1.6	+-5
	2	40.40	42.00	1.60	1.6	39.50	42.00	2.50	2.5	+-5
CO (ppm)	1	256.50	260.00	3.50	0.7	256.50	260.00	3.50	0.7	+-5
	2	256.50	260.00	3.50	0.7	252.50	260.00	7.50	1.5	+-5
CO2 (%)	1	11.86	11.96	0.10	0.5	11.86	11.96	0.10	0.5	+-5
	2	11.86	11.96	0.10	0.5	11.88	11.96	0.08	0.4	+-5

TABLE A-4. CEMS UPSCALE GAS SAMPLING SYSTEM BIAS TEST RESULTS

	Test No.	Initial System Calibration Response	Analyzer Calibration Response	Absolute Difference	Sampling System Bias (% of span)	Final System Calibration Response	Analyzer Calibration Response	Absolute Difference	Sampling System Bias (% of span)	Allowable Sampling System Bias (% of span)
O2 (%)	3	12.50	12.30	0.20	0.8	12.13	12.30	0.17	0.7	+-5
	4	12.13	12.30	0.17	0.7	12.35	12.30	0.05	0.2	+-5
NOx (ppm)	3	39.60	40.00	0.40	0.4	39.80	40.00	0.20	0.2	+-5
	4	39.80	40.00	0.20	0.2	39.10	40.00	0.90	0.9	+-5
CO (ppm)	3	205.00	207.00	2.00	0.4	207.00	207.00	0.00	0.0	+-5
	4	207.00	207.00	0.00	0.0	209.00	207.00	2.00	0.4	+-5
CO2 (%)	3	9.88	10.00	0.12	0.6	9.94	10.00	0.06	0.3	+-5
	4	9.94	10.00	0.06	0.3	9.80	10.00	0.20	1.0	+-5

TABLE A-4. CEMS UPSCALE GAS SAMPLING SYSTEM BIAS TEST RESULTS

	Test No.	Initial System Calibration Response	Analyzer Calibration Response	Absolute Difference	Sampling System Bias (% of span)	Final System Calibration Response	Analyzer Calibration Response	Absolute Difference	Sampling System Bias (% of span)	Allowable Sampling System Bias (% of span)
O2 (%)	5	12.55	12.35	0.20	0.8	12.45	12.35	0.10	0.4	+-5
	6	12.45	12.35	0.10	0.4	12.70	12.35	0.35	1.4	+-5
NOx (ppm)	5	41.00	41.00	0.00	0.0	40.50	41.00	0.50	0.5	+-5
	6	40.50	41.00	0.50	0.5	40.40	41.00	0.60	0.6	+-5
CO (ppm)	5	192.50	207.50	15.00	3.0	206.00	207.50	1.50	0.3	+-5
	6	206.00	207.50	1.50	0.3	203.00	207.50	4.50	0.9	+-5
CO2 (%)	5	10.04	10.04	0.00	0.0	9.84	10.04	0.20	1.0	+-5
	6	9.84	10.04	0.20	1.0	9.78	10.04	0.26	1.3	+-5

TABLE A-5. CEMS ZERO GAS SAMPLING SYSTEM BIAS TEST RESULTS

	Test No.	Initial System Calibration Response	Analyzer Calibration Response	Absolute Difference	Sampling System Bias (% of span)	Final System Calibration Response	Analyzer Calibration Response	Absolute Difference	Sampling System Bias (% of span)	Allowable Sampling System Bias (% of span)
O2 (%)	1	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.0	+-5
	2	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.0	+-5
NOx (ppm)	1	1.40	0.00	1.40	1.4	1.25	0.00	1.25	1.3	+-5
	2	1.25	0.00	1.25	1.3	1.00	0.00	1.00	1.0	+-5
CO (ppm)	1	2.50	0.00	2.50	0.5	6.00	0.00	6.00	1.2	+-5
	2	6.00	0.00	6.00	1.2	0.00	0.00	0.00	0.0	+-5
CO2 (%)	1	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.0	+-5
	2	0,00	0.00	0.00	0.0	-0.04	0.00	0.04	0.2	+-5

TABLE A-5. CEMS ZERO GAS SAMPLING SYSTEM BIAS TEST RESULTS

	Test No.	Initial System Calibration Response	Analyzer Calibration Response	Absolute Difference	Sampling System Bias (% of span)	Final System Calibration Response	Analyzer Calibration Response	Absolute Difference	Sampling System Bias (% of span)	Allowable Sampling System Bias (% of span)
O2 (%)	3	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.0	+-5
	4	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.0	+-5
NOx (ppm)	3	0.00	0.00	0.00	0.0	-0.40	0.00	0.40	0.4	+-5
	4	-0.40	0.00	0.40	0.4	-0.70	0.00	0.70	0.7	+-5
CO (ppm)	3	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.0	+-5
	4	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.0	+-5
CO2 (%)	3	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.0	+-5
	4	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.0	+-5

TABLE A-5. CEMS ZERO GAS SAMPLING SYSTEM BIAS TEST RESULTS

	Test No.	Initial System Calibration Response	Analyzer Calibration Response	Absolute Difference	Sampling System Bias (% of span)	Final System Calibration Response	Analyzer Calibration Response	Absolute Difference	Sampling System Bias (% of span)	Allowable Sampling System Bias (% of span)
O2 (%)	5	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.0	+-5
	6	0.00	0.00	0.00	0.0	0.10	0.00	0.10	0.4	+-5
NOx (ppm)	5	0.00	0.00	0.00	0.0	0.80	0.00	0.80	0.8	+-5
	6	0.80	0.00	0.80	0.8	0.20	0.00	0.20	0.2	+-5
CO (ppm)	5	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.0	+-5
	6	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.0	+-5
CO2 (%)	5	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.0	+-5
	6	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.0	+-5

TABLE A-6. CORRECTED GAS CONCENTRATIONS

	Test No.	$\bar{C}$	Co	Cm	Cma	Cgas
O2 (%)	1	11.31	0.00	15.33	14.94	11.03
	2	11.41	0.00	15.29	14.94	11.15
NOx (ppm)	1	20.00	1.33	40.85	40.30	19.04
	2	18.66	1.13	39.95	40.30	18.20
CO (ppm)	1	76.38	4.25	256.50	255.50	73.06
	2	96.88	3.00	254.50	255.50	95.37
CO2 (%)	1	9.56	0.00	11.86	12.00	9.67
	2	9.52	-0.02	11.87	12.00	9.63

$Cgas = (\bar{C}-Co) \times [Cma/(Cm-Co)]$:Equation 6C-1,EPA Method 6C.

Where : Cgas = Effluent gas concentration, dry basis.

$\bar{C}$ = Average gas concentration indicated by gas analyzer dry basis.

Co = Average of initial and final system calibration bias check responses for the zero gas.

Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas.

Cma = Actual concentration of the upscale calibration gas.

TABLE A-6. CORRECTED GAS CONCENTRATIONS

	Test No.	$\bar{C}$	Co	Cm	Cma	Cgas
O2 (%)	3	11.18	0.00	12.32	11.95	10.85
	4	11.06	0.00	12.24	11.95	10.80
NOx (ppm)	3	17.26	-0.20	39.70	39.80	17.42
	4	17.98	-0.55	39.45	39.80	18.44
CO (ppm)	3	70.73	0.00	206.00	202.00	69.36
	4	14.73	0.00	208.00	202.00	14.31
CO2 (%)	3	9.58	0.00	9.91	10.00	9.67
	4	9.51	0.00	9.87	10.00	9.64

Cgas = $(\bar{C}-Co) \times [Cma/(Cm-Co)]$:Equation 6C-1,EPA Method 6C.

Where : Cgas = Effluent gas concentration, dry basis.

$\bar{C}$ = Average gas concentration indicated by gas analyzer dry basis.

Co = Average of initial and final system calibration bias check responses for the zero gas.

Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas.

Cma = Actual concentration of the upscale calibration gas.

TABLE A-6. CORRECTED GAS CONCENTRATIONS

	Test No.	$\bar{C}$	Co	Cm	Cma	Cgas
O2 (%)	5	11.97	0.00	12.50	11.96	11.45
	6	12.71	0.05	12.58	11.96	12.09
NOx (ppm)	5	15.53	0.40	40.75	39.80	14.92
	6	12.23	0.50	40.45	39.80	11.69
CO (ppm)	5	89.83	0.00	199.25	202.00	91.07
	6	399.17	0.00	204.50	202.00	394.29
CO2 (%)	5	8.95	0.00	9.94	10.02	9.02
	6	8.23	0.00	9.81	10.02	8.41

Cgas = ($\bar{C}$-Co) x [Cma/(Cm-Co)] :Equation 6C-1,EPA Method 6C.

Where : Cgas = Effluent gas concentration, dry basis.

$\bar{C}$ = Average gas concentration indicated by gas analyzer dry basis.

Co = Average of initial and final system calibration bias check responses for the zero gas.

Cm = Average of initial and final system calibration bias check responses for the upscale calibration gas.

Cma = Actual concentration of the upscale calibration gas.

Steiner Environmental, Inc.

Date: 9/25/92

Test Location: Flare Out/In

SAMPLE HANDLING/LOG-IN

NO	SAMPLE TYPE	VOLUME	COMMENTS
1	33758 ___ Meth Can Sample 3 Test		Outlet
2	33759 ___ Meth Bag Sample 3 Test		Outlet
3	33760 ___ Meth Can Sample 3 Test		Inlet
4	33761 ___ Meth Bag Sample 3 Test		Inlet
5	33766 ___ Meth Can Sample 4 Test		Outlet
6	33767 ___ Meth Bag Sample 4 Test		Outlet
7	33768 ___ Meth Can Sample 4 Test		Inlet
8	33769 ___ Meth Bag Sample 4 Test		Inlet
9	33789 ___ Meth Can Sample 5 Test		Inlet
10	33788 ___ Meth Bag Sample 5 Test		Inlet
11	33787 ___ Meth Can Sample 5 Test		Outlet
12	33786 ___ Meth Bag Sample 5 Test		Inlet

CHAIN-OF-CUSTODY

Signature	Date/Time	Signature	Date/Time
Jim Steiner	9/26/92 11:00am		

Steiner Environmental, Inc.

Date: 9/25/92

Test Location: Flare Outlet/In

SAMPLE HANDLING/LOG-IN

NO	SAMPLE TYPE	VOLUME	COMMENTS
1	33754 26A Meth FHW Sample 3 Test		
2	33755 26A Meth MF Sample 3 Test		
3	33756 26A Meth H_2SO_4 Sample 3 Test		
4	33757 26A Meth NaOH Sample 3 Test		
5	33762 26A Meth FHW Sample 4 Test		
6	33763 26A Meth MF Sample 4 Test		
7	33764 26A Meth H_2SO_4 Sample 4 Test		
8	33765 26A Meth NaOH Sample 4 Test		
9	33753 ASTM Meth [illegible] Sample 1,2 Test		
10	33771 ASTM Meth Sample 3,4 Test		
11	33772 26A Meth FHW Sample BL Test		
12	33773 26A Meth MF Sample BL Test		

CHAIN-OF-CUSTODY

Signature	Date/Time	Signature	Date/Time
Jim Steiner	9/27/92 11:00am		9-28-92/ 1110

Date: 9/25/92

Test Location: Flare Out/In

SAMPLE HANDLING/LOG-IN

NO	SAMPLE TYPE	VOLUME	COMMENTS
1	33774 26A Meth H_2SO_4 Sample BL Test		
2	33775 26A Meth NaOH Sample BL Test		
3	33776 8 Meth FHW Sample 5 Test		
4	33777 8 Meth MF Sample 5 Test		
5	33778 8 Meth IPA Sample 5 Test		
6	33779 8 Meth AMF Sample 5 Test		
7	33780 8 Meth H_2O_2 Sample 5 Test		
8	33781 8 Meth FAW Sample 6 Test		
9	33782 8 Meth MF Sample 6 Test		
10	33783 8 Meth IPA Sample 6 Test		
11	33784 8 Meth AMF Sample 6 Test		
12	33785 8 Meth H_2O_2 Sample 6 Test		

CHAIN-OF-CUSTODY

Signature	Date/Time	Signature	Date/Time
Jim Steiner	9/27/92 11:00am	Wayne A. [illegible]	9-28-92 11:10

Steiner Environmental, Inc.

Date: 9/25/92

Test Location: Flare Out/In

SAMPLE HANDLING/LOG-IN

NO	SAMPLE TYPE	VOLUME	COMMENTS
1	33790 8 Meth H_2O_2 Sample BL Test		
2	33791 8 Meth AMF Sample BL Test		
3	33792 8 Meth MF Sample BL Test		
4	33793 8 Meth IPA Sample BL Test		
5	33794 ASTM Meth ____ Sample S.G Test		
6			
7			
8			
9			
10			
11			
12			

CHAIN-OF-CUSTODY

Signature	Date/Time	Signature	Date/Time
Jim Steiner	9/27/92 11:00am	Wayne A. [illegible]	9-28-92 11:10

ANALYTICAL REPORT

SAMPLE TYPE : .1 N H2SO4
SAMPLE COMPONENT : HCl
REQUESTED BY : BFI - ARBOR HILLS
ANALYTICAL METHOD : ISE METER

TEST DATE : 09/23,24,25/9
ANALYSIS DATE: 09/29/92
ANALYST : WB

Sample ID #	Test No.	Sample Volume mL	Cl ppm	HCl mg	QC %
33756	3	415	41	17.01	102.5 DUP
33764	4	420	38	15.93	95.5 REC
33774	BLANK	100	1	0.10	

ANALYTICAL REPORT

SAMPLE TYPE : .1 N NaOH
SAMPLE COMPONENT : Cl2
REQUESTED BY : BFI - ARBOR HILLS
ANALYTICAL METHOD : ISE METER

TEST DATE : 09/23,24,25/92
ANALYSIS DATE: 09/29/92
ANALYST : WB

Sample ID #	Test No.	Sample Volume mL	Cl ppm	Cl2 mg	QC %
33757	3	270	.96	ND	100.0 DUP
33765	4	265	1.1	ND	95.2 REC
33775	BLANK	100	.92	.05	

ND = LESS THAN .05 mg

ANALYTICAL REPORT

SAMPLE TYPE : FILTERABLE SO4
SAMPLING METHOD : M8
SAMPLE COMPONENT : FHW + MF
REQUESTED BY : BFI - ARBOR HILLS
ANALYTICAL METHOD : BaCl2 Titration

TEST DATE :09/23,24,25/92
ANALYSIS DATE :09/29/92
ANALYST :WB

Test No.	Sample Volume mL	Sample Aliquot mL	Titer mL	Analyt. Result (total sample) mg H2SO4
5	100	10	0.32	1.04
6	100	10	0.29	0.89
BLANK	100	10	0.11	0.54

% Duplicate = TEST 5 = 96.88

% Recovery = TEST 6 = 98.38

% CONFIDENCE = 99.55 EPA SO2 LOT 0584 5XXX
NORMALITY = 0.010101

ANALYTICAL REPORT

SAMPLE TYPE : CONDENSIBLE SULFATE
SAMPLING METHOD : M8
SAMPLE COMPONENT : BHW + AMF
REQUESTED BY : BFI - ARBOR HILLS
ANALYTICAL METHOD : BaCL2 Titration

TEST DATE :09/23,24,25/92
ANALYSIS DATE:09/29/92
ANALYST :WB

Test No.	Sample Volume mL	Sample Aliquot ml	Titer mL	Analyt. Result (total sample) mg H2SO4
5	100	10	0.51	2.13
6	100	10	0.84	3.76
AMF BK	100	10	0.08	0.39
IPA BK	100	10	0.07	0.34
Di BK	100	10	0.07	0.34

% Duplicate = TEST 6 = 98.81

% Recovery = TEST 5 = 100.40
% CONFIDENCE = 99.55 EPA SO2 LOT 0584 5XXX
NORMALITY = 0.010101

ANALYTICAL REPORT

SAMPLE TYPE : SO2
SAMPLING METHOD : M8
SAMPLE COMPONENT : 3% H2O2
REQUESTED BY : BFI - ARBOR HILLS

TEST DATE :09/23,24,25/
ANALYSIS DATE :09/29/92
ANALYST :WB

ANALYTICAL METHOD : BaCL2 Titration

Sample ID #	Test No.	Sample Volume mL	Sample Aliquot mL	Titer mL	Analyt. Resul (total sampl mg H2SO4
33780	5	460	10	1.02	21.7
33785	6	430	10	1.05	20.9
33790	BLANK	100	10	0.06	0.3

% Duplicate = TEST 5 = 103.00

% Recovery = TEST 6 = 100.00

% CONFIDENCE = 99.87 EPA SO2 LOT 0584 5XXX
NORMALITY = 0.0100401

SOURCE TEST CALCULATIONS

```
PLANT : BFI ARBOR HILLS                          RUN NO.:          1
        FLARE OUTLET                             DATE    : SEPT 23,1992

                  STANDARD TEMP.:      68 DEG. F

METER TEMP.     =   72.88 DEG. F   |  STATIC PRESS.=      -0.05 in. H20
STACK TEMP.     = 1904.04 DEG. F   |  Cp           =      0.840
SQ.RT. dP       =  0.3220 in. H20  |  STACK I.D.   =     139.50 inch
METER ORIFICE   =    2.00 in. H20  |  DUCT LENGTH  =            inch
METER VOLUME    =  56.948 Cu.Ft.   |  DUCT WIDTH   =            inch
METER Y         =  1.0098          |  STACK AREA   =    106.139 Sq.Ft.
BAR. PRESSURE   =   29.23 in.Hg    |  TEST TIME    =      72.00 min.
COND.(Vlc)      =    84.3 ml       |  NOZZLE DIA.  =            inch

GAS ANALYSIS    =   11.03  % O2          0.00  % CO
                     9.67  % CO2        79.30  % N2

*****************************************************************************

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460)......      =    55.945   dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vic      =     3.968   scf

Bws = Vw(std) / (Vm(std) + Vw(std))............     =     0.066 | Lower
                                                                | Bws
Bws @ Saturated Conditions = Vapor Press. of H2O                | value
@ Dew Point Temp. / (Ps, in.Hg.) ..............     =     1.000 | used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =    111.36

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]   =     29.99

Ms = (Md x (1-Bws)) + (18.0 x Bws)..............    =     29.19

P(stack) = Pbar + [Pstatic / 13.6] ............     =     29.23 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x Ps)] ..............................    =     38.49   ft/sec

Qs = vs x As x 60 ..............................    =   245,112   acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (Ps/29.92) .........................    =    49,935   dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std)/(Tstd +
    460)/ 29.92] x 100 / (Time x Ps x An x vs x 60) =             %
```

SOURCE TEST CALCULATIONS

```
PLANT : BFI ARBOR HILLS
        FLARE OUTLET                              RUN NO.:          2
                                                  DATE   : SEPT 23,1992

                  STANDARD TEMP.:      68 DEG. F

METER TEMP.     =  101.88 DEG. F  :  STATIC PRESS.=      -0.05 in. H20
STACK TEMP.     = 1860.79 DEG. F  :  Cp           =       0.840
SQ.RT. dP       =  0.3146 in. H20 :  STACK I.D.   =     139.50 inch
METER ORIFICE   =    2.00 in. H20 :  DUCT LENGTH  =            inch
METER VOLUME    =  57.253 Cu.Ft.  :  DUCT WIDTH   =            inch
METER Y         =  1.0098         :  STACK AREA   =    106.139 Sq.Ft.
BAR. PRESSURE   =   29.32 in.Hg   :  TEST TIME    =      72.00 min.
COND.(Vlc)      =   131.5 ml      :  NOZZLE DIA.  =            inch

GAS ANALYSIS    :   11.15  % O2          0.00  % CO
                     9.63  % CO2        79.22  % N2

**********************************************************************

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460)......      =    53.506   dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vic       =     6.190   scf

Bws = Vw(std) / (Vm(std) + Vw(std))............      =     0.104 : Lower
                                                                 : Bws
Bws @ Saturated Conditions = Vapor Press. of H20                 : value
@ Dew Point Temp. / (Ps, in.Hg.) ..............      =     1.000 : used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =     114.19

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]    =     29.99

Ms = (Md x (1-Bws)) + (18.0 x Bws)..............     =     28.74

P(stack) = Pbar + [Pstatic / 13.6] ............      =     29.32 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x Ps)] .............................      =     37.49   ft/sec

Qs = vs x As x 60 .............................      =   238,765   acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
        x (Ps/29.92) .........................       =    47,706   dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std)/(Tstd +
    460)/ 29.92] x 100 / (Time x Ps x An x vs x 60) =               %
```

SOURCE TEST CALCULATIONS

```
PLANT : BFI ARBOR HILLS                     RUN NO.:        3
        FLARE OUTLET                        DATE    : SEPT 24,1992

                    STANDARD TEMP.:     68 DEG. F

METER TEMP.     =   90.94 DEG. F   ;  STATIC PRESS.=      -0.05 in. H2O
STACK TEMP.     = 1848.08 DEG. F   ;  Cp           =       0.840
SQ.RT. dP       =  0.3272 in. H2O  ;  STACK I.D.   =     139.50 inch
METER ORIFICE   =    2.50 in. H2O  ;  DUCT LENGTH  =            inch
METER VOLUME    =  63.114 Cu.Ft.   ;  DUCT WIDTH   =            inch
METER Y         =  1.0098          ;  STACK AREA   =    106.139 Sq.Ft.
BAR. PRESSURE   =   29.33 in.Hg    ;  TEST TIME    =      72.00 min.
COND.(Vlc)      =   161.0 ml       ;  NOZZLE DIA.  =            inch

GAS ANALYSIS    =   10.85  % O2            0.00  % CO
                     9.67  % CO2          79.48  % N2

*******************************************************************************

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460)......      =     60.250   dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc       =      7.578   scf

Bws = Vw(std) / (Vm(std) + Vw(std))............      =      0.112 ; Lower
                                                                  ; Bws
Bws @ Saturated Conditions = Vapor Press. of H2O                  ; value
@ Dew Point Temp. / (Ps, in.Hg.) ..............      =      1.000 ; used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =     107.08

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]    =      29.98

Ms = (Md x (1-Bws)) + (18.0 x Bws)..............     =      28.64

P(stack) = Pbar + [Pstatic / 13.6] ............     =      29.33 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x Ps)] ..............................     =      38.95   ft/sec

Qs = vs x As x 60 ..............................     =    248,042  acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (Ps/29.92) .........................    =     49,403  dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std)/(Tstd +
    460)/ 29.92] x 100 / (Time x Ps x An x vs x 60) =             %
```

SOURCE TEST CALCULATIONS

```
PLANT : BFI ARBOR HILLS                      RUN NO.:        4
        FLARE OUTLET                         DATE   : SEPT 24,1992

               STANDARD TEMP.:      68 DEG. F

METER TEMP.     =   97.17 DEG. F  ¦  STATIC PRESS.=      -0.04 in. H2O
STACK TEMP.     = 1891.29 DEG. F  ¦  Cp           =      0.840
SQ.RT. dP       =  0.3155 in. H2O ¦  STACK I.D.   =     139.50 inch
METER ORIFICE   =    2.50 in. H2O ¦  DUCT LENGTH  =            inch
METER VOLUME    =  63.132 Cu.Ft.  ¦  DUCT WIDTH   =            inch
METER Y         =  1.0098         ¦  STACK AREA   =    106.139 Sq.Ft.
BAR. PRESSURE   =   29.31 in.Hg   ¦  TEST TIME    =      72.00 min.
COND.(Vlc)      =   150.5 ml      ¦  NOZZLE DIA.  =            inch

GAS ANALYSIS    :   10.80  % O2          0.00  % CO
                     9.64  % CO2        79.56  % N2

*****************************************************************************

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460)......     =    59.553   dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc      =     7.084   scf

Bws = Vw(std) / (Vm(std) + Vw(std))............     =     0.106 ¦ Lower
                                                                ¦ Bws
Bws @ Saturated Conditions = Vapor Press. of H2O                ¦ value
@ Dew Point Temp. / (Ps, in.Hg.) ..............     =     1.000 ¦ used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =    105.84

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]    =     29.97

Ms = (Md x (1-Bws)) + (18.0 x Bws)..............    =     28.70

P(stack) = Pbar + [Pstatic / 13.6] ............     =     29.31 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x Ps)] ..............................    =     37.88   ft/sec

Qs = vs x As x 60 ..............................    =   241,233   acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (Ps/29.92) .........................    =    47,420   dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std)/(Tstd +
    460)/ 29.92] x 100 / (Time x Ps x An x vs x 60) =             %
```

SOURCE TEST CALCULATIONS

PLANT : BFI ARBOR HILLS
FLARE OUTLET

RUN NO.: 5
DATE : SEPT 25,1992

STANDARD TEMP.: 68 DEG. F

METER TEMP. = 98.6 DEG. F
STACK TEMP. = 1798.79 DEG. F
SQ.RT. dP = 0.3461 in. H20
METER ORIFICE = 2.50 in. H20
METER VOLUME = 63.313 Cu.Ft.
METER Y = 1.0098
BAR. PRESSURE = 29.21 in.Hg
COND.(Vlc) = 144.2 ml

STATIC PRESS. = -0.10 in. H20
Cp = 0.840
STACK I.D. = 139.50 inch
DUCT LENGTH = inch
DUCT WIDTH = inch
STACK AREA = 106.139 Sq.Ft.
TEST TIME = 72.00 min.
NOZZLE DIA. = inch

GAS ANALYSIS = 11.45 % O2 0.00 % CO
9.02 % CO2 79.53 % N2

* * *

Vm(std) = [T(std) + 460 / 29.92] x Vm x Y x
(Pb + (dH / 13.6)) / (Tm + 460)...... = 59.368 dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vic = 6.788 scf

Bws = Vw(std) / (Vm(std) + Vw(std))............. = 0.103 ¦ Lower ¦ Bws ¦ value

Bws @ Saturated Conditions = Vapor Press. of H20
@ Dew Point Temp. / (Ps, in.Hg.) .... = 1.000 ¦ used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 = 119.95

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)] = 29.90

Ms = (Md x (1-Bws)) + (18.0 x Bws).............. = 28.68

P(stack) = Pbar + [Pstatic / 13.6] .... = 29.20 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
/ (Ms x Ps)] .... = 40.82 ft/sec

Qs = vs x As x 60 .... = 259,932 acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
x (Ps/29.92) .... = 53,219 dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std)/(Tstd +
460)/ 29.92] x 100 / (Time x Ps x An x vs x 60) = %

SOURCE TEST CALCULATIONS

PLANT : BFI ARBOR HILLS
FLARE OUTLET

RUN NO.: 6
DATE : SEPT 25,1992

STANDARD TEMP.: 68 DEG. F

METER TEMP. = 101.75 DEG. F ! STATIC PRESS.= -0.09 in. H20
STACK TEMP. = 1700.00 DEG. F ! Cp = 0.840
SQ.RT. dP = 0.3478 in. H20 ! STACK I.D. = 139.50 inch
METER ORIFICE = 2.50 in. H20 ! DUCT LENGTH = inch
METER VOLUME = 62.871 Cu.Ft. ! DUCT WIDTH = inch
METER Y = 1.0098 ! STACK AREA = 106.139 Sq.Ft.
BAR. PRESSURE = 29.14 in.Hg ! TEST TIME = 72.00 min.
COND.(Vlc) = 142.6 ml ! NOZZLE DIA. = inch

GAS ANALYSIS : 12.09 % O2 0.00 % CO
8.41 % CO2 79.50 % N2

****

Vm(std) = [T(std) + 460 / 29.92] x Vm x Y x
(Pb + (dH / 13.6)) / (Tm + 460)...... = 58.484 dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc = 6.712 scf

Bws = Vw(std) / (Vm(std) + Vw(std))............ = 0.103 ! Lower

Bws @ Saturated Conditions = Vapor Press. of H20 ! Bws
@ Dew Point Temp. / (Ps, in.Hg.) .... = 1.000 ! value ! used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 = 135.87

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)] = 29.83

Ms = (Md x (1-Bws)) + (18.0 x Bws).............. = 28.61

P(stack) = Pbar + [Pstatic / 13.6] .... = 29.13 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
/ (Ms x Ps)] .... = 40.21 ft/sec

Qs = vs x As x 60 .... = 256,043 acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
x (Ps/29.92) .... = 54,669 dscf/mi

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std)/(Tstd +
460)/ 29.92] x 100 / (Time x Ps x An x vs x 60) = %

EMISSION RATE CALCULATIONS

PLANT : BFI ARBOR HILLS
SOURCE : FLARE OUTLET

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 3 % O2 Correction

Run No.	1	2	AVERAGE
Date	9/23/92	9/23/92	
Oxygen (%)	11.03	11.15	11.09
Qs(std), dscfm	49,935	47,706	48,821
NOx, ppm	19.04	18.20	18.62
SO2, ppm			
CO, ppm	73.06	95.37	84.22
HC, ppm			
F-Factor	8388.01	8388.01	8388.01
NOx, MW = 46.005			
NOx, lb/hr	6.81	6.22	6.52
NOx, ppm @ O2	34.53	33.41	33.97
NOx, lb/MMBtu	0.0404	0.0391	0.0397
SO2, MW = 64.058			
SO2, lb/hr			
SO2, ppm @ O2			
SO2, lb/MMBtu			
CO, MW = 28.010			
CO, lb/hr	15.91	19.84	17.87
CO, ppm @ O2	132.50	175.09	153.79
CO, lb/MMBtu	0.0944	0.1247	0.1096
HC, MW = 16.043			
HC, lb/hr			
HC, ppm @ O2			
HC, lb/MMBtu			

* lb/hr = 8.223E-5 x Qs(std) x MW x ppm / (Tstd + 460)

* ppm @ O2 = ppm measured x [(20.9 - O2% correction) / (20.9 - %O2 measured)]

* lb/MMBtu = F-Factor x MW x [1.3711E-6 / (Tstd + 460)] x [20.9 / (20.9 - O2%)] x ppm

* lb/Bbl = (lb/MMBtu) x (MMBtu/Bbl)

EMISSION RATE CALCULATIONS

PLANT : BFI ARBOR HILLS
SOURCE : FLARE OUTLET

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 3 % O2 Correction

Run No.	3	4	AVERAGE
Date	9/24/92	9/24/92	
Oxygen (%)	10.85	10.80	10.83
Qs(std), dscfm	49,403	47,420	48,412
NOx, ppm	17.42	18.44	17.93
SO2, ppm			
CO, ppm	69.36	14.31	41.84
HC, ppm	28.80	16.40	22.60
F-Factor	8386.65	8386.65	8386.65
NOx, MW = 46.005			
NOx, lb/hr	6.17	6.26	6.21
NOx, ppm @ O2	31.03	32.68	31.85
NOx, lb/MMBtu	0.0363	0.0382	0.0373
SO2, MW = 64.058			
SO2, lb/hr			
SO2, ppm @ O2			
SO2, lb/MMBtu			
CO, MW = 28.010			
CO, lb/hr	14.94	2.96	8.95
CO, ppm @ O2	123.54	25.36	74.45
CO, lb/MMBtu	0.0880	0.0181	0.0530
HC, MW = 16.043			
HC, lb/hr	3.55	1.94	2.75
HC, ppm @ O2	51.30	29.07	40.18
HC, lb/MMBtu	0.0209	0.0119	0.0164

* lb/hr = 8.223E-5 x Qs(std) x MW x ppm / (Tstd + 460)

* ppm @ O2 = ppm measured x [(20.9 - O2% correction) / (20.9 - %O2 measured)]

* lb/MMBtu = F-Factor x MW x [1.3711E-6 / (Tstd + 460)] x [20.9 / (20.9 - O2%)] x ppm

* lb/Bbl = (lb/MMBtu) x (MMBtu/Bbl)

EMISSION RATE CALCULATIONS

PLANT : BFI ARBOR HILLS
SOURCE : FLARE OUTLET

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg.   3 % 02 Correction

Run No.	5	6	AVERAGE
Date	9/24/92	9/24/92	
Oxygen (%)	11.45	12.09	11.77
Qs(std), dscfm	53,219	54,669	53,944
NOx, ppm	14.92	11.69	13.31
SO2, ppm			
CO, ppm	91.07	394.29	242.68
HC, ppm	23.50		23.50
F-Factor	8323.36	8323.36	8323.36
NOx, MW = 46.005			
NOx, lb/hr	5.69	4.58	5.13
NOx, ppm @ 02	28.26	23.75	26.01
NOx, lb/MMBtu	0.0328	0.0276	0.0302
SO2, MW = 64.058			
SO2, lb/hr			
SO2, ppm @ 02			
SO2, lb/MMBtu			
CO, MW = 28.010			
CO, lb/hr	21.13	94.00	57.57
CO, ppm @ 02	172.50	801.11	486.81
CO, lb/MMBtu	0.1219	0.5663	0.3441
HC, MW = 16.043			
HC, lb/hr	3.12		3.12
HC, ppm @ 02	44.51		44.51
HC, lb/MMBtu	0.0180		0.0180

* lb/hr = 8.223E-5 x Qs(std) x MW x ppm / (Tstd + 460)

* ppm @ 02 = ppm measured x [(20.9 - 02% correction) / (20.9 - %02 measured)]

* lb/MMBtu = F-Factor x MW x [1.3711E-6 / (Tstd + 460)] x [20.9 / (20.9 - 02%)] x ppm

* lb/Bbl = (lb/MMBtu) x (MMBtu/Bbl)

HCl CALCULATIONS

COMPANY NAME : BFI ARBOR HILLS
SOURCE : FLARE OUTLET
DATE : SEPT 24,1992
O2 CORRECTION: 3 %
TEMP.STD. : 68 dF

	Run 3	Run 4	Blank
Tm, dF	90.94	97.17	94.06
Y, meter fac.	1.0098	1.0098	1.0098
Vm, cu.ft. ..	63.114	63.132	63.123
Pb, in.Hg. ..	29.33	29.31	29.32
dH, in.H20 ..	2.50	2.50	2.50
O2, percent .	10.85	10.80	10.83
Qs(std),dscfm	49,403	47,420	48,412
F-Factor	8,386.65	8,386.65	8,386.65

Vm(std) = [T(std) + 460 / 29.92] x Vm x Y x
(Pb + (dH / 13.6)) / (Tm +460) :

	Run 3	Run 4	Blank	
Vm(std)	60.2497	59.5526	59.8986	dscf

LABORATORY ANALYSIS :

	Run 3	Run 4	Blank
mg HCl	17.01	15.93	0.10
* MW of HCl	36.46		

EMISSION CALCULATIONS :

ppm HCl = 1.60982 x (Temp.Std. + 460) x (mg HCl)/(MW x Vm,std)

ppm HCl @ corrected O2% = ppm HCl x [20.9 - O2 correction /
(20.9 - %O2 measured)]

lb/hr = 8.223e-5 x Qs(std) x MW x ppm / (Tstd + 460)

lb/MMBTU = F-Factor x MW x 0.00000137 / [Tstd + 460] x [20.9/
(20.9 - %O2)] x ppm HCl

	Run 3	Run 4	Blank
ppm HCl	6.58	6.24	0.04
ppm HCl @ 3.0 %O2	11.72	11.05	0.07
lb/hr HCl	1.85	1.68	0.01
lb/MMBTU HCl	0.0109	0.0102	0.0001

C12 CALCULATIONS

COMPANY NAME : BFI ARBOR HILLS
SOURCE : FLARE OUTLET
DATE : SEPT 24,1992
02 CORRECTION: 3 % TEMP.STD. : 68 dF

	Run 3	Run 4	Blank
Tm, dF	90.94	97.17	94.06
Y, meter fac.	1.0098	1.0098	1.0098
Vm, cu.ft. ..	63.114	63.132	63.123
Pb, in.Hg. ..	29.33	29.31	29.32
dH, in.H2O ..	2.50	2.50	2.50
02, percent .	10.85	10.80	10.83
Qs(std),dscfm	49,403	47,420	48,412
F-Factor	8,386.65	8,386.65	8,386.65

Vm(std) = [T(std) + 460 / 29.92] x Vm x Y x
(Pb + (dH / 13.6)) / (Tm +460) :

	Run 3	Run 4	Blank	
Vm(std)	60.2497	59.5526	59.8986	dscf

LABORATORY ANALYSIS :

	Run 3	Run 4	Blank
mg C12	0.05	0.05	0.05
* MW of HCl	70.91		

EMISSION CALCULATIONS :

ppm C12 = 1.60982 x (Temp.Std. + 460) x (mg C12)/(MW x Vm,std)

ppm C12 @ corrected 02% = ppm C12 x [20.9 - 02 correction /
(20.9 - %02 measured)]

lb/hr = 8.223e-5 x Qs(std) x MW x ppm / (Tstd + 460)

lb/MMBTU = F-Factor x MW x 0.00000137 / [Tstd + 460] x [20.9/
(20.9 - %02)] x ppm C12

	Run 3	Run 4	Blank
ppm C12	0.01	0.01	0.01
ppm C12 @ 3.0 %02	0.02	0.02	0.02
lb/hr C12	0.01	0.01	0.01
lb/MMBTU C12	0.00003	0.00003	0.00003

SO2 CALCULATIONS

COMPANY NAME : BFI ARBOR HILLS
SOURCE : FLARE OUTLET
DATE : SEPT 25,1992
O2 CORRECTION: 3 %
TEMP.STD. : 68 dF

	Run 5	Run 6	Blank
Tm, dF	98.60	101.75	100.18
Y, meter fac.	1.0098	1.0098	1.0098
Vm, cu.ft. ..	63.313	62.871	63.092
Pb, in.Hg. ..	29.21	29.14	29.18
dH, in.H2O ..	2.50	2.50	2.50
O2, percent .	11.45	12.09	11.77
Qs(std),dscfm	53,219	54,669	53,944
F-Factor	8,323.36	8,323.36	8,323.36

Vm(std) = [T(std) + 460 / 29.92] x Vm x Y x
(Pb + (dH / 13.6)) / (Tm +460) :

	Run 5	Run 6	Blank	
Vm(std)	59.3685	58.4838	58.9341	dscf

LABORATORY ANALYSIS :

	Run 5	Run 6	Blank
mg SO2	14.19	13.69	0.20
* MW of SO2	64.06		

EMISSION CALCULATIONS :

ppm SO2 = 1.60982 x (Temp.Std. + 460) x (mg SO2)/(MW x Vm,std)

ppm SO2 @ corrected O2% = ppm SO2 x [20.9 - O2 correction /
(20.9 - %O2 measured)]

lb/hr = 8.223e-5 x Qs(std) x MW x ppm / (Tstd + 460)

lb/MMBTU = F-Factor x MW x 0.00000137 / [Tstd + 460] x [20.9/
(20.9 - %O2)] x ppm SO2

	Run 5	Run 6	Blank
ppm SO2	3.17	3.11	0.05
ppm SO2 @ 3.0 %O2	6.01	6.31	0.09
lb/hr SO2	1.68	1.69	0.02
lb/MMBTU SO2	0.0097	0.0102	0.0001

SO3 CALCULATIONS

COMPANY NAME : BFI ARBOR HILLS
SOURCE : FLARE OUTLET
DATE : SEPT 25,1992
O2 CORRECTION: 3 % TEMP.STD. : 68 dF

	Run 5	Run 6	Blank
Tm, dF	98.60	101.75	100.18
Y, meter fac.	1.0098	1.0098	1.0098
Vm, cu.ft. ..	63.313	62.871	63.092
Pb, in.Hg. ..	29.21	29.14	29.18
dH, in.H20 ..	2.50	2.50	2.50
O2, percent .	11.45	12.09	11.77
Qs(std),dscfm	53,219	54,669	53,944
F-Factor	8,323.36	8,323.36	8,323.36

Vm(std) = [T(std) + 460 / 29.92] x Vm x Y x
(Pb + (dH / 13.6)) / (Tm +460) :

	Run 5	Run 6	Blank	
Vm(std)	59.3685	58.4838	58.9341	dscf

LABORATORY ANALYSIS :

	Run 5	Run 6	Blank
mg SO3	2.59	3.80	0.72
* MW of SO3	80.06		

EMISSION CALCULATIONS :

ppm SO3 = 1.60982 x (Temp.Std. + 460) x (mg SO3)/(MW x Vm,std)

ppm SO3 @ corrected O2% = ppm SO3 x [20.9 - O2 correction /
(20.9 - %O2 measured)]

lb/hr = 8.223e-5 x Qs(std) x MW x ppm / (Tstd + 460)

lb/MMBTU = F-Factor x MW x 0.00000137 / [Tstd + 460] x [20.9/
(20.9 - %O2)] x ppm SO3

	Run 5	Run 6	Blank
ppm SO3	0.46	0.69	0.13
ppm SO3 @ 3.0 %O2	0.88	1.40	0.25
lb/hr SO3	0.31	0.47	0.09
lb/MMBTU SO3	0.0018	0.0028	0.0005

FUEL/FLOWRATE CALCULATIONS

PLANT	BFI ARBOR HILLS		
SOURCE	FLARE OUTLET	Temp. Std.:	68
DATE	SEPT 24,25,1992	Press. Std:	29.92

FUEL FLOWRATE DATA :

	RUN3	RUN 4	RUN 5
Barometric Press., in.Hg..			
Brake Horsepower			
Fuel Flow, scfh	298200.00	293580.00	298920.00
Oxygen, %	10.85	10.80	11.45
Fuel Flow, acfh			
Fuel Press, psig			
" " psia			
Fuel Temp, dF			

FUEL ANALYSIS DATA :

	RUN 3	RUN 4	RUN 5
Btu/scf, Gross Cal. Value:	538.00	538.00	575.00
Btu/lb, Gross Cal. Value :	8149.00	8149.00	8798.00
Hydrogen, Wt.% :	7.71	7.71	8.27
Carbon, Wt.% :	39.62	39.62	42.35
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	6.48	6.48	1.75
Oxygen, Wt.% :	46.19	46.19	47.64

CALCULATIONS :

	RUN 3	RUN 4	RUN 5	AVERAGE
F-Factor,dscf/MMBtu :	8,386.65	8,386.65	8,323.36	8,365.55
Fuel Rate, scfh :	298200.00	293580.00	298920.00	296900.00
Heat Rate, MMBtu/hr :	160.432	157.946	171.879	163.419
Flue gas flowrate, dscfm :	46634.51	45684.72	52733.27	48350.83

* F-Factor = 10E6 x [3.64(%H) + 1.53(%C) + 0.57(%S) + 0.14(%N) - 0.46(%O2)] / (Btu/lb) x [(Tstd + 460) / 528]

* scfh = fuel acfh x [Pb + (P,psig x 2.036 in.Hg/psi) / (T fuel + 460)] x [(Tstd + 460) / Pstd]
  where: psig = psia - 14.7

* MMBtu/hr = scfh x (Btu/scf) / 10E6

* dscfm = MMBtu/hr x dscf/MMBtu x (1hr/60min) x [20.9 / (20.9- %O2)]

DRY GAS METER / ORIFICE METER CALIBRATION DATA

Date ....AUGUST 25 1992
Bar. Press, in.Hg 29.89
Meter Box No. ...CRATE LOW

Dry Gas Meter No. ... 6825355
Standard Test Meter # 69279
Operator .... AB

STANDARD TEST METER			DRY TEST METER				
Press. dHs (in. H2O)	Temp. Ts (dF)	Volume Vs (ft3)	Sample Rate (cfm)	Temp. Tdi (dF)	Temp. Tdo (dF)	Volume Vd (ft3)	Time t (min)
	0.0	0.000		0	0	0.000	
0.0	0.0	0.000	0.010	0	0	0.000	0.0
Avg/Net :	0.0	0.000			0	0.000	
	82.0	485.012		88	87	10.017	
0.0	81.0	480.143	0.035	85	85	5.016	217.0
Avg/Net :	81.5	4.869			86	5.001	
	79.0	476.262		92	86	1001.015	
-0.2	78.0	471.191	0.100	87	85	995.781	53.0
Avg/Net :	78.5	5.071			88	5.234	
	0.0	0.000		0	0	0.000	
0.0	0.0	0.000		0	0	0.000	0.0
Avg/Net :	0.0	0.000			0	0.000	
	0.0	0.000		0	0	0.000	
0.0	0.0	0.000		0	0	0.000	0.0
Avg/Net :	0.0	0.000			0	0.000	

y = Vs x (Pbar + (dHs / 13.6)) x (Avg. Td + 460) / [Vd x
(Pbar + (dH / 13.6)) x (Ts + 460)]

Ko = [(Vs/t) x [(Tdo + 460) / (Ts + 460)] x [(Pbar + (dHs/13.6) /
(Pbar + (dH/13.6)] / [((Tdo + 460) x dH) / (Pbar + (dH/13.6))
x (Mm)]^0.5

cfm :	0.010	0.035	0.100			Avg.	Std.Dev.
y :		0.9821	0.9843			0.9832	
Ko :							

y : % Relative Std. Dev.

Ko : % Relative Std. Dev.

DRY GAS METER / ORIFICE METER CALIBRATION DATA

Date ....JULY 20 1992
Bar. Press. in.Hg 29.88
Meter Box No. ... 21313

Dry Gas Meter No. ... 103707
Standard Test Meter # 69279
Operator .... AB

STANDARD TEST METER			DRY TEST METER				
Press. dHs (in. H2O)	Temp. Ts (dF)	Volume Vs (ft3)	Press. dH (in. H2O)	Temp. Tdi (dF)	Temp. Tdo (dF)	Volume Vd (ft3)	Time t (min)
	68.0	391.523		83	82	1020.297	
-1.4	67.0	368.346	0.5	82	81	996.854	54.0
Avg/Net :	67.5	23.177			82	23.443	
	68.0	367.739		81	80	996.234	
-2.3	67.0	344.170	1.0	80	79	972.482	40.0
Avg/Net :	67.5	23.569			80	23.752	
	67.0	265.627		80	79	894.385	
-2.5	67.0	237.624	1.5	78	79	866.307	38.0
Avg/Net :	67.0	28.003			79	28.078	
	67.0	299.374		79	80	928.127	
-3.8	68.0	266.025	2.0	78	79	894.793	42.0
Avg/Net :	67.5	33.349			79	33.334	
	67.0	343.531		80	79	971.849	
-5.4	66.0	301.895	3.0	78	78	930.627	42.0
Avg/Net :	66.5	41.636			79	41.222	

y = Vs x (Pbar + (dHs / 13.6)) x (Avg. Td + 460) / [Vd x (Pbar + (dH / 13.6)) x (Ts + 460)]

Ko = [(Vs/t) x [(Tdo + 460) / (Ts + 460)] x [(Pbar + (dHs/13.6) / (Pbar + (dH/13.6)] / [((Tdo + 460) x dH) / (Pbar + (dH/13.6)) x (Mm)]^0.5

dH :	0.5	1.0	1.5	2.0	3.0	Avg.	Std.Dev.
y :	1.0111	1.0076	1.0100	1.0077	1.0123	1.0098	0.0019
Ko :	0.7845	0.7580	0.7735	0.7187	0.7295	0.7528	0.0252

y : 0.18 % Relative Std. Dev.

Ko : 3.34 % Relative Std. Dev.

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

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

STEI01

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

RECEIVED AUG 2 8 1992

DATE : 08/20/92

CUSTOMER ORDER NUMBER: SP-2750-90 R.69

PAGE 1

COMPONENT	CONCENTRATION(v/v)	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CC28672					
			Monitor Labs Model 8440		08/11/92	08/20/92
Nitric Oxide	786 ± 8 ppm	GMIS	S/N 136	02/20/94	786 ppm	787 ppm
NOx	786 ppm	Cylinder #	Continuous		784 ppm	786 ppm
Nitrogen,O2-Free	Balance	CC78162	Chemiluminescence		784 ppm	785 ppm
Cylinder Pressure:	2000 psig	@ 1024 ppm	Last Cal Date: 06/02/92	Mean:	785 ppm	786 ppm
CYLINDER NO.:	CC389					
			Monitor Labs Model 8440		08/11/92	08/18/92
Nitric Oxide	39.6 ± 0.4 ppm	GMIS	S/N 136	02/18/94	39.5 ppm	39.7 ppm
NOx	39.6 ppm	Cylinder #	Continuous		39.7 ppm	39.6 ppm
Nitrogen,O2-Free	Balance	CC65317	Chemiluminescence		39.4 ppm	39.5 ppm
Cylinder Pressure:	2000 psig	@ 48.2 ppm	Last Cal Date: 06/02/92	Mean:	39.5 ppm	39.6 ppm

ppm = umole/mole % = mole-%

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

Analyst: B.E. Gross

Approved: J.T. Marrin

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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
2001 THIRD ST. • UNIT H • RIVERSIDE, CA 92507
TELEPHONE (714) 784-1240

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

STEI01
TO:
SUE POWERS
STEINER ENVIRONMENTAL, INC.
4930 BOYLAN ST.
BAKERSFIELD, CA 93308

DATE : 04/18/91

CUSTOMER ORDER NUMBER: SP2750-90REL.17

PAGE 1

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COMPONENT	CONCENTRATION(v/v)	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CC51313					
			Interscan Model RM2450P		04/08/91	04/16/91
Sulfur Dioxide	965 ± 10 ppm	GMIS	S/N 72138	10/16/92	976 ppm	963 ppm
Nitrogen	Balance	Cylinder #	Electrochemical		961 ppm	968 ppm
Cylinder Pressure: 2000 psig		CC12074	Gas Chromatography		971 ppm	949 ppm
		@ 1009 ppm	Last Cal Date: 05/10/91	Mean:	969 ppm	960 ppm
CYLINDER NO.:	CC28837					
			Interscan Model RM2450P		04/08/91	04/17/91
Sulfur Dioxide	3030 ± 30 ppm	SRM 1664	S/N 72138	10/17/92	3060 ppm	2986 ppm
Nitrogen	Balance	Cylinder #	Electrochemical		3010 ppm	3030 ppm
Cylinder Pressure: 2000 psig		FF1483	Gas Chromatography		3050 ppm	3010 ppm
		@ 2515 ppm	Last Cal Date: 05/10/91	Mean:	3040 ppm	3010 ppm
CYLINDER NO.:	CC72048					
			Monitor Labs Model 8440		04/09/91	04/17/91
Nitric Oxide	1039 ± 10 ppm	GMIS	S/N 136	10/17/92	1030 ppm	1039 ppm
NO_x	1039 ppm	Cylinder #	Continuous		1040 ppm	1036 ppm
Nitrogen, O2-Free	Balance	CC78162	Chemiluminescence		1049 ppm	1039 ppm
Cylinder Pressure: 2000 psig		@ 1020 ppm	Last Cal Date: 03/11/91	Mean:	1039 ppm	1038 ppm

ppm = umole/mole   % = mole-%

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

Analyst: Steve Kozy
S.B. Kozy

Approved:
J.T. Marrin

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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
2001 THIRD ST. • UNIT H • RIVERSIDE, CA 92507
TELEPHONE (714) 784-1240

REPORT OF ANALYSIS
NIST TRACEABLE GAS MIXTURES

PAPE01

TO:

SUE POWERS
PAPE & STEINER
5801 NORRIS ROAD
BAKERSFIELD, CA 93308

DATE: 10/09/90

CUSTOMER ORDER NUMBER: BL-SP275090REL7

PAGE 1

CYLINDER NUMBER	COMPONENT	CONCENTRATION (v/v)	NIST TRACEABLE REFERENCE STANDARD
CC86353	Carbon Dioxide	41.2 ± 0.4 %	VOLUMETRIC
	Nitrogen	Balance	
CC56538	Carbon Monoxide	381 ± 4 ppm	SRM 1680b
	Carbon Dioxide	15.63 ± 0.16 %	SRM 1675b
	Oxygen	3.81 ± 0.04 %	SRM 2658a
	Nitrogen	Balance	
CC83071	Carbon Monoxide	384 ± 4 ppm	SRM 1680b
	Carbon Dioxide	15.77 ± 0.16 %	SRM 1675b
	Oxygen	3.81 ± 0.04 %	SRM 2658a
	Nitrogen	Balance	

ppm = umole/mole % = mole-%

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

Analyst: Mark Monson
M.J. Monson

Approved:
J.T.Marrin

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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

SCOTT-MARRIN, INC.
2001 THIRD ST. • UNIT H • RIVERSIDE, CA 92507
TELEPHONE (714) 784-1240

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

STEI01

TO:

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

DATE : 03/26/91

CUSTOMER ORDER NUMBER: SP-2750-90REL17

PAGE 1

COMPONENT	CONCENTRATION(v/v)	REFERENCE STANDARD	ANALYZER MAKE,MODEL,S/N,DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CC81181					
			Carle Insts Model 8000		03/05/91	03/21/91
Carbon Monoxide	10430 ± 104 ppm	GMIS	S/N 8249	09/21/92	10410 ppm	10420 ppm
		Cylinder #	Methanation/FID		10360 ppm	10540 ppm
Nitrogen	Balance	FF17326	Gas Chromatography		10340 ppm	10490 ppm
Cylinder Pressure: 2000 psig		@ 9860 ppm	Last Cal Date: 01/02/91		Mean: 10370 ppm	10490 ppm

ppm ≐ umole/mole   % = mole-%

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

Analyst: Mark Monson
M.J. Monson

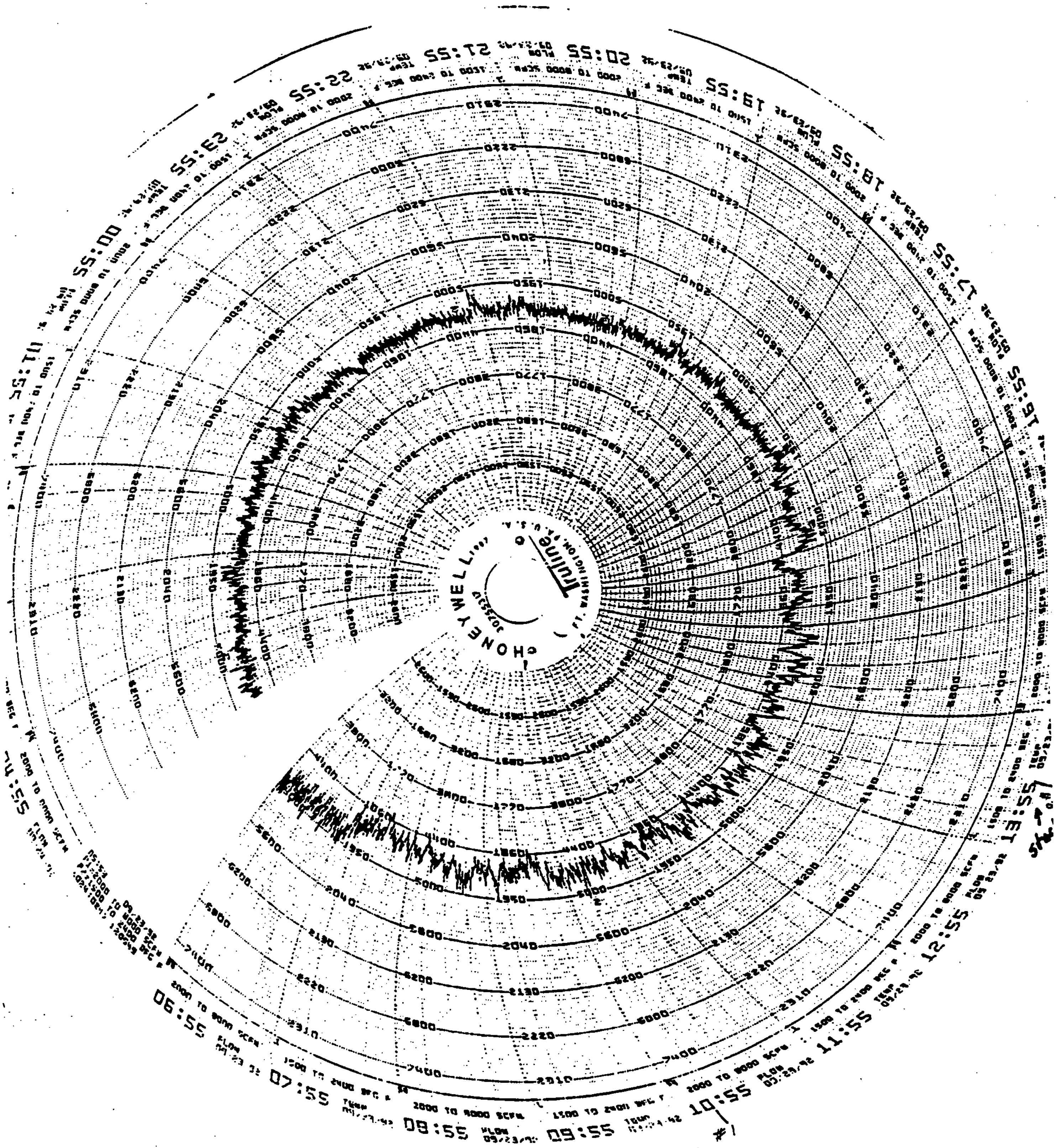
Approved:
J.T. Marrin

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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

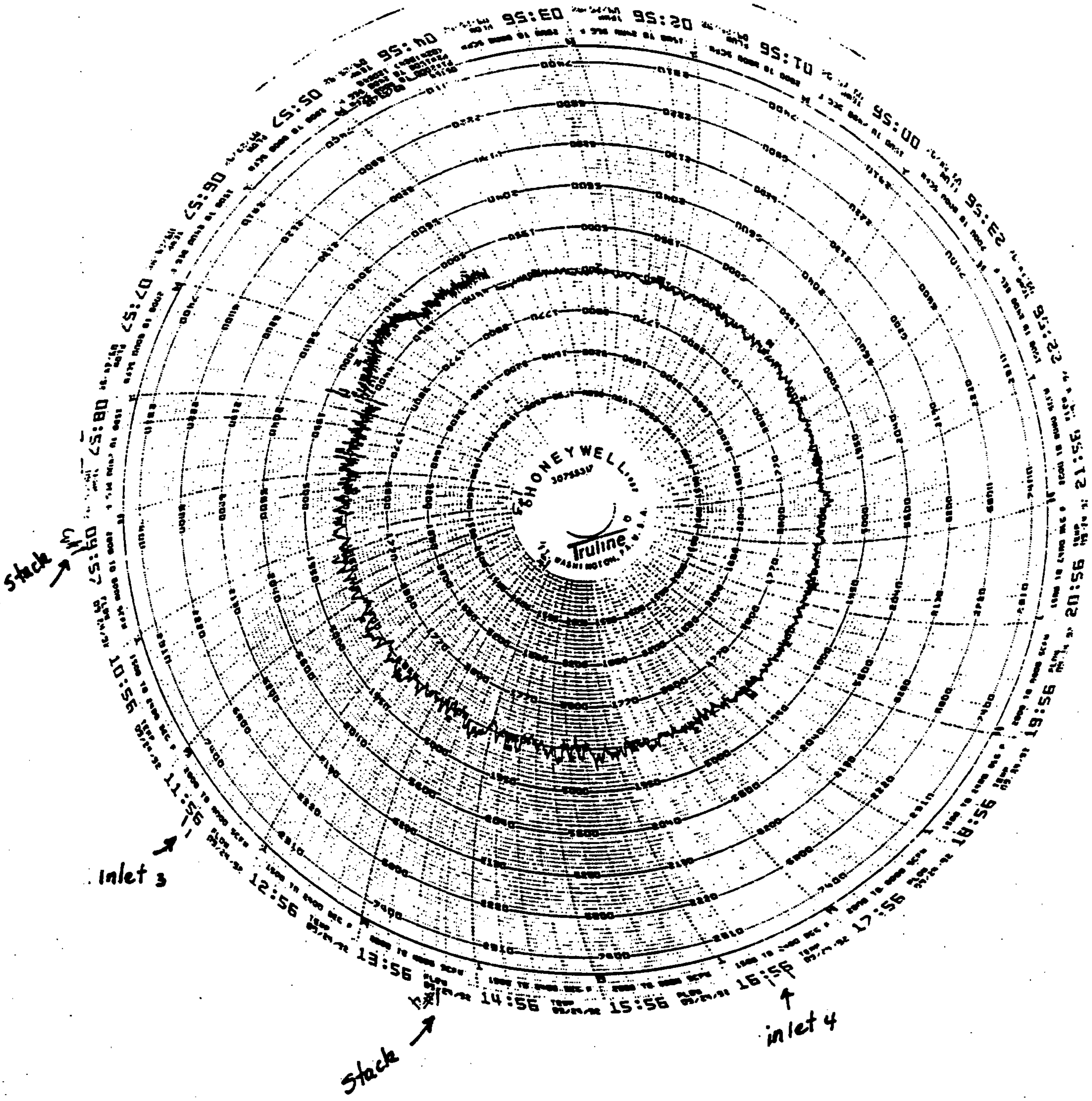
APPENDIX C

FLARE OPERATING DATA



HONEYWELL
FORT WASHINGTON, PA. U.S.A.
06:55
07:55
08:55
09:55
10:55
11:55
12:55
13:55
FLOW
TEMP
09/23/92
2000 TO 8000 SCFM
1500 TO 2400 DEG F
Sta →

↑ #1 stack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Truline
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stack
inlet 3
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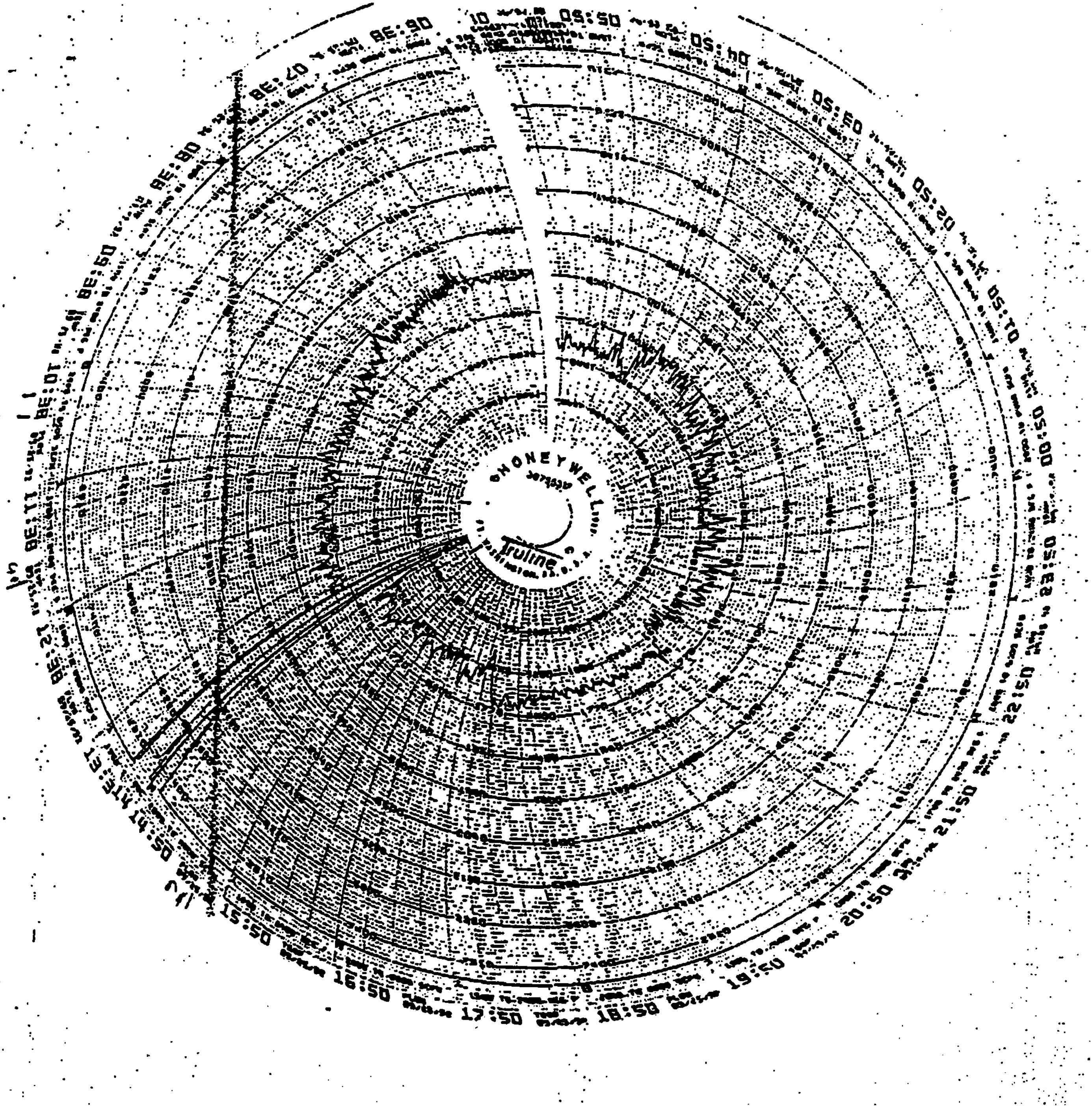
inlet 4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APPENDIX D

AtmAA, INC. ANALYTICAL DATA

AtmAA Inc.
21354 Nordhoff St., Suite 113, Chatsworth, CA 91311 (818) 718-6070 • FAX (818) 718-9779
environmental consultants
laboratory services

RECEIVED
DEC 07 1992
By

December 3, 1992

LTR/489/92

Jim Steiner
Steiner Environmental
4930 Boylan Street
Bakersfield, CA 93308

re: Arbor Hills

Dear Jim:

Please find enclosed the laboratory analysis report, quality assurance summary, and the original chain of custody form for six Summa canister samples and six Tedlar bag samples received on September 28, 1992.

The samples were analyzed for selected components, permanent gases, total gaseous non-methane organics, hydrogen sulfide, and reduced sulfur compounds.

One of the Tedlar bags ID (#33761, Lab #92722-4) was received flat, without sufficient sample for testing.

Sincerely,

AtmAA, Inc.

Michael L. Porter
Laboratory Director

Encl.
MLP/krp

AtmAA
21354 Nordhoff St., Suite 113, Chatsworth, CA 91311 (818) 718-6070 • FAX (818) 718-9779
environmental consultants
laboratory services

LABORATORY ANALYSIS REPORT

Selected Volatile Organic Components Analysis in Summa Canister Samples

Report Date: October 7, 1992
Client: BFI/Steiner
Site: Arbor Hills
Date Received: September 28, 1992
Date Analyzed: September 28, & 29, 1992

	OUTLET	INLET	OUTLET	INLET	Avg including cans	
AtmAA Lab No.:	92722-1	92722-3	92722-5	92722-7		
Sample I.D.:	33758	33760	33766	33768		
	Can 3	Can 3	Can 4	Can 4	OUTLET	INLET
Components:	(Concentration in %, v/v)					
Nitrogen	78.8	2.52	78.0	2.30		
Oxygen	12.1	0.49	11.8	0.46		
Methane		57.4		58.1		
Carbon Dioxide	8.52	40.3	8.32	41.0		
	(Concentration in ppm, v/v)				ppm	ppm
Methane	17.1		3.86			
TGNMO	28.8	8610	16.4	11000	22.9	9230
	(Concentration in ppb, v/v)				ppb	ppb
Benzene	5.46	954	1.94	994	3.41	930
Chlorobenzene	<0.3	706	<0.3	737	<0.15	715
Ethylbenzene	0.43	18700	0.46	19600	0.35	19100
Toluene	0.81	69500	1.44	69700	1.56	68933
m + p xylenes	1.09	40800	0.86	45500		
o-xylene	0.76	15000	0.44	18300	1.35	57000
Vinyl Chloride	<0.1	6580	<0.1	6580	0.10	6590
1,1-dichloroethylene (Vinylidene chloride)	<0.11	239	<0.11	240	< 0.11	240
Chloroform	<0.4	<5	<0.4	<5	nd	nd
1,1,1-trichloroethane	<0.8	152	<0.8	141	< 0.4	147
1,2-dichloroethane	<0.2	271	<0.2	340	< 0.1	383
Carbon Tetrachloride	<0.3	<5	<0.3	<5	nd	nd
Trichloroethylene	<0.8	4370	<0.8	4140	< 0.4	4170
Perchloroethylene	0.88	7740	0.62	7780	0.87	7500
Methylene chloride	<0.2	3550	<0.2	2840	< 0.10	3103
1,1-dichloroethane	<0.47	1590	<0.47	1260	< 0.16	1343

TGNMO is total gaseous non-methane organics measured and reported as ppm methane.

The reported oxygen concentration includes any argon present in the sample, calibration is based on a standard atmosphere containing 20.95% oxygen and 0.93% argon.

LABORATORY ANALYSIS REPORT

Selected Volatile Organic Components Analysis
in Summa Canister Samples

Report Date: October 7, 1992
Client: BFI/Steiner
Site: Arbor Hills
Date Received: September 28, 1992
Date Analyzed: September 28, & 29, 1992

	INLET	OUTLET
AtmAA Lab No.:	92722-9	92722-11
Sample I.D.:	33789	33786
	Can 5	Can 5
Components:	(Concentration in %, v/v)	
Nitrogen	2.32	78.3
Oxygen	0.44	12.7
Methane	57.7	
Carbon Dioxide	40.4	8.01
	(Concentration in ppm, v/v)	
Methane		71.6
TGNMO	8090	23.5
	(Concentration in ppb, v/v)	
Benzene	841	2.82
Chlorobenzene	702	<0.3
Ethylbenzene	19000	<0.3
Toluene	67600	2.42
m+p xylenes	37800	0.74
o-xylene	13600	<0.3
Vinyl Chloride	6610	0.19
1,1-dichloroethylene	241	0.23
Chloroform	<5	<0.4
1,1,1-trichloroethane	148	<0.8
1,2-dichloroethane	538	<0.2
Carbon Tetrachloride	<5	<0.3
Trichloroethylene	4000	<0.8
Perchloroethylene	6980	1.11
Methylene chloride	2920	<0.2
1,1-dichloroethane	1180	<0.47

TGNMO is total gaseous non-methane organics measured and reported as ppm methane.

The reported oxygen concentration includes any argon present in the sample, calibration is based on a standard atmosphere containing 20.95% oxygen and 0.93% argon.

Michael L. Porter
Laboratory Director

QUALITY ASSURANCE SUMMARY
(Repeat Analysis)

Site: Arbor Hills

Component:	Sample ID	Repeat Analysis		Mean Conc.	% Diff. From Mean
		Run #1	Run #2		
		(Concentration in %, v/v)			
Nitrogen	33758	79.0	78.7	78.8	0.19
	33789	2.53	2.11	2.32	9.0
Oxygen	33758	12.1	12.1	12.1	0.0
	33789	0.47	0.42	0.44	5.6
Methane	33760	57.4	57.4	57.4	0.0
Carbon Dioxide	33758	8.60	8.44	8.52	0.94
	33760	40.4	40.2	40.3	0.25
		(Concentration in ppm, v/v)			
TGNMO	33768	11100	11000	11000	0.45
		(Concentration in ppb, v/v)			
Benzene	33760	952	955	954	0.16
	33786	3.18	2.45	2.82	13
Chlorobenzene	33760	628	784	706	11
	33786	<0.3	<0.3	—	—
Ethylbenzene	33760	17900	19500	18700	4.3
	33786	<0.3	<0.3	—	—
Toluene	33760	67700	71300	69500	2.6
	33786	2.47	2.36	2.42	2.3
m + p-xylenes	33760	40800	40800	40800	0,0
	33786	0.81	0.67	0.74	9.4
o-xylene	33760	13800	16300	15000	8.3
	33786	<0.3	<0.3	—	—
Vinyl chloride	33758	<0.1	<0.1	—	—
	33760	6570	6600	6580	0.23
	33786	0.21	0.17	0.19	10

QUALITY ASSURANCE SUMMARY

(Repeat Analysis)

(continued)

Component:	Sample ID	Repeat Analysis		Mean Conc.	% Diff. From Mean
		Run #1	Run #2		
		(Concentration in ppb, v/v)			
1,1-dichloroethylene	33758	< 0.11	< 0.11	—	—
	33760	239	239	239	0.0
	33786	0.23	0.23	0.23	0.0
Chloroform	33789	< 5	< 5	—	—
1,1,1-trichloroethane	33789	146	150	148	1.4
1,2-dichloroethane	33758	< 0.2	< 0.2	—	—
	33789	568	509	538	5.5
Carbon Tetrachloride	33789	< 5	< 5	—	—
Trichloroethylene	33789	3990	4020	4000	0.37
Perchloroethylene	33758	0.82	0.93	0.88	6.3
	33768	7260	8290	7780	6.6
Methylene chloride	33789	2930	2920	2920	0.17
	33786	< 0.2	< 0.2	—	—
1,1-dichloroethane	33766	< 0.47	< 0.47	—	—
	33789	1190	1180	1180	0.42

A set of 6 Summa canister samples laboratory numbers, 92722-(1,3,5,7,9,11,) was analyzed for selected volatile organic components, permanent gases, and total gaseous non-methane organics (TGNMO). Agreement between repeat analyses is a measure of precision and is shown above in the column "% Difference from Mean." Repeat analyses are an important part of AtmAA's quality assurance program. The average % Difference from Mean for 28 repeat measurements from the sample set of 6 Summa canister samples is 3.5%.

AtmAA Inc.
21354 Nordhoff St., Suite 113, Chatsworth, CA 91311 (818) 718-6070 • FAX (818) 718-9779
environmental consultants
laboratory services

LABORATORY ANALYSIS REPORT

Selected Volatile Sulfur Containing Components Analysis in Tedlar Bag Samples

Report Date: October 7, 1992
Client: BFI/Steiner
Site: Arbor Hills
Date Received: September 28, 1992
Date Analyzed: September 28, 1992

ANALYSIS DESCRIPTION

Hydrogen sulfide was analyzed by gas chromatography with a Hall electroylic conductivity detector operated in the oxidative sulfur mode. Methyl mercaptan, ethyl mercaptan, dimethyl sulfide, carbon disulfide, dimethyl disulfide, and carbonyl sulfide were analyzed by GC/Mass Spec.

			INLET	
AtmAA Lab No.:	92722-2	92722-6	92772-8	92722-8
Sample I.D.:	33759	33767	33769	
	Bag 3	Bag 4	Bag 4	
Components:	(Concentration in ppm, v/v)			
				(repeat)
Hydrogen sulfide	<0.5	<0.5	20.7	20.4
Carbonyl sulfide	<0.02	<0.02	0.054	0.047
Methyl mercaptan	<0.04	<0.04	0.29	0.62
Ethyl mercaptan	<0.03	<0.03	0.051	0.11
Dimethyl sulfide	<0.02	<0.02	3.07	3.20
Carbon disulfide	<0.006	<0.006	0.092	0.093
Dimethyl disulfide	<0.005	<0.005	0.11	0.14

LABORATORY ANALYSIS REPORT

Selected Volatile Sulfur Containing Components Analysis
in Tedlar Bag Samples

Report Date: October 7, 1992
Client: BFI/Steiner
Site: Arbor Hills
Date Received: September 28, 1992
Date Analyzed: September 28, 1992

ANALYSIS DESCRIPTION

Hydrogen sulfide was analyzed by gas chromatography with a Hall electroylic conductivity detector operated in the oxidative sulfur mode. Methyl mercaptan, ethyl mercaptan, dimethyl sulfide, carbon disulfide, dimethyl disulfide, and carbonyl sulfide were analyzed by GC/Mass Spec.

	INLET			Avg for bag 5 & 4	
AtmAA Lab No.:	92722-10	92722-12	92722-12		
Sample I.D.:	33788	33786			
	Bag 5	Bag 5		INLET	OUTLET
Components:	(Concentration in ppm, v/v)				
			(repeat)		
Hydrogen sulfide	20.4	< 0.5	< 0.5	20.6	< 0.25
Carbonyl sulfide	0.058	< 0.02	< 0.02	0.056	< 0.01
Methyl mercaptan	0.73	< 0.04	< 0.04	0.51	< 0.02
Ethyl mercaptan	0.13	< 0.03	< 0.03	0.09	< 0.03
Dimethyl sulfide	3.23	< 0.02	< 0.02	3.15	< 0.02
Carbon disulfide	0.093	0.014	0.0077	0.093	0.0085
Dimethyl disulfide	0.11	< 0.005	< 0.005	0.11	< 0.0025

DL.

$$\text{Avg outlet} = \frac{2(0006/2) + .014 + .0077}{4} = 0.0069$$

Michael L. Porter
Laboratory Director

Steiner Environmental, Inc.

Date: 9/25/92

Test Location: Flare Out/In

SAMPLE HANDLING/LOG-IN

	NO	SAMPLE TYPE	VOLUME	COMMENTS
722-1	1	33758 Meth Can Sample 3 Test		Outlet
-2	2	33759 Meth Bag Sample 3 Test		Outlet
-3	3	33760 Meth Can Sample 3 Test		Inlet
-4	4	33761 Meth Bag Sample 3 Test		Inlet
-5	5	33766 Meth Can Sample 4 Test		Outlet
-6	6	33767 Meth Bag Sample 4 Test		Outlet
-7	7	33768 Meth Can Sample 4 Test		Inlet
8	8	33769 Meth Bag Sample 4 Test		Inlet
9	9	33789 Meth Can Sample 5 Test		Inlet
0	10	33788 Meth Bag Sample 5 Test		Inlet
1	11	33787 Meth Can Sample 5 Test		Outlet
	12	33786 Meth Bag Sample 5 Test		Inlet

CHAIN-OF-CUSTODY

Signature	Date/Time	Signature	Date/Time
Jim Steiner	9/26/92 11:00am	Karen R. Potter	9/28/92

AtmAA Inc.
21354 Nordhoff St., Suite 113, Chatsworth, CA 91311 (818) 718-6070 • FAX (818) 718-9779
environmental consultants
laboratory services

RECEIVED
NOV - 2 1992
By________

October 28, 1992

LTR/428/92

John Steiner
Steiner Environmental
4950 Boylan Street
Bakersfield, CA 93308

re: Arbor Hills

Dear John:

Please find enclosed the reported values for permanent gases, methane, and total gaseous non-methane organics in Summa canister samples received from Arbor Hills Landfill on September 28, 1992.

Sincerely,

AtmAA, Inc.

Michael L. Porter
Laboratory Director

Encl.
MLP/krp

AtmAA Inc.
21354 Nordhoff St., Suite 113, Chatsworth, CA 91311 (818) 718-6070 • FAX (818) 718-9779
environmental consultants
laboratory services

LABORATORY ANALYSIS REPORT

Permanent Gases Analysis in Summa Canister Samples

Report Date: October 7, 1992
Client: BFI/Steiner
Site: Arbor Hills
Date Received: September 28, 1992
Date Analyzed: September 28, & 29, 1992

ANALYSIS DESCRIPTION

Nitrogen, oxygen, methane, and carbon dioxide were analyzed by thermal conductivity detection/gas chromatography (TCD/GC). Methane and TGNMO reported in ppm was analyzed by flame ionization detection\total combustion analysis portion (FID/TCA).

AtmAA Lab No.:	92722-1	92722-3	92722-5	92722-7
Sample I.D.:	33758	33760	33766	33768
	Can 3	Can 3	Can 4	Can 4
Components:	(Concentration in %, v/v)			
Nitrogen	78.8	2.52	78.0	2.30
Oxygen	12.1	0.49	11.8	0.46
Methane		57.4		58.1
Carbon Dioxide	8.52	40.3	8.32	41.0
	(Concentration in ppm, v/v)			
Methane	17.1		3.86	
TGNMO	28.8	8610	16.4	11000

TGNMO is total gaseous non-methane organics measured and reported as ppm methane.

The reported oxygen concentration includes any argon present in the sample, calibration is based on a standard atmosphere containing 20.95% oxygen and 0.93% argon.

LABORATORY ANALYSIS REPORT

Permanent Gases Analysis in Summa Canister Samples

Report Date: October 7, 1992
Client: BFI/Steiner
Site: Arbor Hills
Date Received: September 28, 1992
Date Analyzed: September 28, & 29, 1992

ANALYSIS DESCRIPTION

Nitrogen, oxygen, methane, and carbon dioxide were analyzed by thermal conductivity detection/gas chromatography (TCD/GC). Methane and TGNMO reported in ppm was analyzed by flame ionization detection\total combustion analysis portion (FID/TCA).

AtmAA Lab No.:	92722-9	92722-11
Sample I.D.:	33789	33786
	Can 5	Can 5
Components:	(Concentration in %, v/v)	
Nitrogen	2.32	78.3
Oxygen	0.44	12.7
Methane	57.7	
Carbon Dioxide	40.4	8.01
	(Concentration in ppm, v/v)	
Methane		71.6
TGNMO	8090	23.5

TGNMO is total gaseous non-methane organics measured and reported as ppm methane.

The reported oxygen concentration includes any argon present in the sample, calibration is based on a standard atmosphere containing 20.95% oxygen and 0.93% argon.

Michael L. Porter
Laboratory Director