Background Report Reference

AP-42 Section Number: 1.4

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Title: Emissions Source Test Report: Permit Application No. R-249462, Huntington Beach Generating Station

Acurex Environmental

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EMISSIONS SOURCE TEST REPORT FOR

UREA INJECTION COMPLIANCE TESTING

HUNTINGTON BEACH UNIT 2

PERMIT APPLICATION NO. R-249463

Source Location:

Southern California Edison - Huntington Beach Generating Station
21730 Newland Street
Huntington Beach, CA 92646

Prepared for:

Southern California Edison Company
Environmental Affairs
2244 Walnut Grove Avenue
Rosemead, California 91770

Submitted by:

Geraghty & Miller
One Technology Drive, Suite F213
Irvine, California 92718

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Irvine, California 92718

Project Engineer — Doug Urry

Quality Assurance — Martin L. Connair

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APPENDIX PAGE

SECTION 1

INTRODUCTION

Geraghty & Miller was contracted by Southern California Edison Company (SCE) to conduct emissions source testing on Unit 2 located at Edison's Huntington Beach Generating Station. This test program was conducted to quantify the effect of urea injection on various stack emissions as required in the South Coast Air Quality Management District (SCAQMD) Permit to Construct (PTC) No. R-249463 (Condition 14B). Emissions measured were nitrogen oxides (NO_X), carbon monoxide (CO), oxygen (O_2), reactive organic gases (ROG), and ammonia (NH_3).

This report summarizes results for the source tests performed as required by the PTC. Source tests were performed as specified in the conditionally approved Acurex Environmental source test protocol dated July 21, 1993; the conditional approval memorandum issued August 23, 1993 by the SCAQMD; and subsequent phone conversations between Mr. Michael Escarcega of Edison, and Mr. Darren Stroud and Mr. Glenn Kasai of the SCAQMD on November 16 and December 2, 1993, respectively. SCAQMD approved changes to the test scope included waiving the PTC requirement for particulate testing and reducing the number of test loads from six (10, 50, 100, 150, 200, and 215 MW) to three (low, mid-, and high). A copy of the source test protocol, the District memorandum, and records of the referenced phone conversations supporting this test scope are provided in Appendix A.

The results of this source test are summarized in Section 2. Section 3 provides a description of the SCE boiler and Sections 4 through 7 detail sampling and analysis procedures and results for each test parameter. Appendices B through G provide supporting documentation for data presented in Sections 4 through 7 and are specifically referenced where appropriate.

Key information pertaining to the emissions test series is summarized in Table 1-1, and the test matrix used at each of the three test loads (low, mid-, and high) is listed in Table 1-2.

Table 1-1. Huntington Beach Unit 2 Source Test Information

Source Tested	Southern California Edison's Huntington Beach Generating Station, Utility Boiler No. 2
Test Location	21730 Newland Street Huntington Beach, CA 92646
Test Requested By	South Coast Air Quality Management District
Reason For Test	Addition of urea injection system (PTC Application No. R-249463)
Test Dates	March 9 and 11, 1995
Tests Performed By	Geraghty & Miller, Air Program Project Engineer: Doug Urry (714) 453-1264
Key Edison Contacts	Stafford Pease (818) 302-4034 Mike Escarcega (818) 302-4032

Table 1-2. Test Matrix for Huntington Beach Unit 2

Boiler Operating Conditions (low, mid-, high)	Test Parameter	Sampling Method	Analytical Method	Sample Duration (min)	No. of Runs
Baseline	NO_X,CO,O_2	SCAQMD 100.1	[a]Various	60	1
	Moisture/Flow Rate	SCAQMD 1.1-4.1	Gravimetric/ NA	60	1
	[b]ROG	SCAQMD 25.1	[c]TCA/FID	60	1
Urea Injection	NO_X,CO,O_2	SCAQMD 100.1	[a]Various	60	1
	Flow Rate	SCAQMD 1.1-4.1	NA	60	1
	ROG	SCAQMD 25.1	TCA/FID	60	1
	Ammonia/ Moisture	[d]SCAQMD Draft Method 207.1	Colorimetric/ Gravimetric	60	1

[a]Various: NO_X - chemiluminescence
CO - non-dispersive infrared (NDIR)
O_2 - electrochemical
[b]Reactive organic gases (ROG)
[c]TCA/FID - Total combustion analysis/flame ionization detector
[d]SCAQMD Draft Method for Ammonia and Ammonium Compounds From Stationary Sources
NA - Not Applicable

SECTION 2

RESULTS SUMMARY

Boiler operating parameters (boiler output, fuel flow rate and air to fuel ratio), stack gas characteristics (flow rate, temperature and moisture content), and urea injection system data (urea injection rate and concentration) are summarized for each test condition in Table 2-1. Records of boiler operating parameters are provided in Appendix B.

NO_X, CO, O_2, ROG, and NH_3 emission measurement results are summarized in Table 2-2. No emission measurement results exceeded the limits stated in the PTC. For each test condition, Table 2-2 lists stack gas NO_X, CO, O_2, ROG, and NH_3 concentrations and emission rates. NO_X, CO, ROG, and NH_3 concentrations have been corrected to 3 percent O_2 to comply with permit reporting conditions. ROG results presented in Table 2-2 represent an average of duplicate sampling and analysis results.

NO_X, CO, NH_3, and ROG mass emission rates were calculated based on measured concentration data and flow rate data collected during gaseous constituent concentration measurements. Documentation of NO_X, CO, NH_3, and ROG emission rate calculations is provided in Appendix C-6.

Table 2-1. Boiler Operating Conditions and Stack Gas Characteristics

Test Condition	Boiler Output (Net MW)	Fuel Flow Rate (mmscf/hr)	Air to Fuel Ratio	Urea		Stack Gas		
				Injection Rate (gal/hr)	Concentration (%)	Flow Rate (mmscf/hr)	Moisture Content (%)	Temperature (°F)
Full Load, Baseline	215	2.147	21.5	NA	NA	32.83	14.4	232
Full Load, Urea On	215	2.143	21.3	99.6	23	33.33	14.0	232
Mid-load, Baseline	110	1.120	19.5	NA	NA	16.38	13.8	189
Mid-load, Urea On	110	1.135	19.3	30.3	23	16.41	14.0	188
Low Load, Baseline	70	0.771	18.6	NA	NA	11.14	13.6	166
Low Load, Urea On	70	0.772	19.3	18.0	23	11.38	13.9	169

Table 2-2. Source Test Results

Test Condition	Stack Gas O_2	Stack Gas NO_X		Stack Gas CO		Stack Gas [b]ROG		Stack Gas NH_3	
	percent	[a]ppm	lb/hr	[a]ppm	lb/hr	[a]ppm	lb/hr	[a]ppm	lb/hr
Full Load, Baseline	6.7	105	332	106	203	88	97	NA	NA
Full Load, Urea On	7.1	93.1	291	78.3	149	61	66	19	21
Mid-load, Baseline	7.2	64.8	98.6	141	131	60	32	NA	NA
Mid-load, Urea On	7.2	50.2	76.5	145	135	136	72	16	8.8
Low Load, Baseline	7.2	44.3	45.9	183	115	71	25	NA	NA
Low Load, Urea On	7.1	36.1	38.4	167	108	54	20	11	5

NA - Not Applicable
[a]ppm corrected to 3 percent O_2
[b]ROG concentrations are reported as methane

SECTION 3

BOILER DESCRIPTION

Huntington Beach Unit No. 2 is a Babcock & Wilcox (B&W) single face-fired unit rated at 215 MW (net). Maximum capacity of this boiler is 1,560,00 pounds of steam per hour at a nominal pressure of 2400 PSIG. Superheat and reheat steam temperatures are controlled to 1050°F.

This boiler is one of four similar B&W boilers in the SCE system. It is designed to be fired with 24 combination oil/gas burners arranged on the front wall in four rows with each row containing six burners. The boiler is equipped with flue gas recirculation which is intended primarily for steam temperature control. The recycled flue gas enters the wind box through the hoppers at the base of the boiler. Combustion air is fed to the burners through two Ljungstrom regenerative air preheaters via a pair of forced draft fans. Therefore, the windbox is operated under positive pressure. Each of the two air preheaters has an internal, rotating, heat transfer wheel and each preheater handles approximately one half of the total exhaust gas and incoming air.

In the main section of the boiler, hot combustion gas transfers radiant heat to a complex array of water filled tubes which are integral with the walls of the boiler. After the combustion gas leaves the radiant section of the boiler, exhaust flow is split through the east and west sections of the boiler. The gas then enters the secondary superheater zone, reheater zone and primary superheater zone in succession. In these zones, heat is progressively transferred, mainly by convection, from the combustion gas to the superheated steam. Next, the gas exchanges heat with water entering the economizer and is then directed to the air preheaters; gas exiting the air preheaters is either directed to the furnace or out the stack.

SECTION 4

SCAQMD METHOD 100.1, NO_X, CO, AND O_2 CONCENTRATION MEASUREMENTS

Section 4 summarizes SCAQMD Method 100.1 test procedures and results. A description of the sampling and analysis system is provided in Section 4.1. Method 100.1 concentration, stratification, and quality assurance/quality control (QA/QC) results are summarized in Sections 4.2, 4.3, and 4.4, respectively. Finally, SCAQMD Method 100.1 data reduction procedures are discussed in Section 4.5.

NO_X, CO, and O_2 concentration measurements were performed with strict adherence to Method 100.1 sampling and analysis procedures. Each constituent concentration was monitored continuously for 60 minutes, and sampling was performed concurrent with all other gaseous constituent concentration measurements. All measurements were performed at existing sampling facilities on the stack. Sampling locations and stack dimensions are shown in Figure 4-1.

4.1 Sampling System

Continuous emissions monitoring (CEM) instruments in the Geraghty & Miller Mobile Laboratory were used to measure gaseous constituent concentrations present in the sample stream. The Geraghty & Miller Mobile Laboratory is certified by the California Air Resources Board; a copy of the certificate is provided in Appendix H. A schematic of the CEM instrumentation is provided in Figure 4-2. The sample extraction and conditioning system consists of a stainless steel sampling probe connected to a heated teflon sample line located upstream of a Universal Analyzers gas sample conditioner. The sample line between the probe and the sample conditioner is heated to 250°F to maintain the gas stream temperature above the water dew point. The sampling system is constructed to avoid contact between the sample gas and moisture and therefore minimize nitrogen dioxide (NO_2) absorption.

From the sample gas conditioner, the sample stream passes through a flexible Teflon

sample line to a flow control system which meters the sample flow rate through the monitoring instruments. Sample flow rate is controlled with a bypass pressure regulator located at the instrument manifold. Flow to each monitoring instrument is controlled using individual flow control valves and meters. The CEM instrument specifications are summarized in Table 4-1. Instrument output is recorded by a strip chart recorder and an integrated data logging system. The logging device records 1 minute averages throughout each test.

All instrument calibrations were performed using National Institute of Standards and Testing (NIST) traceable gas standards certified to ± 1 percent analytical accuracy. Copies of calibration gas certification sheets are provided in Appendix C-1.

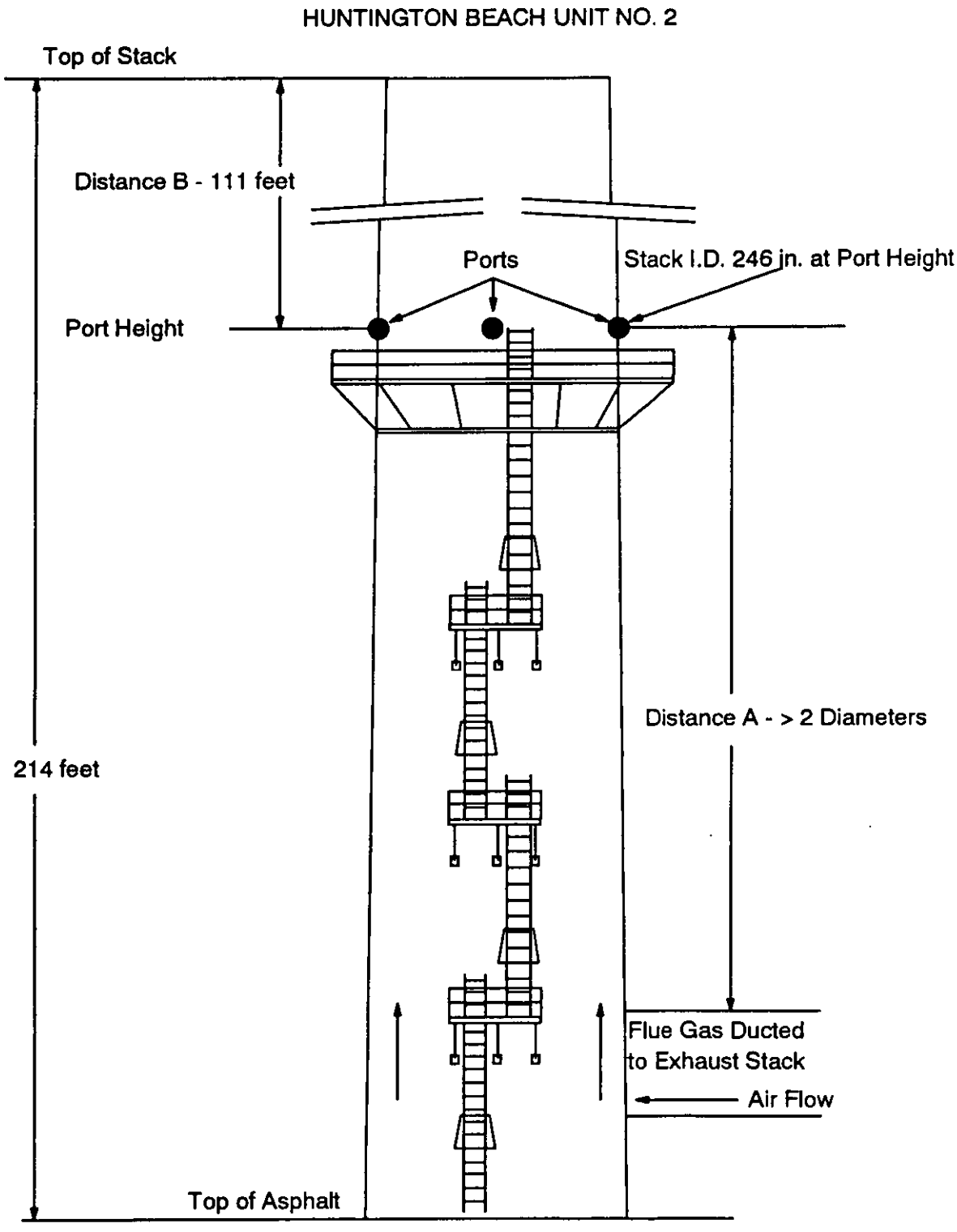


Figure 4-1. Diagram of Stack Dimensions and Sampling Locations

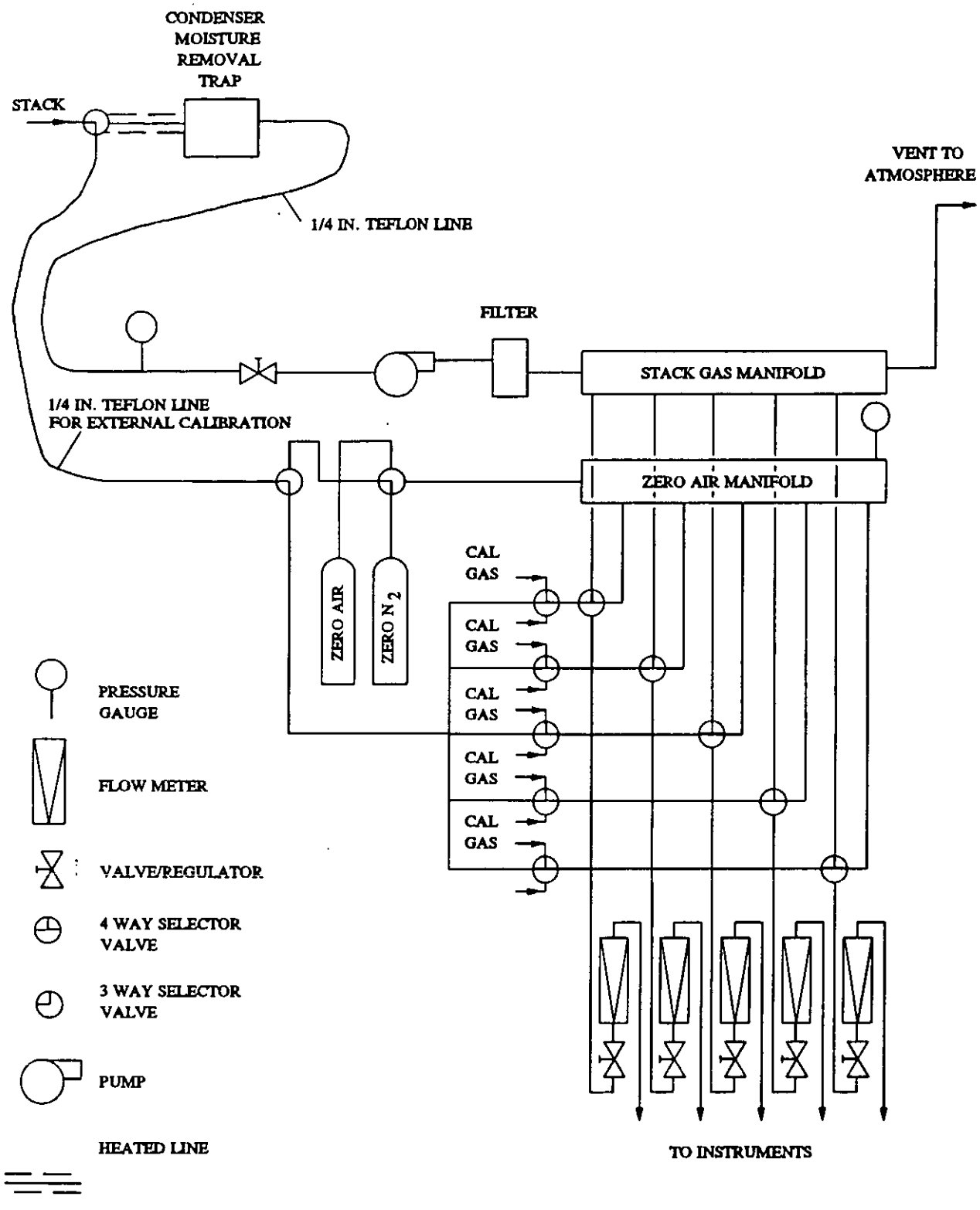


Figure 4-2. Schematic Diagram of Mobile Laboratory CEM Instrumentation

Table 4-1. Continuous Emissions Monitoring Instruments

NO_X CHEMILUMINESCENT ANALYZER—THERMO ELECTRON MODEL 10A	
Response Time (0-95%)	5 sec—NO_X mode
Zero Drift	Negligible after 1/2 hour warmup
Linearity	±1% of full scale
Accuracy	±1% of full scale
Output	0-10 V
Range	0-2.5, 10, 25, 100, 250, 1000, 2500, and 10,000 ppm
Sensitivity	0.1 ppm
O_2 ANALYZER, FUEL TYPE—TELEDYNE MODEL 326A	
Response Time (0-95%)	40 sec
Accuracy	±1% of scale at constant temperature; ±1% of scale at ±5% of reading, whichever is greater, over the operating temperature range
Output	0-100 mV
Range	0-5, 10, 25 %
CO INFRARED ANALYZER—HORIBA MODEL VIA-510	
Response Time (0-95%)	16 sec
Zero Drift	±1%
Span Drift	±1%
Linearity	±1%
Output	0-1 V
Range	0-50, 100, 500, 2000 ppm

4.2 Method 100.1 Emissions Data

NO_X, CO, O_2, and carbon dioxide (CO_2) emissions data are summarized in Table 4-2, which lists stack gas constituent concentrations, and concentrations corrected to 3% O_2 for NO_X and CO, for each test condition. CO_2 concentration measurements were performed to provide data necessary to calculate stack gas molecular weight as prescribed in SCAQMD Method 3.1.

Table 4-2. Method 100.1 Test Results

Test Condition	NO_X (ppm)	NO_X @ 3% O_2 (ppm)	CO (ppm)	CO @ 3% O_2 (ppm)	O_2 (%)	CO_2 (%)
Full Load, Baseline	83.2	105	83.8	106	6.7	8.0
Full Load, Urea On	71.8	93.1	60.4	78.3	7.1	7.9
Mid-load, Baseline	49.6	64.8	108	141	7.2	7.9
Mid-load, Urea On	38.4	50.2	111	145	7.2	7.9
Low Load, Baseline	33.9	44.3	140	183	7.2	8.0
Low Load, Urea On	27.8	36.1	129	167	7.1	7.9

4.3 Stratification Measurement Data

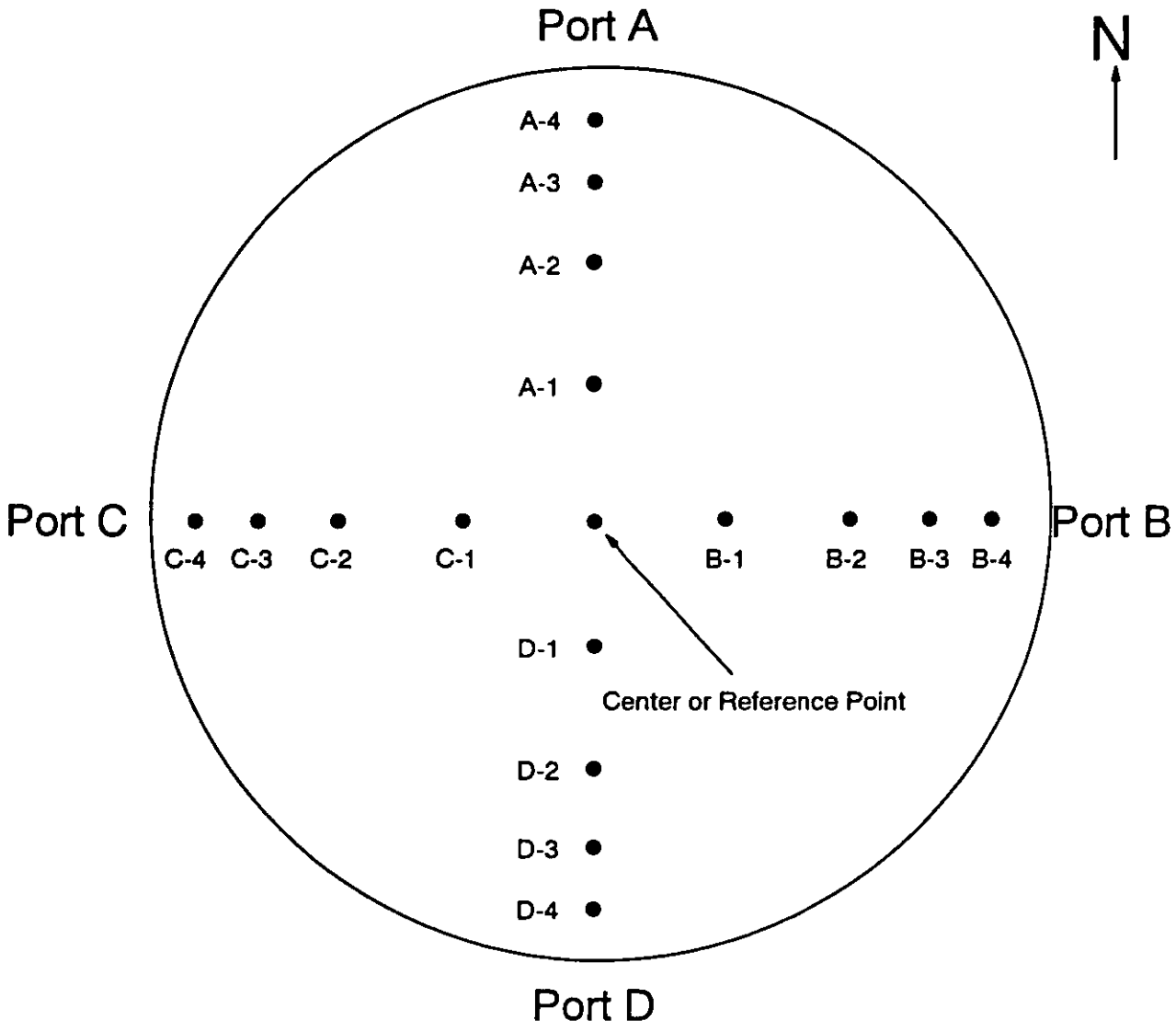
Extensive full and mid-load gaseous constituent stratification tests have been previously performed at this test location following SCAQMD Chapter X guidelines (Reference - CARNOT Reports SCE 1A-10848\R148B910.T and KVB 1K-11724\R194E814.T). The test results show that the stack sampling location meets SCAQMD requirements by demonstrating that the stratification is less than 10 percent at full and mid-load.

Constituent concentration stratification was assessed prior to performing Method 100.1 sampling at the low operating load. Stratification was determined following procedures submitted in the source test protocol.

Each stratification determination was performed by measuring NO_X concentrations at the 16 traverse point locations illustrated in Figure 4-3. Through each sampling port, the sampling probe was first placed at the reference point (center point), followed by the four traverse points, and then returned to the reference point. NO_X concentrations were measured at each sample location for at least 3 minutes.

NO_X concentration measurements performed to assess gaseous constituent stratification

Figure 4-3. Stratification Test Traverse Point Locations



Traverse Point Locations (inches)

Stack I.D.	246 inches
Point 1	79 ½ inches
Point 2	47 ⅜ inches
Point 3	25 ⅞ inches
Point 4	7 ⅞ inches

at low load are summarized Table 4-3. Stratification results were calculated following SCAQMD Source Test Manual, Chapter X, Section 13 procedures. Stratification was less than 10 percent; therefore, all gaseous constituent concentration measurements, including ROG and NH_3, were performed at the center point of the exhaust stack.

Copies of stratification field test data sheets and strip chart records are provided in Appendix C-2 and C-3, respectively

Table 4-3. Low Load (70 MW) Stratification Test Results

Time	Traverse Point	Measured NOx Conc. (ppm)	Kx	Txn	Time	Traverse Point	Measured NOx Conc. (ppm)	Kx	Txn
557	reference	32.7			533	reference	33.1		
601	A-1	33.0	0.99	32.4	536	C-1	33.5	1.01	32.9
604	A-2	33.1	0.99	32.5	539	C-2	33.8	1.02	33.2
607	A-3	34.0	1.02	33.4	542	C-3	33.2	1.00	32.6
617	A-4	33.6	1.01	33.0	545	C-4	33.4	1.00	32.8
614	reference	33.9			548	reference	33.5		
	reference avg:	33.3				reference avg:	33.3		
625	reference	33.6			650	reference	33.4		
628	D-1	33.7	0.99	32.5	653	B-1	34.5	1.02	33.3
631	D-2	33.9	1.00	32.7	658	B-2	33.7	0.99	32.5
634	D-3	34.4	1.01	33.1	701	B-3	35.2	1.04	34.0
638	D-4	34.3	1.01	33.0	704	B-4	34.9	1.03	33.7
642	reference	34.3			707	reference	34.4		
	reference avg:	34.0				reference avg:	33.9		

Statification Test Results:	Txn (avgerage):	33.0
	Txn (maximum):	34.0
	Txn (minimum):	32.4
	Stratification:	4.7%

Where:

Kx = Proportionality Constant (conc. at traverse point x / avg. concentration at reference point)

Tx = Concentration at traverse point x

Txn = Normalized value of concentration at traverse point x

4.4 Sampling System QA/QC

Sampling system and instrument performance measurements were recorded throughout this source test with strict adherence to Method 100.1 QA/QC procedures. Analyzer calibration error, instrument linearity, and system bias were assessed before and after each test run. Zero and calibration drift were assessed following each test run. In addition, sampling system leak checks were performed before and after each test run.

All NO_X, CO, and O_2 analyzer and sampling system performance measurements were performed in accordance with Method 100.1 procedures; results of these measurements are included in Appendix C-7.

Strip charts of the semi-annual analyzer certifications for response time and NO_2 to nitrous oxide (NO) converter efficiency are provided in Appendix C-4. The TECO Model 10AR NO_X analyzer used for this test series was outfitted with a low temperature molybdenum (moly) converter. The moly converter demonstrated an acceptable NO_2 to NO conversion efficiency as evaluated following EPA Method 20, Section 5.6 procedures (see Appendix C-4).

4.5 Data Reduction Procedures

CEM data were permanently recorded on multichannel strip chart recorders; in addition, a data logging system recorded 1 minute average constituent concentrations. The data stored in the logging system was downloaded and used to derive the test results. All CEM data were corrected for instrument drift and sampling system bias per Method 100.1. The calibration responses recorded by the data logger were used to correct the data logger information, and derive the final results presented in Table 4-2 (copies of data logger output are provided in Appendix C-5). The following calculation was used for the correction.

$$C_{gas} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}$$

where:

C_{gas} = Effluent gas concentration, dry basis, ppm

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

C_{ma} = Actual concentration of the upscale calibration gas, ppm

C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm

C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm

Equations provided in Method 100.1, Section 3 were used to compute the NO_X and CO emission rates provided in Section 2.

SECTION 5

SCAQMD METHOD 25.1, ROG MEASUREMENTS

Section 5 provides a summary of SCAQMD Method 25.1 sampling and analysis procedures and results. An overview of the sampling and analysis procedures is provided in Section 5.1. ROG analytical and QA/QC data are summarized in Sections 5.2 and 5.3, respectively.

5.1 Sampling and Analysis Procedures

ROG concentrations in the stack gas were measured following Method 25.1 sampling and analysis procedures. Method 25.1 samples were collected in duplicate at the center of the exhaust stack, concurrently with all other gaseous constituent concentration measurements. ROG samples were collected over a 60 minute test period.

Method 25.1 specifies that sample gas be withdrawn at a constant rate throughout the test duration. Condensibles are collected in a condensate trap chilled with dry ice located upstream of the evacuated tank. The gas phase ROG component is collected in the evacuated tank. Sample gases are withdrawn through a pre-cleaned ⅛ inch stainless steel sampling probe positioned at the center of the exhaust stack. Each sampling line is purged for approximately one minute before initiating sampling.

ROG concentrations are determined through independent analysis of the condensate in the traps and the gases in the tanks. The mass of ROG collected in each condensate trap is measured by first removing all CO_2, and then oxidizing the ROG in the condensate to CO_2. This CO_2 fraction is collected in an evacuated cylinder and injected into the gas analysis module of the total combustion analyzer (TCA) and measured by a non-dispersive infrared (NDIR) detector.

ROG concentrations in the tanks are measured by injecting a portion of the sample gas into the gas analysis module of the TCA which uses a gas chromatograph (GC) column to separate non-methane organics (NMO) from CO, CO_2, and methane (CH_4). The NMO elutes off

the GC as fore-flush and back-flush, and is oxidized to CO_2. A reduction catalyst is used to reduce this CO_2 fraction to CH_4, and finally, the CH_4 is measured using a FID.

A Method 25.1 sampling system field blank was collected to assess sampling apparatus cleanliness and to determined potential sample contamination during set-up, sampling, and recovery activities. The field blank was collected by passing ultra-pure nitrogen gas through the sampling apparatus for approximately 60 minutes.

Method 25.1 sample analyses were performed by Truesdail Laboratories, Inc. located in Tustin, California.

5.2 Method 25.1 Analytical Data

Method 25.1 analytical data are summarized in Table 5-1. For each test condition, duplicate analysis results are listed for ROG, CO, and CO_2. Table 5-1 lists actual and corrected ROG concentrations; corrections are made to 3 percent O_2. ROG emission rates (reported in pounds per hour as methane) are also included in Table 5-1. Emission rates were calculated based on volumetric flow rate data collected during the sampling period (Section 7). Copies of Method 25.1 analytical reports and field test data sheets are provided in Appendix D-1 and D-2, respectively.

5.3 Method 25.1 QA/QC Results

Field blank analytical results indicate 5 ppm residual ROG (as methane) was present in the apparatus. Data presented in Table 5-1 were blank corrected to account for residual ROG present in the Method 25.1 sampling equipment.

Table 5-1. Method 25.1 Test Results

Test Condition	Sample	ROG Concentration (ppm as methane)		ROG Emission Rate (lb/hr as CH_4)	CO (ppm)	CO_2 (%)
		Actual	Corrected to 3 % O_2			
Full Load, Baseline	*Tray 1	58	73	81	77	7.2
	Tray 2	82	103	114	80	7.4
	Average	70	88	97	79	7.3
Full Load, Urea On	Tray 1	31	40	44	59	7.2
	Tray 2	63	82	89	58	7.2
	Average	47	61	66	59	7.2
Mid-load, Baseline	Tray 1	58	76	40	111	7.5
	Tray 2	34	44	24	103	7.4
	Average	46	60	32	107	7.5
Mid-load, Urea On	Tray 1	78	102	54	98	6.9
	Tray 2	130	170	90	101	7.1
	Average	104	136	72	100	7.0
Low Load, Baseline	Tray 1	80	105	38	127	7.4
	Tray 2	28	37	13	131	7.5
	Average	54	71	25	129	7.5
Low Load, Urea On	Tray 1	35	45	17	126	7.7
	Tray 2	49	64	24	115	7.4
	Average	42	54	20	121	7.6

*a tray constitutes one tank and condensate trap set

SECTION 6

DRAFT SCAQMD METHOD 207.1, AMMONIA CONCENTRATION MEASUREMENTS

Section 6 summarizes NH_3 concentration sampling and analysis procedures and results. An overview of the sampling and analysis procedures is provided in Section 6.1. NH_3 concentration results are summarized in Section 6.2.

6.1 Sampling and Analysis Procedures

NH_3 samples were collected and analyzed following SCAQMD Draft Method 207.1, "Analytical Procedures for Determining Ammonia and Ammonium Compounds from Stationary Sources." A copy of this Method is provided in Appendix E-1.

NH_3 concentration measurements were performed only when the urea injection system was in service. For each test, sample gas was collected at the center of the exhaust stack for a 60 minute period. NH_3 testing was performed concurrently with all other gaseous constituent concentration measurements.

NH_3 concentration samples are collected using a standard impinger train. Sample gas is withdrawn from the source at a constant rate through a ¼ teflon sample line and four impingers by a sample pump. The first two impingers contain 100 ml of 0.1 N sulfuric acid, the third is empty, and the fourth contains silica gel. A sampling console controls sample flow rate, and records sample volume and temperature measurements.

A sampling system leak check was performed immediately before and after each test. After each test, the teflon sample line was rinsed with 0.1 N sulfuric acid. This probe wash was combined with the impinger catch for analysis.

NH_3 samples were analyzed in strict accordance to Draft Method 207.1 procedures. This colorimetric method uses a spectrophotometer to measure the absorbance of a sample aliquot after reaction with Nessler reagent. The absorbance of the sample aliquot was compared to calibration

curve absorbencies developed by analyzing 6 standards of known concentration. The NH_3 concentration of the sample aliquot was interpolated from the calibration curve using linear regression.

6.2 Draft Method 207.1 Test Data

NH_3 concentration data are summarized in Table 6-1. For each urea test condition, Table 6-1 lists the analytical results, NH_3 concentration and NH_3 concentration corrected to 3 percent O_2. Also listed are NH_3 emission rates calculated based on flow rate data collected during the test period (Section 7). Copies of NH_3 analytical reports and field test data sheets are provided in Appendix E-2 and E-3, respectively.

Table 6-1. NH_3 Test Data

Test Condition	Analytical Results (mg NH_3/ sample)	Stack Gas Concentration		Stack Gas Emission Rate (lb/hr)
		(ppm)	Corrected to 3 % O_2 (ppm)	
Full Load, Urea On	9.25	14	19	21
Mid-load, Urea On	7.80	12	16	8.8
Low Load, Urea On	5.40	9	11	5

6.3 Draft Method 207.1 QA/QC

Calibration curve results were within Draft Method 207.1 QA/QC requirements; the correlation coefficient for the 6 point calibration curve was 0.9998, exceeding the 0.9995 requirement. Also, 40 μg control samples were analyzed with compliance test samples. These control samples did not deviate (0%) from the calculated curve. Sampling system calibration records are provided in Appendix G.

SECTION 7

SCAQMD METHOD 1.1, 2.1, 3.1, AND 4.1, STACK GAS VOLUMETRIC FLOW RATE MEASUREMENTS

Section 7 summarizes stack gas volumetric flow rate sampling procedures and results. Flow rate measurements were performed during each gaseous constituent concentration test run per requirements cited in Section 1. An overview of the sampling procedure is provided in Section 7.1. Stack gas flow rate data are summarized in Section 7.2.

7.1 Volumetric Flow Rate Measurement Procedures

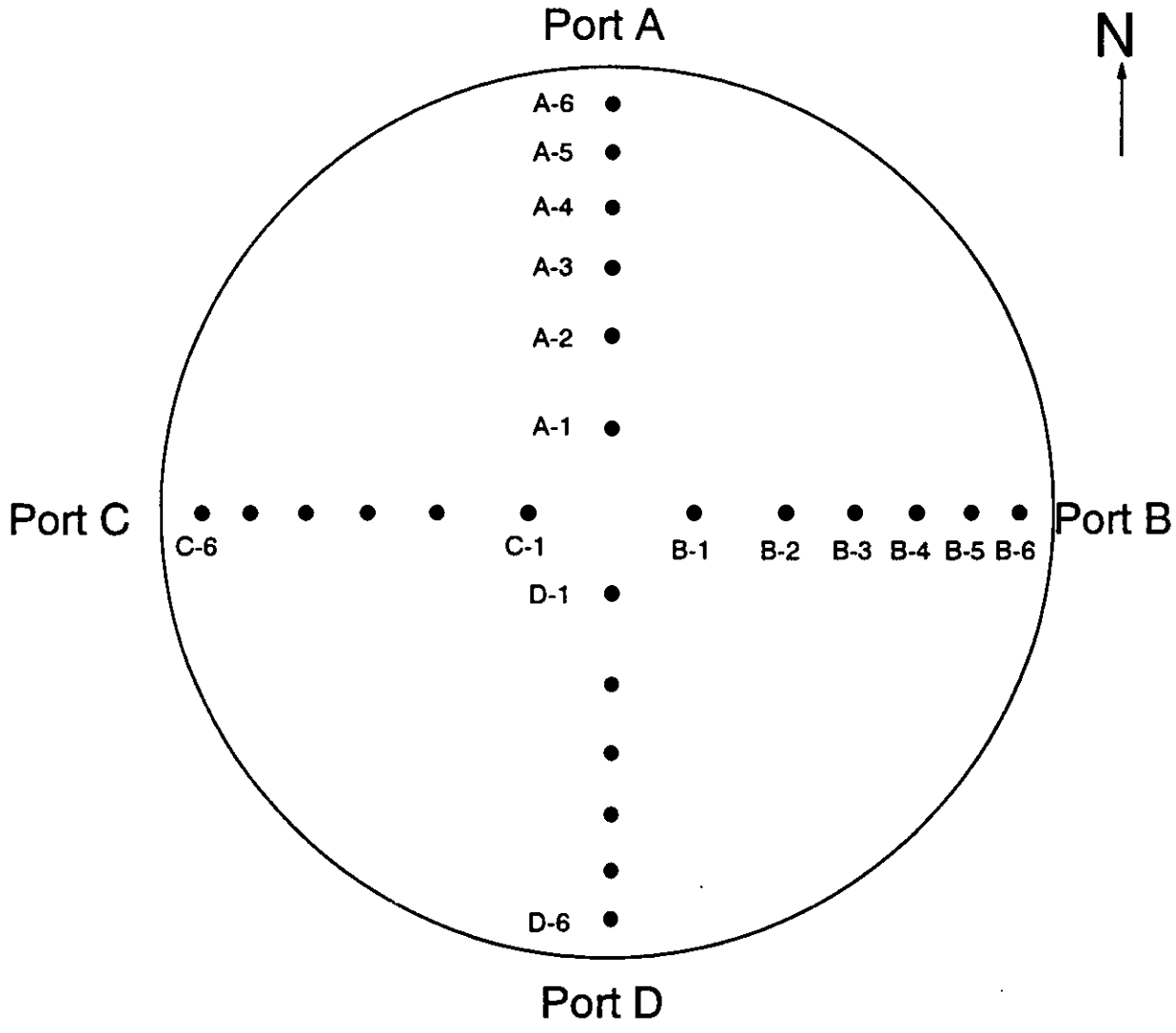
Traverse point locations and exhaust gas velocity, molecular weight, and moisture were determined following SCAQMD Methods 1.1, 2.1, 3.1, and 4.1, respectively. Data collected from Methods 1.1 through 4.1 were used to calculate stack gas volumetric flow rate. Method 1.1 outlines the procedures for choosing the proper traverse points, while Method 2.1 provides the methodology for measuring pressure differentials at each traverse point and calculating the stack gas velocity. For this test, exhaust gas molecular weight was determined from Method 100.1 data per Method 3.1. Exhaust gas moisture content was determined following SCAQMD Method 4.1 procedures.

For this test series, measurements were taken at 24 traverse points, exceeding the Method 1.1 requirement of 16 traverse points. Traverse point locations are illustrated in Figure 7-1.

In accordance with Method 2.1, a calibrated Type S pitot tube and thermocouple were used in conjunction with a magnehelic gauge to measure stack gas velocity pressure and temperature. From these data, the exhaust gas velocity was calculated using standard equations.

Exhaust gas moisture content was measured according to Method 4.1 procedures. Using a standard impinger train, exhaust gas sample was collected at the center of the exhaust stack. During test conditions where the urea injection system was in service, moisture data was obtained from NH_3 sampling and analysis procedures.

Figure 7-1. Velocity Test Traverse Point Locations



Traverse Point Locations (inches)

Stack I.D.	246 inches
Point 1	87 ⅝ inches
Point 2	61 ½ inches
Point 3	43 ½ inches
Point 4	29 inches
Point 5	16 ½ inches
Point 6	5 ⅛ inches

7.2 Volumetric Flow Rate Test Data

Stack gas volumetric flow rate data are summarized in Table 7-1. For each test condition, stack gas flow rate, moisture content, temperature, and molecular weight is listed. Copies of flow rate and moisture calculation sheets, spreadsheets, and field data sheets are provided in Appendix F-1 and F-2, respectively. Copies of pitot and magnehelic calibration records are provided in Appendix G.

Table 7-1. Stack Gas Volumetric Flow Rate Results

Test Condition	Stack Gas Characteristics			
	Flow Rate (dscfm)	Moisture Content (%)	Temperature (°F)	Molecular Weight (lb/lb•mole)
Full Load, Baseline	547,128	14.4	232	29.6
Full Load, Urea On	555,487	14.0	232	29.6
Mid-load, Baseline	272,995	13.8	189	29.6
Mid-load, Urea On	273,563	14.0	188	29.6
Low Load, Baseline	185,712	13.6	166	29.6
Low Load, Urea On	189,613	13.9	169	29.6

APPENDIX A

REFERENCED DOCUMENTS

APPENDIX A-1

SOURCE TEST PROTOCOL

Protocol Issued: July 6, 1993
Revision Number: 2

EMISSIONS SOURCE TEST PROTOCOL

PERMIT APPLICATION NOs. R-249462 and R-249463

Source Location:

Southern California Edison - Huntington Beach Generating Station
21730 Newland Street
Huntington Beach, CA 92646

Prepared for:

Southern California Edison Company
Environmental Affairs
2244 Walnut Grove Avenue
Rosemead, California 91770

Submitted by:

Acurex Environmental
Southwest Regional Office
4879 East La Palma Avenue, Suite 201
Anaheim, California, 92817

EMISSIONS SOURCE TEST PROTOCOL:

PERMIT APPLICATION NOs. R-249462 and R-249463

Source Location:

Southern California Edison - Huntington Beach Generating Station
21730 Newland Street
Huntington Beach, CA 91739

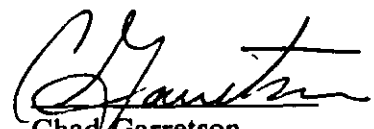
Submitted to:

Southern California Edison Company
Environmental Affairs
2244 Walnut Grove Avenue
Rosemead, California 91770

Submitted by:

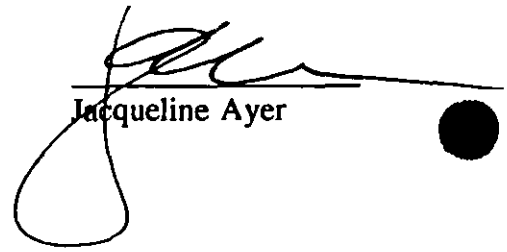
Acurex Environmental
Southwest Regional Office
4879 East La Palma Avenue, Suite 201
Anaheim, California, 92817

Project Engineer



Chad Garretson

Quality Assurance



Jacqueline Ayer

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SECTION 1

INTRODUCTION

Acurex Environmental has been contracted by Southern California Edison Company (Edison) to conduct emissions source testing per the permit to construct (PTC) application Nos. R-249462 and R-249463. The sources requiring emissions testing are Utility Boilers No. 1 and No. 2 located at Edison's Huntington Beach Generating Station (Huntington Beach #1 and #2). PTC application Nos. R-249462 and R-249463 list equipment descriptions and conditions for Huntington Beach #1 and #2, respectively. Key information pertaining to the emissions test series is summarized briefly in Table 1-1.

Table 1-1. Huntington Beach #1 and #2 emissions test series information

Source Tested	Southern California Edison's Huntington Beach Generating Station, Utility Boilers No. 1 and No. 2
Test Location	21730 Newland Street Huntington Beach, CA 92646
Test Requested By	South Coast Air Quality Management District
Reason For Test	Alterations to the existing Permit No. 000686; addition of urea injection systems
Tests To Be Performed By	Acurex Environmental, Southwest Regional Office Project Engineer: Chad Garretson (714) 970-5290
Key Edison Contacts	Stafford Pease (818) 302-4034 Dave Rundstrom (818) 302-9416

This protocol summarizes source test procedures as required by PTC application Nos. R-249462 and R-249463. Section 2 presents the proposed test matrix for each PTC. Section 3 describes sampling locations and procedures. Section 4 summarizes quality assurance (QA) procedures for the emissions test series.

PTC application No. R-249462 provided in Appendix A is identical to Huntington Beach #2 PTC application No. R-249463.

Acurex Environmental's California Air Resources Board (ARB) contractor's certification is provided in Appendix B.

SECTION 2

TEST MATRIX

Huntington Beach #1 and #2 test matrix is presented in Table 2-1. The table identifies the test parameters, sampling and analysis methods, number of runs, and sample duration. The test procedures identified in Table 2-1 will be performed for each of the following boiler load conditions; 50 MW, 100 MW, 150 MW, and full load. Fuel flow rate, air to fuel ratio, and net boiler output (MW) data will be recorded for each test condition. For each operating condition involving urea injection, the urea injection rate and concentration will be recorded, and the urea/water solution injected will contain no more than 35 percent urea by weight. Ammonia slip testing will be performed only while the urea injection system is operating. All emissions testing will be performed while the boilers fire natural gas. Particulate testing will be performed for one boiler only, for each of the load conditions listed above.

Table 2-1. Test Matrix for Huntington Beach Unit #1 and #2

Boiler Operating Conditions	Test Parameter	Sampling Method	Analytical Method	Sample Duration (min)	No. of Runs
Baseline	NO_x,CO,O_2	SCAQMD 100.1	[a]Various	60	1
	Moisture,Flow Rate	SCAQMD 1.1-4.1	Gravimetric	30	2
	[b]Particulate	SCAQMD 5.2	Gravimetric	>60	2
	[c]ROG	SCAQMD 25.2	[d]TCA/NDIR	30	2
Urea Injection	NO_x,CO,O_2	SCAQMD 100.1	[a]Various	60	1
	Flow Rate	SCAQMD 1.1-4.1	NA	30	2
	[b]Particulate	SCAQMD 5.2	Gravimetric	>60	2
	ROG	SCAQMD 25.2	TCA/NDIR	30	2
	Ammonia Slip/ Moisture	[e]SCAQMD Draft Method	Colorimetric/ Gravimetric	30	2

[a]Various: NO_x - chemiluminescence
CO - non-dispersive infared (NDIR)
O_2 - electrochemical
[b]SCAQMD Method 5.2 particulate measurements will be performed on only one boiler
[c]Reactive organic gases (ROG)
[d]TCA/NDIR - Total combustion analysis/non-dispersive infared
[e]SCAQMD Draft Method for Ammonia and Ammonium Compounds From Stationary Sources
NA - Not Applicable

SECTION 3

SAMPLING LOCATIONS AND PROCEDURES

3.1 Sampling Locations

Flue gas from Huntington Beach #1 and #2 are vented through a common exhaust stack. Therefore, the same sampling location will be used for both Huntington Beach #1 and #2 tests. During the test series, only the unit undergoing testing will be operated.

Extractive and integrated samples will be collected through four sample ports located on the Huntington Beach #1 and #2 exhaust stack. The stack sampling location has been previously approved following SCAQMD Chapter X criteria for stratification and flow disturbance. Specific cross-sectional exhaust stack sampling locations for each test method are identified in Sections 3.2 through 3.6. General stack characteristics at the sampling port location follows:

Stack diameter	20 feet 7 inches
Nearest upstream disturbance	>2 stack diameters
Nearest downstream disturbance	>0.5 stack diameters

3.2 SCAQMD Method 100.1, Gaseous Constituent Concentration Measurements

Gaseous constituent concentrations present in the sample stream are measured using the continuous emissions monitoring (CEM) instruments in the Acurex Environmental Mobile Laboratory in accordance with SCAQMD Method 100.1 procedures. A schematic of the CEM instrumentation is provided in Figure 3-1. The sample extraction and conditioning system consists of a stationary stainless steel sampling probe connected to a heated teflon sample line located upstream of a Universal Analyzers gas sample conditioner. The sample line between the probe and the sample conditioner is heated to 250°F to maintain the gas stream temperature

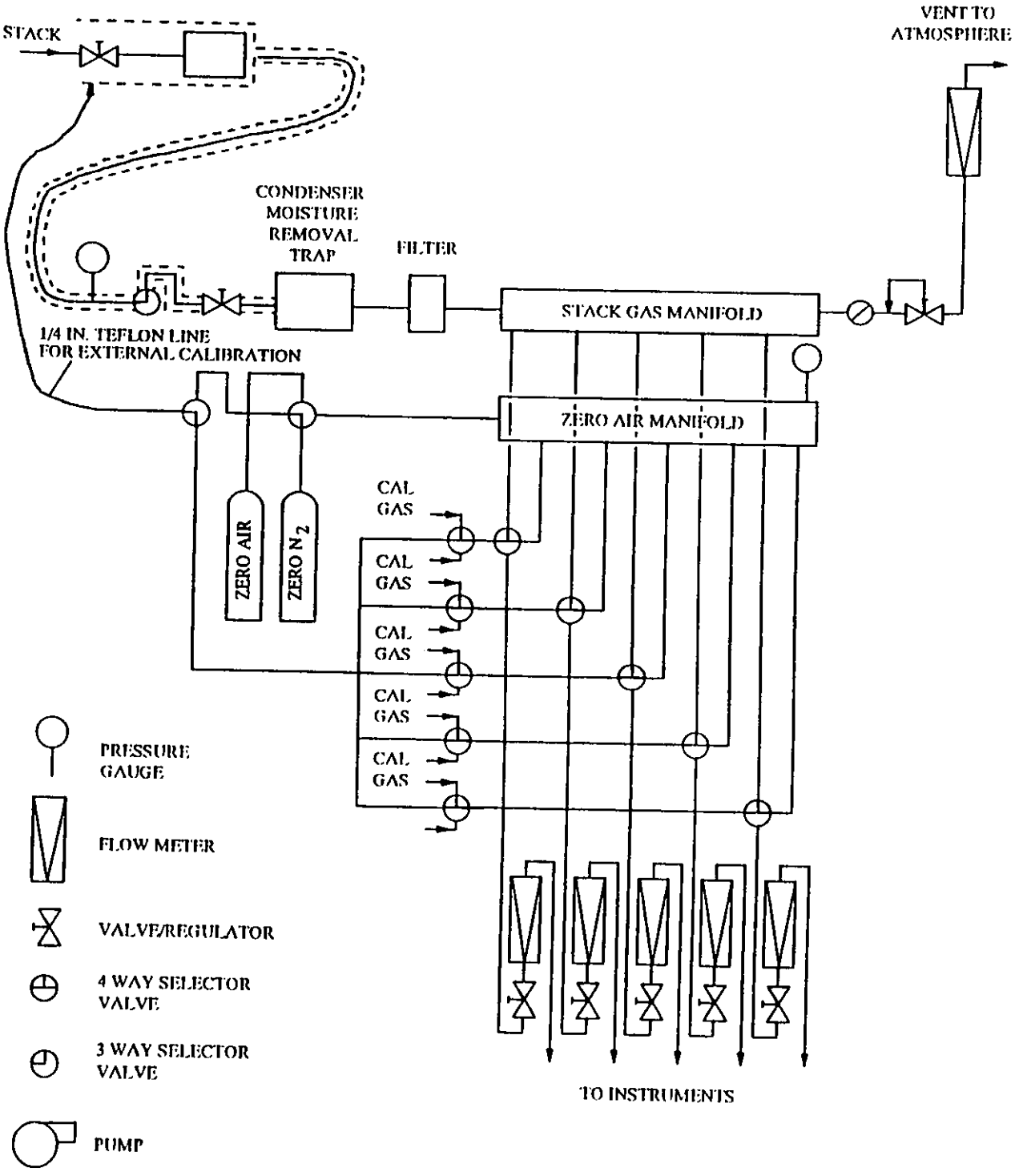


Figure 3-1. Schematic Diagram of CEM Instrumentation in the Acurex Environmental Mobile Laboratory

above the water dew point. The sample gas cooler is constructed to minimize NO_2 absorption.

From the sample gas conditioner, the sample stream passes through flexible teflon sample line to a flow control system which meters the sample flow rate through the various monitoring instruments. Sample flow rate is controlled with a bypass pressure regulator upstream of the instrument manifold. Flow to each instrument is controlled using individual flow control valves and meters. The CEM specifications are summarized in Table 3-1. Instrument output is recorded by a strip chart recorder and an integrated data logging system. The logging device records 1 minute averages throughout each test. The data stored in the logging system is downloaded and used to derive emissions results.

Extensive gaseous constituent stratification tests have been previously performed at this test location following SCAQMD Chapter X guidelines (Reference - Huntington Beach #1, CARNOT Report #1082115/R148B099.T; Huntington Beach #2, CARNOT Report #10848/R148B910.T). The test results show that the stack sampling location meets SCAQMD requirements by demonstrating that the stratification is less than 10 percent.

Because the urea injection system should have a negligible impact on gaseous stratification, Edison and Acurex Environmental propose the following for non-particulate traverses:

(1) conduct a 16 point NO_X or O_2 traverse for the baseline condition of each load

(2) if stratification from the 16 point traverse is less than 10 percent, select a representative sampling location and perform single point sampling for NO_X, O_2, CO, ROG, ammonia, and moisture measurements for each test condition

(3) if stratification is greater than 10 percent, sample gas will be collected along an 8 point traverse for the parameters identified above

NO_X and CO emission data are corrected to 3 percent O_2, and all CEM data are corrected for instrument drift and linearity per SCAQMD Method 100.1. The calibration responses recorded by the data logger are used to correct the data logger information. The following calculation was used for the correction.

$$C_{gas} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o} \qquad (4\text{-}1)$$

Table 3-1. Continuous Emissions Monitoring Instruments

NO_X CHEMILUMINESCENT ANALYZER—THERMO ELECTRON MODEL 10A	
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	±1% of full scale
Output	0-10 V
Range	0-2.5 ppm, 0-10 ppm, 0-25 ppm, 0-100 ppm, 0-250 ppm, 0-1000 ppm, 0-2500 ppm, and 0-10,000 pm
Sensitivity	0.1 ppm
O_2 ANALYZER, FUEL TYPE—TELEDYNE MODEL 326A	
Response Time (0-90%)	60 sec
Accuracy	±1% of scale at constant temperature; ±1% of scale at ±5% of reading, whichever is greater, over the operating temperature range
Output	0-100 mV
Range	0-5, 0-10, and 0-25% O_2
CO INFRARED ANALYZER—HORIBA MODEL PIR 2000	
Response Time (0-90%)	5 sec
Zero Drift	±1%
Span Drift	±1%
Linearity	1%
Resolution	Less than 1% of full scale
Output	0-100 mV
Range	0-500, 0-1500, 0-2500

where:

C_{gas} = Effluent gas concentration, dry basis, ppm

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

C_{ma} = Actual concentration of the upscale calibration gas, ppm

C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm

C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm

3.3 SCAQMD Methods 1.1, 2.1, 3.1, and 4.1, Flow Rate Measurements

Traverse point locations and exhaust gas velocity, molecular weight, and moisture are determined following SCAQMD Methods 1.1, 2.1, 3.1, and 4.1, respectively. Data collected from SCAQMD Methods 1.1 through 4.1 are used to calculate stack gas flow rate. Method 1.1 outlines the procedures for choosing the proper traverse points, while Method 2.1 provides the methodology for measuring pressure differentials at each traverse point and calculating the stack gas velocity. For this test, the exhaust gas molecular weight will be determined per Method 3.1 using Method 100.1 data. Exhaust gas moisture content is determined following SCAQMD Method 4.1 procedures.

Velocity is measured during the test at selected discrete sample points at a cross section of the stack according to SCAQMD Method 1.1 requirements. The cross section is divided into equal areas, to allow measurement of velocity and temperature profiles across the stack. Pressure differential measurements will be performed at 24 traverse point locations, exceeding the Method 1.1 requirements of 16 traverse point locations.

In Method 2.1, a calibrated Type S pitot tube and thermocouple are used, in conjunction with an inclined manometer or magnehelic gauge to measure exhaust gas velocity pressure and temperature. From this data, the exhaust gas velocity is calculated using standard equations.

Exhaust gas moisture content is measured gravimetrically following Method 4.1 procedures. Using a standard impinger train, exhaust gas sample will be collected within a 3 foot radius of the center of the stack. At least 21 standard cubic feet of sample gas will be collected at a rate less than 0.75 cubic foot per minute.

3.4 SCAQMD Method 5.2, Particulate Emissions Measurements

SCAQMD Method 5.2 is used to measure flue gas particulate concentration and emission rates. A sample is withdrawn isokinetically from the source. Particulate matter and condensible material (such as water vapor, organic compounds, and/or sulfuric acid) are collected in impingers and on a glass fiber filter maintained at 248 ±25°F. The quantity of solid particulate collected in the probe, impingers, connecting tubing and on the filter is determined gravimetrically.

A schematic of the Method 5.2 sample train is illustrated in Figure 3-2. The sample is collected using a stainless steel nozzle attached to a borosilicate glass probe liner. A stainless steel sheathed Type K thermocouple (TC) measures stack temperature, while a stainless-steel S-type pitot and magnehelic gauge are used to measure stack gas velocity. The impingers are placed in an ice bath to maintain the sample gas temperature exiting the last impinger at 60°F or less. The first two impingers contain deionized water, the third impinger is empty, and the fourth impinger contains silica gel.

An air-tight pump equipped with a bypass and a shut-off valve maintains a controlled sample flow rate through the system. Sample flow rate is measured using a sharp-edged orifice with upstream and downstream pressure taps. The sample volume is measured using a dry gas meter.

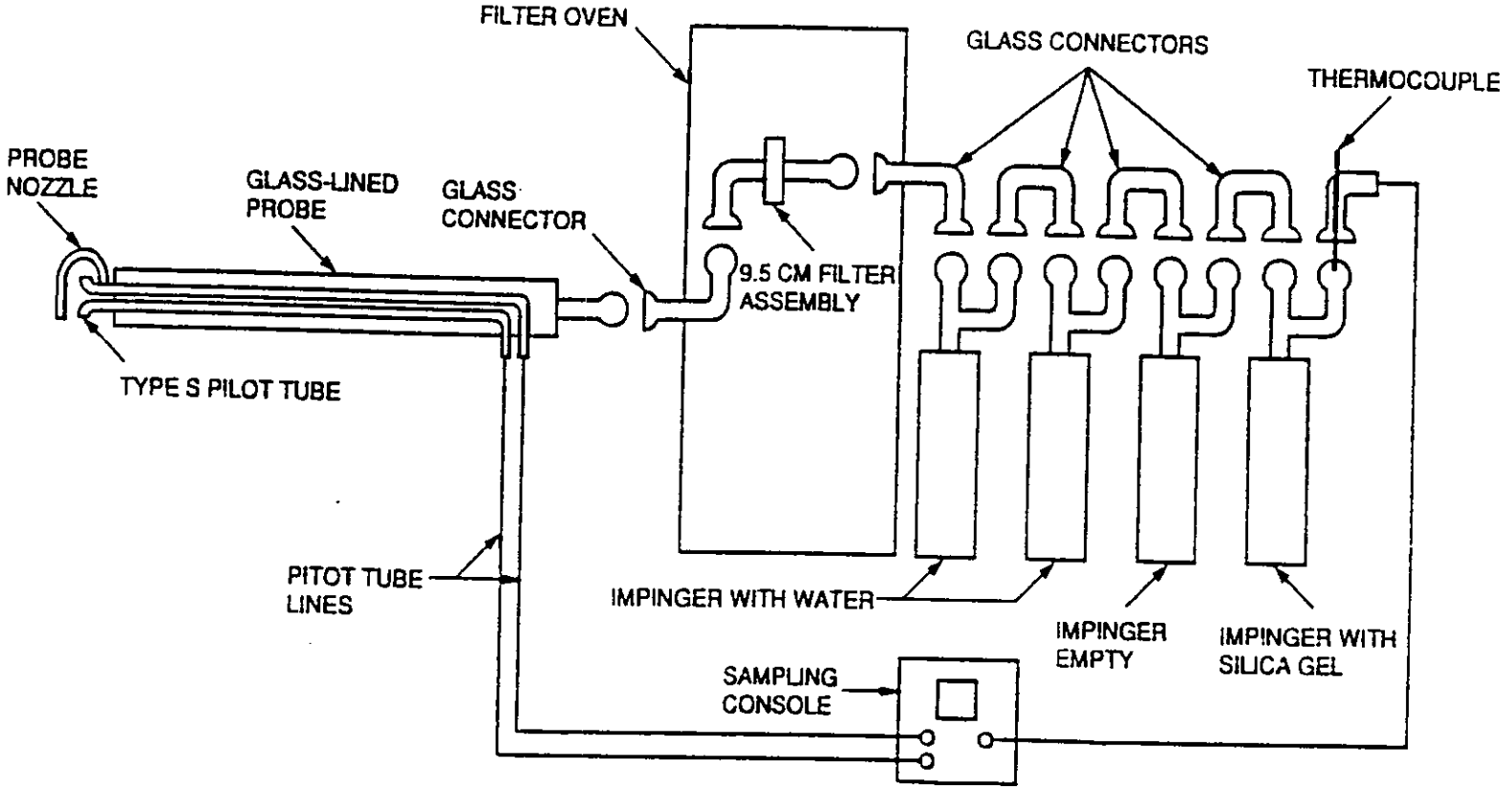
All measurement devices (TC, TC readout, nozzle, pitot, balance for weighings, dry gas meter, orifice, and magnehelic gauges) are calibrated using National Bureau of Standards (NBS) traceable or equivalent techniques. The sample is collected isokinetically at each sample point by adjusting the sample flow rate according to the stack gas velocity and temperature conditions measured at that point.

The flue gas is sampled during the test at selected discrete sample points across the stack; these sampling locations are selected per SCAQMD Method 1.1 requirements. For the purpose of this test program, sample gas will be collected at 24 traverse point locations.

3.5 SCAQMD Method 25.2, ROG Measurements

ROG exhaust gas concentrations will be determined per SCAQMD Method 25.2. A copy of this method is provided in Appendix D. For the purpose of this test program, Method 25.2 samples will be collected in duplicate for each test event. Sample gas will be withdrawn at a

Figure 3-2. Particulate sampling train, Method 5.2



constant rate and collected in a Tedlar bag. Method 25.2 samples will be collected over a one hour period at a single point within a 3 foot radius of the center of the exhaust stack.

The SCAQMD Method 25.2 samples will be analyzed via TCA/FID. The TCA/FID procedure described in Section 5 of SCAQMD Method 25.1 requires injection of an aliquot of sample gas into a gas chromatograph/flame ionization detector (GC/FID) unit, where the CO, carbon dioxide (CO_2), and methane are separated from the ROG present in the sample. The methane concentration is determined with a FID. The GC is back-flushed to recover the ROG, and the back-flush sample is subsequently oxidized and reduced to methane. The concentration of ROG (now in the form of methane) is then measured with an FID. Laboratory analyses will be performed by a certified laboratory, within 72 hours following sample collection.

3.6 SCAQMD Draft Method, Ammonia Slip Measurements

Ammonia slip samples will be collected and analyzed following SCAQMD "Draft Method 207.1, Analytical Procedures for Determining Ammonia and Ammonium Compounds from Stationary Sources." A copy of this method is provided in Appendix E. To collect the ammonia slip sample, Acurex Environmental will follow the general sampling procedures specified in SCAQMD Method 5.2, with the following exceptions:

- No heated filter or probe will be used. Instead, a teflon sampling probe will run directly from the source to the first impinger.
- Immediately following the post-test leak check, the impingers will be capped and the sample line rinsed with 0.1 N sulfuric acid. The probe wash will be added to the impinger catch and rinsate for analysis.
- Sample gas will be collected for 60 minutes at a rate of 0.5 cubic feet per minute.
- The sample will be collected from a single point in the stack, located within a 3 foot radius of the stack center point.

SECTION 4

ACUREX ENVIRONMENTAL QUALITY ASSURANCE PROCEDURES

There are several internal quality control/quality assurance (QA/QC) procedures that Acurex Environmental routinely implements to ensure accurate and representative results. These procedures are discussed briefly here, and include stringent internal QA audits and data validation requirements, rigorous sample chain of custody procedures, and the collection of adequate QA samples.

4.1 Internal QA Auditing and Data Validation Procedures

Key elements of the standard Acurex Environmental QA auditing procedures include: sample recovery and field data sheet QA audits (conducted in the field); mandatory pre- and post-test equipment calibration checks; thorough QA reviews of the reduced field data and the laboratory sample analysis reports for completeness; and finally, a QA and peer review of the draft and final source test report. Data validation procedures include calculating relevant data quality indicators such as measurement precision and accuracy, and evaluating these indicators in terms of data quality requirements specified by the applicable method.

4.2 Sample QA and Chain of Custody Procedures

The key elements of the standard Acurex Environmental chain of custody procedures are:

- Recovery of samples in an appropriate work area using sample containers appropriate to the method
- Collection of all completed field data sheets by the Field Engineer
- Sample identification using a two part sample label; each part is stamped with the same sample identification number. The large label is affixed to the sample and the small label is affixed to the field data sheet
- Completion of sample chain of custody (COC) forms, which identify the sample type,

identification number, and the required analytical procedures. The COC form accompanies the samples to the analytical laboratory, and are signed at each transfer point

- Examination of samples at each transfer point for integrity (i.e. broken seals or damaged containers)

Upon completion of the analyses, the analytical laboratory returns the COC forms with the results to Acurex Environmental. All samples are accounted for by the field engineer.

4.3 QA Samples

In addition the standard QA procedures discussed above, Acurex Environmental will include the collection of various QA samples (field and solution blanks) that are typically included in source test events of this type. For all integrated sampling methods, one field blank will be collected and analyzed for every 10 test events. A reagent blank will be collected and analyzed for each lot of chemicals used. Also, duplicate analyses will be done as appropriate to assess analytical accuracy.

APPENDIX A

PERMIT TO CONSTRUCT, APPLICATION NO. R-249463

PERMIT TO CONSTRUCT

Hunt. Bch. #2

Granted as of February 10, 1992

Legal Owner or Operator: ID 017533

SOUTHERN CALIFORNIA EDISON COMPANY
POST OFFICE BOX 800
2244 WALNUT GROVE AVENUE
ROSEMEAD, CALIFORNIA 91770
ATTN: PETER R. WELSING

Equipment Location: 21730 NEWLAND ST., HUNTINGTON BCH., CA 92646

The equipment described below and as shown on the approved plans and specifications are subject to the special condition, or conditions listed.

Equipment Description:

ALTERATION TO AN EXISTING UTILITY BOILER NO. 2, PERMIT NO. 000686, BY THE ADDITION OF AN UREA INJECTION SYSTEM CONSISTING OF:

1. TWO 7 1/2 H.P. UREA CIRCULATION PUMPS (P-101 A & P-102 B), SERVICING TWO UREA STORAGE TANKS (TK-101 A AND 101 B), 30,000 GALLON CAPACITY EACH, IN COMMON WITH UNIT 2.

2. TWO 5 H.P. WATER DILUTION PUMPS (P-104 A & P-105 C, SPARE).

3. TWO 2 H.P. UREA INJECTION PUMPS (P-107 A & P-108 C, SPARE), IN COMMON WITH UNIT 2.

4. A THREE LEVEL UREA/WATER/AIR NOZZLE SYSTEM CONSISTING OF:

   A) LOOP 1;

      a. NOZZLES A, B, C, AND D LOCATED AT AN ELEVATION OF 85'-0", FRONT WALL.

      b. NOZZLES A, B, C, AND D LOCATED AT AN ELEVATION OF 85'-0", REAR WALL.

   B) LOOP 2;

      NOZZLES A, B, C, AND D LOCATED AT AN ELEVATION OF APPROXIMATELY 95'-0", FRONT WALL.

   C) LOOP 3;

      NOZZLES A, B, C, AND D LOCATED AT AN ELEVATION OF APPROXIMATELY 107-0", FRONT WALL.

Conditions:

1. OPERATION OF THIS BOILER SHALL BE CONDUCTED IN COMPLIANCE WITH ALL DATA AND SPECIFICATIONS SUBMITTED WITH THE APPLICATION UNDER WHICH THIS PERMIT IS ISSUED UNLESS OTHERWISE NOTED BELOW.

2. THIS BOILER SHALL BE PROPERLY MAINTAINED AND KEPT IN GOOD OPERATING CONDITION AT ALL TIMES.

3. THIS BOILER SHALL FIRE NATURAL GAS ONLY, EXCEPT AS ALLOWED BY RULE 1135 WHEN FUEL OIL SHALL BE FIRED.

4. FUEL OIL SUPPLIED AT THE BURNERS OF THIS BOILER SHALL CONTAIN 0.25 PERCENT OR LESS SULFUR BY WEIGHT.

5. THE MAXIMUM EMISSION RATE OF OXIDES OF NITROGEN (NO_x) EMISSIONS, AT THE EXHAUST STACK, AVERAGED OVER ONE HOUR, SHALL NOT EXCEED 200 PPM, DRY AND CORRECTED TO 3% OXYGEN (O_2), WHEN FIRING NATURAL GAS.

   THIS NOx LIMIT IS VALID THROUGH THE ENTIRE PERMIT TO CONSTRUCT PHASE. A SUBSEQUENT LOWER NO_x LIMIT MAY BE ESTABLISHED AT THE PERMIT TO OPERATE PHASE DEPENDING ON SOURCE TESTING RESULTS.

6. THE MAXIMUM EMISSION RATE OF OXIDES OF NITROGEN (NO_x) EMISSIONS, AT THE EXHAUST STACK, AVERAGED OVER ONE HOUR, SHALL NOT EXCEED 290 PPM, DRY AND CORRECTED TO 3% OXYGEN (O_2), WHEN FIRING FUEL OIL.

   THIS NO_x LIMIT IS VALID THROUGH THE ENTIRE PERMIT TO CONSTRUCT PHASE. A SUBSEQUENT LOWER NO_x LIMIT MAY BE ESTABLISHED AT THE PERMIT TO OPERATE PHASE DEPENDING ON SOURCE TESTING RESULTS.

7. THE MAXIMUM CONCENTRATION OF CARBON MONOXIDE (CO) EMISSIONS, AT THE EXHAUST STACK, AVERAGED OVER ONE HOUR, SHALL NOT EXCEED 500 PPM, DRY AND CORRECTED TO 3% OXYGEN (O_2), FOR BOTH NATURAL GAS AND FUEL OIL FIRING.

   THIS CO LIMIT IS VALID THROUGH THE ENTIRE PERMIT TO CONSTRUCT PHASE. A SUBSEQUENT LOWER CO LIMIT MAY BE ESTABLISHED AT THE PERMIT TO OPERATE PHASE DEPENDING ON SOURCE TESTING RESULTS.

8. THE MAXIMUM CONCENTRATION OF AMMONIA (NH_3) SLIP DURING UREA INJECTION, AT THE EXHAUST STACK, SHALL NOT EXCEED 20 PPM, CORRECTED TO 3% DRY OXYGEN (O_2) AND AVERAGED OVER ONE HOUR, FOR BOTH NATURAL GAS AND FUEL OIL FIRING.

   THIS NH_3 LIMIT IS VALID THROUGH THE ENTIRE PERMIT TO CONSTRUCT PHASE. A SUBSEQUENT LOWER NH_3 LIMIT MAY BE ESTABLISHED AT THE PERMIT TO OPERATE PHASE DEPENDING ON SOURCE TESTING RESULTS.

9. THE CONCENTRATION OF UREA IN THE UREA/WATER SOLUTION INJECTED INTO THIS UTILITY BOILER SHALL CONTAIN NO MORE THAN THIRTY-FIVE (35) PERCENT UREA BY WEIGHT.

10. THE UREA/WATER SOLUTION RATE OF INJECTION INTO THIS BOILER SHALL NOT EXCEED THIRTY (30) GALLONS PER MINUTE (GPM) FOR EACH INJECTION NOZZLE.

11. THE OPERATOR OF THIS UTILITY BOILER SHALL INSTALL FLOW METERS THAT MEASURE THE UREA/WATER SOLUTION FLOW RATE IN GALLONS PER MINUTE.

12. THE OPERATOR OF THIS UTILITY BOILER SHALL MAINTAIN RECORDS OF THE CONCENTRATION OF UREA IN THE UREA/WATER SOLUTION FOR THE VARIOUS BOILER LOADS. THE MANNER OF RECORD KEEPING SHALL BE APPROVED IN WRITING BY THE DIRECTOR OF THE COMPLIANCE DIVISION. ALL RECORDS SHALL BE RETAINED FOR A PERIOD OF TWO YEARS AND BE MADE AVAILABLE TO DISTRICT PERSONNEL UPON REQUEST.

13. THE FLOW RATE OF THE UREA/WATER SOLUTION SHALL BE REGULATED ACCORDING TO THE LOAD OF THE BOILER VIA A FULLY MODULATING AUTOMATIC CONTROL SYSTEM.

14. ONCE THE INSTALLATION AND TESTING OF THE UREA INJECTION SYSTEM HAS BEEN COMPLETED, SOUTHERN CALIFORNIA EDISON (SCE) SHALL SUBMIT TO THE DISTRICT BY AUGUST 31, 1992, A FINAL REPORT CONSISTING OF THE FOLLOWING INFORMATION:

    A. A DESCRIPTION OF HOW THE UREA/WATER SOLUTION FLOW IS CONTROLLED AND REGULATED FOR VARIOUS BOILER LOADS.

    B. A QUANTITATIVE ANALYSIS OF THE EFFECT OF UREA INJECTION ON THE EMISSIONS OF CO, NO_x, NH_3, ROG, AND PARTICULATE MATTER AT VARIOUS BOILER LOADS AND UREA INJECTION CONDITIONS. THIS ANALYSIS SHALL INCLUDE SOURCE TESTS CONDUCTED UNDER THE FOLLOWING CRITERIA:

        i) SOURCE TESTING SHALL BE CONDUCTED WITHIN 60 CALENDAR DAYS AFTER NORMAL OPERATION OF THIS BOILER HAS BEEN ESTABLISHED WITH ITS ASSOCIATED UREA INJECTION SYSTEM, BUT NO LATER THAN 180 DAYS AFTER INITIAL START-UP OF THE BOILER WITH ITS ASSOCIATED UREA INJECTION SYSTEM.

ii) THE SOURCE TEST SHALL MEASURE CO., NO_x, AND O_2 BY USING DISTRICT METHOD 100.1; ROG BY USING DISTRICT METHOD 25.1; PARTICULATE MATTER BY USING DISTRICT METHOD 5.1; AND NH_3 SAMPLE EXTRACTION BY USING EPA METHOD 17 AND NH_3 ANALYSIS BY USING EPA METHOD 350.2.

iii) THE SOURCE TESTS FOR MEASURING CO, NO_x, O_2, ROG, NH_3 AND PARTICULATE MATTER SHALL BE CONDUCTED AT BOILER LOADS OF 10 MW, 50 MW, 100 MW, 150 MW, 200 MW, AND 215 MW WHEN THE UREA INJECTION SYSTEM IS IN OPERATION FOR VARIOUS UREA INJECTION CONDITIONS. THE SAMPLING TIME OF EACH LOAD SHALL BE AT A MINIMUM FOR ONE CONSECUTIVE HOUR.

iv) A SOURCE TEST PROTOCOL SHALL BE SUBMITTED TO THE ENGINEER IDENTIFIED ON THE PERMIT TO CONSTRUCT NOT LATER THAN 45 DAYS BEFORE THE PROPOSED TEST DATE AND SHALL BE APPROVED BY THE DIRECTOR OF ENGINEERING BEFORE THE SOURCE TESTS COMMENCE.

v) A TESTING LABORATORY CERTIFIED BY THE CALIFORNIA AIR RESOURCES BOARD AND IN COMPLIANCE WITH DISTRICT RULE 30 (NO CONFLICT OF INTEREST) SHALL CONDUCT THE TEST.

vi) DURING SOURCE TESTING, THE FOLLOWING DATA SHALL BE COLLECTED FOR EACH TEST LOAD OR UREA INJECTION CONDITION:

a) FUEL FLOW RATE (MMSCF/HR FOR GAS AND GAL/HR FOR OIL)

b) AIR/FUEL RATIO AT EACH LOAD.

c) FLUE GAS FLOW RATE (MMSCF/HR) AT EACH LOAD.

d) UREA INJECTION FLOW RATE (GAL/HR) AT EACH LOAD.

e) UREA CONCENTRATION (%) BY WEIGHT AT EACH LOAD

f) MOISTURE CONTENT (%) OF THE FLUE GAS AT EACH LOAD.

g) BOILER EXHAUST STACK TEMPERATURE (^{o}F) AT EACH LOAD.

h) BOILER OUTPUT (NET MW) AT EACH LOAD,

vii) THE SOURCE TEST REPORT SHALL PRESENT ALL EMISSION DATA IN UNITS OF POUNDS PER HOUR (LB/HR), AND PARTS PER MILLION (PPM), ON A DRY BASIS AT 3% OXYGEN.

C. A QUANTITATIVE ANALYSIS OF NO_x EMISSIONS BEFORE AND AFTER THE INSTALLATION OF THE UREA INJECTION SYSTEM WHILE FIRING NATURAL GAS AND FIRING FUEL OIL (IF FUEL OIL IS AVAILABLE). SUCH AN ANALYSIS SHALL COMPARE THE NO_x EMISSIONS DATA, IN PPM (DRY CORRECTED TO 3 PERCENT OXYGEN), OVER A ONE HOUR BASIS, FOR ANY SEVEN (7) DAYS OF OPERATION BEFORE AND AFTER THE INSTALLATION OF THE UREA INJECTION SYSTEM. EACH DAY OF OPERATION SHALL BE FOR A TWENTY-FOUR (24) HOUR PERIOD. THE AVERAGE UTILITY BOILER LOAD SHALL ACCOMPANY EACH NO_x DATA POINT. THE DATA SHALL BE SUBMITTED IN TABULAR FORM CONTAINED ON A 3.5" DISKETTE THAT IS FORMATTED FOR LOTUS 123.

15. THE OWNER OR OPERATOR OF THIS BOILER SHALL INSTALL, OPERATE, AND MAINTAIN IN CALIBRATION AS REQUIRED BY RULE 1135, A CONTINUOUS EMISSION MONITORING SYSTEM (CEMS) FOR NO_x AND A REMOTE TERMINAL UNIT (RTU) FOR DATA GATHERING THAT HAVE BEEN APPROVED BY THE DIRECTOR OF THE APPLIED SCIENCE AND TECHNOLOGY DIVISION TO DEMONSTRATE COMPLIANCE WITH THE DISTRICT-WIDE DAILY LIMITS AS STIPULATED IN RULE 1135.

THIS PERMIT TO CONSTRUCT R-249463 SUPERSEDES PERMIT TO CONSTRUCT 249463 ISSUED FEBRUARY 4, 1992.

Approval or denial of this application for permit to operate the above equipment will be made after an inspection to determine if the equipment has been constructed in accordance with the approved plans and specifications and if the equipment can be operated in compliance with all Rules of the South Coast Air Quality Management District.

Please notify D.W. STROUD 714/396-2526 when construction of equipment is complete.

This Permit to Construct is based on the plans, specifications, and data submitted as it pertains to the release of air contaminants and control measures or reduce air contaminants. No approval or opinion concerning safety and other factors in design, construction or operation of the equipment is expressed or implied.

PERMIT TO CONSTRUCT

This Permit to Construct shall serve as a temporary Permit to Operate provided the Executive Officer is given prior notice of such intent to operate.

This Permit to Construct will become invalid if the Permit to Operate is denied or if this application is cancelled. THIS PERMIT TO CONSTRUCT SHALL EXPIRE ONE YEAR FROM THE DATE OF ISSUANCE unless an extension is granted by the Executive Officer.

By Dorris M Bailey
DORRIS M. BAILEY
Principal Office Assistant

DMB/mb

ORIGINAL

APPENDIX A-2

SCAQMD CONDITIONAL APPROVAL MEMORANDUM

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

MEMORANDUM

DATE: August 23, 1993

TO: Ben Shaw

FROM: John Higuchi

SUBJECT: Evaluation of Source Test Protocol:

Southern California Edison
P.O. Box 800
Rosemead, CA 91770
Huntington Beach Units #1 and #2
(A/N R-249462 and R-249463)

Requested by Ben Shaw
(Memo dated August 2, 1993)

REFERENCE: District Source Test File P93104AB

The Evaluations Unit of Source Testing & Engineering has evaluated the subject source test Protocol dated July 21, 1993, for the subject equipment located at 21730 Newland Street, Huntington Beach, California.

The test protocol is "conditionally acceptable", meaning that minor modification of the existing protocol may be necessary to assure that testing is performed to District standards. The attached evaluation clarifies these modifications.

Testing may proceed with the implementation of the specified modifications. Variations from what has been thus far approved, without written consent from the District, may result in rejection of the final report.

If there are any questions, please contact Glenn Kasai at Ext. 2271.

SM:GK
P93104AB.DOC

Attachment

cc: [redacted]
Steve Marinoff

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
APPLIED SCIENCE & TECHNOLOGY
SOURCE TESTING & ENGINEERING BRANCH

PROTOCOL REVIEW

S/T I.D.: P93104AB

COMPANY: Southern California Edison
P.O. Box 800
Rosemead, CA 91770

EQUIPMENT: Huntington Beach Units #1 and #2
(A/N R-249462 and R-249463)

LOCATION: 21730 Newland Street
Huntington Beach, CA 92646

EVALUATE: NOx, CO, O_2, ROG, Ammonia, Particulate Matter

REQUESTOR: Ben Shaw/ Darren Stroud

TYPE EVAL:

☐ CEMS APPL.	☐ CEMS PROT.	☐ CEMS RPRT.
☒ PERF. PROT.	☐ PERF. RPRT.	☐ OTHER:

☐ The document indicated above has been reviewed by the Evaluations Unit staff and has been determined to contain sufficient information, as presented (see Discussion/ Remediation below for specific instructions, if any).

☒ The document indicated above has been reviewed by the Evaluations Unit staff and has been determined to contain insufficient information, or requires further explanation, in the following area(s) (see complete Discussion/Remediation below):

☐ Completeness of Application/Protocol/Report.

☒ Representativeness of Data & Process.

☒ Rule/Permit Fulfillment.

☒ Sampling & Analytical Methods.

☐ Quality Assurance

☐ Calculations.

DISCUSSION

Representativeness of Data & Process

1) Procedures and schedule for calibrating thermocouples, pressure measurement devices, pitot tubes, and gas meters shall in accordance with Chapter III of the District Source Test Manual.

2) NOx, CO, O_2, and ROG shall be sampled concurrently. Moisture content shall be measured during the gas sampling.

3) The sensitivity of the differential pressure gauge for the velocity measurement device shall conform with Section 2.1.2 of District Method 2.1.

Rule/Permit Fulfillment

1) ROG and ammonia slip measurements shall be sampled for one consecutive hour to satisfy Permit Condition 14(B)(iii), rather than for 30 minutes as proposed by the protocol.

2) ROG shall be sampled using SCAQMD Method 25.1 to satisfy Permit Condition 14(B)(ii), rather than using SCAQMD Draft Method 25.2 as proposed by the protocol. In addition to ROG, the gas sample shall be analyzed and reported for carbon dioxide, methane, and carbon monoxide as outlined by SCAQMD Method 25.1.

3) Test procedures identified in Table 2-1 of the protocol should be performed at 10 MW, 50 MW, 100 MW, 150 MW, 200 MW and 215 MW to satisfy Permit Condition 14(B)(iii).

4) In addition to the process data identified in Section 2 of the protocol, process data listed in Permit Condition 14(B)(vi) of the application shall also be included with the test results.

5) Acurex proposes to test only one unit for particulates. However, since both applications require particulate testing, a test for one of the units would not fulfill the particulate testing requirements for the other unit.

Sampling & Analytical Methods

1) Exhaust flow shall be calculated using the Flue Factor Method (District Source Test Manual, Chapter 10, Section 2). Reference point velocities shall be recorded at five minute intervals.

2) Since ammonia is present in the exhaust, a molybdenum NO_2 to NO converter will be necessary.

3) For particulate sampling using District Method 5.2, the glass fiber filter is to be maintained between 180°-200° F, rather than 248 ± 25° F as specified in the protocol.

4) Should stratification exceed 10 percent, multipoint gas sampling shall be used at every other traverse point, as required by SCAQMD Method 5.1 for particulate matter. These sampling procedures shall also extend to ROG and ammonia testing should stratified conditions exist.

General Continuous Gas Monitoring Requirements

The District requires continuous gas monitoring equipment employing sample extraction and conditioning, and electronic detection, to be conducted strictly according to District Method 100.1, with the emphasis upon representativeness, documentation, and quality assurance. This includes, in part:

1. Gas analyzers must meet minimum acceptable standards for method of detection, sensitivity, noise, precision, linearity, and interference (see TABLE 100.1-1 for details). Also, the gas sample extraction and conditioning equipment (probe, filter, pump, conditioner, connective plumbing, etc., and data acquisition and logging equipment shall meet minimum acceptable specifications, as described in Method 100.1.

2. The entire sampling system for continuous gas monitoring instruments should be leak checked before and after each test run by evacuating the system to a minimum of 20" in. Hg vacuum, and plugging for a period of five minutes. The resultant loss of vacuum can not exceed 1" Hg during this period.

3. Calibration of all analyzers must be accomplished at zero, mid span (40-60% of full scale range), and high span (80-95% of full scale range). The lowest practicable range should be selected for monitoring, so that the measured emission values are within 20-95% of the range. If a significant amount of the data are outside of this range, the data may be rejected, depending upon the application.

4. The calibration gases must be certified according to EPA Protocol Number 1, or certified to an analytical accuracy of ± 1% and be NIST traceable (except cal gases used for system bias check). Generally, if cal gases are more than 18 months old, they must be recertified (superblends, 6 months).

5. A calibration error check, and zero/span drift check must be performed before and after each test run. Calibration error must be less than ± 2% of the range of measurement for zero, mid, and high range calibration gases. Zero/span drift must be less than ± 3% of the range of measurement.

6. A system bias check must be performed before and after each test run by alternately introducing cal gases to the entire sampling system, then to the gas analyzer(s), for comparison. The difference can not exceed ± 5% of the analyzer range.

7. Semi-annual analyzer certifications consisting of linearity plot, calibration curve, response time, interference response, and NO_2 to NO converter efficiency, must be furnished with the other calibrations to satisfy Q/A documentational requirements.

8. NOx measurement must be performed in the NOx mode of the analyzer. An NO_2 to NO converter is required if NO_2 constitutes 5% or more of the total NOx in the

sample stream, or the rule or permit condition requires "NOx" monitoring. The NO_2 to NO converter must be at least 90% efficient (as demonstrated by EPA Method 20, Sect. 5.6). The converter should be high temperature (650°C) stainless steel, if no NH_3 is present. If NH_3 is present in the sample stream, then a low temperature (350°C) molybdenum catalyst must be used in the converter.

9. The connective tubing from the probe to the sample conditioner must be heated above the dewpoint and the dewpoint reported. The sample conditioner must be able to maintain a dewpoint temperature below 35° F. A particulate filter, as described by District Method 100.1, shall also be installed.

10. Data recorder resolution must be at least 0.5% of the range of measurement. A data point for each contaminant/diluent monitored must be recorded at least once/minute. Analog chart recorders must have a minimum 10-inch chart width.

11. All facets of testing must be continuously recorded. This includes the 3-point calibration, system bias, calibration error, and zero/span drift checks, which must precede and conclude each test run.

12. All chart traces, or digital printouts, must be included in the final report and must be clearly identified as to:

-location/source	-range changes
-operator initials	-range of measurement
-date/running times	-calibrations
-actual test interval	-cal gas concentration/cyl. no.
-contaminant/diluent	-range of calibration

When more than one gas trace is shown on a chart, the individual traces must be distinguishable by color coding or some other means (original charts may be submitted, and returned following evaluation). If a gas measurement range has been "offset" from zero, or zero has been "transposed to the right side of the recorder chart, it must be clearly identified.

13. Gaseous measurements must be conducted a minimum of 60 continuous minutes at each load or specified condition, after the readings have stabilized.

Final Test Report

The final Source Test Report must include the following data:

1. A summary of the Source Test results, including applicable rules and permit conditions (show allowable standards) and source test data computed so as to satisfy these requirements.

2. A brief process description. Indicate equipment operation during testing; as well as any other information which may influence the final report.

3. A simple schematic diagram of the process, showing the sampling location, with respect to the upstream and downstream flow disturbances. Also include a cross-sectional diagram of the stack or duct at the sampling location, depicting the sampling points with respect to compass direction.

4. The sampling and analytical procedures. Be specific about all aspects of sampling and analysis. Include diagrams of test equipment and methods.

5. Complete raw field data, including production data indicative of the testing interval, lab analyses, and the test results (show all calculations).

6. Calibration data regarding all sampling and measuring equipment utilized during testing (see District Source Testing Manual, Chapter III or "Quality Assurance Handbook For Air Pollution Measurement Systems", Vol. III, U.S. EPA-600/4-77-0276).

7. A detailed chain-of-custody sheet containing all pertinent test equipment documentation from lab to field and back to the lab, including any change of hand in between.

REMEDIATION

Testing may proceed as described in the protocol with the implementation of the measures discussed in this evaluation.

The above measures must be implemented in the test protocol prior to testing.

Modifications to the approved protocol, without written consent from the District, may result in rejection of the final report.

EVALUATOR: Glenn Kasai EXT: 2271 DATE: August 23, 1993

P93104AB.DOC

APPENDIX A-3

COMMUNICATION MEMO DATED NOVEMBER 16, 1993

TELEPHONE CONFERENCE RECORD

TIME: 10:30 AM | DATE: 11/16/93

PROJECT: HUNTINGTON BEACH UNITS 1&2 UREA COMPLIANCE TESTING

SUBJECT: SOURCE TEST DETAILS

CONFEREES SCE: MIKE ESCARCEGA

TELEPHONE AGENCY: DARREN STROUD (SCAQMD)

CONFERENCE HIGHLIGHTS

SUMMARY

ALTHOUGH PTC. #'S R-249462 & R-249463 REQUIRE SOURCE TESTING AT 10, 50, 100, 150, 200 & 215 MW'S AND PARTICULATE TESTING ON BOTH UNITS 1&2, MR. STROUD AGREED THAT TESTING AT LOW, MID & FULL LOAD ON BOTH UNITS AND PARTICULATE TESTING ON ONE UNIT ONLY, WOULD BE ACCEPTABLE. ALSO, THE LOW LOAD CONDITION SHALL BE DEFINED AS THE LOAD WHERE UREA INJECTION IS FIRST PUT INTO SERVICE.

ADDITIONAL COMMENTS

ACTION REQUIRED

CC: D.R. WELSING
DARREN STROUD

PREPARED BY: Michael D. Escarcega | FAX

(818)302-4032

SCE 64-305 NEW 3/78

APPENDIX A-4

COMMUNICATION MEMO DATED DECEMBER 2, 1993

TELEPHONE CONFERENCE RECORD

TIME: 8:30 AM | DATE: 12/2/93

PROJECT: HUNTINGTON BEACH UNITS 1&2 UREA COMPLIANCE TESTING

SUBJECT: SOURCE TEST DETAILS

CONFEREES SCE: MIKE ESCARCEGA

TELEPHONE AGENCY: GLEN KASAI (SCAQMD)

CONFERENCE HIGHLIGHTS

SUMMARY

THE BELOW ITEMS WERE DISCUSSED & AGREED TO:

1) ROG - METHOD 25.1 TANKS & TRAPS DO NOT NEED TO BE ANALYZED WITHIN 72 HOURS BUT, SHOULD BE ANALYZED WITHIN 1-2 WEEKS.

2) ONLY ONE (1-HR) ROG TEST IN PARALLEL WITH TWO SETS OF TANKS & TRAPS NEED BE PERFORMED @ EACH TEST CONDITION.

3) ONLY ONE (1-HR) NH_3 SLIP TEST NEED BE PERFORMED AT EACH TEST CONDITION WITH UREA IN-SERVICE.

4) THE ROG, NH_3 TESTS SHALL BE CONCURRENT WITH THE ONE-HOUR CEM GASEOUS TEST RUN.

5) EXHAUST FLOW MEASUREMENTS SHALL ALSO BE CONCURRENT WITH ONE-HOUR CEM, ROG, NH_3 TEST RUNS. H_2O SHALL BE SAMPLED FOR ONE-HOUR. IF VELOCITY MEASUREMENTS DO NOT SPAN THE ONE-HOUR TEST RUN, FLUE FACTOR METHOD REFERENCE POINT VELOCITIES AT 15 MINUTE INTERVALS FOR THE REMAINDER OF THE HOUR SHALL BE RECORDED

ADDITIONAL COMMENTS

ACTION REQUIRED

CC: P.R. WELSING
GLENN KASAI

PREPARED BY: Michael D. Escarcega | FAX

(818) 302-4032

SCE 60-906 NEW 3/78

APPENDIX B

RECORDS OF BOILER OPERATING PARAMETERS

SCE ENVIRONMENTAL ENGINEERING

Test Description: UREA COMPLIANCE
Unit: HUNTINGTON BEACH GS #2
Data By: STAFFORD PEASE

Date	m/d/yr	3/9/95		3/9/95		3/9/95		3/9/95		
Test No.		1		1		2		2		
Time	hrs	0140		0210		0340	0355	0410	0425	
Load	MW	110		110		110		110		
Aux. Power	MW	6		6		6		6		
BOOS		14, 17, 19	-24 →	—	—	—	—	—	—	→
Steam Flow	Klbs/hr	6160		6160		665		665		
Feedwater Flow	Klbs/hr	6-10		690		690		690		
SH Temp E/W	deg F	1050/1050		1060/1060		1055/1060		1060/1058		
RH Temp E/W	deg F	1000/1000		1000/1000		1000/1000		1000/1000		
Total Fuel Flow	%	H1		H1		H2		H2		
Air Flow	%	H5		H5		H5		H5		
O2 E/W	%	3.3/2.4		3.4/2.4		3.4/2.4		3.4/2.4		
FD Fans E/W	amps	61/62		60/62		60/65		60/63		
FGR Fans E/W	amps	208/222		208/221		208/220		208/220		
APH Out Temp E/W	deg F	230/205		230/205		230/200		230/200		
Urea System	On/Off	OFF	off	off	off	ON	ON	ON	ON	
Urea Concentration	%	↓	↓	↓	↓	23	23	23	23	
Urea Loop/Mode		↓	↓	↓	↓	3/3	3/3	3/3	3/3	
Urea Flow	GPH	↓	↓	↓	↓	30	30	30.6	30.6	
H2O Flow	GPH	↓	↓	↓	↓	348	354	348	348	
H2O Pressure	PSI	↓	↓	↓	↓	28.9	28.5	27.7	28.8	
KVB CEM Data										
Reference Time	hrs	0145	0200	0215	0230	0345	0400	0415	0430	
Load	MW	110	110	110	110	110	110	110	110	
Fuel Flow	KSCFH	1117.9	1120.6	1121.2	1120.8	1131.7	1137.6	1133.0	1136.2	
Stack Flow	KSCFM	253.7	254.7	255.1	254.6	257.9	258.9	258.0	259.1	
O2	%	6.86	6.89	6.90	6.89	6.92	6.90	6.91	6.93	
NOx raw	ppm	49.8	50.0	50.2	50.3	39.1	39.3	39.1	39.3	
NOx corr.	ppm	63.4	63.9	64.2	64.3	50.1	50.2	50.0	50.4	
NOx	lbs/hr	90	91	92	92	72	72	72	73	

SCE ENVIRONMENTAL ENGINEERING

Test Description: UREA COMPLIANCE
Unit: HUNTINGTON BEACH GS #2
Data By: STAFFORD PEASE

Date	m/d/yr	3/9/95		3/9/95		3/9/95		3/9/95		
Test No.		3		3		4		4		
Time	hrs	0915		0945		1000		1030		
Load	MW	215		215		215		215		
Aux. Power	MW	9.9		10		10		10		
BOOS		14, 17, 19-24								
Steam Flow	Klbs/hr	1360		1360		1360		1360		
Feedwater Flow	Klbs/hr	1480		1480		1490		1490		
SH Temp E/W	deg F	1060/1060		1060/1060		1060/1060		1060/1060		
RH Temp E/W	deg F	1000/990		1000/990		1000/990		1000/990		
Total Fuel Flow	%	83		83		83		83		
Air Flow	%	87		87		88		88		
O2 E/W	%	3.1/2.7		3.1/2.7		3.3/2.8		3.3/2.8		
FD Fans E/W	amps	160/163		155/160		160/160		160/163		
FGR Fans E/W	amps	175/150		185/150		190/148		185/150		
APH Out Temp E/W	deg F	277/240		277/240		280/242		280/242		
Urea System	On/Off	off	off	off	off	ON	ON	ON	ON	
Urea Concentration	%	↓	↓	↓	↓	23	23	23	23	
Urea Loop/Mode						3/3	3/3	3/3	3/3	
Urea Flow	GPH					99.6	99.6	99.6	99.6	
H2O Flow	GPH					186	186	186	180	
H2O Pressure	PSI					17.0	17.1	17.3	16.6	
KVB CEM Data										
Reference Time	hrs	0815	0830	0845	0900	1000	1015	1030	1045	
Load	MW	215	215	215	215	215	215	215	215	
Fuel Flow	KSCFH	2146.3	2145.3	2148.9	2146.0	2142.9	2144.1	2142.1	2142.2	
Stack Flow	KSCFM	4185.1	4183.7	4185.2	4184.6	4186.5	4186.9	4186.4	4188.9	
O2	%	6.81	6.77	6.79	6.79	6.87	6.87	6.87	6.94	
NOx raw	ppm	82.3	81.3	81.4	81.8	70.9	70.7	70.7	71.3	
NOx co	ppm	104.6	103	103.3	103.7	90.4	90.2	90.2	91.3	
NOx	lbs/hr	2810	282	283	281	247	247	246	250	

SCE ENVIRONMENTAL ENGINEERING

Test Description: UREA COMPLIANCE
Unit: HUNTINGTON BEACH GS #2
Data By: STAFFORD PEASE

Date	m/d/yr	3/11/95	→	→	→					
Test No.		5-Strat	→	→	→					
Time	hrs	0530	0600	0630	0700					
Load	MW	70	70	70	70					
Aux. Power	MW	5.3	5.3	5.3	5.5					
BOOS		14,17,19-24	→	→	→					
Steam Flow	Klbs/hr	440	440	440	440					
Feedwater Flow	Klbs/hr	450	450	450	450					
SH Temp E|W	deg F	1060|1050	1060|1050	1060|1050	1060|1050					
RH Temp E|W	deg F	1000|990	1000|990	1000|990	1000|990					
Total Fuel Flow	%	27	27	27	27					
Air Flow	%	30	30	30	30					
O2 E|W	%	2.7|2.0	2.6|1.9	2.7|1.9	2.7|2.0					
FD Fans E|W	amps	52|55	52|55	52|55	52|55					
FGR Fans E|W	amps	222|232	222|232	222|232	220|230					
APH Out Temp E|W	deg F	205|205	205|205	203|203	205|205					
Urea System	On/Off	Off	Off	Off	Off					
Urea Concentration	%	↓	↓	↓	↓					
Urea Loop/Mode		↓	↓	↓	↓					
Urea Flow	GPH	↓	↓	↓	↓					
H2O Flow	GPH	↓	↓	↓	↓					
H2O Pressure	PSI	↓	↓	↓	↓					
KVB CEM Data										
Reference Time	hrs	0530	0600	0630	0700					
Load	MW	70	70	70	70					
Fuel Flow	KSCFH	766.7	772.2	764.2	775.6					
Stack Flow	KSCFM	172.2	171.9	171.6	173.0					
O2	%	6.72	6.54	6.62	6.62					
NOx raw	ppm	35.0	34.2	35.0	35.6					
NOx corr.	ppm	44.2	42.6	43.8	44.6					
NOx	lbs/hr	43	42	43	44					

SCE ENVIRONMENTAL ENGINEERING

Test Description: UREA COMPLIANCE
Unit: HUNTINGTON BEACH GS #2
Data By: STAFFORD PEASE

Date	m/d/yr	3/11/95		3/11/95		3/11/95		3/11/95		
Test No.		6-Base		—		7-Urea		—		
Time	hrs	0800		0830		0935		1005		
Load	MW	70		70		70		70		
Aux. Power	MW	5.5		5.5		5.5		5.5		
BOOS		11, 17, 19-24		—		—		—	→	
Steam Flow	Klbs/hr	440		440		440		440		
Feedwater Flow	Klbs/hr	450		450		450		450		
SH Temp E/W	deg F	1060/1050		1060/1050		1060/1050		1060/1050		
RH Temp E/W	deg F	1000/990		1000/990		1000/990		1000/990		
Total Fuel Flow	%	27		27		27		27		
Air Flow	%	30		30		30		30		
O2 E/W	%	2.7/1.9		2.7/2.0		2.7/2.0		2.8/2.0		
FD Fans E/W	amps	52/54		52/54		52/55		52/55		
FGR Fans E/W	amps	219/232		220/230		222/230		225/230		
APH Out Temp E/W	deg F	200/200		200/205		200/205		205/205		
Urea System	On/Off	OFF	OFF	OFF	OFF	ON	ON	ON	ON	
Urea Concentration	%	↓	↓	↓	↓	23	23	23	23	
Urea Loop/Mode		↓	↓	↓	↓	3/3	3/3	3/3	3/3	
Urea Flow	GPH	↓	↓	↓	↓	18.0	18.0	18.0	18.0	
H2O Flow	GPH	↓	↓	↓	↓	180	180	180	180	
H2O Pressure	PSI	↓	↓	↓	↓	29.3	29.2	28.5	28.7	
KVB CEM Data										
Reference Time	hrs	0815	0830	0845	0900	0945	1000	1015	1030	
Load	MW	70	70	70	70	70	70	70	70	
Fuel Flow	KSCFH	768.6	770.3	772.3	770.8	767.1	770.8	775.9	774.7	
Stack Flow	KSCFM	171.7	172.0	172.1	172.0	171.9	172.7	173.6	173.2	
O2	%	6.64	6.63	6.60	6.62	6.68	6.68	6.66	6.65	
NOx raw	ppm	25.8	35.8	35.8	35.8	28.8	29.2	29.4	29.5	
NOx c	ppm	45.0	44.9	44.9	44.9	36.3	36.8	36.9	37.0	
NOx	lbs/hr	44	44	44	44	35	36	37	37	

APPENDIX C

RECORDS SUPPORTING SCAQMD METHOD 100.1 MEASUREMENTS

APPENDIX C-1

CALIBRATION GAS CERTIFICATION SHEETS

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

REPORT OF ANALYSIS
NIST TRACEABLE GAS MIXTURES

ACUR01
TO: CHAD GARRETTSON
ACUREX
4879 E LA PALMA AVE
STE 201
ANAHEIM, CA 92807-

DATE: 02/19/93

CUSTOMER ORDER NUMBER: EV40239Z

PAGE 1

CYLINDER NUMBER	COMPONENT	CONCENTRATION(v/v)	NIST TRACEABLE REFERENCE STANDARD
CC66796	Oxygen Nitrogen	17.04 ± 0.17 % Balance	SRM 2659
CC51254	Oxygen Nitrogen	9.14 ± 0.09 % Balance	SRM 2658a
CC28267	Oxygen Nitrogen	4.20 ± 0.04 % Balance	SRM 2658a

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: M.S. Calhoun

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

[illegible] CHEMICALS, INC.
[illegible] WEST [illegible] STREET
LONG BEACH, CA [illegible]
([illegible]) [illegible]
TELEPHONE [illegible]

DATE: [illegible]
TIME: [illegible]
PAGE: 1

CERTIFICATE OF ANALYSIS

ACCUREX ENVIRONMENTAL CORP
ONE TECHNOLOGY DRIVE SUITE [illegible]
IRVINE CA [illegible]

CUSTOMER ACCOUNT : [illegible]
CUSTOMER ORDER NO : [illegible]
[illegible]
ORDER DETAIL SEQ : 1

REMARKS : GAS MIXTURE(S) LISTED BELOW ARE TRACEABLE TO NIST CLASS S WEIGHTS AND/OR NIST GAS MIXTURE STANDARD REFERENCE MATERIALS (SRM's) - REFERENCE APCI SGD FIELD DIRECTIVE BOOK I PART 4-3.

PRIMARY GAS MIXTURE : OXYGEN IN NITROGEN

BATCH NO.	ANALYSIS DATE	SAR CODE	CYLINDER NO	COMPONENT REQUESTED	CONCENTRATION REQUESTED	ANALYTICAL RESULT	UNIT OF MEASURE
14[illegible]	[illegible]/94	[illegible]	[illegible]	OXYGEN	4.5	4.50	MOLAR %
				Nitrogen		Balance	

CERTIFICATION

THIS ANALYSIS HAS BEEN PERFORMED UTILIZING APPROVED ANALYTICAL METHOD(S) AND IS CORRECT TO WITHIN THE ANALYTICAL ACCURACIES OF THIS (THESE) METHOD(S).

AUTHORIZED SIGNATURE

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

REPORT OF ANALYSIS
NIST TRACEABLE GAS MIXTURES

ACUR01
TO: CHAD GARRETTSON
ACUREX
4879 E LA PALMA AVE
SUITE 201
ANAHEIM, CA 92807-

DATE: 02/19/93

CUSTOMER ORDER NUMBER: EV40239Z

PAGE 1

CYLINDER NUMBER	COMPONENT	CONCENTRATION(v/v)	NIST TRACEABLE REFERENCE STANDARD
CC28992	Carbon Dioxide Nitrogen	17.75 ± 0.18 % Balance	SRM 1675b
CC60241	Carbon Dioxide Nitrogen	9.89 ± 0.10 % Balance	SRM 1675b

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: _____ Approved: _____
M.S. Calhoun J.T. Marrin

AIR PRODUCTS AND CHEMICALS, INC.
901 WEST 12TH STREET
LONG BEACH, CA 90813
(310) 437-0461
TELEPHONE (800) 350-0461

DATE: 12/21/93
TIME: 17:38
PAGE: 1

CERTIFICATE OF ANALYSIS

ACCUREX ENVIRONMENTAL CORP
ONE TECHNOLOGY DRIVE SUITE F213
IRVINE CA 92718

CUSTOMER ACCOUNT : T5819
CUSTOMER ORDER NO :
ORDER NO : 235-053976
ORDER DETAIL SEQ : 1

REMARKS : GAS MIXTURE(S) LISTED BELOW ARE TRACEABLE TO NIST CLASS S WEIGHTS AND/OR NIST GAS MIXTURE STANDARD REFERENCE MATERIALS (SRM's) - REFERENCE APCI SGD FIELD DIRECTIVE BOOK I PART A-3.

PRIMARY GAS MIXTURE : CARBON MONOXIDE IN NITROGEN

BATCH NO	ANALYSIS DATE	BAR CODE	CYLINDER NO	COMPONENT REQUESTED	CONCENTRATION REQUESTED	ANALYTICAL RESULT	UNIT OF MEASURE
12295	12/20/93	B0N829	SG860091NB	CARBON MONOXIDE	250	250	MOLAR PPM
				Nitrogen		BALANCE	

CERTIFICATION

THIS ANALYSIS HAS BEEN PERFORMED UTILIZING APPROVED ANALYTICAL METHOD(S) AND IS CORRECT TO WITHIN THE ANALYTICAL ACCURACIES OF THIS (THESE) METHOD(S).

Eileen Black Rodriguez
AUTHORIZED SIGNATURE

[illegible] PRODUCTS & CHEMICALS, INC. [illegible]

DATE: [illegible]
TIME: [illegible]
PAGE: [illegible]

* CERTIFICATE OF ANALYSIS *

[illegible] ENVIRONMENTAL CORP
[illegible] TECHNOLOGY DRIVE SUITE [illegible]
[illegible]

CUSTOMER ACCOUNT : [illegible]
CUSTOMER ORDER NO : [illegible]
ORDER NO : [illegible]
ORDER DETAIL SEQ : [illegible]
SHIPPER NUMBER : [illegible]

EPA [illegible] GAS MIXTURE(S) LISTED BELOW ARE TRACEABLE TO NIST CLASS S WEIGHTS AND OR NIST GAS MIXTURE STANDARD REFERENCE MATERIALS (SRM'S) - REFERENCE EPA [illegible] FIELD DIRECTIVE BOOK [illegible] PART A-3.

[illegible] GAS MIXTURE : CARBON MONOXIDE IN NITROGEN

ANALYSIS LINE	DATE	GAS TIME	CYLINDER NO	COMPONENT REQUESTED	CONCENTRATION REQUESTED	ANALYTICAL RESULT	UNIT OF MEASURE
[illegible]	[illegible]	[illegible]	[illegible]	CARBON MONOXIDE	45[illegible]	45[illegible]	[illegible] PPM
				Nitrogen		BALANCE	

CERTIFICATION

THIS ANALYSIS HAS BEEN PERFORMED UTILIZING APPROVED ANALYTICAL METHOD(S) AND IS CORRECT TO WITHIN THE ANALYTICAL ACCURACIES OF THIS (THESE) METHOD(S).

Eileen Black Rodriguez

AUTHORIZED SIGNATURE

LIQUID AIR

AN AIR LIQUIDE GROUP COMPANY

CERTIFICATE OF ANALYSIS

Date: 13 August 1993

Customer: ACUREX CORP.

Document No.: 1466944

P.O. No.: N/A

Serial No.: CC-79007

Lot No: 6581

Part No.: N/A

Primary Standard

COMPONENT	REQUESTED	ACTUAL
NITRIC OXIDE	50 PPM	48.4 PPM
TOTAL NOx		48.4 PPM
NITROGEN	BALANCE	BALANCE

Expiration Date: 13 August 1994

Authorized Signature: _____

Chemist

Composition established through use of a precision, high-load balance, pre-analyzed high purity raw materials. Stringent Quality Control is performed to guarantee that this product conforms with stated specifications.

Liquid Air Division, 2445 South Street, P.O. Box 5548 • Long Beach, CA 90805 • Phone: (310) 492-5300 • Fax: (310) 492-5349

Scott Specialty Gases, Inc.

2600 CAJON BOULEVARD, SAN BERNARDINO, CA 92411 (909) 887-2571 FAX: (909) 887-0540

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS RECERTIFICATION

Customer
ACUREX CORPORATION
CHAD GARRETSON
4879 E LA PALMA AVE
SUITE 201
ANAHEIM CA 92807

Assay Laboratory
Scott Specialty Gases
2600 Cajon Boulevard
San Bernardino, CA 92411

Purchase Order NV30371SC
Scott Project # 0227883#002

ANALYTICAL INFORMATION

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

Cylinder Number AAL5362
Cylinder Pressure 950PSIG
Certification Date 10-05-93
Previous Certification Dates 12-30-91
Acid Rain Exp. General Exp. 10-05-95

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
NITRIC OXIDE	**91.87PPM**	**±1% NIST Traceable**

Balance Gas: Nitrogen

NOX	**92.18PPM**

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

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
GMIS	09-94	ALM33883	99.20PPM

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
TECO / 10AR-38644-258	07-26-93	Chemi-Luminescent

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

Components: NITRIC OXIDE

Previous Certification

Date: 12-30-91	Response Units: mv	
Z1=	R1=	T1=
R2=	Z2=	T2=
Z3=	T3=	R3=
Avg. Conc. of Cust Cyl.	91.42PPM	

Third Triad Analysis

Date: 10-05-93	Response Units: mv	
Z1= 0.00	R1= 96.6	T1= 89.2
R2= 96.6	Z2= 0.00	T2= 89.2
Z3= 0.00	T3= 89.2	R3= 96.6
Avg. Conc. of Cust Cyl.	91.87PPM	

Calibration Curve

Concentration= Ax + B
A =1.026289
B =0.328756

Date:	Response Units:	
Z1=	R1=	T1=
R2=	Z2=	T2=
Z3=	T3=	R3=
Avg. Conc. of Cust Cyl.		

Date:	Response Units:	
Z1=	R1=	T1=
R2=	Z2=	T2=
Z3=	T3=	R3=
Avg. Conc. of Cust Cyl.		

Concentration=

Date:	Response Units:	
Z1=	R1=	T1=
R2=	Z2=	T2=
Z3=	T3=	R3=
Avg. Conc. of Cust Cyl.		

Date:	Response Units:	
Z1=	R1=	T1=
R2=	Z2=	T2=
Z3=	T3=	R3=
Avg. Conc. of Cust Cyl.		

Concentration=

SPECIAL NOTES: IF THIS PRODUCT IS USED FOR ACID RAIN COMPLIANCE, THE ACID RAIN DATE NOTED ABOVE APPLIES PER 40 CFT PART 75, APPENDIX H. OTHERWISE THE GENERAL EXPIRATION DATE APLLIES.

Analyst

Scott Specialty Gases, Inc.

2600 CAJON BOULEVARD, SAN BERNARDINO, CA 92411 (909) 887-2571 FAX: (909) 887-0549

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS RECERTIFICATION

Customer
ACUREX CORPORATION
CHAD GARRETSON
4879 E LA PALMA AVE
SUITE 201
ANAHEIM CA 92807

Assay Laboratory
Scott Specialty Gases
2600 Cajon Boulevard
San Bernardino, CA 92411

Purchase Order NV30371SC
Scott Project # 0227883#002

ANALYTICAL INFORMATION

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

Cylinder Number AAL5362
Cylinder Pressure 950PSIG
Certification Date 10-05-93
Previous Certification Dates 12-30-91
Acid Rain Exp.
General Exp.10-05-95

ANALYZED CYLINDER

Components	Certified Concentration	Analytical Uncertainty*
NITRIC OXIDE	91.87PPM	±1% NIST Traceable

Balance Gas: Nitrogen
NOX 92.18PPM

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

REFERENCE STANDARD

Type	Expiration Date	Cylinder Number	Concentration
GMIS	09-94	ALM33883	99.20PPM

INSTRUMENTATION

Instrument/Model/Serial #	Last Date Calibrated	Analytical Principle
TECO (10AR-38644-258	07-26-93	Chemi-Luminescent

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

Components: NITRIC OXIDE

Previous Certification

Date:12-30-91 Response Units:mv
Z1= R1= T1=
R2= Z2= T2=
Z3= T3= R3=
Avg. Conc. of Cust Cyl. 91.42PPM

Date: Response Units:
Z1= R1= T1=
R2= Z2= T2=
Z3= T3= R3=
Avg. Conc. of Cust Cyl.

Date: Response Units:
Z1= R1= T1=
R2= Z2= T2=
Z3= T3= R3=
Avg. Conc. of Cust Cyl.

Third Triad Analysis

Date:10-05-93 Response Units:mv
Z1= 0.00 R1= 96.6 T1= 89.2
R2= 96.6 Z2= 0.00 T2= 89.2
Z3= 0.00 T3= 89.2 R3= 96.6
Avg. Conc. of Cust Cyl. 91.87PPM

Date: Response Units:
Z1= R1= T1=
R2= Z2= T2=
Z3= T3= R3=
Avg. Conc. of Cust Cyl.

Date: Response Units:
Z1= R1= T1=
R2= Z2= T2=
Z3= T3= R3=
Avg. Conc. of Cust Cyl.

Calibration Curve

Concentration= Ax + B
A =1.026289
B =0.328756

Concentration=

Concentration=

SPECIAL NOTES: IF THIS PRODUCT IS USED FOR ACID RAIN COMPLIANCE, THE ACID RAIN DATE NOTED ABOVE APPLIES PER 40 CFT PART 75, APPENDIX H. OTHERWISE THE GENERAL EXPIRATION DATE APLLIES.

S. King
Analyst

APPENDIX C-2

FIELD TEST DATA SHEETS

TEST VAN DATA SHEET

DATE 3/9/95 PLANT SCE HBGS OPERATOR D. Urry

LOCATION Unit 2 TEST CONDITION

B.P. = 30.01

Time Start/Stop	NH_3 Slip (ppm)	Strip Chart measurements						COMMENTS	
		O_2 (%)	CO_2 (%)	CO (ppm)	CO @3%O_2 (ppm)	NO_x (ppm)	NO_x @3%O_2 (ppm)		
0140/0240	—	7.1	7.6	115	149	51	66	110 MW - Baseline	TEST 1
0240/0440		7.1	7.7	120	156	39	51	110 MW - UREA Inj	TEST 2
0815/0945		6.8	7.9	90	124	82	113	215 MW - Baseline	TEST 3
1000/1100		6.95	7.9	65	83	70.5	90.5	215 MW - UREA INJ.	TEST 4

CEM CALIBRATION SHEET

DATE 3/9/05

PLANT SCE HBGS

LOCATION Unit 2

TEST NUMBER 110 MW - Baseline TEST 1

OPERATOR D. Urry

Constituent	Actual Gas Concentration			Instrument Range	Percent-of-Range	
	High	Mid	Low		High	Low
O_2(%)	9.14	4.50		0-10%		
CO_2(%)	17.75	9.89		0-20%		
CO(ppm)	451	250		0-500ppm		
NO_x(ppm)	92.18	48.4		0-100ppm		
HC(ppm)						
SO_2(ppm)						

	Concentration	Data Logger Measurements (line)						Strip Chart Measurements (divisions)						COMMENTS
		O_2	CO_2	CO	NO_x	SO_2	HC	O_2	CO_2	CO	NO_x	SO_2	HC	
Pre-Test	High	0100	0100	0100	0100			93.5	93.4	94.9	94.8			leak check
	Mid	0104	0104	0104	0104			47.3	53.3	55.1	50.6			1.5 " Hg @ 20"
	Low													in 5 min
	Zero	0056	0056	0056	0056			3.4	5.0	5.0	2.0			
	Zero Bias	0113	0113	0113	0113			2.5	4.9	5.0	2.5			
	Calib. Bias	0117	0121	0122	0126			46.8	52.3	54.3	50.7			
Post-Test	High	0250	0250	0250	0250			93.2	93.9	95.0	96.2			leak check
	Mid	0247	0247	0247	0247			47.0	53.8	55.1	52.3			0.9 " Hg @ 20"
	Low													
	Zero	0244	0244	0244	0244			2.6	5.0	5.0	2.0			
	Zero Bias	0255	0255	0255	0255			2.9	5.3	5.0	2.8			
	Calib. Bias	0258	0301	0304	0357			46.9	53.0	54.0	51.6			

CEM CALIBRATION SHEET

DATE 3/9/95

PLANT SCE HBGS

LOCATION Unit 2

TEST NUMBER 2 110MW - UREA

OPERATOR D. Urry

Constituent	Actual Gas Concentration			Instrument Range	Percent-of-Range	
	High	Mid	Low		High	Low
O_2(%)	9.14	4.50		0-10%		
CO_2(%)	17.75	9.89		0-20%		
CO(ppm)	451	250		0-500ppm		
NO_x(ppm)	92.18	48.4		0-100ppm		
HC(ppm)						
SO_2(ppm)						

	Concentration	Data Logger Measurements (time)						Strip Chart Measurements (divisions)						COMMENTS
		O_2	CO_2	CO	NO_x	SO_2	HC	O_2	CO_2	CO	NO_x	SO_2	HC	
Pre-Test	High	0250	0250	0250	0250			93.2	97.9	95.0	96.2			leak ✓
	Mid	0247	0247	0247	0247			47.0	53.8	55.1	52.3			0.9% CO_2 @ 20%
	Low													
	Zero	0244	0244	0244	0244			2.6	5.0	5.0	2.0			
	Zero Bias	0255	0255	0255	0255			2.9	5.3	5.0	2.8			
	Calib. Bais	0258	0301	0304	0307			46.9	53.0	54.0	51.6			
Post-Test	High	0452	0452	0452	0452			93.0	94.1	94.9	97.1			leak ✓ - OK
	Mid	0448	0448	0448	0448			46.7	54.1	55.0	52.9			
	Low													
	Zero	0445	0445	0445	0445			2.6	5.2	5.0	2.0			
	Zero Bias	0458	0458	0458	0458			2.9	5.6	5.0	2.3			
	Calib. Bias	0501	0504	0506	0508			46.7	53.0	54.0	52.0			

CEM CALIBRATION SHEET

DATE 3/9/95

PLANT SCE HBGS

LOCATION Unit 2

TEST NUMBER TEST3 FULLLOAD - Baseline

OPERATOR D. Urry

Constituent	Actual Gas Concentration			Instrument Range	Percent-of-Range	
	High	Mid	Low		High	Low
O_2(%)	9.14	4.5		0-10%		
CO_2(%)	17.75	9.89		0-20%		
CO(ppm)	451	250		0-500ppm		
NO_x(ppm)	92.18	48.4		0-100ppm		
HC(ppm)						
SO_2(ppm)						

	Concentration	Data Logger Measurements (time)						Strip Chart Measurements (divisions)						COMMENTS
		O_2	CO_2	CO	NO_x	SO_2	HC	O_2	CO_2	CO	NO_x	SO_2	HC	
Pre-Test	High	0740	0740	0740	0740			93.0	94.5	94.8	93.5			Leak ✓-
	Mid	0743	0743	0743	0743			47.2	54.2	55.0	51.0			1"@ 20" Hg
	Low													
	Zero	0736	0736	0736	0736			2.6	5.0	4.9	2.0			
	Zero Bias	0748	0748	0748	0748			2.7	5.5	5.0	2.6			
	Calib. Bias	0751	0754	0757	0800			46.5	53.3	54.0	93.0			
Post-Test	High	0923	0923	0923	0923			93.2	94.8	94.7	94.0			Leak - OK
	Mid	0926	0926	0926	0926			47.2	54.7	55.1	51.2			
	Low													
	Zero	0920	0920	0920	0920			2.5	5.5	5.0	2.0			
	Zero Bias	0932	0932	0932	0932			2.6	5.5	5.0	2.7			
	Calib. Bias	0935	0937	0939	0942			46.5	53.8	54.0	93.4			

CEM CALIBRATION SHEET

DATE 3/9/95

PLANT SCE HBG-5

LOCATION UNIT 2

TEST NUMBER 4 FULL LOAD - UREA

OPERATOR D. Urry

Constituent	Actual Gas Concentration			Instrument Range	Percent-of-Range	
	High	Mid	Low		High	Low
O_2(%)	9.14	4.5		0-10%		
CO_2(%)	17.75	9.89		0-20%		
CO(ppm)	451	250		0-500ppm		
NO_x(ppm)	92.18	48.4		0-100ppm		
HC(ppm)						
SO_2(ppm)						

	Concentration	Data Logger Measurements (time)						Strip Chart Measurements (divisions)						COMMENTS
		O_2	CO_2	CO	NO_x	SO_2	HC	O_2	CO_2	CO	NO_x	SO_2	HC	
Pre-Test	High	0923	0923	0923	0923			93.2	94.8	94.7	94.0			Leak check-OK
	Mid	0926	0926	0926	0926			47.2	54.7	55.1	51.2			
	Low													
	Zero	0920	0920	0920	0920			2.5	5.5	5.0	2.0			
	Zero Bias	0932	0932	0932	0932			2.6	5.5	5.0	2.7			
	Calib. Bias	0935	0937	0939	0942			46.5	53.8	54.0	93.4			
Post-Test	High	1142	1142	1142	1142			94.3	94.4	94.6	92.7			
	Mid	1139	1139	1139	1139			47.2	54.1	55.0	50.3			
	Low													
	Zero	1136	1136	1136	1136			2.5	5.1	5.0	2.1			
	Zero Bias	1147	1147	1147	1147			2.7	5.6	4.9	2.8			
	Calib. Bias	1150	1153	1150	1200			47.1	53.4	54.1	92.0			

TEST VAN DATA SHEET

DATE 3/11/95 PLANT SCE HBGS OPERATOR D. Urry

LOCATION Unit 2 TEST CONDITION 70 65 MW

B.P. = 29.80

Time Start/Stop	NH_3 Slip (ppm)	Strip Chart measurements						COMMENTS
		O_2 (%)	CO_2 (%)	CO (ppm)	CO @3%O_2 (ppm)	NO_x (ppm)	NO_x @3%O_2 (ppm)	
0800/0900		7.15	7.7	140	182	34.5 ~~35.6~~	44.9	65MW - Baseline
0935/1035		7.1	7.8	180	156	28.0	36.3	65MW - UREA INJECTION

TEST VAN DATA SHEET

DATE 3/11/95 PLANT SCE HBGS OPERATOR D. Clary

LOCATION Unit 2 TEST CONDITION 70 65 MW - STRATIFICATION

Time Start/Stop	NH_3 Slip (ppm)	Strip Chart measurements						COMMENTS
		O_2 (%)	CO_2 (%)	CO (ppm)	CO @3%O_2 (ppm)	NO_x (ppm)	NO_x @3%O_2 (ppm)	
0533 -						33.5		PORT C CENTER
0536 -						34.0		P1
0539 -						34.2		P2
0542 -						33.3		P3
0545 -						34.0		P4
0548 -						34.0		CENTER
0557 -						34.0		Port A CENTER
0601 -						33.5		P1
0604 -						34.0		P2
0607 -						34.3		P3
0610 -						34.0		P4
0614 -						34.8		CENTER
0625 -						34.1		PORT D CENTER
0628 -						34.2		P1
0631 -						34.2		P2
0634 -						35.0		P3
0638 -						34.6		P4
0642 -						36.6		CENTER

TEST VAN DATA SHEET

DATE 3/11/95 PLANT SCE HBGS OPERATOR D. Urry

LOCATION Unit 2 TEST CONDITION ~~65~~ 70 MW - STRATIFICATION - CONT.

Time Start/Stop	NH_3 Slip (ppm)	Strip Chart measurements						COMMENTS
		O_2 (%)	CO_2 (%)	CO (ppm)	CO @3%O_2 (ppm)	NO_x (ppm)	NO_x @3%O_2 (ppm)	
0650 -						34.0		Port B CENTER
0653 -						34.5		P1
0658 -						34.0		P2
0701 -						35.4		P3
0704 -						35.4		P4
0707 -						35.0		Port B CENTER

CEM CALIBRATION SHEET

DATE 3/11/95

PLANT SCE HBGS U2

LOCATION Unit 2

TEST NUMBER ~~65~~ 70 MW - STRATIFICATION

OPERATOR D. Urry

Constituent	Actual Gas Concentration			Instrument Range	Percent-of-Range	
	High	Mid	Low		High	Low
O_2(%)	9.14	4.50		0-10 %		
CO_2(%)	17.75	9.89		0-20 %		
CO(ppm)	451	250		0-500 ppm		
NO_x(ppm)	92.18	48.4		0-100 ppm		
HC(ppm)						
SO_2(ppm)						

	Concentration	Data Logger Measurements (time)						Strip Chart Measurements (divisions)						COMMENTS
		O_2	CO_2	CO	NO_x	SO_2	HC	O_2	CO_2	CO	NO_x	SO_2	HC	
Pre-Test	High	0434	0434	0434	0434			92.4	93.8	95.0	96.5			leak check
	Mid	0438	0438	0438	0438			47.2	54.0	55.2	52.6			0.5 lbs @ 2.4
	Low													
	Zero	0430	0430	0430	0430			2.5	5.0	5.0	2.0			
	Zero Bias	0444	0444	0444	0444			2.7	5.3	5.0	2.6			
	Calib. Bais	0448	0450	0452	0455			92.8	53.0	54.0	51.0			
Post-Test	High	0721	0721	0721	0721			93.0	94.2	95.0	96.3			leak ck - OK
	Mid	0718	0718	0718	0718			46.8	54.2	55.4	52.7			
	Low													
	Zero	0715	0715	0715	0715			2.4	5.1	5.0	2.0			
	Zero Bias	0735	0735	0735	0735			3.0	5.3	5.0	2.2			
	Calib. Bias	0739	0741	0743	0746			93.0	52.7	54.3	51.6			

CEM CALIBRATION SHEET

DATE 3/11/95

PLANT SCE HBGS

LOCATION Unit 2

TEST NUMBER ~~65~~ 70 MW Baseline

OPERATOR D. Urry

Constituent	Actual Gas Concentration			Instrument Range	Percent-of-Range	
	High	Mid	Low		High	Low
O_2(%)	9.14	4.50		0-10%		
CO_2(%)	17.75	9.85		0-20%		
CO(ppm)	451	250		0-500ppm		
NO_x(ppm)	92.18	48.4		0-100ppm		
HC(ppm)						
SO_2(ppm)						

	Concentration	Data Logger Measurements (time)						Strip Chart Measurements (divisions)						COMMENTS
		O_2	CO_2	CO	NO_x	SO_2	HC	O_2	CO_2	CO	NO_x	SO_2	HC	
Pre-Test	High	0721	0721	0721	0721			93.0	94.2	95.0	96.3			Leak ✓ - OK
	Mid	0718	0718	0718	0718			46.8	54.2	55.4	52.7			
	Low													
	Zero	0715	0715	0715	0715			2.4	5.1	5.0	2.0			
	Zero Bias	0735	0735	0735	0735			3.6	5.3	5.0	2.2			
	Calib. Bais	0739	0741	0743	0746			93.0	52.7	54.3	51.6			
Post-Test	High	0910	0910	0910	0910			93.0	94.4	95.0	96.0			Leak ✓ - OK
	Mid	0907	0907	0907	0907			46.8	54.3	55.2	52.2			
	Low													
	Zero	0904	0904	0904	0904			2.5	5.1	5.0	2.0			
	Zero Bias	0915	0915	0915	0915			2.5	5.5	5.0	2.4			
	Calib. Bias	0918	0920	0924	0922			92.1	53.8	54.1	51.0			

DATE SCE HBGS

PLANT 3/11/95

LOCATION Unit 2

TEST NUMBER 70 65MW UREA INJ

OPERATOR D. Urry

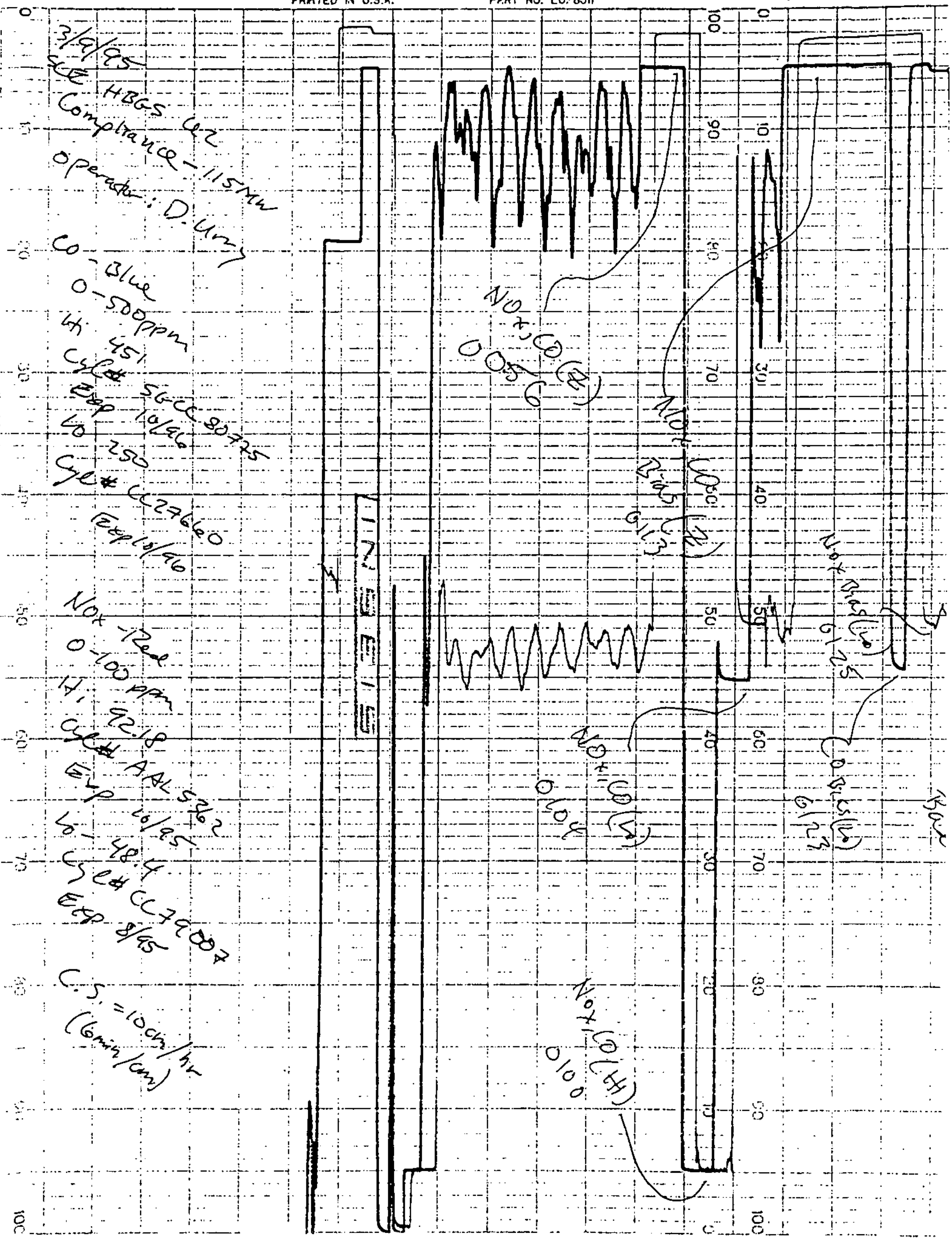
Constituent	Actual Gas Concentration			Instrument Range	Percent-of-Range	
	High	Mid	Low		High	Low
O_2(%)	9.14	4.50		0-10%		
CO_2(%)	17.75	9.89		0-20%		
CO(ppm)	451	250		0-500ppm		
NO_x(ppm)	92.18	48.4		0-100ppm		
HC(ppm)						
SO_2(ppm)						

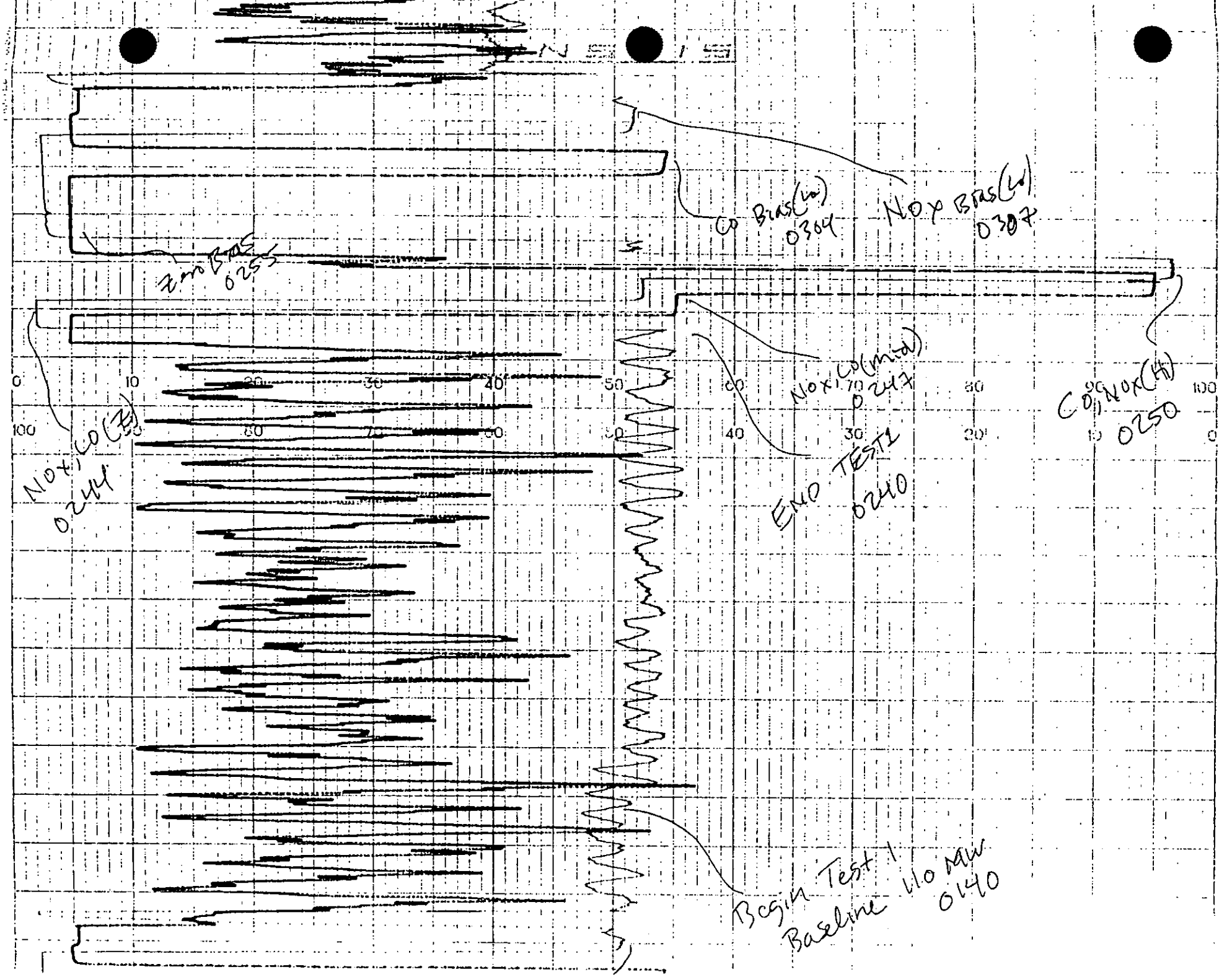
	Concentration	Data Logger Measurements (time)						Strip Chart Measurements (divisions)						COMMENTS
		O_2	CO_2	CO	NO_x	SO_2	HC	O_2	CO_2	CO	NO_x	SO_2	HC	
Pre-Test	High	0910	0910	0910	0910			93.0	94.4	95.0	96.0			leak ✓ - OK
	Mid	0907	0907	0907	0907			46.8	54.3	55.2	52.2			
	Low													
	Zero	0904	0904	0904	0904			2.5	5.1	5.0	2.0			
	Zero Bias	0915	0915	0915	0915			2.5	5.5	5.0	2.4			
	Calib. Bais	0918	0918	0918	0918			92.1	53.8	54.1	51.0			
Post-Test	High	1045	1045	1045	1045			93.3	93.8	95.0	95.5			leak ✓ - OK
	Mid	1042	1042	1042	1042			47.0	53.8	55.3	52.1			
	Low													
	Zero	1039	1039	1039	1039			2.5	4.9	5.1	2.0			
	Zero Bias	1049	1049	1049	1049			2.9	5.1	5.0	2.3			
	Calib. Bias	1053	1055	1058	1100			93.0	53.0	54.2	51.2			

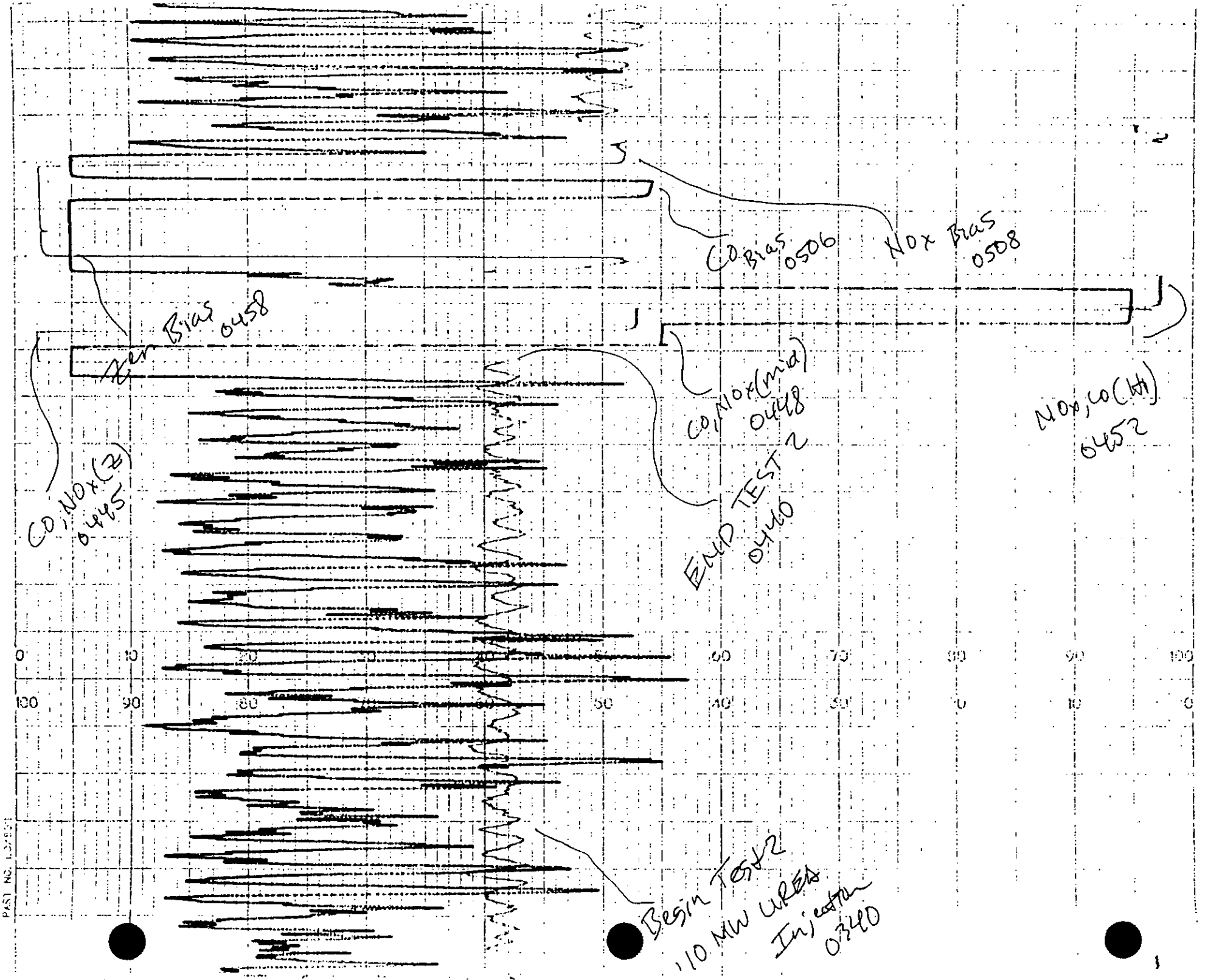
APPENDIX C-3

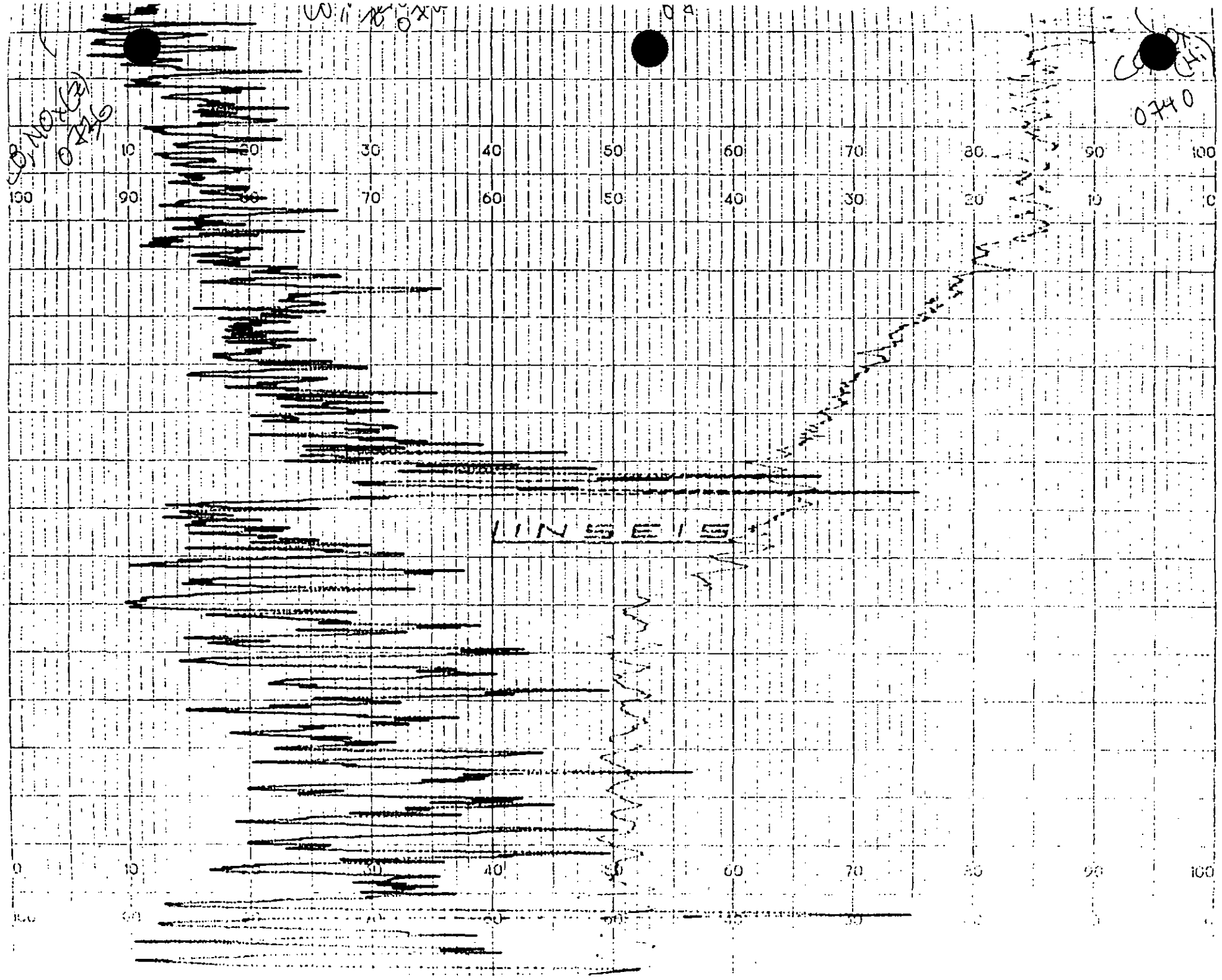
STRIP CHART RECORDS

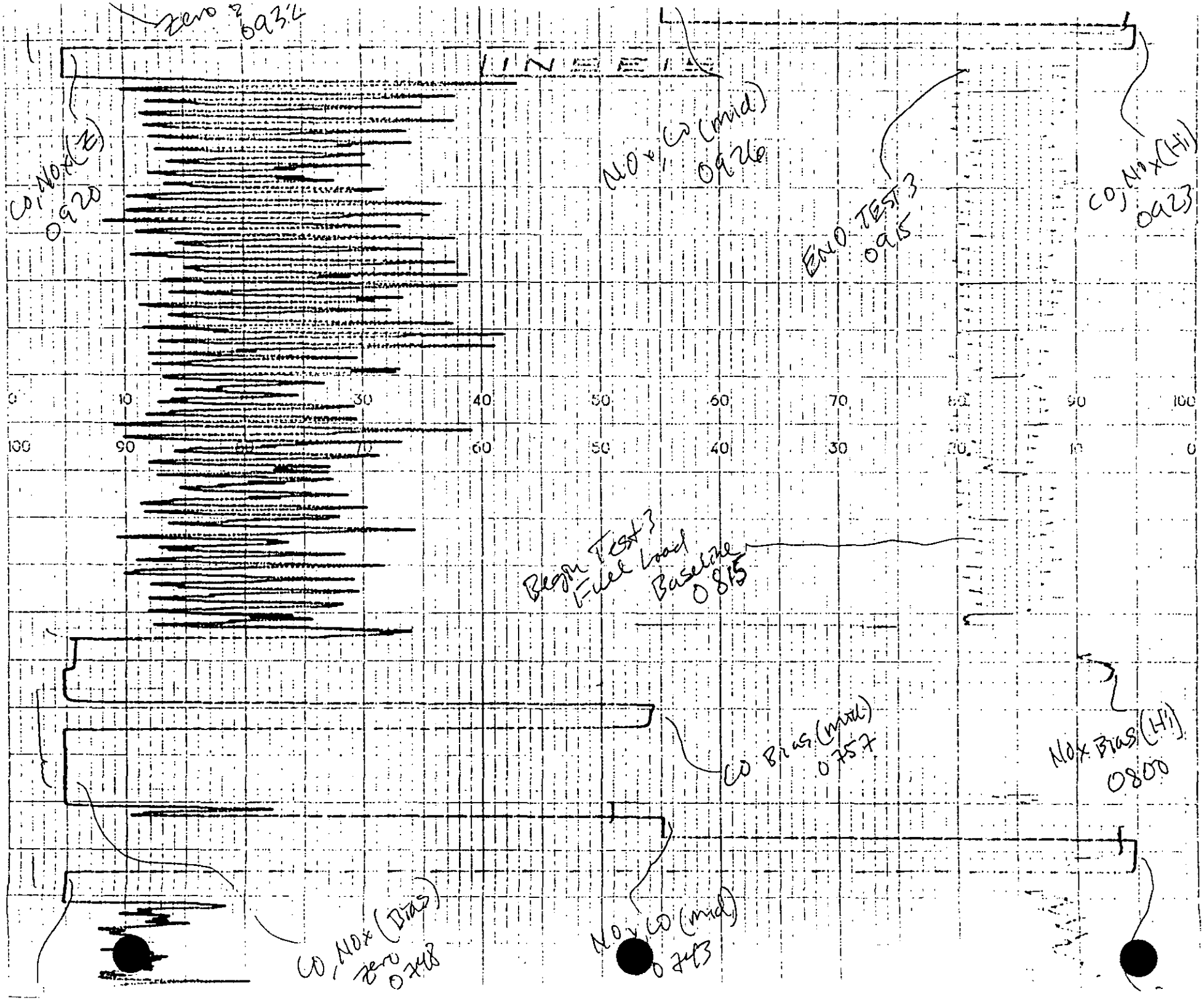
PRINTED IN U.S.A. PART NO. LO/6011

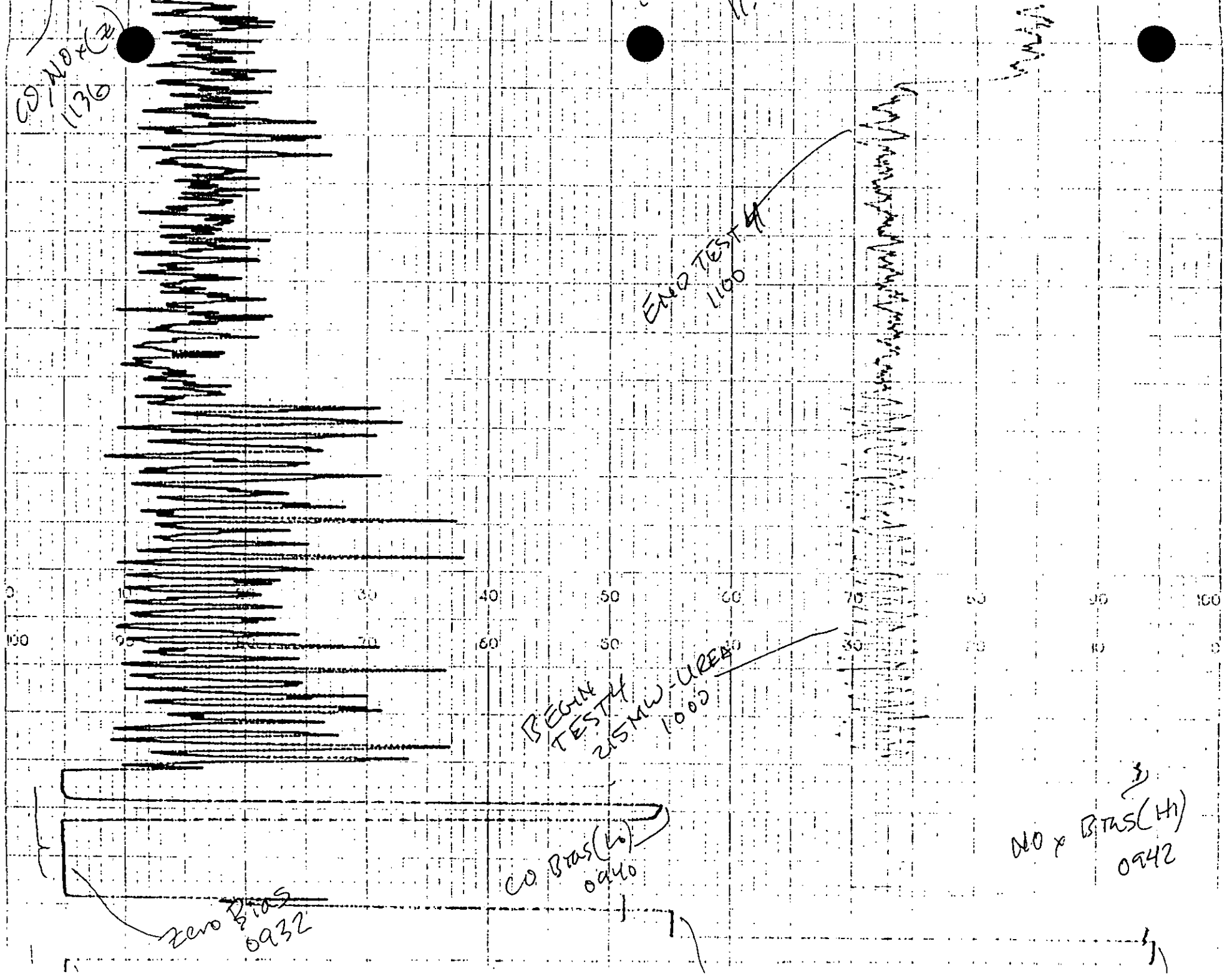


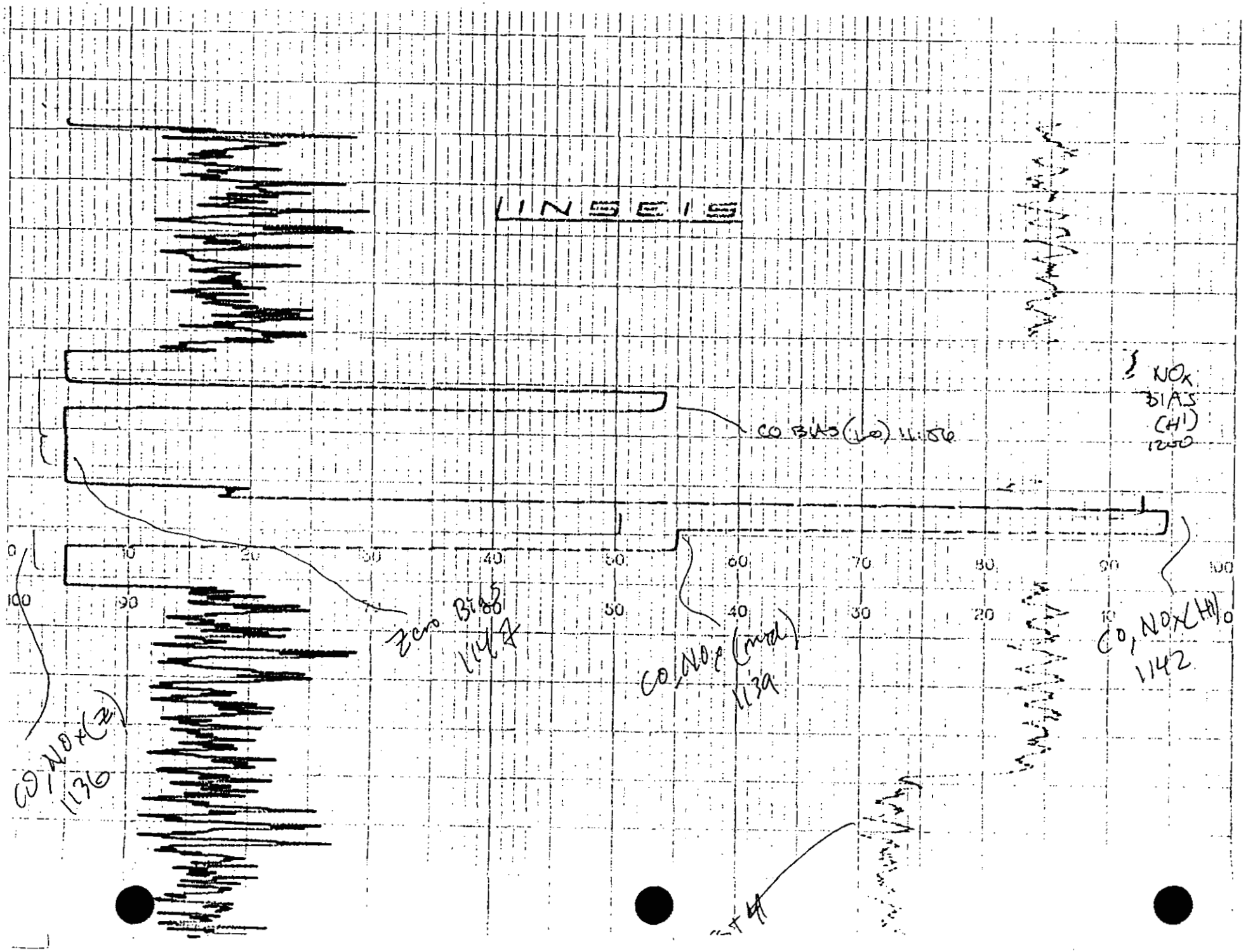

Zero Bias 0255
CO Bias(Lo) 0304
NOx Bias(Lo) 0307
NOx LO(Hi) 0244
NOx LO(mid) 0247
END TEST 0240
CO, NOx(Hi) 0250
Begin Test / Baseline 110 MW 0140

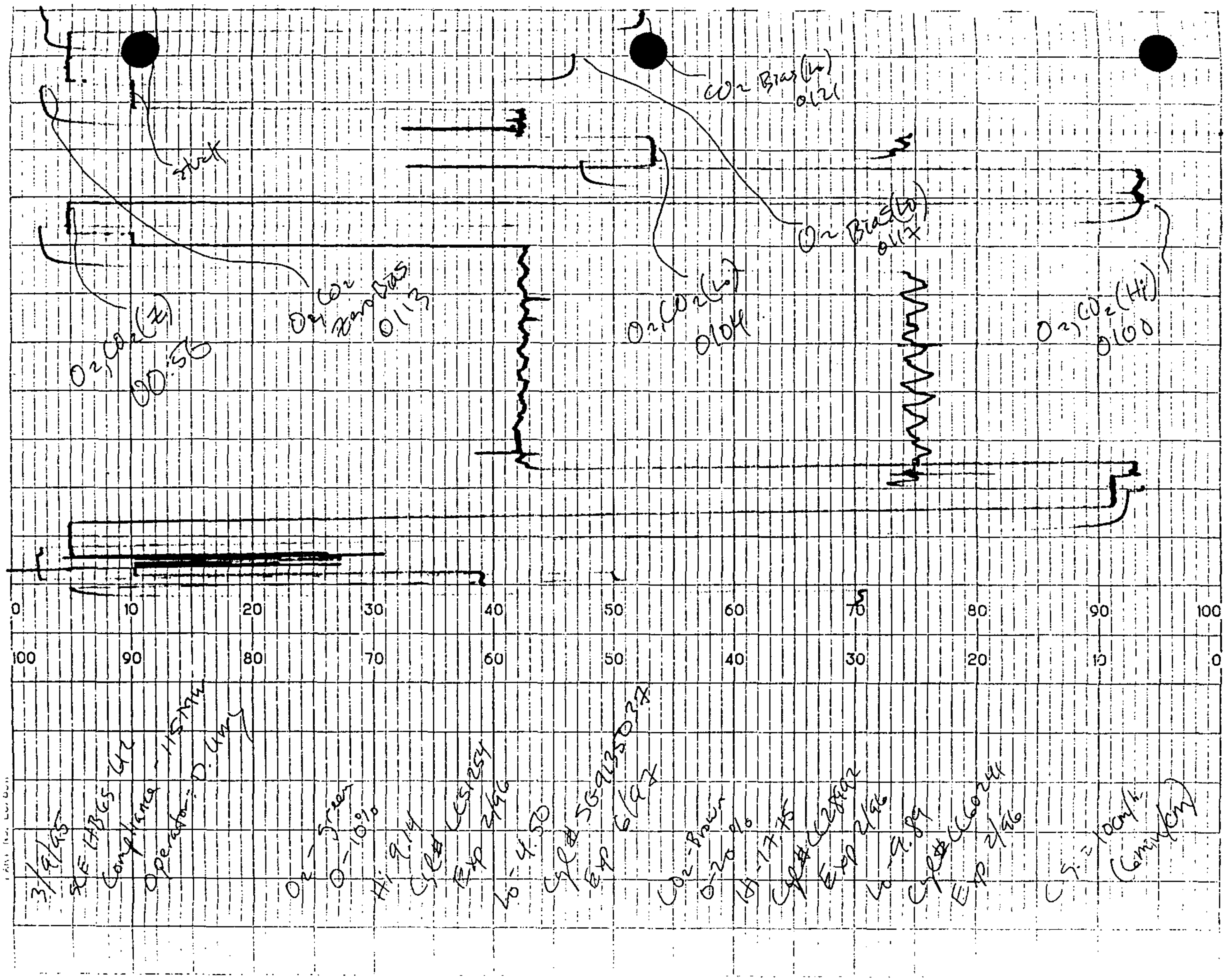

CO Bias 0506
NOx Bias 0508
Xer Bias 0458
CO, NOx(mid) 0448
END TEST 2 0440
NOx, CO(lt) 0452
CO, NOx(rt) 0445
Begin TEST 2 110 MW URES Injection 0340
0
10
20
30
40
50
60
70
80
90
100
100
90
80
50
40
30
0
10
0

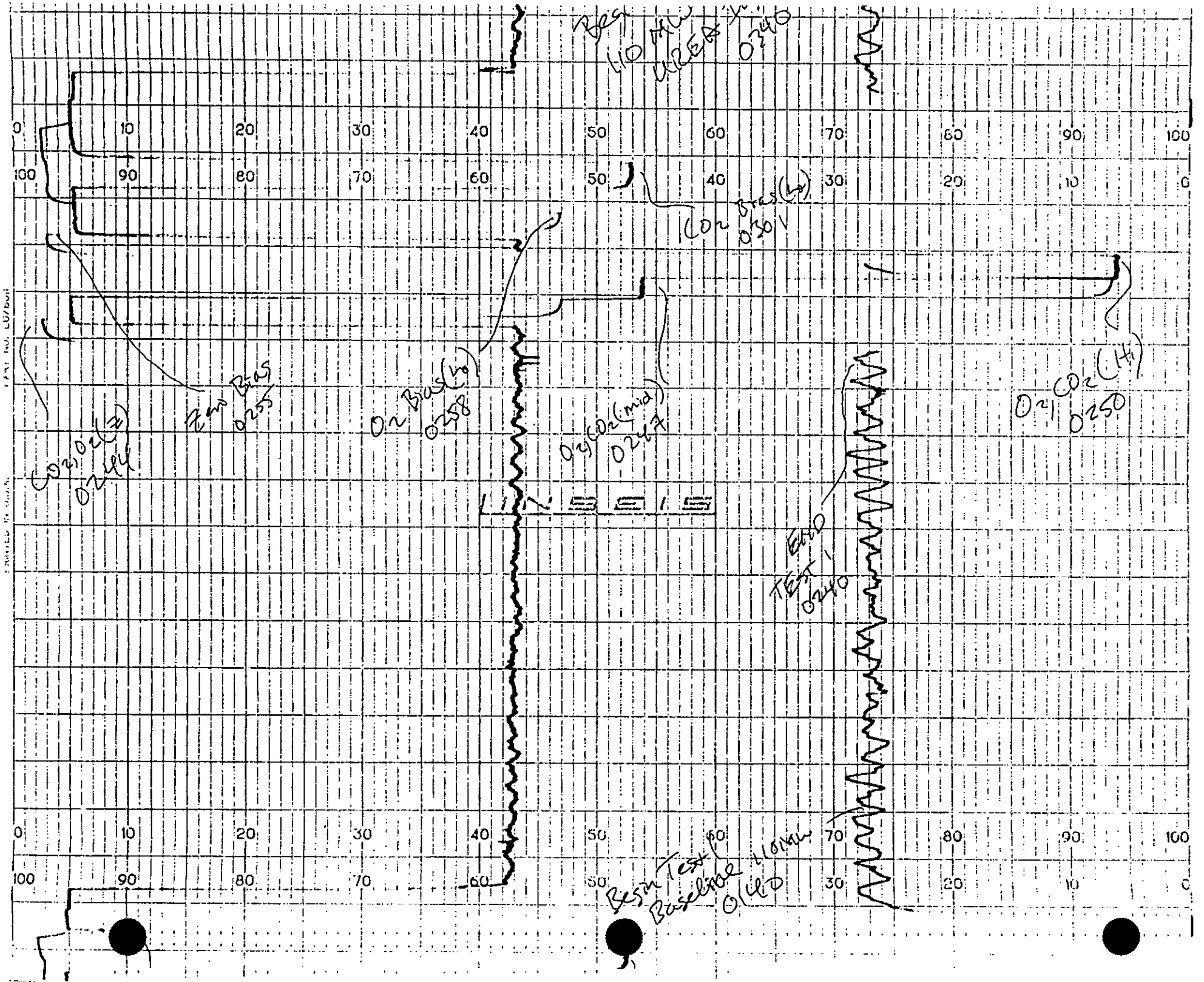

0740
10
20
30
40
50
60
70
80
90
100
LINSEIS


Zero @ 0934
INLET
CO, NOx (H) 0920
NOx, CO (mid) 0926
ENG. TEST 3 0915
CO, NOx (Hi) 0923
0 10 30 40 50 60 70 80 90 100
100 90 60 50 40 30 20 10 0
Begin Test 3 Full Load Baseline 0815
CO Bias (mid) 0757
NOx Bias (Hi) 0800
CO, NOx (Bias) Zero 0748
NOx, CO (mid) 0743


CO NOx (H)
1136
END TEST #1
1100
BEGIN TEST #1
25 MW-UREA
1005
CO BIAS (L)
0940
NO x BIAS (H)
0942
ZERO BIAS
0932


LINSEIS
CO BIAS (LO) 11:56
NOx BIAS (HI) 1200
ZERO BIAS 1147
CO, NOx (mid) 1139
CO, NOx (HI) 1142
CO, NOx (Z) 1136
0
10
20
30
40
50
60
70
80
90
100


3/9/95
SCE HB65 U2
Compliance - 115MW
Operator: D. Way
O2 - Green
0-10%
Hi: 9.14
Cyl# CC51254
Exp 2/96
Lo: 4.50
Cyl# SG9135037X
Exp 6/97
CO2 - Brown
0-20%
Hi: 17.75
Cyl# CC28802
Exp 2/96
Lo: 9.89
Cyl# CC60244
Exp 2/96
CS = 10cm/hr
(6 min/cm)
start
O2, CO2 (Z)
00:56
O2, CO2 Zero Bias
01:13
O2, CO2 (Lo)
01:04
O2 Bias (Lo)
01:17
CO2 Bias (Hi)
01:21
O2, CO2 (Hi)
01:00
0
10
20
30
40
50
60
70
80
90
100
100
90
80
70
60
50
40
30
20
10
0


0 10 20 30 40 50 60 70 80 90 100
100 90 80 70 60 50 40 30 20 10 0
CO2 Bias(L)
0255
O2 Bias(L)
0258
O2 CO2(mid)
0247
CO2 Bias(H)
0251
O2 CO2(H)
0250
CO2 O2(L)
0244
END TEST
0240
Begin Test Baseline
0240

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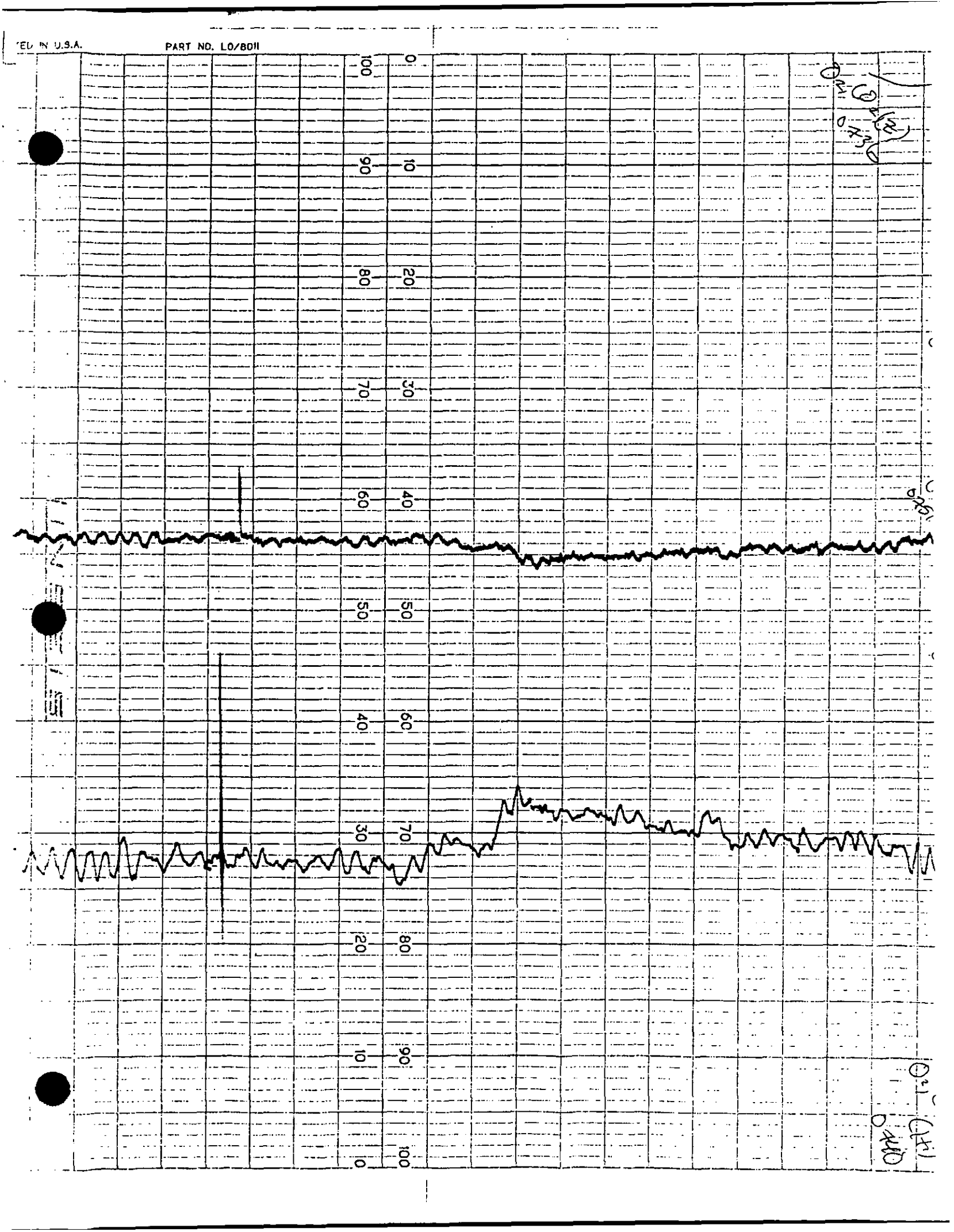
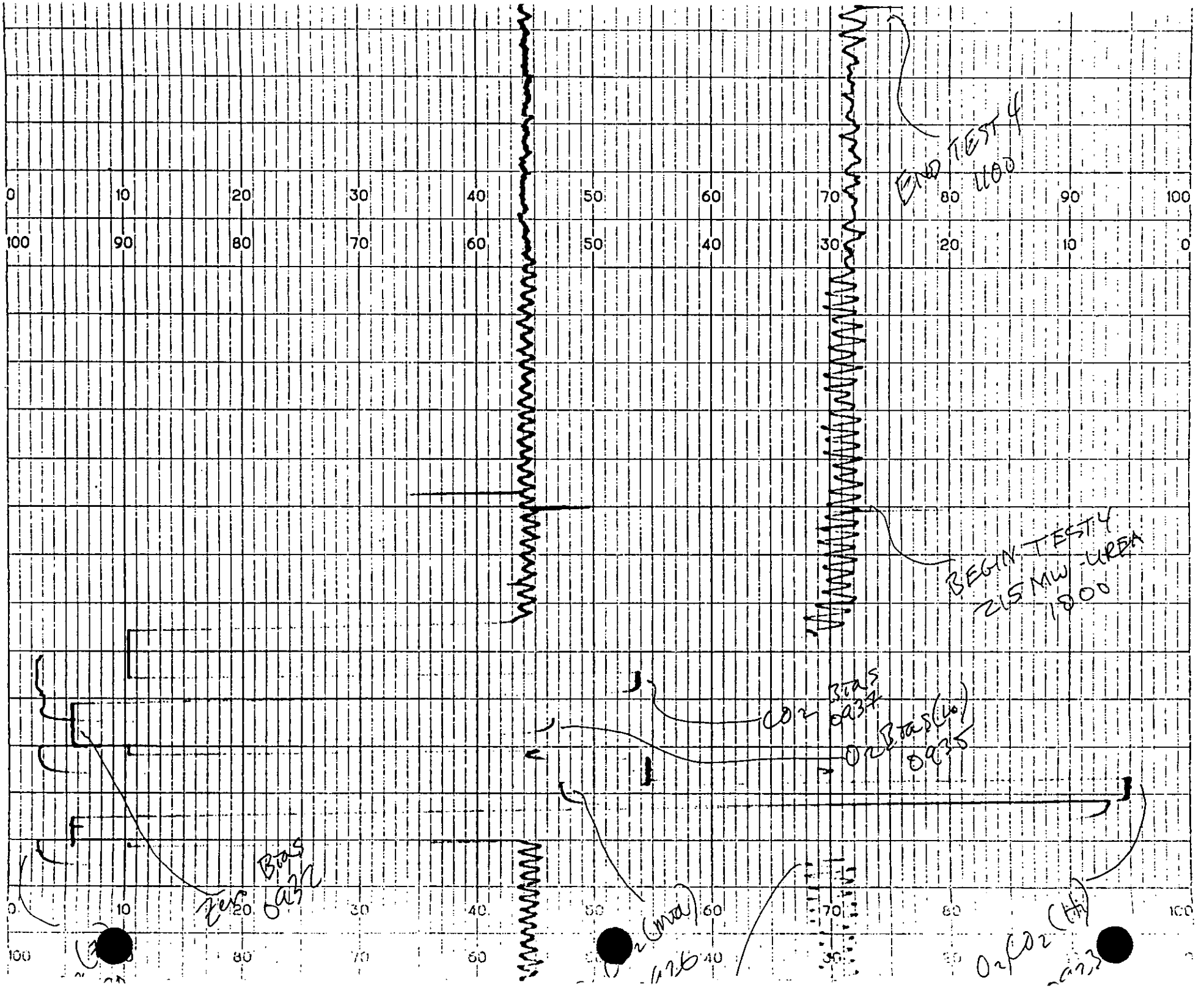
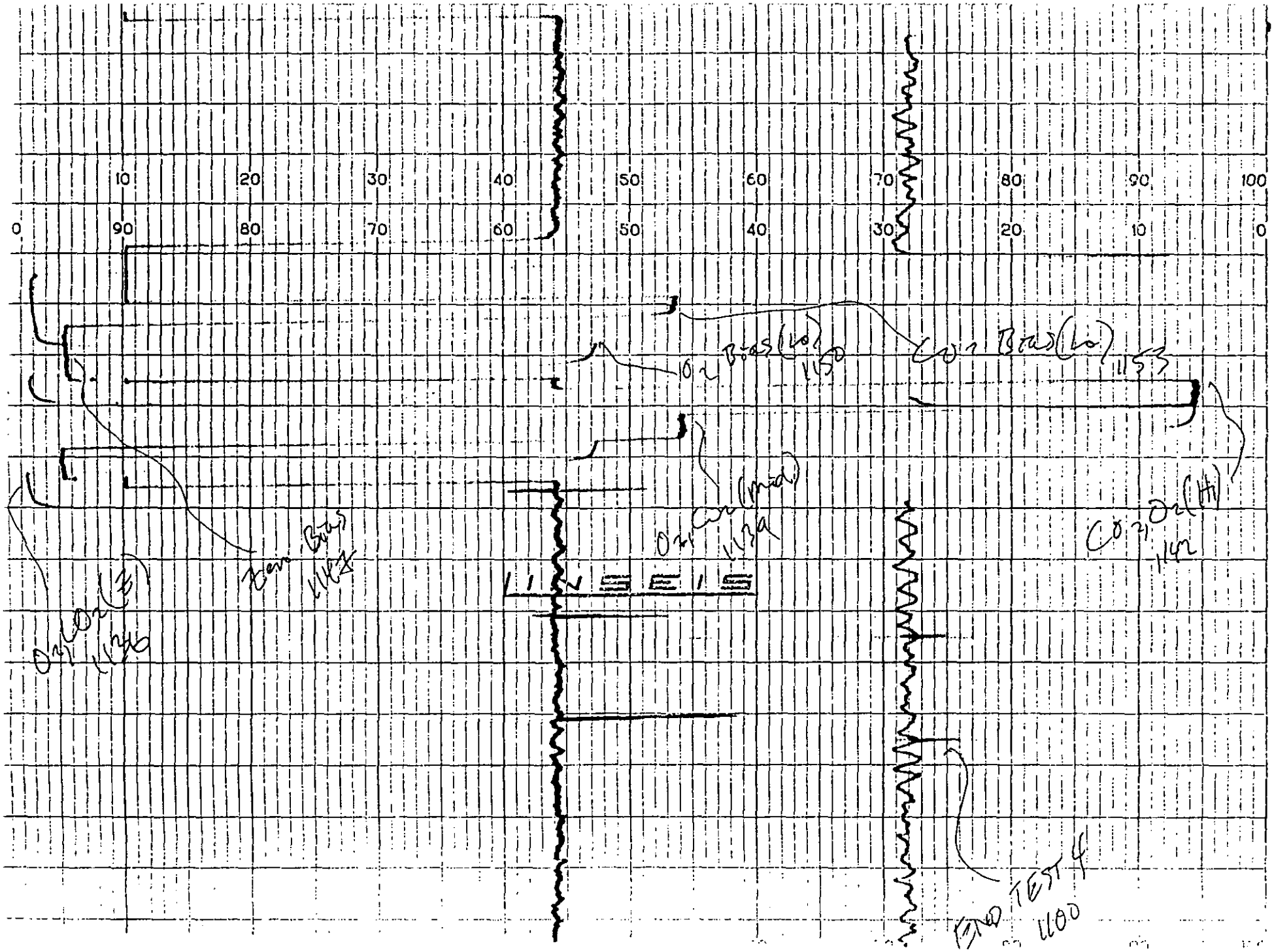
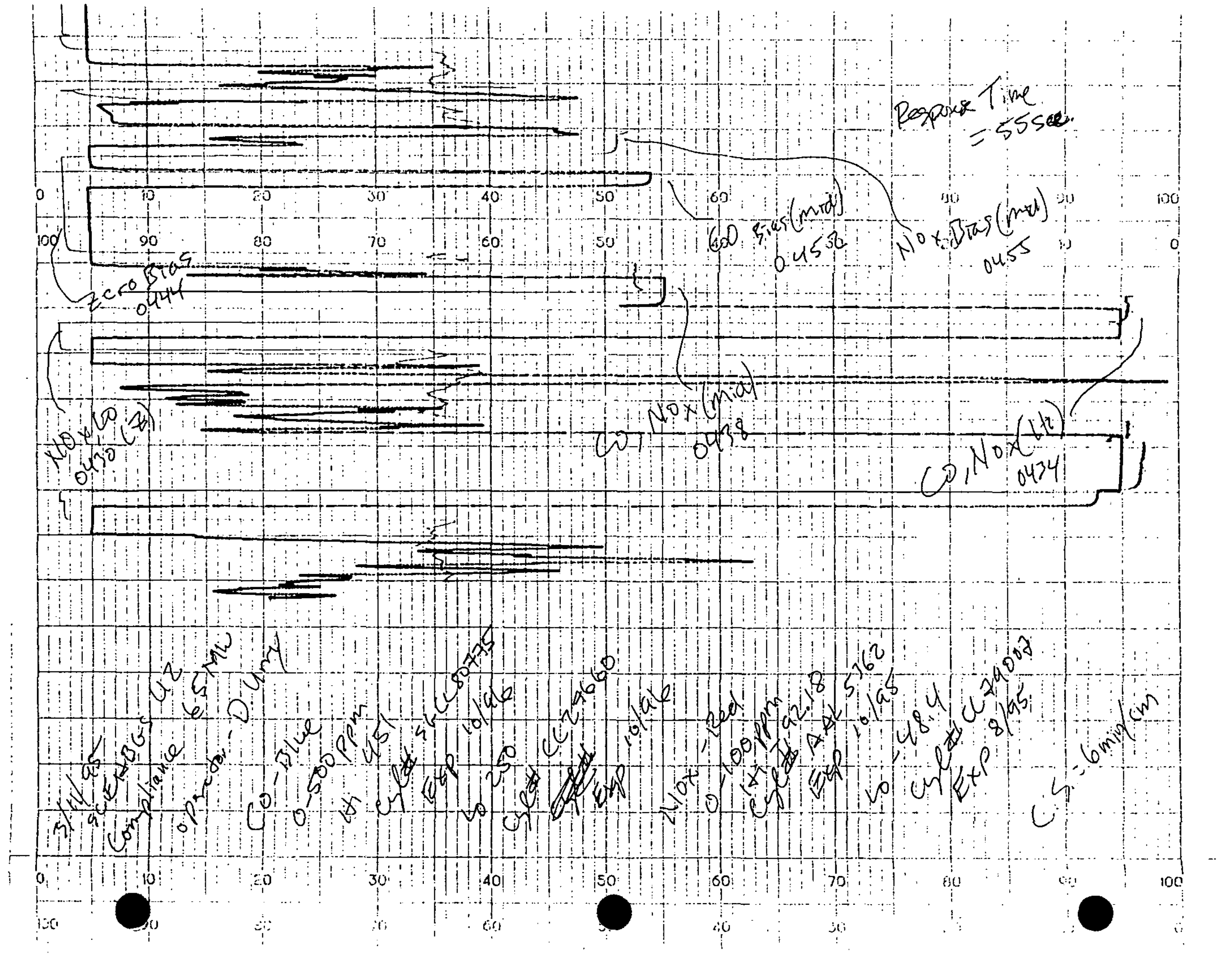
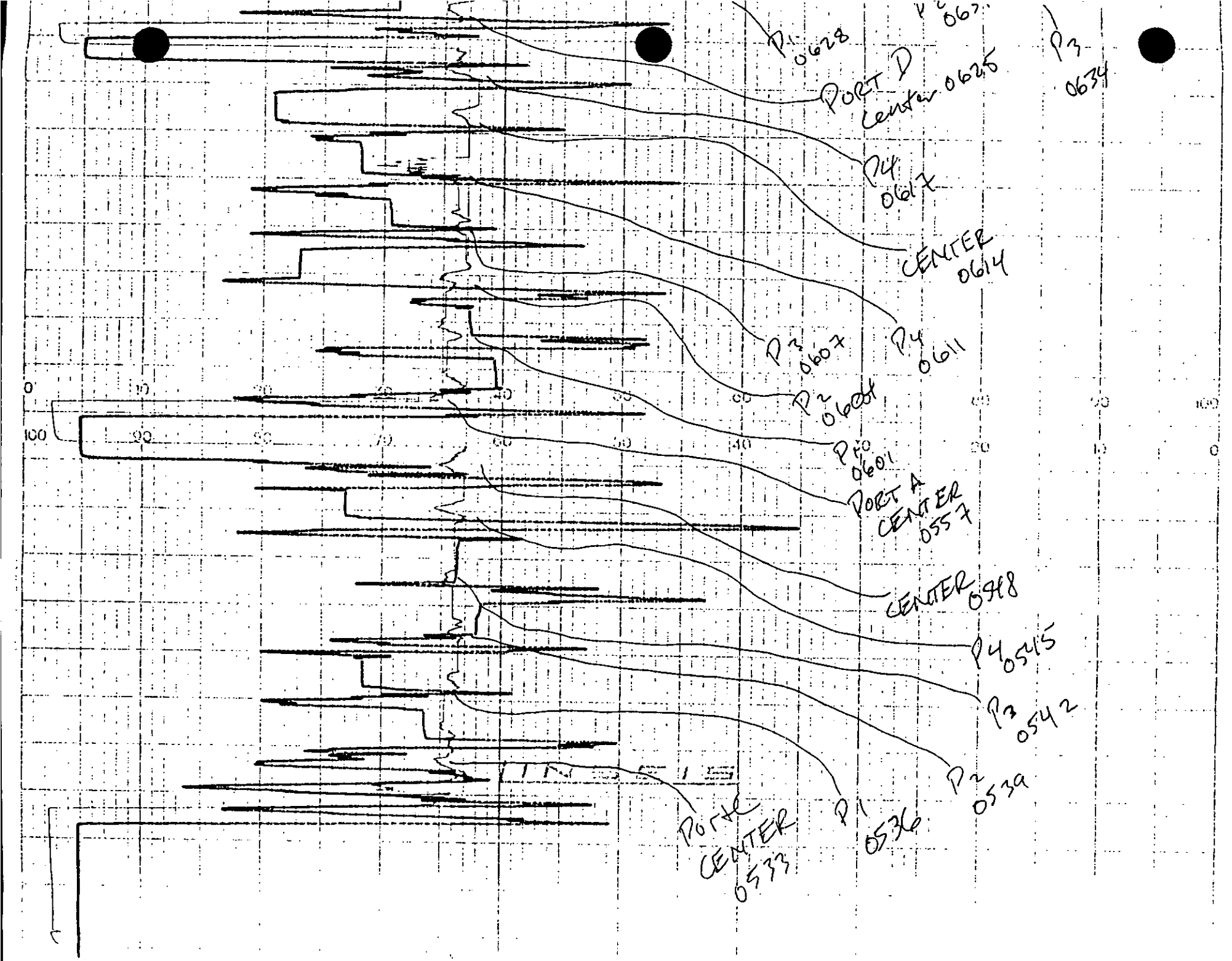

PART NO. L0/8011
100
90
80
70
60
50
40
30
20
10
0

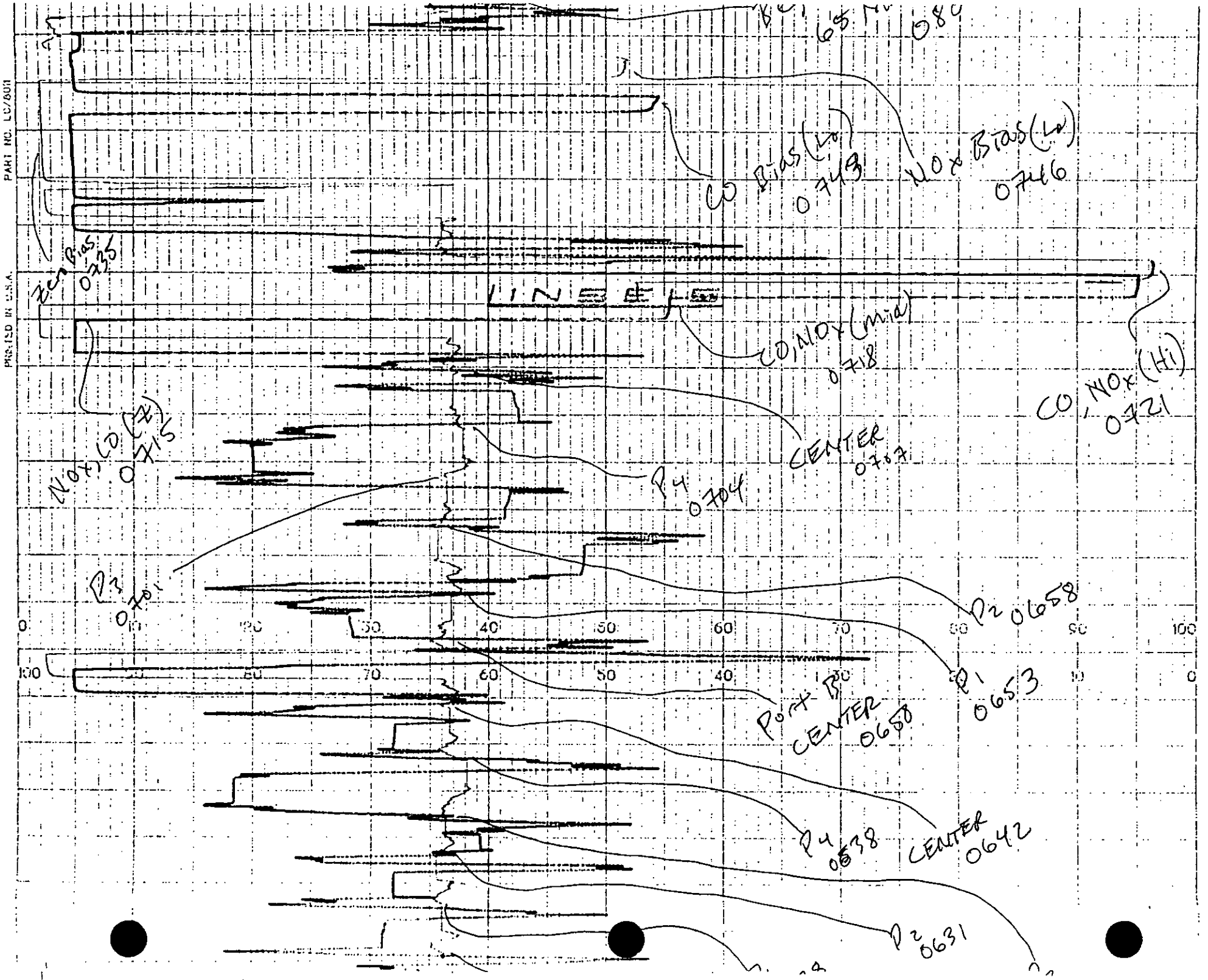
PRINTED IN U.S.A. PART NO. LO/8011

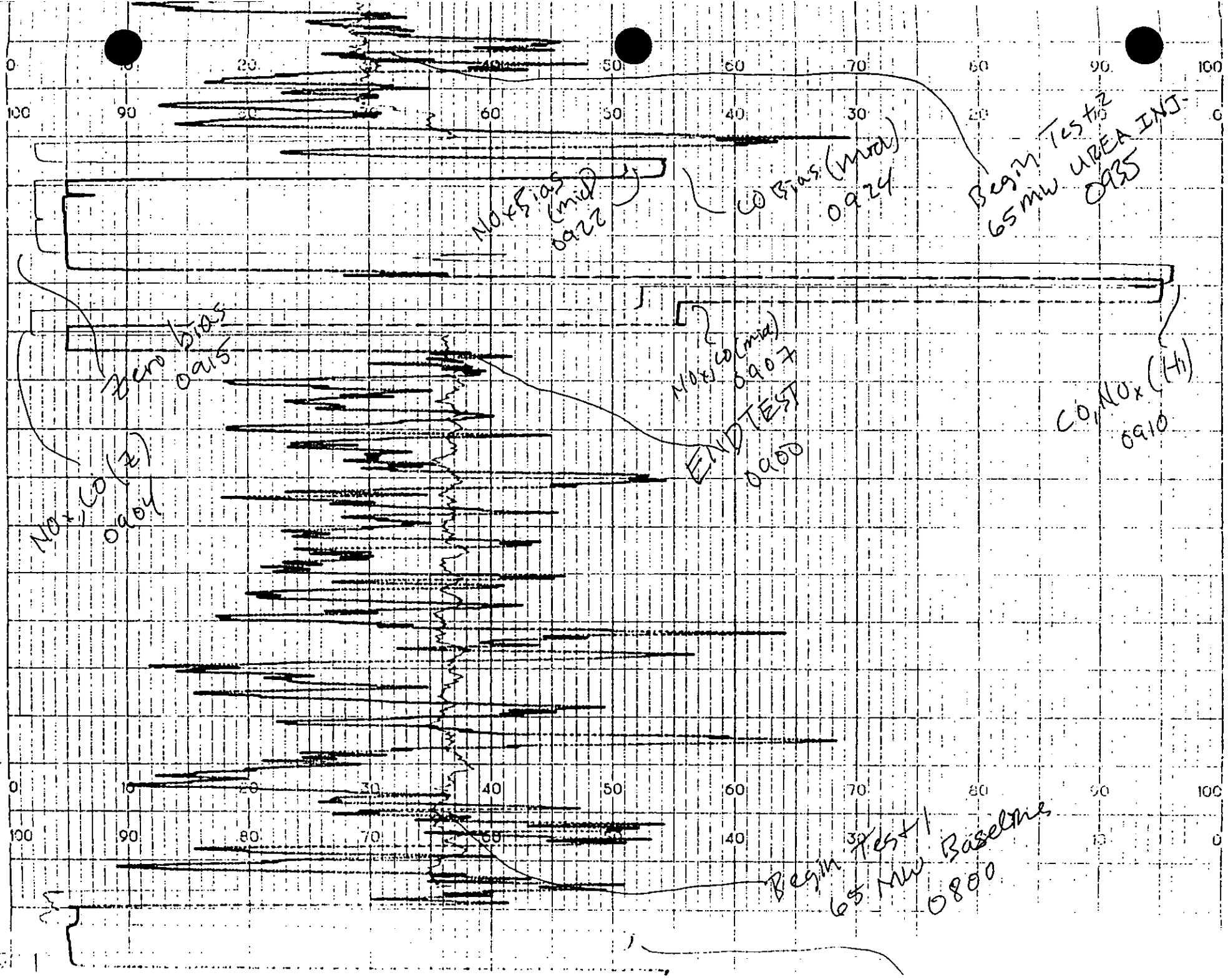

END TEST 4
1100
BEGIN TEST 4
215 MW - UREA
1800
CO2 BIAS
0.03%
O2 BIAS (Lo)
0.035
Zero Bias
0.02%
O2 (mid)
1.26
O2 (Hi)
0.03%

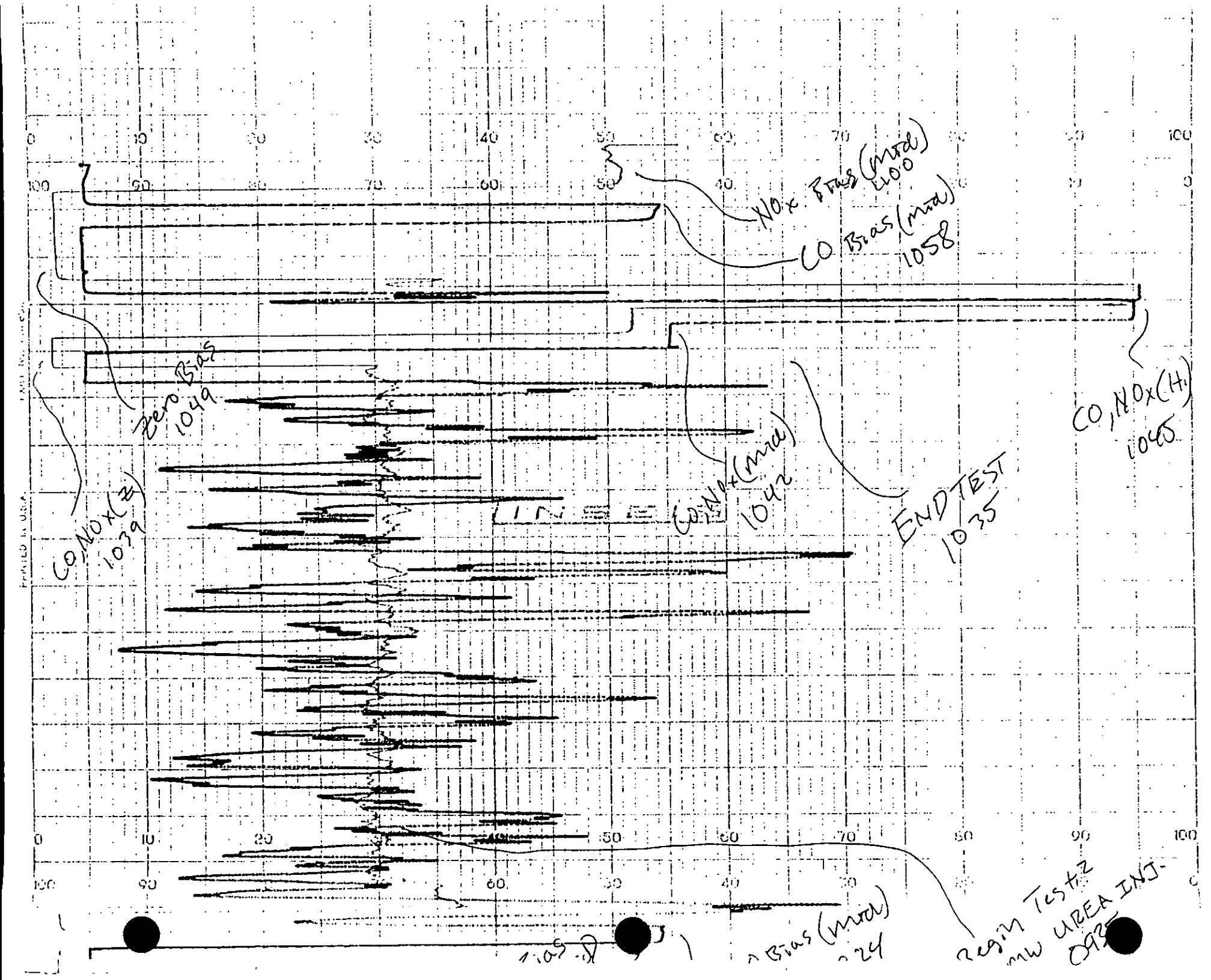

10
20
30
40
50
60
70
80
90
100
0
90
80
70
60
50
40
30
20
10
0
O2 Bias (Lo)
1150
CO2 Bias (Lo)
1153
O2 Cal (Mid)
1139
CO2 O2 (Hi)
1142
O2 CO2 (Hi)
1146
Zero Bias
1143
END TEST 4
1100

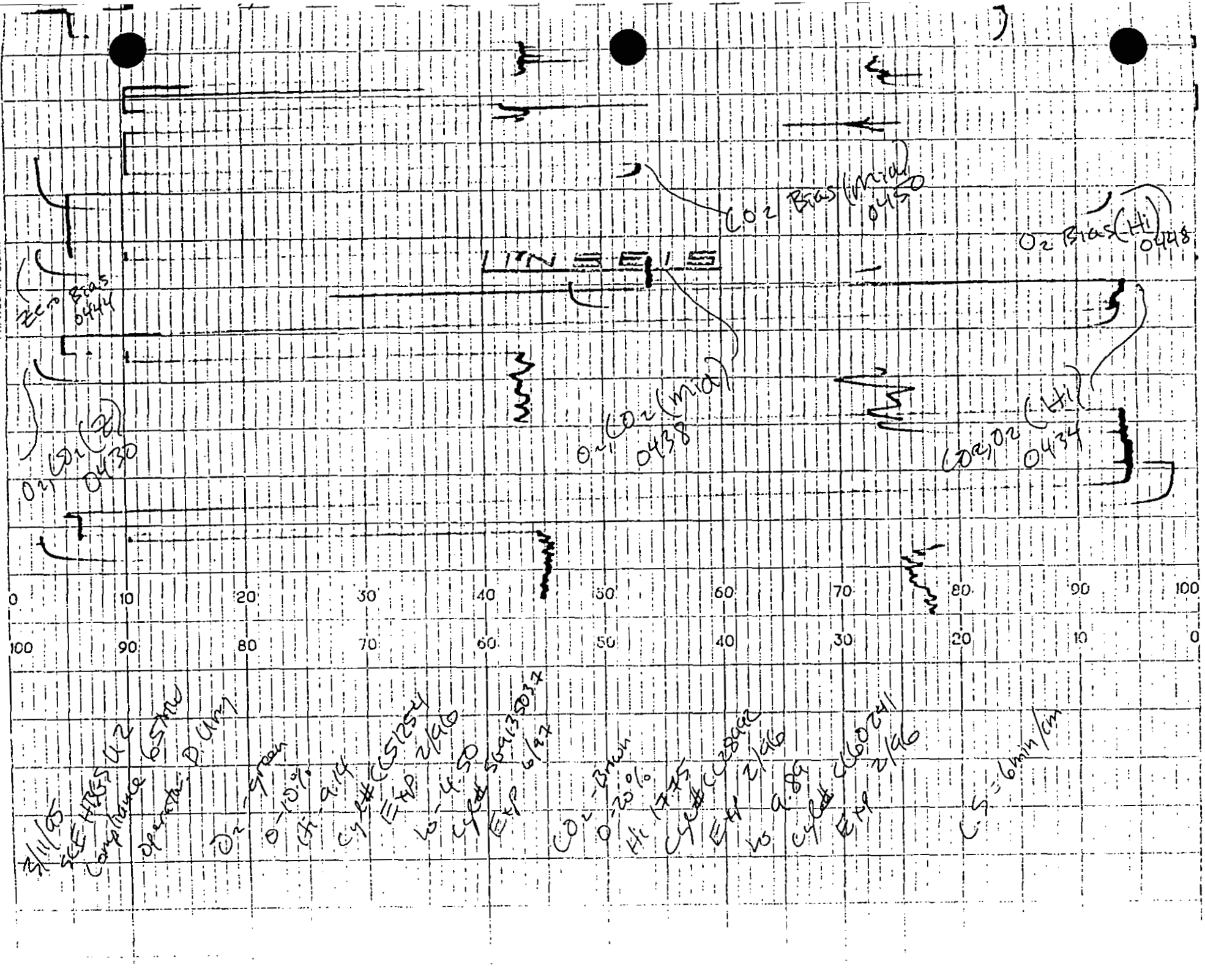

Response Time = 55sec.
CO Bias (mid) 0452
NOx Bias (mid) 0455
Zero Bias 0444
NOx & CO (Z) 0430
CO, NOx (mid) 0438
CO, NOx (Hi) 0434
3/11/05
9CEK4BGS U2
Compliance 6.5MW
Operator - D. Umy
CO - Blue
0-500ppm
Hi 451
Cyl# SCC80775
EXP 10/06
Lo 250
Cyl# CC24660
EXP 10/06
NOx - Red
0-100ppm
Hi 92.18
Cyl# AAL5762
EXP 10/05
Lo 48.4
Cyl# CC29007
EXP 8/05
C.S. = 6min/cm

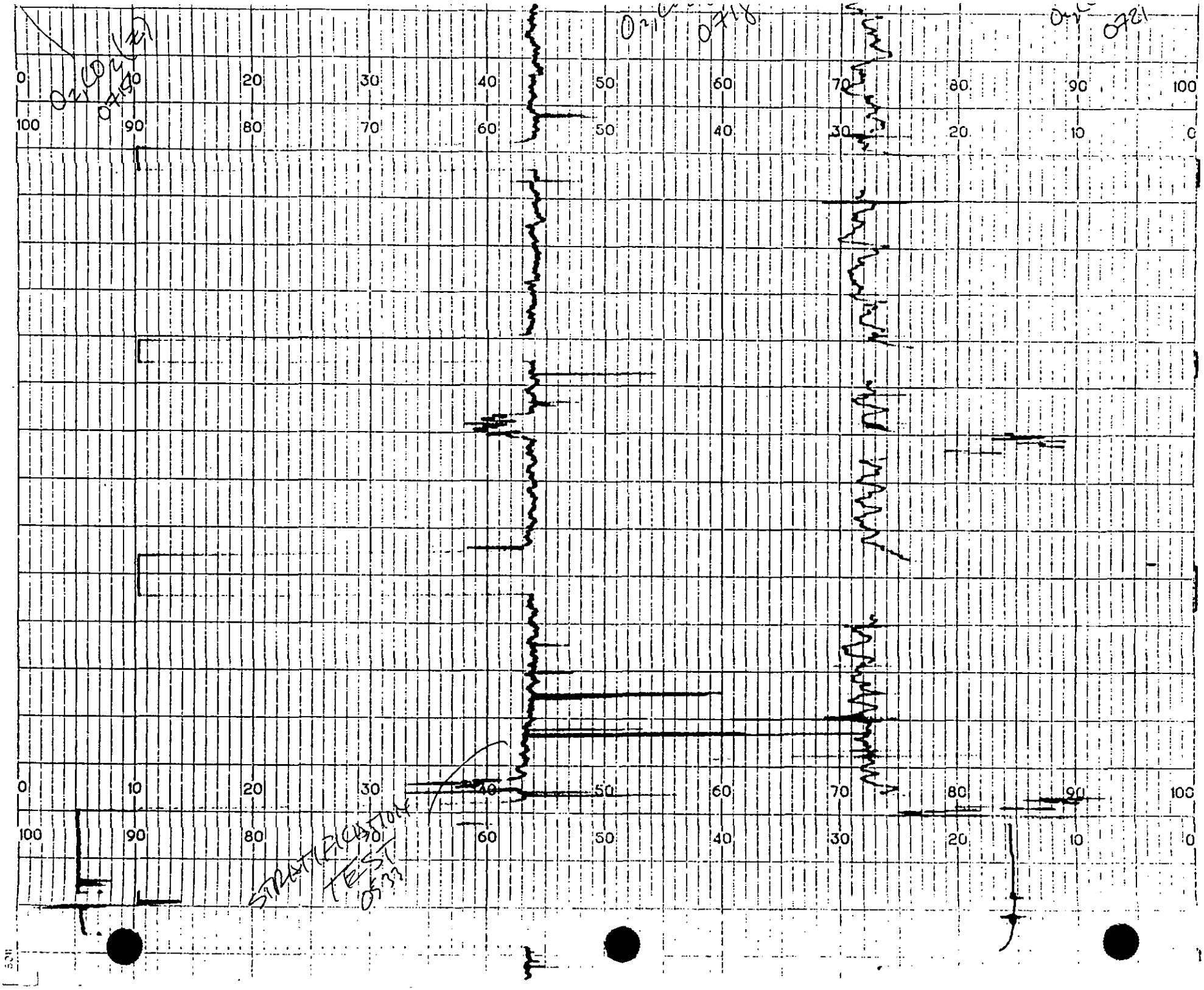

P1 0628
PORT D
Center 0625
P3 0634
P4 0617
CENTER 0614
P3 0607
P4 0611
P2 0604
P1 0601
PORT A
CENTER 0557
CENTER 0518
P4 0545
P3 0542
P2 0539
P1 0536
PORT
CENTER
0533
0
100

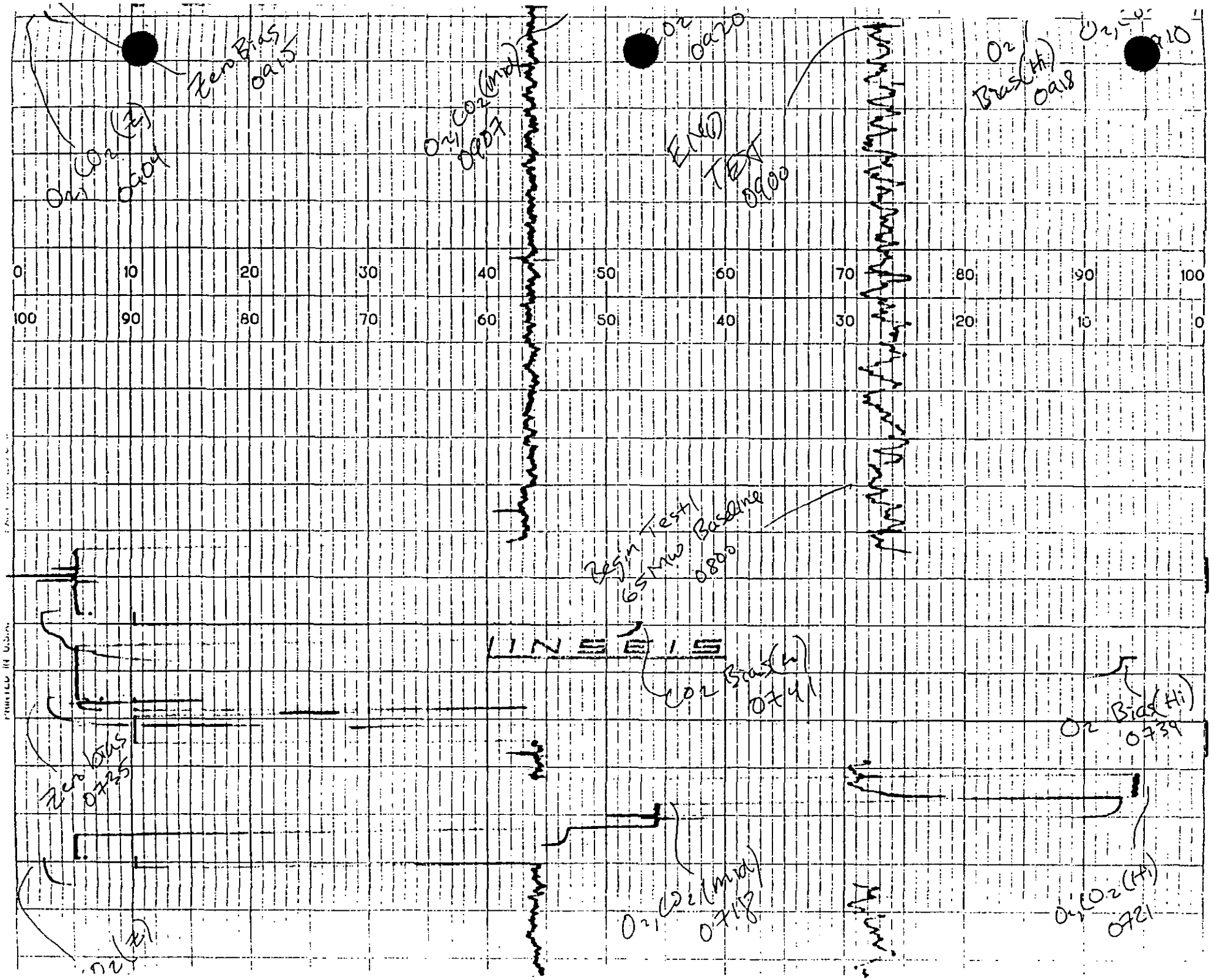

PART NO. LC/601
PRINTED IN U.S.A.
CO BIAS (Lo) 0743
NOx BIAS (Lo) 0746
Zero Bias 0735
LINEAR
CO, NOx (Mid) 0718
CO, NOx (Hi) 0721
NOx, CO (Hi) 0715
CENTER 0707
P4 0704
P3 0701
P2 0658
P1 0653
PORT B CENTER 0650
P4 0638
CENTER 0642
P2 0631
0
10
20
30
40
50
60
70
80
90
100

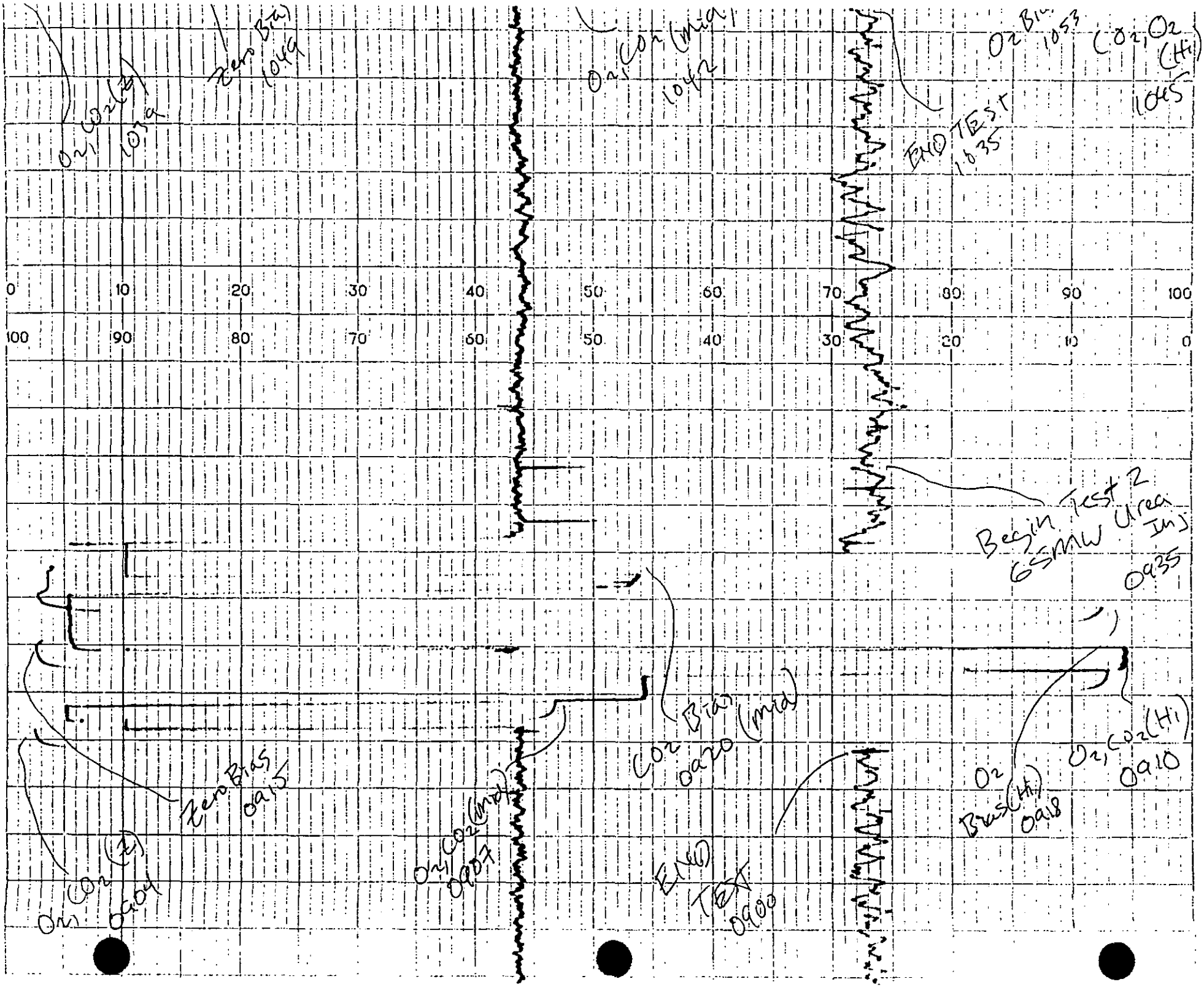

Begin Test 2
65 MW UREA INJ-
0935
NOx Bias (mid)
0922
CO Bias (mid)
0924
Zero Bias
0915
NOx, CO (Hi)
0910
NOx, CO (mid)
0907
END TEST
0900
NOx, CO (lo)
0904
Begin Test 1
65 MW Baseline
0800


NOx Bias (mid)
1100
CO Bias (mid)
1058
Zero Bias
1049
CO,NOx(Hi)
1045
CO,NOx(mid)
1042
CO,NOx(Lo)
1039
END TEST
1035
Begin Test 2
new UREA INJ-


CO2 Bias (Mid) 0445
O2 Bias (Hi) 0448
Zero Bias 0444
O2 (Lo) 0430
O2 (Mid) 0438
CO2/O2 (Hi) 0434
0 10 20 30 40 50 60 70 80 90 100
100 90 80 70 60 50 40 30 20 10 0


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


Zero Bias 0915
O2 CO2 (Mix) 0907
O2 (Hi) 0918
END TEST 0900
0 10 20 30 40 50 60 70 80 90 100
100 90 80 70 60 50 40 30 20 10 0
Begin Test/ 65% N2 Baseline 0800
LINES
CO2 Bias (Lo) 0741
O2 Bias (Hi) 0739
Zero Bias 0725
O2 CO2 (Mix) 0718
O2 CO2 (Hi) 0721


0 10 20 30 40 50 60 70 80 90 100
100 90 80 70 60 50 40 30 20 10 0
END TEST 1035
Begin Test 2 GSMW Urea Inj 0935
Zero Bias 0915
END TEST 0900

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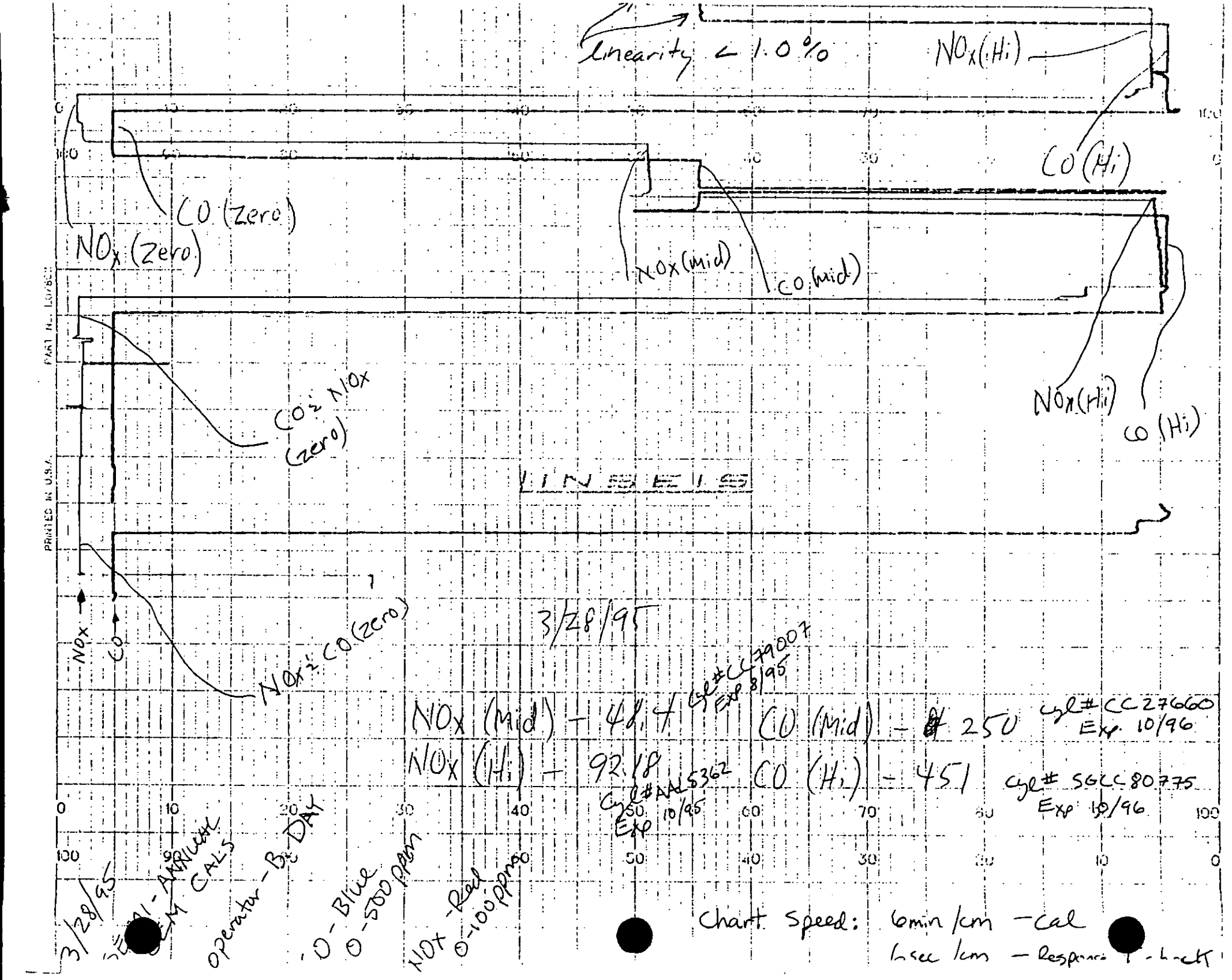
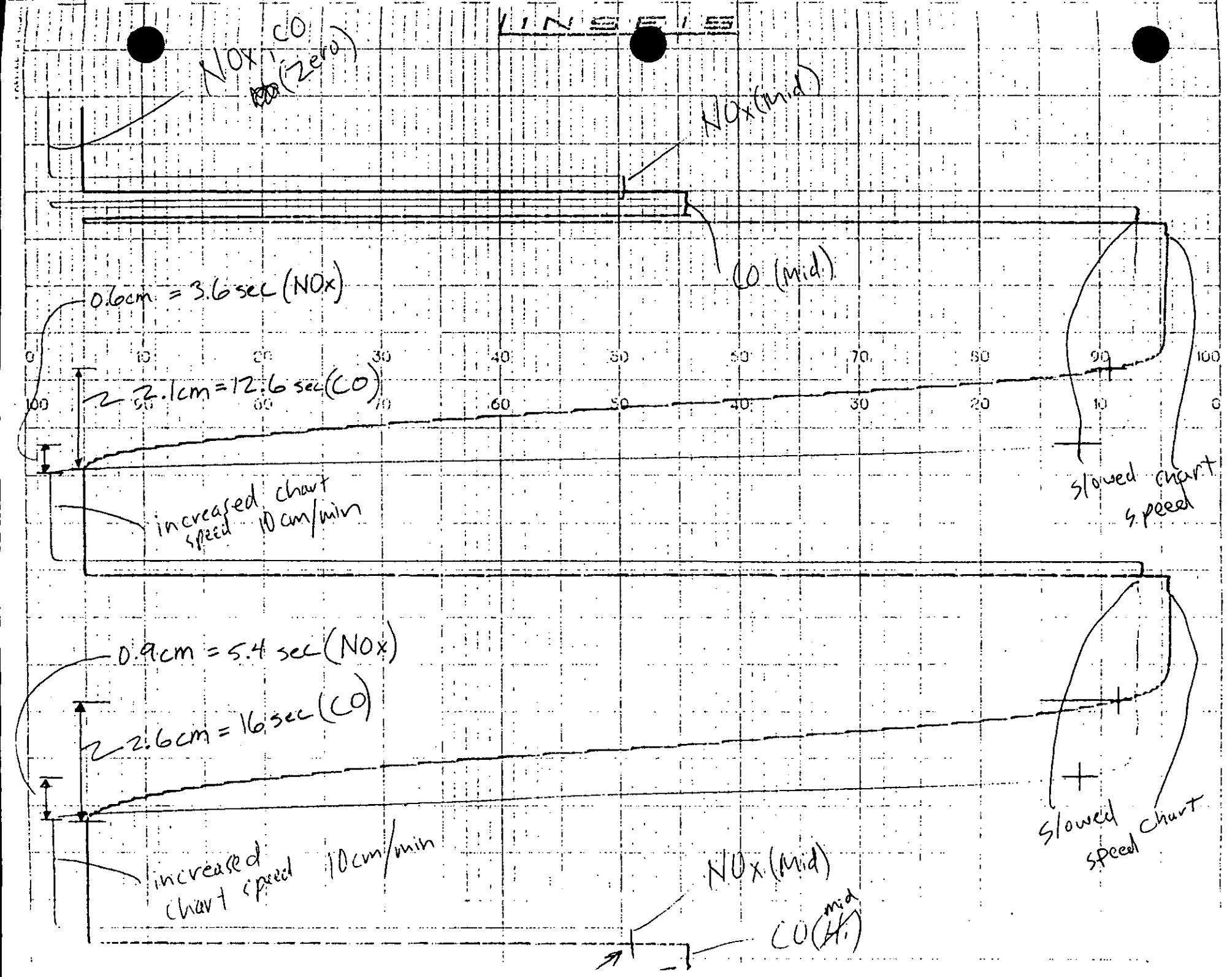
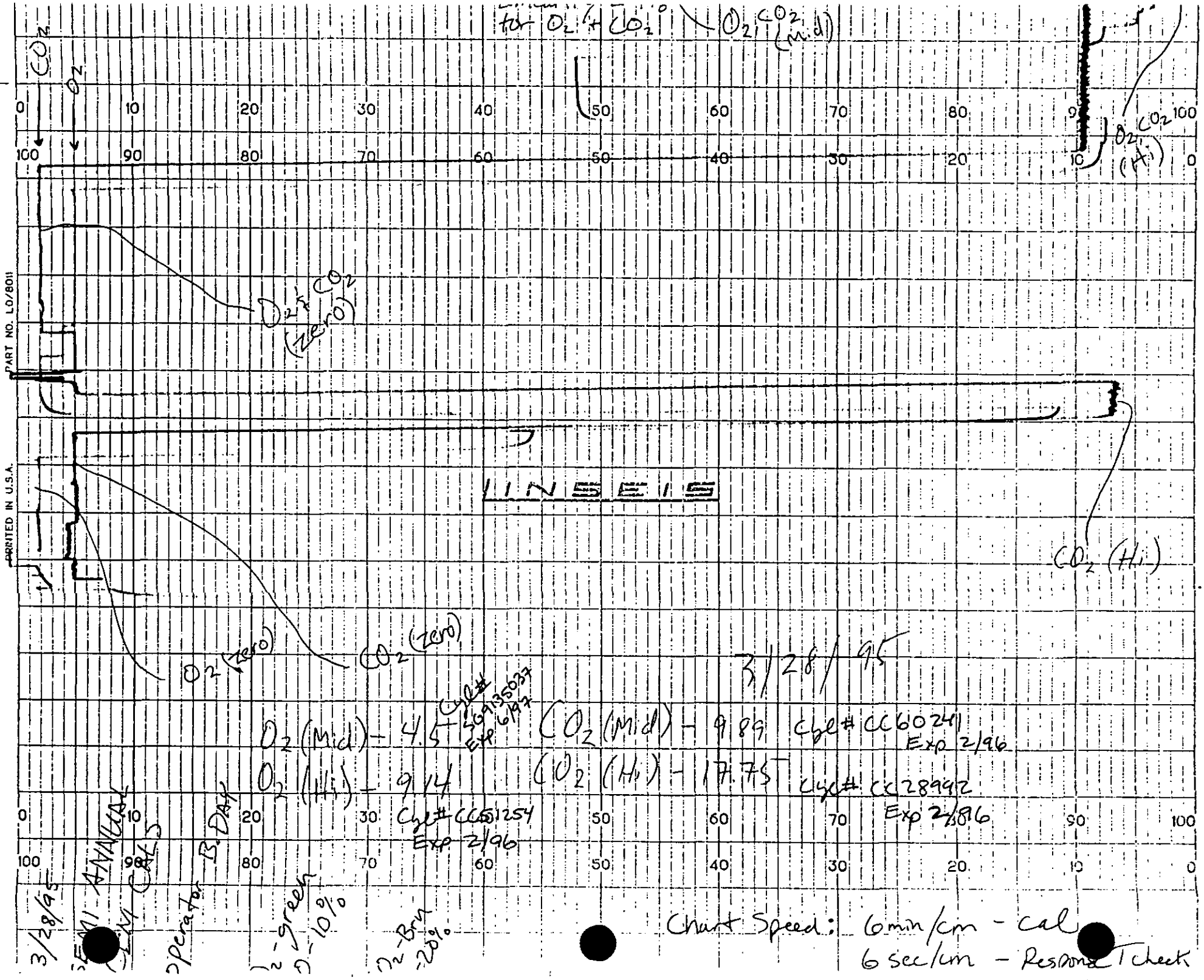
PART NO. LU
O2 CO2 (Low) 1034
Resp Bias 1044
O2 (CO2 (Mid) 1042
CO2 1035
Resp Bias (Mid)
RMO TEST 1035
O2 Bias (Hi) 1053
CO2 O2 (Hi) 1045

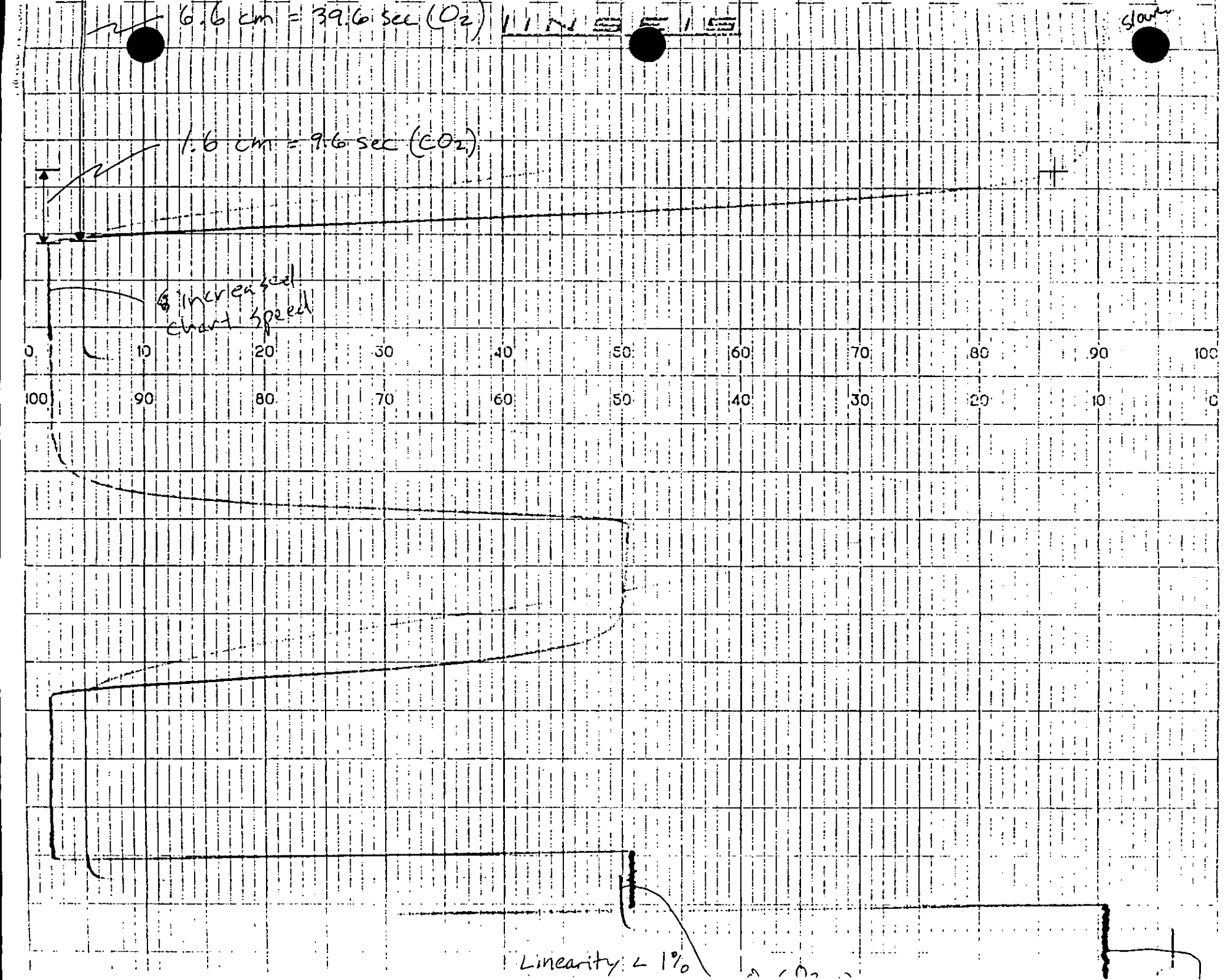
APPENDIX C-4

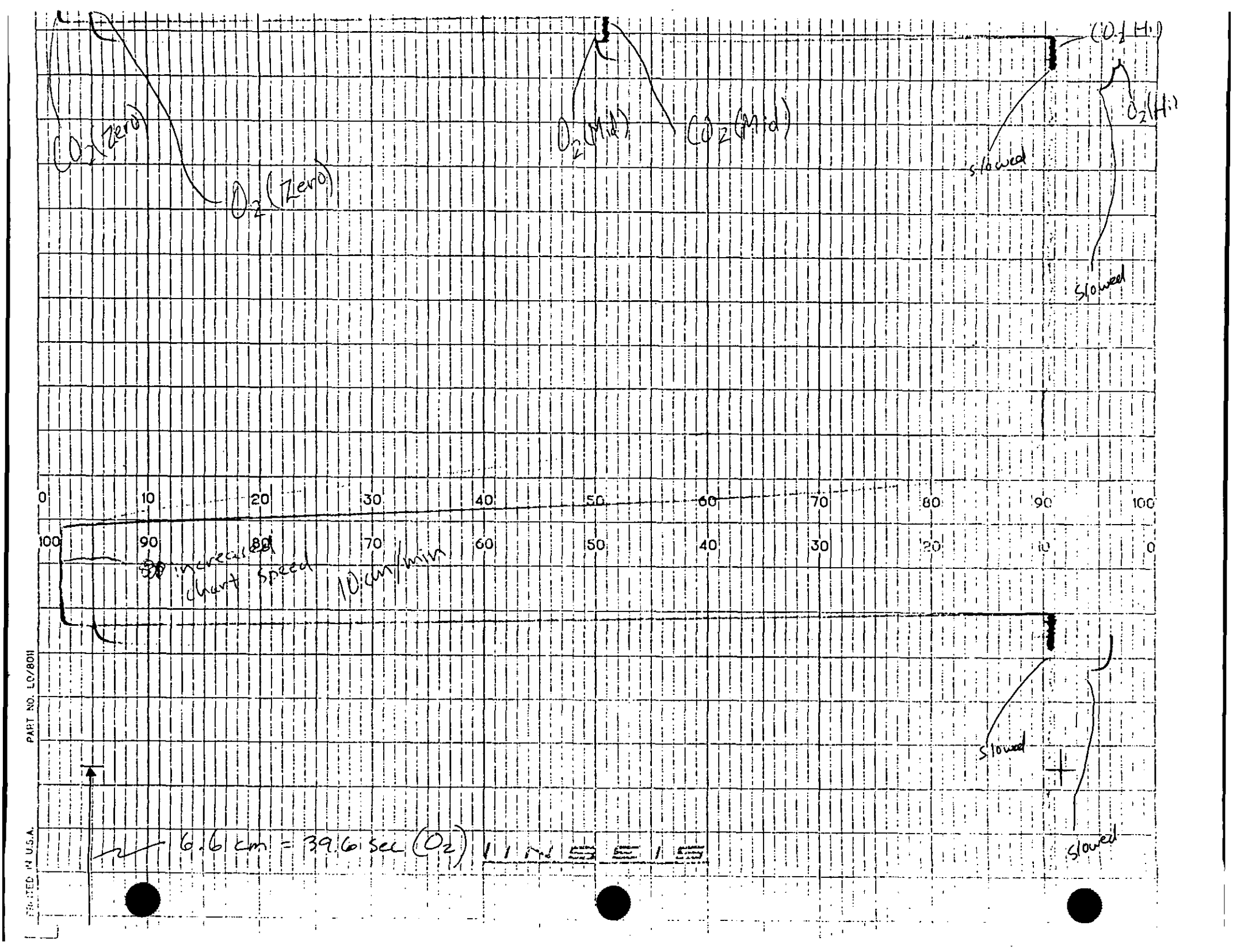
SEMI-ANNUAL INSTRUMENT CALIBRATION RECORDS

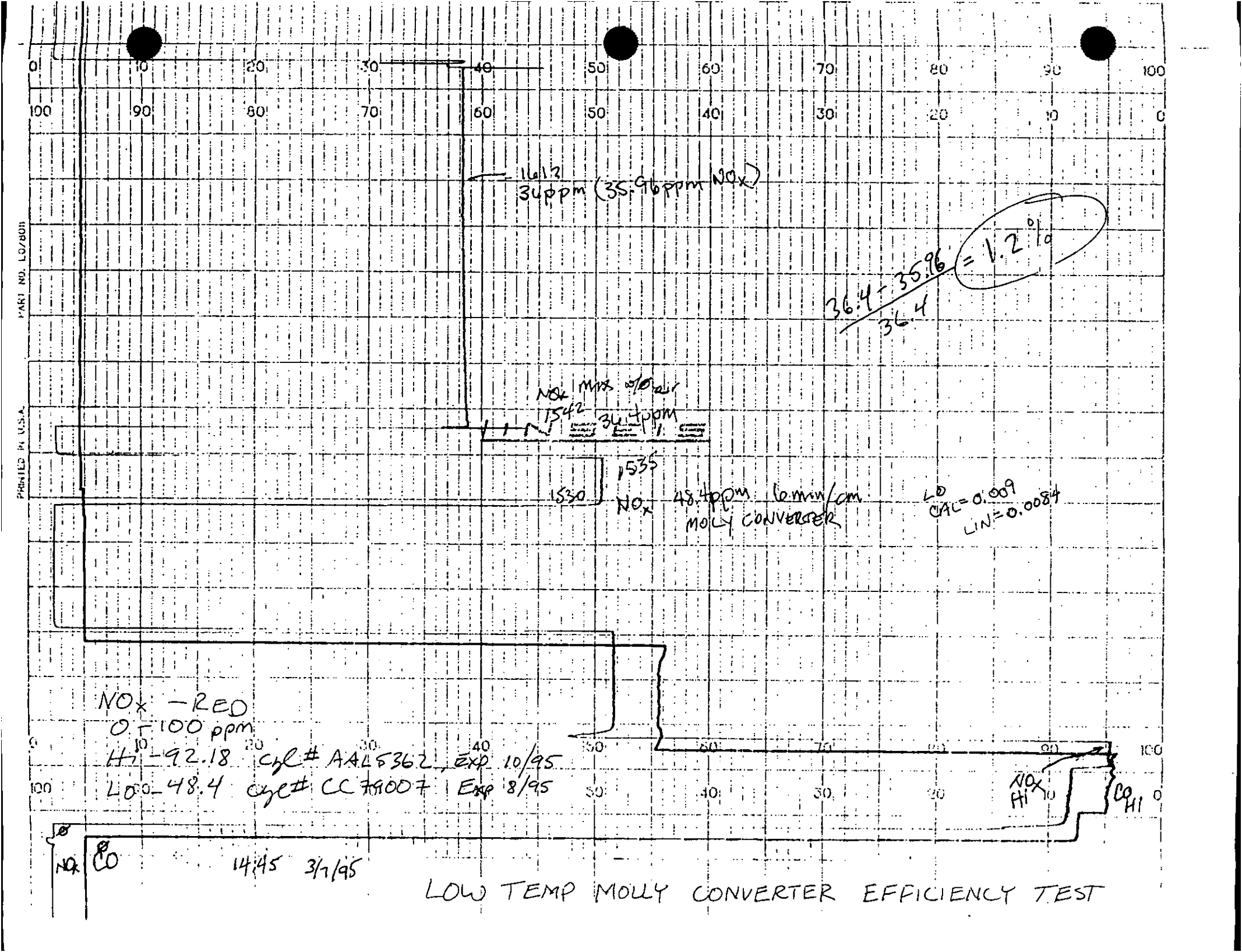

Linearity < 1.0 %
NOx (Hi)
CO (Hi)
CO (Zero)
NOx (Zero)
NOx (Mid)
CO (Mid)
NOx (Hi)
CO (Hi)
CO & NOx (Zero)
NOx & CO (Zero)
NOx
CO
3/28/95
NOx (Mid) = 48.4 cyl# CC279007 Exp 8/95
CO (Mid) = 250 cyl# CC276660 Exp. 10/96
NOx (Hi) = 92.8 cyl# AAL5362 Exp 10/95
CO (Hi) = 451 cyl# SGCC80775 Exp 10/96
3/28/95
Operator - BE DAY
CO - Blue 0-500 ppm
NOx - Red 0-100 ppm
Chart Speed: 6 min/cm - cal
1 sec/cm - Response Check


NOx, CO (zero)
NOx (mid)
CO (mid)
0.6cm = 3.6 sec (NOx)
2.1cm = 12.6 sec (CO)
increased chart speed 10 cm/min
slowed chart speed
0.9cm = 5.4 sec (NOx)
2.6cm = 16 sec (CO)
increased chart speed 10 cm/min
slowed chart speed
NOx (Mid)
CO (Mid)


for O2 + CO2
O2 CO2 (Mid)
O2 CO2 (Hi)
CO2
O2
O2 + CO2 (zero)
LINSEIS
CO2 (Hi)
O2 (zero) CO2 (zero)
3/28/95
O2 (Mid) - 4.5 Cyl# 39135037 Exp 6/97
CO2 (Mid) - 9.8% Cyl# CC60241 Exp 2/96
O2 (Hi) - 9.4
CO2 (Hi) - 17.7% Cyl# CC28992
Cyl# CC61254 Exp 2/96
Exp 2/96
PART NO. LO/8011
PRINTED IN U.S.A.
3/28/95
SEMI-ANNUAL CAL'S
Operator B. Day
N2 - green
O2 - 10%
N2 - Brn
CO2 - 20%
Chart Speed: 6 min/cm - cal
6 sec/cm - Response Check


6.6 cm = 39.6 sec (O2)
1.6 cm = 9.6 sec (CO2)
6 increased chart speed
0
10
20
30
40
50
60
70
80
90
100
100
90
80
70
60
50
40
30
20
10
0
Linearity < 1%


O_2 (Zero)
O_2 (Zero)
O_2 (Mid)
O_2 (Mid)
O_2 (Hi)
O_2 (Hi)
slowed
slowed
slowed
slowed
0 10 20 30 40 50 60 70 80 90 100
100 90 80 70 60 50 40 30 20 10 0
30 inches/min
chart speed
10 cm/min
6.6 cm = 39.6 sec (O_2)
PART NO. LC/80H
PRINTED IN U.S.A.


1613
34ppm (35.96ppm NOx)
36.4 - 35.96 / 36.4 = 1.2%
NOx MAX 0/0 air
1542
34.4ppm
1535
1530
NOx 48.4ppm 6 min/cm
MOLY CONVERTER
LO CAL=0.009
LIN=0.0084
NOx -REO
0-100 ppm
Hi -92.18 cyl# AAL5362, EXP 10/95
Lo -48.4 cyl# CC71007 Exp 8/95
NOx Hi
CO HI
NOx CO
14:45 3/7/95
LOW TEMP MOLY CONVERTER EFFICIENCY TEST

APPENDIX C-5

DATA LOGGER OUTPUT

March 9, 1995 – Mid Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
55	0.071	−0.125	−0.683	−0.587	−0.016	−0.014	
56	0.062	−0.116	0.401	0.344	−0.018	−0.016	Zero
57	4.959	14.13	266.5	354.7	75.7	92	
58	9.01	17.75	449.4	675.6	91.8	138.1	
59	9.13	17.79	449.8	684.2	91.9	139.7	
100	9.16	17.88	449.6	685.3	91.9	140	High
101	8.88	13.96	345.4	520.5	75.9	114.5	
102	5.068	9.71	251.8	286.5	47.48	54.01	
103	4.592	9.71	252.5	277.1	48.33	53.05	
104	4.568	9.69	252.1	276.4	48.38	53.02	Mid
105	5.348	8.63	185.6	207.3	48.33	55.47	
106	7.1	7.1	91.4	118.6	47.3	61.34	
107	7.22	7.43	41.29	53.98	49.32	64.49	
108	7.23	7.41	55.36	72.5	47.99	62.82	
109	6.971	0.974	27.49	42.72	3.901	5.459	
110	0.361	−0.067	−0.435	−0.383	0.57	0.498	
111	0.12	−0.134	−0.44	−0.379	0.48	0.413	
112	0.089	−0.174	−1.067	−0.918	0.417	0.358	
113	0.077	−0.194	−1.05	−0.903	0.395	0.34	Zero Bias
114	0.082	−0.139	−0.079	−0.068	0.441	0.379	
115	2.661	−0.161	−1.298	−1.271	0.406	0.397	
116	4.438	−0.114	−1.676	−1.822	0.392	0.426	
117	4.504	−0.112	−0.785	−0.856	0.345	0.377	O2 Bias Mid
118	4.51	−0.15	−0.294	−0.321	0.318	0.348	
119	2.44	6.125	−4.82	−4.454	0.313	0.307	
120	0.168	9.5	−8.88	−7.67	0.305	0.263	
121	0.096	9.54	−8.16	−7.02	0.313	0.269	CO2 Bias Mid
122	0.107	6.836	37.43	32.22	0.301	0.259	
123	0.097	−0.038	244.6	210.4	0.233	0.2	CO Bias Mid
124	0.065	−0.125	198.6	170.6	18.54	15.93	
125	0.051	−0.085	0.954	0.819	48.33	41.49	NOx Bias Mid
126	0.085	−0.174	−0.017	−0.016	48.21	41.45	
127	10.3	−0.127	0.717	4.282	45.22	121.6	
128	19.43	−0.114	2.28	29.8	10.92	115.9	
129	17.94	0.898	7.19	44.6	17.94	159.4	
130	7.58	7.1	50.42	68.38	48.76	65.93	
131	7.2	7.45	73.1	95.5	48.58	63.49	
132	7.05	7.56	137.1	177.2	45.96	59.42	
133	7.08	7.56	133.3	172.4	47.01	60.88	
134	7.25	7.45	51.27	67.2	49.62	65.06	
135	7.16	7.45	93	121.1	46.88	61.07	
136	7.06	7.58	134.6	174	46.8	60.52	
137	7.19	7.53	74	96.6	48.38	63.18	
138	7.11	7.58	118.8	154.1	46.88	60.86	
139	7.01	7.54	160.8	207.3	46.28	59.66	
140	7.12	7.47	89.1	115.7	48.06	62.44	

March 9, 1995 – Mid Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
141	7.02	7.58	188.2	242.7	45.81	59.1	Begin
142	7.07	7.55	132.4	170.9	47.71	61.73	110 MW
143	7.16	7.55	83.4	108.4	47.7	62.17	Baseline
144	7.05	7.58	139.2	179.8	46.36	59.91	
145	7.15	7.53	79.2	103	49.08	63.86	
146	7.1	7.55	134.8	174.7	48.12	62.46	
147	6.993	7.59	183.9	236.2	47.96	61.71	
148	7.19	7.46	53.71	70.1	50.96	66.53	
149	7.1	7.55	118.7	153.9	49.11	63.74	
150	7.13	7.53	109.2	141.9	50.16	65.2	
151	7.25	7.46	40.14	52.62	51.59	67.66	
152	7.13	7.57	113.8	147.9	49.2	63.99	
153	7.09	7.62	122.3	158.5	49.36	63.97	
154	7.12	7.51	101.7	132.1	49.91	64.84	
155	7.08	7.56	137.2	177.7	49.14	63.66	
156	7.16	7.58	82.5	107.5	50.65	65.99	
157	7.11	7.58	118.3	153.6	49.28	64	
158	7.21	7.52	73.3	95.9	50.96	66.62	
159	7.17	7.49	73.5	95.8	50.46	65.81	
200	7.11	7.52	128.9	167.3	49.65	64.46	
201	7.18	7.56	63.15	82.4	51.2	66.8	
202	7.13	7.65	126.2	164	49.14	63.9	
203	7.02	7.64	155.6	200.6	48.84	62.97	
204	7.11	7.57	94.1	122.1	50.09	65.03	
205	7.04	7.6	173.9	224.5	48.79	63.01	
206	7.15	7.57	75.9	98.6	51.27	66.71	
207	7.21	7.55	70.9	92.7	50.98	66.67	
208	7.14	7.56	94.2	122.5	50.4	65.56	
209	7.14	7.5	83.6	108.8	50.46	65.64	
210	7.12	7.55	107.1	139	49.83	64.72	
211	7.15	7.51	97.6	127	50.88	66.21	
212	7.18	7.56	75.7	98.7	50.88	66.36	
213	7.14	7.61	84.4	109.8	50.11	65.18	
214	7.11	7.7	114.4	148.6	49.63	64.45	
215	7.14	7.6	89.3	116	50.72	65.95	
216	7.15	7.6	107.9	140.4	49.48	64.41	
217	7.08	7.67	112.7	145.9	49.75	64.44	
218	7.2	7.57	65.39	85.4	51.1	66.76	
219	7.11	7.6	123.9	160.7	49.12	63.76	
220	7.04	7.61	145.3	187.6	49.37	63.75	
221	7.24	7.51	41.39	54.09	52.84	69.21	
222	7.14	7.6	103.1	133.9	49.66	64.65	
223	7.05	7.59	136.1	175.7	49.46	63.9	
224	7.24	7.58	50.88	66.63	52.73	69.08	
225	7.1	7.63	130.4	169.1	49.59	64.36	
226	7.06	7.62	147	189.7	49.96	64.58	
227	7.2	7.65	87.8	114.5	50.83	66.43	

March 9, 1995 – Mid Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
228	6.988	7.72	179.2	230.3	49.16	63.24	
229	7.22	7.55	54.09	70.7	51.98	67.99	
230	7.08	7.65	133.1	172.4	49.18	63.73	
231	7.08	7.68	115.2	149	50.36	65.21	
232	7.2	7.66	67.61	88.3	51.37	67.14	
233	7.1	7.71	129.8	168.3	49.45	64.15	
234	7.08	7.61	124.8	161.5	50.22	65.04	
235	7.16	7.61	48.25	62.84	51.93	67.64	
236	7.2	7.66	66.75	87.2	51.68	67.53	
237	7.05	7.67	166.7	215.3	48.96	63.3	
238	7.13	7.62	80.8	104.7	51.47	66.89	
239	7.19	7.68	79.6	103.8	50.87	66.44	
240	7.03	7.66	154.1	198.9	48.76	62.92	End Test
AVG:	7.12	7.59	106.20		49.93		
241	6.502	5.302	59.09	76.6	34.54	44.86	
242	0.644	−0.02	−0.802	−0.713	−0.016	−0.013	
243	0.114	−0.127	−0.66	−0.569	−0.075	−0.064	
244	0.08	−0.058	−0.26	−0.223	−0.079	−0.068	Zero
245	1.947	6.877	134.6	136.5	35.71	34.98	
246	4.439	9.86	250.9	272.7	50.1	54.45	
247	4.525	9.86	250.6	274	50.08	54.74	Mid
248	7.32	16.91	389.2	527.3	86.1	115.4	
249	9.09	17.92	450.3	682.3	93.4	141.5	
250	9.14	17.92	449.6	684.5	93.4	142.2	High
251	8.19	10.63	245.3	361.3	60.4	86.9	
252	7.12	7.14	128.1	166.6	48.8	63.47	
253	2.009	0.127	6.52	8.18	3.432	3.93	
254	0.16	0.011	−0.322	−0.278	0.792	0.684	
255	0.11	0.007	−0.327	−0.282	0.771	0.664	Zero Bias
256	1.987	0	−1.298	−1.2	0.788	0.738	
257	4.417	0	−0.406	−0.44	0.638	0.692	
258	4.513	0	−0.068	−0.074	0.577	0.63	O2 Bias Mid
259	2.908	5.95	−4.262	−4.036	0.535	0.541	
300	0.229	9.54	−7.69	−6.662	0.485	0.421	
301	0.115	9.6	−7.58	−6.524	0.458	0.395	CO2 Bias Mid
302	0.116	9.08	−6.661	−5.736	0.428	0.368	
303	0.117	0.34	215.7	185.8	0.388	0.334	
304	0.104	−0.009	247.3	212.8	0.362	0.312	CO Bias Mid
305	0.09	−0.114	247.2	212.6	0.304	0.261	
306	0.074	−0.13	109.3	94	34.81	29.92	
307	0.067	−0.127	0.632	0.543	49.12	42.2	NOx Bias Mid
308	0.063	−0.118	−0.542	−0.465	49.28	42.33	
309	0.062	−0.034	−0.807	−0.693	49.32	42.37	

March 9, 1995 – Mid Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
341	7.22	7.49	61.18	80	40.57	53.07	Begin
342	7.11	7.6	122.9	159.4	38.25	49.67	110 MW Urea
343	7.1	7.6	101.3	131.3	39.23	50.88	
344	7.18	7.63	72.5	94.7	39.95	52.13	
345	7.11	7.62	120.1	155.9	38.81	50.36	
346	7.08	7.63	119.1	154.2	38.01	49.24	
347	7.12	7.63	106.4	138.1	39.34	51.08	
348	7.17	7.57	81.8	106.6	40.09	52.28	
349	7.19	7.73	60.68	79.3	39.96	52.19	
350	7.08	7.68	166	215	37.96	49.19	
351	7.11	7.66	116.9	151.7	39.13	50.78	
352	7.11	7.59	118.7	153.9	38.17	49.58	
353	6.961	7.66	220.7	283.4	37.2	47.77	
354	7.11	7.65	90.9	117.9	39.39	51.13	
355	7.16	7.59	106.6	138.8	39	50.82	
356	7.06	7.6	134.2	173.4	38.55	49.84	
357	7.21	7.64	63.06	82.4	40.2	52.55	
358	7.24	7.57	47.33	62.04	40.25	52.75	
359	7.16	7.71	90.8	118.2	38.96	50.79	
400	7.05	7.69	149.3	193	37.44	48.41	
401	7.08	7.61	111.6	144.5	38.9	50.38	
402	7.14	7.7	95.5	124.2	39.15	50.94	
403	7.04	7.75	196.2	253.3	37.37	48.27	
404	7.03	7.74	154.3	198.8	38.64	49.87	
405	7.23	7.59	51.71	67.69	40.17	52.6	
406	7.08	7.79	164.1	212.1	38.21	49.51	
407	7.09	7.67	124	160.4	39.29	50.92	
408	7.15	7.67	106.6	138.4	38.7	50.39	
409	7	7.75	194.5	250.5	37.49	48.28	
410	7.11	7.71	105.1	136	39.63	51.41	
411	7.21	7.73	101.1	132	39.84	52.12	
412	7.07	7.71	130.3	168.6	38.64	50.02	
413	7.17	7.71	69.81	90.9	40.27	52.48	
414	7.19	7.64	68.49	89.4	40.03	52.26	
415	7.1	7.77	133.8	173.6	38.07	49.41	
416	7.05	7.75	130.2	168.1	38.37	49.58	
417	7.18	7.66	65.12	85	40.01	52.21	
418	7.04	7.8	174	224.7	37.67	48.65	
419	7.12	7.63	96.8	125.5	39.09	50.76	
420	7.23	7.68	54.8	71.7	40.57	53.12	
421	7.14	7.72	119.2	155	38.86	50.57	
422	7.14	7.64	83.9	109	39.87	51.86	
423	7.21	7.59	54.85	71.7	40.41	52.84	
424	7.17	7.75	102.4	133.5	39.46	51.48	
425	7.07	7.7	135.3	175	38.67	50.03	
426	7.19	7.66	60.18	78.6	40.18	52.45	
427	7.12	7.71	108.3	140.7	38.92	50.6	

March 9, 1995 – Mid Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
428	7.11	7.72	101.1	131.1	39.31	51.01	
429	7.2	7.71	55.14	72	40.34	52.7	
430	7.1	7.78	146.3	189.7	38.2	49.59	
431	7.05	7.71	149.8	193.5	38.39	49.6	
432	7.14	7.73	92.5	120.3	39.76	51.72	
433	7.08	7.74	123.4	159.9	39.01	50.52	
434	7.15	7.58	72.2	94	40.3	52.46	
435	7.12	7.72	128.6	167.1	38.94	50.6	
436	7.09	7.72	118.9	154.1	39.16	50.76	
437	7.17	7.65	68.55	89.3	40.39	52.65	
438	7.04	7.83	145.4	187.7	38.11	49.26	
439	7.06	7.66	131.6	170	39.27	50.77	
440	7.16	7.73	75.9	98.9	39.99	52.08	End Test
Avg:	7.12	7.68	109.20		39.14		
441	7.04	7.79	184.1	237.7	38.2	49.34	
442	4.07	2.354	40.89	52.69	9.68	12.56	
443	0.229	−0.029	−0.186	−0.164	−0.138	−0.119	
444	0.095	−0.045	0.305	0.262	−0.155	−0.133	
445	0.073	−0.036	0.265	0.228	−0.158	−0.136	Zero
446	2.222	7.57	156.8	159.4	38.86	38.42	
447	4.432	9.91	251.1	272.8	50.53	54.9	
448	4.507	9.89	251	274.1	50.53	55.18	Mid
449	6.847	16.27	383.8	503	84.2	109.5	
450	9.03	18.07	450.2	678.7	94.3	142.2	
451	9.11	18.02	449.3	682	94.3	143.2	
452	9.12	18.07	449.5	683.1	94.3	143.3	High
453	8.96	15.39	402.3	608.9	78	118.1	
454	7.3	7.61	125.6	165.7	45.51	59.99	
455	6.98	6.181	88.1	114.5	43.76	56.93	
456	1.327	0.047	−0.248	−0.075	0.743	0.741	
457	0.149	0.013	−1.434	−1.237	0.241	0.208	
458	0.105	0.04	−0.119	−0.102	0.211	0.182	Zero Bias
459	1.774	−0.002	−1.293	−1.239	0.28	0.254	
500	4.376	0.018	−0.649	−0.7	0.135	0.147	
501	4.498	−0.009	−0.672	−0.733	0.115	0.126	O2 Bias Mid
502	2.869	6.291	−4.703	−4.504	0.114	0.115	
503	0.261	9.59	−8.01	−6.952	0.079	0.069	
504	0.14	9.68	−9.19	−7.92	0.065	0.056	CO2 Bias Mid
505	0.12	1.556	171.6	147.8	0.05	0.043	
506	0.106	−0.007	246	211.8	0.026	0.022	CO Bias Mid
507	0.085	0	190.9	164.2	18.14	15.6	
508	0.075	−0.036	0.073	0.063	49.44	42.49	NOx Bias Mid
509	0.079	−0.076	−0.339	−0.291	49.24	42.33	
510	0.45	1.388	10.99	10.06	62.89	55.08	

March 9, 1995 – High Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
735	0.08	−0.02	−0.215	−0.184	0.015	0.013	
736	0.065	−0.009	−0.457	−0.393	0.005	0.004	Zero
737	4.893	14.37	308.5	393.5	73.4	88.9	
738	8.95	18.04	449.3	672.6	90.6	135.7	
739	9.08	18.11	449	680	90.6	137.2	
740	9.11	18.14	450.3	683.5	90.6	137.5	High
741	7.94	13.55	383.8	553.9	67.31	97	
742	4.709	9.86	251.2	278.1	48.63	53.84	
743	4.553	9.87	250.8	274.7	48.61	53.23	Mid
744	5.948	8.19	104.5	118.6	76.6	92.2	
745	5.041	3.603	41.04	51.71	46.81	58.51	
746	0.373	0.007	−1.106	−0.967	1.094	0.958	
747	0.102	−0.02	−0.231	−0.199	0.795	0.684	
748	0.083	0.031	−0.971	−0.835	0.761	0.654	Zero Bias
749	1.886	0.016	−0.92	−0.875	0.805	0.749	
750	4.382	−0.018	−1.304	−1.412	0.621	0.672	
751	4.484	−0.069	−0.802	−0.874	0.559	0.609	O2 Bias Mid
752	4.496	0.59	−1.095	−1.196	0.527	0.576	
753	1.186	9.39	−8.08	−7.34	0.485	0.446	
754	0.155	9.69	−8.14	−7.03	0.464	0.4	CO2 Bias Mid
755	0.123	3.943	110.9	95.5	0.46	0.396	
756	0.106	0.096	245.3	211.2	0.414	0.357	
757	0.094	0.034	245.9	211.6	0.364	0.313	CO Bias Mi
758	0.062	0.087	182.4	156.6	19.87	17.07	
759	0.07	0.02	−0.401	−0.344	71.2	61.17	
800	0.067	0.031	−2.055	−1.766	89.9	77.3	NOx Bias High
801	0.068	0.004	−2.224	−1.911	89.8	77.2	
802	0.571	0.004	−1.959	−1.696	88.2	77.1	
803	16.45	0.009	3.461	21.77	66.28	311.3	
804	19.69	0.105	4.477	68.08	12.1	157.8	
805	20.21	0	4.065	105.2	1.586	40.1	
806	18.82	1.363	13.11	110.5	59.92	1282	
807	7.56	7.66	126.1	171.1	78	106.4	
808	6.892	7.73	67.93	86.7	82.2	105	
809	6.8	7.8	81.8	103.8	80.7	102.5	
810	6.927	7.77	64.5	82.5	82.4	105.6	
811	6.793	7.77	70.3	89	81.4	103.3	
812	6.808	7.9	89.9	114	80.1	101.8	
813	6.871	7.81	56.49	72	82.6	105.3	
814	6.791	7.78	79.1	100.2	81.8	103.7	
815	6.896	7.79	66.57	84.8	81.5	104.3	
816	6.859	7.76	59.76	75.9	82.9	105.7	Begin 215 MW
817	6.815	7.93	82.6	104.9	80.8	102.7	Baseline
818	6.889	7.9	63.72	81.4	81.8	104.5	
819	6.855	7.87	58.45	74.2	83.1	105.9	
820	6.758	7.97	114.6	145.1	79.8	101	
821	6.855	7.92	65.7	83.6	81.5	103.9	

March 9, 1995 – High Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)
822	6.779	7.93	76.2	96.2	82.1	104.1
823	6.76	7.93	83.6	105.8	80.1	101.4
824	6.892	7.94	64.36	82.1	81.3	104
825	6.774	7.92	79.6	100.6	80.9	102.5
826	6.831	7.92	81	103.1	80.2	102.1
827	6.873	7.88	74.1	94.4	81.7	104.2
828	6.75	7.9	96.3	121.8	79.5	100.6
829	6.867	7.89	71	90.4	81.1	103.5
830	6.842	7.82	73	92.7	82.1	104.5
831	6.76	7.95	101	127.8	79.1	100.2
832	6.896	7.92	59.66	76.2	82	104.9
833	6.762	7.94	96.9	122.2	80.9	102.4
834	6.859	7.94	84.1	106.9	80.3	102.4
835	6.919	7.87	53.61	68.58	82	105
836	6.843	7.88	78.8	100.1	81.8	104.1
837	6.881	7.89	75.3	96	80.2	102.5
838	6.88	7.85	65.57	83.7	81.3	103.9
839	6.843	7.91	75.1	95.5	81.3	103.5
840	6.786	8.04	104	131.6	78.8	100.1
841	6.866	7.83	61.27	77.9	82.6	105.3
842	6.777	7.88	78.9	99.9	80.2	101.7
843	6.796	7.95	104.5	132.4	79.6	101.1
844	6.875	7.93	73.8	94	82.3	105
845	6.73	7.92	113.6	143.2	80.5	101.6
846	6.821	7.97	90.6	114.8	80.6	102.5
847	6.889	7.87	61.8	78.8	83.3	106.4
848	6.811	7.89	87.7	111.1	81.7	103.8
849	6.823	7.98	101.6	128.9	79.9	101.7
850	6.892	7.83	78.7	100.3	82.9	105.9
851	6.74	7.94	112.8	142.2	80.7	102.1
852	6.801	8	102.8	130.1	79.7	101.3
853	6.889	7.88	65.09	83	82.9	105.9
854	6.745	7.95	106.9	135	80.4	101.7
855	6.911	7.83	78	99.5	81.8	104.8
856	6.849	7.78	77.1	97.9	82.7	105.4
857	6.772	7.87	96.6	122.2	80.8	102.4
858	6.878	7.84	81	103	80.7	103.2
859	6.898	7.79	57.95	73.9	83.1	106.2
900	6.827	7.8	85.1	107.9	82.1	104.4
901	6.843	7.89	96.4	122.2	79.4	101.3
902	6.931	7.74	46.84	59.79	84.6	108.4
903	6.819	7.9	93.5	118.7	81.1	103.1
904	6.902	7.83	78.2	99.9	81.6	104.4
905	6.902	7.85	61.57	78.7	83.2	106.4
906	6.806	7.91	84.9	107.6	81.2	103.2
907	6.873	7.9	92.6	118	81	103.5
908	6.864	7.83	78.9	100.5	81.8	104.3
909	6.767	7.9	94.6	119.4	81.2	102.9

March 9, 1995 – High Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
910	6.809	7.92	97	123	80.1	101.8	
911	6.911	7.84	67.14	85.7	82.6	105.7	
912	6.797	7.8	85.9	108.6	82.6	104.8	
913	6.765	7.99	100.8	127.4	79.8	101.1	
914	6.905	7.89	73	93.2	82.3	105.3	
915	6.765	7.84	91.9	115.8	82.5	104.4	End Test
Avg:	6.83	7.89	81.62		81.34		
916	6.779	7.89	117.2	148	79.9	101.4	
917	3.8	1.737	18.27	23.22	20.66	26.22	
918	0.195	0.02	−0.581	−0.503	−0.006	−0.005	
919	0.083	−0.018	0.361	0.31	−0.063	−0.054	
920	0.064	−0.018	0.785	0.674	−0.065	−0.056	Zero
921	4.835	14.1	299.8	384	72.6	88	
922	8.99	18.09	449.1	674.2	91	136.6	
923	9.12	18.1	449.3	682.6	91.1	138.4	High
924	6.791	11.54	329.5	444.3	57.43	76.7	
925	4.618	9.99	251	276.1	48.91	53.8	
926	4.555	9.99	251.2	275.1	48.93	53.59	Mid
927	4.81	9.4	226	249.5	58.15	64.82	
928	6.679	7.57	83.5	104.8	72.1	90.6	
929	2.071	0.253	7.93	9.51	5.496	6.408	
930	0.141	0.022	0.198	0.17	0.825	0.712	
931	0.078	0.02	−0.745	−0.64	0.686	0.59	
932	0.075	−0.018	−1.089	−0.936	0.681	0.585	Zero Bias
933	2.222	−0.036	−0.993	−0.951	0.792	0.742	
934	4.41	−0.002	−0.085	−0.091	0.568	0.616	
935	4.228	2.275	−1.693	−1.77	0.512	0.553	O2 Bias Mid
936	0.552	9.71	−9.08	−8.03	0.45	0.398	
937	0.095	9.74	−8.82	−7.59	0.461	0.396	CO2 Bias Mid
938	0.115	5.891	58.45	50.34	0.472	0.406	
939	0.106	0.118	244.7	210.6	0.435	0.374	CO Bias Mid
940	0.064	0.067	228.2	196.1	10.08	8.65	
941	0.057	0.065	4.724	4.056	57.01	48.96	
942	0.059	0.029	−1.501	−1.29	90.3	77.6	NOx Bias High
943	0.055	0.011	−0.976	−0.839	90.4	77.7	
944	0.585	2.098	8.71	8.36	84.4	73.8	
945	6.206	7.77	57.37	70.2	70.4	85.4	
946	6.757	7.78	84.9	107.1	70.2	88.8	
947	6.756	7.84	107.2	135.3	67.87	86	
948	6.877	7.75	46.58	59.25	70.5	89.9	
949	6.805	7.85	73.2	92.8	70	88.9	
950	6.933	7.91	57.68	73.7	69.59	89.3	
951	6.897	7.77	57.83	73.8	70.9	90.6	
952	6.851	7.81	101.2	128.9	68.65	87.5	
953	6.94	7.79	62.82	80.5	69.59	89.3	
954	6.879	7.81	67.78	86.2	70.1	89.4	

March 9, 1995 – High Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
955	6.878	7.87	81.2	103.6	68.38	87.3	
956	6.962	7.85	46.56	59.73	70.4	90.4	
957	6.822	7.95	91.5	116	69.24	88	
958	6.913	7.94	60.62	77.4	68.63	87.9	
959	6.963	7.95	44.93	57.62	70.7	90.8	
1000	6.868	7.86	80	101.9	68.82	87.8	
1001	6.958	7.79	56.65	72.7	69.41	89.2	Begin
1002	6.948	7.8	43.38	55.45	70.9	90.9	215 MW Urea
1003	6.912	7.85	69.2	88.5	68.57	87.8	
1004	7.02	7.81	38.59	49.74	70.6	91	
1005	6.913	7.86	59.67	76.3	69.43	88.8	
1006	6.961	7.8	59.58	76.4	69.06	88.7	
1007	7	7.8	41.48	53.35	70.5	90.8	
1008	6.863	7.91	73.1	93.2	68.5	87.4	
1009	7.01	7.77	49.34	63.53	69.8	90	
1010	6.907	7.83	58.26	74.3	70.1	89.7	
1011	6.857	7.91	92	117	67.9	86.6	
1012	7.01	7.82	46.68	60.13	70.6	91	
1013	6.887	7.89	69.79	89.1	69.11	88.3	
1014	6.971	7.86	59.97	77	69.51	89.4	
1015	6.936	7.81	49.85	63.85	69.63	89.2	
1016	6.86	7.81	90.7	115.5	68.58	87.4	
1017	6.983	7.78	58	74.5	70	90.1	
1018	6.876	7.83	73.7	93.8	69.68	88.9	
1019	6.951	7.84	71.7	91.9	68.9	88.5	
1020	6.95	7.76	52.06	66.69	70.9	90.9	
1021	6.887	7.84	99	126.5	67.95	86.8	
1022	7.02	7.72	43.31	55.85	70.9	91.5	
1023	6.884	7.82	82.3	105.2	69.1	88.3	
1024	7	7.79	53.69	69.04	70	90.2	
1025	6.909	7.8	71.3	91	69.76	89.2	
1026	6.908	7.91	88.2	112.6	68.61	87.8	
1027	6.977	7.84	45.09	57.84	70.8	91	
1028	6.879	7.88	105.2	134.2	68.25	87.1	
1029	6.994	7.88	69.99	90	69.8	89.9	
1030	6.884	7.9	69.86	89.1	68.83	87.9	
1031	6.988	7.8	49.45	63.62	69.89	89.9	
1032	6.95	7.84	54.63	70.1	69.66	89.4	
1033	6.984	7.86	43.53	55.99	69.96	90	
1034	6.955	7.83	46.88	60.18	69.41	89.1	
1035	7.04	7.7	31.61	40.81	70.8	91.5	
1036	7	7.76	50.52	65.04	69.97	90.2	
1037	6.989	7.79	34.46	44.32	70.9	91.3	
1038	7.02	7.8	51.81	66.81	70.7	91.1	
1039	7.02	7.75	47.79	61.61	70.8	91.3	
1040	7.01	7.82	56.42	72.7	70.3	90.6	
1041	6.961	7.87	65.79	84.5	70.3	90.2	

March 9, 1995 – High Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
1042	7.03	7.77	41.41	53.47	70.7	91.3	
1043	6.99	7.82	68.14	87.7	69.58	89.6	
1044	6.993	7.86	51.39	66.11	70.3	90.5	
1045	7.04	7.87	48.81	63.04	70.4	91	
1046	7	7.9	48.19	62.07	69.97	90.1	
1047	7.02	7.9	45.81	59.06	70.1	90.4	
1048	6.962	7.89	61.28	78.6	69.74	89.6	
1049	7.04	7.79	52.32	67.53	70.3	90.8	
1050	6.975	7.88	62.67	80.6	69.59	89.5	
1051	6.985	7.92	51.76	66.59	70.1	90.2	
1052	7	7.87	58.16	74.9	70.1	90.3	
1053	6.966	7.84	62.53	80.3	68.94	88.6	
1054	7.01	7.86	44.31	57.08	69.99	90.2	
1055	6.978	7.89	62.15	79.9	69.2	89	
1056	6.984	7.83	61.78	79.5	69.3	89.1	
1057	7.01	7.8	58.04	74.8	70.1	90.3	
1058	6.999	7.85	61.21	78.8	69.71	89.8	
1059	6.956	7.83	65.04	83.5	69.72	89.5	
1100	7.05	7.88	46.74	60.41	69.84	90.3	
Avg:	6.97	7.83	58.77		69.77		
1136	0.06	−0.063	−0.677	−0.582	0.133	0.114	Zero
1137	1.652	5.924	98.8	101.3	28.38	27.81	
1138	4.457	9.9	250.2	272.1	48.05	52.28	
1139	4.555	9.88	251.2	275.1	48.08	52.65	Mid
1140	7.34	16.06	381.6	520	80.8	108.9	
1141	9.17	18.04	449	685.2	89.6	136.7	
1142	9.22	18	449	688.2	89.7	137.4	High
1143	8.33	11.75	254.6	382.9	82.7	119.4	
1144	6.808	6.523	63.68	81.9	79.9	102.3	
1145	1.063	0.098	1.89	1.932	5.873	5.979	
1146	0.119	0.034	−0.339	−0.292	0.81	0.698	
1147	0.081	0.018	−0.305	−0.262	0.713	0.613	Zero Bias
1148	0.113	0.036	−0.7	−0.602	0.789	0.679	
1149	3.627	0.018	−0.683	−0.716	0.648	0.665	
1150	4.513	−0.004	−1.563	−1.707	0.582	0.636	O2 Bias Mid
1151	4.479	0.983	−1.839	−2.006	0.548	0.599	
1152	0.861	9.53	−7.53	−6.745	0.528	0.476	
1153	0.138	9.76	−8.2	−7.07	0.525	0.452	CO2 Bias Mid
1154	0.118	4.729	97.1	83.6	0.515	0.443	
1155	0.103	0.078	245.8	211.5	0.498	0.428	
1156	0.093	−0.016	246.1	211.7	1.143	0.983	CO Bias Mid
1157	0.09	−0.034	52.78	45.41	81	69.68	
1158	0.085	0.029	−1.969	−1.693	88.5	76.1	
1159	0.081	−0.047	−1.331	−1.145	88.8	76.4	
1200	0.099	−0.063	−1.551	−1.335	88.6	76.2	NOx Bias High

March 11, 1995 – Low Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
430	0.057	−0.145	2.876	2.47	−0.182	−0.156	Zero
431	5.268	14.33	306.6	401.9	75.8	94	
432	8.98	17.78	451.4	677.4	92.2	138.3	
433	9.12	17.88	452.1	686.7	92.3	140.2	
434	9.14	17.93	452	688	92.2	140.4	High
435	6.919	10.27	316.4	428.9	51.78	68.29	
436	4.658	9.78	252.4	278.4	50.1	55.24	
437	4.566	9.84	252.7	276.9	50.07	54.87	
438	4.551	9.8	254	278.1	50.08	54.83	Mid
439	6.014	8.1	150	175.8	36.92	43.92	
440	9.3	3.443	64.32	97.9	14.78	19.79	
441	1.391	−0.033	1.619	1.525	0.549	0.517	
442	0.145	−0.069	1.077	0.931	0.397	0.343	
443	0.075	−0.025	1.54	1.323	0.355	0.305	
444	0.074	−0.038	1.179	1.013	0.352	0.302	Zero Bias
445	4.696	−0.04	0.57	0.645	0.338	0.378	
446	8.85	−0.022	1.01	1.503	0.31	0.46	
447	9.04	−0.089	1.196	1.803	0.274	0.413	
448	9.07	−0.076	0.553	0.837	0.257	0.389	O2 Bias High
449	4.212	7.59	−4.907	−4.87	0.259	0.293	
450	0.308	9.65	−7.35	−6.393	0.246	0.214	CO2 Bias High
451	0.149	2.336	157.9	136.1	0.205	0.177	
452	0.11	−0.031	246.5	212.3	0.175	0.151	CO Bias High
453	0.097	−0.067	101.4	87.3	35	30.11	
454	0.085	−0.067	1.968	1.693	48.45	41.67	
455	0.078	−0.06	1.901	1.634	48.54	41.73	NOx Bias High

LOW LOAD STRATIFICATION TEST

533	7.06	7.91	108.8	140.8	33.21	42.97	CENTER
534	7.04	7.74	117.4	151.7	33.53	43.31	
535	6.997	7.73	207.7	267.5	32.65	42.05	
				Avg:	33.13		
536	7.03	7.68	118.7	153.1	33.51	43.23	C−1
537	7.04	7.66	107.2	138.5	33.63	43.43	
538	6.955	8.18	149.2	191.5	33.27	42.72	
				Avg:	33.47		
539	7.05	7.7	108.4	139.9	34.07	44.01	C−2
540	6.963	7.79	169.3	217.6	33.37	42.88	
541	7.04	7.75	125.8	162.6	34.06	43.99	
				Avg:	33.83		

March 11, 1995 – Low Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
542	7	7.78	188.1	242.4	33.17	42.73	C–3
543	6.922	7.73	212.9	272.7	32.91	42.15	
544	6.961	7.69	165.3	212.3	33.56	43.1	
				Avg:	33.21		
545	7.04	7.72	115.9	149.4	34.18	44.12	C–4
546	6.93	7.84	216.5	277.1	32.79	42.03	
547	6.884	7.82	188.4	240.5	33.24	42.44	
				Avg:	33.40		
548	7.04	7.69	135.9	175.5	33.71	43.54	CENTER
549	6.954	7.73	196.6	252.4	32.89	42.22	
550	7.08	7.66	121.4	157.2	33.79	43.76	
				Avg:	33.46		
557	10.66	7.23	163.8	316.1	30.7	72	CENTER
558	7.42	7.62	142.8	190.8	33.39	44.41	
559	7.22	7.72	87.6	114.6	33.96	44.45	
600	7.07	7.71	153.3	198.4	32.85	42.55	
				Avg:	32.73		
601	7.07	7.73	118.2	152.8	33.65	43.54	A–1
602	7.03	7.75	180.6	233	32.93	42.53	
603	6.965	7.7	214.8	275.9	32.32	41.52	
				Avg:	32.97		
604	7.08	7.65	147.3	190.7	33.17	42.95	A–2
605	7.02	7.76	186	239.7	32.69	42.17	
606	7.02	7.77	184.8	238.2	33.35	43.01	
				Avg:	33.07		
607	7.14	7.65	82.2	106.9	34.4	44.76	A–3
608	6.991	7.7	177.2	228	33.27	42.82	
609	7.1	7.67	113.6	147.1	34.19	44.32	
				Avg:	33.95		
614	7.63	7.54	110.9	150.8	33.77	45.69	CENTER
615	7.06	7.75	141	182.3	33.76	43.68	
616	7.01	7.79	132.3	170.4	34.15	44.01	

March 11, 1995 – Low Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
				Avg:	33.89		
617	7.13	7.68	106.7	138.7	34.18	44.44	A–4
618	6.952	7.79	202.4	259.7	32.83	42.13	
619	7.06	7.81	133.2	172.2	33.71	43.59	
				Avg:	33.57		
625	7.38	7.77	151.3	200.4	33.18	44.01	CENTER
626	7.1	7.73	205.3	266.1	33.06	42.88	
627	7.12	7.72	96.3	125	34.61	44.97	
				Avg:	33.62		
628	7	7.81	183.4	236.2	33.11	42.67	D–1
629	7.01	7.73	141.8	182.6	33.71	43.43	
630	7.06	7.75	114.7	148.4	34.21	44.26	
				Avg:	33.68		
631	7.04	7.72	202.9	261.9	33.36	43.09	D–2
632	6.939	7.77	129.4	165.8	34.18	43.82	
633	6.949	7.75	145.7	186.9	34.18	43.87	
				Avg:	33.91		
634	6.9	7.78	171.1	218.7	33.66	43.04	D–3
635	6.906	7.83	196.8	251.7	33.8	43.23	
636	6.97	7.72	136.3	175.2	34.39	44.19	
637	7.06	7.69	74.7	96.5	35.58	46.02	
				Avg:	34.36		
638	7.1	7.68	102.2	132.6	34.7	45.04	D–4
639	6.835	7.87	221.5	281.9	33.63	42.81	
640	6.91	7.85	159.2	203.5	34.39	44	
641	6.97	7.84	136.1	174.9	34.48	44.31	
				Avg:	34.30		
642	6.929	7.84	146.8	188	33.99	43.54	CENTER
643	7.05	7.77	84.9	109.7	34.78	44.94	
644	6.979	7.79	142.3	183	34.16	43.95	
				Avg:	34.31		
650	7.21	7.81	288.6	378.2	33	43.22	CENTER

March 11, 1995 – Low Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
651	7	7.76	186.6	240.4	33.72	43.44	
652	6.945	7.93	205	263	33.56	43.05	
				Avg:	33.43		
653	7.09	7.74	110.6	143.3	34.88	45.19	B–1
654	7.14	7.65	97.1	126.3	34.74	45.2	
655	7.06	7.79	140.5	181.7	34.26	44.3	
656	7.09	7.72	81.8	106.1	35	45.37	
657	7.03	7.77	185.6	239.6	33.7	43.51	
				Avg:	34.52		
658	6.853	7.85	239.5	305.3	33.11	42.21	B–2
659	6.938	7.74	217.1	278	33.79	43.3	
700	6.978	7.81	141.9	182.4	34.08	43.82	
				Avg:	33.66		
701	6.94	7.75	184.6	236.6	34.05	43.66	B–3
702	7.09	7.67	89.5	115.8	35.6	46.11	
703	7.17	7.74	74.1	96.5	35.79	46.67	
				Avg:	35.15		
704	7.08	7.69	79.5	103	35.06	45.4	B–4
705	7.07	7.79	101	130.8	34.92	45.2	
706	7.03	7.82	130.6	168.5	34.62	44.68	
				Avg:	34.87		
707	7.03	7.79	138.4	178.6	34.61	44.67	CENTER
708	6.953	7.8	198.2	254.4	34.08	43.76	
709	6.886	7.86	170.8	218	34.42	43.96	
				Avg:	34.37		
710	7.02	7.81	131.1	169	34.96	45.09	
711	6.934	7.22	187.1	240.4	30.19	38.87	
712	1.308	−0.109	8.99	9.84	−0.263	−0.242	
713	0.107	−0.063	2.071	1.783	−0.305	−0.262	
714	0.06	−0.004	2.009	1.725	−0.314	−0.269	
715	0.046	−0.036	2.799	2.402	−0.319	−0.274	Zero
716	2.273	7.74	158.7	161.9	39.51	39.08	
717	4.422	9.82	253.2	275	50.09	54.39	
718	4.495	9.86	254.3	277.5	50.08	54.64	Mid
719	7.02	16.08	382.2	508.3	83.3	109.6	

March 11, 1995 – Low Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
720	9.02	18.01	452.6	681.4	93	140	
721	9.09	17.97	452.7	686	93.1	141.1	High
722	8.12	10.86	248.2	363.2	49.31	71.2	
723	7.03	7.76	171.6	221.2	33.44	43.2	
724	6.883	7.83	233.4	298	33.74	43.09	
725	6.923	7.76	196.5	251.6	34.03	43.59	
726	6.882	7.8	226.9	289.5	33.69	43.01	
727	11.71	3.336	60.05	83.8	13.76	18.87	
728	19.98	0.103	1.873	42	0.341	6.706	
729	20.42	0.025	1.975	72.7	0.209	7.67	
730	20.5	0.063	0.35	15.03	0.41	18.83	
731	14.55	3.809	40.46	146.9	17.39	101.1	
732	3.484	0.083	1.574	2.07	0.201	0.306	
733	0.308	−0.049	2.014	1.751	0.027	0.024	
734	0.121	−0.083	1.653	1.425	−0.016	−0.014	
735	0.1	−0.067	0.655	0.563	−0.027	−0.023	Zero Bias
736	1.535	−0.018	0.581	0.549	−0.018	−0.018	
737	8.5	−0.007	0.44	0.608	−0.063	−0.091	
738	9.06	−0.034	−0.192	−0.291	−0.081	−0.123	
739	9.11	−0.009	0.497	0.754	−0.099	−0.151	O2 Bias High
740	4.386	7.7	−3.527	−3.428	−0.128	−0.145	
741	0.694	9.5	−6.41	−5.684	−0.126	−0.112	CO2 Bias Mid
742	0.364	4.511	103	89.4	−0.138	−0.12	
743	0.225	0.029	246.3	213.3	−0.148	−0.128	CO Bias Mid
744	0.136	−0.009	234.3	202.1	7.47	6.424	
745	0.057	−0.06	8.15	7	48.57	41.71	
746	0.044	−0.078	1.862	1.598	49.03	42.08	NOx Bias Mid
747	0.884	−0.056	1.806	1.62	42.27	37.19	
748	13.34	−0.116	1.208	4.834	6.238	8.71	
749	19.94	−0.127	0.502	16.21	0.649	2.138	
750	20.12	0	4.458	105.6	1.451	32.84	
751	20.26	−0.045	5.383	151.1	0.884	24.73	
752	17.15	2.882	50.63	187.5	16.2	99.1	
753	7.86	7.53	157.2	218.2	33.01	45.72	
754	7.14	7.6	185.7	241.5	32.54	42.35	
755	7.08	7.6	193.4	250.5	32.84	42.55	
756	7.1	7.52	152.7	197.9	33.73	43.75	
757	7.23	7.53	43.19	56.52	35.24	46.14	
758	7.15	7.63	121.6	158.4	34.16	44.49	
759	7.2	7.61	84.5	110.4	34.63	45.24	
800	7.07	7.74	209.7	271.5	33.12	42.9	
801	7.07	7.71	184.1	238.1	33.21	42.96	Begin 65 MW
802	7.03	7.74	224.2	289.5	32.76	42.29	Baseline
803	7.07	7.77	158.6	205.2	33.53	43.4	
804	7.06	7.82	154.6	200	33.69	43.59	
805	7.2	7.63	138.1	180	33.74	44.05	

March 11, 1995 – Low Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)
806	7.17	7.66	128.7	167.9	34.16	44.54
807	7.22	7.63	54.18	70.7	35.42	46.33
808	7.25	7.6	58.77	77.1	35.33	46.33
809	7.27	7.59	66.45	87.2	34.7	45.57
810	7.17	7.7	105	137	34	44.36
811	7.14	7.76	111.8	145.5	34.19	44.47
812	7.07	7.74	176.5	228.4	33.43	43.28
813	6.986	7.76	289.4	372.3	32.79	42.19
814	7.08	7.73	173.2	224.1	33.53	43.4
815	7.21	7.72	109.2	142.8	34.27	44.83
816	7.07	7.81	166.5	215.5	33.66	43.57
817	6.994	7.8	198.3	255.2	33.67	43.35
818	7.19	7.62	113.3	147.6	34.39	44.86
819	7.24	7.61	83.7	109.6	34.71	45.5
820	7.16	7.65	117.3	152.9	34.3	44.7
821	7.21	7.69	84.1	109.9	34.46	45.06
822	7.24	7.65	55.52	72.8	35.39	46.37
823	7.2	7.7	167.8	218.9	33.87	44.3
824	7.09	7.71	207.3	268.5	33.33	43.19
825	7.15	7.63	177	230.4	33.42	43.51
826	7.07	7.7	227.6	294.3	33.38	43.2
827	7.03	7.68	183.8	236.8	33.36	43.02
828	7.2	7.59	89	116.1	34.87	45.56
829	7.21	7.65	120.8	157.9	34.3	44.88
830	7.05	7.68	162.5	209.9	33.85	43.75
831	7.14	7.65	86.7	112.8	34.89	45.41
832	7.11	7.74	145.4	188.8	34.04	44.19
833	7.15	7.67	158.2	205.9	33.55	43.67
834	7.11	7.69	118.2	153.3	34.75	45.09
835	7.15	7.73	96.7	125.9	35.11	45.72
836	7.12	7.68	118.7	154.3	34.14	44.35
837	7.19	7.72	137.8	180	34.05	44.47
838	7.05	7.73	164.1	212	33.76	43.62
839	7.1	7.7	104.7	135.8	34.46	44.69
840	7.15	7.6	139.8	182	34.4	44.79
841	7.16	7.67	140.4	182.9	34.24	44.62
842	7.02	7.79	160	206.5	33.78	43.56
843	7.12	7.67	99.6	129.4	34.76	45.15
844	7.18	7.68	125.8	164.2	34.59	45.15
845	7.03	7.83	211.6	273.1	33.6	43.38
846	7	7.83	224.3	288.9	33.37	42.99
847	7.12	7.74	138.4	179.7	34.58	44.89
848	7.07	7.81	129	167.1	34.37	44.52
849	7.13	7.64	128.6	167.1	34.19	44.43
850	7.19	7.69	105	137.1	34.95	45.64
851	7.05	7.82	157.7	203.7	34.27	44.29
852	7.19	7.7	80.8	105.5	35.02	45.72

March 11, 1995 – Low Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
853	7.18	7.65	153.8	200.7	33.88	44.21	
854	7.02	7.78	147.9	190.9	34.13	44.03	
855	7.1	7.67	105.5	136.7	34.96	45.33	
856	7.06	7.71	122.3	158.2	34.64	44.83	
857	7.12	7.64	111.1	144.1	34.8	45.21	
858	7.14	7.67	96.1	124.9	35.02	45.58	
859	7.11	7.74	166.8	216.5	33.81	43.88	
900	7.07	7.75	154.8	200.2	33.93	43.9	End Test
Avg:	7.12	7.70	138.62		34.16		
901	7.09	7.77	165.8	214.9	33.2	43.03	
902	2.087	0.255	21.32	26.28	−0.129	−0.092	
903	0.122	−0.103	2.522	2.175	−0.284	−0.245	
904	0.059	−0.018	2.003	1.721	−0.287	−0.246	Zero
905	2.352	8	167.1	170.3	40.83	40.39	
906	4.433	9.96	253.4	275.4	49.85	54.17	
907	4.496	9.85	253.7	276.8	49.85	54.39	Mid
908	6.846	15.73	374.4	492.4	82.3	107.1	
909	9.01	18.08	451.6	679.3	92.7	139.4	
910	9.08	18.02	451.8	684.4	92.7	140.5	High
911	8.31	10.31	252.5	370.5	44.38	64.48	
912	2.291	0.409	20.05	24.77	5.43	6.747	
913	0.144	0.031	1.495	1.289	0.289	0.249	
914	0.068	−0.042	1.981	1.702	0.181	0.155	
915	0.061	−0.074	1.467	1.26	0.174	0.149	Zero Bias
916	2.467	−0.065	1.653	1.609	0.249	0.234	
917	8.66	−0.038	0.525	0.754	0.113	0.164	
918	9	0.002	1.179	1.774	0.096	0.144	O2 Bias High
919	5.323	6.365	−2.833	−2.715	0.076	0.094	
920	0.355	9.67	−5.902	−5.147	0.02	0.018	CO2 Bias ~~High~~ MID
921	0.09	3.494	0.925	0.795	31.24	26.86	
922	0.105	0.02	0.683	0.588	48.54	41.78	NOx Bias ~~High~~ MID
923	0.162	0.047	164.3	141.9	9.73	8.4	
924	0.158	−0.009	248.3	214.3	0.13	0.112	CO Bias ~~High~~ MID
925	0.268	0.684	243.9	211.1	3.647	3.202	
926	5.773	7.53	111.1	129.2	34.13	40.33	
927	6.919	7.7	245.4	314.2	32.77	41.95	
928	6.914	7.86	277.1	354.6	32.48	41.57	
929	7.07	7.68	131.6	170.1	31.04	40.16	
930	7.18	7.64	80.5	105	27.29	35.6	
931	7.15	7.68	110.7	144.1	27.1	35.27	
932	7.24	7.65	57.71	75.5	28.36	37.16	
933	7.21	7.67	114.5	149.7	27.33	35.73	
934	7.12	7.81	126	163.7	27.59	35.84	
935	7.2	7.67	71.4	93.2	28.12	36.72	

March 11, 1995 – Low Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
936	7.18	7.68	134.3	175	26.87	35.06	Begin 65 MW
937	7.06	7.74	171.4	221.5	26.8	34.67	Urea Inj
938	7.07	7.73	123.2	159.4	27.15	35.13	
939	7.08	7.81	186	241	26.15	33.87	
940	7.13	7.71	180.6	234.6	26.21	34.06	
941	7.15	7.7	134	174.3	27.27	35.49	
942	7.18	7.68	113.3	147.8	26.97	35.19	
943	7.16	7.79	127.4	166	26.96	35.12	
944	7.28	7.66	54.78	71.9	28.44	37.34	
945	7.31	7.71	78.3	103	27.78	36.62	
946	7.19	7.76	111.9	145.9	27.65	36.09	
947	7.29	7.61	51.23	67.42	28.98	38.12	
948	7.22	7.64	72	94.2	28.08	36.75	
949	7.16	7.7	138.2	180.1	27.06	35.25	
950	7.14	7.71	114.6	149	27.39	35.61	
951	7.2	7.69	99.9	130.6	27.59	36.06	
952	7.1	7.76	179.5	232.9	26.23	34.03	
953	7.01	7.77	152.9	197.1	27.32	35.21	
954	7.07	7.75	112.8	146	27.78	35.96	
955	6.944	7.83	206.2	264.5	27.02	34.66	
956	7.08	7.69	108.8	140.7	28.27	36.6	
957	7.04	7.77	138.3	178.6	27.62	35.7	
958	6.964	7.77	165.3	212.3	27.48	35.3	
959	7.06	7.73	99.1	128.2	28.31	36.61	
1000	7.06	7.81	106.2	137.3	28.14	36.39	
1001	7.14	7.75	76.7	99.5	29.27	38.07	
1002	7.28	7.65	29.38	38.63	30.18	39.67	
1003	7.11	7.75	107.2	139	28.06	36.46	
1004	7.02	7.73	109	140.6	28.62	36.91	
1005	7.01	7.81	122.7	158	28.32	36.5	
1006	6.91	7.87	250.9	321.1	27.29	34.91	
1007	7.12	7.68	61.63	79.9	29.46	38.26	
1008	6.958	7.78	142	182.3	27.6	35.45	
1009	7.06	7.71	80.2	103.5	29.28	37.85	
1010	7.13	7.79	99.3	129.1	28.35	36.88	
1011	6.932	7.83	228.8	293.1	27.1	34.74	
1012	6.998	7.69	177.3	228.1	27.63	35.58	
1013	6.876	7.83	301.9	385.4	26.54	33.89	
1014	6.927	7.76	184	235.2	27.67	35.43	
1015	7.1	7.6	89.4	116	28.95	37.55	
1016	7.03	7.68	116.4	150.2	28.49	36.76	
1017	7.14	7.67	69.45	90.2	29.57	38.46	
1018	7.16	7.69	83.9	109.2	29.46	38.39	
1019	7.09	7.68	105.5	136.8	28.25	36.61	
1020	7	7.66	122.1	157.3	28	36.08	
1021	7.02	7.73	165.8	213.6	28	36.09	
1022	7.08	7.7	81.1	105.1	28.72	37.2	

March 11, 1995 – Low Load

Time	O2 (%)	CO2 (%)	CO (ppm)	CO @ 3% (ppm)	NOx (ppm)	NOx @ 3% (ppm)	
1023	7.07	7.68	116.9	151.2	28.27	36.59	
1024	7.03	7.61	113.9	146.7	28.86	37.24	
1025	7.16	7.59	47.76	62.28	29.62	38.6	
1026	7.06	7.67	124.6	161.1	28.47	36.83	
1027	7.07	7.68	124.7	161.4	28.51	36.91	
1028	7.07	7.72	161.4	208.9	28.25	36.58	
1029	6.992	7.78	260.3	335.1	26.98	34.73	
1030	7.06	7.74	151.9	196.2	27.74	35.87	
1031	7.08	7.69	99.2	128.6	28.64	37.1	
1032	7.07	7.65	129.6	167.7	28.1	36.37	
1033	7.13	7.62	78.2	101.7	29.17	37.92	
1034	7.08	7.71	138.1	178.6	27.98	36.25	
1035	6.971	7.81	237	304.6	27.14	34.89	End Test
Avg:	7.08	7.72	129.14		27.97		
1036	3.079	1.535	49.56	62.57	4.522	5.855	
1037	0.174	−0.101	1.27	1.096	−0.235	−0.203	
1038	0.086	−0.132	1.586	1.364	−0.252	−0.216	
1039	0.067	−0.188	1.512	1.299	−0.27	−0.232	Zero
1040	2.399	7.91	166.1	169.9	40.86	40.5	
1041	4.447	9.79	252.4	274.5	49.56	53.9	
1042	4.507	9.76	252.6	275.8	49.55	54.11	Mid
1043	6.047	14.09	337.5	420.3	72.7	90	
1044	8.99	17.84	451.6	677.9	92.1	138.3	
1045	9.11	17.93	451.4	685.4	92.3	140.1	High
1046	8.01	9.93	219.1	318.6	41.38	59.34	
1047	4.249	2.77	119.7	141.1	11.89	15.29	
1048	0.23	−0.018	1.868	1.62	0.25	0.217	
1049	0.086	−0.112	2.065	1.776	0.186	0.16	Zero Bias
1050	2.488	−0.049	1.806	1.683	0.184	0.176	
1051	8.7	−0.121	0.248	0.375	0.097	0.141	
1052	9.04	−0.17	0.35	0.527	0.063	0.095	
1053	9.08	−0.065	0.316	0.479	0.047	0.072	O2 Bias High
1054	4.76	6.954	−3.673	−3.628	0.035	0.043	
1055	0.338	9.61	−6.093	−5.309	0.025	0.022	CO2 Bias Mid
1056	0.191	3.206	138.3	119.5	0.016	0.014	
1057	0.163	0.004	247	213.2	−0.002	−0.002	CO Bias Mid
1058	0.089	−0.049	232.6	200.1	7.63	6.549	
1059	0.039	−0.174	7.02	6.03	48.27	41.42	
1100	0.03	−0.159	1.298	1.113	48.69	41.76	NOx Bias Mid

APPENDIX C-6

EMISSION RATE CALCULATIONS

SCE HBGS UNIT 2 COMPLIANCE PPM TO LB/HR WORKSHEET

Test #	Load	Condition	Flow Rate (dscf/min)	NOx		CO		TGNMO			NH3	
				ppm	lb/hr	ppm	lb/hr		ppm	lb/hr	ppm	lb/hr
1	Mid	Baseline						A:	58	40		
								B:	34	24		
			272995	49.6	98.6	108	131	avg:	46	32		
2	Mid	Urea Inj						A:	78	54		
								B:	130	90		
			273563	38.4	76.5	111	135	avg:	104	72	12	8.8
.3	Full	Baseline						A:	58	81		
								B:	82	114		
			547128	83.2	332	83.8	203	avg:	70	97		
4	Full	Urea Inj						A:	31	44		
								B:	63	89		
			555487	71.8	291	60.4	149	avg:	47	66	14	21
6	Low	Baseline						A:	80	38		
								B:	28	13		
			185712	33.9	45.9	140	115	avg:	54	25		
7	Low	Urea Inj						A:	35	17		
								B:	49	24		
			189613	27.8	38.4	129	108	avg:	42	20	9	5

Molecular Weight (M): 46.01 - NOx
28.01 - CO
16.04 - TGNMO as Methane
17.03 - NH3

E = ((Cg*M*Q*60 min/hr) / 379E06)

Where: E = Mass Emission Rate (lb/hr)
Cg = Gas Concentration (ppm)
M = Molecular Weight of Constituent
Q = Volumetric Flow Rate (dscfm)
379E06 = Conversion Factor (scf/lb*mol)

CORRECTION OF TEST RESULTS TO 3% O2

TEST	O2 (%)	NOX (ppm)	CO (ppm)	ROG (ppm)	NOX@3% (ppm)	CO@3% (ppm)	ROG@3% (ppm)
MID-BASELINE	7.2	49.6	108	A: 58 B: 34 avg: 46	64.8	141	A: 76 B: 44 avg: 60
MID-UREA	7.2	38.4	111	A: 78 B: 130 avg: 104	50.2	145	A: 102 B: 170 avg: 136
FULL BASELINE	6.7	83.2	83.8	A: 58 B: 82 avg: 70	105	106	A: 73 B: 103 avg: 88
FULL UREA	7.1	71.8	60.4	A: 31 B: 63 avg: 47	93.1	78.3	A: 40 B: 82 avg: 61
LOW BASELINE	7.2	33.9	140	A: 80 B: 28 avg: 54	44.3	183	A: 105 B: 37 avg: 71
LOW UREA	7.1	27.8	129	A: 35 B: 49 avg: 42	36.1	167	A: 45 B: 64 avg: 54

SCAQMD METHOD 100.1, CORRECTED TEST AVERAGES

Test #/Description	Time Start/Stop	Measurement Parameter	Bias Results				Calibration Gas Actual	Constituent Average	
			Zero Bias		Calibration Bias				
			Pre	Post	Pre	Post		Raw	Corrected
Mid Load Baseline (Test 1)	0140/0240	O2 (%)	0.1	0.1	4.5	4.5	4.5	7.1	7.2
		NOx (ppm)	0.4	0.8	48.3	49.1	48.4	49.9	49.6
		CO (ppm)	-1.1	-0.3	244.6	247.3	250.0	106.2	108.4
		CO2 (%)	-0.2	0.0	9.5	9.6	9.9	7.6	7.9
Mid Load Urea Inj (Test 2)	0340/0440	O2 (%)	0.1	0.1	4.5	4.5	4.5	7.1	7.2
		NOx (ppm)	0.8	0.2	49.1	49.4	48.4	39.1	38.4
		CO (ppm)	-0.3	-0.1	247.3	246.0	250.0	109.2	110.8
		CO2 (%)	0.0	0.0	9.6	9.7	9.9	7.7	7.9
Full Load Baseline (Test 3)	0815/0915	O2 (%)	0.1	0.1	4.8	4.4	4.5	6.8	6.7
		NOx (ppm)	0.8	0.7	89.9	90.3	92.2	81.3	83.2
		CO (ppm)	-1.0	-1.1	245.9	245.0	250.0	81.6	83.8
		CO2 (%)	0.0	0.0	9.7	9.7	9.9	7.9	8.0
Full Load Urea Inj (Test 4)	1000/1100	O2 (%)	0.1	0.1	4.4	4.5	4.5	7.0	7.1
		NOx (ppm)	0.7	0.7	90.3	88.6	92.2	69.8	71.8
		CO (ppm)	-1.1	-0.3	245.0	246.1	250.0	58.8	60.4
		CO2 (%)	0.0	0.0	9.7	9.8	9.9	7.8	7.9
Low Load Baseline (Test 6)	0800/0900	O2 (%)	0.1	0.1	9.1	9.0	9.1	7.1	7.2
		NOx (ppm)	0.0	0.2	49.0	48.5	48.4	34.2	33.9
		CO (ppm)	0.7	1.5	246.3	248.3	250.0	138.6	139.6
		CO2 (%)	-0.1	-0.1	9.5	9.7	9.9	7.7	8.0
Low Load Urea Inj (Test 7)	0935/1035	O2 (%)	0.1	0.1	9.0	9.1	9.1	7.1	7.1
		NOx (ppm)	0.2	0.2	48.5	48.7	48.4	28.0	27.8
		CO (ppm)	1.5	2.1	248.3	247.0	250.0	129.1	129.4
		CO2 (%)	-0.1	-0.1	9.7	9.6	9.9	7.7	7.9

HBGS - COMPLIANCE

AIR TO FUEL RATIO CALCULATIONS

Test #	V2 (mmdscf)	a duct O2 (%)	c excess O2 (%)	V1 (mmdscf)
1	16.38	2.9	7.2	12.47
2	16.41	2.9	7.2	12.49
3	32.83	3.1	6.7	26.19
4	33.33	3.1	7.1	25.84
6	11.14	2.3	7.2	8.21
7	11.38	2.4	7.1	8.49

Test #	flow rate thru duct			fuel			Air In	
	flow rate (mmdscf/hr)	molecular weight	flow rate (mmlb/hr)	flow rate (mmscf/hr)	molecular weight	flow rate (mmlb/hr)	flow rate (mmlb/hr)	Air to Fuel Ratio
1	12.47	29.6	0.68	1.120	16.04	0.0332	0.65	19.5
2	12.49	29.6	0.68	1.135	16.04	0.0337	0.65	19.3
3	26.19	29.6	1.43	2.147	16.04	0.0637	1.37	21.5
4	25.84	29.6	1.42	2.143	16.04	0.0636	1.35	21.3
6	8.21	29.6	0.45	0.771	16.04	0.0229	0.43	18.6
7	8.49	29.6	0.46	0.772	16.04	0.0229	0.44	19.3

APPENDIX C-7

QA/QC PERFORMANCE MEASUREMENTS SUMMARY TABLES

Table *-*. SCAQMD Method 100.1 instrument calibration results, mid load Baseline, 3/9/95

	O2 (%)	CO2 (%)	CO (ppm)	NOx (ppm)
Calibration Gas Concentration				
Operating Range	0- 10	0- 20	0- 500	0- 100
High Range	9.14	17.75	451	92.2
Mid Range	4.50	9.89	250	48.4
Zero Calibration Response				
Pre-Test Response	0.1	-0.1	0.4	0.0
Post-Test Response	0.1	-0.1	-0.3	-0.1
High Range Calibration Response				
Pre-Test Response	9.2	17.8	449.6	91.9
Post-Test Response	9.1	17.9	449.6	93.4
Mid Range Calibration Response				
Pre-Test Response	4.6	9.7	252.1	48.4
Post-Test Response	4.5	9.9	250.6	50.1
Zero Gas System Bias Respose				
Pre-Test Response	0.1	-0.2	-1.1	0.4
Post-Test Response	0.1	0.0	-0.3	0.8
Cal-Gas System Bias Respose				
Pre-Test Response	4.5	9.5	244.6	48.3
Post-Test Response	4.5	9.6	247.3	49.1
Analyzer Calibration Error (criteria: 2%)				
Pre-Test High	0.2%	0.3%	0.3%	0.3%
Pre-Test Mid	0.7%	1.0%	0.4%	0.0%
Pre-Test Zero	0.6%	0.6%	0.1%	0.0%
Post-Test High	0.0%	0.9%	0.3%	1.3%
Post-Test Mid	0.3%	0.0%	0.1%	1.7%
Post-Test Zero	0.8%	0.3%	0.1%	0.1%
Sampling System Bias Error (criteria: 5%)				
Pre-Test	0.7%	0.8%	1.5%	0.1%
Post-Test	0.2%	1.5%	0.7%	0.9%
Linearity (criteria: 1%)				
Pre-Test	0.3%	0.8%	0.5%	0.1%
Post-Test	0.1%	0.3%	0.3%	1.0%
Zero Calibration Drift (criteria: 3%)	0.2%	0.3%	0.1%	0.1%
Calibration Drift (criteria: 3%)	0.4%	1.0%	0.3%	1.7%

Table *-*. SCAQMD Method 100.1 instrument calibration results, mid load, Urea Injection , 3/9/95

	O2 (%)	CO2 (%)	CO (ppm)	NOx (ppm)
Calibration Gas Concentration				
Operating Range	0- 10	0- 20	0- 500	0- 100
High Range	9.14	17.75	451	92.2
Mid Range	4.50	9.89	250	48.4
Zero Calibration Response				
Pre-Test Response	0.1	-0.1	-0.3	-0.1
Post-Test Response	0.1	0.0	0.3	-0.1
High Range Calibration Response				
Pre-Test Response	9.1	17.9	449.6	93.4
Post-Test Response	9.1	18.1	449.5	94.3
Mid Range Calibration Response				
Pre-Test Response	4.5	9.9	250.6	50.1
Post-Test Response	4.5	9.9	251.0	50.5
Zero Gas System Bias Respose				
Pre-Test Response	0.1	0.0	-0.3	0.8
Post-Test Response	0.1	0.0	-0.1	0.2
Cal-Gas System Bias Respose				
Pre-Test Response	4.5	9.6	247.3	49.1
Post-Test Response	4.5	9.7	246.0	49.4
Analyzer Calibration Error (criteria: 2%)				
Pre-Test High	0.0%	0.9%	0.3%	1.3%
Pre-Test Mid	0.3%	0.2%	0.1%	1.7%
Pre-Test Zero	0.8%	0.3%	0.1%	0.1%
Post-Test High	0.2%	1.6%	0.3%	2.2%
Post-Test Mid	0.1%	0.0%	0.2%	2.1%
Post-Test Zero	0.7%	0.2%	0.1%	0.1%
Sampling System Bias Error (criteria: 5%)				
Pre-Test	0.2%	1.3%	0.7%	0.9%
Post-Test	0.1%	1.1%	1.0%	1.0%
Linearity (criteria: 1%)				
Pre-Test	0.1%	0.5%	0.3%	1.0%
Post-Test	0.2%	0.8%	0.3%	0.9%
Zero Calibration Drift (criteria: 3%)	0.1%	0.1%	0.1%	0.0%
Calibration Drift (criteria: 3%)	0.2%	0.2%	0.1%	0.4%

Table *-*. SCAQMD Method 100.1 instrument calibration results, high load Baseline, 3/9/95

	O2 (%)	CO2 (%)	CO (ppm)	NOx (ppm)
Calibration Gas Concentration				
Operating Range	0- 10	0- 20	0- 500	0- 100
High Range	9.14	17.75	451	92.2
Mid Range	4.50	9.89	250	48.4
Zero Calibration Response				
Pre-Test Response	0.1	0.0	-0.5	0.0
Post-Test Response	0.1	0.0	0.8	-0.1
High Range Calibration Response				
Pre-Test Response	9.1	18.1	450.3	90.6
Post-Test Response	9.1	18.1	449.3	91.1
Mid Range Calibration Response				
Pre-Test Response	4.6	9.9	250.8	48.6
Post-Test Response	4.6	10.0	251.2	48.9
Zero Gas System Bias Respose				
Pre-Test Response	0.1	0.0	-1.0	0.8
Post-Test Response	0.1	0.0	-1.1	0.7
Cal-Gas System Bias Respose				
Pre-Test Response	4.8	9.7	245.9	89.9
Post-Test Response	4.4	9.7	245.0	90.3
Analyzer Calibration Error (criteria: 2%)				
Pre-Test High	0.3%	1.8%	0.1%	1.6%
Pre-Test Mid	0.5%	0.0%	0.2%	0.2%
Pre-Test Zero	0.7%	0.1%	0.1%	0.0%
Post-Test High	0.2%	1.8%	0.3%	1.0%
Post-Test Mid	0.6%	0.5%	0.2%	0.5%
Post-Test Zero	0.6%	0.1%	0.2%	0.1%
Sampling System Bias Error (criteria: 5%)				
Pre-Test	2.9%	1.1%	1.0%	0.7%
Post-Test	1.5%	1.3%	1.2%	0.8%
Linearity (criteria: 1%)				
Pre-Test	0.3%	0.9%	0.3%	1.0%
Post-Test	0.4%	0.4%	0.4%	1.0%
Zero Calibration Drift (criteria: 3%)	0.1%	0.1%	0.3%	0.1%
Calibration Drift (criteria: 3%)	0.1%	0.4%	0.1%	0.3%

Table *-*. SCAQMD Method 100.1 instrument calibration results, high load, Urea Injection , 3/9/95

	O2 (%)	CO2 (%)	CO (ppm)	NOx (ppm)
Calibration Gas Concentration				
Operating Range	0- 10	0- 20	0- 500	0- 100
High Range	9.14	17.75	451	92.2
Mid Range	4.50	9.89	250	48.4
Zero Calibration Response				
Pre-Test Response	0.1	0.0	0.8	-0.1
Post-Test Response	0.1	-0.1	-0.7	0.1
High Range Calibration Response				
Pre-Test Response	9.1	18.1	449.3	91.1
Post-Test Response	9.2	18.0	449.0	89.7
Mid Range Calibration Response				
Pre-Test Response	4.6	10.0	251.2	48.9
Post-Test Response	4.6	9.9	251.2	48.1
Zero Gas System Bias Respose				
Pre-Test Response	0.1	0.0	-1.1	0.7
Post-Test Response	0.1	0.0	-0.3	0.7
Cal-Gas System Bias Respose				
Pre-Test Response	4.4	9.7	245.0	90.3
Post-Test Response	4.5	9.8	246.1	88.6
Analyzer Calibration Error (criteria: 2%)				
Pre-Test High	0.2%	1.8%	0.3%	1.0%
Pre-Test Mid	0.6%	0.5%	0.2%	0.5%
Pre-Test Zero	0.6%	0.1%	0.2%	0.1%
Post-Test High	0.8%	1.3%	0.4%	2.5%
Post-Test Mid	0.6%	0.0%	0.2%	0.3%
Post-Test Zero	0.6%	0.3%	0.1%	0.1%
Sampling System Bias Error (criteria: 5%)				
Pre-Test	1.5%	1.3%	1.2%	0.8%
Post-Test	0.5%	0.6%	1.0%	1.1%
Linearity (criteria: 1%)				
Pre-Test	0.4%	0.4%	0.4%	1.0%
Post-Test	0.1%	0.6%	0.5%	0.9%
Zero Calibration Drift (criteria: 3%)	0.0%	0.2%	0.3%	0.2%
Calibration Drift (criteria: 3%)	0.0%	0.5%	0.0%	0.8%

Table *-*. SCAQMD Method 100.1 instrument calibration results, low load, Stratification, 3/11/95

	O2 (%)	CO2 (%)	CO (ppm)	NOx (ppm)
Calibration Gas Concentration				
Operating Range	0- 10	0- 20	0- 500	0- 100
High Range	9.14	17.75	451	92.2
Mid Range	4.50	9.89	250	48.4
Zero Calibration Response				
Pre-Test Response	0.1	-0.2	2.9	-0.2
Post-Test Response	0.1	0.0	2.8	-0.3
High Range Calibration Response				
Pre-Test Response	9.1	17.9	452.0	92.2
Post-Test Response	9.1	18.0	452.7	93.1
Mid Range Calibration Response				
Pre-Test Response	4.6	9.8	254.0	50.1
Post-Test Response	4.5	9.9	254.3	50.1
Zero Gas System Bias Respose				
Pre-Test Response	0.1	0.0	1.2	0.4
Post-Test Response	0.1	-0.1	0.7	0.0
Cal-Gas System Bias Respose				
Pre-Test Response	9.1	9.7	246.5	48.5
Post-Test Response	9.1	9.5	246.3	49.0
Analyzer Calibration Error (criteria: 2%)				
Pre-Test High	0.0%	0.9%	0.2%	0.0%
Pre-Test Mid	0.5%	0.4%	0.8%	1.7%
Pre-Test Zero	0.6%	0.8%	0.6%	0.2%
Post-Test High	0.5%	1.1%	0.3%	0.9%
Post-Test Mid	0.0%	0.2%	0.9%	1.7%
Post-Test Zero	0.5%	0.2%	0.6%	0.3%
Sampling System Bias Error (criteria: 5%)				
Pre-Test	0.7%	0.8%	1.5%	1.6%
Post-Test	0.2%	1.8%	1.6%	1.0%
Linearity (criteria: 1%)				
Pre-Test	0.2%	0.6%	0.4%	1.7%
Post-Test	0.0%	0.7%	0.4%	1.3%
Zero Calibration Drift (criteria: 3%)	0.1%	0.6%	0.0%	0.1%
Calibration Drift (criteria: 3%)	0.5%	0.3%	0.1%	0.0%

Table *-*. SCAQMD Method 100.1 instrument calibration results, low load, Baseline, 3/11/95

	O2 (%)	CO2 (%)	CO (ppm)	NOx (ppm)
Calibration Gas Concentration				
Operating Range	0- 10	0- 20	0- 500	0- 100
High Range	9.14	17.75	451	92.2
Mid Range	4.50	9.89	250	48.4
Zero Calibration Response				
Pre-Test Response	0.1	0.0	2.8	-0.3
Post-Test Response	0.1	0.0	2.0	-0.3
High Range Calibration Response				
Pre-Test Response	9.1	18.0	452.7	93.1
Post-Test Response	9.1	18.0	451.8	92.7
Mid Range Calibration Response				
Pre-Test Response	4.5	9.9	254.3	50.1
Post-Test Response	4.5	9.9	253.7	49.9
Zero Gas System Bias Respose				
Pre-Test Response	0.1	-0.1	0.7	0.0
Post-Test Response	0.1	-0.1	1.5	0.2
Cal-Gas System Bias Respose				
Pre-Test Response	9.1	9.5	246.3	49.0
Post-Test Response	9.0	9.7	248.3	48.5
Analyzer Calibration Error (criteria: 2%)				
Pre-Test High	0.5%	1.1%	0.3%	0.9%
Pre-Test Mid	0.0%	0.2%	0.9%	1.7%
Pre-Test Zero	0.5%	0.2%	0.6%	0.3%
Post-Test High	0.6%	1.3%	0.2%	0.5%
Post-Test Mid	0.0%	0.2%	0.7%	1.5%
Post-Test Zero	0.6%	0.1%	0.4%	0.3%
Sampling System Bias Error (criteria: 5%)				
Pre-Test	0.2%	1.8%	1.6%	1.0%
Post-Test	0.8%	0.9%	1.1%	1.3%
Linearity (criteria: 1%)				
Pre-Test	0.0%	0.7%	0.4%	1.3%
Post-Test	0.0%	0.9%	0.5%	1.3%
Zero Calibration Drift (criteria: 3%)	0.1%	0.1%	0.2%	0.0%
Calibration Drift (criteria: 3%)	0.0%	0.0%	0.1%	0.2%

Table *-*. SCAQMD Method 100.1 instrument calibration results, low load, Urea Injection, 3/11/95

	O2 (%)	CO2 (%)	CO (ppm)	NOx (ppm)
Calibration Gas Concentration				
Operating Range	0- 10	0- 20	0- 500	0- 100
High Range	9.14	17.75	451	92.2
Mid Range	4.50	9.89	250	48.4
Zero Calibration Response				
Pre-Test Response	0.1	0.0	2.0	-0.3
Post-Test Response	0.1	-0.2	1.5	-0.3
High Range Calibration Response				
Pre-Test Response	9.1	18.0	451.8	92.7
Post-Test Response	9.1	17.9	451.4	92.3
Mid Range Calibration Response				
Pre-Test Response	4.5	9.9	253.7	49.9
Post-Test Response	4.5	9.8	252.6	49.6
Zero Gas System Bias Respose				
Pre-Test Response	0.1	-0.1	1.5	0.2
Post-Test Response	0.1	-0.1	2.1	0.2
Cal-Gas System Bias Respose				
Pre-Test Response	9.0	9.7	248.3	48.5
Post-Test Response	9.1	9.6	247.0	48.7
Analyzer Calibration Error (criteria: 2%)				
Pre-Test High	0.6%	1.3%	0.2%	0.5%
Pre-Test Mid	0.0%	0.2%	0.7%	1.5%
Pre-Test Zero	0.6%	0.1%	0.4%	0.3%
Post-Test High	0.3%	0.9%	0.1%	0.1%
Post-Test Mid	0.1%	0.7%	0.5%	1.1%
Post-Test Zero	0.7%	1.0%	0.3%	0.3%
Sampling System Bias Error (criteria: 5%)				
Pre-Test	0.8%	0.9%	1.1%	1.3%
Post-Test	0.3%	0.8%	1.1%	0.9%
Linearity (criteria: 1%)				
Pre-Test	0.0%	0.9%	0.5%	1.3%
Post-Test	0.1%	0.7%	0.3%	1.2%
Zero Calibration Drift (criteria: 3%)	0.1%	0.9%	0.1%	0.0%
Calibration Drift (criteria: 3%)	0.1%	0.4%	0.2%	0.3%

APPENDIX D

RECORDS SUPPORTING SCAQMD METHOD 25.1 MEASUREMENTS

APPENDIX D-1

ANALYTICAL REPORTS

REPORT

TRUESDAIL LABORATORIES, INC.

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Irvine, CA 92718
Attn: S. Doug Urry

DATE April 11, 1995

RECEIVED March 13, 1995

LABORATORY NO. 53889

SAMPLE

13 tanks with traps

INVESTIGATION

DUPLICATE

Total hydrocarbon analysis (SCAQMD Method 25.1)

RESULTS

The submitted tanks and traps were analyzed for CH_4, CO, CO_2 and nonmethane hydrocarbons (as C_1) according to SCAQMD Method 25.1.

The sample cylinders were analyzed for volatile hydrocarbons (as C_1) by gas chromatography utilizing Tenax adsorption at 0°C, to isolate the nonmethane hydrocarbons, followed by desorption at 100°C, combustion-oxidation of the desorbed hydrocarbons to CO_2, and detection of the CO_2 by nondispersive infrared spectrophotometry. Carbon dioxide and oxygen concentrations were determined by Orsat analysis.

The condensate traps were analyzed for condensable hydrocarbons (as C_1) by volatilization and combustion-oxidation of the trap contents to carbon dioxide (CO_2) which was collected in an evacuated tank. The traps were first purged with carrier gas while in dry ice and the purge gas collected and analyzed for non-methane hydrocarbons. Each vessel and sample cylinder was analyzed for carbon monoxide (CO), methane (CH_4), and carbon dioxide (CO_2) by gas chromatography followed by methanization of the separated components and flame ionization detection of methane.

The results obtained are as follows:

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LN 53889

TABLE I - Method 25.1

SAMPLE	ID	NMVHC ppmvC$_1$	CHC ppmvC$_1$	TOTAL ppmvC$_1$	CH_4 ppmv	CO ppmv	CO_2 %
110 Baseline A	LL	8	55	63	1	111	7.5
110 Baseline B	AA	8	31	39	2	103	7.4
110 Urea A	MD2	7	76	83	2	98	6.9
110 Urea B	JJ	10	125	135	2	101	7.1
215 Baseline A	AD	8	55	63	1	77	7.2
215 Baseline B	MD4	9	78	87	1	80	7.4
215 Urea A	TT	9	27	36	1	59	7.2
215 Urea B	104	12	56	68	1	58	7.2
70 Baseline A	II	10	75	85	3	127	7.4
70 Baseline B	FFX	15	18	33	3	131	7.5
70 Urea A	XX	11	29	40	3	126	7.7
70 Urea B	YY	13	41	54	3	115	7.4
Blank	BN	< 3	5	< 8	< 1	< 1	<0.1
Detection limit		3	1	3	1	1	0.1

TRUESDAIL LABORATORIES, INC.

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CHAIN OF CUSTODY

P.O. Number: _____ Page 1 of 2

Company Name:	Project Manager:
SCE	D. Urry
Project Number:	**Project Name:**
	HBGS U2 Comp.

Sampled by: (Printed and Written Signature)
B. Day

SAMPLE ID TANK/TRAP	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CONTAINERS	ANALYSIS: TGNMO	ANALYSIS: CH_4, CO_2, CO	REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
LL/11	3/9	0140	AIR	110 MW - Baseline	1	X	X	5" - Final Vacuum
AA/88		↓	↓	↓	1	X	X	7"
MD-2/48		0340		110 MW - UREA	1	X	X	4"
JJ/75		↓		110 MW - UREA	1	X	X	2"
AD/22		0815		215 MW - Baseline	1	X	X	3"
MD4/52		↓		↓	1	X	X	3"
~~IT~~ 11/57		1000		215 MW UREA	1	X	X	6"
104/23	↓	↓		↓	1	X	X	8"
II/38	3/11	0800		70MW Baseline	1	X	X	5"
FFX/20	↓	↓	↓	↓	1	X	X	4"

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	3/13/95 1225	[signature]
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)

REMARKS:

Date/Time:

Acurex Environmental Corporation
One Technology Drive, Suite F213
Irvine, CA 92718 (714) 753-0444

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CHAIN OF CUSTODY

P.O. Number: _____ Page 1 of 2

Company Name: SCE	Project Manager: D. Urry
Project Number:	Project Name: HBGS U2 Comp.
Sampled by: (Printed and Written Signature) B. Day	

SAMPLE ID TANK/TRAP	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CONTAINERS	ANALYSIS: TGNMO	ANALYSIS: CH4 CO2 CO						REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
LL/11	3/9	0140	AIR	110 MW - Baseline	1	X	X						5" - Final Vacuum
AA/88		↓	↓	↓	1	X	X						7"
MD-2/48		0340		110 MW - UREA	1	X	X						4"
JJ/75		↓		110 MW - UREA	1	X	X						2"
AD/22		0816		215 MW - Baseline	1	X	X						3"
MD4/52		↓		↓	1	X	X						3"
TT/57		1000		215 MW UREA	1	X	X						6"
104/23	↓	↓		↓	1	X	X						8"
II/38	3/11	0800		70 MW Baseline	1	X	X						5"
FFX/20	↓	↓	↓	↓	1	X	X						4"

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	REMARKS:
[signature]	3/13/95 1225	[signature]	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time

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One Technology Drive, Suite F213
Irvine, CA 92718
(714) 753-0444

APPENDIX E-2

FIELD TEST DATA SHEETS

TOTAL COMBUSTION ANALYSIS
SCAQMD METHOD 25.1
FIELD SAMPLING DATA SHEET

Reference #: _____ Source : Unit 2

Test Site : SCE HBGS Sample Location : Stack

Location : Unit 2 Mid Baseline Ambient Temperature : 59

Date : 3/9/95 Barometric Pressure : 30.01

Operator : B. Day

SAMPLE A

Tank #: LL Trap #: 11

Initial Vacuum : 30

Final Vacuum : 5

SAMPLE B

Tank #: AA Trap #: 88

Initial Vacuum : 30

Final Vacuum : 7

TIME	VACUUM ("Hg)	FLOW ~~(cc/min)~~ Inches water	TIME	VACUUM ("Hg)	FLOW ~~(cc/min)~~ Inches water
0	30	0.70	0	30	0.20
10	26	↓	10	26	↓
20	22		20	22	
30	17		30	18	
40	13		40	14	
50	6		50	11	
60	5	↓	60	8&7	↓

Leak Rate Pre Test: ✓ Post Test: ✓

TOTAL COMBUSTION ANALYSIS
SCAQMD METHOD 25.1
FIELD SAMPLING DATA SHEET

Reference #: _____ Source : UNIT 2

Test Site : SCE - HBGS Sample Location : STACK

Location : UNIT 2 STACK Mid Urea Ambient Temperature : 61

Date : 3-9-95 Barometric Pressure : 30.01

Operator : BD/MC

SAMPLE A

Tank #: MD-2 Trap #: 48

Initial Vacuum : 29

Final Vacuum : 4

SAMPLE B

Tank #: JJ Trap #: 75

Initial Vacuum : 28

Final Vacuum : 2

TIME	VACUUM ("Hg)	FLOW (inches of water ~~cc/min~~)	TIME	VACUUM ("Hg)	FLOW (inches of water ~~cc/min~~)
0	29	0.25	0	28	0.28
10	25		10	22	0.28
20	20		20	17	
30	16		30	12	
40	12		40	7	
50	8		50	4	
60	4	↓	60	2	↓

Leak Rate Pre Test: ✓ Post Test: ✓

TOTAL COMBUSTION ANALYSIS
SCAQMD METHOD 25.1
FIELD SAMPLING DATA SHEET

Reference #: _____ Source : stack

Test Site : Unit 2 Sample Location : Unit 2

Location : SCE 1HBGS Full baseline Ambient Temperature : 68

Date : 3/9/95 Barometric Pressure : 30.01

Operator : B. Day

SAMPLE A

Tank #: AD Trap #: 22

Initial Vacuum : 27

Final Vacuum : 3

SAMPLE B

Tank #: MD4 Trap #: 52

Initial Vacuum : 28

Final Vacuum : 3

TIME	VACUUM ("Hg)	FLOW (cc/min)	TIME	VACUUM ("Hg)	FLOW (cc/min)
0	27	0.20	0	28	0.40
10	23	0.20	10	24	0.40
20	19	↓	20	20	↓
30	15		30	16	
40	11		40	11	
50	7		50	7	
60	3		60	3	

Leak Rate Pre Test: ✓ Post Test: ✓

TOTAL COMBUSTION ANALYSIS
SCAQMD METHOD 25.1
FIELD SAMPLING DATA SHEET

Reference #: _____ Source : Stack

Test Site : SCE HBGS Sample Location : Unit 2

Location : Unit 2 HIGH SULP Ambient Temperature : 70

Date : 3/9/95 1000AM Barometric Pressure : 30.01

Operator : B. Day

SAMPLE A

Tank #: TT Trap #: 57

Initial Vacuum : 30

Final Vacuum : 6

SAMPLE B

Tank #: 104 Trap #: 23

Initial Vacuum : 29

Final Vacuum : 8

TIME	VACUUM ("Hg)	FLOW (cc/min)	TIME	VACUUM ("Hg)	FLOW (cc/min)
0	30	0.20	0	29	0.40
10	26	0.20	10	25	0.30
20	22	0.26	20	24	0.22
30	18	0.23	30	17	0.28
40	14	0.25	40	15	0.25
50	9	0.15	50	12	0.20
60	6	0.10	60	8	0.20

Leak Rate Pre Test: 0.0/0.0 Post Test: _____

TOTAL COMBUSTION ANALYSIS
SCAQMD METHOD 25.1
FIELD SAMPLING DATA SHEET

Reference #: _____ Source : Stack

Test Site : SCE HBGS Sample Location : Unit 2

Location : Unit 2 Low Baseline Ambient Temperature : 58

Date : 3/11/95 Barometric Pressure : 29.80

Operator : BD/MC

SAMPLE A

Tank #: IT Trap #: 38

Initial Vacuum : 30

Final Vacuum : 5

SAMPLE B

Tank #: FFX Trap #: 20

Initial Vacuum : 28

Final Vacuum : 4

TIME	VACUUM ("Hg)	FLOW (cc/min)	TIME	VACUUM ("Hg)	FLOW (cc/min)
0	30	0.20	00	28	0.30
10	25	0.20	10	23	0.30
20	21	0.20	20	20	0.30
30	17	0.20	30	16	0.30
40	14	0.20	40	13	0.30
50	10	0.20	50	9	0.30
60	5	0.20	60	4	0.30

Leak Rate Pre Test: 0.02 inches water Post Test: 0.00

~~Tank FFX~~

TOTAL COMBUSTION ANALYSIS
SCAQMD METHOD 25.1
FIELD SAMPLING DATA SHEET

Reference #: _____ Source : Stack

Test Site : SCE HBGS Sample Location : Unit 2

Location : Unit 2 Low Urea Ambient Temperature : 65

Date : 3/11/95 Barometric Pressure : 29.80

Operator : B. Day

SAMPLE A

Tank #: XX Trap #: 84

Initial Vacuum : 30+

Final Vacuum : 7

SAMPLE B

Tank #: YY Trap #: 46

Initial Vacuum : 29

Final Vacuum : 6

TIME	VACUUM ("Hg)	FLOW (cc/min)	TIME	VACUUM ("Hg)	FLOW (cc/min)
0	30+	0.3	0	29	0.2
10	27	0.3	10	25	0.2
20	23	0.3	20	22	0.3
30	19	0.3	30	18	0.28
40	15	0.28	40	14	0.30
50	11	0.28	50	10	0.28
60	7	0.28	60	6	0.30

Leak Rate Pre Test: 0.02 both Post Test: 0.00

TOTAL COMBUSTION ANALYSIS
SCAQMD METHOD 25.1
FIELD SAMPLING DATA SHEET

Reference #: _____ Source : Blank

Test Site : SCE HBGS Sample Location : _____

Location : Unit 2 Ambient Temperature : _____

Date : 3/12/95 Barometric Pressure : _____

Operator : D. Arey

SAMPLE A		SAMPLE B	
Tank #: BN	Trap #: 06	Tank #: _____	Trap #: _____
Initial Vacuum : 30		Initial Vacuum : _____	
Final Vacuum : 7		Final Vacuum : _____	

TIME	VACUUM ("Hg)	FLOW (cc/min)	TIME	VACUUM ("Hg)	FLOW (cc/min)

Leak Rate Pre Test: 0 Post Test: _____

APPENDIX E

RECORDS SUPPORTING AMMONIA CONCENTRATION MEASUREMENTS

APPENDIX E-1

DRAFT METHOD 207.1

SCAQMD METHOD 207.1

ANALYTICAL METHOD FOR AMMONIA AND AMMONIUM COMPOUNDS FROM STATIONARY SOURCES NESSLER COLORIMETRY

1. Principle and Applicability

1.1 Principle

Free and combined ammonia are withdrawn from the source using a Smith-Greenburg impinger train. The gas or particulate is collected in the train probe and impingers containing sulfuric acid solution. The solution is analyzed for ammonia by colorimetry after reaction with Nessler reagent.

1.2 Applicability

This method is applicable for the determination of ammonia and ammonium ion in furnace stacks, catalytic cracking plant regenerator emissions, galvanizing operations, and other stationary sources when approved by the Executive Officer. The recommended range is 0.4 mg/m^3 to 20 mg/m^3 for a sample of one cubic meter.

1.3 The range and sensitivity of the method has not been established. Commercially prepared, APHA approved reagent has been found with a response of about 430 ug NH_3 in a 50 mL aliquot per optical density (OD) at 440 nm using a 1 cm cell. This factor applies from 20 to 160 ug NH_3. A slightly reduced sensitivity was found at higher concentrations. Very high concentrations shift the absorbance to the 450 to 500 nm range. Based on the above response and a train recovery volume of 500 mL, the estimated sensitivity is approximately 0.1 mg NH_3.

1.4 Interferences

Calcium, iron, magnesium, and sulfide interfere by causing turbidity after the addition of Nessler reagent. Inherent sample color and suspended matter also interfere with direct Nesslerization. Because direct Nesslerization is subject to a number of possible interferences, at least one sample per set must be checked for color and/or turbidity prior to reagent addition, and by spike and recovery to confirm that no interferences exist. In this case, a set of samples is a sample or series of samples taken from one sampling point during one day of testing.

However, blanking and spike recovery may need to be performed more often if emission characteristics are expected to change frequently during one day.

When interferences exist, distill the sample prior to analysis. (See Standard Methods for the Examination of Water and Wastewater, 17th Edition).

1.5 Precision and Accuracy

Precision and accuracy have not been determined.

2. Field Procedures

A copy of the field procedures can be found in the District's Source Test Manual.

3. Laboratory Procedures

3.1 Apparatus

3.1.1 A schematic of the sampling train is shown in Figure 207.1L.

a. Impinger Train

The train consists of four impingers connected in series with leak-free non-contaminating fittings. The first and second Smith-Greenburg impingers shall have standard tips, the third and fourth impingers shall have a modified tip (one-half in. ID glass tube) extending to about one-half in. from the bottom of the flask. The first two impingers each contain 100 mL of 0.1 N H_2SO_4. The third impinger is empty. The fourth (last) impinger contains silica gel.

b. Probe

Probe may be of 316 stainless steel, quartz, or glass. Quartz and glass must be used for corrosive samples.

c. Pre-filter (optional)

A pre-filter may be inserted to remove particulate matter from the sampling train.

3.1.2 Sample Recovery

a. Wash bottle.

b. 500 mL or 1000 mL graduated cylinder, with stopper.

c. Polyethylene bottles, 500 mL or 1000 mL

3.1.3 Sample Analysis

a. Perkin Elmer 552 Spectrophotometer, or equivalent.

b. Spectrophotometer cells, 1 cm.

c. Volumetric flasks, 50 mL, one for each sample, standard and blank.

d. Pipettes, Class A, 2 mL, 4 mL, 8 mL, 10 mL, 12 mL, and 14 mL, or burette for calibration curve.

e. Graduated cylinders, 25 mL, 50 mL, 100 mL, and 250 mL.

3.2 Reagents

3.2.1 Sampling

Unless otherwise indicated, all reagents are to conform to the specifications established by the Committee on Reagents of the American Chemical Society, where such specifications are available. Otherwise, use best available grade.

a. Water

Deionized or distilled to conform to ASTM specifications D-1193-74, Type 3. At the option of the analyst, the KMnO4 test for oxidizable matter may be omitted when high concentrations of organic matter are not expected to be present.

b. Absorbing Solution

Dilute 2.8 mL of concentrated sulfuric acid (18M) to 1 liter with deionized water to form 0.1 N sulfuric acid.

c. Silica Gel

Indicating type. Fresh or dried at 175°C (350°F) for 2 hours, 6 to 16 mesh.

d. Stopcock grease

3.2.2 Sample Recovery

a. Rinse Solution. See absorbing Solution.

3.2.3 Sample analysis

a. Water. See above.

b. Nessler Reagent:
Purchase from a laboratory chemicals supplier (APHA approved) or prepare as follows:

Dissolve 35 grams of mercuric chloride in 500 mL of hot water. Filter and allow to cool. Dissolve 62.5 grams of potassium iodide in 260 mL of cold water. Gradually add the mercuric chloride solution to 250 mL of the iodide solution until a slight permanent red precipitate is formed. Dissolve the precipitate with the remaining iodide solution and again add mercuric chloride slowly until a red precipitate remains.

Dissolve 150 grams of potassium hydroxide in 250 mL of distilled water. Caution: Corrosive. Add solution to the potassium iodide mercuric chloride solution and make up to 1 liter with distilled water. Stir thoroughly and allow to stand a day or so, and decant the clear liquid. Warning: The Nessler reagent should be handled with caution because of its toxicity and corrosive properties.

c. Stock Standard Ammonium Sulfate Solution:
Dissolve 0.194 g of ammonium sulfate in absorbing solution and make up to 500 mL with absorbing solution. One mL of this solution contains 100 ug of ammonia. Discard this solution after one month.

d. Intermediate Standard
Dilute 10 mL of the stock standard solution to 100 mL with absorbing solution. 1 mL of this solution contains 10 ug of ammonia. Discard after one week.

e. Stock Absorbing Solution
Dilute 2.8 mL of concentrated sulfuric acid (19M) to 1 liter with distilled water to form 0.1 N sulfuric acid.

f. Potassium Iodide.

g. Mercuric Chloride

h. Potassium Hydroxide.

i. Ammonium Sulfate.

j. Calibration Standards
Dilute 0 mL, 2 mL, 4 mL, 8 mL, 10 mL, 12 mL and 14 mL of intermediate standard to 50 mL with absorbing solution in a volumetric flask and shake well to mix. This corresponds to 0 ug, 20 ug, 40 ug, 80 ug, 100 ug, 120 ug and 140 ug of ammonia in each flask.

NOTE 1: The calibration standards used in this method are based on experience using an APHA approved Nessler reagent. The prepared Nessler reagent may require calibration standards that differ in concentrations by an order of magnitude.

3.3 Pre-Test Preparation
No special pre-test preparation is required.

3.4 Sample Collection Train Preparation
During the preparation and assembly, keep all opening covered wherever contamination can occur until just prior to assembly. Assemble the impingers in the tray. Load each of the first two impingers with exactly 100 mL of absorbing solution. Leave the third impinger empty. Load the last impinger with approximately 200 to 300 grams of silica gel. If moisture content is to be performed gravimetrically, weight each impinger plus contents to the nearest 0.5 g and record the weights. Reserve about 200 mL of the absorbing solution as a reagent blank.

3.5 Sample Collection Train leak Check
The sample collection train may be leak checked in the Laboratory after assembly using the procedure in the Source Test Manual.

3.6 Sample Recovery
Inspect the train for general condition. Note if the silica gel is completely expended, and if the train or its components are sealed. Note anything other than a colorless, odorless, clear impinger catch, and any other condition that may be reflected in the

analysis. Working in a area protected from the wind and free from dust and ammonia, carefully disconnect the probe and the impingers. Weigh each impinger plus contents to the nearest 0.5 g and record these weights.

Transfer the impinger catch to a 500 mL graduated cylinder (1000 mL if necessary). Rinse the inside of the probe, the impingers and all connecting glassware into the graduated cylinder at least three time using the rinse solution. Be sure to contact all interior surfaces with each rinse.

Dilute the sample to 500 mL with the rinse solution (1000 mL if necessary). Stopper the cylinder and mix well. Transfer the sample to a container. Seal it well, mark the level of the liquid and label the container to clearly identify it contents.

Take 200 mL of the reagent blank, and dilute it to the sample volume with rinse solution. Stopper the cylinder, and mix will. Transfer the blank to a container. Seal it well, mark the level of the liquid and label the container to clearly identify it contents.

3.7 Sample Analysis

Shake the sample well. Transfer 50.0 mL to a volumetric flask. Add 2.0 mL of Nessler reagent to the flask, mix well, and allow the color to develop for a least 10 minutes. Read the absorbance of the sample in a 1 cm cell at 440 nm. Use water in the reference cell. If the sample exceeds the linear range of the spectrophotometer, use a smaller sample aliquot and dilute it to 50.0 mL. Analyze the reagent blank using the same procedure.

3.8 Calculations and Reporting

Using the calibration factor (obtained in Section 3.9), calculate total mg of ammonia as follows:

$$mg = AF \times (ODspl - OD\ blank) \times M$$

Where:

AF	=	Aliquot factor (sample volume/aliquot volume)
ODspl	=	Optical density of the sample
OD blank	=	Optical density of the reagent blank
M	=	Nessler response factor, mg per OD.

Report ammonia to the nearest 0.1 mg.

Report moisture gain to the nearest gram or mL.

3.9 Calibrations

Each bottle of Nessler reagent must be calibrated on opening.

Dilute 0 mL, 2 mL, 4 mL, 8 mL, 10 mL, 12 mL and 14 mL of intermediate standard solution to 50.0 mL with absorbing solution, and shake well. Add 2.0 mL of Nessler reagent to each, mix well, and allow the color to develop for at least 10 minutes. Read the absorbance of each standard in a 1 cm cell at 440 nm. Use water in the reference cell.

Subtract the blank (0 mL standard) from each reading, and calculate the curve of ug of ammonia vs. the corrected absorbance. Correlation coefficient of this curve should be at least 0.9995. Any standard that is more than 7% from the calculated curve must be remade and rerun. Label the Nessler's reagent with the response factor (mg per OD), blank reading, date of calibration and reference to the calibration data. The Nessler's reagent must be recalibrated when control values indicate a change in response or every six months, whichever occurs first.

3.10 Quality Control

Nessler reagent may deteriorate during storage and must be checked frequently. Analyze a 40 ug control solution every set of samples, or every ten samples, whichever occurs first. This control solution must be obtained independently from the calibration standards. Calculate the ammonium content using the corrected absorbance and latest response factor. Measured value should be within $\pm 5\%$ of theoretical. If control values indicate a change, recalibrate the reagent and recalculate the control results. If the recalculated values are still out of range, void the previous analysis and investigate the procedure until it is under control.

Check the reagent blank against previous blank readings. A significant increase in the blank reading (more than 10%) indicates absorbing solution contamination or Nessler reagent deterioration. Investigate this problem until blank is brought to normal levels.

APPENDIX E-2

ANALYTICAL RESULTS

04-Apr-95 Date	standard (ml)	standard (mg)	Blank Absorb.	Absorb.	Absorb. corrected	Percent Deviation	Regression Output:	
							Constant	0.003147
							Std Err of Y Est	0.000715
							R Squared	0.9998
3/4/95	2	0.02	0.047	0.102	0.055	1.5%	No. of Observations	6
3/4/95	4	0.04	0.047	0.165	0.118	0.1%	Degrees of Freedom	4
3/4/95	8	0.08	0.047	0.290	0.243	1.4%	Degrees of Freedom	5
3/4/95	10	0.10	0.047	0.360	0.313	0.7%	X Coefficient(s)	0.311804
3/4/95	12	0.12	0.047	0.423	0.376	0.3%	Std Err of Coef.	0.002152
3/4/95	14	0.14	0.047	0.485	0.438	0.2%	Std Err of Coef.	0.004978
Control		0.04	0.047	0.168	0.121	2.1%		

Test			Blank Absorb.	Absorb.	Absorb. (-blank)	Slope (M)	volume used in analysis (ml)	sample aliquot (ml)	volume collected (ml)	Aliquot Factor	mass collected (mg)
110MW COMP	Run 1	3/9/95	0.05	0.3	0.25	0.31	50	5	500	100	7.80
	Run 2		0.05	0.538 out of cal. range	0.488	0.31	50	10	500	50	7.61
CONTROL	Run 1		0.05	0.178	0.128	0.31	50	50	50	1	0.040
215MW COMP	Run 1		0.05	0.344	0.294	0.31	50	5	500	100	9.17
	Run 2		0.05	0.349	0.299	0.31	50	5	500	100	9.32 / 9.25
CONTROL	Run 1	3/11/95	0.054	0.182	0.128	0.31	50	50	50	1	0.040
70MW COMP	Run 1		0.054	0.230	0.176	0.31	50	5	500	100	5.49
	Run 2		0.054	0.224	0.17	0.31	50	5	500	100	5.30 / 5.40

APPENDIX E-3

SPREADSHEETS AND FIELD TEST DATA SHEETS

AMMONIA SLIP CALCULATION SPREADSHEET

Plant: SCE, HBGS
Date : 3/9/95
Performed by: MC

Sample Location: UNIT 2, BREECHING
Test No./Type: Mid Load, slip 1 - COMPLIANCE
Start/Stop Time: 0340/0440

Conditions: 110 MW, UREA

PARAMETER	SYMBOL	VALUE (calc.)
Gas Meter Correction Factor	(gamma)	1.03
Barometric Pressure (in Hg)	P(b)	30.01
# of Sample Points	#	6
Total Sampling Time (min)	(theta)	(60.0)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	NA
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(0.00)
Gas Meter Initial Reading (cu ft)		913.75
Gas Meter Final Reading (cu ft)		944.47
Net Gas Sample Volume (cu ft)	V(m)	(30.72)
Vol of Liquid Collected (ml)	Vl(c)	110.5
Vol of Liq @ Std. Conds. (scf)	V(w std)	(5.201)
Measure O2 Concentration @KVB	(%)	7.2

FIELD DATA AVERAGES

Avg Orifice Meter Reading (in H20)	dH(avg)	=	0.817
Avg Stack Temperature (degF)	T(s avg)	=	186.5
Average Meter Temperature (degF)	T(m avg)	=	65.7

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	31.90
Stack Gas Water Vapor Proportion	B(wo)	=	0.140
Total Mass: (mg NH3)		=	7.80
NH3 Concentration (ppmv air)		=	12
NH3 Concentration (ppmv air @3.0% O2)		=	16

Sample Point	dClock Time	Orifice Meter,dH (in H2O)	Stack Temp (degF)	Gas Temp (degF) in	Meter (degF) out
1	10	0.82	187	59	60
2	10	0.82	186	67	60
3	10	0.82	186	73	62
4	10	0.82	186	73	64
5	10.0	0.81	187.0	72	63
6	10.0	0.81	187.0	72	63
TOTALS	60.0	4.90	1119.0	416.0	372.0

AMMONIA SLIP CALCULATION SPREADSHEET

Plant: SCE, HBGS
Date : 3/9/95
Performed by: MC

Sample Location: UNIT 2, BREECHING
Test No./Type: High Load, slip 1 - COMPLIANCE
Start/Stop Time: 1000/1100

Conditions: 215 MW, UREA

PARAMETER	SYMBOL	VALUE (calc.)
Gas Meter Correction Factor	(gamma)	1.03
Barometric Pressure (in Hg)	P(b)	30.01
# of Sample Points	#	6
Total Sampling Time (min)	(theta)	(60.0)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	NA
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(0.00)
Gas Meter Initial Reading (cu ft)		975.57
Gas Meter Final Reading (cu ft)		1006.51
Net Gas Sample Volume (cu ft)	V(m)	(30.94)
Vol of Liquid Collected (ml)	Vl(c)	109.0
Vol of Liq @ Std. Conds. (scf)	V(w std)	(5.131)
Measure O2 Concentration @KVB	(%)	7.1

FIELD DATA AVERAGES

Avg Orifice Meter Reading (in H20)	dH(avg)	=	0.828
Avg Stack Temperature (degF)	T(s avg)	=	231.5
Average Meter Temperature (degF)	T(m avg)	=	74.8

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	31.57
Stack Gas Water Vapor Proportion	B(wo)	=	0.140
Total Mass: (mg NH3)		=	9.25
NH3 Concentration (ppmv air)		=	14
NH3 Concentration (ppmv air @3.0% O2)		=	19

Sample Point	dClock Time	Orifice Meter,dH (in H2O)	Stack Temp (degF)	Gas Temp in	Meter (degF) out
1	10	0.80	231	74	75
2	10	0.83	231	74	75
3	10	0.84	232	75	74
4	10	0.84	232	75	73
5	10	0.83	231	77	73
6	10	0.83	232	78	75
TOTALS	60.0	4.97	1389.0	453.0	445.0

AMMONIA SLIP CALCULATION SPREADSHEET

Plant: SCE, HBGS
Date : 3/11/95
Performed by: BD

Sample Location: UNIT 2, BREECHING
Test No./Type: LOW Load, slip 1 - COMPLIANCE
Start/Stop Time: 0935/1035

Conditions: 70 MW, UREA

PARAMETER	SYMBOL	VALUE (calc.)
Gas Meter Correction Factor	(gamma)	1.03
Barometric Pressure (in Hg)	P(b)	29.80
# of Sample Points	#	6
Total Sampling Time (min)	(theta)	(60.0)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	NA
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(0.00)
Gas Meter Initial Reading (cu ft)		37.19
Gas Meter Final Reading (cu ft)		67.68
Net Gas Sample Volume (cu ft)	V(m)	(30.48)
Vol of Liquid Collected (ml)	Vl(c)	107.3
Vol of Liq @ Std. Conds. (scf)	V(w std)	(5.051)
Measure O2 Concentration @KVB	(%)	7.1

FIELD DATA AVERAGES

Avg Orifice Meter Reading (in H20)	dH(avg)	=	0.782
Avg Stack Temperature (degF)	T(s avg)	=	168.8
Average Meter Temperature (degF)	T(m avg)	=	69.8

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	31.18
Stack Gas Water Vapor Proportion	B(wo)	=	0.139
Total Mass: (mg NH3)		=	5.40
NH3 Concentration (ppmv air)		=	9
NH3 Concentration (ppmv air @3.0% O2)		=	11

Sample Point	dClock Time	Orifice Meter,dH (in H2O)	Stack Temp (degF)	Gas Temp (degF) in	Meter (degF) out
1	10	0.79	168	65	65
2	10	0.78	169	69	65
3	10	0.78	169	73	66
4	10	0.78	169	74	69
5	10	0.78	169	75	70
6	10	0.78	169	76	71
TOTALS	60.0	4.69	1013.0	432.0	406.0

110 MW slip 1

PARTICULATE TEST FIELD DATA SHEET

Plant SCE HBGS
Date 3/9/95
Test Location Unit 2 - 110 MW
Run Number 2 (slip 1)
Stack Diameter inches 246
Duct Dimensions in. x in —
Start Time 0342
Operator MC/BD

Barometric Pressure 30.01
Static Pressure −0.35 "H2O
Stack Pressure —
Probe Number —
Pitot Coefficient —
Pitot Number —
Meter Box Number 326
Orifice Coefficient 1.029

Nozzle Size & Number —
Molecule Weight
BWO

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
562.7	661.0			
587.8	592.2	1105		
459.2	460.2			
SILICA GEL			7.1%	
805.3	812.1			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	DRY GAS METER VOLUME FT3	TEMPERATURE °F							PUMP VACUUM in. Hg	√ΔP	GAS METER LEAK CHECK RATE (CFM)
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT			
1	0	—	0.82	918.750	187	—	48	—	—	59	60	9		PRE-0.005@18" Hg
1	10	—	0.82	918.860	186	—	42	—	—	67	60	9		POST-0.005@15 "H
1	20	—	0.82	923.900	186	—	44	—	—	73	62	9		
1	30	—	0.82	929.130	186	—	47	—	—	73	64	9		PITOT LEAK CHECK
1	40	—	0.81	934.200	187	—	48	—	—	72	63	9		
1	50	—	0.81	939.750	187	—	49	—	—	72	63	9		
1	60	—	—	944.470	—	—	—	—	—	—	—	—		
AVG/TOTAL														

HIGH

PARTICULATE TEST FIELD DATA SHEET

Plant SCE HBGS
Date 3/9/95
Test Location Unit 2
Run Number Slip #1 High load
Stack Diameter Inches 20'6"
Duct Dimensions in. x in —
Start Time 10:00A
Operator B. Day

Barometric Pressure 30.01 "Hg
Static Pressure -0.40 "H_2O
Stack Pressure 29.98 "Hg
Probe Number NH_3
Pitot Coefficient —
Pitot Number —
Meter Box Number 326
Orifice Coefficient 1.029

Nozzle Size & Number
Molecule Weight
BWO

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
565.4	662.0			
561.0	565.2	109		
492.0	482.7			
SILICA GEL				
717.9	725.4			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F							PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT			
	0	—	0.80	975.570	231	—	52	—	—	74	75	9	-	PRE-0.005@18"
	10	—	0.83	980.6	231	—	47	—	—	74	75	9	-	POST- 0.000@10"
	20	—	0.84	985.840	232	—	50	—	—	75	74	9	-	
	30	—	0.84	991.030	232	—	51	—	—	75	73	9	-	PITOT LEAK CHECK
	40	—	0.83	996.200	231	—	51	—	—	77	73	9	-	
	50	—	0.83	1001.350	232	—	52	—	—	78	75	9	-	
	60	—	—	1006.508	—	—	—	—	—	—	—	—	-	
AVG/TOTAL														

65 MW - NH_3 Slip

PARTICULATE TEST FIELD DATA SHEET

Plant 3/11/95 | Barometric Pressure 29.80 | Nozzle Size & Number —
Date SCE HB65 | Static Pressure -0.16 | Molecule Weight —
Test Location Unit 2 | Stack Pressure — | BWO —
Run Number 65MW - NH_3 Slip | Probe Number —
Stack Diameter inches — | Pitot Coefficient —
Duct Dimensions in. x in — | Pitot Number —
Start Time 0934 | Meter Box Number 0226
Operator BD/MC | Orifice Coefficient 1.029

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
602.8	697.2	10x3		
556.4	560.2		7.1%	
457.7	459.1			
SILICA GEL				
811.9	818.9			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F							PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT			
	0	—	0.79	37.742	168	—	52	—	—	65	65	8		PRE- 0.005@20"
	10	—	0.78	42.250	169	—	47	—	—	69	65	8		POST- 0.002@9"
	20	—	0.78	47.330	169	—	48	—	—	73	66	8		
	30	—	0.78	52.330	169	—	50	—	—	74	69	8		PITOT LEAK CHECK
	40	—	0.78	57.490	169	—	52	—	—	75	70	8		
	50	—		62.570	169	—	52	—	—	76	71	8		
	60	—	—	67.675	—	—	—	—	—	—	—	—		
AVG/TOTAL														

GERAGHTY & MILLER, INC.
Environmental Services

SUBJECT: NH_3 Slip - Field notes
PROJECT: SCE HB6S U2 COMPLIANCE
CLIENT/PROJECT: NO:

BY: DATE:
CHKD: DATE:
REV: DATE:

PAGE
SHEET 1

3/9/95

SAMPLE	ALIQUOT	ABS	Mass(mg)	Slip - Raw/Corrected
110 MW Slip #1	5	.30	7.80 ~~7.61~~ ~~7.70~~ avg	13/16 ppm
	10	.538	Out of cal range	
Blank	ø	.050		
Control	40 µg	.178		
215 MW Slp	5	.344	9.17	15/19
	5	.349	9.32 >9.25	

9/11/95

	Aliquot	ABS	MASS (mg)	Slip Raw/Corrected
~~70~~ MW Slip #1	5	.230	5.49	9/11
	5	.224	5.30 >5.40	
Blank		.054	~~.040~~	
Control (40µg)		.182	.040	

GERAGHTY & MILLER, INC. Environmental Services

SUBJECT: SCAQMD 207-1
PROJECT: NH_3 Standards
CLIENT/PROJECT NO: SCE HB65 U2

BY: DATE: 3/2/95
CHKD: DATE:
REV: DATE:

PAGE
SHEET 1

Stock Standard F1 → Fischer Scientific Ammonium Sulfate

Dish = 1.11335 g
+ .194
1.30735 g ← Desired final wt. of Amm Sulfate
1.30732 g ← Actual wt. of Dish + Amm Sulfate

Stock Standard EM1 → EM Science Amm. Sulfate

Dish = 1.11310 gr.
+ .194
1.30710 gr ← Desired final wt.
1.30704 gr ← Actual wt. of Dish + Amm. Sulfate

3/4/95

Prepared from F1 stock standard

Standard (ug)	ABS
0 (Blank)	.047
20	.102
40	.165
80	.290
100	.360
120	.423
140	.485

Control

40	.168

↑ Prepared from EM1 Stock Std.

APPENDIX F

RECORDS SUPPORTING VOLUMETRIC FLOW RATE MEASUREMENTS

APPENDIX F-1

VOLUMETRIC FLOW RATE CALCULATION SHEET

ISOKINETIC PERFORMANCE WORKSHEET & PARTICULATE CALCULATIONS

Plant _____ Performed by _____

Date _____

Sample Location _____

Test No./Type _____

Barometric Pressure (in. Hg)	P_b	
Meter volume (std), $17.64 \left(\frac{V_m}{\alpha}\right)\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right)$ $17.64 \left(\frac{(\quad)}{(\quad)}\right)\left(\frac{(\quad) + \frac{(\quad)}{13.6}}{(\quad) + 460}\right)$	$V_{m\ std}$	
Volume of liquid collected (grams)	Vl_c	
Volume of liquid at standard condition (scf) $Vl_c \times 0.04707$	$V_{w\ std}$	
Stack gas proportion of water vapor $\frac{V_{w\ std}}{V_{w\ std} + V_{m\ std}}$, $\frac{(\quad)}{(\quad) + (\quad)}$	B_{wo}	
Molecular weight, stack gas dry (lb/lb-mole) (% CO_2 x 0.44) + (% O_2 x 0.32) + (% N_2 + % CO x 0.28) (___ x 0.44) + (___ x 0.32) + (___ + ___ x 0.28)	M_d	
Molecular weight, stack gas wet (lb/lb-mole) $Md(1-B_{wo}) + 18(B_{wo})$, (___)(1-___) + 18(___)	M_s	
Absolute stack pressure (in. Hg) $P_b + \frac{P_{stack}\ (in.\ H_2O)}{13.6}$, (___) + $\frac{(\quad)}{13.6}$	P_s	

Form 440 3/84

Temperature stack gas, average (^{o}F)	T_s	
Stack velocity (fps) $85.49\ (C_p)\ (\sqrt{\Delta P_{s\ avg}})\ \sqrt{\frac{T_s avg + 460}{P_s \quad M_s}}$ $85.49\ (\_\_\_\_)(\sqrt{\quad})\ \sqrt{\frac{(\_\_\_\_) + 460}{(\_\_\_\_)(\_\_\_\_)}}$	$V_{s(avg)}$	
Total sample time (minutes)	θ	
Nozzle diameter, actual (inches)	N_d	
Percent isokinetic (%) $\frac{17.33\ (T_s + 460)(V_w\ std + V_m\ std)}{\theta \quad V_s \quad P_s \quad N_d^2}$ $\frac{17.33\ (\_\_\_\_ + 460)((\_\_\_\_) + (\_\_\_\_))}{(\_\_\_\_)(\_\_\_\_)(\_\_\_\_)(\_\_\_\_^2)}$	%I	
Area of stack (ft^2) $\pi = 3.1416$ $\pi r^2 \div 144$, $\pi(\_\_\_\_)^2 \div 144$	A_s	
Stack gas volume at standard conditions (dscfm) $60\ (1 - B_{wo})Vs_{avg}\ A_s \left(\frac{528}{T_s\ avg + 460}\right) \left(\frac{Ps}{29.92}\right)$ $60\ (1 - \_\_\_)(\_\_\_)(\_\_\_)\left(\frac{528}{\_\_\_\_ + 460}\right) \left(\frac{(\_\_\_)}{(29.92)}\right)$	Q_s	
Particulate matter concentration, dry (gr/dscf) $15.432\ \frac{M_p(grams)}{Vm_{std}}$, $15.432\ \frac{(\_\_\_\_)}{(\_\_\_\_)}$	$C_{s(std)}$	
Emission rate of particulate matter (lb/hr) $0.00857\ (Q_s)\ C_{s(std)}$, $0.00857\ (\_\_\_\_)(\_\_\_\_)$	E_p	

APPENDIX F-2

SPREADSHEETS AND FIELD TEST DATA SHEETS

FLOWRATE CALCULATIONS

Plant: SCE HBGS
Date : 3/9/95
Sample Location: UNIT 2, 110 MW BASELINE
Performed by: MC

PARAMETER	SYMBOL	VALUE (calc.)
Pitot Tube Correction Factor	C(p)	0.8400
Barometric Pressure (in Hg)	P(b)	30.01
Stack Pressure (in H2O)	P(stack)	-0.350
# of Sample Points	#	24
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	
Width (if rectangular)	W	
Area of Stack (sq ft)	A(s)	(330.06)
O2 Concentration (by CEM)	% O2	7.20
CO2 Concentration (by CEM)	% CO2	7.90
CO Concentration (by CEM)	% CO	0.0
N2 Concentration (by diff.)	% N2	(84.90)

Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)
A-1	0.100	188	0.3162
2	0.100	188	0.3162
3	0.090	190	0.3000
4	0.100	188	0.3162
5	0.090	190	0.3000
6	0.080	190	0.2828
B-1	0.100	188	0.3162
2	0.100	188	0.3162
3	0.080	190	0.2828
4	0.100	188	0.3162
5	0.100	188	0.3162
6	0.080	190	0.2828
C-1	0.100	188	0.3162
2	0.100	188	0.3162
3	0.100	188	0.3162
4	0.080	190	0.2828
5	0.120	187	0.3464
6	0.080	190	0.2828
D-1	0.100	189	0.3162
2	0.100	190	0.3162
3	0.100	191	0.3162
4	0.120	190	0.3464
5	0.100	190	0.3162
6	0.100	190	0.3162
TOTALS	2.32	4537.0	7.4505

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.097
Avg Stack Temperature (degF)	T(s avg)	=	189.0
Avg SQRT(dP)		=	0.310

CALCULATED VALUES

Stack Gas Water Vapor Proportion	B(wo)	=	0.138
Mol. Wt., Stack Gas Dry	M(d)	=	29.55
Mol. Wt., Stack Gas Wet	M(s)	=	27.96
Abs Stack Pressure (in Hg)	P(s)	=	29.98
Avg Stack Velocity (ft/sec)	V(s avg)	=	19.6
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	272995
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	388467

FLOWRATE CALCULATIONS

Plant: SCE HBGS
Date : 3/9/95
Sample Location: UNIT 2, 110 MW UREA INJECTION
Performed by: MC/BD

PARAMETER	SYMBOL	VALUE (calc.)
Pitot Tube Correction Factor	C(p)	0.8400
Barometric Pressure (in Hg)	P(b)	30.01
Stack Pressure (in H2O)	P(stack)	-0.350
# of Sample Points	#	24
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	
Width (if rectangular)	W	
Area of Stack (sq ft)	A(s)	(330.06)
O2 Concentration (by CEM)	% O2	7.20
CO2 Concentration (by CEM)	% CO2	7.90
CO Concentration (by CEM)	% CO	0.0
N2 Concentration (by diff.)	% N2	(84.90)

Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)
A-1	0.100	188	0.3162
2	0.100	188	0.3162
3	0.100	188	0.3162
4	0.120	188	0.3464
5	0.120	188	0.3464
6	0.100	188	0.3162
B-1	0.090	188	0.3000
2	0.090	188	0.3000
3	0.100	188	0.3162
4	0.110	188	0.3317
5	0.100	188	0.3162
6	0.070	188	0.2646
C-1	0.090	188	0.3000
2	0.090	188	0.3000
3	0.100	188	0.3162
4	0.080	188	0.2828
5	0.100	188	0.3162
6	0.060	188	0.2449
D-1	0.100	188	0.3162
2	0.100	188	0.3162
3	0.120	188	0.3464
4	0.100	188	0.3162
5	0.100	188	0.3162
6	0.100	188	0.3162
TOTALS	2.34	4512.0	7.4742

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.098
Avg Stack Temperature (degF)	T(s avg)	=	188.0
Avg SQRT(dP)		=	0.311

CALCULATED VALUES

Stack Gas Water Vapor Proportion	B(wo)	=	0.140
Mol. Wt., Stack Gas Dry	M(d)	=	29.55
Mol. Wt., Stack Gas Wet	M(s)	=	27.93
Abs Stack Pressure (in Hg)	P(s)	=	29.98
Avg Stack Velocity (ft/sec)	V(s avg)	=	19.7
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	273563
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	389554

FLOWRATE CALCULATIONS

Plant: SCE HBGS
Date : 3/9/95
Sample Location: UNIT 2, 215 MW BASELINE
Performed by: MC/BD

PARAMETER	SYMBOL	VALUE (calc.)
Pitot Tube Correction Factor	C(p)	0.8400
Barometric Pressure (in Hg)	P(b)	30.01
Stack Pressure (in H2O)	P(stack)	-0.400
# of Sample Points	#	24
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	
Width (if rectangular)	W	
Area of Stack (sq ft)	A(s)	(330.06)
O2 Concentration (by CEM)	% O2	6.70
CO2 Concentration (by CEM)	% CO2	8.00
CO Concentration (by CEM)	% CO	0.0
N2 Concentration (by diff.)	% N2	(85.29)

Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)
A-1	0.450	232	0.6708
2	0.450	232	0.6708
3	0.450	232	0.6708
4	0.450	232	0.6708
5	0.450	232	0.6708
6	0.400	232	0.6325
B-1	0.390	232	0.6245
2	0.370	232	0.6083
3	0.440	232	0.6633
4	0.430	232	0.6557
5	0.440	232	0.6633
6	0.370	232	0.6083
C-1	0.400	232	0.6325
2	0.380	232	0.6164
3	0.400	232	0.6325
4	0.400	232	0.6325
5	0.450	232	0.6708
6	0.400	232	0.6325
D-1	0.400	232	0.6325
2	0.420	232	0.6481
3	0.420	232	0.6481
4	0.420	232	0.6481
5	0.450	232	0.6708
6	0.400	232	0.6325
TOTALS	10.03	5568.0	15.5070

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.418
Avg Stack Temperature (degF)	T(s avg)	=	232.0
Avg SQRT(dP)		=	0.646

CALCULATED VALUES

Stack Gas Water Vapor Proportion	B(wo)	=	0.144
Mol. Wt., Stack Gas Dry	M(d)	=	29.55
Mol. Wt., Stack Gas Wet	M(s)	=	27.89
Abs Stack Pressure (in Hg)	P(s)	=	29.98
Avg Stack Velocity (ft/sec)	V(s avg)	=	42.2
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	547128
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	836005

FLOWRATE CALCULATIONS

Plant: SCE HBGS
Date : 3/9/95
Sample Location: UNIT 2, 215 MW UREA INJECTION
Performed by: MC/BD

PARAMETER	SYMBOL	VALUE (calc.)
Pitot Tube Correction Factor	C(p)	0.8400
Barometric Pressure (in Hg)	P(b)	30.01
Stack Pressure (in H2O)	P(stack)	-0.400
# of Sample Points	#	24
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	
Width (if rectangular)	W	
Area of Stack (sq ft)	A(s)	(330.06)
O2 Concentration (by CEM)	% O2	7.10
CO2 Concentration (by CEM)	% CO2	7.90
CO Concentration (by CEM)	% CO	0.0
N2 Concentration (by diff.)	% N2	(84.99)

Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)
A-1	0.450	232	0.6708
2	0.460	232	0.6782
3	0.420	232	0.6481
4	0.450	232	0.6708
5	0.440	232	0.6633
6	0.400	232	0.6325
B-1	0.400	232	0.6325
2	0.400	232	0.6325
3	0.420	232	0.6481
4	0.460	232	0.6782
5	0.450	232	0.6708
6	0.390	232	0.6245
C-1	0.440	232	0.6633
2	0.450	232	0.6708
3	0.400	232	0.6325
4	0.450	232	0.6708
5	0.450	232	0.6708
6	0.400	232	0.6325
D-1	0.420	232	0.6481
2	0.440	232	0.6633
3	0.420	232	0.6481
4	0.450	232	0.6708
5	0.450	232	0.6708
6	0.350	232	0.5916
TOTALS	10.26	5568.0	15.6837

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.428
Avg Stack Temperature (degF)	T(s avg)	=	232.0
Avg SQRT(dP)		=	0.653

CALCULATED VALUES

Stack Gas Water Vapor Proportion	B(wo)	=	0.140
Mol. Wt., Stack Gas Dry	M(d)	=	29.55
Mol. Wt., Stack Gas Wet	M(s)	=	27.93
Abs Stack Pressure (in Hg)	P(s)	=	29.98
Avg Stack Velocity (ft/sec)	V(s avg)	=	42.7
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	555487
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	844829

FLOWRATE CALCULATIONS

Plant: SCE HBGS
Date : 3/11/95
Sample Location: UNIT 2, 70 MW BASELINE
Performed by: MC/BD

PARAMETER	SYMBOL	VALUE (calc.)
Pitot Tube Correction Factor	C(p)	0.8400
Barometric Pressure (in Hg)	P(b)	29.80
Stack Pressure (in H2O)	P(stack)	-0.160
# of Sample Points	#	24
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	
Width (if rectangular)	W	
Area of Stack (sq ft)	A(s)	(330.06)
O2 Concentration (by CEM)	% O2	7.20
CO2 Concentration (by CEM)	% CO2	8.00
CO Concentration (by CEM)	% CO	0.0
N2 Concentration (by diff.)	% N2	(84.79)

Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)
A-1	0.040	166	0.2000
2	0.040	166	0.2000
3	0.040	166	0.2000
4	0.050	166	0.2236
5	0.050	166	0.2236
6	0.040	166	0.2000
B-1	0.040	166	0.2000
2	0.040	166	0.2000
3	0.040	166	0.2000
4	0.050	166	0.2236
5	0.050	166	0.2236
6	0.040	166	0.2000
C-1	0.030	166	0.1732
2	0.040	166	0.2000
3	0.040	166	0.2000
4	0.050	166	0.2236
5	0.050	166	0.2236
6	0.040	166	0.2000
D-1	0.050	166	0.2236
2	0.040	166	0.2000
3	0.040	166	0.2000
4	0.050	166	0.2236
5	0.050	166	0.2236
6	0.040	166	0.2000
TOTALS	1.04	3984.0	4.9857

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.043
Avg Stack Temperature (degF)	T(s avg)	=	166.0
Avg SQRT(dP)		=	0.208

CALCULATED VALUES

Stack Gas Water Vapor Proportion	B(wo)	=	0.136
Mol. Wt., Stack Gas Dry	M(d)	=	29.57
Mol. Wt., Stack Gas Wet	M(s)	=	27.99
Abs Stack Pressure (in Hg)	P(s)	=	29.79
Avg Stack Velocity (ft/sec)	V(s avg)	=	12.9
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	185712
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	255966

FLOWRATE CALCULATIONS

Plant: SCE HBGS
Date : 3/11/95
Sample Location: UNIT 2, 70 MW UREA INJECTION
Performed by: MC/BD

PARAMETER	SYMBOL	VALUE (calc.)
Pitot Tube Correction Factor	C(p)	0.8400
Barometric Pressure (in Hg)	P(b)	29.80
Stack Pressure (in H2O)	P(stack)	-0.160
# of Sample Points	#	24
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	
Width (if rectangular)	W	
Area of Stack (sq ft)	A(s)	(330.06)
O2 Concentration (by CEM)	% O2	7.10
CO2 Concentration (by CEM)	% CO2	7.90
CO Concentration (by CEM)	% CO	0.0
N2 Concentration (by diff.)	% N2	(84.99)

Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)
A-1	0.040	169	0.2000
2	0.050	169	0.2236
3	0.040	169	0.2000
4	0.050	169	0.2236
5	0.050	169	0.2236
6	0.030	169	0.1732
B-1	0.050	169	0.2236
2	0.040	169	0.2000
3	0.040	169	0.2000
4	0.050	169	0.2236
5	0.050	169	0.2236
6	0.040	169	0.2000
C-1	0.040	169	0.2000
2	0.040	169	0.2000
3	0.050	169	0.2236
4	0.050	169	0.2236
5	0.040	169	0.2000
6	0.030	169	0.1732
D-1	0.050	169	0.2236
2	0.050	169	0.2236
3	0.050	169	0.2236
4	0.060	169	0.2449
5	0.070	169	0.2646
6	0.040	169	0.2000
TOTALS	1.10	4056.0	5.1156

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.046
Avg Stack Temperature (degF)	T(s avg)	=	169.0
Avg SQRT(dP)		=	0.213

CALCULATED VALUES

Stack Gas Water Vapor Proportion	B(wo)	=	0.139
Mol. Wt., Stack Gas Dry	M(d)	=	29.55
Mol. Wt., Stack Gas Wet	M(s)	=	27.94
Abs Stack Pressure (in Hg)	P(s)	=	29.79
Avg Stack Velocity (ft/sec)	V(s avg)	=	13.3
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	189613
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	263511

MOISTURE AND VOLUME CALCULATIONS

Plant: EDISON, HBGS
Date : 3/9/95
Performed by: MC/BD

Sample Location: UNIT 2
Test No./Type: MOISTURE/BASELINE
Start/Stop Time: 0140/0240

CONDITIONS: **MID LOAD, BASELINE**

PARAMETER	SYMBOL	VALUE (calc.)
Gas Meter Correction Factor	(gamma)	1.029
Barometric Pressure (in Hg)	P(b)	30.01
# of Sample Points	#	6
Total Sampling Time (min)	(theta)	(60.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.0
Length (if rectangular)	L	0.0
Width (if rectangular)	W	0.0
Area of Stack (sq ft)	A(s)	(330.1)
Gas Meter Initial Reading (cu ft)		882.89
Gas Meter Final Reading (cu ft)		913.48
Net Gas Sample Volume (cu ft)	V(m)	(30.60)
Vol of Liquid Collected (ml)	Vl(c)	107.6
Vol of Liq @ Std. Conds. (scf)	V(w std)	(5.065)

FIELD DATA AVERAGES

Avg Orifice Meter Reading (in H20)	dH(avg)	=	0.818
Avg Stack Temperature (degF)	T(s avg)	=	186.5
Average Meter Temperature (degF)	T(m avg)	=	67.3

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	31.67
Stack Gas Water Vapor Proportion	B(wo)	=	0.138

Sample Point	dClock Time	Orifice Meter dH (in H2O)	Stack Temp (degF)	Gas Temp in	Meter (degF) out
1	10	0.83	186	61	61
2	10	0.83	186	67	61
3	10	0.83	187	71	62
4	10	0.81	187	74	64
5	10	0.81	187	76	66
6	10	0.80	186	77	67
TOTALS	60	4.9100	1119.0	426	381

MOISTURE AND VOLUME CALCULATIONS

Plant: EDISON, HBGS
Date : 3/9/95
Performed by: MC/BD

Sample Location: UNIT 2
Test No./Type: MOISTURE/BASELINE
Start/Stop Time: 0815/0915

CONDITIONS: **FULL LOAD, BASELINE**

PARAMETER	SYMBOL	VALUE (calc.)
Gas Meter Correction Factor	(gamma)	1.029
Barometric Pressure (in Hg)	P(b)	30.01
# of Sample Points	#	6
Total Sampling Time (min)	(theta)	(60.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.0
Length (if rectangular)	L	0.0
Width (if rectangular)	W	0.0
Area of Stack (sq ft)	A(s)	(330.1)
Gas Meter Initial Reading (cu ft)		944.66
Gas Meter Final Reading (cu ft)		975.43
Net Gas Sample Volume (cu ft)	V(m)	(30.78)
Vol of Liquid Collected (ml)	Vl(c)	112.2
Vol of Liq @ Std. Conds. (scf)	V(w std)	(5.281)

FIELD DATA AVERAGES

Avg Orifice Meter Reading (in H20)	dH(avg)	=	0.805
Avg Stack Temperature (degF)	T(s avg)	=	229.5
Average Meter Temperature (degF)	T(m avg)	=	73.0

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	31.52
Stack Gas Water Vapor Proportion	B(wo)	=	0.144

Sample Point	dClock Time	Orifice Meter dH (in H2O)	Stack Temp (degF)	Gas Temp in	Meter (degF) out
1	10	0.81	230	68	67
2	10	0.81	228	72	68
3	10	0.81	230	75	70
4	10	0.80	230	78	71
5	10	0.80	230	79	73
6	10	0.80	229	81	74
TOTALS	60	4.8300	1377.0	453	423

MOISTURE AND VOLUME CALCULATIONS

Plant: EDISON, HBGS
Date : 3/11/95
Performed by: MC/BD

Sample Location: UNIT 2
Test No./Type: MOISTURE/BASELINE
Start/Stop Time: 0800/0900

CONDITIONS: **LOW LOAD, BASELINE**

PARAMETER	SYMBOL	VALUE (calc.)
Gas Meter Correction Factor	(gamma)	1.029
Barometric Pressure (in Hg)	P(b)	29.80
# of Sample Points	#	6
Total Sampling Time (min)	(theta)	(60.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.0
Length (if rectangular)	L	0.0
Width (if rectangular)	W	0.0
Area of Stack (sq ft)	A(s)	(330.1)
Gas Meter Initial Reading (cu ft)		6.64
Gas Meter Final Reading (cu ft)		37.05
Net Gas Sample Volume (cu ft)	V(m)	(30.42)
Vol of Liquid Collected (ml)	Vl(c)	105.1
Vol of Liq @ Std. Conds. (scf)	V(w std)	(4.947)

FIELD DATA AVERAGES

Avg Orifice Meter Reading (in H20)	dH(avg)	=	0.798
Avg Stack Temperature (degF)	T(s avg)	=	166.3
Average Meter Temperature (degF)	T(m avg)	=	63.5

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	31.49
Stack Gas Water Vapor Proportion	B(wo)	=	0.136

Sample Point	dClock Time	Orifice Meter dH (in H2O)	Stack Temp (degF)	Gas Temp in	Meter (degF) out
1	10	0.81	166	59	59
2	10	0.81	166	63	59
3	10	0.80	166	65	60
4	10	0.79	166	68	62
5	10	0.79	167	69	64
6	10	0.79	167	69	65
TOTALS	60	4.7900	998.0	393	369

PRELIMINARY VELOCITY TRAVERSE

Plant SCE- HBGS -U2

Date 3-9-95 110 MW - Baseline

Location UNIT 2 STACK RUN 1

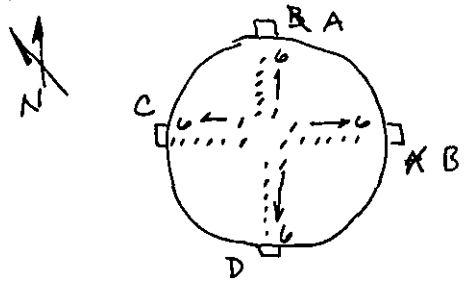
Stack I.D. 20' 6"

Barometric Pressure, in. Hg 30.01

StaticPressure, in. H_2O -0.35" H_2O

Cp 0.84

Operators MC / BD



Schematic Of Traverse Point Layout

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
B-1	0.10	188
2	0.10	188
3	0.09	190
4	0.10	188
5	0.09	190
6	0.08	190
A-1	0.10	188
2	0.10	188
3	0.08	190
4	0.10	188
5	0.10	188
6	0.08	190
C-1	0.10	188
2	0.10	188
3	0.10	188
4	0.08	190
5	0.12	187
6	0.08	190
D-1	0.10	189
2	~~0.07~~ 0.10	190
3	0.10	191
4	0.12	190
5	0.10	190
6	0.10	190
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

PRELIMINARY VELOCITY TRAVERSE

Plant SCE - HBGS

Date 3-9-95 RUN 2

Location UNIT 2 STACK 110MW UREA

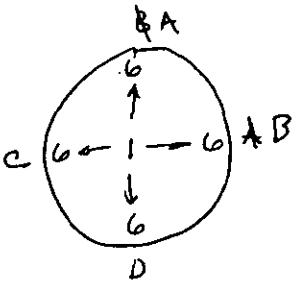
Stack I.D. 20'6"

Barometric Pressure, in. Hg 30.01

StaticPressure, in. H_2O -.35" H_2O

Cp 0.84

Operators MC/JD



Schematic Of Traverse Point Layout

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
B-1	0.09	188
2	0.09	188
3	0.10	188
4	0.11	188
5	0.10	188
6	0.07	188
C-1	0.09	188
2	0.09	188
3	0.10	188
4	0.08	188
5	0.10	188
6	0.06	188
A-1	0.10	188
2	0.10	188
3	0.10	188
4	0.12	188
5	0.12	188
6	0.10	188
D-1	0.10	188
2	0.10	188
3	0.12	188
4	0.10	188
5	0.10	188
6	0.10	188
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

PRELIMINARY VELOCITY TRAVERSE

Plant SCE - HBGS

Date 3-09-95

Location UNIT 2

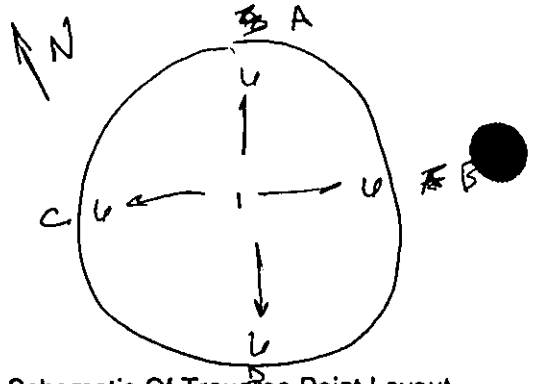
Stack I.D. 20'6" RUN 3 (HIGH) - Baseline

Barometric Pressure, in. Hg 30.01

StaticPressure, in. H_2O -0.40

Cp ~~0.84~~ 0.84

Operators BD/MC



Schematic Of Traverse Point Layout

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A - 1	0.45	232
2	0.45	232
3	0.45	232
4	0.45	232
5	0.45	232
6	0.40	232
B - 1	0.39	232
2	0.37	232
3	0.44	232
4	0.43	232
5	0.44	232
6	0.37	232
C - 1	0.40	232
2	0.38	232
3	0.40	232
4	0.40	232
5	0.45	232
6	0.40	232
D - 1	0.40	232
2	0.42	232
3	0.42	232
4	0.42	232
5	0.45	232
6	0.40	232
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

PRELIMINARY VELOCITY TRAVERSE

Plant SCE HBGS

Date 3/9/95

Location Unit 2

Stack I.D. 20' 6" Run 4 High-UREA

Barometric Pressure, in. Hg 30.01

StaticPressure, in. H_2O −0.40 "H_2O

Cp 0.84

Operators BD/ML

Schematic Of Traverse Point Layout

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
B 1	0.45	232
2	0.46	232
3	0.42	232
4	0.45	232
5	0.44	232
6	0.40	232
A 1	0.40	232
2	0.40	232
3	0.42	232
4	0.46	232
5	0.45	232
6	0.39	232
C 1	0.44	232
2	0.45	232
3	0.40	232
4	0.45	232
5	0.45	232
6	0.40	232
D 1	0.42	232
2	0.44	232
3	0.42	232
4	0.45	232
5	~~0.35~~ 0.45	232
6	0.35	232
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

PRELIMINARY VELOCITY TRAVERSE

Plant SCE - HBGS

Date 3-11-95

Location UNIT 2 ~~STACK~~ 70 MW - Baseline

Stack I.D. 20' 6"

Barometric Pressure, in. Hg 29.80

StaticPressure, in. H_2O - 0.16

Cp 0.84

Operators MC/BD

Schematic Of Traverse Point Layout

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_S), in. H_2O	STACK TEMPERATURE (T_S), °F
~~B~~ A - 1	0.04	166
2	0.04	166
3	0.04	166
4	0.05	166
5	0.05	166
6	0.04	166
AB - 1	0.04	166
~~B~~ 2	0.04	166
3	0.04	166
4	0.05	166
5	0.05	166
6	0.04	166
C - 1	0.03	166
2	0.04	166
3	0.04	166
4	0.05	166
5	0.05	166
6	0.04	166
D - 1	0.05	166
2	0.04	166
3	0.04	166
4	0.05	166
5	0.05	166
6	0.04	166
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_S), in. H_2O	STACK TEMPERATURE (T_S), °F
AVERAGE		

PRELIMINARY VELOCITY TRAVERSE

Plant SCE HBGS

Date 3/11/95 70MW - UREA

Location Unit 2

Stack I.D. 20'6"

Barometric Pressure, in. Hg 29.80

StaticPressure, in. H_2O -.16

Cp 0.84

Operators BD/MC

Schematic Of Traverse Point Layout

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
B-1	0.04	169
2	0.05	169
3	0.04	169
4	0.05	169
5	0.05	169
6	0.03	169
A-1	0.05	169
2	0.04	169
3	0.04	169
4	0.05	169
5	0.05	169
6	0.04	169
C-1	0.04	169
2	0.04	169
3	0.05	169
4	0.05	169
5	0.04	169
6	0.03	169
D-1	0.05	169
2	0.05	169
3	0.05	169
4	0.06	169
5	0.07	169
6	0.04	169
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
AVERAGE		

Moisture 110MW baseline

PARTICULATE TEST FIELD DATA SHEET

Plant SCE - HBGS
Date 3-9-95
Test Location UNIT 2
Run Number 1 - 110MW Baseline
Stack Diameter Inches 246"
Duct Dimensions in. x in —
Start Time 0140
Operator MC/BD

Barometric Pressure 30.01
Static Pressure —
Stack Pressure —
Probe Number H_2O
Pitot Coefficient —
Pitot Number —
Meter Box Number 20326
Orifice Coefficient 1.029

Nozzle Size & Number —
Molecule Weight —
BWO —

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
558.3	650.2			
592.2	597.2			
457.7	459.3			
SILICA GEL				
796.2	805.3			

~~184~~ 101.6

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F							PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT			
1	0		0.83	882.885	186		44			61	61	9		PRE-0.00@15"Hg
1	10		0.83	887.800	186		41			67	61	9		POST-0.00@14"
1	20		0.83	893.120	187		41			71	62	9		
1	30		0.81	898.200	187		44			74	64	9		PITOT LEAK CHECK
1	40		0.81	903.300	187		46			76	66	9		
1	50		0.80	908.400	186		47			77	67	9		
1	60		—	913.482	—		—			—	—	—		
AVG/TOTAL														

PARTICULATE TEST FIELD DATA SHEET

Plant SCE HBGS
Date 3/9/95
Test Location Unit 2
Run Number 2 moisture
Stack Diameter Inches 246
Duct Dimensions in. x in —
Start Time 0815
Operator B. Day

Barometric Pressure 30.01
Static Pressure —
Stack Pressure —
Probe Number —
Pitot Coefficient —
Pitot Number —
Meter Box Number 326
Orifice Coefficient 1.029

Nozzle Size & Number
Molecule Weight
BWO

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
578.5	677.7	112.2		
559.3	563.4			
469.8	470.9			
SILICA GEL				
738.5	746.3			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT³	TEMPERATURE °F							PUMP VACUUM in. Hg	√ΔP	GAS METER LEAK CHECK RATE (CFM)
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT			
	0	—	0.81	944.657	~~330~~	—	50	—	—	68	67	9		PRE- 0.003@16"
	10	—	0.81	949.750	228	—	50	—	—	72	68	9		POST-
	20	—	0.81	954.900	230	—	50	—	—	75	70	9		
	30	—	0.80	960.050	230	—	51	—	—	78	71	9		PITOT LEAK CHECK
	40	—	0.80	965.170	230	—	51	—	—	79	73	9		
	50	—	0.80	970.300	229	—	52	—	—	81	74	9		
	60	—	—	975.433	—	—	—	—	—	—	—	—		
AVG/TOTAL														

65 MW - MOISTURE

PARTICULATE TEST FIELD DATA SHEET

Plant SCE - HBGS
Date 3-11-95
Test Location UNIT 2
Run Number 1
Stack Diameter inches 246"
Duct Dimensions in. x in —
Start Time 0800
Operator BD/MC

Barometric Pressure 29.80
Static Pressure —
Stack Pressure —
Probe Number H2O
Pitot Coefficient —
Pitot Number —
Meter Box Number 326
Orifice Coefficient 1.029

Nozzle Size & Number
Molecule Weight
BWO

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
546.5	638.4	10	5.1	
563.3	567.5			
469.8	471.8			
SILICA GEL				
746.7	753.7			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT³	TEMPERATURE °F							PUMP VACUUM in. Hg	√ΔP	GAS METER LEAK CHECK RATE (CFM)
					STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT			
1	0	—	0.81	006.637	166	—	44	—	—	59	59	8		PRE- 0.009@22
1	10	—	0.81	011.700	166	—	41	—	—	63	59	8		POST- 0.004@2
1	20	—	0.80	016.900	166	—	46	—	—	65	60	8		
1	30	—	0.79	021.900	166	—	48	—	—	68	62	8		PITOT LEAK CHECK
1	40	—	0.79	027.000	167	—	50	—	—	69	64	8		
1	50	—	0.79	032.000	167	—	51	—	—	69	65	8		
1	100	—	—	037.054	—	—	—	—	—	—	—	—		
AVG/TOTAL														

APPENDIX G

SAMPLING EQUIPMENT CALIBRATION RECORDS

APPENDIX G-1

DRY GAS METER CALIBRATION RECORDS

CONSOLE METER PRE-CALIBRATION

Console No. 20326

Barometric Pressure, P_b = 29.89 in. Hg

Ambient Temperature 74 °F

Primary Test Meter No. 259453

Calibrated By B. Day

Date 10/11/94

Orifice Manometer Setting, (ΔH), in. H_2O	Gas Volume: Primary Meter (V_p), ft3	Gas Volume: Dry Gas Meter (V_d), ft3	Temperature: Primary Meter (t_p), °F	Temperature: Dry Gas Volume: Inlet (t_i), °F	Temperature: Dry Gas Volume: Outlet (t_o), °F	Temperature: Dry Gas Volume: Average (t_d), °F	Time (Θ), min	Vacuum Setting, in. Hg	Y	K_o	ΔH@
0.1	2.720	2.770	72 / 75	69 / 75	69 / 70	70.75	14	5	1.024	0.785	1.507
0.1	2.313	2.375	75 / 75	71 / 76	70 / 71	72.00	12	5	1.032	0.778	1.536
0.1	2.313	2-373	75 / 76	74 / 78	71 / 72	73.75	12	5	1.030	0.776	1.534
								Average	1.029	0.780	1.526

	Primary Meter	Total	Dry Gas Meter	Total
Stop	324.697	2.720	361.870	2.770
Start	321.977		359.100	
Stop	327.010	2.313	364.245	2.375
Start	324.697		361870	
Stop	329.323	2.313	366.618	2.373
Start	327.010		364.245	
Stop				
Start				

Calculations

$$Y = \frac{V_p (P_b)\ (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)\ (t_p + 460)}$$

$$K_o \frac{V_p}{\Theta \sqrt{\frac{\Delta H\ (t_d + 460)}{P_b\ (28.96)}}}$$

$$\Delta H@ = \frac{0.0317\ \Delta H}{P_b\ (t_o + 460)} \left[\frac{(t_p + 460)\ \Theta}{V_p}\right]^2$$

FORM 5221 1/92

Full

CONSOLE METER [redacted] CALIBRATION

Client _____ Project No. _____

Barometric Pressure, P_b 29.89 in. Hg

Ambient Temperature 75 °F

Primary Test Meter No. 259453 Console No. 20326

Calibrated By B. Day Date 10/11/94

Pre-Test Meter Correction Factor _____ Date Calib. _____

Post-Test Meter Correction Factor _____

Percent Difference $\left(\frac{\text{Pre} - \text{Post}}{\text{Pre}} \times 100 =\right)$ _____

Orifice Manometer Setting, (ΔH), in. H_2O	Gas Volume		Temperature				Time (Θ), min	Vacuum Setting, in. Hg	Y	K_o	ΔH@
				Dry Gas Volume							
	Primary Meter (V_p), ft3	Dry Gas Meter (V_d), ft3	Primary Meter (t_p), °F	Inlet (t_i), °F	Outlet (t_o), °F	Average (t_d), °F					
0.77	4.950	5.109	77 / 77	77 / 86	74 / 74	77.75	10	5	1.033	0.716	1.787
0.77	5.912	6.106	77 / 78	79 / 87	74 / 75	78.75	12	5	1.032	0.712	1.804
0.77	5.449	5.602	78 / 79	79 / 89	75 / 76	79.75	11	5	1.028	0.715	1.788
								Average	1.031	0.714	1.793

	Primary Meter	Total	Dry Gas Meter	Total
Stop	339773	4.950	377.359	5.109
Start	334.823		372.250	
Stop	345.685	5.912	383.465	6.106
Start	339.773		377.359	
Stop	351.134	5.449	389.067	5.602
Start	345.685		383.465	

Calculations

$$Y = \frac{V_p (P_b)\ (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_p + 460)}$$

$$K_o \frac{V_p}{\Theta \sqrt{\frac{\Delta H\,(t_d + 460)}{P_b\,(28.96)}}}$$

$$\Delta H@ = \frac{0.0317\,\Delta H}{P_b\,(t_o + 460)} \left[\frac{(t_p + 460)\,\Theta}{V_p}\right]^2$$

FORM 5224 1/92

Pall

CONSOLE METER [redacted]-CALIBRATION

Client _____ Project No. _____

Barometric Pressure, P_b 29.89 in. Hg

Ambient Temperature 78 °F

Primary Test Meter No. 259453 Console No. 20326

Calibrated By B. Day Date 10/11/94

Pre-Test Meter Correction Factor _____ Date Calib. _____

Post-Test Meter Correction Factor _____

Percent Difference $\left(\frac{\text{Pre} - \text{Post}}{\text{Pre}} \times 100 =\right)$ _____

Orifice Manometer Setting, (ΔH), in. H_2O	Gas Volume		Temperature				Time (Θ), min	Vacuum Setting, in. Hg	Y	K_o	ΔH@
				Dry Gas Volume							
	Primary Meter (V_p), ft3	Dry Gas Meter (V_d), ft3	Primary Meter (t_p), °F	Inlet (t_i), °F	Outlet (t_o), °F	Average (t_d), °F					
1.8	5.242	5.375	80 / 82	76 / 85	76 / 76	78.25	7	5	1.035	0.708	1.851
1.8	6.738	6.915	82 / 82	85 / 91	76 / 78	82.50	9	5	1.030	0.705	1.844
1.8	5.995	6.145	82 / 83	80 / 93	78 / 79	82.50	8	5	1.030	0.706	1.844
								Average	1.032	0.706	1.846

	Primary Meter	Total	Dry Gas Meter	Total
Stop	357.512	5.242	395.625	5.375
Start	352.270		390.250	
Stop	364.250	6.738	402.540	6.915
Start	357.512		395.625	
Stop	370.245	5.995	408.685	6.145
Start	364.250		402.540	

Calculations

$$Y = \frac{V_p (P_b)\ (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)\ (t_p + 460)}$$

$$K_o \frac{V_p}{\Theta \sqrt{\frac{\Delta H\ (t_d + 460)}{P_b\ (28.96)}}}$$

$$\Delta H@ = \frac{0.0317\ \Delta H}{P_b\ (t_o + 460)} \left[\frac{(t_p + 460)\ \Theta}{V_p}\right]^2$$

FORM 5224 1/92

Cull

CONSOLE METER [redacted]-CALIBRATION

Client _____ Project No. _____

Barometric Pressure, P_b 29.89 in. Hg

Ambient Temperature 80 °F

Primary Test Meter No. 259453 Console No. 20326

Calibrated By B. Day Date 10/11/94

Pre-Test Meter Correction Factor _____ Date Calib. _____

Post-Test Meter Correction Factor _____

Percent Difference $\left(\frac{\text{Pre} - \text{Post}}{\text{Pre}} \times 100 =\right)$ _____

Orifice Manometer Setting, (ΔH), in. H_2O	Gas Volume		Temperature				Time (Θ), min	Vacuum Setting, in. Hg	Y	K_o	ΔH@
	Primary Meter (V_p), ft3	Dry Gas Meter (V_d), ft3	Primary Meter (t_p), °F	Dry Gas Volume							
				Inlet (t_i), °F	Outlet (t_o), °F	Average (t_d), °F					
3.2	11.985	12.267	83 / 84	85 / 98	80 / 81	86	12	4	1.027	0.703	1.841
3.2	9.035	9.240	84 / 84	90 / 99	81 / 83	88.25	9	4	1.023	0.705	1.818
3.2	7.035	7.213	84 / 84	90 / 100	83 / 84	89.25	7	4	1.024	0.705	1.810
								Average	1.025	0.704	1.823

	Primary Meter	Total	Dry Gas Meter	Total
Stop	383.800	11.985	422.567	12.267
Start	371.815		410.300	
Stop	392.835	9.035	431.807	9.240
Start	383.800		422.567	
Stop	399.870	7.035	439.020	7.213
Start	392.835		431.807	

Calculations

$$Y = \frac{V_p (P_b)\ (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_p + 460)}$$

$$K_o \frac{V_p}{\Theta \sqrt{\frac{\Delta H\,(t_d + 460)}{P_b\,(28.96)}}}$$

$$\Delta H@ = \frac{0.0317\,\Delta H}{P_b\,(t_o + 460)} \left[\frac{(t_p + 460)\,\Theta}{V_p}\right]^2$$

FORM 5224 1/92

CONSOLE METER POST-CALIBRATION

Client SCE Project No. _____

Barometric Pressure, P_b 30.14 in. Hg

Ambient Temperature 69 °F

Primary Test Meter No. 259453 Console No. 20326

Calibrated By B. Day Date 3/14/95

Pre-Test Meter Correction Factor _____ Date Calib. _____

Post-Test Meter Correction Factor _____

Percent Difference $\left(\frac{\text{Pre} - \text{Post}}{\text{Pre}} \times 100 =\right)$ _____

Orifice Manometer Setting, (ΔH), in. H_2O	Gas Volume		Temperature				Time (Θ), min	Vacuum Setting, in. Hg	Y	K_o	ΔH@
	Primary Meter (V_p), ft3	Dry Gas Meter (V_d), ft3	Primary Meter (t_p), °F	Dry Gas Volume Inlet (t_i), °F	Dry Gas Volume Outlet (t_o), °F	Dry Gas Volume Average (t_d), °F					
1.0	7.861	8.060	70/71	71/78	68/69	71.50	14	6	1.026	0.720	1.766
1.0	5.639	5.763	71/71	75/79	69/70	73.25	10	6	1.020	0.721	1.749
1.0	5.616	5.764	71/72	76/80	70/70	74.0	10	6	1.024	0.718	1.764
								Average	1.023	0.720	1.760

	Primary Meter	Total	Dry Gas Meter	Total
Stop	645.808	7861	98.810	8.060
Start	637.947		90.750	
Stop	651.447	5.639	104.573	5.763
Start	645.808		98.810	
Stop	657.063	5.616	110.337	5.764
Start	651.447		104.573	

Calculations

$$Y = \frac{V_p (P_b)\ (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)\ (t_p + 460)}$$

$$K_o \frac{V_p}{\Theta \sqrt{\frac{\Delta H\ (t_d + 460)}{P_b\ (28.96)}}}$$

$$\Delta H@ = \frac{0.0317\ \Delta H}{P_b\ (t_o + 460)} \left[\frac{(t_p + 460)\ \Theta}{V_p}\right]^2$$

FORM 5224 1/92

728

CONSOLE METER POST-CALIBRATION

Client SCE Project No. _____

Barometric Pressure, P_b 30.14 in. Hg

Ambient Temperature 65 °F

Primary Test Meter No. 259453 Console No. 20326

Calibrated By B. Day Date 3/14/95

Pre-Test Meter Correction Factor _____ Date Calib. _____

Post-Test Meter Correction Factor _____

Percent Difference $\left(\frac{\text{Pre} - \text{Post}}{\text{Pre}} \times 100 =\right)$ _____

Orifice Manometer Setting, (ΔH), in. H_2O	Gas Volume		Temperature				Time (Θ), min	Vacuum Setting, in. Hg	Y	K_o	ΔH@
	Primary Meter (V_p), ft3	Dry Gas Meter (V_d), ft3	Primary Meter (t_p), °F	Dry Gas Volume Inlet (t_i), °F	Dry Gas Volume Outlet (t_o), °F	Dry Gas Volume Average (t_d), °F					
0.77/	5.947	6.115	68 / 68	64 / 73	63 / 64	66.0	12	4	1.034	0.728	1.747
0.77/	5.425	5.587	68 / 69	71 / 78	64 / 66	69.75	11	4	1.029	0.721	1.756
0.77/	5.434	5.605	69 / 70	73 / 80	66 / 68	71.75	11	4	1.029	0.721	1.750
								Average	1.031	0.723	1.751

	Primary Meter	Total	Dry Gas Meter	Total
Stop	624.951	5.947	77.365	6.115
Start	619.004		71.250	
Stop	630.376	5.425	82.952	5.587
Start	624.951		77.365	
Stop	635.810	5.434	88.557	5.605
Start	630.376		82.952	

Calculations

$$Y = \frac{V_p (P_b)\ (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)\ (t_p + 460)}$$

$$K_o \frac{V_p}{\Theta \sqrt{\frac{\Delta H\ (t_d + 460)}{P_b\ (28.96)}}}$$

$$\Delta H@ = \frac{0.0317\ \Delta H}{P_b\ (t_o + 460)} \left[\frac{(t_p + 460)\ \Theta}{\quad}\right]^2$$

APPENDIX G-2

MAGNEHELIC CALIBRATION RECORDS

DATA SHEET FOR MAGNEHELIC GAGE
(<10" H_2O) CALIBRATION WITH INCLINED MANOMETER

Magnehelic Gauge I.D.# 80808
Reference Gauge I.D.# IM-1

Date 3/7/95
Calibrated by B. Day
Calibration for:
Semiannual ✓
Bimonthly
Other

Full Scale of Magnehelic Gauge 0.5 "H_2O

System Leak Test (Pass-Fail) P or F:		10" H_2O Press.			10" H_2O Vac.
Leak Test ~90%F.S. (Pass-Fail) P or F:		" H_2O Press.			"H_2O Vac.
Full Scale %	Magne. H_1 in. H_2O	Standard H_2 in. H_2O	$H_2' - H_2$ x p*	Differ. $H = H_2' - H_1$	Deviation $100\Delta H/H_2'$ %	Remarks**
20	0.1	0.10		0	0	
40	0.2	0.20		0	0	
60	0.3	0.29		0.01	3.4	
80	0.4	0.39		0.01	2.6	
100	0.5	0.48		0.02	4.2	
20	0.1	0.10		0	0	
40	0.2	0.20		0	0	
60	0.3	0.30		0	0	
80	0.4	0.39		0.01	2.6	
100	0.5	0.49		0.01	2.0	
20	0.1	0.10		0	0	
40	0.2	0.20		0	0	
60	0.3	0.29		0.01	3.4	
80	0.4	0.39		0.01	2.6	
100	0.5	0.49		0.01	2.0	
Vac. 50%	0.25	0.25		0	0	Vacuum

* 1.0 in. for H_2O and Oil Manometer. 13.55 in. for Hg. Manometer
** Average Deviation, 95% CI. Correction Factor (0.95 F 1.05). Precision (± 3%)

Figure III-13

Example Data Sheet for Differential Pressure Gauge

DATA SHEET FOR MAGNEHELIC GAGE
(<10" H_2O) CALIBRATION WITH INCLINED MANOMETER

Magnehelic Gauge I.D.# R9109111EV18

Reference Gauge I.D.# IM-1

Date 3/7/95

Calibrated by B. Day

Calibration for:
Semiannual ✓
Bimonthly
Other

Full Scale of Magnehelic Gauge 0-2.0 "H_2O

System Leak Test (Pass-Fail) P or F:			10" H_2O Press.			10" H_2O Vac.
Leak Test ~90%F.S. (Pass-Fail) P or F:			" H_2O Press.			"H_2O Vac.
Full Scale %	Magne. H_1 in. H_2O	Standard H_2 in. H_2O	$H_2' - H_2$ x p*	Differ. $H = H_2' - H_1$	Deviation $100\Delta H/H_2'$ %	Remarks**
20	0.4	0.39		0.01	2.6	
40	0.8	0.78		0.02	2.6	
60	1.2	1.18		0.03	2.6	
80	1.6	1.59		0.01	0.6	
100	2.0	2.00		0	0	
20	0.4	0.39		0.01	2.6	
40	0.8	0.78		0.02	2.6	
60	1.2	1.18		0.03	2.6	
80	1.6	1.59		0.01	0.6	
100	2.0	2.00		0	0	
20	0.4	0.40		0	0	
40	0.8	0.78		0.02	2.6	
60	1.2	1.17		0.03	2.6	
80	1.6	1.58		0.02	1.3	
100	2.0	2.00		0	0	
50%	1.0	1.0		0	0	

* 1.0 in. for H_2O and Oil Manometer. 13.55 in. for Hg. Manometer

** Average Deviation, 95% CI. Correction Factor (0.95 F 1.05). Precision (± 3%)

Figure III-13

Example Data Sheet for Differential Pressure Gauge

DATA SHEET FOR MAGNEHELIC GAGE
(<10" H_2O) CALIBRATION WITH INCLINED MANOMETER

Magnehelic Gauge I.D.# R28D

Reference Gauge I.D.# IM-1

Date 3/7/95

Calibrated by B. Day

Calibration for:
Semiannual ✓
Bimonthly
Other

Full Scale of Magnehelic Gauge 0-6 "H_2O

System Leak Test (Pass-Fail) P or F:	10" H_2O Press.	10" H_2O Vac.
Leak Test ~90%F.S. (Pass-Fail) P or F:	" H_2O Press.	"H_2O Vac.

Full Scale %	Magne. H_1 in. H_2O	Standard H_2 in. H_2O	$H_2' - H_2$ x %	Differ. $H = H_2' - H_1$	Deviation $100\Delta H/H_2'$ %	Remarks**
20	1.2	1.21		0.01	0.8	
40	2.4	2.41		0.01	0.4	
60	3.6	3.64		0.04	1.1	
80	4.8	4.82		0.02	0.4	
100	6.0	6.00		0	0	
20	1.2	1.20		0	0	
40	2.4	2.44		0.04	1.6	
60	3.6	3.65		0.05	1.4	
80	4.8	4.80		0	0	
100	6.0	6.00		0	0	
20	1.2	1.20		0	0	
40	2.4	2.44		0.04	1.6	
60	3.6	3.64		0.04	1.1	
80	4.8	4.82		0.02	0.4	
100	6.0	6.00		0	0	
50%	3.0	3.0		0	0	

1.0 in. for H_2O and Oil Manometer. 13.55 in. for Hg. Manometer

** Average Deviation, 95% CI. Correction Factor (0.95 F 1.05). Precision (± 3%)

Figure III-13

Example Data Sheet for Differential Pressure Gauge

APPENDIX G-3

THERMOCOUPLE CALIBRATION RECORDS

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

ROG/NH_3 Sampling Probe

Date 4/11/95 Thermocouple number ROG P-1

Ambient temperature 63°F Barometric pressure 29.79 in. Hg

Calibrator D. Urry Reference: mercury-in-glass _____

other Simulator/Calibrator

Reference point number	Source[a] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[b] %
	Simulator	0	0.6	0.1 %
		100	100	0
		200	202	0.3
		300	300	0
		400	400	0
		500	500	0

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right]$ 100 ≤ 1.5%.

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 4/11/95 Thermocouple number Umbilical #2 Exit Temp 424

Ambient temperature 63°F Barometric pressure 29.79 in. Hg

Calibrator D. Urry Reference: mercury-in-glass _____

other Simulator / Calibrator

Reference point number	Source[a] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[b] %
	Simulator	0	0.4	0.1%
		100	100	0
		200	202	0.3
		300	300	0
		400	399	.0.1
		500	500	0

[a] Type of calibration system used.

[b] $\left| \frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °C} + 273} \right| \times 100 \leq 1.5\%$.

(ref temp, °C + 273)

Quality Assurance Handbook M5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Umbilical #2 Stack Temp

Date 4/11/95 Thermocouple number 422

Ambient temperature 63°F Barometric pressure 29.79 in. Hg

Calibrator D. Ung Reference: mercury-in-glass _____

other Simulator / Calibrator

Reference point number	Source[a] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[b] %
	Simulator	0	0.4	0.1
		100	~~202~~ 100	0
		202	202	0.3
		300	301	0.1
		400	399	0.1
		500	499	0.1

[a] Type of calibration system used.

[b] $\left| \frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460} \right| 100 \leq 1.5\%$.

Quality Assurance Handbook M5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Umbilical #1 stack Temp

Date 4/11/95 Thermocouple number U12

Ambient temperature 63 °F Barometric pressure 29.79 in. Hg

Calibrator D. Urry Reference: mercury-in-glass _____

other Simulator/Calibrator

Reference point number	Source[a] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[b] %
	Simulator ↓	0	0.4	0.1
		100	100	0
		200	202	0.3
		300	301	0.1
		400	400	0
		500	498	0.2

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right]$ 100 ≤ 1.5%.

Quality Assurance Handbook M5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Umbilical #1 Exit Temp

Date 4/11/95 Thermocouple number U14

Ambient temperature 63°F Barometric pressure 29.79 in. Hg

Calibrator D. Umy Reference: mercury-in-glass _____

other Simulator/Calibrator

Reference point number	Source[a] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[b] %
	Simulator	0	0.4	0.1
		100	100	0
		200	202	0.3
		300	300	0
		400	400	0
		500	498	0.2

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right]$ 100 ≤ 1.5%.

Quality Assurance Handbook H5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Conde #20326 Stack Temp

Date 4/4/95 Thermocouple number C26

Ambient temperature 66°F Barometric pressure 29.79 in. Hg

Calibrator D Urry Reference: mercury-in-glass _____

other Simulator / Calibrator

Reference point number	Source[a] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[b] %
	Simulator	0	−2	0.4
		100	94	1.1
		200	197	0.5
		300	295	0.7
		400	393	0.8
		500	492	0.8

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right] 100 \leq 1.5\%$.

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Console # 20326 Exit Temp

Date 4/11/95 Thermocouple number CH6

Ambient temperature 66°F Barometric pressure 29.79 in. Hg

Calibrator D. Urry Reference: mercury-in-glass _____

other simulator/Calibrator

Reference point number	Source[a] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[b] %
	Simulator	0	-2	0.4
		100	~~147~~ 44	1.1
		200	197	0.5
		300	296	0.5
		400	393	0.8
		500	493	0.7

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right]$ 100 ≤ 1.5%.

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Dry gas meter in Console # 2032 ~~Temp~~

Date 4/11/95 Thermocouple number _____

Ambient temperature 66°F Barometric pressure 29.79 in. Hg

Calibrator D Urry Reference: mercury-in-glass _____

other Simulator / calibrator

Reference point number	Source[a] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[b] %
	Simulator	0	-2	0.4
		100	94	1.1
		200	197	0.5
		300	295	0.7
		400	393	0.8
		500	492	0.8

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right] 100 \leq 1.5\%$.

Quality Assurance Handbook MS-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Console # 20326
Dry Gas Meter out

Date 4/11/95 Thermocouple number _____

Ambient temperature 66°F Barometric pressure 29.79 in. Hg

Calibrator D. Urry Reference: mercury-in-glass _____

other Simulator/calibrator

Reference point number	Source[a] (specify)	Reference thermometer temperature, °F	Thermocouple potentiometer temperature, °F	Temperature difference,[b] %
	Simulator	0	-2	0.4
		100	94	1.1
		200	197	0.5
		300	296	0.5
		400	393	0.8
		500	492	0.8

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right] 100 \leq 1.5\%$.

Quality Assurance Handbook M5-2.5

APPENDIX G-4

PITOT CALIBRATION RECORDS

Pitot #: S120 I
calibrated 3/6/95
by: Blaine Day

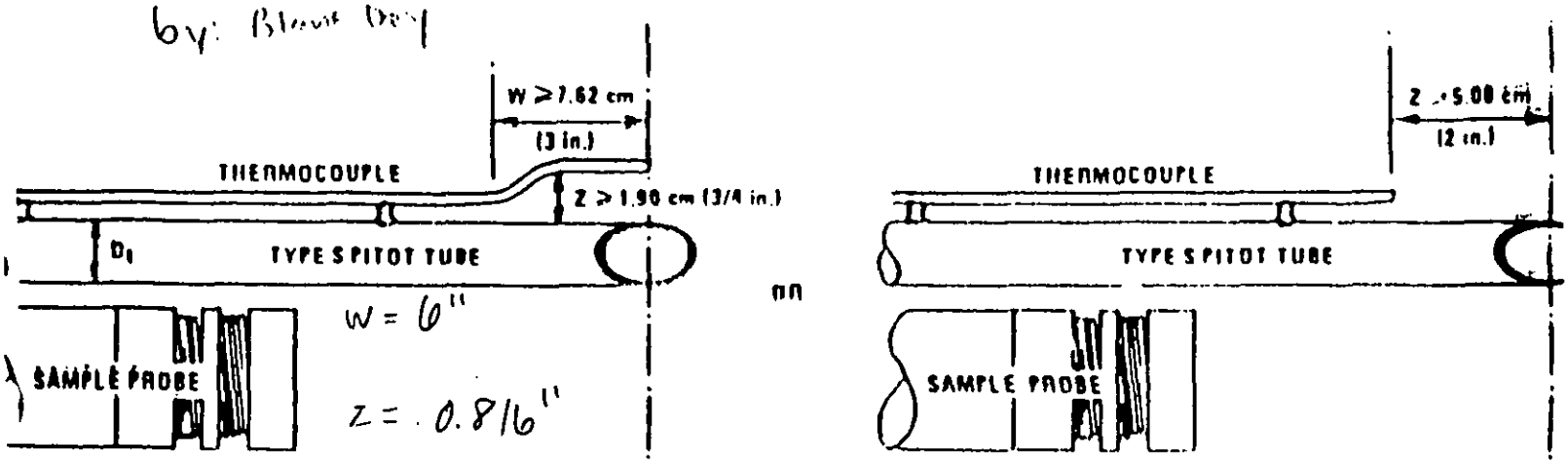
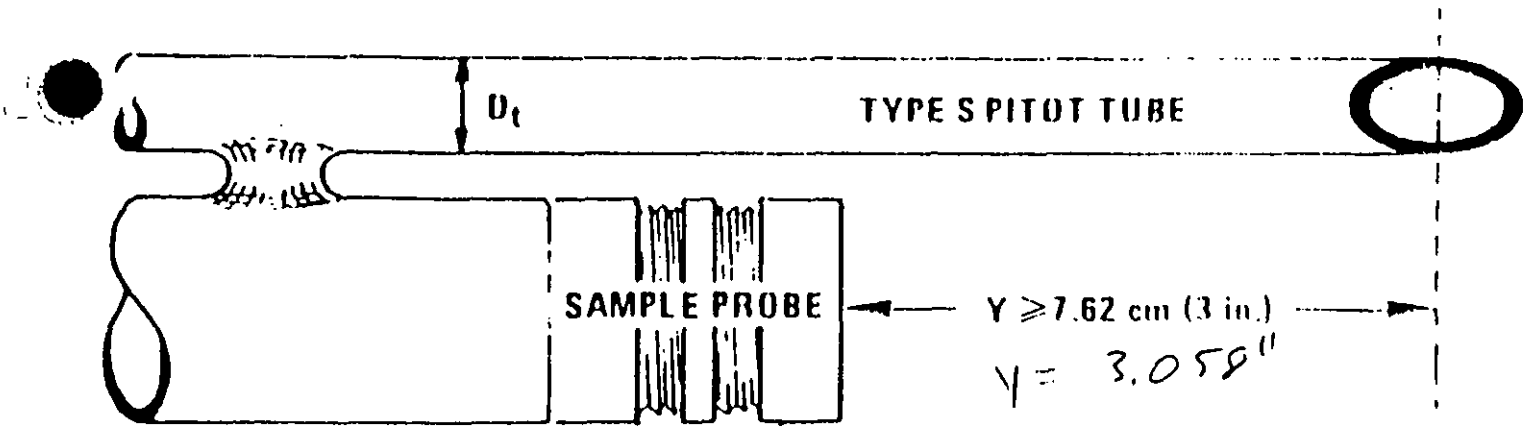


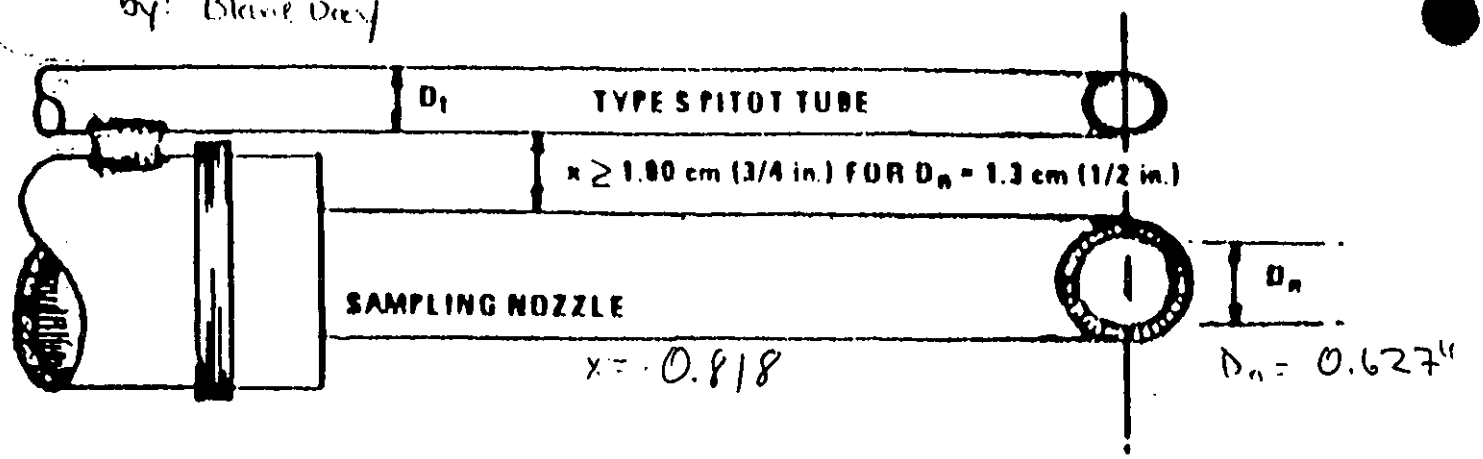
Figure 2-7. Proper thermocouple placement to prevent interference; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).



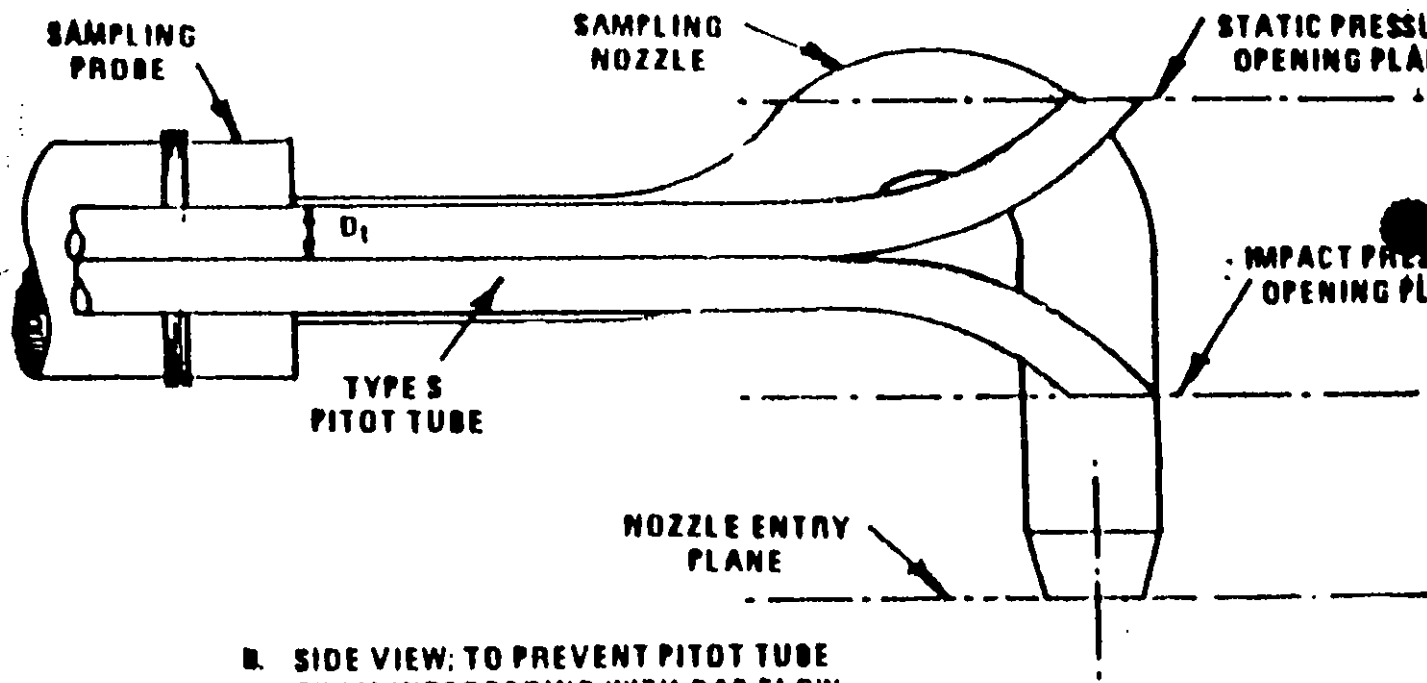
gure 2-8. Minimum pitot-sample probe separation needed to prevent interferenc
, between 0.48 and 0.95 cm (3/16 and 3/8 in.).

Pitot # S1201
Calibrated @ 3/6/95
by: Blaine Davy

semiannual cal. required



A. BOTTOM VIEW; SHOWING MINIMUM PITOT-NOZZLE SEPARATION.

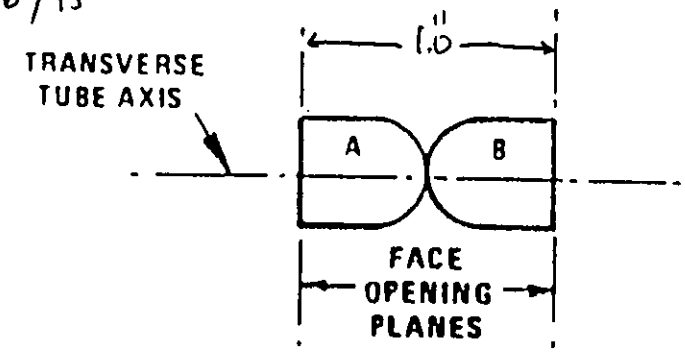


B. SIDE VIEW; TO PREVENT PITOT TUBE FROM INTERFERING WITH GAS FLOW STREAMLINES APPROACHING THE NOZZLE, THE IMPACT PRESSURE OPENING PLANE OF THE PITOT TUBE SHALL BE EVEN WITH OR ABOVE THE NOZZLE ENTRY PLANE.

Figure 2-6. Proper pitot tube-sampling nozzle configuration to prevent aerodynamic interfer[illegible] bl[illegible] hook-type nozzle; centers of nozzle and pitot opening aligned; D_t between 0.48 and [illegible] (3[illegible] and 3/8 in.).

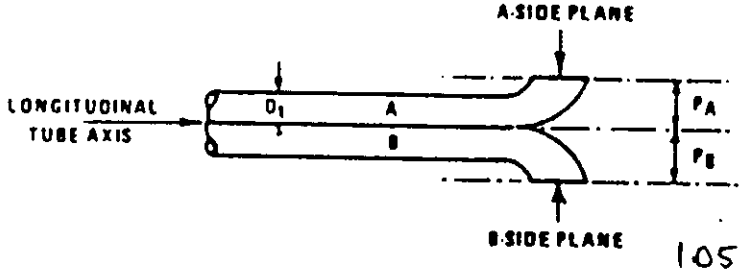
[Figure 2-6 amended by 52 FR 34639, September 14, 1987]

Pitot # 51201
Calibrated 3/6/95
By: B. Day



(a)

$D_1 = .380"$
$P_A = .5"$
$P_B = .5"$



(b)

$1.05(.38) < .5 < 1.5(.38)$
$0.399 < .5 < .570$

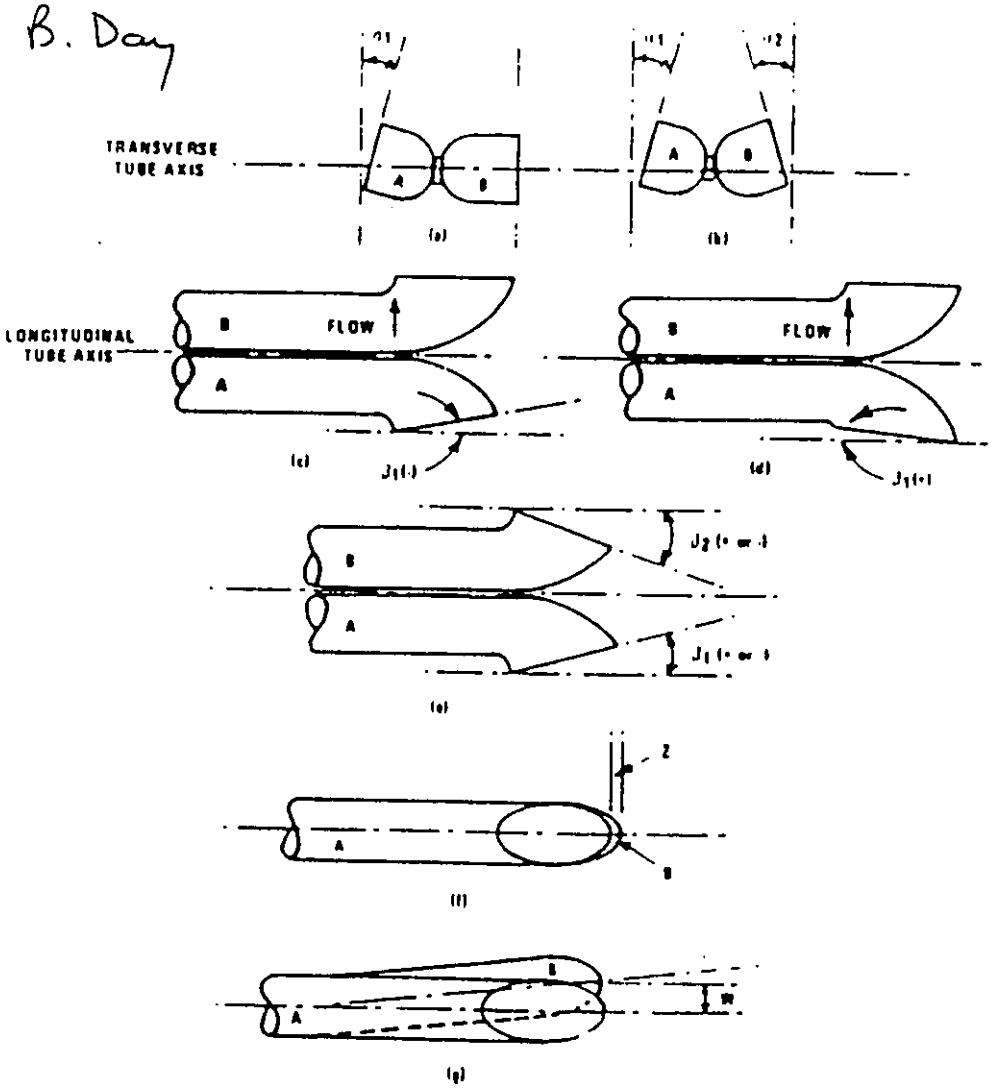
(c)

Properly constructed Type S pitot tube, shown in: (a) end view; face opening planes perpendicular to transverse axis; (b) top view; face opening planes parallel to longitudinal axis; (c) side view; both legs of equal length and centerlines coincident, when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.

Figure III-2

Proper Pitot Tube Configuration

Pitot # S1201
calibrated 3/6/95
By: B. Day



Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect the baseline value of Cp(s) so long as $\alpha 1$ and $\alpha 2$ 10° $\beta 1$ and $\beta 2$ 5°, z 0.32 cm (1/8 in.) and w 0.08 cm (1/32 in.) (citation 11 in Section 6).

$\alpha_1 = 0°$ $\beta_1 = 1°$ $z = 0°$

$\alpha_2 = 0°$ $\beta_2 = 0°$ $w = 0°$

Figure III-3

Improper Pitot Tube Configuration

APPENDIX H

CALIFORNIA ARB CONTRACTORS PROGRAM CERTIFICATION CERTIFICATE

State of California

Air Resources Board

Approved Independent Contractor

Acurex Environmental Corporation, a Geraghty & Miller Company

This is to certify that the company listed above has been approved by the Air Resources Board to conduct compliance testing pursuant to Section 91207, Title 17, California Code of Regulations, until June 30, 1995, for those test methods listed below:

ARB Source Test Methods:

1, 2, 3, 4

Visible Emissions Evaluation

James J. Morgester, Chief
Compliance Division

Laura McKinney, Manager
Certification and Investigation Section

90 56165

State of California

Air Resources Board

Approved Independent Contractor

Acurex Environmental Corporation, a Geraghty & Miller Company

This is to certify that the company listed above has been approved by the Air Resources Board to conduct compliance testing pursuant to Section 91207, Title 17, California Code of Regulations, until June 30, 1995, for those test methods listed below:

ARB Source Test Methods:
10, 100 (OC2, NOx, O2, SO2, THC)

James J. Morgester, Chief
Compliance Division

Laura McKinney, Manager
Certification and Investigation Section

90 56165

APPENDIX I

SCAQMD LABORATORY APPROVAL CERTIFICATION

South Coast
AIR QUALITY MANAGEMENT DISTRICT
21865 E. Copley Drive, Diamond Bar, CA 91765-4182 (909) 396-2000

December 9, 1994

Martin J. Connair
Acurex Environmental Corp.
One Technology Drive, Suite F213
Irvine, Ca. 92718

Laboratory:	**Acurex Environmental Corp.**
Reference #:	**94 LA 0826**
Application Date:	**October 26, 1994**

Dear Mr. Connair:

We have received and reviewed your letter dated November 23, 1994. Subject to the condition listed below, your application information indicates that your firm has met the necessary requirements for approval under our program. Approval ensures that your lab/test facilities fulfill the District's testing and analysis requirements for the following methods:

SCAQMD Methods	**1-4**
SCAQMD Method	**5**
SCAQMD Method	**25.1 Sampling**
SCAQMD Method	**100.1**

Approval is granted for the period **beginning: November 18, 1994 and ending: November 18, 1995** with the provision that the condition listed below has been met.

1) The District has developed some guidelines covering sample conditioning requirements for SCAQMD Method 100.1 (attached). Please provide data and other information that demonstrates that the sample conditioning system that you will be using for Method 100.1 tests meets or exceeds those requirements.

Please be advised that the District has the right to inspect or audit your facility any time during the duration of your approval under the program. In all cases, the approved test facility must notify the Laboratory Approval Program Manager in writing of any changes in procedures, personnel, equipment or policies which may change the conditions of the original approval. Failure to follow District methods or the conditions submitted in the application package without proper notification and approval will result in the cancellation of your approval.

Please feel free to contact Arun RoyChowdhury (ex. 2268) or me with any questions.

Sincerely,

Gary Dixon
Manager, Program Evaluation Branch
(909) 396-2238

GD:ks
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