AP42 Section: 1.4

Background Chapter 4

Reference: 16

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

Acurex Environmental,

March 1996

AP-42 ~~3?~~ #10
Section 1.4
(BID Ch. 2)

EMISSIONS SOURCE TEST REPORT:

PERMIT APPLICATION NO. R-249462

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
One Technology Drive, Suite F213
Irvine California, 92718

Project Engineer ____________ Chad Garretson

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SECTION 1

INTRODUCTION

Acurex Environmental was contracted by Southern California Edison Company (SCE) to conduct emissions source testing on Unit No. 1 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. R249462 (Condition 14B). Emissions measured were nitrogen oxides (NO_X), carbon monoxide (CO), oxygen (O_2), reactive organic gases (ROG), ammonia (NH_3), and particulates.

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. The most significant change to the test scope as specified in the PTC, but approved by the SCAQMD was 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 and District memorandum, and records of the referenced phone conversations 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 8 detail sampling and analysis procedures and results for each test parameter identified in Table 1-2. Appendices B through H provide supporting documentation for data presented in Sections 4 through 8 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 #1 Source Test Information

Source Tested	Southern California Edison's Huntington Beach Generating Station, Utility Boiler No. 1
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-249462)
Test Dates	January 5-8, 1994
Tests Performed By	Acurex Environmental, Southwest Regional Office Project Engineer: Chad Garretson (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 #1

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/ NA	60	1
	Particulate	SCAQMD 5.2	Gravimetric	>60	2
	[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 1.1,2.1,4.1	NA	60	1
	Particulate	SCAQMD 5.2	Gravimetric	>60	2
	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, NH_3, and particulate emission measurement results are summarized in Table 2-2. No emission measurement results exceed PTC limits. For each test condition, Table 2-2 lists stack gas NO_X, CO, O_2, ROG, NH_3, and particulate concentrations (corrected to 3 percent oxygen) and emission rates. ROG results presented in Table 2-2 represent an average of duplicate sampling and analysis results. Particulate results represent the average of two sampling runs.

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 D-7.

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	2.026	19.5	NA	NA	26.72	14.5	240
Full Load, Urea On	215	2.035	19.7	144.6	21	27.02	16.1	240
Mid-load, Baseline	116	1.110	19.9	NA	NA	15.65	14.2	193
Mid-load, Urea On	116	1.122	19.6	48.0	21	15.37	14.7	197
Low Load, Baseline	69	0.7128	19.0	NA	NA	10.03	13.8	181
Low Load, Urea On	69	0.7186	19.5	27.9	21	10.33	14.5	178

Table 2-2. Source Test Results

Test Condition	Stack Gas O_2	Stack Gas NO_x		Stack Gas CO		Stack Gas ROG		Stack Gas NH_3		Stack Gas Particulate	
	percent	[a]ppm	lb/hr	[a]ppm	lb/hr	[a]ppm	lb/hr	[a]ppm	lb/hr	[a]grains/dscf	lb/hr
Full Load, Baseline	5.0	89.3	257	408	715	74.5	74.8	NA	NA	0.0024	7.7
Full Load, Urea On	5.0	76.6	223	420	747	122	124	14	15	0.0024	8.1
Mid-load, Baseline	5.9	65.4	104	253	244	326	181	NA	NA	0.0024	4.7
Mid-load, Urea On	5.8	47.5	74.6	282	269	184	101	19	11	0.0036	6.9
Low Load, Baseline	6.4	41.6	41.2	313	188	333	114	NA	NA	0.0021	2.5
Low Load, Urea On	6.4	32.5	33.1	331	205	385	136	16	6.0	0.0032	3.9

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

SECTION 3

BOILER DESCRIPTION

Huntington Beach Unit No. 1 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.

4.1 Sampling System

Continuous emissions monitoring (CEM) instruments in the Acurex Environmental Mobile Laboratory were used to measure gaseous constituent concentrations present in the sample stream. The Acurex Environmental Mobile Laboratory is certified by the California Air Resources Board; a copy of the certificate is provided in Appendix J. A schematic of the CEM instrumentation is provided in Figure 4-1. 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 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 Bureau of Standards (NBS) traceable gas standards certified to ± 1 percent analytical accuracy. Copies of calibration gas certification sheets are provided in Appendix D-1.

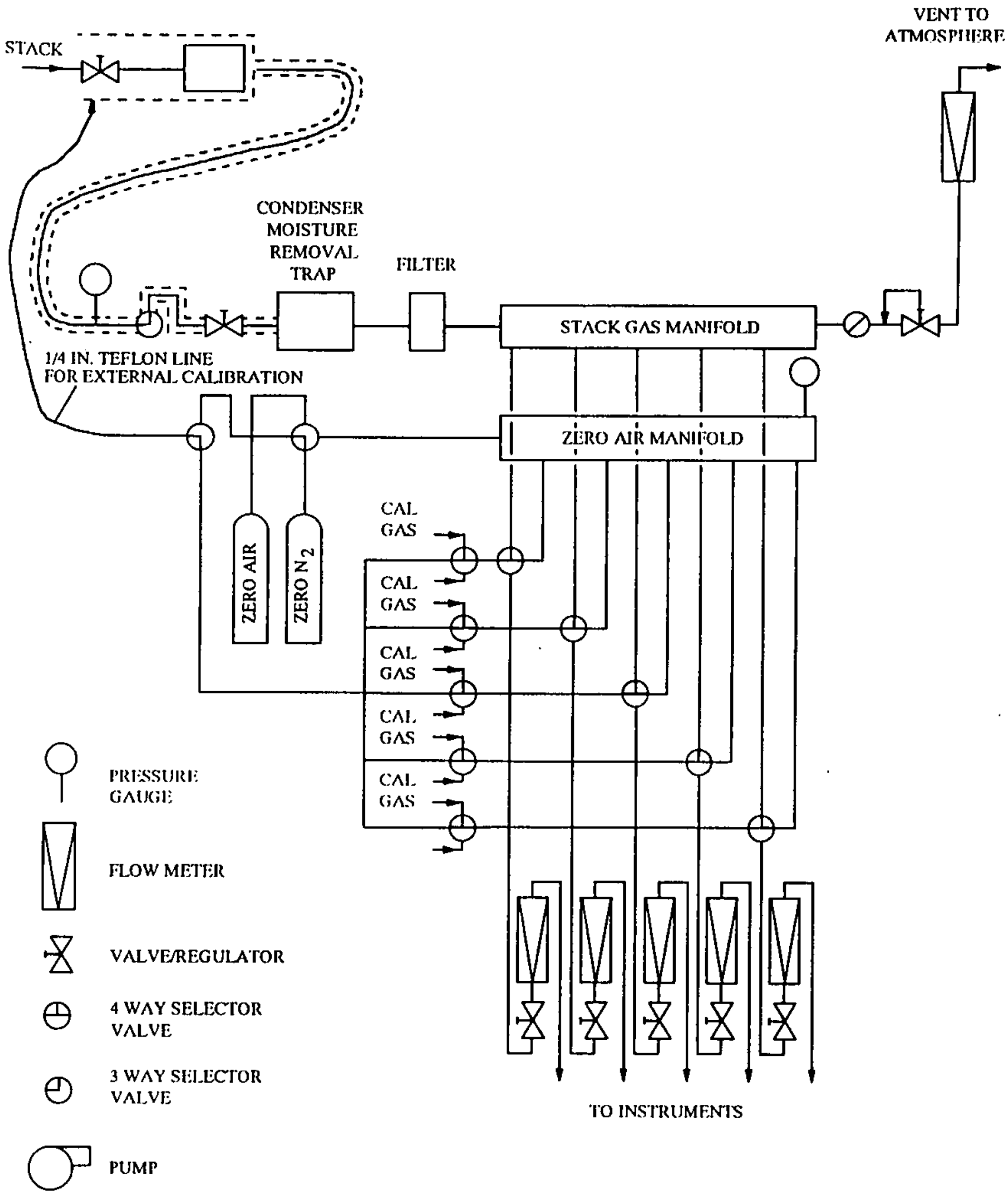


Figure 3-1. Schematic Diagram of CEM Instrumentation in the Acurex Environmental Mobile Laboratory

Table 4-1. Continuous Emissions Monitoring Instruments

NO_X CHEMILUMINESCENT ANALYZER—THERMO ELECTRON MODEL 10A	
Response Time (0-95%)	3 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%)	30 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—TECO MODEL 48	
Response Time (0-95%)	30 sec
Zero Drift	±1%
Span Drift	±1%
Linearity	1%
Output	4-20 mA
Range	0-1, 2, 5, 10, 20, 50, 100, 200, 500, 1000 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 taken 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

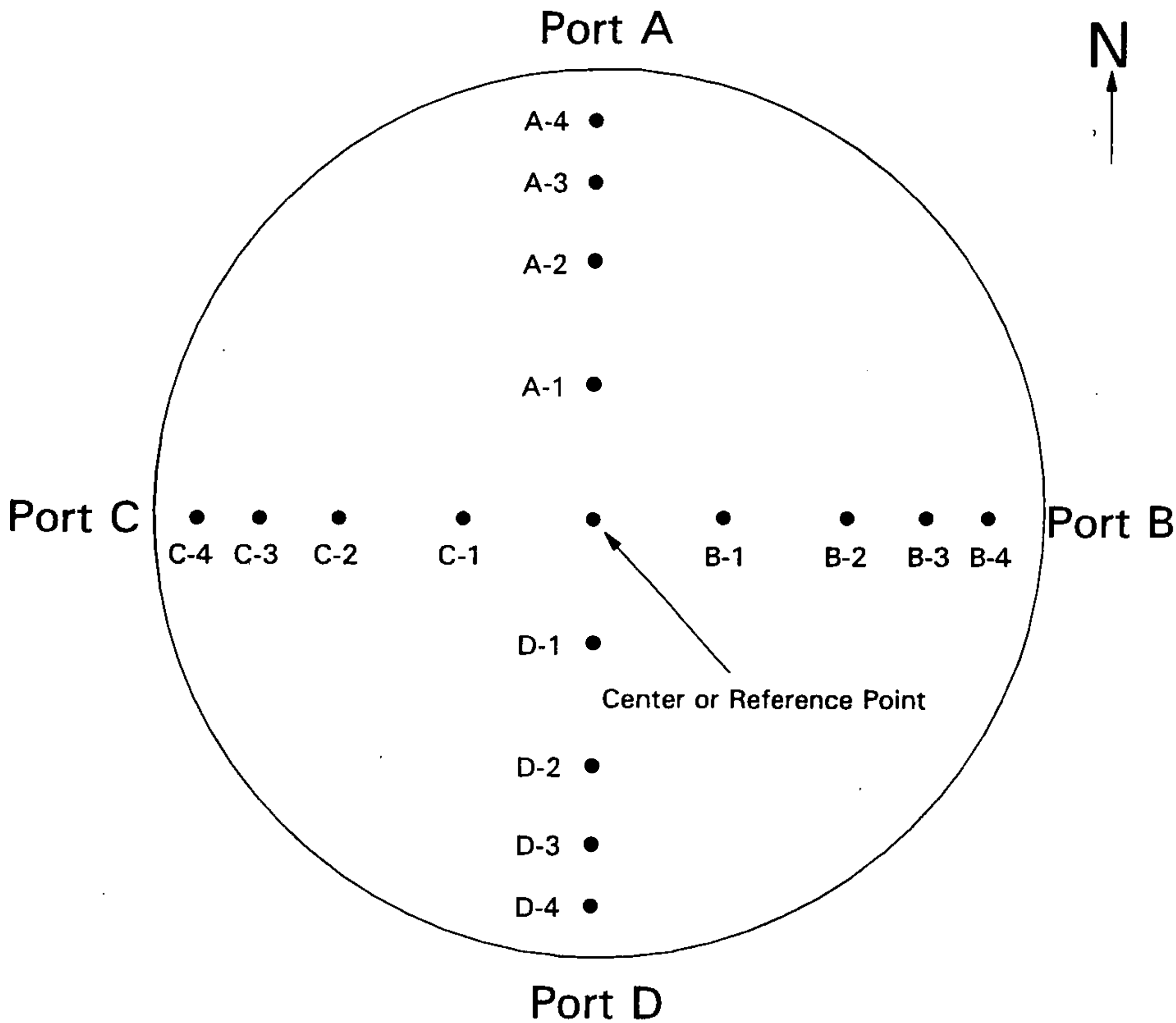
Test Condition	NO_X (ppm)	NO_X @ 3% O_2 (ppm)	CO (ppm)	CO @ 3% O_2 (ppm)	O_2 (%)	CO_2 (%)
Full Load, Baseline	79.2	89.3	362	408	5.0	9.1
Full Load, Urea On	68.1	76.6	374	420	5.0	9.2
Mid-load, Baseline	54.7	65.4	211	253	5.9	8.6
Mid-load, Urea On	40.0	47.5	237	282	5.8	8.7
Low Load, Baseline	33.8	41.6	254	313	6.4	8.3
Low Load, Urea On	26.4	32.5	269	331	6.4	8.3

4.3 Stratification Measurement Data

Constituent concentration stratification was assessed prior to performing Method 100.1 sampling at full, mid-, and low operating loads. 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 4-2. A copy of the field test data sheet documenting stratification test traverse point locations is provided in Appendix D-4. A stack diagram showing sampling port locations is provided in Appendix C. Through each sampling port, the sampling probe was first placed at the reference point (center point), followed by each traverse point, and then returned to the reference point. NO_X concentrations were measured at each sample location for at least 3 minutes.

Figure 4-2. Stratification Test Traverse Point Locations



Traverse Point Locations (inches)

Stack I.D.	246 inches
Point 1	79 ½ inches
Point 2	47 ⅝ inches
Point 3	25 ⅞ inches
Point 4	7 ⅞ inches

NO_X concentration measurements performed to assess gaseous constituent stratification at full, mid-, and low operating loads are summarized Tables 4-3, 4-4, and 4-5, respectively. Results were calculated following SCAQMD Source Test Manual, Chapter X, Section 13 procedures. Stratification was less than 10% at each operating load; 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 D-2 and D-3, respectively

Table 4-3. Full Load (215 MW) Stratification Test Results

Time	Traverse Point	NOx Conc. Tx (ppm)	Kx	Txn	Time	Traverse Point	NOx Conc. Tx (ppm)	Kx	Txn
0948	reference	79.5			1041	reference	77.5		
0952	D-1	79.5	1.00	79.5	1044	B-1	77.0	0.99	79.0
0954	D-2	79.5	1.00	79.5	1047	B-2	77.0	0.99	79.0
0958	D-3	79.5	1.00	79.5	1050	B-3	77.0	0.99	79.0
1002	D-4	79.5	1.00	79.5	1053	B-4	77.5	1.00	79.5
1007	reference	79.5			1056	reference	77.5		
	reference avg:	79.5				reference avg:	77.5		
1017	reference	77.0			1108	reference	77.5		
1020	C-1	77.0	1.00	79.5	1111	A-1	77.5	1.00	79.5
1023	C-2	77.0	1.00	79.5	1114	A-2	77.5	1.00	79.5
1026	C-3	77.0	1.00	79.5	1117	A-3	77.5	1.00	79.5
1029	C-4	77.0	1.00	79.5	1119	A-4	77.5	1.00	79.5
1033	reference	77.0			1122	reference	77.5		
	reference avg:	77.0				reference avg:	77.5		

Statification Test Results:

Txn (average):	79.4
Txn (maximum):	79.5
Txn (minimum):	79.0
Stratification:	0.6%

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

Table 4-4. Mid-load (114 MW) Stratification Test Results

Time	Traverse Point	NOx Conc. Tx (ppm)	Kx	Txn	Time	Traverse Point	NOx Conc. Tx (ppm)	Kx	Txn
2110	reference	40.0			2218	reference	38.5		
2115	D–1	41.0	1.03	41.0	2221	C–1	39.0	1.01	40.3
2119	D–2	40.0	1.00	40.0	2224	C–2	39.0	1.01	40.3
2122	D–3	40.0	1.00	40.0	2228	C–3	38.5	0.99	39.7
2125	D–4	40.0	1.00	40.0	2231	C–4	39.0	1.01	40.3
2128	reference	40.0			2234	reference	39.0		
	reference avg:	40.0				reference avg:	38.8		
2155	reference	39.5			2240	reference	38.5		
2158	B–1	39.0	0.99	39.5	2243	A–1	39.0	1.00	40.0
2201	B–2	39.5	1.00	40.0	2246	A–2	39.0	1.00	40.0
2204	B–3	39.5	1.00	40.0	2249	A–3	39.0	1.00	40.0
2207	B–4	39.5	1.00	40.0	2252	A–4	39.0	1.00	40.0
2210	reference	39.5			2255	reference	39.0		
	reference avg:	39.5				reference avg:	38.8		

Statification Test Results:

Txn (average):	40.1
Txn (maximum):	41.0
Txn (minimum):	39.5
Stratification:	3.8%

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

Table 4-5. Low Load (67 MW) Stratification Test Results

Time	Traverse Point	NOx Conc. Tx (ppm)	Kx	Txn	Time	Traverse Point	NOx Conc. Tx (ppm)	Kx	Txn
2113	reference	27.5			2200	reference	25.5		
2116	D−1	27.5	1.00	27.5	2203	B−1	25.5	0.99	27.2
2119	D−2	27.5	1.00	27.5	2206	B−2	25.5	0.99	27.2
2122	D−3	27.0	0.98	27.0	2209	B−3	26.0	1.01	27.8
2125	D−4	27.5	1.00	27.5	2212	B−4	26.0	1.01	27.8
2129	reference	27.5			2217	reference	26.0		
	reference avg:	27.5				reference avg:	25.8		
2138	reference	27.0			2229	reference	25.5		
2141	A−1	26.5	0.99	27.2	2232	C−1	26.0	1.02	28.0
2144	A−2	27.0	1.01	27.8	2235	C−2	26.0	1.02	28.0
2147	A−3	26.5	0.99	27.2	2238	C−3	26.0	1.02	28.0
2150	A−4	27.0	1.01	27.8	2241	C−4	25.0	0.98	27.0
2153	reference	26.5			2244	reference	25.5		
	reference avg:	26.8				reference avg:	25.5		

Statification Test Results: Txn (average): 27.5
Txn (maximum): 28.0
Txn (minimum): 27.0
Stratification: 3.9%

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 Results

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.

Instrument calibration results are summarized in Table 4-6, which lists the performance tolerance and the range of measurements recorded for each system performance measurement (calibration results from each test run are provided in Appendix D-8). All analyzer and sampling system performance measurements were within error tolerances listed in Method 100.1 procedures with one exception. The post-test NO_X analyzer calibration error measurement for the mid-load stratification test was 2.0 percent instead of < 2.0 percent as specified in the method (see Table D-8-4). This response was measured for the high range calibration gas (92.2 ppm NO_X). Because NO_X concentration measurements were below 45 ppm for the mid-load stratification test, and the mid range calibration gas (48.0 ppm NO_X) post-test calibration error was < 2.0 percent (0.3 percent actual), exceeding the high range analyzer calibration error tolerance for this test does not affect data quality.

Strip charts of the semi-annual analyzer certifications for response time and NO_2 to nitrous oxide (NO) converter efficiency are provided in Appendix D-5. 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.

Table 4-6. Method 100.1 QA/QC Measurements Summary

Sampling System Performance Measurements	Range of Measurements	Method 100.1 Performance Tolerance
Analyzer Calibration Error	0.0 - 2.0 %	< 2 %
Sampling System Bias	0.0 - 3.0 %	< 5 %
Linearity Error	0.1 - 0.9 %	< 1 %
Zero Calibration Drift	0.0 - 0.3 %	< 3 %
Calibration Drift	0.0 - 0.9 %	< 3 %

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 linearity 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 D-6). 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

Due to a data logger programming error, O_2 concentrations were not logged for tests performed at the full load operating condition. As a result, strip chart records were used to calculate O_2 concentrations at this condition.

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 5.2, PARTICULATE MEASUREMENTS

Section 5 summarizes SCAQMD Method 5.2 sampling and analysis procedures and results. An overview of the sampling and analysis procedures is provided in Section 5.1. Particulate sampling data are summarized in Section 5.2.

5.1 Sampling and Analysis Procedures

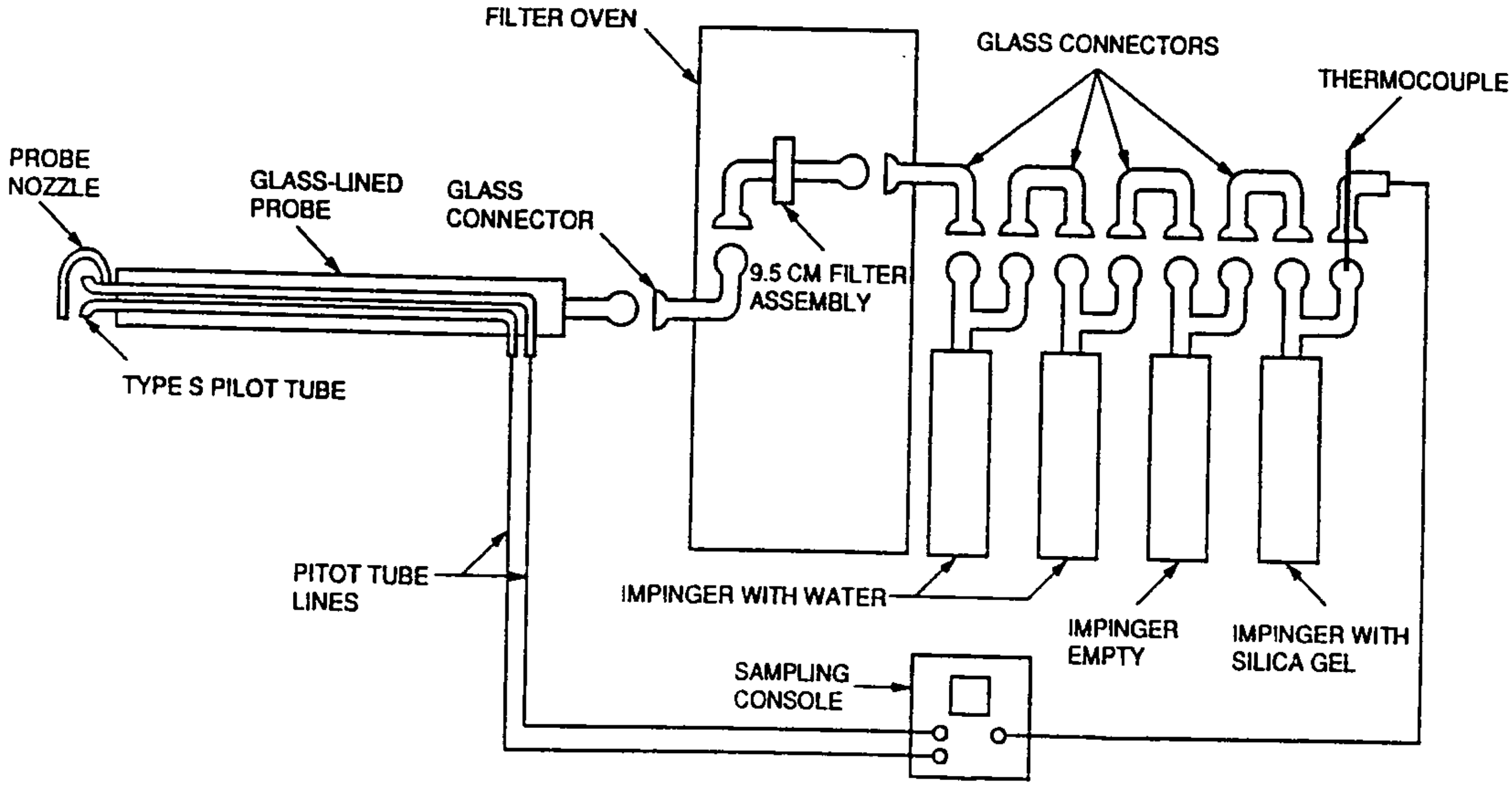
Method 5.2 was used to measure stack gas particulate concentrations and emission rates. Particulate samples were withdrawn isokinetically using the sampling train illustrated in Figure 5-1. Solid particulate collects in the probe and on a glass fiber filter maintained at 190 ± 10°F, and condensible particulate collects in the impingers.

Method 5.2 requires the collection of sample gas 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 incline manometer 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 by-pass and shut-off valves maintains a controlled sample flow rate through the system. Sample flow rate is measured using a critical flow orifice located down stream of the dry gas meter. 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 amount of total particulate collected for each test is determined gravimetrically. Total particulate is comprised of solid particulate collected in the probe and on the filter, and condensible particulate collected in the impingers. The probe-wash and filter sample fractions are analyzed for total residue weight. Condensible particulate collected in the impingers is

Figure 5-1. Particulate Sampling Train, Method 5.2



determined by analyzing the distilled water impinger catch for total residue weight and organic residue following a methylene chloride extraction.

For this test series each particulate sample was collected isokinetically at 24 traverse point locations. Particulate test traverse point locations are illustrated in Figure 5-2. Six traverse points were accessed from each of four ports (a stack diagram illustrating sampling port locations is provided in Appendix C).

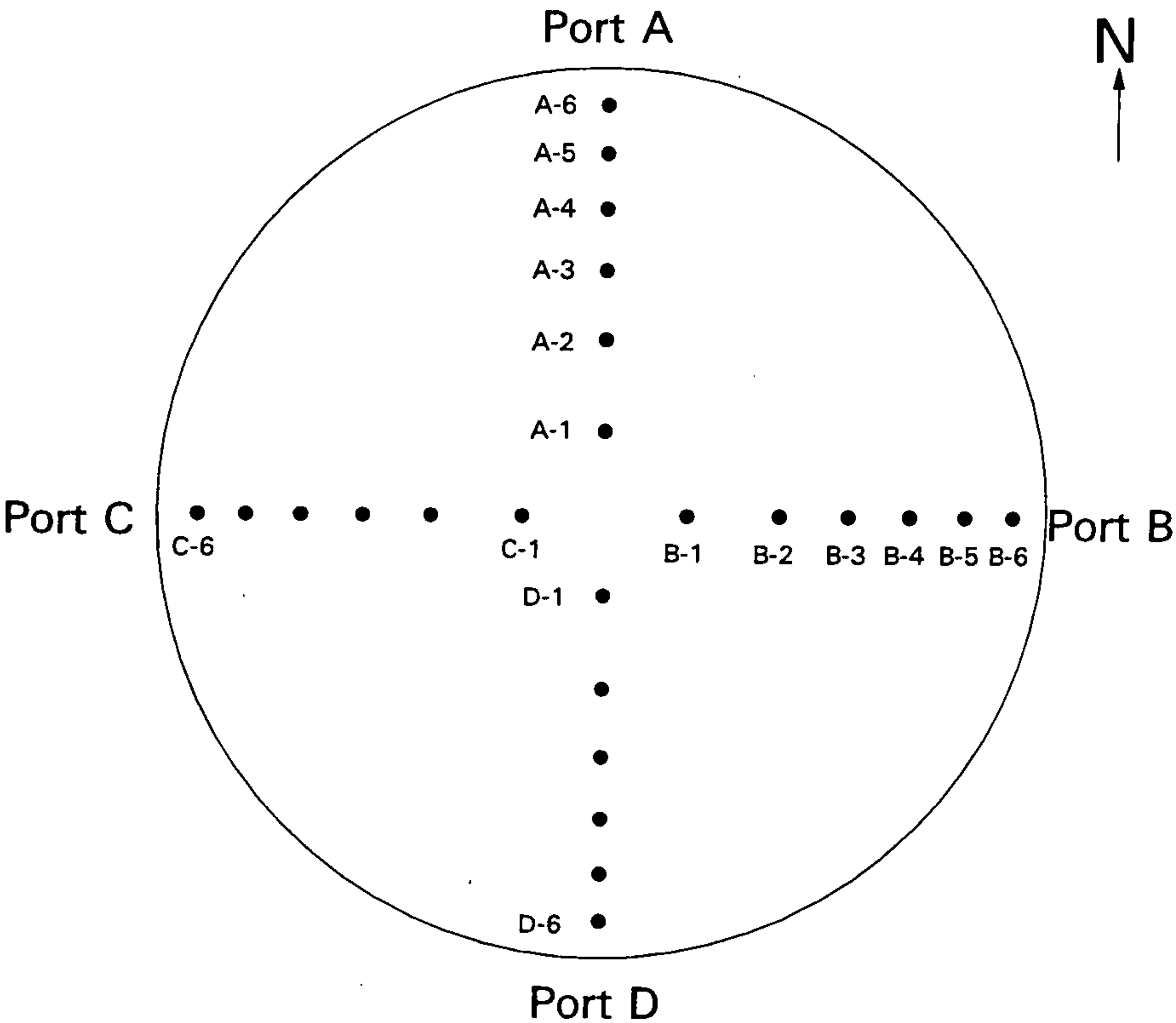
5.2 Method 5.2 Test Data

Particulate test results for full, mid-, and low load operating conditions are summarized in Table 5-1. For each test, Table 5-1 lists the particulate concentration and emission rate, and the percent isokinetic result. Emission rates listed in Table 5-1 were calculated based on flow rate data collected during particulate sampling.

Table 5-1. Method 5.2 Test Results

Test Condition	Run #	Concentration (gr/dscf)		Emission Rate (lbs/hr)	Percent Isokinetic (%)
		Actual	Corrected to 3 % O_2		
Full Load, Baseline	Run 1	0.0017	0.0019	6.2	100.9
	Run 2	0.0025	0.0028	9.2	98.9
Full Load, Urea On	Run 1	0.0022	0.0025	8.6	100.7
	Run 2	0.0019	0.0022	7.5	100.3
Mid-load, Baseline	Run 1	0.0022	0.0026	5.0	102.2
	Run 2	0.0018	0.0022	4.3	101.0
Mid-load, Urea On	Run 1	0.0024	0.0029	5.6	102.2
	Run 2	0.0036	0.0043	8.2	102.7
Low Load, Baseline	Run 1	0.0017	0.0021	2.6	103.5
	Run 2	0.0016	0.0020	2.4	102.8
Low Load, Urea On	Run 1	0.0031	0.0038	4.7	103.1
	Run 2	0.0021	0.0025	3.1	104.4

Figure 5-2. Particulate 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 0 inches
Point 5	16 ½ inches
Point 6	5 ⅛ inches

A summary of Method 5.2 calculations is provided in Appendix E-1, and copies of particulate gravimetric results and field data sheets are provided in Appendix E-2 and E-3, respectively.

Method 5.2 sampling equipment was calibrated following SCAQMD Source Test Manual, Chapter III procedures. Copies of dry gas meter, nozzle, pitot, and TC calibration records are provided in Appendix I.

The dry gas meter correction factor (Y) used for particulate sampling (console #30325) was 0.9895 as determined from a previous semi-annual calibration performed on July 14, 1993. Acurex Environmental performs semi-annual dry gas meter calibrations per SCAQMD Source Test Manual, Chapter III procedures. Following the January 1994 source test reported herein, a post-test semi-annual calibration was performed, resulting in a new gas meter correction factor (Y = 1.034). For the purpose of calculating final particulate sample volumes, the post-test gas meter correction factor was used (Y = 1.034).

5.3 Method 5.2 QA/QC Results

Lot analyses were performed on distilled water and methylene chloride solutions used for Method 5.2 sampling and analysis. No residue was measured in the methylene chloride blank sample. However, blank results indicate the presence of some particulate residue in the distilled water used for Method 5.2 sampling. A residue weight of 0.00095 grams was measured for a distilled water blank sample containing 371 milliliters. The results presented in Table 5-1 were corrected to account for background particulate residue present in the distilled water.

SECTION 6

SCAQMD METHOD 25.1, ROG MEASUREMENTS

Section 6 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 6.1. ROG analytical data are summarized in Section 6.2.

6.1 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.

ROG sample gas are withdrawn at a constant rate from the source by an evacuated tank. 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. A pre-cleaned, ⅛ inch stainless steel sampling probe is used to access the center of the exhaust stack, and each sampling line is purged for approximately one minute prior to collecting each sample.

ROG concentrations are determined through independent analysis of the condensate in the traps and the gases in the tanks. ROG concentrations in the condensate traps are measured by first removing all CO_2, and then oxidizing the organic portion of the condensate to CO_2. This CO_2 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 CO_2 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. 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 Horizon Air Measurements located in Newbury Springs, California, and AAtmAA Laboratories located in Calabasas, California.

6.2 Method 25.1 Analytical Data

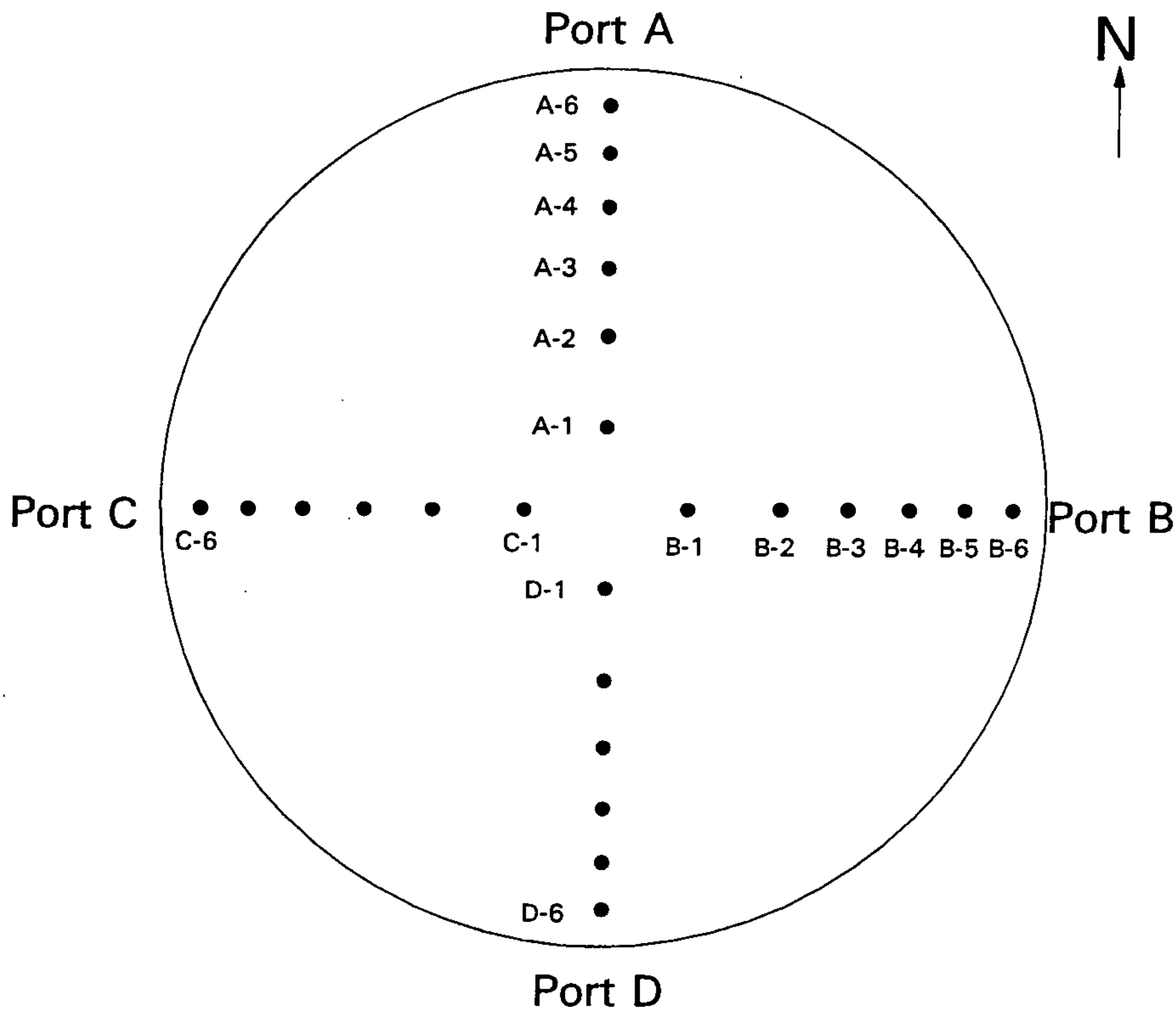
Method 25.1 analytical data are summarized in Table 6-1. For each test condition, duplicate analysis results are listed for ROG, CO, and CO_2. Table 6-1 lists actual ROG concentrations and ROG concentrations corrected to 3 percent O_2, as well as ROG emission rates reported in pounds per hour as carbon. Emission rates were calculated based on flow rate data collected during the test period (Section 8). Copies of Method 25.1 analytical reports and field test data sheets are provided in Appendix F-1 and F-2, respectively.

The Method 25.1 field data sheet for the mid-load baseline test condition indicates that Tray 2, (a tray constitutes one tank and condensate trap set), did not pass the post-test leak check. Also, CO and CO_2 results for this sample indicate that sample dilution occurred. As a result, Tray 2 results were not used to compute results presented in Section 2, but instead, ROG emissions at the mid-load operating condition were based solely on Tray 1 test results.

6.3 Method 25.1 QA/QC Results

Field blank analytical results indicate 5.6 ppm residual ROG (as methane) was present in the apparatus. Data presented in Table 6-1 were blank corrected to account for residual ROG present in the Method 25.1 sampling equipment.

Figure 5-2. Particulate 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 0 inches
Point 5	16 ½ inches
Point 6	5 ⅛ inches

Table 6-1. Method 25.1 Test Results

Test Condition	Sample	ROG Concentration (ppm as methane)		ROG Emission Rate (lb/hr as CH_4)	CO [a](ppm)	CO_2 (%)
		Actual	Corrected to 3 % O_2			
Full Load, Baseline	[b]Tray 1	18.3	20.6	20.7	405	5.98
	Tray 2	114	128	129	448	5.72
	Average	66.2	74.5	74.8	427	5.85
Full Load, Urea On	Tray 1	66.5	74.9	76.0	462	5.82
	Tray 2	151	169	172	457	6.19
	Average	109	122	124	460	6.01
Mid-load, Baseline	Tray 1	274	326	181	259	6.44
	[c]Tray 2	168	201	111	42.6	1.24
	Average	NC	NC	NC	NC	NC
Mid-load, Urea On	Tray 1	139	165	90.7	302	5.82
	Tray 2	171	202	111	315	5.62
	Average	155	184	101	309	5.72
Low Load, Baseline	Tray 1	209	258	88.6	333	6.30
	Tray 2	331	408	140	333	5.57
	Average	270	333	114	333	5.94
Low Load, Urea On	Tray 1	302	373	132	310	5.37
	Tray 2	321	397	140	325	6.75
	Average	312	385	136	318	6.06

[a]reported concentrations are corrected to 3% O_2
[b]a tray constitutes one tank and condensate trap set
[c]test results are invalid
NC - Not Calculated

SECTION 7

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.

7.1 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 G-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 TC 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.

7.2 Draft Method 207.1 Test Data

NH_3 concentration data are summarized in Table 7-1. For each urea test condition, Table 7-1 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 8). Copies of NH_3 analytical reports and field test data sheets are provided in Appendix G-2 and G-3, respectively.

Table 7-1. NH_3 Test Data

Test Condition	Analytical Results		Stack Gas Concentration		Stack Gas Emission Rate (lb/hr)
	Run #	NH_3 (mg)	(ppm)	Corrected to 3 % O_2 (ppm)	
Full Load, Urea On	Run 1	5.58			
	Run 2	5.86			
	Run 3	5.94			
	Average	5.79	12	13	15
Mid-load, Urea On	Run 1	7.98			
	Run 2	7.99			
	Run 3	7.83			
	Average	7.93	16	19	11
Low Load, Urea On	Run 1	9.28			
	Run 2	9.04			
	Run 3	9.17			
	Average	9.16	13	17	6.0

Stack gas concentration and emission rate data were calculated using the average of three analysis results summarized in Table 7-1. For each sample, Run 1 was performed on January 4, 1994, and Runs 2 and 3 were performed on March 19, 1994. Additional analyses were performed on March 19 because the control sample analyzed on January 4 was not prepared per the intent of the author of Draft Method 207.1. Following discussions with Joan Niertet of the SCAQMD, Acurex Environmental correctly prepared the 40 μg control sample and reanalyzed the samples on March 19.

7.3 Draft Method 207.1 QA/QC Results

Calibration curve results were within Draft Method 207.1 QA/QC requirements for analyses performed on January 4 and March 19, 1994. The correlation coefficients for the 6 point calibration curves were 0.9998 and 0.9997, respectively, exceeding the 0.9995 requirement. Also, the 40 μg control sample prepared and analyzed on March 19 deviated 4.0 percent from the calculated curve, within the $\pm$ 5 percent requirement.

Sampling system calibration records are provided in Appendix I.

SECTION 8

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

Section 8 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 8.1. Stack gas flow rate data are summarized in Section 8.2.

8.1 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 5-2.

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. Because exhaust stack Δp measurements did not span the entire 60 minute test period, reference point Δp measurements were recorded at 5 minute intervals for the remainder of the test period.

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.

8.2 Volumetric Flow Rate Test Data

Stack gas volumetric flow rate data are summarized in Table 8-1. 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 H-1 and H-2, respectively.

Reference point Δp measurements, recorded at 5 minute intervals after completing the velocity traverse, are listed on the spreadsheets provided in Appendix H-2. Copies of pitot and magnehelic calibration records are provided in Appendix I.

Table 8-1. 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	445253	14.5	240	29.7
Full Load, Urea On	450359	16.1	240	29.7
Mid-load, Baseline	260769	14.2	193	29.6
Mid-load, Urea On	259391	14.7	181	29.6
Low Load, Baseline	167591	13.8	178	29.6
Low Load, Urea On	172150	14.5	178	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

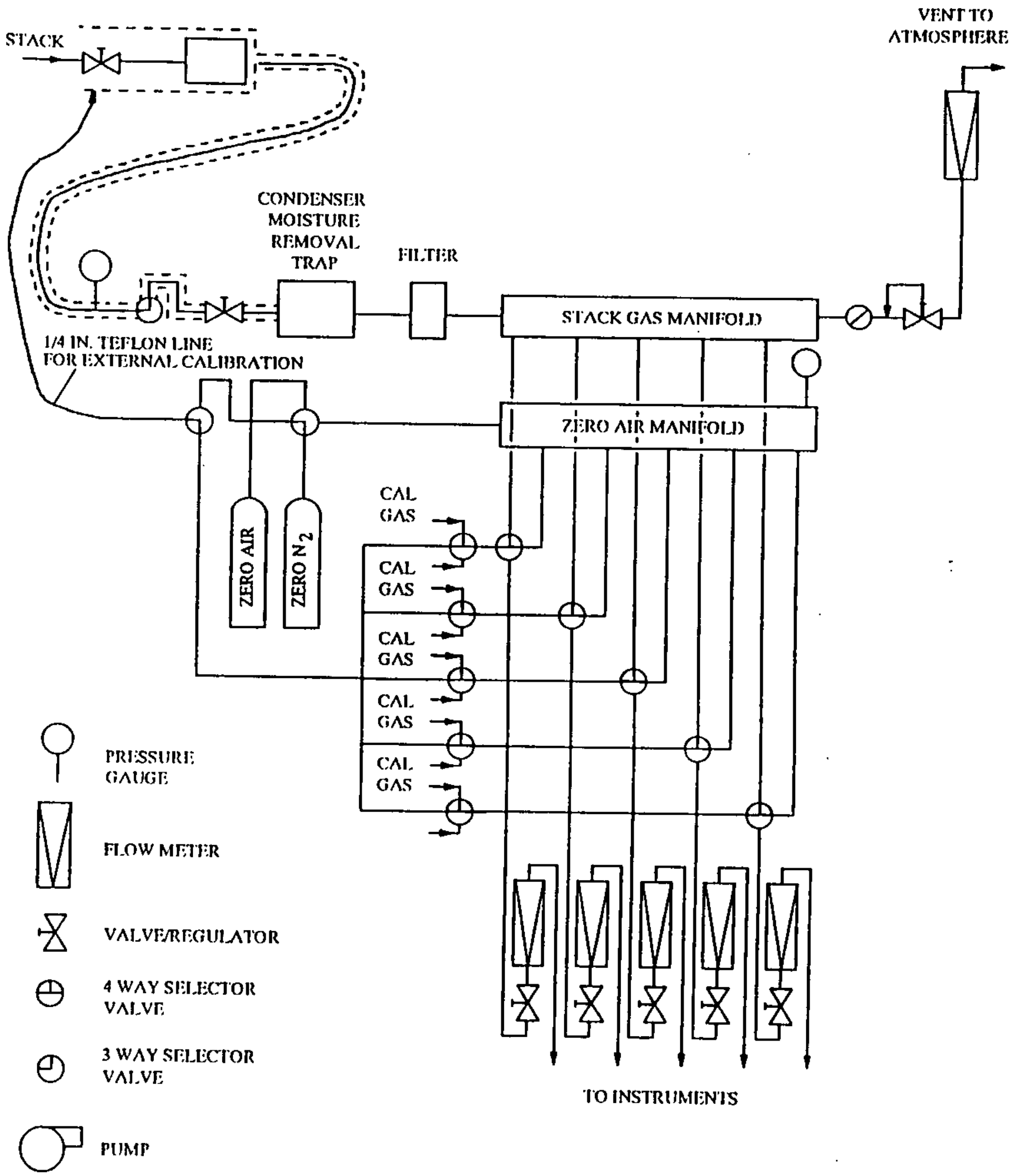


Figure 3-1. Schematic Diagram of CEM Instrumentation in the Acurex Environmental Mobile Laboratory

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.

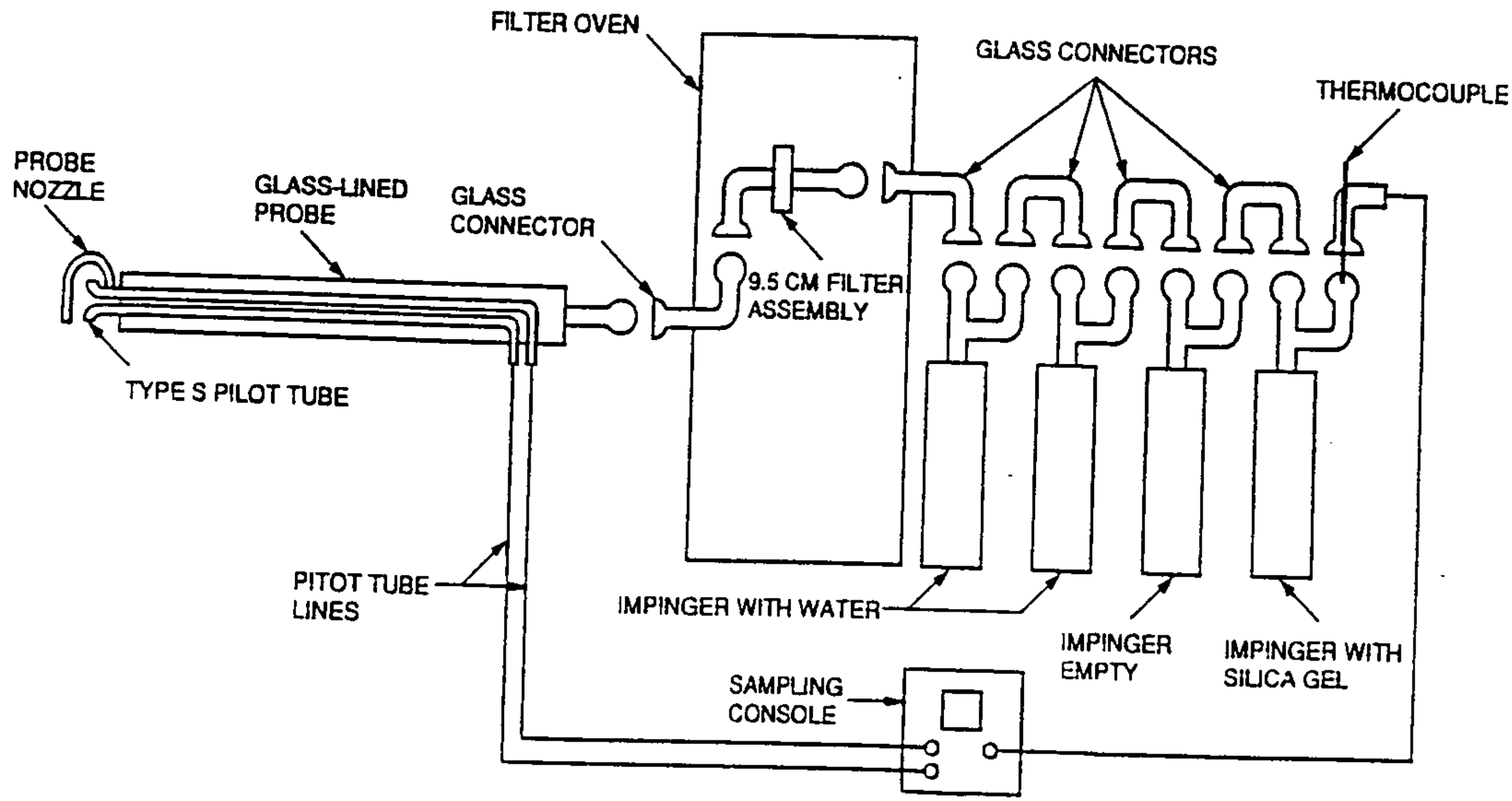
All measurement devices (TC, TC readout, nozzle, pitot, balance for weighings, dry gas meter, orifice, and magnehelic gauges) are calibrated using National Bureau of Standards (NBS) traceable or equivalent techniques. The sample is collected isokinetically at each sample point by adjusting the sample 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-249462

PERMIT TO CONSTRUCT

HUNT. BCH. #1

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. 1, 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-103 A & P-105 C, SPARE).

3. TWO 2 H.P. UREA INJECTION PUMPS (P-106 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.

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SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
21865 East Copley Drive, Diamond Bar, CA 91765

PERMIT TO CONSTRUCT

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.

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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.

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PERMIT TO CONSTRUCT

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 304 (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 (°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.

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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-249462 SUPERSEDES PERMIT TO CONSTRUCT 249462 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.

ORIGINAL

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
21865 East Copley Drive, Diamond Bar, CA 91765

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.
[x] 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).

[x] 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.

[x] Representativeness of Data & Process.

[x] Rule/Permit Fulfillment.

[x] 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).

by 65, ..., 215 MW

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.

Can test at Unit 1 only

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.

<u>General Continuous Gas Monitoring Requirements</u>

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	DATE
10:30 AM	11/16/93

PROJECT
HUNTINGTON BEACH UNITS 1&2 UREA COMPLIANCE TESTING

SUBJECT
SOURCE TEST DETAILS

CONFEREES

SCE	TELEPHONE AGENCY
MIKE ESCARCEGA	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
(818) 302-4032

PAX

SCE 84-306 NEW 3/76

APPENDIX A-4

COMMUNICATION MEMO DATED DECEMBER 2, 1993

TELEPHONE CONFERENCE RECORD

TIME	DATE
8:30 AM	12/2/93

PROJECT
HUNTINGTON BEACH UNITS 1&2 UREA COMPLIANCE TESTING

SUBJECT
SOURCE TEST DETAILS

CONFEREES

SCE	TELEPHONE AGENCY
MIKE ESCARCEGA	GLEN KASAI (SCAQMD)

SUMMARY

CONFERENCE HIGHLIGHTS

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

~~ADDITIONAL COMMENTS~~

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

ACTION REQUIRED

CC: P.R. WELSING
GLENN KASAI

PREPARED BY	FAX
Michael D. Escarcega (818) 302-4032	

APPENDIX B

RECORDS OF BOILER OPERATING PARAMETERS

t Description:	Urea Compliance								
:	Huntington Beach #1.								
Data By:	S. Pease								
Date	m\d\yr	1/5/94							
Test #		I-A	I-B	I-C	I-D	2-A	2-B	2-C	2-D
Time		1005	1140	1250	1330	1610	1730	1930	2045
Load -	Net MW	215	215	215	215	215	215	215	215
Aux Load	MW	10.2	10.3	10.1	10.3	10.3	10.4	10.3	10.3
BOOS		top row +	14 & 17						
FW Flow	Klbs/hr	1440	1450	1450	1450	1450	1440	1440	1440
Steam Flow	Klbs/hr	1490	1490	1490	1490	1490	1480	1480	1480
Fuel Flow	%	96.5	97	96.5	97	97	96.5	97	97
Air Flow	%	98	99	99	99	99	98	99	99
Steam Pressure	PSI	2400	2400	2401	2403	2401	2402	2402	2401
S.H. Temp. E/W	°F	1065/1060	1065/1060	1065/1060	1065/1040	1065/1060	1065/1060	1065/1060	1065/1060
R.H. Temp. E/W	°F	1000/990	1005/995	1005/995	1005/915	1005/995	1005/995	1005/995	1005/995
FD Fan E/W	Amps	102/125	105/128	105/125	105/128	105/128	105/128	105/128	105/128
FGR Fan E/W	Amps	165/200	165/200	165/200	165/200	165/200	165/200	165/200	165/200
WP to Furn O.FP	" H_2O	5.5	5.5	5.5	5.6	5.6	5.6	5.6	5.6
O_2 E/W	%	1.1-1.6/2.6	1.0-1.6/2.6	1.2-1.6/2.6	1.3-1.6/2.6	1.6/2.6	1.3-1.7/2.6	1.0-1.4/2.6	1.4/2.6
APH Outlet E/W	°F	300/265	300/265	300/265	300/265	300/265	300/265	300/265	300/265
Urea System	ON/OFF	off	off	off	off	ON	ON	ON	ON
Urea Concentration	%	—	—	—	—	21.1	21.1	21.1	21.1
Urea Loop/Mode		—	—	—	—	3/2	→	→	→
Urea Flow	GPH	—	—	—	—	145.80	144.60	144.00	144.00
H_2O Flow	GPH	—	—	—	—	120.00	120.00	120.00	120.00
H_2O Pressure	PSI	—	—	—	—	14.9	14.9	15.1	15.1
KUB Reference Time	hrs	1015	1145	1245	1330	1615	1730	1930	2045
KUB Fuel Flow	KSCFH	2025.2	2029.5	2022.2	2030.1	2031.8	2034.5	2030.8	2019.0
KUB Stack Flow	KSCFM	405.0	405.2	403.5	404.7	405.8	405.6	404.8	402.2
CEM O_2	%	—	—	—	4.8	—	4.8	—	—
NOx Raw/Corr	PPM	—	—	—	78.0/86.7	—	66.5/73.9	—	—
CO Raw/Corr	PPM	—	—	—	365/406	—	375/417	—	—

Baseline
1240-1340

w/urea
1701-1801

Test Description:	Urea Compliance									
Unit:	Huntington Beach 1									
Data By:	B Novodvorsky									
Date	m\d\yr	1/6/94	1/6/94	1/7/94	1/7/94	1/7/94	1/7/94	1/7/94	1/7/94	
Test #		1	1	1	1	2	2	2	2	
Time		2145	2325	0100	0145	0300	0400	0500	0600	0700
Load -	Net MW	112	116	116	116	116	116	116	116	116
Aux Load	MW	6.5	6.7	6.7	6.7	6.7	6.7	6.5	6.6	6.5
BOOS		4,17,19-24	→	→	→	→	→	→	→	→
FW Flow	Klbs/hr	700	700	700	700	700	700	700	700	700
Steam Flow	Klbs/hr	740	740	740	740	740	740	740	740	740
Fuel Flow	%	54	54	54	54	54	53	53	53	53
Air Flow	%	54	54	54	54	54	53	53	53	53
Steam Pressure	lbs	1663	1663	1665	1664	1662	1664	1664	1664	1663
S.H. Temp. E/W	°F	1060/1060	1060/1060	1060/1060	1060/1060	1060/1060	1060/1060	1060/1060	1060/1060	1060/1060
R.H. temp. E/W	°F	990/1010	990/1005	980/1000	980/1000	980/1000	990/990	980/995	980/995	980/995
FD Fan E/W	Amps	20/20	20/20	20/20	20/20	20/20	20/20	20/20	20/20	20/20
FGR Fan E/W	Amps	250/270	245/265	245/265	245/260	240/260	240/260	245/260	240/265	240/260
WP To Furn Diff	" H_2O	2	2	2	2	2	2	2	2	2
O_2 E/W	%	.7-1.3/2.9	.7-1.1/2.9	1.5/3.0	1.0-2.0/2.9	2.0/3.0	1.7-2.3/3.1	1.7/3.1	1.2-1.6/3.1	1.7-2.3/3.1
APH Outlet E/W	°F	230/250	225/245	225/245	225/245	220/245	220/240	220/240	220/240	215/235
Urea System	on/off	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
Urea Concentration	%	21	21	21	21					
Urea Loop / Mode		3/2	3/2	3/2	3/2					
Urea Flow	GPH	45.6	48.0	48.0	48.6					
H_2O Flow	GPH	324	318	320	312					
H_2O Pressure	lbs	29.8	30.6	30.0	30.0					
KVB Reference Time	hrs	2200	2330	0100	0145	0300	0400	0500	0600	0700
KVB Fuel Flow	KSCFH	1126.4	1125.7	1122.4	1119.2	1117.9	1109.8	1109.8	1108.4	1107.2
KVB Stack Flow	KSCFM	235.7	234.6	233.6	233.0	232.4	233.1	232.6	232.3	232.4
CEM O_2	%	5.8	5.8	5.8	N/A	5.9	5.9	5.9	N/A	N/A
NO_x Raw/Corr	PPM	39.5/46.2	39/46.2	39.0/46.2		54.5/65.0	55.0/65.6	53.5/63.8		
CO Raw/Corr	PPM	240/280	240/280	245/290		240/286	210/250	215/257		

0005-0105 w/Urea

0421-0521 Baseline

Unit: Huntington Beach 1
Data By: B Novodvorsky

SCE Environmental Engineering

Date	m\d\yr	1/7/94	1/7/94	1/8/94	1/8/94	1/8/94	1/8/94	1/8/94	1/8/94
Test #		1	1	1	1	2	2	2	2
Time		2110	2250	0010	0120	0210	0314	0435	0600
Load -	Net MW	65	68	68	69	69	69	69	69
Aux Load	MW	5.6	5.5	5.6	5.5	5.3	5.3	5.5	5.6
BOOS		417, 19-24	→	→	→	→	→	→	→
FW Flow	Klbs/hr	450	410	410	410	410	410	410	410
Steam Flow	klbs/hr	450	410	410	410	410	410	410	410
Fuel Flow	%	36	34	34	34	34	34	34	34
Air Flow	%	36	34	34	34	34	34	34	34
Steam Pressure	lbs	1302	1306	1306	1306	1306	1306	1306	1303
S.H. Temp. E/W	°F	1060/1055	1070/1060	1060/1060	1060/1060	1060/1060	1060/1060	1060/1060	1060/1060
R.H temp. E/W	°F	990/1000	990/995	990/995	990/995	990/990	990/990	990/990	990/990
FD Fan E/W	Amps	20/20	20/20	20/20	20/20	20/20	20/20	20/20	20/20
FGR Fan E/W	Amps	255/280	250/280	250/280	250/280	250/280	250/280	250/280	250/280
WP To Furn O.Ff	" H_2O	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
O_2 E/W	%	1.0-1.4/3.3	1.0/3.2	1.0/3.2	1.0/3.2	1.0/3.2	1.0/3.2	1.0/3.2	1.0/3.2
APH Outlet E/W	°F	205/255	200/255	200/255	195/255	195/255	195/255	195/255	195/252
Urea System	on/off	ON	ON	ON	ON	OFF	OFF	OFF	OFF
Urea Concentration	%	21	21	21	21				
Urea Loop/Mode		3/2	3/2	3/2	3/2				
Urea Flow	GPH	27	27.6	27.5	28.2				
H_2O Flow	GPH	348	348	348	348				
H_2O Pressure	lbs	30	30	30	30				
KUB Reference Time	hrs	2115	2245	0015	0115	0215	0315	0430	0600
KUB Fuel Flow	KSCFH	765.0	718.0	716.5	720.7	706.2	710.4	712.8	712.9
KUB Stack Flow	KSCFM	162.3	152.9	152.5	153.4	150.3	151.0	151.7	151.6
CEM O_2	%	6.1	6.2	6.2	N/A	N/A	6.2	6.2	N/A
NO_x Raw/Corr	PPM	27.0/32.7	25.5/31.1	25.0/30.4			32.0/39.0	32.5/39.6	
CO Raw/Corr	PPM	275/332	285/347	220/330			265/322	260/317	

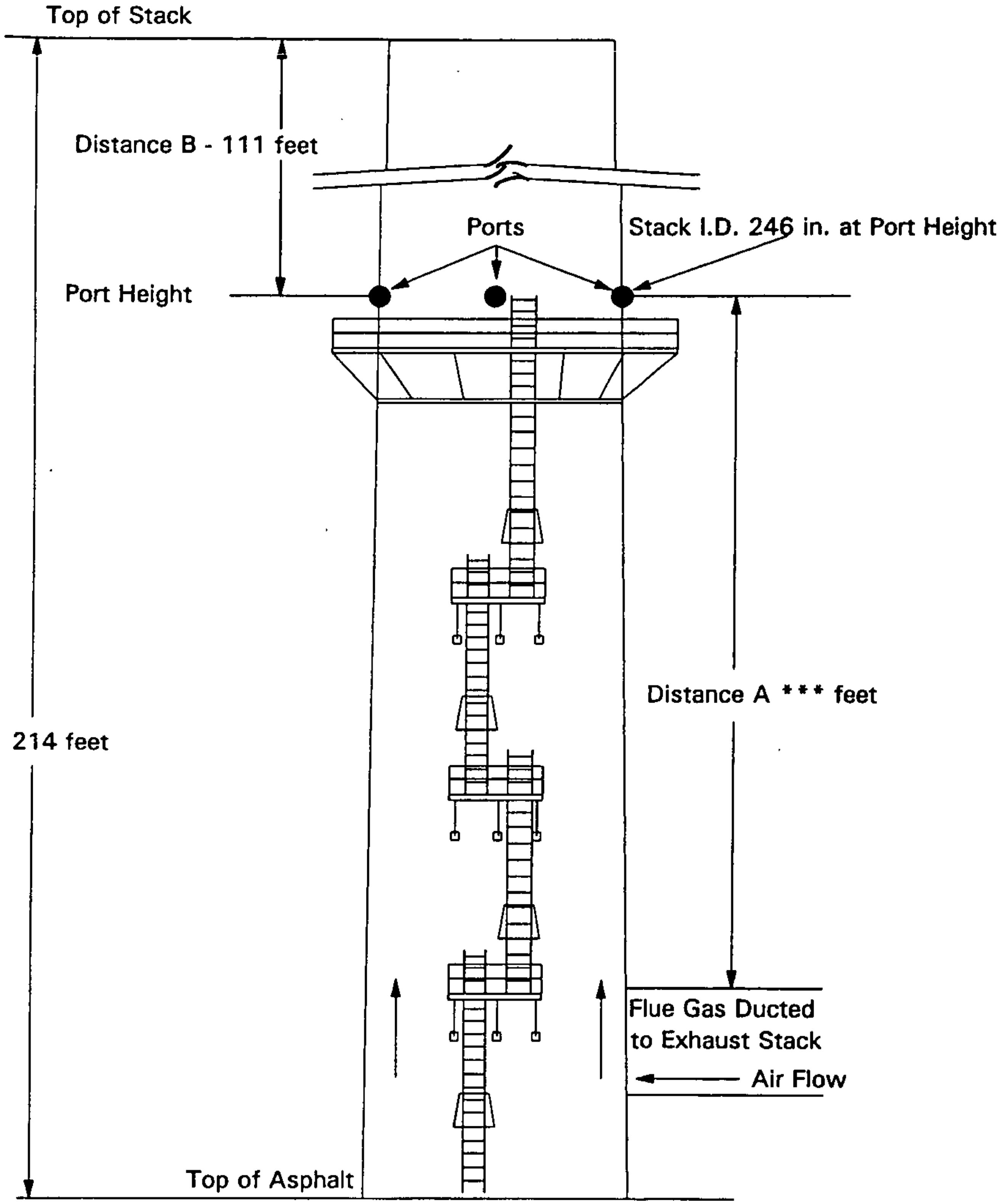
0012-
0112
w/Urea

0427-
0527
Baseline

APPENDIX C

STACK DIAGRAM ILLUSTRATING SAMPLING PORT LOCATIONS

HUNTINGTON BEACH UNIT NO. 1



Duct Diameters Upstream From Flow Disturbance (Distance A):
Duct Diameters Downstream From Flow Disturbance (Distance B): 5.4 diameters

APPENDIX D

RECORDS SUPPORTING SCAQMD METHOD 100.1 MEASUREMENTS

APPENDIX D-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: EV402392

<><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><><>

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.

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 **Certification Date** 10-05-93 **Acid Rain Exp.**
Cylinder Pressure 950PSIG **Previous Certification Dates** 12-30-91 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	Previous Certification	Third Triad Analysis	Calibration Curve
NITRIC OXIDE	Date:12-30-91 Response Units:mv Z1= R1= T1= R2= Z2= T2= Z3= T3= R3= Avg. Conc. of Cust Cyl. 91.42PPM	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	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 logo]

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#003

ANALYTICAL INFORMATION

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

Cylinder Number AAL14063
Cylinder Pressure 1400PSIG
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	47.78PPM	±1% NIST Traceable

Balance Gas: Nitrogen
NOX* **47.95PPM**

*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. 47.80PPM

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: 10-04-93 Response Units: mv
Z1= 0.00 R1= 96.8 T1= 46.2
R2= 96.6 Z2= 0.00 T2= 46.3
Z3= 0.00 T3= 46.2 R3= 96.6
Avg. Conc. of Cust Cyl. 47.78PPM

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 = 1.028289
B = 0.328788

Concentration=

Concentration=

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

Analyst

AIR PRODUCTS AND CHEMICALS, INC.
901 WEST 12TH STREET
LONG BEACH, CA 9081[illegible]
(310) 437-[illegible]
[illegible]

DATE: 10/27/93
TIME: 11:00
PAGE: 1

****
* CERTIFICATE OF ANALYSIS *
****

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

CUSTOMER ACCOUNT : [illegible]
CUSTOMER ORDER NO : [illegible]
ORDER NO : 235-052029
ORDER DETAIL SEQ : [illegible]
SHIPPER NUMBER : 235-9-53499

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	BAF CODE	CYLINDER NO	COMPONENT REQUESTED	CONCENTRATION REQUESTED	ANALYTICAL RESULT	UNIT OF MEASURE
[illegible]	[illegible]	RM0571	SS1650NB	CARBON MONOXIDE	450	451	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

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	BQN829	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

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

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: M.S. Calhoun

Approved: J.T. Marrin

APPENDIX D-2

FIELD TEST DATA SHEETS

CEM CALIBRATION SHEET

DATE 1/5/94

PLANT SCE HBGS

LOCATION Unit 1

TEST NUMBER STRATIFICATION, 215 MW

OPERATOR D. URRY

Constituent	Actual Gas Concentration			Instrument Range	Percent-of-Range	
	High	Mid	Low		High	Low
O_2(%)	9.14		4.20	0-10%	91.4%	42.0%
CO_2(%)	17.75		9.89	0-20%	88.8%	49.5%
CO(ppm)	451		250	0-500 ppm	90.2%	50.0%
HC(ppm)						
NO_x(ppm)	92.2		48.0	0-100 ppm	92.2%	48.0%
SO_2(ppm)						

Time	Concentration	Data Logger Measurements						Strip Chart Measurements (divisions)						COMMENTS
		O_2 (%)	CO_2 (%)	CO (ppm)	SO_2 (ppm)	NO_x (ppm)	HC as methane	O_2 (%)	CO_2 (%)	CO (ppm)	SO_2 (ppm)	NO_x (ppm)	HC as methane	
Pre	High	0823	0823	0823		0823		92.3	93.8	95.2		95.0		Leak ✓ 21.5" Hg @ 0839
	Mid	0816	0816	0816		0816		43.3	53.8	55.5		49.8		21.0" Hg @ 0844
	Low													
	Zero	0809 ~~0738~~	0809 ~~0738~~	0809 ~~0738~~		0809 ~~0738~~		2.0	5.0	5.0		2.1		
	External	0855	0858	0904		0901		43.0	53.2	55.5		48.5		
	Ext. Zero	0850	0850	0850		0850		4.0	5.1	5.1		2.1		
Post	High	1143	1143	1145		1145		91.8	93.8	95.5		95.7		22" Hg @ 1147
	Mid													21.5" @ 1152
	Low	1138	1138	1138		1138		43.0	53.5	55.5		50.0		
	Zero	1131	1131	1131		1131		2.0	4.9	5.0		2.2		
	External	1207	1210	1216		1218		42.5	53.0	95.5		92.8		
	Ext. Z	1203	1203	1203		1203		2.5	5.1	5.4		2.9		

CEM CALIBRATION SHEET

DATE 1/5/94

PLANT SCE HBGS

LOCATION Unit 1

TEST NUMBER TEST #1, 215 MW BASELINE

OPERATOR D. URRY

Constituent	Actual Gas Concentration High	Actual Gas Concentration Mid	Actual Gas Concentration Low	Instrument Range	Percent-of-Range High	Percent-of-Range Low
O_2(%)	9.14		4.20	0-10%	91.4%	42.0%
CO_2(%)	17.75		9.89	0-20%	88.8%	49.5%
CO(ppm)	451		250	0-500 ppm	90.2%	50.0%
HC(ppm)						
NO_x(ppm)	92.2		48.0	0-100 ppm	92.2%	48.0%
SO_2(ppm)						

Time	Concentration	Data Logger O_2 (%)	Data Logger CO_2 (%)	Data Logger CO (ppm)	Data Logger SO_2 (ppm)	Data Logger NO_x (ppm)	Data Logger HC as methane	Strip Chart O_2 (%)	Strip Chart CO_2 (%)	Strip Chart CO (ppm)	Strip Chart SO_2 (ppm)	Strip Chart NO_x (ppm)	Strip Chart HC as methane	COMMENTS Leak check
Pre	High	1143	1143	1145		1145		91.8	93.8	95.5		95.7		
	Mid													22" Hg @ 1147
	Low	1138	1138	1138		1138		43.0	53.5	55.5		50.0		21.5" Hg @ 1152
	Zero	1131	1131	1131		1131		2.0	4.9	5.0		2.2		
	External	1207	1210	1216		1218		42.5	53.0	95.5		92.8		
	Ext. Zero	1203	1203	1203		1203		2.5	5.1	5.4		2.9		
Post	High	1354	1354	1354		1354		92.8	93.5	94.8		94.8		
	Mid													
	Low	1350	1350	1350		1350		43.4	53.6	55.6		49.8		20.6" Hg @ 1407
	Zero	1346	1346	1346		1346		1.9	4.8	5.0		2.5		19.9" Hg @ 1412
	External	1432	1434	1440		1437		43.0	53.1	94.8		92.5		
	E[illegible] Zero	1429	1429	1429		1429		[illegible]	5.1	5.0		3.0		

CEM CALIBRATION SHEET

DATE 1/5/94

PLANT SCE HBGS

LOCATION UNIT 1

TEST NUMBER TEST 2 - NH_3 Slip 215MW w/ Unecc

OPERATOR D. URRY

Constituent	Actual Gas Concentration			Instrument Range	Percent-of-Range	
	High	Mid	Low		High	Low
O_2(%)	9.14		4.20	0-10%	91.4%	42.0%
CO_2(%)	17.75		9.89	0-20%	88.8%	49.5%
CO(ppm)	451		250	0-500 ppm	90.2%	50.0%
HC(ppm)						
NO_x(ppm)	92.2		48.0	0-100 ppm	92.2%	48.0%
SO_2(ppm)						

Time	Concentration	Data Logger Measurements						Strip Chart Measurements (divisions)						COMMENTS
		O_2 (%)	CO_2 (%)	CO (ppm)	SO_2 (ppm)	NO_x (ppm)	HC as methane	O_2 (%)	CO_2 (%)	CO (ppm)	SO_2 (ppm)	NO_x (ppm)	HC as methane	Leak CHECK
Pre	High	1607 ~~1603~~	1607 ~~1603~~	1607 ~~1603~~		1607 ~~1603~~		93.0	93.8 ~~53.8~~	94.9		94.9		21.5" Hg @ 1613
	Mid	1603	1603	1603		1603		43.5	53.8	55.5		49.9		20.7" Hg @ 1618
	Low													
	Zero	1559	1559	1559		1559		2.0	5.1	5.0		2.3		
	External	1628	1630	1635		1632		43.0	53.2	94.9		48.6		
	External 2	1625	1625	1625		1625		2.2	5.2	5.1		2.6		
Post	High	1823	1823	1823		1823		92.1	94.0	94.8		94.9		21.3" Hg @ 1824
	Mid	1819	1819	1819		1819		43.1	54.0	55.4		49.7		20.7" @ 1829
	Low													
	Zero	1814	1814	1814		1814		2.0	5.1	5.0		2.1		
	External	1850	1853	1858		1856		42.6	53.5	94.7		48.9		
	Ext 2	1848	1848	1848		1848		2.4	5.2	5.0		2.3		

TEST VAN DATA SHEET

DATE 1/5/93 PLANT SCE HBGS OPERATOR D. URRY

LOCATION Unit 1 OPERATING LOAD 215 MW - STRATIFICATION TEST

Time Start/Stop	NH_3 Slip	Strip Chart measurements O_2 (%)	CO_2 (%)	CO (ppm)	CO @3%O_2 (ppm)	NO_x (ppm)	NO_x @3%O_2 (ppm)	COMMENTS
0948		4.8	8.8	~~365~~		79.5	88.4	Port D Center
0952		4.8	8.8			79.5	88.4	Point 1
0954		4.8	8.8			79.5	88.4	Point 2
0958		4.8	8.8			79.5	88.4	Point 3
1002		4.8	8.8			79.5	88.4	Point 4
1007		4.8	8.8			79.5	88.4	Center
1017		4.8	9.0			77.0	85.6	Port C Center
1020		4.8	9.0			77.0	85.6	Point 1
1023		4.8	9.0			77.0	85.6	Point 2
1026		4.8	9.0			77.0	85.6	Point 3
1029		4.8	8.9			77.0	85.6	Point 4
1033		4.8	8.9			77.0	85.6	Center
1041		4.8	8.9			77.5	86.2	Port B Center
1044		4.8	8.9			77.0	85.6	Point 1
1047		4.8	8.9			77.0	85.6	Point 2
1050		4.8	8.9			77.0	85.6	Point 3
1053		4.8	8.9			77.5	86.2	Point 4
1056		4.8	8.9			77.5	86.2	Center

TEST VAN DATA SHEET

DATE 1/5/93 PLANT SCE HBGS OPERATOR D. Urry

LOCATION Unit 1 OPERATING LOAD 215 MW – STRATIFICATION TEST / CONTINUED

Time Start/Stop	NH_3 Slip	Strip Chart measurements: O_2 (%)	CO_2 (%)	CO (ppm)	CO @3%O_2 (ppm)	NO_x (ppm)	NO_x @3%O_2 (ppm)	COMMENTS
1108		4.8	8.9		DU.	77.5	86.2	PORT A CENTER
1111		4.8	8.9			77.5	86.2	Point 1
1114		4.8	8.9			77.5	86.2	Point 2
1117		4.8	8.9			77.5	86.2	Point 3
1119		4.8	8.9			77.5	86.2	Point 4
1122		4.8	8.9			77.5	86.2	CENTER

TEST VAN DATA SHEET

DATE 1/5/94 PLANT SCE HBGS OPERATOR D. URRY

LOCATION UNIT 1 OPERATING LOAD 215 MW

Time Start/Stop	NH_3 Slip	Strip Chart measurements O_2 (%)	CO_2 (%)	CO (ppm)	CO @3% O_2 (ppm)	NO_x (ppm)	NO_x @3% O_2 (ppm)	COMMENTS Barometric P = 29.99
1240/1340		4.8	8.9	365	406	78.0	86.7	TEST 1 - Baseline
1701/1801		4.8	8.9	375	417	66.5	73.9	TEST 2 - NH_3 Slip

CEM CALIBRATION SHEET

DATE 1/6/94
PLANT SCE HBGS
LOCATION Unit 1
TEST NUMBER STRATIFICATION - 110 MW
OPERATOR D. URRY

Constituent	Actual Gas Concentration High	Actual Gas Concentration Mid	Actual Gas Concentration Low	Instrument Range	Percent-of-Range High	Percent-of-Range Low
O_2(%)	9.14		4.20	0-10%	91.4%	42.0%
CO_2(%)	17.75		9.89	0-20%	88.8%	49.5%
CO(ppm)	451		250	0-500ppm	90.2%	50.0%
HC(ppm)						
NO_x(ppm)	92.2		48.0	0-100ppm	92.2%	48.0%
SO_2(ppm)						

Time	Concentration	Data Logger Measurements O_2 (%)	Data Logger CO_2 (%)	Data Logger CO (ppm)	Data Logger SO_2 (ppm)	Data Logger NO_x (ppm)	Data Logger HC as methane	Strip Chart Measurements (divisions) O_2 (%)	Strip Chart CO_2 (%)	Strip Chart CO (ppm)	Strip Chart SO_2 (ppm)	Strip Chart NO_x (ppm)	Strip Chart HC as methane	COMMENTS LEAK CHECK
Pre	High	1954	1954	1954		1954		93.7	94.3	95.1		94.8		22.2" Hg @ 2012
	Mid													22.0" Hg @ 2017
	Low	1950	1950	1950		1450		44.1	54.3	55.8		49.4		
	Zero	1946	1946	1446		1446		2.4	5.2	5.0	[illegible]	2.0		
	External	2027	2032	2029		2034		43.6	53.8	55.5		48.8		
	Ext. ZERO	2024	2024	2024		2024		2.7	5.5	5.0		2.0		
Post	High	2309	2309	2309		2309		93.3	95.0	94.5		95.9		
	Mid													22.0" @ 2310
	Low	2305	2305	2305		2305		44.0	54.6	55.0		50.0		21.5" Hg @ 2315
	Zero	2302	2302	2302		2302		2.6	5.5	5.0		1.7		
	External	2325	2327	2330		2332		43.5	54.2	55.0		49.0		
	Ext. Z	2322	2322	2322		2322		2.9	5.7	5.1		1.7		

CEM CALIBRATION SHEET

CJ

DATE ~~1/6/94~~ 1/7/94

PLANT SCE HBGS

LOCATION UNIT 1 STACK

TEST NUMBER 110 MW TEST 2 - Baseline

OPERATOR D. URRY

Constituent	Actual Gas Concentration			Instrument Range	Percent-of-Range	
	High	Mid	Low		High	Low
O_2(%)	9.14		4.20	0-10%	91.4%	42.0%
CO_2(%)	17.75		9.89	0-20%	88.8%	49.5%
CO(ppm)	451		250	0-500ppm	90.2%	50.0%
HC(ppm)						
NO_x(ppm)	92.2		48.0	0-100ppm	92.2%	48.0%
SO_2(ppm)						

Time	Concentration	Data Logger Measurements						Strip Chart Measurements (divisions)						COMMENTS
		O_2 (%)	CO_2 (%)	CO (ppm)	SO_2 (ppm)	NO_x (ppm)	HC as methane	O_2 (%)	CO_2 (%)	CO (ppm)	SO_2 (ppm)	NO_x (ppm)	HC as methane	LEAK CHECK
Pre	High	0314	0314	0314		0314		93.6	95.5	94.0		94.3		21.2" Hg @ 0320
	Mid													20.5" Hg @ 0325
	Low	0310	0310	0310		0310		44.1	54.8	55.0		49.2		
	Zero	0307	0307	0307		0307		2.7	5.6	5.0		2.0		
	External	0335	0338	0343		0340		43.8	54.2	54.5		48.5		
	Ext Zero	0332	0332	0332		0332		3.0	5.7	6.0		2.0		
Post	High	0536	0536	0536		0536		93.6	95.3	94.0		94.3		
	Mid													21.6" Hg @ 0538
	Low	0531	0531	0531		0531		44.0	54.7	54.8		49.2		21.0" Hg @ 0543
	Zero	0528	0528	0528		0528		2.6	5.6	5.0		2.0		
	External	0551	0553	0557		0555		43.8	54.2	54.5		48.9		
	Ext. Z	0548	0548	0548		0548		3.0	5.7	6.0		2.1		

CEM CALIBRATION SHEET

DATE 1/6/94

PLANT SCE HBGS

LOCATION UNIT 1 STACK

TEST NUMBER 110MW TEST 1 - NH_3 Slip

OPERATOR D. WRAY

Constituent	Actual Gas Concentration			Instrument Range	Percent-of-Range	
	High	Mid	Low		High	Low
O_2(%)	9.14		4.20	0-10%	91.4%	42.0%
CO_2(%)	17.75		9.89	0-20%	88.8%	49.5%
CO(ppm)	451		250	0-500ppm	90.2%	50.0%
HC(ppm)						
NO_x(ppm)	92.2		48.0	0-100ppm	92.2%	48.0%
SO_2(ppm)						

Time	Concentration	Data Logger Measurements						Strip Chart Measurements (divisions)						COMMENTS
		O_2 (%)	CO_2 (%)	CO (ppm)	SO_2 (ppm)	NO_x (ppm)	HC as methane	O_2 (%)	CO_2 (%)	CO (ppm)	SO_2 (ppm)	NO_x (ppm)	HC as methane	LEAK CHECK
Pre	High	2348	2348	2348		2348		93.3	95.2	94.8		95.0		22.0" Hg @ 2310
	Mid													21.5" @ 2315
	Low	2345	2345	2345		2345		44.0	54.7	55.1		49.7		
	Zero	2342	2342	2342		2342		2.6	5.5	5.0		2.0		
	External	2355	2357	2359		0001		43.3	54.2	55.0		48.7		
	Ext. Z	2352	2352	2352		2352		2.7	5.7	5.0		2.0		
Post	High	0117	0117	0117		0117		93.4	95.4	94.7		95.6		
	Mid													23.2" Hg @ 0127
	Low	0113	0113	0113		0113		44.0	54.7	55.2		50.0		22.8" Hg @ 0132
	Zero	0110	0110	0110		0110		2.7	5.5	5.0		2.0		
	External	0140	0143	0146		0149		43.8	54.3	55.0		49.0		
	Zero Ext.	0137	0137	0137		0137		3.0	5.7	5.1		2.0		

TEST VAN DATA SHEET

DATE 1/6/94 PLANT SCE HBGS OPERATOR D. URRY

LOCATION UNIT 1 STACK OPERATING LOAD 110MW

Time Start/Stop	NH_3 Slip	Strip Chart measurements: O_2 (%)	CO_2 (%)	CO (ppm)	CO @3%O_2 (ppm)	NO_x (ppm)	NO_x @3%O_2 (ppm)	COMMENTS
2110		5.9	8.4			40.0	47.7	Port D STACK CENTER
2115		5.9	8.5			41.0	48.9	Point 1
2119		5.8	8.5			40.0	47.4	Point 2
2122		5.8	8.5			40.0	47.4	Point 3
2125		5.8	8.5			40.0	47.4	Point 4
2128		5.8	8.5			40.0	47.4	STACK CENTER
2155		5.8	8.5			39.5	46.8	Port B STACK CENTER
2158		5.8	8.5			39.0	46.2	Point 1
2201		5.8	8.5			39.5	46.2	Point 2
2204		5.8	8.5			39.5	46.2	Point 3
2207		5.8	8.5			39.5	46.2	Point 4
2210		5.8	8.6			39.5	46.2	STACK CENTER
2218		5.7	8.6			38.5	45.3	Port C Stack CENTER
2221		5.7	8.6			39.0	45.9	Point 1
2224		5.7	8.6			39.0	45.9	Point 2
2228		5.7	8.6			38.5	45.3	Point 3
2231		5.7	8.6			39.0	45.9	Point 4
2234		5.7	8.5			39.0	45.9	Stack CENTER

TEST VAN DATA SHEET

DATE 1/6/94 PLANT SCE HBGS OPERATOR D. URRY

LOCATION UNIT 1 STACK OPERATING LOAD 110 MW

Time Start/Stop	NH_3 Slip	Strip Chart measurements O_2 (%)	CO_2 (%)	CO (ppm)	CO @3% O_2 (ppm)	NO_x (ppm)	NO_x @3% O_2 (ppm)	COMMENTS
2240		5.8	8.6			38.5	45.6	Port A STACK CENTER
2243		5.8	8.6			39.0	46.2	Point 1
2246		5.8	8.6			39.0	46.2	Point 2
2249		5.7	8.6			39.0	45.9	Point 3
2252		5.8	8.6			39.0	46.2	~~STACK CENTER~~ POINT 4
2255		5.7	8.6			39.0	45.9	STACK CENTER

TEST VAN DATA SHEET

DATE 1/6/94. PLANT SCE HBGS OPERATOR D. URRY

LOCATION UNIT 1 STACK OPERATING LOAD 110 MW

B.P. 30.21

Time Start/Stop	NH_3 Slip	Strip Chart measurements: O_2 (%)	CO_2 (%)	CO (ppm)	CO @3% O_2 (ppm)	NO_x (ppm)	NO_x @3% O_2 (ppm)	COMMENTS
0005/0105		5.8	8.6	245	290	39.0	46.2	TEST 1 - NH_3 Slip
0421/0521		5.9	8.6	215	257	53.5	63.8	TEST 2 - BASELINE

CEM CALIBRATION SHEET

DATE 1/7/94

PLANT SCE HB65

LOCATION Unit 1 STACK

TEST NUMBER 65 MW - STRATIFICATION

OPERATOR D. URRY

Constituent	Actual Gas Concentration			Instrument Range	Percent-of-Range	
	High	Mid	Low		High	Low
O_2(%)	9.14		4.20	0-10%	91.4%	42.0%
CO_2(%)	17.75		9.89	0-20%	88.8%	49.5%
CO(ppm)	451		250	0-500ppm	90.2%	50.0%
HC(ppm)						
NO_x(ppm)	92.2		48.0	0-100ppm	92.2%	48.0%
SO_2(ppm)						

Time	Concentration	Data Logger Measurements						Strip Chart Measurements (divisions)						COMMENTS
		O_2 (%)	CO_2 (%)	CO (ppm)	SO_2 (ppm)	NO_x (ppm)	HC as methane	O_2 (%)	CO_2 (%)	CO (ppm)	SO_2 (ppm)	NO_x (ppm)	HC as methane	LEAK CHECK
Pre	High	2031	2031	2031		2031		92.8	94.0	94.9		94.9		
	Mid													21.2 "Hg @ 2035
	Low	2024	2024	2024		2024		43.8	53.9	55.0		49.5		20.2" Hg @ 2040
	Zero	2019	2019	2019		2019		2.5	5.1	5.0		2.0		
	External	2048	2050	2052		2054		43.0	53.3	54.9		49.2		
	Ext Z.	2045	2045	2045		2045		2.8	5.2	5.0		2.3		
Post	High	2256	2256	2256		2256		92.1	94.0	94.7		95.6		
	Mid													21.3 " Hg @ 2304
	Low	2253	2253	2253		2253		43.4	53.9	55.1		50.0		
	Zero	2249	2249	2249		2249		2.4	5.2	5.0		2.0		20.5 "Hg @ 2309
	External	2317	2320	2325		2322		43.0	53.4	54.7		49.0		
	Ext. Z	2314	2314	2314		2314		2.8	5.3	5.1		2.0		

CEM CALIBRATION SHEET

DATE ~~1/7/94~~ 1/8/94 CA

PLANT SCE HBGS

LOCATION UNIT 1 - STACK

TEST NUMBER 65MW - TEST 2 Baseline

OPERATOR D. URRY

Constituent	Actual Gas Concentration			Instrument Range	Percent-of-Range	
	High	Mid	Low		High	Low
O_2(%)	9.14		4.20	0-10%	91.4%	42.0%
CO_2(%)	17.75		9.84	0-20%	88.0%	49.5%
CO(ppm)	451		250	0-500 ppm	90.2%	50.0%
HC(ppm)						
NO_x(ppm)	92.2		48.0	0-100 ppm	92.2%	48.0%
SO_2(ppm)						

Time	Concentration	Data Logger Measurements						Strip Chart Measurements (divisions)						COMMENTS
		O_2 (%)	CO_2 (%)	CO (ppm)	SO_2 (ppm)	NO_x (ppm)	HC as methane	O_2 (%)	CO_2 (%)	CO (ppm)	SO_2 (ppm)	NO_x (ppm)	HC as methane	
Pre	High	0319	0319	0319		0319		92.8	93.8	94.9		94.0		
	Mid													
	Low	0315	0315	0315		0315		43.7	53.9	55.3		49.1		22.0" Hg @ 0321
	Zero	0312	0312	0312		0312		2.3	5.2	5.0		2.0		21.7" Hg @ 0326
	External	0337	0339	0341		0343		43.4	53.5	55.0		48.1		
	Ext Zero	0333	0333	0333		0333		2.7	5.3	5.1		2.0		
Post	High	0542	0542	0542		0542		92.7	94.0	94.7		94.0		
	Mid													
	Low	0538	0538	0538		0538		43.7	53.9	55.0		49.1		21.1" Hg @ 0549
	Zero	0534	0534	0534		0534		2.2	5.2	5.0		2.0		20.6" Hg @ 0554
	External	0606	0608	0614		0610		43.4	53.5	54.7		48.3		
	Ext Z	0603	0603	0603		0603		2.7	5.4	5.0		2.0		

CEM CALIBRATION SHEET

DATE 1/7/94

PLANT SCE HB 6 5

LOCATION UNIT 1 STACK

TEST NUMBER TEST 1 - NH_3 Slip - 65MW

OPERATOR D. URRY

Constituent	Actual Gas Concentration High	Actual Gas Concentration Mid	Actual Gas Concentration Low	Instrument Range	Percent-of-Range High	Percent-of-Range Low
O_2(%)	9.14		4.20	0-10%	91.4%	42.0%
CO_2(%)	17.75		9.89	0-20%	88.8%	49.5%
CO(ppm)	451		250	0-500ppm	90.2%	50.0%
HC(ppm)						
NO_x(ppm)	92.2		48.0	0-100ppm	92.2%	48.0%
SO_2(ppm)						

Time	Concentration	Data Logger Measurements O_2 (%)	CO_2 (%)	CO (ppm)	SO_2 (ppm)	NO_x (ppm)	HC as methane	Strip Chart Measurements (divisions) O_2 (%)	CO_2 (%)	CO (ppm)	SO_2 (ppm)	NO_x (ppm)	HC as methane	COMMENTS
Pre	High	2256	2256	2256		2256		92.1	94.0	94.7		95.6		
	Mid													21.3" Hg @ 2304
	Low	2253	2253	2253		2253		43.4	53.9	55.1		50.0		20.5" Hg @ 2309
	Zero	2249	2249	2249		2249		2.4	5.2	5.0		2.0		
	External	2317	2320	2325		2322		43.0	53.4	54.7		49.0		
	Ext. Z	2314	2314	2314		2314		2.8	5.3	5.1		2.0		
Post	High	0126	0126	0126		0126		92.0	93.9	94.7		95.9		
	Mid													
	Low	0122	0122	0122		0122		43.3	53.9	55.1		50.0		21.0" Hg @ 0031
	Zero	0118	0118	0118		0118		2.3	5.2	5.0		2.0		20.2" Hg @ 0136
	External	0152	0154	0157		0159		43.0	53.4	54.7		49.0		
	Ext. Z	0148	0148	0148		0148		2.6	5.2	5.1		[illegible]		

TEST VAN DATA SHEET

DATE 1/7/94 PLANT SCE - HBGS OPERATOR D. URRY

LOCATION UNIT 1 OPERATING LOAD 65MW - STRATIFICATION

Time Start/Stop	NH_3 Slip	Strip Chart measurements O_2 (%)	CO_2 (%)	CO (ppm)	CO @3% O_2 (ppm)	NO_x (ppm)	NO_x @3% O_2 (ppm)	COMMENTS
2113		6.1	8.2			27.5	33.3	PORT D STACK CENTER
2116		6.1	8.2			27.5	33.3	POINT 1
2119		6.1	8.2			27.5	33.3	Point 2
2122		6.1	8.2			27.0	32.7	Point 3
2125		6.1	8.2			27.5	33.3	Point 4
2129		6.1	8.2			27.5	33.3	STACK CENTER
2138		6.1	8.2	275	335	27.0	32.7	PORT A STACK CENTER
2141		6.1	8.2			26.5	32.1	Point 1
2144		6.2	8.2			27.0	32.9	Point 2
2147		6.2	8.2			26.5	32.3	Point 3
2150		6.2	8.2			27.0	32.9	Point 4
2153		6.2	8.2			26.5	32.3	STACK CENTER
2200		6.2	8.2			25.5	31.1	PORT B STACK CENTER
2203		6.2	8.2			25.5	31.1	POINT 1
2206		6.1	8.2			25.5	30.8	POINT 2
2209		6.2	8.2	300	365	26.0	31.7	POINT 3
2212		6.1	8.2			26.0	31.4	POINT 4
2217		6.2	8:2			26.0	31.7	STACK CENTER

TEST VAN DATA SHEET

DATE 1/7/94 PLANT SCE HBGS OPERATOR D. URRY

LOCATION UNIT 1 STACK OPERATING LOAD 65 MW - STRATIFICATION TEST

Time Start/Stop	NH_3 Slip	Strip Chart measurements: O_2 (%)	CO_2 (%)	CO (ppm)	CO @3% O_2 (ppm)	NO_x (ppm)	NO_x @3% O_2 (ppm)	COMMENTS
2229		6.2	8.2	285	347	25.5	31.1	PORT C STACK CENTER
2232		6.2	8.2			26.0	31.7	POINT 1
2235		6.2	8.2			26.0	31.7	POINT 2
2238		6.2	8.2			26.0	31.7	POINT 3
2241		6.2	8.2			25.0	30.4	POINT 4
2244		6.2	8.2			25.5	31.1	STACK CENTER

TEST VAN DATA SHEET

DATE 1/7/94 PLANT SCE HBGS OPERATOR D. URRY

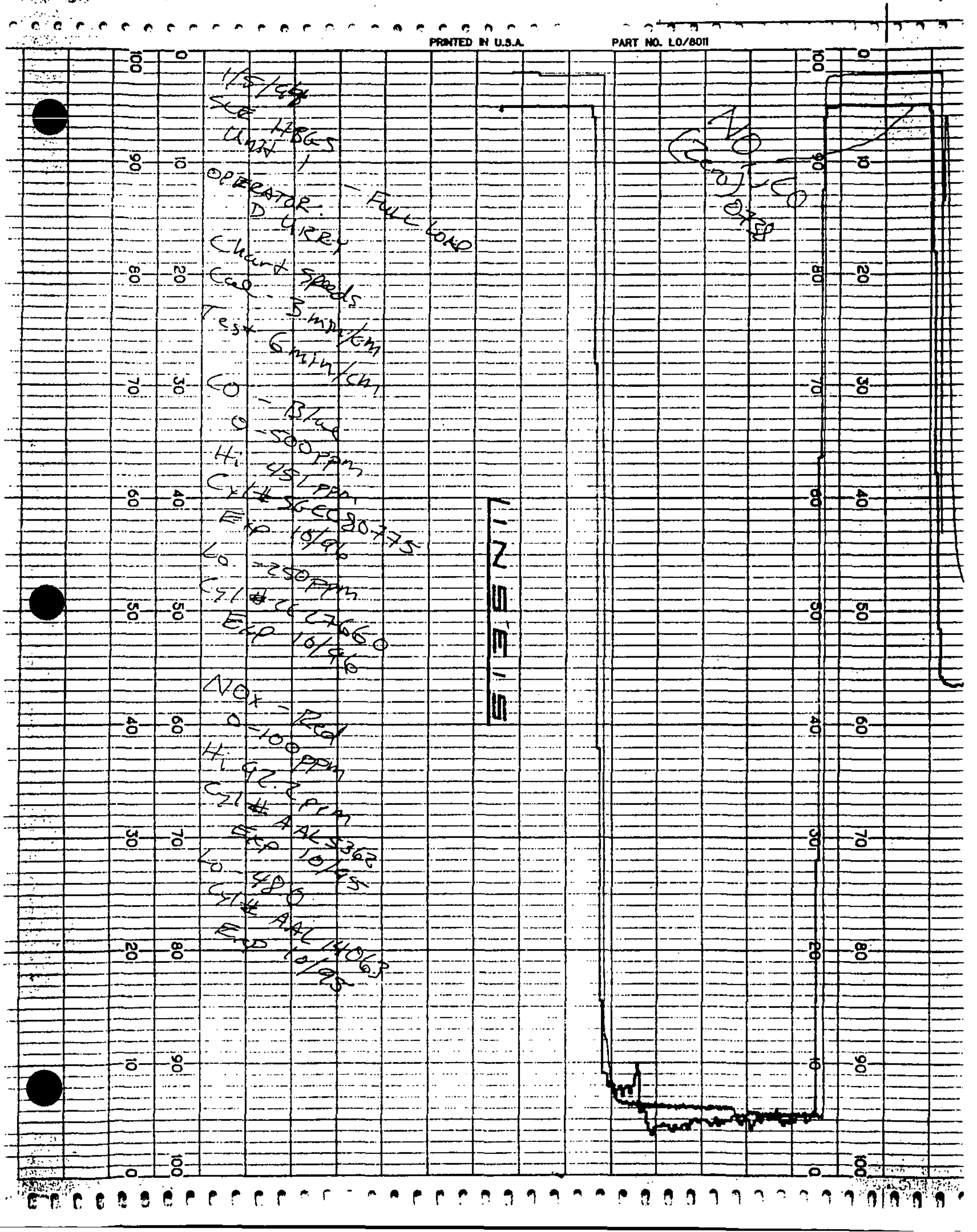
LOCATION UNIT 1 STACK OPERATING LOAD 65 MW

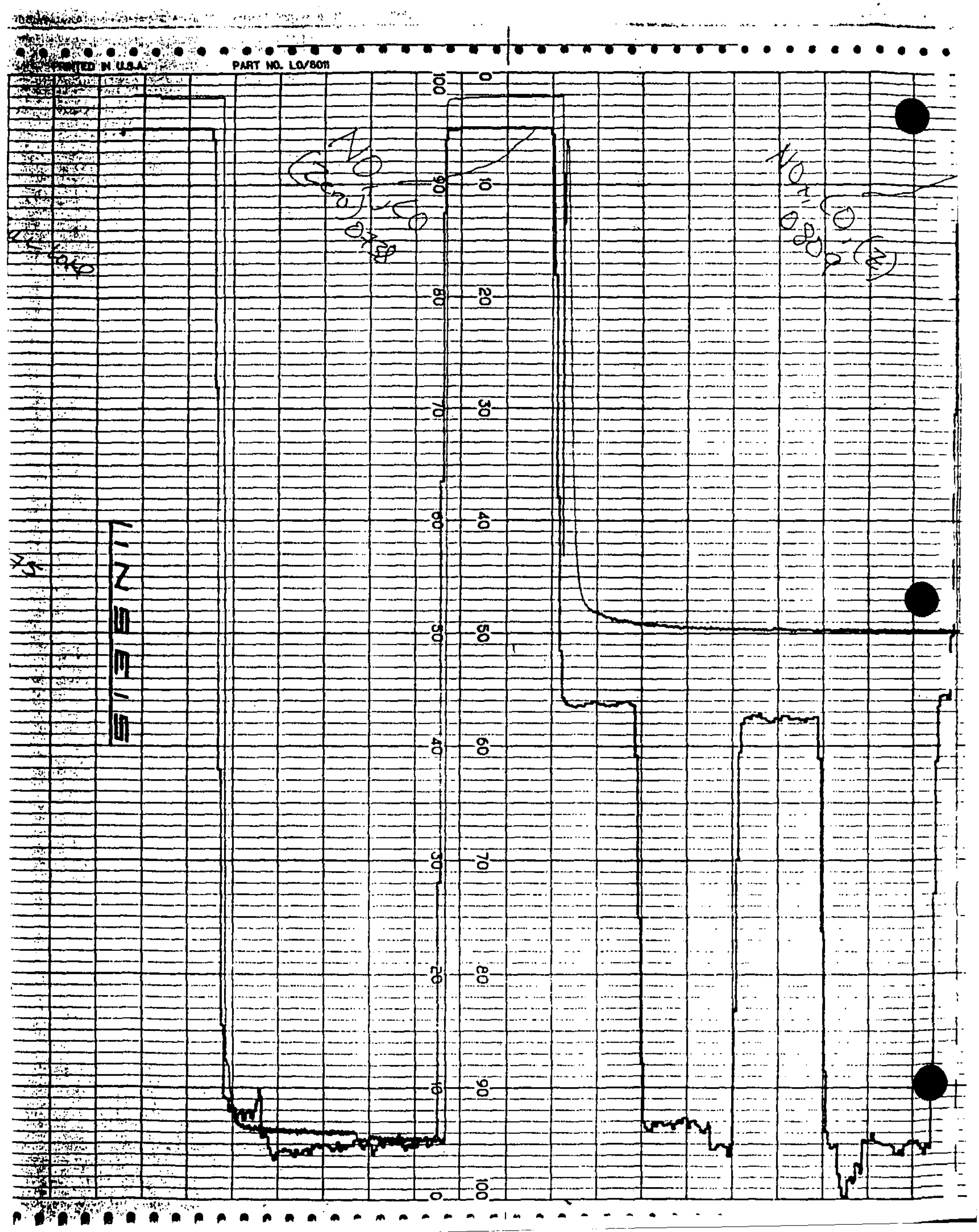
B.P. = 30.16

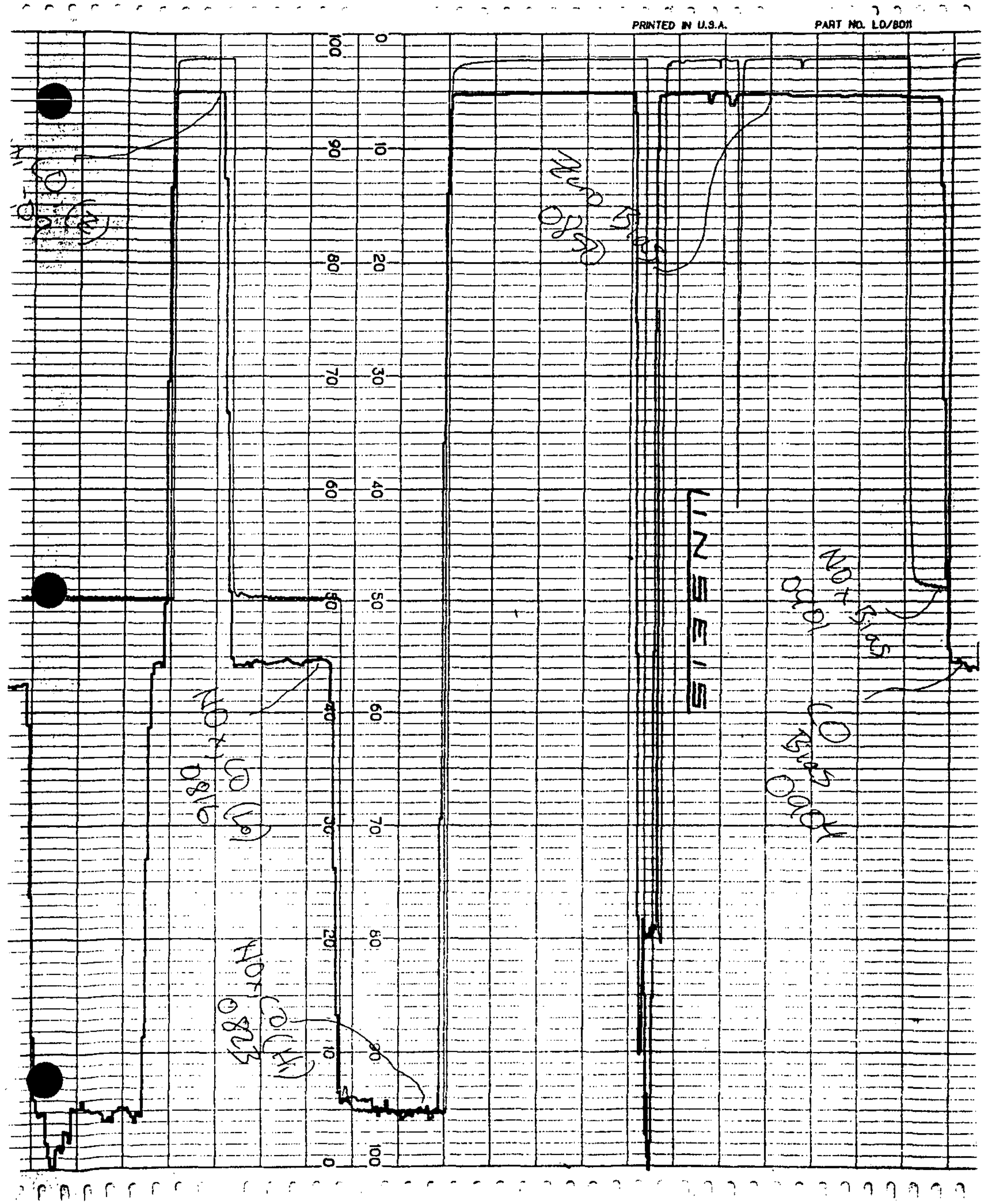
Time Start/Stop	NH_3 Slip	Strip Chart measurements O_2 (%)	CO_2 (%)	CO (ppm)	CO @3% O_2 (ppm)	NO_x (ppm)	NO_x @3% O_2 (ppm)	COMMENTS
0012/0112		6.2	8.2	270	330	25.5	31.1	TEST 1 - NH_3 Slip
0427/0527		6.2	8.2	260	317	32.5	39.6	TEST 2 - BASELINE

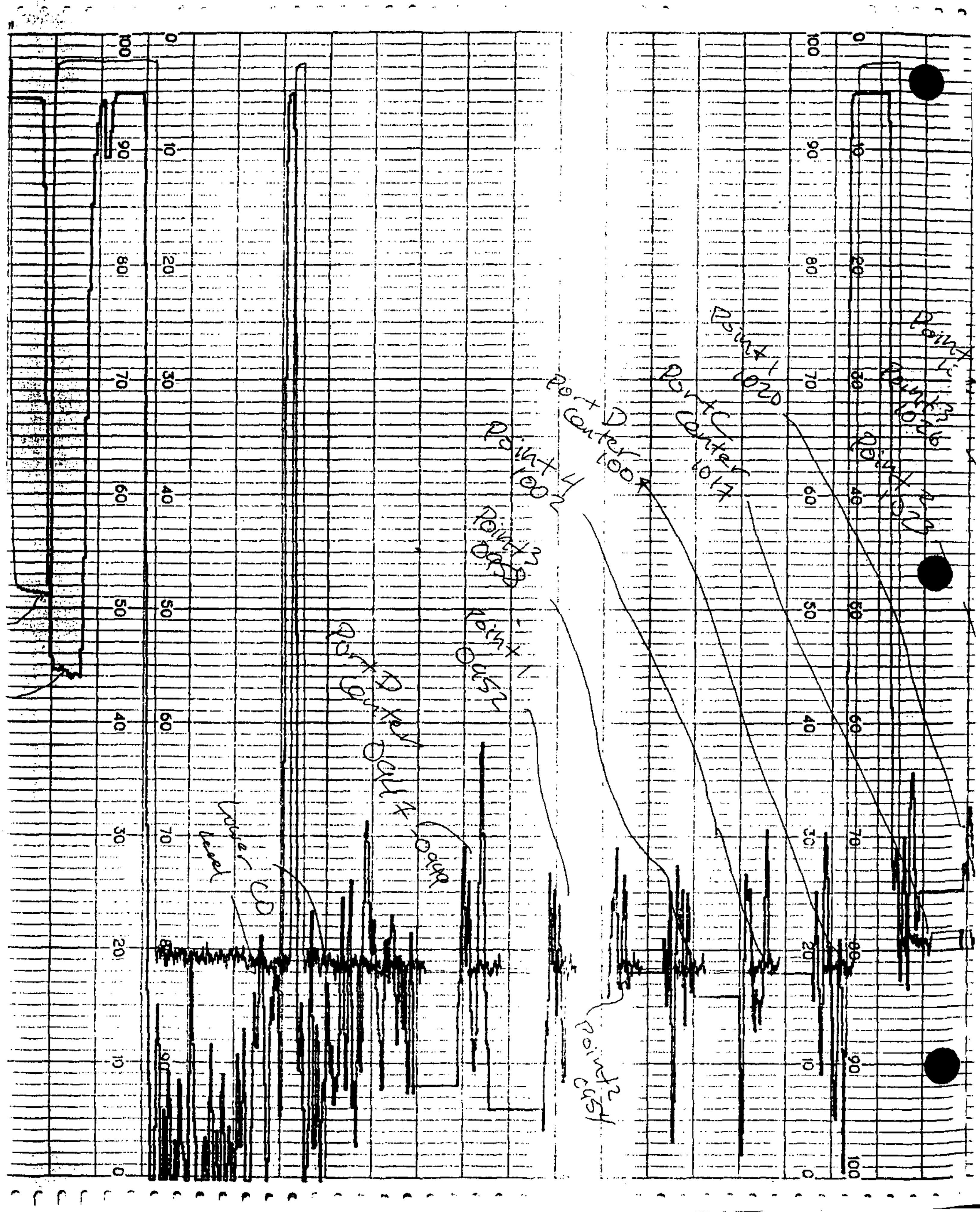
APPENDIX D-3

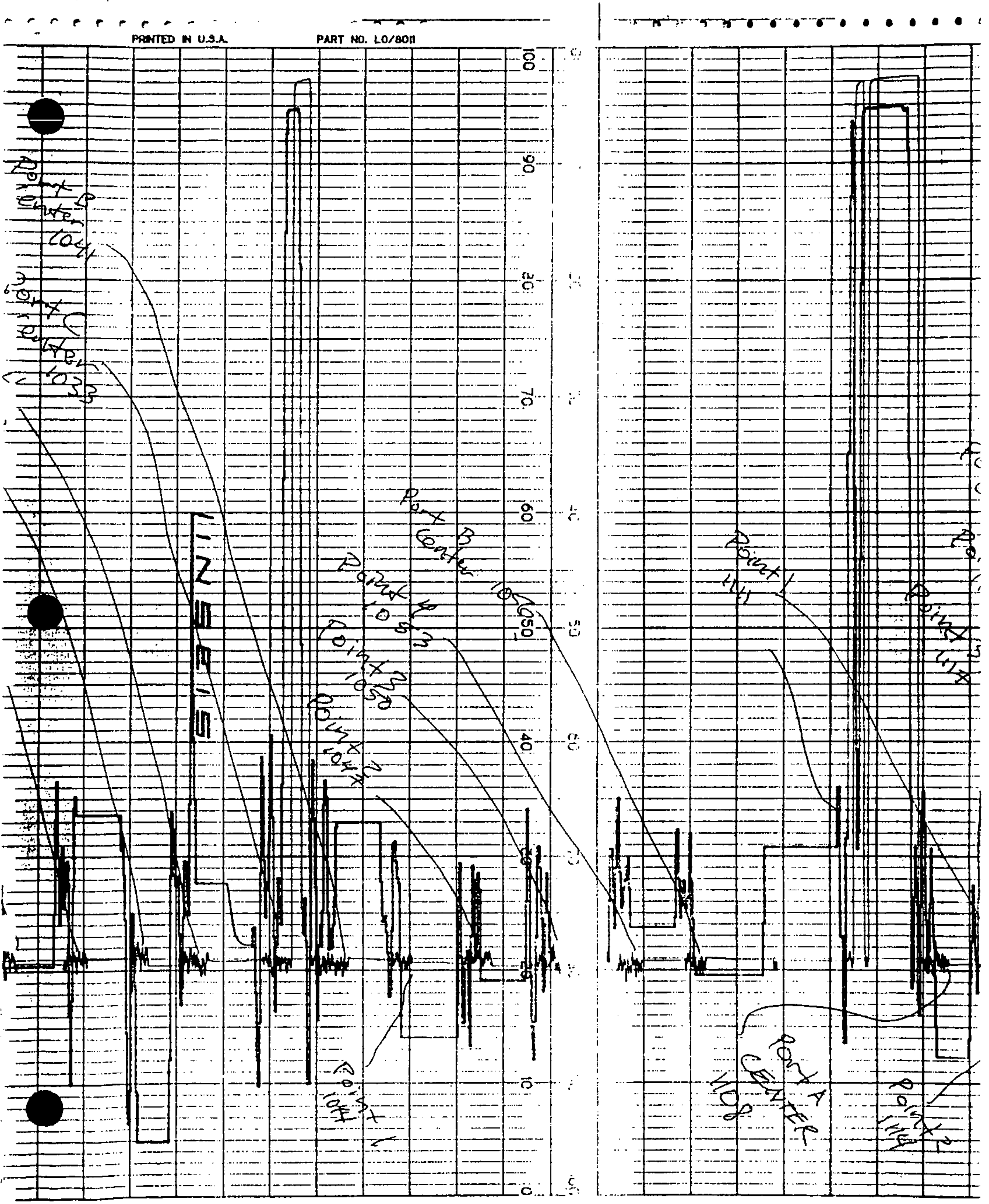
STRIP CHART RECORDS

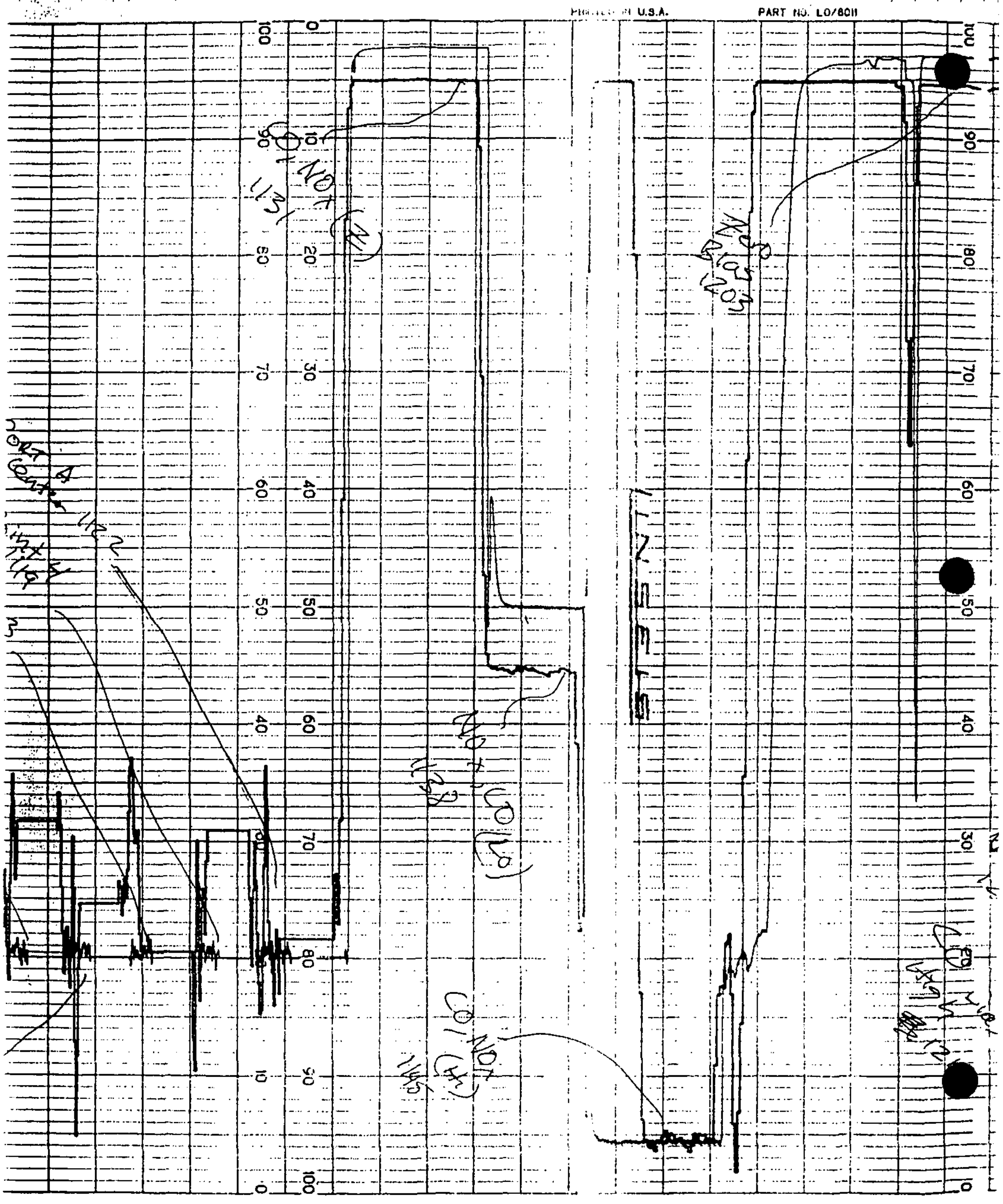

PRINTED IN U.S.A.
PART NO. L0/8011
LINSEIS
11/5/96
SCE HBGS
Unit 1 - Full Load
OPERATOR: D URREY
Chart speeds
Cal. 3 min/cm
Test 6 min/cm
CO - Blue
0-500 PPM
Hi 45L PPM
Cyl# SGC 30775
Exp 10/96
Lo 250 PPM
Cyl# CC 17660
Exp 10/96
NOx - Red
0-100 PPM
Hi 92.2 PPM
Cyl# AAL 5362
Exp 10/95
Lo 48.0
Cyl# AAL 14063
Exp 10/95
NO CO
Zero
0725

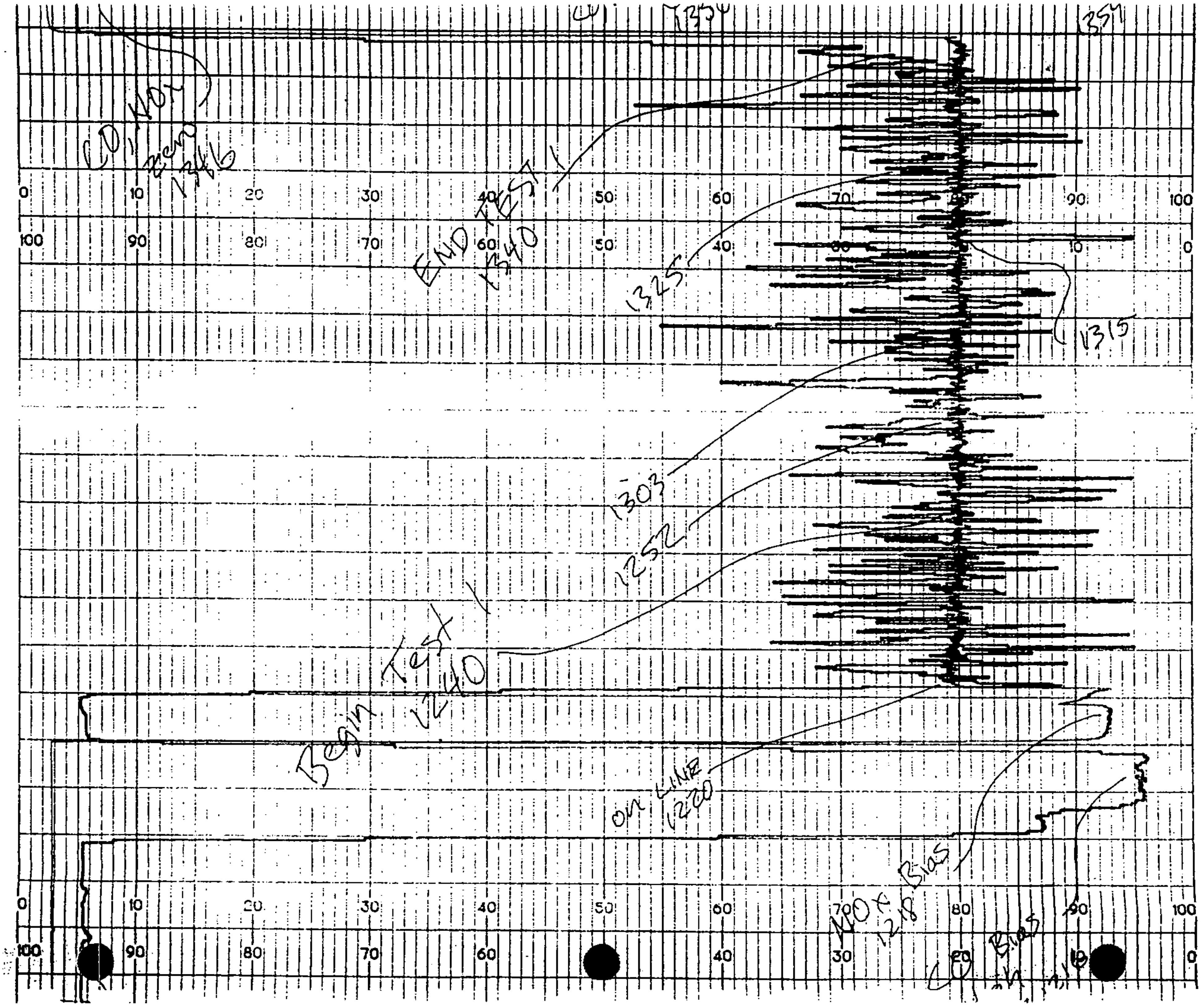

PRINTED IN U.S.A.
PART NO. LO/8011
0
10
20
30
40
50
60
70
80
90
100
100
90
80
70
60
50
40
30
20
10
0

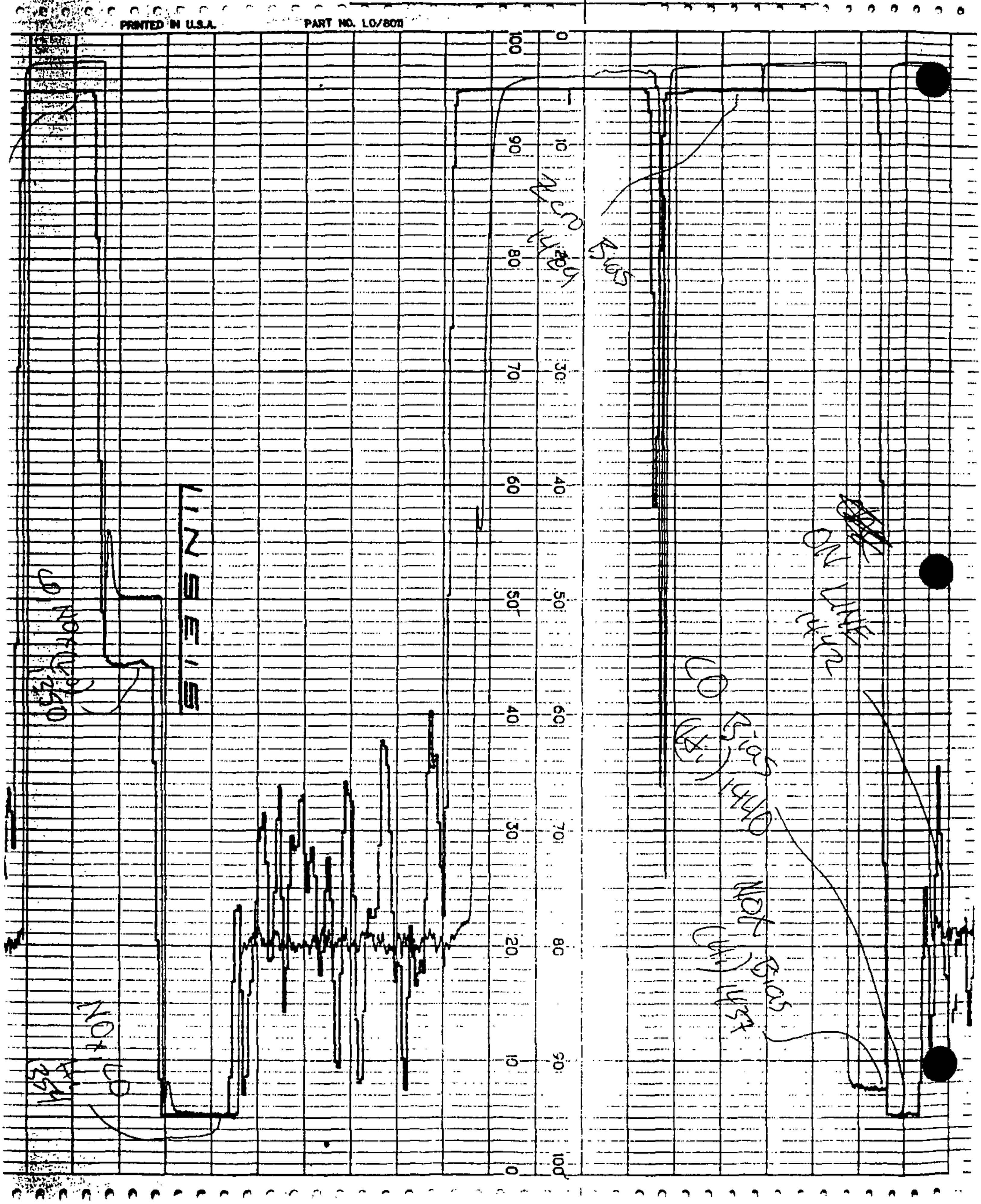

PRINTED IN U.S.A.
PART NO. L0/8011
LINSEIS
NO+CO (Lo)
0816
NO+CO (Hi)
0823
CO Span
0804


Port C Center 1017
Port D Center 1007
Point 4 1002
Lower CD level

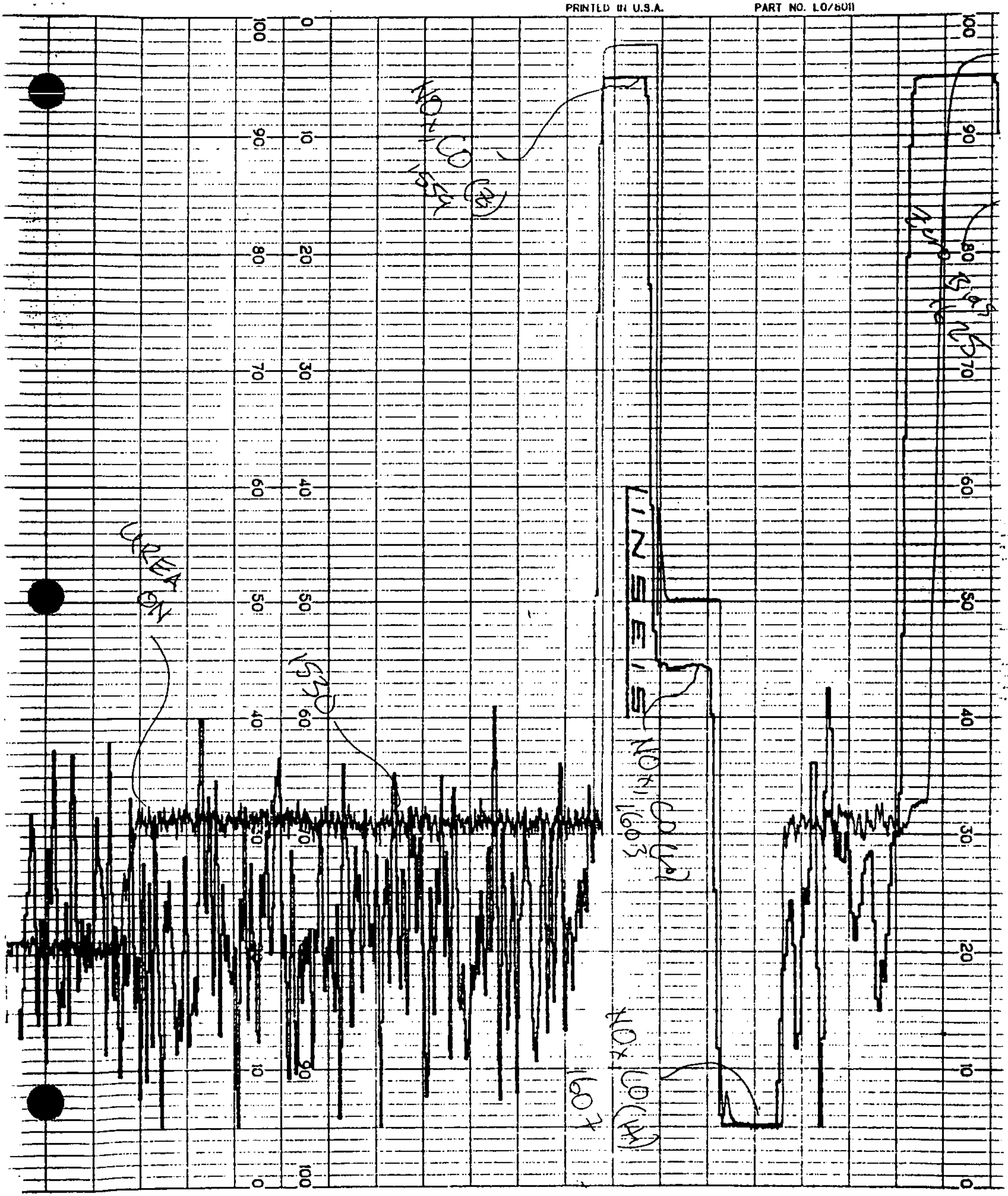

PRINTED IN U.S.A.
PART NO. L0/8011
100
90
80
70
60
50
40
10
0
Point A
CENTER
1108
Point 1
1044

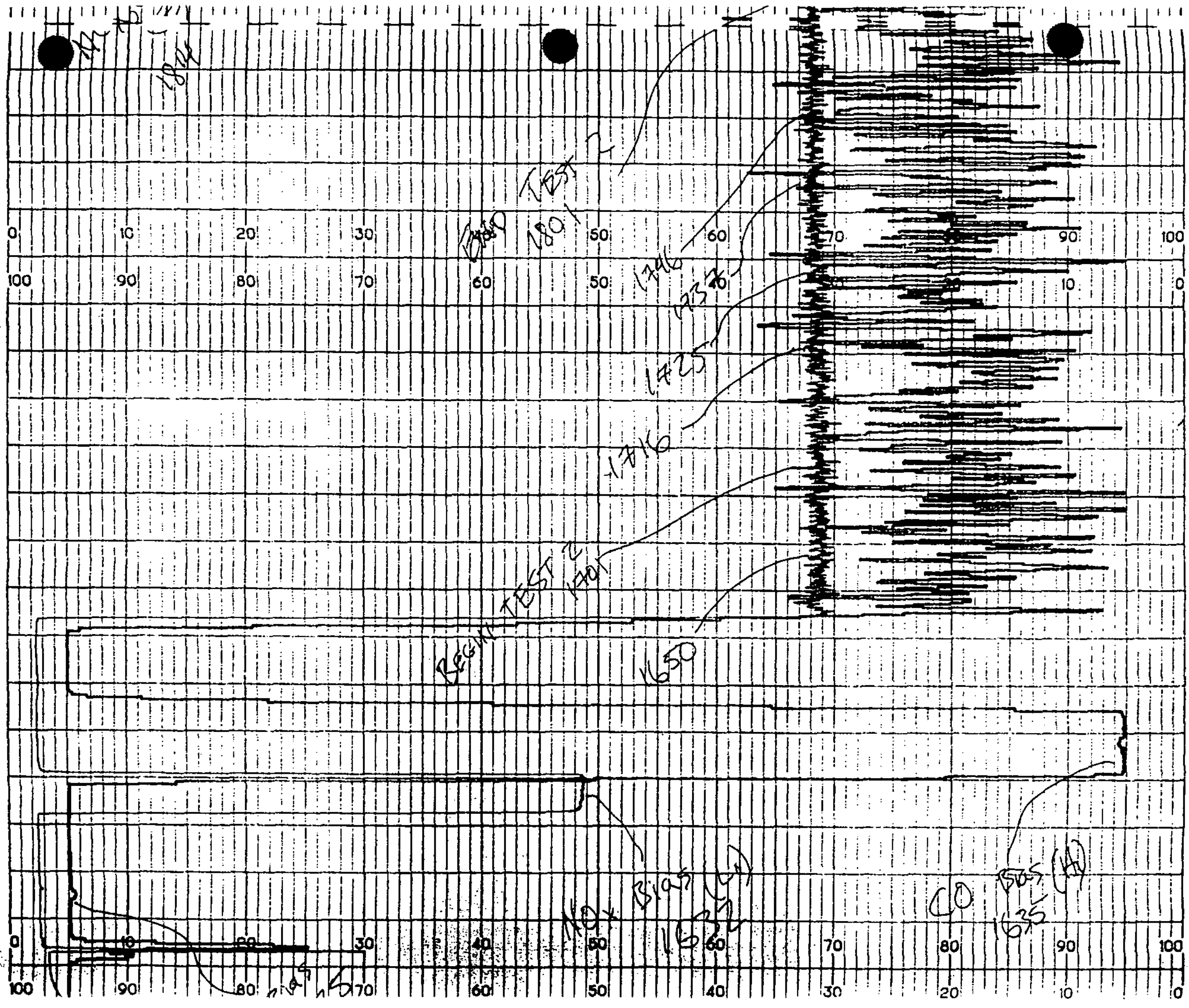

PRINTED IN U.S.A.
PART NO. LO/6011
LINSEIS


CO, NOx
zero
1346
END TEST 1
1340
1325
1315
1303
1252
Begin Test 1
1240
ON LINE
1220
NOx
1218
Bias
CO
Bias
1354
0 10 20 30 40 50 60 70 80 90 100
100 90 80 70 60 50 40 30 20 10 0


PRINTED IN U.S.A.
PART NO. LO/8011
LINSEIS
ON LINE
CO Bias
NOT Bias

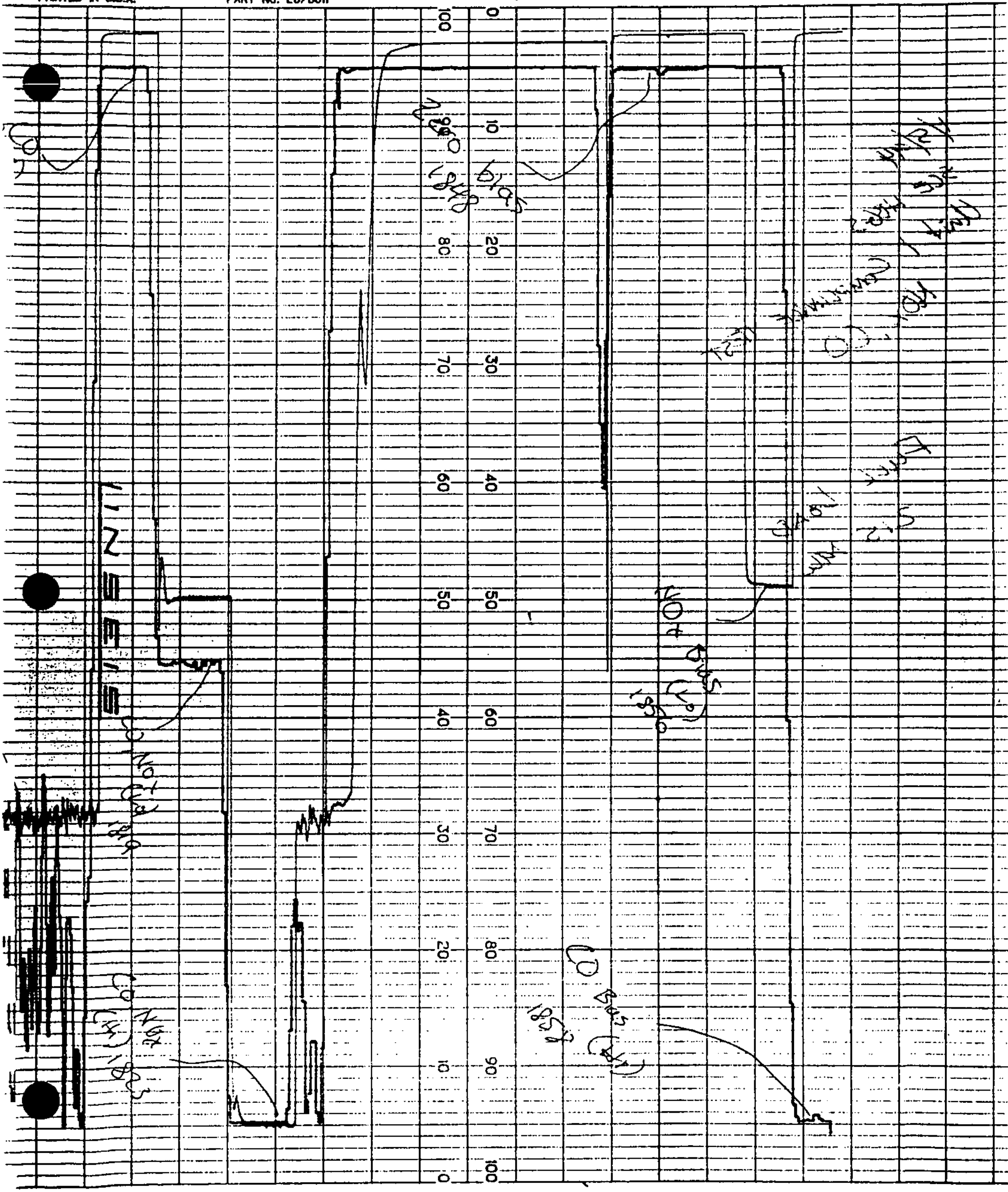
PRINTED IN U.S.A. PART NO. L0/6011

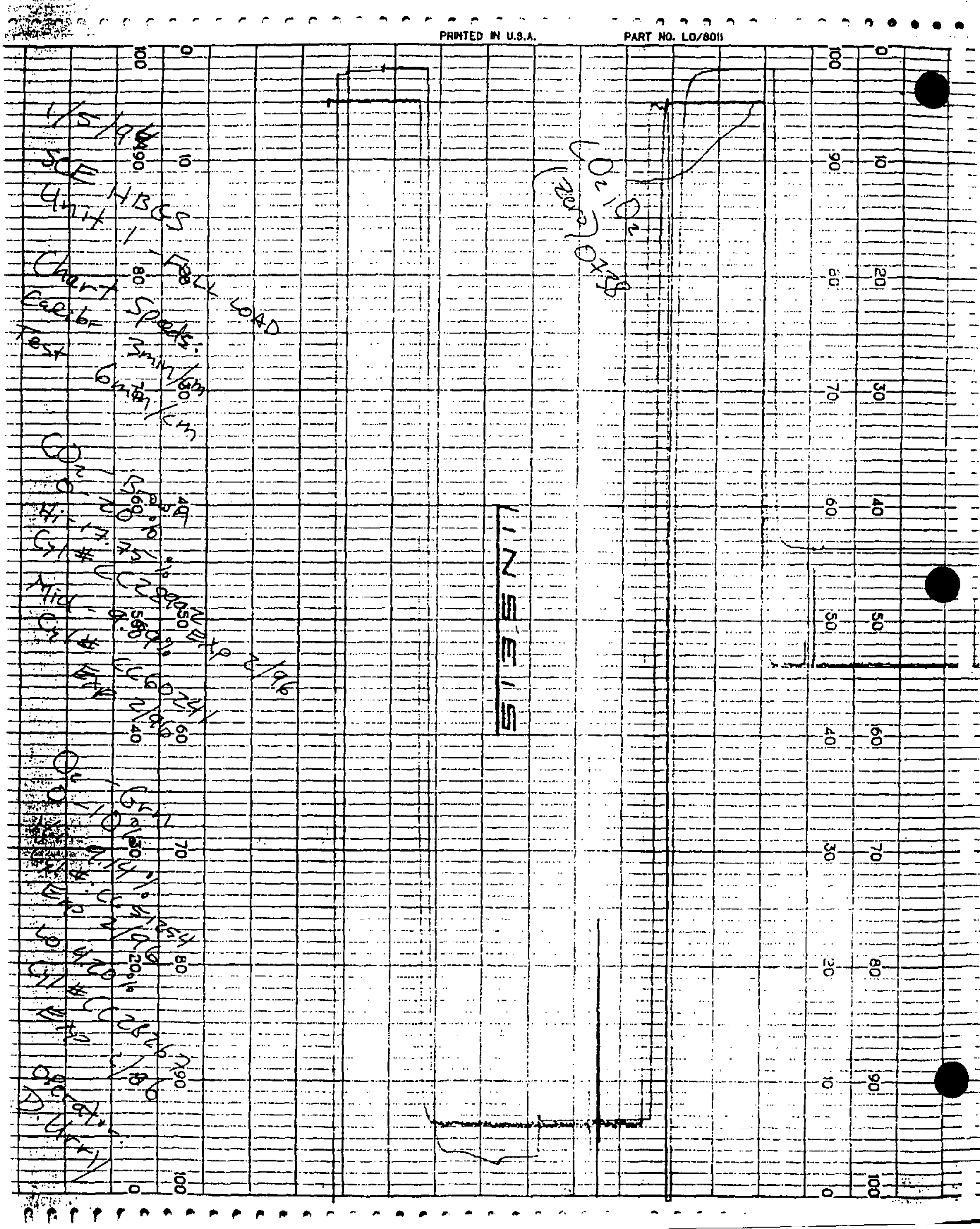




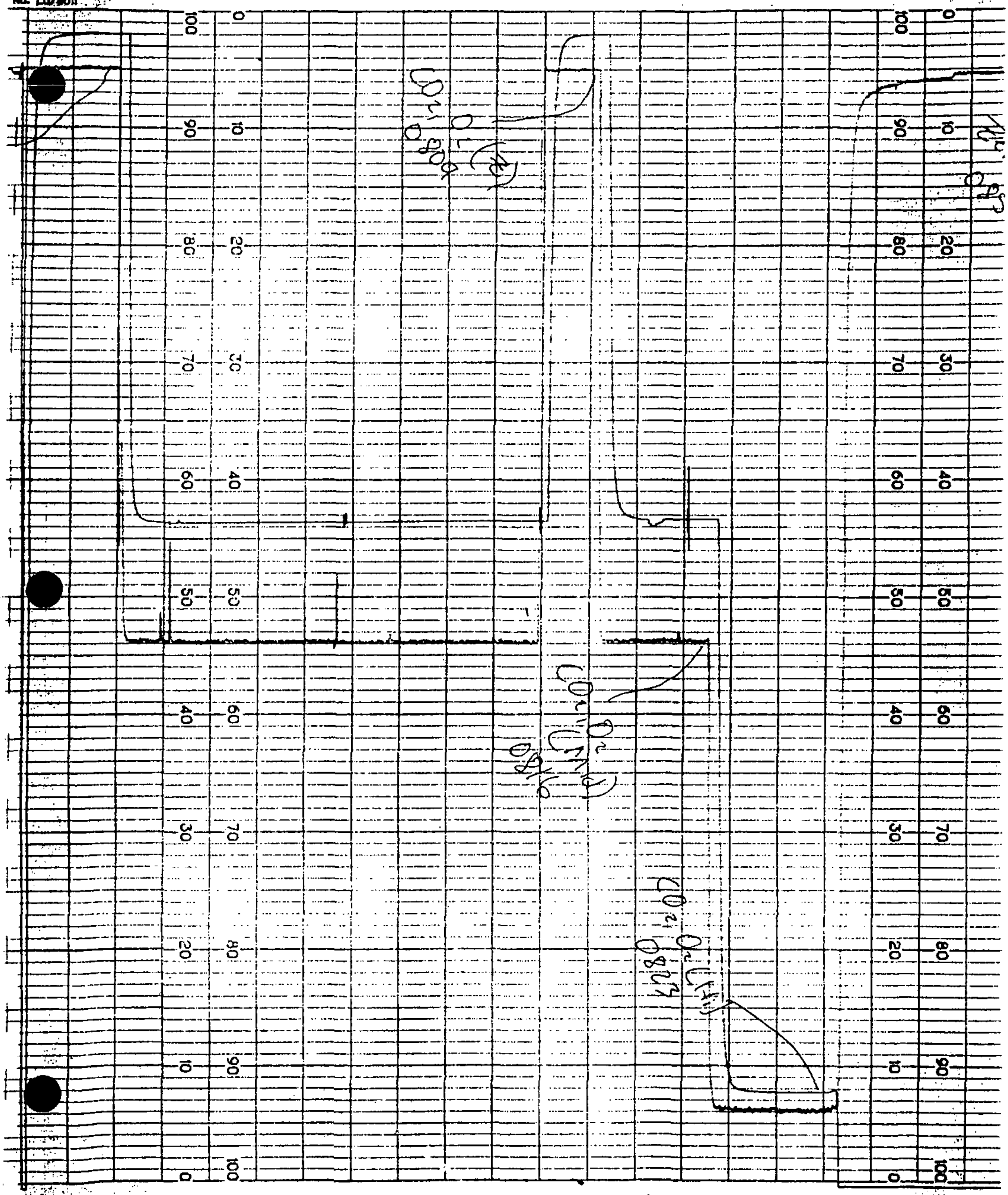
END TEST 2
1801
1746
1735
1725
1716
BEGIN TEST 2
1701
1650
NOx BIAS (L)
1632
CO BIAS (H)
1635

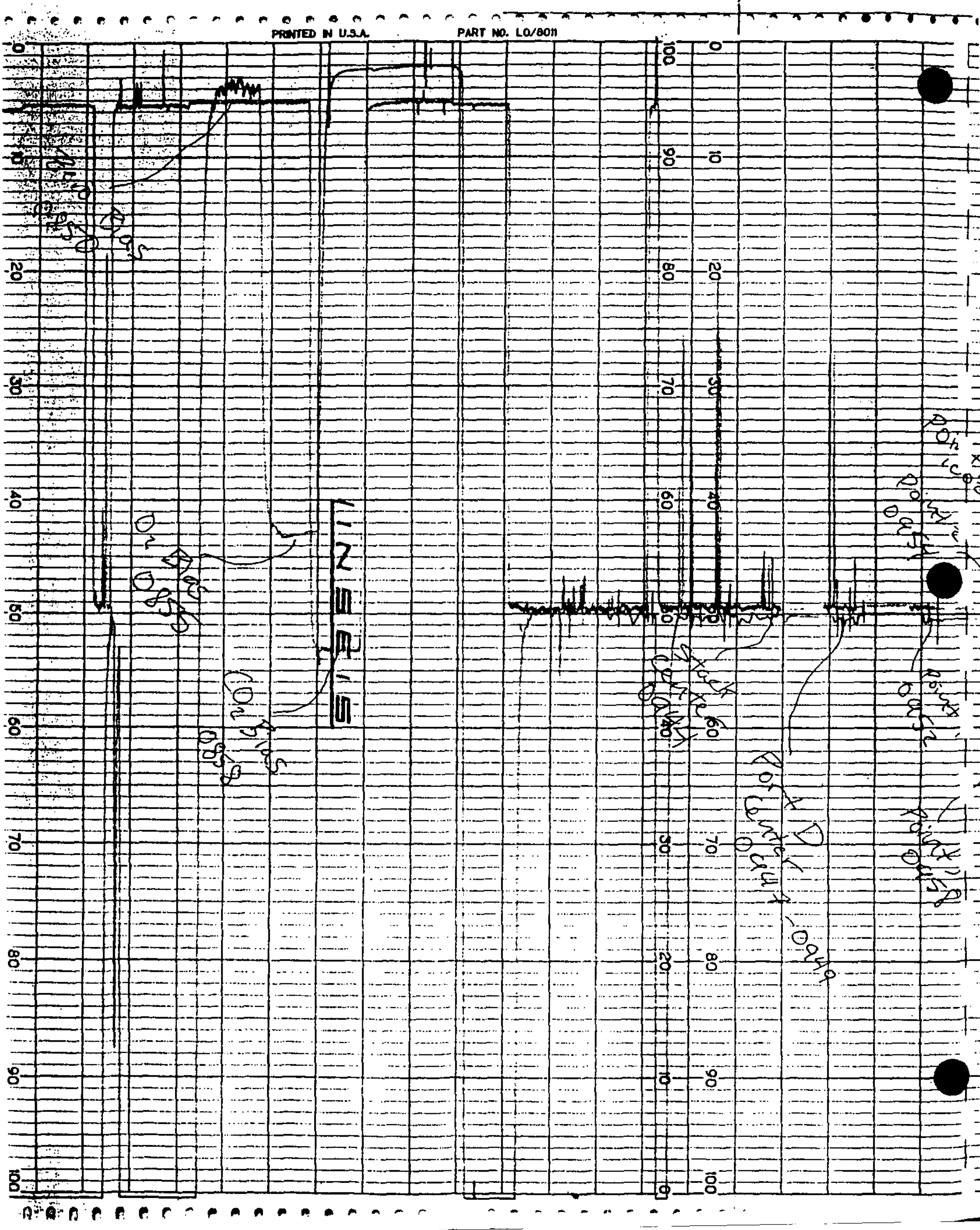
PRINTED IN U.S.A. PART NO. LO/8011



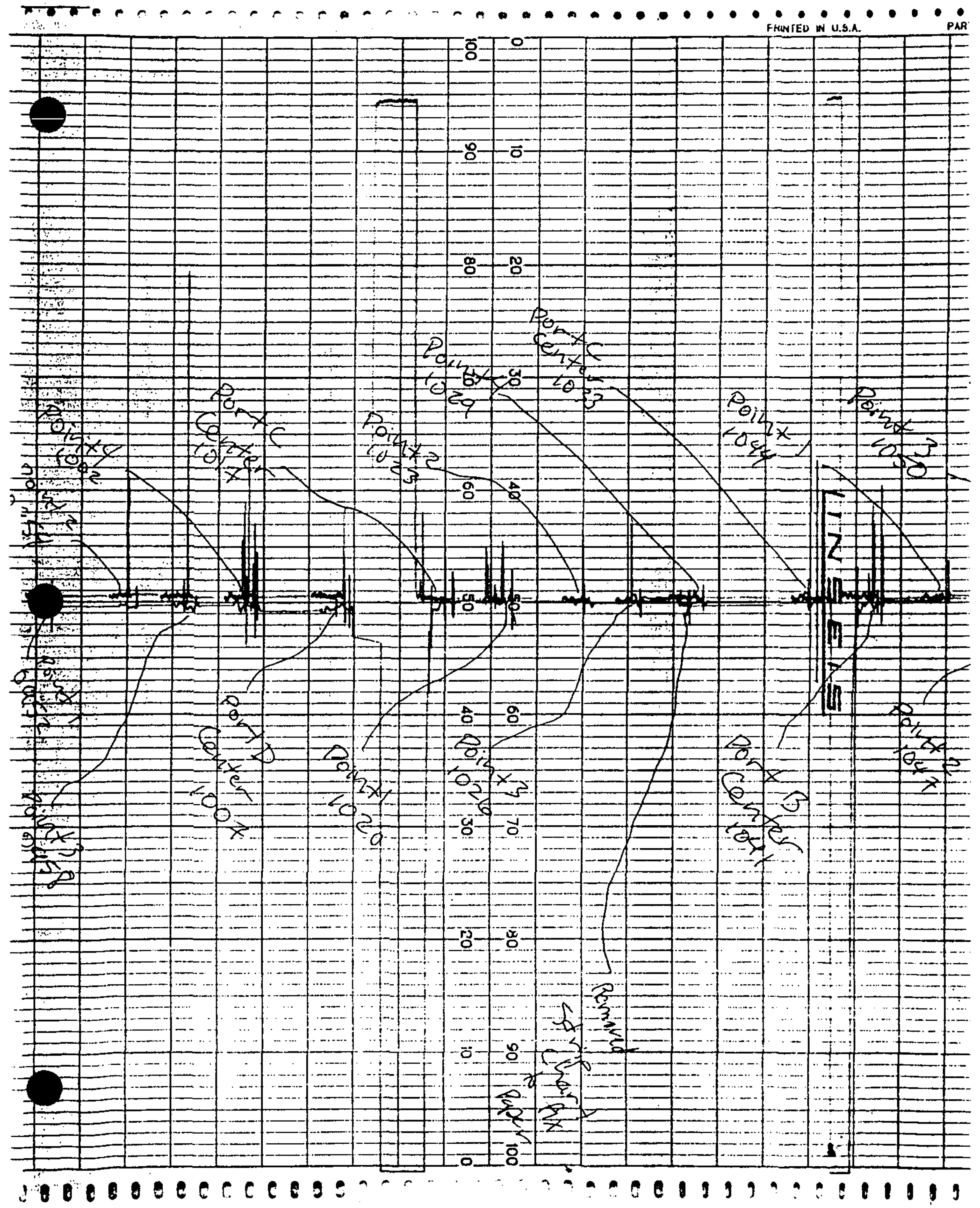

PRINTED IN U.S.A.
PART NO. LO/8011
LINSEIS
1/5/94
SCE HBGS
Unit 1, Full Load
Chart Speeds:
Calibr 3min/cm
Test 6min/cm
CO2 - Blue
O2 - Grn
CO2, O2
0738

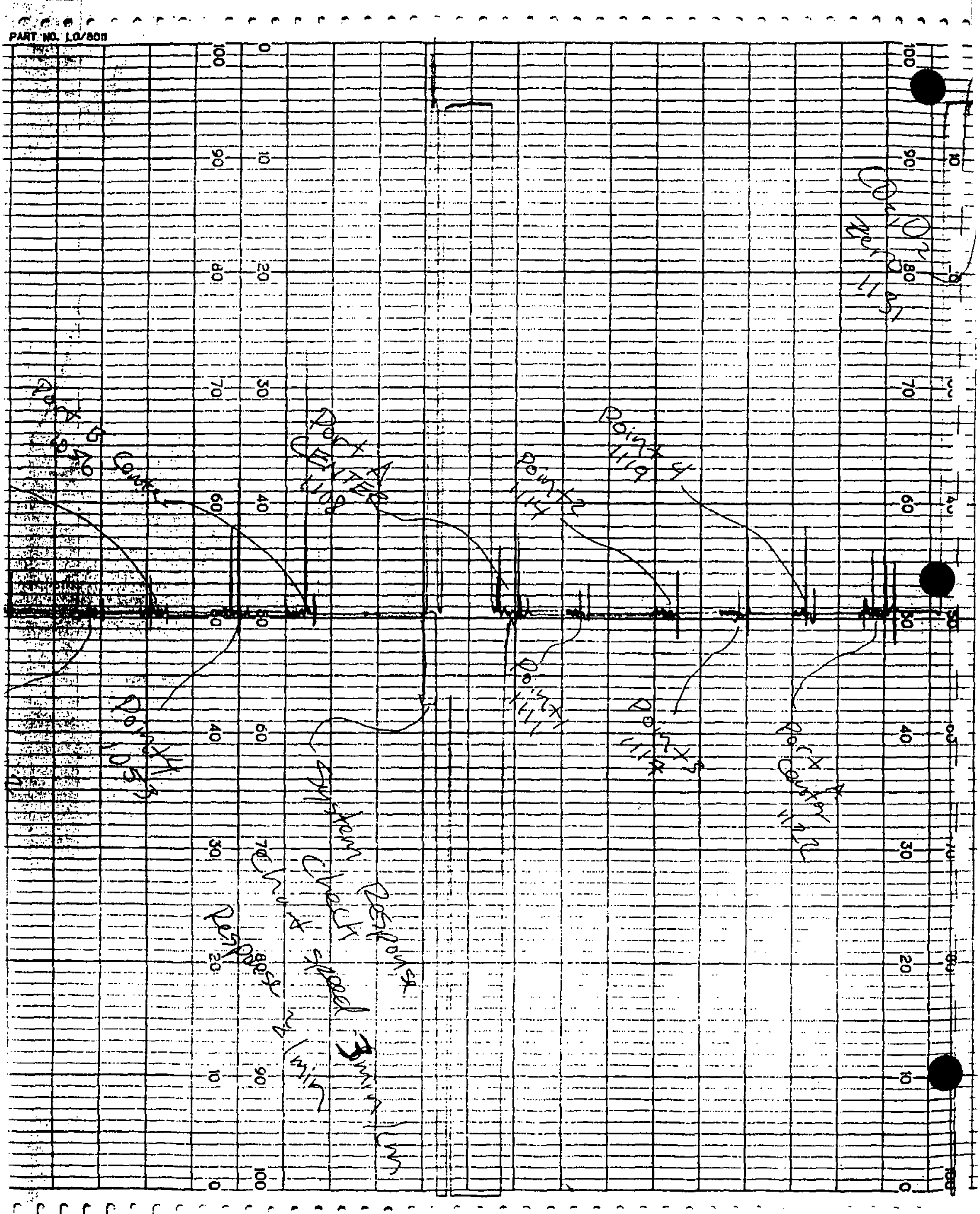
NO. LD/9011



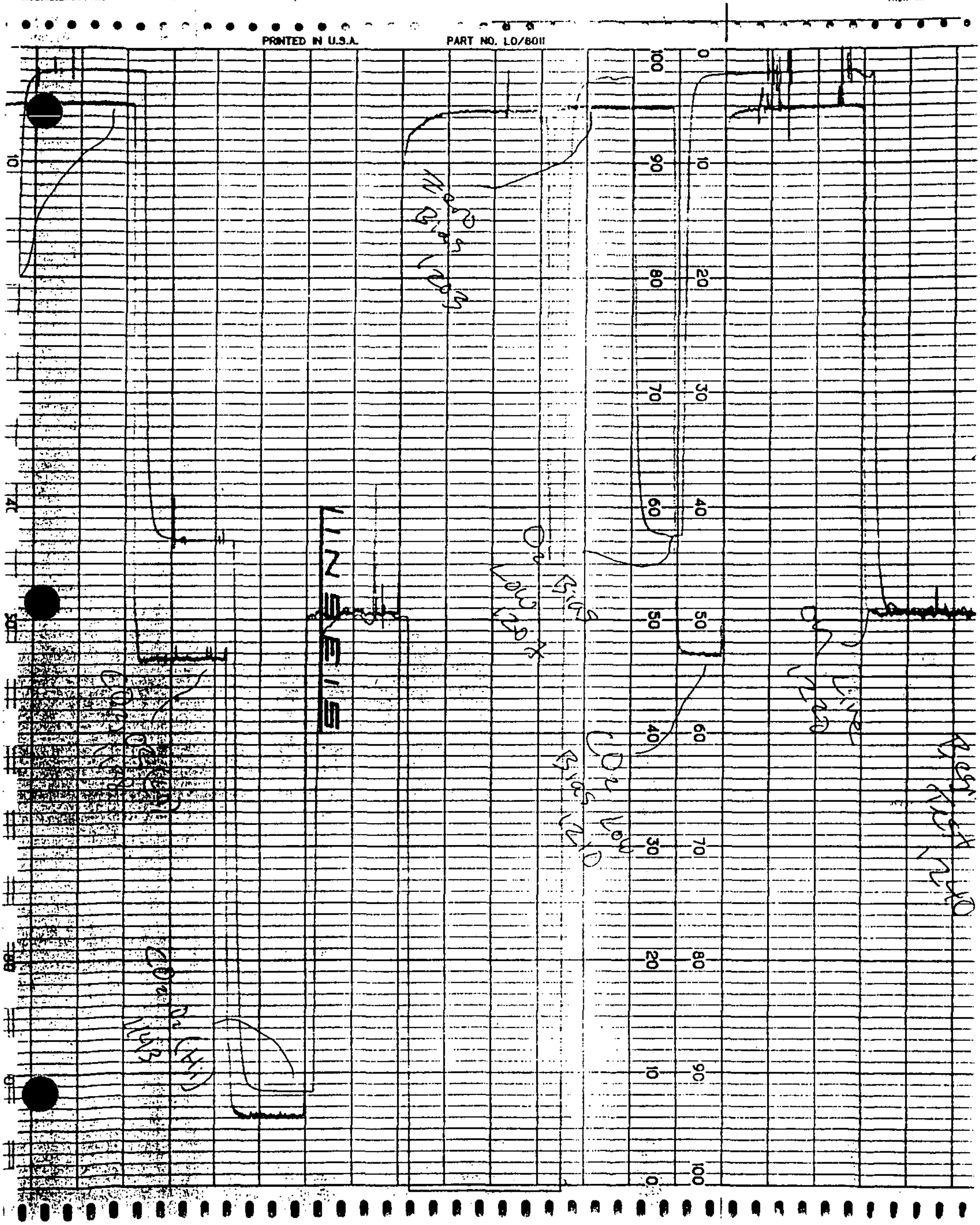


PRINTED IN U.S.A.
PART NO. LO/8011
LINSEIS


PRINTED IN U.S.A.
Point C Center 1033
Point C Center 1017
Point D Center 1007
Point B Center 1041
Point 1 1020
Point 4 1026
Removed



PART NO. L0/8011
100
90
80
70
60
50
40
30
20
10
0
Point A Center 1122
Point 4 1119
Point 5 1117
Point 2 1114
Point 1 1111
Point A CENTER 1108
System Response Check
Chart speed 3 min/cm
Response ~1 min
Point 4 1053
Point B Center 1046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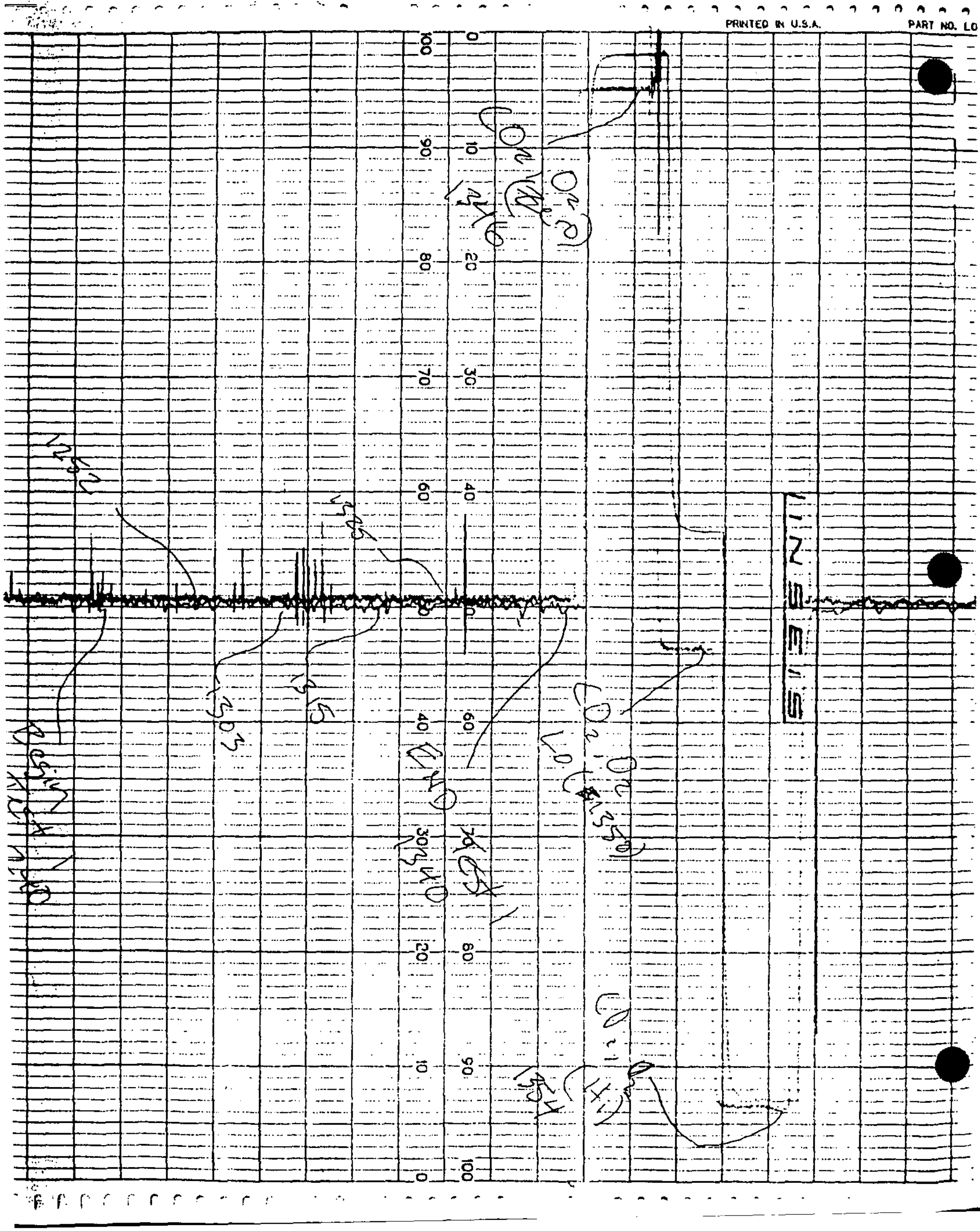
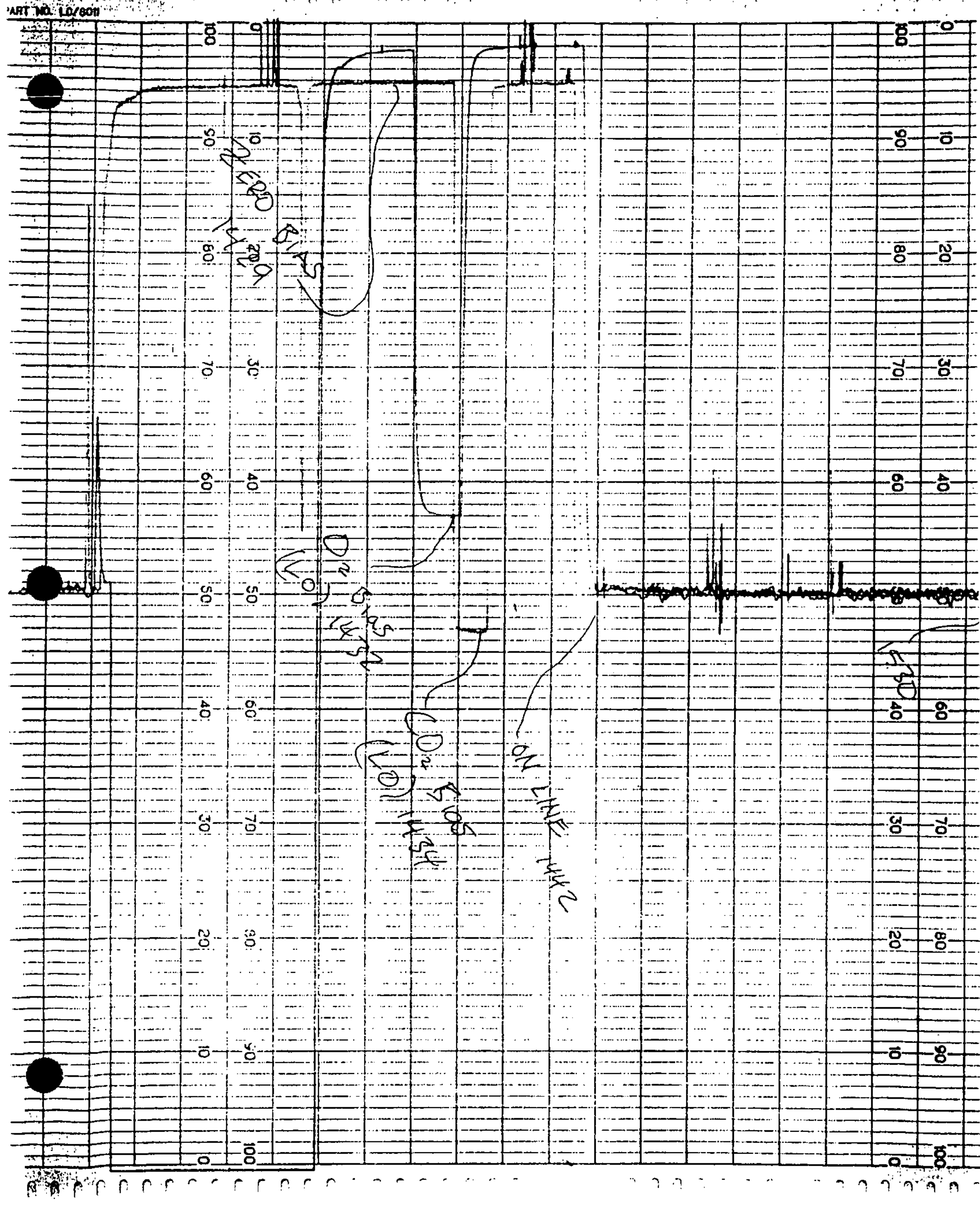
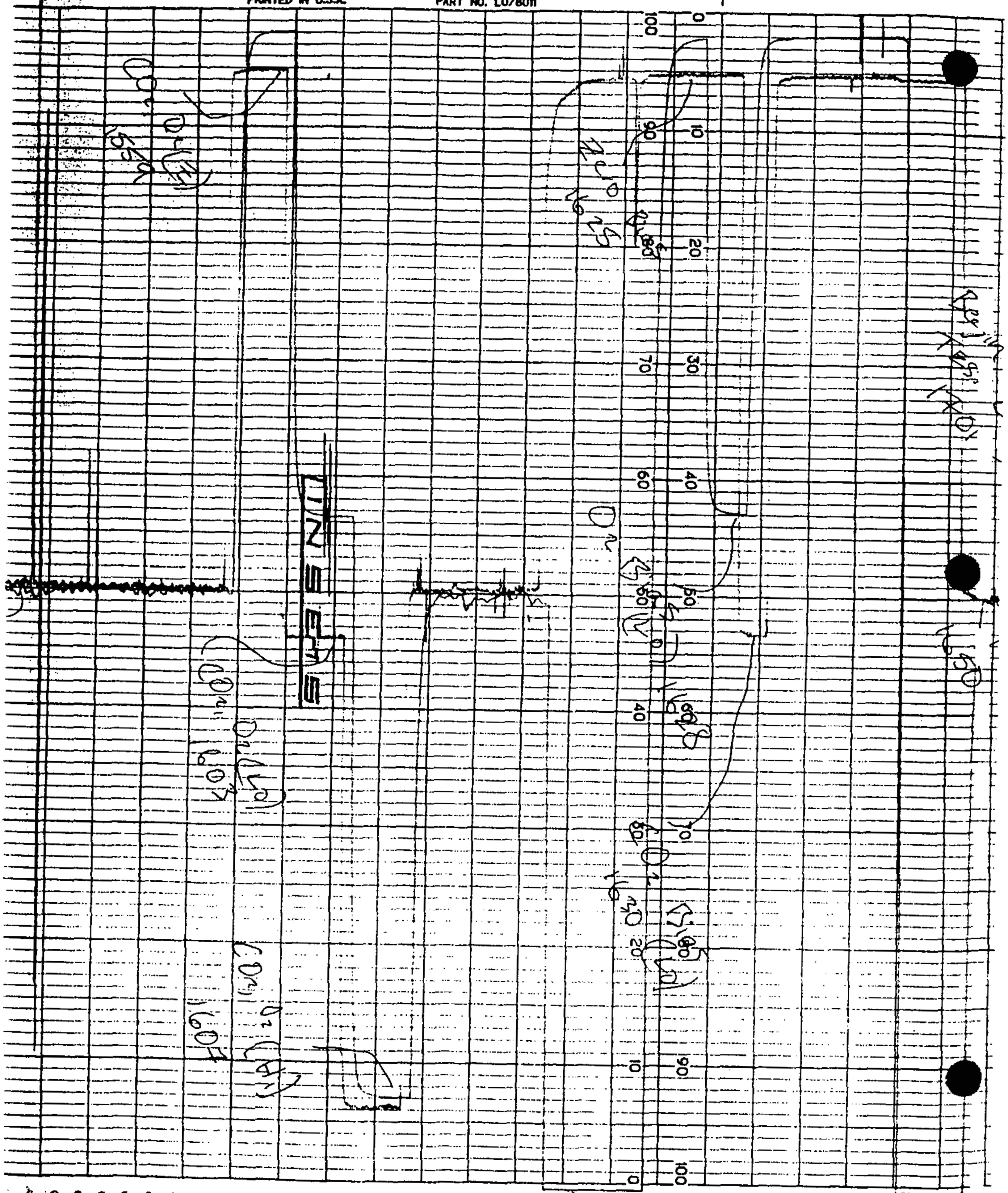
PART NO. L0/6011


PRINTED IN U.S.A.
PART NO. LO
LINSEIS

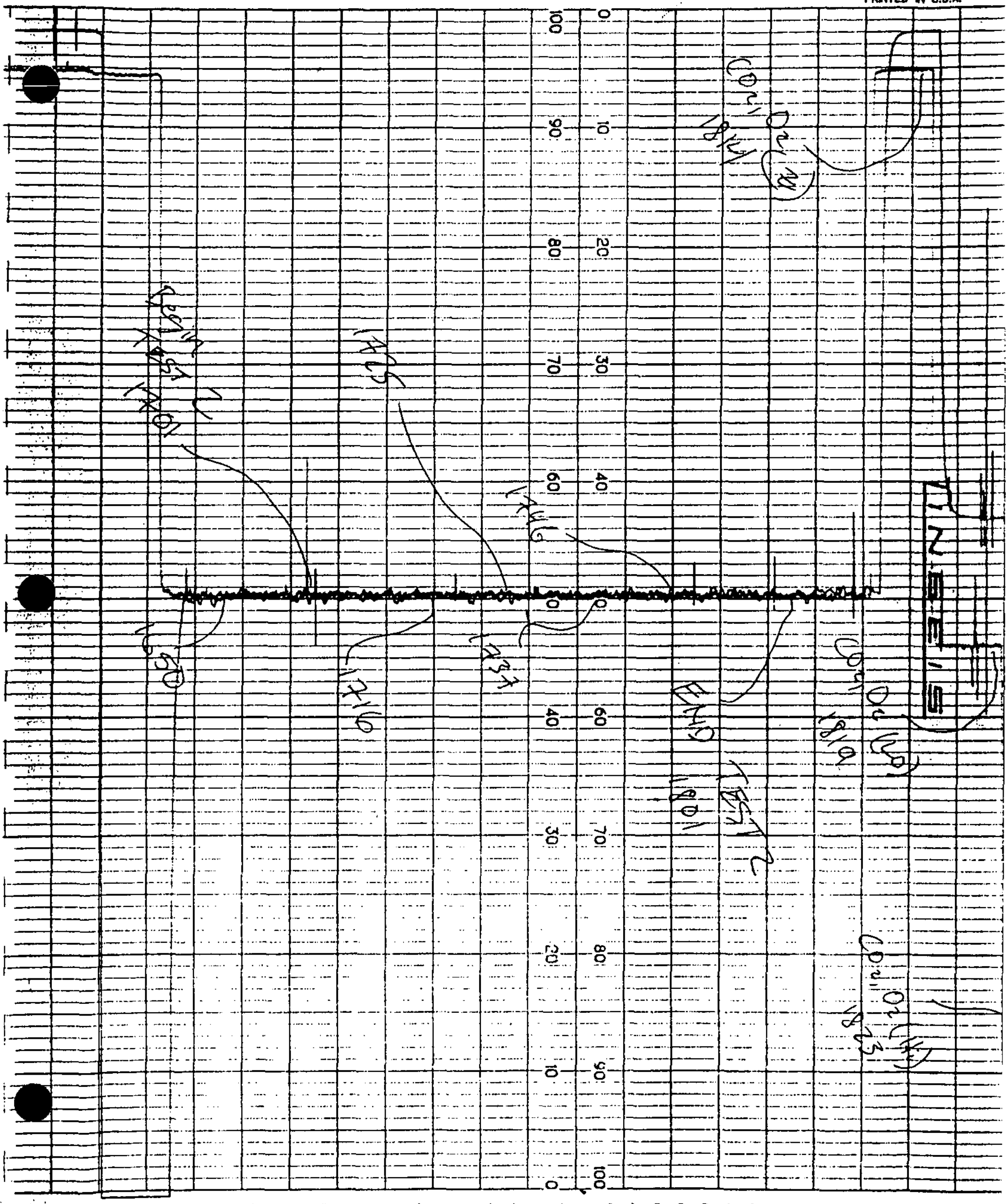

PART NO. LD/601
ON LINE 1442

PRINTED IN U.S.A.

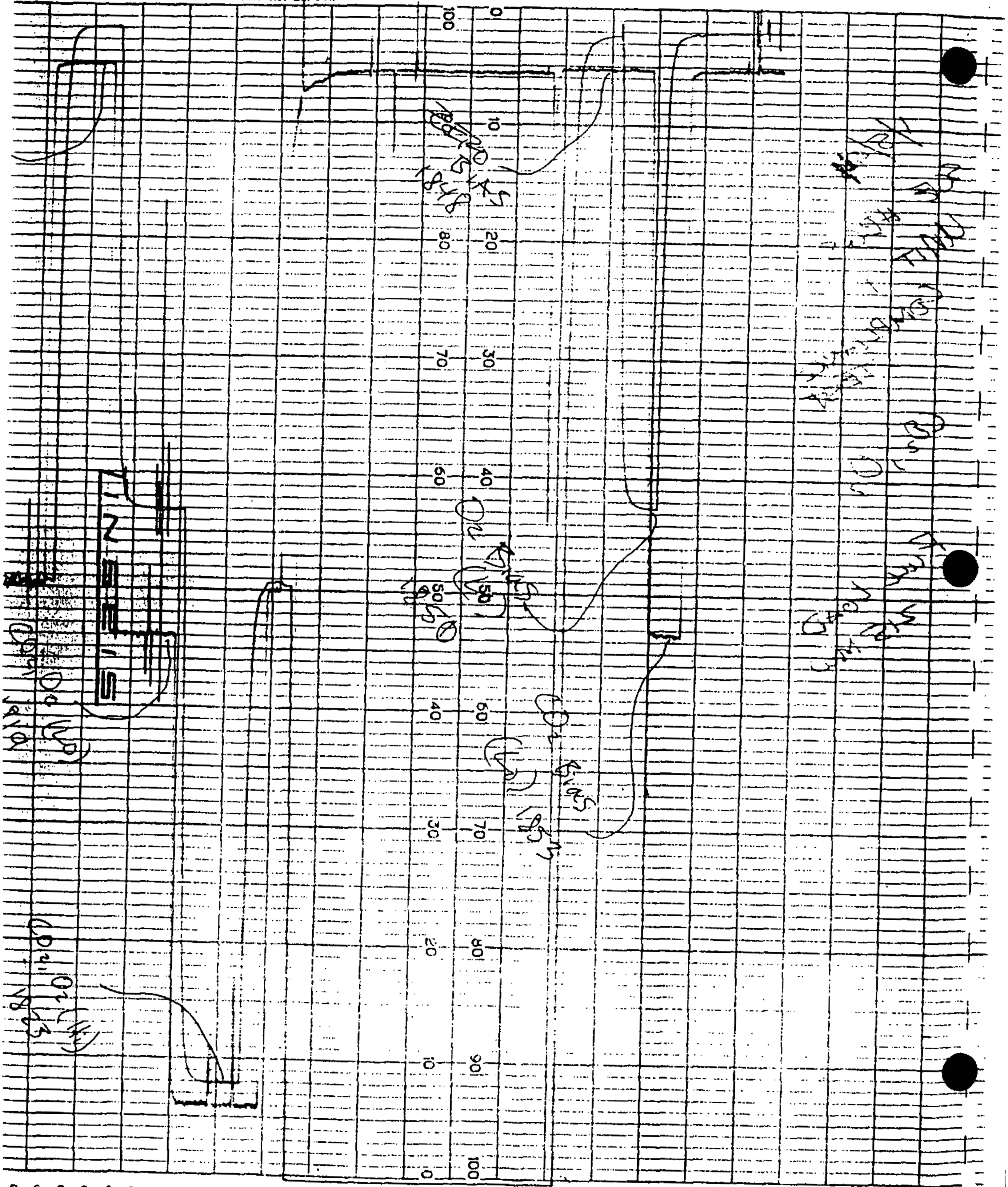
PART NO. LO/6011



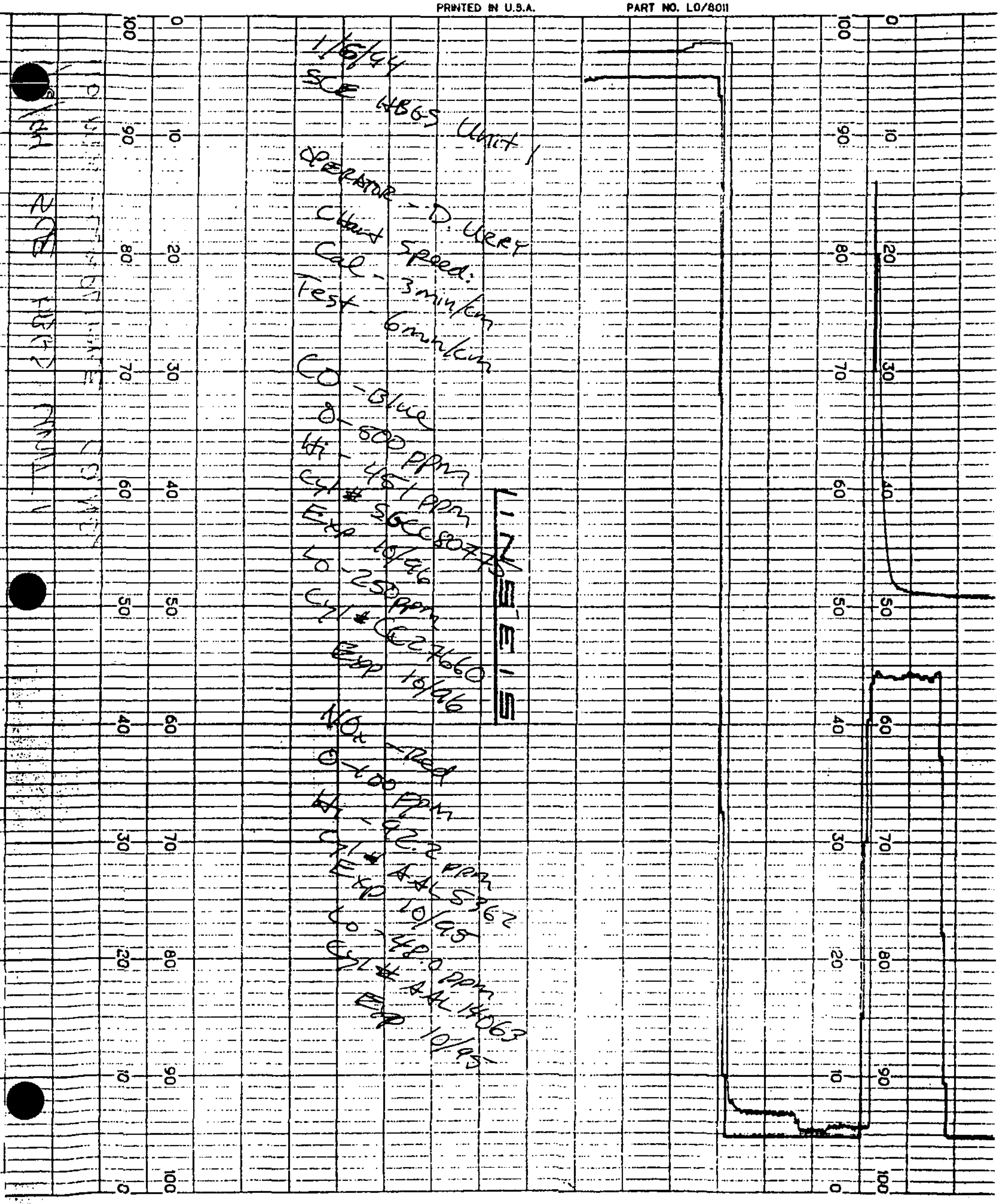
PRINTED IN U.S.A.

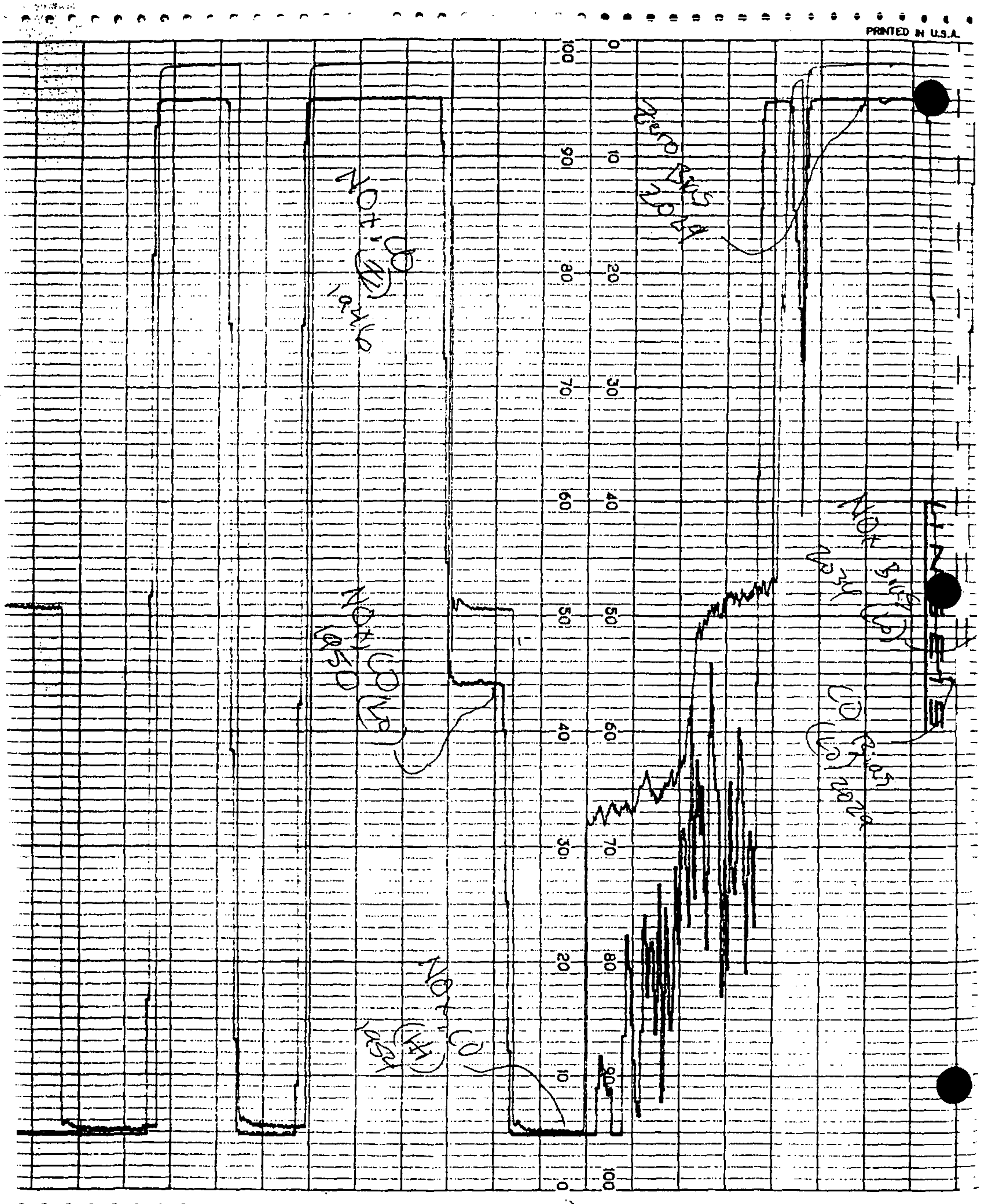


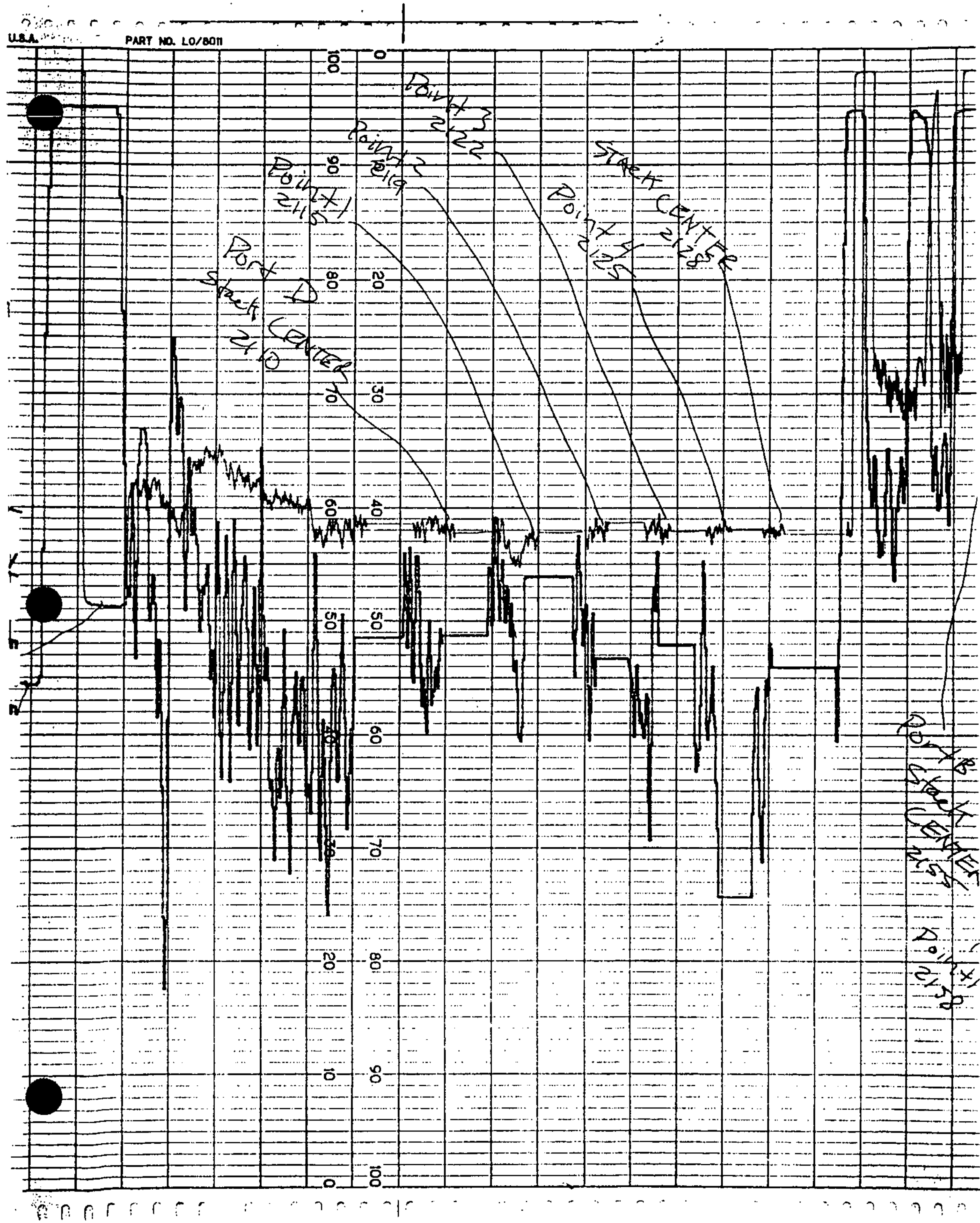
PRINTED IN U.S.A. PART NO. L0/8011



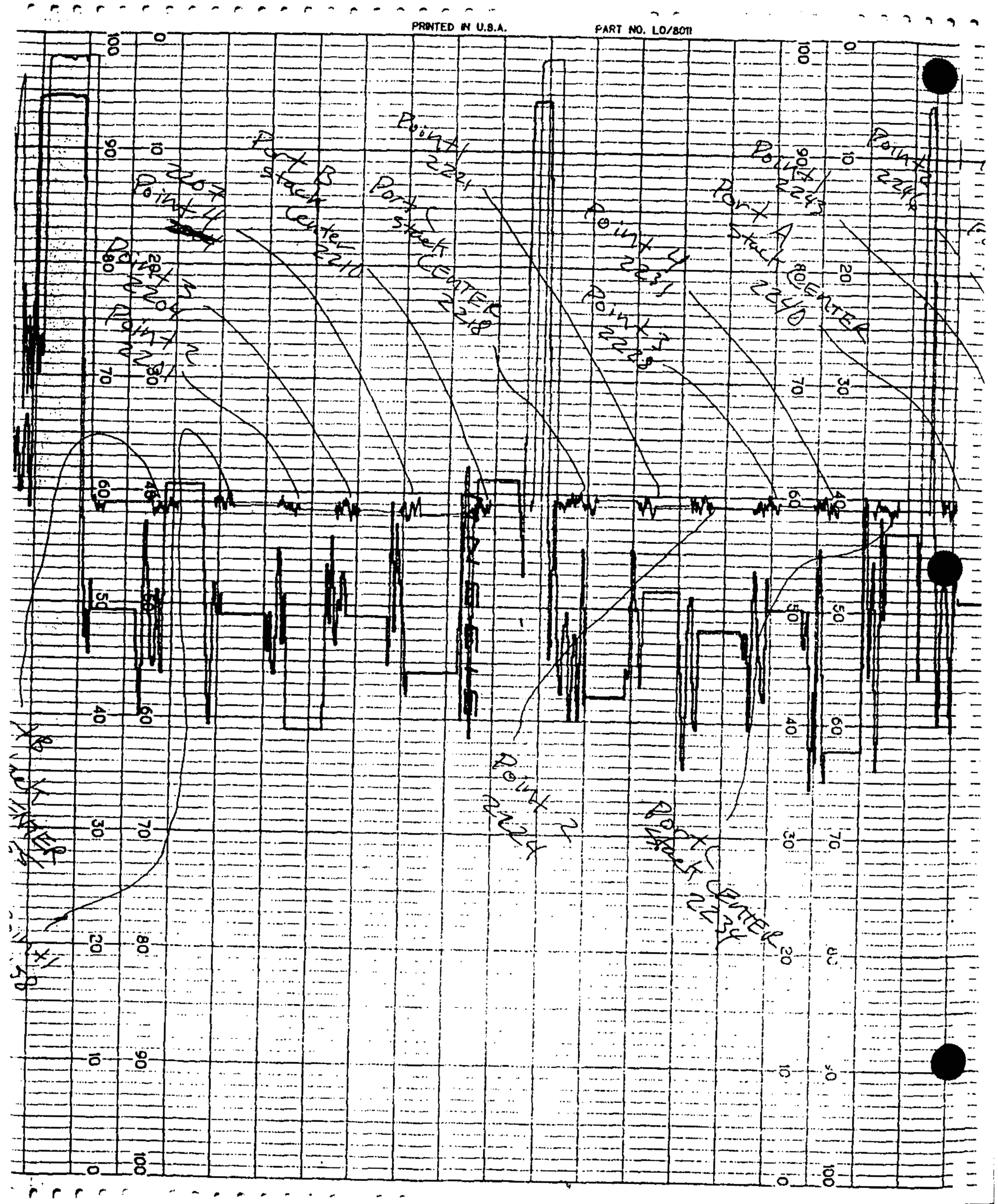
PRINTED IN U.S.A. PART NO. L0/8011




PRINTED IN U.S.A.
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100

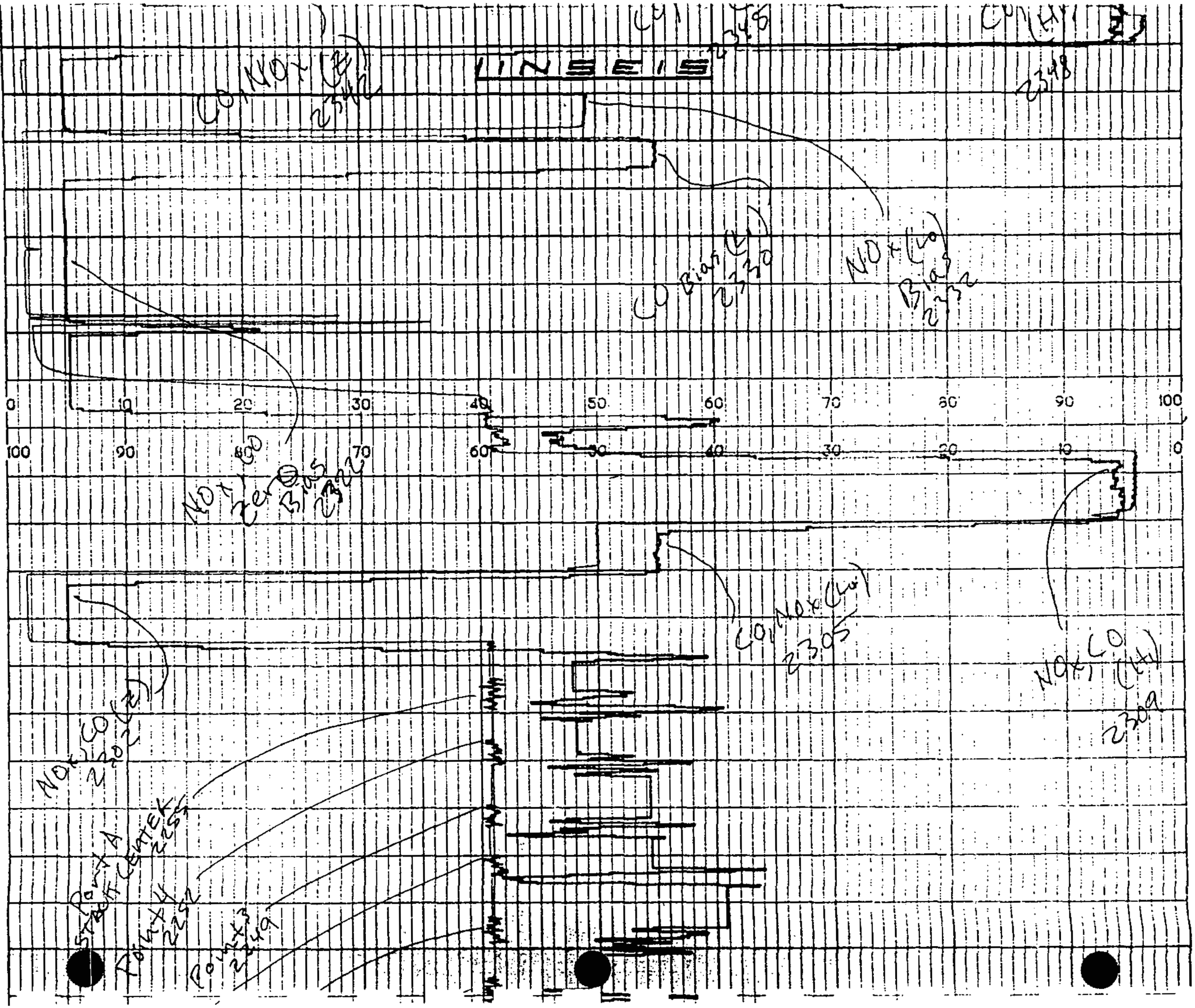


U.S.A.
PART NO. LO/8011
Point 3 2122
Point 2 2119
Point 1 2116
Port D Stack CENTER 2110
STACK CENTER 2128
Point 4 2125

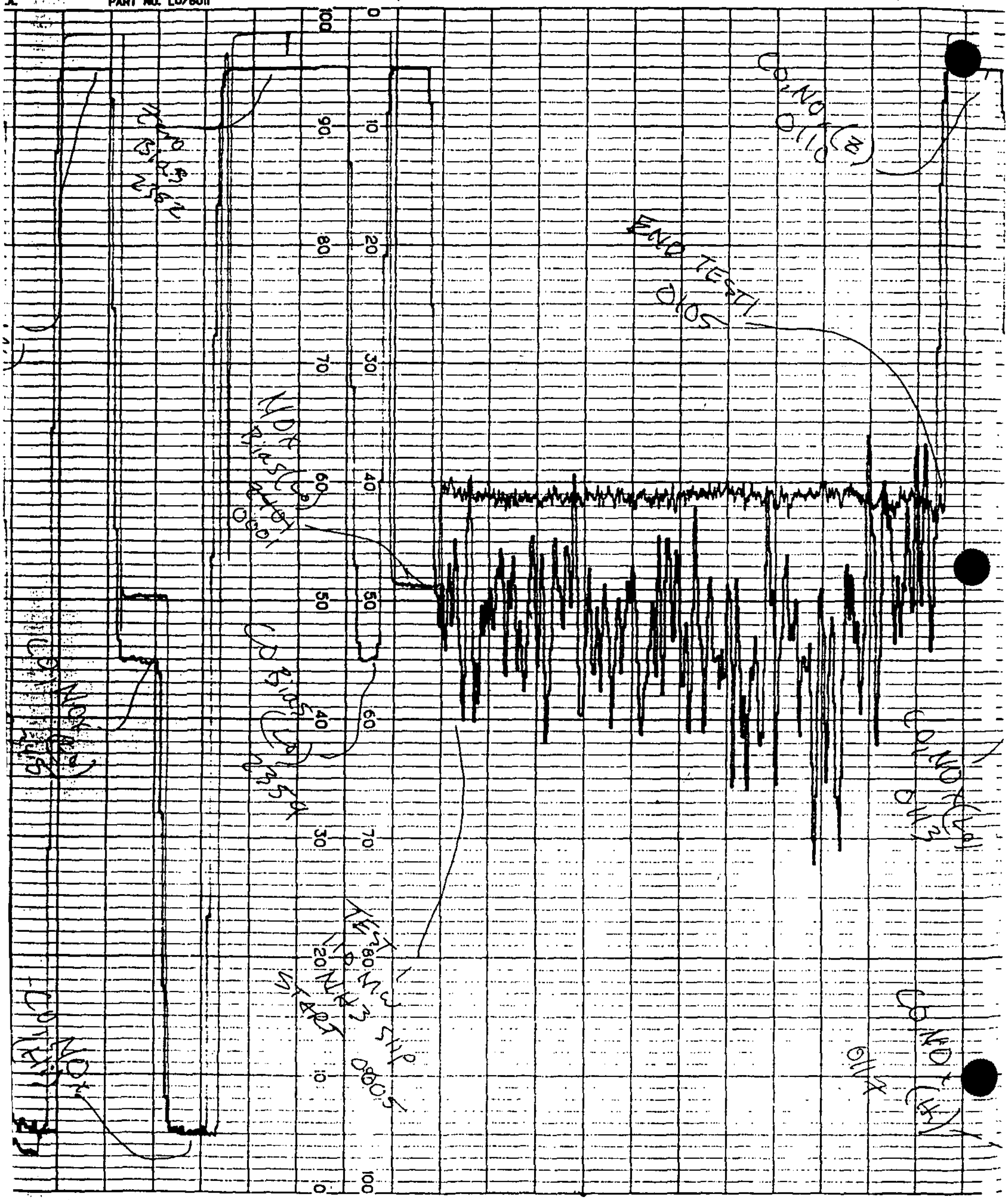


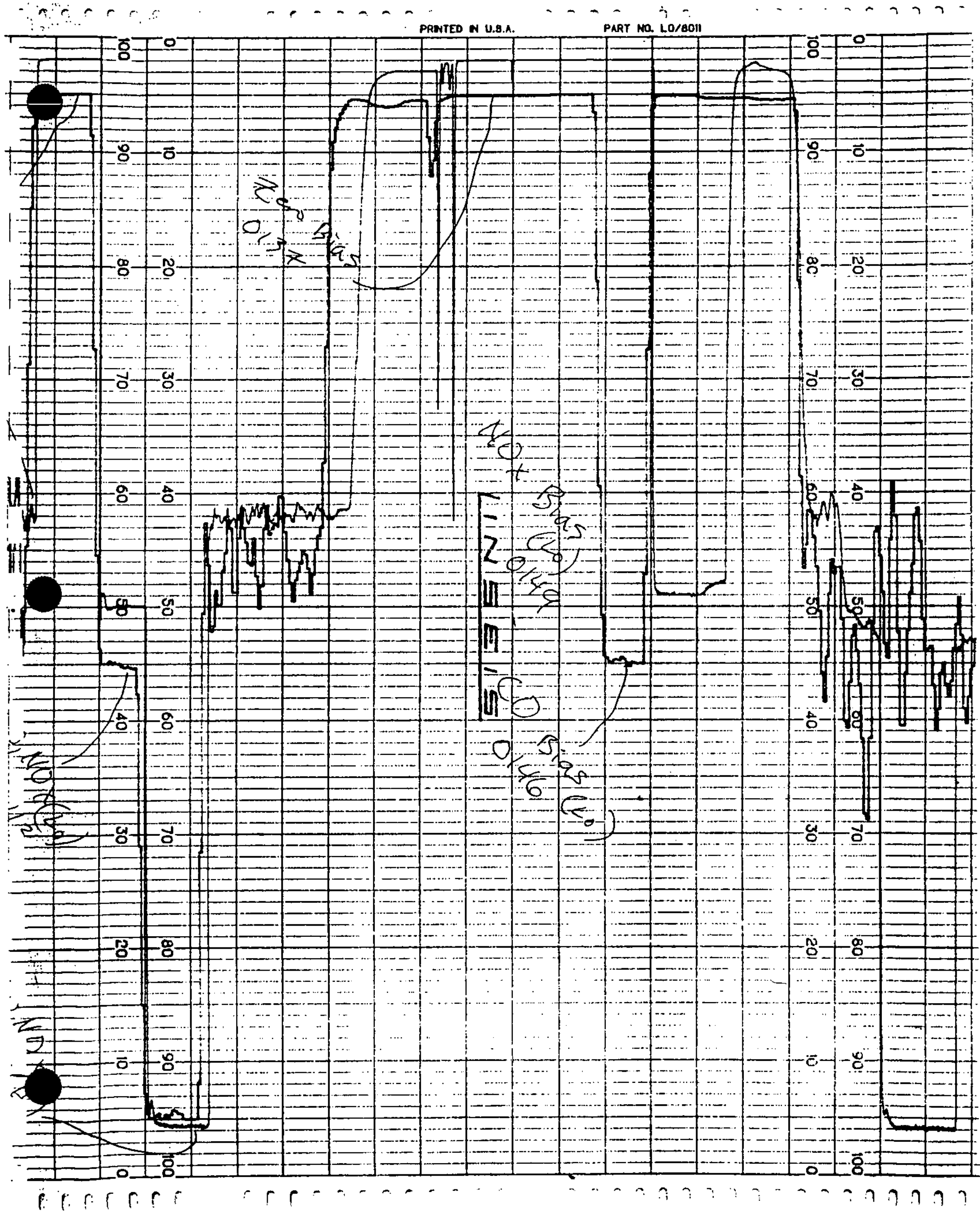
PRINTED IN U.S.A.
PART NO. LO/8011
Port B stack Center 2210
Port C stack CENTER 2218
Port A stack CENTER 2240
Point 2 2224
Port C CENTER 2234

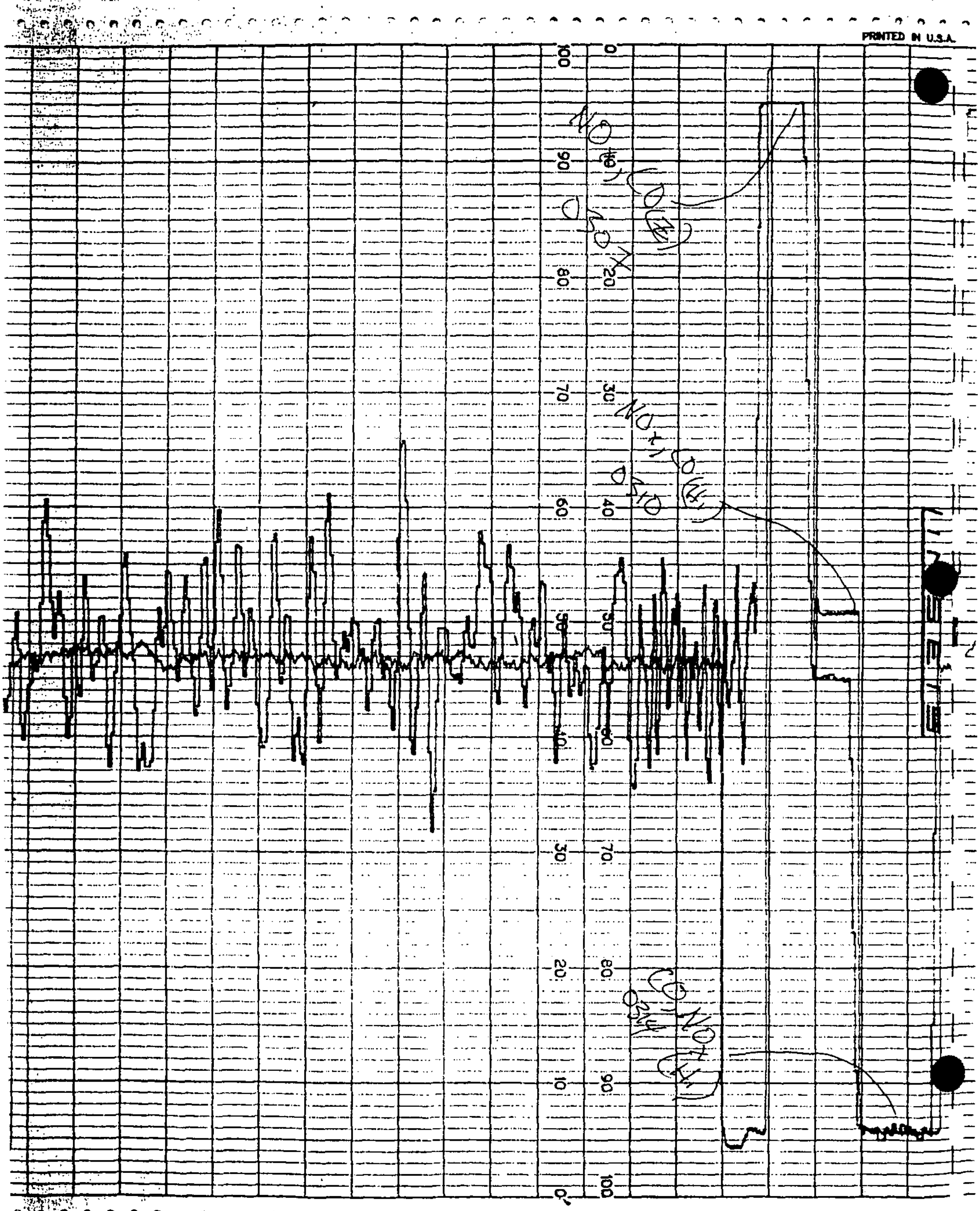
PRINTED IN U.S.A.



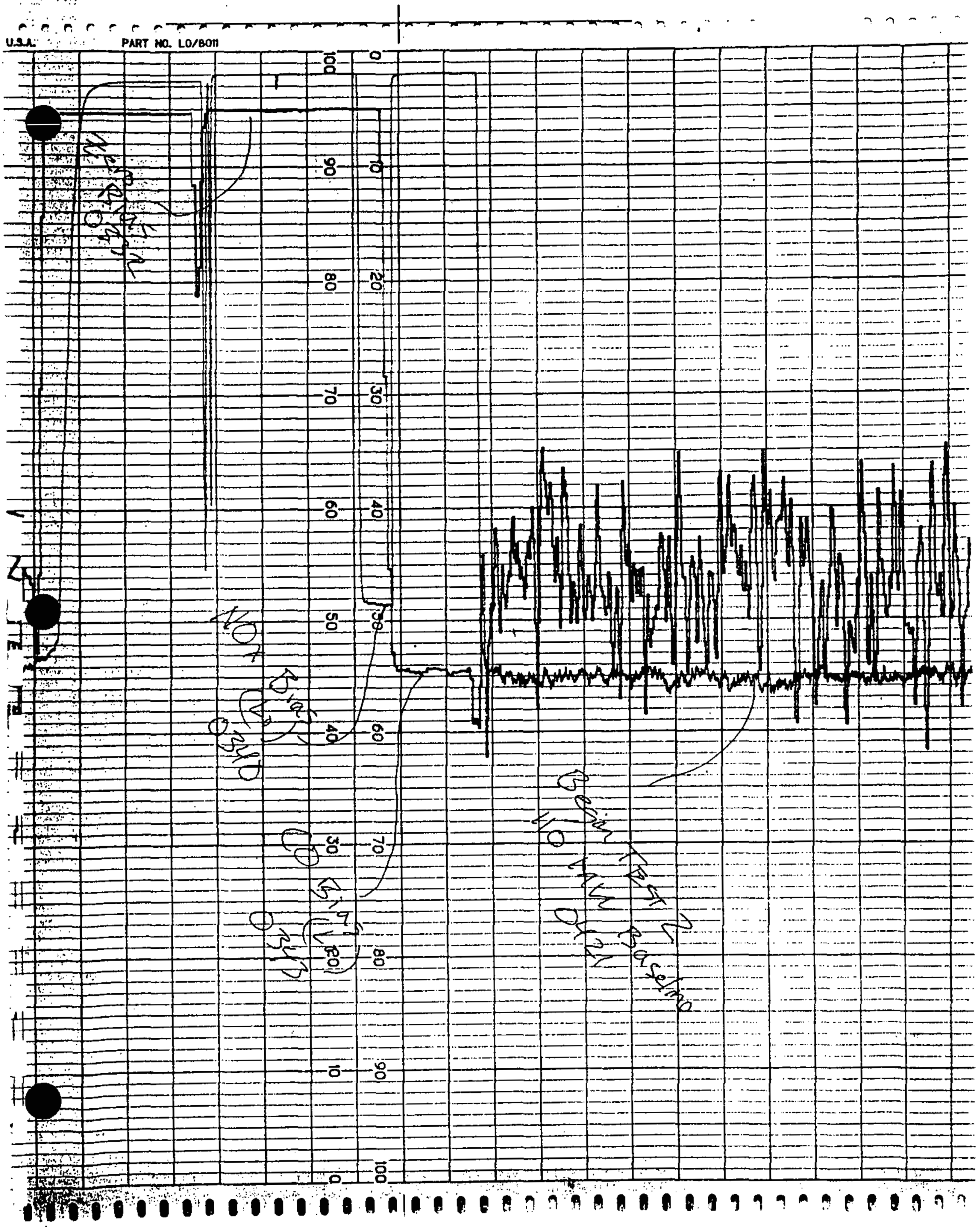
PART NO. L0/8011



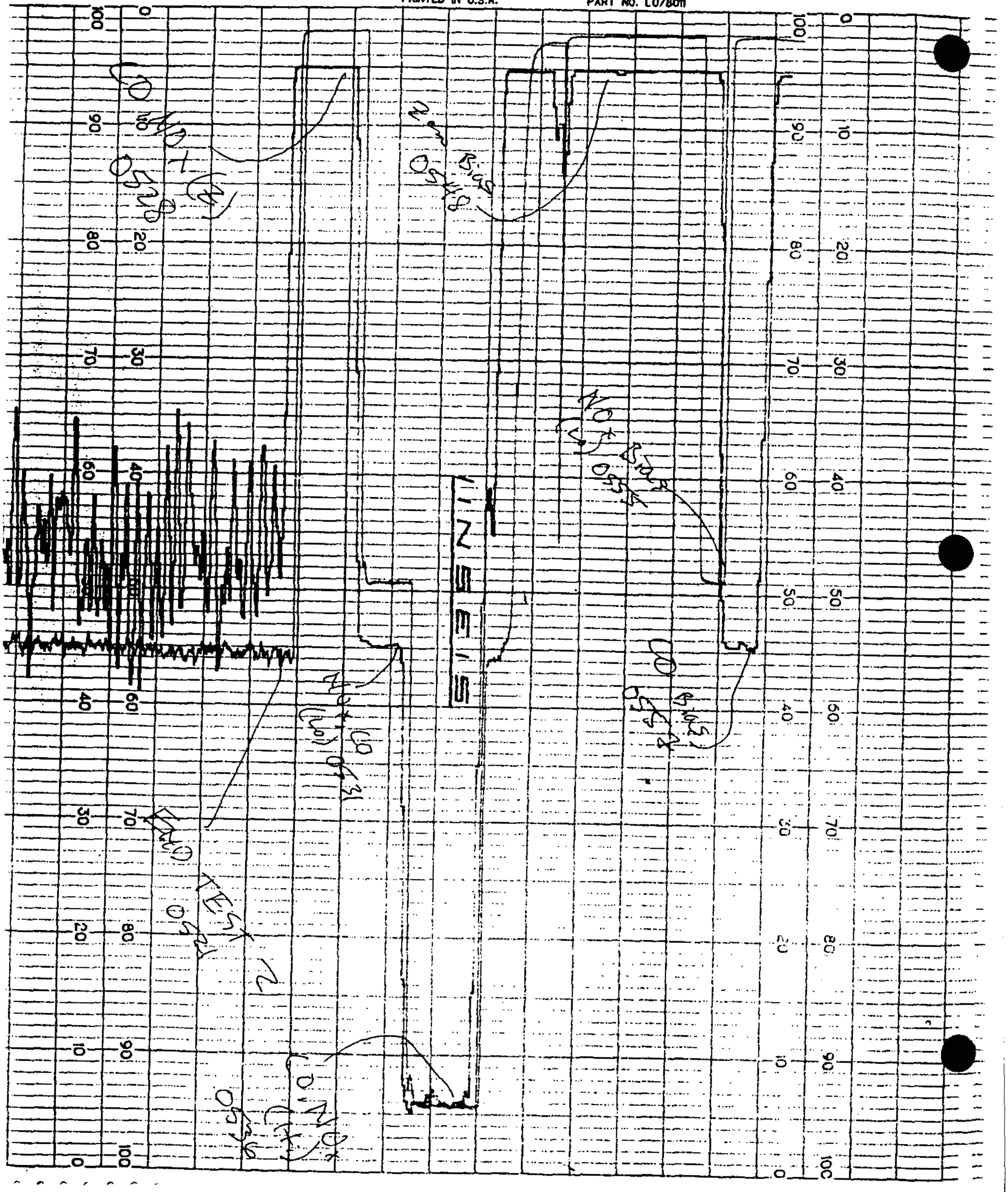

PRINTED IN U.S.A.
PART NO. LO/8011
LINSEIS

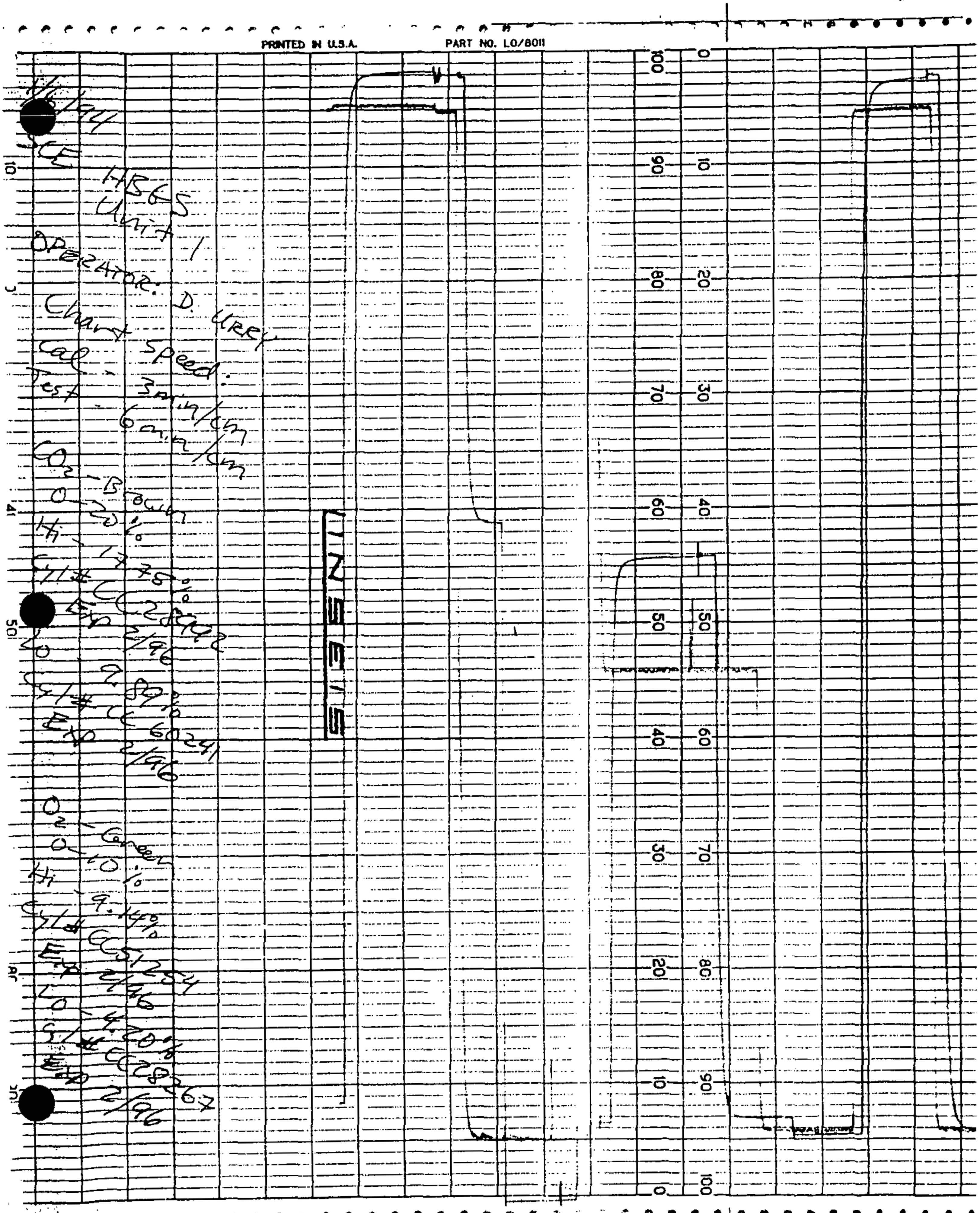

PRINTED IN U.S.A.

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

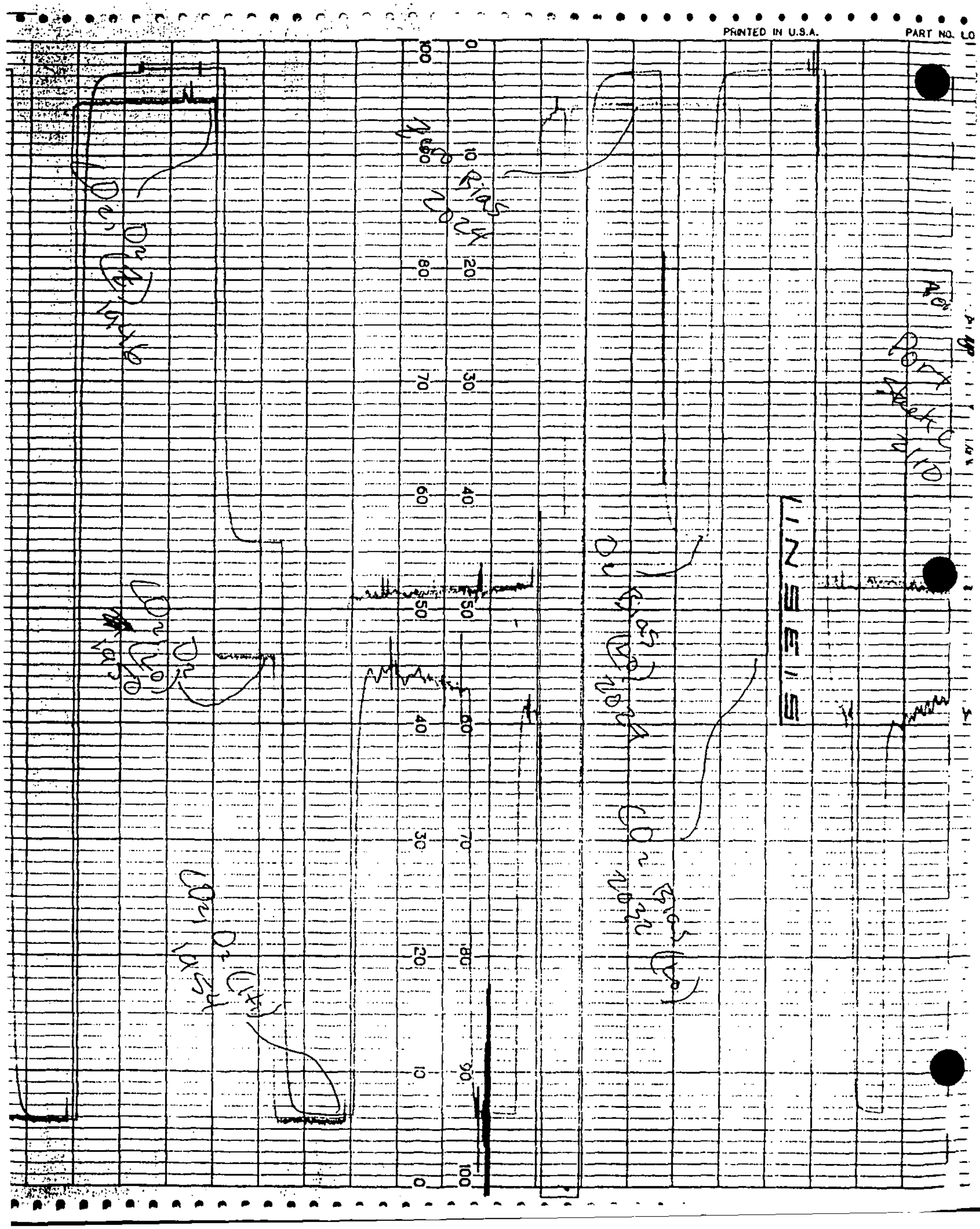


PRINTED IN U.S.A. PART NO. L0/8011

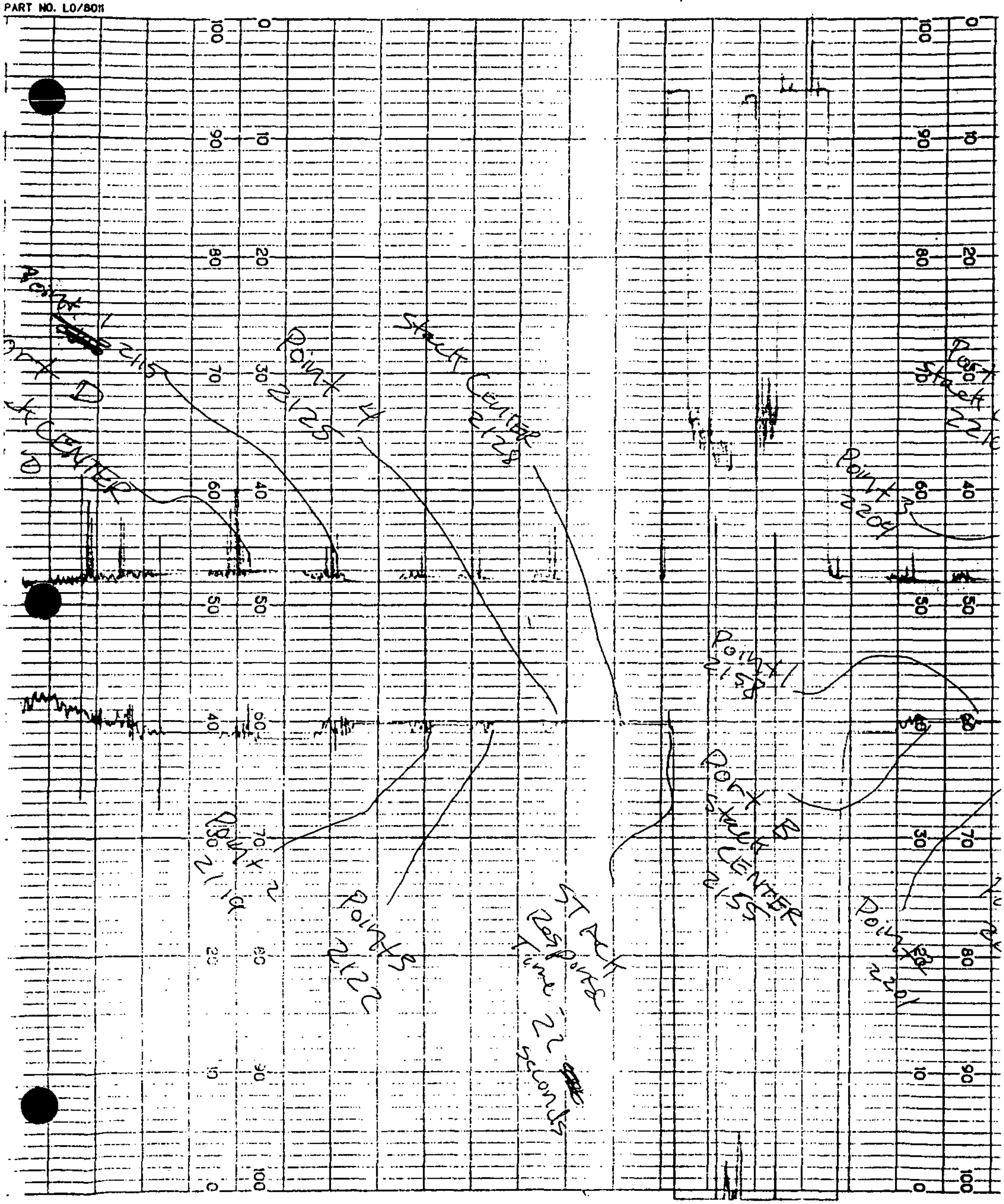




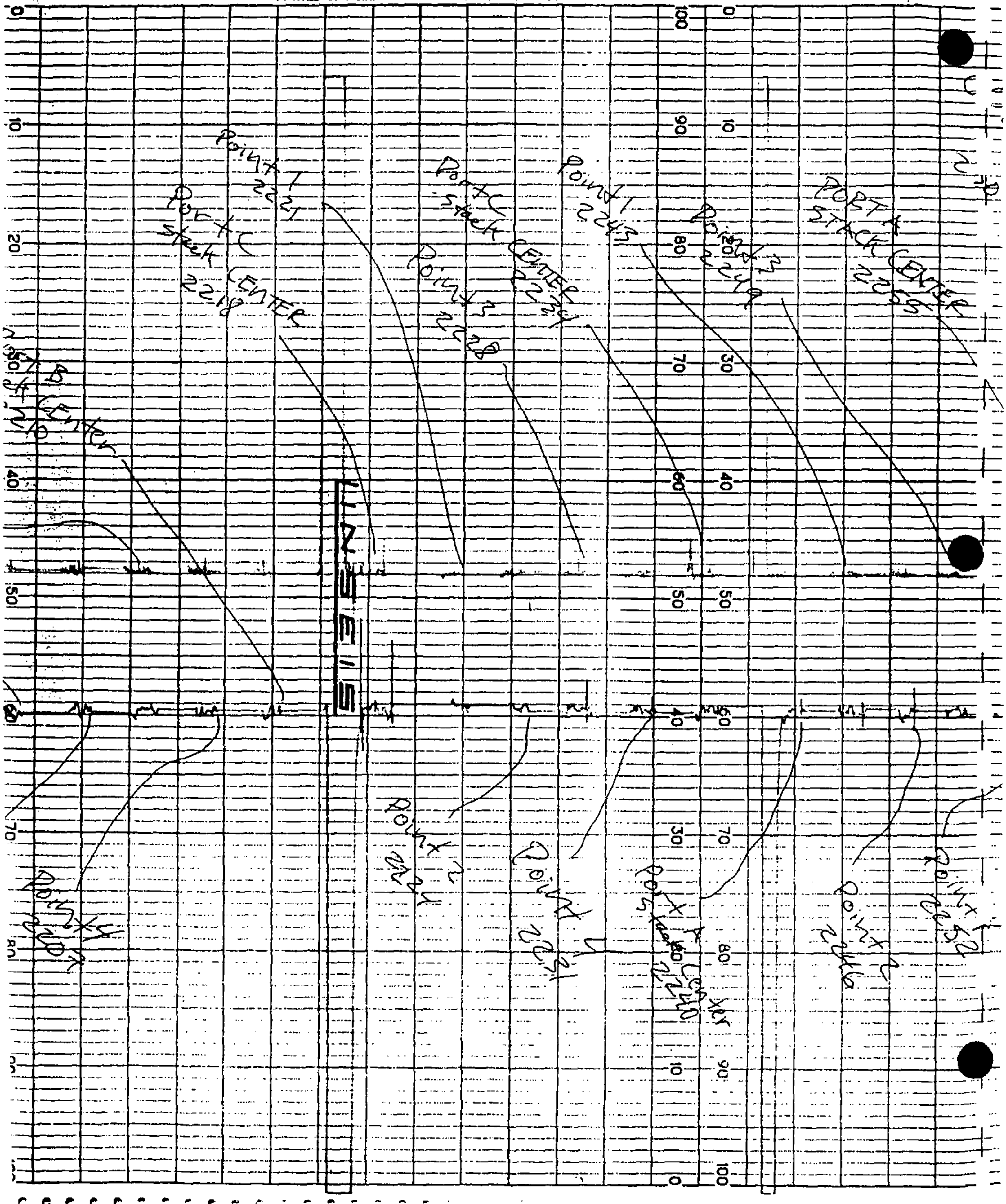
1/11/94
SCE HB65
Unit 1
OPERATOR: D. UREY
Chart Speed:
Cal - 3min/cm
Test - 6min/cm
CO_2 - Brown
0 - 0%
Hi - 17.75%
Cyl # CC28442
Exp 2/96
Lo - 8.89%
Cyl # CC 60241
Exp 2/96
O_2 - Green
0 - 0%
Hi - 9.44%
Cyl # CC51554
Exp 2/96
Lo - 4.20%
Cyl # CC28867
Exp 2/96

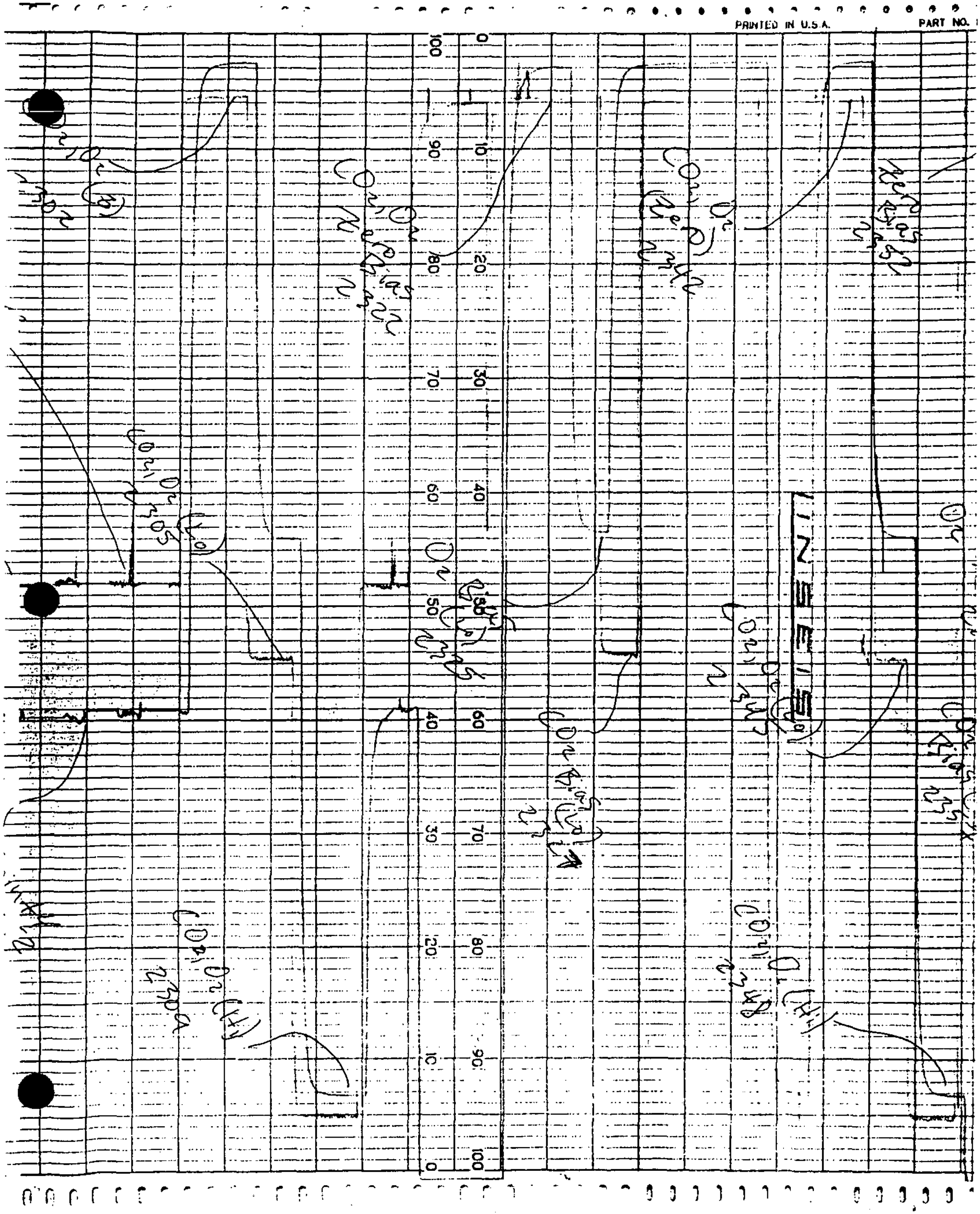

PRINTED IN U.S.A.
PART NO. LO
LINSEIS

PART NO. L0/80N

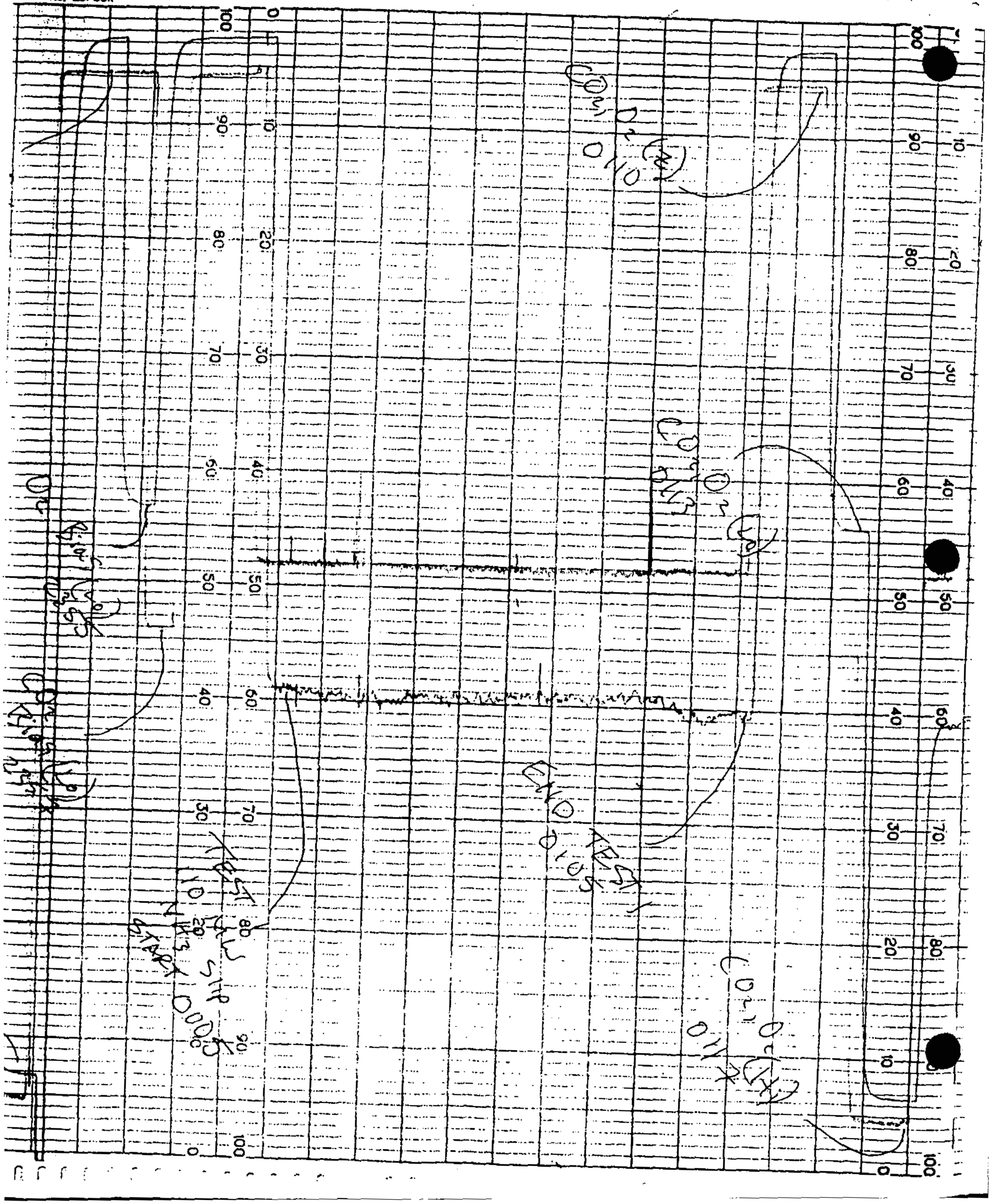


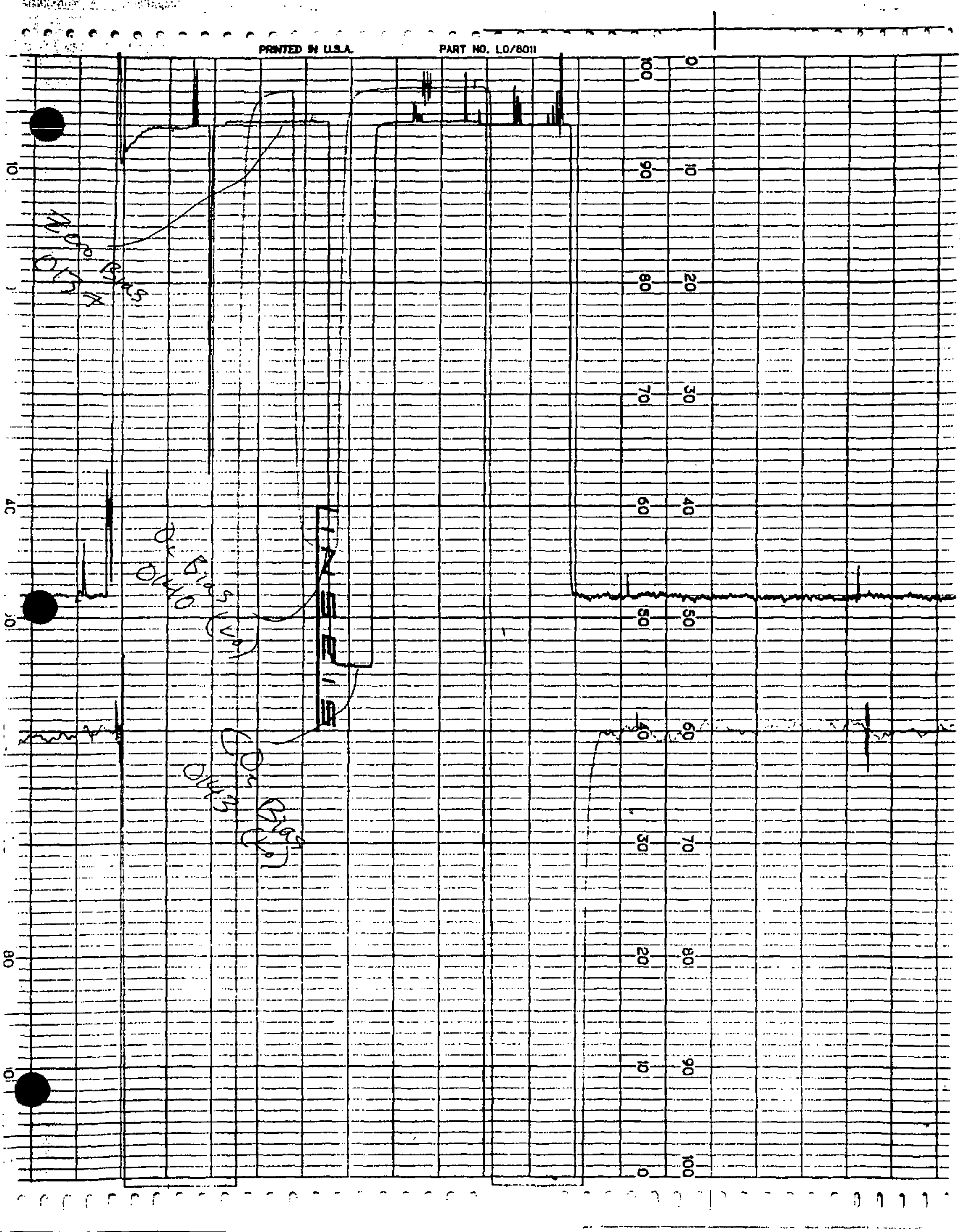
PRINTED IN U.S.A. PART NO. LO/8011

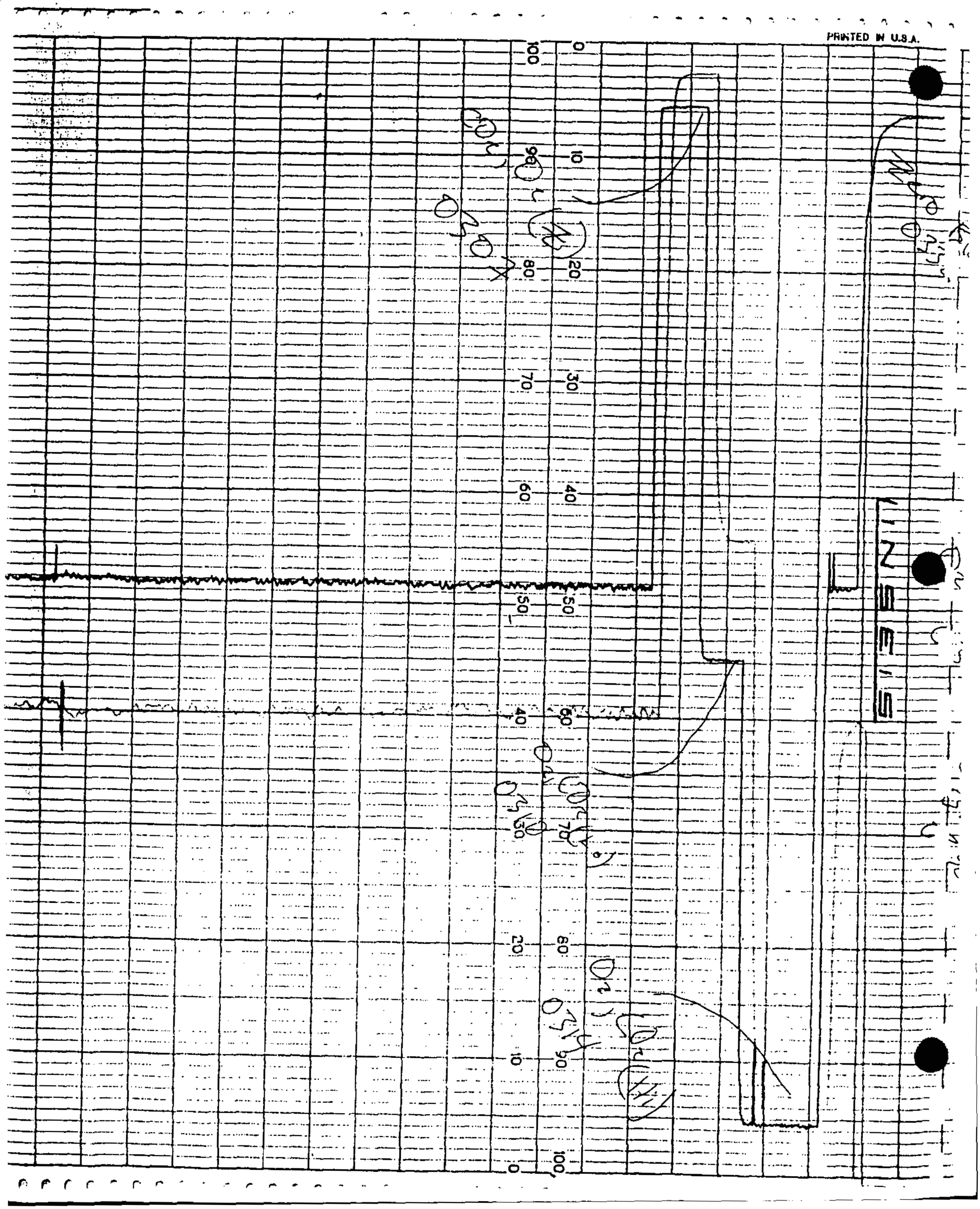



PRINTED IN U.S.A.
PART NO.
LINSEIS

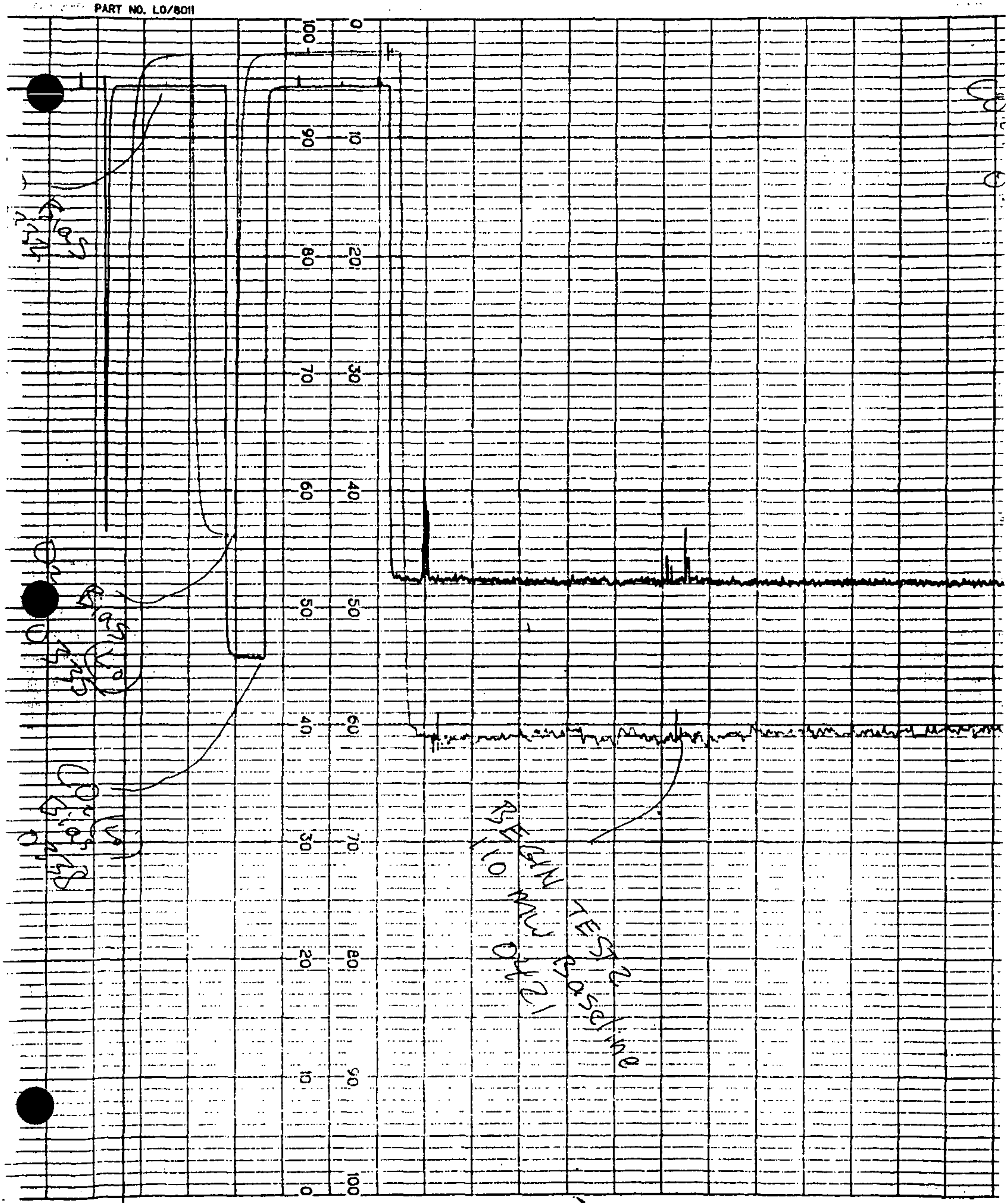
PART NO. L0/6011



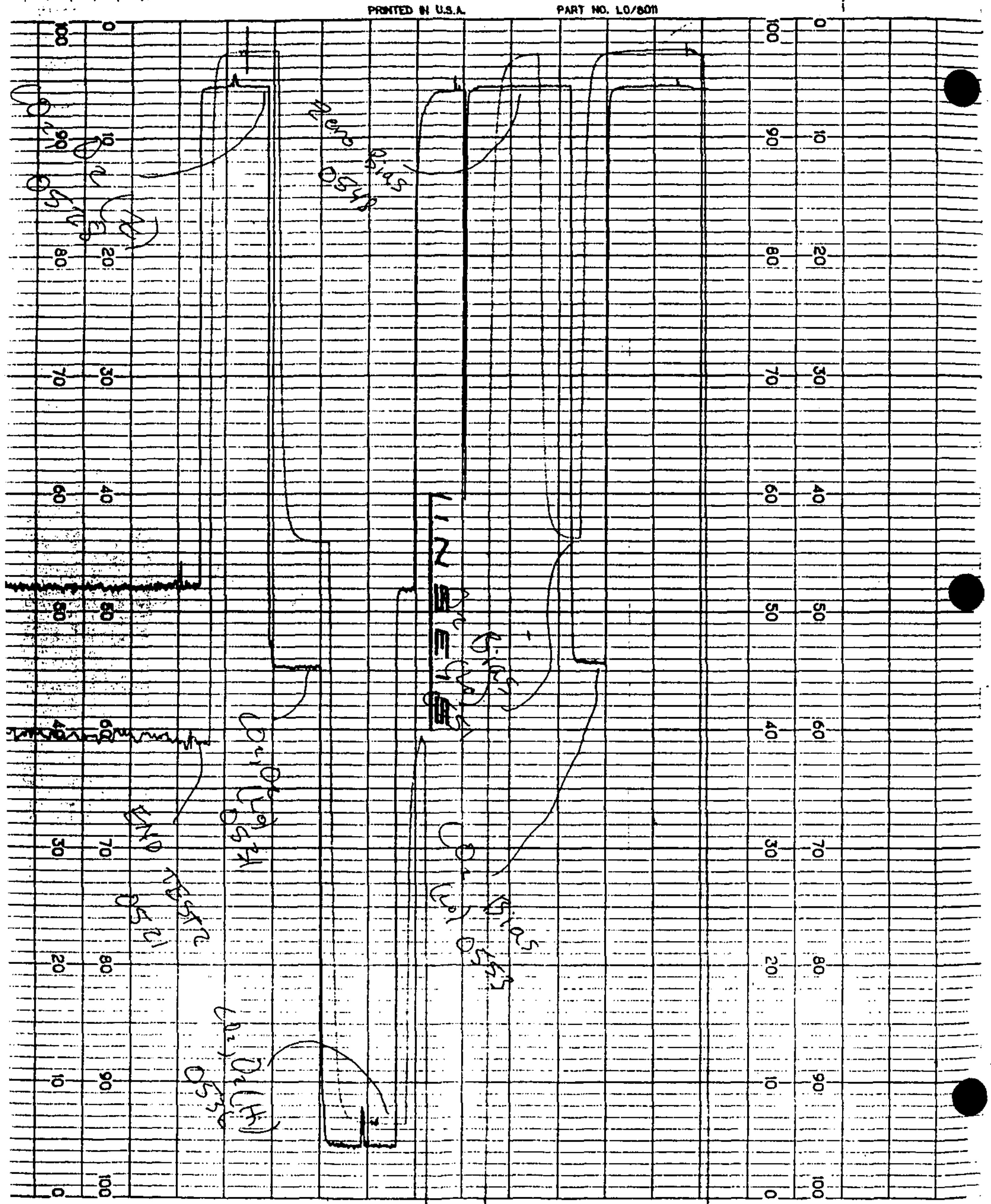

PRINTED IN U.S.A.
PART NO. LO/8011

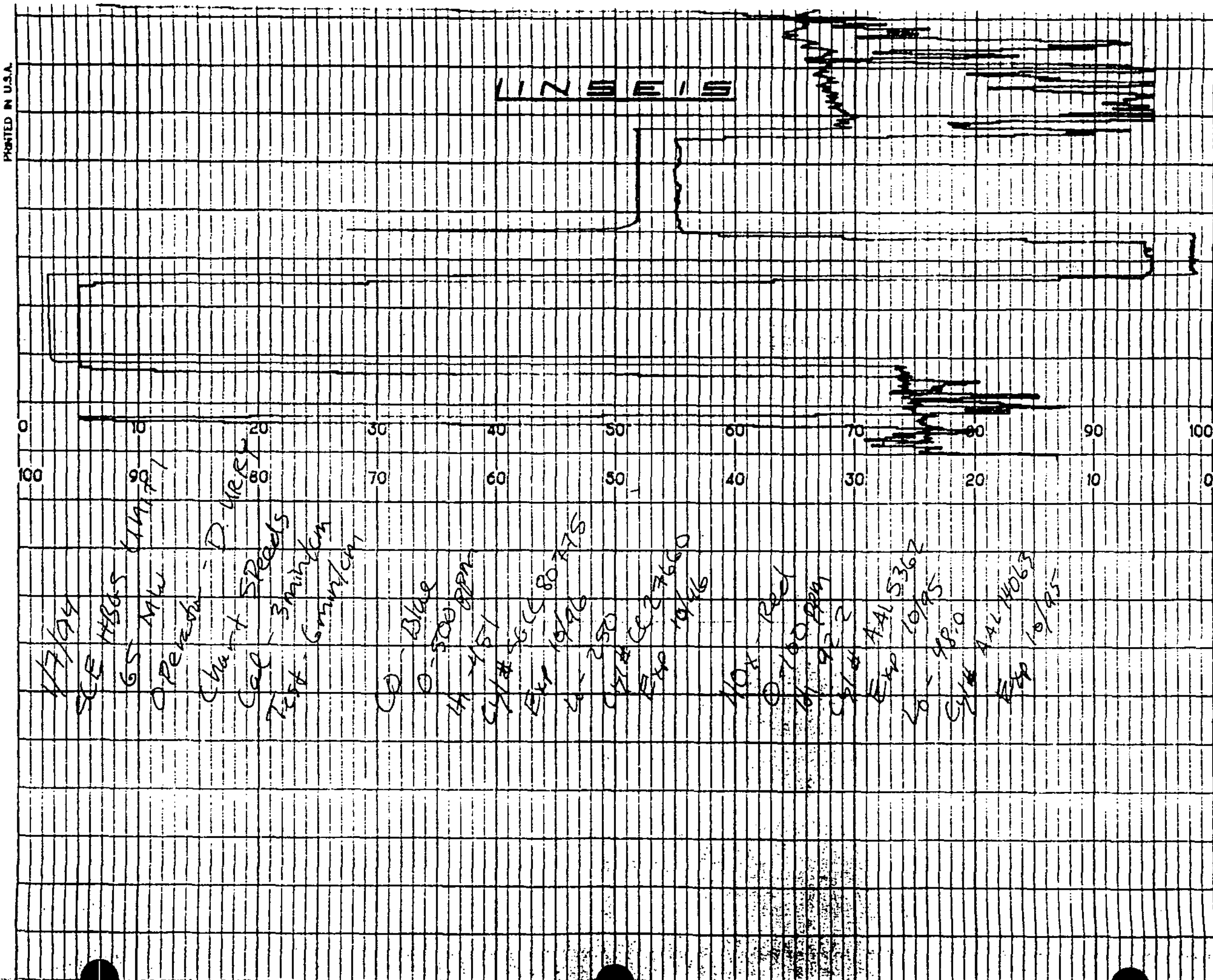

PRINTED IN U.S.A.
LINSEIS

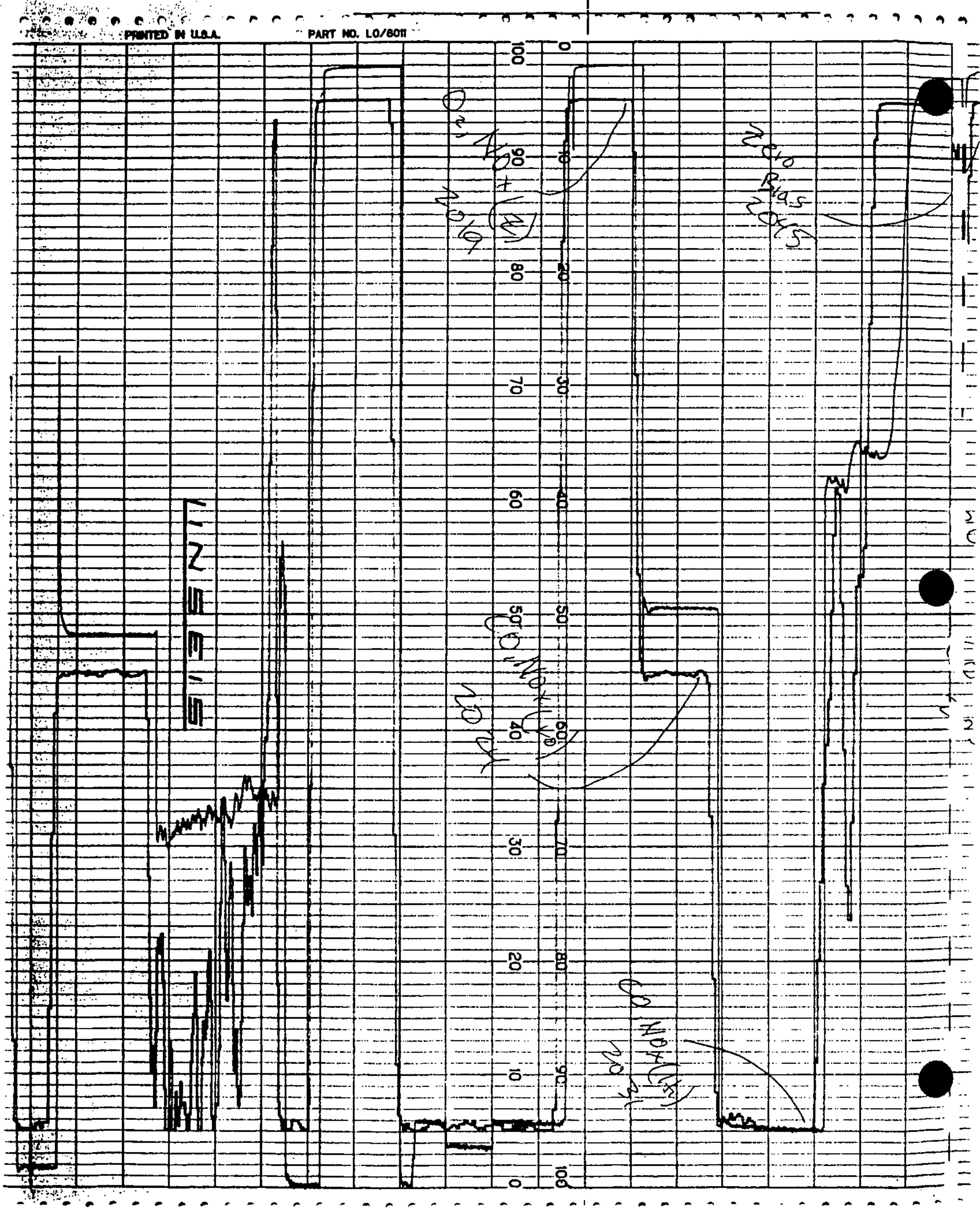
PART NO. LO/8011



PRINTED IN U.S.A.   PART NO. L0/8011




PRINTED IN U.S.A.
LINSEIS
1/7/94
SCE HB65 Unit 1
65 MW
Operator - D. Urry
Chart Speeds
Cal - 3min/cm
Test - 6min/cm
CO - Blue
0-500 ppm
Hi - 451
Cyl # SCC 80775
Exp 10/96
Lo - 250
Cyl # CC27660
Exp 10/96
NOx - Red
0-100 ppm
Hi - 92.2
Cyl # AAL 5362
Exp 10/95
Lo - 48.0
Cyl # AAL 14063
Exp 10/95


PRINTED IN U.S.A.
PART NO. LO/6011
100
90
80
70
60
50
40
30
20
10
0

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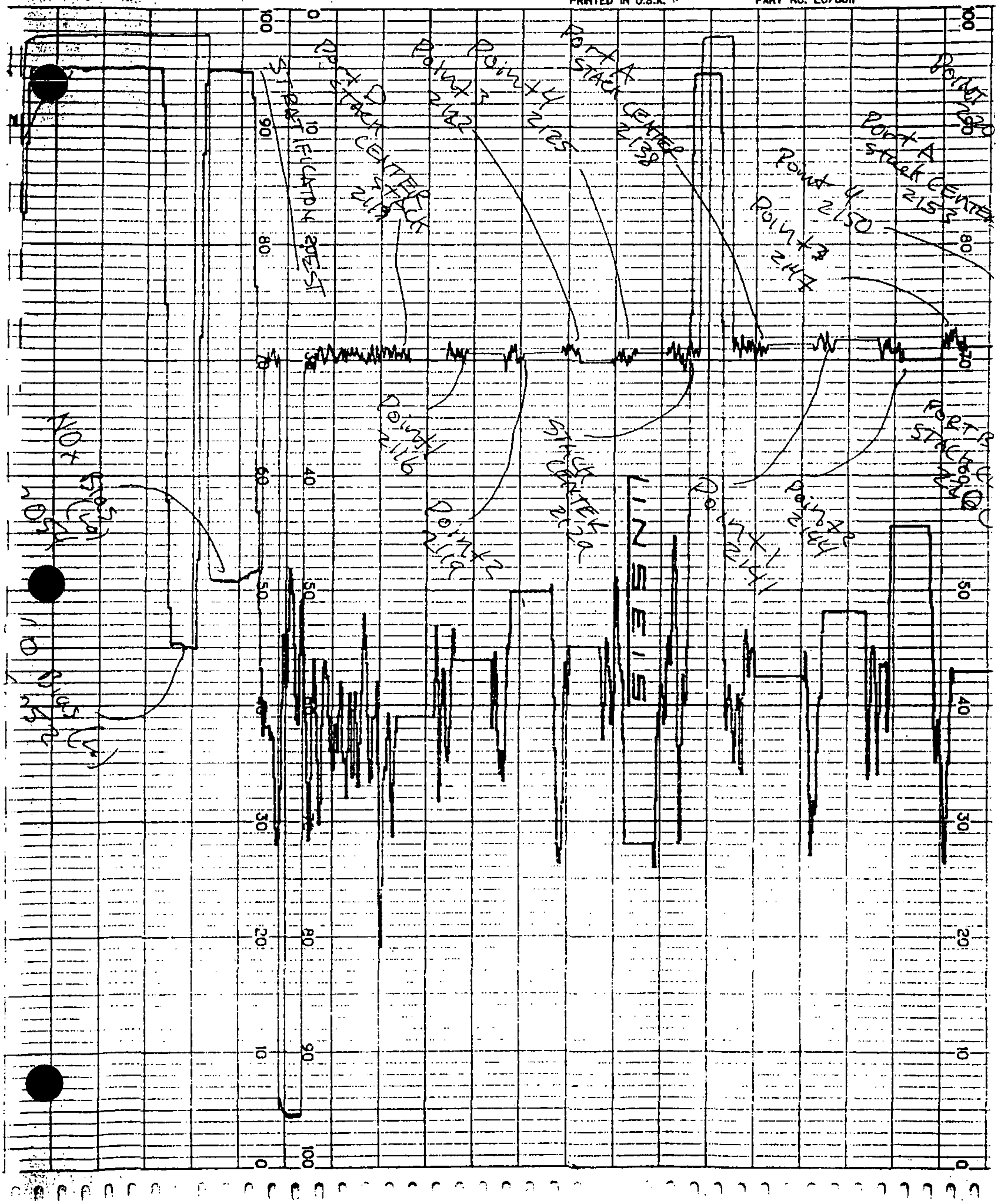

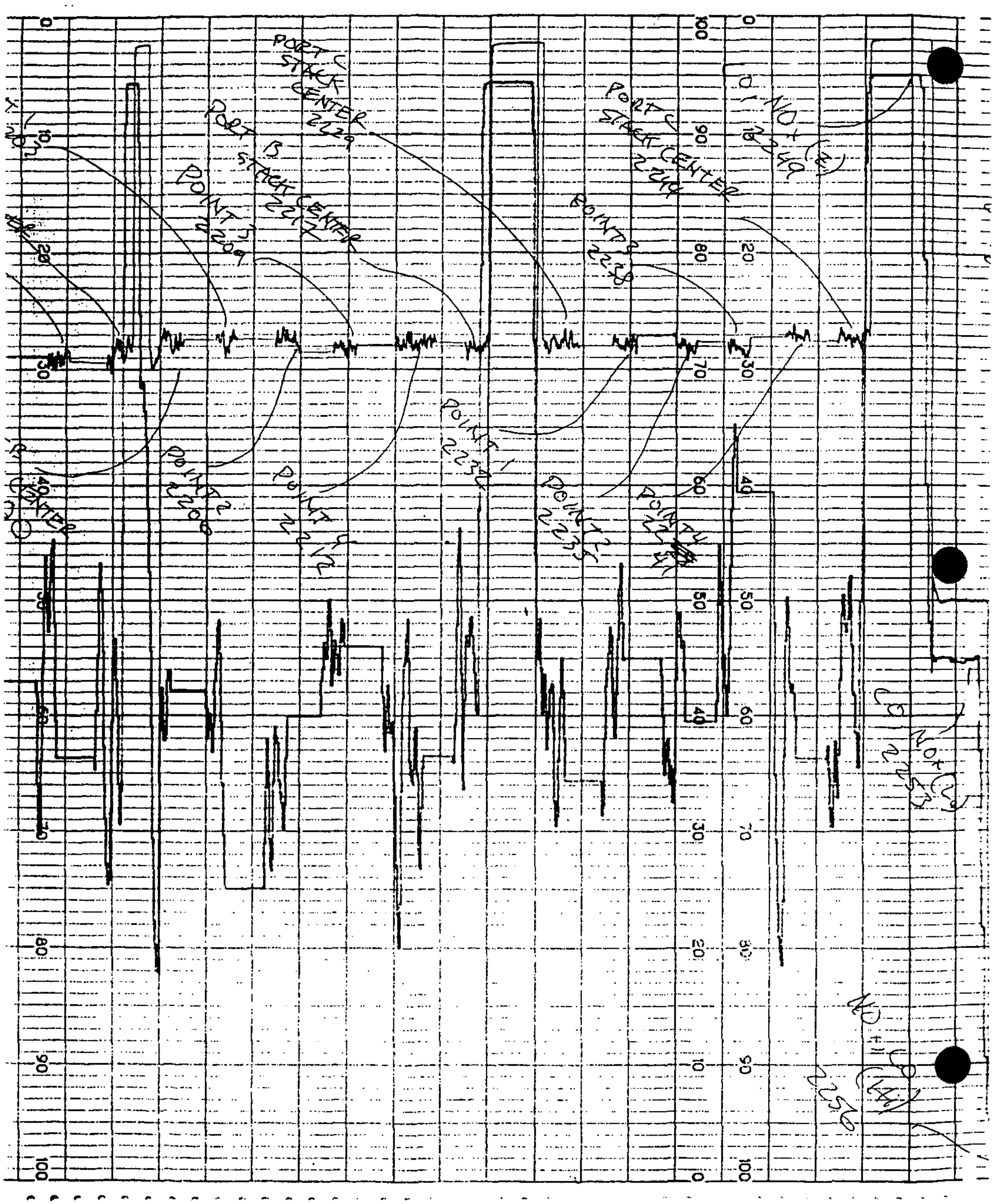
PORT C STACK CENTER 2229
PORT B STACK CENTER 2217
POINT 3 2209
POINT 2 2206
POINT 4 2212
POINT 1 2230
POINT 2 2233
POINT 4
PORT C STACK CENTER 2244
POINT 3 2238
D1 ND + (2) 2249
LO NOT (2) 2253
ND + II (LH) 2256
B CENTER

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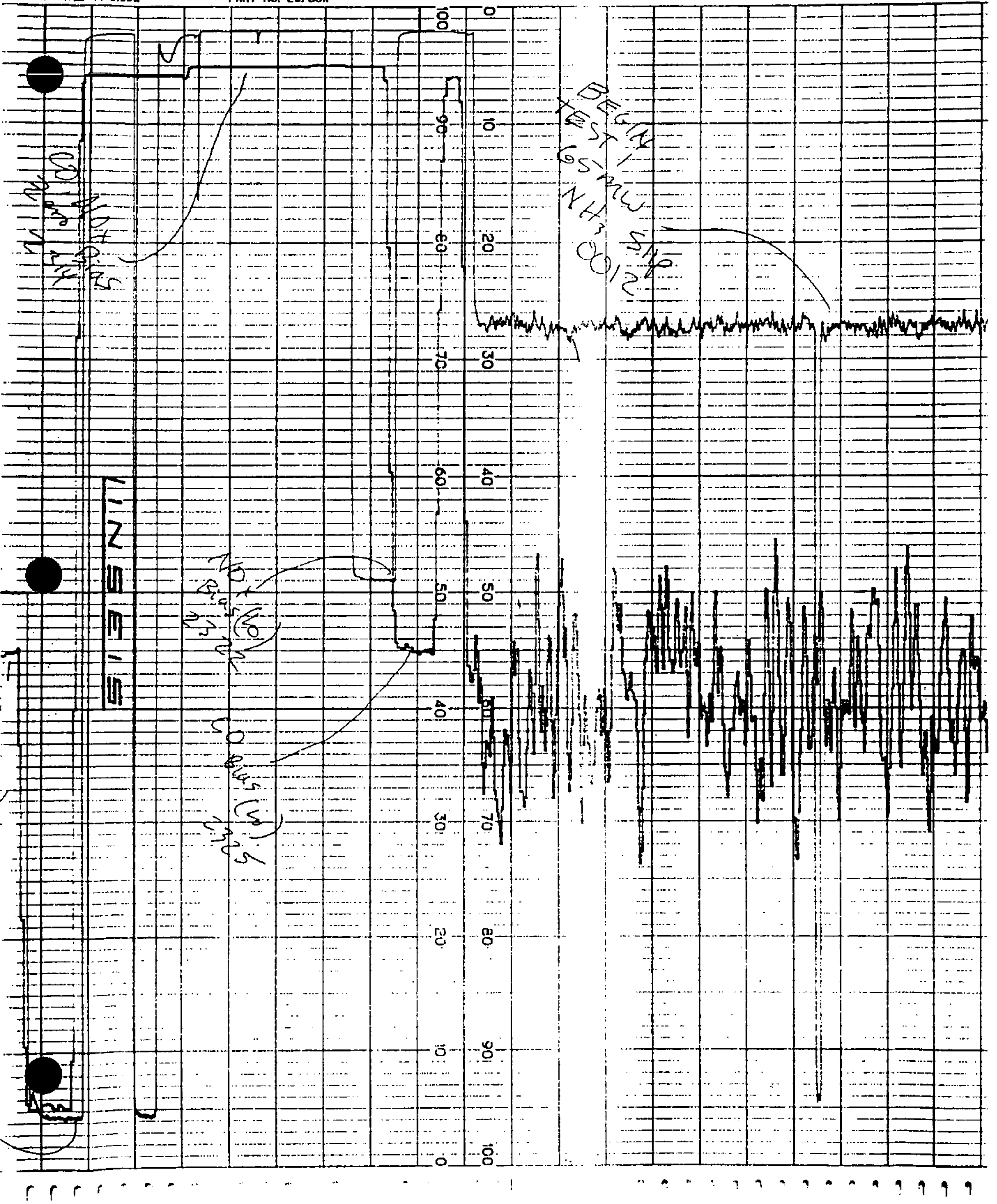

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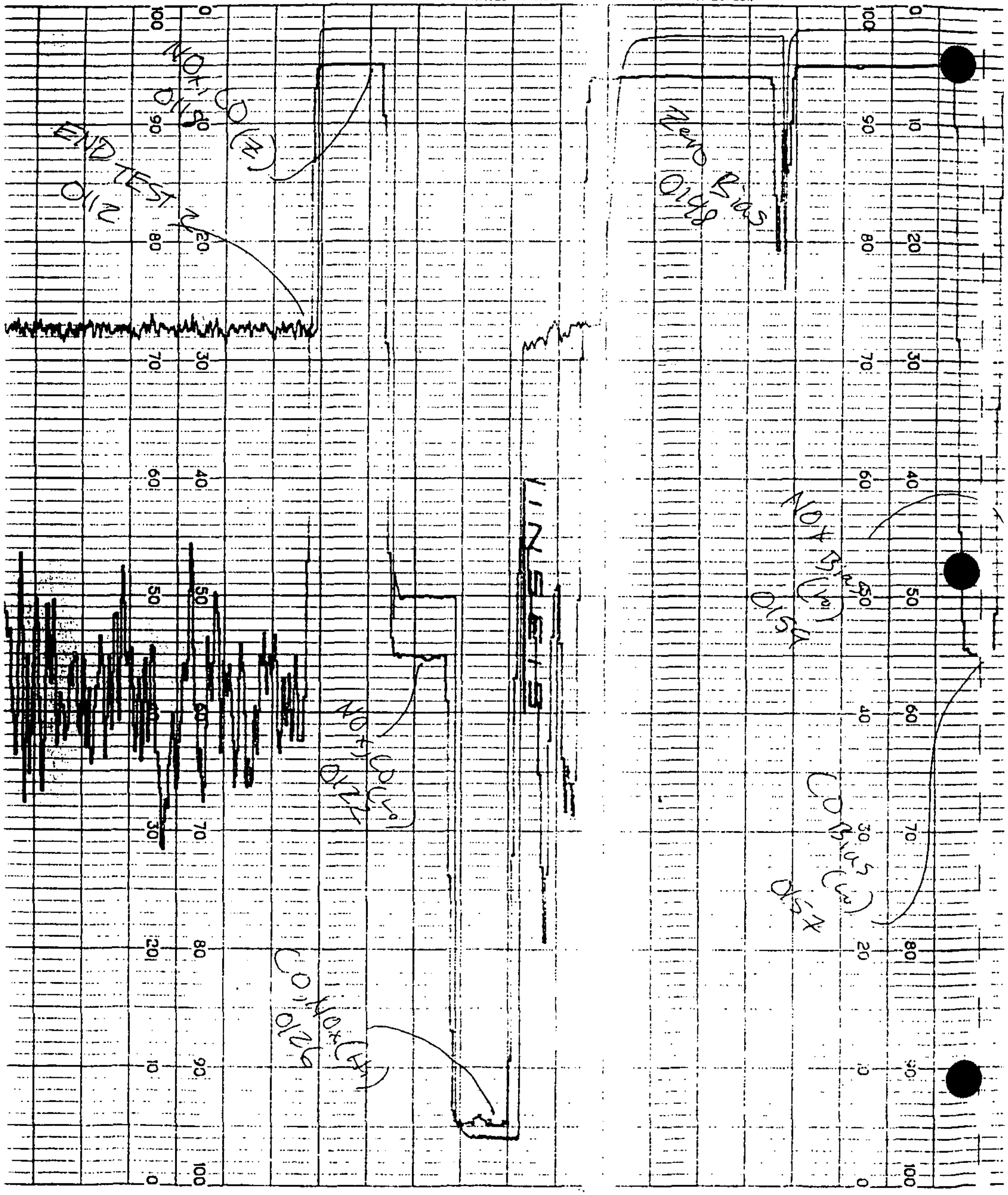

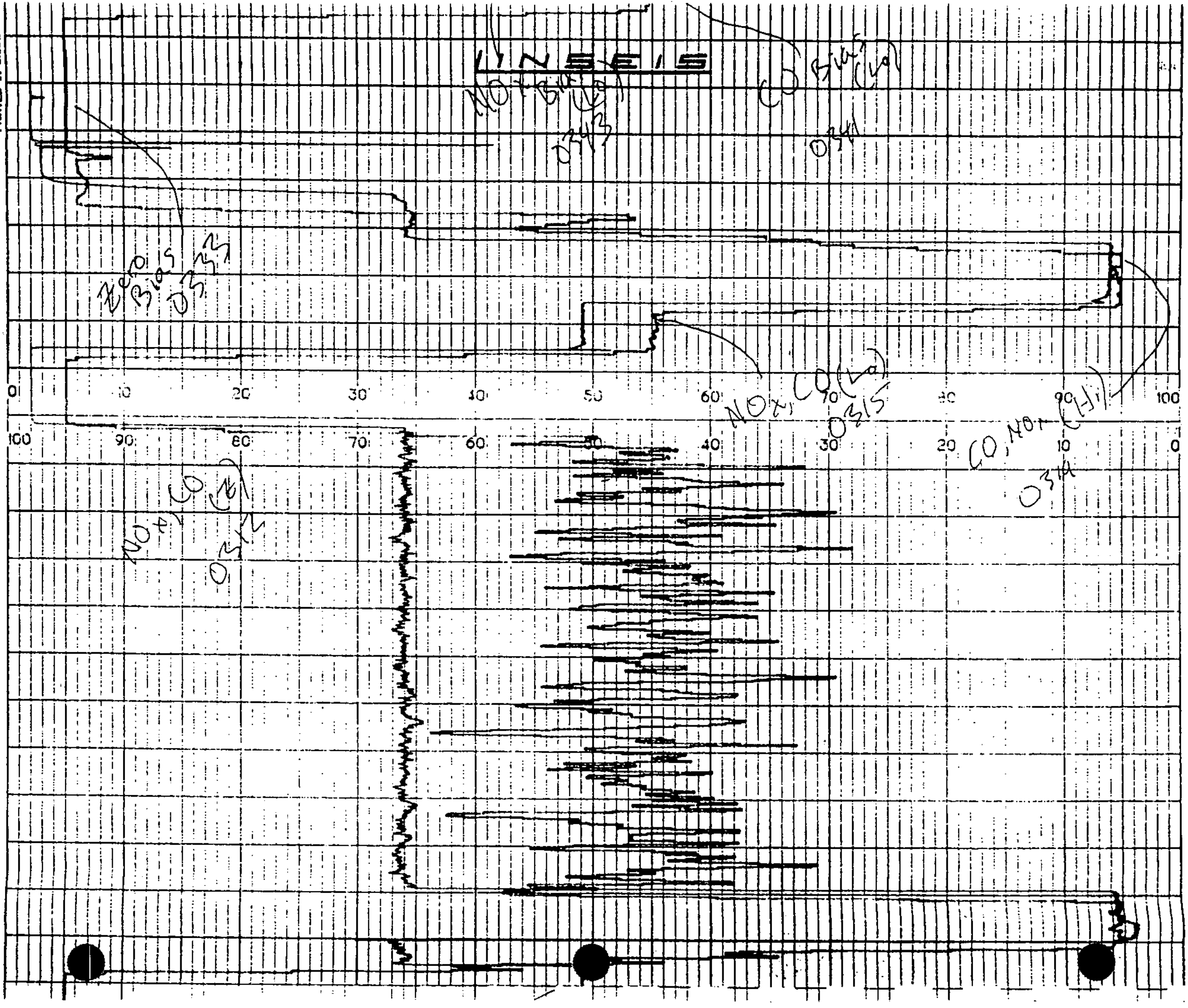
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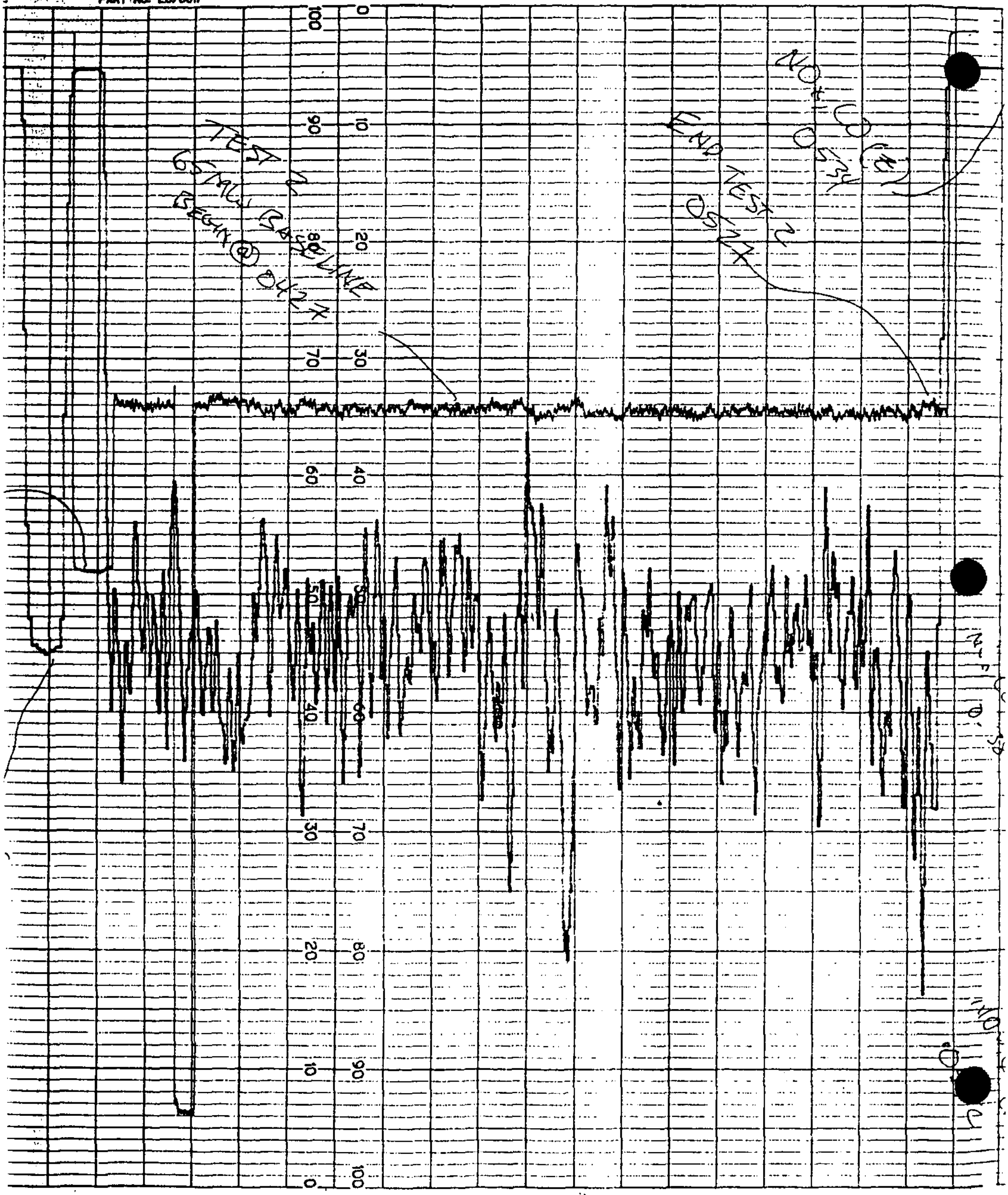
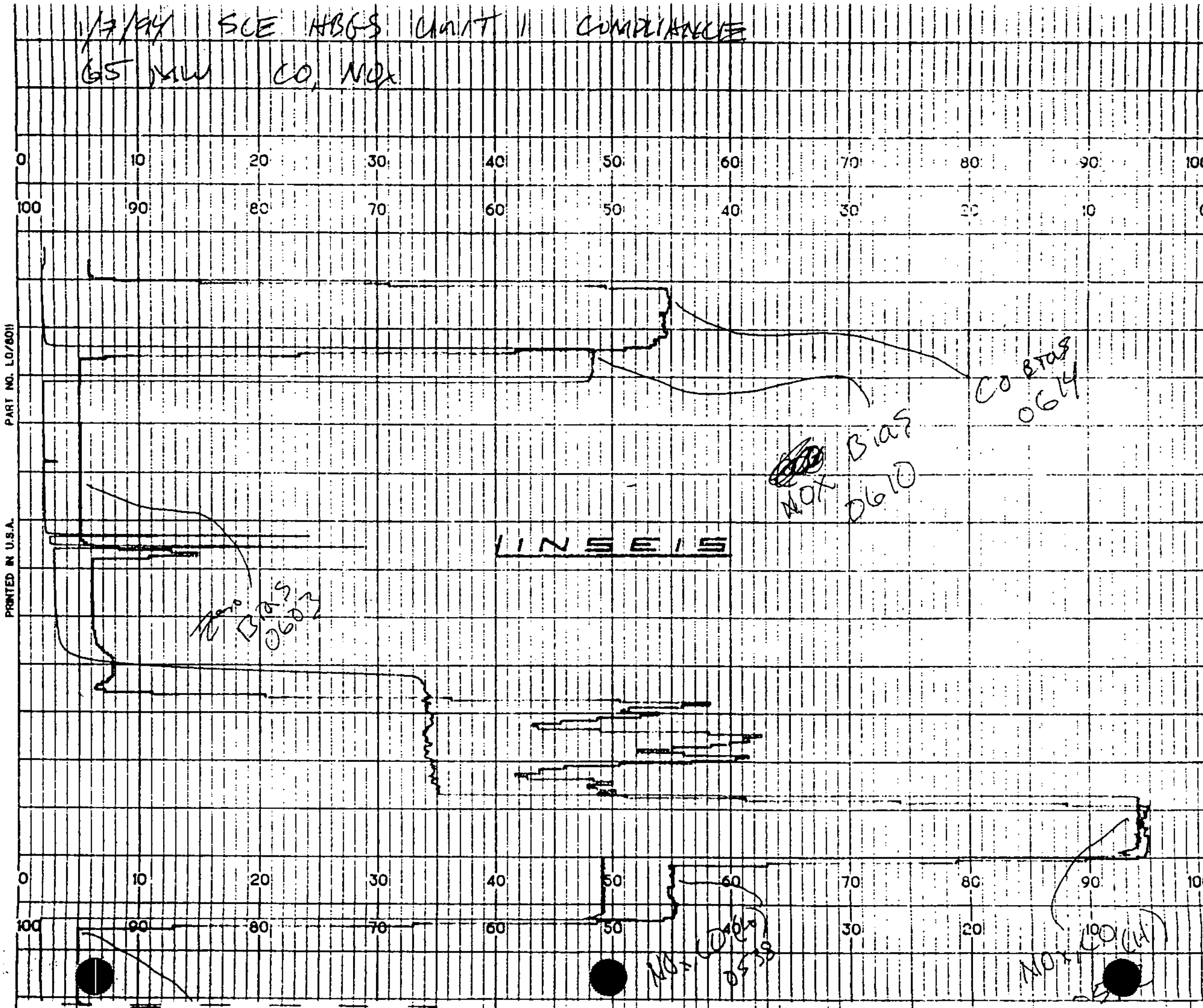
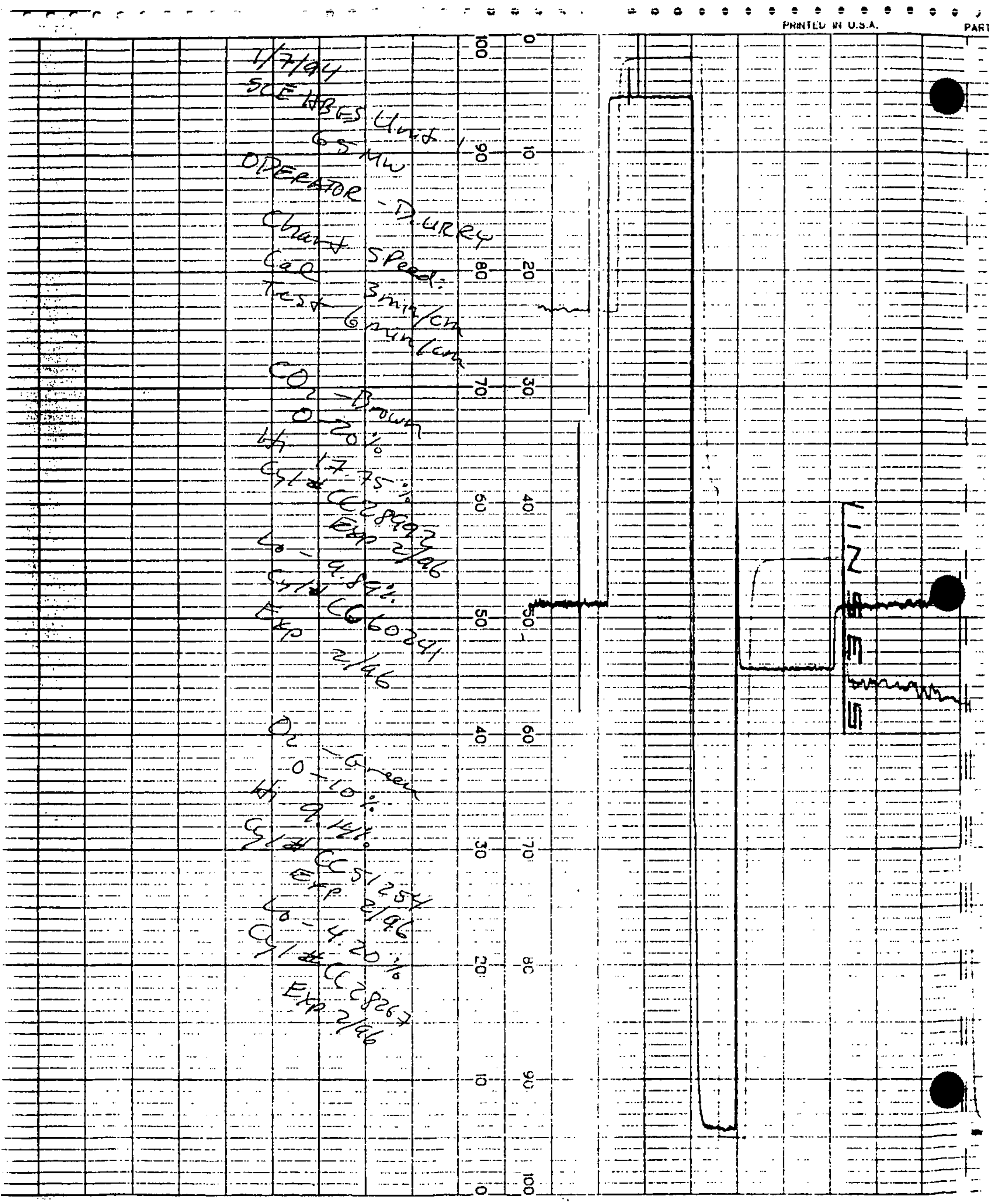
0 10 20 30 40 50 60 70 80 90 100
100 90 80 70 60 50 40 30 20 10 0

PART NO. L0/6011

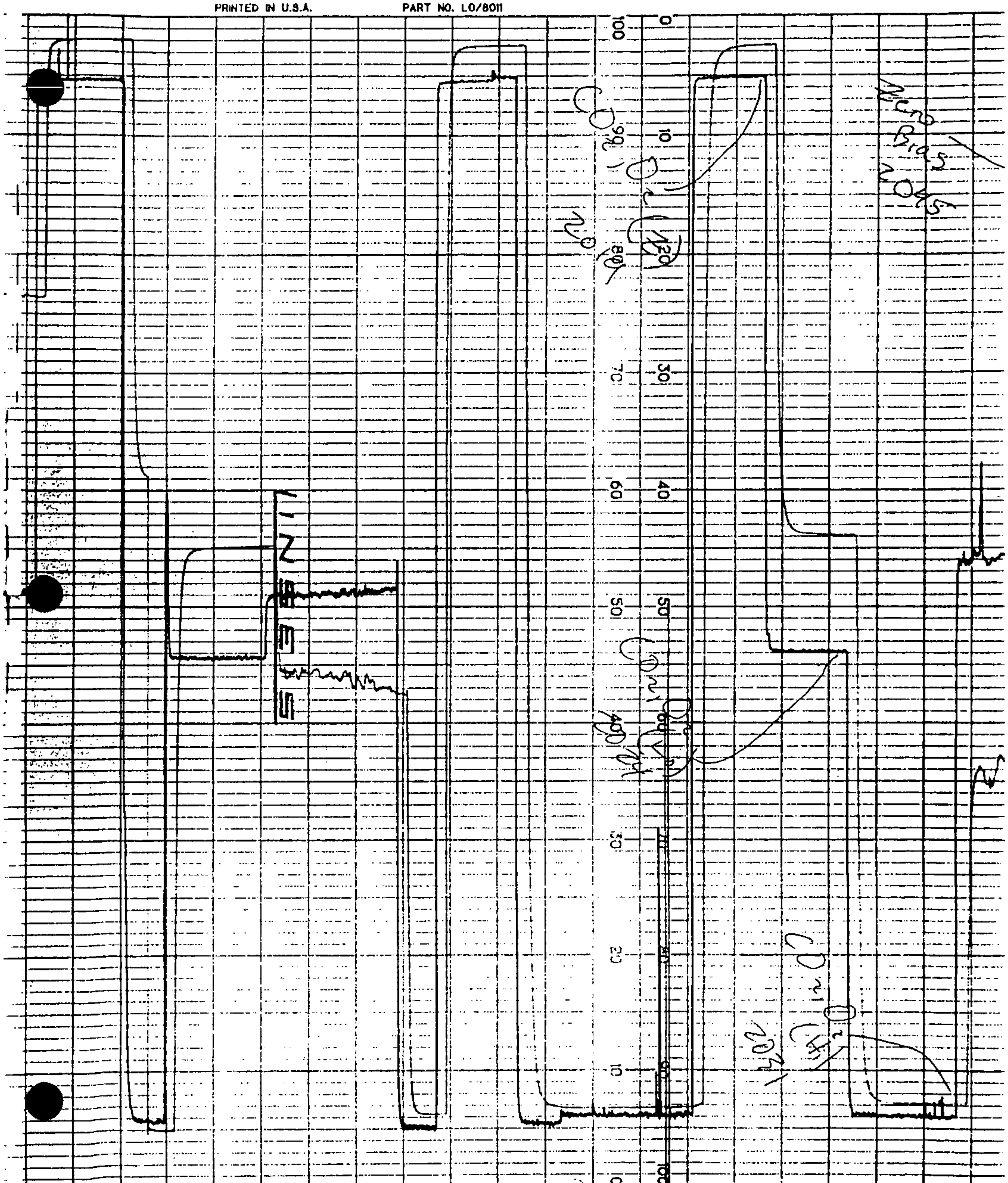


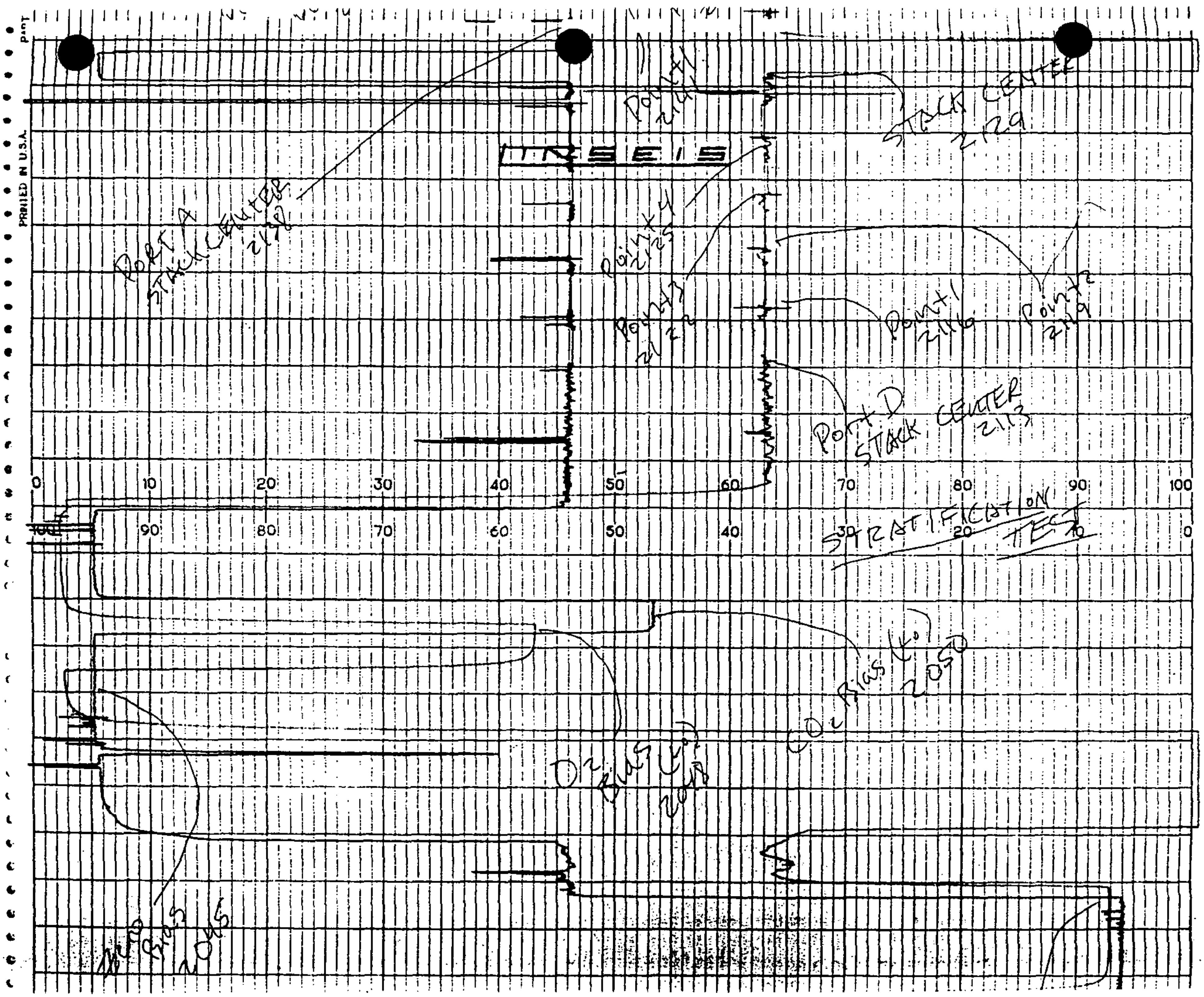
PRINTED IN U.S.A. PART NO. LO/8011



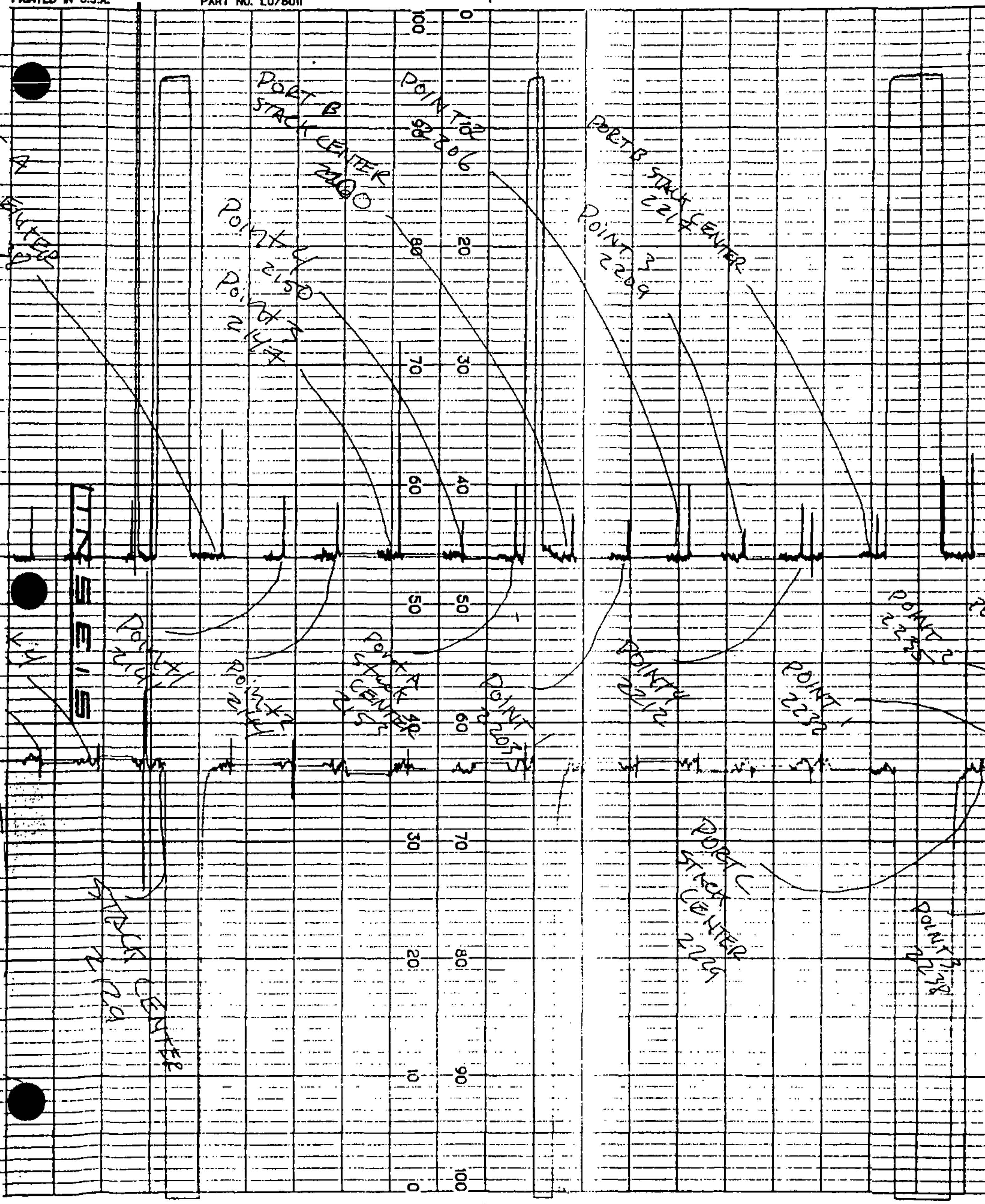

PRINTED IN U.S.A.
1/7/94
SCE HBGS Unit 1
65 MW
OPERATOR - D. URREY
Chart Speed:
Cal 3 min/cm
Test 6 min/cm
CO2 - Brown
0 - 20%
Hi 17.75%
Cyl # CC28992
Exp 2/96
Lo - 4.58%
Cyl # CC60241
Exp 2/96
O2 - Green
0 - 10%
Hi 9.14%
Cyl # CC51257
Exp. 2/96
Lo - 4.20%
Cyl # CC28267
Exp 2/96

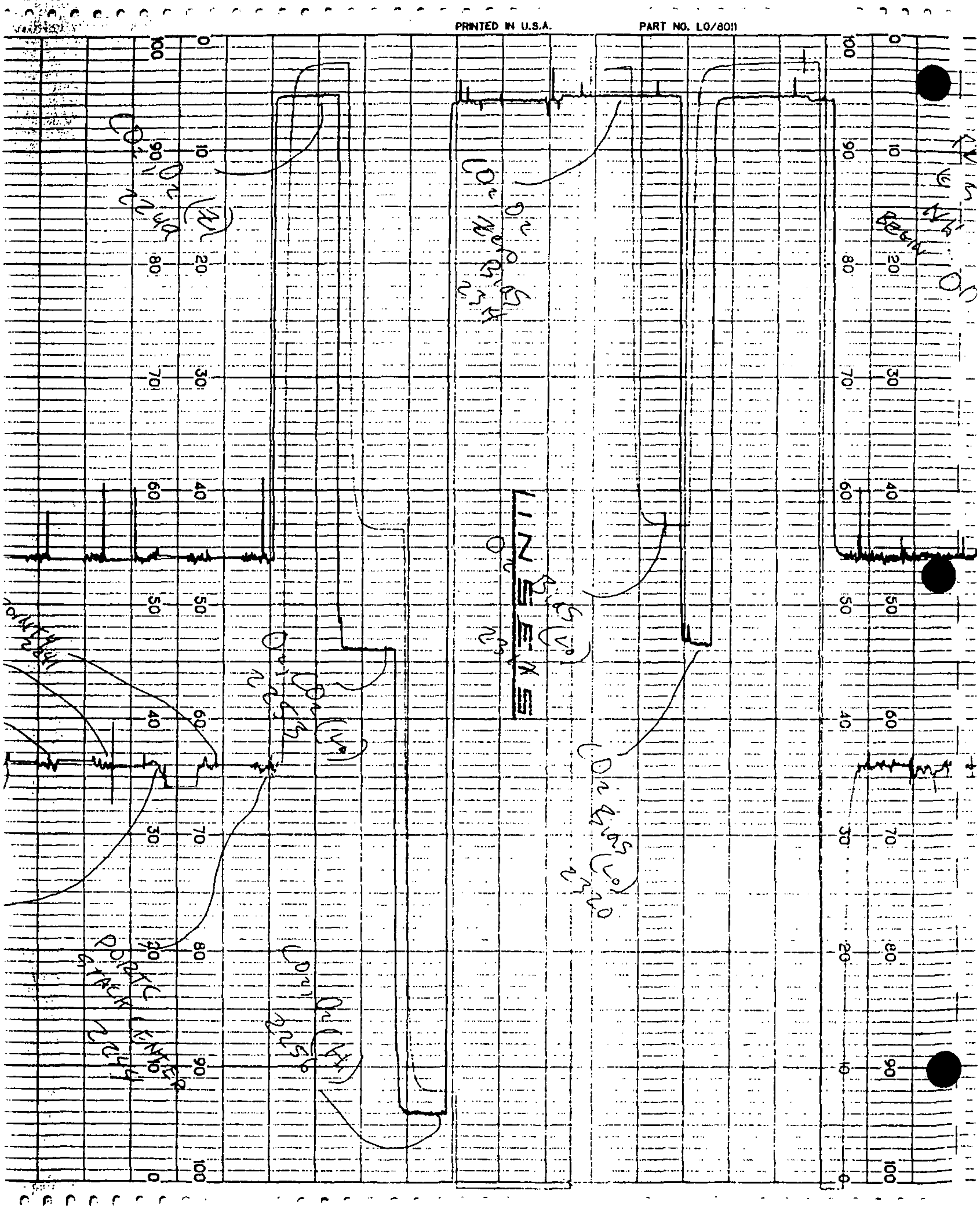
PRINTED IN U.S.A. PART NO. LO/8011




PRINTED IN U.S.A.
TRSE 15
PORT A STACK CENTER 2112
POINT X 2141
STACK CENTER 2129
POINT X 4 2125
POINT X 3 2122
POINT 1 2116
POINT 2 2119
PORT D STACK CENTER 2113
STRATIFICATION TEST
O2 BIAS (0) 2008
CO2 BIAS (0) 2050
ZERO BIAS 2045
0
10
20
30
40
50
60
70
80
90
100

PRINTED IN U.S.A. PART NO. L0/8011

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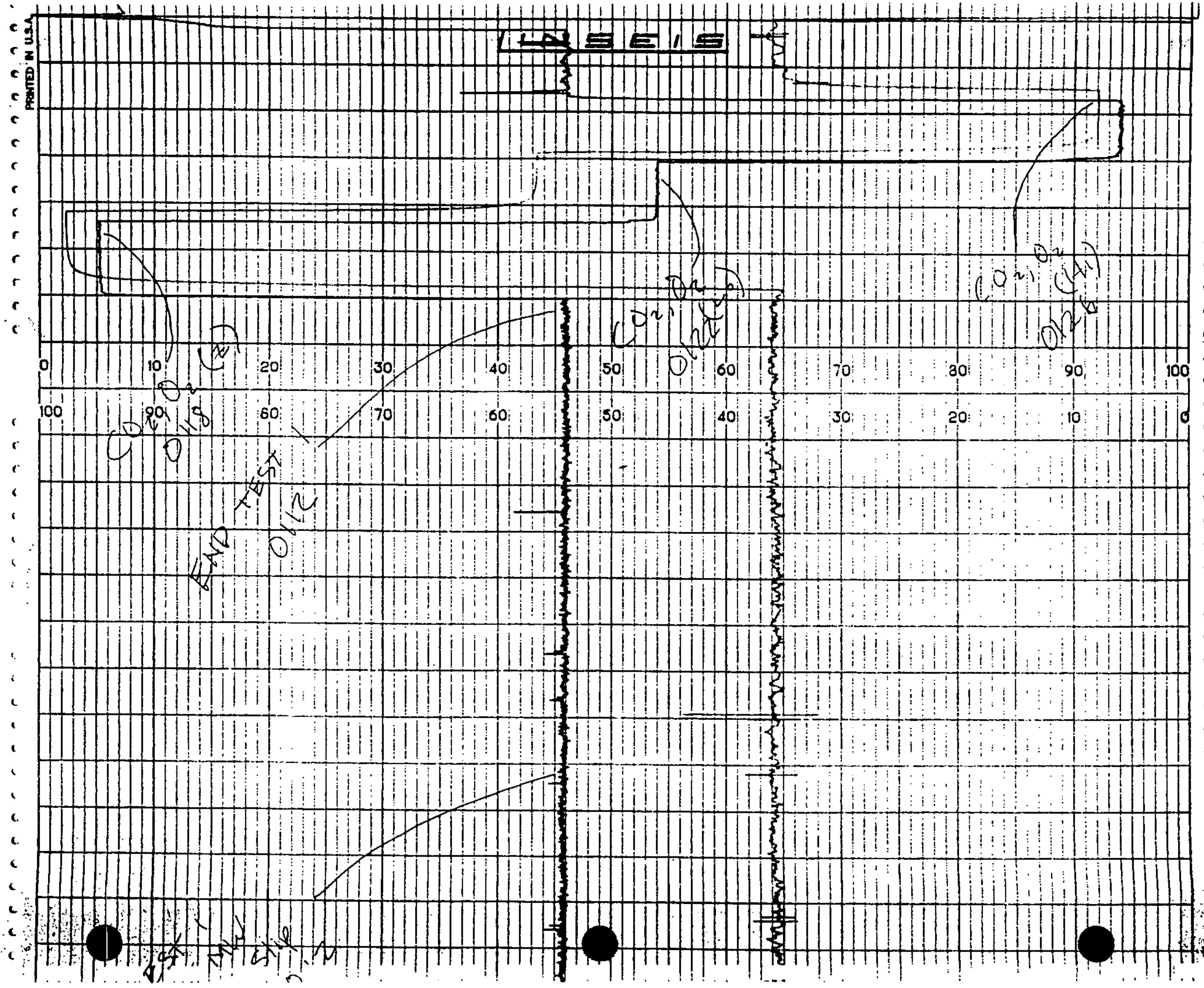
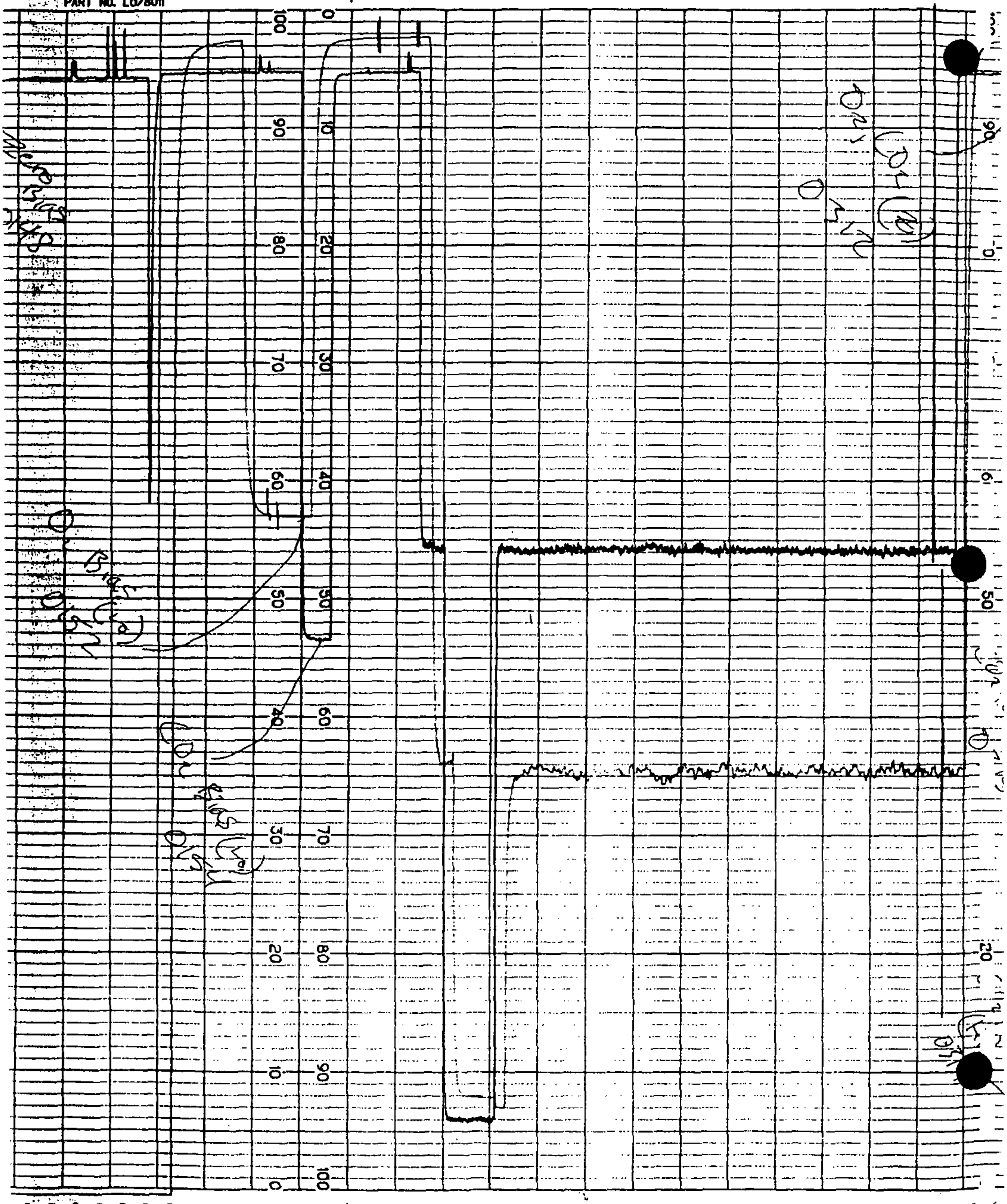
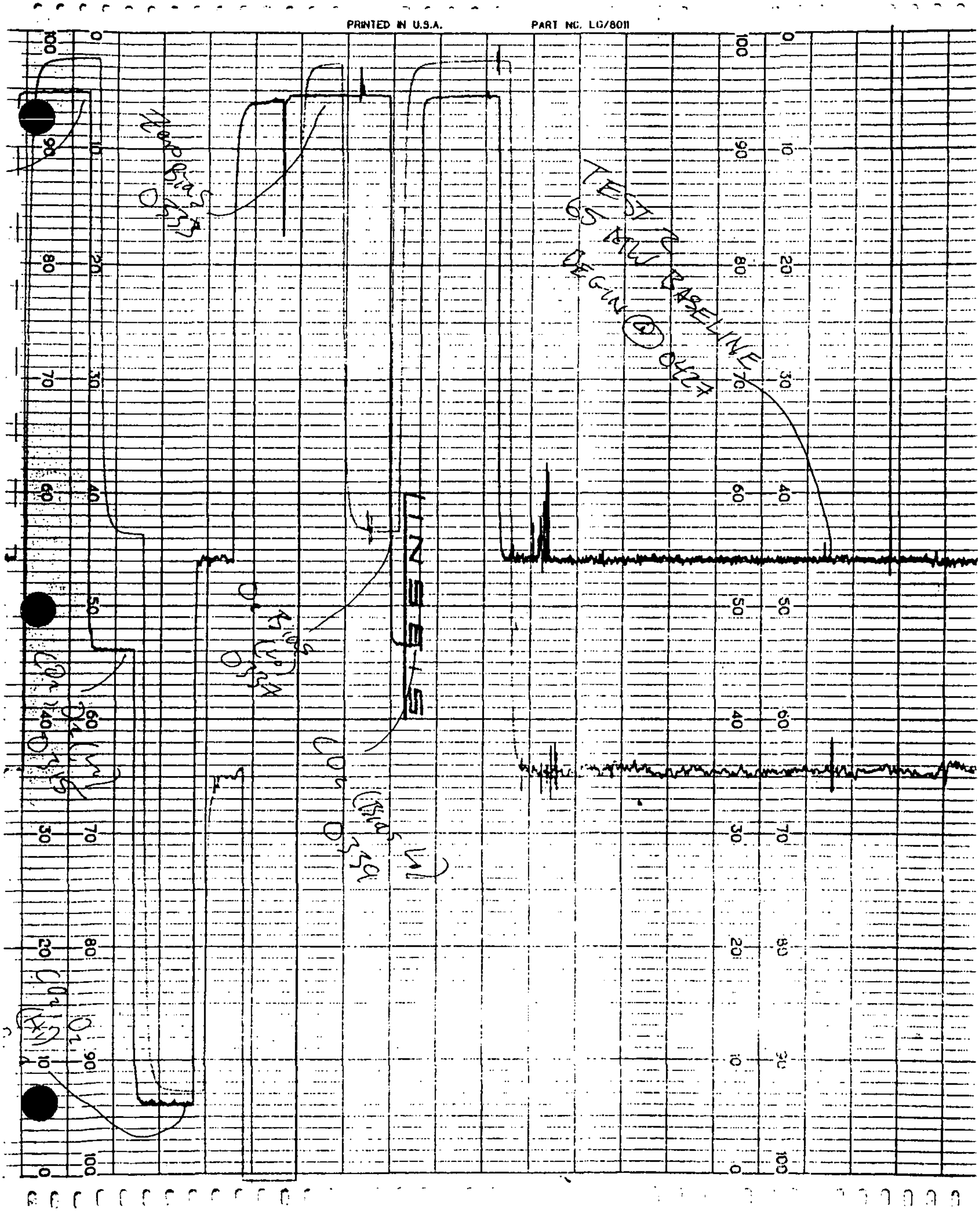
PART NO. L0/8011

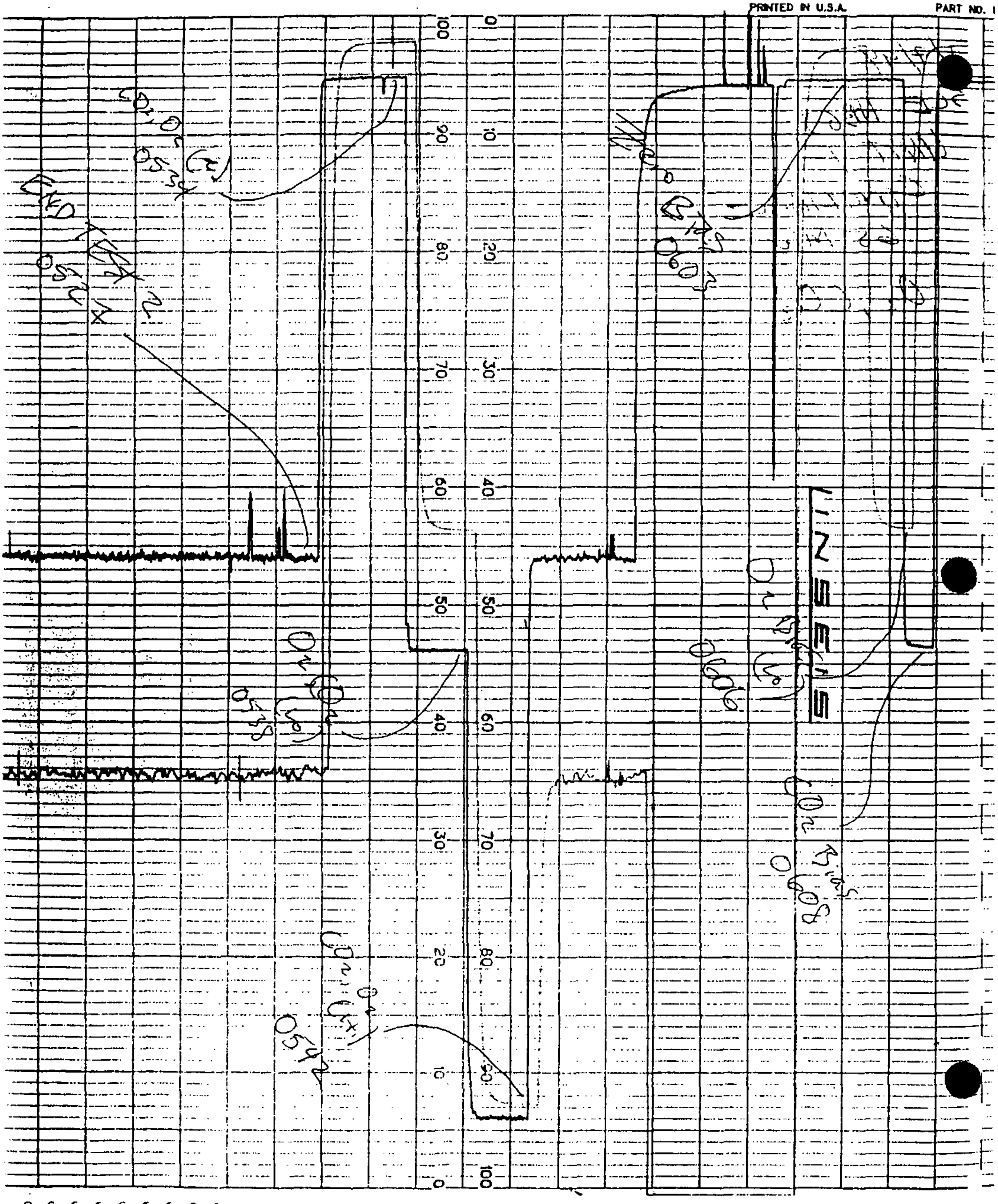

PRINTED IN U.S.A.
END TEST 1
0112
CO_2, O_2 (H)
0118
CO_2, O_2
0122
CO_2, O_2 (H)
0126

PART NO. LO/6011




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

PRINTED IN U.S.A. PART NO. 1



APPENDIX D-4

STRATIFICATION TEST TRAVERSE POINT LOCATIONS

STRATIFICATION

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Plant: EDISON HBGS

Date: 1/4/94

Sampling Location: UNIT 1

Inside of Far Wall to Outside of Nipple (Distance A):

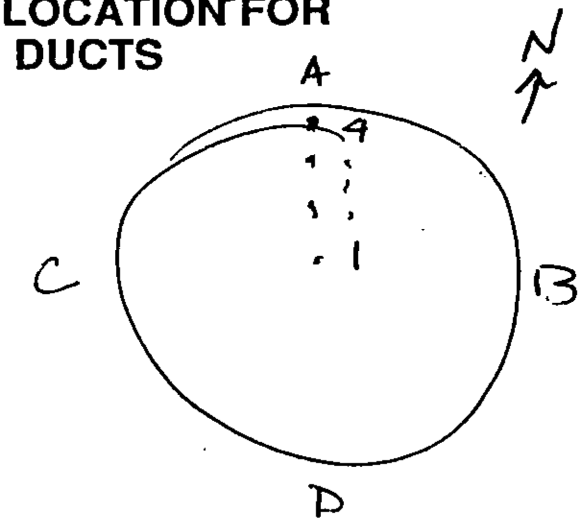
Inside of Near Wall to Outside of Nipple (Distance B): 17"

Stack I.D. (Distance A, Distance B): 20' 6"

Nearest Upstream Disturbance:

Nearest Downstream Disturbance:

Calculator: AJ



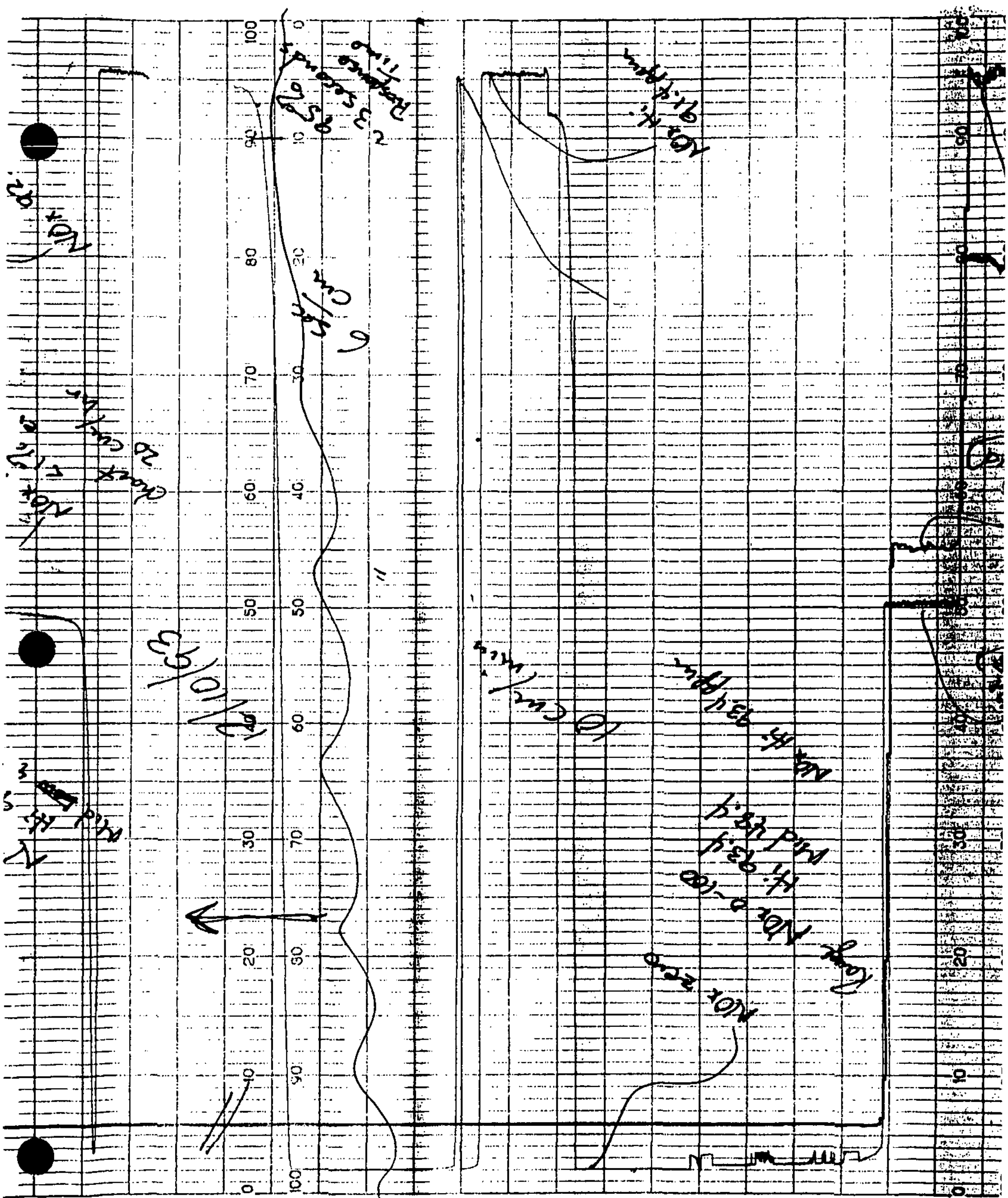
Schematic of Sampling Location

Traverse Point Number -1	Fraction of Stack I.D.	Stack I.D.	Product of Columns 2 and 3 (To Nearest 1/8 Inch)	Distance B	Traverse Point Location From Outside of Nipple (Sum of Columns 4 and 5)
A-1	0.032	7 7/8"	20'6"	17"	24 7/8"
-2	0.105	25 7/8"	(246")		42 7/8"
-3	0.194	47 3/4"			64 3/4"
-4	0.323	79 1/2"			96 1/2"
B-1 -1					
-2					
-3					
-4					
C-1 -1			ditto		
-2					
-3					
-4					
D-1 -1					
-2					
-3					
-4					
Center	0.5	246	123"	17"	140"

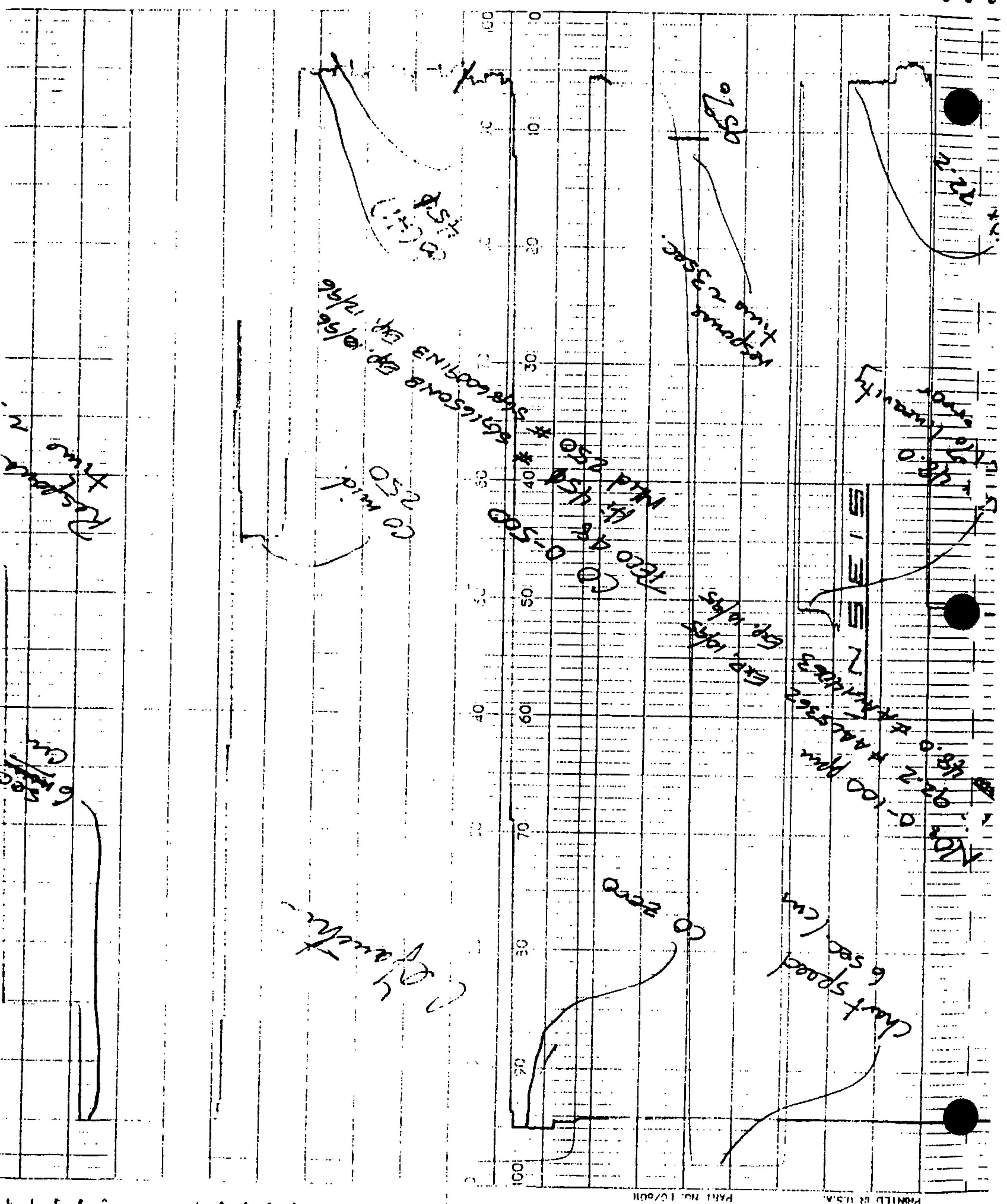
FORM 5240M 7/93

APPENDIX D-5

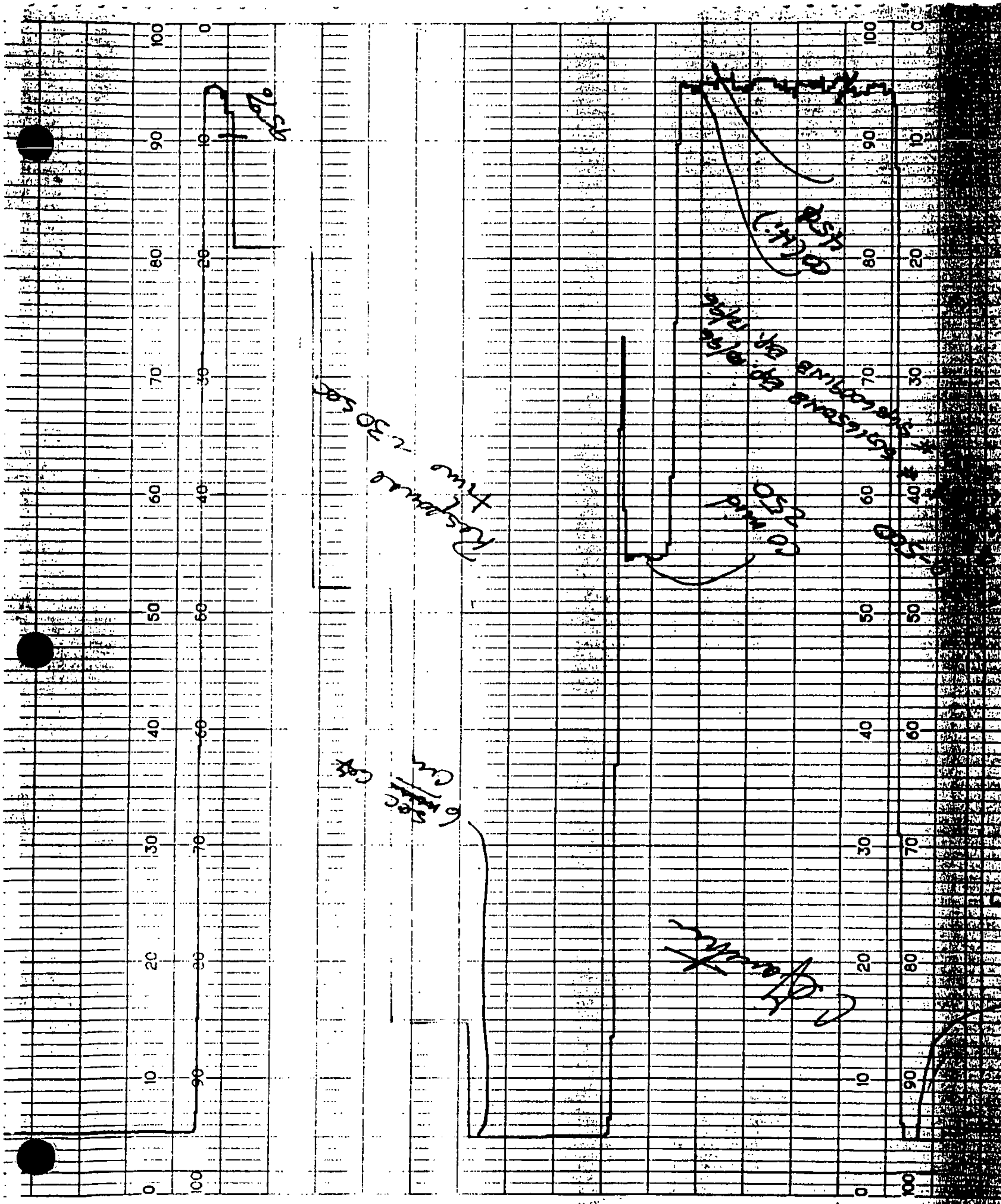
SEMI-ANNUAL INSTRUMENT CALIBRATION RECORDS



NO_2, CO Response time   Page 1 of 3

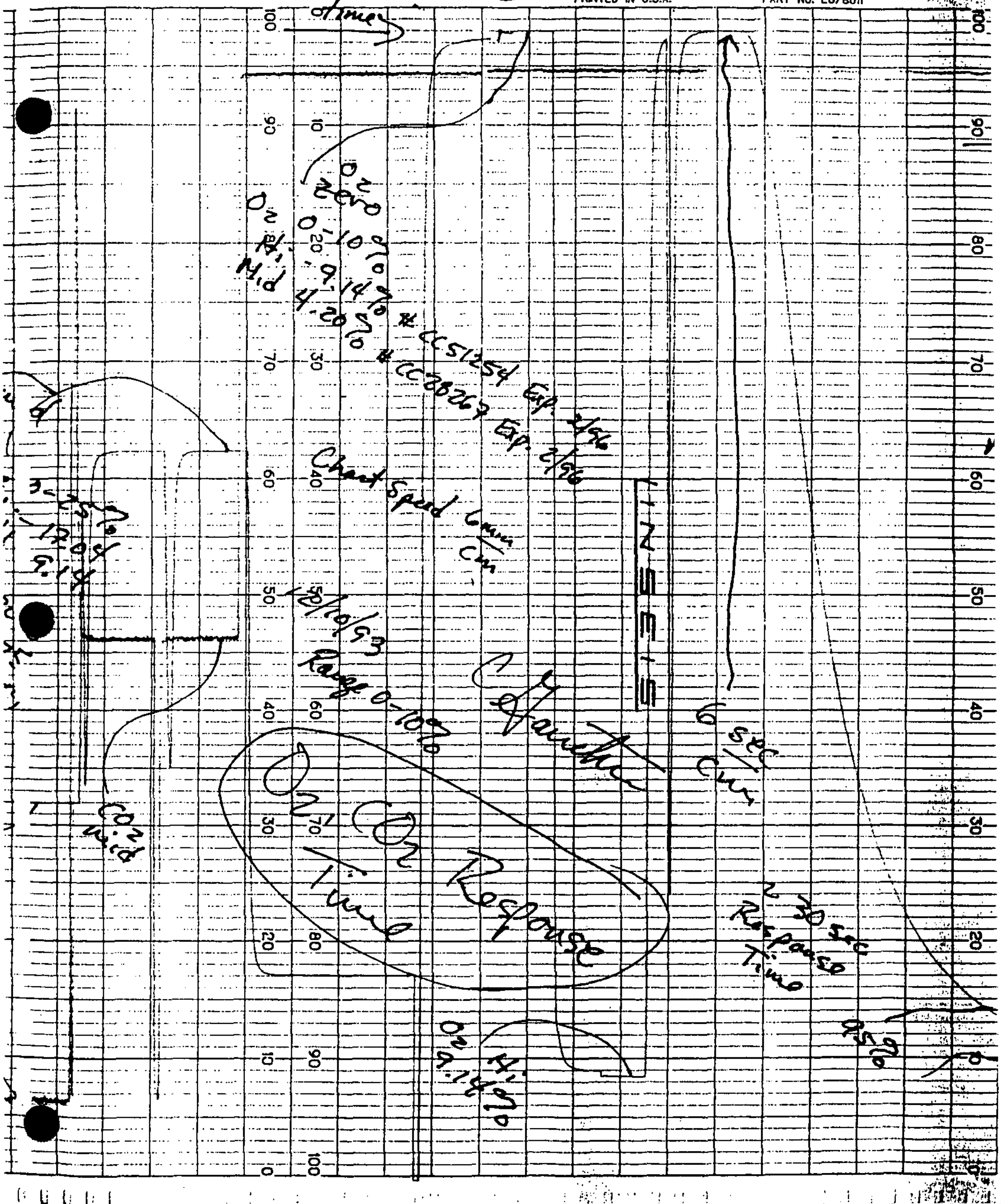


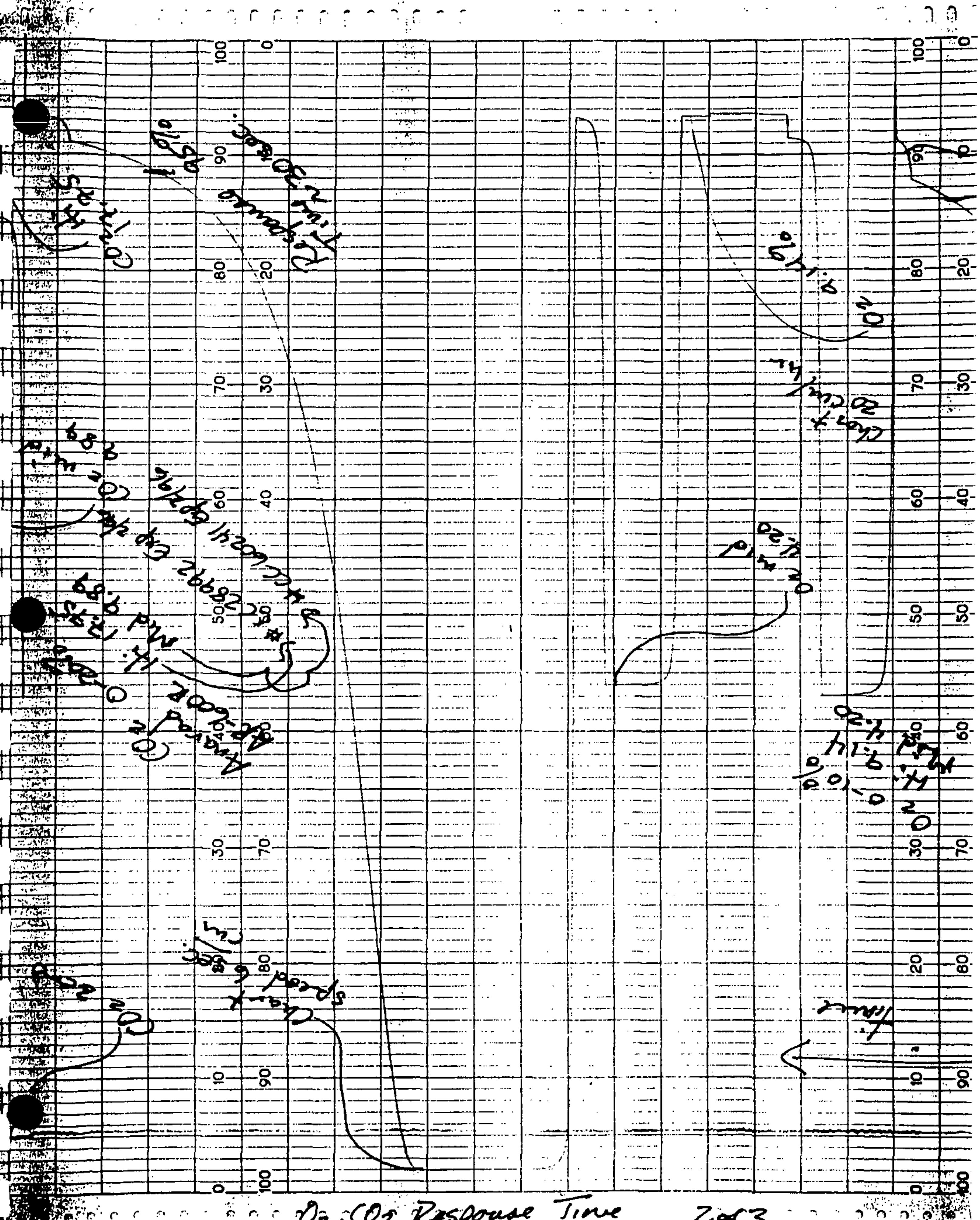
NOx, CO, Response Page 2 of 3



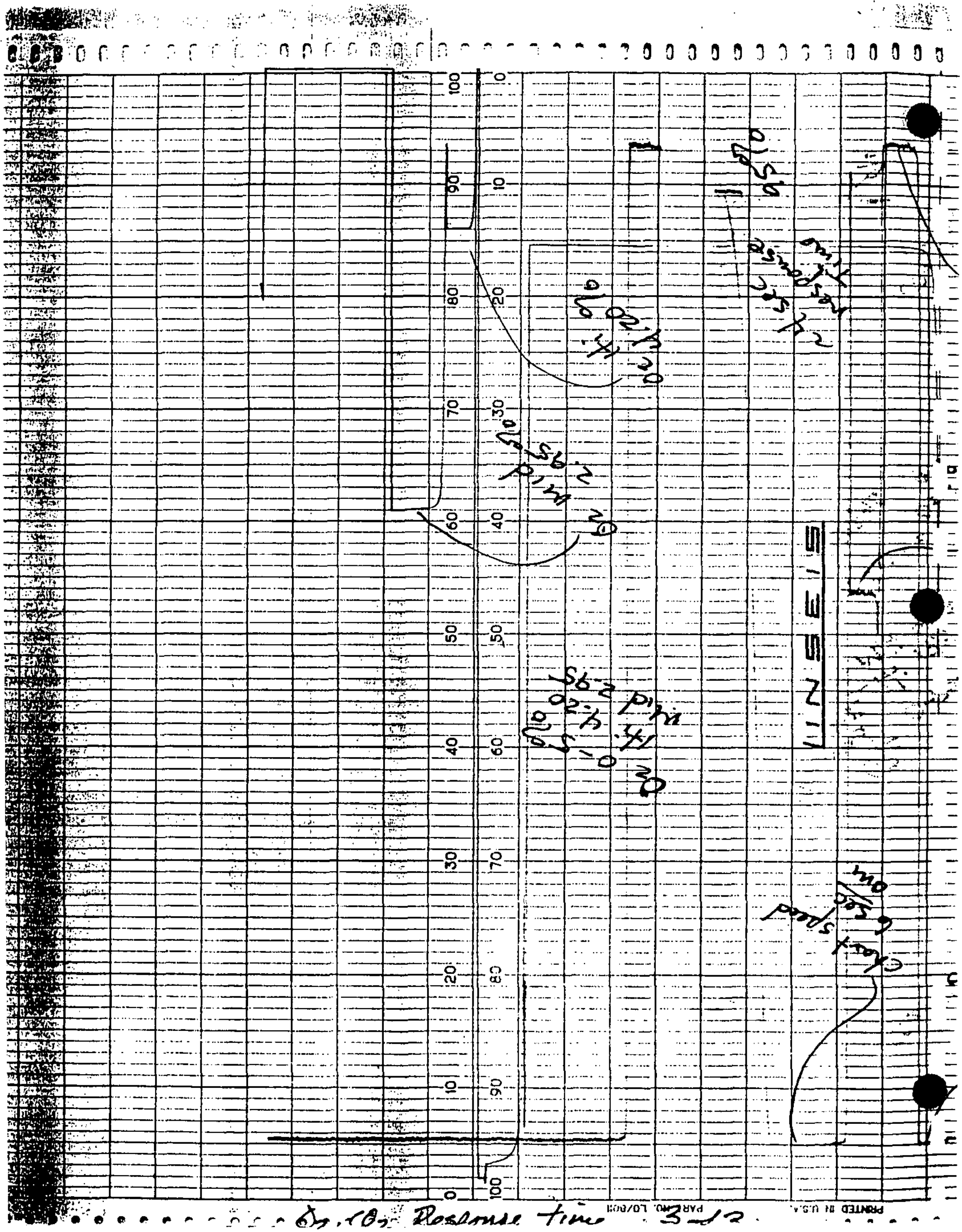
NOx, CO Response Time Pg 3 of 3

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

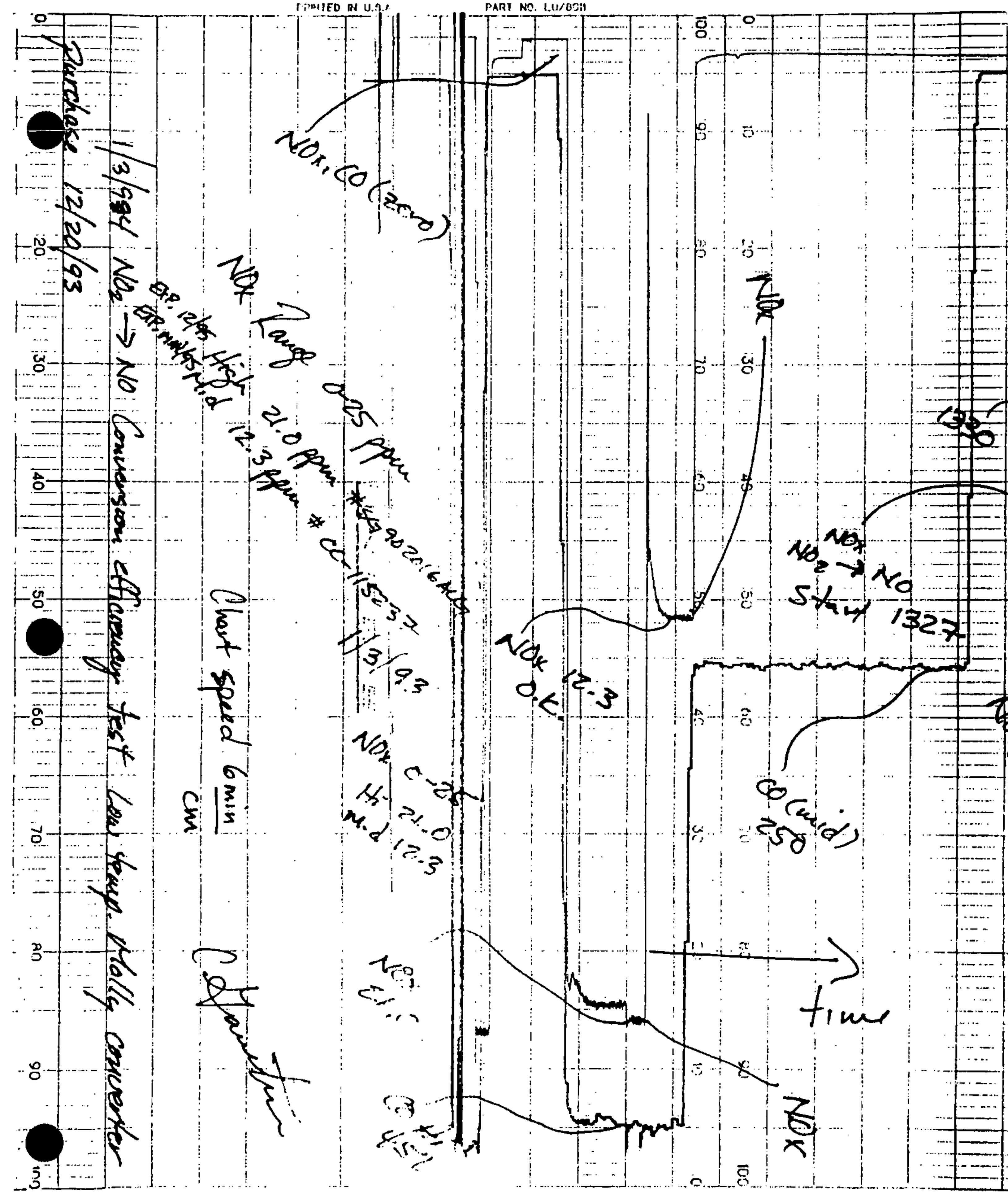




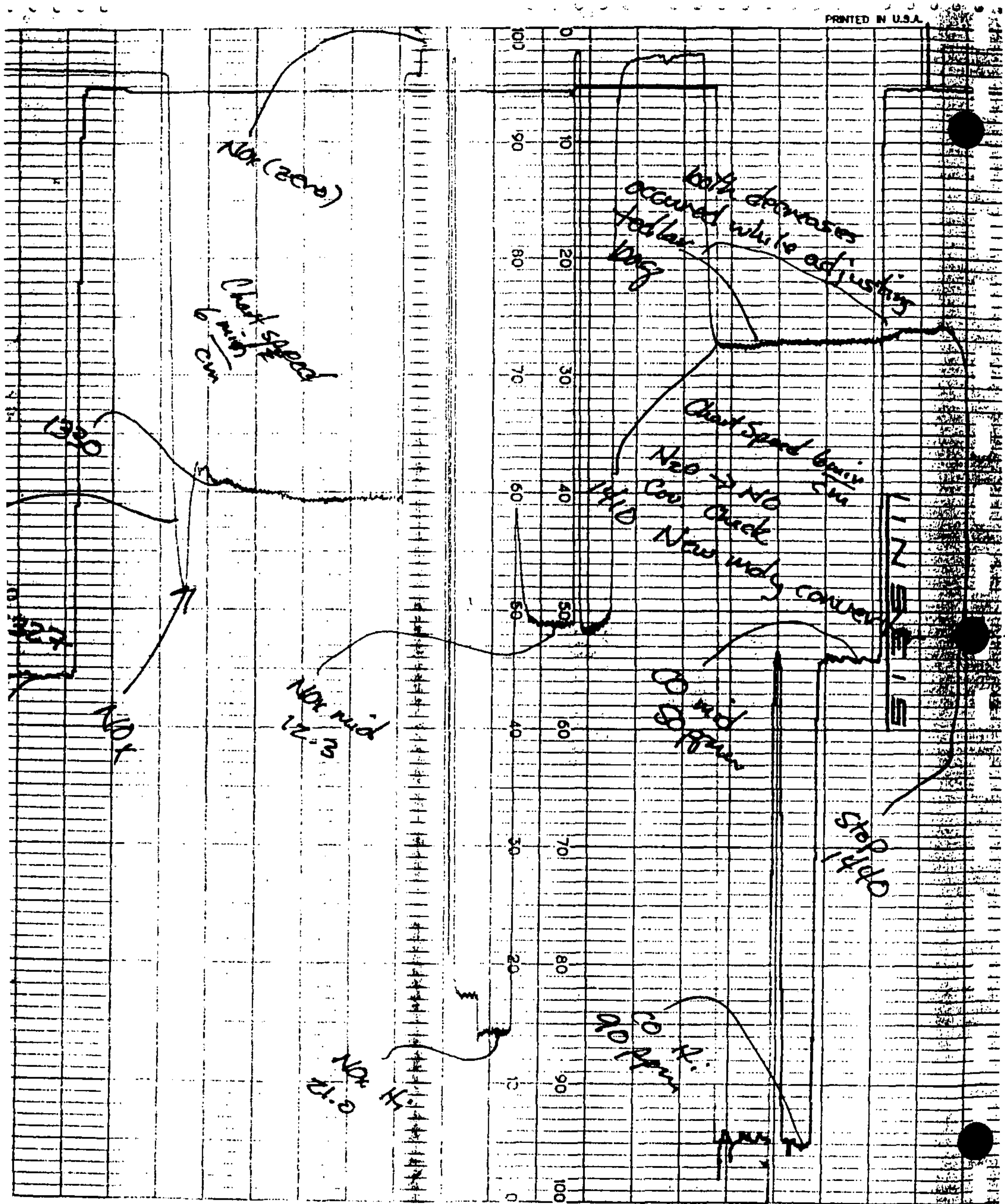
O_2, CO_2 Response Time



Dr. O2 Response time 3-12



$NO_2 \rightarrow NO$ Conv. Eff. Page 1 of 2



$NO_2 \rightarrow NO$ Conv. Eff. Page 2 of 2

APPENDIX D-6

DATA LOGGER OUTPUT

215MW	CO2	NOx	CO
754	9.75	47.63	263.9
755	9.66	47.71	262.7
756	9.69	47.71	263.6
757	9.74	47.74	297
758	9.67	47.71	449.5
759	9.72	47.73	469.6
800	9.68	47.75	456.2
801	9.72	47.76	449.4
802	9.69	47.78	452.4
803	9.74	47.77	451.9
804	9.74	47.81	451.7
805	9.74	47.8	347.1
806	5.463	23.28	206.3
807	−0.029	−0.167	3.127
808	0	−0.203	−1.041
809	−0.004	−0.205	−1.035 zero
810	6.533	34.2	91.3
811	9.69	47.63	253.4
812	9.68	47.72	252.6
813	9.73	47.76	252.7
814	9.66	47.77	251.7
815	9.66	47.81	252.7
816	9.65	47.78	251.3 mid
817	14.54	77.5	316
818	17.67	92.8	446
819	17.7	93	446.3
820	17.74	93	449.8
821	17.71	93.1	451.1
822	17.7	93.1	453
823	17.71	93.1	451.1 high
824	17.7	38.54	340
825	14.68	0.176	4.121
826	1.298	0.02	0.056
827	0.371	−0.049	0.012
828	0.223	−0.088	0.014
829	0.168	−0.131	−0.439
830	0.15	−0.128	−0.434
831	0.199	−0.123	−0.482
832	0.103	−0.143	−0.493
833	0.056	−0.151	−0.459
834	0.047	−0.157	−0.461
835	0.067	−0.167	−0.49
836	0.056	−0.185	−0.485
837	5.117	47.89	96
838	8.58	74.8	406.4
839	5.669	49.66	434.1
840	0.047	0.044	38.91
841	0.085	0.005	−0.032
842	0.083	−0.043	−0.333

215MW	CO2	NOx	CO
843	0.123	−0.061	−0.514
844	0.127	−0.096	−0.518
845	0.058	−0.131	−0.479
846	0.045	−0.02	0.107
847	0.094	−0.121	1.356
848	0.06	5.749	0.282
849	−0.004	−0.064	1.695
850	0.056	−0.186	−0.006
851	0.009	−0.187	−0.016
852	−0.011	−0.087	0.162
853	0.002	−0.165	0.963
854	0.016	−0.19	1.008
855	0.016	−0.2	0.945
856	1.946	−0.202	1.283
857	9.57	−0.195	0.569
858	9.61	−0.182	0.972
859	9.58	−0.184	0.984
900	1.318	40.54	1.499
901	0.087	46.52	1.952
902	0.004	36.25	6.016
903	0.018	−0.032	211.4
904	0.04	−0.133	253.1
905	0.076	−0.104	208.4
906	0.125	−0.065	24.04
907	0.112	−0.079	9.54
908	0.087	−0.133	−0.51
909	0.065	−0.098	−0.441
910	0.659	7.4	7.99
911	8.74	78.3	370.3
912	8.83	78.5	444.9
913	8.83	78.6	473.2
914	8.85	78.4	464.9
915	8.84	78.7	461.5
916	8.86	78.7	463.7
917	8.99	78.5	446.2
918	8.81	78.6	486.1
919	8.79	78.5	457.5
920	8.68	78.5	478.5
921	8.87	78.6	460.5
922	8.85	78.7	477.9
923	8.83	79	440.6
924	8.82	78.9	484.8
925	8.8	79.5	419.2
926	8.87	79.2	402
927	8.82	79.2	431
928	7.91	67.94	410.1
929	−0.112	0.393	89.8
930	6.911	65.33	162.1
931	8.84	78.7	427.8

zero bias

mid bias

mid bias

215MW	CO2	NOx	CO
932	8.84	79	432.6
933	8.19	79	443
934	8.66	79.4	430.7
935	8.79	79.2	426.4
936	8.84	79.6	403.3
937	8.21	79.1	395.3
938	8.32	79.1	433.5
939	8.84	79.5	374.9
940	8.78	79.6	358.6
941	8.85	79.2	400.9
942	8.8	79.3	395.4
943	8.67	79.4	377.4
944	8.78	79	395.7
945	8.81	79.3	405.7
946	8.49	79.8	398
947	8.44	79.6	356.7
948	8.83	79.4	408.4
949	8.84	79.6	331.1
950	8.8	79.1	427
951	8.82	79.3	378.4
952	8.85	79.2	374
953	8.85	79.4	407
954	8.8	79.2	355
955	8.8	79.2	370.6
956	8.65	79.4	381.4
957	8.83	79.4	389.9
958	8.82	79.6	380.1
959	8.86	79.4	373.3
1000	8.52	79.4	386.8
1001	8.83	79.4	408
1002	8.84	79.1	374.7
1003	8.63	79.1	399.3
1004	8.81	79.2	362.9
1005	8.79	79.4	386.9
1006	8.79	79.3	357.2
1007	8.82	79.3	412.2
1008	8.76	79.1	408.6
1009	0.679	2.879	162.4
1010	0.069	0.326	0.054
1011	0.092	0.261	0.047
1012	0.056	0.203	−0.045
1013	0.063	0.176	0.028
1014	2.465	23.75	14.85
1015	8.75	76.7	313.5
1016	8.85	76.8	359.3
1017	8.85	77.2	342
1018	8.85	77.4	344
1019	8.7	77	347.3
1020	8.85	76.5	328.2

215MW	CO2	NOx	CO
1021	8.79	77	355.4
1022	8.85	76.7	331
1023	8.89	76.7	334.2
1024	8.81	76.7	361
1025	8.86	76.5	332.4
1026	8.79	76.5	404
1027	8.81	76.9	390
1028	8.87	76.9	332.5
1029	8.88	76.9	355.1
1030	8.85	77.5	293.9
1031	8.9	76.8	361.2
1032	8.85	77.1	348.5
1033	8.86	77.2	320.1
1034	8.92	77.2	346
1035	1.582	10.58	168.6
1036	0.107	0.396	0.588
1037	4.875	44.92	85.1
1038	8.85	76.8	379
1039	8.87	77.2	333.5
1040	8.83	77.4	345
1041	8.75	77.4	344.7
1042	8.78	77.2	335.2
1043	8.86	77	367.6
1044	8.85	77.1	334.3
1045	8.85	77.2	371.1
1046	8.85	76.7	385.5
1047	8.85	76.8	353.5
1048	8.89	77.1	346.1
1049	8.86	77.3	380.1
1050	8.85	77	351.7
1051	8.85	77.4	349.9
1052	8.89	77.6	327.7
1053	8.77	77.3	337.3
1054	8.78	77.3	337.8
1055	8.85	77	335.4
1056	8.86	77.7	338.7
1057	8.57	77.2	348.1
1058	2.326	20.24	232.4
1059	5.742	48.36	205.7
1100	0.118	0.529	28.75
1101	0.067	0.41	0.426
1102	0.069	0.343	0.122
1103	0.069	0.304	-0.112
1104	0.069	0.264	-0.47
1105	0.069	0.852	0.589
1106	8.38	75.5	239.5
1107	8.76	77.2	351.5
1108	8.84	76.8	339
1109	8.83	77.2	365.5

215MW	CO2	NOx	CO	
1110	8.85	77	370.4	
1111	8.83	77.6	335.4	
1112	8.85	77.4	322.7	
1113	8.85	77	371.2	
1114	8.86	77.2	384.1	
1115	8.84	77.5	359.1	
1116	8.85	77.6	324.8	
1117	8.88	77.2	317.8	
1118	8.84	77.2	378.9	
1119	8.78	77.4	360.4	
1120	8.88	77.6	351.1	
1121	8.79	77	365.7	
1122	8.84	77.3	342.7	
1123	8.77	77.3	375.6	
1124	5.838	48.51	337.9	
1125	0.013	0.085	23.25	
1126	0.034	−0.1	−1.115	
1127	0.011	−0.14	−1.219	
1128	0	−0.143	−1.237	
1129	0.011	−0.167	−1.232	
1130	−0.054	−0.177	−1.17	
1131	−0.042	−0.186	−1.22	zero
1132	−0.06	−0.187	−1.355	
1133	5.12	23.21	46.23	
1134	9.67	47.25	247.2	
1135	9.65	48.01	252.1	
1136	9.69	48	251.2	
1137	9.66	48.05	252.7	
1138	9.67	48.06	252	mid
1139	12.06	66.59	268.4	
1140	17.72	92.9	137.4	
1141	17.69	93.4	−0.414	
1142	17.75	93.4	−0.522	
1143	17.75	93.4	163.8	high
1144	15.94	93.4	453.4	
1145	8.85	93.4	451	
1146	8.9	93.5	453.7	
1147	8.84	93.5	451.9	
1148	8.8	84.4	430.1	
1149	8.54	78.1	398.5	
1150	7.77	76.8	258.6	
1151	0.57	59.71	0.627	
1152	0.288	17.9	−0.527	
1153	0.107	2.958	−0.467	
1154	0.067	1.744	−0.455	
1155	0.089	1.41	−0.532	
1156	0.074	1.322	−0.458	
1157	0.054	1.243	−0.53	
1158	0.085	0.915	−0.525	

215MW	CO2	NOx	CO
1159	0.087	1.039	−0.449
1200	1.888	15.6	37.99
1201	0.067	0.647	38.08
1202	0.027	0.564	0.989
1203	0.018	0.528	1.006
1204	0.002	0.512	0.82
1205	0.049	0.534	2.732
1206	0.067	0.473	1.784
1207	0.067	0.474	1.321
1208	2.325	0.44	2.093
1209	9.52	0.434	0.725
1210	9.59	0.428	0.96
1211	8.77	0.399	2.287
1212	0.248	0.392	305.8
1213	0.069	0.368	411.2
1214	−0.047	0.351	444.7
1215	0.004	0.336	453.2
1216	0.058	0.329	452.1
1217	0.06	39.17	394.2
1218	0.067	90.5	17.44
1219	−0.074	90.5	1.976
1220	0.002	88.5	−0.02
1221	7.6	78.1	180.6
1222	8.89	77	392.1
1223	8.83	77.3	360.7
1224	8.81	77.1	356.8
1225	8.84	77.5	369.9
1226	8.85	77.4	400.4
1227	8.85	77.7	348.8
1228	8.82	77.7	381.2
1229	8.82	77.7	380.4
1230	8.78	77.6	344.9
1231	8.83	77.4	349.1
1232	8.85	77.1	386.8
1233	8.84	77.7	361
1234	8.85	77.6	354.4
1235	8.84	77.8	361.1
1236	8.81	77.7	363.8
1237	8.83	78.2	357.1
1238	8.84	77.5	377.3
1239	8.81	77.5	378
1240	8.8	77.9	358.3
1241	8.86	77.6	384.6
1242	8.86	77.8	350.8
1243	8.84	77.7	364.6
1244	8.83	77.7	361.9
1245	8.87	77.3	397.7
1246	8.87	77.9	400.6
1247	8.85	77.9	362.7

zero bias

mid bias

high ~~mid~~ bias

START 215MW BASELINE TEST

215MW	CO2	NOx	CO
1248	8.88	77.7	377.8
1249	8.84	78	386.5
1250	8.85	77.5	376.4
1251	8.84	78	357.2
1252	8.84	77.6	333.6
1253	8.85	77.5	339.6
1254	8.81	77.2	356.3
1255	8.83	77.5	350.7
1256	8.85	77.6	382.9
1257	8.84	77.4	361.9
1258	8.82	77.7	387.2
1259	8.81	77.7	345.3
1300	8.84	77.8	316
1301	8.82	77.3	377.5
1302	8.85	77.8	382.4
1303	8.82	77.6	372.1
1304	8.85	77.6	353.7
1305	8.85	77.8	359.7
1306	8.84	78.1	371.4
1307	8.85	78	329.6
1308	8.87	77.8	361.3
1309	8.81	78	355.6
1310	8.77	77.4	378.8
1311	8.82	77.7	403.5
1312	8.8	77.4	328.9
1313	8.84	77.7	346.2
1314	8.84	77.8	336.6
1315	8.84	77.9	342.2
1316	8.84	77.6	356.2
1317	8.82	77.8	329.3
1318	8.87	77.3	427.2
1319	8.85	77.5	342
1320	8.88	77.8	384.3
1321	8.8	77.7	368.6
1322	8.82	78.2	320.6
1323	8.86	77.9	359.9
1324	8.89	77.7	370.5
1325	8.86	77.9	362
1326	8.83	78	381.7
1327	8.83	77.6	370.9
1328	8.81	77.9	357.3
1329	8.83	78	339.8
1330	8.84	77.6	376.2
1331	8.81	77.3	371.4
1332	8.81	77.6	342.8
1333	8.83	77.1	364
1334	8.82	77.7	390.3
1335	8.86	77.7	313
1336	8.85	77.2	343.2

215MW	CO2	NOx	CO
1337	8.85	77.5	381.6
1338	8.86	77.4	386.2
1339	8.83	77.4	357.3
1340	8.81	77.9	340.5
1341	8.83	77.6	339.5
1342	4.168	32.49	245.3
1343	-0.067	0.183	2.935
1344	-0.038	0.125	-1.167
1345	0.058	0.099	-1.194
1346	-0.007	0.081	-1.362
1347	1.166	12.12	5.848
1348	9.7	46.19	221.2
1349	9.65	47.78	253.4
1350	9.65	47.73	252.3
1351	13.6	71.7	298.7
1352	17.69	92.3	450.3
1353	17.69	92.5	453.9
1354	17.69	92.6	454.1
1355	17.68	92.5	451.7
1356	13.44	84.6	430.4
1357	8.64	77	399.5
1358	8.75	77.2	343.2
1359	8.82	77.5	347.9
1400	8.82	77.7	356.4
1401	8.78	77.4	329.7
1402	8.84	77.5	361.5
1403	8.85	77.4	386
1404	8.81	77.1	346.2
1405	8.85	77.3	386.6
1406	8.84	77.8	316.8
1407	8.84	77.5	388.9
1408	8.86	77.2	387
1409	8.06	77.6	323.5
1410	7.04	76.9	290.2
1411	0.762	65.84	13.3
1412	0.324	24.84	-1.056
1413	0.19	3.818	-1.188
1414	0.078	2.114	-1.166
1415	0.067	1.781	-1.154
1416	0.121	1.71	-1.179
1417	0.078	1.673	-1.105
1418	0.076	1.649	-1.076
1419	0.067	1.457	-1.098
1420	0.067	1.232	-1.129
1421	-0.112	1.165	-1.098
1422	-0.058	1.256	-1.104
1423	1.704	14.44	10.26
1424	0.181	13.19	78.2
1425	0.047	0.831	0.916

END TEST

avgs:

CO_2	NOx	CO
8.8	77.7	362

zero

mid

high

65MW	O2	CO2	NOx	CO
321	6.267	8.05	32.1	238.8
322	6.22	7.29	31.48	200.5
323	16.36	0.742	26.41	18.27
324	19.98	0.286	4.743	4.546
325	20.25	0.197	0.723	7.13
326	20.29	0.134	0.365	7.48
327	20.31	0.107	0.307	4.875
328	20.34	0.13	0.264	3.85
329	19.79	0.384	4.955	10.22
330	2.914	0.009	−0.35	0.32
331	0.113	0	−0.542	−0.966
332	0.03	−0.002	−0.552	−1.043
333	0.009	0	−0.578	−0.994 zero
334	2.07	0	−0.507	−0.99
335	4.051	0.002	−0.594	−1.064
336	4.092	−0.031	−0.603	−1.064
337	4.102	0.022	−0.607	−1.073
338	1.27	8.64	−0.605	−1.569
339	0.025	9.6	−0.598	−1.571
340	−0.005	0.767	−0.598	143.1
341	−0.015	0.087	−0.605	248.4 mid bias
342	−0.017	0.072	18.39	222.6
343	−0.02	0.029	45.74	8.96
344	−0.017	0	45.71	−1.002
345	3.699	6.436	33.28	107.9
346	6.14	8	31.34	245
347	6.192	8.02	31.44	270.9
348	6.209	8.08	31.61	250.8
349	6.224	8.03	31.65	215.3
350	6.217	7.81	31.57	234.3
351	6.205	7.9	31.49	241.7
352	6.234	8.03	57.5	245
353	6.212	8.05	91	231.3
354	6.21	8.12	91.1	212.3
355	6.184	8.1	37.99	270.3
356	6.199	8.04	31.56	236.9
357	6.208	8.07	31	257.1
358	6.183	8.13	31.02	254
359	6.171	8.12	31.21	258.8
400	6.196	8.12	31.17	282.2
401	6.183	8.11	31.37	279.3
402	6.185	8.11	31.42	274.9
403	6.224	8.06	32.02	267.4
404	6.245	8.08	32.1	226.3
405	6.23	8.06	31.58	218.1
406	6.244	8.05	32.08	231.4
407	6.211	8.09	32.02	225
408	6.212	8.09	31.27	238.8
409	6.188	8.07	31.46	250.8

mid bias

65MW	O2	CO2	NOx	CO
410	6.221	8.09	31.86	268.2
411	6.22	8.11	31.72	250.6
412	6.223	8.11	31.96	235.7
413	6.219	8.07	32.24	245.2
414	6.231	8.08	31.87	243.4
415	6.197	8.06	31.84	267
416	6.252	8.01	31.98	229.7
417	6.223	8.08	32.04	260.6
418	6.215	8.09	31.81	233.4
419	6.214	8.11	31.89	217.8
420	6.212	8.1	31.83	256.8
421	6.225	8.04	32.01	238.7
422	6.204	8.06	31.51	259.9
423	6.198	8.05	31.77	256.1
424	6.212	8.04	31.72	235.5
425	6.216	8.06	32.07	221.1
426	6.199	8.11	31.75	249.2
427	6.219	8.05	31.98	229.8
428	6.202	8.06	31.9	230.5
429	6.243	8.08	32.07	215.3
430	6.22	8.11	31.95	230.8
431	6.213	8.06	31.83	230.1
432	6.206	8.09	31.52	258
433	6.188	8.06	31.65	259
434	6.187	8.09	31.92	270.4
435	6.198	7.47	31.58	261.8
436	6.206	8.1	31.62	315.5
437	6.218	8.11	32.29	237.3
438	6.243	8.09	32.62	183.8
439	6.232	8.11	32.35	211.7
440	6.239	8.1	32.07	229.5
441	6.2	8.06	31.82	276
442	6.143	8.12	31.5	270.4
443	6.151	8.1	31.45	364.9
444	6.181	8.07	32.36	248.4
445	6.191	8.08	32.21	244.2
446	6.2	8.11	32.05	267
447	6.216	8.07	32.33	257.1
448	6.232	8.06	32.67	204.8
449	6.222	8.1	31.99	240.3
450	6.213	8.1	32.11	249
451	6.204	8.09	32.02	275.7
452	6.224	8.1	31.98	276.4
453	6.209	8.09	32.32	230.2
454	6.179	8.07	31.98	251.4
455	6.193	8.08	32	278.5
456	6.207	8.06	32.15	252.7
457	6.21	8.05	32.36	255.3
458	6.216	8.08	32.53	246.9

START 65MW
BASELINE TEST

65MW	O2	CO2	NOx	CO	
459	6.201	8.08	32.05	235.3	
500	6.193	8.05	32.23	258.1	
501	6.207	8.09	32.32	226.1	
502	6.187	8.08	32.09	265.1	
503	6.177	8.12	32.09	282.7	
504	6.193	8.12	31.83	247.9	
505	6.186	8.1	32.03	272.6	
506	6.205	8.05	32.12	246.6	
507	6.234	8.08	31.99	289.9	
508	6.196	8.11	32.1	249.1	
509	6.2	8.05	32.13	229.6	
510	6.184	8.11	32.19	262.6	
511	6.229	8.12	31.97	237	
512	6.207	8.09	32.06	238.8	
513	6.224	8.08	32.5	235.1	
514	6.227	8.09	32.24	251.6	
515	6.204	8.08	32.1	288	
516	6.225	8.05	32.62	219.1	
517	6.225	8.11	32.2	219.2	
518	6.208	8.06	32.3	257.8	
519	6.24	8.1	32.42	231.9	
520	6.21	8.11	32.52	244.7	
521	6.197	7.74	32.2	223.1	
522	6.192	8.08	32.05	263.6	
523	6.178	8.13	32.09	286.1	
524	6.179	8.13	32.55	252.3	
525	6.209	7.95	32.05	247.5	
526	6.231	8.07	32.31	270.2	
527	6.151	8.13	31.56	294.1	
528	6.168	8.1	31.71	329.6	
529	6.078	7.32	27.14	281	
530	0.761	0.06	−0.599	58.32	
531	0.008	0.013	−0.679	−1.492	
532	−0.018	0.002	−0.699	−1.467	
533	−0.028	0.016	−0.711	−1.466	
534	−0.028	0.011	−0.697	−1.559	zero
535	1.747	6.043	31.95	73.5	
536	4.066	9.66	46.89	249.7	
537	4.123	9.66	46.84	249	
538	4.13	9.66	46.85	249.2	mid
539	6.61	14.35	78.2	311.4	
540	8.98	17.68	91.5	447.6	
541	9.03	17.7	91.5	448.1	
542	9.04	17.72	91.5	446.4	high
543	7.52	10.53	43.39	354.1	
544	6.251	8.12	32.18	218.3	
545	6.234	8.13	31.85	200.2	
546	6.213	8.1	31.61	259.5	
547	6.229	8.04	31.76	274.4	

END TEST

	O_2	CO_2	NO_x	CO
avgs:	6.2	8.1	32.1	252

65MW	O2	CO2	NOx	CO
548	6.248	8.04	31.83	210.5
549	6.196	7.86	31.6	238.7
550	14.94	1.044	29.06	41.77
551	19.87	0.304	6.856	11.47
552	20.2	0.228	1.115	11.85
553	20.29	0.174	0.653	6.396
554	20.35	0.134	0.49	4.724
555	20.37	0.094	0.414	4.422
556	20.37	0.134	0.385	4.111
557	20.38	0.076	0.34	4.043
558	19.56	0.939	3.306	9.51
559	12.44	0.078	1.204	16.05
600	0.411	0.103	−0.464	−1.032
601	0.058	0.051	−0.481	−1.041
602	0.019	0	−0.521	−0.993
603	0.004	0.018	−0.541	−0.953
604	2.807	0.034	−0.453	−0.962
605	4.078	0.027	−0.544	−0.981
606	4.107	0.045	−0.555	−1.04
607	1.354	8.55	−0.575	−1.321
608	0.029	9.6	−0.564	−1.479
609	−0.002	1.608	40.11	−1.314
610	−0.012	0.076	46.04	−0.961
611	−0.015	0.018	10.86	93.6
612	−0.019	0.047	−0.544	244.3
613	−0.022	0.027	−0.608	246.2
614	−0.023	0.013	−0.624	247.6
615	2.471	0.042	−0.617	217

bias zero

mid bias

mid bias

	215MW	CO2	NOx	CO	
	1426	0.011	0.715	−0.04	
	1427	0.031	0.653	−0.421	
	1428	0.031	0.601	−0.29	
	1429	0	0.547	−0.452	zero bias
	1430	−0.004	0.768	−0.476	
	1431	0.045	0.487	−0.481	
	1432	−0.047	0.432	−0.468	
	1433	2.8	0.421	−0.524	
	1434	9.51	0.389	−1.03	
	1435	9.38	3.617	−1.073	
mid bias	1436	0.232	89.5	−0.691	
	1437	0.063	90.2	−0.572	
	1438	−0.127	62.04	20.08	
	1439	−0.011	0.492	409.6	high bias
	1440	0.025	0.37	449.6	
	1441	4.261	40.49	425.1	
	1442	8.75	76.5	362.8	
	1443	8.8	76.5	392.9	
	1444	8.83	76.9	380.2	
	1445	8.8	77.2	350.1	
	1446	8.8	76.9	369.9	
	1447	8.79	77.1	379.7	
	1448	8.84	77.1	324.6	
	1449	8.83	76.9	388.8	
	1450	8.81	77.3	355.4	
	1451	8.8	77.3	351.9	
	1452	8.79	77.4	371.2	
	1453	8.84	77.3	361.3	
	1454	8.74	77.2	343	
	1455	8.71	76.4	349.1	
	1456	8.83	71.4	389	
	1457	8.82	67.52	388.6	
	1458	8.85	66.71	355	
	1459	8.88	66.76	389.1	
	1500	8.9	66.73	386.6	
	1501	8.85	66.7	365.6	
	1502	8.83	66.61	401.8	
	1503	8.84	66.28	370.2	
	1504	8.89	66.51	403.4	
	1505	8.93	66.93	375.6	
	1506	8.9	66.12	391.1	
	1507	8.87	66.56	313.9	
	1508	8.88	66.94	345.5	
	1509	8.84	66.6	361.1	
	1510	8.65	66.62	367.2	
	1511	8.82	66.61	397	
	1512	8.86	66.6	361.3	
	1513	8.84	66.39	365.5	
	1514	8.84	66.37	382.4	

215MW	CO2	NOx	CO	
1515	8.85	66.58	345.3	
1516	8.84	66.41	344.9	
1517	8.83	66.61	329.2	
1518	8.87	66.38	382.6	
1519	8.84	66.59	396.2	
1520	8.84	67.33	378.3	
1521	8.88	66.57	388.5	
1522	8.86	66.93	353.2	
1523	8.85	66.93	376.6	
1524	8.81	66.78	388.3	
1525	8.82	66.79	344.9	
1526	8.86	67.22	370.7	
1527	8.8	67.04	361.4	
1528	8.81	67.33	345.2	
1529	8.83	66.69	363.4	
1530	8.84	66.97	381.2	
1531	8.82	66.9	341.2	
1532	5.326	67	350.9	
1533	8.86	66.67	355.9	
1534	8.84	66.51	340.1	
1535	8.87	67.12	374.9	
1536	8.85	66.85	386	
1537	8.88	66.87	332.9	
1538	8.89	66.8	373.3	
1539	8.75	66.9	340.7	
1540	8.9	66.94	399.5	
1541	8.89	66.48	396.2	
1542	8.85	66.71	368.8	
1543	8.84	66.81	364	
1544	8.83	66.66	329.9	
1545	8.83	67.17	367.5	
1546	8.83	66.77	376.3	
1547	8.83	67.02	384.7	
1548	8.85	66.65	336.9	
1549	8.86	66.85	402.9	
1550	8.92	67.19	355.7	
1551	8.9	67.05	370.2	
1552	8.85	66.93	337	
1553	8.89	66.81	375.7	
1554	8.89	66.65	368.3	
1555	8.94	67.22	350.5	
1556	6.483	45.78	318.4	
1557	−0.04	0.015	35.6	
1558	0.02	−0.059	−1.308	
1559	0.067	−0.082	−1.228	zero
1600	7.07	35.99	110.4	
1601	9.77	47.83	252.1	
1602	9.78	47.77	252.6	
1603	9.68	47.77	251.7	mid

215MW	CO2	NOx	CO	
1604	14.3	78	318.8	
1605	17.68	92.5	450.1	
1606	17.67	92.7	453.9	
1607	17.67	92.7	451.2	high
1608	11.72	74	433.5	
1609	8.82	67	379.6	
1610	8.84	67.18	341	
1611	8.85	66.49	350.1	
1612	8.81	66.64	326.6	
1613	8.85	67.07	351.5	
1614	8.88	66.48	355.7	
1615	8.82	67.04	360.5	
1616	5.963	65.64	207.6	
1617	0.565	53.39	2.261	
1618	0.281	11.27	−1.185	
1619	0.192	2.08	−1.148	
1620	0.074	1.274	−1.124	
1621	0.067	1.037	−1.141	
1622	0.465	3.51	9.72	
1623	0.074	0.273	44.22	
1624	0.022	0.175	−0.391	
1625	−0.02	0.144	−0.502	zero bias
1626	0.067	0.161	0.609	
1627	−0.016	0.104	−0.42	
1628	−0.058	0.085	−0.459	
1629	6.897	0.077	−0.875	
1630	9.61	0.087	−1.139	mid bias
1631	2.341	36.98	−0.831	
1632	0.027	46.56	−0.529	
1633	0.063	30.08	29.39	
1634	0.054	0.137	419.4	
1635	−0.007	0.052	450.3	high bias
1636	0.071	0.038	448	
1637	0.011	0.011	450.4	
1638	0.029	0.071	334.2	
1639	0.118	0.158	11.35	
1640	0.065	0.026	−1.077	
1641	0.087	0.014	−1.172	
1642	0.078	0.035	−1.119	
1643	4.25	34.58	68.82	
1644	8.85	65.83	339.5	
1645	8.82	66.59	384.5	
1646	8.84	66.47	354.2	
1647	8.83	66.52	363.5	
1648	8.83	66.38	362.9	
1649	8.86	66.68	383.8	
1650	8.85	66.6	416.3	
1651	8.86	66.85	373.7	
1652	8.87	66.64	398.8	

ART 215MW
REA TEST

215MW	CO2	NOx	CO
1653	8.83	66.59	398.4
1654	8.86	66.31	396.8
1655	8.83	66.59	346.5
1656	8.86	66.67	378.5
1657	8.83	66.21	405.7
1658	8.85	66.55	411.5
1659	8.85	67.13	382.4
1700	8.87	66.65	376.9
1701	8.73	66.77	385.8
1702	8.83	66.53	389.6
1703	8.83	66.41	390
1704	8.82	66.33	374.7
1705	8.85	66.67	363.4
1706	8.85	66.52	375.9
1707	8.87	66.76	329
1708	8.87	66.18	395.3
1709	8.85	66.33	385.7
1710	8.87	66.69	361.4
1711	8.82	66.49	353.1
1712	8.83	66.6	335.8
1713	8.86	66.88	387
1714	8.88	66.32	400.5
1715	8.86	66.47	397.6
1716	8.88	66.5	392.4
1717	8.83	66.12	390.9
1718	8.86	66.37	375.7
1719	8.85	66.42	362.7
1720	8.86	66.81	400.8
1721	8.89	66.7	327.6
1722	8.88	66.32	326.9
1723	8.85	66.4	376
1724	8.82	66.46	368.8
1725	8.84	66.38	365.5
1726	8.84	66.26	367.6
1727	8.84	66.24	354.3
1728	8.87	66.26	381.5
1729	8.84	66.3	407.7
1730	8.85	66.43	344.9
1731	8.86	66.23	367.1
1732	8.84	66.28	376.4
1733	8.86	66.34	391.7
1734	8.86	66.32	379.5
1735	8.83	65.8	361
1736	8.89	66.18	391.9
1737	8.85	65.99	383.1
1738	8.84	65.9	354.4
1739	8.84	66.36	393.7
1740	8.87	66.3	335.4
1741	8.88	66.22	412.7

215MW	CO2	NOx	CO	
1742	8.88	66.03	399.2	
1743	8.84	66.11	369.2	
1744	8.84	66.05	411.8	
1745	8.84	66.46	371.8	
1746	8.86	66	361.9	
1747	8.87	66.02	340.1	
1748	8.84	65.97	338.6	
1749	8.84	66.34	385.1	
1750	8.83	66.19	341.7	
1751	8.84	66.27	352.4	
1752	8.88	66.22	354.3	
1753	8.86	65.92	380.9	
1754	8.84	66.03	399	
1755	8.84	65.88	400.5	
1756	8.87	66.28	381.9	
1757	8.86	65.96	391.3	
1758	8.86	66.07	378.7	
1759	8.84	66.12	361.5	
1800	8.85	66.21	337.1	
1801	8.86	66.2	358.7	END TEST 1801
1802	8.86	66.44	414.6	
1803	8.89	66.49	355.2	
1804	8.89	66.51	392.5	
1805	8.85	66.4	385.6	
1806	8.85	66.26	349.5	
1807	8.91	66.28	377.9	
1808	8.85	65.92	350.4	
1809	8.84	66.12	399.5	
1810	8.86	66.11	407.8	
1811	8.48	60.24	412.6	
1812	0.051	−0.05	95.2	
1813	0.049	−0.199	−1.169	
1814	−0.036	−0.231	−1.244	zero
1815	1.588	15.87	10.05	
1816	9.59	47.81	229.3	
1817	9.72	47.77	251.1	
1818	9.72	47.75	252.5	
1819	9.66	47.75	251.1	mid
1820	15.07	81.1	336.7	
1821	17.75	92.7	451	
1822	17.62	92.8	451.5	
1823	17.59	92.8	451.1	high
1824	17.54	74.1	418.5	
1825	17.71	66.81	399.8	
1826	9.5	65.98	390	
1827	0.815	62.38	42.2	
1828	0.34	25.86	−0.031	
1829	0.201	4.785	−0.79	
1830	0.094	1.217	−0.822	

avgs:	CO_2	NO_x	CO
	8.9	66.3	373

215MW	CO2	NOx	CO	
1831	0.103	0.818	−0.582	
1832	0.045	0.684	−0.904	
1833	0.15	0.646	−0.494	
1834	0.136	0.629	−1.032	
1835	0.027	0.613	−0.966	
1836	0.134	0.612	−1.145	
1837	0.136	0.608	−1.171	
1838	0.134	0.607	−1.166	
1839	0.121	0.59	−1.12	
1840	0.123	0.576	−0.964	
1841	0.127	0.59	−1.12	
1842	0.125	0.586	−0.863	
1843	0.105	0.567	−1.1	
1844	0.069	0.536	−0.749	
1845	1.517	9.76	64.96	
1846	0.036	−0.015	42.04	
1847	−0.009	−0.047	0.024	
1848	−0.002	−0.065	−0.359	zero bias
1849	0	−0.059	1.071	
1850	0.047	−0.09	0.018	
1851	1.379	−0.094	−0.095	
1852	9.59	−0.097	−0.994	
1853	9.59	−0.122	−1.082	mid bias
1854	0.918	43.11	−0.6	
1855	0.067	~~46.8~~	−0.487	
1856	0.034	46.82	−0.445	
1857	0.06	4.486	~~247~~	
1858	−0.042	−0.089	449.9	high bias
1859	0.067	−0.119	448.8	
1900	−0.007	−0.137	450.3	
1901	0.042	−0.111	376.9	

110 MW	O2	CO2	NOx	CO	
1941	−0.003	−0.067	−0.143	−1.403	
1942	−0.006	−0.067	−0.162	−1.258	
1943	−0.012	−0.033	−0.166	−1.475	
1944	−0.013	−0.042	−0.169	−1.267	
1945	−0.015	−0.056	−0.166	−1.494	
1946	−0.015	−0.007	−0.173	−1.481	zero
1947	1.775	5.896	29.82	70.4	
1948	4.12	9.68	47.18	251.1	
1949	4.165	9.63	47.36	252	
1950	4.17	9.64	47.4	252	mid
1951	6.503	14.37	77.2	311.2	
1952	9.05	17.68	92.4	452.1	
1953	9.09	17.68	92.4	452.9	
1954	9.1	17.7	92.5	452.2	high
1955	9.1	17.69	92.6	453.7	
1956	6.296	9.68	67.4	466.5	
1957	5.315	8.54	64.78	463.3	
1958	5.261	8.54	64.54	443.7	
1959	5.346	8.55	63.54	411.6	
2000	5.333	8.59	63.02	397.6	
2001	5.349	8.6	63.24	373	
2002	5.378	8.56	62.12	380.4	
2003	5.395	8.48	61.53	386.9	
2004	5.423	8.49	59.62	374.3	
2005	5.467	8.55	54.16	335.9	
2006	6.151	8.48	49.19	319	
2007	9	8.47	47.93	310.6	
2008	9.07	8.48	47.44	326.3	
2009	9.12	8.53	47.13	279.9	
2010	9.08	8.48	46.2	338.1	
2011	9.08	8.47	46.36	340.2	
2012	8.55	8.45	46.27	322	
2013	5.704	8.45	45.68	315.1	
2014	5.617	8.39	45.4	334.3	
2015	6.781	6.069	45.25	182.4	
2016	18.77	0.529	34.82	3.685	
2017	20.11	0.223	11.93	−0.137	
2018	20.35	0.176	1.984	−0.288	
2019	18.94	1.309	6.623	12.15	
2020	4.576	0.078	0.199	57.9	
2021	0.115	0.036	0.046	−0.929	
2022	0.033	−0.013	−0.018	−1.074	
2023	0.014	−0.02	−0.061	−1.141	
2024	0.004	0.049	−0.085	−1.186	external zero
2025	1.877	0.036	−0.083	−0.278	
2026	4.051	−0.02	−0.124	−1.018	
2027	4.095	−0.067	−0.155	−1.094	
2028	3.132	−0.06	−0.178	26.78	
2029	0.105	−0.022	−0.183	240	

mid bias

110 MW	O2	CO2	NOx	CO	
2030	0.005	−0.049	−0.203	251	mid bias
2031	−0.003	8.01	−0.201	121.4	
2032	−0.007	9.58	−0.202	−1.334	
2033	−0.009	1.728	38.92	−1.315	mid bias
2034	−0.014	0.065	46.72	−1.184	
2035	−0.011	0.067	46.73	−1.15	
2036	3.85	7.35	37.45	96.1	
2037	5.597	8.32	36.16	200.5	
2038	5.728	8.39	36.02	148.6	
2039	8.7	8.44	36.74	191	
2040	9.05	8.42	38.2	230	
2041	9.06	8.38	39.04	317.1	
2042	9.03	8.33	39.14	140.6	
2043	6.141	8.33	36.01	132.3	
2044	5.724	8.3	34.19	180	
2045	5.71	8.38	33.26	184.1	
2046	5.68	8.32	33.57	214.5	
2047	5.609	8.38	33.22	230.2	
2048	5.596	8.44	34.84	233	
2049	5.565	8.45	35.12	236.6	
2050	5.531	8.51	35.44	223.6	
2051	5.541	8.45	36.02	232.5	
2052	5.552	8.43	36.25	240.2	
2053	5.623	8.42	37.49	231.5	
2054	5.631	8.42	36.98	215.5	
2055	5.645	8.41	37.22	298.5	
2056	5.688	8.4	37.54	283	
2057	5.717	8.14	37.86	293.9	
2058	5.718	8.25	37.76	264.2	
2059	5.76	8.3	39.9	265.7	
2100	5.722	8.32	40.58	280.9	
2101	5.721	8.3	39.77	263.5	
2102	5.782	8.24	39.78	311.8	
2103	5.835	8.29	40.08	268.9	
2104	5.824	8.34	39.77	256.5	
2105	5.832	8.28	39.51	290.1	
2106	5.848	8.32	39.69	229.3	
2107	5.842	8.32	39.96	221	
2108	5.835	8.3	39.34	220.4	
2109	5.833	7.85	39.45	254.4	
2110	5.83	8.21	39.81	247.8	
2111	5.882	8.28	40.11	236.5	
2112	5.846	8.31	40.46	209	
2113	5.77	8.31	42.05	201	
2114	5.811	8.27	42.5	218.3	
2115	5.789	8.29	40.9	241.6	
2116	5.781	8.24	40.71	252.2	
2117	5.785	8.32	40.42	215.1	
2118	5.76	8.39	39.97	224	

110 MW	O2	CO2	NOx	CO
2119	5.788	8.32	40.05	246.6
2120	5.787	8.3	39.88	253.9
2121	5.767	8.3	39.68	267.3
2122	5.781	8.29	40.04	269
2123	5.749	8.31	40.09	228.3
2124	5.802	8.29	40.25	251.4
2125	5.762	8.37	39.93	256.2
2126	5.75	8.21	39.7	280.2
2127	5.738	8.42	40.13	293
2128	5.741	8.34	40.04	303
2129	5.765	8.29	39.97	247.6
2130	6.862	6.519	30.85	222.5
2131	19.39	0.136	−0.124	25.18
2132	20.27	0.089	−0.197	0.452
2133	18.4	2.162	9.86	15.81
2134	10.91	5.634	25.96	153
2135	10.37	5.889	27.62	172.7
2136	9.53	5.891	27.51	177
2137	9.68	6.206	28.96	181.7
2138	9.73	6.172	28.88	164.8
2139	13.23	2.576	25.67	77.5
2140	19.76	0.281	14.76	1.622
2141	20.2	0.134	5.912	6.747
2142	13.93	4.841	25.36	93.7
2143	10.15	5.491	25.2	163.7
2144	10.9	5.089	22.79	156.8
2145	19.15	0.065	−0.157	39.03
2146	20.24	0.076	−0.138	0.878
2147	20.23	0.069	0.006	0.527
2148	20.01	0.109	0.005	0.433
2149	19.82	−0.136	−0.08	0.615
2150	20.23	0.094	−0.247	1.135
2151	13.37	5.467	27.16	71.9
2152	5.959	8.3	39.61	232.8
2153	5.779	8.39	39.18	248.7
2154	5.767	8.33	39.54	209.7
2155	5.732	8.33	39.65	242.8
2156	5.72	8.38	39.28	220.9
2157	5.726	8.4	38.91	224.6
2158	5.776	8.36	39.03	240.3
2159	5.734	8.35	39.11	230
2200	5.687	8.37	39.18	242.7
2201	5.717	8.38	39.51	218.6
2202	5.733	8.4	39.62	243.4
2203	5.697	8.4	39.27	215.2
2204	5.695	8.41	39.6	228.4
2205	5.723	8.39	39.67	224.1
2206	5.727	8.44	39.67	207.8
2207	5.72	8.41	39.43	214.8

110 MW	O2	CO2	NOx	CO
2208	5.71	8.39	39.3	243.8
2209	5.727	8.37	39.19	190.4
2210	5.705	8.42	39.47	215.5
2211	7.08	6.559	28.52	182.8
2212	19.49	0.096	−0.134	30.99
2213	20.27	0.094	−0.21	1.48
2214	17.74	2.822	14.21	14.36
2215	6.241	8.38	39.06	200.6
2216	5.707	8.54	38.56	237.5
2217	5.656	8.43	38.5	237.8
2218	5.702	8.43	38.9	253
2219	5.715	8.41	39.11	237.7
2220	5.641	8.44	38.86	247
2221	5.653	8.41	38.62	219.1
2222	5.66	8.41	39.21	237
2223	5.669	8.39	38.9	266.7
2224	5.667	8.42	38.44	247.8
2225	5.684	8.38	39.05	245
2226	5.673	8.38	38.86	249.7
2227	5.687	8.38	38.58	226.3
2228	5.684	8.37	38.93	245.9
2229	5.687	8.45	38.72	233.1
2230	5.679	8.45	38.61	279.6
2231	5.691	8.45	39.05	235.7
2232	5.72	8.31	39.15	240.9
2233	5.679	8.43	38.79	220.7
2234	5.674	8.45	39.26	242.8
2235	6.827	6.759	29.5	215.7
2236	19.38	0.143	−0.227	38.4
2237	12.28	6.205	29.91	86.7
2238	5.807	8.43	39.04	240.2
2239	5.687	8.44	38.5	222.1
2240	5.702	8.44	38.87	233.9
2241	5.695	8.39	39.22	237.5
2242	5.681	8.45	38.9	238.9
2243	5.709	8.39	38.89	246.9
2244	5.706	8.41	39.06	259.5
2245	5.755	8.34	39.6	223
2246	5.689	8.44	38.94	230.2
2247	5.692	8.41	39.03	239.9
2248	5.675	8.44	38.72	214.5
2249	5.698	8.41	39.09	232.1
2250	5.695	8.45	39.16	230.3
2251	5.718	8.41	39.2	229.3
2252	5.741	8.36	39.21	237.9
2253	5.685	8.46	38.76	215
2254	5.681	8.44	38.95	229.7
2255	5.673	8.41	39.06	244.9
2256	5.68	8.33	39.16	216.5

110 MW	O2	CO2	NOx	CO	
2257	5.646	8.44	39.01	228.7	
2258	5.653	8.08	35.39	246.2	
2259	0.904	0.031	−0.524	53.88	
2300	0.016	0.002	−0.586	−1.553	
2301	−0.01	0.022	−0.605	−1.532	
2302	−0.016	0.007	−0.607	−1.52	zero
2303	2.466	7.61	39.23	118.4	
2304	4.11	9.74	48.04	248.9	
2305	4.141	9.76	48.03	249.4	mid
2306	6.922	14.96	81.5	327.2	
2307	9.01	17.78	93.6	446.9	
2308	9.05	17.83	93.8	448.8	
2309	9.06	17.82	93.8	445	high
2310	8.19	14.11	68.62	422.4	
2311	5.8	8.44	39.86	228.3	
2312	5.645	8.38	38.76	215.8	
2313	5.714	7.5	38.57	205.3	
2314	16.79	0.764	28.78	3.984	
2315	20	0.248	6.007	0.528	
2316	20.31	0.101	0.665	0.559	
2317	20.38	0.054	0.193	0.528	
2318	19.97	1.068	4.884	2.469	
2319	9.01	0.36	1.986	34.3	
2320	0.246	−0.074	−0.542	−0.951	
2321	0.041	−0.004	−0.554	−0.993	
2322	0.012	0.025	−0.581	−1.019	ext. zero
2323	0.721	0.031	−0.497	−1.071	
2324	3.926	0.036	−0.586	−1.075	
2325	4.083	−0.009	−0.603	−1.071	mid bias O2
2326	1.527	7.98	−0.61	−1.471	mid bias
2327	0.032	9.71	−0.599	−1.612	
2328	−0.001	6.83	−0.605	11.27	
2329	−0.011	0.092	−0.605	225.6	
2330	−0.016	0.067	−0.606	248.7	mid bias
2331	−0.016	0.067	42.33	108.5	
2332	−0.02	0.051	47.16	−0.986	mid bias
2333	−0.024	0.042	12.89	−1.142	
2334	−0.028	−0.027	−0.639	−1.563	
2335	−0.029	−0.027	−0.674	−1.534	
2336	3.676	10.08	59.4	122.6	
2337	8.91	17.85	94	443.5	
2338	9.04	17.84	92.5	447	
2339	4.851	5.822	26.03	279.9	
2340	0.096	−0.013	−0.612	−0.84	
2341	−0.007	0	−0.665	−1.5	
2342	−0.021	−0.022	−0.675	−1.53	zero
2343	2.201	2.704	37.24	107.5	
2344	4.096	8.58	47.25	249	
2345	4.136	9.79	47.25	249.9	mid

110 MW	O2	CO2	NOx	CO	
2346	6.941	15.25	82.3	327.7	
2347	9.01	17.84	92.3	447.3	
2348	9.05	17.84	92.3	448.6	high
2349	10.39	10.51	48.77	310.8	
2350	1.95	0.06	0.182	10.4	
2351	0.05	0.069	-0.551	-1.096	
2352	-0.003	0.056	-0.604	-1.071	ext. zero
2353	0.827	0	-0.482	-1.031	
2354	3.933	0.009	-0.619	-1.081	
2355	4.073	0.013	-0.633	-1.083	
2356	1.633	7.71	-0.675	-1.403	
2357	0.022	9.64	-0.666	-1.493	mid bias
2358	-0.013	1.799	-0.65	120.5	
2359	-0.024	0.054	-0.664	248.8	mid bias
2400	-0.025	0.054	41.14	110.3	
1	-0.029	0.007	46.3	-0.881	
2	-0.029	-0.013	46.36	-1.018	
3	3.072	6.283	39.76	98	
4	5.581	8.47	38.02	226	START 110MW UREA TEST
5	5.643	8.44	38.6	227.2	
6	5.627	8.45	38.26	220	
7	5.661	8.42	38.69	247.5	
8	5.666	8.45	38.68	214.9	
9	5.662	8.49	38.57	248.8	
10	5.681	8.43	38.96	229.9	
11	5.707	8.41	39.08	222.9	
12	5.681	8.46	39.03	226.3	
13	5.694	8.43	38.85	218.5	
14	5.699	8.43	38.91	240.2	
15	5.709	8.43	39.1	238.7	
16	5.705	8.26	38.82	223.2	
17	5.681	8.47	38.64	237.7	
18	5.74	8.39	39.02	239.4	
19	5.726	8.43	38.88	220.2	
20	5.726	8.46	38.9	211.9	
21	5.715	8.46	38.86	200.5	
22	5.672	8.45	38.67	261.7	
23	5.676	8.49	38.9	235.1	
24	5.684	8.45	38.54	244.6	
25	5.706	8.48	38.74	230.9	
26	5.692	8.47	38.99	251.2	
27	5.711	8.49	39.1	238.2	
28	5.665	8.48	38.53	217.6	
29	5.682	8.51	39.06	247	
30	5.713	8.45	38.85	259.7	
31	5.676	8.48	38.87	237.6	
32	5.697	8.45	39.13	231.8	
33	5.703	8.47	38.72	215.3	
34	5.677	8.51	38.51	220.3	

110 MW	O2	CO2	NOx	CO	
35	5.662	8.47	38.56	250.4	
36	5.689	8.44	38.49	233	
37	5.654	8.47	38.44	248.4	
38	5.666	8.45	38.27	232.8	
39	5.643	8.47	38.03	250.7	
40	5.684	8.47	38.46	240.9	
41	5.658	8.48	38.77	257.4	
42	5.677	8.48	38.46	251.9	
43	5.65	8.5	38.82	276.4	
44	5.672	8.46	38.54	259.2	
45	5.697	8.46	39.33	240.6	
46	5.662	8.46	38.6	222.9	
47	5.696	8.45	39.2	259.4	
48	5.664	8.5	38.58	224.1	
49	5.635	8.52	38.56	236.5	
50	5.672	8.48	38.63	258.5	
51	5.607	8.5	37.97	276.8	
52	5.667	8.49	38.58	256	
53	5.662	8.52	38.78	265.4	
54	5.65	8.36	38.32	269.3	
55	5.71	8.44	38.41	266.6	
56	5.707	8.45	39	223	
57	5.766	8.46	39.02	248.9	
58	5.82	8.4	39.25	196.8	
59	5.785	8.42	39.29	234.6	
100	5.845	8.39	39.7	206.9	
101	5.803	8.42	38.82	203.6	
102	5.785	8.42	38.78	226.8	O2 CO2 NOx CO
103	5.766	8.4	39.06	202.6	
104	5.755	8.43	39.31	196.6	avgs: 5.7 8.5 38.8 236
105	5.773	8.39	40.01	190.9	END TEST
106	5.681	7.78	34.67	215.2	
107	0.73	0.011	−0.686	49.28	
108	0.008	0.011	−0.735	−1.43	
109	−0.018	0.011	−0.743	−1.596	
110	−0.024	0.011	−0.744	−1.581	zero
111	2.458	7.65	39.12	111.4	
112	4.104	9.78	47.56	248.5	
113	4.14	9.8	47.55	249.8	low
114	7.04	15.39	83.4	334.7	
115	9.02	17.91	92.8	447.8	
116	9.06	17.86	92.9	447	
117	9.07	17.86	92.9	449.4	high
118	7.35	11.34	52.84	330.1	
119	5.828	8.41	39.77	223	
120	5.788	8.46	39.58	202.3	
121	5.78	8.39	39.03	195	
122	5.776	8.4	39.48	202.2	
123	5.768	8.4	39.68	184.8	

110 MW	O2	CO2	NOx	CO	
124	5.727	8.37	39.07	209.6	
125	5.714	8.45	39.26	206.4	
126	5.917	6.513	39.38	140.6	
127	17.12	0.134	34.77	11.81	
128	20.03	0.248	6.731	0.863	
129	20.36	0.13	0.772	2.062	
130	20.39	0.134	0.296	3.885	
131	20.4	0.132	0.27	2.714	
132	20.43	0.04	0.257	1.084	
133	19.26	0.771	3.183	15.32	
134	8.77	0.034	3.643	0.216	
135	0.229	0.029	−0.679	−1.029	
136	0.041	0.025	−0.681	−1.08	
137	0.011	0.027	−0.68	−1.084	ext. zero
138	2.695	0.004	−0.548	−1.048	
139	4.069	0.027	−0.695	−1.05	
140	4.1	0.011	−0.711	−0.999	
141	1.646	7.95	−0.702	−1.404	
142	0.037	9.68	−0.723	−1.503	mid bias
143	−0.002	9.72	−0.701	−1.526	
144	−0.01	1.143	−0.715	138.2	
145	−0.017	0.067	−0.715	247.4	mid bias
146	−0.023	0.009	−0.727	248.2	
147	−0.019	0.011	30.35	167.2	
148	−0.022	0.038	46.49	−0.413	
149	−0.023	0.047	46.58	−1.041	
150	−0.017	−0.009	46.23	−0.841	
151	10.37	0.072	44.06	0.4	
152	19.83	0.118	5.462	0.52	
153	20.39	0.02	−0.235	0.524	
154	20.33	0.085	0.084	1	
155	20.3	0.051	0.496	1.46	
156	20.31	−0.4	11.99	1.277	
157	10.76	7.27	38.5	121.9	
158	5.83	8.48	38.81	213	
159	5.768	8.43	44	221.3	
200	5.705	8.47	48.78	248.9	
201	5.702	8.49	51.58	278.2	
202	5.794	8.4	92.4	216.2	
203	5.776	8.43	93.1	214.4	
204	5.741	8.47	93.1	237.9	
205	5.675	8.47	93.2	216.7	
206	5.695	8.5	87.9	259.3	
207	5.72	8.45	50.77	244.1	
208	5.745	8.49	50.76	258	
209	5.708	8.48	50.45	212.3	
210	5.691	8.49	50.16	219.5	
211	5.681	8.49	50	253.8	
212	5.712	8.48	50.32	231.8	

110 MW	O2	CO2	NOx	CO
213	5.69	8.49	50.05	243.2
214	5.702	8.48	50.31	237.3
215	5.662	8.47	49.77	244.6
216	5.747	8.46	51.1	277.2
217	5.768	8.44	51.19	218.8
218	5.73	8.47	50.82	228.2
219	5.735	8.5	50.7	241.9
220	5.734	8.49	50.56	215.6
221	5.698	8.47	50.5	233.2
222	5.683	8.49	50.69	218.1
223	5.689	8.49	50.53	251.9
224	5.707	8.53	50.64	222.3
225	5.695	8.52	50.68	248.9
226	5.731	8.5	51.16	256.5
227	5.727	8.53	51.06	230.6
228	5.718	8.49	51.2	215
229	5.735	8.49	51.05	229
230	5.696	8.47	50.8	243.3
231	5.697	8.46	50.94	235.6
232	5.737	8.47	51.23	219.7
233	5.704	8.53	50.66	233.4
234	5.71	8.5	50.54	253.8
235	5.71	8.47	50.64	240.3
236	5.71	8.49	50.74	244.8
237	5.729	8.51	51.19	223.5
238	5.699	8.49	51.02	207
239	5.703	8.47	51.24	225.6
240	5.675	8.48	50.82	231.2
241	5.693	8.49	51.01	226.1
242	5.639	8.51	50.39	249.2
243	5.675	8.53	50.31	245
244	5.666	8.49	50.14	248.6
245	5.726	8.5	51.23	265.7
246	5.696	8.53	51.34	229.1
247	5.678	8.53	51.02	257.6
248	5.682	8.53	51	239.5
249	5.7	8.47	51.3	264.7
250	5.726	8.5	51.39	250
251	5.702	8.54	50.87	217.6
252	5.694	8.52	51.06	237.8
253	5.664	8.5	51.03	233.4
254	5.718	8.45	51.3	258.3
255	5.695	8.53	50.93	240.7
256	5.693	8.52	51.34	244.5
257	5.718	8.48	70.5	268.4
258	5.676	8.52	92.8	242.6
259	5.695	8.47	92.9	246
300	5.709	8.5	92.4	235.6
301	5.668	8.52	91.4	255.6

110 MW	O2	CO2	NOx	CO	
302	5.679	8.53	91.7	229	
303	3.512	3.592	35.37	163	
304	0.091	0.011	−0.696	0.203	
305	−0.008	0	−0.743	−1.475	
306	−0.019	0.013	−0.758	−1.52	
307	−0.024	0	−0.773	−1.462	zero
308	1.641	5.945	30.57	73.4	
309	4.071	9.76	46.85	247.6	
310	4.141	9.77	46.83	247.9	mid
311	6.318	14.92	77.6	314.1	
312	8.99	17.84	91.6	444.3	
313	9.06	17.91	91.6	446.7	
314	9.07	17.92	91.7	444.5	high
315	9.07	17.93	91.6	444.8	
316	8.72	15.37	77.6	429.6	
317	5.98	8.47	51.17	231.4	
318	5.848	7.26	50.31	187.9	
319	16.41	0.881	36.95	7.26	
320	20	0.3	8.02	0.596	
321	20.36	0.15	0.801	0.613	
322	20.44	0.134	0.127	0.619	
323	20.46	0.134	−0.021	0.608	
324	20.47	0.134	−0.066	0.6	
325	20.47	0.134	−0.073	0.521	
326	20.47	0.134	−0.086	0.53	
327	20.47	0.116	−0.123	0.621	
328	20.1	1.156	6.439	2.713	
329	8.06	0.351	3.751	33.92	
330	0.254	0.029	−0.677	−1.049	
331	0.047	0	−0.694	−1.033	
332	0.016	0.056	−0.707	−1.04	zero bias
333	0.448	0.087	−0.608	−0.781	
334	3.843	0.063	−0.73	−0.497	
335	4.1	0.009	−0.743	−0.78	mid bias
336	2.979	4.697	−0.743	−1.008	
337	0.117	9.73	−0.745	−1.532	
338	0.004	9.73	−0.695	−1.54	
339	−0.008	0.756	44.34	−1.177	
340	−0.014	0.069	46.14	−0.981	
341	−0.018	0.009	7.99	112.4	
342	−0.02	0.067	−0.693	246	
343	−0.022	0.042	−0.737	247.3	mid bias
344	−0.023	0.011	−0.748	246	
345	−0.024	0.081	−0.746	247.2	
346	0.057	0.859	6.258	246.9	
347	4.943	8.31	51.83	262.5	
348	5.766	8.35	52.04	236.4	
349	5.812	8.39	52.61	217.2	
350	5.832	8.17	52.71	207.5	

110 MW	O2	CO2	NOx	CO
351	5.849	7.96	52.88	209.2
352	5.852	8.37	52.85	189.8
353	5.843	8.4	52.93	205.6
354	5.84	8.39	52.7	190.4
355	5.852	8.37	53.02	218.2
356	5.849	8.4	52.65	163.1
357	5.835	8.38	52.53	184.9
358	5.838	8.39	52.7	191.2
359	5.83	8.4	52.32	196.8
400	5.82	8.42	52.7	209.7
401	5.811	8.42	52.34	211
402	5.833	8.38	52.9	213.5
403	5.804	8.39	52.47	192
404	5.793	8.39	52.27	215.4
405	5.791	8.42	52.65	227.3
406	5.816	8.42	52.88	205.3
407	5.776	8.42	52.37	202
408	5.773	8.4	52.11	205.7
409	5.81	8.41	52.31	228.1
410	5.818	8.39	53.08	228.2
411	5.858	8.4	53.52	201.6
412	5.842	8.4	52.77	211.7
413	5.872	8.38	53.16	206.8
414	5.783	8.44	52.31	199.2
415	5.78	8.43	52.21	213.9
416	5.806	8.39	52.53	210.9
417	5.827	8.42	53.11	229.7
418	5.832	8.39	52.86	218.8
419	5.87	8.38	53.47	183.3
420	5.831	8.42	52.94	180.1
421	5.842	8.36	52.89	191.5
422	5.799	8.38	52.75	202.9
423	5.839	8.33	53.62	190.7
424	5.823	8.32	53.28	213.1
425	5.86	8.37	53.51	173.6
426	5.848	8.41	53.42	189.7
427	5.822	8.44	53.14	176.3
428	5.792	8.42	52.73	184.4
429	5.805	8.4	52.61	235.6
430	5.816	8.41	52.67	191.6
431	5.759	8.41	52	206.4
432	5.792	8.45	52.68	235.3
433	5.776	8.44	52.93	226.6
434	5.791	8.41	52.76	195.8
435	5.794	8.47	52.64	211
436	5.785	8.47	52.71	243.1
437	5.78	8.45	53.1	215.1
438	5.78	8.38	52.75	195
439	5.793	8.43	52.85	233.5

START 110MW BASELINE TEST

110 MW	O2	CO2	NOx	CO
440	5.78	8.41	52.95	196.9
441	5.776	8.4	52.98	216
442	5.809	8.39	52.88	187.9
443	5.782	8.39	52.55	195.7
444	5.799	8.43	52.23	234.8
445	5.778	8.42	52.48	206.6
446	5.791	8.44	52.58	245.7
447	5.789	8.47	52.43	182.8
448	5.799	8.44	52.65	208.2
449	5.799	8.41	52.29	184.9
450	5.779	8.44	52.55	197.9
451	5.807	8.4	52.73	233.9
452	5.823	8.41	52.63	199.8
453	5.785	8.44	52.27	199.1
454	5.787	8.42	52.81	202.6
455	5.768	8.44	52.62	187.8
456	5.784	8.41	52.94	186.6
457	5.775	8.47	52.33	214.7
458	5.767	8.45	52.59	219.5
459	5.805	8.45	52.77	214.9
500	5.769	8.47	52.89	220.6
501	5.773	8.41	52.76	215.8
502	5.778	8.41	52.52	216
503	5.785	8.45	52.65	213.6
504	5.799	8.4	52.78	230.9
505	5.8	8.4	52.83	230.7
506	5.776	8.46	53.2	214.1
507	5.815	8.41	53.04	215.9
508	5.792	8.45	53.03	203.8
509	5.811	8.46	53.41	198.1
510	5.798	8.41	53.22	213.4
511	5.792	8.46	52.97	174.8
512	5.765	8.49	52.83	207.7
513	5.779	8.43	52.83	215.3
514	5.82	8.44	52.82	186.5
515	5.766	8.43	52.91	236.1
516	5.793	8.45	53.18	220.5
517	5.792	8.45	52.76	195
518	5.808	8.42	52.85	224.3
519	5.825	8.41	53	195.2
520	5.857	8.4	53.32	205.4
521	5.802	8.39	52.88	202.1
522	5.842	8.39	53.3	193.8
523	5.07	5.86	34.19	187.6
524	0.307	0.081	-0.682	12.25
525	-0.002	0.029	-0.746	-1.55
526	-0.023	-0.004	-0.775	-1.499
527	-0.028	-0.022	-0.792	-1.443
528	-0.03	0.007	-0.791	-1.44

END TEST.

	O_2	CO_2	NO_x	CO
avgs:	5.8	8.4	52.8	208

zero

110 MW	O2	CO2	NOx	CO	
529	2.515	8	39.95	118.7	
530	4.101	9.8	46.87	247.4	
531	4.14	9.81	46.9	248.1	low
532	6.004	13.86	73	297.5	
533	8.97	17.93	91.6	445	
534	9.06	17.94	91.7	442.7	
535	9.07	17.81	91.7	444.1	
536	9.07	17.89	91.7	444.8	high
537	7.23	10.48	60.32	315.4	
538	5.831	7.88	52.29	171.8	
539	15.78	0.924	44.27	14.46	
540	19.93	0.338	11.67	−0.346	
541	20.35	0.154	1.031	−0.377	
542	20.44	0.134	0.278	−0.373	
543	20.47	0.125	0.108	−0.361	
544	20.48	0.098	0.064	−0.375	
545	19.03	0.939	4.422	12.19	
546	4.326	0.047	−0.481	17.18	
547	0.151	0.051	−0.505	−1.011	
548	0.03	0.058	−0.538	−1.017	zero bias
549	1.243	0	−0.542	−0.257	
550	4.002	0.018	−0.552	−0.918	
551	4.103	0.034	−0.571	−0.991	
552	1.599	8.14	−0.554	−1.29	
553	0.034	9.72	−0.548	−1.509	
554	−0.004	4.113	28.47	−1.358	
555	−0.017	0.078	46.47	−1.021	
556	−0.02	0.063	4.809	133.2	
557	−0.024	0.06	−0.529	246.3	mid bias
558	−0.023	0.056	−0.545	244.6	
559	0.085	0.063	−0.432	71	
559	18.63	0	−0.339	0.056	

mid bias

65MW	O2	CO2	NOx	CO	
2000	0.004	−0.06	−0.455	−1.54	
2001	−0.004	0.022	−0.459	−1.601	
2002	−0.009	−0.029	−0.474	−1.556	
2003	−0.012	0.036	−0.482	−1.631	
2004	3.478	9.25	56.86	106.7	
2005	8.96	17.79	93.5	443.4	
2006	9.07	17.82	91.6	448.7	
2007	9.08	17.67	92.8	445.6	
2008	9.08	17.7	93.8	447.6	
2009	9.08	17.66	93.8	445.9	
2010	9.08	17.62	92.8	447.4	
2011	9.08	17.63	91.6	446.6	
2012	9.07	17.62	91.7	448.6	
2013	9.08	17.48	91.8	446.4	
2014	9.07	17.67	91.8	450.4	
2015	6.898	9.69	17.1	211.8	
2016	0.237	0.002	−0.51	−0.879	
2017	0.018	−0.027	−0.562	−1.586	
2018	−0.002	−0.036	−0.599	−1.53	
2019	−0.009	−0.004	−0.599	−1.585	zero
2020	2.429	7.62	38.7	114.9	
2021	4.111	9.69	47.09	250.7	
2022	4.141	9.68	47.13	249.1	
2023	4.145	9.65	47.12	249.8	
2024	4.145	9.71	47.15	249.6	low
2025	6.738	14.97	79.4	326.3	
2026	8.99	17.63	92	444.3	
2027	9.03	17.69	92.1	443.7	
2028	9.04	17.64	92.2	446.8	
2029	9.04	17.69	92.2	449.5	
2030	9.04	17.66	92.3	449.4	
2031	9.04	17.65	92.3	450.2	high
2032	7.33	10	45.49	376.6	
2033	6.231	7.9	35.82	212	
2034	6.102	8.12	33.04	293.5	
2035	6.426	6.711	33.78	167.4	
2036	16.96	0.813	30.03	8.25	
2037	19.79	0.329	10.49	0.457	
2038	20.12	0.136	1.471	0.538	
2039	20.23	0.134	0.61	0.555	
2040	20.25	0.002	0.45	0.489	
2041	18.69	1.026	4.099	11.04	
2042	3.838	−0.022	−0.204	27.98	
2043	0.13	−0.04	−0.279	−1.022	
2044	0.041	0.025	−0.33	−1.049	
2045	0.02	0.056	−0.339	−1.35	zero bias
2046	2.68	0.049	−0.347	−0.812	
2047	4.055	−0.004	−0.405	−1.149	mid bias
2048	4.081	0.04	−0.41	−1.091	

65MW	O2	CO2	NOx	CO	
2049	1.346	8.66	−0.406	−1.829	
2050	0.038	9.56	−0.408	−1.612	mid bias
2051	0.009	2.351	−0.417	104.8	
2052	−0.002	0.067	−0.428	247.8	
2053	−0.004	0.054	22.02	205.8	
2054	−0.013	−0.069	46.83	3.703	
2055	−0.006	−0.011	46.78	−1.011	
2056	0.036	−0.025	46.14	−0.052	
2057	4.154	7.3	28.58	149.3	
2058	6.048	8.12	54.65	282.4	
2059	6.073	8.13	92.7	308.1	
2100	6.098	8.07	92.9	284.3	
2101	6.119	8.11	69.63	237.4	
2102	6.107	8.08	27.95	259	
2103	6.09	8.11	26.91	286.3	
2104	6.106	7.85	27.11	281.9	
2105	6.074	7.62	27.15	286.9	
2106	6.082	8.1	27.01	284.5	
2107	6.078	8.13	26.93	282.2	
2108	6.091	8.08	27	294.7	
2109	6.084	8.12	27.43	287	
2110	6.078	8.12	26.98	272.6	
2111	6.078	8.11	26.93	284.1	
2112	6.064	8.14	26.81	300.5	
2113	6.081	8.08	26.95	314.9	
2114	6.068	8.12	27.03	302.3	
2115	6.042	8.12	26.86	276	
2116	6.078	8.08	27.03	277.4	
2117	6.055	8.17	27.01	266.3	
2118	6.058	8.17	27.33	270.8	
2119	6.023	8.16	26.93	298.3	
2120	6.068	8	27.13	241	
2121	6.039	8.18	26.5	306.9	
2122	6.05	8.1	26.85	292.6	
2123	6.086	8.12	27.66	266.2	
2124	6.081	8.17	27.16	262.1	
2125	6.084	8.14	27.54	244.9	
2126	6.06	8.06	26.86	295.1	
2127	6.095	8.11	26.75	278.4	
2128	5.989	0.496	27.31	257.7	
2129	6.106	8.09	26.97	239.3	
2130	6.098	8.01	26.76	288.6	
2131	16.75	0.494	0.327	81.6	
2132	20.13	0.112	−0.282	0.955	
2133	20.19	0.08	−0.327	0.851	
2134	20.19	0.154	−0.212	0.833	
2135	9.9	7.59	25.24	163.1	
2136	6.199	8.12	26.47	277	
2137	6.133	8.1	26.3	285.6	

65MW	O2	CO2	NOx	CO
2138	6.114	8.14	26.79	258.4
2139	6.11	7.96	26.57	254.9
2140	6.107	8.08	26.08	301.9
2141	6.092	8.1	26.27	296.5
2142	6.119	8.05	26.43	272.1
2143	6.138	8.13	26.3	264.5
2144	6.108	8.14	26.74	265
2145	6.18	8.05	26.91	237.7
2146	6.158	8.09	25.88	267.7
2147	6.11	8.13	25.58	315.6
2148	6.122	7.99	26.51	281.3
2149	6.138	8.12	26.73	295.4
2150	6.164	8.1	26.75	226.3
2151	6.138	8.09	26.42	242.1
2152	6.15	8.05	26.57	241
2153	6.089	8.1	25.53	319
2154	6.125	8.05	25.93	268.9
2155	13.57	2.324	6.072	184.1
2156	20.08	0.134	−0.278	1.74
2157	14.39	4.964	17.14	52.53
2158	6.481	8.01	26.03	167.3
2159	6.144	8.12	24.55	338.2
2200	6.127	8.08	25.56	298.4
2201	6.129	8.1	25.12	262.5
2202	6.136	8.09	25.03	280.2
2203	6.128	8.1	25.35	250.7
2204	6.098	8.1	24.87	315.7
2205	6.103	8.12	24.65	315.3
2206	6.088	8.14	24.93	298.2
2207	6.136	8.04	25.63	280.7
2208	6.137	8.11	25.54	239.9
2209	6.09	8.1	25.89	250.5
2210	6.137	8.09	25.53	253.6
2211	6.123	8.15	25.53	276.7
2212	6.081	8.12	25.11	338.5
2213	6.132	8.06	25.45	254.2
2214	6.083	8.1	25.18	289.8
2215	6.104	8.12	25.03	311.5
2216	6.168	8.08	25.72	243.5
2217	6.15	8.11	25.73	264.1
2218	6.132	8.05	25.51	240.4
2219	13.12	2.611	6.867	164.2
2220	20.07	0.121	−0.269	1.959
2221	20.2	0.078	−0.329	1.606
2222	20.21	0.089	−0.338	1.692
2223	20.21	0.132	−0.339	1.521
2224	20.21	0.112	−0.364	1.579
2225	20.21	0.072	−0.358	1.723
2226	10.23	7.35	23.98	155.1

65MW	O2	CO2	NOx	CO	
2227	6.245	8.04	25.3	263.1	
2228	6.15	8.12	25	273.6	
2229	6.152	8.07	25.15	290.3	
2230	6.126	8.04	25.22	298.8	
2231	6.159	8.12	25.58	251.9	
2232	6.169	8.12	25.39	253.7	
2233	6.141	8.06	24.98	251.4	
2234	6.166	8.04	25.42	294.3	
2235	6.169	8.06	25.77	267.7	
2236	6.164	7.95	25.76	253.5	
2237	6.133	8.08	25.39	233	
2238	6.185	8.07	26.02	233.1	
2239	6.263	8.08	25.32	207	
2240	6.142	8.1	24.44	359.2	
2241	6.169	8.1	24.78	250.8	
2242	6.158	8.06	24.49	281.7	
2243	6.173	8.04	24.67	307.6	
2244	6.188	8.1	25.04	264.1	
2245	6.17	7.97	24.97	231.7	
2246	3.482	3.078	7.55	185.4	
2247	0.081	0.029	−0.605	−0.633	
2248	0	0	−0.618	−1.508	
2249	−0.011	0	−0.633	−1.505	zero
2250	1.372	4.957	27.39	57.51	
2251	4.029	9.66	47.72	247.5	
2252	4.104	9.66	47.68	249.9	
2253	4.111	9.71	47.71	250.5	mid
2254	7.18	15.54	85.4	350.3	
2255	8.94	17.67	93	448.9	
2256	8.97	17.69	93.1	447.2	high
2257	10.91	11.86	56.29	394	
2258	19.82	0.101	−0.091	19.24	
2259	20.17	0.054	−0.209	2.499	
2300	20.17	0.089	−0.253	2.462	
2301	20.17	0.078	−0.271	2.543	
2302	20.17	0.06	12.83	2.521	
2303	20.16	0.096	92.8	2.463	
2304	20.06	0.087	93	2.706	
2305	18.8	0.069	75	2.504	
2306	19.52	0.116	1.683	2.46	
2307	20.09	0.083	1.805	2.558	
2308	20.14	0.123	0.299	2.545	
2309	20.14	0.123	−0.176	2.555	
2310	20.18	0.094	−0.192	3.027	
2311	8.68	0.029	0.529	1.358	
2312	0.234	0.054	−0.523	−1.089	
2313	0.06	0.04	−0.537	−1.033	
2314	0.029	−0.002	−0.543	−1.05	zero bias
2315	2.079	0.045	−0.454	−1.094	

65MW	O2	CO2	NOx	CO
2316	4.027	0	−0.543	−1.003
2317	4.069	−0.013	−0.545	−1.034
2318	4.074	0.06	−0.542	−1.11
2319	1.591	7.76	−0.542	−1.549
2320	0.044	9.58	−0.542	−1.577
2321	0.01	2.436	35.93	−1.375
2322	−0.003	0.038	46.63	−1.048
2323	−0.008	0.038	46.67	−1.093
2324	−0.012	0.067	5.093	130.1
2325	−0.016	0.065	−0.482	247.9
2326	−0.016	0.045	−0.523	249.8
2327	4.889	0.101	−0.485	170
2328	18.82	0.13	−0.342	5.278
2329	7.96	7.26	22.67	185.9
2330	6.197	8.05	24.38	267.4
2331	6.144	7.95	24.42	295.7
2332	6.165	8.06	24.22	299.3
2333	6.146	8.08	24.14	307.3
2334	6.171	8.11	24.57	280.6
2335	6.138	8.11	24.62	281.5
2336	6.152	8.07	24.44	291.3
2337	6.204	8.06	25.13	252.1
2338	6.193	8.05	24.9	275
2339	6.184	8.1	24.95	271.2
2340	6.222	8.05	25.42	243.5
2341	6.18	8.08	24.82	268.5
2342	6.165	8.09	24.49	254.4
2343	6.167	8.08	24.54	290.8
2344	6.173	8.05	24.58	296.1
2345	6.174	8.08	24.77	276.4
2346	6.17	8.06	24.45	283.8
2347	6.224	8.05	25.35	246.5
2348	6.217	8.08	25.25	246.8
2349	6.182	8.04	24.61	265.3
2350	6.192	8.1	24.56	282.6
2351	6.186	8.08	24.83	290.4
2352	6.203	8.04	24.79	240.9
2353	6.225	7.99	25.18	241.6
2354	6.21	8.04	25.04	237.5
2355	6.209	8.02	25.14	244.4
2356	6.195	8.04	24.53	245.9
2357	6.222	8.04	24.79	253.6
2358	6.208	8.09	24.66	260
2359	6.17	8.11	24.28	278.1
2400	6.184	8.06	24.85	253.2
1	6.178	8.04	24.5	270.5
2	6.169	8.06	24.69	293.4
3	6.168	8.06	24.66	268.6
4	6.161	8.08	24.58	274.2

mid bias

mid bias

Start 65MW Urea Test

65MW	O2	CO2	NOx	CO
5	6.161	8.09	24.36	279.7
6	6.178	8.08	24.41	298.6
7	6.196	8.08	24.85	260.1
8	6.197	8.05	24.79	234.8
9	6.178	8.06	24.72	272.6
10	6.185	8.02	24.04	286.6
11	6.156	8.06	27.87	298.9
12	6.149	8.07	65.13	267.2
13	6.187	8.07	25.3	255.3
14	6.176	8.04	24.77	254.1
15	6.164	8.04	24.48	275
16	6.171	8.1	24.75	292.8
17	6.137	8.08	24.83	273.4
18	6.172	8.06	25	257.9
19	6.186	8.05	25.09	270
20	6.178	8.1	24.72	238.6
21	6.164	8.06	24.59	243.9
22	6.158	8.09	24.38	304.9
23	6.213	8.06	24.94	265.1
24	6.179	8.06	24.6	274.7
25	6.207	8.08	25.39	231.1
26	6.189	8.08	24.61	248.5
27	6.191	8.08	24.46	294.5
28	6.165	8.04	24.64	298.5
29	6.211	7.99	24.87	275.1
30	6.2	8.07	24.66	250.8
31	6.175	8.11	24.41	286.1
32	6.187	8.11	24.68	262.6
33	6.22	8.06	24.76	269.7
34	6.194	8.05	24.53	265.9
35	6.217	8.04	24.83	279.3
36	6.203	8.05	24.67	248.3
37	6.192	8.07	24.89	252.1
38	6.218	8.1	25.01	250.4
39	6.181	8.12	24.69	280.8
40	6.208	8.08	24.87	256.6
41	6.196	8.13	24.87	281.5
42	6.209	8.1	25.34	246
43	6.204	8.1	24.92	267.4
44	6.198	8.11	25.01	277
45	6.195	8.09	24.73	255.4
46	6.177	8.12	24.82	268.2
47	6.195	8.08	24.76	282.3
48	6.15	8.07	25	262.1
49	6.176	8.07	24.93	269
50	6.174	8.1	24.8	253.1
51	6.185	8.12	25.19	244.6
52	6.202	8.1	24.99	248.3
53	6.144	8.15	24.48	275

65MW	O2	CO2	NOx	CO
54	6.146	8.13	24.84	272.8
55	6.149	8.1	24.75	262.8
56	6.167	8.11	24.97	310.8
57	6.135	8.12	24.84	305.7
58	6.138	8.12	24.63	292.4
59	6.17	8.13	24.72	263.2
100	6.188	8.11	25.13	235.4
101	6.167	8.09	24.71	291.1
102	6.158	8.12	25.01	273.5
103	6.187	8.07	25.26	239.9
104	6.139	8.11	24.93	267.8
105	6.146	8.11	24.81	270.5
106	6.166	8.12	24.89	272.7
107	6.157	8.12	24.87	292.6
108	6.154	8.11	24.85	287.9
109	6.175	8.12	25.21	253.2
110	6.179	8.12	24.92	253.6
111	6.183	8.09	24.93	274.6
112	6.153	8.09	24.72	268.5
113	6.195	8.06	25.1	271.2
114	3.82	3.371	8.92	181.6
115	0.089	0.029	−0.607	−0.183
116	−0.006	0.004	−0.61	−1.54
117	−0.018	0	−0.627	−1.537
118	−0.023	0.004	−0.62	−1.588
119	2.223	7.24	37.93	114.1
120	4.059	9.69	47.76	249.3
121	4.098	9.67	47.75	250
122	4.103	9.7	47.81	250.6
123	7.03	15.24	84.6	340.5
124	8.93	17.66	93.4	448.1
125	8.97	17.7	93.4	446.3
126	8.97	17.69	93.5	449.4
127	7.52	10.56	40.14	337.6
128	6.244	8.09	25.79	222.5
129	6.189	8.05	24.95	316.5
130	6.16	8.06	24.83	260
131	6.248	6.793	24.54	245.3
132	16.31	0.467	19.05	10.46
133	19.72	0.308	4.275	4.871
134	20.07	0.134	0.446	4.131
135	20.15	0.134	0.124	3.743
136	20.18	0.134	0.036	3.558
137	20.19	0.134	0.006	3.55
138	20.2	0.103	−0.006	3.682
139	20.2	0.094	−0.007	4.113
140	20.21	0.067	−0.011	4.09
141	20.21	0.013	−0.021	3.938
142	20.22	0.092	−0.01	3.69

END TEST

	O_2	CO_2	NO_x	CO
avgs:	6.2	8.1	25.5	268

zero

mid

high

	65MW	O2	CO2	NOx	CO	
	143	19.61	1.348	3.624	7.74	
	144	12.38	0.512	0.045	47.88	
	145	0.475	0	−0.56	2.298	
	146	0.065	0.009	−0.592	−1.009	
	147	0.025	0.051	−0.597	−1.029	
	148	0.01	0.009	−0.613	−1.015	zero
	149	2.741	0	−0.596	−0.667	
	150	4.045	−0.025	−0.618	−1.051	
	151	4.073	0.054	−0.613	−1.079	
	152	4.077	0.038	−0.613	−1.062	
	153	2.98	4.44	−0.641	−1.166	
mid bias	154	0.108	9.57	−0.629	−1.527	
	155	0.007	3.8	−0.635	63.09	mid bias
	156	−0.008	0.047	−0.649	245.8	
	157	−0.013	0.002	−0.644	248.1	
	158	−0.013	0	42.8	106	
	159	−0.019	0.018	46.77	−0.907	
	200	0.029	0.662	44.86	0.101	
	201	5.239	7.98	31.7	146.5	
	202	6.16	8.02	31.12	220.5	
	203	6.214	8.83	44.54	284	
	204	8.65	17.58	93	415.6	
	205	8.96	17.68	93.4	448.4	
	206	8.97	17.67	92.7	446.4	
	207	8.97	17.69	92	445.8	
	208	8.98	17.68	91.9	447.1	
	209	9.04	17.67	91.9	446.6	
	210	8.07	12.13	55	395.2	
	211	6.338	8.02	31.56	200.9	
	212	6.243	8.1	31.04	238.7	
	213	6.203	8.09	31.16	232.3	
	214	6.173	8.05	30.87	266.2	
	215	6.195	8.05	31.05	279.7	
	216	6.205	8.04	31.64	252.6	
	217	6.203	8.05	31.34	240.2	
	218	6.218	8.05	31.17	244.5	
	219	6.265	8.01	31.42	260.3	
	220	6.247	7.99	32.06	215.1	
	221	6.218	8.03	31.52	201.6	
	222	6.236	8.03	31.24	267.6	
	223	6.222	8.07	31.2	258.2	
	224	6.204	8.04	31.54	253.1	
	225	6.239	7.99	31.45	232.5	
	226	6.196	8.02	31.56	241.7	
	227	6.203	8.02	31.45	228.6	
	228	6.198	8.02	31.46	257.5	
	229	6.266	8	31.55	237.2	
	230	6.295	7.98	31.8	263.5	
	231	6.267	8.04	32.6	181.8	

65MW	O2	CO2	NOx	CO	
232	6.212	8.11	31.49	251.6	
233	6.183	8.09	31.51	263.6	
234	6.219	8.07	31.94	220.3	
235	6.228	8	31.73	213.1	
236	6.224	8.01	31.41	271.9	
237	6.196	8.05	31.42	219.8	
238	6.152	8.09	31.04	297.2	
239	6.208	8.1	31.35	261.2	
240	6.21	8.09	31.4	241.3	
241	6.22	8.08	31.44	247.4	
242	6.187	8.06	31.29	238.4	
243	6.202	8.06	30.92	267.1	
244	6.228	8.07	31.38	251.4	
245	6.221	8.04	31.35	237	
246	6.238	8.03	31.38	275.5	
247	6.238	8.07	31.7	228	
248	6.218	8.1	31.46	267	
249	6.187	8.1	31.6	265.4	
250	6.204	8.1	31.38	249.1	
251	6.216	8.09	31.39	265.9	
252	6.222	8.1	31.53	249.9	
253	6.206	8.11	31.64	230.5	
254	6.183	8.07	30.94	245.2	
255	6.226	8.02	31.47	278.5	
256	6.233	8.03	31.7	239.3	
257	6.217	8.1	31.55	229.1	
258	6.2	8.07	31.41	275.5	
259	6.188	8.07	31.4	308.8	
300	6.193	8.07	31.78	260.3	
301	6.222	8.04	31.57	222	
302	6.194	8.09	31.27	259.5	
303	6.215	8.09	31.55	278.5	
304	6.212	8.05	31.79	236.6	
305	6.21	6.99	31.67	263.9	
306	6.212	8.02	31.56	246.6	
307	6.226	8.05	31.77	239.4	
308	4.107	3.845	12.86	170.1	
309	0.107	0.002	−0.575	1.956	
310	−0.006	0	−0.613	−1.333	
311	−0.019	−0.007	−0.614	−1.49	
312	−0.024	−0.011	−0.621	−1.491	zero
313	1.969	6.697	34.08	87.6	
314	4.076	9.67	46.76	248.9	
315	4.123	9.72	46.79	250.7	mid
316	6.665	14.72	79.2	320	
317	8.98	17.62	91.3	449.2	
318	9.02	17.66	91.4	449.3	
319	9.03	17.68	91.5	448.6	high
320	7.6	10.83	44.77	385.5	

APPENDIX D-7

EMISSION RATE CALCULATIONS

PPM TO LB/HR WORKSHEET

	Run #	flow rate (dscf/min)	NOx ppm	NOx lb/hr	CO ppm	CO lb/hr	TGNMO ppm	TGNMO lb/hr	NH3 ppm	NH3 lb/hr
Full Baseline	Tray 1	445253					18.3	20.7		
	Tray 2	445253					114	129		
	Average:	445253	79.2	257	362	715	66.2	74.8		
Full w/ Urea	Tray 1	450359					66.5	76.0		
	Tray 2	450359					151	172		
	Average:	450359	68.1	223	374	747	109	124	12	15
Mid Baseline	Tray 1	260769					274	181		
invalid	Tray 2	260769					168	111		
	Average:	260769	54.7	104	211	244	~~274~~	~~105~~		
Mid w/ Urea	Tray 1	256213					139	90.7		
	Tray 2	256213					171	111		
	Average:	256213	40.0	74.6	237	269	155	101	16	11
Low Baseline	Tray 1	167198					209	88.6		
	Tray 2	167198					331	140		
	Average:	167198	33.8	41.2	254	188	270	114		
Low w/ Urea	Tray 1	172150					302	132		
	Tray 2	172150					321	140		
	Average:	172150	26.4	33.1	269	205	312	136	13	6.0
M = Molecular Wt.			46.01		28.01		12.01		17.03	

$$E = \frac{C_S \cdot M}{379 \times 10^6} \cdot Q \cdot 60$$

60 min / hr

E = Emission rate, lb/hr

C_S = Concentration of gas, ppm

Q = Stack gas flow rate, dscfm

379×10^6 = conversion factor, scf/

APPENDIX D-8

QA/QC PERFORMANCE MEASUREMENTS SUMMARY TABLES

Table D-8-1. SCAQMD Method 100.1 instrument calibration results, full load stratification test, 1/5/94

	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	4.20	9.89	250	48.0
Zero Calibration Response (divisions)				
Pre–Test Response	2.0	5.0	5.0	2.1
Post–Test Response	2.0	4.9	5.0	2.2
High Range Calibration Response (divisions)				
Pre–Test Response	92.3	93.8	95.2	95.0
Post–Test Response	91.8	93.8	95.5	95.7
Mid Range Calibration Response (divisions)				
Pre–Test Response	43.3	53.8	55.5	49.8
Post–Test Response	43.0	53.5	55.5	50.0
Zero Gas System Bias Respose (divisions)				
Pre–Test Response	4.0	5.1	5.1	2.1
Post–Test Response	2.5	5.1	5.4	2.9
Cal–Gas System Bias Respose (divisions)				
Pre–Test Response	43.0	53.2	55.5	48.5
Post–Test Response	42.5	53.0	95.5	92.8
Analyzer Calibration Error (%)				
Pre–Test High Range	1.1%	0.0%	0.0%	0.7%
Pre–Test Mid Range	0.7%	0.7%	0.5%	0.3%
Post–Test High Range	1.6%	0.1%	0.3%	1.3%
Post–Test Mid Range	1.0%	0.9%	0.5%	0.2%
Sampling System Bias Error (%)				
Pre–Test	3.0%	1.3%	0.4%	1.6%
Post–Test	2.0%	1.6%	0.1%	2.3%
Linearity (%)				
Pre–Test	0.2%	0.7%	0.5%	0.7%
Post–Test	0.3%	0.9%	0.3%	0.9%
Zero Calibration Drift (%)				
Stratification Test	0.0%	0.1%	0.0%	0.1%
Calibration Drift (%)				
Stratification Test	0.3%	0.2%	0.0%	0.1%

Table D-8-2. SCAQMD Method 100.1 instrument calibration results, full load baseline test, 1/5/94

	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	4.20	9.89	250	48.0
Zero Calibration Response (divisions)				
Pre–Test Response	2.0	4.9	5.0	2.2
Post–Test Response	1.9	4.8	5.0	2.5
High Range Calibration Response (divisions)				
Pre–Test Response	91.8	93.8	95.5	95.7
Post–Test Response	92.8	93.5	94.8	94.8
Mid Range Calibration Response (divisions)				
Pre–Test Response	43.0	53.5	55.5	50.0
Post–Test Response	43.4	53.6	55.6	49.8
Zero Gas System Bias Respose (divisions)				
Pre–Test Response	2.5	5.1	5.4	2.9
Post–Test Response	2.5	5.1	5.0	3.0
Cal–Gas System Bias Respose (divisions)				
Pre–Test Response	42.5	53.0	95.5	92.8
Post–Test Response	43.0	53.1	94.8	92.5
Analyzer Calibration Error (%)				
Pre–Test High Range	1.6%	0.1%	0.3%	1.3%
Pre–Test Mid Range	1.0%	0.9%	0.5%	0.2%
Post–Test High Range	0.5%	0.0%	0.4%	0.1%
Post–Test Mid Range	0.5%	0.7%	0.6%	0.7%
Sampling System Bias Error (%)				
Pre–Test	2.0%	1.6%	0.1%	2.3%
Post–Test	1.5%	1.5%	0.4%	2.7%
Linearity (%)				
Pre–Test	0.3%	0.9%	0.3%	0.9%
Post–Test	0.3%	0.6%	0.8%	0.8%
Zero Calibration Drift (%)				
Baseline Test	0.1%	0.1%	0.0%	0.3%
Calibration Drift (%)				
Baseline Test	0.5%	0.2%	0.1%	0.5%

Table D-8-3. SCAQMD Method 100.1 instrument calibration results, full load urea on test, 1/5/94

	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	4.20	9.89	250	48.0
Zero Calibration Response (divisions)				
Pre–Test Response	2.0	5.1	5.0	2.3
Post–Test Response	2.0	5.1	5.0	2.1
High Range Calibration Response (divisions)				
Pre–Test Response	93.0	93.8	94.9	94.9
Post–Test Response	92.1	94.0	94.8	94.9
Mid Range Calibration Response (divisions)				
Pre–Test Response	43.5	53.8	55.5	49.9
Post–Test Response	43.1	54.0	55.4	49.7
Zero Gas System Bias Respose (divisions)				
Pre–Test Response	2.2	5.2	5.1	2.6
Post–Test Response	2.4	5.2	5.0	2.3
Cal–Gas System Bias Respose (divisions)				
Pre–Test Response	43.0	53.2	94.9	48.6
Post–Test Response	42.6	53.5	94.7	48.9
Analyzer Calibration Error (%)				
Pre–Test High Range	0.4%	0.1%	0.3%	0.4%
Pre–Test Mid Range	0.5%	0.8%	0.5%	0.4%
Post–Test High Range	1.3%	0.2%	0.4%	0.6%
Post–Test Mid Range	0.9%	0.6%	0.4%	0.4%
Sampling System Bias Error (%)				
Pre–Test	1.2%	1.5%	0.4%	2.0%
Post–Test	1.8%	1.2%	0.5%	1.4%
Linearity (%)				
Pre–Test	0.3%	0.7%	0.7%	0.6%
Post–Test	0.3%	0.6%	0.6%	0.7%
Zero Calibration Drift (%)				
Urea On Test	0.0%	0.0%	0.0%	0.2%
Calibration Drift (%)				
Urea On Test	0.4%	0.2%	0.1%	0.0%

Table D-8-4. SCAQMD Method 100.1 instrument calibration results, mid load stratification test, 1/6/94

	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	4.20	9.89	250	48.0
Zero Calibration Response (divisions)				
Pre–Test Response	2.4	5.2	5.0	2.0
Post–Test Response	2.6	5.5	5.0	1.7
High Range Calibration Response (divisions)				
Pre–Test Response	93.7	94.3	95.1	94.8
Post–Test Response	93.3	95.0	94.5	95.9
Mid Range Calibration Response (divisions)				
Pre–Test Response	44.1	54.3	55.8	49.4
Post–Test Response	44.0	54.6	55.0	50.0
Zero Gas System Bias Respose (divisions)				
Pre–Test Response	2.7	5.5	5.0	2.0
Post–Test Response	2.9	5.7	5.1	1.7
Cal–Gas System Bias Respose (divisions)				
Pre–Test Response	43.6	53.8	55.5	48.8
Post–Test Response	43.5	54.2	55.0	49.0
Analyzer Calibration Error (%)				
Pre–Test High Range	0.1%	0.3%	0.1%	0.6%
Pre–Test Mid Range	0.3%	0.4%	0.8%	0.6%
Post–Test High Range	0.7%	0.8%	0.7%	2.0%
Post–Test Mid Range	0.6%	0.4%	0.0%	0.3%
Sampling System Bias Error (%)				
Pre–Test	1.1%	1.2%	0.5%	1.2%
Post–Test	1.4%	1.0%	0.1%	0.7%
Linearity (%)				
Pre–Test	0.3%	0.5%	0.9%	0.9%
Post–Test	0.3%	0.8%	0.4%	0.7%
Zero Calibration Drift (%)				
Stratification Test	0.2%	0.3%	0.0%	0.3%
Calibration Drift (%)				
Stratification Test	0.3%	0.0%	0.8%	0.9%

Table D-8-5. SCAQMD Method 100.1 instrument calibration results, mid load baseline test, 1/7/94

	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	4.20	9.89	250	48.0
Zero Calibration Response (divisions)				
Pre–Test Response	2.7	5.6	5.0	2.0
Post–Test Response	2.6	5.6	5.0	2.0
High Range Calibration Response (divisions)				
Pre–Test Response	93.6	95.5	94.0	94.3
Post–Test Response	93.6	95.3	94.0	94.3
Mid Range Calibration Response (divisions)				
Pre–Test Response	44.1	54.8	55.0	49.2
Post–Test Response	44.0	54.7	54.8	49.2
Zero Gas System Bias Respose (divisions)				
Pre–Test Response	3.0	5.7	5.0	2.0
Post–Test Response	3.0	5.7	5.0	2.1
Cal–Gas System Bias Respose (divisions)				
Pre–Test Response	43.8	54.2	54.5	48.5
Post–Test Response	43.8	54.2	54.5	48.9
Analyzer Calibration Error (%)				
Pre–Test High Range	0.5%	1.2%	1.2%	0.1%
Pre–Test Mid Range	0.6%	0.3%	0.0%	0.8%
Post–Test High Range	0.4%	0.9%	1.2%	0.1%
Post–Test Mid Range	0.6%	0.3%	0.2%	0.8%
Sampling System Bias Error (%)				
Pre–Test	1.2%	1.0%	0.5%	1.5%
Post–Test	1.2%	1.0%	0.5%	1.2%
Linearity (%)				
Pre–Test	0.4%	0.9%	0.7%	0.9%
Post–Test	0.4%	0.9%	0.5%	0.9%
Zero Calibration Drift (%)				
Baseline Test	0.1%	0.0%	0.0%	0.0%
Calibration Drift (%)				
Baseline Test	0.0%	0.1%	0.2%	0.0%

Table D-8-6. SCAQMD Method 100.1 instrument calibration results, mid load urea on test, 1/6/94

	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	4.20	9.89	250	48.0
Zero Calibration Response (divisions)				
Pre–Test Response	2.6	5.5	5.0	2.0
Post–Test Response	2.7	5.5	5.0	2.0
High Range Calibration Response (divisions)				
Pre–Test Response	93.3	95.2	94.8	95.0
Post–Test Response	93.4	95.4	94.7	95.6
Mid Range Calibration Response (divisions)				
Pre–Test Response	44.0	54.7	55.1	49.7
Post–Test Response	44.0	54.7	55.2	50.0
Zero Gas System Bias Respose (divisions)				
Pre–Test Response	2.7	5.7	5.0	2.0
Post–Test Response	3.0	5.7	5.1	2.0
Cal–Gas System Bias Respose (divisions)				
Pre–Test Response	43.3	54.2	55.0	48.7
Post–Test Response	43.8	54.3	55.0	49.0
Analyzer Calibration Error (%)				
Pre–Test High Range	0.7%	1.0%	0.4%	0.8%
Pre–Test Mid Range	0.6%	0.3%	0.1%	0.3%
Post–Test High Range	0.7%	1.2%	0.5%	1.4%
Post–Test Mid Range	0.7%	0.3%	0.2%	0.0%
Sampling System Bias Error (%)				
Pre–Test	1.4%	1.0%	0.0%	1.3%
Post–Test	1.2%	0.9%	0.1%	1.0%
Linearity (%)				
Pre–Test	0.3%	0.8%	0.3%	0.7%
Post–Test	0.4%	0.9%	0.5%	0.7%
Zero Calibration Drift (%)				
Urea On Test	0.1%	0.0%	0.0%	0.0%
Calibration Drift (%)				
Urea On Test	0.1%	0.0%	0.1%	0.3%

Table D-8-7. SCAQMD Method 100.1 instrument calibration results, low load stratification test, 1/7/94

	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	4.20	9.89	250	48.0
Zero Calibration Response (divisions)				
Pre-Test Response	2.5	5.1	5.0	2.0
Post-Test Response	2.4	5.2	5.0	2.0
High Range Calibration Response (divisions)				
Pre-Test Response	92.8	94.0	94.9	94.9
Post-Test Response	92.1	94.0	94.7	95.6
Mid Range Calibration Response (divisions)				
Pre-Test Response	43.8	53.9	55.0	49.5
Post-Test Response	43.4	53.9	55.1	50.0
Zero Gas System Bias Respose (divisions)				
Pre-Test Response	2.8	5.2	5.0	2.3
Post-Test Response	2.8	5.3	5.1	2.0
Cal-Gas System Bias Respose (divisions)				
Pre-Test Response	43.0	53.3	54.9	49.2
Post-Test Response	43.0	53.4	54.7	49.0
Analyzer Calibration Error (%)				
Pre-Test High Range	1.1%	0.2%	0.3%	0.7%
Pre-Test Mid Range	0.7%	0.7%	0.0%	0.5%
Post-Test High Range	1.7%	0.0%	0.5%	1.4%
Post-Test Mid Range	1.0%	0.8%	0.1%	0.0%
Sampling System Bias Error (%)				
Pre-Test	1.8%	1.4%	0.1%	1.1%
Post-Test	1.8%	1.4%	0.4%	1.0%
Linearity (%)				
Pre-Test	0.2%	0.7%	0.2%	0.9%
Post-Test	0.2%	0.8%	0.4%	0.7%
Zero Calibration Drift (%)				
Stratification Test	0.1%	0.1%	0.0%	0.0%
Calibration Drift (%)				
Stratification Test	0.3%	0.1%	0.1%	0.5%

Table D-8-8. SCAQMD Method 100.1 instrument calibration results, low load baseline test, 1/8/94

	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	4.20	9.89	250	48.0
Zero Calibration Response (divisions)				
Pre-Test Response	2.3	5.2	5.0	2.0
Post-Test Response	2.2	5.2	5.0	2.0
High Range Calibration Response (divisions)				
Pre-Test Response	92.8	93.8	94.9	94.0
Post-Test Response	92.7	94.0	94.7	94.0
Mid Range Calibration Response (divisions)				
Pre-Test Response	43.7	53.9	55.3	49.1
Post-Test Response	43.7	53.9	55.0	49.1
Zero Gas System Bias Respose (divisions)				
Pre-Test Response	2.7	5.3	5.1	2.0
Post-Test Response	2.7	5.4	5.0	2.0
Cal-Gas System Bias Respose (divisions)				
Pre-Test Response	43.4	53.5	55.0	48.1
Post-Test Response	43.4	53.5	54.7	48.3
Analyzer Calibration Error (%)				
Pre-Test High Range	0.9%	0.2%	0.3%	0.2%
Pre-Test Mid Range	0.6%	0.8%	0.3%	0.9%
Post-Test High Range	0.9%	0.0%	0.5%	0.2%
Post-Test Mid Range	0.5%	0.8%	0.0%	0.9%
Sampling System Bias Error (%)				
Pre-Test	1.3%	1.3%	0.1%	1.9%
Post-Test	1.3%	1.4%	0.3%	1.7%
Linearity (%)				
Pre-Test	0.2%	0.7%	0.5%	0.8%
Post-Test	0.1%	0.8%	0.3%	0.8%
Zero Calibration Drift (%)				
Baseline Test	0.1%	0.0%	0.0%	0.0%
Calibration Drift (%)				
Baseline Test	0.1%	0.0%	0.3%	0.0%

Table D-8-9. SCAQMD Method 100.1 instrument calibration results, low load urea on test, 1/7/94

	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	4.20	9.89	250	48.0
Zero Calibration Response (divisions)				
Pre–Test Response	2.4	5.2	5.0	2.0
Post–Test Response	2.3	5.2	5.0	2.0
High Range Calibration Response (divisions)				
Pre–Test Response	92.1	94.0	94.7	95.6
Post–Test Response	92.0	93.9	94.7	95.9
Mid Range Calibration Response (divisions)				
Pre–Test Response	43.4	53.9	55.1	50.0
Post–Test Response	43.3	53.9	55.1	50.0
Zero Gas System Bias Respose (divisions)				
Pre–Test Response	2.8	5.3	5.1	2.0
Post–Test Response	2.6	5.2	5.1	2.0
Cal–Gas System Bias Respose (divisions)				
Pre–Test Response	43.0	53.4	54.7	49.0
Post–Test Response	43.0	53.4	54.7	49.0
Analyzer Calibration Error (%)				
Pre–Test High Range	1.7%	0.0%	0.5%	1.4%
Pre–Test Mid Range	1.0%	0.8%	0.1%	0.0%
Post–Test High Range	1.7%	0.0%	0.5%	1.7%
Post–Test Mid Range	1.0%	0.8%	0.1%	0.0%
Sampling System Bias Error (%)				
Pre–Test	1.8%	1.4%	0.4%	1.0%
Post–Test	1.6%	1.3%	0.4%	1.0%
Linearity (%)				
Pre–Test	0.2%	0.8%	0.4%	0.7%
Post–Test	0.2%	0.7%	0.4%	0.9%
Zero Calibration Drift (%)				
Urea On Test	0.1%	0.0%	0.0%	0.0%
Calibration Drift (%)				
Urea On Test	0.0%	0.0%	0.0%	0.0%

APPENDIX E

RECORDS SUPPORTING SCAQMD METHOD 5.2 MEASUREMENTS

APPENDIX E-1

METHOD 5.2 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), $$Y \cdot 17.64 \left(\frac{V_m}{\bullet}\right)\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right)$$ $$17.64\left(\frac{(\_\_\_)}{(\_\_\_)}\right)\left(\frac{(\_\_\_) + \frac{(\_\_\_)}{13.6}}{(\_\_\_) + 460}\right)$$	$V_{m\ std}$	
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 $$\frac{V_{w\ std}}{V_{w\ std} + V_{m\ std}}, \quad \frac{(\_\_\_)}{(\_\_\_) + (\_\_\_)}$$	B_{wo}	
Molecular weight, stack gas dry (lb/lb-mole) $(\%\ CO_2 \times 0.44) + (\%\ O_2 \times 0.32) + (\%\ N_2 + \%\ CO \times 0.28)$ $(\_\_\_ \times 0.44) + (\_\_\_ \times 0.32) + (\_\_\_ + \_\_\_ \times 0.28)$	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) $$P_b + \frac{P_{stack}\ (\text{in. } H_2O)}{13.6}, \quad (\_\_\_) + \frac{(\_\_\_)}{13.6}$$	P_s	

Form 440 3/84

Y = γ = dry gas meter correction factor

Temperature stack gas, average (^{o}F)	T_s	
Stack velocity (fps) $85.49\ (C_p)\ (\sqrt{\Delta P_{s\ avg}})\ \sqrt{\frac{T_s avg + 460}{P_s \quad M_s}}$ $85.49\ (\_\_\_\_)(\sqrt{\quad\quad})\ \sqrt{\frac{(\_\_\_\_) + 460}{(\_\_\_\_)(\_\_\_\_)}}$	$V_{s(avg)}$	
Total sample time (minutes)	θ	
Nozzle diameter, actual (inches)	N_d	
Percent isokinetic (%) $\frac{17.33\ (T_s + 460)(V_w \text{ std} + V_m \text{ std})}{\theta \quad V_s \quad P_s \quad N_d^2}$ $\frac{17.33\ (\_\_\_\_ + 460)((\_\_\_\_) + (\_\_\_\_))}{(\_\_\_\_\_\_)(\_\_\_\_\_\_)(\_\_\_\_\_\_)(\_\_\_\_\_\_^2)}$	%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) $15.432\ \frac{M_p(\text{grams})}{Vm_{std}}$, $15.432\ \frac{(\_\_\_\_\_)}{(\_\_\_\_\_\_)}$	$C_{s(std)}$	
Emission rate of particulate matter (lb/hr) $0.00857\ (Q_s)\ C_{s(std)}$, $0.00857\ (\_\_\_\_\_\_)(\_\_\_\_\_\_)$	E_p	

APPENDIX E-2

GRAVIMETRIC ANALYSIS RECORDS

WEIGHT OF PARTICULATE COLLECTED

TEST SITE: Huntington Beach Generating Station
TEST LOCATION: Unit 1
OPERATING CONDITIONS: 215 MW
DATE: 1/5/94

Distilled Water Blank Weight (g):	0.00095
Distilled Water Blank Volume (ml):	371
Methylene Chloride Blank Wt. (g):	0.00015
Methylene Chloride Blank Vol. (ml):	305

	Pre-Test Avg.	Post-Test Avg.
Control Filter #10:	0.35500	0.35513
Control Filter #16:	0.35601	0.35612

Run Number: Baseline , Run 1
Filter Number: #01
Pre-Filter Recovered Volume (ml): 195
Post-Filter Recovered Volume (ml): 495

	Gross (g)	Tare (g)	Net (g)
Pre-Filter Residue	56.84620	56.84310	0.00310
Pre-Filter Residue Corrected			0.00260
Filter	0.35357	0.35439	0.00000 (0.00082)
Post-Filter	**Gross (g)**	**Tare (g)**	**Net (g)**
Aqueous	47.43170	47.42800	0.00370
Aqueous Corrected			0.00243
Organic	58.29460	58.29200	0.00260
Total Condensable Particulate:			0.00503
Total Particulate:			0.00763

Run Number: Baseline, Run 2
Filter Number: #02
Pre-Filter Recovered Volume (ml): 196
Post-Filter Recovered Volume (ml): 584

	Gross (g)	Tare (g)	Net (g)
Pre-Filter Residue	58.01390	58.00955	0.00435
Pre-Filter Residue Corrected			0.00384
Filter	0.35321	0.35335	0.00000 (0.0001
Post-Filter	**Gross (g)**	**Tare (g)**	**Net (g)**
Aqueous	56.47695	56.46755	0.00940
Aqueous Corrected			0.00790
Organic	48.52340	48.52035	0.00305
Total Condensable Particulate:			0.01095
Total Particulate:			0.01480

Run Number: With Urea, Run 1
Filter Number: #03
Pre-Filter Recovered Volume (ml): 213
Post-Filter Recovered Volume (ml): 726

	Gross (g)	Tare (g)	Net (g)
Pre-Filter Residue	54.34665	54.34335	0.00330
Pre-Filter Residue Corrected			0.00275
Filter	0.35790	0.35682	0.00108
Post-Filter	**Gross (g)**	**Tare (g)**	**Net (g)**
Aqueous	57.39385	57.38470	0.00915
Aqueous Corrected			0.00729
Organic	56.35720	56.35415	0.00305
Total Condensable Particulate:			0.01034
Total Particulate:			0.01418

Run Number: With Urea, Run 2
Filter Number: #04
Pre-Filter Recovered Volume (ml): 166
Post-Filter Recovered Volume (ml): 688

	Gross (g)	Tare (g)	Net (g)
Pre-Filter Residue	47.47000	47.46670	0.00330
Pre-Filter Residue Corrected			0.00287
Filter	0.36053	0.35976	0.00077
Post-Filter	**Gross (g)**	**Tare (g)**	**Net (g)**
Aqueous	58.33575	58.32890	0.00685
Aqueous Corrected			0.00508
Organic	54.71065	54.70705	0.00360
Total Condensable Particulate:			0.00869
Total Particulate:			0.01233

WEIGHT OF PARTICULATE COLLECTED

TEST SITE: Huntington Beach Generating Station
TEST LOCATION: Unit 1
OPERATING CONDITIONS: 110 MW
DATE: 1/6/94 & 1/7/94

Distilled Water Blank Weight (g):	0.00095
Distilled Water Blank Volume (ml):	371
Methylene Chloride Blank Wt (g):	0.00015
Methylene Chloride Blank Vol. (ml):	305

	Pre-Test Avg.	Post-Test Avg.
Control Filter #10:	0.35500	0.35513
Control Filter #16:	0.35601	0.35612

Run Number: Baseline , Run 1
Filter Number: #08
Pre-Filter Recovered Volume (ml): 220
Post-Filter Recovered Volume (ml): 610

	Gross (g)	Tare (g)	Net (g)
Pre-Filter Residue	47.83200	47.82805	0.00395
Pre-Filter Residue Corrected			0.00338
Filter	0.35568	0.35458	0.00110
Post-Filter	Gross (g)	Tare (g)	Net (g)
Aqueous	55.23370	55.22880	0.00490
Aqueous Corrected			0.00333
Organic	48.88645	48.88310	0.00335
Total Condensable Particulate:			0.00669
Total Particulate:			0.01117

Run Number: Baseline, Run 2
Filter Number: #09
Pre-Filter Recovered Volume (ml): 1[illegible]
Post-Filter Recovered Volume (ml): 5[illegible]

	Gross (g)	Tare (g)	Net (g)
Pre-Filter Residue	47.94905	47.94590	0.003[illegible]5
Pre-Filter Residue Corrected			0.00[illegible]4
Filter	0.35545	0.35642	0.00[illegible]0
Post-Filter	Gross (g)	Tare (g)	Net (g)
Aqueous	46.57675	46.57300	0.00375
Aqueous Corrected			0.00236
Organic	43.78105	43.77655	0.00[illegible]50
Total Condensable Particulate:			0.00687
Total Particulate:			0.00951

10.00

Run Number: With Urea, Run 1
Filter Number: #05
Pre-Filter Recovered Volume (ml): 190
Post-Filter Recovered Volume (ml): 575

	Gross (g)	Tare (g)	Net (g)
Pre-Filter Residue	56.98320	56.97715	0.00605
Pre-Filter Residue Corrected			0.00556
Filter	0.35786	0.35696	0.00090
Post-Filter	Gross (g)	Tare (g)	Net (g)
Aqueous	47.89595	47.89120	0.00475
Aqueous Corrected			0.00327
Organic	49.35595	49.35330	0.00265
Total Condensable Particulate:			0.00593
Total Particulate:			0.01239

Run Number: With Urea, Run 2
Filter Number: #06
Pre-Filter Recovered Volume (ml): 198
Post-Filter Recovered Volume (ml): 559

	Gross (g)	Tare (g)	Net (g)
Pre-Filter Residue	57.43145	57.42705	0.00440
Pre-Filter Residue Corrected			0.00389
Filter	0.35791	0.35719	0.00072
Post-Filter	Gross (g)	Tare (g)	Net (g)
Aqueous	60.71180	60.69865	0.01315
Aqueous Corrected			0.01171
Organic	56.74495	56.74310	0.00185
Total Condensable Particulate:			0.01357
Total Particulate:			0.01818

WEIGHT OF PARTICULATE COLLECTED

TEST SITE: Huntington Beach Generating Station
TEST LOCATION: Unit 1
OPERATING CONDITIONS: 65 MW
DATE: 1/7/94 & 1/8/94

Distilled Water Blank Weight (g):	0.00095
Distilled Water Blank Volume (ml):	371
Methylene Chloride Blank Wt. (g):	0.00015
Methylene Chloride Blank Vol. (ml):	305

	Pre-Test Avg.	Post-Test Avg.
Control Filter #10:	0.35500	0.35513
Control Filter #16:	0.35601	0.35612

Run Number: Baseline , Run 1
Filter Number: #13
Pre-Filter Recovered Volume (ml): 177
Post-Filter Recovered Volume (ml): 596

	Gross (g)	Tare (g)	Net (g)
Pre-Filter Residue	46.14200	46.13800	0.00400
Pre-Filter Residue Corrected			0.00354
Filter	0.35506	0.35419	0.00087
Post-Filter	**Gross (g)**	**Tare (g)**	**Net (g)**
Aqueous	47.36235	47.36015	0.00220
Aqueous Corrected			0.00067
Organic	46.76535	46.76265	0.00270
Total Condensable Particulate:			0.00337
Total Particulate:			0.00779

Run Number: Baseline, Run 2
Filter Number: #14
Pre-Filter Recovered Volume (ml): 190
Post-Filter Recovered Volume (ml): 518

	Gross (g)	Tare (g)	Net (g)
Pre-Filter Residue	46.99200	46.98915	0.00285
Pre-Filter Residue Corrected			0.00236
Filter	0.35332	0.35287	0.00045
Post-Filter	**Gross (g)**	**Tare (g)**	**Net (g)**
Aqueous	56.79220	56.78915	0.00305
Aqueous Corrected			0.00172
Organic	53.65760	53.65485	0.00275
Total Condensable Particulate:			0.00447
Total Particulate:			0.00729

Run Number: With Urea, Run 1
Filter Number: #11
Pre-Filter Recovered Volume (ml): 254
Post-Filter Recovered Volume (ml): 590

	Gross (g)	Tare (g)	Net (g)
Pre-Filter Residue	48.48855	48.48235	0.00620
Pre-Filter Residue Corrected			0.00554
Filter	0.36099	0.35743	0.00356
Post-Filter	**Gross (g)**	**Tare (g)**	**Net (g)**
Aqueous	43.18340	43.17960	0.00380
Aqueous Corrected			0.00228
Organic	55.87550	55.87290	0.00260
Total Condensable Particulate:			0.00489
Total Particulate:			0.01400

Run Number: With Urea, Run 2
Filter Number: #12
Pre-Filter Recovered Volume (ml): 211
Post-Filter Recovered Volume (ml): 600

	Gross (g)	Tare (g)	Net (g)
Pre-Filter Residue	58.70560	58.70145	0.00415
Pre-Filter Residue Corrected			0.00360
Filter	0.35792	0.35655	0.00137
Post-Filter	**Gross (g)**	**Tare (g)**	**Net (g)**
Aqueous	56.31515	56.31235	0.00280
Aqueous Corrected			0.00126
Organic	46.28200	46.27900	0.00300
Total Condensable Particulate:			0.00426
Total Particulate:			0.00924

Edison HBGS

METHOD 5.2 DATA SHEET ANALYSIS DATES: 1/20 - 2/4 BY: DJZ

****

RUN ID: 215 MW W/UREA RUN #: 1 DATE: 1/5/94 TIME: 1557

PROBE WASH - AQUEOUS RESIDUE

PW ID#: 00293 TARE ID: 1 FINAL 54.34665

VOLUME: 213 INITIAL 54.34335

=========

NET 0.0033

IMPINGER CATCH - ORGANIC RESIDUE 1/27 - AQUEOUS RESIDUE

IC #A ID: 00294 TARE ID: 23 TARE ID: 34

VOLUME: 486 FINAL 56.3572 FINAL 57.39385

IC #B ID: 00295 INITIAL 56.35415 INITIAL 57.3847

========= =========

VOLUME: 240 NET 0.00305 NET 0.00915

NOTES: 1+2

****

RUN ID: 215 MW W/UREA RUN #: 2 DATE: 1/5/94 TIME: 1900

PROBE WASH - AQUEOUS RESIDUE

PW ID#: 00296 TARE ID: 30 FINAL 47.4700

VOLUME: 166 INITIAL 47.4667

=========

NET 0.0033

IMPINGER CATCH - ORGANIC RESIDUE 1/27 - AQUEOUS RESIDUE

IC #A ID: 00297 TARE ID: 37 TARE ID: 42

VOLUME: 482 FINAL 54.71065 FINAL 58.33575

IC #B ID: 00298 INITIAL 54.70705 INITIAL 58.3289

========= =========

VOLUME: 206 NET 0.0036 NET 0.00685

NOTES:

3+4

****

METHOD 5.2 DATA SHEET   ANALYSIS DATES: 1/24-2/4   BY: [illegible]

****

RUN ID: 215 MW BASELINE   RUN #: 1   DATE: 1/5/94   TIME: 1010

PROBE WASH			- AQUEOUS RESIDUE	
PW ID#:	00287	TARE ID: 36	FINAL	56.8462
VOLUME:	195		INITIAL	56.8431
			NET	0.00031

IMPINGER CATCH		- ORGANIC RESIDUE 1/27		- AQUEOUS RESIDUE	
IC #A ID:	00286	TARE ID:	32	TARE ID:	28
VOLUME:	495	FINAL	58.2946	FINAL	47.4317
IC #B ID:	N/A	INITIAL	58.2920	INITIAL	47.4280
VOLUME:	N/A	NET	0.0026	NET	0.0037

NOTES:

SHC

****

RUN ID: 215 MW BASELINE   RUN #: 2   DATE: 1/5/94   TIME: 1230

PROBE WASH			- AQUEOUS RESIDUE	
PW ID#:	00290	TARE ID: 40	FINAL	58.0139
VOLUME:	196		INITIAL	58.00955
			NET	0.00435

IMPINGER CATCH   sl loss

IMPINGER CATCH		- ORGANIC RESIDUE		- AQUEOUS RESIDUE	
IC #A ID:	00289	TARE ID:	55	TARE ID:	27
VOLUME:	494	FINAL	48.5234	FINAL	56.47695
IC #B ID:	00288	INITIAL	48.52035	INITIAL	56.46755
VOLUME:	90	NET	0.00305	NET	0.0094

NOTES: Erl

****

METHOD 5.2 DATA SHEET ANALYSIS DATES: 1/26 - 2/4 BY: [illegible]

****

RUN ID: 110 MW W/UREA RUN #: 1 DATE: 1/6/94 TIME: 2100

PROBE WASH

Note: label says Baseline
chain says w/ Urea

PW ID#: 00305 TARE ID: 44

VOLUME: 190

- AQUEOUS RESIDUE

FINAL 56.9832

INITIAL 56.97715

NET 0.00605

Note: label says Baseline
chain says w/ Urea

IMPINGER CATCH

IC #A ID: 00306

VOLUME: 489

IC #B ID: 00307

VOLUME: 86

- ORGANIC RESIDUE

TARE ID: 9

FINAL 49.35595

INITIAL 49.3533

NET 0.00265

- AQUEOUS RESIDUE

TARE ID: 19

FINAL 47.89595

INITIAL 47.8912

NET 0.00475

NOTES:
4+5

****

RUN ID: 110 MW W/UREA RUN #: 2 DATE: 1/6/94 TIME: 2323

PROBE WASH

PW ID#: 00304 TARE ID: 43

VOLUME: 198

- AQUEOUS RESIDUE

FINAL 57.43145

INITIAL 57.42705

NET 0.0044

IMPINGER CATCH

IC #A ID: 00302

VOLUME: 475

IC #B ID: 00303

VOLUME: 84

- ORGANIC RESIDUE

TARE ID: 6

FINAL 56.74495

INITIAL 56.7431

NET 0.00185

- AQUEOUS RESIDUE

TARE ID: 52

FINAL 60.7118

INITIAL 60.69865

NET 0.01215

NOTES:
2+3

****

METHOD 5.2 DATA SHEET   ANALYSIS DATES: 1/24 - 2/4   BY: [illegible]

****

RUN ID: 110 MW BASELINE   RUN #: 1   DATE: 1/7/94   TIME: 0257

PROBE WASH   Note: label says w/ Urea, chain says Baseline

PW ID#: 00299   TARE ID: 59

VOLUME: 220

- AQUEOUS RESIDUE
FINAL 47.8320
INITIAL 47.82805
NET 0.00395

Note: label says w/ Urea, chain says Baseline

IMPINGER CATCH

IC #A ID: 00300
VOLUME: 456
IC #B ID: 00301
VOLUME: 154

- ORGANIC RESIDUE
TARE ID: 7
FINAL 48.88645
INITIAL 48.8831
NET 0.00335

- AQUEOUS RESIDUE
TARE ID: 33
FINAL 55.2337
INITIAL 55.2288
NET 0.0049

NOTES: Labels say w/ Urea, Chain says Baseline
1:2 PW bottle tag says 110 MW, Run 1 Base

****

RUN ID: 110 MW BASELINE   RUN #: 2   DATE: 1/7/94   TIME: 0519

PROBE WASH

PW ID#: ~~00310~~ ~~299~~ 0310   TARE ID: 24

VOLUME: 199

- AQUEOUS RESIDUE
FINAL 47.94905
INITIAL 47.9459
NET 0.00315

IMPINGER CATCH

IC #A ID: 00308
VOLUME: 474
IC #B ID: 00309
VOLUME: 66

- ORGANIC RESIDUE
TARE ID: 47
FINAL 43.78105
INITIAL 43.77655
NET 0.0045

- AQUEOUS RESIDUE
TARE ID: 26
FINAL 46.57675
INITIAL 46.5730
NET 0.00375

NOTES:
3+4

****

METHOD 5.2 DATA SHEET   ANALYSIS DATES: 1/20-2/4   BY: [illegible]

****

RUN ID: 65 MW W/UREA   RUN #: 1   DATE: 1/7/94   TIME: 2108

PROBE WASH   - AQUEOUS RESIDUE

PW ID#: 00312   TARE ID: 48   FINAL 48.48855

VOLUME: 254   INITIAL 48.48235

=========

NET 0.0062

IMPINGER CATCH		- ORGANIC RESIDUE		- AQUEOUS RESIDUE	
IC #A ID:	00313	TARE ID:	11	TARE ID:	3
VOLUME:	458	FINAL	55.8755	FINAL	43.1834
IC #B ID:	00315	INITIAL	55.8729	INITIAL	43.1796
VOLUME:	132	NET	0.0026	NET	0.0038

NOTES:
5+6

****

RUN ID: 65 MW W/UREA   RUN #: 2   DATE: 1/7/94   TIME: 2338

PROBE WASH   - AQUEOUS RESIDUE

PW ID#: 00314   TARE ID: 20   FINAL 58.7056

VOLUME: 211   INITIAL 58.70145

=========

NET 0.00415

IMPINGER CATCH		- ORGANIC RESIDUE		- AQUEOUS RESIDUE	
IC #A ID:	00316	TARE ID:	21	TARE ID:	56
VOLUME:	454	FINAL	46.2820	FINAL	56.31515
IC #B ID:	00317	INITIAL	46.2790	INITIAL	56.31235
VOLUME:	146	NET	0.0030	NET	0.0028

NOTES:
1+2

****

METHOD 5.2 DATA SHEET   ANALYSIS DATES: 1/20 - 2/4   BY: [illegible]

****

RUN ID: 65 MW BASELINE   RUN #: 1   DATE: 1/8/94   TIME: 0212

PROBE WASH

PW ID#: 00318   TARE ID: 38

VOLUME: 177

- AQUEOUS RESIDUE

FINAL 46.1420

INITIAL 46.1380

=========

NET 0.0040

IMPINGER CATCH

IC #A ID: 00319

VOLUME: 450

IC #B ID: 00320

VOLUME: 146

- ORGANIC RESIDUE

TARE ID: 31

FINAL 46.76535

INITIAL 46.76265

=========

NET 0.0027

- AQUEOUS RESIDUE

TARE ID: 50

FINAL 47.36235

INITIAL 47.36015

=========

NET 0.0022

NOTES:

3+4

****

RUN ID: 65 MW BASELINE   RUN #: 2   DATE: 1/8/94   TIME: 0428

PROBE WASH

PW ID#: 00321   TARE ID: 39

VOLUME: 190

190 ga

- AQUEOUS RESIDUE

FINAL 46.9920

INITIAL 46.98915

=========

NET 0.00285

IMPINGER CATCH

IC #A ID: 00322

VOLUME: 470

IC #B ID: 00323

VOLUME: 48

- ORGANIC RESIDUE

TARE ID: 2

FINAL 53.6576

INITIAL 53.65485

=========

NET 0.00275

- AQUEOUS RESIDUE

TARE ID: 13

FINAL 56.7922

INITIAL 56.78915

=========

NET 0.00315

NOTES:

5+6

****

METHOD 5.2 DATA SHEET ANALYSIS DATES: 1/20 - 2/4 BY: [illegible]

****

RUN ID: HBGS UNIT 1 COMPLIANCE DATE: 1/8/94 TIME: N/A

DI SOLUTION BLANK - AQUEOUS RESIDUE

ID#: 00325 TARE ID: 35 FINAL 50.8649

VOLUME: 371 INITIAL 50.86395

=========

NET 0.00095

NOTES:

250
121
371

****

MeCl Blank Tare ID 10 AQUEOUS RESIDUE

Volume 305

Final 55.3815

Initial 55.38135

0.00015

ACUREX ENVIRONMENTAL SYSTEMS DIVISION
CHAIN OF CUSTODY

Acurex Proposal Number: ____________

Company Name:	Project Manager:
EDISON	GARRETSON
Project Number: 9585.012	Project Name: HBGS UNIT 1 COMPLIANCE

Sampled by (Printed and Written Signature): J. RUDD / C. Garretson

SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CONTAINERS	ANALYSIS: Aqueous Residue	Organic Residue	Volume					REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
00293	1/5	1557	DI	215 MW w/Urea RUN 1	1	X		X					Probewash (PW)
00294	↓	↓	↓	↓	1	X	X	X	combine & analyze				Impinger Catch (IC) #A
00295	↓	↓	↓	↓	1								IC #B
00296	↓	1900	↓	215 MW w/Urea RUN 2	1	X		X					PW
00297	↓	↓	↓	↓	1	X	X	X	combine & analyze				IC #A
00298	↓	↓	↓	↓	1								IC #B
00287	↓	1010	↓	215 MW BASELINE RUN 1	1	X		X					PW
00286	↓		↓	↓	1	X	X	X					IC

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	REMARKS:
C. Garretson	1/14 1200		
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time
		[illegible signature]	1/19/90 1900

Acurex Environmental Systems Division
555 Clyde Avenue, Bldg. 6
Mountain View, CA 94039
(415) 961-5700

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ACUREX ENVIRONMENTAL SYSTEMS DIVISION
CHAIN OF CUSTODY

Acurex Proposal Number: ____________

Company Name: EDISON	Project Manager: GARRETSON
Project Number: 9585.012	Project Name: HBGS Unit 1 Compliance
Sampled by: (Printed and Written Signature) J. RUDD / C. Gauthier	

SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CONTAINERS	ANALYSIS: Aqueous Residue	Organic Residue	Column						REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
00290	1/5	1230	DI	215 MW BASELINE RUN 2	1	X		X						PW
00289	↓	↓	↓	↓	1	X	X	X		combine & analyze				IC #A
00288	↓	↓	↓	↓	1									IC #B
00305	1/6	2100 ~~[illegible]~~	↓	110 MW w/Urea RUN 1	1	X		X						PW
00306	↓	↓	↓	↓	1	X	X	X		combine & analyze				IC #A
00307	↓	↓	↓	↓	1									IC #B
00304	↓	2323 ~~[illegible]~~	↓	110 MW w/Urea RUN 2	1	X		X						PW
00302	↓	↓	↓	↓	1	X	X	X		combine & analyze				IC #A
00303	↓	↓	↓	↓	1									IC #B

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	REMARKS:
C. Gauthier	1/14 1200		
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature) [signature]	Date/Time 1/[illegible] [illegible]

Acurex Environmental Systems Division
555 Clyde Avenue, Bldg. 6
Mountain View, CA 94039
[redacted]5) 961-5700

F ..92

ACUREX ENVIRONMENTAL SYSTEMS DIVISION
CHAIN OF CUSTODY

Acurex Proposal Number: ______

Company Name: EDISON	Project Manager: GARRETSON
Project Number: 9585.012	Project Name: HBGS Unit 1 Compliance
Sampled by: (Printed and Written Signature) J. Rudd / C. Garretson	

SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CONTAINERS	ANALYSIS: Aqueous Residue	Organic Residue	Volume					REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
00310	1/7	0519	DI	110 MW BASELINE Run 2	1	X		X					PW
00308	↓	↓	↓	↓	1	X	X	X	Combine & analyze				IC #A
00309	↓	~~0519~~	↓	↓	1								IC #B
00299	↓	0257	↓	110 MW BASELINE RUN 1	1	X		X					PW
00300	↓	↓	↓	↓	1	X	X	X	Combine & analyze				IC #A
00301	↓	↓	↓	↓	1								IC #B
00312	↓	2108	↓	65 MW W/Urea Run 1	1	X		X					PW
00313	↓	↓	↓	↓	1	X	X	X	Combine & analyze				IC #A
00315	↓	↓	↓	↓	1								IC #B

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	REMARKS:
C. Garretson	1/14 1200		
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time
		[signature]	1/?/94 1100

Acurex Environmental Systems Division
... Avenue, Bldg. 6
Mountain View, CA 94039
(415) 961-5700

ACUREX ENVIRONMENTAL SYSTEMS DIVISION
CHAIN OF CUSTODY

Acurex Proposal Number: ____________

Company Name: EDISON	Project Manager: GARRETSON
Project Number: 9585.012	Project Name: HBGS Unit 1 Compliance
Sampled by: (Printed and Written Signature) J RUDD /	

SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CONTAINERS	Aqueous Residue	Organic Residue	Volume					REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
00314	1/7	2338	DI	65 MW w/Urea Run 2	1	X		X					PW
00316	↓	↓	↓	↓	1	X	X	X	Combine & analyze				IC #A
00317	↓	↓	↓	↓	1								IC #B
00318	1/8	0212	↓	65 MW Baseline Run 1	1	X		X					PW
00319	↓	↓	↓	↓	1	X	X	X	Combine & Analyze				IC #A
00320	↓	↓	↓	↓	1								IC #B
00321	↓	0428	↓	65 MW Baseline Run 2	1	X		X					PW
00322	↓	↓	↓	↓	1	X	X	X	Combine & Analyze				IC #A
00323	↓	↓	↓	↓	1								IC #B
00325	↓	—	↓	DI SOLUTION BLANK		X		X					

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	REMARKS:
	1/14 1200		
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time: 1/19/94 19[illegible]

Acurex Environmental Systems Division
555 Clyde Avenue, Bldg. 6
Mountain View, CA 94039

Client: HBGS 9585.012 Circle: Tare/Final

	1st Reading	2nd Reading	3rd Reading	4th Reading	Average
	Time: 13:30 Date: 1/18/94 Temp: 69F RH: 43% Initials: AM	Time: 10:30 Date: 1/19 Temp: 69F RH: 44% Initials: AM	Time: 1300 Date: 1/20 Temp: 70F RH: 48% Initials: AM	Time: Date: Temp: RH: Initials:	
S-Weight #1 70	70.0003	70.0004	70.0004		
S-Weight #2 50	50.0002	50.0004	50.0005		
S-Weight #3 51	51.0003	51.0004	51.0004		
Dish ID					
48	48.4823	48.4824 ✓			48.48235
1	54.3435	54.3432 ✓			54.34335
43	57.4269	57.4272 ✓			57.42705
39	46.9902	46.9893	46.9890 ✓		46.98915
40	58.0095	58.0096 ✓			58.00955
20	58.7014	58.7015 ✓			58.70145
36	56.8430	56.8432 ✓			56.8431
35	50.8640	50.8639 ✓			50.86395
59	47.8281	47.8280 ✓			47.82805
32	58.2920	58.2920 ✓			58.2920
28	47.4281	47.4279 ✓			47.4280
34	57.3846	57.3848 ✓			57.3847
26	46.5728	46.5732 ✓			46.5730
44	56.9772	56.9771 ✓			56.97715
38	46.1379	46.1381 ✓			46.1380
24	47.9459	47.9459 ✓			47.9459
30	47.4682	47.4668	47.4666 ✓		47.4667
42	58.3289	58.3289 ✓			58.3289
37	54.7069	54.7072 ✓			54.70705
23	56.3541	56.3542 ✓			56.35415
33	55.2287	55.2289 ✓			55.2288
19	47.8912	47.8912 ✓			47.8912
52	60.6987	60.6986 ✓			60.69865

EVAPORATION DISHES TARE AND FINAL WEIGHTS

Client: HBGS 5585.012

Circle: Tare/Final

	1st Reading	2nd Reading	3rd Reading	4th Reading	Average
	Time: 1330 Date: 1/18 Temp: 69F RH: 47% Initials: [illegible]	Time: 1014 Date: [illegible] Temp: RH: Initials: [illegible]	Time: Date: Temp: RH: Initials:	Time: Date: Temp: RH: Initials:	
S-Weight #1	←	←			
S-Weight #2	←	←			
S-Weight #3	←	←			
Dish ID					
2	53.6547	53.6550 ✓			53.65485
56	56.3124	56.3123 ✓			56.31235
3	43.1796	43.1796 ✓			43.1796
27	56.4673	56.4678 ✓			56.46755
55	48.5203	48.5204 ✓			48.52035
21	46.2788	46.2792 ✓			46.2790
50	47.3600	47.3603 ✓			47.36015
13	56.7889	56.7894 ✓			56.78915
31	46.7625	46.7628 ✓			46.76265
68	56.5545	56.5544 ✓			
53	57.0026	57.0027 ✓			
73	59.7544	59.7548 ✓			
47	43.7764	43.7767 ✓			43.77655
10	55.3812	55.3815 ✓			55.38135
14	47.4770	47.4773 ✓			
9	49.3532	49.3534 ✓			49.3533
64	44.4613	44.4612 ✓			
6	56.7432	56.7430 ✓			56.7431
11	55.8728	55.8730 ✓			55.8729
7	48.8830	48.8832 ✓			48.8831

EVAPORATION DISHES TARE AND FINAL WEIGHTS

Client: Edison HBGS

Circle: Tare/Final

	1st Reading	2nd Reading	3rd Reading	4th Reading	Average
	Time: 1100 Date: 2/4/94 Temp: 72 RH: 43 Initials: JJZ	Time: 1730 Date: 2/4/94 Temp: 74 RH: 40 Initials: JJZ	Time: Date: Temp: RH: Initials:	Time: Date: Temp: RH: Initials:	
S-Weight #1 70	70.0004	70.0005			
S-Weight #2 50	50.0004	50.0005			
S-Weight #3 51	51.0004	51.0005			
Dish ID 1	1.0000	1.0001			
36	56.8460	56.8464	✓		56.8462
32	58.2944	58.2948	✓		58.2946
24	47.9490	47.9491	✓		47.94905
44	56.9830	56.9834	✓		56.9832
35	50.8647	50.8651	✓		50.8649
48	48.4884	48.4887	✓		48.48855
40	58.0137	58.0141	✓		58.0139
39	46.9918	46.9922	✓		46.9920
1	54.3467	54.3466	✓		54.34665
23	56.3570	56.3574	✓		56.3572
37	54.7105	54.7108	✓		54.71065
38	46.1418	46.1422	✓		46.1420
59	47.8318	47.8322	✓		47.8320
20	58.7054	58.7058	✓		58.7056
43	57.4312	57.4317	✓		57.43145
30	47.4698	47.4702	✓		47.4700
10	55.3813	55.3817	✓		55.3815
13	56.7921	56.7923	✓		56.7922
7	48.8862	48.8867	✓		48.88645
19	47.8958	47.8961	✓		47.89595
11	55.8753	55.8757	✓		55.8755
55	48.5234	48.5234	✓		48.5234
50	47.3623	47.3624	✓		47.36235

EVAPORATION DISHES TARE AND FINAL WEIGHTS

Client: Edison HBGS

Circle: Tare/Final

	1st Reading	2nd Reading	3rd Reading	4th Reading	Average
	Time: 1100 Date: 24 Temp: 72 RH: 43 Initials: JMZ	Time: 1720 Date: 24 Temp: 74 RH: 40 Initials: JMZ	Time: Date: Temp: RH: Initials:	Time: Date: Temp: RH: Initials:	
S-Weight #1 70	70.0004	70.0005			
S-Weight #2 50	50.0004	50.0005			
S-Weight #3 51	51.0004	51.0005			
Dish ID	1.0000	1.0001			
6	56.7448	56.7451	✓		56.74495
9	49.3559	49.3560	✓		49.35595
47	43.7809	43.7812	✓		43.78105
21	46.2820	46.2820	✓		46.2820
2	53.6574	53.6578	✓		53.6576
33	55.2335	55.2339	✓		55.2337
52	60.7116	60.7120	✓		60.7118
31	46.7652	46.7655	✓		46.76535
34	57.3937	57.3940	✓		57.39385
42	58.3356	58.3359	✓		58.33575
28	47.4317	47.4317	✓		47.4317
27	56.4770	56.4769	✓		56.47695
26	46.5768	46.5767	✓		46.57675
56	56.3150	56.3153	✓		56.31515
3	43.1833	43.1835	✓		43.1834

FILTERS TARE AND FINAL WEIGHTS

Client: EDISON HBGS

Circle: Tare/Final

		1st Reading	2nd Reading	3rd Reading	4th Reading	Average
		Time: 12/9/93 Date: 0925 Temp: 68°F RH: 60% Initials: CG	Time: 12/12/93 Date: 0955 Temp: 66°F RH: 62% Initials: CG	Time: 12/14/93 Date: 1200 Temp: 69°F RH: 40% Initials: CG	Time: Date: Temp: RH: Initials:	
100 mg	S-Weight #1	0.39748	0.40014	0.40007		
	S-Weight #2	0.29752				
	S-Weight #3					
	Filter ID					
215MW 31	01	0.35442	0.35436	0.35441	✓	0.35439
5MW 32	02	0.35377	0.35325	0.35344	✓	0.35335
215MW 1	03	0.35412	0.35684	0.35679	✓	0.35682
5MW 02	04	0.35702	0.35985	0.35966	✓	0.35971
10MW 1	05	0.35429	0.35709	0.35683	✓	0.35696
MW 02	06	0.35454	0.35731 CG	0.35707	✓	0.35719
	07	0.35433	0.35712	0.35696	✓	0.35704
B	08	0.35193	0.35470	0.35446	✓	0.35458
MW 32	09	0.35374	0.35654	0.35629	✓	0.35642
CONTROL #1	10	0.35233	0.35517	0.35483	✓	0.35500
MW 1	11	0.35471	0.35747	0.35739	✓	0.35743

FILTERS TARE AND FINAL WEIGHTS

EDISON
Client: HBGS

Circle: Tare/Final

400 mg

	1st Reading	2nd Reading	3rd Reading	4th Reading	Average
	Time: 1000 Date: 1/7/94 Temp: 70°F RH: 30% Initials: CG	Time: 1630 Date: 1/7/94 Temp: 72°F RH: 28% Initials: CG	Time: Date: Temp: RH: Initials:	Time: Date: Temp: RH: Initials:	
S-Weight #1	0.40008	0.40013			
S-Weight #2					
S-Weight #3					
Filter ID					
12	0.35651	0.35658	65MW U2		0.35655
13	0.35415	0.35432	65MW B1		0.35419
14	0.35285	0.35289	65MW B2		0.35287
15	0.35337	————	Dropped	on floor	
16	0.35593	0.35609	Control #2		0.35601
17	0.35638	0.35644			0.35641

Client: EDISON HBGS

Circle: Tare / Final (Final circled)

	1st Reading	2nd Reading	3rd Reading	4th Reading	Average
	Time: 1800 hrs Date: 1/25/94 Temp: 68°F RH: 47% Initials: CG	Time: 0830 Date: 1/26/94 Temp: 68°F RH: 48% Initials: CG	Time: Date: Temp: RH: Initials:	Time: Date: Temp: RH: Initials:	
S-Weight #1	0.40013	0.40027			
S-Weight #2					
S-Weight #3					
Filter ID					
01	0.35354	0.35360			0.35357
02	0.35325	0.35316			0.35321
03	0.35782	0.35797			0.35790
04	0.36050	0.36055			0.36053
05	0.35782	0.35789			0.35786
06	0.35790	0.35792			0.35791
08	0.35562	0.35574			0.35568
09	0.35545	0.35545			0.35545
10	0.35508	0.35517			0.35513
11	0.36090	0.36107			0.36099
12	0.35788	0.35795			0.35792
13	0.35500	0.35511			0.35506
14	0.35328	0.35338			0.35332
16	0.35605	0.35619			0.35612

APPENDIX E-3

SPREADSHEETS AND FIELD TEST DATA SHEETS

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant:	SCE HBGS	Performed by:	JR, BD
Date:	1/5/94	Sample Location:	UNIT 1 STACK
Test No./Type:	215 MW BASELINE, PARTICULATE #1	Start/Stop Time:	1010/1155

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.369
Pitot Tube Correction Factor	C(p)	0.8400
Gas Meter Correction Factor	(gamma)	1.0340
Barometric Pressure (in Hg)	P(b)	29.99
Stack Pressure (in H2O)	P(stack)	-0.380
# of Sample Points	#	24
Total Sampling Time (min)	(theta)	(72.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		570.94
Gas Meter Final Reading (cu ft)		635.66
Net Gas Sample Volume (cu ft)	V(m)	(64.72)
Vol of Liquid Collected (ml)	Vl(c)	244.5
Vol of Liq @ Std. Conds. (scf)	V(w std)	(11.509)
Filter and pre-Filter Residue Particulate Wt. (gm)		0.0026
Total Condensable Particulate Wt. (gm)		0.0050
Total Particulate Wt. (gm)	M(p)	(0.0076)
O2 Concentration (by CEM)	% O2	5.0
CO2 Concentration (by CEM)	% CO2	9.1
CO Concentration (by CEM)	% CO	0.362
N2 Concentration (by diff.)	% N2	(85.54)

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter,dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	Gas Meter Temp (degF) out	SQRT(dP)
A-1	3	0.24	2.69	237	60	60	0.4899
2	3	0.25	2.80	237	62	60	0.5000
3	3	0.28	3.16	236	65	61	0.5292
4	3	0.30	3.40	236	69	61	0.5477
5	3	0.29	3.28	236	70	61	0.5385
6	3	0.25	2.84	231	70	62	0.5000
B-1	3	0.26	2.95	233	63	62	0.5099
2	3	0.26	2.94	237	67	62	0.5099
3	3	0.27	3.06	237	70	63	0.5196
4	3	0.27	3.07	237	72	63	0.5196
5	3	0.27	3.08	235	74	64	0.5196
6	3	0.26	2.97	237	75	64	0.5099
C-1	3	0.25	3.47	233	64	64	0.5000
2	3	0.21	3.71	239	68	64	0.4583
3	3	0.21	3.83	238	72	64	0.4583
4	3	0.21	4.29	239	74	64	0.4583
5	3	0.24	4.30	239	75	65	0.4899
6	3	0.23	3.41	239	77	65	0.4796
D-1	3	0.22	3.38	240	68	66	0.4690
2	3	0.21	3.39	240	72	60	0.4583
3	3	0.21	3.51	239	74	66	0.4583
4	3	0.22	3.63	240	76	66.	0.4690
5	3	0.23	3.53	240	77	67	0.4796
6	3	0.23	3.88	239	77	67	0.4796
							0.0000
							0.0000
							0.0000
							0.0000
TOTALS	72	5.870	80.57	5694	1691	1521	11.8519

FIELD DATA AVERAGES			
Avg Velocity Head (in H2O)	dP(avg)	=	0.245
Avg Orifice Meter Reading (in H20)	dH(avg)	=	3.357
Avg Stack Temperature (degF)	T(s avg)	=	237.3
Average Meter Temperature (degF)	T(m avg)	=	66.9
Avg SQRT(dP)		=	0.494

CALCULATED VALUES			
Meter Volume (std, cu. ft.)	V(m std)	=	67.74
Stack Gas Water Vapor Proportion	B(wo)	=	0.145
Mol. Wt., Stack Gas Dry	M(d)	=	29.66
Mol. Wt., Stack Gas Wet	M(s)	=	27.96
Abs Stack Pressure (in Hg)	P(s)	=	29.96
Avg Stack Velocity (ft/sec)	V(s avg)	=	52.4
Isokineticity (%)	% I	=	100.9
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	415284
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	640668
Particulate Loading, dry (gr/dscf)	C(s std)	=	0.0017
Particulate Loading, dry @3% O2 (gr/dscf)		=	0.0019
Particulate Emission Rate(lb/hr)	E(p)	=	6.2

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant: SCE HBGS
Date: 1/5/94
Performed by: JR, BD
Sample Location: UNIT 1 STACK
Test No./Type: 215 MW BASELINE, PARTICULATE #2
Start/Stop Time: 1230/1435

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.369
Pitot Tube Correction Factor	C(p)	0.8400
Gas Meter Correction Factor	(gamma)	1.034
Barometric Pressure (in Hg)	P(b)	29.99
Stack Pressure (in H2O)	P(stack)	−0.380
# of Sample Points	#	24
Total Sampling Time (min)	(theta)	(96.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		636.89
Gas Meter Final Reading (cu ft)		725.05
Net Gas Sample Volume (cu ft)	V(m)	(88.16)
Vol of Liquid Collected (ml)	Vl(c)	292.9
Vol of Liq @ Std. Conds. (scf)	V(w std)	(13.787)
Filter and pre−Filter Residue Particulate Wt. (gm)		0.0038
Total Condensable Particulate Wt. (gm)		0.0110
Total Particulate Wt. (gm)	M(p)	(0.0148)
O2 Concentration (by CEM)	% O2	5.0
CO2 Concentration (by CEM)	% CO2	9.1
CO Concentration (by CEM)	% CO	0.362
N2 Concentration (by diff.)	% N2	(85.54)

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.[illegible]
Avg Orifice Meter Reading (in H20)	dH(avg)	=	2.822
Avg Stack Temperature (degF)	T(s avg)	=	239.3
Average Meter Temperature (degF)	T(m avg)	=	68.9
Avg SQRT(dP)		=	0.506

CALCULATED VALUES

Meter Volume (std. cu. ft.)	V(m std)	=	91.81
Stack Gas Water Vapor Proportion	B(wo)	=	0.[illegible]31
Mol. Wt., Stack Gas Dry	M(d)	=	29[illegible]6
Mol. Wt., Stack Gas Wet	M(s)	=	28[illegible]3
Abs Stack Pressure (in Hg)	P(s)	=	2[illegible]6
Avg Stack Velocity (ft/sec)	V(s avg)	=	[illegible]1
Isokineticity (%)	% I	=	[illegible].9
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	430646
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	655121
Particulate Loading, dry (gr/dscf)	C(s std)	=	0.0025
Particulate Loading, dry @3% O2 (gr/dscf)		=	0.0028
Particulate Emission Rate(lb/hr)	E(p)	=	9.2

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter, dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	Gas Meter Temp (degF) out	SQRT(dP)
A−1	4	0.21	2.37	239	66	65	0.4583
2	4	0.19	2.16	240	73	65	0.4359
3	4	0.22	2.50	240	75	65	0.4690
4	4	0.25	0.29	239	76	66	0.5000
5	4	0.24	2.73	239	75	66	0.4899
6	4	0.23	2.62	239	75	67	0.4796
B−1	4	0.21	2.36	240	63	63	0.4583
2	4	0.18	2.02	240	65	63	0.4243
3	4	0.21	2.37	240	69	72	0.4583
4	4	0.22	2.49	239	71	63	0.4690
5	4	0.23	2.61	239	72	63	0.4796
6	4	0.21	2.39	237	73	64	0.4583
C−1	4	0.27	3.06	235	65	65	0.5196
2	4	0.27	3.05	240	68	65	0.5196
3	4	0.29	3.28	240	72	65	0.5385
4	4	0.32	3.64	240	73	66	0.5657
5	4	0.33	3.75	239	72	66	0.5745
6	4	0.33	3.75	240	73	67	0.5745
D−1	4	0.26	2.95	239	68	68	0.5099
2	4	0.27	3.07	240	73	68	0.5196
3	4	0.30	3.42	240	76	67	0.5477
4	4	0.32	3.66	240	77	68	0.5657
5	4	0.31	3.54	240	77	68	0.5568
6	4	0.32	3.66	240	77	69	0.5657
							0.0000
							0.0000
							0.0000
							0.0000
TOTALS	96	6.19	67.74	5744	1724	1584	12.1381

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant: SCE HBGS
Date: 1/5/94

Performed by: JR, BD
Sample Location: UNIT 1 STACK

Test No./Type: PARTICULATE #1/215 MW, WITH UREA
Start/Stop Time: 1557/1825

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.369
Pitot Tube Correction Factor	C(p)	0.84
Gas Meter Correction Factor	(gamma)	1.034
Barometric Pressure (in Hg)	P(b)	29.99
Stack Pressure (in H2O)	P(stack)	−0.38
# of Sample Points	#	24
Total Sampling Time (min)	(theta)	(96.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		726.16
Gas Meter Final Reading (cu ft)		819.90
Net Gas Sample Volume (cu ft)	V(m)	(93.74)
Vol of Liquid Collected (ml)	Vl(c)	372.3
Vol of Liq @ Std. Conds. (scf)	V(w std)	(17.524)
Filter and pre−Filter Residue Particulate Wt. (gm)		0.0038
Total Condensable Particulate Wt. (gm)		0.0103
Total Particulate Wt. (gm)	M(p)	(0.0142)
O2 Concentration (by CEM)	% O2	5.0
CO2 Concentration (by CEM)	% CO2	9.2
CO Concentration (by CEM)	% CO	0.374
N2 Concentration (by diff.)	% N2	(85.43)

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.294
Avg Orifice Meter Reading (in H20)	dH(avg)	=	3.333
Avg Stack Temperature (degF)	T(s avg)	=	237.8
Average Meter Temperature (degF)	T(m avg)	=	66.9
Avg SQRT(dP)		=	0.541

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	98.13
Stack Gas Water Vapor Proportion	B(wo)	=	0.152
Mol. Wt., Stack Gas Dry	M(d)	=	29.67
Mol. Wt., Stack Gas Wet	M(s)	=	27.90
Abs Stack Pressure (in Hg)	P(s)	=	29.96
Avg Stack Velocity (ft/sec)	V(s avg)	=	35.5
Isokineticity (%)	% I	=	100.7
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	452066
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	703147
Particulate Loading, dry (gr/dscf)	C(s std)	=	0.0022
Particulate Loading, dry @3% O2 (gr/dscf)		=	0.0025
Particulate Emission Rate(lb/hr)	E(p)	=	8.6

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter, dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	out	SQRT(dP)
A−1	4	0.250	2.81	238	63	63	0.5000
2	4	0.260	2.94	238	68	63	0.5099
3	4	0.270	3.07	237	74	63	0.5196
4	4	0.280	3.19	237	75	64	0.5292
5	4	0.280	3.20	236	76	65	0.5292
6	4	0.260	2.98	236	77	65	0.5099
B−1	4	0.270	3.05	236	64	64	0.5196
2	4	0.260	2.93	238	66	64	0.5099
3	4	0.230	2.61	238	71	64	0.4796
4	4	0.270	3.07	238	73	64	0.5196
5	4	0.270	3.07	238	73	64	0.5196
6	4	0.240	2.73	237	73	64	0.4899
C−1	4	0.310	3.47	239	61	61	0.5568
2	4	0.330	3.71	239	66	61	0.5745
3	4	0.340	3.83	239	70	61	0.5831
4	4	0.380	4.29	239	72	61	0.6164
5	4	0.380	4.30	239	72	62	0.6164
6	4	0.300	3.41	238	73	63	0.5477
D−1	4	0.300	3.38	236	62	62	0.5477
2	4	0.300	3.39	238	67	62	0.5477
3	4	0.310	3.51	239	71	63	0.5568
4	4	0.320	3.63	238	74	63	0.5657
5	4	0.310	3.53	238	76	64	0.5568
6	4	0.340	3.88	238	77	65	0.5831
							0.0000
							0.0000
							0.0000
							0.0000
TOTALS	96	7.060	79.98	5707	1694	1515	12.9887

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant: SCE HBGS	Performed by: JR, BD	Test No./Type:	PARTICULATE #2/215 MW, WITH UREA
Date: 1/5/94	Sample Location: UNIT 1 STACK	Start/Stop Time:	1900/2056

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.369
Pitot Tube Correction Factor	C(p)	0.8400
Gas Meter Correction Factor	(gamma)	1.0340
Barometric Pressure (in Hg)	P(b)	29.99
Stack Pressure (in H2O)	P(stack)	−0.380
# of Sample Points	#	24
Total Sampling Time (min)	(theta)	(96.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		821.14
Gas Meter Final Reading (cu ft)		915.20
Net Gas Sample Volume (cu ft)	V(m)	(94.07)
Vol of Liquid Collected (ml)	Vl(c)	364.7
Vol of Liq @ Std. Conds. (scf)	V(w std)	(17.166)
Filter and pre-Filter Residue Particulate Wt. (gm)		0.0036
Total Condensable Particulate Wt. (gm)		0.0087
Total Particulate Wt. (gm)	M(p)	(0.0123)
O2 Concentration (by CEM)	% O2	5.0
CO2 Concentration (by CEM)	% CO2	9.2
CO Concentration (by CEM)	% CO	0.374
N2 Concentration (by diff.)	% N2	(85.43)

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter,dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	out	SQRT(dP)
A−1	4	0.24	2.70	238	64	64	0.4899
2	4	0.24	2.72	237	68	63	0.4899
3	4	0.25	2.84	237	72	63	0.5000
4	4	0.29	3.30	237	74	64	0.5385
5	4	0.31	3.54	237	75	64	0.5568
6	4	0.24	2.74	236	75	64	0.4899
B−1	4	0.24	2.72	235	65	65	0.4899
2	4	0.26	2.96	237	72	65	0.5099
3	4	0.25	2.85	237	75	65	0.5000
4	4	0.25	2.85	237	76	65	0.5000
5	4	0.29	3.31	237	76	65	0.5385
6	4	0.24	2.74	238	77	66	0.4899
C−1	4	0.34	3.82	238	62	62	0.5831
2	4	0.34	3.82	238	64	62	0.5831
3	4	0.34	3.84	237	68	62	0.5831
4	4	0.36	4.07	238	70	62	0.6000
5	4	0.35	3.97	237	71	62	0.5916
6	4	0.31	3.52	237	72	63	0.5568
D−1	4	0.30	3.39	237	66	64	0.5477
2	4	0.33	3.75	238	72	63	0.5745
3	4	0.36	4.10	237	73	64	0.6000
4	4	0.34	3.87	238	73	64	0.5831
5	4	0.34	3.87	237	74	64	0.5831
6	4	0.31	3.53	238	75	65	0.5568
							0.0000
							0.0000
							0.0000
							0.0000
TOTALS	96	7.12	80.82	5693	1709	1530	13.0360

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.2[illegible]
Avg Orifice Meter Reading (in H20)	dH(avg)	=	3.368
Avg Stack Temperature (degF)	T(s avg)	=	237.2
Average Meter Temperature (degF)	T(m avg)	=	67.5
Avg SQRT(dP)		=	0.543

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	98.3[illegible]
Stack Gas Water Vapor Proportion	B(wo)	=	0.14[illegible]
Mol. Wt., Stack Gas Dry	M(d)	=	29.[illegible]7
Mol. Wt., Stack Gas Wet	M(s)	=	27.94
Abs Stack Pressure (in Hg)	P(s)	=	29.96
Avg Stack Velocity (ft/sec)	V(s avg)	=	35.6
Isokineticity (%)	% I	=	10[illegible].3
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	455[illegible]92
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	70498[illegible]
Particulate Loading, dry (gr/dscf)	C(s std)	=	0.0019
Particulate Loading, dry @3% O2 (gr/dscf)		=	0.0022
Particulate Emission Rate(lb/hr)	E(p)	=	7.5[illegible]

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant: SCE HBGS
Date: 1/7/94

Performed by: JR, BD
Sample Location: UNIT 1 STACK

Test No./Type: PARTICULATE #1/110 MW BASELINE
Start/Stop Time: 0257/0457

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.425
Pitot Tube Correction Factor	C(p)	0.84
Gas Meter Correction Factor	(gamma)	1.034
Barometric Pressure (in Hg)	P(b)	30.21
Stack Pressure (in H2O)	P(stack)	−0.40
# of Sample Points	#	24
Total Sampling Time (min)	(theta)	(96.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		94.04
Gas Meter Final Reading (cu ft)		167.41
Net Gas Sample Volume (cu ft)	V(m)	(73.37)
Vol of Liquid Collected (ml)	Vl(c)	251.0
Vol of Liq @ Std. Conds. (scf)	V(w std)	(11.815)
Filter and pre−Filter Residue Particulate Wt. (gm)		0.0045
Total Condensable Particulate Wt. (gm)		0.0067
Total Particulate Wt. (gm)	M(p)	(0.0112)
O2 Concentration (by CEM)	% O2	5.9
CO2 Concentration (by CEM)	% CO2	8.6
CO Concentration (by CEM)	% CO	0.211
N2 Concentration (by diff.)	% N2	(85.29)

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.092
Avg Orifice Meter Reading (in H20)	dH(avg)	=	1.975
Avg Stack Temperature (degF)	T(s avg)	=	[illegible]1.8
Average Meter Temperature (degF)	T(m avg)	=	[illegible]9.6
Avg SQRT(dP)		=	.302

CALCULATED VALUES

Meter Volume (std. cu. ft.)	V(m std)	=	[illegible].18
Stack Gas Water Vapor Proportion	B(wo)	=	[illegible]31
Mol. Wt., Stack Gas Dry	M(d)	=	[illegible].61
Mol. Wt., Stack Gas Wet	M(s)	=	[illegible].09
Abs Stack Pressure (in Hg)	P(s)	=	[illegible]0.18
Avg Stack Velocity (ft/sec)	V(s avg)	=	[illegible]19.0
Isokineticity (%)	% I	=	[illegible]02.2
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	[illegible]7134
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	[illegible]6298
Particulate Loading, dry (gr/dscf)	C(s std)	=	[illegible].0022
Particulate Loading, dry @3% O2 (gr/dscf)		=	[illegible]0026
Particulate Emission Rate(lb/hr)	E(p)	=	[illegible]5.0

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter, dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	Gas Meter Temp (degF) out	SQRT(dP)
A−1	4	0.08	1.71	192	54	54	0.2828
2	4	0.08	1.71	193	61	54	0.2828
3	4	0.09	1.94	192	64	55	0.3000
4	4	0.10	2.16	192	67	56	0.3162
5	4	0.09	1.95	192	68	57	0.3000
6	4	0.07	1.52	192	70	59	0.2646
B−1	4	0.08	1.72	192	59	59	0.2828
2	4	0.08	1.73	192	64	60	0.2828
3	4	0.09	1.96	192	71	60	0.3000
4	4	0.08	1.75	191	72	61	0.2828
5	4	0.08	1.76	190	74	62	0.2828
6	4	0.07	1.54	190	75	62	0.2646
C−1	4	0.08	1.71	192	54	53	0.2828
2	4	0.12	2.57	192	61	52	0.3464
3	4	0.11	2.36	191	61	52	0.3317
4	4	0.11	2.35	192	60	52	0.3317
5	4	0.11	2.36	191	61	52	0.3317
6	4	0.09	1.94	190	62	53	0.3000
D−1	4	0.08	1.71	193	55	56	0.2828
2	4	0.09	1.93	193	60	56	0.3000
3	4	0.09	1.94	192	61	56	0.3000
4	4	0.12	2.58	192	62	56	0.3464
5	4	0.12	2.58	192	61	55	0.3464
6	4	0.09	1.93	192	60	54	0.3000
							0.0000
							0.0000
							0.0000
							0.0000
TOTALS	96	2.20	47.41	4602	1517	1346	7.2423

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant: SCE HBGS
Date: 1/7/94

Performed by: JR, BD
Sample Location: UNIT 1 STACK

Test No./Type: PARTICULATE #2/110 MW BASELINE
Start/Stop Time: 0519/0719

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.425
Pitot Tube Correction Factor	C(p)	0.84
Gas Meter Correction Factor	(gamma)	1.034
Barometric Pressure (in Hg)	P(b)	30.21
Stack Pressure (in H2O)	P(stack)	−0.40
# of Sample Points	#	24
Total Sampling Time (min)	(theta)	(96.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		167.79
Gas Meter Final Reading (cu ft)		242.48
Net Gas Sample Volume (cu ft)	V(m)	(74.69)
Vol of Liquid Collected (ml)	Vl(c)	259.6
Vol of Liq @ Std. Conds. (scf)	V(w std)	(12.219)
Filter and pre−Filter Residue Particulate Wt. (gm)		0.0026
Total Condensable Particulate Wt. (gm)		0.0069
Total Particulate Wt. (gm)	M(p)	(0.0095)
O2 Concentration (by CEM)	% O2	5.9
CO2 Concentration (by CEM)	% CO2	8.6
CO Concentration (by CEM)	% CO	0.211
N2 Concentration (by diff.)	% N2	(85.29)

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.[illegible]
Avg Orifice Meter Reading (in H20)	dH(avg)	=	2.092
Avg Stack Temperature (degF)	T(s avg)	=	188.7
Average Meter Temperature (degF)	T(m avg)	=	61.5
Avg SQRT(dP)		=	0.310

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	79.[illegible]
Stack Gas Water Vapor Proportion	B(wo)	=	0.1[illegible]
Mol. Wt., Stack Gas Dry	M(d)	=	29.[illegible]1
Mol. Wt., Stack Gas Wet	M(s)	=	28[illegible]5
Abs Stack Pressure (in Hg)	P(s)	=	3[illegible]3
Avg Stack Velocity (ft/sec)	V(s avg)	=	1[illegible]5
Isokineticity (%)	% I	=	10[illegible]0
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	274[illegible]5
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	385[illegible]8
Particulate Loading, dry (gr/dscf)	C(s std)	=	0.0018
Particulate Loading, dry @3% O2 (gr/dscf)		=	0.0022
Particulate Emission Rate(lb/hr)	E(p)	=	4.3

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter, dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	Gas Meter Temp (degF) out	SQRT(dP)
A−1	4	0.09	1.95	190	60	60	0.3000
2	4	0.09	1.95	189	63	59	0.3000
3	4	0.09	1.96	189	67	59	0.3000
4	4	0.10	2.18	190	68	59	0.3162
5	4	0.09	1.96	190	67	59	0.3000
6	4	0.08	1.74	191	68	59	0.2828
B−1	4	0.09	1.94	191	60	59	0.3000
2	4	0.08	1.74	191	64	59	0.2828
3	4	0.09	1.96	191	69	59	0.3000
4	4	0.09	1.96	191	69	59	0.3000
5	4	0.08	1.74	191	69	59	0.2828
6	4	0.07	1.52	191	69	58	0.2646
C−1	4	0.10	2.15	190	57	57	0.3162
2	4	0.10	2.17	189	63	57	0.3162
3	4	0.11	2.39	188	66	56	0.3317
4	4	0.10	2.18	186	67	56	0.3162
5	4	0.11	2.40	186	68	56	0.3317
6	4	0.09	1.97	185	66	56	0.3000
D−1	4	0.10	2.16	187	58	56	0.3162
2	4	0.11	2.39	187	63	56	0.3317
3	4	0.12	2.60	187	65	56	0.3464
4	4	0.11	2.39	186	65	56	0.3317
5	4	0.12	2.62	187	67	56	0.3464
6	4	0.10	2.19	186	70	56	0.3162
							0.0000
							0.0000
							0.0000
							0.0000
TOTALS	96	2.31	50.21	4529	1568	1382	7.4299

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant: SCE HBGS
Date: 1/6/94

Performed by: JR, BD
Sample Location: UNIT 1 STACK

Test No./Type: PARTICULATE #1/110 MW, WITH UREA
Start/Stop Time: 2100/2300

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.425
Pitot Tube Correction Factor	C(p)	0.84
Gas Meter Correction Factor	(gamma)	1.034
Barometric Pressure (in Hg)	P(b)	30.21
Stack Pressure (in H2O)	P(stack)	−0.40
# of Sample Points	#	24
Total Sampling Time (min)	(theta)	(96.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	*L*	*0.00*
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		931.19
Gas Meter Final Reading (cu ft)		1005.58
Net Gas Sample Volume (cu ft)	V(m)	(74.39)
Vol of Liquid Collected (ml)	Vl(c)	265.4
Vol of Liq @ Std. Conds. (scf)	V(w std)	(12.492)
Filter and pre−Filter Residue Particulate Wt. (gm)		0.0065
Total Condensable Particulate Wt. (gm)		0.0059
Total Particulate Wt. (gm)	M(p)	(0.0124)
O2 Concentration (by CEM)	% O2	5.8
CO2 Concentration (by CEM)	% CO2	8.7
CO Concentration (by CEM)	% CO	0.237
N2 Concentration (by diff.)	% N2	(85.26)

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter,dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	Gas Meter Temp (degF) out	SQRT(dP)
A−1	4	0.07	1.49	200	61	60	0.2646
2	4	0.08	1.71	199	62	58	0.2828
3	4	0.09	1.93	199	64	59	0.3000
4	4	0.10	2.14	199	66	58	0.3162
5	4	0.09	1.93	198	66	58	0.3000
6	4	0.07	1.50	198	66	58	0.2646
B−1	4	0.07	1.49	198	59	58	0.2646
2	4	0.09	1.92	198	64	57	0.3000
3	4	0.11	2.37	197	67	58	0.3317
4	4	0.09	1.95	197	70	59	0.3000
5	4	0.10	2.16	197	70	58	0.3162
6	4	0.07	1.51	197	71	59	0.2646
C−1	4	0.09	1.91	202	58	59	0.3000
2	4	0.11	2.33	205	61	58	0.3317
3	4	0.11	2.34	203	64	58	0.3317
4	4	0.11	2.35	203	67	59	0.3317
5	4	0.11	2.35	203	68	59	0.3317
6	4	0.09	1.93	202	68	59	0.3000
D−1	4	0.10	2.13	202	61	61	0.3162
2	4	0.11	2.35	202	67	60	0.3317
3	4	0.11	2.36	202	69	60	0.3317
4	4	0.11	2.36	201	69	60	0.3317
5	4	0.11	2.36	201	69	61	0.3317
6	4	0.10	2.15	200	69	60	0.3162
							0.0000
							0.0000
							0.0000
							0.0000
TOTALS	96	2.29	49.02	4803	1576	1414	7.3910

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.095
Avg Orifice Meter Reading (in H20)	dH(avg)	=	2.043
Avg Stack Temperature (degF)	T(s avg)	=	200.1
Average Meter Temperature (degF)	T(m avg)	=	62.3
Avg SQRT(dP)		=	0.308

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	78.87
Stack Gas Water Vapor Proportion	B(wo)	=	0.137
Mol. Wt., Stack Gas Dry	M(d)	=	29.6[illegible]
Mol. Wt., Stack Gas Wet	*M(s)*	=	28.0[illegible]
Abs Stack Pressure (in Hg)	P(s)	=	30.[illegible]
Avg Stack Velocity (ft/sec)	V(s avg)	=	19.5
Isokineticity (%)	% I	=	102.2
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	269438
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	386847
Particulate Loading, dry (gr/dscf)	C(s std)	=	0.0024
Particulate Loading, dry @3% O2 (gr/dscf)		=	0.0029
Particulate Emission Rate(lb/hr)	E(p)	=	5.6

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant:	SCE HBGS	Performed by:	JR, BD
Date:	1/6/94	Sample Location:	UNIT 1 STACK

Test No./Type:	PARTICULATE #2/110 MW, WITH UREA
Start/Stop Time:	2323/0123

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.425
Pitot Tube Correction Factor	C(p)	0.84
Gas Meter Correction Factor	(gamma)	1.034
Barometric Pressure (in Hg)	P(b)	30.21
Stack Pressure (in H2O)	P(stack)	-0.40
# of Sample Points	#	24
Total Sampling Time (min)	(theta)	(96.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		6.20
Gas Meter Final Reading (cu ft)		79.60
Net Gas Sample Volume (cu ft)	V(m)	(73.40)
Vol of Liquid Collected (ml)	Vl(c)	221.9
Vol of Liq @ Std. Conds. (scf)	V(w std)	(10.445)
Filter and pre-Filter Residue Particulate Wt. (gm)		0.0046
Total Condensable Particulate Wt. (gm)		0.0136
Total Particulate Wt. (gm)	M(p)	(0.0182)
O2 Concentration (by CEM)	% O2	5.8
CO2 Concentration (by CEM)	% CO2	8.7
CO Concentration (by CEM)	% CO	0.237
N2 Concentration (by diff.)	% N2	(85.26)

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.[illegible]
Avg Orifice Meter Reading (in H20)	dH(avg)	=	1.896
Avg Stack Temperature (degF)	T(s avg)	=	195.6
Average Meter Temperature (degF)	T(m avg)	=	64.8
Avg SQRT(dP)		=	0.295

CALCULATED VALUES

Meter Volume (std. cu. ft.)	V(m std)	=	77.42
Stack Gas Water Vapor Proportion	B(wo)	=	0.11[illegible]
Mol. Wt., Stack Gas Dry	M(d)	=	29.[illegible]
Mol. Wt., Stack Gas Wet	M(s)	=	28.[illegible]
Abs Stack Pressure (in Hg)	P(s)	=	30.[illegible]
Avg Stack Velocity (ft/sec)	V(s avg)	=	18.[illegible]
Isokineticity (%)	% I	=	10[illegible]
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	2632[illegible]
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	36776[illegible]
Particulate Loading, dry (gr/dscf)	C(s std)	=	0.0036
Particulate Loading, dry @3% O2 (gr/dscf)		=	0.0043
Particulate Emission Rate(lb/hr)	E(p)	=	8.2

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter,dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	out	SQRT(dP)
A-1	4	0.08	1.73	193	61	61	0.2828
2	4	0.07	1.52	195	71	60	0.2646
3	4	0.08	1.74	195	73	61	0.2828
4	4	0.08	1.75	193	75	61	0.2828
5	4	0.08	1.75	193	75	62	0.2828
6	4	0.07	1.54	192	76	63	0.2646
B-1	4	0.07	1.50	197	60	60	0.2646
2	4	0.08	1.72	198	64	60	0.2828
3	4	0.08	1.73	197	68	60	0.2828
4	4	0.08	1.73	197	68	60	0.2828
5	4	0.09	1.95	197	69	60	0.3000
6	4	0.06	1.30	197	71	60	0.2449
C-1	4	0.09	1.93	197	61	60	0.3000
2	4	0.10	2.15	197	65	61	0.3162
3	4	0.11	2.38	197	70	62	0.3317
4	4	0.11	2.39	197	74	63	0.3317
5	4	0.10	2.19	196	75	64	0.3162
6	4	0.09	1.97	196	75	65	0.3000
D-1	4	0.08	1.73	193	61	61	0.2828
2	4	0.09	1.94	194	63	61	0.3000
3	4	0.11	2.38	194	65	61	0.3317
4	4	0.11	2.38	195	67	60	0.3317
5	4	0.10	2.16	197	68	60	0.3162
6	4	0.09	1.95	197	69	60	0.3000
							0.0000
							0.0000
							0.0000
							0.0000
TOTALS	96	2.10	45.51	4694	1644	1466	7.0767

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant: SCE HBGS
Date: 1/8/94

Performed by: JR, BD
Sample Location: UNIT 1 STACK

Test No./Type: PARTICULATE #1/65 MW BASELINE
Start/Stop Time: 0212/0412

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.492
Pitot Tube Correction Factor	C(p)	0.84
Gas Meter Correction Factor	(gamma)	1.034
Barometric Pressure (in Hg)	P(b)	30.16
Stack Pressure (in H2O)	P(stack)	-0.35
# of Sample Points	#	24
Total Sampling Time (min)	(theta)	(96.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		381.81
Gas Meter Final Reading (cu ft)		447.53
Net Gas Sample Volume (cu ft)	V(m)	(65.71)
Vol of Liquid Collected (ml)	Vl(c)	225.9
Vol of Liq @ Std. Conds. (scf)	V(w std)	(10.633)
Filter and pre-Filter Residue Particulate Wt. (gm)		0.0044
Total Condensable Particulate Wt. (gm)		0.0034
Total Particulate Wt. (gm)	M(p)	(0.0078)
O2 Concentration (by CEM)	% O2	6.4
CO2 Concentration (by CEM)	% CO2	8.3
CO Concentration (by CEM)	% CO	0.254
N2 Concentration (by diff.)	% N2	(85.05)

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter,dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	Gas Meter Temp (degF) out	SQRT(dP)
A-1	4	0.04	1.57	175	54	53	0.2000
2	4	0.04	1.58	175	60	53	0.2000
3	4	0.04	1.58	176	63	53	0.2000
4	4	0.04	1.58	175	63	53	0.2000
5	4	0.04	1.58	176	63	53	0.2000
6	4	0.04	1.58	175	64	53	0.2000
B-1	4	0.03	1.17	175	54	53	0.1732
2	4	0.04	1.58	175	63	54	0.2000
3	4	0.04	1.59	174	65	54	0.2000
4	4	0.04	1.58	175	66	55	0.2000
5	4	0.03	1.19	175	68	56	0.1732
6	4	0.03	1.19	174	67	56	0.1732
C-1	4	0.04	1.55	175	49	49	0.2000
2	4	0.04	1.56	175	54	49	0.2000
3	4	0.05	1.96	176	59	50	0.2236
4	4	0.04	1.57	176	62	51	0.2000
5	4	0.04	1.58	176	64	52	0.2000
6	4	0.03	1.19	175	66	53	0.1732
D-1	4	0.04	1.57	174	55	54	0.2000
2	4	0.04	1.58	176	62	53	0.2000
3	4	0.04	1.58	176	62	53	0.2000
4	4	0.05	1.97	176	62	53	0.2236
5	4	0.04	1.58	176	63	53	0.2000
6	4	0.04	1.58	175	63	53	0.2000
							0.0000
							0.0000
							0.0000
							0.0000
TOTALS	96	0.94	37.04	4206	1471	1269	4.7400

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.039
Avg Orifice Meter Reading (in H20)	dH(avg)	=	1.543
Avg Stack Temperature (degF)	T(s avg)	=	175.3
Average Meter Temperature (degF)	T(m avg)	=	57.1
Avg SQRT(dP)		=	0.198

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	70.[illegible]8
Stack Gas Water Vapor Proportion	B(wo)	=	0.1[illegible]2
Mol. Wt., Stack Gas Dry	M(d)	=	2[illegible].[illegible]8
Mol. Wt., Stack Gas Wet	M(s)	=	28[illegible]5
Abs Stack Pressure (in Hg)	P(s)	=	3[illegible]3
Avg Stack Velocity (ft/sec)	V(s avg)	=	[illegible]
Isokineticity (%)	% I	=	10[illegible].5
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	176983
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	243453
Particulate Loading, dry (gr/dscf)	C(s std)	=	0.0017
Particulate Loading, dry @3% O2 (gr/dscf)		=	0.0021
Particulate Emission Rate(lb/hr)	E(p)	=	2.6

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant: SCE HBGS
Date: 1/8/94

Performed by: JR, BD
Sample Location: UNIT 1 STACK

Test No./Type: PARTICULATE #2/65 MW BASELINE
Start/Stop Time: 0428/0628

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.492
Pitot Tube Correction Factor	C(p)	0.84
Gas Meter Correction Factor	(gamma)	1.034
Barometric Pressure (in Hg)	P(b)	30.16
Stack Pressure (in H2O)	P(stack)	-0.35
# of Sample Points	#	24
Total Sampling Time (min)	(theta)	(96.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		449.59
Gas Meter Final Reading (cu ft)		514.60
Net Gas Sample Volume (cu ft)	V(m)	(65.02)
Vol of Liquid Collected (ml)	Vl(c)	227.9
Vol of Liq @ Std. Conds. (scf)	V(w std)	(10.727)
Filter and pre-Filter Residue Particulate Wt. (gm)		0.0028
Total Condensable Particulate Wt. (gm)		0.0045
Total Particulate Wt. (gm)	M(p)	(0.0073)
O2 Concentration (by CEM)	% O2	6.40
CO2 Concentration (by CEM)	% CO2	8.30
CO Concentration (by CEM)	% CO	0.254
N2 Concentration (by diff.)	% N2	(85.05)

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter, dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	Gas Meter Temp (degF) out	SQRT(dP)
A-1	4	0.03	1.18	172	54	54	0.1732
2	4	0.04	1.58	175	60	54	0.2000
3	4	0.04	1.58	174	64	54	0.2000
4	4	0.04	1.59	173	67	55	0.2000
5	4	0.04	1.60	173	69	56	0.2000
6	4	0.03	1.20	172	71	57	0.1732
B-1	4	0.04	1.59	171	57	56	0.2000
2	4	0.04	1.59	174	67	58	0.2000
3	4	0.04	1.59	175	69	58	0.2000
4	4	0.05	2.00	174	70	58	0.2236
5	4	0.04	1.60	173	71	58	0.2000
6	4	0.03	1.20	173	71	59	0.1732
C-1	4	0.03	1.19	172	59	58	0.1732
2	4	0.04	1.59	175	66	59	0.2000
3	4	0.04	1.59	175	66	58	0.2000
4	4	0.04	1.59	173	64	56	0.2000
5	4	0.03	1.19	173	62	55	0.1732
6	4	0.03	1.19	172	59	54	0.1732
D-1	4	0.04	1.57	172	54	53	0.2000
2	4	0.05	1.97	173	57	52	0.2236
3	4	0.05	1.97	173	58	51	0.2236
4	4	0.04	1.57	174	58	51	0.2000
5	4	0.04	1.57	173	58	50	0.2000
6	4	0.04	1.57	172	57	50	0.2000
							0.0000
							0.0000
							0.0000
							0.0000
TOTALS	96	0.93	36.86	4156	1508	1324	4.7101

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.0[illegible]
Avg Orifice Meter Reading (in H20)	dH(avg)	=	1.536
Avg Stack Temperature (degF)	T(s avg)	=	173.2
Average Meter Temperature (degF)	T(m avg)	=	59.0
Avg SQRT(dP)		=	0.196

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	6[illegible].17
Stack Gas Water Vapor Proportion	B(wo)	=	0[illegible]34
Mol. Wt., Stack Gas Dry	M(d)	=	2[illegible]58
Mol. Wt., Stack Gas Wet	M(s)	=	28.[illegible]3
Abs Stack Pressure (in Hg)	P(s)	=	30.13
Avg Stack Velocity (ft/sec)	V(s avg)	=	12.2
Isokineticity (%)	% I	=	102.8
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	175706
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	241650
Particulate Loading, dry (gr/dscf)	C(s std)	=	0.0016
Particulate Loading, dry @3% O2 (gr/dscf)		=	0.0020
Particulate Emission Rate(lb/hr)	E(p)	=	2.4

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant: SCE HBGS
Date: 1/7/94

Performed by: JR, BD
Sample Location: UNIT 1 STACK

Test No./Type: PARTICULATE #1/65 MW, WITH UREA
Start/Stop Time: 2108/2308

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.492
Pitot Tube Correction Factor	C(p)	0.84
Gas Meter Correction Factor	(gamma)	1.034
Barometric Pressure (in Hg)	P(b)	30.16
Stack Pressure (in H2O)	P(stack)	−0.35
# of Sample Points	#	24
Total Sampling Time (min)	(theta)	(96.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		250.99
Gas Meter Final Reading (cu ft)		316.18
Net Gas Sample Volume (cu ft)	V(m)	(65.19)
Vol of Liquid Collected (ml)	Vl(c)	241.6
Vol of Liq @ Std. Conds. (scf)	V(w std)	(11.372)
Filter and pre-Filter Residue Particulate Wt. (gm)		0.0091
Total Condensable Particulate Wt. (gm)		0.0049
Total Particulate Wt. (gm)	M(p)	(0.0140)
O2 Concentration (by CEM)	% O2	6.4
CO2 Concentration (by CEM)	% CO2	8.3
CO Concentration (by CEM)	% CO	0.269
N2 Concentration (by diff.)	% N2	(85.03)

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter, dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	Gas Meter Temp (degF) out	SQRT(dP)
A-1	4	0.04	1.56	178	56	55	0.2000
2	4	0.04	1.56	182	62	56	0.2000
3	4	0.05	1.96	181	65	55	0.2236
4	4	0.05	1.97	181	68	57	0.2236
5	4	0.04	1.58	181	69	57	0.2000
6	4	0.03	1.18	181	67	57	0.1732
B-1	4	0.04	1.57	178	59	54	0.2000
2	4	0.03	1.18	179	65	56	0.1732
3	4	0.04	1.57	180	64	56	0.2000
4	4	0.04	1.57	181	66	56	0.2000
5	4	0.04	1.58	180	66	57	0.2000
6	4	0.03	1.18	180	65	57	0.1732
C-1	4	0.03	1.17	182	60	57	0.1732
2	4	0.04	1.56	183	64	56	0.2000
3	4	0.04	1.57	183	65	56	0.2000
4	4	0.05	1.96	183	67	57	0.2236
5	4	0.05	1.97	182	67	57	0.2236
6	4	0.04	1.57	182	68	57	0.2000
D-1	4	0.03	1.16	185	55	55	0.1732
2	4	0.04	1.55	184	57	55	0.2000
3	4	0.04	1.56	184	61	55	0.2000
4	4	0.04	1.56	184	63	55	0.2000
5	4	0.04	1.56	183	65	55	0.2000
6	4	0.04	1.57	182	67	56	0.2000
							0.0000
							0.0000
							0.0000
							0.0000
TOTALS	96	0.95	37.22	4359	1531	1344	4.7605

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.040
Avg Orifice Meter Reading (in H20)	dH(avg)	=	1.551
Avg Stack Temperature (degF)	T(s avg)	=	181.6
Average Meter Temperature (degF)	T(m avg)	=	59.9
Avg SQRT(dP)		=	198

CALCULATED VALUES

Meter Volume (std. cu. ft.)	V(m std)	=	9.24
Stack Gas Water Vapor Proportion	B(wo)	=	41
Mol. Wt., Stack Gas Dry	M(d)	=	9.58
Mol. Wt., Stack Gas Wet	M(s)	=	27.95
Abs Stack Pressure (in Hg)	P(s)	=	30.13
Avg Stack Velocity (ft/sec)	V(s avg)	=	12.4
Isokineticity (%)	% I	=	103.1
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	75270
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	6208
Particulate Loading, dry (gr/dscf)	C(s std)		0.0031
Particulate Loading, dry @3% O2 (gr/dscf)			0.0038
Particulate Emission Rate(lb/hr)	E(p)		4.7

ISOKINETIC PERFORMANCE WORKSHEET AND PARTICULATE CALCULATIONS

Plant: SCE HBGS
Date: 1/7/94

Performed by: JR, BD
Sample Location: UNIT 1 STACK

Test No./Type: PARTICULATE #2/65 MW, WITH UREA
Start/Stop Time: 2338/0138

PARAMETER	SYMBOL	VALUE (calc.)
Nozzle Diameter, Actual (in)	N(d)	0.492
Pitot Tube Correction Factor	C(p)	0.84
Gas Meter Correction Factor	(gamma)	1.034
Barometric Pressure (in Hg)	P(b)	30.16
Stack Pressure (in H2O)	P(stack)	−0.35
# of Sample Points	#	24
Total Sampling Time (min)	(theta)	(96.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		316.77
Gas Meter Final Reading (cu ft)		381.08
Net Gas Sample Volume (cu ft)	V(m)	(64.31)
Vol of Liquid Collected (ml)	Vl(c)	237.5
Vol of Liq @ Std. Conds. (scf)	V(w std)	(11.179)
Filter and pre-Filter Residue Particulate Wt. (gm)		0.0050
Total Condensable Particulate Wt. (gm)		0.0043
Total Particulate Wt. (gm)	M(p)	(0.0092)
O2 Concentration (by CEM)	% O2	6.4
CO2 Concentration (by CEM)	% CO2	8.3
CO Concentration (by CEM)	% CO	0.269
N2 Concentration (by diff.)	% N2	(85.03)

Sample Point	dClock Time	Velocity Head, dP (in H2O)	Orifice Meter,dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	out	SQRT(dP)
A−1	4	0.03	1.17	175	52	52	0.1732
2	4	0.03	1.17	178	55	52	0.1732
3	4	0.04	1.56	178	59	52	0.2000
4	4	0.03	1.18	178	62	52	0.1732
5	4	0.03	1.18	178	63	53	0.1732
6	4	0.03	1.18	178	64	53	0.1732
B−1	4	0.04	1.57	175	54	53	0.2000
2	4	0.04	1.58	177	63	54	0.2000
3	4	0.04	1.58	177	67	54	0.2000
4	4	0.03	1.19	177	68	54	0.1732
5	4	0.04	1.58	177	67	54	0.2000
6	4	0.03	1.19	178	69	56	0.1732
C−1	4	0.04	1.57	175	56	55	0.2000
2	4	0.04	1.58	177	62	56	0.2000
3	4	0.04	1.58	178	66	56	0.2000
4	4	0.05	1.98	178	67	56	0.2236
5	4	0.05	1.98	178	66	56	0.2236
6	4	0.04	1.58	176	65	56	0.2000
D−1	4	0.04	1.57	175	57	55	0.2000
2	4	0.04	1.57	178	62	55	0.2000
3	4	0.04	1.58	178	64	55	0.2000
4	4	0.04	1.58	178	65	55	0.2000
5	4	0.04	1.58	178	65	55	0.2000
6	4	0.03	1.18	177	65	55	0.1732
							0.0000
							0.0000
							0.0000
							0.0000
TOTALS	96	0.90	35.46	4252	1503	1304	4.6329

FIELD DATA AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.03[illegible]
Avg Orifice Meter Reading (in H20)	dH(avg)	=	1.478
Avg Stack Temperature (degF)	T(s avg)	=	177.2
Average Meter Temperature (degF)	T(m avg)	=	58.5
Avg SQRT(dP)		=	0.193

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	6[illegible].48
Stack Gas Water Vapor Proportion	B(wo)	=	0[illegible]40
Mol. Wt., Stack Gas Dry	M(d)	=	2[illegible].58
Mol. Wt., Stack Gas Wet	M(s)	=	[illegible]96
Abs Stack Pressure (in Hg)	P(s)	=	[illegible].13
Avg Stack Velocity (ft/sec)	V(s avg)	=	[illegible]2.1
Isokineticity (%)	% I	=	[illegible]4.4
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	1[illegible]1289
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	238739
Particulate Loading, dry (gr/dscf)	C(s std)	=	0.0021
Particulate Loading, dry @3% O2 (gr/dscf)		=	0.0025
Particulate Emission Rate(lb/hr)	E(p)	=	3.1[illegible]

PARTICULATE

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Plant: EDISON HBGS

Date: 1/4/94

Sampling Location: UNIT 1

Inside of Far Wall to Outside of Nipple (Distance A):

0.125
.25
.375
0.5
0.625
.75
0.875

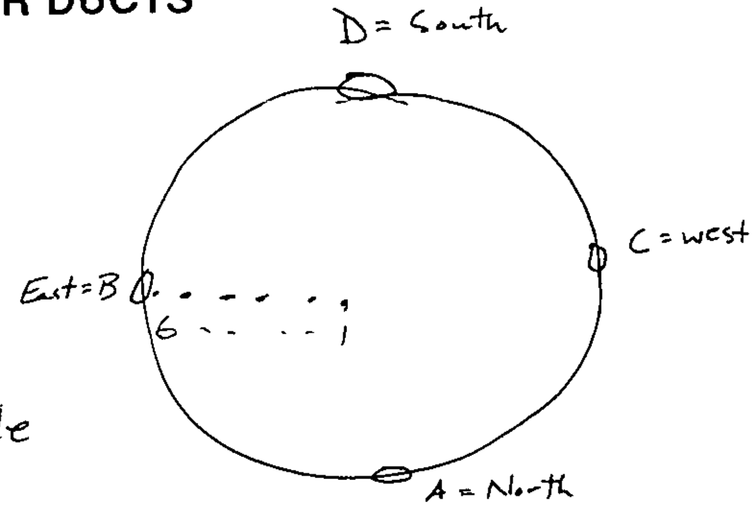
Inside of Near Wall to Outside of Nipple (Distance B): 17"

Stack I.D. (Distance A, Distance B): 20' 6"

Nearest Upstream Disturbance: X will provide

Nearest Downstream Disturbance: X

Calculator: CH



Schematic of Sampling Location

Traverse Point Number	Fraction of Stack I.D.	Stack I.D.	Product of Columns 2 and 3 (To Nearest 1/8 Inch)	Distance B	Traverse Point Location From Outside of Nipple (Sum of Columns 4 and 5)
A-1	0.021	20' 6"	5 1/8"	17"	22 1/8"
-2	0.067	↓	16 1/2"	↓	33 1/2"
-3	0.118		29"		46"
-4	0.177		43 1/2"		60 1/2"
-5	0.250		61 1/2"		78 1/2"
-6	0.356		87 5/8"		104 5/8"
B-1					
-2					
-3					
-4					
-5					
-6					
C-1					
↓ etc.					
			ditto		

$\Delta H_a = 1.847$

$Y = 0.9895$

$K_o = 0.6982$

FORM 5240M 7/93

RUN 1, PARTICULATE, FULL LOAD, W/ UREA

PARTICULATE TEST FIELD DATA SHEET

1/2

Plant	Edison HBGS
Date	1-5-94
Test Location	Unit #1
Run Number	#1
Stack Diameter inches	20' 6"
Duct Dimensions in. x in.	—
Start Time	3:57 pm
Operator	RUDD
Barometric Pressure	29.99
Static Pressure	- .38
Stack Pressure	—
Probe Number	12'
Pitot Coefficient	.84
Pitot Number	—
Meter Box Number	325
Orifice Coefficient	γ= .9895
Nozzle Size & Number	.3687
Molecule Weight	
BWO	

umbilical #1

FILTER DATA		
NUMBER	TARE	FINAL WT.
03		

IMPINGER VOLUMES		CO_2	O_2	CO
528.9	794.3	9.2	5.0	0.374
554.7	642.6			
438.1	454.6	372.3		
SILICA GEL				
870.3	912.8			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM In. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
C-1	0	.31	3.47	726.158	239	175	55		175	61	61	6		PRE- .010/min @ 15"
2	4	.33	3.71	730.8	239	178	56		178	66	61	7		POST-
3	8	.34	3.83	734.9	239	180	57		180	70	61	8		
4	12	.38	4.29	739.0	239	177	58		175	72	61	10		PITOT LEAK CHECK
5	16	.38	4.30	743.4	239	179	58		178	72	62	11		
6	20	.30	3.41	747.7	238	177	58		182	73	63	7	.005/min @ 12"	
Bm.	24			751.7									.010/min @ 12"	
A-1	0	.25	2.81	751.8	238	175	60		178	63	63	5		
2	4	.26	2.94	755.4	238	178	60		180	68	63	6		
3	8	.27	3.07	759.3	237	177	60		181	74	63	6		
4	12	.28	3.19	762.8	237	178	60		181	75	64	7		
5	16	.28	3.20	766.5	236	182	60		183	76	65	7		
6	20	.26	2.98	770.4	236	182	60		182	77	65	7	.005/min @ 10"	
	24			774.0									.010/min @ 12"	
B-1	0	.27	3.05	774.2	236	178	60		180	64	64	6		
2	4	.26	2.93	778.1	238	178	60		181	66	64	6		
AVG/TOTAL														

#5214 7/92

2/2

Run 1, Part., Full Load, w/ UREA

PARTICULATE TEST FIELD DATA SHEET

Plant	Edison HBGS	Barometric Pressure	29.99	Nozzle Size & Number	.3687
Date	1-5-94	Static Pressure	-.38	Molecule Weight	
Test Location	Unit #1	Stack Pressure	—	BWO	
Run Number	#1	Probe Number	12'	Umbilical #1	
Stack Diameter inches	20' 6"	Pitot Coefficient	.84		
Duct Dimensions in. x in.		Pitot Number	—		
Start Time		Meter Box Number	325		
Operator	RUDD	Orifice Coefficient	γ= .9895		

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
SILICA GEL				

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
B-3	8	.23	2.61	781.8	238	178	56		181	71	64	6		PRE-
4	12	.27	3.07	785.0	238	180	57		180	73	64	6		POST-
5	16	.27	3.07	789.0	238	180	58		181	73	64	7		
6	20	.24	2.73	793.0	237	181	59		182	73	64	6	.005/.008	"PITOT LEAK CHECK"
	24			796.2									.010/m @ 12"	
b-1	0	.30	3.38	796.4	236	179	55		181	62	62	7		
2	4	.30	3.39	800.3	238	181	56		180	67	62	7		
3	8	.31	3.51	804.1	239	183	56		182	71	63	8		
4	12	.32	3.63	808.1	238	182	56		181	74	63	8		
5	16	.31	3.53	812.1	238	181	55		182	76	64	8		
6	20	.34	3.88	816.2	238	181	56		183	77	65	8	.007/m @ 12"	
	24			820.402										
AVG														

625 pm

№ 00293 1/5/94 HBGS UNIT 1, P1 w/urea Probe Wash 215MW

№ 00294 1/5/94 HBGS UNIT 1, P1 w/urea IC #A 215MW

№ 00295 1/5/94 HBGS UNIT 1, P1 w/urea IC #B 215MW

#5214 7/92

RUN 2, PARTICULATE, FULL LOAD, W/ UREA ½

PARTICULATE TEST FIELD DATA SHEET

Plant: Edison HBGS
Date: 1-5-94
Test Location: Unit #1
Run Number: #2
Stack Diameter inches: 20' 6"
Duct Dimensions in. x in.: —
Start Time: 7:00 pm.
Operator: RUDD

Barometric Pressure: 29.99
Static Pressure: -.38
Stack Pressure: —
Probe Number: 12'
Pitot Coefficient: .84
Pitot Number: —
Meter Box Number: 325
Orifice Coefficient: γ= .9895

Nozzle Size & Number: .3687
Molecule Weight:
BWO: 573.9
umbilical #1

FILTER DATA		
NUMBER	TARE	FINAL WT.
04		

IMPINGER VOLUMES		CO_2	O_2	CO
~~[illegible]~~	787.3	9.2	5.0	0.374
555.5	644.0			
431.3	452.0	364.7		
SILICA GEL				
817.9	860.0			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT³	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
C-1	0	.34	3.82	821.136	238	176	50		178	62	62	8		PRE- .010 @ 15"
2	4	.34	3.82	825.2	238	177	50		179	64	62	8		POST-
3	8	.34	3.84	829.3	237	178	48		180	68	62	8		
4	12	.36	4.07	833.5	238	179	49		180	70	62	9		PITOT LEAK
5	16	.35	3.97	837.9	237	175	49		178	71	62	9		CHECK ok.
6	20	.31	3.52	842.3	237	178	50		177	72	63	8		
	24			846.2									.004/min @ 10"	
D-1	0	.30	3.39	846.4	237	180	60		180	66	64	7	.010/min @ 15"	
2	4	.33	3.75	850.2	238	179	60		182	72	63	8		
3	8	.36	4.10	854.2	237	180	60		180	73	64	8		
4	12	.34	3.87	858.6	238	181	60		180	73	64	9		
5	16	.34	3.87	863.0	237	178	60		177	74	64	9		
6	20	.31	3.53	867.0	238	180	60		178	75	65	8	.005/min @ 10"	
	24			871.0									.010/min @ 15"	
A-1	0	.24	2.70	871.5	238	174	60		175	64	64	5		
	4	.24	2.72	875.1	237	176	60		176	68	63	5		
AVG/TOTAL					237					72	[illegible]			

Run 2, Part., Full Load, w/ Wrca

PARTICULATE TEST FIELD DATA SHEET

Plant ______
Date 1-5-94
Test Location ______
Run Number ______
Stack Diameter inches ______
Duct Dimensions in. x in. ______
Start Time ______
Operator ______

Barometric Pressure ______
Static Pressure ______
Stack Pressure ______
Probe Number ______
Pitot Coefficient ______
Pitot Number ______
Meter Box Number ______
Orifice Coefficient ______

Nozzle Size & Number ______
Molecule Weight ______
BWO ______
Umbilical #1

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
SILICA GEL				

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT3	TEMPERATURE °F STACK	PROBE	IMPINGER	~~ORGANIC MODULE~~	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
A-3	8	.25	2.84	878.8	237	178	56		180	72	63	6		PRE-
4	12	.29	3.30	882.2	237	180	57		180	74	64	7		POST-
5	16	.31	3.54	886.1	237	180	57		180	75	64	8		
6	20	.24	2.74	890.2	236	178	60		178	75	64	6		PITOT LEAK CHECK
	24			893.8									.005/m @ 10"	
B-1	0	.24	2.72	894.0	235	180	60		179	65	65	6	.010/min @ 15"	
2	4	.26	2.96	897.6	237	179	60		180	72	65	6		
3	8	.25	2.85	901.3	237	179	60		179	75	65	6		
4	12	.25	2.85	904.8	237	182	60		181	76	65	6		
5	16	.29	3.31	908.6	237	181	60		180	76	65	7		.004/min @ 10"
6	20	.24	2.74	912.6	238	180	60		180	77	66	6		
	24			916.102								A =	North	
												B =	East	
												C =	West	
												D =	South	

1/5/94 HBGS Unit 1, PZ w/urea
№ 00297 IC #A 215MW

8:56 pm

1/5/94 HBGS Unit 1, PZ w/urea
AV № 00296 Probewash 215MW

1/5/94 HBGS Unit 1, PZ urea
№ 00298 IC #B 215MW

#5214 7/92

Run 1, Full Load, Baseline

1/2

PARTICULATE TEST FIELD DATA SHEET

Plant: Edison HBGS
Date: 1-5-94
Test Location: Unit #1
Run Number: Run 1
Stack Diameter inches: 20' 6"
Duct Dimensions in. x in: —
Start Time: 10:10
Operator: Rudd

Barometric Pressure: 29.99
Static Pressure: -.38
Stack Pressure: —
Probe Number: 12'
Pitot Coefficient: .84
Pitot Number: —
Meter Box Number: 325
Orifice Coefficient: γ= .9895

Nozzle Size & Number: .3687
Molecule Weight:
BWO:
Umbilical #1

FILTER DATA		
NUMBER	TARE	FINAL WT.
01		

IMPINGER VOLUMES		CO_2	O_2	CO
		9.1	5.0	0.3?2
567.8	653.6			
563.0	638.3			
434.9	467.1			
SILICA GEL				
836.0	886.7			

244.5

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT3	TEMPERATURE °F STACK	PROBE	IMPINGER	~~ORGANIC~~ MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
A 1	0	.24	2.69	570.938	237	195	55		209	60	60	6		PRE- .010/min @ 15"
2	3	.25	2.80	573.6	237	195	54		203	62	60	6		POST-
3	6	.28	3.16	576.3	236	190	54		202	65	61	7		
4	9	.30	3.40	579.2	236	188	52		201	69	61	8		PITOT LEAK CHECK ok
5	12	.29	3.28	582.2	236	180	53	—	210	70	61	8		
6	15	.25	2.84	585.0	231	180	54		212	70	62	7		
	18			587.8										.010/min @ 15"
B-1	0	.26	2.95	588.0	233	174	60		195	63	62	6		.010/min @ 15"
2	3	.26	2.94	590.8	237	178	60		190	67	62	6		
3	6	.27	3.06	593.6	237	180	60		184	70	63	7		
4	9	.27	3.07	596.3	237	174	60		180	72	63	7		
5	12	.27	3.08	599.2	235	181	60		180	74	64	7		
6	15	.26	2.97	602.0	237	181	60		180	75	64	7		
	18			604.9										.005/min @ 8"
C-1	0	.25	2.84	605.2	233	178	60		175	64	64	6		.011/min @ 15"
2	3	.21	2.37	607.9	239	180	60		180	68	64	6		
AVG/TOTAL														

"F214 7-"

Run #1 Full Load Base Line

2/2

PARTICULATE TEST FIELD DATA SHEET

Plant: See Page #1
Date: 1-5-94
Test Location:
Run Number: #1
Stack Diameter inches:
Duct Dimensions in. x in.:
Start Time:
Operator:

Barometric Pressure:
Static Pressure:
Stack Pressure:
Probe Number:
Pitot Coefficient:
Pitot Number:
Meter Box Number:
Orifice Coefficient:

Nozzle Size & Number:
Molecule Weight:
BWO:

Umbilical #1

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
SILICA GEL				

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT3	TEMPERATURE °F STACK	PROBE	IMPINGER	~~ORGANIC MODULE~~	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
C 3	6	.21	2.38	610.4	238	180	60		180	72	64	6		PRE-
4	9	.21	2.39	612.8	239	181	60		178	74	64	6		POST-
5	12	.24	2.73	615.4	239	181	60		180	75	65	6		
6	15	.23	2.62	618.0	239	180	60		180	77	65	6	.005/min @	7" PITOT LEAK CHECK
	18			620.7									.010/min @ 15"	
D 1	0	.22	2.49	620.9	240	178	60		180	68	66	6		
2	3	.21	2.37	623.5	240	180	60		179	72	60	6		
3	6	.21	2.39	626.0	239	179	60		180	74	66	6		
4	9	.22	2.50	628.5	240	173	60		178	76	66	6		
5	12	.23	2.62	631.1	240	175	60		179	77	67	6		
6	15	.23	2.63	633.7	239	180	60		180	77	67	6		
	18			636.360									.005/min @ 8"	

1/5/94
Nº 00287 MS RUN 1 PROBE WASH ~~Bottle B~~

1155

1/5/94
AV Nº 00286 MS RUN 1 ~~Bottle A~~

#5214 7/92

Run 2, Particulate, Full Load, Baseline 1/2

PARTICULATE TEST FIELD DATA SHEET

Plant: Edison HBGS
Date: 1-5-94
Test Location: Unit #1
Run Number: #2
Stack Diameter inches: 20' 6"
Duct Dimensions in. x in.: —
Start Time: 12:30
Operator: J. Rudd

Barometric Pressure: 29.99
Static Pressure: -.38
Stack Pressure: —
Probe Number: 12'
Pitot Coefficient: .84
Pitot Number: —
Meter Box Number: 325
Orifice Coefficient: γ = .9895

Nozzle Size & Number: 3687
Molecule Weight:
BWO:
umbilical #1

FILTER DATA		
NUMBER	TARE	FINAL WT.
#02		

IMPINGER VOLUMES		CO_2	O_2	CO
562.3	668.0	9.1	5.0	0-3.2
567.2	642.1	—		
429.1	478.0		292.9	
SILICA GEL				
767.3	830.7			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT3	TEMPERATURE °F STACK	PROBE	IMPINGER	~~ORGANIC MODULE~~	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
B-1	0	.21	2.36	636.888	240	178	60		177	63	63	5		PRE- .010/min @ 15"
2	~~3~~ 4	.18	2.02	640.1	240	178	59		178	65	63	5		POST-
3	~~6~~ 8	.21	2.37	643.3	240	180	58		180	69	62	5		
4	~~9~~ 12	.22	2.49	646.6	239	176	58		178	71	63	5		PITOT LEAK CHECK
5	~~12~~ 16	.23	2.61	649.9	239	180	60		178	72	63	6		
6	~~15~~ 20	.21	2.39	653.4	237	180	60		180	73	64	6	.005/min @ 8"	
	~~18~~ 24	—	—	656.8	—								.010/min 15"	
A-1	0	.21	2.37	657.0	239	174	60		174	66	65	5		
2	~~3~~ 4	.19	2.16	660.4	240	180	60		181	73	65	5		
3	~~6~~ 8	.22	2.50	663.6	240	179	60		182	75	65	6		
4	~~9~~ 12	.25	2.85	667.0	239	180	60		180	76	66	6		
5	~~12~~ 16	.24	2.73	670.8	239	178	60		177	75	66	6		
6	~~15~~ 20	.23	2.62	674.2	239	177	60		178	75	67	6		
	~~18~~ 24	—	—	677.8	—								.005/min @ 8"	
C-1	0	.27	3.06	678.2	235	175	60		177	65	65	6	.010/min @ 20"	
2	4	.27	3.05	681.8	240	178	60		178	68	65	7		
AVG/TOTAL														

#5214 7/92

Run #2 Part., Full Load, Base Line 2/2

PARTICULATE TEST FIELD DATA SHEET

Plant

Date 1-5-94

Test Location

Run Number

Stack Diameter inches

Duct Dimensions in. x in.

Start Time

Operator

Barometric Pressure

Static Pressure

Stack Pressure

Probe Number

Pitot Coefficient

Pitot Number

Meter Box Number

Orifice Coefficient

Nozzle Size & Number

Molecule Weight

BWO

umbilical #1

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
SILICA GEL				

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
C-3	8	.29	3.28	685.5	240	180	60		178	72	65	8		PRE-
4	12	.32	3.64	689.5	240	180	60		179	73	66	9		POST-
5	16	.33	3.75	693.7	239	182	60		178	72	66	10		
6	20	.33	3.75	699.8	240	193	60		181	73	67	10		PITOT LEAK CHECK
	24	—	—	701.87									.004/min 11"	
D-1	0	.26	2.95	702.1	239	184	60		181	68	68	8	.010/min @ 15"	
2	4	.27	3.07	706.0	240	185	60		181	73	68	8		
3	8	.30	3.42	709.5	240	193	60		180	76	67	9		
4	12	.32	3.66	713.5	240	192	60		180	77	68	9		
5	16	.31	3.54	717.7	240	191	60		182	77	68	9		
6	20	.32	3.66	721.7	240	191	60		181	77	69	10	.005/min @ 15"	
	24	—	—	725.851										

1/5/94
Nº 00289 MS RUN 2 Bottle A

1/5/94
Nº 00290 MS RUN 2 PROBE WASH

2:35 pm

1/5/94
Nº 00288 MS RUN 2 Bottle B

#5214 7/92

Run 1, 110MW, PARTICULATE, W/ UREA 1/2

PARTICULATE TEST FIELD DATA SHEET

Plant Edison HBGS
Date 1-6-94
Test Location Unit #1
Run Number #1
Stack Diameter inches 20' 6"
Duct Dimensions in. x in. —
Start Time 9:00 pm
Operator RUDD

Barometric Pressure 30.21
Static Pressure -.40
Stack Pressure —
Probe Number 12'
Pitot Coefficient .84
Pitot Number —
Meter Box Number 325
Orifice Coefficient γ= .9895

Nozzle Size & Number 4251
Molecule Weight
BWO
umbilical #1

FILTER DATA		
NUMBER	TARE	FINAL WT.
05		

IMPINGER VOLUMES		CO_2	O_2	CO
575.6	695.0	8.7	5.8	0.237
554.3	631.7			
431.1	461.9			
SILICA GEL				
827.3	865.1		265.4	

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
C-1	0	.09	1.91	931.188	202	185	51		191	58	59	4		PRE- .010/min @ 15"
2	4	.11	2.33	934.1	205	188	52		192	61	58	5		POST-
3	8	.11	2.34	937.3	203	183	44		194	64	58	5		
4	12	.11	2.35	940.7	203	182	47		194	67	59	5		PITOT LEAK
5	16	.11	2.35	944.0	203	184	48		193	68	57	5		OK CHECK
6	20	.09	1.93	947.3	202	182	53		197	68	59	5	.006/min	@ 10"
	24			950.3									.019	@ 15"
D-1	0	.10	2.13	950.5	202	181	57		193	61	61	5		
2	4	.11	2.35	953.7	202	183	57		197	67	60	5		
3	8	.11	2.36	957.0	202	185	58		196	69	60	5		
4	12	.11	2.36	960.3	201	186	58		196	69	60	5		
5	16	.11	2.36	963.7	201	187	58		196	69	61	5		
6	20	.10	2.15	967.4	200	185	58		197	69	60	5	.003/min	@ 10"
	24			970.3									.010	@ 15"
A-1	0	.07	1.49	970.4	200	183	59		198	61	60	3		
2	4	.08	1.71	973.0	199	188	59		195	62	58	4		
AVG/TOTAL														

#5214 7/92

Run 1, 110 MW, Part., w/ UREA

PARTICULATE TEST FIELD DATA SHEET

Plant ______ Barometric Pressure ______ Nozzle Size & Number ______

Date 1-6-94 Static Pressure ______ Molecule Weight ______

Test Location ______ Stack Pressure ______ BWO ______

Run Number ______ Probe Number ______ umbilical #1

Stack Diameter inches ______ Pitot Coefficient ______

Duct Dimensions in. x in. ______ Pitot Number ______

Start Time ______ Meter Box Number ______

Operator ______ Orifice Coefficient ______

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
SILICA GEL				

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
A-3	8	.09	1.93	975.8	199	178	57		190	64	59	4		PRE-
4	12	.10	2.14	978.8	199	183	57		196	66	58	5		POST-
5	16	.09	1.93	982.0	198	183	58		197	66	58	5		
6	20	.07	1.50	984.9	198	185	57		198	66	58	3	.005/@5"	PITOT LEAK
	24			987.7									.010/@15"	CHECK
B-1	0	.07	1.49	987.8	198	185	56		195	59	58	3		
2	4	.09	1.92	990.5	198	184	55		196	64	57	5		
3	8	.11	2.37	993.6	197	185	55		197	67	58	5		
4	12	.09	1.95	996.9	197	183	55		198	70	59	5		
5	16	.10	2.16	1000.0	197	184	56		197	70	58	5		
6	20	.07	1.51	1003.2	197	187	56		197	71	59	4		
	24			1005.978									.003/min @ 10"	
AVG/TOTAL														

1/7/94, 110MW, Baseline,
Nº 00307 IC# B, Particulate Run 1

1/7/94, 110MW, Baseline, Run 1
Nº 00306 IC #A, Particulate

1/7/94 110 MW Baseline Run 1
Nº 00305 Probewash Particulate

A - North
B - West
East
South

#5214 7/92

RUN 2, PARTICULATE, 110 MW, W/ UREA 1/2

PARTICULATE TEST FIELD DATA SHEET

Plant	Edison HBGS	Barometric Pressure	30.21	Nozzle Size & Number	.4251
Date	1-6 ~~4~~ 7-94	Static Pressure	-.40	Molecule Weight	
Test Location	Unit #1	Stack Pressure	—	BWO	
Run Number	#2	Probe Number	12'	umbilical #)	
Stack Diameter inches	20'6"	Pitot Coefficient	.84		
Duct Dimensions in. x in.	—	Pitot Number	—		
Start Time	11:23 pm	Meter Box Number	325 $H_@$ = 1.847		
Operator	RUDD	Orifice Coefficient	γ = .9895		

FILTER DATA

NUMBER	TARE	FINAL WT.
06		

IMPINGER VOLUMES		CO_2	O_2	CO
561.7	670.8	8.7	5.8	0.237
568.2	646.0			
436.3	449.9			
SILICA GEL		221.9		
854.4	875.8			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
B-1	0	.07	1.50	6.200	197	178	48		180	60	60	4		PRE- .010/@ 15"
2	4	.08	1.72	9.00	198	179	40		187	64	60	4		POST-
3	8	.08	1.73	11.0	197	181	42		186	68	60	4		
4	12	.08	1.73	14.8	197	180	41		200	68	60	4		PITOT LEAK
5	16	.09	1.95	17.7	197	180	43		203	69	60	4		CHECK ok
6	20	.06	1.30	20.7	197	181	45		202	71	60	3		.008/min @ 6"
	24	—	—	23.3										.010/min @ 15"
A-1	0	.08	1.73	23.4	193	183	48		202	61	61	4		
2	4	.07	1.52	26.3	195	179	49		203	71	60	4		
3	8	.08	1.74	29.1	195	181	52		205	73	61	4		
4	12	.08	1.75	32.0	193	180	53		204	75	61	4		
5	16	.08	1.75	34.9	193	180	55		204	75	62	4		
6	20	.07	1.54	37.8	192	180	56		203	76	63	4		.005/@ 6"
	24	—	—	40.5										.010 @ 15'
D-1	0	.08	1.73	40.7	193	180	56		202	61	61	4		
2	4	.09	1.94	43.5	194	182	57		201	63	61	4		
AVG/TOTAL														

Run 2, Part., 110 MW, w/ [illegible]EA

2/2

PARTICULATE TEST FIELD DATA SHEET

Plant ____
Date 1-6 7-94
Test Location ____
Run Number ____
Stack Diameter inches ____
Duct Dimensions in. x in. ____
Start Time ____
Operator ____

Barometric Pressure ____
Static Pressure ____
Stack Pressure ____
Probe Number ____
Pitot Coefficient ____
Pitot Number ____
Meter Box Number ____
Orifice Coefficient ____

Nozzle Size & Number ____
Molecule Weight ____
BWO ____
umbilical #1

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
SILICA GEL				

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
D-3	8	.11	2.38	46.6	194	183	58		198	65	61	5		PRE-
4	12	.11	2.38	49.9	195	180	59		199	67	60	5		POST-
5	16	.10	2.16	53.2	197	181	58		199	68	60	5		
6	20	.09	1.95	56.5	197	182	59		200	69	60	4	.005/@ 8"	PITOT LEAK CHECK
	24			59.7									.010/m @ 15"	
C-1	0	.09	1.93	59.8	197	180	60		201	61	60	4		
2	4	.10	2.15	63.4	197	181	60		202	65	61	5		
3	8	.11	2.38	66.6	197	181	60		202	70	62	5		
4	12	.11	2.39	70.0	197	180	60		203	74	63	5		
5	16	.10	2.19	73.4	196	179	60		202	75	64	5		
6	20	.09	1.97	76.7	196	181	60		201	75	65	5	.006/mn @10"	
	24			80.000										
												A -	North	
												B -	West	
												C -	East	
AVG/TOTAL												D -	South	

1/6/94 EDISON HBGS UNIT 1, ~~1/6/94~~
Nº 00302 IC #A Particulate 110MW

1/7/94 EDISON HBGS UNIT 1, w/unea
Nº 00304 Probewash Part. Run 2

1/6/94 EDISON HBGS UNIT W/unea
Nº 00303 IC#B, Particulate

#5214 7/92

Run #1, 110 MW, Base Line, Part.

1/2

PARTICULATE TEST FIELD DATA SHEET

Plant: Edison HBGS
Date: 1-7-94
Test Location: Unit #1
Run Number: #1
Stack Diameter inches: 20' 6"
Duct Dimensions in. x in: —
Start Time: 2:57 am
Operator: RUDD

Barometric Pressure: 30.21
Static Pressure: -.40
Stack Pressure: —
Probe Number: 12'
Pitot Coefficient: .84
Pitot Number: —
Meter Box Number: 325
Orifice Coefficient: γ= .9895

Nozzle Size & Number: .4251
Molecule Weight:
BWO:
umbilical #1

FILTER DATA		
NUMBER	TARE	FINAL WT.
08		

IMPINGER VOLUMES		CO_2	O_2	CO
568.5	672.3	8.6	5.9	0.211
566.7	640.1			
468.0	503.4			
SILICA GEL				
882.5	920.9	251.0		

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	~~ORGANIC~~ MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
D-1	0	.08	1.71	94.037	193	188	48		200	55	56	5		PRE- .010/in @ 15"
2	4	.09	1.93	96.9	193	186	48		200	60	56	6		POST-
3	8	.09	1.94	100.00	192	184	46		198	61	56	7		
4	12	.12	2.58	103.0	192	180	46		198	62	56	10		PITOT LEAK CHECK ok
5	16	.12	2.58	106.6	192	180	48		196	61	55	11		
6	20	.09	1.93	110.1	192	181	48		197	60	54	8	.008/.010 @ 12"	
	24			113.2									.010/@ 15"	
C-1	0	.08	1.71	113.3	192	180	53		193	54	53	7		
2	4	.12	2.57	116.2	192	181	52		190	61	52	11		
3	8	.11	2.36	119.4	191	180	53		188	61	52	10		
4	12	.11	2.35	122.8	192	180	54		189	60	52	10		
5	16	.11	2.36	126.2	191	181	54		188	61	52	10		
6	20	.09	1.94	129.4	190	179	54		187	62	53	8	.007/@ 12"	
	24			132.5									.010/in @ 15"	
A-1	0	.08	1.71	132.7	192	180	57		184	54	54	6		
2	4	.08	1.71	135.6	193	180	57		182	61	54	6		
AVG/TOTAL														

#5214 7/92

Run #1, 110 mw, Basc Line, Part

PARTICULATE TEST FIELD DATA SHEET

Plant

Date 1-7-94

Test Location

Run Number

Stack Diameter inches

Duct Dimensions in. x in.

Start Time

Operator

Barometric Pressure

Static Pressure

Stack Pressure

Probe Number

Pitot Coefficient

Pitot Number

Meter Box Number

Orifice Coefficient

Nozzle Size & Number

Molecule Weight

BWO

umbilical # 1

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
SILICA GEL				

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT3	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			
A-3	8	.09	1.94	138.5	192	180	58		191	64	55	8		PRE-
4	12	.10	2.16	141.4	192	182	58		192	67	56	8		POST-
5	16	.09	1.95	144.5	192	183	58		190	68	57	8		
6	20	.07	1.52	147.6	192	183	57		191	70	59	6	.005/@12"	PITOT LEAK CHECK
	24			150.3									.010/@15"	
B-1	0	.08	1.72	150.4	192	180	57		191	59	59	5		
2	4	.08	1.73	153.3	192	181	59		192	64	60	5		
3	8	.09	1.96	156.2	192	181	57		193	71	60	6		
4	12	.08	1.75	159.1	191	182	58		193	72	61	6		
5	16	.08	1.76	162.1	190	182	59		194	74	62	6		
6	20	.07	1.54	165.0	190	183	60		194	75	62	6	.008/min @ 15"	
	24			167.710										
AVG/TOTAL														

1/6/94 HBGS UNIT 1, 110 MW w/urea
Nº 00299 Probewash, Particulate

1/6/94 EDISON HBGS UNIT 1; 1/6/94
Nº 00301 IC #B, Part. 110 MW

EDISON HBGS UNIT 1; 1/6/94 110MW
Nº 00300 IC #A Particulate

A - North
D - South
B - West
East

Run 2, Particulate, 110 MW, Baseline

1/2

PARTICULATE TEST FIELD DATA SHEET

Plant: Edison HBGS
Date: 1-7-94
Test Location: Unit #1
Run Number: #2
Stack Diameter inches: 20' 6"
Duct Dimensions in. x in.: —
Start Time: 5:19 am
Operator: RUDD

Barometric Pressure: 30.21 cH
Static Pressure: -.40
Stack Pressure: —
Probe Number: 12'
Pitot Coefficient: .84
Pitot Number: —
Meter Box Number: 325
Orifice Coefficient: γ= .9895

Nozzle Size & Number: .4251
Molecule Weight:
BWO:
umbilical #1

FILTER DATA		
NUMBER	TARE	FINAL WT.
09		

IMPINGER VOLUMES		CO_2	O_2	CO
566.9	673.6	8.6	5.9	0.211
563.8	642.7			
430.0	463.4			
SILICA GEL			259.6	
819.8	860.4			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT³	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC ~~MODULE~~	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
A-1	0	.09	1.95	167.790	190	178	49		180	60	60	5		PRE- .010/in. @15"
2	4	.09	1.95	171.0	189	178	47		181	63	59	5		POST-
3	8	.09	1.96	173.9	189	180	46		189	67	59	5		
4	12	.10	2.18	177.0	190	181	47		188	68	59	6		PITOT LEAK CHECK ok
5	16	.09	1.96	180.0	190	181	48		187	67	59	5		
6	20	.08	1.74	183.2	191	182	48		188	68	59	5	.005/@ 8"	
	24	—	—	186.2	—							—	.010 @ 15"	
B-1	0	.09	1.94	186.3	191	177	49		187	60	59	5		
2	4	.08	1.74	189.3	191	180	51		188	64	57	4		
3	8	.09	1.96	192.0	191	180	53		192	69	59	4		
4	12	.09	1.96	195.0	191	180	52		193	69	57	5		
5	16	.08	1.74	198.0	191	179	54		191	69	59	4		
6	20	.07	1.52	200.4	191	180	56		193	69	58	4	.006/@ 6"	
	24	—	—	203.0	—							—	.010/@ 15"	
C-1	0	.10	2.15	203.1	190	181	53		190	57	57	5		
2	4	.10	2.17	206.3	189	182	54		192	63	57	5		
AVG/TOTAL														

#5214 7/92

2/2

Run #2, Part., 110 MW, Base Line

PARTICULATE TEST FIELD DATA SHEET

Plant ______
Date 1-7-94
Test Location ______
Run Number ______
Stack Diameter Inches ______
Duct Dimensions in. x in. ______
Start Time ______
Operator ______

Barometric Pressure ______
Static Pressure ______
Stack Pressure ______
Probe Number ______
Pitot Coefficient ______
Pitot Number ______
Meter Box Number ______
Orifice Coefficient ______

Nozzle Size & Number ______
Molecule Weight ______
BWO ______

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
SILICA GEL				

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT3	TEMPERATURE °F STACK	PROBE	IMPINGER	~~ORGANIC~~ MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
C-3	8	.11	2.39	209.6	188	181	55		193	66	56	6		PRE-
4	12	.10	2.18	213.0	186	182	56		172	67	56	6		POST-
5	16	.11	2.40	216.1	186	182	57		191	68	56	6		
6	20	.09	1.97	219.5	185	181	58		192	66	56	6	.008 @ 12"	PITOT LEAK CHECK
	24	—	—	222.6									.010 @ 15"	
D-1	0	.10	2.16	222.7	187	182	59		193	58	56	6		
2	4	.11	2.39	226.0	187	182	59		192	63	56	6		
3	8	.12	2.60	229.4	187	180	60		193	65	56	7		
4	12	.11	2.39	233.0	186	179	59		194	65	56	7		
5	16	.12	2.62	236.0	187	179	60		195	67	56	7		
6	20	.10	2.19	239.5	186	178	60		194	70	56	6	.004/min @ 10"	
	24	—	—	242.780										
AVG/TOTAL														

1/7/94 110 MW Baseline Run 2
№ 00310 Probewash, Particulate

1/7/94 110 MW Baseline Run 2
№ 00308 IC #A, Particulate

1/7/94 110 MW Baseline Run 2
№ 00309 IC #B, Particulate

#5214 7/92

Run 1, Particulate, 65 MW Baseline 1/2

PARTICULATE TEST FIELD DATA SHEET

Plant: Edison HBGS
Date: 1-8-94
Test Location: Unit #1
Run Number: #1
Stack Diameter inches: 20'6"
Duct Dimensions in. x in.: —
Start Time: 2:12 A.M.
Operator: RUDD

Barometric Pressure: 30.16
Static Pressure: -.35
Stack Pressure: —
Probe Number: 12'
Pitot Coefficient: .84
Pitot Number: —
Meter Box Number: 325 $H@ = 1.847$
Orifice Coefficient: γ = .9895

Nozzle Size & Number: .4916
Molecule Weight:
BWO:
umbilical #1

FILTER DATA		
NUMBER	TARE	FINAL WT.
013		

IMPINGER VOLUMES		CO_2	O_2	CO
572.5	680.1	8.3	6.4	0.254
562.5	627.3			
480.4	503.3			
SILICA GEL		225.9		
846.8	877.4			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	~~ORGANIC MODULE~~	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
C-1	0	.04	1.55	381.810	175	178	47		183	49	49	3		PRE- .010/~2 15"
2	~~3~~ 4	.04	1.56	384.6	175	178	48		184	54	49	3		POST-
3	~~6~~ 8	.05	1.96	387.4	176	180	48		192	59	50	3		
4	~~9~~ 12	.04	1.57	390.4	176	181	48		199	62	51	3		PITOT LEAK CHECK OK
5	~~12~~ 16	.04	1.58	393.2	176	180	50		200	64	52	3		
6	~~15~~ 20	.03	1.19	396.0	175	129	51		198	66	53	3	OK	
	~~18~~ 24			398.5									.010/2 10"	
D-1	0	.04	1.57	398.6	174	180	54		198	55	54	3		
2	~~3~~ 4	.04	1.58	401.4	176	181	53		200	62	53	3		
3	~~6~~ 8	.04	1.58	404.0	176	181	54		201	62	53	3		
4	~~9~~ 12	.05	1.97	407.0	176	179	55		202	62	53	5		
5	~~12~~ 16	.04	1.58	410.0	176	180	56		202	63	53	4		
6	~~15~~ 20	.04	1.58	412.8	175	181	57		201	63	53	4	OK	
*	~~18~~ 24			415.5									.010/@10"	
A-1	0	.04	1.57	415.6	175	180	56		201	54	53	3		
2	~~3~~ 4	.04	1.58	418.4	175	181	57		200	60	53	3		
AVG/TOTAL														

#5214 7/92

2/2

Run #1, Part., 65 MW, Baseline

PARTICULATE TEST FIELD DATA SHEET

Plant
Date 1-8-94
Test Location
Run Number
Stack Diameter inches
Duct Dimensions in. x in.
Start Time
Operator

Barometric Pressure
Static Pressure
Stack Pressure
Probe Number
Pitot Coefficient
Pitot Number
Meter Box Number
Orifice Coefficient

Nozzle Size & Number
Molecule Weight
BWO

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
SILICA GEL				

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT3	TEMPERATURE °F STACK	PROBE	IMPINGER	~~ORGANIC MODULE~~	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
A-3	8	.04	1.58	421.1	176	182	58		202	63	53	4		PRE-
4	12	.04	1.58	423.9	175	180	59		201	63	53	4		POST-
5	16	.04	1.58	426.6	176	181	59		202	63	53	4		
6	20	.04	1.58	429.4	175	179	60		201	64	53	4	OK	PITOT LEAK CHECK
	24			432.1									.010 @ 10	
B-1	0	.03	1.17	432.2	175	180	60		203	54	53	3		
2	4	.04	1.58	434.6	175	181	59		202	63	54	4		
OUT 3	8	.04	1.59	437.4	174	179	60		200	65	54	4		
4	12	.04	1.58	440.2	175	180	60		201	66	55	4		
5	16	.03	1.19	443.0	175	180	60		201	68	56	3		
6	20	.03	1.19	445.4	174	181	60		202	67	56	3	.003/min @ 10"	
	24			447.825										
AVG/TOTAL														

1/8/94 Particulate, 65MW, Baseline
№ 00320 IC#B, Run 1

B - North

1/8/94 Particulate, 65MW, Baseline
№ 00319 IC#A, Run 1

1/8/94 Particulate, 65MW, Baseline
№ 00318 Probe rinse, Run 1

#5214 7/92

PARTICULATE, RUN 2, 65 MW BASELINE 1/2

PARTICULATE TEST FIELD DATA SHEET

Plant: Edison HBGS
Date: 1-8-94
Test Location: Unit #1
Run Number: # 2
Stack Diameter inches: 20' 6"
Duct Dimensions in. x in.: ——
Start Time: 4:28 am
Operator: RUDD

Barometric Pressure: 30.16
Static Pressure: -.35
Stack Pressure: ——
Probe Number: 12'
Pitot Coefficient: .84
Pitot Number: ——
Meter Box Number: 325
Orifice Coefficient: γ = .9895

Nozzle Size & Number: .4916
Molecule Weight:
BWO:
umbilical #1

FILTER DATA		
NUMBER	TARE	FINAL WT.
14		

IMPINGER VOLUMES		CO_2	O_2	CO
564.6	704.1	8.3	6.4	0.254
570.1	621.7			
467.2	480.4			
SILICA GEL				
842.0	865.6			

2279

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
A-1	0	.03	1.18	449.585	172	183	48		195	54	54	5		PRE-.010/@ 015"
2	4	.04	1.58	452.1	175	182	47		202	60	54	5		POST-
3	8	.04	1.58	454.7	174	181	46		202	64	54	5		
4	12	.04	1.59	457.5	173	183	46		201	67	55	5		PITOT LEAK CHECK ok
5	16	.04	1.60	460.3	173	180	48		202	69	56	6		
6	20	.03	1.20	463.0	172	181	51		203	71	57	5	OK	
	24			465.4									.010/@ 10"	
B-1	0	.04	1.59	465.5	171	176	51		204	57	56	6		
2	4	.04	1.59	468.2	174	180	51		201	67	58	6		
3	8	.04	1.59	471.0	175	184	52		203	69	58	6		
4	12	.05	2.00	473.8	174	188	53		204	70	58	8		
5	16	.04	1.60	476.8	173	190	54		200	71	58	7		
6	20	.03	1.20	479.6	173	191	55		201	71	59	5	OK	
	24			482.1									.010/@ 10"	
C-1	0	.03	1.19	482.2	172	182	58		200	59	58	5		
2	4	.04	1.59	484.5	175	184	57		201	66	59	6		
AVG/TOTAL														

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Part., Run 2, 65 mw, Base Line 2/2

PARTICULATE TEST FIELD DATA SHEET

Plant ______
Date 1-8-94
Test Location ______
Run Number ______
Stack Diameter inches ______
Duct Dimensions in. x in. ______
Start Time ______
Operator ______

Barometric Pressure ______
Static Pressure ______
Stack Pressure ______
Probe Number ______
Pitot Coefficient ______
Pitot Number ______
Meter Box Number ______
Orifice Coefficient ______

Nozzle Size & Number ______
Molecule Weight ______
BWO ______

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
SILICA GEL				

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	~~ORGANIC MODULE~~	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
C-3	8	.04	1.59	487.2	175	191	57		200	66	58	6		PRE-
4	12	.04	1.59	490.0	173	189	56		202	64	56	6		POST-
5	16	.03	1.19	492.7	173	188	56		201	62	55	6		
6	20	.03	1.19	495.2	172	189	57		202	59	54	6		PITOT LEAK CHECK
	24			497.6										
D-1	0	.04	1.57	497.7	172	181	53		201	54	53	6		
2	4	.05	1.97	500.7	173	180	50		202	57	52	8		
3	8	.05	1.97	503.6	173	179	49		200	58	51	8		
4	12	.04	1.57	506.6	174	178	49		203	58	51	8		
5	16	.04	1.57	509.4	173	179	51		202	58	50	7		
6	20	.04	1.57	512.1	172	180	52		201	57	50	7		.004/min @ 12"
	24			514.900										
AVG/TOTAL														

1/8/94 Particulate 65MW Baseline
№ 00323 IC #B Run 2

1/8/94 Particulate, 65MW, Baseline
№ 00321 Probewash, Run 2

1/8/94 Part. 65MW Baseline
№ 00322 IC #A Run 2

1/8/94
№ 00325 Solution Blank

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PARTICULATE, RUN 1, 65MW, w/UREA 1/2

PARTICULATE TEST FIELD DATA SHEET

Plant: Edison HBGS
Date: 1-7-94
Test Location: Unit #1
Run Number: #1
Stack Diameter inches: 20' 6"
Duct Dimensions in. x in: —
Start Time: 9:08 pm
Operator: RUDD

Barometric Pressure: 30.16
Static Pressure: -.35
Stack Pressure: —
Probe Number: 12'
Pitot Coefficient: .84
Pitot Number: —
Meter Box Number: 325 ΔH@ = 1.847
Orifice Coefficient: γ = .9895

Nozzle Size & Number: .4916
Molecule Weight:
BWO: 568.5
Umbilical #1 560.0

FILTER DATA		
NUMBER	TARE	FINAL WT.
011		

IMPINGER VOLUMES		CO_2	O_2	CO
~~365.8~~ 0	722.8	8.3	6.4	0.269
~~504.7~~ 0	612.9			
478.4	485.3			
SILICA GEL				
849.1	872.6			241.6

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT3	STACK °F	PROBE °F	IMPINGER °F	ORGANIC MODULE °F	OVEN °F	GAS METER IN °F	GAS METER OUT °F	PUMP VACUUM in. Hg	√ΔP	GAS METER LEAK CHECK RATE (CFM)
B-1	0	.03	1.16	250.992	185	178	47		178	55	55	2		PRE- .010/@ 15"
2	4	.04	1.55	253.3	184	180	47		180	57	55	3		POST-
3	8	.04	1.56	255.9	184	180	46		190	61	55	3		
4	12	.04	1.56	258.7	184	182	44		191	63	55	3		PITOT LEAK
5	16	.04	1.56	261.4	183	182	45		190	65	55	3		CHECK ok
6	20	.04	1.57	264.1	182	182	45		190	67	56	3		
	24			266.8									.005/@5" .010/@10"	
C-1	0	.03	1.17	266.9	182	181	50		183	60	57	2		
2	4	.04	1.56	269.3	183	182	50		184	64	56	3		
3	8	.04	1.57	272.0	183	181	51		183	65	56	3		
4	12	.05	1.96	274.8	183	183	52		183	67	57	4		
5	16	.05	1.97	278.0	182	182	52		183	67	57	4		
6	20	.04	1.57	280.8	182	181	57		200	68	57	4	.004/@6"	
	24			283.8									.010/@10"	
A-1	0	.04	1.56	284.0	178	180	52		198	56	55	3		
2	4	.04	1.56	286.8	182	180	51		200	62	56	3		

1/7/94 Particulate, 65MW, w/urea. Probe wash Run #1

1/7/94 Particulate, 65MW, Urea ... 00... I #A

HBGS 1/7/94 65MW, Urea ... 00... #12 Particulate

Part., Run #1, 65 MW, w/ UREA

2/2

PARTICULATE TEST FIELD DATA SHEET

Plant ______ Barometric Pressure ______ Nozzle Size & Number ______

Date ______ Static Pressure ______ Molecule Weight ______

Test Location ______ Stack Pressure ______ BWO ______

Run Number ______ Probe Number ______

Stack Diameter inches ______ Pitot Coefficient ______

Duct Dimensions in. x in. ______ Pitot Number ______

Start Time ______ Meter Box Number ______

Operator ______ Orifice Coefficient ______

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
SILICA GEL				

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
A-3	8	.05	1.96	289.5	181	182	50		200	65	55	4		PRE-
4	12	.05	1.97	292.5	181	183	50		200	68	57	4		POST-
5	16	.04	1.58	295.6	181	182	50		200	69	57	4		
6	20	.03	1.18	298.3	181	181	50		200	67	57	3	.007/@10"	PITOT LEAK
	24			300.7									.010/@10"	CHECK
B-1	0	.04	1.57	300.8	178	180	52		200	59	54	3		
2	4	.03	1.18	303.6	179	180	53		200	65	56	3		
3	8	.04	1.57	306.1	180	180	55		200	64	56	3		
4	12	.04	1.57	308.8	181	181	55		200	66	56	3		
5	16	.04	1.58	311.5	180	181	56		200	66	57	3		
6	20	.03	1.18	314.2	180	182	57		200	65	57	3	.004/min @ 12"	
	24			316.578										
AVG/TOTAL														

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PARTICULATE, RUN 2, 65 MW w/Urea 1/2

PARTICULATE TEST FIELD DATA SHEET

Plant Edison HBGS
Date 1-7̶8-94
Test Location Unit #1
Run Number # 2
Stack Diameter inches 20' 6"
Duct Dimensions in. x in. —
Start Time 11:38 pm
Operator RUDD

Barometric Pressure 30.16
Static Pressure -.35
Stack Pressure —
Probe Number 12'
Pitot Coefficient .84
Pitot Number —
Meter Box Number 325 $H_@$ = 1.847
Orifice Coefficient γ = .9895

Nozzle Size & Number .4916
Molecule Weight
BWO
Umbilical #1

FILTER DATA		
NUMBER	TARE	FINAL WT.
012		

IMPINGER VOLUMES		CO_2	O_2	CO
571.7	682.0	8.3	6.4	0.269
570.2	644.5			
468.2	490.1			
SILICA GEL		237.5		
893.2	924.2			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT3	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC ~~MODULE~~	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
A-1	0	.03	1.17	316.770	175	180	48		200	52	52	3		PRE- .005/@15"
2	4	.03	1.17	319.1	178	181	48		200	55	52	3		POST-
OUT 3	8	.04	1.56	321.5	178	179	46		200	59	52	5		
4	12	.03	1.18	324.3	178	178	47		200	62	52	4		PITOT LEAK CHECK ok
5	16	.03	1.18	326.6	178	178	48		201	63	53	4		
6	20	.03	1.18	329.0	178	179	48		200	64	53	4	.003/@	7"
	24	—	—	331.3									.010/@	10"
B-1	0	.04	1.57	331.4	175	177	50		199	54	53	5		
2	4	.04	1.58	334.2	177	178	51		201	63	54	5		
OUT 3	8	.04	1.58	337.1	177	180	53		202	67	54	5		
4	12	.03	1.19	339.7	177	179	54		202	68	54	4		
5	16	.04	1.58	342.2	177	181	55		201	67	54	5		
6	20	.03	1.19	345.0	178	180	56		200	69	56	5	.004/@	7"
	24	—	—	347.5									.010/@	10"
C-1	0	.04	1.57	347.6	175	177	55		201	56	55	5		
2	4	.04	1.58	350.4	177	178	55		202	62	56	5		

1/8/94 Particulate, 65MW, Urea 31.
1/8/94 Particulate, 65MW, w/urea 00 T #A
1/8/94 Particulate, 65MW, w/Urea 17 T #B

2/2

Part., Run #2, 65 MW, w/ UREA

PARTICULATE TEST FIELD DATA SHEET

Plant ______ Barometric Pressure ______ Nozzle Size & Number ______

Date ______ Static Pressure ______ Molecule Weight ______

Test Location ______ Stack Pressure ______ BWO ______

Run Number ______ Probe Number ______

Stack Diameter inches ______ Pitot Coefficient ______

Duct Dimensions in. x in. ______ Pitot Number ______

Start Time ______ Meter Box Number ______

Operator ______ Orifice Coefficient ______

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
SILICA GEL				

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	~~ORGANIC MODULE~~	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
C-3	8	.04	1.58	353.1	178	181	54		202	66	56	5		PRE-
4	12	.05	1.98	356.0	178	180	55		200	67	56	6		POST-
5	16	.05	1.98	359.0	178	179	55		201	66	56	7		
6	20	.04	1.58	362.2	176	181	58		200	65	56	6		PITOT LEAK CHECK
	24			364.9									OK .010/@10"	
D-1	0	.04	1.57	365.1	175	182	59		200	57	55	5		
2	4	.04	1.57	367.9	178	181	58		202	62	55	5		
3	8	.04	1.58	370.7	178	182	59		201	64	55	5		
4	12	.04	1.58	373.4	178	183	59		202	65	55	5		
5	16	.04	1.58	376.2	178	182	58		201	65	55	5		
6	20	.03	1.18	379.0	177	181	59		200	65	55	5		
	24			381.481									.010/	@ 10"
												A- North		
												B- West		
												D- South		
AVG/TOTAL												C- East		

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APPENDIX F

RECORDS SUPPORTING SCAQMD METHOD 25.1 MEASUREMENTS

APPENDIX F-1

ANALYTICAL REPORTS

HORIZON
AIR MEASUREMENT SERVICES, INC.

M25-018-FR

February 1, 1994

Mr. Chad Garretson
Acurex Environmental Coporation
555 Clyde Avenue
Mountain View, California 94039

RE: SCAQMD METHOD 25.1 RESULTS

Dear Mr. Garretson:

Please find enclosed the corrected results of the SCAQMD Method 25.1 testing you conducted on January 8, 1994.

If you have any questions concerning the results, please call me at (805) 498-8781. HORIZON appreciates the opportunity to provide Acurex Enviornmental with our services and we look forward to working with you again in the future.

Sincerely,

HORIZON AIR MEASUREMENT SERVICES, INC.

Edward S. Swede
Air Quality Technician

ES:lmg

Enclosures

Facility: ACCUREX
Source: NA
Job No.: M25-018
Test Date: 1/8/94

Method 25.1 Analysis

CLIENT: ACCUREX

SAMPLE ID	65 UREA	65UREA	65 BASE	65 BASE	FIELD BLANK
Methane in Tank	7.4	7.7	7.9	7.8	<1
TNMHC,Tank (noncond.)	5.5	6.6	5.6	6.9	<1
TNMHC - condensables	302.4	320.3	209	329	6
TNMHC - Total	307.8	326.9	214.3	336.1	5.6
CO Concentration	251.0	263.0	270.0	270.0	<1
CO2 Concentration	53700	67500	63000	55700	40
Sample Parameters					
Tank #	79	80	54	53	40
Trap #	23	14	12	41	22
Sample Tank Vol.	12.338	12.376	12.110	12.105	12.282
Initial Pressure (Pi)	110.0	2.5	2.5	2.5	5.0
Initial Temperature	292	292	292	292	292
Final Pressure (Pf)	602	708	591	545	530
Final Temperature	292	292	292	292	292
Sample Volume	8.02	11.53	9.41	8.67	8.52
Analysis Pressure (Pa)	800	800	800	800	800
Analysis Temperature	292	292	292	292	292
ICV Volume	2.266	2.266	2.266	2.266	2.266
ICV Final Pressure	800	800	800	800	800
ICV Final Temp.	292	292	292	292	292
CO2 in ICV	1070.0	1630.0	867.0	1260.0	20.9
TNMHC,Trap(cond.)	302	320	209	329	6
Stack Total TNMHC	308	327	214	336	6

NOTE: All hydrocarbon values are in terms of ppm, v/v, as methane.

Facility: ACCUREX
Source: NA
Job No.: M25-018
Test Date: 1/8/94

Method 25.1 Analysis

TOTAL COMBUSTION ANALYSIS RESULTS

CLIENT: ACCUREX

SAMPLE ID	215 UREA	215 UREA	215 BASE	215 BASE
Methane in Tank	<1	<1	<1	<1
TNMHC,Tank (noncond.)	7.8	6.5	6.7	11.4
TNMHC - condensables	64.4	149.6	17	108
TNMHC - Total	72.1	156.1	23.9	119.6
CO Concentration	410.0	406.0	360.0	398.0
CO2 Concentration	58200	61900	59800	57200
Sample Parameters				
Tank #	71	72	81	82
Trap #	34	42	13	17
Sample Tank Vol.	12.330	12.265	12.345	12.379
Initial Pressure (Pi)	2.5	2.5	5.0	5.0
Initial Temperature	292	292	292	292
Final Pressure (Pf)	517	527	548	507
Final Temperature	292	292	292	292
Sample Volume	8.38	8.50	8.85	8.21
Analysis Pressure (Pa)	800	800	800	800
Analysis Temperature	292	292	292	292
ICV Volume	2.266	2.266	2.266	2.266
ICV Final Pressure	800	800	800	800
ICV Final Temp.	292	292	292	292
CO2 in ICV	238.0	561.0	67.0	392.0
TNMHC,Trap(cond.)	64	150	17	108
Stack Total TNMHC	72	156	24	120

NOTE: All hydrocarbon values are in terms of ppm, v/v, as methane.

Facility: ACCUREX
Source: NA
Job No.: M25-018
Test Date: 1/8/94

TOTAL COMBUSTION ANALYSIS RESULTS
CLIENT: ACCUREX

SAMPLE ID	110 UREA	110 ~~BASE~~ UREA	110 BASE	110 BASE
Methane in Tank	<1	<1	<1	<1
TNMHC,Tank (noncond.)	4.5	8.3	8.5	2.3
TNMHC - condensables	140.5	168.0	271	171
TNMHC - Total	145.0	176.2	279.1	173.7
CO Concentration	255.0	266.0	217.0	35.7
CO2 Concentration	58200	56200	64400	12400
Sample Parameters				
Tank #	24	26	55	60
Trap #	43	91	80	28
Sample Tank Vol.	12.350	12.006	12.090	12.110
Initial Pressure (Pi)	5.0	5.0	2.5	2.5
Initial Temperature	292	292	292	292
Final Pressure (Pf)	533	512	553	591
Final Temperature	292	292	292	292
Sample Volume	8.61	8.04	8.79	9.41
Analysis Pressure (Pa)	800	800	800	800
Analysis Temperature	292	292	292	292
ICV Volume	2.266	2.266	2.266	2.266
ICV Final Pressure	800	800	800	800
ICV Final Temp.	292	292	292	292
CO2 in ICV	534.0	596.0	1050.0	712.0
TNMHC,Trap(cond.)	140	168	271	171
Stack Total TNMHC	145	176	279	174

NOTE: All hydrocarbon values are in terms of ppm, v/v, as methane.

AtmAA Inc.
23917 Craftsman Rd., Calabasas, CA 91302 • (818) 223-3277 • FAX (818) 223-8250

environmental consultants
laboratory services

LABORATORY ANALYSIS REPORT

CO, CH4, CO2, & Total Gaseous Non-Methane Organics (TGNMO)
Analysis in Tanks and Traps by SCAQMD Method 25 (FID/TCA)

Report Date: January 18, 1994
Client: Horizon/Acurex
P.O. No.: Verbal
Client Project No.: M25-018
Source Location: Horizon
Source Test Date: January 5, 7, 8, & 10, 1994

Date Received: January 12, 1993
Date Analyzed: January 12 & 13, 1994

AtmAA Lab No.	Sample ID Tank	Trap	ICV	CO (ppmv)	CH4 (ppmv)	CO2 (%)	TGNMO (ppmv)	CO2 in ICV (ppmv)	P1	P2
90124-1	40	22	22	< 1	< 1	40.2 *	< 1	20.9	530	800
90124-2	79	23	3	251	7.38	5.37	5.46	1070	602	800
90124-3	80	14	21	263	7.74	6.75	6.61	1630	708	800
90124-4	81	13	38	360	< 1	5.98	6.73	67.0	548	800
90124-5	82	17	25	398	< 1	5.72	11.4	392	507	800
90124-6	55	80	13	217	< 1	6.44	8.49	1050	553	800
90124-7	60	28	20	35.7	< 1	1.24	2.29	712	591	800
90124-8	71	34	5	410	< 1	5.82	7.76	238	517	800
90124-9	72	42	SB1	406	< 1	6.19	6.54	561	527	800
90124-10	24	43	29	255	< 1	5.82	4.50	534	533	800
90124-11	26	91	8	266	< 1	5.62	8.26	596	512	800
90124-12	53	41	18	270	7.75	5.57	6.92	1260	545	800
90124-13	54	12	34	270	7.88	6.30	5.64	867	591	800
90124-14	System blk.		26					5.36		

* *reported in ppmv*

P1 - Initial Pressure, mm Hg
P2 - Final Pressure, mm Hg

Michael L. Porter
Laboratory Director

QUALITY ASSURANCE SUMMARY
(Repeat Analysis)

Client Proj. No.: M25-018
Date Received: January 12, 1994
Date Analyzed: January 12 & 13, 1994

Components	Sample ID	Repeat Analysis Run #1	Repeat Analysis Run #2	Mean Conc.	% Diff. From Mean
		(Concentration in ppmv)			
CO	TK-79	250	252	251	0.40
	TK-82	399	396	398	0.38
CH4	TK-80	7.72	7.76	7.74	0.26
	TK-71	< 1	< 1	---	---
CO2	TK-55	5.93	6.94	6.44	7.8
	TK-60	1.22	1.25	1.24	1.2
	TK-54	6.39	6.21	6.30	1.4
TGNMO	TK-80	6.41	6.81	6.61	3.0
	TK-71	8.06	7.45	7.76	3.9
CO2 in ICV	ICV-25	407	378	392	3.6
(in trap, transfer	ICV-5	246	231	238	2.9
tanks)	ICV-29	532	536	534	0.37
	ICV-34	868	866	867	0.12

A set of 13 TCA samples laboratory numbers, 90124-(1-13) was analyzed for CO, CH4, CO2, and TGNMO. Agreement between repeat analysis is a measure of precision and is shown above in the column "% Difference from Mean." Repeat analyses are an important part of AtmAA's quality assurance program. The average % Difference from Mean for 12 repeat measurements from the sample set of 13 TCA samples is 2.1%.

Gas standards (containing CO, CH4, CO2 and propane) used for TCA analyses, were prepared and certified by Scott Specialty Gases.

Acurex Environmental
CORPORATION
A Geraghty & Miller Company

CHAIN OF CUSTODY

P.O. Number: NV3051ZSC

Company Name: EDISON HBGS	Project Manager: GARRETSON
Project Number: 9585.012	Project Name: UNIT 1 COMPLIANCE
Sampled by: (Printed and Written Signature) C GARRETSON / B. DAY	

SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CONTAINERS	ANALYSIS: TGNMO	CH_4, CO_2, CO	Trap #	Ai (Torr)	Af	An		REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
Tank 71	1/5	1751	Air	215 MW, w/ Urea	1	X	X	34	2.5	X	X		
Tank 72	↓	↓	↓	↓	1	X	X	42	2.5	X	X		
Tank 81	↓	1235	↓	215 MW, Baseline	1	X	X	13	5.0	X	X		
Tank 82	↓	↓	↓	↓	1	X	X	12	5.0	X	X		
Tank 24	1/7	0003	↓	110 MW, w/ Urea	1	X	X	43	5.0	X	X		
Tank 26	↓	↓	↓	↓	1	X	X	91	5.0	X	X		
Tank 55	↓	0416	↓	110 MW Baseline	1	X	X	80	2.5	X	X		
Tank 60	↓	↓	↓	↓	1	X	X	28	2.5	X	X		high
Tank 79	1/8	0008	↓	65 MW w/ Urea	1	X	X	23	110	X	X		* Note initial pressure reading
Tank 80	↓	↓	↓	↓	1	X	X	14	2.5	X	X		

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	REMARKS: Pressure gained as a result of obtaining an "OK" pre leak check. Contact Chad Garretson if you have questions (714) 453-1264
Relinquished by: (Signature) [signature]	1/10 1000	Received by: (Signature)	
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature) [signature]	Date/Time

Acurex Environmental Corporation
555 Clyde Ave., P.O. Box 7044
Mountain View, CA 94039
(415) 961-5700

Acurex Environmental CORPORATION *A Geraghty & Miller Company*

CHAIN OF CUSTODY

P.O. Number: ____________ Page 2 of 2

Company Name: EDISON HBGS	Project Manager: GARRETSON
Project Number: 9585.012	Project Name: UNIT 1 COMPLIANCE
Sampled by: (Printed and Written Signature) C GARRETSON / B. DAY	

SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION	NO. OF CONTAINERS	ANALYSIS: TGNMO	CH_4, CO_2, CO	Trap #	Pi (Torr)	Pf	Ry		REMARKS (preservation, special analytical or turnaround requirements, duplicate sample, etc.)
Tank 54	1/8	0423	Air	65MW Baseline	1	X	X	12	2.5	X	X		
Tank 53	↓	↓	↓	↓	1	X	X	41	2.5	X	X		
Tank 40	1/10	0815	↓	Field Blank	1	X	X	22	5.0	X	X		

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	REMARKS:
C Garretson	1/10 1000		
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time

Acurex Environmental Corporation
555 Clyde Ave., P.O. Box 7044
Mountain View, CA 94039
( ) 961-5700

Form 5192 4/90

CHAIN OF CUSTODY RECORD

Client/Project Name: Acurex

Project Location: Horizon

Project No.: M25-018

Field Logbook No.:

Sampler: (Signature)

Chain of Custody Tape No.:

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	CO_2	Trap #	Tank #				REMARKS
ICV #20	1/11/94		-7	Trap Burn	✓	28	60				
13			-6		✓	80	55				
21			-3		✓	14	80				
3			90124 -2		✓	23	79				
18			-12		✓	41	53				
34			-13	↓	✓	12	54				
					✓						
					✓						

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	1/12/94	1015		1/12/94	10:15
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
Sample Disposal Method:			Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES
996 Lawrence Drive, Suite 108
Newbury Park, CA 91320 (805) 498-8781

ANALYTICAL LABORATORY

Atm AA.

№ 2323

CHAIN OF CUSTODY RECORD

Client/Project Name: Acurex

Project Location: Horizon

Project No.: M25-018

Field Logbook No.:

Sampler: (Signature) Ed S. Swele

Chain of Custody Tape No.:

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	CO_2	Trap #	Tank #				REMARKS
ICV # 26	1/11/94		90124- 14	Trap Burn							
22			90124- 1			22	40				
25			-5			17	82				
38			-4			13	81				
8			-11			91	26				
09			-10			43	24				
5			-8			34	71				
SB1			-9			42	72				

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Ed S. Swele	1/12/94	1015	Michael S. Porter	1/12/94	10:15
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time

Sample Disposal Method:	Disposed of by: (Signature)	Date	Time

SAMPLE COLLECTOR

HORIZON AIR MEASUREMENT SERVICES
996 Lawrence Drive, Suite 108
Newbury Park, CA 91320 (805) 498-8781

ANALYTICAL LABORATORY

ATm AA

Nº 2322

SCAQMD METHOD 25.1
Sample and Equipment Receipt Form

Client: Acurex

Job #: M25-018

90124

Tank #	Trap #	P(i)	P(f)	P(s)	Comments	
40	22	5.0	530	800	-1 Ana on 40 only	90124-1
79	23	2.5	602	800	-2	-2
80	14	2.5	708	800	-3	-3
81	13	5.0	548	800	-4	4
82	17	5.0	507	800	-5	5
55	80	2.5	553	800	-6	6
60	28	2.5	591	800	-7	7
71	34	2.5	517	800	-8	8
72	42	2.5	527	800	-9	9
24	43	5.0	533	800	-10	10
26	91	5.0	512	800	-11	-11

Rotameters & Other Equipment	Analysis:	Turnaround Time Requested:
	TCA Complete O_2	15 10 5 2 (days)

Date Received: 1/10/94 By: [signature]

Relinquished by: [signature] Date: 1/12/94 Received by: [signature] Date: 1/12/94

AtmAA, Inc.

Relinquished by:_____ Date:_____ Received by:_____ Date:_____

SCAQMD METHOD 25.1
Sample and Equipment Receipt Form

Client: Acurex
Job #: M25-018

Tank #	Trap #	P(i)	P(f)	P(s)	Comments
53	41	2.5	545	800	9924-12
54	12	2.5	591	800	-13

Rotameters & Other Equipment	Analysis:		Turnaround Time Requested:
	TCA Complete	O_2	15 10 5 2 (days)

Date Received: 1/10/94 By: [signature]

Relinquished by: [signature] Date: 1/12/94 Received by: Michael [signature] Date: 1/12/94

Relinquished by: ______ Date: ______ AtmAA, Inc. Received by: ______ Date: ______

APPENDIX F-2

FIELD TEST DATA SHEETS

TOTAL COMBUSTION ANALYSIS
SCAQMD METHOD 25
FIELD SAMPLING DATA SHEET

Job #: NA
Facility: SCE HBGS
Location: Unit 1 Port C
Date: 1/5/94
Operator: B. Day

Control Device: N/A
Sample Location: Port C
Ambient Temperature:
Barometric Pressure: 29.99

SAMPLE A

Tank #: 71 Trap #: 34
Initial Vacuum: 28"
Final Vacuum: 8.5"

error in reading Time should be 1651 ect.

Rot - 52

TIME	VACUUM ("Hg)	FLOW (cc/min)
1751	28.0"	150
1756	26.5"	
1801	24.5"	
1806	22.5"	
1811	21.0	
1816	20.0	
1821	18.0	
1826	16.0	
1831	15.0	
1836	13.5	
1841	12.0	

SAMPLE B

Tank #: 72 Trap #: 42
Initial Vacuum: 30"
Final Vacuum: 9.5

ditto

Rot - 53

TIME	VACUUM ("Hg)	FLOW (cc/min)
1751	30.0"	150
1756	29.0	
1801	27.0	
1806	25.0	
1811	23.0	
1816	21.5	
1821	20.0	
1826	18.0	
1831	17.0	
1836	15.0	
1841	13.5	

Leak Rate Pre Test: OK/OK
Post Test: OK/OK

1846	10.0
1851	8.5

1846	11.0
1851	9.5

Trap # 34 froze between point 1811 & 1816

TOTAL COMBUSTION ANALYSIS
SCAQMD METHOD 25
FIELD SAMPLING DATA SHEET

Job #: NA

Facility : SCE HBGS

Location : Unit 1

Date: 1/5/93

Operator: B. Day

Control Device: NA

Sample Location: Port C

Ambient Temperature:

Barometric Pressure: 29.99

SAMPLE A

Tank #: 81 Trap #: 13

Initial Vacuum: 30"

Final Vacuum: 8.5"

Rot - 52

TIME	VACUUM ("Hg)	FLOW (cc/min)
1235	30.0"	150
1240	28.0	
1245	26.0	
1250	24.0	
1255	22.5	
1300	21.0	
1305	19.5	
1310	17.0	
1315	15.5	
1320	13.5	
1325	12.0	

SAMPLE B

Tank #: ~~80~~ 82 Trap #: 17

Initial Vacuum: 28"

Final Vacuum: 8.0"

Rot - 50

TIME	VACUUM ("Hg)	FLOW (cc/min)
1235	28.0"	150
1240	26.0	
1245	25.0	
1250	23.0	
1255	22.0	
1300	20.0	
1305	18.5	
1310	16.5	
1315	15.0	
1320	13.0	
1325	12.0	

Leak Rate Pre Test: OK / OK

Post Test: OK / OK

1330 10.3
1335 8.5

1330 10.0
1335 8.0

TOTAL COMBUSTION ANALYSIS
SCAQMD METHOD 25
FIELD SAMPLING DATA SHEET

Job #: NA
Control Device: NA
Facility: SCE HBGS
Sample Location:
Location: Unit 1 west port
Ambient Temperature:
Date: 1/6/94
Barometric Pressure: 30.21
Operator: B. Day

SAMPLE A

Tank #: 24 Trap #: 43
Initial Vacuum: 28.5"
Final Vacuum: 8.0

Rot = 52

TIME	VACUUM ("Hg)	FLOW (cc/min)
0003	28.5"	150
0008	27.0	
0013	25.0	
0018	23.0	
0023	21.5	
0028	20.0	
0033	18.0	
0038	16.0	
0043	14.0	
0048	13.5	
0053	12.0	

SAMPLE B

Tank #: 26 Trap #: 91
Initial Vacuum: 30"+
Final Vacuum: 11.0

Rot = 53

TIME	VACUUM ("Hg)	FLOW (cc/min)
0003	30"+	150
0008	29.0	
0013	27.0	
0018	25.0	
0023	23.0	
0028	21.0	
0033	19.5	
0038	17.0	
0043	15.0	
0048	15.0	
0053	14.0	

Leak Rate Pre Test: OK/OK

Post Test: OK/OK

0058	10.0
0103	8.0

0058	13.0
0103	11.0

Trap 91 Froze between points 0043 & 0048

TOTAL COMBUSTION ANALYSIS
SCAQMD METHOD 25
FIELD SAMPLING DATA SHEET

Job #: NA

Control Device: NA

Facility: SCE HBGS

Sample Location: West Stack

Location: Unit 1 West Stack

Ambient Temperature:

Date: 1/6/94

Barometric Pressure: 30.21

Operator: B. Day

SAMPLE A

Tank #: 55 Trap #: 80

Initial Vacuum: 28"

Final Vacuum: 6"

Roto 1 SAMPLE B

Tank #: 60 Trap #: 28

Initial Vacuum: 30" +

Final Vacuum: 7"

TIME	VACUUM ("Hg)	FLOW (cc/min)
0416	28.0	150
0421	26.0	
0426	24.0	
0431	22.0	
0436	20.0	
0441	18.5	
0446	16.5	
0451	14.5	
0456	13.0	
0501	11.0	
0506	9.0	

TIME	VACUUM ("Hg)	FLOW (cc/min)
0416	30.0	150
0421	28.0	
0426	22.0	
0431	18.0	
0436	14.0	
0441	12.0	
0446	8.5	
stop 0451	7.0	
0456		
0501		
0506		

Something went wrong, rapid pressure gain, flow setup bumped ... part ...

Leak Rate Pre Test: OK/OK

Post Test: OK/~~[illegible]~~ BD post leak, Failed. obvious loss of pressure over course of test. Location of leak was in the control knob of rotameter BD

0511 7.5
516 6.0

0511
0516

TOTAL COMBUSTION ANALYSIS
SCAQMD METHOD 25
FIELD SAMPLING DATA SHEET

Job #: NA
Facility: SCE HBGS
Location: Unit 1
Date: 1/7/94
Operator: B. Day

Control Device: NA
Sample Location: West ~~[illegible]~~ AD Port
Ambient Temperature:
Barometric Pressure: ~~[illegible]~~ 30.16

SAMPLE A

Tank #: 79 Trap #: 23
Initial Vacuum: 25.5"
Final Vacuum: 3.0

Roto 2

TIME	VACUUM ("Hg)	FLOW (cc/min)
0008	25.5	150
0013	24.0	
0018	22.0	
0023	20.0	
0028	18.0	
0033	17.0	
0038	16.0	
0043	13.0	
0048	10.5	
0053	8.5	
0058	7.0	
0103	5.0	
0108	3.0	

SAMPLE B

Tank #: 80 Trap #: 14
Initial Vacuum: 28.5"
Final Vacuum: 6.0

Roto 1

TIME	VACUUM ("Hg)	FLOW (cc/min)
0008	28.5	150
0013	27.0	
0018	25.0	
0023	22.0	
0028	19.5	
0033	17.0	
0038	16.0	
0043	14.0	
0048	12.5	
0053	11.0	
0058	9.0	
0103	7.5	
0108	6.0	

Leak Rate Pre Test: OK/OK
Post Test: OK/OK

Froze up
0028 - 0033

TOTAL COMBUSTION ANALYSIS
SCAQMD METHOD 25
FIELD SAMPLING DATA SHEET

Job #: NA

Facility : SCE HB GS

Location : Unit West Port

Date: 1/7/94

Operator: B. Day

Control Device: N4

Sample Location:

Ambient Temperature:

Barometric Pressure:

SAMPLE A

Tank #: 54 Trap #: 17

Initial Vacuum: 30"

Final Vacuum: 8

SAMPLE B

Tank #: 53 Trap #: 41

Initial Vacuum: 28"

Final Vacuum: 8

TIME	VACUUM ("Hg)	FLOW (cc/min)
0423	30"	150
0428	30"	
0433	29"	
0438	28"	
0443	26"	
0448	23.5	
0453	21.0	
0458	19.0	
0503	16.5	
0508	14.5	
0513	13.0	

TIME	VACUUM ("Hg)	FLOW (cc/min)
0423	28"	150
0428	26"	
0433	24"	
0438	22.5"	
0443	21.0"	
0448	19.0"	
0453	17.0"	
0458	16.0"	
0503	14.0	
0508	13.0	
0513	11.0	

Leak Rate Pre Test: OK/OK

Post Test: OK OK

0518 10.5

0523 8.0

0518 ~~000~~ 9.5

0523 8.0

TOTAL COMBUSTION ANALYSIS
SCAQMD METHOD 25.1
FIELD SAMPLING DATA SHEET

Reference #: 9585.012

Test Site : EDISON

Location : HBGS UNIT 1

Date : 1/10/93

Operator : CG

Source : Field Blank

Sample Location : "

Ambient Temperature : —

Barometric Pressure : 30.02

SAMPLE A

Tank #: 40 Trap #: 22

Initial Vacuum : 28"

Final Vacuum : 8.0"

SAMPLE B

Tank #: Trap #:

Initial Vacuum :

Final Vacuum :

TIME	VACUUM ("Hg)	FLOW (cc/min)	TIME	VACUUM ("Hg)	FLOW (cc/min)
0815	28"	200+			
0818	24.5"				
0824	18.0"				
0828	14.0"				
0832	10.5"				
0835	8.0"				

Leak Rate Pre Test: ok ~~ok~~ Post Test: ok

APPENDIX G

RECORDS SUPPORTING AMMONIA CONCENTRATION MEASUREMENTS

APPENDIX G-1

DRAFT METHOD 207.1

DKA FI 3/93

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^{o}C (350^{o}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 ±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 G-2

ANALYTICAL RESULTS

Client:	EDISON, HBGS	Test Conditions:	215 MW, 110 MW, 65 MW
Location:	UNIT 1	Analysis By:	C. Garretson

Date: 01/13/94

Date	standard (ml)	(mg)	Blank Absorb.	Absorb.	Absorb. corrected	Percent Deviation	Regression Output:		
							Constant		0.013610
							Std Err of Y Est		0.000653
							R Squared		0.9998
01/04/94	2	0.02	0.016	0.034	0.018	2.4%	No. of Observations		6
01/04/94	4	0.04	0.016	0.085	0.069	0.1%	Degrees of Freedom		4
01/04/94	8	0.08	0.016	0.189	0.173	0.4%	Degrees of Freedom		5
01/04/94	10	0.10	0.016	0.240	0.224	0.8%	X Coefficient(s)	0.382044	
01/04/94	12	0.12	0.016	0.294	0.278	0.2%	Std Err of Coef.	0.002410	
01/04/94	14	0.14	0.016	0.349	0.333	0.6%	Std Err of Coef.	0.004978	
Control Sample									
01/13/94	40ug	0.04	0.020	0.092	0.072	2.7%			

Test		Blank Absorb.	Absorb.	Abosob. (−blank)	Slope (M)	volume used in analysis (ml)	sample aliquot (ml)	volume collected (ml)	Aliquot Factor	mass collected (mg)
215 MW	Run 1	0.021	0.167	0.146	0.38	52	5	500	100.0	5.58
110 MW	Run 1	0.021	0.230	0.209	0.38	52	5	500	100.0	7.98
65 MW	Run 1	0.021	0.264	0.243	0.38	52	5	500	100.0	9.28

Mixed @ 1240

1/4/94 Standards Curve @ 1255 hrs

	Absorb.
blank Old Sol'n	0.019
blank New Sol'n	0.016
2 ml	0.034
4 ml	0.085
8 ml	0.189
10 ml	0.240
12 ml	0.294
14 ml	0.349

← mixed standards w/ new solution

$R^2 = 0.9998$

HBGS Unit 1 Compliance | SLIP ANALYSES

1/13/94 1815 hrs Analyzed by C Garretson

Sample	Aliquot	Absorb.	mg	SLIP Raw/Corrected (ppm)
215 MW	5 ml	0.167	5.58	12/13
110 MW	5 ml	0.230	7.98	16/19
65 MW	5 ml	0.264	9.28	13/17
blank	—	0.021		

Added Nesslers 1815 hrs

Analyzed 1830 hrs

Bausch & Lomb Spec 20 Last Calibrated 9/15/93

1/13/94

Control Sample

215 MW $\quad 5.58\ mg = 11.16\ \mu g/ml$

Standard $\quad 10\ \mu g/ml$

Will mix control sample in a 500ml Volumetric flask + take a 50ml aliquot for analysis

$$\frac{40\ \mu g}{50\ ml} = \frac{400\ \mu g}{500\ ml}$$

18 ml of 215 MW sample =	200.88 µg
+ 20 ml of 10 $\frac{\mu g}{ml}$ standard =	200 µg
dilute to 500 ml	≈ 400 µg

1/13/94 @ 1915 hrs

	Abs.	
blank	0.020	
Control Sample	0.092	=> 2.7% deviation from calib. curve

04-Apr-94

Date	standard (ml)	(mg)	Blank Absorb.	Absorb.	Absorb. corrected	Percent Deviation	Regression Output:		
							Constant		0.007087
							Std Err of Y Est		0.000873
							R Squared		0.9997
3/19/94	2	0.02	0.005	0.035	0.030	1.8%	No. of Observations		6
3/19/94	4	0.04	0.005	0.083	0.078	0.7%	Degrees of Freedom		4
3/19/94	8	0.08	0.005	0.180	0.175	0.4%	Degrees of Freedom		5
3/19/94	10	0.10	0.005	0.230	0.225	1.2%	X Coefficient(s)	0.418552	
3/19/94	12	0.12	0.005	0.275	0.270	0.1%	Std Err of Coef.	0.003529	
3/19/94	14	0.14	0.005	0.320	0.315	0.8%	Std Err of Coef.	0.004978	
Control (4/4/94)		0.04	0.006	0.081	0.075	4.0%			

Test		Blank Absorb.	Absorb.	Abosob. (−blank)	Slope (M)	volume used in analysis (ml)	sample aliquot (ml)	volume collected (ml)	Aliquot Factor	mass collected (mg)
Low−load	Run 1	0.004	0.22	0.216	0.42	52	5	500	100	9.04
	Run 2	0.004	0.223	0.219	0.42	52	5	500	100	9.17
									avg:	9.10
Mid−Load	Run 1	0.004	0.195	0.191	0.42	52	5	500	100	7.99
	Run 2	0.004	0.191	0.187	0.42	52	5	500	100	7.83
									avg:	7.91
Full Load	Run 1	0.004	0.144	0.14	0.42	52	5	500	100	5.86
	Run 2	0.004	0.146	0.142	0.42	52	5	500	100	5.94
									avg:	5.90

GERAGHTY & MILLER, INC.
Environmental Services

SUBJECT: SLIP ANALYSES
PROJECT: HBGS/EGS COMPLIANCE
CLIENT/PROJECT NO: EDISON 9585

BY: DATE: 4/4/94
CHKD: DATE:
REV: DATE:

PAGE
SHEET 1

(S1) → ~~Initial~~ Stock Standard mixed 3/19/94 and curve also run on 3/19/94

(S1) Created from Fisher Brand Ammonia Sulfate

4/4/94 Mixed ~~Second~~ Standard (S2) by dissolving 0.194 g of VWR Brand Ammonia Sulfate in 500 ml of 0.1 N H_2SO_4

	Aliquot	Absorbance Run 1/Run 2	total mg Run 1/Run 2
blank	∅	0.003/0.006	2.13/2.[illegible] (2.07)
Etiwanda #3, Mid-Load, ~~Run~~ Test 1	10 ml	0.105/0.102	
Etiwanda #3, Mid-Load, ~~Run~~ Test 2	10 ml	0.136/0.139	2.78/2.78 (2.78)
Etiwanda #3, Full load	10 ml	0.160/0.165	3.29/3.33 (3.31)
blank	∅	0.004	
Huntington Bch #1, Low Load	5 ml	0.220/0.223	9.04/9.17 (9.10)
Huntington BCH #1, Mid-Load	5 ml	0.195/0.191	7.99/7.83 (7.91)
Huntington BCH #1 Full Load	5 ml	0.144/0.146	5.86/5.94 (5.90)
Control Sample (S2)	40 ug	0.081	4.0% Deviation
Blank → 0.006			

APPENDIX G-3

SPREADSHEETS AND FIELD TEST DATA SHEETS

AMMONIA SLIP CALCULATION SPREADSHEET

Plant: SCE, HBGS
Date : 1/5/94
Performed by: BD

Sample Location: UNIT 1, STACK
Test No./Type: NH3 Slip
Start/Stop Time: 1650/1750

Conditions: 215 MW

PARAMETER	SYMBOL	VALUE (calc.)
Gas Meter Correction Factor	(gamma)	1.019
Barometric Pressure (in Hg)	P(b)	29.99
# of Sample Points	#	4
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)		13.02
Gas Meter Final Reading (cu ft)		35.84
Net Gas Sample Volume (cu ft)	V(m)	(22.82)
Vol of Liquid Collected (ml)	Vl(c)	95.5
Vol of Liq @ Std. Conds. (scf)	V(w std)	(4.495)
Measure O2 Concentration @KVB	(%)	5.0

FIELD DATA AVERAGES

Avg Orifice Meter Reading (in H20)	dH(avg)	=	0.500
Avg Stack Temperature (degF)	T(s avg)	=	240.0
Average Meter Temperature (degF)	T(m avg)	=	64.0

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	23.50
Stack Gas Water Vapor Proportion	B(wo)	=	0.161
Total Mass: (mg NH3)		=	5.79
NH3 Concentration (ppmv air)		=	12
NH3 Concentration (ppmv air @3.0% O2)		=	14

Sample Point	dClock Time	Orifice Meter,dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	Gas Meter Temp (degF) out
1	15	0.50	240	64	62
2	15	0.50	240	66	62
3	15	0.50	240	67	62
4	15	0.50	240	67	62
TOTALS	60.0	2.00	960.0	264.0	248.0

AMMONIA SLIP CALCULATION SPREADSHEET

Plant: SCE, HBGS
Date : 1/7/94
Performed by: BD

Sample Location: UNIT 1, STACK
Test No./Type: NH3 Slip
Start/Stop Time: 0002/0102

Conditions: 110 MW

PARAMETER	SYMBOL	VALUE (calc.)
Gas Meter Correction Factor	(gamma)	1.019
Barometric Pressure (in Hg)	P(b)	30.21
# of Sample Points	#	4
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)		36.08
Gas Meter Final Reading (cu ft)		59.25
Net Gas Sample Volume (cu ft)	V(m)	(23.17)
Vol of Liquid Collected (ml)	Vl(c)	87.7
Vol of Liq @ Std. Conds. (scf)	V(w std)	(4.128)
Measure O2 Concentration @KVB	(%)	5.8

FIELD DATA AVERAGES

Avg Orifice Meter Reading (in H20)	dH(avg)	=	0.500
Avg Stack Temperature (degF)	T(s avg)	=	197.0
Average Meter Temperature (degF)	T(m avg)	=	64.0

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	24.04
Stack Gas Water Vapor Proportion	B(wo)	=	0.147
Total Mass: (mg NH3)		=	7.93
NH3 Concentration (ppmv air)		=	16
NH3 Concentration (ppmv air @3.0% O2)		=	19

Sample Point	dClock Time	Orifice Meter.dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	Gas Meter Temp (degF) out
1	15	0.50	197	65	60
2	15	0.50	197	68	61
3	15	0.50	197	68	61
4	15	0.50	197	68	61
TOTALS	60.0	2.00	788.0	269.0	243.0

AMMONIA SLIP CALCULATION SPREADSHEET

Plant: SCE, HBGS
Date : 1/8/94
Performed by: BD

Sample Location: UNIT 1, STACK
Test No./Type: NH3 Slip
Start/Stop Time: 0008/0108

Conditions: 65 MW

PARAMETER	SYMBOL	VALUE (calc.)
Gas Meter Correction Factor	(gamma)	1.019
Barometric Pressure (in Hg)	P(b)	30.00
# of Sample Points	#	4
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)		84.07
Gas Meter Final Reading (cu ft)		116.60
Net Gas Sample Volume (cu ft)	V(m)	(32.53)
Vol of Liquid Collected (ml)	Vl(c)	122.7
Vol of Liq @ Std. Conds. (scf)	V(w std)	(5.775)
Measure O2 Concentration	(%)	6.4

FIELD DATA AVERAGES

Avg Orifice Meter Reading (in H20)	dH(avg)	=	1.000
Avg Stack Temperature (degF)	T(s avg)	=	180.8
Average Meter Temperature (degF)	T(m avg)	=	56.4

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	34.06
Stack Gas Water Vapor Proportion	B(wo)	=	0.145
Total Mass: (mg NH3)		=	9.16
NH3 Concentration (ppmv air)		=	13
NH3 Concentration (ppmv air @3.0% O2)		=	16

Sample Point	dClock Time	Orifice Meter,dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	Gas Meter Temp (degF) out
1	15	1.00	181	56	56
2	15	1.00	181	57	56
3	15	1.00	180	58	56
4	15	1.00	181	56	56
TOTALS	60.0	4.00	723.0	227.0	224.0

NH_3 SLIP, FULL LOAD, W/ UREA

PARTICULATE TEST FIELD DATA SHEET

Plant: SCE HBGS
Date: 1/5/94
Test Location: Unit 1 Port C
Run Number: 1
Stack Diameter inches: 20' 6"
Duct Dimensions in. x in.: —
Start Time: 1750 ← time is incorrect should be 1650
Operator: B. Day

Barometric Pressure: 29.99
Static Pressure: -0.38
Stack Pressure: 29.61
Probe Number: —
Pitot Coefficient: —
Pitot Number: —
Meter Box Number: 20151
Orifice Coefficient: 1.09

Nozzle Size & Number: —
Molecule Weight: —
BWO: ~16.1%
umbilical #2

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
587.1	671.6		5.0	
557.0	559.1	95.5		
465.7	467.1			
SILICA GEL				
869.5	877.0			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
1	0	—	0.50	013.023	240	—	58	—	—	62	61	6"	—	PRE- 0.001 @ 15
1	15	—	0.50	018.615	240	—	55	—	—	64	62	6"	—	POST- 0.003 @ 15
1	30	—	0.50	024.352	240	—	55	—	—	66	62	6"	—	
1	45	—	0.50	030.010	240	—	55	—	—	67	62	6"	—	PITOT LEAK CHECK
1	60	—	0.50	035.838	240	—	56	—	—	67	62	6"	—	
AVG/TOTAL														

Nº 00291 NH_3 Slip #1 1/5/94

NH_3 SLIP, 110MW, / UREA

PARTICULATE TEST FIELD DATA SHEET

Plant: SCE HBGS
Date: ~~1/6/94~~ 1/7/94
Test Location: Port C West Unit 1
Run Number: 1
Stack Diameter inches: 20' 6"
Duct Dimensions in. x in.: —
Start Time: 0002
Operator: B. Day

Barometric Pressure: 30.21
Static Pressure: -0.40
Stack Pressure: 29.81
Probe Number: —
Pitot Coefficient: —
Pitot Number: —
Meter Box Number: 20151
Orifice Coefficient: 1.019

Nozzle Size & Number: —
Molecule Weight: —
BWO: 14.7%
umbilical #2

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
569.3	569.9		5.8	
568.5	571.1		87.7	
467.3	545.9			
SILICA GEL				
876.6	882.5			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F: STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
1	0	—	0.50	036.080	198	—	52	—	—	61	60	6"	—	PRE- 0.003 @ 15
1	15	—	0.50	041.905	197	—	48	—	—	65	61	6"	—	POST- 0.003 @ 15
1	30	—	0.50	047.604	197	—	46	—	—	68	61	6"	—	
1	45	—	0.50	053.601	197	—	49	—	—	68	61	6"	—	PITOT LEAK CHECK
1	60	—	0.50	059.250	197	—	49	—	—	68	61	6"	—	
AVG/TOTAL														

EDISON HBGS UNIT 1 110 MW
Nº 00311 NH_3 SLIP

#5214 7/92

65MW, NH_3 SLIP

PARTICULATE TEST FIELD DATA SHEET

Plant: SCE HBGS
Date: ~~C.D~~ ~~1/7/93~~ 1/8/94
Test Location: West Port Unit 1
Run Number: 1
Stack Diameter inches: 20' 6"
Duct Dimensions in. x in.: —
Start Time: 0008
Operator: B. Day

Barometric Pressure: 30.16
Static Pressure: -0.35
Stack Pressure: 29.81
Probe Number: —
Pitot Coefficient: —
Pitot Number: —
Meter Box Number: 20151
Orifice Coefficient: 1.019

Nozzle Size & Number: —
Molecule Weight: —
BWO: 14.5%
umbilical #2

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
578.5	679.8		6.4	
566.0	571.8			
430.5	433.9			
SILICA GEL				
816.1	828.3			

122.7

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT³	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
1	0	—	1.0	084.071	182	—	50	—	—	56	56	10"	—	PRE-0.003@16"
1	15	—	1.0	092.185	181	—	46	—	—	56	56	10"	—	POST-0.003@16"
1	30	—	1.0	100.258	181	—	50	—	—	57	56	11"	—	
1	45	—	1.0	108.150	180	—	52	—	—	58	56	11"	—	PITOT LEAK CHECK
1	60	—	1.0	116.603	181	—	54	—	—	56	56	11"	—	
AVG/TOTAL														

1/8/94 HBGS Unit 1, NH_3 Slip
№ 00326

#5214 7/92

APPENDIX H

RECORDS SUPPORTING VOLUMETRIC FLOW RATE MEASUREMENTS

APPENDIX H-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), $17.64 \left(\frac{V_m}{\alpha}\right)\left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m + 460}\right)$ $17.64 \left(\frac{(\_\_\_)}{(\_\_\_)}\right)\left(\frac{(\_\_\_) + \frac{(\_\_\_)}{13.6}}{(\_\_\_) + 460}\right)$	$V_{m\ std}$	
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 $\frac{V_{w\ std}}{V_{w\ std} + V_{m\ std}}$, $\frac{(\_\_\_)}{(\_\_\_) + (\_\_\_)}$	B_{wo}	
Molecular weight, stack gas dry (lb/lb-mole) $(\%\ CO_2 \times 0.44) + (\%\ O_2 \times 0.32) + (\%\ N_2 + \%\ CO \times 0.28)$ $(\_\_\_ \times 0.44) + (\_\_\_ \times 0.32) + (\_\_\_ + \_\_\_ \times 0.28)$	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) $P_b + \frac{P_{stack}\ (\text{in. } H_2O)}{13.6}$, $(\_\_\_) + \frac{(\_\_\_)}{13.6}$	P_s	

Form 440 3/84

Temperature stack gas, average (^{o}F)	T_s	
Stack velocity (fps) $85.49\ (C_p)\ (\sqrt{\Delta P_{s\ avg}})\ \sqrt{\frac{T_s avg + 460}{P_s\ M_s}}$ $85.49\ (\_\_\_)(\sqrt{\quad})\ \sqrt{\frac{(\_\_\_) + 460}{(\_\_\_)(\_\_\_)}}$	$V_{s(avg)}$	
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	

Form 440a 3/84

APPENDIX H-2

SPREADSHEETS AND FIELD TEST DATA SHEETS

FLOW RATE CALCULATION USING FLUE FACTOR METHOD

Plant: EDISON HBGS
Date : 1/5/94
Sample Location: UNIT 1
Performed by: CG/BD

Conditions: 215 MW BASELINE
Start/Stop: 1235/1335

PARAMETER	SYMBOL	VALUE (calc.)
Pitot Tube Correction Factor	C(p)	0.84
Barometric Pressure (in Hg)	P(b)	29.99
Static Pressure (in H2O)	P(stack)	−0.38
# of Sample Points	#	24
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123
Length (if rectangular)	L	
Width (if rectangular)	W	
Area of Stack (sq ft)	A(s)	(330.06)
O2 Concentration	% O2	5.0
CO2 Concentration	% CO2	9.1
CO Concentration	% CO	0.362
N2 Concentration (by diff.)	% N2	(85.54)

VELOCITY TRAVERSE MEASUREMENTS

Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)	Stack Velocity (ft/sec)
A−1	0.20	240	0.45	29.4
2	0.25	240	0.50	32.8
3	0.23	240	0.48	31.5
4	0.28	240	0.53	34.7
5	0.28	240	0.53	34.7
6	0.22	240	0.47	30.8
B−1	0.21	239	0.46	30.1
2	0.18	239	0.42	27.8
3	0.21	239	0.46	30.1
4	0.22	239	0.47	30.8
5	0.23	239	0.48	31.5
6	0.21	239	0.46	30.1
C−1	0.35	240	0.59	38.8
2	0.37	240	0.61	39.9
3	0.38	240	0.62	40.5
4	0.35	240	0.59	38.8
5	0.37	240	0.61	39.9
6	0.29	240	0.54	35.3
D−1	0.31	240	0.56	36.5
2	0.33	240	0.57	37.7
3	0.33	240	0.57	37.7
4	0.36	240	0.60	39.4
5	0.37	240	0.61	39.9
6	0.31	240	0.56	36.5
TOTALS	6.84	5754	12.73	835.2

REFERENCE POINT VELOCITY MEASUREMENTS

Time	Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)	Stack Velocity (ft/sec)
1315	C−2	0.35	240	0.59	38.8
1320	C−2	0.37	240	0.61	39.9
1325	C−2	0.34	240	0.58	38.3
1330	C−2	0.36	240	0.60	39.4
1335	C−2	0.33	240	0.57	37.7
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
	TOTALS	1.75	1200	2.96	194.1

VELOCITY TRAVERSE AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.285
Avg Stack Temperature (degF)	T(s avg)	=	239.8
Avg SQRT(dP)		=	0.530

CALCULATED VALUES FROM VELOCITY TRAVERSE AND MOISTURE MEASUREMENTS

Stack Gas Water Vapor Proportion	B(wo)	=	[illegible].45
Mol. Wt., Stack Gas Dry	M(d)	=	[illegible].66
Mol. Wt., Stack Gas Wet	M(s)	=	[illegible].97
Abs Stack Pressure (in Hg)	P(s)	=	[illegible]9.96
Avg Stack Velocity (ft/sec)	V(s avg)	=	34.8
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	445253
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	689191

ADJUSTED STACK GAS FLOW BASED ON FLUE FACTOR REFERENCE POINT VELOCITY MEASUREMENTS

Average ref. point vel. during sampling (ft/sec)	U(rs)	=	****
Average stack gas vel. during traverse (ft/sec)	U(t)	=	****
Average ref. point vel. during traverse (ft/sec)	U(r)	=	****
Flue Factor {U(t) / U(r)}		=	****

445253 dscfm = 26.72MMscfh

FLOW RATE CALCULATION USING FLUE FACTOR METHOD

Plant: EDISON HBGS
Date : 1/5/94
Sample Location: UNIT 1
Performed by: CG/BD

Conditions: 215 MW With UREA
Start/Stop: 1650/1750

PARAMETER	SYMBOL	VALUE (calc.)
Pitot Tube Correction Factor	C(p)	0.84
Barometric Pressure (in Hg)	P(b)	29.99
Static Pressure (in H2O)	P(stack)	−0.38
# of Sample Points	#	24
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123
Length (if rectangular)	L	
Width (if rectangular)	W	
Area of Stack (sq ft)	A(s)	(330.06)
O2 Concentration	% O2	5.0
CO2 Concentration	% CO2	9.2
CO Concentration	% CO	0.374
N2 Concentration (by diff.)	% N2	(85.43)

VELOCITY TRAVERSE MEASUREMENTS

Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)	Stack Velocity (ft/sec)
A−1	0.25	240	0.50	32.9
2	0.26	240	0.51	33.6
3	0.27	240	0.52	34.2
4	0.28	240	0.53	34.8
5	0.28	240	0.53	34.8
6	0.26	240	0.51	33.6
B−1	0.27	240	0.52	34.2
2	0.26	240	0.51	33.6
3	0.23	240	0.48	31.6
4	0.27	240	0.52	34.2
5	0.27	240	0.52	34.2
6	0.24	240	0.49	32.3
C−1	0.35	240	0.59	39.0
2	0.38	240	0.62	40.6
3	0.35	240	0.59	39.0
4	0.38	240	0.62	40.6
5	0.36	240	0.60	39.5
6	0.26	240	0.51	33.6
D−1	0.32	240	0.57	37.2
2	0.33	240	0.57	37.8
3	0.34	240	0.58	38.4
4	0.35	240	0.59	39.0
5	0.33	240	0.57	37.8
6	0.28	240	0.53	34.8
TOTALS	7.17	5760	13.08	861.2

REFERENCE POINT VELOCITY MEASUREMENTS

Time	Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)	Stack Velocity (ft/sec)
1716	C−2	0.33	240	0.57	37.8
1721	C−2	0.35	240	0.59	39.0
1726	C−2	0.34	240	0.58	38.4
1731	C−2	0.33	240	0.57	37.8
1736	C−2	0.36	240	0.60	39.5
1741	C−2	0.35	240	0.59	39.0
1746	C−2	0.34	240	0.58	38.4
1751	C−2	0.37	240	0.61	40.0
					0.0
					0.0
					0.0
	TOTALS	2.77	1920	4.71	309.9

VELOCITY TRAVERSE AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.299
Avg Stack Temperature (degF)	T(s avg)	=	240.0
Avg SQRT(dP)		=	0.545

CALCULATED VALUES FROM VELOCITY TRAVERSE AND MOISTURE MEASUREMENTS

Stack Gas Water Vapor Proportion	B(wo)	=	0.161
Mol. Wt., Stack Gas Dry	M(d)	=	29.67
Mol. Wt., Stack Gas Wet	M(s)	=	27.79
Abs Stack Pressure (in Hg)	P(s)	=	29.96
Avg Stack Velocity (ft/sec)	V(s avg)	=	35.9
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	450359
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	710643

ADJUSTED STACK GAS FLOW BASED ON FLUE FACTOR REFERENCE POINT VELOCITY MEASUREMENTS

Average ref. point vel. during sampling (ft/sec)	U(rs)	=	[illegible]
Average stack gas vel. during traverse (ft/sec)	U(t)	=	****
Average ref. point vel. during traverse (ft/sec)	U(r)	=	****
Flue Factor {U(t) / U(r)}		=	****

27.02 mmSCF/hr

FLOW RATE CALCULATION USING FLUE FACTOR METHOD

Plant: EDISON HBGS
Date: 1/7/94
Sample Location: UNIT 1
Performed by: CG/BD

Conditions: 110 MW BASELINE
Start/Stop: 0415/0431

PARAMETER	SYMBOL	VALUE (calc.)
Pitot Tube Correction Factor	C(p)	0.84
Barometric Pressure (in Hg)	P(b)	30.21
Static Pressure (in H2O)	P(stack)	-0.40
# of Sample Points	#	24
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123
Length (if rectangular)	L	
Width (if rectangular)	W	
Area of Stack (sq ft)	A(s)	(330.06)
O2 Concentration	% O2	5.9
CO2 Concentration	% CO2	8.6
CO Concentration	% CO	0.211
N2 Concentration (by diff.)	% N2	(85.29)

VELOCITY TRAVERSE MEASUREMENTS

Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)	Stack Velocity (ft/sec)
A-1	0.08	193	0.28	17.9
2	0.08	193	0.28	17.9
3	0.09	193	0.30	19.0
4	0.08	193	0.28	17.9
5	0.08	193	0.28	17.9
6	0.07	193	0.26	16.7
B-1	0.09	193	0.30	19.0
2	0.09	193	0.30	19.0
3	0.08	193	0.28	17.9
4	0.10	193	0.32	20.0
5	0.10	193	0.32	20.0
6	0.08	193	0.28	17.9
C-1	0.09	193	0.30	19.0
2	0.07	193	0.26	16.7
3	0.10	193	0.32	20.0
4	0.11	193	0.33	21.0
5	0.10	193	0.32	20.0
6	0.07	193	0.26	16.7
D-1	0.09	193	0.30	19.0
2	0.09	193	0.30	19.0
3	0.10	193	0.32	20.0
4	0.12	193	0.35	21.9
5	0.10	193	0.32	20.0
6	0.08	193	0.28	17.9
TOTALS	2.14	4632	7.15	451.6

REFERENCE POINT VELOCITY MEASUREMENTS

Time	Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)	Stack Velocity (ft/sec)
0436	C-3	0.10	193	0.32	20.0
0441	C-3	0.11	193	0.33	21.0
0446	C-3	0.10	193	0.32	20.0
0451	C-3	0.12	193	0.35	21.9
0456	C-3	0.09	193	0.30	19.0
0501	C-3	0.11	193	0.33	21.0
0506	C-3	0.10	193	0.32	20.0
0511	C-3	0.12	193	0.35	21.9
0516	C-3	0.12	193	0.35	21.9
					0.0
					0.0
	TOTALS	0.97	1737	2.95	186.4

VELOCITY TRAVERSE AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.089
Avg Stack Temperature (degF)	T(s avg)	=	193.0
Avg SQRT(dP)		=	0.298

CALCULATED VALUES FROM VELOCITY TRAVERSE AND MOISTURE MEASUREMENTS

Stack Gas Water Vapor Proportion	B(wo)	=	[illegible]42
Mol. Wt., Stack Gas Dry	M(d)	=	[illegible].61
Mol. Wt., Stack Gas Wet	M(s)	=	[illegible].96
Abs Stack Pressure (in Hg)	P(s)	=	30.18
Avg Stack Velocity (ft/sec)	V(s avg)	=	18.8
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	260769
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	372634

ADJUSTED STACK GAS FLOW BASED ON FLUE FACTOR REFERENCE POINT VELOCITY MEASUREMENTS

Average ref. point vel. during sampling (ft/sec)	U(rs)	=	****
Average stack gas vel. during traverse (ft/sec)	U(t)	=	****
Average ref. point vel. during traverse (ft/sec)	U(r)	=	****
Flue Factor {U(t) / U(r)}		=	****

15.65 mm SCF/hr

FLOW RATE CALCULATION USING FLUE FACTOR METHOD

Plant: EDISON HBGS
Date : 1/7/94
Sample Location: UNIT 1
Performed by: CG/BD

Conditions: 110 MW With UREA
Start/Stop: 0002/0102

PARAMETER	SYMBOL	VALUE (calc.)
Pitot Tube Correction Factor	C(p)	0.84
Barometric Pressure (in Hg)	P(b)	30.21
Static Pressure (in H2O)	P(stack)	−0.40
# of Sample Points	#	24
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123
Length (if rectangular)	L	
Width (if rectangular)	W	
Area of Stack (sq ft)	A(s)	(330.06)
O2 Concentration	% O2	5.8
CO2 Concentration	% CO2	8.7
CO Concentration	% CO	0.237
N2 Concentration (by diff.)	% N2	(85.26)

VELOCITY TRAVERSE MEASUREMENTS

Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)	Stack Velocity (ft/sec)
A−1	0.07	197	0.26	16.8
2	0.08	197	0.28	17.9
3	0.09	197	0.30	19.0
4	0.09	197	0.30	19.0
5	0.08	197	0.28	17.9
6	0.07	197	0.26	16.8
B−1	0.07	197	0.26	16.8
2	0.08	197	0.28	17.9
3	0.10	197	0.32	20.1
4	0.09	197	0.30	19.0
5	0.08	197	0.28	17.9
6	0.07	197	0.26	16.8
C−1	0.09	197	0.30	19.0
2	0.10	197	0.32	20.1
3	0.10	197	0.32	20.1
4	0.10	197	0.32	20.1
5	0.10	197	0.32	20.1
6	0.07	197	0.26	16.8
D−1	0.08	197	0.28	17.9
2	0.09	197	0.30	19.0
3	0.09	197	0.30	19.0
4	0.10	197	0.32	20.1
5	0.12	197	0.35	22.0
6	0.09	197	0.30	19.0
TOTALS	2.10	4728	7.08	449.0

REFERENCE POINT VELOCITY MEASUREMENTS

Time	Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)	Stack Velocity (ft/sec)
0013	C−3	0.11	197	0.33	21.0
0018	C−3	0.10	197	0.32	20.1
0023	C−3	0.10	197	0.32	20.1
0028	C−3	0.08	197	0.28	17.9
0033	C−3	0.10	197	0.32	20.1
0038	C−3	0.11	197	0.33	21.0
0043	C−3	0.09	197	0.30	19.0
0048	C−3	0.10	197	0.32	20.1
0053	C−3	0.12	197	0.35	22.0
0058	C−3	0.09	197	0.30	19.0
0103	C−3	0.08	197	0.28	17.9
	TOTALS	1.08	2167	3.44	218.2

VELOCITY TRAVERSE AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.088
Avg Stack Temperature (degF)	T(s avg)	=	197.0
Avg SQRT(dP)		=	0.295

CALCULATED VALUES FROM VELOCITY TRAVERSE AND MOISTURE MEASUREMENTS

Stack Gas Water Vapor Proportion	B(wo)	=	[illegible]
Mol. Wt., Stack Gas Dry	M(d)	=	29.62
Mol. Wt., Stack Gas Wet	M(s)	=	27.93
Abs Stack Pressure (in Hg)	P(s)	=	30.18
Avg Stack Velocity (ft/sec)	V(s avg)	=	18.7
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	256213
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	370525

ADJUSTED STACK GAS FLOW BASED ON FLUE FACTOR REFERENCE POINT VELOCITY MEASUREMENTS

Average ref. point vel. during sampling (ft/sec)	U(rs)	=	[illegible]
Average stack gas vel. during traverse (ft/sec)	U(t)	=	****
Average ref. point vel. during traverse (ft/sec)	U(r)	=	****
Flue Factor {U(t) / U(r)}		=	****

15.37 SCF/hr

FLOW RATE CALCULATION USING FLUE FACTOR METHOD.

Plant: EDISON HBGS
Date: 1/8/94
Sample Location: UNIT 1
Performed by: CG/BD

Conditions: 65 MW BASELINE
Start/Stop: 0423/0523

PARAMETER	SYMBOL	VALUE (calc.)
Pitot Tube Correction Factor	C(p)	0.84
Barometric Pressure (in Hg)	P(b)	30.16
Static Pressure (in H2O)	P(stack)	−0.35
# of Sample Points	#	24
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123
Length (if rectangular)	L	
Width (if rectangular)	W	
Area of Stack (sq ft)	A(s)	(330.06)
O2 Concentration	% O2	6.4
CO2 Concentration	% CO2	8.3
CO Concentration	% CO	0.254
N2 Concentration (by diff.)	*% N2*	(85.05)

VELOCITY TRAVERSE MEASUREMENTS

Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)	Stack Velocity (ft/sec)
A−1	0.03	181	0.17	10.8
2	0.04	181	0.20	12.5
3	0.04	181	0.20	12.5
4	0.04	181	0.20	12.5
5	0.04	181	0.20	12.5
6	0.03	181	0.17	10.8
B−1	0.03	181	0.17	10.8
2	0.03	181	0.17	10.8
3	0.04	181	0.20	12.5
4	0.04	181	0.20	12.5
5	0.04	181	0.20	12.5
6	0.03	181	0.17	10.8
C−1	0.03	181	0.17	10.8
2	0.03	181	0.17	10.8
3	0.03	181	0.17	10.8
4	0.04	181	0.20	12.5
5	0.03	181	0.17	10.8
6	0.03	181	0.17	10.8
D−1	0.03	181	0.17	10.8
2	0.04	181	0.20	12.5
3	0.04	181	0.20	12.5
4	0.05	181	0.22	14.0
5	0.05	181	0.22	14.0
6	0.03	181	0.17	10.8
TOTALS	0.86	4344	4.53	283.3

REFERENCE POINT VELOCITY MEASUREMENTS

Time	Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)	Stack Velocity (ft/sec)
0448	C−2	0.03	181	0.17	10.8
0453	C−2	0.03	181	0.17	10.8
0458	C−2	0.04	181	0.20	12.5
0503	C−2	0.03	181	0.17	10.8
0508	C−2	0.04	181	0.20	12.5
0513	C−2	0.04	181	0.20	12.5
0518	C−2	0.04	181	0.20	12.5
0523	C−2	0.04	181	0.20	12.5
				0.00	0.0
					0.0
					0.0
	TOTALS	0.29	1448	1.52	95.1

VELOCITY TRAVERSE AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.036
Avg Stack Temperature (degF)	T(s avg)	=	181.0
Avg SQRT(dP)		=	0.189

CALCULATED VALUES FROM VELOCITY TRAVERSE AND MOISTURE MEASUREMENTS

Stack Gas Water Vapor Proportion	B(wo)	=	[illegible]38
Mol. Wt., Stack Gas Dry	M(d)	=	[illegible].58
Mol. Wt., Stack Gas Wet	M(s)	=	[illegible]7.99
Abs Stack Pressure (in Hg)	P(s)	=	[illegible]0.13
Avg Stack Velocity (ft/sec)	V(s avg)	=	11.8
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	167198
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	233803

ADJUSTED STACK GAS FLOW BASED ON FLUE FACTOR REFERENCE POINT VELOCITY MEASUREMENTS

Average ref. point vel. during sampling (ft/sec)	U(rs)	=	****
Average stack gas vel. during traverse (ft/sec)	U(t)	=	****
Average ref. point vel. during traverse (ft/sec)	U(r)	=	****
Flue Factor {U(t) / U(r)}		=	****

10.03 SCF/hr

FLOW RATE CALCULATION USING FLUE FACTOR METHOD

Plant: EDISON HBGS
Date : 1/8/94
Sample Location: UNIT 1
Performed by: CG/BD

Conditions: 65 MW With UREA
Start/Stop: 0008/0108

PARAMETER	SYMBOL	VALUE (calc.)
Pitot Tube Correction Factor	C(p)	0.84
Barometric Pressure (in Hg)	P(b)	30.16
Static Pressure (in H2O)	P(stack)	−0.35
# of Sample Points	#	24
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123
Length (if rectangular)	L	
Width (if rectangular)	W	
Area of Stack (sq ft)	A(s)	(330.06)
O2 Concentration	% O2	6.4
CO2 Concentration	% CO2	8.3
CO Concentration	% CO	0.269
N2 Concentration (by diff.)	% N2	(85.03)

VELOCITY TRAVERSE MEASUREMENTS

Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)	Stack Velocity (ft/sec)
A−1	0.04	178	0.20	12.5
2	0.04	178	0.20	12.5
3	0.03	178	0.17	10.8
4	0.04	178	0.20	12.5
5	0.03	178	0.17	10.8
6	0.03	178	0.17	10.8
B−1	0.03	178	0.17	10.8
2	0.04	178	0.20	12.5
3	0.04	178	0.20	12.5
4	0.04	178	0.20	12.5
5	0.03	178	0.17	10.8
6	0.03	178	0.17	10.8
C−1	0.04	178	0.20	12.5
2	0.04	178	0.20	12.5
3	0.05	178	0.22	14.0
4	0.05	178	0.22	14.0
5	0.05	178	0.22	14.0
6	0.04	178	0.20	12.5
D−1	0.04	178	0.20	12.5
2	0.03	178	0.17	10.8
3	0.04	178	0.20	12.5
4	0.05	178	0.22	14.0
5	0.04	178	0.20	12.5
6	0.03	178	0.17	10.8
TOTALS	0.92	4272	4.68	292.7

REFERENCE POINT VELOCITY MEASUREMENTS

Time	Sample Point	Velocity Head, dP (in H2O)	Stack Temp (degF)	SQRT(dP)	Stack Velocity (ft/sec)
0028	C−3	0.05	178	0.22	14.0
0033	C−3	0.05	178	0.22	14.0
0038	C−3	0.04	178	0.20	12.5
0043	C−3	0.04	178	0.20	12.5
0048	C−3	0.05	178	0.22	14.0
0053	C−3	0.05	178	0.22	14.0
0058	C−3	0.04	178	0.20	12.5
0103	C−3	0.04	178	0.20	12.5
0108	C−3	0.04	178	0.20	12.5
					0.0
					0.0
	TOTALS	0.40	1602	1.89	118.5

VELOCITY TRAVERSE AVERAGES

Avg Velocity Head (in H2O)	dP(avg)	=	0.038
Avg Stack Temperature (degF)	T(s avg)	=	178.0
Avg SQRT(dP)		=	0.195

CALCULATED VALUES FROM VELOCITY TRAVERSE AND MOISTURE MEASUREMENTS

Stack Gas Water Vapor Proportion	B(wo)	=	[illegible]45
Mol. Wt., Stack Gas Dry	M(d)	=	[illegible]58
Mol. Wt., Stack Gas Wet	M(s)	=	[illegible]90
Abs Stack Pressure (in Hg)	P(s)	=	[illegible]13
Avg Stack Velocity (ft/sec)	V(s avg)	=	[illegible]2.2
Stack Gas STD Vol Flow (dscfm)	Q(s)	=	17[illegible]50
Actual Stack Gas Vol Flow (acfm)	Q(a)	=	241563

ADJUSTED STACK GAS FLOW BASED ON FLUE FACTOR REFERENCE POINT VELOCITY MEASUREMENTS

Average ref. point vel. during sampling (ft/sec)	U(rs)	=	[illegible]
Average stack gas vel. during traverse (ft/sec)	U(t)	=	****
Average ref. point vel. during traverse (ft/sec)	U(r)	=	****
Flue Factor {U(t) / U(r)}		=	****

10.33 mmSCF/hr

MOISTURE AND VOLUME CALCULATIONS

Plant: EDISON, HBGS
Date : 1/5/94
Performed by: CG/BD

Sample Location: UNIT 1
Test No./Type: MOISTURE/BASELINE
Start/Stop Time: 1234/1334

CONDITIONS: 215 MW

PARAMETER	SYMBOL	VALUE (calc.)
Gas Meter Correction Factor	(gamma)	1.019
Barometric Pressure (in Hg)	P(b)	29.99
# of Sample Points	#	4
Total Sampling Time (min)	(theta)	(60.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		979.73
Gas Meter Final Reading (cu ft)		1012.77
Net Gas Sample Volume (cu ft)	V(m)	(33.04)
Vol of Liquid Collected (ml)	Vl(c)	121.1
Vol of Liq @ Std. Conds. (scf)	V(w std)	(5.700)

FIELD DATA AVERAGES

Avg Orifice Meter Reading (in H20)	dH(avg)	=	1.000
Avg Stack Temperature (degF)	T(s avg)	=	240.5
Average Meter Temperature (degF)	T(m avg)	=	69.9

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	33.69
Stack Gas Water Vapor Proportion	B(wo)	=	0.145

Sample Point	dClock Time	Orifice Meter dH (in H2O)	Stack Temp (degF)	Gas Temp in	Meter (degF) out
1	15	1.00	241	69	68
2	15	1.00	240	71	69
3	15	1.00	240	71	70
4	15	1.00	241	71	70
TOTALS	60	4.0000	962.0	282	277

MOISTURE AND VOLUME CALCULATIONS

Plant: EDISON, HBGS
Date : 1/7/94
Performed by: BD

Sample Location: UNIT 1
Test No./Type: MOISTURE/BASELINE
Start/Stop Time: 0416/0516

CONDITIONS: **110 MW**

PARAMETER	SYMBOL	VALUE (calc.)
Gas Meter Correction Factor	(gamma)	1.019
Barometric Pressure (in Hg)	P(b)	30.21
# of Sample Points	#	4
Total Sampling Time (min)	(theta)	(60.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		59.45
Gas Meter Final Reading (cu ft)		83.08
Net Gas Sample Volume (cu ft)	V(m)	(23.63)
Vol of Liquid Collected (ml)	Vl(c)	85.9
Vol of Liq @ Std. Conds. (scf)	V(w std)	(4.043)

FIELD DATA AVERAGES

Avg Orifice Meter Reading (in H20)	dH(avg)	=	0.500
Avg Stack Temperature (degF)	T(s avg)	=	19[illegible].0
Average Meter Temperature (degF)	T(m avg)	=	6[illegible].3

CALCULATED VALUES

Meter Volume (std, cu. ft.)	V(m std)	=	24.[illegible]0
Stack Gas Water Vapor Proportion	B(wo)	=	0.1[illegible]2

Sample Point	dClock Time	Orifice Meter dH (in H2O)	Stack Temp (degF)	Gas Meter Temp (degF) in	Gas Meter Temp (degF) out
1	15	0.50	193	65	60
2	15	0.50	194	67	61
3	15	0.50	193	68	62
4	15	0.50	192	69	62
TOTALS	60	2.0000	772.0	269	245

MOISTURE AND VOLUME CALCULATIONS

Plant: EDISON, HBGS
Date : 1/8/94
Performed by: BD

Sample Location: UNIT 1
Test No./Type: MOISTURE/BASELINE
Start/Stop Time: 0423/0523

CONDITIONS: 65 MW

PARAMETER	SYMBOL	VALUE (calc.)
Gas Meter Correction Factor	(gamma)	1.019
Barometric Pressure (in Hg)	P(b)	30.16
# of Sample Points	#	4
Total Sampling Time (min)	(theta)	(60.00)
Stack (Duct) Dimensions (in):		
Radius (if round)	R	123.00
Length (if rectangular)	L	0.00
Width (if rectangular)	W	0.00
Area of Stack (sq ft)	A(s)	(330.06)
Gas Meter Initial Reading (cu ft)		117.03
Gas Meter Final Reading (cu ft)		149.42
Net Gas Sample Volume (cu ft)	V(m)	(32.39)
Vol of Liquid Collected (ml)	Vl(c)	114.9
Vol of Liq @ Std. Conds. (scf)	V(w std)	(5.408)

FIELD DATA AVERAGES

Avg Orifice Meter Reading (in H20)	dH(avg)	=	[illegible]00
Avg Stack Temperature (degF)	T(s avg)	=	[illegible]8.0
Average Meter Temperature (degF)	T(m avg)	=	[illegible]0.8

CALCULATED VALUES

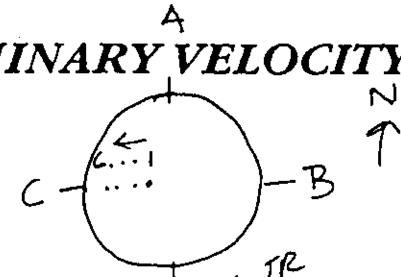
Meter Volume (std, cu. ft.)	V(m std)	=	[illegible]5.81
Stack Gas Water Vapor Proportion	B(wo)	=	0.138

Sample Point	dClock Time	Orifice Meter dH (in H2O)	Stack Temp (degF)	Gas Temp in	Meter (degF) out
1	15	1.00	178	60	57
2	15	1.00	178	64	58
3	15	1.00	178	66	58
4	15	1.00	178	65	58
TOTALS	60	4.0000	712.0	255	231

PRELIMINARY VELOCITY TRAVERSE

Plant Edison HB6S
Date 1-5-94
Location Unit #1
Stack I.D. 20' 6"
Barometric Pressure, in. Hg 29.99
StaticPressure, in. H_2O -.38
Cp .84
Operators RUDD

prelim. for nozzel sizing



CG & JR 12:45

start 1245 end 1315

Schematic Of Traverse Point Layout

9:30

out

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-1	.21	235
2	.19	
3	.19	
4	.22	
5	.24	
6	.19	
~~Port D-1~~	~~.31~~	
~~2~~	~~.33~~	
~~3~~	~~.33~~	
~~4~~	~~.36~~	
~~5~~	~~.37~~	
~~6~~	~~.31~~	
Port C-2	.35	1315
	.37	1320
	.34	1325
	.36	1330
	.33	1335
Reference Point Velocity Measurements		
AVERAGE	.22	235

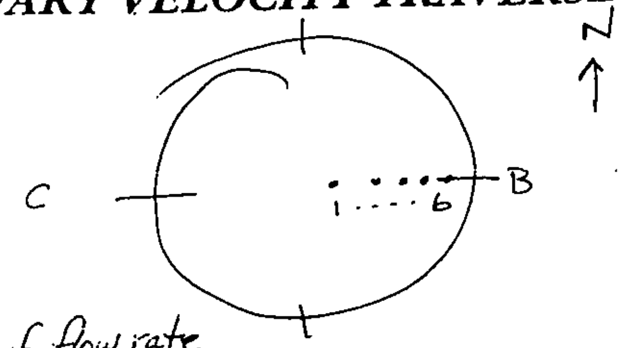
TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-1	.20	240
2	.25	
3	.23	
4	.28	
5	.28	
6	.22	
B-1	.21	239
2	.18	
3	.21	
4	.22	
5	.23	
6	.21	
static -.48		
D-1	.31	240
2	.33	
3	.33	
4	.36	
5	.37	
6	.31	
C-1	.35	240 Static -
2	.37	
3	.38	
4	.35	
5	.37	
6	.24	
AVERAGE		

#5217 8/90

PRELIMINARY VELOCITY TRAVERSE

Plant: Edison HBGS
Date: 1/5/94
Location: Unit 1
Stack I.D.: 240.6"
Barometric Pressure, in. Hg: 29.99
StaticPressure, in. H_2O: -0.38
Cp: 0.84
Operators: CG

~~CG~~ Collection of flow rate data began @ ~ 1700 hrs CG



Schematic Of Traverse Point Layout

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-1	.25	240
-2	.26	
-3	.27	
-4	.28	
-5	.28	
-6	.26	
B-1	.27	
-2	.26	
-3	.23	
-4	.27	
-5	.27	
-6	.24	
C-1	.35	*
-2	.38	1716
-3	.35	1721
-4	.38	:
-5	.36	:
-6	.26	:
D-1	.32	ect..
-2	.33	
-3	.34	
-4	.35	
-5	.33	
-6	.28	
AVERAGE		

* All meas. were collected between 1700-1800 hrs; recorded times reflect an error in converting to military time; correct time is indicated in column denoted by the * CG

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
C-2		
1816	.33	
1821	.35	
1826	.34	
1831	.33	
1836	.36	
1841	.35	
1846	.34	
1851	.37	
AVERAGE		

Reference Point Velocity Measurements

#5217 8/90

PRELIMINARY VELOCITY TRAVERSE

Plant: SCE HBGS

Date: ~~1/6/94~~ CG 1/7/94

Location: West, Port Unit 1 Urea

Stack I.D.: 20' 6"

Barometric Pressure, in. Hg: 30.21

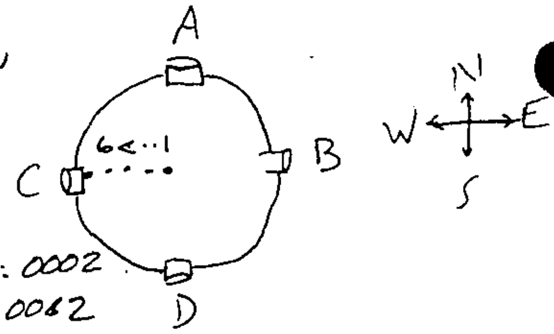
Static Pressure, in. H_2O: -0.40

START: 0002

Cp: 0.84

STOP: 0062

Operators: B. Day C. Garretson.



Schematic Of Traverse Point Layout

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_S), in. H_2O	STACK TEMPERATURE (T_S), °F
A - 1	[illegible]	0.07
2	[illegible]	0.08 197 CG
3	[illegible]	0.09
4	[illegible]	0.09
5	[illegible]	0.08
6	[illegible]	0.07
B - 1	[illegible]	0.07
2	[illegible]	0.08
3	[illegible]	0.10
4	[illegible]	0.09
5	[illegible]	0.08
6	[illegible]	0.07
C - 1	.09	
2	.10	
3	.10	
4	.10	
5	.10	
6	.07	
Reference	Point Velocity	Measurements
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_S), in. H_2O	STACK TEMPERATURE (T_S), °F
D - 1	.08	197
2	.09	
3	.09	
4	.10	
5	.12	
6	.09	
C - 3	.11	0013
	.10	0018
	.10	0023
	.08	0028
	.10	0033
	.11	0038
	.09	0043
	.10	0048
	.12	0053
	.09	0058
	.08	0103
		[illegible]
AVERAGE		

#5217 8/90

PRELIMINARY VELOCITY TRAVERSE

Plant SCE HBGS

Date ~~1/6/94 CG~~ 1/7/94

Location @ Unit 1

Stack I.D. 20' 6"

Barometric Pressure, in. Hg 30.21

StaticPressure, in. H_2O -0.40

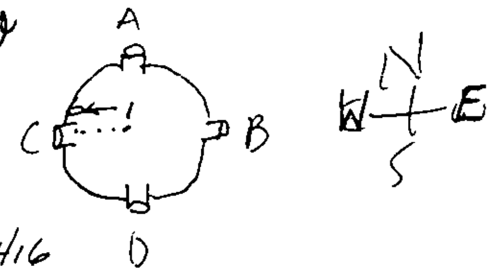
Cp 0.84

Operators R. Day C. Garretson

Baseline

START: 0416

STOP: 0431



Schematic Of Traverse Point Layout

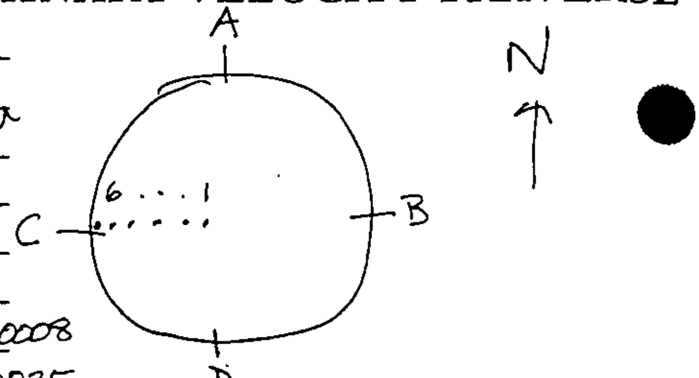
TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-1	.08	193
2	.08	
3	.09	
4	.08	
5	.08	
6	.07	
B-1	RD ~~.05~~ .09	
2	RD ~~.05~~ .09	
3	RD ~~.10~~ .08	
4	.10	
5	.10	
6	.08	
C-1	.09	
2	.07	
3	.10	
4	.11	
5	.10	
6	.07	
Reference Point Velocity Measurements		
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
D-1	.09	193
2	.09	
3	.10	
4	.12	
5	.10	
6	.08	
C-3	0436	.10
3	0441	.11
3	0446	.10
3	0451	.12
3	0456	.09
3	0501	.11
3	0506	.10
3	0511	.12
3	0516	.12
AVERAGE		

#5217 8/90

PRELIMINARY VELOCITY TRAVERSE

Plant: Edison HBGS
Date: 1-8-94
Location: Unit 1
Stack I.D.: 20' 6"
Barometric Pressure, in. Hg: 30.16
StaticPressure, in. H_2O: -.35
Cp: .84 START: 0008
Operators: RUDD & CG STOP: 0025



Schematic Of Traverse Point Layout

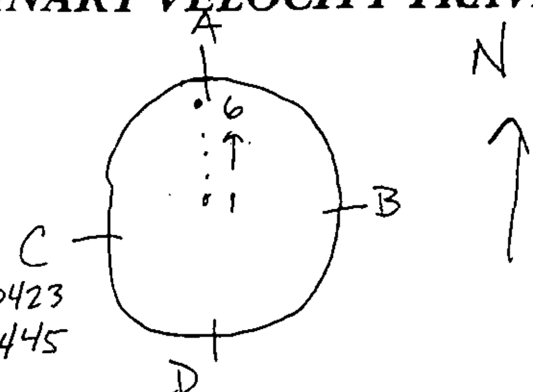
TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-1	.04	178
2	.04	
3	.03	
4	.04	
5	.03	
6	.03	
B-1	.03	178
2	.04	
3	.04	
4	.04	
5	.03	
6	.03	
D-1	.04	
2	.03	
3	.04	
4	.05	
5	.04	
6	.03	
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
C-1	.04	178
2	.04	
3	.05	
4	.05	
5	.05	
6	.04	
C-3	0028	.05
3	0033	.05
3	0038	.04
3	0043	.04
3	0048	.05
3	0053	.05
	0058	.04
	0103	.04
	0108	.04
Reference Point Velocity Measurements		
AVERAGE		

#5217 8/90

PRELIMINARY VELOCITY TRAVERSE

Plant: SCE HBGS
Date: 1/8/94
Location: Unit 1
Stack I.D.: 20' 6"
Barometric Pressure, in. Hg: 30.16
StaticPressure, in. H_2O: -0.35   START: 0423
Cp: 0.84   STOP: 0445
Operators: R. Day G. Garretson



Schematic Of Traverse Point Layout

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
A-1	.03	1~~4~~81
2	.04	
3	.04	
4	.04	
5	.04	
6	.03	
B-1	.03	
2	.03	
3	.04	
4	.04	
5	.04	
6	.03	
C-1	.03	
2	.03	
3	.03	
4	.04	
5	.03	
6	.03	
AVERAGE		

TRAVERSE POINT NUMBER	VELOCITY HEAD (Δp_s), in. H_2O	STACK TEMPERATURE (T_s), °F
D-1	.03	181
2	.04	
3	.04	
4	.05	
5	.05	
6	.03	
C-2	.03	0448
2	.03	0453
2	.04	0458
2	.03	0503
2	.04	0508
2	.04	0513
2	.04	0518
2	.04	0523
Reference Point Velocity	Measurements	
AVERAGE		

#5217 8/90

MOISTURE, FULL LOAD, BASELINE

PARTICULATE TEST FIELD DATA SHEET

Plant: SCE HBGS
Date: 1/5/93
Test Location: Unit 1
Run Number: 1
Stack Diameter inches: 20' 6"
Duct Dimensions in. x in: —
Start Time: 1234
Operator: B. Day

Barometric Pressure: 29.99
Static Pressure: -0.38
Stack Pressure: 29.61
Probe Number: —
Pitot Coefficient: —
Pitot Number: —
Meter Box Number: 20151
Orifice Coefficient: 1.019

Nozzle Size & Number: —
Molecule Weight: —
BWO: 14.5%

umbilical #2

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
560.1	662.9			
604.7	609.7	121.1		
SILICA GEL				
871.7	885.0			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
01	0	—	1.0	979.733	241	—	—	—	—	66	68	8"	—	PRE- 0.001 @ 15" vac
01	15	—	1.0	988.000	241	—	—	—	—	69	68	8"	—	POST- 0.001 @ 15"
01	30	—	1.0	995.851	240	—	—	—	—	71	69	9"	—	
01	45	—	1.0	4.507	240	—	—	—	—	71	70	9"	—	PITOT LEAK CHECK
01	60	—	1.0	12.771	241	—	—	—	—	71	70	9"	—	
AVG/TOTAL														

#5214 7/92

MOISTURE, BASELINE, 110 MW

PARTICULATE TEST FIELD DATA SHEET

Plant: SCE HBGS
Date: ~~CA 1/6/94~~ 1/7/94
Test Location: West Stack Unit 1
Run Number: 2
Stack Diameter inches: 20'6"
Duct Dimensions in. x in.: —
Start Time: 0416
Operator: B. Day

Barometric Pressure: 30.21
Static Pressure: -0.40
Stack Pressure: 29.41
Probe Number: —
Pitot Coefficient: —
Pitot Number: —
Meter Box Number: 20151
Orifice Coefficient: 1.019

Nozzle Size & Number: —
Molecule Weight: —
BWO: 14.2%
umbilical #2

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO_2	O_2	CO
588.4	666.5			
609.7	611.3			
		85.9		
SILICA GEL				
885.0	891.2			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT^3	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM in. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
1	0	—	0.50	059.454	195	—	55	—	—	60	59	5"	—	PRE- .002@
1	15	—	0.50	065.304	193	—	50	—	—	65	60	5"	—	POST- .002@
1	30	—	.050	071.185	194	—	48	—	—	67	61	5"	—	
1	45	—	.050	077.000	193	—	49	—	—	68	62	5"	—	PITOT LEAK CHECK
1	60	—	0.50	083.082	192	—	48	—	—	69	62	5"	—	
AVG/TOTAL														

#5214 7/92

MOISTURE, BASELINE, 65 MW

PARTICULATE TEST FIELD DATA SHEET

Plant: SCE HBGS
Date: 1/8/94
Test Location: Unit 1 West Port
Run Number: 2
Stack Diameter inches: 20' 6"
Duct Dimensions in. x in.: —
Start Time: 0423
Operator: B. Day

Barometric Pressure: 30.16
Static Pressure: -0.35
Stack Pressure: 29.81
Probe Number: —
Pitot Coefficient: —
Pitot Number: —
Meter Box Number: 20151
Orifice Coefficient: 1.019

Nozzle Size & Number: —
Molecule Weight: —
BWO: 13.8%
Umbilical #2

FILTER DATA		
NUMBER	TARE	FINAL WT.

IMPINGER VOLUMES		CO2	O2	CO
666.5	757.0			
611.3	623.6			
			114.9	
SILICA GEL				
891.2	903.3			

SAMPLE POINT	CLOCK TIME	VELOCITY HEAD ΔP in. wg.	ORIFICE METER ΔH in. wg.	GAS METER VOLUME FT3	TEMPERATURE °F STACK	PROBE	IMPINGER	ORGANIC MODULE	OVEN	GAS METER IN	GAS METER OUT	PUMP VACUUM In. Hg	$\sqrt{\Delta P}$	GAS METER LEAK CHECK RATE (CFM)
1	0	—	1.0	117.028	178	—	48	—	—	56	56	9"	—	PRE- 0.002 @ 15
1	15	—	1.0	124.898	178	—	46	—	—	60	57	9"	—	POST- 0.002 @ 15
1	30	—	1.0	133.165	178	—	48	—	—	64	58	9"	—	
1	45	—	1.0	141.250	178	—	54	—	—	66	58	9"	—	PITOT LEAK CHECK
1	60	—	1.0	149.421	178	—	54	—	—	66	58	9"	—	
AVG/TOTAL														

#5214 7/92

APPENDIX I

SAMPLING EQUIPMENT CALIBRATION RECORDS

APPENDIX I-1

DRY GAS METER CALIBRATION RECORDS

CONSOLE METER ~~[illegible]~~-CALIBRATION
Full

Console No. 20325

Barometric Pressure, P_b = 29.88 in. Hg

Ambient Temperature 75° F °F

Primary Test Meter No. 259453 Acurex sticker # 60031

Calibrated By B. Day

Date 7/14/93

ΔH	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@
0.14	0.2 cfm	3.003	3.016	72 / 73	74 / 78	73 / 74	74.75	14	4"	0.9996	0.7293	1.716
0.14	0.2 cfm	2.136	2.154	73 / 73	75 / 80	75 / 75	76.25	10	4"	0.9973	0.7251	1.725
0.14	0.2 cfm	2.334	2.360	74 / 75	78 / 83	75 / 75	77.75	11	3.5"	0.9947	0.7194	1.753
~~[illegible]~~												
									Average	0.9972	0.7246	1.731

	Primary Meter	Total	Dry Gas Meter	Total
Stop	005.613	3.003	332.252	3.016
Start	002.610		329.236	
Stop	007.749	2.136	334.406	2.154
Start	005.613		332.252	
Stop	010.083	2.334	336.766	2.360
Start	007.749		334.406	
Stop				
Start				

Calculations

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

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

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

FORM 5221 1/92

CONSOLE METER [redacted]-CALIBRATION
Full

Console No. 20325

Barometric Pressure, P_b = 29.88 in. Hg

Ambient Temperature 75° °F

Primary Test Meter No. ~~[illegible]~~ ~~[illegible]~~ 259453

Calibrated By B. Day

Date 7/14/93

.H	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@
0.73	0.5 cfm	4.733	4.844	74 / 74	82 / 92	76 / 77	81.75	10	5"	0.9895	0.7001	1.820
0.73	0.5 cfm	4.747	4.873	74 / 74	82 / 91	78 / 78	82.25	10	5"	0.9874	0.7018	1.807
0.73	0.5 cfm	4.732	4.865	74 / 74	84 / 94	78 / 79	83.75	10	5"	0.9886	0.6987	1.814
									Average	0.9885	0.7002	1.814

	Primary Meter	Total	Dry Gas Meter	Total
Stop	016.183	4.733	342.997	4.844
Start	011.450		338.153	
Stop	020.930	4.747	347.870	4.873
Start	016.183		342.997	
Stop	025.662	4.732	352.735	4.865
Start	020.930		347.870	
Stop				
Start				

Calculations

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

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

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

M 5221 1/92

CONSOLE METER [redacted]-CALIBRATION
Full

Console No. 20325

Barometric Pressure, P_b = 1st run 29.85 2nd & 3rd runs 30.00 in. Hg

Ambient Temperature 75° °F

Primary Test Meter No. 259453

Calibrated By R. Day

Date 7/10/93

Flow Rate chan	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@
1.0	3.3	10.789	10.944	73 / 71	74 / 88	70 / 71	75.75	11	5	0.9848	0.6858	1.924
1.0	3.3	9.780	9.899	69 / 70	74 / 83	69 / 70	74.00	10	5	0.9884	0.6867	1.914
1.0	3.3	9.737	9.872	70 / 70	76 / 92	70 / 73	77.75	10	5	0.9927	0.6813	1.921
									Average	0.9886	0.6846	1.920

	Primary Meter	Total	Dry Gas Meter	Total
Stop	185.487	10.789	395.232	10.944
Start	174.698		384.288	
Stop	196.420	9.780	406.280	9.899
Start	186.640		396.381	
Stop	206.157	9.737	416.152	9.872
Start	196.420		406.280	
Stop				
Start				

Calculations

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

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

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

FORM 5221 1/92

CONSOLE METER [redacted]-CALIBRATION
Full

Console No. 20325
Barometric Pressure, P_b = 29.88 in. Hg
Ambient Temperature 75° °F

Primary Test Meter No. 259453
Calibrated By B. Day
Date 7/14/93

ΔH	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	$\Delta H@$
1.9	0.75	11.159	11.453	76 / 76	81 / 96	78 / 80	83.75	15	5"	0.9838	0.6808	1.924
1.9	0.75	8.268	8.430	70 / 70	71 / 83	70 / 70	73.5	11	5"	0.9827	0.6945	1.879
1.9	0.75	7.328	7.506	71 / 71	80 / 90	71 / 72	78.25	10	5"	0.9850	0.6741	1.966
									Average	0.9838	0.6834	1.923

	Primary Meter	Total	Dry Gas Meter	Total
Stop	039.009	11.159	366.418	11.453
Start	027.850		354.965	
Stop	047.277	8.268	374.848	8.430
Start	039.009		366.418	
Stop	054.605	7.328	382.354	7.506
Start	047.227		374.848	
Stop				
Start				

Calculations

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

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

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

POST

CONSOLE METER ~~PRE~~-CALIBRATION

Console No. 20325

Barometric Pressure, P_b = 29.53 in. Hg

Ambient Temperature 60° °F

Primary Test Meter No. 259453

Calibrated By B. Day

Date 12/8/93

Flow cfm	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	Dry Gas Volume: Inlet (t_i), °F	Dry Gas Volume: Outlet (t_o), °F	Dry Gas Volume: Average (t_d), °F	Time (Θ), min	Vacuum Setting, in. Hg	Y	K_o	ΔH@
0.75	2.00	9.814	10.052	60 / 61	56 / 69	54 / 56	59.0	13	5	0.969	0.685	1.967
0.75	2.00	9.731	10.014	61 / 61	63 / 75	56 / 58	63.0	13	5	0.971	0.677	1.989
0.75	2.00	8.262	8.491	61 / 62	75 / 77	59 / 60	68.0	11	5	0.980	0.676	1.960
									Average	0.973	0.679	1.972

	Primary Meter	Total	Dry Gas Meter	Total
Stop	555.315	9.814	534.100	10.052
Start	545.501		524.048	
Stop	565.046	9.731	544.114	10.014
Start	555.315		534.100	
Stop	573.308	8.262	552.605	8.491
Start	565.046		544.114	
Stop				
Start				

Passed

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 ~~PRE~~POST-CALIBRATION

Client ______ Project No. ______

Barometric Pressure, P_b 29.50 in. Hg

Ambient Temperature 63 °F

Primary Test Meter No. 259453 Console No. 20325

Calibrated By B. Day Date 1/22/94

Pre-Test Meter Correction Factor ______ Date Calib. ______

Post-Test Meter Correction Factor ______

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

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@
0.75	6.205	6.394	58 / 61	58 / 61	55 / 55	57.25	13	5	1.037	0.708	1.846
0.75	4.773	4.908	61 / 62	58 / 64	55 / 57	58.50	10	6	1.036	0.708	1.856
0.75	4.780	4.918	62 / 62	62 / 67	57 / 58	61.00	10	6	1.033	0.707	1.845
								Average	1.035	0.708	1.849

	Primary Meter	Total	Dry Gas Meter	Total
Stop	721.190	6.205	156.944	6.394
Start	714.985		150.550	
Stop	725.963	4.773	161.852	4.908
Start	721.190		156.944	
Stop	730.743	4.780	166.770	4.918
Start	725.963		161.852	

Average Y 1.034

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

Full

CONSOLE METER ~~POST~~-CALIBRATION

Client ____________ Project No. ____________

Barometric Pressure, P_b 29.49 in. Hg

Ambient Temperature 63° F °F

Primary Test Meter No. 259453 Console No. 20325

Calibrated By B. Day Date 1/21/94

Pre-Test Meter Correction Factor ____________ Date Calib. ____________

Post-Test Meter Correction Factor ____________

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

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@
1.0	9.896	10.147	62 / 63	60 / 66	59 / 60	61.25	18	5	1.031	0.704	1.866
1.0	6.818	6.989	63 / 63	62 / 68	60 / 60	62.5	11	5	1.029	0.792	1.465
1.0	5.506	5.629	63 / 64	67 / 72	60 / 61	65.0	10	5	1.022	0.702	1.851
								Average	1.027	0.733	1.727

	Primary Meter	Total	Dry Gas Meter	Total
Stop	701.779	9.896	137.047	10.147
Start	691.875		126.900	
Stop	708.597	6.818	144.036	6.989
Start	701.779		137.047	
Stop	714.103	5.506	149.665	5.629
Start	708.597		144.036	

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~~ Full-CALIBRATION

Client Owens Corning Project No. ______ Calibrated By B. Day Date 1/21/94

Barometric Pressure, P_b 29.49 in. Hg Pre-Test Meter Correction Factor ______ Date Calib. ______

Ambient Temperature 63° F °F Post-Test Meter Correction Factor ______

Primary Test Meter No. 259453 Console No. 20325 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					
1.75	8.356	8.600	60 / 60	58 / 66	57 / 58	59.75	12	5	1.034	0.675	2.018
1.75	6.994	7.215	61 / 61	62 / 67	58 / 59	61.5	10	5	1.035	0.677	2.002
1.75	7.756	7.980	61 / 62	67 / 68	59 / 59	63.25	11	5	1.030	0.681	1.967
								Average	1.033	0.678	1.996

	Primary Meter	Total	Dry Gas Meter	Total
Stop	676.831	8.356	111.400	8.600
Start	668.475		102.800	
Stop	683.825	6.994	118.615	7.215
Start	676.831		111.400	
Stop	691.581	7.756	126.595	7.980
Start	683.825		118.615	

Calculations

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

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

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

ORM 5224 1.92

CONSOLE METER ~~PRE~~ Full-CALIBRATION

Console No. 20325

Barometric Pressure, P_b = 29.48 in. Hg

Ambient Temperature 62° °F

Primary Test Meter No. 259453

Calibrated By B. Day

Date 1/20/94

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	$\Delta H@$
3.0	10.164	10.445	58 / 59	52 / 58	52 / 53	53.75	11	5	1.045	0.688	1.977
3.0	10.721	11.010	59 / 59	58 / 64	53 / 55	57.5	12	5	1.038	0.663	2.104
3.0	12.217	12.655	59 / 60	64 / 66	55 / 57	60.5	13	5	1.042	0.695	1.894
								Average	1.042	0.682	1.992

	Primary Meter	Total	Dry Gas Meter	Total
Stop	644.962	10.104	78.645	10.445
Start	634.798		68.200	
Stop	655.683	10.721	89.655	11.010
Start	644.962		78.645	
Stop	667.900	12.217	102.310	12.655
Start	655.683		89.655	
Stop				
Start				

Calculations

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

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

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

POST

CONSOLE METER [redacted] CALIBRATION

Console No. 20151

Barometric Pressure, P_b = 29.52 in. Hg

Ambient Temperature 62° F °F

Primary Test Meter No. 259453

Calibrated By B. Day

Date 1/11/94

fm	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@
.4	0.5	5.127	5.107	57 / 58	55 / 60	55 / 55	56.25	13	5"	1.000	0.718	1.791
.55	1.0	6.009	5.985	58 / 58	60 / 64	56 / 57	59.25	11	6"	0.996	0.701	1.860
.65	1.5	8.489	8.463	58 / 59	63 / 68	57 / 59	61.75	13	6"	0.994	0.683	1.946
.75	2.0	7.614	7.592	59 / 59	66 / 70	59 / 60	63.75	10	5"	0.993	0.688	1.905
									Average	0.996	0.698	1.876

	Primary Meter	Total	Dry Gas Meter	Total
Stop	579.035	5.127	155.207	5.107
Start	573.908		150.100	
Stop	585.044	6.009	161.192	5.985
Start	579.035		155.207	
Stop	593.533	8.489	169.655	8.463
Start	585.044		161.192	
Stop	601.147	7.614	177.247	7.592
Start	593.533		169.655	

Calculations

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

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

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

CONSOLE METER PRE-CALIBRATION

Console No. 20151

Barometric Pressure, P_b = 29.57 in. Hg

Ambient Temperature 63° °F

Primary Test Meter No. 259453

Calibrated By B. Day

Date 12/7/93

Flow cfm	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@
0.5	0.83	5.638	5.594	63 / 63	60 / 64	60 / 60	61.0	11	5	1.002	0.721	1.778
0.5	0.83	6.652	6.614	63 / 63	64 / 68	61 / 62	64.0	13	5	1.006	0.718	1.774
0.5	0.83	5.656	5.605	67 / 67	65 / 69	64 / 65	66.0	11	6	1.007	0.719	1.774
									Average	1.005	0.719	1.775

	Primary Meter	Total	Dry Gas Meter	Total
Stop	495.748	5.638	898.724	5.594
Start	490.110		893.130	
Stop	502.400	6.652	905.338	6.614
Start	495.748		898.724	
Stop	544.984	5.656	947.705	5.605
Start	539.328		942.100	
Stop				
Start				

Pass

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

CONSOLE METER PRE-CALIBRATION

Console No. 20151

Barometric Pressure, P_b = 29.57 in. Hg

Ambient Temperature 64° °F

Primary Test Meter No. 259453

Calibrated By B. Day

Date 12/7/93

ow m	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@
.75	2.10	7.698	7.669	64 / 65	67 / 70	62 / 63	65.5	10	5	1.001	0.678	1.989
.75	2.10	13.826	13.771	65 / 65	70 / 74	63 / 65	68.0	18	5	1.004	0.675	1.992
.75	2.10	8.352	8.313	66 / 66	64 / 69	64 / 64	65.5	11	5	0.999	0.669	2.056
									Average	1.001	0.674	2.012

	Primary Meter	Total	Dry Gas Meter	Total
Stop	516.550	7.698	919.419	7.669
Start	508.852		911.750	
Stop	530.376	13.826	933.190	13.771
Start	516.550		919.419	
Stop	538.728	8.352	941.563	8.313
Start	530.376		933.190	
Stop				
Start				

Pass

Calculations

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

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

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

M 5221 1/92

CONSOLE METER PRE-CALIBRATION

Console No. 20325

Barometric Pressure, P_b = 29.57 In. Hg

Ambient Temperature 68° °F

Primary Test Meter No. 259453

Calibrated By B. Day

Date 12/7/93

Flow cfm	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	$\Delta H@$
0.5	0.80	5.508	5.625	66/66	61/67	60/61	62.0	11	5	0.970	0.717	1.813
0.5	0.80	4.954	5.074	66/66	62/67	60/61	62.5	10	5	0.968	0.709	1.850
0.5	0.80	6.940	7.109	66/66	64/70	61/61	64.0	14	5	0.971	0.709	1.843
									Average	0.970		

	Primary Meter	Total	Dry Gas Meter	Total
Stop	438.208	5.508	458.775	5.625
Start	432.700		453.150	
Stop	443.162	4.954	463.849	5.074
Start	438.208		458.775	
Stop	450.102	6.940	470.958	7.109
Start	443.162		463.849	
Stop				
Start				

Passed

Calculations

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

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

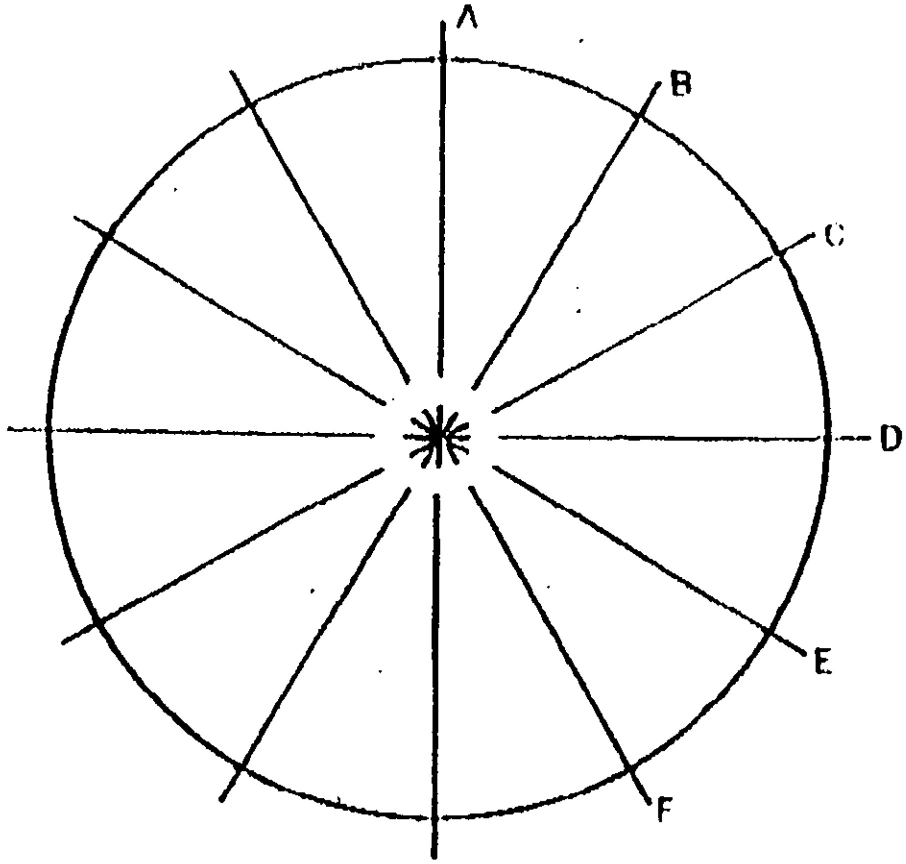
$$\Delta H@ = \frac{0.0317\ \Delta H}{P_b (t_o + 460)} \left[\frac{(t_p + 460)\ \Theta}{V_p}\right]^2$$

APPENDIX I-2

NOZZLE CALIBRATION RECORDS

Corporation

NOZZLE MEASUREMENT



DIAMETER DIMENSION

A 0.3671

B 0.3690

C 0.3650

D 0.3700

E 0.3700

F 0.3709

AVG. 0.3687

NOZZLE SERIAL

NS12-1

DATE

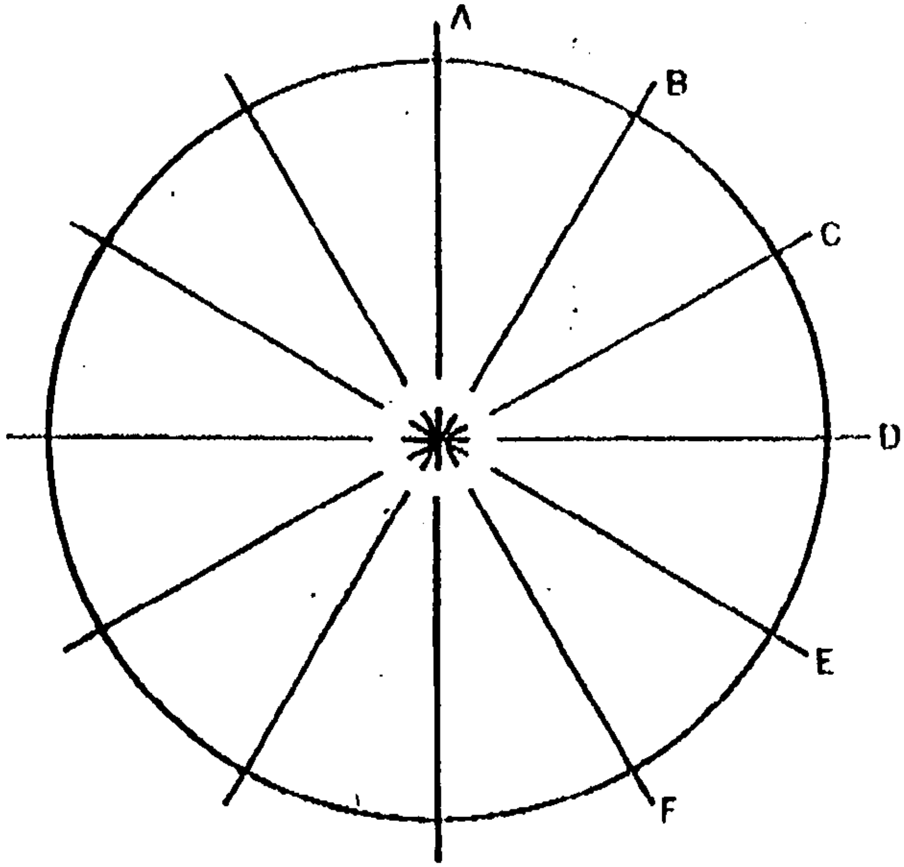
4/15/93

RECORDED BY

B. Day

Corporation

NOZZLE MEASUREMENT



DIAMETER
DIMENSION

A 0.4210
B 0.4241
C 0.4287
D 0.4288
E 0.4250
F 0.4230

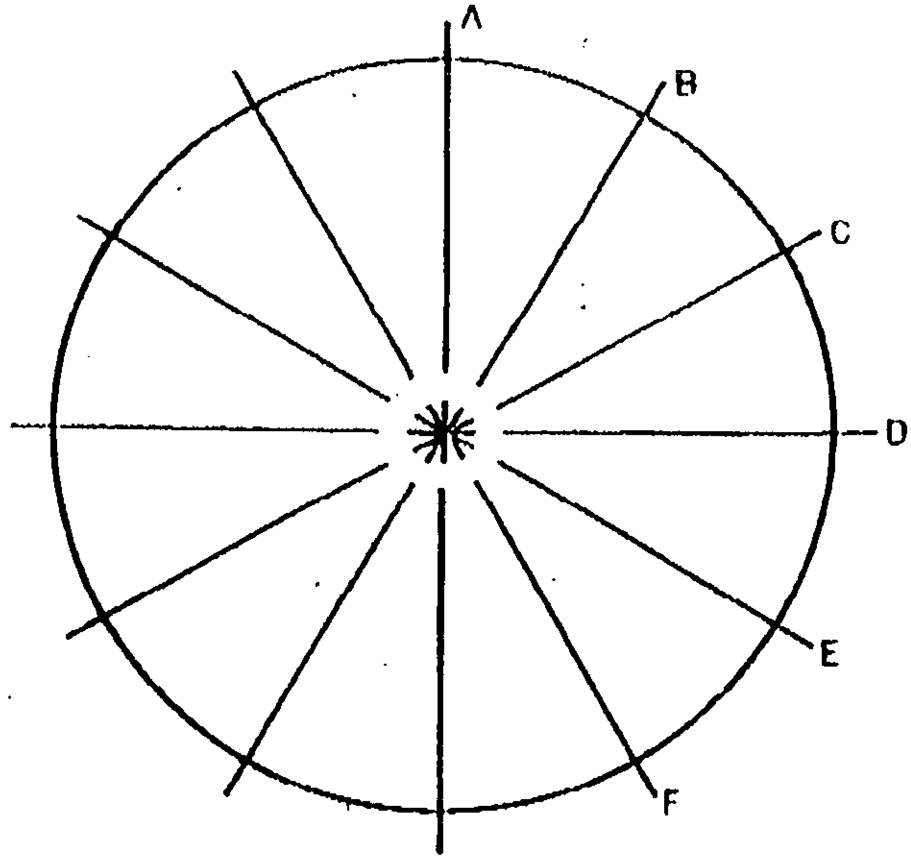
AVG. 0.4251

NOZZLE SERIAL
NS14-1

DATE
4/15/93

RECORDED BY
B. Day

NOZZLE MEASUREMENT



DIAMETER
DIMENSION

A 0.4911
B 0.4930
C 0.4925
D 0.4923
E 0.4905
F 0.4900

AVG. 0.4916

NOZZLE SERIAL
NS16-1

DATE
4/17/93

RECORDED BY
B. Day

APPENDIX I-3

MAGNEHELIC CALIBRATION RECORDS

Date: 1/4/94

Meter Box Number: M1

Calibration Standard: 0-6" Incline manometer

Operator B. Day

Gage	Serial Number	Magnehelic Reading (in. H_2O)	Monometer Reading (in. H_2O)
0-.5"	80808	0.10 0.20 0.31 0.41 0.50	0.1 0.2 0.3 0.4 0.5
0-.5"	80808	0.10 0.20 0.30 0.41 0.50	0.1 0.2 0.3 0.4 0.5
0-.5"	80808	0.10 0.21 0.30 0.41 0.50	0.1 0.2 0.3 0.4 0.5

pressure leak checks: Pass
vacuum leak checks: Pass

Date: 1/4/94

Meter Box Number: M1

Calibration Standard: 0-6" Incline manometer

Operator B. Day

Gage	Serial Number	Magnehelic Reading (in. H_2O)	Monometer Reading (in. H_2O)
0-2"	R910911	0.40 0.80 1.19 1.59 2.00	0.4 0.8 1.2 1.6 2.0
0-2"	R910911	0.40 0.80 1.20 1.59 1.99	0.4 0.8 1.2 1.6 2.0
0-2"	R910911	0.40 0.80 1.20 1.60 2.00	0.4 0.8 1.2 1.6 2.0

pressure leak checks: Pass
vacuum leak checks: Pass

Date: 1/4/94

Meter Box Number: M1

Calibration Standard: 0-6" Incline manometer

Operator B. Day

Gage	Serial Number	Magnehelic Reading (in. H_2O)	Monometer Reading (in. H_2O)
0-6"	R80927	1.19 2.40 3.59 4.80 6.01	1.2 2.4 3.6 4.8 6.0
0-6"	R80927	1.20 2.40 3.61 4.80 6.01	1.2 2.4 3.6 4.8 6.0
0-6"	R80927	1.20 2.39 3.60 4.79 6.00	1.2 2.4 3.6 4.8 6.0

pressure leak checks: Pass
vacuum leak checks: Pass

APPENDIX I-4

THERMOCOUPLE CALIBRATION RECORDS

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 12/8/93 Thermocouple number CB1

Ambient temperature 65 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Fluke #1

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Ice Bath			
1min		33	33	0
2min		33	33	0
3min		33	33	0

[a] Type of calibration system used.

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

Quality Assurance Handbook M5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 12/8/93 Thermocouple number CB2

Ambient temperature 65 Barometric pressure 29.55 in. Hg

Calibrator R. Day Reference: mercury-in-glass ________

other Fluke #1

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Ice Bath			
1min		33	33	
2min		33	33	
3min		33	33	

[a]Type of calibration system used.

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

Quality Assurance Handbook M5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 12/8/93 Thermocouple number CB3

Ambient temperature 65 Barometric pressure 29.55 in. Hg

Calibrator R. Day Reference: mercury-in-glass ______

other Flake #1

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Ice Bath			
1min		33	33	
2min		32	33	
3min		33	33	

[a]Type of calibration system used.

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

Quality Assurance Handbook M5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 12/8/93 Thermocouple number CB4

Ambient temperature 65 Barometric pressure 29.55 in. Hg

Calibrator R. Day Reference: mercury-in-glass

other Flake #1

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Ice Bath			
1min		33	33	
2min		33	33	
3min		33	33	

[a] Type of calibration system used.

°F + 460

460

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

°F + 460

Quality Assurance Handbook M5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM Hot Box #2

Date 12/8/93 Thermocouple number HB2

Ambient temperature 65 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Fluke #1

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Console Hot Box heater			
1min		180	180	
2min		179	180	0.2
3min		180	179	0.2

[a]Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM Hot Box #3

Date 12/8/93 Thermocouple number HB3

Ambient temperature 65 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Fluke #1

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	console Hot Box heater			
1 min		175	174	0.2
2min		177	175	0.3
3min		175	175	

[a]Type of calibration system used.

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

Quality Assurance Handbook M5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM Hot Box #1

Date 12/8/93 Thermocouple number HB1

Ambient temperature 65 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Fluke #1

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Console Hot Box heater			
1min		179	177	0.3
2min		178	176	0.3
3min		179	177	0.3

[a] Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM
Probe liner #2

Date 12/8/93 Thermocouple number P12-2A

Ambient temperature 65 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Fluke #1

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Console probe heater			
1min		180	178	0.3
2min		180	179	0.2
3min		179	178	0.2

[a]Type of calibration system used.

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

(Printed: °C + 273 in each term, handwritten corrected to °F + 460.)

Quality Assurance Handbook M5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM Probe Liner #1

Date 12/8/93 Thermocouple number P12-1A

Ambient temperature 65 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Fluke #1

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Console probe heater			
1min		180	179	0.2
2min		180	179	0.2
3min		179	178	0.2

[a]Type of calibration system used.

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

Quality Assurance Handbook M5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM 12ft probe #1 stack temp

Date 12/8/93 Thermocouple number P12-1

Ambient temperature 65 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass 0-300

other ______

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
Ice Bath	H_2O			
1min		32	32.4	0.1
2min		32	32.6	0.1
3min		32	32.6	0.1
Boiling Pt	H_2O			
1min		212	212.4	0.1
2min		212	212.6	0.1
3min		212	212.6	0.1
Ambient				
1min		66	66	
2min		67	66	0.2
3min		66	66	

[a] Type of calibration system used.

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

Quality Assurance Handbook M5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM 12 ft probe #2 Stack

Date 12/8/93 Thermocouple number P12-2

Ambient temperature 67 . Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ________

other ________

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
Boiling	H_2O			
1min		212	212.0	
2min		212	212.4	0.1
3min		212	213.0	0.1
Ice Bath	H_2O			
1min		32	33	0.2
2min		32	33	0.2
3min		32	33	0.2
Ambient	Air			
1min		67	66	0.2
2min		67	66	0.2
3min		67	66	0.2

[a]Type of calibration system used.

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

Quality Assurance Handbook M5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

= serial number of calibrator

Date 12/8/93 Thermocouple number 307

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: ~~mercury-in-glass~~ Fluke #1

other Fluke

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Calibrator	0	0	
		201.6	200	0.2
		399.0	400	0.1
		601.0	600	0.1
		801.0	800	0.1
		1001.0	1000	
		1400.0	1400.0	
		2000.0	2000.0	

[a] Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 12/8/93 Thermocouple number Fluke #1

Ambient temperature 65 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass 0-300°F

other ____________

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
Ice Bath	H_2O			
1min		32	32.8	0.2
2min		32	32.6	0.1
3min		32	32.6	0.1
Boiling Pt.	H_2O			
1min		212	213.6	0.2
2min		212	213.8	0.3
3min		212	213.8	0.3
Ambient	Air			
1min		67	67.2	0.1
2min		67	67.2	0.1
3min		67	67.2	0.1

[a]Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, } {}^\circ\cancel{C}F + \overset{460}{\cancel{273}}) - (\text{test thermom temp, } {}^\circ\cancel{C}F + \overset{460}{\cancel{273}})}{\text{ref temp, } \cancel{{}^\circ C + 273}\ {}^\circ F + 460}\right] 100 \le 1.5\%.$

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM Gas meter In console 2072

Date 12/8/93 Thermocouple number GM5A

Ambient temperature 68 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Fluke # 1

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
Ice Bath	H_2O			
1min		32	31	0.2
2min		32	31	0.2
3min		32	31	0.2
Boiling	H_2O			
1min		212	210	0.3
2min		212	210	0.3
3min		212	211	0.1

[a]Type of calibration system used.

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

Gas Meter Out
console # 20325

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 12/8/93 Thermocouple number GM5B

Ambient temperature 68 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Fluke # 1

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
Ice Bath	H_2O			
1min		32	33	0.2
2min		32	32	
3min		32	33	0.2
Boiling	H_2O			
1min		212	211	0.1
2min		212	211	0.1
3min		212	212	

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, } \overset{\circ F}{\cancel{{}^\circ C}} + \overset{460}{273}) - (\text{test thermom temp, } \overset{\circ F}{\cancel{{}^\circ C}} + \overset{460}{273})}{\text{ref temp, } \cancel{{}^\circ C} + 273 \quad {}^\circ F + 460}\right] 100 \le 1.5\%.$

Quality Assurance Handbook M5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Gas meter console Out 20151

Date 12/8/93 Thermocouple number GM7B

Ambient temperature 68 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Fluke # 1

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
Ice Bath	H_2O			
1min		32	30	0.4
2min		32	30	0.4
3min		32	30	0.4
Boiling	H_2O			
1min		212	211	0.1
2min		212	211	0.1
3min		212	211	0.1

[a]Type of calibration system used.

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

Quality Assurance Handbook M5-2.5

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Gas meter In console 20151

Date 12/8/93 Thermocouple number GM7A

Ambient temperature 68 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Fluke #1

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
Ice Bath	H_2O			
1min		32	30	0.4
2min		32	30	0.4
3min		32	30	0.4
Boiling Pt.	H_2O			
1min		212	211	0.1
2min		212	210	0.3
3min		212	210	0.3

[a]Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

console 20151
Aux.

Date 12/8/93 Thermocouple number C57

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator # 307

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Simulator			
		0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a] Type of calibration system used.

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

460 °F + 460

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

console 20151
Exit temp

Date 12/8/93 Thermocouple number C47

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a] Type of calibration system used.

[b] $$\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \le 1.5\%$$

°F + 460 °F + 460 °F + 460

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

console 20151
oven temp.

Date 12/8/93 Thermocouple number C37

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a]Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

console 20151
stack temp

Date 12/8/93 Thermocouple number C27

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a]Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

console 20151
Probe temp.

Date 12/8/93 Thermocouple number C17

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Simulator ↓	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a]Type of calibration system used.

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

460 °F + 460

°F + 460

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

console 20325
Aux. temp

Date 12/8/93 Thermocouple number C55

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	0	
		200	199	0.2
		400	395	0.6
		600	598	0.2

[a]Type of calibration system used.

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

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

console 20325
Exit temp.

Date 12/8/93 Thermocouple number C45

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	-2	0.4
		200	198	0.3
		400	395	0.6
		600	598	0.2

[a] Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

console 20325
oven temp.

Date 12/8/93 Thermocouple number C35

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ________

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Simulator	0	-2	0.4
		200	198	0.3
		400	395	0.6
		600	598	0.2
		800	799	0.1

[a] Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

console 20325
stack temp.

Date 12/8/93. Thermocouple number C25

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	-2	0.4
		200	198	0.3
		400	395	0.6
		600	598	0.2
		800	800	

[a] Type of calibration system used.

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

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0

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

console 20325
probe temp

Date 12/8/93 Thermocouple number C 15

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	-2	0.4
		200	198	0.3
		400	395	0.6
		600	598	0.2

[a]Type of calibration system used.

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

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM Umbilical #2
Aux. temp A end = ... or ... Connec

Date 12/8/93 Thermocouple number U25A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator # 307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	0	
	↓	200	200	
	↓	400	396	0.5
	↓	600	598	0.2

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, } {}^\circ C + 273) - (\text{test thermom temp, } {}^\circ C + 273)}{\text{ref temp, } {}^\circ C + 273}\right] 100 \le 1.5\%$.

460 °F + 460 °F + 460

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #2 Exit temp. A end male

Date 12/8/93 Thermocouple number U24A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #1 307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a] Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #2 oven temp male

Date 12/8/93 Thermocouple number U23A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator # 307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a]Type of calibration system used.

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

°F + 460

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #2
stack temp male

Date 12/8/93 Thermocouple number U22A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator # 307

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Simulator			
		0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °C + 273}) - (\text{test thermom temp, °C + 273})}{\text{ref temp, °C + 273}}\right] 100 \le 1.5\%$

460 °F + 460 °F + 460

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM Umbilical #2 Probe temp. ma

Date 12/8/93 Thermocouple number U21A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Simulator			
	↓	0	0	
	↓	200	200	
	↓	400	396	0.5
	↓	600	598	0.2

[a] Type of calibration system used.

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

°F + 460

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #1
Aux. temp mak

Date 12/8/93 Thermocouple number U15A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator # 307

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a]Type of calibration system used.

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

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #1
Exit temp. male

Date 12/8/93 Thermocouple number U14A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \le 1.5\%$

°F + 460 °F + 460

°F + 460

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #1 oven temp. make

Date 12/8/93. Thermocouple number U13A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a]Type of calibration system used.

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

(handwritten corrections: °F + 460 in place of °C + 273)

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #1
stack temp ma

Date 12/8/93 Thermocouple number U12A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a]Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, }^\circ F + 460) - (\text{test thermom temp, }^\circ F + 460)}{\text{ref temp, }^\circ C + 273 \;\; ^\circ F + 460}\right] 100 \le 1.5\%$.

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #1
Probe temp. male

Date 12/8/93 Thermocouple number U13A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a]Type of calibration system used.

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

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #3
Aux. temp. male

Date 12/8/93 Thermocouple number U35A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Simulator	0	-2	0.4
	↓	200	199	0.2
	↓	400	395	0.6
	↓	600	598	0.2

[a]Type of calibration system used.

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

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #3 Exit temp. make

Date 12/8/93 Thermocouple number U34A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	-2	0.4
		200	198	0.3
		400	395	0.6
		600	598	0.2

[a]Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

umbilical #3
oven temp. mal

Date 12/8/93 Thermocouple number U33A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	-2	0.4
		200	198	0.3
		400	395	0.6
		600	598	0.2
		800	799	0.1

[a]Type of calibration system used.

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

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #3 stack temp. male

Date 12/8/93 Thermocouple number U32A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	-2	0.4
		200	198	0.3
		400	395	0.6
		600	598	0.2
		800	800	

[a] Type of calibration system used.

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

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #3 probe temp. m

Date 12/8/93 Thermocouple number U31A

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Simulator	0	-2	0.4
		200	198	0.3
		400	395	0.6
		600	598	0.2

[a]Type of calibration system used.

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

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #2 Aux. temp. female end

Date 12/8/93 Thermocouple number U25B

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator # 307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	0	
	↓	200	200	
	↓	400	396	0.5
	↓	600	598	0.2

[a]Type of calibration system used.

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

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #2 Exit temp

Date 12/8/93 Thermocouple number U24B

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #1 307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a]Type of calibration system used.

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

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #2
Oven temp female e.

Date 12/8/93 Thermocouple number 023B

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a]Type of calibration system used.

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

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #2 stack temp. fe

Date 12/8/93 Thermocouple number U22 B

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #1 307

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a]Type of calibration system used.

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

(printed: °C + 273)

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #2
Probe temp. female

Date 12/8/93 Thermocouple number U21B

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C °F	Thermocouple potentiometer temperature, °C °F	Temperature difference,[b] %
	Simulator			
	↓	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a] Type of calibration system used.

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

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #1 Aux. temp. female [illegible]

Date 12/8/93 Thermocouple number U15B

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator # 307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a] Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

umbilical #1
Exit temp. female c.

Date 12/8/93 Thermocouple number U14B

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Simulator # 307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a]Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, } \cancel{^\circ C}\ ^\circ F + \cancel{273}\ 460) - (\text{test thermom temp, } \cancel{^\circ C}\ ^\circ F + \cancel{273}\ 460)}{\text{ref temp, } \cancel{^\circ C}\ ^\circ F + \cancel{273}\ 460}\right] 100 \le 1.5\%.$

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #1 oven temp. female

Date 12/8/93 Thermocouple number U13B

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference, %[b]
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

[a]Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #1 Stack temp. female en

Date 12/8/93 Thermocouple number U12B

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	0	
		200	200	
		400	396	0.5
		600	598	0.2

a Type of calibration system used.

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

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

umbilical #3
Aux. temp female

Date 12/8/93 Thermocouple number U35B

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	-2	0.4
		200	199	0.2
		400	395	0.6
		600	598	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%.

(Printed form: ref temp, °C + 273; test thermom temp, °C + 273; handwritten corrections to °F + 460.)

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #3
Exit temp. female enc

Date 12/8/93 Thermocouple number U34B

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator	0	-2	0.4
		200	198	0.3
		400	395	0.6
		600	598	0.2

[a]Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #3
oven temp. Female e l

Date 12/8/93 Thermocouple number U33B

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Simulator #207

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator			
		0	-2	0.4
		200	198	0.3
		400	395	0.6
		600	598	0.2
		800	799	0.1

[a]Type of calibration system used.

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

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STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #3 stack temp female

Date 12/8/93 Thermocouple number U32B

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator B. Day Reference: mercury-in-glass ______

other Simulator #307

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator			
		0	-2	0.4
		200	198	0.3
		400	395	0.6
		600	598	0.2
		800	800	

[a]Type of calibration system used.

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

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM umbilical #3 probe temp. fe[illegible]

Date 12/8/93. Thermocouple number U31B

Ambient temperature 67 Barometric pressure 29.55 in. Hg

Calibrator [illegible] Reference: mercury-in-glass

other Thermocouple Simulator #307 K-type

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
	Simulator			
	↓	0	-2	0.4
		200	198	0.3
		400	395	0.6
		600	598	0.2

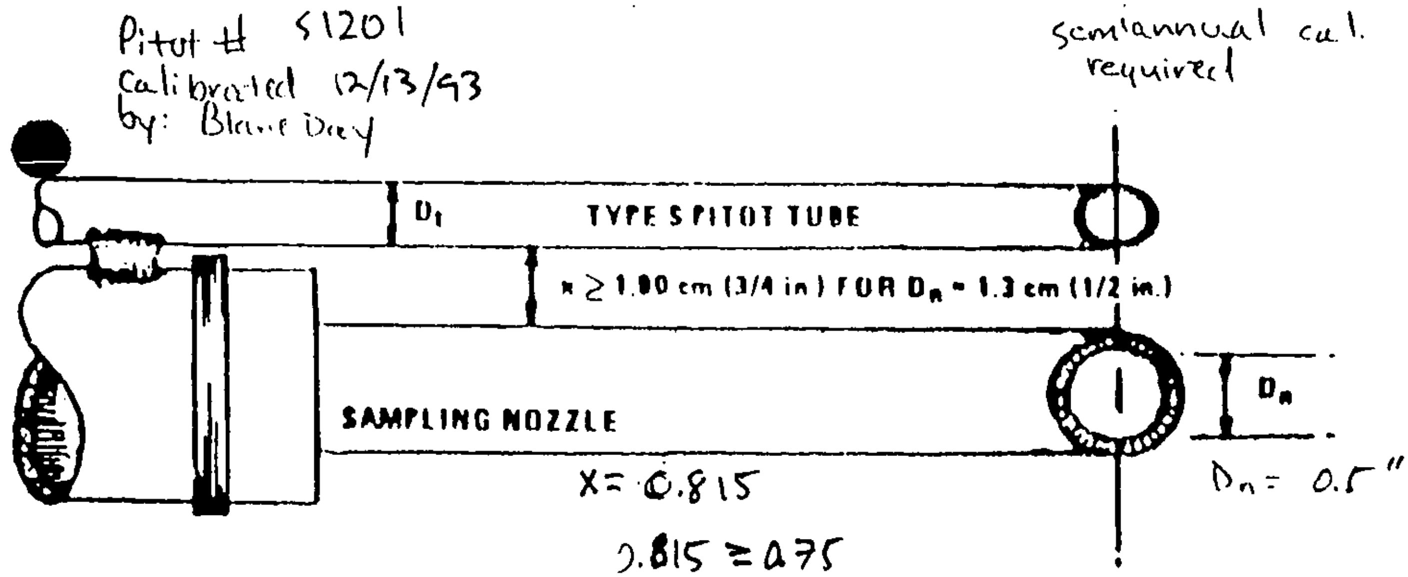
[a] Type of calibration system used.

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

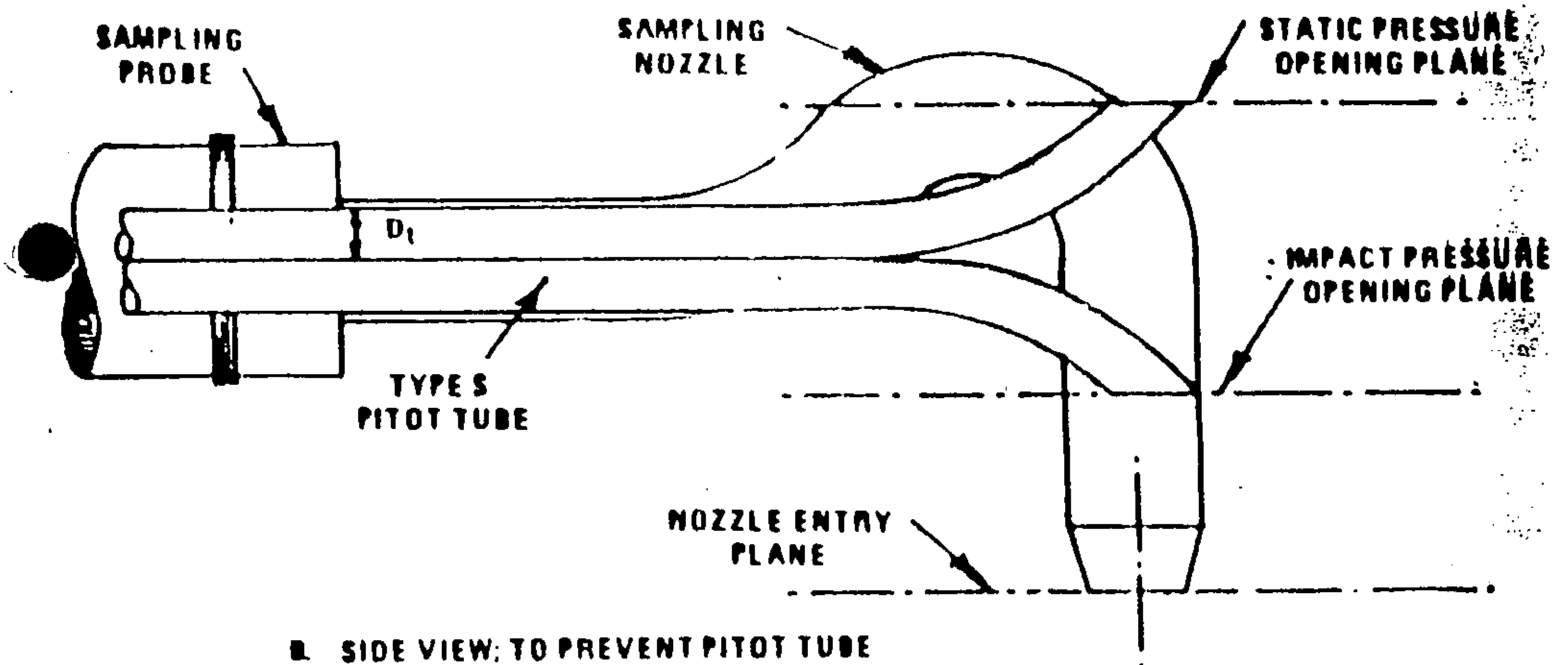
Quality Assurance Handbook M5-2.5

APPENDIX I-5

PITOT CALIBRATION RECORDS



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

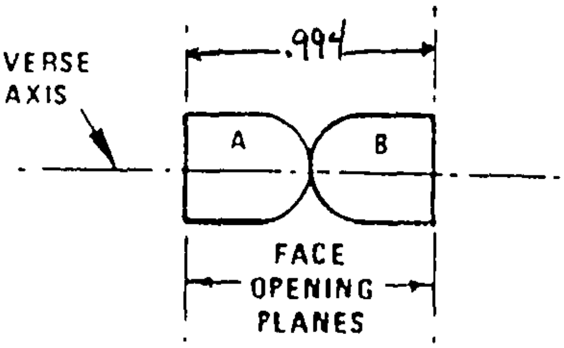


B. SIDE VIEW; TO PREVENT PITOT TUBE FROM INTERFERING WITH GAS FLOW STREAMLINES APPROACHING THE NOZZLE, THE IMPACT PRESSURE OPENING PLANE OF THE PITOT TUBE SHALL BE EVEN WITH OR ABOVE THE NOZZLE ENTRY PLANE.

igure 2-6. Proper pitot tube-sampling nozzle configuration to prevent aerodynamic interference; ...hook-type nozzle; centers of nozzle and pitot opening aligned; D_t between 0.48 and 0.95 cm ...and 3/8 in.).

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

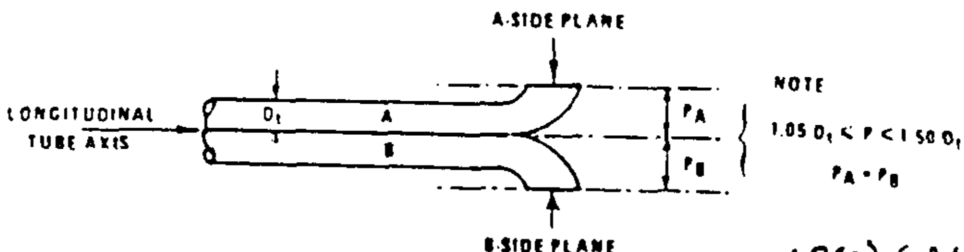
Pitot # S1201
calibrated 12/13/93
by: B. Day



$D_1 =$

(a)

$D_1 = 0.381$
$P_A = 0.497$
$P_B = 0.497$



(b)

$1.05(.381) < 0.497 < 1.50(.381)$

$0.4 < 0.497 < 0.572$

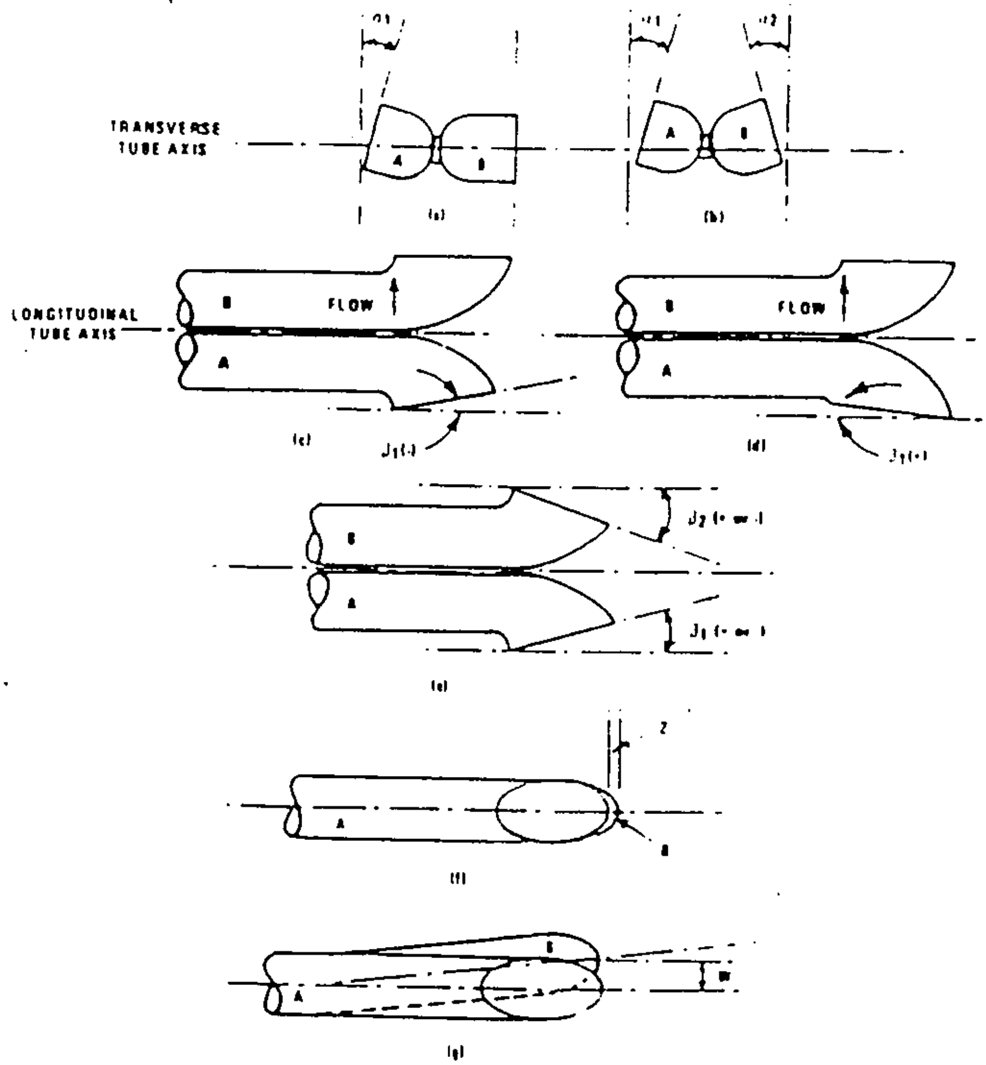
(c)

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 12/13/93
by: Blane 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 α1 and α2 ≤ 10°, β1 and β2 ≤ 5°, z ≤ 0.32 cm (1/8 in.) and w ≤ 0.08 cm (1/32 in.) (citation 11 in Section 6).

$a_1 = 0°$ $B_1 = 1°$ $z = 0°$
$a_2 = 0°$ $B_2 = 0°$ $w = 0°$

Figure III-3

Improper Pitot Tube Configuration

Pitot id s 51201
calibrated 12/13/93
by: [illegible]

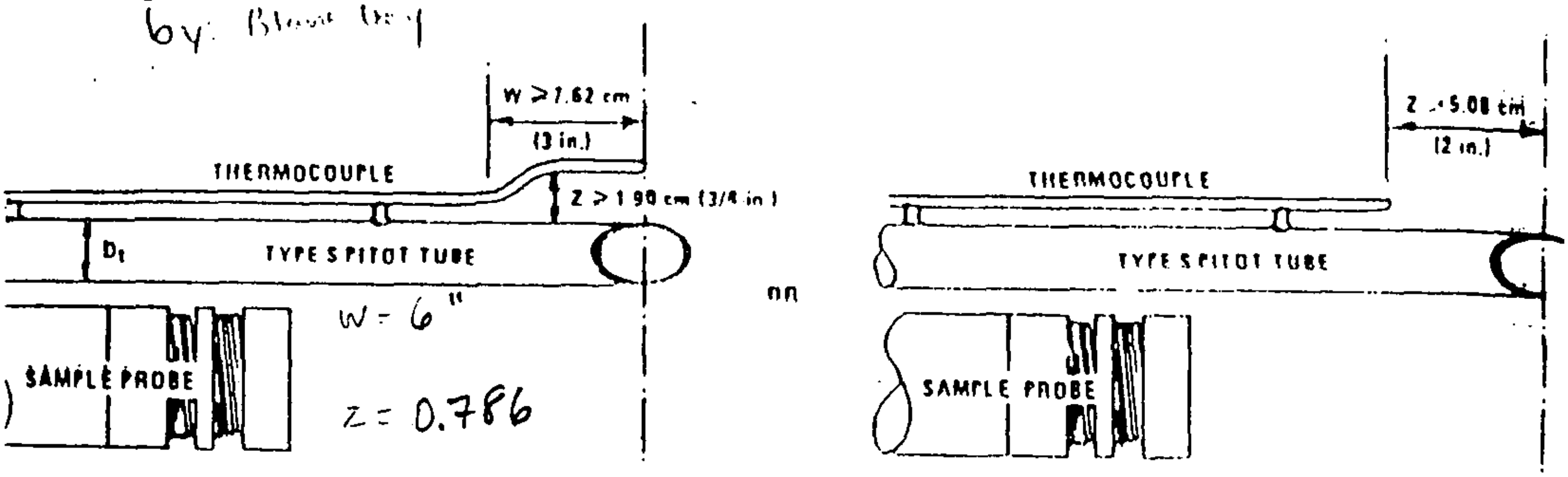
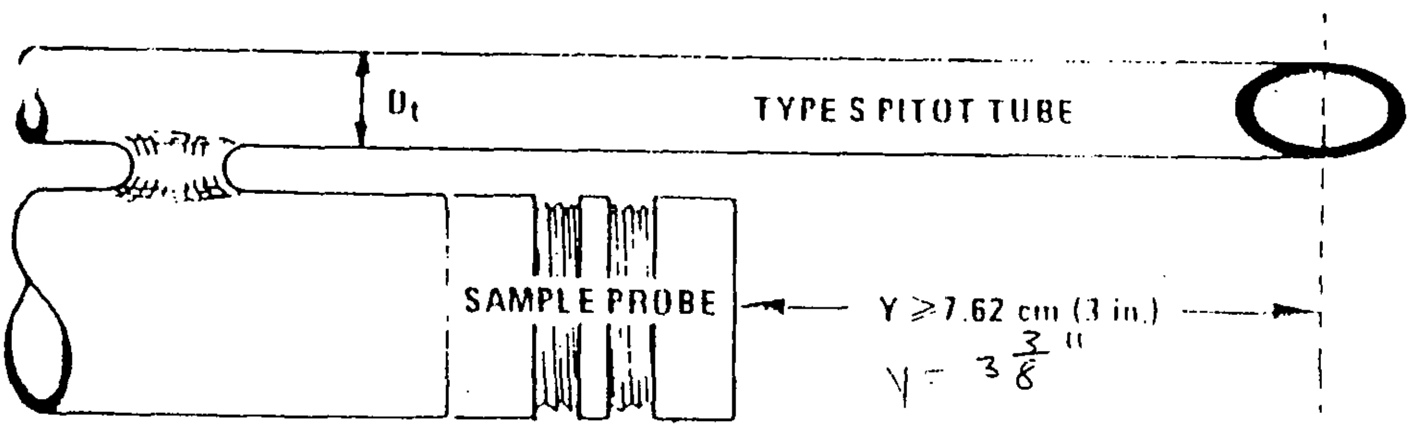


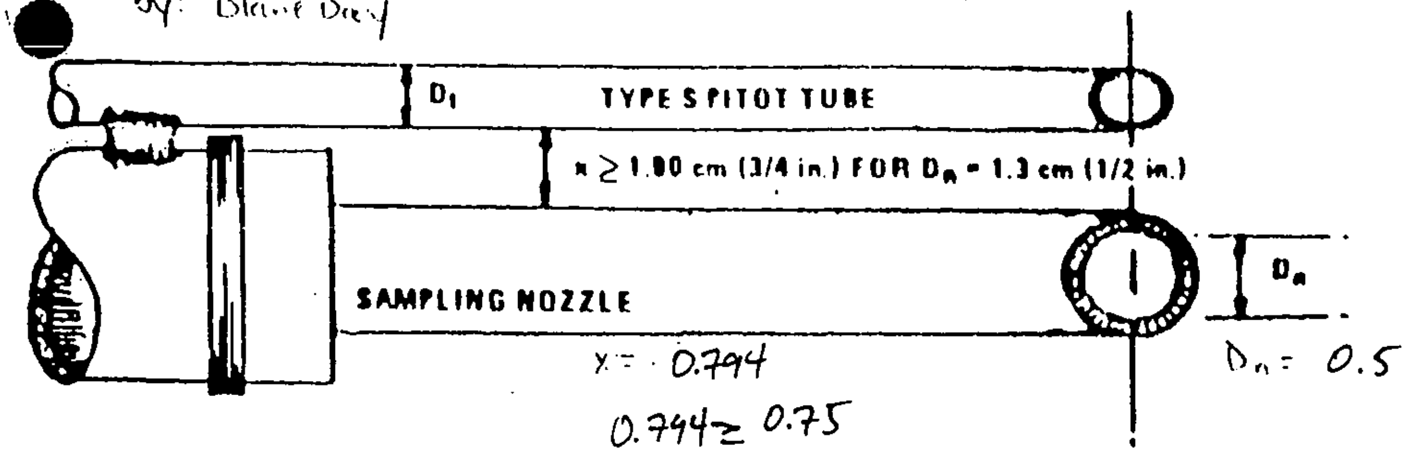
Figure 2.7. Proper thermocouple placement to prevent interference; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.)



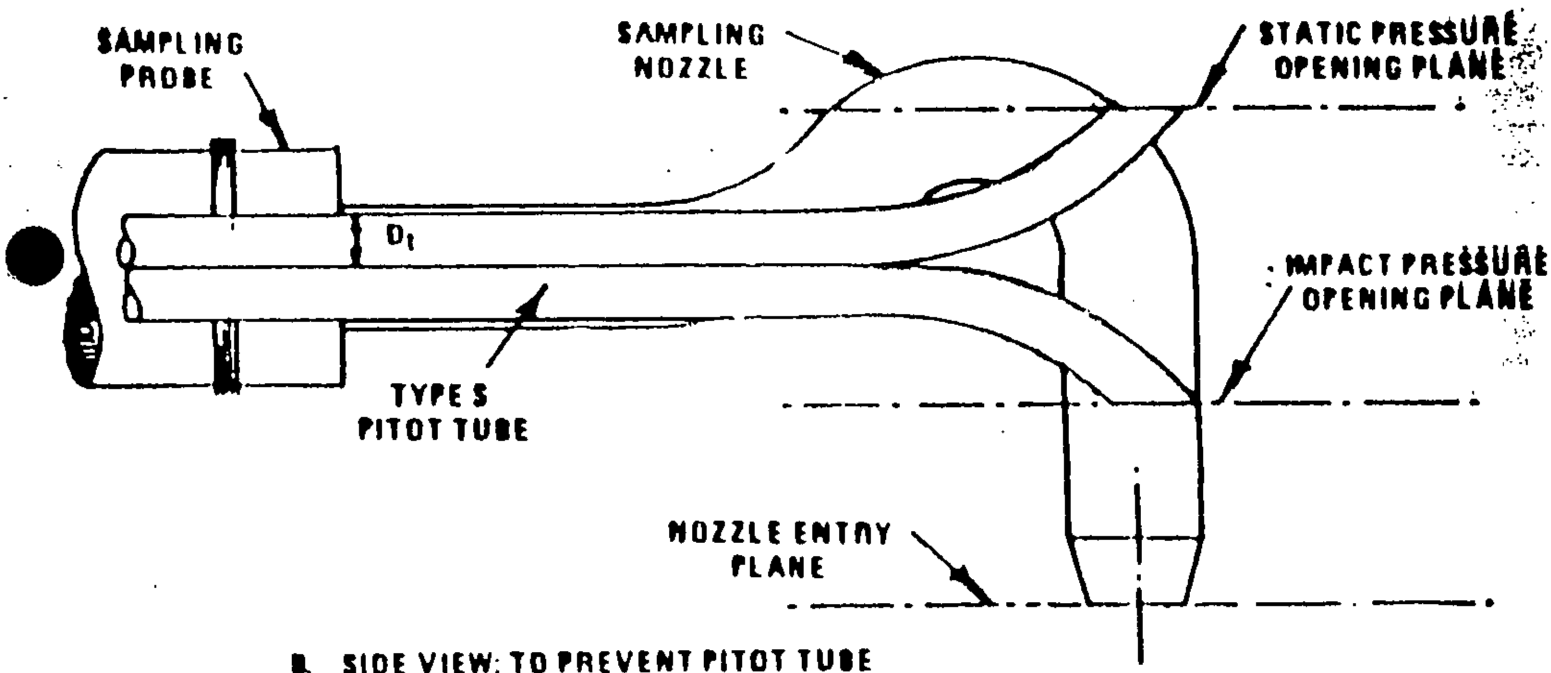
gure 2-8. Minimum pitot-sample probe separation needed to prevent interferenc
between 0.48 and 0.95 cm (3/16 and 3/8 in.).

Pitot # S 1202
Calibrated 12/13/93
by: Blane Day

semiannual cal. required



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

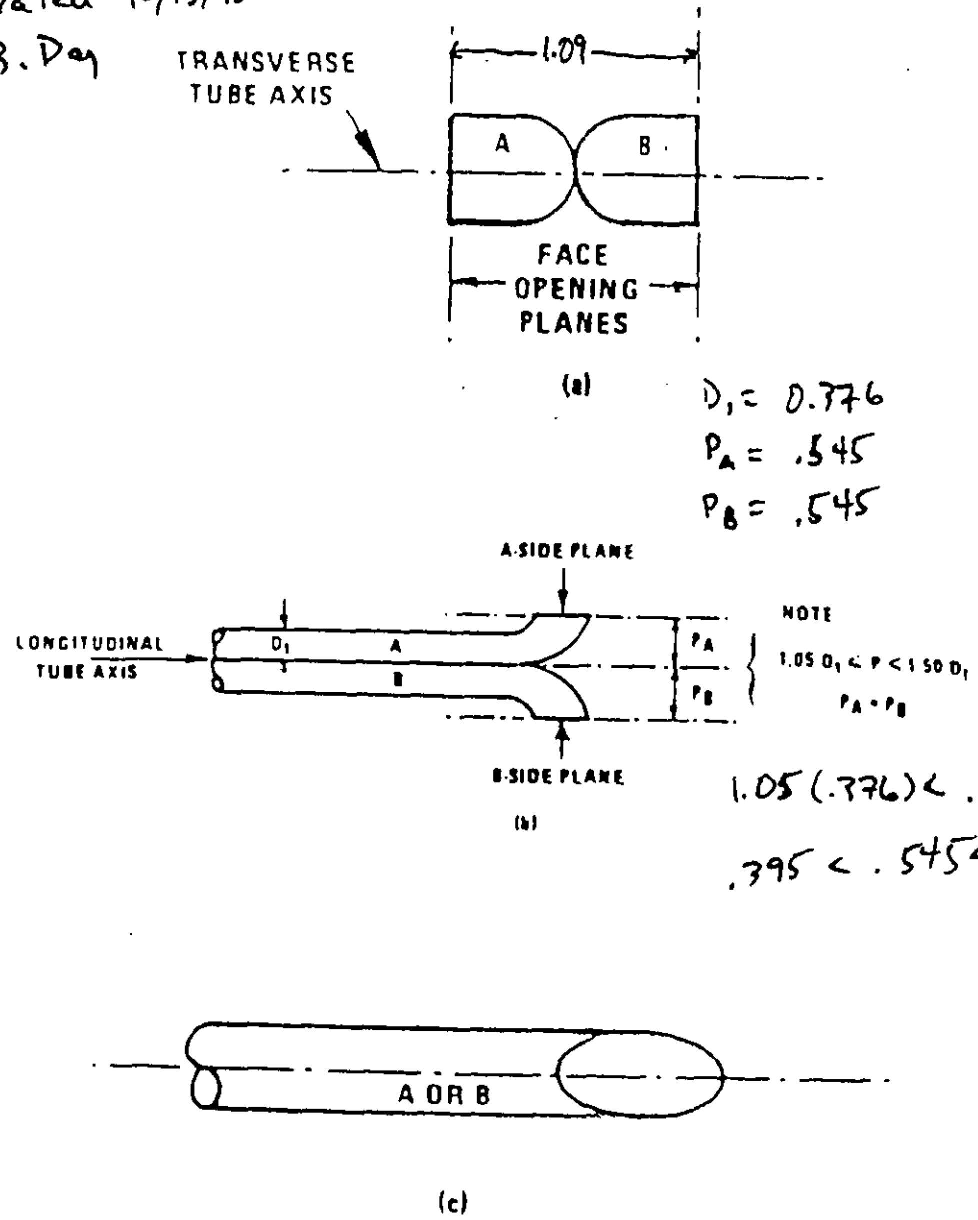


B. SIDE VIEW; TO PREVENT PITOT TUBE FROM INTERFERING WITH GAS FLOW STREAMLINES APPROACHING THE NOZZLE, THE IMPACT PRESSURE OPENING PLANE OF THE PITOT TUBE SHALL BE EVEN WITH OR ABOVE THE NOZZLE ENTRY PLANE.

Figure 2-6. Proper pitot tube-sampling nozzle configuration to prevent aerodynamic interference; b[illegible]nhook-type nozzle; centers of nozzle and pitot opening aligned; D_t between 0.48 and 0.95 cm (3[illegible] and 3/8 in.).

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

Pitot # s1202
calibrated 12/13/93
by: B. Day



$D_1 = 0.776$
$P_A = .545$
$P_B = .545$

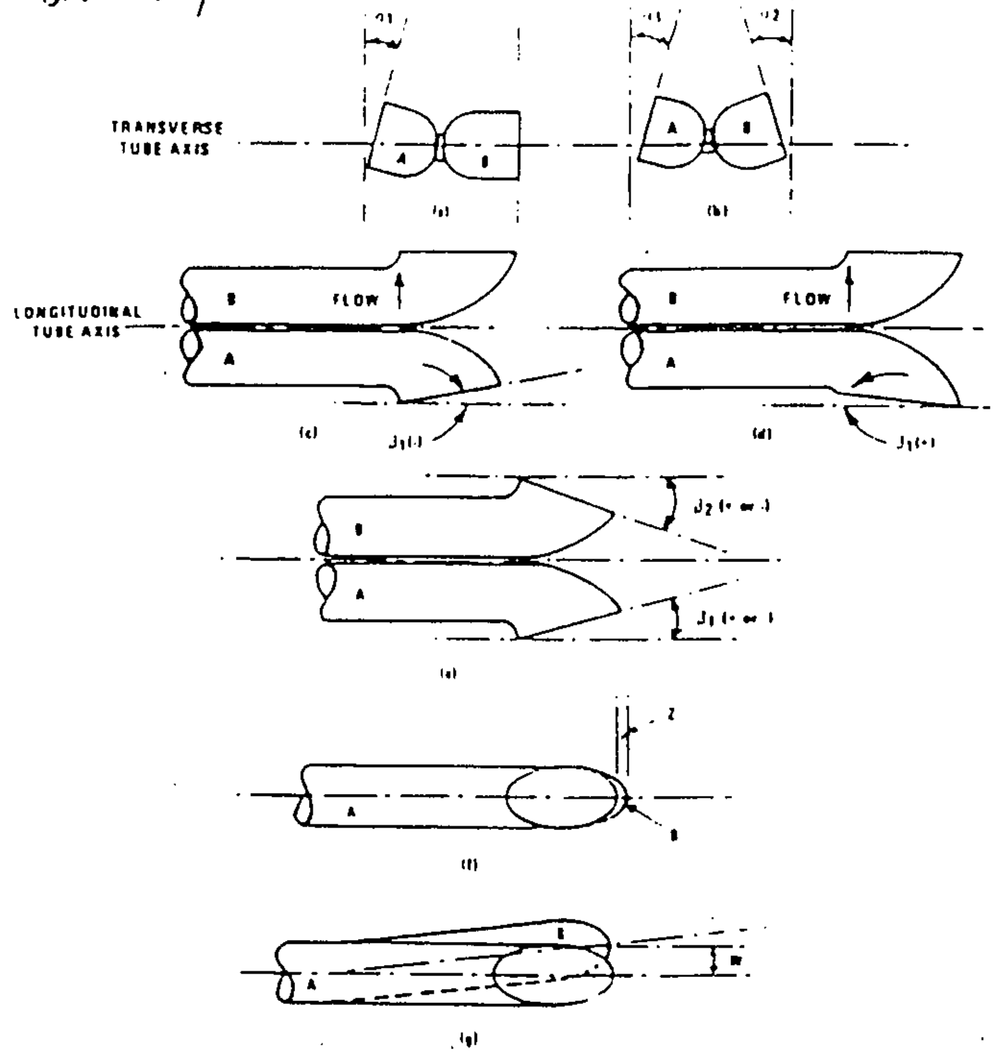
$1.05(.376) < .545 < 1.5(.376)$
$.395 < .545 < .564$

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 # S 1202
calibrated 12/13/98
by: Blane 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).

$a_1 = 0°$ $B_1 = 0°$ $z = 0°$

$a_2 = 0°$ $B_2 = 0°$ $w = 0°$

Figure III-3

Improper Pitot Tube Configuration

Pitot # S1202
calibrated 12/13/93
by: Blaine [illegible]

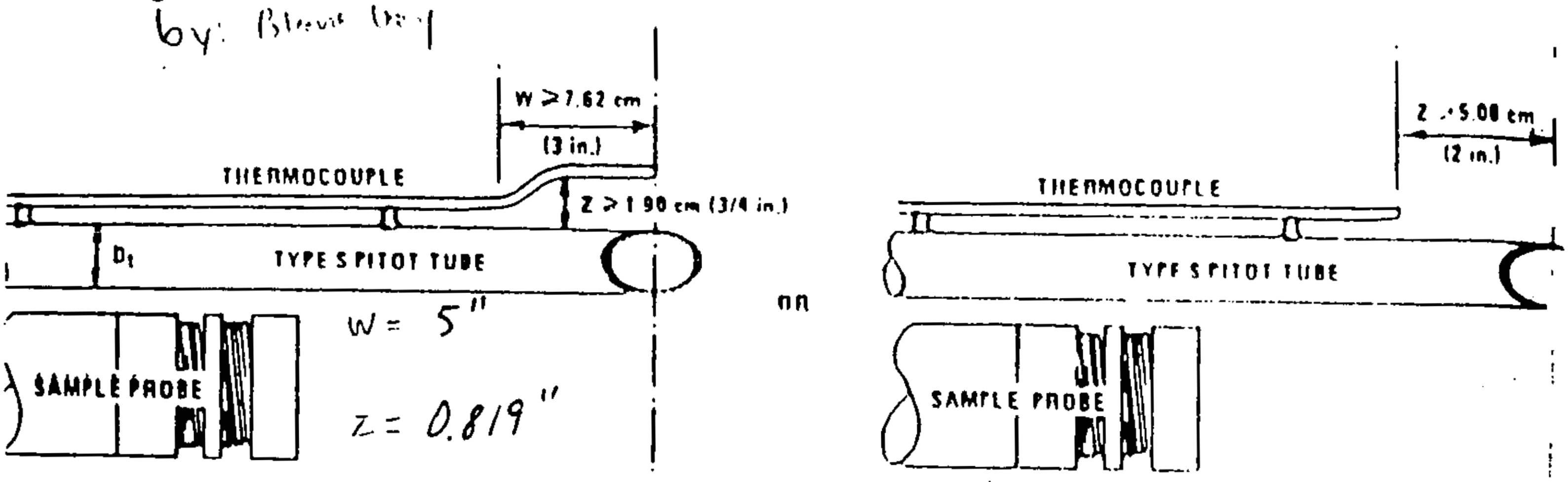
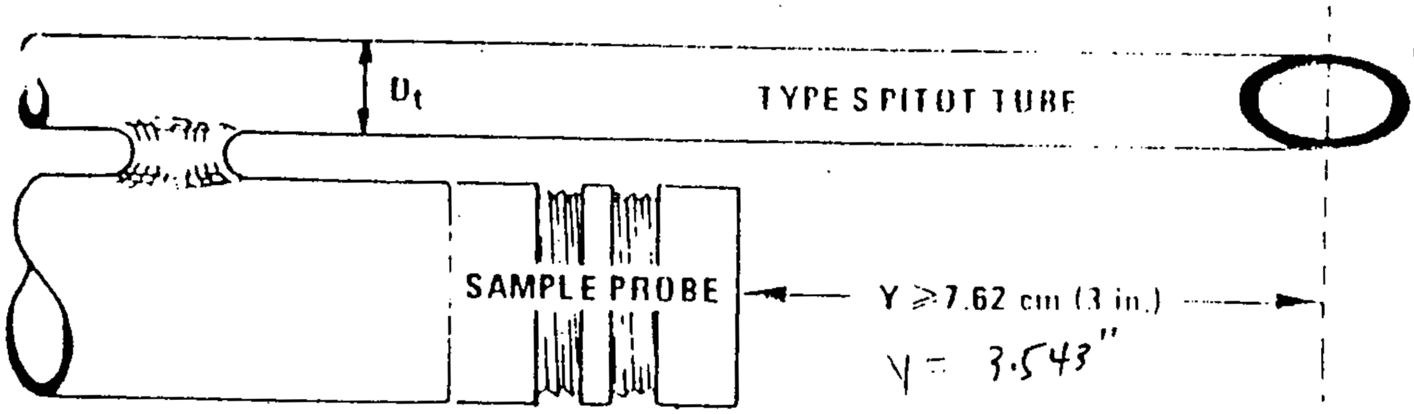


Figure 2-7. Proper thermocouple placement to prevent interference; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).



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

APPENDIX J

CALIFORNIA ARB CONTRACTORS PROGRAM CERTIFICATION CERTIFICATE

State of California

Air Resources Board

Approved Independent Contractor

Acurex Environmental Corporation

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, 1994, for those test methods listed below:

ARB Source Test Methods:
1, 2, 3, 4, 5, 10, 100(CO_2, NO_x, O_2, SO_2, THC)
Visible Emissions Evaluation

James J. Morgester, Chief
Compliance Division

Laura McKinney, Manager
Investigation and Certification Section