Florida Gas Transmission Company
P. O. Box 945100 Maitland, Florida 32794-5100 (407) 875-5800

Certified Mail

October 16, 1992

Mr. Alan Zahm, P.E.
Supervisor, Permitting
Air Resource Management
3319 Maguire Blvd, Suite 232
Orlando, Florida 32803-3767

Dear Mr. Zahm:

RE: Air Permit - AC42-189455
Florida Gas Transmission Company - Station 17
Marion County, Silver Spring, Florida
Natural Gas Compressor Engine (Unit No.5)

In response to your October 8, 1992, letter to Mr. William Osbourne referencing the expiration of the above-referenced air permit, I've attached a copy of a letter from Steve Smallwood with the Florida DER. As you will note in his letter, the DER extended the expiration date of this permit to June 1993.

Please call me at 407-875-5816 if you have any questions.

Sincerely,

Allan Weatherford

Allan Weatherford
Compliance Environmentalist

bc
aw1016az
attachments

cc: Chuck Truby
Raymond Young
Bill Osbourne
Steve Smallwood, Florida DER ✓

Fold at line over top of envelope to the right of the return address
CERTIFIED
P 250 257 128
MAIL

RECEIVED
OCT 21 1992
Division of Air Resources Management

Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

May 15, 1992

RECEIVED
MAY 18 1992
TECH OPERATIONS

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Allan Weatherford
Compliance Environmentalist
Florida Gas Transmission Company
P.O. Box 945100
Maitland, Florida 32399-2400

Dear Mr. Weatherford:

Re: Construction Permits Nos. AC 57-188869, AC 67-189220, AC 20-189438, AC 62-189439, AC 04-189454, AC 42-189455, AC 48-189456, AC 05-189665, and AC 56-189457

The Department is in receipt of your letter dated April 29, 1992, requesting the extension of the expiration dates of the above referenced permits. This request is acceptable. The expiration dates of these construction permits will be changed as follows:

FROM: June 30, 1992
TO: June 30, 1993

This letter must be attached to the above mentioned permits and shall become a part of each permit.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the permit applicant and the parties listed below must be filed within 14 days of receipt of this intent. Petitions filed by other persons must be filed within 14 days of publication of the public notice or within 14 days of their receipt of this intent, whichever first occurs. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The Petition shall contain the following information:

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
(d) A statement of the material facts disputed by Petitioner, if any;
(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and
(g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this intent. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of receipt of this intent in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

Sincerely,

for STEVE SMALLWOOD, P.E.
Director
Division of Air Resources Mgmt.

SS/TH/plm

Attachment to be Incorporated:
Mr. Weatherford's letter of April 29, 1992

cc: Ed Middleswart
Charles Collins
Andy Kutyna
Isidore Goldman

Florida Gas Transmission Company

P. O. Box 945100 Maitland, Florida 32794-5100 (407) 875-5800

Federal Express

April 29, 1992

Mr. Clair Fancy
Florida Department of
Environmental Regulation
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dear Mr. Fancy:

RE: Request for Extensions of Construction Permits
Phase II Air Permits

Permit No. AC57-188869
Florida Gas Transmission Company, Station 12
Munson, Santa Rosa County, Florida

Permit No. AC67-189220
Florida Gas Transmission Company, Station 13
Caryville, Washington County, Florida

Permit No. AC20-189438
Florida Gas Transmission Company, Station 14
Quincy, Gadsden County, Florida

Permit No. AC62-189439
Florida Gas Transmission Company, Station 15
Perry, Taylor County, Florida

Permit No. AC04-189454
Florida Gas Transmission Company, Station 16
Brooker, Bradford County, Florida

Permit No. AC42-189455
Florida Gas Transmission Company, Station 17
Salt Springs, Marion County, Florida

Permit No. AC48-189456
Florida Gas Transmission Company, Station 18
Orlando, Orange County, Florida

Permit No. AC05-189665
Florida Gas Transmission Company, Station 19
Melbourne, Brevard County, Florida

Permit No. AC56-189457
Florida Gas Transmission Company, Station 20
Ft. Pierce, St. Lucie County, Florida

On behalf of Florida Gas Transmission Company, I respectfully request extensions of the construction permits referenced above. The permits are due to expire on June 30, 1992 and FGT needs more time to evaluate the operation and performance of the engines.

Emissions tests were done on the engines in March 1992. The test reports will be submitted to DER within the next two weeks. Preliminary results indicate that all emission limits were met.

FGT requests the expiration dates be extended to June 30, 1993. This 12-month extension will allow FGT the necessary time to thoroughly evaluate the operation of the new engines and to determine if additions or revisions to the permits are needed.

In anticipation of your approval, I've enclosed a check for $450 to cover the permit extension fee for each of the nine stations.

Sincerely,

Allan Weatherford
Compliance Environmentalist

bc
aw0429cf

cc: Chuck Truby
Raymond Young
Fred Griffin
Bill Osborne
Glenn Sellars
Levon Carroll
Bob Beckham
Don Sterba
Duwood Mulford
Buddy Morris
James Dollar
Jim Read
Les Shadd
Leroy Coker
Wayne Daniels
Riley Jackson
Donnie Owings
Joe Kolb
Tom Gardiner, ENSR

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400
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May 15, 1992

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Duwood Mulford
Buddy Morris
James Dollar
Jim Read
Les Shadd
Leroy Coker
Wayne Daniels
Riley Jackson
Donnie Owings
Joe Kolb
Tom Gardiner, ENSR
J. Blum

TEST REPORT
on
EXHAUST EMISSIONS
from a
DRESSER RAND 412KVSR COMPRESSOR ENGINE
at
FLORIDA GAS TRANSMISSION'S
COMPRESSOR STATION NO. 17
SILVER SRPINGS, MARION COUNTY, FLORIDA

Prepared For

FLORIDA GAS TRANSMISSION COMPANY

April 1992

Prepared by

Cubix Corporation

9225 Lockhart Hwy., Austin, Texas 78747
(512) 243-0202 FAX (512) 243-0222

TABLE OF CONTENTS

INTRODUCTION

One Dresser Rand 412KVSR compressor engine was tested to determine the quantity of emissions released into the atmosphere. The tests were conducted on March 24, 1992 at Compressor Station No. 17 located near Silver Springs, in Marion County, Florida. This compressor station is owned and operated by Florida Gas Transmission Company (an affiliate of Enron).

The tests were conducted to determine the unit's compliance status with regard to the Florida Department of Environmental Regulation's Permit No. AC 42-189455.

Quantities of nitrogen oxides (NOx), carbon monoxide (CO), nonmethane hydrocarbon emissions (VOC), and other combustion products were determined in the exhaust stack of the engine. The tests followed the procedures set forth in the Code of Federal Regulations, Title 40, Part 60, Appendix A, Methods 1, 2, 3, 3a, 4, 7e, 9, 10, 18, 19, 25 and 25a, ASTM D-3246, and the American Gas Association's Carbon Balance Method*. All field testing was conducted by Cubix Corporation of Austin, Texas. The laboratory analyses for VOC concentrations and total sulfur in the fuel were conducted by Clean Air Engineering of Palatine, Illinois and Southern Petroleum Labs of Houston, Texas, respectively.

This test report has been reviewed and approved for submittal to the FDER by the following representatives:

*NOTE: Additional test methods (3a, 18, 25a, 19 and carbon balance) were done for comparison purposes. Florida Gas intends to formally request that Methods 3 and 25 be replaced by Methods 3a and 25a.

Florida Gas Transmission Co.

Cubix Corporation

Table 1
Background Data

Source Owner/Operator:	**Florida Gas Transmission Co.** 601 South Lake Destiny Drive Maitland, Florida 32751 (407) 875-5816 TEL (407) 875-5896 FAX Attn: Allan Weatherford
Testing Organization	**Cubix Corporation** 9225 Lockhart Hwy Austin, Texas 78747 (512) 243-0202 TEL (512) 243-0222 FAX Attn: Lowell Faulkner
Test Participants:	**Florida Gas Transmission Co.** Allan Weatherford Fred Griffin **Dresser Rand** David Anderson **Cubix Corporation** Lowell Faulkner Rick Krenzke Joe Rudyk
Test Date:	March 24, 1992
Location:	near Silver Springs in Marion County, Florida
Process Description:	Dresser Rand compressor engine
Sampling Points:	Exhaust stack of compressor engine (See Appendix A)
Regulatory Application:	Florida Department of Environmental Regulation Permit No. AC42-189455

Required Test Methods:	EPA Method 1 for traverse point layout EPA Method 2 for stack gas velocity EPA Method 3 for O_2 and CO_2 concentrations EPA Method 4 for moisture content EPA Method 7e for NOx concentrations EPA Method 9 for opacity observations EPA Method 10 for CO concentrations EPA Method 25 for VOC concentration ASTM D-3246 for indirect measurement of SO_2 emissions
Alternate Test Methods: (conducted for comparison purposes)	EPA Method 3a for CO_2 and O_2 concentrations Stoichiometric calculation of moisture content EPA Method 18 for VOC portion of THC concentration EPA Method 19 for calculation of stack flow rate EPA Method 25a for THC concentration AGA Carbon Balance Method for stack flow rate calculation

SUMMARY OF RESULTS

One Dresser Rand 412KVSR compressor engine was tested to determine the quantity of emissions vented to the atmosphere. The emission measurements reported herein result from tests conducted on March 24, 1992 at Compressor Station No. 17 located near Silver Springs, in Marion County, Florida. The purpose of these tests was to determine the compliance status of this engine with regard to the FDER permit.

The permit required that tests be conducted for NOx, O_2, CO_2, CO, nonmethane hydrocarbons (i.e. VOC), SO_2, and opacity. These parameters were measured throughout three 1-hour test runs on this engine while operating at full load and full speed.

The results from these three test runs are presented in Table 2. This table includes the operating data and ambient conditions for each test run. The measured concentrations of NOx, CO, O_2, CO_2, VOC, and the stack flow rates are presented in the same units and using the same test methods listed in the permit. The calculated mass emission rates of NOx, CO, and VOC are presented in terms of lbs/hr, TPY, and g/hp-hr for comparison with the permit limits.

The sulfur content of the fuel provided an indirect measurement of SO_2 emissions. The SO_2 emission rate is calculated from the total sulfur in the fuel and the estimated fuel flow as based on the Florida Gas provided horsepower.

The average emissions over the three test runs for NOx were found to be 8.28 lbs/hr, 36.3 tons/yr, and 1.58 g/hp-hr. By comparison, permit limits are 10.6 lbs/hr, 46.3 tons/yr, and 2.0 g/hp-hr. CO emissions averaged 10.0 lbs/hr, 43.8 tons/yr, and 1.91 g/hp-hr and are limited by the permit to 14.8 lbs/hr, 64.9 tons/yr, and 2.8 g/hp-hr. The tons/yr emission rates are based on 8760 hrs/year operation of the engine.

The total sulfur content of the fuel was determined via laboratory analysis by Southern Petroleum Labs of Houston, Texas. The result of that analysis is contained in Appendix H and show that the fuel contained less than 0.059 grains/100 DSCF. The permit limits the sulfur content of the fuel to

10 grains/100 DSCF. The mass emission rate of SO_2 presented in Table 2 was calculated from the estimated fuel flow to the engine assuming that all sulfur in the fuel was oxidized to SO_2. The SO_2 emission rate based on this calculation averaged <0.0015 lbs/hr or <0.0066 tons/yr. The permit limits for SO_2 mass emissions are 0.49 lbs/hr and 2.2 tons/yr.

Nonmethane hydrocarbon (i.e. VOC) concentrations were measured as required by the permit using EPA Method 25. Table 2 contains the results of those measurements. The average VOC emissions using Method 25 were 3.2 lbs/hr, 14.0 tons/yr, and 0.61 g/hp-hr. The permit limits nonmethane hydrocarbon emissions to 9.0 lbs/hr, 39.4 tons/yr, and 1.7 g/hp-hr.

It is Cubix's belief that the applicability of using EPA Method 25 on this type of source is questionable. Method 25 results are affected by CO_2 and moisture interferents, both of which are present in percent levels in engine exhaust. These interferences would be expected to cause a high bias of the VOC concentration measurements. Even under ideal circumstances (i.e. measurements made from a matrix of air containing little or no CO_2 or moisture), the minimum detection limit of this method is 50 ppmv as compared to a minimum detection limit of <1.0 ppmv using other EPA test methods. For this reason, Cubix chose to also conduct VOC testing on this source using alternate, more appropriate methods.

Appendix I contains the results of these engine tests using alternate test methods. The alternate methods provided for a continuous measurement of total hydrocarbon concentrations (THC) using EPA Method 25a. The nonmethane portion of the THC was measured periodically during each test run using an on-site gas chromatograph as per EPA Method 18.

Examination of the data in Appendix I shows that the VOC emissions using the alternate methods averaged 1.01 lbs/hr (4.42 tons/yr and 0.19 g/hp-hr). When compared with the data obtained from Method 25, one can see that the CO_2 and moisture interferents may have biased the VOC concentrations high. In addition, the alternate methods are much less labor intensive, which eliminates a lot of the possibility of human error from the field or lab personnel.

Other alternate methods test results presented in Appendix I include the use of EPA Method 3a for O_2 and CO_2 concentrations rather than the Orsat procedure of EPA Method 3. Since turbulent, pulsating, engine exhaust can sometimes produce questionable flow rate results using a pitot tube, the exhaust flow rates were calculated stoichiometrically using two methods: (1) EPA Method 19 F-factors and (2) American Gas Association's Carbon Balance Method. Appendix I contains data that compares the flow rate results using these methods with those using the pitot tube traverse techniques of EPA Methods 1-4. The moisture content was also calculated stoichiometrically and compared with that obtained using EPA Method 4.

Appendix I shows that the instrumental techniques of EPA Method 3a provide more precision in measuring O_2 and CO_2 concentrations than the Orsat procedures of Method 3. When the proper analyzer range is used, EPA Method 3a provides a precision of tenfold that of EPA Method 3, even under the best of circumstances (i.e. no human error in performing Orsat). In addition, the *Quality Assurance* section of this report shows that EPA Method 3a results can be directly traced to various QA procedures including certified calibration gases and instrument linearity and interference tests. EPA Method 3 provides for no quality assurance procedures to ensure the accuracy of the results.

Data showing the use of stoichiometric calculations for determination of stack flow rate (i.e. F-factors and carbon balance) as well as for the stack moisture content included in Appendix I demonstrates that alternate methods are in agreement with the pitot tube traverse technique. During all three test runs on this engine, the moisture content obtained from stoichiometric calculations showed agreement within 10% of that obtained using EPA Method 4. The flow rate determination using F-factors agreed with the pitot tube measurements within 10%, averaged over the three test runs, and the carbon balance provided agreement within 15%.

Cubix's purpose in performing the additional testing on this unit in order to provide the data included in Appendix I is threefold:

(1) The unofficial VOC data provides alternate results to consider with regard to the compliance status of the unit. As stated earlier, Cubix believes that the data obtained from the alternate methods is more accurate than that obtained from the permit required test method.

(2) It is hoped that the data included in Appendix I can be used to allow for alternate test methods to be used on future emission tests on similar sources.

(3) The stoichiometric flow rate data included in Appendix I helps to verify the reasonableness of the results obtained from the pitot tube measurements of the exhaust flow.

Examples of any calculations necessary for presentation of the results of this section of the report or the alternate data contained in Appendix I are available in Appendix B of this report. Field data sheets and chain of custody records is presented in Appendix A as is the Method 25 laboratory analysis results. The strip chart records on which the instrumental analyses were recorded are provided in Appendix E and the chromatograms used for the Method 18 analyses can be found in Appendix F.

Opacity observation results and the certification for the technician performing the visible emission readings are contained in Appendix G. The permit stipulated that visible emissions shall not exceed 10%.No opacity was observed throughout the three 1-hour tests.

TABLE 2
SUMMARY OF RESULTS

Operator/Plant	Florida Gas Silver Springs Compressor Stati
Location	Marion County, Florida
Source	Dresser-Rand Compressor Engine
Technicians	RK,LF,JR

Test Run No.	C-1	C-2	C-3
Date	3/24/92	3/24/92	3/24/92
Start Time	10:06	13:00	14:10
Stop Time	11:06	14:00	15:10
Engine/Compressor Operation			
Engine Speed (rpm)	330	329	330
Ignition Timing (°BTDC)	14	14	14
Air Manifold Pressure (psig)	8.8	9	9
Air Manifold Temperature (°F)	128	128	128
Estimated Fuel Flow AT 7800 BTU/hp-hr (SCFH	17951	17951	18699
Fuel Temperature (°F)	68	68	68
Fuel Manifold Pressure (psig)	27.5	27.4	27.4
Pre-Combustion Chamber Pressure (psig)	19	19.1	19.2
Exhaust Temperature (°F)	704	701	700
Turbo (rpm x 100)	158/157	159/157	160/159
Pockets Open	12	12	12
Suction Pressure (psig)	790	742	733
Suction Temperature (°F)	69	68	69
Discharge Pressure (psig)	938	915	905
Discharge Temperature (°F)	98	108	104
Engine Load (BHP)	2352	2352	2450
Torque (%)	98	98	99
Ambient Conditions			
Atmospheric Pressure (in. Hg)	30.05	30.03	30.03
Temperature (°F) : Dry bulb	70	72	72
(°F) Wet bulb	62	62	68
Humidity (lb/lb air)	0.0098	0.0093	0.0134
Measured Emissions			
NOx (ppmv)	192	160	133
CO (ppmv)	329	324	312
O2 via EPA Method 3 (vol %)	12.2	12.0	12.0
CO2 via EPA Method 3 (vol %)	4.8	5.0	5.0
VOC via EPA Method 25 (ppmv)	195.7	167.0	176.6
SO2 in fuel (grains/100 DSCF)	<0.059	<0.059	<0.059
Stack Volumetric Flow Rates			
via Pitot Tube (SCFH, dry)	4.38E+05	4.26E+05	4.18E+05
Calculated Emission Rates (via pitot tube)			
NOx (lbs/hr)	10.05	8.14	6.65
CO (lbs/hr)	10.5	10.0	9.5
VOC (lbs/hr)	3.56	2.96	3.07
SO2 (lbs/hr)	<0.0015	<0.0015	<0.0016
NOx (tons/yr)	44.0	35.7	29.1
CO (tons/yr)	45.9	43.9	41.6
VOC (tons/yr)	15.6	12.9	13.4
SO2 (tons/yr)	<0.0066	<0.0066	<0.0069
NOx (g/hp-hr)	1.94	1.57	1.23
CO (g/hp/hr)	2.02	1.94	1.76
VOC (g/hp-hr)	0.69	0.57	0.57

PROCESS DESCRIPTION

Florida Gas Transmission Co. owns and operates Compressor Station No. 17 located near Silver Springs, Florida. This plant uses engines to compress natural gas to allow for transportation in the main pipeline system. This compressor station is a part of a system developed by Florida Gas Transmission Company to allow the transport of natural gas from reserves in Texas to the Florida market.

The engine tested is a Dresser Rand 412KVSR compressor engine bearing the serial number 412KVSRA226AP. The engine is rated at 2400 BHP. It is a lean burn, high air/fuel ratio engine including a precombustion chamber on each cylinder, main chamber mixture regulation, and a variable timing spark control responsive to speed, torque, and air temperature.

The engine emissions are vented to the atmosphere through a 23.5" ID exhaust pipe at approximately 45 feet above grade. Two sample ports were installed in a straight horizontal section of the exhaust pipe between the engine and the silencer. The ports met EPA Method 1 criteria with regard to location. A field diagram of the sampling location can be found in Appendix A.

ANALYTICAL TECHNIQUE

The sampling and analysis procedures used during these tests conform in principle with the methods outlined in the Code of Federal Regulations, Title 40, Part 60, Appendix A, Methods 1, 2, 3, 3a, 4, 7e, 9, 10, 18, 19, 25, and 25a, ASTM D-3246, and AGA's carbon balance method for flow rate measurement. Table 3 provides a description of the analyzers used for the instrumental portion of the tests.

Figure 1 depicts the sample system used for the tests. A stainless steel probe was inserted into the sample port of the stack. The gas sample was continuously pulled through the probe and transported via 3/8 inch heat-traced Teflon® tubing to the mobile laboratory located at ground level. To prevent the possibility of condensation of heavier hydrocarbons, the sample was then delivered to the THC analyzer and gas chromatograph portion of the sample manifold via a stainless steel/Teflon® diaphragm pump through more heat-traced sample line (i.e. wet sample). The remaining sample then passed through a stainless steel minimum-contact condenser designed to dry it. The dry sample returned to the sample manifold. From the manifold, the sample was partitioned to the NOx, CO, O_2, and CO_2 analyzers through glass and stainless steel rotameters that controlled the flow rate of the sample.

Figure 1 shows that the sample system was also equipped with a separate path through which a calibration gas could be delivered to the probe and back through the entire sampling system. This allowed for convenient performance of system bias checks as required by the testing methods.

All instruments were housed in an air conditioned trailer-mounted mobile laboratory. Gaseous calibration standards were provided in aluminum cylinders with the concentrations certified by the vendor. EPA Protocol No. 1 was used to determine the cylinder concentrations where applicable (i.e. NOx calibration gases).

All data from the continuous monitoring instruments were recorded on two synchronized 3-pen strip chart recorders (Soltec Model 1243). These recorders were operated at a chart speed of 30 centimeters/hour, recording over a 25-centimeter width. Strip chart records can be found in Appendix E of this report.

EPA Method 1 was used to determine the velocity traverse point locations. The stack diagram of Appendix A shows that the sample ports did meet the location criteria set forth by the method. The sample ports were located approximately 5 diameters downstream and 5 diameters upstream of the nearest flow disturbances.

EPA Method 2 was used to measure the stack gas velocity. A pitot tube and inclined manometer were used to measure the head pressure at each of sixteen traverse points. The stack temperature was determined with a K-type thermocouple and digital thermometer. Cubix checked for cyclonic flow during the first test run and found that none existed.

The stack gas analyses for CO_2 and O_2 concentrations were performed in accordance with procedures set forth in EPA Method 3. An Orsat device was used on a bag sample collected throughout each test run. Instrumental analyses (NDIR) as per EPA Method 3a were also used for O_2 and CO_2 concentrations due to the greater accuracy and precision provided by the instruments. The CO_2 analyzer was based on the principle of infrared absorption; and, the O_2 analyzer operated on a paramagnetic cell. The data presented in *Summary of Results* contains the O_2 and CO_2 concentrations obtained from EPA Method 3. Appendix I makes use of the data obtained from EPA Method 3a.

EPA Method 4 was used to measure the moisture content of the stack during each test run. An impinger train was used in conjunction with a calibrated dry gas meter. The sample used for the moisture determination was taken from the heat traced-line upstream of the condensor (see *Figure 1*). The moisture content was also estimated stoichiometrically using the combustion moisture, excess air dilution, and ambient humidity in the combustion air. The velocity template in Appendix I shows that the agreement was greater than 90% between stack moisture measurement methods. All calculations involved in the *Summary of Results* make use of the moisture measurements obtained from EPA Method 4.

Means, in addition to EPA Methods 1-4, were also employed to obtain the stack gas flow rate. The F-factor calculations of EPA Method 19 and the AGA carbon balance method both provided results that were approximately 10% less than those obtained by the pitot tube measurement. Both of these methods use stoichiometric relationships based on the estimated fuel flow, fuel composition, and excess air concentration for calculation of the stack flow rates. The *Summary of Results* uses the pitot tube values in all calculations to be consistent with the permit provisions. However, the alternate methods provided for a check of the pitot tube traverse results.

EPA Method 7e was used to determine concentrations of NOx. A chemiluminescence cell analyzer was used. The NOx mass emission rates were calculated as if all the NOx were in the form of NO_2. This approach corresponds to EPA's convention. However, it tends to overestimate the actual stack NOx mass emission rates, since the majority of the NOx is in the form of NO which is less dense (i.e. lbs of emissions per ppmv concentration) than the NO_2 form of NOx. This gives a worst case scenario of NOx emissions.

Opacity was determined via EPA Method 9. A one-hour opacity test run was performed concurrently with each gaseous compliance test run. The observer was certified with EPA in Florida. Appendix G provides the observer's field data sheets as well as Method 9 certification documentation.

CO emission concentrations were quantified in accordance with procedures set forth in EPA Method 10. A continuous nondispersive infrared (NDIR) analyzer was used for this purpose. This analyzer was equipped with a gas correlation filter which also removes any interference from CO_2, or other combustion products.

The non-methane portion of the hydrocarbon emissions (i.e. VOC) were determined using EPA Method 25 as required by the permit. Clean Air Engineering of Palatine, Illinois provided the sample system apparatus for Cubix's sample collection. A Clean Air Engineering Model 2610 instrument was used for the sample collection.

A gaseous sample was pulled under a vacuum through a heated probe and filter to a trap/tank assembly. The trap was immersed in dry ice to remove moisture and heavier hydrocarbons. The remaining sample was then collected in the tank. The tank started with a vacuum of approximately 30 in. Hg and the sample rate was set such that the vacuum was nearly depleted at the end of each one-hour test run. Each one-hour test run coincided with the other gaseous analyses. The field data sheets involved with the sample collection of this measurement are included in Appendix A. Following sample collection, the tanks and traps were packed in dry ice and shipped to Clean Air Engineering where the laboratory analyses for nonmethane hydrocarbon concentrations were performed. The data presented in *Summary of Results* reflects the VOC measurements taken using this technique.

VOC concentrations were also quantified during each test run using EPA Methods 25a and 18. Cubix feels that these test methods provide more accurate results on this type of source than does Method 25. The unofficial data contained in Appendix I summarizes the results obtained using these alternate methods.

Total hydrocarbon concentrations were determined continuously throughout each test run using an flame ionization detector (FID). This instrument was calibrated before and after each test run using methane standards of a known concentration. Therefore, the response of this instrument is based on methane equivalents.

During each test run, a minimum of two shots were taken on a gas chromatograph as per the procedures of EPA Method 18. The chromatograms contained in Appendix F show that the methane concentration of the THC was separated on the unit to allow for the determination of the VOC portion of the THC. A Hewlett Packard 5890 gas chromatograph equipped with a flame ionization detector and a 1cc sample loop was operated with a temperature program of 40°C for 1 min. and an increase of 15°C per minute until 150°C was reached. The Chrompack PoraPlot Q capillary column head pressure was maintained at 8 psi. The hydrogen and air flows to the detector were maintained at 10 psi and 20 psi respectively. This instrument was calibrated on methane standards before and after each test run.

One fuel sample was taken at this compressor station and analyzed via ASTM D-3246 to determine the total sulfur content of the fuel. By assuming that all of the sulfur in the fuel was oxidized to SO_2, the SO_2 mass emission rate can be calculated from the fuel flow to the engine. The fuel flow to the engine was estimated based on the horsepower value provided by Florida Gas, the heating value of the fuel, and an assumed heat efficiency (i.e. BTU/hp-hr) for an engine of this type. The fuel analysis was conducted by Southern Petroleum Labs of Houston, Texas and a copy of that report is contained in Appendix H.

Cubix personnel collected ambient absolute pressure, temperature and humidity data. A sling psychrometer was used to determine temperature and humidity conditions. An aircraft-type aneroid barometer (altimeter) was used to measure absolute atmospheric pressure.

During the tests, the engine and compressor operational data was collected by Florida Gas personnel and is presented in Appendix A. Key operational data collected include compressor discharge pressures, compressor suction pressures, engine manifold pressure, engine speed, timing, and horsepower. Florida Gas also provided a recent fuel composition analysis to allow for the calculation of the heating values and F-factors.

TABLE 3
ANALYTICAL INSTRUMENTATION

Parameter	Model and Manufacturer	Common Use Ranges	Sensitivity	Response Time (sec.)	Detection Principle
NOx	TECO 10S	0-10 ppm 0-100 ppm 0-200 ppm 0-500 ppm 0-1,000 ppm 0-5,000 ppm	0.1ppm	1.7	Thermal reduction of NO_2 to NO. Chemiluminescence of reaction of NO with O_3. Detection by PMT. Inherently linear for listed ranges.
CO	TECO 48	0-10 ppm 0-20 ppm 0-50 ppm 0-100 ppm 0-200 ppm 0-500 ppm 0-1000 ppm	0.1ppm	10	Infrared absorption, gas filter correlation detector, micro-processor based linearization.
CO_2	Servomex 1410 B	0-4% 0-20%	0.02%	30	Infrared absorption, analog linearization.
O_2	Servomex 1420 B	0-10% 0-25 %	0.1%	15	Paramagnetic cell, inherently linear.
THC	JUM Model 5-100	0-10, 0-100, 0-1000, 0-10000 0-100000 ppm	0.2 ppm	5.0	Flame ionization of hydrocarbons inherently linear over 2 orders of magnitude.
VOC	HP 5890A	0-10, 0-100 ppm	0.5 ppm	na	Flame ionization of hydrocarbons inherently linear over 2 orders of magnitude.

NOTE: Higher ranges available by sample dilution.
Other ranges available via signal attenuation.

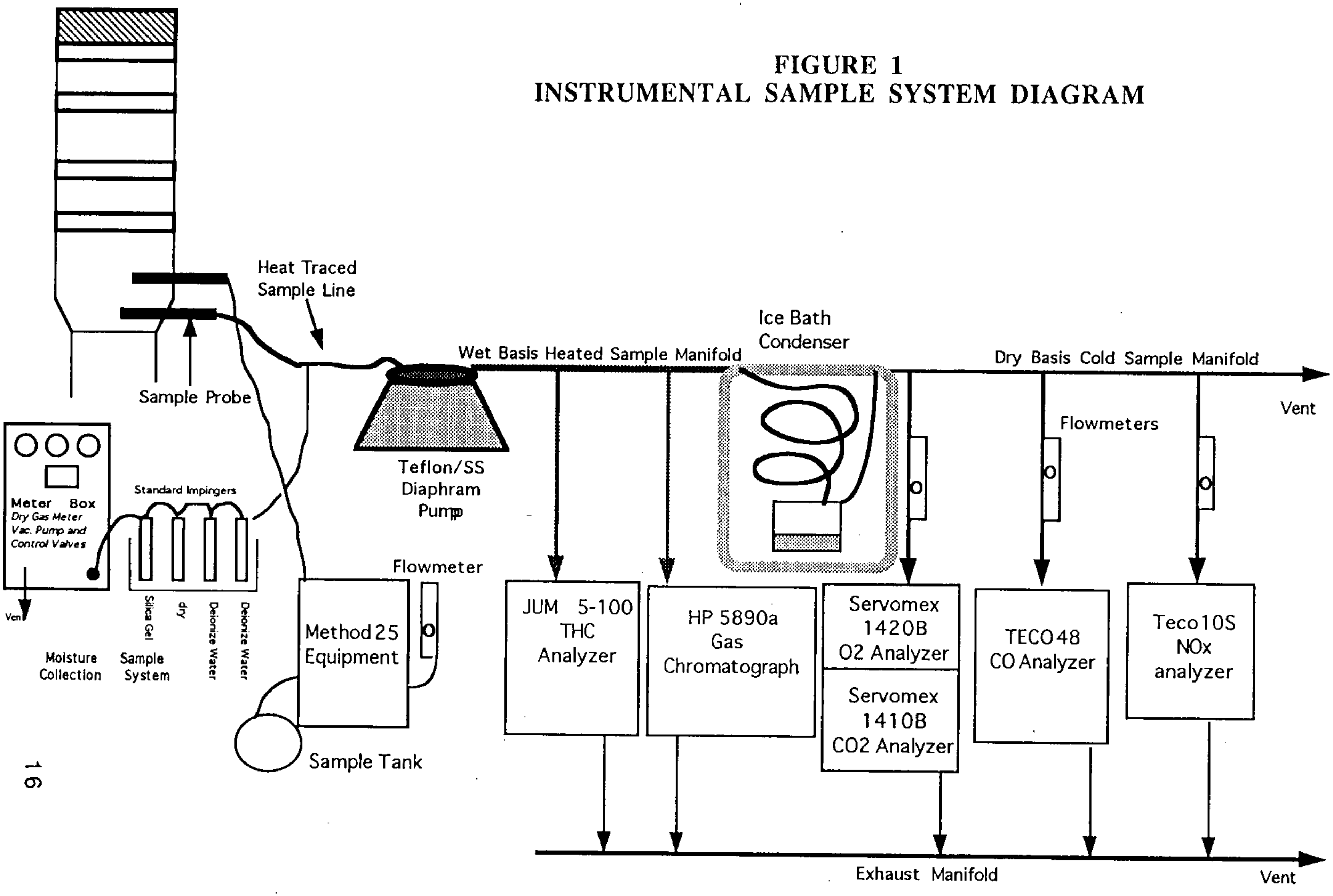


FIGURE 1
INSTRUMENTAL SAMPLE SYSTEM DIAGRAM

QUALITY ASSURANCE ACTIVITIES

A number of quality assurance activities were undertaken before, during, and after this testing project. This section of the report combined with the documentation in Appendices C and D describe each of those activities.

Each instrument's response was checked and adjusted in the field prior to the collection of data via multi-point calibration. The instrument's linearity was checked by first adjusting the it's zero and span responses to zero (nitrogen) and an upscale calibration gas in the range of the expected concentrations. The instrument response was then challenged with other calibration gases of known concentration and accepted as being linear if the response of the other calibration gases agreed within ± 2 percent of range of the predicted values. (The response of the infrared absorption type CO and CO_2 analyzers is electronically linearized.). The strip chart excerpts that present the results of the multi-point linearity test are provided in Appendix C.

Before and after each test run, the analyzers were checked for zero and span drift. This allowed each test run to be bracketed by calibrations and documents the precision of the data just collected. The criterion for acceptable data is that the instrument drift is no more than 2 percent of the full scale response. The quality assurance worksheets in Appendix E summarize all multipoint calibration checks and zero to span checks performed during the tests. These worksheets (as prepared from the strip chart records of Appendix E) show that no drifts in excess of 2 percent existed.

Interference response tests on the instruments were conducted by the instrument vendors and Cubix Corporation on the NOx, CO, CO_2, and O_2 analyzers. The sum of the interference responses for H_2O, CO, SO_2, CO_2 and O_2 (as appropriate for each analyzer) are less than 2 percent of the applicable full scale span value. The instruments used for the tests meet the performance specifications for EPA Methods 3a, 7e, and 10. The results of the interference tests are available in Appendix C of this report.

The residence time of the sampling and measurement system was estimated using the pump flow rate and the sampling system volume. The pump's rated flow is 0.8 SCFM at 5 psig. The sampling system volume is 0.13 scf. Therefore, the sample residence time is approximately 10 seconds.

The NOx and O_2 sampling and analysis system was checked for response time per the procedures outlined in EPA's Method 20. The average NOx analyzer's response times were 0.61 minutes upscale and 0.65 minutes downscale. The O_2 analyzer's response times were 0.76 minutes (46 seconds) upscale and 0.88 minutes (53 seconds) downscale. The results of these response time tests are contained in Appendix C.

The sampling systems were leak checked by demonstrating that a vacuum greater than 10" Hg (21 in. Hg actual) could be held for at least 1 minute with a decline of less than 1" Hg. A leak test was conducted after the sample system was set up and before the system was dismantled (i.e. after testing was completed). This test was conducted to ensure that ambient air had not diluted the sample. Any leakage detected prior to the tests was repaired and another leak check conducted before testing commenced. No leaks were found during the post test leak checks.

The moisture train and Method 25 sample systems were leak checked independently of the gaseous sample system before and after each individual test run. These leak checks were performed in accordance with EPA Methods 4 and 25 to ensure that the sample was not diluted by ambient air. No leaks were detected.

The absence of leaks in the sampling system was also verified by a system bias check. The sampling system's integrity was tested by comparing the responses of the NOx analyzer to a calibration gas introduced via two paths. The first path was into the analyzer via the zero/span calibration manifold. The second path was to introduce a calibration gas into the sample system at the sample probe. Any difference in the instrument responses by these two methods was attributed to sampling system bias or leakage. NOx was used for this bias check because it is the most reactive of the compounds measured. The bias check was also conducted using methane standards on the THC analyzer. The criteria for acceptance is agreement within 2% of the full scale range of the analyzer. Examination of the strip chart excerpts and Instrumental Analysis Quality Assurance Data worksheet in Appendix C show that the analyzer response via both sample paths agreed within 2% in all cases.

The efficiency of the NO_2 to NO converter in the NOx analyzer was checked by having the analyzer sample a mixture of NO in N_2 standard gas and zero air from a Tedlar® bag. When this bag is mixed and exposed to sunlight, the NO is oxidized to NO_2 over approximately a 30-minute period. If the NOx instrument's converter is 100% efficient, then the NOx response does not decrease as the NO in the bag is converted to NO_2. The criterion for acceptability is a demonstrated NOx converter efficiency greater than 90%. The strip chart excerpts that demonstrate the converter efficiency test are available in Appendix C. The above mentioned quality assurance worksheet of Appendix C also summarizes the results of the converter efficiency test.

The control gases used to calibrate the instruments were analyzed and certified by the compressed gas vendors to ± 1% accuracy for NOx and O_2, and to ± 2% accuracy for the remaining gases. EPA Protocol No. 1 was used, where applicable (i.e. NOx gases), to assign the concentration values traceable to the National Bureau of Standards, Standard Reference Materials (SRM's). The gas calibration sheets as prepared by the vendor are contained in Appendix D.

The pitot tube tips used during the testing were visually inspected to ensure that they met the criteria of EPA Method 2. The pitot tubes were also wind tunnel tested and the results of those tests are contained in Appendix D. The pitot tube lines were leak checked in the field each time connection to the manometer was made in accordance with EPA Method 2 guidelines.

The dry gas meter used for the moisture train was calibrated prior to testing in accordance with EPA Method 4. A standard dry gas meter traceable to NIST was used for this calibration. Calibration certification documentation of the dry gas meter can be found in Appendix D.

Appendix D also contains calibration data on the altimeter and digital thermometer used during this testing.

The observer for the opacity measurements was certified in Florida. The certification for the observer can be found in Appendix G.

Two Method 25 audit samples were provided by EPA at another compressor station during this series of compressor station tests. These audit samples were collected using the same equipment and techniques used during this test. The laboratory analysis of these audits were conducted concurrently with the sample analyses. The results of the audit samples are included in Appendix C.

Cubix collected and reported the enclosed test data in accordance with the procedures and quality assurance activities described in this test report. Cubix makes no warranty as to the suitability of the test methods. Cubix also assumes no liability relating to the interpretation and use of the test data.

APPENDIX A: FIELD DATA SHEETS AND OPERATIONAL DATA

SIGN IN SHEET

JOB NAME: Florida Gas

DATE: 3 / 24 / 92

LOCATION: Silver Springs

PERMIT #: AC 42-189455

PSD FL 162

SOURCE(S): ~~[illegible]~~ Dresser-Rand Engine

where is the ~~plate with name/serial number for this engine?~~

PARTICIPANTS: Cubix Corporation

Florida Gas

D-R

NAME:	AFFILIATION:	PHONE NUMBER:
Lowell Fairbairn	CUBIX	512 243 0202
Rick J. Krenzke	Cubix Corp.	512-243-0202
David N. Anderson	Dresser-Rand	607-937-2128
Allan Witanderford	FLA. GAS	(407) 875-5800
Fred Griffin	" "	" " "
Joe Rudyk	Cubix Corp.	512-243-0202

112 KVSRA

112KVSRA226AP

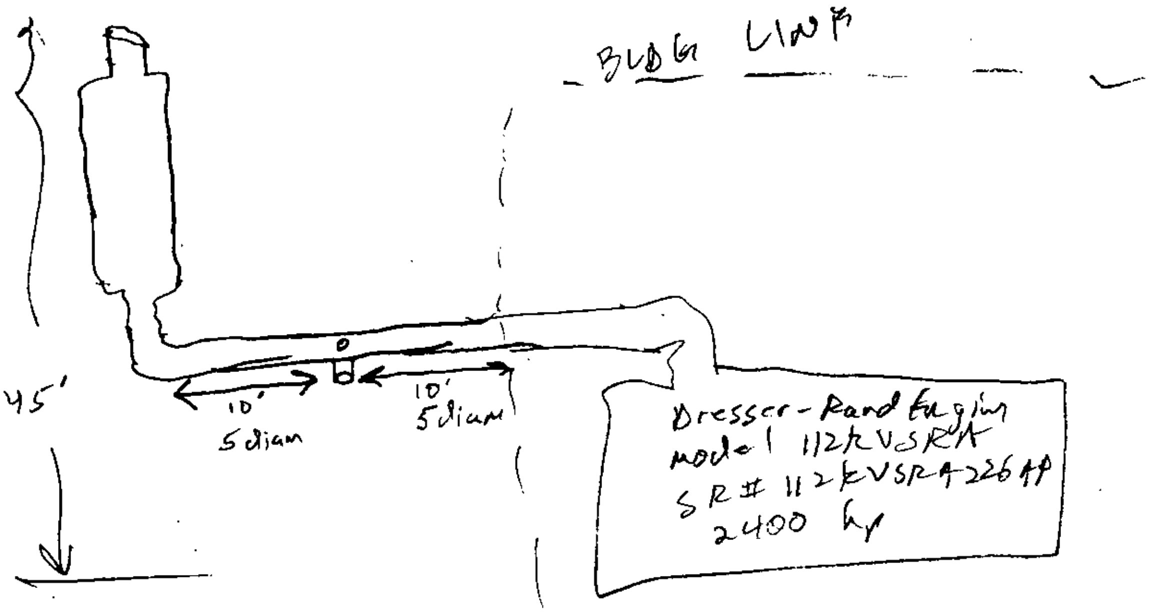
2400 ~~[illegible]~~

Circular Stack Sampling Traverse Point Layout
(EPA Method 1)

Date: 3/24/92
Plant: FGT / Silver Springs
Source: Dresser Rand Engine
Technician(s) RK LF SR

Port + Stack ID: 27.5 in.
Port Extension 4 in.
Stack ID: 23.5 in.
Stack Area 3.01 ft^2
Total Req'd Traverse Pts. 16
No. of Traverse Pts. 8 /diam.
No. of Traverse Pts. 8 /port

Stack Diagram (Side View showing major unit components, dimensions and nearest upstream & downstream flow disturbances)



Traverse Point Number	Length Factor (% of diameter) Number of traverse pts./diameter 4	6	8	12	Distance from Reference Point (inches)
1	6.7	4.4	3.2	2.1	.75=1
2	25.0	14.6	10.5	8.2	2.5
3	75.0	29.6	19.4	11.8	4.6
4	93.3	70.4	32.3	17.7	7.6
5		85.4	67.7	25.0	15.9
6		95.6	80.6	35.6	18.9
7			89.5	64.4	21
8			96.8	75.0	22.7=22.5
9				82.3	
10				88.2	
11				93.3	
12				97.9	

MOISTURE AND VELOCITY FIELD DATA SHEETS

Date: 3-24-92
Plant/Operator: FGT - Silver Springs #17
Source: Dresser Model 412 KVSR Recip
Technicians: RK, LF, JR
Atm. Pres. 30.05 in.Hg(Pb)
Test Run # C-1

Dry Gas Meter ID: Anderson # 12863061
Dry Gas Meter Factor: .9904 (Kd)
Pitot Tube #/Type: #109 S-Type
Pitot Tube Factor: .84 (Kp)
Static Pres. + 1.3 in.H2O(Pg)
Average Stack Temp. ~~646~~ 646 °F(Ts)

Pre-test Leak check	ft.3/min at in. Hg Vacuum
OK	0.0 @ 21"
Post-test Leak check	0 ft.3/min at 23 in. Hg Vacuum
OK	

Impinger #	Contents	Initial Weight	Final Weight
1	H2O	577.8	610.3
2	H2O	598.0	596.2
3	MT	460.0	462.3
4	SG	845.1	858.2
5			
6			
Totals	X	2480.9	2527

Moisture Train

	Initial	Final
Time:	10:11	1114
Meter Reading (ft3 or L)	838.300	862.65
Meter Temp. (°F)	90	116
Sample Box #	T-7	

O2 %	12.1
CO2 %	4.7

Orsat Results

Pitot Tube Traverse/Stack Temp./Angle

Traverse Pt.	Bottom ΔP (" H2O)	°F	ß	Side ΔP (" H2O)	°F	ß
1	1.3			1.4		
2	1.4			1.3		
3	1.4			1.4		
4	1.2			1.2		
5	1.3			1.2		
6	1.2			1.3		
7	1.1			1.2		
8	1.3			1.1		
9						
10						
11						
12						

MOISTURE AND VELOCITY FIELD DATA SHEETS

Date: 3/24/98
Plant/Operator: FGT / Silver Springs
Source: Dresser Engine
Technicians: RK LF JC
Atm. Pres. 30.03 in.Hg(Pb)
Test Run # C-2

Dry Gas Meter ID: Anderson
Dry Gas Meter Factor: .9904 (Kd)
Pitot Tube #/Type: 107 / S-type
Pitot Tube Factor: .84 (Kp)
Static Pres. + 1.4 in.H2O(Pg)
Average Stack Temp. 656 °F(Ts)

		Impinger #	Contents	Initial Weight	Final Weight
Pre-test Leak check OK	0 ft.3/min at 21 in. Hg Vacuum	1	H_2O	610.3	644.0
		2	H_2O	596.2	598.4
Post-test Leak check OK	0 ft.3/min at 24 in. Hg Vacuum	3	MT	462.3	463.8
		4	SILICA	858.2	868.3
		5			
		6			
		Totals	X	2527	2574.5

Moisture Train

	Initial	Final
Time:	1307	1405
Meter Reading (ft3 or L)	863.16	888.52
Meter Temp. (°F)	80	109
Sample Box #	TV 750	

O2 %	12.0
CO2 %	5.0

Orsat Results

Pitot Tube Traverse/Stack Temp./Angle

Traverse Pt.	B ΔP (" H2O)	°F	ß	S ΔP (" H2O)	°F	ß
1	1.2			1.3		
2	1.3			1.3		
3	1.2			1.2		
4	1.1			1.2		
5	1.2			1.3		
6	1.3			1.2		
7	1.2			1.1		
8	1.1			1.1		
9						
10						
11						
12						

MOISTURE AND VELOCITY FIELD DATA SHEETS

Date: 3/24/92
Plant/Operator: FGT / Silver Springs
Source: Dresser Recip Unit #5
Technicians: RK, LF, JR
Atm. Pres. 30.03 in.Hg(Pb)
Test Run # C-3

Dry Gas Meter ID: Anderson
Dry Gas Meter Factor: .9904 (Kd)
Pitot Tube #/Type: .84
Pitot Tube Factor: # 107 S-Type (Kp)
Static Pres. + 1.4 in.H2O(Pg)
Average Stack Temp. 655 °F(Ts)

Pre-test Leak check	ft.3/min at in. Hg Vacuum
OK	0.0 @ 28"
Post-test Leak check	**ft.3/min at in. Hg Vacuum**
OK	0.0 @ 25"

Impinger #	Contents	Initial Weight	Final Weight
1	H_2O	598.4	646.5
2	H_2O	544.0	630.9
3	mT	463.8	465.0
4	SG	868.3	876.5
5			
6			
Totals		2574.5	2618.9

Moisture Train

	Initial	Final
Time:	1419	1510
Meter Reading (ft3 or L)	889.130	911.22
Meter Temp. (°F)	95	101
Sample Box #	Tr 7 Box	

O2 %	12.0
CO2 %	5.0

Pitot Tube Traverse/Stack Temp./Angle

Traverse Pt.	ΔP (" H2O) B	°F	ß	ΔP (" H2O) S	°F	ß
1	1.2			1.2		
2	1.2			1.2		
3	1.2			1.1		
4	1.1			1.1		
5	1.2			1.2		
6	1.2			1.3		
7	1.1			1.3		
8	1.0			1.2		
9						
10						
11						
12						

Silver Springs Compressor Station--Moisture, Molecular Weight, Stack Flow Rate

Operator/Plant Florida Gas Silver Springs Compressor Stati
Location Marion County, Florida
Source Dresser-Rand Compressor Engine
Technicians RK,LF,JR

Test Run No.	C-1	C-2	C-3
Stack Moisture & Molecular Wt. via EPA Method 4			
CO2 (%)	4.80	5.00	5.00
O2 (%)	12.20	12.00	12.00
Beginning Meter Reading (ft3)	838.300	863.160	889.130
Ending Meter Reading (ft3)	862.650	888.520	911.220
Beginning Impinger Wt (g)	2480.9	2527	2574.5
Ending Impinger Wt. (g)	2527	2574.5	2618.9
Dry Gas Meter Factor (Kd)	0.9904	0.9904	0.9904
Dry Gas Meter Temperature (°F begin)	90	80	95
Dry Gas Meter Temperature (°F end)	116	109	101
Atmospheric Pressure (in Hg, abs.)	30.05	30.03	30.03
Stack Gas Moisture (% volume)	8.74	8.54	9.16
Dry Gas Fraction	0.913	0.915	0.908
Stack Gas Molecular Wt. (lbs/lb-mole)	28.27	28.32	28.25
Stack Flow Rate via Pitot Tube			
Pitot Tube Factor	0.84	0.84	0.84
ΔP #1	1.30	1.20	1.20
ΔP #2	1.40	1.30	1.20
ΔP #3	1.40	1.20	1.20
ΔP #4	1.20	1.10	1.10
ΔP #5	1.30	1.20	1.20
ΔP #6	1.20	1.30	1.20
ΔP #7	1.10	1.20	1.10
ΔP #8	1.30	1.10	1.00
ΔP #9	1.40	1.30	1.20
ΔP #10	1.30	1.30	1.20
ΔP #11	1.40	1.20	1.10
ΔP #12	1.20	1.20	1.10
ΔP #13	1.20	1.30	1.20
ΔP #14	1.30	1.20	1.30
ΔP #15	1.20	1.10	1.30
ΔP #16	1.10	1.10	1.20
Sum of Square Root of ΔP's	18.0	17.6	17.3
Number of Traverse Points	16	16	16
Average Square Root of ΔP's	1.13	1.10	1.08
Average Temperature (°F)	646	656	655
Static Pressure (in. H2O)	1.3	1.4	1.4
Stack Diameter (in.)	23.5	23.5	23.5
Stack Area (ft2)	3.01	3.01	3.01
Stack Velocity (ft/min)	5524	5409	5342
Stack Flow,wet (ACFM)	16638	16291	16091
Stack Flow,dry (SCFH)	4.38E+05	4.26E+05	4.18E+05

Volatile Organic Carbon by Method 25

Client: Florida GAS Trans.
Plant: Silver Springs # 17
Operator: JR, LF, RK
Run Number: C-1
Tank Number: 4 T-89
Sampling Train ID#:
Side: Left / Right: Sample-1
Start Time: 1006

Project #:
Sample Location: Stack
Date: 3-24-92
Sample ID: C-2
Trap Number: X-48
% CO2: 5.0
% H2O: 9.0
Stop Time: 1100

Pressure Readings	Tank Vacuum Manometer mm Hg / in Hg	Tank Vacuum Gauge mm Hg / in Hg	Barometric Pressure mm Hg / in Hg	Ambient Temperature C / F
Pre Test	28.00	28.80	30.05	68
Post Test	5.70	6.00	30.05	69

Leak Rate	Tank* (in Hg) Allowable	Tank* (in Hg) Actual	Trap black ball reading
Pre Test	1.051	0	0
Post Test	1.051	0	0

$$\Delta P = .01 \frac{F \, Pb \, \emptyset}{Vt}$$

ΔP = Pressure Change (in Hg)
F = Sampling Flow Rate cc / min
Pb = Barometric Pressure (in Hg)
ø = Leak Check Time Period (min)
Vt = Sample Train Volume (cc); approx 100 cc

Clock Time	Gauge Vacuum (in Hg)	Flowmeter Setting (silver ball)	Probe Temp C/F	Filter Temp C/F	Notes
10500	28.80	35	265	260	Start
1005	26.40	35	265	260	
1010	24.70	35	265	260	
1015	23.00	30	265	261	
1020	21.00	33	265	261	Adjust Flow
1025	18.80	33	266	263	"
1030	16.50	35	266	264	
1035	14.90	33	267	264	
1040	12.30	35	267	265	
1045	10.50	30	267	266	
1050	8.70	28	267	267	Adjust Flow
1055	7.90	24	267	267	" "
1100	6.00	30	267	267	

Volatile Organic Carbon by Method 25

Client:	Florida Gas Trans	Project #:	
Plant:	Silver Springs	Sample Location:	
Operator:	JR, LF, RK	Date:	3-24-92
Run Number:	Ch2	Sample ID:	C-2
Tank Number:	4 T-80	Trap Number:	C-1
Sampling Train ID#:		% CO2:	5.0
Side: Left / Right:	Sample -1	% H2O:	9.0
Start Time:	1130	Stop Time:	1230

Pressure Readings	Tank Vacuum Manometer mm Hg / in Hg	Tank Vacuum Gauge mm Hg / in Hg	Barometric Pressure mm Hg / in Hg	Ambient Temperature C / F
Pre Test	28.00	28.80	30.05	69
Post Test	7.50	7.90	30.05	71

Leak Rate	Tank* (in Hg) Allowable	Tank* (in Hg) Actual	Trap black ball reading
Pre Test	1.051	0	0
Post Test	1.051	0	0

$$\Delta P = .01 \frac{F\,Pb\,\emptyset}{Vt}$$

ΔP = Pressure Change (in Hg)
F = Sampling Flow Rate cc / min
Pb = Barometric Pressure (in Hg)
ø = Leak Check Time Period (min)
Vt = Sample Train Volume (cc); approx 100 cc

Clock Time	Gauge Vacuum (in Hg)	Flowmeter Setting (silver ball)	Probe Temp C/F	Filter Temp C/F	Notes
1130	28.80	35	267	266	Start
1135	27.00	33	267	266	
1140	24.80	35	267	265	
1145	22.60	33	267	265	
1150	20.90	30	267	266	
1155	19.20	28	267	267	Adjust Flow
1200	17.00	35	267	267	
1205	15.20	33	267	267	
1210	13.80	30	267	267	
1215	12.10	28	267	267	
1220	11.20	25	267	267	Adjust Flow
1225	9.40	35	267	267	
1230	7.90	30	267	267	

Volatile Organic Carbon by Method 25

Client: Florida GAS Trans
Project #:
Plant: Silver Springs
Sample Location: Stack
Operator: JR, LF, QK
Date: 3-24-92
Run Number: C-3
Sample ID: C-2
Tank Number: 4T-187
Trap Number: N04
Sampling Train ID#:
% CO2: 5.0
Side: Left / Right: Sample 1
% H2O: 9.0
Start Time: 1310
Stop Time: 1410

Pressure Readings	Tank Vacuum Manometer mm Hg / in Hg	Tank Vacuum Gauge mm Hg / in Hg	Barometric Pressure mm Hg / in Hg	Ambient Temperature C / F
Pre Test	28.00	28.80	30.05	71
Post Test	6.60	6.50	30.04	72

Leak Rate	Tank* (in Hg) Allowable	Actual	Trap black ball reading
Pre Test	1.0517	0	0
Post Test	1.0514	0	0

$$\Delta P = .01 \frac{F\ Pb\ \emptyset}{Vt}$$

ΔP = Pressure Change (in Hg)
F = Sampling Flow Rate cc / min
Pb = Barometric Pressure (in Hg)
ø = Leak Check Time Period (min)
Vt = Sample Train Volume (cc); approx 100 cc

Clock Time	Gauge Vacuum (in Hg)	Flowmeter Setting (silver ball)	Probe Temp C / F	Filter Temp C / F	Notes
1310	28.80	35	267	267	Start
1315	26.40	35	267	267	
1320	24.30	35	267	267	
1325	22.20	33	267	267	
1330	20.40	35	267	267	
1335	18.90	33	267	267	
1340	17.20	30	267	269	Adjust Flow
1345	15.70	33	267	267	
1350	13.90	30	267	269	
1355	12.50	28	267	267	
1400	11.40	25	267	266	Adjust Flow
1405	8.70	35	269	265	
1410	6.50	30	267	263	

4336

CHAIN OF CUSTODY RECORD

PROJ. NO.

DEPT. NO. 8151

PROJECT NAME: Cubix Corp

SAMPLERS: (Signature) [signature] Joseph Rudyk

LAB NO.	SAMPLE NO.	DATE	TIME	SAMPLE LOCATION	NO. OF CONTAINERS	CO2 BLANK value (ppmvc)	NMHC BLANK value (ppmvc)	REMARKS
	C-2	3/18/92	1020	Trap # N20		1.9		Quincy - Fla. GAS ✓
	C-3	3/18/92	1325	N21		1.8		Caryville - Fla. GAS ✓
				YWR		0.9		
	C-~~2~~	3/18/92	1210	TANK # 4T19			0.0	Caryville - Fla GAS ✓
	C-3	3/18/92	1325	4T22			0.0	Caryville - Fla GAS ✓
				4T29			1.8	
	C-3	3/26/92	1100	4T41			2.1	Melbourne - Fla. GAS ✓
				4T66			0.1	
				4T71			0.0	
	C-2	3/24/92	1330	~~4T80~~			~~0.0~~	Silver Springs - Fla. GAS ✓
	C-3	3/20/92	1120	4T81			0.2	Perry - Fla. GAS
	C-1	3/24/92	1000	~~4T89~~			0.7	Silver Springs - Fla. GAS ?
	C-2	3/20/92	1000	4T91			0.1	~~Perry - Fla. GAS~~
	C-2	3/26/92	955	4T103			0.5	Melbourne Fla. GAS.

LAB 4/2

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Relinquished by: (Signature)	Date / Time	Received for Laboratory by:	Date / Time		

REMARKS:

Clean Air Engineering
500 W. Wood Street
Palatine, IL 60067
708/991-3300

4334

CHAIN OF CUSTODY RECORD

PROJ. NO.
DEPT. NO. 8151

PROJECT NAME: Cubix Corp.

SAMPLERS: (Signature) [signature] Joseph Rudyk

LAB NO.	SAMPLE NO.	DATE	TIME	SAMPLE LOCATION	NO. OF CONTAINERS	CO2 BLANK VALUE (ppmv)						REMARKS
	C-1	3/20/92	830	Trap # B35		3.0						Melbourne - Fla. GAS ✓
	C-2	3/17/92	1530	B53		4.5						MUNSON - Fla. GAS ✓
	C-5	3/27/92		~~B233~~		1.3						Melbourne
	~~C-2~~	~~3/24/92~~	~~1130~~	~~C1~~		~~2.4~~						~~Silver Springs - Fla. GAS~~ ✓
	C-1	3/19/92	100	C3		3.5						Quincy - Fla. GAS
	Adit-2	3/26/92		C7		0.8						Melbourne
→	C-3	3/29/92	1120	C10		6.6						Perry - Fla. GAS ✓
	C-3	3/17/92	1643	C13		3.6						MUNSON. - Fla. GAS ✓
	C-3			C15		3.6						Brooker
	C-2	3/26/92	955	C37		0.8						Melbourne - Fla. GAS ✓
	C-2	3/18	1300	R002		4.3						Coating with C-PG
				R004		1.2						
				R008		2.5						
				X1		2.6						
→	C-1	3/20/92	830	X10 LAB 4/2		2.5						Perry - Fla. GAS ✓

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Relinquished by: (Signature)	Date / Time	Received for Laboratory by:	Date / Time		

REMARKS:

Clean Air Engineering
500 W. Wood Street
Palatine, IL 60067
708/991-3300

4335

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME	NO. OF CONTAINERS	CO2 BLANK VALUE (PPM VC)	REMARKS
DEPT. NO. 8151	Cubix Corp			
SAMPLERS: (Signature)	Joseph Rudyk			

LAB NO.	SAMPLE NO.	DATE	TIME	SAMPLE LOCATION	NO. OF CONTAINERS	CO2 BLANK VALUE (PPM VC)						REMARKS
→	C-2	3/20/92	1000	Trap # X13 ? Brooker		1.8						Perry - Fla. GAS ✓
				X14		0.9						
				X16		2.3						
	Audit-1	3/26/92		X23		2.6						Melbourne
				X27		1.8						
				X28		8.0						
	C-3	3/24/92	1100	X32		3.3						Melbourne - Fla. GAS ✓
	C-1	3/24/92	1000	X48		9.0						Silver Springs - Fla. GAS
	C-4	3/27/92		X9		2.3						Melbourne
	C-3	3/19/92	1135	N2		5.6						[illegible] - Fla. GAS ✓
	C-3	3/24/92	1310	N4		3.0						Silver Spring - Fla. GAS ✓
				N7		2.1						
	C-6	3/27/92		N8		2.6						Melbourne
	C-1	3/17/92	1425	N13		8.7						Munson - Fla GAS ✓
	C-4	3/18/92	1100	N19		3.0						Caryville - Fla GAS ✓

LAB 4/2

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[signature]	4/1/92 1:42	Tom Grosskan			
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Relinquished by: (Signature)	Date / Time	Received for Laboratory by:	Date / Time		

REMARKS:

CAE
Clean Air Engineering
500 W. Wood Street
Palatine, IL 60067
708/991-3300

4337

CHAIN OF CUSTODY RECORD

PROJ. NO.

DEPT. NO. 8151

PROJECT NAME: Cubix Corp

SAMPLERS: (Signature) [signature] Joseph Rudyk

NO. OF CONTAINERS

NMHC

BLANK VALUE (ppmvc)

LAB NO.	SAMPLE NO.	DATE	TIME	SAMPLE LOCATION	NO. OF CONTAINERS	NMHC BLANK VALUE (ppmvc)					REMARKS
	Audit-2	3/26/92		TANK # 4T107		0.1					Melbourne
	C-2	3/23/92	1773	4T108		0.1					Brooker — Fla. GAS ✓
→	C-1	3/20/92	930	4T114		0.2					Perry — Fla. GAS ✓
	C-6	3/27/92		4T119		0.7					Melbourne
	C-1	3/23/92	1526	4T121		0.1					Brooker — Fla. GAS ✓
				4T127		0.4					
	Audit 1	3/26/92		4T128		0.2					Melbourne
	C-1	3/19/92	900	4T149		0.9					Quincy — Fla. GAS ✓
				4T159		1.1					
	C-3	3/19/92	1135	4T177		1.1					Quincy — Fla. GAS ✓
	C-3	3/23/92	1833	4T182		0.1					Brooker — Fla. GAS ✓
	C-3	3/24/92	1310	4T187		1.5					Silver Springs Fla. GAS ✓
	C-4	3/27/92		4T193		0.2					Melbourne
	C-1	3/26/92	8:30	4T194		0.1					Melbourne — Fla. GAS ✓
	C-5	3/27/92		4T197		0.1					Melbourne

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Relinquished by: (Signature)	Date / Time	Received for Laboratory by:	Date / Time		

REMARKS:

CAE

500 W. Wood Street

Table of Carbon Concentration for Method 25.
Samples collected by Cubix Corp. at Florida
Gas & Trans on 3/24/92 and reported on 4/30/92.

		Carbon Concentration			
Source	Sample - Run ID #	Total (Mc) (mg/dscm)	Total (C) (ppmv)	Condensible (Ccm) (ppmv)	Noncondensible (Ctm) (ppmv)
SILVER SPRINGS	C-1	97.7	195.7	155.4	40.3
	C-2	83.4	167.0	117.6	49.4
	C-3	88.2	176.6	140.3	36.2

Compiled By: [signature] On: 5-1-92

Page 1

Approved By: [signature] On: 5/1/92

Job No. 8160		Plant: Florida Gas & Trans.	
Client Cubix		Sample Loc. Silver Springs	
Disk/File 8160S		(In/Out) Stack	
Page No. 2		Date 3/24/92	

Preliminary Data	C-1	C-2	C-3
Run No.	C-1	C-2	C-3
Tank No.	4T89	4T80	4T187
Trap No.	X48	C1	NO 4
Tank Volume V(cc)	4272	4255	4265
Field Data			
PTI (mm Hg)	-711	-711	-711
TTI (F)	68	69	71
PbI (mm Hg)	763	763	763
PT (mm Hg)	-145	-191	-168
TT (F)	69	71	72
Pb (mm Hg)	763	763	763
Noncondensible Organics			
PT(Lab) (mm Hg)	-148	-200	-174
TT(Lab) (F)	78	77	78
Pb(Lab) (mm Hg)	734	743	743
PTF (mm Hg)	920	920	920
TTF (F)	78	77	78
PbF (mm Hg)	734	743	743
Ba (ppmv C)	0.7	0.6	1.5
Ctm 1 (ppmv C)	14.8	16.4	13.1
Ctm 2 (ppmv C)	14.8	16.4	13.5
Ctm 3 (ppmv C)	14.6	15.8	13.8
Avg. Ctm (ppmv C)	14.7	16.2	13.5
RSD Ctm (%)	0.8	2.1	2.6
Condensible Organics			
ICV Tank No.	4T175	4T183	4T213
ICV Tank, Vv (cc)	3928	3962	4265
PFI (mm Hg)	-722	-730	-732
TFI (F)	78	77	78
PbFI (mm Hg)	734	743	743
PF (mm Hg)	920	920	920
TF (F)	78	77	78
PbFf (mm Hg)	734	743	743
Bt (ppmv C)	9.0	2.4	3.0
Ccm 1 (ppmv C)	67.5	41.9	50.0
Ccm 2 (ppmv C)	67.6	42.2	49.5
Ccm 3 (ppmv C)	68.3	42.9	48.5
Avg. Ccm (ppmv C)	67.8	42.3	49.3
RSD Ccm (%)	0.6	1.2	1.5
Total Gaseous Nonmethane Organics (TGNMO)			
Vs (cc)	3176	2895	3025
Dil. Factor (Non)	2.874	3.163	3.029
Dil. Factor (Con)	2.642	2.946	3.029
Ct (ppmv C)	40.3	49.4	36.2
Cc (ppmv C)	155.4	117.6	140.3
Ct+Cc= C (ppmv C)	195.7	167.0	176.6
Mc (mg C/dscm)	97.7	83.4	88.2

A/C KVSRA 226AP Field Emissions Acceptance Test 3/24/92

100% Load - 330 RPM

C/S 17

DNA 1 of 2

	1A	1B	2A	2B	3A	3B
TYPE- KVSRA						
ENGINE SERIAL NO. 226AP	10:40		1:01	1:20	2:15	2:51
ENGINE SPEED-RPM Moore	330		330	330	329	330
TURBO SPEED PE/WE-RPM	15700 / 15900		15800 / 16000	15760 / 15920	15800 / 16000	15850 / 16000
SPARK DYNALCO/MOORE %	14° / 47.8%		14° / 48.0%	14° / 47.7%	14° / 48.1%	14° / 48.2%
AMBIENT TEMP.	74°			77°	75°	77°
AIR MANFLD TEMP	128°		128°	128°	128	128°
FUEL TEMP						
LUBE OIL IN/OUT TEMP	146° / 163		146° / 163°	146° / 162	145° / 161°	145° / 161°
JACKET WATER IN/OUT TEMP	167° / 170°		167° / 170°	167° / 170°	168° / 172°	169° / 172°
AFTER CLR TEMP IN/OUT	125° / 126°		124° / 126°	124° / 126°	125 / 127°	124° / 126°
TURBO WATER OUT TEMP PE/WE						
AIR MANFLD PRESS PSIG	8.9			9.0	9.1	9.1
FUEL MANFLD PRESS PSIG	27.6			27.4	27.3	27.4
PCC FUEL MANFLD PRESS PSIG	19.0			19.1	19.1	19.2
FUEL SUPPLY PRESS						
FUEL FLOW						
BLOWOFF SIGNAL ~~PRESS~~				47.3%	44%	44%
MAIN OIL PUMP PRESS	68			68	68.5	68.5
PRE LUBE PUMP PRESS						
MAIN BRG OIL PRESS	50.5			51	51	51
TURBO OIL PRESS PE/WE	38.3 / 35.5			38.5 / 35.7	38.5 / 35.7	38.5 / 35.7
JACKET WATER PRESS IN/OUT				28 / 14.2	29.0 / 15.5	29.2 / 15.7
GAS SUCTION TEMP	69°			68°	69°	69°
GAS DISCH TEMP	96-98°			101°-102°	102°-104°	103°-104°
GAS SUCTION PRESS	792			740	738	735
GAS DISCH PRESS	940			915	908	909
TORQUE DYNALCO/MOORE	98 / 99			98 / 99	98 / 99	99 / 100
LOAD STEP	13			15	15	15
Barometer in Hg	30.05		30.05	30.03	30.03	30.03
POWER CYL TEMP						
#1/2	776 / 786			768 / 781	766 / 777	768 / 780
#3/4	817 / 818			815 / 815	810 / 812	812 / 813
#5/6	792 / 761			789 / 761	785 / 759	787 / 760
#7/8	772 / 797			771 / 794	768 / 790	771 / 791
#9/10	821 / 821			809 / 819	805 / 815	806 / 817
#11/12	822 / 796			822 / 794	816 / 789	817 / 792
TURBO EXHAUST TEMP PE/WE	704 / 731			702 / 730	697 / 729	701 / 728
% / CO_2 %	12.2 / 4.8			12.0 / 4.8	12.4 / 4.8	12.4 / 4.9
[illegible] / lb/hr / g/bhp-hr	329 / 11.9 / 2.29	[illegible] / 1.97		324 / 10.0 / 1.90	312 / 9.5 / 1.81	
[illegible] / g/f	197 / 11.0 / [illegible]	[illegible] / 1.09		160 / 8.1 / 1.50	133 / 6.6 / 1.27	

Guarantee

2.3 g/bhp-hr

2.0 g/bhp-hr

12KVSRA 2260HP Field Emission Acceptance Test 3/24/92

110% Load - 330 RPM

C/S 17

	4A			
TYPE- KVSRA				
ENGINE SERIAL NO. 226AP	337			
ENGINE SPEED-RPM Moore	330			
TURBO SPEED PE/WE-RPM	16800 / 16900			
SPARK Dynalco / Moore %	12° / 58.0 %			
AMBIENT TEMP.	76°			
AIR MANFLD TEMP	101°			
FUEL TEMP				
LUBE OIL IN/OUT TEMP	146° / 162°			
JACKET WATER IN/OUT TEMP	169° / 173°			
AFTER CLR TEMP IN/OUT	96° / 100°			
TURBO WATER OUT TEMP PE/WE				
AIR MANFLD PRESS PSIG Gauge / Moore	10.0 / 10.3			
FUEL MANFLD PRESS PSIG	32.1			
PCC FUEL MANFLD PRESS PSIG	20.1			
FUEL SUPPLY PRESS				
FUEL FLOW				
BLOWOFF SIGNAL ~~PRESS~~	60.0 %			
MAIN OIL PUMP PRESS	68.5			
PRE LUBE PUMP PRESS	[illegible]			
MAIN BRG OIL PRESS	57.0			
TURBO OIL PRESS PE/WE	38.5 / 35.5			
JACKET WATER PRESS IN/OUT	29.5 / 16.0			
GAS SUCTION TEMP	68°			
GAS DISCH TEMP	104-105°			
GAS SUCTION PRESS	730			
GAS DISCH PRESS	910			
TORQUE Dynalco / Moore	109 / 110			
LOAD Step	9			
Barometer	30.03			
POWER CYL TEMP				
#1/2	800 / 819			
#3/4	848 / 844			
#5/6	825 / 794			
#7/8	804 / 830			
#9/10	841 / 856			
#11/12	859 / 828			
..RBO EXHAUST TEMP PE/WE	721 / 753			
/ CO_2 %	12.1 / 4.9			
	315/10.4/1.72			

APPENDIX B: EXAMPLE CALCULATIONS

MOISTURE CONTENT

refers to test run C-1

V_1 = initial dry gas meter reading = 838.3 ft^3
V_2 = final dry gas meter reading = 862.65 ft^3
V_{net} = total gas sample volume collected (ft^3)
= V_2-V_1
= 862.65 - 838.3 = 24.35 ft^3

M_1 = initial weight of impinger train = 2480.9 g
M_2 = final weight of impinger train = 2527.0 g

MWC = total weight gain of all impingers (g)
= M_2 - M_1 = 2527.0 - 2480.9
= 46.1 g

K_d = dry gas meter factor (unitless) = 0.9904

$V_{corrected}$ = V_{net} x K_d = x
= 24.35 x 0.9904 = 24.116 ft^3

1.335 liters weighs 1 gram at standard conditions
499.4 = Gas constant
P_{bar} = barometric pressure (in Hg) = 30.05
T = temperature of gas DGM (F^o) = 92.5

F_w = moisture fraction by volume

$$= \frac{\text{volume } H_2O \text{ collected in impingers}}{\text{vol. } H_2O \text{ collected + volume gas dry gas collected}}$$

$$= \frac{\text{MWC x 1.335}}{(\text{MWC x 1.335}) + (((V_{cor} \text{ x } P_{bar}) / (T + 460)) \text{ x 499.4})}$$

$$= \frac{(46.1 \text{ x } 1.335)}{(46.1 \text{ x } 1.335) + (((24.116 \text{ x } 30.05) / (103 + 460)) \text{ x } 499.4)}$$

= 0.074 moisture

MOLECULAR WEIGHT

refers to test run C-1

MW_{H_2O} = molecular wt of H_2O = 18 lb/lb-mole
MW_{CO_2} = molecular wt of CO_2 = 44 lb/lb-mole
MW_{O_2} = molecular wt of O_2 = 32 lb/lb-mole
MW_{N_2} = molecular wt of N_2 = 28 lb/lb-mole
C_{CO_2} = concentration of CO_2 = 4.8 (from Orsat)
C_{O_2} = concentration of O_2 = 12.2(from Orsat)
C_{N_2} = concentration of N_2 = $1-(C_{CO_2}+C_{O_2})$ = 0.83
Fw = moisture fraction = 0.0874
F_d = dry gas fraction = 1 - Fw = 0.9126

MW = molecular weight of stack gas (lb/lb-mole)
= wt of H_2O + wt. of CO_2 + wt. of O_2 + wt. of N_2

$$= (MW_{H_2O} \times F_w) + (F_d \times ((MW_{CO_2} \times C_{CO_2}) + (MW_{O_2} \times C_{O_2}) + (MW_{N_2} \times C_{N_2})))$$

$$= (18 \times 0.0874) + (0.9126 \times ((44 \times 0.048) + (32 \times 0.122) + (28 \times 0.83)))$$

$$= 28.27 \text{ lb/lb-mole}$$

STACK GAS VELOCITY AND FLOW RATE

refers to test run C-1

K_p = pitot tube factor = .84

ΔP = pressure difference in stack as measured (in. H_2O)

$(\sqrt{\Delta P})avg$ = average of square root of ΔP's = 1.1255

T_s = stack temperature = 646 F° = 1106 R°

P_b = atmospheric pressure (in Hg) = 30.05

P_g = stack static pressure (in. H_2O) = 1.3

Ps = absolute stack pressure

= P_b + (Pg x .0735 in.Hg / in.H_2O) = 30.146 in. Hg

V = stack velocity (ft/min)

= 5128 x Kp x $(\sqrt{\Delta P})avg$ x $\sqrt{(Ts / (Ps \times MW))}$

= 5128.8 x .84 x 1.1255 x $\sqrt{(1106/ (30.146 \times 28.27)}$

= 5524 ft/min

Q_a = stack flow rate (ft^3/min)

= V x A , where A= area of stack = 3.01 ft^2

= 5524 x 3.01 = 16630 ft^3/min

Qd= stack flow rate on dry basis at standard conditions (SCFH)

= Q_a x 1059 x (Ps / Ts) x Fd

= 16630 x 1059 x (30.146/1106) x 0.9126

= 4.38 x 10^5 SCFH

FLOW RATE DETERMINATION BY F-FACTOR (EPA Method 19)
refers to test run C-1

Q_f = estimated fuel flow = 17951 SCF/hr
F_{BTU} = heating value of gas = 1022 BTU/SCF
F = O_2 F factor = 8636 SCF/MMBTU
C_{O_2} = concentration of O_2 = 12.25 %(from analyzer)

Q_d = stack flow rate on dry basis at standard conditions (SCFH)
= $Q_f \times F_{BTU} \times 10^{-6} \times F \times 20.9 / (20.9 - C_{O_2})$
= $17951 \times 1022 \times 10^{-6} \times 8636 \times 20.9 / (20.9 - 12.25)$
= 3.83×10^5 SCFH

With CO2 F-factor (i.e. F=1023), same calculation is used except for final term......
$Q_d = Q_f \times F_{BTU} \times 10^{-6} \times F \times 100/C_{CO_2}$
= $17951 \times 1022 \times 10^{-6} \times 1023 \times 100/4.82$
= 3.89×10^5 SCFH

* For calculation of f-factor and heating value of fuels, see Appendix H.

MASS EMISSION RATES
refers to test run C-1

NOx = concentration of NOx = 192 ppmv
CO = observed concentration of CO = 329 ppmv
VOC = observed concentration via EPA Method 25 and 18
= 42.9 ppmv
1 SCF NOx = 11.94×10^{-8} lbs
1 SCF CO = 7.26×10^{-8} lbs
1 SCF C1(methane) = 4.15×10^{-8} lbs
Qd = stack flow rate = 4.38×10^{5} SCFH
E_{NOx} = mass emission rate of NOx (lb/hr)
= NOx x Qd x 11.94×10^{-8}
$E_{NOx} = 192 \times 4.38 \times 10^{5} \times 11.94 \times 10^{-8}$

E_{NOx} = 10.0 lb/hr
E_{CO} = 10.5 lb/hr
E_{VOC} = 0.78 lb/hr

HP = engine horsepower = 2352 hp
454 g = 1.0 lb

$E_{NOx\ (g/hp\text{-}hr)} = E_{NOx} \times 454 / HP$
$= 10.0 \times 454 / 2352$
$E_{NOx\ (g/hp\text{-}hr)}$ = 1.94 g/hp-hr
$E_{CO\ (g/hp\text{-}hr)}$ = 2.02 g/hp-hr
$E_{VOC\ (g/hp\text{-}hr)}$ = 0.15 g/hp-hr

Stack Gas Flow Rate via AGA Carbon Balance Method

Refers to Test Run #C-1

Q_f = fuel flow = 17951 SCF/hr
Cf = carbon content of fuel (from fuel analysis) = 1.023
Ce = exhaust gas carbon content
= CO + THC (as C1) + CO2
= (329 + 820) / 10000 + 4.82 = 4.935 %

Q = stack flow rate
= Qf x Cf x 100 / Ce
= 17951 x 1.023 x 100 / 4.935
= 3.72×10^5 SCFH

SO2 Emission Rate from Fuel Analysis

Refers to Test Run #C-1

S = sulfur content of fuel = <0.059 grains/100 DSCF

7000 grains = 1.0 lb

Q_f = 17951 SCF/hr

SO2 = mass emission rate of SO2

= S / 100 / 7000 x Q_f

= <0.059 /100 / 7000 x 17951

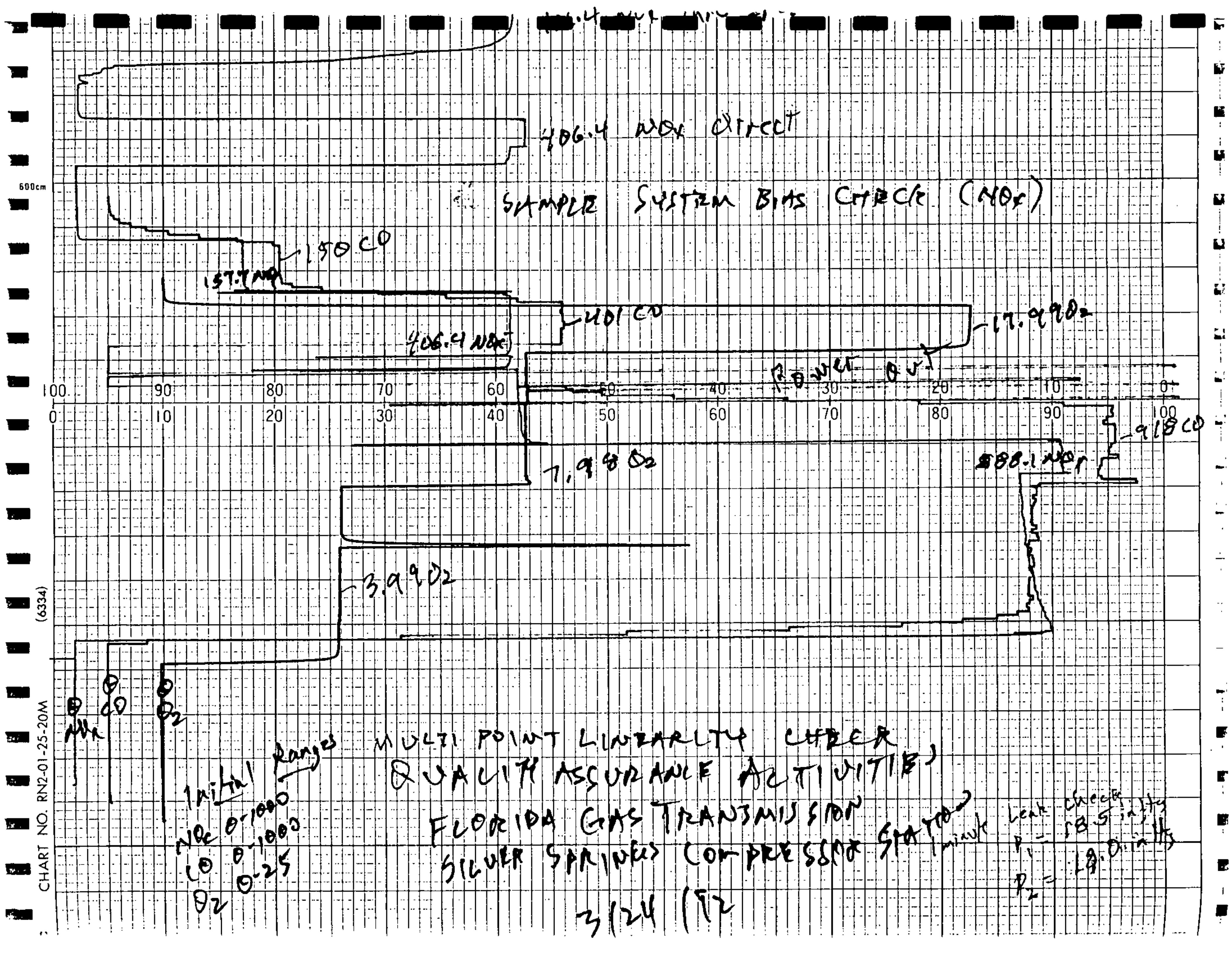
= <0.0015 lbs/hr

Moisture Content via Stoichiometry
Refers to test run #1

H = Ambient humidity (via psychrometer) = 0.0098 lb/lb air
O2 = O2 concentration in stack = 12.25%
F = wet basis O2 F-factor (from fuel calcs)
= 10643 DSCF/MMBTU
FW = moisture F-factor = 2007 SCF of H2O/MMBTU
CM = combustion moisture % at 0% O2
= Fw / F x 100 = 2007 / 10643 x 100
= 18.86 %

Fw = moisture content
= (CM x (20.9 - O2)/20.9) + (H x 64.3)
= (18.86 x (20.9 - 12.25)/20.9) + (.0098 x 64.3)
= 8.43 %

APPENDIX C:
QUALITY ASSURANCE ACTIVITIES



406.4 NOx DIRECT
SAMPLE SYSTEM BIAS CHECK (NOx)
150 CO
157.7 NOx
401 CO
406.4 NOx
17.9 O2
POWER OUT
918 CO
888.1 NOx
7.98 O2
3.99 O2
0 NOx
0 CO
0 O2
MULTI POINT LINEARITY CHECK
QUALITY ASSURANCE ACTIVITIES
FLORIDA GAS TRANSMISSION
SILVER SPRINGS COMPRESSOR STATION
3/24/92
Initial Ranges
NOx 0-1000
CO 0-1000
O2 0-25
1 minute Leak Check
P1 = 18.5 in Hg
P2 = 18.0 in Hg
600cm
(6334)
CHART NO. RN2-01-25-20M

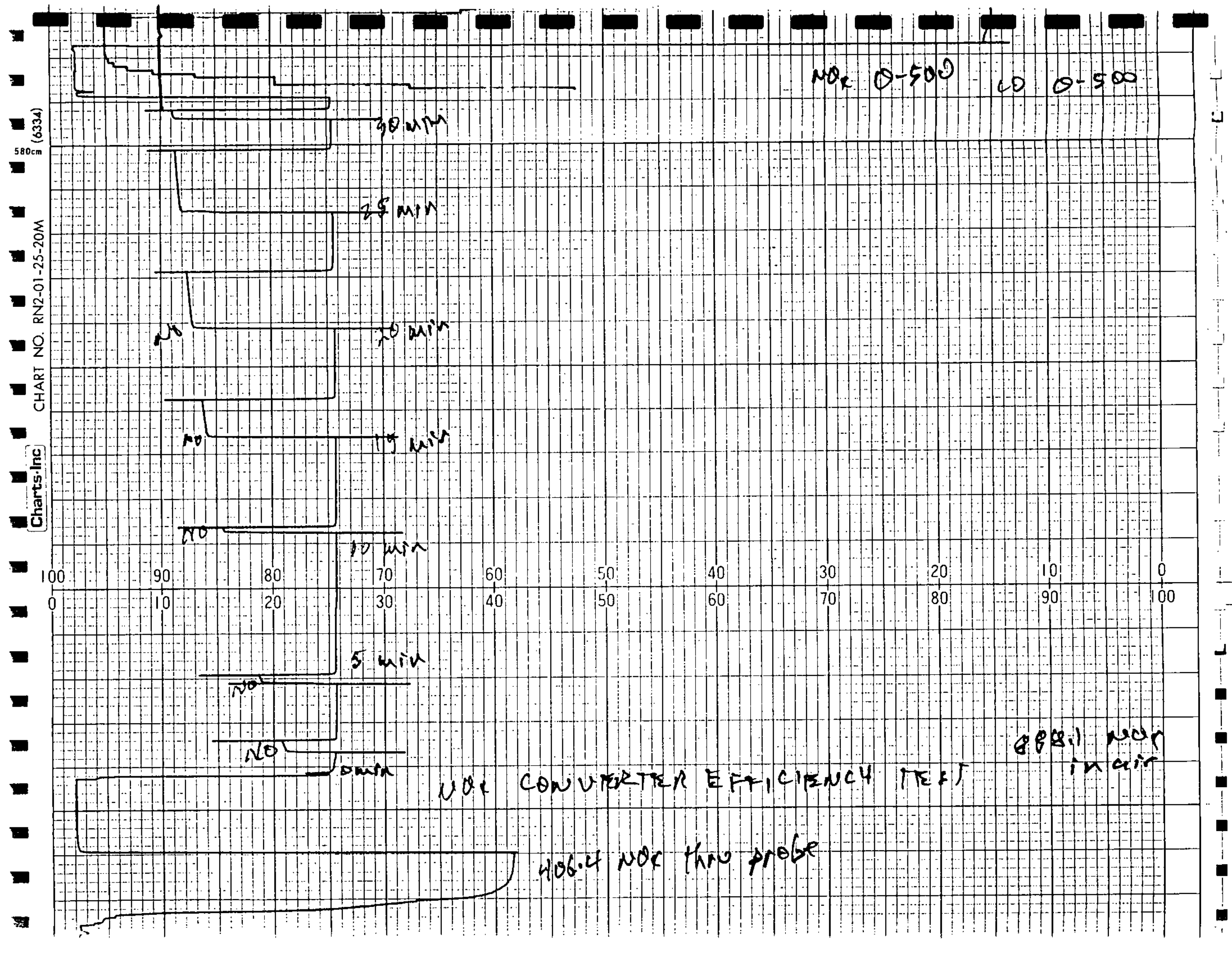


CHART NO. RN2-01-25-20M
(6334)
580cm
Charts-Inc
NOx 0-500
CO 0-500
30 min
25 min
NO
20 min
NO
15 min
NO
10 min
5 min
NO
NO
0 min
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
NOx CONVERTER EFFICIENCY TEST
888.1 NOx in air
406.4 NOx thru probe

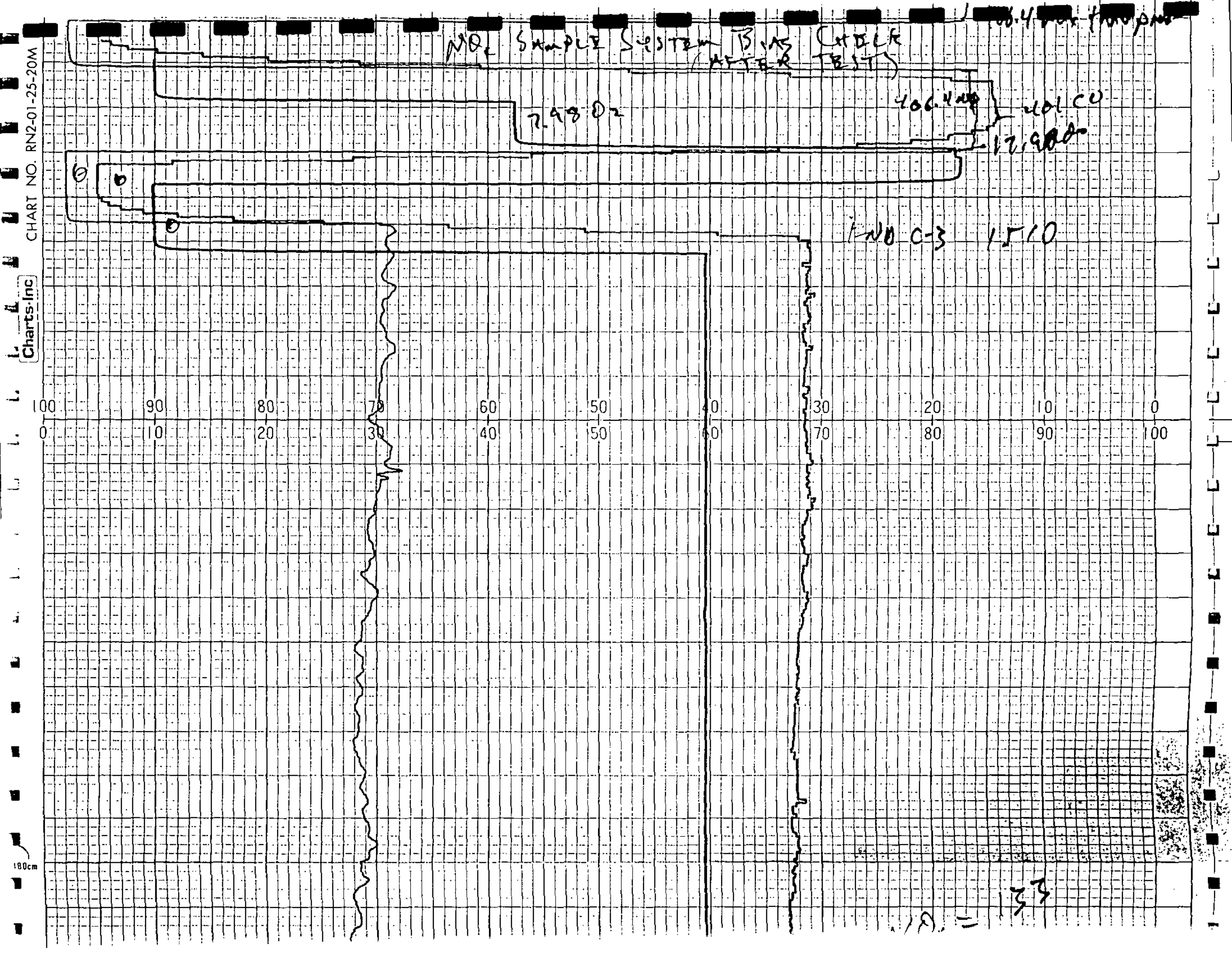
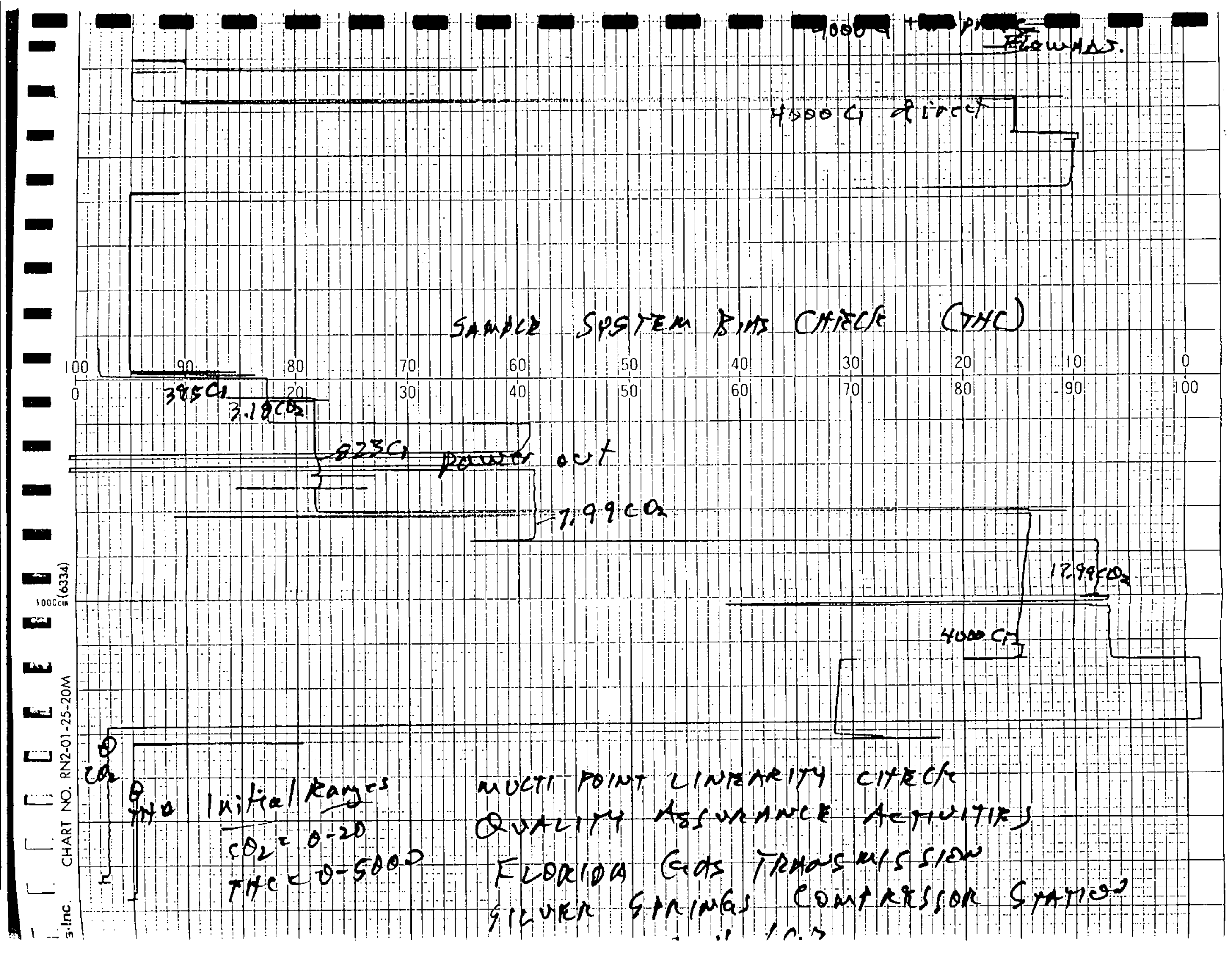
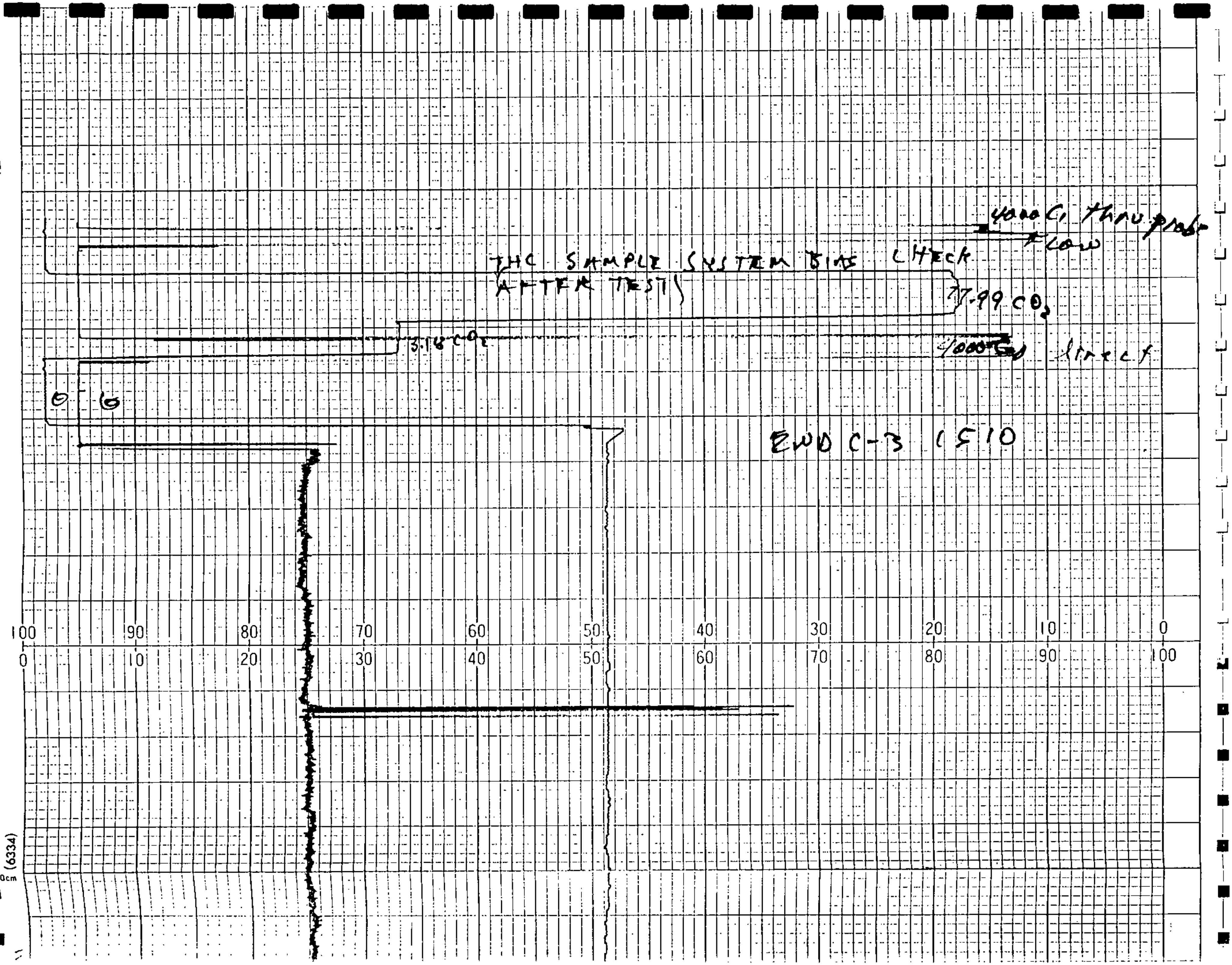


CHART NO. RN2-01-25-20M
Charts·Inc
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
180cm
NOx SAMPLE SYSTEM BIAS CHECK
(AFTER TESTS)
401 CO
12,900
END C-3 1510
133


4000 C1 direct
SAMPLE SYSTEM BIAS CHECK (THC)
100 90 80 70 60 50 40 30 20 10 0
0 20 30 40 50 60 70 80 90 100
385 C1
3.18 CO2
823 C1
power out
7.99 CO2
17.99 CO2
4000 C1
1000cm (6334)
CHART NO. RN2-01-25-20M
0 CO2
0 THC
Initial Ranges
CO2 = 0-20
THC = 0-5000
MULTI POINT LINEARITY CHECK
QUALITY ASSURANCE ACTIVITIES
FLORIDA GAS TRANSMISSION
SILVER SPRINGS COMPRESSOR STATION


THC SAMPLE SYSTEM BIAS CHECK
(AFTER TEST)
77.99 CO2
3.18 CO2
EWD C-3 1510
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
(6334)
880cm

	CERTIFIED GAS INPUT		INITIAL CALIBRATION & LINEARITY CHECK		TEST RUN #C1	ZERO and SPAN CALIBRATION CHECK		TEST RUN #C2	ZERO and SPAN CALIBRATION CHECK		TEST RUN #C3	ZERO and SPAN CALIBRATION CHECK	
	Concentration (% or ppm)	Target (% Chart)	Initial (% Chart)	Difference (% Chart)		Final (% Chart)	Drift (% Chart)		Final (% Chart)	Drift (% Chart)		Final (% Chart)	Drift (% Chart)
NOx					Avg. ppm			Avg. ppm			Avg. ppm		
zero	0.0	2.0	1.9	-0.1	192.0	2.0	0.0	160.0	2.1	0.1	133.0	2.0	0.0
low	157.7	17.8	17.1	-0.7	% Chart	n.a.	n.a.	% Chart	n.a.	n.a.	% Chart	n.a.	n.a.
mid	406.4	42.6	41.2	-1.4	40.4	83.8	0.5	34.0	83.9	0.6	28.6	83.9	0.6
high	888.1	90.8	90.9	0.1		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.
full scale	1000.0				500.0			500.0			500.0		
CO					Avg. ppm			Avg. ppm			Avg. ppm		
zero	0.0	5.0	5.0	0.0	329.0	4.9	-0.1	324.0	4.9	-0.1	312.0	5.0	0.0
low	150.0	20.3	20.4	0.1	% Chart	n.a.	n.a.	% Chart	n.a.	n.a.	% Chart	n.a.	n.a.
mid	401.0	45.3	45.9	0.6	70.8	85.1	-0.1	69.8	85.8	0.6	67.4	85.3	0.1
high	918.0	96.5	95.5	-1.0		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.
full scale	1000.0				500.0			500.0			500.0		
O2					Avg.%			Avg.%			Avg.%		
zero	0.0	10.0	9.9	-0.1	12.25	9.9	-0.1	12.05	10.0	0.0	12.40	10.0	0.0
low	3.99	26.0	25.9	-0.1	% Chart	n.a.	n.a.	% Chart	n.a.	n.a.	% Chart	n.a.	n.a.
mid	7.98	41.9	42.7	0.8	59.0	42.3	0.4	58.2	41.8	-0.1	59.6	42.4	0.5
high	17.90	81.6	82.7	1.1		81.9	0.3		80.9	-0.7		82.5	0.9
full scale	25.0				25.0			25.0			25.0		
CO2					Avg.%			Avg.%			Avg.%		
zero	0.0	2.0	2.8	0.8	4.82	2.0	0.0	4.89	2.0	0.0	4.91	2.0	0.0
low	3.18	17.8	17.4	-0.4	% Chart	32.7	-1.1	% Chart	33.1	-0.7	% Chart	33.2	-0.6
mid	7.99	42.0	41.3	-0.7	50.2	80.8	-1.1	50.9	81.9	0.0	51.1	82.2	0.3
high	17.99	92.0	92.2	0.3		n.a.	n.a.		n.a.	n.a.		n.a.	n.a.
full scale	20				10.0			10.0			10.0		
THC					Avg. ppmv			Avg. ppmv			Avg.ppmv		
zero	0.0	5.0	5.0	0.0	820	4.9	-0.1	975	5.0	0.0	1015	5.0	0.0
low	395	12.9	13.0	0.1	% Chart	n.a.	n.a.	% Chart	n.a.	n.a.	% Chart	n.a.	n.a.
mid	823	21.5	21.7	0.2	21.4	n.a.	n.a.	24.5	n.a.	n.a.	25.3	n.a.	n.a.
high	4000	85.0	86.1	1.1		84.7	-0.3		83.8	-1.2		86.8	1.8
full scale	5000				5000			5000			5000		

Thermo Electron CORPORATION

Richard A. Curran
Regional Sales Manager

TR 7

Environmental Instruments Division

108 South Street
Hopkinton, Massachusetts 01748
(617) 435-5321

INTERFERENCE RESPONSE TEST

DATE OF TEST JAN 20, 1992

ANALYZER TYPE 10~~AR~~S RANGE 0-25PPM SERIAL NO. 105-19481-184

TEST GAS TYPE	CONCENTRATION PPM	ANALYZER OUTPUT RESPONSE	% OF SPAN
CO	500	< .1 PPM	< .1%
CO_2	201	< .1 PPM	< .1%
CO_2	10%	< .1 PPM	< .1%
O_2	20.9%	< .1 PPM	< .1%

Continous Emission Analyzer Interference Response Tests

Date: 7/8/88
Technician: KRB / MM

Analyzer Type: Thermo Enviromental
Analyzer Model: Model 48 Gas Filter Correlation Analyzer
Serial Number: 48-23576-210
Analyzer Test Range: 0-20ppmV

Test Gas		Analyzer Response		Response
Type Gas	Concentration	Concentration PPMv	% of Range	Ratio
Air	CO Free	0.0	N/A	
CO_2/O_2	4%/18%	0.0	↓	0.000
CO_2/O_2	12%/8%	-0.2	↓	-0.017/-0.025
CO_2/O_2	21%/3%	-0.3	↓	-0.014/-0.100
Air	Dry	0.4	↓	CO Impurity?
NOx	176 ppmv	0.4	↓	0.002
NOx	3030 ppmv	0.4	↓	0.0001
SO_2	401 ppmv	-0.2	↓	0.0005
Propane	240 ppmv	0.4	↓	0.002

(First three ratios: PPMv/%; last four ratios: PPMv/PPMv)

all interferences are negligible

TR 7 O_2 ANALYZER

Continous Emission Analyzer Interference Response Tests

Date: 1/16/92
Technician: LF

Analyzer Type: SERVOMEX O_2 ANALYZER
Analyzer Model: 1400
Serial Number: 01420 B701 627
Analyzer Test Range: 0-10

Test Gas		Analyzer Response		Response
Type Gas	Concentration	Concentration	% of Range	Ratio
CO	471 ppm	<.05%	<.5	
SO_2	398 ppm	<.05%	<.5	
CO_2	8%	<.05%	<.5	
NO_x	898 ppm	<.05%	<.5	

TA 7 CO_2 ANALYZER

Continous Emission Analyzer Interference Response Tests

Date: 1/16/92
Technician: LF

Analyzer Type: CO_2
Analyzer Model: SERVOMEX 1400
Serial Number: 01410 ~~[illegible]~~ B619
Analyzer Test Range: 0-20

Test Gas		Analyzer Response		Response Ratio
Type Gas	Concentration	Concentration	% of Range	
CO	491	<.02%	~~<.005~~ <.5	
SO_2	398	<.02%	~~<.005~~ <.5	
O_2	20.9	<.02%	~~<.005~~ <.5	
NO_x	888	<.02%	~~[illegible]~~ <.5	

Response Time Data Sheet

Date: 3/24/89

Plant: — Austin Office

Technician: MM/DC

Sample Manifold Press.: 6 psi

Sample Line Length: 140 ft.

Pump Model No.: 6-3 Dia-pump

Analyzer:	NO_x Analyzer	Oxygen Analyzer
Model:	TECO 10AR	Teledyne 320 AX
Range:	0 – 1000 ppm	0 – 25 %
Span Gas:	900 ppm NO_x	Air: 20.9% O_2
Upscale Response	.65 min	.72 min
	.60	.75
	.60	.80
Average	.61 min	.76 min
Downscale Response	.65 min	.90 min
	.65	.90
	.65	.85
Average	.65 min	.88 min

Comments:

3/8" Sample line

Igloo Condenser

Instrumental Analysis
Quality Assurance Data

Date: 3/24/92
Plant: FGT Silver Springs
Technician: LF RK JR

NOx Analyzer: NO2 to NO Converter Efficiency Test

NO Calibration Gas: 888.1 ppm
Dilutent Gas: Air (20.9% oxygen)

	NOx Concentration (ppm)	% Decrease from Initial Concentration	NO Concentration (ppm)
Initial Concentration	237	n.a.	189
10 minute Concentration	237	0	136
20 minute Concentration	237	0	106
30 minute Concentration	234	1.3	93

Sampling System Bias Check

Analysis	Calibration Gas Concentration (ppm)	Full Scale Span (ppm)	Direct Calibration Response (ppm)	Thru-Probe Sample System Response (ppm)	System Calibration Bias (% of Span)
Zero Gas					
NOx (before test)	406.4	1000	407	398	-0.9%
SO2					
THC (before test)	4000	5000	3975	3915	-1.2%
NOx (after test)	406.4	500	406	405.5	-0.1%
THC (after test)	4000	5000	4090	3990	-2.0%

% Calibration Bias = $\frac{\text{(Thru-Probe Response)} - \text{(Direct Calibration Response)}}{\text{Full Scale Span}}$ X 100 *

* EPA (40 CFR 60, Appendix A)

Table of Carbon Concentration for Method 25.
Audit samples collected by Cubix Corp. at Fl.
Gas & Trans on 3/26/92 and reported on 4/30/92.

Source	Sample - Run ID #	Carbon Concentration Total (Mc) (mg/dscm)	Total (C) (ppmv)	Condensible (Ccm) (ppmv)	Noncondensible (Ctm) (ppmv)
AUDITS	#470A	110.7	221.8	89.3	132.5
	#470B	806.8	1615.9	131.8	1484.1

Compiled By: *[signature]* On: 5-1-92

Approved By: *[initials]* On: 5/1/92

Job No. 8160		Plant: Florida Gas & Trans	
Client Cubix		Sample Loc. Audits (In/Out)	
Disk/File 8160			
Page No. 2		Date 3/26/92	

Preliminary Data			
Run No.		Audit #473B	Audit #473A
Tank No.		4T128	4T107
Trap No.		X23	C7
Tank Volume V(cc)		4033	4010
Field Data			
PTI	(mm Hg)	-711	-709
TTI	(F)	85	82
PbI	(mm Hg)	760	760
PT	(mm Hg)	0	0
TT	(F)	82	78
Pb	(mm Hg)	760	760
Noncondensible Organics			
PT(Lab)	(mm Hg)	24	4
TT(Lab)	(F)	78	78
Pb(Lab)	(mm Hg)	734	734
PTF	(mm Hg)	924	920
TTF	(F)	78	78
PbF	(mm Hg)	734	734
Ba	(ppmv C)	0.2	0.1
Ctm 1	(ppmv C)	56.3	642.8
Ctm 2	(ppmv C)	56.7	627.8
Ctm 3	(ppmv C)	56.9	639.3
Avg. Ctm	(ppmv C)	56.6	636.6
RSD Ctm	(%)	0.5	1.2
Condensible Organics			
ICV Tank No.		4T143	4T266
ICV Tank, Vv (cc)		4047	4270
PFI	(mm Hg)	-720	-722
TFI	(F)	78	78
PbFI	(mm Hg)	734	734
PF	(mm Hg)	1840	940
TF	(F)	78	78
PbFf	(mm Hg)	734	734
Bt	(ppmv C)	2.6	0.8
Ccm 1	(ppmv C)	26.6	52.1
Ccm 2	(ppmv C)	27.2	53.9
Ccm 3	(ppmv C)	27.2	53.7
Avg. Ccm	(ppmv C)	27.0	53.2
RSD Ccm	(%)	1.3	1.9
Total Gaseous Nonmethane Organics (TGNMO)			
Vs	(cc)	3678	3675
Dil. Factor (Non)		2.348	2.332
Dil. Factor (Con)		3.658	2.513
Ct	(ppmv C)	132.5	1484.1
Cc	(ppmv C)	89.3	131.8
Ct+Cc= C	(ppmv C)	221.8	1615.9
Mc	(mg C/dscm)	110.7	806.8

APPENDIX D:
CALIBRATION CERTIFICATIONS

1290 COMBERMERE STREET, TROY, MICHIGAN 48084 (313) 589-2950

Your P.O. # : 90317

Customer :
CUBIX CORPORATION
1713 FORT VIEW ROAD
AUSTIN, TX. 78704

****** CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES ******

PERFORMED ACCORDING TO SECTION 3.0.4

Certified Per Traceability Protocol # 1 — Procedure # G1

File # P08133

Certified Accuracy 1 % NBS Traceable

Expiration Date : 7-28-92

Cylinder Number : ALM-016031

Cylinder Pressure 1900 psig

CERTIFIED EPA PROTOCOL

ANALYZED CYLINDER: COMPONENT	CERTIFIED CONC.	REFERENCE STD: SRM # (CRM #)	CYLINDER NUMBER	CONC.	INSTRUMENTATION: INSTR/MODEL/SERIAL #	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
NITRIC OXIDE	888.1 PPM	2631	FF-16175	2854 PPM	BECKMAN 951A	1-8-91	CHEMILUMINESCENCE
		GMIS*	HA-6840	971.6 PPM			

BALANCE GAS : NITROGEN

NITROGEN DIOXIDE 5.82 PPM (FROM SECOND ANALYSIS)

FIRST ANALYSIS DATE : 1-21-91

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
0.00	30.50	889.5	2854 PPM	98.00	2854
0.00	30.50	889.5		98.00	2854
0.00	30.50	889.5		98.00	2854

CALCULATED RESULTS 889.5 / 889.5 / 889.5

AVERAGE : 889.5 PPM

SECOND ANALYSIS DATE : 1-28-91

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
0.00	30.40	886.6	2854 PPM	98.00	2854
0.00	30.40	886.6		98.00	2854
0.00	30.40	886.6		98.00	2854
0.00	30.60 NOX	892.5			

CALCULATED RESULTS 886.6 / 886.6 / 886.6 — 892.5 PPM NOX

AVERAGE : 886.6 PPM

CALIBRATION CURVE 1 st DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
2631	2854	100	98.00	2854	0.00
	1428	50	49.00	1428	-0.00
	971.6	34	33.10	965.2	-0.66
	489.0	17	16.80	490.8	0.38
	0.0000	0	0.00	0.0000	0.00
		0		0.0000	0.00
		0		0.00	0.00
16866	489.0	LOW	16.80	490.8	0.38
N/A	971.6	GMIS*	33.10	965.2	-0.66

* GMIS - GAS MANUFACTURER'S INTERNAL STANDARD

Analyst : [signature] Approved By : [signature]

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

1290 COMBERMERE STREET, TROY, MICHIGAN 48084 (313) 589-2950

Our Project # : [illegible]

Your P.O. # : 91004

Expiration Date : 8-18-92

Cylinder Number AAL-9912

Cylinder Pressure 1900 psig

Customer :
CUBIX CORPORATION
1713 FORT VIEW ROAD
AUSTIN, TX. 78704

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

Certified Per Traceability Protocol # 1 — Procedure # 81

File # P08274

Certified Accuracy 1 % NBS Traceable

EPA PROTOCOL

COMPONENT	CERTIFIED CONC.	REFERENCE STD: SRM # (CRM #)	CYLINDER NUMBER	CONC.	GAS ANALYZER: MAKE/MODEL	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
NITRIC OXIDE	157.7 PPM	1685	AAL-9851	236.0 PPM	BECKMAN	12-4-90	CHEMILUMINESCENCE
		GMIS#	AAL-14484	145.3 PPM	951A		
		1684	ALM-003623	97.28 PPM			

BALANCE GAS : NITROGEN

NITROGEN DIOXIDE 1.77 PPM

FIRST ANALYSIS — DATE : 2-11-91

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
0.00	53.30	157.4	236.0 PPM	80.00	236.0
0.00	53.30	157.4		80.00	236.0
0.00	53.30	157.4		80.00	236.0

CALCULATED RESULTS 157.4, 157.4, 157.4

AVERAGE : 157.4 PPM

SECOND ANALYSIS — DATE : 2-18-91

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
0.00	53.50	158.0	236.0 PPM	80.00	236.0
0.00	53.50	158.0		80.00	236.0
0.00	53.50	158.0		80.00	236.0
0.00	54.10 NOX	159.8			

CALCULATED RESULTS 158.0, 158.0, 158.0 — 159.8 PPM NOX

AVERAGE : 158.0 PPM

CALIBRATION CURVE — 2 nd DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
1685	236.0	100	80.00	236.0	-0.00
	207.6	88	70.30	208.1	0.23
	145.3	62	49.10	145.1	-0.17
1684	97.28	41	33.00	97.54	0.27
	0.0000	0	0.00	0.0000	0.00
		0		0.00	0.00
		0		0.00	0.00
1684	97.28	LOW	33.00	97.54	0.27
1685	236.0	HIGH	80.00	236.0	-0.00

GMIS - GAS MANUFACTURER'S INTERNAL STANDARD

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

Analyst [signature] Approved [signature] [redacted] Sc[redacted]nvir[redacted]enta[redacted]hno[redacted], Inc[redacted]

1290 COMBERMERE STREET, TROY, MICHIGAN 48084 (313) 589-2950

Shipped From : Scott Michigan

Our Project # : 53222B

Your P.O. # : 92 0000

Expiration Date : 7-21-93

Cylinder Number : AAL5112

Cylinder Pressure 1900 psig

1 of 1 Component(s)

:tomer :
CUBIX CORPORATION
9225 LOCKHART HWY
AUSTIN TX 78747

* * * * CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES * * * *
PERFORMED ACCORDING TO SECTION 3.0.4
Certified Per Traceability Procedure # G1
Protocol # 1
File # PO-2143
Certified Accuracy 1 % NBS Traceable

NALYZED CYLINDER		REFERENCE STD			INSTRUMENTATION		
OMPONENT	CERTIFIED CONC.	SRM # (CRM #)	CYLINDER NUMBER	CONC.	INSTR/MODEL/SERIAL #	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
RIC OXIDE	406.4 PPM	1687	ALM-014665	965.5 PPM	BECKMAN	1-15-92	CHEMILUMINESCENCE
		1685	ALM-008700	250.3 PPM	951A		
					270-082895B		
ANCE GAS : NITROGEN							

ROGEN DIOXIDE 0.00 PPM (FROM SECOND ANALYSIS)

FIRST ANALYSIS DATE : 1-15-92

:O	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	REFERENCE GAS (mV)	RESULTS PPM
	40.70	406.9	965.5 PPM	96.50	965.5
	40.70	406.9		96.50	965.5
	40.70	406.9		96.50	965.5

CALCULATED RESULTS 406.9
406.9
406.9

AVERAGE : 406.9 PPM

SECOND ANALYSIS DATE : 1-21-92

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	REFERENCE GAS (mV)	RESULTS PPM
0.00	40.60	405.9	965.5 PPM	96.50	965.5
0.00	40.60	405.9		96.50	965.5
0.00	40.60	405.9		96.50	965.5
0.00	40.60 NOX	405.9			

CALCULATED RESULTS 405.9
405.9
405.9 405.9 PPM NOX

AVERAGE : 405.9 PPM

CALIBRATION CURVE 1 ST DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
1684B	965.5	100	96.50	965.5	0.00
	748.0	77	75.00	750.3	0.30
	395.0	41	39.60	395.9	0.22
1685	250.3	26	25.10	250.7	0.16
	0.0000	0		0.0000	0.00
				0.0000	0.00
		0		0.00	0.00
1685	250.3	LOW	25.10	250.7	0.16
1684B	965.5	HIGH	96.50	965.5	0.00

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

IS - GAS MANUFACTURER'S INTERNAL STANDARD Analyst : F. P. Dorn Approved By : F. Shapiro

Scott Specialty Gases, Inc.
FAX: 713-644-0244
PHONE: 713-644-4820
3714 LAPAS DRIVE, HOUSTON, TEXAS 77023

6/03/91

CUBIX CORPORATION
9225 LOCKHART

AUSTIN TX 78747-0000
KEVUN JANCK

PROJECT #: 04-11057
PO #: 91105

CYLINDER #: ALM006621
ANALYTICAL ACCURACY: +-1%

COMPONENT	REQUESTED CONCENTRATION		ANALYSIS 1 (MOLES) U/M	
N MONOXIDE	150.0	PPM	150.	PPM
NE	80.0	PPM	79.7	PPM
OGEN		BALANCE		BALANCE

ANALYTICAL METHOD: GRAV.MASTER GAS

DATE OF ANALYSIS: 6/03/91

ANALYST: ____________ ANALYST

APPROVED BY: ____________ SUPERVISOR

CERTIFIED

Scott Specialty Gases, Inc.

3714 LAPAS DRIVE, HOUSTON, TX 77023-0000
PHONE: 713-644-4820 FAX:713-644-0244

10/17/91

CUBIX CORPORATION
9225 LOCKHART HWY

AUSTIN TX 78747-0000

PROJECT #: 04-13936
PO #: 910523

CYLINDER #: AAL9308

ANALYTICAL ACCURACY: +-1%

COMPONENT	REQUESTED CONCENTRATION		ANALYSIS 1 (MOLES)	U/M
BON MONOXIDE	400.0	PPM	401.	PPM
ETHANE	400.0	PPM	395.	PPM
ITROGEN	BALANCE		BALANCE	

ANALYTICAL METHOD: ACUBLEND MASTER

DATE OF ANALYSIS: 10/17/91

ANALYST: ____________
ANALYST

APPROVED BY: ____________
SUPERVISOR

Scott Specialty Gases, Inc.

3714 LAPAS DRIVE, HOUSTON, TX 77023-0000
PHONE: 713-644-4820 FAX:713-644-0244

10/22/91

CUBIX CORPORATION
9225 LOCKHART HWY

AUSTIN TX 78747-0000

PROJECT #: 04-13836
PO #: 910505

CYLINDER #: AAL13971

ANALYTICAL ACCURACY: +-1%

COMPONENT	REQUESTED CONCENTRATION		ANALYSIS 1 (MOLES) U/M	
[illegible]ON MONOXIDE	910.0	PPM	916.	PPM
[illegible]THANE	820.0	PPM	823.	PPM
[illegible]TROGEN	BALANCE		BALANCE	

NOTES: EXP: 11/92

CERTIFIED

ANALYTICAL METHOD: ACUBLEND MASTER

DATE OF ANALYSIS: 10/22/91

ANALYST: [signature] ANALYST APPROVED BY: [signature] SUPERVISOR 10/23

Matheson®
Gas Products
World Leader in Specialty Gases & Equipment

OST OFFICE BOX 908
LA PORTE, TEXAS 77571
TELEPHONE: (713) 471-2544

RECEIVED JAN 1 7 1992

WILSON OXYGEN AND SUPPLY CO.
2801 MONTOPOLIS
AUSTIN, TX 78760

Date 1-8-92

Our Invoice # 104-63230

Your P.O. # 04312

Lot No. ______

ntlemen:

Below are the results of the analysis you requested, as reported by our laboratory. Results are in volume rcent, unless otherwise indicated.

LABORATORY REPORT ON GAS ANALYSIS

1R

	CYL. # MIXTURE REQ.	SX-23633 ANALYSIS
BON KIDE	3.20%	3.18% ± .02
YGEN	18.00%	17.9% ± .02
TROGEN	BALANCE	BALANCE

1R

	CYL. # MIXTURE REQ.	SX-23625 ANALYSIS
BON KIDE	8.00%	7.98% ± .02
YGEN	8.00%	7.98% ± .02
TROGEN	BALANCE	BALANCE

1R

	CYL. # MIXTURE REQ.	SX-23652 ANALYSIS
BON KIDE	18.00%	17.99% ± .02
YGEN	4.00%	3.99% ± .02
TROGEN	BALANCE	BALANCE

CYL. # MIXTURE REQ.	ANALYSIS

ACCEPTED BY

WILSON OXYGEN

Analyst JOHN K. WRIGHT

Scott Specialty Gases
a division of
Scott Environmental Technology, Inc.
RSGP
3714 LAPAS DRIVE, HOUSTON, TEXAS 77023, (713) 644-4820, FAX 644-0244

CUBIX CORPORATION
P.O. BOX 5083
AUSTIN, TX. 78763

Date: MARCH 1, 1990
Our Project No.: 0403425
Your P.O. No.: 90035

Gentlemen:
Thank you for choosing Scott for your Specialty Gas needs. The analyses for the gases ordered, as reported by our laboratory, are listed below. Results are in volume percent, unless otherwise indicated.

ANALYTICAL REPORT

Cyl No. AAL17750 Analytical Accuracy ±1%

Component WT%	Concentration
CARBON MONOXIDE	4000 PPM
METHANE	4000 PPM
NITROGEN	BALANCE
NBS TRACEABLE BY WEIGHT	

Cyl No. Analytical Accuracy

Component	Concentration

Cyl No. Analytical Accuracy

Component	Concentration

Cyl No. Analytical Accuracy

Component	Concentration

Analyst John Lempe

Approved By [signature]

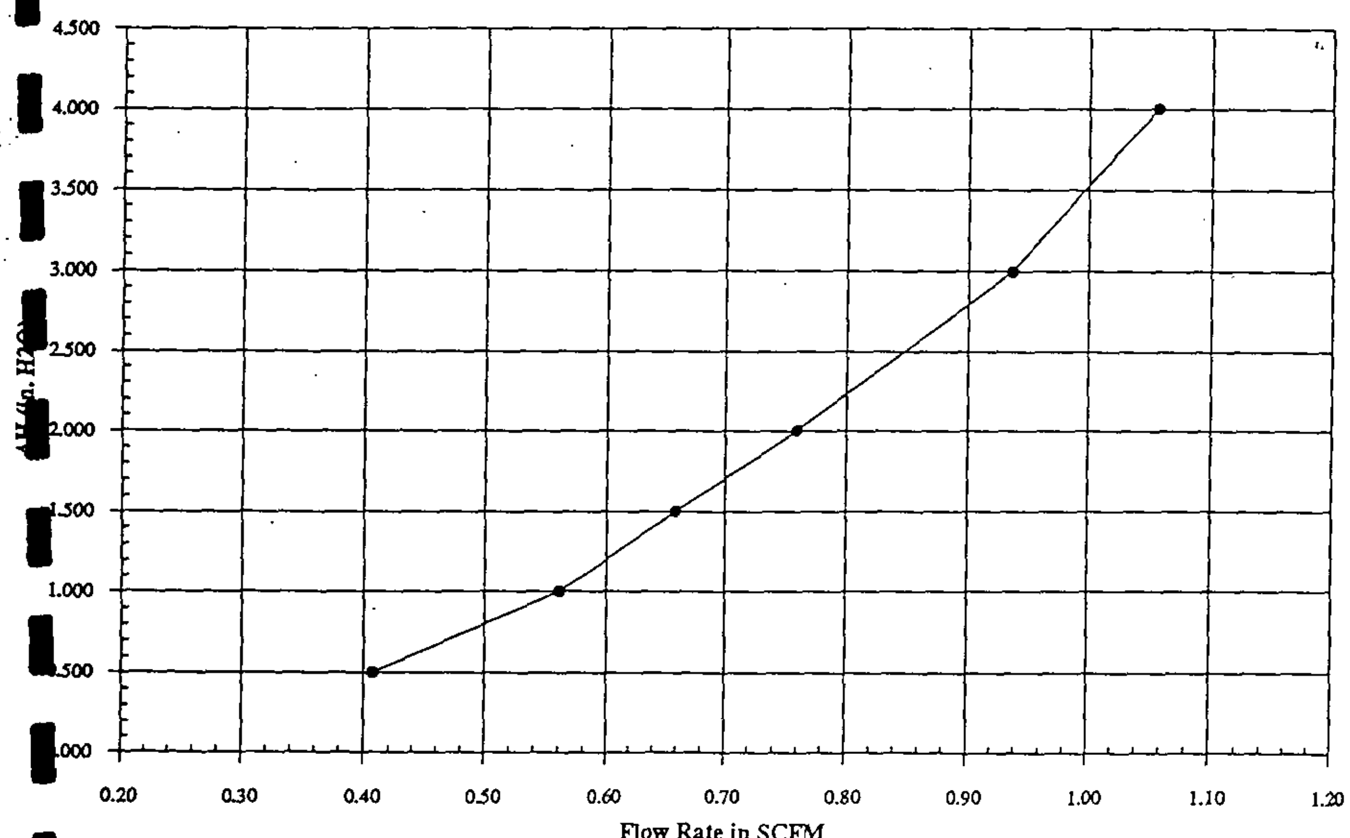
The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the company without extra cost.

METER BOX DRY GAS METER and ORIFICE CALIBRATION

...e:	8/2/91	Test Meter ID	P164240
...rev, Calib. Date:	12/27/90	Make & Model	American Singer
...ation:	1713 Fortview, Austin, Tx	Calibration Factor	0.998
...nician:	DH,LI,JB		
...er No:	1286-3061		
...tm. Pressure:	29.32		

		Meter Box				Standard Test Meter					
...ifice Meter Setting ...n. H20)	Elapsed Time (min.)	Starting Reading ft3	Ending Reading ft3	Starting Avg. Temp. °F	Ending Avg. Temp (°F)	Starting Reading (ft3)	Ending Reading (ft3)	Starting Avg. Temp (°F)	Ending Avg. Temp (°F)	Calculated Meter Factor (Kd)	Calculated ΔH@ 0.75 SCFM (" H2O)
.50	10.00	43.095	47.310	77	86	0.000	4.080	72	72	0.9821	1.704
1.00	10.00	47.310	53.164	86	97	4.080	9.695	72	72	0.9899	1.767
1.50	10.00	53.164	60.138	97	109	9.695	16.300	72	73	0.9956	1.880
.00	10.00	60.138	68.398	109	114	16.300	23.900	73	73	0.9797	1.868
.00	10.00	68.398	78.344	114	120	23.900	33.287	73	73	1.0121	1.820
4.00	10.00	78.344	89.968	120	124	33.287	43.872	73	72	0.9834	1.888
	Averages:			101	108			73	73	0.9904	1.845

Differential Pressure vs. Flow Rate Calibration Curve Andersen 8/91



Testing by Cubix Corporation

Trailer #7 Altimeter

ALTIMETER SCALE ERROR					
PART NO. 5934P-1A.83			SERIAL NO. 3H909		
ALTIMETER PRESSURE					
TEST PT (FT)	INDICATOR READINGS AT + 25 °C	TEST PT (FT)	INDICATOR READINGS AT + 25 °C	TEST PT (FT)	INDICATOR READINGS AT + 25 °C
-1000	0	8,000	-45	30,000	
0 0	-20	10,000	-50	35,000	
500	-15	12,000	-70	40,000	
1000	-10	14,000	-70	45,000	
1500	-15	16,000	-65	50,000	
2000	-15	18,000	-50	55,000	
3000	-25	20,000	-45	60,000	
4000	-25	22,000		70,000	
6000	-30	25,000		80,000	

BFG/C9102

COMPONENT ALTIMETER

PART NO. 5934P-1A.83

SERIAL NO. 3H909

MFG. UNITED WORK ORDER # K0687

☐ Overhaul ☐ Repair ☒ Bench Check & Test

The Aircraft Appliance Identified above was overhauled, repaired, or bench tested (as per block marked) and inspected, in accordance with current Federal Aviation Administration Regulations, and is approved for return to service. Details of this component are on file at this repair station.

[signature]

AUTHORIZED SIGNATURE

FEB 11 1992

DATE

TEL-TRU MANUFACTURING. CO.

408 ST. PAUL STREET ROCHESTER, NY 14605 USA

CERTIFICATE OF CALIBRATION

TEL-TRU ORDER NO.	LINE NUMBER	TICKET NO.	ORDER REC WK NO.	SHIP BY WK NO.
23832	111		43	47

CUSTOMER NUMBER	CUSTOMER P.O. NO.	MANUFACTURING NO.
2-52845000	910537	Stock

QUANTITY	ITEM NUMBER	DESCRIPTION
4	34100260	GT300R 2.5" Stem 25/125F

TOLERANCE OF ±1% OF RANGE: EX. 0-200°F = ±2°F	THERMOMETERS CALIBRATED AGAINST MASTER PRECISION THERMOMETERS, DIRECTLY TRACEABLE TO NATIONAL BUREAU OF STANDARDS.

TAG NUMBER	CALIBRATING TEMPERATURE -40°F / -40°C	0°F / -17.8°C	50°F / 10°C	100°F / 37.8°C	140°F / 60°C	160°F / 71°C	200°F / 93°C	220°F / 104°C	295°F / 146°C	400°F / 204°C	750°F / 399°C
1			50°F	100°F							
2			50°F	100°F							
3			50°F	100°F							
4			50°F	100°F							

DATE: 10-25-91 TESTED BY: BL CHECKED BY:

Pitot Tube Calibration Sheet

Date: 10/23/91
Technician: JB
Calibration pitot tube
Type: std
Size (OD): 1/4"
ID number: 450
Cp (std): 0.99
S-Type pitot tube
Size (OD): 3/8"
ID Number: 207

A-Side Calibration			
Δp std in H2O	Δp s in H2O	Cp(s)	DEV
0.675	0.930	0.843	0.003
0.675	0.925	0.846	0.006
0.670	0.925	0.843	0.003
0.545	0.750	0.844	0.004
0.545	0.755	0.841	0.001
0.550	0.750	0.848	0.008
0.250	0.350	0.837	0.003
0.250	0.355	0.831	0.009
0.245	0.350	0.828	0.012
	A-Side Averages	**0.840**	**0.005**

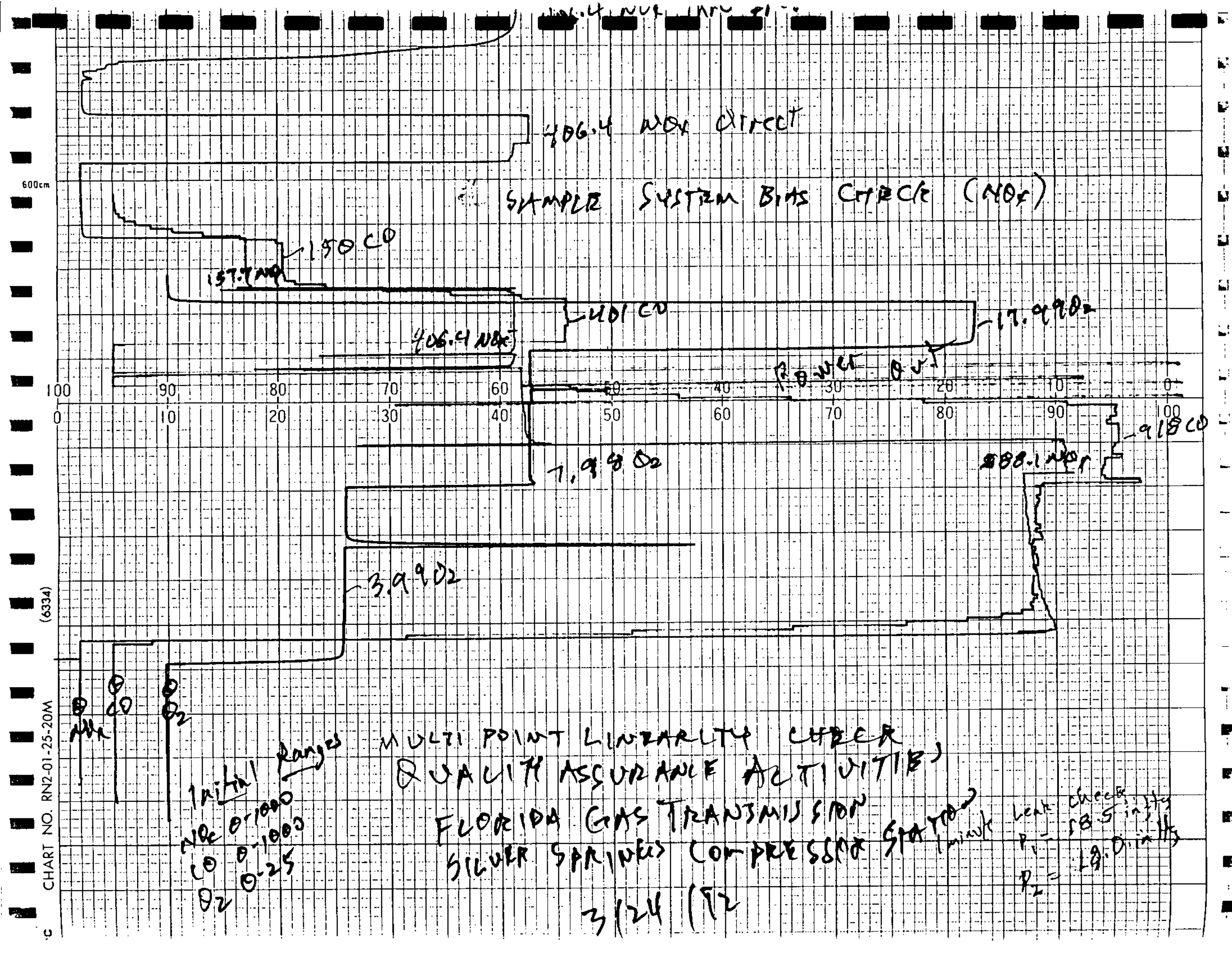
B-Side Calibration			
Δp std in H2O	Δp s in H2O	Cp(s)	DEV
0.670	0.930	0.840	0.003
0.670	0.925	0.843	0.001
0.675	0.925	0.846	0.002
0.560	0.775	0.842	0.002
0.560	0.770	0.844	0.001
0.555	0.770	0.840	0.003
0.225	0.310	0.843	0.000
0.225	0.305	0.850	0.007
0.220	0.305	0.841	0.002
	B-Side Averages	**0.843**	**0.002**

Average DEV =	0.004	must be less ≤ 0.01
Cp(s) from Side A - Cp(s) from Side B =	0.003	must be less ≤ 0.01

Calibrations Performed by Cubix Corporation, Austin, Texas

APPENDIX E:
STRIP CHART RECORDS

NO_x, O_2, CO


406.4 NOx direct
600cm
SAMPLE SYSTEM BIAS CHECK (NOx)
150 CO
157.7 NOx
401 CO
17.99 O_2
406.4 NOx
POWER OUT
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
918 CO
888.1 NOx
7.98 O_2
3.99 O_2
(6334)
NOx
CO
O_2
MULTI POINT LINEARITY CHECK
QUALITY ASSURANCE ACTIVITIES
FLORIDA GAS TRANSMISSION
SILVER SPRINGS COMPRESSOR STATION
Initial Ranges
NOx 0-1000
CO 0-1000
O_2 0-25
1 minute leak check
P_1 = 18.5 in Hg
P_2 = 19.0 in Hg
3/24/92
CHART NO. RN2-01-25-20M

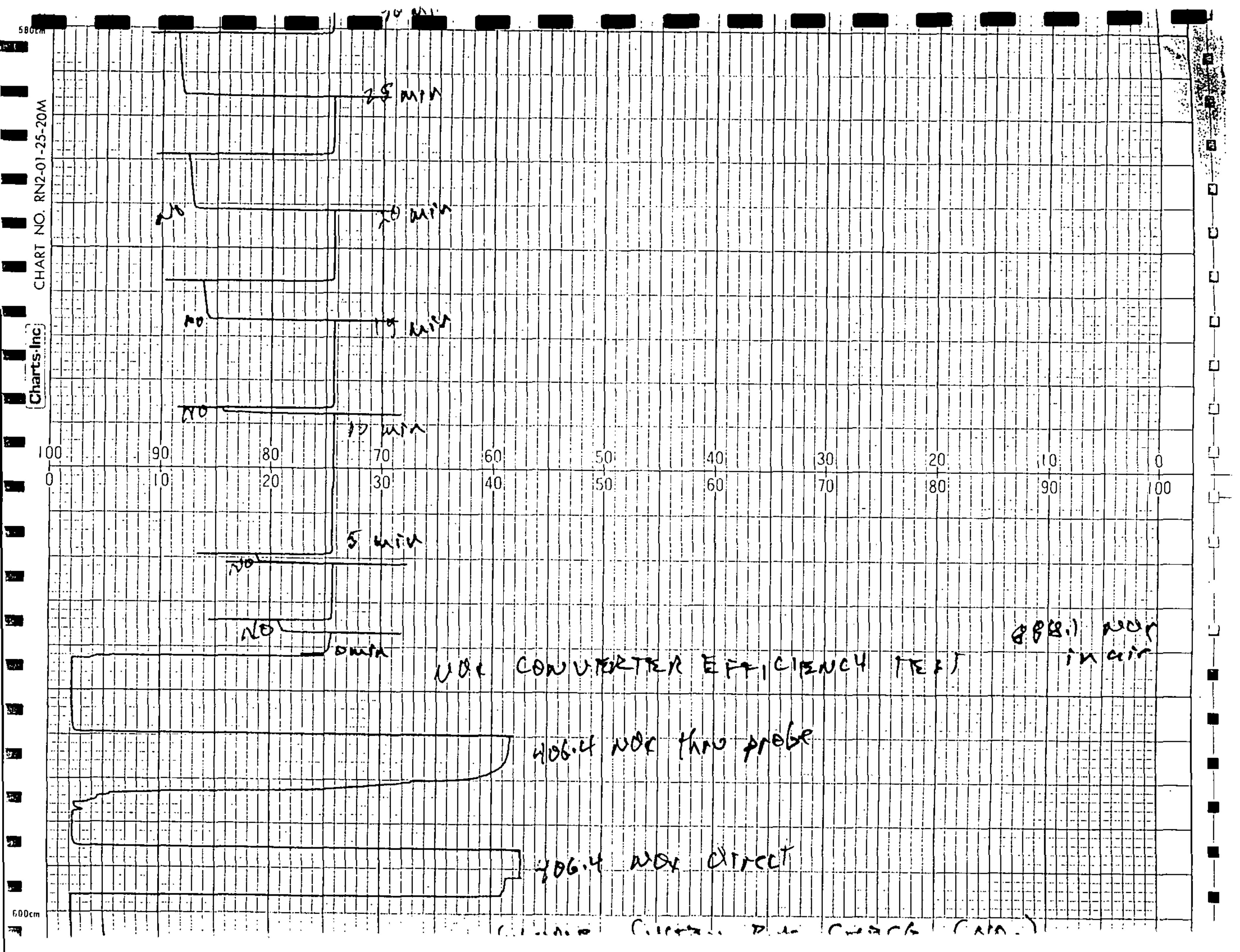
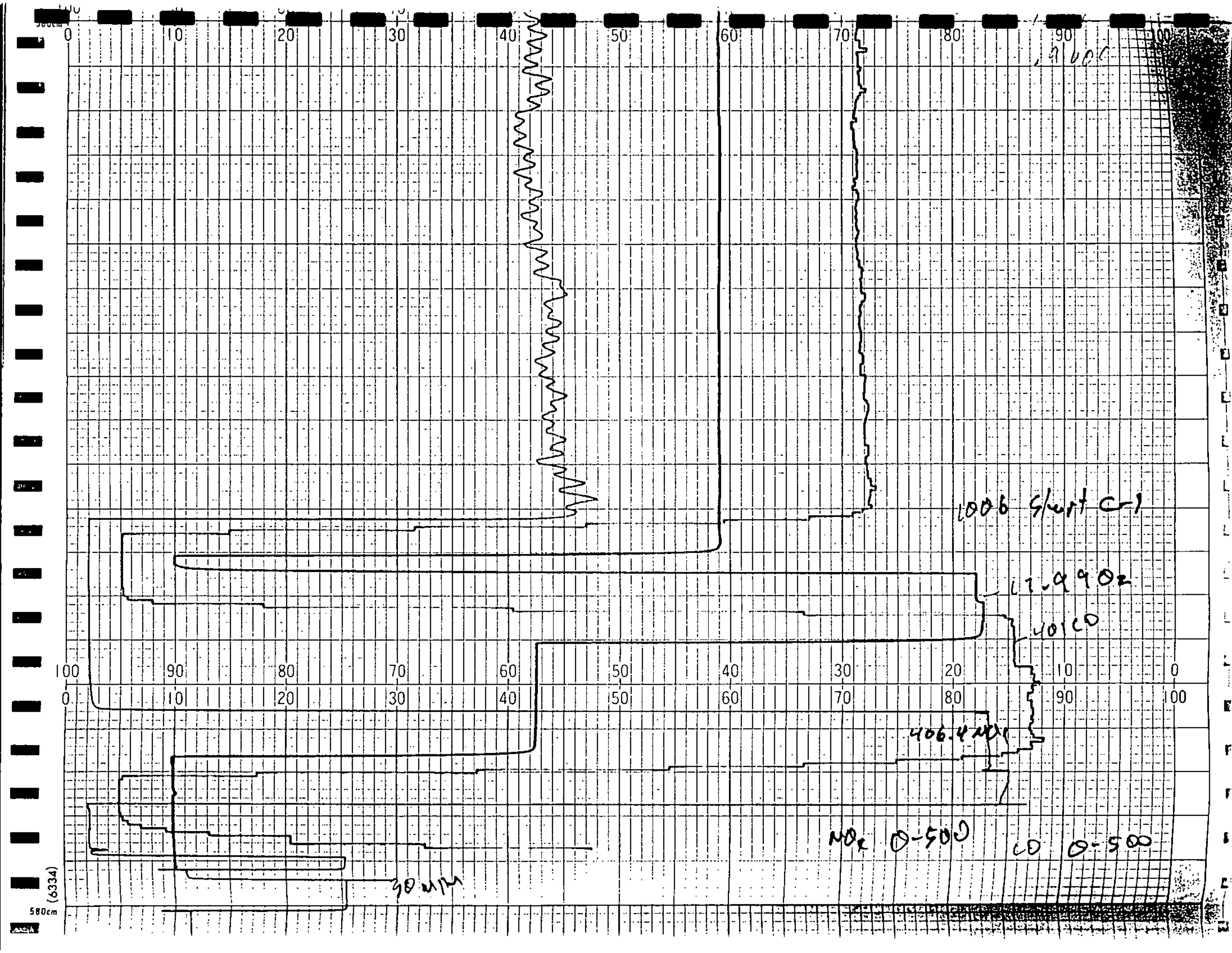


CHART NO. RN2-01-25-20M
Charts Inc
580cm
600cm
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
25 min
NO
20 min
NO
15 min
NO
10 min
5 min
NO
NO
0 min
NOx CONVERTER EFFICIENCY TEST
88.1 NOx in air
406.4 NOx thru probe
406.4 NOx direct


1006 Start C-1
17.99 O2
40 CO
406.4 NOx
NOx 0-500
CO 0-500
30 MIN

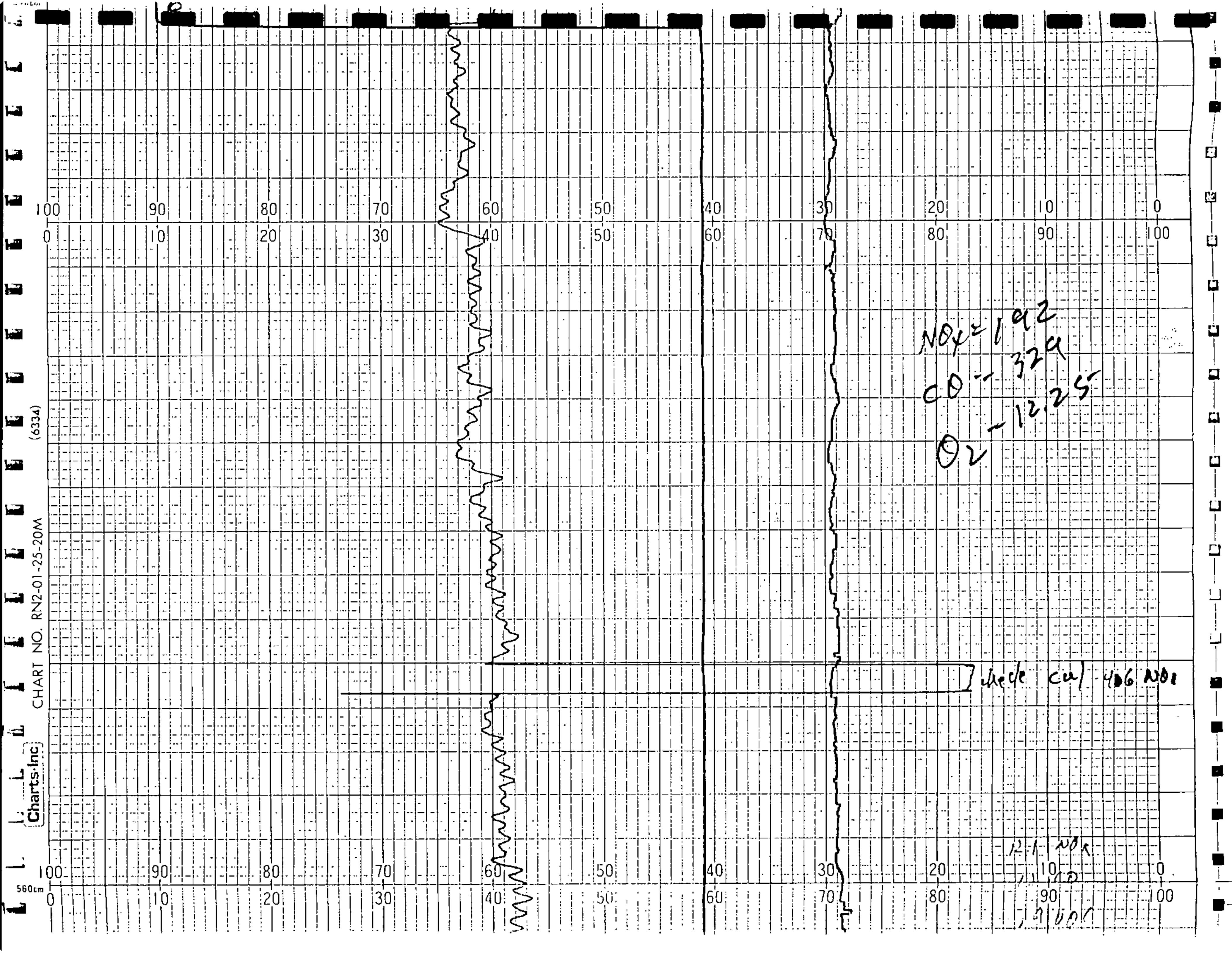


CHART NO. RN2-01-25-20M
(6334)
Charts-Inc
560cm
NOx = 192
CO ~ 329
O2 ~ 12.25
check cal 406 NOx

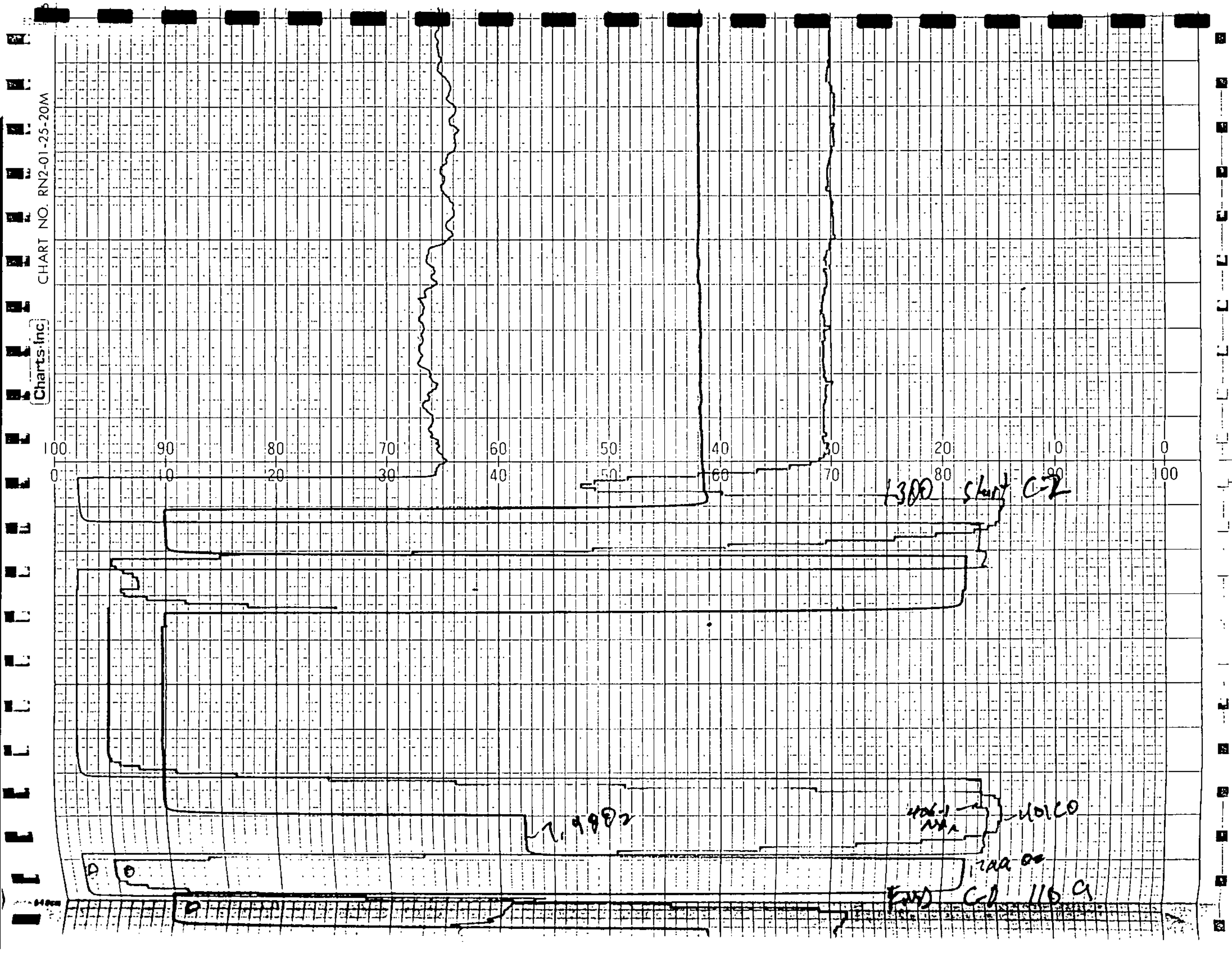
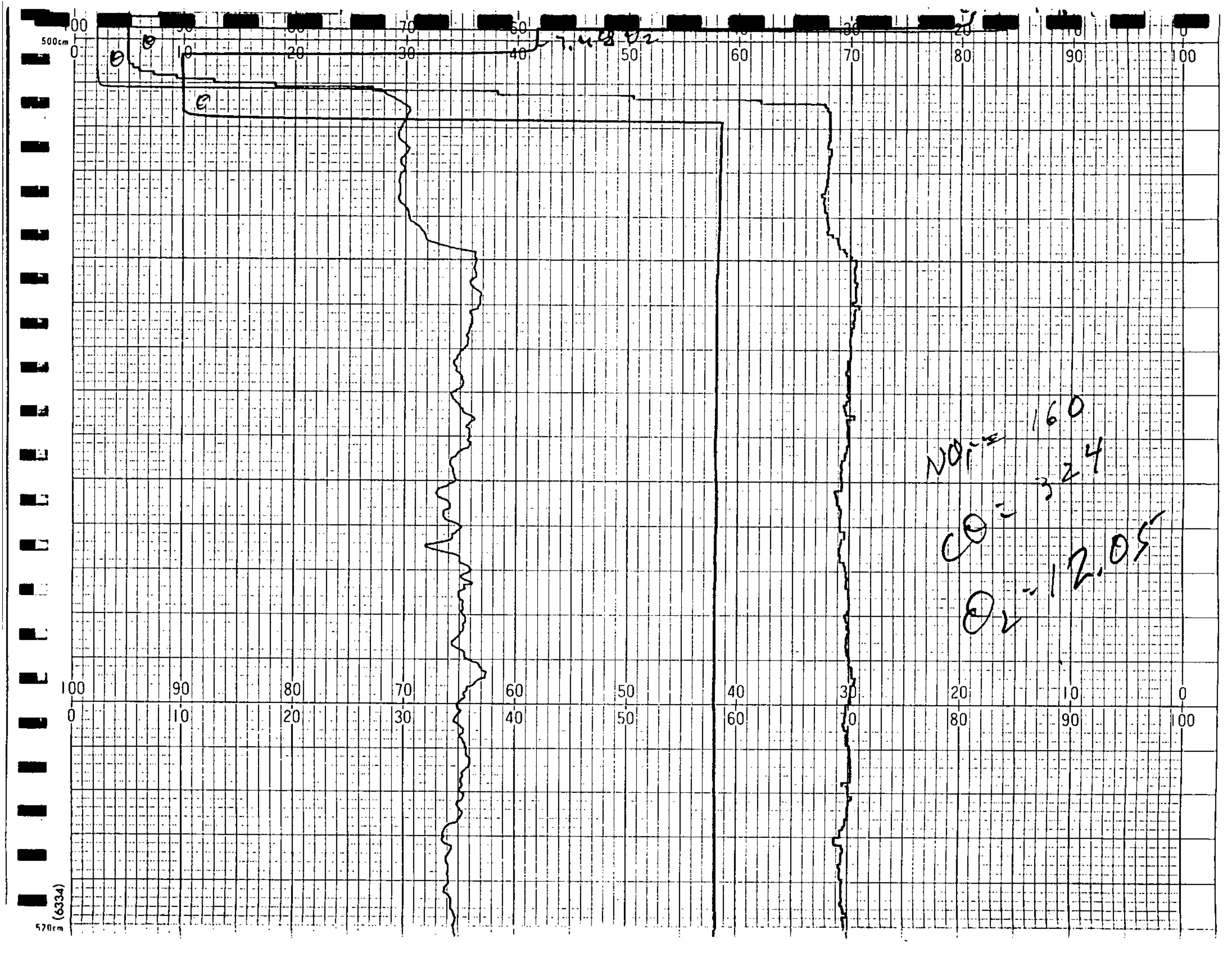
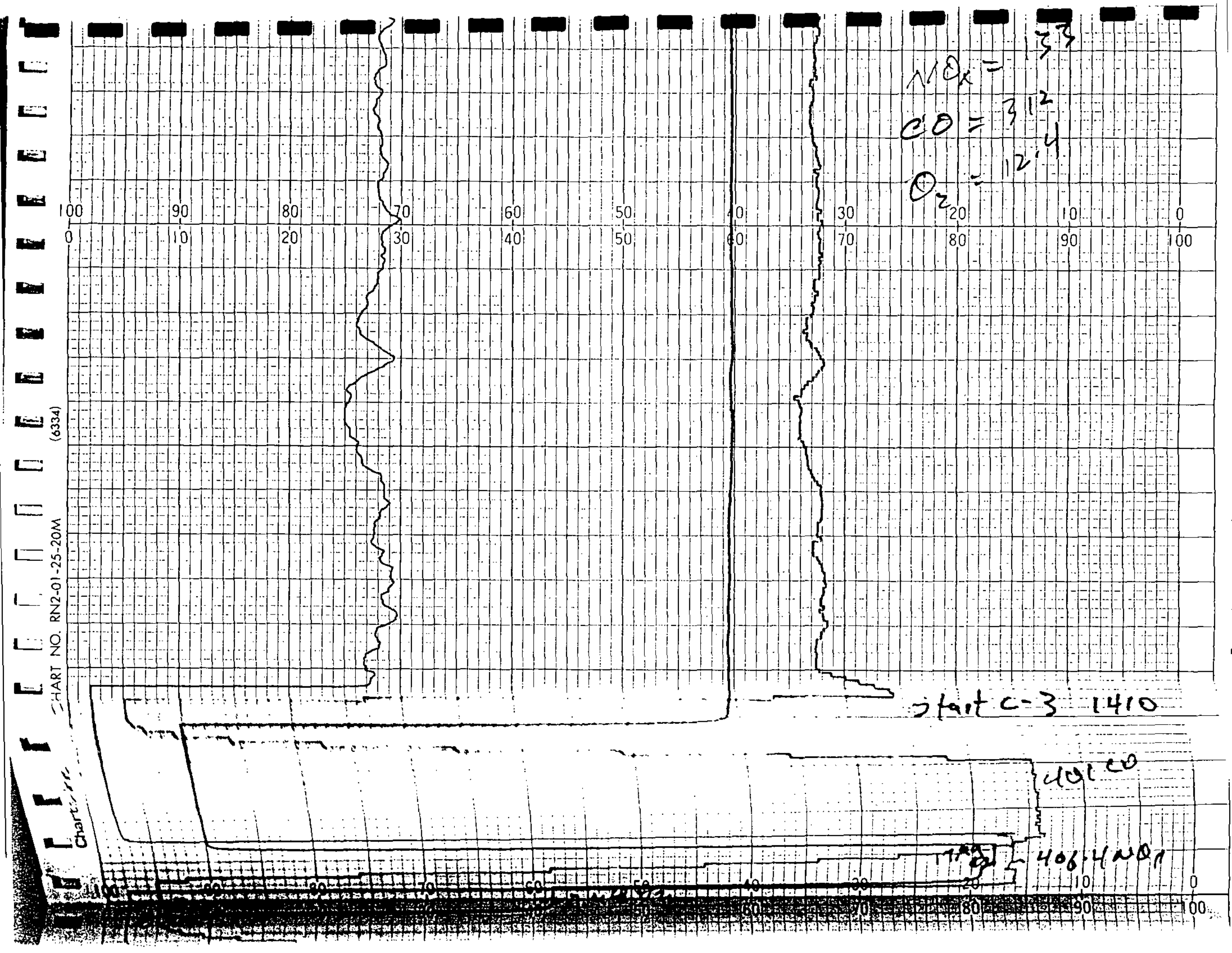


CHART NO. RN2-01-25-20M
Charts Inc
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
1300 Start C-2
ENDS C-2 110 CO


500cm
520cm
(6334)
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
7.48 O2
NO1= 16.0
324
CO=
O2= 12.05


NOx = 33
CO = 3.12
O2 = 12.4
start C-3 1410
401 CO
406.4 NO1
CHART NO. RN2-01-25-20M
(6334)
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100

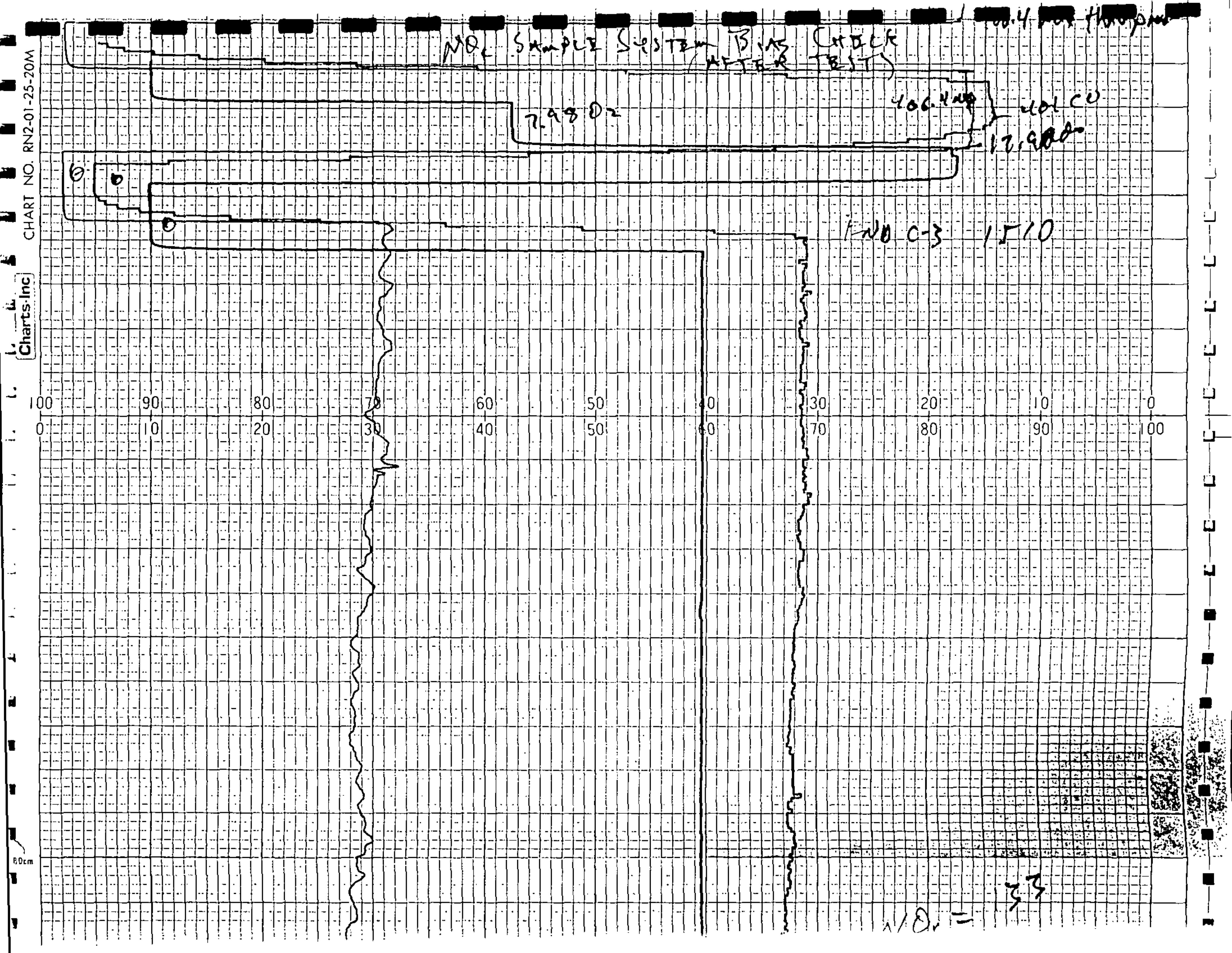
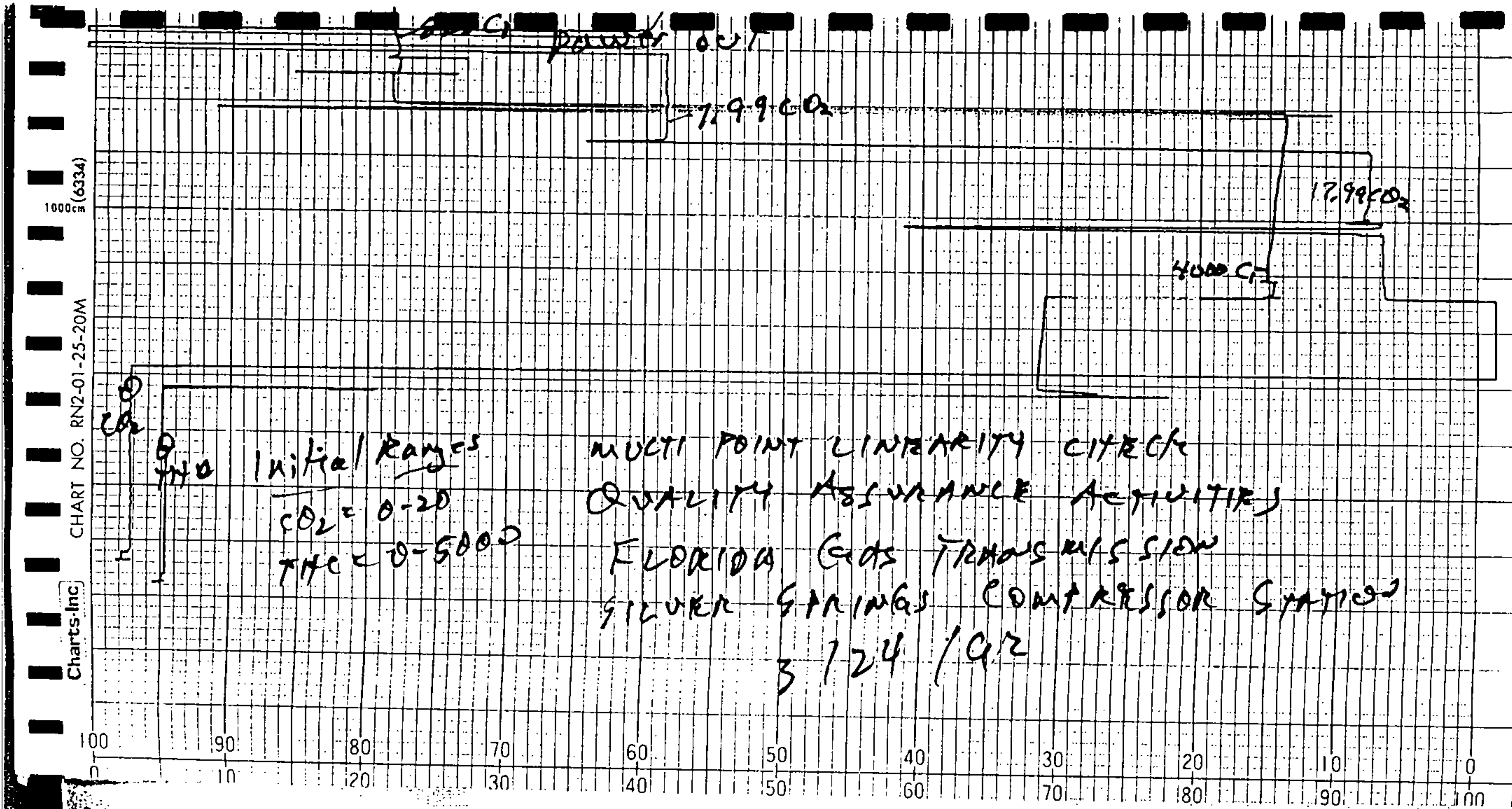
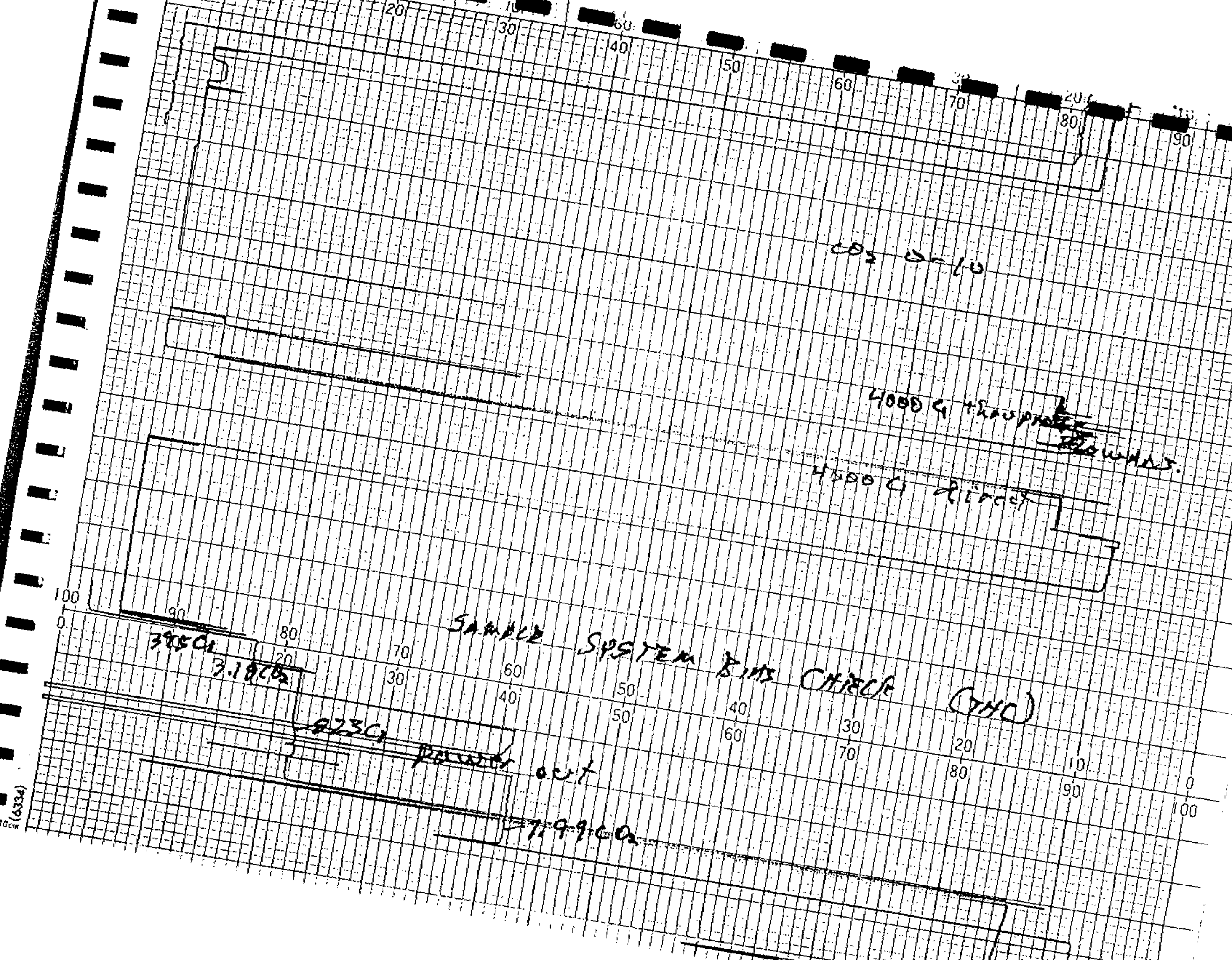


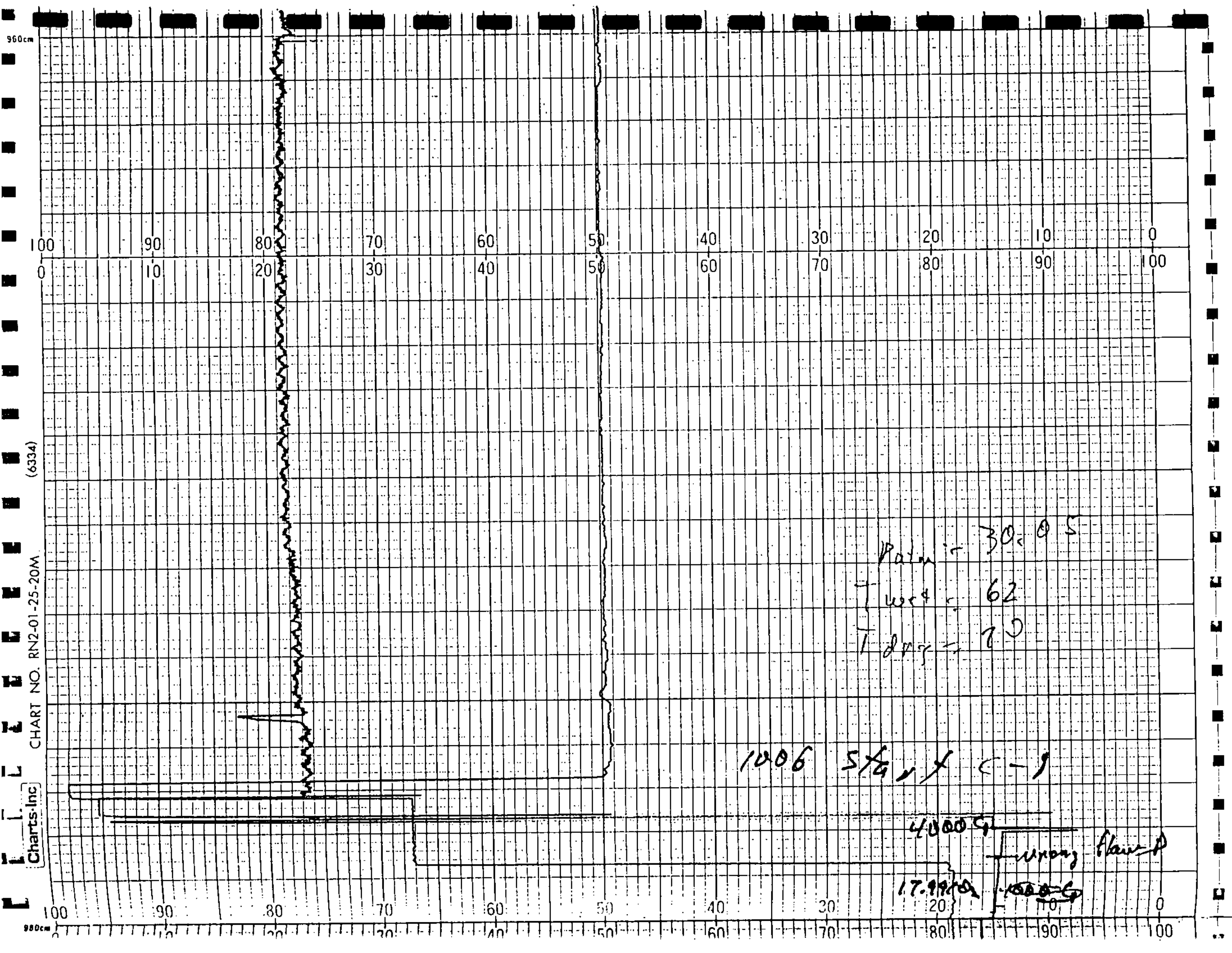
CHART NO. RN2-01-25-20M
Charts-Inc
NOx SAMPLE SYSTEM BIAS CHECK
(AFTER TEST)
7.98 O2
406.4 NOx
401 CO
12,900
END C-3 1510
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
NOx = 33

CO_2, THC


power out
17.99 CO2
17.99 CO2
4000 CH
0 CO2
0 THC
Initial Ranges
CO2 = 0-20
THC = 0-5000
MULTI POINT LINEARITY CHECK
QUALITY ASSURANCE ACTIVITIES
FLORIDA GAS TRANSMISSION
SILVER SPRINGS COMPRESSOR STATION
3/24/92
CHART NO. RN2-01-25-20M
Charts-Inc
1000cm (6334)



SAMPLE SYSTEM BIAS CHECK (THC)
3.18CO2
8.23CO2
Power out
7.99CO2


960cm
980cm
CHART NO. RN2-01-25-20M
(6334)
Charts·Inc
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
Patm = 30.05
Twet = 62
Tdry = 70
1006 Start C-1
4000 G
wrong flow
1000 G

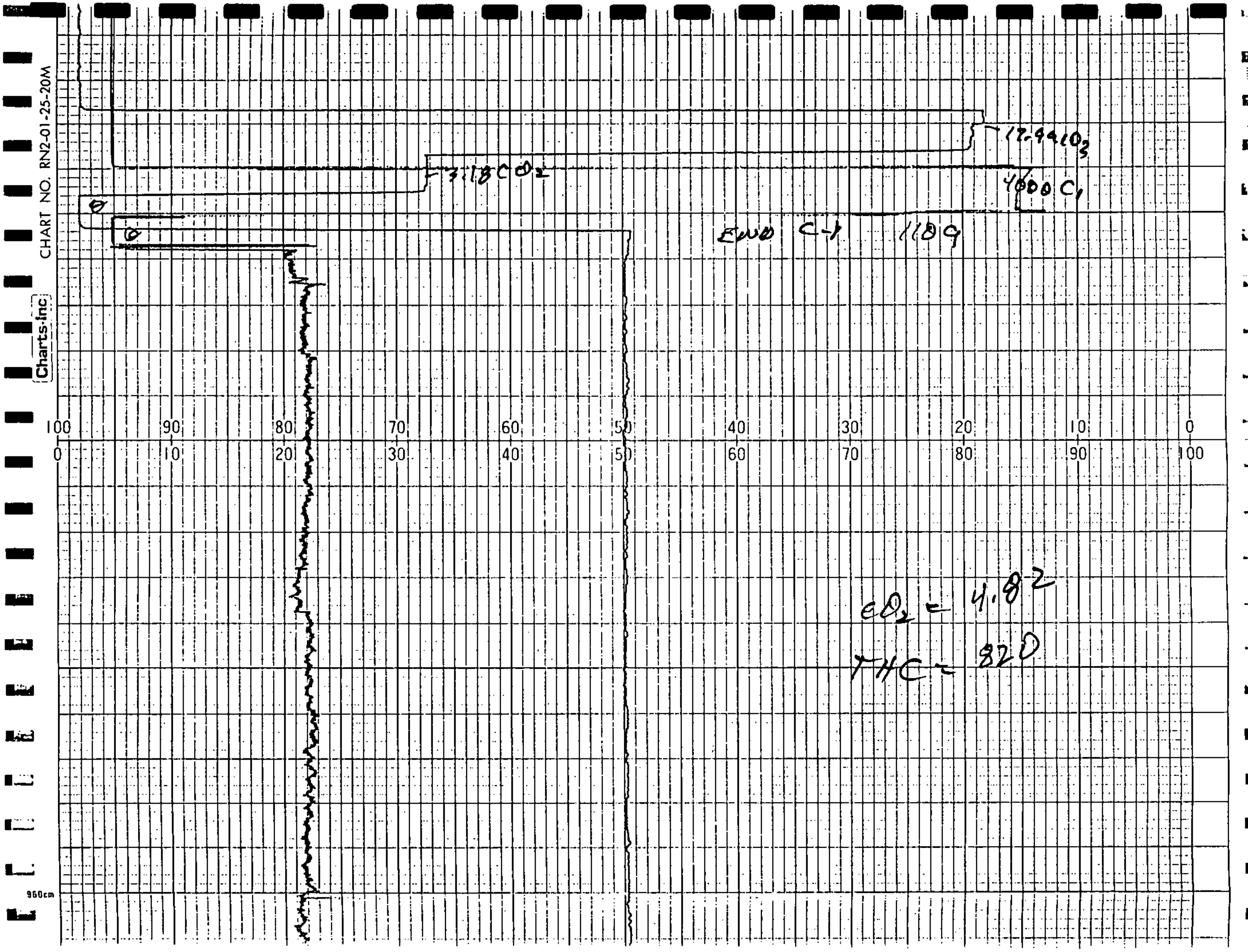
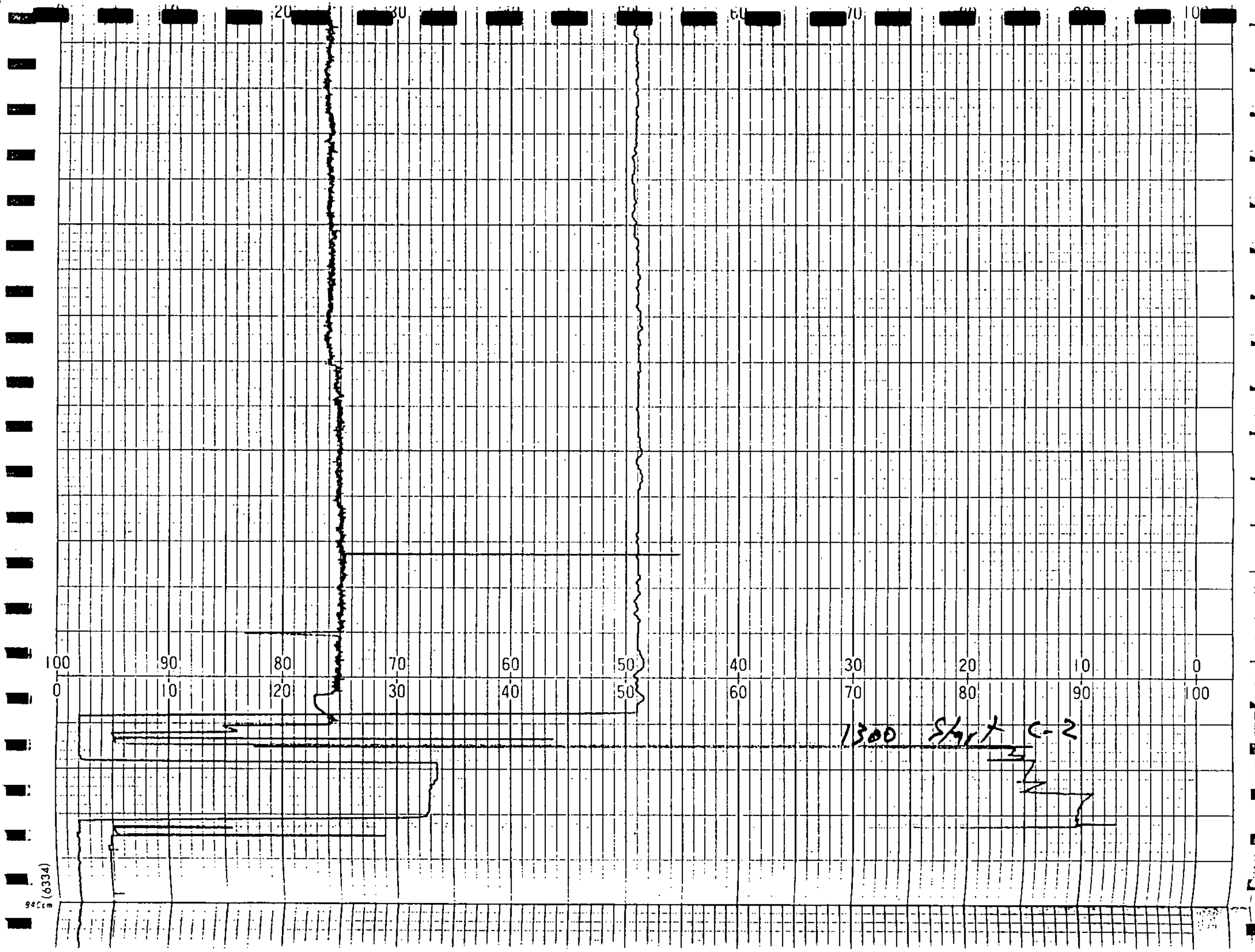
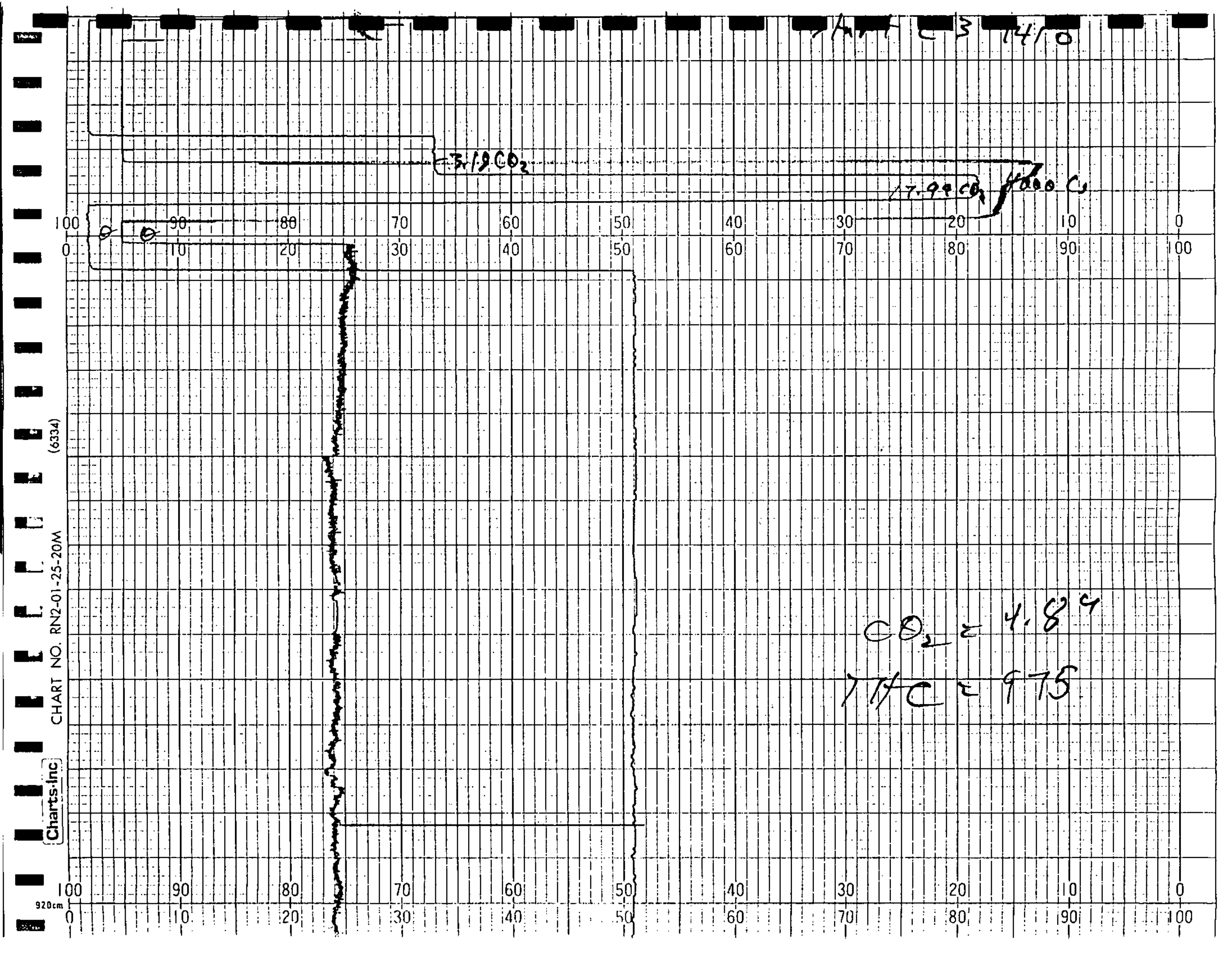


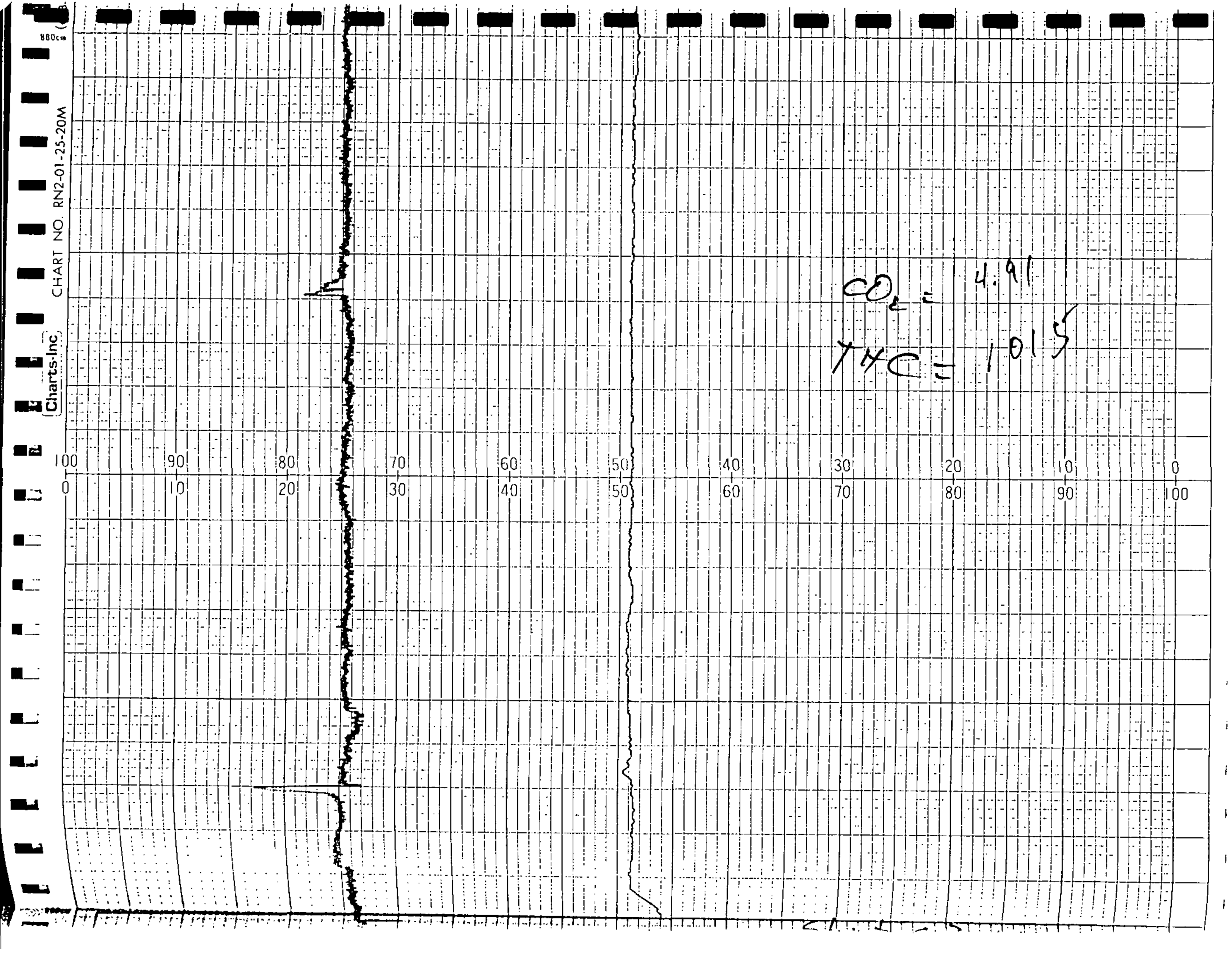
CHART NO. RN2-01-25-20M
Charts·Inc
17.94 CO2
3.18 CO2
4000 C1
END C-1 1109
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
CO2 = 4.82
THC = 820
960cm



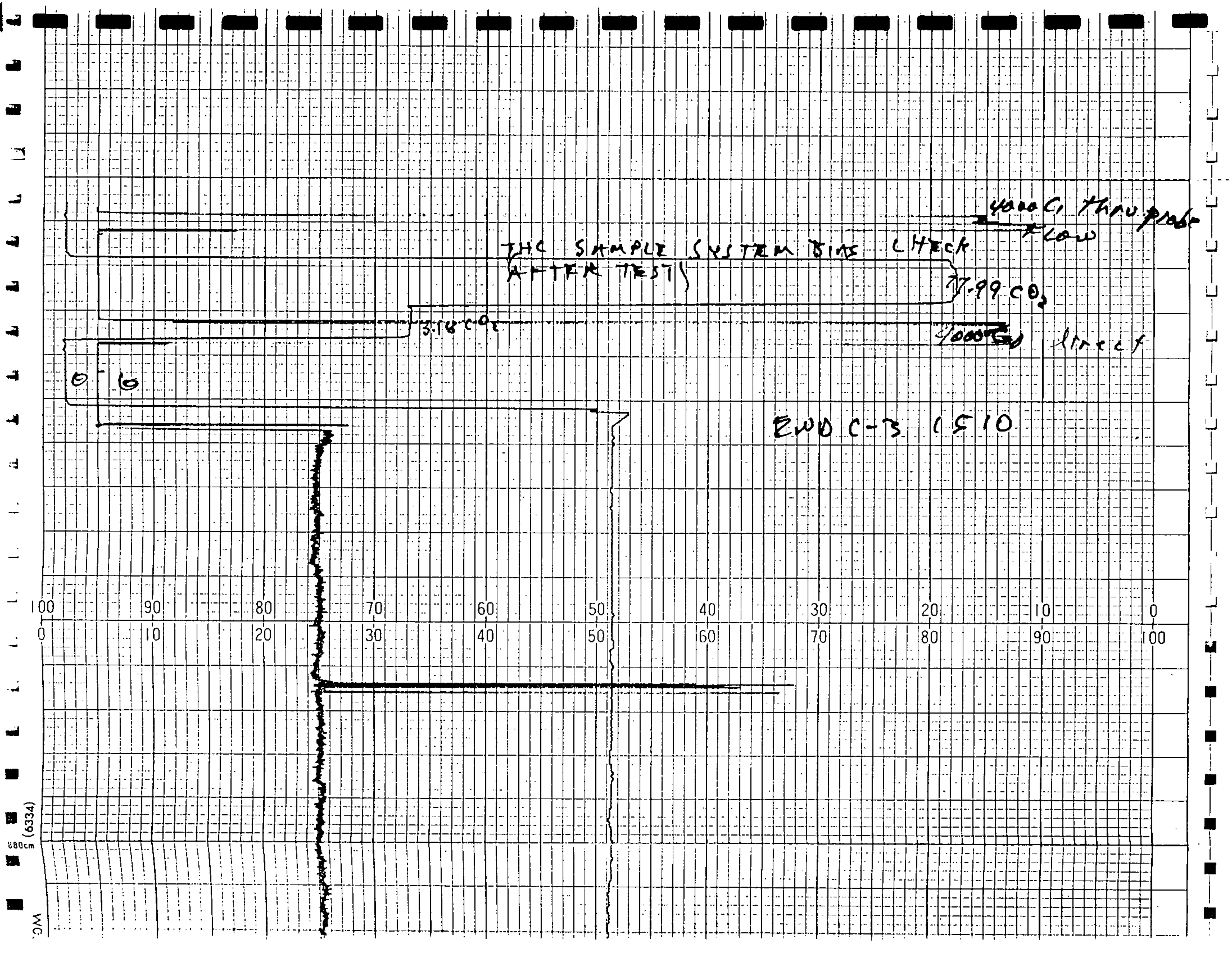
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
1300 Start C-2
(6334)



3.19 CO_2
7.94 CO_2
CO_2 = 4.84
THC = 975
(6334)
CHART NO. RN2-01-25-20M
Charts-Inc
920cm

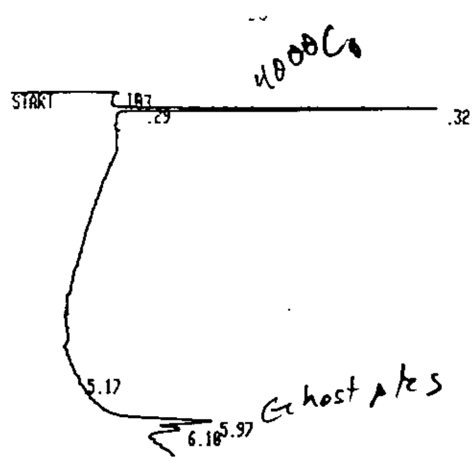


880cm
CHART NO. RN2-01-25-20M
Charts·Inc
100 90 80 70 60 50 40 30 20 10 0
0 10 20 30 40 50 60 70 80 90 100
CO_2 = 4.91
THC = 1.015



4000 C₁ thru probe
flow
THC SAMPLE SYSTEM BIAS CHECK
(AFTER TEST)
7.99 CO₂
3.18 CO₂
1000 C₁ direct
0
G
END C-3 1510
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
90
100
(6334)
WC

APPENDIX F
CHROMATOGRAMS

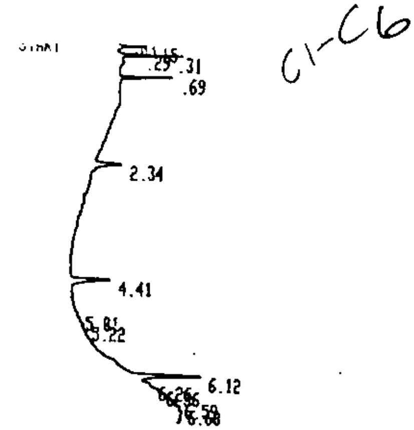


RUN # 12 MAR/24/92 10:34:15
WORKFILE ID: C
WORKFILE NAME:

AREA%

RT	AREA	TYPE	AR/HT	AREA%
0.03	1345	BB	0.060	0.308
0.29	290	D PV	0.013	0.067
0.32	366070	D VB	0.015	83.920
5.17	3140	BV	0.216	0.720
5.97	42450	VV	0.243	9.732
6.10	22917	VV	0.169	5.254

TOTAL AREA= 436210
MUL FACTOR= 1.0000E+00

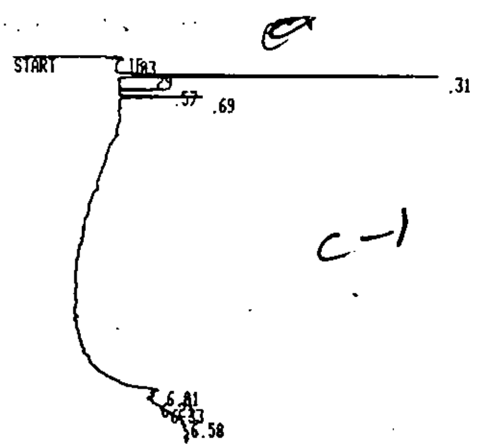


RUN # 13 MAR/24/92 10:44:55
WORKFILE ID: C
WORKFILE NAME:

AREA%

RT	AREA	TYPE	AR/HT	AREA%
0.03	613	PB	0.037	4.253
0.15	763	D BP	0.025	5.294
0.29	329	D VV	0.016	2.283
0.31	1130	D VB	0.015	7.840 c1
0.69	1298	D PB	0.021	9.005 c2
2.34	1976	BB	0.063	13.709 c3
4.41	2940	PV	0.062	20.397 c4
5.01	271	PP	0.146	1.880 c5
5.22	212	PB	0.071	1.471
~~6.12~~	~~0~~	~~PV~~	~~0.000~~	~~0.000~~
6.26	428	VV	0.052	2.969 c6
6.36	629	VV	0.063	4.364
6.59	2909	VV	0.182	20.182
6.68	916	VV	0.073	6.355

TOTAL AREA= 14414
MUL FACTOR= 1.0000E+00

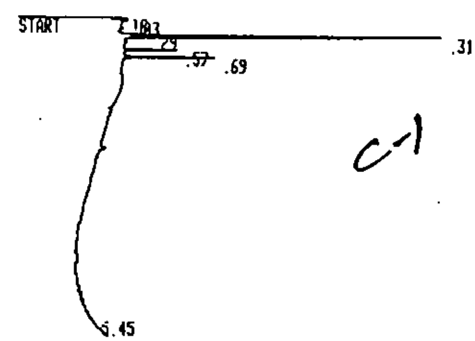


RUN # 14 MAR/24/92 10:56:17
WORKFILE ID: C
WORKFILE NAME:

AREA%

RT	AREA	TYPE	AR/HT	AREA%
~~0.03~~	~~1546~~	~~PV~~	~~0.075~~	~~1.989~~
~~0.29~~	~~296~~	~~PV~~	~~0.013~~	~~0.381~~
0.31	62765	D VB	0.015	80.765 c1
0.57	1014	D PB	0.018	1.305 } VOC
0.69	2130	D BB	0.021	2.741 }
~~6.01~~	~~1472~~	~~PV~~	~~0.033~~	~~1.894~~
~~6.21~~	~~1157~~	~~VV~~	~~0.067~~	~~1.409~~

4.77% VOC

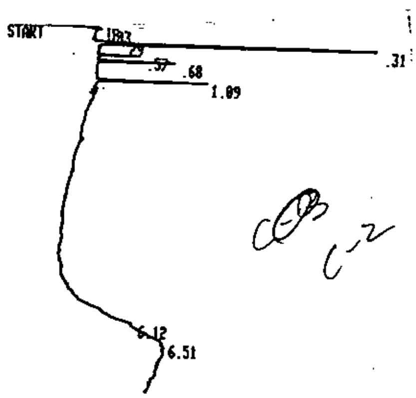


RUN # 15 MAR/24/92 11:08:18
WORKFILE ID: C
WORKFILE NAME:

AREA%

RT	AREA	TYPE	AR/HT	AREA%
~~0.03~~	~~1244~~	~~PV~~	~~0.064~~	~~1.565~~
~~0.29~~	~~361~~	~~D PV~~	~~0.015~~	~~0.454~~
0.31	69336	D VB	0.015	87.210 c1
0.57	1124	D BB	0.018	1.414 } V
0.69	2342	D BB	0.021	2.946 }
~~5.45~~	~~5098~~	~~VV~~	~~0.232~~	~~6.412~~

~~10.0% VOC~~
4.77 % VOC



RUN # 22 MAR/24/92 13:45:43
WORKFILE ID: C
WORKFILE NAME:

AREA%

RT	AREA	TYPE	AR/HT	AREA%	
~~0.03~~	~~600~~	~~PV~~	~~0.034~~	~~0.768~~	
~~0.29~~	~~331~~	~~PV~~	~~0.013~~	~~0.424~~	
0.31	64790	D VB	0.015	82.946	C1
0.57	1037	D BV	0.018	1.328	VOC
0.68	2313	D PB	0.021	2.961	VOC
1.09	3029	D PB	0.019	3.878	VOC
~~6.12~~	~~0~~	~~PV~~	~~0.000~~	~~0.000~~	
~~6.51~~	~~6011~~	~~VV~~	~~0.284~~	~~7.696~~	

TOTAL AREA= 78111
MUL FACTOR= 1.0000E+00

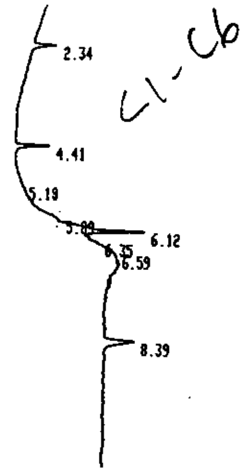
8.96 % VOC

RUN # 16 MAR/24/92 11:25:05
WORKFILE ID: C
WORKFILE NAME:

AREA%

RT	AREA	TYPE	AR/HT	AREA%	
0.03	815	PB	0.045	0.794	
0.29	340	D PV	0.015	0.331	
0.31	30058	D VB	0.015	29.283	C1
6.13	43522	VV	0.406	42.401	ghost peaks
6.38	27910	VV	0.215	27.191	ghost peaks

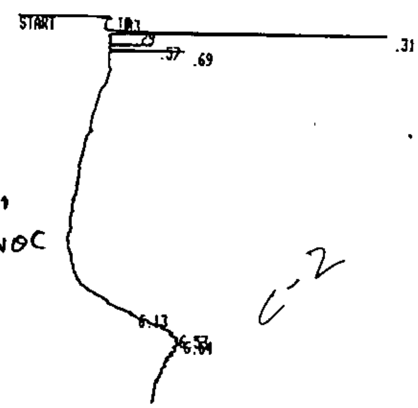
TOTAL AREA= 102640
MUL FACTOR= 1.0000E+00



RUN # 18 MAR/24/92 12:09:53
WORKFILE ID: C
WORKFILE NAME:

AREA%

RT	AREA	TYPE	AR/HT	AREA%	
0.04	489	BB	0.029	2.126	
0.29	398	D BV	0.017	1.731	
0.31	733	D VB	0.017	3.187	C1
0.69	1299	D BB	0.021	5.648	C2
2.34	2150	BB	0.067	9.348	C3
4.41	2572	PB	0.056	11.183	C4
5.18	309	PP	0.166	1.344	C5
5.89	0	PP	0.000	0.000	
6.12	8221	PV	0.084	35.745	
6.35	741	VV	0.110	3.222	C6
6.59	1831	VV	0.277	7.961	
8.39	[illegible]	PP	[illegible]		



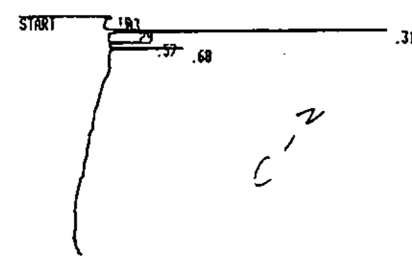
RUN # 20 MAR/24/92 13:21:05
WORKFILE ID: C
WORKFILE NAME:

AREA%

RT	AREA	TYPE	AR/HT	AREA%	
~~0.03~~	~~216~~	~~PB~~	~~0.039~~	~~[illegible]~~	
~~0.29~~	~~313~~	~~PV~~	~~0.013~~	~~0.353~~	
0.31	64538	D VB	0.015	72.812	C1
0.57	1036	D PB	0.018	1.169	VOC
0.69	2224	D BB	0.021	2.509	VOC
~~6.13~~	~~0~~	~~PV~~	~~0.000~~	~~0.000~~	
~~6.53~~	~~14119~~	~~VV~~	~~0.281~~	~~15.929~~	
~~6.64~~	~~5691~~	~~VV~~	~~0.112~~	~~6.421~~	

TOTAL AREA= 88637

4.81 % VOC

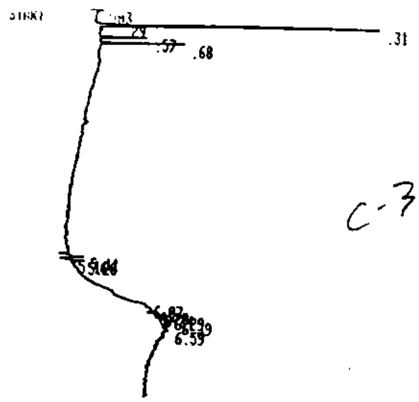


RUN # 21 MAR/24/92 13:35:18
WORKFILE ID: C
WORKFILE NAME:

AREA%

RT	AREA	TYPE	AR/HT	AREA%	
~~0.03~~	~~1319~~	~~PP~~	~~0.074~~	~~1.932~~	
~~0.29~~	~~228~~	~~PV~~	~~0.010~~	~~0.334~~	
0.31	63480	D VB	0.015	93.001	
0.57	1032	D PB	0.018	1.512	VOC
0.68	2198	D BB	0.021	3.220	VOC

4.84



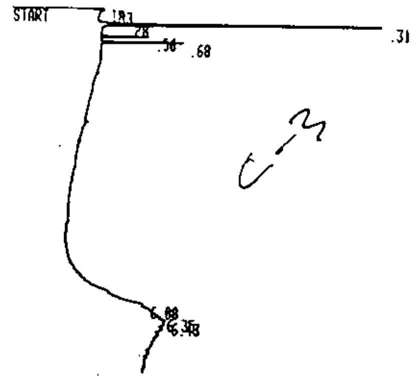
RUN # 24 MAR/24/92 14:19:56
WORKFILE ID: C
WORKFILE NAME:

AREA%

RT	AREA	TYPE	AR/HT	AREA%
0.03	803	PB	0.042	0.722
0.29	284	PV	0.012	0.255
0.31	68427	D VB	0.015	61.525 C1
0.57	1106	D PB	0.018	1.866
0.68	2513	D PB	0.021	2.260 VOC
5.11	969	D BP	0.033	0.871
5.16	322	PV	0.025	0.290
5.20	680	D VV	0.024	0.611
6.07	12480	BV	0.227	11.221
6.20	7110	VV	0.128	6.393
6.24	1973	VV	0.032	1.774
6.29	3738	D VV	0.052	3.361
6.39	4670	VV	0.060	4.199
6.59	6063	VV	0.110	5.452

TOTAL AREA= 111220
MUL FACTOR= 1.0000E+00

6.39



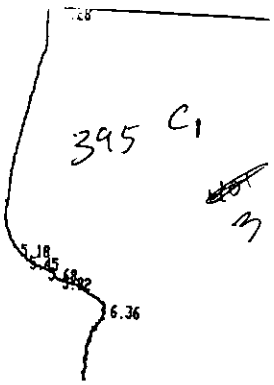
RUN # 25 MAR/24/92 14:35:02
WORKFILE ID: C
WORKFILE NAME:

AREA%

RT	AREA	TYPE	AR/HT	AREA%
~~0.03~~	~~713~~	~~BV~~	~~0.045~~	~~0.963~~
~~0.28~~	~~288~~	~~D PV~~	~~0.013~~	~~0.389~~
0.31	67021	D VB	0.015	90.502 C1
0.56	1181	D BV	0.018	1.595 VOC
0.68	2522	D VP	0.022	3.406
~~6.00~~	~~0~~	~~PV~~	~~0.000~~	~~0.000~~
~~6.35~~	~~1920~~	~~VV~~	~~0.234~~	~~2.593~~
~~6.43~~	~~410~~	~~VB~~	~~0.063~~	~~0.554~~

TOTAL AREA= 74055
MUL FACTOR= 1.0000E+00

5.24

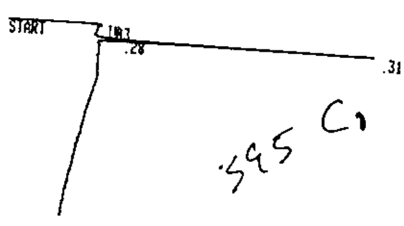


RUN # 23 MAR/24/92
WORKFILE ID: C
WORKFILE NAME:

AREA%

RT	AREA	TYPE	AR/HT
0.03	737	PB	0.047
0.28	320	D PV	0.015
0.31	26442	D VB	0.015
5.18	141	PP	0.062
5.45	200	BP	0.083
5.68	0	PV	0.000
5.82	996	VV	0.133
6.36	6586	VV	0.387

TOTAL AREA= 35422
MUL FACTOR= 1.0000E+00

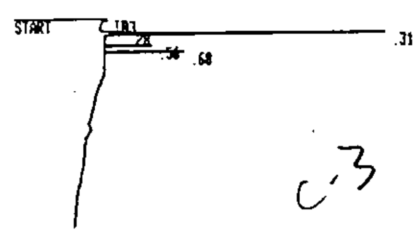


RUN # 27 MAR/24/92 15:00:20
WORKFILE ID: C
WORKFILE NAME:

AREA%

RT	AREA	TYPE	AR/HT	AREA%
0.03	582	PB	0.034	1.984
0.28	405	D BV	0.016	1.381
0.31	28351	D VB	0.015	96.636

TOTAL AREA= 29338
MUL FACTOR= 1.0000E+00



RUN # 26 MAR/24/92 14:50:20
WORKFILE ID: C
WORKFILE NAME:

AREA%

RT	AREA	TYPE	AR/HT	AREA%
0.03	1401	PB	0.078	1.924
0.28	341	D BV	0.014	0.468
0.31	67526	D VB	0.015 C1	92.727
0.56	1158	D PB	0.018 VOC	1.590
0.68	2396	D PB	0.021	3.290

TOTAL AREA= 72822
MUL FACTOR= 1.0000E+00

5.00%

APPENDIX G
OPACITY OBSERVATIONS

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Rick J. Krenzke

met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue.

Thomas Rose
President

232749
Certificate Number

Vice President

Orlando
Location

David B. Savage, Jr.
Program Manager

February 26, 1992
Date of Issue

VISIBLE EMISSION OBSERVATION FORM

SOURCE NAME: Florida Gas - Silver Springs Comp. St. #17

ADDRESS: P.O. Box 337

CITY: Silver Springs | **STATE:** Fl | **ZIP:** 32688-0337

PHONE: 904-685-2421 | **SOURCE ID NUMBER:** Unit # 5

PROCESS EQUIPMENT: Dresser Model 412 KVSR | **OPERATING MODE:** Full Load

CONTROL EQUIPMENT: NA | **OPERATING MODE:** NA

DESCRIBE EMISSION POINT: Exhaust Stack of Recip. Engine

HEIGHT ABOVE GROUND LEVEL: 60' | **HEIGHT RELATIVE TO OBSERVER:** 54'

DISTANCE FROM OBSERVER: 120' | **DIRECTION FROM OBSERVER:** N

DESCRIBE EMISSIONS: No Visible Emissions

EMISSION COLOR: No Visible Emissions | **PLUME TYPE:** CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☑ YES ☐ | **IS WATER DROPLET PLUME:** ATTACHED ☐ DETACHED ☐

AT WHAT POINT IN THE PLUME WAS OPACITY DETERMINED: Exit of Exhaust Stack

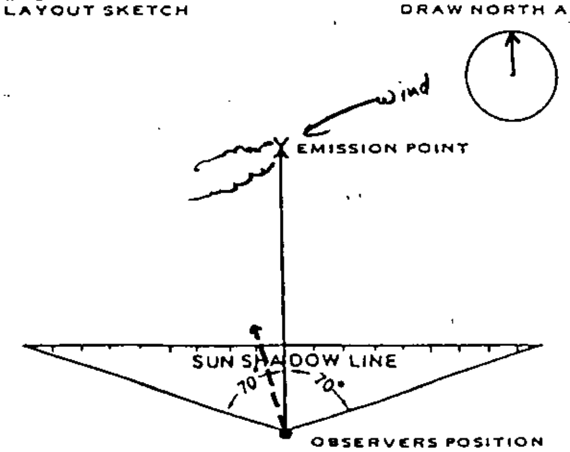
DESCRIBE BACKGROUND: Sky

BACKGROUND COLOR: Blue | **SKY CONDITIONS:** 10-20% white Cloud Cover

WIND SPEED: ≈ 5-10 mph | **WIND DIRECTION:** NNE

AMBIENT TEMP.	WET BULB TEMP.	RELATIVE HUMIDITY

SOURCE LAYOUT SKETCH | **DRAW NORTH ARROW**



COMMENTS:

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE:

TITLE: | DATE:

OBSERVATION DATE: 3/24/92 | **START TIME:** 10:30 am | **STOP TIME:** 11:30 am

M \ SEC	0	15	30	45	M \ SEC	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD: 0 | **NUMBER OF READINGS ABOVE** 0 % WERE 0

RANGE OF OPACITY READINGS: MINIMUM 0 MAXIMUM 0

OBSERVER'S NAME (PRINT): RICK J. KRENZKE

OBSERVER'S SIGNATURE: Rick J. Krenzke | **DATE:** 3/24/92

ORGANIZATION: Cubix Corp.

CERTIFIED BY: State of Florida via ETA | **DATE:** 2-27-92

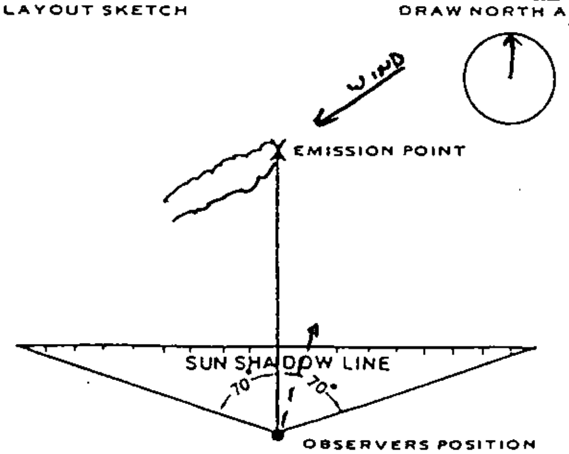
VERIFIED BY: | **DATE:**

EPA 110 0101

VISIBLE EMISSION OBSERVATION FORM

SOURCE NAME	Florida GAS - Silver Springs Comp St. #17
ADDRESS	P.O. Box 337
CITY	Silver Springs
STATE	Florida
ZIP	32688-0337
PHONE	904-685-2421
SOURCE ID NUMBER	Unit #5
PROCESS EQUIPMENT	Dresser Model 412 KVSR
OPERATING MODE	Full Load
CONTROL EQUIPMENT	NA
OPERATING MODE	NA
DESCRIBE EMISSION POINT	Exhaust Stack of Recip. Engine
HEIGHT ABOVE GROUND LEVEL	60'
HEIGHT RELATIVE TO OBSERVER	54'
DISTANCE FROM OBSERVER	120'
DIRECTION FROM OBSERVER	
DESCRIBE EMISSIONS	No Visible Emissions
EMISSION COLOR	No Visible Emissions
PLUME TYPE	CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT	NO ☑ YES ☐
IS WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☐
AT WHAT POINT IN THE PLUME WAS OPACITY DETERMINED	Exit of Exhaust Stack
DESCRIBE BACKGROUND	Sky
BACKGROUND COLOR	Blue/white
SKY CONDITIONS	30-50 Cloud Cover
WIND SPEED	20 MPH
WIND DIRECTION	NNE
AMBIENT TEMP.	
WET BULB TEMP.	
RELATIVE HUMIDITY	

SOURCE LAYOUT SKETCH | DRAW NORTH ARROW



COMMENTS

OBSERVATION DATE	START TIME	STOP TIME
3/24/92	1310	1410

M \ sec	0	15	30	45	M \ sec	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD	0
NUMBER OF READINGS ABOVE	0 % WERE 0
RANGE OF OPACITY READINGS	0 MINIMUM 0 MAXIMUM
OBSERVER'S NAME (PRINT)	RICK J. KRENZKE
OBSERVER'S SIGNATURE	Rick J. Krenzke
DATE	3/24/92
ORGANIZATION	Cubix Corp.
CERTIFIED BY	State of Florida by ETA
DATE	2-27-92
VERIFIED BY	
DATE	

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE

TITLE | DATE

EPA 1R 0101

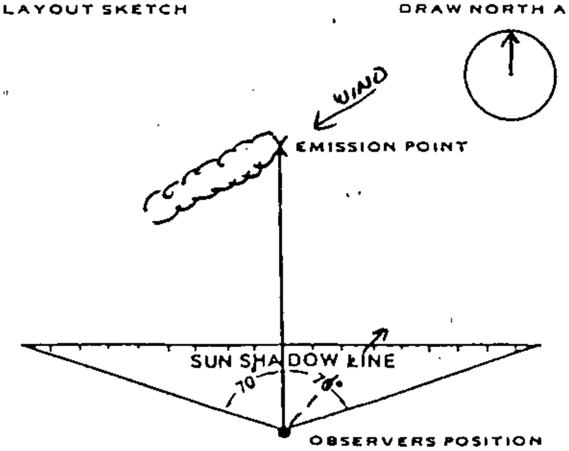
VISIBLE EMISSION OBSERVATION FORM

SOURCE NAME	Florida Gas - Silver Springs Comp. St. #17
ADDRESS	P.O. Box 337
CITY	Silver Springs
STATE	Fl
ZIP	32688-0337
PHONE	904-685-2421
SOURCE ID NUMBER	Unit #5
PROCESS EQUIPMENT	Dresser Model 412 KVSR
OPERATING MODE	Full Load
CONTROL EQUIPMENT	NA
OPERATING MODE	NA
DESCRIBE EMISSION POINT	Exhaust Stack of Recip Engine
HEIGHT ABOVE GROUND LEVEL	60'
HEIGHT RELATIVE TO OBSERVER	54'
DISTANCE FROM OBSERVER	120'
DIRECTION FROM OBSERVER	N
DESCRIBE EMISSIONS	No Visible Emissions
EMISSION COLOR	No VE
PLUME TYPE:	CONTINUOUS ☑ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT	NO ☑ YES ☐
IS WATER DROPLET PLUME	ATTACHED ☐ DETACHED ☐
AT WHAT POINT IN THE PLUME WAS OPACITY DETERMINED	Exit of Exhaust Stack
DESCRIBE BACKGROUND	Sky
BACKGROUND COLOR	Blue/white
SKY CONDITIONS	50-70% White Clouds
WIND SPEED	10 mph
WIND DIRECTION	NNE
AMBIENT TEMP.	
WET BULB TEMP.	
RELATIVE HUMIDITY	

OBSERVATION DATE	START TIME	STOP TIME
3/24/92	1420	1520

M \ SEC	0	15	30	45	M \ SEC	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	0	0	0	56	0	0	0	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	0	0
30	0	0	0	0	60	0	0	0	0

SOURCE LAYOUT SKETCH — DRAW NORTH ARROW



AVERAGE OPACITY FOR HIGHEST PERIOD	0
NUMBER OF READINGS ABOVE	0 % WERE 0
RANGE OF OPACITY READINGS	0 MINIMUM 0 MAXIMUM
OBSERVER'S NAME (PRINT)	RICK J. KRENZKE
OBSERVER'S SIGNATURE	Rick J. Krenzke
DATE	3-24-92
ORGANIZATION	Cubix Corp.
CERTIFIED BY	State of Florida by ETA
DATE	2-27-92
VERIFIED BY	
DATE	

COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE

TITLE	DATE

EPA TH 0101

APPENDIX H:
FUEL ANALYSES
AND CALCULATIONS

CERTIFICATE OF ANALYSIS NUMBER 199905

SAMPLE IDENT.: SILVER SPRINGS M-5
FLORIDA GAS TRANS.
DRESSER ENGINE FUEL GAS
45 PSIG 17 TONY N
03/24/92 @ 12:45

DATE: APRIL 08, 1992

P. O. NO.: 92143

FOR: CUBIX CORPORATION
9225 LOCKHART HIGHWAY
AUSTIN, TEXAS 78747

ATTN: MR. JOE RUDYK

ASTM D-3246
TOTAL SULFUR ANALYSIS

< 1 ppm by wt.

< 0.059 Grains/100 cu. ft. by vol.

< 0.105 Grains/100 cu. ft. by wt.

SOUTHERN PETROLEUM LABORATORIES, INC.

J. C. WINFREY

ANALYSIS

DATE: 03/24/92 ANALYSIS TIME: 345 STREAM SEQUENCE: 12
TIME: 12:20 CYCLE TIME: 360 STREAM#: 2
ANALYZER#: 1 MODE: RUN CYCLE START TIME: 12:14

COMP NAME	COMP CODE	MOLE %	GAL/MCF**	B.T.U.*	SP. GR.*
HEXANE +	151	0.016	0.0071	0.84	0.0005
PROPANE 3	152	0.252	0.0694	6.35	0.0038
I-BUTANE 4	153	0.021	0.0069	0.68	0.0004
N-BUTANE 4	154	0.012	0.0038	0.39	0.0002
IPENTANE 5	155	3428.62-6	0.0013	0.14	0.0001
NPENTANE 5	156	2199.86-6	0.0008	0.09	0.0001
NITROGEN	157	0.436	0.0000	0.00	0.0042
METHANE 1	158	96.452	0.0000	976.39	0.5343
CO2 1	159	0.763	0.0000	0.00	0.0116
ETHANE 2	160	2.042	0.5463	36.22	0.0212
TOTALS		100.000	0.6355	1021.11	0.5764

* @ 14.730 PSIA DRY & UNCORRECTED FOR COMPRESSIBILITY

** @ 14.730 & 60 DEG. F

COMPRESSIBILITY FACTOR (1/Z) = 1.0021
DRY B.T.U. @ 14.730 PSIA & 60 DEG. F CORRECTED FOR (1/Z) = 1023.3
SAT B.T.U. @ 14.730 PSIA & 60 DEG. F CORRECTED FOR (1/Z) = 1005.5
REAL SPECIFIC GRAVITY = 0.5773
UNNORMALIZED TOTAL = 99.99

ACTIVE ALARMS

NONE

FLORIDA GAS TRANSMISSION CO.
BROOKER LAB- comm /
STANDARD GAS 1041.8 / 0.5939
CERTIFIED VALUE BTU 1041.9 GRAV. 0.5939
TOTAL SULFUR 0.45 GR/CCF H^2S 0.25 GR/CCF
H^2O 0.6 #/MMCF BY Bill [illegible]

Allen WeaTherford

From c/s 16 Brooker

Client: Florida Gas
Sample ID: Silver Springs Station Fuel Gas

CALCULATION OF DENSITY AND HEATING VALUE

Component	% Volume	Molecular Wt.	Density (lb/ft3)	% volume x Density	weight %	Component Gross Btu/lb	Weight Fract. Btu	Gross Heating Value (Btu/SCF)	Volume Fract. Btu
Hydrogen		2.016	0.0053	0.00000	0.0000	61100	0.00	325	0
Oxygen		32.000	0.0846	0.00000	0.0000	0	0.00	0	
Nitrogen	0.4360	28.016	0.0744	0.00032	0.7347	0	0.00	0	0
CO2	0.7630	44.01	0.117	0.00089	2.0218	0	0.00	0	0
CO		28.01	0.074	0.00000	0.0000	4347	0.00	322	0
Methane	96.4520	16.041	0.0424	0.04090	92.6222	23879	22117.26	1013	977.06
Ethane	2.0420	30.067	0.0803	0.00164	3.7137	22320	828.90	1792	36.593
Ethylene		28.051	0.0746	0.00000	0.0000	21644	0.00	1614	0
Propane	0.2520	44.092	0.1196	0.00030	0.6826	21661	147.86	2590	6.5268
propylene		42.077	0.111	0.00000	0.0000	21041	0.00	2336	0
Isobutane	0.0210	58.118	0.1582	0.00003	0.0752	21308	16.03	3363	0.7062
n-butane	0.0120	58.118	0.1582	0.00002	0.0430	21257	9.14	4016	0.4819
Isobutene		56.102	0.148	0.00000	0.0000	20840	0.00	3068	0
Isopentane	0.0034	72.144	0.1904	0.00001	0.0148	21091	3.12	4008	0.1374
n-pentane	0.0022	72.144	0.1904	0.00000	0.0095	21052	2.00	3993	0.0878
n-hexane	0.0160	86.169	0.2274	0.00004	0.0824	20940	17.26	4762	0.7619
H2S		34.076	0.0911	0.00000	0.0000	7100	0.00	647	0
total	100.00	Average Density		0.04415	100.0000	Gross Heating Value		Gross Heating Value	
		Specific Gravity		0.57717		Btu/lb	23142	Btu/SCF	1022

CALCULATION OF F FACTORS

Component	Mol. Wt.	C Factor	H Factor	% volume	Fract. Wt.	Weight Percents: Carbon	Hydrogen	Nitrogen	Oxygen	Sulfur
Hydrogen	2.016	0	1	0.00	0.0000	0	0			
Oxygen	32	0	0	0.00	0.0000				0	
Nitrogen	28.016	0	0	0.44	12.2150	0	0	0.731789842		
CO2	44.01	0.272273	0	0.76	33.5796	0.54773973	0		1.4625	
CO	28.01	0.42587	0	0.00	0.0000	0	0		0	
Methane	16.041	0.75	0.25	96.45	1547.1865	69.5180687	23.17269			
Ethane	30.067	0.8	0.2	2.04	61.3968	2.94258882	0.7356472			
Ethylene	28.051	0.85714	0.14286	0.00	0.0000	0	0			
Propane	44.092	0.81818	0.18182	0.25	11.1112	0.54463175	0.1210294			
Propene	42.077	0.85714	0.14286	0.00	0.0000	0	0			
Isobutane	58.118	0.82759	0.17247	0.02	1.2205	0.06051164	0.0126106			
n-butane	58.118	0.82759	0.17247	0.01	0.6974	0.03457808	0.0072061			
Isobutene	56.102	0.85714	0.14286	0.00	0.0000	0	0			
Isopentane	72.144	0.83333	0.16667	0.00	0.2474	0.01234896	0.0024699			
n-pentane	72.144	0.83333	0.16667	0.00	0.1587	0.0079233	0.0015847			
n-hexane	86.169	0.83721	0.16279	0.02	1.3787	0.06915112	0.013446			
H2S	34.08	0	0	0.00	0.0000	0	0			0
Totals				99.99963	1669.1918	73.7375421	24.07	0.731789842	1.4625	0
										99.999

CALCULATED VALUES		
O2 F Factor (dry)	**8636**	DSCF of Exhaust/MM Btu of Fuel Burned @ 0% excess air
O2 F Factor (wet)	**10643**	SCF of Exhaust/MM Btu of Fuel Burned @ 0% excess air
Moisture F Factor	**2007**	SCF of Water/MM Btu of Fuel Burned @ 0% excess air
Combust. Moisture	**18.86**	volume % water in flue gas @ 0% excess air
Fo	**1.8**	fuel factor (dimensionless)
VOC Portion of fuel	**2.35**	%
CO2 F Factor	**1023**	DSCF of CO2/MM Btu of Fuel Burned @ 0% excess air

APPENDIX I: ALTERNATIVE COMPLIANCE TEST DATA

Operator/Plant Florida Gas Silver Springs Compressor Stati
Location Marion County, Florida
Source Dresser-Rand Compressor Engine
Technicians RK,LF,JR

Test Run No.	C-1	C-2	C-3
Date	3/24/92	3/24/92	3/24/92
Start Time	10:06	13:00	14:10
Stop Time	11:06	14:00	15:10
Engine/Compressor Operation			
Engine Speed (rpm)	330	329	330
Ignition Timing (°BTDC)	14	14	14
Air Manifold Pressure (psig)	8.8	9	9
Air Manifold Temperature (°F)	128	128	128
Estimated Fuel Flow AT 7800 BTU/hp-hr (SCFH)	17951	17951	18699
Fuel Temperature (°F)	68	68	68
Fuel Manifold Pressure (psig)	27.5	27.4	27.4
Pre-Combustion Chamber Pressure (psig)	19	19.1	19.2
Exhaust Temperature (°F)	704	701	700
Turbo (rpm x 100)	158/157	159/157	160/159
Pockets Open	12	12	12
Suction Pressure (psig)	790	742	733
Suction Temperature (°F)	69	68	69
Discharge Pressure (psig)	938	915	905
Discharge Temperature (°F)	98	108	104
Engine Load (BHP)	2352	2352	2450
Torque (%)	98	98	99
Ambient Conditions			
Atmospheric Pressure (in. Hg)	30.05	30.03	30.03
Temperature (°F) : Dry bulb	70	72	72
(°F) Wet bulb	62	62	68
Humidity (lb/lb air)	0.0098	0.0093	0.0134
Measured Emissions			
NOx (ppmv)	192	160	133
CO (ppmv)	329	324	312
O2 via Method 3a (%)	12.3	12.1	12.4
CO2 via Method 3a (%)	4.82	4.89	4.91
THC via EPA Method 25a (ppmv, wet)	820	975	1015
VOC via EPA Method 18 (% of THC)	4.77%	6.20%	5.54%
VOC i.e. non methane via EPA 18 (ppmv, wet)	39.1	60.5	56.3
VOC via Methods 25a and 18 (ppmv, dry)	42.9	66.1	61.9
SO2 in fuel (grains/100 DSCF)	<0.059	<0.059	<0.059
Stack Volumetric Flow Rates			
via Pitot Tube (SCFH, dry)	4.38E+05	4.26E+05	4.18E+05
Calculated Emission Rates (via pitot tube)			
NOx (lbs/hr)	10.0	8.1	6.6
CO (lbs/hr)	10.5	10.0	9.5
VOC (lbs/hr)	0.78	1.17	1.08
SO2 (lbs/hr)	<0.0015	<0.0015	<0.0016
NOx (tons/yr)	44.0	35.7	29.1
CO (tons/yr)	45.9	44.0	41.6
VOC (tons/yr)	3.42	5.13	4.71
SO2 (tons/yr)	<0.0066	<0.0066	<0.0069
NOx (g/hp-hr)	1.94	1.57	1.23
CO (g/hp/hr)	2.02	1.94	1.76
VOC (g/hp-hr)	0.15	0.23	0.20

Operator/Plant	Florida Gas Silver Springs Compressor Stati
Location	Marion County, Florida
Source	Dresser-Rand Compressor Engine
Technicians	RK,LF,JR

Test Run No.	C-1	C-2	C-3
Stack Moisture & Molecular Wt. via EPA Method 4			
CO_2 (%)	4.82	4.89	4.91
O_2 (%)	12.25	12.05	12.40
Beginning Meter Reading (ft3)	838.300	863.160	889.130
Ending Meter Reading (ft3)	862.650	888.520	911.220
Beginning Impinger Wt (g)	2480.9	2527	2574.5
Ending Impinger Wt. (g)	2527	2574.5	2618.9
Dry Gas Meter Factor (Kd)	0.9904	0.9904	0.9904
Dry Gas Meter Temperature (°F begin)	90	80	95
Dry Gas Meter Temperature (°F end)	116	109	101
Atmospheric Pressure (in Hg, abs.)	30.05	30.03	30.03
Stack Gas Moisture (% volume)	8.74	8.54	9.16
Dry Gas Fraction	0.913	0.915	0.908
Stack Gas Molecular Wt. (lbs/lb-mole)	28.28	28.30	28.25
Stack Moisture & Molecular Wt. via Stoichiometry			
Fuel Moisture Content (vol % @ 0% O_2)	18.86	18.86	18.86
Moisture Content (vol %)	8.43	8.59	8.53
Difference between methods	3%	1%	7%
Stack Flow Rate via Pitot Tube			
Pitot Tube Factor	0.84	0.84	0.84
ΔP #1	1.30	1.20	1.20
ΔP #2	1.40	1.30	1.20
ΔP #3	1.40	1.20	1.20
ΔP #4	1.20	1.10	1.10
ΔP #5	1.30	1.20	1.20
ΔP #6	1.20	1.30	1.20
ΔP #7	1.10	1.20	1.10
ΔP #8	1.30	1.10	1.00
ΔP #9	1.40	1.30	1.20
ΔP #10	1.30	1.30	1.20
ΔP #11	1.40	1.20	1.10
ΔP #12	1.20	1.20	1.10
ΔP #13	1.20	1.30	1.20
ΔP #14	1.30	1.20	1.30
ΔP #15	1.20	1.10	1.30
ΔP #16	1.10	1.10	1.20
Sum of Square Root of ΔP's	18.0	17.6	17.3
Number of Traverse Points	16	16	16
Average Square Root of ΔP's	1.13	1.10	1.08
Average Temperature (°F)	646	656	655
Static Pressure (in. H_2O)	1.3	1.4	1.4
Stack Diameter (in.)	23.5	23.5	23.5
Stack Area (ft2)	3.01	3.01	3.01
Stack Velocity (ft/min)	5523	5410	5342
Stack Flow,wet (ACFM)	16637	16295	16091
Stack Flow,dry (SCFH)	4.38E+05	4.26E+05	4.18E+05
Stack Flow Rate via EPA Method 19			
Fuel Flow to Engine (SCFH)	17951	17951	18699
Fuel Heating Value (BTU/SCF)	1022	1022	1022
Fuel O_2 F-Factor (DSCFH/MMBTU)	8636	8636	8636
Fuel CO_2 F-Factor (DSCFH/MMBTU)	1023	1023	1023
Stack Flow, dry via O_2 F-factor (SCFH)	3.83E+05	3.74E+05	4.06E+05
Stack Flow, dry via CO_2 F-factor (SCFH)	3.89E+05	3.84E+05	3.98E+05
Difference between O_2 F-factor and pitot tube	13%	12%	3%
Difference between CO_2 F-factor and pitot tube	11%	10%	5%
Stack Flow Rate via Carbon Balance			
Fuel Carbon Content	1.023	1.023	1.023
Exhaust Carbon Content	4.93	5.02	5.04
Stack Flow, dry via carbon balance (SCFH)	3.72E+05	3.66E+05	3.79E+05
Difference between carbon balance and pitot tube	15%	14%	9%