



KERN COUNTY AIR POLLUTION CONTROL DISTRICT

PERMIT TO OPERATE

2700 "M" STREET, SUITE 275
BAKERSFIELD, CA. 93301
TELEPHONE: (805) 861-3682

Number: 4013601(E)

PERMIT TO OPERATE IS HEREBY GRANTED TO:

Shell Western E & P, Inc.

FOR EQUIPMENT LOCATED AT:

Sec. 10, T29S, R28E (Kern River)

EQUIPMENT OR PROCESS DESCRIPTION:

Turbine Engine Cogeneration System

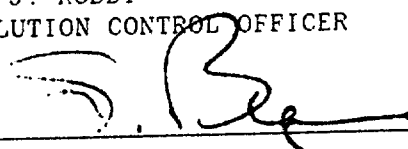
OPERATIONAL CONDITIONS LISTED BELOW.

THIS PERMIT BECOMES VOID UPON ANY CHANGE OF OWNERSHIP OR LOCATION, OR ANY ALTERATION.

NOTE: The permittee may be required to provide adequate sampling and testing facilities. Equipment modification requires a new permit.

WILLIAM J. RODDY
AIR POLLUTION CONTROL OFFICER

REVOCABLE: This permit does not authorize the emission of air contaminants in excess of those allowed by the Rules and Regulations of the K.C.A.P.C.D.

By: 

For Period: 2-28-91 TO 2-28-92

CONDITIONAL APPROVAL:

Compliance with all conditions of approval imposed by any applicable Authority to Construct is required for life of this equipment unless modified by application. Equipment authorized by this Permit to Operate shall comply in full with applicable Rule 210.1 requirements.

EQUIPMENT DESCRIPTION: 20 MW Gas Fired Gas Turbine Engine Cogeneration System, including the following:

- a. Fuel gas preparation system consisting of:
 1. Inlet gas/liquid separator,
 2. Electric fuel/gas compressor,
 3. Fuel gas surge drum,
- b. General Electric, Model LM 2500 PE, gas turbine generator set rated at 22.89 MW electrical output with combustor water injector system for NOx control,
- c. Unfired heat recovery steam generator,
- d. Selective catalytic reduction system (SCR) NOx control system,
- e. Ammonia storage control and distribution system for support of the SCR system,
- f. Carbon monoxide catalytic converter,
- g. Continuously recording emission monitors for NOx, CO and O2.

OPERATIONAL CONDITIONS:

1. Gas turbine engine shall be fired exclusively with PUC-regulated quality natural gas or unregulated natural gas documented to be of comparable quality. (Rule 210.1)
2. Lube oil cooler/accumulator vent shall be equipped with device(s) sufficient to prevent any detectable emissions. (Rules 209 & 210.1)
3. Gas turbine water injection rate shall be maintained at water to fuel ratio documented to result in compliance with emission limits. (Rule 209)
4. Ammonia injection rate shall be controlled to maintain ammonia "break through" to less than 20 ppmv. (Rule 419)

5. If water injection, SCR or catalytic conversion system is inoperative, gas turbine engine shall be shutdown. (Rule 209)
6. Inlet gas temperature for both catalyst beds shall be maintained within the range recommended by catalyst manufacturer. (Rule 209)
7. Gas turbine engine shall not burn more than 5.76 MM scf/day of natural gas. (Rule 209)
8. All gas turbine engine exhaust shall flow through both catalyst beds. (Rule 210.1)
9. Gas turbine engine exhaust may be diverted to bypass stack during cold turbine startup. (Rule 209)
10. Gas turbine engine exhaust may be diverted to bypass stack under Rule 111, Equipment Breakdown Conditions, provided all applicable record keeping and reporting requirements of Rule 111 are fulfilled. (Rule 111)

SPECIAL CONDITIONS:

- a. SWEPI shall comply in full with Rule 422 (New Source Performance Standards) requirements including notification, record keeping, and monitoring requirements.
- b. Continuous emission monitoring system for NO_x (as NO_2), CO and O_2 serving exhaust gas stream shall conform to Rule 108 specifications. (Rule 108)
- c. Continuous emission monitoring system shall be calibrated and operated according to EPA guidelines as specified in CFR, Part 60, Appendix B. (Rule 108)
- d. Audits of monitors shall be conducted annually by independent laboratory in accordance with EPA guidelines, witnessed by District, and reports shall be submitted to District within 30 days of such audit. (Rule 108)
- e. SWEPI continuous emission monitoring printouts shall be made readily available for District inspection upon request. (Rule 108)
- f. SWEPI shall keep accurate records of all maintenance activities, periodic inspections, and repairs of the SCR unit, CO catalyst, water and NH_3 injection systems, and their associated controllers and instrumentation units.
- g. SWEPI shall maintain records of ammonia consumption.
- h. SWEPI shall notify the District in writing 30 days prior to any planned shutdown of the turbine system. The APCD shall be afforded the opportunity to inspect and sample the SCR and CO catalyst systems.
- i. SWEPI shall keep accurate records of daily fuel consumption of gas turbine engine and shall make them readily available for District inspection upon request. (Rule 209)
- j. Steam produced at this facility for use in oil-production operations shall affect only wells connected to well vent vapor recovery systems. (Rule 210.1)
- k. SWEPI shall provide design details, including but not limited to engineering drawings of SCR and catalytic converter units for District approval prior to installation. (Rule 209)
- l. Non-compliance with NO_x emission sampling limit shall require: shutdown of gas turbine, down-throttling (reduced fuel consumption), or installation of additional SCR catalyst volume-increased emission limit(s) will require modified Authority to Construct before continued operation at such levels pursuant to Section 42350 of California Health & Safety Code, a variance from this condition cannot be obtained. (Rule 109)

SHELL WESTERN E & P, INC.

Permit #4013601(E)

Page

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Warning:

Failure of catalysts to perform as required because of catalyst poisoning or fouling shall not be recognized as basis for Rule 111 enforcement exemption. (Rule 209)

EMISSION SAMPLING LIMITS:

<u>Particulates:</u>	3.36	lbm/hr	(Rule 210.1)
<u>Sulfur Compounds:</u>	1.13	lbm/hr	(of SO ₂) (Rule 210.1)
	0.30	lbm/hr	(of SO ₄) (Rule 210.1)
<u>Oxides of Nitrogen:</u>	13.15	lbm/hr	(as NO ₂) (Rule 210.1)
<u>Hydrocarbons:</u>	10.08	lbm/hr	(Rule 210.1)
<u>Carbon Monoxide:</u>	6.40	lbm/hr	(Rule 210.1)

Compliance with emission sampling limit consistent with Policy Procedure E-1801 shall be demonstrated by District-witnessed sample collection by independent testing laboratory within 60 days after startup of this equipment and annually within 60 days prior to permit anniversary date, and the official test results and field data submitted within 30 days thereafter. Samples shall be collected during maximum fuel consumption and use of evaporative coolers. (Rule 108.1)



KERN COUNTY AIR POLLUTION CONTROL DISTRICT

PERMIT TO OPERATE

Number: 4013612(C)

2700 "M" STREET, SUITE 275
BAKERSFIELD, CA. 93301
TELEPHONE: (805) 861-3682

PERMIT TO OPERATE IS HEREBY GRANTED TO: Shell Western E & P, Inc.
FOR EQUIPMENT LOCATED AT: Sec. 10, T29S, R28E (Kern River)
EQUIPMENT OR PROCESS DESCRIPTION: Turbine Engine Cogeneration System
OPERATIONAL CONDITIONS LISTED BELOW.

THIS PERMIT BECOMES VOID UPON ANY CHANGE OF OWNERSHIP OR LOCATION, OR ANY ALTERATION.

NOTE: The permittee may be required to provide adequate sampling and testing facilities. Equipment modification requires a new permit.

WILLIAM J. RODDY
AIR POLLUTION CONTROL OFFICER

REVOCABLE: This permit does not authorize the emission of air contaminants in excess of those allowed by the Rules and Regulations of the K.C.A.P.C.D.

By: [Signature]

For Period: 2-28-91 TO 2-28-92

CONDITIONAL APPROVAL:

Compliance with all conditions of approval imposed by any applicable Authority to construct is required for life of this equipment unless modified by application. Equipment authorized by this Permit to Operate shall comply in full with applicable Rule 210.1 requirements.

EQUIPMENT DESCRIPTION:

- Allison, Model 501 KB5, gas turbine generator set rated at 4.0 MW electrical output with combustor water injector system for NO_x control,
- Unfired heat recovery steam generator,
- Continuously recording emission monitors for NO_x, CO and O₂.

OPERATIONAL CONDITIONS:

- Gas turbine engine shall be fired exclusively with PUC-regulated quality natural gas or unregulated natural gas documented to be of comparable quality. (Rule 210.1)
- Lube oil cooler/accumulator vent shall be equipped with device(s) sufficient to prevent any detectable emissions. (Rules 209 & 210.1)
- Gas turbine engine water injection rate shall be no less than 0.53 by weight, water to fuel ratio, or rate documented to result in compliance with emission limits. (Rule 209)
- Exhaust gas combustion contaminant emissions shall not exceed 0.1 gr/scf. (Rule 407.2)
- Exhaust gas sulfur compound concentration shall not exceed 150 ppmv @ 15 excess oxygen and or dry basis. (Rule 422)
- Exhaust gas oxides of nitrogen shall not exceed 206 ppmv at 15% excess oxygen and on dry basis. (Rule 422)
- Gas turbine engine shall not burn more than 1.33 MM scf/day of fuel gas. (Rule 210.1)
- Fuel gas sulfur content shall not exceed .1 gr/100 scf of fuel gas without prior District approval. (Rule 210.1)

9. SWEPI shall keep accurate daily record of sulfur content and volume flow rate of fuel gas and such records shall be readily available for District inspection upon request. (Rule 422)
10. Gas turbine engine shall exhaust only to heat recovery steam generator. (Rule 210.1)
11. Gas turbine engine exhaust may be diverted to bypass stack under Rule 111, Equipment Breakdown Conditions, provided all applicable record keeping and reporting requirements of Rule 111 are fulfilled. (Rule 111)
12. Gas turbine engine bypass exhaust stack shall be gas-tight. (Rule 209)
13. If water injection system is inoperative, gas turbine shall be shut down. (Rule 210.1)
14. Gas turbine engine shall be equipped with continuously recording fuel gas flowrate indicator. (Rules 209 & 422)

SPECIAL CONDITIONS:

- a. SWEPI shall comply in full with Rule 422 (New Source Performance Standards) requirements including notification, record keeping, and monitoring requirements.
- b. Continuous emission monitoring system for NO_x (as NO_2), CO and O_2 serving exhaust gas stream shall conform to Rule 108 specifications. (Rule 108)
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- e. SWEPI continuous emission monitoring printouts shall be made readily available for District inspection upon request. (Rule 108)
- f. SWEPI shall keep accurate records of daily fuel consumption of gas turbine engine and shall make them readily available for District inspection upon request. (Rule 209)
- g. All steam produced by this source operation shall be used to steam only existing wells served by existing vapor control system(s). Any emissions from new wells drilled into zone steamed by this equipment shall be fully controlled or offset. (Rule 210.1)

EMISSION SAMPLING LIMITS:

<u>Particulates:</u>	0.67	lbm/hr	(Rule 210.1)
<u>Sulfur Compounds:</u>	0.22	lbm/hr	(of SO_2) (Rule 210.1)
	0.06	lbm/hr	(of SO_4) (Rule 210.1)
<u>Oxides of Nitrogen:</u>	8.34	lbm/hr	(as NO_2) (Rule 210.1)
<u>Hydrocarbons:</u>	2.00	lbm/hr	(Rule 210.1)
<u>Carbon Monoxide:</u>	5.08	lbm/hr	(Rule 210.1)

SHELL WESTERN E & P, INC.

Permit #4013612(C)

Page 3

COMPLIANCE TESTING REQUIREMENTS:

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STATE OF CALIFORNIA AIR TOXICS HOT SPOTS REQUIREMENTS:

Facility shall comply with California Health and Safety Code Sections 44300 through 44384. (Rule 208.1)



KERN COUNTY AIR POLLUTION CONTROL DISTRICT

PERMIT TO OPERATE

Number: 4013613(C)

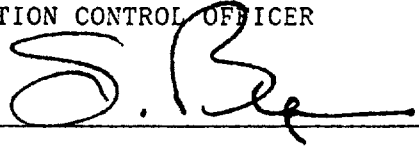
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AIR POLLUTION CONTROL OFFICER

By: 

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SHELL WESTERN E & P, INC.
Permit #4013613(C)
Page 3

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STATE OF CALIFORNIA AIR TOXICS HOT SPOTS REQUIREMENTS:

Facility shall comply with California Health and Safety Code Sections 44300 through 44384. (Rule 208.1)

BK023

**SOURCE TESTING OF THREE NATURAL GAS FIRED TURBINES
AT THE SEKR COGENERATION FACILITY,
BAKERSFIELD, CALIFORNIA**

Prepared for:

**Shell Western Exploration and Production, Inc.
P.O. Box 11164
Bakersfield, California 93389**

For Submittal to:

**San Joaquin Valley Unified Air Pollution Control District
2700 M Street, Suite 275
Bakersfield, California 93301**

Test Date:

March 31 and April 1, 1992

Report Date:

April 27, 1992

Prepared by:

**Engineering-Science, Inc.
2520 Pegasus Drive
Bakersfield, California 93308
(805)393-0272**

*Rec 5/17/92
J. F. V.*

ES ENGINEERING-SCIENCE

BK023

**SOURCE TESTING OF THREE NATURAL GAS FIRED TURBINES
AT THE SEKR COGENERATION FACILITY,
BAKERSFIELD, CALIFORNIA**

Prepared for:

**Shell Western Exploration and Production, Inc.
P.O. Box 11164
Bakersfield, California 93389**

For Submittal to:

**San Joaquin Valley Unified Air Pollution Control District
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Test Dates:

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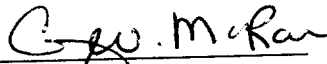
Report Date:

April 27, 1992

Prepared by:

**Engineering-Science, Inc.
2520 Pegasus Drive
Bakersfield, California 93308
(805)393-0272**

Endorsed by:


Project Manager
Engineering-Science, Inc.

RECEIVED

**MAY 5 1992
KERN COUNTY AIR
POLLUTION CONTROL DISTRICT**

SUMMARY OF SOURCE TEST RESULTS

Company : SWEPI – SEKR
Test Date : 31-Mar-92

Permit # 4013612C
UNIT 2, HRSG OUTLET STACK

[illegible]

SUMMARY OF SOURCE TEST RESULTS

Company : SWEPI - SEKR
Test Date : 31-Mar-92

Permit # 4013613C
UNIT 3, HRSG OUTLET STACK

	gr/scf	gr/scf @12% CO2	ppm(v)	ppm(v) @15% O2	lb/hr	lb/MMBtu
PARTICULATE						
Mean						
SULFATE						
Mean						
NOx as NO2, dry						
Run 1			29.08	29.93	5.04	0.1093
2			28.80	30.09	5.06	0.1099
Mean			28.94	30.01	5.05	0.1096
CO						
Run 1			5.62	5.79	0.59	0.0129
2			5.54	5.79	0.59	0.0129
Mean			5.58	5.79	0.59	0.0129
SO2						
Mean						
HC (non-methane)						
Mean						

Scrubber Liquor Analysis :
Chlorides-

Specific Gravity-

Comments :

ANNUAL 210.1 - PUC GAS F 4.0 MW TURBINE PWR COPER W
H2O INT

For Regulatory Agency Use Only :

27-14- 5/21/92

PG 1 OF 2

Permit # 4013601F
UNIT 1, HRSG OUTLET STACK

[illegible]

SUMMARY OF SOURCE TEST RESULTS

PG 2 OF 2

Company : SWEPI - SEKR
 Test Date : 01-Apr-92

Permit # 4013601F
 UNIT 1, HRSG OUTLET STACK

	gr/scf	gr/scf @12% CO ₂	ppm(v)	ppm(v) @15% O ₂	lb/hr	lb/MMBtu
PARTICULATE						
Run 7						
8						
9						
10						
Mean						
SULFATE						
Run 7						
8						
9						
10						
Mean						
NOx as NO₂, dry						
Run 7			7.79	7.00	6.34	0.0255
8			7.68	6.89	6.23	0.0252
9			7.90	7.01	6.34	0.0256
10			7.84	6.97	6.31	0.0255
Mean			8.08	7.21	6.45	0.0263
CO						
Run 7			0.30	0.27	0.15	0.0006
8			0.30	0.27	0.15	0.0006
9			0.29	0.26	0.14	0.0006
10			0.28	0.25	0.14	0.0006
Mean			0.30	0.27	0.15	0.0006
SO₂						
Mean						
HC (non-methane)						
Mean						

Scrubber Liquor Analysis :
 Chlorides—

Specific Gravity—

Comments : ANNUAL 210.1 - PUE GAS TURBINE PWR 22.89^{MMW} CO FLOW
 W H₂O INS NH₃/SCR + CO CATALYST

For Regulatory Agency Use Only :

N.A.N. 5/21/92

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SECTION 6	TEST METHODOLOGY
SECTION 7	RAW DATA
SECTION 8	QUALITY ASSURANCE

SECTION 1
INTRODUCTION

**SOURCE TESTING OF THREE NATURAL GAS FIRED
TURBINES AT THE SEKR COGENERATION FACILITY,
BAKERSFIELD, CALIFORNIA**

INTRODUCTION

Engineering-Science, Inc. (ES), Bakersfield, California conducted air emissions testing of three natural gas fired turbines located at the SEKR Cogeneration Facility located in the Kern River Oil Field, Bakersfield, California. Testing was conducted to demonstrate the facility's compliance with the Authority to Construct Permit No.'s 4013601F, 4013612C, and 4013613C for Turbines 1-3, respectively. Turbine 1 is rated at 20 MW and Turbines 2 and 3 are rated at 4 MW each. These permits were issued by the San Joaquin Valley Unified Air Pollution Control District (District).

Testing procedures were conducted in accordance with the guidelines published in 40 CFR, Part 60, Appendix A and Appendix B, dated July 1990 and CARB Method 100. Testing consisted of Continuous Emission Monitoring (CEM) for Nitrogen Oxides (NO_x), Carbon Monoxide (CO), and Oxygen (O_2). The turbines were operated at base load conditions and fueled by natural gas. On March 31, 1992 duplicate 1-hour tests were performed on Turbines 2 and 3.

Ten CEM runs were conducted April 1, 1992 on Turbine 1 for determining compliance and Relative Accuracy for the facility CEM NO_x , CO, and O_2 monitors. The facility's analyzer system is configured to cycle on a regular interval to monitor the emissions from all three unit's stacks using a single set of analyzers. The CEM system was operated in its normal mode during this test period.

A fuel sample was collected and analyzed for Carbon (C), Hydrogen (H), Oxygen (O), Nitrogen (N), Sulfur (S), and heating value (Btu). The fuel analysis and fuel consumption (supplied by SWEPI SEKR plant personnel) was used to determine exhaust gas flowrates and pollutant mass emission rates in accordance with F-Factor calculation methods specified in 40 CFR, Part 60, Appendix A.

Mr. Ken Kirkpatrick of Shell Western Exploration and Production, Inc. coordinated activities for the plant and was responsible for supplying ES with the plant operating data. The testing program was observed by Mr. Greg LeFore of the District. The ES testing team was comprised of Messrs. Jim Polhamus and Cesario Mangaoang.

SECTION 2

DATA SUMMARIES

SECTION 2

DATA SUMMARIES

The test results for NO_x and CO are presented in the Summary of Source Test Results at the front of this report. Additional data summaries are presented in the following tables of this section to supplement and clarify results. Section 3, Test Method Calculations presents emission calculations for Relative Accuracy of CEM instruments (NO_x , CO, and O_2), gaseous components (NO_x and CO) emissions, and the fuel calculations used for determining these emissions. Carbon Monoxide relative accuracy was calculated using the applicable emission standard value of 43.47 ppm in the RA equation. This calculation method was used due to the very low CO emissions (< 1 ppm).

EMISSION DATA SUMMARY GAS COMPONENTS

SWEPI – SEKR
UNIT 2, HRSG OUTLET STACK

31 – Mar – 92

NITROGEN DIOXIDE

Run #	% O2	Corrected ppm (dry)	Corrected ppm (dry) @ 15% O2	lb/hr	lb/MMBtu
1	14.89	27.41	26.91	4.61	0.0982
2	14.89	27.32	26.80	4.65	0.0979
Average	14.89	27.37	26.85	4.63	0.0981

CARBON MONOXIDE

Run #	Corrected ppm (dry)	Corrected ppm (dry) @ 15% O2	lb/hr	lb/MMBtu
1	4.84	4.75	0.50	0.0106
2	4.88	4.79	0.51	0.0106
Average	4.86	4.77	0.50	0.0106

SULFUR DIOXIDE

Run #	Corrected ppm (dry)	Corrected ppm (dry) @ 15% O2	lb/hr	lb/MMBtu
Average				

HYDROCARBON (NON-METHANE)

Run #	Corrected ppm (dry)	Corrected ppm (dry) @ 15% O2	lb/hr	lb/MMBtu
1				
2				
Average				

EMISSION DATA SUMMARY GAS COMPONENTS

SWEPI - SEKR
UNIT 3, HRSG OUTLET STACK

31-Mar-92

NITROGEN DIOXIDE

<u>Run #</u>	<u>% O2</u>	<u>Corrected ppm (dry)</u>	<u>Corrected ppm (dry) @ 15% O2</u>	<u>lb/hr</u>	<u>lb/MMBtu</u>
1	15.17	29.08	29.93	5.04	0.1093
2	15.25	28.80	30.09	5.06	0.1099
Average	15.21	28.94	30.01	5.05	0.1096

CARBON MONOXIDE

<u>Run #</u>	<u>Corrected ppm (dry)</u>	<u>Corrected ppm (dry) @ 15% O2</u>	<u>lb/hr</u>	<u>lb/MMBtu</u>
1	5.62	5.79	0.59	0.0129
2	5.54	5.79	0.59	0.0129
Average	5.58	5.79	0.59	0.0129

SULFUR DIOXIDE

<u>Run #</u>	<u>Corrected ppm (dry)</u>	<u>Corrected ppm (dry) @ 15% O2</u>	<u>lb/hr</u>	<u>lb/MMBtu</u>
Average				

HYDROCARBON (NON-METHANE)

<u>Run #</u>	<u>Corrected ppm (dry)</u>	<u>Corrected ppm (dry) @ 15% O2</u>	<u>lb/hr</u>	<u>lb/MMBtu</u>
Average				

**EMISSION DATA SUMMARY
GAS COMPONENTS**

PG 1 OF 2

SWEPI - SEKR
UNIT 1, HRSG OUTLET STACK

01-Apr-92

NITROGEN DIOXIDE

<u>Run #</u>	<u>% O2</u>	<u>Corrected ppm (dry)</u>	<u>Corrected ppm (dry) @ 15% O2</u>	<u>lb/hr</u>	<u>lb/MMBtu</u>
1	14.23	8.43	7.45	6.34	0.0272
2	14.50	8.40	7.75	6.58	0.0283
3	14.19	8.89	7.82	7.11	0.0286
4	14.23	8.23	7.28	6.64	0.0266
5	14.24	7.99	7.08	6.36	0.0258
6	14.31	7.67	6.87	6.21	0.0251
<u>Average</u>					

CARBON MONOXIDE

<u>Run #</u>	<u>Corrected ppm (dry)</u>	<u>Corrected ppm (dry) @ 15% O2</u>	<u>lb/hr</u>	<u>lb/MMBtu</u>
1	0.39	0.35	0.18	0.0008
2	0.34	0.31	0.16	0.0007
3	0.33	0.29	0.16	0.0007
4	0.25	0.22	0.12	0.0005
5	0.26	0.23	0.13	0.0005
6	0.30	0.27	0.15	0.0006
<u>Average</u>				

SULFUR DIOXIDE

<u>Run #</u>	<u>Corrected ppm (dry)</u>	<u>Corrected ppm (dry) @ 15% O2</u>	<u>lb/hr</u>	<u>lb/MMBtu</u>
<u>Average</u>				

HYDROCARBON (NON-METHANE)

<u>Run #</u>	<u>Corrected ppm (dry)</u>	<u>Corrected ppm (dry) @ 15% O2</u>	<u>lb/hr</u>	<u>lb/MMBtu</u>
<u>Average</u>				

EMISSION DATA SUMMARY GAS COMPONENTS

PG 2 OF 2

SWEPI - SEKR
UNIT 1, HRSG OUTLET STACK

01-Apr-92

NITROGEN DIOXIDE

Run #	% O2	Corrected ppm (dry)	Corrected ppm (dry) @ 15% O2	lb/hr	lb/MMBtu
7	14.33	7.79	7.00	6.34	0.0255
8	14.33	7.68	6.89	6.23	0.0252
9	14.25	7.90	7.01	6.34	0.0256
10	14.27	7.84	6.97	6.31	0.0255
Average	14.29	8.08	7.21	6.45	0.0263

CARBON MONOXIDE

Run #	Corrected ppm (dry)	Corrected ppm (dry) @ 15% O2	lb/hr	lb/MMBtu
7	0.30	0.27	0.15	0.0006
8	0.30	0.27	0.15	0.0006
9	0.29	0.26	0.14	0.0006
10	0.28	0.25	0.14	0.0006
Average	0.30	0.27	0.15	0.0006

SULFUR DIOXIDE

Run #	Corrected ppm (dry)	Corrected ppm (dry) @ 15% O2	lb/hr	lb/MMBtu
Average				

HYDROCARBON (NON-METHANE)

Run #	Corrected ppm (dry)	Corrected ppm (dry) @ 15% O2	lb/hr	lb/MMBtu
Average				

SECTION 3

TEST METHOD CALCULATIONS

EMISSION CALCULATIONS GAS COMPONENTS

SWEPI – SEKR
UNIT 2, HRSG OUTLET STACK

DATA :			
	Run 1	Run 2	Average
Date	31-Mar-92	31-Mar-92	
Oxygen (%)	14.89	14.89	14.89
Qs(std), dscfm	23,139	23,376	23,258
F-Factor, dscf/MMBtu	8,498.04	8,498.04	8,498.04
NOx, ppm	27.41	27.32	27.37
CO, ppm	4.84	4.88	4.86
SO2, ppm			
HC (non-methane), ppm			
Fuel, Lb/hr	2,043	2,064	2,054
Fuel, ft3/lb	21.99	21.99	21.99

CALCULATIONS :			
NOx, lb/hr	4.61	4.65	4.63
NOx, ppm @ 15 %O2	26.91	26.80	26.85
NOx, lb/MMBtu	0.0982	0.0979	0.0981
NOx, lb/MMscf of fuel	102.72	102.37	102.54
CO, lb/hr	0.50	0.51	0.50
CO, ppm @ 15 %O2	4.75	4.79	4.77
CO, lb/MMBtu	0.0106	0.0106	0.0106
CO, lb/MMscf of fuel	11.05	11.13	11.09
SO2, lb/hr			
SO2, ppm @ 15 %O2			
SO2, lb/MMBtu			
SO2, lb/MMscf of fuel			
HC, lb/hr			
HC, ppm @ 15 %O2			
HC, lb/MMBtu			
HC, lb/MMscf of fuel			

EQUATIONS :

$$\text{lb/hr} = (0.00000137 \text{ Lb-Mole } ^\circ\text{R} / \text{ft}^3) \times 60 \text{ min/hr} \times Q_s(\text{std}) \times \text{MW} \times \text{ppm} / [T(\text{std}) + 460]$$

$$\text{ppm @ 15 \%O}_2 = \text{ppm measured} \times [(20.9 - 15 \% \text{O}_2) / (20.9 - \% \text{O}_2 \text{ measured})]$$

$$\text{lb/MMBtu} = \text{F-Factor} \times \text{MW} \times [(1.3711\text{E}-6 \text{ Lb-Mole } ^\circ\text{R} / \text{ft}^3) / (T(\text{std}) + 460)] \times [20.9 / (20.9 - \text{O}_2\%)] \times \text{ppm}$$

$$\text{lb/MMscf of fuel} = [(\text{lb/hr}) / (\text{lb fuel/hr}) / (\text{ft}^3/\text{lb fuel}) \times (1\text{E}+06/\text{MM})]$$

CONSTANTS :

Standard Temp. T(std): 60 °F
Oxygen Correction : 15 % O2

NOx, MW = 46.005 lb/lb-mole SO2, MW = 64.058 lb/lb-mole
CO, MW = 28.010 lb/lb-mole HC, MW = 16.043 lb/lb-mole

EMISSION CALCULATIONS GAS COMPONENTS

SWEPI – SEKR
UNIT 3, HRSG OUTLET STACK

DATA :

	Run 1	Run 2	Average
Date	31 – Mar – 92	31 – Mar – 92	
Oxygen (%)	15.17	15.25	15.21
Qs(std), dscfm	23,806	24,143	23,975
F – Factor, dscf/MMBtu	8,498.04	8,498.04	8,498.04
NOx, ppm	29.08	28.80	28.94
CO, ppm	5.62	5.54	5.58
SO2, ppm			
HC (non – methane), ppm			
Fuel, Lb/hr	2,004	2,004	2,004
Fuel, ft3/lb	21.99	21.99	21.99

CALCULATIONS :

NOx, lb/hr	5.04	5.06	5.05
NOx, ppm @ 15 %O2	29.93	30.09	30.01
NOx, lb/MMBtu	0.1093	0.1099	0.1096
NOx, lb/MMscf of fuel	114.29	114.79	114.54
CO, lb/hr	0.59	0.59	0.59
CO, ppm @ 15 %O2	5.79	5.79	5.79
CO, lb/MMBtu	0.0129	0.0129	0.0129
CO, lb/MMscf of fuel	13.45	13.44	13.45
SO2, lb/hr			
SO2, ppm @ 15 %O2			
SO2, lb/MMBtu			
SO2, lb/MMscf of fuel			
HC, lb/hr			
HC, ppm @ 15 %O2			
HC, lb/MMBtu			
HC, lb/MMscf of fuel			

EQUATIONS :

$$\text{lb/hr} = (0.00000137 \text{ Lb-Mole } ^\circ\text{R} / \text{ft}^3) \times 60 \text{ min/hr} \times \text{Qs(std)} \times \text{MW} \times \text{ppm} / [\text{T(std)} + 460]$$

$$\text{ppm @ 15 \%O}_2 = \text{ppm measured} \times [(20.9 - 15 \% \text{O}_2) / (20.9 - \% \text{O}_2 \text{ measured})]$$

$$\text{lb/MMBtu} = \text{F-Factor} \times \text{MW} \times [(1.3711 \text{E}-6 \text{ Lb-Mole } ^\circ\text{R} / \text{ft}^3) / (\text{T(std)} + 460)] \times [20.9 / (20.9 - \text{O}_2\%)] \times \text{ppm}$$

$$\text{Lb/MMscf of fuel} = [(\text{lb/hr}) / (\text{lb fuel/hr}) / (\text{ft}^3/\text{lb fuel}) \times (1 \text{E}+06/\text{MM})]$$

CONSTANTS :

Standard Temp. T(std): 60 °F
Oxygen Correction : 15 % O2

NOx, MW = 46.005 lb/lb-mole SO2, MW = 64.058 lb/lb-mole
CO, MW = 28.010 lb/lb-mole HC, MW = 16.043 lb/lb-mole

EMISSION CALCULATIONS GAS COMPONENTS

PG 1 OF 2

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

DATA :

	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Average
Date	01-Apr-92	01-Apr-92	01-Apr-92	01-Apr-92	01-Apr-92	01-Apr-92	
Oxygen (%)	14.23	14.50	14.19	14.23	14.24	14.31	
Qs(std), dscfm	103,347	107,601	109,873	110,930	109,400	111,161	
F-Factor, dscf/MMBtu	8,498.04	8,498.04	8,498.04	8,498.04	8,498.04	8,498.04	
NOx, ppm	8.43	8.40	8.89	8.23	7.99	7.67	
CO, ppm	0.39	0.34	0.33	0.25	0.26	0.30	
SO2, ppm							
HC (non-methane), ppm							
Fuel, Lb/hr	10,127	10,117	10,831	10,870	10,704	10,762	
Fuel, ft3/lb	21.99	21.99	21.99	21.99	21.99	21.99	

CALCULATIONS :

NOx, lb/hr	6.34	6.58	7.11	6.64	6.36	6.21
NOx, ppm @ 15 %O2	7.45	7.75	7.82	7.28	7.08	6.87
NOx, lb/MMBtu	0.0272	0.0283	0.0286	0.0266	0.0258	0.0251
NOx, lb/MMscf of fuel	28.46	29.56	29.84	27.79	27.02	26.24
CO, lb/hr	0.18	0.16	0.16	0.12	0.13	0.15
CO, ppm @ 15 %O2	0.35	0.31	0.29	0.22	0.23	0.27
CO, lb/MMBtu	0.0008	0.0007	0.0007	0.0005	0.0005	0.0006
CO, lb/MMscf of fuel	0.80	0.73	0.67	0.51	0.54	0.62
SO2, lb/hr						
SO2, ppm @ 15 %O2						
SO2, lb/MMBtu						
SO2, lb/MMscf of fuel						
HC, lb/hr						
HC, ppm @ 15 %O2						
HC, lb/MMBtu						
HC, lb/MMscf of fuel						

EQUATIONS :

$$\text{lb/hr} = (0.00000137 \text{ Lb-Mole } ^\circ\text{R} / \text{ft}^3) \times 60 \text{ min/hr} \times Qs(\text{std}) \times MW \times \text{ppm} / [T(\text{std}) + 460]$$

$$\text{ppm @ 15 \%O}_2 = \text{ppm measured} \times [(20.9 - 15 \%O_2) / (20.9 - \%O_2 \text{ measured})]$$

$$\text{lb/MMBtu} = F\text{-Factor} \times MW \times [(1.3711\text{E-}6 \text{ Lb-Mole } ^\circ\text{R} / \text{ft}^3) / (T(\text{std}) + 460)] \times [20.9 / (20.9 - O_2\%)] \times \text{ppm}$$

$$\text{Lb/MMscf of fuel} = [(\text{lb/hr}) / (\text{lb fuel/hr}) / (\text{ft}^3/\text{lb fuel}) \times (1\text{E}+06/\text{MM})]$$

CONSTANTS :

Standard Temp. T(std): 60 °F
Oxygen Correction : 15 % O2

NOx, MW = 46.005 lb/lb-mole SO2, MW = 64.058 lb/lb-mole
CO, MW = 28.010 lb/lb-mole HC, MW = 16.043 lb/lb-mole

EMISSION CALCULATIONS GAS COMPONENTS

PG 2 OF 2

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

DATA :

	Run 7	Run 8	Run 9	Run 10	Average
Date	01-Apr-92	01-Apr-92	01-Apr-92	01-Apr-92	
Oxygen (%)	14.33	14.33	14.25	14.27	14.30
Qs(std), dscfm	111,810	111,613	110,270	110,603	109,661
F-Factor, dscf/MMBtu	8,498.04	8,498.04	8,498.04	8,498.04	8,498.04
NOx, ppm	7.79	7.68	7.9	7.84	8.08
CO, ppm	0.30	0.30	0.29	0.28	0.30
SO2, ppm					
HC (non-methane), ppm					
Fuel, Lb/hr	10,792	10,773	10,773	10,773	10,652
Fuel, ft3/lb	21.99	21.99	21.99	21.99	21.99

CALCULATIONS :

NOx, lb/hr	6.34	6.24	6.34	6.31	6.45
NOx, ppm @ 15 %O2	7.00	6.90	7.01	6.98	7.21
NOx, lb/MMBtu	0.0255	0.0252	0.0256	0.0255	0.0263
NOx, lb/MMscf of fuel	26.70	26.32	26.75	26.63	27.53
CO, lb/hr	0.15	0.15	0.14	0.14	0.15
CO, ppm @ 15 %O2	0.27	0.27	0.26	0.25	0.27
CO, lb/MMBtu	0.0006	0.0006	0.0006	0.0006	0.0006
CO, lb/MMscf of fuel	0.63	0.63	0.60	0.58	0.63
SO2, lb/hr					
SO2, ppm @ 15 %O2					
SO2, lb/MMBtu					
SO2, lb/MMscf of fuel					
HC, lb/hr					
HC, ppm @ 15 %O2					
HC, lb/MMBtu					
HC, lb/MMscf of fuel					

EQUATIONS :

$$\text{lb/hr} = (0.00000137 \text{ Lb-Mole } ^\circ\text{R} / \text{ft}^3) \times 60 \text{ min/hr} \times Q_s(\text{std}) \times \text{MW} \times \text{ppm} / [T(\text{std}) + 460]$$

$$\text{ppm @ 15 \%O}_2 = \text{ppm measured} \times [(20.9 - 15 \%O_2) / (20.9 - \%O_2 \text{ measured})]$$

$$\text{lb/MMBtu} = \text{F-Factor} \times \text{MW} \times [(1.3711\text{E}-6 \text{ Lb-Mole } ^\circ\text{R} / \text{ft}^3) / (T(\text{std}) + 460)] \times [20.9 / (20.9 - O_2\%)] \times \text{ppm}$$

$$\text{Lb/MMscf of fuel} = [(\text{lb/hr}) / (\text{lb fuel/hr}) / (\text{ft}^3/\text{lb fuel}) \times (1\text{E}+06/\text{MM})]$$

CONSTANTS :

Standard Temp. T(std): 60 °F
Oxygen Correction : 15 % O2

NOx, MW = 46.005 lb/lb-mole SO2, MW = 64.058 lb/lb-mole
CO, MW = 28.010 lb/lb-mole HC, MW = 16.043 lb/lb-mole

FUEL BASED CALCULATIONS

SWEPI – SEKR
UNIT 2, HRSG OUTLET STACK

31-Mar-92

FUEL ANALYSIS DATA								
Run #	Fuel Value (%), Moisture & Ash Free					GCV		
	Carbon	Hydrogen	Nitrogen	Oxygen	Sulfur	BTU/lb	ft3/lb	lb/gal
1	73.46	23.76	1.36	1.42	0.00	22,995		
2	73.46	23.76	1.36	1.42	0.00	22,995		

CALCULATIONS									
Run #	Stack Gas Oxygen %	Fuel Gas Flowrate		Fuel Oil Flowrate		Solid Fuel lb/hr	Heat Input MMBTU/hr	F-Factor dscf/MMBTU	Qs(std) dscfm
		lb/hr	ft3/hr	lb/hr	gal/hr				
1	14.89	2043					46.97844	8,498.04	23,139
2	14.89	2064					47.46133	8,498.04	23,376

$$\text{Heat Input, MMBTU/hr} = (\text{lb/hr fuel gas}) \times \text{BTU/lb} \times \text{MM}/1\text{E}+06$$

$$= (\text{ft}^3/\text{hr fuel gas}) \times \text{BTU/lb} / (\text{ft}^3/\text{lb fuel gas}) \times \text{MM}/1\text{E}+06$$

$$= (\text{lb/hr fuel oil}) \times \text{BTU/lb} \times \text{MM}/1\text{E}+06$$

$$= (\text{gal/hr fuel oil}) \times \text{lb/gal} \times \text{BTU/lb} \times \text{MM}/1\text{E}+06$$

$$= (\text{lb/hr solid fuel}) \times \text{BTU/lb} \times \text{MM}/1\text{E}+06$$

$$\text{F-Factor, dscf/MMBTU} = 1\text{E}+06 [3.64 \times (\% \text{ H}) + 1.53 \times (\% \text{ C}) + 0.57 \times (\% \text{ S}) + 0.14 \times (\% \text{ N}) - 0.46 \times (\% \text{ O}_2)] / (\text{BTU/lb}) \times [(\text{Tstd} + 460) / 528]$$

$$\text{Qs(std), dscfm} = \text{MMBTU/hr} \times [\text{F-Factor} \times (20.9 / (20.9 - \% \text{ O}_2)) \times (\text{hr} / 60 \text{ min})]$$

$$\text{GCV} = \text{Gross Calorific Value of fuel}$$

$$\text{Standard Temperature} = 60 \text{ }^\circ\text{F}$$

FUEL BASED CALCULATIONS

SWEPI – SEKR
UNIT 3, HRSG OUTLET STACK

31 – Mar – 92

FUEL ANALYSIS DATA								
Run #	Fuel Value (%), Moisture & Ash Free					GCV		
	Carbon	Hydrogen	Nitrogen	Oxygen	Sulfur	BTU/lb	ft3/lb	lb/gal
1	73.46	23.76	1.36	1.42	0.00	22,995		
2	73.46	23.76	1.36	1.42	0.00	22,995		

CALCULATIONS								
Run #	Stack Gas Oxygen %	Fuel Gas Flowrate		Fuel Oil Flowrate		Solid Fuel lb/hr	Heat Input MMBTU/hr	F – Factor dscf/MMBTU
		lb/hr	ft3/hr	lb/hr	gal/hr			
1	15.17	2004					46.08164	8,498.04
2	15.25	2004					46.08164	8,498.04
								23,806
								24,143

$$\begin{aligned}
 \text{Heat Input, MMBTU/hr} &= (\text{lb/hr fuel gas}) \times \text{BTU/lb} \times \text{MM}/1\text{E}+06 \\
 &= (\text{ft}^3/\text{hr fuel gas}) \times \text{BTU/lb} / (\text{ft}^3/\text{lb fuel gas}) \times \text{MM}/1\text{E}+06 \\
 &= (\text{lb/hr fuel oil}) \times \text{BTU/lb} \times \text{MM}/1\text{E}+06 \\
 &= (\text{gal/hr fuel oil}) \times \text{lb/gal} \times \text{BTU/lb} \times \text{MM}/1\text{E}+06 \\
 &= (\text{lb/hr solid fuel}) \times \text{BTU/lb} \times \text{MM}/1\text{E}+06 \\
 \text{F – Factor, dscf/MMBTU} &= 1\text{E}+06 [3.64 \times (\% \text{ H}) + 1.53 \times (\% \text{ C}) + 0.57 \times (\% \text{ S}) + 0.14 \times (\% \text{ N}) - 0.46 \times (\% \text{ O}_2)] / (\text{BTU/lb}) \times [(\text{Tstd} + 460) / 528] \\
 \text{Qs(std), dscfm} &= \text{MMBTU/hr} \times [\text{F – Factor} \times (20.9 / (20.9 - \% \text{O}_2)) \times (\text{hr} / 60 \text{ min})] \\
 \text{GCV} &= \text{Gross Calorific Value of fuel} \\
 \text{Standard Temperature} &= 60 \text{ }^\circ\text{F}
 \end{aligned}$$

FUEL BASED CALCULATIONS

PG 1 OF 2

SWEPI - SEKR
UNIT 1, HRSG OUTLET STACK

01-Apr-92

FUEL ANALYSIS DATA								
Run #	Fuel Value (%), Moisture & Ash Free					GCV		
	Carbon	Hydrogen	Nitrogen	Oxygen	Sulfur	BTU/lb	ft3/lb	lb/gal
1	73.46	23.76	1.36	1.42	0.00	22,995		
2	73.46	23.76	1.36	1.42	0.00	22,995		
3	73.46	23.76	1.36	1.42	0.00	22,995		
4	73.46	23.76	1.36	1.42	0.00	22,995		
5	73.46	23.76	1.36	1.42	0.00	22,995		
6	73.46	23.76	1.36	1.42	0.00	22,995		

CALCULATIONS									
Run #	Stack Gas Oxygen %	Fuel Gas Flowrate		Fuel Oil Flowrate		Solid Fuel lb/hr	Heat Input MMBTU/hr	F-Factor dscf/MMBTU	Qs(std) dscfm
		lb/hr	ft3/hr	lb/hr	gal/hr				
1	14.23	10,127					232.869	8,498.04	103,347
2	14.50	10,117					232.639	8,498.04	107,601
3	14.19	10,831					249.057	8,498.04	109,873
4	14.23	10,870					249.954	8,498.04	110,930
5	14.24	10,704					246.137	8,498.04	109,400
6	14.31	10,762					247.470	8,498.04	111,161

$$\begin{aligned}
 \text{Heat Input, MMBTU/hr} &= (\text{lb/hr fuel gas}) \times \text{BTU/lb} \times \text{MM}/1\text{E}+06 \\
 &= (\text{ft3/hr fuel gas}) \times \text{BTU/lb} / (\text{ft3/lb fuel gas}) \times \text{MM}/1\text{E}+06 \\
 &= (\text{lb/hr fuel oil}) \times \text{BTU/lb} \times \text{MM}/1\text{E}+06 \\
 &= (\text{gal/hr fuel oil}) \times \text{lb/gal} \times \text{BTU/lb} \times \text{MM}/1\text{E}+06 \\
 &= (\text{lb/hr solid fuel}) \times \text{BTU/lb} \times \text{MM}/1\text{E}+06
 \end{aligned}$$

$$\text{F-Factor, dscf/MMBTU} = 1\text{E}+06 [3.64 \times (\% \text{ H}) + 1.53 \times (\% \text{ C}) + 0.57 \times (\% \text{ S}) + 0.14 \times (\% \text{ N}) - 0.46 \times (\% \text{ O}_2)] / (\text{BTU/lb}) \times [(\text{Tstd} + 460) / 528]$$

$$\text{Qs(std), dscfm} = \text{MMBTU/hr} \times [\text{F-Factor} \times (20.9 / (20.9 - \% \text{O}_2)) \times (\text{hr} / 60 \text{ min})]$$

$$\text{GCV} = \text{Gross Calorific Value of fuel}$$

$$\text{Standard Temperature} = 60 \text{ } ^\circ\text{F}$$

FUEL BASED CALCULATIONS

SWEPI - SEKR

01-Apr-92

UNIT 1, HRSQ OUTLET STACK

FUEL ANALYSIS DATA

Run #	Fuel Value (%), Moisture & Ash Free					GCV BTU/lb	ft3/lb	lb/gal
	Carbon	Hydrogen	Nitrogen	Oxygen	Sulfur			
7	73.46	23.76	1.36	1.42	0.00	22,995		
8	73.46	23.76	1.36	1.42	0.00	22,995		
9	73.46	23.76	1.36	1.42	0.00	22,995		
10	73.46	23.76	1.36	1.42	0.00	22,995		

CALCULATIONS

Run #	Stack Gas Oxygen %	Fuel Gas Flowrate		Fuel Oil Flowrate		Solid Fuel lb/hr	Heat Input MMBTU/hr	F-Factor dscf/MMBTU	Qs(std) dscfm
		lb/hr	ft3/hr	lb/hr	gal/hr				
7	14.33	10,792					248.160	8,498.04	111,810
8	14.33	10,773					247.723	8,498.04	111,613
9	14.25	10,773					247.723	8,498.04	110,270
10	14.27	10,773					247.723	8,498.04	110,603

$$\text{Heat Input, MMBTU/hr} = (\text{lb/hr fuel gas}) \times \text{BTU/lb} \times \text{MM}/1\text{E}+06$$

$$= (\text{ft}^3/\text{hr fuel gas}) \times \text{BTU/lb} / (\text{ft}^3/\text{lb fuel gas}) \times \text{MM}/1\text{E}+06$$

$$= (\text{lb/hr fuel oil}) \times \text{BTU/lb} \times \text{MM}/1\text{E}+06$$

$$= (\text{gal/hr fuel oil}) \times \text{lb/gal} \times \text{BTU/lb} \times \text{MM}/1\text{E}+06$$

$$= (\text{lb/hr solid fuel}) \times \text{BTU/lb} \times \text{MM}/1\text{E}+06$$

$$\text{F-Factor, dscf/MMBTU} = 1\text{E}+06 [3.64 \times (\% \text{H}) + 1.53 \times (\% \text{C}) + 0.57 \times (\% \text{S}) + 0.14 \times (\% \text{N}) - 0.46 \times (\% \text{O}_2)] / (\text{BTU/lb}) \times [(\text{Tstd} + 460) / 528]$$

$$\text{Qs(std), dscfm} = \text{MMBTU/hr} \times [\text{F-Factor} \times (20.9 / (20.9 - \% \text{O}_2)) \times (\text{hr} / 60 \text{ min})]$$

$$\text{GCV} = \text{Gross Calorific Value of fuel}$$

$$\text{Standard Temperature} = 60 \text{ }^\circ\text{F}$$

RELATIVE ACCURACY CALCULATIONS – O2 (%)

01-Apr-92

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

Run No.	RM Test Values		Plant CEM Values		Difference d
	Runs not Used for RA	Runs Used for RA	Runs not Used for RA	Runs Used for RA	
1		14.23		14.70	0.47
2		14.50		14.65	0.15
3		14.19		14.40	0.21
4		14.23		14.35	0.12
5		14.24		14.45	0.21
6		14.31		14.45	0.14
7		14.33		14.45	0.12
8		14.33		14.50	0.17
9		14.25		14.40	0.15
10		14.27		14.40	0.13
11					
12					

$\overline{RM}$: 14.29

$\overline{d}$: 0.19

Standard Deviation (Std.Dev.) : 0.10

t-VALUES TABLE			
n	t0.975	n	t0.975
2	12.706	10	2.262
3	4.303	11	2.228
4	3.182	12	2.201
5	2.776	13	2.179
6	2.571	14	2.160
7	2.447	15	2.145
8	2.365	16	2.131
9	2.306		

CONFIDENCE COEFFICIENT

CC = $t_{0.975} \times [\text{Std.Dev.} / (\text{Sq.Rt. } n)] = 0.07$
 Where : CC = 2.5 percent error Confidence Coefficient.
 n , number of valid test runs = 10
 t0.975, t-Value from table = 2.262

RELATIVE ACCURACY

$$RA (\%) = (| \overline{d} | + | CC |) / \overline{RM} \times 100 = \boxed{1.83}$$

RELATIVE ACCURACY CALCULATIONS – NOx (ppm)

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

01–Apr–92

Run No.	RM Test Values		Plant CEM Values		Difference d
	Runs not Used for RA	Runs Used for RA	Runs not Used for RA	Runs Used for RA	
1		9.43		8.00	–1.43
2		9.40		8.00	–1.40
3		8.89		9.00	0.11
4		8.23		8.00	–0.23
5		7.99		7.00	–0.99
6		7.67		7.00	–0.67
7		7.79		7.00	–0.79
8		7.68		8.00	0.32
9		7.90		8.00	0.10
10		7.84		8.00	0.16
11					
12					

$\overline{RM}$: 8.28

$\overline{d}$: –0.48

Standard Deviation (Std.Dev.) : 0.66

t–VALUES TABLE			
n	t0.975	n	t0.975
2	12.706	10	2.262
3	4.303	11	2.228
4	3.182	12	2.201
5	2.776	13	2.179
6	2.571	14	2.160
7	2.447	15	2.145
8	2.365	16	2.131
9	2.306		

CONFIDENCE COEFFICIENT

$$CC = t0.975 \times [\text{Std.Dev.} / (\text{Sq.Rt. } n)] = 0.47$$

Where : CC = 2.5 percent error Confidence Coefficient.

n , number of valid test runs = 10

t0.975, t–Value from table = 2.262

RELATIVE ACCURACY

$$RA (\%) = (|\overline{d}| + |CC|) / \overline{RM} \times 100 = \boxed{11.53}$$

RELATIVE ACCURACY CALCULATIONS – CO (ppm)

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

01 – Apr – 92

Run No.	RM Test Values		Plant CEM Values		Difference d
	Runs not Used for RA	Runs Used for RA	Runs not Used for RA	Runs Used for RA	
1		0.39		0.00	-0.39
2		0.34		0.00	-0.34
3		0.33		0.00	-0.33
4		0.25		0.00	-0.25
5		0.26		0.00	-0.26
6		0.30		0.00	-0.30
7		0.30		0.00	-0.30
8		0.30		0.00	-0.30
9		0.29		0.00	-0.29
10		0.28		0.00	-0.28
11					
12					

$\overline{RM} : 0.30$

$\overline{d} : -0.30$

Standard Deviation (Std.Dev.) : 0.04

t-VALUES TABLE			
n	t0.975	n	t0.975
2	12.706	10	2.262
3	4.303	11	2.228
4	3.182	12	2.201
5	2.776	13	2.179
6	2.571	14	2.160
7	2.447	15	2.145
8	2.365	16	2.131
9	2.306		

CONFIDENCE COEFFICIENT

$$CC = t_{0.975} \times [\text{Std.Dev.} / (\text{Sq.Rt. } n)] = 0.03$$

Where : CC = 2.5 percent error Confidence Coefficient.

n , number of valid test runs = 10

t0.975, t-Value from table = 2.262

RELATIVE ACCURACY

$$RA (\%) = (| \overline{d} | + | CC |) / \text{STD} \times 100 = 0.77$$

Where : STD = Applicable CO Standard of 43.47 ppm

SECTION 4

CONTINUOUS TEST METHODS

GAS ANALYZER DATA

SWEPI – SEKR
UNIT 2, HRSG OUTLET STACK

Date : 31-Mar-92
Run No. : 1

Point #	O2, %		CO2, %		NOx, ppm		CO, ppm		SO2, ppm	
	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
1	15.00	14.98	3.40	3.40	27.00	27.05	4.45	4.45		
2	15.00	14.94	3.40	3.40	27.20	27.36	4.80	4.79		
3	15.00	14.91	3.40	3.40	27.00	27.26	5.00	4.99		
4	15.00	14.87	3.40	3.40	27.20	27.57	4.90	4.88		
5	15.00	14.83	3.40	3.40	27.20	27.67	5.00	4.98		
6	15.00	14.80	3.40	3.40	27.00	27.58	5.00	4.97		
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30										
MEAN :	14.89		3.40		27.41		4.84			

Zero Check	0.00	0.00	0.00	0.00
Span Check	14.20	8.22	42.80	8.88
Initial Span Value	13.99	8.22	43.80	8.83
Drift, Percent	1.5	0.0	-2.3	0.6
Zero Drift, Zcf	0.00000	0.00000	0.00000	0.00000
Span Drift, Scf	0.00250	0.00000	-0.00381	0.00094

Drift, Percent = [(Span Check – Zero Check) – Calib. Gas] / Calib. Gas x 100

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value – [Zcf x (Point # – 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # – 0.5))]

GAS ANALYZER DATA

SWEPI – SEKR
UNIT 2, HRSG OUTLET STACK

Date : 31-Mar-92
Run No. : 2

O2, %		CO2, %		NOx, ppm		CO, ppm		SO2, ppm	
Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
Point #									
1	14.80	14.81	3.32	3.32	27.40	27.39	4.90	4.90	
2	14.80	14.84	3.32	3.32	27.40	27.37	4.90	4.89	
3	14.80	14.87	3.32	3.32	27.40	27.35	4.95	4.93	
4	14.80	14.90	3.32	3.32	27.40	27.33	4.90	4.87	
5	14.80	14.93	3.32	3.32	27.40	27.31	4.85	4.81	
6	14.80	14.96	3.32	3.32	27.30	27.19	4.95	4.90	
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30									
MEAN :		14.89	3.32		27.32		4.88		

Zero Check	0.00	0.00	0.00	0.00
Span Check	13.83	8.22	44.00	8.93
Initial Span Value	13.99	8.22	43.80	8.83
Drift, Percent	-1.1	0.0	0.5	1.1
Zero Drift, Zcf	0.00000	0.00000	0.00000	0.00000
Span Drift, Scf	-0.00191	0.00000	0.00076	0.00189

Drift, Percent = [(Span Check – Zero Check) – Calib. Gas] / Calib. Gas x 100

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value – [Zcf x (Point # – 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # – 0.5))]

GAS ANALYZER DATA

SWEPI – SEKR
UNIT 3, HRSG OUTLET STACK

Date : 31-Mar-92
Run No. : 1

O2, %		CO2, %		NOx, ppm		CO, ppm		SO2, ppm	
Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
Point #									
1	15.00	14.99	3.44	3.44	28.50	28.48	5.60	5.60	
2	15.20	15.18	3.44	3.44	28.80	28.73	5.65	5.66	
3	15.25	15.22	3.44	3.44	29.30	29.19	5.60	5.62	
4	15.25	15.21	3.44	3.44	29.40	29.24	5.60	5.62	
5	15.25	15.20	3.44	3.43	29.60	29.40	5.55	5.58	
6	15.25	15.19	3.44	3.43	29.70	29.45	5.60	5.64	
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30									
MEAN :	15.17		3.44		29.08		5.62		

Zero Check	0.00	0.00	0.00	-0.10
Span Check	14.05	8.24	44.20	8.82
Initial Span Value	13.99	8.22	43.80	8.83
Drift, Percent	0.4	0.2	0.9	1.0
Zero Drift, Zcf	0.00000	0.00000	0.00000	-0.01667
Span Drift, Scf	0.00071	0.00041	0.00152	0.00170

Drift, Percent = [(Span Check – Zero Check) – Calib. Gas] / Calib. Gas x 100

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value – [Zcf x (Point # – 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # – 0.5))]

GAS ANALYZER DATA

SWEPI – SEKR
UNIT 3, HRSG OUTLET STACK

Date : 31-Mar-92
Run No. : 2

Point #	O2, %		CO2, %		NOx, ppm		CO, ppm		SO2, ppm	
	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
1	15.25	15.25	3.30	3.30	28.50	28.54	5.60	5.60		
2	15.25	15.24	3.30	3.30	28.50	28.63	5.60	5.60		
3	15.30	15.28	3.30	3.30	28.70	28.92	5.50	5.51		
4	15.30	15.27	3.30	3.30	28.50	28.81	5.50	5.51		
5	15.30	15.27	3.30	3.30	28.50	28.90	5.50	5.51		
6	15.25	15.21	3.30	3.30	28.50	28.99	5.50	5.52		
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30										
MEAN :	15.25		3.30		28.80		5.54			

Zero Check	0.00	0.00	0.00	0.00
Span Check	14.03	8.22	43.00	8.80
Initial Span Value	13.99	8.22	43.80	8.83
Drift, Percent	0.3	0.0	-1.8	-0.3
Zero Drift, Zcf	0.00000	0.00000	0.00000	0.00000
Span Drift, Scf	0.00048	0.00000	-0.00304	-0.00057

Drift, Percent = [(Span Check – Zero Check) – Calib. Gas] / Calib. Gas x 100

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value – [Zcf x (Point # – 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # – 0.5))]

GAS ANALYZER DATA

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

Date : 01-Apr-92
Run No. : 1

Point #	O2, %		CO2, %		NOx, ppm		CO, ppm		SO2, ppm	
	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
1	14.20	14.21	3.58	3.58	8.38	8.40	0.40	0.40		
2	14.18	14.20	3.58	3.57	8.70	8.77	0.38	0.38		
3	14.25	14.28	3.58	3.57	8.00	8.11	0.40	0.40		
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30										
MEAN :	14.23		3.57		8.43		0.39			

Zero Check	0.00	0.00	0.00	0.00
Span Check	13.95	8.26	22.88	12.00
Initial Span Value	13.99	8.22	23.25	12.00
Drift, Percent	-0.3	0.5	-1.6	0.0
Zero Drift, Zcf	0.00000	0.00000	0.00000	0.00000
Span Drift, Scf	-0.00095	0.00162	-0.00530	0.00000

Drift, Percent = [(Span Check – Zero Check) – Calib. Gas] / Calib. Gas x 100

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value – [Zcf x (Point # – 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # – 0.5))]

GAS ANALYZER DATA

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

Date : 01-Apr-92
Run No. : 2

O2, %		CO2, %		NOx, ppm		CO, ppm		SO2, ppm	
Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
Point #									
1	14.50	14.50	3.58	3.58	8.30	8.30	0.36	0.36	
2	14.50	14.50	3.58	3.59	8.25	8.26	0.36	0.36	
3	14.50	14.50	3.58	3.59	8.63	8.65	0.30	0.30	
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30									
MEAN :	14.50		3.59		8.40		0.34		

Zero Check	0.00	0.00	0.00	0.00
Span Check	13.99	8.18	23.20	12.00
Initial Span Value	13.99	8.22	23.25	12.00
Drift, Percent	0.0	-0.5	-0.2	0.0
Zero Drift, Zcf	0.00000	0.00000	0.00000	0.00000
Span Drift, Scf	0.00000	-0.00162	-0.00072	0.00000

Drift, Percent = $[(\text{Span Check} - \text{Zero Check}) - \text{Calib. Gas}] / \text{Calib. Gas} \times 100$

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = $(\% \text{ Drift} / 100) / \# \text{ of Readings}$

Cz, Zero Corr. Concentration = measured value - $[Zcf \times (\text{Point \#} - 0.5)]$

Drift Corrected Reading = $Cz / [1 + (\text{Scf} \times (\text{Point \#} - 0.5))]$

GAS ANALYZER DATA

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

Date : 01-Apr-92
Run No. : 3

Point #	O ₂ , %		CO ₂ , %		NO _x , ppm		CO, ppm		SO ₂ , ppm	
	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
1	14.20	14.20	3.72	3.72	9.13	9.12	0.40	0.40		
2	14.20	14.19	3.76	3.75	8.75	8.73	0.30	0.30		
3	14.20	14.19	3.76	3.75	8.87	8.83	0.30	0.30		
4										
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30										
MEAN :	14.19		3.74		8.89		0.33			

Zero Check	0.00	0.02	0.00	0.00
Span Check	14.00	8.22	23.38	12.00
Initial Span Value	13.99	8.22	23.25	12.00
Drift, Percent	0.1	-0.2	0.6	0.0
Zero Drift, Zcf	0.00000	0.00667	0.00000	0.00000
Span Drift, Scf	0.00024	-0.00081	0.00186	0.00000

Drift, Percent = [(Span Check – Zero Check) – Calib. Gas] / Calib. Gas x 100

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value – [Zcf x (Point # – 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # – 0.5))]

GAS ANALYZER DATA

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

Date : 01-Apr-92
Run No. : 4

Point #	O ₂ , %		CO ₂ , %		NO _x , ppm		CO, ppm		SO ₂ , ppm	
	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
1	14.20	14.21	3.76	3.76	8.25	8.24	0.28	0.28		
2	14.20	14.23	3.76	3.76	8.25	8.23	0.24	0.24		
3	14.20	14.25	3.76	3.76	8.25	8.22	0.24	0.24		
4										
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MEAN :	14.23		3.76		8.23		0.25			

Zero Check	0.00	0.00	0.00	0.00
Span Check	13.93	8.22	23.35	12.00
Initial Span Value	13.99	8.22	23.25	12.00
Drift, Percent	-0.4	0.0	0.4	0.0
Zero Drift, Zcf	0.00000	0.00000	0.00000	0.00000
Span Drift, Scf	-0.00143	0.00000	0.00143	0.00000

Drift, Percent = [(Span Check – Zero Check) – Calib. Gas] / Calib. Gas x 100

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value – [Zcf x (Point # – 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # – 0.5))]

GAS ANALYZER DATA

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

Date : 01-Apr-92
Run No. : 5

Point #	O2, %		CO2, %		NOx, ppm		CO, ppm		SO2, ppm	
	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
1	14.23	14.23	3.70	3.70	8.00	8.00	0.24	0.24		
2	14.23	14.23	3.70	3.70	8.25	8.24	0.24	0.24		
3	14.25	14.25	3.70	3.70	7.75	7.74	0.30	0.30		
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30										
MEAN :	14.24		3.70		7.99		0.26			

Zero Check	0.00	0.00	0.00	0.00
Span Check	13.99	8.22	23.30	12.00
Initial Span Value	13.99	8.22	23.25	12.00
Drift, Percent	0.0	0.0	0.2	0.0
Zero Drift, Zcf	0.00000	0.00000	0.00000	0.00000
Span Drift, Scf	0.00000	0.00000	0.00072	0.00000

Drift, Percent = [(Span Check – Zero Check) – Calib. Gas] / Calib. Gas x 100

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value – [Zcf x (Point # – 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # – 0.5))]

GAS ANALYZER DATA

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

Date : 01-Apr-92
Run No. : 6

Point #	O2, %		CO2, %		NOx, ppm		CO, ppm		SO2, ppm	
	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
1	14.33	14.33	3.64	3.64	7.75	7.75	0.30	0.30		
2	14.30	14.30	3.64	3.64	7.75	7.76	0.30	0.30		
3	14.30	14.30	3.64	3.64	7.50	7.51	0.30	0.30		
4										
5										
6										
7										
8										
9										
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19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
MEAN :	14.31		3.64		7.67		0.30			

Zero Check	0.00	0.00	0.00	0.00
Span Check	13.99	8.22	23.20	12.00
Initial Span Value	13.99	8.22	23.25	12.00
Drift, Percent	0.0	0.0	-0.2	0.0
Zero Drift, Zcf	0.00000	0.00000	0.00000	0.00000
Span Drift, Scf	0.00000	0.00000	-0.00072	0.00000

Drift, Percent = $[(\text{Span Check} - \text{Zero Check}) - \text{Calib. Gas}] / \text{Calib. Gas} \times 100$

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = $(\% \text{ Drift} / 100) / \# \text{ of Readings}$

Cz, Zero Corr. Concentration = measured value - $[Zcf \times (\text{Point \#} - 0.5)]$

Drift Corrected Reading = $Cz / [1 + (\text{Scf} \times (\text{Point \#} - 0.5))]$

GAS ANALYZER DATA

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

Date : 01-Apr-92
Run No. : 7

Point #	O2, %		CO2, %		NOx, ppm		CO, ppm		SO2, ppm	
	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
1	14.30	14.30	3.64	3.64	7.88	7.88	0.30	0.30		
2	14.33	14.33	3.64	3.64	7.75	7.75	0.30	0.30		
3	14.35	14.35	3.64	3.64	7.75	7.75	0.30	0.30		
4										
5										
6										
7										
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9										
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24										
25										
26										
27										
28										
29										
30										
MEAN :	14.33		3.64		7.79		0.30			

Zero Check	0.00	0.00	0.00	0.00
Span Check	13.99	8.22	23.25	12.00
Initial Span Value	13.99	8.22	23.25	12.00
Drift, Percent	0.0	0.0	0.0	0.0
Zero Drift, Zcf	0.00000	0.00000	0.00000	0.00000
Span Drift, Scf	0.00000	0.00000	0.00000	0.00000

Drift, Percent = [(Span Check – Zero Check) – Calib. Gas] / Calib. Gas x 100

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value – [Zcf x (Point # – 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # – 0.5))]

GAS ANALYZER DATA

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

Date : 01-Apr-92
Run No. : 8

Point #	O ₂ , %		CO ₂ , %		NO _x , ppm		CO, ppm		SO ₂ , ppm	
	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
1	14.33	14.33	3.64	3.64	7.63	7.62	0.30	0.30		
2	14.33	14.33	3.64	3.64	7.75	7.72	0.30	0.30		
3	14.33	14.33	3.64	3.64	7.75	7.69	0.30	0.30		
4										
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27										
28										
29										
30										
MEAN :	14.33		3.64		7.68		0.30			

Zero Check	0.00	0.00	0.00	0.00
Span Check	13.99	8.22	23.45	12.00
Initial Span Value	13.99	8.22	23.25	12.00
Drift, Percent	0.0	0.0	0.9	0.0
Zero Drift, Zcf	0.00000	0.00000	0.00000	0.00000
Span Drift, Scf	0.00000	0.00000	0.00287	0.00000

Drift, Percent = [(Span Check – Zero Check) – Calib. Gas] / Calib. Gas x 100

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value – [Zcf x (Point # – 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # – 0.5))]

GAS ANALYZER DATA

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

Date : 01-Apr-92
Run No. : 9

Point #	O2, %		CO2, %		NOx, ppm		CO, ppm		SO2, ppm	
	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
1	14.25	14.25	3.64	3.64	7.88	7.88	0.28	0.28		
2	14.25	14.25	3.64	3.64	7.95	7.95	0.30	0.30		
3	14.25	14.25	3.64	3.64	7.88	7.88	0.30	0.30		
4										
5										
6										
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28										
29										
30										
MEAN :	14.25		3.64		7.90		0.29			

Zero Check	0.00	0.00	0.00	0.00
Span Check	13.99	8.22	23.25	12.00
Initial Span Value	13.99	8.22	23.25	12.00
Drift, Percent	0.0	0.0	0.0	0.0
Zero Drift, Zcf	0.00000	0.00000	0.00000	0.00000
Span Drift, Scf	0.00000	0.00000	0.00000	0.00000

Drift, Percent = [(Span Check – Zero Check) – Calib. Gas] / Calib. Gas x 100

Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value – [Zcf x (Point # – 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # – 0.5))]

GAS ANALYZER DATA

SWEPI – SEKR
UNIT 1, HRSG OUTLET STACK

Date : 01-Apr-92
Run No. : 10

Point #	O2, %		CO2, %		NOx, ppm		CO, ppm		SO2, ppm	
	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading	Instrument Reading	Drift Corrected Reading
1	14.25	14.26	3.64	3.64	7.88	7.88	0.24	0.24		
2	14.25	14.27	3.64	3.64	7.88	7.88	0.30	0.30		
3	14.25	14.28	3.64	3.64	7.75	7.75	0.30	0.30		
4										
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29										
30										
MEAN :	14.27		3.64		7.84		0.28			

Zero Check	0.00	0.00	0.00	0.00
Span Check	13.95	8.22	23.25	12.00
Initial Span Value	13.99	8.22	23.25	12.00
Drift, Percent	-0.3	0.0	0.0	0.0
Zero Drift, Zcf	0.00000	0.00000	0.00000	0.00000
Span Drift, Scf	-0.00095	0.00000	0.00000	0.00000

Drift, Percent = [(Span Check – Zero Check) – Calib. Gas] / Calib. Gas x 100

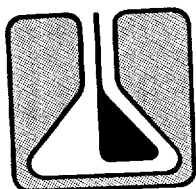
Zero Drift Correction Factor, Zcf = Zero Check / # of Readings

Span Drift Correction Factor, Scf = (% Drift / 100) / # of Readings

Cz, Zero Corr. Concentration = measured value – [Zcf x (Point # – 0.5)]

Drift Corrected Reading = Cz / [1 + (Scf x (Point # – 0.5))]

SECTION 5
LAB ANALYSIS DATA



ZALCO LABORATORIES, INC.

Analytical & Consulting Services

ENGINEERING SCIENCE
2520 Pegasus Drive
Bakersfield, CA 93308

Lab. No.: 031073_001
Received: Apr 3, 1992
Reported: Apr 3, 1992

Attention: Jim Polhamus

Sample Description: SWEPI SEKR BK 9203025 3/31/92

* CHROMATOGRAPHIC ANALYSIS (Z 1635) *

Components	Mole %	Wt %	CHONS	Wt %
Hydrogen	0.000	0.000	CARBON	73.46
Carbon Dioxide	.696	1.779	HYDROGEN	23.76
Oxygen	.067	.124	OXYGEN	1.42
Nitrogen	.834	1.356	NITROGEN	1.36
Carbon Monoxide	0.000	0.000	SULFUR	0.00
Hydrogen Sulfide	0.000	0.000		
Methane	93.237	86.839	Totals	99.99
Ethane	4.256	7.430	Total H/C	.32
Propane	.777	1.989		
IsoButane	.049	.166		
N-Butane	.050	.168		
IsoPentane	.016	.065		
N-Pentane	.009	.038		
Hexanes+	.009	.045		
Totals =	100.000	100.000		

SPECIFIC GRAVITY (Air = 1) .5958
SPECIFIC VOLUME, cu.ft./lb * 21.99
GROSS CALORIFIC VALUE, BTU/cu.ft. * 1027.75
GROSS CALORIFIC VALUE, BTU/cu.ft. ** 1045.52
GROSS CALORIFIC VALUE, BTU/lb ** 22994.83
NET CALORIFIC VALUE, BTU/cu.ft. ** 942.96
NET CALORIFIC VALUE, BTU/lb ** 20739.03
DSCF EXHAUST PER SCF FUEL (0% Oxygen) 8.8665
COMPRESSIBILITY FACTOR 'Z' (60 F, 1 ATM) .9978
EPA 'F' Factor @ 68 F: 8628.380 DSCF / MM Btu.
KCAPCD 'F' Factor @ 60 F: 8498.954 DSCF / MM Btu.

* Water Saturated

** Dry Gas @ 60 F, 14.73 psia

Kathie Zimmerman
Analyst

Jim Etherton
Laboratory Director

4309 Armour Avenue Bakersfield, California 93308

(805) 395-0539

FAX (805) 395-3069

SECTION 6
TEST METHODOLOGY

SECTION 6

TEST METHODOLOGY

Continuous Emissions Monitoring

Sample Extraction and Conditioning

Sampling was performed using a system which delivers a conditioned, continuous gas sample to the gas analyzers. The gas sample was extracted through a stainless steel probe, then passed through a heated (250°F) teflon sample line, a sample condenser (for moisture removal), an in-line filter (for particulate removal), and a stainless steel pump. The clean, dry sample was then transported via unheated teflon line to the analyzer manifold (located within the mobile van) for sample distribution to the continuous emissions monitors.

Continuous Emissions Monitors (CEMS)

Table 6-1 describe the CEMS used in the mobile van to analyze the exhaust gases. Calibrations of the CEMS were performed using EPA Protocol 1 or NIST certified calibration gases. Copies of the gas certification are included in the appendix of this report.

Prior to performing the emissions testing, a leak check of the sample system was performed. A check of sampling system bias was performed by injecting calibration gas (for each parameter) at the sample probe and then observing instrument response. A response within ± 5 percent of instrument range was considered acceptable. The leak check was repeated at the conclusion of the test day to verify the validity of the tests.

Before each test run, an initial calibration of the analyzers was performed by introducing zero and span gases and making appropriate adjustments. During each test run, analyzer response data was recorded for each instrument. At the conclusion of the test run, a calibration check was performed to verify acceptable zero and span drift limits.

Fuel Gas

A fuel gas sample was collected in a stainless steel gas sample cylinder, properly labeled, and delivered to the laboratory with the accompanying chain-of-custody form. The samples were analyzed by gas chromatography for CHONS (carbon, hydrogen, oxygen, nitrogen, and sulfur) and heating value in accordance with ASTM Method D-3588.

SECTION 7

RAW DATA

ENGINEERING-SCIENCE, INC.
CEM FIELD DATA SHEET

PLANT SUEPT-SEKR

CEM VAN NO. 1

DATE 3-31-92

TEST LOCATION OUTLET STACK HRS

UNIT # 2

OPERATOR JP

O₂, %

Calibration Gases:

High	13.99	Cyl. #	CC 66282
Mid		Cyl. #	
Low		Cyl. #	

CO₂, %

Calibration Gases:

High	8.22	Cyl. #	CC 66282
Mid		Cyl. #	
Low		Cyl. #	

NO_x, ppm

Calibration Gases:

High	43.8	Cyl. #	CC 101249
Mid		Cyl. #	
Low		Cyl. #	

CO, ppm

Calibration Gases:

High	8.83	Cyl. #	CC 12823
Mid		Cyl. #	
Low		Cyl. #	

SO₂, ppm

Calibration Gases:

High		Cyl. #	
Mid		Cyl. #	
Low		Cyl. #	

Calibration Gases:

High		Cyl. #	
Mid		Cyl. #	
Low		Cyl. #	

TIME	SAMPLE POINT	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	CO (ppm)	SO ₂ (ppm)	COMMENTS / RUN #
		13.99	8.22	43.8	8.83		Span gas values used for test.
		0.0	0.0	0.0	0.0		INT CAL ✓
		13.99	8.22	43.8	8.83		ZERO
							SPAN
							Leak ✓ @ 15" H ₂ O = 0.0"
							START RUN 1
0935		15.0	3.40	27.0	4.45		
0945		15.0	3.40	27.2	4.80		
0955		15.0	3.40	27.0	5.00		
1005		15.0	3.40	27.2	4.90		
1015		15.0	3.40	27.2	5.00		
1025		16.0	3.40	27.0	5.00		
1035							1 hr cal ✓
		0.0	0.0	0.0	0.0		Zero
		14.2	8.22	42.8	8.85		SPAN

Swaziland - 20/25 - 20/25

PLANT

PLANT
TEST LOCATION

CEM VAN NO.

—

DATE
OPERATOR

3-31-92

7

TIME	SAMPLE POINT	O2 (%)	CO2 (%)	NOx (ppm)	CO (ppm)	SO2 (ppm)	COMMENTS / RUN #
		13.49	8.22	43.8	8.83		Span gas values used for test.
							INTECAL ADJ
		0.0	0.0	0.0	0.0		ZERO
		13.99	8.22	43.8	8.83		SPAN
1105		14.8	3.32	27.4	4.9		START RUN 2
1125		14.8	3.32	27.4	4.9		
1125		14.8	3.32	27.4	4.95		
1135		14.8	3.32	27.4	4.9		
1145		14.8	3.32	27.4	4.85		
1155		14.8	3.32	27.3	4.95		
1205							INTECAL
		0.0	0.0	0.0	0.0		ZERO
		13.83	8.22	44.0	8.93		SPAN
							LEAK CHECK IS 116.00
							INTECAL ADJ
		0.0	0.0	0.0	0.0		ZERO
		13.99	8.22	43.8	8.83		SPAN
							CO UNITS
1320		15.0	3.44	28.5	5.6		START RUN 3
1330		15.20	3.44	28.8	5.65		
1340		15.25	3.44	29.3	5.60		
1350		15.25	3.44	29.4	5.60		
1400		15.25	3.44	29.6	5.55		
1410		15.25	3.44	29.7	5.60		
1420							INTECAL
		0.0	0.0	0.0	-1		ZERO
		14.03	8.24	44.2	8.82		SPAN

DATE 3-31-92

[illegible]

ENGINEERING-SCIENCE, INC.
CEM FIELD DATA SHEET

PLANT SWEET-SHAR
TEST LOCATION HRSG UNIT #1

CEM VAN NO. 1

DATE 4-1-92
OPERATOR SP4 CM

O₂, %

Calibration Gases:

High	13.99%	Cyl. #	CC60282
Mid	3.00	Cyl. #	CC811417
Low		Cyl. #	

CO₂, %

Calibration Gases:

High	8.22	Cyl. #	CC60282
Mid	2.81	Cyl. #	CC811417
Low		Cyl. #	

NO_x, ppm

Calibration Gases:

High	23.25	Cyl. #	CC108778
Mid	12.10	Cyl. #	CC108779
Low		Cyl. #	

CO, ppm

Calibration Gases:

High	12.00	Cyl. #	CC108779
Mid	8.53	Cyl. #	CC12823
Low		Cyl. #	

SO₂, ppm

Calibration Gases:

High		Cyl. #	
Mid		Cyl. #	
Low		Cyl. #	

Calibration Gases:

High		Cyl. #	
Mid		Cyl. #	
Low		Cyl. #	

TIME	SAMPLE POINT	O ₂ (%)	CO ₂ (%)	NO _x (ppm)	CO (ppm)	SO ₂ (ppm)	COMMENTS / RUN #
		13.99	8.22	23.25	12.00		Span gas values used for test.
		0.0	0.0	0.0	0.0		INT CAL ✓
		13.99	8.22	23.25	12.00		ZERO
		13.99	8.22	23.25	12.00		SPAN
		3.05	2.90	12.20	8.64		LINEARITY ✓
		0.0	0.0	0.0	0.0		HIGH
							MID
							ZERO
							IPK ✓ @ 15" H ₂ O = 0.0"
0900		14.2	3.58	8.38	.4		START RUN 1
0910		14.18	3.58	8.70	.38		
0920		14.25	3.58	8.00	.40		
0930		0.0	0.0	0.0	0.0		INT CAL ✓
		13.95	8.20	22.88	12.0		ZERO
							SPAN

ENGINEERING-SCIENCE, INC.
CEM FIELD DATA SHEET

Page 2 of 4

PLANT TEST LOCATION SUPER-SOL CEM VAN NO. 1 DATE 4/10/2012 OPERATOR JPB/cm

TIME	SAMPLE POINT	O2 (%)	CO2 (%)	NOX (ppm)	CO (ppm)	SO2 (ppm)	COMMENTS / RUN #
		13.99	8.22	23.25	12.00		Span gas values used for test.
		0.0	0.0	0.0	0.0		CH1 ADJ
		13.99	8.22	23.25	12.00		ZERO
							SPAN
0945		14.5	3.58	8.3	13.6		START RUN 2
0955		14.5	3.58	8.25	13.6		
1005		14.5	3.58	8.63	13.0		
1015							INT CAL ✓
		0.0	0.0	0.0	0.0		ZERO
		13.99	8.18	23.2	12.0		SPAN
							CH1 ADJ
							ZERO
		13.99	8.22	23.25	12.0		SPAN
1040		14.20	3.72	9.13	14		START RUN 3
1050		14.20	3.76	8.75	13		RELEASE UNIT 60 ADJUST FROM 0.1400 ppm
1100		14.20	3.76	8.89	13		
1110							INT CAL ✓
		0.0	0.0	0.0	0		ZERO
		14.00	8.22	23.38	12.0		SPAN
							CH1 ADJ
		0.0	0.0	0.0	0.0		ZERO
		13.99	8.22	23.25	12.0		SPAN
1130		14.20	3.76	8.25	12.8		START RUN 4
1140		14.20	3.76	8.25	12.4		
1150		14.20	3.76	8.25	12.1		
1200							INT CAL ✓
		0.0	0.0	0.0	0.0		ZERO
		13.93	8.22	23.35	12.00		SPAN

ENGINEERING-SCIENCE, INC.
CEM FIELD DATA SHEET

Page 3 of 4

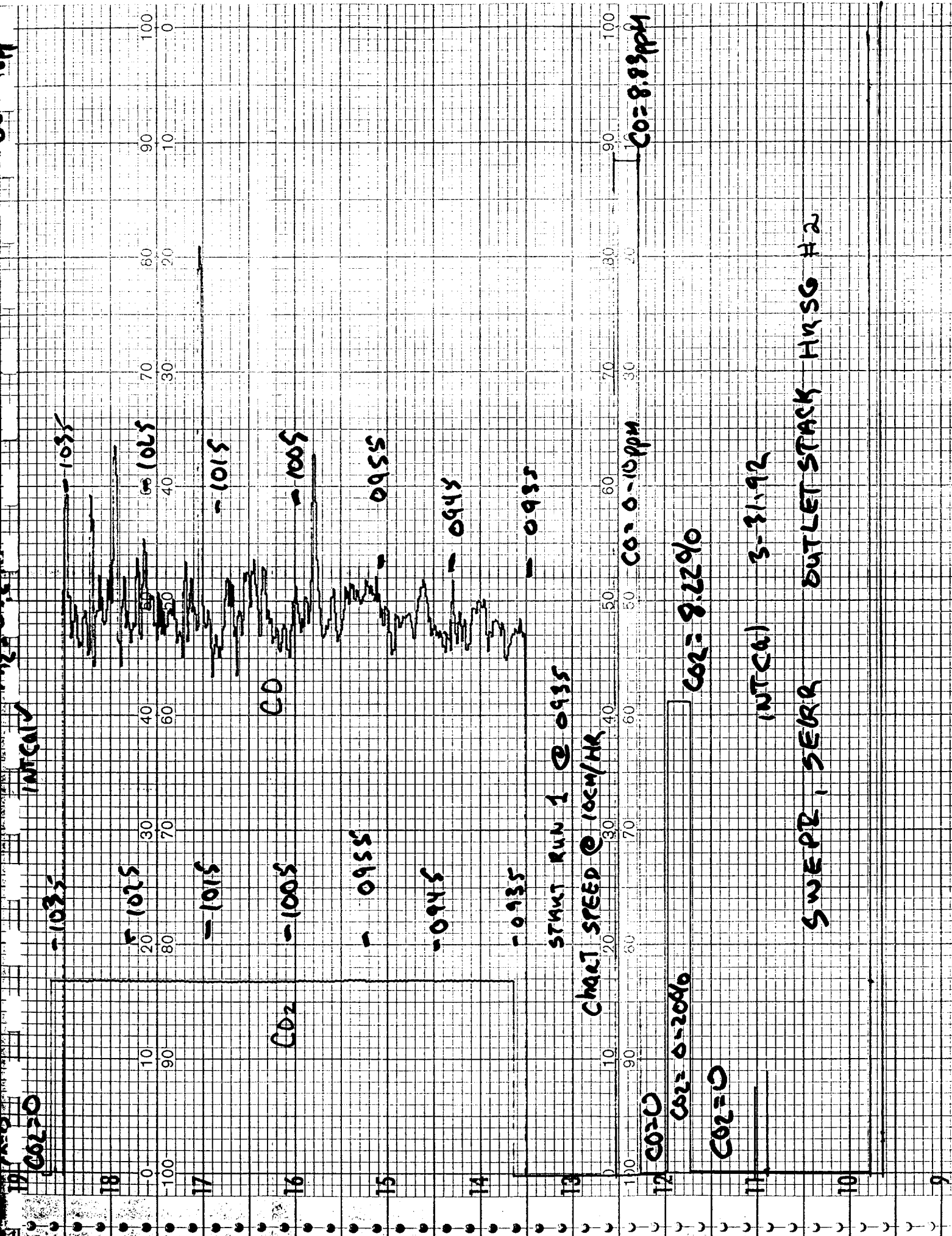
PLANT SWEET-SEK2 CEM VAN NO. 1 DATE 9-1-92
TEST LOCATION HRSG UNIT 4 OPERATOR SPACM

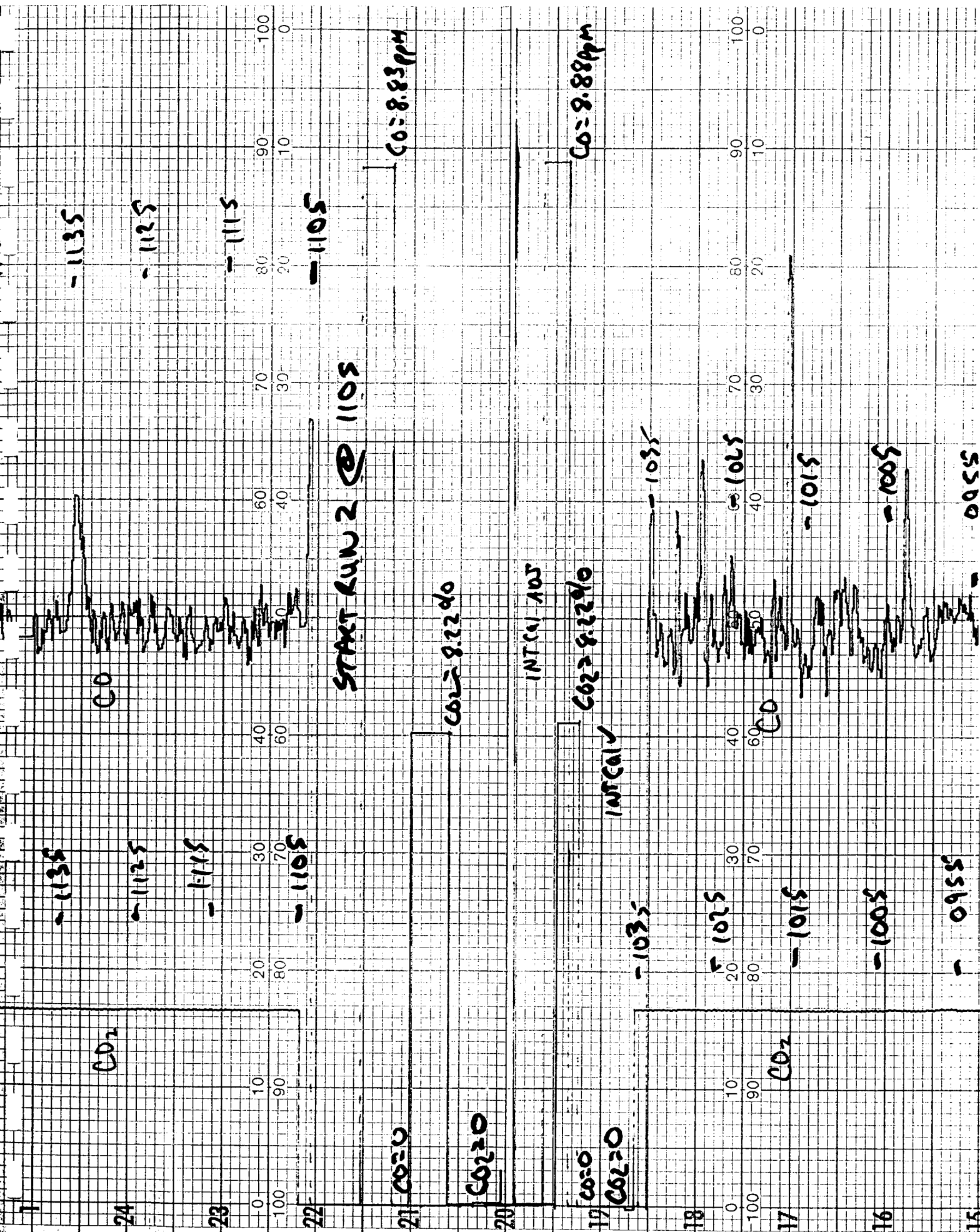
TIME	SAMPLE POINT	O2 (%)	CO2 (%)	NOx (ppm)	CO (ppm)	SO2 (ppm)	COMMENTS / RUN #
		13.99	8.22	23.25	12.00		Span gas values used for test.
		0.0	0.0	0.0	0.0		CO1 ADJ
		13.99	8.22	23.25	12.0		ZERO
							SPAN
1215		14.23	3.7	8.0	12.40		START RUNS
1225		14.23	3.7	8.25	12.4		
1235		14.25	3.7	7.75	12.0		
1245							INT COIL
		0.0	0.0	0.0	0.0		ZERO
		13.99	8.22	23.3	12.0		SPAN
							CO1 ADJ
				0.0			ZERO
				23.25			SPAN
1300		14.33	3.64	7.75	13		START RUNS
1310		14.30	3.64	7.75	13		
1320		14.30	3.64	7.5	13		
1330							INT COIL
		0.0	0.0	0.0	0		ZERO
		13.99	8.22	23.2	12.0		SPAN
							CO1 ADJ
				0.0			ZERO
				23.25			SPAN
1345		14.30	3.64	7.88	13		START RUNS
1355		14.35	3.64	7.75	13		
1405		14.35	3.64	7.75	13		
1415							INT COIL
		0.0	0.0	0.0	0.0		ZERO
		13.99	8.22	23.25	12.00		SPAN

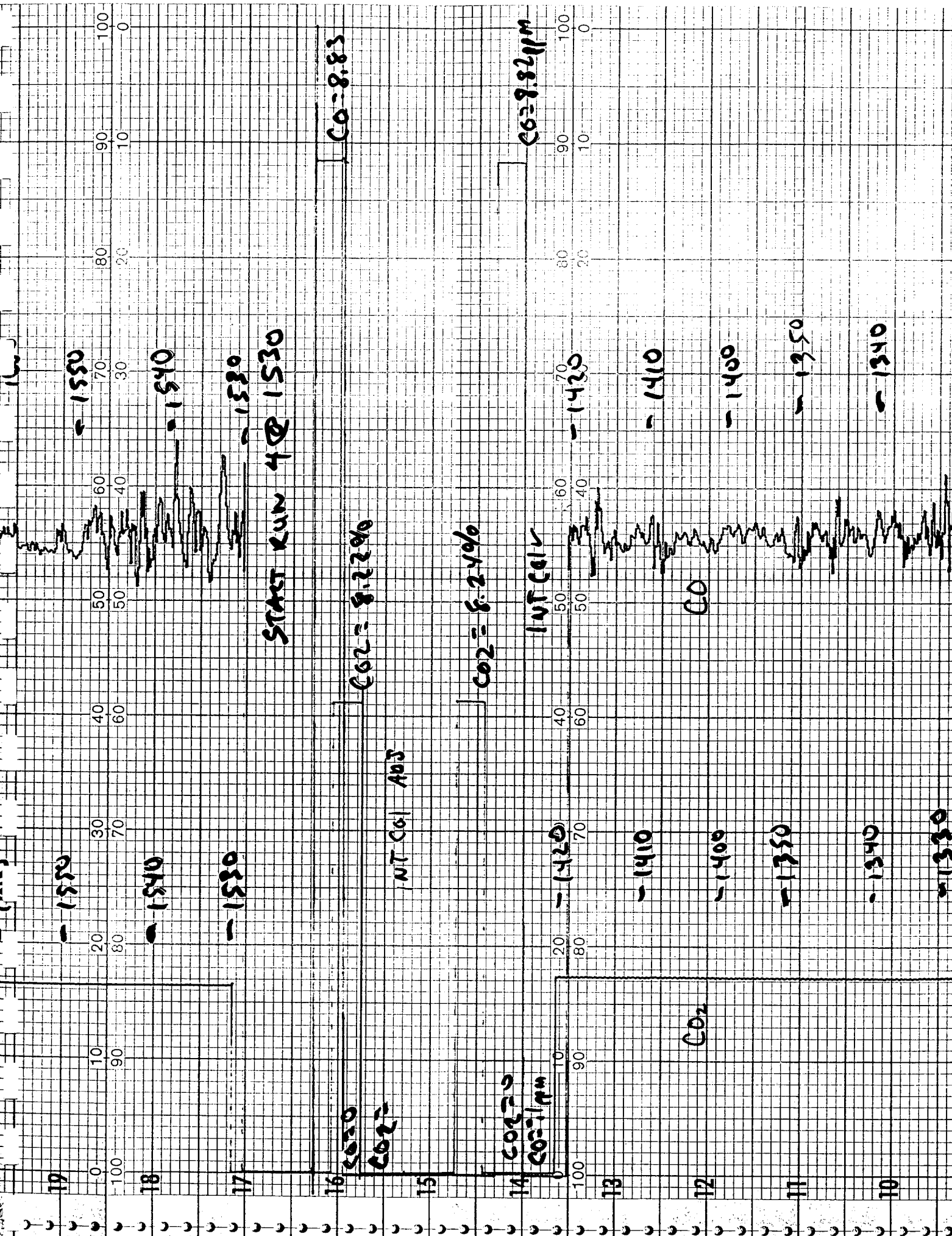
Page 1 of 4

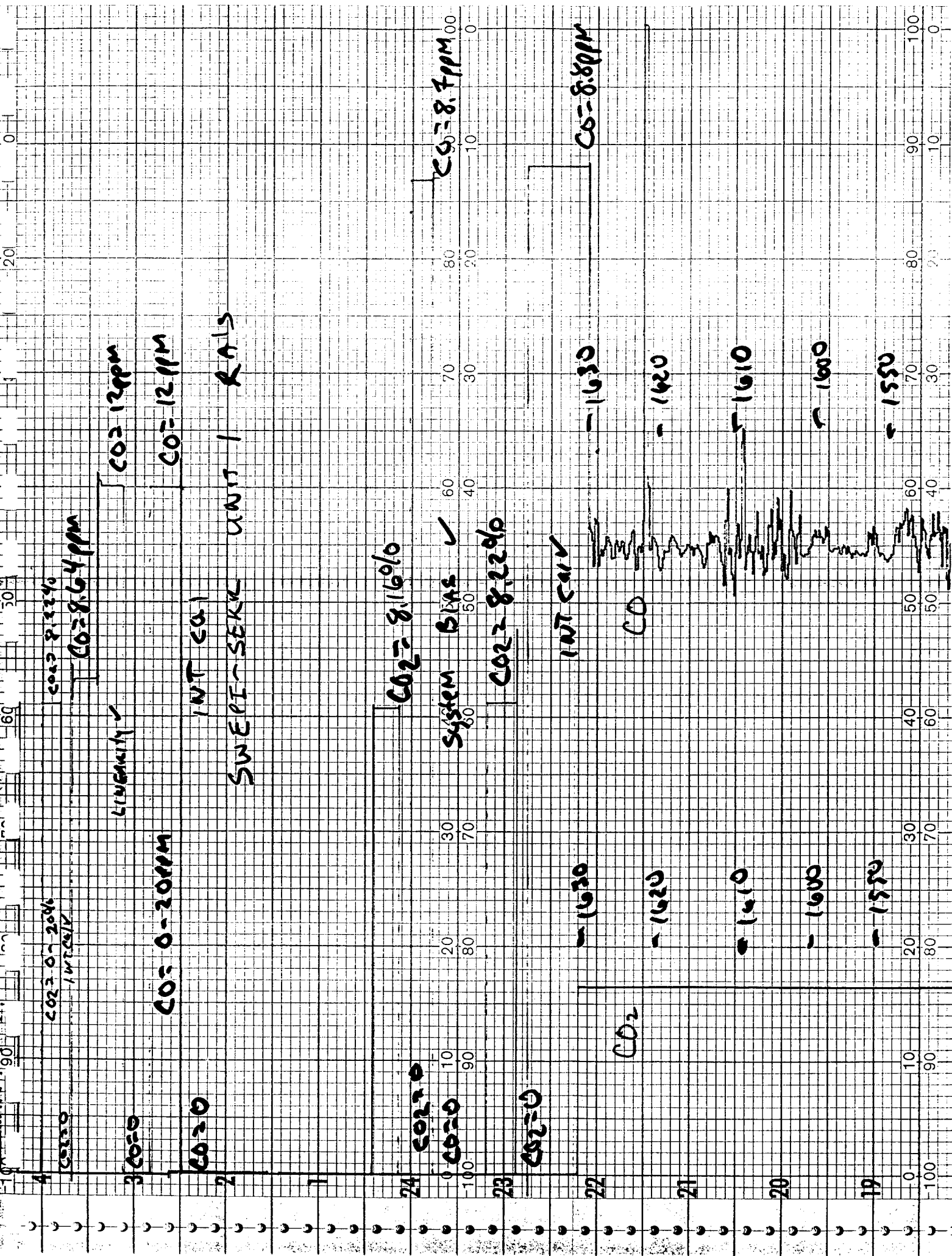
DATE 4-1-92
OPERATOR TP & CW

[illegible]









34

02-8.2240

Op 17: 82702
Op 22: 82703

CO-129PM

NTCALV

0930

0260

0160-

0900

CHARTERED BY

START RUN 1 @ 0900

60312.2ppm

$$C02 = 8.22\%$$

✓ Solid Brass

$$C_{12} = 2.9\%$$
$$\cos = 8.22\%$$

CO2 0-20%

cost 8.22%

$$C_0 = 8.64 \text{ ppm}$$

6/12/2019 ✓

CO2 12ppm

CO2 = 8.22%

CO = 12.91%

INTCALV

CO2 = 8.22%

CO = 12.91%

RAISED UNIT LOAD
FROM 10.1 MW to 10.8 MW.

START RUN 3 @ 1040

CO2 = 8.22%

CO = 12.91%

CO2 = 8.18%

CO = 12.91%

INTCALV

CO2 = 8.22%

CO = 12.91%

CO2 = 8.22%

CO = 12.91%

START RUN 2 @ 0945

CO=12 ppm

INT CAL V

-1245

-1245

-1235

CO₂

-1225

-1215

START RUNS @ 145

CO₂ 8.22%

CO=12 ppm

INT CAL V

-1200

CO₂

-1150

-1200

CO

-1150

-1140

-1140

-1130

START RUN 1 @ 1130

CO₂ 8.22%

-CAL ADS -

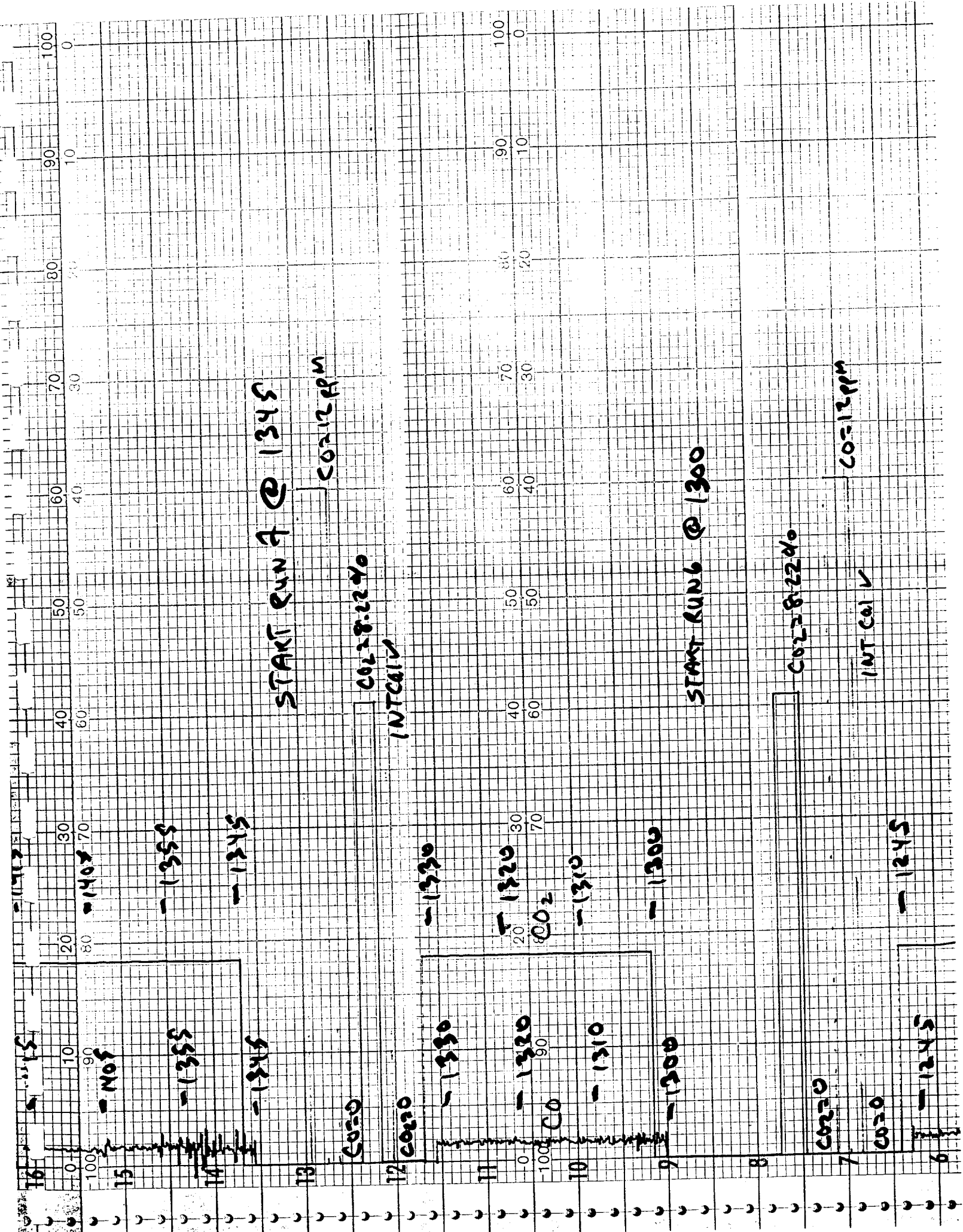
CO₂ 8.22%

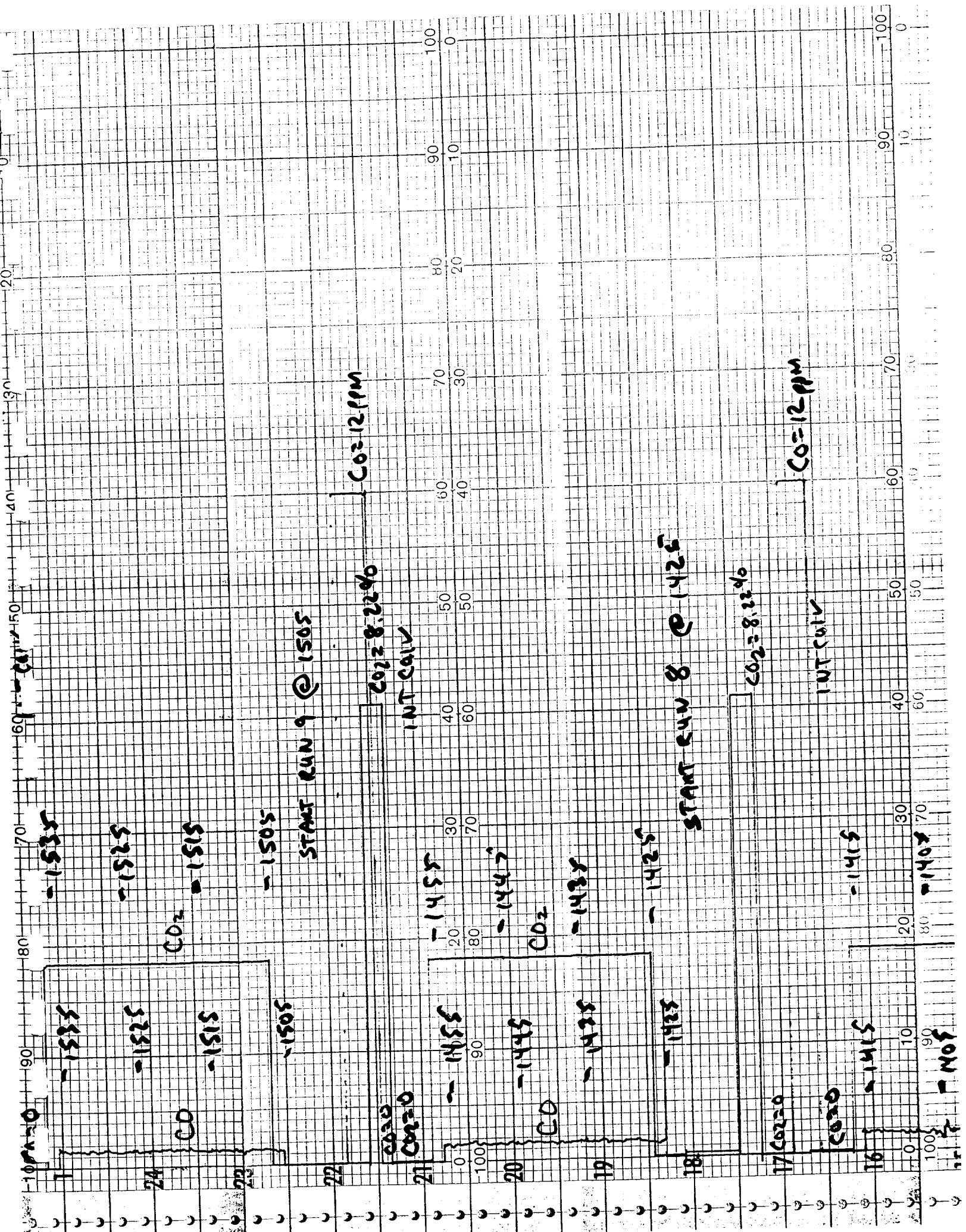
-102%

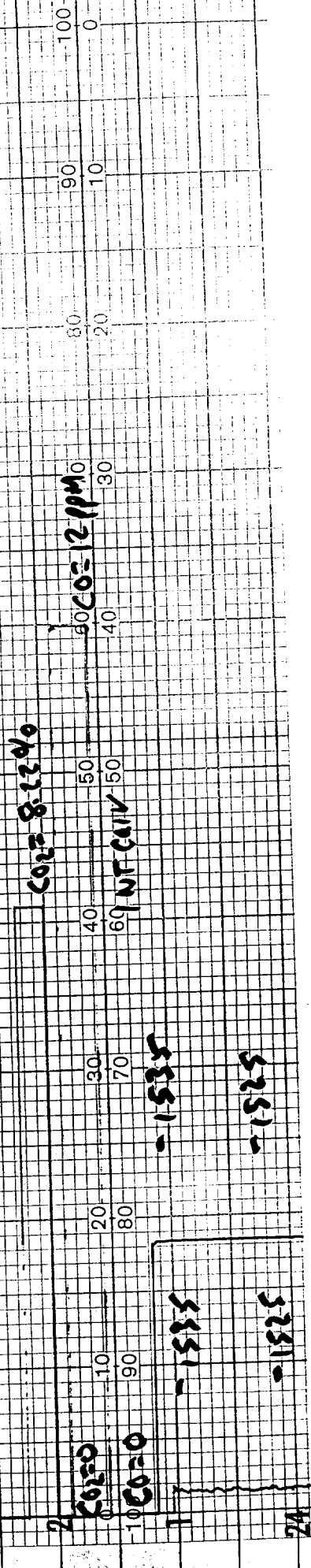
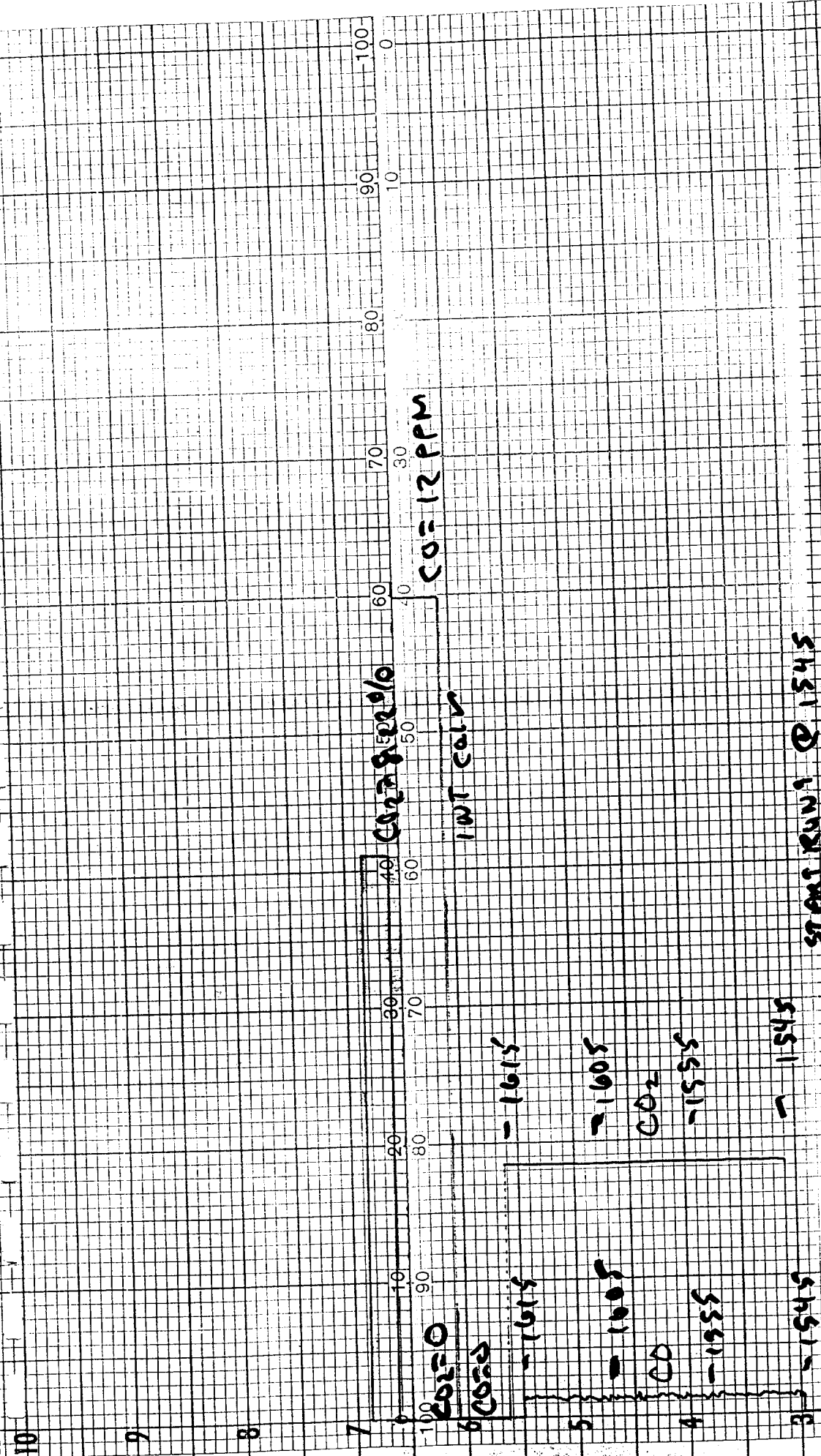
CO=12 ppm

INT CAL V

CO=0







NOX = 42.5

NOX=0

INITIAL AOS

NOX=0

INITIAL

NOX = 42.8 ppm O₂ = 14.2%

-1035

-1025

-1015

-1005

-0955

-0945

-0935

NOX

O₂

-1005

-0955

-0945

-0935

START RUN @ 0935

chart speed @ 10cm/Hr

O₂ = 0.25%

O₂ = 13.99%

NOX = 43.8 ppm

O₂ = 0

NOX = 0-100 ppm

NOX=0

INITIAL

3-31-92

SWEEP 30 SEK

OUTLET STACK HRS6 #2

MC 417

NOX=0

INT CAL

O₂ = 13.83%

-1205

-1155

-1145

-1135

-1125

-1115

-1105

-1205

-1155

-1145

-1135

-1125

-1115

-1105

NOx

O₂

START RUN 2 @ 1105

ZK 1101-24-20 M/TM2 cm

O₂=0

NOx=0

NOx=0

O₂ = 13.19%

NOx = 43.8 ppm

INT CAL

O₂ = 14.2%

NOx = 42.8 ppm

INT CAL

-1035

-1035

-1410

-1410

NOx

-1340

-1350

-1320

-1410

-1400

O₂

-1340

-1330

-1320

START CUR @ 1320

O₂ = 13.99%

NOx = 43.8 ppm

NOx = 0

INT CAL

SWEET, SEK

HUSG #3

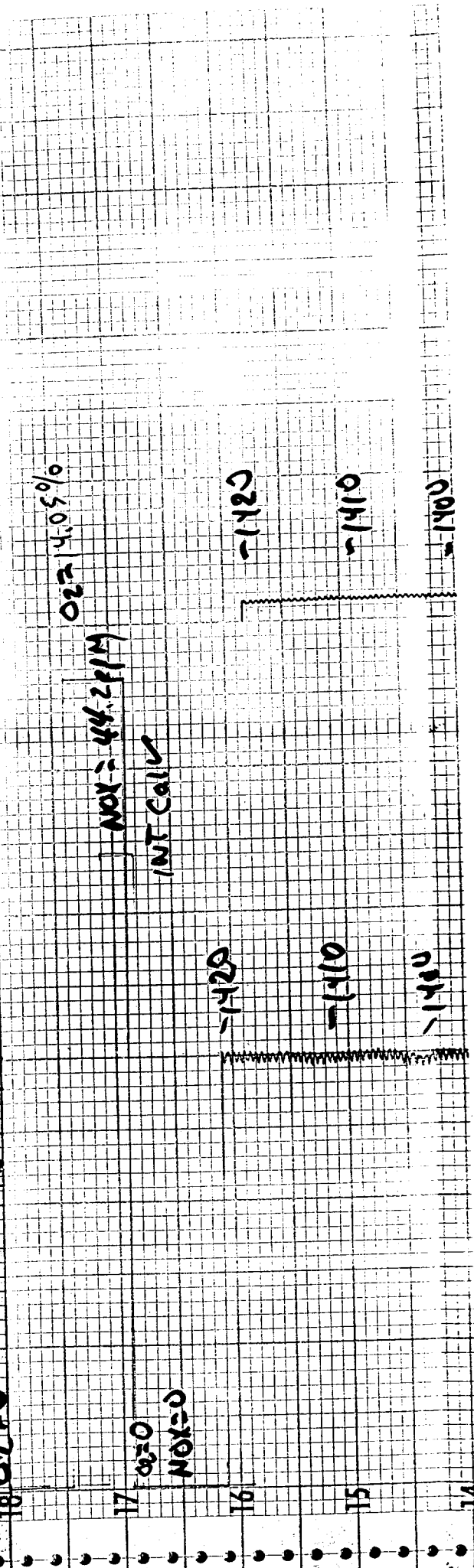
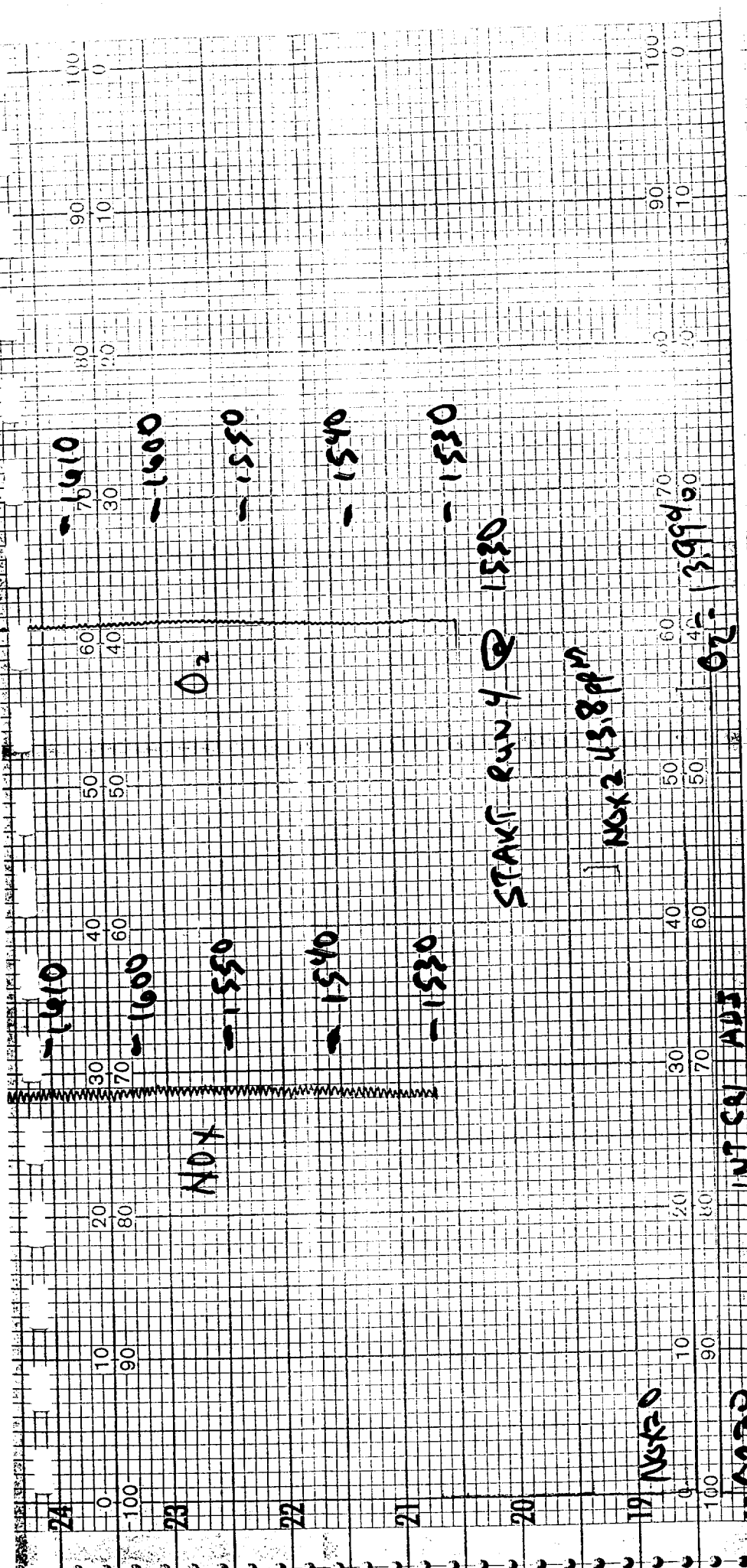
3-31-92

NOx = 44 ppm

INT CAL

O₂ = 13.83%

-1320



511

NOX=23.22%

O₂ = 30.5%

O₂ = 13.99%

O₂ = 13.99%

O₂ = 0.25%

O₂ = 0

INTCAL

SWEEP-SEK UNIT 1 RA115

NOX = 42.81%

O₂ = 13.85%

System Bias ✓

NOX = 43.1%

O₂ = 14.03%

INTCAL ✓

O₂ = 0.5%

-1490

-1690

-1620

-1620

-1610

-1610

NOX

O₂

NOX=0

O₂=0

NOX=0

O₂=0

NOX=0

24

0

100

90

10

60

40

20

0

30

70

10

90

80

60

40

20

0

10

90

80

60

40

20

0

90

10

60

40

20

0

30

70

10

90

80

60

40

20

0

10

90

80

60

40

20

0

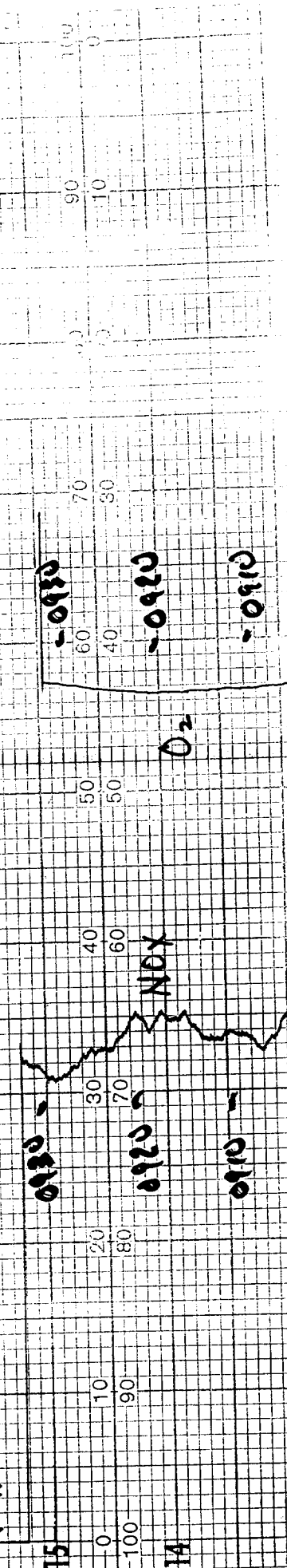
START RUN2 @ 0945

NOX = 23.25 ppm
NOX = 22.85 ppm

O2 = 13.99%
O2 = 13.95%

calms

INTERVAL



START RUN 1 @ 0900

chart speed @ 100 mm

O2 = 13.75%

NOX = 23.05 ppm

System Bias

NOX = 12.2 ppm

LINEARITY

NOX = 23.25 ppm

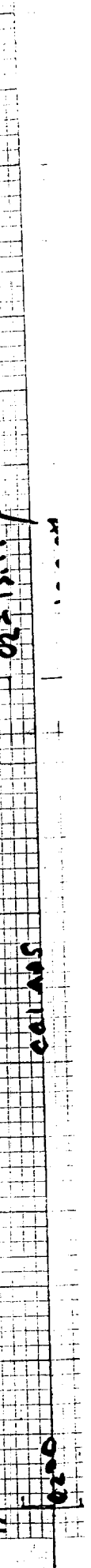
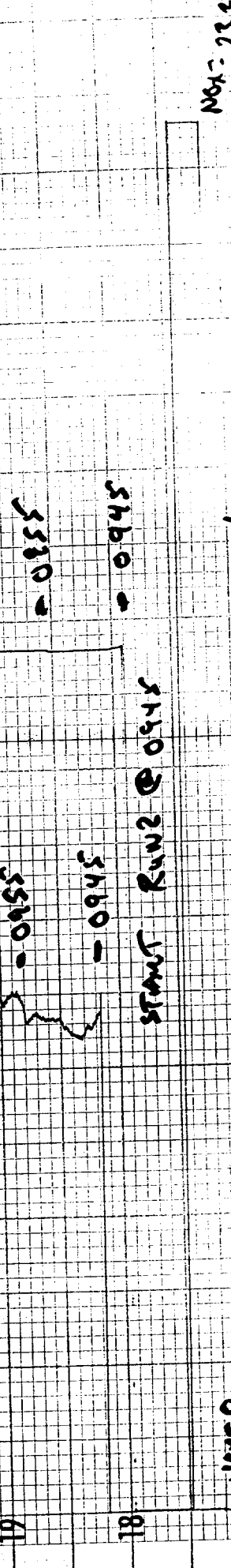
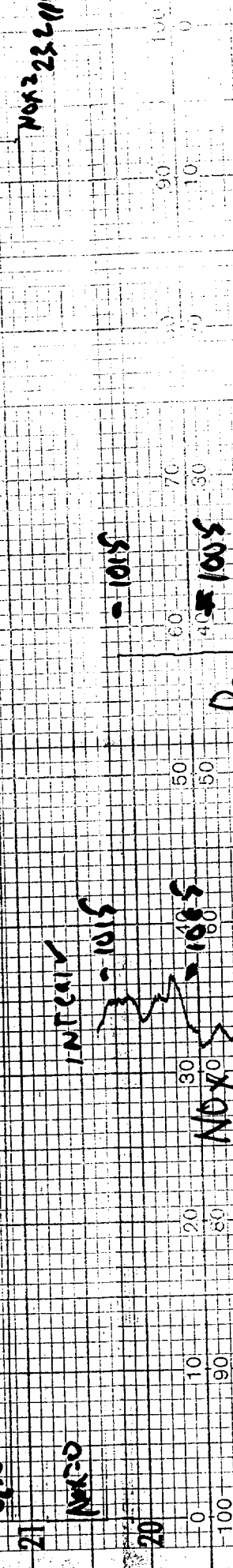
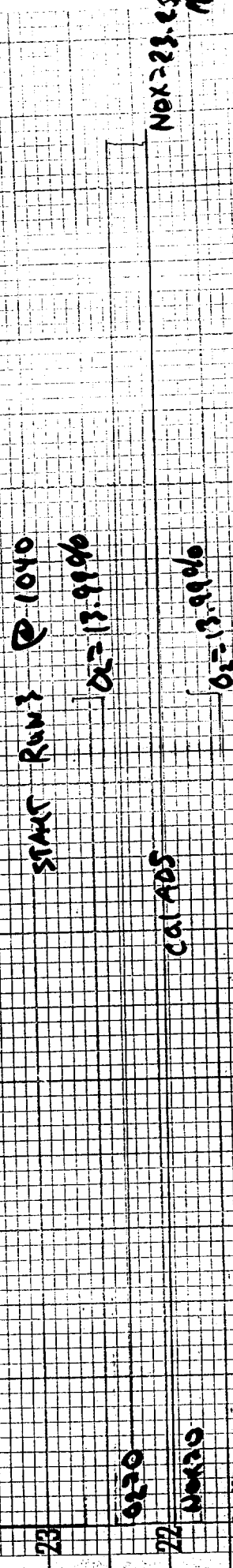
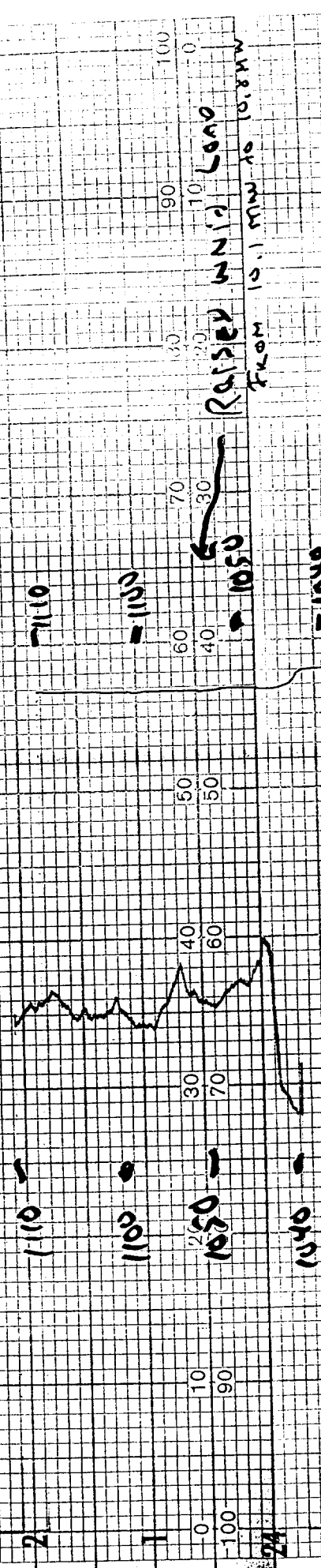
NOX = 12.25 ppm

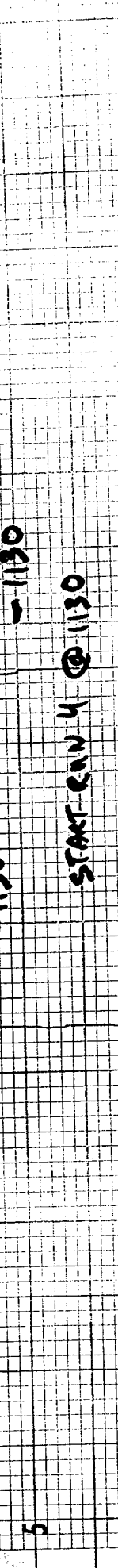
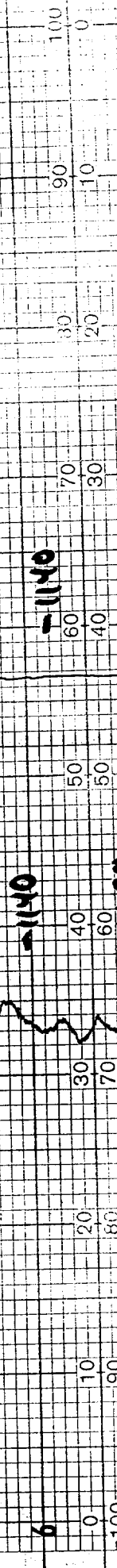
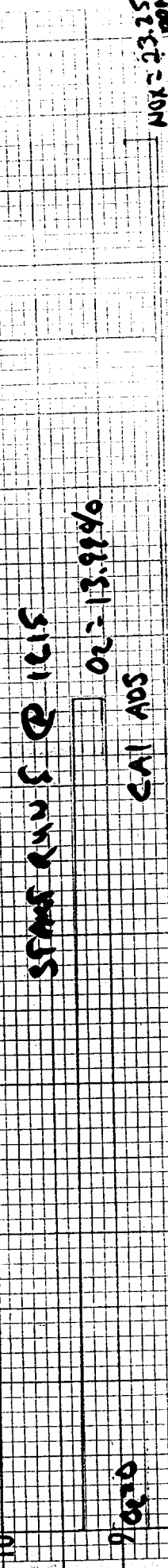
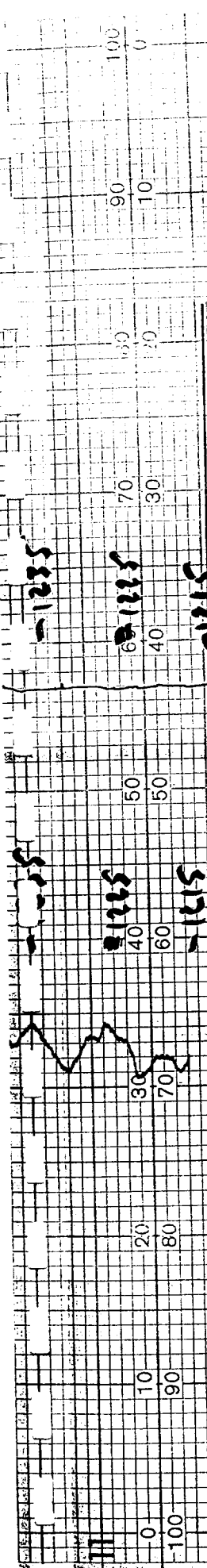
NOX = 23.25 ppm

O2 = 3.05%

NOX = 12.25 ppm

NOX = 23.28 ppm





313

Cal 1250

$$0.2 = 13.99\%$$

NOX = 23.25ppm

NOX3
23.2 PM

Team

1330

三

✓ 330

221

01310

0301

2021

START RUN @ 1300

CU-A05-

$$02 = 13.99\%$$

Box = 23.5ppr

max = 23.3914

1000

5421-

5421-1

1235

5321-

521

5221

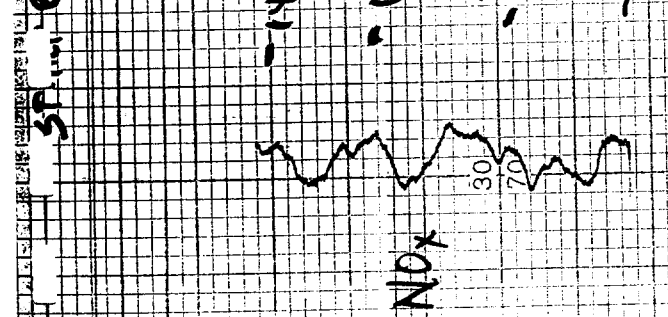
521

三

NOX=28.25PM
NOX=23.45PM

-CAL ADS-
02-13.9946

INT CALV

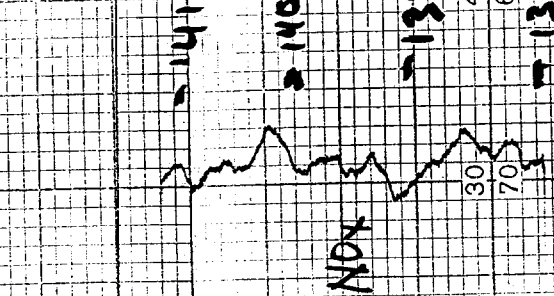


02-20
NOx=0

START RUN 9 @ 1425

NOx=25.25PM

INT CALV

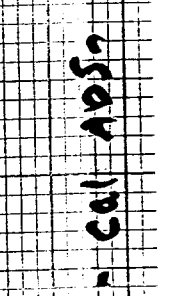


02-20
NOx=0

START RUN 7 @ 1345

NOx=23.25PM

INT CALV



02-20
NOx=0

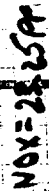
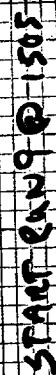
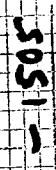
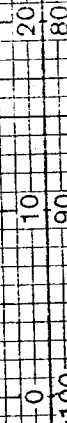
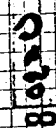
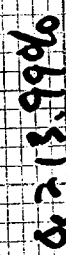
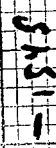
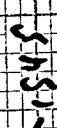
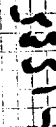
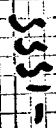
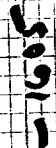
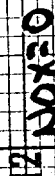
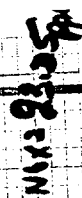


DIAGRAM NUMBER: 2200 VERSION: 4
 DATE: 03/31/92 TIME: 08:39:47

CONTROL 1		CONTROL 2		CONTROL 3		CONTROL 4	
P1 START	P1 WATER INJ. ON	P1 REMOTE MODE ON	P1 GEN. REG. ON	P1 TURB EXH TMP	P1 UNDER SPEED	P1 TURB EXH TMP	P1 UNDER SPEED
P2 STOP	P2 WATER INJ. OFF	P2 REMOTE MODE OFF	P2 GEN. REG. OFF	P2 GBOX BRNG TMP	P2 OVER SPEED	P2 GBOX BRNG TMP	P2 OVER SPEED
P3 OPEN C.B.	P3 WTR INJ. RSE RATIO	P3 GOV IN ISOCH MODE	P3 FIRE SYSTEM ARMED	P3 GEN BRNG TEMP	P3 GEN 86-G FAIL	P3 GEN BRNG TEMP	P3 GEN 86-G FAIL
P4 CLOSE C.B.	P4 WTR INJ. LMR RATIO	P4 GOV IN DRDOP MODE	P4 FIRE SYSTEM DISARM	P3 STATOR TEMP	P3 TC FAILURE	P3 STATOR TEMP	P3 TC FAILURE
P5 SPEED/LOAD RAISE	P5 HOT WASH OFF	P5 GOV IN KW MODE	P5 HALON DISCHARGE	P4 TURB VIBRATN	P4 TURB STAGNATH	P4 TURB VIBRATN	P4 TURB STAGNATH
P6 SPEED/LOAD LOWER	P6 MOTOR TURBINE ON	P6 GOV IN TH MODE	P6 AIR FILTER OFF	P5 G-BOX VIBRATN	P5 ENCLOS FIRE	P5 G-BOX VIBRATN	P5 ENCLOS FIRE
P7 VOLTS/VARS RAISE	P7 MOTOR TURBINE OFF	P7 SYNC MODE MEN		P5 GEN VIBRATION	ALARM SUMMARY	P5 GEN VIBRATION	ALARM SUMMARY
P8 VOLTS/VARS LOWER		P8 ALARM RESET		P5 UNDER VOLTAGE	SDOWN SUMMARY	P5 UNDER VOLTAGE	SDOWN SUMMARY
				P5 OVER VOLTAGE	READY TO START	P5 OVER VOLTAGE	READY TO START
				P6 TURB EXH PRS		P6 TURB EXH PRS	

SAMPLING:
 EMISSIONS: 02=15.55 CO= 4.88 NOx=29.05
 GAS TURBINE: GTG-01 GTG-02 GTG-03
 INJ. WATER : 8471.2 1695.5 1616.5
 FUEL FLOW : 10753 2082.3 2016.5

Figure 1

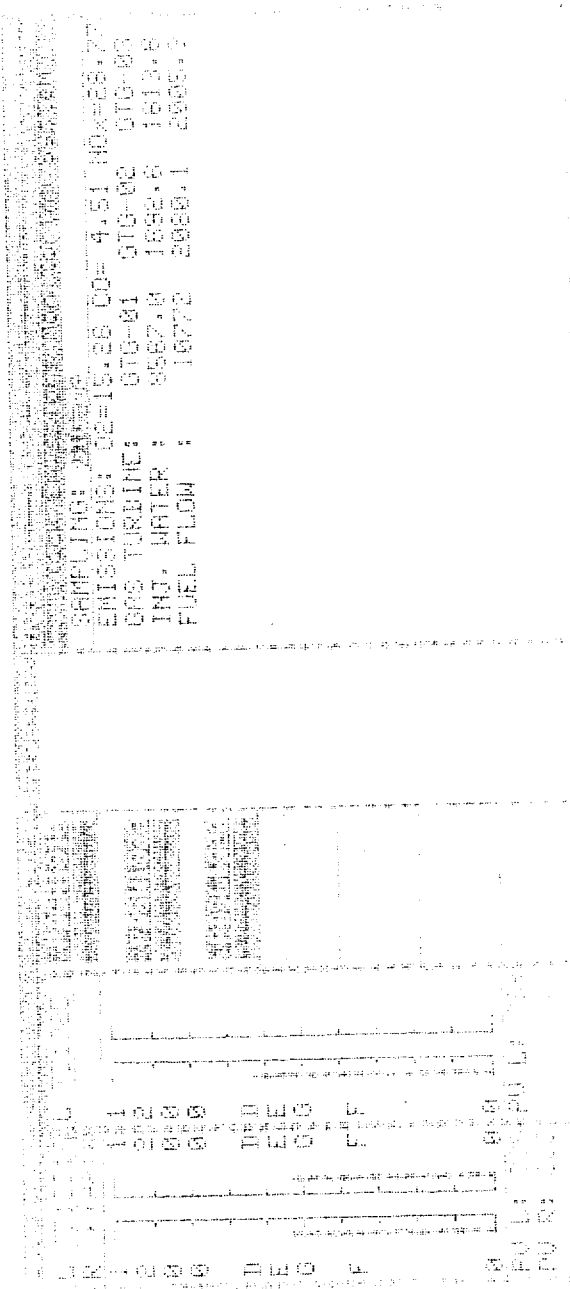
DIAGRAM NUMBER: 2200 VERSION: 4

DATE: 03/31/92 TIME: 09:08:13

TURBINE SPEED		14170	FUEL GAS FLOW		2075	EMERGENCY S/D		SHUTDOWN ALARMS		CONTROL	
GEN KW OUTPUT		3040	GAS SUPPLY PRS		250	FAIL TO CRANK		TURB EXH TMP		GEN. REG. ON	
PHASE A VOLTS		12390	GAS MANIFOLD PRS		161	FAIL TO FIRE		GBOX BRNG TMP		GEN. REG. OFF	
PHASE B VOLTS		12449	COMP INLET TEMP		51.6	FLAME OUT		GEN BRNG TEMP		FIRE SYSTEM ARMED	
PHASE C VOLTS		12434	TURB EXH TEMP		829	LUBE OIL SYS		STATOR TEMP		FIRE SYSTEM DISARM	
PHASE A CURRENT		140	COMP INLET PRESS		2.7	FUEL GAS SYS		TURB VIBRATION		HALON DISCHARGE	
PHASE B CURRENT		145	TURB EXH PRESS		0.0	GOVERN MALFNC		G-BOX VIBRATION		AIR FILTER	
PHASE C CURRENT		144	INJ WATER FLOW		1858	LUBE OIL PRS		GEN VIBRATION		ALARM SUMMARY	
TIT TEMPERATURE		1879	INJ WATER RATIO		9.80	CMP INLET PRS		UNDER VOLTAGE		SHUTDOWN SUMMARY	
						TURB EXH PRS		OVER VOLTAGE		READY TO START	
START			WATER INJ. ON			REMOTE MODE ON		GEN. REG. ON			
STOP			WATER INJ. OFF			REMOTE MODE OFF		GEN. REG. OFF			
OPEN C.B.			WATER INJ. GATE			GOV IN ISOCH MODE		FIRE SYSTEM ARMED			
CLOSE C.B.			WTR INJ RSE RATIO			GOV IN DROOP MODE		FIRE SYSTEM DISARM			
SPEED/LOAD RAISE			WTR INJ LWR RATIO			GOV IN KW MODE		HALON DISCHARGE			
SPEED/LOAD LOWER			HOT WASH			GOV IN					
VOLTS/VARS RAISE			MOTOR TURBINE ON			SYNC MODE					
VOLTS/VARS LOWER			MOTOR TURBINE OFF			ALARM RESET					

DIAGRAM NUMBER: 2155 VERSION: 2

DATE: 03/31/92 TIME: 09:09:57



SAMPLING: 02/15/92
EMISSIONS: 02/15/92 CO= 4.51 NOx=26.7
GAS TURBINE: 02/15/92 02/15/92
INJ. WATER: 9562.8 1832.8 1613.8
FUEL FLOW: 18772 2080.1 2005.3

DIAGRAM NUMBER: 2200 VERSION: 4

DATE: 03/31/92 TIME: 09:41:55

Turbine Speed		14170	Fuel Gas Flow		2043	EMERGENCY S/D		TURB EXH TMP	UNDER SPEED
Gen KW Output		3016	Gas Supply Prs		257	FAIL TO CRANK		GENX BRNG TMP	OVER SPEED
Gen Bus Volts		12346	Gas Manif'd Prs		100	FAIL TO FIRE		GEN BRNG TEMP	GEN 86-G FAIL
Phase A Volts		12434	Comp Inlet Temp		52.0	FLAME OUT		STATOR TEMP	TC FAILURE
Phase B Volts		12405	Turb Exh Temp		931	LUBE OIL SYS		TURB VIBRATN	TURB STAGNATN
Phase C Volts		12405	Comp Inlet Press		2.0	FUEL GAS SYS		G-BOX VIBRATN	ENCLOS FIRE
Phase A Current		138	Turb Exh Press		0.0	GOVERN MALFNG		GEN VIBRATION	ALARM SUMMARY
Phase B Current		143	Inj Water Flow		1684	LUBE OIL PRS		UNDER VOLTAGE	SDOWN SUMMARY
Phase C Current		142	Inj Water Ratio		0.81	CMP INLET PRS		OVER VOLTAGE	READY TO STRT
TIT Temperature		1806				TURB EXH PRS			
CONTROL						SHUTDOWN ALARMS			
P1	START		P1	WATER INJ. ON		P1	REMOTE MODE ON	P1	GEN. REG. ON
P2	STOP		P2	WATER INJ. OFF		P2	REMOTE MODE OFF	P2	GEN. REG. OFF
P3	OPEN C.B.		P3	WATER INJ. AUTO		P3	GOV IN ISOCH MODE	P3	FIRE SYSTEM ARMED
P4	CLOSE C.B.		P4	WTR INJ RSE RATIO		P4	GOV IN DEOP MODE	P4	FIRE SYSTEM DISARM
P5	SPEED/LOAD RAISE		P5	WTR INJ LMR RATIO		P5	GOV IN KW MODE	P5	HALON DISCHARGE
P6	SPEED/LOAD LOWER		P6	HOT WASH		P6	GOV IN LT MODE	P6	AIR FILTER OFF
P7	VOLTS/VARS RAISE		P7	MOTOR TURBINE ON		P7	SYNC MODE	P7	
P8	VOLTS/VARS LOWER		P8	MOTOR TURBINE OFF		P8	ALARM RESET	P8	

[illegible]

DIAGRAM NUMBER: 2155 VERSION: 2
 DATE: 03/31/92 TIME: 09:38:05

NO. 241		SIP		SIP	
L TE1921R L TE1925		L TE1921R L TE1925		L TE1921R L TE1925	
R TE1921R		R TE1921R		R TE1921R	
1 2 0 0 0		1 2 0 0 0		1 2 0 0 0	
D E C		D E C		D E C	
L		L		L	
0		0		0	
PU L: 633		PU L: 754		PU L: 633	
PU R: 633		PU R: 633		PU R: 633	

SAMPLING: 01/1/92
 EMISSIONS: 02=15.25 CO= 3.92 NOx=28.13
 GAS TURBINE: GTG-01 GTG-02 GTG-03
 INJ. WATER: 8416.4 1743.3 1613.6
 FUEL FLOW: 10772 2085.1 2010.5

Unit #2
Begin Run #1

DIAGRAM NUMBER: 2200 VERSION: 4
DATE: 03/31/92 TIME: 10:10:19

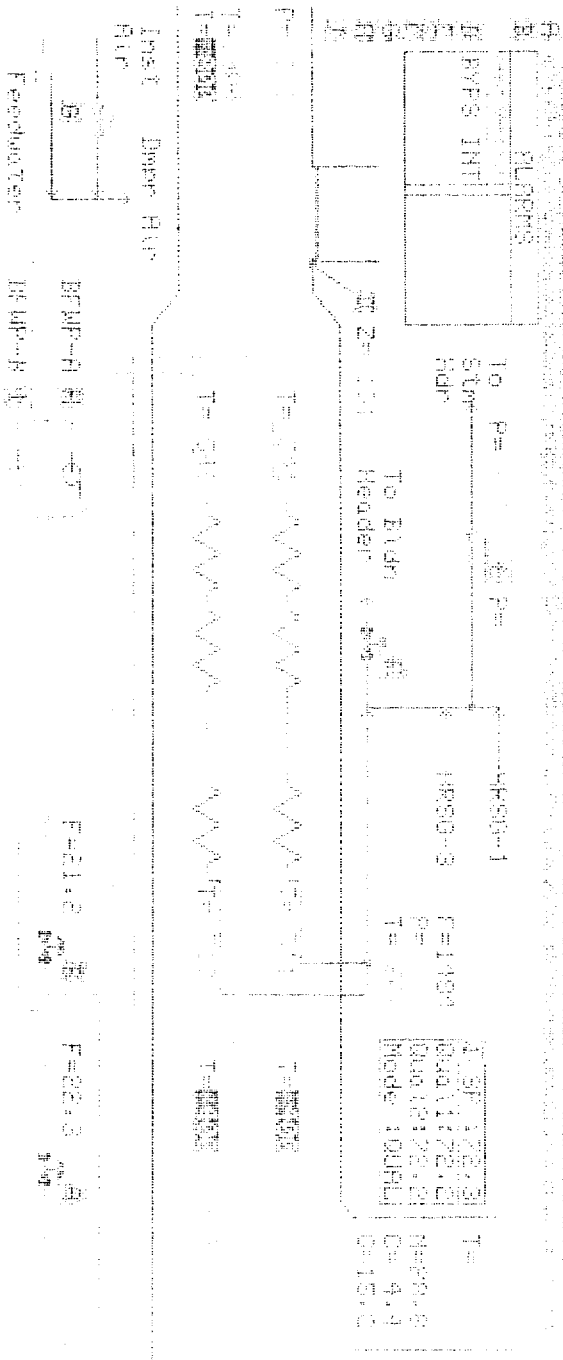
CONTROL 1		CONTROL 2		CONTROL 3		CONTROL 4	
P1 START	P2 STOP	P3 OPEN C.B.	P4 CLOSE C.B.	P5 SPEED/LOAD RAISE	P6 SPEED/LOAD LOWER	P7 VOLTS/VARS RAISE	P8 VOLTS/VARS LOWER
P9 TURBINE SPEED 14170	P10 GEN KW OUTPUT 3045	P11 GEN BUS VOLTS 12361	P12 PHASE A VOLTS 12434	P13 PHASE B VOLTS 12419	P14 PHASE C VOLTS 12405	P15 PHASE A CURRENT 138	P16 PHASE B CURRENT 145
P17 PHASE C CURRENT 144	P18 TIT TEMPERATURE 1071	P19 FUEL GAS FLOW 2058	P20 GAS SUPPLY PRS 100	P21 GAS MANIFOLD PRS 100	P22 COMP INLET TEMP 92.5	P23 TURB EXH TEMP 92	P24 COMP INLET PRESS 0.0
P25 TURB EXH PRESS 0.0	P26 INJ WATER FLOW 1698	P27 INJ WATER RATIO 6.0	P28 FUEL OIL SYS	P29 GOVERN MALFNG	P30 LUBE OIL PRS	P31 CMP INLET PRS	P32 TURB EXH PRS
P33 REMOTE MODE ON	P34 REMOTE MODE OFF	P35 GOV IN ISOCH MODE	P36 GOV IN DROOP MODE	P37 GOV IN KW MODE	P38 GOV IN	P39 SYNC MODE	P40 ALARM RESET
P41 TURB EXH TMP	P42 GEN. REG. OFF	P43 GEN. REG. OFF	P44 FIRE SYSTEM ARMED	P45 FIRE SYSTEM DISARM	P46 HALON DISCHARGE	P47 AIR FILTER	P48
P49 EMERGENCY S/D	P50 TURB EXH TMP	P51 UNDER SPEED	P52 OVER SPEED	P53 GEN 86-G FAIL	P54 TC FAILURE	P55 TURB STAGNATH	P56 ENCLOS FIRE
P57 ALARM SUMMARY	P58 SHUTDOWN SUMMARY	P59 READY TO START	P60	P61	P62	P63	P64

Unit 2
End Run #1
Fuel Flow =
2043 #/hr

DIAGRAM NUMBER: 2200 VERSION: 4
DATE: 03/31/92 TIME: 10:42:24

Turbine		Fuel Gas Flow		SHUTDOWN ALARMS	
Turbine Speed	14170	Gas Supply Prs	2022	EMERGENCY S/D	TURB EXH TMP
Gen KW Output	2877	Gas Manifold Prs	158	FAIL TO CRANK	OVER SPEED
Gen Bus Volts	12361	Comp Inlet Temp	54.0	FAIL TO FIRE	GEN BRNG TMP
Phase A Volts	12419	Turb Exh Temp	927	FLAME OUT	TC FAILURE
Phase B Volts	12405	Comp Inlet Press	2.6	LUBE OIL SYS	TURB STAGNATH
Phase C Volts	12405	Turb Inlet Press	0.0	FUEL GAS SYS	ENCLOS FIRE
Phase A Current	136	Turb Exh Press	1667	GOVERN MALFNG	ALARM SUMMARY
Phase B Current	142	Inj Water Flow	0.02	LUBE OIL PRS	SDOWN SUMMARY
Phase C Current	141	Inj Water Ratio	0.02	CMP INLET PRS	READY TO START
TIT Temperature	1556			TURB EXH PRS	
START/STOP		WATER INJ.		GEN. REG.	
P1 START		P1 WATER INJ. ON		P1 REMOTE MODE ON	P1 GEN. REG. OFF
P2 STOP		P2 WATER INJ. OFF		P2 REMOTE MODE OFF	P2 GEN. REG. OFF
P3 OPEN C.B.		P3 WATER INJ. AUTO		P3 GOV IN ISOCH MODE	P3 FIRE SYSTEM ARMED
P4 CLOSE C.B.		P4 WTR INJ RSE RATIO		P4 GOV IN DROOP MODE	P4 FIRE SYSTEM DISARM
P5 SPEED/LOAD RAISE		P5 WTR INJ LWR RATIO		P5 GOV IN KW MODE	P5 HALON DISCHARGE
P6 SPEED/LOAD LOWER		P6 HOT WASH		P6 GOV IN 10% MODE	
P7 VOLTS/VARS RAISE		P7 MOTOR TURBINE ON		P7 SYNC MODE	P7 AIR FILTER
P8 VOLTS/VARS LOWER		P8 MOTOR TURBINE OFF		P8 ALARM RESET	P8 OFF

DIAGRAM NUMBER: 2250 VERSION: 1
 DATE: 03/31/92 TIME: 10:38:13



1. **Introduction**
 2. **Background**
 3. **Methodology**
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 90. **Notes**
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 92. **Appendix**
 93. **Notes**
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 97. **References**
 98. **Appendix**
 99. **Notes**
 100. **References**

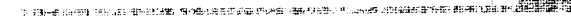


DIAGRAM NUMBER: 2200 VERSION: 4
DATE: 03/31/92 TIME: 11:11:31

SHUTDOWN ALARMS			
EMERGENCY S/D			
FAIL TO CRANK			
FAIL TO FIRE			
FLAME OUT			
LUBE OIL SYS			
LUBE OIL SYS			
GOVERN MALFNC			
LUBE OIL PRS			
CMP INLET PRS			
TURB EXH PRS			
TURB EXH TMP			
GEN BRNG TMP			
GEN BRNG TMP			
STATOR TEMP			
TURB VIBRATN			
G-BOX VIBRATN			
GEN VIBRATION			
UNDER VOLTAGE			
OVER VOLTAGE			
ALARM SUMMARY			
SDOWN SUMMARY			
READY TO START			
CONTROL			
P1 GEN. REG. ON			
P2 GEN. REG. OFF			
P3 FIRE SYSTEM RESET			
P4 FIRE SYSTEM DISARM			
P5 HALON DISCHARGE			
P6 AIR FILTER			
CONTROL			
P1 REMOTE MODE ON			
P2 REMOTE MODE OFF			
P3 GOV IN ISOCH MODE			
P4 GOV IN OROP MODE			
P5 GOV IN KM MODE			
P6 GOV IN TIT MODE			
P7 SYNC MODE			
P8 ALARM RESET			
CONTROL			
P1 WATER INT. ON			
P2 WATER INT. OFF			
P3 WTR INT. RSE RATIO			
P4 WTR INT. LMR RATIO			
P5 HOT WTRSH			
P6 MOTOR TURBINE ON			
P7 MOTOR TURBINE OFF			
P8 MOTOR TURBINE			
CONTROL			
P1 START			
P2 STOP			
P3 OPEN C.B.			
P4 CLOSE C.B.			
P5 SPEED/LOAD RAISE			
P6 SPEED/LOAD LOWER			
P7 VOLTS/VARS RAISE			
P8 VOLTS/VARS LOWER			

DIAGRAM NUMBER: 2250 VERSION: 1
 DATE: 03/31/92 TIME: 11:11:28

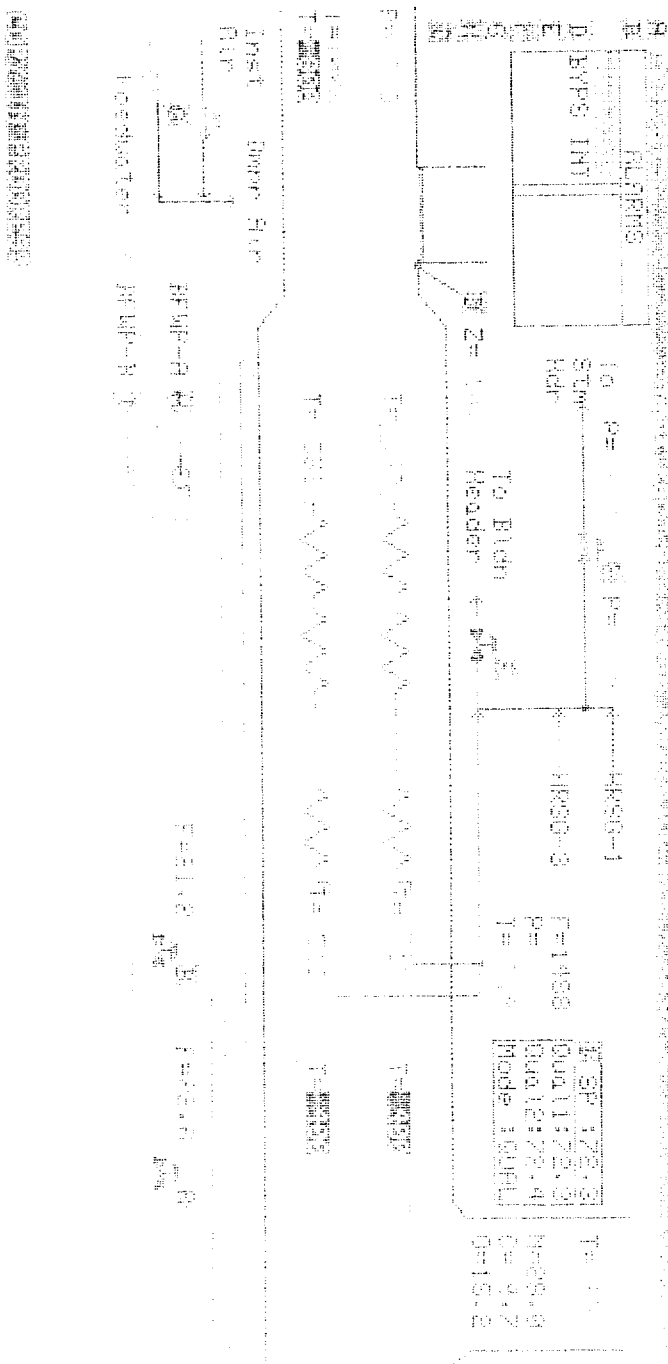


DIAGRAM NUMBER: 2200 VERSION: 4
 DATE: 03/31/92 TIME: 11:38:00

Unit 2
 Bay 2 Tur # 2

TURBINE SPEED		14170	FUEL GAS FLOW		2084
Gen KM Output		3025	Gas Supply Pres		450
Gen Bus Volts		12375	Gas Manifold Pres		450
Phase A Volts		12434	Comp Inlet Temp		51.3
Phase B Volts		12419	Turb Exh Temp		92.8
Phase C Volts		12405	Comp Inlet Pres		8.6
Phase A Current		139	Turb Exh Pres		0.4
Phase B Current		144	Inj Water Flow		1724
Phase C Current		143	Inj Water Ratio		0.85
TIT Temperature		1977			

CONTROL 1		CONTROL 2		CONTROL 3		SHUTDOWN ALARMS	
P1	START	P3	WATER INT. ON	P1	REMOTE MODE ON	P1	GEN. REG. ON
P2	STOP	P2	WATER INT. OFF	P2	REMOTE MODE OFF	P2	GEN. REG. OFF
P2	OPEN C.B.	P3	WATER INT. OFF	P3	GOV IN ISCOH MODE	P3	FIRE SYSTEM ARMED
P1	CLOSE C.B.	P3	WTR INT RSE RATIO	P1	GOV IN OROP MODE	P2	FIRE SYSTEM DISARM
P3	SPEED/LOAD RAISE	P3	WTR INT LMR RATIO	P3	GOV IN KM MODE	P3	HALON DISCHARGE
P3	SPEED/LOAD LOWER	P3	HOT WASH OFF	P3	GOV IN TIT MODE	P3	
P2	VOLTS/VARS RAISE	P2	MOTOR TURBINE ON	P2	SYNC MODE MAN	P2	AIR FILTER ON
P2	VOLTS/VARS LOWER	P2	MOTOR TURBINE OFF	P2	ALARM RESET	P2	

EMERGENCY S/D		TURB EXH TMP		UNDER SPEED	
FAIL TO CRANK		GBOX BRNG TMP		OVER SPEED	
FAIL TO FIRE		GEN BRNG TMP		GEN 86-6 FAIL	
FLAME OUT		STATOR TEMP		TO FAILURE	
LUBE OIL SYS		TURB VIBRATN		TURB STAGMATN	
FUEL GAS SYS		G-BOX VIBRATN		ENCLOS FIRE	
GOVERN MALFNC		GEN VIBRATION			
LUBE OIL PRS		UNDER VOLTAGE		ALARM SUMMARY	
CMP INLET PRS		OVER VOLTAGE		SDOWN SUMMARY	
TURB EXH PRS				READY TO STRT	

DATE: 03/31/92

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DIAGRAM NUMBER: 2200 VERSION: 4
 DATE: 03/31/92 TIME: 12:07:59

Unit #2
 End Run #2
 Fuel Flow =
 2064 #/hr

TURBINE SPEED		14170
Gen KM Output	3045	Gas Supply Pres
Gen Bus Volts	12346	Gas Manifold Pres
Phase A Volts	12434	Comp Inlet Temp
Phase B Volts	12419	Turb Exh Temp
Phase C Volts	12419	Comp Inlet Pres
Phase A Current	139	Turb Exh Press
Phase B Current	144	Inj Water Flow
Phase C Current	143	Inj Water Ratio
TIT Temperature	1677	
FUEL GAS FLOW		2063
EMERGENCY S/D		
FAIL TO CRANK		
FAIL TO FIRE		
FLAME OUT		
LUBE OIL SYS		
FUEL GAS SYS		
GOVERN MALFNC		
LUBE OIL PRES		
CMP INLET PRES		
TUB EXH PRES		
TURB EXH TMP		
GEN BRNG TMP		
GEN BRNG TEMP		
STATOR TEMP		
TURB VIBRATN		
G-BOX VIBRATION		
UNDER VOLTAGE		
OVER VOLTAGE		
ALARM SUMMARY		
SDOWN SUMMARY		
READY TO START		
CONTROL 1		
P1 START		
P2 STOP		
P3 OPEN C.B.		
P4 CLOSE C.B.		
P5 SPEED/LOAD RAISE		
P6 SPEED/LOAD LOWER		
P7 VOLTS/VARS RAISE		
P8 VOLTS/VARS LOWER		
CONTROL 2		
P1 WATER INJ. ON		
P2 WATER INJ. OFF		
P3 WTR INJ. RSE RATIO		
P4 WTR INJ. LMR RATIO		
P5 HOT WASH		
P6 MOTOR TURBINE ON		
P7 MOTOR TURBINE OFF		
CONTROL 3		
P1 REMOTE MODE ON		
P2 REMOTE MODE OFF		
P3 GOV IN ISOCH MODE		
P4 GOV IN DROOP MODE		
P5 GOV IN KM MODE		
P6 GOV IN		
P7 SYNC MODE		
P8 ALARM RESET		
CONTROL 4		
P1 GEN. REG. ON		
P2 GEN. REG. OFF		
P3 FIRE SYSTEM ARMED		
P4 FIRE SYSTEM DISARM		
P5 HRLON DISCHARGE		
P6 AIR FILTER		

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DIAGRAM NUMBER: 2250 VERSION: 1

DATE: 03/31/92 TIME: 12:08:06

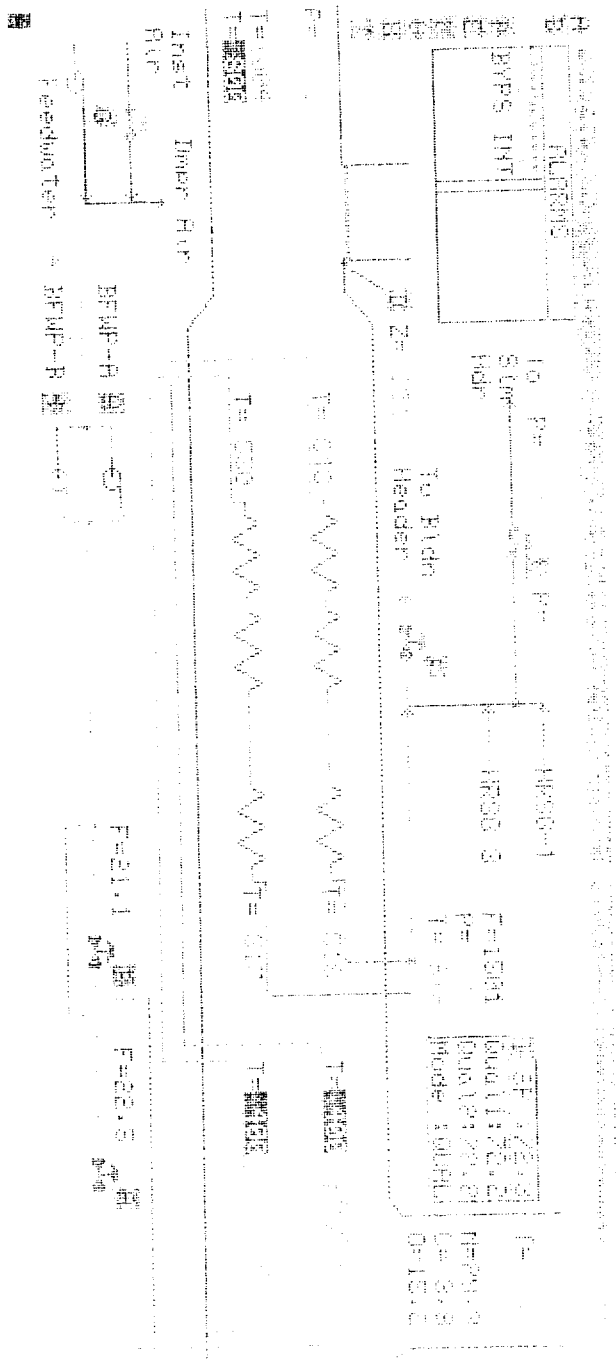


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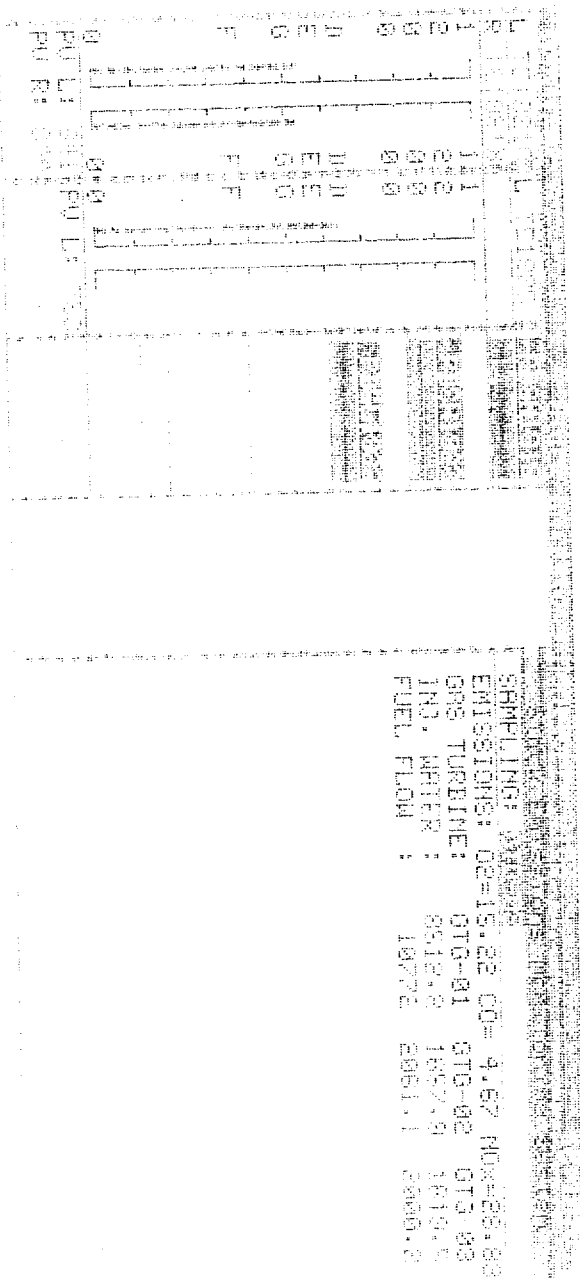


DIAGRAM NUMBER: 2200 VERSION: 4
 DATE: 03/31/92 TIME: 12:38:25

Turbine Speed 14170		Fuel Gas Flow 2033		EMERGENCY S/D		SHUTDOWN ALARMS	
Gen KM Output 2381		Gas Supply Pres 257		FAIL TO CRANK		TURB EXH TMP	
Gen Bus Volts 12346		Gas Manifold Pres 158		FAIL TO FIRE		GEN BRNG TMP	
Phase A Volts 12419		Comp Inlet Temp 54.3		FLAME OUT		GEN BRNG TEMP	
Phase B Volts 12405		Turb Exh Temp 968		LUBE OIL SYS		STATOR TEMP	
Phase C Volts 12405		Comp Inlet Pres 2.6		FUEL GAS SYS		TURB VIBRATN	
Phase A Current 138		Turb Exh Press 0.8		GOVERN MALFNC		G-BOX VIBRATION	
Phase B Current 142		Inj Water Flow 1727		LUBE OIL PRS		GEN VIBRATION	
Phase C Current 148		Inj Water Ratio 0.88		CMP INLET PRS		UNDER VOLTAGE	
TIT Temperature 1806				TURB EXH PRS		OVER VOLTAGE	
						ALARM SUMMARY	
						SDOWN SUMMARY	
						READY TO STRT	
P1 START		P1 WRITER INT. ON		P1 REMOTE MODE ON		P1 GEN. REG. OFF	
P2 STOP		P2 WRITER INT. OFF		P2 REMOTE MODE OFF		P2 GEN. REG. OFF	
P3 OPEN C.B.		P3 WTR INT. RSE RATIO		P3 GOV IN ISOCH MODE		P3 FIRE SYSTEM ARMED	
P4 CLOSE C.B.		P4 WTR INT LMR RATIO		P4 GOV IN DROOP MODE		P4 FIRE SYSTEM DISARM	
P5 SPEED/LOAD RAISE		P5 HOT WRSH OFF		P5 GOV IN KM MODE		P5 HALON DISCHARGE	
P6 SPEED/LOAD LOWER		P6 MOTOR TURBINE ON		P6 SYNC MODE WENT		P6 AIR FILTER OFF	
P7 VOLTS/VARS RAISE		P7 MOTOR TURBINE OFF		P7 ALARM RESET			
P8 VOLTS/VARS LOWER							

DIAGRAM NUMBER: 2155 VERSION: 2
 DATE: 03/31/92 TIME: 12:41:16

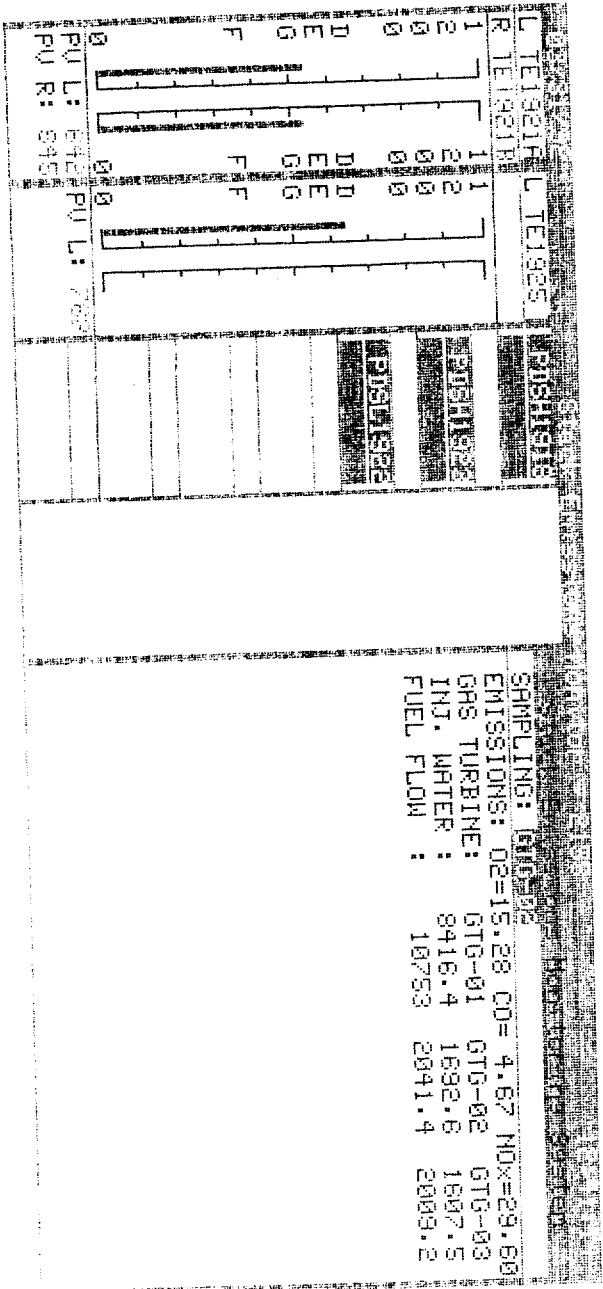
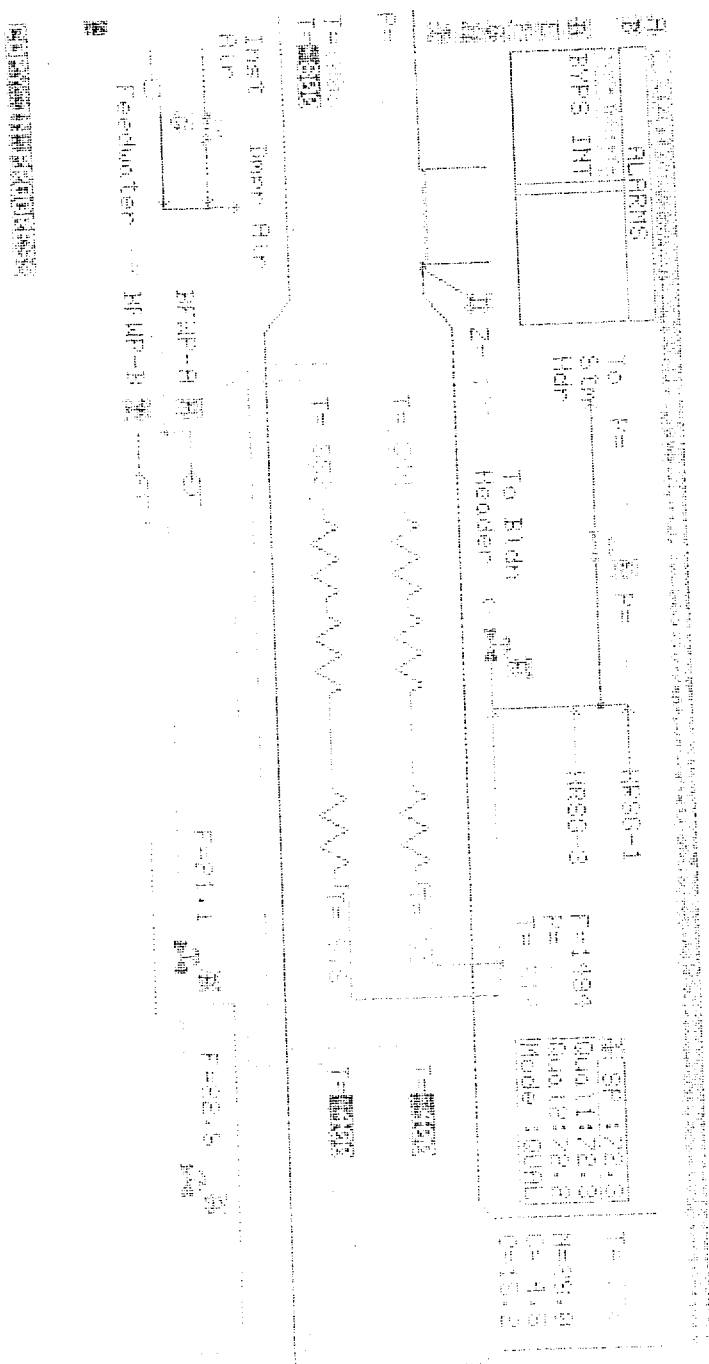


DIAGRAM NUMBER: 2250 VERSION: 1

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TIME: 12:38:32



$$\frac{u_n + 3}{n} \quad \text{RHS} \quad \#2$$

TURBINE SPEED		14139	FUEL GAS FLOW	2019	EMERGENCY S/D	TURB EXH TMP	UNDER SPEED
01	GEN KM Output	3006	GAS Supply Pres	255	FAIL TO CRANK	GEN EXH TMP	OVER SPEED
02	Gen Bus Volts	12346	GAS Manifold Pres	152	FAIL TO FIRE	GEN BRNG TMP	GEN 88-G FAIL
03	Phase A Volts	12419	Comp Inlet Temp	53.7	FLAME OUT	STATOR TEMP	TO FAILURE
04	Phase B Volts	12463	Turb Exh Temp	903	LUBE OIL SYS	TURB VIBRTN	TURB STAGNATN
05	Phase C Volts	12449	Comp Inlet Pres	2.3	FUEL GAS SYS	G-BOX VIBRTN	ENCLOS FIRE
06	Phase A Current	140	Turb Exh Press	1.7	GOVERN MALFNC	GEN VIBRATION	
07	Phase B Current	139	Inj Water Flow	1614	LUBE OIL PRS	UNDER VOLTAGE	ALARM SUMMARY
08	Phase C Current	139	Inj Water Ratio	2006	COMP INLET PRS	OVER VOLTAGE	SDOWN SUMMARY
09	TTT Temperature	1061			TURB EXH PRS		READY TO STRT

CONTROL 2		CONTROL 3		CONTROL 4	
01	WATER INJ. ON	01	REMOTE MODE ON	01	GEN. REG. ON
02	WATER INJ. OFF	02	REMOTE MODE OFF	02	GEN. REG. OFF
03	WATER INJ. RATE	03	GOV IN ISOCH MODE	03	FIRE SYSTEM ARMED
04	WTR INJ RSE RATIO	04	GOV IN DROOP MODE	04	FIRE SYSTEM DISCHRG
05	WTR INJ LMR RATIO	05	GOV IN KW MODE	05	HALON DISCHARGE
06	HOT WASH OFF	06	GOV IN 12.4000	06	
07	MOTOR TURBINE ON	07	SYNC MODE MENU	07	AIR FILTER
08	MOTOR TURBINE OFF	08	ALARM RESET	08	

SHUTDOWN ALARMS	
01	UNDER SPEED
02	OVER SPEED
03	GEN 88-G FAIL
04	TO FAILURE
05	TURB STAGNATN
06	ENCLOS FIRE
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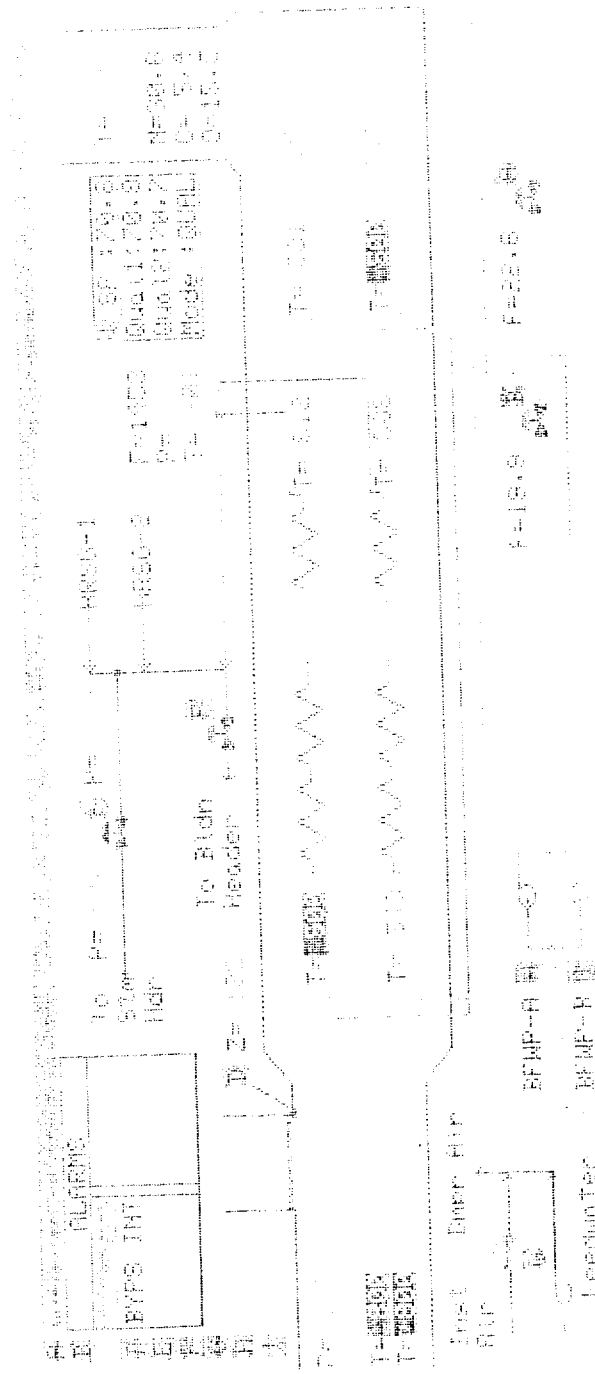
DIAGRAM NUMBER: 2200 VERSION: 4
 DATE: 03/31/92 TIME: 16:12:58

Unit 3
 Run #2

CONTROL 1 TURBINE SPEED 14138 GEN KW OUTPUT 2877 GEN BUS VOLTS 12376 PHASE A VOLTS 12449 PHASE B VOLTS 12463 PHASE C VOLTS 12478 PHASE A CURRENT 138 PHASE B CURRENT 137 PHASE C CURRENT 138 TIT TEMPERATURE 1873		FUEL GAS FLOW 1988 GAS SUPPLY PRS 151 GAS MANIFOLD PRS 151 COMP INLET TEMP 153.7 TURB INLET TEMP 154 COMP INLET PRESS 154 TURB EXH PRESS 154 INJ WATER FLOW 1617 INJ WATER RATIO 0.53		SHUTDOWN ALARMS EMERGENCY S/D TURB EXH TMP UNDER SPEED FAIL TO CRANK GEN BRNG TMP OVER SPEED FAIL TO FIRE GEN BRNG TEMP GEN 86-G FAIL FLAME OUT STATOR TEMP TC FAILURE LUBE OIL SYS TURB VIBRATION TURB STAGNATION FUEL GAS SYS G-BOX VIBRATION ENCLOS FIRE GOVERN MALFNC GEN VIBRATION ALARM SUMMARY LUBE OIL PRS UNDER VOLTAGE SHUTDOWN SUMMARY CMP INLET PRS OVER VOLTAGE READY TO START TURB EXH PRS		CONTROL 2 WATER INJ. ON P1 WATER INJ. OFF P2 WATER INJ. AUTO P3 WTR INJ RSE RATIO P4 WTR INJ LWR RATIO P5 HOT WASH OFF P6 MOTOR TURBINE ON P7 MOTOR TURBINE OFF P8		CONTROL 3 REMOTE MODE ON P1 REMOTE MODE OFF P2 GOV IN ISOCH MODE P3 GOV IN DROOP MODE P4 GOV IN KW MODE P5 GOV IN TIT MODE P6 SYNC MODE P7 ALARM RESET P8		CONTROL 4 GEN. REG. ON P1 GEN. REG. OFF P2 FIRE SYSTEM ARMED P3 FIRE SYSTEM DISARM P4 HALON DISCHARGE P5 AIR FILTER DEF P6	
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DIAGRAM NUMBER: 2350 VERSION: 1

DATE: 03/31/92 TIME: 16:12:56



Unit #3

End Run #2

Fuel Flow =
2004 #/hr

DIAGRAM NUMBER: 2200 VERSION: 4
DATE: 03/31/92 TIME: 16:27:54

SHUTDOWN ALARMS		SHUTDOWN ALARMS	
EMERGENCY S/D	TURB EXH TMP	UNDER SPEED	
FAIL TO CRANK	GBOX BRNG TMP	OVER SPEED	
FAIL TO FIRE	GEN BRNG TMP	GEN 86-G FAIL	
FLAME OUT	STATOR TEMP	TC FAILURE	
LUBE OIL SYS	TURB VIBRATN	TURB STAGNATN	
FUEL GAS SYS	G-BOX VIBRATN	ENCLOS FIRE	
GOVERN MALFNC	GEN VIBRATION	ALARM SUMMARY	
LUBE OIL PRS	UNDER VOLTAGE	SHUTDOWN SUMMARY	
CMP INLET PRS	OVER VOLTAGE	READY TO START	
TURB EXH PRS			
CONTROL		CONTROL	
P1 WATER INJ. ON	P2 REMOTE MODE ON	P1 GEN. REG. ON	
P2 WATER INJ. OFF	P3 REMOTE MODE OFF	P2 GEN. REG. OFF	
P3 WATER INJ. AUTO	P4 GOV IN ISOCH MODE	P3 FIRE SYSTEM ARMED	
P4 WTR INJ RSE RATIO	P5 GOV IN DROOP MODE	P4 FIRE SYSTEM DISARM	
P5 WTR INJ LWR RATIO	P6 GOV IN KW MODE	P5 HALON DISCHARGE	
P6 HOT WASH OFF	P7 GOV IN TIT MODE	P6 AIR FILTER OFF	
P7 MOTOR TURBINE ON	P8 GOV IN TIT MODE		
P8 MOTOR TURBINE OFF	P9 ALARM RESET		
CONTROL		CONTROL	
P1 START	P2 STOP	P3 OPEN C.B.	
P4 CLOSE C.B.	P5 SPEED/LOAD RAISE	P6 SPEED/LOAD LOWER	
P7 VOLTS/VARS RAISE	P8 VOLTS/VARS LOWER		

COPY IN PROGRESS

DIAGRAM NUMBER: 2155 VERSION: 2

DATE: 03/31/92 TIME: 16:30:07

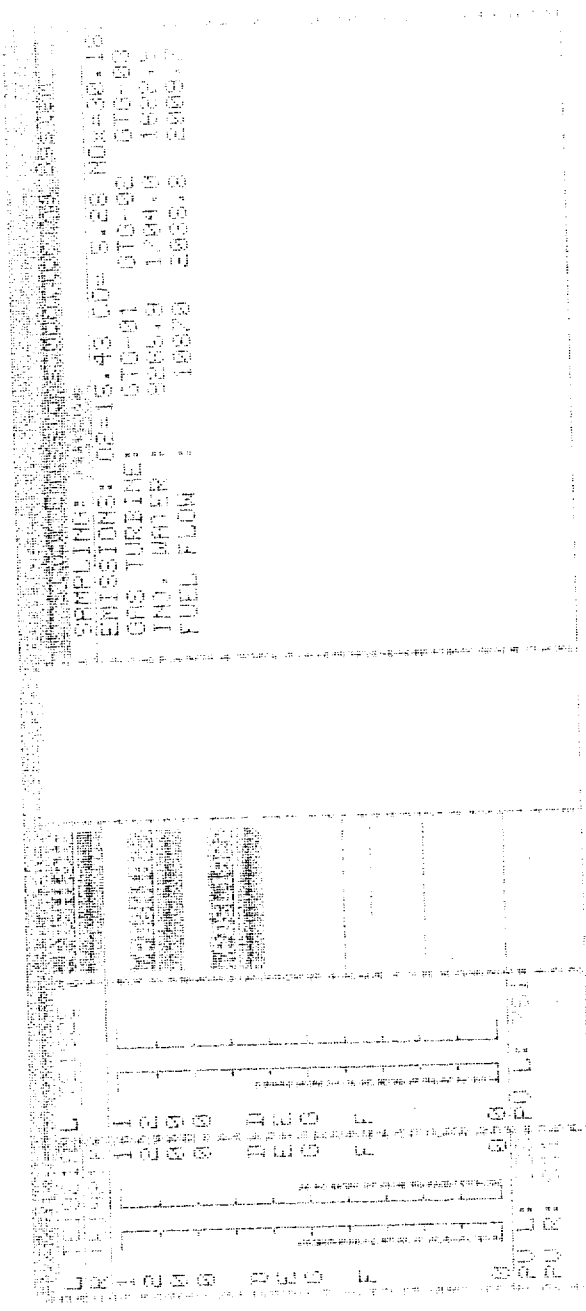
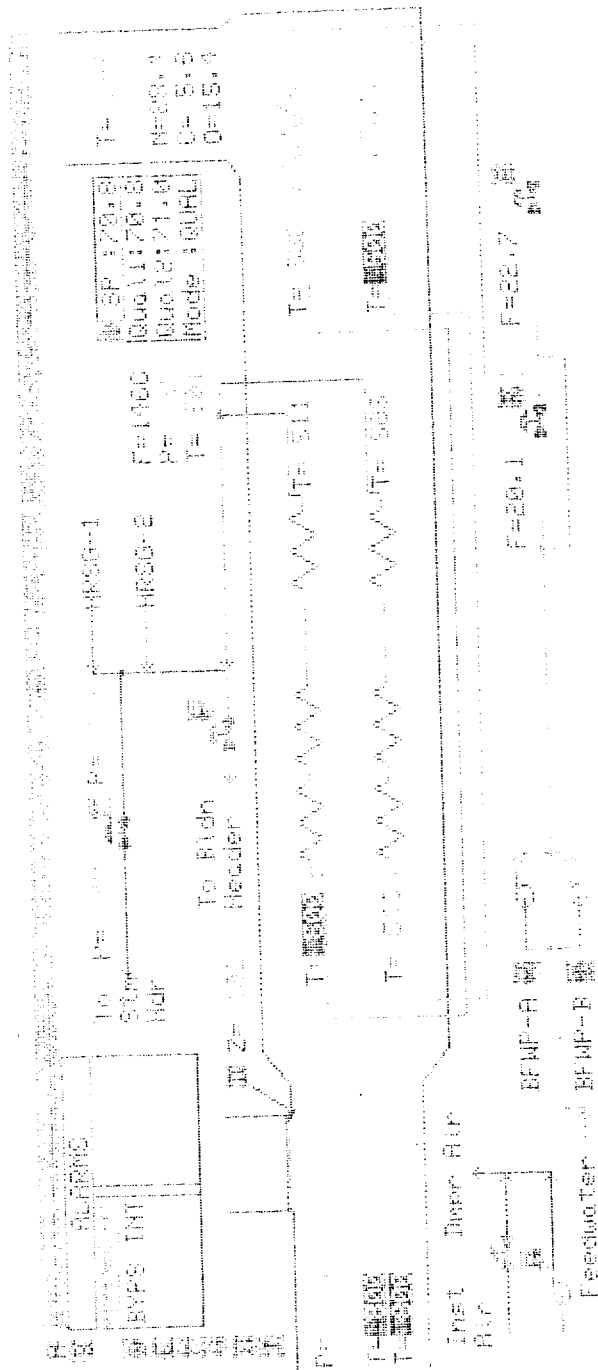


DIAGRAM NUMBER: 2350 VERSION: 1

DATE: 03/31/92



1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

DIAGRAM NUMBER: 2200 VERSION: 4

DATE: 03/31/92 TIME: 16:43:04

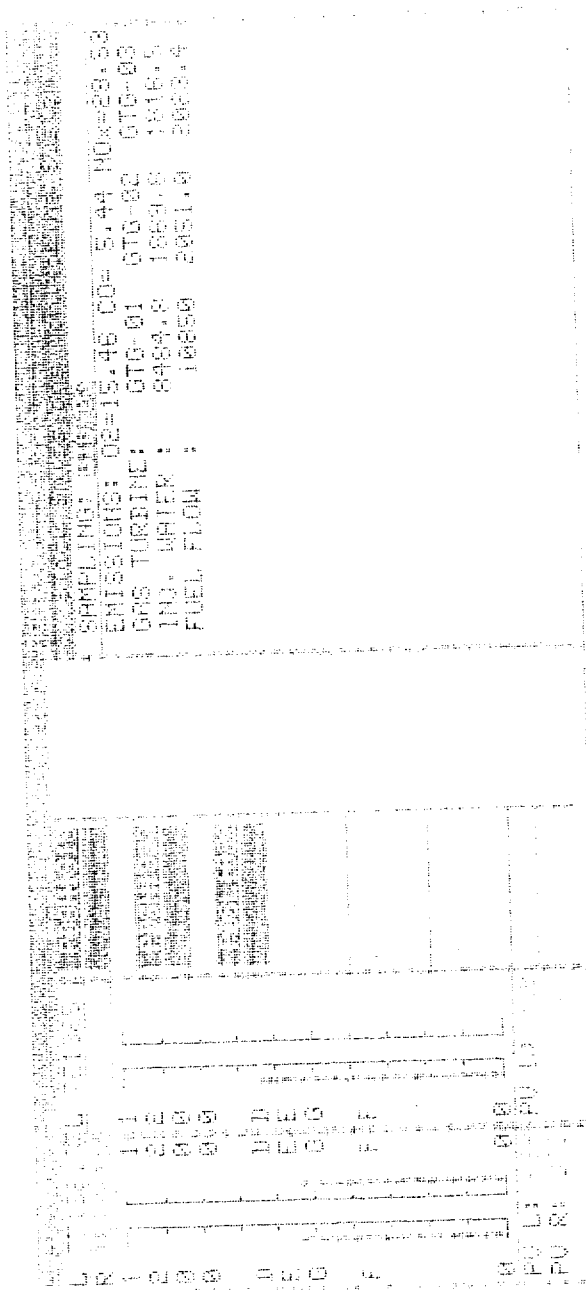
Turbine Speed 14139		Fuel Gas Flow 1882		EMERGENCY S/D		SHUTDOWN ALARMS		UNDER SPEED	
Gen KW Output 2991		Gas Supply Prs 259		FAIL TO CRANK		TURB EXH TMP		OVER SPEED	
Gen Bus Volts 12375		Gas Manifold Prs 151		FAIL TO FIRE		GBOX BRNG TMP		GEN 86-G FAIL	
Phase A Volts 12449		Comp Inlet Temp 54.0		FLAME OUT		GEN BRNG TMP		TO FAILURE	
Phase B Volts 12463		Turb Exh Temp 904		LUBE OIL SYS		STATOR TEMP		TURB STAGNATN	
Phase C Volts 12478		Comp Inlet Press 2.2		FUEL GAS SYS		TURB VIBRATN		ENCLOS FIRE	
Phase A Current 138		Turb Exh Press 1.0		GOVERN MALFNC		G-BOX VIBRATN		ALARM SUMMARY	
Phase B Current 137		Inj Water Flow 1628		LUBE OIL PRS		GEN VIBRATION		SDOWN SUMMARY	
Phase C Current 137		Inj Water Ratio 0.82		CMP INLET PRS		UNDER VOLTAGE		READY TO START	
TIT Temperature 1873				TURB EXH PRS		OVER VOLTAGE			
P1 START		P1 WATER INJ. ON		P1 REMOTE MODE ON		P1 GEN. REG. ON			
P2 STOP		P2 WATER INJ. OFF		P2 REMOTE MODE OFF		P2 GEN. REG. OFF			
P3 OPEN C.B.		P3 WATER INJ. AUTO		P3 GOV IN ISOCH MODE		P3 FIRE SYSTEM ARMED			
P4 CLOSE C.B.		P4 WTR INJ RSE RATIO		P4 GOV IN DROOP MODE		P4 FIRE SYSTEM DISARM			
P5 SPEED/LOAD RAISE		P5 WTR INJ LWR RATIO		P5 GOV IN KW MODE		P5 HALON DISCHARGE			
P6 SPEED/LOAD LOWER		P6 HOT WASH OFF		P6 GOV IN 111 MODE		P6 AIR FILTER OFF			
P7 VOLTS/VARS RAISE		P7 MOTOR TURBINE ON		P7 SYNC MODE MAN					
P8 VOLTS/VARS LOWER		P8 MOTOR TURBINE OFF		P8 ALARM RESET					

DIAGRAM NUMBER: 2155

VERSION: 2

DATE: 03/31/92

TIME: 16:44:58



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DIAGRAM NUMBER: 2200 VERSION: 4
 DATE: 03/31/92 TIME: 16:57:57

COMBUSTION		CONTROL 2		CONTROL 3		SHUTDOWN ALARMS	
Turbine Speed	14139	P1 WATER INJ. ON	P2 WATER INJ. OFF	P3 WATER INJ. OFF	P4 WATER INJ. OFF	EMERGENCY S/D	TURB EXH TMP
Gen KW Output	3016	P5 WATER INJ. OFF	P6 WATER INJ. OFF	P7 WATER INJ. OFF	P8 WATER INJ. OFF	FAIL TO CRANK	ISBOX BRNG TMP
Gen Bus Volts	12390	P9 WTR INJ RSE RATIO	P10 WTR INJ LMR RATIO	P11 WTR INJ LMR RATIO	P12 WTR INJ LMR RATIO	FAIL TO FIRE	GEN BRNG TMP
Phase A Volts	12449	P13 HOT WASH	P14 MOTOR TURBINE ON	P15 MOTOR TURBINE ON	P16 MOTOR TURBINE ON	FLAME OUT	STATOR TEMP
Phase B Volts	12478	P17 CLOSE C.B.	P18 SPEED/LOAD RAISE	P19 SPEED/LOAD LOWER	P20 SPEED/LOAD LOWER	LUBE OIL SYS	TURB VIBRATN
Phase C Volts	12478	P21 OPEN C.B.	P22 SPEED/LOAD RAISE	P23 SPEED/LOAD LOWER	P24 SPEED/LOAD LOWER	FUEL GAS SYS	IS-BOX VIBRATN
Phase A Current	140	P25 START	P26 STOP	P27 OPEN C.B.	P28 CLOSE C.B.	GOVERN MALFND	GEN VIBRATION
Phase B Current	139	P29 START	P30 STOP	P31 WATER INJ. ON	P32 WATER INJ. OFF	LUBE OIL PRS	UNDER VOLTAGE
Phase C Current	139	P33 START	P34 STOP	P35 WTR INJ RSE RATIO	P36 WTR INJ LMR RATIO	CMP INLET PRS	OVER VOLTAGE
TIT Temperature	1351	P37 START	P38 STOP	P39 WTR INJ RSE RATIO	P40 WTR INJ LMR RATIO	TURB EXH PRS	
						SHUTDOWN ALARMS	
						UNDER SPEED	UNDER SPEED
						OVER SPEED	OVER SPEED
						GEN 88-G FAIL	GEN 88-G FAIL
						TC FAILURE	TC FAILURE
						TURB STAGNATN	TURB STAGNATN
						ENCLOS FIRE	ENCLOS FIRE
						ALARM SUMMARY	ALARM SUMMARY
						SDOWN SUMMARY	SDOWN SUMMARY
						READY TO START	READY TO START
						SHUTDOWN ALARMS	
						P1 GEN. REG. ON	P1 GEN. REG. ON
						P2 GEN. REG. OFF	P2 GEN. REG. OFF
						P3 FIRE SYSTEM ARMED	P3 FIRE SYSTEM ARMED
						P4 FIRE SYSTM DISARM	P4 FIRE SYSTM DISARM
						P5 HALON DISCHARGE	P5 HALON DISCHARGE
						P6 AIR FILTER	P6 AIR FILTER

DIAGRAM NUMBER: 2155 VERSION: 2
 DATE: 04/01/92 TIME: 08:49:27

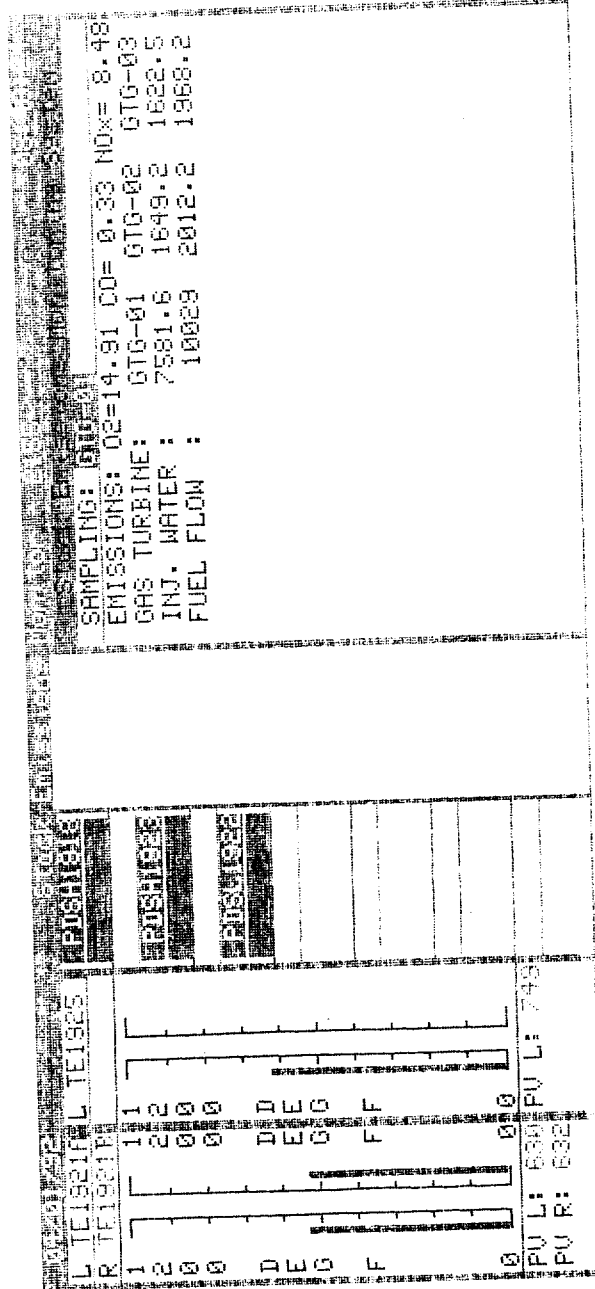


DIAGRAM NUMBER: 2100 VERSION: 1

DATE: 04/01/92 TIME: 08:51:09

ALARMS & SHUTDOWNS			
Gas Gen Speed 9243	LOCAL EMER STOP	TURB LOW OIL PRS	STATOR TEMP A1
Pwr Trb Speed 3602	REMOTE EMER STOP	TURB LOW OIL TMP	STATOR TEMP A2
Gen MW Output 19.6	FIRE	TRB ACC GBOX TMP	STATOR TEMP B1
Gen Measur Out 0.00	FAIL TO CRANK	AIR IN FILT D.P.	STATOR TEMP B2
Gen Voltage 13.4	FAIL TO IGNITE	SCV OIL FILT DP	STATOR TEMP C1
Gen Amperease 865	FLAME OUT	GEN LOW OIL PRS	STATOR TEMP C2
Turb L.O. Press 48.4	TURBINE OVERTEMP	GEN LOW OIL TMP	HALON
Turb L.O. Temp 144	GG FAIL TO ACCEL	GEN BRG D.E. TMP	TRB ROOM LFL
Trb Scv oil Prs 6.0	PT FAIL TO ACCEL	GEN OIL D.E. TMP	GEN ROOM LFL
Gen L.O. Press 29.6	GAS GEN UNDERSPD	GEN BRG X.E. TMP	120 VOLT BATTERY
Gen L.O. Temp 140	PWR TRB UNDERSPD	GEN OIL X.E. TMP	24 VOLT BATTERY
Fuel Gas Flow 9890	VIBRATN SYS MALF	SUMP A SCAU TEMP	START SYS SUMMRY
Inj Water Flow 7650	FUEL GAS PRS HI	SUMP B SCAU TEMP	UPS FAILURE
Inj Water Ratio 0.77	GOVERNOR SYSTEM	SUMP C SCAU TEMP	AC OIL PUMP FAIL
Fuel Manfld Prs 272	TRBN LOCKOUT RLY	SUMP D SCAU TEMP	DC OIL PUMP FAIL
Inj Manfld Prs 248	HIGH VIBRATION	GEN ENCL AIR TEMP	AUX OIL PUMP
Comp Inlet Temp 64.8	GAS GEN OVERSPD	TRB ENCL AIR TEMP	GEN FAIL TO SYNC
Comp Disch Prs 240	PWR TRB OVERSPD	GEN AIR OUT TEMP	UTIL FAIL SYNC
Gas Supply Prs 413	START OVER TEMP	EXCITR AIR TEMP	
Gas Supply Temp 62.3			

DIAGRAM NUMBER: 2150 VERSION: 3
 DATE: 04/01/92 TIME: 08:54:20

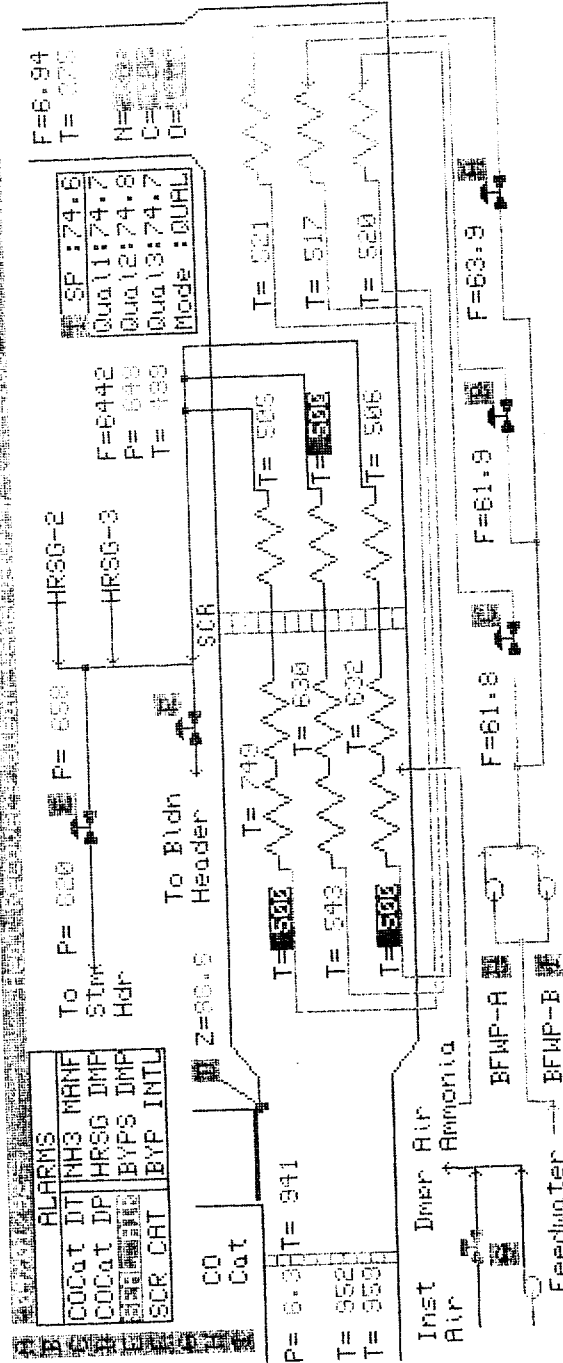
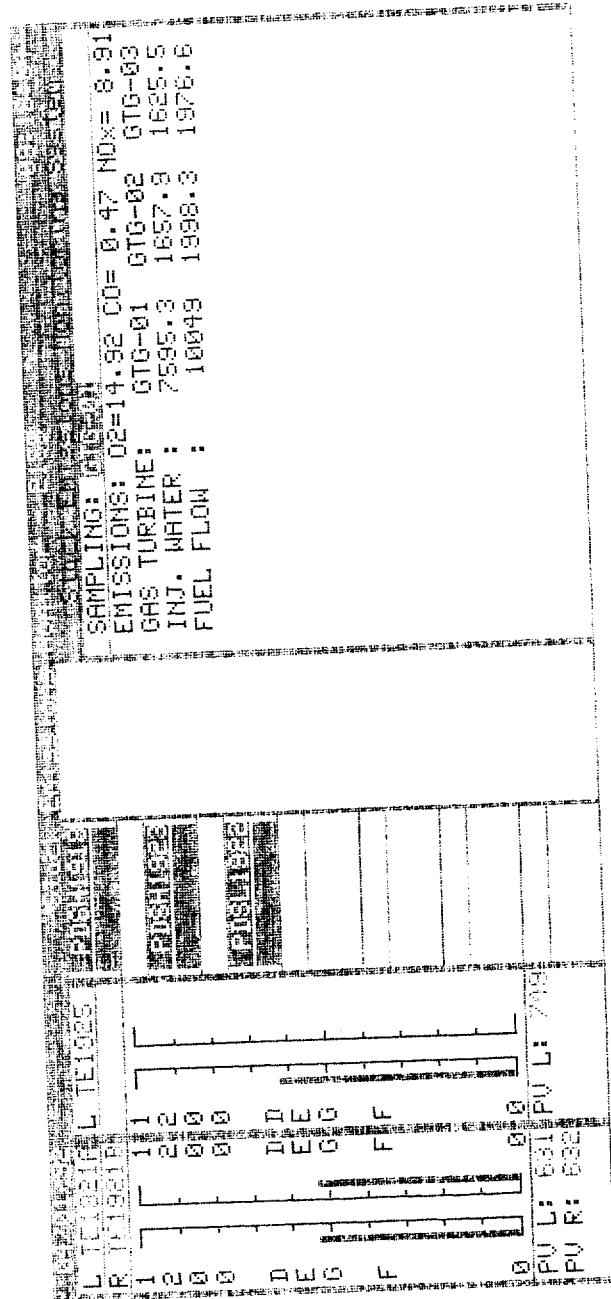


DIAGRAM NUMBER: 2155 VERSION: 2
 DATE: 04/01/92 TIME: 09:18:57



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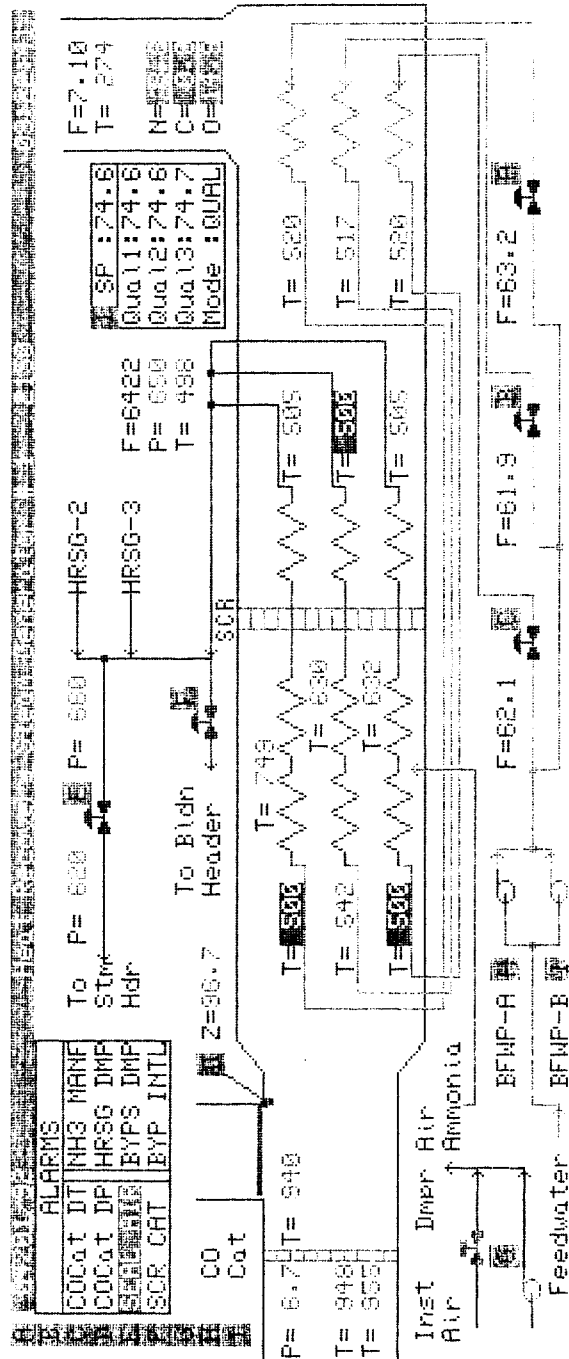
DIAGRAM NUMBER: 2100 VERSION: 1 Unit #1
 DATE: 04/01/92 TIME: 09:20:40 Begin Run #1

ALARMS & SHUTDOWNS			
Gas Gen Speed 9267	LOCAL EMER STOP	TURB LOW OIL PRS	STATOR TEMP A1
Pwr Trb Speed 3597	REMOTE EMER STOP	TURB LOW OIL TMP	STATOR TEMP A2
Gen MW Output 19.6	FIRE	TRB ACC GBOX TMP	STATOR TEMP B1
Gen Mesovar Out 0.00	FAIL TO CRANK	AIR IN FILT D.P.	STATOR TEMP B2
Gen Voltage 13.4	FAIL TO IGNITE	SCV OIL FILT DP	STATOR TEMP C1
Gen Amperease 868	FLAME OUT	GEN LOW OIL PRS	STATOR TEMP C2
Turb L.O. Press 48.8	TURBINE OVERTEMP	GEN LOW OIL TEMP	HALON
Turb L.O. Temp 145	GG FAIL TO ACCEL	GEN BRG D.E. TMP	TRB ROOM LFL
Trb Scv oil Prs 7.2	PT FAIL TO ACCEL	GEN OIL D.E. TMP	GEN ROOM LFL
Gen L.O. Press 29.6	GAS GEN UNDERSPD	GEN BRG X.E. TMP	120 VOLT BATTERY
Gen L.O. Temp 140	PWR TRB UNDERSPD	GEN OIL X.E. TMP	24 VOLT BATTERY
Fuel Gas Flow 10088	VIBRATN SYS MALF	SUMP A SCAV TEMP	START SYS SUMMRY
Inj Water Flow 7541	FUEL GAS PRS HI	SUMP B SCAV TEMP	UPS FAILURE
Inj Water Ratio 0.75	GOVERNOR SYSTEM	SUMP C SCAV TEMP	AC OIL PUMP FAIL
Fuel Manfld Prs 273	TRBN LOCKOUT RLY	SUMP D SCAV TEMP	DC OIL PUMP FAIL
Inj Manfld Prs 248	HIGH VIBRATION	GEN ENCL AIR TEMP	AUX OIL PUMP
Comp Inlet Temp 64.8	GAS GEN OVERSPD	TRB ENCL AIR TEMP	GEN FAIL TO SYNC
Comp Disch Prs 247	PWR TRB OVERSPD	GEN AIR OUT TEMP	UTIL FAIL SYNC
Gas Supply Prs 415	START OVER TEMP	EXCITR AIR TEMP	
Gas Supply Tmp 53.8			

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DIAGRAM NUMBER: 2150 VERSION: 3

DATE: 04/01/92 TIME: 09:22:46



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DATE: 04/01/92
TIME: 09:50:24



Unit #1
 End Run #1
 Begin Run #2
 Fuel Flow =

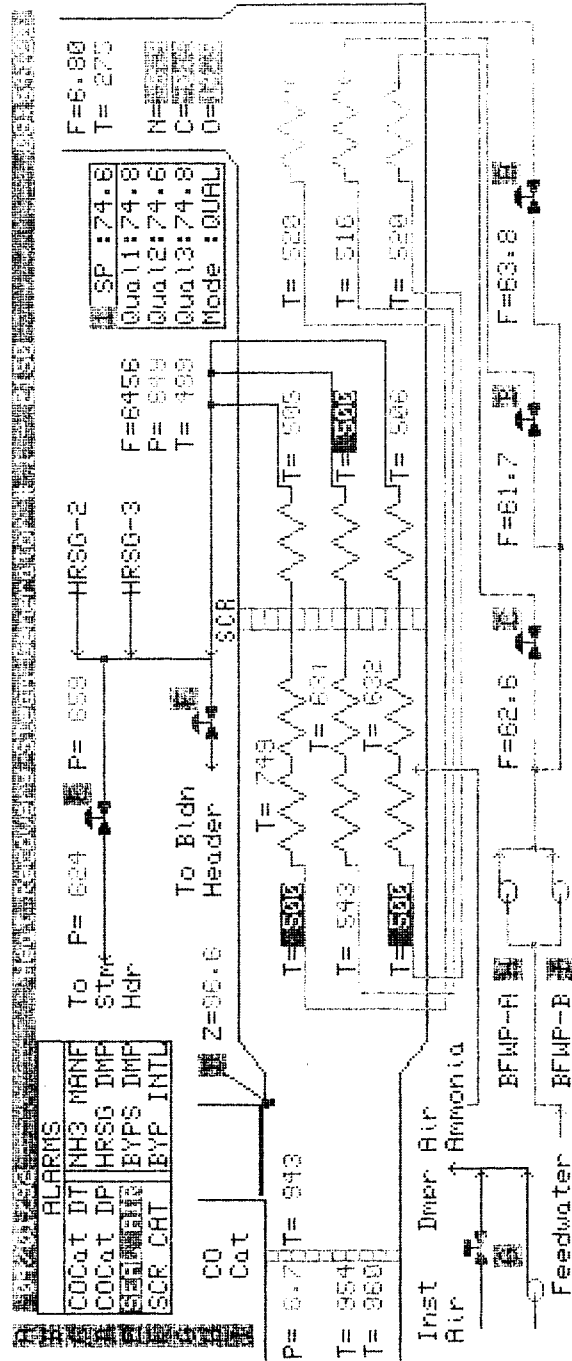
DIAGRAM NUMBER: 2100 VERSION: 1
 DATE: 04/01/92 TIME: 09:52:10

6105-01 Operational Parameters - 0100				ALARMS & SHUTDOWNS			
Gas Gen Speed	9290	LOCAL EMER STOP	TURB LOW OIL PRS	STATOR TEMP A1	STATOR TEMP A2	STATOR TEMP B1	STATOR TEMP B2
Pwr Trb Speed	3597	REMOTE EMER STOP	TURB LOW OIL TMP	STATOR TEMP C1	STATOR TEMP C2	HALON	TRB ROOM LFL
Gen MW Output	19.7	FIRE	TRB ACC GEOX TMP	SCV OIL FILT DP	GEN LOW OIL PRS	GEN LOW OIL TEMP	GEN BRG D-E. TMP
Gen Megavar Out	0.00	FAIL TO CRANK	AIR IN FILT D.P.	GEN LOW OIL PRS	GEN LOW OIL TEMP	GEN BRG D-E. TMP	GEN OIL D-E. TMP
Gen Voltage	13.4	FAIL TO IGNITE	SCV OIL FILT DP	GEN LOW OIL PRS	GEN LOW OIL TEMP	GEN BRG D-E. TMP	GEN OIL X-E. TMP
Gen Amperease	870	FLAME OUT	GEN LOW OIL PRS	GEN LOW OIL TEMP	GEN BRG D-E. TMP	GEN OIL X-E. TMP	SUMP A SCAV TEMP
Turb L.O. Press	48.6	TURBINE OVERTEMP	GEN LOW OIL TEMP	GEN BRG D-E. TMP	GEN OIL D-E. TMP	GEN OIL X-E. TMP	SUMP B SCAV TEMP
Turb L.O. Temp	145	GG FAIL TO ACCEL	GEN BRG D-E. TMP	GEN OIL D-E. TMP	GEN OIL X-E. TMP	SUMP A SCAV TEMP	SUMP C SCAV TEMP
Trb Scv oil Prs	6.8	PT FAIL TO ACCEL	GEN OIL D-E. TMP	GEN OIL X-E. TMP	SUMP A SCAV TEMP	SUMP B SCAV TEMP	SUMP D SCAV TEMP
Gen L.O. Press	25.7	GAS GEN UNDERSPD	PWR TRB UNDERSPD	VIBRATN SYS MALF	FUEL GAS PRS HI	GOVERNOR SYSTEM	TRBN LOCKOUT RLY
Gen L.O. Temp	149	FUEL GAS FLOW	10166	Inj Water Flow	7568	FUEL GAS PRS HI	GOVERNOR SYSTEM
Fuel Gas Flow	10166	Inj Water Flow	7568	Fuel Manfld Prs	274	Inj Manfld Prs	249
Inj Water Flow	7568	Fuel Manfld Prs	274	Comp Inlet Temp	66.1	Comp Disch Prs	248
Inj Water Ratio	0.74	Comp Inlet Temp	66.1	Gas Supply Prs	418	Gas Supply Tmp	95.8
Fuel Manfld Prs	274	Comp Disch Prs	248	Gas Supply Prs	418	Gas Supply Tmp	95.8
Inj Manfld Prs	249	Gas Supply Prs	418	Gas Supply Tmp	95.8	START OVER TEMP	
Comp Inlet Temp	66.1	Gas Supply Tmp	95.8	START OVER TEMP			
Comp Disch Prs	248						
Gas Supply Prs	418						
Gas Supply Tmp	95.8						

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DIAGRAM NUMBER: 2150 VERSION: 3

DATE: 04/01/92 TIME: 09:54:23



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DIAGRAM NUMBER: 2155 VERSION: 2

DATE: 04/01/92 TIME: 10:18:26

L IE1921L L IE1923		Emissions Monitoring for System	
R IE1921R		SAMPLING: MILESON	
1	1	EMISSIONS: O2=14.91 CO= 1.23 NOx= 7.81	
2	2	GAS TURBINE: GTG-01 GTG-02 GTG-03	
0	0	INJ. WATER : 7526.9 1625.5 1634.4	
0	0	FUEL FLOW : 10088 2014.4 1989.2	
1 1			
2 2			
0 0			
0 0			
D D			
E E			
G G			
F F			
0 0			
PU L: 631 PU L: 750			
PU R: 633			

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Unit 1
End Run #2
Fuel Flow =
10,117 #/hr

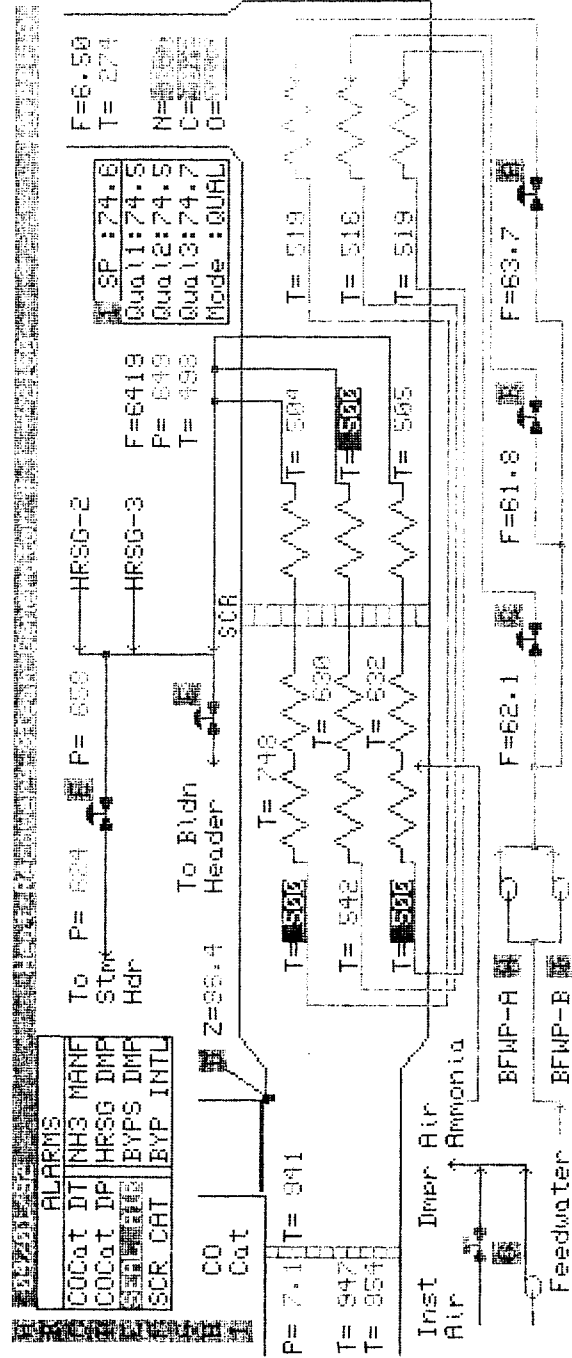
DIAGRAM NUMBER: 2100 VERSION: 1
DATE: 04/01/92 TIME: 10:20:12

ALARMS & SHUTDOWNS			
Gas Gen Speed 9279	LOCAL EMER STOP	TURB LOW OIL PRS	STATOR TEMP A1
Pwr Trb Speed 3597	REMOTE EMER STOP	TURB LOW OIL TMP	STATOR TEMP A2
Gen MW Output 19.7	FIRE	TRB ACC GEOX TMP	STATOR TEMP B1
Gen Mesovar Out 0.00	FAIL TO CRANK	AIR IN FILT D.P.	STATOR TEMP B2
Gen Voltage 13.4	FAIL TO IGNITE	SCV OIL FILT DP	STATOR TEMP C1
Gen Amperease 872	FLAME OUT	GEN LOW OIL PRS	STATOR TEMP C2
Turb L.O. Press 48.4	TURBINE OVERTEMP	GEN LOW OIL TEMP	HALON
Turb L.O. Temp 145	GG FAIL TO ACCEL	GEN BRG D-E. TMP	TRB ROOM LFL
Trb Scv oil Prs 7.2	PT FAIL TO ACCEL	GEN OIL D-E. TMP	GEN ROOM LFL
Gen L.O. Press 29.0	GAS GEN UNDERSPD	GEN BRG X-E. TMP	120 VOLT BATTERY
Gen L.O. Temp 140	PWR TRB UNDERSPD	GEN OIL X-E. TMP	24 VOLT BATTERY
Fuel Gas Flow 10068	VIBRATN SYS MALF	SUMP A SCVU TEMP	START SYS SUMMRY
Inj Water Flow 7568	FUEL GAS PRS HI	SUMP B SCVU TEMP	UPS FAILURE
Inj Water Ratio 0.75	GOVERNOR SYSTEM	SUMP C SCVU TEMP	AC OIL PUMP FAIL
Fuel Manfld Prs 275	TRBN LOCKOUT RLY	SUMP D SCVU TEMP	DC OIL PUMP FAIL
Inj Manfld Prs 249	HIGH VIBRATION	TRB ENCL AIR TEMP	AUX OIL PUMP
Comp Inlet Temp 63.8	GAS GEN OVERSPD	GEN ENCL AIR TEMP	GEN FAIL TO SYNC
Comp Disch Prs 249	PWR TRB OVERSPD	GEN AIR OUT TEMP	UTIL FAIL SYNC
Gas Supply Prs 412	START OVER TEMP	EXCITR AIR TEMP	
Gas Supply Tmp 65.2			

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DIAGRAM NUMBER: 2150 VERSION: 3

DATE: 04/01/92 TIME: 10:22:21



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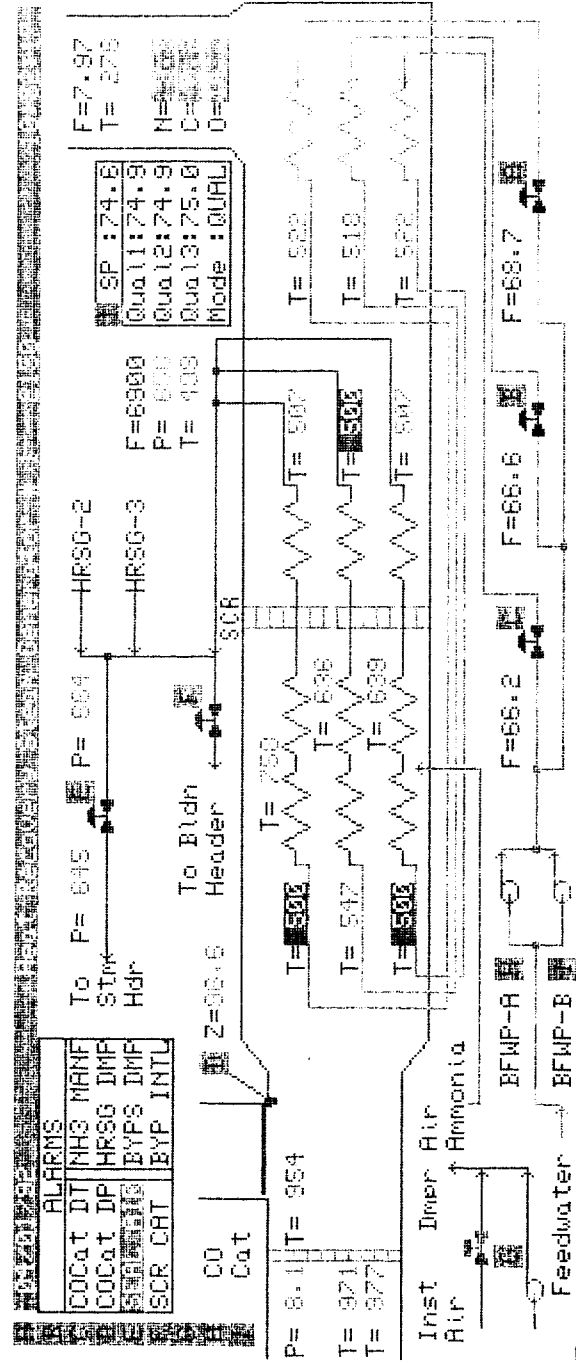
DATE: 04/01/92

SAMPLING: G1G-21
EMISSIONS: 02=14.65 CO= 0.12 NOx= 9.18
GAS TURBINE: GTG-01 GTG-02 GTG-03
INT. WATER: 8402.7 1622.5 1631.4
FUEL FLOW: 19850 2009.3 1981.6

[illegible]

COPY IN PROGRESS

DATE: 04/01/92



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DIAGRAM NUMBER: 2100 VERSION: 1

DATE: 04/01/92 TIME: 10:54:50

Unit 1

Start Run #3

End Run #3

Fuel Flow=

10,831 #/hr

Gas Gen Speed	3607	LOCAL EMER STOP	ALARMS & SHUTDOWNS	STATOR TEMP A1
Pur Trb Speed	3602	REMOTE EMER STOP	TURB LOW OIL PRS	STATOR TEMP A2
Gen MW Output	21.5	FIRE	TURB LOW OIL TMP	STATOR TEMP B1
Gen Measur Out	0.00	FAIL TO CRANK	AIR IN FILT D.P.	STATOR TEMP C1
Gen Voltage	13.4	FAIL TO IGNITE	SCV OIL FILT DP	STATOR TEMP C2
Gen Amperease	952	FLAME OUT	GEN LOW OIL PRS	HALON
Turb L.O. Press	51.0	TURBINE OVERTEMP	GEN LOW OIL TMP	TRB ROOM LFL
Turb L.O. Temp	145	GG FAIL TO ACCEL	GEN BRO D.E. TMP	GEN ROOM LFL
Trb Scv oil Prs	7.4	PT FAIL TO ACCEL	GEN OIL D.E. TMP	120 VOLT BATTERY
Gen L.O. Press	29.7	GAS GEN UNDERSPD	GEN BRO X.E. TMP	24 VOLT BATTERY
Gen L.O. Temp	140	PWR TRB UNDERSPD	GEN OIL X.E. TMP	START SYS SUMMARY
Fuel Gas Flow	10831	VIBRATN SYS MALF	SUMP A SCAV TEMP	UPS FAILURE
Inj Water Flow	8625	FUEL GAS PRS HI	SUMP B SCAV TEMP	AC OIL PUMP FAIL
Inj Water Ratio	0.80	GOVERNOR SYSTEM	SUMP C SCAV TEMP	DC OIL PUMP FAIL
Fuel Manfid Prs	291	TRBN LOCKOUT RLY	SUMP D SCAV TEMP	AUX OIL PUMP
Inj Manfid Prs	265	HIGH VIBRATION	GEN ENCL AIR TEMP	GEN FAIL TO SYNC
Comp Inlet Temp	61.5	GAS GEN OVERSPD	TRB ENCL AIR TEMP	UTIL FAIL SYNC
Comp Disch Prs	261	PWR TRB OVERSPD	GEN AIR OUT TEMP	
Gas Supply Prs	411	START OVER TEMP	EXCITR AIR TEMP	
Gas Supply Imp	65.2			

COPY IN PROGRESS

DATE: 04/01/92

COPY IN PROGRESS

DIAGRAM NUMBER: 2155 VERSION: 2

DATE: 04/01/92 TIME: 11:35:20

L IE1316 L IE1325		L IE1316 L IE1325	
R IE1316 R IE1325		R IE1316 R IE1325	
1	1	1	1
2	2	2	2
0	0	0	0
0	0	0	0
0	0	0	0
D	D	D	D
E	E	E	E
E	E	E	E
G	G	G	G
F	F	F	F
0	0	0	0
PU L: 641 PU L: 642		PU L: 641 PU L: 642	
PU R: 642		PU R: 642	

SAMPLING: 02-14.64 CO= 9.13 NOx= 8.45
GAS TURBINE: GT0-01 GT0-02 GT0-03
INJ. WATER: 8662.8 1622.5 1634.4
FUEL FLOW: 10950 1985.0 1956.6

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DIAGRAM NUMBER: 2100 VERSION: 1

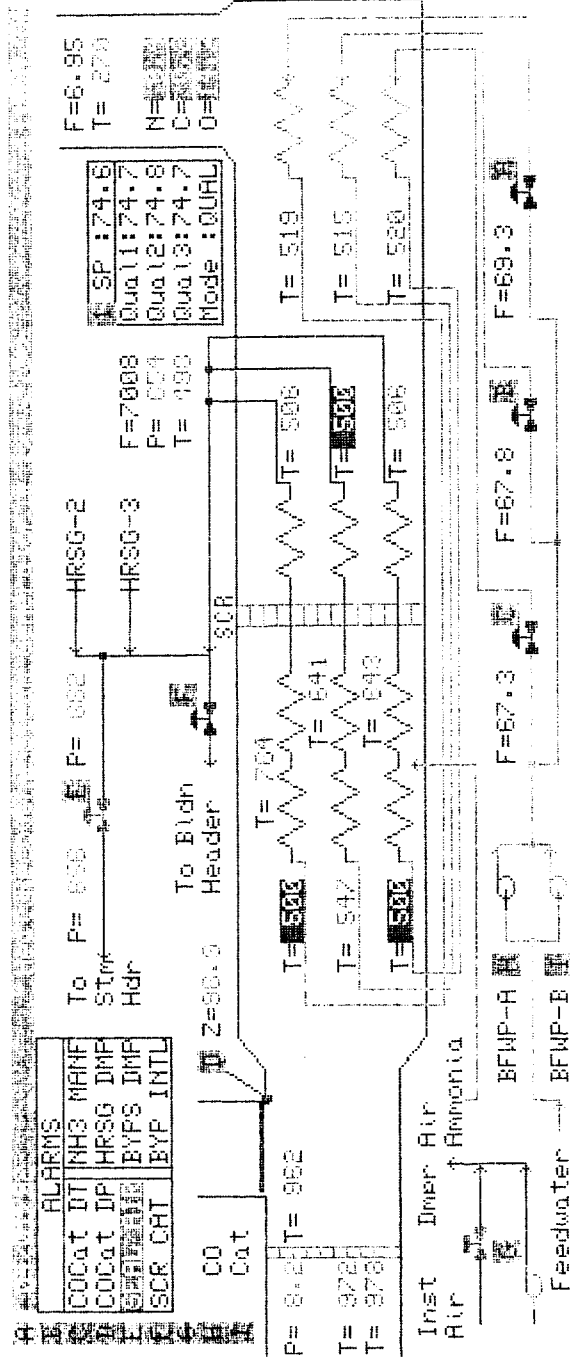
DATE: 04/01/92 TIME: 11:37:16

ALARMS & SHUTDOWNS			
Gas Gen Speed 9613	LOCAL EMER STOP	TURB LOW OIL PRS	STATOR TEMP A1
Pwr Trb Speed 3602	REMOTE EMER STOP	TURB LOW OIL TMP	STATOR TEMP A2
Gen MW Output 21.5	FIRE	TRB ACC GBOX TMP	STATOR TEMP B1
Gen Mesavac Out 0.00	FAIL TO CRANK	AIR IN FILT D.P.	STATOR TEMP B2
Gen Voltage 13.3	FAIL TO IGNITE	SCV OIL FILT DP	STATOR TEMP C1
Gen Ampereage 950	FLAME OUT	GEN LOW OIL PRS	STATOR TEMP C2
Turb L.O. Press 51.1	TURBINE OVERTEMP	GEN LOW OIL TEMP	HALON
Turb L.O. Temp 146	GG FAIL TO ACCEL	GEN BRG D.E. TMP	TRB ROOM LFL
Trb Scv oil Prs 6.8	PT FAIL TO ACCEL	GEN OIL D.E. TMP	GEN ROOM LFL
Gen L.O. Press 29.4	GAS GEN UNDERSPD	GEN BRG X.E. TMP	120 VOLT BATTERY
Gen L.O. Temp 140	PWR TRB UNDERSPD	GEN OIL X.E. TMP	124 VOLT BATTERY
Fuel Gas Flow 10829	VIBRATN SYS MALF	SUMP A SCVU TEMP	START SYS SUMMRY
Inj Water Flow 8649	FUEL GAS PRS HI	SUMP B SCVU TEMP	UPS FAILURE
Inj Water Ratio 0.79	GOVERNOR SYSTEM	SUMP C SCVU TEMP	IAC OIL PUMP FAIL
Fuel Manfid Prs 291	TRBN LOCKOUT RLY	SUMP D SCVU TEMP	DC OIL PUMP FAIL
Inj Manfid Prs 266	HIGH VIBRATION	GEN ENCL AIR TEMP	AUX OIL PUMP
Comp Inlet Temp 62.1	GAS GEN OVERSPD	TRB ENCL AIR TEMP	GEN FAIL TO SYNC
Comp Disch Prs 262	PWR TRB OVERSPD	GEN AIR OUT TEMP	UTIL FAIL SYNC
Gas Supply Prs 403	START OVER TEMP	EXCITR AIR TEMP	
Gas Supply Tmp 68.2			

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DIAGRAM NUMBER: 2150 VERSION: 3

DATE: 04/01/92 TIME: 11:39:25



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DIAGRAM NUMBER: 2155 VERSION: 2

DATE: 04/01/92 TIME: 12:03:48

L TE1921R L TE1925		R TE1921R R TE1925	
1	1	1	1
2	2	2	2
0	0	0	0
0	0	0	0
0	0	0	0
D	D	D	D
E	E	E	E
E	E	E	E
G	G	G	G
F	F	F	F
0	0	0	0
PU L: 641 PU L: 753		PU R: 642 PU R: 753	

SAMPLING: 01/01

EMISSIONS: 02=14.66 CO= 1.32 NOx= 8.68

GAS TURBINE: GT0-01 GT0-02 GT0-03

INJ. WATER : 8553.3 1681.1 1628.5

FUEL FLOW : 10909 1961.0 1954.8

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DIAGRAM NUMBER: 2100 VERSION: 1

DATE: 04/01/92 TIME: 12:05:48

Unit 1

Run #4

Fuel Flow)=

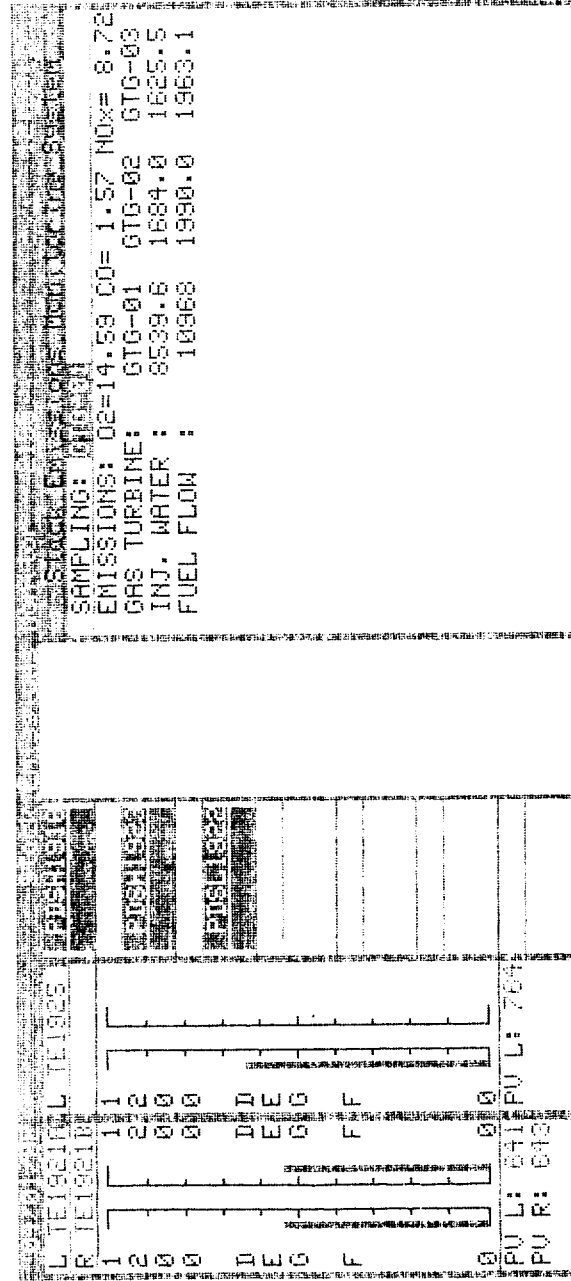
10,870 #/hr

ALARMS & SHUTDOWNS			
Gas Gen Speed 9535	LOCAL EMER STOP	TURB LOW OIL PRS	STATOR TEMP A1
Pwr Trb Speed 3602	REMOTE EMER STOP	TURB LOW OIL TMP	STATOR TEMP A2
Gen MW Output 21.4	FIRE	TRB ACC GBOX TMP	STATOR TEMP B1
Gen Measur Out 0.00	FAIL TO CRANK	AIR IN FILT D.P.	STATOR TEMP B2
Gen Voltage 13.4	FAIL TO IGNITE	SCV OIL FILT DP	STATOR TEMP C1
Gen Ampereage 946	FLAME OUT	GEN LOW OIL PRS	STATOR TEMP C2
Turb L.O. Press 51.0	TURBINE OVERTEMP	GEN LOW OIL TMP	HALON
Turb L.O. Temp 146	GG FAIL TO ACCEL	GEN BRO D-E. TMP	TRB ROOM LFL
Trb Scv oil Prs 7.2	PT FAIL TO ACCEL	GEN OIL D-E. TMP	GEN ROOM LFL
Gen L.O. Press 29.6	GAS GEN UNDERSPD	GEN BRO X-E. TMP	120 VOLT BATTERY
Gen L.O. Temp 140	PWR TRB UNDERSPD	GEN OIL X-E. TMP	24 VOLT BATTERY
Fuel Gas Flow 10870	VIBRATN SYS MALF	SUMP A SCRV TEMP	START SYS SUMMRY
Inj Water Flow 8663	FUEL GAS PRS HI	SUMP B SCRV TEMP	UPS FAILURE
Inj Water Ratio 0.80	GOVERNOR SYSTEM	SUMP C SCRV TEMP	AC OIL PUMP FAIL
Fuel Manfld Prs 290	TRBN LOCKOUT RLY	SUMP D SCRV TEMP	DC OIL PUMP FAIL
Inj Manfld Prs 265	HIGH VIBRATION	GEN ENCL AIR TEMP	AUX OIL PUMP
Comp Inlet Temp 62.3	GAS GEN OVERSPD	TRB ENCL AIR TEMP	GEN FAIL TO SYNC
Comp Disch Prs 261	PWR TRB OVERSPD	GEN AIR OUT TEMP	UTIL FAIL SYNC
Gas Supply Prs 411	START OVER TEMP	EXCITR AIR TEMP	
Gas Supply Tmp 69.2			

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DIAGRAM NUMBER: 2155 VERSION: 2

DATE: 04/01/92 TIME: 12:33:20



COPY IN PROGRESS

DIAGRAM NUMBER: 2100 VERSION: 1

DATE: 04/01/92 TIME: 12:35:09

Unit #1
Start Run #5

ALARMS & SHUTDOWNS			
Gas Gen Speed 9537	LOCAL EMER STOP	TURB LOW OIL PRS	STATOR TEMP A1
Pwr Trb Speed 3602	REMOTE EMER STOP	TURB LOW OIL TMP	STATOR TEMP A2
Gen MW Output 21.1	FIRE	TRB ACC GBOX TMP	STATOR TEMP B1
Gen Mesavar Out 0.00	FAIL TO CRANK	AIR IN FILT D.P.	STATOR TEMP B2
Gen Voltage 13.4	FAIL TO IGNITE	SCV OIL FILT DP	STATOR TEMP C1
Gen Amperease 937	FLAME OUT	GEN LOW OIL PRS	STATOR TEMP C2
Turb L.O. Press 50.3	TURBINE OVERTEMP	GEN LOW OIL TEMP	HALON
Turb L.O. Temp 146	GG FAIL TO ACCEL	GEN BRG D-E. TMP	TRB ROOM LFL
Trb Scv oil Prs 7.2	PT FAIL TO ACCEL	GEN OIL D-E. TMP	GEN ROOM LFL
Gen L.O. Press 23.5	GAS GEN UNDERSPD	GEN OIL X-E. TMP	120 VOLT BATTERY
Gen L.O. Temp 140	PWR TRB UNDERSPD	GEN OIL X-E. TMP	24 VOLT BATTERY
Fuel Gas Flow 10733	VIBRATN SYS MALF	SUMP A SCVU TEMP	START SYS SUMMARY
Inj Water Flow 8594	FUEL GAS PRS HI	SUMP B SCVU TEMP	UPS FAILURE
Inj Water Ratio 0.80	GOVERNOR SYSTEM	SUMP C SCVU TEMP	AC OIL PUMP FAIL
Fuel Manfld Prs 288	TRBN LOCKOUT RLY	SUMP D SCVU TEMP	DC OIL PUMP FAIL
Inj Manfld Prs 264	HIGH VIBRATION	GEN ENCL AIR TEMP	AUX OIL PUMP
Comp Inlet Temp 63.3	GAS GEN OVERSPD	TRB ENCL AIR TEMP	GEN FAIL TO SYNC
Comp Disch Prs 259	PWR TRB OVERSPD	GEN AIR OUT TEMP	UTIL FAIL SYNC
Gas Supply Prs 413	START OVER TEMP	EXCITR AIR TEMP	
Gas Supply Tmp 69.5			

COPY IN PROGRESS

DATE: 04/01/92



DIAGRAM NUMBER: 2100 VERSION: 1

DATE: 04/01/92 TIME: 13:10:32

Unit 1

End Run #5

Fuel Flow =

10,704 #/hr

Start Run #6

ALARMS & SHUTDOWNS			
Gas Gen Speed 9480	LOCAL EMER STOP	TURB LOW OIL PRS	STATOR TEMP A1
Pwr Trb Speed 3597	REMOTE EMER STOP	TURB LOW OIL TMP	STATOR TEMP A2
Gen MW Output 21.0	FIRE	TRB ACC GBOX TMP	STATOR TEMP B1
Gen Mesavowr Out 0.00	FAIL TO CRANK	AIR IN FILT D.P.	STATOR TEMP B2
Gen Voltage 13.3	FAIL TO IGNITE	SCV OIL FILT DP	STATOR TEMP C1
Gen Amperease 933	FLAME OUT	GEN LOW OIL PRS	STATOR TEMP C2
Turb L.O. Press 50.5	TURBINE OVERTEMP	GEN LOW OIL TEMP	HALON
Turb L.O. Temp 145	GG FAIL TO ACCEL	GEN BRG D.E. TMP	TRB ROOM LFL
Trb Scv oil Prs 7.2	PT FAIL TO ACCEL	GEN OIL D.E. TMP	GEN ROOM LFL
Gen L.O. Press 29.8	GAS GEN UNDERSPD	GEN OIL X.E. TMP	120 VOLT BATTERY
Gen L.O. Temp 140	PWR TRB UNDERSPD	SUMP A SCRAV TEMP	24 VOLT BATTERY
Fuel Gas Flow 10674	VIBRATN SYS MALF	SUMP B SCRAV TEMP	START SYS SUMMARY
Inj Water Flow 8635	FUEL GAS PRS HI	SUMP C SCRAV TEMP	UPS FAILURE
Inj Water Ratio 0.78	GOVERNOR SYSTEM	SUMP D SCRAV TEMP	AC OIL PUMP FAIL
Fuel Manfld Prs 286	TRBN LOCKOUT RLY	GEN ENCL AIR TEMP	DC OIL PUMP FAIL
Inj Manfld Prs 264	HIGH VIBRATION	TRB ENCL AIR TEMP	AUX OIL PUMP
Comp Inlet Temp 62.6	GAS GEN OVERSPD	GEN AIR OUT TEMP	GEN FAIL TO SYNC
Comp Disch Prs 258	PWR TRB OVERSPD	EXCITER AIR TEMP	UTIL FAIL SYNC
Gas Supply Prs 414	START OVER TEMP		
Gas Supply Tmp 70.8			

COPY IN PROGRESS

DIAGRAM NUMBER: 2155 VERSION: 2

DATE: 04/01/92 TIME: 13:49:28

L 1E1925		L 1E1925		L 1E1925	
R 1E1925		R 1E1925		R 1E1925	
1	00	1	00	1	00
2	00	2	00	2	00
0	00	0	00	0	00
0	00	0	00	0	00
D	00	D	00	D	00
E	00	E	00	E	00
G	00	G	00	G	00
F	00	F	00	F	00
0	00	0	00	0	00
PU L: 637	PU L: 758	PU L: 637	PU L: 758	PU L: 637	PU L: 758
PU R: 643	PU R: 758	PU R: 643	PU R: 758	PU R: 643	PU R: 758

SAMPLING: 10000

EMISSIONS: 02=14.75 CO= 0.35 NOx= 8.33

GAS TURBINE: GT0-01 GT0-02 GT0-03

INJ. WATER: 8306.9 1675.4 1628.5

FUEL FLOW: 10733 2014.8 1982.4

COPY IN PROGRESS

DIAGRAM NUMBER: 2100 VERSION: 1

DATE: 04/01/92 TIME: 13:51:08

Unit #1

End Run #6

Fuel Flow =

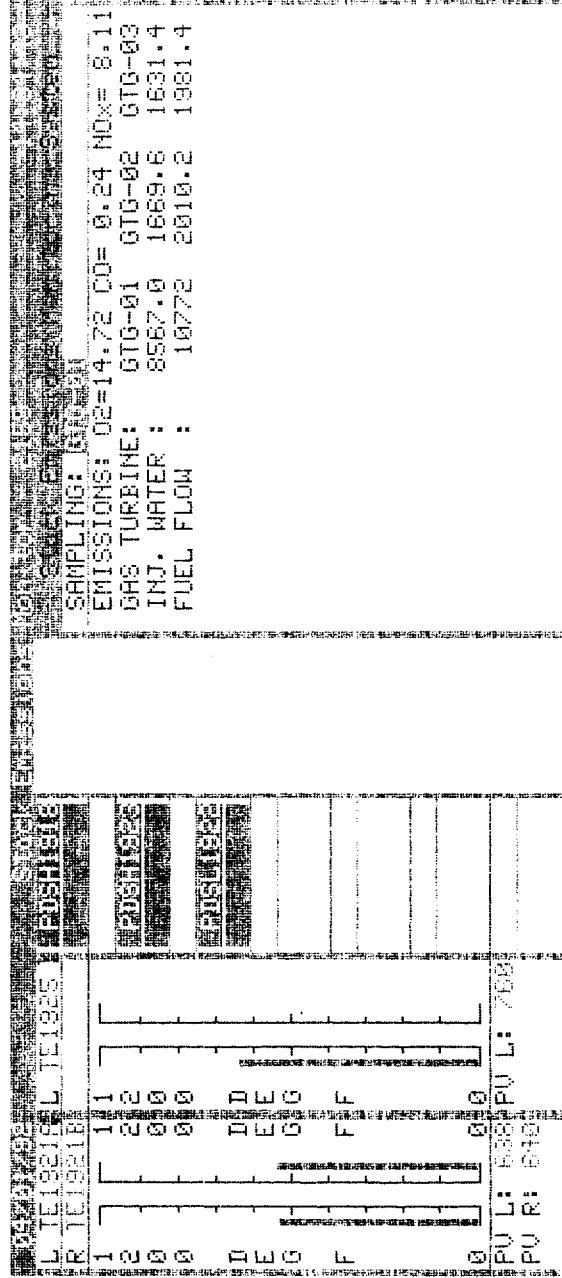
10,762 #/hr

ALARMS & SHUTDOWNS			
Gas Gen Speed 9537	LOCAL EMER STOP	TURB LOW OIL PRS	STATOR TEMP A1
Pwr Trb Speed 3597	REMOTE EMER STOP	TURB LOW OIL TMP	STATOR TEMP A2
Gen MW Output 21.1	FIRE	TRB ACC GBOX TMP	STATOR TEMP B1
Gen Mesovar Out 0.00	FAIL TO CRANK	AIR IN FILT D.P.	STATOR TEMP B2
Gen Voltage 13.3	FAIL TO IGNITE	SCV OIL FILT DP	STATOR TEMP C1
Gen Amperease 941	FLAME OUT	GEN LOW OIL PRS	STATOR TEMP C2
Turb L.O. Press 50.3	TURBINE OVERTEMP	GEN LOW OIL TEMP	HALON
Turb L.O. Temp 145	GG FAIL TO ACCEL	GEN BRG D.E. TMP	TRB ROOM LFL
Trb Scv oil Prs 7.2	PT FAIL TO ACCEL	GEN OIL D.E. TMP	GEN ROOM LFL
Gen L.O. Press 29.8	GAS GEN UNDERSPD	GEN BRG X.E. TMP	120 VOLT BATTERY
Gen L.O. Temp 140	PWR TRB UNDERSPD	GEN OIL X.E. TMP	24 VOLT BATTERY
Fuel Gas Flow 10850	VIBRATN SYS MALF	SUMP A SCAV TEMP	START SYS SUMMARY
Inj Water Flow 8622	FUEL GAS PRS HI	SUMP B SCAV TEMP	UPS FAILURE
Inj Water Ratio 0.78	GOVERNOR SYSTEM	SUMP C SCAV TEMP	AC OIL PUMP FAIL
Fuel Manfld Prs 287	TRBN LOCKOUT RLY	SUMP D SCAV TEMP	DC OIL PUMP FAIL
Inj Manfld Prs 288	HIGH VIBRATION	GEN ENCL AIR TEMP	AUX OIL PUMP
Comp Inlet Temp 62.8	GAS GEN OVERSPD	TRB ENCL AIR TEMP	GEN FAIL TO SYNC
Comp Disch Prs 258	PWR TRB OVERSPD	GEN AIR OUT TEMP	UTIL FAIL SYNC
Gas Supply Prs 411	START OVER TEMP	EXCITR AIR TEMP	
Gas Supply Temp 71.4			

COPY IN PROGRESS

DIAGRAM NUMBER: 2155 VERSION: 2

DATE: 04/01/92 TIME: 14:34:46



COPY IN PROGRESS

DIAGRAM NUMBER: 2100 VERSION: 1

DATE: 04/01/92 TIME: 14:41:55

Unit #1

Run #7

Fuel Flow=

10,792 #/hr

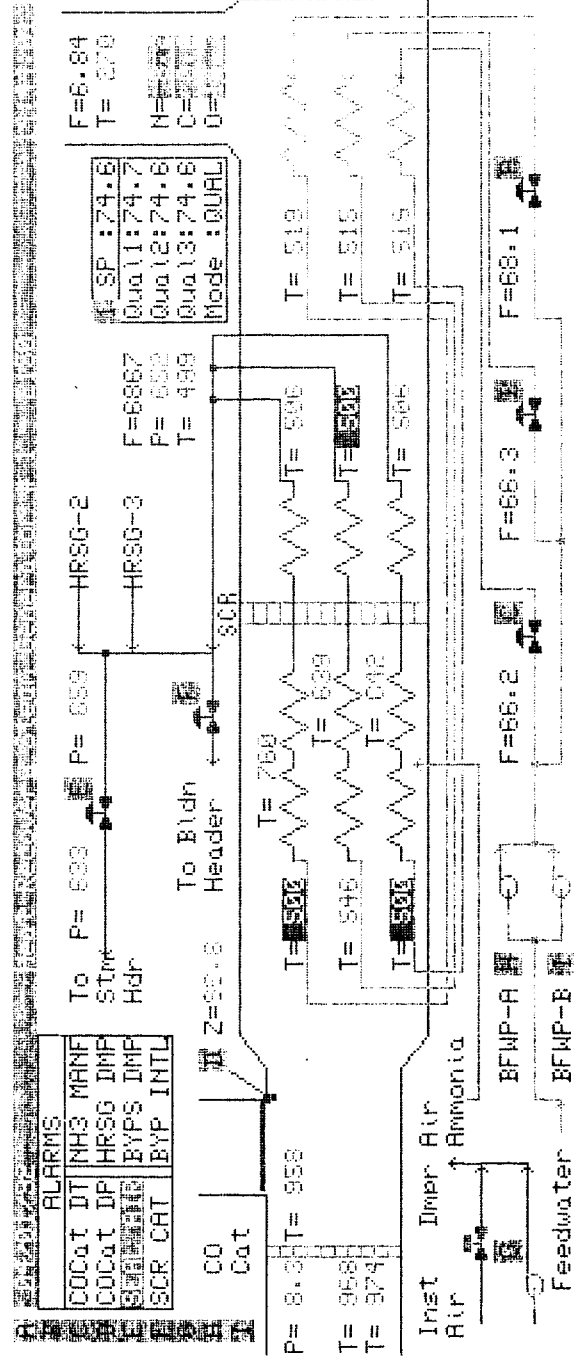
Begin Run #8

ALARMS & SHUTDOWNS			
LOCAL EMER STOP	TURB LOW OIL PRS	STATOR TEMP A1	
REMOTE EMER STOP	TURB LOW OIL TMP	STATOR TEMP A2	
FIRE	TURB ACC GBOX TMP	STATOR TEMP B1	
FAIL TO CRANK	AIR IN FILT D.P.	STATOR TEMP B2	
FAIL TO IGNITE	SCV OIL FILT DP	STATOR TEMP C1	
FLAME OUT	GEN LOW OIL PRS	STATOR TEMP C2	
		HALON	
		TRB ROOM LFL	
		GEN ROOM LFL	
		120 VOLT BATTERY	
		24 VOLT BATTERY	
		START SYS SUMMARY	
		UPS FAILURE	
		AC OIL PUMP FAIL	
		DC OIL PUMP FAIL	
		AUX OIL PUMP	
		GEN FAIL TO SYNC	
		UTIL/FIL SYNC	
Gas Gen Speed 9560			
Pwr Trb Speed 3597			
Gen MW Output 21.1			
Gen Megawatt Out 0.00			
Gen Voltage 13.3			
Gen Amperease 937			
Turb L.O. Press 59.8			
Turb L.O. Temp 145			
Trb Scv oil Prs 7.2			
Gen L.O. Press 29.4			
Gen L.O. Temp 140			
Fuel Gas Flow 10792			
Inj Water Flow 8444			
Inj Water Ratio 0.78			
Fuel Manfld Prs 287			
Inj Manfld Prs 263			
Comp Inlet Temp 63.6			
Comp Disch Prs 259			
Gas Supply Prs 415			
Gas Supply Temp 79.1			

COPY IN PROGRESS

DIAGRAM NUMBER: 2150 VERSION: 3

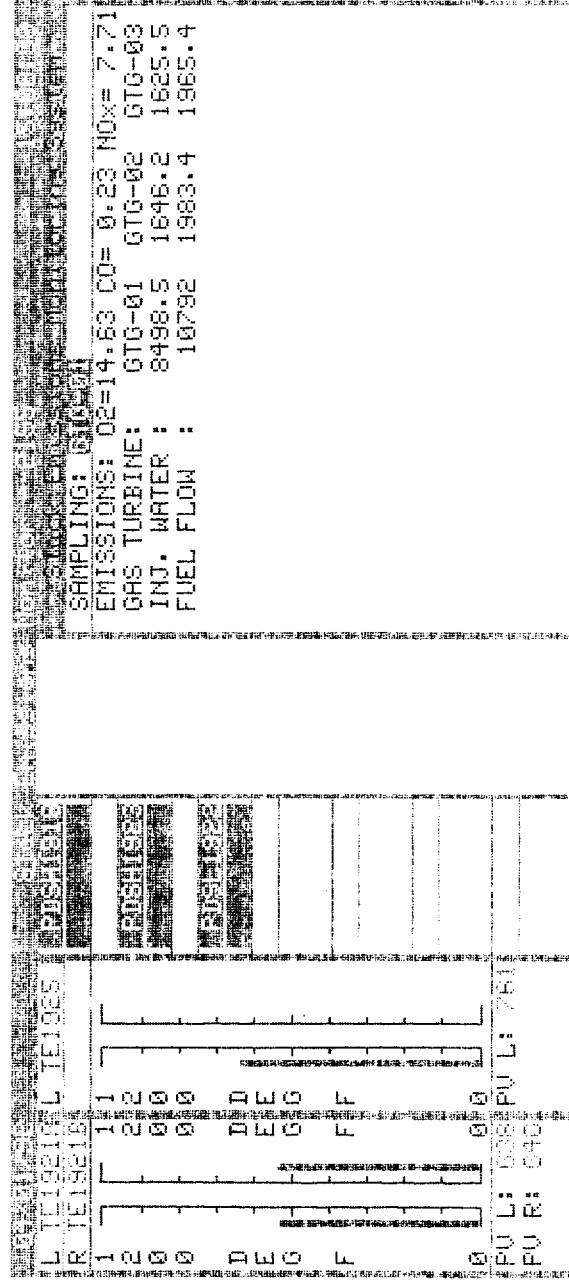
DATE: 04/01/92 TIME: 14:44:04



COPY IN PROGRESS

DIAGRAM NUMBER: 2155 VERSION: 2

DATE: 04/01/92 TIME: 15:06:41



COPY IN PROGRESS

DIAGRAM NUMBER: 2100 VERSION: 1

DATE: 04/01/92

TIME: 15:08:24

Unit #1

End Run# 8

Fuel Flow=

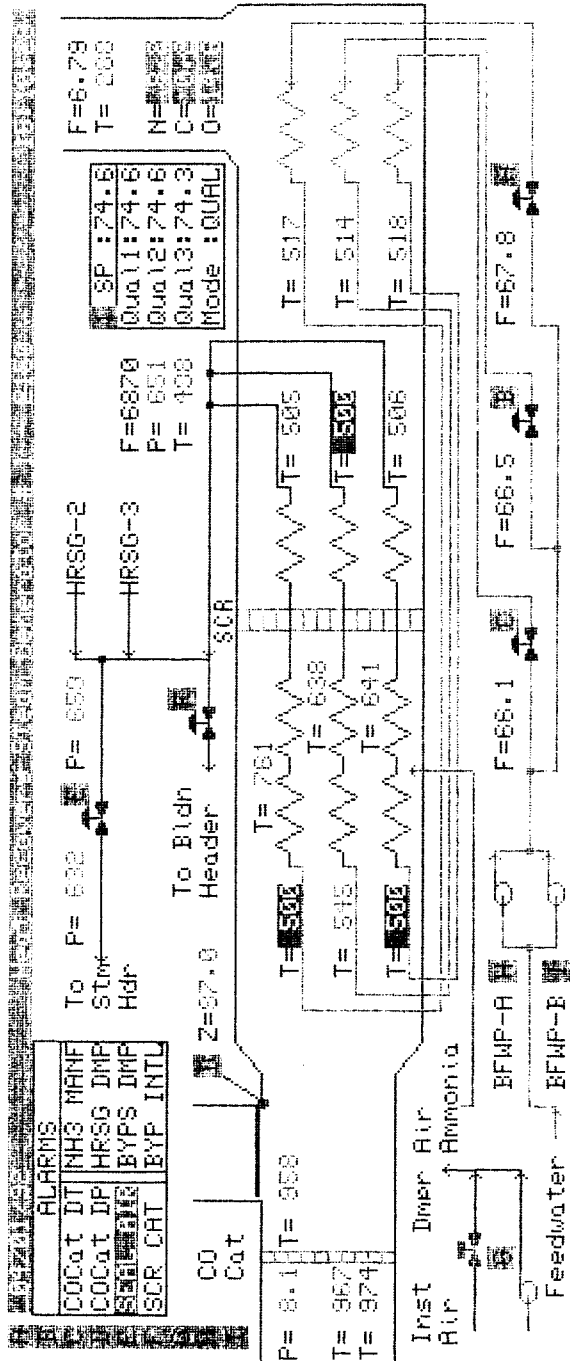
10,773 #/hr

ALARMS & SHUTDOWNS		ALARMS & SHUTDOWNS	
Gas Gen Speed 9537	LOCAL EMER STOP	TURB LOW OIL PRS	STATOR TEMP A1
Pwr Trb Speed 3602	REMOTE EMER STOP	TURB LOW OIL TMP	STATOR TEMP A2
Gen MW Output 21.1	FIRE	TRB ACC GBOX TMP	STATOR TEMP B1
Gen Megavar Out 0.00	FAIL TO CRANK	AIR IN FILT D.P.	STATOR TEMP B2
Gen Voltage 13.3	FAIL TO IGNITE	SCV OIL FILT DP	STATOR TEMP C1
Gen Amperease 937	FLAME OUT	GEN LOW OIL PRS	STATOR TEMP C2
Turb L.O. Press 50.5	TURBINE OVERTEMP	GEN LOW OIL TMP	HALON
Turb L.O. Temp 145	PT FAIL TO ACCEL	GEN BRG D.E. TMP	TRB ROOM LFL
Trb Scv oil Prs 7.0	GAS GEN UNDERSPD	GEN OIL D.E. TMP	GEN ROOM LFL
Gen L.O. Press 29.8	PWR TRB UNDERSPD	GEN BRG X.E. TMP	120 VOLT BATTERY
Gen L.O. Temp 140	VIBRATN SYS MALF	GEN OIL X.E. TMP	24 VOLT BATTERY
Fuel Gas Flow 10753	FUEL GAS PRS HI	SUMP A SCVU TEMP	START SYS SUMMRY
Inj Water Flow 8457	GOVERNOR SYSTEM	SUMP B SCVU TEMP	UPS FAILURE
Inj Water Ratio 0.79	TRBN LOCKOUT RLY	SUMP C SCVU TEMP	AC OIL PUMP FAIL
Fuel Manfld Prs 287	HIGH VIBRATION	SUMP D SCVU TEMP	DC OIL PUMP FAIL
Inj Manfld Prs 262	GAS GEN OVERSPD	GEN ENCL AIR TEMP	AUX OIL PUMP
Comp Inlet Temp 64.1	PWR TRB OVERSPD	TRB ENCL AIR TEMP	GEN FAIL TO SYNC
Comp Disch Prs 259	START OVER TEMP	GEN AIR OUT TEMP	UTIL FAIL SYNC
Gas Supply Prs 413		EXCITER AIR TEMP	
Gas Supply Tmp 71.2			

COPY IN PROGRESS

DIAGRAM NUMBER: 2150 VERSION: 3

DATE: 04/01/92 TIME: 15:10:32



COPY IN PROGRESS

Emissions and Performance

7:44:50									
Emissions and Performance									
NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3									
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1									
unit	ppm	lb/hr	15 min	1-hr	2-hr	lb/hr	lb/hr	ess	injection ratio
1	0	0.00	0.00	0.00	0.00	14.7	6.19	227.06	0.74
2	4	0.01	0.47	0.48	0.49	15.0	4.63	46.17	0.83
3	5	0.01	0.57	0.58	0.58	15.2	4.86	45.33	0.82

Emissions and Performance

7:59:50									
Emissions and Performance									
NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3									
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1									
unit	ppm	lb/hr	15 min	1-hr	2-hr	lb/hr	lb/hr	ess	injection ratio
1	0	0.00	0.00	0.00	0.00	14.7	6.19	227.25	0.74
2	5	0.01	0.49	0.48	0.49	15.0	4.60	45.97	0.83
3	6	0.01	0.60	0.58	0.58	15.2	4.88	45.18	0.82

8:01:20 START: calibration analyzers

Analyzer calibration for units 1-2-3

Readings in ppm (pct for O2) span ratio to nominal; zero difference from nominal in pct FS

8:07:10									
Analyzer calibration for units 1-2-3									
gas	ndes1	rdna2	ratio	drift	limit	xc	diff	drift	limit
O2	14.8	-0.0	0.998	0.13	1.2	0.038	-0.04	1.2	1.2
CO	25.8	1.1	1.229	-0.59	2.5	-1.345	-0.11	1.2	1.2
NOx	0.2	63.8	0.949	-0.23	1.2	-0.209	0.04	1.2	1.2

8:07:17 STOP: calibration analyzers

Emissions and Performance

8:29:50									
Emissions and Performance									
NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3									
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1									
unit	ppm	lb/hr	15 min	1-hr	2-hr	lb/hr	lb/hr	ess	injection ratio
1	0	0.00	0.00	0.00	0.00	14.7	6.19	227.06	0.74
2	4	0.01	0.47	0.48	0.49	15.0	4.63	46.17	0.83
3	5	0.01	0.57	0.58	0.58	15.2	4.86	45.33	0.82

unit	CO				NOx				injection			
	ppm		lb/hr		lb/hr		lb/hr		water		ratio	
	uncorr	corr	15 min	1-hr	2-hr	15 min	1-hr	2-hr	\$/hr	oil	\$/hr	ratio
1	0	0	0.00	0.00	0.00	6.69	6.46	5.85	0.03	228.14	0.00	0.75
2	5	5	0.01	0.50	0.49	4.55	4.59	4.60	0.10	45.86	0.00	0.53
3	6	6	0.01	0.60	0.59	4.67	4.78	4.87	0.10	45.14	0.00	0.82

Shell Western E & P - S. E. Kern River - Enhanced Recovery Oil Field Support Facility 8/29/57 Wednesday, April 1, 1992

Emissions and Performance

NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1

unit	CO				NOx				injection			
	ppm		lb/hr		lb/hr		lb/hr		water		ratio	
	uncorr	corr	15 min	1-hr	2-hr	15 min	1-hr	2-hr	\$/hr	oil	\$/hr	ratio
1	0	0	0.00	0.00	0.00	6.69	6.46	5.85	0.03	228.14	0.00	0.75
2	5	5	0.01	0.50	0.49	4.55	4.59	4.60	0.10	45.86	0.00	0.53
3	6	6	0.01	0.60	0.59	4.67	4.78	4.87	0.10	45.14	0.00	0.82

Emissions and Performance

NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1

unit	CO				NOx				injection			
	ppm		lb/hr		lb/hr		lb/hr		water		ratio	
	uncorr	corr	15 min	1-hr	2-hr	15 min	1-hr	2-hr	\$/hr	oil	\$/hr	ratio
1	0	0	0.00	0.00	0.00	6.69	6.46	5.85	0.03	228.14	0.00	0.75
2	5	5	0.01	0.50	0.49	4.55	4.59	4.60	0.10	45.86	0.00	0.53
3	6	6	0.01	0.60	0.59	4.67	4.78	4.87	0.10	45.14	0.00	0.82

Emissions and Performance

NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1

unit	CO				NOx				injection			
	ppm		lb/hr		lb/hr		lb/hr		water		ratio	
	uncorr	corr	15 min	1-hr	2-hr	15 min	1-hr	2-hr	\$/hr	oil	\$/hr	ratio
1	0	0	0.00	0.00	0.00	6.69	6.46	5.85	0.03	228.14	0.00	0.75
2	5	5	0.01	0.50	0.49	4.55	4.59	4.60	0.10	45.86	0.00	0.53
3	6	6	0.01	0.60	0.59	4.67	4.78	4.87	0.10	45.14	0.00	0.82

RA Testing
Begin Run #1

unit	ppm	lbs/hr	15 min	1-hr	2-hr	lb/hr	15 min	1-hr	2-hr	lb/hr	mmbtu	gas	oil	water	injection
1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	229.15	0.00	7507.5	0.75
2	5	0.01	0.49	0.50	0.49	0.01	0.49	0.49	0.49	0.01	0.10	45.81	0.00	1659.0	0.83
3	6	0.01	0.57	0.59	0.58	0.01	0.57	0.59	0.58	0.01	0.10	45.23	0.00	1517.5	0.82

$O_2 = 14.7\%$
 $NO_x = 8 \text{ ppm}, 6.34 \text{ \# / hr}$
 $CO = 0 \text{ ppm}, 0.00 \text{ \# / hr}$

Emissions and Performance

NO_x gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3
 CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1

End Run # 1

Shell Western E & P - S. E. Kern River - Enhanced Recovers Oil Field Support Facility 9:29:53 Wednesday, April 1, 1992

unit	ppm	lbs/hr	15 min	1-hr	2-hr	lb/hr	15 min	1-hr	2-hr	lb/hr	mmbtu	gas	oil	water	injection
1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	229.43	0.00	7551.1	0.75
2	5	0.01	0.47	0.49	0.49	0.01	0.47	0.49	0.49	0.01	0.10	45.85	0.00	1659.0	0.83
3	6	0.01	0.57	0.58	0.59	0.01	0.57	0.58	0.59	0.01	0.11	45.23	0.00	1618.8	0.82

Emissions and Performance

NO_x gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3
 CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1

unit	ppm	lbs/hr	15 min	1-hr	2-hr	lb/hr	15 min	1-hr	2-hr	lb/hr	mmbtu	gas	oil	water	injection
1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	229.92	0.00	7561.3	0.75
2	5	0.01	0.48	0.48	0.49	0.01	0.48	0.48	0.49	0.01	0.10	45.86	0.00	1662.0	0.83
3	6	0.01	0.58	0.58	0.59	0.01	0.58	0.59	0.59	0.01	0.11	45.38	0.00	1621.4	0.82

Emissions and Performance

NO_x gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3
 CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1

unit	ppm	lbs/hr	15 min	1-hr	2-hr	lb/hr	15 min	1-hr	2-hr	lb/hr	mmbtu	gas	oil	water	injection
1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	230.28	0.00	7600.0	0.75
2	5	0.01	0.48	0.48	0.49	0.01	0.48	0.48	0.49	0.01	0.10	45.86	0.00	1655.8	0.83
3	6	0.01	0.59	0.58	0.59	0.01	0.59	0.58	0.59	0.01	0.10	45.23	0.00	1624.3	0.82

Begin Run #2

unit	uncorr	corr	mbbtu	15 min	1-hr	2-hr	lb/hr	15 min	1-hr	2-hr	mbbtu	gas	oil	water	injection
1	0	0	0.00	0.00	0.00	0.00	14.7	14.7	7	7	0.03	225.22	0.00	7519.3	0.75
2	4	4	0.01	0.45	0.47	0.48	15.0	15.0	27	27	0.10	43.65	0.00	1652.8	0.83
3	5	6	0.01	0.57	0.58	0.58	15.2	15.2	27	28	0.10	45.11	0.00	1627.6	0.83

10:44:50

Emissions and Performance

NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1

unit	uncorr	corr	lbs/	15 min	1-hr	2-hr	lb/hr	15 min	1-hr	2-hr	mbbtu	gas	oil	water	injection
1	0	0	0.00	0.00	0.00	0.00	14.7	14.7	8	7	0.03	234.54	0.00	7767.7	0.75
2	5	5	0.01	0.48	0.47	0.48	15.0	15.0	26	26	0.10	43.65	0.00	1651.3	0.83
3	6	6	0.01	0.57	0.58	0.58	15.2	15.2	27	28	0.10	45.03	0.00	1629.4	0.83

10:59:50

Emissions and Performance

NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1

unit	uncorr	corr	lbs/	15 min	1-hr	2-hr	lb/hr	15 min	1-hr	2-hr	mbbtu	gas	oil	water	injection
1	0	0	0.00	0.00	0.00	0.00	14.4	14.4	9	8	0.03	247.19	0.00	5534.1	0.79
2	5	5	0.01	0.47	0.47	0.47	15.0	15.0	27	27	0.10	45.55	0.00	1647.8	0.83
3	6	6	0.01	0.57	0.58	0.58	15.2	15.2	27	28	0.10	44.91	0.00	1624.2	0.83

11:14:50

Emissions and Performance

NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1

unit	uncorr	corr	lbs/	15 min	1-hr	2-hr	lb/hr	15 min	1-hr	2-hr	mbbtu	gas	oil	water	injection
1	0	0	0.00	0.00	0.00	0.00	14.4	14.4	8	8	0.03	246.61	0.00	8507.6	0.79
2	5	5	0.01	0.48	0.47	0.47	15.0	15.0	26	26	0.10	45.58	0.00	1654.5	0.83
3	6	6	0.01	0.57	0.57	0.57	15.2	15.2	27	28	0.10	44.92	0.00	1623.1	0.83

End Run #3

O₂ = 14.47%
NO_x = 9ppm, 7.06 #/hr
CO = 0ppm, 0.00 #/hr

Emissions and Performance

11:29:50

NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1

unit	CO			NOx			ambtu/hr			injection		
	ppm	uncorr	corr	lbs/hr	15 min	1-hr	2-hr	ss	oil	\$/hr	ratio	ratio
1	0	0	0	0.00	0.00	0.00	0.00	247.16	0.00	5505.3	0.79	0.79
2	4	4	27	0.46	0.47	0.47	0.47	45.60	0.00	1646.5	0.83	0.83
3	5	5	27	0.57	0.57	0.57	0.57	44.95	0.00	1623.0	0.83	0.83

Begin Run #4

Emissions and Performance

11:44:50

NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1

unit	CO			NOx			ambtu/hr			injection		
	ppm	uncorr	corr	lbs/hr	15 min	1-hr	2-hr	ss	oil	\$/hr	ratio	ratio
1	0	0	7	0.00	0.00	0.00	0.00	247.47	0.00	5522.6	0.79	0.79
2	5	5	26	0.48	0.47	0.47	0.47	45.64	0.00	1653.7	0.83	0.83
3	5	5	27	0.56	0.57	0.57	0.57	44.95	0.00	1622.2	0.83	0.83

O₂ = 14.35%

Emissions and Performance

11:59:50

NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1

NO_x = 8 ppm, 6.34 #/hr
CO = 0 ppm, 0.00 #/hr

unit	CO			NOx			ambtu/hr			injection		
	ppm	uncorr	corr	lbs/hr	15 min	1-hr	2-hr	ss	oil	\$/hr	ratio	ratio
1	0	0	7	0.00	0.00	0.00	0.00	247.22	0.00	5564.5	0.79	0.79
2	4	4	27	0.46	0.46	0.46	0.46	45.75	0.00	1652.7	0.83	0.83
3	5	5	27	0.57	0.57	0.57	0.57	45.03	0.00	1621.5	0.82	0.82

End-Run #4

Emissions and Performance

12:14:50

NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1

unit	CO			NOx			ambtu/hr			injection		
	ppm	uncorr	corr	lbs/hr	15 min	1-hr	2-hr	ss	oil	\$/hr	ratio	ratio
1	0	0	7	0.00	0.00	0.00	0.00	247.22	0.00	5564.5	0.79	0.79
2	4	4	27	0.46	0.46	0.46	0.46	45.75	0.00	1652.7	0.83	0.83
3	5	5	27	0.57	0.57	0.57	0.57	45.03	0.00	1621.5	0.82	0.82

unit	uncorr	corr	lbs/hr	lb/hr	15 min	1-hr	2-hr	mmbtu	gas	oil	water	injection
1	0	0	0.00	0.00	0.00	0.00	0.00	0.03	247.50	0.00	8544.1	0.79
2	5	5	0.01	0.46	0.46	0.47	0.42	0.10	45.61	0.00	1651.8	0.83
3	5	6	0.01	0.57	0.57	0.57	0.42	0.10	44.96	0.00	1622.3	0.83

Shell Western E & P - S. E. Kern River - Enhanced Recovery Oil Field Support Facility

Wednesday, April 1, 1992

12:14:57

12:29:50

Emissions and Performance

NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3												
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1												

unit	uncorr	corr	lbs/hr	lb/hr	15 min	1-hr	2-hr	mmbtu	gas	oil	water	injection
1	0	0	0.00	0.00	0.00	0.00	0.00	0.02	247.12	0.00	8533.6	0.79
2	5	5	0.01	0.46	0.46	0.47	0.42	0.10	45.61	0.00	1645.8	0.83
3	6	6	0.01	0.58	0.57	0.57	0.42	0.10	45.00	0.00	1623.8	0.83

12:44:50

Emissions and Performance

NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3												
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1												

12:59:50

Emissions and Performance

NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3												
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1												

13:14:50

Emissions and Performance

NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3												
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1												

13:14:50

Emissions and Performance

unit	uncorr	corr	lbs/hr	lb/hr	15 min	1-hr	2-hr	mmbtu	gas	oil	water	injection
1	0	0	0.00	0.00	0.00	0.00	0.00	0.02	243.14	0.00	8273.6	0.78
2	4	4	0.01	0.45	0.47	0.47	0.41	0.10	45.57	0.00	1547.0	0.83
3	6	6	0.01	0.58	0.58	0.57	0.41	0.10	44.99	0.00	1622.0	0.82

End Run #5

$O_2 = 14.45\%$
 $NO_x = 7ppm, 5.81 \text{ \#}/hr$
 $CO = 0ppm, 0.00 \text{ \#}/hr$

unit	CO			NOx			SOx			H2S			NH3			H2O			Injection		
	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr

Begin Run#7

Emissions and Performance

unit	CO			NOx			SOx			H2S			NH3			H2O			Injection		
	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr
	1	0	0	15 min	0.00	0.00	1-hr	0.00	0.00	2-hr	0.00	0.00	15 min	0.00	0.00	1-hr	0.00	0.00	1-hr	0.00	0.00
2	0	0	0	0.00	0.00	0.00	1-hr	0.00	0.00	2-hr	0.00	0.00	15 min	0.00	0.00	1-hr	0.00	0.00	1-hr	0.00	0.00
3	0	0	0	0.00	0.00	0.00	1-hr	0.00	0.00	2-hr	0.00	0.00	15 min	0.00	0.00	1-hr	0.00	0.00	1-hr	0.00	0.00

CO = 0 ppm, 0.00 #/hr
 NOx = 7 ppm, 6.03 #/hr
 SOx = 0 ppm, 0.00 #/hr

Emissions and Performance

unit	CO			NOx			SOx			H2S			NH3			H2O			Injection		
	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr
	1	0	0	15 min	0.00	0.00	1-hr	0.00	0.00	2-hr	0.00	0.00	15 min	0.00	0.00	1-hr	0.00	0.00	1-hr	0.00	0.00
2	0	0	0	0.00	0.00	0.00	1-hr	0.00	0.00	2-hr	0.00	0.00	15 min	0.00	0.00	1-hr	0.00	0.00	1-hr	0.00	0.00
3	0	0	0	0.00	0.00	0.00	1-hr	0.00	0.00	2-hr	0.00	0.00	15 min	0.00	0.00	1-hr	0.00	0.00	1-hr	0.00	0.00

End Run#7

Emissions and Performance

unit	CO			NOx			SOx			H2S			NH3			H2O			Injection		
	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr	unit	uncorr	corr
	1	0	0	15 min	0.00	0.00	1-hr	0.00	0.00	2-hr	0.00	0.00	15 min	0.00	0.00	1-hr	0.00	0.00	1-hr	0.00	0.00
2	0	0	0	0.00	0.00	0.00	1-hr	0.00	0.00	2-hr	0.00	0.00	15 min	0.00	0.00	1-hr	0.00	0.00	1-hr	0.00	0.00
3	0	0	0	0.00	0.00	0.00	1-hr	0.00	0.00	2-hr	0.00	0.00	15 min	0.00	0.00	1-hr	0.00	0.00	1-hr	0.00	0.00

Emissions and Performance									
unit	uncorr	corr	lbs/hr	15 min	1-hr	2-hr	lb/hr	mmbtu	ratio
1	0	0	0.00	0.00	0.00	0.00	0.00	0.02	0.78
2	5	5	0.01	0.48	0.47	0.47	0.09	0.09	0.53
3	6	6	0.01	0.59	0.58	0.58	0.10	0.10	0.53
14:44:50									
Emissions and Performance									
NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3									
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1									
unit	uncorr	corr	lbs/hr	15 min	1-hr	2-hr	lb/hr	mmbtu	ratio
1	0	0	0.00	0.00	0.00	0.00	0.03	0.03	0.79
2	5	5	0.01	0.48	0.47	0.47	0.09	0.09	0.53
3	6	6	0.01	0.59	0.58	0.58	0.10	0.10	0.53
14:59:50									
Emissions and Performance									
NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3									
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1									
unit	uncorr	corr	lbs/hr	15 min	1-hr	2-hr	lb/hr	mmbtu	ratio
1	0	0	0.00	0.00	0.00	0.00	0.03	0.03	0.79
2	5	5	0.01	0.48	0.47	0.47	0.09	0.09	0.53
3	6	6	0.01	0.59	0.58	0.58	0.10	0.10	0.53
15:14:50									
Emissions and Performance									
NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3									
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1									
unit	uncorr	corr	lbs/hr	15 min	1-hr	2-hr	lb/hr	mmbtu	ratio
1	0	0	0.00	0.00	0.00	0.00	0.03	0.03	0.79
2	5	5	0.01	0.48	0.47	0.47	0.09	0.09	0.53
3	6	6	0.01	0.59	0.58	0.58	0.10	0.10	0.53
15:29:50									
Emissions and Performance									
NOx gas limit - Turb 1: 13.1 - Turb 2: 8.3 - Turb 3: 8.3									
CO gas limit - Turb 1: 6.4 - Turb 2: 5.1 - Turb 3: 5.1									
unit	uncorr	corr	lbs/hr	15 min	1-hr	2-hr	lb/hr	mmbtu	ratio
1	0	0	0.00	0.00	0.00	0.00	0.03	0.03	0.79
2	5	5	0.01	0.48	0.47	0.47	0.09	0.09	0.53
3	6	6	0.01	0.59	0.58	0.58	0.10	0.10	0.53

Begin Run #8

Shell Western E & P - S. E. Kern River - Enhanced Recovery Oil Field Support Facility 15:00:00 Wednesday April 17 1992

End Run #8

O₂ = 14.5 %
 NO_x = 8 ppm, 6.11 #/hr
 CO = 0 ppm, 0.00 #/hr

Emissions and Performance

15:29:50

Start Run #9

Emissions and Performance

5/14/56

unit	CO				NOx				gas limit		Turb 1:		Turb 2:		Turb 3:		water \$/hr	injection ratio
	lbs/hr				lb/hr				lb/hr		lb/hr		lb/hr					
	uncorr	corr	15 min	1-hr	2-hr	uncorr	corr	15 min	1-hr	2-hr	uncorr	corr	15 min	1-hr	2-hr	uncorr	corr	
1	0	0	0.00	0.00	0.00	7	7	5.88	3.98	5.92	0.02	0.02	243.00	0.00	0.00	2437.8	0.79	
2	5	5	0.01	0.48	0.47	25	26	4.24	4.27	4.32	0.09	0.09	45.29	0.00	0.00	1535.8	0.83	
3	6	6	0.01	0.59	0.58	26	27	4.43	4.52	4.55	0.10	0.10	44.80	0.00	0.00	1520.2	0.83	

15:14:50

Emissions and Performance

5:29:50																											
unit	CO						NOx						gas limit		Turb 1:		Turb 2:		Turb 3:		mmbtu/hr gas oil	water \$/hr	injection ratio				
	ppm			lbs/hr			15 min			1-hr			2-hr		uncorr		corr		15 min					1-hr		2-hr	
	uncorr	corr	lbs/hr	15 min	1-hr	2-hr	uncorr	corr	15 min	1-hr	2-hr	uncorr	corr	15 min	1-hr	2-hr	uncorr	corr	15 min	1-hr				2-hr	uncorr	corr	15 min
1	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	8	7	6.21	6.06	5.98	0.03	0.03	244.71	0.00	0.00	8373.0	0.79				
2	5	5	0.01	0.47	0.47	0.47	26	26	4.24	4.27	4.29	26	26	4.24	4.27	4.29	0.09	0.09	45.27	0.00	0.00	1541.2	0.83				
3	6	6	0.01	0.57	0.58	0.58	27	28	4.51	4.51	4.54	27	28	4.51	4.51	4.54	0.10	0.10	44.76	0.00	0.00	1516.5	0.83				
D2 = 14.4%																											

O₂ = 14.4%

NO_x = 8 ppm, 6.05 #/hr

CO = 0 ppm, 0.00 #/hr

End Run #9

Missions and Performance

[illegible]

Emissions and Performance

[illegible]

100

[illegible]
$$\begin{aligned} \text{NO}_x &= 8 \text{ ppm}, 6.26 \text{ \# / hr} \\ \text{CO} &= 0 \text{ ppm}, 0.00 \text{ \# / hr} \end{aligned}$$

2015-01-01

unit	CO				NOx				lb/ ambr/hr	water t/hr	injection ratio
	uncorr	corr	lbs/ ambr/hr	lb/hr	15 min	1-hr	2-hr	lb/ ambr/hr			
1	0	0	0.00	0.00	0.00	0.00	0.00	0.03	sss	oil	0.79
2	4	5	0.01	0.46	0.46	4.29	4.28	0.09	45.13	0.00	0.83
3	5	6	0.01	0.55	0.57	4.49	4.51	0.10	44.69	0.00	0.83

End Run #10

Emissions and Performance

Emissions and Fuel Consumption		16:29:50	
NOx	ees limit - Turb 1:	13.1	- Turb 2:
		5.5	- Turb 3:
CO	ees limit - Turb 1:	6.4	- Turb 2:
		5.1	- Turb 3:
		5.9	
		5.1	

modulær

10

unit	CP des limit - Turb-1				5' - Turb 2				5' - Turb 3				mmbtu/hr		water #/hr	injection ratio
	ppm		lb/hr		ppm		lb/hr		ppm		lb/hr		gas	oil		
	uncorr	corr	15 min	1-hr	uncorr	corr	15 min	1-hr	uncorr	corr	15 min	1-hr				
1	0	0	0.00	0.00	0	8	6.26	6.22	7	6.26	6.22	6.15	243.81	0.00	8351.0	0.78
2	5	5	0.01	0.47	26	26	4.27	4.30	26	4.27	4.30	4.28	45.10	0.00	1627.4	0.83
3	6	6	0.01	0.57	27	27	4.51	4.51	28	4.51	4.51	4.51	44.66	0.00	1610.1	0.82

SECTION 8
QUALITY ASSURANCE

SECTION 8

QUALITY ASSURANCE

This report has been reviewed for technical and editorial quality and for compliance with project requirements.

The analyzers employed for continuous monitoring of NO_x, CO, CO₂, and O₂ were California Air Resources Board (CARB) approved instruments. Sampling system bias checks of the continuous monitor sampling system was performed using either the EPA protocol 1 or NIST certified calibration gases (certificate copies included). All other checks of the continuous monitor system required by the regulatory agency methodology were also performed.

All field samples were labeled and logged in on a chain-of-custody sheet. Chain-of-custody sheets remained with samples and documented sample movement.

SAMPLE SYSTEM BIAS CHECK

COMPANY SWEPI-SEK
TEST LOCATION HRSG UNIT 243

DATE 3-31-92
OPERATOR JP

Parameter	Instrument Full Scale	Span Gas Value	Scale	Internal Response	System Response	Percent Difference
O ₂	0-25%		Zero	0.5		
		13.99	Upscale	14.03	13.85	1.28
CO ₂	0-20%		Zero	0.0		
		8.22	Upscale	8.22	8.16	.73
NO _x	0-100ppm		Zero	0.0		
		43.8	Upscale	43.0	42.8	.47
CO	0-10ppm		Zero	0.0		
		8.83	Upscale	8.8	8.7	1.14
SO ₂			Zero			
			Upscale			
HC			Zero			
			Upscale			
			Zero			
			Upscale			

For EPA:

$$\text{Percent Difference} = [(\text{System Response} - \text{Internal Response}) / \text{Instrument Full Scale}] \times 100$$

✓ For Kern County:

$$\text{Percent Difference} = [(\text{Internal Response} - \text{System Response}) / \text{Internal Response}] \times 100$$

SAMPLE SYSTEM BIAS CHECK

COMPANY SWEDE - SEER

DATE 4-1-92

TEST LOCATION HRSG UNIT 1

OPERATOR JP & CM

Parameter	Instrument Full Scale	Span Gas Value	Scale	Internal Response	System Response	Percent Difference
O2	0-25%		Zero	0.0		
		13.99	Upscale	13.99	13.75	1.72
CO2	0-20%		Zero	0.0		
		8.22	Upscale	8.22	8.22	0
NOx	0-25 ppm		Zero	0.0		
		23.25	Upscale	23.25	23.05	.86
CO	0-20 ppm		Zero	0.0		
		12.00	Upscale	12.00	12.2	-1.67
SO2			Zero			
			Upscale			
HC			Zero			
			Upscale			
			Zero			
			Upscale			

For EPA :

Percent Difference = $[(\text{System Response} - \text{Internal Response}) / \text{Instrument Full Scale}] \times 100$

✓ For Kern County :

Percent Difference = $[(\text{Internal Response} - \text{System Response}) / \text{Internal Response}] \times 100$



2001 THIRD ST. • UNIT H • RIVERSIDE, CA 92507
TELEPHONE (714) 781-1240

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

ENSIØ1

TO:

NIK NIELSEN
ENGINEERING SCIENCES, INC.
P.O. BOX 2007
IRVINDALE, CA 91706

DATE : 12/23/91

CUSTOMER ORDER NUMBER: V: NICK NIELSEN

PAGE 1

COMPONENT	CONCENTRATION (v/v)	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CC104249					
Nitric Oxide	43.8 ± 0.4 ppm	GMIS	Monitor Labs Model 0440		12/12/91	12/19/91
		Cylinder #	S/N 136	05/19/93	43.6 ppm	43.6 ppm
Nitrogen, O2-Free Balance		CC99513	Continuous		43.9 ppm	43.7 ppm
Cylinder Pressure: 2000 psig		649.1 ppm	Chemiluminescence		43.8 ppm	43.8 ppm
			Last Cal Date: 11/25/91	Mean:	43.8 ppm	43.8 ppm

$$\text{ppm} = \mu\text{mole/mole}$$

$t = \text{mole-}\%$

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

Analyst:

B.E. Gross

Approved:

J.T. Marrin

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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS



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

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

ENSIØ1

TO:

D.J. WYMAN
ENGINEERING SCIENCES, INC.
P.O. BOX 2007
IRVINDALE, CA 91706

DATE : 10/04/91

CUSTOMER ORDER NUMBER: FI-1216-24

PAGE 1

COMPONENT	CONCENTRATION (v/v)	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.: CC60282					
Oxygen	13.99 ± 0.14 %	GMIS	Varian Model 1860 S/N None	04/01/93	10/01/91 13.99 %
		Cylinder #	Thermal Conductivity		13.98 %
		CC12233	Gas Chromatography		13.98 %
		@ 23.89 %	Last Cal Date: 10/04/91	Mean:	13.99 %
Carbon Dioxide	8.22 ± 0.08 %	GMIS	Varian Model 1860 S/N None	04/03/93	10/03/91 8.21 %
		Cylinder #	Thermal Conductivity		8.21 %
Nitrogen	Balance	CC60261	Gas Chromatography		8.23 %
Cylinder Pressure: 2000 psig		@ 17.60 %	Last Cal Date: 08/21/91	Mean:	8.22 %
CYLINDER NO.: CC192					
Nitric Oxide	89.9 ± 0.9 ppm	GMIS	Monitor Labs Model 8440 S/N 136	04/01/92	09/24/91 10/01/91 89.7 ppm 90.0 ppm
		Cylinder #	Continuous		89.7 ppm 90.1 ppm
		CC88860	Chemiluminescence		89.9 ppm 89.9 ppm
		@ 107.5 ppm	Last Cal Date: 02/07/91	Mean:	89.8 ppm 89.8 ppm
Carbon Monoxide	47.4 ± 0.5 ppm	GMIS	Carle Insts Model 8000 S/N 8249	04/03/92	09/19/91 10/03/91 47.0 ppm 47.7 ppm
		Cylinder #	Methanation/FID		47.4 ppm 47.1 ppm
Nitrogen, O2-Free Balance		CC12564	Gas Chromatography		47.4 ppm 47.7 ppm
Cylinder Pressure: 2000 psig		@ 42.4 ppm	Last Cal Date: 07/19/91	Mean:	47.3 ppm 47.5 ppm

ppm = umole/mole t = mole-t

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

Analyst:

M.J. Monson

Approved:

J.T. Marrin

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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

REPORT OF ANALYSIS

CUSTOMER ORDER NUMBER: FI-1144-26

PAGE 2

COMPONENT	CONCENTRATION (v/v)	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.: CC12823					
Carbon Monoxide	8.83 ± 0.18 ppm	GMIS	Carle Insts Model 8000 S/N 8249	10/02/92	03/25/91 04/02/91 8.89 ppm 0.00 ppm
Nitrogen	Balance	Cylinder #	Methanation/FID		8.86 ppm 8.79 ppm
Cylinder Pressure: 2000 psig		CC163	Gas Chromatography		8.88 ppm 8.82 ppm
		@ 9.85 ppm	Last Cal Date: 04/16/91	Mean: 0.05 ppm	8.88 ppm
CYLINDER NO.: CC56894					
Nitric Oxide	9.29 ± 0.19 ppm	GMIS	Monitor Labs Model 8440 S/N 136	10/02/91	03/26/91 04/02/91 9.27 ppm 9.27 ppm
Nitrogen, O2-Free Balance		Cylinder #	Continuous		9.28 ppm 9.29 ppm
Cylinder Pressure: 2000 psig		CC7305	Chemiluminescence		9.34 ppm 9.28 ppm
		@ 10.03 ppm	Last Cal Date: 01/11/91	Mean: 9.35 ppm	9.28 ppm
CYLINDER NO.: CC28278					
Nitric Oxide	13.17 ± 0.26 ppm	GMIS	Monitor Labs Model 8440 S/N 136	10/02/91	03/26/91 04/02/91 13.21 ppm 13.14 ppm
		Cylinder #	Continuous		13.15 ppm 13.10 ppm
		CC28063	Chemiluminescence		13.23 ppm 13.08 ppm
		@ 19.31 ppm	Last Cal Date: 01/31/91	Mean: 13.20 ppm	13.13 ppm
Carbon Monoxide	13.05 ± 0.26 ppm	GMIS	Carle Insts Model 8000 S/N 8249	10/03/91	03/27/91 04/03/91 13.16 ppm 13.04 ppm
Nitrogen, O2-Free Balance		Cylinder #	Methanation/FID		13.02 ppm 13.02 ppm
Cylinder Pressure: 2000 psig		CC12168	Gas Chromatography		12.94 ppm 13.08 ppm
		@ 17.79 ppm	Last Cal Date: 04/16/91	Mean: 13.04 ppm	13.05 ppm

$$\text{ppm} = \text{umole/mole}$$

% = mole-%

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

REPORT OF ANALYSIS

CUSTOMER ORDER NUMBER: VERBAL C.HOLT

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XX					
COMPONENT	CONCENTRATION (v/v)	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.: CC12333					
Oxygen	2.950 ± 0.030 %	GMIS	Varian Model 1868 S/N None	03/16/93	09/16/91 2.956 %
		Cylinder #	Thermal Conductivity		2.935 %
		CC81219	Gas Chromatography		2.968 %
		@ 5.12 %	Last Cal Date: 10/24/91		Mean: 2.956 %
Carbon Dioxide	2.740 ± 0.027 %	GMIS	Varian Model 1868 S/N None	03/09/93	09/09/91 2.738 %
		Cylinder #	Thermal Conductivity		2.738 %
Nitrogen	Balance	CC28297	Gas Chromatography		2.743 %
Cylinder Pressure: 2000 psig		@ 7.48 %	Last Cal Date: 08/21/91		Mean: 2.748 %
CYLINDER NO.: CC81147					
Oxygen	3.00 ± 0.03 %	GMIS	Varian Model 1868 S/N None	03/16/93	09/16/91 2.983 %
		Cylinder #	Thermal Conductivity		3.00 %
		CC81219	Gas Chromatography		3.03 %
		@ 5.12 %	Last Cal Date: 10/24/91		Mean: 3.00 %
Carbon Dioxide	2.811 ± 0.028 %	GMIS	Varian Model 1868 S/N None	03/09/93	09/09/91 2.811 %
		Cylinder #	Thermal Conductivity		2.800 %
Nitrogen	Balance	CC28297	Gas Chromatography		2.815 %
Cylinder Pressure: 2000 psig		@ 7.48 %	Last Cal Date: 08/21/91		Mean: 2.811 %
CYLINDER NO.: CC67257					
Oxygen	20.90 ± 0.21 %	GMIS	Varian Model 1868 S/N None	03/17/93	09/17/91 20.95 %
		Cylinder #	Thermal Conductivity		20.91 %
Ultrazero Air	Balance	CC12233	Gas Chromatography		20.84 %
Cylinder Pressure: 2000 psig		@ 23.89 %	Last Cal Date: 10/24/91		Mean: 20.90 %
CYLINDER NO.: CC28515					
Oxygen	20.94 ± 0.21 %	GMIS	Varian Model 1868 S/N None	03/17/93	09/17/91 20.98 %
		Cylinder #	Thermal Conductivity		21.02 %
Ultrazero Air	Balance	CC12233	Gas Chromatography		20.89 %
Cylinder Pressure: 2000 psig		@ 23.89 %	Last Cal Date: 10/24/91		Mean: 20.94 %

ppm = umole/mole % = mole-%

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



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

REPORT OF ANALYSIS
EPA PROTOCOL GAS MIXTURES

ENSI01
TO: D.J. WYMAN
ENGINEERING SCIENCE, INC.
6060 N. IRWINDALE AVE.
SUITE J
IRWINDALE, CA 91706-

DATE : 03/05/22

CUSTOMER ORDER NUMBER: NICK NIELSEN

PAGE 1

COMPONENT	CONCENTRATION (v/v)	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA	
CYLINDER NO.:	CC108778					
Carbon Monoxide	23.36 ± 0.23 ppm	OWS Cylinder # CC12564 @ 42.2 ppm	Carle Instr Model 0808 S/N 8240 Methanation/PID Gas Chromatography Last Cal Date: 01/29/92	02/04/92	02/26/92 23.67 ppm	03/04/92 23.48 ppm
					23.18 ppm	23.21 ppm
					23.36 ppm	23.35 ppm
				Mean:	23.48 ppm	23.31 ppm
Nitric Oxide	23.25 ± 0.23 ppm	OWS Cylinder #	Monitor Labs Model 8448 S/N 126 Continuous	02/04/92	02/26/92 23.28 ppm	03/04/92 23.22 ppm
					23.17 ppm	23.15 ppm
Nitrogen, O2-Free Balance		CC12081	Chemiluminescence		23.36 ppm	23.33 ppm
Cylinder Pressure: 2000 psig		@ 21.43 ppm	Last Cal Date: 02/26/92	Mean:	23.27 ppm	23.23 ppm

ppm = umole/mole

4 - mole-4

The above analyses were performed in accordance with EPA-1987 Traceability Protocol # 1, Section 3.6.4, Procedure G1.

Analyst:

Approved:

S.E. GROBE

J.T. Mallin

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

STANDARD CALIBRATION GASES IN ALUMINUM CYLINDERS

REPORT OF ANALYSIS

CUSTOMER ORDER NUMBER: V: N. NIELSEN

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COMPONENT	CONCENTRATION (v/v)	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	EXPIRATION DATE	REPLICATE ANALYSIS DATA
CYLINDER NO.: CC106802					
Nitric Oxide	90.7 ± 0.9 ppm	GMIS Cylinder # CC88868 @ 102.7 g	Monitor Labs Model 8440 S/N 136 Continuous Chemiluminescence Last Cal Date: 03/05/92	09/04/92	02/26/92 03/04/92 90.7 ppm 90.3 ppm 90.9 ppm 90.6 ppm 90.5 ppm 90.6 ppm Mean: 90.7 ppm 90.6 ppm
Carbon Monoxide	126.1 ± 1.3 ppm	GMIS Cylinder # CC87848 @ 277.1 g	Carle Insts Model 8000 S/N 8249 Methanation/FID Gas Chromatography Last Cal Date: 12/11/91	09/04/92	02/26/92 03/04/92 126.4 ppm 126.6 ppm 125.3 ppm 126.1 ppm 126.1 ppm 126.0 ppm Mean: 125.9 ppm 126.2 ppm
CYLINDER NO.: CC108782					
Nitric Oxide	12.05 ± 0.12 ppm	GMIS Cylinder # CC12981 @ 21.43 g	Monitor Labs Model 8440 S/N 136 Continuous Chemiluminescence Last Cal Date: 02/28/92	09/04/92	02/26/92 03/04/92 12.03 ppm 12.03 ppm 11.98 ppm 12.07 ppm 12.14 ppm 12.05 ppm Mean: 12.05 ppm 12.05 ppm
Carbon Monoxide	11.83 ± 0.24 ppm	GMIS Cylinder # CC12168 @ 17.73 g	Carle Insts Model 8000 S/N 8249 Methanation/FID Gas Chromatography Last Cal Date: 01/29/92	09/04/92	02/26/92 03/04/92 11.76 ppm 11.85 ppm 11.92 ppm 11.78 ppm 11.84 ppm 11.80 ppm Mean: 11.84 ppm 11.81 ppm
CYLINDER NO.: CC108779					
Nitric Oxide	12.10 ± 0.12 ppm	GMIS Cylinder # CC12981 @ 21.43 g	Monitor Labs Model 8440 S/N 136 Continuous Chemiluminescence Last Cal Date: 02/28/92	09/04/92	02/26/92 03/04/92 12.09 ppm 12.08 ppm 12.05 ppm 12.00 ppm 12.19 ppm 12.11 ppm Mean: 12.11 ppm 12.09 ppm
Carbon Monoxide	12.00 ± 0.24 ppm	GMIS Cylinder # CC12168 @ 17.73 g	Carle Insts Model 8000 S/N 8249 Methanation/FID Gas Chromatography Last Cal Date: 01/29/92	09/04/92	02/26/92 03/04/92 11.97 ppm 12.06 ppm 11.90 ppm 11.99 ppm 12.00 ppm 12.03 ppm Mean: 11.96 ppm 12.03 ppm
CYLINDER NO.: CC108778					
Nitric Oxide	23.25 ± 0.23 ppm	GMIS Cylinder # CC12981 @ 21.43 g	Monitor Labs Model 8440 S/N 136 Continuous Chemiluminescence Last Cal Date: 02/28/92	09/04/92	02/26/92 03/04/92 23.28 ppm 23.22 ppm 23.17 ppm 23.15 ppm 23.36 ppm 23.33 ppm Mean: 23.27 ppm 23.23 ppm

$$\text{ppm} \leftarrow \text{umole/mole}$$

% = mole-%

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

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