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I. C. ENGINE EMISSION TESTS AT SOUTHERN CALIFORNIA GAS GOLETA STATION

August 20-24 and 27-28, 1990

Prepared for

Southern California Gas Company
810 South Flower Street
Mail Location 211F
Los Angeles, California 90017

September 1990

Prepared by

Pape & Steiner Environmental Services
5801 Norris Road
Bakersfield, California 93308

Report PS-90-2255/Project 6862-90

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SECTION 1

INTRODUCTION

At the request of Southern California Gas Company, Pape & Steiner Environmental Services conducted a series of emission tests at SoCal's Goleta Station. The purpose of these tests was to measure NO_x emissions from seven IC engines (Units 2 through 8) equipped with catalytic converters for NO_x control.

Southern California Gas Company operates IC engines at their Goleta Station. These engines are used to inject gas into the Goleta natural gas storage field. Four Ingersol-Rand LVG 8-cylinder engines and three Ingersol-Rand KVG 6-cylinder engines are equipped with Englehard NO_x control catalysts and air-to-fuel ratio controllers.

CARB Method 1-100 was used to measure NO_x and O_2 concentrations. A multi-point (0, 50%, 80%) linearity check on the NO_x analyzer and a NO_2 to NO converter (TECO Model 300) efficiency check were performed prior to each test day using a certified tank of NO_2 in N_2. Three tests (40 min.) were run on each engine to obtain at least 120 minutes of emission data. Three tests were run at the catalyst inlet and the catalyst outlet alternatively to demonstrate 80% NO_x reduction. The engines were operated with the fuel mixture enriched, according to Englehard catalyst specifications. All air/fuel ratio controllers were operated in "automatic" mode using the controller set-point determined during the most

recent weekly recalibration process. Fuel flowrate data was collected during each test. One fuel sample was collected each day and analyzed. F-Factors were calculated from the results of the fuel analyses and used to determine lb/MMBtu emission factors. Lb/hr data was calculated from the firing rate and emissions factors.

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

SECTION 2

TEST PROGRAM

Table 2-1 presents the test matrix for this program with the air-to-fuel ratio controller set in the "automatic" mode.

Section 3 summarizes the results of these tests.

TABLE 2-1. GOLETA STATION TEST MATRIX WITH AFR IN AUTOMATIC MODE

Date	Engine Number	Test Location	Test Number	AFR Setpoint (millivolts)	AFR Range (millivolts)	Engine HP	Test Parameter	Test Time
08/20/90	3	Outlet	1	900	897-907	562	NO_x/O_2	8:10 am - 8:50 am
		Inlet	1	900	897-908	562	NO_x/O_2	9:05 am - 9:45 am
		Outlet	2	900	896-910	562	NO_x/O_2	10:05 am - 10:45 am
		Inlet	2	900	895-906	562	NO_x/O_2	11:00 am - 11:40 am
		Outlet	3	900	895-904	562	NO_x/O_2	11:55 am - 12:35 pm
		Inlet	3	900	896-908	562	NO_x/O_2	12:50 pm - 1:30 pm
08/21/90	4	Outlet	1	900	873-913	560	NO_x/O_2	9:20 am - 10:00 am
		Inlet	1	900	891-907	560	NO_x/O_2	10:15 am - 10:55 am
		Outlet	2	900	885-908	560	NO_x/O_2	11:12 am - 11:52 am
		Inlet	2	900	891-912	560	NO_x/O_2	12:05 pm - 12:45 pm
		Outlet	3	900	888-909	560	NO_x/O_2	1:00 pm - 1:40 pm
		Inlet	3	900	885-911	560	NO_x/O_2	1:50 pm - 2:30 pm
08/22/90	5	Outlet	1	900	893-910	560	NO_x/O_2	8:10 am - 8:50 am
		Inlet	1	900	891-906	560	NO_x/O_2	9:00 am - 9:40 am
		Outlet	2	900	894-907	560	NO_x/O_2	9:50 am - 10:30 am
		Inlet	2	900	885-907	560	NO_x/O_2	10:40 am - 11:20 am
		Outlet	3	900	887-908	560	NO_x/O_2	11:30 am - 12:10 pm
		Inlet	3	900	883-910	560	NO_x/O_2	12:20 pm - 1:00 pm

TABLE 2-1. GOLETA STATION TEST MATRIX WITH AFR IN AUTOMATIC MODE (CONTINUED)

Date	Engine Number	Test Location	Test Number	AFR Setpoint (millivolts)	AFR Range (millivolts)	Engine HP	Test Parameter	Test Time
08/23/90	6	Outlet	1	875	870-876[a] 911-915[b]	576	NO_x/O_2	9:05 am - 9:45 am
		Inlet	1	875	870-882[a] 857-889[b]	576	NO_x/O_2	9:55 am - 10:35 am
		Outlet	2	875	832-878[a] 681-896[b]	576	NO_x/O_2	10:47 am - 11:27 am
		Inlet	2	875	853-894[a] 859-892[b]	576	NO_x/O_2	12:55 pm - 1:35 pm
		Outlet	3	875	853-888[a] 861-887[b]	576	NO_x/O_2	1:35 pm - 2:15 pm
		Inlet	3	875	869-884[a] 870-882[b]	576	NO_x/O_2	2:25 pm - 3:05 pm
08/24/90	7	Outlet	1	840	831-852[a] 835-861[b]	542	NO_x/O_2	7:45 am - 8:25 am
		Inlet	1	840	829-858[a] 827-872[b]	542	NO_x/O_2	8:35 am - 9:15 am
		Outlet	2	840	782-874[a] 821-868[b]	542	NO_x/O_2	9:25 am - 10:05 am
		Inlet	2	840	794-863[a] 813-861[b]	542	NO_x/O_2	10:15 am - 10:55 am
		Outlet	3	840	821-852[a] 816-863[b]	542	NO_x/O_2	11:05 am - 11:45 am
		Inlet	3	840	769-869[a] 816-878[b]	542	NO_x/O_2	11:55 am - 12:35 pm

[a]Right engine bank setting
[b]Left engine bank setting

TABLE 2-1. GOLETA STATION TEST MATRIX WITH AFR IN AUTOMATIC MODE (CONCLUDED)

Date	Engine Number	Test Location	Test Number	AFR Setpoint (millivolts)	AFR Range (millivolts)	Engine HP	Test Parameter	Test Time
08/27/90	8	Outlet	1	850	838-883[a] 833-876[b]	555	NO_x/O_2	8:40 am - 9:20 am
		Inlet	1	850	828-863[a] 837-859[b]	555	NO_x/O_2	9:30 am - 10:10 am
		Outlet	2	850	834-863[a] 841-859[b]	555	NO_x/O_2	10:20 am - 11:00 am
		Inlet	2	850	828-863[a] 835-860[b]	555	NO_x/O_2	11:10 am - 11:50 am
		Outlet	3	850	826-875[a] 837-865[b]	555	NO_x/O_2	12:00 pm - 12:40 pm
		Inlet	3	850	838-873[a] 828-861[b]	555	NO_x/O_2	12:50 pm - 1:30 pm
08/28/90	2	Outlet	1	920	923-926	567	NO_x/O_2	8:05 am - 8:45 am
		Inlet	1	920	918-926	567	NO_x/O_2	8:55 am - 9:35 am
		Outlet	2	920	874-928	567	NO_x/O_2	9:45 am - 10:25 am
		Inlet	2	920	912-933	567	NO_x/O_2	10:35 am - 11:15 am
		Outlet	3	920	916-930	567	NO_x/O_2	11:25 am - 12:05 pm
		Inlet	3	920	918-923	567	NO_x/O_2	12:15 pm - 12:55 pm

[a]Right engine bank setting
[b]Left engine bank setting

SECTION 3

TEST RESULTS

Tables 3-1 to 3-14 summarize the results of the tests performed on each engine with the AFR controller in the "automatic" mode. Table 3-15 summarizes the NO_x reduction efficiency for each engine catalyst.

TABLE 3-1.

SUMMARY OF EMISSIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #3 INLET
DATE : AUGUST 20,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	6519	6402	6328	6416
Heat Input, MMBtu/hr	7.5	7.4	7.3	7.4
Horsepower	562	562	562	562
Oxygen, %	0.31	0.34	0.30	0.32
NOx, ppm	2184	2190	2261	2212
NOx, ppm @ O2 corr.	626	629	648	634
NOx, lb/MMBtu	2.28	2.29	2.36	2.31
NOx, lb/hr	17.11	16.87	17.19	17.06
NOx, g/HP-hr	13.81	13.62	13.87	13.77

TABLE 3-2.

SUMMARY OF EMISSIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #3 OUT
DATE : AUGUST 20,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	6347	6382	6330	6353
Heat Input, MMBtu/hr	7.3	7.3	7.3	7.3
Horsepower	562	562	562	562
Oxygen, %	0.24	0.18	0.25	0.22
NOx, ppm	68	78	79	75
NOx, ppm @ O2 corr.	19 ✓	22 ✓	22 ✓	21 ✓
NOx, lb/MMBtu	0.07	0.08	0.08	0.08
NOx, lb/hr	0.52	0.59	0.60	0.57
NOx, g/HP-hr	0.42	0.48	0.49	0.46

TABLE 3-3.

SUMMARY OF EMISSIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #4 INLET
DATE : AUGUST 21,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	6412	6414	6565	6463
Heat Input, MMBtu/hr	7.6	7.6	7.7	7.6
Horsepower	560	560	560	560
Oxygen, %	0.46	0.42	0.42	0.43
NOx, ppm	1996	2014	2084	2031
NOx, ppm @ O2 corr.	576	580	600	585
NOx, lb/MMBtu	2.11	2.13	2.20	2.15
NOx, lb/hr	15.98	16.09	17.05	16.37
NOx, g/HP-hr	12.94	13.04	13.81	13.26

TABLE 3-4.

SUMMARY OF EMISSIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #4 OUTLET
DATE : AUGUST 21,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	6646	6536	6494	6559
Heat Input, MMBtu/hr	7.8	7.7	7.7	7.7
Horsepower	560	560	560	560
Oxygen, %	0.21	0.19	0.49	0.30
NOx, ppm	72	71	68	70
NOx, ppm @ O2 corr.	20	20	20	20
NOx, lb/MMBtu	0.08	0.07	0.07	0.07
NOx, lb/hr	0.59	0.57	0.55	0.57
NOx, g/HP-hr	0.48	0.46	0.45	0.46

TABLE 3-5.

SUMMARY OF EMISSIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #5 INLET
DATE : AUGUST 22,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	6517	6515	6437	6490
Heat Input, MMBtu/hr	7.0	7.0	7.0	7.0
Horsepower	560	560	560	560
Oxygen, %	0.40	0.40	0.38	0.39
NOx, ppm	2264	2296	2295	2285
NOx, ppm @ O2 corr.	652	661	660	658
NOx, lb/MMBtu	2.38	2.41	2.41	2.40
NOx, lb/hr	16.59	16.82	16.60	16.67
NOx, g/HP-hr	13.44	13.62	13.44	13.50

TABLE 3-6.

SUMMARY OF EMISSIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #5 OUTLET
DATE : AUGUST 22,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	6498	6497	6463	6486
Heat Input, MMBtu/hr	7.0	7.0	7.0	7.0
Horsepower	560	560	560	560
Oxygen, %	0.20	0.20	0.20	0.20
NOx, ppm	334	344	363	347
NOx, ppm @ O2 corr.	95	98	104	99
NOx, lb/MMBtu	0.35	0.36	0.38	0.36
NOx, lb/hr	2.41	2.49	2.62	2.51
NOx, g/HP-hr	1.96	2.02	2.12	2.03

TABLE 3-7.

SUMMARY OF EMISSIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #6 INLET
DATE : AUGUST 23,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	6657	6208	6044	6303
Heat Input, MMBtu/hr	7.6	7.1	6.9	7.2
Horsepower	576	576	576	576
Oxygen, %	0.23	0.21	0.24	0.23
NOx, ppm	2246	2274	2302	2274
NOx, ppm @ O2 corr.	641	649	657	649
NOx, lb/MMBtu	2.34	2.37	2.40	2.37
NOx, lb/hr	17.71	16.71	16.49	16.97
NOx, g/HP-hr	13.95	13.16	12.99	13.36

TABLE 3-8.

SUMMARY OF EMISSIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #6 OUTLET
DATE : AUGUST 23,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	6561	6064	6094	6239
Heat Input, MMBtu/hr	7.5	6.9	6.9	7.1
Horsepower	576	576	576	576
Oxygen, %	0.15	0.15	0.19	0.16
NOx, ppm	183	203	194	193
NOx, ppm @ O2 corr.	52	58	55	55
NOx, lb/MMBtu	0.19	0.21	0.20	0.20
NOx, lb/hr	1.42	1.46	1.40	1.42
NOx, g/HP-hr	1.12	1.15	1.10	1.12

TABLE 3-9.

SUMMARY OF EMISSIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #7 INLET
DATE : AUGUST 24,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	6552	6451	6521	6508
Heat Input, MMBtu/hr	7.1	7.0	7.1	7.1
Horsepower	542	542	542	542
Oxygen, %	0.20	0.23	0.22	0.22
NOx, ppm	1479	1537	1537	1518
NOx, ppm @ O2 corr.	422	439	438	433
NOx, lb/MMBtu	1.54	1.60	1.60	1.58
NOx, lb/hr	10.97	11.23	11.35	11.18
NOx, g/HP-hr	9.18	9.40	9.50	9.36

TABLE 3-10.

SUMMARY OF EMISSIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #7 OUTLET
DATE : AUGUST 24,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	6518	6559	6509	6529
Heat Input, MMBtu/hr	7.1	7.1	7.1	7.1
Horsepower	542	542	542	542
Oxygen, %	0.21	0.18	0.15	0.18
NOx, ppm	133	163	179	158
NOx, ppm @ O2 corr.	38	46	51	45
NOx, lb/MMBtu	0.14	0.17	0.19	0.17
NOx, lb/hr	0.99	1.21	1.31	1.17
NOx, g/HP-hr	0.82	1.01	1.10	0.98

TABLE 3-11.

SUMMARY OF EMISSIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #8 INLET
DATE : AUGUST 27,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	6651	6367	6221	6413
Heat Input, MMBtu/hr	6.8	6.5	6.4	6.6
Horsepower	555	555	555	555
Oxygen, %	0.17	0.17	0.20	0.18
NOx, ppm	2490	2496	2548	2511
NOx, ppm @ O2 corr.	709	710	726	715
NOx, lb/MMBtu	2.58	2.59	2.65	2.61
NOx, lb/hr	17.62	16.90	16.89	17.14
NOx, g/HP-hr	14.40	13.82	13.80	14.01

TABLE 3-12.

SUMMARY OF EMISSIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #8 OUTLET
DATE : AUGUST 27,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	6719	6600	6303	6541
Heat Input, MMBtu/hr	6.9	6.8	6.5	6.7
Horsepower	555	555	555	555
Oxygen, %	0.09	0.12	0.11	0.11
NOx, ppm	476	522	521	506
NOx, ppm @ O2 corr.	135	148	148	143
NOx, lb/MMBtu	0.49	0.54	0.54	0.52
NOx, lb/hr	3.39	3.65	3.49	3.51
NOx, g/HP-hr	2.77	2.99	2.85	2.87

TABLE 3-13.

SUMMARY OF EMISSIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #2 INLET
DATE : AUGUST 28,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	7294	6453	7259	7002
Heat Input, MMBtu/hr	8.1	7.2	8.1	7.8
Horsepower	567	567	567	567
Oxygen, %	0.24	0.19	0.24	0.22
NOx, ppm	1613	1672	1735	1673
NOx, ppm @ O2 corr.	461	476	495	477
NOx, lb/MMBtu	1.68	1.74	1.81	1.74
NOx, lb/hr	13.67	12.50	14.63	13.60
NOx, g/HP-hr	10.93	10.00	11.70	10.88

TABLE 3-14.

SUMMARY OF EMISSIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #2 OUTLET
DATE : AUGUST 28,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Fuel Flow, scfh	7169	7090	6335	6865
Heat Input, MMBtu/hr	8.0	7.9	7.0	7.6
Horsepower	567	567	567	567
Oxygen, %	0.10	0.09	0.08	0.09
NOx, ppm	20	15	23	19
NOx, ppm @ O2 corr.	6	4	7	6
NOx, lb/MMBtu	0.02	0.02	0.02	0.02
NOx, lb/hr	0.16	0.13	0.17	0.15
NOx, g/HP-hr	0.13	0.10	0.14	0.12

TABLE 3-15. NO_x REDUCTION EFFICIENCIES IN THE AUTOMATIC MODE

Date	Engine No.	Test No.	Inlet NO_x (ppm at 15% O_2)	Outlet NO_x (ppm at 15% O_2)	NO_x Reduction %*
08/20/90	3	Average	634	21	97
08/21/90	4	Average	585	20	97
08/22/90	5	Average	658	99	85
08/23/90	6	Average	649	55	92
08/24/90	7	Average	433	45	90
08/27/90	8	Average	715	143	80
08/28/90	2	Average	477	6	99

*NO_x Reduction Efficiency = $\frac{(NO_x \text{ at } 15\% O_2) \text{ in} - (NO_x \text{ at } 15\% O_2) \text{ out}}{(NO_x \text{ at } 15\% O_2) \text{ in}} \times 100$

SECTION 4

SAMPLING EQUIPMENT AND PROCEDURES

This section of the report describes the equipment and procedures used for these tests.

4.1 SAMPLING PROCEDURES FOR CONTINUOUS MONITORING

The continuous monitors used in the Pape & Steiner Mobile Monitoring Lab are shown in Table 4-1. Figure 4-1 is a schematic of the continuous monitoring system. The procedures used to continuously monitor stack gases for NO_x and O_2 strictly follow CARB Method 1-100.

Sample was taken from the stack (at a single point) using a 316 stainless steel probe. A heated Balston filter holder and fiberglass filter (99.9999 percent efficiency retention of 0.6 micron particles) was connected to the outlet of the probe. Sample gas was transported through heated Teflon sample line (maintained at >250°F) by a Teflon-lined diaphragm pump to a 316 stainless steel refrigeration type conditioner (Hankison Model E-4G-SS). The sample gas was passed through the conditioner two separate times under vacuum before entering the pump, then two additional times under pressure. The clean, dry sample gas (~35°F) was then transported to the continuous analyzer system through an unheated Teflon line. A TECO Model 300 NO_2 to NO converter was placed before the NO_x analyzer to prevent NH_3 interference with the NO_x reading. A series of flowmeters, valves, and regulators maintain constant flow through the system at a constant pressure.

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

NO_x CHEMILUMINESCENT ANALYZER -- THERMO ELECTRON MODEL 10

Response Time (0-90%)	1.5 sec -- NO mode; 1.7 sec -- NO_x mode
Zero Drift	Negligible after 1/2 hour warmup
Linearity	±1% of full scale
Accuracy	Derived from the NO or NO_2 calibration gas, ±1% of full scale
Output	0-10 V
Operating Ranges	0-2, 5, 10, 25, 100, 250 ,1000, 2500, and 10,000 ppm

O_2 ANALYZER, FUEL TYPE -- TELEDYNE MODEL 326

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

CO_2/CO INFRARED ANALYZER -- ANARAD MODEL AR-600

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

CO GAS FILTER CORRELATION - THERMO ELECTRON MODEL 48

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

SO_2 UV ANALYZER -- DUPONT MODEL 400

Response Time (0-90%)	Less than 1 second
Zero Drift	Less than 1% full scale in 24 hours
Linearity	±1% full scale
Accuracy	±2% full scale
Output	0-5 V
Operating Ranges	0-100 ppm, 0-1000 ppm

STRIP CHART RECORDERS (3) -- MOLYTEK MODEL 2800

Pen Response	0.75 seconds Full Scale
Input Spans	10, 20, 50, 100 MV; 1, 5, 10 VDC
Zero Set	LH standard, adjustable to 100% of Full Scale
Accuracy	±0.25% of Span
Dead Band	±0.15% of Span
Linearity	±0.25% of Span
Chart Speed	0.5, 1, 2, 3, 6, 12 inches/hour; 0.5, 1, 2, 4, 10 inches/minute
Recording Pen	Fiber tip cartridge
Chart Width	10 inches

SCOTSMAN TRAILER

Fully Insulated	Air conditioned	8-ft x 14-ft x 11-ft

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

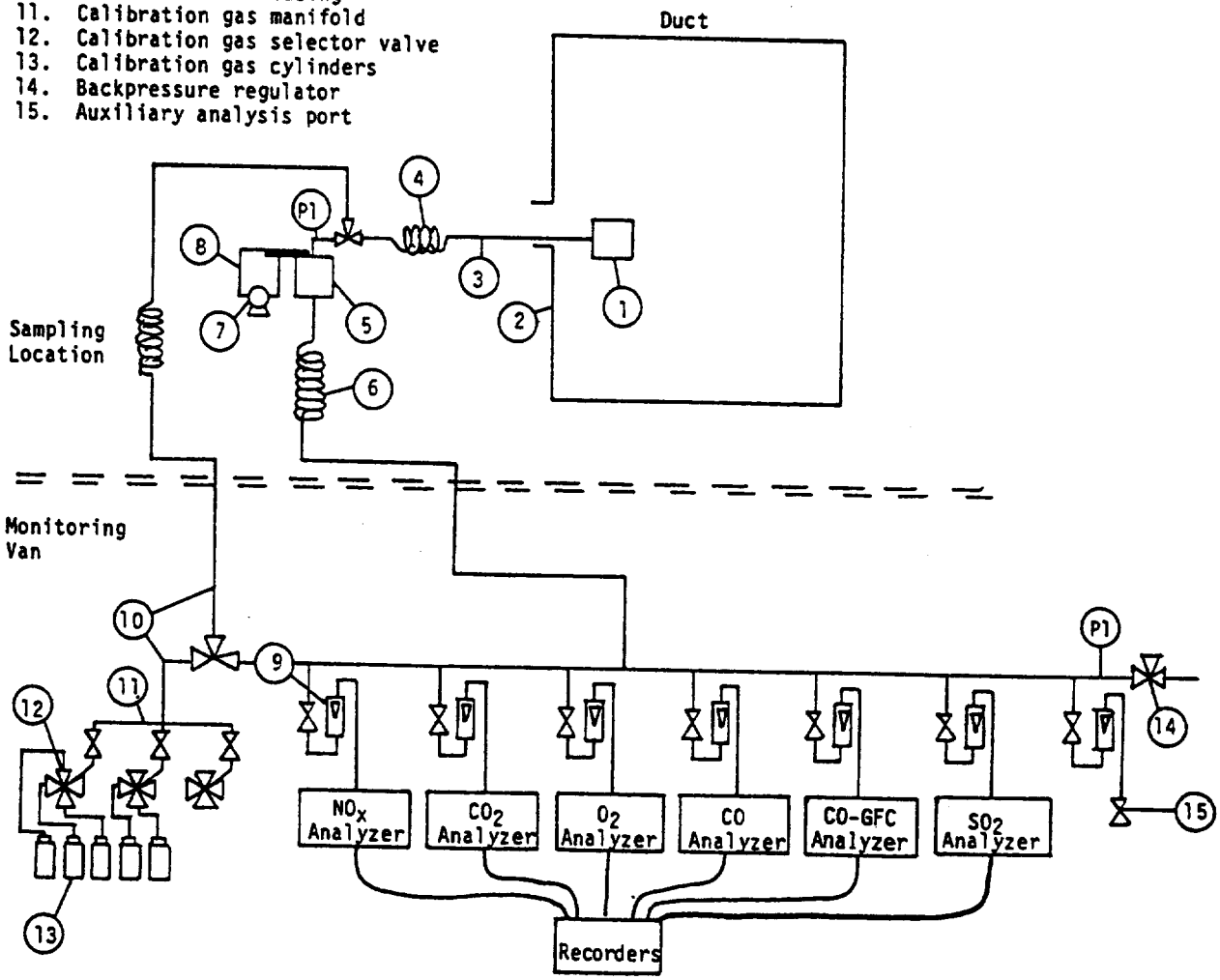

FIGURE 4-1. SCHEMATIC OF CONTINUOUS MONITORING SYSTEM

Calibrations of the continuous analyzers were performed using EPA Protocol 1 calibration gases (±1%) for NO_x and NBS certified calibration gases (±1%) for O_2. Copies of the gas certifications are included in the Appendix of this report. All pertinent data (date, time, test locations, analyzer range, cal gas value) were recorded on both the field data sheets and continuous analyzer strip charts in the field.

At the start of a test day, a leak-check was performed. The sample probe was removed from the stack and the end was sealed. A leak-check was successful only if pressure at the analyzer system and flow through the rotameters to the individual analyzers all dropped to zero. A mandatory leak-check was performed at the completion of each test day.

An initial calibration was performed at the start of a test period by introducing zero and span gases for each analyzer and making the necessary adjustments. Calibration gas values were recorded on the continuous monitor strip charts and field data sheets. A calibration check was completed at the end of a test and adjustments (if necessary) to the analyzers were made in preparation for another test.

An external calibration of the sampling system was performed at the start of a test day. EPA Protocol 1 gas was flowed through the entire sampling system from the probe tip. The response of the analyzers had to be within ±5% of the certified tank value before testing could proceed. An external calibration was also performed at the end of each test day.

Test data was collected by recording 10-minute averages from the strip chart recordings onto the field data sheets. Data collected over the test period was averaged and reported. A fuel analysis was used to

calculate the F-factor, dscf/MMBtu corrected to zero percent O_2 (standard conditions 60°F, 29.92 inches Mercury), as described in 40 CFR 60.45. The pollutant concentration and the F-factor were used to calculate an emission factor in lb/MMBtu.

SECTION 5

ANALYSIS PROCEDURES

5.1 FUEL

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

TABLE 5-1. FUEL ANALYSIS METHODS

LABORATORY TEST PROCEDURES FOR FUEL OILS AND FUEL GASES

Reference: EPA Title 40, Section 60.45

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

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GAS ANALYSIS BY CHROMATOGRAPH

PAPE & STEINER ENVIRONMENTAL SERVICES
5801 Norris Road
Bakersfield, CA 93308

SAMPLED: AUGUST 20, 1990
SUBMITTED: AUGUST 27, 1990
REPORTED: AUGUST 29, 1990

Attention: Jim Steiner

LAB # 2986

Sample ID : SO CAL GAS COMPANY
GOLETA, CA
ENGINE #3

P&S ID # :24071

ANALYZED GAS	MOLE %	WT %	CHONS WT %	
OXYGEN	0.06	0.10	CARBON	74.25
NITROGEN	0.39	0.56	HYDROGEN	22.44
CARBON DIOXIDE	1.61	3.64	OXYGEN	2.75
HYDROGEN	ND	0.00	NITROGEN	0.56
CARBON MONOXIDE	ND	0.00	SULFUR	0.00
HYDROGEN SULFIDE	ND	0.00		
METHANE	84.30	69.47		
ETHANE	7.93	12.25		
PROPANE	4.49	10.17		
iso-BUTANE	0.35	1.05		
n-BUTANE	0.67	2.00		
iso-PENTANE	0.11	0.41		
n-PENTANE	0.07	0.26		
HEXANE +	0.02	0.09		

SPECIFIC GRAVITY * : 0.672

SPECIFIC VOLUME : 19.58 cu ft/lb

HYDROGEN SULFIDE (Draeger) : ppm

TOTAL * BTU/cu ft DRY : 1149
WET : 1129

NET * BTU/cu ft DRY : 1039
WET : 1021

BTU/lb : 22501

BTU/lb : 20356

* CALCULATED ACCORDING TO : ASTM D-3588

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GAS ANALYSIS BY CHROMATOGRAPH

PAPE & STEINER ENVIRONMENTAL SERVICES
5801 Norris Road
Bakersfield, CA 93308

SAMPLED: AUGUST 21, 1990
SUBMITTED: AUGUST 27, 1990
REPORTED: AUGUST 29, 1990

Attention: Jim Steiner

LAB # 2986-2

Sample ID : SO CAL GAS COMPANY
GOLETA, CA
ENGINE #4

P&S ID # : 24072

ANALYZED GAS

	MOLE %	WT %	CHONS WT %	
OXYGEN	0.02	0.03	CARBON	76.05
NITROGEN	0.41	0.59	HYDROGEN	23.11
CARBON DIOXIDE	0.13	0.30	OXYGEN	0.25
HYDROGEN	ND	0.00	NITROGEN	0.59
CARBON MONOXIDE	ND	0.00	SULFUR	0.00
HYDROGEN SULFIDE	ND	0.00		
METHANE	84.84	70.30		
ETHANE	7.98	12.40		
PROPANE	5.12	11.66		
iso-BUTANE	0.42	1.26		
n-BUTANE	0.82	2.46		
iso-PENTANE	0.14	0.52		
n-PENTANE	0.09	0.34		
HEXANE +	0.03	0.09		

SPECIFIC GRAVITY * : 0.669

SPECIFIC VOLUME : 19.61 cu ft/lb

HYDROGEN SULFIDE (Draeger) : ppm

TOTAL * BTU/cu ft	DRY	: 1180	NET * BTU/cu ft	DRY	: 1069
	WET	: 1159		WET	: 1050
BTU/lb		: 23134	BTU/lb		: 20949

* CALCULATED ACCORDING TO : ASTM D-3588

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GAS ANALYSIS BY CHROMATOGRAPH

PAPE & STEINER ENVIRONMENTAL SERVICES
5801 Norris Road
Bakersfield, CA 93308

Attention: Jim Steiner

SAMPLED: AUGUST 22, 1990
SUBMITTED: AUGUST 27, 1990
REPORTED: AUGUST 29, 1990

LAB # 2986-3

Sample ID : SO CAL GAS COMPANY
GOLETA, CA
ENGINE #5

P&S ID # : 24073

ANALYZED GAS

	MOLE %	WT %	CHONS WT %	
OXYGEN	0.04	0.07	CARBON	73.77
NITROGEN	0.48	0.75	HYDROGEN	23.36
CARBON DIOXIDE	1.14	2.81	OXYGEN	2.12
HYDROGEN	ND	0.00	NITROGEN	0.75
CARBON MONOXIDE	ND	0.00	SULFUR	0.00
HYDROGEN SULFIDE	ND	0.00		
METHANE	92.26	82.94		
ETHANE	3.21	5.41		
PROPANE	1.99	4.92		
iso-BUTANE	0.24	0.78		
n-BUTANE	0.44	1.43		
iso-PENTANE	0.09	0.36		
n-PENTANE	0.06	0.24		
HEXANE +	0.05	0.10		

SPECIFIC GRAVITY * : 0.616

SPECIFIC VOLUME : 21.33 cu ft/lb

HYDROGEN SULFIDE (Draeger) : ppm

TOTAL * BTU/cu ft	DRY	: 1072	NET * BTU/cu ft	DRY	: 968
	WET	: 1053		WET	: 951
BTU/lb		: 22868	BTU/lb		: 20642

* CALCULATED ACCORDING TO : ASTM D-3588

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5801 Norris Road
Bakersfield, CA 93308

Attention: Jim Steiner

SAMPLED: AUGUST 23, 1990
SUBMITTED: AUGUST 27, 1990
REPORTED: AUGUST 29, 1990

LAB # 2986-4

Sample ID : SO CAL GAS COMPANY
GOLETA, CA
ENGINE #6

P&S ID # : 24074

ANALYZED GAS

	MOLE %	WT %	CHONS WT %	
OXYGEN	0.02	0.03	CARBON	74.38
NITROGEN	0.44	0.64	HYDROGEN	22.70
CARBON DIOXIDE	1.34	3.09	OXYGEN	2.28
HYDROGEN	ND	0.00	NITROGEN	0.64
CARBON MONOXIDE	ND	0.00	SULFUR	0.00
HYDROGEN SULFIDE	ND	0.00		
METHANE	85.70	71.91		
ETHANE	7.35	11.56		
PROPANE	4.11	9.48		
iso-BUTANE	0.31	0.94		
n-BUTANE	0.58	1.76		
iso-PENTANE	0.08	0.30		
n-PENTANE	0.06	0.23		
HEXANE +	0.01	0.05		

SPECIFIC GRAVITY * : 0.660

SPECIFIC VOLUME : 19.92 cu ft/lb

HYDROGEN SULFIDE (Draeger) : ppm

TOTAL * BTU/cu ft DRY : 1137
WET : 1117

NET * BTU/cu ft DRY : 1028
WET : 1010

BTU/lb : 22654

BTU/lb : 20490

* CALCULATED ACCORDING TO : ASTM D-3588

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GAS ANALYSIS BY CHROMATOGRAPH

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5801 Norris Road
Bakersfield, CA 93308

Attention: Jim Steiner

SAMPLED: AUGUST 24, 1990
SUBMITTED: AUGUST 27, 1990
REPORTED: AUGUST 29, 1990

LAB # 2986-5

Sample ID : SO CAL GAS COMPANY
GOLETA, CA
ENGINE #7

P&S ID # : 24075

ANALYZED GAS

	MOLE %	WT %	CHONS WT %	
OXYGEN	0.05	0.09	CARBON	73.48
NITROGEN	1.16	1.78	HYDROGEN	23.06
CARBON DIOXIDE	0.91	2.20	OXYGEN	1.69
HYDROGEN	ND	0.00	NITROGEN	1.78
CARBON MONOXIDE	ND	0.00	SULFUR	0.00
HYDROGEN SULFIDE	ND	0.00		
METHANE	90.74	79.85		
ETHANE	3.51	5.79		
PROPANE	2.18	5.27		
iso-BUTANE	0.41	1.31		
n-BUTANE	0.67	2.14		
iso-PENTANE	0.16	0.63		
n-PENTANE	0.12	0.47		
HEXANE +	0.09	0.24		

SPECIFIC GRAVITY * : 0.629

SPECIFIC VOLUME : 20.87 cu ft/lb

HYDROGEN SULFIDE (Draeger) : ppm

TOTAL * BTU/cu ft DRY : 1086
WET : 1067

NET * BTU/cu ft DRY : 981
WET : 964

BTU/lb : 22663

BTU/lb : 20479

* CALCULATED ACCORDING TO : ASTM D-3588

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GAS ANALYSIS BY CHROMATOGRAPH

PAPE & STEINER ENVIRONMENTAL SERVICES
5801 Norris Road
Bakersfield, CA 93308

Attention: Jim Steiner

SAMPLED: AUGUST 27, 1990
SUBMITTED: AUGUST 29, 1990
REPORTED: AUGUST 30, 1990

LAB # 2991-2

Sample ID : SO CAL GAS COMPANY
GOLETA, CA
ENGINE #8

P&S ID # : 24076

ANALYZED GAS	MOLE %	WT %	CHONS WT %	
OXYGEN	0.04	0.08	CARBON	73.37
NITROGEN	0.74	1.23	HYDROGEN	24.00
CARBON DIOXIDE	0.70	1.83	OXYGEN	1.40
HYDROGEN	ND	0.00	NITROGEN	1.23
CARBON MONOXIDE	ND	0.00	SULFUR	0.00
HYDROGEN SULFIDE	ND	0.00		
METHANE	96.06	91.35		
ETHANE	1.74	3.10		
PROPANE	0.42	1.10		
iso-BUTANE	0.06	0.21		
n-BUTANE	0.08	0.28		
iso-PENTANE	0.04	0.17		
n-PENTANE	0.03	0.13		
HEXANE +	0.09	0.15		

SPECIFIC GRAVITY * : 0.582

SPECIFIC VOLUME : 22.54 cu ft/lb

HYDROGEN SULFIDE (Draeger) : ppm

TOTAL * BTU/cu ft DRY : 1026
WET : 1008

NET * BTU/cu ft DRY : 924
WET : 908

BTU/lb : 23123

BTU/lb : 20831

* CALCULATED ACCORDING TO : ASTM D-3588

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GAS ANALYSIS BY CHROMATOGRAPH

PAPE & STEINER ENVIRONMENTAL SERVICES
5801 Norris Road
Bakersfield, CA 93308

Attention: Jim Steiner

SAMPLED: AUGUST 28, 1990
SUBMITTED: AUGUST 29, 1990
REPORTED: AUGUST 30, 1990

LAB # 2991-1

Sample ID : SO CAL GAS COMPANY
GOLETA, CA
ENGINE #2

P&S ID # : 24077

ANALYZED GAS

	MOLE %	WT %	CHONS WT %	
XYGEN	0.19	0.32	CARBON	73.78
NITROGEN	1.08	1.62	HYDROGEN	22.84
CARBON DIOXIDE	0.84	1.98	OXYGEN	1.76
HYDROGEN	ND	0.00	NITROGEN	1.62
CARBON MONOXIDE	ND	0.00	SULFUR	0.00
HYDROGEN SULFIDE	ND	0.00		
METHANE	87.37	74.89		
ETHANE	5.93	9.53		
PROPANE	3.67	8.65		
iso-BUTANE	0.27	0.84		
n-BUTANE	0.48	1.49		
iso-PENTANE	0.08	0.31		
n-PENTANE	0.06	0.23		
HEXANE +	0.03	0.09		

SPECIFIC GRAVITY * : 0.646

SPECIFIC VOLUME : 20.32 cu ft/lb

HYDROGEN SULFIDE (Draeger) : ppm

TOTAL * BTU/cu ft DRY : 1113
WET : 1094

NET * BTU/cu ft DRY : 1006
WET : 989

BTU/lb : 22619

BTU/lb : 20454

* CALCULATED ACCORDING TO : ASTM D-3588

SECTION 6

QUALITY ASSURANCE

This section of the report describes the QA/QC procedures employed on the test program.

6.1 CONTINUOUS MONITORS QUALITY ASSURANCE

The NO_x analyzer is calibrated before and after each test using an EPA Protocol 1 gas (±1%) traceable to NBS. The O_2 analyzer is calibrated before and after each test using a NBS certified gas mixture (±1%). Copies of the calibration gas certificates appear in the Appendix of this report.

A sampling system check was performed at the beginning and end of each test day. This was done by introducing an EPA Protocol 1 gas at the sampling probe and measuring the system response. The purpose of this was to check the system for leaks and sample loss. NO_2 to NO converter checks were performed prior to each test day using a certified NO_2/NO calibration gas and the results are shown in Table 6-1. In addition, an NO_2 to NO converter check was performed in accordance with Section 5.6 of EPA Method 20 and the results are shown in Figure 6-1.

Multipoint calibration linearity checks of the continuous analyzers were performed on May 16 and 17, 1990. These results were well within CARB limitations of ±2% of full scale. Tables 6-2 through 6-7 list the results of these checks.

TABLE 6-1. DAILY NO_2 TO NO CONVERTER CHECKS

Date	Component	Certified Values (ppm)	Measured Values (ppm)	Converter Efficiency %
08/20/90	NO	40.23	40.40	
	NO_2	22.00	21.60	
	Total	62.23	62.00	99.63
08/21/90	NO	40.23	41.00	
	NO_2	22.00	21.00	
	Total	62.23	62.00	99.63
08/22/90	NO	40.23	41.25	
	NO_2	22.00	20.00	
	Total	62.23	61.25	99.98
08/23/90	NO	40.23	41.25	
	NO_2	22.00	20.00	
	Total	62.23	61.25	99.98
08/24/90	NO	40.23	41.25	
	NO_2	22.00	20.25	
	Total	62.23	61.50	98.83
08/27/90	NO	40.23	42.50	
	NO_2	22.00	20.00	
	Total	62.23	62.50	100.43
08/28/90	NO	40.23	40.50	
	NO_2	22.00	20.75	
	Total	62.23	61.25	98.43

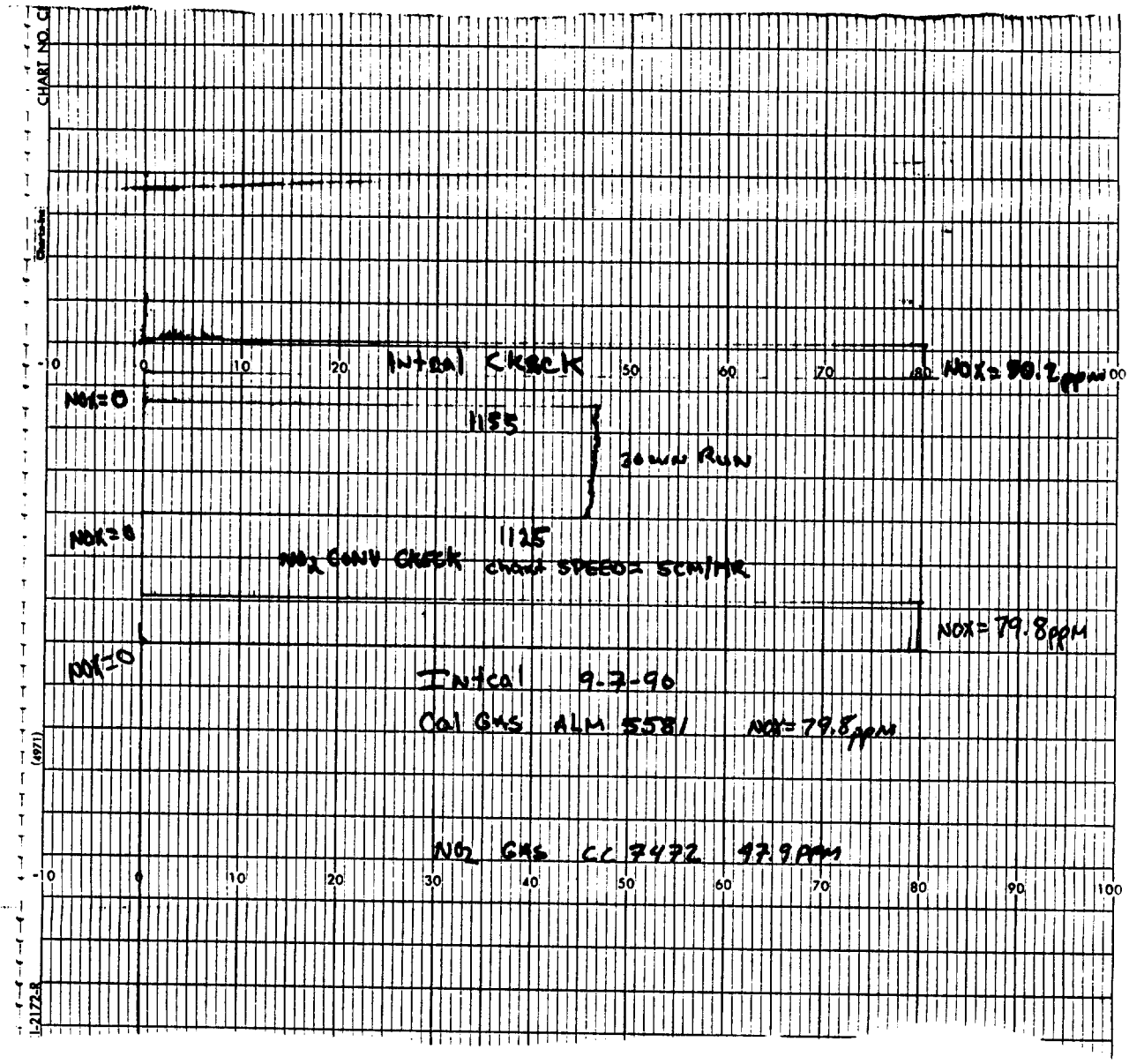

FIGURE 6-1. NO_2 TO NO CONVERTER CHECK

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TABLE 6-2.

NO_x CALIBRATION SUMMARY

1. Station T-1

2. Analyzer TECO NOX
   Model 10 AR S/N 14751-150
3. Calibration by JP Date 5/16/90
4. Calibrator Manufacturer ENVIRONICS
   Model 201-1520 S/N 1122
5. NO_x Standard ALM-2375, ALM 2892 Concentration 8805, 2973
   Cylinder Pressure 1700, 1200

NO_x CALIBRATION AND LINEARITY CHECKS

0 - 10,000 ppm

Calibration Points	1 Flow, Dil. cc/min	2 Flow, Std cc/min	3 $(NO_x)_{out}$ ppm	4 Chart ppm	% Difference + 2% Full Scale
Zero	1012.50	—	0	0	0
80% URL	104.8	918	7904	7904	0
1	327	690.5	5975	6020	+.45
2	554.4	462.6	4005	4110	+1.05
3	788.7	230.4	2004	2100	+.96

0 - 1,000 ppm

Calibration Points	1 Flow, Dil. cc/min	2 Flow, Std cc/min	3 $(NO_x)_{out}$ ppm	4 Chart ppm	% Difference + 2% Full Scale
Zero	6007.5	—	0	0	0
80% URL	5465.5	547.6	802	802	0
1	5595.3	410.3	601.5	608	+.65
2	5732.7	274.0	401.6	412	+1.04
3	5867.6	137.7	202	215	+1.3

TABLE 6-2. (CONCLUDED)

NO_x CALIBRATION AND LINEARITY CHECKS

0 - 100 ppm

Calibration Points	1 Flow, Dil. cc/min	2 Flow, Std cc/min	3 $(NO_x)_{out}$ ppm	4 Chart ppm	% Difference + 2% Full Scale
Zero	9500	—	0	0	0
80% URL	9244.9	257.1	80.5	80.5	0
1	9307.3	193.2	60.5	61.3	+.8
2	9372.3	129.3	40.5	42	+1.5
3	9437.2	65.1	20.4	21.5	+1.1

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TABLE 6-3.

CO CALIBRATION SUMMARY

1. Station T-1

2. Analyzer ANARAD CO
   Model AR 602 S/N 1482
3. Calibration by JP Date 5/16/90
4. Calibrator Manufacturer ENVIRONICS
   Model 201-520 S/N 1122
5. CO Standard AAL-566 Concentration 9942ppm
   Cylinder Pressure 1550

CO CALIBRATION AND LINEARITY CHECKS

0 - 10,000 RANGE

Calibration Points	Flow, Dil. 1 cc/min	Flow, Std 2 cc/min	3 $(CO)_{out}$ ppm	4 Chart ppm	% Difference + 2% Full Scale
Zero	1000	—	0	0	0
80% URL	187.2	815.4	8065	8065	0
1	392.0	609.3	6050	6050	0
2	594.4	406.1	4045	4180	+1.35
3	791.7	203.1	2030	2220	+1.9

Calibration Points	Flow, Dil. 1 cc/min	Flow, Std 2 cc/min	3 $(CO)_{out}$ ppm	4 Chart ppm	% Difference + 2% Full Scale
Zero					
80% URL					
1					
2					
3					

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TABLE 6-4.

CO CALIBRATION SUMMARY

1. Station T-1

2. Analyzer TECO CO
   Model 48 S/N 21130-195
3. Calibration by JP Date 5/16/90
4. Calibrator Manufacturer ENVIRONICS
   Model 201-1820 S/N 1127
5. CO Standard AAL 5660 ABL-114/ALM1166 Concentration 9942ppm/1003ppm/99.6ppm
   Cylinder Pressure 1550, 1400/1750

CO CALIBRATION AND LINEARITY CHECKS

0-1000 ppm

Calibration Points	Flow, Dil. 1 cc/min	Flow, Std 2 cc/min	3 $(CO)_{out}$ ppm	4 Chart ppm	% Difference + 2% Full Scale
Zero	9500	—	0	0	0
80% URL	8730.3	764.1	800.0	800.0	0
1	8925.2	573.3	600.1	600.0	+.01
2	9112.5	382.8	401	405	+.5
3	9304.8	192	201	210	+1.0

0-100 ppm

Calibration Points	Flow, Dil. 1 cc/min	Flow, Std 2 cc/min	3 $(CO)_{out}$ ppm	4 Chart ppm	% Difference + 2% Full Scale
Zero	9500	—	0	0	0
80% URL	8740	757.7	80.0	80.0	0
1	8927.7	568.6	60.0	59.6	-.4
2	9115	379.3	40.0	40.0	0
3	9304.8	190	20.0	20.0	0

TABLE 6-4. (CONCLUDED)

CO CALIBRATION AND LINEARITY CHECKS

Calibration Points	Flow, Dil. 1 cc/min	Flow, Std 2 cc/min	0-20 ppm 3 $(CO)_{out}$ ppm	4 Chart ppm	% Difference + 2% Full Scale
Zero	9560	—	0	0	0
80% URL	8735	762	16.01	16.01	0
1	8925.2	571.5	12.01	12.0	-.01
2	9120	381.5	8.02	8.0	-.02
3	9304.8	191.3	4.02	4.1	+.4

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TABLE 6-5.

CO_2 CALIBRATION SUMMARY

1. Station T-1

2. Analyzer ANARAD CO_2
   Model AR602 S/N 1482
3. Calibration by SP Date 5/16/90
4. Calibrator Manufacturer ENVIRONICS
   Model 201-1520 S/N 1122
5. CO_2 Standard AAL 799 Concentration 20%
   Cylinder Pressure 950

CO_2 CALIBRATION AND LINEARITY CHECKS

0-20%

Calibration Points	Flow, Dil. 1 cc/min	Flow, Std 2 cc/min	3 $(CO_2)_{out}$ %	4 Chart %	% Difference ± 2% Full Scale
Zero	1015	—	0	0	0
80% URL	204.7	800.9	15.9	15.9	0
1	399.5	1001	12.01	11.96	-.25
2	599.4	400.9	8.02	7.98	-.20
3	794.2	201	4.03	3.92	-.55

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TABLE 6-6.

SO_2 CALIBRATION SUMMARY

1. Station T-1
2. Analyzer DUPONT SO_2 Analyzer.
   Model 400 S/N 6329
3. Calibration by JP Date 5/17/90
4. Calibrator Manufacturer ENVIRONICS
   Model 201-1500 S/N 1122
5. SO_2 Standard AAL-9414 Concentration 972 ppm
   Cylinder Pressure 1800

SO_2 CALIBRATION AND LINEARITY CHECKS

Calibration Points	Flow, Dil.[1] cc/min	Flow, Std[2] cc/min	$(SO_2)_{out}$[3] ppm	Chart ppm[4]	% Difference + 2% Full Scale
Zero	1000	—	0	0	0
80% URL	767.3	845.7	812	812	0
1	377.1	629.6	608	620	+1.2
2	1166.4	835	406	421	+1.5
3	3182.3	824.6	200	210	+1.0

0-1000 ppm

Calibration Points	Flow, Dil.[1] cc/min	Flow, Std[2] cc/min	$(SO_2)_{out}$[3] ppm	Chart ppm[4]	% Difference + 2% Full Scale
Zero	9000	—	0	0	0
80% URL	8263.2	743.3	80.2	80.2	0
1	8450.5	557.5	60.2	61.0	+.8
2	8635.4	372.4	40.2	41.1	+.9
3	8817.7	196.8	20.2	21.2	+1.0

0-100 ppm

Pape & Steiner Environmental Services

TABLE 6-7.

O_2 CALIBRATION SUMMARY

1. Station T-1

2. Analyzer TELEDYNE O_2
   Model 326A S/N 36423
3. Calibration by SP Date 5/17/90
4. Calibrator Manufacturer ENVIRONICS
   Model 201-1520 S/N 1122
5. O_2 Standard A14722 Concentration 46%
   Cylinder Pressure 1850

O_2 CALIBRATION AND LINEARITY CHECKS

0-25%

Calibration Points	Flow, Dil. 1 cc/min	Flow, Std 2 cc/min	3 $(O_2)_{out}$ %	4 Chart %	% Difference + 2% Full Scale
Zero	2000	—	0	0	0
80% URL	1116.5	890.9	19.97	19.97	0
1	1338.8	668.3	14.98	15.05	+.28
2	1561.1	445.9	10.00	10.05	+.2
3	1783.4	223.6	5.01	5.3	+1.16

0-10%

Calibration Points	Flow, Dil. 1 cc/min	Flow, Std 2 cc/min	3 $(O_2)_{out}$ %	4 Chart %	% Difference + 2% Full Scale
Zero	2000	—	0	0	0
80% URL	1648.5	357.1	8.00	8.00	0
1	1738.5	268.2	6.00	6.12	+.24
2	1828.4	179.0	4.01	4.2	+1.9
3	1918.3	90.4	2.03	2.2	+1.7

TABLE 6-7. (CONCLUDED)

O_2 CALIBRATION AND LINEARITY CHECKS

0-5%

Calibration Points	Flow, Dil. 1 cc/min	Flow, Std 2 cc/min	3 $(O_2)_{out}$ %	4 Chart %	% Difference + 2% Full Scale
Zero	7000	—	0	0	0
80% URL	6379.7	623.3	4.00	4.00	0
1	6534.6	467.7	3.00	3.05	+1.0
2	6689.5	312.0	2.00	2.05	+1.0
3	6844.3	156.8	1.00	1.09	+1.8

APPENDIX A

PAPE & STEINER RAW DATA

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal. Gas - Goleta
Date 8-20-90 Run No. 1 & 2
Test Location IC Engine # 3
Operator CR
Fuel Type Nat. Gas Trailer No. 1

APCD Witness/Number Randy Schmidt
Client Rep Jim Erdely
Generator Type
Burner Type
O_2 Controller Type

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN. NO_x ppm	Out. NO_x ppm	Comments
		1.00				1176.4 5013.0	41.39 81.96	SPAN GAS Values
		0.0					40.60	External Response
								Good Leak Check
0810		0.27					63.00	Run 1 Outlet
20		0.24					65.50	
30		0.23					67.00	FG-A# 24071
40		0.23					73.00	
0850		1.00					39.80	SPAN
		0.0					-0.50	ZERO
0905		0.32				2188		Run 1 Inlet
15		0.32				2225		
25		0.30				2220		
35		0.30				2250		
0945		1.0				2080		SPAN
		0.0				0.0		ZERO
1005		0.18					77.50	Run 2 Outlet
15		0.18					78.70	
25		0.18					76.25	
35		0.18					75.50	
1045		1.00					80.00	SPAN
		0.0					0.30	ZERO

Miscellaneous Information

CALIBRATION GASES
NO_x 2171, 13433, 012887, 005396
SO_2
CO
$CO/CO_2/(O_2)$ 8168

Wet Bulb: _____ Dry Bulb: _____
Barometric Press: _____

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

PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO	40.23	40.40
NO_2	22.00	21.60

Conv. Efficiency:

A-2

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal. Gas Goleta
Date 8-20-90 Run No. 2 + 3
Test Location IC Engine #3
Operator CR
Fuel Type Nat. Gas Trailer No. 1

APCD Witness/Number Randy Schmidt
Client Rep Jim Erdely
Generator Type
Burner Type
O_2 Controller Type

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN. NO_x ppm	Out. NO_x ppm	Comments
		1.0				2013	81.90	SPAN Gas Values
1100		0.35				2230		Run 2 Inlet
10		0.32				2240		
20		0.33				2240		
30		0.32				2240		
1140		0.96				2100		SPAN
		0.0				0.0		ZERO
1155		0.25				80.00		Run 3 Outlet
05		0.25				78.75		
15		0.25				77.50		
25		0.24				77.00		
1235		0.98				79.75		SPAN
		0.0				0.0		ZERO
1250		0.31				2230		Run 3 Inlet
00		0.30				2280		
10		0.29				2280		
20		0.28				2250		
1330		0.99				2010		SPAN
		0.0				0.0		ZERO
		0.05				1990		External Response

CALIBRATION GASES
NO_x 13433,005396,
SO_2
CO
$CO/CO_2/O_2$ 8168

Wet Bulb: _____ Dry Bulb: _____
Barometric Press: _____

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

PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Goleta
Date 8-20-90 Run No. _____
Test Location IC Engine # 3
Operator CR
Fuel Type Nat. Gas Trailer No. 1

APCD Witness/Number Randy Schmidt
Client Rep Jim Erdely
Generator Type _____
Burner Type _____
O_2 Controller Type _____

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN. NO_x ppm	Out. NO_x ppm	Comments
		1.0				2013	81.90	SPAN GAS VALUES
1350		0.31				2350		MIN. Set Pt. IN.
								AFR Set Pt 870
1425		0.50					80.00	Min Set Pt. Out.
								AFR Set Pt. 870
1500		0.50					55.00	MAX. Set Pt. Out.
								AFR Set Pt. 950
1525		0.26				1400		MAX. Set Pt. IN.
								AFR Set Pt. 950
1540		0.25				1938		# 4 Set Pt. IN
								AFR Set Pt. 925
1605		0.65					76.25	#4 Set Pt. Out
								AFR Set Pt. 925

Miscellaneous Information

CALIBRATION GASES
NO_x 13433, 5592, 012987
SO_2 _____
CO _____
CO/CO_2 (O2) 8168

Wet Bulb: _____ Dry Bulb: _____
Barometric Press: _____

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

PROCESS DATA
Fuel Flow: _____
Steam Flow: _____
Rating: _____

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency: _____

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant Southern California Gas Goleta
Date 8-21-90 Run No. 1 + 2
Test Location IC Engine # 4
Operator CR
Fuel Type Nat. Gas Trailer No. 1

APCD Witness/Number Randy Schmidt
Client Rep Jim Erdely
Generator Type
Burner Type
O_2 Controller Type

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN. NO_x ppm	Out NO_x ppm	Comments
		1.00				~~1171.4~~ 1013	~~41.39~~ 41.90	SPAN Gas Values
		0.04					41.0	External Response
								Good Leak Check
0920		0.22					73.50	RUN 1 Outlet
30		0.22					70.00	
40		0.22					72.50	E.G. - All 24072
50		0.22					72.00	
1000		0.98					41.00	SPAN
		0.02					0.50	ZERO
1015		0.44				2000		RUN 1 Inlet
25		0.47				1983		
35		0.45				1975		
45		0.46				1950		
1055		1.00				1975		SPAN
		0.0				0.0		ZERO
1112		0.18					77.50	RUN 2 Outlet
22		0.18					73.75	
32		0.19					68.75	
42		0.19					66.25	
1152		1.00					82.50	SPAN
		0.0					1.00	ZERO

Miscellaneous Information

CALIBRATION GASES
NO_x 2171, 13433, 012987, 005396
SO_2
CO Conv gas 8235
$CO/CO_2/O_2$ 8168

Wet Bulb: _____ Dry Bulb: _____
Barometric Press: _____

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

PROCESS DATA
Fuel Flow: _____
Steam Flow: _____
Rating: _____

CONVERTER GAS

	Cal Gas Values	Actual Values
NO	40.23	41.0
NO_2	22.00	21.0

Conv. Efficiency: _____

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Goleta
Date 8-21-90 Run No. 2 + 3
Test Location IC Engines #4
Operator CR
Fuel Type Nat. Gas Trailer No. 1

APCD Witness/Number Randy Schmidt
Client Rep Jim Erdely
Generator Type
Burner Type
O_2 Controller Type

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	In. NO_x ppm	Out NO_x ppm	Comments
		1.0				2013	81.90	SPAN Gas Values
1205		0.40				2000		Run 2 Inlet
15		0.42				2020		
25		0.43				2040		
35		0.43				2090		
1245		0.98				2060		SPAN
		0.0				0.0		ZERO
1300		0.53					68.75	Run 3 Outlet
10		0.49					67.50	
20		0.47					67.50	
30		0.47					65.00	
1340		1.00					80.00	SPAN
		0.0					0.0	ZERO
1350		0.46				2050		Run 3 Inlet
00		0.43				2080		
10		0.40				2100		
20		0.40				2120		
1430		0.0				0.0		ZERO
		0.99				2020		SPAN
		0.03				1980		External Response

CALIBRATION GASES
NO_x 13433, 005396
SO_2
CO
$CO/CO_2/O_2$ 8168

Wet Bulb: Dry Bulb:
Barometric Press:

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

PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Co
Date 8-21-90 Run No. Set Point tests
Test Location IC Engine # 4
Operator CR
Fuel Type Nat. Gas Trailer No. 1

APCD Witness/Number Randy Schmidt
Client Rep Jim Erdely
Generator Type
Burner Type
O_2 Controller Type

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN NO_x ppm	Out NO_x ppm	Comments
		1.00				2013	81.90	SPAN Gas Values
1500		0.42				2140		Min. Set Pt IN. AFR Set Pt. 875
1530		0.54					80.00	Min. Set Pt. Out. AFR Set Pt. 875
1550		0.54					72.00	Max. Set Pt. Out AFR Set Pt. 950
1610		0.27				1400		Max. Set Pt. IN AFR Set Pt. 950
1630		0.31				1825		#4 Set Pt. IN AFR Set Pt. 925
1650		0.43					88.75	#4 Set Pt. Out AFR Set Pt. 925

Miscellaneous Information

CALIBRATION GASES
NO_x 13433, 005396
SO_2
CO
$CO/CO_2/O_2$

Wet Bulb: Dry Bulb:
Barometric Press:

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

PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Goleta
Date 8-22-90 Run No. 1 + 2
Test Location IC Engine # 5
Operator CR
Fuel Type Nat. Gas Trailer No. 1

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

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN NO_x ppm	OUT NO_x ppm	Comments
		1.00				2013	~~81.90~~ 3020	SPAN Gas Values
		0.05					198.0	External Response
								Good Leak Check
0810		0.24					330.0	Run 1 Outlet
20		0.20					330.0	
30		0.19					335.0	
40		0.18					340.0	FG. A/L 24073
0850		0.98					202.0	SPAN
		0.0					0.0	ZERO
0900		0.40				2280		Run 1 Inlet
10		0.40				2290		
20		0.40				2290		
30		0.40				2280		
0940		1.00				2050		SPAN
		0.0				0.0		ZERO
0950		0.21					338.0	Run 2 Outlet
00		0.20					335.0	
10		0.20					339.0	
20		0.20					340.0	
1030		1.00					195.0	SPAN
		0.0					0.0	ZERO

Miscellaneous Information

CALIBRATION GASES
NO_x 13433, 5592, 005396
SO_2
~~CO~~ Conv. Gas - 8235
$CO/CO_2/O_2$ 8168

Wet Bulb: Dry Bulb:
Barometric Press:

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

PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO	40.23	41.25
NO_2	22.00	20.00

Conv. Efficiency:

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Goleta
Date 8-22-90 Run No. 2 & 3
Test Location IC Engine # 5
Operator CR
Fuel Type Nat. Gas Trailer No. 1

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

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN NO_x ppm	Out NO_x ppm	Comments
		1.00				2013	202.0	SPAN Gas Values
1040		0.40				2300		Run 2 Inlet
50		0.40				2300		
00		0.40				2300		
10		0.39				2300		
1120		1.00				2020		SPAN
		0.0				0.0		ZERO
1130		0.20					362.0	Run 3 Outlet
40		0.19					360.0	
50		0.20					362.0	
00		0.20					363.0	
1210		1.00					200.0	SPAN
		0.0					0.0	ZERO
1220		0.39				2300		Run 3 Inlet
30		0.38				2325		
40		0.38				2320		
50		0.38				2320		
1300		0.0				0.0		ZERO
		1.00				2050		SPAN
		0.05				2000		External Response

CALIBRATION GASES
NO_x 5592,005396
SO_2
CO
CO/CO_2 (O) 8168

Wet Bulb: Dry Bulb:
Barometric Press:

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

PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Co
Date 8-22-90 Run No. Set point tests
Test Location IC Engine # 5
Operator CR
Fuel Type Nat. Gas Trailer No. 1

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

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN NO_x ppm	Out NO_x ppm	Comments
		1.00				2013	202.0	SPAN GAS Values
1325		0.42				2350		MIN. Set Pt. IN.
								AFR Set Pt. 885
1345		0.20					390.0	MIN Set Pt. Out.
								AFR Set Pt. 885
1400		0.20					385.0	MAX. Set Pt. Out.
								AFR Set Pt. 935
1420		0.27				1840		MAX. Set Pt IN
								AFR Set Pt. 935
1435		0.29				2090		# 4 Set Pt. IN
								AFR Set Pt 920
1500		0.19					420.0	# 4 Set Pt. Out
								AFR Set Pt. 920

Miscellaneous Information

CALIBRATION GASES
NO_x 5592, 005396
SO_2
CO
$CO/CO_2/(O_2)$ 8168

Wet Bulb: _____ Dry Bulb: _____
Barometric Press: _____

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

PROCESS DATA
Fuel Flow: _____
Steam Flow: _____
Rating: _____

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency: _____

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Goleta
Date 8-23-90 Run No. 1 + 2
Test Location IC Engine # 6
Operator CR
Fuel Type Nat. Gas Trailer No. 1

APCD Witness/Number Randy Schmidt
Client Rep Jim Erdely
Generator Type
Burner Type
O_2 Controller Type

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN NO_x ppm	OUT NO_x ppm	Comments
		1.0				2013	202.0	SPAN Gas Values
		0.02					201.0	External Response
								Good Leak Check
0815		0.20					132.5	RUN 1 Outlet
25		0.19					137.5	Void
35		0.19					147.5	
45		0.19					153.75	
0855		0.90					225.0	SPAN
		0.0					0.0	ZERO
0905		0.15					167.50	RUN 1 Outlet
15		0.15					192.50	
25		0.15					203.75	F.G. All 24074
35		0.15					168.75	
0945		0.96					202.0	SPAN
		0.0					0.0	ZERO
0955		0.23				2150		RUN 1 Inlet
05		0.23				2150		
15		0.23				2200		
25		0.23				2500		
1035		1.00				2020		SPAN
		0.0				0.0		ZERO

Miscellaneous Information

CALIBRATION GASES
NO_x 5592, 005396
SO_2
CO Conv. gas - 8235
$CO/CO_2/O_2$ 8168

Wet Bulb: _____ Dry Bulb: _____
Barometric Press: _____

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

PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO	40.23	41.25
NO_2	22.00	20.00

Conv. Efficiency:

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Goleta
Date 8-23-90 Run No. 2 + 3
Test Location IC Engine #6
Operator CR
Fuel Type Nat. Gas Trailer No. 1

APCD Witness/Number Randy Schmidt
Client Rep Jim Erdely
Generator Type
Burner Type
O_2 Controller Type

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN NO_x ppm	OUT NO_x ppm	Comments
		1.0				2013	202.0	SPAN Gas Values
1047		0.15					195.0	Run 2 Outlet
57		0.15					230.0	
07		0.15					185.0	
17		0.15					200.0	
1127		1.00					200.0	SPAN
		0.0					0.0	ZERO
1245		0.20				2275		Run 2 Inlet
55		0.20				2290		
05		0.21				2300		
15		0.22				2270		
1325		1.0				2030		SPAN
		0.0				0.0		ZERO
1335		0.19					198.0	Run 3 Outlet
45		0.19					190.0	
55		0.19					190.0	
05		0.19					190.0	
1415		1.0					197.0	SPAN
		0.0					-3.0	ZERO

CALIBRATION GASES
NO_x 5592, 005396
SO_2
CO
CO/CO_2 (O2) 8168

Wet Bulb: Dry Bulb:
Barometric Press:

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

PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So Cal Gas Goleta
Date 8-23-90 Run No. 3
Test Location IC Engine #6
Operator CR
Fuel Type Nat. Gas Trailer No. 1

APCD Witness/Number Randy Schmidt
Client Rep Jim Erdely
Generator Type
Burner Type
O_2 Controller Type

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN NO_x ppm	Out NO_x ppm	Comments
		1.00				2093	202.0	SPAN Gas Values
1425		0.24				2295		Run 3 Inlet
35		0.24				2295		
45		0.24				2300		
55		0.24				2290		
1505		0.0				0.0		ZERO
		1.02				2000		SPAN
		0.04				1950		External Response

Miscellaneous Information

CALIBRATION GASES
NO_x 5592, 005396
SO_2
CO
CO/CO_2 (O₂) 8168

Wet Bulb: _____ Dry Bulb: _____
Barometric Press: _____

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

PROCESS DATA
Fuel Flow: _____
Steam Flow: _____
Rating: _____

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency: _____

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Goleta
Date 8-23-90 Run No. Set Point tests
Test Location IC Engine #6
Operator CR
Fuel Type Nat. Gas Trailer No. 1

APCD Witness/Number Randy Schmidt
Client Rep Jim Evdely
Generator Type
Burner Type
O_2 Controller Type

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN. NO_x ppm	Out. NO_x ppm	Comments
		1.00				2013	202.0	SPAN GAS Values
1530		0.27				2400		Min. Set Pt. In. AFR Set Pt. 850
1550		0.19					150.0	Min. Set Pt. Out. AFR Set Pt. 850
1613		0.19					168.0	Max. Set Pt. Out. AFR Set Pt. 925
1629		0.24				1620		Max. Set Pt. In. AFR Set Pt. 925
1645		0.24				2000		# 4 Set Pt. In. AFR Set Pt. 900
1705		0.19					240.0	# 4 Set Pt. Out. AFR Set Pt. 900

Miscellaneous Information

CALIBRATION GASES
NO_x 5592, 005396
SO_2
CO
CO/CO_2 (O_2) 8168

Wet Bulb: Dry Bulb:
Barometric Press:

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

PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal. Gas Goleta
Date 8-24-90 Run No. 1 + 2
Test Location IC Engine # 7
Operator CR
Fuel Type Nat. Gas Trailer No. 1

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

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN NO_y ppm	Out NO_x ppm	Comments
		1.0				2013	202.0	SPAN Gas Values
		0.05					200.0	External Response
								Good Leak Check
0745		0.23					146.25	Run 1 Outlet
55		0.20					135.00	
05		0.20					127.50	F.G. Rd 24075
15		0.20					127.50	
0825		1.00					203.75	SPAN
		0.0					0.0	ZERO
0835		0.20				1465		Run 1 Inlet
45		0.20				1475		
55		0.20				1530		
05		0.20				1530		
0915		1.00				2065		SPAN
		0.0				12.50		ZERO
0925		0.19					175.50	Run 2 Outlet
35		0.18					169.25	
45		0.18					155.00	
55		0.18					147.50	
1005		1.00					200.0	SPAN
		0.0					0.0	ZERO

Miscellaneous Information

CALIBRATION GASES
NO_x 5592, 005396
SO_2
CO Conv. Gas 8235
$CO/CO_2/O_2$ 8168

Wet Bulb: _____ Dry Bulb: _____
Barometric Press: _____

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

PROCESS DATA
Fuel Flow: _____
Steam Flow: _____
Rating: _____

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		41.25
NO_2		20.25

Conv. Efficiency: _____

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Goleta
Date 8-24-90 Run No. 2 + 3
Test Location IC Engine # 7
Operator CR
Fuel Type Nat. Gas Trailer No. 1

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

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN NO_x ppm	Out NO_x ppm	Comments
		1.0				2013	202.0	SPAN Gas Values
1015		0.23				1515		Run 2 Inlet
25		0.23				1525		
35		0.23				1545		
45		0.23				1570		
1055		1.00				2018		SPAN
		0.0				0.0		ZERO
1105		0.15					180.50	Run 3 Outlet
15		0.15					183.00	
25		0.15					175.00	
35		0.15					160.00	
1145		1.00					192.50	SPAN
		0.0					-3.00	ZERO
1155		0.22				1505		Run 3 Inlet
05		0.22				1525		
15		0.22				1563		
25		0.22				1565		
1235		0.0				0.0		ZERO
		1.00				2020		SPAN
		0.05				2000		External Response

CALIBRATION GASES
NO_x 5592, 005396
SO_2
CO
CO/CO_2 (O2) 8168

Wet Bulb: Dry Bulb:
Barometric Press:

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

PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal. Gas Goleta
Date 8-24-90 Run No. Set Point Tests
Test Location IC Engine # 7
Operator CR
Fuel Type Nat. Gas Trailer No. 1

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

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN NO_x ppm	Out NO_x ppm	Comments
		1.00				2013	202.0	SPAN Gas Values
1257		0.28				1588		Min. Set Pt. IN.
								AFR Set Pt. 820
1317		0.14					195.0	Min Set Pt. Out.
								AFR Set Pt. 820
1337		0.14					161.25	Max Set Pt. Out.
								AFR Set Pt. 880
1358		0.23				1435		Max Set Pt. IN.
								AFR Set Pt. 880
1414		0.23				1538		#4 Set Pt IN.
								AFR Set Pt. 860
1438		0.18					198.75	#4 Set Pt. Out.
								AFR Set Pt. 860

Miscellaneous Information

CALIBRATION GASES
NO_x 5592, 005396
SO_2
CO
$CO/CO_2/O_2$ 8168

Wet Bulb: Dry Bulb:
Barometric Press:

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

PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Goleta
Date 8-27-90 Run No. 1
Test Location IC Engine #8
Operator CR
Fuel Type Nat. Gas Trailer No. 1

APCD Witness/Number Randy Schmidt
Client Rep Jim Erdely
Generator Type
Burner Type
O_2 Controller Type

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN NO_x ppm	Out NO_x ppm	Comments
		1.00				1171.1/3013	81.9/3020	SPAN Gas Values
		0.05				1145.0		External Response
								Good Leak Check
						0.0	0.0	Lin Check ZERO
						1975.0	200.5	" " High
						1155.0	81.75	" " MID
0840		0.09					465	Run 1 Outlet
50		0.09					465	
00		0.09					475	F.G. All 24076
10		0.09					490	
0920		1.00					200.0	SPAN
		0.0					0.0	ZERO
0930		0.17				2500		Run 1 Inlet
40		0.17				2520		
50		0.17				2520		
00		0.17				2510		
1010		1.00				2050		SPAN
		0.0				0.0		ZERO

Miscellaneous Information

CALIBRATION GASES
NO_x 13433, 5592, 012987, 005396
SO_2
CO Conv. Gas 8235
CO/CO_2 (O₂) 8168

Wet Bulb: _____ Dry Bulb: _____
Barometric Press: _____

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

PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO	40.23	42.50
NO_2	22.00	20.00

Conv. Efficiency:

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal. Gas Goleta
Date 8-27-90 Run No. 2 + 3
Test Location IC Engine #8
Operator CR
Fuel Type Nat. Gas Trailer No. 1

APCD Witness/Number Randy Schmidt
Client Rep Jim Erdely
Generator Type
Burner Type
O_2 Controller Type

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	In. NO_x ppm	Out. NO_x ppm	Comments
		1.0				2013	2020	SPAN GAS VALUES
1020		0.12					505	RUN 2 Outlet
30		0.12					520	
40		0.12					520	
50		0.12					530	
1100		1.00					201.0	SPAN
		0.0					2.0	ZERO
1110		0.18				2500		RUN 2 Inlet
20		0.18				2500		
30		0.18				2500		
40		0.18				2500		
1150		1.00					2020	SPAN
		0.02					0.0	ZERO
1200		0.11					515	RUN 3 Outlet
10		0.11					510	
20		0.11					520	
30		0.11					530	
1240		1.01					200.0	SPAN
		0.0					0.0	ZERO

Miscellaneous Information

CALIBRATION GASES
NO_x 5592, 005396
SO_2
CO
CO/CO_2 (O2) 8168

Wet Bulb: _____ Dry Bulb: _____
Barometric Press: _____

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

PROCESS DATA
Fuel Flow: _____
Steam Flow: _____
Rating: _____

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency: _____

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So Cal. Gas Goleta
Date 8-27-90 Run No. 3
Test Location IC Engine # 8
Operator CR
Fuel Type Nat. Gas Trailer No. 1

APCD Witness/Number Randy Schmidt
Client Rep Jim Erdely
Generator Type
Burner Type
O_2 Controller Type

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN NO_x ppm	Out NO_x ppm	Comments
		1.0				2013	202.0	SPAN Gas Values
1250		0.23				2500		Run 3 Inlet
00		0.19				2520		
10		0.18				2580		
20		0.18				2560		
1330		0.0				0.0		ZERO
		1.00				2000		SPAN
		0.03				1980		External Response

CALIBRATION GASES
NO_x 5592, 005396
SO_2
CO
CO/CO_2 (O_2) 8168

Wet Bulb: _____ Dry Bulb: _____
Barometric Press: _____

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

PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency:

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Co Goleta
Date 8-27-96 Run No. Set Point Tests
Test Location IC Engine # 8
Operator CR
Fuel Type Nat. Gas Trailer No. 1

APCD Witness/Number Randy Schmidt
Client Rep Jim Erdely
Generator Type
Burner Type
O_2 Controller Type

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN NO_x ppm	Out NO_x ppm	Comments
		1.6				2013	2020	SPAN GAS VALUES
1355		0.21				2580		MIN. Set Pt. IN AFR Set Pt. 845
1415		0.14					555	MIN. Set Pt Out. AFR Set Pt. 845
1500		0.13					602	MAX. Set Pt. Out. AFR Set Pt 870
1520		0.15				2500		MAX Set Pt. IN. AFR Set Pt. 870
1535		0.17				2550		# 4 Set Pt. IN. AFR Set Pt. 860
1600		0.13					602	# 4 Set Pt. Out. AFR Set Pt. 860

Miscellaneous Information

CALIBRATION GASES
NO_x 5592, 005396
SO_2
CO
$CO/CO_2/O_2$ 8168

Wet Bulb: _____ Dry Bulb: _____
Barometric Press: _____

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

PROCESS DATA
Fuel Flow: _____
Steam Flow: _____
Rating: _____

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency: _____

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Goleta
Date 8-28-90 Run No. 1
Test Location IC Engine # 2
Operator CR
Fuel Type Nat Gas Trailer No. 1

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

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	In. NO_x ppm	Out. NO_x ppm	Comments
		1.0				2013	~~41.37~~ 202.0	SPAN Gas Values
		0.05					200.0	External Response
								Good Leak Check
0805		0.10					23.00	RUN 1 Outlet
15		0.10					20.00	
25		0.10					18.50	FG AN 24077
35		0.10					18.00	
0845		1.00					41.10	SPAN
		0.0					0.0	ZERO
0855		0.20				1595		RUN 1 INlet
05		0.23				1588		
15		0.23				1638		
25		0.28				1650		
0935		1.00				2025		SPAN
		0.0				0.0		ZERO
0945		0.10					18.50	RUN 2 Outlet
55		0.10					15.50	
05		0.10					1200	
15		0.10					15.00	
1025		1.00					41.00	SPAN
		0.02					-0.20	ZERO

Miscellaneous Information

CALIBRATION GASES
NO_x 2171, 5592, 005396
SO_2
CO Conv. Gas - 8235
CO/CO_2 (O_2) 8168

Wet Bulb: _____ Dry Bulb: _____
Barometric Press: _____

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

PROCESS DATA
Fuel Flow: _____
Steam Flow: _____
Rating: _____

CONVERTER GAS

	Cal Gas Values	Actual Values
NO	40.23	40.50
NO_2		

Conv. Efficiency: _____

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Goleta
Date 8-28-90 Run No. 2 & 3
Test Location IC Engine # 2
Operator CR
Fuel Type Nat. Gas Trailer No. 1

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

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	In. NO_x ppm	Out. NO_x ppm	Comments
		1.0				2013	41.39	SPAN GAS Values
1035		0.20				1738		RUN 2 Inlet
45		0.20				1638		
55		0.20				1650		
05		0.20				1670		
1115		1.01				2015		SPAN
		0.02				12.5		ZERO
1125		0.09					33.20	RUN 3 Outlet
35		0.09					29.00	
45		0.09					17.50	
55		0.10					15.20	
1205		1.00					42.00	SPAN
		0.02					1.0	ZERO
1215		0.27				1800		RUN 3 Inlet
25		0.24				1725		
35		0.23				1675		
45		0.23				1725		
1255		0.02				0.0		ZERO
		1.02				2005		SPAN
		0.05				1995		External Response

Miscellaneous Information

CALIBRATION GASES
NO_x 2171, 005396
SO_2
CO
CO/CO_2 (O) 8168

Wet Bulb: _____ Dry Bulb: _____
Barometric Press: _____

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

PROCESS DATA
Fuel Flow: _____
Steam Flow: _____
Rating: _____

CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

Conv. Efficiency: _____

Pape & Steiner Environmental Services

CONTINUOUS MONITOR DATA SHEET

Plant So. Cal Gas Goleta
Date 8-28-90 Run No. Set Point Tests
Test Location IC Engine #2
Operator CR
Fuel Type Nat. Gas Trailer No. 1

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

[Dry Uncorrected]

Time	Sample Point	O_2 %	CO_2 %	CO ppm	SO_2 ppm	IN NO_x ppm	Out NO_x ppm	Comments
		1.0				2013	41.39	SPRN Gas Values
1325		0.28				2113		Min. Set Pt. In, AFR Set Pt. 895
1350		0.18					26.00	Min. Set Pt. Out, AFR Set Pt. 895
1405		0.18					20.80	Max Set Pt. Out, AFR Set Pt. 960
1443		0.22				972.5		Max Set Pt. In, AFR Set Pt. 960
1457		0.22				1155		#4 Set Pt In, AFR Set Pt. 940
1518		0.12					32.00	#4 Set Pt Out AFR Set Pt. 940

CALIBRATION GASES
NO_x 2171, 005396
SO_2
CO
CO/CO_2 (O2) 8168

Wet Bulb: Dry Bulb:
Barometric Press:

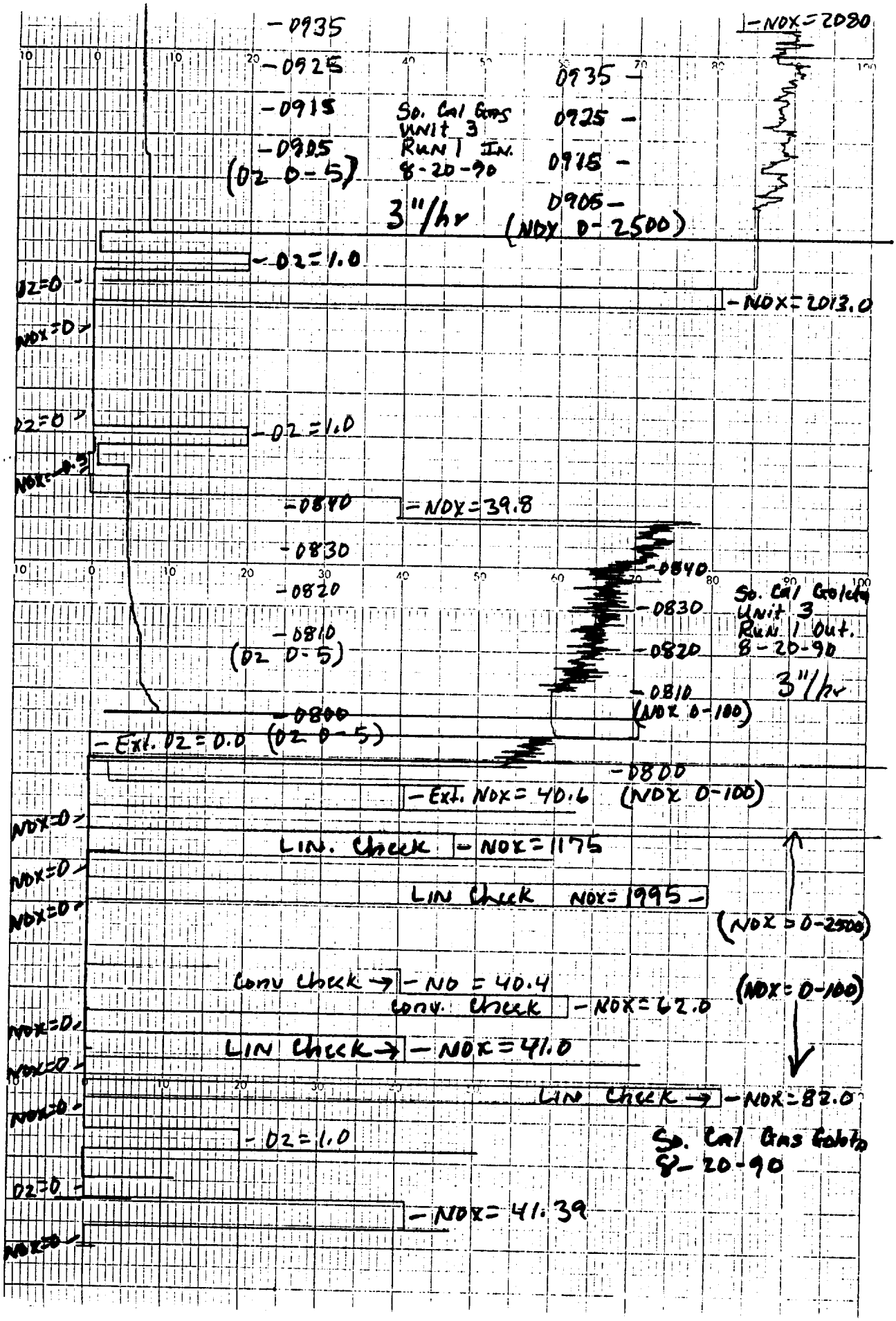
RESPONSE TIME
Upscale: Downscale:
Upscale: Downscale:
Upscale: Downscale:

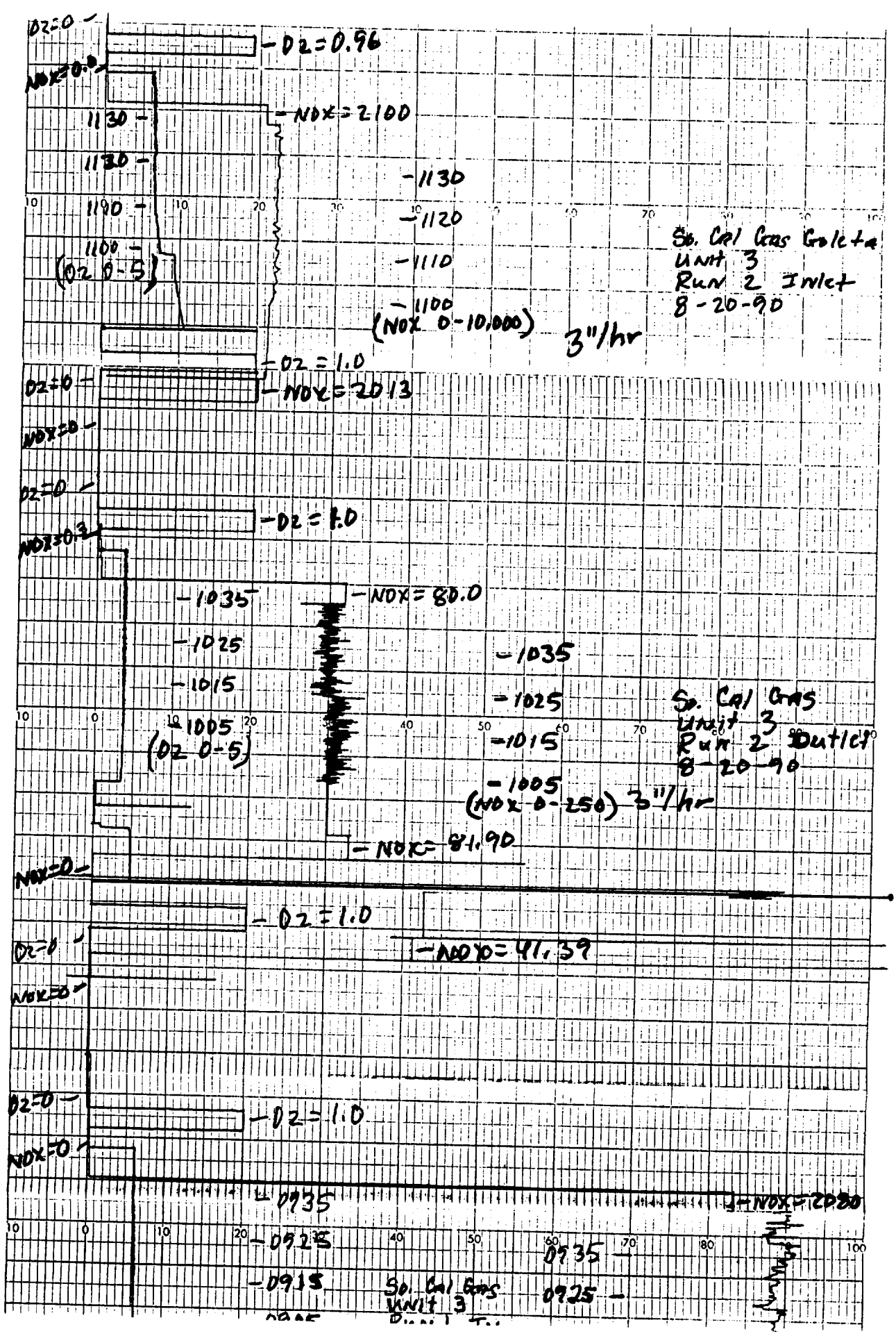
PROCESS DATA
Fuel Flow:
Steam Flow:
Rating:

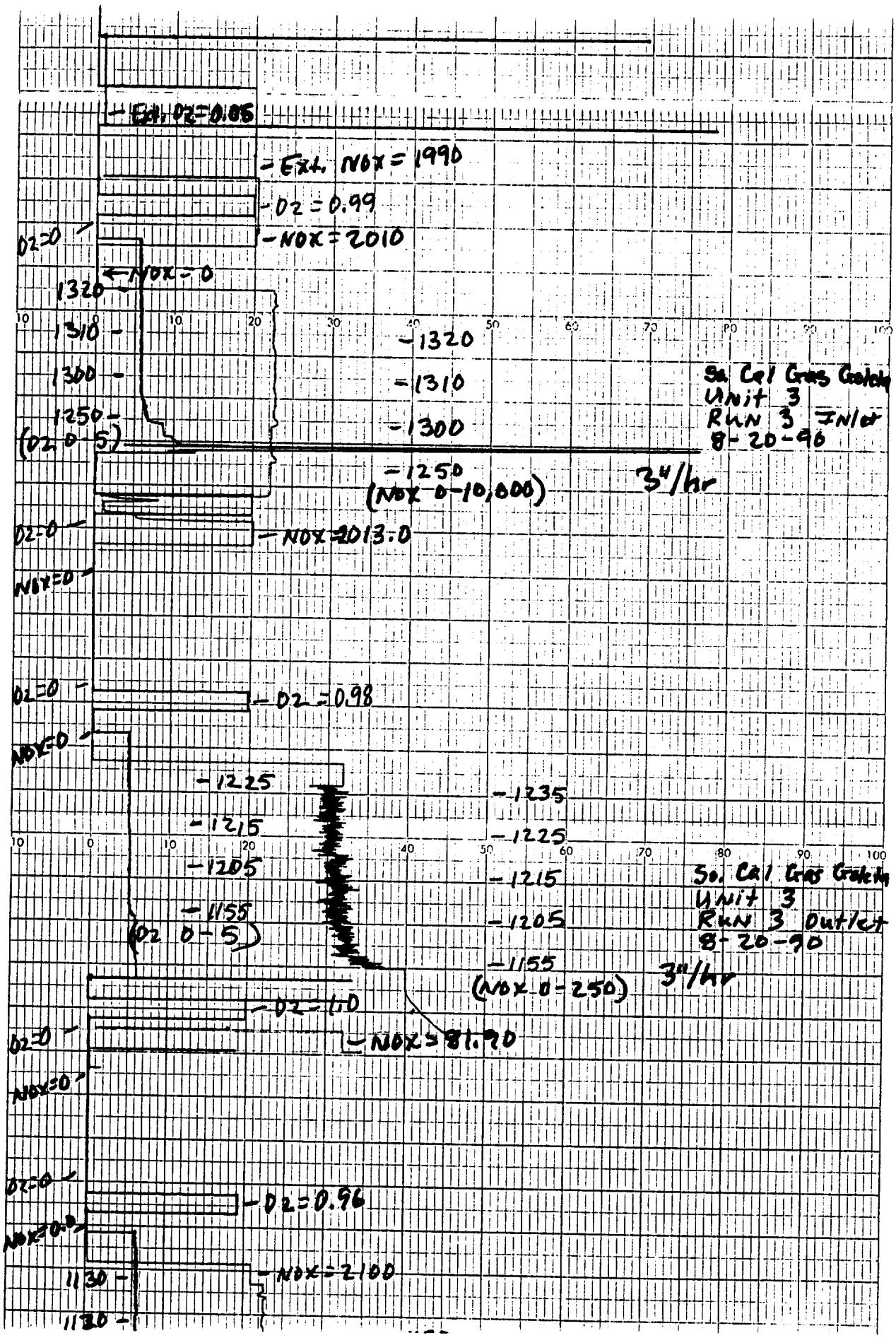
CONVERTER GAS

	Cal Gas Values	Actual Values
NO		
NO_2		

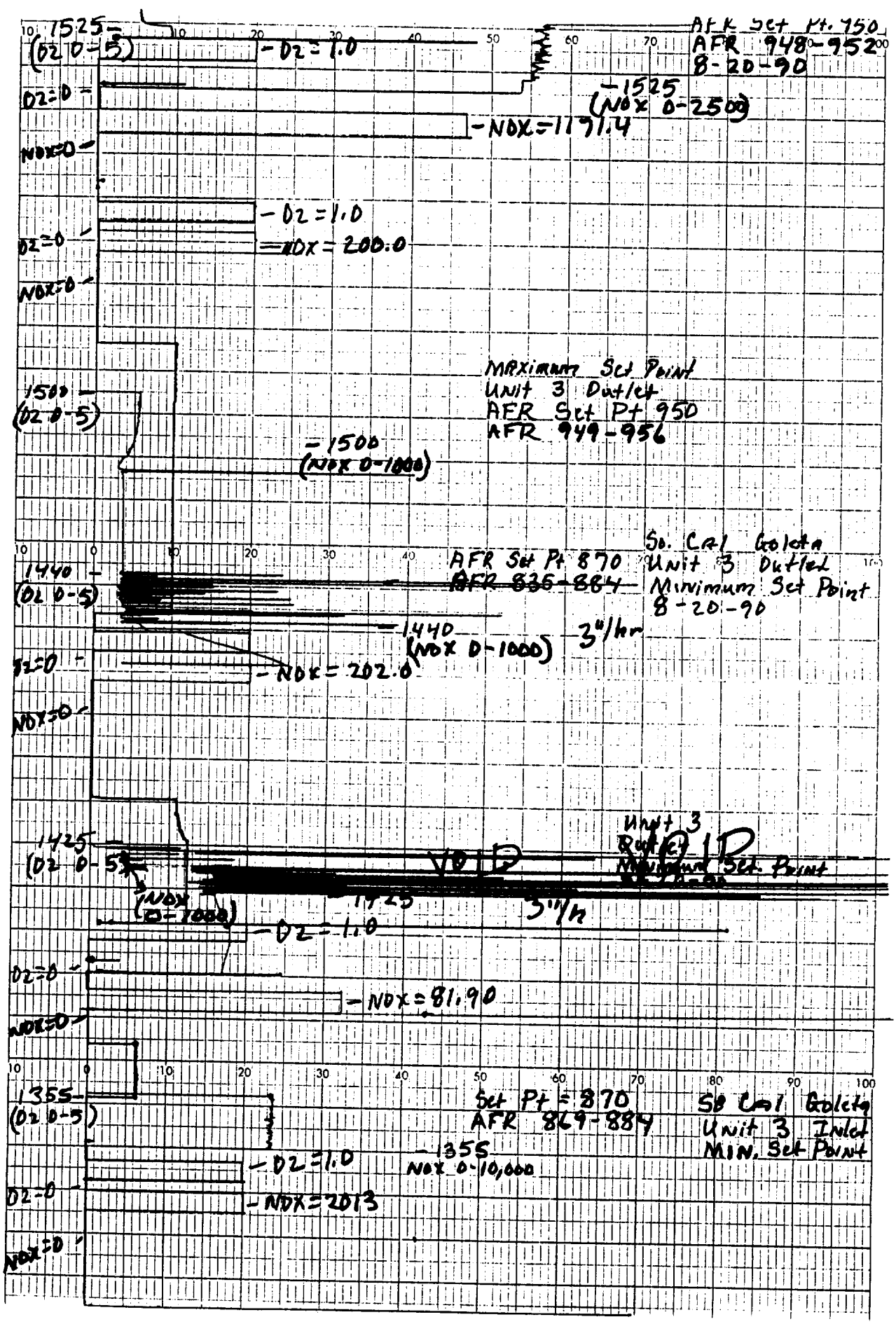
Conv. Efficiency:


-0935
-0925
-0915
-0905
(O2 0-5)
So. Cal Gas Unit 3 Run 1 In. 8-20-90
3"/hr
0935
0925
0915
0905
(NOX 0-2500)
-NOX=2080
-O2=1.0
O2=0
NOX=0
-NOX=2013.0
-O2=1.0
-0840
-NOX=39.8
-0830
-0820
-0810
(O2 0-5)
-0800
-Ext. O2=0.0 (O2 0-5)
-0840
-0830
-0820
-0810
(NOX 0-100)
So. Cal Gas Unit 3 Run 1 Out. 8-20-90
3"/hr
-0800
-Ext. NOX=40.6 (NOX 0-100)
LIN. Check -NOX=1175
LIN Check NOX=1995
(NOX=0-2500)
Conv Check → -NO=40.4
Conv. Check -NOX=42.0
(NOX=0-100)
LIN Check → -NOX=41.0
LIN Check → -NOX=82.0
So. Cal Gas Co. 8-20-90
-O2=1.0
-NOX=41.39
CHART NO. 41044
(1527)
Charts-Inc

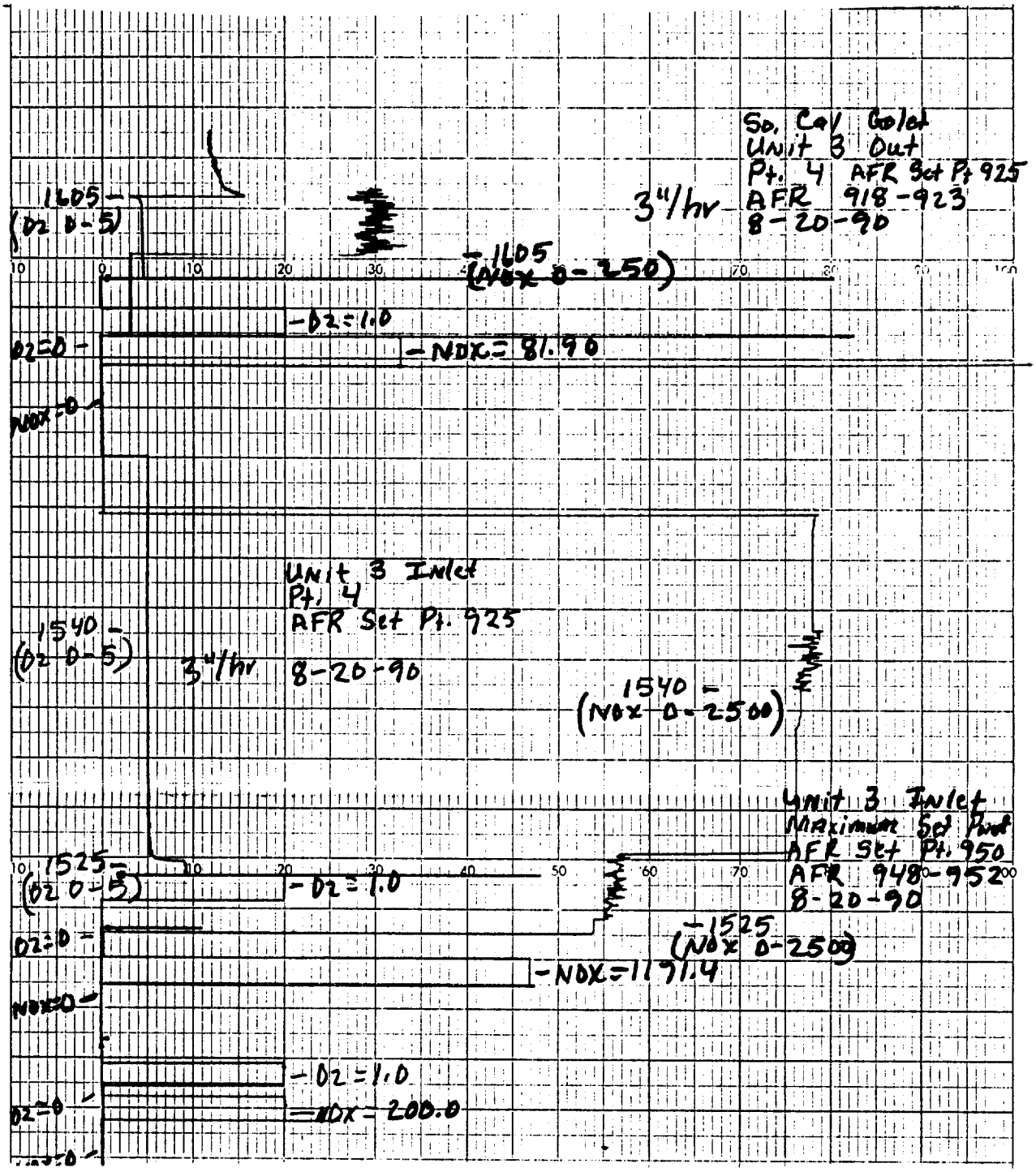

O2=0
O2=0.96
NOX=0.0
NOX=2100
1130
1130
1190
1100
(O2 0-5)
1130
1120
1110
1100
(NOX 0-10,000)
3"/hr
So. Cal Gas Co Inlet
Unit 3
Run 2 Inlet
8-20-90
O2=1.0
O2=0
NOX=2013
NOX=0
O2=0
O2=1.0
NOX=0.3
1035
1025
1015
1005
(O2 0-5)
NOX=80.0
1035
1025
1015
1005
(NOX 0-250) 3"/hr
So. Cal Gas
Unit 3
Run 2 Outlet
8-20-90
NOX=81.90
NOX=0
O2=1.0
O2=0
NOX=41.39
NOX=0
O2=0
O2=1.0
NOX=0
0935
0925
0915
NOX=2020
0935
0925
So. Cal Gas
Unit 3
Run 1
Charts-Inc
(1527)
CHART NO. 41044
Charts-Inc



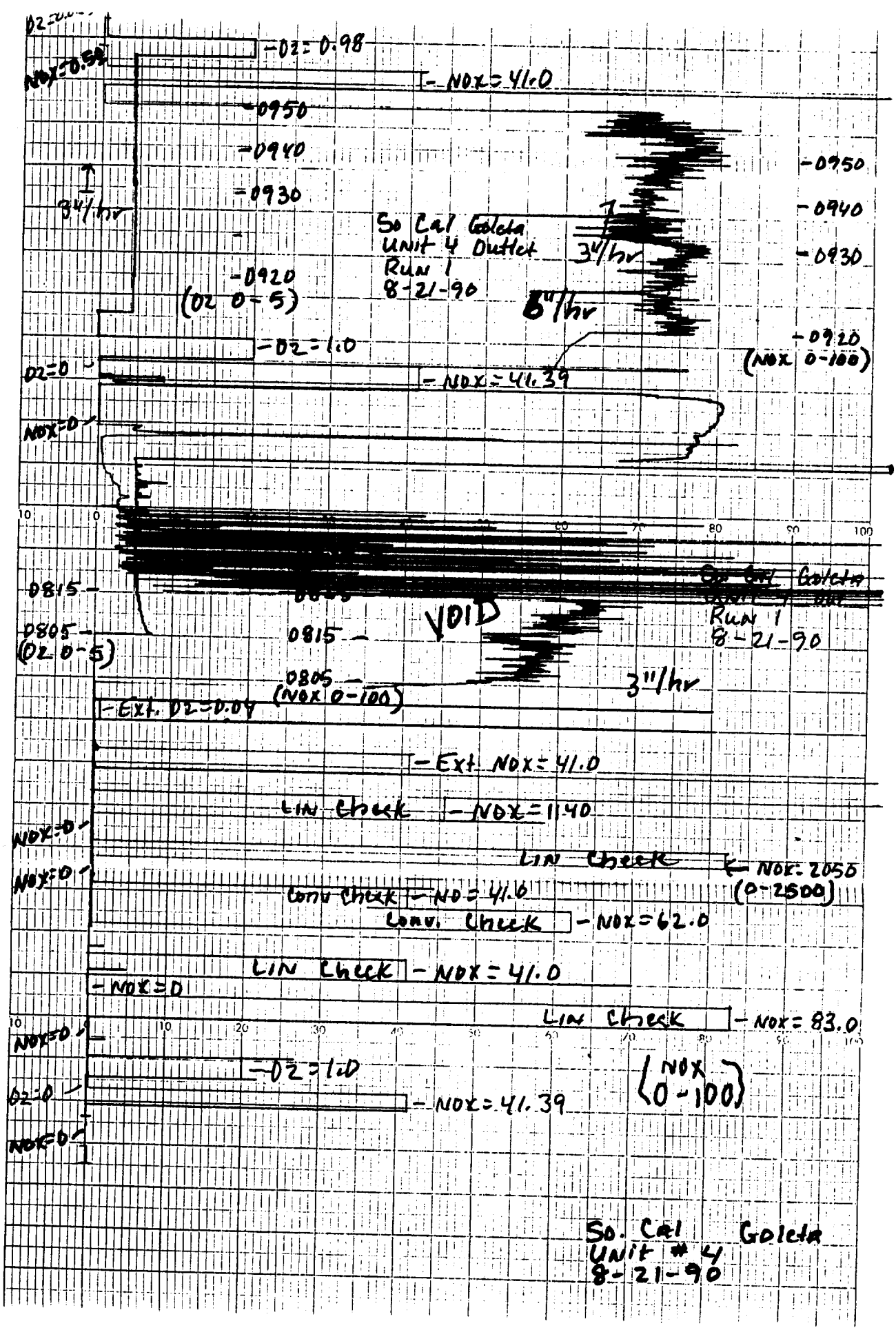
Ext. O2=0.05
Ext. NOX = 1990
O2 = 0.99
NOX = 2010
O2=0
NOX = 0
1320
1310
1300
1250
(O2 0-5)
1320
1310
1300
1250
(NOX 0-10,000)
3"/hr
So. Cal Gas Goleta
Unit 3
Run 3 Inlet
8-20-90
O2=0
NOX 2013.0
NOX=0
O2=0
O2 = 0.98
NOX=0
1225
1215
1205
1155
(O2 0-5)
1235
1225
1215
1205
1155
(NOX 0-250)
3"/hr
So. Cal Gas Goleta
Unit 3
Run 3 Outlet
8-20-90
O2 = 1.0
NOX = 81.90
O2=0
NOX=0
O2=0
O2 = 0.96
NOX=0.0
1130
1130
NOX = 2100



AFR Set Pt. 950
AFR 948-952
8-20-90
1525
(O2 0-5)
O2 = 1.0
O2 = 0
1525
(NOX 0-2500)
NOX = 1191.4
NOX = 0
O2 = 1.0
O2 = 0
NOX = 200.0
NOX = 0
Maximum Set Point
Unit 3 Outlet
AFR Set Pt 950
AFR 949-956
1500
(O2 0-5)
1500
(NOX 0-1000)
So. Cal Goleta
Unit 3 Outlet
Minimum Set Point
8-20-90
AFR Set Pt 870
AFR 835-884
1440
(O2 0-5)
1440
(NOX 0-1000)
3"/hr
O2 = 0
NOX = 202.0
NOX = 0
Unit 3
Outlet
Minimum Set Point
1425
(O2 0-5)
VOID
(NOX 0-1000)
1425
3"/h
O2 = 1.0
O2 = 0
NOX = 81.90
NOX = 0
1355
(O2 0-5)
Set Pt = 870
AFR 869-884
SB Cal Goleta
Unit 3 Inlet
MIN. Set Point
1355
NOX 0-10,000
O2 = 1.0
O2 = 0
NOX = 2013
NOX = 0



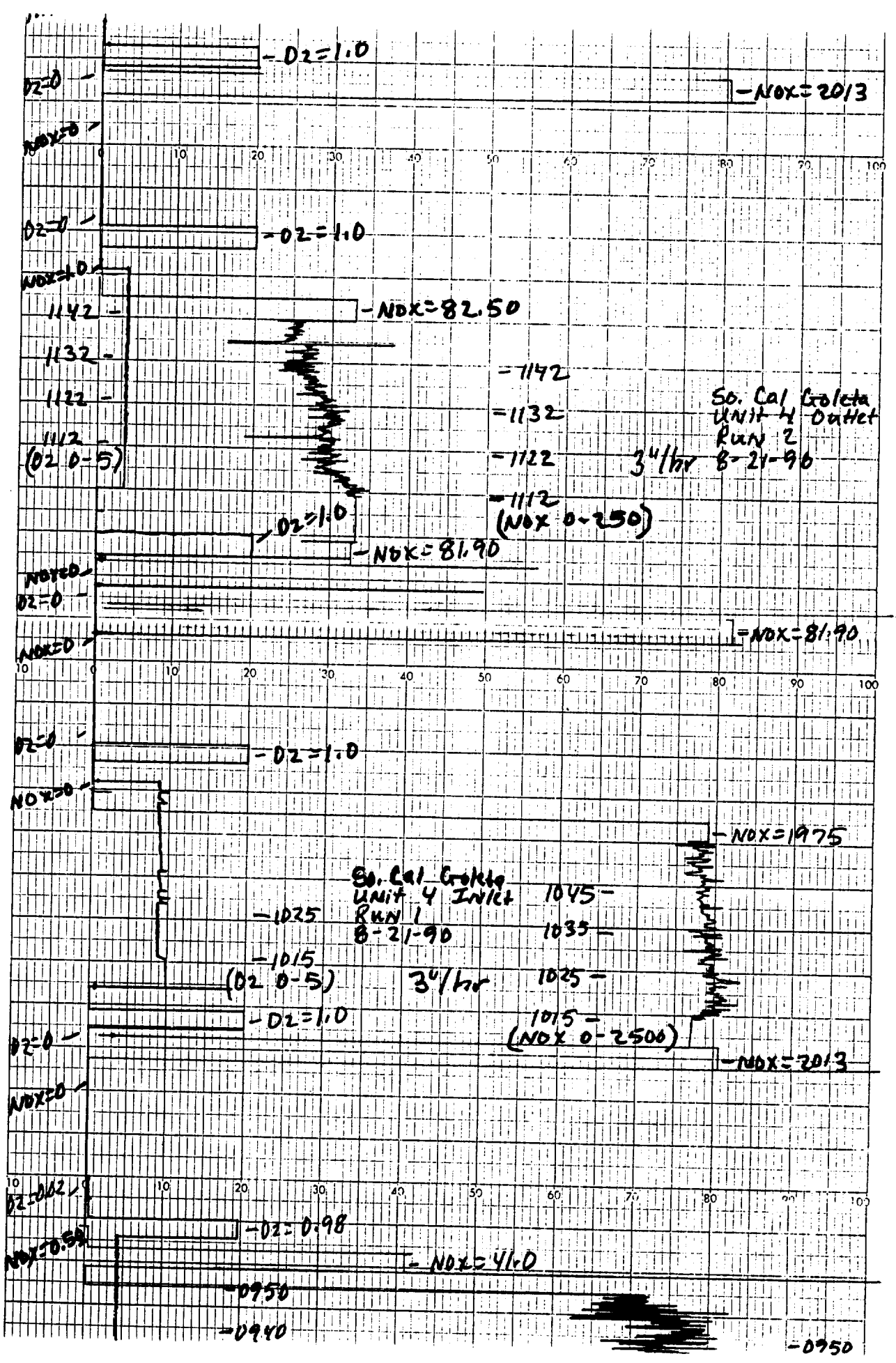
Charts Inc
(1527)
CHART NO. 414044



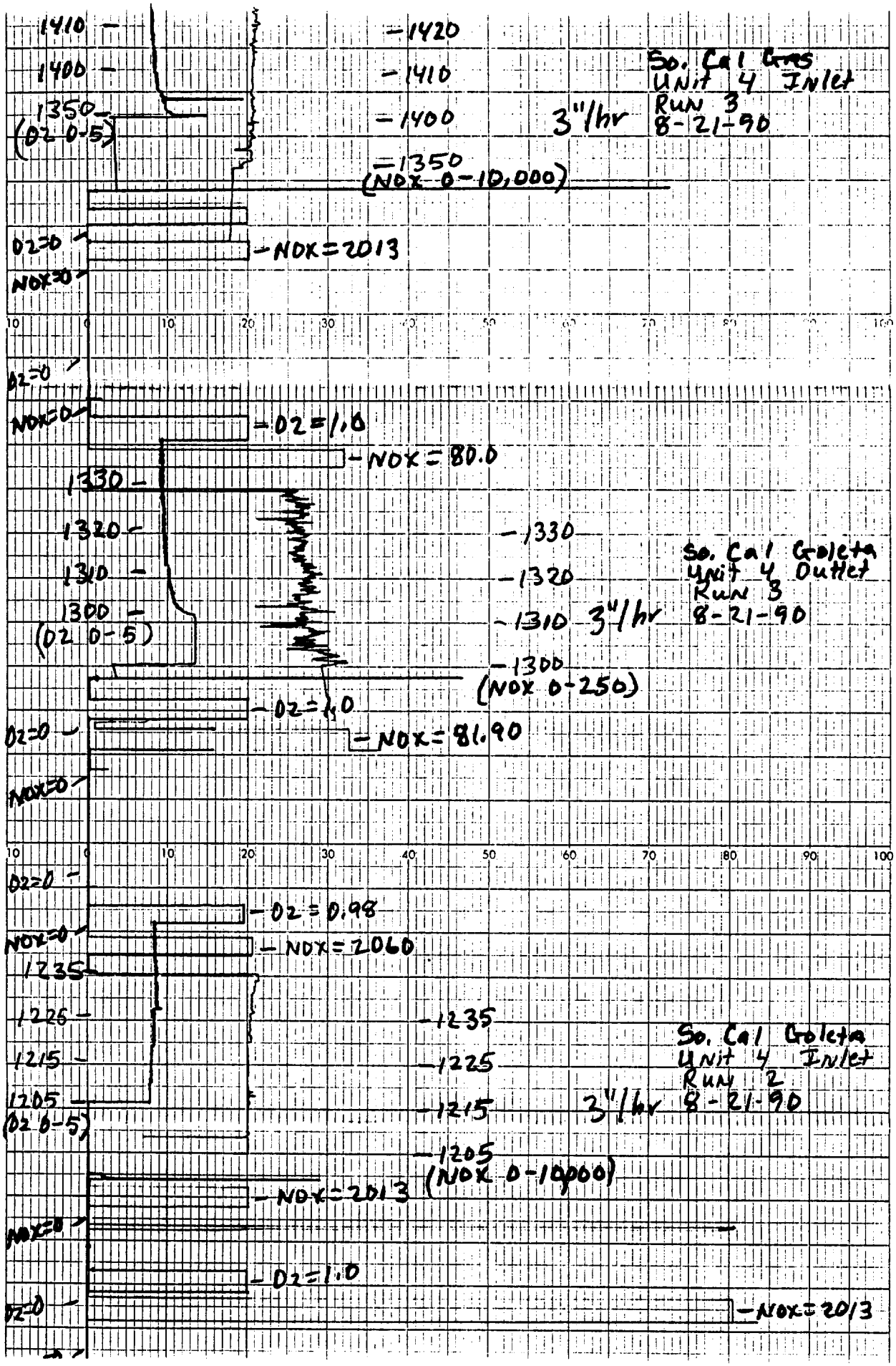
(1527)

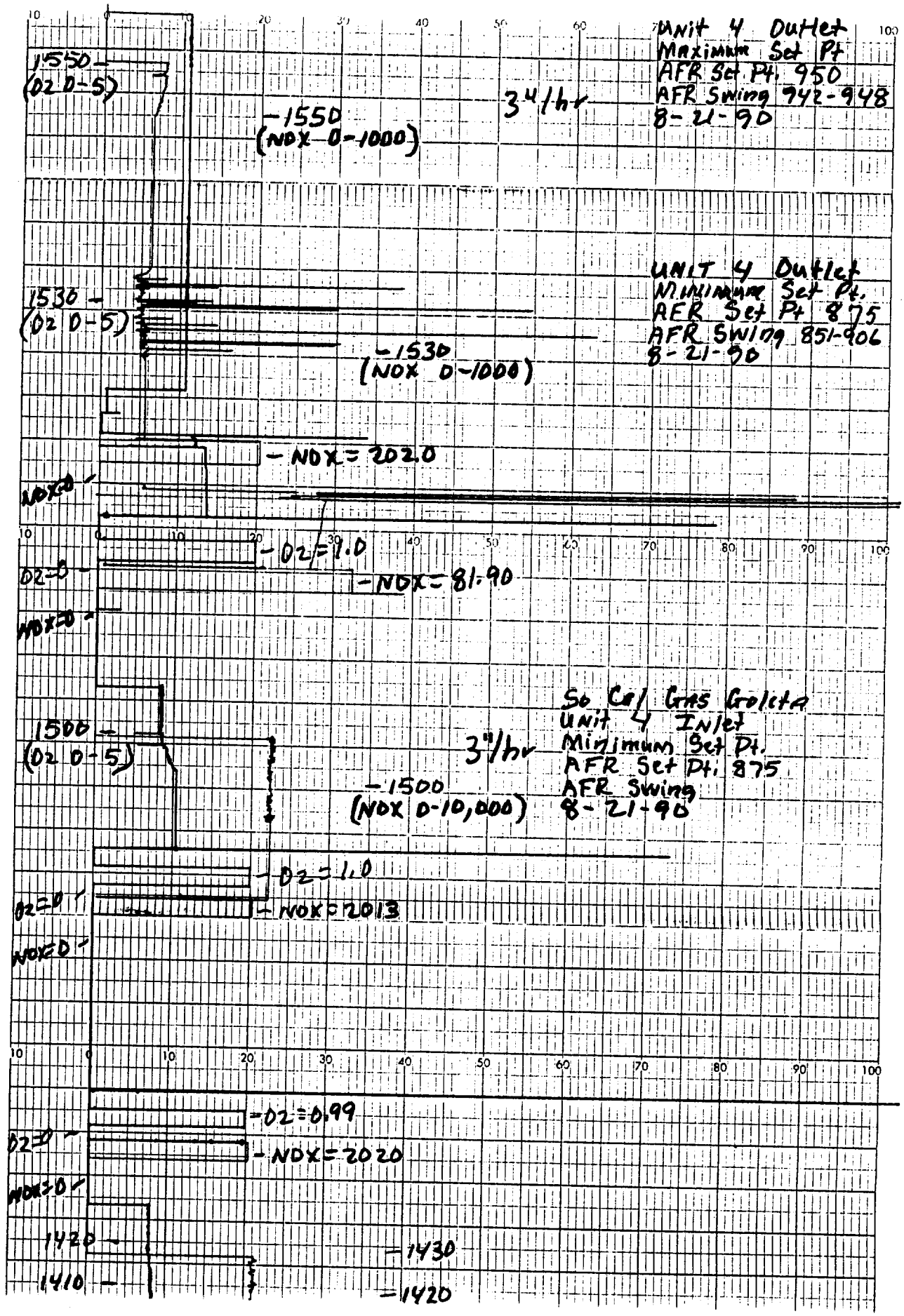
CHART NO. 41044

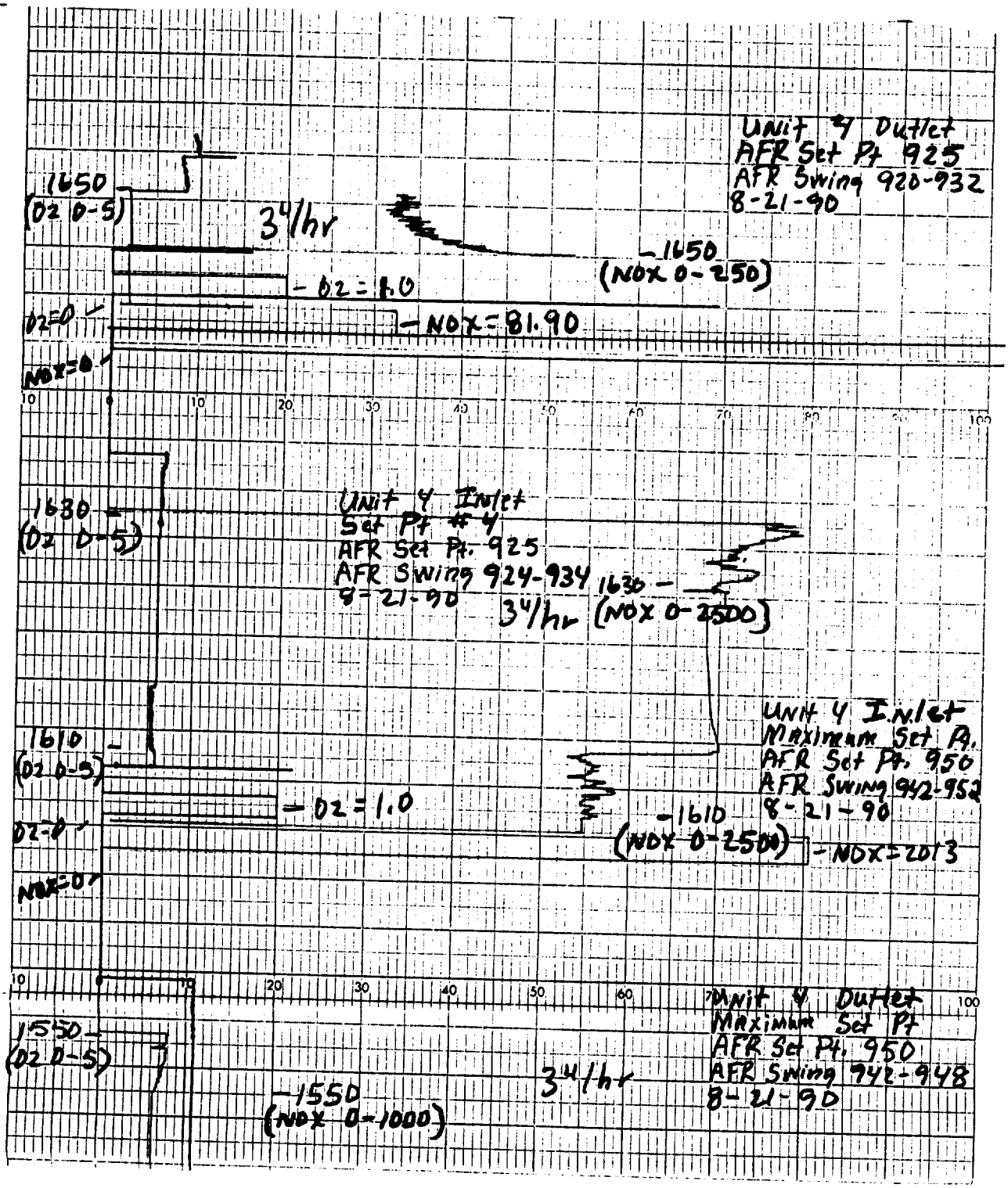
Charts-Inc



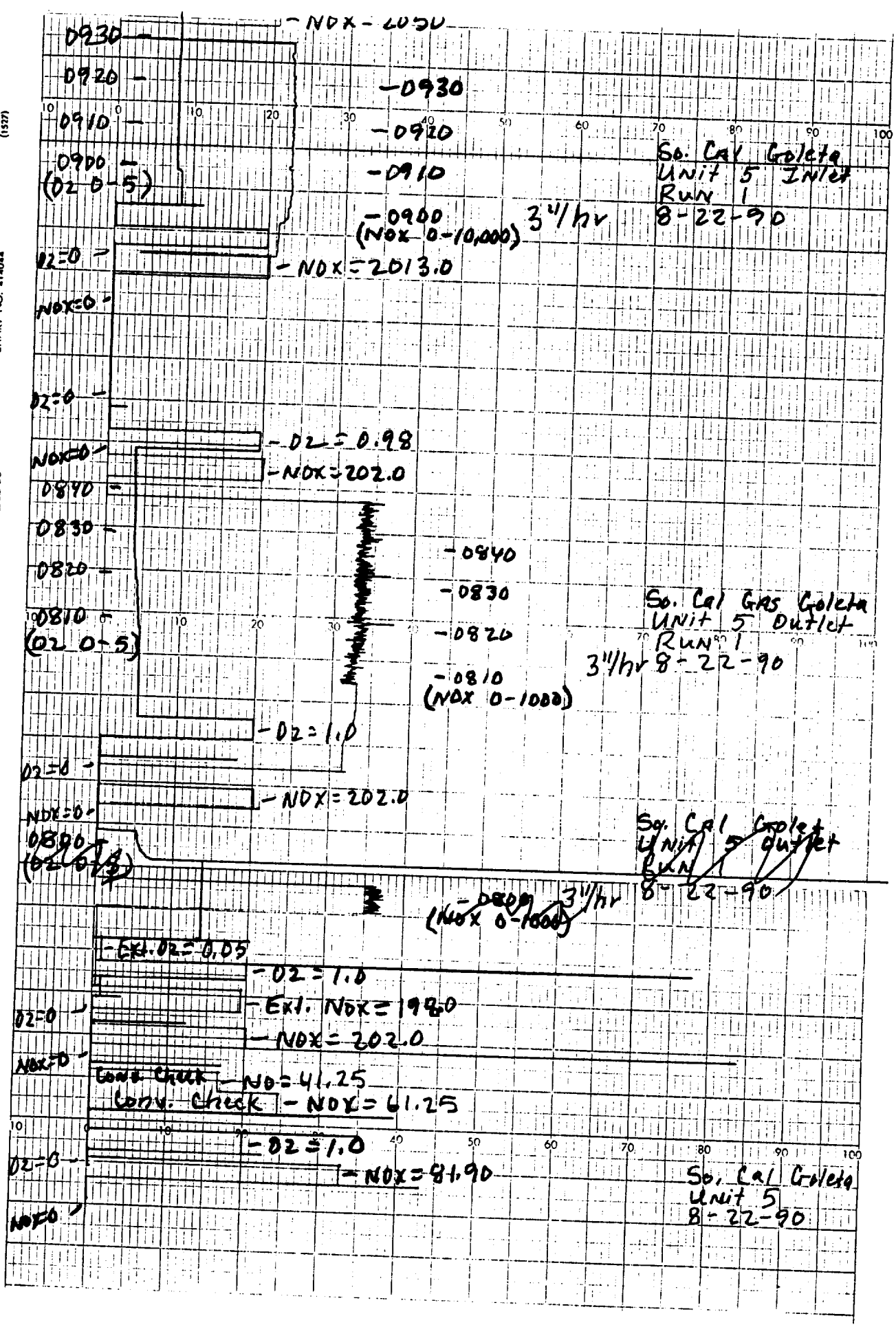
Charts-Inc
(1527)
CHART NO. 414044
Charts-Inc

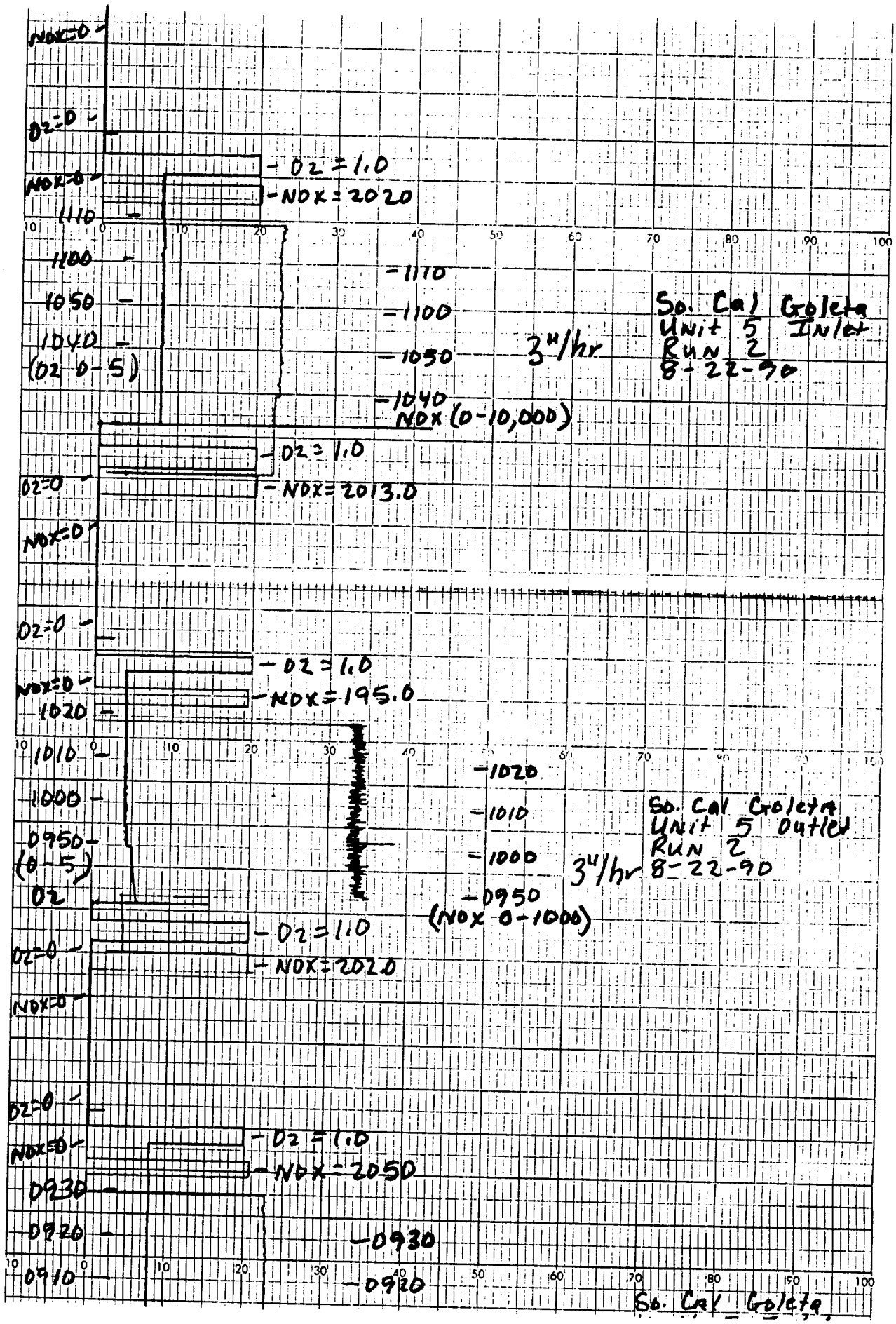

1410
1400
1350
(O2 0-5)
O2=0
NOX=0
-1420
-1410
-1400
-1350
(NOX 0-10,000)
3"/hr
So. Cal Gas
Unit 4 Inlet
Run 3
8-21-90
-NOX=2013
10
0
10
20
30
40
50
60
70
80
90
100
O2=0
NOX=0
-O2=1.0
-NOX=80.0
1330
1320
1310
1300
(O2 0-5)
-1330
-1320
-1310
-1300
(NOX 0-250)
3"/hr
So. Cal Goleta
Unit 4 Outlet
Run 3
8-21-90
-O2=1.0
-NOX=81.90
O2=0
NOX=0
10
0
10
20
30
40
50
60
70
80
90
100
O2=0
NOX=0
-O2=0.98
-NOX=2060
1235
1225
1215
1205
(O2 0-5)
-1235
-1225
-1215
-1205
(NOX 0-10000)
3"/hr
So. Cal Goleta
Unit 4 Inlet
Run 2
8-21-90
-NOX=2013
NOX=0
-O2=1.0
O2=0
-NOX=2013
CHART
Charts-Inc
CHART NO. 414044
(1527)


Unit 4 Outlet
Maximum Set Pt
AFR Set Pt. 950
AFR Swing 942-948
8-21-90
3"/hr
1550
(O2 0-5)
-1550
(NOX 0-1000)
UNIT 4 Outlet
Minimum Set Pt.
AFR Set Pt 875
AFR Swing 851-906
8-21-90
1530
(O2 0-5)
-1530
(NOX 0-1000)
- NOX = 2020
NOX=0
- O2 = 1.0
O2=0
- NOX = 81.90
NOX=0
So Cal Gas Golleta
Unit 4 Inlet
Minimum Set Pt.
AFR Set Pt. 875
AFR Swing
8-21-90
3"/hr
1500
(O2 0-5)
-1500
(NOX 0-10,000)
- O2 = 1.0
O2=0
- NOX = 2013
NOX=0
- O2 = 0.99
O2=0
- NOX = 2020
NOX=0
1420
1410
-1430
-1420

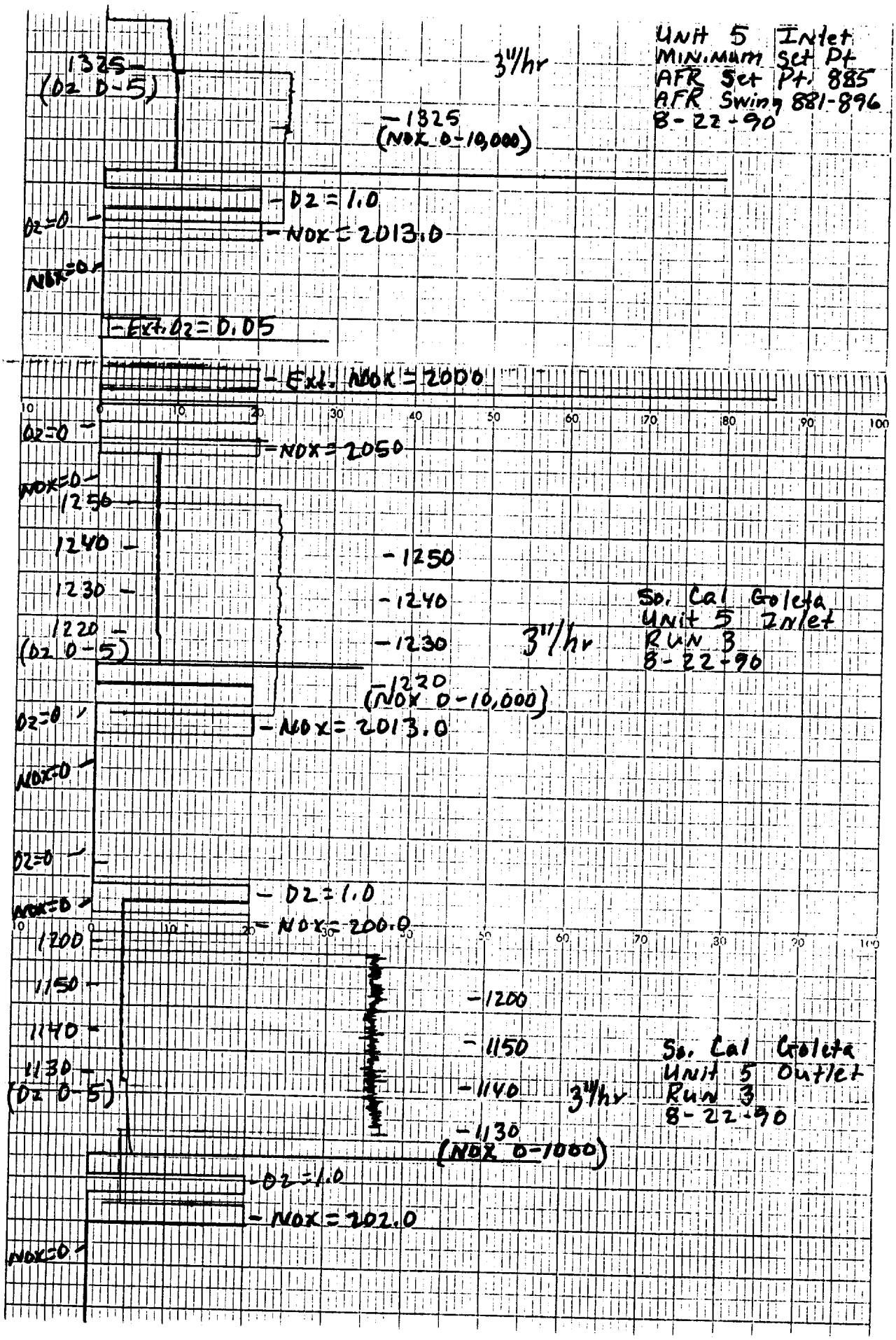


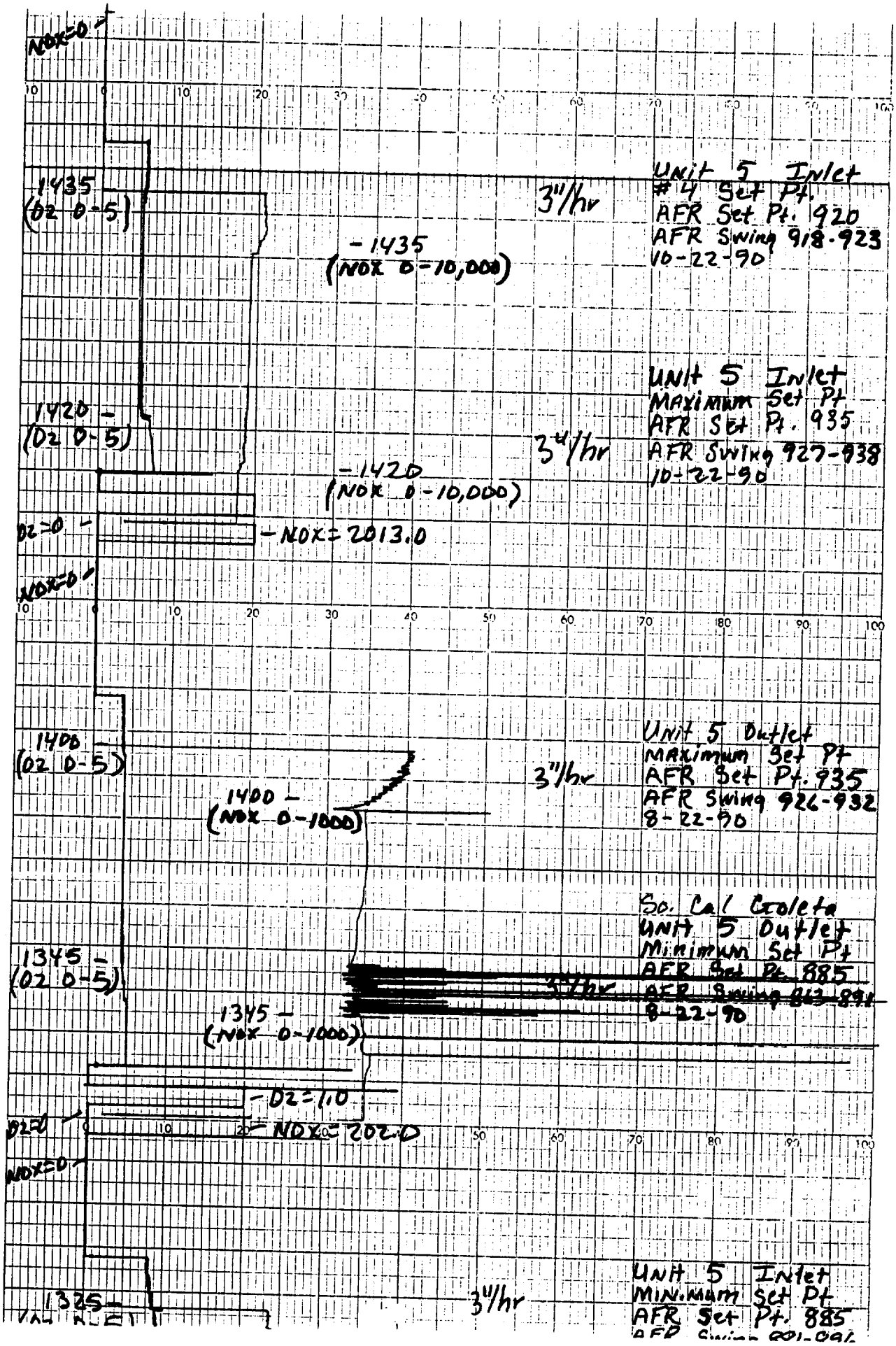
Unit 4 Outlet
AFR Set Pt 925
AFR Swing 920-932
8-21-90
1650
(O2 0-5)
3 4/hr
1650
(NOX 0-250)
O2 = 1.0
O2=0
NOX = 81.90
NOX=0
Unit 4 Inlet
Set Pt #4
AFR Set Pt. 925
AFR Swing 924-934
8-21-90
1630
(O2 0-5)
1630
(NOX 0-2500)
3 4/hr
Unit 4 Inlet
Maximum Set Pt.
AFR Set Pt. 950
AFR Swing 942-952
8-21-90
1610
(O2 0-5)
O2 = 1.0
O2=0
NOX=0
1610
(NOX 0-2500)
NOX=2013
Unit 4 Outlet
Maximum Set Pt
AFR Set Pt. 950
AFR Swing 942-948
8-21-90
1550
(O2 0-5)
1550
(NOX 0-1000)
3 4/hr


- NOX - 2050
0930
0920
0910
0900
(O2 0-5)
-0930
-0920
-0910
-0900
(NOX 0-10,000)
3"/hr
So. Cal Gaslecta
Unit 5 Inlet
Run 1
8-22-90
O2=0
- NOX = 2013.0
NOX=0
O2=0
- O2 = 0.98
NOX=0
- NOX = 202.0
0840
0830
0820
0810
(O2 0-5)
-0840
-0830
-0820
-0810
(NOX 0-1000)
So. Cal Gas Gaslecta
Unit 5 Outlet
Run 1
3"/hr 8-22-90
- O2 = 1.0
O2=0
- NOX = 202.0
NOX=0
0800
(O2 0-5)
(NOX 0-1000)
3"/hr
So. Cal Gaslecta
Unit 5 Outlet
Run 1
8-22-90
- Ext. O2 = 0.05
- O2 = 1.0
O2=0
- Ext. NOX = 198.0
- NOX = 202.0
NOX=0
Conv. Check - NO = 41.25
Conv. Check - NOX = 41.25
- O2 = 1.0
O2=0
- NOX = 81.90
NOX=0
So. Cal Gaslecta
Unit 5
8-22-90
CHART NO. 41044
Charts-Inc
(1527)
044



(1527)
CHART NO. 41044
Charts Inc
(1527)


UNH 5 Inlet
MIN. Mum Set Pt
AFR Set Pt. 885
AFR Swing 881-896
8-22-90
3"/hr
1325
(O2 0-5)
1825
(NOX 0-10,000)
O2 = 1.0
NOX = 2013.0
O2=0
NOX=0
Ext. O2 = 0.05
Ext. NOX = 2000
10 0 10 20 30 40 50 60 70 80 90 100
O2=0
NOX = 2050
NOX=0
1250
1240
1230
1220
(O2 0-5)
1250
1240
1230
1220
(NOX 0-10,000)
So. Cal Goleta
Unit 5 Inlet
RUN 3
8-22-90
3"/hr
O2=0
NOX = 2013.0
NOX=0
O2=0
O2 = 1.0
NOX = 200.0
NOX=0
10 0 10 20 30 40 50 60 70 80 90 100
1200
1150
1140
1130
(O2 0-5)
1200
1150
1140
1130
(NOX 0-1000)
So. Cal Goleta
Unit 5 Outlet
Run 3
8-22-90
3"/hr
O2 = 1.0
NOX = 202.0
NOX=0
CHART NO. 41044
(1327)
Charts-Inc


NOX=0
1435
(O2 0-5)
-1435
(NOX 0-10,000)
3"/hr
UNIT 5 INLET
#4 SET PT.
AFR SET PT. 920
AFR SWING 918-923
10-22-90
1420
(O2 0-5)
-1420
(NOX 0-10,000)
O2=0
-NOX=2013.0
3"/hr
UNIT 5 INLET
MAXIMUM SET PT
AFR SET PT. 935
AFR SWING 927-938
10-22-90
NOX=0
1400
(O2 0-5)
1400
(NOX 0-1000)
3"/hr
UNIT 5 OUTLET
MAXIMUM SET PT
AFR SET PT. 935
AFR SWING 926-932
8-22-90
1345
(O2 0-5)
1345
(NOX 0-1000)
-O2=1.10
-NOX=202.0
3"/hr
SO. CAL EDISON
UNIT 5 OUTLET
MINIMUM SET PT
AFR SET PT. 885
AFR SWING 883-891
8-22-90
NOX=0
1325
3"/hr
UNIT 5 INLET
MINIMUM SET PT
AFR SET PT. 885
AFR SWING 881-891
10 0 10 20 30 40 50 60 70 80 90 100
(1527)
CHART NO. 414044
Chart-Inc

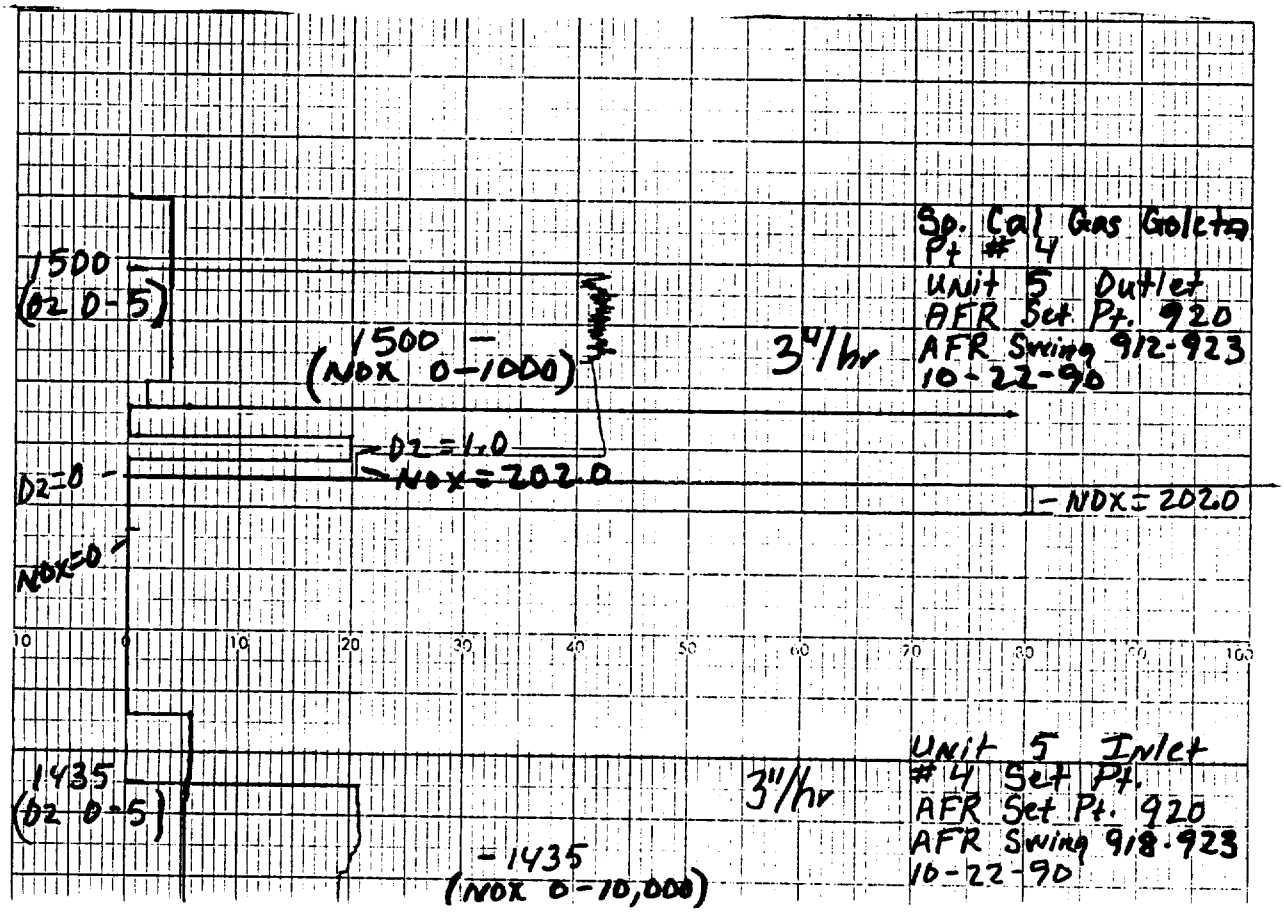
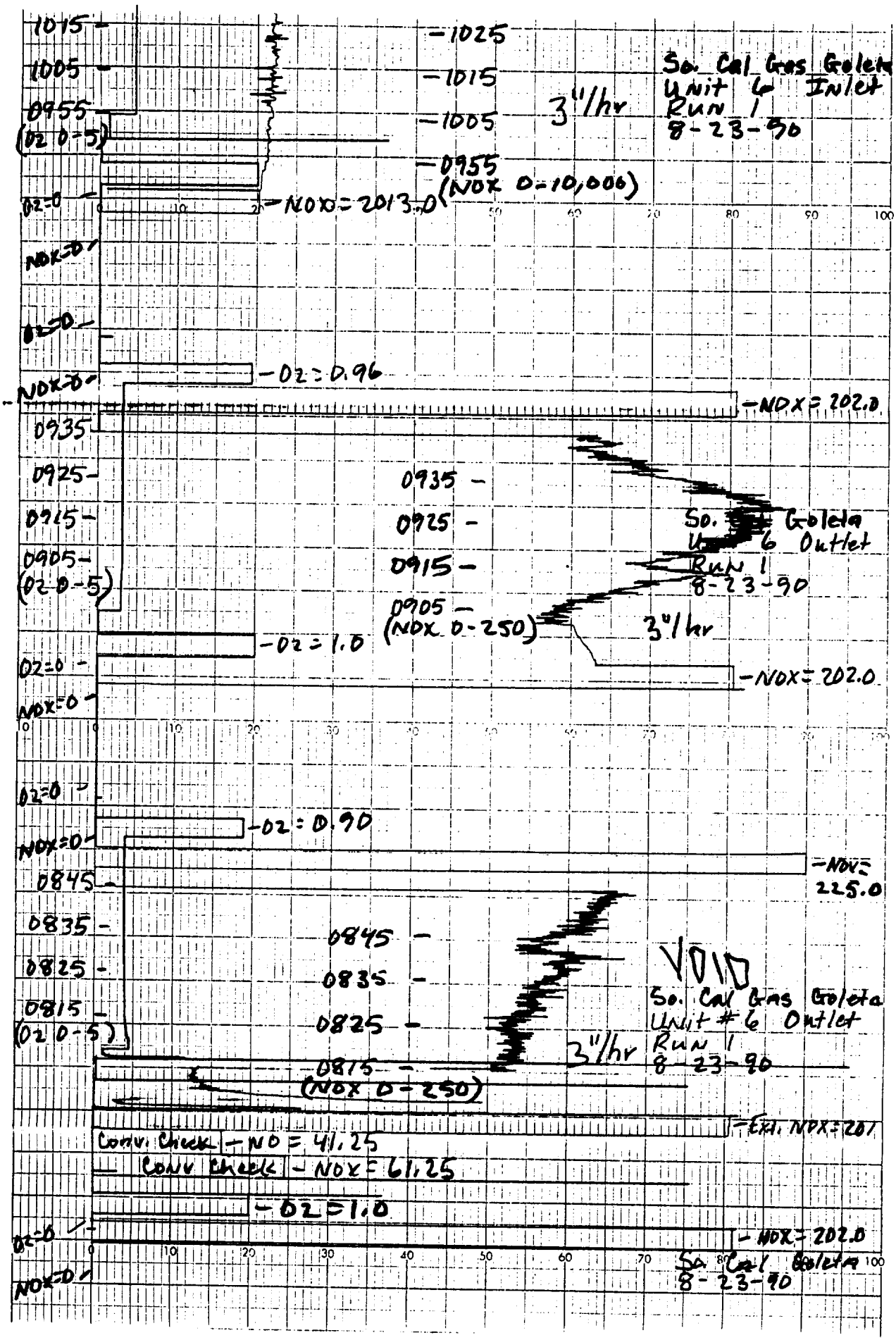
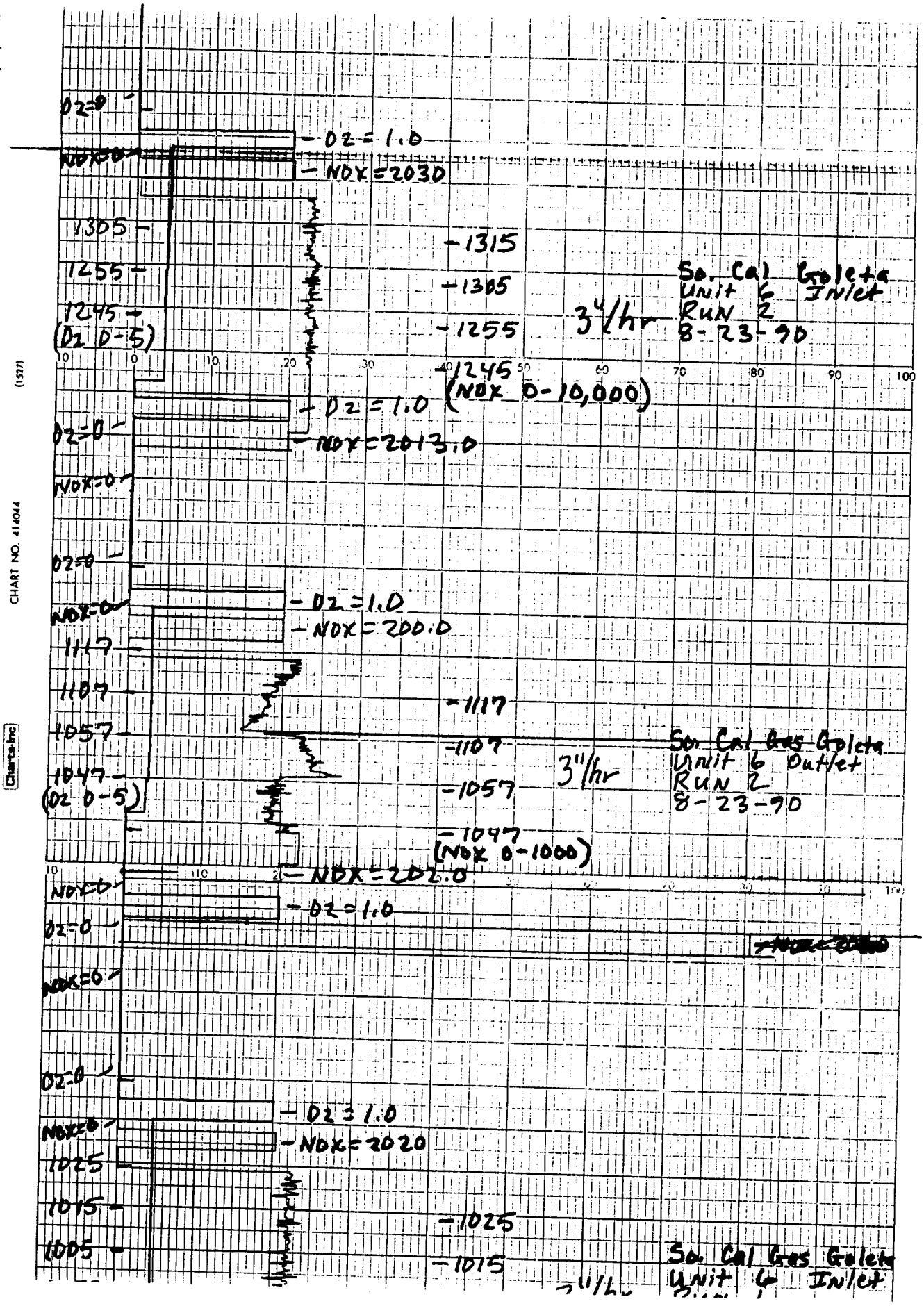


CHART NO. 41044
Charts-Inc
1500
(O2 0-5)
1500 –
(NOX 0-1000)
3"/hr
Sp. Cal Gas Goleta
Pt # 4
Unit 5 Outlet
AFR Set Pt. 920
AFR Swing 912-923
10-22-90
O2 = 1.0
NOx = 202.0
O2=0
NOX=0
– NOX = 202.0
10 0 10 20 30 40 50 60 70 80 90 100
1435
(O2 0-5)
= 1435
(NOX 0-10,000)
3"/hr
Unit 5 Inlet
#4 Set Pt.
AFR Set Pt. 920
AFR Swing 918-923
10-22-90


So. Cal Gas Goleta
Unit 6 Inlet
Run 1
8-23-90
3"/hr
1015
1005
0955
(O2 0-5)
1025
1015
1005
0955
(NOX 0-10,000)
O2=0
NOX=0
NOX=2013.0
O2=0.96
NOX=202.0
0935
0925
0915
0905
(O2 0-5)
(NOX 0-250)
So. Goleta
Unit 6 Outlet
Run 1
8-23-90
3"/hr
O2=1.0
NOX=202.0
O2=0.90
NOX=225.0
0845
0835
0825
0815
(O2 0-5)
(NOX 0-250)
VOID
So. Cal Gas Goleta
Unit #6 Outlet
Run 1
8-23-90
3"/hr
EXH. NOX=201
Conv. Check - NO = 41.25
Conv Check - NOX = 61.25
O2=1.0
NOX=202.0
So. Cal Goleta
8-23-90
CHART NO. 41044
Charts-Inc
(1527)


O2=0
O2=1.0
NOX=0
NOX=2030
1305
1255
1245
(O2 0-5)
1315
1305
1255
1245
(NOX 0-10,000)
So. Cal Gas Goleta
Unit 6 Inlet
Run 2
8-23-90
3"/hr
O2=0
O2=1.0
NOX=0
NOX=2013.0
O2=0
O2=1.0
NOX=0
NOX=200.0
1117
1107
1057
1047
(O2 0-5)
1117
1107
1057
1047
(NOX 0-1000)
So. Cal Gas Goleta
Unit 6 Outlet
Run 2
8-23-90
3"/hr
NOX=0
NOX=202.0
O2=0
O2=1.0
NOX=0
O2=0
O2=1.0
NOX=0
NOX=2020
1025
1015
1005
1025
1015
So. Cal Gas Goleta
Unit 6 Inlet
CHART NO. 414044
Charts-Inc
(1527)

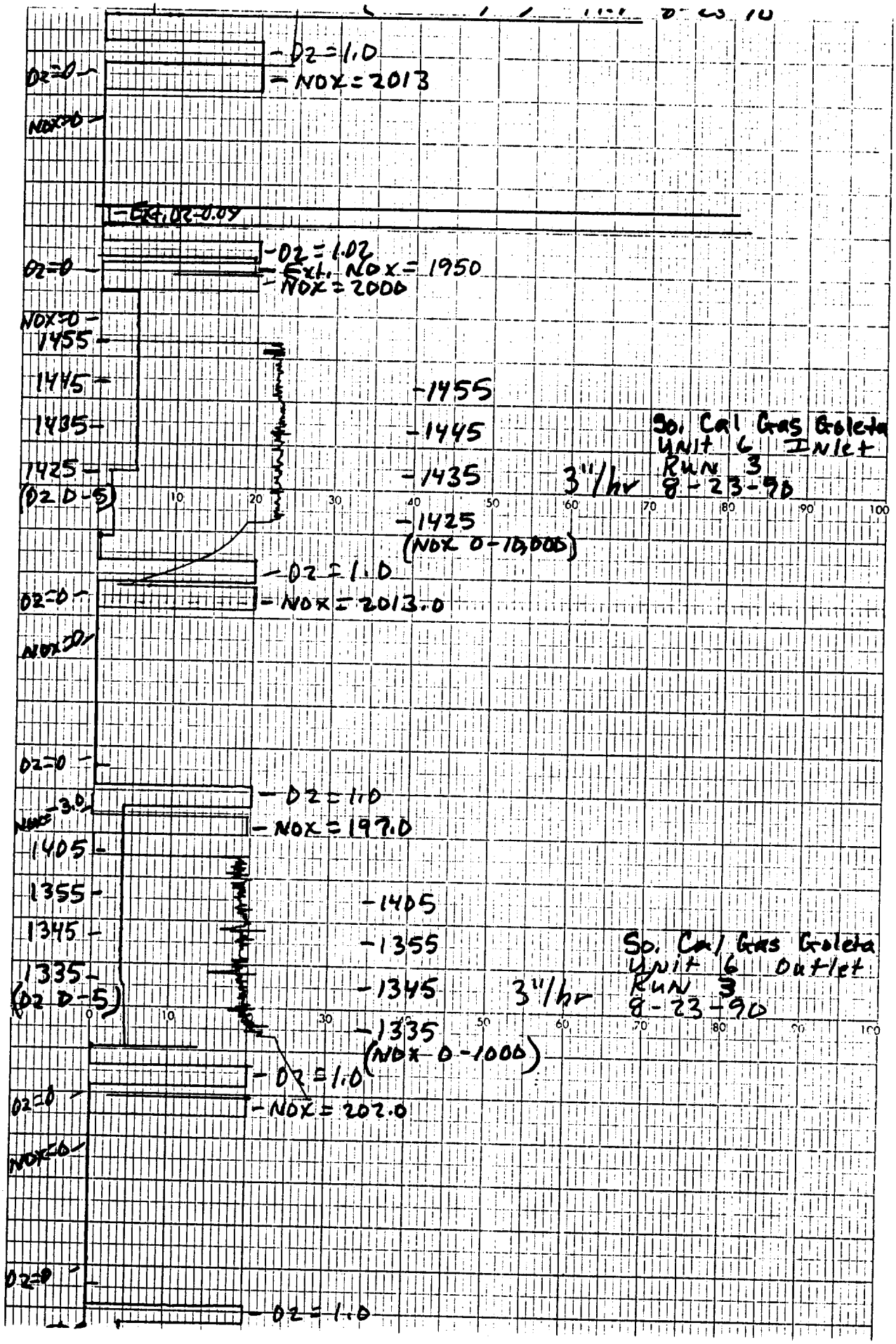
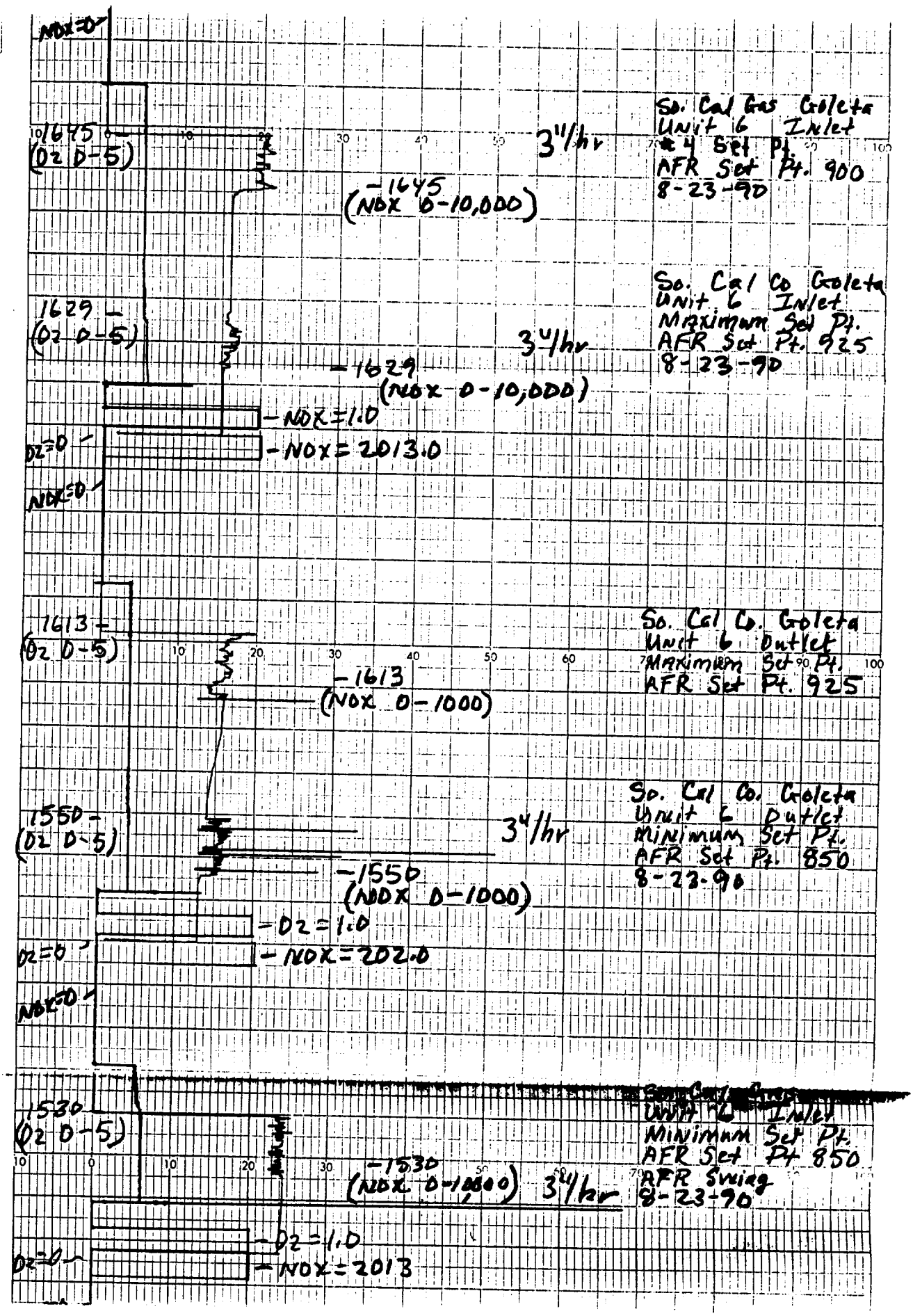


CHART NO. 41044 (1527)

Charts-Inc


So. Cal Gas Goleta
Unit 6 Inlet
#4 Set Pt.
AFR Set Pt. 900
8-23-90
3"/hr
1645
(O2 0-5)
1645
(NOX 0-10,000)
So. Cal Co Goleta
Unit 6 Inlet
Maximum Set Pt.
AFR Set Pt. 925
8-23-90
1629
(O2 0-5)
3"/hr
1629
(NOX 0-10,000)
NOX=1.0
NOX=2013.0
O2=0
NOX=0
1613
(O2 0-5)
So. Cal Co. Goleta
Unit 6 Outlet
Maximum Set Pt.
AFR Set Pt. 925
1613
(NOX 0-1000)
1550
(O2 0-5)
So. Cal Co. Goleta
Unit 6 Outlet
Minimum Set Pt.
AFR Set Pt. 850
8-23-90
3"/hr
1550
(NOX 0-1000)
O2=1.0
NOX=202.0
O2=0
NOX=0
1530
(O2 0-5)
So. Cal Gas
Unit #6 Inlet
Minimum Set Pt.
AFR Set Pt 850
AFR Swing
8-23-90
1530
(NOX 0-10000)
3"/hr
O2=1.0
NOX=2013
O2=0

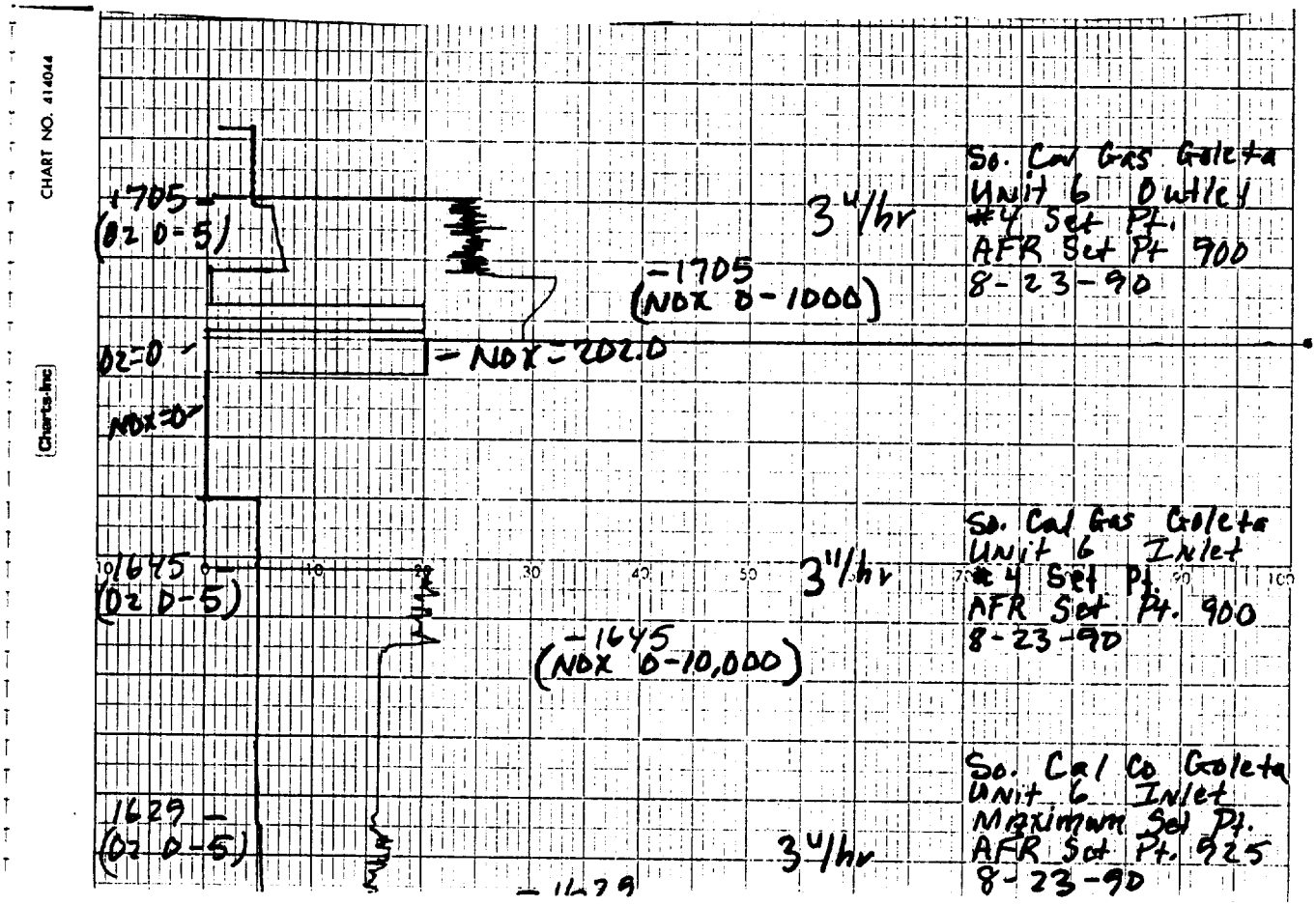
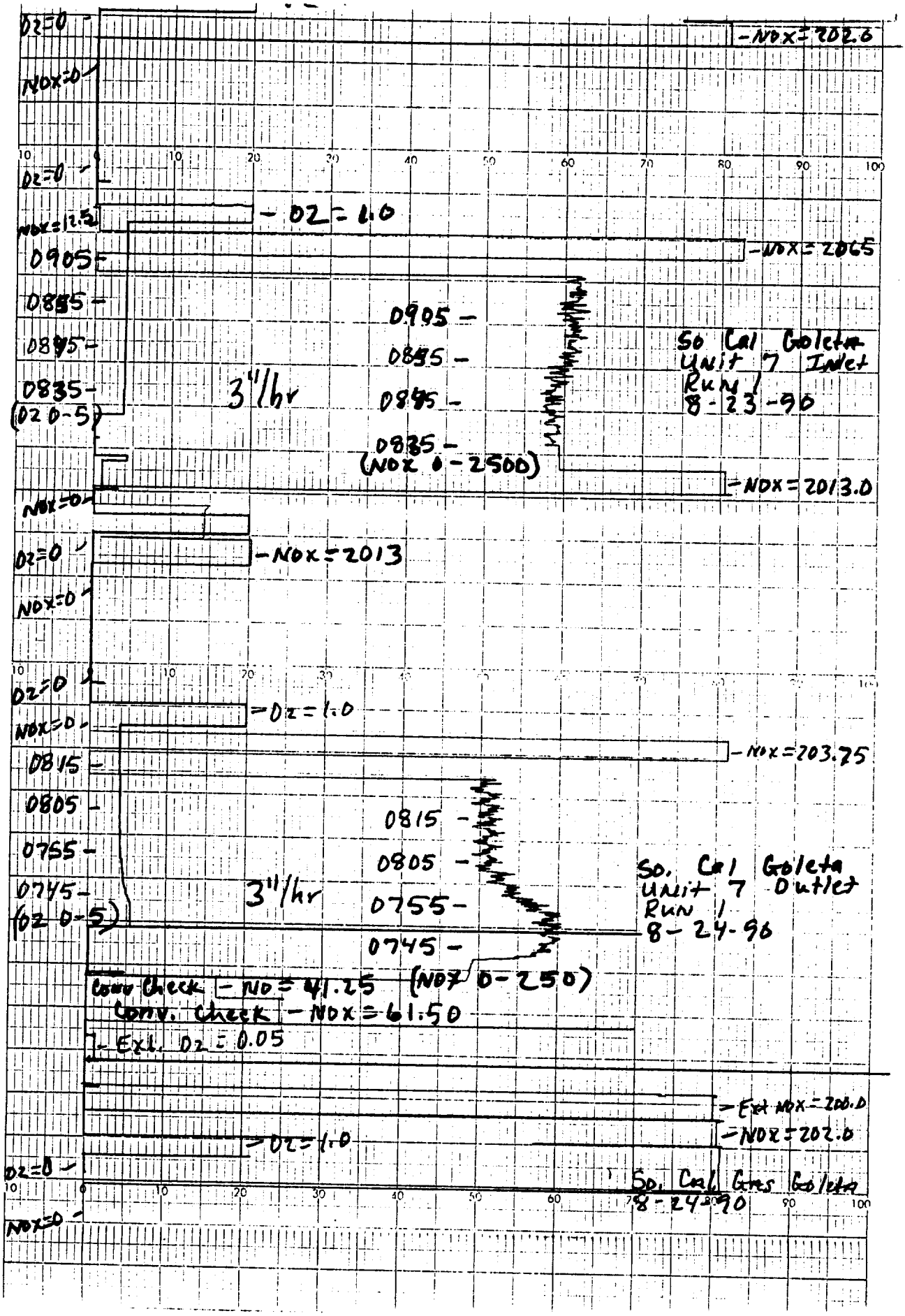
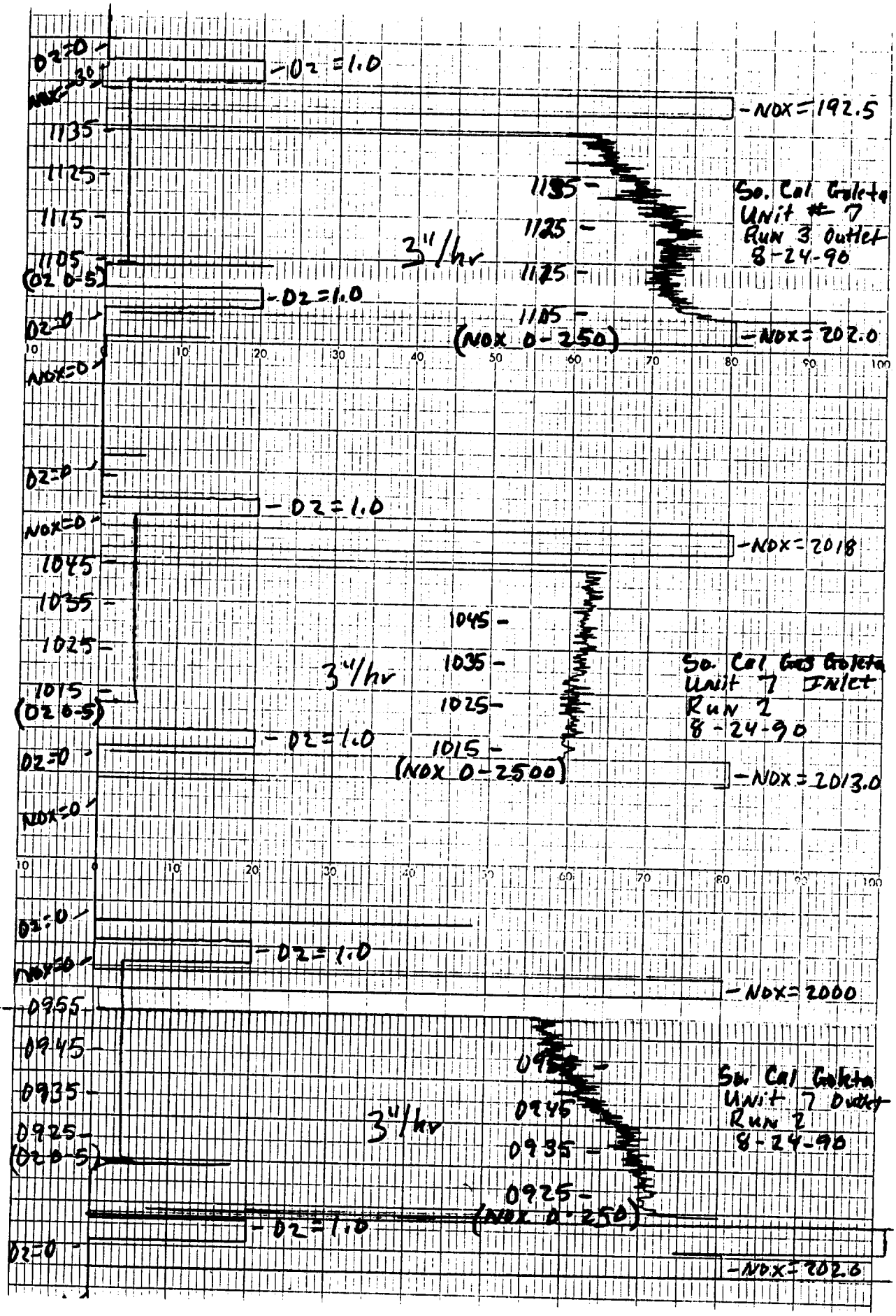
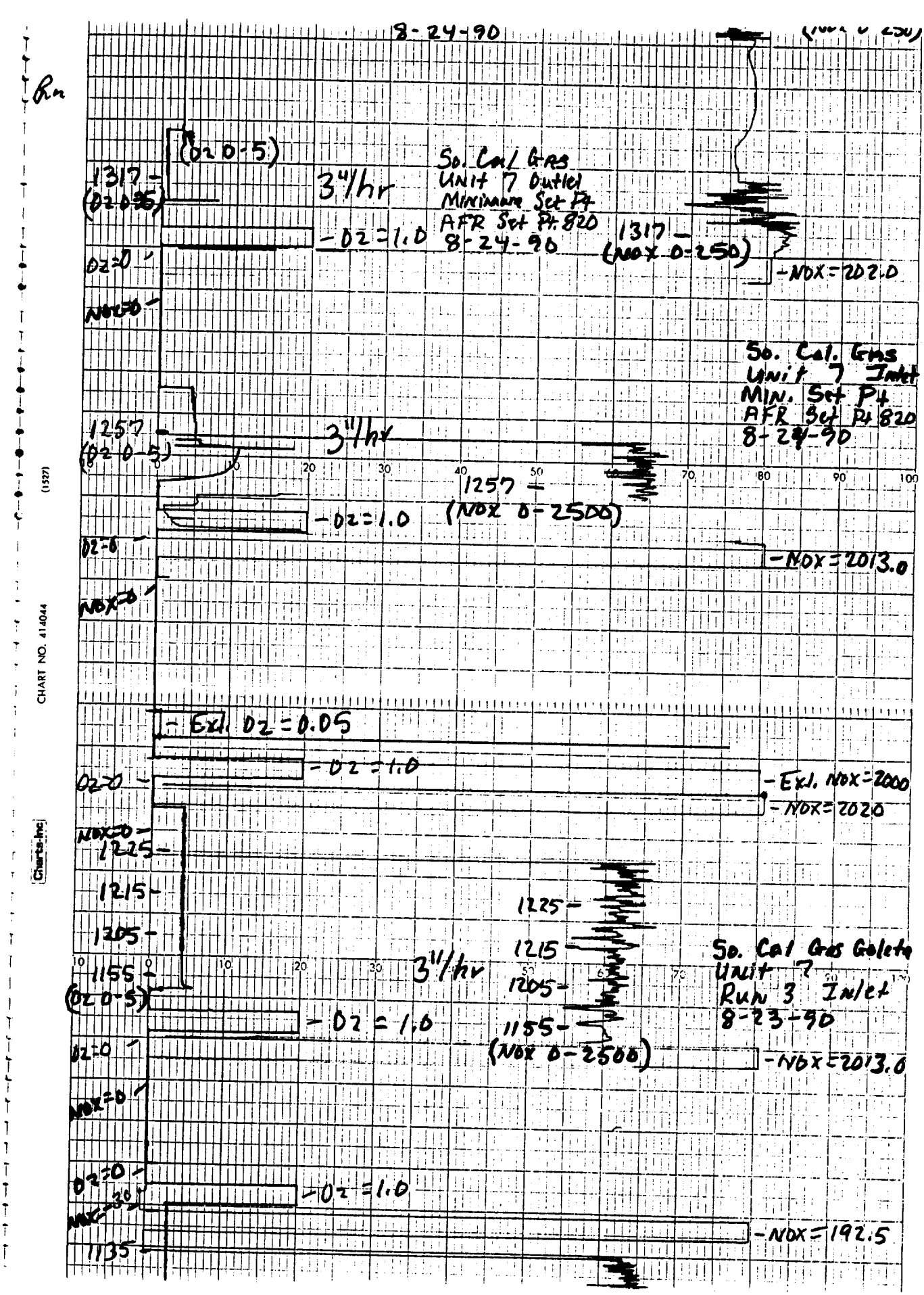
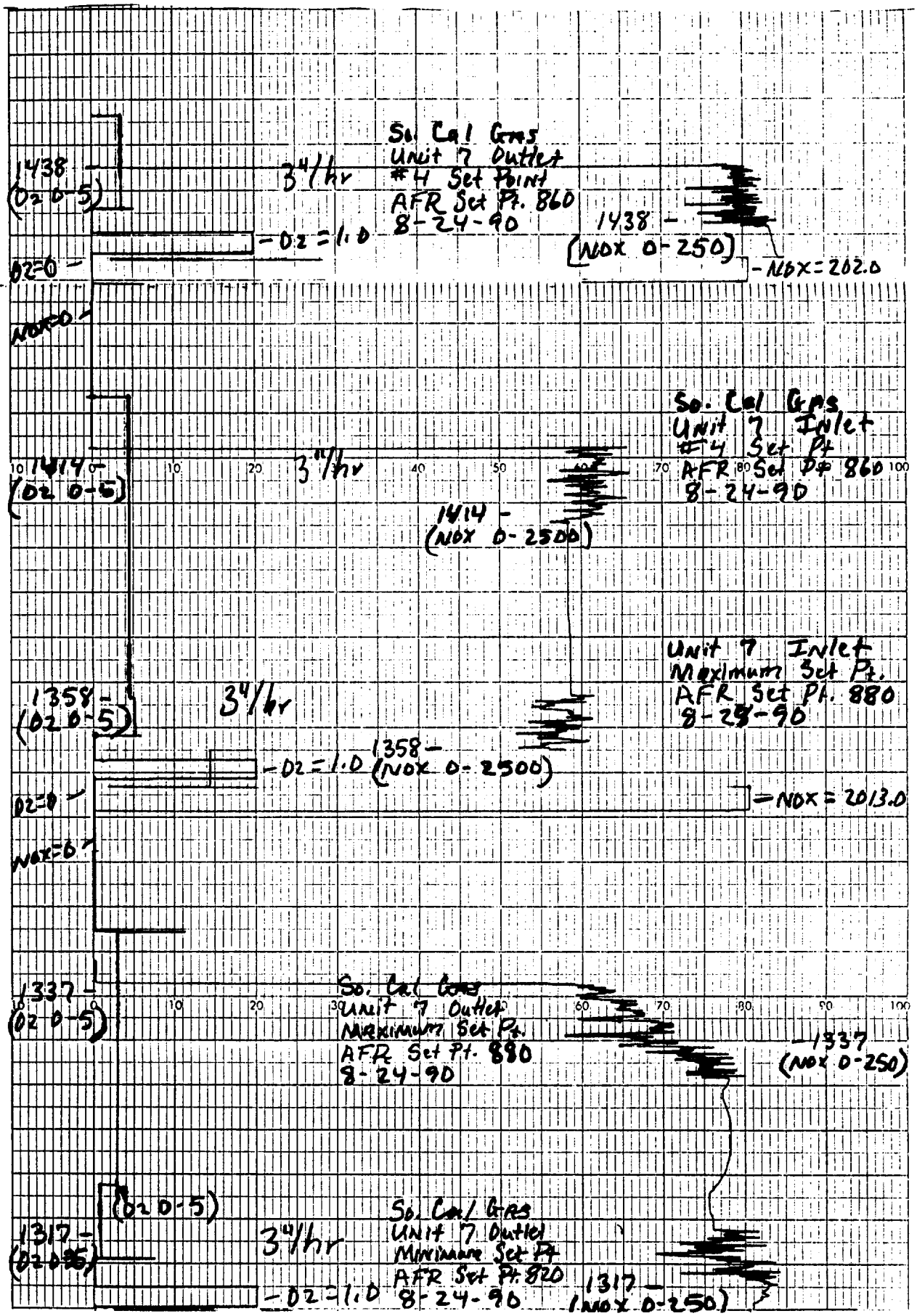


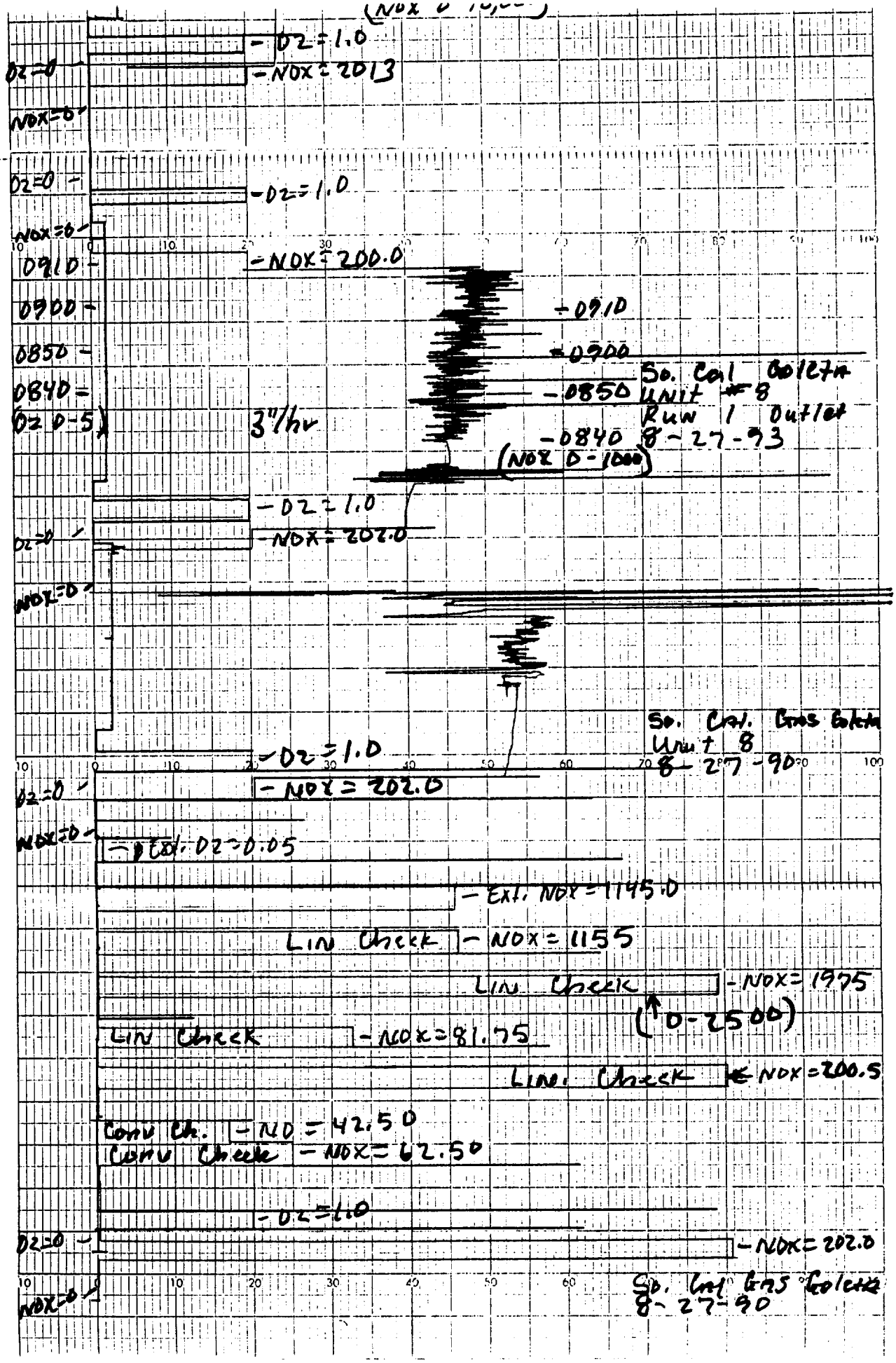
CHART NO. 414044
Charts-Inc
1705
(O2 0-5)
3"/hr
So. Cal Gas Goleta
Unit 6 Outlet
#4 Set Pt.
AFR Set Pt 900
8-23-90
-1705
(NOX 0-1000)
O2=0
NOX=202.0
NOX=0
1645
(O2 0-5)
3"/hr
So. Cal Gas Goleta
Unit 6 Inlet
#4 Set Pt.
AFR Set Pt. 900
8-23-90
-1645
(NOX 0-10,000)
1629
(O2 0-5)
3"/hr
So. Cal Co Goleta
Unit 6 Inlet
Maximum Set Pt.
AFR Set Pt. 925
8-23-90
-1629

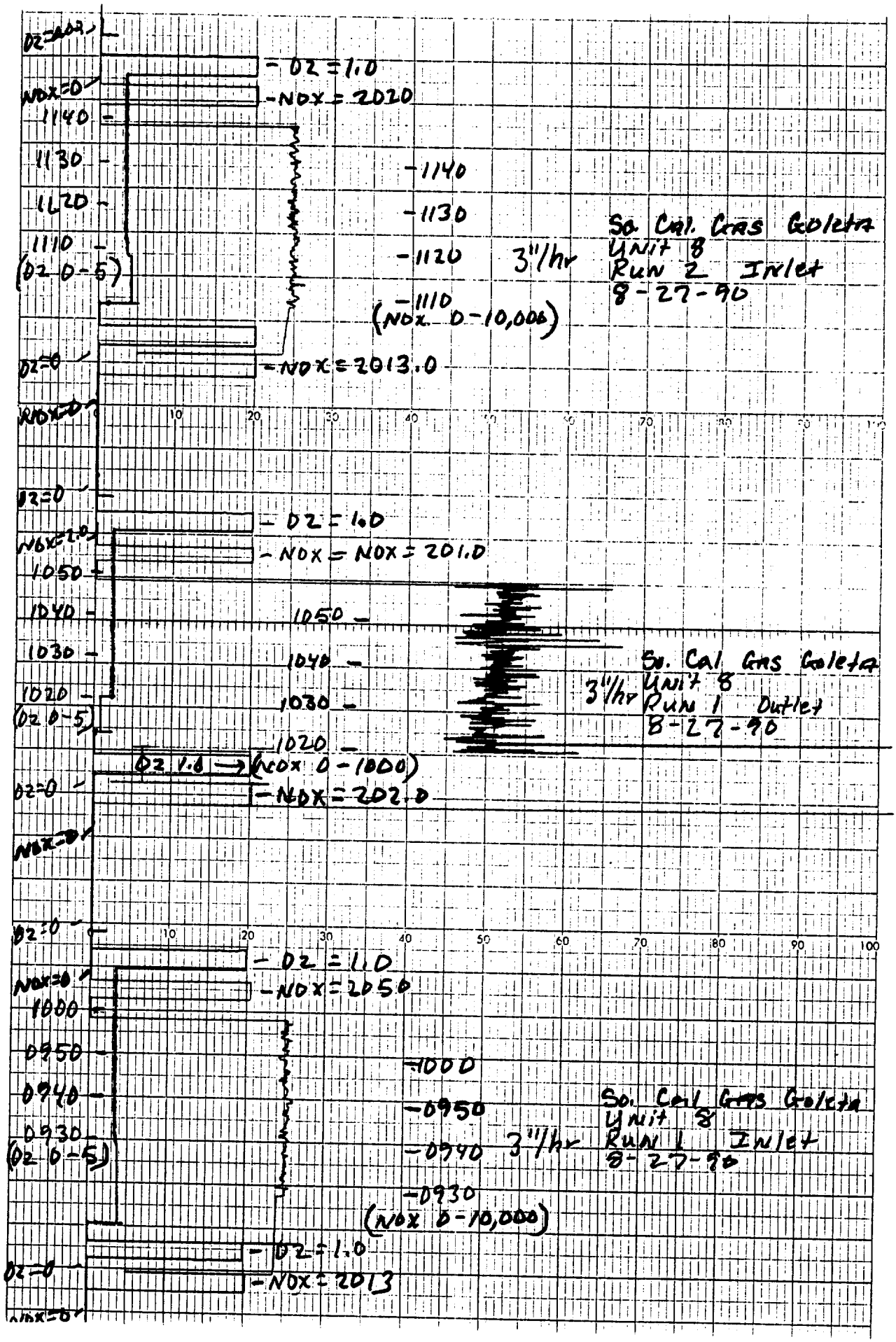

O2=0
NOX=0
-NOX=202.6
10 0 10 20 30 40 50 60 70 80 90 100
O2=0
NOX=12.5
- O2 = 1.0
0905
-NOX=2065
0855
0845
0835
(O2 0-5)
3"/hr
0905 -
0855 -
0845 -
0835 -
(NOX 0-2500)
So Cal Goleta
Unit 7 Inlet
Run 1
8-23-90
-NOX=2013.0
NOX=0
O2=0
-NOX=2013
NOX=0
10 0 10 20 30 40 50 60 70 80 90 100
O2=0
-O2=1.0
NOX=0
-NOX=203.75
0815
0805
0755
0745
(O2 0-5)
3"/hr
0815 -
0805 -
0755 -
0745 -
(NOX 0-250)
So. Cal Goleta
Unit 7 Outlet
Run 1
8-24-90
Conv Check - NO = 41.25
Conv. Check - NOX = 61.50
- Ext. O2 = 0.05
-Ext NOX=200.0
-NOX=202.0
-O2=1.0
O2=0
NOX=0
10 0 10 20 30 40 50 60 70 80 90 100
So. Cal Gas Goleta
8-24-90
CHART NO. 414044
Charts-Inc
(1527)
(1527)

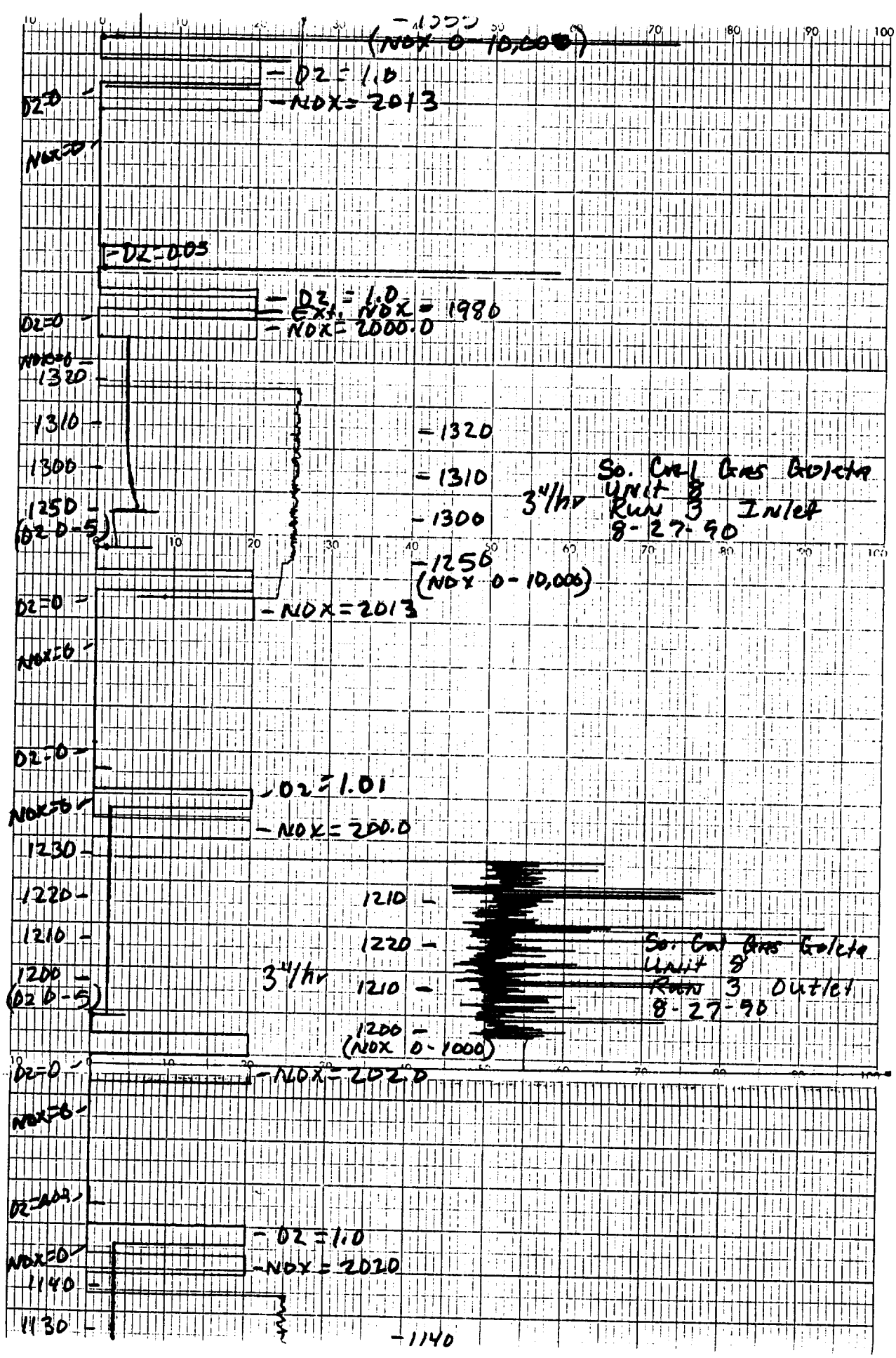

O2=0
O2=30
1135
1125
1115
1105
(O2 0-5)
O2=0
10
0
10
20
30
40
50
60
70
80
90
100
NOX=0
O2=0
NOX=0
1045
1035
1025
1015
(O2 0-5)
O2=0
NOX=0
10
0
10
20
30
40
50
60
70
80
90
100
O2=0
NOX=0
0955
0945
0935
0925
(O2 0-5)
O2=0
-O2=1.0
-NOX=192.5
So. Cal Gaketa
Unit #7
Run 3 Outlet
8-24-90
3"/hr
(NOX 0-250)
-NOX=202.0
-NOX=2018
So. Cal Gas Gaketa
Unit 7 Inlet
Run 2
8-24-90
(NOX 0-2500)
-NOX=2013.0
-NOX=2000
Sw. Cal Gaketa
Unit 7 Outlet
Run 2
8-24-90
(NOX 0-250)
-NOX=202.6
(1527)
CHART NO. 41044
Charts-Inc


8-24-90
Run
(O2 0-5)
1317 –
(O2 0-25)
3"/hr
So. Cal Gas
UNIT 7 Outlet
Minimum Set Pt
AFR Set Pt 820
8-24-90
– O2 = 1.0
O2 = 0 –
NOX = 0 –
1317 –
(NOX 0-250)
– NOX = 202.0
So. Cal. Gas
Unit 7 Inlet
MIN. Set Pt
AFR Set Pt 820
8-24-90
1257 –
(O2 0-5)
3"/hr
0 20 30 40 50 70 80 90 100
1257 –
(NOX 0-2500)
– O2 = 1.0
– NOX = 2013.0
O2 = 0 –
NOX = 0 –
– Exl. O2 = 0.05
– O2 = 1.0
O2 = 0 –
– Exl. NOX = 2000
– NOX = 2020
NOX = 0 –
1225 –
1215 –
1205 –
1155 –
(O2 0-5)
3"/hr
– O2 = 1.0
O2 = 0 –
NOX = 0 –
1135 –
1225 –
1215 –
1205 –
1155 –
(NOX 0-2500)
So. Cal Gas Goleta
Unit 7
Run 3 Inlet
8-23-90
– NOX = 2013.0
O2 = 0 –
NOX = 30 –
– O2 = 1.0
– NOX = 192.5
(1327)
CHART NO. 414044
Charts, Inc.


So. Cal Gas
Unit 7 Outlet
#4 Set Point
AFR Set Pt. 860
8-24-90
1438
(O2 0-5)
3"/hr
-O2=1.0
1438
(NOX 0-250)
-NOX=202.0
O2=0
NOX=0
So. Cal Gas
Unit 7 Inlet
#4 Set Pt
AFR Set Pt 860
8-24-90
1414
(O2 0-5)
3"/hr
1414
(NOX 0-2500)
Unit 7 Inlet
Maximum Set Pt.
AFR Set Pt. 880
8-23-90
1358
(O2 0-5)
3"/hr
-O2=1.0
1358
(NOX 0-2500)
=NOX=2013.0
O2=0
NOX=0
1337
(O2 0-5)
So. Cal Gas
Unit 7 Outlet
Maximum Set Pt.
AFR Set Pt. 880
8-24-90
1337
(NOX 0-250)
(O2 0-5)
1317
(O2 0-5)
3"/hr
-O2=1.0
So. Cal Gas
UNIT 7 Outlet
Minimum Set Pt
AFR Set Pt. 820
8-24-90
1317
(NOX 0-250)
CHART NO. 414044
(1527)
Charts-Inc


(NOX 0 1000)
O2=0
NOX=0
-O2=1.0
-NOX=2013
O2=0
NOX=0
-O2=1.0
-NOX=200.0
0910
0900
0850
0840
O2 0-5
3"/hr
-0910
-0900
-0850
-0840
So. Cal Gas Co
Unit #8
Run 1 Outlet
8-27-93
(NOX 0-1000)
-O2=1.0
-NOX=202.0
O2=0
NOX=0
So. Cal. Gas Co
Unit 8
8-27-90
-O2=1.0
-NOX=202.0
O2=0
NOX=0
-Ext. O2=0.05
-Ext. NOX=1145.0
LIN Check
-NOX=1155
LIN Check
-NOX=1975
(0-2500)
LIN Check
-NOX=81.75
Line. Check
-NOX=200.5
Conv Ch.
-NO=42.50
Conv Check
-NOX=62.50
-O2=1.0
O2=0
NOX=0
-NOX=202.0
So. Cal Gas Co
8-27-90
Charts-Inc
CHART NO. 41044
(1527)
Charts-Inc


O2=20.9
- O2 = 1.0
NOX=0
-NOX = 2020
1140
1130
1120
1110
(O2 0-5)
-1140
-1130
-1120
-1110
(NOx 0-10,000)
3"/hr
So. Cal. Gas Goleta
Unit 8
Run 2 Inlet
8-27-90
O2=0
-NOX = 2013.0
NOX=0
10
20
30
40
50
60
70
80
90
100
O2=0
- O2 = 1.0
NOX=2.0
-NOX = NOX = 201.0
1050
1040
1030
1020
(O2 0-5)
1050
1040
1030
1020
3"/hr
So. Cal Gas Goleta
Unit 8
Run 1 Outlet
8-27-90
O2 1.6 → (NOx 0-1000)
O2=0
-NOX = 202.0
NOX=0
O2=0
10
20
30
40
50
60
70
80
90
100
- O2 = 1.0
NOX=0
-NOX = 2050
1000
0950
0940
0930
(O2 0-5)
-1000
-0950
-0940
-0930
(NOx 0-10,000)
3"/hr
So. Cal Gas Goleta
Unit 8
Run 1 Inlet
8-27-90
- O2 = 1.0
O2=0
-NOX = 2013
NOX=0
CHART NO. 41044
Charts-Inc
(1527)
CHART NO. 41044
Inc


(NOX 0-10,000)
-O2=1.0
-NOX=2013
O2=0
NOX=0
-O2=.005
-O2=1.0
-Ext. NOX=1980
-NOX=2000.0
1320
1310
1300
1250
(O2 0-5)
-1320
-1310
-1300
3"/hr
So. Coal Gas Gulch
Unit 8
Run 3 Inlet
8-27-90
-1250
(NOX 0-10,000)
-NOX=2013
O2=0
NOX=0
O2=0
-O2=1.01
NOX=0
-NOX=200.0
1230
1220
1210
1200
(O2 0-5)
1210
1220
1210
1200
3"/hr
So. Coal Gas Gulch
Unit 8
Run 3 Outlet
8-27-90
(NOX 0-1000)
O2=0
-NOX=202.0
NOX=0
O2=.002
-O2=1.0
NOX=0
-NOX=2020
1140
1130
-1140

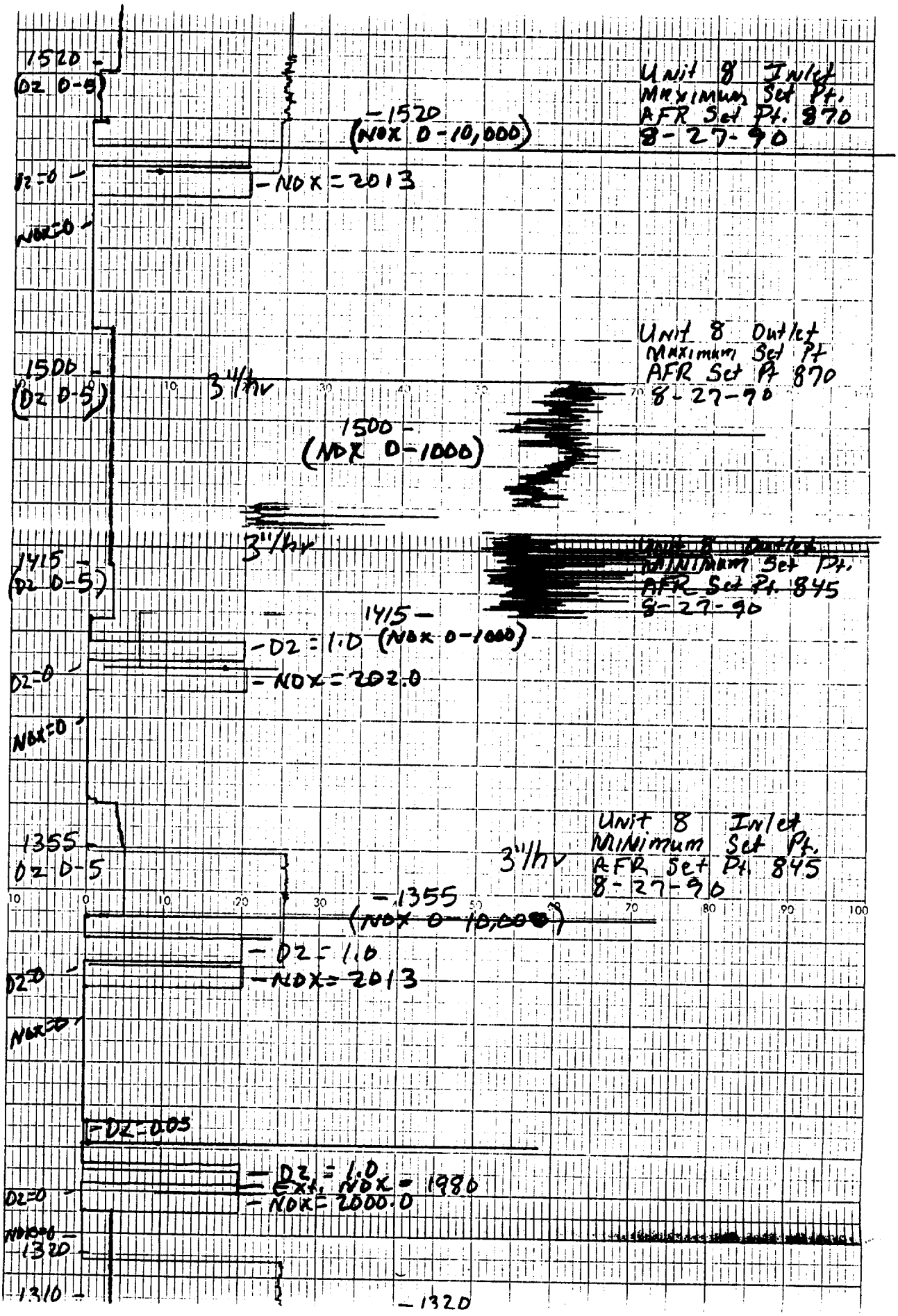


CHART NO. 414044
Charts Inc
1520
(O2 0-5)
-1520
(NOX 0-10,000)
Unit 8 Inlet
Maximum Set Pt.
AFR Set Pt. 870
8-27-90
-NOX=2013
O2=0
NOX=0
1500
(O2 0-5)
3"/hr
Unit 8 Outlet
Maximum Set Pt
AFR Set Pt 870
8-27-90
1500
(NOX 0-1000)
3"/hr
1415
(O2 0-5)
Unit 8 Outlet
Minimum Set Pt.
AFR Set Pt. 845
8-27-90
1415
(NOX 0-1000)
-O2=1.0
-NOX=202.0
O2=0
NOX=0
1355
O2 0-5
3"/hr
Unit 8 Inlet
Minimum Set Pt.
AFR Set Pt. 845
8-27-90
-1355
(NOX 0-10,000)
-O2=1.0
-NOX=2013
O2=0
NOX=0
-O2=0.05
-O2=1.0
-Ext. NOX=1980
-NOX=2000.0
O2=0
NOX=0
1320
1310
-1320
CHART NO. 414044
(1527)
Charts Inc

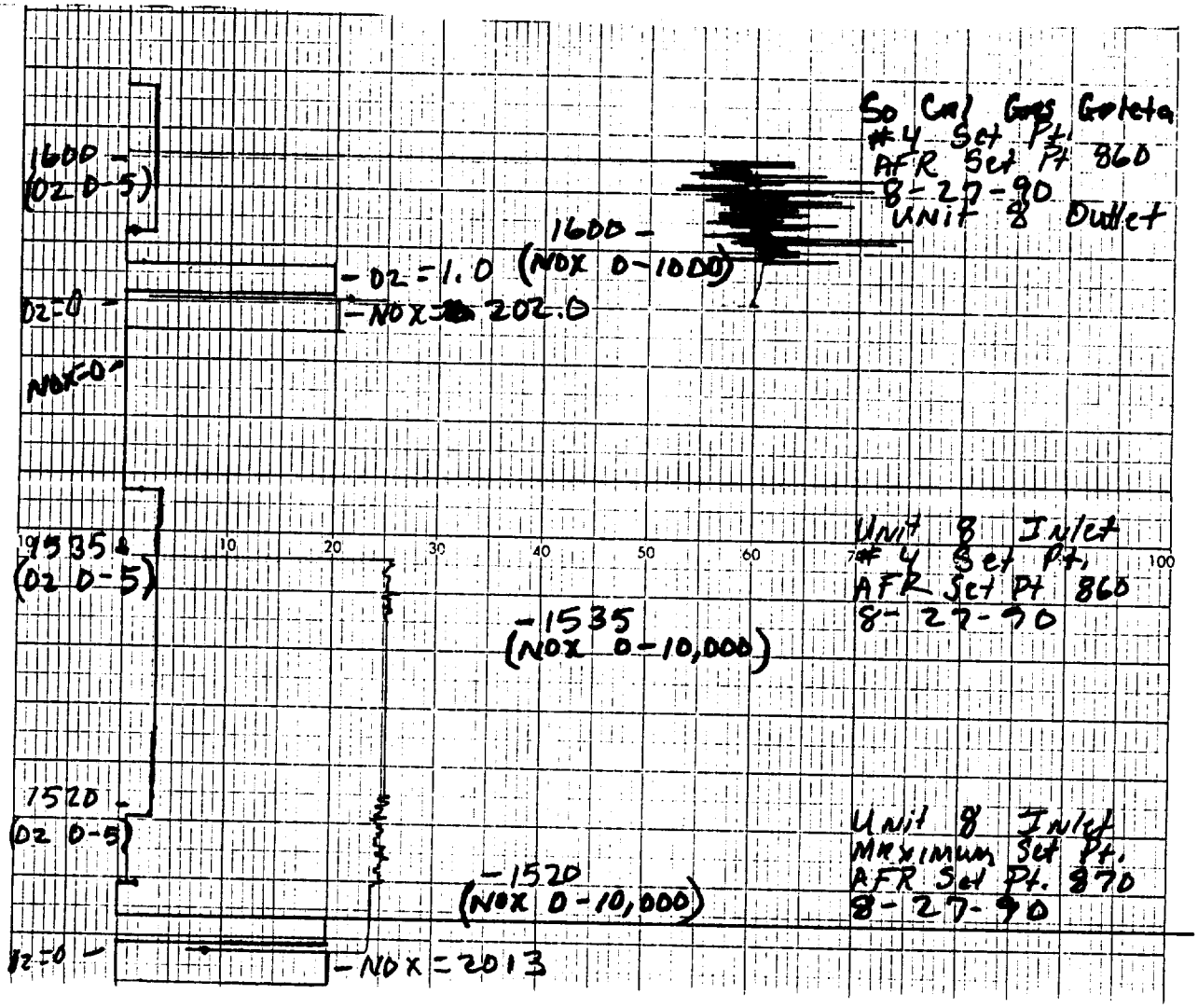
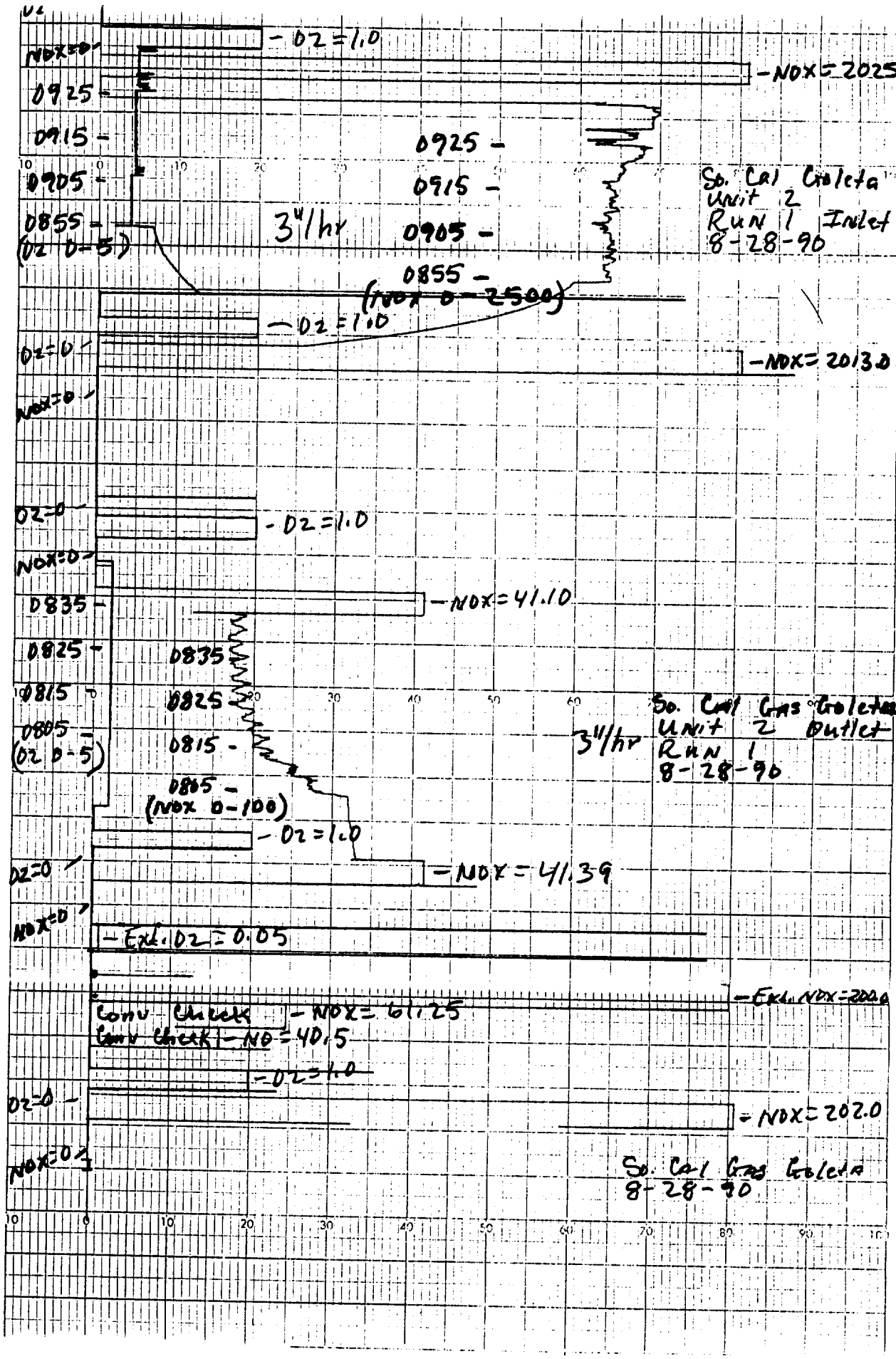
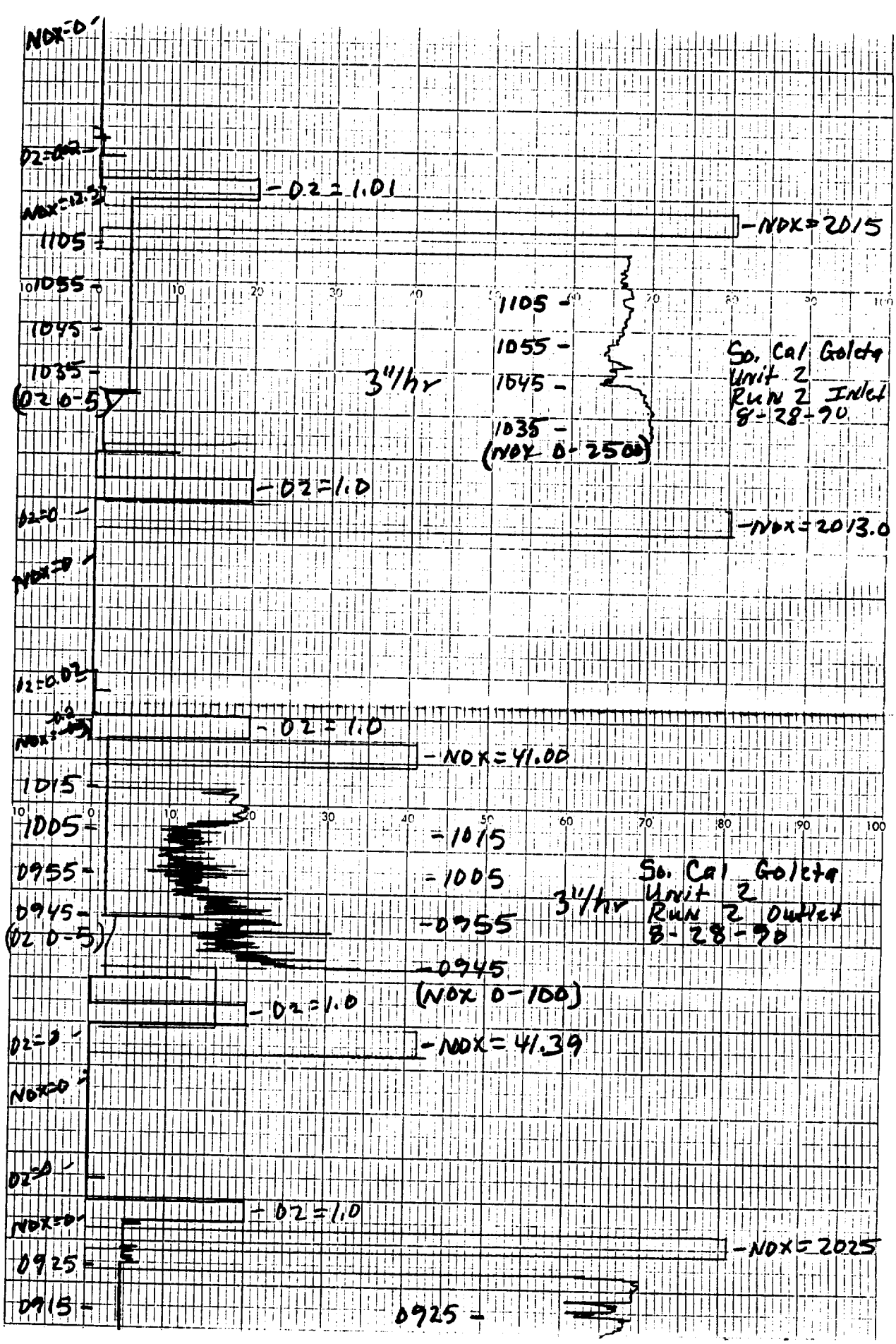


CHART NO. 414044 (1527)


O2
NOX=0
0925
0915
0905
0855
(O2 0-5)
- O2 = 1.0
- NOX = 2025
0925
0915
0905
0855
(NOX 0-2500)
3"/hr
So. Cal Calcta
Unit 2
Run 1 Inlet
8-28-90
- O2 = 1.0
- NOX = 2013.0
O2=0
NOX=0
O2=0
- O2 = 1.0
NOX=0
0835
0825
0815
0805
(O2 0-5)
- NOX = 41.10
0835
0825
0815
0805
(NOX 0-100)
3"/hr
So. Cal Gas Calcta
Unit 2 Outlet
Run 1
8-28-90
- O2 = 1.0
- NOX = 41.39
O2=0
NOX=0
- Exh. O2 = 0.05
- Exh. NOX = 200.0
Conv Check - NOX = 61.25
Conv Check - NO = 40.5
- O2 = 1.0
O2=0
NOX=0
- NOX = 202.0
So. Cal Gas Calcta
8-28-90
Charts-Inc
(1377)
CHART NO. 41044
Charts-Inc


NOX=0
O2=0
-O2=1.01
NOX=12.3
-NOX=2015
1105
1055
1045
1035
(O2 0-5)
3"/hr
1105
1055
1045
1035
(NOX 0-2500)
So. Cal Gold
Unit 2
Run 2 Inlet
8-28-90
-O2=1.0
O2=0
-NOX=2013.0
NOX=0
O2=0.02
NOX=0
-O2=1.0
-NOX=41.00
1015
1005
0955
0945
(O2 0-5)
=1015
=1005
-0955
-0945
(NOX 0-100)
3"/hr
So. Cal Gold
Unit 2
Run 2 Outlet
8-28-90
-O2=1.0
-NOX=41.39
O2=0
NOX=0
O2=0
NOX=0
-O2=1.0
-NOX=2025
0925
0915
0925
Charts-Inc
(1527)
CHART NO. 414044
Charts-Inc

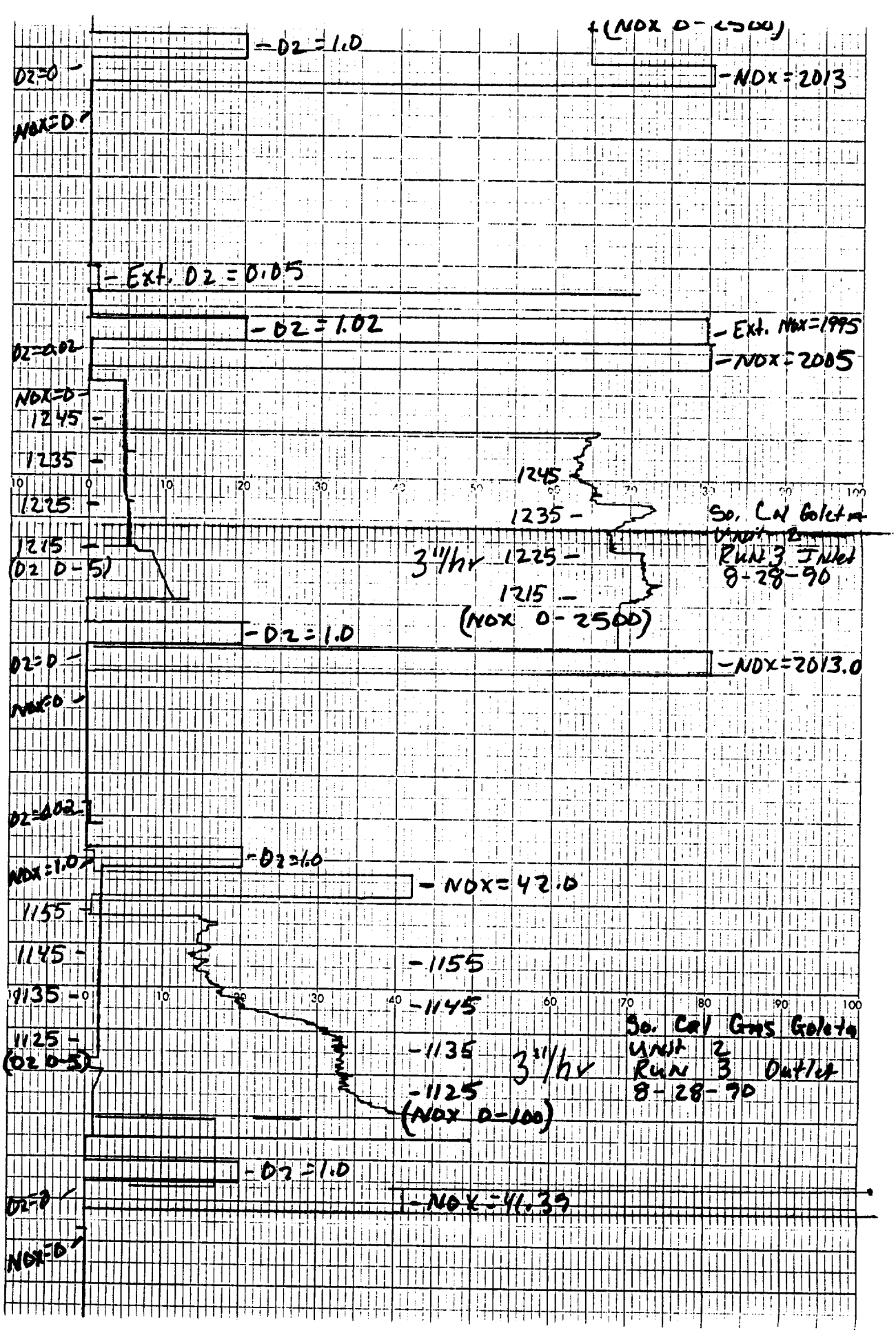
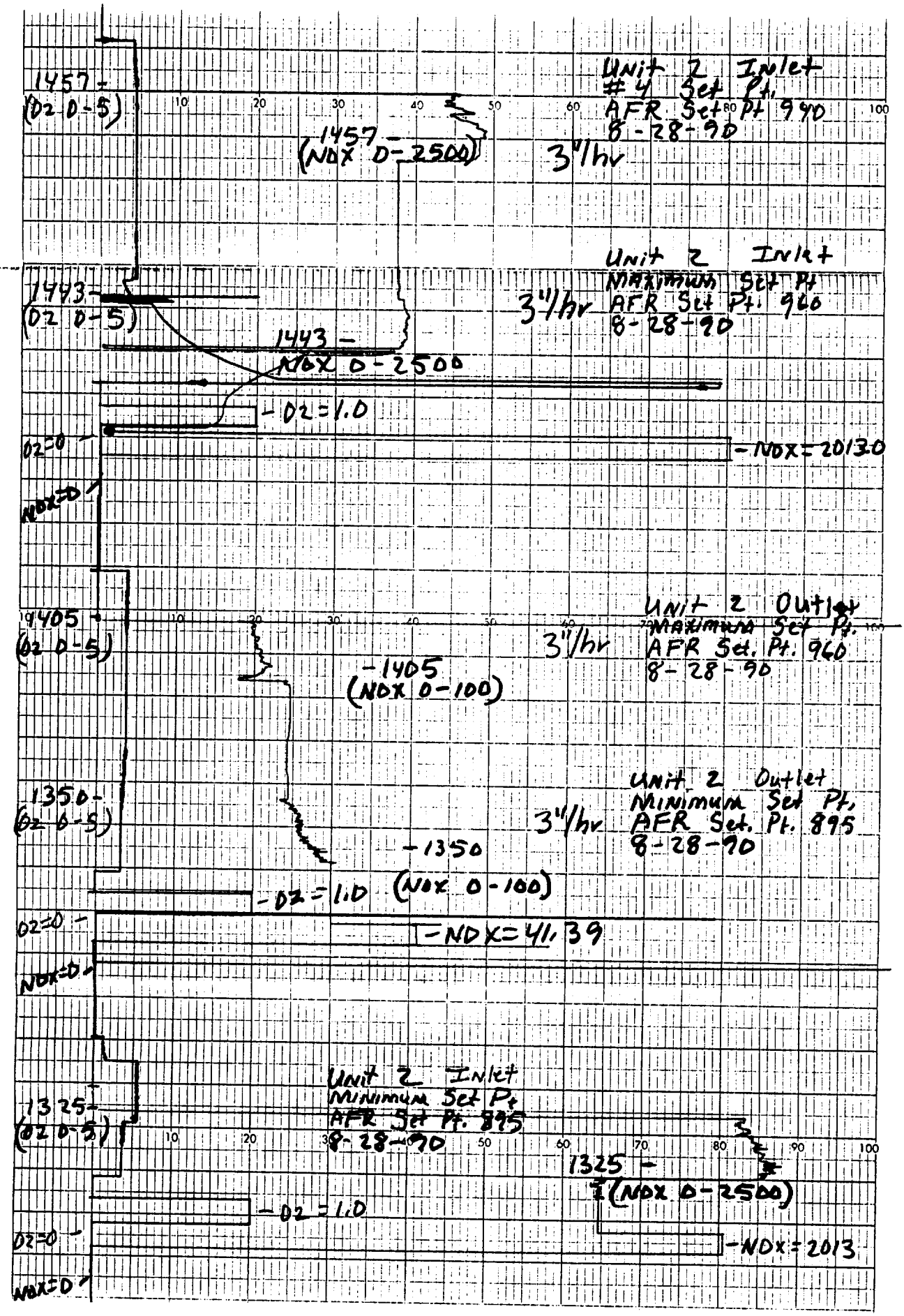
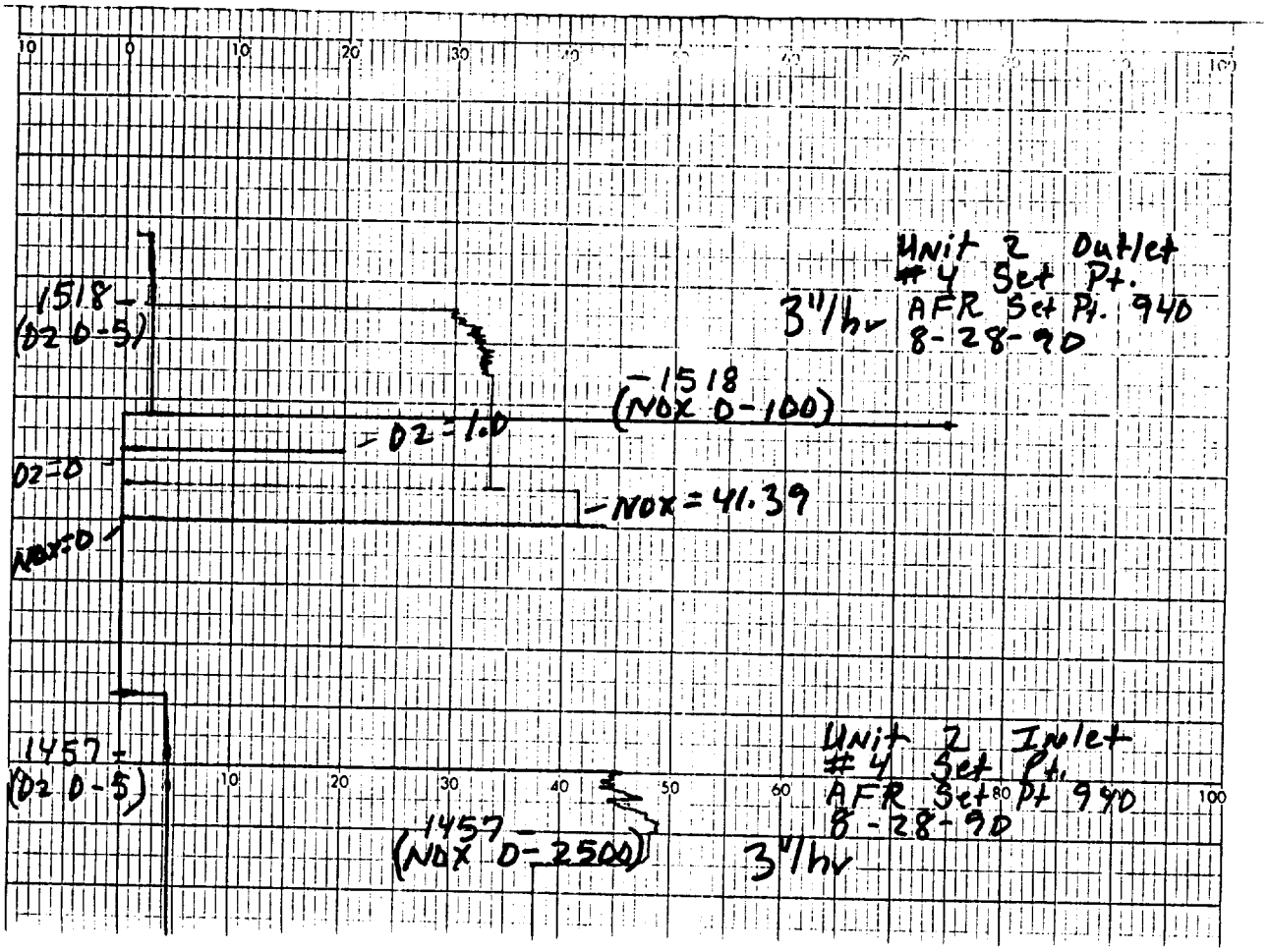


CHART NO. 414044
Charts-Inc
(1527)
CHART NO. 414044


1457 - (O2 0-5)
1457 - (NOX 0-2500)
Unit 2 Inlet #4 Set Pt. AFR Set Pt 940 8-28-90
3"/hr
1443 - (O2 0-5)
1443 - NOX 0-2500
Unit 2 Inlet Maximum Set Pt AFR Set Pt 960 8-28-90
3"/hr
-O2=1.0
O2=0
-NOX=2013.0
NOX=0
1405 - (O2 0-5)
-1405 (NOX 0-100)
Unit 2 Outlet Maximum Set Pt. AFR Set. Pt. 960 8-28-90
3"/hr
1350 - (O2 0-5)
-1350 (NOX 0-100)
Unit 2 Outlet Minimum Set Pt. AFR Set. Pt. 895 8-28-90
3"/hr
-O2=1.0
O2=0
-NOX=41.39
NOX=0
1325 - (O2 0-5)
Unit 2 Inlet Minimum Set Pt AFR Set Pt. 895 8-28-90
1325 - (NOX 0-2500)
-O2=1.0
O2=0
-NOX=2013
NOX=0
10
20
30
40
50
60
70
80
90
100
CHART NO. 41044
Charts-Inc
(1327)
1044


1518
(O2 0-5)
O2=0
NOX=0
1518
(NOX 0-100)
O2=1.0
NOX=41.39
Unit 2 Outlet
#4 Set Pt.
AFR Set Pt. 940
8-28-90
3"/hr
1457
(O2 0-5)
1457
(NOX 0-2500)
3"/hr
Unit 2 Inlet
#4 Set Pt.
AFR Set Pt 940
8-28-90

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #3 INLET
Date : 8/20/90
Test Run : 2
Test Condition: 562 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.35	0.35							2230.00	2218.02
2	0.32	0.32							2240.00	2204.27
3	0.33	0.34							2240.00	2181.08
4	0.32	0.33							2240.00	2158.38
MEAN		0.34								2190.44

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	0.96				2100.00
Cal. Gas	1.00				2013.00
Scf	-0.01000				0.01080
Zcf	0.00000				0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #3 INLET
Date : 8/20/90
Test Run : 3
Test Condition: 562 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.31	0.31							2230.00	2230.42
2	0.30	0.30							2280.00	2281.27
3	0.29	0.29							2280.00	2282.13
4	0.28	0.28							2250.00	2252.94
MEAN		0.30								2261.69

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	0.99				2010.00
Cal. Gas	1.00				2013.00
Scf	-0.00250				-0.00037
Zcf	0.00000				0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #3 OUT
Date : 8/20/90
Test Run : 1
Test Condition: 562 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.27								63.00	63.27
2	0.24								65.50	66.34
3	0.23								67.00	68.44
4	0.23								73.00	75.17
MEAN	0.24									68.31

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				-0.50
Span Check	1.00				39.80
Cal. Gas	1.00				41.39
Scf					-0.00658
Zcf					-0.12500

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #3 OUT

Date : 8/20/90
Test Run : 2
Test Condition: 562 HP

Concentration : Drift Uncorrected (A) / Corrected (B)

	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.18								77.50	77.72
2	0.18								78.70	79.39
3	0.18								76.25	77.36
4	0.18								75.50	77.05
MEAN	0.18									77.88

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.30
Span Check	1.00				80.00
Cal. Gas	1.00				81.90
Scf					-0.00672
Zcf					0.07500

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #3 OUT
Date : 8/20/90
Test Run : 3
Test Condition: 562 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.25	0.25							80.00	80.26
2	0.25	0.25							78.75	79.53
3	0.25	0.25							77.50	78.79
4	0.24	0.24							77.00	78.81
MEAN		0.25								79.35

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	0.98				79.75
Cal. Gas	1.00				81.90
Scf	-0.00500				-0.00656
Zcf	0.00000				0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #4 INLET
Date : 8/21/90
Test Run : 1
Test Condition: 560 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.44								2000.00	2004.73
2	0.47								1983.00	1997.14
3	0.45								1975.00	1998.58
4	0.46								1950.00	1982.75
MEAN	0.46									1995.80

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				1975.00
Cal. Gas	1.00				2013.00
Scf					-0.00472
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #4 INLET

Date : 8/21/90
Test Run : 2
Test Condition: 560 HP

Concentration : Drift Uncorrected (A) / Corrected (B)

	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.40	0.40							2000.00	1994.18
2	0.42	0.42							2020.00	2002.47
3	0.43	0.44							2040.00	2010.66
4	0.43	0.44							2090.00	2048.16
MEAN		0.42								2013.87

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	0.98				2060.00
Cal. Gas	1.00				2013.00
Scf	-0.00500				0.00584
Zcf	0.00000				0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #4 INLET
Date : 8/21/90
Test Run : 3
Test Condition: 560 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.46	0.46							2050.00	2049.11
2	0.43	0.43							2080.00	2077.29
3	0.40	0.40							2100.00	2095.45
4	0.40	0.40							2120.00	2113.57
MEAN		0.42								2083.85

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	0.99				2020.00
Cal. Gas	1.00				2013.00
Scf	-0.00250				0.00087
Zcf	0.00000				0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #4 OUTLET
Date : 8/21/90
Test Run : 1
Test Condition: 560 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.22	0.22							73.50	73.63
2	0.22	0.22							70.00	70.35
3	0.22	0.21							72.50	73.12
4	0.22	0.21							72.00	72.87
MEAN		0.21								72.49

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.02				0.40
Span Check	0.98				41.00
Cal. Gas	1.00				41.39
Scf	-0.01000				-0.00477
Zcf	0.00500				0.10000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #4 OUTLET
Date : 8/21/90
Test Run : 2
Test Condition: 560 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.18								77.50	77.42
2	0.18								73.75	73.51
3	0.19								68.75	68.33
4	0.19								66.25	65.66
MEAN	0.19									71.23

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				1.00
Span Check	1.00				82.50
Cal. Gas	1.00				81.90
Scf					-0.00122
Zcf					0.25000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #4 OUTLET
Date : 8/21/90
Test Run : 3
Test Condition: 560 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.53								68.75	68.95
2	0.49								67.50	68.09
3	0.47								67.50	68.49
4	0.47								65.00	66.35
MEAN	0.49								67.97	

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				80.00
Cal. Gas	1.00				81.90
Scf					-0.00580
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #5 INLET
Date : 8/22/90
Test Run : 1
Test Condition: 560 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.40								2280.00	2274.77
2	0.40								2290.00	2274.32
3	0.40								2290.00	2263.99
4	0.40								2280.00	2243.91
MEAN	0.40									2264.25

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				2050.00
Cal. Gas	1.00				2013.00
Scf					0.00460
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #5 INLET
Date : 8/22/90
Test Run : 2
Test Condition: 560 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.40								2300.00	2299.00
2	0.40								2300.00	2297.00
3	0.40								2300.00	2295.01
4	0.39								2300.00	2293.02
MEAN	0.40									2296.01

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				2020.00
Cal. Gas	1.00				2013.00
Scf					0.00087
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #5 INLET
Date : 8/22/90
Test Run : 3
Test Condition: 560 HP

Concentration : Drift Uncorrected (A) / Corrected (B)

Point #	%O2 A	%O2 B	%CO2 A	%CO2 B	ppm CO A	ppm CO B	ppm SO2 A	ppm SO2 B	ppm NOx A	ppm NOx B
1	0.39								2300.00	2294.73
2	0.38								2325.00	2309.08
3	0.38								2320.00	2293.65
4	0.38								2320.00	2283.28
MEAN	0.38									2295.19

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				2050.00
Cal. Gas	1.00				2013.00
Scf					0.00460
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #5 OUTLET
Date : 8/22/90
Test Run : 1
Test Condition: 560 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.24	0.24							330.00	
2	0.20	0.20							330.00	
3	0.19	0.19							335.00	
4	0.18	0.18							340.00	
MEAN		0.20							333.75	

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	0.98				202.00
Cal. Gas	1.00				202.00
Scf	-0.00500				
Zcf	0.00000				

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #5 OUTLET
Date : 8/22/90
Test Run : 2
Test Condition: 560 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.21								338.00	339.47
2	0.20								335.00	339.41
3	0.20								339.00	346.50
4	0.20								340.00	350.63
MEAN	0.20									344.00

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				195.00
Cal. Gas	1.00				202.00
Scf					-0.00866
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #5 OUTLET

Date : 8/22/90
Test Run : 3
Test Condition: 560 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.20								362.00	362.45
2	0.19								360.00	361.34
3	0.20								362.00	364.25
4	0.20								363.00	366.17
MEAN	0.20									363.55

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				200.00
Cal. Gas	1.00				202.00
Scf					-0.00248
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #6 INLET
Date : 8/23/90
Test Run : 1
Test Condition: 576 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.23								2150.00	2149.07
2	0.23								2150.00	2147.20
3	0.23								2200.00	2195.23
4	0.23								2500.00	2492.42
MEAN	0.23									2245.98

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				2020.00
Cal. Gas	1.00				2013.00
Scf					0.00087
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #6 INLET
Date : 8/23/90
Test Run : 2
Test Condition: 576 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.20								2275.00	2272.60
2	0.20								2290.00	2282.77
3	0.21								2300.00	2287.92
4	0.22								2270.00	2253.35
MEAN	0.21									2274.16

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				2030.00
Cal. Gas	1.00				2013.00
Scf					0.00211
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #6 INLET
Date : 8/23/90
Test Run : 3
Test Condition: 576 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.24	0.24							2295.00	2296.85
2	0.24	0.24							2295.00	2300.57
3	0.24	0.24							2300.00	2309.32
4	0.24	0.24							2290.00	2303.01
MEAN		0.24								2302.44

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.02				2000.00
Cal. Gas	1.00				2013.00
Scf	0.00500				-0.00161
Zcf	0.00000				0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #6 OUTLET

Date : 8/23/90
Test Run : 1
Test Condition: 576 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.15	0.15							167.50	
2	0.15	0.15							192.50	
3	0.15	0.15							203.75	
4	0.15	0.16							168.75	
MEAN		0.15							183.13	

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	0.96		/		202.00
Cal. Gas	1.00				202.00
Scf	-0.01000				
Zcf	0.00000				

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #6 OUTLET

Date : 8/23/90
Test Run : 2
Test Condition: 576 HP

Concentration : Drift Uncorrected (A) / Corrected (B)

Point #	%O2 A	%O2 B	%CO2 A	%CO2 B	ppm CO A	ppm CO B	ppm SO2 A	ppm SO2 B	ppm NOx A	ppm NOx B
1	0.15								195.00	195.24
2	0.15								230.00	230.86
3	0.15								185.00	186.15
4	0.15								200.00	201.75
MEAN	0.15									203.50

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				200.00
Cal. Gas	1.00				202.00
Scf					-0.00248
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #6 OUTLET
Date : 8/23/90
Test Run : 3
Test Condition: 576 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.19								198.00	198.62
2	0.19								190.00	191.84
3	0.19								190.00	193.07
4	0.19								190.00	194.31
MEAN	0.19									194.46

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				-3.00
Span Check	1.00				197.00
Cal. Gas	1.00				202.00
Scf					-0.00248
Zcf					-0.75000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #7 INLET
Date : 8/24/90
Test Run : 1
Test Condition: 542 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.20								1465.00	1459.86
2	0.20								1475.00	1459.57
3	0.20								1530.00	1503.75
4	0.20								1530.00	1493.42
MEAN	0.20								1479.15	

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				12.50
Span Check	1.00				2065.00
Cal. Gas	1.00				2013.00
Scf					0.00491
Zcf					3.12500

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #7 INLET

Date : 8/24/90
Test Run : 2
Test Condition: 542 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.23								1515.00	1514.53
2	0.23								1525.00	1523.58
3	0.23								1545.00	1542.61
4	0.23								1570.00	1566.60
MEAN	0.23									1536.83

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				2018.00
Cal. Gas	1.00				2013.00
Scf					0.00062
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #7 INLET
Date : 8/24/90
Test Run : 3
Test Condition: 542 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.22								1505.00	1504.35
2	0.22								1525.00	1523.01
3	0.22								1563.00	1559.61
4	0.22								1565.00	1560.25
MEAN	0.22									1536.81

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				2020.00
Cal. Gas	1.00				2013.00
Scf					0.00087
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #7 OUTLET

Date : 8/24/90
Test Run : 1
Test Condition: 542 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.23								146.25	146.09
2	0.20								135.00	134.56
3	0.20								127.50	126.81
4	0.20								127.50	126.54
MEAN	0.21									133.50

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				203.75
Cal. Gas	1.00				202.00
Scf					0.00217
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #7 OUTLET
Date : 8/24/90
Test Run : 2
Test Condition: 542 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.19								175.50	175.72
2	0.18								169.25	169.88
3	0.18								155.00	155.97
4	0.18								147.50	148.79
MEAN	0.18									162.59

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				200.00
Cal. Gas	1.00				202.00
Scf					-0.00248
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #7 OUTLET
Date : 8/24/90
Test Run : 3
Test Condition: 542 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.15								180.50	181.61
2	0.15								183.00	186.37
3	0.15								175.00	180.51
4	0.15								160.00	167.34
MEAN	0.15									178.96

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				-3.00
Span Check	1.00				192.50
Cal. Gas	1.00				202.00
Scf					-0.00804
Zcf					-0.75000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #8 INLET

Date : 8/27/90
Test Run : 1
Test Condition: 555 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.17								2500.00	2494.27
2	0.17								2520.00	2502.75
3	0.17								2520.00	2491.38
4	0.17								2510.00	2470.27
MEAN	0.17									2489.67

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				2050.00
Cal. Gas	1.00				2013.00
Scf					0.00460
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #8 INLET
Date : 8/27/90
Test Run : 2
Test Condition: 555 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.18	0.18							2500.00	2498.91
2	0.18	0.17							2500.00	2496.74
3	0.18	0.17							2500.00	2494.58
4	0.18	0.17							2500.00	2492.42
MEAN		0.17								2495.66

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.02				0.00
Span Check	1.00				2020.00
Cal. Gas	1.00				2013.00
Scf	-0.00500				0.00087
Zcf	0.00500				0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #8 INLET
Date : 8/27/90
Test Run : 3
Test Condition: 555 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.23								2500.00	2502.02
2	0.19								2520.00	2526.12
3	0.18								2580.00	2590.46
4	0.18								2560.00	2574.55
MEAN	0.20									2548.29

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				2000.00
Cal. Gas	1.00				2013.00
Scf					-0.00161
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #8 OUTLET
Date : 8/27/90
Test Run : 1
Test Condition: 555 HP

Concentration : Drift Uncorrected (A) / Corrected (B)

Point #	%O2 A	%O2 B	%CO2 A	%CO2 B	ppm CO A	ppm CO B	ppm SO2 A	ppm SO2 B	ppm NOx A	ppm NOx B
1	0.09								465.00	465.58
2	0.09								465.00	466.73
3	0.09								475.00	477.96
4	0.09								490.00	494.28
MEAN	0.09									476.14

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				200.00
Cal. Gas	1.00				202.00
Scf					-0.00248
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #8 OUTLET
Date : 8/27/90
Test Run : 2
Test Condition: 555 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.12								505.00	505.69
2	0.12								520.00	522.16
3	0.12								520.00	523.61
4	0.12								530.00	535.21
MEAN	0.12									521.67

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				2.00
Span Check	1.00				201.00
Cal. Gas	1.00				202.00
Scf					-0.00371
Zcf					0.50000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #8 OUTLET
Date : 8/27/90
Test Run : 3
Test Condition: 555 HP

Concentration : Drift Uncorrected (A) / Corrected (B)

	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.11	0.11							515.00	515.64
2	0.11	0.11							510.00	511.90
3	0.11	0.11							520.00	523.24
4	0.11	0.11							530.00	534.63
MEAN		0.11								521.35

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.01				200.00
Cal. Gas	1.00				202.00
Scf	0.00250				-0.00248
Zcf	0.00000				0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Date : 8/28/90
Test Run : 1
Station : ENGINE #2 INLET
Test Condition: 567 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.20								1595.00	1593.81
2	0.23								1588.00	1584.46
3	0.23								1638.00	1631.92
4	0.28								1650.00	1641.44
MEAN	0.24									1612.91

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				2025.00
Cal. Gas	1.00				2013.00
Scf					0.00149
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #2 INLET
Date : 8/28/90
Test Run : 2
Test Condition: 567 HP

Concentration : Drift Uncorrected (A) / Corrected (B)

Point #	%O2 A	%O2 B	%CO2 A	%CO2 B	ppm CO A	ppm CO B	ppm SO2 A	ppm SO2 B	ppm NOx A	ppm NOx B
1	0.20	0.20							1738.00	1737.57
2	0.20	0.19							1638.00	1636.51
3	0.20	0.19							1650.00	1647.56
4	0.20	0.18							1670.00	1666.67
MEAN		0.19								1672.08

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.02				12.50
Span Check	1.01				2015.00
Cal. Gas	1.00				2013.00
Scf	-0.00250				-0.00130
Zcf	0.00500				3.12500

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #2 INLET
Date : 8/28/90
Test Run : 3
Test Condition: 567 HP

Concentration : Drift Uncorrected (A) / Corrected (B)

	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.27								1800.00	1800.89
2	0.24								1725.00	1727.57
3	0.23								1675.00	1679.17
4	0.23								1725.00	1731.02
MEAN	0.24									1734.66

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.02				0.00
Span Check	1.02				2005.00
Cal. Gas	1.00				2013.00
Scf					-0.00099
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #2 OUTLET
Date : 8/28/90
Test Run : 1
Test Condition: 567 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.10								23.00	23.02
2	0.10								20.00	20.05
3	0.10								18.50	18.58
4	0.10								18.00	18.11
MEAN	0.10									19.94

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.00				0.00
Span Check	1.00				41.10
Cal. Gas	1.00				41.39
Scf					-0.00175
Zcf					0.00000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #2 OUTLET
Date : 8/28/90
Test Run : 2
Test Condition: 567 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.10	0.10							18.50	18.54
2	0.10	0.09							15.50	15.60
3	0.10	0.09							12.00	12.16
4	0.10	0.08							15.00	15.24
MEAN		0.09								15.38

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.02				-0.20
Span Check	1.00				41.00
Cal. Gas	1.00				41.39
Scf	-0.00500				-0.00115
Zcf	0.00500				-0.05000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

A. CALIBRATION AND CORRECTION DATA

Company : SO CAL GAS
Station : ENGINE #2 OUTLET
Date : 8/28/90
Test Run : 3
Test Condition: 567 HP

	Concentration : Drift Uncorrected (A) / Corrected (B)									
	%O2		%CO2		ppm CO		ppm SO2		ppm NOx	
	A	B	A	B	A	B	A	B	A	B
Point #										
1	0.09	0.09							33.20	33.11
2	0.09	0.08							29.00	28.73
3	0.09	0.08							17.50	16.97
4	0.10	0.08							15.20	14.44
MEAN		0.08								23.31

	%O2	%CO2	ppm CO	ppm SO2	ppm NOx
Zero Check	0.02				1.00
Span Check	1.00				42.00
Cal. Gas	1.00				41.39
Scf	-0.00500				-0.00236
Zcf	0.00500				0.25000

Scf, Span Drift Correction Factor = (% Drift / 100) / # of Readings
Zcf, Zero Drift Correction Factor = Zero Drift / # of Readings
Cz, Zero Corr. Concentration = measured value - [Zcf x (Point # - 0.5)]
B, Corrected Concentration = Cz / [1 + (Scf x (Point # - 0.5))]

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : SO CAL GAS Date : 8/20/90

Station : ENGINE #3 INLET

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.00				2080.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				2080.00
Percent Drift	0.0				3.3

Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	0.96				2100.00
Zero Drift	0.00				0.00
Final, Actual Span	0.96				2100.00
Percent Drift	-4.0				4.3

Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	0.99				2010.00
Zero Drift	0.00				0.00
Final, Actual Span	0.99				2010.00
Percent Drift	-1.0				-0.1

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : SO CAL GAS Date : 8/20/90

Station : ENGINE #3 OUT

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				41.39
Measured Span	1.00				39.80
Zero Drift	0.00				-0.50
Final, Actual Span	1.00				40.30
Percent Drift	0.0				-2.6

Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				81.90
Measured Span	1.00				80.00
Zero Drift	0.00				0.30
Final, Actual Span	1.00				79.70
Percent Drift	0.0				-2.7

Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				81.90
Measured Span	0.98				79.75
Zero Drift	0.00				0.00
Final, Actual Span	0.98				79.75
Percent Drift	-2.0				-2.6

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : SO CAL GAS Date : 8/21/90

Station : ENGINE #4 INLET

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.00				1975.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				1975.00
Percent Drift	0.0				-1.9

Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	0.98				2060.00
Zero Drift	0.00				0.00
Final, Actual Span	0.98				2060.00
Percent Drift	-2.0				2.3

Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	0.99				2020.00
Zero Drift	0.00				0.00
Final, Actual Span	0.99				2020.00
Percent Drift	-1.0				0.3

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : SO CAL GAS Date : 8/21/90

Station : ENGINE #4 OUTLET

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				41.39
Measured Span	0.98				41.00
Zero Drift	0.02				0.40
Final, Actual Span	0.96				40.60
Percent Drift	-4.0				-1.9

Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				81.90
Measured Span	1.00				82.50
Zero Drift	0.00				1.00
Final, Actual Span	1.00				81.50
Percent Drift	0.0				-0.5

Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				81.90
Measured Span	1.00				80.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				80.00
Percent Drift	0.0				-2.3

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : SO CAL GAS Date : 8/22/90

Station : ENGINE #5 INLET

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.00				2050.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				2050.00
Percent Drift	0.0				1.8

Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.00				2020.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				2020.00
Percent Drift	0.0				0.3

Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.00				2050.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				2050.00
Percent Drift	0.0				1.8

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : SO CAL GAS Date : 8/22/90

Station : ENGINE #5 OUTLET

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				202.00
Measured Span	0.98				202.00
Zero Drift	0.00				0.00
Final, Actual Span	0.98				202.00
Percent Drift	-2.0				0.0

Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				202.00
Measured Span	1.00				195.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				195.00
Percent Drift	0.0				-3.5

Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				202.00
Measured Span	1.00				200.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				200.00
Percent Drift	0.0				-1.0

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : SO CAL GAS Date : 8/23/90

Station : ENGINE #6 INLET

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.00				2020.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				2020.00
Percent Drift	0.0				0.3

Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.00				2030.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				2030.00
Percent Drift	0.0				0.8

Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.02				2000.00
Zero Drift	0.00				0.00
Final, Actual Span	1.02				2000.00
Percent Drift	2.0				-0.6

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : SO CAL GAS Date : 8/23/90

Station : ENGINE #6 OUTLET

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				202.00
Measured Span	0.96				202.00
Zero Drift	0.00				0.00
Final, Actual Span	0.96				202.00
Percent Drift	-4.0				0.0

Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				202.00
Measured Span	1.00				200.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				200.00
Percent Drift	0.0				-1.0

Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				202.00
Measured Span	1.00				197.00
Zero Drift	0.00				-3.00
Final, Actual Span	1.00				200.00
Percent Drift	0.0				-1.0

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : SO CAL GAS Date : 8/24/90

Station : ENGINE #7 INLET

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.00				2065.00
Zero Drift	0.00				12.50
Final, Actual Span	1.00				2052.50
Percent Drift	0.0				2.0

Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.00				2018.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				2018.00
Percent Drift	0.0				0.2

Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.00				2020.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				2020.00
Percent Drift	0.0				0.3

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : SO CAL GAS Date : 8/24/90

Station : ENGINE #7 OUTLET

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				202.00
Measured Span	1.00				203.75
Zero Drift	0.00				0.00
Final, Actual Span	1.00				203.75
Percent Drift	0.0				0.9

Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				202.00
Measured Span	1.00				200.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				200.00
Percent Drift	0.0				-1.0

Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				202.00
Measured Span	1.00				192.50
Zero Drift	0.00				-3.00
Final, Actual Span	1.00				195.50
Percent Drift	0.0				-3.2

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : SO CAL GAS Date : 8/27/90

Station : ENGINE #8 INLET

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.00				2050.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				2050.00
Percent Drift	0.0				1.8

Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.00				2020.00
Zero Drift	0.02				0.00
Final, Actual Span	0.98				2020.00
Percent Drift	-2.0				0.3

Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.00				2000.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				2000.00
Percent Drift	0.0				-0.6

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : SO CAL GAS Date : 8/27/90

Station : ENGINE #8 OUTLET

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				202.00
Measured Span	1.00				200.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				200.00
Percent Drift	0.0				-1.0

Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				202.00
Measured Span	1.00				201.00
Zero Drift	0.00				2.00
Final, Actual Span	1.00				199.00
Percent Drift	0.0				-1.5

Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				202.00
Measured Span	1.01				200.00
Zero Drift	0.00				0.00
Final, Actual Span	1.01				200.00
Percent Drift	1.0				-1.0

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : SO CAL GAS Dàte : 8/28/90

Station : ENGINE #2 INLET

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.00				2025.00
Zero Drift	0.00				0.00
Final, Actual Span	1.00				2025.00
Percent Drift	0.0				0.6

Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.01				2015.00
Zero Drift	0.02				12.50
Final, Actual Span	0.99				2002.50
Percent Drift	-1.0				-0.5

Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				2013.00
Measured Span	1.02				2005.00
Zero Drift	0.02				0.00
Final, Actual Span	1.00				2005.00
Percent Drift	0.0				-0.4

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

B. ZERO AND SPAN DRIFT PERCENT CALCULATIONS

Company : SO CAL GAS Date : 8/28/90

Station : ENGINE #2 OUTLET

Run 1	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				41.39
Measured Span	1.00				41.10
Zero Drift	0.00				0.00
Final, Actual Span	1.00				41.10
Percent Drift	0.0				-0.7

Run 2	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				41.39
Measured Span	1.00				41.00
Zero Drift	0.02				-0.20
Final, Actual Span	0.98				41.20
Percent Drift	-2.0				-0.5

Run 3	O2 (%)	CO2 (%)	CO (ppm)	SO2 (ppm)	NOx (ppm)
Initial Span	1.00				41.39
Measured Span	1.00				42.00
Zero Drift	0.02				1.00
Final, Actual Span	0.98				41.00
Percent Drift	-2.0				-0.9

Final, Actual Span = Measured Span - Zero Drift

Percent Drift = (Final, Actual Span - Initial Span) / Initial Span x 100

Pape & Steiner Environmental Services

SAMPLE HANDLING/LOG-IN

Date 8-20 Thru 8-24-90 Test Location Sd. Cnl. Gas - Goleta

	Sample Type	Volume	Comments
1.	24071 Meth F.G. Sample All Test		IC Engine # 3
2.	24072 Meth F.G. Sample All Test		IC Engine # 4
3.	24073 Meth F.G. Sample All Test		IC Engine # 5
4.	24074 Meth F.G. Sample All Test		IC Engine # 6
5.	24075 Meth F.G. Sample All Test		IC Engine # 7
6.	24076 Meth F.G Sample All Test		IC Engine # 8
7.	24077 Meth F.G. Sample All Test		IC Engine # 2
8.			
9.			
10.			
11.			
12.			

CHAIN OF CUSTODY

Charles Reshard

FUEL / FLOWRATE CALCULATIONS

PLANT ..... SO CAL GAS
SOURCE ..... ENGINE #3 INLET Temp. Std.: 68
DATE ..... AUGUST 20,1990 Press. Std: 29.92

FUEL FLOWRATE DATA :

	RUN 1	RUN 2	RUN 3
Barometric Press., in.Hg..	29.87	29.89	29.89
Brake Horsepower	562.00	562.00	562.00
Fuel Flow, scfh			
Oxygen, %	0.31	0.34	0.30
Fuel Flow, acfh	5998.00	6000.00	5998.00
Fuel Press, psig	1.00	1.00	1.00
" " psia	15.67	15.68	15.68
Fuel Temp, dF	58.00	68.00	74.00

FUEL ANALYSIS DATA :

	RUN 1	RUN 2	RUN 3
Btu/scf, Gross Cal. Value:	1149.00	1149.00	1149.00
Btu/lb, Gross Cal. Value :	22501.00	22501.00	22501.00
Hydrogen, Wt.% :	22.44	22.44	22.44
Carbon, Wt.% :	74.25	74.25	74.25
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	0.56	0.56	0.56
Oxygen, Wt.% :	2.75	2.75	2.75

CALCULATIONS :

	RUN 1	RUN 2	RUN 3	AVERAGE
F-Factor,dscf/MMBtu :	8,626.17	8,626.17	8,626.17	8,626.17
Fuel Rate, scfh :	6519.61	6402.27	6328.23	6416.70
Heat Rate, MMBtu/hr :	7.491	7.356	7.271	7.373
Flue gas flowrate, dscfm :	1093.20	1075.09	1060.59	1076.29

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

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

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

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

FUEL / FLOWRATE CALCULATIONS

PLANT ..... SO CAL GAS
SOURCE ..... ENGINE #3 OUT Temp. Std.: 68
DATE ..... AUGUST 20,1990 Press. Std: 29.92

FUEL FLOWRATE DATA :

	RUN 1	RUN 2	RUN 3
Barometric Press., in.Hg..	29.87	29.89	29.89
Brake Horsepower	562.00	562.00	562.00
Fuel Flow, scfh			
Oxygen, %	0.24	0.18	0.25
Fuel Flow, acfh	5806.00	5902.00	6000.00
Fuel Press, psig	1.00	1.00	1.00
" " psia	15.67	15.68	15.68
Fuel Temp, dF	55.00	61.00	74.00

FUEL ANALYSIS DATA :

	RUN 1	RUN 2	RUN 3
Btu/scf, Gross Cal. Value:	1149.00	1149.00	1149.00
Btu/lb, Gross Cal. Value :	22501.00	22501.00	22501.00
Hydrogen, Wt.% :	22.44	22.44	22.44
Carbon, Wt.% :	74.25	74.25	74.25
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	0.56	0.56	0.56
Oxygen, Wt.% :	2.75	2.75	2.75

CALCULATIONS :

	RUN 1	RUN 2	RUN 3	AVERAGE
F-Factor,dscf/MMBtu :	8,626.17	8,626.17	8,626.17	8,626.17
Fuel Rate, scfh :	6347.67	6382.32	6330.34	6353.44
Heat Rate, MMBtu/hr :	7.293	7.333	7.274	7.300
Flue gas flowrate, dscfm :	1060.76	1063.46	1058.38	1060.87

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

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

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

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

FUEL / FLOWRATE CALCULATIONS

PLANT ..... SO CAL GAS
SOURCE ..... ENGINE #4 INLET Temp. Std.: 68
DATE ..... AUGUST 21,1990 Press. Std: 29.92

FUEL FLOWRATE DATA :

	RUN 1	RUN 2	RUN 3
Barometric Press., in.Hg..	29.94	29.95	29.97
Brake Horsepower	560.00	560.00	560.00
Fuel Flow, scfh			
Oxygen, %	0.46	0.42	0.42
Fuel Flow, acfh	6102.00	6102.00	6207.00
Fuel Press, psig	1.00	1.00	1.00
" " psia	15.71	15.71	15.72
Fuel Temp, dF	77.00	77.00	74.00

FUEL ANALYSIS DATA :

	RUN 1	RUN 2	RUN 3
Btu/scf, Gross Cal. Value:	1180.00	1180.00	1180.00
Btu/lb, Gross Cal. Value :	23134.00	23134.00	23134.00
Hydrogen, Wt.% :	23.11	23.11	23.11
Carbon, Wt.% :	76.05	76.05	76.05
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	0.59	0.59	0.59
Oxygen, Wt.% :	0.25	0.25	0.25

CALCULATIONS :

	RUN 1	RUN 2	RUN 3	AVERAGE
F-Factor,dscf/MMBtu :	8,664.50	8,664.50	8,664.50	8,664.50
Fuel Rate, scfh :	6412.01	6414.02	6565.14	6463.72
Heat Rate, MMBtu/hr :	7.566	7.569	7.747	7.627
Flue gas flowrate, dscfm :	1117.21	1115.37	1141.65	1124.75

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

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

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

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

FUEL / FLOWRATE CALCULATIONS

PLANT ..... SO CAL GAS
SOURCE ..... ENGINE #4 OUTLET Temp. Std.: 68
DATE ..... AUGUST 21,1990 Press. Std: 29.92

FUEL FLOWRATE DATA :

	RUN 1	RUN 2	RUN 3
Barometric Press., in.Hg..	29.94	29.95	29.96
Brake Horsepower	560.00	560.00	560.00
Fuel Flow, scfh			
Oxygen, %	0.21	0.19	0.49
Fuel Flow, acfh	6207.00	6207.00	6153.00
Fuel Press, psig	1.00	1.00	1.00
" " psia	15.71	15.72	15.72
Fuel Temp, dF	67.00	76.00	75.00

FUEL ANALYSIS DATA :

	RUN 1	RUN 2	RUN 3
Btu/scf, Gross Cal. Value:	1180.00	1180.00	1180.00
Btu/lb, Gross Cal. Value :	23134.00	23134.00	23134.00
Hydrogen, Wt.% :	23.11	23.11	23.11
Carbon, Wt.% :	76.05	76.05	76.05
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	0.59	0.59	0.59
Oxygen, Wt.% :	0.25	0.25	0.25

CALCULATIONS :

	RUN 1	RUN 2	RUN 3	AVERAGE
F-Factor,dscf/MMBtu :	8,664.50	8,664.50	8,664.50	8,664.50
Fuel Rate, scfh :	6646.11	6536.56	6493.83	6558.83
Heat Rate, MMBtu/hr :	7.842	7.713	7.663	7.739
Flue gas flowrate, dscfm :	1144.00	1124.06	1133.13	1133.73

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

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

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

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

FUEL / FLOWRATE CALCULATIONS

PLANT	SO CAL GAS		
SOURCE	ENGINE #5 INLET	Temp. Std.:	68
DATE	AUGUST 22,1990	Press. Std:	29.92

FUEL FLOWRATE DATA :

	RUN 1	RUN 2	RUN 3
Barometric Press., in.Hg..	29.93	29.93	29.90
Brake Horsepower	560.00	560.00	560.00
Fuel Flow, scfh			
Oxygen, %	0.40	0.40	0.38
Fuel Flow, acfh	6000.00	6102.00	6102.00
Fuel Press, psig	1.08	1.08	1.08
" " psia	15.78	15.78	15.77
Fuel Temp, dF	62.00	71.00	77.00

FUEL ANALYSIS DATA :

	RUN 1	RUN 2	RUN 3
Btu/scf, Gross Cal. Value:	1072.00	1072.00	1072.00
Btu/lb, Gross Cal. Value :	22868.00	22868.00	22868.00
Hydrogen, Wt.% :	23.36	23.36	23.36
Carbon, Wt.% :	73.77	73.77	73.77
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	0.75	0.75	0.75
Oxygen, Wt.% :	2.12	2.12	2.12

CALCULATIONS :

	RUN 1	RUN 2	RUN 3	AVERAGE
F-Factor,dscf/MMBtu :	8,615.90	8,615.90	8,615.90	8,615.90
Fuel Rate, scfh :	6517.01	6515.47	6436.65	6489.71
Heat Rate, MMBtu/hr :	6.986	6.985	6.900	6.957
Flue gas flowrate, dscfm :	1022.79	1022.54	1009.19	1018.17

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

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

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

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

FUEL / FLOWRATE CALCULATIONS

PLANT ..... SO CAL GAS
SOURCE ..... ENGINE #5 OUTLET Temp. Std.: 68
DATE ..... AUGUST 22,1990 Press. Std: 29.92

FUEL FLOWRATE DATA :

	RUN 1	RUN 2	RUN 3
Barometric Press., in.Hg..	29.93	29.93	29.91
Brake Horsepower	560.00	560.00	560.00
Fuel Flow, scfh			
Oxygen, %	0.20	0.20	0.20
Fuel Flow, acfh	5902.00	6050.00	6102.00
Fuel Press, psig	1.08	1.08	1.08
" " psia	15.78	15.78	15.77
Fuel Temp, dF	55.00	68.00	75.00

FUEL ANALYSIS DATA :

	RUN 1	RUN 2	RUN 3
Btu/scf, Gross Cal. Value:	1072.00	1072.00	1072.00
Btu/lb, Gross Cal. Value :	22868.00	22868.00	22868.00
Hydrogen, Wt.% :	23.36	23.36	23.36
Carbon, Wt.% :	73.77	73.77	73.77
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	0.75	0.75	0.75
Oxygen, Wt.% :	2.12	2.12	2.12

CALCULATIONS :

	RUN 1	RUN 2	RUN 3	AVERAGE
F-Factor,dscf/MMBtu :	8,615.90	8,615.90	8,615.90	8,615.90
Fuel Rate, scfh :	6497.70	6496.65	6462.73	6485.69
Heat Rate, MMBtu/hr :	6.966	6.964	6.928	6.953
Flue gas flowrate, dscfm :	1009.90	1009.74	1004.47	1008.04

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

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

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

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

FUEL / FLOWRATE CALCULATIONS

PLANT ..... SO CAL GAS
SOURCE ..... ENGINE #6 INLET Temp. Std.: 68
DATE ..... AUGUST 23,1990 Press. Std: 29.92

FUEL FLOWRATE DATA :

	RUN 1	RUN 2	RUN 3
Barometric Press., in.Hg..	29.83	29.83	29.82
Brake Horsepower	576.00	576.00	576.00
Fuel Flow, scfh			
Oxygen, %	0.23	0.21	0.24
Fuel Flow, acfh	6279.00	6000.00	5854.00
Fuel Press, psig	0.90	0.90	0.90
" " psia	15.55	15.55	15.50
Fuel Temp, dF	67.00	80.00	81.00

FUEL ANALYSIS DATA :

	RUN 1	RUN 2	RUN 3
Btu/scf, Gross Cal. Value:	1137.00	1137.00	1137.00
Btu/lb, Gross Cal. Value :	22654.00	22654.00	22654.00
Hydrogen, Wt.% :	22.70	22.70	22.70
Carbon, Wt.% :	74.38	74.38	74.38
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	0.64	0.64	0.64
Oxygen, Wt.% :	2.28	2.28	2.28

CALCULATIONS :

	RUN 1	RUN 2	RUN 3	AVERAGE
F-Factor,dscf/MMBtu :	8,628.51	8,628.51	8,628.51	8,628.51
Fuel Rate, scfh :	6657.27	6208.31	6044.14	6303.24
Heat Rate, MMBtu/hr :	7.569	7.059	6.872	7.167
Flue gas flowrate, dscfm :	1100.64	1025.43	999.76	1041.94

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

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

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

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

FUEL / FLOWRATE CALCULATIONS

PLANT ..... SO CAL GAS
SOURCE ..... ENGINE #6 OUTLET Temp. Std.: 68
DATE ..... AUGUST 23,1990 Press. Std: 29.92

FUEL FLOWRATE DATA :

	RUN 1	RUN 2	RUN 3
Barometric Press., in.Hg..	29.83	29.83	29.82
Brake Horsepower	576.00	576.00	576.00
Fuel Flow, scfh			
Oxygen, %	0.15	0.15	0.19
Fuel Flow, acfh	6153.00	5806.00	5902.00
Fuel Press, psig	0.90	0.90	0.90
" " psia	15.55	15.55	15.55
Fuel Temp, dF	64.00	75.00	81.00

FUEL ANALYSIS DATA :

	RUN 1	RUN 2	RUN 3
Btu/scf, Gross Cal. Value:	1137.00	1137.00	1137.00
Btu/lb, Gross Cal. Value :	22654.00	22654.00	22654.00
Hydrogen, Wt.% :	22.70	22.70	22.70
Carbon, Wt.% :	74.38	74.38	74.38
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	0.64	0.64	0.64
Oxygen, Wt.% :	2.28	2.28	2.28

CALCULATIONS :

	RUN 1	RUN 2	RUN 3	AVERAGE
F-Factor,dscf/MMBtu :	8,628.51	8,628.51	8,628.51	8,628.51
Fuel Rate, scfh :	6561.03	6063.72	6093.70	6239.48
Heat Rate, MMBtu/hr :	7.460	6.894	6.929	7.094
Flue gas flowrate, dscfm :	1080.55	998.65	1005.52	1028.24

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

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

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

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

FUEL / FLOWRATE CALCULATIONS

PLANT ..... SO CAL GAS
SOURCE ..... ENGINE #7 INLET Temp. Std.: 68
DATE ..... AUGUST 24,1990 Press. Std: 29.92

FUEL FLOWRATE DATA :

	RUN 1	RUN 2	RUN 3
Barometric Press., in.Hg..	29.88	29.90	29.90
Brake Horsepower	542.00	542.00	542.00
Fuel Flow, scfh			
Oxygen, %	0.20	0.23	0.22
Fuel Flow, acfh	6053.00	6025.00	6102.00
Fuel Press, psig	0.90	0.90	0.90
" " psia	15.58	15.59	15.59
Fuel Temp, dF	57.00	63.00	64.00

FUEL ANALYSIS DATA :

	RUN 1	RUN 2	RUN 3
Btu/scf, Gross Cal. Value:	1086.00	1086.00	1086.00
Btu/lb, Gross Cal. Value :	22663.00	22663.00	22663.00
Hydrogen, Wt.% :	23.06	23.06	23.06
Carbon, Wt.% :	73.48	73.48	73.48
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	1.78	1.78	1.78
Oxygen, Wt.% :	1.69	1.69	1.69

CALCULATIONS :

	RUN 1	RUN 2	RUN 3	AVERAGE
F-Factor,dscf/MMBtu :	8,641.16	8,641.16	8,641.16	8,641.16
Fuel Rate, scfh :	6552.12	6451.05	6521.03	6508.07
Heat Rate, MMBtu/hr :	7.116	7.006	7.082	7.068
Flue gas flowrate, dscfm :	1034.68	1020.20	1030.77	1028.55

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

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

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

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

FUEL / FLOWRATE CALCULATIONS

PLANT ..... SO CAL GAS
SOURCE ..... ENGINE #7 OUTLET Temp. Std.: 68
DATE ..... AUGUST 24,1990 Press. Std: 29.92

FUEL FLOWRATE DATA :

	RUN 1	RUN 2	RUN 3
Barometric Press., in.Hg..	29.88	29.90	29.90
Brake Horsepower	542.00	542.00	542.00
Fuel Flow, scfh			
Oxygen, %	0.21	0.18	0.15
Fuel Flow, acfh	5975.00	6102.00	6102.00
Fuel Press, psig	0.90	0.90	0.90
" " psia	15.58	15.59	15.59
Fuel Temp, dF	53.00	61.00	65.00

FUEL ANALYSIS DATA :

	RUN 1	RUN 2	RUN 3
Btu/scf, Gross Cal. Value:	1086.00	1086.00	1086.00
Btu/lb, Gross Cal. Value :	22663.00	22663.00	22663.00
Hydrogen, Wt.% :	23.06	23.06	23.06
Carbon, Wt.% :	73.48	73.48	73.48
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	1.78	1.78	1.78
Oxygen, Wt.% :	1.69	1.69	1.69

CALCULATIONS :

	RUN 1	RUN 2	RUN 3	AVERAGE
F-Factor,dscf/MMBtu :	8,641.16	8,641.16	8,641.16	8,641.16
Fuel Rate, scfh :	6518.11	6558.58	6508.61	6528.43
Heat Rate, MMBtu/hr :	7.079	7.123	7.068	7.090
Flue gas flowrate, dscfm :	1029.81	1034.71	1025.34	1029.95

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

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

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

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

FUEL / FLOWRATE CALCULATIONS

PLANT ..... SO CAL GAS
SOURCE ..... ENGINE #8 INLET Temp. Std.: 68
DATE ..... AUGUST 27,1990 Press. Std: 29.92

FUEL FLOWRATE DATA :

	RUN 1	RUN 2	RUN 3
Barometric Press., in.Hg..	29.99	29.99	29.97
Brake Horsepower	555.00	555.00	555.00
Fuel Flow, scfh			
Oxygen, %	0.17	0.17	0.20
Fuel Flow, acfh	6076.00	5975.00	6030.00
Fuel Press, psig	0.90	0.90	0.90
" " psia	15.63	15.63	15.62
Fuel Temp, dF	53.00	67.00	84.00

FUEL ANALYSIS DATA :

	RUN 1	RUN 2	RUN 3
Btu/scf, Gross Cal. Value:	1026.00	1026.00	1026.00
Btu/lb, Gross Cal. Value :	23123.00	23123.00	23123.00
Hydrogen, Wt.% :	24.00	24.00	24.00
Carbon, Wt.% :	73.37	73.37	73.37
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	1.23	1.23	1.23
Oxygen, Wt.% :	1.40	1.40	1.40

CALCULATIONS :

	RUN 1	RUN 2	RUN 3	AVERAGE
F-Factor,dscf/MMBtu :	8,612.39	8,612.39	8,612.39	8,612.39
Fuel Rate, scfh :	6651.29	6366.97	6220.86	6413.04
Heat Rate, MMBtu/hr :	6.824	6.533	6.383	6.580
Flue gas flowrate, dscfm :	987.58	945.36	925.01	952.65

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

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

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

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

FUEL / FLOWRATE CALCULATIONS

PLANT ..... SO CAL GAS
SOURCE ..... ENGINE #8 OUTLET Temp. Std.: 68
DATE ..... AUGUST 27,1990 Press. Std: 29.92

FUEL FLOWRATE DATA :

	RUN 1	RUN 2	RUN 3
Barometric Press., in.Hg..	29.99	29.99	29.98
Brake Horsepower	555.00	555.00	555.00
Fuel Flow, scfh			
Oxygen, %	0.09	0.12	0.11
Fuel Flow, acfh	6102.00	6076.00	6007.00
Fuel Press, psig	0.90	0.90	0.90
" " psia	15.63	15.63	15.63
Fuel Temp, dF	50.00	57.00	75.00

FUEL ANALYSIS DATA :

	RUN 1	RUN 2	RUN 3
Btu/scf, Gross Cal. Value:	1026.00	1026.00	1026.00
Btu/lb, Gross Cal. Value :	23123.00	23123.00	23123.00
Hydrogen, Wt.% :	24.00	24.00	24.00
Carbon, Wt.% :	73.37	73.37	73.37
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	1.23	1.23	1.23
Oxygen, Wt.% :	1.40	1.40	1.40

CALCULATIONS :

	RUN 1	RUN 2	RUN 3	AVERAGE
F-Factor,dscf/MMBtu :	8,612.39	8,612.39	8,612.39	8,612.39
Fuel Rate, scfh :	6719.04	6599.83	6303.37	6540.74
Heat Rate, MMBtu/hr :	6.894	6.771	6.467	6.711
Flue gas flowrate, dscfm :	993.81	977.58	933.22	968.20

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

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

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

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

FUEL / FLOWRATE CALCULATIONS

PLANT ..... SO CAL GAS
SOURCE ..... ENGINE #2 INLET Temp. Std.: 68
DATE ..... AUGUST 28,1990 Press. Std: 29.92

FUEL FLOWRATE DATA :

	RUN 1	RUN 2	RUN 3
Barometric Press., in.Hg..	29.93	29.93	29.91
Brake Horsepower	567.00	567.00	567.00
Fuel Flow, scfh			
Oxygen, %	0.24	0.19	0.24
Fuel Flow, acfh	6737.00	6143.00	6979.00
Fuel Press, psig	1.00	1.00	1.00
" " psia	15.70	15.70	15.69
Fuel Temp, dF	61.00	77.00	82.00

FUEL ANALYSIS DATA :

	RUN 1	RUN 2	RUN 3
Btu/scf, Gross Cal. Value:	1113.00	1113.00	1113.00
Btu/lb, Gross Cal. Value :	22619.00	22619.00	22619.00
Hydrogen, Wt.% :	22.84	22.84	22.84
Carbon, Wt.% :	73.78	73.78	73.78
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	1.62	1.62	1.62
Oxygen, Wt.% :	1.76	1.76	1.76

CALCULATIONS :

	RUN 1	RUN 2	RUN 3	AVERAGE
F-Factor,dscf/MMBtu :	8,640.44	8,640.44	8,640.44	8,640.44
Fuel Rate, scfh :	7294.40	6453.08	7259.10	7002.19
Heat Rate, MMBtu/hr :	8.119	7.182	8.079	7.793
Flue gas flowrate, dscfm :	1182.73	1043.79	1177.01	1134.51

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

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

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

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

FUEL / FLOWRATE CALCULATIONS

PLANT ..... SO CAL GAS
SOURCE ..... ENGINE #2 OUTLET Temp. Std.: 68
DATE ..... AUGUST 28,1990 Press. Std: 29.92

FUEL FLOWRATE DATA :

	RUN 1	RUN 2	RUN 3
Barometric Press., in.Hg..	29.93	29.93	29.93
Brake Horsepower	567.00	567.00	567.00
Fuel Flow, scfh			
Oxygen, %	0.10	0.09	0.08
Fuel Flow, acfh	6545.00	6636.00	6076.00
Fuel Press, psig	1.00	1.00	1.00
" " psia	15.70	15.70	15.70
Fuel Temp, dF	55.00	68.00	81.00

FUEL ANALYSIS DATA :

	RUN 1	RUN 2	RUN 3
Btu/scf, Gross Cal. Value:	1113.00	1113.00	1113.00
Btu/lb, Gross Cal. Value :	22619.00	22619.00	22619.00
Hydrogen, Wt.% :	22.84	22.84	22.84
Carbon, Wt.% :	73.78	73.78	73.78
Sulfur, Wt.% :	0.00	0.00	0.00
Nitrogen, Wt.% :	1.62	1.62	1.62
Oxygen, Wt.% :	1.76	1.76	1.76

CALCULATIONS :

	RUN 1	RUN 2	RUN 3	AVERAGE
F-Factor,dscf/MMBtu :	8,640.44	8,640.44	8,640.44	8,640.44
Fuel Rate, scfh :	7169.07	7089.79	6335.50	6864.79
Heat Rate, MMBtu/hr :	7.979	7.891	7.051	7.641
Flue gas flowrate, dscfm :	1154.59	1141.27	1019.36	1105.07

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

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

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

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

EMISSION RATE CALCULATIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #3 INLET
DATE : AUGUST 20,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	0.31	0.34	0.30	0.32
Qs(std), dscfm	1093.20	1075.09	1060.59	1076.29
NOx, ppm	2184.40	2190.44	2261.69	2212.18
CO, ppm				
HC, ppm				
F-Factor	8626.17	8626.17	8626.17	8626.17
NOx, MW = 46.005				
NOx, lb/hr	17.11	16.87	17.19	17.06
NOx, ppm @ O2	625.93	628.58	647.77	634.09
NOx, lb/MMBtu	2.2850	2.2946	2.3647	2.3148
NOx, g/HP-hr	13.81	13.62	13.87	13.77
CO, MW = 28.010				
CO, lb/hr				
CO, ppm @ O2				
CO, lb/MMBtu				
CO, g/HP-hr				
HC, MW = 16.043				
HC, lb/hr				
HC, ppm @ O2				
HC, lb/MMBtu				
HC, g/HP-hr				

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

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

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

* g/HP-hr = lb/hr x (453.59 g/lb) / HP

EMISSION RATE CALCULATIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #3 OUT
DATE : AUGUST 20,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	0.24	0.18	0.25	0.22
Qs(std), dscfm	1060.76	1063.46	1058.38	1060.87
NOx, ppm	68.31	77.88	79.35	75.18
CO, ppm				
HC, ppm				
F-Factor	8626.17	8626.17	8626.17	8626.17
NOx, MW = 46.005				
NOx, lb/hr	0.52	0.59	0.60	0.57
NOx, ppm @ O2	19.51	22.18	22.67	21.45
NOx, lb/MMBtu	0.0712	0.0810	0.0828	0.0783
NOx, g/HP-hr	0.42	0.48	0.49	0.46
CO, MW = 28.010				
CO, lb/hr				
CO, ppm @ O2				
CO, lb/MMBtu				
CO, g/HP-hr				
HC, MW = 16.043				
HC, lb/hr				
HC, ppm @ O2				
HC, lb/MMBtu				
HC, g/HP-hr				

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

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

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

* g/HP-hr = lb/hr x (453.59 g/lb) / HP

EMISSION RATE CALCULATIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #4 INLET
DATE : AUGUST 21,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	0.46	0.42	0.42	0.43
Qs(std), dscfm	1117.21	1115.37	1141.65	1124.75
NOx, ppm	1995.80	2013.87	2083.85	2031.17
CO, ppm				
HC, ppm				
F-Factor	8664.50	8664.50	8664.50	8664.50
NOx, MW = 46.005				
NOx, lb/hr	15.98	16.09	17.05	16.37
NOx, ppm @ O2	576.09	580.17	600.33	585.53
NOx, lb/MMBtu	2.1124	2.1273	2.2012	2.1470
NOx, g/HP-hr	12.94	13.04	13.81	13.26
CO, MW = 28.010				
CO, lb/hr				
CO, ppm @ O2				
CO, lb/MMBtu				
CO, g/HP-hr				
HC, MW = 16.043				
HC, lb/hr				
HC, ppm @ O2				
HC, lb/MMBtu				
HC, g/HP-hr				

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

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

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

* g/HP-hr = lb/hr x (453.59 g/lb) / HP

EMISSION RATE CALCULATIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #4 OUTLET
DATE : AUGUST 21,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	0.21	0.19	0.49	0.30
Qs(std), dscfm	1144.00	1124.06	1133.13	1133.73
NOx, ppm	72.49	71.23	67.97	70.56
CO, ppm				
HC, ppm				
F-Factor	8664.50	8664.50	8664.50	8664.50
NOx, MW = 46.005				
NOx, lb/hr	0.59	0.57	0.55	0.57
NOx, ppm @ O2	20.67	20.29	19.65	20.20
NOx, lb/MMBtu	0.0758	0.0744	0.0720	0.0741
NOx, g/HP-hr	0.48	0.46	0.45	0.46
CO, MW = 28.010				
CO, lb/hr				
CO, ppm @ O2				
CO, lb/MMBtu				
CO, g/HP-hr				
HC, MW = 16.043				
HC, lb/hr				
HC, ppm @ O2				
HC, lb/MMBtu				
HC, g/HP-hr				

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

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

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

* g/HP-hr = lb/hr x (453.59 g/lb) / HP

EMISSION RATE CALCULATIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #5 INLET
DATE : AUGUST 22,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	0.40	0.40	0.38	0.39
Qs(std), dscfm	1022.79	1022.54	1009.19	1018.17
NOx, ppm	2264.25	2296.01	2295.19	2285.15
CO, ppm				
HC, ppm				
F-Factor	8615.90	8615.90	8615.90	8615.90
NOx, MW = 46.005				
NOx, lb/hr	16.59	16.82	16.60	16.67
NOx, ppm @ O2	651.66	660.80	659.92	657.46
NOx, lb/MMBtu	2.3761	2.4094	2.4062	2.3972
NOx, g/HP-hr	13.44	13.62	13.44	13.50
CO, MW = 28.010				
CO, lb/hr				
CO, ppm @ O2				
CO, lb/MMBtu				
CO, g/HP-hr				
HC, MW = 16.043				
HC, lb/hr				
HC, ppm @ O2				
HC, lb/MMBtu				
HC, g/HP-hr				

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

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

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

* g/HP-hr = lb/hr x (453.59 g/lb) / HP

EMISSION RATE CALCULATIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #5 OUTLET
DATE : AUGUST 22,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	0.20	0.20	0.20	0.20
Qs(std), dscfm	1009.90	1009.74	1004.47	1008.04
NOx, ppm	333.75	344.00	363.55	347.10
CO, ppm				
HC, ppm				
F-Factor	8615.90	8615.90	8615.90	8615.90
NOx, MW = 46.005				
NOx, lb/hr	2.41	2.49	2.62	2.51
NOx, ppm @ O2	95.13	98.05	103.62	98.93
NOx, lb/MMBtu	0.3468	0.3575	0.3778	0.3607
NOx, g/HP-hr	1.96	2.02	2.12	2.03
CO, MW = 28.010				
CO, lb/hr				
CO, ppm @ O2				
CO, lb/MMBtu				
CO, g/HP-hr				
HC, MW = 16.043				
HC, lb/hr				
HC, ppm @ O2				
HC, lb/MMBtu				
HC, g/HP-hr				

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

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

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

* g/HP-hr = lb/hr x (453.59 g/lb) / HP

EMISSION RATE CALCULATIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #6 INLET
DATE : AUGUST 23,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	0.23	0.21	0.24	0.23
Qs(std), dscfm	1100.64	1025.43	999.76	1041.94
NOx, ppm	2245.98	2274.16	2302.44	2274.19
CO, ppm				
HC, ppm				
F-Factor	8628.51	8628.51	8628.51	8628.51
NOx, MW = 46.005				
NOx, lb/hr	17.71	16.71	16.49	16.97
NOx, ppm @ O2	641.09	648.50	657.52	649.04
NOx, lb/MMBtu	2.3409	2.3680	2.4009	2.3700
NOx, g/HP-hr	13.95	13.16	12.99	13.36
CO, MW = 28.010				
CO, lb/hr				
CO, ppm @ O2				
CO, lb/MMBtu				
CO, g/HP-hr				
HC, MW = 16.043				
HC, lb/hr				
HC, ppm @ O2				
HC, lb/MMBtu				
HC, g/HP-hr				

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

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

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

* g/HP-hr = lb/hr x (453.59 g/lb) / HP

EMISSION RATE CALCULATIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #6 OUTLET
DATE : AUGUST 23,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	0.15	0.15	0.19	0.16
Qs(std), dscfm	1080.55	998.65	1005.52	1028.24
NOx, ppm	183.13	203.50	194.46	193.70
CO, ppm				
HC, ppm				
F-Factor	8628.51	8628.51	8628.51	8628.51
NOx, MW = 46.005				
NOx, lb/hr	1.42	1.46	1.40	1.42
NOx, ppm @ O2	52.07	57.86	55.40	55.11
NOx, lb/MMBtu	0.1901	0.2113	0.2023	0.2012
NOx, g/HP-hr	1.12	1.15	1.10	1.12
CO, MW = 28.010				
CO, lb/hr				
CO, ppm @ O2				
CO, lb/MMBtu				
CO, g/HP-hr				
HC, MW = 16.043				
HC, lb/hr				
HC, ppm @ O2				
HC, lb/MMBtu				
HC, g/HP-hr				

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

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

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

* g/HP-hr = lb/hr x (453.59 g/lb) / HP

EMISSION RATE CALCULATIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #7 INLET
DATE : AUGUST 24,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	0.20	0.23	0.22	0.22
Qs(std), dscfm	1034.68	1020.20	1030.77	1028.55
NOx, ppm	1479.15	1536.83	1536.81	1517.60
CO, ppm				
HC, ppm				
F-Factor	8641.16	8641.16	8641.16	8641.16
NOx, MW = 46.005				
NOx, lb/hr	10.97	11.23	11.35	11.18
NOx, ppm @ O2	421.59	438.67	438.45	432.90
NOx, lb/MMBtu	1.5417	1.6041	1.6033	1.5831
NOx, g/HP-hr	9.18	9.40	9.50	9.36
CO, MW = 28.010				
CO, lb/hr				
CO, ppm @ O2				
CO, lb/MMBtu				
CO, g/HP-hr				
HC, MW = 16.043				
HC, lb/hr				
HC, ppm @ O2				
HC, lb/MMBtu				
HC, g/HP-hr				

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

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

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

* g/HP-hr = lb/hr x (453.59 g/lb) / HP

EMISSION RATE CALCULATIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #7 OUTLET
DATE : AUGUST 24,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	0.21	0.18	0.15	0.18
Qs(std), dscfm	1029.81	1034.71	1025.34	1029.95
NOx, ppm	133.50	162.59	178.96	158.35
CO, ppm				
HC, ppm				
F-Factor	8641.16	8641.16	8641.16	8641.16
NOx, MW = 46.005				
NOx, lb/hr	0.99	1.21	1.31	1.17
NOx, ppm @ O2	38.07	46.30	50.89	45.08
NOx, lb/MMBtu	0.1392	0.1693	0.1861	0.1649
NOx, g/HP-hr	0.82	1.01	1.10	0.98
CO, MW = 28.010				
CO, lb/hr				
CO, ppm @ O2				
CO, lb/MMBtu				
CO, g/HP-hr				
HC, MW = 16.043				
HC, lb/hr				
HC, ppm @ O2				
HC, lb/MMBtu				
HC, g/HP-hr				

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

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

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

* g/HP-hr = lb/hr x (453.59 g/lb) / HP

EMISSION RATE CALCULATIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #8 INLET
DATE : AUGUST 27,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	0.17	0.17	0.20	0.18
Qs(std), dscfm	987.58	945.36	925.01	952.65
NOx, ppm	2489.67	2495.66	2548.29	2511.21
CO, ppm				
HC, ppm				
F-Factor	8612.39	8612.39	8612.39	8612.39
NOx, MW = 46.005				
NOx, lb/hr	17.62	16.90	16.89	17.14
NOx, ppm @ O2	708.59	710.29	726.32	715.07
NOx, lb/MMBtu	2.5826	2.5888	2.6472	2.6062
NOx, g/HP-hr	14.40	13.82	13.80	14.01
CO, MW = 28.010				
CO, lb/hr				
CO, ppm @ O2				
CO, lb/MMBtu				
CO, g/HP-hr				
HC, MW = 16.043				
HC, lb/hr				
HC, ppm @ O2				
HC, lb/MMBtu				
HC, g/HP-hr				

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

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

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

* g/HP-hr = lb/hr x (453.59 g/lb) / HP

EMISSION RATE CALCULATIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #8 OUTLET
DATE : AUGUST 27,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	0.09	0.12	0.11	0.11
Qs(std), dscfm	993.81	977.58	933.22	968.20
NOx, ppm	476.14	521.67	521.35	506.39
CO, ppm				
HC, ppm				
F-Factor	8612.39	8612.39	8612.39	8612.39
NOx, MW = 46.005				
NOx, lb/hr	3.39	3.65	3.49	3.51
NOx, ppm @ O2	134.99	148.12	147.95	143.69
NOx, lb/MMBtu	0.4920	0.5398	0.5392	0.5237
NOx, g/HP-hr	2.77	2.99	2.85	2.87
CO, MW = 28.010				
CO, lb/hr				
CO, ppm @ O2				
CO, lb/MMBtu				
CO, g/HP-hr				
HC, MW = 16.043				
HC, lb/hr				
HC, ppm @ O2				
HC, lb/MMBtu				
HC, g/HP-hr				

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

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

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

* g/HP-hr = lb/hr x (453.59 g/lb) / HP

EMISSION RATE CALCULATIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #2 INLET
DATE : AUGUST 28,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	0.24	0.19	0.24	0.22
Qs(std), dscfm	1182.73	1043.79	1177.01	1134.51
NOx, ppm	1612.91	1672.08	1734.66	1673.22
CO, ppm				
HC, ppm				
F-Factor	8640.44	8640.44	8640.44	8640.44
NOx, MW = 46.005				
NOx, lb/hr	13.67	12.50	14.63	13.60
NOx, ppm @ O2	460.61	476.35	495.38	477.45
NOx, lb/MMBtu	1.6842	1.7418	1.8114	1.7458
NOx, g/HP-hr	10.93	10.00	11.70	10.88
CO, MW = 28.010				
CO, lb/hr				
CO, ppm @ O2				
CO, lb/MMBtu				
CO, g/HP-hr				
HC, MW = 16.043				
HC, lb/hr				
HC, ppm @ O2				
HC, lb/MMBtu				
HC, g/HP-hr				

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

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

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

* g/HP-hr = lb/hr x (453.59 g/lb) / HP

EMISSION RATE CALCULATIONS

PLANT : SO CAL GAS
SOURCE : ENGINE #2 OUTLET
DATE : AUGUST 28,1990

Temp. Std. : 68 dF
Press. Std.: 29.92 in. Hg. 15 % O2 Correction

	RUN 1	RUN 2	RUN 3	AVERAGE
Oxygen (%)	0.10	0.09	0.08	0.09
Qs(std), dscfm	1154.59	1141.27	1019.36	1105.07
NOx, ppm	19.94	15.38	23.31	19.54
CO, ppm				
HC, ppm				
F-Factor	8640.44	8640.44	8640.44	8640.44
NOx, MW = 46.005				
NOx, lb/hr	0.16	0.13	0.17	0.15
NOx, ppm @ O2	5.66	4.36	6.61	5.54
NOx, lb/MMBtu	0.0207	0.0159	0.0242	0.0203
NOx, g/HP-hr	0.13	0.10	0.14	0.12
CO, MW = 28.010				
CO, lb/hr				
CO, ppm @ O2				
CO, lb/MMBtu				
CO, g/HP-hr				
HC, MW = 16.043				
HC, lb/hr				
HC, ppm @ O2				
HC, lb/MMBtu				
HC, g/HP-hr				

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

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

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

* g/HP-hr = lb/hr x (453.59 g/lb) / HP

Scott Specialty Gases a division of
Scott Environmental Technology Inc. 2600 CAJON BLVD., SAN BERNARDINO, CA 92405
TELEX: 510-100-8831 (ScotGas)
FAX: 714-887-0549
PHONE: 714-887-2571

PAPE AND STEINER
5801 NORRIS ROAD
BAKERSFIELD, CA 93308
ATTEN: SUE POWERS

Date: 2/16/90
Our Project No.: 5077
Your P.O. No.: SP2546-90 REL 5

Gentlemen:

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

ANALYTICAL REPORT

Cyl. No. ALM-8235 Analytical Accuracy ±1%

Component	Concentration
NITRIC OXIDE	40.23 ppm
NOX	62.23 ppm
NITROGEN DIOXIDE	22 ppm
NITROGEN	BALANCE

NO2 is ±5% NO is ±1%

Cyl. No. _____ Analytical Accuracy _____

Component	Concentration

Cyl. No. _____ Analytical Accuracy _____

Component	Concentration

Cyl. No. _____ Analytical Accuracy _____

Component	Concentration

Analyst _____

Approved By R. Shealy

Scott Specialty Gases

a division of Scott Environmental Technology, Inc.

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

Our Project # : 3.
Your P.O. # : SP-2302-89

Customer :
PAPE AND STEINER
3801 NORRIS ROAD
BAKERSFIELD, CA 93308

Expiration Date : 1-24-91

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

Certified Per Traceability Procedure # G1
Protocol # 1

Cylinder Number ALM-005396

File # P02945

Cylinder Pressure 2000 psig

Certified Accuracy 1 % NBS Traceable

COMPONENT	CERTIFIED CONC.	REFERENCE STD SRM # (CRM #)	REFERENCE STD CYLINDER NUMBER	REFERENCE STD CONC.	GAS ANALYZER MAKE/MODEL/SERIAL #	GAS ANALYZER LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
NITRIC OXIDE	2003 PPM	2631	FF18958	2859 PPM	BECKMAN/951/0101108	12-7-88	CHEMILUMINESCENCE
		2630	FF18947	1403 PPM			

BALANCE GAS : NITROGEN

NITROGEN DIOXIDE 9.72 PPM

A-145

FIRST ANALYSIS DATE 7-15-89

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	REFERENCE GAS (mV)	RESULTS PPM
0.00	68.60	2001	2859 PPM	98.00	2859
0.00	68.60	2001		98.00	2859
0.00	68.70	2004		98.00	2859

CALCULATED RESULTS 2001, 2001, 2004

AVERAGE : 2002 PPM

SECOND ANALYSIS DATE : 7-24-89

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	REFERENCE GAS (mV)	RESULTS PPM
0.00	68.60	2001	2859 PPM	98.00	2859
0.00	68.70	2004		98.00	2859
0.00	68.70	2004		98.00	2859
0.00	69.00 NOX	2013			

CALCULATED RESULTS 2001, 2004, 2004

2013 PPM NOX

AVERAGE : 2003 PPM

CALIBRATION CURVE 1 st DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
2631	2859	100	98.00	2859	.00
	2287	80	78.20	2281	-0.25
	1715	60	58.50	1707	-0.51
	1144	40	39.10	1141	-0.25
	571.8	20	19.70	574.8	0.53
	0.0000	0	0.00	0.0000	0.00
	0.00			0.00	0.00
1687	951.0	LOW	32.60	951.2	0.02
2630	1403		47.60	1389	-1.02

* GMIS - GAS MANUFACTURER'S INTERNAL STANDARD

Analyst : Rohit G. Patel

Approved By : J. Shapiro

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

Scott Specialty Gases

a division of

TELEX: 510-100-8831 (ScotGas)
FAX: 714-887-0549
PHONE: 714-887-2571

Scott Environmental Technology Inc. 2600 CAJON BLVD., SAN BERNARDINO, CA 92405

Pape & Steiner

Shipped From: Scott San Bernardino
Date Shipped 11/27/89
Our Project No: 3535
Your P.O. No: SP2302-89 REL 35
Page 1 of 1
Expiration Date: 5/91
CGA G60

CERTIFICATE OF ANALYSIS – EPA PROTOCOL GASES*

Certified Per Traceability Protocol No. 1 Procedure No. G1 Cylinder No. AAL 2171 Cylinder Pressure 1900 PSIG Certified Accuracy ±1 % NBS Traceable

REFERENCE STD

COMPONENTS	CERTIFIED CONC	SRM/CRM NO.	CYL. NO.	CONC.
Nitric Oxide	41.32 PPM	CRM 1684 B	ALM-3640	97.28 PPM
NOX	41.39 PPM			

GAS ANALYZER

MAKE/MODEL/SERIAL NO.	LAST CAL. DATE	ANALYTICAL PRINCIPLE
Thermo-Electron 10 AR S/N 14853-150	11/10/89	Chemi-Luminenscent

BALANCE GAS Nitrogen

ANALYZER READINGS: Z = Zero Gas T = Test Gas R = Reference Gas

A-146

Component Nitric Oxide
First Analysis Date 11/13/89 Units PPM

Z	R	T
0.0	97.23	41.21
R 97.14	Z 0.0	T 41.23
R 0.0	T 41.27	R 97.20
Z		R

Mean Test Assay 41.27

Second Analysis Date 11/21/89 Units PPM

Z	R	T
0.0	97.26	41.30
R 97.25	Z 0.05	T 41.33
Z 0.06	T 41.40	R 97.32

Mean Test Assay 41.32

Component
Date Units

Z	R	T
R	Z	T
Z	T	R

Mean Test Assay

Date Units

Z	R	T
R	Z	T
Z	T	R

Mean Test Assay

Component
Date Units

Z	R	T
R	Z	T
Z	T	R

Mean Test Assay

Date Units

Z	R	T
R	Z	T
Z	T	R

Mean Test Assay

Chronology: Date
Assay

Analyst Lee Oldham

Approved By: Doug Grant

Scott Specialty Gases

a division of

Scott Environmental Technology Inc. 2600 CAJON BLVD., SAN BERNARDINO, CA 92405
TELEX: 510-100-8831 (ScotGas)
FAX: 714-887-0549
PHONE: 714-887-2571

Shipped From: Scott SAN BERNARDINO
Date Shipped 7-17-89
Our Project No: 01341
Your P.O. No: SP2302-89 R20
Page 1 of 1
Expiration Date: 1-17-91

PAPE & STEINER
ATTN: SUE POWERS

CERTIFICATE OF ANALYSIS – EPA PROTOCOL GASES*

Certified Per Traceability Protocol No. 1 Procedure No. G1 Cylinder No. AAL-13433 Cylinder Pressure 1900 psig Certified Accuracy ±1 % NBS Traceable

REFERENCE STD

COMPONENTS	CERTIFIED CONC	SRM/CRM NO.	CYL. NO.	CONC.
Nitric Oxide	81.59 PPM	SRM 1684 B	CAL-12787	94.80 PPM
NOX	81.90 PPM			

GAS ANALYZER

MAKE/MODEL/SERIAL NO.	LAST CAL. DATE	ANALYTICAL PRINCIPLE
Thermo-Electron 10 AR S/N 14853-150	5-2-89	Chemi-Luminenscent

BALANCE GAS Nitrogen

ANALYZER READINGS: Z = Zero Gas T = Test Gas R = Reference Gas

Component Nitric Oxide
First Analysis Date 7-5-89 Units PPM

Z 0.00	R 94.83	T 81.70
R 94.78	Z -0.01	T 81.63
Z -0.03	T 81.67	R 94.75

Mean Test Assay 81.68 PPM

Second Analysis Date 7-12-89 Units PPM

Z 0.00	R 94.50	T 81.32
R 94.50	Z 0.02	T 81.32
Z 0.03	T 81.30	R 94.43

Mean Test Assay 81.59 PPM

Component ____ Date ____ Units ____

Z ____	R ____	T ____
R ____	Z ____	T ____
Z ____	T ____	R ____

Mean Test Assay ____

Date ____ Units ____

Z ____	R ____	T ____
R ____	Z ____	T ____
Z ____	T ____	R ____

Mean Test Assay ____

Component ____ Date ____ Units ____

Z ____	R ____	T ____
R ____	Z ____	T ____
Z ____	T ____	R ____

Mean Test Assay ____

Date ____ Units ____

Z ____	R ____	T ____
R ____	Z ____	T ____
Z ____	T ____	R ____

Mean Test Assay ____

Chronology: Date ____
Assay ____

Analyst Doug Hagberg

Approved By: [signature]

A-147

Scott Specialty Gases

a division of

TELEX: 510-100-8831 (ScotGas)
FAX: 714-887-0549
PHONE: 714-887-2571

Scott Environmental Technology Inc. 2600 CAJON BLVD., SAN BERNARDINO, CA 92405

Shipped From: Scott SAN BERNARDINO
Date Shipped 8-29-89
Our Project No: 2163
Your PO No: SP2302-89 REL#24
Page 1 of 1
Expiration Date: 2-29-91

PAPE & STEINER
ATTN: SUE POWERS

CERTIFICATE OF ANALYSIS – EPA PROTOCOL GASES*

Certified Per Traceability Protocol No. 1 Procedure No. G1 Cylinder No. ALM-5592 Cylinder Pressure 1900 psig Certified Accuracy ±1 % NBS Traceable

REFERENCE STD

COMPONENTS	CERTIFIED CONC	SRM/CRM NO.	CYL. NO.	CONC.
Nitric Oxide	201.6 PPM	CRM 1685 B	CAL-6960	233.8 PPM
NOX	202.0 PPM			

GAS ANALYZER

MAKE/MODEL/SERIAL NO.	LAST CAL. DATE	ANALYTICAL PRINCIPLE
Thermo-Electron	8-2-89	Chemi-Luminenscent
10 AR S/N 14853-150		

RECEIVED
SEP 0 1 1989
Ans'd.....

BALANCE GAS Nitrogen

ANALYZER READINGS: Z = Zero Gas T = Test Gas R = Reference Gas

A-148

Component Nitric Oxide
First Analysis Date 8-18-89 Units PPM

Z 0.00	R 93.33	T 80.45
R 93.53	Z 0.03	T 80.73
Z -0.02	T 80.68	R 93.51

Mean Test Assay 201.7 PPM

Second Analysis Date 8-28-89 Units PPM

Z 0.00	R 92.75	T 79.88
R 92.53	Z 0.04	T 79.70
Z 0.03	T 79.77	R 92.38

Mean Test Assay 201.6 PPM

Component _____
Date _____ Units _____

Z _____	R _____	T _____
R _____	Z _____	T _____
Z _____	T _____	R _____

Mean Test Assay _____

Date _____ Units _____

Z _____	R _____	T _____
R _____	Z _____	T _____
Z _____	T _____	R _____

Mean Test Assay _____

Component _____
Date _____ Units _____

Z _____	R _____	T _____
R _____	Z _____	T _____
Z _____	T _____	R _____

Mean Test Assay _____

Date _____ Units _____

Z _____	R _____	T _____
R _____	Z _____	T _____
Z _____	T _____	R _____

Mean Test Assay _____

Chronology: Date _____
Assay _____

Analyst Doug Hagberg/Carrie Boddy Approved By: Doug Grant

Scott Specialty Gases

a division of Scott Environmental Technology, Inc.

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

Shipped From : Scott Michigan

Our Project # : 12083

Your P.O. # : SP-2546-90

Expiration Date : 12-8-91

Cylinder Number ALM-012987

Cylinder Pressure 1900 psig

Customer :
PAPE AND STEINER
5801 NORRIS RD
BAKERSFIELD CA 93308

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

Certified Per Traceability Procedure # G1
Protocol # 1

File # P06242

Certified Accuracy 1 % NBS Traceable

COMPONENT	CERTIFIED CONC.	REFERENCE STD SRM # (CRM #)	REFERENCE STD CYLINDER NUMBER	REFERENCE STD CONC.	GAS ANALYZER MAKE/MODEL	GAS ANALYZER LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
NITRIC OXIDE	1171.4 PPM	2630	FF-16162	1428 PPM	BECKMAN 951 0101108	5-10-90	CHEMILUMINESCENCE
		GMIS*	ALM-002223	513.0 PPM			

BALANCE GAS : NITROGEN

NITROGEN DIOXIDE 8.09 PPM

A-149

FIRST ANALYSIS DATE : 6-1-90

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	REFERENCE GAS (mV)	RESULTS PPM
0.00	81.90	1169.4	1428.0 PPM	100.00	1428.0
0.00	81.90	1169.4		100.00	1428.0
0.00	82.00	1170.9		100.00	1428.0

CALCULATED RESULTS 1169.4, 1169.4, 1170.9

AVERAGE : 1169.9 PPM

SECOND ANALYSIS DATE : 6-8-90

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	REFERENCE GAS (mV)	RESULTS PPM
0.00	82.20	1173.7	1428.0 PPM	100.00	1428.0
0.00	82.10	1172.3		100.00	1428.0
0.00	82.10	1172.3		100.00	1428.0
0.00	82.70 NOX	1180.9			

CALCULATED RESULTS 1173.7, 1172.3, 1172.3

1180.9 PPM NOX

AVERAGE : 1172.8 PPM

CALIBRATION CURVE 1 st DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
2630	1428	100	100.00	1428	.00
	1003	70	70.10	1001	-0.20
	513.0	36	36.10	515.2	0.43
	472.0	33	33.00	470.9	-0.23
	0.0000	0	0.00	0.0000	0.00
		0		0.00	0.00
		0		0.00	0.00
1686	472.0	LOW	33.00	470.9	-0.23
N/A	513.0	GMIS*	36.10	515.2	0.43

* GMIS - GAS MANUFACTURER'S INTERNAL STANDARD

Analyst : Rick

Approved By : J Shapiro

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

Scott Specialty Gases, Inc.
FAX: 714-887-0549
PHONE: 714-887-2571
2600 CAJON BLVD., SAN BERNARDINO, CA 92405

RECEIVED
JUN 04 1990
Ans'd.....

5/29/90

PAPE & STEINER
5801 NORRIS RD
BAKERSFIELD
CA 93308-0000

PROJECT #: 02-07052
PO #: SP2546-90 REL 17

CYLINDER #: AAL8168

ANALYTICAL ACCURACY: +/-1%

COMPONENT	REQUESTED CONCENTRATION		ANALYSIS 1 (MOLES)	U/M
CARBON DIOXIDE	10.0	PCT	10.04	PCT
*CARBON MONOXIDE	.04	PCT	.0400	PCT
OXYGEN	1.0	PCT	1.000	PCT
NITROGEN	BALANCE	GAS		N/A

NOTES: * CO TRACEABLE TO CRM2636

DATE OF ANALYSIS: 5/26/90

ANALYST: _____ MAYNARD JOHNSON

APPROVED BY: _____ ROBERT SHEALY

APPENDIX B

AUTOMATIC SETPOINT TEST OPERATING DATA

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-20-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, Ca

Unit #: 3 Inlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type: _____

Fuel Flow: 5998 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 58

Wet Bulb (°F): 65 Dry Bulb (°F): 68

RH (%): 85 Barometric Pressure ("Hg): 29.87

HP (Rated): 650 HP (Actual): 562

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 1 0905 - 0945

Air to Fuel Ratio (AFR) Setpoint 900 MV

AFR Controller 897 - 908 MV

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-20-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, Ca.

Unit #: 3 Inlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type:

Fuel Flow: 6000 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 68

Wet Bulb (°F): 62 Dry Bulb (°F): 65

RH (%): 85 Barometric Pressure ("Hg): 29.89

HP (Rated): 650 HP (Actual): 562

KW (Rated): KW (Actual):

OTHER NOTES

Run 2 1100 - 1140

Air to Fuel Ratio (AFR) Set Point 900 mv

AFR Controller 895 - 906 mv

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-20-90 Client: SD Cal Gas Goleta

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 3 Inlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type: _____

Fuel Flow: 5998 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 74

Wet Bulb (°F): 63 Dry Bulb (°F): 67

RH (%): 80 Barometric Pressure ("Hg): 29.89

HP (Rated): 650 HP (Actual): 562

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 3 1250-1330

Air to Fuel Ratio (AFR) Set Point 900 MV

AFR controller 896-908 MV

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-20-90 Client: So. Cal Gas -

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 3 Outlet Manufacturer: Ingersoll - Rand

Model #: LVG-8 Catalyst Type: _____

Fuel Flow: 5806 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 55

Wet Bulb (°F): 65 Dry Bulb (°F): 67

RH (%): 90 Barometric Pressure ("Hg): 29.87

HP (Rated): 650 HP (Actual): 562

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 1 0810 - 0850

AIR TO FUEL RATIO (AFR) Set Point 900 MV.

AFR Controller 897 - 907 MV

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-20-90 Client: So Cal Gas

Engine Test Location: IC Engine Plant: Goleta, Ca.

Unit #: 3 Outlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type:

Fuel Flow: 5902 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 61

Wet Bulb (°F): 65 Dry Bulb (°F): 70

RH (%): 78 Barometric Pressure ("Hg): 29.89

HP (Rated): 650 HP (Actual): 562

KW (Rated): KW (Actual):

OTHER NOTES

Run 2 1005 - 1045

Air to Fuel Ratio (AFR) Set point 900 MV

AFR Controller 896-910 MV

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-20-90 Client: So Cal Gas Goleta

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 3 Outlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type: _____

Fuel Flow: 6000 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 74

Wet Bulb (°F): 64 Dry Bulb (°F): 67

RH (%): 85 Barometric Pressure ("Hg): 29.89

HP (Rated): 650 HP (Actual): 562

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

RUN 3 1155 - 1235

AIR to Fuel Ratio (AFR) Set Point 900 MV

AFR controller 895 - 904 MV

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-21-90 Client: So. Cal. Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 4 Inlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type:

Fuel Flow: 6102 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 77

Wet Bulb (°F): 63 Dry Bulb (°F): 65

RH (%): 90 Barometric Pressure ("Hg): 29.94

HP (Rated): 650 HP (Actual): 560

KW (Rated): KW (Actual):

OTHER NOTES

Run 1 1015 - 1055

Air to Fuel Ratio (AFR) Set Point 900

AFR Controller Swing 891-907

Lean - OFF Rich1 - ON Rich2 - OFF

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-21-90 Client: So, Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 4 Inlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type: _____

Fuel Flow: 6102 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 77

Wet Bulb (°F): 65 Dry Bulb (°F): 67

RH (%): 90 Barometric Pressure ("Hg): 29.95

HP (Rated): 650 HP (Actual): 560

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 2 1205-1245

Air to Fuel Ratio (AFR) Set Point 900

AFR Controller Swing 891-912

Lean - off Rich-1 - on Rich-2 - off

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-21-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 4 Inlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type:

Fuel Flow: 6207 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 74

Wet Bulb (°F): 68 Dry Bulb (°F): 78

RH (%): 60 Barometric Pressure ("Hg): 29.97

HP (Rated): 650 HP (Actual): 560

KW (Rated): KW (Actual):

OTHER NOTES

Run 3 1350-1436

Air to Fuel Ratio (AFR) Set Point 900

AFR Controller Swing 885-911

LEAN off Rich-1 on Rich-2 off

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-21-90 Client: So Cal Gas

Engine Test Location: IC Engine Plant: Goleta, Ca

Unit #: 4 Outlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type: _____

Fuel Flow: 6207 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 67

Wet Bulb (°F): 63 Dry Bulb (°F): 65

RH (%): 90 Barometric Pressure ("Hg): 29.94

HP (Rated): 650 HP (Actual): 560

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 1 09.20 -1000

Air to Fuel Ratio (AFR) Set Point 900

AFR controller swing 873-913

Lean - off Rich-1 - on Rich-2 - off

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-21-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, Ca

Unit #: 4 Outlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type: _____

Fuel Flow: 6207 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 76

Wet Bulb (°F): 63 Dry Bulb (°F): 66

RH (%): 85 Barometric Pressure ("Hg): 29.95

HP (Rated): 650 HP (Actual): 560

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 2 1112 - 1152

Air to Fuel Ratio (AFR) Set Point 900

AFR Controller Swing 885-908

Lean - off Rich-1 - on Rich-2 - off

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-21-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 4 Outlet Manufacturer: Ingersoll-Rand

Model #: Catalyst Type:

Fuel Flow: 6153 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 75

Wet Bulb (°F): 68 Dry Bulb (°F): 76

RH (%): 67 Barometric Pressure ("Hg): 29.96

HP (Rated): 650 HP (Actual): 560

KW (Rated): KW (Actual):

OTHER NOTES

Run 3 1300 - 1340

Air to Fuel Ratio (AFR) Set Point 900

AFR Controller swing 888 - 909

Lean-off Rich-1 on Rich-2 off

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-22-90

Client: So. Cal Gas

Engine Test Location: IC Engine

Plant: Goleta, CA

Unit #: 5 Inlet

Manufacturer: Ingersoll-Rand

Model #: LVG-8

Catalyst Type:

Fuel Flow: 6000

Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.08

Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 62

Wet Bulb (°F): 65

Dry Bulb (°F): 69

RH (%): 80

Barometric Pressure ("Hg): 29.93

HP (Rated): 650

HP (Actual): 560

KW (Rated):

KW (Actual):

OTHER NOTES

Run 1 0900 - 0940

Air to Fuel Ratio (AFR) Set Point 900

AFR Controller Swing 891 - 906

Lean Off Rich-1 ON Rich-2 ON

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-22-90

Client: So. Cal Gas

Engine Test Location: IC Engine

Plant: Goleta, CA

Unit #: 5 Inlet

Manufacturer: Ingersoll-Rand

Model #: LVG-8

Catalyst Type:

Fuel Flow: 6102

Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.08

Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 71

Wet Bulb (°F): 65

Dry Bulb (°F): 72

RH (%): 69

Barometric Pressure ("Hg): 29.93

HP (Rated): 650

HP (Actual): 560

KW (Rated):

KW (Actual):

OTHER NOTES

Run 2 1040 – 1120

Air to Fuel Ratio (AFR) Set Point 900

AFR Controller Swing 885-907

LEAN off Rich-1 on Rich-2 on

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-22-90

Client: So. Cal Gas

Engine Test Location: IC Engine

Plant: Goleta, CA

Unit #: 5 Inlet

Manufacturer: Ingersoll-Rand

Model #: LVG-8

Catalyst Type: _____

Fuel Flow: 6102

Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.08

Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 77

Wet Bulb (°F): 66

Dry Bulb (°F): 74

RH (%): 67

Barometric Pressure ("Hg): 29.9

HP (Rated): 650

HP (Actual): 560

KW (Rated): _____

KW (Actual): _____

OTHER NOTES

Run 3 1220-1300

Air to Fuel Ratio (AFR) Set Point 900

AFR Controller Swing 883-910

Lean OFF Rich-1 on Rich-2 on

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-22-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 5 Outlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type: _____

Fuel Flow: 5902 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.08 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 55

Wet Bulb (°F): 64 Dry Bulb (°F): 68

RH (%): 80 Barometric Pressure ("Hg): 29.93

HP (Rated): 650 HP (Actual): 560

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 1 0810-0850

Air to Fuel Ratio (AFR) Set Point 900

AFR Controller Swing 893-910

Lean off Rich-1 on Rich-2 on

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-22-90

Client: So. Cal Gas

Engine Test Location: IC Engine

Plant: Goleta, CA

Unit #: 5 Outlet

Manufacturer: Ingersoll-Rand

Model #: LVG-8

Catalyst Type:

Fuel Flow: 6050

Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.08

Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 68

Wet Bulb (°F): 66

Dry Bulb (°F): 71

RH (%): 77

Barometric Pressure ("Hg): 29.93

HP (Rated): 650

HP (Actual): 560

KW (Rated):

KW (Actual):

OTHER NOTES

Run 2 Outlet 0950 - 1030

Air to Fuel Ratio (AFR) Set Point 900

AFR Controller Swing 894-907

LEAN OFF Rich-1 on Rich-2 on

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-22-90

Client: So. Cal Gas

Engine Test Location: IC Engine

Plant: Goleta, CA

Unit #: 5 Outlet

Manufacturer: Ingersoll-Rand

Model #: LVG-8

Catalyst Type:

Fuel Flow: 6102

Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.08

Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 75

Wet Bulb (°F): 66

Dry Bulb (°F): 73

RH (%): 70

Barometric Pressure ("Hg): 29.91

HP (Rated): 650

HP (Actual): 560

KW (Rated):

KW (Actual):

OTHER NOTES

Run 3 1130-1210

Air to Fuel Ratio (AFR) Set Point 900

AFR Controller Swing 887-908

LEAN OFF Rich-1 ON Rich-2 ON

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-23-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 6 Inlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type:

Fuel Flow: 6279 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 67

Wet Bulb (°F): 63 Dry Bulb (°F): 69

RH (%): 73 Barometric Pressure ("Hg): 29.83

HP (Rated): 600 HP (Actual): 576

KW (Rated): KW (Actual):

OTHER NOTES

Run 1 0955 - 1035

Air to Fuel Ratio (AFR) Set Point 875

AFR Controller Swing RB 870-882 LB 857-889

RB LEAN OFF Rich-1 ON Rich-2 ON

LB LEAN OFF Rich-1 ON Rich-2 ON

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-23-90

Client: So. Cal Gas

Engine Test Location: IC Engine

Plant: Goleta, CA

Unit #: 6 Inlet

Manufacturer: Ingersoll-Rand

Model #: KVG-6

Catalyst Type:

Fuel Flow: 6000

Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90

Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 80

Wet Bulb (°F): 65

Dry Bulb (°F): 74

RH (%): 62

Barometric Pressure ("Hg): 29.83

HP (Rated): 650

HP (Actual): 576

KW (Rated):

KW (Actual):

OTHER NOTES

Run 2 1255-1335

Air to Fuel Ratio (AFR) Set Point 875

AFR Controller Swing RB 853-894 LB 859-892

RB LEAN OFF Rich-1 ON Rich-2 ON

LB LEAN OFF Rich-1 ON Rich-2 ON

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-23-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 6 Inlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type: _____

Fuel Flow: 5854 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 81.

Wet Bulb (°F): 65 Dry Bulb (°F): 73

RH (%): 67 Barometric Pressure ("Hg): 29.82

HP (Rated): 650 HP (Actual): 576

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 3 1425 - 1505

Air to Fuel Ratio (AFR) Set Point 875

AFR Controller Swing RB 869-884 LB 870-882

RB LEAN OFF Rich-1 ON Rich-2 ON

LB LEAN OFF Rich-1 ON Rich-2 ON

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-23-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 6 Outlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type: _____

Fuel Flow: 6153 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 64

Wet Bulb (°F): 63 Dry Bulb (°F): 67

RH (%): 80 Barometric Pressure ("Hg): 29.83

HP (Rated): 600 HP (Actual): 576

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 1 0905 - 0945

Air to Fuel Ratio (AFR) Set Point 875

AFR Controller Swing RB 870-876 LB 911-915

RB Lean OFF Rich-1 ON Rich-2 ON

LB Lean OFF Rich-1 ON Rich-2 ON

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-23-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 6 Outlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type: _____

Fuel Flow: 5806 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 75

Wet Bulb (°F): 64 Dry Bulb (°F): 72

RH (%): 65 Barometric Pressure ("Hg): 29.83

HP (Rated): 600 HP (Actual): 576

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 2 1047-1127

Air to Fuel Ratio (AFR) Set Point 875

AFR Controller Swing RB 832-878 LB 681-896

RB LEAN OFF Rich-1 ON Rich-2 ON

LB LEAN OFF Rich-1 ON Rich-2 ON

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-23-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 6 Outlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type: _____

Fuel Flow: 5902 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 81

Wet Bulb (°F): 65 Dry Bulb (°F): 74

RH (%): 62 Barometric Pressure ("Hg): 29.82

HP (Rated): 650 HP (Actual): 576

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 3 1335-1415

Air to Fuel Ratio (AFR) Set Point 875

AFR Controller Swing RB 853-888 LB 861-887

RB LEAN OFF Rich-1 ON Rich-2 ON

LB LEAN OFF Rich-1 ON Rich-2 ON

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-24-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 7 Inlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type: _____

Fuel Flow: 6053 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 57

Wet Bulb (°F): 63 Dry Bulb (°F): 66

RH (%): 85 Barometric Pressure ("Hg): 29.88

HP (Rated): 600 HP (Actual): _____

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 1 0835-0915

Air to Fuel Ratio (AFR) Set Point 840

AFR Controller Swing RB 829-858 LB 827-872

RB LEAN OFF Rich-1 ON Rich-2 ON

LB LEAN OFF Rich-1 ON Rich-2 ON

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-24-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 7 Inlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type:

Fuel Flow: 6025 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 63

Wet Bulb (°F): 63 Dry Bulb (°F): 70

RH (%): 68 Barometric Pressure ("Hg): 29.90

HP (Rated): 600 HP (Actual):

KW (Rated): KW (Actual):

OTHER NOTES

Run 2 1015 - 1055

Air to Fuel Ratio (AFR) Set Point 840

AFR Controller Swing RB 794 - 863 LB 813 - 861

RB LEAN OFF Rich-1 ON Rich-2 ON

LB LEAN OFF Rich-1 ON Rich-2 ON

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-24-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 7 Inlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type:

Fuel Flow: 6102 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 64

Wet Bulb (°F): 66 Dry Bulb (°F): 74

RH (%): 67 Barometric Pressure ("Hg): 29.90

HP (Rated): 600 HP (Actual):

KW (Rated): KW (Actual):

OTHER NOTES

Run 3 1155-1235

Air to Fuel Ratio (AFR) Set Point 840

AFR Controller Swing RB 769-869 LB 816-878

RB LEAN OFF Rich-1 ON Rich-2 ON

LB LEAN OFF Rich-1 ON Rich-2 ON

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-24-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: # 7 Outlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type:

Fuel Flow: 5975 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 53

Wet Bulb (°F): 63 Dry Bulb (°F): 65

RH (%): 89 Barometric Pressure ("Hg): 29.88

HP (Rated): 600 HP (Actual):

KW (Rated): KW (Actual):

OTHER NOTES

Run 1 0745-0825

Air to Fuel Ratio (AFR) Set Point 840

AFR Controller Swing RB 831-852 LB 835-861

RB LEAN OFF Rich-1 ON Rich-2 ON

LB LEAN OFF Rich-1 ON Rich-2 ON

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-24-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 7 Outlet Manufacturer: Ingevsoll-Rand

Model #: KVG-6 Catalyst Type:

Fuel Flow: 6102 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 61

Wet Bulb (°F): 64 Dry Bulb (°F): 69

RH (%): 77 Barometric Pressure ("Hg): 29.90

HP (Rated): 600 HP (Actual):

KW (Rated): KW (Actual):

OTHER NOTES

Run 2 0925-1005

Air to Fuel Ratio (AFR) Set Point 840

AFR Controller Swing RB 782-874 LB 821-868

RB LEAN OFF Rich-1 ON Rich-2 ON

LB LEAN OFF Rich-1 ON Rich-2 ON

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-24-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 7 Outlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type:

Fuel Flow: 6102 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 65

Wet Bulb (°F): 66 Dry Bulb (°F): 73

RH (%): 68 Barometric Pressure ("Hg): 29.90

HP (Rated): 600 HP (Actual):

KW (Rated): KW (Actual):

OTHER NOTES

Run 3 1105 - 1145

Air to Fuel Ratio (AFR) Set Point 840

AFR Controller Swing RB 821 - 852 LB 816 - 863

RB LEAN OFF Rich-1 ON Rich-2 ON

LB LEAN OFF Rich-1 ON Rich-2 ON

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-27-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 8 Inlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type:

Fuel Flow: 6076 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 53

Wet Bulb (°F): 64 Dry Bulb (°F): 69

RH (%): 77 Barometric Pressure ("Hg): 29.99

HP (Rated): 600 HP (Actual): 555

KW (Rated): KW (Actual):

OTHER NOTES

Run 1 0930 - 1010

Air to Fuel Ratio (AFR) Set Point 850

AFR Controller Swing RB 828-863 LB 837-859

RB LEAN OFF Rich-1 ON Rich-2 OFF

LB LEAN OFF Rich-1 ON Rich-2 OFF

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-2-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 8 Inlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type:

Fuel Flow: 5975 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 67

Wet Bulb (°F): 65 Dry Bulb (°F): 72

RH (%): 69 Barometric Pressure ("Hg): 29.99

HP (Rated): 600 HP (Actual): 555

KW (Rated): KW (Actual):

OTHER NOTES

Run 2 1110-1150

Air to Fuel Ratio (AFR) Set Point 850

AFR Controller Swing RB 828-863 LB 835-860

RB LEAN OFF Rich-1 ON Rich-2 OFF

LB LEAN OFF Rich-1 ON Rich-2 OFF

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-27-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 8 Inlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type:

Fuel Flow: 6030 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.9 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 84

Wet Bulb (°F): 65 Dry Bulb (°F): 76

RH (%): 55 Barometric Pressure ("Hg): 29.97

HP (Rated): 600 HP (Actual): 555

KW (Rated): KW (Actual):

OTHER NOTES

Run 3 1250-1330

Air to Fuel Ratio (AFR) Set Point 850

AFR Controller Swing RB 838-873 LB 828-861

RB LEAN OFF Rich-1 ON Rich-2 OFF

LB LEAN OFF Rich-1 ON Rich-2 OFF

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-27-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 8 Outlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type:

Fuel Flow: 6102 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 50

Wet Bulb (°F): 63 Dry Bulb (°F): 68

RH (%): 77 Barometric Pressure ("Hg): 29.99

HP (Rated): 600 HP (Actual): 555

KW (Rated): KW (Actual):

OTHER NOTES

Run 1 0840-0920

Air to Fuel Ratio (AFR) Set Point 850

AFR Controller Swing RB 838-883 LB 833-876

RB LEAN OFF Rich-1 ON Rich-2 ~~OFF~~

LB LEAN OFF Rich-1 ON Rich-2 OFF

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-27-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 8 Outlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type: _____

Fuel Flow: 6076 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 57

Wet Bulb (°F): 65 Dry Bulb (°F): 72

RH (%): 69 Barometric Pressure ("Hg): 29.99

HP (Rated): 600 HP (Actual): 555

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 2 1020-1100

Air to Fuel Ratio (AFR) Set Point 850

AFR Controller Swing RB 834-863 LB 841-859

RB LEAN OFF Rich-1 ON Rich-2 OFF

LB LEAN OFF Rich-1 ON Rich-2 OFF

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-27-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 8 Outlet Manufacturer: Ingersoll-Rand

Model #: KVG-6 Catalyst Type:

Fuel Flow: 6007 Fuel Flow Units: ACFH

Fuel Gas Pressure: 0.90 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 75

Wet Bulb (°F): 65 Dry Bulb (°F): 74

RH (%): 62 Barometric Pressure ("Hg): 29.98

HP (Rated): 600 HP (Actual): 555

KW (Rated): KW (Actual):

OTHER NOTES

Run 3 1200-1240

Air to Fuel Ratio (AFR) Set Point 850

AFR Controller Swing RB 826-875 LB 837-865

RB LEAN OFF Rich-1 ON Rich-2 OFF

LB LEAN OFF Rich-1 ON Rich-2 OFF

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-28-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 2 Inlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type:

Fuel Flow: 6737 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 61

Wet Bulb (°F): 64 Dry Bulb (°F): 67

RH (%): 86 Barometric Pressure ("Hg): 29.93

HP (Rated): 650 HP (Actual): 567

KW (Rated): KW (Actual):

OTHER NOTES

Run 1 0855-0935

Air to Fuel Ratio (AFR) Set Point 920

AFR Controller Swing 918-926

Lean off Rich-1 on Rich-2 off

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-28-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 2 Inlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type:

Fuel Flow: 6143 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 77

Wet Bulb (°F): 66 Dry Bulb (°F): 73

RH (%): 69 Barometric Pressure ("Hg): 29.93

HP (Rated): 650 HP (Actual): 567

KW (Rated): KW (Actual):

OTHER NOTES

Run 2 1035 - 1115

Air to Fuel Ratio (AFR) Set Point 920

AFR Controller Swing 912 - 933

LEARN off Rich-1 ON Rich-2 off

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-28-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 2 Inlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type:

Fuel Flow: 6979 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 82

Wet Bulb (°F): 65 Dry Bulb (°F): 76

RH (%): 55 Barometric Pressure ("Hg): 29.91

HP (Rated): 650 HP (Actual): 567

KW (Rated): KW (Actual):

OTHER NOTES

Run 3 1215-1255

Air to Fuel Ratio (AFR) Set Point

AFR Controller Swing 918-923

LEAN OFF Rich-1 ON Rich-2 OFF

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-28-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 2 Outlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type: _____

Fuel Flow: 6545 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 55

Wet Bulb (°F): 62 Dry Bulb (°F): 66

RH (%): 80 Barometric Pressure ("Hg): 29.93

HP (Rated): 650 HP (Actual): 567

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 1 0805 - 0845

Air to Fuel Ratio (AFR) Set Point 920

AFR Controller Swing 923-926

LEAN off Rich-1 on Rich-2 off

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-28-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 2 Outlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type:

Fuel Flow: 6636 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 68

Wet Bulb (°F): 65 Dry Bulb (°F): 72

RH (%): 69 Barometric Pressure ("Hg): 29.93

HP (Rated): 650 HP (Actual): 567

KW (Rated): KW (Actual):

OTHER NOTES

Run 2 0945-1025

Air to Fuel Ratio (AFR) Set Point 920

AFR Controller Swing 874-928

Lean OFF Rich-1 ON Rich-2 OFF

I. C. ENGINE COMPLIANCE DATA CHECK LIST

Date: 8-28-90 Client: So. Cal Gas

Engine Test Location: IC Engine Plant: Goleta, CA

Unit #: 2 Outlet Manufacturer: Ingersoll-Rand

Model #: LVG-8 Catalyst Type: _____

Fuel Flow: 6076 Fuel Flow Units: ACFH

Fuel Gas Pressure: 1.0 Fuel Gas Pressure Units: PSIG

Fuel Gas Temp. (°F): 81

Wet Bulb (°F): 68 Dry Bulb (°F): 75

RH (%): 70 Barometric Pressure ("Hg): 29.93

HP (Rated): 650 HP (Actual): 567

KW (Rated): _____ KW (Actual): _____

OTHER NOTES

Run 3 1125-1205

Air to Fuel Ratio (AFR) Set Point 920

AFR Controller Swing 916-930

LEAN OFF Rich-1 ON Rich-2 OFF