APPLICATION NUMBER 1483000170 J002

Marathon Oil Company

SOURCE DESCRIPTION (OR SCC CODE) Gasoline/Fuel Oil Loading Rack with V.R.U.

CONTROL EQUIPMENT John Zink Adsorption/Absorption Gasoline Vapor Recovery Unit

DATE(S) OF TEST June 8, 1994

FINAL TEST REPORT RECEIVED ON July 5, 1994

POLLUTANT(S) TESTED Hydrocarbon

TEST METHOD U.S. EPA Reference Methods 2A, 25B, 21 and 40 CFR 60 Subsection 60.503 (d)

TEST FIRM John F. Jordan Service Co., Inc.

EMISSION RATES*: .81# VOC/hour

ACTUAL 2.4 mg/liter ALLOWABLE** 30 mg/liter

OPERATING RATES*:

DURING TEST** 273,250 gal./6.6 hrs. MAXIMUM** 495,000 gals./6.6 hrs.

EMISSION FACTOR***

COMMENTS:

I HEREBY VERIFY THAT THE INFORMATION CONTAINED WITHIN THE STACK TEST REPORT HAS BEEN REVIEWED AND IT HAS BEEN DETERMINED THAT THE TEST PROCEDURES, ANALYSES AND CALCULATIONS ARE:

[x] **AN ACCEPTABLE DEMONSTRATION OF CONFORMANCE WITH THE APPROVED TESTING METHODOLOGY.**

[ ] **AN UNACCEPTABLE DEMONSTRATION OF CONFORMANCE WITH THE APPROVED TESTING METHODOLOGY.**

July 11, 1994
DATE OF REVIEW

D.L. Bien, AQS DLB
PREPARED BY

Le Roy R. Gruber
REVIEWED BY

* BASED ON- RUN AVERAGE
** SPECIFY APPLICABLE UNITS
*** SPECIFY IN UNITS OF MASS/INPUT

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OBSERVERS REPORT

COMPLIANCE TEST FOR

Hydrocarbons

Conducted on: Gasoline/Fuel Oil Loading Rack with V.R.U.

Source: Marathon Oil Company, June 8, 1994

Premise Number: 1483000170 J002

Test Firm: John F. Jordan Service Co., Inc

Prepared by: Denise L. Bien

Date Prepared: July 11, 1994

DEPARTMENT OF ENVIRONMENTAL SERVICES - AIR QUALITY MANAGEMENT
(D.O.E.S. - A.Q.M.)

mss/observer.rpt

Testing of Volatile Organic Compounds (VOC) emissions was conducted on June 8, 1994, at the Marathon Oil Company loading rack, 1483000170 J002. Ohio Administrative Code (OAC) Rule 3745-21-09 (Q)(1)(b) (control of VOC emissions) specifies a limit of 0.25 lb.VOC/1000 gals. gasoline loaded (30.2 mg/l) loaded, also applicable are OAC Rule 3745-31-05, 40 CFR Part 60 subpart XX (NSPS). This source uses a Zink Charcoal vapor recovery unit to control VOC emissions.

U.S. EPA Reference Methods 2A, 21, 40 CFR 60 Subsection 60.503 and 25B were utilized. A total of 273,250 gallons of gasoline was loaded over a test period of 6.6 hours. The emissions from this unit were 0.020 lbs.VOC/1000 gals. of gasoline (2.36 mg/l), this is less than the permit allowable rate of 0.25 lb voc/1000 gals. gasoline loaded.

The permit allowable maximum throughput for the source is 1,800,000 gal/day (75,000 gals./hr.). The average gallons per hour throughput during testing was 41,527 gals./hr., which is 55% of the maximum rate. Loading rack periods of heavy throughput were from 7:30-8:30 a.m. when 74,200 accountable gallons were loaded. During the period of 7:13 to 9:30 a.m., there was constant loading of at least one bay. A throughput of 74,200 gals./hr. during heavy loading, is 99% of the maximum hourly throughput. A total of 44 trucks were loaded during testing.

The Vacuum for the vapor recovery system reached 27" - 28" consistently. The vacuum value is recorded. It is a critical operating parameter. The greatest maximum back pressure recorded during the testing was 10" H2O, this was while all arms were loading. The maximum allowable back pressure is 18".

A control unit efficiency of 99.5% was calculated from the average VOC inlet and outlet concentrations of 24.5% and .14%. A total volume of 1755 cubic meters of air was exhausted from the control system outlet. Total mg of VOC emitted 2,438,900 (about 53#).

Quality assurance measures utilized during testing included, calibrations of the continuous instruments with NBS traceable gasses, turbine meter calibration and barometer calibration. None of the trucks used during testing had any leaks. Calculations of emission rate and gasoline throughput was verified.

In conclusion, the data contained within this report is of sufficient accuracy and precision to determine compliance. However, throughput was at 55% of maximum. Therefore, testing was not performed under worst case conditions, as required. Annual testing should be continued as per OEPA Engineering Guidance. If the gasoline throughput rate is increased, testing should occur immediately. Annual testing should occur during the hotter months of June, July and August , due to gasoline vapor volatility.

273,250 accountable gals. / 6.58 hrs. = 41,527 gals./hr.

41.5 10^3 gals./hrs.

0.81 lbs. VOC / lb. × lb. / 41.5 10^3 gals. = 0.020 lbs. / 10^3 gals.

lb. / 10^3 gals. × 10^3 gals. / gal. × g. / lb. × mg. / g × gal. / l. = mg. / l.

0.020 lbs. / 10^3 gal. × 1000 gals × 454 g / lb. × 10^3 mg / g × 0.26 gals. / l. =

2.36 mg/l

M. L. Bjen

1,800,000 gals. / day ≠ 495,000 gals. / 6.6 hrs.

273,250 gals. / 495,000 gals. = 55%

RECEIVED
JUL 5 1994
Hamilton County Department
of Environmental Services

VOLATILE ORGANIC COMPOUND EMISSION TEST REPORT

OF THE

MARATHON OIL COMPANY

LEBANON, OHIO TRANSPORT LOADING TERMINAL

ON THE

JOHN ZINK CARBON VAPOR RECOVERY UNIT

ON

JUNE 8, 1994

REPORTED BY: JOHN F. JORDAN SERVICE CO., INC.
2820 S. ENGLISH STATION ROAD
LOUISVILLE, KENTUCKY 40299

TEST PERSONNEL: GLEN TOLOCZKO
KENNY CAMPBELL

APPROVAL:
DAVE GIBSON
DIVISION MANAGER
TECHNICAL SERVICE GROUP

In reference to the **Marathon Oil Company** Air Emission Source Test conducted at the **Lebanon, OH** Transport Loading Facility on **June 8, 1994** and described in the following report;

I certify under penalty of law that the information provided in this document is true, accurate and complete. I am aware that there are significant civil and criminal penalties, including fines or imprisonment or both, for submitting false, inaccurate or incomplete information.

by: _____

GLEN D. TOLOCZKO
TECHNICAL SERVICES
John Jordan Service Co. Inc.

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APPENDIX B..... Instrument and calibration information

APPENDIX C..... Computer printout, VOC analyzer strip charts

EXECUTIVE SUMMARY

The Marathon Oil Company terminal in Lebanon, Ohio is a bulk transport loading facility for Gasoline and Fuel Oil products.

The products are bottom loaded into transport tankers and the displaced hydrocarbon vapors are balanced to a JOHN ZINK CARBON ADSORPTION/ABSORPTION VAPOR RECOVERY UNIT (VRU).

This facility was source tested for air emissions on June 8, 1994. The purpose of this test was to confirm proper operation of the VRU and verify compliance with applicable VOC (Volatile Organic Compound) air emission requirements.

The Gasoline Terminal Air Emission Source Test was conducted in accordance with procedures established, and the test methods referenced, in the Code Of Federal Regulations; CFR 40, Part 60, Subpart XX. Specific procedures used include:

EPA Test Method	Measurement
Method 2A	Exhaust Vapor Volume
Method 25B	Inlet and Outlet VOC Concentrations
Method 21	Potential Leak Sources
40 CFR 60 Subsection 60.503 (d)	Transport Loading Maximum Backpressure

The results of this air emission test demonstrate that this source is in compliance with all applicable Federal and Local requirements. A summary of the data is presented below.

Test Parameter	Measured Value	Required Value
VOC Emissions	2.36 mg/liter	35 mg/liter

TERMINAL OPERATION AND DESCRIPTION

Light petroleum products are bottom loaded at four loading racks at the Marathon Oil Company, Lebanon, Ohio terminal.

All four bays are equipped to load Regular Unleaded, Premium Unleaded and Blend grade Unleaded. All bays also have various grades of Fuel Oil and Ethanol available for loading.

Each rack is equipped with vapor recovery hoses positioned at the transport loading positions for hook up to the Vapor Control System. The vapor hoses and associated piping transports the vapors to the VRU. The system also employs a pressure relief valve and an underground knockout tank upstream from the VRU.

A general overview of the loading rack layout is shown in Figure 1.

The test began at 7:06 am and ran for 6 hours and 35 minutes. 273,250 gallons of accountable gasoline were loaded during the test and 361,950 gallons were loaded overall. Maximum backpressure exerted at the loading rack was 8.5" H_2O.

JOHN ZINK VAPOR RECOVERY UNIT

The Marathon Oil Company terminal is equipped with a John Zink Adsorption/ Absorption Gasoline Vapor Recovery Unit. Hydrocarbon vapors enter the John Zink VRU into one of two Carbon Adsorbers. The hydrocarbon-air mixture flows up through the adsorber where the bulk of the hydrocarbons are adsorbed. The air continues through the Carbon Adsorber and is vented to the atmosphere. The saturated carbon is then desorbed by employing vacuum regeneration at 27.5" Hg Vacuum, while the second Carbon Adsorber is receiving the hydrocarbon-air mixture generated in transport loading activity. The purpose of regeneration is to restore the carbon to a level where it will effectively adsorb hydrocarbons again. The two carbon adsorbers alternate between adsorption and regeneration at 15 minute intervals.

When a Carbon Adsorber is in the regeneration mode, a liquid ring vacuum pump pulls the hydrocarbon from the carbon. The rich hydrocarbon vapors from the Carbon Adsorber are mixed with the vacuum pump seal fluid and are discharged to an Absorber/Separator.

The liquid hydrocarbons are condensed and separated from the seal fluid in the separator compartment and are discharged back to a holding tank. Any remaining hydrocarbons pass up through the packed Absorber tower and are contacted by a fresh stream of gasoline which absorbs most of the remaining hydrocarbons. The small amount of hydrocarbon that is left then leaves the top of the absorber and is directed back to the Carbon Adsorber where the whole process is repeated.

The John Zink Unit is illustrated schematically in Figure 2.

MEASUREMENT AND DATA ANALYSIS

The non dispersive infrared analyzer, turbine flow meter, exhaust vapor thermistor and exhaust pressure transducer are connected to the VRU exhaust stack in order to acquire their respective data. A quad check valve assembly is employed to provide for proper VRU regeneration air flow and allow one turbine flow meter to satisfy both carbon vessel measurement requirements.

The barometric pressure transducer and ambient thermistor are located in close proximity to the VRU to acquire ambient atmospheric conditions for use in subsequent standardization equations. A test schematic depicting general test equipment configuration is included as Figure 3.

Each transducer data channel is properly scaled and connected to the computer input board. Using an operations code program each input channel is read 10 times in a 5 second interval and mass, flow, concentration, temperature and pressure values are averaged and stored in an array on hard disk for subsequent use.

After sixty 5 second intervals (5 minutes) the hard disk array is polled and average values are determined for concentration, pressure and temperature. These values along with the flow for the 5 minute period are used to compute the mass emitted for that 5 minute period. These averaged and summed values are then printed out as the 5 minute interval data and are again stored on hard disk until the six hour test period is completed.

Upon completion of the test the 5 minute interval data is polled to determine test averages for inlet and outlet HC concentration, pressure and temperature data for all test intervals during which VRU exhaust flow was greater than zero and volume and milligram emission data is summed for all 5 minute periods to arrive at a final test period total.

This data acquisition methodology essentially represents a series of very short (5 sec) intervals during which VRU operation is measured, averaged and standardized. This effectively removes all judgemental decisions from data reduction processes and provides a technically unbiased analysis of VRU operation.

Additionally, pretest and post test vapor analyzer calibrations are conducted, along with an hourly analyzer calibration drift check verification. Following the conclusion of the six hour test the loading rack volumes are calculated and final mass emission values are determined.

Copies of the transport loading rack sheets, hydrocarbon analyzer strip charts and computer print outs are attached as Appendices to this report.

TEST EQUIPMENT

Test Trailer No. 1

Quantity	Item
2	Thermistor Temperature Probes
1	IBM PC Compatible Computer with 16 Channel, 12 Bit A/D Input Card
1	Gastech Model #1214 Combustible Gas Indicator
1	Setra Model #264 Variable Differential Pressure Transducer
1	Setraceram Model #304 Digital Barometer
1	American Meter Co. 8" Turbine Flow Meter
1	Yokogawa HR 2400 Ten Channel Strip Chart Recorder
1	Kent Model #P100M Dual Channel Recorder
2	Horiba PIR-2000 NonDispersive InfraRed Gas Analyzer
1	Horiba VIA-500 NonDispersive InfraRed Gas Analyzer

All equipment specifications are shown in Appendix B along with available calibration and accuracy information.

EXAMPLE CALCULATIONS

A. TERMINOLOGY:

T_a = Ambient Temperature (^{o} Celsius).
P_b = Barometric Pressure (mm Hg).
L_t = Total volume of liquid dispensed from all controlled racks during the test period (Liters).
V_e = Volume of air-hydrocarbon mixture exhausted from the processing unit (Cubic meters).
V_{es} = Normalized volume of air-hydrocarbon mixture exhausted (Cubic meters at 20° Celsius, 760 mm Hg).
C_e = Volume fraction of hydrocarbons in exhausted mixture (Vol% as C_3H_8/100, corrected for methane content, if required).
T_e = Temperature at process unit exhaust (^{o} Celsius).
P_e = Pressure at processing unit exhaust (mm Hg. absolute).
M_e = Mass of VOC emitted (mg).
$(M/L)_e$ = Mass of hydrocarbons exhausted from the processing unit per volume of liquid loaded (mg/liter).
$(M/T)_e$ = Mass of hydrocarbons exhausted from the processing unit per unit time (lb/hour).

CONSTANTS:

0.3858 = (273.2^o C + 20° C)/(760 mm Hg) Normalization Factor
1.83×10^6 mg/M^3 = Standard Density of C_3H_8.
454,000 = Conversion Factor mg/lb.
3.785 = Conversion Factor liter/gal.
264.2 = Conversion Factor gal/meter^3.

B. CALCULATE THE FOLLOWING RESULTS FOR EACH PERIOD OF THE VAPOR CONTROL SYSTEM OPERATION:

(1.) Volume of air-hydrocarbon mixture exhausted from the vapor control system:

$$V_e = (V_{ef} - V_{ei}) \quad (\text{Meters}^3)$$

(where subscript $_f$ refers to final and subscript $_i$ refers to initial)

V_e = Totalized volume from flow rate and time records.

(2.) Normalized volume of exhausted mixture:

$$V_{es} = \frac{(0.3858^o \text{ Kelvin/mm Hg}) \times V_e \times P_e}{(T_e + 273.2)} \quad (\text{Meters}^3)$$

(3.) Mass of hydrocarbons exhausted from the vapor control system:

$$M_e = \frac{(1.83 \times 10^6 \text{ mg } C_3H_8)}{\text{Meter}^3} \times V_{es} \times C_e \quad (\text{mg.})$$

(equation B)

C. CALCULATE THE AVERAGE MASS OF HYDROCARBONS EMITTED PER VOLUME OF GASOLINE LOADED:

$$(M/L)_e = M_e/L_t \text{ (mg/liter)}$$

D. CALCULATE THE AVERAGE MASS OF HYDROCARBONS EMITTED PER UNIT TIME:

$$(M/T)_e = (M/L)_e \times \frac{1 \text{ lb}}{454{,}000 \text{ mg}} \times \frac{3.785 \text{ liter}}{1 \text{ gal}} \times \frac{\text{Acct Gal}}{\text{Test Time}} \text{ (lb/hr)}$$

E. CALCULATION FOR EFFICIENCY (IF USED):

Unit efficiency = [1-(outlet mg/inlet mg)] X 100%

Where inlet milligrams is derived using inlet concentration and volume of liquid loaded onto transports, assuming a vapor growth ratio of 1:1 and no gross leaks.

F. EXAMPLE ME CALCULATION FOR A FIVE MINUTE INTERVAL

This is an example calculation only, and not an interval from this test. This is intended to clarify the computer method for arriving at the VOC mass emitted data for each test interval.

Barometric Pressure (Baro-P) = 768.4 mm HG
Exhaust Pressure (Exhaust-P)= 1.0 mm HG
Ambient Temperature (Ambient-T) = 16.8^{o} Celcius
Exhaust Temperature (Exhaust-T) = 18.3^{o} Celcius
Inlet Hydrocarbon Concentration (HCin) = 34 %
Outlet Hydrocarbon Concentration (HCout) = 0.55%
Volume Emitted (VE) = 42.9 m^3
Volume Emitted Standardized (VES) = 43.6 m^3
Milligrams Emitted (ME) = 436931.5

Please Note: All data fields are rounded to two places following the decimal point for display purposes only.

1.) Therefore, for this calculation:

	0.545	lowest possible value before rounding for display
HCout =>	**0.55%**	**value displayed (after rounding)**
	0.555	highest possible value before rounding for display
	43.55	lowest possible value before rounding for display
VES =>	**43.6**	**value displayed (after rounding)**
	43.65	highest possible value before rounding for display

2.) Using the above values in the previous equation B we have:

$(1.83 \times 10^6) \times (0.00545) \times (43.55)$ = 434,345.9 mg.
436,931.5 mg.
$(1.83 \times 10^6) \times (0.0055) \times (43.6)$ = 438,834.0 mg.
$(1.83 \times 10^6) \times (0.00555) \times (43.65)$ = 443,330.0 mg.

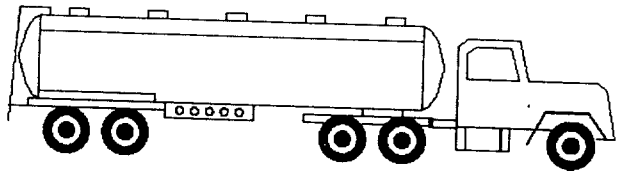
NOTE: The value for ME printed by the computer for this interval is **436,931.5.** While this is not the result produced from entering the printed values for HCout and VES into equation B, it is the result produced by the calculation carried out on the stored computer data, prior to rounding for display.

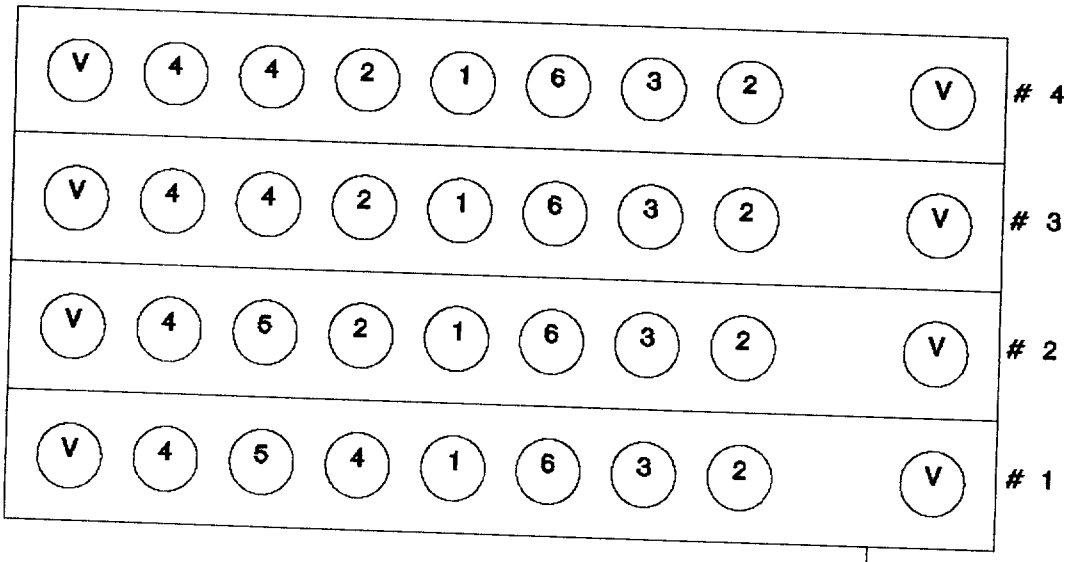
DATA SUMMARY

TERMINAL DESCRIPTION	Marathon Oil Co. Lebanon, Ohio
VAPOR CONTROL UNIT TYPE	John Zink VRU
TEST DATE	06-8-94
TEST PERIOD	07:06-13:41
AVERAGE OUTLET CONCENTRATION (Propane)	0.14 % by Vol
AVERAGE INLET CONCENTRATION (Propane)	24.5 % by Vol
AVERAGE AMBIENT TEMPERATURE	56° F
TOTAL PETROLEUM LOADED	361,950 gallons
ACCOUNTABLE PETROLEUM LOADED	273,250 gallons
AVERAGE HYDROCARBON EMISSIONS (Calculated with Total Loaded Product)	1.78 mg/liter 0.81 lb/hr
AVERAGE HYDROCARBON EMISSIONS (Calculated with Accountable Product Loaded)	2.36 mg/liter 0.81 lb/hr
NUMBER OF TRUCKS LOADED	44
NUMBER OF LEAKING TRUCKS	0
VOLUME OF LEAKING TRUCKS	0 gallons
MAXIMUM PRESSURE AT TRUCK VAPOR HOSE	8.5" H_2O
STRIP CHART SPEED	150 mm/hour
UNIT EFFICIENCY (calc. using accountable gallons)	99.5 %

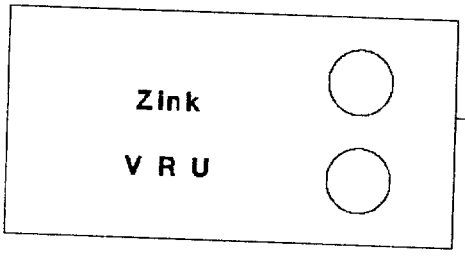
MARATHON OIL COMPANY
Lebanon, Ohio

Figure 1





LEGEND
1 Regular U/L - 87 Oct
2 Blend grade U/L - 84 Oct
3 Premium U/L - 92 Oct
4 Low Sulfur No. 2 Fuel Oil
5 Low Sulfur No. 1 Fuel Oil
6 Ethanol
V Vapor Recovery



Under ground

Note: Not Drawn to Scale

General Overview Only

Figure 2

Activated Carbon Vapor Recovery Unit Schematic

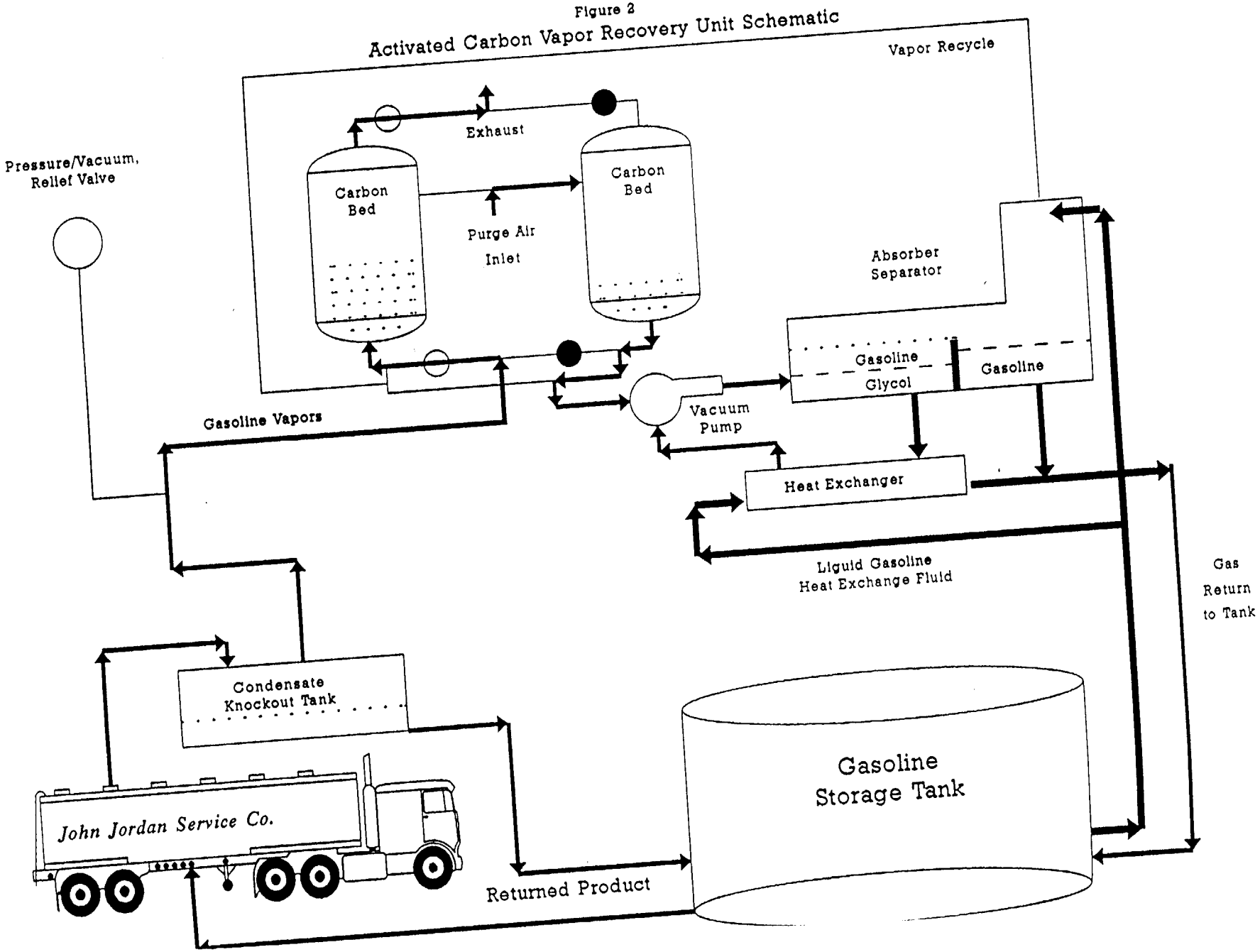
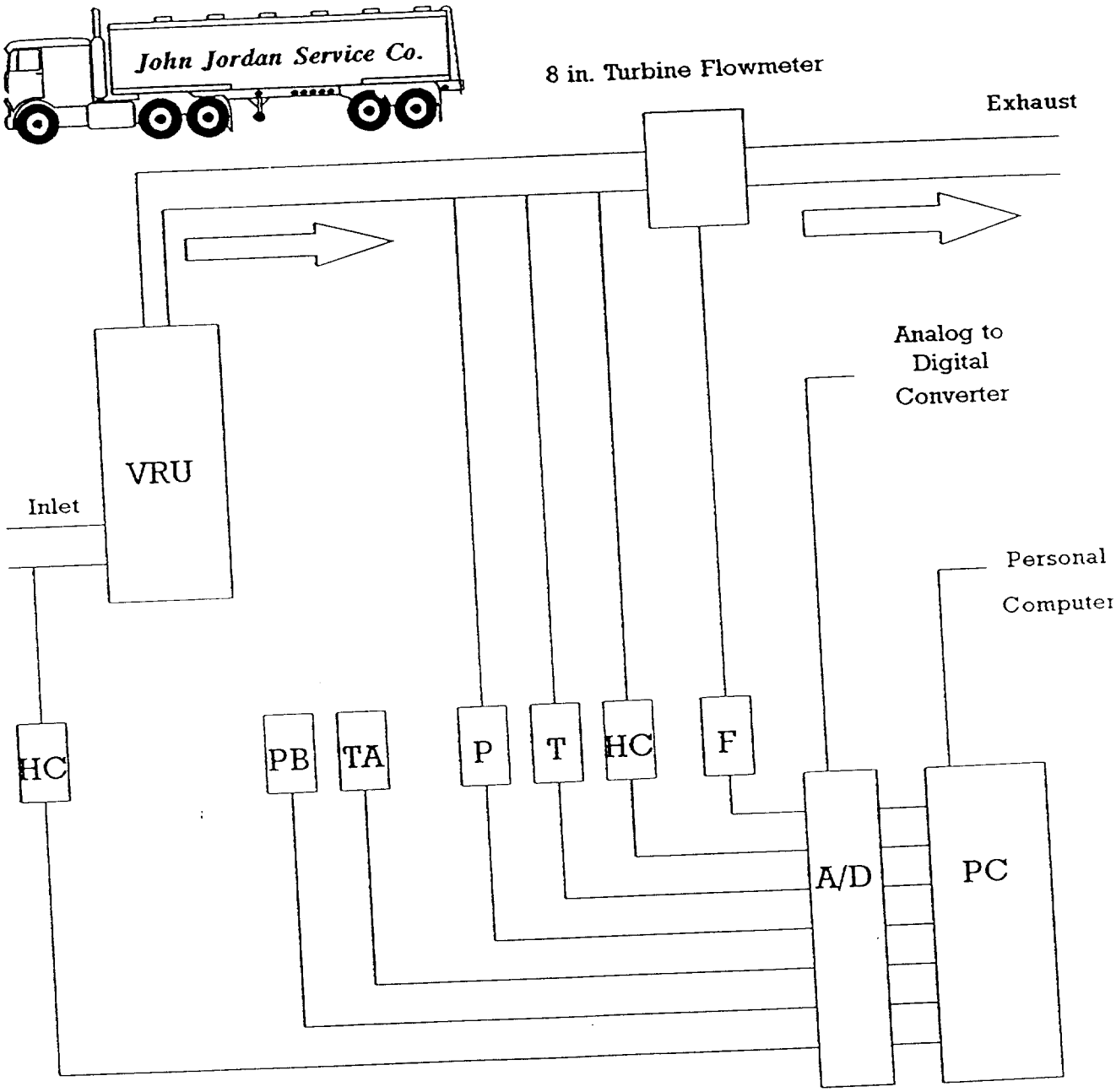


Figure 3
Vapor Recovery Unit Test Schematic

Test Equipment Diagram
Note: Not to Scale



F --- Exhaust Flow

HC --- Hydrocarbon Concentration

P --- Pressure

T --- Temperature

PB --- Barometric Pressure

TA --- Ambient Temperature

APPENDIX A

:06 AM

Denise

1.

TERMINAL LOCATION: Marathon - Lebanon DATE: 6-8-94

SEQ. NO. 1 TANKER NAME: Silver Oil Co LOAD START TIME: 7:13
BAY NO. 2 TRAILER NO. 200 OH T959HH LOAD STOP TIME: 7:20

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
5"wc 2150	GAS	GAS	OK	2150	~~0~~

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 2 TANKER NAME: Swifty Oil LOAD START TIME: 7:13
BAY NO. 3 TRAILER NO. 122 Ind 10254 LOAD STOP TIME: 7:24

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
8.5" 8900	GAS	GAS	OK	8900	~~0~~

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 3 TANKER NAME: Duncan Oil Co LOAD START TIME: 7:31
BAY NO. 3 TRAILER NO. OH T165DZ LOAD STOP TIME: 7:50

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
6.6"	D 5000 G 3700	GAS	OK	3700	5000 D

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS. 8700

SEQ. NO. 4 TANKER NAME: Marathon Oil LOAD START TIME: 7:32
BAY NO. 2 TRAILER NO. 6362 In 533854 LOAD STOP TIME: 7:39

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
5.4"	9050 GAS	GAS	OK	9050	~~0~~

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 5 TANKER NAME: Marathon Oil LOAD START TIME: 7:32
BAY NO. 4 TRAILER NO. 30085 500872 LOAD STOP TIME: 7:41

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
5.0"	9150 GAS	GAS	OK	9150	~~0~~

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

Total of load 1	2150	Accountable load 1	2150
Total of load 2	8900	Accountable load 2	8900
Total of load 3	8700	Accountable load 3	3700
Total of load 4	9050	Accountable load 4	9050
Total of load 5	9150	Accountable load 5	9150
Total this page	37,950	Accountable this pg.	32,950

2.

TERMINAL LOCATION: Marathon DATE: 6-8

SEQ. NO. 6 TANKER NAME: Marathon LOAD START TIME: 7:40 am
BAY NO. 2 TRAILER NO. 6361 In 533853 LOAD STOP TIME: 7:55

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
4½"	GAS	GAS	OK	9050	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 7 TANKER NAME: Emery Trans LOAD START TIME: 7:56
BAY NO. 4 TRAILER NO. 212 OH T26EGU. LOAD STOP TIME: 8:06

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
✓	GAS	Diesel	OK	8500	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 8 TANKER NAME: IDEALEASE Oil LOAD START TIME: 8:00
BAY NO. 3 TRAILER NO. 7285 OH T87HD LOAD STOP TIME: 8:10

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
✓	GAS	GAS	OK	8500	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 9 TANKER NAME: BEDDY Oil LOAD START TIME: 7:56
BAY NO. 2 TRAILER NO. 3 OH T888EJ LOAD STOP TIME: 8:09

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
✓	GAS	GAS	OK	8600	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 10 TANKER NAME: HARTLEY Oil LOAD START TIME: 8:11
BAY NO. 1 TRAILER NO. T640DD LOAD STOP TIME: 8:18

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
3.5	Diesel	Diesel	OK	Ø	7500

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

Total of load 1	9050	Accountable load 1	9050
Total of load 2	8500	Accountable load 2	8500
Total of load 3	8500	Accountable load 3	8500
Total of load 4	8600	Accountable load 4	8600
Total of load 5	7500 D	Accountable load 5	Ø
Total this page	42150	Accountable this pg.	34650

TERMINAL LOCATION: Marathon Oil DATE: 6-8-94

SEQ. NO. 11 TANKER NAME: J. HEYOB LOAD START TIME: 8:11
BAY NO. 4 TRAILER NO. 2 OH. T976DN LOAD STOP TIME: 8:20

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Diesel	Diesel	OK	Ø	7300

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 12 TANKER NAME: OWENSVILLE SHD LOAD START TIME: 8:12
BAY NO. 2 TRAILER NO. 214 OH T283HD LOAD STOP TIME: 8:18

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
GAS	GAS	OK	8500	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 13 TANKER NAME: Marathon LOAD START TIME: 8:15
BAY NO. 3 TRAILER NO. 6370 In 533851 LOAD STOP TIME: 8:25

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
8" Diesel	Diesel	✓	Ø	7900

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 14 TANKER NAME: Marathon Oil LOAD START TIME: 8:26
BAY NO. 4 TRAILER NO. 3008[illegible] In 50088[illegible] LOAD STOP TIME: 8:35

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
4.0 GAS	GAS	OK	9150	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 15 TANKER NAME: VULCAN LOAD START TIME: /
BAY NO. 3 TRAILER NO. 64 OH T262DA LOAD STOP TIME: /

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Diesel	Diesel	X	Ø	7500

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

Total of load 1	7300	Accountable load 1	Ø
Total of load 2	8500	Accountable load 2	8500
Total of load 3	7900	Accountable load 3	Ø
Total of load 4	9150	Accountable load 4	9150
Total of load 5	7500	Accountable load 5	Ø
Total this page	40,350	Accountable this pg.	17,650

4.

TERMINAL LOCATION: Marathon oil DATE: 6-8-94

SEQ. NO. 16 TANKER NAME: STEPHENSON OIL LOAD START TIME: 8:35
BAY NO. 1 TRAILER NO. T226JZ LOAD STOP TIME: 8:53

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
4"	GAS	GAS	OK	8000	Ø

MAXIMUM BACK PRESSURE 5.0 TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 17 TANKER NAME: MARATHON OIL LOAD START TIME: 8:37
BAY NO. 2 TRAILER NO. 6368 LOAD STOP TIME: 8:50

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
4.5"	GAS	GAS	OK	9150	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 18 TANKER NAME: PREMIER LOAD START TIME: 8:55
BAY NO. 2 TRAILER NO. 7137 T124GB LOAD STOP TIME:

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
3.5	Diesel	Diesel	X	Ø	7000

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 19 TANKER NAME: M Wright Petroleum LOAD START TIME: 9:35
BAY NO. 1 TRAILER NO. LOAD STOP TIME: 9:46

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
5.0	Diesel	Diesel	X	Ø	5000

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 20 TANKER NAME: Silver Oil Co LOAD START TIME: 9:35
BAY NO. 2 TRAILER NO. 200 LOAD STOP TIME:

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
3.5"	Gas	Gas	OK	7700	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

Total of load 1	8000 ✓	Accountable load 1	8000 ✓
Total of load 2	9150 ✓	Accountable load 2	9150 ✓
Total of load 3	7000 D	Accountable load 3	Ø
Total of load 4	5000 D	Accountable load 4	Ø
Total of load 5	7700 ✓	Accountable load 5	7700 ✓
Total this page	36,850	Accountable this pg.	24,850

5.0

TERMINAL LOCATION: MARATHON OIL DATE: 6-8-94

SEQ. NO. 21 TANKER NAME: Marathon oil LOAD START TIME: 9:46
BAY NO. 3 TRAILER NO. 6362 LOAD STOP TIME: 10:00

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
GAS	GAS	OK	9050	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 22 TANKER NAME: Marathon oil LOAD START TIME: 9:48
BAY NO. 4 TRAILER NO. 30085 LOAD STOP TIME: 10:00

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Gas	Gas	ok	9150	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 23 TANKER NAME: EMERY LOAD START TIME:
BAY NO. 3 TRAILER NO. 212 LOAD STOP TIME:

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Gas	Gas	OK	8500	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 24 TANKER NAME: Hartley Oil Co. LOAD START TIME: 10:41 am
BAY NO. 4 TRAILER NO. T642DD LOAD STOP TIME: 10:55 am

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Gas Diesel	Diesel	ok	5000	2500

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 25 TANKER NAME: Marathon LOAD START TIME: 10:58am
BAY NO. 4 TRAILER NO. 6361 LOAD STOP TIME:

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
GAS	GAS	ok	9050	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

Total of load 1	9050	Accountable load 1	9050
Total of load 2	9150	Accountable load 2	9150
Total of load 3	8500	Accountable load 3	8500
Total of load 4	7500	Accountable load 4	5000
Total of load 5	9050	Accountable load 5	9050
Total this page	43,250	Accountable this pg.	46,750

200,550 150,850

(6)

TERMINAL LOCATION: MARATHON - LEBANON, OH DATE: 6-8-94

SEQ. NO. 26 TANKER NAME: Lykins Oil Co. LOAD START TIME: 11:12 am
BAY NO. 2 TRAILER NO. 7284 LOAD STOP TIME:

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Diesel	Gas	N/A	Ø	7000

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 27 TANKER NAME: Vulcan Oil Co. LOAD START TIME: 11:19 am
BAY NO. 4 TRAILER NO. 64 LOAD STOP TIME:

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Diesel	Diesel	N/A	Ø	7500

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 28 TANKER NAME: MARATHON LOAD START TIME: 11:19
BAY NO. 3 TRAILER NO. 6370 OH 533851 LOAD STOP TIME: 11:35

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Gas	Gas	n/o	9000	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 29 TANKER NAME: Swift LOAD START TIME: 11:26
BAY NO. 1 TRAILER NO. 122 In 10254 LOAD STOP TIME: 11:42

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Gas	Gas	no	8900	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 30 TANKER NAME: Marathon LOAD START TIME: 11:35
BAY NO. 4 TRAILER NO. 6368 LOAD STOP TIME:

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Gas	Gas	no	9150	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

Total of load 1	7000	Accountable load 1	Ø
Total of load 2	7500	Accountable load 2	Ø
Total of load 3	9000	Accountable load 3	9000
Total of load 4	8900	Accountable load 4	8900
Total of load 5	9150	Accountable load 5	9150
Total this page	41,550	Accountable this pg.	27,050

242,100 177 900

TERMINAL LOCATION: MARATHON DATE: 6-8-94

SEQ. NO. 31 TANKER NAME: Marathon LOAD START TIME: 1135
BAY NO. 2 TRAILER NO. 30084 LOAD STOP TIME: 1141

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Gas	Gas	OK	9150	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 32 TANKER NAME: marathon LOAD START TIME: 1149
BAY NO. 2 TRAILER NO. 6362 LOAD STOP TIME: 1158

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Gas	Gas	OK	9050	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 33 TANKER NAME: Premier LOAD START TIME: 12:19
BAY NO. 3 TRAILER NO. T472DB LOAD STOP TIME: 12:31

	PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
5."	Gas	Gas	OK	8000	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 34 TANKER NAME: Rankin Oil LOAD START TIME: 12:03
BAY NO. 4 TRAILER NO. 821A T866CR LOAD STOP TIME: 12:20

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Diesel	Diesel	X	Ø	7500

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 35 TANKER NAME: MARATHON LOAD START TIME: 12:19
BAY NO. 2 TRAILER NO. 30085 LOAD STOP TIME: 12:25

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
GAS	GAS	X	9150	Ø

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

Total of load 1	9150	Accountable load 1	9150
Total of load 2	9050	Accountable load 2	9050
Total of load 3	7500 D	Accountable load 3	Ø
Total of load 4	8000	Accountable load 4	8000
Total of load 5	9150	Accountable load 5	9150
Total this page	43,850	Accountable this pg.	35,350

Sub-Total: 285,950 Sub Tot: 213,250

8.

TERMINAL LOCATION: MARATHON DATE: 6-8-94

SEQ. NO. 36 TANKER NAME: HARTLEY LOAD START TIME: 12:36
BAY NO. 4 TRAILER NO. LOAD STOP TIME:

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Diesel	Gas Diesel	NA	0	7500

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 37 TANKER NAME: BEODDY OIL LOAD START TIME: 1235
BAY NO. 2 TRAILER NO. 3 T888EJ LOAD STOP TIME: 12:56

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Gas	Gas	OK	8600	0

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 38 TANKER NAME: NEW PARIS OIL LOAD START TIME: 12:52
BAY NO. 1 TRAILER NO. 42 LOAD STOP TIME: 1:01 PM

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Gas	Gas	OK	8400	0

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 39 TANKER NAME: WRIGHT LOAD START TIME: 12:50
BAY NO. 3 TRAILER NO. T-829EE LOAD STOP TIME: 1:04 PM

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Gas	Gas	OK	8600	0

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 40 TANKER NAME: Marathon oil LOAD START TIME: 1:08
BAY NO. 2 TRAILER NO. 30084 LOAD STOP TIME:

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Gas	Gas		9150	0

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

Total of load 1	7500 D	Accountable load 1	0
Total of load 2	8600	Accountable load 2	8600
Total of load 3	8400	Accountable load 3	8400
Total of load 4	8600	Accountable load 4	8600
Total of load 5	9150	Accountable load 5	9150
Total this page	43250	Accountable this pg.	34,750

TERMINAL LOCATION: MARATHON DATE: 6-8-94

SEQ. NO. 41 TANKER NAME: VOGEL OIL LOAD START TIME: 1:09 pm
BAY NO. 3 TRAILER NO. LOAD STOP TIME: 1:20

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Diesel	Diesel	+	0	7500

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 42 TANKER NAME: Stephenson Oil LOAD START TIME: 1:28
BAY NO. 2 TRAILER NO. T226JZ LOAD STOP TIME: :

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Gas	Gas	OK	8500	

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 43 TANKER NAME: Silver Oil LOAD START TIME: 1:28
BAY NO. 3 TRAILER NO. #200 LOAD STOP TIME: :

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
Gas	Gas	OK	7100	

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. 44 TANKER NAME: Marathon Oil LOAD START TIME: 1:37 pm
BAY NO. 4 TRAILER NO. 6361 LOAD STOP TIME:

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.
GAS	GAS	OK	9050	

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

SEQ. NO. TANKER NAME: LOAD START TIME:
BAY NO. TRAILER NO. LOAD STOP TIME:

PRODUCT	PREV. PROD.	LEAK	ACCOUNTABLE GALLONS	NON-ACCOUNTABLE GALS.

MAXIMUM BACK PRESSURE TOTAL GALS. ACCOUNTABLE TOTAL LOAD GALS.

Total of load 1	7500	Accountable load 1	~~0~~
Total of load 2	8500	Accountable load 2	8500
Total of load 3	7100	Accountable load 3	7100
Total of load 4	9050	Accountable load 4	9050
Total of load 5		Accountable load 5	
Total this page	32,750	Accountable this pg.	25,250

361,950 273,250

APPENDIX B

CYLINDER NUMBER: FF-16799

COMPONENT	REQUESTED	ACTUAL
PROPANE	2.50%	2.502%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-36265

COMPONENT	REQUESTED	ACTUAL
PROPANE	2.50%	2.499%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-33663

COMPONENT	REQUESTED	ACTUAL
PROPANE	2.50%	2.501%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-16886

COMPONENT	REQUESTED	ACTUAL
PROPANE	2.50%	2.505%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-14130

COMPONENT	REQUESTED	ACTUAL
PROPANE	2.50%	2.498%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-041952

COMPONENT	REQUESTED	ACTUAL
PROPANE	1.00%	0.997%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-12880

COMPONENT	REQUESTED	ACTUAL
PROPANE	1.35%	1.351%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-27095

COMPONENT	REQUESTED	ACTUAL
PROPANE	1.35%	1.350%
NITROGEN	BALANCE	BALANCE

Matheson Gas Products
World Leader in Specialty Gases & Equipment

October 9, 1991

John Jordan Service Co.
2820 S. English Station Rd.
P. O. Box 99535
Louisville KY 40299

Reference P.O.# J-1508

Gentlemen:

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

CYLINDER NUMBER: FF-22002

COMPONENT	REQUESTED	ACTUAL
PROPANE	9.00%	8.994%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-60393

COMPONENT	REQUESTED	ACTUAL
PROPANE	4.50%	4.501%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-11779

COMPONENT	REQUESTED	ACTUAL
PROPANE	26.00%	26.016%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-33222

COMPONENT	REQUESTED	ACTUAL
PROPANE	17.00%	17.045%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-12966

COMPONENT	REQUESTED	ACTUAL
PROPANE	17.00%	16.992%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-11722

COMPONENT	REQUESTED	ACTUAL
PROPANE	9.00%	8.993%
NITROGEN	BALANCE	BALANCE

1650 Enterprise Parkway
P.O. Box 358
Twinsburg, Ohio 44087
Phone: (216) 425-4406

Matheson Gas Products
World Leader in Specialty Gases & Equipment

January 15, 1991

John Jordan Service Co.
2820 S. English Station Rd.
P. O. Box 99535
Louisville, Kentucky 40299

Reference P.O.# J1190

Gentlemen:

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

CYLINDER NUMBER: FF-12815

COMPONENT	REQUESTED	ACTUAL
PROPANE	80.00%	79.964%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-14073

COMPONENT	REQUESTED	ACTUAL
PROPANE	40.00%	39.973%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-11051

COMPONENT	REQUESTED	ACTUAL
PROPANE	9.00%	9.000%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-2962

COMPONENT	REQUESTED	ACTUAL
PROPANE	9.00%	8.999%
NITROGEN	BALANCE	BALANCE

Sincerely yours,
MATHESON GAS PRODUCTS, INC.

Wray LaFond
Branch Manager

WL/bc

1650 Enterprise Parkway
P.O. Box 358
Twinsburg, Ohio 44087
Phone: (216) 425-4406

CYLINDER NUMBER: FF-22507

COMPONENT	REQUESTED	ACTUAL
PROPANE	45.00%	45.001%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-26331

COMPONENT	REQUESTED	ACTUAL
PROPANE	45.00%	44.985%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-30304

COMPONENT	REQUESTED	ACTUAL
PROPANE	26.00%	26.004%
NITROGEN	BALANCE	BALANCE

Sincerely yours,
MATHESON GAS PRODUCTS, INC.

Wray LaFond
Branch Manager

WL/bc

Air Products

INDUSTRIAL GAS DIVISION

Air Products and Chemicals, Inc.
Specialty Gas Department
12722 South Wentworth Avenue
Chicago, IL 60628
(312) 785-3000

ANALYTICAL REPORT

SAMPLE OF: Propane in Nitrogen

DATE: 12-28-93

PAGE: 1 of 1

SHIPPER NO.:

CUSTOMER ORDER NO.:

SAMPLE DATE: 12-28-93

REQUESTED BY:

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

ANALYTICAL METHOD		ANALYST
Electrolytic Cell (O_2 Trace)		
Infrared Horiba		
Ion Mobility for N_2 in Ar		
Dew Point		
Hydrogen Flame Analyzer (THC)		
Wet Analysis		
Flame Photometer		

ANALYTICAL METHOD		ANALYST
Gas Chromatography		
Infrared Spectroscopy		
C.G. Flame Ionization Unit		
Chemiluminescence		
Paramagnetic		
Gravimetric	X	RVD

ANALYSIS

LAB NO.	CYL. NO.	COMPONENT REQUESTED	CONCENTRATION REQUESTED	ANALYTICAL RESULT	UNIT OF MEASURE
3 -16124	BQG 985	Propane	50	50.10 N.T	Molar %
361-16124	BQH 597	Propane	50	50.13	Molar %

Bal Propane
49.9%

CERTIFICATION

This analysis has been performed utilizing the analytical method(s) stated and is correct to within the analytical accuracies of this (these) method

C: Cylinder
File

Matheson Gas Products
World Leader in Specialty Gases & Equipment

March 18, 1992

John Jordan Service Co.
2820 S. English Station Rd.
P. O. Box 99535
Louisville, Kentucky 40299

Reference P.O.# 146

Gentlemen:

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

CYLINDER NUMBER: FF-36469

COMPONENT	REQUESTED	ACTUAL
PROPANE	26.00%	25.994%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-1562

COMPONENT	REQUESTED	ACTUAL
PROPANE	17.00%	17.000%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-27752

COMPONENT	REQUESTED	ACTUAL
PROPANE	80.00%	79.994%
NITROGEN	BALANCE	BALANCE

CYLINDER NUMBER: FF-1401

COMPONENT	REQUESTED	ACTUAL
OXYGEN	7.00%	7.44%
NITROGEN	BALANCE	BALANCE

1650 Enterprise Parkway
P.O. Box 358
Twinsburg, Ohio 44087
Phone: (216) 425-4406
Toll Free: (800) 426-9427

PRN

SETRA SYSTEMS
PRESSURE TRANSDUCER CALIBRATION CERTIFICATE

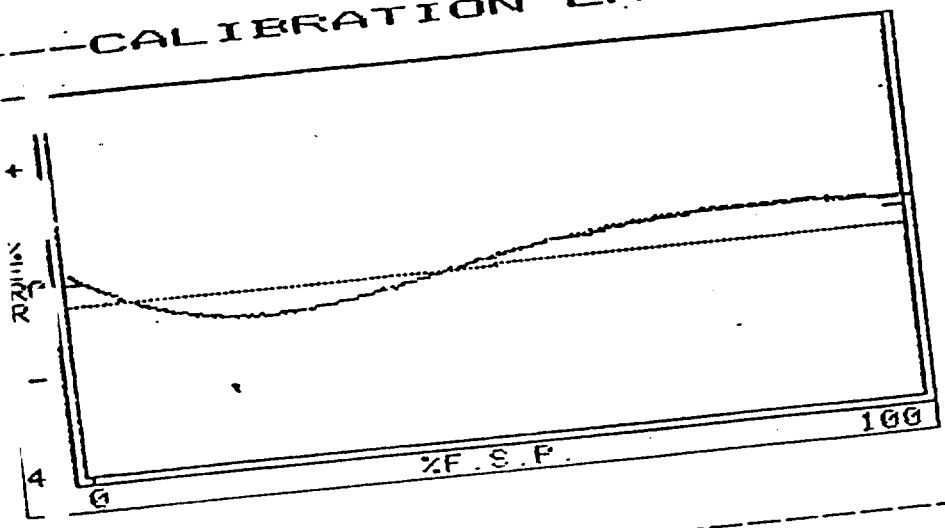
S/N 211710

DATE 6-6-89

MODEL: 264
RANGE: 0-25 IN-WC
OUT: .025 TO 5.025 VDC
EXCIT: 24 VDC

T. ORD.: STOCK-211710
TECHNICIAN: LM
STANDARD: 239.SPD10
PART NO.: 264100.27

CALIBRATION ERROR CURVE



CALCULATIONS

APPLIED PRESSURE	TRANSDUCER OUTPUT	PERCENT ERROR
0000.009 IN-W	+00.0384VDC	+00.637% FS
+0002.558 IN-W	+00.5015VDC	-00.309% FS
+0005.045 IN-W	+00.9829VDC	-00.637% FS
0007.560 IN-W	+01.4903VDC	-00.559% FS
0010.000 IN-W	+01.9921VDC	-00.293% FS
+0012.546 IN-W	+02.5193VDC	+00.056% FS
0015.084 IN-W	+03.0428VDC	+00.364% FS
0017.508 IN-W	+03.5379VDC	+00.562% FS
+0020.046 IN-W	+04.0499VDC	+00.637% FS
+0022.570 IN-W	+04.5538VDC	+00.610% FS
+0025.042 IN-W	+05.0452VDC	+00.539% FS

NOTE THAT PERCENTAGE ERROR CALCULATIONS ARE RELATIVE TO THE BEST STRAIGHT LINE, AS DEFINED BY ISA STANDARD #S-37.1.

ZERO ERROR: +00.232% FS
SPAN ERROR: +00.002% FS
HYSTERESIS: -00.003% FS

SETRA SYSTEMS CALIBRATION DATA IS TRACEABLE TO THE N.B.S.

EXTRAPOLATED ENDPOINTS: 0 IN-WC +00.0366VDC
25 IN-WC +05.0367VDC

OPTIONS: NONE

- HAGOG PARK, ACTON, MA, 01720, U.S.A.******
ED# 5/06/89

TABLE I

ANALOG OUTPUT VOLTAGES FOR VARIOUS PRESSURE RANGES, MODEL 361. (Revised June 29, 1982)

ESSURE	PRESSURE RANGE AND DIGITAL DISPLAY	ANALOG OUTPUT* RELATIVE TO OUTPUT RETURN	NOMINAL ANALOG OUTPUT** RELATIVE TO ANALOG GROUND
	All Ranges	0 to 5.000V (±5 mV)	
solute	800 to 1100 mBar	0 to 2.400V (±3 mV)	6.40 to 8.80 V
	11 to 16 psia	0 to 2.909V (±3 mV)	6.40 to 9.31 V
arometric	600 to 825 mmHg	0 to 2.400V (±3 mV)	6.40 to 8.80 V
	22 to 32 in. Hg (4 digits only)	0 to 2.909V (±3 mV)	6.40 to 9.31 V

Calibrated into 50Kohm load; operable into loads of 5000 ohms or greater.

** The 6.40 V may vary ± several millivolts from unit to unit.

NOTE: Analog output voltages typically are measured between the Analog Output (Contact 35) and the Analog Return (Contact 37) on the edge connector.

The Analog Return is 6.4 VDC above the Analog Ground (Contact 32).

FOR BAROMETRIC PRESSURE UNITS: The Analog Output (Contact 35) with respect to Analog Ground (Contact 32) projects linearly to zero VDC at true absolute zero pressure. Analog output may be measured with respect to Analog Return or Analog Ground, but not both simultaneously.

SERIES 300 DIGITAL PRESSURE MEASUREMENT SYSTEM

CALIBRATION CERTIFICATE

PRESSURE RANGE: 800 to 1100 mbar

SETRA JOB NO.: 307238R

PURCHASED BY: JOHN DORAN SERVICE CO.

PURCHASE ORDER NO.:

LINE VOLTAGE: 117 VAC 60 HZ

DATE OF INSPECTION: 12-14-87

MANOMETER MODEL NO.: 361

TRANSDUCER MODEL NO.:

READOUT MODEL NO.:

INSPECTOR: G. AHERN

OUTPUT @ 70° ±5 F*

Analog Voltage (Volts dc)
Digital Display (mbar)

SERIAL NUMBERS ☑ Manometer ☐ Transducer ☐ Readout	APPLIED PRESSURE 800 mbar	APPLIED PRESSURE 1100 mbar	APPLIED PRESSURE	
138365	+00014	2.4002		
	800.0	1100.0		

NOTES: REPLACED SENSOR WIRE, MINOR RECAL, FINAL Q.C.

THIS CALIBRATION CERTIFIED PER NBS TRACEABLE STANDARDS

*NOTE: Installation or removal of pressure fitting may change zero output slightly. See operating instructions if zero output readjustment wanted.

OPTIONS

☐ Remote Zero ☐ Remote Sensitivity ☐ BCD Output ☐ Remote Cal

☐ Other

setra

Setra Systems, Inc.
45 Nagog Park, Acton, MA 01720 (617)263-1400

Meter Designation

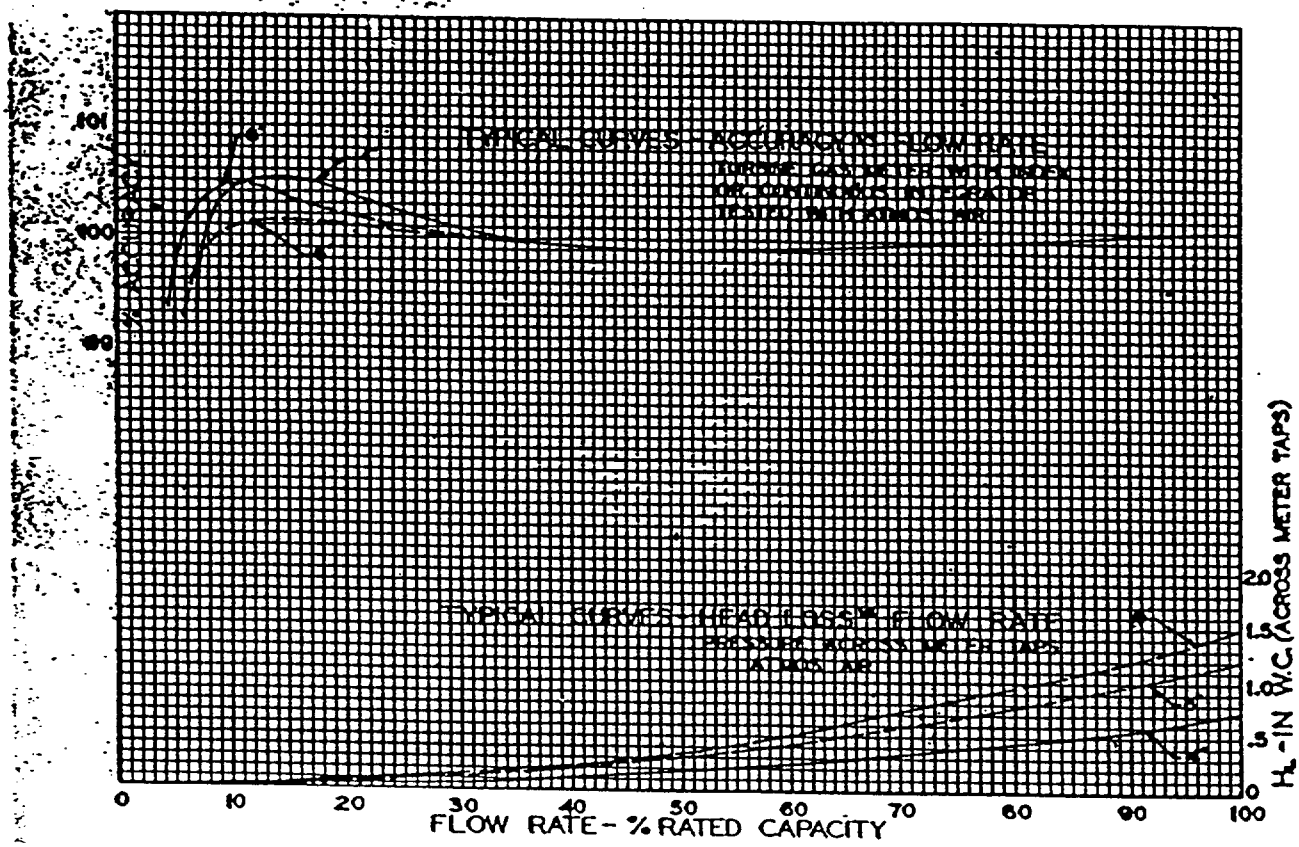
8" GT 175#

SINGER
AMERICAN METER COMPANY

Manufacturer's Number
83-21429

Cartridge Number
M 17201

AMERICAN GAS TURBINE METER



Chg. gears 46/59

FLOW RATE (AIR)	% ACCURACY	DIFFERENTIAL (inches H_2O) Tested on air
38,500	99.8	.30
8,000	100.8	.07
3,000	99.2	.02

Customer: Economy Power

Date tested: 5/4/83

Tested by:

TEST TRAILER #1 FLOW METER CALIBRATION 5-19-93
COMPUTER PRINTOUT

Test was restarted at :12:25:42

7	12:35	765.3	1.1	19.1	21.0	99.9	0.00	40.3	40.4	0
	12:40	765.4	1.1	19.4	21.8	99.9	0.00	39.0	39.1	0
	12:45	765.6	1.1	19.8	22.3	99.9	0.00	40.0	40.0	0
	12:50	765.8	1.1	19.8	22.3	99.9	0.00	39.6	39.6	0

$\bar{x}$ = 39.78 m³/5min

	12:55	766.0	1.3	19.8	22.1	99.9	0.00	44.8	44.9	0
	13:00	766.0	2.5	19.8	22.2	99.9	0.00	73.6	73.8	0
	Time	Baro-P mm Hg	Exhaust-P mm Hg	Ambient-T Deg C	Exhaust-T Deg C	HCin %	HCout %	VE atm^3	VES atm^3	Hc mg
8	13:05	766.1	2.5	20.0	22.4	99.9	0.00	75.0	75.2	0
	13:10	766.3	2.5	20.1	22.6	99.9	0.00	73.4	73.6	0
	13:15	766.4	2.4	20.1	22.5	99.9	0.00	74.5	74.7	0
	13:20	766.5	2.5	20.1	22.4	99.9	0.00	74.3	74.5	0

$\bar{x}$ = 74.50 m³/5min

9	13:30	766.8	5.3	20.3	22.5	99.9	0.00	118.6	119.4	0
	13:35	766.8	5.3	20.4	22.4	99.9	0.00	118.0	118.8	0
	13:40	766.8	5.3	20.4	22.4	99.9	0.00	118.0	118.8	0
	13:45	766.9	5.3	20.2	21.9	99.9	0.00	117.4	118.5	0

$\bar{x}$ = 118.87 m³/5min

	PITOT TUBE FLOW m³/5min	FLOW METER (m³/5min)	Y
30%	39.21	39.8	1.01
60%	74.72	74.5	0.99
90%	118.77	118.87	1.00

5-19-93

:\Sprdsht\L123R23\Method2B.wk1 40 CFR 60 METHOD 2B Trailer 1 60% of max flow

PITOT TUBE VELOCITY AND FLOW RATE CALIBRATION FOR 8" TURBINE

DEFINITIONS:

Ma	=Mol. wt. of Air (lb/lb−mole)
vs	=Duct gas velocity (ft/sec)
Qsd	=Std. dry volumetric duct flow rate (dscf/hr)
Kp	=Pitot tube constant
Cp	=Pitot tube coeffient (dimensionless)
Del p	=Velocity head of stack gas (in H_2O)
Ts	=Absolute avg. stack gas temperature (°R)
Tstd	=Standard temperature (20°C or 68°F)
Ps	=Absolute duct pressure (in Hg.)
Pstd	=Standard pressure (in Hg.)
Pbar	=Barometric pressure (mm Hg.)
A	=Cross sectional area of duct (ft^2)

DATA INPUT: please enter the following data using correct units;

	Del p=	0.145	in. H^2O (from pitot tube)
	Ts =	22.4	°C (from thermister/thermometer)
	Ps =	1.2	in H_2O (from pitot tube)
**********	Ps =	2.2416	mm Hg (calculated)
	Pbar=	766.3	mm Hg (from barometer)
	Dia =	8	in I.D.
**********	A =	0.349065	ft^2 (calculated from above)

CORRECTED DATA/CONSTANTS USED IN FORMULAS:

Tstd =	528	°R
Ts =	532.32	°R
Pstd =	29.92	in. Hg
Pbar =	30.16929	in. Hg
Ps =	30.25754	in. Hg
Ma =	28.9644	lb/lb−mole (from Mark's M.E. Handbook)
Cp =	0.99	Dimensionless
Kp =	85.49	ft[(lb/lb−mole)(in. Hg)]^0.5 / sec[(°R) (in. H^2O)]

CALCULATE: Average duct gas velocity

vs = Kp*Cp*[(Del p)^0.5] * [(Ts/(Ps*Ma))^0.5] Eq. 2.9

vs = 25.11723 (ft/sec) = 1507.034 (ft/min.) = 459.4615 (m/min.)

CALCULATE: Average duct gas volumetric flow rate

Qsd = 3600*vs*A*[(Tstd*Ps)/(Ts*Pstd)] Eq. 2.10

Qsd = 31660.26 (scf/hr)

Qsd = 527.6710 (scf/min) = 14.94364 ($meters^3$/min)
3947.253 (gal/min)
Qsd = 74.71822 ($meter^3$/5 min.)

5-19-93

:\Sprdsht\L123R23\Method2B.wk1 40 CFR 60 METHOD 2B Trailer 1 90% of max flow

PITOT TUBE VELOCITY AND FLOW RATE CALIBRATION FOR 8" TURBINE

)EFINITIONS:

Ma	=Mol. wt. of Air (lb/lb−mole)
vs	=Duct gas velocity (ft/sec)
Qsd	=Std. dry volumetric duct flow rate (dscf/hr)
Kp	=Pitot tube constant
Cp	=Pitot tube coeffient (dimensionless)
Del p	=Velocity head of stack gas (in H_2O)
Ts	=Absolute avg. stack gas temperature (°R)
Tstd	=Standard temperature (20°C or 68°F)
Ps	=Absolute duct pressure (in Hg.)
Pstd	=Standard pressure (in Hg.)
Pbar	=Barometric pressure (mm Hg.)
A	=Cross sectional area of duct (ft^2)

DATA INPUT: please enter the following data using correct units;

	Del p=	0.365	in. H^2O (from pitot tube)
	Ts =	22.6	°C (from thermister/thermometer)
	Ps =	2.8	in H_2O (from pitot tube)
**********	Ps =	5.2304	mm Hg (calculated)
	Pbar=	766.8	mm Hg (from barometer)
	Dia =	8	in I.D.
**********	A =	0.349065	ft^2 (calculated from above)

CORRECTED DATA/CONSTANTS USED IN FORMULAS:

Tstd =	528	°R
Ts =	532.68	°R
Pstd =	29.92	in. Hg
Pbar =	30.18897	in. Hg
Ps =	30.39489	in. Hg
Ma =	28.9644	lb/lb−mole (from Mark's M.E. Handbook)
Cp =	0.99	Dimensionless
Kp =	85.49	ft[(lb/lb−mole)(in. Hg)]^0.5 / sec[(°R) (in. H^2O)]

CALCULATE: Average duct gas velocity

vs = Kp*Cp*[(Del p)^0.5] * [(Ts/(Ps*Ma))^0.5] Eq. 2.9

vs = 39.77384 (ft/sec) = 2386.430 (ft/min.) = 727.5702 (m/min.)

CALCULATE: Average duct gas volumetric flow rate

Qsd = 3600*vs*A*[(Tstd*Ps)/(Ts*Pstd)] Eq. 2.10

Qsd = 50328.46 (scf/hr)

Qsd = 838.8076 (scf/min) = 23.75503 ($meters^3$/min)
6274.717 (gal/min)

Qsd = 118.7751 ($meter^3$/5 min.)

5-19-93

\Sprdsht\L123R23\Method2B.wk1 40 CFR 60 METHOD 2B Trailer 1 30% of max flow

PITOT TUBE VELOCITY AND FLOW RATE CALIBRATION FOR 8" TURBINE

EFINITIONS:

Ma	=Mol. wt. of Air (lb/lb−mole)
vs	=Duct gas velocity (ft/sec)
Qsd	=Std. dry volumetric duct flow rate (dscf/hr)
Kp	=Pitot tube constant
Cp	=Pitot tube coeffient (dimensionless)
Del p	=Velocity head of stack gas (in H_2O)
Ts	=Absolute avg. stack gas temperature (°R)
Tstd	=Standard temperature (20°C or 68°F)
Ps	=Absolute duct pressure (in Hg.)
Pstd	=Standard pressure (in Hg.)
Pbar	=Barometric pressure (mm Hg.)
A	=Cross sectional area of duct (ft^2)

DATA INPUT: please enter the following data using correct units;

	Del p=	0.04	in. H^2O (from pitot tube)
	Ts =	21.9	°C (from thermister/thermometer)
	Ps =	0.34	in H_2O (from pitot tube)
**********	Ps =	0.63512	mm Hg (calculated)
	Pbar=	765.5	mm Hg (from barometer)
	Dia =	8	in I.D.
**********	A =	0.349065	ft^2 (calculated from above)

CORRECTED DATA/CONSTANTS USED IN FORMULAS:

Tstd =	528	°R
Ts =	531.42	°R
Pstd =	29.92	in. Hg
Pbar =	30.13779	in. Hg
Ps =	30.1628	in. Hg
Ma =	28.9644	lb/lb−mole (from Mark's M.E. Handbook)
Cp =	0.99	Dimensionless
Kp =	85.49	ft[(lb/lb−mole)(in. Hg)]^0.5 / sec[(°R) (in. H^2O)]

CALCULATE: Average duct gas velocity

vs = Kp*Cp*[(Del p)^0.5] * [(Ts/(Ps*Ma))^0.5] Eq. 2.9

vs = 13.20174 (ft/sec) = 792.1047 (ft/min.) = 241.4953 (m/min.)

CALCULATE: Average duct gas volumetric flow rate

Qsd = 3600*vs*A*[(Tstd*Ps)/(Ts*Pstd)] Eq. 2.10

Qsd = 16616.78 (scf/hr)

Qsd = 276.9463 (scf/min) = 7.843121 ($meters^3$/min)
2071.702 (gal/min)

Qsd = 39.21560 ($meter^3$/5 min.)

Post test Calibration DATA
Barometer, & exhaust temperature probes.
DATE June 29 1990

Temprobe reference °C (mercury in bulb)	Temp probe test °C	Error
27.9 °C	27.6 °C	1.07%
.3°C	.3°C	0.08

Barometer reference mmHg (mercury barometer)	Barometer test mm Hg	Error
771.5 mm Hg	771.2 mm Hg	.3 mm Hg

AMBIENT-T	EXHAUST-T	BARO-P	EXHAUST-P	HC/IN	HC/OUT	ABSOLUTE-P	VE	VES	ME
27.6	27.6	771.2	.017	26.1	.546	771.2	.0	.0	.0

Supporting computer DATA

	AMBIENT-T	EXHAUST-T	BARO-P	EXHAUST-P	HC/IN	HC/OUT	ABSOLUTE-P	VE	VES	ME
8	27.6	.3	771.2	.017	34.9	.424	771.2	.0	.0	.0

Supporting Computer DATA

HORIBA INSTRUMENTS INC-
LINEARIZER CALIBRATION TABLE

0-100 % C3H8

April 17, 1991

PIR-2000
1 mm

JORDAN SERVICE CO-

SERIAL#607030

INPUT %F.S.	CONCENTRATION	POT #	OUTPUT 0-1 V
0	.003	0	0
8	5.457	1	.0546
16	11.196	2	.112
24	17.263	3	.1726
32	23.702	4	.237
40	30.559	5	.3056
50	39.786	6	.3979
60	49.828	7	.4983
70	60.775	8	.6078
85	79.1	9	.791
100	99.997	10	1

PO # J1311

HORIBA INSTRUMENTS INC.
LINEARIZER CALIBRATION TABLE

Ø – 2Ø% C3H8

April 24, 1991

PIR-2ØØØ
6 M.M.

JOHN F. JO

SERIAL# 902013

INPUT %F.S.	CONCENTRATION	POT #	OUTPUT Ø-1 V
Ø	-.Ø16	Ø	-.ØØØ8
8	1.Ø67	1	.Ø533
16	2.145	2	.1Ø72
24	3.262	3	.1631
32	4.455	4	.2228
4Ø	5.754	5	.2877
5Ø	7.558	6	.3779
6Ø	9.591	7	.4796
7Ø	11.865	8	.5932
85	15.712	9	.7856
1ØØ	2Ø.ØØ1	1Ø	1

ANALYZER CALIBRATION

HORIBA PIR-2000 S/N 905014 RANGES: 0-20%, 0-50% AND 0-100%

RANGE: 0-20%

CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
FF-16677	18.014 %	18 %	0.077777 %
FF-2062	18.01 %	18 %	0.055555 %
FF-20321	9.005 %	9.37 %	-3.89541 %
5-3254	8.995 %	9.36 %	-3.89957 %
FF-38429	4.51 %	4.82 %	-6.43153 %
FF-37654	4.507 %	4.8 %	-6.10416 %
FF-17792	0 %	0 %	0 %

Regression Output:

Constant		0.280058
Std Err of Y Regression Output:		0.186339
R Squared		0.999375
No. of Observations		7
Degrees of Freedom		5
X Coefficient(s)	0.989666	
Std Err of Coef.	0.011061	

RANGE: 0-100%

CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
5-3008	84.921 %	84.9 %	0.024734 %
FF-38259	79.649 %	79.6 %	0.061557 %
5-2486	49.811 %	48.5 %	2.703092 %
RR-33030	44.61 %	44.5 %	0.247191 %
RR-39545	26.036 %	25.7 %	1.307392 %
FF-30304	26.004 %	26.1 %	-0.36781 %
FF-17792	0 %	0 %	0 %

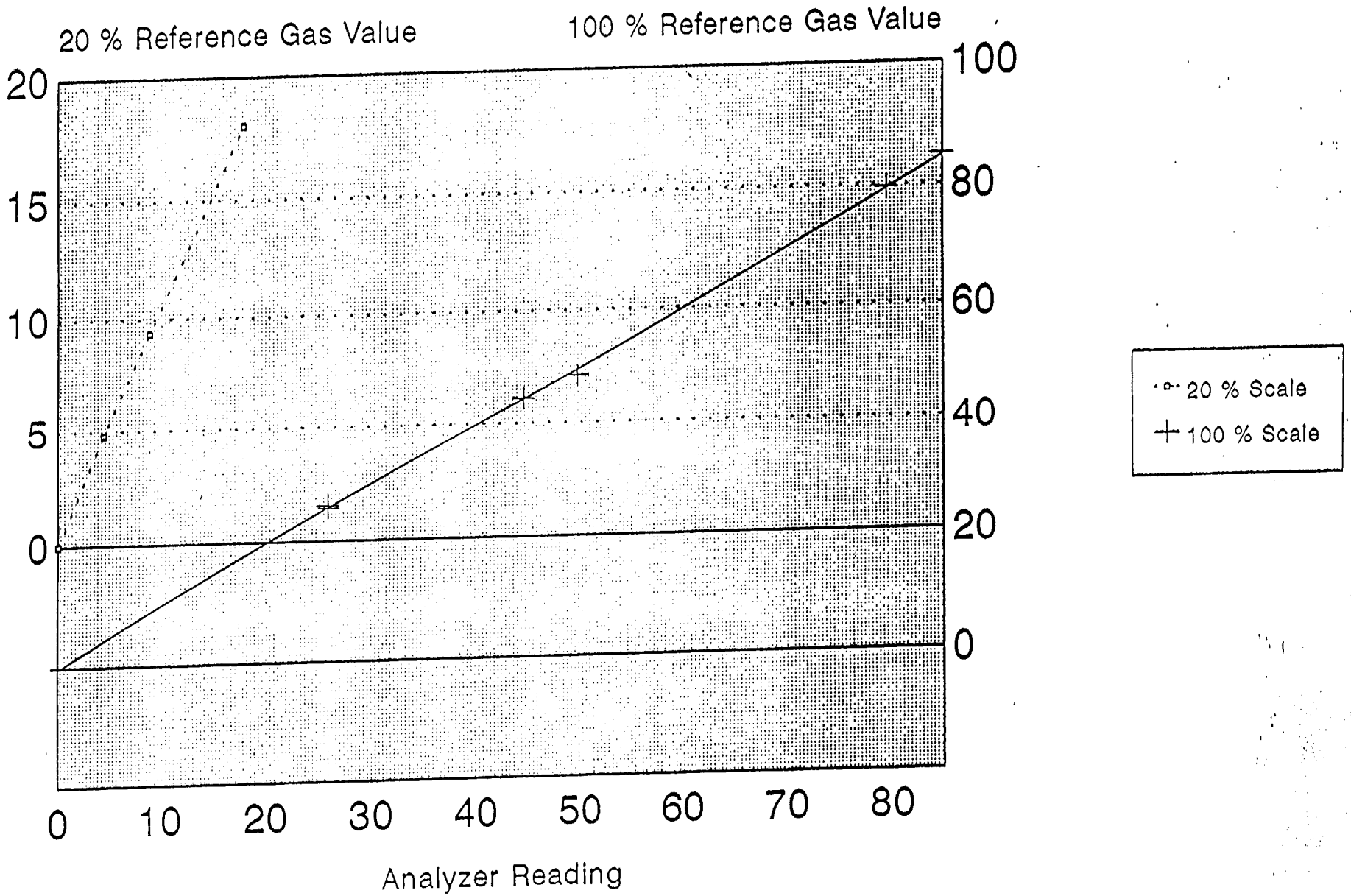
Regression Output:

Constant		-0.20546
Std Err of Y Est		0.533441
R Squared		0.999743
No. of Observations		7
Degrees of Freedom		5
X Coefficient(s)	0.999058	
Std Err of Coef.	0.007153	

VOC Analyzer Calibration

Horiba PIR 2000

Serial No. 905014



INSTRUCTION MANUAL

FOR

HORIBA MODELS VIA-300 & VIA-500 GENERAL PURPOSE INFRARED GAS ANALYZERS

MANUAL NO. 090918A 5/83

HORIBA INSTRUMENTS INCORPORATED

HORIBA INSTRUMENTS INC.
1021 DURYEA AVENUE
IRVINE INDUSTRIAL COMPLEX
IRVINE, CALIFORNIA 92714
TELEPHONE 714/540-7874

SPECIFICATIONS

MODEL.....Horiba Model VIA-300 and VIA-500 General Purpose Infrared Gas Analyzers.

PRINCIPLE OF MEASUREMENT.....Nondispersive Infrared Ray Detection (NDIR)

OBJECT OF MEASUREMENT.....Various sample gases such as stack gas

COMPONENTS TO BE MEASURED.....CO, CO_2, NO, SO_2, n-C_6H_{14}, C_3H_8, CH_4, etc.

MEASURING RANGES.....Two ranges, X2 or X2.5 (standard)

REPEATABILITY.....Within ±1.0% of full scale

SPEED OF RESPONSE.....Selectable by ADD-3 between 0.5 to 15.5 seconds (electronic system)

OUTPUTS.....0-100 mV, 0-1V (unisolated)
0-1V, 0-16 mA or 4-20 mA (isolated)

INDICATION.....Indicator is scaled in 100 equal divisions (Class 1.5) (standard)

AMBIENT TEMPERATURE.....0-40°C

POWER SOURCE.....AC 115V ±10V (50 or 60 Hz)

POWER CONSUMPTION.....Approximately 150VA

EXTERNAL DRAWINGS.....Refer to Figure 4-1 (Ref. Fwg. No. V320241)

WEIGHT.....VIA-300: Approximately 15 kg.
VIA-500: Approximately 20 kg.

10-20-92

ANALYZER CALIBRATION

HORIBA VIA 500F S/N 56030717 RANGES: 0-10%, 0-20%

RANGE: 0-10%

CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
FF-20321	9.005 %	9.01 %	-0.05549 %
5-3254	8.995 %	8.98 %	0.167037 %
FF-38429	4.51 %	4.5 %	0.222222 %
FF-37654	4.507 %	4.5 %	0.155555 %
FF-16799	2.502 %	2.49 %	0.481927 %
FF-34712	3.004 %	3.01 %	-0.19933 %
FF-17792	0 %	0 %	0 %

Regression Output:

Constant		-0.00296
Std Err of Y Regression Output:		0.009098
R Squared		0.999993
No. of Observations		7
Degrees of Freedom		5
X Coefficient(s)	0.999622	
Std Err of Coef.	0.001112	

RANGE: 0-20%

CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
FF-16677	18.014 %	18.01 %	0.022209 %
FF-2062	18.01 %	17.98 %	0.166852 %
FF-20321	9.005 %	8.86 %	1.636568 %
5-3254	8.995 %	8.74 %	2.917620 %
FF-38429	4.51 %	4.5 %	0.222222 %
FF-37654	4.507 %	4.5 %	0.155555 %
FF-17792	0 %	0 %	0 %

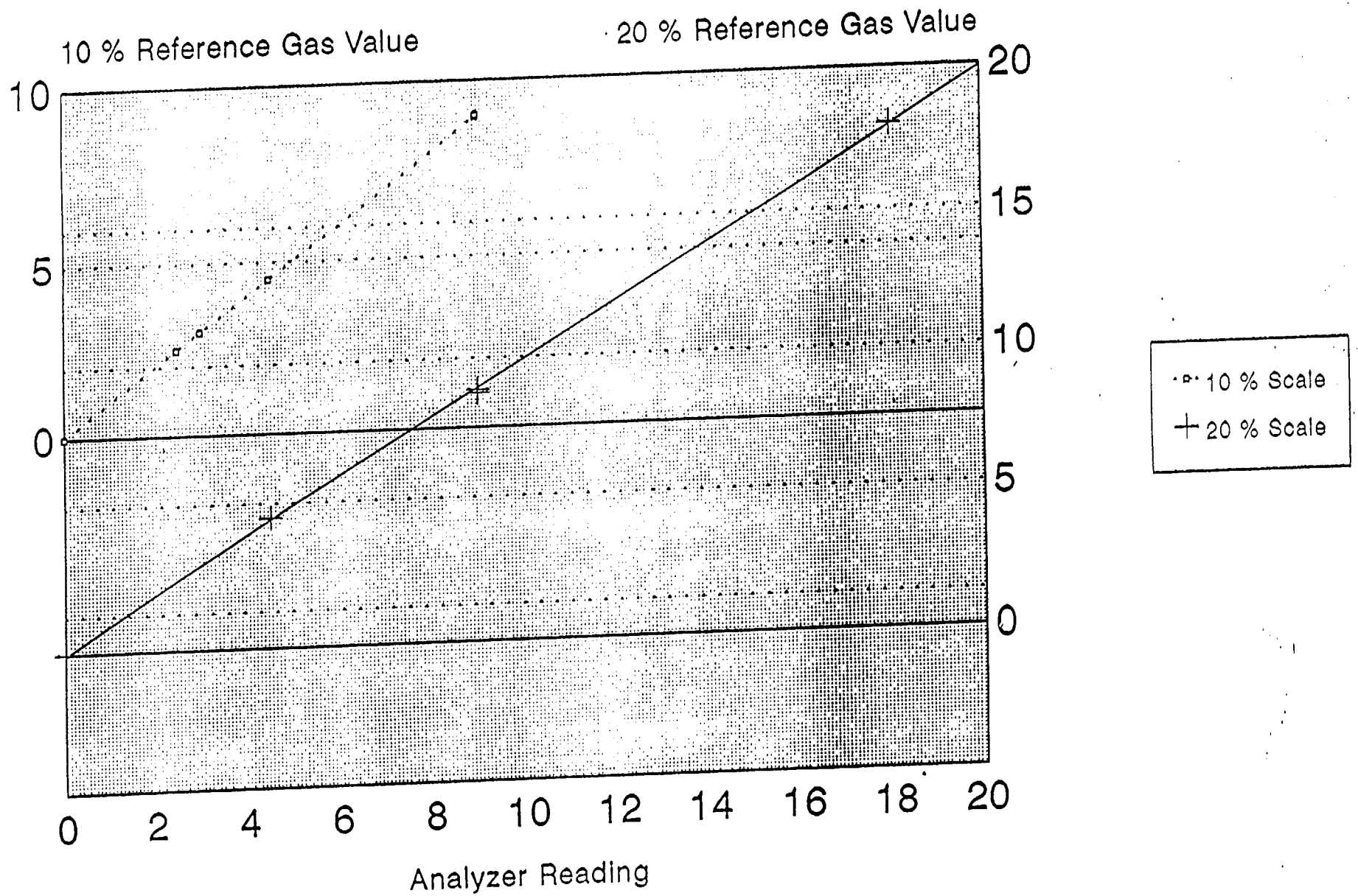
Regression Output:

Constant		0
Std Err of Y Est		0.104496
R Squared		0.999768
No. of Observations		7
Degrees of Freedom		6
X Coefficient(s)	0.994963	
Std Err of Coef.	0.003581	

VOC Analyzer Calibration

Horiba VIA 500

Serial No. 56030717



ANALYZER CALIBRATION

O.F.C. MODEL IR-752 S/N 4301 RANGES: 0-3% AND 0-5%

RANGE: 0-3%

CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
FF-16799	2.502 %	2.5 %	0.08 %
RR-24969	2.506 %	2.52 %	-0.55555 %
RR-32756	1.513 %	1.55 %	-2.38709 %
FF-20969	1.35 %	1.34 %	0.746268 %
RR-4837	1.002 %	1 %	0.2 %
6-1517	1.002 %	1.01 %	-0.79207 %
FF-17792	0 %	0 %	0 %

Regression Output:

Constant		0.001926
Std Err of Y Regression Output:		0.016730
R Squared		0.999706
No. of Observations		7
Degrees of Freedom		5
X Coefficient(s)	1.003191	
Std Err of Coef.	0.007693	

RANGE: 0-5%

CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
FF-37654	4.507 %	4.5 %	0.155555 %
FF-38429	4.51 %	4.5 %	0.222222 %
FF-34712	3.004 %	3.01 %	-0.19933 %
FF-16799	2.502 %	2.42 %	3.388429 %
RR-32756	1.513 %	1.54 %	-1.75324 %
FF-20969	1.35 %	1.33 %	1.503759 %
FF-17792	0 %	0 %	0 %

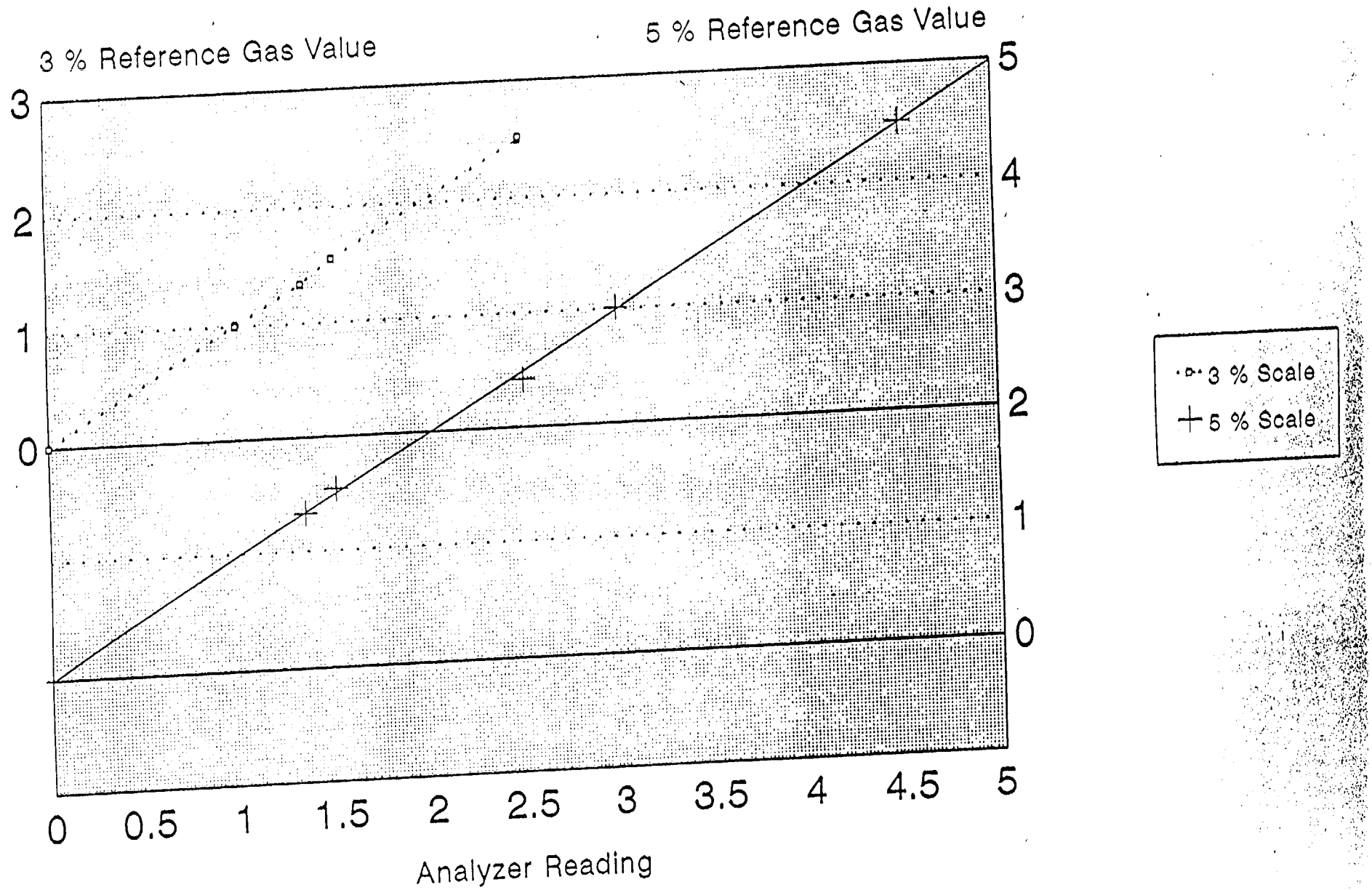
Regression Output:

Constant		-0.00693
Std Err of Y Est		0.037156
R Squared		0.999589
No. of Observations		7
Degrees of Freedom		5
X Coefficient(s)	0.997845	
Std Err of Coef.	0.009047	

VOC Analyzer Calibration

OFC IR-702

Serial No. 4301



ANALYZER CALIBRATION

HORIBA PIR-2000 ppm S/N 810020 RANGES: 0-500 ppm, 0-1000 ppm, and 0-2500 ppm

ANGE: 0-500 ppm

CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
RA-56558	553.1 ppm	553 ppm	0.018083 %
RR-1409	330.8 ppm	321 ppm	3.052959 %
RR-13154	266.3 ppm	272 ppm	-2.09558 %
RR-12043	220.5 ppm	222 ppm	-0.67567 %
RA-56284	200.1 ppm	198 ppm	1.060606 %
RR-19766	166.5 ppm	169 ppm	-1.47928 %
RR-35253	83.4 ppm	87 ppm	-4.13793 %
FF-17792	0 %	0 %	0 %

Regression Output:		
Constant		1.850548
Constant		1.850548
Std Err of Y Regression Output:		4.889754
R Squared		0.999254
No. of Observations		8
Degrees of Freedom		6
X Coefficient(s)	0.992582	
X Coefficient(s)	0.992582	
Std Err of Coef.	0.011066	

RANGE: 0-1000 ppm

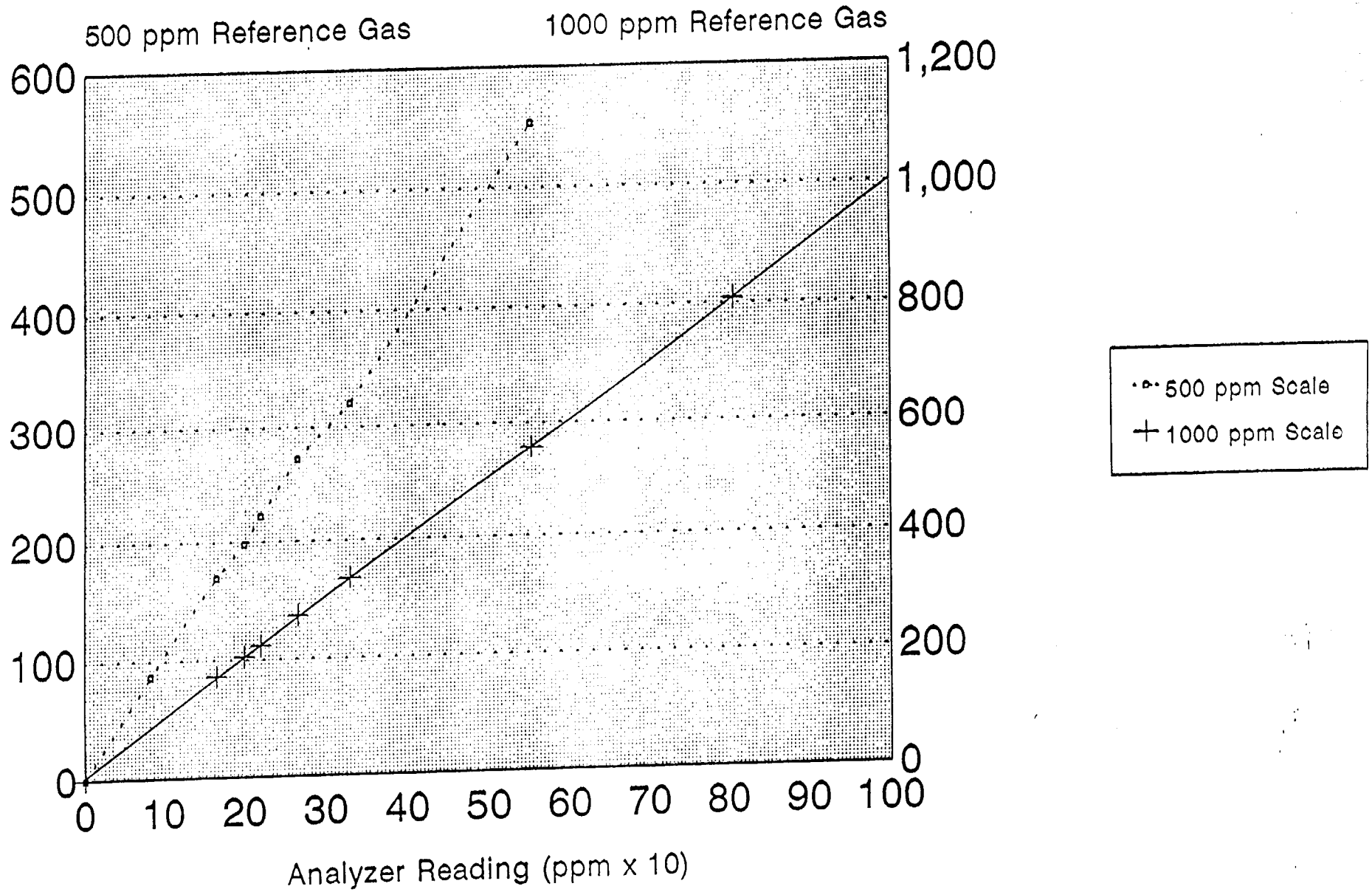
CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
RA-58150	806.5 ppm	807 ppm	-0.06195 %
RR-27273	806.2 ppm	809 ppm	-0.34610 %
RA-56558	553.1 ppm	556 ppm	-0.52158 %
RR-13154	330.8 ppm	335 ppm	-1.25373 %
RR-1409	266.3 ppm	273 ppm	-2.45421 %
RR-12043	220.5 ppm	223 ppm	-1.12107 %
RA-56284	200.1 ppm	205 ppm	-2.39024 %
RR-19766	166.5 ppm	173 ppm	-3.75722 %
FF-17792	0 %	0 %	0 %

Regression Output:		
Constant		4.287900
Std Err of Y Regression Output:		2.431733
R Squared		0.999936
No. of Observations		9
Degrees of Freedom		7
Degrees of Freedom		5
X Coefficient(s)	0.997733	
Std Err of Coef.	0.003002	

VOC Analyzer Calibration

Horiba PIR 2000

Serial No. 810020



OFC Infrared Instruments
Division of Optical Filter Corporation

IR-2200 OXYGEN ANALYZER
OPERATIONS & MAINTENANCE MANUAL

This manual describes the installation, calibration, operation, and routine maintenance of the OFC INFRARED INSTRUMENTS.

Before operating this instrument it is recommended that the user read through this manual to insure efficient operation and accurate results.

OFC INFRARED INSTRUMENTS.

Mailing Adress
P.O. Box 6935, Ventura., California 93003

Shipping Address
4820 McGrath Street., Ventura, California 93003

(805) 650-5005

TEST TRAILER #1 FLOW METER CALIBRATION 5-19-93
COMPUTER PRINTOUT

Test was restarted at :12:25:42

12:35	765.3	1.1	19.1	21.0	99.9	0.00	40.3	40.4	0
12:40	765.4	1.1	19.4	21.8	99.9	0.00	39.0	39.1	0
12:45	765.6	1.1	19.8	22.3	99.9	0.00	40.0	40.0	0
12:50	765.8	1.1	19.8	22.3	99.9	0.00	39.6	39.6	0

$\bar{x}$ = 39.78 m³/5min

Time	Baro-P mm Hg	Exhaust-P mm Hg	Ambient-T Deg C	Exhaust-T Deg C	HCin %	HCout %	VE mtr^3	VES mtr^3	HC mg
12:55	766.0	1.3	19.8	22.1	99.9	0.00	44.8	44.9	0
13:00	766.0	2.5	19.8	22.2	99.9	0.00	73.6	73.8	0
13:05	766.1	2.5	20.0	22.4	99.9	0.00	75.0	75.2	0
13:10	766.3	2.5	20.1	22.6	99.9	0.00	73.4	73.6	0
13:15	766.4	2.4	20.1	22.5	99.9	0.00	74.5	74.7	0
13:20	766.5	2.5	20.1	22.4	99.9	0.00	74.3	74.5	0

$\bar{x}$ = 74.50 m³/5min

13:30	766.8	5.3	20.3	22.5	99.9	0.00	118.6	119.4	0
13:35	766.8	5.3	20.4	22.4	99.9	0.00	118.0	118.8	0
13:40	766.8	5.3	20.4	22.4	99.9	0.00	118.0	118.8	0
13:45	766.9	5.3	20.2	21.9	99.9	0.00	117.4	118.5	0

$\bar{x}$ = 118.87 m³/5min

	PITOT TUBE FLOW m³/5min	FLOW METER (m³/5min)	Y
30%	39.21	39.8	1.01
60%	74.72	74.5	0.99
90%	118.77	118.87	1.00

5-19-93

:\Sprdsht\L123R23\Method2B.wk1 40 CFR 60 METHOD 2B Trailer 1 60% of max flow

PITOT TUBE VELOCITY AND FLOW RATE CALIBRATION FOR 8" TURBINE

DEFINITIONS:

Ma	=Mol. wt. of Air (lb/lb−mole)
vs	=Duct gas velocity (ft/sec)
Qsd	=Std. dry volumetric duct flow rate (dscf/hr)
Kp	=Pitot tube constant
Cp	=Pitot tube coeffient (dimensionless)
Del p	=Velocity head of stack gas (in H_2O)
Ts	=Absolute avg. stack gas temperature (°R)
Tstd	=Standard temperature (20°C or 68°F)
Ps	=Absolute duct pressure (in Hg.)
Pstd	=Standard pressure (in Hg.)
Pbar	=Barometric pressure (mm Hg.)
A	=Cross sectional area of duct (ft^2)

DATA INPUT: please enter the following data using correct units;

	Del p=	0.145 in. H^2O (from pitot tube)
	Ts =	22.4 °C (from thermister/thermometer)
	Ps =	1.2 in H_2O (from pitot tube)
**********	Ps =	2.2416 mm Hg (calculated)
	Pbar=	766.3 mm Hg (from barometer)
	Dia =	8 in I.D.
**********	A =	0.349065 ft^2 (calculated from above)

CORRECTED DATA/CONSTANTS USED IN FORMULAS:

Tstd =	528	°R
Ts =	532.32	°R
Pstd =	29.92	in. Hg
Pbar =	30.16929	in. Hg
Ps =	30.25754	in. Hg
Ma =	28.9644	lb/lb−mole (from Mark's M.E. Handbook)
Cp =	0.99	Dimensionless
Kp =	85.49	ft[(lb/lb−mole)(in. Hg)] ^ 0.5 / sec[(°R) (in. H^20)]

CALCULATE: Average duct gas velocity

vs = Kp*Cp*[(Del p) ^ 0.5] * [(Ts/(Ps*Ma)) ^ 0.5] Eq. 2.9

vs = 25.11723 (ft/sec) = 1507.034 (ft/min.) = 459.4615 (m/min.)

CALCULATE: Average duct gas volumetric flow rate

Qsd = 3600*vs*A*[(Tstd*Ps)/(Ts*Pstd)] Eq. 2.10

Qsd = 31660.26 (scf/hr)

Qsd = 527.6710 (scf/min) = 14.94364 ($meters^3$/min)
3947.253 (gal/min)

Qsd = 74.71822 ($meter^3$/5 min.)

5-19-93

:\Sprdsht\L123R23\Method2B.wk1 40 CFR 60 METHOD 2B Trailer 1 90% of max flow

PITOT TUBE VELOCITY AND FLOW RATE CALIBRATION FOR 8" TURBINE

)EFINITIONS:

Ma	=Mol. wt. of Air (lb/lb−mole)
vs	=Duct gas velocity (ft/sec)
Qsd	=Std. dry volumetric duct flow rate (dscf/hr)
Kp	=Pitot tube constant
Cp	=Pitot tube coeffient (dimensionless)
Del p	=Velocity head of stack gas (in H_2O)
Ts	=Absolute avg. stack gas temperature (°R)
Tstd	=Standard temperature (20°C or 68°F)
Ps	=Absolute duct pressure (in Hg.)
Pstd	=Standard pressure (in Hg.)
Pbar	=Barometric pressure (mm Hg.)
A	=Cross sectional area of duct (ft^2)

DATA INPUT: please enter the following data using correct units;

	Del p=	0.365 in. H^2O (from pitot tube)
	Ts =	22.6 °C (from thermister/thermometer)
	Ps =	2.8 in H_2O (from pitot tube)
**********	Ps =	5.2304 mm Hg (calculated)
	Pbar=	766.8 mm Hg (from barometer)
	Dia =	8 in I.D.
**********	A =	0.349065 ft^2 (calculated from above)

CORRECTED DATA/CONSTANTS USED IN FORMULAS:

Tstd =	528	°R
Ts =	532.68	°R
Pstd =	29.92	in. Hg
Pbar =	30.18897	in. Hg
Ps =	30.39489	in. Hg
Ma =	28.9644	lb/lb−mole (from Mark's M.E. Handbook)
Cp =	0.99	Dimensionless
Kp =	85.49	ft[(lb/lb−mole)(in. Hg)]^0.5 / sec[(°R) (in. H^2O)]

CALCULATE: Average duct gas velocity

vs = Kp*Cp*[(Del p)^0.5] * [(Ts/(Ps*Ma))^0.5] Eq. 2.9

vs = 39.77384 (ft/sec) = 2386.430 (ft/min.) = 727.5702 (m/min.)

CALCULATE: Average duct gas volumetric flow rate

Qsd = 3600*vs*A*[(Tstd*Ps)/(Ts*Pstd)] Eq. 2.10

Qsd = 50328.46 (scf/hr)

Qsd = 838.8076 (scf/min) = 23.75503 ($meters^3$/min)
6274.717 (gal/min)

Qsd = 118.7751 ($meter^3$/5 min.)

5-19-93

\Sprdsht\L123R23\Method2B.wk1 40 CFR 60 METHOD 2B Trailer 1 30% of max flow

PITOT TUBE VELOCITY AND FLOW RATE CALIBRATION FOR 8" TURBINE

EFINITIONS:

Ma	=Mol. wt. of Air (lb/lb−mole)
vs	=Duct gas velocity (ft/sec)
Qsd	=Std. dry volumetric duct flow rate (dscf/hr)
Kp	=Pitot tube constant
Cp	=Pitot tube coeffient (dimensionless)
Del p	=Velocity head of stack gas (in H_2O)
Ts	=Absolute avg. stack gas temperature (°R)
Tstd	=Standard temperature (20°C or 68°F)
Ps	=Absolute duct pressure (in Hg.)
Pstd	=Standard pressure (in Hg.)
Pbar	=Barometric pressure (mm Hg.)
A	=Cross sectional area of duct (ft^2)

DATA INPUT: please enter the following data using correct units;

	Del p=	0.04 in. H^2O (from pitot tube)
	Ts =	21.9 °C (from thermister/thermometer)
	Ps =	0.34 in H_2O (from pitot tube)
**********	Ps =	0.63512 mm Hg (calculated)
	Pbar=	765.5 mm Hg (from barometer)
	Dia =	8 in I.D.
**********	A =	0.349065 ft^2 (calculated from above)

CORRECTED DATA/CONSTANTS USED IN FORMULAS:

Tstd =	528	°R
Ts =	531.42	°R
Pstd =	29.92	in. Hg
Pbar =	30.13779	in. Hg
Ps =	30.1628	in. Hg
Ma =	28.9644	lb/lb−mole (from Mark's M.E. Handbook)
Cp =	0.99	Dimensionless
Kp =	85.49	ft[(lb/lb−mole)(in. Hg)]^0.5 / sec[(°R) (in. H^2O)]

CALCULATE: Average duct gas velocity

vs = Kp*Cp*[(Del p)^0.5] * [(Ts/(Ps*Ma))^0.5] Eq. 2.9

vs = 13.20174 (ft/sec) = 792.1047 (ft/min.) = 241.4953 (m/min.)

CALCULATE: Average duct gas volumetric flow rate

Qsd = 3600*vs*A*[(Tstd*Ps)/(Ts*Pstd)] Eq. 2.10

Qsd = 16616.78 (scf/hr)

Qsd = 276.9463 (scf/min) = 7.843121 ($meters^3$/min)
2071.702 (gal/min)

Qsd = 39.21560 ($meter^3$/5 min.)

Post test calibration DATA
Barometer, & exhaust temperature probes.
DATE June 29 1990

mercury in bulb Temprobe reference °C	Temp probe test °C	Error
27.9 °C	27.6 °C	1.07%
.3°C	.3°C	0.08

mercury barometer Barometer reference mm Hg	Barometer test mm Hg	Error
771.5 mm Hg	771.2 mm Hg	.3 mm Hg

AMBIENT-T	EXHAUST-T	BARO-P	EXHAUST-P	HC/IN	HC/OUT	ABSOLUTE-P	VE	VES	ME
27.6	27.6	771.2	.017	26.1	.546	771.2	.0	.0	.0

Supporting Computer DATA

E	AMBIENT-T	EXHAUST-T	BARO-P	EXHAUST-P	HC/IN	HC/OUT	ABSOLUTE-P	VE	VES	ME
8	27.6	? .3	771.2	.017	34.9	.424	771.2	.0	.0	.0

Supporting Computer DATA

HORIBA INSTRUMENTS INC-
LINEARIZER CALIBRATION TABLE

April 17, 1991

0-100 % C3H8

PIR-2000
1 mm

JORDAN SERVICE CO-
SERIAL#607030

INPUT %F.S.	CONCENTRATION	POT #	OUTPUT 0-1 V
0	.003	0	0
8	5.457	1	.0546
16	11.196	2	.112
24	17.263	3	.1726
32	23.702	4	.237
40	30.559	5	.3056
50	39.786	6	.3979
60	49.828	7	.4983
70	60.775	8	.6078
85	79.1	9	.791
100	99.997	10	1

PO # J1311

HORIBA INSTRUMENTS INC.
LINEARIZER CALIBRATION TABLE

Ø – 2Ø% C3H8

April 24, 1991

PIR-2ØØØ
6 M.M.

JOHN F. JO

SERIAL# 902013

INPUT %F.S.	CONCENTRATION	POT #	OUTPUT Ø-1 V
Ø	-.Ø16	Ø	-.ØØØ8
8	1.Ø67	1	.Ø533
16	2.145	2	.1Ø72
24	3.262	3	.1631
32	4.455	4	.2228
4Ø	5.754	5	.2877
5Ø	7.558	6	.3779
6Ø	9.591	7	.4796
7Ø	11.865	8	.5932
85	15.712	9	.7856
1ØØ	2Ø.ØØ1	1Ø	1

ANALYZER CALIBRATION

HORIBA PIR-2000 S/N 905014 RANGES: 0-20%, 0-50% AND 0-100%

RANGE: 0-20%

CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
FF-16677	18.014 %	18 %	0.077777 %
FF-2062	18.01 %	18 %	0.055555 %
FF-20321	9.005 %	9.37 %	-3.89541 %
5-3254	8.995 %	9.36 %	-3.89957 %
FF-38429	4.51 %	4.82 %	-6.43153 %
FF-37654	4.507 %	4.8 %	-6.10416 %
FF-17792	0 %	0 %	0 %

Regression Output:

Constant		0.280058
Std Err of Y Regression Output:		0.186339
R Squared		0.999375
No. of Observations		7
Degrees of Freedom		5
X Coefficient(s)	0.989666	
Std Err of Coef.	0.011061	

RANGE: 0-100%

CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
5-3008	84.921 %	84.9 %	0.024734 %
FF-38259	79.649 %	79.6 %	0.061557 %
5-2486	49.811 %	48.5 %	2.703092 %
RR-33030	44.61 %	44.5 %	0.247191 %
RR-39545	26.036 %	25.7 %	1.307392 %
FF-30304	26.004 %	26.1 %	-0.36781 %
FF-17792	0 %	0 %	0 %

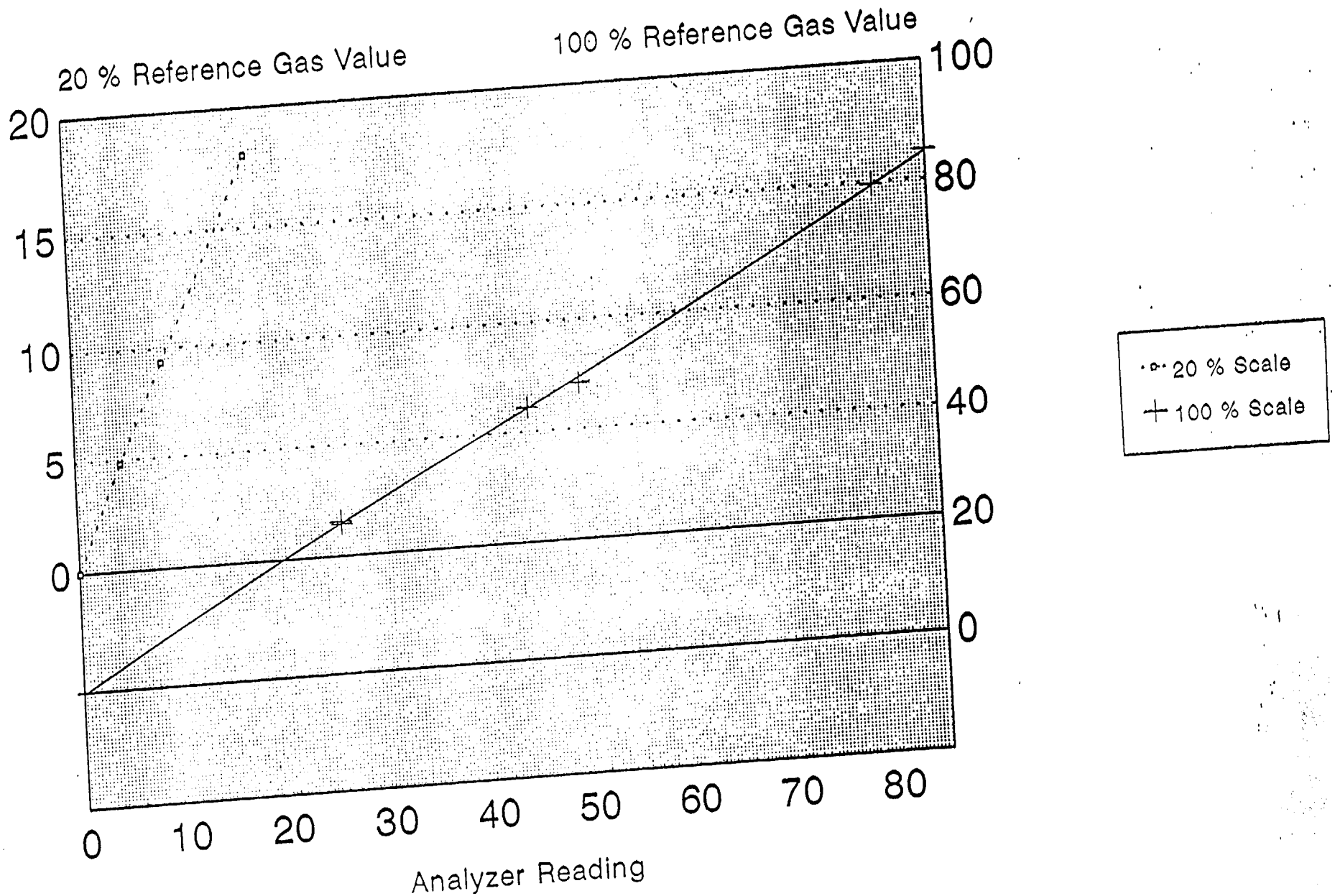
Regression Output:

Constant		-0.20546
Std Err of Y Est		0.533441
R Squared		0.999743
No. of Observations		7
Degrees of Freedom		5
X Coefficient(s)	0.999058	
Std Err of Coef.	0.007153	

VOC Analyzer Calibration

Horiba PIR 2000

Serial No. 905014



10-20-92

ANALYZER CALIBRATION

HORIBA VIA 500F S/N 56030717 RANGES: 0-10%, 0-20%

RANGE: 0-10%

CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
FF-20321	9.005 %	9.01 %	-0.05549 %
5-3254	8.995 %	8.98 %	0.167037 %
FF-38429	4.51 %	4.5 %	0.222222 %
FF-37654	4.507 %	4.5 %	0.155555 %
FF-16799	2.502 %	2.49 %	0.481927 %
FF-34712	3.004 %	3.01 %	-0.19933 %
FF-17792	0 %	0 %	0 %

Regression Output:

Constant		-0.00296
Std Err of Y Regression Output:		0.009098
R Squared		0.999993
No. of Observations		7
Degrees of Freedom		5
X Coefficient(s)	0.999622	
Std Err of Coef.	0.001112	

RANGE: 0-20%

CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
FF-16677	18.014 %	18.01 %	0.022209 %
FF-2062	18.01 %	17.98 %	0.166852 %
FF-20321	9.005 %	8.86 %	1.636568 %
5-3254	8.995 %	8.74 %	2.917620 %
FF-38429	4.51 %	4.5 %	0.222222 %
FF-37654	4.507 %	4.5 %	0.155555 %
FF-17792	0 %	0 %	0 %

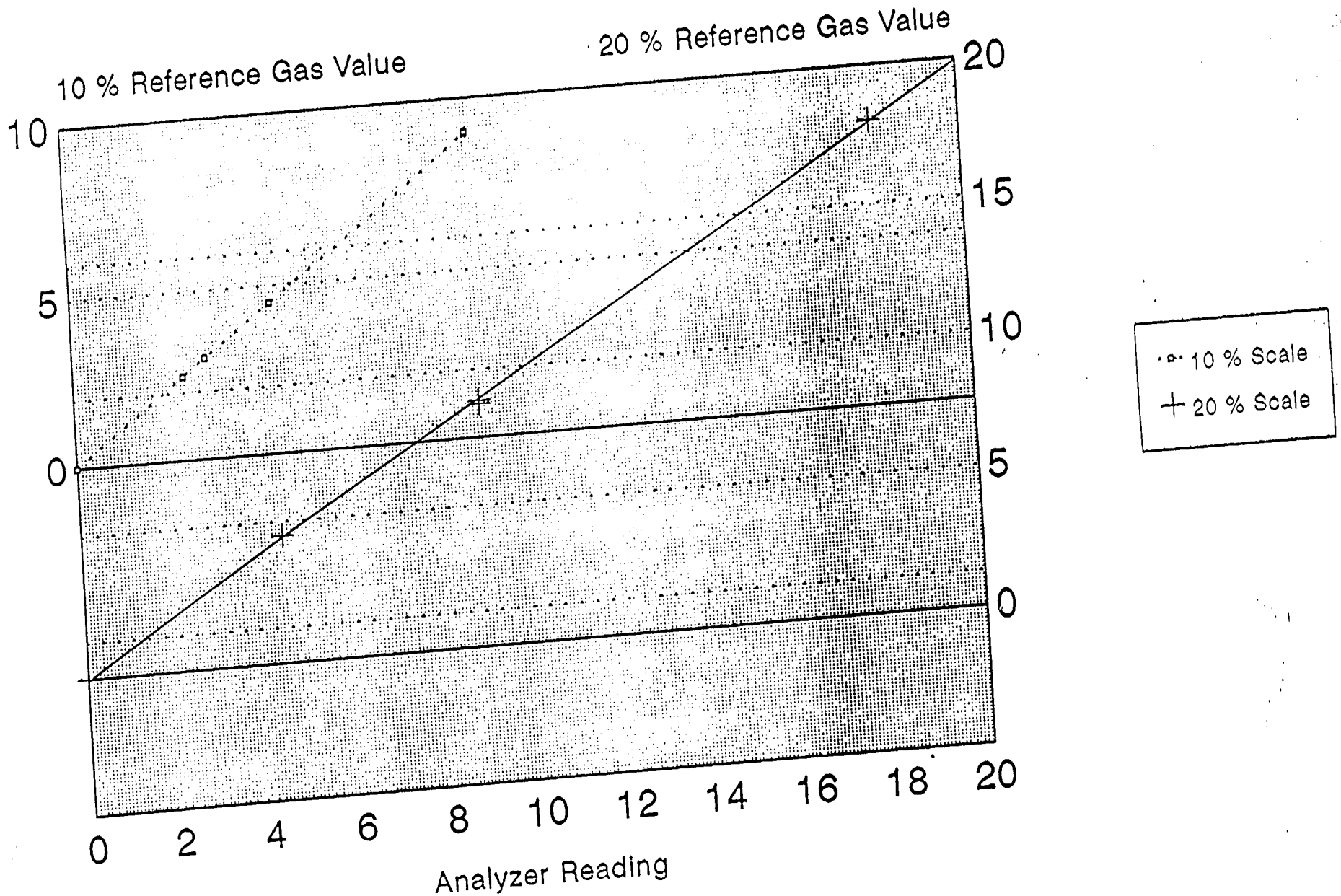
Regression Output:

Constant		0
Std Err of Y Est		0.104496
R Squared		0.999768
No. of Observations		7
Degrees of Freedom		6
X Coefficient(s)	0.994963	
Std Err of Coef.	0.003581	

VOC Analyzer Calibration

Horiba VIA 500

Serial No. 56030717



ANALYZER CALIBRATION

RANGES: 0-3% AND 0-5%

O.F.C. MODEL IR-752 S/N 4301

RANGE: 0-3%

CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
FF-16799	2.502 %	2.5 %	0.08 %
RR-24969	2.506 %	2.52 %	-0.55555 %
RR-32756	1.513 %	1.55 %	-2.38709 %
FF-20969	1.35 %	1.34 %	0.746268 %
RR-4837	1.002 %	1 %	0.2 %
6-1517	1.002 %	1.01 %	-0.79207 %
FF-17792	0 %	0 %	0 %

Regression Output:

Constant		0.001926
Std Err of Y Regression Output:		0.016730
R Squared		0.999706
No. of Observations		7
Degrees of Freedom		5
X Coefficient(s)	1.003191	
Std Err of Coef.	0.007693	

RANGE: 0-5%

CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
FF-37654	4.507 %	4.5 %	0.155555 %
FF-38429	4.51 %	4.5 %	0.222222 %
FF-34712	3.004 %	3.01 %	-0.19933 %
FF-16799	2.502 %	2.42 %	3.388429 %
RR-32756	1.513 %	1.54 %	-1.75324 %
FF-20969	1.35 %	1.33 %	1.503759 %
FF-17792	0 %	0 %	0 %

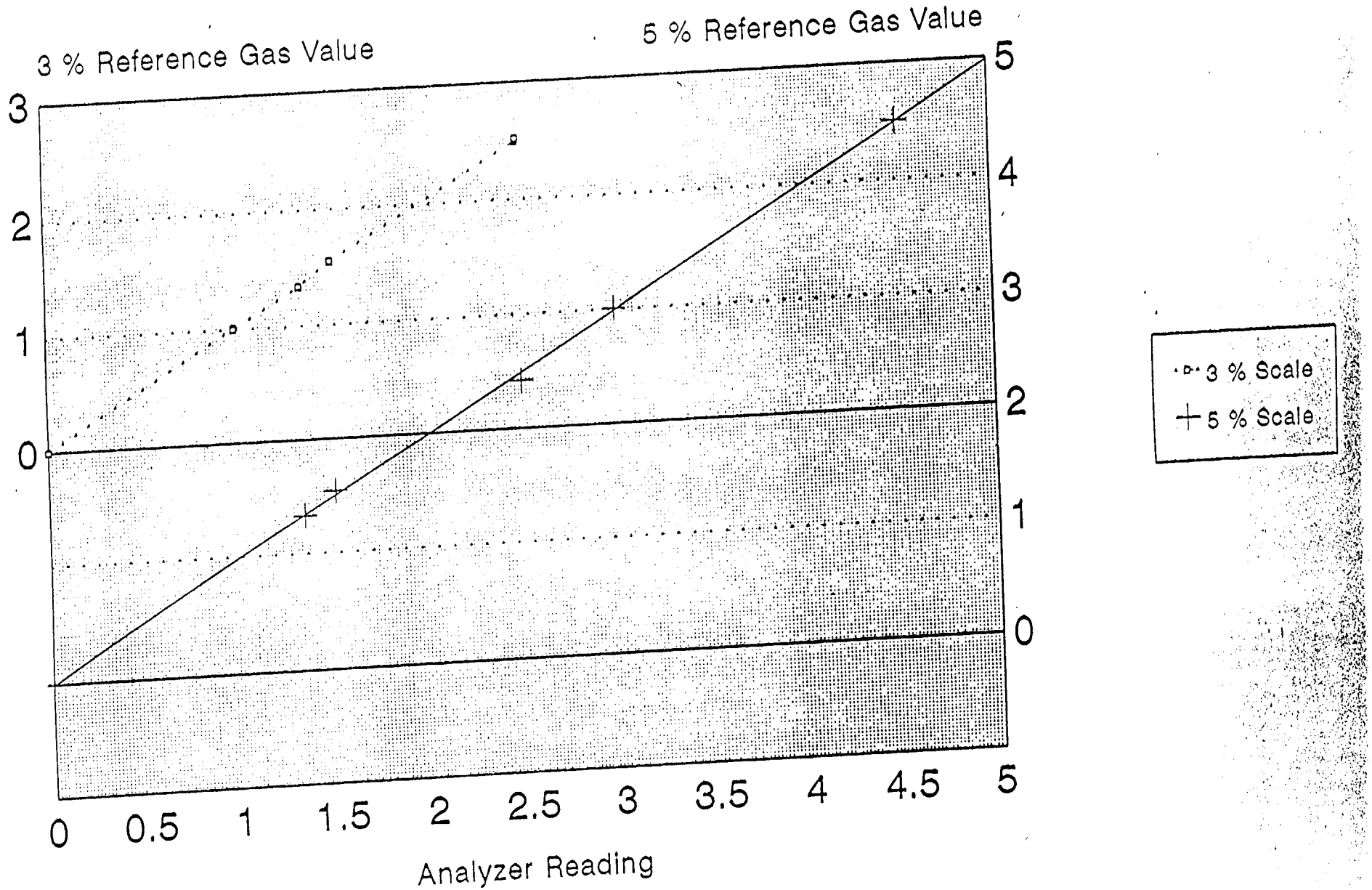
Regression Output:

Constant		-0.00693
Std Err of Y Est		0.037156
R Squared		0.999589
No. of Observations		7
Degrees of Freedom		5
X Coefficient(s)	0.997845	
Std Err of Coef.	0.009047	

VOC Analyzer Calibration

OFC IR-702

Serial No. 4301



ANALYZER CALIBRATION

RANGES: 0–500 ppm, 0–1000 ppm, and 0–2500 ppm

HORIBA PIR–2000 ppm S/N 810020

NGE: 0–500 ppm

CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
RA–56558	553.1 ppm	553 ppm	0.018083 %
RR–1409	330.8 ppm	321 ppm	3.052959 %
RR–13154	266.3 ppm	272 ppm	–2.09558 %
RR–12043	220.5 ppm	222 ppm	–0.67567 %
RA–56284	200.1 ppm	198 ppm	1.060606 %
RR–19766	166.5 ppm	169 ppm	–1.47928 %
RR–35253	83.4 ppm	87 ppm	–4.13793 %
FF–17792	0 %	0 %	0 %

Regression Output:		
Constant		1.850548
Constant		1.850548
Std Err of Y Regression Output:		4.889754
R Squared		0.999254
No. of Observations		8
Degrees of Freedom		6
X Coefficient(s)	0.992582	
X Coefficient(s)	0.992582	
Std Err of Coef.	0.011066	

ANGE: 0–1000 ppm

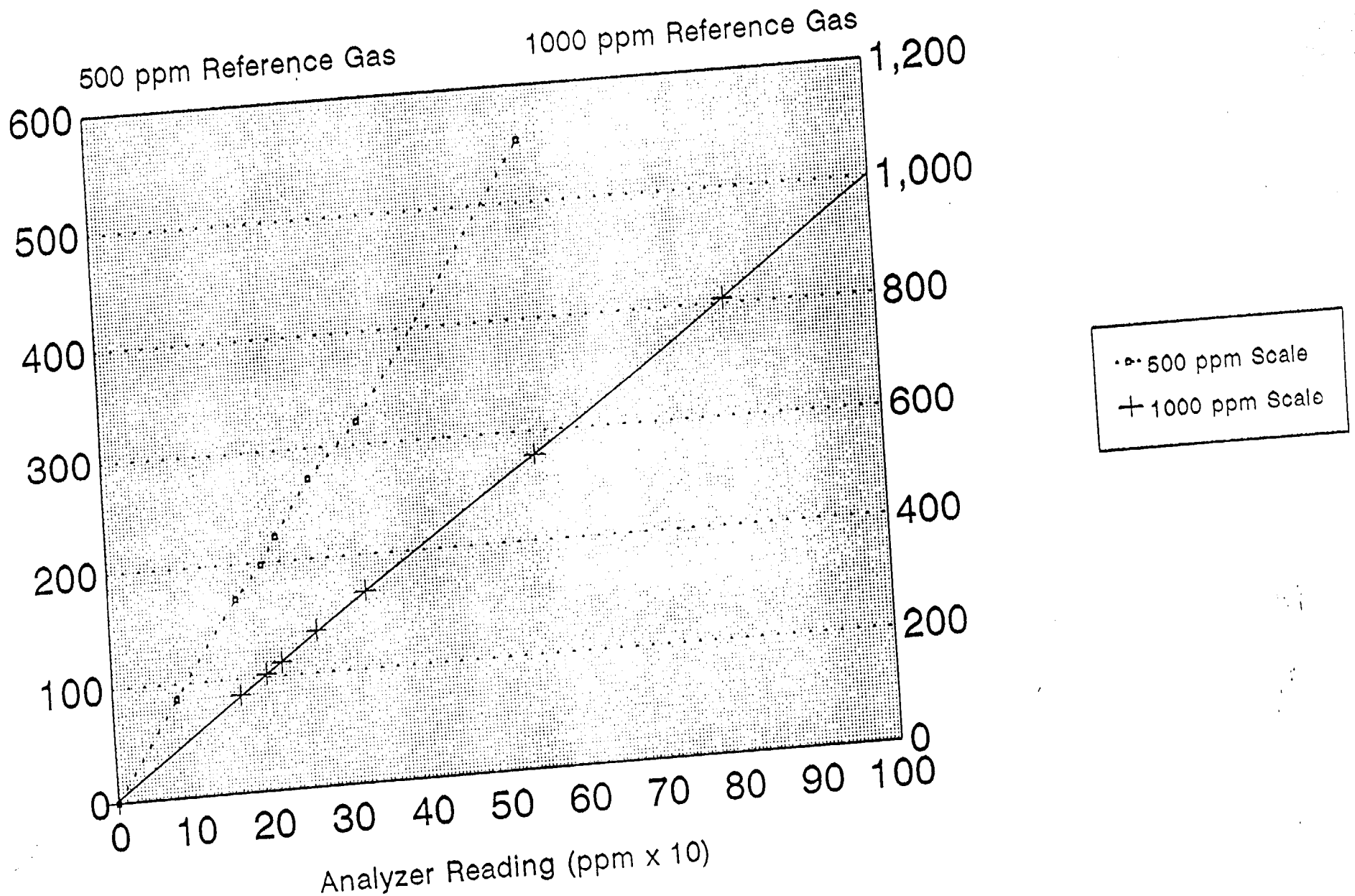
CYLINDER #	BOTTLE VALUE	ACTUAL READING	% ERROR
RA–58150	806.5 ppm	807 ppm	–0.06195 %
RR–27273	806.2 ppm	809 ppm	–0.34610 %
RA–56558	553.1 ppm	556 ppm	–0.52158 %
RR–13154	330.8 ppm	335 ppm	–1.25373 %
RR–1409	266.3 ppm	273 ppm	–2.45421 %
RR–12043	220.5 ppm	223 ppm	–1.12107 %
RA–56284	200.1 ppm	205 ppm	–2.39024 %
RR–19766	166.5 ppm	173 ppm	–3.75722 %
FF–17792	0 %	0 %	0 %

Regression Output:		
Constant		4.287900
Std Err of Y Regression Output:		2.431733
R Squared		0.999936
No. of Observations		9
Degrees of Freedom		7
Degrees of Freedom		5
X Coefficient(s)	0.997733	
Std Err of Coef.	0.003002	

VOC Analyzer Calibration

Horiba PIR 2000

Serial No. 810020



OFC Infrared Instruments
Division of Optical Filter Corporation

IR-2200 OXYGEN ANALYZER
OPERATIONS & MAINTENANCE MANUAL

This manual describes the installation, calibration, operation, and routine maintenance of the OFC INFRARED INSTRUMENTS.

Before operating this instrument it is recommended that the user read through this manual to insure efficient operation and accurate results.

OFC INFRARED INSTRUMENTS.

Mailing Adress
P.O. Box 6935, Ventura., California 93003

Shipping Address
4820 McGrath Street., Ventura, California 93003

(805) 650-5005

INSTRUMENT IDENTIFICATION SHEET

MODEL NUMBER: IR 2200-3052.5

SERIAL NUMBER: 4156

GAS: O_2

FULL SCALE VALUE: 1.000 10.00 25.0 %

RECORDER OUTPUT: R_2 = 100 mV

SPECIAL DATA: INTERNAL PUMP ASS'Y PER 53472

ORIGINAL PURCHASER - TO WHICH THE ATTACHED WARRANTY IS EXTENDED:

FISHER SUPPLY CO

DATE OF ORIGINAL SHIPMENT: 12 JUNE 91

ndustrial Gas Division
Air Products and Chemicals, Inc.
P.O. Box 32576
Louisville, KY 40232
Telephone (502) 456-6222

AIR PRODUCTS

October 5, 1987

John Jordan Service Co.
P.O. Box 99535
Louisville, KY 40299

Attn: Donna Keeling

Dear Ms. Keeling,

This is to certify that under normal use and conditions, the shelf life of the span gas propane/nitrogen that we supply to John Jordan Service Company should last in excess of one year.

If any further clarification is needed, contact me at (502) 456-6222.

Sincerely,

AIR PRODUCTS AND CHEMICALS, INC.

Thomas F. Reynolds, Jr.
District Manager

TFR/km

Matheson®
P.O. Box 358
1650 Enterprise Parkway
Twinsburg, Ohio 44087
Phone: (216) 425-4406

RECEIVED
JUN 21 1993

June 16, 1993

Ed Menzenski
John Jordan Service Company
PO Box 99535
Louisville KY 40269

Dear Mr. Menzenski,

In response to your questions regarding the certification life of a Propane, balance Nitrogen mixture, we reccommend a three year period from the last analysis date. We arrived at this three year limitation because of our own experience and because of the limits put on EPA Protocol mixtures of the same matrix. The Quality Assurance and Technical Support Division of the Atmospheric Research and Exposure Assessment Laboratory have done studies on the stability of this type of mixture and have found them to be stable for a period of at least three years. If you have any further questions, please feel free to call me at 1-800-426-9427.

Sincerely,
MATHESON GAS PRODUCTS, INC.

Les Gibson
Asst Branch Manager

LG/bc

enc

TABLE 2-2. CERTIFICATION PERIODS FOR COMPRESSED GAS CALIBRATION STANDARDS IN PASSIVATED ALUMINUM CYLINDERS

Certified components	Balance gas	Applicable concentration range	Certification period (months)
Aromatic organic gases	Nitrogen	≥0.25 ppm	36
Aliphatic organic gases	Nitrogen	≥0.20 ppm	36
Benzene	Nitrogen	≥0.25 ppm	36
Carbon dioxide and oxygen (i.e., blood gas)	Nitrogen	≥5% CO_2, ≥0% O_2	36
Carbon dioxide and nitrous oxide	Air	≥340 ppm CO_2, ≥300 ppb N_2O	36
Carbon dioxide	Nitrogen	>0.5%	36
Carbon monoxide	Air	≥10 ppm	24
Carbon monoxide	Nitrogen	≥10 ppm	36
Carbon monoxide, propane, and carbon dioxide	Nitrogen	≥1.6% CO, ≥600 ppm C_3H_8, ≥0% CO_2	36
Hydrogen sulfide	Nitrogen	≥5 ppm	12
Methane	Air	≥1 ppm	36
Methane and propane	Air	≥4 ppm CH_4, ≥1 ppm C_3H_8	36
Nitric oxide	Nitrogen	≥5 ppm	24
Nitrogen dioxide	Air	≥1000 ppm	24
Oxides of nitrogen	Air	≥100 ppm	24
Oxygen	Nitrogen	≥2%	36
Propane	Air	≥3 ppm	36
Propane	Nitrogen	≥100 ppm	36
Propane and oxygen	Nitrogen	≥100 ppm C_3H_8 ≥5% O_2	36
Sulfur dioxide	Nitrogen or air	50-499 ppm	24
Sulfur dioxide	Nitrogen or air	≥500 ppm	36
Tetrachloroethylene	Nitrogen	≥0.25 ppm	36
Multicomponent mixtures	—	—	See text
Mixtures with lower concentrations	—	—	See text

APPENDIX C

COMPUTER PRINTOUT LEGEND

AMBIENT-T ---------- Ambient temperature -- ° Celsius.

EXHAUST-T ---------- Exhaust temperature -- ° Celsius.

EXHAUST-P ---------- Exhaust pressure ----- mm Hg.

BARO-P---------- Barometric pressure -- mm Hg.

HC/IN ---------- Inlet HC (when used) - % by volume.

HC/OUT ---------- Exhaust HC ---------- volume fraction of hydrocarbon.

VES ---------- Flow ---------- standard cubic meters.

ME ---------- Total milligrams ----- mg of VOC emitted.

VE ---------- Flow ---------- cubic meters.

VAPOR RECOVERY SYSTEM PERFORMANCE TEST

JOHN JORDON SERVICE COMPANY
TECHNICAL SERVICES GROUP
502 267-8344

est for : MARATHON OIL COMPANY
LEBANON, OHIO

he unit tested was a ZINK

LEN TOLOCZKO and KENNY CAMPBELL performed the test on 06-08-1994

Test performed with mobile lab 1

.he strip chart recorder speed is 150 mm per hour.

****

All data fields are rounded 2 places following the decimal for display purposes.

Internal to the program all data fields are 8 digits and 12 bit fields.

****

OUTLET CALIBRATION GAS INFORMATION

Outlet analyzer range is 0 - 10%

Allowable range is + or - 5% of actual span gas concentration

Low range span gas concentration	: 2.505 %,	Cylinder # FF-16886
Mid range span gas concentration	: 4.501 %,	Cylinder # FF-60393
Hi range span gas concentration	: 8.999 %,	Cylinder # FF-2962
Zero span analyzer reading	: 0.00 %	
Low range analyzer reading	: 2.50 %	
Low range analyzer error	: -0.19 %	
Mid range analyzer reading	: 4.49 %	
Mid range analyzer error	: -0.20 %	
Hi range analyzer reading	: 8.98 %	
HI range analyzer error	: -0.19 %	

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INLET CALIBRATION GAS INFORMATION

Allowable range is + or - 5% of actual span gas concentration

Low range span gas concentration	: 26.004 %,	Cylinder # FF-30304
Mid range span gas concentration	: 49.9 %,	Cylinder # BQG-985
Hi range span gas concentration	: 79.994 %,	Cylinder # FF-27752
Zero span analyzer reading	: 0.0 %	
Low range analyzer reading	: 25.4 %	
Low range analyzer error	: -2.42 %	
Mid range analyzer reading	: 48.5 %	
Mid range analyzer error	: -2.89 %	
Hi range analyzer reading	: 79.6 %	
HI range analyzer error	: -0.47 %	

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Time	Baro-P mm Hg	Exhaust-P mm Hg	Ambient-T Deg C	Exhaust-T Deg C	HCin %	HCout %	VE mtr^3	VES mtr^3	ME mg
07:11	743.7	0.6	14.4	16.1	35.9	0.03	22.2	22.1	10787.95
:16	743.8	0.3	14.5	16.1	37.1	0.03	14.4	14.3	7712.483
:21	743.9	0.8	14.6	15.9	29.1	0.03	34.9	34.7	19007.7
07:26	743.8	0.3	14.7	15.7	32.0	0.04	16.9	16.8	11925.82
:31	743.7	0.2	14.6	15.5	35.8	0.04	3.2	3.2	2596.69
07:36	743.7	0.6	14.8	15.4	27.8	0.06	25.1	25.0	27145.67
:41	743.6	2.3	15.0	15.7	24.7	0.04	65.2	64.9	51936.59
07:46	743.5	0.3	15.4	15.6	19.7	0.04	11.8	11.7	9518.572
07:51	743.5	0.4	15.4	15.6	34.7	0.05	17.3	17.2	15156.72
7:56	743.4	0.4	15.4	15.5	26.9	0.05	13.6	13.5	12009.63
08:01	743.4	1.7	15.1	15.6	12.6	0.03	54.0	53.7	33956.71
8:06	743.4	1.6	15.0	15.3	10.1	0.05	52.0	51.8	50205.26
09:11	743.4	0.5	14.9	15.1	7.3	0.04	27.3	27.1	18493.02
08:16	743.2	1.9	15.0	15.2	3.8	0.03	44.5	44.3	21471.28

utlet span check completed at 08:17:17 the reading is : 4.58 % Allowable : 4.22 thru 4.76

Outlet zero check completed at 08:18:02 the reading is : 0.05 % Allowable : -0.27 thru 0.27

8:21	743.2	2.1	15.2	15.6	4.1	0.03	37.0	36.8	18625.92
08:26	743.0	0.7	15.4	15.5	4.3	0.03	26.8	26.6	14946.74
08:31	743.0	0.4	15.4	15.4	17.0	0.03	18.5	18.4	10709.03
8:36	743.1	0.8	15.5	15.4	26.2	0.02	28.8	28.7	12394.06
08:41	743.2	0.8	15.5	15.5	21.7	0.02	33.5	33.3	14874.95
8:46	743.2	0.9	15.6	15.4	25.6	0.03	33.9	33.7	19458.82
08:51	743.2	0.3	15.7	15.3	31.7	0.03	12.9	12.9	6252.864
08:56	743.3	0.7	15.3	15.3	31.7	0.03	29.8	29.6	13539.03
09:01	743.1	0.3	15.2	15.3	27.9	0.03	13.8	13.7	6449.926
09:06	743.0	0.2	15.3	15.2	26.6	0.03	9.3	9.2	4401.992

utlet span check completed at 09:07:16 the reading is : 4.57 % Allowable : 4.22 thru 4.76

Time	Baro-P mm Hg	Exhaust-P mm Hg	Ambient-T Deg C	Exhaust-T Deg C	HCin %	HCout %	VE mtr^3	VES mtr^3	ME mg

Outlet zero check completed at 09:08:46 the reading is : 0.05 % Allowable : -0.27 thru 0.27

:11	742.8	0.3	15.5	15.0	18.6	0.02	2.5	2.5	949.9713
~~:16	742.8	0.6	16.1	15.4	38.9	0.01	24.4	24.2	6005.635
09:21	742.9	0.2	15.8	15.3	36.5	0.01	6.0	5.9	1005.42
:26	742.7	0.2	15.9	15.2	36.8	0.01	1.5	1.5	162.4832
09:31	742.7	0.5	16.0	15.2	30.3	0.00	12.8	12.7	355.5329
:36	742.7	0.8	16.3	15.6	28.7	0.00	30.8	30.6	1318.706
09:41	742.7	0.6	16.7	15.8	19.1	0.02	21.4	21.2	7303.139
09:46	742.7	0.3	17.0	15.7	29.6	0.02	6.9	6.9	2538.531
:51	742.7	1.5	17.5	16.1	21.3	0.01	38.4	38.1	4853.144
09:56	742.7	0.6	17.7	16.5	25.7	0.00	22.0	21.8	583.6688
:01	742.7	0.6	18.0	16.6	36.9	0.02	22.2	22.0	6940.581
10:06	742.8	0.3	18.9	16.5	36.9	0.02	5.8	5.8	2516.738

outlet span check completed at 10:09:39 the reading is : 4.57 % Allowable : 4.22 thru 4.76

utlet zero check completed at 10:11:04 the reading is : 0.04 % Allowable : -0.27 thru 0.27

10:11	743.0	0.9	19.4	17.1	28.3	1.43	15.1	14.9	390238.1

nlet span check completed at 10:11:34 the reading is : 48.9 % Allowable : 46.1 thru 50.8

Inlet zero check completed at 10:12:49 the reading is : 0.6 % Allowable : -2.4 thru 2.4

.0:16	743.2	0.5	19.2	17.7	34.9	0.00	11.5	11.3	937.6174
0:21	743.4	0.3	18.3	17.4	35.8	0.02	9.9	9.8	3155.431
10:26	743.4	0.2	18.2	16.9	34.8	0.02	1.5	1.5	627.983
0:31	743.4	0.8	18.7	17.3	38.4	0.01	25.7	25.3	4077.721
10:36	743.5	0.3	18.8	17.2	36.9	0.01	6.1	6.1	1014.23
.0:41	743.5	0.2	18.9	17.0	38.2	0.01	2.2	2.2	513.1364
0:46	743.6	0.6	18.9	16.8	15.5	0.01	11.6	11.5	2558.962
10:51	743.5	1.0	19.2	17.7	7.6	0.01	35.7	35.3	9550.727
0:56	743.5	0.3	19.2	17.7	11.0	0.03	10.0	9.8	5931.305

Time	Baro-P mm Hg	Exhaust-P mm Hg	Ambient-T Deg C	Exhaust-T Deg C	HCin %	HCout %	VE mtr^3	VES mtr^3	ME mg
11:01	743.5	0.2	19.4	17.4	14.9	0.04	0.5	0.5	367.3438
:06	743.4	1.0	20.4	18.2	27.7	0.03	29.2	28.8	15191.17
11:11	743.4	0.4	20.9	19.3	37.2	0.02	16.5	16.2	5069.096

Outlet span check completed at 11:14:33 the reading is : 4.57 % Allowable : 4.22 thru 4.76

tlet zero check completed at 11:15:38 the reading is : 0.05 % Allowable : -0.27 thru 0.27

11:16	743.5	0.2	20.5	18.7	36.2	0.02	2.7	2.6	935.2057
:21	743.7	0.2	20.3	18.6	25.4	0.01	6.9	6.8	1045.945
11:26	743.9	1.6	20.8	19.3	10.3	0.00	43.6	42.9	3604.045
11:31	743.9	1.7	22.0	20.5	6.7	0.02	50.6	49.6	19693.38
:36	744.1	1.0	22.2	20.5	25.7	0.02	35.3	34.5	14164.59
11:41	744.1	0.8	21.8	20.3	32.3	0.03	28.1	27.5	13821.12
:46	744.1	0.9	21.3	20.3	35.6	0.01	31.9	31.2	7829.966
11:51	744.3	0.3	21.0	19.9	36.1	0.01	7.5	7.3	1642.026
11:56	744.4	0.4	20.8	19.7	37.2	0.02	18.2	17.9	5587.344
:01	744.5	0.5	21.2	19.5	28.2	0.02	15.5	15.2	6709.066
12:06	744.6	0.9	22.3	20.3	22.4	0.02	33.3	32.6	9083.551

tlet span check completed at 12:08:32 the reading is : 4.56 % Allowable : 4.22 thru 4.76

Outlet zero check completed at 12:09:37 the reading is : 0.05 % Allowable : -0.27 thru 0.27

12:11	744.6	0.5	21.9	20.6	1.6	0.03	16.5	16.1	7873.363
2:16	744.8	0.2	22.2	20.1	3.1	0.03	6.0	5.9	3563.13
12:21	744.8	0.9	22.7	20.2	28.1	0.02	29.5	28.9	13020.87
2:26	745.0	0.9	23.1	21.2	34.7	0.02	31.3	30.6	10889.61
12:31	745.0	0.3	23.1	20.9	34.2	0.02	10.8	10.6	4624.809
12:36	745.2	0.2	23.7	20.7	30.9	0.03	5.3	5.2	2817.117
2:41	745.3	1.3	24.5	21.0	2.5	0.02	34.4	33.6	13214.56
12:46	745.5	0.7	24.3	21.9	2.5	0.03	28.7	28.0	14310.96
2:51	745.6	0.5	23.6	21.8	9.4	0.04	20.9	20.3	16732.56

191,792.296

Time	Baro-P mm Hg	Exhaust-P mm Hg	Ambient-T Deg C	Exhaust-T Deg C	HCin %	HCout %	VE mtr^3	VES mtr^3	ME mg
12:56	745.7	0.7	24.0	21.7	9.4	0.04	27.6	26.9	21500.08
:01	745.7	1.4	25.1	22.1	10.5	0.02	43.4	42.4	19099.52
:06	745.7	0.4	23.8	21.9	13.0	0.02	10.9	10.6	4764.315
13:11	745.7	0.4	22.9	21.4	27.5	0.03	9.9	9.7	5086.686
:16	745.8	0.9	22.7	21.3	14.4	0.03	31.9	31.2	18010.64
13:21	745.9	1.3	22.7	21.5	21.8	0.03	38.8	37.9	17874.13
:26	745.9	0.3	22.8	21.0	33.3	0.03	6.2	6.0	2810.645
13:31	%1233.6	12.5	%4886.2	%4885.5	72.2	6			
17	90.7	8.4	953378.8						
13:36	668.1	1.6	-23.5	-24.8	7.1	0.76			
10.2	10.6	146079.5							
13:41	677.3	1.8	-20.7	-21.6	8.1	0.87			
11.5	12.0	191788.8							

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POST TEST OUTLET SPAN CHECK

Span check performed at 13:45:06

ERO range analyzer reading is : 0.02 %
ZERO range allowable readings are -0.27 thru 0.27

ID range analyzer reading is : 4.53 %
ID range allowable readings are 4.22 thru 4.76

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POST TEST INLET SPAN CHECK

Span check performed at 13:46:14

ERO range analyzer reading is : 0.0 %
ZERO range allowable readings are -2.4 thru 2.4

ID range analyzer reading is : 48.5 %
MID range allowable readings are 46.1 thru 50.8

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PRELIMINARY TEST RESULTS

ıe test data file name is D:\MARALEBN.DAT

There were 79 test intervals, 79 of which had flow.

Average barometric pressure was ~~748.22~~ mm Hg 744 mm Hg
Average flow pressure was 0.85 mm Hg
verage ambient temperature was ~~79.28~~ celcius 18°C
verage exhaust temperature was ~~78.29~~ celcius 19°C
Average inlet concentration was 24.49 %
verage outlet concentration was 0.14 %

Total volume emitted was 1755.06 cubic meters
Total volume emitted standardized was 1652.28 cubic meters
otal milli-grams emitted was 2438900

Accountable gallons loaded was 273250
otal gallons loaded was 361950

Accountable liters loaded was 1034363
Total liters loaded was 1370129

Accountable milli-grams emitted per liter loaded was 2.36
Total milli-grams emitted per liter loaded was 1.78

Unit efficencey for accountable gas loaded was 99.47 %
nit efficencey for total gas loaded was 99.60 %