TEST REPORT

SCOPE: EMISSIONS AND OUTPUT

FUEL: EPA TEST FUEL (CRIBS)

TEST STANDARD: EPA

MODEL: HT-2000 WOOD STOVE

United States
Environmental Protection Agency
Wood Heater Certification Test Report

F.X. Drolet
Quebec, Canada
High Tek 2000 (HT2000)
Certification

Report By:

Bill Nowak

CONFIDENTIAL

RELEASED ONLY BY
AUTHORIZED PERSONNEL

8/6/93

PAGE NUMBER INDEX

M-5H INDIVIDUAL TEST RUN PAGE INDEX

The data sheets in the individual test runs are organized in the following sequence:

A. Computer Printouts

Table 1	Field Data
Table 2	Field Data
Table 3	Field Data Averages
Table 4	Calculations
Table 5	Proportional Rate Variation

B. Raw Data Sheets

		No. of Pages
Data Sheet # 1	Computer Input Data	1
Data Sheet # 2	Meter box Data Sheets	variable
Data Sheet # 3	Moisture Catch Sheet	1
Data Sheet # 4	Scale Sheets	1
4-1	Initial Filter Weights	variable
4-2	Initial Beaker Weights	variable
4-3	Constant Weights	variable
4-4	Scale QA Checks	variable
Data Sheet # 5	Particulate Catch Processing Sheet	1
# 5-1	Front Half Catch	1
# 5-2	Back Half Catch	1
# 5-3	Blank Catch	1
Data Sheet # 6	Net Particulate Catch Calc Sheet	1
Data Sheet # 7	Particulate Calc Sheet	1
Data Sheet # 8	Miscellaneous Test Data	1
Data Sheet # 9	Stove Operating Data	1
Data Sheet # 10	Fuel Moisture	1
Data Sheet # 11	Wood Density	1
Data Sheet # 12	Burn Rate And Flue Gas Data	variable
Data Sheet # 13	Pre Burn Data	variable
Data Sheet # 14	Temperature Data	variable
Data Sheet # 15	Pre and Post test Zero/Span Audits	1
# 15-1	CO_2	1
# 15-2	O_2	1
# 15-3	CO	1
# 15-4	SO_2	1
Data Sheet # 16	Quality Checks	1

TEST SERIES INFORMATION

Unit name and model number: High Tek 2000 (HT2000)

Type of unit: noncat

Manufacturer: F.X. Drolet
Address: 1700 Leon-Harmel
Quebec, Canada G1N 4R9

Contact: Eric Laganiere
Phone Number: 418-527-3060

Observers: Eric Laganiere

Date Rev'd 6/14/93 Aged: 6/18/93 Dates Tested: 6/23-7/1/93

Tested by: Energy and Environmental Systems Performance Corporation (EESPC) using EPA Methods 28, 28A and 5H where applicable.

Test Location: 1315 South Central Avenue, Unit C
Kent, WA 98032
Test Site Elevation: 42 feet above sea level

EESPC's Field Team
Supervisor: Bill Nowak
Team Members: Chip Wadington
Darla Kingman
Lorrie Ulhmann

The following pages contain (1) test unit storage information, (2) a diagram showing the height and location of the stack components and sampling ports, and (3) copies of the certification test notices and cancellations sent to the EPA.

STOVE STORAGE INFORMATION

1. **Temporary Storage at EESPC**

A single, steel, banding strap is place around the unit, preventing opening of the loading door.

2. **Permanent Storage**

After certification is granted, additional banding is placed both horizontally and vertically around the unit to prevent access to the interior of the unit. An address label is then taped over the intersecting bands to act as a seal. Warning labels are affixed on the unit. The unit is then shipped via common carrier to the manufacturer's designated storage facility unless otherwise noted. A sample of the warning label follows.

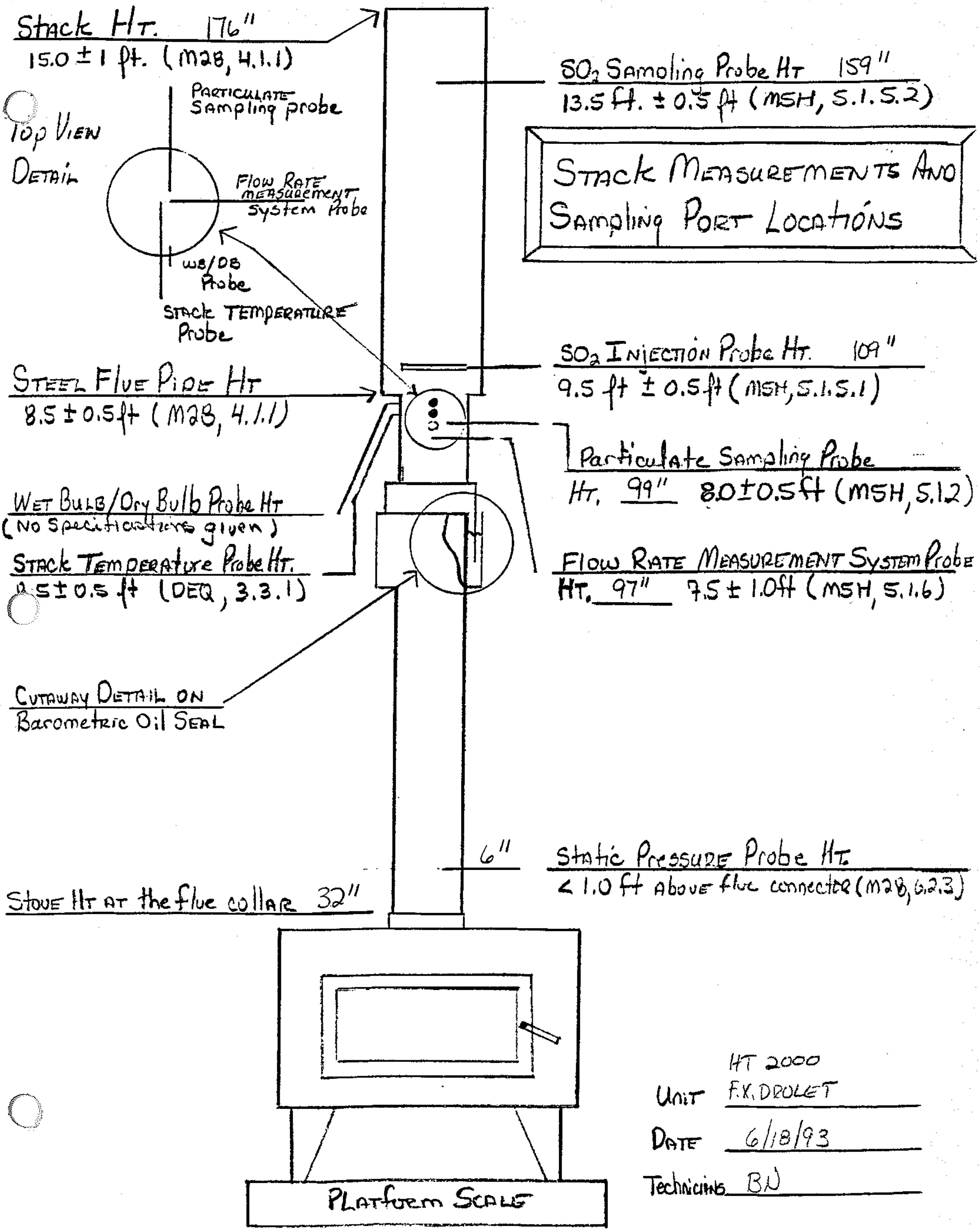
WARNING

SEALED EPA TEST UNIT

DO NOT TAMPER WITH SEALS
TO DO SO WILL VOID CERTIFICATION

F.X. Drolet
High Tek 2000 (HT2000)

Stack Measurements and Sampling Port Locations



Unit HT 2000 F.X. DROLET

Date 6/18/93

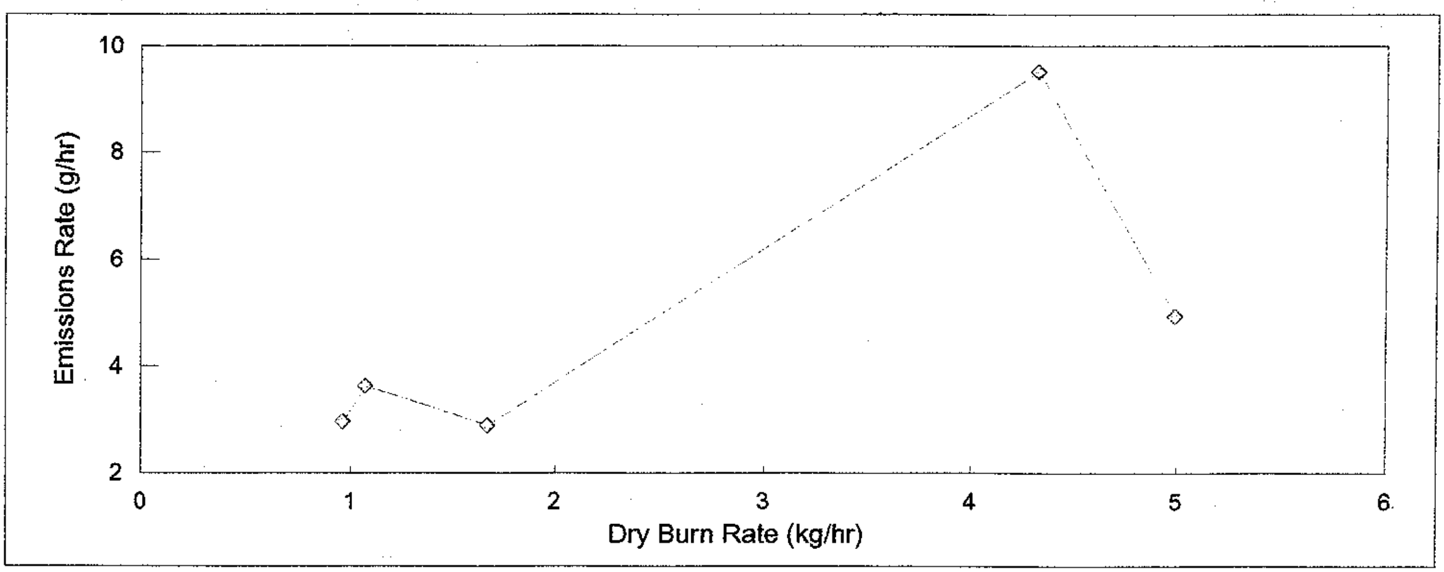
Technicians BN

Wood Heater Emission Test Summary

Laboratory/Wood Heater Information

Stove Manufacturer:	F. X. DROLET
Model Identification:	HT-2000
Stove Type> 1=cat, 2=noncat, 3=pellet:	2
Laboratory Name:	EESPC
Laboratory Contact:	BILL NOWAK
Telephone no.:	206-859-8318
Test Dates:	6/23-7/1/93
Test Methods Used	
Method 28/Other:	28
Sampling Method:	5H

Run no.	Burn Rate (kg/hr)	Emission Rate (g/hr)	Heat Output (Btu/hr)	Wtd Avg (g/hr) 3.79
1	0.96	2.96	11576	
2	1.07	3.62	12902	
4	1.67	2.88	20137	
3	4.32	9.51	52091	
6	4.99	4.93	60170	
			NA	
5	1.20	1.15	NA	Fan Confirmation
			NA	



NA

Unit FX Drolet HT2000

DATA SUMMARY

	RUN #	1	2	4	3	6		5	
Particulate Emissions:									
Concentration:	grains/dscf:	.1349	.1519	.0778	.0836	.0367		.0442	
Emissions Rate	grams/hr:	2.96	3.62	2.88	9.51	4.93		1.15	
Emissions Factor	grams/kg:	3.08	3.40	1.72	2.20	.99		.96	
Front Half Catch	% of total	20.5	18.3	22.4	24.9	75.7		27.3	
Total Mass Captured	total catch:	1.2742	1.5937	.5417	.1685	.0709		.3764	
Efficiency Values:									
Overall Efficiency	%	NA	NA	NA	NA	NA	NA	NA	NA
Combustion Efficiency	%	NA	NA	NA	NA	NA	NA	NA	NA
Heat Transfer Efficiency	%	NA	NA	NA	NA	NA	NA	NA	NA
Heat Output:	BTU/hr								
Fuel Burn Rates:									
Average kg/hr (wet)	Kg/hr	.96	1.07	1.67	4.32	4.99		1.20	
Average kg/hr (dry)	Kg/hr								
Fuel Moisture Content:									
Kindling (wet basis)	%	10.661	10.233	10.661	11.137	8.369		11.111	
Pretest Fuel (wet basis)	%	17.754	18.486	18.249	18.977	18.618		17.786	
Test Fuel (wet basis)	%	18.664	18.492	18.963	20.221	18.158		18.748	
Air to Fuel Ratio		NA	NA	NA	NA	NA	NA	NA	NA

	RUN #	1	2	4	3	6		5	
Average Stack Gas									
Avg CO_2	%	6.73	7.86	8.37	7.38	7.22		8.25	
Avg O_2	%								
Avg CO	%	2.18	1.26	.86	.17	.13		1.22	
Avg Moisture	%	8.88	8.23	5.45	7.88	8.58		7.40	
Average Stack Gas Flow Rate									
EPA CMB	dscfm	5.64	6.13	9.52	29.25	34.58		6.68	
Tacer Gas	dscfm	3.516	4.281	6.717	12.312	13.900		4.942	
Draft (static)	in H_2O	-.028	-.030	-.055	-.058	-.081		-.052	
Proportionality Average	%	100	100	100	100	100	100	100	100
Average Stack Gas Emission Factors:									
CO	g/Kg	256.74	146.06	97.83	23.11	18.16		136.43	
	g/hr	246.73	155.84	163.57	99.91	90.67		163.86	
Average Temperatures									
Stack Gas	°F	218	244	366	761	780		330	
Firebox	°F	671	736	903	1165	1206		815	
Secondary	°F	766	802	928	1072	1054		870	
Catalytic Combustor	°F	NA	NA	NA	NA	NA	NA	NA	NA
Top	°F	330	347	325	502	479		370	
Left Side	°F	337	352	426	597	620		406	
Back	°F	181	159	128	122	126		284	
Right Side	°F	343	372	479	605	628		429	
Bottom	°F	238	241	305	409	420		292	
Temperature Change	°F	-75.6	-60.0	-46.2	-77.4	-51.8		-123.0	

	RUN #	1	2	4	3	6		5	
Test Chamber Enviroment									
Average Barometer	in. Hg	30.30	30.33	30.15	30.10	30.12		30.06	
Average Temperature	°F	79	79	83	83	81		85	
Ambient Moisture	% H_2O	1.35	1.3	1.15	1.4	1.4		1.4	
Relative Humidity	%RH	47.0	45.0	34.5	51.0	58.0		39.5	
Air Velocity	m/sec	0	0	0	0	0	0	0	0

Test Fuel Weight and Burn Time									
Density (dry basis)	gm/cm^3	.3545	.4889	.3990	.3859	.4700	NA	.4268	NA
Coal Bed Weight	lbs	5.2	5.4	4.8	4.4	4.7		5.0	
Pre Test Fuel (inc kindling)	lbs	55.8	33.6	37.5	34.5	45.2		47.7	
Test Fuel	lbs	21.7	22.6	21.6	21.9	21.3		22.0	
Burn Time	min	500	470	285	110	95		405	

Unit FX HT2000
Date 6-18-93
Technicians CW
Page 1 of 1
WST5-Form3

CATALYTIC COMBUSTOR AGING DATA
OR
STOVE AGING DATA
WOODSTOVE TEST DATA SHEET #25

Hr. #	Date	T/C# Time	Firebox Temp	Secondary Burn Temp	Post Cat	In Cat	Comments
1	6-18	1000	652	1218			
2	"	1100	771	815			
3	"	1200	809	1129			
4	"	1300	615	643			
5	"	1400	735	850			
6	"	1500	580	606			
7	"	1600	696	766			
8	6/21	0930	770	1384			
9		1030	877	1158			
10		1130	779	1379			

TABLE 1 ----- RAW DATA

CLIENT : F.X. DROLET TEST No. : 1

MODEL: HT2000 DATE: 23-Jun-93

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	35.000	0.150	80	1.23	11.00	900
5	36.500	1.320	82	0.44	6.00	300
10	41.053	0.160	85	1.04	7.50	850
15	42.688	0.210	87	1.02	8.30	750
20	44.553	0.220	87	1.24	9.80	725
25	46.482	0.220	87	0.92	12.00	725
30	48.411	0.210	87	1.33	7.50	750
35	50.276	0.210	87	1.28	9.40	750
40	52.142	0.190	87	1.17	10.10	775
45	53.947	0.210	87	0.99	10.80	750
50	55.812	0.220	88	0.72	11.60	725
55	57.748	0.220	88	0.75	11.20	725
60	59.685	0.200	88	0.77	11.10	750
65	61.621	0.220	88	0.58	12.50	725
70	63.493	0.220	89	0.62	11.90	725
75	65.437	0.220	89	0.53	11.20	725
80	67.380	0.190	89	0.95	11.90	775
85	69.199	0.200	90	0.88	11.20	750
90	71.085	0.190	90	0.91	11.70	775
95	72.910	0.190	90	0.82	12.60	775
100	74.735	0.200	91	0.49	11.80	750
105	76.627	0.190	91	0.72	11.30	775
110	78.459	0.180	91	0.85	10.70	800
115	80.233	0.190	92	0.76	11.20	775
120	82.072	0.180	92	0.73	11.30	800
125	83.852	0.180	92	0.67	10.90	800
130	85.633	0.180	92	0.63	9.80	800
135	87.414	0.180	92	0.64	9.70	800
140	89.195	0.160	93	0.76	8.60	825
145	90.983	0.150	93	2.65	8.20	875
150	92.617	0.120	94	2.65	7.70	950
155	94.128	0.110	94	2.75	6.70	1025
160	95.529	0.120	94	2.15	7.00	975
165	97.001	0.120	94	1.55	6.30	950
170	98.512	0.120	95	1.52	6.40	950
175	100.029	0.110	95	2.33	6.90	1025
180	101.434	0.110	95	2.07	6.10	1025
185	102.840	0.110	95	1.99	6.40	1025
190	104.246	0.100	95	2.08	5.30	1050
195	105.618	0.009	95	2.08	5.70	1125
200	106.899	0.090	95	2.30	5.50	1100
205	108.209	0.100	95	2.26	5.20	1050
210	109.581	0.100	95	2.38	4.90	1075
215	110.921	0.090	95	2.62	5.00	1125

490	179.178	0.080	95	1.79	4.70	1175
495	180.404	0.080	95	1.69	4.70	1175
500	181.631	0.080	95	1.95	4.30	1175
505						

CLIENT : F.X. DROLET TEST No. 1

MODEL: HT2000 DATE: *********

****

METER CAL. FACTOR (Y) ------	1.028		Wt. WOOD BURNED(LB) -------	21.7	Lbs
BAROMETRIC PRESS.(Pb) ------	30.3	in Hg	WET,FUEL MOISTURE % -------	18.664	%
LEAK RATE POST (Lp) ------	0.005	cfm	Wt. PART. COLLECTED -------	1.2742	g
WATER VOL. (V1c) ------	301.8	Ml	METER VOLUME Vm -------	146.631	mcf
TEST TIME (MIN) ------	500	min	HC MOLE FRACTION -------	0.0132	

TABLE 3 -----FIELD DATA AVERAGES

CLIENT :F.X. DROLET   TEST No. 1

MODEL: HT2000   DATE: 23-Jun-93

****

AVG DELTA H	-------	0.13 in H2O	AVG PRCNT CO	-------	2.18 %
AVG METER TEMP. Tm	-------	93 deg F	AVG PRCNT CO2	-------	6.73 %
AVG PPM SO2	-------	1025 PPM	AVG BAL CO2/CO	-------	3.09 %

TABLE 4 ----- CALCULATIONS

CLIENT : F.X. DROLET TEST No. 1

MODEL: HT2000 DATE: 23-Jun-93

****

STD SAMPLE VOL. Vm(std) -----	145.79	dscf	STACK GAS FLOW Qsd -------	338.461 & 5.64	dscf/Hr & dscf/min
VOL. WATER VAPOR Vw(std) ----	14.206	scf	PARTICULATE CONCTRT. Cs ------	0.0087	g/dscf
PRCNT MSTR Bws -------	8.88	%	PARTC.EMISS. RATE E -------	2.96	g/Hr
BURN RATE BR -------	0.96	Kg/Hr	MOLES OF GAS PER Lb WOOD Nt --	0.42	Lb-mole/Lb
CO EMISSION RATE -------	246.73 & 256.74	g/Hr & g/Kgdry fuel	PART.EMISS. RATE ------	3.08	g/Kgdry fuel

TABLE 5 ----- PROPORTIONAL RATE VARIATION

CLIENT : F.X. DROLET — TEST No. : 1

MODEL: HT2000 — DATE: 23-Jun-93

****

	TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE	
	5	1372.4	96		100	
	10	1386.1	97			
	15	1399.9	98			
	20	1406.5	99			
	25	1406.4	99			
	30	1406.4	99			
	35	1406.5	99			
	40	1407.3	99			
	45	1406.6	99			
	50	1405.3	99			
	55	1408.9	99			
	60	1409.6	99			
	65	1457.4	102			
	70	1361.1	96			
	75	1412.1	99			
	80	1411.4	99			
	85	1411.1	99			
	90	1414.6	99			
	95	1414.4	99			
	100	1413.1	99			
	105	1416.5	100			
	110	1417.3	100			
	115	1415.4	99			
	120	1420.1	100			
	125	1418.9	100			
	130	1419.7	100			
	135	1419.7	100			
	140	1418.4	100			
	145	1467.1	103			
	150	1420.6	100			
	155	1424.9	100			
	160	1425.4	100			
	165	1424.7	100			
	170	1423.6	100			
	175	1428.0	100			
	180	1426.9	100			
	185	1427.9	100			
	190	1427.9	100			
	195	1427.4	100			
	200	1427.6	100			
	205	1427.7	100			
	210	1427.4	100			
	215	1427.3	100			
	220	1427.9	100			

225	1427.9	100
230	1427.9	100
235	1426.7	100
240	1427.9	100
245	1427.9	100
250	1427.9	100
255	1427.9	100
260	1426.7	100
265	1427.7	100
270	1427.7	100
275	1427.9	100
280	1427.9	100
285	1427.9	100
290	1426.7	100
295	1427.9	100
300	1427.9	100
305	1427.3	100
310	1428.4	100
315	1427.3	100
320	1427.6	100
325	1427.6	100
330	1427.6	100
335	1427.6	100
340	1427.6	100
345	1428.4	100
350	1427.3	100
355	1427.9	100
360	1427.9	100
365	1426.7	100
370	1427.9	100
375	1427.9	100
380	1427.9	100
385	1427.3	100
390	1427.6	100
395	1427.6	100
400	1427.6	100
405	1427.6	100
410	1427.9	100
415	1427.6	100
420	1427.6	100
425	1427.6	100
430	1427.6	100
435	1427.6	100
440	1427.3	100
445	1428.4	100
450	1427.6	100
455	1427.6	100
460	1427.3	100
465	1427.6	100
470	1428.4	100
475	1426.7	100
480	1427.9	100
485	1428.4	100
490	1427.3	100

495	1427.3	100
500	1428.4	100
505		
510		

COMPUTER INPUT DATA WOODSTOVE DATA SHEET #1

Client F. X. DROLET

Client Address 1700 LEONHARMEL
QUEBEC, QUEBEC G1N 4R9 CANADA

Client Phone 514-565-6336

Project No. ____ Model No. HT 2000

Run No. 1 Date of Test 6/23/93 Est Grams/Hr ____

Stove Type: Cat ____ Non Cat X Pellet ____

Data To Be Submitted To: Oregon ____ Colorado ____ EPA ____

Burn Category: Low (<0.8 Kg/Hr) .9607 Med Hi (1.26 - 1.90 Kg/Hr) ____
Med Low (0.8 - 1.25 Kg/Hr) ____ Max (>1.9 Kg/Hr) ____

Fuel % Moisture (dry) 22.947 %(wet) 18.664 %
(00.00) (Data Sheet #10)

Stack Static Pressure -.028 "H_2O
(0.000) (Data Sheet #12)

Barometric Pressure 30.30 "Hg
(00.00) (Data Sheet #2)

Temperature (Average Room) Combustion Air 79 oF
(00) (Data Sheet #14)

Flue Gas Moisture 8.8817 %
(00.000) (Data Sheet #7)

Ambient Moisture 1.35 %
(0.00) (Data Sheet #8)

Stove Weight 487 lbs
(000) (Data Sheet #8)

Stove Temperature Change -75.6 oF
(000) (Data Sheet #14)

Particulate Emission .1349 gr/dscf
(0.0000) (Data Sheet #7)

Fuel Higher Heating Value (dry) 8694 BTU/lb
(0000) (CT&E Sheet)

Fuel Type: Wood: X Pellets: ____

Total Fuel Consumed During Burn 21.7 lbs
(00.0) (Data Sheet #8)

Total Particulate Catch 1.2742 g
(0.0000) (Data Sheet #6)

H_2O Captured 301.8 g
(00.0) (Data Sheet #3)

Dry Gas Meter Volume 146.631 CF
(00.000) (Data Sheet #2)

Dry Gas Meter: Y Factor: 1.028 Post Test Leak Rate .005 CFM

TIME: 500

Meter Box Data Sheet Page # 2

Meter Box 5H Y Factor 1.028

Leak Checks: 16 " Hg @ .004 cfm
15.0 " Hg @ .005 cfm
" Hg @ cfm
" Hg @ cfm

Inject SO2 @ 100 cc/min

Page 1 of 5

Unit: Fx

Run: 1 Date: 6-23-93

Operator(s). CW

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 1.03			Sampling Ratio : 13 : 1				BAROMETER: 30.30		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
00	1040	35.000	—	3.896	.15	80	900	80	2.0
05	45	36.500	—	11.644	1.32	82	300	82	10.0
10	50	41.053	41.053	4.087	.16	85	850	85	2.0
15	55	42.688	42.688	4.615	.21	87	750	87	2.0
20	1100	44.553	44.553	4.774	.22	87	725	87	2.0
25	05	46.482	46.482	4.774	.22	87	725	87	2.0
30	10	48.411	48.411	4.615	.21	87	750	87	2.0
35	15	50.276	50.276	4.615	.21	87	750	87	2.0
40	20	52.142	52.142	4.466	.19	87	775	87	2.0
45	25	53.947	53.947	4.615	.21	87	750	87	2.0
50	1130	55.812	55.812	4.766	.22	88	725	88	2.0
55	35	57.748	57.748	4.766	.22	88	725	88	2.0
ROTO PRESS: 1.03			TOTALS :	61.633	3.54	1032	BAROMETER: 30.30		
60	1140	59.685	59.685	4.607	.20	88	750	88	2.0
65	45	61.621	61.621	4.766	.22	88	725	88	2.0
70	50	63.493	63.493	4.757	.22	89	725	89	2.0
75	55	65.437	65.437	4.757	.22	89	725	89	2.0
80	1200	67.380	67.380	4.450	.19	89	775	89	2.0
85	05	69.199	69.199	4.590	.20	90	750	90	2.0
90	10	71.085	71.085	4.442	.19	90	775	90	2.0
95	15	72.910	72.910	4.442	.19	90	775	90	2.0
100	20	74.735	74.735	4.582	.20	91	750	91	2.0
105	25	76.627	76.627	4.434	.19	91	775	91	2.0
110	30	78.459	78.459	4.295	.18	91	800	91	2.0
115	35	80.233	80.233	4.426	.19	92	775	92	2.0
			TOTALS:	54.548	2.39	1078	MAX VACC =		
TOTAL CU FT			TOTALS:	116.181	5.93	2110	AV BP:		

Meter Box Data Sheet Page # 2

Page 3 of 5

Meter Box 5H Y Factor 1.028

Unit: Fx

Run: 1 Date: 6-23-93

Leak Checks: 16 " Hg @ .004 cfm
15.0 " Hg @ .005 cfm
" Hg @ cfm
" Hg @ cfm

Operator(s): CW

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 1.01		Sampling Ratio : 13 : 1					BAROMETER: 30.30		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
240	1440	117.325	117.325	3.032	.09	95	1125	95	2.0
245	45	118.606	118.606	3.032	.09	95	1125	95	2.0
250	50	119.887	119.887	3.032	.09	95	1125	95	2.0
255	55	121.168	121.168	3.032	.09	95	1125	95	2.0
260	1500	122.448	122.448	3.101	.09	95	1100	95	2.0
265	05	123.758	123.758	3.101	.09	95	1100	95	2.0
270	10	125.068	125.068	2.843	.08	95	1200	95	2.0
275	15	126.269	126.269	2.843	.08	95	1200	95	2.0
280	20	127.470	127.470	2.843	.08	95	1200	95	2.0
285	25	128.671	128.671	2.843	.08	95	1200	95	2.0
290	30	129.871	129.871	2.843	.08	95	1200	95	2.0
295	35	131.072	131.072	2.843	.08	95	1200	95	2.0
ROTO PRESS: 1.01			TOTALS :	35.388	1.02	1140	BAROMETER: 30.30		
300	1540	132.273	132.273	2.903	.08	95	1175	95	2.0
305	45	133.499	133.499	2.903	.08	95	1175	95	2.0
310	50	134.726	134.726	2.903	.08	95	1175	95	2.0
315	55	135.952	135.952	2.966	.08	95	1150	95	2.0
320	1600	137.205	137.205	2.966	.08	95	1150	95	2.0
325	05	138.458	138.458	2.966	.08	95	1150	95	2.0
330	10	139.711	139.711	2.966	.08	95	1150	95	2.0
335	15	140.964	140.964	2.966	.08	95	1150	95	2.0
340	20	142.217	142.217	2.903	.08	95	1175	95	2.0
345	25	143.444	143.444	2.903	.08	95	1175	95	2.0
350	1630	144.670	144.670	2.843	.08	95	1200	95	2.0
355	35	145.871	145.871	2.843	.08	95	1200	95	2.0
			TOTALS:	35.031	.960	1140	MAX VACC =		
TOTAL CU FT			TOTALS:	70.419	1.98	2280	AV BP:		

Meter Box Data Sheet Page # 2

Page 4 of 5

Meter Box 5H Y Factor 1.029

Unit: Fx

Run: 1 Date: 6-23-93

Leak Checks: 16 " Hg @ .004 cfm
15.0 " Hg @ .005 cfm
" Hg @ cfm
" Hg @ cfm

Operator(s): CW

Inject SO_2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 1.01			Sampling Ratio : 13 : 1				BAROMETER: 30.32		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO_2 PPM	ROTO TEMP	PUMP VACC
360	1640	147.072	147.072	2.843	.08	95	1200	95	2.0
365	45	148.272	148.272	2.843	.08	95	1200	95	2.0
370	50	149.473	149.473	2.843	.08	95	1200	95	2.0
375	55	150.674	150.674	2.843	.08	95	1200	95	2.0
380	1700	151.875	151.875	2.903	.08	95	1175	95	2.0
385	05	153.101	153.101	2.966	.08	95	1150	95	2.0
390	10	154.354	154.354	2.966	.08	95	1150	95	2.0
395	15	155.607	155.607	2.966	.08	95	1150	95	2.0
400	20	156.860	156.860	2.966	.08	95	1150	95	2.0
405	25	158.113	158.113	3.032	.09	95	1125	95	2.0
410	30	159.394	159.394	2.966	.08	95	1150	95	2.0
415	35	160.647	160.647	2.966	.08	95	1150	95	2.0
ROTO PRESS: 1.01			TOTALS :	35.103	.97	1140	BAROMETER: 30.30		
420	1740	161.900	161.900	2.966	.08	95	1150	95	2.0
425	45	163.153	163.153	2.966	.08	95	1150	95	2.0
430	50	164.406	164.406	2.966	.08	95	1150	95	2.0
435	55	165.659	165.659	2.903	.08	95	1175	95	2.0
440	1800	166.885	166.885	2.903	.08	95	1175	95	2.0
445	05	168.112	168.112	2.966	.08	95	1150	95	2.0
450	10	169.365	169.365	2.966	.08	95	1150	95	2.0
455	15	170.618	170.618	2.903	.08	95	1175	95	2.0
460	20	171.844	171.844	2.966	.08	95	1150	95	2.0
465	25	173.097	173.097	2.903	.08	95	1175	95	2.0
470	30	174.324	174.324	2.843	.08	95	1200	95	2.0
475	35	175.524	175.524	2.843	.08	95	1200	95	2.0
			TOTALS:	35.094	.96	1140	MAX VACC =		
TOTAL CU FT			TOTALS:	70.197	1.93	2280	AV BP:		

Meter Box Data Sheet Page # 2

Meter Box 5H Y Factor 1.029

Leak Checks: 16 " Hg @ .004 cfm
15.0 " Hg @ .005 cfm
" Hg @ cfm
" Hg @ cfm

Inject SO2 @ 100 cc/min

Unit: Fx

Run: 1 Date: 6-23-93

Operator(s): CW

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 1.01			Sampling Ratio : 13 : 1				BAROMETER: 30.30		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
480	1840	176.725	176.725	2.903	.08	95	1175	95	2.0
485	45	177.952	177.952	2.903	.08	95	1175	95	2.0
490	50	179.178	179.178	2.903	.08	95	1175	95	2.0
495	55	180.404	180.404	2.903	.08	95	1175	95	2.0
500	1900	181.631	181.631	2.903	.08	95	1175	95	2.0
				14.515	.40	475			
				116.181	5.93	2110			
				83.783	2.88	2260			
				70.419	1.98	2280			
				70.197	1.93	2280		÷	101
				355.095	1.312	9405			
ROTO PRESS:			TOTALS :				BAROMETER:		
			TOTALS:			93	MAX VACC =		10.0
TOTAL CU FT	146.631		TOTALS:	3.516	.130	553	AV BP: 30.30		

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

	Balance Level	Balance Zeroed
Initial:	✓	✓
Final:	✓	✓

Unit: FX

Run: 1

Date: 6-22-[illegible]

Technician(s): Initial: CW

Final: CW

Approved By: ______

IMPINGER #1

Final Weight 797.8 grams

Initial Weight 571.8 grams

Net 226.0 ✓ grams

IMPINGER #2

Final Weight 614.6 grams

Initial Weight 581.0 grams

Net 33.6 ✓ grams

IMPINGER #3

Final Weight 488.6 grams

Initial Weight 486.0 grams

Net 2.6 ✓ grams

IMPINGER #4 (SILICA GEL)

Final Weight 856.2 grams

Initial Weight 816.6 grams

Net 39.6 ✓ grams

TOTAL MASS OF H_2O CAPTURED 301.8 ✓ grams

Scale Check: 295.0g = 295.0 g
590.0g = [illegible] g
885.0g = [illegible] g

Front Half Filter # 445F
#
Back Half Filter # 445B

Notes: ______

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 5/27/93 Time 1030 By DK Front Half ✓ Back Half ✓

Manufacturer: S&S Size: 11 cm 8.2cm Lot. No.: ZB901 Grade: #25 glass

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
441F	.6921	6/1	1016	LU	.6924	6/2	1044	DK	✓			
442F	.6988	6/1	1017	LU	.6988		1046		✓			
443F	.6982	6/1	1018	LU	.6977		1048		✓			
444F	.7058	6/1	1019	LU	.7054		1050		✓			
445F	.7014	6/1	1020	LU	.7002		1052		✓			
446F	.6996	6/1	1021	LU	.6994		1054		✓			
447F	.7022	6/1	1022	LU	.7022		1056		✓			
448F	.7079	6/1	1023	LU	.7076		1058		✓			
449F	.6984	6/1	1024	LU	.6982		1100		✓			
450F	.7079	6/1	1025	LU	.7080		1102		✓			
441B	.3750	6/1	1026	LU	.3745	6/2	1126	DK	✓			
442B	.3730	6/1	1027	LU	.3725		1128		✓			
443B	.3776	6/1	1028	LU	.3771		1130		✓			
444B	.3779	6/1	1029	LU	.3774		1132		✓			
445B	.3738	6/1	1030	LU	.3733		1134		✓			
446B	.3736	6/1	1031	LU	.3731		1136		✓			
447B	.3755	6/1	1032	LU	.3750		1138		✓			
448B	.3790	6/1	1033	LU	.3785		1140		✓			
449B	.3728	6/1	1034	LU	.3726		1142		✓			
450B	.3801	6/1	1035	LU	.3796		1144		✓			

Checked by Bill Nowak Date: 6/2/93 Time 1328

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
58	70	48	6/1	900	LU
62	75	48	6/2	1042	DK

WOODSTOVE DATA SHEET #4-2:
INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 6/4/93 Time: 0900 By: DK

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
376	101.1787	6/7	1012	LU	101.1782	6/8	952	DK	✓			
377	106.4080	6/7	1014	LU	106.4076		954		✓			
378	105.4899	6/7	1016	LU	105.4895		956		✓			
379	97.6639	6/7	1018	LU	97.6636		958		✓			
380	103.9232	6/7	1020	LU	103.9230		1000		✓			
381	104.7513	6/7	1022	LU	104.7509	6/8	1002	DK	✓			
382	105.3599		1024	LU	105.3600		1004		✓			
383	98.6273		1026	LU	98.6268		1006		✓			
384	105.3535		1028	LU	105.3530		1008		✓			
385	104.7898		1030	LU	104.7898		1010		✓			
386	105.9197	6/7	1032	LU	105.9193	6/8	1012	DK	✓			
387	99.9773		1034		99.9772		1014		✓			
388	97.9826		1036		97.9825		1016		✓			
389	105.5321		1038		105.5318		1018		✓			
390	96.1094		1040		96.1093		1020		✓			
391	95.6015	6/7	1042	LU	95.6011	6/8	1022	DK	✓			
392	100.2328		1044		100.2325		1024		✓			
393	100.4634		1046		100.4631		1026		✓			
394	105.4896		1048		105.4891		1028		✓			
395	98.5641	6/7	1050		98.5638		1030		✓			
396	108.2162	6/7	1052	LU	108.2159	6/8	1032	DK	✓			
397	99.6752		1054		99.6750		1034		✓			
398	108.5969		1056		108.5964		1036		✓			
399	96.8981		1058		96.8978		1038		✓			
400	95.9540		1100		95.9536		1040		✓			

Checked By: Bill Nourch Date: 6/8/93 Time: 1130

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
56	68	47	6/7	940	LU
56	68	47	6/8	950	DK

WST5-Form9,Pg1, 4/90
Unit FX
Run # 1
Date: 6-23-95

WOODSTOVE DATA SHEET #4-3: CONSTAN FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
386		6/24	0630	BD	106.0320	6/25	936	LU	106.0310	6/28	1012	DK	106.0305	6/29	908	LU
387		6/24	1700	DK	100.3535	6/28	1014	DK	100.3533	6/29	910	LU				
388		6/24	0630	BD	98.1027	6/25	938	LU	98.0897	6/28	1016	DK	98.0892	6/29	912	LU
389		6/24	1700	DK	105.7132	6/28	1018	DK	105.7129	6/29	914	LU				
390		6/24	1700	DK	96.2901	6/28	1020	DK	96.2900	6/29	916	LU				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
445F		6-23	1930	CW	.8508	6/24	1712	DK	.8505	6/25	940	LU				
445B		6-23	1930	CW	.5433	6/24	1714	DK	.5430	6/25	942	LU				

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By
Date	**Filter #**	**Final WT**	**By**

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	WB	DB	%RH
1	6/24	1710	DK	60	74	44
2	6/25	930	LU	64	77	49
3	6/28	1010	DK	59	71	49
4	6/29	904	LU	59	71	49
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 6/10/93

Through ____________

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0001	10.0001	1.0000	0.0999			DK	6/10	1000	70	58	48
99.9999	10.0001	0.9998	0.1000			LW	6/11	904	68	56	47
100.0003	10.0000	0.9996	0.0999			DK	6/14	910	76	63	49
99.9999	10.0003	1.0001	0.1002			LW	6/15	902	70	58	48
99.9998	10.0002	1.0000	0.0998			DK	6/16	900	70	58	48
99.9996	9.9997	0.9998	0.0997			LW	6/17	904	70	58	48
100.0004	10.0003	1.0000	0.1000			DK	6/18	0830	69	57	47
100.0001	10.0001	1.0000	0.1000			LW	6/21	908	68	56	47
100.0001	10.0000	1.0001	0.0999			DK	6/22	900	66	55	49
99.9996	9.9997	0.9997	0.0998			LW	6/23	906	70	58	48
99.9998	9.9999	0.9999	0.1000			DK	6/24	1700	74	60	44
99.9998	9.9997	0.9997	0.0995			LW	6/25	930	77	64	49
100.0001	10.0000	0.9999	0.0997			DK	6/28	1000	71	59	49
100.0003	10.0003	1.0001	0.1000			LW	6/29	904	71	59	49

WST7-Form1 Rev5/90

Dates: From 3-11-93

Through 6/9/93

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0004	10.0001	1.0000	.0999			CW	3-11	0915	69	54	36
99.9998	10.0000	0.9999	0.0997			OK	3/12	0830	68	52	32
100.0003	10.0002	1.0000	.0997			CW	3-15	0930	72	57	39
100.0000	10.0002	1.0000	0.1000			DK	3/16	0900	72	57	39
100.0001	10.0001	1.0002	0.1001			DK	3/17	1330	72	58	42
100.0001	10.0003	1.0002	0.1001			CW	3-18	1700	75	60	47
99.9999	10.0000	0.9998	0.0999			OK	3/19	0900	71	57	41
100.0003	10.0001	1.0000	.0999			BN	3-23	0900	73	60	47
100.0002	10.0001	1.0000	0.0999			DK	3/19	1300	77	63	46
100.0001	10.0001	1.0001	.0999			CW	4-20	0900	75	60	41
100.0000	10.0002	1.0002	0.0999			OK	4/26	0906	66	55	49
100.0001	10.0001	1.0001	.1001			CW	4-28	0900	69	56	44
100.0002	10.0001	0.9999	0.0999			DK	5/4	1120	75	62	48
100.0001	10.0001	1.0000	.1000			CW	5-5	1000	75	60	41
99.9998	9.9999	0.9999	0.1000			OK	5/6	946	76	62	45
99.9997	10.0001	1.0000	0.0999			DK	5/7	1620	74	60	44
100.0002	10.0002	1.0001	.0999			BN	5-10	0900	71	59	49
100.0002	10.0002	1.0002	.1001			CW	5-11	1000	73	59	43
100.0000	10.0000	1.0000	0.0999			DK	5/12	900	75	61	44
100.0001	10.0001	1.0001	.1000			CW	5-13	1600	71	58	45
99.9997	10.0002	1.0002	0.1001			DK	5/14	1000	70	58	48
99.9999	10.0001	0.9999	0.0998			DK	5/19	1010	71	59	49
99.9999	10.0000	0.9998	0.0998			BN	5/20	1720	74	60	44
99.9997	10.0002	1.0000	0.0998			DK	5/21	950	70	58	48
100.0001	10.0002	1.0000	0.0999			LU	5/24	1115	77	65	46
100.0001	10.0002	1.0001	0.1001			DK	5/25	1030	70	58	48
100.0003	10.0000	0.9998	0.1000			LU	5/26	1230	77	64	49
100.0000	10.0002	1.0000	0.1000			DK	5/27	940	77	64	49
99.9997	10.0001	0.9999	0.1000			LU	5/28	908	76	63	49
99.9999	10.0000	0.9999	0.0997			LU	6/1	900	70	58	48
100.0002	10.0003	1.0001	0.1001			DK	6/2	940	75	62	48
100.0000	10.0000	1.0001	0.0998			LU	6/3	956	70	58	48
100.0001	9.9999	0.9999	0.0999			DK	6/4	0930	68	56	47
100.0000	9.9998	0.9999	0.0999			LU	6/7	0940	68	56	47
99.9996	10.0001	0.9999	0.0999			DK	6/8	0900	68	56	47
99.9995	9.9997	0.9999	0.0996			LU	6/9	0904	68	56	47

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: FX HT2000
Run: 1 Date: 5-23-93
Technician(s): [illegible]

FRONT HALF

FILTER #: 445F
FINAL WT: .8505 g
TARE WT: .7002 g
NET WT: .1503 g

BEAKER #: 356
ml: 100
desc: ACETONE

FINAL WT: 106.0305 g
TARE WT: 105.9193 g
NET WT: .1112 g

FILTER #: ______
FINAL WT: ______ g
TARE WT: ______ g
NET WT: ______ g

BEAKER #: ______
ml: ______
desc: ACETONE

FINAL WT: ______ g
TARE WT: ______ g
NET WT: ______ g

TOTAL VOLUME OF ACETONE USED IN WASH 100 ml

BACK HALF

FILTER #: 445B
FINAL WT: .5430 g
TARE WT: .3733 g
NET WT: .1697 g

BEAKER #: 387
ml: 200
desc: ACETONE

FINAL WT: 100.3533 g
TARE WT: 99.9772 g
NET WT: .3761 g

FILTER #: ______
FINAL WT: ______ g
TARE WT: ______ g
NET WT: ______ g

BEAKER #: 388
ml: 75
desc: METHCHLOR

FINAL WT: 98.0892 g
TARE WT: 97.9825 g
NET WT: .1067 g

BEAKER #: 389
ml: 225
desc: H2O

FINAL WT: 105.7129 g
TARE WT: 105.5318 g
NET WT: .1811 g

BEAKER #: 390
ml: 215
desc: H2O

FINAL WT: 96.2900 g
TARE WT: 96.1093 g
NET WT: .1807 g

BEAKER #: ______
ml: ______
desc: ______

FINAL WT: .3618 g
TARE WT: ______ g
NET WT: ______ g

BEAKER #: ______
ml: ______
desc: ______

FINAL WT: ______ g
TARE WT: ______ g
NET WT: ______ g

TOTAL VOLUME OF ACETONE USED IN WASH 200 ml
TOTAL VOLUME OF DICHLOROMETHANE USED IN EXTRACTION 75 ml
TOTAL VOLUME OF DISTILLED WATER DRIED 440 ml

PRTCATCH

WOODSTOVE BLANKS PROCESSING
WOODSTOVE DATA SHEET # 5A

Unit: HT2000 (FX)
Run: 1 Date: 6/23/93
Technician(s): BN

BLANKS DONE: 6/15/93

BEAKER #: A
200 ml ACETONE
FISHER OPTIMA LOT #: 924059

FINAL WT: 108.9002 g
TARE WT: 108.8998 g
NET WT: .0004 g

BEAKER #: B
15 ml DICHLOROMETHANE
FISHER OPTIMA LOT #: 910732

FINAL WT: 106.3060 g
TARE WT: 106.3054 g
NET WT: .0006 g

BEAKER #: C
200 ml DISTILLED WATER
BONNEAU PRODUCTS CERTIFIED

FINAL WT: 106.9637 g
TARE WT: 106.9635 g
NET WT: .0002 g

BEAKER TARES INTO DESSC: TIME: 0900 DATE: 6/4/93

BKR #	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME	4TH WT	TIME
A	108.8997	1102	108.8998	1044				
B	106.3056	1104	106.3054	1046				
C	106.9640	1106	106.9635	1048				

SCALE ROOM QC : TARES

DATE	TIME	BY	WB	DB	%
6/7	940	LK	56	68	47
6/8	1042	DK	56	68	47

SCALE ROOM QC : FINALS

DATE	TIME	BY	WB	DB	%
6/14	926	DK	63	76	49
6/15	902	LK	58	70	48

BEAKERS: FINAL WEIGHTS

BKR #	IN DSC	TIME	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME
A	6/11	1030	108.9001	928	108.9002	912		
B	6/11	1031	106.3059	930	106.3060	914		
C	6/11	1032	106.9639	932	106.9637	916		

BKR #	4TH WT	TIME	5TH WT	TIME	6TH WT	TIME	7TH WT	TIME

Unit: HT2000 (FX)
Run: 1
Date: 6/23/93
Technician(s): BN
WSTAPP1-AppDoc19-page2
Rev 6/90

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Blank Audit: By: Bill Nowak Date: 6/15/93

Blank Calculations:

Acetone: .0004 g ÷ 200 ml = .000002 g/ml

Dichloromethane: .0006 g ÷ 75 ml = .000008 g/ml

Distilled Water: .0002 g ÷ 200 ml = .000001 g/ml

Front Half Catch:

Filters:	.1503 g	-	1	(.0000 g)	=	.1503 g
	Total Catch		No. of filters	Blank Value/ filter		Net Catch
Beakers:	.1112 g	-	100	(.000002 g)	=	.1110 g
	Total Catch		Ml of Acetone	Blank Value/ ml of Acetone		Net Catch

Total Front Half Catch .2613 g

Back Half Catch:

Filters:	.1697 g	-	1	(.0000 g)	=	.1697 g
	Total Catch		No. of filters	Blank Value/ filter		Net Catch

Beakers:

1. Acetone/Impingers:	.3761 g	-	200	(.000002 g)	=	.3757 g
	Total Catch		ml of acetone	Blank Value/ ml of Acetone		Net Catch
2. Extract/Impingers:	.1067 g	-	75	.0006 (.000008 g)	=	.1061 g
	Total Catch		ml. of Dichloromethane	Blank Value/ ml of Dichloro-methane		Net Catch
3. Water/Impingers:	.3618 g	-	440	(.000001 g)	=	.3614 g
	Total Catch		ml. of water	Blank Value/ ml of water		Net Catch

Total Back Half Catch 1.0129 g
Total Catch 1.2742 g
% Front Half 20.5 %

EPA METHOD 5H PARTICULATE CALCULATIONS
WOODSTOVE TEST DATA SHEET #7

Unit: HT 2000
Run: 1 Date: 6/23/9-
Technician(s): BN

1) Vm(std)= $\dfrac{(146.631 \text{ Vm})(17.64)(1.028 \text{ mcf})(30.30 \text{ " Hg} + \frac{.130 \text{ " H2O}}{13.6})}{(553 \text{ TmA})} = \dfrac{145.7377}{000.0000}$ dscf

2) Vw(std)= (.04707)(301.8 ml H2O)= $\dfrac{14.2057}{00.0000}$ scf

3) Asw= $\dfrac{(14.2057 \text{ scf})}{(14.2057 \text{ scf} + 145.7377 \text{ dscf})} = \dfrac{.0888}{.0000}$ Bws X 100 = $\dfrac{8.8817}{00.0000}$ % H2O

4) Cs= $\dfrac{(1.2742 \text{ g.})}{(145.7377 \text{ dscf})}(15.43) = \dfrac{.1349}{0.0000}$ gr/dscf

5) Estimated g/hr= $\dfrac{(1.2742 \text{ g.})}{(145.7377 \text{ dscf})}\left(\dfrac{3.5116}{00.000} \text{ dscfm}\right)(60) = \dfrac{1.8444}{00.0000}$ g/hr

---

Vm =	total cubic feet pulled on meter box during test	(p. 2)	(000.000 V
mcf =	meter correction factor (Y factor) of the meter box used for the test	(p. 2)	(0.000 mcf
" Hg =	average barometric pressure during the test	(p. 2)	(00.00 " Hg
" H2O =	average delta H for the test	(p. 2)	(.000 " H2O
TmA =	average meter temperature for the test in degrees Absolute	(p. 2)	(000 TmA
ml H2O =	total water caught during the test	(p. 3)	(000.0 ml H2O
g. =	total particulate catch for the test	(p. 6)	(00.0000 g.
dscfm =	average stack flow during the test	(computer printout)	(00.000 dscf

PRTCALC

Miscellaneous Test Data Sheet Page # 8

Unit: FX HT 2000 Run: 1 Date: 6/23/93

Test Chamber Air Velocity Start: 0 Stop: 0 Avg: 0

Wet Bulb / Dry Bulb
Start: WB: 60 DB: 72 = 50 % RH 1.3 %H2O
Stop: WB: 62 DB: 77 = 44 % RH 1.4 %H2O

Average % Relative Humidity 47.0 Average % Ambient Moisture: 1.35

Empty Stove Weight: 487 lbs
Empty Stove Weight w/ Stack & Oil Seal: Wet: 533.4 Dry: 533.1

Kindling Weight: Paper: .3 lbs Wood: 5.2 lbs

Preburn Fuel Wt: 8.5+ 20.3+21.8 Total: 50.6 lbs

Total Kindling & Preburn Fuel Weight (Wood Only) ==> Total: 55.8 lbs

Coal Bed Weight: RANGE: 5.4 - 4.4 lbs SCALE: 538.5 - 537.5 lbs
Upper = .25 x fuel wt
Always round DOWN to nearest tenth
Lower = .20 x fuel wt
Always round UP to nearest tenth
Actual Coal Bed Weight: 5.2 lbs

Maximum Coal Bed Weight Removal ((5.4 Upper + 4.4 Lower)/2).25 = 1.2 lbs

Test Fuel (.75 x 1.5 x 5 " spacers) = 16 pcs

Dimensions	Length in inches	No. pcs	Wt. in lbs	% of load
2 x 4	NA	NA	NA	NA
4 x 4	18.5	5	21.7	100.0

Test Fuel Weight: 21.7 lbs

Estimated Dry Burn Rate Calculation
$$\frac{21.7 - (21.7 \times .18664)}{2.2046} \times \frac{60}{500\ \text{Time}} = .9607\ \text{Kg/Hr}$$

Estimated EPA Heat Output in BTU's / Hr
$$19{,}140 \times \frac{63}{100} \times .9607\ \text{DBR} = 11{,}584\ \text{BTU's/Hr}$$

EPA Default Efficiencies: NON-CAT: 63 CAT: 72 PELLET: 78

NOTES: 8008
1.00 - 481
1.25 - 385

Unit: FX HT 2000 Run: 1 Date: 6/23/93

WOODSTOVE OPERATING DATA

FIRE STARTED: 0735 PST/PDST

WARM UP AND PREBURN: PRIMARY AIR: set wide open for all warm-up/preburn fuel charges. then set to CLOSED at start of preburn.

SECONDARY AIR: NA CAT BYPASS: NA

CHARCOAL BED PREPARATION: raked and leveled prior to each warm-up/preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 40 sec.

TEST: Door Wide Open during loading 1 min 05 sec

PRIMARY AIR: opened full for first 5 min. , then set to run setting of CLOSED .

SECONDARY AIR: NA CAT BYPASS: NA

FAN: ON/OFF during warm-up ON/OFF during preburn
ON/OFF first 30 minutes of test ON/OFF balance of test run
Fan speed set at HIGH .

WOOD DATA: KINDLING: a mix of the grades listed below

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2X4	Manke/Tacoma	Std or btr	s. grn D fir
TEST:	2X4	Packwood	#2 or btr	s. grn D fir
	4x4	Packwood	#2 or btr	s. grn D fir

PELLET FUEL APFI#: ________

All grades WCLB rules

WARM UP INFORMATION:
All pre-burn/warm up fuel pieces were either 13 or ______ inches.

1st warm up/preburn fuel charge (8.5 lbs) added at 0805 .

2nd warm up/preburn fuel charge (20.3 lbs) added at 0845 .

3rd warm up/preburn fuel charge (21.8 lbs) added at 0915 .

4th warm up/preburn fuel charge (______ lbs) added at ______ .

5th warm up/preburn fuel charge (______ lbs) added at ______ .

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

Unit: FX HT 2000
Run: 1
Date: 10/23/93
Technician:
WST1-Form7-Rev11/89

Room Temperature: 70 °F

Correction Factor: 0

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes____. No ✓.
Time Test Fuel Moisture Readings taken at: 900
Calibration Checks: X ✓ Y ✓ 12.0 12.2 22.0 22.0

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1	2x4x8	K	10.5	11.2	11.5	12.3	11.5	12.3	11.933
2									
3									
4	2x4x8	P	19.5	21.3	20.5	22.4	20.5	22.4	22.033
5	2x4x8	P	18.5	20.1	18.5	20.1	18.0	19.6	19.933
6	2x4x8	P	19.0	20.7	18.5	20.1	18.5	20.1	20.300
7	2x4x8	P	21.5	23.5	21.5	23.5	21.0	22.9	23.300
8	2x4x8	P	21.0	22.9	21.0	22.9	19.5	21.3	22.367
9									107.933
10									
11									
12	4x4x18½	T	19.5	21.3	22.0	24.1	20.5	22.4	22.600
13	4x4x18½	T	20.0	21.8	20.5	22.4	21.5	23.5	22.567
14	4x4x18½	T	21.0	22.9	20.5	22.4	21.5	23.5	22.933
15	4x4x18½	T	21.0	22.9	21.0	22.9	20.5	22.4	22.733
16	4x4x18½	T	22.0	24.1	22.0	24.1	21.5	23.5	23.900
17									114.733
18									
19									
20	FEET	T	19.5	21.3	20.5	22.4	20.5	22.4	22.033

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	11.933 %	21.587 %	22.947 %
% Moisture - Wet Basis:	10.661 %	17.754 %	18.664 %

To obtain Wet from Dry: $\frac{100 \times \%\ \text{Dry Rdg.}}{100 + \%\ \text{Dry Rdg.}}$ = % Moisture, Wet Basis

Acceptable Ranges: 16-20% wet; 19-25% dry
(17.5 - 22.5 on Meter [Uncor reading] at 70°F)

Key for Use: K= Kindling P= Pretest Fuel T= Test Fuel

Unit: FX DROLET
Run#: 1
Date: 6/22/93
Technician:

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 4 x 4 x 3 1/2

Depth (D): 8.9 cm

Width (W): 8.9 cm

Length (L): 8.4 cm, 8.6 cm, 8.5 cm, 8.4 cm

Length $\bar{X}$ = 8.475 cm

Volume: 671.305 cm^3 (D X W X L)

MOISTURE: Room Temperature: 69 °F Correction Factor: 0

Uncorrected Meter Readings Corrected for temperature: Yes ___ No ✓

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	18.5	20.1 %
Bottom:	19.0	20.7 %
Side:	20.0	21.8 %
$\bar{X}$:		20.867 %

Avg % Moisture (Dry) 20.867 %

Avg % Moisture (Wet) 17.264 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 285.6 g Dry Weight: 238.0 g

% Moisture Dried Basis: 16.667 %
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	6/22/93	1000	216 °F
Out of Dryer	7/1/93	1005	221 °F

(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 238.0 g (dry wt) ÷ 671.305 cm^3 (volume) = .3545 g/cm^3

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ________ g

Wet Wt: ________ g (Gross Wet Wt.) - ________ g (Tare Beaker Wt.) = ________ g (Net Wet Wt.)

Dry Wt: ________ g (Gross Dry Wt.) - ________ g (Tare Beaker Wt.) = ________ g (Net Dry Wt.)

% Moisture Dried Basis: ________ %
[1 - (Net Dry Wt ÷ Net Wet Wt.)] X 100

558.3

PAGE 12 [illegible]S DATA SHEET

MANUFACT[illegible]ER/MODEL FX HT 2000 **RUN** 1 **DATE** 6/23/93 **PAGE** 1 **OF** 5

TIME	SCALE	FUEL	DROP	v.	CO2	v.	O2	v.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
0 / 1040	560.0	21.7	0	.444	11.0	.347	8.6	.123	1.23	9.0	111	180	6.2	129	375	-.049	900
05 / 45	558.9	20.6	1.1	.241	6.0	.576	14.3	.044	.44	13.6	112	260	4.7	135	553	-.064	300
10 / 50	558.3	20.0	.6	.304	7.5	.479	11.9	.104	1.04	7.2	126	213	11.0	132	320	-.050	850
15 / 55	557.8	19.5	.5	.335	8.3	.451	11.2	.102	1.02	8.1	123	194	10.2	131	294	-.050	750
20 / 1100	557.0	18.7	.8	.394	9.8	.405	10.0	.124	1.24	7.9	125	190	11.5	132	287	-.048	725
25 / 05	556.4	18.1	.6	.485	12.0	.334	8.3	.092	.92	13.1	126	194	11.0	133	313	-.049	725
30 / 10	555.8	17.5	.6	.304	7.5	.467	11.6	.133	1.33	5.7	124	189	11.3	133	301	-.046	750
35 / 15	555.2	16.9	.6	.378	9.4	.416	10.3	.128	1.28	7.3	124	188	11.3	133	301	-.048	750
40 / 20	554.5	16.2	.7	.405	10.1	.394	9.8	.117	1.17	8.6	124	189	11.3	133	300	-.047	775
45 / 25	553.7	15.4	.8	.434	10.8	.371	9.2	.099	.99	10.9	124	190	11.3	133	301	-.048	750
50 / 30	553.1	14.8	.6	.469	11.6	.357	8.8	.072	.72	16.2	123	194	10.2	131	309	-.050	725
55 / 35	552.6	14.3	.5	.451	11.2	.364	9.0	.075	.75	14.9	123	195	10.2	131	309	-.049	725
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	3963	-.598	-----
60 / 40	550.0	13.7	.6	.448	11.1	.368	9.1	.077	.77	14.4	122	193	10.5	131	307	-.048	750
65 / 45	551.4	13.1	.6	.505	12.5	.326	8.1	.058	.58	21.6	122	196	10.5	132	321	-.049	725
70 / 50	550.9	12.6	.5	.478	11.9	.350	8.7	.062	.62	19.1	121	196	10.0	131	315	-.048	725
75 / 55	550.5	12.2	.4	.451	11.2	.372	9.2	.053	.53	21.1	121	194	10.0	130	308	-.045	725
80 / 1200	549.9	11.6	.6	.478	11.9	.337	8.3	.095	.95	12.5	120	193	9.5	130	311	-.046	775
85 / 05	549.3	11.0	.6	.453	11.2	.362	9.0	.088	.88	12.8	119	191	8.8	129	304	-.046	750
90 / 10	548.7	10.4	.6	.471	11.7	.344	8.5	.091	.91	12.8	118	193	8.5	128	308	-.046	775
95 / 15	548.2	9.9	.5	.509	12.6	.307	7.6	.082	.82	15.4	119	196	8.8	130	321	-.049	775
100 / 20	547.7	9.4	.5	.477	11.8	.342	8.5	.049	.49	24.2	117	193	8.0	126	308	-.046	750
105 / 25	547.4	9.1	.3	.456	11.3	.373	9.2	.072	.72	15.7	117	191	8.0	126	303	-.045	775
110 / 30	547.0	8.7	.4	.432	10.7	.371	9.2	.085	.85	12.6	115	185	7.8	125	292	-.045	800
115 / 35	546.6	8.3	.4	.450	11.2	.351	8.8	.076	.76	14.7	114	184	7.5	123	289	-.043	775
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	3687	-.556	-----
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	7650	-1.154	-----

538.3

PAGE 12 S DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 1 **DATE** 6/23/93 **PAGE** 2 **OF** 5

TIME	SCALE	FUEL	DROP	v.	CO2	v.	O2	v.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
120 / 1240	546.1	7.8	.5	.455	11.3	.351	8.7	.073	.73	15.5	112	180	7.0	121	286	-.043	800
125 / 45	545.8	7.5	.3	.439	10.9	.369	9.1	.067	.67	16.3	111	178	6.9	120	283	-.042	800
130 / 50	545.6	7.3	.2	.395	9.8	.417	10.3	.063	.63	15.6	108	172	6.0	118	271	-.039	800
135 / 55	545.3	7.0	.3	.391	9.7	.414	10.3	.064	.64	15.2	108	171	6.0	118	268	-.038	800
140 / 1300	545.0	6.7	.3	.386	8.6	.415	10.3	.076	.76	12.6	107	167	5.9	117	260	-.036	825
145 / 05	544.7	6.4	.3	.330	8.2	.486	12.0	.265	2.65	3.1	106	159	5.8	114	236	-.035	875
150 / 10	544.5	6.2	.2	.310	7.7	.474	11.7	.265	2.65	2.9	104	151	5.6	111	228	-.032	950
155 / 15	544.3	6.0	.2	.271	6.7	.478	11.8	.275	2.75	2.4	102	150	5.1	110	222	-.031	1025
160 / 20	544.1	5.8	.2	.284	7.0	.475	11.8	.215	2.15	3.3	100	147	4.8	109	218	-.030	975
165 / 25	543.9	5.6	.2	.253	6.3	.527	13.1	.155	1.55	4.0	99	143	4.6	108	209	-.028	950
170 / 30	543.8	5.5	.1	.257	6.4	.524	13.0	.152	1.52	4.2	99	141	4.6	108	204	-.028	950
175 / 35	543.6	5.3	.2	.239	6.9	.520	12.9	.233	2.33	2.5	98	138	4.6	106	198	-.027	1025
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	2883	-.409	-----
180 / 40	543.4	5.1	.2	.248	6.1	.510	12.6	.207	2.07	3.0	98	137	4.6	106	198	-.026	1025
185 / 45	543.3	5.0	.1	.257	6.4	.509	12.6	.199	1.99	3.2	97	137	4.5	105	198	-.026	1025
190 / 50	543.2	4.9	.1	.215	5.3	.526	13.0	.208	2.08	2.6	96	135	4.4	105	197	-.026	1050
195 / 55	543.1	4.8	.1	.232	5.7	.518	12.8	.208	2.08	2.8	95	134	4.3	104	196	-.025	1125
200 / 1400	543.0	4.7	.1	.223	5.5	.524	13.0	.230	2.30	2.4	94	133	3.9	103	197	-.025	1100
205 / 05	542.9	4.6	.1	.209	5.2	.536	13.3	.226	2.26	2.3	94	132	3.9	102	191	-.024	1050
210 / 10	542.8	4.5	.1	.199	4.9	.547	13.6	.238	2.38	2.1	94	130	3.9	102	183	-.023	1075
215 / 15	542.7	4.4	.1	.202	5.0	.534	13.2	.262	2.62	1.9	93	128	4.0	102	182	-.021	1125
220 / 20	542.7	4.4	Ø	.198	4.9	.536	13.3	.272	2.72	1.8	93	128	4.0	102	181	-.021	1125
225 / 25	542.6	4.3	.1	.194	4.8	.538	13.3	.277	2.77	1.7	93	128	4.0	102	180	-.021	1125
230 / 30	542.5	4.2	.1	.195	4.8	.540	13.4	.271	2.71	1.8	93	127	4.0	102	181	-.020	1125
235 / 35	542.4	4.1	.1	.193	4.8	.543	13.5	.272	2.72	1.8	93	127	4.0	102	180	-.020	1125
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	2216.4	-.278	-----
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	5147	-.687	-----

538.3

PAGE 12 [illegible]S DATA SHEET
MANUFACT[illegible]ER/MODEL FX HT 2000 RUN 1 DATE 6/23/93 PAGE 3 OF 5

TIME	SCALE	FUEL	DROP	v.	CO2	v.	O2	v.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
240 / 1440	542.4	4.1	Ø	.193	4.8	.540	13.4	.272	2.72	1.8	93	127	4.0	102	178	-.020	1125
245 / 45	542.3	4.0	.1	.187	4.6	.517	13.6	.267	2.67	1.7	93	127	4.0	102	178	-.020	1125
250 / 50	542.2	3.9	.1	.202	5.0	.511	13.4	.245	2.45	2.0	93	127	4.0	102	177	-.020	1125
255 / 55	542.1	3.8	.1	.198	4.9	.540	13.4	.265	2.65	1.8	93	127	4.0	102	176	-.020	1125
260 / 1500	542.1	3.8	Ø	.181	4.5	.557	13.8	.260	2.60	1.7	93	126	4.0	102	177	-.020	1100
265 / 05	542.0	3.7	.1	.181	4.5	.558	13.8	.251	2.51	1.8	93	123	4.1	100	168	-.019	1100
270 / 10	542.0	3.7	Ø	.189	4.7	.545	13.5	.268	2.68	1.7	93	122	4.1	100	166	-.019	1200
275 / 15	541.9	3.6	.1	.189	4.7	.551	13.7	.267	2.67	1.8	92	122	4.0	99	168	-.019	1200
280 / 20	541.8	3.5	.1	.191	4.7	.547	13.6	.287	2.87	1.6	92	123	4.0	99	169	-.019	1200
285 / 25	541.7	3.4	.1	.186	4.6	.540	13.4	.337	3.37	1.4	93	124	4.1	101	172	-.019	1200
290 / 30	541.6	3.3	.1	.191	4.7	.537	13.3	.350	3.50	1.4	93	124	4.1	101	171	-.019	1200
295 / 35	541.6	3.3	Ø	.192	4.7	.529	13.1	.364	3.64	1.3	93	125	4.1	101	172	-.019	1200
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	2072	-.233	-----
300 / 40	541.5	3.2	.1	.191	4.7	.530	13.1	.362	3.62	1.3	93	125	4.1	101	173	-.019	1175
305 / 45	541.4	3.1	.1	.193	4.8	.529	13.1	.360	3.60	1.3	93	125	4.1	101	173	-.019	1175
310 / 50	541.3	3.0	.1	.191	4.7	.529	13.1	.359	3.59	1.3	93	125	4.1	101	173	-.019	1175
315 / 55	541.2	2.9	.1	.191	4.7	.530	13.1	.357	3.57	1.3	93	125	4.1	101	173	-.019	1150
320 / 1600	541.1	2.8	.1	.195	4.8	.524	13.0	.365	3.65	1.3	93	125	4.1	101	173	-.019	1150
325 / 05	541.1	2.8	Ø	.197	4.9	.522	12.9	.368	3.68	1.3	93	125	4.1	101	173	-.019	1150
330 / 10	541.0	2.7	.1	.191	4.7	.530	13.1	.372	3.72	1.3	93	125	4.1	101	173	-.019	1150
335 / 15	540.9	2.6	.1	.191	4.7	.528	13.1	.377	3.77	1.3	93	125	4.1	101	174	-.019	1150
340 / 20	540.8	2.5	.1	.194	4.8	.525	13.1	.380	3.80	1.3	93	125	4.1	101	174	-.019	1175
345 / 25	540.7	2.4	.1	.194	4.8	.525	13.0	.383	3.83	1.3	93	125	4.1	101	175	-.019	1175
350 / 30	540.6	2.3	.1	.197	4.9	.525	13.0	.380	3.80	1.3	93	126	4.1	101	174	-.019	1200
355 / 35	540.5	2.2	.1	.198	4.9	.524	13.0	.380	3.82	1.3	93	126	4.1	101	175	-.019	1200
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	2083	-.228	-----
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	4155	-.461	-----

539.3

PAGE 12 GA[illegible] DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 1 **DATE** 6/23/93 **PAGE** 4 **OF** 5

TIME	SCALE	FUEL	DROP	v.	CO2	v.	O2	v.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
360 / 1640	540.4	2.1	.1	.196	4.8	.529	13.1	.369	3.69	1.3	93	126	4.1	101	175	-.019	1200
365 / 45	540.4	2.1	∅	.194	4.8	.526	13.0	.373	3.73	1.3	93	126	4.1	101	175	-.019	1200
370 / 50	540.3	2.0	.1	.196	4.8	.526	13.0	.371	3.71	1.3	93	126	4.1	101	174	-.019	1200
375 / 55	540.2	1.9	.1	.198	4.9	.523	13.0	.376	3.76	1.3	93	126	4.1	101	175	-.019	1200
380 / 1700	540.1	1.8	.1	.199	4.9	.524	13.0	.368	3.68	1.3	93	126	4.1	101	175	-.019	1175
385 / 05	540.0	1.7	.1	.199	4.9	.526	13.0	.365	3.65	1.3	93	126	4.1	101	175	-.019	1150
390 / 10	539.9	1.6	.1	.198	4.9	.523	13.0	.368	3.68	1.3	93	126	4.1	101	175	-.019	1150
395 / 15	539.8	1.5	.1	.200	4.9	.528	13.1	.361	3.61	1.4	93	126	4.1	101	174	-.019	1150
400 / 20	539.7	1.4	.1	.196	4.8	.534	13.2	.355	3.55	1.4	93	125	4.1	101	175	-.019	1150
405 / 25	539.7	1.4	∅	.196	4.8	.537	13.3	.350	3.50	1.4	93	125	4.1	101	175	-.019	1125
410 / 30	539.6	1.3	.1	.195	4.8	.537	13.3	.348	3.48	1.4	93	125	4.1	101	174	-.019	1150
415 / 35	539.5	1.2	.1	.191	4.7	.539	13.4	.349	3.49	1.4	93	125	4.1	101	174	-.019	1150
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	-----	2096	-.228	-------
420 / 40	539.4	1.1	.1	.193	4.8	.530	13.1	.151	1.51	3.2	93	126	4.1	101	174	-.020	1150
425 / 45	539.3	1.0	.1	.255	6.3	.523	13.0	.142	1.42	4.4	93	126	4.1	101	174	-.020	1150
430 / 50	539.3	1.0	∅	.247	6.1	.528	13.1	.157	1.57	3.9	93	126	4.1	101	175	-.020	1150
435 / 55	539.2	.9	.1	.243	6.0	.533	13.2	.154	1.54	3.9	93	126	4.1	101	174	-.020	1175
440 / 1800	539.1	.8	.1	.238	5.9	.536	13.3	.156	1.56	3.8	93	126	4.1	101	174	-.020	1175
445 / 05	539.0	.7	.1	.240	5.9	.534	13.2	.155	1.55	3.8	93	126	4.1	101	174	-.020	1150
450 / 10	539.0	.7	∅	.234	5.8	.540	13.4	.149	1.49	3.9	93	126	4.1	101	174	-.020	1150
455 / 15	538.9	.6	.1	.229	5.7	.544	13.5	.168	1.68	3.4	93	126	4.1	101	173	-.020	1175
460 / 20	538.8	.5	.1	.222	5.5	.547	13.6	.168	1.68	3.3	93	126	4.1	101	175	-.020	1150
465 / 25	538.7	.4	.1	.224	5.5	.541	13.4	.178	1.78	3.1	93	125	4.1	101	175	-.020	1175
470 / 30	538.7	.4	∅	.225	5.6	.516	13.5	.170	1.70	3.3	93	125	4.1	101	174	-.020	1200
475 / 35	538.6	.3	.1	.195	4.8	.574	14.2	.215	2.15	2.2	92	125	3.8	99	174	-.020	1200
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	-----	2090	-.240	-------
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	-----	4186	-.468	-------

538.3

PAGE 12 GAS DATA SHEET

MANUFACTURER/MODEL FX HT 2000 **RUN** 1 **DATE** 6/23/93 **PAGE** 5 **OF** 5

TIME	SCALE	FUEL	DROP	V.	CO2	V.	O2	V.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
480/1840	538.5	.2	.1	.187	4.6	.586	14.4	.195	1.95	2.4	92	125	3.8	99	175	-.020	1175
485/45	538.5	.2	Ø	.187	4.6	.586	14.5	.180	1.80	2.6	92	124	3.8	99	173	-.020	1175
490/50	538.4	.1	.1	.190	4.7	.582	14.4	.179	1.79	2.6	92	124	3.8	99	172	-.020	1175
495/55	538.11	.1	Ø	.190	4.7	.586	14.5	.169	1.69	2.8	92	124	3.8	99	171	-.020	1175
500/1900	538.3	Ø	.1	.172	4.3	.596	14.8	.195	1.95	2.2	92	124	3.8	99	171	-.020	1175
															862	÷.100	÷101
															22000	÷2.870	
															218	÷.028	
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----			-------
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----			-------
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----			-------

538.5 - 537.5

PAGE 1 PREBURN DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 1 **DATE** 6/23/93 **PAGE** 1 **OF** 1

TIME	SCALE WT	BURN RATE	STACK	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	STATIC	COMMENTS
00 / 935	546.1	—	686	694	579	120	539	419	974	1367	84	-.075	PRIMARY AIR SET AT: 470.2
05 / 40	544.8	1.3	403	601	574	119	535	420	835	1130	85	-.061	CLOSED
10 / 45	544.3	.5	360	535	553	119	512	413	804	1142	84	-.055	SECONDARY AIR SET AT: 426.4
15 / 50	543.6	.7	349	506	535	116	495	409	795	1173	83	-.052	NA
20 / 55	542.9	.7	341	490	515	116	477	400	793	1291	83	-.052	FAN: 394.6
25 / 1000	542.1	.8	344	486	500	115	465	393	793	1388	83	-.053	
30 / 05	541.4	.7	342	487	491	115	459	386	791	1369	83	-.052	387.6
35 / 10	540.7	.7	330	480	481	111	458	375	792	1379	82	-.051	PUMPS ON AT: 1005
40 / 15	540.1	.6	320	479	473	110	453	367	790	1317	81	-.050	376.4
45 / 20	539.6	.5	301	463	469	108	450	354	792	1296	81	-.046	CHECK WB/DB: 106/180 368.8
50 / 25	539.3	.3	288	450	464	108	444	352	791	1161	82	-.043	363.6
55 / 30	539.0	.3	281	436	458	107	442	344	791	1107	82	-.042	357.4
------	------	------	-----	------	------	------	------	------	------	------	------	-----	----------------------
60 / 35	538.7	.3	270	418	450	106	439	336	794	1098	81	-.040	349.8
65 / 40	538.3	.4	375	402	447	105	437	337	1043	986	81	-.049	345.6

PAGE 14 TEMPERATURE DATA SHEET

MANUFACTURER/MODEL EX HT 2000 RUN 1 DATE 6/23/93 PAGE 1 OF 5

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	
0 / 1040	402	447	105	437	337	1043	986	81	1362	245	34	245	36	38	345.6
05 / 45	393	440	106	438	336	710	715	82	1362	245	34	245	36	38	
10 / 50	391	420	108	428	334	599	822	82	1362	246	35	246	36	38	
15 / 55	375	403	107	416	331	603	807	81	1363	246	35	246	37	38	
20 / 1100	362	392	106	411	323	617	910	80	1363	246	35	246	37	38	
25 / 05	408	377	134	409	328	608	1204	80	1363	246	35	246	37	38	
30 / 10	438	367	177	393	324	602	956	79	1363	247	36	246	38	38	
35 / 15	446	360	199	383	318	599	1058	79	1363	247	35	246	38	38	
40 / 20	400	364	109	381	305	607	1126	79	1364	247	35	246	38	38	
45 / 25	403	363	103	383	295	630	1119	80	1364	247	35	246	38	38	
50 / 30	415	361	100	384	285	627	1199	79	1364	246	35	247	38	38	
55 / 35	460	355	120	385	290	629	1169	79	1364	246	35	247	38	38	
TOTAL	4893	4649	1474	4848	3806	7874	12071	961	------	------	------	------	------	------	------
60 / 40	490	350	157	380	291	639	1177	79	1365	246	35	247	38	38	
65 / 45	513	351	183	380	286	656	1245	78	1366	247	35	248	38	38	
70 / 50	476	359	122	379	275	664	1211	79	1366	248	34	248	38	38	
75 / 55	452	363	106	384	264	667	1177	80	1366	248	35	248	38	38	
80 / 1200	443	365	101	384	262	677	1228	80	1366	248	36	248	38	38	
85 / 05	462	364	108	382	258	682	1076	80	1367	248	36	248	38	38	
90 / 10	511	362	146	382	259	694	1215	79	1369	248	36	248	38	38	
95 / 15	545	362	177	380	254	701	1301	79	1371	247	36	247	37	38	
100 / 20	482	370	109	381	245	714	1230	80	1377	247	36	247	36	38	
105 / 25	473	372	105	383	244	708	1151	80	1381	248	36	248	36	38	
110 / 30	441	377	100	388	231	737	1169	80	1390	248	36	248	36	38	
115 / 35	431	379	98	390	231	743	1142	80	1395	248	36	248	36	38	
TOTAL	5719	4374	1512	4593	3100	8282	14322	954	------	------	------	------	------	------	------
TOTAL	10612	9023	2986	9441	6906	16156	26393	1915	------	------	------	------	------	------	------

 TEMPERATURE DATA SHEET

MANUFACTURER/MODEL FX HT 2000 RUN 1 DATE 6/23/93 PAGE 2 OF 5

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	
120 / 1240	491	375	147	392	237	753	1064	79	1404	248	36	248	36	38	345.6
125 / 45	499	378	174	394	233	758	1027	79	1410	248	36	248	36	38	
130 / 50	424	391	111	395	223	753	948	80	1423	248	36	248	36	38	
135 / 55	416	392	107	397	223	752	948	80	1424	248	36	247	36	39	
140 / 1300	394	393	101	398	219	745	977	81	1426	248	36	247	36	39	
145 / 05	390	387	118	400	219	743	815	80	1430	248	34	248	36	39	
150 / 10	390	382	149	394	222	742	797	80	1432	248	33	247	36	39	
155 / 15	378	379	178	393	220	744	776	79	1433	248	33	246	36	38	
160 / 20	366	375	202	387	221	738	779	78	1435	248	34	245	36	38	
165 / 25	305	378	108	384	212	728	729	79	1437	248	34	245	36	38	
170 / 30	296	377	105	385	212	726	722	78	1438	248	34	245	36	38	
175 / 35	304	368	121	384	210	727	724	78	1441	248	34	245	36	38	
TOTAL	4653	4575	1621	4703	2651	8909	10306	951	------	------	------	------	------	------	------
180 / 40	318	359	162	378	213	724	719	77	1444	247	33	245	36	37	
185 / 45	322	357	181	374	214	721	716	77	1445	248	33	244	36	37	
190 / 50	325	350	191	371	214	714	717	77	1446	248	33	244	36	37	
195 / 55	327	349	209	369	214	710	719	77	1447	247	33	244	36	37	
200 / 1400	299	349	140	363	214	707	706	78	1448	247	34	244	35	36	
205 / 05	277	350	112	364	207	707	697	78	1449	247	35	244	35	36	
210 / 10	266	346	110	363	208	700	683	78	1450	248	36	245	35	36	
215 / 15	287	335	157	351	213	694	666	77	1451	247	36	245	35	36	
220 / 20	290	333	180	348	213	693	652	78	1451	248	36	245	35	36	
225 / 25	290	330	192	340	212	688	646	79	1451	247	36	245	35	36	
230 / 30	290	328	203	336	212	684	638	79	1449	248	36	245	35	35	
235 / 35	290	326	211	335	214	676	633	79	1447	247	36	246	35	35	
TOTAL	3581	4112	2048	4295	2548	8418	8192	934	------	------	------	------	------	------	------
TOTAL	8234	8687	3669	8998	5199	17327	18498	1885	------	------	------	------	------	------	------

PAGE 14 TEMPERATURE DATA SHEET

MANUFACTURER/MODEL FX HT 2000 RUN 1 DATE 6/23/93 PAGE 3 OF 5

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / CAT	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	
240 / 1440	289	324	218	330	216	666	628	80	1449	248	36	247	34	35	345.6
245 / 45	289	323	220	331	216	664	625	80	1449	248	36	246	34	35	
250 / 50	288	322	222	327	216	656	630	80	1449	248	36	247	34	35	
255 / 55	286	320	224	322	215	651	625	80	1449	248	36	246	34	35	
260 / 1500	258	326	123	327	214	646	619	81	1449	248	36	248	34	35	
265 / 05	245	322	113	325	207	636	606	81	1449	248	36	248	34	34	
270 / 10	256	315	145	315	212	633	600	80	1449	248	36	248	34	34	
275 / 15	260	313	171	312	212	629	601	80	1448	248	36	248	34	34	
280 / 20	263	312	189	309	215	630	599	80	1447	248	36	248	34	34	
285 / 25	265	310	199	306	214	633	610	81	1442	248	36	248	34	34	
290 / 30	266	308	208	303	213	634	611	80	1438	248	37	248	34	34	
295 / 35	268	307	213	302	215	638	613	80	1440	248	37	248	34	34	
TOTAL	3233	3802	2245	3809	2565	7716	7367	963	------	------	------	------	------	------	------
300 / 40	268	307	215	301	213	641	613	80	1442	248	37	248	34	34	
305 / 45	269	306	218	301	216	643	612	80	1443	248	37	247	34	34	
310 / 50	269	306	219	301	217	642	610	80	1445	248	37	247	34	34	
315 / 55	269	306	220	302	218	642	609	80	1446	248	37	247	34	34	
320 / 1600	270	305	222	304	220	640	615	86	1448	248	37	247	34	34	
325 / 05	270	305	222	302	220	639	615	80	1448	247	37	247	34	34	
330 / 10	270	304	223	299	220	646	609	80	1448	247	37	247	34	34	
335 / 15	270	303	223	302	221	647	608	80	1449	247	36	246	34	34	
340 / 20	270	303	224	301	222	653	613	80	1449	247	37	246	34	34	
345 / 25	271	302	224	301	222	656	615	79	1449	247	37	247	34	34	
350 / 30	271	303	225	301	221	659	614	80	1449	247	37	246	34	34	
355 / 35	272	303	225	303	223	659	617	80	1448	247	37	246	34	34	
TOTAL	3239	3653	2660	3618	2633	7767	7350	959	------	------	------	------	------	------	------
TOTAL	6472	7455	4905	7427	5198	15483	14717	1922	------	------	------	------	------	------	------

PAGE 1 TEMPERATURE DATA SHEET
MANUFACTURER/MODEL FX HT2000 **RUN** 1 **DATE** 6/23/93 **PAGE** 4 **OF** 5

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	345.6
360 / 1640	272	304	225	302	223	657	616	80	1446	247	37	246	34	34	
365 / 45	273	304	226	303	223	657	613	80	1446	247	37	246	34	34	
370 / 50	273	303	226	303	223	655	616	80	1446	248	37	246	34	34	
375 / 55	273	303	227	303	225	673	609	80	1445	247	37	247	34	34	
380 / 1700	273	302	227	305	225	670	614	80	1445	248	37	247	34	34	
385 / 05	273	303	228	306	227	670	610	80	1446	248	37	246	34	34	
390 / 10	273	302	228	310	228	668	612	79	1447	248	37	247	34	34	
395 / 15	272	303	228	304	228	659	616	79	1448	248	37	247	34	34	
400 / 20	273	305	229	304	230	658	608	79	1448	248	37	247	34	34	
405 / 25	272	305	230	304	230	659	608	79	1447	248	37	247	34	34	
410 / 30	272	306	231	303	231	647	606	79	1447	248	36	247	34	34	
415 / 35	272	306	232	303	231	642	600	79	1447	247	36	247	34	34	
TOTAL	3271	3646	2737	3650	2724	7915	7322	954	------	------	------	------	------	------	------
420 / 40	273	305	233	303	232	654	616	79	1446	248	36	247	34	34	
425 / 45	273	306	233	304	233	658	618	79	1447	248	36	247	34	34	
430 / 50	276	306	234	304	235	667	611	79	1446	248	36	247	34	34	
435 / 55	276	307	235	306	235	662	625	79	1446	248	37	247	34	34	
440 / 1800	278	309	236	306	236	665	627	79	1447	248	37	247	34	34	
445 / 05	278	308	236	309	236	663	627	79	1448	248	37	247	34	34	
450 / 10	278	310	237	307	238	661	627	79	1448	248	37	248	34	34	
455 / 15	278	309	237	308	238	657	626	79	1449	248	36	247	34	34	
460 / 20	279	310	238	307	237	657	627	79	1449	248	36	247	34	34	
465 / 25	279	308	239	310	239	657	627	78	1449	248	36	248	34	34	
470 / 30	278	308	238	311	239	642	628	78	1449	248	36	248	34	34	
475 / 35	278	306	238	309	240	628	617	77	1448	248	35	248	34	34	
TOTAL	3324	3692	2834	3684	2838	7871	7476	944	------	------	------	------	------	------	------
TOTAL	6595	7338.	5571.	7334	5562	15786	14798.	1898.	------	------	------	------	------	------	------

PAGE 14 TEMPERATURE DATA SHEET
MANUFACTURER/MODEL FX HT 2000 RUN 1 DATE 6/23/93 PAGE 5 OF 5

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	3456
480 / 1840	277	304	238	305	240	619	610	77	1447	247	35	247	34	34	
485 / 45	276	303	238	300	240	614	603	78	1447	247	35	247	34	34	
490 / 50	275	301	238	297	242	611	602	78	1446	247	35	247	34	34	
495 / 55	273	300	238	296	242	607	596	78	1446	247	35	246	34	34	
500 / 1900	273	301	238	295	243	598	593	78	1445	246	35	245	34	34	
									÷101						
	1374	1509	1190	1493	1207	3049	3004	389							
	33287	34012	18321	34693	24072	67801	77410	8009		ΔT START		345.6			
	330.	337.	181.	343.	238.	671.	766	79		STOP		270.0			
												-75.6			
TOTAL									------	------	------	------	------	------	------
TOTAL									------	------	------	------	------	------	------
TOTAL									------	------	------	------	------	------	------

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/23/93 Analyte: CO_2 (15-1)

Source: FX HT 2000 Run #: 1

Zero Cyl #: T132257 Conc. 00.0 % CO_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS40875 Conc. 12.6 % CO_2 Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 407069

Range: 0 - 25.0% CO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ______

EPA Span Value = 25.0% CO_2
EPA Control Limits = ± 2.5% of 25.0% CO_2 = ± 0.625% CO_2

Pre Run Audit: By: DK Time: 0930 Temp: 84 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	-.029	-.029	-.116
Span	504	.504	12.6	50.5	.505	12.538	-.062	-.488

Comments:

Post Run Audit: By: DK Time: 1910 Temp: 78 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.3	.003	.046	.046	.183
Span	50.4	.504	12.6	50.1	.501	12.439	-.161	-1.278

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/23/93 Analyte: O_2 (15-2)

Source: FX HT 2000 Run #: 1

Zero Cyl #: T132257 Conc. 00.0 % O_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS40875 Conc. 12.8 % O_2 Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Teledyne Model: 320 Ax SN: 37465

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% O_2
EPA Control Limits = + 2.5% of 25.0% O_2 = + 0.625% O_2

Pre Run Audit: By: DK Time: 935 Temp: 84 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	+ Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	-.042	-.042	-.168
Span	12.8	.512	12.8	12.8	.511	12.665	-.135	-1.056

Comments: Teledyne #2 Cyl % Exp % Act % Adj to + Δ %

Post Run Audit: By: DK Time: 1915 Temp.: 78 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	+ Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.1	.004	.057	.057	.230
Span	12.8	.512	12.8	12.7	.510	12.640	-.160	-1.250

Comments: Teledyne #2 Cyl % Exp % Act % Adj to + Δ %

Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/23/93 Analyte: CO (15-3)

Source: FX HT 2000 Run #: 1

Zero Cyl #: T132257 Conc. 00.0 % CO Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS 40875 Conc. 5.01 % CO Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 408005

Range: 0 - 10.0% CO Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 10.0% CO
EPA Control Limits = ±2.5% of 10.0% CO = ± 0.25% CO

Pre Run Audit: By: DK Time: 940 Temp: 84 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.000	.000	.000
Span	50.1	.501	5.01	50.2	.502	5.020	.010	.200

Comments:

Post Run Audit: By: DK Time: 1920 Temp.: 78 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.1	.001	.010	.010	.100
Span	50.1	.501	5.01	49.9	.499	4.990	-.020	-.399

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/23/93 Analyte: SO_2 (15-4)

Source: FX HT 2000 Run #: 1

Zero Cyl #: T132257 Conc. 00.0 ppm SO_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: CC 79076 Conc. 1268 ppm SO_2 Cyl Press: 500 psi

Certified by: LIQUID AIR Date: 2/26/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 403019

Range: 0 - 2500 ppm SO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 2500 ppm SO_2
EPA Control Limits = +2.5% of 2500 ppm SO_2 = +62.5 ppm SO_2

Pre Run Audit: By: DK Time: 945 Temp: 84 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	00.4	.004	5.400	5.400	.216
Span	50.7	.507	1268	50.9	.509	1276.392	8.392	.662

Comments:

Post Run Audit: By: DK Time: 1925 Temp: 78 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	02.0	.020	45.669	45.669	1.827
Span	50.7	.507	1268	50.5	.505	1266.324	-1.676	-.132

Comments:

+ Conc. Difference = Act ppm - Exp (Std) ppm

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

QUALITY CHECKS
DATA SHEET 16

Unit: FX HT 2000 Run: 1 Date: 6/23/93

Thermocouple Check:

T/C #1	68.8	°F	T/C #13	69.0	°F
T/C #2	68.9	°F	T/C #14	68.3	°F
T/C #3	73.4	°F	T/C #15	69.1	°F
T/C #4	75.5	°F	T/C #16	56.2	°F
T/C #5	74.8	°F	T/C #17	58.6	°F
T/C #6	75.8	°F	T/C #18	73.4	°F
T/C #7	75.4	°F	T/C #19		°F
T/C #8	75.2	°F	T/C #20		°F
T/C #9	75.7	°F	T/C #21		°F
T/C #10	74.1	°F	T/C #22		°F
T/C #11	68.2	°F	T/C #23	69.1	°F
T/C #12	69.4	°F	T/C #24	807.2	°F

Thermocoouple Readout:

pretest zero and span check and calibration						post test zero and span			% difference
ZERO	-.2	°F	ADJ. TO	0	°F	ZERO	-.2	°F	.010
SPAN	1999.2	°F	ADJ. TO	2000.0	°F	SPAN	2002.2	°F	.110

Thermocouple Readout Pretest Linearity Check

0 =	0	°F	200 =	201.5	°F	400 =	398.7	°F
600 =	600.8	°F	800 =	801.0	°F	1000 =	1000.0	°F
1200 =	1197.6	°F	1400 =	1398.5	°F	1600 =	1599.0	°F
1800 =	1799.4	°F	2000 =	2000.0	°F			

Sample Train Leak Check	Pre	✓	Post	✓
Combustion Gas Train Leak Check	Pre	✓	Post	✓
Tracer Gas Train (SO_2) Leak Check	Pre	✓	Post	✓
Darft (Static) Gauge Zero Check	Pre	✓	Post	✓

Scale Check

Pre 543.4 - 533.4 = 10.0

Post 548.2 - 538.2 = 10.0

Stack Cleaned Proir to Test Run: YES ✓ NO ____

TABLE 1 ----- RAW DATA

CLIENT : fx drolet TEST No. : 2

MODEL: ht 2000 DATE: 24-Jun-93

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	186.000	0.150	85	0.88	12.30	875
5	187.500	1.120	85	0.38	5.20	325
10	191.584	0.160	88	0.85	5.30	850
15	193.171	0.240	89	0.67	7.50	700
20	195.103	0.230	90	0.64	7.20	700
25	197.043	0.290	90	0.83	10.30	625
30	199.214	0.220	91	1.22	6.60	725
35	201.094	0.190	91	1.43	8.20	775
40	202.853	0.200	91	1.15	8.80	750
45	204.670	0.230	91	1.00	9.20	700
50	206.617	0.270	92	0.94	11.60	650
55	208.720	0.270	92	0.96	10.30	650
60	210.824	0.250	93	1.18	10.60	675
65	212.857	0.270	93	0.98	11.40	650
70	214.968	0.270	93	0.84	11.90	650
75	217.080	0.290	93	0.62	12.10	625
80	219.275	0.270	93	0.60	12.30	650
85	221.386	0.270	94	0.71	12.50	650
90	223.505	0.250	94	0.69	12.70	675
95	225.546	0.250	94	0.47	13.20	675
100	227.586	0.250	94	0.47	12.40	675
105	229.627	0.250	94	0.62	11.70	675
110	231.668	0.210	95	1.14	10.10	725
115	233.575	0.160	95	1.71	8.00	825
120	235.251	0.170	95	1.33	9.30	800
125	236.983	0.150	95	1.79	7.50	875
130	238.566	0.170	95	0.93	8.80	800
135	240.297	0.210	95	0.67	9.60	725
140	242.208	0.210	95	0.74	9.30	725
145	244.118	0.200	95	0.83	9.00	750
150	245.965	0.190	95	0.78	9.20	775
155	247.752	0.190	95	0.71	9.90	775
160	249.539	0.160	95	1.07	7.80	825
165	251.218	0.160	95	1.04	8.20	825
170	252.897	0.190	95	0.99	8.30	775
175	254.684	0.190	95	1.10	8.50	775
180	256.472	0.170	95	1.04	9.10	800
185	258.203	0.170	95	1.11	9.20	800
190	259.935	0.160	95	1.23	8.60	825
195	261.614	0.150	96	1.35	7.70	850
200	263.249	0.150	96	1.42	7.30	850
205	264.885	0.150	96	1.34	7.30	850
210	266.521	0.140	96	1.40	7.70	875
215	268.110	0.150	96	1.54	7.30	850

220	269.745	0.150	96	1.51	7.30	850
225	271.381	0.150	96	1.51	7.30	850
230	273.017	0.160	96	1.44	6.90	825
235	274.702	0.150	96	1.32	7.00	850
240	276.338	0.150	97	1.28	7.10	850
245	277.982	0.140	97	1.29	7.30	875
250	279.579	0.140	97	1.34	7.30	900
255	281.132	0.140	97	1.67	6.70	900
260	282.685	0.140	97	1.57	6.70	875
265	284.283	0.140	97	1.57	6.80	900
270	285.836	0.150	97	1.54	6.50	850
275	287.480	0.150	97	1.61	6.50	850
280	289.124	0.140	97	1.79	6.50	900
285	290.677	0.140	97	1.83	6.60	900
290	292.230	0.140	97	1.83	6.60	900
295	293.783	0.140	97	1.90	6.40	875
300	295.381	0.140	97	1.88	5.90	875
305	296.978	0.140	97	1.81	6.10	900
310	298.531	0.150	97	1.73	5.80	850
315	300.175	0.150	97	1.71	5.70	850
320	301.820	0.140	97	1.71	6.30	900
325	303.373	0.130	97	1.70	6.30	925
330	304.884	0.140	97	1.62	6.30	900
335	306.437	0.140	97	1.65	6.30	900
340	307.990	0.140	97	1.65	6.40	900
345	309.543	0.140	97	1.59	6.50	900
350	311.096	0.140	97	1.51	6.50	875
355	312.693	0.150	97	1.45	6.20	850
360	314.337	0.140	97	1.39	6.30	875
365	315.935	0.130	97	1.29	7.00	925
370	317.446	0.130	97	1.20	7.10	925
375	318.957	0.140	97	1.23	7.10	900
380	320.510	0.140	97	1.21	7.10	900
385	322.063	0.140	97	1.21	7.10	900
390	323.616	0.140	97	1.20	7.10	900
395	325.169	0.150	97	1.17	6.70	850
400	326.813	0.150	97	1.23	6.60	850
405	328.458	0.140	97	1.32	6.90	875
410	330.055	0.140	97	1.39	6.80	875
415	331.652	0.140	97	1.45	6.60	875
420	333.250	0.150	97	1.49	6.70	850
425	334.897	0.150	97	1.53	6.60	850
430	336.544	0.150	97	1.50	6.20	850
435	338.191	0.160	97	1.53	6.20	825
440	339.888	0.150	97	1.52	6.10	850
445	341.535	0.130	97	1.62	6.40	900
450	343.090	0.130	97	1.68	6.30	900
455	344.646	0.130	97	1.50	6.30	900
460	346.202	0.130	97	1.51	6.30	900
465	347.757	0.130	97	1.35	6.10	900
470	349.313	0.130	97	1.22	6.30	900
475						

TABLE 2---RAW DATA

CLIENT : fx drolet — TEST No. 2

MODEL: ht 2000 — DATE: 24-Jun-93

****

METER CAL. FACTOR (Y) ------	1.028		Wt. WOOD BURNED(LB) -------	22.6	Lbs
BAROMETRIC PRESS.(Pb) ------	30.33	in Hg	WET,FUEL MOISTURE % -------	18.492	%
LEAK RATE POST (Lp) ------	0.001	cfm	Wt. PART. COLLECTED -------	1.5937	g
WATER VOL. (V1c) ------	308.4	Ml	METER VOLUME Vm -------	163.313	mcf
TEST TIME (MIN) ------	470	min	HC MOLE FRACTION -------	0.0132	

TABLE 3 -----FIELD DATA AVERAGES

CLIENT :fx drolet		TEST No.	2
MODEL: ht 2000		DATE:	24-Jun-93

****

AVG DELTA H	-------	0.18 in H2O	AVG PRCNT CO	-------	1.26	%
AVG METER TEMP. Tm	-------	95 deg F	AVG PRCNT CO2	-------	7.86	%
AVG PPM SO2	-------	815 PPM	AVG BAL CO2/CO	-------	6.22	%

TABLE 4 ----- CALCULATIONS

CLIENT : fx drolet TEST No. 2

MODEL: ht 2000 DATE: 24-Jun-93

****

STD SAMPLE VOL. Vm(std) -----	161.94	dscf	STACK GAS FLOW Qsd -------	367.983	dscf/Hr
				&	
				6.13	dscf/min
VOL. WATER VAPOR Vw(std) ----	14.516	scf	PARTICULATE CONCTRT. Cs ------	0.0098	g/dscf
PRCNT MSTR Bws -------	8.23	%	PARTC.EMISS. RATE E -------	3.62	g/Hr
BURN RATE BR -------	1.07	Kg/Hr	MOLES OF GAS PER Lb WOOD Nt --	0.41	Lb-mole/Lb
CO EMISSION RATE -------	155.84	g/Hr	PART.EMISS. RATE ------	3.40	g/Kgdry fuel
	&				
	146.06	g/Kgdry fuel			

TABLE 5 ----- PROPORTIONAL RATE VARIATION

CLIENT : fx drolet TEST No. : 2

MODEL: ht 2000 DATE: 24-Jun-93

****

	TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE	
	5	1325.8	96		100	
	10	1340.2	97			
	15	1353.9	98			
	20	1355.2	99			
	25	1359.5	99			
	30	1357.4	99			
	35	1362.0	99			
	40	1362.2	99			
	45	1361.7	99			
	50	1360.7	99			
	55	1363.7	99			
	60	1363.1	99			
	65	1366.4	99			
	70	1366.4	99			
	75	1367.0	99			
	80	1366.2	99			
	85	1365.1	99			
	90	1369.1	100			
	95	1369.3	100			
	100	1368.7	100			
	105	1369.3	100			
	110	1368.1	99			
	115	1371.6	100			
	120	1371.6	100			
	125	1374.5	100			
	130	1373.9	100			
	135	1373.7	100			
	140	1374.5	100			
	145	1373.8	100			
	150	1374.2	100			
	155	1373.9	100			
	160	1373.9	100			
	165	1374.0	100			
	170	1374.0	100			
	175	1373.9	100			
	180	1374.6	100			
	185	1373.7	100			
	190	1374.5	100			
	195	1372.8	100			
	200	1376.0	100			
	205	1376.9	100			
	210	1376.9	100			
	215	1376.6	100			
	220	1376.0	100			

225	1376.9	100
230	1376.9	100
235	1376.4	100
240	1375.6	100
245	1381.1	100
250	1381.1	100
255	1381.4	100
260	1381.4	100
265	1381.9	101
270	1381.4	100
275	1381.1	100
280	1381.1	100
285	1381.4	100
290	1381.4	100
295	1381.4	100
300	1381.9	101
305	1381.1	100
310	1381.4	100
315	1381.1	100
320	1382.0	101
325	1381.4	100
330	1381.3	100
335	1381.4	100
340	1381.4	100
345	1381.4	100
350	1381.4	100
355	1381.1	100
360	1381.1	100
365	1381.9	101
370	1381.3	100
375	1381.3	100
380	1381.4	100
385	1381.4	100
390	1381.4	100
395	1381.4	100
400	1381.1	100
405	1382.0	101
410	1381.1	100
415	1381.1	100
420	1381.9	101
425	1383.6	101
430	1383.6	101
435	1383.6	101
440	1383.8	101
445	1383.6	101
450	1383.1	101
455	1384.0	101
460	1384.0	101
465	1383.1	101
470	1384.0	101
475		
480		

COMPUTER INPUT DATA WOODSTOVE DATA SHEET #1

Client FX DROLET

Client Address 1700 LEONHARMEL

QUEBEC, QUEBEC G1N 4R9

Client Phone 514-565-6336

Project No. ________ Model No. HT 2000

Run No. 2 Date of Test 6/24/93 Est Grams/Hr ________

Stove Type: Cat ____ Non Cat X Pellet ____

Data To Be Submitted To: Oregon ____ Colorado ____ EPA ____

Burn Category: Low (<0.8 Kg/Hr) ____ Med Hi (1.26 - 1.90 Kg/Hr) ____
Med Low (0.8 - 1.25 Kg/Hr) 1.0667 Max (>1.9 Kg/Hr) ____

Fuel % Moisture (dry) 22.687 %(wet) 18.492 %
(00.00) (Data Sheet #10)

Stack Static Pressure -.030 "H_2O
(0.000) (Data Sheet #12)

Barometric Pressure 30.33 "Hg
(00.00) (Data Sheet #2)

Temperature (Average Room) Combustion Air 79 °F
(00) (Data Sheet #14)

Flue Gas Moisture 8.2279 %
(00.000) (Data Sheet #7)

Ambient Moisture 1.3 %
(0.00) (Data Sheet #8)

Stove Weight 487 lbs
(000) (Data Sheet #8)

Stove Temperature Change -60.0 °F
(000) (Data Sheet #14)

Particulate Emission .1519 gr/dscf
(0.0000) (Data Sheet #7)

Fuel Higher Heating Value (dry) 8616 BTU/lb
(0000) (CT&E Sheet)

Fuel Type: Wood: ✓ Pellets: ____

Total Fuel Consumed During Burn 22.6 lbs
(00.0) (Data Sheet #8)

Total Particulate Catch 1.5937 g
(0.0000) (Data Sheet #6)

H_2O Captured 308.4 g
(00.0) (Data Sheet #3)

Dry Gas Meter Volume 163.313 CF
(00.000) (Data Sheet #2)

Dry Gas Meter: Y Factor: 1.028 Post Test Leak Rate .001 CFM

TIME: 470

Meter Box Data Sheet Page # 2

Meter Box 5H Y Factor 1.023

Leak Checks: 15 " Hg @ .005 cfm
15.0 " Hg @ .001 cfm
" Hg @ cfm
" Hg @ cfm

Inject SO2 @ 100 cc/min

Unit: Fx

Run: 2 Date: 6-24-93

Operator(s): CW

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 1.01			Sampling Ratio : 13 : 1				BAROMETER: 30.40		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
00	1015	186.000	—	3.983	.15	85	875	85	2.0
05	20	187.500	—	10,724	1.12	85	325	85	11.0
10	25	191.584	191.584	4.078	.16	88	850	88	2.0
15	30	193.171	193.171	4.943	.24	89	700	89	3.0
20	35	195.103	195.103	4.934	.23	90	700	90	3.0
25	40	197.043	197.043	5.526	.29	90	625	90	3.0
30	45	199.214	199.214	4.755	.22	91	725	91	2.0
35	50	201.094	201.094	4.448	.19	91	775	91	2.0
40	55	202.853	202.853	4.596	.20	91	750	91	2.0
45	1100	204.670	204.670	4.925	.23	91	700	91	2.0
50	05	206.617	206.617	5.294	.27	92	650	92	3.0
55	10	208.720	208.720	5.294	.27	92	650	92	3.0
ROTO PRESS: 1.01			TOTALS :	63.500	3.57	1075	BAROMETER: 30.40		
60	1115	210.824	210.824	5.089	.25	93	675	93	3.0
65	20	212.857	212.857	5.284	.27	93	650	93	2.0
70	25	214.968	214.968	5.284	.27	93	650	93	3.0
75	30	217.080	217.080	5.496	.29	93	625	93	3.0
80	35	219.275	219.275	5.284	.27	93	650	93	3.0
85	40	221.386	221.386	5.275	.27	94	650	94	3.0
90	45	223.505	223.505	5.079	.25	94	675	94	3.0
95	50	225.546	225.546	5.079	.25	94	675	94	3.0
100	55	227.586	227.586	5.079	.25	94	675	94	3.0
105	1200	229.627	229.627	5.079	.25	94	675	94	3.0
110	05	231.668	231.668	4.721	.21	95	725	95	3.0
115	10	233.575	233.575	4.148	.16	95	825	95	3.0
			TOTALS:	60.897	2.99	1125	MAX VACC =		
TOTAL CU FT			TOTALS:	124.397	6.56	2200	AV BP:		

Meter Box Data Sheet Page # 2

Page 2 of 4

Meter Box 5H Y Factor 1.028

Unit: FX

Run: 2 Date: 6-24-93

Leak Checks: 15 " Hg @ .005 cfm
15.0 " Hg @ .001 cfm
" Hg @ cfm
" Hg @ cfm

Operator(s): CL

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 1.03			Sampling Ratio : 13 : 1				BAROMETER: 30.35		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
120	1215	235.251	235.251	4.271	.17	95	800	95	3.0
125	20	236.983	236.983	3.905	.15	95	875	95	3.0
130	25	238.566	238.566	4.271	.17	95	800	95	3.0
135	30	240.297	240.297	4.713	.21	95	725	95	3.0
140	35	242.208	242.208	4.713	.21	95	725	95	3.0
145	40	244.118	244.118	4.556	.20	95	750	95	3.0
150	45	245.965	245.965	4.409	.19	95	775	95	3.0
155	50	247.752	247.752	4.409	.19	95	775	95	3.0
160	55	249.539	249.539	4.142	.16	95	825	95	3.0
165	1300	251.218	251.218	4.142	.16	95	825	95	3.0
170	05	252.897	252.897	4.409	.19	95	775	95	3.0
175	10	254.684	254.684	4.409	.19	95	775	95	3.0
ROTO PRESS: 1.03			TOTALS :	52.349	2.19	1140	BAROMETER: 30.35		
180	1315	256.472	256.472	4.271	.17	95	800	95	3.0
185	20	258.203	258.203	4.271	.17	95	800	95	3.0
190	25	259.935	259.935	4.142	.16	95	825	95	3.0
195	30	261.614	261.614	4.013	.15	96	850	96	3.0
200	35	263.249	263.249	4.013	.15	96	850	96	3.0
205	40	264.885	264.885	4.013	.15	96	850	96	3.0
210	45	266.521	266.521	3.898	.14	96	875	96	3.0
215	50	268.110	268.110	4.013	.15	96	850	96	3.0
220	55	269.745	269.745	4.013	.15	96	850	96	3.0
225	1400	271.381	271.381	4.013	.15	96	850	96	3.0
230	05	273.017	273.017	4.134	.16	96	875	96	3.0
235	10	274.702	274.702	4.013	.15	96	850	96	3.0
			TOTALS:	48.807	1.85	1149	MAX VACC =		
TOTAL CU FT			TOTALS:	101.156	4.04	2289	AV BP:		

Sub T: 225.553 10.16 4489

242
319

Meter Box Data Sheet Page # 2

Meter Box 5H Y Factor 1.028

Leak Checks: 15 " Hg @ .005 cfm
15.0 " Hg @ .001 cfm
" Hg @ cfm
" Hg @ cfm

Inject SO2 @ 100 cc/min

Unit: Fx

Run: 2 Date: 6-24-93

Operator(s): CW

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 1.03			Sampling Ratio : 13 : 1				BAROMETER: 30.30		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
240	1415	276.338	276.338	3.999	.15	97	850	97	3.0
245	20	277.982	277.982	3.885	.14	97	875	97	3.0
250	25	279.579	279.579	3.777	.14	97	900	97	3.0
255	30	281.132	281.132	3.777	.14	97	900	97	3.0
260	35	282.685	282.685	3.885	.14	97	875	97	3.0
265	40	284.283	284.283	3.777	.14	97	900	97	3.0
270	45	285.836	285.836	3.999	.15	97	850	97	3.0
275	50	287.480	287.480	3.999	.15	97	850	97	3.0
280	55	289.124	289.124	3.777	.14	97	900	97	3.0
285	1500	290.677	290.677	3.777	.14	97	900	97	3.0
290	05	292.230	292.230	3.777	.14	97	900	97	3.0
295	10	293.783	293.783	3.885	.14	97	875	97	3.0
ROTO PRESS:		1.03	TOTALS :	46.314	1.71	1164	BAROMETER: 30.30		
300	1515	295.381	295.381	3.885	.14	97	875	97	3.0
305	20	296.978	296.978	3.777	.14	97	900	97	3.0
310	25	298.531	298.531	3.999	.15	97	850	97	3.0
315	30	300.175	300.175	3.999	.15	97	850	97	3.0
320	35	301.820	301.820	3.777	.14	97	900	97	3.0
325	40	303.373	303.373	3.675	.13	97	925	97	3.0
330	45	304.884	304.884	3.777	.14	97	900	97	3.0
335	50	306.437	306.437	3.777	.14	97	900	97	3.0
340	55	307.990	307.990	3.777	.14	97	900	97	3.0
345	1600	309.543	309.543	3.777	.14	97	900	97	3.0
350	05	311.096	311.096	3.885	.14	97	875	97	3.0
355	10	312.693	312.693	3.999	.15	97	850	97	3.0
			TOTALS:	46.104	1.70	1164	MAX VACC =		
TOTAL CU FT			TOTALS:	92.418	3.41	2328	AV BP:		

Meter Box Data Sheet Page # 2

Meter Box 5H Y Factor 1.028

Leak Checks: 15 " Hg @ .005 cfm
15.0 " Hg @ .001 cfm
_____ " Hg @ _____ cfm
_____ " Hg @ _____ cfm

Inject SO2 @ 100 cc/min

Unit: Fx

Run: 2 Date: 6-24-93

Operator(s): (u)

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 1.03			Sampling Ratio : 13 : 1				BAROMETER: 30.30		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
360	1615	314.337	314.337	3.885	.14	97	875	97	3.0
365	20	315.935	315.935	3.675	.13	97	925	97	3.0
370	25	317.446	317.446	3.675	.13	97	925	97	3.0
375	30	318.957	318.957	3.777	.14	97	900	97	3.0
380	35	320.510	320.510	3.777	.14	97	900	97	3.0
385	40	322.063	322.063	3.777	.14	97	900	97	3.0
390	45	323.616	323.616	3.777	.14	97	900	97	3.0
395	50	325.169	325.169	3.999	.15	97	850	97	3.0
400	55	326.813	326.813	3.999	.15	97	850	97	3.0
405	1700	328.458	328.458	3.885	.14	97	875	97	3.0
410	05	330.055	330.055	3.885	.14	97	875	97	3.0
415	10	331.652	331.652	3.885	.14	97	875	97	3.0
ROTO PRESS: 1.03			TOTALS :	45.996	1.68	1164	BAROMETER: 30.25		
420	1715	333.250	333.250	3.992	.15	97	850	97	3.0
425	20	334.897	334.897	3.992	.15	97	850	97	3.0
430	25	336.544	336.544	3.992	.15	97	850	97	3.0
435	30	338.191	338.191	4.113	.16	97	825	97	3.0
440	35	339.888	339.888	3.992	.15	97	850	97	3.0
445	40	341.535	341.535	3.771	.13	97	900	97	3.0
450	45	343.090	343.090	3.771	.13	97	900	97	3.0
455	50	344.646	344.646	3.771	.13	97	900	97	3.0
460	55	346.202	346.202	3.771	.13	97	900	97	3.0
465	1800	347.757	347.757	3.771	.13	97	900	97	3.0
470	05	349.313	349.313	3.771	.13	97	900	97	3.0
475	10			42.107	1.54	1067			
			TOTALS:	88.703	3.22	2231	MAX VACC =		11.0
TOTAL CU FT		163.313	TOTALS:	406.674	17.23	9048	AV BP:	30.33	

÷ 95

4.281 .181 95

555

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

Initial: Balance Level ✓ Balance Zeroed ✓

Final: ✓ ✓

Unit: FL HT2000

Run: 2

Date: 6-24-93

Technician(s): Initial: CW

Final: CW

Approved By: ____________

IMPINGER #1

Final Weight 822.1 grams

Initial Weight 572.0 grams

Net 250.1 grams

IMPINGER #2

Final Weight 601.5 grams

Initial Weight 582.6 grams

Net 18.9 grams

IMPINGER #3

Final Weight 489.8 grams

Initial Weight 486.2 grams

Net 3.6 grams

IMPINGER #4 (SILICA GEL)

Final Weight 891.9 grams

Initial Weight 856.1 grams

Net 35.8 grams

TOTAL MASS OF H_2O CAPTURED 308.4 grams

Scale Check:
295.0g = 295.0 g
590.0g = 590.0 g
885.0g = [illegible] g

Front Half Filter # 446 F
#
Back Half Filter # [illegible] F

Notes:

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 5/27/93 Time 1030 By DK Front Half ✓ Back Half ✓

Manufacturer: S&S Size: 11 cm 8.2 cm Lot. No.: ZB901 Grade: #25 glass

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
441F	.6921	6/1	1016	LU	.6924	6/2	1044	DK	✓			
442F	.6988	6/1	1017	LU	.6988		1046		✓			
443F	.6982	6/1	1018	LU	.6977		1048		✓			
444F	.7058	6/1	1019	LU	.7054		1050		✓			
445F	.7004	6/1	1020	LU	~~.7002~~		1052		✓			
446F	.6996	6/1	1021	LU	.6994		1054		✓			
447F	.7022	6/1	1022	LU	.7022		1056		✓			
448F	.7079	6/1	1023	LU	.7076		1058		✓			
449F	.6984	6/1	1024	LU	.6982		1100		✓			
450F	.7079	6/1	1025	LU	.7080		1102		✓			
441B	.3750	6/1	1026	LU	.3745	6/2	1126	DK	✓			
442B	.3730	6/1	1027	LU	.3725		1128		✓			
443B	.3776	6/1	1028	LU	.3771		1130		✓			
444B	.3779	6/1	1029	LU	.3774		1132		✓			
445B	.3738	6/1	1030	LU	~~.3733~~		1134		✓			
446B	.3736	6/1	1031	LU	.3731		1136		✓			
447B	.3755	6/1	1032	LU	.3750		1138		✓			
448B	.3790	6/1	1033	LU	.3785		1140		✓			
449B	.3728	6/1	1034	LU	.3726		1142		✓			
450B	.3801	6/1	1035	LU	.3796		1144		✓			

Checked by Bill Mowek Date: 6/2/93 Time 1328

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
58	70	48	6/1	900	LU
62	75	48	6/2	1042	DK

WOODSTOVE DATA SHEET #4-2:
INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 6/4/93 Time: 0900 By: DK

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
376	101.1787	6/7	1012	LU	101.1782	6/8	952	DK	✓			
377	106.4080	6/7	1014	LU	106.4076		954		✓			
378	105.4899	6/7	1016	LU	105.4895		956		✓			
379	97.6639	6/7	1018	LU	97.6636		958		✓			
380	103.9232	6/7	1020	LU	103.9230		1000		✓			
381	104.7513	6/7	1022	LU	104.7509	6/8	1002	DK	✓			
382	105.3599		1024	LU	105.3600		1004		✓			
383	98.6273		1026	LU	98.6268		1006		✓			
384	105.3535		1028	LU	105.3530		1008		✓			
385	104.7898		1030	LU	104.7898		1010		✓			
386	105.9197	6/7	1032	LU	105.9193	6/8	1012	DK	✓			
387	99.9773		1034		99.9772		1014		✓			
388	97.9826		1036		97.9825		1016		✓			
389	105.5321		1038		105.5318		1018		✓			
390	96.1094		1040		96.1093		1020		✓			
391	95.6015	6/7	1042	LU	95.6011	6/8	1022	DK	✓			
392	100.2328		1044		100.2325		1024		✓			
393	100.4634		1046		100.4631		1026		✓			
394	105.4896		1048		105.4891		1028		✓			
395	98.5641	6/7	1050		98.5638		1030		✓			
396	108.2162	6/7	1052	LU	108.2159	6/8	1032	DK	✓			
397	99.6752		1054		99.6750		1034		✓			
398	108.5969		1056		108.5964		1036		✓			
399	96.8981		1058		96.8978		1038		✓			
400	95.9540		1100		95.9536		1040		✓			

Checked By: Bill Houck Date: 6/8/93 Time: 1130

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
56	68	47	6/7	940	LU
56	68	47	6/8	950	DK

WST5-Form9,Pg1, [illegible]4/90
Unit FY
Run # 2
Date: 6/24/93

WOODSTOVE DATA SHEET #4-3: CONSTA[illegible] FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
391		6/25	1300	DK	95.7377	6/28	1024	DK	95.7374	6/29	918	LU				
392		6/25	1300	DK	100.6685	6/28	1026	DK	100.6674	6/29	920	LU	100.6673	6/30	1056	DK
393		6/25	1300	DK	100.6059	6/28	1028	DK	100.6035	6/29	922	LU	100.6023	6/30	1058	DK
					100.6001	7/1	916	LU	100.5996	7/2	914	DK				
394		6/25	1300	DK	105.7118	6/28	1030	DK	105.7105	6/29	924	LU	105.7108	6/30	1100	DK
395		6/25	1200	DK	98.8143	6/28	1032	DK	98.8138	6/29	926	LU				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
4416F		6/21	1830	CL	.8550	6/25	944	LU	.8550	6/28	1034	DK				
4416B		6/21	1830	CL	.6391	6/25	946	LU	.6331	6/28	1036	DK	.6336	6/29	928	LU

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	WB	DB	%RH
1	6/25	930	LU	64	77	49
2	6/28	1022	DK	59	71	49
3	6/29	904	LU	59	71	49
4	6/30	1054	DK	60	73	47
5	7/1	910	LU	60	73	47

SCALE ROOM ENVIRONMENTAL CONDITIONS

6	7/2	908	DK	58	70	48
7						
8						
9						

Comments

Dates: From 6/10/93

Through ____________

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0001	10.0001	1.0000	0.0999			DK	6/10	1000	70	58	48
99.9999	10.0001	0.9998	0.1000			LL	6/11	904	68	56	47
100.0003	10.0000	0.9996	0.0999			DK	6/14	910	76	63	49
99.9999	10.0003	1.0001	0.1002			LL	6/15	902	70	58	48
99.9998	10.0002	1.0000	0.0998			DK	6/16	900	70	58	48
99.9996	9.9997	0.9998	0.0997			LL	6/17	904	70	58	48
100.0004	10.0003	1.0000	0.1000			DK	6/18	0830	69	57	47
100.0001	10.0001	1.0000	0.1000			LL	6/21	908	68	56	47
100.0001	10.0000	1.0001	0.0999			DK	6/22	900	66	55	49
99.9996	9.9997	0.9997	0.0998			LL	6/23	906	70	58	48
99.9998	9.9999	0.9999	0.1000			DK	6/24	1700	74	60	44
99.9998	9.9997	0.9997	0.0995			LL	6/25	930	77	64	49
100.0001	10.0000	0.9999	0.0997			DK	6/28	1000	71	59	49
100.0003	10.0003	1.0001	0.1000			LL	6/29	904	71	59	49
100.0002	10.0001	1.0001	0.0999			DK	6/30	1045	73	60	47
99.9999	10.0000	1.0000	0.1000			LL	7/1	910	73	60	47
100.0003	10.0002	1.0002	0.1001			DK	7/2	908	70	58	48

WST7-Form1 Rev5/90

Dates: From 3-11-93

Through 6/9/93

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0004	10.0001	1.0000	.0999			CW	3-11	0915	69	54	36
99.9998	10.0000	0.9999	0.0997			DK	3/12	0830	68	52	32
100.0003	10.0002	1.0000	.0997			CW	3-15	0930	72	57	39
100.0000	10.0002	1.0000	0.1000			DK	3/16	0900	72	57	39
100.0001	10.0001	1.0002	0.1001			DK	3/17	1330	72	58	42
100.0001	10.0003	1.0002	0.1001			CW	3-18	1700	75	60	47
99.9999	10.0000	0.9998	0.0999			DK	3/19	0900	71	57	41
100.0003	10.0001	1.0000	.0999			BN	3-23	0900	73	60	47
100.0002	10.0001	1.0000	0.0999			DK	3/19	1300	77	63	46
100.0001	10.0001	1.0001	.0999			CW	4-20	0900	75	60	41
100.0000	10.0002	1.0002	0.0999			DK	4/26	0900	66	55	49
100.0001	10.0001	1.0001	.1001			CW	4-28	0900	69	56	44
100.0002	10.0001	0.9999	0.0999			DK	5/4	1120	75	62	48
100.0001	10.0001	1.0000	.1000			CW	5-5	1000	75	60	41
99.9998	9.9999	0.9999	0.1000			DK	5/6	946	76	62	45
99.9997	10.0001	1.0000	0.0999			DK	5/7	1620	74	60	44
100.0002	10.0002	1.0001	.0999			BN	5-10	0900	71	59	49
100.0002	10.0002	1.0002	.1001			CW	5-11	1000	73	59	43
100.0000	10.0000	1.0000	0.0999			DK	5/12	900	75	61	44
100.0001	10.0001	1.0001	.1000			CW	5-13	1600	71	58	45
99.9997	10.0002	1.0002	0.1001			DK	5/14	1000	70	58	48
99.9999	10.0001	0.9999	0.0998			DK	5/19	1010	71	59	49
99.9999	10.0000	0.9998	0.0998			BN	5/20	1720	74	60	44
99.9997	10.0002	1.0000	0.0998			DK	5/21	950	70	58	48
100.0001	10.0002	1.0000	0.0999			LU	5/24	1115	77	65	46
100.0001	10.0002	1.0001	0.1001			DK	5/25	1030	70	58	48
100.0003	10.0000	0.9998	0.1000			LU	5/26	1230	77	64	49
100.0000	10.0002	1.0000	0.1000			DK	5/27	940	77	64	49
99.9997	10.0001	0.9999	0.1000			LU	5/28	908	76	63	49
99.9999	10.0000	0.9999	0.0997			LU	6/1	900	70	58	48
100.0002	10.0003	1.0001	0.1001			DK	6/2	940	75	62	48
100.0000	10.0000	1.0001	0.0998			LU	6/3	956	70	58	48
100.0001	9.9999	0.9999	0.0999			DK	6/4	0930	68	56	47
100.0000	9.9998	0.9999	0.0999			LU	6/7	0940	68	56	47
99.9996	10.0001	0.9999	0.0999			DK	6/8	0900	68	56	47
99.9995	9.9997	0.9999	0.0996			LU	6/9	0904	68	56	47

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: Fx
Run: 2 Date: 6-24-93
Technician(s): CJ

FRONT HALF

FILTER #:	446F	BEAKER #:	391	FINAL WT:	95.7374 g
FINAL WT:	.8550 g	ml:	100	TARE WT:	95.6011 g
TARE WT:	.6994 g	desc:	ACETONE	NET WT:	.1363 g
NET WT:	.1556 g				

FILTER #:		BEAKER #:		FINAL WT:	g
FINAL WT:	g	ml:		TARE WT:	g
TARE WT:	g	desc:	ACETONE	NET WT:	g
NET WT:	g				

TOTAL VOLUME OF ACETONE
USED IN WASH 100. ml

BACK HALF

FILTER #:	446B	BEAKER #:	392	FINAL WT:	100.6673 g
FINAL WT:	.6336 g	ml:	200	TARE WT:	100.2325 g
TARE WT:	.3731 g	desc:	ACETONE	NET WT:	.4348 g
NET WT:	.2605 g				

FILTER #:		BEAKER #:	393	FINAL WT:	100.5996 g
FINAL WT:	g	ml:	75	TARE WT:	100.4631 g
TARE WT:	g	desc:	METHCHLOR	NET WT:	.1365 g
NET WT:	g				

BEAKER #:	394	FINAL WT:	105.7108 g
ml:	225	TARE WT:	105.4891 g
desc:	H2O	NET WT:	.2217 g

BEAKER #:	395	FINAL WT:	98.8138 g
ml:	250	TARE WT:	98.5638 g
desc:	H2O	NET WT:	.2500 g

BEAKER #:		FINAL WT:	.4717 g
ml:		TARE WT:	g
desc:		NET WT:	g

BEAKER #:		FINAL WT:	g
ml:		TARE WT:	g
desc:		NET WT:	g

TOTAL VOLUME OF ACETONE
USED IN WASH 200 ml
TOTAL VOLUME OF DICHLOROMETHANE
USED IN EXTRACTION 75 ml
TOTAL VOLUME OF DISTILLED
WATER DRIED 475 ml

PRTCATCH

WOODSTOVE BLANKS PROCESSING
WOODSTOVE DATA SHEET # 5A

BLANKS DONE: 6/15/93

Unit: FX HT 2000
Run: 2 Date: 6/24/93
Technician(s): CW / LK

BEAKER #: A 200 ml ACETONE FISHER OPTIMA LOT #: 924059	FINAL WT: 108.9002 g TARE WT: 108.8998 g NET WT: .0004 g
BEAKER #: B 15 ml DICHLOROMETHANE FISHER OPTIMA LOT #: 910732	FINAL WT: 106.3060 g TARE WT: 106.3054 g NET WT: .0006 g
BEAKER #: C 200 ml DISTILLED WATER BONNEAU PRODUCTS CERTIFIED	FINAL WT: 106.9637 g TARE WT: 106.9635 g NET WT: .0002 g

BEAKER TARES INTO DESSC: TIME: 0900 DATE: 6/4/93

BKR #	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME	4TH WT	TIME
A	108.8997	1102	108.8998	1044				
B	106.3056	1104	106.3054	1046				
C	106.9640	1106	106.9635	1048				

SCALE ROOM QC : TARES

DATE	TIME	BY	WB	DB	%
6/7	940	LK	56	68	47
6/8	1042	DK	56	68	47

SCALE ROOM QC : FINALS

DATE	TIME	BY	WB	DB	%
6/14	926	DK	63	76	49
6/15	902	LK	58	70	48

BEAKERS: FINAL WEIGHTS

BKR #	IN DSC	TIME	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME
A	6/11	1030	108.9001	928	108.9002	912		
B	6/11	1031	106.3059	930	106.3060	914		
C	6/11	1032	106.9639	932	106.9637	916		

BKR #	4TH WT	TIME	5TH WT	TIME	6TH WT	TIME	7TH WT	TIME

Unit: FY HT2000
Run: 2
Date: 6/24/93
Technician(s): BN
WSTAPP1-AppDoc19-page2
Rev 6/90

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Blank Audit: By: Bill Novak Date: 6/15/93

Blank Calculations:

Acetone: .0004 g ÷ 200 ml = .000002 g/ml

Dichloromethane: .0006 g ÷ 75 ml = .000008 g/ml

Distillted Water: .0002 g ÷ 200 ml = .000001 g/ml

Front Half Catch:

Filters: .1556 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .1556 g (Net Catch)

Beakers: .1363 g (Total Catch) - 100 (Ml of Acetone) (.000002 g) (Blank Value/ml of Acetone) = .1361 g (Net Catch)

Total Front Half Catch .2917 g

Back Half Catch:

Filters: .2605 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .2605 g (Net Catch)

Beakers:

1. Acetone/Impingers:
.4348 g (Total Catch) - 200 (ml of acetone) (.000002 g) (Blank Value/ml of Acetone) = .4344 g (Net Catch)

2. Extract/Impingers:
.1365 g (Total Catch) - 75 (ml. of Dichloromethane) (.000008 g) .0006 (Blank Value/ml of Dichloromethane) = .1359 g (Net Catch)

3. Water/Impingers:
.4717 g (Total Catch) - 475 (ml. of water) (.000001 g) (Blank Value/ml of water) = .4712 g (Net Catch)

Total Back Half Catch 1.3020 g
Total Catch 1.5937 g
% Front Half 18.3 %

EPA METHOD 5H PARTICULATE CALCULATIONS
WOODSTOVE TEST DATA SHEET #7

Unit: HT2000

Run: 2 Date: 6/24/92

Technician(s): BN/DK

1) $Vm(std) = \dfrac{(163.313\ Vm)(17.64)(1.028\ mcf)\left(30.33\ "\ Hg + \dfrac{.181\ "\ H2O}{13.6}\right)}{(555\ TmA)} = \dfrac{161.9133}{000.0000}$ dscf

2) $Vw(std) = (.04707)(308.4\ ml\ H2O) = \dfrac{14.5164}{00.0000}$ scf

3) $Asw = \dfrac{(14.5164\ scf)}{(14.5164\ scf + 161.9133\ dscf)} = \dfrac{.0823}{.0000}$ Bws X 100 = $\dfrac{8.2279}{00.0000}$ % H2O

4) $Cs = \dfrac{(1.5937\ g.)}{(161.9133\ dscf)}(15.43) = \dfrac{.1519}{0.0000}$ gr/dscf

5) Estimated $g/hr = \dfrac{(1.5937\ g.)}{(161.9133\ dscf)}\left(\dfrac{4.281}{00.000}\ dscfm\right)(60) = \dfrac{2.5283}{00.0000}$ g/hr

Vm =	total cubic feet pulled on meter box during test	(p. 2)	(000.000 V
mcf =	meter correction factor (Y factor) of the meter box used for the test	(p. 2)	(0.000 mcf
" Hg =	average barometric pressure during the test	(p. 2)	(00.00 " Hg
" H2O =	average delta H for the test	(p. 2)	(.000 " H2O
TmA =	average meter temperature for the test in degrees Absolute	(p. 2)	(000 TmA
ml H2O =	total water caught during the test	(p. 2)	(000.0 ml H2O
g. =	total particulate catch for the test	(p. 3)	(00.0000 g.
dscfm =	average stack flow during the test	(computer printout)	(00.000 dscf

PRTCALC

Miscellaneous Test Data Sheet Page # 8

Unit: FX HT2000 Run: 2 Date: 6/24/93

Test Chamber Air Velocity Start: 0 Stop: 0 Avg: 0

Wet Bulb / Dry Bulb

Start: WB: 60 DB: 72 = 51 % RH 1.3 %H20

Stop: WB: 63 DB: 80 = 39 % RH 1.3 %H20

Average % Relative Humidity 45.0 Average % Ambient Moisture: 1.3

Empty Stove Weight: 487 lbs

Empty Stove Weight w/ Stack & Oil Seal: Wet: 533.2 Dry: 532.9

Kindling Weight: Paper: .3 lbs Wood: 10.4 lbs

Preburn Fuel Wt: 23.2 Total: 23.2 lbs

Total Kindling & Preburn Fuel Weight (Wood Only) ==> Total: 33.6 lbs

Coal Bed Weight: RANGE: 5.6 - 4.6 lbs SCALE: 538.5 - 537.5 lbs

Upper = .25 x fuel wt
Always round DOWN to nearest tenth
Lower = .20 x fuel wt
Always round UP to nearest tenth

Actual Coal Bed Weight: 5.4 lbs

Maximum Coal Bed Weight Removal ((5.6 Upper + 4.6 Lower)/2).25 = 1.3 lbs

Test Fuel (.75 x 1.5 x 5 " spacers) = 16 pcs

Dimensions	Length in inches	No. pcs	Wt. in lbs	% of load
2 x 4	NA	NA	NA	NA
4 x 4	17 1/2	5	22.6	100.0

Test Fuel Weight: 22.6 lbs

Estimated Dry Burn Rate Calculation $\frac{22.6 - (22.6 \times .18492)}{2.2046} \times \frac{60}{470 \text{ Time}} = $ 1.0667 Kg/Hr

Estimated EPA Heat Output in BTU's / Hr $19,140 \times \frac{63}{100} \times$ 1.0667 DBR = 12,862 BTU's/Hr

EPA Default Efficiencies: NON-CAT: 63 CAT: 72 PELLET: 78

NOTES: 8356

1.25 = 402

WOODSTOVE OPERATING DATA

FIRE STARTED: 0750 PST/PDST

WARM UP AND PREBURN: PRIMARY AIR: set wide open for all warm-up/preburn fuel charges. then set to 1/8 at start of preburn.

SECONDARY AIR: NA CAT BYPASS: NA

CHARCOAL BED PREPARATION: raked and leveled prior to each warm-up/preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 20 sec.

TEST: Door Wide Open during loading 0 min 50 sec

PRIMARY AIR: opened full for first 5 min. , then set to run setting of 1/8 .

SECONDARY AIR: NA CAT BYPASS: NA

FAN: ON/OFF during warm-up ON/OFF during preburn
ON/OFF first 30 minutes of test ON/OFF balance of test run
Fan speed set at HIGH .

WOOD DATA: KINDLING: a mix of the grades listed below

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2X4	Manke/Tacoma	Std or btr	s. grn D fir
TEST:	2X4	Packwood	#2 or btr	s. grn D fir
	4x4	Packwood	#2 or btr	s. grn D fir

PELLET FUEL APFI#: ____

All grades WCLB rules

WARM UP INFORMATION:
All pre-burn/warm up fuel pieces were either 13 or 13 inches.

1st warm up/preburn fuel charge (23.2 lbs) added at 0846 .

2nd warm up/preburn fuel charge (____ lbs) added at ____ .

3rd warm up/preburn fuel charge (____ lbs) added at ____ .

4th warm up/preburn fuel charge (____ lbs) added at ____ .

5th warm up/preburn fuel charge (____ lbs) added at ____ .

Unit: FX HT 2000
Run: 2
Date: 6/24/93
Technician:
WST1-Form7-Rev11/89

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

84 → 1/8"

Room Temperature: 70 °F   Correction Factor: 0

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes____. No ✓.
Time Test Fuel Moisture Readings taken at: 900
Calibration Checks: X ✓ Y ✓ 12.0 12.0 22.0 22.0

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1	2x4x8	K	10.5	11.2	11.0	11.8	10.5	11.2	11.400
2									
3									
4	2x4x8	P	21.0	22.9	21.5	23.5	21.5	23.5	23.300
5	2x4x8	P	19.5	21.3	20.0	21.8	20.0	21.8	21.633
6	2x4x8	P	21.0	22.9	21.0	22.9	21.5	23.5	23.100
7									68.033
8									
9									
10									
11									
12	4x4x17½	T	22.0	24.1	22.0	24.1	22.0	24.1	24.100
13	4x4x17½	T	21.5	23.5	21.5	23.5	21.0	22.9	23.300
14	4x4x17½	T	22.0	24.1	22.0	24.1	21.0	22.9	23.700
15	4x4x17½	T	21.0	22.9	18.5	20.1	19.5	21.3	21.433
16	4x4x17½	T	19.5	21.3	19.0	20.7	19.0	20.7	20.900
17									113.433
18									
19									
20	FEET	T	19.5	21.3	20.0	21.8	20.0	21.8	21.633

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	11.400 %	22.678 %	22.687 %
% Moisture - Wet Basis:	10.233 %	18.486 %	18.492 %

To obtain Wet from Dry: $\frac{100 \times \%\ \text{Dry Rdg.}}{100 + \%\ \text{Dry Rdg.}}$ = % Moisture, Wet Basis

Acceptable Ranges: 16-20% wet; 19-25% dry
(17.5 - 22.5 on Meter [Uncor reading] at 70°F)

Key for Use: K= Kindling P= Pretest Fuel T= Test Fuel

Unit: EXCELL HT-2000
Run#: 2
Date: 6/24/93
Technician:

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 4 x 4 x 3½

Depth (D): 9.0 cm

Width (W): 9.0 cm

Length (L): 8.6 cm
8.65 cm
8.35 cm
8.40 cm

Length $\bar{X}$ = 8.50 cm

Volume: 688.500 cm^3
(D X W X L)

MOISTURE: Room Temperature: 70 °F Correction Factor: 0

Uncorrected Meter Readings Corrected for temperature: Yes ___ No ✓

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	20.5	22.4 %
Bottom:	21.5	23.5 %
Side:	21.0	22.9 %
$\bar{X}$:		22.933 %

Avg % Moisture (Dry) 22.933 %

Avg % Moisture (Wet) 18.655 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 404.5 g Dry Weight: 336.6 g

% Moisture Dried Basis: 16.786 %
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	6/24/93	0930	217.9 °F
Out of Dryer	7/1/93	1005	221 °F

(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 336.6 g (dry wt) ÷ 688.500 cm^3 (volume) = .4889 g/cm^3

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ______ g

Wet Wt: ______ g (Gross Wet Wt.) - ______ g (Tare Beaker Wt.) = ______ g (Net Wet Wt.)

Dry Wt: ______ g (Gross Dry Wt.) - ______ g (Tare Beaker Wt.) = ______ g (Net Dry Wt.)

% Moisture Dried Basis: ______ %
[1 - (Net Dry Wt ÷ Net Wet Wt.)] X 100

538.3

PAGE 12 GAS DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 2 **DATE** 6/24/93 **PAGE** 1 **OF** 4

TIME	SCALE	FUEL	DROP	v.	CO2	v.	O2	v.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
0 / 1015	560.9	22.6	Ø	.494	12.3	.291	7.2	.088	.85	13.9	112	188	7.0	130	378	-.045	875
05 / 20	560.3	22.0	.6	.209	5.2	.598	14.8	.038	.38	13.6	109	238	4.2	131	489	-.059	325
10 / 25	559.8	21.5	.5	.213	5.3	.583	14.4	.085	.85	6.2	121	203	9.5	130	308	-.046	850
15 / 30	559.3	21.0	.5	.302	7.5	.511	12.7	.067	.67	11.2	119	189	9.2	130	299	-.045	700
20 / 35	558.8	20.5	.5	.289	7.2	.538	13.3	.064	.64	11.2	118	178	9.0	126	279	-.044	700
25 / 40	558.1	19.8	.7	.415	10.3	.422	10.5	.083	.83	12.4	120	184	9.3	130	308	-.044	625
30 / 45	557.6	19.3	.5	.265	6.6	.555	13.8	.122	1.22	5.4	119	177	9.2	127	272	-.042	725
35 / 50	557.0	18.7	.6	.372	8.2	.408	10.1	.143	1.43	6.5	119	179	9.2	129	294	-.045	775
40 / 55	556.4	18.1	.6	.354	8.8	.458	11.3	.115	1.15	7.6	120	180	9.3	130	290	-.045	750
45 / 1100	555.8	17.5	.6	.371	9.2	.449	11.1	.100	1.00	9.2	120	182	9.3	130	298	-.045	700
50 / 05	555.1	16.8	.7	.466	11.6	.377	9.3	.094	.94	12.3	121	192	9.5	131	335	-.046	650
55 / 10	554.5	16.2	.6	.415	10.3	.911	10.2	.096	.96	10.7	120	190	9.3	131	329	-.047	650
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	-----	3879	-.553	-------
60 / 15	553.8	15.5	.7	.428	10.6	.397	9.8	.118	1.18	9.0	118	189	9.0	130	328	-.050	675
65 / 20	553.2	14.9	.6	.460	11.4	.374	9.3	.098	.98	11.7	118	190	9.0	130	336	-.050	650
70 / 25	552.6	14.3	.6	.480	11.9	.357	8.8	.084	.84	14.2	117	192	8.5	130	341	-.050	650
75 / 30	552.0	13.7	.6	.487	12.1	.351	8.7	.062	.62	19.5	117	195	8.5	130	348	-.050	625
80 / 35	551.4	13.1	.6	.496	12.3	.342	8.5	.060	.60	20.5	117	196	8.5	130	348	-.050	650
85 / 40	550.8	12.5	.6	.505	12.5	.328	8.1	.071	.71	17.7	117	196	8.5	130	347	-.050	650
90 / 45	550.2	11.9	.6	.513	12.7	.329	8.1	.069	.69	18.5	117	195	8.5	130	342	-.050	675
95 / 50	549.6	11.3	.6	.530	13.2	.310	7.7	.047	.47	28.0	117	196	8.5	130	351	-.050	675
100 / 55	549.0	10.7	.6	.501	12.4	.344	8.5	.047	.47	26.5	116	194	8.0	129	344	-.049	675
105 / 1200	548.5	10.2	.5	.470	11.7	.353	8.7	.062	.62	18.8	114	193	7.5	128	338	.049	675
110 / 05	548.1	9.8	.4	.406	10.1	.438	10.9	.114	1.14	8.8	113	187	7.3	126	318	-.047	725
115 / 10	547.8	9.5	.3	.323	8.0	.485	12.0	.171	1.71	4.7	110	173	6.5	120	277	-.043	825
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	-----	4018	-.588	-------
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	-----	7897	-1.141	-------

538.3

PAGE 12 [illegible]S DATA SHEET
MANUFACT[illegible]ER/MODEL FX HT 2000 **RUN** 2 **DATE** 6/24/93 **PAGE** 2 **OF** 4

TIME	SCALE	FUEL	DROP	v.	CO2	v.	O2	v.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
120 / 1215	547.4	9.1	.4	.374	9.3	.451	11.2	.133	1.33	6.7	109	169	6.4	120	275	-.040	800
125 / 20	547.0	8.7	.4	.304	7.5	.499	12.4	.179	1.79	4.2	108	165	6.3	119	266	-.040	875
130 / 25	546.6	8.3	.4	.355	8.8	.439	10.9	.093	.93	9.5	107	165	6.1	119	274	-.040	800
135 / 30	546.3	8.0	.3	.386	9.6	.432	10.7	.067	.67	14.3	107	167	6.1	119	277	-.038	725
140 / 35	546.0	7.7	.3	.374	9.3	.439	10.9	.074	.74	12.5	107	166	6.1	119	274	-.038	725
145 / 40	545.7	7.4	.3	.362	9.0	.453	11.2	.083	.83	10.8	107	163	6.1	119	263	-.038	750
150 / 45	545.4	7.1	.3	.370	9.2	.429	10.6	.078	.78	11.8	106	162	5.9	118	263	-.038	775
155 / 50	545.1	6.8	.3	.397	9.9	.395	9.8	.071	.71	13.9	105	163	5.6	117	272	-.038	775
160 / 55	544.8	6.5	.3	.316	7.8	.432	10.7	.107	1.07	7.3	104	161	5.4	116	264	-.036	825
165 / 1300	544.6	6.3	.2	.331	8.2	.470	11.6	.104	1.04	7.9	103	158	5.2	115	260	-.035	825
170 / 05	544.4	6.1	.2	.335	8.3	.458	11.3	.099	.99	8.4	103	156	5.2	115	252	-.034	775
175 / 10	544.2	5.9	.2	.344	8.5	.460	11.4	.110	1.10	7.8	102	153	5.0	112	245	-.032	775
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	3185	-.447	-----
180 / 15	543.9	5.6	.3	.365	9.1	.436	10.8	.104	1.04	8.7	102	152	5.0	112	244	-.031	800
185 / 20	543.7	5.4	.2	.369	9.2	.439	10.9	.111	1.11	8.2	102	152	5.0	112	244	-.031	800
190 / 25	543.5	5.2	.2	.346	8.6	.456	11.3	.123	1.23	7.0	101	150	4.8	110	240	-.031	825
195 / 30	543.4	5.1	.1	.309	7.7	.484	12.0	.135	1.35	5.7	99	146	4.5	110	235	-.030	850
200 / 35	543.2	4.9	.2	.296	7.3	.487	12.1	.142	1.42	5.2	97	143	4.5	109	225	-.028	850
205 / 40	543.1	4.8	.1	.296	7.3	.492	12.2	.134	1.34	5.5	97	141	4.5	109	219	-.026	850
210 / 45	543.0	4.7	.1	.310	7.7	.472	11.7	.140	1.40	5.5	96	140	4.3	108	217	-.026	875
215 / 50	542.9	4.6	.1	.294	7.3	.488	12.1	.151	1.51	4.7	96	139	4.3	108	217	-.026	850
220 / 55	542.8	4.5	.1	.296	7.3	.486	12.0	.151	1.51	4.9	96	138	4.3	108	217	-.026	850
225 / 1400	542.7	4.4	.1	.295	7.3	.486	12.0	.151	1.51	4.8	95	139	4.0	108	219	-.025	850
230 / 05	542.6	4.3	.1	.280	6.9	.504	12.5	.144	1.44	4.8	96	139	4.3	108	216	-.025	825
235 / 10	542.5	4.2	.1	.284	7.0	.501	12.4	.132	1.32	5.3	96	138	4.3	108	211	-.024	850
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	2704	-.329	-----
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	5889	-.776	-----

538.3

PAGE 12 [illegible]S DATA SHEET
MANUFAC[illegible]ER/MODEL FX HT 2000 **RUN** 2 **DATE** 6/24/93 **PAGE** 3 **OF** 4

TIME	SCALE	FUEL	DROP	v.	CO2	v.	O2	v.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
240 / 1415	542.4	4.1	.1	.286	7.1	.494	12.2	.128	1.28	5.5	96	136	4.3	108	203	-.022	850
245 / 20	542.3	4.0	.1	.293	7.3	.492	12.2	.129	1.29	5.6	96	136	4.3	108	205	-.024	875
250 / 25	542.2	3.9	.1	.294	7.3	.493	12.2	.134	1.34	5.4	96	136	4.3	108	205	-.024	900
255 / 30	542.1	3.8	.1	.269	6.7	.514	12.7	.167	1.67	4.0	96	137	4.3	108	206	-.024	900
260 / 35	542.0	3.7	.1	.269	6.7	.512	12.7	.157	1.57	4.2	96	137	4.3	108	207	-.023	875
265 / 40	541.9	3.6	.1	.275	6.8	.508	12.6	.157	1.57	4.3	96	137	4.3	108	207	-.021	900
270 / 45	541.8	3.5	.1	.262	6.5	.521	12.9	.151	1.54	4.2	96	136	4.3	108	204	-.021	850
275 / 50	541.7	3.4	.1	.262	6.5	.521	12.9	.161	1.61	4.0	96	134	4.3	107	200	-.021	850
280 / 55	541.6	3.3	.1	.264	6.5	.512	12.7	.179	1.79	3.7	95	133	4.2	105	199	-.021	900
285 / 1500	541.5	3.2	.1	.266	6.6	.512	12.7	.183	1.83	3.6	95	134	4.2	105	199	-.021	900
290 / 05	541.5	3.2	.1	.265	6.6	.514	12.7	.183	1.83	3.6	96	134	4.3	107	201	-.023	900
295 / 10	541.4	3.1	.1	.257	6.4	.520	12.9	.190	1.90	3.4	95	135	4.2	106	203	-.023	875
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	2439	-.268	-----
300 / 15	541.3	3.0	.1	.237	5.9	.536	13.3	.188	1.88	3.1	95	134	4.2	106	202	-.022	875
305 / 20	541.2	2.9	.1	.245	6.1	.537	13.3	.181	1.81	3.4	95	134	4.2	105	200	-.022	900
310 / 25	541.1	2.8	.1	.236	5.8	.543	13.5	.173	1.73	3.4	96	134	4.3	105	196	-.021	850
315 / 30	541.0	2.7	.1	.231	5.7	.536	13.3	.171	1.71	3.3	95	131	4.2	104	192	-.021	850
320 / 35	541.0	2.7	Ø	.254	6.3	.526	13.0	.171	1.71	3.7	95	131	4.2	104	190	-.020	900
325 / 40	540.9	2.6	.1	.254	6.3	.530	13.1	.170	1.70	3.7	95	131	4.2	104	192	-.020	925
330 / 45	540.8	2.5	.1	.254	6.3	.535	13.3	.162	1.62	3.9	95	131	4.2	104	194	-.020	900
335 / 50	540.7	2.4	.1	.254	6.3	.530	13.1	.165	1.65	3.8	94	132	4.0	104	195	-.020	900
340 / 55	540.6	2.3	.1	.258	6.4	.525	13.0	.165	1.65	3.9	95	133	4.2	104	198	-.020	900
345 / 1600	540.5	2.2	.1	.264	6.5	.523	13.0	.159	1.59	4.1	95	134	4.2	104	198	-.020	900
350 / 05	540.4	2.1	.1	.262	6.5	.529	13.1	.151	1.51	4.3	95	134	4.2	104	201	-.020	875
355 / 10	540.4	2.1	Ø	.249	6.2	.541	13.4	.145	1.45	4.3	96	134	4.3	105	197	-.020	850
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	2355	-.246	-----
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	4794	-.514	-----

538.3

PAGE 12 S DATA SHEET
MANUFACT ER/MODEL FX HT 2000 **RUN** 2 **DATE** 6/24/93 **PAGE** 4 **OF** 4

TIME	SCALE	FUEL	DROP	V.	CO2	V.	O2	V.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
360 / 1615	540.3	2.0	.1	.255	6.3	.532	13.2	.139	1.39	4.5	96	132	4.3	105	193	-.020	875
365 / 20	540.2	1.9	.1	.281	7.0	.514	12.7	.129	1.29	5.4	95	133	4.2	104	192	-.019	925
370 / 25	540.1	1.8	.1	.288	7.1	.507	12.6	.120	1.20	5.9	96	133	4.3	105	196	-.019	925
375 / 30	540.0	1.7	.1	.286	7.1	.507	12.6	.123	1.23	5.8	96	133	4.3	105	197	-.019	900
380 / 35	539.9	1.6	.1	.286	7.1	.507	12.6	.121	1.21	5.9	96	135	4.3	105	199	-.019	900
385 / 40	539.8	1.5	.1	.287	7.1	.511	12.7	.121	1.21	5.9	96	136	4.3	105	200	-.019	900
390 / 45	539.7	1.4	.1	.286	7.1	.511	12.7	.120	1.20	5.9	96	136	4.3	105	203	-.019	900
395 / 50	539.6	1.3	.1	.271	6.7	.527	13.1	.117	1.17	5.7	96	136	4.3	105	202	-.019	850
400 / 55	539.5	1.2	.1	.267	6.6	.527	13.1	.123	1.23	5.4	97	134	4.5	106	198	-.019	850
405 / 1700	539.4	1.1	.1	.280	6.9	.513	12.7	.132	1.32	5.3	96	133	4.3	105	196	-.019	875
410 / 05	539.3	1.0	.1	.273	6.8	.525	13.0	.139	1.39	4.9	95	133	4.2	104	196	-.019	875
415 / 10	539.2	.9	.1	.268	6.6	.525	13.0	.145	1.45	4.6	96	134	4.3	105	199	-.019	875
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	2371	-.229	-----
420 / 15	539.2	.9	Ø	.270	6.7	.523	13.0	.149	1.49	4.5	96	134	4.3	105	202	-.019	850
425 / 20	539.1	.8	.1	.266	6.6	.524	13.0	.153	1.53	4.3	96	135	4.3	105	203	-.019	850
430 / 25	539.0	.7	.1	.251	6.2	.541	13.4	.150	1.50	4.1	96	135	4.3	105	204	-.019	850
435 / 30	538.9	.6	.1	.249	6.2	.538	13.3	.153	1.53	4.0	95	133	4.2	104	198	-.019	825
440 / 35	538.8	.5	.1	.247	6.1	.541	13.4	.152	1.52	4.0	95	133	4.2	104	197	-.019	850
445 / 40	538.7	.4	.1	.259	6.4	.529	13.1	.162	1.62	4.0	95	133	4.2	104	195	-.019	900
450 / 45	538.6	.3	.1	.256	6.3	.529	13.1	.168	1.68	3.8	95	133	4.2	104	200	-.019	900
455 / 50	538.5	2	.1	.255	6.3	.535	13.3	.150	1.50	4.2	95	133	4.2	104	200	-.019	900
460 / 55	538.5	.2	Ø	.254	6.3	.538	13.3	.151	1.51	4.2	95	134	4.2	104	200	-.019	900
465 / 1800	538.4	.1	.1	.248	6.1	.551	13.7	.135	1.35	4.6	95	135	4.2	104	200	-.019	900
470 / 05	538.3	Ø	.1	.256	6.3	.513	13.5	.122	1.22	5.2	95	135	4.2	104	201	-.019	900
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	2200	-.209	÷95
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	23151	-2.869	-----
															244	-.030	-----

538.5 - 537.5

 PREBURN DATA SHEET

MANUFACTURER/MODEL FX HT 2000 RUN 2 DATE 6/24/93 PAGE 1 OF 1

TIME	SCALE WT	BURN RATE	STACK	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / CAT	AMBIENT	STATIC	COMMENTS
00 / 0910	547.0	0	642	622	445	107	449	346	927	1350	77	-.080	PRIMARY AIR SET AT: 1/8
05 / 15	545.9	1.1	375	520	453	103	461	348	805	890	78	-.055	
10 / 20	545.1	.8	365	464	439	102	459	351	804	1313	77	-.060	SECONDARY AIR SET AT:
15 / 25	544.3	.8	361	456	428	100	452	350	810	1321	78	-.059	NA
20 / 30	543.5	.8	358	456	419	101	453	351	776	1372	78	-.058	FAN: ON
25 / 35	542.7	.8	369	535	405	152	444	351	764	1356	79	-.058	HIGH
30 / 40	542.0	.7	375	563	397	181	443	351	766	1335	79	-.058	
35 / 45	541.3	.7	371	510	399	113	440	346	778	1340	80	-.055	PUMPS ON AT: 0940
40 / 50	540.6	.7	365	496	399	104	445	331	788	1318	79	-.051	
45 / 55	539.9	.7	361	489	398	101	448	327	803	1297	78	-.050	CHECK WB/DB: 115/196
50 / 1000	539.4	.5	351	484	397	100	451	327	820	1288	79	-.048	
55 / 05	539.0	.4	321	471	399	101	457	323	833	1376	79	-.046	
------	------	-------	-----	------	------	------	------	------	------	-------	------	-----	------------------
60 / 10	538.7	.3	299	443	400	100	458	321	857	1293	79	-.043	344.4
65 / 15	538.3	.4	378	445	401	124	463	322	1013	963	78	-.045	351.0
70 / 20													
75 / 25													

PAGE 1 TEMPERATURE DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 2 **DATE** 6/24/93 **PAGE** 1 **OF** 4

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	351.0
0 / 1015	445	401	124	463	322	1013	963	78	1410	231	36	220	35	37	
05 / 20	452	391	166	450	330	592	700	77	1406	233	36	221	35	37	
10 / 25	440	373	192	425	331	568	676	77	1395	237	36	227	35	37	
15 / 30	381	364	119	403	324	570	718	77	1386	245	37	233	36	37	
20 / 35	349	355	108	396	323	583	683	77	1386	248	37	236	36	37	
25 / 40	347	345	102	386	319	574	895	78	1388	247	37	241	36	37	
30 / 45	389	333	151	382	319	572	765	77	1391	247	37	243	36	37	
35 / 50	397	325	179	375	315	595	868	76	1393	246	37	245	36	37	
40 / 55	418	324	194	375	313	595	829	76	1395	245	37	246	36	37	
45 / 1100	394	330	129	371	300	606	857	76	1396	246	37	247	36	37	
50 / 05	405	333	103	375	287	603	942	75	1399	246	37	247	36	37	
55 / 10	406	334	100	373	283	605	902	75	1403	247	37	248	36	37	
TOTAL	4823	4208	1667	4774	3766	7476	9798	919	------	------	------	------	------	------	------
60 / 15	462	325	136	370	283	619	948	75	1407	246	37	247	36	37	
65 / 20	488	325	164	365	279	623	1012	75	1409	246	37	247	36	37	
70 / 25	509	330	186	364	275	640	1040	76	1414	246	37	247	36	37	
75 / 30	482	344	117	363	260	651	1094	76	1422	246	37	248	36	37	
80 / 35	468	351	101	367	258	661	1143	76	1427	247	37	248	36	37	
85 / 40	467	361	98	366	253	676	1116	77	1431	247	37	248	35	37	
90 / 45	516	362	125	368	248	686	1078	76	1435	247	36	248	35	37	
95 / 50	548	366	155	368	246	693	1138	76	1441	247	36	248	36	37	
100 / 55	560	365	180	369	242	692	1054	76	1446	247	36	248	36	37	
105 / 1200	494	372	114	371	237	704	1016	78	1448	246	36	248	36	37	
110 / 05	461	372	102	378	230	711	893	77	1449	247	36	248	36	37	
115 / 10	400	370	99	379	229	719	854	78	1448	247	36	248	36	37	
TOTAL	5855	4243	1577	4428	3040	8075	12386	916	------	------	------	------	------	------	------
TOTAL	10678	8451	3244	9202	6806	15551	22184	1835	------	------	------	------	------	------	------

PAGE 14 TEMPERATURE DATA SHEET
MANUFACTURER/MODEL FX HT 2000 RUN 2 DATE 6/24/93 PAGE 2 OF 4

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	351.0
120 / 1215	430	363	139	381	227	730	866	78	1449	248	37	247	36	37	
125 / 20	423	360	165	380	225	735	865	78	1448	248	37	246	36	37	
130 / 25	424	360	188	379	224	750	927	78	1447	248	37	245	35	37	
135 / 30	379	372	112	382	214	753	934	79	1447	248	37	245	35	37	
140 / 35	370	374	105	382	215	747	971	79	1447	248	37	246	35	37	
145 / 40	353	376	100	385	210	749	931	79	1446	248	37	246	35	37	
150 / 45	401	370	143	384	214	745	1018	78	1446	248	37	247	35	37	
155 / 50	425	372	172	382	213	754	1069	78	1446	248	37	247	35	37	
160 / 55	430	374	189	381	212	767	915	78	1447	248	37	247	35	37	
165 / 1300	385	379	132	379	211	775	889	79	1446	248	37	247	35	37	
170 / 05	348	382	105	384	208	783	904	79	1446	248	37	247	35	37	
175 / 10	329	383	102	386	205	776	883	80	1446	248	37	247	35	37	
TOTAL	4697	4465	1652	4585	2578	9064	11172	943	------	------	------	------	------	------	------
180 / 15	366	378	147	389	206	779	889	79	1447	248	35	248	35	37	
185 / 20	377	379	173	387	210	780	836	79	1447	248	35	248	35	37	
190 / 25	379	380	191	384	211	784	816	79	1447	247	35	248	35	37	
195 / 30	343	385	134	381	210	795	802	80	1449	246	36	248	35	37	
200 / 35	316	388	109	383	209	788	802	81	1448	246	36	248	35	37	
205 / 40	297	388	103	384	208	789	801	81	1448	246	36	248	35	37	
210 / 45	327	378	143	383	211	792	802	80	1448	246	36	248	35	37	
215 / 50	336	373	183	378	212	813	785	79	1449	246	36	248	35	37	
220 / 55	337	376	192	383	212	812	783	79	1448	246	36	248	35	37	
225 / 1400	340	375	205	380	214	812	781	79	1448	245	36	248	35	37	
230 / 05	301	382	119	381	209	823	772	80	1448	246	36	248	35	37	
235 / 10	287	386	108	383	211	824	767	81	1448	245	36	248	35	37	
TOTAL	4006	4562	1807	4596	2523	9591	9636	957	------	------	------	------	------	------	
TOTAL	8703	9027	3459	9181	5101	18655	20808	1900	------	------	------	------	------	------	------

PAGE 14 TEMPERATURE DATA SHEET
MANUFACTURER/MODEL FX HT 2000 RUN 2 DATE 6/24/93 PAGE 3 OF 4

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	
240 1415	300	373	129	382	213	823	760	81	1449	246	35	248	35	37	351.0
245 20	308	370	156	378	214	824	757	80	1449	246	35	248	36	37	
250 25	315	368	183	374	219	817	755	81	1449	246	35	248	36	37	
255 30	320	365	203	375	220	789	733	81	1449	246	36	248	36	37	
260 35	322	362	216	375	221	795	732	80	1448	246	35	248	36	36	
265 40	322	360	220	370	222	796	732	81	1445	246	35	248	36	36	
270 45	279	364	116	378	219	791	728	81	1445	246	36	248	35	36	
275 50	262	360	106	379	221	778	724	81	1441	246	36	248	35	36	
280 55	295	349	163	374	225	777	716	81	1446	246	36	248	35	36	
285 1500	299	349	180	367	226	773	717	81	1446	246	36	248	35	35	
290 05	304	346	197	371	229	764	716	81	1447	246	36	248	35	35	
295 10	307	344	210	367	229	763	715	80	1448	246	36	248	35	35	
TOTAL	3633	4310	2079	4490	2658	9490	8785	969	------	------	------	------	------	------	------
300 15	307	343	220	362	231	783	692	80	1448	246	37	248	35	35	
305 20	307	343	176	360	230	796	695	81	1447	246	38	248	35	35	
310 25	266	346	116	365	229	807	694	82	1448	247	38	248	34	35	
315 30	270	336	130	370	229	774	690	80	1449	248	38	248	34	35	
320 35	278	333	156	362	232	778	686	81	1448	247	38	248	34	35	
325 40	281	328	173	361	233	774	686	80	1448	248	38	248	34	34	
330 45	287	327	196	367	232	760	677	80	1449	248	38	248	34	34	
335 50	290	325	210	361	232	761	678	80	1448	248	38	248	34	34	
340 55	293	322	220	364	236	754	676	80	1448	248	37	248	34	34	
345 1600	296	321	227	361	236	757	676	80	1449	248	37	248	34	34	
350 05	279	323	155	360	237	761	676	81	1448	248	37	248	34	34	
355 10	259	326	114	365	231	759	685	81	1447	248	37	248	34	34	
TOTAL	3413	3973	2093	4358	2788	9264	8211	966	------	------	------	------	------	------	------
TOTAL	7046	8283	4172	8848	5446	18754	16996	1935	------	------	------	------	------	------	------

PAGE 14 TEMPERATURE DATA SHEET
MANUFACTURER/MODEL FX HT 2000 RUN 2 DATE 6/24/93 PAGE 4 OF 4

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / CAT	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	3510
360 / 1615	268	322	132	362	235	756	685	81	1447	248	37	248	34	34	
365 / 20	277	321	162	357	235	759	695	81	1445	247	37	248	33	33	
370 / 25	284	319	189	358	237	758	700	81	1445	247	37	247	33	33	
375 / 30	290	322	203	355	236	751	700	81	1442	247	37	247	33	33	
380 / 35	297	325	221	352	239	741	701	81	1445	248	37	248	33	33	
385 / 40	300	327	225	352	240	741	705	82	1445	248	36	248	33	33	
390 / 45	303	328	234	360	240	744	700	81	1446	248	35	248	33	33	
395 / 50	268	335	121	360	235	745	703	81	1443	248	37	248	33	33	
400 / 55	256	337	110	359	234	746	702	82	1447	248	37	248	33	33	
405 / 1700	281	332	165	360	237	745	711	80	1438	248	37	248	33	33	
410 / 05	289	334	191	348	241	743	700	81	1444	247	37	248	33	33	
415 / 10	292	335	209	347	243	742	699	81	1446	248	37	247	33	33	
TOTAL	3405	3937	2165	4270	2852	8971	8401	973	------	------	------	------	------	------	------
420 / 15	294	333	225	354	245	743	706	81	1446	248	38	247	33	33	
425 / 20	300	335	235	347	247	744	709	81	1446	246	37	246	33	33	
430 / 25	277	342	143	349	244	742	709	81	1446	244	37	245	33	33	
435 / 30	257	343	113	351	246	738	706	81	1444	242	37	244	33	33	
440 / 35	251	344	111	353	247	740	706	81	1444	242	37	244	33	33	
445 / 40	277	337	162	345	248	737	706	81	1444	240	37	244	33	33	
450 / 45	285	335	195	349	249	717	709	81	1442	239	37	242	33	33	
455 / 50	290	344	217	342	250	714	709	81	1443	238	37	241	33	33	
460 / 55	294	335	231	343	251	711	706	81	1443	238	37	241	33	33	
465 / 1800	297	334	240	344	253	698	701	81	1442	238	37	241	33	33	
470 / 05	289	336	238	340	252	699	701	81	1441	237	37	241	33	33	
	3111	3718	2110	3817	2732	7983	7768	891	÷95	ΔT	351.0	- 291	.0 =	60.0	
TOTAL	32943	33416	15150	35318	22937	69914	76157	7534	------	------	------	------	------	------	------
TOTAL	347.	352.	159.	372.	241	736	802.	79	------	------	------	------	------	------	------

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/24/93 Analyte: CO_2 (15-1)

Source: FX HT 2000 Run #: 2

Zero Cyl #: T132257 Conc. 00.0 % CO_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS40875 Conc. 12.6 % CO_2 Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 407069

Range: 0 - 25.0% CO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% CO_2
EPA Control Limits = ± 2.5% of 25.0% CO_2 = ± 0.625% CO_2

Pre Run Audit: By: BW Time: 915 Temp: 78 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	-.029	-.029	-.116
Span	50.4	.504	12.6	50.6	.506	12.563	-.037	-.291

Comments:

Post Run Audit: By: DK Time: 1815 Temp: 81 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.001	-.004	-.004	-.016
Span	50.4	.504	12.6	50.5	.505	12.538	-.062	-.488

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

WST6-Form9 Rev 8/88

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/24/93 Analyte: O_2 (15-2)

Source: FX HT 2000 Run #: 2

Zero Cyl #: T132257 Conc. 00.0 % O_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS40875 Conc. 12.8 % O_2 Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Teledyne Model: 320 Ax SN: 37465

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% O_2

EPA Control Limits = ÷ 2.5% of 25.0% O_2 = + 0.625% O_2

Pre Run Audit: By: BN Time: 920 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	0.1	.004	.057	.057	.230
Span	12.8	.512	12.8	13.0	.524	12.988	.108	.845

Comments: Teledyne #2 Cyl % ____ Exp % ____ Act % ____ Adj to ____ + Δ % ____

Post Run Audit: By: DK Time: 1820 Temp.: 81 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.001	-.017	-.017	-.068
Span	12.8	.512	12.8	12.8	.518	12.839	.039	.304

Comments: Teledyne #2 Cyl % ____ Exp % ____ Act % ____ Adj to ____ + Δ % ____

+ Conc. Difference = Act % - Exp (Std) %

Zero % Differece = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Exp \% (ppm)}}$ X 100

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/24/93 Analyte: CO (15-3)

Source: FX HT 2000 Run #: 2

Zero Cyl #: T132257 Conc. 00.0 % CO Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS 40875 Conc. 5.01 % CO Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 408005

Range: 0 - 10.0% CO Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 10.0% CO
EPA Control Limits = ±2.5% of 10.0% CO = ± 0.25% CO

Pre Run Audit: By: BW Time: 925 Temp: 78 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	.000	.000	.000
Span	50.1	.501	5.01	51.7	.517	5.17	.160	3.194

Comments:

Post Run Audit: By: DK Time: 1825 Temp.: 81 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.4	.004	.040	.040	.400
Span	50.1	.501	5.01	50.9	.509	5.090	.080	1.597

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/24/93 Analyte: SO_2 (15-4)

Source: FX HT 2000 Run #: 2

Zero Cyl #: T132257 Conc. 00.0 ppm SO_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: CC 790716 Conc. 1268 ppm SO_2 Cyl Press: 500 psi

Certified by: LIQUID AIR Date: 2/26/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 403019

Range: 0 - 2500 ppm SO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 2500 ppm SO_2
EPA Control Limits = +2.5% of 2500 ppm SO_2 = +62.5 ppm SO_2

Pre Run Audit: By: BN Time: 930 Temp: 78 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	01.5	.015	33.085	33.085	1.323
Span	50.7	.507	1268	52.0	.520	1304.077	36.077	2.845

Comments:

Post Run Audit: By: OK Time: 1830 Temp: 81 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	01.0	.010	20.501	20.501	.820
Span	50.7	.507	1268	51.7	.517	1296.526	28.526	2.250

Comments:

± Conc. Difference = Act ppm - Exp (Std) ppm

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

QUALITY CHECKS
DATA SHEET 16

Unit: FX HT 2000 Run: 2 Date: 6/24/93

Thermocouple Check:

T/C #1	69.8	°F	T/C #13	69.0	°F
T/C #2	69.8	°F	T/C #14	69.2	°F
T/C #3	72.0	°F	T/C #15	69.7	°F
T/C #4	72.6	°F	T/C #16	44.0	°F
T/C #5	72.7	°F	T/C #17	52.6	°F
T/C #6	73.4	°F	T/C #18	74.8	°F
T/C #7	72.7	°F	T/C #19		°F
T/C #8	73.4	°F	T/C #20		°F
T/C #9	73.8	°F	T/C #21		°F
T/C #10	73.1	°F	T/C #22		°F
T/C #11	69.7	°F	T/C #23	70.2	°F
T/C #12	69.9	°F	T/C #24	219.2	°F

Thermocoouple Readout:

pretest zero and span check and calibration						post test zero and span			% difference
ZERO	-.2	°F	ADJ. TO	0	°F	ZERO	.1	°F	.005
SPAN	2000.0	°F	ADJ. TO	2000.0	°F	SPAN	2003.3	°F	.165

Thermocouple Readout Pretest Linearity Check

0 =	0	°F	200 =	201.4	°F	400 =	398.7	°F
600 =	601.0	°F	800 =	801.2	°F	1000 =	1000.3	°F
1200 =	1198.0	°F	1400 =	1399.0	°F	1600 =	1599.6	°F
1800 =	1799.9	°F	2000 =	2000.0	°F			

Sample Train Leak Check	Pre ✓	Post ✓
Combustion Gas Train Leak Check	Pre ✓	Post ✓
Tracer Gas Train (SO_2) Leak Check	Pre ✓	Post ✓
Darft (Static) Gauge Zero Check	Pre ✓	Post ✓

Scale Check

Pre 543.2 - 533.2 = 10.0

Post 548.0 - 538.0 = 10.0

Stack Cleaned Proir to Test Run: YES _____ NO ✓

TABLE 1 ----- RAW DATA

CLIENT : FX DROLET   TEST No. : 4

MODEL: HT 2000   DATE: 29-Jun-93

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	381.500	0.150	80	0.77	6.40	600
5	383.000	0.610	82	0.35	0.92	300
10	386.058	0.180	84	0.59	2.20	550
15	387.742	0.200	85	0.60	3.60	525
20	389.432	0.270	86	0.51	8.30	450
25	391.504	0.240	88	0.85	8.00	475
30	393.482	0.230	89	0.84	9.60	475
35	395.468	0.260	90	0.76	10.30	450
40	397.571	0.230	91	1.08	10.50	475
45	399.571	0.210	91	1.07	11.30	500
50	401.471	0.210	92	0.87	12.30	500
55	403.378	0.210	92	0.76	12.80	500
60	405.285	0.230	93	0.30	13.10	475
65	407.299	0.230	93	0.28	12.30	475
70	409.313	0.230	94	0.30	13.30	475
75	411.335	0.210	94	0.30	13.30	500
80	413.256	0.230	95	0.27	13.40	475
85	415.285	0.230	95	0.19	13.50	475
90	417.314	0.230	95	0.24	13.80	475
95	419.343	0.200	96	0.24	14.40	500
100	421.277	0.230	96	0.18	14.20	475
105	423.314	0.220	97	0.20	12.00	475
110	425.357	0.220	97	0.24	10.70	475
115	427.401	0.200	97	0.23	10.40	500
120	429.343	0.200	98	0.29	10.40	500
125	431.295	0.200	98	0.33	10.70	500
130	433.248	0.200	98	0.33	10.60	500
135	435.201	0.180	99	0.25	9.90	525
140	437.067	0.160	99	0.69	7.70	550
145	438.849	0.160	99	0.73	7.80	550
150	440.631	0.180	99	0.72	7.50	525
155	442.497	0.180	99	0.65	7.60	525
160	444.364	0.180	99	0.72	7.50	525
165	446.230	0.180	99	0.74	7.30	525
170	448.097	0.180	99	0.91	6.90	525
175	449.963	0.180	99	1.00	6.70	525
180	451.829	0.180	99	1.12	6.60	525
185	453.695	0.180	99	1.19	6.60	525
190	455.561	0.180	99	1.21	6.60	525
195	457.427	0.180	99	1.29	6.50	525
200	459.293	0.180	99	1.30	6.50	525
205	461.159	0.180	99	1.53	6.20	525
210	463.024	0.180	99	1.50	6.20	525
215	464.890	0.180	99	1.50	6.30	525

TABLE 2---RAW DATA

CLIENT : FX DROLET   TEST No. 4

MODEL: HT 2000   DATE: 29-Jun-93

****

METER CAL. FACTOR (Y) ------	1.028	Wt. WOOD BURNED(LB) -------	21.6	Lbs
BAROMETRIC PRESS.(Pb) ------	30.15 in Hg	WET,FUEL MOISTURE % -------	18.963	%
LEAK RATE POST (Lp) ------	0.001 cfm	Wt. PART. COLLECTED -------	0.5417	g
WATER VOL. (V1c) ------	131.7 Ml	METER VOLUME Vm -------	109.179	mcf
TEST TIME (MIN) ------	285 min	HC MOLE FRACTION -------	0.0132	

TABLE 3 -----FIELD DATA AVERAGES

CLIENT :FX DROLET TEST No. 4

MODEL: HT 2000 DATE: 29-Jun-93

****

AVG DELTA H	-------	0.20 in H_2O	AVG PRCNT CO	-------	0.86	%
AVG METER TEMP. Tm	-------	96 deg F	AVG PRCNT CO_2	-------	8.37	%
AVG PPM SO_2	-------	509 PPM	AVG BAL CO_2/CO	-------	9.79	%

TABLE 4 ----- CALCULATIONS

CLIENT : FX DROLET TEST No. 4

MODEL: HT 2000 DATE: 29-Jun-93

****

STD SAMPLE VOL. Vm(std) -----	107.52	dscf	STACK GAS FLOW Qsd -------	571.275 & 9.52	dscf/Hr & dscf/min
VOL. WATER VAPOR Vw(std) ----	6.199	scf	PARTICULATE CONCTRT. Cs ------	0.0050	g/dscf
PRCNT MSTR Bws -------	5.45	%	PARTC.EMISS. RATE E -------	2.88	g/Hr
BURN RATE BR -------	1.67	Kg/Hr	MOLES OF GAS PER Lb WOOD Nt --	0.40	Lb-mole/Lb
CO EMISSION RATE -------	163.57 & 97.83	g/Hr & g/Kgdry fuel	PART.EMISS. RATE ------	1.72	g/Kgdry fuel

TABLE 5 ----- PROPORTIONAL RATE VARIATION

CLIENT : FX DROLET TEST No. : 4

MODEL: HT 2000 DATE: 29-Jun-93

****

	TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE	
	5	910.4	96		100	
	10	925.6	97			
	15	930.9	98			
	20	890.2	94			
	25	933.1	98			
	30	937.6	99			
	35	939.7	99			
	40	941.0	99			
	45	943.7	99			
	50	942.8	99			
	55	945.4	99			
	60	944.6	99			
	65	946.9	100			
	70	946.0	99			
	75	948.9	100			
	80	948.1	100			
	85	950.5	100			
	90	950.5	100			
	95	949.6	100			
	100	951.9	100			
	105	951.7	100			
	110	953.6	100			
	115	954.1	100			
	120	953.3	100			
	125	957.3	101			
	130	957.8	101			
	135	956.9	101			
	140	959.1	101			
	145	959.5	101			
	150	959.5	101			
	155	959.1	101			
	160	959.6	101			
	165	959.1	101			
	170	959.6	101			
	175	959.1	101			
	180	959.1	101			
	185	959.1	101			
	190	959.1	101			
	195	959.1	101			
	200	959.1	101			
	205	959.1	101			
	210	958.6	101			
	215	959.1	101			
	220	959.1	101			

225	959.1	101
230	959.1	101
235	959.1	101
240	959.1	101
245	959.1	101
250	959.1	101
255	959.5	101
260	959.6	101
265	959.1	101
270	959.6	101
275	959.0	101
280	959.5	101
285	959.5	101
290		
295		

COMPUTER INPUT DATA WOODSTOVE DATA SHEET #1

Client FX DEOLET

Client Address 1700 LEON HARMEL

QUEBEC, QUEBEC, CANADA G1N 4R9

Client Phone 514- 565-6336

Project No. ______ Model No. #T2000

Run No. 4 Date of Test 6/29/93 Est Grams/Hr ______

Stove Type: Cat ______ Non Cat X Pellet ______

Data To Be Submitted To: Oregon ______ Colorado ______ EPA ______

Burn Category: Low (<0.8 Kg/Hr) ______ Med Hi (1.26 - 1.90 Kg/Hr) ______
Med Low (0.8 - 1.25 Kg/Hr) 1.6715 Max (>1.9 Kg/Hr) ______

Fuel % Moisture (dry) 23.400 %(wet) 18.963 %
(00.00) (Data Sheet #10)

Stack Static Pressure -.055 "H_2O
(0.000) (Data Sheet #12)

Barometric Pressure 30.15 "Hg
(00.00) (Data Sheet #2)

Temperature (Average Room) Combustion Air 83 °F
(00) (Data Sheet #14)

Flue Gas Moisture 5.4564 %
(00.000) (Data Sheet #7)

Ambient Moisture 1.15 %
(0.00) (Data Sheet #8)

Stove Weight 487 lbs
(000) (Data Sheet #8)

Stove Temperature Change -46.2 °F
(000) (Data Sheet #14)

Particulate Emission .0778 gr/dscf
(0.0000) (Data Sheet #7)

Fuel Higher Heating Value (dry) 8637 BTU/lb
(0000) (CT&E Sheet)

Fuel Type: Wood: X Pellets: ______

Total Fuel Consumed During Burn 21.6 lbs
(00.0) (Data Sheet #8)

Total Particulate Catch .5417 g
(0.0000) (Data Sheet #6)

H_2O Captured 131.7 g
(00.0) (Data Sheet #3)

Dry Gas Meter Volume 109.179 CF
(00.000) (Data Sheet #2)

Dry Gas Meter: Y Factor: 1.028 Post Test Leak Rate .001 CFM

TIME: 285

Meter Box Data Sheet Page # 2

Meter Box 5H Y Factor 1.028

Leak Checks: 16 " Hg @ .002 cfm
15.0 " Hg @ .001 cfm
" Hg @ cfm
" Hg @ cfm

Inject SO2 @ 100 cc/min

Unit: FX

Run: 4 Date: 6-29-[illegible]

Operator(s): [illegible], DK

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 1.03			Sampling Ratio : 19 : 1				BAROMETER: 30.18		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
00	1035	381.500	—	5.821	.15	80	600	80	1.0
05	40	383.000	—	11.598	.61	82	300	82	5.0
10	45	386.058	386.058	6.303	.18	84	550	84	1.0
15	50	387.742	387.742	6.591	.20	85	525	85	1.0
20	55	389.432	389.432	7.675	.27	86	450	86	1.0
25	1100	391.504	391.504	7.245	.24	88	475	88	2.0
30	05	393.482	393.482	7.232	.23	89	475	89	2.0
35	10	395.468	395.468	7.620	.26	90	450	90	2.0
40	15	397.571	397.571	7.205	.23	91	475	91	2.0
45	20	399.571	399.571	6.845	.21	91	500	91	2.0
50	25	401.471	401.471	6.833	.21	92	500	92	2.0
55	1130	403.378	403.378	6.833	.21	92	500	92	2.0
ROTO PRESS: 1.03			TOTALS :	87.801	3.00	1050	BAROMETER: 30.18		
60	1135	405.285	405.285	7.179	.23	93	475	93	2.0
65	40	407.299	407.299	7.179	.23	93	475	93	2.0
70	45	409.313	409.313	7.166	.23	94	475	94	2.0
75	50	411.335	411.335	6.808	.21	94	500	94	2.0
80	55	413.256	413.256	7.154	.23	95	475	95	2.0
85	1200	415.285	415.285	7.154	.23	95	475	95	2.0
90	05	417.314	417.314	7.154	.23	95	475	95	2.0
95	10	419.343	419.343	6.784	.20	96	500	96	2.0
100	15	421.277	421.277	7.141	.23	96	475	96	2.0
105	20	423.314	423.314	7.128	.22	97	475	97	2.0
110	25	425.357	425.357	7.128	.22	97	475	97	2.0
115	30	427.401	427.401	6.771	.20	97	500	97	2.0
			TOTALS:	84.746	2.66	1142	MAX VACC =	—	
TOTAL CU FT		—	TOTALS:	172.547	5.66	2192	AV BP:	—	

Meter Box Data Sheet Page # 2

Page 2 of 3

Meter Box 514 Y Factor 1.028

Unit: FX

Run: 4 Date: 6-29-93

Leak Checks: 16 " Hg @ .002 cfm
15.0 " Hg @ .001 cfm
" Hg @ cfm
" Hg @ cfm

Operator(s): CW DK

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 1.03			Sampling Ratio : 19 : 1				BAROMETER: 30.12		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
120	1235	429.343	429.343	6.746	.20	98	500	.98	2.0
125	40	431.295	431.295	6.746	.20	98	500	98	2.0
130	45	433.248	433.248	6.746	.20	98	500	98	2.0
135	50	435.201	435.201	6.413	.18	99	525	99	2.0
140	55	437.067	437.067	6.122	.16	99	550	99	2.0
145	1300	438.849	438.849	6.122	.16	99	550	99	2.0
150	05	440.631	440.631	6.413	.18	99	525	99	2.0
155	10	442.497	442.497	6.413	.18	99	525	99	2.0
160	15	444.364	444.364	6.413	.18	99	525	99	2.0
165	20	446.230	446.230	6.413	.18	99	525	99	2.0
170	25	448.097	448.097	6.413	.18	99	525	99	2.0
175	1330	449.963	449.963	6.413	.18	99	525	99	2.0
ROTO PRESS:	1.01		TOTALS :	77.373	2.18	1185	BAROMETER: 30.13		
180	35	451.829	451.829	6.415	.18	99	525	99	2.0
185	40	453.695	453.695	6.415	.18	99	525	99	2.0
190	45	455.561	455.561	6.415	.18	99	525	99	2.0
195	50	457.427	457.427	6.415	.18	99	525	99	2.0
200	55	459.293	459.293	6.415	.18	99	525	99	2.0
205	1400	461.159	461.159	6.415	.18	99	525	99	2.0
210	05	463.024	463.024	6.415	.18	99	525	99	2.0
215	10	464.890	464.890	6.415	.18	99	525	99	2.0
220	15	466.756	466.756	6.415	.18	99	525	99	2.0
225	20	468.622	468.622	6.415	.18	99	525	99	2.0
230	25	470.488	470.488	6.415	.18	99	525	99	2.0
235	30	472.354	472.354	6.415	.18	99	525	99	2.0
			TOTALS:	76.980	2.160	1188	MAX VACC =	—	
TOTAL CU FT	—		TOTALS:	154.353	4.340	2373	AV BP:		

Meter Box Data Sheet Page # 2

Meter Box 5H Y Factor 1.028

Leak Checks: 16.0 " Hg @ .002 cfm
15.0 " Hg @ .001 cfm
_____ " Hg @ _____ cfm
_____ " Hg @ _____ cfm

Inject SO2 @ 100 cc/min

Unit: FX HT 2000

Run: 4 Date: 6/29/93

Operator(s): CW, DK

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 1.00			Sampling Ratio : 19 : 1				BAROMETER: 30.12		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
240	1435	474.220	474.220	6.413	.18	99	525	99	2.0
245	40	476.086	476.086	6.413	.18	99	525	99	2.0
250	45	477.952	477.952	6.121	.16	99	550	99	2.0
255	50	479.734	479.734	6.413	.18	99	525	99	2.0
260	55	481.601	481.601	6.413	.18	99	525	99	2.0
265	1500	483.467	483.467	6.413	.18	99	525	99	2.0
270	05	485.334	485.334	6.121	.16	99	550	99	2.0
275	10	487.115	487.115	6.121	.16	99	550	99	2.0
280	15	488.897	488.897	6.121	.16	99	550	99	2.0
285	20	490.679	490.679	6.121	.16	99	550	99	2.0
290	25						÷58		
295				62.670	1.700	990			
ROTO PRESS: ________			TOTALS :	389.570	11.700	5555	BAROMETER: ______		
300						96			
305									
310									
315									
320									
325									
330									
335									
340									
345									
350									
355									
			TOTALS:			96	MAX VACC = 5.0		
TOTAL CU FT		109.179	TOTALS:	6.717	.202	556	AV BP: 30.15		

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

	Balance Level	Balance Zeroed
Initial:	✓	✓
Final:	✓	✓

Unit: Fx

Run: 4

Date: 6-29-93

Technician(s): Initial: CW

Final: CW

Approved By: ____

IMPINGER #1

Final Weight 663.7 grams

Initial Weight 566.5 grams

Net 97.2 ✓ grams

IMPINGER #2

Final Weight 600.2 grams

Initial Weight 577.8 grams

Net 22.4 ✓ grams

IMPINGER #3

Final Weight 488.5 grams

Initial Weight 486.0 grams

Net 2.5 ✓ grams

IMPINGER #4 (SILICA GEL)

Final Weight 906.5 grams

Initial Weight 896.9 grams

Net 9.6 ✓ grams

TOTAL MASS OF H_2O CAPTURED 131.7 ✓ grams

Scale Check: 295.0g = 295.0 g
590.0g = 590.3 g
885.0g = 885.1 g

Front Half Filter # 4481F

#

Back Half Filter # 4481B

Notes:

WST5-Form9, Pg2, Rev1/90

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 5/27/93 Time 1030 By DK Front Half ✓ Back Half ✓

Manufacturer: S&S Size: 11 cm / 8.2 cm Lot. No.: ZB901 Grade: #25 glass

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
441F	.6921	6/1	1016	LU	.6924	6/2	1044	DK	✓			
442F	.6988	6/1	1017	LU	.6988		1046		✓			
443F	.6982	6/1	1018	LU	.6977		1048		✓			
444F	.7058	6/1	1019	LU	.7054		1050		✓			
445F	.7004	6/1	1020	LU	.7002		1052		✓			
446F	.6996	6/1	1021	LU	.6994		1054		✓			
447F	.7022	6/1	1022	LU	.7022		1056		✓			
448F	.7079	6/1	1023	LU	.7076		1058		✓			
449F	.6984	6/1	1024	LU	.6982		1100		✓			
450F	.7079	6/1	1025	LU	.7080		1102		✓			
441B	.3750	6/1	1026	LU	.3745	6/2	1126	DK	✓			
442B	.3730	6/1	1027	LU	.3725		1128		✓			
443B	.3776	6/1	1028	LU	.3771		1130		✓			
444B	.3779	6/1	1029	LU	.3774		1132		✓			
445B	.3738	6/1	1030	LU	.3733		1134		✓			
446B	.3736	6/1	1031	LU	.3731		1136		✓			
447B	.3755	6/1	1032	LU	.3750		1138		✓			
448B	.3790	6/1	1033	LU	.3785		1140		✓			
449B	.3728	6/1	1034	LU	.3726		1142		✓			
450B	.3801	6/1	1035	LU	.3796		1144		✓			

Checked by Bill Nowak Date: 6/2/93 Time 1328

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
58	70	48	6/1	900	LU
62	75	48	6/2	1042	DK

Unit FX
Run # 4
Date: 6-24-93

WOODSTOVE DATA SHEET #4-3: CONSTA FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
406		6/30	0630	BW	98.1702	7/1	930	LW	98.1704	7/2	920	DK	✓			
407		6/30	0900	DK	106.5647	7/1	932	LW	106.5642	7/2	922	DK	✓			
408		6/30	0630	BW	95.7716	7/1	934	LW	95.7704	7/2	924	DK	95.7699	7/6	920	LW
409		6/30	0630	BW	98.2563	7/1	936	LW	98.2565	7/2	926	DK	✓			
410		6/30	0900	DK	107.4194	7/1	938	LW	107.4196	7/2	928	DK	✓			

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
448F		6-29	1600	CW	.7959	6/30	1120	DK	.7959	7/1	940	LW	✓			
448B		6-29	1600	CW	.4883	6/30	1122	DK	.4878	7/1	942	LW	✓			

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	WB	DB	%RH
1	6/30	1118	DK	60	73	47
2	7/1	910	LW	60	73	47
3	7/2	908	DK	58	70	48
4	7/6	906	LW	60	73	47
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

Dates: From 6/10/93

Through 7/6/93

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0001	10.0001	1.0000	0.0999			DK	6/10	1000	70	58	48
99.9999	10.0001	0.9998	0.1000			LU	6/11	904	68	56	47
100.0003	10.0000	0.9996	0.0999			DK	6/14	910	76	63	49
99.9999	10.0003	1.0001	0.1002			LU	6/15	902	70	58	48
99.9998	10.0002	1.0000	0.0998			DK	6/16	900	70	58	48
99.9996	9.9997	0.9998	0.0997			LU	6/17	904	70	58	48
100.0004	10.0003	1.0000	0.1000			DK	6/18	0830	69	57	47
100.0001	10.0001	1.0000	0.1000			LU	6/21	908	68	56	47
100.0001	10.0000	1.0001	0.0999			DK	6/22	900	66	55	49
99.9996	9.9997	0.9997	0.0998			LU	6/23	906	70	58	48
99.9998	9.9999	0.9999	0.1000			DK	6/24	1700	74	60	44
99.9998	9.9997	0.9997	0.0995			LU	6/25	930	77	64	49
100.0001	10.0000	0.9999	0.0997			DK	6/28	1000	71	59	49
100.0003	10.0003	1.0001	0.1000			LU	6/29	904	71	59	49
100.0002	10.0001	1.0001	0.0999			DK	6/30	1045	73	60	47
99.9999	10.0000	1.0000	0.1000			LU	7/1	910	73	60	47
100.0003	10.0002	1.0002	0.1001			DK	7/2	908	70	58	48
99.9998	10.0002	1.0000	0.0999			LU	7/6	906	73	60	47

Dates: From 3-11-93

Through 6/9/93

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0004	10.0001	1.0000	.0999			CW	3-11	0915	69	54	36
99.9998	10.0000	0.9999	0.0997			DK	3/12	0830	68	52	32
100.0003	10.0002	1.0000	.0997			CW	3-15	0930	72	57	39
100.0000	10.0002	1.0000	0.1000			DK	3/16	0900	72	57	39
100.0001	10.0001	1.0002	0.1001			DK	3/17	1330	72	58	42
100.0001	10.0003	1.0002	0.1001			CW	3-18	1700	75	60	47
99.9999	10.0000	0.9998	0.0999			DK	3/19	0900	71	57	41
100.0003	10.0001	1.0000	.0999			BN	3-23	0900	73	60	47
100.0002	10.0001	1.0000	0.0999			DK	3/19	1300	77	63	46
100.0001	10.0001	1.0001	.0999			CW	4-20	0900	75	60	41
100.0000	10.0002	1.0002	0.0999			DK	4/26	0900	66	55	49
100.0001	10.0001	1.0001	.1001			CW	4-28	0900	69	56	44
100.0002	10.0001	0.9999	0.0999			DK	5/4	1120	75	62	48
100.0001	10.0001	1.0000	.1000			CW	5-5	1000	75	60	41
99.9998	9.9999	0.9999	0.1000			DK	5/6	946	76	62	45
99.9997	10.0001	1.0000	0.0999			DK	5/7	1620	74	60	44
100.0002	10.0002	1.0001	.0999			BN	5-10	0900	71	59	49
100.0002	10.0002	1.0002	.1001			CW	5-11	1000	73	59	43
100.0000	10.0000	1.0000	0.0999			DK	5/12	900	75	61	44
100.0001	10.0001	1.0001	.1000			CW	5-13	1600	71	58	45
99.9997	10.0002	1.0002	0.1001			DK	5/14	1000	70	58	48
99.9999	10.0001	0.9999	0.0998			DK	5/19	1010	71	59	49
99.9999	10.0000	0.9998	0.0998			BN	5/20	1720	74	60	44
99.9997	10.0002	1.0000	0.0998			DK	5/21	950	70	58	48
100.0001	10.0002	1.0000	0.0999			LU	5/24	1115	77	65	46
100.0001	10.0002	1.0001	0.1001			DK	5/25	1030	70	58	48
100.0003	10.0000	0.9998	0.1000			LU	5/26	1230	77	64	49
100.0000	10.0002	1.0000	0.1000			DK	5/27	940	77	64	49
99.9997	10.0001	0.9999	0.1000			LU	5/28	908	76	63	49
99.9999	10.0000	0.9999	0.0997			LU	6/1	900	70	58	48
100.0002	10.0003	1.0001	0.1001			DK	6/2	940	75	62	48
100.0000	10.0000	1.0001	0.0998			LU	6/3	956	70	58	48
100.0001	9.9999	0.9999	0.0999			DK	6/4	0930	68	56	47
100.0000	9.9998	0.9999	0.0999			LU	6/7	0940	68	56	47
99.9996	10.0001	0.9999	0.0999			DK	6/8	0900	68	56	47
99.9995	9.9997	0.9999	0.0996			LU	6/9	0904	68	56	47

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: Fx HT 2000
Run: 4 Date: 6-29-95
Technician(s): CW

FRONT HALF

FILTER #: 448F
FINAL WT: .7959 g
TARE WT: .7076 g
NET WT: .0883 g

BEAKER #: 406
ml: 50
desc: ACETONE

FINAL WT: 98.1704 g
TARE WT: 98.1374 g
NET WT: .0330 g

FILTER #:
FINAL WT: g
TARE WT: g
NET WT: g

BEAKER #:
ml:
desc: ACETONE

FINAL WT: g
TARE WT: g
NET WT: g

TOTAL VOLUME OF ACETONE USED IN WASH 50 ml

BACK HALF

FILTER #: 448B
FINAL WT: .4878 g
TARE WT: .3785 g
NET WT: .1093 g

BEAKER #: 407
ml: 115
desc: ACETONE

FINAL WT: 106.5642 g
TARE WT: 106.4078 g
NET WT: .1564 g

FILTER #:
FINAL WT: g
TARE WT: g
NET WT: g

BEAKER #: 408
ml: 75
desc: METHCHLOR

FINAL WT: 95.7699 g
TARE WT: 95.7324 g
NET WT: .0375 g

BEAKER #: 409
ml: 150
desc: H2O

FINAL WT: 98.2565 g
TARE WT: 98.1952 g
NET WT: .0613 g

BEAKER #: 410
ml: 150
desc: H2O

FINAL WT: 107.4196 g
TARE WT: 107.3625 g
NET WT: .0571 g

BEAKER #:
ml:
desc:

FINAL WT: .1184 g
TARE WT: g
NET WT: g

BEAKER #:
ml:
desc:

FINAL WT: g
TARE WT: g
NET WT: g

TOTAL VOLUME OF ACETONE USED IN WASH 115 ml
TOTAL VOLUME OF DICHLOROMETHANE USED IN EXTRACTION 75 ml
TOTAL VOLUME OF DISTILLED WATER DRIED 300 ml

PRTCATCH

WOODSTOVE BLANKS PROCESSING
WOODSTOVE DATA SHEET # 5A

Unit: FX HT2000
Run: 4 Date: 6/29/93

BLANKS DONE: 6/15/93

Technician(s): CW

BEAKER #: A
200 ml ACETONE
FISHER OPTIMA LOT #: 924059

FINAL WT: 108.9002 g
TARE WT: 108.8998 g
NET WT: .0004 g

BEAKER #: B
15 ml DICHLOROMETHANE
FISHER OPTIMA LOT #: 910732

FINAL WT: 106.3060 g
TARE WT: 106.3054 g
NET WT: .0006 g

BEAKER #: C
200 ml DISTILLED WATER
BONNEAU PRODUCTS CERTIFIED

FINAL WT: 106.9637 g
TARE WT: 106.9635 g
NET WT: .0002 g

BEAKER TARES INTO DESSC: TIME: 0900 DATE: 6/4/93

BKR #	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME	4TH WT	TIME
A	108.8997	1102	108.8998	1044				
B	106.3056	1104	106.3054	1046				
C	106.9640	1106	106.9635	1048				

SCALE ROOM QC : TARES

DATE	TIME	BY	WB	DB	%
6/7	940	LU	56	68	47
6/8	1042	DK	56	68	47

SCALE ROOM QC : FINALS

DATE	TIME	BY	WB	DB	%
6/14	926	DK	63	76	49
6/15	902	LU	58	70	48

BEAKERS: FINAL WEIGHTS

BKR #	IN DSC	TIME	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME
A	6/11	1030	108.9001	928	108.9002	912		
B	6/11	1031	106.3059	930	106.3060	914		
C	6/11	1032	106.9639	932	106.9637	916		

BKR #	4TH WT	TIME	5TH WT	TIME	6TH WT	TIME	7TH WT	TIME

Unit: FL HT2000
Run: 4
Date: 6/29/93
Technician(s): CW
WSTAPP1-AppDoc19-page2
Rev 6/90

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Blank Audit: By: Bill Nowak Date: 6/15/93

Blank Calculations:

Acetone:	.0004 g ÷	200	ml =	.000002	g/ml
Dichloromethane:	.0006 g ÷	75	ml =	.000008	g/ml
Distillted Water:	.0002 g ÷	200	ml =	.000001	g/ml

Front Half Catch:

Filters: .0883 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .0883 g (Net Catch)

Beakers: .0330 g (Total Catch) - 50 (Ml of Acetone) (.000002 g) (Blank Value/ml of Acetone) = .0329 g (Net Catch)

Total Front Half Catch .1212 g

Back Half Catch:

Filters: .1093 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .1093 g (Net Catch)

Beakers:

1. Acetone/Impingers:
   .1564 g (Total Catch) - 115 (ml of acetone) (.000002 g) (Blank Value/ml of Acetone) = .1562 g (Net Catch)

2. Extract/Impingers:
   .0375 g (Total Catch) - 75 (ml. of Dichloromethane) (.000008 g) (Blank Value/ml of Dichloromethane) = .0369 g (Net Catch)
   .0006

3. Water/Impingers:
   .1184 g (Total Catch) - 300 (ml. of water) (.000001 g) (Blank Value/ml of water) = .1181 g (Net Catch)

Total Back Half Catch .4205 g
Total Catch .5417 g
% Front Half 22.4 %

EPA METHOD 5H PARTICULATE CALCULATIONS
WOODSTOVE TEST DATA SHEET #7

Unit: FX HT2000

Run: 4 Date: 6/29/95

Technician(s): DK

1) $Vm(std) = \dfrac{(109.179\ Vm)(17.64)(1.028\ mcf)(30.15\ \text{" Hg} + \frac{.202\ \text{" H2O}}{13.6})}{(556\ TmA)} = \dfrac{107.4131}{000.0000}$ dscf

2) $Vw(std) = (.04707)(131.7\ \text{ml H2O}) = \dfrac{6.1991}{00.0000}$ scf

3) $Asw = \dfrac{(6.1991\ scf)}{(6.1991\ scf + 107.4131\ dscf)} = \dfrac{.0546}{.0000}\ Bws \times 100 = \dfrac{5.4564}{00.0000}$ % H2O

4) $Cs = \dfrac{(.5417\ g.)}{(107.4131\ dscf)}(15.43) = \dfrac{.0778}{0.0000}$ gr/dscf

5) $\text{Estimated g/hr} = \dfrac{(.5417\ g.)}{(107.4131\ dscf)}\left(\dfrac{6.717}{00.000}\ dscfm\right)(60) = \dfrac{2.0325}{00.0000}$ g/hr

Vm =	total cubic feet pulled on meter box during test	(p. 2)	(000.000 V
mcf =	meter correction factor (Y factor) of the meter box used for the test	(p. 2)	(0.000 mcf
" Hg =	average barometric pressure during the test	(p. 2)	(00.00 " Hg
" H2O =	average delta H for the test	(p. 2)	(.000 " H2O
TmA =	average meter temperature for the test in degrees Absolute	(p. 2)	(000 TmA
ml H2O =	total water caught during the test	(p. 3)	(000.0 ml H2O
g. =	total particulate catch for the test	(p. 6)	(00.0000 g.
dscfm =	average stack flow during the test	(computer printout)	(00.000 dscf

PRTCALC

Miscellaneous Test Data Sheet Page # 8

Unit: FX HT 2000 Run: 4 Date: 6/20/93

Test Chamber Air Velocity Start: 0 Stop: 0 Avg: 0

Wet Bulb / Dry Bulb

Start: WB: 63 DB: 76 = 49 % RH 1.5 %H20

Stop: WB: 60 DB: 86 = 20 % RH .9 %H20

Average % Relative Humidity 34.5 Average % Ambient Moisture: 1.15

Empty Stove Weight: 487 lbs

Empty Stove Weight w/ Stack & Oil Seal: Wet: 536.7 Dry: 536.3

Kindling Weight: Paper: .3 lbs Wood: 8.3 lbs

Preburn Fuel Wt: 6.9 + 22.3 Total: 29.2 lbs

Total Kindling & Preburn Fuel Weight (Wood Only) ==> Total: 37.5 lbs

Coal Bed Weight: RANGE: 5.4 - 4.4 lbs SCALE: 541.7 - 540.7 lbs

Upper = .25 x fuel wt
Always round DOWN to nearest tenth
Lower = .20 x fuel wt
Always round UP to nearest tenth

Actual Coal Bed Weight: 4.8 lbs

Maximum Coal Bed Weight Removal ((5.4 Upper + 4.4 Lower)/2).25 = 1.2 lbs

Test Fuel (.75 x 1.5 x 5 " spacers) = 16 pcs

Dimensions	Length in inches	No. pcs	Wt. in lbs	% of load
2 x 4	NA	NA	NA	NA
4 x 4	18.5	5	21.6	100.0

Test Fuel Weight: 21.6 lbs

Estimated Dry Burn Rate Calculation

$$\frac{21.6 - (21.6 \times .18963)}{2.2046} \times \frac{60}{285 \text{ (Time)}} = 1.6715 \text{ Kg/Hr}$$

Estimated EPA Heat Output in BTU's / Hr

$$19{,}140 \times \frac{63}{100} \times 1.6715 \text{ (DBR)} = 20{,}155 \text{ BTU's/Hr}$$

EPA Default Efficiencies: NON-CAT: 63 CAT: 72 PELLET: 78

NOTES: 7.9398

1.9 = 250

1.25 = 381

WOODSTOVE OPERATING DATA

FIRE STARTED: 0800 PST/PDST

WARM UP AND PREBURN: PRIMARY AIR: set wide open for all warm-up/preburn fuel charges. then set to 3/8" at start of preburn.

SECONDARY AIR: NA CAT BYPASS: NA

CHARCOAL BED PREPARATION: raked and leveled prior to each warm-up/preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 15 sec.

TEST: Door Wide Open during loading 0 min 50 sec

PRIMARY AIR: opened full for first 5 min. , then set to run setting of 3/8".

SECONDARY AIR: NA CAT BYPASS: NA

FAN: ON/OFF during warm-up ON/OFF during preburn
ON/OFF first 30 minutes of test ON/OFF balance of test run
Fan speed set at HIGH.

WOOD DATA: KINDLING: a mix of the grades listed below

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2X4	Manke/Tacoma	Std or btr	s. grn D fir
TEST:	2X4	Packwood	#2 or btr	s. grn D fir
	4x4	Packwood	#2 or btr	s. grn D fir

PELLET FUEL APFI#: ____________

All grades WCLB rules

WARM UP INFORMATION:
All pre-burn/warm up fuel pieces were either ______ or 13 inches.

1st warm up/preburn fuel charge (6.9 lbs) added at 0830 .

2nd warm up/preburn fuel charge (22.3 lbs) added at 0915 .

3rd warm up/preburn fuel charge (______ lbs) added at ______ .

4th warm up/preburn fuel charge (______ lbs) added at ______ .

5th warm up/preburn fuel charge (______ lbs) added at ______ .

Unit: FX HT 2000
Run: 4
Date: 6/29/93
Technician:

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

WST1-Form7-Rev11/89

Room Temperature: 70 °F

Correction Factor: 0

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes____. No ✓.
Time Test Fuel Moisture Readings taken at: 930
Calibration Checks: X ✓ Y ✓ 12.0 12.2 22.0 22.0

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1	2x4x8	K	10.5	11.2	11.5	12.3	11.5	12.3	11.933
2									
3									
4	2x4x8	P	22.0	24.1	21.5	23.5	22.0	24.1	23.900
5	2x4x8	P	18.5	20.1	19.0	20.7	18.0	19.6	20.133
6	2x4x8	P	21.0	22.9	21.5	23.5	20.5	22.4	22.933
7									66.967
8									
9									
10									
11									
12	4x4x	T	20.5	22.4	22.0	24.1	20.5	22.4	22.967
13	4x4x	T	20.5	22.4	21.5	23.5	21.0	22.9	22.933
14	4x4x	T	22.0	24.1	22.0	24.1	21.5	23.5	23.900
15	4x4x	T	22.0	24.1	21.5	23.5	22.0	24.1	23.900
16	4x4x	T	21.5	23.5	21.0	22.9	21.5	23.5	23.300
17									117.000
18									
19									
20	FEET	T	20.5	22.4	21.0	22.9	20.0	21.8	22.367

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	11.933 %	22.322 %	23.400 %
% Moisture - Wet Basis:	10.661 %	18.249 %	18.963 %

To obtain Wet from Dry: $\frac{100 \times \%\ \text{Dry Rdg.}}{100 + \%\ \text{Dry Rdg.}}$ = % Moisture, Wet Basis

Acceptable Ranges: 16-20% wet; 19-25% dry
(17.5 - 22.5 on Meter [Uncor reading] at 70°F)

Key for Use: K= Kindling P= Pretest Fuel T= Test Fuel

Unit: FXHT 2000
Run#: 4
Date: 6/29/93
Technician: DK

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 4 x 4 x 3½

Depth (D): 9.0 cm

Width (W): 8.98 cm

Length (L): 8.8 cm
8.65 cm
8.75 cm
8.72 cm

Length $\bar{X}$ = 8.73 cm

Volume: 705.559 cm^3
(D X W X L)

MOISTURE: Room Temperature: ✓ °F Correction Factor: ✓

Uncorrected Meter Readings Corrected for temperature: Yes ___ No ✓

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	20.0	21.8 %
Bottom:	20.5	22.4 %
Side:	21.5	23.5 %
$\bar{X}$:		22.567 %

Avg % Moisture (Dry) 22.567 %

Avg % Moisture (Wet) 18.412 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 342.0 g Dry Weight: 281.52 g

% Moisture Dried Basis: 17.6842 %
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp	
Into Dryer	6/29/93	930	213	°F
Out of Dryer	7/6/93	1030	215	°F

(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 281.52 g (dry wt) ÷ 705.559 cm^3 (volume) = .3990 g/cm^3

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ______ g

Wet Wt: ______ g - ______ g = ______ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: ______ g ÷ ______ g = ______ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

% Moisture Dried Basis: ______ %
[1 - (Net Dry Wt ÷ Net Wet Wt.)] X 100

541

PAGE 12 G.S DATA SHEET
MANUFACTURER/MODEL FX HT 2000 RUN 4 DATE 6/29/93 PAGE 1 OF 3

TIME	SCALE	FUEL	DROP	V.	CO2	V.	O2	V.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
0/1035	562.7	21.6	Ø	.258	6.4	.542	13.4	.077	.77	8.3	81	94	3.2	119	360	-.050	600
05/40	562.2	21.1	.5	.038	.92	.778	19.3	.035	.35	2.6	77	95	2.5	119	388	-.051	300
10/45	561.8	20.7	.4	.091	2.2	.730	18.1	.059	.59	3.8	80	110	2.4	110	294	-.046	550
15/50	561.2	20.1	.6	.147	3.6	.594	14.7	.060	.60	6.0	85	116	3.0	115	339	-.050	525
20/55	560.4	19.3	.8	.334	8.3	.443	11.0	.051	.51	16.2	89	123	3.4	126	447	-.060	450
25/1100	559.6	18.5	.8	.322	8.0	.491	12.2	.085	.85	9.4	91	122	3.9	122	402	-.056	475
30/05	558.8	17.7	.8	.387	9.6	.426	10.6	.084	.84	11.4	93	124	4.1	125	404	-.056	475
35/10	557.9	16.8	.9	.416	10.3	.402	10.0	.076	.76	13.6	96	124	4.7	129	444	-.060	450
40/15	557.0	15.9	.9	.424	10.5	.390	9.7	.108	1.08	9.7	97	126	4.8	130	464	-.062	475
45/20	556.2	15.1	.8	.455	11.3	.360	8.9	.107	1.07	10.6	98	126	5.0	130	467	-.063	500
50/25	555.2	14.1	1.0	.494	12.3	.328	8.1	.087	.87	14.1	98	126	5.0	131	473	-.064	500
55/30	554.3	13.2	.9	.515	12.8	.312	7.7	.076	.76	16.8	98	127	5.0	131	491	-.064	500
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	------	4973	-.682	-------
60/35	553.4	12.3	.9	.528	13.1	.306	7.6	.030	.30	43.7	97	125	4.8	131	500	-.064	475
65/40	552.6	11.5	.8	.497	12.3	.331	8.2	.028	.28	44.1	96	123	4.7	131	491	-.065	475
70/45	551.7	10.6	.9	.536	13.3	.295	7.3	.030	.30	44.4	95	123	4.5	132	504	-.066	475
75/50	551.1	10.0	.6	.536	13.3	.293	7.2	.030	.30	44.4	95	122	4.5	132	505	-.066	500
80/55	550.3	9.2	.8	.539	13.4	.290	7.2	.027	.27	49.6	94	121	4.4	131	501	-.066	475
85/1200	549.6	8.5	.7	.543	13.5	.290	7.2	.019	.19	71.0	94	120	4.4	131	493	-.064	475
90/05	548.8	7.7	.8	.554	13.8	.272	6.7	.024	.24	57.3	93	118	4.3	131	494	-.063	475
95/10	548.2	7.1	.6	.578	14.4	.253	6.2	.024	.24	59.8	92	117	4.2	131	496	-.062	500
100/15	547.5	6.4	.7	.570	14.2	.269	6.6	.018	.18	78.6	91	114	4.1	131	496	-.063	475
105/20	546.9	5.8	.6	.482	12.0	.336	8.3	.020	.20	59.8	89	109	3.9	128	455	-.061	475
110/25	546.5	5.4	.4	.431	10.7	.373	9.2	.024	.24	44.6	87	105	3.7	125	424	-.058	475
115/30	546.1	5.0	.4	.418	10.4	.382	9.5	.023	.23	45.1	86	104	3.6	122	409	-.056	500
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	------	5768	-.754	-------
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	------	16741.	-1.436	-------

5411

PAGE 12 GAS DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 4 **DATE** 6/29/93 **PAGE** 2 **OF** 3

TIME	SCALE	FUEL	DROP	v.	CO2	v.	O2	v.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPH
120 / 1235	545.8	4.7	.3	.419	10.4	.381	9.4	.029	.29	35.9	85	102	3.5	121	392	-.052	500
125 / 40	545.4	4.3	.4	.430	10.7	.372	9.2	.033	.33	32.3	85	101	3.5	121	387	-.052	500
130 / 45	545.1	4.0	.3	.429	10.6	.367	9.1	.033	.33	32.3	84	98	3.4	121	381	-.051	500
135 / 50	544.9	3.8	.2	.397	9.9	.440	10.9	.025	.25	39.4	83	95	3.3	120	365	-.050	525
140 / 55	544.7	3.6	.2	.309	7.7	.476	11.8	.069	.69	11.1	82	90	3.4	118	341	-.048	550
145 / 1300	544.5	3.4	.2	.313	7.8	.470	11.6	.073	.73	10.6	80	88	3.2	117	333	-.046	550
150 / 05	544.4	3.3	.1	.304	7.5	.483	12.0	.072	.72	10.5	79	86	3.2	117	324	-.055	525
155 / 10	544.3	3.2	.1	.305	7.6	.480	11.9	.065	.65	11.6	78	86	2.9	112	319	-.055	525
160 / 15	544.1	3.0	.2	.301	7.5	.486	12.0	.072	.72	10.4	78	85	3.0	114	316	-.054	525
165 / 20	544.0	2.9	.1	.294	7.3	.494	12.2	.074	.74	9.8	78	85	3.0	112	312	-.055	525
170 / 25	543.8	2.7	.2	.277	6.9	.511	12.7	.091	.91	7.5	77	85	2.9	111	308	-.053	525
175 / 30	543.7	2.6	.1	.272	6.7	.514	12.7	.100	1.00	6.7	77	86	2.7	110	305	-.053	525
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	------	4083	-.624	------
180 / 35	543.6	2.5	.1	.267	6.6	.517	12.8	.112	1.12	5.9	78	86	3.0	111	305	-.052	525
185 / 40	543.5	2.4	.1	.266	6.6	.516	12.8	.119	1.19	5.5	78	87	2.9	110	305	-.052	525
190 / 45	543.4	2.3	.1	.266	6.6	.517	12.8	.121	1.21	5.4	78	87	2.9	110	308	-.054	525
195 / 50	543.2	2.1	.2	.264	6.5	.516	12.8	.129	1.29	5.1	78	88	2.8	110	311	-.053	525
200 / 55	543.1	2.0	.1	.262	6.5	.520	12.9	.130	1.30	5.0	78	88	2.8	111	304	-.053	525
205 / 1400	543.0	1.9	.1	.250	6.2	.525	13.0	.153	1.53	4.0	78	88	2.8	110	294	-.052	525
210 / 05	542.9	1.8	.1	.251	6.2	.524	13.0	.150	1.50	4.1	79	89	3.0	111	294	-.053	525
215 / 10	542.8	1.7	.1	.254	6.3	.525	13.0	.150	1.50	4.2	79	90	3.1	110	285	-.052	525
220 / 15	542.6	1.5	.2	.255	6.3	.522	12.9	.151	1.51	4.2	78	90	2.7	110	292	-.052	525
225 / 20	542.5	1.4	.1	.242	6.0	.539	13.4	.141	1.41	4.3	79	91	3.0	111	293	-.051	525
230 / 25	542.3	1.2	.2	.238	5.9	.537	13.3	.138	1.38	4.3	79	91	3.0	110	287	-.050	525
235 / 30	542.2	1.1	.1	.242	6.0	.533	13.2	.141	1.41	4.3	79	91	3.0	110	284	-.049	525
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	------	3562	-.623	------
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	------	7645	-1.247	------

541.1

PAGE 12 [illegible]S DATA SHEET
MANUFACTURER/MODEL FX HT2000 **RUN** 4 **DATE** 6/29/93 **PAGE** 3 **OF** 3

TIME	SCALE	FUEL	DROP	V.	CO2	V.	O2	V.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
240 / 1135	542.1	1.0	.1	.245	6.1	.533	13.2	.142	1.42	4.3	80	91	3.1	111	280	-.049	525
245 / 40	542.0	.9	.1	.246	6.1	.531	13.2	.149	1.49	4.1	80	91	3.1	111	280	-.050	525
250 / 45	541.9	.8	.1	.256	6.3	.524	13.0	.133	1.33	4.8	79	91	3.0	111	286	-.050	550
255 / 50	541.7	.6	.2	.244	6.0	.547	13.6	.123	1.23	4.9	79	91	3.0	111	296	-.051	525
260 / 55	541.6	.5	.1	.230	5.7	.553	13.7	.129	1.29	4.4	79	91	3.0	110	287	-.051	525
265 / 1500	541.5	.4	.1	.220	5.4	.556	13.8	.137	1.37	4.0	80	91	3.1	110	280	-.050	525
270 / 05	541.4	.3	.1	.221	5.5	.557	13.6	.141	1.41	3.9	80	92	3.0	109	273	-.050	550
275 / 10	541.3	.2	.1	.223	6.5	.553	13.7	.144	1.44	3.8	80	92	3.0	109	275	-.049	550
280 / 15	541.2	.1	.1	.220	5.4	.559	13.9	.145	1.45	3.8	80	92	3.0	110	282	-.049	550
285 / 20	541.1	~~0~~	.1	.219	5.4	.560	13.9	.143	1.43	3.8	80	92	3.0	110	287	-.049	550
290 / 25															2826	-.498	
295 / 30															21212	-3.181	
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	-----			-----
															3666	-.055	
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	-----			-----
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	-----			-----

÷ 58

541.7 - 540.7

PAGE 13 PREBURN DATA SHEET

MANUFACTURER/MODEL FX HT 2000 RUN 4 DATE 6/29/93 PAGE 1 OF 1

TIME	SCALE WT	BURN RATE	STACK	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC /~~-CAT-~~	AMBIENT	STATIC	COMMENTS
0 / 0930	551.7	—	1062	604	423	118	429	411	945	1401	77	-.088	PRIMARY AIR SET AT:
05 / 35	550.3	1.4	646	558	442	110	453	407	880	1422	77	-.076	3/8"
10 / 40	548.7	1.6	586	506	418	110	471	404	874	1390	77	-.075	SECONDARY AIR SET AT:
15 / 45	547.3	1.4	571	489	451	110	482	398	902	1367	77	-.071	NA
20 / 50	546.2	1.1	565	493	459	108	496	394	880	1468	80	-.070	FAN: HIGH
25 / 55	545.0	1.2	541	498	469	107	506	391	909	1499	80	-.069	
30 / 1000	543.9	1.1	535	501	477	110	512	384	901	1482	81	-.068	
35 / 05	543.0	.9	521	501	489	111	513	380	905	1431	82	-.066	PUMPS ON AT: 1000
40 / 10	542.4	.6	485	474	502	110	521	375	973	1320	85	-.064	
45 / 15	541.8	.6	469	455	512	113	530	371	1043	1434	85	-.064	CHECK WB/DB: 86/117
50 / 20	541.4	.4	429	437	517	114	541	368	1080	1095	85	-.057	breakdown 1017
55 / 25	541.3	.1	365	383	516	114	548	368	987	956	84	-.052	
------	------	------	------	------	------	------	------	------	------	------	------	------	------
60 / 30	541.2	.1	341	343	502	114	540	372	944	897	84	-.050	
65 / 35	541.1	.1	360	321	490	115	525	374	900	788	84	-.050	365.0

PAGE TEMPERATURE DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 4 **DATE** 6/29/93 **PAGE** 1 **OF** 3

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / CAT	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	365.0
0 / 1035	321	490	115	525	374	900	788	84	1400	230	38	227	33	38	
05 / 40	282	462	113	498	372	662	486	84	1398	234	37	233	33	36	
10 / 45	267	433	115	471	374	648	525	82	1395	239	35	233	33	37	
15 / 50	279	393	153	435	374	637	614	82	1390	240	37	233	33	38	
20 / 55	369	369	191	418	372	654	914	82	1387	242	37	232	33	38	
25 / 1100	356	371	137	413	367	798	872	82	1385	242	37	232	33	38	
30 / 05	334	369	119	426	357	823	901	82	1381	243	38	233	33	38	
35 / 10	353	366	111	443	352	843	1142	80	1386	244	38	234	33	38	
40 / 15	369	360	110	455	346	905	928	81	1389	245	38	236	33	38	
45 / 20	380	360	110	467	339	934	946	81	1396	245	38	237	33	38	
50 / 25	383	366	107	480	334	968	949	81	1400	246	38	238	33	38	
55 / 30	400	369	109	494	327	987	1031	81	1406	247	38	240	33	38	
TOTAL	4093	4708	1490	5525	4288	9759	10096	982	------	------	------	------	------	------	------
60 / 35	413	378	110	509	321	921	1261	82	1413	247	37	241	33	38	
65 / 40	418	384	111	510	315	908	1261	82	1416	247	37	242	33	38	
70 / 45	428	396	110	510	308	901	1351	83	1420	247	36	243	34	38	
75 / 50	437	408	110	511	304	906	1325	82	1422	247	36	243	34	38	
80 / 55	441	417	111	513	300	919	1234	84	1425	247	36	244	34	38	
85 / 1200	443	424	110	516	298	938	1281	84	1426	247	35	245	34	38	
90 / 05	444	436	110	524	293	951	1403	85	1429	248	35	246	34	38	
95 / 10	451	445	110	531	291	960	1438	85	1433	248	34	246	34	38	
100 / 15	459	456	112	533	287	960	1404	84	1444	248	33	247	34	37	
105 / 20	447	465	112	536	284	964	1161	85	1445	248	33	247	34	37	
110 / 25	412	474	112	535	282	979	1123	85	1447	248	33	248	34	37	
115 / 30	391	478	111	532	277	995	1118	85	1449	248	33	248	34	36	
TOTAL	5184	5161	1329	6260	3560	11302	15360	1006	------	------	------	------	------	------	------
TOTAL	9277	9869	2819	11785	7848	21061	25456	1988	------	------	------	------	------	------	------

PAGE 1 TEMPERATURE DATA SHEET

MANUFACTURER/MODEL FX HT 2000 RUN 4 DATE 6/29/93 PAGE 2 OF 3

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	3665.0
120 / 1235	371	486	110	529	276	1025	1062	85	1452	248	33	248	34	36	
125 / 40	358	490	110	535	276	1053	1121	85	1453	248	33	248	34	36	
130 / 45	350	490	112	540	276	1067	1070	85	1454	248	34	248	34	36	
135 / 50	337	492	112	539	277	1052	994	84	1455	248	33	248	34	36	
140 / 55	319	487	112	534	277	1052	916	83	1454	248	33	248	34	35	
145 / 1300	307	478	113	532	276	1052	906	84	1452	247	33	247	34	35	
150 / 05	295	469	113	523	277	1004	889	83	1446	247	33	247	34	35	
155 / 10	288	469	113	519	277	990	889	83	1443	246	33	247	33	35	
160 / 15	280	462	113	512	281	983	887	83	1439	246	33	245	33	35	
165 / 20	275	459	113	504	281	916	876	83	1437	245	33	245	33	35	
170 / 25	269	451	110	496	281	954	856	83	1441	245	33	245	33	35	
175 / 30	265	451	110	489	283	942	845	83	1441	246	33	245	33	35	
TOTAL	3714	5684	1341	6252	3338	12150	11311	1004	------	------	------	------	------	------	------
180 / 35	262	446	113	482	285	931	833	83	1441	247	34	246	33	35	
185 / 40	296	430	160	476	285	919	821	83	1441	247	34	246	33	35	
190 / 45	301	430	183	472	290	915	821	83	1439	247	34	245	33	35	
195 / 50	283	430	141	465	290	912	814	84	1439	247	34	245	33	34	
200 / 55	271	433	123	465	292	904	814	84	1439	247	35	245	33	34	
205 / 1400	260	433	116	458	292	904	796	83	1438	247	35	244	33	34	
210 / 05	253	430	113	454	292	899	794	83	1438	247	36	244	33	34	
215 / 10	271	420	135	454	294	892	784	83	1437	247	36	244	33	34	
220 / 15	282	416	176	450	294	886	787	83	1437	247	36	244	33	34	
225 / 20	293	413	208	442	297	886	773	83	1437	248	36	244	33	34	
230 / 25	261	422	125	438	297	886	773	83	1434	247	37	244	33	34	
235 / 30	250	422	116	438	297	886	773	84	1433	247	38	243	33	34	
TOTAL	3283	5125	1709	5494	3505	10820	9583	999	------	------	------	------	------	------	------
TOTAL	6997	10809	3050	11746	6843	22970	20894	2003	------	------	------	------	------	------	------

PAGE 1 TEMPERATURE DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 4 **DATE** 6/29/93 **PAGE** 3 **OF** 3

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	
240 / 1435	244	419	114	435	298	884	771	83	1432	247	37	244	33	33	365.0
245 / 40	262	405	139	435	298	881	771	83	1431	247	37	244	33	33	
250 / 45	272	402	177	432	300	815	776	83	1430	247	37	244	33	33	
255 / 50	282	402	208	432	300	850	761	84	1430	247	37	243	33	33	
260 / 55	259	409	134	428	303	831	751	84	1429	247	37	243	33	33	
265 / 1500	248	409	119	428	303	819	742	84	1430	247	38	243	33	33	
270 / 05	238	406	114	423	303	802	734	85	1430	247	38	243	33	33	
275 / 10	255	397	143	418	304	795	731	84	1432	247	38	243	33	33	
280 / 15	267	397	185	413	304	792	731	84	1433	247	38	243	33	33	
285 / 20	273	394	208	412	307	795	731	84	1300	221	38	206	33	33	
	2600	4040	1541	4256	3020	8324	7499	838	1266	209	38	195	33	33	
	18814	24718	7410	27787	17711	52355	53849	4829							
TOTAL	325.	426.	128.	479.	305.	903.	928.	83.	------	------	------	------	------	------	------
													ΔT	365.0	START
														318.8	STOP
														- 46.2	
TOTAL															
TOTAL									------	------	------	------	------	------	------

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/29/93 Analyte: O_2 (15-2)

Source: FX HT 2000 Run #: 4

Zero Cyl #: T132257 Conc. 00.0 % O_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS40875 Conc. 12.8 % O_2 Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Teledyne Model: 320 Ax SN: 37465

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% O_2
EPA Control Limits = ± 2.5% of 25.0% O_2 = ± 0.625% O_2

Pre Run Audit: By: DK Time: 935 Temp: 77 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.001	-.017	-.017	-.068
Span	12.8	.512	12.8	12.8	.513	12.715	-.085	-.667

Comments: Teledyne #2 Cyl % ____ Exp % ____ Act % ____ Adj to ____ ± Δ % ____

Post Run Audit: By: DK Time: 1535 Temp.: 82 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.1	.003	.033	.033	.130
Span	12.8	.512	12.8	12.7	.510	12.640	-.160	-1.250

Comments: Teledyne #2 Cyl % ____ Exp % ____ Act % ____ Adj to ____ ± Δ % ____

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/29/93 Analyte: CO (15-3)

Source: FX HT 2000 Run #: 4

Zero Cyl #: T132257 Conc. 00.0 % CO Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS 40875 Conc. 5.01 % CO Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 408005

Range: 0 - 10.0% CO Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 10.0% CO
EPA Control Limits = ±2.5% of 10.0% CO = ± 0.25% CO

Pre Run Audit: By: DK Time: 940 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	000.	.000	.000	.000	.000
Span	50.1	.501	5.01	50.2	.502	5.020	.010	.200

Comments:

Post Run Audit: By: DK Time: 1540 Temp.: 82 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.001	.010	.010	.100
Span	50.1	.501	5.01	50.0	.500	5.000	-.010	-.200

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/29/93 Analyte: SO_2 (15-4)

Source: FX HT 2000 Run #: 4

Zero Cyl #: T132257 Conc. 00.0 ppm SO_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: CC 79076 Conc. 1268 ppm SO_2 Cyl Press: 500 psi

Certified by: LIQUID AIR Date: 2/26/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 403019

Range: 0 - 2500 ppm SO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 2500 ppm SO_2
EPA Control Limits = ±2.5% of 2500 ppm SO_2 = ±62.5 ppm SO_2

Pre Run Audit: By: DK Time: 945 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	00.7	.007	12.951	12.951	.518
Span	50.7	.507	1268	50.9	.509	1276.392	8.392	.662

Comments:

Post Run Audit: By: DK Time: 1545 Temp: 82 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	01.0	.010	20.501	20.501	.820
Span	50.7	.507	1268	50.6	.506	1268.841	.841	.066

Comments:

± Conc. Difference = Act ppm - Exp (Std) ppm

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

QUALITY CHECKS
DATA SHEET 16

Unit: FX HT 2000 Run: 4 Date: 6/29/93

Thermocouple Check:

T/C #1	70.6	°F	T/C #13	69.7	°F
T/C #2	70.5	°F	T/C #14	70.2	°F
T/C #3	71.9	°F	T/C #15	70.5	°F
T/C #4	71.9	°F	T/C #16	61.1	°F
T/C #5	71.9	°F	T/C #17	63.3	°F
T/C #6	72.1	°F	T/C #18	74.4	°F
T/C #7	71.8	°F	T/C #19	70.8	°F
T/C #8	72.0	°F	T/C #20		°F
T/C #9	72.7	°F	T/C #21		°F
T/C #10	71.9	°F	T/C #22		°F
T/C #11	70.6	°F	T/C #23	70.9	°F
T/C #12	70.8	°F	T/C #24	210.7	°F

Thermocoouple Readout:

pretest zero and span check and calibration						post test zero and span			% difference
ZERO	.4	°F	ADJ. TO	0	°F	ZERO	.3	°F	.015
SPAN	2000.6	°F	ADJ. TO	2000.0	°F	SPAN	2004.2	°F	.210

Thermocouple Readout Pretest Linearity Check

0 =	0	°F	200 =	201.8	°F	400 =	399.0	°F
600 =	601.2	°F	800 =	801.4	°F	1000 =	1000.6	°F
1200 =	1198.2	°F	1400 =	1399.2	°F	1600 =	1599.8	°F
1800 =	1800.2	°F	2000 =	2000.0	°F			

	Pre	Post
Sample Train Leak Check	✓	✓
Combustion Gas Train Leak Check	✓	✓
Tracer Gas Train (SO_2) Leak Check	✓	✓
Darft (Static) Gauge Zero Check	✓	✓

Scale Check

Pre 546.7 - 536.7 = 10.0

Post 550.9 - 540.9 = 10.0

Stack Cleaned Proir to Test Run: YES ____ NO ✓

TABLE 1 ----- RAW DATA

CLIENT : FX DROLET TEST No. : 3

MODEL: HT2000 DATE: 28-Jun-93

****

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	350.000	0.150	77	0.10	12.20	250
5	351.500	0.120	79	0.19	9.80	275
10	352.889	0.120	80	0.14	10.90	275
15	354.284	0.120	82	0.15	9.40	275
20	355.689	0.120	84	0.11	9.40	275
25	357.104	0.120	85	0.08	8.90	275
30	358.525	0.120	85	0.06	8.90	275
35	359.945	0.120	86	0.07	8.00	275
40	361.371	0.120	87	0.07	7.80	275
45	362.802	0.110	88	0.07	7.80	275
50	364.238	0.110	89	0.05	8.10	275
55	365.679	0.110	89	0.03	8.30	275
60	367.121	0.110	90	0.04	8.10	275
65	368.568	0.110	90	0.05	7.20	275
70	370.014	0.100	91	0.04	7.40	275
75	371.466	0.100	92	0.05	6.90	275
80	372.924	0.100	92	0.09	5.40	275
85	374.381	0.100	92	0.30	4.60	275
90	375.838	0.090	93	0.31	4.50	300
95	377.179	0.090	93	0.40	4.20	300
100	378.520	0.090	93	0.49	4.10	300
105	379.861	0.090	93	0.51	3.90	300
110	381.202	0.090	93	0.51	4.00	300
115						

TABLE 2---RAW DATA

CLIENT : FX DROLET   TEST No. 3

MODEL: HT2000   DATE: 28-Jun-93

****

METER CAL. FACTOR (Y) ------	1.028		Wt. WOOD BURNED(LB) -------	21.9	Lbs
BAROMETRIC PRESS.(Pb) ------	30.1	in Hg	WET,FUEL MOISTURE % -------	20.221	%
LEAK RATE POST (Lp) ------	0.001	cfm	Wt. PART. COLLECTED -------	0.1685	g
WATER VOL. (V1c) ------	56.5	Ml	METER VOLUME Vm -------	31.202	mcf
TEST TIME (MIN) ------	110	min	HC MOLE FRACTION -------	0.0132	

TABLE 3 -----FIELD DATA AVERAGES

CLIENT :FX DROLET TEST No. 3

MODEL: HT2000 DATE: 28-Jun-93

****

AVG DELTA H	-------	0.11 in H2O	AVG PRCNT CO	-------	0.17	%
AVG METER TEMP. Tm	-------	88 deg F	AVG PRCNT CO2	-------	7.38	%
AVG PPM SO2	-------	279 PPM	AVG BAL CO2/CO	-------	43.43	%

TABLE 4 ----- CALCULATIONS

CLIENT : FX DROLET TEST No. 3

MODEL: HT2000 DATE: 28-Jun-93

****

STD SAMPLE VOL. Vm(std) -----	31.11	dscf	STACK GAS FLOW Qsd -------	1755.052 29.25	dscf/Hr & dscf/min
VOL. WATER VAPOR Vw(std) ----	2.659	scf	PARTICULATE CONCTRT. Cs ------	0.0054	g/dscf
PRCNT MSTR Bws -------	7.88	%	PARTC.EMISS. RATE E -------	9.51	g/Hr
BURN RATE BR -------	4.32	Kg/Hr	MOLES OF GAS PER Lb WOOD Nt --	0.48	Lb-mole/Lb
CO EMISSION RATE -------	99.91 23.11	g/Hr & g/Kgdry fuel	PART.EMISS. RATE ------	2.20	g/Kgdry fuel

TABLE 5 ----- PROPORTIONAL RATE VARIATION

CLIENT : FX DROLET TEST No. : 3

MODEL: HT2000 DATE: 28-Jun-93

****

	TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE	
	5	380.8	97		100	
	10	386.8	98			
	15	387.4	99			
	20	388.7	99			
	25	390.4	99			
	30	391.7	100			
	35	391.1	99			
	40	392.0	100			
	45	392.7	100			
	50	393.3	100			
	55	394.3	100			
	60	394.2	100			
	65	395.2	101			
	70	394.6	100			
	75	395.5	101			
	80	396.8	101			
	85	396.5	101			
	90	396.2	101			
	95	397.4	101			
	100	397.4	101			
	105	397.4	101			
	110	397.4	101			
	115					
	120					

COMPUTER INPUT DATA WOODSTOVE DATA SHEET #1

Client FX DROLET

Client Address 1700 LEON HARMEL
QUEBEC, QUEBEC, CANADA G1N 4R9

Client Phone 514-565-6336

Project No. ______ Model No. ______

Run No. 3 Date of Test 6/28/93 Est Grams/Hr ______

Stove Type: Cat ______ Non Cat X Pellet ______

Data To Be Submitted To: Oregon ______ Colorado ______ EPA ______

Burn Category: Low (<0.8 Kg/Hr) ______ Med Hi (1.26 - 1.90 Kg/Hr) ______
Med Low (0.8 - 1.25 Kg/Hr) ______ Max (>1.9 Kg/Hr) 4.3225

Fuel % Moisture (dry) 25.347 %(wet) 20.221 %
(00.00) (Data Sheet #10)

Stack Static Pressure -.058 "H_2O
(0.000) (Data Sheet #12)

Barometric Pressure 30.10 "Hg
(00.00) (Data Sheet #2)

Temperature (Average Room) Combustion Air 83 °F
(00) (Data Sheet #14)

Flue Gas Moisture 7.8809 %
(00.000) (Data Sheet #7)

Ambient Moisture 1.40 %
(0.00) (Data Sheet #8)

Stove Weight 487 lbs
(000) (Data Sheet #8)

Stove Temperature Change -77.4 °F
(000) (Data Sheet #14)

Particulate Emission .0836 gr/dscf
(0.0000) (Data Sheet #7)

Fuel Higher Heating Value (dry) 8624 BTU/lb
(0000) (CT&E Sheet)

Fuel Type: Wood: X Pellets: ______

Total Fuel Consumed During Burn 21.9 lbs
(00.0) (Data Sheet #8)

Total Particulate Catch .1685 g
(0.0000) (Data Sheet #6)

H_2O Captured 56.5 g
(00.0) (Data Sheet #3)

Dry Gas Meter Volume 31.202 CF
(00.000) (Data Sheet #2)

Dry Gas Meter: Y Factor: 1.028 Post Test Leak Rate .001 CFM

TIME: 115

Meter Box Data Sheet Page # 2

Page 1 of 1

Meter Box 5H Y Factor 1.028

Unit: Fx

Run: 3 Date: 6-28-95

Leak Checks: 15 " Hg @ .002 cfm
16.0 " Hg @ .001 cfm
" Hg @ cfm
" Hg @ cfm

Operator(s): CW

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.509

ROTO PRESS: 1.05			Sampling Ratio : 47 : 1				BAROMETER: 30.10		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
00	1155	350.000	—	14.011	.15	77	250	77	2.0
05	1200	351.500	—	12.690	.12	79	275	79	1.0
10	05	352.889	352.889	12.666	.12	80	275	80	1.0
15	10	354.284	354.284	12.620	.12	82	275	82	1.0
20	15	355.689	355.689	12.573	.12	84	275	84	1.0
25	20	357.104	357.104	12.550	.12	85	275	85	1.0
30	25	358.525	358.525	12.550	.12	85	275	85	1.0
35	30	359.945	359.945	12.527	.12	86	275	86	1.0
40	35	361.371	361.371	12.504	.12	87	275	87	1.0
45	40	362.802	362.802	12.481	.11	88	275	88	1.0
50	45	364.238	364.238	12.459	.11	89	275	89	1.0
55	50	365.679	365.679	12.459	.11	89	275	89	1.0
ROTO PRESS: 1.05			TOTALS :	152.030	1.44	1011	BAROMETER: 30.10		
60	1255	367.121	367.121	12.436	.11	90	275	90	1.0
65	1300	368.568	368.568	12.436	.11	90	275	90	1.0
70	05	370.014	370.014	12.414	.10	91	275	91	1.0
75	10	371.466	371.466	12.391	.10	92	275	92	1.0
80	15	372.924	372.924	12.391	.10	92	275	92	1.0
85	20	374.381	374.381	12.391	.10	92	275	92	1.0
90	25	375.838	375.838	11.338	.09	93	300	93	1.0
95	30	377.179	377.179	11.338	.09	93	300	93	1.0
100	35	378.520	378.520	11.338	.09	93	300	93	1.0
105	40	379.861	379.861	11.338	.09	93	300	93	1.0
110	45	381.202	381.202	11.338	.09	93	300	93	1.0
115				131.149	1.07	1012			
			TOTALS:	283.179	2.51	2023	MAX VACC =		2.0
TOTAL CU FT		31.202	TOTALS:	12.312	.109	88	AV BP:	30.10	

548

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

Initial: Balance Level ✓ Balance Zeroed ✓

Final: ✓ ✓

Unit: Fy

Run: 3

Date: 6-28-93

Technician(s): Initial: CW

Final: CW

Approved By: ______

IMPINGER #1

Final Weight 601.2 grams
Initial Weight 553.8 grams
Net 47.4 grams

IMPINGER #2

Final Weight 580.3 grams
Initial Weight 577.9 grams
Net 2.4 grams

IMPINGER #3

Final Weight 487.1 grams
Initial Weight 486.1 grams
Net 1.0 grams

IMPINGER #4 (SILICA GEL)

Final Weight 897.2 grams
Initial Weight 891.5 grams
Net 5.7 grams

TOTAL MASS OF H_2O CAPTURED 56.5 grams

Scale Check: 295.0g = 295.0 g
590.0g = 590.0 g
885.0g = 885.0 g

Front Half Filter # 447F

Back Half Filter # 447B

Notes:

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 5/27/93 Time 1030 By DK Front Half ✓ Back Half ✓

Manufacturer: S&S Size: 11 cm 8.2 cm Lot.No.: ZB901 Grade: #25 glass

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
441F	.6921	6/1	1016	LU	.6924	6/2	1044	DK	✓			
442F	.6988	6/1	1017	LU	.6988		1046		✓			
443F	.6982	6/1	1018	LU	.6977		1048		✓			
444F	.7058	6/1	1019	LU	.7054		1050		✓			
445F	.7004	6/1	1020	LU	.7002		1052		✓			
446F	.6996	6/1	1021	LU	.6994		1054		✓			
447F	.7022	6/1	1022	LU	.7022		1056		✓			
448F	.7079	6/1	1023	LU	.7076		1058		✓			
449F	.6984	6/1	1024	LU	.6982		1100		✓			
450F	.7079	6/1	1025	LU	.7080		1102		✓			
441B	.3750	6/1	1026	LU	.3745	6/2	1126	DK	✓			
442B	.3730	6/1	1027	LU	.3725		1128		✓			
443B	.3776	6/1	1028	LU	.3771		1130		✓			
444B	.3779	6/1	1029	LU	.3774		1132		✓			
445B	.3738	6/1	1030	LU	.3733		1134		✓			
446B	.3736	6/1	1031	LU	.3731		1136		✓			
447B	.3755	6/1	1032	LU	.3750		1138		✓			
448B	.3790	6/1	1033	LU	.3785		1140		✓			
449B	.3728	6/1	1034	LU	.3726		1142		✓			
450B	.3801	6/1	1035	LU	.3796		1144		✓			

Checked by Bill Nowak Date: 6/2/93 Time 1328

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
58	70	48	6/1	900	LU
62	75	48	6/2	1042	DK

WOODSTOVE DATA SHEET #4-2:
INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 6/4/93 Time: 0900 By: DK

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
376	101.1787	6/7	1012	LU	101.1782	6/8	952	DK	✓			
377	106.4080	6/7	1014	LU	106.4076		954		✓			
378	105.4899	6/7	1016	LU	105.4895		956		✓			
379	97.6639	6/7	1018	LU	97.6636		958		✓			
380	103.9232	6/7	1020	LU	103.9230		1000		✓			
381	104.7513	6/7	1022	LU	104.7509	6/8	1002	DK	✓			
382	105.3599		1024	LU	105.3600		1004		✓			
383	98.6273		1026	LU	98.6268		1006		✓			
384	105.3535		1028	LU	105.3530		1008		✓			
385	104.7898		1030	LU	104.7898		1010		✓			
386	105.9197	6/7	1032	LU	105.9193	6/8	1012	DK	✓			
387	99.9773		1034		99.9772		1014		✓			
388	97.9826		1036		97.9825		1016		✓			
389	105.5321		1038		105.5318		1018		✓			
390	96.1094		1040		96.1093		1020		✓			
391	95.6015	6/7	1042	LU	95.6011	6/8	1022	DK	✓			
392	100.2328		1044		100.2325		1024		✓			
393	100.4634		1046		100.4631		1026		✓			
394	105.4896		1048		105.4891		1028		✓			
395	98.5641	6/7	1050		98.5638		1030		✓			
396	108.2162	6/7	1052	LU	108.2159	6/8	1032	DK	✓			
397	99.6752		1054		99.6750		1034		✓			
398	108.5969		1056		108.5964		1036		✓			
399	96.8981		1058		96.8978		1038		✓			
400	95.9540		1100		95.9536		1040		✓			

Checked By: Bill Nowak Date: 6/8/93 Time: 1130

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
56	68	47	6/7	940	LU
56	68	47	6/8	950	DK

WST5-Form9, Pg [illegible] v4/90
Unit Fx
Run # 3
Date: 6-28-93

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
396	6/29	0900	DK	108.2328	6/30	1104	DK	108.2323	7/1	918	LU				
397	6/29	0900	DK	99.7350	6/30	1106	DK	99.7337	7/1	920	LU	99.7341	7/2	916	DK
398	6/29	0900	DK	108.6134	6/30	1108	DK	108.6131	7/1	922	LU				
399	6/29	0900	DK	96.9045	6/30	1110	DK	96.9033	7/1	924	LU	96.9035	7/2	918	DK
400	6/29	0900	DK	95.9561	6/30	1112	DK	95.9561	7/1	926	LU				

FINAL FILTER WEIGHTS

Filter #	Into Dessic Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
447F	6-28	1415	CW	.7276	6/29	930	LU	.7278	6/30	1114	DK				
447B	6-28	1415	CW	.4205	6/29	932	LU	.4191	6/30	1116	DK	.4186	7/1	928	LU

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	WB	DB	%RH
1	6/29	904	LU	59	71	49
2	6/30	1102	DK	60	73	47
3	7/1	918	LU	60	73	47
4	7/2	908	DK	58	70	48
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 6/10/93

Through ____________

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0001	10.0001	1.0000	0.0999			DK	6/10	1000	70	58	48
99.9999	10.0001	0.9998	0.1000			LL	6/11	904	68	56	47
100.0003	10.0000	0.9996	0.0999			DK	6/14	910	76	63	49
99.9999	10.0003	1.0001	0.1002			LL	6/15	902	70	58	48
99.9998	10.0002	1.0000	0.0998			DK	6/16	900	70	58	48
99.9996	9.9997	0.9998	0.0997			LL	6/17	904	70	58	48
100.0004	10.0003	1.0000	0.1000			DK	6/18	0830	69	57	47
100.0001	10.0001	1.0000	0.1000			LL	6/21	908	68	56	47
100.0001	10.0000	1.0001	0.0999			DK	6/22	900	66	55	49
99.9996	9.9997	0.9997	0.0998			LL	6/23	906	70	58	48
99.9998	9.9999	0.9999	0.1000			DK	6/24	1700	74	60	44
99.9998	9.9997	0.9997	0.0995			LL	6/25	930	77	64	49
100.0001	10.0000	0.9999	0.0997			DK	6/28	1000	71	59	49
100.0003	10.0003	1.0001	0.1000			LL	6/29	904	71	59	49
100.0002	10.0001	1.0001	0.0999			DK	6/30	1045	73	60	47
99.9999	10.0000	1.0000	0.1000			LL	7/1	910	73	60	47
100.0003	10.0002	1.0002	0.1001			DK	7/2	908	70	58	48

WST7-Form Rev5/90

Dates: From 3-11-93

Through 6/9/93

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0004	10.0001	1.0000	.0999			CW	3-11	0915	69	57	36
99.9998	10.0000	0.9999	0.0997			DK	3/12	0830	68	52	32
100.0003	10.0002	1.0000	.0997			CW	3-15	0930	72	57	39
100.0000	10.0002	1.0000	0.1000			DK	3/16	0900	72	57	39
100.0001	10.0001	1.0002	0.1001			DK	3/17	1330	72	58	42
100.0001	10.0003	1.0002	0.1001			CW	3-18	1700	75	60	47
99.9999	10.0000	0.9998	0.0999			DK	3/19	0900	71	57	41
100.0003	10.0001	1.0000	.0999			BN	3-23	0900	73	60	47
100.0002	10.0001	1.0000	0.0999			DK	3/19	1300	77	63	46
100.0001	10.0001	1.0001	.0999			CW	4-20	0900	75	60	41
100.0000	10.0002	1.0002	0.0999			DK	4/26	0906	66	55	49
100.0001	10.0001	1.0001	.1001			CW	4-28	0900	69	56	44
100.0002	10.0001	0.9999	0.0999			DK	5/4	1120	75	62	48
100.0001	10.0001	1.0000	.1000			CW	5-5	1000	75	60	41
99.9998	9.9999	0.9999	0.1000			DK	5/6	946	76	62	45
99.9997	10.0001	1.0000	0.0999			DK	5/7	1620	74	60	44
100.0002	10.0002	1.0001	.0999			BN	5-10	0900	71	59	49
100.0002	10.0002	1.0002	.1001			CW	5-11	1000	73	59	43
100.0000	10.0000	1.0000	0.0999			DK	5/12	900	75	61	44
100.0001	10.0001	1.0001	.1000			CW	5-13	1600	71	58	45
99.9997	10.0002	1.0002	0.1001			DK	5/14	1000	70	58	48
99.9999	10.0001	0.9999	0.0998			DK	5/19	1010	71	59	49
99.9999	10.0000	0.9998	0.0998			BN	5/20	1720	74	60	44
99.9997	10.0002	1.0000	0.0998			DK	5/21	950	70	58	48
100.0001	10.0002	1.0000	0.0999			LU	5/24	1115	77	65	46
100.0001	10.0002	1.0001	0.1001			DK	5/25	1030	70	58	48
100.0003	10.0000	0.9998	0.1000			LU	5/26	1230	77	64	49
100.0000	10.0002	1.0000	0.1000			DK	5/27	940	77	64	49
99.9997	10.0001	0.9999	0.1000			LU	5/28	908	76	63	49
99.9999	10.0000	0.9999	0.0997			LU	6/1	900	70	58	48
100.0002	10.0003	1.0001	0.1001			DK	6/2	940	75	62	48
100.0000	10.0000	1.0001	0.0998			LU	6/3	956	70	58	48
100.0001	9.9999	0.9999	0.0999			DK	6/4	0930	68	56	47
100.0000	9.9998	0.9999	0.0999			LU	6/7	0940	68	56	47
99.9996	10.0001	0.9999	0.0999			DK	6/8	0900	68	56	47
99.9995	9.9997	0.9999	0.0996			LU	6/9	0904	68	56	47

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: Fx
Run: 3 Date: 6-28-93
Technician(s): CW

FRONT HALF

FILTER #: 447F
FINAL WT: .7278 g
TARE WT: .7022 g
NET WT: .0256 g

BEAKER #: 396
ml: 50
desc: ACETONE

FINAL WT: 108.2323 g
TARE WT: 108.2159 g
NET WT: .0164 g

FILTER #: ____
FINAL WT: ____ g
TARE WT: ____ g
NET WT: ____ g

BEAKER #: ____
ml: ____
desc: ACETONE

FINAL WT: ____ g
TARE WT: ____ g
NET WT: ____ g

TOTAL VOLUME OF ACETONE USED IN WASH 50 ml

BACK HALF

FILTER #: 447B
FINAL WT: .4186 g
TARE WT: .3750 g
NET WT: .0436 g

BEAKER #: 397
ml: 90
desc: ACETONE

FINAL WT: 99.7341 g
TARE WT: 99.6750 g
NET WT: .0591 g

FILTER #: ____
FINAL WT: ____ g
TARE WT: ____ g
NET WT: ____ g

BEAKER #: 398
ml: 75
desc: METHCHLOR

FINAL WT: 108.6131 g
TARE WT: 108.5964 g
NET WT: .0167 g

BEAKER #: 399
ml: 150
desc: H2O

FINAL WT: 96.9035 g
TARE WT: 96.8978 g
NET WT: .0057 g

BEAKER #: 400
ml: 50
desc: H2O

FINAL WT: 95.9561 g
TARE WT: 95.9536 g
NET WT: .0025 g

BEAKER #: ____
ml: ____
desc: ____

FINAL WT: .0082 g
TARE WT: ____ g
NET WT: ____ g

BEAKER #: ____
ml: ____
desc: ____

FINAL WT: ____ g
TARE WT: ____ g
NET WT: ____ g

TOTAL VOLUME OF ACETONE USED IN WASH 90 ml
TOTAL VOLUME OF DICHLOROMETHANE USED IN EXTRACTION 75 ml
TOTAL VOLUME OF DISTILLED WATER DRIED 200 ml

PRTCATCH

WOODSTOVE BLANKS PROCESSING
WOODSTOVE DATA SHEET # 5A

Unit: FX HT2000
Run: 3 Date: 6/28/93
BLANKS DONE: 6/15/93
Technician(s): BN/CW

BEAKER #: A
200 ml ACETONE
FISHER OPTIMA LOT #: 924059

FINAL WT: 108.9002 g
TARE WT: 108.8998 g
NET WT: .0004 g

BEAKER #: B
15 ml DICHLOROMETHANE
FISHER OPTIMA LOT #: 910732

FINAL WT: 106.3060 g
TARE WT: 106.3054 g
NET WT: .0006 g

BEAKER #: C
200 ml DISTILLED WATER
BONNEAU PRODUCTS CERTIFIED

FINAL WT: 106.9637 g
TARE WT: 106.9635 g
NET WT: .0002 g

BEAKER TARES INTO DESSC: TIME: 0900 DATE: 6/4/93

BKR #	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME	4TH WT	TIME
A	108.8997	1102	108.8998	1044				
B	106.3056	1104	106.3054	1046				
C	106.9640	1106	106.9635	1048				

SCALE ROOM QC : TARES

DATE	TIME	BY	WB	DB	%
6/7	940	LU	56	68	47
6/8	1042	DK	56	68	47

SCALE ROOM QC : FINALS

DATE	TIME	BY	WB	DB	%
6/14	926	DK	63	76	49
6/15	902	LU	58	70	48

BEAKERS: FINAL WEIGHTS

BKR #	IN DSC	TIME	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME
A	6/11	1030	108.9001	928	108.9002	912		
B	6/11	1031	106.3059	930	106.3060	914		
C	6/11	1032	106.9639	932	106.9637	916		

BKR #	4TH WT	TIME	5TH WT	TIME	6TH WT	TIME	7TH WT	TIME

Unit: HT 2000
Run: 3
Date: 6/28/93
Technician(s): LK
WSTAPP1-AppDoc19-page2
Rev 6/90

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Blank Audit: By: Bill Novak Date: 6/15/93

Blank Calculations:

Acetone:	.0004 g ÷	200	ml =	.000002	g/ml
Dichloromethane:	.0006 g ÷	75	ml =	.000008	g/ml
Distillted Water:	.0002 g ÷	200	ml =	.000001	g/ml

Front Half Catch:

Filters: .0256 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .0256 g (Net Catch)

Beakers: .0164 g (Total Catch) - 50 (Ml of Acetone) (.000002 g) (Blank Value/ml of Acetone) = .0163 g (Net Catch)

Total Front Half Catch .0419 g

Back Half Catch:

Filters: .0436 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .0436 g (Net Catch)

Beakers:

1. Acetone/Impingers:
.0591 g (Total Catch) - 90 (ml of acetone) (.000002 g) (Blank Value/ml of Acetone) = .0589 g (Net Catch)

2. Extract/Impingers:
.0167 g (Total Catch) - 75 (ml. of Dichloromethane) (.000008 g) .0006 (Blank Value/ml of Dichloromethane) = .0161 g (Net Catch)

3. Water/Impingers:
.0082 g (Total Catch) - 200 (ml. of water) (.000001 g) (Blank Value/ml of water) = .0080 g (Net Catch)

Total Back Half Catch .1266 g
Total Catch .1685 g
% Front Half 24.9 %

EPA METHOD 5H PARTICULATE CALCULATIONS
WOODSTOVE TEST DATA SHEET #7

Unit: FX 11-2000
Run: 2 Date: 6/28/93
Technician(s): CW

1) $Vm(std) = \dfrac{(31.202\ Vm)(17.64)(1.028\ mcf)(30.10\ "\ Hg + \frac{.109\ "\ H2O}{13.6})}{(548\ TmA)} = \dfrac{31.08168}{000.0000}$ dscf

2) $Vw(std) = (.04707)(56.5\ ml\ H2O) = \dfrac{2.6595}{00.0000}$ scf

3) $Asw = \dfrac{(2.6595\ scf)}{(2.6595\ scf + 31.08168\ dscf)} = \dfrac{.0788}{.0000}$ Bws X 100 = $\dfrac{7.8809}{00.0000}$ % H2O

4) $Cs = \dfrac{(.1685\ g.)}{(31.08168\ dscf)}(15.43) = \dfrac{.0836}{0.0000}$ gr/dscf

5) Estimated g/hr= $\dfrac{(.1685\ g.)}{(31.08168\ dscf)}\left(\dfrac{12.312}{00.000}\ dscfm\right)(60) = \dfrac{4.0041}{00.0000}$ g/hr

Vm =	total cubic feet pulled on meter box during test	(p. 2)	(000.000 V
mcf =	meter correction factor (Y factor) of the meter box used for the test	(p. 2)	(0.000 mcf
" Hg =	average barometric pressure during the test	(p. 2)	(00.00 " Hg
" H2O =	average delta H for the test	(p. 2)	(.000 " H2O
TmA =	average meter temperature for the test in degrees Absolute	(p. 2)	(000 TmA
ml H2O =	total water caught during the test	(p. 3)	(000.0 ml H2O
g. =	total particulate catch for the test	(p. 6)	(00.0000 g.
dscfm =	average stack flow during the test	(computer printout)	(00.000 dscf

PRTCALC

Miscellaneous Test Data Sheet Page # 8

Unit: FX HT 2000 Run: 3 Date: 6/28/93

Test Chamber Air Velocity Start: 0 Stop: 0 Avg: 0

Wet Bulb / Dry Bulb

Start: WB: 60 DB: 71 = 54 % RH 1.4 %H2O

Stop: WB: 62 DB: 75 = 48 % RH 1.4 %H2O

Average % Relative Humidity 51.0 Average % Ambient Moisture: 1.4

Empty Stove Weight: 487. lbs

Empty Stove Weight w/ Stack & Oil Seal: Wet: 536.7 Dry: 536.3

Kindling Weight: Paper: .3 lbs Wood: 6.6 lbs

Preburn Fuel Wt: 20.2 + 5.1 + 2.6 Total: 27.9 lbs

Total Kindling & Preburn Fuel Weight (Wood Only) ==> Total: 34.5 lbs

Coal Bed Weight: RANGE: 5.4 - 4.4 lbs SCALE: 541.7 - 540.7 lbs
Upper = .25 x fuel wt
Always round DOWN to nearest tenth
Lower = .20 x fuel wt
Always round UP to nearest tenth

Actual Coal Bed Weight: 4.4 lbs

Maximum Coal Bed Weight Removal ((5.4 Upper + 4.4 Lower)/2).25 = 1.2 lbs

Test Fuel (.75 x 1.5 x 5 " spacers) = 16 pcs

Dimensions	Length in inches	No. pcs	Wt. in lbs	% of load
2 x 4	NA	NA	NA	NA
4 x 4	17	5	21.9	100.0

Test Fuel Weight: 21.9 lbs

Estimated Dry Burn Rate Calculation $\frac{21.9 - (21.9 \times .20221)}{2.2046} \times \frac{60}{110 \text{ Time}} = 4.3228$ Kg/Hr

Estimated EPA Heat Output in BTU's / Hr $19,140 \times \frac{63}{100} \times 4.3228 \text{ (DBR)} = 52,125$ BTU's/Hr

EPA Default Efficiencies: NON-CAT: 63 CAT: 72 PELLET: 78

NOTES:

WOODSTOVE OPERATING DATA

FIRE STARTED: 1000 PST/PDST

WARM UP AND PREBURN: PRIMARY AIR: set wide open for all warm-up/preburn fuel charges. then set to WIDE OPEN at start of preburn.

SECONDARY AIR: NA CAT BYPASS: NA

CHARCOAL BED PREPARATION: raked and leveled prior to each warm-up/preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 25 sec.

TEST: Door Wide Open during loading 0 min 45 sec

PRIMARY AIR: opened full for first 5 min. , then set to run setting of WIDE OPEN .

SECONDARY AIR: NA CAT BYPASS: NA

FAN: ON/OFF during warm-up ON/OFF during preburn
ON/OFF first 30 minutes of test ON/OFF balance of test run
Fan speed set at HIGH .

WOOD DATA: KINDLING: a mix of the grades listed below

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2X4	Manke/Tacoma	Std or btr	s. grn D fir
TEST:	2X4	Packwood	#2 or btr	s. grn D fir
	4x4	Packwood	#2 or btr	s. grn D fir

PELLET FUEL APFI#: ________________

All grades WCLB rules

WARM UP INFORMATION:
All pre-burn/warm up fuel pieces were either 13 or 13 inches.

1st warm up/preburn fuel charge (20.2 lbs) added at 1045 .

2nd warm up/preburn fuel charge (5.1 lbs) added at 1117 .

3rd warm up/preburn fuel charge (26 lbs) added at 1128 .

4th warm up/preburn fuel charge (________ lbs) added at __________ .

5th warm up/preburn fuel charge (________ lbs) added at __________ .

Unit: FX HT 2000
Run: 3
Date: 6/28/93
Technician:

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

WST1-Form7-Rev11/89

Room Temperature: 69 °F

Correction Factor: Ø

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes____. No √.
Time Test Fuel Moisture Readings taken at: 1000
Calibration Checks: X √ Y √ 12.0 12.1 22.0 21.9

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1	2x4x8	K	12.5	13.5	11.0	11.8	11.5	12.3	12.533
2									
3									
4	2x4x8	P	20.0	21.8	19.5	21.3	20.0	21.8	21.633
5	2x4x8	P	23.0	25.2	23.5	25.7	23.5	25.7	25.533
6	2x4x8	P	21.5	23.5	21.0	22.9	21.0	22.9	23.100
7									70.266
8									
9	4x4x17"	T	22.0	24.1	22.0	24.1	23.5	25.7	24.633
10	"	T	23.5	25.7	22.0	24.1	23.5	25.7	25.167
11	"	T	23.5	25.7	23.5	25.7	23.5	25.7	25.700
12	"	T	23.5	25.7	23.5	25.7	23.5	25.7	25.700
13	"	T	23.0	25.2	23.5	25.7	23.5	25.7	25.533
14									126.733
15									
16									
17									
18									
19									
20	.75x1.5x5"	T	23.0	25.2	23.0	25.2	22.5	24.6	25.000

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	12.533%	23.422 %	25.347%
% Moisture - Wet Basis:	11.137%	18.977 %	20.221%

To obtain Wet from Dry: $\frac{100 \times \%\ \text{Dry Rdg.}}{100 + \%\ \text{Dry Rdg.}}$ = % Moisture, Wet Basis

Acceptable Ranges: 16-20% wet; 19-25% dry
(17.5 - 22.5 on Meter [Uncor reading] at 70°F)

Key for Use: K= Kindling P= Pretest Fuel T= Test Fuel

Unit: FX HT 2000
Run#: 3
Date: 6/25/93
Technician:

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 4" x 4" x 4"

Depth (D): 9.015 cm

Width (W): 9.000 cm

Length (L): 8.986 cm
8.855 cm
8.715 cm
8.775 cm

Length $\bar{X}$ = 8.831 cm

Volume: 716.503 cm^3
(D X W X L)

MOISTURE: Room Temperature: 72 °F Correction Factor: Ø

Uncorrected Meter Readings Corrected for temperature: Yes ___ No X

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	23.0	25.2 %
Bottom:	23.5	25.7 %
Side:	23.5	25.7 %
$\bar{X}$:		25.533 %

Avg % Moisture (Dry) 25.533 %

Aug % Moisture (Wet) 20.340 %

Scale: Leveled In √ Out √

Zeroed: In √ Out √

Wet Weight: 358.6 g Dry Weight: 276.51 g

% Moisture Dried Basis: 22.8918 %
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	6-25-93	1000	230 °F
Out of Dryer	7/6/93	1030	215 °F

(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 276.51 g (dry wt) ÷ 716.503 cm^3 (volume) = .3859 g/cm^3

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ______ g

Wet Wt: ______ g - ______ g = ______ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: ______ g ÷ ______ g = ______ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

% Moisture Dried Basis: ______ %
[1 - (Net Dry Wt ÷ Net Wet Wt.)] X 100

507

PAGE 12 GAS DATA SHEET
MANUFACTURER/MODEL FX HT 2000 RUN 3 DATE 6/28/93 PAGE 1 OF 1

TIME	SCALE	FUEL	DROP	v.	CO2	v.	O2	v.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
0 / 1155	562.6	21.9	Ø	.490	12.2	.318	7.9	.010	.10	122	100	197	2.8	141	775	-.064	250
05 / 1200	560.7	20.0	1.9	.394	9.8	.400	9.9	.019	.19	51.5	99	177	2.6	149	951	-.065	275
10 / 05	558.6	17.9	2.1	.438	10.9	.384	9.5	.014	.14	77.7	101	175	4.0	152	999	-.065	275
15 / 10	556.8	16.1	1.8	.379	9.4	.436	10.8	.015	.15	62.7	99	167	3.9	149	922	-.065	275
20 / 15	555.1	14.4	1.7	.377	9.4	.433	10.7	.011	.11	85.0	98	164	3.8	149	913	-.062	275
25 / 20	553.5	12.8	1.6	.360	8.9	.446	11.0	.008	.08	112	96	160	3.5	148	888	-.062	275
30 / 25	552.0	11.3	1.5	.357	8.9	.450	11.1	.006	.06	148	95	156	3.4	147	867	-.062	275
35 / 30	550.6	9.9	1.4	.321	8.0	.483	12.0	.007	.07	114	94	152	3.3	145	808	-.061	275
40 / 35	549.4	8.7	1.2	.314	7.8	.488	12.1	.007	.07	111	92	148	3.1	144	816	-.060	275
45 / 40	548.2	7.5	1.2	.314	7.8	.485	12.0	.007	.07	111	92	147	3.1	144	816	-.060	275
50 / 45	547.0	6.3	1.2	.325	8.1	.473	11.7	.005	.05	161	91	146	3.0	144	820	-.060	275
55 / 50	545.9	5.2	1.1	.334	8.3	.461	11.4	.003	.03	276	90	143	2.9	143	815	-.060	275
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	10413	-.746	-----
60 / 55	544.9	4.2	1.0	.325	8.1	.473	11.7	.004	.04	201	89	139	2.8	142	785	-.060	275
65 / 1300	544.1	3.4	.8	.291	7.2	.504	12.5	.005	.05	144	88	136	2.7	141	763	-.058	275
70 / 05	543.3	2.6	.8	.297	7.4	.498	12.3	.004	.04	184	88	134	2.7	141	756	-.057	275
75 / 10	542.7	2.0	.6	.277	6.9	.515	12.8	.005	.05	137	87	132	2.8	140	733	-.056	275
80 / 15	542.3	1.6	.4	.218	5.4	.576	14.3	.009	.09	60.0	85	128	2.5	136	654	-.055	275
85 / 20	541.9	1.2	.4	.187	4.6	.611	15.1	.030	.30	15.4	84	122	2.6	134	602	-.051	275
90 / 25	541.7	1.0	.2	.180	4.5	.618	15.3	.031	.31	14.4	83	122	2.4	133	595	-.051	300
95 / 30	541.4	.7	.3	.170	4.2	.629	15.6	.040	.40	10.5	83	120	2.4	132	570	-.050	300
100 / 35	541.2	.5	.2	.166	4.1	.633	15.7	.049	.49	8.4	83	118	2.4	131	558	-.050	300
105 / 40	540.9	.2	.3	.159	3.9	.642	15.9	.051	.51	7.7	83	116	2.4	131	539	-.048	300
110 / 45	540.7	Ø	.2	.160	4.0	.637	15.8	.051	.51	7.8	83	115	2.4	131	536	-.048	300
115 / 50															7091	-.584	
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	17564	-1.330	-----
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	-----	-----	761	-.058	-----

T.E. : 541.7
B.E. : 540.7

547.2 ?

541.7 - 540.7

PAGE 13 PREBURN DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 3 **DATE** 6/28/93 **PAGE** 1 **OF** 1

OIL SEAL 19

TIME	SCALE WT	BURN RATE	STACK	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	STATIC	COMMENTS	
0 / 1050	557.4	—	252	256	304	177	320	393	390	363	69	-.046	PRIMARY AIR SET AT:	OK
05 / 55	556.3	1.1	651	277	278	186	308	393	661	1020	70	-.075	WIDE OPEN	✓
10 / 1100	554.3	2.0	786	396	284	191	327	385	649	1143	72	-.083	SECONDARY AIR SET AT:	✓
15 / 05	552.5	1.8	804	439	325	126	342	377	735	1296	73	-.084	NA	✓
20 / 10	550.4	2.1	822	457	361	103	367	368	806	1370	76	-.084	FAN: ON HIGH	✓
25 / 15	548.1	2.3	892	493	404	99	398	362	860	1463	78	-.086	~~ADDED 5.1 lbs~~	✓
30 / 20	550.6	2.6	1027	542	445	101	428	364	860	1382	86	-.087		✓
35 / 25	548.3	2.3	952	568	485	102	456	372	869	1418	80	-.079	PUMPS ON AT: 1120	
40 / 30	548.7	2.2	1020	584	514	102	472	382	885	1430	81	-.077	+2.6	136
45 / 35	546.4	2.3	1004	600	538	102	497	388	1019	1433	82	-.074	CHECK WB/DB: 106/215	141
50 / 40	544.4	2.0	973	617	561	104	532	404	1027	1475	82	-.070		152
55 / 45	542.8	1.6	903	598	578	104	559	416	1258	1495	83	-.066		158
------	------	------	------	------	------	------	------	------	------	------	------	------	------------------------	166
60 / 1150	541.6	1.2	859	559	594	107	594	428	1225	1446	83	-.064		
65 / 55	540.7	1.1	775	575	605	108	620	441	1392	1252	83	-.064	469.8	

PAGE 1 TEMPERATURE DATA SHEET

MANUFACTURER/MODEL FX HT 2000 **RUN** 3 **DATE** 6/28/93 **PAGE** 1 **OF** 1

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	469.8
0 / 1155	575	605	108	620	441	1392	1252	83	1401	240	33	248	39	39	161
05 / 1200	581	595	111	625	463	926	1005	83	1401	240	33	248	39	39	156
10 / 05	618	582	115	601	466	916	1029	84	1414	244	33	247	39	39	155
15 / 10	623	576	115	582	465	1029	1015	83	1434	246	34	246	39	39	158
20 / 15	618	574	116	574	457	1088	1029	84	1449	247	36	247	39	39	158
25 / 20	607	579	117	574	449	1114	1019	83	1441	247	37	247	39	39	158
30 / 25	596	586	115	576	437	1144	1065	82	1437	247	37	246	39	39	158
35 / 30	577	592	119	580	425	1160	1084	82	1439	247	37	246	38	39	155
40 / 35	560	594	120	584	419	1179	1152	82	1444	248	37	247	38	38	155
45 / 40	547	597	121	589	410	1183	1304	83	1446	248	37	248	38	38	153
50 / 45	543	602	122	594	400	1207	1311	83	1448	248	37	243	38	38	152
55 / 50	523	607	123	603	393	1233	1313	83	1447	247	37	243	38	38	151
TOTAL	6968	7089	1402	7102	5225	13571	13578	995	------	------	------	------	------	------	------
60 / 55	513	619	126	617	389	1274	1204	84	1448	247	37	241	37	38	150
65 / 1300	495	625	126	627	384	1285	1170	83	1447	246	37	240	37	38	148
70 / 05	489	629	126	638	380	1302	1187	84	1447	245	37	241	37	39	147
75 / 10	479	628	127	645	378	1298	1133	84	1448	245	37	240	37	39	146
80 / 15	444	627	128	647	376	1262	979	83	1449	244	37	239	36	39	146
85 / 20	396	613	128	639	377	1225	899	83	1448	243	37	240	36	39	162
90 / 25	380	607	127	631	377	1175	917	84	1444	242	37	241	36	39	167
95 / 30	364	594	127	619	378	1137	893	84	1440	240	37	241	35	38	167
100 / 35	349	577	127	600	378	1113	877	83	1441	239	36	241	35	38	165
105 / 40	336	561	127	586	378	1088	904	83	1436	239	36	242	35	38	164
110 / 45	329	551	127	575	380	1075	905	83	1434	238	36	242	35	38	163
115 / 50	4574	6631	1396	6824	4175	13234	11068	918	÷23		469.8 =	392.4	= 77.	4	
TOTAL	11542	13720	2798	13926	9400	26805	24646	1913	------	------	------	------	------	------	------
TOTAL	502	597	122	605	409	1165	1072	83	------	------	------	------	------	------	------

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/28/93 Analyte: CO_2 (15-1)

Source: FX HT 2000 Run #: 3

Zero Cyl #: T132257 Conc. 00.0 % CO_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS40875 Conc. 12.6 % CO_2 Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 407069

Range: 0 - 25.0% CO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% CO_2
EPA Control Limits = ± 2.5% of 25.0% CO_2 = ± 0.625% CO_2

Pre Run Audit: By: DK Time: 1045 Temp: 69 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	-.029	-.029	-.116
Span	50.4	.504	12.6	50.5	.505	12.538	-.062	-.488

Comments:

Post Run Audit: By: DK Time: 1355 Temp: 83 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc Difference	Δ %
Zero	00.0	.000	00.0	00.2	.002	.021	.021	.084
Span	50.4	.504	12.6	50.6	.506	12.563	-.037	-.291

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/28/93 Analyte: O_2 (15-2)

Source: FX HT 2000 Run #: 3

Zero Cyl #: T132257 Conc. 00.0 % O_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS40875 Conc. 12.8 % O_2 Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Teledyne Model: 320 Ax SN: 37465

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% O_2
EPA Control Limits = + 2.5% of 25.0% O_2 = + 0.625% O_2

Pre Run Audit: By: DK Time: 1050 Temp: 69 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.001	-.017	-.017	-.068
Span	12.8	.512	12.8	12.8	.513	12.715	-.085	-.667

Comments: Teledyne #2 Cyl % ____ Exp % ____ Act % ____ Adj to ____ + Δ % ____

Post Run Audit: By: DK Time: 1400 Temp.: 83 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.2	.009	.182	.182	.727
Span	12.8	.512	12.8	12.7	.510	12.640	-.160	-1.250

Comments: Teledyne #2 Cyl % ____ Exp % ____ Act % ____ Adj to ____ + Δ % ____

+ Conc. Difference = Act % - Exp (Std) %

Zero % Differece = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}}$ X 100

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/28/93 Analyte: CO (15-3)

Source: FX HT 2000 Run #: 3

Zero Cyl #: T132257 Conc. 00.0 % CO Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS 40875 Conc. 5.01 % CO Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 408005

Range: 0 - 10.0% CO Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 10.0% CO
EPA Control Limits = ±2.5% of 10.0% CO = ± 0.25% CO

Pre Run Audit: By: DK Time: 1055 Temp: 70 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.000	.000	.000
Span	50.1	.501	5.01	50.2	.502	5.020	.010	.200

Comments:

Post Run Audit: By: DK Time: 1405 Temp.: 83 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.1	.001	.010	.010	.100
Span	50.1	.501	5.01	50.3	.503	5.030	.020	.399

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/28/93 Analyte: SO_2 (15-4)

Source: FX HT 2000 Run #: 3

Zero Cyl #: T132257 Conc. 00.0 ppm SO_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: CC 79076 Conc. 1268 ppm SO_2 Cyl Press: 500 psi

Certified by: LIQUID AIR Date: 2/26/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 403019

Range: 0 - 2500 ppm SO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 2500 ppm SO_2
EPA Control Limits = ±2.5% of 2500 ppm SO_2 = ±62.5 ppm SO_2

Pre Run Audit: By: DK Time: 1100 Temp: 72 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	00.8	.008	15.467	15.467	.619
Span	50.7	.507	1268	50.9	.509	1276.392	8.392	.662

Comments:

Post Run Audit: By: DK Time: 1410 Temp: 83 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	1.2	.012	25.535	25.535	1.021
Span	50.7	.507	1268	50.6	.506	1268.841	.841	.066

Comments:

± Conc. Difference = Act ppm - Exp (Std) ppm

Zero % Differece = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Exp \% (ppm)}}$ X 100

QUALITY CHECKS
DATA SHEET 16

Unit: FX HT 2000 Run: 3 Date: 6/28/03

Thermocouple Check:

T/C #1	68.6	°F	T/C #13	69.1	°F
T/C #2	68.5	°F	T/C #14	68.2	°F
T/C #3	67.4	°F	T/C #15	69.4	°F
T/C #4	69.6	°F	T/C #16	52.3	°F
T/C #5	69.3	°F	T/C #17	61.5	°F
T/C #6	69.7	°F	T/C #18	73.6	°F
T/C #7	69.6	°F	T/C #19		°F
T/C #8	69.4	°F	T/C #20		°F
T/C #9	68.6	°F	T/C #21		°F
T/C #10	67.6	°F	T/C #22		°F
T/C #11	66.4	°F	T/C #23	68.2	°F
T/C #12	69.9	°F	T/C #24		°F

Thermocoouple Readout:

pretest zero and span check and calibration — post test zero and span — % difference

ZERO	-.2	°F	ADJ. TO	.0	°F	ZERO	1.0	°F	.050
SPAN	1997.9	°F	ADJ. TO	2000.0	°F	SPAN	2002.9	°F	.145

Thermocouple Readout Pretest Linearity Check

0 =	.0	°F	200 =	201.6	°F	400 =	399.0	°F
600 =	601.3	°F	800 =	801.5	°F	1000 =	1000.6	°F
1200 =	1198.2	°F	1400 =	1399.2	°F	1600 =	1599.7	°F
1800 =	1800.1	°F	2000 =	2000.0	°F			

Sample Train Leak Check	Pre ✓	Post ✓
Combustion Gas Train Leak Check	Pre ✓	Post ✓
Tracer Gas Train (SO_2) Leak Check	Pre ✓	Post ✓
Darft (Static) Gauge Zero Check	Pre ✓	Post ✓

Scale Check

Pre 546.7 - 536.7 = 10.0 ✓

Post 550.1 - 540.1 = 10.0 ✓

Stack Cleaned Proir to Test Run: YES ✓ NO ____

TABLE 1 ----- RAW DATA

CLIENT : FX DROLET TEST No. : 6

MODEL: HT2000 DATE: 01-Jul-93

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	626.500	0.150	80	0.11	5.50	250
5	628.000	0.150	80	0.14	10.60	250
10	629.524	0.150	82	0.12	9.60	250
15	631.060	0.150	83	0.11	9.80	250
20	632.601	0.150	84	0.15	10.10	250
25	634.148	0.150	85	0.10	10.90	250
30	635.701	0.150	86	0.05	8.50	250
35	637.259	0.150	87	0.05	7.80	250
40	638.823	0.140	88	0.05	7.30	250
45	640.393	0.140	88	0.05	7.00	250
50	641.962	0.140	89	0.06	6.80	250
55	643.538	0.140	89	0.04	7.00	250
60	645.114	0.140	90	0.05	6.70	250
65	646.695	0.140	90	0.06	6.80	250
70	648.276	0.140	91	0.07	6.40	250
75	649.863	0.140	91	0.10	5.60	250
80	651.450	0.140	92	0.20	4.70	250
85	653.043	0.140	92	0.31	4.50	250
90	654.636	0.170	92	0.38	4.50	225
95	656.405	0.170	92	0.41	4.30	225
100						

CLIENT : FX DROLET TEST No. 6

MODEL: HT2000 DATE: *********

****

METER CAL. FACTOR (Y) ------	1.028	Wt. WOOD BURNED(LB) -------	21.3 Lbs
BAROMETRIC PRESS.(Pb) ------	30.12 in Hg	WET,FUEL MOISTURE % -------	18.158 %
LEAK RATE POST (Lp) ------	0.002 cfm	Wt. PART. COLLECTED -------	0.0709 g
WATER VOL. (V1c) ------	59.5 Ml	METER VOLUME Vm -------	29.905 mcf
TEST TIME (MIN) ------	95 min	HC MOLE FRACTION -------	0.0132

TABLE 3 -----FIELD DATA AVERAGES

CLIENT :FX DROLET TEST No. 6

MODEL: HT2000 DATE: 01-Jul-93

****

AVG DELTA H	-------	0.15 in H_2O	AVG PRCNT CO	-------	0.13	%
AVG METER TEMP. Tm	-------	88 deg F	AVG PRCNT CO_2	-------	7.22	%
AVG PPM SO_2	-------	248 PPM	AVG BAL CO_2/CO	-------	55.33	%

TABLE 4 ----- CALCULATIONS

CLIENT : FX DROLET | TEST No. 6

MODEL: HT2000 | DATE: 01-Jul-93

****

STD SAMPLE VOL. Vm(std) -----	29.86	dscf	STACK GAS FLOW Qsd -------	2074.725 & 34.58	dscf/Hr & dscf/min
VOL. WATER VAPOR Vw(std) ----	2.801	scf	PARTICULATE CONCTRT. Cs ------	0.0024	g/dscf
PRCNT MSTR Bws -------	8.58	%	PARTC.EMISS. RATE E -------	4.93	g/Hr
BURN RATE BR -------	4.99	Kg/Hr	MOLES OF GAS PER Lb WOOD Nt --	0.49	Lb-mole/Lb
CO EMISSION RATE -------	90.67 & 18.16	g/Hr & g/Kgdry fuel	PART.EMISS. RATE ------	0.99	g/Kgdry fuel

TABLE 5 ----- PROPORTIONAL RATE VARIATION

CLIENT : FX DROLET   TEST No. : 6

MODEL: HT2000   DATE: 01-Jul-93

	TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE	
	5	379.7	97		100	
	10	385.0	99			
	15	387.0	99			
	20	387.5	99			
	25	388.3	99			
	30	389.1	100			
	35	389.6	100			
	40	390.4	100			
	45	391.6	100			
	50	391.0	100			
	55	392.3	100			
	60	392.0	100			
	65	392.9	101			
	70	392.5	101			
	75	393.6	101			
	80	393.3	101			
	85	394.4	101			
	90	394.4	101			
	95	394.2	101			
	100					
	105					

COMPUTER INPUT DATA WOODSTOVE DATA SHEET #1

Client FX DROLET

Client Address 1700 LÉON-HARMEL
QUEBEC, QUEBEC G1N 4R9 CANADA

Client Phone 418-527-3060

Project No. ______ Model No. HT 2000

Run No. 6 Date of Test 7/1/93 Est Grams/Hr ______

Stove Type: Cat ______ Non Cat X Pellet ______

Data To Be Submitted To: Oregon ______ Colorado ______ EPA ______

Burn Category: Low (<0.8 Kg/Hr) ______ Med Hi (1.26 - 1.90 Kg/Hr) ______
Med Low (0.8 - 1.25 Kg/Hr) ______ Max (>1.9 Kg/Hr) 4.9441

Fuel % Moisture (dry) 22.187 %(wet) 18.158 %
(00.00) (Data Sheet #10)

Stack Static Pressure -.081 "H_2O
(0.000) (Data Sheet #12)

Barometric Pressure 30.12 "Hg
(00.00) (Data Sheet #2)

Temperature (Average Room) Combustion Air 81 °F
(00) (Data Sheet #14)

Flue Gas Moisture 8.5863 %
(00.000) (Data Sheet #7)

Ambient Moisture 1.4 %
(0.00) (Data Sheet #8)

Stove Weight 487 lbs
(000) (Data Sheet #8)

Stove Temperature Change -51.8 °F
(000) (Data Sheet #14)

Particulate Emission .0367 gr/dscf
(0.0000) (Data Sheet #7)

Fuel Higher Heating Value (dry) ______ BTU/lb
(0000) (CT&E Sheet)

Fuel Type: Wood: X Pellets: ______

Total Fuel Consumed During Burn 21.3 lbs
(00.0) (Data Sheet #8)

Total Particulate Catch .0709 g
(0.0000) (Data Sheet #6)

H_2O Captured 59.5 g
(00.0) (Data Sheet #3)

Dry Gas Meter Volume 29.905 CF
(00.000) (Data Sheet #2)

Dry Gas Meter: Y Factor: 1.028 Post Test Leak Rate .002 CFM

TIME: 95

Meter Box Data Sheet Page # 2

Meter Box SH Y Factor 1.023

Leak Checks: 15 " Hg @ .001 cfm
15.0 " Hg @ .002 cfm
____ " Hg @ ____ cfm
____ " Hg @ ____ cfm

Inject SO2 @ 100 cc/min

Page 1 of 1

Unit: FX

Run: 6 Date: 7-1-93

Operator(s): CW

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS:	.90		Sampling Ratio :	46		: 1	BAROMETER:	30.12	
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
00	1035	626.500	—	13.940	.15	80	250	80	1.0
05	40	628.000	—	13.940	.15	80	250	80	1.0
10	45	629.524	629.524	13.888	.15	82	250	82	1.0
15	50	631.060	631.060	13.863	.15	83	250	83	1.0
20	55	632.601	632.601	13.837	.15	84	250	84	1.0
25	1100	634.148	634.148	13.812	.15	85	250	85	1.0
30	05	635.701	635.701	13.787	.15	86	250	86	1.0
35	10	637.259	637.259	13.762	.15	87	250	87	1.0
40	15	638.823	638.823	13.736	.14	88	250	88	1.0
45	20	640.393	640.393	13.736	.14	88	250	88	1.0
50	25	641.962	641.962	13.711	.14	89	250	89	1.0
55	1130	643.538	643.538	13.711	.14	89	250	89	1.0
ROTO PRESS:	.98		TOTALS :	165.723	1.760	1021	BAROMETER:	30.12	
60	1135	645.114	645.114	13.686	.14	90	250	90	1.0
65	40	646.695	646.695	13.686	.14	90	250	90	1.0
70	45	648.276	648.276	13.662	.14	91	250	91	1.0
75	50	649.863	649.863	13.662	.14	91	250	91	2.0
80	55	651.450	651.450	13.637	.14	92	250	92	2.0
85	1200	653.043	653.043	13.637	.14	92	250	92	2.0
90	05	654.636	654.636	15.152	.17	92	225	92	2.0
95	10	656.405	656.405	15.152	.17	92	225	92	2.0
100									
105			20'	112.274	1.180	730			
110									
115				277.997	2.940	1751			
			TOTALS:				MAX VACC =		2.0
TOTAL CU FT		29.905	TOTALS:	13.900	.147	88	AV BP:	30.12	

548

MOISTURE SHEET

Woodstove Data Sheet #3

Moisture Determination

Initial: Balance Level ✓ Balance Zeroed ✓

Final: ✓ ✓

Unit: FX

Run: 6

Date: 4-1-93

Technician(s): Initial: CW

Final: BN

Approved By: ______

IMPINGER #1

Final Weight 620.1 grams

Initial Weight 571.3 grams

Net 48.8 grams

IMPINGER #2

Final Weight 590.4 grams

Initial Weight 587.6 grams

Net 2.8 grams

IMPINGER #3

Final Weight 486.6 grams

Initial Weight 486.0 grams

Net .6 grams

IMPINGER #4 (SILICA GEL)

Final Weight 851.3 grams

Initial Weight 844.0 grams

Net 7.3 grams

TOTAL MASS OF H_2O CAPTURED 59.5 grams

Scale Check: 295.0g = 295.0 g
590.0g = 590.0 g
885.0g = 885.0 g

Front Half Filter # 451F
#
Back Half Filter # 451B

Notes: ______

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 5/27/93 Time 1030 By DK Front Half ✓ Back Half ✓

Manufacturer: S&S Size: 11 cm / 8.2 cm Lot. No.: ZB901 Grade: #25 glass

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
441F	.6921	6/1	1016	LU	.6924	6/2	1044	DK	✓			
442F	.6988	6/1	1017	LU	.6988		1046		✓			
443F	.6982	6/1	1018	LU	.6977		1048		✓			
444F	.7058	6/1	1019	LU	.7054		1050		✓			
445F	.7004	6/1	1020	LU	.7002		1052		✓			
446F	.6996	6/1	1021	LU	.6994		1054		✓			
447F	.7022	6/1	1022	LU	.7022		1056		✓			
448F	.7079	6/1	1023	LU	.7076		1058		✓			
449F	.6984	6/1	1024	LU	.6982		1100		✓			
450F	.7079	6/1	1025	LU	.7080		1102		✓			
441B	.3750	6/1	1026	LU	.3745	6/2	1126	DK	✓			
442B	.3730	6/1	1027	LU	.3725		1128		✓			
443B	.3776	6/1	1028	LU	.3771		1130		✓			
444B	.3779	6/1	1029	LU	.3774		1132		✓			
445B	.3738	6/1	1030	LU	.3733		1134		✓			
446B	.3736	6/1	1031	LU	.3731		1136		✓			
447B	.3755	6/1	1032	LU	.3750		1138		✓			
448B	.3790	6/1	1033	LU	.3785		1140		✓			
449B	.3728	6/1	1034	LU	.3726		1142		✓			
450B	.3801	6/1	1035	LU	.3796		1144		✓			

Checked by Bill Nowak Date: 6/2/93 Time 1328

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
58	70	48	6/1	900	LU
62	75	48	6/2	1042	DK

WOODSTOVE DATA SHEET #4-2:
INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 6/8/93 Time: 730 By: DK

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
401	96.2832	6/10	1026	DK	96.2827	6/11	916	LU	✓			
402	105.5756		1028		105.5758	6/11	918		✓			
403	106.3133		1030		106.3135	6/11	920		✓			
404	108.2121		1032		108.2124	6/11	922		✓			
405	97.1689		1034		97.1688	6/11	924		✓			
406	98.1375	6/10	1036	DK	98.1374	6/11	926	LU	✓			
407	106.4073		1038		106.4078		928		✓			
408	95.7319		1040		95.7324		930		✓			
409	98.1956		1042		98.1952		932		✓			
410	107.3623		1044		107.3625		934		✓			
411	106.4695	6/10	1046	DK	106.4700	6/11	936	LU	✓			
412	107.7046		1048		107.7044		938		✓			
413	94.3924		1050		94.3927		940		✓			
414	107.4818		1052		107.4813		942		✓			
415	98.3546		1054		98.3551		944		✓			
416	104.5937	6/10	1056	DK	104.5935	6/11	946	LU	✓			
417	107.0401		1058		107.0401		948		✓			
418	104.2895		1100		104.2896		950		✓			
419	120.2896		1102		120.2894		952		✓			
420	98.8126		1104		98.8130		954		✓			
421	104.8317	6/10	1106	DK	104.8320	6/11	956	LU	✓			
422	97.1427		1108		97.1424		958		✓			
423	97.8661		1110		97.8660		1000		✓			
424	106.4696		1112		106.4697		1002		✓			
425	100.0065		1114		100.0060		1004		✓			

Checked By: Bill Nowak Date: 6/11/93 Time: 11:30

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
58	70	48	6/10	1024	DK
56	68	47	6/11	904	LU

WST5-Form9, [illegible], Rev4/90
Unit FX HT2000
Run # 6
Date: 7/1/93

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
416		7/2	900	LU	104.6111	7/6	932	LU	104.6114	7/7	938	DK				
417		7/2	900	LU	107.0493	7/6	934	LU	107.0494	7/7	940	DK				
418		7/2	900	LU	104.2920	7/6	936	LU	104.2924	7/7	942	DK				
419		7/2	900	LU	120.2926	7/6	938	LU	120.2927	7/7	944	DK				
420		7/2	900	LU	98.8153	7/6	940	LU	98.8153	7/7	946	DK				

FINAL FILTER WEIGHTS

Filter #	Into Dessic	Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
450F		7/1	1300	BN	.7442	7/2	958	DK	.7441	7/6	942	LU				
450B		7/1	1300	BN	.3803	7/2	1000	DK	.3801	7/6	944	LU				

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	WB	DB	%RH
1	7/2	908	DK	58	70	48
2	7/6	906	LU	60	73	47
3	7/7	936	DK	61	74	47
4						
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

Dates: From 6/10/93

Through ____________

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0001	10.0001	1.0000	0.0999			DK	6/10	1000	70	58	48
99.9999	10.0001	0.9998	0.1000			LL	6/11	904	68	56	47
100.0003	10.0000	0.9996	0.0999			DK	6/14	910	76	63	49
99.9999	10.0003	1.0001	0.1002			LL	6/15	902	70	58	48
99.9998	10.0002	1.0000	0.0998			DK	6/16	900	70	58	48
99.9996	9.9997	0.9998	0.0997			LL	6/17	904	70	58	48
100.0004	10.0003	1.0000	0.1000			DK	6/18	0830	69	57	47
100.0001	10.0001	1.0000	0.1000			LL	6/21	908	68	56	47
100.0001	10.0000	1.0001	0.0999			DK	6/22	900	66	55	49
99.9996	9.9997	0.9997	0.0998			LL	6/23	906	70	58	48
99.9998	9.9999	0.9999	0.1000			DK	6/24	1700	74	60	44
99.9998	9.9997	0.9997	0.0995			LL	6/25	930	77	64	49
100.0001	10.0000	0.9999	0.0997			DK	6/28	1000	71	59	49
100.0003	10.0003	1.0001	0.1000			LL	6/29	904	71	59	49
100.0002	10.0001	1.0001	0.0999			DK	6/30	1045	73	60	47
99.9999	10.0000	1.0000	0.1000			LL	7/1	910	73	60	47
100.0003	10.0002	1.0002	0.1001			DK	7/2	908	70	58	48
99.9998	10.0002	1.0000	0.0999			LL	7/6	906	73	60	47
100.0003	10.0003	1.0001	0.1000			DK	7/7	920	74	61	47

WST7-For Rev5/90

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Dates: From 3-11-93

Through 6/9/93

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0004	10.0001	1.0000	.0999			CW	3-11	0915	69	54	36
99.9998	10.0000	0.9999	0.0997			DK	3/12	0830	68	52	32
100.0003	10.0007	1.0000	.0997			CW	3-15	0930	72	57	39
100.0000	10.0002	1.0000	0.1000			DK	3/16	0900	72	57	39
100.0001	10.0001	1.0002	0.1001			DK	3/17	1330	72	58	42
100.0001	10.0003	1.0007	0.1001			CW	3-18	1700	75	60	47
99.9999	10.0000	0.9998	0.0999			DK	3/19	0900	71	57	41
100.0003	10.0001	1.0000	.0999			BN	3-23	0900	73	60	47
100.0002	10.0001	1.0000	0.0999			DK	3/19	1300	77	63	46
100.0001	10.0001	1.0001	.0999			CW	4-20	0900	75	60	41
100.0000	10.0002	1.0002	0.0999			DK	4/26	0906	66	55	49
100.0001	10.0001	1.0001	.1001			CW	4-28	0900	69	56	44
100.0002	10.0001	0.9999	0.0999			DK	5/4	1120	75	62	48
100.0001	10.0001	1.0000	.1000			CW	5-5	1000	75	60	41
99.9998	9.9999	0.9999	0.1000			DK	5/6	946	76	62	45
99.9997	10.0001	1.0000	0.0999			DK	5/7	1620	74	60	44
100.0002	10.0002	1.0001	.0999			BN	5-10	0900	71	59	49
100.0002	10.0002	1.0002	.1001			CW	5-11	1000	73	59	43
100.0000	10.0000	1.0000	0.0999			DK	5/12	900	75	61	44
100.0001	10.0001	1.0001	.1000			CW	5-13	1600	71	58	45
99.9997	10.0002	1.0002	0.1001			DK	5/14	1000	70	58	48
99.9999	10.0001	0.9999	0.0998			DK	5/19	1010	71	59	49
99.9999	10.0000	0.9998	0.0998			BW	5/20	1120	71	60	44
99.9997	10.0002	1.0000	0.0998			DK	5/21	950	70	58	48
100.0001	10.0002	1.0000	0.0999			LU	5/24	1115	77	65	46
100.0001	10.0002	1.0001	0.1001			DK	5/25	1030	70	58	48
100.0003	10.0000	0.9998	0.1000			LU	5/26	1230	77	64	49
100.0000	10.0002	1.0000	0.1000			DK	5/27	940	77	64	49
99.9997	10.0001	0.9999	0.1000			LU	5/28	908	76	63	49
99.9999	10.0000	0.9999	0.0997			LU	6/1	900	70	58	48
100.0002	10.0003	1.0001	0.1001			DK	6/2	940	75	62	48
100.0000	10.0000	1.0001	0.0998			LU	6/3	956	70	58	48
100.0001	9.9999	0.9999	0.0999			DK	6/4	0930	68	56	47
100.0000	9.9998	0.9999	0.0999			LU	6/7	0940	68	56	47
99.9996	10.0001	0.9999	0.0999			DK	6/8	0900	68	56	47
99.9995	9.9997	0.9999	0.0996			LU	6/9	0904	68	56	47

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: FX DROLET
Run: 6 Date: 7/1/93
Technician(s):

FRONT HALF

FILTER #:	450F	BEAKER #:	416	FINAL WT:	104.6114 g
FINAL WT:	.7441 g	ml:	175	TARE WT:	104.5935 g
TARE WT:	.7080 g	desc:	ACETONE	NET WT:	.0179 g
NET WT:	.0361 g				
FILTER #:		BEAKER #:		FINAL WT:	g
FINAL WT:	g	ml:		TARE WT:	g
TARE WT:	g	desc:	ACETONE	NET WT:	g
NET WT:	g				

TOTAL VOLUME OF ACETONE USED IN WASH 175 ml

BACK HALF

FILTER #:	450B	BEAKER #:	417	FINAL WT:	107.0494 g
FINAL WT:	.3801 g	ml:	125	TARE WT:	107.0401 g
TARE WT:	.3796 g	desc:	ACETONE	NET WT:	.0093 g
NET WT:	.0005 g				
FILTER #:		BEAKER #:	418	FINAL WT:	104.2924 g
FINAL WT:	g	ml:	75	TARE WT:	104.2896 g
TARE WT:	g	desc:	METHCHLOR	NET WT:	.0028 g
NET WT:	g				
		BEAKER #:	419	FINAL WT:	120.2927 g
		ml:	150	TARE WT:	120.2894 g
		desc:	H2O	NET WT:	.0033 g
		BEAKER #:	420	FINAL WT:	98.8153 g
		ml:	100	TARE WT:	98.8130 g
		desc:	H2O	NET WT:	.0023 g
		BEAKER #:		FINAL WT:	.0056 g
		ml:		TARE WT:	g
		desc:		NET WT:	g
		BEAKER #:		FINAL WT:	g
		ml:		TARE WT:	g
		desc:		NET WT:	g

TOTAL VOLUME OF ACETONE USED IN WASH 125 ml
TOTAL VOLUME OF DICHLOROMETHANE USED IN EXTRACTION 75 ml
TOTAL VOLUME OF DISTILLED WATER DRIED 250 ml

PRTCATCH

Unit: FX HT 2000
Run: 6
Date: 7/1/93
Technician(s):
WSTAPP1-AppDoc19-page2
Rev 6/90

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Blank Audit: By: Bill Nowak Date: 6/15/93

Blank Calculations:

Acetone:	.0004 g ÷	200	ml =	.000002	g/ml
Dichloromethane:	.0006 g ÷	75	ml =	.000008	g/ml
Distillted Water:	.0002 g ÷	200	ml =	.000001	g/ml

Front Half Catch:

Filters: .0361 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .0361 g (Net Catch)

Beakers: .0179 g (Total Catch) - 175 (Ml of Acetone) (.000002 g) (Blank Value/ml of Acetone) = .0176 g (Net Catch)

Total Front Half Catch .0537 g

Back Half Catch:

Filters: .0005 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .0005 g (Net Catch)

Beakers:
1. Acetone/Impingers:
.0093 g (Total Catch) - 125 (ml of acetone) (.000002 g) (Blank Value/ml of Acetone) = .0091 g (Net Catch)

2. Extract/Impingers:
.0028 g (Total Catch) - 75 (ml. of Dichloromethane) .0006 (.000008 g) (Blank Value/ml of Dichloromethane) = .0022 g (Net Catch)

3. Water/Impingers:
.0056 g (Total Catch) - 250 (ml. of water) (.000001 g) (Blank Value/ml of water) = .0054 g (Net Catch)

Total Back Half Catch .0172 g
Total Catch .0709 g
% Front Half 75.7 %

EPA METHOD 5H PARTICULATE CALCULATIONS
WOODSTOVE TEST DATA SHEET #7

Unit: FX HT 2000
Run: 6 Date: 7/1/93
Technician(s): ____

1) Vm(std)= $\dfrac{(29.905\text{ Vm})(17.64)(1.028\text{ mcf})\left(30.12\text{ " Hg} + \dfrac{.147\text{ " H2O}}{13.6}\right)}{(548\text{ TmA})}$ = 29.8171 dscf (000.0000)

2) Vw(std)= (.04707)(59.5 ml H2O)= 2.8007 scf (00.0000)

3) Asw= $\dfrac{(2.8007\text{ scf})}{(2.8007\text{ scf} + 29.8171\text{ dscf})}$ = .0859 (.0000) Bws X 100 = 8.5863 (00.0000) % H2O

4) Cs= $\dfrac{(.0709\text{ g.})}{(29.8171\text{ dscf})}$ (15.43)= .0367 (0.0000) gr/dscf

5) Estimated g/hr= $\dfrac{(.0709\text{ g.})}{(29.8171\text{ dscf})}$ (13.900 (00.000) dscfm)(60)= 1.9831 (00.0000) g/hr

Vm = total cubic feet pulled on meter box during test	(p. 2)	(000.000 V
mcf = meter correction factor (Y factor) of the meter box used for the test	(p. 2)	(0.000 mcf
" Hg = average barometric pressure during the test	(p. 2)	(00.00 " Hg
" H2O = average delta H for the test	(p. 2)	(.000 " H2O
TmA = average meter temperature for the test in degrees Absolute	(p. 2)	(000 TmA
ml H2O = total water caught during the test	(p. 3)	(000.0 ml H2O
g. = total particulate catch for the test	(p. 6)	(00.0000 g.
dscfm = average stack flow during the test	(computer printout)	(00.000 dscf

PRTCALC

Miscellaneous Test Data Sheet Page # 8

Unit: FX HT 2000 Run: 6 Date: 7/1/93

Test Chamber Air Velocity Start: 0 Stop: 0 Avg: 0

Wet Bulb / Dry Bulb

Start: WB: 60 DB: 69 = 62 % RH 1.4 %H2O

Stop: WB: 60 DB: 71 = 54 % RH 1.4 %H2O

Average % Relative Humidity 58.0 Average % Ambient Moisture: 1.4

Empty Stove Weight: 487 lbs

Empty Stove Weight w/ Stack & Oil Seal: Wet: 537.4 Dry: 537.6

Kindling Weight: Paper: .3 lbs Wood: 8.7 lbs

Preburn Fuel Wt: 9.2 + 21.2 + 6.1 Total: 36.5 lbs

Total Kindling & Preburn Fuel Weight (Wood Only) ==> Total: 45.2 lbs

Coal Bed Weight: RANGE: 5.3 - 4.3 lbs SCALE: 542.9 - 541.9 lbs

Upper = .25 x fuel wt

Always round DOWN to nearest tenth

Lower = .20 x fuel wt

Always round UP to nearest tenth

Actual Coal Bed Weight: 4.7 lbs

Maximum Coal Bed Weight Removal ((5.3 Upper + 4.3 Lower)/2).25 = 1.2 lbs

Test Fuel (.75 x 1.5 x 5 " spacers) = 16 pcs

Test Fuel Dimensions	Length in inches	No. pcs	Wt. in lbs	% of load
2 x 4	NA	NA	NA	NA
4 x 4	18.5	5	21.3	100.0

Test Fuel Weight: 21.3 lbs

Estimated Dry Burn Rate Calculation $\frac{21.3 - (21.3 \times .18153)}{2.2046} \times \frac{60}{95\ \text{Time}} = 4.9941$ Kg/Hr

Estimated EPA Heat Output in BTU's / Hr $19{,}140 \times \frac{63}{100} \times 4.9941\ \text{DBR} = 60,220$ BTU's/Hr

EPA Default Efficiencies: NON-CAT: 63 CAT: 72 PELLET: 78

NOTES: 7.9073

96 min

WOODSTOVE OPERATING DATA

FIRE STARTED: 0815 PST/PDST

WARM UP AND PREBURN: PRIMARY AIR: set wide open for all warm-up/preburn fuel charges. then set to WIDE OPEN at start of preburn.

SECONDARY AIR: NA CAT BYPASS: N/A

CHARCOAL BED PREPARATION: raked and leveled prior to each warm-up/preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 20 sec.

TEST: Door Wide Open during loading 0 min 50 sec

PRIMARY AIR: opened full for first 5 min. , then set to run setting of WIDE OPEN.

SECONDARY AIR: N/A CAT BYPASS: N/A

FAN: ON/OFF during warm-up ON/OFF during preburn
ON/OFF first 30 minutes of test ON/OFF balance of test run
Fan speed set at HIGH.

WOOD DATA: KINDLING: a mix of the grades listed below

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2X4	Manke/Tacoma	Std or btr	s. grn D fir
TEST:	2X4	Packwood	#2 or btr	s. grn D fir
	4x4	Packwood	#2 or btr	s. grn D fir

PELLET FUEL APFI#: ________

All grades WCLB rules

WARM UP INFORMATION:
All pre-burn/warm up fuel pieces were either 13 or ____ inches.

1st warm up/preburn fuel charge (9.2 lbs) added at 0855 .

2nd warm up/preburn fuel charge (21.2 lbs) added at 0935 .

3rd warm up/preburn fuel charge (6.1 lbs) added at 1001 .

4th warm up/preburn fuel charge (____ lbs) added at ____ .

5th warm up/preburn fuel charge (____ lbs) added at ____ .

Unit: FX
Run: 6
Date: 4-1-93
Technician: Cw

WST1-Form7-Rev11/89

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

Room Temperature: 70 °F

Correction Factor: ∅

NOTE: Record readings to the nearest 0.5% moisture

Uncor Values are corrected for temperature: Yes____. No X.

Time Test Fuel Moisture Readings taken at: 900

Calibration Checks: X ✓ Y ✓ 12.0 12.0 22.0 21.8

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1		K	8.0	8.4	9.0	9.5	9.0	9.5	9.133
2									
3	2x4x8'	P	20.5	22.4	20.0	21.8	20.0	21.8	22.000
4	"	P	19.5	21.3	19.5	21.3	20.0	21.8	21.467
5	"	P	23.0	25.2	22.5	24.6	23.5	25.7	25.167
6									68.634
7									
8									
9									
10	4x4x	T	21.0	22.9	21.5	23.5	22.0	24.1	23.500
11	"	T	20.5	22.4	21.0	22.9	21.0	22.9	22.733
12	"	T	19.0	20.7	19.5	21.3	18.5	20.1	20.700
13	"	T	18.5	20.1	18.5	20.1	18.5	20.1	20.100
14	"	T	22.0	24.1	21.5	23.5	22.0	24.1	23.900
15									110.933
16									
17									
18									
19									
20	.75x1.5x5	T	21.0	22.9	19.5	21.3	19.5	21.3	21.833

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	9.133 %	22.878 %	22.187 %
% Moisture - Wet Basis:	8.369 %	18.618 %	18.158 %

To obtain Wet from Dry: $\frac{100 \times \% \text{ Dry Rdg.}}{100 + \% \text{ Dry Rdg.}}$ = % Moisture, Wet Basis

Acceptable Ranges: 16-20% wet; 19-25% dry
(17.5 - 22.5 on Meter [Uncor reading] at 70°F)

Key for Use: K= Kindling P= Pretest Fuel T= Test Fuel

Unit: FX HT 2000
Run#: 6
Date: 7/1/93
Technician:

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 4 x 4 x 3½

Depth (D): 8.95 cm

Width (W): 8.98 cm

Length (L): 9.4 cm, 9.0 cm, 9.10 cm, 9.3 cm

Length $\bar{X}$ = 9.178 cm

Volume: 737.605 cm^3
(D X W X L)

MOISTURE: Room Temperature: 70 °F Correction Factor: 0

Uncorrected Meter Readings Corrected for temperature: Yes ___ No ✓

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	18.5	20.1 %
Bottom:	19.0	20.7 %
Side:	19.0	20.7 %
$\bar{X}$:		20.500 %

Avg % Moisture (Dry) 20.500 %

Avg % Moisture (Wet) 17.012 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 411.4 g Dry Weight: 346.71 g

% Moisture Dried Basis: 15.724 %
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	7/1/93	10:00	223 °F
Out of Dryer	7/6/93	1030	215 °F

(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 346.71 g (dry wt) ÷ 737.605 cm^3 (volume) = .4700 g/cm^3

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ______ g

Wet Wt: ______ g (Gross Wet Wt.) - ______ g (Tare Beaker Wt.) = ______ g (Net Wet Wt.)

Dry Wt: ______ g (Gross Dry Wt.) ÷ ______ g (Tare Beaker Wt.) = ______ g (Net Dry Wt.)

% Moisture Dried Basis: ______ %
[1 - (Net Dry Wt ÷ Net Wet Wt.)] X 100

542.3

PAGE 12 [illegible] DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 6 **DATE** 7/1/93 **PAGE** 1 **OF** 1

TIME	SCALE	FUEL	DROP	v.	CO2	v.	O2	v.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
0 / 1035	563.6	21.3	Ø	.223	5.5	.580	14.4	.011	.11	50.2	98	154	4.1	138	604	-.076	250
05 / 40	561.7	19.4	1.9	.427	10.6	.420	10.4	.014	.14	75.7	109	165	6.5	153	941	-.094	250
10 / 45	559.2	16.9	2.5	.386	9.6	.434	10.8	.012	.12	79.8	117	163	8.9	156	960	-.091	250
15 / 50	557.3	15.0	1.9	.394	9.8	.428	10.6	.011	.11	88.9	115	151	8.8	157	958	-.090	250
20 / 55	555.5	13.2	1.8	.406	10.1	.405	10.0	.015	.15	67.2	114	144	8.7	157	970	-.090	250
25 / 1100	553.5	11.2	2.0	.441	10.9	.365	9.0	.010	.10	109	111	139	8.0	157	983	-.091	250
30 / 05	551.9	9.6	1.6	.343	8.5	.474	11.7	.005	.05	170	108	132	7.5	152	862	-.086	250
35 / 10	550.5	8.2	1.4	.313	7.8	.499	12.4	.005	.05	155	105	128	6.8	150	831	-.085	250
40 / 15	549.4	7.1	1.1	.296	7.3	.515	12.8	.005	.05	147	102	126	6.0	148	805	-.082	250
45 / 20	548.3	6.0	1.1	.281	7.0	.529	13.1	.005	.05	139	101	127	5.8	148	788	-.081	250
50 / 25	547.4	5.1	.9	.273	6.8	.531	13.2	.006	.06	113	100	127	5.5	147	784	-.083	250
55 / 30	546.5	4.2	.9	.284	7.0	.524	13.0	.004	.04	176	98	125	5.1	147	779	-.081	250
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	------	10265	-1.030	-------
60 / 35	545.7	3.4	.8	.269	6.7	.542	13.4	.005	.05	133	95	120	4.6	144	750	-.081	250
65 / 40	545.1	2.8	.6	.273	6.8	.532	13.2	.006	.06	113	93	114	4.5	143	749	-.081	250
70 / 45	544.5	2.2	.6	.259	6.4	.547	13.6	.007	.07	91.7	91	106	4.0	142	724	-.079	250
75 / 50	544.0	1.7	.5	.226	5.6	.582	14.4	.010	.10	56.0	88	99	3.8	139	678	-.076	250
80 / 55	543.5	1.2	.5	.188	4.7	.624	15.5	.020	.20	232	86	98	3.7	138	639	-.071	250
85 / 1200	543.0	.7	.5	.183	4.5	.627	15.5	.031	.31	146	84	104	3.2	136	613	-.069	250
90 / 05	542.6	.3	.4	.180	4.5	.629	15.6	.038	.38	11.7	84	108	3.2	135	598	-.069	225
95 / 10	542.3	Ø	.3	.175	4.3	.635	15.7	.041	.41	10.6	84	108	3.2	135	587	-.069	225
																	÷20
															5338	.595	
															15603	-1.625	
															780	-.081	
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	------			-------
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	------			-------

542.9 - 541.9   547.9 +

PAGE [illegible] PREBURN DATA SHEET

MANUFACTURER/MODEL FX HT 2000 **RUN** 6 **DATE** 7/1/93 **PAGE** 1 **OF** 1

TIME	SCALE WT	BURN RATE	STACK	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	STATIC	COMMENTS
0 / 935	560.2	0	465	352	455	149	467	360	730	614	76	-.071	PRIMARY AIR SET AT:
05 / 40	557.8	2.4	996	425	456	113	450	379	834	950	76	-.091	WIDE OPEN
10 / 45	554.4	3.4	1105	533	491	107	462	390	881	1113	77	-.095	SECONDARY AIR SET AT:
15 / 50	552.2	2.2	1129	580	520	108	486	391	935	1197	78	-.094	NA
20 / 55	549.7	2.5	934	588	543	108	506	393	971	1126	80	-.086	FAN: ON
25 / 1000	548.0	1.7	935	576	575	108	537	398	1043	1377	80	-.087	+ 6.1 1001
30 / 05	551.1	3.0	1098	645	592	109	562	398	1164	1493	80	-.091	
35 / 10	548.3	2.8	1044	669	608	110	593	399	1243	1542	79	-.090	PUMPS ON AT: 1005 475.8
40 / 15	546.1	2.2	996	669	625	113	619	399	1305	1508	79	-.090	
45 / 20	544.5	1.6	895	619	638	114	640	401	1318	1385	81	-.087	CHECK WB/DB: 111/164
50 / 25	543.5	1.0	860	563	636	115	663	408	1269	1293	81	-.084	477.0
55 / 30	542.7	.8	786	521	638	117	664	415	1254	1141	81	-.079	
------	------	------	------	------	------	------	------	------	------	------	------	------	------
60 / 35	542.3	.4	604	474	633	121	659	424	1218	968	82	-.076	462.2

PAGE __ TEMPERATURE DATA SHEET
MANUFACTURER/MODEL FX HT 2000 RUN 6 DATE 7/1/93 PAGE 1 OF 1

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	462.2
0 / 1035	474	633	121	659	424	1218	968	82	1398	210	38	247	33	34	
05 / 40	485	610	124	637	443	1005	832	81	1400	212	38	247	33	34	
10 / 45	572	597	125	613	458	1028	909	82	1417	214	38	247	33	34	
15 / 50	603	598	127	601	459	1080	985	81	1433	216	38	246	34	34	
20 / 55	621	607	128	597	456	1081	1070	82	1446	218	38	246	34	34	
25 / 1100	641	619	126	599	453	1120	1173	81	1448	230	37	246	34	39	
30 / 05	603	635	124	609	443	1202	1138	81	1449	238	37	247	34	39	
35 / 10	553	634	124	618	435	1240	1064	81	1446	241	36	247	34	39	
40 / 15	521	632	124	624	429	1247	1026	82	1440	246	35	247	34	38	
45 / 20	489	632	122	629	420	1253	1091	81	1441	245	34	245	34	38	
50 / 25	473	627	123	635	412	1262	1186	81	1438	244	34	244	34	38	
55 / 30	458	627	124	641	407	1291	1260	81	1439	246	34	245	34	38	
TOTAL	6493	7453	1492	7462	5239	14027	12702	976	------	------	------	------	------	------	------
60 / 35	439	625	127	641	400	1294	1162	80	1442	247	34	246	34	38	
65 / 40	425	629	126	642	397	1310	1159	80	1444	247	34	246	34	37	
70 / 45	416	633	127	643	395	1325	1120	81	1448	248	34	248	34	36	
75 / 50	397	631	129	651	393	1305	1030	82	1448	245	34	248	34	36	
80 / 55	379	625	127	646	392	1268	1035	82	1449	246	34	248	34	36	
85 / 1200	358	612	127	637	392	1224	989	81	1448	246	34	247	34	36	
90 / 05	342	598	128	624	393	1191	954	80	1445	245	34	246	34	36	
95 / 10	331	588	127	613	393	1171	927	80	1441	244	34	245	34	36	
										ΔT START		462.2			
	3087	4941	1018	5097	3155	10088	8376	646	÷20	STOP		410.4			
	9580	12394	2510	12559	8394	24115	21078	1622				-51.8			
	479	620	126	628	420	1206	1054	81							
TOTAL									------	------	------	------	------	------	------
TOTAL									------	------	------	------	------	------	------

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 7/1/93 Analyte: CO_2 (15-1)

Source: FX HT 2000 Run #: 6

Zero Cyl #: T132257 Conc. 00.0 % CO_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS40875 Conc. 12.6 % CO_2 Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 407069

Range: 0 - 25.0% CO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% CO_2
EPA Control Limits = ± 2.5% of 25.0% CO_2 = ± 0.625% CO_2

Pre Run Audit: By: DK Time: 930 Temp: 76 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.001	-.004	-.004	-.016
Span	50.4	.504	12.6	50.6	.506	12.563	-.037	-.291

Comments:

Post Run Audit: By: DK Time: 1220 Temp: 80 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	-.029	-.029	-.116
Span	50.4	.504	12.6	50.4	.504	12.514	-.086	-.686

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 7/1/93 Analyte: O_2 (15-2)

Source: FX HT 2000 Run #: 6

Zero Cyl #: T132257 Conc. 00.0 % O_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS40875 Conc. 12.8 % O_2 Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Teledyne Model: 320 Ax SN: 37465

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% O_2
EPA Control Limits = + 2.5% of 25.0% O_2 = + 0.625% O_2

Pre Run Audit: By: DK Time: 935 Temp: 76 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.1	.002	.008	008	.031
Span	12.8	.512	12.8	12.8	.514	12.739	-.061	-.473

Comments: Teledyne #2 Cyl % Exp % Act % Adj to + Δ %

Post Run Audit: By: DK Time: 1225 Temp.: 80 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.1	.004	.057	.057	.230
Span	12.8	.512	12.8	12.8	.513	12.715	-.085	-.667

Comments: Teledyne #2 Cyl % Exp % Act % Adj to + Δ %

+ Conc. Difference = Act % - Exp (Std) %

Zero % Differece = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Exp \% (ppm)}}$ X 100

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 7/1/93 Analyte: CO (15-3)

Source: FX HT 2000 Run #: 6

Zero Cyl #: T132257 Conc. 00.0 % CO Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS 40875 Conc. 5.01 % CO Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 408005

Range: 0 - 10.0% CO Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 10.0% CO
EPA Control Limits = ±2.5% of 10.0% CO = ± 0.25% CO

Pre Run Audit: By: DK Time: 940 Temp: 76 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	.000	.000	.000
Span	50.1	.501	5.01	50.2	.502	5.020	.010	.200

Comments:

Post Run Audit: By: DK Time: 1230 Temp.: 80 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.000	.000	.000	.000
Span	50.1	.501	5.01	50.2	.502	5.020	.010	.200

Comments:

± Conc. Difference = Act % - Exp (Std) %

Zero % Differece = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Exp \% (ppm)}}$ X 100

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 7/1/93 Analyte: SO_2 (15-4)

Source: FX HT 2000 Run #:

Zero Cyl #: T132257 Conc. 00.0 ppm SO_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: CC 79076 Conc. 1268 ppm SO_2 Cyl Press: 500 psi

Certified by: LIQUID AIR Date: 2/26/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 403019

Range: 0 - 2500 ppm SO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 2500 ppm SO_2
EPA Control Limits = +2.5% of 2500 ppm SO_2 = +62.5 ppm SO_2

Pre Run Audit: By: DK Time: 945 Temp: 77 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	00.7	.007	17.951	12 951	.518
Span	50.7	.507	1268	50.9	.509	1276.392	8.392	.662

Comments:

Post Run Audit: By: DK Time: 1235 Temp: 80 °F

Audit Results

Point #	Expected Response			Actual Response			+ Conc. Difference	Δ %
	Meter	DVM	ppm	Meter	DVM	ppm		
Zero	00.0	.000	00.0	00.6	.006	10.434	10 434	.417
Span	50.7	.507	1268	50.8	.508	1273.875	5.875	.463

Comments:

+ Conc. Difference = Act ppm - Exp (Std) ppm

$$\text{Zero \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

QUALITY CHECKS
DATA SHEET 16

Unit: FX HT 2000 Run: 6 Date: 7/1/93

Thermocouple Check:

T/C #1	76.3	°F	T/C #13	73.5	°F
T/C #2	79.4	°F	T/C #14	73.9	°F
T/C #3	76.7	°F	T/C #15	76.4	°F
T/C #4	76.6	°F	T/C #16	62.7	°F
T/C #5	77.1	°F	T/C #17	70.4	°F
T/C #6	78.0	°F	T/C #18	78.3	°F
T/C #7	77.6	°F	T/C #19	76.7	°F
T/C #8	78.3	°F	T/C #20		°F
T/C #9	80.2	°F	T/C #21		°F
T/C #10	78.0	°F	T/C #22		°F
T/C #11	71.6	°F	T/C #23	73.6	°F
T/C #12	77.0	°F	T/C #24	224.4	°F

Thermocoouple Readout:

pretest zero and span check and calibration — post test zero and span — % difference

ZERO	1.0	°F	ADJ. TO	0.0	°F	ZERO	-.2	°F	-.010
SPAN	1995.8	°F	ADJ. TO	2000.0	°F	SPAN	2001.6	°F	.080

Thermocouple Readout Pretest Linearity Check

0 =	0	°F	200 =	201.6	°F	400 =	398.9	°F
600 =	601.2	°F	800 =	801.1	°F	1000 =	1000.4	°F
1200 =	1198.0	°F	1400 =	1398.8	°F	1600 =	1599.4	°F
1800 =	1799.9	°F	2000 =	2000.0	°F			

Sample Train Leak Check	Pre ✓	Post ✓
Combustion Gas Train Leak Check	Pre ✓	Post ✓
Tracer Gas Train (SO_2) Leak Check	Pre ✓	Post ✓
Darft (Static) Gauge Zero Check	Pre ✓	Post ✓

Scale Check

Pre 547.4 - 537.4 = 10.0 ✓

Post 552.0 - 542.0 = 10.0 ✓

Stack Cleaned Proir to Test Run: YES _____ NO ✓

TABLE 1 ----- RAW DATA

CLIENT : FX DROLET TEST No. : 5

MODEL: HT2000 DATE: 30-Jun-93

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	491.000	0.150	87	0.53	8.20	700
5	492.500	1.190	89	0.60	4.20	250
10	496.830	0.220	92	0.82	9.40	575
15	498.742	0.200	94	1.10	12.80	600
20	500.588	0.200	94	1.22	12.10	600
25	502.434	0.220	94	1.16	13.20	575
30	504.360	0.190	94	1.16	13.40	625
35	506.133	0.220	94	0.88	14.20	575
40	508.059	0.220	94	0.85	13.90	575
45	509.985	0.190	94	1.19	14.10	625
50	511.757	0.200	94	1.10	14.10	600
55	513.603	0.200	95	1.01	13.30	600
60	515.456	0.200	96	0.97	13.30	600
65	517.316	0.220	96	0.72	12.80	575
70	519.256	0.240	96	0.49	12.90	550
75	521.284	0.220	97	0.66	11.40	575
80	523.231	0.200	97	0.61	11.70	600
85	525.097	0.200	97	0.57	12.90	600
90	526.963	0.210	98	0.53	13.80	575
95	528.917	0.210	99	0.32	13.50	575
100	530.878	0.210	99	0.23	13.30	575
105	532.839	0.210	99	0.31	12.30	575
110	534.801	0.210	99	0.36	11.20	575
115	536.762	0.200	99	0.44	9.30	600
120	538.641	0.180	99	0.47	10.00	625
125	540.451	0.180	99	0.44	10.20	625
130	542.261	0.170	99	0.38	10.10	650
135	544.001	0.160	100	0.40	10.10	650
140	545.748	0.160	100	0.40	10.00	650
145	547.495	0.160	100	0.37	9.10	650
150	549.242	0.160	100	0.43	8.70	650
155	550.988	0.160	100	0.48	8.60	650
160	552.735	0.150	100	0.52	8.60	675
165	554.417	0.150	100	0.59	8.60	675
170	556.099	0.150	100	0.71	8.60	675
175	557.781	0.150	100	0.92	8.30	675
180	559.463	0.150	100	1.02	8.30	675
185	561.146	0.140	100	1.16	8.30	700
190	562.768	0.140	100	1.09	7.40	700
195	564.390	0.140	100	1.16	7.40	700
200	566.012	0.140	100	1.22	7.40	700
205	567.634	0.140	100	1.39	7.20	700
210	569.256	0.130	100	1.52	7.10	725
215	570.822	0.130	100	1.52	7.10	725

220	572.389	0.130	100	1.49	7.20	725
225	573.955	0.130	100	1.61	7.00	725
230	575.521	0.120	100	1.28	6.80	750
235	577.035	0.120	100	1.33	6.70	750
240	578.549	0.120	101	1.30	6.80	750
245	580.069	0.120	101	1.44	6.80	775
250	581.540	0.120	101	1.32	6.40	775
255	583.011	0.120	101	1.39	6.30	775
260	584.482	0.120	101	1.52	6.10	775
265	585.953	0.120	101	1.58	6.00	775
270	587.424	0.120	101	1.68	6.80	775
275	588.895	0.120	101	1.73	5.40	775
280	590.366	0.120	101	1.81	5.40	775
285	591.837	0.120	101	1.89	5.20	775
290	593.308	0.120	101	1.96	5.00	775
295	594.779	0.120	101	1.90	5.20	775
300	596.250	0.110	101	1.88	5.20	800
305	597.677	0.110	101	1.77	5.50	800
310	599.105	0.110	101	1.86	5.40	800
315	600.532	0.110	101	1.78	6.30	800
320	601.960	0.110	101	1.76	6.30	800
325	603.387	0.110	101	1.82	6.30	800
330	604.815	0.110	101	2.00	5.10	800
335	606.242	0.110	101	1.99	4.90	800
340	607.670	0.110	102	1.74	4.90	775
345	609.149	0.100	102	1.81	5.10	825
350	610.538	0.090	103	1.74	5.20	850
355	611.891	0.090	103	1.72	5.30	850
360	613.244	0.100	103	1.72	5.50	825
365	614.639	0.090	103	1.64	5.50	850
370	615.992	0.090	103	1.57	5.60	850
375	617.345	0.090	103	1.73	5.40	850
380	618.698	0.090	103	1.82	5.20	850
385	620.051	0.090	103	1.92	5.00	850
390	621.405	0.100	103	2.20	4.60	825
395	622.799	0.110	103	2.26	4.10	800
400	624.237	0.110	103	2.23	4.10	800
405	625.674	0.110	103	1.84	4.30	800
410						

TABLE 2--RAW DATA

CLIENT : FX DROLET TEST No. 5

MODEL: HT2000 DATE: 30-Jun-93

****

METER CAL. FACTOR (Y) ------	1.028		Wt. WOOD BURNED(LB) -------	22.0	Lbs
BAROMETRIC PRESS.(Pb) ------	30.06	in Hg	WET,FUEL MOISTURE % -------	18.748	%
LEAK RATE POST (Lp) ------	0.008	cfm	Wt. PART. COLLECTED -------	0.3764	g
WATER VOL. (V1c) ------	223.2	Ml	METER VOLUME Vm -------	134.674	mcf
TEST TIME (MIN) ------	405	min	HC MOLE FRACTION -------	0.0132	

TABLE 3 -----FIELD DATA AVERAGES

CLIENT :FX DROLET   TEST No.   5

MODEL: HT2000   DATE: 30-Jun-93

****

AVG DELTA H	-------	0.16	in H2O	AVG PRCNT CO	-------	1.22	%
AVG METER TEMP. Tm	-------	99	deg F	AVG PRCNT CO2	-------	8.25	%
AVG PPM SO2	-------	702	PPM	AVG BAL CO2/CO	-------	6.76	%

TABLE 4 ----- CALCULATIONS

CLIENT : FX DROLET | TEST No. 5

MODEL: HT2000 | DATE: 30-Jun-93

****

STD SAMPLE VOL. Vm(std) -----	131.38	dscf	STACK GAS FLOW Qsd -------	401.025	dscf/Hr &
				6.68	dscf/min
VOL. WATER VAPOR Vw(std) ----	10.506	scf	PARTICULATE CONCTRT. Cs ------	0.0029	g/dscf
PRCNT MSTR Bws -------	7.40	%	PARTC.EMISS. RATE E -------	1.15	g/Hr
BURN RATE BR -------	1.20	Kg/Hr	MOLES OF GAS PER Lb WOOD Nt --	0.39	Lb-mole/Lb
CO EMISSION RATE -------	163.86	g/Hr &	PART.EMISS. RATE ------	0.96	g/Kgdry fuel
	136.43	g/Kgdry fuel			

TABLE 5 ----- PROPORTIONAL RATE VARIATION

CLIENT : FX DROLET   TEST No. : 5

MODEL: HT2000   DATE: 30-Jun-93

	TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE	
	5	1045.4	95		100	
	10	1075.6	97			
	15	1084.9	98			
	20	1091.0	99			
	25	1091.0	99			
	30	1090.9	99			
	35	1091.5	99			
	40	1090.9	99			
	45	1090.9	99			
	50	1090.8	99			
	55	1090.0	99			
	60	1092.1	99			
	65	1095.3	99			
	70	1094.9	99			
	75	1093.8	99			
	80	1096.8	99			
	85	1096.8	99			
	90	1095.9	99			
	95	1097.8	99			
	100	1100.7	100			
	105	1100.7	100			
	110	1101.3	100			
	115	1100.7	100			
	120	1100.5	100			
	125	1104.2	100			
	130	1104.2	100			
	135	1103.0	100			
	140	1106.4	100			
	145	1106.4	100			
	150	1106.4	100			
	155	1105.8	100			
	160	1106.4	100			
	165	1106.2	100			
	170	1106.2	100			
	175	1106.2	100			
	180	1106.2	100			
	185	1106.8	100			
	190	1106.2	100			
	195	1106.2	100			
	200	1106.2	100			
	205	1106.2	100			
	210	1106.2	100			
	215	1106.1	100			
	220	1106.8	100			

225	1106.1	100
230	1106.1	100
235	1106.3	100
240	1105.3	100
245	1108.7	100
250	1108.7	100
255	1108.7	100
260	1108.7	100
265	1108.7	100
270	1108.7	100
275	1108.7	100
280	1108.7	100
285	1108.7	100
290	1108.7	100
295	1108.7	100
300	1108.7	100
305	1110.2	101
310	1111.0	101
315	1110.2	101
320	1111.0	101
325	1110.2	101
330	1111.0	101
335	1110.2	101
340	1110.0	101
345	1112.7	101
350	1111.4	101
355	1114.4	101
360	1114.4	101
365	1115.2	101
370	1114.4	101
375	1114.4	101
380	1114.4	101
385	1114.4	101
390	1115.2	101
395	1114.4	101
400	1114.8	101
405	1114.0	101
410		
415		

COMPUTER INPUT DATA WOODSTOVE DATA SHEET #1

Client FX DROLET

Client Address 1700 LÉON-HARMEL
QUEBEC, QUEBEC G1N 4R9 CANADA

Client Phone 418-527-3060

Project No. ______ Model No. HT2000

Run No. 5 Date of Test 6/30/93 Est Grams/Hr ______

Stove Type: Cat ______ Non Cat X Pellet ______

Data To Be Submitted To: Oregon ______ Colorado ______ EPA ______

Burn Category: Low (<0.8 Kg/Hr) ______ Med Hi (1.26 - 1.90 Kg/Hr) ______
Med Low (0.8 - 1.25 Kg/Hr) 1.2012 Max (>1.9 Kg/Hr) ______

Fuel % Moisture (dry) 23.073 %(wet) 18.748 %
(00.00) (Data Sheet #10)

Stack Static Pressure -.052 "H_2O
(0.000) (Data Sheet #12)

Barometric Pressure 30.06 "Hg
(00.00) (Data Sheet #2)

Temperature (Average Room) Combustion Air 85 °F
(00) (Data Sheet #14)

Flue Gas Moisture 7.4047 %
(00.000) (Data Sheet #7)

Ambient Moisture 1.4 %
(0.00) (Data Sheet #8)

Stove Weight 487 lbs
(000) (Data Sheet #8)

Stove Temperature Change -123.0 °F
(000) (Data Sheet #14)

Particulate Emission .0442 gr/dscf
(0.0000) (Data Sheet #7)

Fuel Higher Heating Value (dry) 8685 BTU/lb
(0000) (CT&E Sheet)

Fuel Type: Wood: ✓ Pellets: ______

Total Fuel Consumed During Burn 22.0 lbs
(00.0) (Data Sheet #8)

Total Particulate Catch .3764 g
(0.0000) (Data Sheet #6)

H_2O Captured 223.2 g
(00.0) (Data Sheet #3)

Dry Gas Meter Volume 134.674 CF
(00.000) (Data Sheet #2)

Dry Gas Meter: Y Factor: 1.028 Post Test Leak Rate .008 CFM

TIME: 405

4

Meter Box Data Sheet Page # 2

Meter Box 5H Y Factor 1.028

Leak Checks: 15 " Hg @ .012 cfm
15.0 " Hg @ .008 cfm
" Hg @ cfm
" Hg @ cfm

Inject SO2 @ 100 cc/min

Unit: FX HT 2000

Run: 5 Date: 6/30/93

Operator(s): CW, DK

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 1.05			Sampling Ratio : 16 : 1				BAROMETER: 30.14		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
00	1215	491.000	—	4.919	.15	87	700	87	1.0
05	20	492.500	—	13.723	1.19	89	250	89	7.0
10	25	496.830	496.830	5.966	.22	92	575	92	2.0
15	30	498.742	498.742	5.666	.20	94	600	94	2.0
20	35	500.588	500.588	5.666	.20	94	600	94	2.0
25	1240	502.434	502.434	5.913	.22	94	575	94	2.0
30	45	504.360	504.360	5.440	.19	94	625	94	2.0
35	50	506.133	506.133	5.913	.22	94	575	94	2.0
40	55	508.059	508.059	5.913	.22	94	575	94	2.0
45	1300	509.985	509.985	5.440	.19	94	625	94	2.0
50	05	511.757	511.757	5.666	.20	94	600	94	2.0
55	10	513.603	513.603	5.656	.20	95	600	95	2.0
ROTO PRESS: 1.05			TOTALS :	75.881	3.40	1115	BAROMETER: 30.14		
60	1315	515.456	515.456	5.656	.20	96	600	96	2.0
65	20	517.316	517.316	5.891	.22	96	575	96	2.0
70	25	519.256	519.256	6.159	.24	96	550	96	2.0
75	30	521.284	521.284	5.881	.22	97	575	97	2.0
80	35	523.231	523.231	5.636	.20	97	600	97	2.0
85	40	525.097	525.097	5.636	.20	97	600	97	2.0
90	45	526.963	526.963	5.870	.21	98	575	98	2.0
95	50	528.917	528.917	5.860	.21	99	575	99	3.0
100	55	530.878	530.878	5.860	.21	99	575	99	3.0
105	1400	532.839	532.839	5.860	.21	99	575	99	3.0
110	05	534.801	534.801	5.860	.21	99	575	99	2.5
115	10	536.762	536.762	5.616	.20	99	600	99	2.5
			TOTALS:	69.785	2.530	1172	MAX VACC =	—	
TOTAL CU FT		—	TOTALS:	145.666	5.93	2287	AV BP:		

Meter Box Data Sheet Page # 2

Meter Box 5H Y Factor 1.028

Unit: FX HT 2000

Run: 5 Date: 6/30/93

Leak Checks: 15.0 " Hg @ .012 cfm
15.0 " Hg @ .008 cfm
" Hg @ cfm
" Hg @ cfm

Operator(s): CW, DK

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 1.0			Sampling Ratio : 16 : 1				BAROMETER: 30.04		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
240	1615	578.549	578.549	4.461	.12	101	750	101	2.0
245	20	580.069	580.069	4.317	.12	101	775	101	2.0
250	25	581.540	581.540	4.317	.12	101	775	101	2.0
255	30	583.011	583.011	4.317	.12	101	775	101	2.0
260	35	584.482	584.482	4.317	.12	101	775	101	2.0
265	40	585.953	585.953	4.317	.12	101	775	101	2.0
270	45	587.424	587.424	4.317	.12	101	775	101	2.0
275	50	588.895	588.895	4.317	.12	101	775	101	2.0
280	55	590.366	590.366	4.317	.12	101	775	101	2.0
285	1700	591.837	591.837	4.317	.12	101	775	101	2.0
290	05	593.308	593.308	4.317	.12	101	775	101	2.0
295	10	594.779	594.779	4.317	.12	101	775	101	2.0
ROTO PRESS: 1.0			TOTALS :	51.948	1.44	1212	BAROMETER: 29.99		
300	15	596.250	596.250	4.175	.11	101	800	101	2.0
305	20	597.677	597.677	4.175	.11	101	800	101	2.0
310	25	599.105	599.105	4.175	.11	101	800	101	2.0
315	30	600.532	600.532	4.175	.11	101	800	101	2.0
320	35	601.960	601.960	4.175	.11	101	800	101	2.0
325	40	603.387	603.387	4.175	.11	101	800	101	2.0
330	45	604.815	604.815	4.175	.11	101	800	101	2.0
335	50	606.242	606.242	4.175	.11	101	800	101	2.0
340	55	607.670	607.670	4.302	.11	102	775	102	2.0
345	1800	609.149	609.149	4.042	.10	102	825	102	2.0
350	05	610.538	610.538	3.916	.09	103	850	103	2.0
355	10	611.891	611.891	3.916	.09	103	850	103	2.0
			TOTALS:	49.576	1.27	1218	MAX VACC =	—	
TOTAL CU FT	—		TOTALS:	101.524	2.71	2430	AV BP:		

Meter Box Data Sheet Page # 2

Meter Box 5H Y Factor 1.028

Unit: FX HT 2000

Run: 5 Date: 6/30/93

Operator(s): CW, DK

Leak Checks: 15.0 " Hg @ .012 cfm
15.0 " Hg @ .008 cfm
_____ " Hg @ _____ cfm
_____ " Hg @ _____ cfm

Inject SO2 @ 100 cc/min

Nozzle: Probe @ 3/8 " od

Initial Volume: 1.500

ROTO PRESS: 1.0			Sampling Ratio : 16 : 1				BAROMETER: 29.99		
MN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
360	1815	613.244	613.244	4.034	.10	103	825	103	2.0
365	20	614.639	614.639	3.916	.09	103	850	103	2.0
370	25	615.992	615.992	3.916	.09	103	850	103	2.0
375	30	617.345	617.345	3.916	.09	103	850	103	2.0
380	35	618.698	618.698	3.916	.09	103	850	103	2.0
385	40	620.051	620.051	3.916	.09	103	850	103	2.0
390	45	621.405	621.405	4.034	.10	103	825	103	2.0
395	50	622.799	622.799	4.160	.11	103	800	103	2.0
400	55	624.237	624.237	4.160	.11	103	800	103	2.0
405	1900	625.674	625.674	4.160	.11	103	800	103	2.0
410									
415				40.128	.980	1030	÷82		
ROTO PRESS:			TOTALS :	405.251	13.160	8144	BAROMETER:		
420						99			
425									
430									
435									
440									
445									
450									
455									
460									
465									
470									
475									
			TOTALS:			99	MAX VACC =	7.0	
TOTAL CU FT		134.674	TOTALS:	4.942	.160	559	AV BP:	30.06	

MOISTURE SHEET
Woodstove Data Sheet #3

Moisture Determination

Initial: Balance Level ✓ Balance Zeroed ✓

Final: ✓ ✓

Unit: FX

Run: 5

Date: 6-30-93

Technician(s): Initial: cw

Final: DK

Approved By:

IMPINGER #1

Final Weight 748.1 grams

Initial Weight 568.6 grams

Net 179.5 grams

IMPINGER #2

Final Weight 598.4 grams

Initial Weight 584.8 grams

Net 13.6 grams

IMPINGER #3

Final Weight 489.2 grams

Initial Weight 486.1 grams

Net 3.1 grams

IMPINGER #4 (SILICA GEL)

Final Weight 844.1 grams

Initial Weight 817.1 grams

Net 27.0 grams

TOTAL MASS OF H_2O CAPTURED 223.2 grams

Scale Check: 295.0g = 295.0 g
590.0g = ______ g
885.0g = 885.0 g

Front Half Filter # 449F
#
Back Half Filter # 449B

Notes:

WOODSTOVE DATA SHEET #4-1: INITIAL FILTER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date 5/27/93 Time 1030 By DK Front Half ✓ Back Half ✓

Manufacturer: S&S Size: 11 cm 8.2 cm Lot.No.: ZB901 Grade: #25 glass

Filter #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
441F	.6921	6/1	1016	LU	.6924	6/2	1044	DK	✓			
442F	.6988	6/1	1017	LU	.6988		1046		✓			
443F	.6982	6/1	1018	LU	.6977		1048		✓			
444F	.7058	6/1	1019	LU	.7054		1050		✓			
445F	.7004	6/1	1020	LU	.7002		1052		✓			
446F	.6996	6/1	1021	LU	.6994		1054		✓			
447F	.7022	6/1	1022	LU	.7022		1056		✓			
448F	.7079	6/1	1023	LU	.7076		1058		✓			
449F	.6984	6/1	1024	LU	.6982		1100		✓			
450F	.7079	6/1	1025	LU	.7080		1102		✓			
441B	.3750	6/1	1026	LU	.3745	6/2	1126	DK	✓			
442B	.3730	6/1	1027	LU	.3725		1128		✓			
443B	.3776	6/1	1028	LU	.3771		1130		✓			
444B	.3779	6/1	1029	LU	.3774		1132		✓			
445B	.3738	6/1	1030	LU	.3733		1134		✓			
446B	.3736	6/1	1031	LU	.3731		1136		✓			
447B	.3755	6/1	1032	LU	.3750		1138		✓			
448B	.3790	6/1	1033	LU	.3785		1140		✓			
449B	.3728	6/1	1034	LU	.3726		1142		✓			
450B	.3801	6/1	1035	LU	.3796		1144		✓			

Checked by Bill Mowek Date: 6/2/93 Time 1328

QA REWEIGH

Filter #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
58	70	48	6/1	900	LU
62	75	48	6/2	1042	DK

WOODSTOVE DATA SHEET #4-2:
INITIAL BEAKER WEIGHTS (TARE WEIGHTS)

Into Dessicator: Date: 6/8/93 Time: 730 By: DK

Beaker #	First Wt	Date	Time	By	Second Wt	Date	Time	By	Third Wt	Date	Time	By
401	96.2832	6/10	1026	DK	96.2827	6/11	916	LU	✓			
402	105.5756		1028		105.5758	6/11	918		✓			
403	106.3133		1030		106.3135	6/11	920		✓			
404	108.2121		1032		108.2124	6/11	922		✓			
405	97.1689		1034		97.1688	6/11	924		✓			
406	98.1375	6/10	1036	DK	98.1374	6/11	926	LU	✓			
407	106.4073		1038		106.4078		928		✓			
408	95.7319		1040		95.7324		930		✓			
409	98.1956		1042		98.1952		932		✓			
410	107.3623		1044		107.3625		934		✓			
411	106.4695	6/10	1046	DK	106.4700	6/11	936	LU	✓			
412	107.7046		1048		107.7044		938		✓			
413	94.3924		1050		94.3927		940		✓			
414	107.4818		1052		107.4813		942		✓			
415	98.3546		1054		98.3551		944		✓			
416	104.5937	6/10	1056	DK	104.5935	6/11	946	LU	✓			
417	107.0401		1058		107.0401		948		✓			
418	104.2895		1100		104.2896		950		✓			
419	120.2896		1102		120.2894		952		✓			
420	98.8126		1104		98.8130		954		✓			
421	104.8317	6/10	1106	DK	104.8320	6/11	956	LU	✓			
422	97.1427		1108		97.1424		958		✓			
423	97.8661		1110		97.8660		1000		✓			
424	106.4696		1112		106.4697		1002		✓			
425	100.0065		1114		100.0060		1004		✓			

Checked By: Bill Nowak Date: 6/11/93 Time: 11:30

QA REWEIGH

Beaker #	WT	Date	Time	By

BALANCE ROOM ENVIRONMENTAL CONDITIONS

WB	DB	%RH	Date	Time	By
58	70	48	6/10	1024	DK
56	68	47	6/11	904	LU

WST5-Form9, [illegible] Rev4/90
Unit FX HT 2000
Run # 5
Date: 6/30/93

WOODSTOVE DATA SHEET #4-3: CONSTANT FINAL WEIGHTS

FINAL BEAKER WEIGHTS

Beaker #	Into Dessic Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
411	7/1	900	LU	106.4993	7/2	930	DK	106.4989	7/6	922	LU				
412	7/1	900	LU	107.8065	7/2	932	DK	107.8060	7/6	924	LU				
413	7/1	900	LU	94.4325	7/2	934	DK	94.4321	7/6	926	LU				
414	7/2	900	DK	107.5295	7/6	928	LU	107.5296	7/7	932	DK				
415	7/2	900	DK	98.3996	7/6	930	LU	98.3998	7/7	934	DK				

FINAL FILTER WEIGHTS

Filter #	Into Dessic Date	Time	By	First	Date	Time	By	Second	Date	Time	By	Third	Date	Time	By
449F	6/30	1945	DK	.7723	7/1	954	LU	.7723	7/2	936	DK				
449B	6/30	1945	DK	.4136	7/1	956	LU	.4134	7/2	938	DK				

QA REWEIGH: FINAL WEIGHTS

Date	Beaker #	Final Wt	By

Date	Filter #	Final WT	By

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	WB	DB	%RH
1	7/1	910	LU	60	73	47
2	7/2	908	DK	58	70	48
3	7/6	906	LU	60	73	47
4	7/7	930	DK	61	74	47
5						

SCALE ROOM ENVIRONMENTAL CONDITIONS

6						
7						
8						
9						

Comments

Dates: From 6/10/93

Through ______

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0001	10.0001	1.0000	0.0999			DK	6/10	1000	70	58	48
99.9999	10.0001	0.9998	0.1000			LU	6/11	904	68	56	47
100.0003	10.0000	0.9996	0.0999			DK	6/14	910	76	63	49
99.9999	10.0003	1.0001	0.1002			LU	6/15	902	70	58	48
99.9998	10.0002	1.0000	0.0998			DK	6/16	900	70	58	48
99.9996	9.9997	0.9998	0.0997			LU	6/17	904	70	58	48
100.0004	10.0003	1.0000	0.1000			DK	6/18	0830	69	57	47
100.0001	10.0001	1.0000	0.1000			LU	6/21	908	68	56	47
100.0001	10.0000	1.0001	0.0999			DK	6/22	900	66	55	49
99.9996	9.9997	0.9997	0.0998			LU	6/23	906	70	58	48
99.9998	9.9999	0.9999	0.1000			DK	6/24	1700	74	60	44
99.9998	9.9997	0.9997	0.0995			LU	6/25	930	77	64	49
100.0001	10.0000	0.9999	0.0997			DK	6/28	1000	71	59	49
100.0003	10.0003	1.0001	0.1000			LU	6/29	904	71	59	49
100.0002	10.0001	1.0001	0.0999			DK	6/30	1045	73	60	47
99.9999	10.0000	1.0000	0.1000			LU	7/1	910	73	60	47
100.0003	10.0002	1.0002	0.1001			DK	7/2	908	70	58	48
99.9998	10.0002	1.0000	0.0999			LU	7/6	906	73	60	47
100.0003	10.0003	1.0001	0.1000			DK	7/7	920	74	61	47

WST7-For Rev5/90

Dates: From 3-11-93

Through 6/9/93

WOODSTOVE DATA SHEET #4-4
SCALE QA SHEET

Scale Sartorius
Model A1205
SN 37010004

100g Weight	10g Weight	1.0g Weight	100mg Weight	Blank Filter	Blank Beaker	Tech	Date	Time	Dry Bulb	Wet Bulb	% RH
100.0004	10.0001	1.0000	.0999			CW	3-11	0915	69	54	36
99.9998	10.0000	0.9999	0.0997			OK	3/12	0830	68	52	32
100.0003	10.0002	1.0000	.0997			CW	3-15	0930	72	57	39
100.0000	10.0002	1.0000	0.1000			DK	3/16	0900	72	57	39
100.0001	10.0001	1.0002	0.1001			DK	3/17	1330	72	58	42
100.0001	10.0003	1.0002	0.1001			CW	3-18	1700	75	60	47
99.9999	10.0000	0.9998	0.0999			OK	3/19	0900	71	57	41
100.0003	10.0001	1.0000	.0999			BN	3-23	0900	73	60	47
100.0002	10.0001	1.0000	0.0999			DK	3/19	1300	77	63	46
100.0001	10.0001	1.0001	.0999			CW	4-20	0900	75	60	41
100.0000	10.0002	1.0002	0.0999			OK	4/26	0906	66	55	49
100.0001	10.0001	1.0001	.1001			CW	4-28	0900	69	56	44
100.0002	10.0001	0.9999	0.0999			DK	5/4	1120	75	62	48
100.0001	10.0001	1.0000	.1000			CW	5-5	1000	75	60	41
99.9998	9.9999	0.9999	0.1000			OK	5/6	946	76	62	45
99.9997	10.0001	1.0000	0.0999			DK	5/7	1620	74	60	44
100.0002	10.0002	1.0001	.0999			BN	5-10	0900	71	59	49
100.0002	10.0002	1.0002	.1001			CW	5-11	1000	73	59	43
100.0000	10.0000	1.0000	0.0999			DK	5/12	900	75	61	44
100.0001	10.0001	1.0001	.1000			CW	5-13	1600	71	58	45
99.9997	10.0002	1.0002	0.1001			DK	5/14	1000	70	58	48
99.9999	10.0001	0.9999	0.0998			DK	5/19	1010	71	59	49
99.9999	10.0000	0.9998	0.0998			BN	5/20	1720	71	60	44
99.9997	10.0002	1.0000	0.0998			DK	5/21	950	70	58	48
100.0001	10.0002	1.0000	0.0999			LU	5/24	1115	77	65	46
100.0001	10.0002	1.0001	0.1001			DK	5/25	1030	70	58	48
100.0003	10.0000	0.9998	0.1000			LU	5/26	1230	77	64	49
100.0000	10.0002	1.0000	0.1000			DK	5/27	940	77	64	49
99.9997	10.0001	0.9999	0.1000			LU	5/28	908	76	63	49
99.9999	10.0000	0.9999	0.0997			LU	6/1	900	70	58	48
100.0002	10.0003	1.0001	0.1001			DK	6/2	940	75	62	48
100.0000	10.0000	1.0001	0.0998			LU	6/3	956	70	58	48
100.0001	9.9999	0.9999	0.0999			DK	6/4	0930	68	56	48
100.0000	9.9998	0.9999	0.0999			LU	6/7	0940	68	56	47
99.9996	10.0001	0.9999	0.0999			DK	6/8	0900	68	56	47
99.9995	9.9997	0.9999	0.0996			LU	6/9	0904	68	56	47

WOODSTOVE PARTICULATE CATCH PROCESSING
WOODSTOVE DATA SHEET # 5

Unit: FX HT 2000
Run: 5 Date: 6/30/93
Technician(s): DK. CW

FRONT HALF

FILTER #: 449F
FINAL WT: .7723 g
TARE WT: .6982 g
NET WT: .0741 g

BEAKER #: 411
ml: 75
desc: ACETONE

FINAL WT: 106.4989 g
TARE WT: 106.4700 g
NET WT: .0289 g

FILTER #: ____
FINAL WT: ____ g
TARE WT: ____ g
NET WT: ____ g

BEAKER #: ____
ml: ____
desc: ACETONE

FINAL WT: ____ g
TARE WT: ____ g
NET WT: ____ g

TOTAL VOLUME OF ACETONE USED IN WASH 75 ml

BACK HALF

FILTER #: 449B
FINAL WT: .4134 g
TARE WT: .3726 g
NET WT: .0408 g

BEAKER #: 412
ml: 170
desc: ACETONE

FINAL WT: 107.8060 g
TARE WT: 107.7044 g
NET WT: .1016 g

FILTER #: ____
FINAL WT: ____ g
TARE WT: ____ g
NET WT: ____ g

BEAKER #: 413
ml: 75
desc: METHCHLOR

FINAL WT: 94.4321 g
TARE WT: 94.3927 g
NET WT: .0394 g

BEAKER #: 414
ml: 200
desc: H2O

FINAL WT: 107.5296 g
TARE WT: 107.4813 g
NET WT: .0483 g

BEAKER #: 415
ml: 200
desc: H2O

FINAL WT: 98.3998 g
TARE WT: 98.3551 g
NET WT: .0447 g

BEAKER #: ____
ml: ____
desc: ____

FINAL WT: .0930 g
TARE WT: ____ g
NET WT: ____ g

BEAKER #: ____
ml: ____
desc: ____

FINAL WT: ____ g
TARE WT: ____ g
NET WT: ____ g

TOTAL VOLUME OF ACETONE USED IN WASH 170 ml
TOTAL VOLUME OF DICHLOROMETHANE USED IN EXTRACTION 75 ml
TOTAL VOLUME OF DISTILLED WATER DRIED 400 ml

PRTCATCH

WOODSTOVE BLANKS PROCESSING
WOODSTOVE DATA SHEET # 5A

BLANKS DONE: 6/15/93

Unit: FX HT 2000
Run: 5 Date: 6/30/93
Technician(s): DK

BEAKER #: A
200 ml ACETONE
FISHER OPTIMA LOT #: 924059

FINAL WT: 108.9002 g
TARE WT: 108.8998 g
NET WT: .0004 g

BEAKER #: B
15 ml DICHLOROMETHANE
FISHER OPTIMA LOT #: 910732

FINAL WT: 106.3060 g
TARE WT: 106.3054 g
NET WT: .0006 g

BEAKER #: C
200 ml DISTILLED WATER
BONNEAU PRODUCTS CERTIFIED

FINAL WT: 106.9637 g
TARE WT: 106.9635 g
NET WT: .0002 g

BEAKER TARES INTO DESSC: TIME: 0900 DATE: 6/4/93

BKR #	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME	4TH WT	TIME
A	108.8997	1102	108.8998	1044	✓			
B	106.3056	1104	106.3054	1046	✓			
C	106.9640	1106	106.9635	1048	✓			

SCALE ROOM QC : TARES

DATE	TIME	BY	WB	DB	%
6/7	940	LW	56	68	47
6/9	1042	DK	56	68	47

SCALE ROOM QC : FINALS

DATE	TIME	BY	WB	DB	%
6/14	926	DK	63	76	49
6/15	902	LW	58	70	48

BEAKERS: FINAL WEIGHTS

BKR #	IN DSC	TIME	1ST WT	TIME	2ND WT	TIME	3RD WT	TIME
A	6/11	1030	108.9001	928	108.9002	912	✓	
B	6/11	1031	106.3059	930	106.3060	914	✓	
C	6/11	1032	106.9639	932	106.9637	916	✓	

BKR #	4TH WT	TIME	5TH WT	TIME	6TH WT	TIME	7TH WT	TIME

Unit: FX HT2000
Run: 5
Date: 6/30/93
Technician(s):
WSTAPP1-AppDoc19-page2
Rev 6/90

NET PARTICULATE CATCH CALCULATION
WOODSTOVE TEST DATA SHEET #6

Blank Audit: By: Bill Houck Date: 6/15/93

Blank Calculations:

Acetone:	.0004 g ÷	200	ml =	.00 00 02	g/ml
Dichloromethane:	.0006 g ÷	75	ml =	.00 00 08	g/ml
Distillted Water:	.0002 g ÷	200	ml =	.00 00 01	g/ml

Front Half Catch:

Filters: .0741 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .0741 g (Net Catch)

Beakers: .0289 g (Total Catch) - 75 (Ml of Acetone) (.00 00 02 g) (Blank Value/ml of Acetone) = .0288 g (Net Catch)

Total Front Half Catch .1029 g

Back Half Catch:

Filters: .0408 g (Total Catch) - 1 (No. of filters) (.0000 g) (Blank Value/filter) = .0408 g (Net Catch)

Beakers:

1. Acetone/Impingers:
   .1016 g (Total Catch) - 170 (ml of acetone) (.00 00 02 g) (Blank Value/ml of Acetone) = .1013 g (Net Catch)

2. Extract/Impingers:
   .0394 g (Total Catch) - 75 (ml. of Dichloromethane) (.00 00 08 g) [.0006] (Blank Value/ml of Dichloromethane) = .0388 g (Net Catch)

3. Water/Impingers:
   .0930 g (Total Catch) - 400 (ml. of water) (.00 00 01 g) (Blank Value/ml of water) = .0926 g (Net Catch)

Total Back Half Catch .2735 g
Total Catch .3764 g
% Front Half 27.3 %

EPA METHOD 5H PARTICULATE CALCULATIONS
WOODSTOVE TEST DATA SHEET #7

Unit: FX HT 2000

Run: 5 Date: 6/30/93

Technician(s): ______

1) $Vm(std) = \dfrac{(134.674\ Vm)(17.64)(1.028\ mcf)\left(30.06\ \text{" Hg} + \dfrac{.160\ \text{" H2O}}{13.6}\right)}{(559\ TmA)} = \dfrac{131.3780}{000.0000}$ dscf

2) $Vw(std) = (.04707)(223.2\ \text{ml H2O}) = \dfrac{10.5060}{00.0000}$ scf

3) $Asw = \dfrac{(10.5060\ scf)}{(10.5060\ scf + 131.3780\ dscf)} = \dfrac{.0740}{.0000}$ Bws X 100 = $\dfrac{7.4047}{00.0000}$ % H2O

4) $Cs = \dfrac{(.3764\ g.)}{(131.3780\ dscf)}(15.43) = \dfrac{.0442}{0.0000}$ gr/dscf

5) Estimated g/hr= $\dfrac{(.3764\ g.)}{(131.3780\ dscf)}\left(\dfrac{4.942}{00.000}\ dscfm\right)(60) = \dfrac{.8495}{00.0000}$ g/hr

Vm =	total cubic feet pulled on meter box during test	(p. 2)	(000.000 V
mcf =	meter correction factor (Y factor) of the meter box used for the test	(p. 2)	(0.000 mcf
" Hg =	average barometric pressure during the test	(p. 2)	(00.00 " Hg
" H2O =	average delta H for the test	(p. 2)	(.000 " H2O
TmA =	average meter temperature for the test in degrees Absolute	(p. 2)	(000 TmA
ml H2O =	total water caught during the test	(p. 3)	(000.0 ml H2O
g. =	total particulate catch for the test	(p. 6)	(00.0000 g.
dscfm =	average stack flow during the test	(computer printout)	(00.000 dscf

PRTCALC

Miscellaneous Test Data Sheet Page # 8

Unit: FX HT 2000 Run: 5 Date: 6/30/93

Test Chamber Air Velocity Start: 0 Stop: 0 Avg: 0

Wet Bulb / Dry Bulb
Start: WB: 63 DB: 75 = 52 % RH 1.5 %H2O
Stop: WB: 63 DB: 86 = 27 % RH 1.3 %H2O

Average % Relative Humidity 39.5 Average % Ambient Moisture: 1.4

Empty Stove Weight: 487 lbs
Empty Stove Weight w/ Stack & Oil Seal: Wet: 536.7 Dry: 536.3

Kindling Weight: Paper: .3 lbs Wood: 7.6 lbs

Preburn Fuel Wt: 19.9 + 20.2 Total: 40.1 lbs

Total Kindling & Preburn Fuel Weight (Wood Only) ==> Total: 47.7 lbs

Coal Bed Weight: RANGE: 5.5 - 4.4 lbs SCALE: 541.8 - 540.7 lbs
Upper = .25 x fuel wt
Always round DOWN to nearest tenth
Lower = .20 x fuel wt
Always round UP to nearest tenth
Actual Coal Bed Weight: 5.0 lbs

Maximum Coal Bed Weight Removal ((5.5 Upper + 4.4 Lower)/2).25 = 1.2 lbs

Test Fuel (.75 x 1.5 x 5 " spacers) = 16 pcs

Dimensions	Length in inches	No. pcs	Wt. in lbs	% of load
2 x 4	NA	NA	NA	NA
4 x 4	17"	5	20.0	100

Test Fuel Weight: 22.0 lbs

Estimated Dry Burn Rate Calculation $\frac{22.0 - (22.0 \times .18748)}{2.2046} \times \frac{60}{405 \text{ Time}} = 1.2012$ Kg/Hr

Estimated EPA Heat Output in BTU's / Hr $19{,}140 \times \frac{63}{100} \times 1.2012 \text{ (DBR)} = 14484$ BTU's/Hr

EPA Default Efficiencies: NON-CAT: 63 CAT: 72 PELLET: 78

NOTES:
.8125
390 = 1.24
487 = .99

WOODSTOVE OPERATING DATA

FIRE STARTED: 0815 PST/PDST

WARM UP AND PREBURN: PRIMARY AIR: set wide open for all warm-up/preburn fuel charges. then set to 1/8" at start of preburn.

SECONDARY AIR: NA CAT BYPASS: NA

CHARCOAL BED PREPARATION: raked and leveled prior to each warm-up/preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 15 sec.

TEST: Door Wide Open during loading 1 min 10 sec

PRIMARY AIR: opened full for first 5 min. , then set to run setting of 1/8".

SECONDARY AIR: NA CAT BYPASS: NA

FAN: ON/OFF during warm-up ON/OFF during preburn
ON/OFF first —— minutes of test ON/OFF balance of test run
Fan speed set at OFF (CONFIRMATION).

WOOD DATA: KINDLING: a mix of the grades listed below

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2X4	Manke/Tacoma	Std or btr	s. grn D fir
TEST:	2X4	Packwood	#2 or btr	s. grn D fir
	4x4	Packwood	#2 or btr	s. grn D fir

PELLET FUEL APFI#: ________

All grades WCLB rules

WARM UP INFORMATION:
All pre-burn/warm up fuel pieces were either 13 or 13 inches.

1st warm up/preburn fuel charge (19.9 lbs) added at 0930 .

2nd warm up/preburn fuel charge (20.2 lbs) added at 1030 .

3rd warm up/preburn fuel charge (____ lbs) added at ____ .

4th warm up/preburn fuel charge (____ lbs) added at ____ .

5th warm up/preburn fuel charge (____ lbs) added at ____ .

Unit: FX HT 2000
Run: 5
Date: 6/30/93
Technician: CW
WST1-Form7-Rev11/89

FUEL MOISTURE
WOODSTOVE TEST DATA SHEET #10

Room Temperature: 69 °F

Correction Factor: 0

NOTE: Record readings to the nearest 0.5% moisture
Uncor Values are corrected for temperature: Yes ____ . No X .
Time Test Fuel Moisture Readings taken at: 0930
Calibration Checks: X ✓ Y ✓ 12.0 12.0 22.0 21.8

Pc #	Dimen	Use	Top Uncor	Top Cor	Bottom Uncor	Bottom Cor	Side Uncor	Side Cor	Piece Avg Corrected
1	2"x4"x8'	K	12.0	12.9	11.5	12.3	11.5	12.3	12.500
2									
3									
4	2"x4"x8'	P	18.0	19.6	18.5	20.1	18.0	19.6	19.767
5	"	P	22.5	24.6	23.0	25.2	23.0	25.2	25.000
6	"	P	18.5	20.1	18.0	19.6	18.5	20.1	19.933
7	"	P	19.5	21.3	20.0	21.8	20.5	22.4	21.833
8									86.533
9									
10	4"x4"x17"	T	18.0	19.6	18.5	20.1	18.5	20.1	19.933
11	"	T	20.0	21.8	20.5	22.4	20.0	21.8	22.000
12	"	T	21.0	22.9	22.0	24.1	22.5	24.6	23.867
13	"	T	22.0	24.1	22.5	24.6	21.0	22.9	23.867
14	"	T	23.5	25.7	23.5	25.7	23.5	25.7	25.700
15									115.367
16									
17									
18									
19									
20	.75"x1.5"x5"	T	21.0	22.9	21.5	23.5	23.0	25.2	24.033

SPACER

	Kindling	Pretest Fuel	Test Load
% Moisture - Dry Basis:	12.500 %	21.633 %	23.073 %
% Moisture - Wet Basis:	11.111 %	17.786 %	18.748 %

To obtain Wet from Dry: $\frac{100 \times \%\ \text{Dry Rdg.}}{100 + \%\ \text{Dry Rdg.}}$ = % Moisture, Wet Basis

Acceptable Ranges: 16-20% wet; 19-25% dry
(17.5 - 22.5 on Meter [Uncor reading] at 70°F)

Key for Use: K= Kindling P= Pretest Fuel T= Test Fuel

Unit: FX HT 2000
Run#: 5
Date: 6/30/93
Technician:

WOOD DENSITY DETERMINATION
WOODSTOVE TEST DATA SHEET #11

WST2-form11-Rev 6/90

Wood Piece: Nominal Dimensions: 4 x 4 x 4

Depth (D): 8.945 cm

Width (W): 8.925 cm

Length (L): 8.830 cm
8.920 cm
8.845 cm
8.840 cm

Length $\bar{X}$ = 8.871 cm

Volume: 708.209 cm^3
(D X W X L)

MOISTURE: Room Temperature: 69 °F Correction Factor: 0

Uncorrected Meter Readings Corrected for temperature: Yes___ No X

NOTE: Record moisture meter readings to the nearest 0.5%

	Uncor	Cor
Top:	21.5	23.5 %
Bottom:	21.5	23.5 %
Side:	21.0	22.9 %
$\bar{X}$:		23.300 %

Avg % Moisture (Dry) 23.300 %

Avg % Moisture (Wet) 18.897 %

Scale: Leveled In ✓ Out ✓

Zeroed: In ✓ Out ✓

Wet Weight: 336.2 g Dry Weight: 302.26 g

% Moisture Dried Basis: 10.0952 %
[1 - (Dry Wt ÷ Wet Wt)] X 100

	Date	Time	Temp
Into Dryer	6-30-93	0930	220 °F
Out of Dryer	7/6/03	1030	215 °F

(Minimum Time in Dryer: 24 hrs.) Minimum Dryer Temp 100°C (212°F)

Density = 302.26 g ÷ 708.209 cm^3 = .4268 g/cm^3
(dry wt) (volume)

Pellet Fuel Moisture Content Determination

Tare Beaker Wt. ______ g

Wet Wt: ______ g - ______ g = ______ g
Gross Wet Wt. Tare Beaker Wt. Net Wet Wt.

Dry Wt: ______ g ÷ ______ g = ______ g
Gross Dry Wt. Tare Beaker Wt. Net Dry Wt.

% Moisture Dried Basis: ______ %
[1 - (Net Dry Wt ÷ Net Wet Wt.)] X 100

541.3

PAGE 12 DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 5 **DATE** 6/30/93 **PAGE** 1 **OF** 4

TIME	SCALE	FUEL	DROP	v.	CO2	v.	O2	v.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
0 / 1215	563.3	22.0	0	.331	8.2	.452	11.2	.053	.53	15.5	81	95	3.1	118	356	-.049	700
05 / 20	562.4	21.1	.9	.168	4.2	.551	13.7	.060	.60	6.9	82	108	2.8	136	631	-.074	250
10 / 25	561.8	20.5	.6	.379	9.4	.410	10.2	.082	.82	11.5	84	115	2.8	124	443	-.066	575
15 / 30	561.0	19.7	.8	.514	12.8	.285	7.0	.110	1.10	11.6	85	114	3.0	125	445	-.066	600
20 / 35	560.0	18.7	1.0	.488	12.1	.318	7.9	.122	1.22	9.9	85	111	3.0	125	447	-.066	600
25 / 40	559.0	17.7	1.0	.532	13.2	.264	6.5	.116	1.16	11.4	88	122	3.4	129	483	-.069	575
30 / 45	558.2	16.9	.8	.541	13.4	.274	6.8	.116	1.16	11.6	91	123	3.8	130	483	-.069	625
35 / 50	557.1	15.8	1.1	.570	14.2	.239	5.9	.088	.88	16.1	94	129	4.1	131	495	-.070	575
40 / 55	556.2	14.9	.9	.561	13.9	.252	6.2	.085	.85	16.4	98	126	5.1	132	493	-.070	575
45 / 1300	555.5	14.2	.7	.567	14.1	.237	5.9	.119	1.19	11.8	98	128	5.1	133	489	-.069	625
50 / 05	554.4	13.1	1.1	.568	14.1	.237	5.9	.110	1.10	12.8	99	127	5.3	133	492	-.069	600
55 / 10	553.6	12.3	.8	.534	13.3	.268	6.6	.101	1.01	13.1	98	126	5.1	133	487	-.068	600
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	------	5744	-.805	-------
60 / 15	552.9	11.6	.7	.534	13.3	.260	6.4	.097	.97	13.7	97	125	4.9	132	483	-.068	600
65 / 20	551.9	10.6	1.0	.516	12.8	.289	7.1	.072	.72	17.8	96	122	4.8	130	469	-.066	575
70 / 25	551.3	10.0	.6	.518	12.9	.294	7.3	.049	.49	26.2	95	120	4.6	129	450	-.065	550
75 / 30	550.6	9.3	.7	.460	11.4	.344	8.5	.066	.66	17.3	94	117	4.5	128	435	-.064	575
80 / 35	550.5	9.2	.1	.472	11.7	.319	7.9	.061	.61	19.2	92	115	4.1	128	449	-.066	600
85 / 40	549.7	8.4	.8	.518	12.9	.283	7.0	.057	.57	22.6	92	114	4.1	129	455	-.067	600
90 / 45	549.1	7.8	.6	.555	13.8	.243	6.0	.053	.53	26.0	90	112	3.9	128	465	-.068	575
95 / 50	548.5	7.2	.6	.544	13.5	.260	6.4	.032	.32	42.2	90	110	4.0	128	460	-.069	575
100 / 55	548.0	6.7	.5	.536	13.3	.260	6.4	.023	.23	57.9	89	107	4.1	128	460	-.068	575
105 / 1400	547.5	6.2	.5	.497	12.3	.298	7.4	.031	.31	39.8	88	103	3.8	128	452	-.066	575
110 / 05	547.2	5.9	.3	.450	11.2	.336	8.3	.036	.36	31.0	86	98	3.7	125	421	-.065	575
115 / 10	546.9	5.6	.3	.376	9.3	.393	9.7	.044	.44	21.2	85	94	3.7	123	396	-.064	600
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	------	5395	-.796	-------
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	------	11139	-1.601	-------

541.3

PAGE 12 ... DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 5 **DATE** 6/30/93 **PAGE** 2 **OF** 4

TIME	SCALE	FUEL	DROP	V.	CO2	V.	O2	V.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
120 / 1415	546.6	5.3	.3	.404	10.0	.363	9.0	.047	.47	21.3	84	92	3.7	124	381	-.063	625
125 / 20	546.4	5.1	.2	.411	10.2	.357	8.8	.044	.44	23.2	84	92	3.7	120	376	-.063	625
130 / 25	546.2	4.9	.2	.409	10.1	.361	8.9	.038	.38	26.7	84	91	3.7	120	374	-.060	650
135 / 30	545.9	4.6	.3	.408	10.1	.366	9.1	.040	.40	25.3	84	91	3.7	119	362	-.060	650
140 / 35	545.7	4.4	.2	.401	10.0	.373	9.2	.040	.40	24.9	84	91	3.7	118	355	-.058	650
145 / 40	545.5	4.2	.2	.366	9.1	.417	10.3	.037	.37	24.6	84	91	3.7	118	345	-.056	650
150 / 45	545.4	4.1	.1	.350	8.7	.426	10.6	.043	.43	20.2	84	91	3.7	117	338	-.055	650
155 / 50	545.3	4.0	.1	.348	8.6	.425	10.5	.048	.48	18.0	84	90	3.7	117	331	-.055	650
160 / 55	545.2	3.9	.1	.345	8.6	.430	10.7	.052	.52	16.5	84	90	3.7	115	326	-.054	675
165 / 1500	545.0	3.7	.2	.348	8.6	.428	10.6	.059	.59	14.6	84	90	3.7	116	323	-.054	675
170 / 05	544.9	3.6	.1	.345	8.6	.432	10.7	.071	.71	12.1	84	90	3.7	116	323	-.053	675
175 / 10	544.8	3.5	.1	.335	8.3	.438	10.9	.092	.92	9.0	84	90	3.7	115	318	-.052	675
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	-----	4152	-.683	------
180 / 15	544.7	3.4	.1	.333	8.3	.440	10.9	.102	1.02	8.1	83	89	3.5	115	316	-.052	675
185 / 20	544.6	3.3	.1	.333	8.3	.435	10.8	.116	1.16	7.1	83	89	3.5	115	316	-.050	700
190 / 25	544.5	3.2	.1	.297	7.4	.474	11.7	.109	1.09	6.8	83	89	3.5	115	304	-.049	700
195 / 30	544.4	3.1	.1	.300	7.4	.474	11.7	.116	1.16	6.4	83	89	3.5	114	299	-.048	700
200 / 35	544.3	3.0	.1	.297	7.4	.473	11.7	.122	1.22	6.0	84	89	3.7	115	299	-.048	700
205 / 40	544.1	2.8	.2	.290	7.2	.477	11.8	.139	1.39	5.2	84	89	3.7	114	295	-.047	700
210 / 45	544.1	2.8	.0	.285	7.1	.479	11.9	.152	1.52	4.6	84	89	3.7	114	291	-.047	725
215 / 50	544.0	2.7	.1	.286	7.1	.478	11.8	.154	1.52	4.7	84	90	3.7	114	291	-.047	725
220 / 55	543.8	2.5	.2	.289	7.2	.473	11.7	.149	1.49	4.8	85	90	3.8	115	287	-.047	725
225 / 1600	543.8	2.5	.0	.284	7.0	.479	11.9	.161	1.61	4.8	85	90	3.8	114	285	-.045	725
230 / 05	543.7	2.4	.1	.274	6.8	.499	12.4	.128	1.28	5.3	85	90	3.8	112	281	-.045	750
235 / 10	543.6	2.3	.1	.271	6.7	.500	12.4	.133	1.33	5.0	85	90	3.8	112	279	-.045	750
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	-----	3543	-.570	------
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	-----	7695	-1.253	------

541.3

PAGE 12 GAS DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 5 **DATE** 6/30/93 **PAGE** 3 **OF** 4

TIME	SCALE	FUEL	DROP	V.	CO2	V.	O2	V.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
240 / 1615	543.5	2.2	.1	.275	6.8	.498	12.3	.130	1.30	5.2	86	88	4.1	114	275	-.045	750
245 / 20	543.4	2.1	.1	.275	6.8	.493	12.2	.144	1.44	4.7	86	88	4.1	113	272	-.043	775
250 / 25	543.3	2.0	.1	.258	6.4	.511	12.7	.132	1.32	4.8	86	88	4.1	113	272	-.045	775
255 / 30	543.3	2.0	.0	.253	6.3	.514	12.7	.139	1.39	4.5	86	88	4.1	112	268	-.044	775
260 / 35	543.2	1.9	.1	.248	6.1	.516	12.8	.152	1.52	4.0	86	88	4.1	112	264	-.044	775
265 / 40	543.2	1.9	.0	.242	6.0	.519	12.9	.158	1.58	3.8	86	88	4.1	112	264	-.043	775
270 / 45	543.1	1.8	.1	.236	6.8	.525	13.0	.168	1.68	3.5	86	88	4.1	112	261	-.044	775
275 / 50	543.0	1.7	.1	.218	5.4	.541	13.4	.173	1.73	3.1	87	85	3.7	108	258	-.044	775
280 / 55	543.0	1.7	.0	.218	5.4	.541	13.4	.181	1.81	3.0	87	86	4.2	111	256	-.041	775
285 / 1700	542.9	1.6	.1	.209	5.2	.546	13.5	.189	1.89	2.7	87	87	4.2	111	256	-.041	775
290 / 05	542.8	1.5	.1	.204	5.0	.551	13.7	.196	1.96	2.6	87	88	4.2	110	251	-.040	775
295 / 10	542.8	1.5	.0	.209	5.2	.544	13.5	.190	1.90	2.7	87	90	4.2	110	251	-.040	775
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	------	3148	-.514	-------
300 / 15	542.8	1.5	.0	.209	5.2	.546	13.5	.188	1.88	2.8	87	91	4.2	111	248	-.042	800
305 / 20	542.7	1.4	.1	.224	5.5	.536	13.3	.177	1.77	3.1	87	92	4.3	110	248	-.043	800
310 / 25	542.6	1.3	.1	.220	5.4	.543	13.5	.186	1.86	2.9	87	93	4.2	111	247	-.043	800
315 / 30	542.6	1.3	.0	.216	6.3	.546	13.5	.178	1.78	3.0	88	94	4.3	111	247	-.043	800
320 / 35	542.5	1.2	.1	.215	6.3	.544	13.5	.176	1.76	3.0	89	95	4.5	110	243	-.041	800
325 / 40	542.5	1.2	.0	.216	6.3	.543	13.5	.182	1.82	2.9	88	95	4.4	109	243	-.040	800
330 / 45	542.4	1.1	.1	.206	5.1	.556	13.8	.200	2.00	2.5	88	95	4.3	109	243	-.040	800
335 / 50	542.3	1.0	.1	.200	4.9	.554	13.7	.199	1.99	2.5	88	95	4.3	110	241	-.040	800
340 / 55	542.2	.9	.1	.200	4.9	.516	14.0	.174	1.74	2.8	88	95	4.3	110	241	-.040	775
345 / 1800	542.1	.8	.1	.208	5.1	.554	13.7	.181	1.81	2.8	98	166	3.7	108	223	-.040	825
350 / 05	542.1	.8	.0	.212	5.2	.553	13.7	.174	1.74	3.0	105	171	5.0	110	223	-.038	850
355 / 10	542.0	.7	.1	.216	5.3	.548	13.6	.172	1.72	3.1	109	174	5.1	112	223	-.038	850
TOTAL	------	------	------	------		------		------		------	------	------	----	------	2870	-.488	-------
TOTAL	------	------	------	------				------		------	------	------	----	------	6018	-1.002	-------

541.3

PAGE 12 [illegible]S DATA SHEET

MANUFACTURER/MODEL FX HT 2000 RUN 5 DATE 6/30/93 PAGE 4 OF 4

TIME	SCALE	FUEL	DROP	v.	CO2	v.	O2	v.	CO	BAL	WET B	DRY B	%H2O	CAL WB	STACK	STATIC	SO2 PPM
360 / 1815	541.9	.6	.1	.222	5.5	.542	13.4	.172	1.72	3.2	111	175	7.0	116	224	-.038	825
365 / 20	541.8	.5	.1	.224	5.5	.545	13.5	.164	1.64	3.4	112	175	7.5	119	224	-.038	850
370 / 25	541.8	.5	.Ø	.226	5.6	.542	13.4	.157	1.57	3.6	112	177	7.5	119	223	-.038	850
375 / 30	541.7	.4	.1	.218	5.4	.548	13.6	.173	1.73	3.1	113	177	7.8	119	223	-.038	850
380 / 35	541.6	.3	.1	.211	5.2	.554	13.7	.182	1.82	2.8	113	176	7.8	119	223	-.038	860
385 / 40	541.6	.3	.Ø	.202	5.0	.563	14.0	.192	1.92	2.6	113	176	7.8	119	222	-.038	850
390 / 45	541.5	.2	.1	.187	4.6	.576	14.3	.220	2.20	2.1	113	176	7.8	119	222	-.038	825
395 / 50	541.4	.1	.1	.167	4.1	.589	14.6	.226	2.26	1.8	112	174	7.5	118	222	-.038	800
400 / 55	541.4	.1	.Ø	.165	4.1	.597	14.8	.223	2.23	1.8	112	173	7.3	118	222	-.038	800
405 / 1900	541.3	.Ø	.1	.175	4.3	.599	14.9	.184	1.84	2.4	111	172	7.3	117	218	-.038	800
															2223	-.380	
															27075	-4.236	÷ 82
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	------	330	-.052	------
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	------			-------
TOTAL	-----	-----	-----	-----		-----		-----		-----	-----	-----	----	------			-------

541.0 - 540.7

PAGE 13 PREBURN DATA SHEET

MANUFACTURER/MODEL FX HT 2000 **RUN** 5 **DATE** 6/30/93 **PAGE** 1 **OF** 1

TIME	SCALE WT	BURN RATE	STACK	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	STATIC	COMMENTS
0 / 1050	549.8	—	905	715	540	316	576	404	1120	1451	82	-.095	PRIMARY AIR SET AT:
05 / 1055	547.9	1.9	535	649	542	325	585	393	1020	1350	83	-.077	1/8"
10 / 1100	547.3	.6	509	615	533	328	573	388	973	1316	82	-.075	SECONDARY AIR SET AT:
15 / 05	546.8	.5	503	603	516	329	563	381	954	1380	82	-.072	NA
20 / 1110	546.1	.7	498	602	505	329	548	376	944	1312	84	-.072	FAN: OFF CONFIRMATION
25 / 15	545.3	.8	491	594	493	329	542	368	942	1311	83	-.071	
30 / 20	544.6	.7	474	592	484	328	536	362	945	1328	84	-.069	
35 / 25	544.1	.5	442	571	480	326	541	356	1021	1350	84	-.066	PUMPS ON AT: 1125
40 / 1130	543.7	.4	421	539	476	325	541	350	1030	1248	83	-.063	
45 / 35	543.4	.3	401	517	474	325	543	346	1037	1368	82	-.061	CHECK WB/DB: 82/94
50 / 40	543.3	.1	385	504	479	322	540	343	1043	1227	83	-.060	
55 / 45	543.1	.2	358	477	480	322	539	343	1051	1107	83	-.056	
------	------	------	------	------	------	------	------	------	------	------	------	------	------
60 / 1150	543.0	.1	343	449	479	322	537	342	1048	1020	83	-.052	425.8
65 / 55	542.9	.1	333	426	478	322	534	345	1040	995	82	-.050	421.0 -.9 1159
70 / 1200	541.9	.1	322	408	475	324	529	349	1029	975	82	-.049	417.0
75 / 05	541.7	.2	356	395	473	323	522	353	1012	906	82	-.049	
80 / 10	541.4	.3	311	385	469	323	517	356	961	869	82	-.048	
85 / 15	541.3	.1	356	378	459	323	509	359	909	788	83	-.049	405.6
90 / 20													

PAGE 1 TEMPERATURE DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 5 **DATE** 6/30/93 **PAGE** 1 **OF** 4

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / ~~CAT~~	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	
0 / 1215	378	459	323	509	359	909	788	83	1406	246	36	234	35	33	405.6
05 / 20	363	440	322	488	363	813	624	82	1403	246	36	236	35	33	
10 / 25	422	425	320	474	365	741	751	81	1400	245	36	240	35	33	
15 / 30	454	408	315	454	363	825	853	81	1395	244	36	244	36	35	
20 / 35	476	403	312	460	361	820	899	82	1390	244	36	245	36	35	
25 / 40	501	397	308	463	354	918	1209	80	1385	245	36	246	36	35	
30 / 45	508	397	307	473	350	926	1226	81	1380	245	36	247	36	35	
35 / 50	523	394	306	484	344	938	1310	82	1390	246	36	247	36	35	
40 / 55	531	397	307	493	337	944	1245	82	1397	247	36	246	36	35	
45 / 1300	537	397	307	499	334	951	1357	83	1402	247	36	247	36	35	
50 / 05	548	400	307	507	328	974	1372	84	1406	246	36	247	35	35	
55 / 10	548	401	308	515	322	986	1329	84	1411	245	36	247	35	35	
TOTAL	5789	4918	3742	5819	4180	10745	12963	985	------	------	------	------	------	------	------
60 / 15	554	406	308	519	316	980	1345	85	1414	244	36	248	35	35	
65 / 20	550	411	308	519	311	965	1313	84	1418	244	36	248	34	35	
70 / 25	533	421	308	513	305	938	1267	85	1425	244	36	248	34	35	
75 / 30	517	431	308	507	302	925	1144	86	1430	245	36	247	34	35	
80 / 35	517	443	308	500	298	918	1161	85	1439	244	36	246	34	35	
85 / 40	517	451	308	500	298	918	1213	85	1436	245	36	246	34	36	
90 / 45	532	466	306	491	291	915	1269	85	1440	246	36	246	35	36	
95 / 50	537	474	306	495	291	915	1260	86	1442	247	36	246	35	37	
100 / 55	537	480	306	487	286	915	1300	86	1442	247	36	247	35	37	
105 / 1400	534	480	307	487	286	920	1125	85	1448	247	36	247	35	38	
110 / 05	521	484	307	487	280	920	1109	85	1451	248	36	247	35	38	
115 / 10	499	481	307	482	280	930	995	84	1455	248	36	245	36	38	
TOTAL	6348	5428	3687	5987	3544	11159	14501	1021	------	------	------	------	------	------	------
TOTAL	12137	10346	7429	11806	7724	21904	27464	2006	------	------	------	------	------	------	------

PAGE 1 TEMPERATURE DATA SHEET
MANUFACTURER/MODEL FX HT 2000 RUN 5 DATE 6/30/93 PAGE 2 OF 4

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / CAT	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	405.6
120 / 1415	471	479	307	488	277	942	1039	85	1457	248	36	243	36	38	
125 / 20	452	477	307	488	277	950	1110	85	1457	248	35	243	36	38	
130 / 25	446	477	307	488	277	955	1060	86	1459	247	35	240	36	38	
135 / 30	440	477	306	494	275	963	1030	86	1451	247	35	239	36	38	
140 / 35	443	478	306	489	275	963	990	86	1445	248	34	238	36	38	
145 / 40	421	478	306	494	275	963	971	87	1441	248	34	238	36	38	
150 / 45	405	472	305	489	275	960	959	86	1440	248	35	237	36	38	
155 / 50	395	470	305	489	274	960	936	85	1442	248	35	236	36	38	
160 / 55	387	470	302	482	275	953	927	85	1443	248	35	235	36	38	
165 / 1500	381	470	302	482	275	950	921	86	1446	248	35	235	36	38	
170 / 05	375	463	300	482	276	945	913	86	1446	248	35	234	36	38	
175 / 10	370	460	300	477	276	928	911	86	1446	248	35	233	36	38	
TOTAL	4986	5671	3653	5842	3307	11432	11767	1029	------	------	------	------	------	------	------
180 / 15	362	458	298	471	279	922	898	85	1446	248	34	233	35	38	
185 / 20	362	458	298	471	279	911	878	86	1446	248	33	232	35	38	
190 / 25	348	450	298	466	279	894	824	85	1445	248	33	232	35	38	
195 / 30	341	450	294	461	282	880	824	86	1446	248	33	232	35	38	
200 / 35	341	441	294	451	282	864	829	86	1451	248	33	232	35	38	
205 / 40	336	437	294	445	282	848	822	85	1457	248	33	232	35	38	
210 / 45	336	434	291	439	286	836	815	85	1462	248	33	232	35	37	
215 / 50	329	429	291	435	286	828	809	86	1465	248	33	232	35	37	
220 / 55	324	426	286	429	284	820	809	86	1467	248	33	232	35	37	
225 / 1600	324	422	286	425	284	814	790	87	1468	248	33	232	35	37	
230 / 05	319	417	286	420	286	811	771	87	1463	248	33	232	34	37	
235 / 10	319	414	282	417	280	805	761	87	1454	248	33	233	34	37	
TOTAL	4041	5236	3498	5330	3389	10233	9830	1031	------	------	------	------	------	------	------
TOTAL	9027	10907	7151	11172	6696	21665	21597	2060	------	------	------	------	------	------	------

PAGE TEMPERATURE DATA SHEET
MANUFACTURER/MODEL FX HT 2000 RUN 5 DATE 6/30/93 PAGE 3 OF 4

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / CAT	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	405.6
240 / 1615	312	407	280	413	281	798	759	87	1447	248	33	234	34	37	
245 / 20	309	404	278	410	281	791	744	88	1445	248	33	235	34	37	
250 / 25	309	404	278	405	281	783	732	88	1443	248	34	235	34	36	
255 / 30	304	396	274	402	281	776	727	88	1443	248	35	236	34	36	
260 / 35	298	391	274	398	281	769	719	87	1442	248	36	236	34	36	
265 / 40	298	391	271	398	281	766	713	87	1442	248	36	236	34	36	
270 / 45	294	383	268	390	281	751	692	87	1440	248	37	237	34	36	
275 / 50	291	380	268	386	281	732	685	87	1439	248	37	237	34	36	
280 / 55	288	374	265	381	279	712	671	87	1437	248	38	238	33	36	
285 / 1700	288	374	265	376	279	700	661	87	1435	248	38	238	33	36	
290 / 05	281	367	261	369	280	691	659	87	1431	248	38	238	33	36	
295 / 10	277	367	261	365	278	695	655	87	1438	248	38	239	33	36	
TOTAL	3549	4638	3243	4693	3364	8964	8417	1047	------	------	------	------	------	------	------
300 / 15	277	362	259	361	278	697	649	87	1439	248	38	239	33	35	
305 / 20	273	357	259	356	278	690	670	87	1439	248	38	239	33	35	
310 / 25	273	357	255	356	278	685	664	87	1439	248	37	239	33	35	
315 / 30	271	351	255	356	281	675	656	88	1441	248	37	239	33	35	
320 / 35	266	347	253	351	279	667	651	87	1442	248	37	239	33	35	
325 / 40	242	344	253	351	279	667	652	87	1444	248	36	239	33	35	
330 / 45	264	344	248	346	277	663	633	87	1444	248	36	240	33	35	
335 / 50	264	339	248	346	277	663	629	87	1444	248	36	240	33	35	
340 / 55	261	339	248	341	277	661	629	87	1446	248	36	240	33	35	
345 / 1800	253	333	245	341	275	654	629	87	1444	248	36	240	33	35	
350 / 05	253	333	245	339	275	648	622	87	1442	248	36	240	33	35	
355 / 10	253	333	245	339	275	648	622	87	1439	248	36	240	33	35	
TOTAL	3150	4139	3013	4183	3329	8018	7706	1045	------	------	------	------	------	------	------
TOTAL	6699	8777	6256	8876	6693	16982	16123	2092	------	------	------	------	------	------	------

PAGE TEMPERATURE DATA SHEET
MANUFACTURER/MODEL FX HT 2000 **RUN** 5 **DATE** 6/30/93 **PAGE** 4 **OF** 4

TIME	TOP	LT SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC / CAT	AMBIENT	FURNACE	SAMPLE	IMP OUT	C. GAS	GAS IMP	SO2 IMP	405.6
360 / 1815	253	333	245	336	281	645	629	87	1439	248	36	240	33	35	
365 / 20	253	333	245	336	286	639	629	87	1437	248	36	240	33	35	
370 / 25	253	333	244	332	286	633	629	87	1437	248	36	240	33	35	
375 / 30	253	333	244	332	286	633	629	86	1437	248	36	235	33	35	
380 / 35	253	333	244	327	286	628	626	86	1435	248	36	235	33	35	
385 / 40	253	332	244	327	286	625	619	85	1434	248	36	235	33	35	
390 / 45	253	330	244	325	286	625	609	84	1434	248	36	235	33	35	
395 / 50	247	326	244	325	286	620	597	83	1430	248	36	235	33	35	
400 / 55	247	322	244	325	286	620	597	83	1425	248	36	235	33	35	
405 / 1900	245	320	244	318	286	621	597	83	1425	248	36	235	33	35	
	2510	3295	2442	3283	2855	6289	6161	851							
	30373	33325	23278	35137	23968	66840	71345	7009						÷82	
TOTAL	370	406	284	429	292	815	870	85	------	------	------	------	------	------	------
												ΔT	405.6	START	
													282.6	STOP	
													-123.0		
TOTAL									------	------	------	------	------	------	------
TOTAL									------	------	------	------	------	------	------

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/30/93 Analyte: CO_2 (15-1)

Source: FX HT 2000 Run #: 5

Zero Cyl #: T132257 Conc. 00.0 % CO_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS40875 Conc. 12.6 % CO_2 Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 407069

Range: 0 - 25.0% CO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter:

EPA Span Value = 25.0% CO_2

EPA Control Limits = ± 2.5% of 25.0% CO_2 = ± 0.625% CO_2

Pre Run Audit: By: DK Time: 1045 Temp: 78 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	+.029	+.029	+.116
Span	504	.504	12.6	50.3	.503	12.489	-.111	-.883

Comments:

Post Run Audit: By: BW Time: 1915 Temp: 83 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.2	.002	.021	.021	.084
Span	50.4	.504	12.6	50.7	.507	12.588	-.012	-.093

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/30/93 Analyte: O_2 (15-2)

Source: FX HT 2000 Run #: 5

Zero Cyl #: T132257 Conc. 00.0 % O_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS40875 Conc. 12.8 % O_2 Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Teledyne Model: 320 Ax SN: 37465

Range: 0 - 25.0% O_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 25.0% O_2

EPA Control Limits = $\pm$ 2.5% of 25.0% O_2 = $\pm$ 0.625% O_2

Pre Run Audit: By: DK Time: 1050 Temp: 82 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	$\pm$ Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.0	.001	-.017	-.017	-.068
Span	12.8	.512	12.8	12.8	.512	12.690	-.110	-.862

Comments: Teledyne #2 Cyl % ___ Exp % ___ Act % ___ Adj to ___ $\pm$ Δ % ___

Post Run Audit: By: BW Time: 1915 Temp.: 83 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response %	Actual Response Meter	Actual Response DVM	Actual Response %	$\pm$ Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.1	.006	.107	.107	.429
Span	12.8	.512	12.8	12.7	.502	12.441	-.359	-2.804

Comments: Teledyne #2 Cyl % ___ Exp % ___ Act % ___ Adj to ___ $\pm$ Δ % ___

$\pm$ Conc. Difference = Act % - Exp (Std) %

Zero % Differece = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Exp \% (ppm)}}$ X 100

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/30/93 Analyte: CO (15-3)

Source: FX HT 2000 Run #: 5

Zero Cyl #: T132257 Conc. 00.0 % CO Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: AS 40875 Conc. 5.01 % CO Cyl Press: 500 psi

Certified by: MATHESON Date: 1/11/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 408005

Range: 0 - 10.0% CO Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 10.0% CO
EPA Control Limits = ±2.5% of 10.0% CO = ± 0.25% CO

Pre Run Audit: By: DK Time: 1055 Temp: 83 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.0	.000	.000	000	.000
Span	50.1	.501	5.01	50.2	.502	5.020	.010	.200

Comments:

Post Run Audit: By: BW Time: 1915 Temp.: 83 °F

Audit Results

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
Zero	00.0	.000	00.0	00.2	.002	.020	.020	.200
Span	50.1	.501	5.01	49.8	.498	4.98	-.030	-.599

Comments:

± Conc. Difference = Act % - Exp (Std) %

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

PRE AND POST TEST ZERO/SPAN CHECK
WOODSTOVE DATA SHEET #15

Site: EEMC - West, Kent, WA 98032 Date: 6/30/93 Analyte: SO_2 (15-4)

Source: FX HT 2000 Run #: 5

Zero Cyl #: T132257 Conc. 00.0 ppm SO_2 Cyl Press: 2000 psi

Certified by: LIQUID AIR Date: 6/10/93

Span Cyl #: CC 79076 Conc. 1268 ppm SO_2 Cyl Press: 500 psi

Certified by: LIQUID AIR Date: 2/26/93

Analyzer: Make: Horiba Model: PIR-2000 SN: 403019

Range: 0 - 2500 ppm SO_2 Analyzer Output: 0 - 1.0 v.

Flow: 1.5 SCFH Measured by: Rotameter: X Flowmeter: ____

EPA Span Value = 2500 ppm SO_2

EPA Control Limits = ±2.5% of 2500 ppm SO_2 = ±62.5 ppm SO_2

Pre Run Audit: By: DK Time: 1100 Temp: 82 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response ppm	Actual Response Meter	Actual Response DVM	Actual Response ppm	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	00.7	.007	12.951	12.951	.518
Span	50.7	.507	1268	50.8	.508	1273.875	5.875	.463

Comments:

Post Run Audit: By: BW Time: 1925 Temp: 83 °F

Audit Results

Point #	Expected Response Meter	Expected Response DVM	Expected Response ppm	Actual Response Meter	Actual Response DVM	Actual Response ppm	± Conc. Difference	Δ %
Zero	00.0	.000	00.0	01.7	.017	38.1157	38.1157	1.5247
Span	50.7	.507	1268	51.6	.516	1294.009	26.009	2.051

Comments:

± Conc. Difference = Act ppm - Exp (Std) ppm

$$\text{Zero \% Differece} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Full Scale Value}} \times 100$$

$$\text{Span \% Difference} = \frac{\text{Act \% (ppm)} - \text{Exp \% (ppm)}}{\text{Exp \% (ppm)}} \times 100$$

QUALITY CHECKS
DATA SHEET 16

Unit: F X Run: 5 Date: 6-30-93

Thermocouple Check:

T/C #1	72.2	°F	T/C #13	71.8	°F
T/C #2	72.3	°F	T/C #14	71.6	°F
T/C #3	72.1	°F	T/C #15	72.7	°F
T/C #4	73.5	°F	T/C #16	45.3	°F
T/C #5	73.3	°F	T/C #17	57.5	°F
T/C #6	74.1	°F	T/C #18	76.4	°F
T/C #7	73.5	°F	T/C #19	72.4	°F
T/C #8	73.8	°F	T/C #20	–	°F
T/C #9	74.2	°F	T/C #21	–	°F
T/C #10	69.9	°F	T/C #22	–	°F
T/C #11	69.8	°F	T/C #23	72.4	°F
T/C #12	73.2	°F	T/C #24	225.0	°F

Thermocoouple Readout:

pretest zero and span check and calibration — post test zero and span — % difference

ZERO	-.4	°F	ADJ. TO	0.0	°F	ZERO	1.3	°F	.065	
SPAN	2001.0	°F	ADJ. TO	2000.0	°F	SPAN	2000.2	°F	.010	

Thermocouple Readout Pretest Linearity Check

0 =	0.0 °F		200 =	201.6 °F		400 =	398.9 °F
600 =	601.2 °F		800 =	801.4 °F		1000 =	1000.4 °F
1200 =	1198.0 °F		1400 =	1398.9 °F		1600 =	1599.4 °F
1800 =	1799.7 °F		2000 =	2000.0 °F			

Sample Train Leak Check	Pre ✓	Post ✓
Combustion Gas Train Leak Check	Pre ✓	Post ✓
Tracer Gas Train (SO_2) Leak Check	Pre ✓	Post ✓
Darft (Static) Gauge Zero Check	Pre ✓	Post ✓

Scale Check

Pre 546.7 – 536.7 = 10.0 ✓

Post 551.1 – 541.1 = 10 ✓

Stack Cleaned Proir to Test Run: YES ____ NO X

Phillips SCALE COMPANY, INC.

Certificate of Inspection

For:

Co. EEMC At: KENT WA.

Make Weight-TRONIX S/N 016 409

Inspected By Kenneth H Jackson Date 1-20-87

> This certifies that the above scale met all State Highway Weighing Requirements when tested on the above date with 875. lbs. of test wts.

Next Inspection Due → Date 6-20-87

Phillips SCALE COMPANY, INC.

Certificate of Inspection

For:

Co. EESPC At: 1315 Central Ave

Make Weightronix S/N 16409

Inspected By Art Hall Date 6-8-93

This certifies that the above listed device met all Weighing Requirements when tested on the above date with weights traceable to N.B.S.

Load		Reading	Load		Reading	Load		Reading
Ø	Lbs	Ø	150	Lbs	150	350	Lbs	350
50	Lbs	50	200	Lbs	200	450	Lbs	450
100	Lbs	100	250	Lbs	250	500	Lbs	500

Next Inspection Date 12-1-93

QUALITY CONTROL SERVICES
LABORATORY AND METROLOGY EQUIPMENT: SALES AND SERVICE

REPORT OF SERVICE AND CALIBRATION

CUSTOMER Energy. Env. Syst Perf MAKE Sartorius LOCATION

ADDRESS 1315 S. Central Unit MODEL A120S CONTACT Bill Novak

Kent Wa 98032 S/N 37010004 TECHNICIAN [illegible]

This Serv Date 6/16/93 Last Serv Date 12/18/92 Next Serv Due 12/ /93

Function Tested	As Found	Manufacturer's Tolerance	After Service
Cornerload	±.2	±.2mg	±.1mg
Optical Range	—	N/A	—
Optical Range w/Tare	—	N/A	—
Linearity or 50-50	±.4mg	±.2mg	±.2mg
Hysteresis	±.1mg	±.1mg	±.1mg
Calibration	+.4mg	±.1mg	±.1mg

Individual Wt. Readings	As Found	Manufacturer's Tolerance	After Service
10mg	-.1mg	±.1mg	±.1mg
50mg	+.2mg	±.1mg	±.1mg
10g	+.2mg	±.1mg	±.1mg
50g	+.4mg	±.1mg	±.1mg
100g	+.4mg	±.1mg	±0mg

IMPORTANT NOTICE:
All balances are serviced under lab ambient conditions. Manufacturer's tolerances are for new equipment used under ideal conditions. Your results may reflect the age of the equipment and environmental conditions.

OTHER INFORMATION AND COMMENTS PERTAINING TO THIS SERVICE AND CALIBRATION:

INFORMATION ON STANDARDS USED IN THIS SERVICE AND CALIBRATION:
One or more of the following standards were used as references for this calibration. Their calibration is traceable to the National Reference Standards maintained by the National Institute of Standards and Technology. Our N.I.S.T. traceable Reference Number is 732/246308.

Manufacturer	Description	Serial No.	Date of Last Calibr.	Next Calibr. Due
Rice Lake	1mg - 100g	A45	7/2/92	7/2/93
Rice Lake	1mg - 5kg	7764	1/25/93	1/25/98
Rice Lake	5g - 2kg	D74	7/30/92	7/30/93
Rice Lake	1kg - 5kg	C4488	7/2/92	7/2/93

rev. 3-30-93

QUALITY CONTROL SERVICES

LABORATORY AND METROLOGY EQUIPMENT: SALES AND SERVICE

REPORT OF SERVICE AND CALIBRATION

CUSTOMER ENERGY & ENV. SYST. PERF. MAKE OHAUS LOCATION

ADDRESS 1315 S. CENTRAL UNIT C MODEL C4000D CONTACT Bill NOWAK

KENT WA 98032 S/N 4163 TECHNICIAN DDRC

This Serv Date 6/16/93 Last Serv Date 12/18/92 Next Serv Due 12/ /93

Function Tested	As Found	Manufacturer's Tolerance	After Service
Cornerload	±.1g	±.2g	±.1g
Optical Range	N/A	N/A	N/A
Optical Range w/Tare	N/A	N/A	N/A
Linearity or 50-50	±.2g	±.1g	±.1g
Hysteresis	±.1g	±.1g	±.1g
Calibration	±.01g/+.3g	±.01g/±.1g	±.01g/.1g

Individual Wt. Readings	As Found	Manufacturer's Tolerance	After Service
200g	±0	±.1g	±.0g
400g	±0	±.1g	±.0g
1KG	±0	±.1g	±.0g
2KG	+.1g	±.1g	±.0g
4KG	+.3g	±.1g	±.0g

IMPORTANT NOTICE:
All balances are serviced under lab ambient conditions. Manufacturer's tolerances are for new equipment used under ideal conditions. Your results may reflect the age of the equipment and environmental conditions.

OTHER INFORMATION AND COMMENTS PERTAINING TO THIS SERVICE AND CALIBRATION:

VIBRATION PRESENT DISPLAY FAILING

INFORMATION ON STANDARDS USED IN THIS SERVICE AND CALIBRATION:
One or more of the following standards were used as references for this calibration. Their calibration is traceable to the National Reference Standards maintained by the National Institute of Standards and Technology. Our N.I.S.T. traceable Reference Number is 732/246308.

Manufacturer	Description	Serial No.	Date of Last Calibr.	Next Calibr. Due
Rice Lake	1mg - 100g	A45	7/2/92	7/2/93
Rice Lake	1mg - 5kg	7764	1/25/93	1/25/98
Rice Lake	5g - 2kg	D74	7/30/92	7/30/93
Rice Lake	1kg - 5kg	C4488	7/2/92	7/2/93

rev. 3-30-93

Data Sheet #32
Thermocouple Calibration Record

Thermocouples Check against
Reference Thermometer serial number 9123454
Ice Water Bath $0^{\circ}C = 32^{\circ}F$
Boiling Water $100^{\circ}C = 212^{\circ}F$
Room Temperature 69
Barometric Pressure 30.01
DATE: 6/21/93

TC	Location	Ice Bath Temp	Boiling Water Temp
1	Wet Bulb	32.3	211.9
2	Dry Bulb	32.2	212.1
3	Stack	32.2	212.1
4	Stove Top	32.1	211.9
5	Left Side	32.1	211.8
6	Back	32.2	211.8
7	Right Side	32.2	211.9
8	Bottom	32.3	211.9
9	Firebox	32.3	212.1
10	Secondary/Cat	32.2	212.1
11	Ambient	32.2	212.2
12	Tube Furnace	32.2	212.2
13	Sample Box	32.1	211.9
14	Impinger Out	32.1	212.0
15	C. Gas Box	32.1	211.9
16	C. Gas Out	32.4	211.9
17	SO2 Out	32.4	212.2
18	Upper Ambient	32.1	212.1
19			
20			
21			
22			
23	Calibrator	NA	NA
24	Oven	32.3	212.2

Data Sheet #32
Thermocouple Calibration Record

Thermocouples Check against	
Reference Thermometer	serial number 9123454
Ice Water Bath	0°C = 32° F
Boiling Water	100°C = 212° F
Room Temperature	70
Barometric Pressure	30.05

DATE: 12/31/92

TC	Location	Ice Bath Temp	Boiling Water Temp
1	Wet Bulb	32.1	211.9
2	Dry Bulb	32.1	211.9
3	Stack	32.3	212.1
4	Stove Top	32.4	212.1
5	Left Side	32.2	212.0
6	Back	32.1	212.1
7	Right Side	32.1	212.1
8	Bottom	32.1	211.9
9	Firebox	32.5	212.2
10	Secondary/Cat	32.4	212.2
11	Ambient	32.4	212.1
12	Tube Furnace	32.5	212.2
13	Sample Box	32.5	212.2
14	Impinger Out	32.1	212.0
15	C. Gas Box	32.0	212.0
16	C. Gas Out	32.0	212.0
17	SO2 Out	32.1	212.1
18	Upper Ambient	32.1	212.1
19			
20			
21			
22			
23	Calibrator	NA	NA
24	Oven	32.1	212.3

Stack Temperature Sensor Calibration Date Sheet

Date: 6/21/93
Ambient Temperature: 72
Technician: BW

Thermocouple Number: T/C Readout
Barometric Pressure: 30.02
Reference: Mercury in glass
FISHER #9123454
Other: OMEGA CL-300

Reference Point No. [a]	Source [b]	Reference Thermometer Temperature °F	Thermocouple Potentiometer Temperature °F	Difference (%)[c]
32	Ice Water	32	32.2	-.04
212	Boiling Water	212	212.2	-.03
250	Omega	250	250.3	-.04
300	Omega	300	300.2	-.03
400	Omega	400	400.3	-.03
500	Omega	500	500.3	-.03
600	Omega	600	600.2	-.02
700	Omega	700	700.1	-.01
800	Omega	800	800.1	-.01
900	Omega	900	900.2	-.01
1000	Omega	1000	1000.1	-.01
1200	Omega	1200	1200.1	-.01
1400	Omega	1400	1399.9	.01
1600	Omega	1600	1599.9	.00
1800	Omega	1800	1800.1	-.00
2000	Omega	2000	2000.2	-.01

[a] Every 50°F for each reference point
[b] Type of Calibration System Used
c (reference temperature) - (Test thermocouple temperature)

Reference temperature x100<1.5%

Stack Temperature Sensor Calibration Date Sheet

Date: 12/31/92
Ambient Temperature: 70
Technician: BW

Thermocouple Number: T/C Readout
Barometric Pressure: 29.98
Reference: Mercury in glass
FISHER #9123454
Other: OMEGA CL-300

Reference Point No. [a]	Source [b]	Reference Thermometer Temperature °F	Thermocouple Potentiometer Temperature °F	Difference (%)[c]
32	Ice Water	32	32.2	-.04
212	Boiling Water	212	211.9	.01
250	Omega	250	250.3	-.04
300	Omega	300	300.1	-.01
400	Omega	400	400.2	-.02
500	Omega	500	500.3	-.03
600	Omega	600	600.1	-.01
700	Omega	700	699.8	.02
800	Omega	800	799.9	.01
900	Omega	900	900.1	-.01
1000	Omega	1000	1000.0	.00
1200	Omega	1200	1199.8	.01
1400	Omega	1400	1399.7	.02
1600	Omega	1600	1599.8	.01
1800	Omega	1800	1799.9	.00
2000	Omega	2000	1999.8	.01

[a] Every 50°F for each reference point
[b] Type of Calibration System Used
c (reference temperature) - (Test thermocouple temperature)

Reference temperature x100<1.5%

TRACEABILITY DOCUMENTATION

S02 INECTION ROTAMETER, DRY GAS METER AND SLING PSYCHROMETER THERMOTERS IN LAB. CHECKED AGAINST FISHER SN 9123434 (NIST).

DATE: 12/31/92

SO2 Injection Rotameter

FISHER SN 9123454
NIST Traceable

SO2 Injection TC
°F

Actual	°C Adjusted	°C = °F	°F
20	19.91	67.8	68.0
24	23.92	75.1	75.2
25	24.92	76.9	77.1
30	29.93	85.9	86.1

Dry Gas Meter Thermocouples

Actual	°C Adjusted	°C = °F	5H in	5H out	KK
20	19.91	67.8	67.9	67.9	68
24	23.92	75.1	75.2	75.3	75
25	24.92	76.9	76.7	76.8	76
30	29.93	85.9	85.8	85.8	86

Sling Psychrometer

Actual	°C Adjusted	°C = °F		Wet Bulb	Dry Bulb
20	19.91	67.8		68	68
24	23.92	75.1		75	75
25	24.92	76.9		76	77
30	29.93	85.9		86	86

Conversions = F=(Cx1.8)+32 C=(F-32)/1.8

Adjusted temperatures derived from an eleven point calibration of the Fisher thermometer.

VANEOMETER CALIBRATION

EEMC uses a Dwyer Model #480 Vaneometer to measure test chamber air velocity. The manufacturer's specifications for accuracy are ±5.0% to 100 FPM and ±10% from 100 FPM to top of scale. EEMC insures that the instrument is level and clean prior to taking each reading. According to EPA personnel (Westlin, RTP) no further calibration of the instrument is necessary.

DRAFT GAUGE CALIBRATION

EEMC uses a Dwyer Model 115-AV 0 - 0.25" inclined water manometer (readi- bility resolution ±0.001" of water) to measure the static pressure in the stack. Once leveled and zeroed as per the manufacturer's written operating instructions, the Dwyer 0 - 0.25" manometer is a primary standard and needs no additional calibration.

The manometer is leveled and zeroed at the start of each test run, checked as necessary during the run to verify that the settings have not changed and again at the end of each test run. The results of each check are recorded on Woodstove Data Sheet #16 in each individual test run.

BAROMETER CALIBRATION

EEMC uses a Princo Model 469 NOVA Mercury Barometer to measure Barometric Pressure at the Kent, WA Lab. When installed and maintained as per the manufacturer's written operating instructions, the Princo Model 469 NOVA Mercury Barometer is a primary standard and needs no additional calibration.

MOISTURE METER CALIBRATION

The Delmhorst Model RC-1C, SN 16152 Moisture Meter is calibrated each time the meter is turned on using the two (2) calibration settings (Zero and Span). The potentiometers for each calibration point (X = Zero, Y = Span) are adjusted until the meter is correctly calibrated. Then the operation of the meter is checked in the normal operating range used during testing (11 - 25%) with a Delmhorst Model MCS-1 Moisture Content Standard at 12.0% and 22%.

EEMC also has a second Moisture Meter - Delmhorst Model G-30 SN 2477 - to use as a backup and as means of checking the readings on the Model RC-1C.

Post Test
Meter Box Audits
Woodstove Data Sheet #32

Unit: FX Drolet HT2000
Date: 7-2-93
Technician: CW
WST9-Form2,Rev12/88

METER BOX CALIBRATION AUDIT

Test Data

Run #	1	2	3	4	5	6	7	8	9	10
Avg. Δ H	.130	.181	.109	.202	.160	.147				
Max Vac	10.0	11.0	2.0	5.0	7.0	2.0				

Avg. Test Series Δ H: .155 in H_2O. Test Series Max Vac: 11.0 in Hg

Audit Dry Gas Meter: KK Correction (Y) Factor: 1.010
Test Dry Gas Meter: H Correction (Y) Factor: 1.028

Audit Data

		Audit #1	Audit #2	Audit #3
BP:		30.05	30.05	30.05
Vac:		11.0	11.0	11.0
Audit Meter:	Final Vol	206.450	211.619	216.675
	Initial Vol	200.500	206.450	211.619
	Vol (V_w, ft^3)	5.950	5.169	5.056
Audit Meter:	Initial	72	72	72
Temp (°F)(Tw)	Mid	72	72	72
	Final	72	72	72
	Avg (°F/°A)	72 532	532	72 532
Δ H (in H_2O)	Initial	.155	.155	.155
	Mid	.155	.155	.155
	Final	.155	.155	.155
	Avg	.155	.155	.155
Dry Gas Meter:	Final Vol	667.400	672.500	677.500
	Initial Vol	661.500	667.400	672.500
	Vol (V_d, ft^3)	5.900	5.100	5.000
Dry Gas Meter	Initial	—	—	—
Temp (°F): Inlet	Mid	—	—	—
	Final	—	—	—
	Avg (°F/°A)	—	—	—
Dry Gas Meter	Initial	76	78	78
Temp (°F): Outlet	Mid	77	78	78
	Final	78	78	79
	Avg (°F/°A)	77	78	79
Avg Dry Gas Meter Temp (T_m-°F/°A)		537	538	538
Time (minutes)		26.83	23.48	24.00

$$Y = \frac{(Vw)(MCF)(BP)(Tm)}{(Vd)(BP + \frac{\Delta H}{13.6})(Tw)}$$

$$\text{Y Factor \% Difference} = \frac{\text{Act} - \text{Exp}}{\text{Exp}} \times 100$$

NOTE: MCF = Meter Correction (Y) Factor for Dry Gas Meter used as a Transfer Standard

Run 1

$$Y = \frac{(5.950)(30.05)(1.028)(537)}{(5.900)(30.05 + \frac{.155}{13.6})(532)} = \frac{98702.66}{94356.71} = 1.046$$

$$\Delta\% = \frac{(1.046 - 1.028)}{1.028} \times 100 = 1.751 \%$$

Run 2

$$Y = \frac{(5.169)(30.05)(1.028)(538)}{(5.100)(30.05 + \frac{.155}{13.6})(532)} = \frac{85906.57}{81562.58} = 1.053$$

$$\Delta\% = \frac{(1.053 - 1.028)}{1.028} \times 100 = 2.432 \%$$

Run 3

$$Y = \frac{(5.056)(30.05)(1.028)(538)}{(5.000)(30.05 + \frac{.155}{13.6})(532)} = \frac{84028.56}{79963.32} = 1.051$$

$$\Delta\% = \frac{(1.051 - 1.028)}{1.028} \times 100 = 2.237 \%$$

NOTE: The Y Factor % Difference must be < ±5.0% to be acceptable

Determination of Interpolated Y Factor for Average Certification Test Series Delta H from Dry Gas Meter Calibration Data:

.1 (A) inch H_2O Delta H = 1.030 (C) Calculated Calibration Y Factor (from Calibrations)

.2 (B) inch H_2O Delta H = 1.027 (D) Calculated Calibration Y Factor (from Calibrations)

.2 (B) - .1 (A) = .1 X 100 = 10 (E)

1.027 (D) - 1.030 (C) = -.003 ÷ 10 (E) = -.0003 (F)

.155 (Avg Delta H) - .1 (A) = .055 X 100 = 5.5 (G)

[-.0003 (F) x 5.5 (G)] + 1.030 (C) = 1.028 Interpolated Y Factor For Avg. Test Series Delta H

Volume Metering System Leak Check: 0.000 inch H_2O in one minute

Date 4-14-93
Calibrated by [illegible]
Dry Gas Meter H Box 5

DRY GAS METER CALIBRATION

BAROMETRIC PRESSURE, Pb = 30.10 in. Hg.

Orifice Manometer Setting, ΔH, in. H_2O		.1	.2	.3	.5	.75	1.0
Gas Volume Wet Test Meter Vw ft³	Final	106.558	111.600	116.645	123.215	128.780	133.843
	Initial	101.500	106.558	111.600	116.645	123.215	128.780
	Vw, ft³	5.058	5.042	5.045	6.570	5.565	5.063
Gas Volume Dry Test Meter Vd ft³	Final	240.000	245.000	250.000	256.500	262.000	267.000
	Initial	235.000	240.000	245.000	250.000	256.500	262.000
	Vd ft³	5.000	5.000	5.000	6.500	5.500	5.000
TEMPERATURES — WET TEST METER tw	Initial	70	78	80	84	86	86
	Middle	74	79	82	85	86	86
	End	78	80	84	86	86	86
	Average	74 (534)	79 (539)	(542)	(545)	86 (546)	(546)
TEMPERATURES — DRY GAS METER tm	Initial	81	87	91	93	95	97
	Middle	84	89	92	94	96	97
	End	87	91	93	95	97	97
	Average	(84) 544	89 (549)	92 (552)	(554)	556	557
θ Time, Minutes		27.67	20.00	16.00	16.00	11.50	9.117
$y = \frac{(Vw)(Pb)(tm)}{Vd\left(Pb + \frac{\Delta H}{13.6}\right)(tw)}$		$\frac{82821.72}{80386.63}$ = 1.030	$\frac{83318.55}{81159.13}$ = 1.027	$\frac{83823.68}{81630.78}$ = 1.027	$\frac{109557.38}{106759.49}$ = 1.026	$\frac{93133.61}{90555.91}$ = 1.028	$\frac{84884.74}{82373.74}$ = 1.030
$\Delta H@ = \frac{.0317\,(\Delta H)}{Pb\,(tm)}\left[\frac{(tw)\theta}{Vw}\right]^2$				1.691			
$Ko = \frac{Vw}{\theta}\sqrt{\frac{\left(Pb + \frac{\Delta H}{13.6}\right)(28.97)}{tm + 460\ (\quad H)}}$							

Averages:

y = 1.028

ΔH = ________

Ko = ________

Ko = Factor for HP-65

$Pb + \frac{\Delta H}{13.6} = Pm$

28.97 - molecular weight of air

y = ratio of accuracy of wet test meter to dry test meter. Tolerance = 0.01

H = Orifice pressure differential that gives 0.75 cfm of air at 70 F and 29.92 inches of mercury, in H O. Tolerance 0.15.

Date 12/16/92
Calibrated by BW
Dry Gas Meter KK Box ______

DRY GAS METER CALIBRATION

BAROMETRIC PRESSURE, Pb = 29.98 in.Hg.

Orifice Manometer Setting, ΔH, in. H_2O		.1	~~.2~~.1	~~.3~~.1	~~.5~~.1	~~.75~~.1	1.0
Gas Volume Wet Test Meter Vw ft³	Final	5.000	5.000	5.000	5.000	5.000	
	Initial	Reset 0	0	0	0	0	
	Vw, ft³	5.000	5.000	5.000	5.000	5.000	
Gas Volume Dry Test Meter Vd ft³	Final	560.017	565.109	570.227	575.340	580.405	
	Initial	555.000	560.100	565.200	570.300	575.400	
	Vd ft³	5.017	5.009	5.027	5.040	5.005	
TEMPERATURES — WET TEST METER tw	Initial	68	68	68	68	68	
	Middle	68	68	68	68	68	
	End	68	68	68	68	68	
	Average	68 - 528	68 - 528	68 - 528	68 - 528	68 - 528	
TEMPERATURES — DRY GAS METER tm	Initial	68	69	69	69	70	
	Middle	69	69	69	69	69	
	End	69	69	70	69	69	
	Average	69 - 529	69 - 529	69 - 529	69 - 529	69 - 529	
θ Time, Minutes							
$y = \dfrac{(Vw)\ (Pb)\ (tm)}{Vd\ (Pb + \frac{\Delta H}{13.6})\ (tw)}$		1.002	1.00	1.004	1.006	0.999	
$\Delta H@ = \dfrac{.0317\ (\Delta H)}{Pb\ (tm)} \left[\dfrac{(tw)\theta}{Vw}\right]^2$							
$Ko = \dfrac{Vw}{\theta} \sqrt{\dfrac{(Pb + \frac{\Delta H}{13.6})(28.97)}{tm + 460\ (\quad H)}}$							

Averages:

y = 1.002

ΔH = ______

Ko = ______

Ko = Factor for HP-65

$Pb + \dfrac{\Delta H}{13.6} = Pm$

Overall — 1.002

28.97 - molecular weight of air

y = ratio of accuracy of wet test meter to dry test meter. Tolerance 0.01

H = Orifice pressure differential that gives 0.75 cfm of air at 70 F and 29.92 inches of mercury, in H O. Tolerance 0.15.

Date
Calibrated by 15
Dry Gas Meter KK Box

DRY GAS METER CALIBRATION

BAROMETRIC PRESSURE, Pb = 29.98 in. Hg.

Orifice Manometer Setting, ΔH, in. H_2O		~~1~~ .2	.2	~~3~~ .2	~~.5~~ .2	~~.75~~ .2	1.0
Gas Volume Wet Test Meter Vw ft³	Final	5.000	5.000	5.000	5.000	5.000	
	Initial	0	0	0	0	0	
	Vw, ft³	5.000	5.000	5.000	5.000	5.000	
Gas Volume Dry Test Meter Vd ft³	Final	585.641	590.726	595.836	601.009	606.115	
	Initial	580.600	585.700	590.800	596.000	601.100	
	Vd ft³	5.041	5.026	5.036	5.009	5.015	
TEMPERATURES — WET TEST METER tw	Initial	68	68	68	68	68	
	Middle	68	68	68	68	68	
	End	68	68	68	68	68	
	Average	68 - 528	68 - 528	68 - 528	68 - 528	68 - 528	
TEMPERATURES — DRY GAS METER tm	Initial	69	69	69	69	69	
	Middle	70	69	69	69	69	
	End	69	69	69	69	69	
	Average	69 - 529	69 - 529	69 - 529	69 - 529	69 - 529	
θ Time, Minutes							
$y = \dfrac{(Vw)(Pb)(tm)}{Vd\left(Pb + \dfrac{\Delta H}{13.6}\right)(tw)}$		1.007	1.004	1.006	1.000	1.002	
$\Delta H@ = \dfrac{.0317\,(\Delta H)}{Pb\,(tm)}\left[\dfrac{(tw)\theta}{Vw}\right]^2$							
$Ko = \dfrac{Vw}{\theta}\sqrt{\dfrac{\left(Pb + \dfrac{\Delta H}{13.6}\right)(28.97)}{tm + 460\ (\quad H)}}$							

Averages:

y = 1.004

ΔH = ______

Ko = ______

Ko = Factor for HP-65

$$Pb + \frac{\Delta H}{13.6} = Pm$$

.97 - molecular weight of air
- ratio of accuracy of wet test meter to dry test meter. Tolerance = 0.01
H = Orifice pressure differential that gives 0.75 cfm of air at 70 F and 29.92 inches of mercury, in H O.
Tolerance 0.15.

DRY GAS METER CALIBRATION

Date
Calibrated by [illegible]
Dry Gas Meter [illegible] Box ______

BAROMETRIC PRESSURE, Pb = 29.98 in. Hg.

Orifice Manometer Setting, ΔH, in. H_2O		~~1~~.3	~~2~~.3	.3	~~.5~~.3	~~.75~~.3	1.0
Gas Volume Wet Test Meter V_w ft^3	Final	5.000	5,000	5,000	5,000	5,000	
	Initial	0	0	0	0	0	
	V_w, ft^3	5,000	5,000	5,000	5,000	5,000	
Gas Volume Dry Test Meter V_d ft^3	Final	611.283	616.310	621.398	626.515	631.589	
	Initial	606.300	611.300	616.400	621.500	626.600	
	V_d ft^3	4.983	5.010	4.998	5.015	4.989	
TEMPERATURES — WET TEST METER t_w	Initial	68	68	68	68	68	
	Middle	68	68	68	68	68	
	End	68	68	68	68	68	
	Average	68 - 528	68 · 528	68 · 528	68 · 528	68 · 528	
TEMPERATURES — DRY GAS METER t_m	Initial	69	69	69	69	69	
	Middle	69	69	69	69	69	
	End	69	69	69	69	69	
	Average	69 - 529	69 · 529	69 - 529	69 - 529	69 - 529	
θ Time, Minutes							
$y = \dfrac{(V_w)(P_b)(t_m)}{V_d\left(P_b + \dfrac{\Delta H}{13.6}\right)(t_w)}$		.995	1.001	.998	1.002	.997	
$\Delta H@ = \dfrac{.0317\,(\Delta H)}{P_b\,(t_m)}\left[\dfrac{(t_w)\theta}{V_w}\right]^2$							
$K_o = \dfrac{V_w}{\theta}\sqrt{\dfrac{\left(P_b + \dfrac{\Delta H}{13.6}\right)(28.97)}{t_m + 460\;(\quad H)}}$							

Averages:

y = .999

ΔH = ______

Ko = ______

Ko = Factor for HP-65

$$P_b + \frac{\Delta H}{13.6} = P_m$$

[illegible]97 - molecular weight of air

[illegible] ratio of accuracy of wet test meter to dry test meter. Tolerance = 0.01

H = Orifice pressure differential that gives 0.75 cfm of air at 70 F and 29.92 inches of mercury, in H O.
Tolerance 0.15.

Date [illegible]
Calibrated by BD
Dry Gas Meter ______ Box ______
KK

DRY GAS METER CALIBRATION

BAROMETRIC PRESSURE, Pb = 29.98 in.Hg.

Orifice Manometer Setting, ΔH, in. H_2O		~~1~~.4	~~2~~.4	~~3~~.4	~~5~~.4	~~75~~.4	1.0
Gas Volume Wet Test Meter Vw ft^3	Final	5.000	5.000	5.000	5.000	5.000	
	Initial	0	0	0	0	0	
	Vw, ft^3	5.000	5.000	5.000	5.000	5.000	
Gas Volume Dry Test Meter Vd ft^3	Final	637.003	642.119	647.198	652.312	657.409	
	Initial	632.000	637.100	642.200	647.300	652.400	
	Vd ft^3	5.003	5.019	4.998	5.012	5.009	
TEMPERATURES — WET TEST METER tw	Initial	68	68	68	68	68	
	Middle	68	68	68	68	68	
	End	68	68	68	68	68	
	Average	68-528	68-528	68-528	68-528	68-528	
TEMPERATURES — DRY GAS METER tm	Initial	69	69	69	69	69	
	Middle	69	69	69	69	69	
	End	69	69	69	69	69	
	Average	69-529	69-529	69-529	69-529	69-529	
θ Time, Minutes							
$y = \dfrac{(Vw)(Pb)(tm)}{Vd\left(Pb + \dfrac{\Delta H}{13.6}\right)(tw)}$		1.000	1.003	.999	1.001	1.001	
$\Delta H@ = \dfrac{.0317\,(\Delta H)}{Pb\,(tm)}\left[\dfrac{(tw)\theta}{Vw}\right]^2$							
$Ko = \dfrac{Vw}{\theta}\sqrt{\dfrac{\left(Pb + \dfrac{\Delta H}{13.6}\right)(28.97)}{tm + 460\ (\quad H)}}$							

Averages:

y = 1.001

ΔH = ______

Ko = ______

Ko = Factor for HP-65

$$Pb + \frac{\Delta H}{13.6} = Pm$$

.97 - molecular weight of air

y = ratio of accuracy of wet test meter to dry test meter. Tolerance = 0.01

H = Orifice pressure differential that gives 0.75 cfm of air at 70 F and 29.92 inches of mercury, in H O. Tolerance 0.15.

DRY GAS METER CALIBRATION

Calibrated by
Dry Gas Meter HC Box

BAROMETRIC PRESSURE, Pb = 29.98 in.Hg.

Orifice Manometer Setting, ΔH, in. H_2O		~~1~~.5	~~2~~.5	~~3~~.5	.5	~~.75~~ .5	1.0
Gas Volume Wet Test Meter V_w ft^3	Final	5.000	5.000	5.000	5.000	5.000	
	Initial	0	0	0	0	0	
	V_w, ft^3	5.000	5.000	5.000	5.000	5.000	
Gas Volume Dry Test Meter V_d ft^3	Final	663.008	668.110	673.197	678.291	683.395	
	Initial	658.000	663.100	668.200	673.300	678.400	
	V_d ft^3	5.008	5.010	4.997	4.991	4.995	
TEMPERATURES — WET TEST METER t_w	Initial	69	69	69	69	69	
	Middle	69	69	69	69	69	
	End	69	69	69	69	69	
	Average	69-529	69-529	69-529	69-529	69-529	
TEMPERATURES — DRY GAS METER t_m	Initial	69	69	69	69	69	
	Middle	69	69	69	69	69	
	End	69	69	69	69	69	
	Average	69-529	69-529	69-529	69-529	69-529	
θ Time, Minutes							
$y = \dfrac{(V_w)(P_b)(t_m)}{V_d\,(P_b + \frac{\Delta H}{13.6})\,(t_w)}$		1.002	1.003	1.001	.999	1.000	
$\Delta H@ = \dfrac{.0317\,(\Delta H)}{P_b\,(t_m)}\left[\dfrac{(t_w)\theta}{V_w}\right]^2$							
$K_o = \dfrac{V_w}{\theta}\sqrt{\dfrac{(P_b + \frac{\Delta H}{13.6})(28.97)}{t_m + 460\;(\quad H)}}$							

Averages:

y = 1.001

ΔH@ = ______

Ko = ______

Ko = Factor for HP-65

$$P_b + \frac{\Delta H}{13.6} = P_m$$

.97 - molecular weight of air

= ratio of accuracy of wet test meter to dry test meter. Tolerance = 0.01

H = Orifice pressure differential that gives 0.75 cfm of air at 70 F and 29.92 inches of mercury, in H O. Tolerance 0.15.

DRY GAS METER CALIBRATION

Calibrated by ______
Dry Gas Meter 16 Box ______

BAROMETRIC PRESSURE, Pb = 29.98 in.Hg.

Orifice Manometer Setting, ΔH, in. H_2O		~~1~~.75	~~2~~.75	~~3~~.75	~~4~~.75	.75	1.0
Gas Volume Wet Test Meter V_w ft^3	Final	5.000	5.000	5.000	5.000	5.000	
	Initial	0	0	0	0	0	
	V_w, ft^3	5.000	5.000	5.000	5.000	5.000	
Gas Volume Dry Test Meter V_d ft^3	Final	689.020	694.113	699.199	704.289	709.291	
	Initial	684.000	689.100	694.200	699.300	704.300	
	V_d ft^3	5.020	5.013	4.999	4.989	4.991	
TEMPERATURES — WET TEST METER t_w	Initial	69	69	69	69	69	
	Middle	69	69	69	69	69	
	End	69	69	69	69	69	
	Average	69-529	69-529	69-529	69-529	69-529	
TEMPERATURES — DRY GAS METER t_m	Initial	69	69	69	69	69	
	Middle	69	69	69	69	69	
	End	69	69	69	69	69	
	Average	69-529	69-529	69-529	69-529	69-529	
θ Time, Minutes							
$y = \dfrac{(V_w)(P_b)(t_m)}{V_d\left(P_b + \dfrac{\Delta H}{13.6}\right)(t_w)}$		1.006	1.004	1.002	1.000	1.000	
$\Delta H@ = \dfrac{.0317\,(\Delta H)}{P_b\,(t_m)}\left[\dfrac{(t_w)\theta}{V_w}\right]^2$							
$K_o = \dfrac{V_w}{\theta}\sqrt{\dfrac{\left(P_b + \dfrac{\Delta H}{13.6}\right)(28.97)}{t_m + 460\,(\quad H)}}$							

Averages:

y = 1.002

ΔH = ______

Ko = ______

Ko = Factor for HP-65

$$P_b + \frac{\Delta H}{13.6} = P_m$$

.97 - molecular weight of air

= ratio of accuracy of wet test meter to dry test meter. Tolerance = 0.01

H = Orifice pressure differential that gives 0.75 cfm of air at 70 F and 29.92 inches of mercury, in H O. Tolerance 0.15.

Wet Test Meter Serial Number AA455 Date 12/11/92

Range of Wet Test Meter Flow Reat 0 – 0.4 cuft/min

Volume of Test Flask Vs= 2 l (0.5284 cu. ft)

Satisfactory Leak Check? yes

Ambient Temperature of Equilibrate Liquid in Wet Test Meter and Reservoir 68°F

Test Number	Manometer Reading, a mm H20	Final Volume (Vf), l	Initial Volume (Vi), l	Total Volume (Vm), b l	Flask Volume (Vs), l	Percent Error, c %
1	0.3	0.5259	0 (reset)	0.5259	0.5284	0.47
2	0.3	0.5261	0	0.5261	0.5284	0.435
3	0.3	0.5247	0	0.5247	0.5284	0.70

a – Must be less than 10 mm H20 (0.4 "H20)

Calculations:

b – Vm – Vf – Vi

$\bar{X}_{1-3} = 0.535$

c – % error = 100(Vm – Vs)/Vs = ________ (±1%)

WET TEST METER CALIBRATION LOG

SO2 ROTAMETER CALIBRATION

DATE: 4/23/93 BY: BD LAST CAL : 10/24/92 BY: BD

MANUFACTURER: COLE PARMER SN: ~~EEMC #2~~ 061645
BUBBLE TUBE MAKE & ID: SKC 125/250 EEMC #1 COLE-PARMER

BAROMETRIC PRESSURE: 30.00 " Hg TEMPERATURE: 70 F
CALIBRATION AT: EEMC KENT, WASHINGTON LAB

SPAN #	VOLUME	~~MIN~~ or SEC	RTMTR	VOLUME cc/min
1	125	156.26	50	VOLUME / AVERAGE X 60 =
		156.08		
		156.19		
		156.20		
		156.14		125 / 156.1638 X 60=
		155.89		
		156.30		
		156.25		
	TOTAL	1249.31		48.0265
	AVERAGE	156.1638		cc/min
2	125	75.30	100	VOLUME / AVERAGE X 60 =
		74.86		
		74.90		
		75.16		
		75.10		125 / 75.11 X 60=
		75.13		
		74.98		
		75.15		
	TOTAL	75.11		99.8535
	AVERAGE			cc/min
3	125	48.46	150	VOLUME / AVERAGE X 60 =
		49.50		
		49.46		
		50.01		
		50.07		125 / 49.6825 X 60=
		49.63		
		49.75		
		50.08		
	TOTAL	397.4600		150.9586
	AVERAGE	49.6825		cc/min

SETTING	CC/MIN
0	0
50	48.0265
100	99.8535
150	150.9586

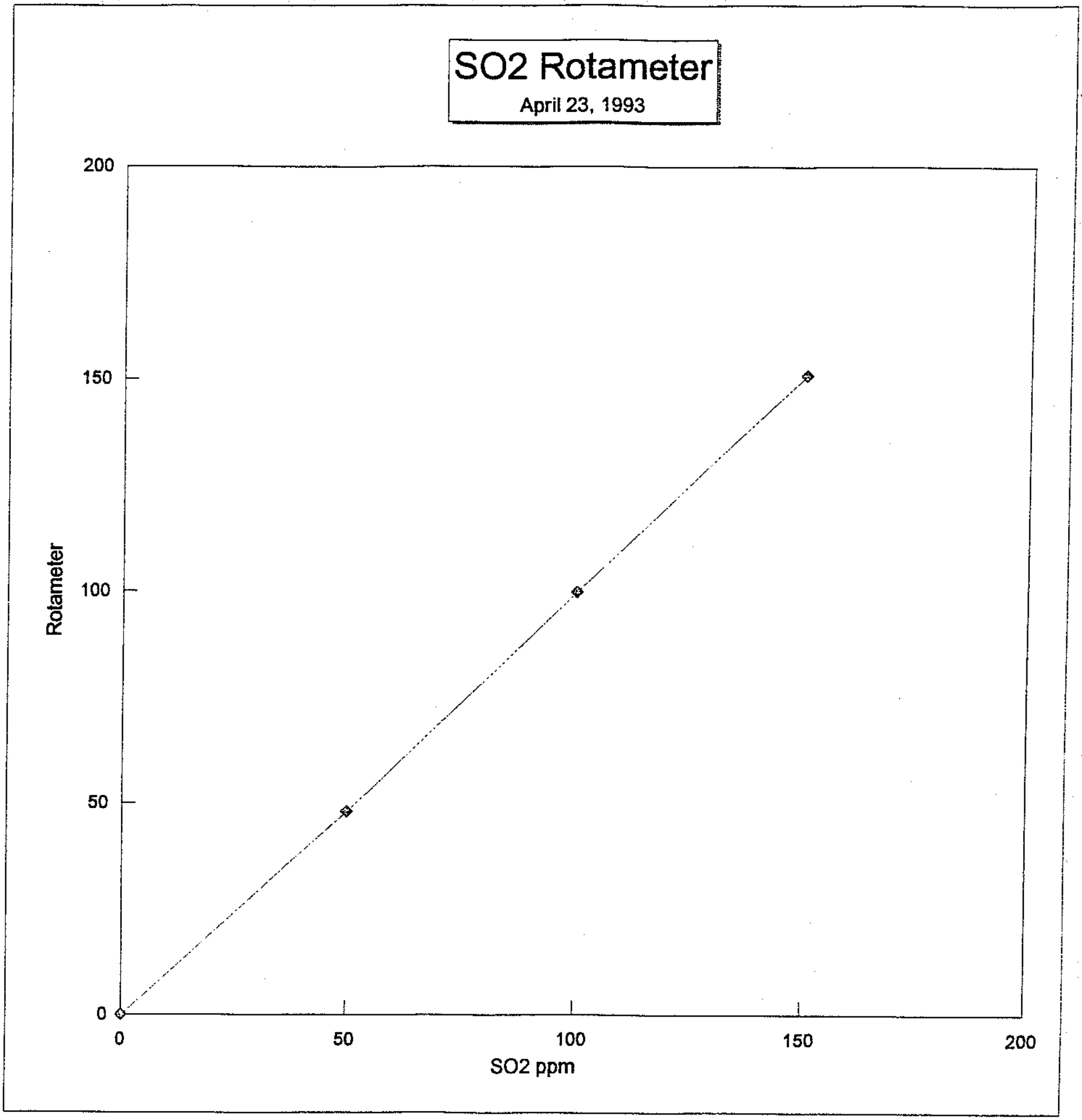
SLOPE = ____

Y-INT = ____

r = ____

r^2 = ____

ROTAMETER SETTING FOR 100 cc/min : 100



Regression Output:

Constant	9	-0.99577
Std Err of Y Est		1.302315
R Squared		0.999734
No. of Observations		4
Degrees of Freedom		2

X Coefficient(s)	1.009406
Std Err of Coef.	0.011648

DATE 12/15/92

CEM Gas Train Response Time

Elapsed time	CO2 Conc. (v.)	CO2 Conc. (v.)	CO2 Conc. (v.)	O2 Conc. (v.)	O2 Conc. (v.)	O2 Conc. (v.)	CO Conc. (v.)	CO Conc. (v.)	CO Conc. (v.)
00 sec	,515	,517	,514	.492	,492	.492	,486	,484	,484
15	,467	,457	,453	,532	,551	,546	,431	,426	,421
30	,029	,032	,031	,787	,782	,782	,028	,027	,029
45	,012	,014	,012	,831	,829	,828	,010	,009	,009
60	,002	,003	,003	,831	,832	,830	,003	,002	,001
75	,000	,001	,001	,831	,833	,832	,000	,000	,000
90	,000	,000	,000	,831	,833	,832	,000	,000	,000
105	,000	,000	,000	,831	,832	,833	,000	,000	,000
120	,000	,000	,000	,831	,832	,833	,000	,000	,000
135									
150									
165									
180									
Initial Response	~10	~10	~10	~10	~10	~10	~10	~10	~10
95 % Response	~35	~35	~35	~36	~37	~36	~36	~36	~36
Flow rate	1.5 ScFH								

Comments:

DATE 12/15/92

Tracer Gas Train Response Time

Elapsed time	SO2 Conc. (v.)	SO2 Conc. (v.)	SO2 Conc. (v.)	SO2 Conc. (v.)	SO2 Conc. (v.)	SO2 Conc. (v.)	SO2 Conc. (v.)	SO2 Conc. (v.)	SO2 Conc. (v.)
00 sec	.501	.501	.501						
15	.188	.194	.188						
30	.015	.016	.016						
45	.008	.008	.009						
60	.005	.005	.006						
75	.003	.003	.004						
90	.003	.003	.002						
105	.002	.002	.002						
120	.002	.002	.002						
135									
150									
165									
180									
Initial Response	~11	~11	~11						
95 % Response	~38	~38	~38						
Flow rate	1.5SCFH	→	→						

Comments:

Orsat Analysis Data Sheet Date: 5/28/93

Gas	1	2	3	AVE	CONC	TANK ID
CO	8.4	8.5	8.5	8.47	8.50	Liquid Air
CO2	21.2	21.1	21.1	21.13	21.25	CC6084100
O2	21.2	21.2	21.1	21.17	21.24	11/19/90
CO	2.4	2.5	2.5	2.47	2.49	Liquid Air
CO2	6.2	6.3	6.2	6.23	6.25	T201070
O2	6.3	6.3	6.2	6.27	6.25	11/19/90
CO	0	0	0	0	0	Liquid Air
CO2	0	0	0	0	0	T132257
O2	0	0	0	0	0	12/7/92
CO	4.9	5.1	5.0	5.00	5.01	MATHESON
CO2	12.5	12.6	12.6	12.56	12.6	AS40875
O2	12.7	12.7	12.8	12.73	12.8	1/11/93
CO	0	0	0	0	0	LIQUID AIR
CO2	0	0	0	0	0	T188172
O2	0	0	0	0	0	1/28/93
CO						
CO2						
O2						
CO						
CO2						
O2						
CO						
CO2						
O2						

FX

EEMC

CO2 ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Site: EEMC KENT, WA Date: 6/21/93

Analyzer: Make: HORIBA Model: PIR 2000 SN: 407069

Calibration by: D. Kingman

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ______
BP: 30.00 Instrument ID: PRINCO
Temp: 68 Instrument ID: TR

Analyzer last calibrated: 6/11/93 By: D. Kingman

Cylinders:

1. #T132257 Concentration: 00.0 % CO2 Cyl. Press.: 2000 PSI
   Certified by: LIQUID AIR Date: 6/10/93

2. #AS40875 Concentration 12.6 % CO2 Cyl. Press.: 500 PSI
   Certified by: MATHESON Date: 1/11/93

3. #CC1084100 Concentration 21.25 % CO2 Cyl. Press.: 1100 PSI
   Certified by: LIQUID AIR Date: 11/19/90

4. #T201070 Concentration 6.25 % CO2 Cyl. Press.: 1300 PSI
   Certified by: LIQUID AIR Date 11/19/90

Analyzer: Calibrated Range: 0-25.0 % Output: 0-1.0 V.
Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ______

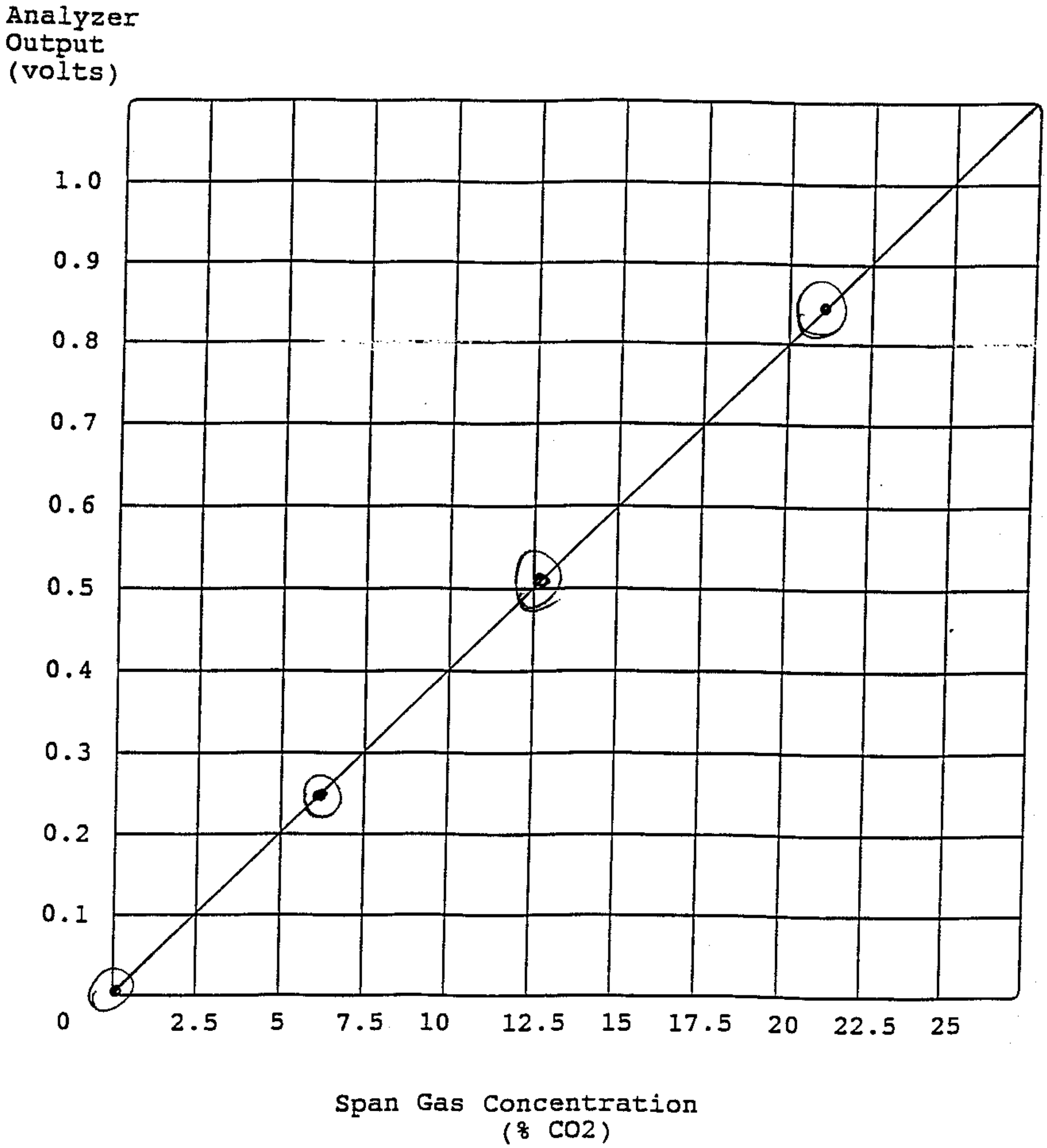
Calibration Results

Point	Cyl.	%	Expected		Actual		Adj.		%	Potentiometer	
#	#	CO2	Meter	DVM	Meter	DVM	Meter	DVM	Dif.	Unadj.	Adj.
1	1	00.0	00.0	.000	00.0	.000	—	—		7.79	—
2	2	12.6	50.4	.504	49.6	.496	50.4	.504		2.02	2.35
3	3	21.25	85.0	.850	85.6	.856	—	—		—	—
4	4	6.25	25.0	.250	25.3	.253	—	—		—	—
5	1	00.0	00.0	.000	00.0	.000	—	—		—	—

Comments: .5: 12 414

Linear Regression Results:

Y = MX + B
Slope (M) = 0.0402265
Y Intercept (B) = -0.0000204
Correlation Coefficient (r) = 0.9999849
r^2 = 0.9999699



EPA Span Value = +/- 2.0% of 25% CO2 = +/- .5%
Cal Volts = Cal Volt Conc - Std Conc = +/- Conc Diff = +/-Δ%

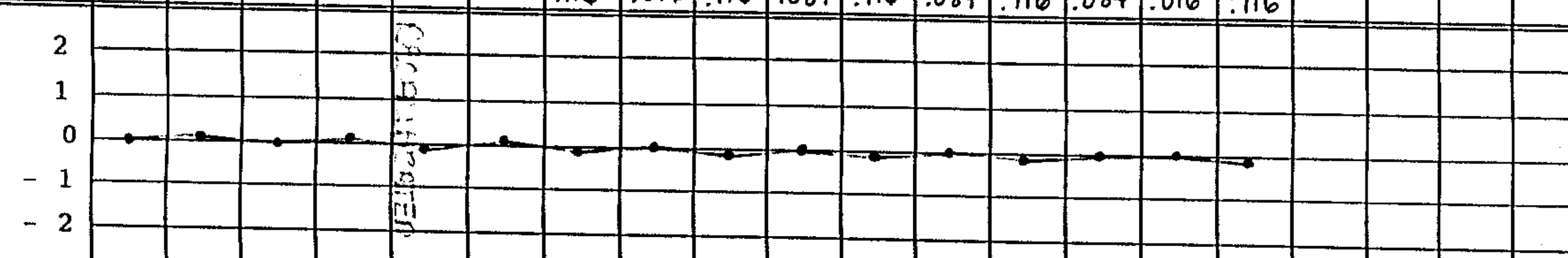
.856 = 21.400 - 21.25 = .150 = .706

.253 = 6.325 - 6.25 = .075 = 1.200

SITE	EESPC	LOCATION	KENT, WA
OPERATORS	BILL NOWAK/CINDY KINGMAN	GAS	CO2
INSTRUMENT/SERIAL NO	HORIBA PIR-2000 407069	RANGE	0.0 - 25.0%
REFERENCE MATERIAL OR METHOD	ZERO AND SPANS WITH CERTIFIED CYLINDER GAS		

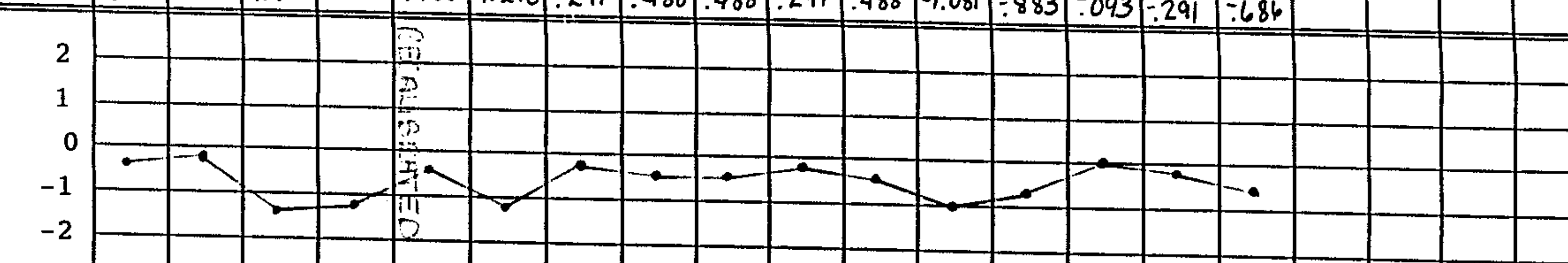
DATE 1993	6/17	6/17	6/18	6/18	6/23	6/23	6/24	6/24	6/28	6/28	6/29	6/29	6/30	6/30	7/1	7/1				
ZERO RESPONSE	.006	.031	.006	.031	-.029	.046	-.029	-.004	-.029	.021	-.029	.021	-.029	.021	-.004	-.029				
ZERO ACTUAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% DIFFERENCE	.024	.123	.024	.123	-.116	.183	-.116	-.016	-.116	.084	-.116	.084	-.116	.084	-.016	-.116				

ZERO



SPAN RESPONSE	12.545	12.570	12.421	12.446	12.538	12.439	12.563	12.538	12.538	12.563	12.538	12.464	12.489	12.588	12.563	12.514				
SPAN ACTUAL	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6				
% DIFFERENCE	-.434	-.237	-1.420	-1.223	-.488	-1.278	-.291	-.488	-.488	-.291	-.488	-1.081	-.883	-.093	-.291	-.684				

SPAN



COMMENTS RUN NUMBER	PRE 5	POST 5	PRE 1	POST 1	PRE 1	POST 1	PRE 2	POST 2	PRE 3	POST 3	PRE 4	POST 4	PRE 5	POST 5	PRE 6	POST 6	PRE	POST	PRE	POST
UNIT	S-12	HEATILATOR	S-12 I	HEATILATOR INSERT	HT2000	FX DROLET	HT2000	FX DROLET	HT2000	FX DROLET	HT2000	FX DROLET	HT2000	FX DROLET	HT2000	FX DROLET				

CO2

FX

EEMC

O2 ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Site: EEMC KENT, WA Date: 6/21/93

Analyzer: Make: Teledyne Model: 320 A SN: 37400

Calibration by: D. Kingman

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ____
BP: 30.00 Instrument ID: PRINCO
Temp: 68 Instrument ID: TR

Analyzer last calibrated: 6/11/93 By: D. Kingman

Cylinders:
1. #T132257 Concentration: 00.0 % O2 Cyl. Press.: 2000 PSI
Certified by: LIQUID AIR Date: 6/10/93

2. #AS40875 Concentration 12.8 % O2 Cyl. Press.: 500 PSI
Certified by: MATHESON Date: 1/11/93

3. #CCC6084100 Concentration 21.24 % O2 Cyl. Press.: 1100 PSI
Certified by: LIQUID AIR Date: 11/19/90

4. #T201070 Concentration 6.25 % O2 Cyl. Press.: 1300 PSI
Certified by: LIQUID AIR Date 11/8/90

Analyzer: Calibrated Range: 0-25.0 % Output: 0-1.0 V.
Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ____

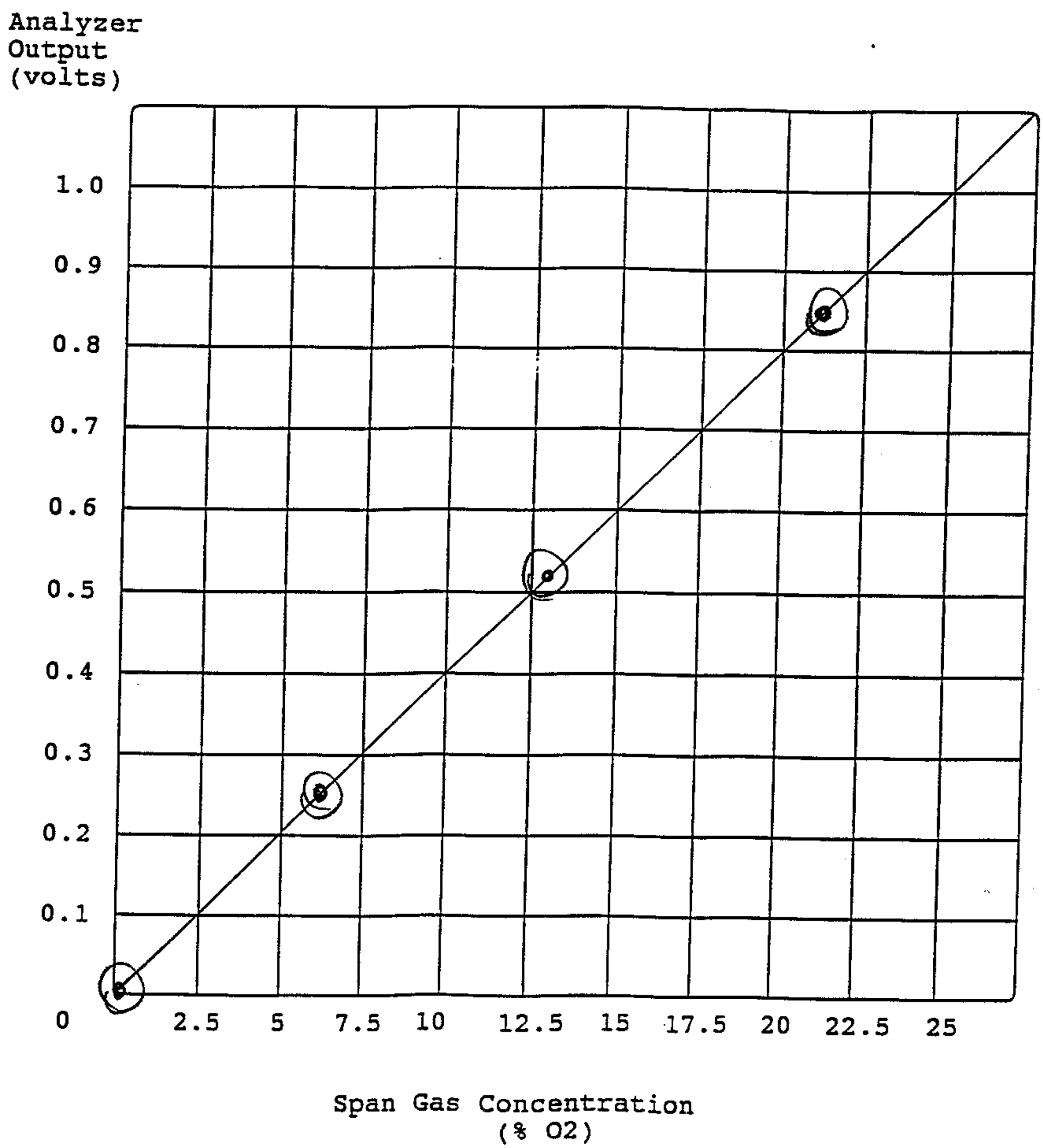
Calibration Results

Point #	Cyl. #	% O2	Expected Meter	Expected DVM	Actual Meter	Actual DVM	Adj. Meter	Adj. DVM	% Dif.	Potentiometer Unadj.	Potentiometer Adj.
1	1	00.0	00.0	.000	00.0	.000	—	—		—	—
2	2	12.8	12.8	.512	12.8	.513	12.8	.512		—	—
3	3	21.24	21.2	.850	21.2	.857	—	—		—	—
4	4	6.25	6.3	.250	6.4	.258	—	—		—	—
5	1	00.0	00.0	.000	00.0	.000	—	—		—	—

Comments: .5= 12.391

Linear Regression Results:

Y = MX + B
Slope (M) = 0.0402097
Y Intercept (B) = 0.0017375
Correlation Coefficient (r) = 0.9999395
r^2 = 0.9998790



EPA Span Value = +/- 2.0% of 25% O2 = +/- .5%
Cal Volts = Cal Volt Conc - Std Conc = +/- Conc Diff = +/-Δ%

.857 = 21.425 - 21.24 = .185 = .871

.258 = 6.450 - 6.25 = .200 = 3.200

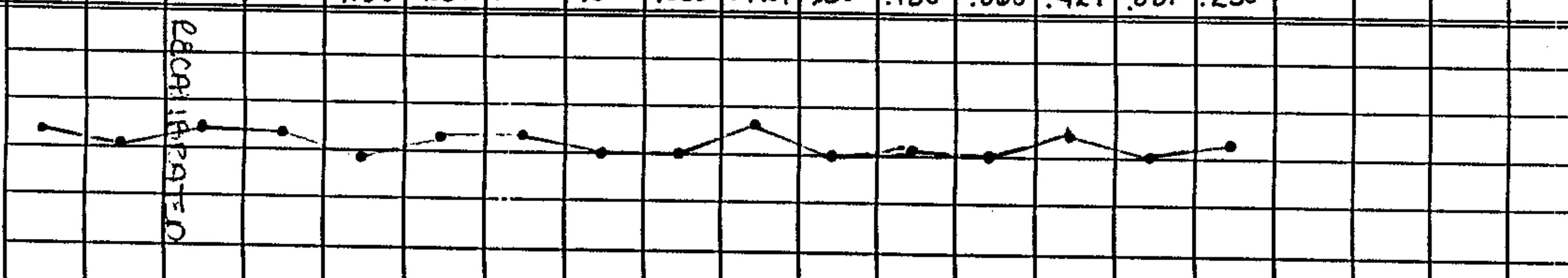
SITE: EESPC | LOCATION: KENT, WA | OPERATORS: BILL NOWAK/CINDY KINGMAN

GAS: 02 | INSTRUMENT/SERIAL NO: TELEDYNE 320A 37465 | RANGE: 0.0 - 25.0%

REFERENCE MATERIAL OR METHOD: ZERO AND SPANS WITH CERTIFIED CYLINDER GAS

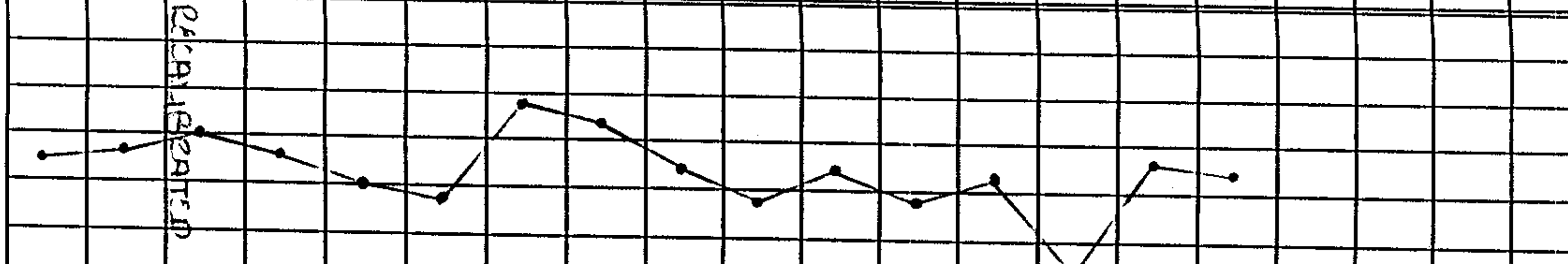
DATE 1993	6/17	6/17	6/18	6/18	6/23	6/23	6/24	6/24	6/28	6/28	6/29	6/29	6/30	6/30	7/1	7/1				
ZERO RESPONSE	.077	.028	.102	.077	-.042	.057	.057	-.017	-.017	.182	-.017	.033	-.017	.107	.008	.057				
ZERO ACTUAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% DIFFERENCE	.310	.111	.409	.310	-.168	.230	.230	-.068	-.068	.727	-.068	.130	-.068	.429	.031	.230				

ZERO



SPAN RESPONSE	12.726	12.751	12.801	12.751	12.665	12.640	12.988	12.839	12.715	12.640	12.715	12.640	12.690	12.441	12.739	12.715
SPAN ACTUAL	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
% DIFFERENCE	-.576	-.382	.005	-.382	-1.056	-1.250	.845	.304	-.667	-1.250	-.667	-1.250	-.862	-2.804	-.473	-.667

SPAN



COMMENTS RUN NUMBER	PRE 5	POST 5	PRE 1	POST 1	PRE 1	POST 1	PRE 2	POST 2	PRE 3	POST 3	PRE 4	POST 4	PRE 5	POST 5	PRE 6	POST 6	PRE	POST	PRE	POST
UNIT	S-12	HEATILATOR	S-12	HEATILATOR INSERT	HT 2000	FX DROLET	HT 2000	FX DROLET	HT 2000	FX DROLET	HT 2000	FX DROLET	HT 2000	FX DROLET	HT 2000	FX DROLET				

FX

EEMC

CO ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Site: EEMC KENT, WA Date: 6/21/93

Analyzer: Make: HORIBA Model: PIR 2000 SN: 408005

Calibration by: D. Kingman

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ____
BP: 30.00 Instrument ID: PRINCO
Temp: 68 Instrument ID: TR

Analyzer last calibrated: 6/11/93 By: D. Kingman

Cylinders:
1. #T132257 Concentration: 00.0 % CO Cyl. Press.: 2000 PSI
Certified by: LIQUID AIR Date: 6/10/93

2. #AS40875 Concentration 5.01 % CO Cyl. Press.: 500 PSI
Certified by: MATHESON Date: 1/11/93

3. #CC6084100 Concentration 8.50 % CO Cyl. Press.: 1100 PSI
Certified by: LIQUID AIR Date: 11/19/90

4. #T201070 Concentration 2.49 % CO Cyl. Press.: 1300 PSI
Certified by: LIQUID AIR Date 11/19/90

Analyzer: Calibrated Range: 0-10.0 % Output: 0-1.0 V.
Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ____

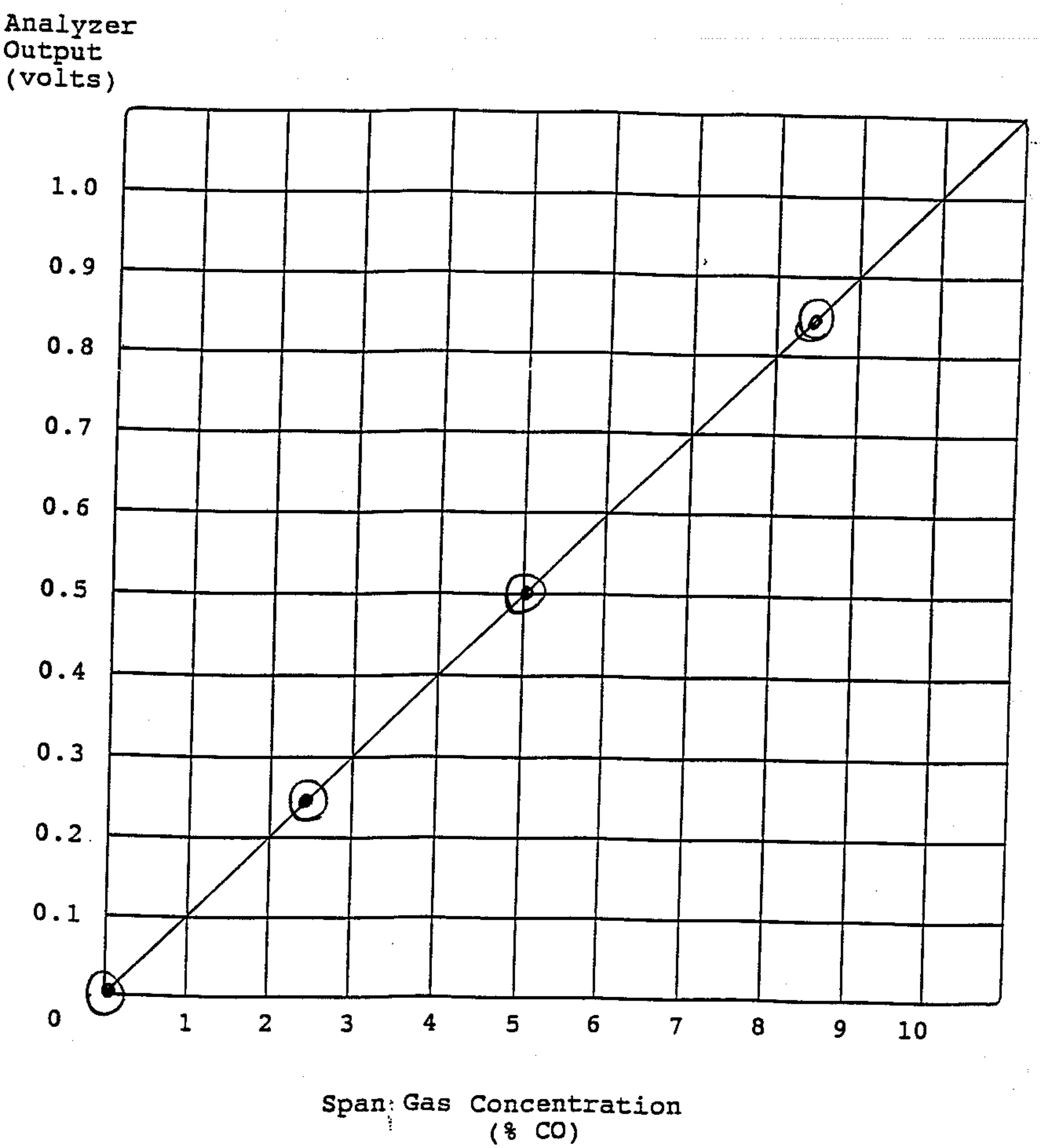
Calibration Results

Point	Cyl.	%	Expected		Actual		Adj.		%	Potentiometer	
#	#	CO	Meter	DVM	Meter	DVM	Meter	DVM	Dif.	Unadj.	Adj.
1	1	00.0	00.0	.000	00.0	.000	—	—		3.00	—
2	2	5.01	50.1	.501	49.7	.497	50.1	.501		2.75	2.98
3	3	8.50	85.0	.850	85.0	.850	—	—		—	—
4	4	2.49	24.9	.249	24.9	.249	—	—		—	—
5	1	00.0	00.0	.000	00.0	.000	—	—		—	—

Comments: .5 = 5.000

Linear Regression Results:

Y = MX + B
Slope (M) = 0.1000000
Y Intercept (B) = 0.0000000
Correlation Coefficient (r) = 1.0000000
r^2 = 1.0000000

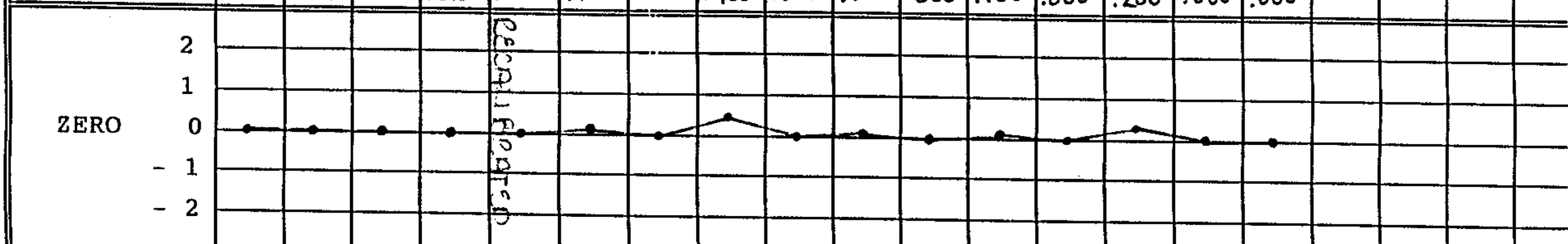


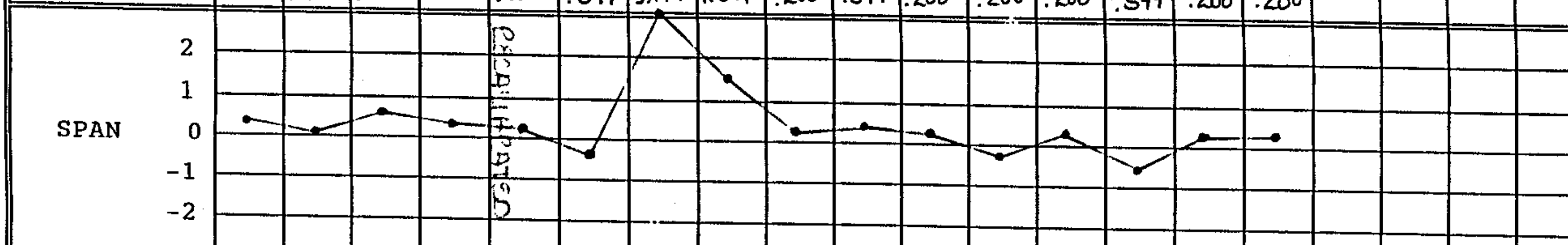
EPA Span Value = +/- 2.0% of 10% CO = +/- .2%
Cal Volts = Cal Volt Conc - Std Conc = +/- Conc Diff = +/-△%

.850 = 8.500 - 8.50 = .000 = .000
.249 = 2.490 - 2.49 = .000 = .000

SITE	EESPC	LOCATION	KENT, WA	OPERATORS	BILL NOWAK/CINDY KINGMAN
GAS	CO	INSTRUMENT/SERIAL NO	HORIBA PIR-2000 408005	RANGE	0.0 - 10.0 %
REFERENCE MATERIAL OR METHOD		ZERO AND SPANS WITH CERTIFIED CYLINDER GAS			

DATE 1993	6/17	6/17	6/18	6/18	6/23	6/23	6/24	6/24	6/28	6/28	6/29	6/29	6/30	6/30	7/1	7/1				
ZERO RESPONSE	.002	.002	.002	.002	.000	.010	.000	.040	.000	.010	.000	.010	.000	.020	.006	.000				
ZERO ACTUAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% DIFFERENCE	.021	.021	.021	.021	.000	.100	.000	.400	.000	.100	.000	.100	.000	.200	.000	.000				
ZERO (2, 1, 0, -1, -2)					RECALIBRATED															
SPAN RESPONSE	5.026	5.016	5.046	5.026	5.020	4.990	5.17	5.090	5.020	5.030	5.020	5.000	5.020	4.98	5.020	5.020				
SPAN ACTUAL	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01				
% DIFFERENCE	.326	.127	.725	.326	.200	-.399	3.194	1.597	.200	.399	.200	-.200	.200	-.599	.200	.200				
SPAN (2, 1, 0, -1, -2)					RECALIBRATED															
COMMENTS RUN NUMBER	PRE 5	POST 5	PRE 1	POST 1	PRE 1	POST 1	PRE 2	POST 2	PRE 3	POST 3	PRE 4	POST 4	PRE 5	POST 5	PRE 6	POST 6	PRE	POST	PRE	POST
UNIT	S-12	HEATILATOR	S-12	HEATILATOR INSERT	HT2000	FX DEOLET	HT2000	FX DEOLET	HT2000	FX DEOLET	HT2000	FX DEOLET	HT2000	FX DEOLET	HT2000	FX DEOLET				





CO

FX

EEMC

SO2 ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Site: EEMC KENT, WA Date: 6/21/93

Analyzer: Make: HORIBA Model: PIR2000 SN: 403019

Calibration by: D Kingman

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ____
BP: 30.00 Instrument ID: PRINCO
Temp: 68 Instrument ID: TR

Analyzer last calibrated: 6/11/93 By: D. Kingman

Cylinders:
1. #T132257 Concentration: 00.0 PPM SO2 Cyl. Press.: 2000 PSI
Certified by: LIQUID AIR Date: 6/10/93

2. #CC79076 Concentration 1268 PPM SO2 Cyl. Press.: 500 PSI
Certified by: LIQUID AIR Date: 2/26/93

3. #2065 Concentration 2208 PPM SO2 Cyl. Press.: 1800 PSI
Certified by: LIQUID AIR Date: 1/28/93

4. #CC97188 Concentration 497 PPM SO2 Cyl. Press.: 1800 PSI
Certified by: LIQUID AIR Date 1/28/93

Analyzer: Calibrated Range: 0-2500 PPM Output: 0-1.0 V.
Flow: 1.5 SCFH Measured by: Rotameter: X Mass Flowmeter: ____

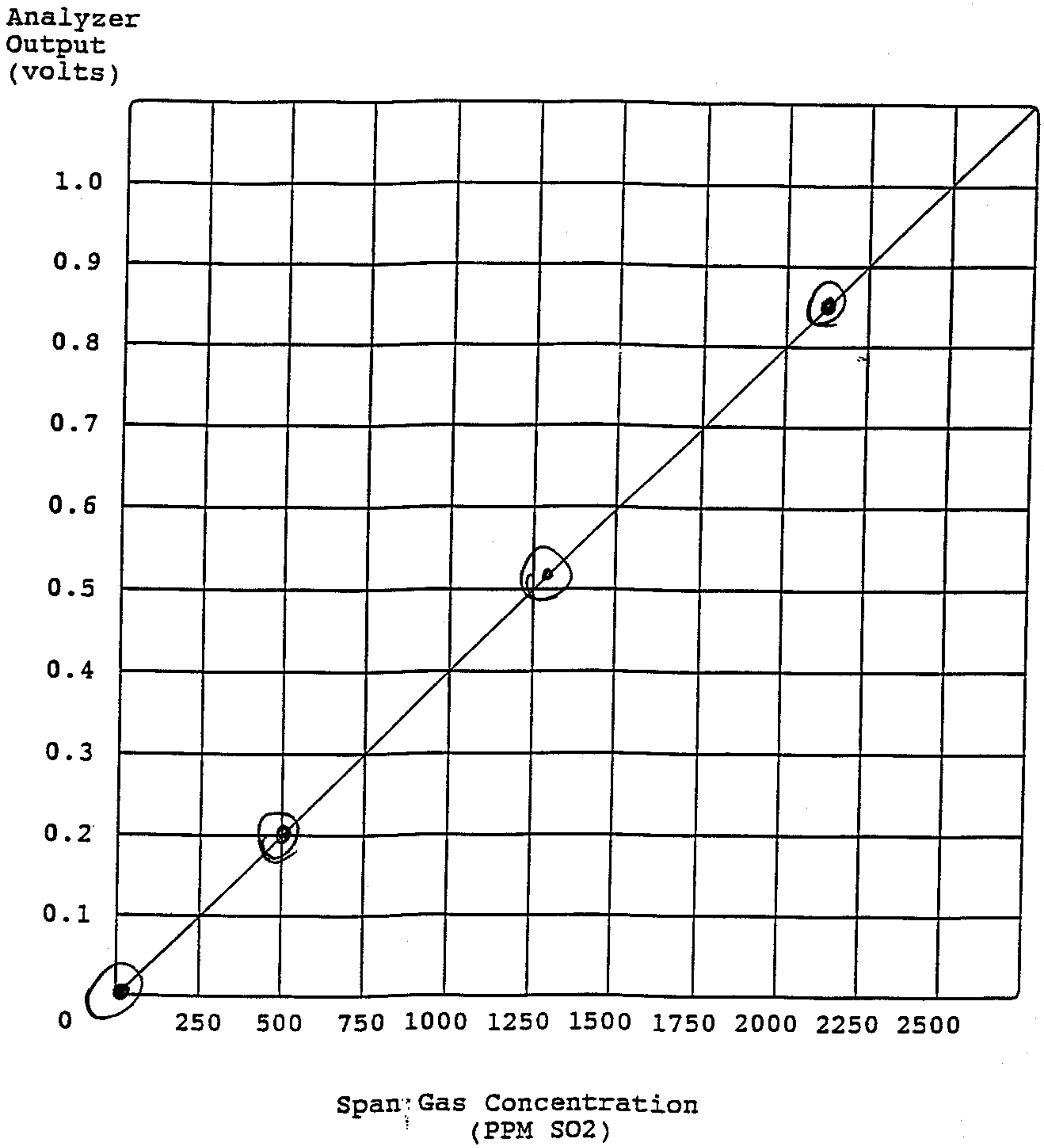
Calibration Results

Point	Cyl.	PPM	Expected		Actual		Adj.		%	Potentiometer	
#	#	SO2	Meter	DVM	Meter	DVM	Meter	DVM	Dif.	Unadj.	Adj.
1	1	00.0	00.0	.000	00.0	.000	—	—		1.80	—
2	2	1268	50.7	.507	50.7	.507	—	—		6.95	—
3	3	2208	88.3	.883	87.8	.878	—	—		—	—
4	4	497	19.9	.199	20.1	.201	—	—		—	—
5	1	00.0	00.0	.000	00.0	.000	—	—		—	—

Comments: .5= 1253.740

Linear Regression Results:

Y = MX + B
Slope (M) = 0.0018628
Y Intercept (B) = 0.0003973
Correlation Coefficient (r) = 0.9999894
r^2 = 0.9999787



EPA Span Value = +/- 2.0% of 2500 PPM SO2 = +/- 50 PPM
Cal Volts = Cal Volt Conc - Std Conc = +/- Conc Diff = +/-Δ%

.878 = 2195.866 - 2208 = -12.134 = -.550

.201 = 502.698 - 497 = 5.698 = 1.147

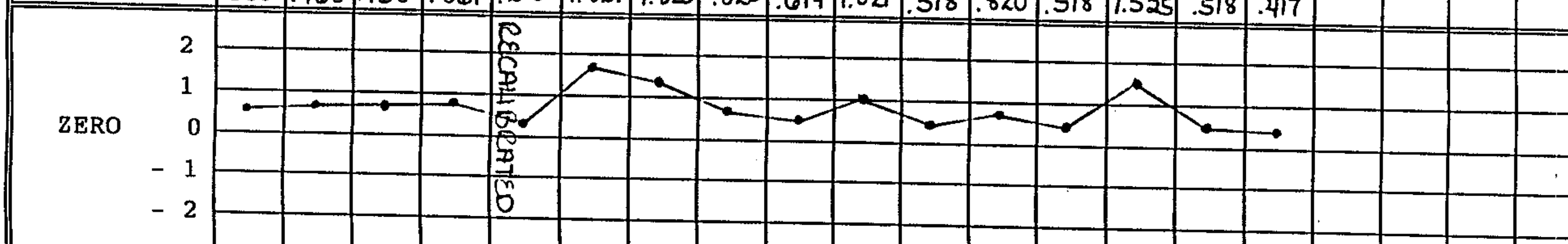
SITE: EESPC   LOCATION: KENT, WA   OPERATORS: BILL NOWAK/CINDY KINGMAN

GAS: SO2   INSTRUMENT/SERIAL NO: HORIBA PIR-2000 403019   RANGE: 0.0 - 2500 PPM

REFERENCE MATERIAL OR METHOD: ZERO AND SPANS WITH CERTIFIED CYLINDER GAS

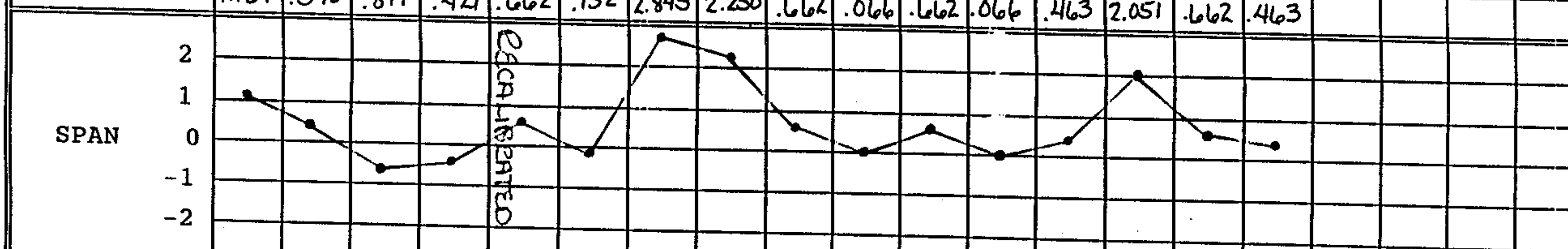
DATE 1993	6/17	6/17	6/18	6/18	6/23	6/23	6/24	6/24	6/28	6/28	6/29	6/29	6/30	6/30	7/1	7/1				
ZERO RESPONSE	16.698	19.210	19.210	21.722	5.400	45.669	38.085	20.501	15.467	25.535	12.951	20.501	12.951	38.119	12.951	10.434				
ZERO ACTUAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% DIFFERENCE	.668	.768	.768	.869	.216	1.827	1.323	.820	.619	1.021	.518	.820	.518	1.525	.518	.417				

ZERO



SPAN RESPONSE	1283	1275	1258	1263	1274	1266	1304	1297	1276	1269	1276	1269	1274	1294	1276	1274				
SPAN ACTUAL	1268	1268	1268	1268	1268	1268	1268	1268	1268	1268	1268	1268	1268	1268	1268	1268				
% DIFFERENCE	1.164	.570	-.817	-.421	.662	-.132	2.845	2.250	.662	.066	.662	.066	.463	2.051	.662	.463				

SPAN



COMMENTS RUN NUMBER	PRE 5	POST 5	PRE 1	POST 1	PRE 1	POST 1	PRE 2	POST 2	PRE 3	POST 3	PRE 4	POST 4	PRE 5	POST 5	PRE 6	POST 6	PRE	POST	PRE	POST
UNIT	S-12	HEATILATOR	S-12	HEATILATOR INSERT	HT2000	FX DROLET	HT2000	FX DROLET	HT2000	FX DROLET	HT2000	FX DROLET	HT2000	FX DROLET	HT2000	FX DROLET				

ANALYSIS OF CALIBRATION GAS MIXTURES

TEST DATE: 6/21/93 SOURCE TESTED: SO2

REFERENCE METHOD USED: EPA M6

SPECIES	CALIBRATION GAS MIX		VENDOR TANK ID
	SAMPLE #1	1292	CC 79076
SO2	SAMPLE #2	1354	VENDOR TANK VALUE
	SAMPLE #3	1251	1268
	AVERAGE	1299	

SPECIES	CALIBRATION GAS MIX		VENDOR TANK ID
	SAMPLE #1	2231	2065
SO2	SAMPLE #2	2180	VENDOR TANK VALUE
	SAMPLE #3	2227	2208
	AVERAGE	2213	

SPECIES	CALIBRATION GAS MIX		VENDOR TANK ID
	SAMPLE #1	521	CC 97188
SO2	SAMPLE #2	518	VENDOR TANK VALUE
	SAMPLE #3	482	497
	AVERAGE	507	

SPECIES	CALIBRATION GAS MIX		VENDOR TANK ID
	SAMPLE #1		
	SAMPLE #2		VENDOR TANK VALUE
	SAMPLE #3		
	AVERAGE		

SPECIES	CALIBRATION GAS MIX		VENDOR TANK ID
	SAMPLE #1		
	SAMPLE #2		VENDOR TANK VALUE
	SAMPLE #3		
	AVERAGE		

Triplicate analyses of the gas mixtures shall be performed within 30 days prior to use, using EPA Method #6. Each test must be within 20% of the three test mean.

SO2 TANK CALCULATIONS

Date: 6/21/93 Tank ID: CC79076
1268 ppm

Test #1

Gas Volume - Dry Standard Conditions

$$Vm(std) = \frac{VmKY * (Pb + \frac{\Delta H}{13.6})}{Tm}$$

$$Vm(std) = \frac{(1.55\ cf)17.64(1.028\ mcf)(30.10\ Hg + \frac{.02\ \Delta H}{13.6})}{(530\ Tm)} = 1.596\ \text{dscf}$$

Concentration SO2 - ppm v/v dry

Normality (N) = 0.0101 ml Ba ++ = 480

$$\text{ppm v/v dry} = \frac{(mlBa++)(32)(N)(13.29*10^{-6})(10^{6})}{Vm(std)}$$

$$\text{ppm v/v dry} = \frac{(480)(32)(0.0101)(13.29*10^{-6})(10^{6})}{1.596} = 1292\ ppm$$

Test #2

Gas Volume - Dry Standard Conditions

$$Vm(std) = \frac{VmKY * (Pb + \frac{\Delta H}{13.6})}{Tm}$$

$$Vm(std) = \frac{(1.5\ cf)17.64(1.028\ mcf)(30.10\ Hg + \frac{.02\ \Delta H}{13.6})}{(532\ Tm)} = 1.539\ \text{dscf}$$

Concentration SO2 - ppm v/v dry

Normality (N) = 0.0101 ml Ba ++ = 485

$$\text{ppm v/v dry} = \frac{(mlBa++)(32)(N)(13.29*10^{-6})(10^{6})}{Vm(std)}$$

$$\text{ppm v/v dry} = \frac{(485)(32)(0.0101)(13.29*10^{-6})(10^{6})}{1.539} = 1354\ ppm$$

Test #3

Gas Volume - Dry Standard Conditions

$$Vm(std) = \frac{VmKY * (Pb + \frac{\Delta H}{13.6})}{Tm}$$

$$Vm(std) = \frac{(1.6\ cf)17.64(1.028\ mcf)(30.10\ Hg + \frac{.02\ \Delta H}{13.6})}{(532\ Tm)} = 1.642\ \text{dscf}$$

Concentration SO2 - ppm v/v dry

Normality (N) = 0.0101 ml Ba ++ = 478

$$\text{ppm v/v dry} = \frac{(mlBa++)(32)(N)(13.29*10^{-6})(10^{6})}{Vm(std)}$$

$$\text{ppm v/v dry} = \frac{(478)(32)(0.0101)(13.29*10^{-6})(10^{6})}{1.642} = 1251\ ppm$$

ALPHAGAZ
DIVISION OF LIQUID AIR CORPORATION

15-Feb-93
PACIFIC RIM OXYGEN

P.O. NO.: 17047
TUKWILA, WA

CERTIFICATION OF CYLINDER # CC-79076

COMPONENT:	MEAN CONCENTRATION:
SULFUR DIOXIDE	1268 +/- 19 ppm
NITROGEN	BALANCE

Cylinder pressure: 2000 psi
Expiration date: 17-Aug-94

This mixture was prepared and analyzed following EPA Revised Traceability Protocol No.1, Section 3.0.4, per Procedure G1. The concentration of the Sulfur Dioxide was determined by direct comparison with NBS SRM 1662a, Sample No.:93-9-D, S/N FF-28200, 1013 +/- 10 ppm Sulfur Dioxide in Nitrogen, dated March 19, 1991. The analysis was performed on Horiba Gas Emission Analyzer System, Model No. CMA-331A, and S/N 244/701/826. The last multipoint calibration was done on January 11, 1993.

Authorized signature

2445 South Street • P.O. Box 5548 • Long Beach, CA 90805 • Phone (310) 492-5300 • Fax (310) 492-5395

SO2 TANK CALCULATIONS

Date: 6/21/93 Tank ID: 2065
2208

Test #1

Gas Volume - Dry Standard Conditions

$$Vm(std) = \frac{VmKY * (Pb + \frac{\Delta H}{13.6})}{Tm}$$

$$Vm(std) = \frac{(1.55\ cf)17.64(1.028\ mcf)(30.12\ Hg + \frac{.02\ \Delta H}{13.6})}{(533\ Tm)} = 1.588\ \text{dscf}$$

Concentration SO2 - ppm v/v dry

Normality (N) = 0.0101 ml Ba ++ = 825

$$\text{ppm v/v dry} = \frac{(mlBa{++})(32)(N)(13.29*10^{-6})(10^6)}{Vm(std)}$$

$$\text{ppm v/v dry} = \frac{(825)(32)(0.0101)(13.29*10^{-6})(10^6)}{1.588} = 2231\ ppm$$

Test #2

Gas Volume - Dry Standard Conditions

$$Vm(std) = \frac{VmKY * (Pb + \frac{\Delta H}{13.6})}{Tm}$$

$$Vm(std) = \frac{(1.5\ cf)17.64(1.028\ mcf)(30.12\ Hg + \frac{.02\ \Delta H}{13.6})}{(533\ Tm)} = 1.537\ \text{dscf}$$

Concentration SO2 - ppm v/v dry

Normality (N) = 0.0101 ml Ba ++ = 780

$$\text{ppm v/v dry} = \frac{(mlBa{++})(32)(N)(13.29*10^{-6})(10^6)}{Vm(std)}$$

$$\text{ppm v/v dry} = \frac{(780)(32)(0.0101)(13.29*10^{-6})(10^6)}{1.537} = 2180\ ppm$$

Test #3

Gas Volume - Dry Standard Conditions

$$Vm(std) = \frac{VmKY * (Pb + \frac{\Delta H}{13.6})}{Tm}$$

$$Vm(std) = \frac{(1.6\ cf)17.64(1.028\ mcf)(30.12\ Hg + \frac{.02\ \Delta H}{13.6})}{(533\ Tm)} = 1.640\ \text{dscf}$$

Concentration SO2 - ppm v/v dry

Normality (N) = 0.0101 ml Ba ++ = 850

$$\text{ppm v/v dry} = \frac{(mlBa{++})(32)(N)(13.29*10^{-6})(10^6)}{Vm(std)}$$

$$\text{ppm v/v dry} = \frac{(850)(32)(0.0101)(13.29*10^{-6})(10^6)}{1.640} = 2227\ ppm$$

ALPHAGAZ
DIVISION OF LIQUID AIR CORPORATION

DATE: March 3, 1990 EXPIRATION DATE: September 3, [illegible]

CUSTOMER: A L Compressed Gas P. O. NUMBER: 202

CERTIFICATION OF CYLINDER AL 2065, PRESSURE 1990 psig

1. These gases were analyzed and certified according to EPA protocol #1.
2. Thermo-Electron Model 43a Analyzer using EPA method EQSA 0486 060 was used for the analysis. The date of the analyzer's last audit was 12/5/1989.
3. National Institute of Standards and Technology's standard reference material 1664a which is 2339. ppm in sulfur dioxide in cylinder FF18327, which expires 12/27/91 was used as the reference.
4. Brooks flow controllers, model 5850 which was calibrated 3/5/90 was used to dilute the sample into the range of the analyzer.

DATA

2/27/91				
Blank	0.000	0.000	0.000	
SRM	1.086	1.087	1.088	
AL2065	1.033	1.028	1.028	Indicated SO2 2212 ppm
3/9/91				
Blank	0.000	0.000	0.000	
SRM	1.164	1.051	1.054	
AL2065	1.093	1.094	1.091	Indicated SO2 2204 ppm

Average 2208. ppm Sulfur Dioxide
In NITROGEN balance

Analyst

0

ALPHAGAZ

DIVISION OF LIQUID AIR CORPORATION

EPA PROTOCOL NO.1 WORK SHEET   COMPONENT:SULFUR DIOXIDE   304-1317

NBS SRM 1662a   FF-28200   93-9-D   1013 +/- 10 ppm SO2 in N2

	TRIAD #1	TRIAD #2	TRIAD #3	TRIAD #4	TRIAD #5	TRIAD #6
DATE	02/05/93	02/05/93	02/05/93	02/15/93	02/15/93	02/15/93
UNITS	VDC X10	VDC X10	VDC X10	VDC X10	VDC X10	VDC X10
FF-28200	1013	1013	1013	1012	1012	1012
ZERO	0	0	0	0	0	0
CC-79076	1267	1267	1267	1267	1267	1267
ASSAYS:	1267.00	1267.00	1267.00	1268.25	1268.25	1268.25
	VALID	VALID	VALID	VALID	VALID	VALID

TRIADS 1,2,3 MEAN: 1267.0   TRIADS 4,5,6 MEAN: 1268.3

CONCENTRATION IN ppm: 1268

VARIABILITY	VDC X10	PPM x PPM
ZERO :	0.0005	0.8724
MIXd :	0.0005	0.8724
LINEARITY :	0.0100	348.94
TOLERANCE	SQRT SUM :	19 ppm

2445 South Street • P.O. Box 5548 • Long Beach, CA 90805 • Phone (310) 492-5300 • Fax (310) 492-5395

SO2 TANK CALCULATIONS

Date: 5/28/93 Tank ID: CC97188 497

Test #1

Gas Volume - Dry Standard Conditions

$$Vm(std) = \frac{VmKY * (Pb + \frac{\Delta H}{13.6})}{Tm}$$

$$Vm(std) = \frac{(1.60\ cf)17.64(1.028\ mcf)(30.10\ Hg + \frac{0.03\ \Delta H}{13.6})}{(532\ Tm)} = 1.642\ \text{dscf}$$

Concentration SO2 - ppm v/v dry

Normality (N) = 0.0101 ml Ba ++ = 185

$$\text{ppm v/v dry} = \frac{(mlBa{+}{+})(32)(N)(13.29*10^{-6})(10^{6})}{Vm(std)}$$

$$\text{ppm v/v dry} = \frac{(185)(32)(0.0101)(13.29*10^{-6})(10^{6})}{1.642} = 484\ ppm$$

Test #2

Gas Volume - Dry Standard Conditions

$$Vm(std) = \frac{VmKY * (Pb + \frac{\Delta H}{13.6})}{Tm}$$

$$Vm(std) = \frac{(1.55\ cf)17.64(1.028\ mcf)(30.10\ Hg + \frac{.03\ \Delta H}{13.6})}{(532\ Tm)} = 1.590\ \text{dscf}$$

Concentration SO2 - ppm v/v dry

Normality (N) = 0.0101 ml Ba ++ = 187

$$\text{ppm v/v dry} = \frac{(mlBa{+}{+})(32)(N)(13.29*10^{-6})(10^{6})}{Vm(std)}$$

$$\text{ppm v/v dry} = \frac{(187)(32)(0.0101)(13.29*10^{-6})(10^{6})}{1.590} = 505\ ppm$$

Test #3

Gas Volume - Dry Standard Conditions

$$Vm(std) = \frac{VmKY * (Pb + \frac{\Delta H}{13.6})}{Tm}$$

$$Vm(std) = \frac{(1.58\ cf)17.64(1.028\ mcf)(30.10\ Hg + \frac{.03\ \Delta H}{13.6})}{(532\ Tm)} = 1.621\ \text{dscf}$$

Concentration SO2 - ppm v/v dry

Normality (N) = 0.0101 ml Ba ++ = 190

$$\text{ppm v/v dry} = \frac{(mlBa{+}{+})(32)(N)(13.29*10^{-6})(10^{6})}{Vm(std)}$$

$$\text{ppm v/v dry} = \frac{(190)(32)(0.0101)(13.29*10^{-6})(10^{6})}{1.621} = 503\ ppm$$

ALPHAGAZ
DIVISION OF LIQUID AIR CORPORATION

EPA PROTOCOL NO.1 DATA SHEET COMPONENT:SULFUR DIOXIDE 0-600 ppm
NBS SRM 1661a FF28536 94-36-E 485 +/- 5 ppm SO2 in N2

	TRIAD #1	TRIAD #2	TRIAD #3	TRIAD #4	TRIAD #5	TRIAD #6
DATE	07/19/91	07/19/91	07/19/91	08/08/91	08/08/91	08/08/91
UNITS	VDC X10	VDC X10	VDC X10	VDC X10	VDC X10	VDC X10
FF-28536	8.83	8.82	8.82	8.80	8.82	8.83
ZERO	0.00	0.00	0.00	0.00	0.00	0.00
CC-97188	9.03	9.05	9.07	9.02	9.04	9.03

EPA PROTOCOL NO.1 DATA SHEET COMPONENT:SULFUR DIOXIDE 0-600 ppm
NBS SRM 1661a FF28536 94-36-E 485 +/- 5 ppm SO2 in N2

	TRIAD #1	TRIAD #2	TRIAD #3	TRIAD #4	TRIAD #5	TRIAD #6
DATE	07/19/91	07/19/91	07/19/91	08/08/91	08/08/91	08/08/91
UNITS	VDC X10	VDC X10	VDC X10	VDC X10	VDC X10	VDC X10
FF-28536	8.83	8.82	8.82	8.80	8.82	8.83
ZERO	0.00	0.00	0.00	0.00	0.00	0.00
CC-97188	9.03	9.05	9.07	9.02	9.04	9.03
ASSAYS:	495.99	497.65	498.75	497.13	497.10	495.99
	VALID	VALID	VALID	VALID	VALID	VALID

TRIADS 1,2,3 MEAN: 497.5 TRIADS 4,5,6 MEAN: 496.7
SULFUR DIOXIDE CONCENTRATION IN ppm: 497

VARIABILITY	VDC	PPM x PPM
ZERO :	0.0005	0.0885
SRM :	0.0300	318.6225
SRMd :	0.0010	0.3540
MIXd :	0.0010	0.3540
LINEARITY :	0.0100	35.4025

TOLERANCE SQRT SUM : 19 ppm

2445 South Street • P.O. Box 5548 • Long Beach, CA 90805 • Phone (213) 492-5300 • Fax (213) 492-5349

EXAMPLE CALIBRATION/DATA FLOW

All individual test run raw data sheets are organized in a manner that would allow a data reviewer to follow the data as it is being calculated in a step by step fashion. In many cases, the equations used to calculate a specific required data are given on the raw data sheets themselves.

For example, the particulate emission rate in g/dscf is calculated on Data Sheet #7. However, the data used to derive this data begins on Data Sheet #2(Meterbox Data Sheet) where the meter volume (cubic feet), average meter temperature (°F), average Δ H (in.H_2O), and average Barometric pressure (in. Hg) are recorded and averaged. Each of the averages for these parameters are used in equation 1 on P. 7 where the volume (MCF) is converted to dscf.

The moisture catch sheet (p. 3) total (g. H_2O) is transferred to P. 7 and the percent stack moisture is calculated in equations 2 and 3.

The gross and net gravimetric (g) particulate catches are determined and calculated on PP. 4-6. Pages 4-1, 4-2 and 4-3 show the initial (tare) constant weights for filters (p. 4-1) and beakers (p. 4-2) and the final constant weights (p. 4-3) for those filters and beakers used for each run. Final and tare weight data is transferred to P. 5-1 (front half catch) and P. 5-2 (back half catch) and the gross gravimetric (g) catch for each filter and beaker is calculated. On P. 5-3 the gravimetric catch for each blank is calculated. The gross gravimetric catch for each filter and beaker is transferred to P. 6 and the net gravimetric catch (g) is calculated, as well as front half and back half catch totals. The net gravimetric catch (g) is transferred to P. 7 and the grain loading/dscf is calculated in equation 4.

Some data sheet specific information is listed below on a page by page basis.

P. 8 The % ambient moisture is determined by interpolating from psychrometric charts which are contained in the State of Oregon Department of Environmental Quality's "Standard Method for Measuring the Emissions and Efficiencies of Woodstoves".

The % relative humidity is determined from the wet bulb/dry bulb temperature readings using the tables found in Section 3.1.2.4 of the State of Montana Air Quality Bureau's Quality Assurance Manual.

P. 10 The uncorrected moisture meter readings are corrected for pin insulation and may or may not be corrected for ambient (wood) temperatures. All corrections are based upon the correction equations or tables supplied by the moisture meter manufacturer. (These are standard, known corrections.)

P. 11 The moisture meter readings are corrected as discussed above.

P. 12 The gas concentrations shown for each gas monitored (CO_2, O_2, CO and SO_2) are determined by converting the analyzer's voltage output recorded on P. 12 to the concentration shown using the analyzer's current calibration curve. The SO_2 concentration is determined using the manufacturer's calibration curve and the current calibration curve.

The cal. W/B (calculated wet bulb) temperature is obtained by first determining the % moisture in the extracted flue gas stream using the temperature data from thermocouples 1 (Wet Bulb) and 2 (Dry Bulb). Then based upon the stack temperature (thermocouple 3) and the % moisture in the extracted gas stream, a calculated wet bulb temperature is determined. All data is derived from the psychrometric tables found in the State of Oregon's "Standard Method for Measuring the Emissions and Efficiencies of Woodstoves".

The following pages contain the equations used to generate the data on Tables 3-5 on the computer printouts:

Dry Gas Volume (standard):

$$V_{m(std)} = \frac{V_m * 17.65 * mcf * \left(P_{bar} + \frac{\Delta H}{13.6}\right)}{T_m}$$

Volume of Water:

$$V_{w(std)} = (0.04707)(ml\ H_2O)$$

Moisture Content:

$$B_{ws} = \left(\frac{V_w}{V_w + V_{m(std)}}\right) * 100$$

Dry Burn Rate:

$$Br = \left(\frac{Wwt - (Wwt * \% H_2O)}{2.2046}\right) * \frac{60}{\theta}$$

Carbon Balance (N_t):

$$Nt = \frac{K_3 Nc}{(YCO_2 + YCO + YHC)}$$

Stack Flow Rate (Q_{sd}):

$$Q_{sd} = K_4 N_t Br$$

Particulate Concentration (C_s):

$$C_s = \frac{M_n}{V_{m(std)}}$$

Particulate Emission Rate (E):

$$E = C_s Q_{sd}$$

Proportional Rate Variation (Pr):

$$Pr = \left(\frac{\theta S_i * V_{mi(std)}}{10 \sum_{i=1}^{n} [S_i * V_{mi(std)}]}\right) * 100$$

Where:

Br = dry wood burn rate, kg/hr.

B_{ws} = Water vapor in the gas stream, proportion by volume.

c_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscm (g/dscf).

E = Particulate Emission Rate, g/hr.

ΔH = Average pressure differential across the orifice meter (see Figure 5-2), mm H_2O (in. H_2O).

K_3 = 1.0 lb/lb (english)
1000 g/kg (metric)

K_4 = 0.02406 dsm^3/g-mole(metric)
384.8 dscf/lb-mole (english)

m_n = Total amount of particulate matter collected, mg.

mcf = Dry gas meter correction factor.

N_c = Gram atoms of carbon/gram of dry fuel (lb/lb), equal to 0.0425.

N_t = Total dry moles of exhaust gas/Kg of dry wood burned.

P_r = Percent of proportional sampling rate.

P_{bar} = Barometric pressure at the sampling site, mm Hg (in. Hg).

Q_{sd} = Total gas flow rate, dscf/hr.

S_i = Concentration measured at the SO_2 analyzer for the "i^{th}" 5 minute interval, ppm.

S_1 = Concentration measured at the SO_2 analyzer fot the first 5 minute interval ppm

T_m = Absolute average DGM temperature (see Figure 5-2), °K (°R).

T_{std} = Standard absolute temperature, 293°K (528°R).

V_m = Volume of gas sample as measured by dry gas meter, dcm (dcf).

$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).

$V_{w(std)}$ = Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf).

W_{wt} = Wet wood weight.

Y = Dry gas meter calibration factor.

$Y =$ Dry gas meter calibration factor.

$Y_{CO} =$ Measured mole fraction of CO (dry).

$Y_{CO2} =$ Measured mole fraction of CO_2 (dry).

$Y_{HC} =$ Assumed mole fraction of HC (dry);
=0.0088 for catalytic woodheaters
=0.0132 for noncalytic woodheaters
=0.0080 for pellet fired woodheaters

$\theta =$ Total sampling time, min.

13.6 = Specific gravity of mercury.

60 = Sec/min.

100 = Conversion to percent.

M5H PARTICULATE SAMPLING TRAIN

1. Probe

   3/8" seamless SS-20" long. Outlet end of probe is attached to a SS outlet fitting with a Sweglock SS union. The probe is unheated except for the portion that is in the stack and the heated filter box. The probe is sealed to the stack with a washer.

2. Filter Holder

   A 3" or 4" standard M5 filter holder. A SS filter support with gasket.

3. Filters

   3" or 4" fiber glass (#25 glass) manufactured by Schleicher and Schuell.

4. Front Half Filter Heater

   A box containing a fan for air circulation and a cone heater. The temperature in the box is monitored with a type K thermocouple and adjusted with a voltage regulator to maintain a temperature below 248 °F.

5. Desiccant

   Indicating silica gel, 6-20 mesh. The silica gel is changed as needed.

6. Filter (Back Half) Holder

   Same as front half 3" or 4" filter.

7. Impinger Gas

Type K thermocouple threaded into the exit "arm" of the impinger. Ice is added to the cooler whenever necessary to maintain an exit gas temperature less than 68 °F.

8. <u>Meterbox</u>

RAC Stack Sampler modified by EESPC

Ranges: 0-1.0" inclined water manometer

0-10.0" vertical water manometer

Accuracy: Dry gas Meter 0-999.999 cu ft $\pm$1.0%

Temperatures are monitored using two type K thermocouples.

SAMPLING PROCEDURES AND INSTALLATION DESCRIPTION

This section is broken into two major parts. The first contains a brief description of the sampling and procedures used by EESPC when performing a test using EPA Methods 28, 28A and 5H. The second section contains a complete listing of all equipment in each of the major sampling trains and a diagram of each major train.

EESPC uses EPA M5H for the particulate sampling procedure and collects the required data so that efficiency of a unit can be calculated using the Oregon Method.

TEST FACILITY AND WOOD HEATER EQUIPMENT LIST

1. Flue Pipe

   The diameter of the 24 gauge black steel flue pipe used for each stove varies with the size of the stove's flue collar, e.g., 6" flue pipe is used with a 6" flue collar. The joint at the flue collar is sealed with mortar. The pipe is attached to the stove at the flue collar with three sheet metal screws. All sampling ports are sized for the sampling probes and sealed using washers.

2. Insulated Flue Pipe

   The diameter of the insulated flue pipe matches the diameter of the flue collar on the stove. The 6", 7" and 8" pipe meet the requirements of UL 103 HT. The SO_2 injection loop port is sealed with high temperature silicone sealant.

3. Liquid Seal

   The liquid (oil) seal used by EESPC varies in size with the flue pipe. The seals are made of 12 gauge steel. The liquid sealant is mineral oil. The cooler consists of 3/8" copper tubing which is coiled in the bottom of the lower half of the seal. Ambient air is pumped through this line when necessary to cool the seal.

4. Supports

   The lower half of the seal and the 24 gauge steel black flue pipe is supported by the stove. The upper half of the seal and the insulated flue pipe are hung from wooden supports.

5. Platform Scale

   Platform (30" X 30" deck)

Manufacturer:	Weightronics	
Model:platform:	DS-014/SN 4479	readout: W1-110/SN 016409

Type:	Electronic
Range:	0-1000 lb.
Capacity:	1000 lb.
Resolution:	±0.1 lb.
Accuracy:	±0.1%

6. Fuel Balance Scale

EESPC uses the platform scale listed above to weigh the fuel charges.

7. Fuel Storage Area

EESPC stores the fuel in a humidity and temperature regulated room.

8. Moisture Meter

EESPC has two moisture meters which it uses to determine wood moisture levels.

The primary meter is:

Manufacturer:	Delmhorst Instrument Co.	
Model:	RC-1C/SN 16152 with 26-E probe and #496 insulated pins.	
Type:	Electrical Resistance	
Resolution:	±0.1% moisture	
Ranges:	6-11%, 11-25%, 25-80%	
Accuracy:	Moisture	ContentAccuracy
	6-12%	±0.5%
	12-20%	±1.0%
	20%-saturation point	±2.0%

Type of Calibration: The RC-1C is equipped with two potentiometers (Zero and Span) which are checked and adjusted on a daily basis. The unit is also checked with a calibration block.

Electrode and Pin Type: 26-E probe and #496 insulated pins

The backup moisture meter:

Manufacturer:	Delmhorst Instrument Co.	
Model:	G-30SN/2477 with 26-E probe and #496 insulated pins	
Type:	Electrical Resistance	
Resolution:	±0.1% moisture	
Accuracy:	Moisture	ContentAccuracy
	6-12%	±0.5%
	12-20%	±1.0%
	20%-saturation point	±2.0%

Type of Calibration: Calibration is accomplished with an internal calibration point and a potentiometer. The calibration can also be checked against a calibration block.

Description of Operation: The pins are pounded into the wood to be sampled. The meter reading is recorded on Data Sheet #10 (Wood Moisture) or Data Sheet #11 (Density Determination). This is the uncorrected reading which is then corrected for pin insulation and, as needed, temperature using the correction tables for each parameter supplied by the manufacturer.

9. Temperature Monitors

The temperatures are monitored with Type K thermocouples. Each thermocouple's calibration is checked prior to use.

The thermocouple readout is an Omega Model 410B-K/SN 05/4475, with a range of -58 °F to 1999 °F (type K) and an accuracy of ±0.9 °C, which can be read at ±0.1 °F. EESPC reads and rounds to 1.0 °F. The single channel readout is interfaced with a manually operated selector switch that allows 24 channels to be monitored with the same readout. The thermocouples are attached to the test unit with sheet metal screws. The thermocouples monitoring internal stove temperature are sealed at the point of entry with sealant.

10. Draft Gauge

Manufacturer:	Dwyer
Model:	
Type:	Inclined Water Manometer
Range:	0-0.25" water
Resolution:	0.001" water
Accuracy:	±0.001" water (readability)

11. Anemometer

Manufacturer:	Dwyer
Model:	480 Vaneometer/SN S 222 D
Range:	0-400 FPM
Accuracy:	±5% of full scale from 0-1 FPM

12. Humidity Gauge

Manufacturer:	Bacharach
Model:	SAC
Type:	Sling Psychrometer
Range:	Wet Bulb:30-110 °F

Dry Bulb: 30-110 °F

Resolution: ±1 °F

Accuracy: ±1 °F

13. Barometer

Manufacturer: Princo Instruments, Inc.

Model: NOVA 469

Type: Mercury Barometer

Range: 20-32" Hg

Resolution: 0.01" Hg

Accuracy: ±0.01" when calibrated and installed as per the manufacturer's written operating instructions.

Equation 6.3.1a of the "Standard Methods for Measuring the Emissions and Efficiencies of Residential Wood Stoves" and equation #1 are programmed into a Hewlett Packard 15C calculator which first calculates stack gas flow rate and then the ΔH. The stack gas flow rate and ΔH are both recorded on Data sheet #2. The ΔH is used to set the flow rate through the dry gas meter at 5 minute intervals during the test.

In order to successfully maintain the correct sampling ratio, the following data is recorded on Data Sheet #2 (Meter Box Data Sheet): temperature (°F) at the SO_2 injection rotameter (Tr), pressure (inches H_2O) at the SO_2 injection rotameter (Pr), SO_2 injection rate (cc/min), barometric pressure (BP) (inches Hg), stack gas SO_2 concentration (ppm SO_2), sampling ratio (Sr), and the average dry gas meter temperature (°F). This data is entered into the HP15C, which is used to first calculate a stack gas flow rate (dscf) and then a ΔH for every sampling interval. The flow rate through the dry gas meter is adjusted and maintained by maintaining the appropriate ΔH.

CEM MONITORS

1. Calibration Gases

EESPC uses vendor certified (±2.0%) calibration gases for each CEM. The concentrations purchased coincide with ranges specified in M5H. Upon receipt of the cylinder, the concentrations are verified with Method 3 (ORSAT) analysis.

2. Flow Regulators

EESPC uses a variety of standard gas flow regulators to meter the flow of calibration gases from the cylinders.

3. Point of Injection

Calibration gases are injected directly into the end of the probe. The line carrying the calibration gases from the cylinders is connected to the probe with a short piece of rubber tubing.

4. Sample Gas Conditioning System

The combustion gas is conditioned with a train that is a duplicate of a M5H train. It contains the following components:

SS probe
Glass 4" M5H filter and holder in a heated box
4 1000 ml glass impingers
Glass 4" M5H filter and holder
Indicating silica gel
Type K thermocouple to monitor exit gas temperature
Thomas pump

5. Filters

The filters used are the same as EPA M5H filters.

6. Manifold and Exhaust

The gas stream is delivered to each analyzer through a manifold and flowmeter with the excess gases being routed to an exhaust.

7. CO Analyzer

Horiba PIR 2000/SN 408005
Nondispersive infrared (NDIR)

The gas stream flow is controlled by a SS flowmeter downstream of the analyzer. The calibrated range used is 0-10.0% by volume. The resolution is 0.01% CO. The manufacturer's specification given for linearity is ±1.0%.

8. CO_2 Analyzer

Horiba PIR 2000/SN 407069

The CO_2 analyzer is also a NDIR and is operated in exactly the same manner as the CO analyzer. The range of the CO_2 analyzer is 0-25.0% CO_2.

COMBUSTION GAS ANALYZER TRAIN OPERATING INSTRUCTIONS

A. Pretest Preparation, Checks and Audit Procedures

1. Clean the probe with acetone and a brush. Seal the end of the probe for a leak check.
2. Remove the filter holder from the sample box and change the filter.

3. Empty water from all the impingers in the train. Clean all impingers and fill the first 2 with 100 ml of water.
4. Remove the second filter holder from the train and change the filter.
5. Visually check the indicating silica gel in the fourth impinger. If it is visibly impacted by water, replace the silica gel with dry silica gel.
6. Turn on the pump and perform a leak check on the entire train. This is done by placing the exhaust line in water. A successful leak check is accomplished when no bubbles are detected.
7. Slowly release the plug from the probe to prevent any back flushing.
8. Turn off the pump.
9. Turn on the heat in the sample box. Adjust Variac voltage controller so that temperature in the sample box does not exceed 248 °F.
10. Open the bypass valve on the pump.
11. Connect the probe to the zero/span gas delivery line.
12. Turn on the zero gas and adjust the flow rate to 1.5 SCFH.
13. Wait until the zero gas has completely flushed the train and a stable reading is obtained.
14. Record the zero gas readings of the DVM on Data Sheets #15.
15. Turn off the zero gas at the cylinder.
16. Disconnect the zero/span gas delivery line from the zero gas cylinder.
17. Connect the zero/span gas delivery line to the span gas source for each analyzer.
18. Turn on the span gas and adjust the flow rate to 1.5 SCFH. Wait until a stable reading is obtained on each analyzer. Repeat until all three analyzers are spanned properly.
19. Record the span gas readings of the DVM. Record the analyzer's output and all other pertinent information Data Sheets #15.
20. Turn off the span gas at the cylinder.
21. Disconnect the probe from the zero/span gas delivery line.
22. Insert the probe in the stack.
23. Close the bypass valve on the pumps.
24. Approximately 15-20 minutes before the actual start of the test, turn on the pump and adjust the flow through each analyzer until the flow rate is 1.5 SCFH.

B. Operation During Testing

1. Monitor the flow rate to the analyzers periodically to maintain a flow rate of 1.5 SCFH. Make any necessary adjustments.
2. Record data as follows:
   a. At the start of each 5 minute data cycle, record the scale weight, wet bulb/dry bulb, stack gas temperature and static pressure on Data Sheet #12 (Gas Data).
   b. Record the combustion gas (CO_2, O_2 and CO) analyzer data and the SO_2 analyzer data on Data Sheet #12.
   c. Record the remainder of the temperature data.

C. Post Test Checks and Audit Procedures

1. Remove the probe from the stack. (Be careful when handling the probe as it can be quite hot.)
2. Seal the end of the probe.
3. Perform a leak check on the entire train.
4. Slowly release the plug from the end of the probe to prevent any back flushing.
5. Turn off the pump.
6. Open the bypass valve on the pump.
7. Connect the probe to the zero/span gas delivery line.
8. Turn on the zero gas and adjust the flow rate through each analyzer to 1.5 SCFH.
9. Wait until the zero gas has completely flushed the train and a stable reading is obtained from each analyzer.
10. Record the zero gas reading. Record each analyzer's output and all other pertinent information on Data Sheets #15.
11. Turn off the zero gas at the cylinder.
12. Disconnect the zero/span gas delivery line from the zero gas cylinder.
13. Connect the zero/span gas delivery line to the span gas source for each analyzer.
14. Turn on the span gas and adjust until the flow rate through each analyzer to 1.5 SCFH. Wait until the span gas has completely flushed the train and a stable reading is obtained on each analyzer.
15. Record the span gas reading. Record each analyzer's output and all other pertinent information on Data Sheets #15.
16. Turn off the span gas at the cylinder.

17. Disconnect the probe from the zero/span gas delivery line.

D. Determination of the Combustion Gas Train's Response Time

1. The response time of the combustion gas analyzer train is to be determined using the following procedures. It is best to determine the combustion gas analyzer train response time during the "charcoal phase" of a test burn so that CO levels are relatively stable.
   a. Leak check the combustion gas (CEM) analyzer train.
   b. Zero the CO analyzer using ambient air.
   c. Calibrate the CO analyzer.
   d. Insert the probe for the combustion gas analyzer train in the stack.
   e. Sample flue gas until a stable reading is obtained.
   f. Remove the probe from the stack, note the exact CO concentration as measured on the DVM and start a stop watch at the exact time of removal.
   g. Observe the stop watch and DVM. Record the length of time to initial response, i.e., when the CO levels begin to decline.
   h. Continue observing the stop watch and DVM. Record the time when the analyzer's output equals zero (0.000 v).
   i. Repeat steps d-h 2 or 3 times to verify results.

E. Calibration and Audit Procedures for the Combustion Gas Analyzers

1. Calibrate by presenting zero and span gases to each analyzer at the probe and through the entire sampling train. (See Sections 6.7.2 and 6.9 [M5H].) Record the responses on the appropriate calibration forms.
2. Immediately prior to and after each test run, present the zero and span gases to the analyzers through the entire sampling train as is discussed in section C. Record each analyzer's response on Data Sheets #15.
3. Calculate the ± concentration difference and the actual percent difference as follows using the zero and span gas values obtained in #2 above. All calculations are to be based upon the actual gas concentrations involved.

$$\pm \text{Concentration Difference} = \text{Actual Conc}\,(\%) - \text{Std Conc}\,(\%)$$

$$\text{Zero \% Difference} = \frac{\text{Act Conc (\% or ppm)} - \text{Std Conc (\% or ppm)}}{\text{Full Scale Value (\% or ppm)}} * 100$$

$$\text{Span Act \% Difference} = \frac{\text{Act Response (\% or ppm) - Exp Response (\% or ppm)}}{\text{Expected Response (\% or ppm)}} * 100$$

Then refer to Section 4.2 and 4.3 (M5H) to determine whether the audits are acceptable or not.

TRACER GAS (SO_2) EQUIPMENT

1. SO_2 Injection Probe

   A circular SS loop about 4" in diameter is positioned in the center of the stack. The loop extends outside the stack and is connected to the line leading from the SO_2 injection rotameter with Sweglock fittings. The loop is inserted in the stack at 9.5 ±0.5 ft above the top of the scale.

2. Rotameter

   A rotameter that has been calibrated with a bubble tube. The rotameter is all glass, stainless steel and Teflon. The rotameter has a flow control mechanism which is set to the calibrated flow.

3. Temperature

   The temperature at the injection rotameter is measured with a type K thermocouple.

4. Injection Gas

   Pure SO_2, 99.999% pure, released from the cylinder through a SS regulator and shut off valve.

5. Calibration Gases

   EESPC uses vendor certified calibration gases with traceability established in accordance with EPA Protocol #1 as specified in Section 3.3.1 and verified using EPA Method 6.

6. Sample Probe

   3/8" SS tubing inserted at 13.5 ±0.5 feet above the platform scale. No obstructions are in the stack between the injection and sample probes.

7. Combustor

   Lindberg tube furnace, Model 55035/SN 800125, range 0-2000 °F. The temperature in the tube furnace is monitored with a type K thermocouple and controlled with a Variac voltage regulator. Power adjustments are made as necessary to maintain temperature at 1425 °F ±25 °F.

8. Sample Condenser

The sample condenser consists of 3 modified M5 impingers immersed in a freezer. A filter assembly

The exit gas temperature is monitored with a type K thermocouple.

9. Filter

A standard EPA M5H 3" or 4" filter.

10. SO_2 Analyzer

Horiba, PIR 2000/SN 403019

Nondispersive infrared (NDIR)

The analyzer is operated as per the manufacturer's instructions at a flow rate of 1.5 SCFH. The calibration range is 0-2500 ppm SO_2 at a resolution of ±25.0 ppm. The manufacturer's specification for linearity is ±1.0%. The voltage response is displayed on a DVM which is converted to ppm using the manufacturer's calibration curves.

11. Flow Control

Flow through the tracer gas sampling train is controlled by a SS flowmeter.

TRACER GAS TRAIN OPERATING INSTRUCTIONS

A. Pretest Preparation and Checks and Audit Procedures

1. Clean the probe with a brush. After cleaning, seal the end of the probe. **Note: Do Not Use Acetone Or Other Organic Solvents To Clean The Probe Immediately Prior To Running A Test Or Conducting A Leak Check.**
2. Turn on the tube furnace in order to insure that the unit is at the correct operating temperature (1425 °F) at the start of the test.
3. Remove all water and clean the impingers.
4. Change the filter.
5. Turn on the pump.
6. Perform a leak check on the entire tracer gas train. This is done by placing the SO_2 exhaust line in water. A successful leak check is accomplished when no bubbles are detected.
7. Slowly remove the plug from the end of the probe to prevent any back flushing.
8. Turn off the pump.
9. Bypass the pump.

10. Connect the probe to the zero/span delivery gas line.
11. Connect the zero/span gas delivery line to the zero gas cylinder and turn on the zero gas and adjust the flow until the flow rate through the SO_2 analyzer is 1.5 SCFH.
12. Wait until the zero gas has completely flushed the train.
13. Record the zero gas reading. Record the SO_2 analyzer's DVM output on Data Sheets #15.
14. Turn off zero gas at the cylinder.
15. Disconnect the zero/span gas delivery line from the zero gas cylinder.
16. Connect the zero/span gas delivery line to the span gas cylinder.
17. Turn on the span gas and adjust the flow until the flow rate through the SO_2 analyzer is 1.5 SCFH. Wait until the span gas has completely flushed the train and a stable reading is obtained on the analyzer.
18. Record the span gas reading. Record the analyzer's output and all other pertinent information on Data Sheets #15.
19. Turn off the span gas at the cylinder.
20. Disconnect the zero/span gas delivery line from the probe.
21. Insert the probe in the stack.
22. Close the bypass on the pump.
23. Approximately 15 to 20 minutes before the actual start of the test, turn on the SO_2 injection train and the pump for the tracer gas train.

B. <u>Operation</u>

1. Turn on the tube furnace to insure furnace is at approximately 1425 °F when the test begins.
2. Approximately 15-20 minutes before the actual start of the test, turn on the cylinder of pure SO_2.
3. Using the rotameter's current calibration, adjust the SO_2 flow rate to the calibrated level.
4. Turn on the pump in the tracer gas train. Adjust the flow rate through the SO_2 analyzer so that it remains at 1.5 SCFH.
5. Monitor the SO_2 concentrations in the stack and stack gas flow rates in order to establish a sampling ratio for the test and a correct ΔH at the start of the test.
6. At the start of the test and every 5 minutes thereafter, record the SO_2 analyzer output in volts and the stack gas SO_2 concentration in order to

calculate the stack gas flow rate and determine the correct ΔH for the meter box.

Also monitor and record the temperature at the Rotameter (Tr), pressure at the Rotameter (Pr), barometric pressure (BP) SO_2 injection rate (cc/min) and static pressure on Data Sheets #2 and #12.

C. Post Test Checks and Audit (Zero/Span) Procedures

1. Remove the probe from the stack. (Be careful when removing the probe from the stack as it can be quite hot.)
2. Plug the end of the probe.
3. Perform a leak check.
4. Slowly remove the plug from the end of the probe to prevent any back flushing.
5. Turn off the pump.
6. Bypass the pump.
7. Connect the probe to the zero/span gas delivery line.
8. Connect the zero/span gas delivery line to the zero gas cylinder. Turn on and adjust until the flow rate through the SO_2 analyzer is 1.5 SCFH.
9. Wait until the zero gas has completely flushed the train.
10. Record the zero gas reading. Record the SO_2 analyzer's DVM output on Data Sheet #15.
11. Turn off zero gas at the cylinder.
12. Disconnect the zero/span gas delivery line from the zero gas cylinder.
13. Connect the zero/span gas delivery line to the span gas cylinder.
14. Turn on the span gas and adjust the flow until the flow rate through the SO_2 analyzer is 1.5 SCFH. Wait until the span gas has completely flushed the train and a stable reading is obtained.
15. Record the span gas reading. Record the analyzer's output and all other pertinent information on Data Sheet #15.
16. Turn off the span gas at the cylinder.
17. Disconnect the zero/span gas delivery line from the probe.

D. Determination of Tracer Gas Train's Response Time

1. Zero and calibrate the SO_2 analyzer.
2. Prepare and leak check the tracer gas train as per A above.
3. Insert the probe in the stack which contains flue gas and SO_2 concentrations in the ranges normally encountered during wood stove testing.

4. Sample flue gas with SO_2 concentrations until a stable reading is obtained. It is best to determine the tracer gas train's response time during the "charcoal phase" of a test burn so that the SO_2 concentrations are as stable as possible.
5. Remove the probe from the stack, noting the exact SO_2 concentration as measured by the DVM and starting a stop watch at the exact time of removal.
6. Observe the stop watch and DVM. Record the length of time to the initial response, i.e., when the SO_2 levels begin to decline.
7. Continue observing the stop watch and DVM. Record the time when the SO_2 analyzer's output equals zero (0.000 v.).
8. Repeat steps 3-7 two or three times to verify results.

E. Calibration and Audit Procedures for the Tracer Gas (SO_2) Analyzer

1. Calibrate by presenting zero and span gases to the analyzer at the probe and through the entire sampling train. Record the responses on the appropriate calibration form.
2. Immediately prior to and after each test run, present the zero and span gases to the analyzer through the entire sampling train as is discussed in Sections A and C. Record the analyzer's response on Data Sheet #15.
3. Calculate the $\pm$ concentration differences and actual percent difference as follows using values obtained in #2 above as the expected response. All calculations are to be based upon the actual gas concentration involved.

$$\pm \text{Concentration Difference} = \text{Actual Conc (\%)} - \text{Std Conc (\%)}$$

$$\text{Zero \% Difference} = \frac{\text{Act Conc (\% or ppm)} - \text{Std Conc (\% or ppm)}}{\text{Full Scale Value (\% or ppm)}} * 100$$

$$\text{Span Act \% Difference} = \frac{\text{Act Response (\% or ppm)} - \text{Exp Response (\% or ppm)}}{\text{Expected Response (\% or ppm)}} * 100$$

Then refer to Section 4.2 and 4.3 (M5H) to determine whether the audits are acceptable or not.

TEMPERATURE SENSING OPERATING INSTRUCTIONS

A. Operate the thermocouple readout selector switch and record the temperature for each thermocouple. All the temperature in the test facility should be approximately the same. Repair as necessary.

B. Check the operation and output of the thermocouple readout using the Omega NBS Traceable Thermocouple Simulator. The simulator is hooked up to thermocouple readout #23. Check the readout over its full range at 200 °F intervals. Record the data on Data Sheet #16.

C. One hour before the actual test start record stove temperatures (thermocouple readout #'s 4, 5, 6, 7 and 8), firebox (readout #9), post catalytic combustor or secondary burn chamber (readout #10), and room temperature (readout #11). Record the temperatures every 5 minutes until the start of the test on Data Sheet #13 (Preburn).

D. During the test record the temperatures every 5 minutes for each of the thermocouples on Data Sheets #12 and 14.

FUEL PREPARATION

A. No more than 4 hours prior to use, obtain 3 moisture readings from each piece of wood. Record all moisture readings on Data Sheet #10.

B. Obtain kindling by finely splitting pieces that otherwise cannot be used as test fuel. Weigh the kindling and record the weight on Data Sheet #8.

C. Obtain the pretest fuel by using 2 x 4's. The length of the pretest fuel can be no less than 1/3 the length of the test fuel. Weigh the pretest fuel prior to its being loaded in the stove. Record weights on Data Sheets #8 and #9.

D. Obtain the test fuel by cutting dimensional lumber (either 2 x 4's or 4 x 4's) so that the length is 5/6's the length of the longest usable dimension of the firebox. Use the mix of 2 x 4's and 4 x 4's specified in Section 4.3 M28. The test fuel shall be essentially free of knots, sap seams or rotten areas.

E. The spacers shall measure 1 x 5 x 1" (nominally). The spacers shall be free of knots, sap seams or rotten areas. Nail the spacers to the 2 x 4's and 4 x 4's as described in the regulations.

F. Take a photograph of the assembled fuel charge at a 90° angle from the photograph that will be take when the fuel charge is loaded in the stove.

WOOD DENSITY DETERMINATION

A. When cutting the test fuel, cut a representative piece of 2 x 4 or 4 x 4 that is approximately 3 to 5-inches in length.

B. Take a moisture reading from the top, bottom and side of the piece. Record readings on Data Sheet #11. Determine the % moisture on a wet and dry basis.

C. Weight the piece on a balance.

D. Take measurements of width, depth and length at the four corners with a micrometer. Determine the volume of the piece. (Length x width x depth = Volume in cubic centimeters)

E. Dry the piece in an oven at 95-100 °C for a minimum of 24 hours.

F. Reweigh the piece on the balance.

G. Calculate % moisture on a dried basis.

$$\%\text{ moisture (dry basis)} = 1 - \frac{\text{dried weight}}{\text{wet weight}} * 100$$

H. Calculate the density.

$$\text{Density (g / cc)} = \frac{\text{dried weight (g)}}{\text{volume (cc)}}$$

BTU'S/LB DETEMINATION

A. When cutting the test fuel (only the test fuel, not the kindling, pretest fuel or spacers), collect a sawdust sample. Place in a clearly marked plastic bag.

B. Forward sample to a commercial laboratory for BTU contents analysis.

STOVE PREPARATION

A. Clean the stove.

B. Weigh the stove, record the weight on Data Sheet #8.

C. Add approximately 0.3 lb. of wadded newspaper to the stove. Record weight of newspaper on Data Sheet #8. Add 4-8 lb. of kindling to the stove, and record the weight of the kindling on Data Sheet #8.

D. Light the paper and kindling, leaving the stove's air draft control(s) wide open and the door cracked until well ignited.

E. Close door.

F. When between 50% - 75% of the weight of the kindling has been burned add the first pretest fuel charge.

G. Continue to add pretest fuel until the stove has thoroughly warmed up. As necessary, rake the coal bed prior to adding additional pretest fuel charges.

H. Remove all material from the firebox after two or more hours of burning on high. Obtain the dry empty stove weight and record on Data Sheet #8.

I. Set the stove's air draft control(s) at the desired setting a minimum of 1 hour before the test run is to begin.

J. As necessary set the heat exchange blower(s) at the specified setting a minimum of one hour before the test is to begin.

K. Record the stove surface temperatures, firebox and post catalytic or secondary burn temperatures and scale weigh for a minimum of one hour before the test run begins. As necessary add fuel, rake the coal bed, level the coal bed and/or remove coals during the first 45 minutes of the hour immediately preceding the start of the test. Record all information concerning raking, fuel additions, etc. on Data Sheet #13.

L. If necessary, sometime during the last 15 minutes before the start of the test, open the door and brake up all large pieces and then rake and level the pretest fuel in the stove. At this time, level the coal bed as necessary to accommodate loading the fuel charge into the stove. Close the door. Total time door can be open during the last 15 minutes is 1 minute. No further manipulation of the stove is allowed during the 15 minutes immediately preceding the start of the test.

M. When the weight of the coal bed equals 20-25% of the weight of the test fuel charge, load the test fuel. Take a photograph of the fuel load in the stove immediately after loading the fuel. Leave the door open as per the manufacturer's instruction, but no longer than 5 minutes.

N. Document all stove operating data from ignition through loading and test start up on Data Sheet #9.

Wood Heater Efficiency Summary

Laboratory/Wood Heater Information

Stove Manufacturer:	F.X. DROLET
Model Identification:	HT-2000
Stove Type> 1=cat, 2=noncat, 3=pellet:	2
Laboratory Name:	EESPC
Laboratory Contact:	Bill Nowak
Telephone no.:	206-859-8318
Test Dates:	6/23-7/1/93
Test Methods Used	
Method 28/Other:	28A
Sampling Method:	5H

Run no.	Burn Rate (kg/hr)	Overall Efficiency (%)	Heat Output (Btu/hr)	Wtd Avg Ovr Eff % 68.2
1	0.96	67.7	12460	
2	1.07	69.2	14014	
4	1.67	73.3	23330	
6	4.99	48.9	46625	

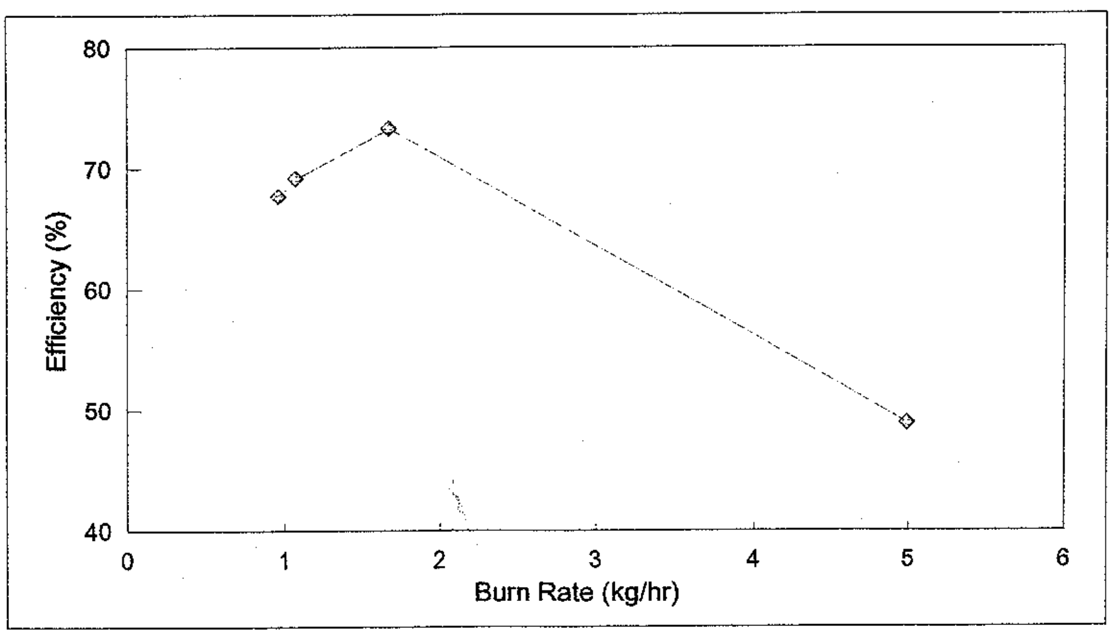


TABLE 1

RESULTS OF EFFICIENCY TESTING ON THE FX DROLET WOOD STOVE

RUN NUMBER 1   PROJECT NUMBER   SERIAL NUMBER C1103

DATE OF TEST: 6/23/93   STOVE MODEL: HT 2000

AVERAGE EFFICIENCIES

¶

****

* COMBUSTION= 83.8 ¶ % * HEAT TRANS.= 80.8 ¶ % * OVERALL= 67.7 ¶ % *

****

EMISSIONS

¶

****

* PARTICULATES: 3.304 (grams/Kg-wood) 3.174 (grams/hour) *

* CARBON MONOXIDE: 246.148 (grams/Kg-wood) 236.474 (grams/hour) *

****

TEST DATA

BURN RATE=================================>	2.60	(lb/hr-wet)
BURN RATE=================================>	0.96	(kg/hr-dry)
BURN RATE=================================>	1.18	(kg/hr-wet)
FUEL MOISTURE ============================>	18.66	(% Wet basis)
HEAT OUTPUT===============================>	12460.42	(Btu/hr)
FUEL HIGHER HEATING VALUE=================>	8694.00	(Btu/lb-dry)
AVERAGE STACK FLOW RATE===================>	6.08	(DSCF/minute w/HC)
AIR TO FUEL RATIO=========================>	13.22	(lb-air/lb-fuel)
AVERAGE EXCESS AIR========================>	106.54	(% Stoichiometric)
AVERAGE STACK TEMPERATURE=================>	235.79	(Degrees F)
AVERAGE STACK MOISTURE ===================>	8.85	(% volume-wet w/HC)
AVERAGE CO2===============================>	7.14	(% volume-dry w/HC)
AVERAGE O2================================>	11.85	(% volume-dry w/HC)
AVERAGE CO================================>	1.97	(% volume-dry w/HC)

-> 101   15:43:32

67.4176   07-08-1993

OVERALL EFFICIENCY WITHOUT STOVE TEMPERATURE CHANGE= 67.1 %

TABLE 2B
FIELD DATA

CLIENT: FX DROLET RUN NUMBER: 1 DATE: 6/23/93

			Dry and HC free					
PT	TIME	WT. FUEL	%CO2	%O2	%CO	WT BLB	DRY BLB	TRACER
1	0	21.70	11.00	8.60	1.23	129.0	375.0	900.0
2	5	20.60	6.00	14.30	0.44	135.0	553.0	300.0
3	10	20.00	7.50	11.90	1.04	132.0	320.0	850.0
4	15	19.50	8.30	11.20	1.02	131.0	294.0	750.0
5	20	18.70	9.80	10.00	1.24	132.0	287.0	725.0
6	25	18.10	12.00	8.30	0.92	133.0	313.0	725.0
7	30	17.50	7.50	11.60	1.33	133.0	301.0	750.0
8	35	16.90	9.40	10.30	1.28	133.0	301.0	750.0
9	40	16.20	10.10	9.80	1.17	133.0	300.0	775.0
10	45	15.40	10.80	9.20	0.99	133.0	301.0	750.0
11	50	14.80	11.60	8.80	0.72	131.0	309.0	725.0
12	55	14.30	11.20	9.00	0.75	131.0	309.0	725.0
13	60	13.70	11.10	9.10	0.77	131.0	307.0	750.0
14	65	13.10	12.50	8.10	0.58	132.0	321.0	725.0
15	70	12.60	11.90	8.70	0.62	131.0	315.0	725.0
16	75	12.20	11.20	9.20	0.53	130.0	308.0	725.0
17	80	11.60	11.90	8.30	0.95	130.0	311.0	775.0
18	85	11.00	11.20	9.00	0.88	129.0	304.0	750.0
19	90	10.40	11.70	8.50	0.91	128.0	308.0	775.0
20	95	9.90	12.60	7.60	0.82	130.0	321.0	775.0
21	100	9.40	11.80	8.50	0.49	126.0	308.0	750.0
22	105	9.10	11.30	9.20	0.72	126.0	303.0	775.0
23	110	8.70	10.70	9.20	0.85	125.0	292.0	800.0
24	115	8.30	11.20	8.80	0.76	123.0	289.0	775.0
25	120	7.80	11.30	8.70	0.73	121.0	286.0	800.0
26	125	7.50	10.90	9.10	0.67	120.0	283.0	800.0
27	130	7.30	9.80	10.30	0.63	118.0	271.0	800.0
28	135	7.00	9.70	10.30	0.64	118.0	268.0	800.0
29	140	6.70	8.60	10.30	0.76	117.0	260.0	825.0
30	145	6.40	8.20	12.00	2.65	114.0	236.0	875.0
31	150	6.20	7.70	11.70	2.65	111.0	228.0	950.0
32	155	6.00	6.70	11.80	2.75	110.0	222.0	%1025.0
33	160	5.80	7.00	11.80	2.15	109.0	218.0	975.0
34	165	5.60	6.30	13.10	1.55	108.0	209.0	950.0
35	170	5.50	6.40	13.00	1.52	108.0	204.0	950.0
36	175	5.30	6.90	12.90	2.33	106.0	198.0	%1025.0
37	180	5.10	6.10	12.60	2.07	106.0	198.0	%1025.0
38	185	5.00	6.40	12.60	1.99	105.0	198.0	%1025.0
39	190	4.90	5.30	13.00	2.08	105.0	197.0	%1050.0
40	195	4.80	5.70	12.80	2.08	104.0	196.0	%1125.0
41	200	4.70	5.50	13.00	2.30	103.0	197.0	%1100.0
42	205	4.60	5.20	13.30	2.26	102.0	191.0	%1050.0
43	210	4.50	4.90	13.60	2.38	102.0	183.0	%1075.0
44	215	4.40	5.00	13.20	2.62	102.0	182.0	%1125.0
45	220	4.40	4.90	13.30	2.72	102.0	181.0	%1125.0
46	225	4.30	4.80	13.30	2.77	102.0	180.0	%1125.0
47	230	4.20	4.80	13.40	2.71	102.0	181.0	%1125.0
48	235	4.10	4.80	13.50	2.72	102.0	180.0	%1125.0
49	240	4.10	4.80	13.40	2.72	102.0	178.0	%1125.0

50	245	4.00	4.60	13.60	2.67	102.0	178.0	%1125.0

TABLE 2B
FIELD DATA

CLIENT: FX DROLET RUN NUMBER: 1 DATE: 6/23/93

			Dry and HC free					
PT	TIME	WT. FUEL	%CO2	%O2	%CO	WT BLB	DRY BLB	TRACER
51	250	3.90	5.00	13.40	2.45	102.0	177.0	%1125.0
52	255	3.80	4.90	13.40	2.65	102.0	176.0	%1125.0
53	260	3.80	4.50	13.80	2.60	102.0	177.0	%1100.0
54	265	3.70	4.50	13.80	2.51	100.0	168.0	%1100.0
55	270	3.70	4.70	13.50	2.68	100.0	166.0	%1200.0
56	275	3.60	4.70	13.70	2.67	99.0	168.0	%1200.0
57	280	3.50	4.70	13.60	2.87	99.0	169.0	%1200.0
58	285	3.40	4.60	13.40	3.37	101.0	172.0	%1200.0
59	290	3.30	4.70	13.30	3.50	101.0	171.0	%1200.0
60	295	3.30	4.70	13.10	3.64	101.0	172.0	%1200.0
61	300	3.20	4.70	13.10	3.62	101.0	173.0	%1175.0
62	305	3.10	4.80	13.10	3.60	101.0	173.0	%1175.0
63	310	3.00	4.70	13.10	3.59	101.0	173.0	%1175.0
64	315	2.90	4.70	13.10	3.57	101.0	173.0	%1150.0
65	320	2.80	4.80	13.00	3.65	101.0	173.0	%1150.0
66	325	2.80	4.90	12.90	3.68	101.0	173.0	%1150.0
67	330	2.70	4.70	13.10	3.72	101.0	173.0	%1150.0
68	335	2.60	4.70	13.10	3.77	101.0	174.0	%1150.0
69	340	2.50	4.80	13.10	3.80	101.0	174.0	%1175.0
70	345	2.40	4.80	13.00	3.83	101.0	175.0	%1175.0
71	350	2.30	4.90	13.00	3.80	101.0	174.0	%1200.0
72	355	2.20	4.90	13.00	3.82	101.0	175.0	%1200.0
73	360	2.10	4.80	13.10	3.69	101.0	175.0	%1200.0
74	365	2.10	4.80	13.00	3.73	101.0	175.0	%1200.0
75	370	2.00	4.80	13.00	3.71	101.0	174.0	%1200.0
76	375	1.90	4.90	13.00	3.76	101.0	175.0	%1200.0
77	380	1.80	4.90	13.00	3.68	101.0	175.0	%1175.0
78	385	1.70	4.90	13.00	3.65	101.0	175.0	%1150.0
79	390	1.60	4.90	13.00	3.68	101.0	175.0	%1150.0
80	395	1.50	4.90	13.10	3.61	101.0	174.0	%1150.0
81	400	1.40	4.80	13.20	3.55	101.0	175.0	%1150.0
82	405	1.40	4.80	13.30	3.50	101.0	175.0	%1125.0
83	410	1.30	4.80	13.30	3.48	101.0	174.0	%1150.0
84	415	1.20	4.70	13.40	3.49	101.0	174.0	%1150.0
85	420	1.10	4.80	13.10	1.51	101.0	174.0	%1150.0
86	425	1.00	6.30	13.00	1.42	101.0	174.0	%1150.0
87	430	1.00	6.10	13.10	1.57	101.0	175.0	%1150.0
88	435	0.90	6.00	13.20	1.54	101.0	174.0	%1175.0
89	440	0.80	5.90	13.30	1.56	101.0	174.0	%1175.0
90	445	0.70	5.90	13.20	1.55	101.0	174.0	%1150.0
91	450	0.70	5.80	13.40	1.49	101.0	174.0	%1150.0
92	455	0.60	5.70	13.50	1.68	101.0	173.0	%1175.0
93	460	0.50	5.50	13.60	1.68	101.0	175.0	%1150.0
94	465	0.40	5.50	13.40	1.78	101.0	175.0	%1175.0
95	470	0.40	5.60	13.50	1.70	101.0	174.0	%1200.0
96	475	0.30	4.80	14.20	2.15	99.0	174.0	%1200.0
97	480	0.20	4.60	14.40	1.95	99.0	175.0	%1175.0
98	485	0.20	4.60	14.50	1.80	99.0	173.0	%1175.0
99	490	0.10	4.70	14.40	1.79	99.0	172.0	%1175.0

100	495	0.10	4.70	14.50	1.69	99.0	171.0	%1175.0

TABLE 2B
FIELD DATA

CLIENT: FX DROLET   RUN NUMBER: 1   DATE: 6/23/93

PT	TIME	WT. FUEL	Dry and HC free %CO2	%O2	%CO	WT BLB	DRY BLB	TRACER
101	500	0.00	4.30	14.80	1.95	99.0	171.0	%1175.0

TABLE 3
CHO BALANCED TEST DATA

CLIENT: FX DROLET RUN NUMBER: 1 DATE: 6/23/93

PT	FLOW RATE (DSCFM w/HC)	DRY BURN RATE (LB/HOUR-CALCULATED)	STACK MOISTURE (%VOLUME-w/HC)	STACK TEMP (F)
1	6.58	3.15	10.31	375.0
2	19.75	4.96	6.13	553.0
3	6.97	2.17	15.31	320.0
4	7.90	2.75	15.87	294.0
5	8.17	3.59	16.96	287.0
6	8.17	4.33	16.42	313.0
7	7.90	2.51	17.02	301.0
8	7.90	3.33	17.02	301.0
9	7.64	3.45	17.07	300.0
10	7.90	3.73	17.02	301.0
11	8.17	4.12	15.11	309.0
12	8.17	3.93	15.11	309.0
13	7.90	3.78	15.21	307.0
14	8.17	4.41	15.26	321.0
15	8.17	4.24	14.81	315.0
16	8.17	3.88	14.43	308.0
17	7.64	4.00	14.28	311.0
18	7.90	3.87	13.91	304.0
19	7.64	3.92	13.01	308.0
20	7.64	4.15	13.77	321.0
21	7.90	3.89	11.64	308.0
22	7.64	3.80	11.90	303.0
23	7.41	3.36	11.81	292.0
24	7.64	3.61	10.69	289.0
25	7.41	3.52	9.63	286.0
26	7.41	3.36	9.19	283.0
27	7.41	3.05	8.69	271.0
28	7.41	2.99	8.84	268.0
29	7.18	2.25	8.72	260.0
30	6.77	3.31	8.43	236.0
31	6.24	2.69	7.39	228.0
32	5.78	2.06	7.25	222.0
33	6.08	2.07	7.02	218.0
34	6.24	1.86	7.06	209.0
35	6.24	1.87	7.33	204.0
36	5.78	2.29	6.81	198.0
37	5.78	1.69	6.81	198.0
38	5.78	1.82	6.40	198.0
39	5.64	1.36	6.45	197.0
40	5.27	1.41	6.11	196.0
41	5.39	1.48	5.66	197.0
42	5.64	1.46	5.61	191.0
43	5.51	1.41	6.05	183.0
44	5.27	1.38	6.10	182.0
45	5.27	1.39	6.16	181.0
46	5.27	1.36	6.21	180.0
47	5.27	1.37	6.16	181.0
48	5.27	1.40	6.21	180.0
49	5.27	1.37	6.32	178.0

50	5.27	1.31	6.32	178.0

TABLE 3
CHO BALANCED TEST DATA

CLIENT: FX DROLET RUN NUMBER: 1 DATE: 6/23/93

PT	FLOW RATE (DSCFM w/HC)	DRY BURN RATE (LB/HOUR-CALCULATED)	STACK MOISTURE (%VOLUME-w/HC)	STACK TEMP (F)
51	5.27	1.37	6.38	177.0
52	5.27	1.39	6.43	176.0
53	5.39	1.32	6.38	177.0
54	5.39	1.28	6.14	168.0
55	4.94	1.25	6.25	166.0
56	4.94	1.30	5.78	168.0
57	4.94	1.34	5.73	169.0
58	4.94	1.43	6.28	172.0
59	4.94	1.49	6.33	171.0
60	4.94	1.49	6.28	172.0
61	5.04	1.52	6.22	173.0
62	5.04	1.56	6.22	173.0
63	5.04	1.51	6.22	173.0
64	5.15	1.53	6.22	173.0
65	5.15	1.58	6.22	173.0
66	5.15	1.61	6.22	173.0
67	5.15	1.59	6.22	173.0
68	5.15	1.60	6.17	174.0
69	5.04	1.63	6.17	174.0
70	5.04	1.61	6.11	175.0
71	4.94	1.61	6.17	174.0
72	4.94	1.62	6.11	175.0
73	4.94	1.55	6.11	175.0
74	4.94	1.54	6.11	175.0
75	4.94	1.54	6.17	174.0
76	4.94	1.60	6.11	175.0
77	5.04	1.60	6.11	175.0
78	5.15	1.63	6.11	175.0
79	5.15	1.64	6.11	175.0
80	5.15	1.64	6.17	174.0
81	5.15	1.60	6.11	175.0
82	5.27	1.64	6.11	175.0
83	5.15	1.60	6.17	174.0
84	5.15	1.58	6.17	174.0
85	5.15	0.81	6.17	174.0
86	5.15	1.46	6.17	174.0
87	5.15	1.45	6.11	175.0
88	5.04	1.39	6.17	174.0
89	5.04	1.37	6.17	174.0
90	5.15	1.38	6.17	174.0
91	5.15	1.36	6.17	174.0
92	5.04	1.38	6.22	173.0
93	5.15	1.34	6.11	175.0
94	5.04	1.30	6.11	175.0
95	4.94	1.31	6.17	174.0
96	4.94	1.28	5.45	174.0
97	5.04	1.19	5.40	175.0
98	5.04	1.16	5.51	173.0
99	5.04	1.18	5.56	172.0

100	5.04	1.17	5.62	171.0

TABLE 3
CHO BALANCED TEST DATA

CLIENT: FX DROLET RUN NUMBER: 1 DATE: 6/23/93

PT	FLOW RATE (DSCFM w/HC)	DRY BURN RATE (LB/HOUR-CALCULATED)	STACK MOISTURE (%VOLUME-w/HC)	STACK TEMP (F)
101	5.04	1.16	5.62	171.0

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (708) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

July 8, 1993

PLEASE ADDRESS ALL CORRESPONDENCE TO:
609 CHARLES ST., BILLINGS, MT 59102
TELEPHONE: (406) 252-5818
FAX: (406) 252-5818

ENERGY & ENVIRONMENTAL
SYSTEMS PERFORMANCE CORP.
1315 S. Central Ave., Unit C
Kent, WA 98032

Sample identification by
EESPC

FX Drolet HT2000 Run 1

Kind of sample reported to us Wood

Sample taken at ------

Sample taken by ------

Date sampled June 23, 1993

Date received July 6, 1993

Analysis Report No. 51-44236

SHORT PROXIMATE ANALYSIS

	As Received	Dry Basis		
% Moisture	8.44	xxxxx		
% Ash	0.12	0.13		
Btu/lb	7960	8694	MAF	8705
% Sulfur	xxxxx	xxxxx		

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Billings Laboratory

TABLE 1

RESULTS OF EFFICIENCY TESTING ON THE FX DROLET WOOD STOVE

RUN NUMBER 2 PROJECT NUMBER SERIAL NUMBER C1103

DATE OF TEST: 6/25/93 STOVE MODEL: HT2000

AVERAGE EFFICIENCIES

¶
****
* COMBUSTION= 85.0 ¶ % * HEAT TRANS.= 81.3 ¶ % * OVERALL= 69.2 ¶ % *
****

EMISSIONS

¶
****

* PARTICULATES:	3.534	(grams/Kg-wood)	3.769	(grams/hour) *
* CARBON MONOXIDE:	144.138	(grams/Kg-wood)	153.746	(grams/hour) *

****

TEST DATA

BURN RATE=====================================>	2.89	(lb/hr-wet)
BURN RATE=====================================>	1.07	(kg/hr-dry)
BURN RATE=====================================>	1.31	(kg/hr-wet)
FUEL MOISTURE ================================>	18.49	(% Wet basis)
HEAT OUTPUT===================================>	14013.72	(Btu/hr)
FUEL HIGHER HEATING VALUE=====================>	8616.00	(Btu/lb-dry)
AVERAGE STACK FLOW RATE=======================>	6.44	(DSCF/minute w/HC)
AIR TO FUEL RATIO=============================>	12.56	(lb-air/lb-fuel)
AVERAGE EXCESS AIR============================>	114.66	(% Stoichiometric)
AVERAGE STACK TEMPERATURE=====================>	252.74	(Degrees F)
AVERAGE STACK MOISTURE =======================>	8.16	(% volume-wet w/HC)
AVERAGE CO2===================================>	7.92	(% volume-dry w/HC)
AVERAGE O2====================================>	11.74	(% volume-dry w/HC)
AVERAGE CO====================================>	1.21	(% volume-dry w/HC)

-> 95
69.49331

09:27:52
07-09-1993

OVERALL EFFICIENCY WITHOUT STOVE TEMPERATURE CHANGE= 68.8 %

TABLE 2A
TEST DATA LISTING

CLIENT: FX DROLET RUN NUMBER: 2 DATE OF TEST: 6/25/93

PROJECT NUMBER:
FUEL MOISTURE: 22.687
BAROMETRIC PRESSURE (in Hg): 30.33
STOVE WEIGHT (lbs): 487
CHANGE IN STOVE TEMPERATURE(F): -60
FUEL COMPOSITION: %C= 51 %H 7.3 %O= 41
METHOD 5 RESULTS: % MOISTURE= 8.2279 GRAIN LOADING (gr/scf)= .1519

MODEL NUMBER: HT2000
STACK STATIC PRESSURE(in Hg):-.0022065
ROOM TEMPERATURE (F): 79
AMBIENT MOISTURE CONTENT (%): 1.3
FUEL HHV (BTU/lb): 8616

TABLE 2B
FIELD DATA

CLIENT: FX DROLET   RUN NUMBER: 2   DATE: 6/25/93

			Dry and HC free					
PT	TIME	WT. FUEL	%CO2	%O2	%CO	WT BLB	DRY BLB	TRACER
1	0	22.60	12.30	7.20	0.88	130.0	378.0	875.0
2	5	22.00	5.20	14.80	0.38	131.0	489.0	325.0
3	10	21.50	5.30	14.40	0.85	130.0	308.0	850.0
4	15	21.00	7.50	12.70	0.67	130.0	299.0	700.0
5	20	20.50	7.20	13.30	0.64	126.0	279.0	700.0
6	25	19.80	10.30	10.50	0.83	130.0	308.0	625.0
7	30	19.30	6.60	13.80	1.22	127.0	272.0	725.0
8	35	18.70	8.20	10.10	1.43	129.0	294.0	775.0
9	40	18.10	8.80	11.30	1.15	130.0	290.0	750.0
10	45	17.50	9.20	11.10	1.00	130.0	298.0	700.0
11	50	16.80	11.60	9.30	0.94	131.0	335.0	650.0
12	55	16.20	10.30	10.20	0.96	131.0	329.0	650.0
13	60	15.50	10.60	9.80	1.18	130.0	328.0	675.0
14	65	14.90	11.40	9.30	0.98	130.0	336.0	650.0
15	70	14.30	11.90	8.80	0.84	130.0	341.0	650.0
16	75	13.70	12.10	8.70	0.62	130.0	348.0	625.0
17	80	13.10	12.30	8.50	0.60	130.0	348.0	650.0
18	85	12.50	12.50	8.10	0.71	130.0	347.0	650.0
19	90	11.90	12.70	8.10	0.69	130.0	342.0	675.0
20	95	11.30	13.20	7.70	0.47	130.0	351.0	675.0
21	100	10.70	12.40	8.50	0.47	129.0	344.0	675.0
22	105	10.20	11.70	8.70	0.62	128.0	338.0	675.0
23	110	9.80	10.10	10.90	1.14	126.0	318.0	725.0
24	115	9.50	8.00	12.00	1.71	120.0	277.0	825.0
25	120	9.10	9.30	11.20	1.33	120.0	275.0	800.0
26	125	8.70	7.50	12.40	1.79	119.0	266.0	875.0
27	130	8.30	8.80	10.90	0.93	119.0	274.0	800.0
28	135	8.00	9.60	10.70	0.67	119.0	277.0	725.0
29	140	7.70	9.30	10.90	0.74	119.0	274.0	725.0
30	145	7.40	9.00	11.20	0.83	119.0	263.0	750.0
31	150	7.10	9.20	10.60	0.78	118.0	263.0	775.0
32	155	6.80	9.90	9.80	0.71	117.0	272.0	775.0
33	160	6.50	7.80	10.70	1.07	116.0	264.0	825.0
34	165	6.30	8.20	11.60	1.04	115.0	260.0	825.0
35	170	6.10	8.30	11.30	0.99	115.0	252.0	775.0
36	175	5.90	8.50	11.40	1.10	112.0	245.0	775.0
37	180	5.60	9.10	10.80	1.04	112.0	244.0	800.0
38	185	5.40	9.20	10.90	1.11	112.0	244.0	800.0
39	190	5.20	8.60	11.30	1.23	110.0	240.0	825.0
40	195	5.10	7.70	12.00	1.35	110.0	235.0	850.0
41	200	4.90	7.30	12.10	1.42	109.0	225.0	850.0
42	205	4.80	7.30	12.20	1.34	109.0	219.0	850.0
43	210	4.70	7.70	11.70	1.40	108.0	217.0	875.0
44	215	4.60	7.30	12.10	1.54	108.0	217.0	850.0
45	220	4.50	7.30	12.00	1.51	108.0	217.0	850.0
46	225	4.40	7.30	12.00	1.51	108.0	219.0	850.0
47	230	4.30	6.90	12.50	1.44	108.0	216.0	825.0
48	235	4.20	7.00	12.40	1.32	108.0	211.0	850.0
49	240	4.10	7.10	12.20	1.28	108.0	203.0	850.0

50	245	4.00	7.30	12.20	1.29	108.0	205.0	875.0

TABLE 2B
FIELD DATA

CLIENT: FX DROLET RUN NUMBER: 2 DATE: 6/25/93

PT	TIME	WT. FUEL	Dry and HC free %CO2	%O2	%CO	WT BLB	DRY BLB	TRACER
51	250	3.90	7.30	12.20	1.34	108.0	205.0	900.0
52	255	3.80	6.70	12.70	1.67	108.0	206.0	900.0
53	260	3.70	6.70	12.70	1.57	108.0	207.0	875.0
54	265	3.60	6.80	12.60	1.57	108.0	207.0	900.0
55	270	3.50	6.50	12.90	1.54	108.0	204.0	850.0
56	275	3.40	6.50	12.90	1.61	107.0	200.0	850.0
57	280	3.30	6.50	12.70	1.79	105.0	199.0	900.0
58	285	3.20	6.60	12.70	1.83	105.0	199.0	900.0
59	290	3.20	6.60	12.70	1.83	107.0	201.0	900.0
60	295	3.10	6.40	12.90	1.90	106.0	203.0	875.0
61	300	3.00	5.90	13.30	1.88	106.0	202.0	875.0
62	305	2.90	6.10	13.30	1.81	105.0	200.0	900.0
63	310	2.80	5.80	13.50	1.73	105.0	196.0	850.0
64	315	2.70	5.70	13.30	1.71	104.0	192.0	850.0
65	320	2.70	6.30	13.00	1.71	104.0	190.0	900.0
66	325	2.60	6.30	13.10	1.70	104.0	192.0	925.0
67	330	2.50	6.30	13.30	1.62	104.0	194.0	900.0
68	335	2.40	6.30	13.10	1.65	104.0	195.0	900.0
[illegible]	340	2.30	6.40	13.00	1.65	104.0	198.0	900.0
70	345	2.20	6.50	13.00	1.59	104.0	198.0	900.0
71	350	2.10	6.50	13.10	1.51	104.0	201.0	875.0
72	355	2.10	6.20	13.40	1.45	105.0	197.0	850.0
73	360	2.00	6.30	13.20	1.39	105.0	193.0	875.0
74	365	1.90	7.00	12.70	1.29	104.0	192.0	925.0
75	370	1.80	7.10	12.60	1.20	105.0	196.0	925.0
76	375	1.70	7.10	12.60	1.23	105.0	197.0	900.0
77	380	1.60	7.10	12.60	1.21	105.0	199.0	900.0
78	385	1.50	7.10	12.70	1.21	105.0	200.0	900.0
79	390	1.40	7.10	12.70	1.20	105.0	203.0	900.0
80	395	1.30	6.70	13.10	1.17	105.0	202.0	850.0
81	400	1.20	6.60	13.10	1.23	106.0	198.0	850.0
82	405	1.10	6.90	12.70	1.32	105.0	196.0	875.0
83	410	1.00	6.80	13.00	1.39	104.0	196.0	875.0
84	415	0.90	6.60	13.00	1.45	105.0	199.0	875.0
85	420	0.90	6.70	13.00	1.49	105.0	202.0	850.0
86	425	0.80	6.60	13.00	1.53	105.0	203.0	850.0
87	430	0.70	6.20	13.40	1.50	105.0	204.0	850.0
88	435	0.60	6.20	13.30	1.53	104.0	198.0	825.0
89	440	0.50	6.10	13.40	1.52	104.0	197.0	850.0
90	445	0.40	6.40	13.10	1.62	104.0	195.0	900.0
91	450	0.30	6.30	13.10	1.68	104.0	200.0	900.0
92	455	0.20	6.30	13.30	1.50	104.0	200.0	900.0
93	460	0.20	6.30	13.30	1.51	104.0	200.0	900.0
[illegible]	465	0.10	6.10	13.70	1.35	104.0	200.0	900.0
[illegible]	470	0.00	6.30	13.50	1.22	104.0	201.0	900.0

TABLE 3
CHO BALANCED TEST DATA

CLIENT: FX DROLET RUN NUMBER: 2 DATE: 6/25/93

PT	FLOW RATE (DSCFM w/HC)	DRY BURN RATE (LB/HOUR-CALCULATED)	STACK MOISTURE (%VOLUME-w/HC)	STACK TEMP (F)
1	5.87	2.95	10.35	378.0
2	15.81	3.14	5.73	489.0
3	6.04	1.34	13.73	308.0
4	7.34	2.38	14.17	299.0
5	7.34	2.38	12.50	279.0
6	8.22	3.92	13.73	308.0
7	7.09	2.38	13.48	272.0
8	6.63	2.09	13.73	294.0
9	6.85	2.78	14.60	290.0
10	7.34	3.09	14.21	298.0
11	7.90	4.28	13.13	335.0
12	7.90	3.74	13.42	329.0
13	7.61	3.77	12.77	328.0
14	7.90	4.17	12.38	336.0
15	7.90	4.25	12.14	341.0
16	8.22	4.40	11.80	348.0
17	7.90	4.29	11.80	348.0
18	7.90	4.34	11.85	347.0
19	7.61	4.30	12.09	342.0
20	7.61	4.37	11.66	351.0
21	7.61	4.13	11.30	344.0
22	7.61	3.82	10.92	338.0
23	7.09	3.54	10.59	318.0
24	6.23	2.54	9.05	277.0
25	6.42	2.94	9.15	275.0
26	5.87	2.28	9.05	266.0
27	6.42	2.39	8.65	274.0
28	7.09	2.94	8.50	277.0
29	7.09	2.86	8.65	274.0
30	6.85	2.72	9.20	263.0
31	6.63	2.54	8.67	263.0
32	6.63	2.67	7.69	272.0
33	6.23	1.76	7.58	264.0
34	6.23	2.24	7.28	260.0
35	6.63	2.33	7.69	252.0
36	6.63	2.53	6.62	245.0
37	6.42	2.58	6.67	244.0
38	6.42	2.70	6.67	244.0
39	6.23	2.46	5.98	240.0
40	6.04	2.15	6.23	235.0
41	6.04	2.00	6.32	225.0
42	6.04	1.99	6.63	219.0
43	5.87	2.03	6.31	217.0
44	6.04	2.05	6.31	217.0
45	6.04	2.01	6.31	217.0
46	6.04	2.01	6.20	219.0
47	6.23	1.96	6.36	216.0
48	6.04	1.88	6.62	211.0
49	6.04	1.86	7.03	203.0

50	5.87	1.91	6.93	205.0

TABLE 3
CHO BALANCED TEST DATA

CLIENT: FX DROLET RUN NUMBER: 2 DATE: 6/25/93

PT	FLOW RATE (DSCFM w/HC)	DRY BURN RATE (LB/HOUR-CALCULATED)	STACK MOISTURE (%VOLUME-w/HC)	STACK TEMP (F)
51	5.71	1.88	6.93	205.0
52	5.71	1.85	6.88	206.0
53	5.87	1.86	6.82	207.0
54	5.71	1.83	6.82	207.0
55	6.04	1.85	6.98	204.0
56	6.04	1.88	6.78	200.0
57	5.71	1.79	6.04	199.0
58	5.71	1.86	6.04	199.0
59	5.71	1.86	6.72	201.0
60	5.87	1.89	6.22	203.0
61	5.87	1.73	6.27	202.0
62	5.71	1.76	5.99	200.0
63	6.04	1.73	6.19	196.0
64	6.04	1.60	6.02	192.0
65	5.71	1.74	6.12	190.0
66	5.55	1.72	6.02	192.0
67	5.71	1.79	5.92	194.0
68	5.71	1.74	5.86	195.0
[illegible]	5.71	1.77	5.71	198.0
70	5.71	1.79	5.71	198.0
71	5.87	1.84	5.55	201.0
72	6.04	1.79	6.14	197.0
73	5.87	1.71	6.35	193.0
74	5.55	1.80	6.02	192.0
75	5.55	1.78	6.19	196.0
76	5.71	1.85	6.14	197.0
77	5.71	1.84	6.04	199.0
78	5.71	1.86	5.99	200.0
79	5.71	1.86	5.83	203.0
80	6.04	1.86	5.88	202.0
81	6.04	1.83	6.48	198.0
82	5.87	1.86	6.19	196.0
83	5.87	1.92	5.81	196.0
84	5.87	1.84	6.04	199.0
85	6.04	1.96	5.88	202.0
86	6.04	1.93	5.83	203.0
87	6.04	1.82	5.78	204.0
88	6.23	1.85	5.71	198.0
89	6.04	1.77	5.76	197.0
90	5.71	1.78	5.86	195.0
91	5.71	1.76	5.60	200.0
92	5.71	1.74	5.60	200.0
93	5.71	1.74	5.60	200.0
[illegible]	5.71	1.69	5.60	200.0
[illegible]	5.71	1.68	5.55	201.0

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (708) 953-9300
Member of the SGS Group (Société Générale de Surveillance)

July 8, 1993

PLEASE ADDRESS ALL CORRESPONDENCE TO:
609 CHARLES ST., BILLINGS, MT 59102
TELEPHONE: (406) 252-5818
FAX: (406) 252-5818

ENERGY & ENVIRONMENTAL
SYSTEMS PERFORMANCE CORP.
1315 S. Central Ave., Unit C
Kent, WA 98032

Sample identification by
EESPC

FX Drolet HT2000 Run 2

Kind of sample reported to us	Wood
Sample taken at	------
Sample taken by	------
Date sampled	June 24, 1993
Date received	July 6, 1993

Analysis Report No. 51-44237

SHORT PROXIMATE ANALYSIS

	As Received	Dry Basis		
% Moisture	8.61	xxxxx		
% Ash	0.06	0.07		
Btu/lb	7874	8616	**MAF**	8622
% Sulfur	xxxxx	xxxxx		

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Billings Laboratory

TABLE 1

RESULTS OF EFFICIENCY TESTING ON THE FX DROLET WOOD STOVE

RUN NUMBER 4 PROJECT NUMBER SERIAL NUMBER C1103

DATE OF TEST: 6/29/93 STOVE MODEL: HT2000

AVERAGE EFFICIENCIES

¶

COMBUSTION= 90.3 ¶ %	HEAT TRANS.= 81.2 ¶ %	OVERALL= 73.3 ¶ %

EMISSIONS

¶

PARTICULATES:	1.879	(grams/Kg-wood)	3.141	(grams/hour)
CARBON MONOXIDE:	102.457	(grams/Kg-wood)	171.258	(grams/hour)

TEST DATA

BURN RATE	4.55	(lb/hr-wet)
BURN RATE	1.67	(kg/hr-dry)
BURN RATE	2.06	(kg/hr-wet)
FUEL MOISTURE	18.96	(% Wet basis)
HEAT OUTPUT	23330.00	(Btu/hr)
FUEL HIGHER HEATING VALUE	8637.00	(Btu/lb-dry)
AVERAGE STACK FLOW RATE	10.44	(DSCF/minute w/HC)
AIR TO FUEL RATIO	13.11	(lb-air/lb-fuel)
AVERAGE EXCESS AIR	102.99	(% Stoichiometric)
AVERAGE STACK TEMPERATURE	369.62	(Degrees F)
AVERAGE STACK MOISTURE	5.43	(% volume-wet w/HC)
AVERAGE CO2	8.34	(% volume-dry w/HC)
AVERAGE O2	11.37	(% volume-dry w/HC)
AVERAGE CO	0.83	(% volume-dry w/HC)

-> 58 15:01:56

73.17082 07-09-1993

OVERALL EFFICIENCY WITHOUT STOVE TEMPERATURE CHANGE= 73.0 %

TABLE 2B
FIELD DATA

CLIENT: FX DROLET RUN NUMBER: 4 DATE: 6/29/93

			Dry and HC free					
PT	TIME	WT. FUEL	%CO2	%O2	%CO	WT BLB	DRY BLB	TRACER
1	0	21.60	6.40	13.40	0.77	119.0	360.0	600.0
2	5	21.10	0.92	19.30	0.35	119.0	388.0	300.0
3	10	20.70	2.20	18.10	0.59	110.0	294.0	550.0
4	15	20.10	3.60	14.70	0.60	115.0	339.0	525.0
5	20	19.30	8.30	11.00	0.51	126.0	447.0	450.0
6	25	18.50	8.00	12.20	0.85	122.0	402.0	475.0
7	30	17.70	9.60	10.60	0.84	125.0	404.0	475.0
8	35	16.80	10.30	10.00	0.76	129.0	444.0	450.0
9	40	15.90	10.50	9.70	1.08	130.0	464.0	475.0
10	45	15.10	11.30	8.90	1.07	130.0	467.0	500.0
11	50	14.10	12.30	8.10	0.87	131.0	473.0	500.0
12	55	13.20	12.80	7.70	0.76	131.0	491.0	500.0
13	60	12.30	13.10	7.60	0.30	131.0	500.0	475.0
14	65	11.50	12.30	8.20	0.28	131.0	491.0	475.0
15	70	10.60	13.30	7.30	0.30	132.0	504.0	475.0
16	75	10.00	13.30	7.20	0.30	132.0	505.0	500.0
17	80	9.20	13.40	7.20	0.27	131.0	501.0	475.0
18	85	8.50	13.50	7.20	0.19	131.0	493.0	475.0
19	90	7.70	13.80	6.70	0.24	131.0	494.0	475.0
20	95	7.10	14.40	6.20	0.24	131.0	496.0	500.0
21	100	6.40	14.20	6.60	0.18	131.0	496.0	475.0
22	105	5.80	12.00	8.30	0.20	128.0	455.0	475.0
23	110	5.40	10.70	9.20	0.24	125.0	424.0	475.0
24	115	5.00	10.40	9.50	0.23	122.0	409.0	500.0
25	120	4.70	10.40	9.40	0.29	121.0	392.0	500.0
26	125	4.30	10.70	9.20	0.33	121.0	387.0	500.0
27	130	4.00	10.60	9.10	0.33	121.0	381.0	500.0
28	135	3.80	9.90	10.90	0.25	120.0	365.0	525.0
29	140	3.60	7.70	11.80	0.69	118.0	341.0	550.0
30	145	3.40	7.80	11.60	0.73	117.0	333.0	550.0
31	150	3.30	7.50	12.00	0.72	117.0	324.0	525.0
32	155	3.20	7.60	11.90	0.65	112.0	319.0	525.0
33	160	3.00	7.50	12.00	0.72	114.0	316.0	525.0
34	165	2.90	7.30	12.20	0.74	112.0	312.0	525.0
35	170	2.70	6.90	12.70	0.91	111.0	308.0	525.0
36	175	2.60	6.70	12.70	1.00	110.0	305.0	525.0
37	180	2.50	6.60	12.80	1.12	111.0	305.0	525.0
38	185	2.40	6.60	12.80	1.19	110.0	305.0	525.0
39	190	2.30	6.60	12.80	1.21	110.0	308.0	525.0
40	195	2.10	6.50	12.80	1.29	110.0	311.0	525.0
41	200	2.00	6.50	12.90	1.30	111.0	304.0	525.0
42	205	1.90	6.20	13.00	1.53	110.0	294.0	525.0
43	210	1.80	6.20	13.00	1.50	111.0	294.0	525.0
44	215	1.70	6.30	13.00	1.50	110.0	285.0	525.0
45	220	1.50	6.30	12.90	1.51	110.0	292.0	525.0
46	225	1.40	6.00	13.40	1.41	111.0	293.0	525.0
47	230	1.20	5.90	13.30	1.38	110.0	287.0	525.0
48	235	1.10	6.00	13.20	1.41	110.0	284.0	525.0
49	240	1.00	6.10	13.20	1.42	111.0	280.0	525.0

50	245	0.90	6.10	13.20	1.49	111.0	280.0	525.0

TABLE 2B
FIELD DATA

CLIENT: FX DROLET RUN NUMBER: 4 DATE: 6/29/93

			Dry and HC free					
PT	TIME	WT. FUEL	%CO2	%O2	%CO	WT BLB	DRY BLB	TRACER
51	250	0.80	6.30	13.00	1.33	111.0	286.0	550.0
52	255	0.60	6.00	13.60	1.23	111.0	296.0	525.0
53	260	0.50	5.70	13.70	1.29	110.0	287.0	525.0
54	265	0.40	5.40	13.80	1.37	110.0	280.0	525.0
55	270	0.30	5.50	13.80	1.41	109.0	273.0	550.0
56	275	0.20	6.50	13.70	1.44	109.0	275.0	550.0
57	280	0.10	5.40	13.90	1.45	110.0	282.0	550.0
58	285	0.00	5.40	13.90	1.43	110.0	287.0	550.0

TABLE 3
CHO BALANCED TEST DATA

CLIENT: FX DROLET RUN NUMBER: 4 DATE: 6/29/93

PT	FLOW RATE (DSCFM w/HC)	DRY BURN RATE (LB/HOUR-CALCULATED)	STACK MOISTURE (%VOLUME-w/HC)	STACK TEMP (F)
1	8.78	2.34	5.52	360.0
2	17.57	0.50	3.78	388.0
3	9.58	1.00	4.08	294.0
4	10.04	0.59	4.19	339.0
5	11.71	3.54	5.48	447.0
6	11.09	3.97	5.08	402.0
7	11.09	4.68	7.27	404.0
8	11.71	5.27	8.21	444.0
9	11.09	5.27	7.90	464.0
10	10.54	5.34	7.72	467.0
11	10.54	5.72	8.28	473.0
12	10.54	5.90	7.21	491.0
13	11.09	6.10	6.68	500.0
14	11.09	5.63	7.21	491.0
15	11.09	6.14	7.38	504.0
16	10.54	5.79	7.32	505.0
17	11.09	6.17	6.62	501.0
18	11.09	6.20	7.09	493.0
[illegible]	11.09	6.27	7.03	494.0
20	10.54	6.26	6.91	496.0
21	11.09	6.55	6.91	496.0
22	11.09	5.33	6.68	455.0
23	11.09	4.57	6.06	424.0
24	10.54	4.20	4.65	409.0
25	10.54	4.20	4.96	392.0
26	10.54	4.41	5.27	387.0
27	10.54	4.26	5.64	381.0
28	10.04	4.23	5.91	365.0
29	9.58	2.88	6.02	341.0
30	9.58	2.90	5.85	333.0
31	10.04	2.95	6.41	324.0
32	10.04	2.94	3.63	319.0
33	10.04	2.95	5.02	316.0
34	10.04	2.88	4.08	312.0
35	10.04	2.89	3.75	308.0
36	10.04	2.77	3.38	305.0
37	10.04	2.81	3.94	305.0
38	10.04	2.86	3.38	305.0
39	10.04	2.88	3.19	308.0
40	10.04	2.84	3.00	311.0
41	10.04	2.90	4.01	304.0
42	10.04	2.84	4.08	294.0
43	10.04	2.82	4.64	294.0
[illegible]	10.04	2.91	4.65	285.0
[illegible]	10.04	2.87	4.21	292.0
46	10.04	2.77	4.70	293.0
47	10.04	2.61	4.52	287.0
48	10.04	2.67	4.72	284.0
49	10.04	2.77	5.53	280.0

50	10.04	2.82	5.53	280.0

TABLE 3
CHO BALANCED TEST DATA

CLIENT: FX DROLET RUN NUMBER: 4 DATE: 6/29/93

PT	FLOW RATE (DSCFM w/HC)	DRY BURN RATE (LB/HOUR-CALCULATED)	STACK MOISTURE (%VOLUME-w/HC)	STACK TEMP (F)
51	9.58	2.66	5.15	286.0
52	10.04	2.74	4.51	296.0
53	10.04	2.56	4.52	287.0
54	10.04	2.39	4.97	280.0
55	9.58	2.40	4.87	273.0
56	9.58	3.23	4.74	275.0
57	9.58	2.39	4.84	282.0
58	9.58	2.37	4.52	287.0

July 8, 1993

PLEASE ADDRESS ALL CORRESPONDENCE TO:
609 CHARLES ST., BILLINGS, MT 59102
TELEPHONE: (406) 252-5818
FAX: (406) 252-5818

ENERGY & ENVIRONMENTAL
SYSTEMS PERFORMANCE CORP.
1315 S. Central Ave., Unit C
Kent, WA 98032

Sample identification by
EESPC

FX Drolet HT2000 Run 4

Kind of sample reported to us Wood

Sample taken at ------

Sample taken by ------

Date sampled June 29, 1993

Date received July 6, 1993

Analysis Report No. 51-44239

SHORT PROXIMATE ANALYSIS

	As Received	Dry Basis		
% Moisture	9.72	xxxxx		
% Ash	0.04	0.04		
Btu/lb	7797	8637	**MAF**	8640
% Sulfur	xxxxx	xxxxx		

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Billings Laboratory

TABLE 1

RESULTS OF EFFICIENCY TESTING ON THE FX DROLET WOOD STOVE

RUN NUMBER 6   PROJECT NUMBER   SERIAL NUMBER C1103

DATE OF TEST: 7/1/93   STOVE MODEL: HT2000

AVERAGE EFFICIENCIES

¶

COMBUSTION= 98.0 ¶ %	HEAT TRANS.= 49.9 ¶ %	OVERALL= 48.9 ¶ %

EMISSIONS

¶

PARTICULATES:	1.164	(grams/Kg-wood)	5.812	(grams/hour)
CARBON MONOXIDE:	21.480	(grams/Kg-wood)	107.271	(grams/hour)

TEST DATA

BURN RATE	13.45	(lb/hr-wet)
BURN RATE	4.99	(kg/hr-dry)
BURN RATE	6.10	(kg/hr-wet)
FUEL MOISTURE	18.16	(% Wet basis)
HEAT OUTPUT	46624.77	(Btu/hr)
FUEL HIGHER HEATING VALUE	8663.00	(Btu/lb-dry)
AVERAGE STACK FLOW RATE	40.77	(DSCF/minute w/HC)
AIR TO FUEL RATIO	17.29	(lb-air/lb-fuel)
AVERAGE EXCESS AIR	152.82	(% Stoichiometric)
AVERAGE STACK TEMPERATURE	778.09	(Degrees F)
AVERAGE STACK MOISTURE	8.58	(% volume-wet w/HC)
AVERAGE CO2	7.17	(% volume-dry w/HC)
AVERAGE O2	12.94	(% volume-dry w/HC)
AVERAGE CO	0.13	(% volume-dry w/HC)

-> 20   08:58:04

48.1992   07-16-1993

OVERALL EFFICIENCY WITHOUT STOVE TEMPERATURE CHANGE= 47.9 %

TABLE 2B
FIELD DATA

CLIENT: FX DROLET RUN NUMBER: 6 DATE: 7/1/93

			Dry and HC free					
PT	TIME	WT. FUEL	%CO2	%O2	%CO	WT BLB	DRY BLB	TRACER
1	0	21.30	5.50	14.40	0.11	138.0	604.0	250.0
2	5	19.40	10.60	10.40	0.14	153.0	941.0	250.0
3	10	16.90	9.60	10.80	0.12	156.0	960.0	250.0
4	15	15.00	9.80	10.60	0.11	157.0	958.0	250.0
5	20	13.20	10.10	10.00	0.15	157.0	970.0	250.0
6	25	11.20	10.90	9.00	0.10	157.0	983.0	250.0
7	30	9.60	8.50	11.70	0.05	152.0	862.0	250.0
8	35	8.20	7.80	12.40	0.05	150.0	831.0	250.0
9	40	7.10	7.30	12.80	0.05	148.0	805.0	250.0
10	45	6.00	7.00	13.10	0.05	148.0	788.0	250.0
11	50	5.10	6.80	13.20	0.06	147.0	784.0	250.0
12	55	4.20	7.00	13.00	0.04	147.0	779.0	250.0
13	60	3.40	6.70	13.40	0.05	144.0	750.0	250.0
14	65	2.80	6.80	13.20	0.06	143.0	749.0	250.0
15	70	2.20	6.40	13.60	0.07	142.0	724.0	250.0
16	75	1.70	5.60	14.40	0.10	139.0	678.0	250.0
17	80	1.20	4.70	15.50	0.20	138.0	639.0	250.0
18	85	0.70	4.50	15.50	0.31	136.0	613.0	250.0
[illegible]	90	0.30	4.50	15.60	0.38	135.0	598.0	225.0
20	95	0.00	4.30	15.70	0.41	135.0	587.0	225.0

TABLE 3
CHO BALANCED TEST DATA

CLIENT: FX DROLET RUN NUMBER: 6 DATE: 7/1/93

PT	FLOW RATE (DSCFM w/HC)	DRY BURN RATE (LB/HOUR-CALCULATED)	STACK MOISTURE (%VOLUME-w/HC)	STACK TEMP (F)
1	40.32	7.53	7.88	604.0
2	40.32	18.21	8.19	941.0
3	40.32	15.39	12.71	960.0
4	40.32	15.70	14.72	958.0
5	40.32	15.74	14.10	970.0
6	40.32	16.54	13.43	983.0
7	40.32	12.99	10.67	862.0
8	40.32	11.82	8.95	831.0
9	40.32	10.78	9.21	805.0
10	40.32	10.28	10.14	788.0
11	40.32	9.78	8.94	784.0
12	40.32	10.05	9.22	779.0
13	40.32	9.78	6.77	750.0
14	40.32	9.78	5.52	749.0
15	40.32	9.13	5.67	724.0
16	40.32	7.87	4.69	678.0
17	40.32	7.06	5.82	639.0
18	40.32	6.63	5.13	613.0
19	44.80	7.82	4.95	598.0
20	44.80	7.32	5.61	587.0

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (708) 953-9300
Member of the SGS Group (Société Générale de Surveillance)

July 15, 1993

PLEASE ADDRESS ALL CORRESPONDENCE TO:
609 CHARLES ST., BILLINGS, MT 59102
TELEPHONE: (406) 252-5818
FAX: (406) 252-5818

ENERGY & ENVIRONMENTAL
SYSTEMS PERFORMANCE CORP.
1315 S. Central Ave., Unit C
Kent, WA 98032

Sample identification by
EESPC

FX FT 2000 Run 6

Kind of sample reported to us Wood

Sample taken at ------

Sample taken by ------

Date sampled July 1, 1993

Date received July 13, 1993

Analysis Report No. 51-44274

SHORT PROXIMATE ANALYSIS

	As Received	Dry Basis		
% Moisture	8.50	xxxxx		
% Ash	xxxxx	xxxxx		
Btu/lb	7927	8663	MAF	xxxxx
% Sulfur	xxxxx	xxxxx		

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Billings Laboratory

TABLE 1

RESULTS OF EFFICIENCY TESTING ON THE FX DROLET WOOD STOVE

RUN NUMBER 3   PROJECT NUMBER   SERIAL NUMBER C1103

DATE OF TEST: 6/28/93   STOVE MODEL: HT2000

AVERAGE EFFICIENCIES

¶
****
* COMBUSTION= %101.5 ¶ % * HEAT TRANS.= 56.4 ¶ % * OVERALL= 57.2 ¶ % *
****

EMISSIONS

¶
****
* PARTICULATES: 2.654 (grams/Kg-wood) 11.473 (grams/hour) *
* CARBON MONOXIDE: 26.557 (grams/Kg-wood) 114.797 (grams/hour) *
****

TEST DATA

BURN RATE===================================>	11.95	(lb/hr-wet)
BURN RATE===================================>	4.32	(kg/hr-dry)
BURN RATE===================================>	5.42	(kg/hr-wet)
FUEL MOISTURE ==============================>	20.22	(% Wet basis)
HEAT OUTPUT=================================>	47006.57	(Btu/hr)
FUEL HIGHER HEATING VALUE===================>	8624.00	(Btu/lb-dry)
AVERAGE STACK FLOW RATE=====================>	35.22	(DSCF/minute w/HC)
AIR TO FUEL RATIO===========================>	17.36	(lb-air/lb-fuel)
AVERAGE EXCESS AIR==========================>	134.21	(% Stoichiometric)
AVERAGE STACK TEMPERATURE===================>	764.81	(Degrees F)
AVERAGE STACK MOISTURE =====================>	7.90	(% volume-wet w/HC)
AVERAGE CO2=================================>	7.47	(% volume-dry w/HC)
AVERAGE O2==================================>	12.44	(% volume-dry w/HC)
AVERAGE CO==================================>	0.17	(% volume-dry w/HC)

-> 23   10:00:27
54.09755   07-09-1993

OVERALL EFFICIENCY WITHOUT STOVE TEMPERATURE CHANGE= 55.8 %

TABLE 3
CHO BALANCED TEST DATA

CLIENT: FX DROLET RUN NUMBER: 3 DATE: 6/28/93

PT	FLOW RATE (DSCFM w/HC)	DRY BURN RATE (LB/HOUR-CALCULATED)	STACK MOISTURE (%VOLUME-w/HC)	STACK TEMP (F)
1	39.28	18.58	3.66	775.0
2	35.71	12.92	6.15	954.0
3	35.71	15.58	8.07	999.0
4	35.71	13.08	10.42	922.0
5	35.71	12.81	11.62	913.0
6	35.71	11.65	11.33	888.0
7	35.71	11.77	10.61	867.0
8	35.71	10.46	9.08	828.0
9	35.71	9.99	7.42	816.0
10	35.71	9.82	7.42	816.0
11	35.71	10.21	6.87	820.0
12	35.71	10.28	4.33	815.0
13	35.71	10.19	5.34	785.0
14	35.71	8.70	5.35	763.0
15	35.71	8.97	6.33	756.0
16	35.71	8.25	6.58	733.0
17	35.71	6.10	6.61	654.0
18	35.71	5.45	8.95	602.0
[illegible]	32.73	5.05	7.47	595.0
20	32.73	4.85	8.70	570.0
21	32.73	4.93	8.09	558.0
22	32.73	4.70	10.90	539.0
23	32.73	4.84	11.35	536.0

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (708) 953-9300
Member of the SGS Group (Société Générale de Surveillance)

July 8, 1993

PLEASE ADDRESS ALL CORRESPONDENCE TO:
609 CHARLES ST., BILLINGS, MT 59102
TELEPHONE: (406) 252-5818
FAX: (406) 252-5818

ENERGY & ENVIRONMENTAL
SYSTEMS PERFORMANCE CORP.
1315 S. Central Ave., Unit C
Kent, WA 98032

Sample identification by
EESPC

FX Drolet HT2000 Run 3

Kind of sample reported to us Wood

Sample taken at ------

Sample taken by ------

Date sampled June 28, 1993

Date received July 6, 1993

Analysis Report No. 51-44238

SHORT PROXIMATE ANALYSIS

	As Received	Dry Basis		
% Moisture	8.65	xxxxx		
% Ash	0.07	0.08		
Btu/lb	7878	8624	MAF	8631
% Sulfur	xxxxx	xxxxx		

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Billings Laboratory

TABLE 1

RESULTS OF EFFICIENCY TESTING ON THE FX DROLET WOOD STOVE

RUN NUMBER 5 PROJECT NUMBER SERIAL NUMBER C1103

DATE OF TEST: 6/30/93 STOVE MODEL: HT2000

AVERAGE EFFICIENCIES

¶
****
* COMBUSTION= 92.6 ¶ % * HEAT TRANS.= 81.6 ¶ % * OVERALL= 75.6 ¶ % *
****

EMISSIONS

¶
****
* PARTICULATES: 1.068 (grams/Kg-wood) 1.283 (grams/hour) *
* CARBON MONOXIDE: 140.401 (grams/Kg-wood) 168.652 (grams/hour) *
****

TEST DATA

BURN RATE==================================>	3.26	(lb/hr-wet)
BURN RATE==================================>	1.20	(kg/hr-dry)
BURN RATE==================================>	1.48	(kg/hr-wet)
FUEL MOISTURE =============================>	18.75	(% Wet basis)
HEAT OUTPUT================================>	17381.23	(Btu/hr)
FUEL HIGHER HEATING VALUE==================>	8685.00	(Btu/lb-dry)
AVERAGE STACK FLOW RATE====================>	7.47	(DSCF/minute w/HC)
AIR TO FUEL RATIO==========================>	13.16	(lb-air/lb-fuel)
AVERAGE EXCESS AIR=========================>	88.70	(% Stoichiometric)
AVERAGE STACK TEMPERATURE==================>	348.19	(Degrees F)
AVERAGE STACK MOISTURE ====================>	7.40	(% volume-wet w/HC)
AVERAGE CO2================================>	8.52	(% volume-dry w/HC)
AVERAGE O2=================================>	10.73	(% volume-dry w/HC)
AVERAGE CO=================================>	1.14	(% volume-dry w/HC)

1 --> 82
74.15474
OVERALL EFFICIENCY WITHOUT STOVE TEMPERATURE CHANGE= 74.6 %

16:13:49
07-13-1993

TABLE 2A
TEST DATA LISTING

CLIENT: FX DROLET

RUN NUMBER: 5

DATE OF TEST: 6/30/93

PROJECT NUMBER:
FUEL MOISTURE: 23.073
BAROMETRIC PRESSURE (in Hg): 30.06
STOVE WEIGHT (lbs): 487
CHANGE IN STOVE TEMPERATURE(F): -123
FUEL COMPOSITION: %C= 51 %H 7.3
METHOD 5 RESULTS: % MOISTURE= 7.4047

MODEL NUMBER: HT2000
STACK STATIC PRESSURE(in Hg):-.0038246
ROOM TEMPERATURE (F): 85
AMBIENT MOISTURE CONTENT (%): 1.4
FUEL HHV (BTU/lb): 8685
%O= 41
GRAIN LOADING (gr/scf)= .0442

50	245	2.10	6.80	12.20	1.44	113.0	272.0	775.0

TABLE 2B
FIELD DATA

CLIENT: FX DROLET   RUN NUMBER: 5   DATE: 6/30/93

PT	TIME	WT. FUEL	Dry and HC free %CO2	%O2	%CO	WT BLB	DRY BLB	TRACER
51	250	2.00	6.40	12.70	1.32	113.0	272.0	775.0
52	255	2.00	6.30	12.70	1.39	112.0	268.0	775.0
53	260	1.90	6.10	12.80	1.52	112.0	264.0	775.0
54	265	1.90	6.00	12.90	1.58	112.0	264.0	775.0
55	270	1.80	6.80	13.00	1.68	112.0	261.0	775.0
56	275	1.70	5.40	13.40	1.73	108.0	258.0	775.0
57	280	1.70	5.40	13.40	1.81	111.0	256.0	775.0
58	285	1.60	5.20	13.50	1.89	111.0	256.0	775.0
59	290	1.50	5.00	13.70	1.96	110.0	251.0	775.0
60	295	1.50	5.20	13.50	1.90	110.0	251.0	775.0
61	300	1.50	5.20	13.50	1.88	111.0	248.0	800.0
62	305	1.40	5.50	13.30	1.77	110.0	248.0	800.0
63	310	1.30	5.40	13.50	1.86	111.0	247.0	800.0
64	315	1.30	6.30	13.50	1.78	111.0	247.0	800.0
65	320	1.20	6.30	13.50	1.76	110.0	243.0	800.0
66	325	1.20	6.30	13.50	1.82	109.0	243.0	800.0
67	330	1.10	5.10	13.80	2.00	109.0	243.0	800.0
68	335	1.00	4.90	13.70	1.99	110.0	241.0	800.0
[illegible]	340	0.90	4.90	14.00	1.74	110.0	241.0	775.0
70	345	0.80	5.10	13.70	1.81	108.0	223.0	825.0
71	350	0.80	5.20	13.70	1.74	110.0	223.0	850.0
72	355	0.70	5.30	13.60	1.72	112.0	223.0	850.0
73	360	0.60	5.50	13.40	1.72	116.0	224.0	825.0
74	365	0.50	5.50	13.50	1.64	119.0	224.0	850.0
75	370	0.50	5.60	13.40	1.57	119.0	223.0	850.0
76	375	0.40	5.40	13.60	1.73	119.0	223.0	850.0
77	380	0.30	5.20	13.70	1.82	119.0	223.0	850.0
78	385	0.30	5.00	14.00	1.92	119.0	222.0	850.0
79	390	0.20	4.60	14.30	2.20	119.0	222.0	825.0
80	395	0.10	4.10	14.60	2.26	118.0	222.0	800.0
81	400	0.10	4.10	14.80	2.23	118.0	222.0	800.0
82	405	0.00	4.30	14.90	1.84	117.0	218.0	800.0

TABLE 3
CHO BALANCED TEST DATA

CLIENT: FX DROLET

RUN NUMBER: 5 DATE: 6/30/93

PT	FLOW RATE (DSCFM w/HC)	DRY BURN RATE (LB/HOUR-CALCULATED)	STACK MOISTURE (%VOLUME-w/HC)	STACK TEMP (F)
1	0.00	0.00	5.16	356.0
2	0.00	0.00	4.07	631.0
3	0.00	0.00	4.18	443.0
4	0.00	0.00	4.87	445.0
5	0.00	0.00	4.74	447.0
6	0.00	0.00	5.97	483.0
7	0.00	0.00	6.88	483.0
8	0.00	0.00	7.08	495.0
9	0.00	0.00	8.15	493.0
10	0.00	0.00	9.35	489.0
11	0.00	0.00	9.17	492.0
12	0.00	0.00	9.47	487.0
13	0.00	0.00	8.74	483.0
14	0.00	0.00	7.72	469.0
15	0.00	0.00	7.96	450.0
16	0.00	0.00	7.99	435.0
17	0.00	0.00	7.15	449.0
18	0.00	0.00	7.66	455.0
[illegible]	0.00	0.00	6.18	465.0
20	0.00	0.00	6.48	460.0
21	0.00	0.00	6.48	460.0
22	0.00	0.00	6.96	452.0
23	0.00	0.00	6.34	421.0
24	0.00	0.00	6.30	396.0
25	0.00	0.00	8.00	381.0
26	0.00	0.00	5.31	376.0
27	0.00	0.00	5.43	374.0
28	0.00	0.00	5.47	362.0
29	0.00	0.00	5.22	355.0
30	0.00	0.00	5.85	345.0
31	0.00	0.00	5.62	338.0
32	0.00	0.00	6.06	331.0
33	0.00	0.00	5.08	326.0
34	0.00	0.00	5.91	323.0
35	0.00	0.00	5.91	323.0
36	0.00	0.00	5.59	318.0
37	0.00	0.00	5.71	316.0
38	0.00	0.00	5.71	316.0
39	0.00	0.00	6.47	304.0
40	0.00	0.00	6.17	299.0
41	0.00	0.00	6.17	299.0
42	0.00	0.00	6.42	295.0
43	0.00	0.00	6.67	291.0
44	0.00	0.00	6.67	291.0
45	0.00	0.00	7.55	287.0
46	0.00	0.00	7.06	285.0
47	0.00	0.00	6.12	281.0
48	0.00	0.00	6.24	279.0
49	0.00	0.00	7.69	275.0

50	0.00	0.00	7.28	272.0

TABLE 3
CHO BALANCED TEST DATA

CLIENT: FX DROLET RUN NUMBER: 5 DATE: 6/30/93

PT	FLOW RATE (DSCFM w/HC)	DRY BURN RATE (LB/HOUR-CALCULATED)	STACK MOISTURE (%VOLUME-w/HC)	STACK TEMP (F)
51	0.00	0.00	7.28	272.0
52	0.00	0.00	6.94	268.0
53	0.00	0.00	7.20	264.0
54	0.00	0.00	7.20	264.0
55	0.00	0.00	7.39	261.0
56	0.00	0.00	5.37	258.0
57	0.00	0.00	7.14	256.0
58	0.00	0.00	7.14	256.0
59	0.00	0.00	6.90	251.0
60	0.00	0.00	6.90	251.0
61	0.00	0.00	7.65	248.0
62	0.00	0.00	7.09	248.0
63	0.00	0.00	7.71	247.0
64	0.00	0.00	7.71	247.0
65	0.00	0.00	7.41	243.0
66	0.00	0.00	6.86	243.0
67	0.00	0.00	6.86	243.0
68	0.00	0.00	7.54	241.0
[illegible]	0.00	0.00	7.54	241.0
70	0.00	0.00	7.62	223.0
71	0.00	0.00	8.69	223.0
72	0.00	0.00	9.81	223.0
73	0.00	0.00	12.16	224.0
74	0.00	0.00	14.11	224.0
75	0.00	0.00	14.17	223.0
76	0.00	0.00	14.17	223.0
77	0.00	0.00	14.17	223.0
78	0.00	0.00	14.23	222.0
79	0.00	0.00	14.23	222.0
80	0.00	0.00	13.57	222.0
81	0.00	0.00	13.57	222.0
82	0.00	0.00	13.17	218.0

COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 1919 SOUTH HIGHLAND AVE., SUITE 210-B, LOMBARD, ILLINOIS 60148 • (708) 953-9300
SINCE 1908
Member of the SGS Group (Société Générale de Surveillance)

July 8, 1993

PLEASE ADDRESS ALL CORRESPONDENCE TO:
609 CHARLES ST., BILLINGS, MT 59102
TELEPHONE: (406) 252-5818
FAX: (406) 252-5818

ENERGY & ENVIRONMENTAL
SYSTEMS PERFORMANCE CORP.
1315 S. Central Ave., Unit C
Kent, WA 98032

Sample identification by
EESPC

FX Drolet HT2000 Run 5

Kind of sample reported to us Wood

Sample taken at ------

Sample taken by ------

Date sampled June 30, 1993

Date received July 6, 1993

Analysis Report No. 51-44240

SHORT PROXIMATE ANALYSIS

	As Received	Dry Basis		
% Moisture	10.03	xxxxx		
% Ash	0.04	0.05		
Btu/lb	7814	8685	MAF	8689
% Sulfur	xxxxx	xxxxx		

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Manager, Billings Laboratory